MONTANA DEPARTMENT OF TRANSPORTATION
STREAM MITIGATION MONITORING REPORT

Ashley Creek
Flathead County, Montana

Project Completed: 2010
Monitoring Report #3: December, 2015

Prepared for:

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Prepared by:

CONFLUENCE

MONTANA DEPARTMENT OF TRANSPORTATION

STREAM MITIGATION MONITORING REPORT #3

YEAR 2015

Ashley Creek
Flathead County, Montana

MDT Project Number: NH-MT 5-3(59) FST
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USACE Permit: NWO-2009-01808-MTM

Prepared for:

MONTANA DEPARTMENT OF TRANSPORTATION
2701 Prospect Ave
Helena, MT 59620-1001

Prepared by:

Confluence Consulting, Inc.
P.O. Box 1133
Bozeman, MT 59771

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Cover Photo: Upper extent of Ashley Creek stream mitigation site taken in 2015.

1.0 INTRODUCTION

As part of construction of the U.S. Highway 2 South Kalispell Bypass project, the Montana Department of Transportation (MDT) modified a segment of Ashley Creek at the North Bridge crossing. The following report provides the results of the third year of post construction mitigation monitoring along this segment of Ashley Creek and compares these results to project performance standards outlined in the post-construction monitoring plan for the site. This project was constructed in 2010; therefore, these results provide documentation of the site's condition five years following the project's completion.

One of the goals of the project is to provide compensatory mitigation for stream impacts associated with the U.S. 93 Alternative widening segment of the Kalispell Bypass in the Missoula District. If successful, the project will create, enhance, restore, and maintain permanent, naturally self-sustaining, native or native-like stream and riparian habitat. Prior to the project, Ashley Creek had been modified by human activities, and was V-shaped with steep side slopes (1.5:1). Objectives intended to meet the project's goal include:

- Widening 413 feet of the Ashley Creek stream channel and laying back the slopes from 1.5:1 to 2:1,
- Implementing an aggressive re-vegetation plan along the re-sloped banks to re-establish native riparian and upland vegetation.

Provisions outlined within the USACE permit include monitoring of the on and off-site stream mitigation areas for five years following channel construction to determine whether the site meets, or is trending toward meeting the performance standards specified in the mitigation plan for the site. The performance standards for the on-site mitigation plan for Ashley Creek are outlined below.

<u>Quantitative success criteria for Ashley Creek:</u>

1. **Riparian Buffer Success** will be achieved when:
    a. Woody and riparian vegetation becomes established, and noxious weeds do not exceed 10% cover within the riparian buffer areas.
    b. Any area within the creditable buffer area disturbed by the project construction must have at least 50% areal cover of non-noxious weed species by the end of the monitoring period.

2. **Vegetation Success** will be achieved when:
    a. Combined areal cover of riparian and stream bank vegetation communities is ≥70%
    b. Planted trees and shrubs will be considered successful where they exhibit 50% survival after 5 years.

3. **Vegetation along Stream banks** will be considered successful when banks are vegetated with a majority of deep-rooting riparian plant species having root stability indexes ≥6 (subject to 1.a and 1.b above).

4. **Stream bank Stability Success** will be achieved where; following restoration, less than 25% of bank length is unstable and classified as eroding bank. For this purpose "eroding bank" will be defined as any bank greater than two feet in length that is more than 50% bare mineral soil and has no roots, surface vegetation, or other stabilizing structure (e.g. rock, woody debris) to inhibit erosion.

Qualitative success criteria for Ashley Creek:

5. **Channel Form Success** will be achieved when the stream stabilizes, includes pool and riffle features, allows for flood events to occupy the floodplain, and the habitat features such as riparian plant communities have successfully established along stream banks.

Additional reporting requirements include:

6. **Photo Documentation** success of restored stream channel and stream bank vegetation community development showing distinct positive changes from pre-construction to final monitoring year in comparison with the established reference reach.

Results of the third year monitoring of the Ashley Creek project are included in Section 4 and compared to performance standards in Section 5. Section 6 provides management recommendations to maximize the potential for meeting all performance standards at this and other similar mitigation sites. Additional reporting requirements including maps indicating the endpoints of riparian belt transects, perpendicular transect surveys and locations of noxious weed infestations, repeated survey results at four perpendicular transects and a longitudinal stream profile, photo documentation of the project site, and a planting schematic from the approved design are included as appendices to this report.

2.0 SITE LOCATION

The project reach includes approximately 430 feet of Ashley Creek extending to either side of the U.S. Highway 93 ALT Bridge (Figure 1). The site extends approximately 275 feet upstream and 125 feet downstream of the Highway 93 Bridge to a rock grade control structure downstream of a pedestrian bridge. The project site is located in Section 13, Township 7 North, Range 22 West, in Flathead County, Montana.

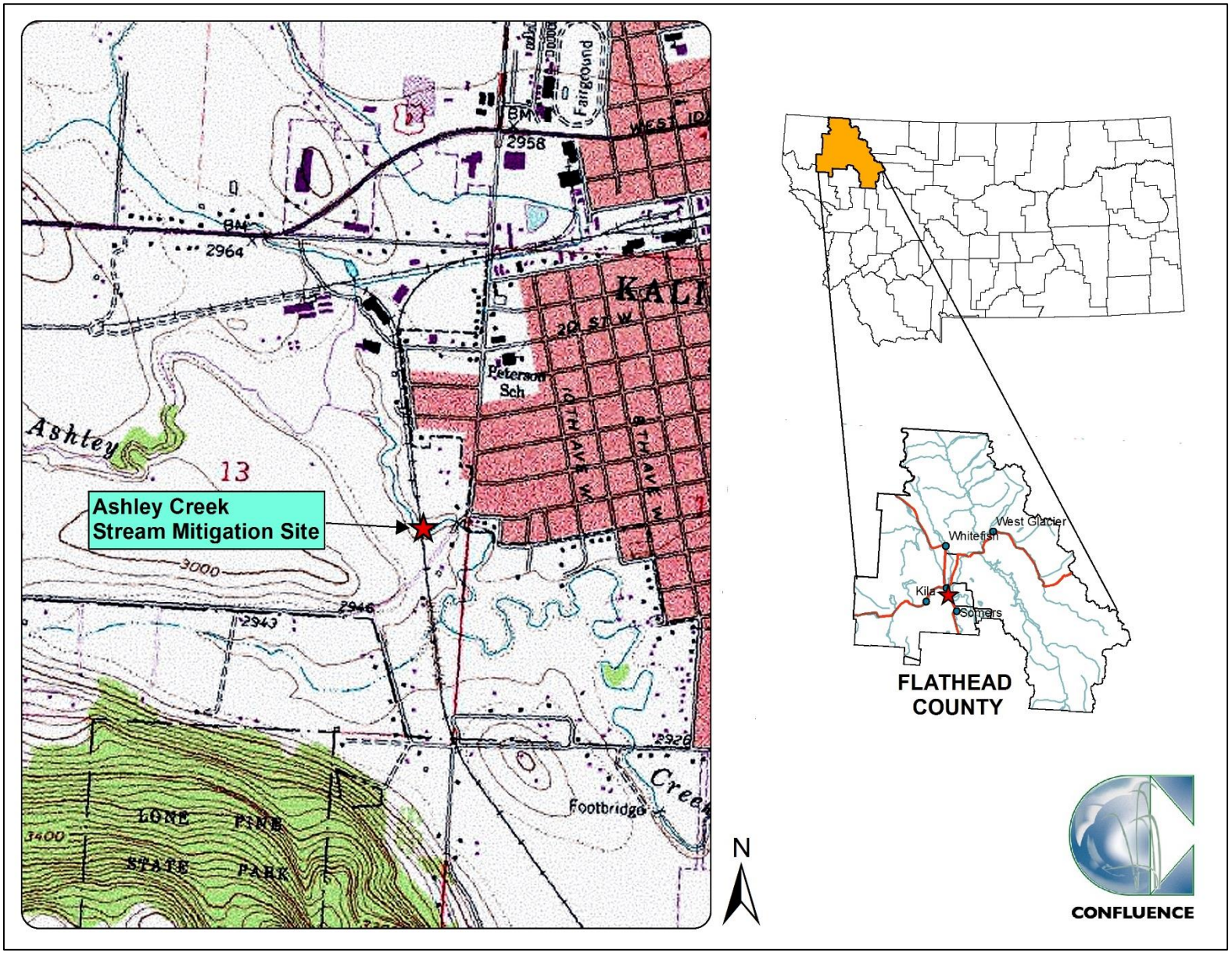


Figure 1. Location of the Ashley Creek stream mitigation monitoring site.

3.0 MONITORING METHODS

Monitoring field crews visited the project site on August 19, 2015 while survey crews visited the site on August 26, 2015. The following data were collected at the Ashley Creek stream mitigation site:

3.1. Vegetation Inventories and Community Mapping

Two 25-foot wide riparian belt transects established during the first monitoring event in 2013 were monitored to document areal percent cover of total vegetation, woody vegetation, and noxious weeds. The riparian belt transect on the right (south) bank runs parallel to the channel for 208 feet, while the riparian transect on the left (north) bank extends 243 feet (Figure 2, Appendix A).

A vegetation inventory was conducted along both stream banks, which included compiling a list of all plant species and their associated cover classes identified within three feet of the active channel. Percent cover of all species observed along the entire length of each bank was estimated and recorded using the following classification values: 0 (less than 1 percent), 1 (1 to 5 percent), 2 (6 to 10 percent), 3 (11 to 20 percent), 4 (21 to 50 percent), and 5 (greater than 50 percent).

Vegetation community boundaries were determined in the field during the active growing season and subsequently delineated on the 2015 aerial photographs. Community types were named based on the predominant vegetation species that characterized each mapped polygon (Figure 2, Appendix A). Bank stability indices were assigned to the stream bank community types using Winward (2000) stability scores.

The project site was visually inspected to document the presence of noxious weeds. All noxious weed infestations were mapped on aerial photographs, with species and extents noted (Figure 2, Appendix A). Observations of isolated noxious weed occurrences were included in the species lists and total areal percent cover estimate of noxious weeds within the project area, but were not mapped.

The project area was visually inspected to document woody vegetation plantings. The total number of live and dead plantings was recorded to calculate woody plant survival.

3.2. Bank Erosion Inventory

Both stream banks within the project reach were visually inspected to document eroding banks. Each eroding bank within the project reach was photo-documented. Data collected at each eroding bank included bank length and potential causes of bank erosion.

3.3. Channel Surveys

Four perpendicular transects (cross sections) established during the initial monitoring event in 2013 were re-surveyed; two at riffles and two at pools. A longitudinal profile of the channel thalweg was surveyed to document bedform complexity and aquatic habitat conditions.

3.4. Photo-Documentation

Photo documentation of the site was repeated at four photo points established during the 2013 monitoring event to document changes in the site over time. In addition to these points, photos were taken facing upstream, downstream, left and right from the center of the channel, and at the endpoints of each perpendicular transect.

3.5. Wildlife Documentation

Wildlife use of the project reach was documented by creating a list of all bird, mammal, and herpetile species observed during the site visit. Wildlife species were identified through visual observation, scat, tracks, and observation of nests, burrows, dens, feathers, etc.

4.0 RESULTS

4.1. Riparian and Stream Bank Vegetation Inventory

Table 1 summarizes percent cover of total vegetation, bare ground, woody vegetation, and noxious weeds for the riparian and stream bank transects surveyed along Ashley Creek. Areas adjacent to the channel were re-sloped at a consistent angle from the bed of the channel to the top of the embankment; therefore, no definable stream banks exist on either side of the channel. As a result, the stream banks along Ashley Creek were considered within the riparian vegetation transect. In 2015, the project reach exhibited 28% coverage by woody species, 10% by noxious weeds, and 12% bare ground. Overall, 78% of the reach exhibited desirable vegetation cover (88% total vegetation cover minus 10% noxious weeds).

Table 1. Percent cover along riparian belt transects at Ashley Creek in 2013, 2014 and 2015.

Belt Transect	Length (ft)	Total % Riparian Cover			% Bare Ground			% Woody Cover			% Noxious Weed Cover		
		2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015
Right (south bank)	208	92%	95%	85%	8%	5%	15%	23%	25%	25%	12%	15%	11%
Left (north bank)	243	84%	90%	90%	16%	10%	10%	30%	30%	30%	10%	10%	10%
Total	451	88%	92%	88%	12%	8%	12%	26%	28%	28%	11%	12%	10%

Dominant species recorded along the riparian and stream bank transects were combined with visual observations in other areas to develop a vegetation community map (Figure 3, Appendix A). Two vegetation community types were observed in 2015, which included community Types 1 – *Phalaris arundinacea* and 3 – *Phalaris arundinacea/Elymus* spp. Side slopes along the straight channel alignment are dominated by wild rye (*Elymus* spp.) and reed canary grass *(Phalaris arundinacea).* As the planted shrubs mature and become larger over time, the corridor is expected to become more dominated by woody species. The right bank along the upstream extent of the project reach, which was not disturbed during construction, is dominated by reed canary grass. These plant communities have remained consistent throughout the past three monitoring events.

Table 2 is a comprehensive list of plant species observed during the 2013, 2014, and 2015 monitoring events. In 2015, 77 plant species were observed on site, an increase

by 11 species since the second monitoring event in 2014 and 21 species from the initial monitoring event in 2013. In 2015, 43% of the species observed were hydrophytic based on the 2014 National Wetland Plant List (NWPL) (Lichvar *et al*., 2014).

Table 2. Comprehensive plant species list for the Ashley Creek stream mitigation site in 2013, 2014, and 2015.

Scientific Name	Common Name	WMVC Indicator Status*
Agropyron sp.	Wheatgrass	NL
Agrostis gigantea	Black Bent	FAC
Agrostis stolonifera	**Spreading Bent**	**FAC**
Alnus incana	Speckled Alder	FACW
Alopecurus pratensis	Field Meadow-Foxtail	FAC
Amelanchier alnifolia	**Saskatoon Service-Berry**	**FACU**
Artemisia absinthium	**Absinthium**	**NL**
Artemisia biennis	Biennial Wormwood	FACW
Avena fatua	Wild Oats	NL
Betula pumila	Bog Birch	OBL
Bromus carinatus	California Brome	NL
Bromus inermis	Smooth Brome	FAC
Bromus tectorum	Cheatgrass	NL
Carex stipata	**Stalk-Grain Sedge**	**OBL**
Centaurea stoebe	Spotted Knapweed	NL
Chenopodium album	Lamb's-Quarters	FACU
Cirsium arvense	Canadian Thistle	FAC
Cirsium vulgare	Bull Thistle	FACU
Convolvulus arvensis	Field Bindweed	NL
Cornus alba	Red Osier	FACW
Cynoglossum officinale	Gypsy-Flower	FACU
Descurainia sophia	Herb Sophia	NL
Elodea canadensis	**Canadian Waterweed**	**OBL**
Elymus canadensis	Nodding Wild Rye	FAC
Elymus hispidus	Intermediate Wheatgrass	NL
Elymus repens	Creeping Wild Rye	FAC
Elymus trachycaulus	**Slender Wild Rye**	**FAC**
Equisetum hyemale	Tall Scouring-Rush	FACW
Festuca idahoensis	Bluebunch Fescue	FACU
Galium aparine	Sticky-Willy	FACU
Helianthus maximiliani	Maximilian Sunflower	UPL
Helianthus nuttallii	Nuttall's Sunflower	FACW
Kochia scoparia	Mexican Kochia	NL
Lactuca serriola	Prickly Lettuce	FACU
Lupinus argenteus	Silvery Lupine	NL
Lupinus lepidus	Stemless-dwarf Lupine	NL
Lupinus sp.	Lupine	NL
Malva neglecta	Dwarf Cheeseweed	NL
Medicago lupulina	Black Medick	FACU
Medicago sativa	Alfalfa	UPL
Melilotus albus	White Sweetclover	NL
Melilotus officinalis	Yellow Sweet-Clover	FACU
Onopordum acanthium	Scotch Thistle	NL
Pascopyrum smithii	Western-Wheat Grass	FACU
Peritoma serrulata	Rocky Mountain Beeplant	FACU
Phalaris arundinacea	Reed Canary Grass	FACW
Plantago major	Great Plantain	FAC
Poa palustris	Fowl Blue Grass	FAC
Poa pratensis	Kentucky Blue Grass	FAC
Populus angustifolia	Narrow-Leaf Cottonwood	FACW
Populus balsamifera	Balsam Poplar	FAC
Potamogeton richardsonii	**Red-Head Pondweed**	**OBL**
Prunus virginiana	Choke Cherry	FACU
Rosa woodsii	Woods' Rose	FACU
Rumex acetosa	Garden Sorrel	FAC
Rumex crispus	Curly Dock	FAC
Salix bebbiana	Gray Willow	FACW
Salix drummondiana	**Drummond's Willow**	**FACW**
Salix exigua	Narrow-Leaf Willow	FACW
Salix lasiandra	Pacific Willow	FACW
Scirpus microcarpus	Red-Tinge Bulrush	OBL
Silene latifolia	Bladder Campion	NL
Silene repens	Creeping Catchfly	NL
Silene vulgaris	Maiden's-tears	NL
Sinapis arvensis	Corn Mustard	NL
Solanum dulcamara	Climbing Nightshade	FAC
Solidago canadensis	Canadian Goldenrod	FACU
Sonchus arvensis	Field Sow-Thistle	FACU
Symphoricarpos albus	Common Snowberry	FACU
Symphoricarpos occidentalis	**Western Snowberry**	**FAC**
Symphyotrichum ascendens	**Western American-Aster**	**FACU**
Tanacetum vulgare	Common Tansy	FACU
Taraxacum officinale	Common Dandelion	FACU
Thlaspi arvense	Field Pennycress	UPL
Tragopogon dubius	**Meadow Goat's-Beard**	**NL**
Verbascum thapsus	Great Mullein	FACU
Vicia americana	American Purple Vetch	FAC

*****Based on 2014 NWPL (Lichvar *et al*., 2014)
New species identified in 2015 are **bolded**.

4.2. Stream Bank Vegetation Composition

The stream bank vegetation inventory identified 17 plant species along the banks of Ashley Creek (Table 3). Stability ratings are provided on a scale from 1 to 10, and indicate a plant's ability to resist erosive forces based on root characteristics (Winward, 2000). The Winward stability ratings are based on vegetation communities rather than

individual species; therefore, a vegetation community was assigned to each stream bank based on one or more dominant species. If the community type was defined by more than one dominant species, the more dominant species stability rating was reported. Success criteria outlined in the monitoring plan state the vegetation along the stream banks will be considered successful when banks are vegetated with a majority of deep-rooting riparian plant species having root stability indices ≥6. Reed canary grass comprised greater than 50% cover along the left stream bank and between 11 and 20% on the right. Bare ground accounted for greater than 50% of the right stream bank. While bare ground, with an associated stability index of 1, represented more than 50% of the right bank, reed canary grass, with an associated stability index of 9, dominated the remaining bank areas.

Table 3. Comprehensive list of species and their associated cover classes along the banks of the Ashley Creek stream mitigation site in 2015.

Streambank Species	Left Bank	Right Bank	WMVC Indicator Status**
Agrostis stolonifera	X	X	FAC
Alnus incana		X	FACW
Bare Ground	X	X	NL
Bromus inermis		X	FAC
Carex stipata	X		OBL
Cornus alba	X		FACW
Elymus repens	X	X	FAC
Helianthus maximiliani	X		UPL
Lactuca serriola		X	FACU
Medicago lupulina	X		FACU
Melilotus officinalis	X		FACU
*Phalaris arundinacea**	X	X	FACW
Salix bebbiana	X		FACW
Salix drummondiana	X		FACW
Sonchus arvensis	X		FACU
Tanacetum vulgare		X	FACU
Thlaspi arvense		X	UPL

*Dominant species observed along Ashley Creek stream banks.
**Based on 2014 NWPL (Lichvar *et al*., 2014).

4.3. Noxious Weed Inventory

Twelve infestations of four Montana Listed Priority 2B noxious weeds were mapped within the riparian corridor at the Ashley Creek stream mitigation site and are listed in Table 4. Noxious weed occurrences are displayed on Figure 3 in Appendix A with the exception of those observed in trace amounts, which were not mapped. Gypsy-flower (*Cynoglossum officinale)* was observed in isolated trace amounts, and was therefore not mapped, but is included in Table 4. Each mapped noxious weed occurrence was

identified in areas less than 0.1 acre in size with a low cover class (1 to 5 percent). An estimated 10% of the project area has been colonized by noxious weeds.

Cheatgrass (*Bromus tectorum*), a Priority 3 regulated weed species (not noxious), was also observed within the site. Regulated plants have the potential to cause significant negative impacts. The Montana Department of Agriculture (July 2015) recommends research, education, and prevention to minimize the spread of regulated plant species.

Table 4. Montana State listed noxious weed and regulated species observed in 2015 at the Ashley Creek Stream Mitigation Site.

Category*	Scientific Name	Common Name
Priority 2B	*Centaurea stoebe*	Spotted Knapweed
	Cirsium arvense	Canadian Thistle
	Convolvulus arvensis	Field Bindweed
	Cynoglossum officinale	Gypsy-Flower
	Tanacetum vulgare	Common Tansy
Priority 3 State Regulated	*Bromus tectorum*	Cheatgrass

*Based on the Montana Department of Agriculture's Noxious Weed List, 2015.

4.4. Woody Plant Survival

Woody plantings observed included bog birch, serviceberry, chokecherry, Woods' rose, snowberry, coyote willow, Bebb's willow, Drummond's willow, speckled alder, and red osier dogwood. Table 5 indicates the total number of woody plantings observed and the number of those that remained alive. The Ashley Creek planting plan called for installation of 130 trees and shrubs. As compared to the planting plan, 71% (92 of 130 plants) remain alive five years following construction.

Table 5. Woody plant survival at the Ashley Creek stream mitigation site in 2013, 2014, and 2015.

Year	Total Plants Inspected	Surviving Plants	# of Woody Plantings in Design	Plant Survival based on Planting Plan
2013	99	93	130	72%
2014	73	66		51%
2015	106	92		71%

4.5. Bank Erosion Inventory

Four bank segments were classified as eroding within the Ashley Creek project site. Photos of each eroding bank are included in Appendix C of this report. Figure 2 in Appendix A provides locations of each eroding bank. The total length of eroding bank along the reconstructed segment of Ashley Creek was 238 feet, or 28% of the total bank length of 860 feet.

Eroding bank EBL1 occurs upstream and downstream of a storm water culvert that discharges to Ashley Creek upstream of the highway bridge. During construction of the project, riprap was placed below the culvert outlet to protect the bank from erosion.

Portions of the riprap placed below the culvert have sloughed into the channel. A separate inspection (RESPEC, 2014) provided additional details, causes of erosion, and recommended actions to stabilize this bank. This report cited the lack of riprap placement in a key trench at the toe of the slope, poorly graded riprap, and disturbance of fine grained soils during construction as causes for riprap failure and bank instability at this location. Due to these factors, erosion severity is considered moderate at this location. The extent of erosion along EBL1 was 32 feet in 2013, 40 feet in 2014, and 45 feet in 2015. MDT intends to address this bank segment as part of a larger project to expand the U.S. 93 Alt roadway to 4 lanes in 2016/2017 (U.S. Army Corps Individual Permit NOW-2014-02184-MTB, #1).

Eroding bank EBR1 begins along a high terrace that was not disturbed during construction of the project and extends along the straight segment of the channel. The eroding bank length increased from 53 feet in 2014 to 97 feet in 2015 (Additional Photos 3 and 4 in Appendix C). Erosion along this bank appears to stem from saturation of fine-grained bank materials during high flows followed by sloughing of the lower bank. Vegetation along these banks does not appear capable of withstanding erosion and sloughing following high flows. Chunks of vegetated soil have begun to slough from areas higher up the bank, and have deposited along the bank toe. This action has resulted in the exposure of bare ground along a steep lower bank angle. Erosion severity along this bank is now considered high due to the lack of vegetation capable of stabilizing the bank, the relatively steep bank angle, fine grained bank materials, and lack of functional floodplain along this segment of the channel. Due to these factors, erosion is likely to continue at this location and stabilization efforts are warranted.

Eroding banks EBL2 and EBR2 also occur along the straight channel segment of Ashley Creek. These banks were documented as eroding during the 2014 monitoring event, but do not appear to have eroded further in 2015. The eroding bank length at EBL2 remains at 40 feet, while EBR2 remains at 56 feet. Bank conditions and causes of erosion are identical to EBR1, with fine grained soils, relatively steep bank slopes, and lack of functional floodplain adjacent to the channel. Erosion severity along these banks is considered moderate to high based on existing conditions and the likelihood that lateral erosion will continue. Due to these factors, stabilization efforts are warranted to meet mitigation performance criteria for stream bank stability.

4.6. Channel Form

The presence of pool and riffle habitats within the project reach are illustrated by the results of perpendicular transect and longitudinal profile surveys of the channel bed. Bankfull widths and maximum depths surveyed at two pools and two riffles within the project reach are summarized in Table 6, while plotted survey results are included in Appendix B. The bankfull widths and maximum depths reported in the 2014 monitoring event were adjusted based on a refinement of the bankfull elevation at these transects.

The longitudinal profile indicates the presence of three distinct pools. A deep pool exists at the upstream end of the project reach, where the newly aligned segment of Ashley Creek turns east. Transect #1 runs through this pool, which is formed by a tight

meander bend in the channel generating scour against the riprapped north bank. This pool exhibits a bankfull width of 45.1 feet, maximum depth of 9.8 feet, with a well-developed floodplain bench on the south side of the channel. Surveys indicate the point bar along the right (south) bank is extending northward, and is slowly narrowing the channel. It should be noted the left (north) bank of this transect has been riprapped. Surveying through riprap can often lead to varying results based on the exact location of surveyed points; therefore elevation changes along the left bank are not attributed to bank retreat or erosion. The channel width along this meander appears nearly double that of the channel upstream; therefore channel narrowing and point bar development is considered a natural process and is not expected to disturb the project reach.

Transect #2 runs through a second pool which has formed along a straight channel segment between Station 1+40 and 2+30. Bankfull width of the channel at Transect #2 is 31 feet, while the maximum depth at this transect is 7.9 feet. Although the transect survey indicates a slightly shallower pool in 2015, the longitudinal profile indicates maintenance of maximum pool depth just upstream of the surveyed transect. Erosion has been noted along the right bank at Transect #2, with lateral movement of approximately 2 feet over the past two years. Lateral bank migration noted along the right side of T2 is attributed to saturation of fine grained sediments during high flows, lack of vegetation establishment along the bank, relatively steep stream banks, and lack of floodplain on either side of the channel.

Transect #3 runs through a 50-foot riffle that extends from Station 2+30 to 2+80. Erosion has also been noted along the right bank of Transect #3, with lateral movement of approximately 1 foot over the past two years. Bankfull width at Transect #3 is 27 feet, while the maximum depth is 2.8 feet.

Transect #4 is located just upstream of the confluence with Spring Creek. As shown in the longitudinal profile, its location lies at the tail end of the third pool, and is approximately 20 feet upstream of the next riffle crest. Other than a slight increase in the bed elevation, the channel appears to have only elevation changes, which could potentially be within the error limits of the survey. The bankfull width at this transect is 28.5 feet, while the maximum depth is 2.6 feet.

Table 6. Channel width and depth surveyed at Ashley Creek transects in 2013, 2014, and 2015.

Transect	Type	Maximum Depth (ft)			Bankfull Width (ft)		
		2013	2014*	2015	2013	2014*	2015
1	Pool	**	9.9	10.1	43.8	43.6	45.1
2	Pool	**	8.2	7.9	29.0	30.8	31.0
3	Riffle	2.6	2.8	2.8	26.3	26.3	27.0
4	Riffle	3	2.7	2.6	30.0	29.5	28.5
Average Riffles		**2.8**	**2.8**	**2.7**	**28.2**	**27.9**	**27.8**
Average Pools		N/A	**9.1**	**9.0**	**36.4**	**37.2**	**38.1**

*2014 maximum depth and bankfull width adjusted from previous monitoring report based on refinement of bankfull elevation
** Maximum depth was not surveyed at pools in 2013.

4.7. Wildlife Documentation

Table 7 provides a comprehensive list of wildlife observed on site during the 2013, 2014, and 2015 monitoring events. In 2015, one additional bird species was observed (black-capped chickadee). A total of 10 birds and signs of two mammals have been observed during the three monitoring events. The relatively low number of species observed is attributed to the proximity of the project to Highway 93, frequent usage of the bike path next to the stream channel, and an overall lack of mature riparian habitat.

Table 7. Comprehensive list of wildlife species observed at Ashley Creek during 2013, 2014, and 2015 monitoring events.

Common Name	Scientific Name
Birds	
American Crow	*Corvus brachyrhynchos*
American Robin	*Turdus migratorius*
Black-billed Magpie	*Pica hudsonia*
Black-capped chickadee	***Poecile atricapillus***
Canada Goose	*Branta canadensis*
Common Raven	*Corvus corax*
Mallard	*Anas platyrhynchos*
Red-winged Blackbird	*Agelaius phoeniceus*
Sparrow sp.	*Passer* sp.
Swallow sp.	*Tachycineta* sp.
Mammals	
Raccoon (tracks)	*Procyon lotor*
White-tailed Deer (tracks)	*Odocoileus virginianus*

Species observed in 2015 are **bolded**.

5.0 COMPARISON OF RESULTS TO PERFORMANCE STANDARDS

Monitoring of the modified segment of Ashley Creek is intended to document whether the site is meeting, or moving toward meeting the performance standards outlined in the monitoring plan. The third year of monitoring suggests five of the six quantitative performance standards are being met five years after the project was constructed (Table 8). Channel form success is considered a qualitative criterion, and is discussed in more detail in the following section. Additional reporting requirements including photo documentation of the project site, and as-built topographic surveys have been completed and are included as appendices to this annual monitoring report to provide further evidence of the site's condition.

5.1. Riparian Buffer Establishment

Performance criteria for vegetation cover require 50% or greater cover of non-noxious weed species by the end of the monitoring period. The second year monitoring results indicated 78% of the riparian areas were vegetated with desirable species, with 88% total cover and 10% noxious weed cover. Areas of bare ground were observed again in

2015 on both banks, and appeared limited to areas where reseeding efforts were not successful or where bank erosion had occurred. No large patches of bare ground were observed. Overall, the riparian areas adjacent to Ashley Creek are revegetating well with a diversity of hydrophytic and non-hydrophytic herbaceous and woody species.

Noxious weed cover was approximately 10% of the project site. Although noxious weed infestations were scattered along the entire length of both banks, they were most heavily concentrated near the pedestrian bridge. Performance criteria for noxious weeds require 10% or less cover; therefore the site is currently at the threshold for success of this category, and weed control efforts along Ashley Creek will be necessary to achieve this performance target in the future. The majority of the riparian areas along the project reach occur on relatively steeply sloped banks within 25 feet of the channel; therefore, chemical treatment may be challenging without compromising water quality. Hand pulling, spot spraying, or biological control methods may be the most effective treatment for weed eradication along Ashley Creek.

5.2. Vegetation Success

Riparian vegetation transects were established along the narrow, vegetated zone between the active stream channel and the adjacent pedestrian trail / vehicle access road. These riparian areas included the 3-foot stream bank vegetation zone on both banks; therefore, the results provided in Table 1 are also reflective of the combined stream bank and riparian zones. These results indicate 78% of the combined riparian and stream bank areas have successfully vegetated with non-noxious weed species, which meets the performance criteria goal of >70% cover.

A total of 106 trees and shrubs were located within the project area. Of these, 92 remained alive. The planting plan sheet called for 130 planted trees and shrubs; therefore, 24 additional trees/shrubs were not located. If 100% of the planted trees/shrubs that were not located are assumed dead, the current survival rate is 71% (92 of 130 plants). The performance criteria requires >50% survival five years following construction. As compared to planting plan for Ashley Creek, survival rates of woody vegetation installed within the project area are currently meeting the success criteria.

5.3. Vegetation Along Stream Banks

Reed canary grass comprised greater than 50% cover along the left stream bank and between 11 and 20% on the right. Bare ground due to bank erosion accounted for greater than 50% of the right stream bank. While bare ground, with an associated stability index of 1, represented more than 50% of the right bank, reed canary grass, with an associated stability index of 9, dominated all other stream bank areas. Based on the vegetation present within project reach, the performance criteria for stream bank vegetation is currently being met.

5.4. Stream Bank Stability Success

The stream bank inventory identified four eroding stream banks, totaling 238 feet, or 28% of the total project bank length of 860 feet. Eroding bank EBL1, which has lengthened each of the past two years, is currently being evaluated by MDT to repair

and stabilize as part of a bridge expansion project over Ashley Creek. Eroding bank EBR1 has lengthened to 97 feet from 53 feet in 2014. Based on Transects #2 and #3 (Section 4.6), this bank has retreated between 1 and 2 feet over the past year. Although this erosion rate is not particularly high, movement of the toe has resulted in a steep bank angle leading down to the channel that may not be able to establish vegetation. As a result, continued erosion along this bank is anticipated. Based on the percentage of eroding banks observed within the project reach, the success criteria for stream bank stability is not currently being met along Ashley Creek.

5.5. Channel Form Success

The development of pool and riffle habitat features within this segment of Ashley Creek is evident by inspecting the longitudinal profile and surveyed transects at pool and riffle features (Appendix B). Three well developed pools occur within the reach, each separated by a distinct riffle. Pool features exist along a meander bend at the upstream extent of the project and within the straight segment of the channel. Pool depths are considerably deep (~8 feet) and provide adequate, slow water habitat for fish. Maximum riffle depths average 2.7 feet, and continue to provide shallower habitat for insect production.

Bank erosion has been observed within the project reach along the straight segment of the channel upstream and beneath the Highway 93 Bridge. Erosion rates do not appear overly rapid, (<1 foot/year); however, the length of erosion observed has increased each of the past two years. Bank repairs at the storm water culvert outlet upstream of the bridge may be warranted due to improper placement of riprap materials during construction. A vertical grade control structure exists at the downstream extent of the project reach, immediately below the confluence of Spring Creek. This grade control will provide long term vertical stability of the altered segment of Ashley Creek.

Construction of the bypass highway over Ashley Creek included incorporating a bike path on both sides of the creek beneath the new bridge. These bike paths were built on embankments well above the floodplain to ensure their protection during high water events. While these embankments provide adequate elevation to protect the bike paths, they encroach against the channel and eliminate any functional floodplain throughout the project reach. During high water events, Ashley Creek must pass through this confined reach, which contains fine grained stream banks graded to a relatively steep slope. As a result of these conditions, the lower slopes of the embankments are eroding and preventing establishment of stable vegetation communities. Erosion along the lower banks is expected to continue as the channel widens in an effort to establish a functional floodplain. As a result of these conditions, the channel form success criteria along Ashely Creek is not currently being met, and additional actions are likely warranted to prevent continued erosion.

Table 8. Summary of performance criteria and reporting requirements, Ashley Creek stream mitigation site, 2015.

Type	Parameter	Performance Standard	Status	Site Meeting Performance Standards?
Quantitative Performance Criteria	Riparian Buffer Establishment	1a. Areas within creditable riparian buffer disturbed during construction must have 50% or greater aerial cover of non-noxious weed species by the end of the monitoring period	Vegetation transect surveys indicate **78%** of the riparian areas have re-vegetated with non-noxious weed species.	**YES**
		1b. Montana State-listed noxious weeds do not exceed 10% cover	Vegetation surveys indicate **10%** cover of the project area by noxious weeds.	**YES**
	Vegetation Success	2a. Combined aerial cover of riparian and stream bank vegetation communities is at least 70%	Combined aerial cover of riparian and stream bank vegetation communities is **78%**.	**YES**
		2b. Planted trees and shrubs must exhibit 50% survival after 5 years	Inspections indicated **71%** survival of woody plantings based on planting plan	**YES**
	Vegetation along Stream Banks	3. Majority of plants on the stream bank must have root stability indices of at least 6	Dominant vegetation along the majority of both stream banks is reed canarygrass, with root stability index of 9**.**	**YES**
	Stream Bank Stability Success	4. Less than 25% of bank length is unstable and classified as eroding bank.	Total eroding stream bank length is 238', or **28%** of the total bank length within the project reach.	**NO**
Qualitative Performance Criteria	Channel Form Success	5. Achieved when the stream stabilizes, includes pool and riffles, allows for flood events to occupy the floodplain, and the habitat features such as riparian plant communities have successfully established along stream banks.	Channel form narrative included in Section 5.5 of 2015 Monitoring Report	**NO**

6.0 MANAGEMENT AND DESIGN RECOMMENDATIONS

6.1. Bank Slopes

Results of the surveyed transects suggest the north bank of the modified channel segment has been graded to a slope ranging from 1.7:1 and 1.9:1, which falls within the range of bank slopes stated in the project's objectives. The height of the north bank between the top of the stream bank and the pedestrian trail is approximately 10 feet. These bank slopes, combined with the bank height results in an incised channel segment with relatively steeply graded banks. Tall stream banks composed of fine grained materials are susceptible to erosion, as there is little opportunity for flood discharges to spread across a functional floodplain and dissipate energy. Portions of the bank toe consist of a clay lens which provides some degree of toe stability and protection from erosion. However, much of the toe consists of fine grained soils that become saturated and slough off following higher discharges. Bank sloughing is occurring on the left bank near the upstream end of the project reach adjacent to a storm water culvert outlet (Photo Point 4.2), and may partially be attributed to the slope of the constructed bank in this area.

The reconstructed bridge span accommodates paved pedestrian trails on both sides of the creek. However, the span does not accommodate a functional floodplain on either side of the channel. Future bridge spans that are capable of accommodating gentler bank slopes (2H:1V minimum) and a floodplain bench on one or both sides of the channel (such as that shown in Photo Point 3.2) to allow flood discharges to dissipate energy and decrease the potential for bank erosion are recommended. Pedestrian and bike trails can be designed to function as floodplain terraces if designed to the proper elevation, (although they would be periodically inundated during flood events preventing pedestrian use). This approach would allow for a greater capacity for flooding while maintaining a pedestrian use corridor.

6.2. Culvert outlet on north bank

Stone materials placed along the toe of the bank beneath a culvert upstream from the new bridge have continued to slough into the stream channel. These materials appear to be sloughing due to the steep bank angle (steeper than 1H:1V), saturation of the bank when the culvert discharges water on the bank, and improper placement of riprap beneath the culvert outlet. Stone toe protection beneath this culvert will need to be replaced to maintain bank and culvert protection if additional material continues to slough. MDT is currently evaluating stabilization alternatives at the outlet of this culvert as part of a bridge expansion project over Ashley Creek.

7.0 LITERATURE CITED

Montana Department of Agriculture. 2015. Montana Noxious Weed List. Accessed October 2015 at: http://agr.mt.gov/agr/Programs/Weeds/PDF/2015WeedList.pdf

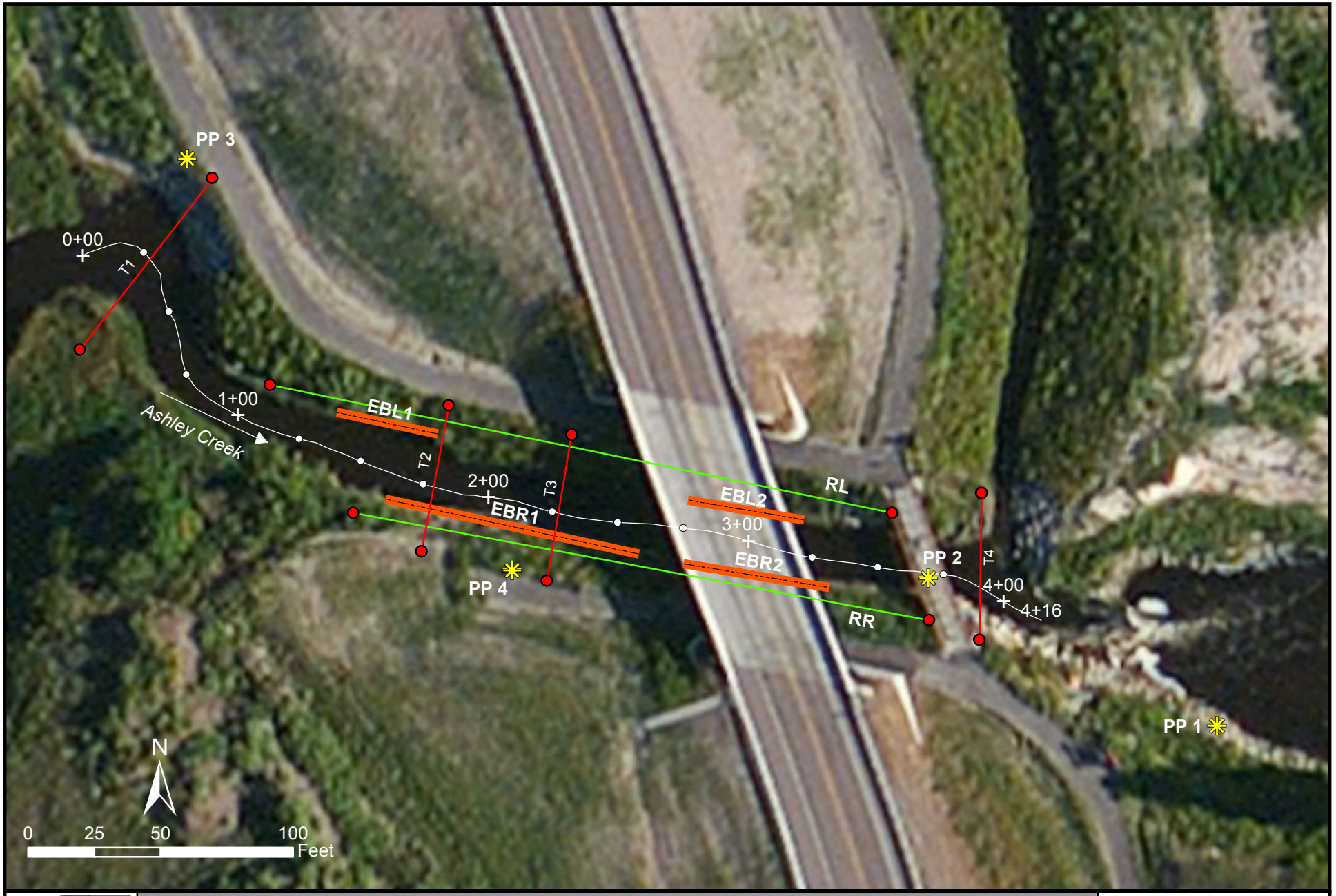
RESPEC. 2014. Technical Memorandum provided to KLJ on 10/22/14. Subject: Kalispell Bypass – Ashley Creek Culvert

Winward, 2000. Monitoring the Vegetation Resources in Riparian Areas. Gen. Tech. Report RMRS-GTR.47. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Appendix A

Project Site Maps

MDT Stream Mitigation Monitoring
Ashley Creek
Flathead County, Montana



CONFLUENCE
consulting incorporated

Legend

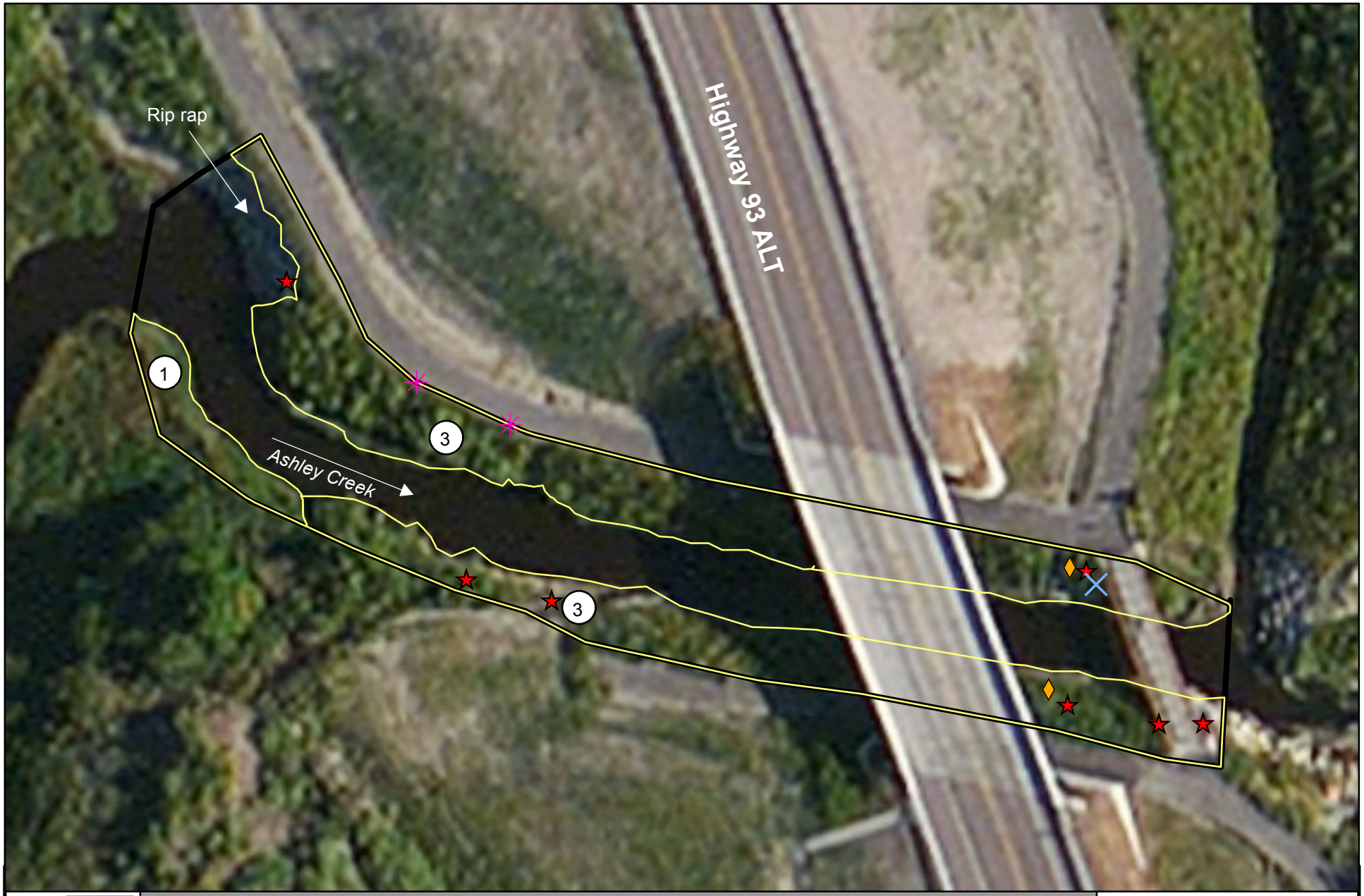
- Photo Points
- Riparian and Perpendicular Transect Endpoints
- Channel Thalweg
- Major Station (100')
- Minor Station (25')
- Eroding Banks
- Pool and Riffle Transects
- Riparian Transects

Ashley Creek - 2015 Monitoring Features

Figure 2

Date: 10/16/2015

Ashley_features2015.mxd



CONFLUENCE
consulting incorporated

Legend

- Project Boundary
- Vegetation Community Boundary
- Centaurea stoebe
- Cirsium arvense
- Convolvulus arvensis
- Tanacetum vulgare
- 1 Phalaris Community
- 3 Phalaris/Elymus Community

0 25 50 Feet

N

Ashley Creek - 2015 Noxious Weeds and Vegetation Communities

Figure 3

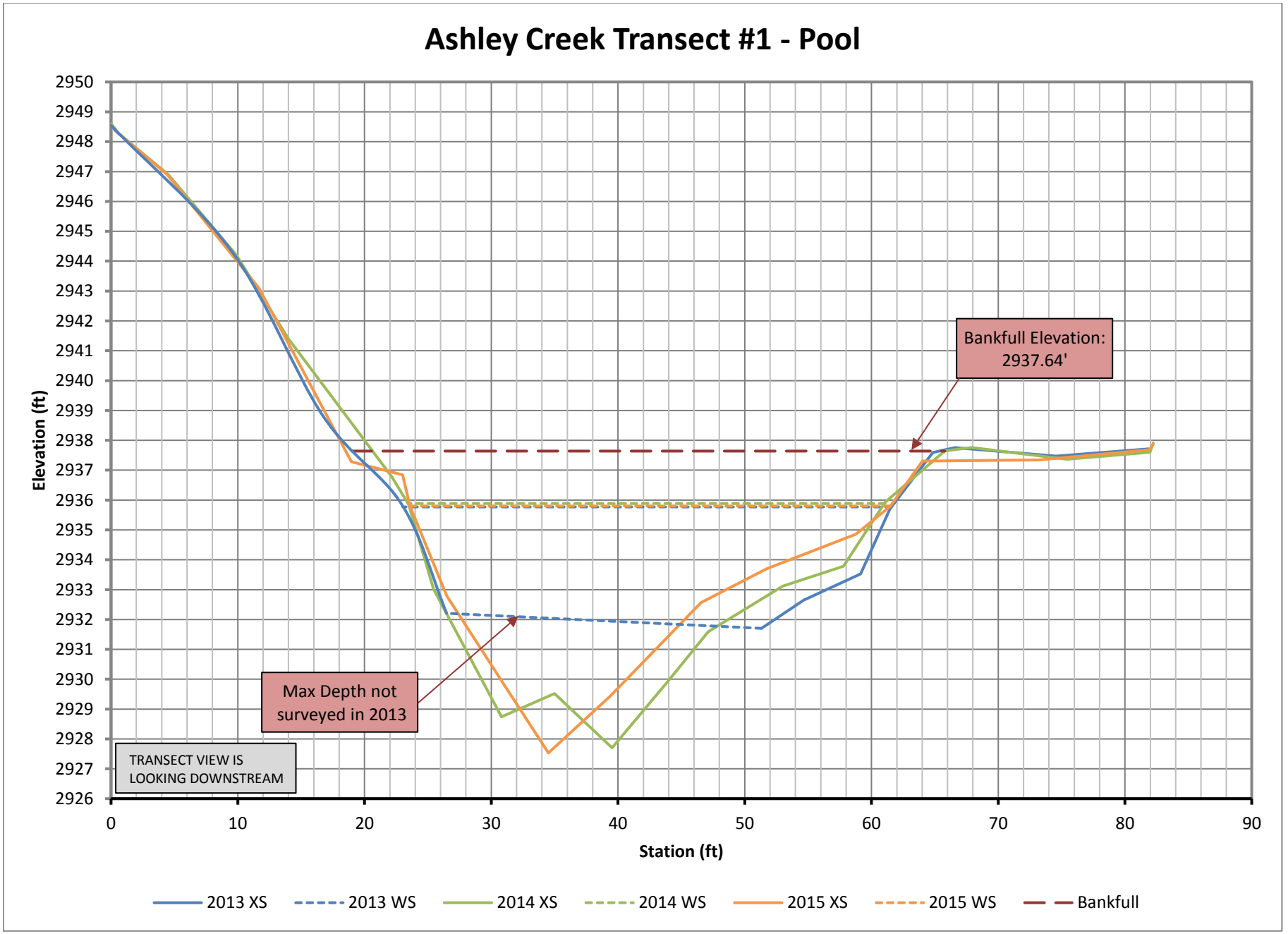
Date: 10/08/2015

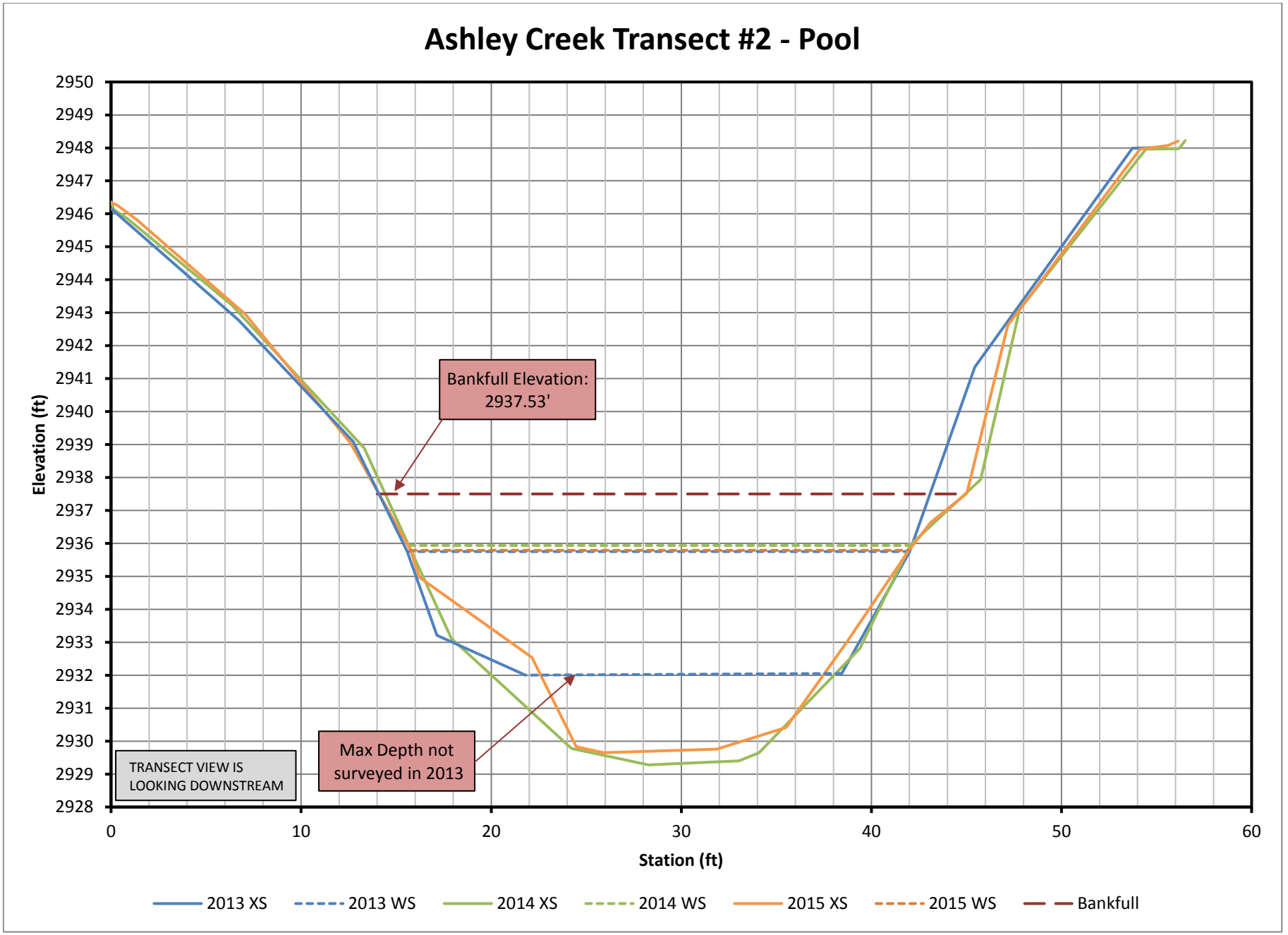
Ashley_monitor2015.mxd

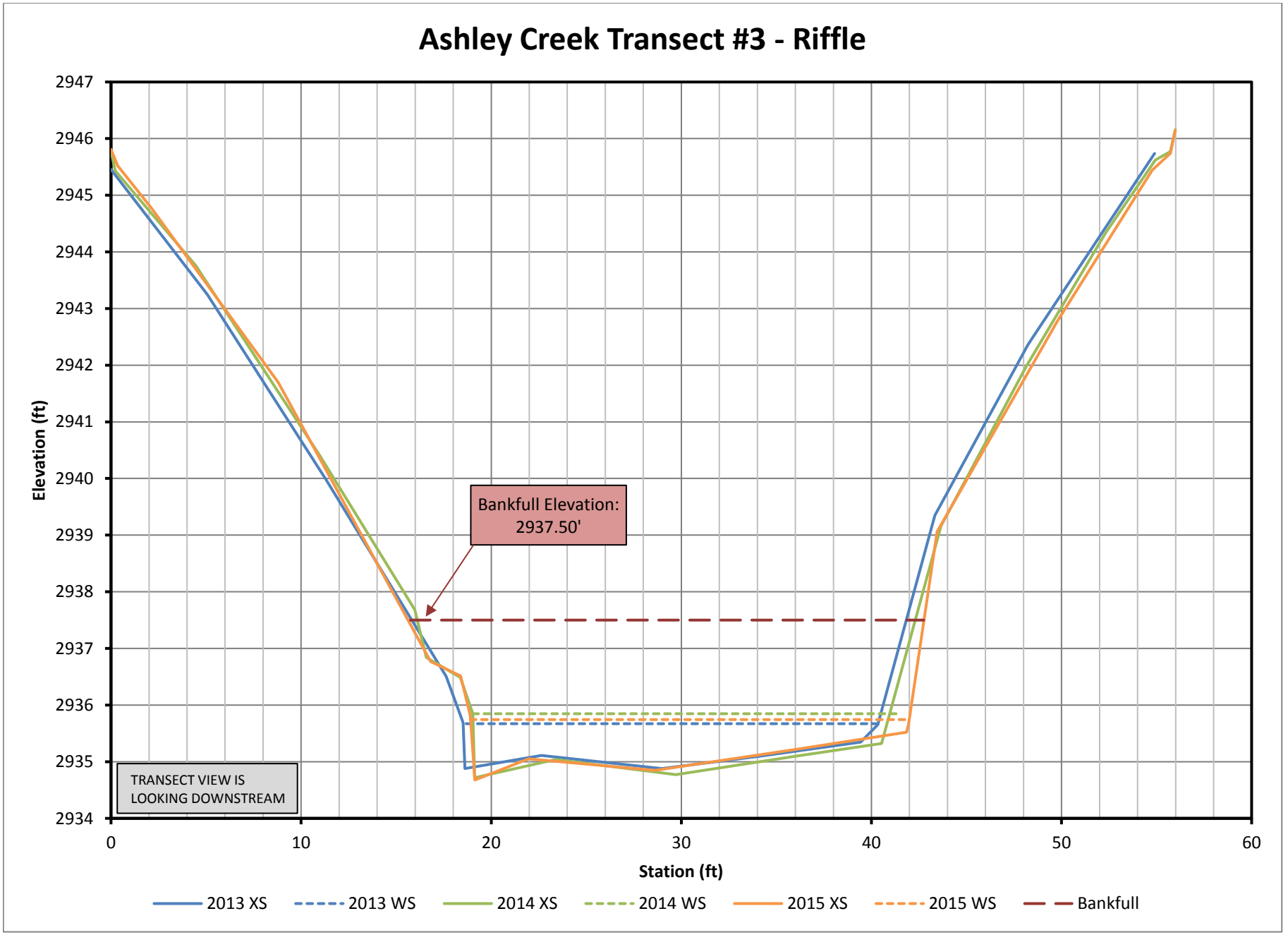
Appendix B

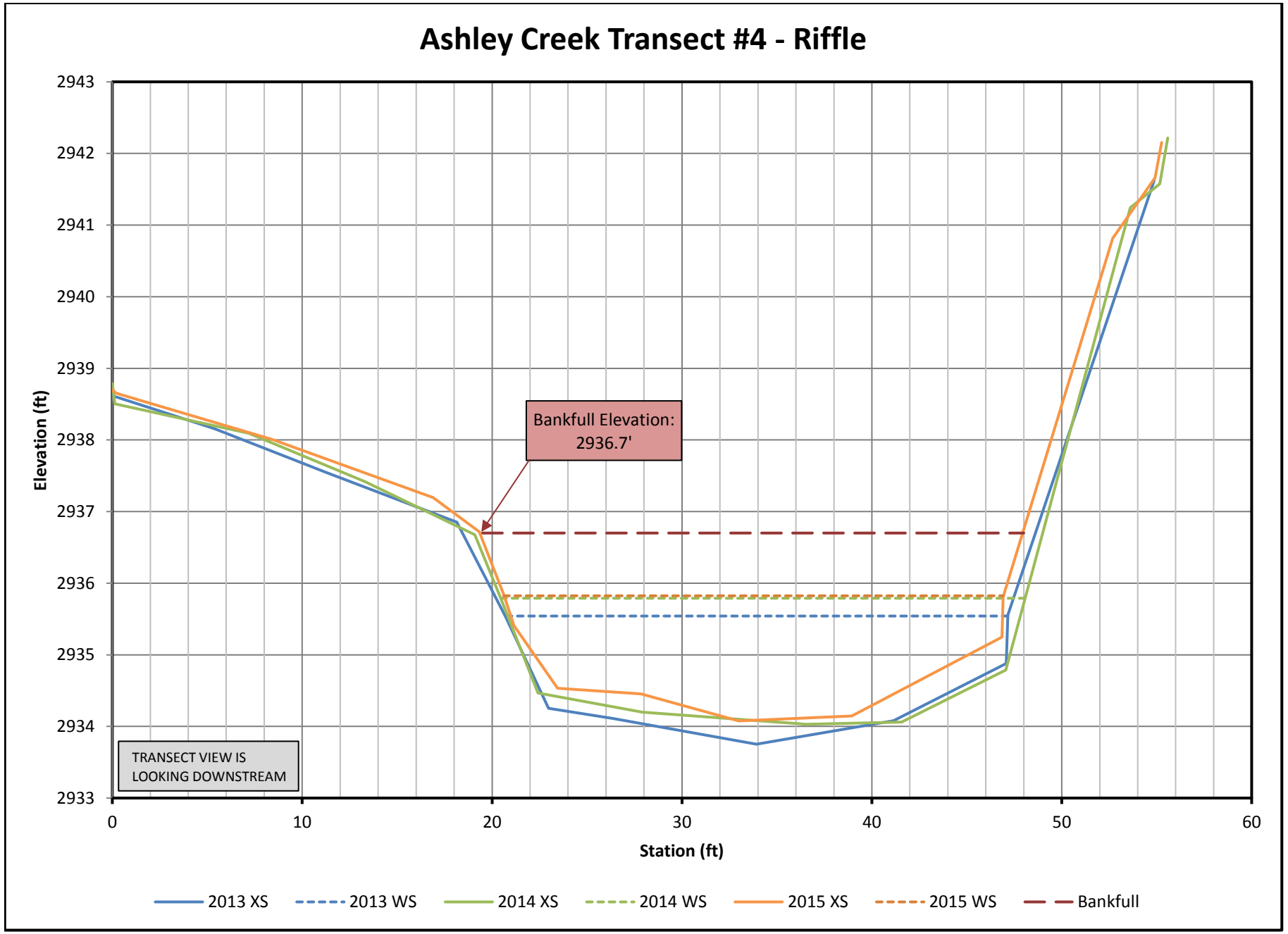
Perpendicular Transect Plots and Longitudinal Profile

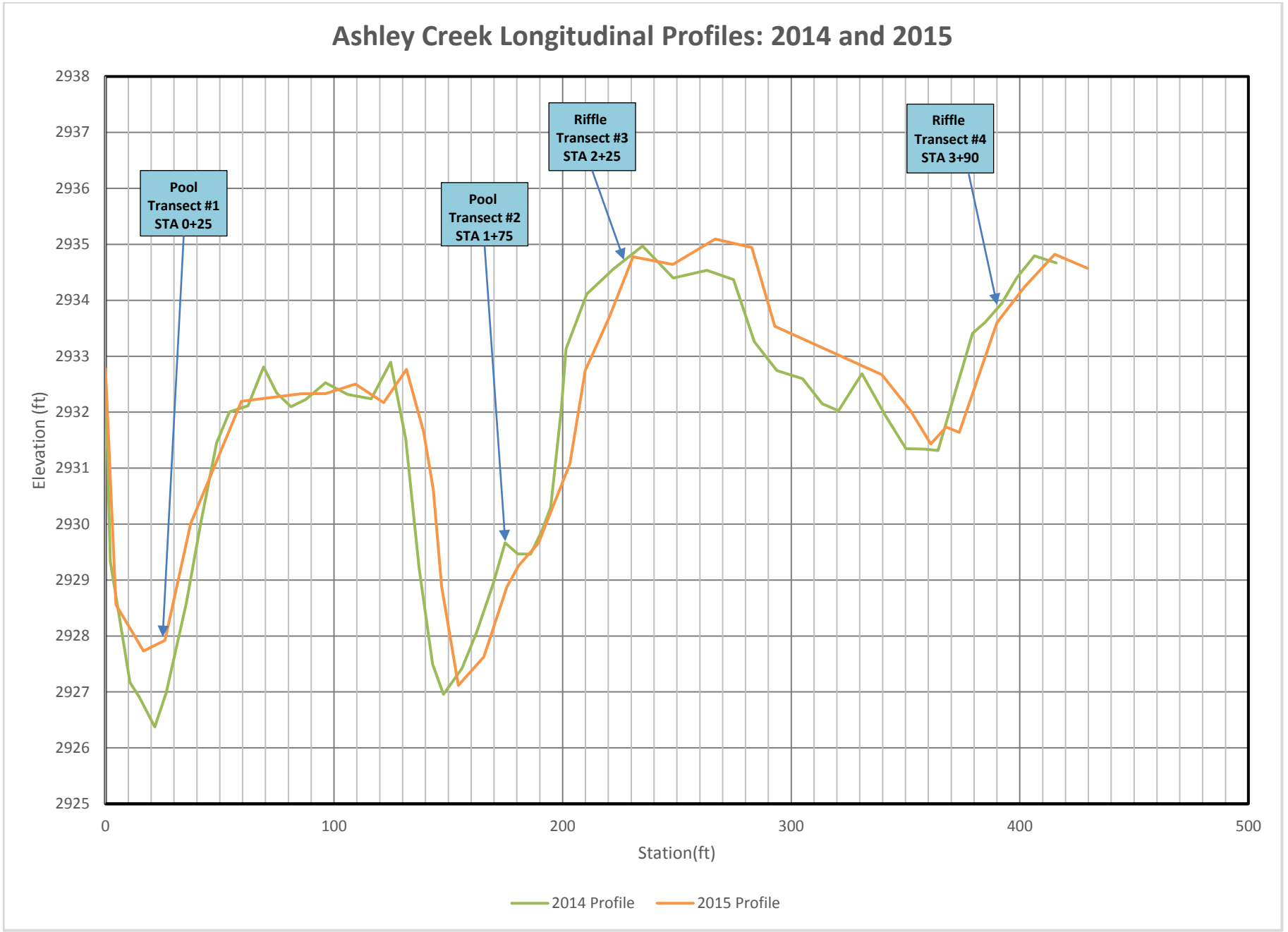
MDT Stream Mitigation Monitoring
Ashley Creek
Flathead County, Montana


Ashley Creek Transect #1 - Pool
Elevation (ft)
2950
2949
2948
2947
2946
2945
2944
2943
2942
2941
2940
2939
2938
2937
2936
2935
2934
2933
2932
2931
2930
2929
2928
2927
2926
0
10
20
30
40
50
60
70
80
90
Station (ft)
Bankfull Elevation: 2937.64'
Max Depth not surveyed in 2013
TRANSECT VIEW IS LOOKING DOWNSTREAM
2013 XS
2013 WS
2014 XS
2014 WS
2015 XS
2015 WS
Bankfull


Ashley Creek Transect #2 - Pool
Elevation (ft)
2950
2949
2948
2947
2946
2945
2944
2943
2942
2941
2940
2939
2938
2937
2936
2935
2934
2933
2932
2931
2930
2929
2928
0
10
20
30
40
50
60
Station (ft)
Bankfull Elevation: 2937.53'
Max Depth not surveyed in 2013
TRANSECT VIEW IS LOOKING DOWNSTREAM
2013 XS
2013 WS
2014 XS
2014 WS
2015 XS
2015 WS
Bankfull


Ashley Creek Transect #3 - Riffle
Elevation (ft)
2947
2946
2945
2944
2943
2942
2941
2940
2939
2938
2937
2936
2935
2934
0
10
20
30
40
50
60
Station (ft)
Bankfull Elevation:
2937.50'
TRANSECT VIEW IS
LOOKING DOWNSTREAM
2013 XS
2013 WS
2014 XS
2014 WS
2015 XS
2015 WS
Bankfull


Ashley Creek Transect #4 - Riffle
Elevation (ft)
2943
2942
2941
2940
2939
2938
2937
2936
2935
2934
2933
Bankfull Elevation:
2936.7'
TRANSECT VIEW IS
LOOKING DOWNSTREAM
0
10
20
30
40
50
60
Station (ft)
2013 XS
2013 WS
2014 XS
2014 WS
2015 XS
2015 WS
Bankfull


Ashley Creek Longitudinal Profiles: 2014 and 2015
Pool Transect #1 STA 0+25
Pool Transect #2 STA 1+75
Riffle Transect #3 STA 2+25
Riffle Transect #4 STA 3+90
Elevation (ft)
2938
2937
2936
2935
2934
2933
2932
2931
2930
2929
2928
2927
2926
2925
0
100
200
300
400
500
Station(ft)
2014 Profile
2015 Profile

Appendix C

Project Area Photos

MDT Stream Mitigation Monitoring
Ashley Creek
Flathead County, Montana

PHOTO INFORMATION

PROJECT NAME: Ashley Creek Stream Mitigation Site

DATE: 2013 and 2015 Monitoring Events

CONFLUENCE

Photo Point 1—2013
Description: View of grade control structure downstream of project area. **Compass:** 315 (Northwest)

Photo Point 1—2015
Description: View of grade control structure downstream of project area. **Compass:** 315 (Northwest)

Photo Point 2—2013
Description: View of grade control structure downstream of project area. **Compass:** 315 (Northwest)

Photo Point 2—2015
Description: View looking upstream from pedestrian bridge. **Compass:** 293 (West-Northwest)

Photo Point 3.1—2013
Description: View looking south at upstream end of project site. **Compass:** 180 (South)

Photo Point 3.1—2015
Description: View looking south at upstream end of project site. **Compass:** 180 (South)

PHOTO INFORMATION

PROJECT NAME: Ashley Creek Stream Mitigation Site

DATE: 2013 and 2015 Monitoring Events

CONFLUENCE

Photo Point 3.2—2013
Description: View looking at upstream end of project site. **Compass:** 225 (Southwest)

Photo Point 3.2—2015
Description: View looking at upstream end of project site. **Compass:** 225 (Southwest)

Photo Point 4.1—2013
Description: View of channel looking downstream.
Compass: 90 (East)

Photo Point 4.1—2015
Description: View of channel looking downstream.
Compass: 90 (East)

Photo Point 4.2—2013
Description: View of channel looking upstream.
Compass: 315 (Northwest)

Photo Point 4.2—2015
Description: View of channel looking upstream.
Compass: 315 (Northwest)

PHOTO INFORMATION

PROJECT NAME: Ashley Creek Stream Mitigation Site

DATE: 2013 and 2015 Monitoring Events

CONFLUENCE

Additional Photo 1 - 2013
Description: View of Ashley/Spring Creek confluence.
Compass: 0 (North)

Additional Photo 1 - 2015
Description: View of Ashley/Spring Creek confluence.
Compass: 0 (North)

Additional Photo 2 - 2013
Description: View of eroding bank EBR1
Compass: 225 (South-Southwest)

Additional Photo 2 - 2015
Description: View of eroding bank EBR1
Compass: 225 (South-Southwest)

Additional Photo 3 - 2015
Description: View of additional bank erosion along EBR1 noted in 2015. **Compass:** 315 (Northwest)

Additional Photo 4 - 2015
Description: View of additional bank erosion along EBR1 noted in 2015. **Compass:** 0 (North)

PHOTO INFORMATION

PROJECT NAME: Ashley Creek Stream Mitigation Site

DATE: 2013, 2014, and 2015 Monitoring Events

CONFLUENCE

Additional Photo 5 - 2013
Description: EBR2
Compass: 180 (South)

Additional Photo 5 - 2015
Description: EBR2
Compass: 180 (South)

Additional Photo 6 - 2014
Description: EBL1
Compass: 0 (North)

Additional Photo 6 - 2015
Description: EBL1
Compass: 0 (North)

Additional Photo 5 - 2014
Description: View of EBL2
Compass: 315 (Northwest)

Additional Photo 5 - 2015
Description: View of EBL2
Compass: 315 (Northwest)

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T1 Left: Looking South West to T1 Right

T1 Right: Looking North East to T1 Left

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T1 Left Looking South West Upstream

T1 Left: Looking South East Downstream

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T1 Right: Looking North Upstream

T1 Right: Looking East down stream

T2 Left: Looking South to T2 Right

T2 Right: Looking North to T2 Left

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T2 Left Looking West Upstream

T2 Left: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T2: Looking West from Creek

T2: Looking East from creek

T2 Right: Looking North Upstream

T2 Right: Looking East down stream

T3 Left: Looking South West to T3 Right

T3 Right: Looking North East to T3 Left

T3 Left Looking West Upstream

T3 Left: Looking East down stream

T3: Looking West from Creek

T3: Looking East from Creek

T3 Right: Looking West Upstream

T3 Right: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T4 Left: Looking South to T4 Right

T4 Right: Looking North to T4 Left

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T1 Left Looking West Upstream

T1 Left: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION—ASHLEY CREEK

DATE: 8-26-15

T4: Looking West from Creek

T4: Looking East from Creek

T4 Right: Looking West Upstream

T4 Right: Looking East down stream

Appendix D

Channel Construction Details

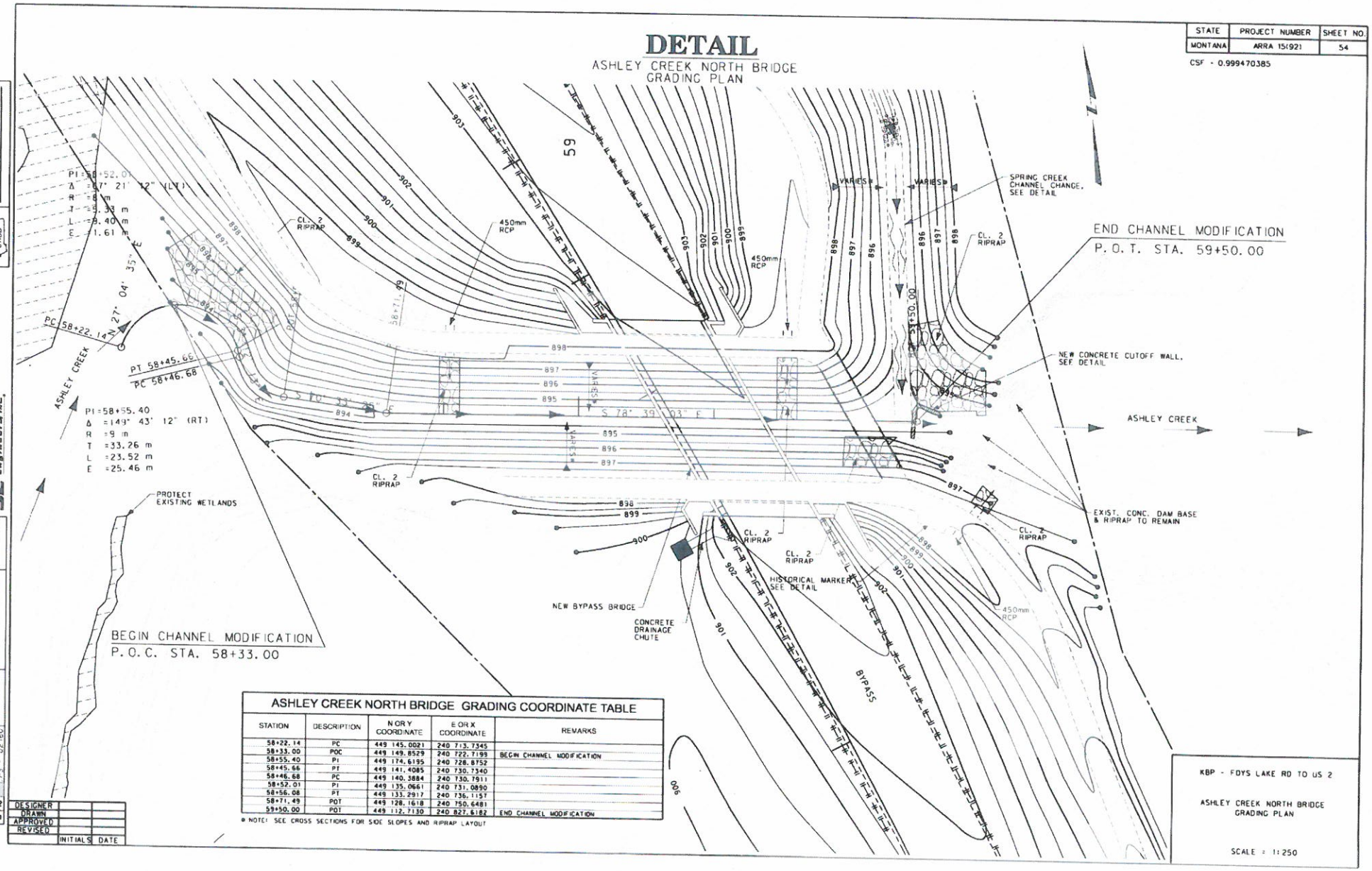
MDT Stream Mitigation Monitoring
Ashley Creek
Flathead County, Montana

DETAIL

ASHLEY CREEK NORTH BRIDGE
GRADING PLAN

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	ARRA 15(92)	54

CSF - 0.999470385



ASHLEY CREEK NORTH BRIDGE GRADING COORDINATE TABLE

STATION	DESCRIPTION	N OR Y COORDINATE	E OR X COORDINATE	REMARKS
58+22.14	PC	449 145.0021	240 713.7345	
58+33.00	POC	449 149.8529	240 722.7199	BEGIN CHANNEL MODIFICATION
58+55.40	PI	449 174.6195	240 728.8752	
58+45.66	PT	449 141.4085	240 730.7340	
58+46.68	PC	449 140.3884	240 730.7911	
58+52.01	PI	449 135.0661	240 731.0890	
58+56.08	PT	449 133.2917	240 736.1157	
58+71.49	POT	449 128.1618	240 750.6481	
59+50.00	POT	449 112.7130	240 827.6182	END CHANNEL MODIFICATION

* NOTE! SEE CROSS SECTIONS FOR SIDE SLOPES AND RIPRAP LAYOUT

KBP - FOYS LAKE RD TO US 2

ASHLEY CREEK NORTH BRIDGE
GRADING PLAN

SCALE = 1:250

	INITIALS	DATE
DESIGNER		
DRAWN		
APPROVED		
REVISED		

MONTANA DEPARTMENT OF TRANSPORTATION

MONTANA CADD

SE Stallings Engineers, Inc.

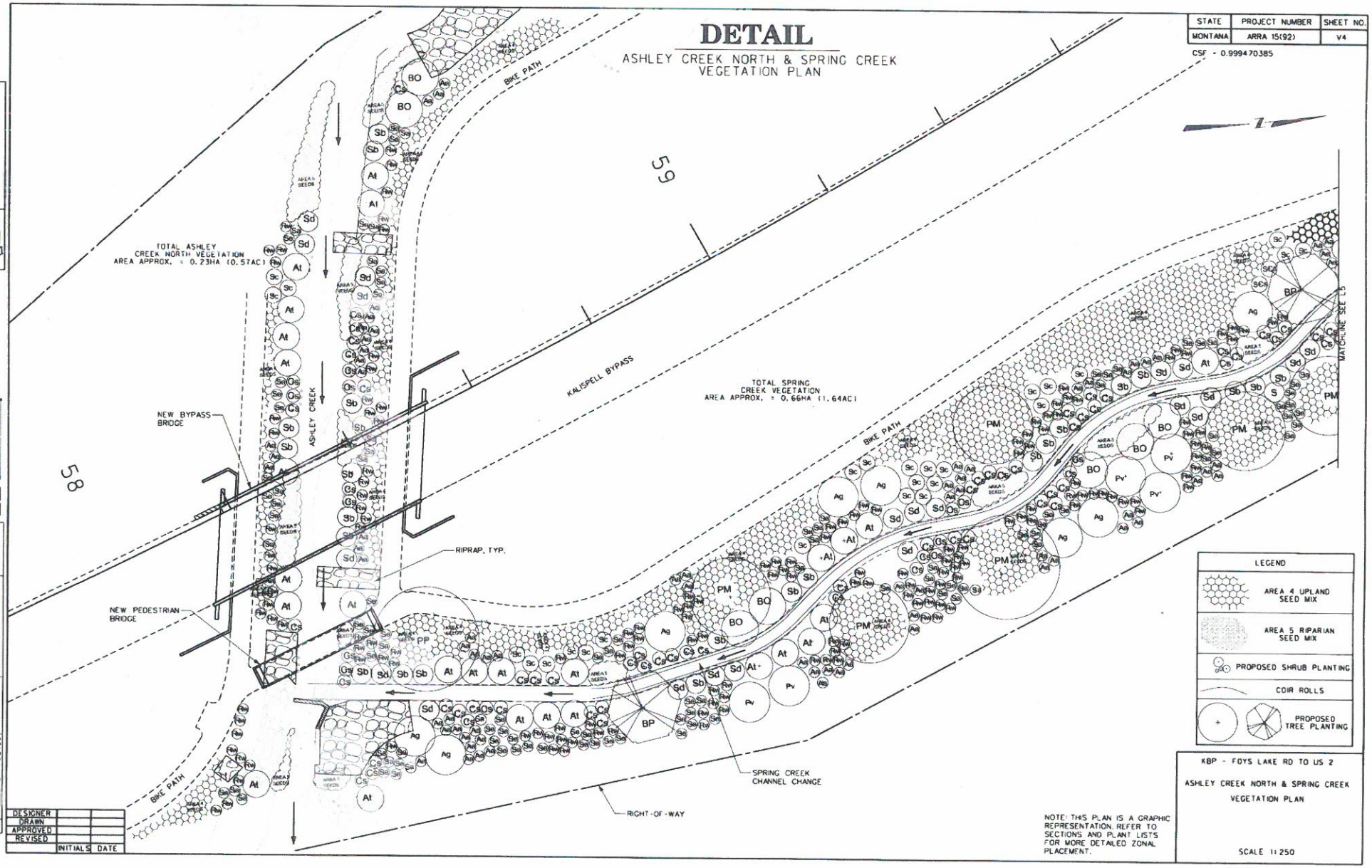
S:\dgn\20180\0dgns\54.DGN CHECKED BY
10/6/2009 11:16:22 AM REVIEWED BY
CHECKED BY
NO. DATE

DETAIL

ASHLEY CREEK NORTH & SPRING CREEK
VEGETATION PLAN

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	ARRA 15(92)	V4

CSF - 0.999470385



LEGEND

- AREA 4 UPLAND SEED MIX
- AREA 5 RIPARIAN SEED MIX
- PROPOSED SHRUB PLANTING
- COIR ROLLS
- PROPOSED TREE PLANTING

NOTE: THIS PLAN IS A GRAPHIC REPRESENTATION. REFER TO SECTIONS AND PLANT LISTS FOR MORE DETAILED ZONAL PLACEMENT.

KBP - FOYS LAKE RD TO US 2

ASHLEY CREEK NORTH & SPRING CREEK VEGETATION PLAN

SCALE 1:250

	INITIALS	DATE
DESIGNER		
DRAWN		
APPROVED		
REVISED		

MONTANA DEPARTMENT OF TRANSPORTATION

MONTANA CADD

SE Stalling Engineers, INC.

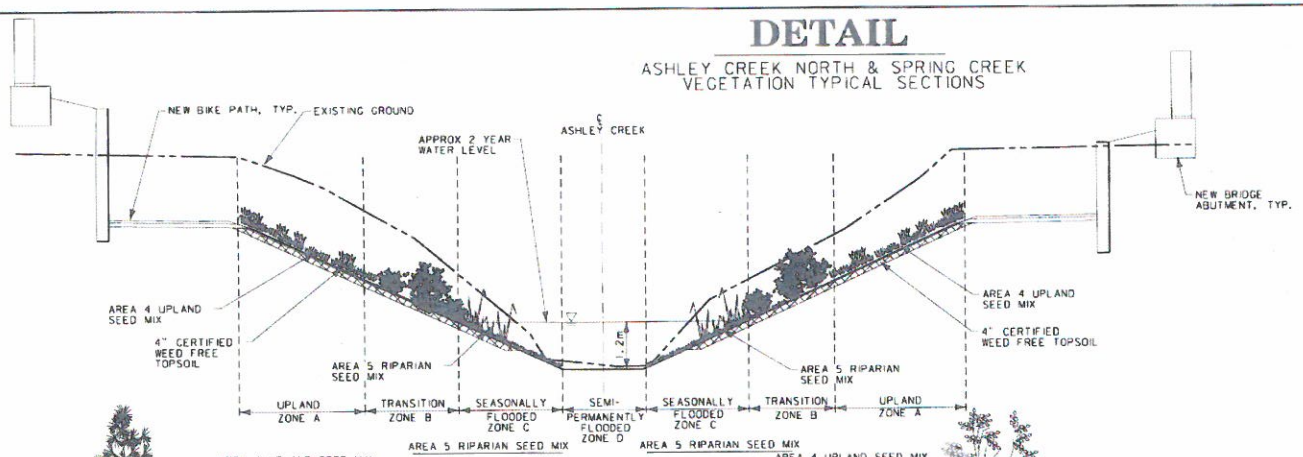
DETAIL

ASHLEY CREEK NORTH & SPRING CREEK VEGETATION TYPICAL SECTIONS

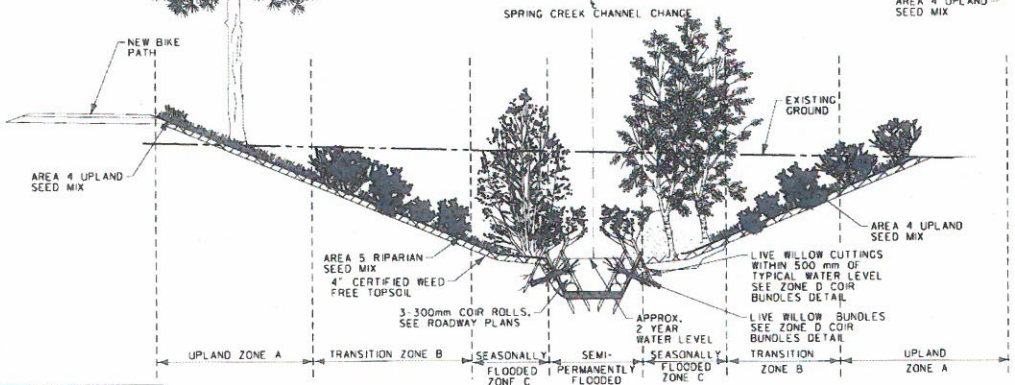
STATE	PROJECT NUMBER	SHEET NO.
MONTANA	ARRA 15(92)	V3

CSF = 0.999470385

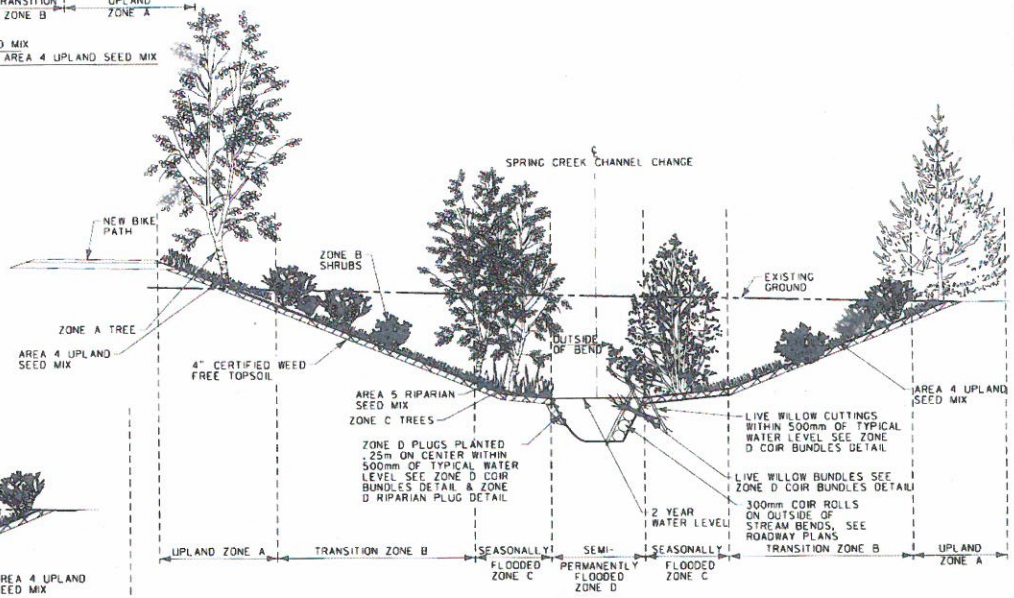
NOTES: 1. SEE ROADWAY PLANS FOR CHANNEL CONSTRUCTION DETAILS.
2. TYPICAL SECTIONS ARE GENERAL CONCEPTUAL DESIGN. FOR INFORMATION ONLY



ASHLEY CREEK NORTH BRIDGE TYPICAL SECTION
SCALE: NOT TO SCALE



SPRING CREEK CHANNEL CHANGE RIFFLE TYPICAL SECTION
SCALE: NOT TO SCALE



SPRING CREEK CHANNEL CHANGE POOL TYPICAL SECTION
SCALE: NOT TO SCALE

KBP - FOYS LAKE RD TO US 2

ASHLEY CREEK NORTH & SPRING CREEK VEGETATION TYPICAL SECTIONS

NO SCALE

DESIGNER		
DRAWN		
APPROVED		
REVISED		
	INITIALS	DATE

MONTANA DEPARTMENT OF TRANSPORTATION

MONTANA CADD

SE Stalling Engineering, Inc.

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	ARRA 15(92)	V2

CSF = 0.999470385

DETAIL

ASHLEY CREEK NORTH & SPRING CREEK VEGETATION SUMMARY & DETAILS

CHANNEL PLANTING SEQUENCE

1. PLACE COIR ROLL AS PER COIR ROLLS DETAIL IN ROADWAY PLANS AND SPECIAL PROVISIONS.
2. INSTALL PLANTS BETWEEN THE DATES OF OCTOBER 1 AND NOVEMBER 15 OR APRIL 30 AND JUNE 1 PROVIDED THE GROUND IS NOT FROZEN.
3. PLANT RIPARIAN PLUGS AS PER PLANTING DETAIL. INSTALL CUTTINGS BETWEEN APRIL 15 AND MAY 1.
4. PLANT WILLOW CUTTINGS AND BUNDLES AS PER PLANTING DETAIL.
5. INSTALL JUTE NETTING ON SLOPES GREATER THAN 3:1 AS PER SPECIAL PROVISIONS.
6. SEED UPLAND AREA 4 AND RIPARIAN AREA 5 AS PER SEEDING SPECIAL PROVISIONS.
7. PLANT TREES AND SHRUBS AS PER PLANTING DETAILS.
8. APPLY WEED FREE ORGANIC COMPOST MULCH AS PER SPECIAL PROVISIONS.

ASHLEY CREEK NORTH & SPRING CREEK CHANNEL CHANGE PLANT LIST *

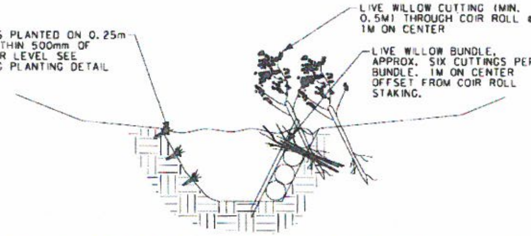
TYPE	BOTANICAL NAME	COMMON NAME	QNTY	SIZE
ZONE A UPLAND				
TREES				
BP	BETULA PAPYRIFERA	PAPER BIRCH	4	10' B&B
PP	PINUS PONDEROSA	PONDEROSA PINE	3	7' B&B
PM	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	8	6' B&B
ZONE B TRANSITIONAL				
SHRUBS				
TYPE	BOTANICAL NAME	COMMON NAME	QNTY	SIZE
Aa	AMELANCHIER ALNIFOLIA	SASKATOON SERVICEBERRY	108	1 GAL.
Pv	PRUNUS VIRGINIANA	COMMON CHOKECHERRY	8	5 GAL.
Rw	ROSA WOODSII	WOODS ROSE	243	1 GAL.
Sc	SHEPHERDIA CANADENSIS	CANADA BUFFALOBERRY	41	1 GAL.
Sa	SYMPHORICARPOS ALBUS	SNOWBERRY	156	1 GAL.
ZONE C SEASONALLY FLOODED				
TREES				
TYPE	BOTANICAL NAME	COMMON NAME	QNTY	SIZE
BO	BETULA OCCIDENTALIS	WATER BIRCH	11	15 GAL.
SHRUBS				
TYPE	BOTANICAL NAME	COMMON NAME	QNTY	SIZE
At	ALNUS INCANA SSP. TENUIFOLIA	THIN-LEAF ALDER	43	5 GAL.
Cs	CORNUS STOLONIFERA/SERICEA	RED-OSIER DOGWOOD	102	1 GAL.
Sb	SALIX BEBBIANA	BEBB WILLOW	38	5 GAL.
Sd	SALIX DRUMMONDIANA	DRUMMOND WILLOW	33	5 GAL.
ZONE D SEMI-PERMANENTLY FLOODED				
COIR ROLL STAKING SPACE @ 1m ON CENTER				
TYPE	BOTANICAL NAME	COMMON NAME	QNTY	
Sb	SALIX DRUMMONDIANA	DRUMMOND WILLOW	500	CUTTINGS
Sb	SALIX EXIGUA	SANDBAR WILLOW	500	CUTTINGS
COIR ROLL LAYERING SPACE 6 CUTTINGS PER BUNDLE @ 1m ON CENTER				
TYPE	BOTANICAL NAME	COMMON NAME	QNTY	
Sb	SALIX DRUMMONDIANA	DRUMMOND WILLOW	1500	CUTTINGS
Sb	SALIX EXIGUA	SANDBAR WILLOW	1500	CUTTINGS
STREAMBANK PLUGS				
	BOTANICAL NAME	COMMON NAME	QNTY	
	CAREX NEBRASCENSIS	NEBRASKA SEDGE	288	PLUGS
	CAREX UTRICULATA	BEAKED SEDGE	403	PLUGS
	CAREX VESICARIA	INFLATED SEDGE	288	PLUGS
	GLYCERIA ELATA (STRIATA)	FOWL MANNAGRASS	173	PLUGS

* FOR INFORMATION ONLY. INCLUDE ALL COSTS AND INCIDENTAL ITEMS ASSOCIATED WITH THE INSTALLATION OF THIS ITEM IN THE LUMP SUM BID PRICE FOR "VEGETATION".

JUTE NETTING *

STATION		square meters
FROM	TO	
58+19.58	61+31.96	6372
TOTAL		6372

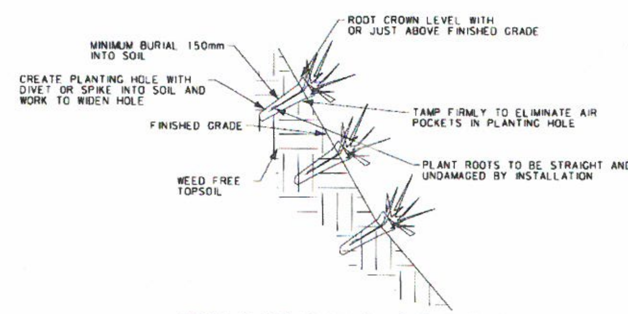
* FOR INFORMATION ONLY. INCLUDE ALL COSTS AND INCIDENTAL ITEMS ASSOCIATED WITH THE INSTALLATION OF THIS ITEM IN THE LUMP SUM BID PRICE FOR "VEGETATION".



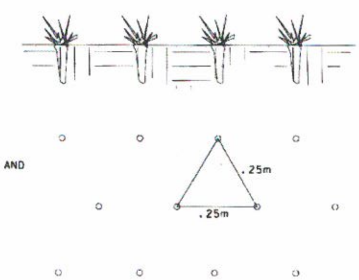
ZONE D COIR BUNDLES WITH WILLOW CUTTINGS AND LAYERING
SCALE: NOT TO SCALE

HARVESTING AND INSTALLATION NOTE:

1. HARVEST AND PLANT CUTTINGS DURING DORMANT SEASON.
2. USE HEALTHY STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE CUTTINGS OR SPLIT ENDS DURING INSTALLATTION.
4. BRIEFLY SOAK CUTTINGS IN WATER AND ROOTING HORMONE PRIOR TO INSTALLATION.
5. FOR LAYERING, BUNDLE 6 CUTTINGS TOGETHER AND BIND WITH BIODEGRADABLE JUTE STRING.
6. INSTALL WILLOW CUTTING AND WILLOW BUNDLE LAYERING DURING BANK GRADING AND COIR PLACEMENT.
7. WILLOW CUTTING AND WILLOW BUNDLES SHALL EXTEND INTO EXPECTED MOISTURE SOIL ZONES.
8. IF NECESSARY, CUT SMALL HOLES IN COIR ROLLS AND INSERT LIVE WILLOW CUTTING.
9. INSERT BUNDLES INTO SOIL BETWEEN COIR ROLLS.



ZONE D RIPARIAN PLUG PLANTING
FOR INSIDE BEND OF SPRING CREEK POOLS
SCALE: NOT TO SCALE



SPACING

KBP - FOYS LAKE RD TO US 2

ASHLEY CREEK NORTH & SPRING CREEK VEGETATION SUMMARY & DETAILS

NO SCALE

	INITIALS	DATE
DESIGNER		
DRAWN		
APPROVED		
REVISED		

DESIGNED BY
REVIEWED BY
CHECKED BY
CPS - U2160