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Natural Resource Consultants

Range Road Dump Stabilization Project

CRE-53-06

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ABSTRACT

A diversion channel isolated McIntyre Creek near Whitehorse from its original channel, which was located at the toe of the abandoned Range Road dump. The upstream end of the diversion channel was actively eroding, and there was a high degree of risk that the creek would eventually return to its original channel. If this occurred, it was likely that refuse and associated contaminants would be released into the Yukon River. To reduce this risk, a secondary berm in an area downstream of the active erosion was constructed in 2006. As such, McIntyre Creek will be able to erode its bank and move laterally until it reaches the secondary berm, which will prevent the creek from reaching the toe of the dump.

ACKNOWLEDGEMENTS

The Yukon River Panel Restoration and Enhancement Fund provided funding for this project. The City of Whitehorse provided in-kind donations of heavy equipment (Excavator and Loader) and operators which helped make this project possible. Specifically, we would like to thank Gordon Smith for coordination of the project on behalf of the City. Al Malloy and Trevor Miller, from the City provided equipment operation services. Technical review and assistance to the project was provided by Al von Finster with Fisheries and Oceans Canada. Hugh Monaghan, Executive Secretary of the Yukon River Panel, provided administrative direction and assistance. Emmie Fairclough, Ta'an Kwäch'än Renewable Resources Management Coordinator, provided general project direction and logistical assistance. Fred and Nolan Charlie, Jack Kodwat and Kathy Belisle helped with the harvest and planting operation.

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1.0 INTRODUCTION

The Range Road dumpsite is located within the City of Whitehorse, Yukon at the confluence of McIntyre Creek and the Yukon River (Figure 1). The U.S. Army established the dumpsite in the early 1940's during World War II, although the extent of use is unclear (Stanley Associates 1992). The site served as the primary Whitehorse landfill from about 1949 until the late 1970's (von Finster 1993). Refuse was first dumped to the east over the edge of the escarpment and deposited directly into the Yukon River and later refuse was dumped to the north east, into the lower McIntyre Creek valley. During the early 1970's, the Range Road Dump was abandoned following a mass movement of refuse which blocked the creek (von Finster 1993). A diversion channel was constructed to the north of the slide, which forms the current channel of the creek. Spoil from the channel was used to construct a berm between the diversion channel and the refuse-blocked lower reach of McIntyre Creek. The combination of the new channel and the berm has isolated the dumpsite from McIntyre Creek.

Currently the creek is eroding the upstream end of the berm (photos 1 and 2). If this was to continue, McIntyre Creek would eventually breach the berm and flow into its original channel. This would result in the mobilization of both refuse and contaminants from the dumpsite into the Yukon River. As such, the Ta'an Kwäch'än Council (TKC) proposed to construct a secondary berm away from the stream channel that would prevent McIntrye Creek from entering the toe of the dump, should the old berm breach (Figure 2). The objectives of this project as listed in the project proposal included:

1. Help prevent McIntyre Creek from moving into the toe of the Range Road Dump and releasing contaminants into the Yukon River.
2. Provide training, stewardship, employment opportunities, and build capacity in the TKC Traditional Territory.
3. Promote awareness of salmon, and foster a stewardship ethic within the City of Whitehorse.

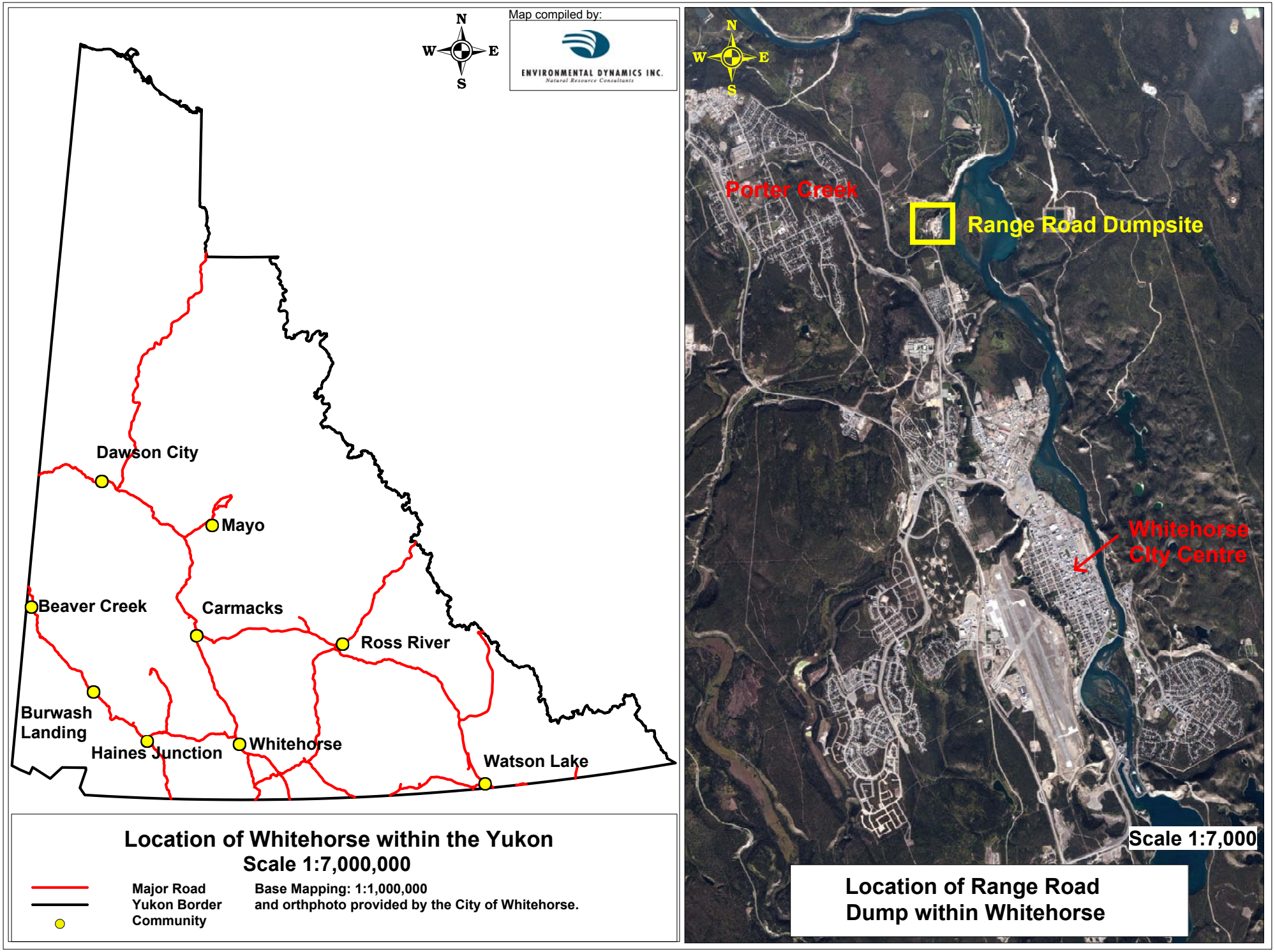

Figure 1. Study Area Map.

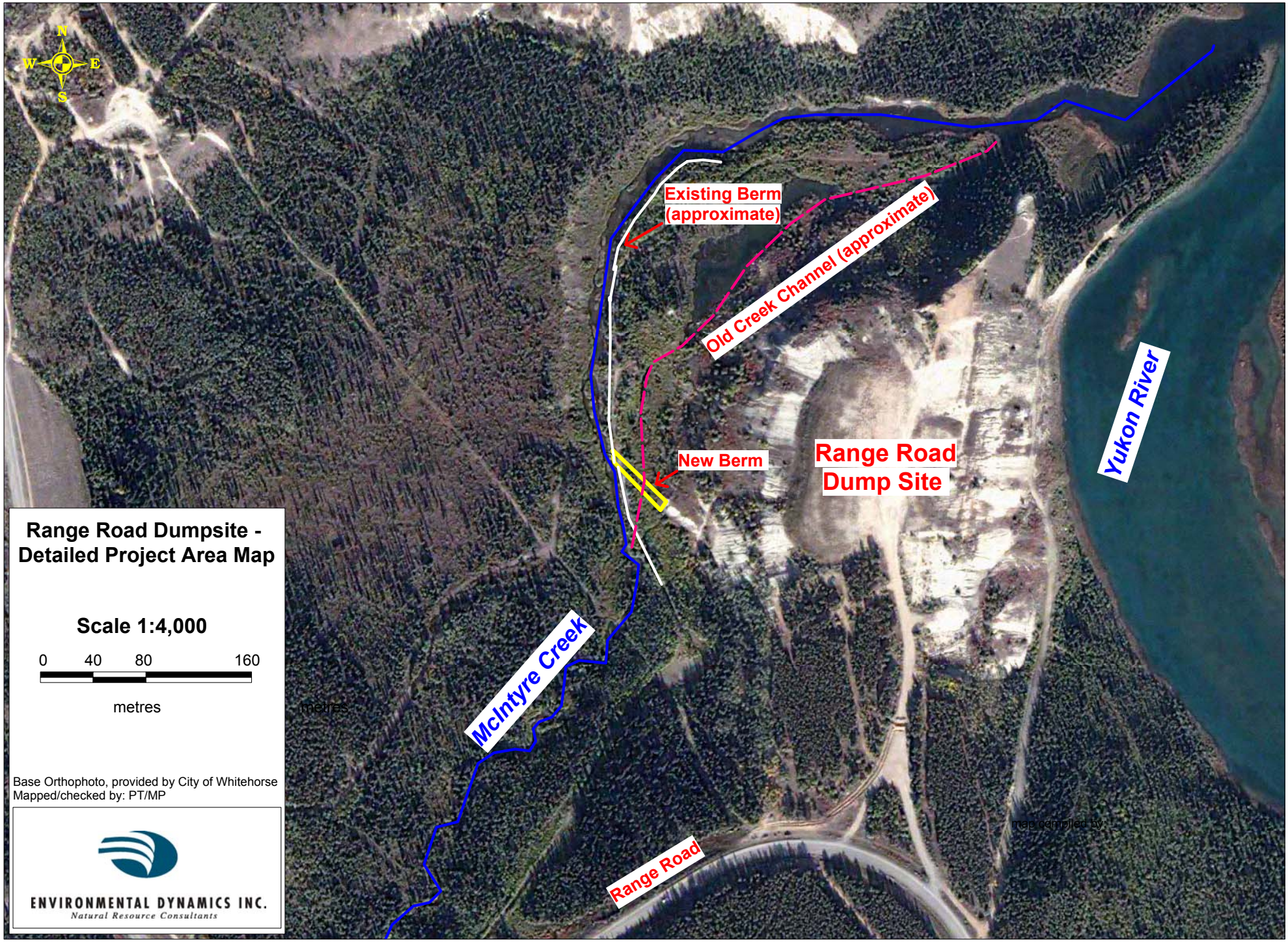

Figure 2. Detailed site orthophoto including locations of prescription.

Photo 1. Downstream view of McIntyre Creek at the upstream end of existing berm. Significant undercutting of the bank adjacent to the berm has occurred at this site.

Photo 2. Downstream view of McIntyre Creek near the upstream end of berm. Significant erosion of the berm has occurred at this site.

1.1 Project Area

The Yukon River in the area of the project and McIntyre Creek provide habitat for many fish species, including economically and culturally important species (Table 1). The section of McIntyre Creek adjacent to the upstream section of the old berm is aggrading. It is essentially one long riffle/run habitat with a bed material composed mainly of gravels. There appears to be little physical fish habitat complexity; however, the approximate location has been documented to be used by juvenile chinook salmon. Beniston and Lister (1991) documented the highest levels of chinook salmon (in pocket water and to a lesser extent in run habitats) for McIntyre Creek in the section from Range Road extending 796 m downstream. This area also serves as important migration habitat for adult chinook salmon, which spawn in upstream areas of McIntyre Creek.

Table 1. Common fish species that may be present near the study area. These and additional species have been documented in the Yukon River and/or McIntryre Creek (adapted from FISS, 2005[1] and von Finster 2003).

Category	Common Name	Scientific Name
Salmon species	chinook salmon	*Oncorhynchus tshawytscha*
Freshwater game fish species[3]	Arctic grayling	*Thymallus arcticus*
	broad whitefish	*Coregonus nasus*
	lake whitefish	*Coregonus clupeaformis*
	burbot	*Lota lota*
	inconnu	*Stenodus leucichthys*
	rainbow trout[2]	*Oncorhynchus mykiss*
	Arctic char[2]	*Salvelinus alpinus*
	northern pike	*Esox lucius*
	least cisco	*Coregonus sardinella*
	lake trout	*Salvelinus namaycush*
Other fish species	longnose sucker	*Catostomus catostomus*
	lake chub	*Couesius plumbeus*
	slimy sculpin	*Cottus cognatus*
	pygmy whitefish	*Prosopium coulteri*
	round whitefish	*Prosopium cylindraceum*

[1] Additional fish species listed in FISS were not included due to specific reasons, i.e. chum salmon and Arctic lamprey have not been documented in this portion of the watershed and Dolly Varden are only present in the upper portions of Yukon River watershed.
[2] These species are not native to these streams.
[3] As categorized by the Yukon Territorial Government freshwater fishery regulations.

Both McIntyre Creek and the Yukon River are regulated by upstream hydro-electrical developments. McIntyre Creek flows have been augmented by the capture of the Fish Lake and upper Porter Creek watersheds by the Yukon Electrical Company Limited's Whitehorse Power project (von Finster 1993). As such, flows in the creek are very stable throughout the year.

2.0 METHODS

This project included implementing a stream stabilization bioengineering prescription developed in 2005 (Tobler, 2006). In the interest of providing the relevant background information on the project, important details from 2005 prescription works have been included (Section 2.1).

2.1 Prescription Development (2005)

In the spring of 2005, the site was visited by the project team (biologists/bioengineer/TKC) and other stakeholders (i.e. DFO, the City of Whitehorse). The prescription developed to prevent the berm from entering the toe of the dump was the construction of a secondary berm (stabilized with bioengineering) away from the current stream channel which the stream will eventually erode to. Specifics of the prescribed berm are presented in the report for project CRE53N-05 (Tobler 2006), a profile of the berm site is presented in Figure 3.

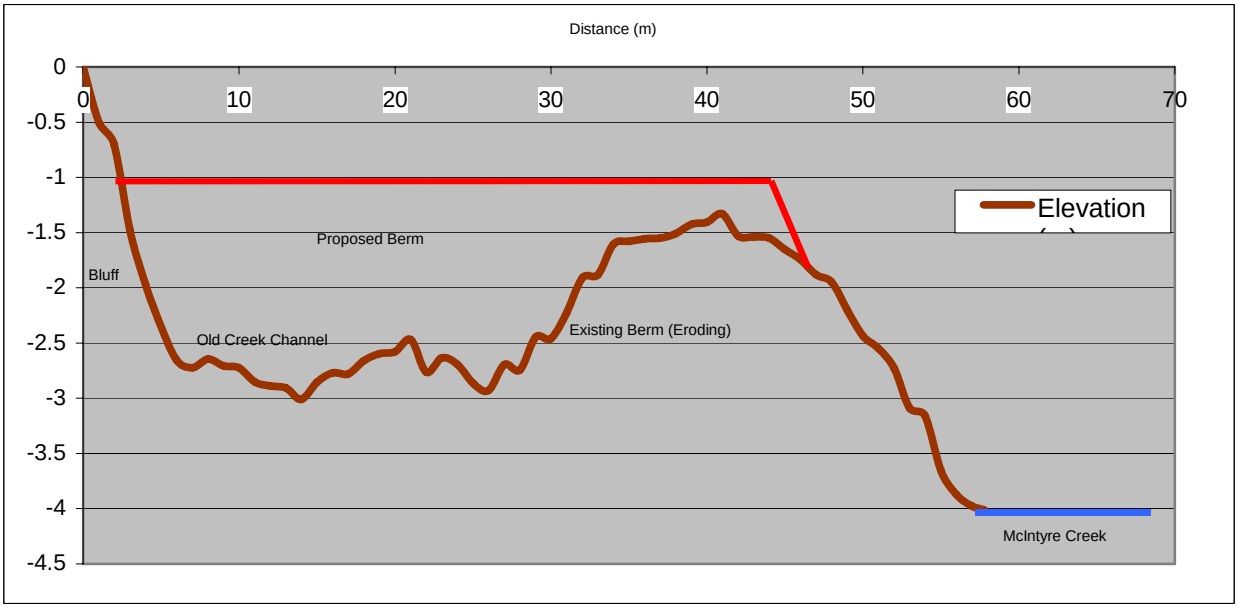

Figure 3: Longitudinal profile of proposed berm site**.**

The proposed new berm was designed to tie into the existing berm at the downstream end. It was to extend approximately 42 m to connect into an existing hill slope (see Figure 2). It was proposed to be constructed of approximately 360 m^3 of granular fill material. This was based on a berm height of approximately 0.5 m above the height of the existing berm (at the surveyed location), the top of the berm being 2 m wide and the slopes of the berm being 2:1[1]. This material was to be hauled in, as no such material is available on site. The material was to be trucked to the top of the dumpsite and moved down the slope via bulldozer to the new berm location.

As the berm was planned for an area outside of the high water mark a water license was not required. A land-use permit (YA5X167) was obtained as part of the 2005 prescription works.

[1] The backside of the berm could have a slope as high as 1:1 if the material brought in is inadequate to achieve 2:1.

2.2 Berm Construction (2006)

The construction works were directed and overseen by a biologist from Environmental Dynamics assisted by two TKC Technicians. Equipment works were completed by the City of Whitehorse and Castle Rock Enterprises. A detailed description of the construction process is presented in Section 3.0.

3.0 RESULTS/DISCUSSION

The following sections outline the results/discussion for the project.

3.1 Willow and Poplar Harvest

Two members of the TKC, along with a Project Biologist, harvested willows (*Salix* spp.) and balsam poplar (*Populus balsamifera*) from local donor sites. Donor sites were located along quad trails/old roads in the vicinity of the dump site and at a gravel pit site approximately 60 km west of Whitehorse. These sites were selected because they were not located in sensitive areas and were within general distance guidelines suggested for bioengineering works. Polster (pers. comm. 2006) suggests a general rule of locating donor sites within 300 m elevation and 100 km horizontal distance from the planting site. The cuttings were soaked in Long Lake and/or McIntyre Creek for up to two weeks to keep them moist and aid in rooting success[1].

3.2 Fill Material Delivery and Transport to Berm Site

The initial project plan called for 360 m^3 of fill material to be pushed down the slope from the top of the dumpsite. While this amount of material accounted for some loss (approximately 220 m^3 was needed for the berm), further inspection by the construction crew (including City of Whitehorse personnel) revealed that significantly more material was required. The issue was that it was a significantly long (approx 200 m) push down a very steep slope, with some extreme pitches. Essentially, to ensure that the cap material on the dumpsite was not significantly disturbed, additional fill material was needed to construct a road down to the berm location (photos 3 and 4).

It should be noted that all other transport alternatives were explored, including the use of old roads that lead from Range Road to the old berm. These roads were brushed in and wet and it was determined that significant road upgrade works would be required. As such, the original plan of pushing the material down the hill was determined to be most feasible. However, almost double the fill material budgeted was required (approx 685 m^3). The fill material delivered was inorganic pitrun.

[1] Polster Pers. Comm. (2005) indicates that soaking stems for a long duration (min 10 days) removes anti-rooting inhibitors.

Photo 3. View of bulldozer pushing fill material down the slope. Note that berm location is in the valley behind the trees (in the foreground).

Photo 4. Downslope view of path used by bulldozer to push material down slope.

Once all of the fill was delivered and the bulldozer pushed as much material downslope, the excavator bailed much of the fill material over the bottom slope in the location of the proposed berm (Photo 5).

Photo 5. Excavator bailing material over slope. Proposed berm location to the bottom left of the photo.

3.3 Berm Construction

As the ground in the area of the berm was soft, the excavator had to use the berm as a work platform. As such, material was placed in a layered fashion, with the excavator running back and forth on the top of the berm to compact the material. Three lifts or rows of brush layering were incorporated in the berm (Photos 6). Species used included willow (*Salix* spp.) and balsam poplar (*Populus balsamifera*), both of which are prevalent on the site at present.

Photo 6. Willow and poplar stakes incorporated into the berm (brush layers).

As the excavator had to use the berm as a work platform, the top of the berm ended up to be wider (> 2.2 m) than originally planned (2 m; Photo 7). As the wider berm required additional fill material, which was a limiting, it was decided that the slopes of berm would be reduced to 1.5:1, rather than the original design of 2:1. Given that the resulting berm is wider at the top and presumably stronger than the original design, this was not seen to be an issue that affected the objective of the berm.

The completed berm on average was over 0.75 m higher than the lowest portion of the existing berm (within 10 m of their intersection). Photos 8 and 9 demonstrate the angle of the berm in relation to McIntyre Creek which is conducive to directing the stream back into its channel following an upstream breach of the berm. In order to provide moisture for the brush layers, the berm was watered using a 2-inch pump. The berm was grass seeded with native seed. It should be noted that a significant rainfall event occurred in the area a few days following construction completion.

Photo 7. Berm nearing completion, taken from old berm location near McIntyre Creek.

Photo 8. Completed berm with McIntyre Creek in background (flowing left to right).

Photo 9. Completed berm with McIntyre Creek in the background.

The berm, constructed in 2006, should effectively prevent McIntyre Creek from entering an area of contaminants at the toe of the dump. While it may take McIntyre Creek a few years to erode to the toe of the new berm, this should allow the bioengineering works time to establish and stabilize the berm. It is anticipated that a dense wall of rooted material will establish (to help stabilize the berm) long before McIntyre Creek erodes to the toe of this berm. This work away from the channel will prevent the stream from moving into the contaminated area, while allowing for natural movement of the channel upstream of this point. This preventative measure should eliminate the need for future restoration works that would be much more complicated and costly (if the stream reached the toe of the dump).

Three TKC Technicians were employed and trained as part of this project. The Technicians gained knowledge on bioengineering techniques and the project philosophy of developing non-obtrusive measures to prevent a stream from entering an area of concern.

The TKC issued a press release to promote the project (Appendix A). In addition, the project was described at two-public presentations in association with a related clean-up project for the dumpsite. In general, the project has been well-received and will continue to be promoted as the TKC continue their efforts with the Range Road Dumpsite.

4.0 CONCLUSION/RECOMMENDATIONS

This project has succeeded in meeting the following objectives:

1. Helping to prevent McIntyre Creek from moving into the toe of the Range Road Dump and releasing contaminants into the Yukon River.
2. Providing training, stewardship, employment opportunities, and building capacity in the TKC Traditional Territory.
3. Promoting awareness of salmon, and fostering a stewardship ethic within the City of Whitehorse.

The performance of the berm should be monitored over the next few years. Data that should be collected include the components in Table 2:

Table 2. Details of monitoring.

Parameter Being Monitored	Action/Procedure
Elevation of the berm	Using a level and rod, determine if the minimum elevation of the crest of the new berm is higher than the crest of the old berm upstream of the site (within 10 m).
Success of brush layers	Evaluate the success of the brush layers. Select a representative section of each row of brush layers, and count the percentage of stems with live growth (min 50 stems for each row).
General observations of the site	Photos and notes on the site stability including comment on grass growth, erosion etc. Photos and evaluation should include the condition/erosion of the old berm upstream of the new berm.

This monitoring program should be completed on an annual basis in late summer for 5 years, or until the berm is deemed to be well-vegetated and stable.

It is also recommended that the berm be irrigated on a regular basis in the spring and summer of 2007. Provision of moisture should increase the probability of successful establishment of the brush layers.

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APPENDIX A:

Press Release

Media Advisory

TA'AN KWÄCH'ÄN COUNCIL PARTNERS WITH THE CITY OF WHITEHORSE TO PREVENT FUTURE CONTAMINATION OF SALMON BEARING WATERS.

The Ta'an Kwäch'än Council with assistance from biologists at EDI Environmental Dynamics Inc., is constructing a berm to prevent the lower portion of McIntyre Creek from re-entering a channel that is clogged with waste and debris from the historic Range Road dumpsite located near the confluence of McIntyre Creek and the Yukon River. This site, known in Southern Tutchone as *Chasàn Chù* ("copper creek"), is culturally important to the Ta'an Kwäch'än, serving as a traditional fishing camp and travel corridor up the creek valley to Fish Lake. Furthermore McIntyre Creek is a chinook salmon spawning and rearing stream and is important spring waterfowl habitat at the receiving waters in a side channel of the Yukon River.

The lower portion of McIntyre Creek (downstream of Range Road) was at one time moved from its route to isolate it from large volumes of dump waste and debris filling the channel and adjacent slope. The debris in this location began with a slope failure causing a large slide of waste and debris from the Range Road dumpsite to enter the stream channel. Subsequently, more waste and debris began to accumulate below this slope. Eventually, it was determined that the most effective means of halting the contamination of McIntyre Creek and the Yukon River was to move the creek to the other side of the valley and isolate it from the dump refuse. To accomplish this, a berm was constructed along the length of the stream. This berm isolated the stream from its historic channel until recently. McIntyre Creek has begun to erode the upstream end of the berm, threatening to re-enter its past route through dump waste and debris.

On September 13th Ta'an Kwäch'än Council and Environmental Dynamics began construction of a berm to remedy the situation. The construction includes building a new section of berm using bio-technical methods. The new berm section will prevent McIntyre Creek from re-entering its historic channel and becoming exposed to the large amounts of debris and waste. To minimize in-stream works, the berm will be located in an area set-back from the stream channel. The set-back will allow the stream to adjust naturally (i.e. erode towards the berm) and prevent the creek from entering the toe of the dumpsite. Funding for this portion of the project comes from the Yukon River Panel's Restoration and Enhancement Fund. The City of Whitehorse is also providing considerable in-kind assistance which includes provisions of heavy equipment and operators.

The Ta'an Kwäch'än Council has also been involved in a clean-up operation to remove large amounts of old dump waste/debris along the riparian areas of the Yukon River and the mouth of McIntyre Creek. Clean-up started in the spring and will commence in October, when water levels are low in the Yukon River. Funding for the cleanup was provided by the Yukon Government Community Development Fund.

For further information or comments, please contact:

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