



P.O. Box 21072
 Whitehorse, Y.T.
 Y1A 6P7

Office Phone: 867-668-6838
 Home Phone: 867-668-1043
 email: bonnieburns@northwestel.net

TECHNICAL MEMO

To: Steve Wilbur
 Victoria Gold

Date: October 21st, 2019

From: Bonnie Burns
 Laberge Environmental Services

Re: **EROSION CONTROL INSTALLATIONS AT SPECIFIC SITES, EAGLE GOLD PROJECT**

Bonnie Burns and Krystal Isbister of Laberge Environmental Services assessed five main areas of erosion concern at the Eagle Gold Project site from June 5th to 7th, 2019. These areas were examined and prescriptions for treatment devised. Donor sites for willow staking and bioengineering were also identified at this time. (See Technical Memo submitted on June 20th, 2019 for details.)

A custom reclamation seed mix was ordered from BrettYoung of Calmar, Alberta. Due to their small size, fowl bluegrass, ticklegrass and tufted hairgrass seeds were shipped in bags comprised of 16%, 26% and 58% respectively. Slender wheatgrass seeds were shipped in individual bags and applied separately due to their much larger size. The composition of the mix that was applied to the seeded areas is summarized below in Table 1.

TABLE 1 SEED MIX FOR EROSION CONTROL AT EAGLE GOLD PROJECT		
Common Name	Scientific Name	Percent Composition
Fowl bluegrass	<i>Poa palustris</i>	15
Tickle grass	<i>Agrostis scabra</i>	25
Tufted hairgrass	<i>Deschampsia caespitosa</i>	30
Slender wheatgrass	<i>Elymus trachycaulus</i>	30

Site #1 Lower Dublin South Pond and Weir

On September 20th and 21st, Katie Babin, Helaina Moses and Bryan Moses of Victoria Gold, and Bonnie Burns, Krystal Isbister and Patrick Soprovich of Laberge Environmental Services commenced the erosion control program. Willows were harvested from the donor site at W29 and staged at Site 1, Lower Dublin South Pond and Weir (LDSP).

Seeds were weighed and hand spread at the weir area and the surrounding slopes of the LDSP at a rate of 18.5 kg/ha. The small seed mix was spread by one person followed by a second person spreading the wheatgrass. This will ensure a much more even coverage rather than having them mixed together, due to the great variation in size. Willow staking was completed along the east shore of the pond.

On September 22nd and 23rd, the crew was joined by Yukon College students in the Environmental Monitoring Certification Program along with their instructor David Petkovich. The participating students were Kaleb Pritchett, Brett Marco-Wolftail, Jillian Mullett and Khole Caesar.

All crew members worked on willow staking, mostly along the stream between the silt fences which have captured significant soil and provide an excellent growth medium. Once the willows are established the silt fences can gradually be removed. In addition, two pole drains were constructed and installed in erosion channels. One wattle fence was established upslope of the other bioengineering works where significant erosion had occurred in the past. Coco-matting geotextile material was laid on the upslope side of the wattle fence to help control any undercutting.

The cutbank above the LDSP was seeded at a rate of 30.5 kg/ha due to the steepness of the slope. In addition, jute mats were overlain down the slope in 3 different areas and represents a trial for this technique.

Several plots of locally collected seed were set up at Site #1 on September 23rd. A crew with Yukon Seed and Restoration Inc (YSR) collected wheatgrass (*Elymus alaskanus*, 28 g), fescue (*Festuca saximontana*, 2 g) and bluejoint (*Calamagrostis canadensis*, <0.5 g) from the Elsa and Keno areas. YSR is a local company jointly owned by Na-Cho Nyäk Dun Development Corporation (NNDDC; 51%), Core Geosciences Services Inc. (Coregeo; 34%), and Maureen Huggard (15%).

On September 22nd Bonnie Burns (Laberge) and Helaina Moses (Victoria Gold) made some seed collections near W29. Plots were set up on September 23rd. The seed was not cleaned but spread along with the vegetative material which will add carbon and texture etc to the soil. Species collected were bluejoint and yarrow (*Achillea millefolium*).

Table 2 details the location of the installations and plots, and all activities are displayed on Figure 1.

TABLE 2 DESCRIPTION AND LOCATION OF INSTALLATIONS, SEPT 2019				
Description	Latitude	Longitude	Date Installed	Details
Y - pole drain	64° 1' 54.271"	135° 50' 21.109"	9/22/2019	total length, 5.5 m
long pole drain	64° 1' 54.397"	135° 50' 2.112"	9/22/2019	total length, 11.9 m
wattle fence	64° 1' 53.17"	135° 50' 20.371"	9/22/2019	
VG bluejoint plot	64° 1' 54.451"	135° 50' 20.818"	9/22/2019	0.8 m x 2 m
VG yarrow plot	64° 1' 54.592"	135° 50' 20.339"	9/22/2019	0.8 m x 1.2 m
VG another bluejoint plot	64° 1' 54.379"	135° 50' 21.401"	9/23/2019	1.6 m x 2m
YS wheatgrass plot	64° 1' 57.331"	135° 50' 27.528"	9/23/2019	1.7 m x 2.3 m
YS fescue plot	64° 1' 57.378"	135° 50' 27.344"	9/23/2019	0.7 m x 1.1 m
YS bluejoint plot	64° 1' 57.335"	135° 50' 27.002"	9/23/2019	0.4 m x 0.9 m

Site 2: Ditch C

Ditch C was seeded by Katie Babin and Jessica Wilkinson of Victoria Gold on October 2nd at a rate of 18.5 kg/ha (Figure 2).

Site 3: Heap Leach Embankment

As this area encompasses a total of 5 ha, it was divided into zones for ease of planning and seeding. Over the course of two days the heap leach embankment was hand seeded at a rate of 30.5 kg/ha (Figure 3). The application rate was increased here due to the steepness of the slope. The increased grass growth will provide more rapid erosion control.

Site 4: Event Pond and area

Zone 8 on the Event Pond embankment, an area of 1.2 ha, was seeded by Phil Emmerson and Jessica Wilkinson of Victoria Gold on Oct 6, 2019, at a rate of 30.5 kg/ha (Figure 3). The remaining areas of the event pond embankment were not seeded as soil preparation was required.

Site 5: Conveyor Belt Ditch

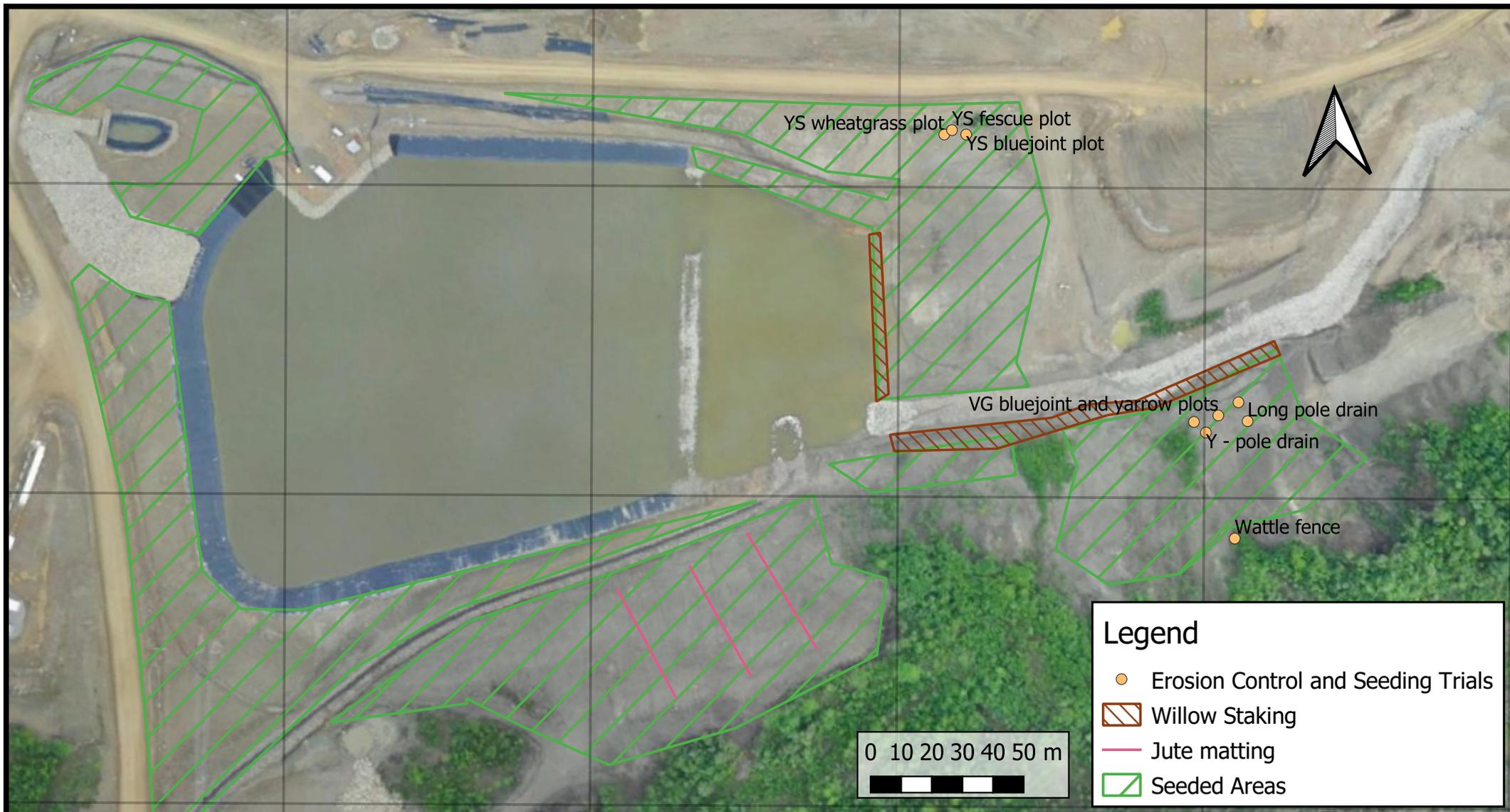
On September 22nd, willows were harvested from the donor site near surface water station, W26, Stewart Gulch. The collected willows were staged at the first creek crossing along the conveyor belt area. Staking was to commence that day but the ground was too frozen to allow for successful installation. It was hoped that warmer weather would occur within the next few days, however this was not the case and Site 5 did not receive any treatment in 2019.

Summary

Over the course of four days (Sept 20 to 23) approximately 7.15 ha were seeded with a combined effort of 70 person hours, broadcasting about 250 kg of seeds. This time included actual seeding only, not weighing or organizing the seed. Additional activities included classroom and hands-on training for Victorai Gold staff and Yukon College students, on site seed collections and bioengineering installations.

Recommendations for 2020

- If the stored harvested willows are still viable in the spring, stake along the banks of the creeks along the conveyor belt area. Apply the mixed seed and the wheatgrass seed at the 18.5 kg/ha rate. If the stakes have not survived winter storage, harvest fresh willow early in the spring prior to any bud development and install stakes and any bioengineering structures.
- Prepare the remaining slopes at the event pond embankment and apply the mixed seed and the wheatgrass seed at the 30.5 kg/ha rate in May or June – timing to be determined by weather and spring conditions.
- Conduct an assessment of each site in mid summer (July) and set up permanent plots and photo hubs at each of the 5 sites.
- Depending on the above assessment, apply seed to any areas missed or newly eroded areas. Only use the annual rye grass if it is at least late July to ensure that they do not produce seed and thus remain an annual grass.



7100900.0N

7100800.0N

7100700.0N

Legend

-  Erosion Control and Seeding Trials
-  Willow Staking
-  Jute matting
-  Seeded Areas

Notes:
 Seed mix: slender wheatgrass, fowl bluegrass, ticklegrass, tufted hairgrass
 Application rate: 18.5 kg/ha (around pond)
 30.5 kg/ha (cutbank)

Bioengineering species: feltleaf willow, little tree willow
 Seeding trial species: Alaska wheatgrass, rocky mountain fescue, bluejoint reedgrass, yarrow

Figure 1: Site 1 - Revegetation Areas September 2019

**Prepared by: Krystal Isbister
FloraTek Consulting**



Coordinate System: NAD 83/Yukon Albers

Mapping Software: QGIS 3.2.2

Date: October 10th, 2019

458100.0E

458200.0E

458300.0E

458400.0E

458500.0E

458600.0E

7101200.0N

7101100.0N

7101000.0N



Legend

 Seeded Areas

0 25 50 75 100 125 m



Notes:
 Seed mix: Slender wheatgrass, fowl bluegrass,
 ticklegrass and tufted hairgrass
 Application rate: 18.5 kg/ha

Figure 2: Site 2 - Ditch C Revegetation Areas October 2019

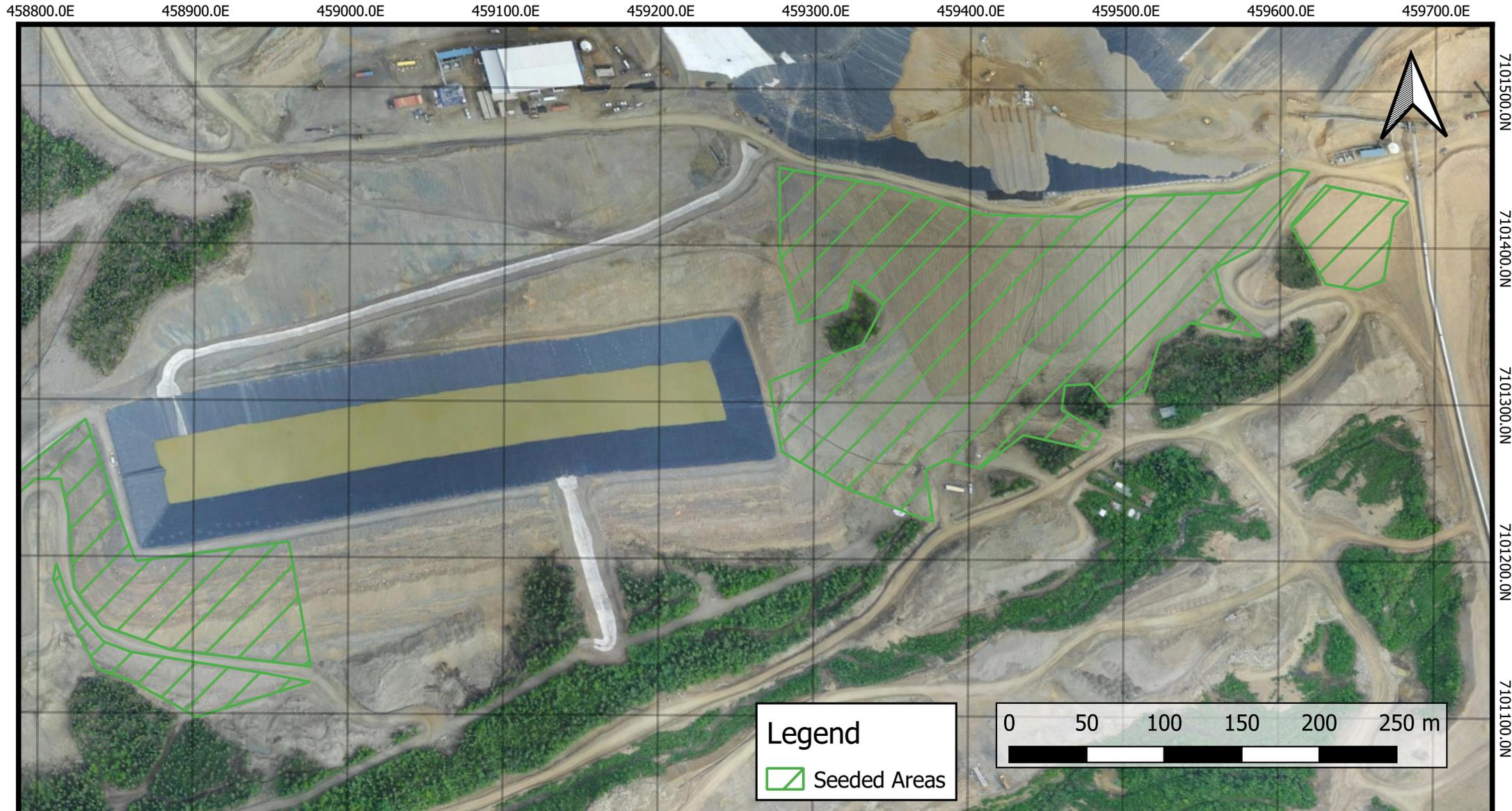
**Prepared by: Krystal Isbister
FloraTek Consulting**



Coordinate System: NAD 83/Yukon Albers

Mapping Software: QGIS 3.2.2

Date: October 10th, 2019



Notes:
 Seed mix - slender wheatgrass, fowl bluegrass,
 ticklegrass and tufted hairgrass

Application Rate: 30.5 kg/ha

Total area seeded - 6 ha

Figure 3: Sites 3 & 4 - Revegetation Areas September 2019

**Prepared by: Krystal Isbister
 FloraTek Consulting**



Coordinate System: NAD 83/Yukon Albers
 Mapping Software: QGIS 3.2.2
 Date: October 16th, 2019

PHOTOGRAPHS, SEPTEMBER 2019



Photo #1: willows staged near Site #1.



Photo #2: willow staking, Site #1.



Photo #3: Y pole drain prior to burial.



Photo #4: long pole drain prior to burial.



Photo #5: wattle fence prior to coco mat installation



Photo #6: Seed plots and staked willows, Site #1.



Photo #7: Seeding around the LDSP.



Photo #8: laying down the jute mats on the cutbank



Photo #9: Staging willows at Site #5.



Photo #10: Seeding the heap leach embankment



Photo #11: Celebrating the completion of a long day of seeding.



Photo #12: The happy crew. Absent from photo: Katie Babin, Bryan Moses, David Petkovich and Bonnie Burns.