1400 South 19th Avenue
Bozeman, MT 59718

January 17, 2014

To: To: Governor's Office, Sheena Wilson, State Capitol, Room 204, P.O. Box 200801, Helena, MT 59620-0801
Environmental Quality Council, State Capitol, Room 106, P.O. Box 201704, Helena, MT 59620-1704
Dept. of Environmental Quality, Metcalf Building, P.O. Box 200901, Helena, MT 59620-0901
Dept. of Natural Resources & Conservation, P.O. Box 201601, Helena, MT 59620-1601
Montana Fish, Wildlife & Parks:

Director's Office	Parks Division	Lands Section	FWP Commissioners
Fisheries Division	Legal Unit	Wildlife Division	Design & Construction

MT Historical Society, State Historic Preservation Office, P.O. Box 201202, Helena, MT 59620-1202
MT State Parks Association, P.O. Box 699, Billings, MT 59103
MT State Library, 1515 E. Sixth Ave., P.O. Box 201800, Helena, MT 59620
James Jensen, Montana Environmental Information Center, P.O. Box 1184, Helena, MT 59624
Janet Ellis, Montana Audubon Council, P.O. Box 595, Helena, MT 59624
George Ochenski, P.O. Box 689, Helena, MT 59624
Jerry DiMarco, P.O. Box 1571, Bozeman, MT 59771
Montana Wildlife Federation, P.O. Box 1175, Helena, MT 59624
Wayne Hurst, P.O. Box 728, Libby, MT 59923
Jack Jones, 3014 Irene St., Butte, MT 59701
Skyline Sportsmen, PO BOX 173, Butte, MT 59701
Montana TU, PO Box 7186, Missoula, MT 59807
George Grant TU, P.O. Box 563, Butte, MT 59702

Ladies and Gentlemen:

The enclosed draft Environmental Assessment has been prepared for habitat restoration in Poindexter Slough. The Beaverhead Watershed Committee and Montana Fish, Wildlife & Parks (FWP) propose to replace existing irrigation infrastructure, modify channel dimensions, and transplant riparian vegetation to improve fisheries habitat and restore natural processes of habitat formation and maintenance to Poindexter Slough.

There is a 30 day comment period for this EA. Written comments can be mailed or emailed to the address below, and must be received by 5:00 pm, February 17, 2014. Please include name and address with any comment. A public informational meeting will be held at the Dillon Search and Rescue Building on January 28th at 6 pm.

Matt Jaeger
Montana Fish, Wildlife & Parks
730 ½ N. Montana
Dillon, MT 59725
406-683-9310
mattjaeger@mt.gov

Thank you for your interest.

Sincerely,

Patrick J. Flowers
Region Three Supervisor

Attachment

Draft
Environmental Assessment

Poindexter Slough Habitat Restoration

17 January 2014

Montana Fish, Wildlife & Parks

Draft Environmental Assessment
CHECKLIST

PART I. PROPOSED ACTION DESCRIPTION

1. Type of proposed state action: The Beaverhead Watershed Committee and Montana Fish, Wildlife & Parks (FWP) propose to replace existing irrigation infrastructure, modify channel dimensions, and transplant riparian vegetation to improve fisheries habitat and restore natural processes of habitat formation and maintenance to Poindexter Slough. The proposed work would consist of replacing an existing 48" screw gate on the Beaverhead River that diverts flow into Poindexter Slough with two 5' screw gates capable of conveying periodic increased flows to mobilize sediment and maintain fish habitat. Habitat maintenance flows would have a 3 day peak of 150 to 200 cfs, last for a total of 7 to 10 days, and occur once every two to five years if conditions allow. Typical base flow of Poindexter Slough is presently about 50 cfs, which would be maintained following this project. Two existing 5' wide by 5' tall screw gates, a pin-and-plank diversion structure, and an irrigation pump at the Dillon Canal Diversion on Poindexter Slough would be replaced with two 6' wide x 4' tall screw gates and a new pin-and-plank diversion structure and irrigation pump set 2 feet lower in elevation. The upper 3,100 feet of the Dillon Canal and adjacent 1,900 feet of Poindexter Slough would be regraded to satisfy irrigation requirements at the new diversion and screw gate elevations without creating a seasonal backwater or barrier to fish movement. The upper 1,462 feet of stream that is channelized and entrenched will be widened to the approximate dimensions that occur in the middle 10,500 feet of Poindexter Slough and a flood plain will be constructed. The lower 13,104 feet of stream that is over-widened and unable to effectively transport fine sediment will be narrowed to the approximate dimensions that occur in the middle 10,500 feet of Poindexter Slough. One hundred seventy-nine pools will be deepened and narrowed throughout the 25,066 foot length of Poindexter Slough such that fine sediment will be effectively transported and adequate depth maintained to improve adult trout habitat. All constructed stream banks will be revegetated and stabilized with locally salvaged and transplanted sod mats and willows. Channel dimensions, habitat improvement and revegetation locations, and irrigation infrastructure specifications are described in Appendix 1. A flow management plan that describes magnitude and duration of habitat maintenance flows is contained in Appendix 2.

2. Agency authority for the proposed action:

The Montana Code Annotated (MCA) 87-1-201 requires that FWP supervise fish and gives authority to spend collected resources for the purpose of their management, of which habitat restoration is a part. MCA 87-1-257 directs FWP to administer a river restoration program that implements physical projects to improve rivers and their associated lands in order to conserve and enhance fish habitat in cooperation with individuals and conservation districts. Similarly, MCA 87-1-272 through 273 directs the FWP to administer a Future Fisheries Improvement Program, which involves physical projects to restore degraded fish habitat in rivers and lakes for the purpose of improving wild fisheries. The proposed fisheries habitat restoration project on Poindexter Slough was funded in part through the aforementioned programs and developed in coordination with adjacent private landowners and the Beaverhead Conservation District through their Watershed Committee. About 3.2 miles of Poindexter Slough and the proposed project occurs on the Poindexter Slough Fishing Access Site (FAS). MCA 23-1-127 defines erosion control, stream bank stabilization, and planting of native trees, grasses and shrubs for the purpose of habitat stabilization as maintenance of FASs.

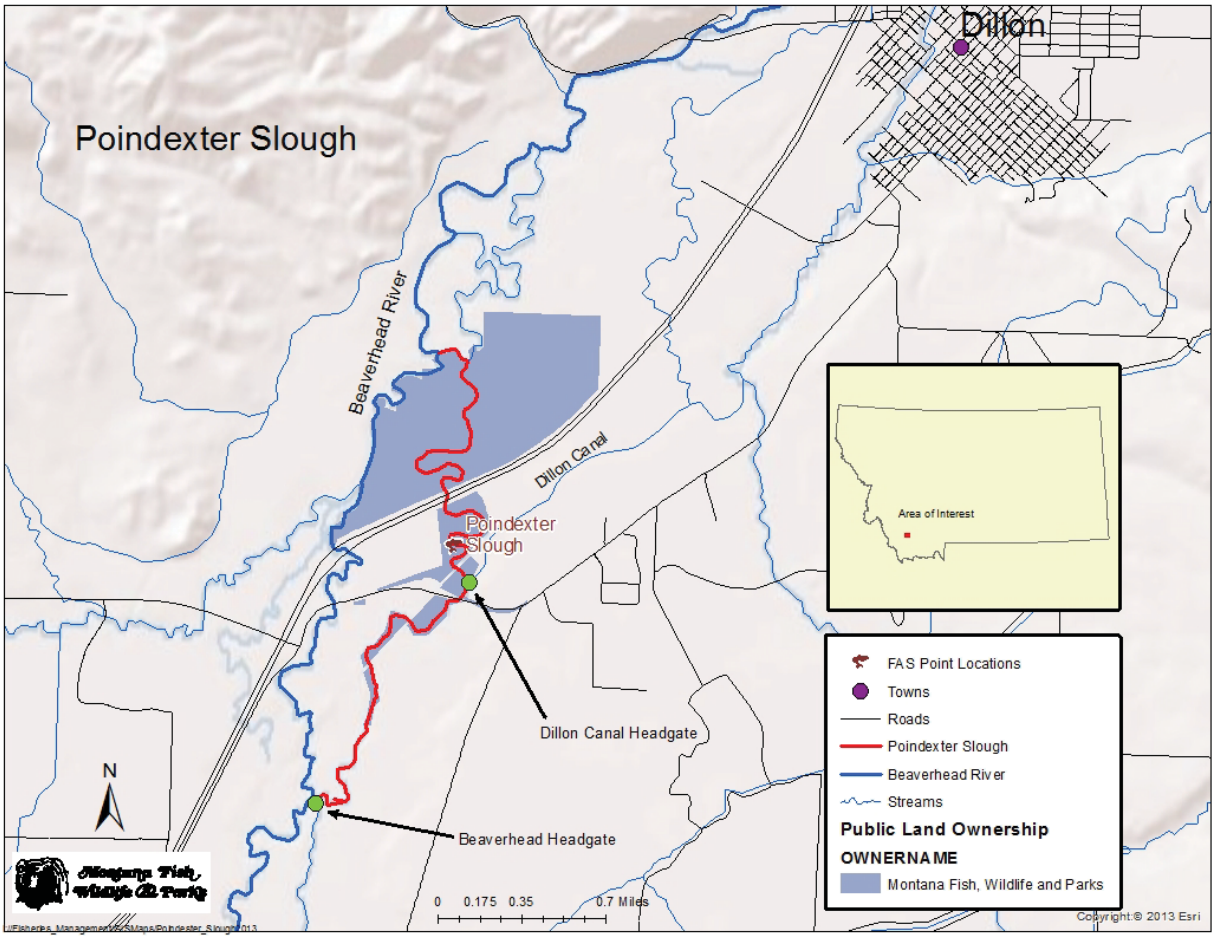
Finally, MCA 75-7-101 provides protection to natural rivers and streambeds to keep sedimentation to a minimum.

3. Name, address and phone number of project sponsor (if other than the agency):
Beaverhead Conservation District and Watershed Committee
420 Barrett Street
Dillon, MT 59725
406-683-3802

4. Anticipated Schedule:
Estimated Construction Commencement Date: Spring 2014
Estimated Completion Date: Spring 2015
Current Status of Project Design (% complete): 100%

5. Location affected by proposed action (county, range and township – included map):
Poindexter Slough is about 4 miles southwest of Dillon, MT in Beaverhead County (Township 7 S., Range 9 W., Sections 26, 34, and 35; see Figure 1)

Figure 1. Poindexter Slough. The proposed project location is shown in red and referenced irrigation infrastructure in green.



6. Project size -- estimate the number of acres that would be directly affected that are currently:

	Acres		Acres
(a) Developed:		(d) Floodplain	0
Residential	0		
Industrial	0	(e) Productive:	
(existing shop area)		Irrigated cropland	0
(b) Open Space/	0	Dry cropland	0
Woodlands/Recreation		Forestry	0
(c) Wetlands/Riparian	4.2	Rangeland	0
Areas		Other	0

8. Permits, Funding & Overlapping Jurisdiction.

(a) Permits: permits will be filed at least 2 weeks prior to project start.

Agency Name	Permits
Army Corps of Engineers	404
Montana Department of Environmental Quality	318
Montana Fish, Wildlife & Parks	124
Beaverhead County	Floodplain Permit

(b) Funding:

Agency Name	Funding Amount
Private or landowner donations	$80,000
HB 223 grant	$16,638
DNRC Renewable Resources Grant	$100,000
Future Fisheries Improvement Program	$88,643
U.S. Fish and Wildlife Service Partners Program	$10,000
Montana Fish, Wildlife & Parks	$40,000

(c) Other Overlapping or Additional Jurisdictional Responsibilities:

Agency Name	Type of Responsibility
Montana Department of Natural Resources & Conservation	Water rights

9. Narrative summary of the proposed action: Poindexter Slough is a 4.7 mile long valley-bottom channel of the Beaverhead River fed by a combination of groundwater and flow from the Beaverhead River. The lower 3.2 miles are located on an FWP FAS and provide one of the few publically accessible spring creek angling experiences in southwest Montana. When good habitat conditions occur, abundances of over 2,000 adult trout per mile and excellent angling are supported by Poindexter Slough. Because of its accessibility and close proximity to the city of Dillon, Poindexter Slough is a heavily frequented sport fishery that has accommodated up to 4,095 angler days per year. Poindexter Slough is also important to the local economy of Dillon; during periods of high angler use it is estimated that over $433,000 of direct expenditures are made annually in Beaverhead County by anglers fishing Poindexter

Slough.

Periodic surveys completed by FWP have documented a steady decline in the fishery and angler use of Poindexter Slough over the past 12 years related to changes in irrigation practices. Abundances of adult brown trout declined from about 2,400 fish per mile in 1999 to between 500 and 1,000 fish per mile during most of the 2000's. Annual angler use declined commensurately during this period from over 4,000 angler days to a low of 610 angler days and average angler satisfaction rating transitioned from "excellent" to "poor." The observed declines are primarily related to indirect habitat degradation following conversion from flood to pivot irrigation in the areas surrounding Poindexter Slough. Poindexter Slough was traditionally fed largely by groundwater returning from flood irrigation. These "spring" sources were adequate to meet the irrigation demands of the Dillon Canal, which diverts its water right about half way down the slough, and create a very productive and stable spring creek fishery. As pivots replaced flood irrigation, groundwater inputs decreased and Poindexter Slough was supplemented with increasingly more water from the Beaverhead River in order to deliver the Dillon Canal's water right. Diverted Beaverhead River water carries and deposits a large amount of fine sediment into Poindexter Slough, which has progressively filled pool habitat and degraded riffle habitat. In addition to the aforementioned declines in fish abundance and angler use, aquatic insect habitat has been reduced as the streambed has been covered by fine sediment. Because Poindexter Slough is a relict Beaverhead River channel its present dimensions require relatively large flows of up to 500 cfs in some reaches to most effectively maintain habitats by mobilizing and flushing fine sediments from pools and riffles. The present infrastructure allows a maximum of 50 cfs to be diverted from the Beaverhead River in addition to the up to 25 cfs of accreted flows Poindexter Slough gains over its length.

A 2,000 foot reach of stream backwatered by the Dillon Canal diversion further degrades habitat and complicates sediment transport issues in Poindexter Slough. A pin-and-plank diversion structure is presently used to raise water surface elevation several feet to serve an adjacent landowner's irrigation pump and feed the Dillon Canal. This structure results in seasonal creation of a small impoundment, which inundates 2,000 feet of stream habitat and captures sediment throughout the irrigation season. Following the irrigation season the boards are removed and the stream recolonizes a channel by eroding through deposited sediments resulting in relatively low quality habitat in the previously backwatered reach and transport of the sediment trapped there downstream, thereby causing further habitat degradation. Additionally, the present diversion structure serves as a seasonal barrier to upstream fish movements.

In order to effectively mobilize and transport fine sediment and restore better habitat conditions, capacity for larger habitat maintenance flows and elimination of backwatered reaches is required. Increasing the size of the Beaverhead River head gate would allow adequate habitat maintenance flows (150 to 200 cfs) in upper reaches, although it is infeasible to divert the volume of flow (~500 cfs) needed to maintain habitats in the lower reaches of Poindexter Slough. However, adequate habitat maintenance flows can be achieved throughout Poindexter Slough by a combination of increasing the size of the Beaverhead River head gate and selectively narrowing the channel in lower reaches. This alternative seeks to employ an active approach to channel enhancement by increasing the quantity and depth of pool habitat, restoring appropriate width-to-depth ratios for riffles and pools, removing or isolating fine sediment deposits from stream bed, and encouraging natural recruitment of willows and other woody riparian vegetation in conjunction with periodic habitat maintenance flows. The proposed work would consist of replacing an existing 48" screw gate on the Beaverhead River that diverts flow into Poindexter Slough with two 5' screw gates capable of accommodating periodic increased flows to mobilize sediment and maintain fish habitat. Habitat maintenance flows would have a 3 day peak of 150 to 200 cfs, last for a total of 7 to 10 days, and occur once every two to five years if conditions allow. Typical base flow of Poindexter Slough is presently about 50 cfs, which would be maintained following this project. Two existing 5' wide by 5'

tall screw gates, a pin-and-plank diversion structure, and an irrigation pump at the Dillon Canal Diversion on Poindexter Slough would be replaced with two 6' wide x 4' tall screw gates and a new pin-and-plank diversion structure and irrigation pump set 2 feet lower in elevation. The upper 3,100 feet of the Dillon Canal and adjacent 1,900 feet of Poindexter Slough would be regraded to satisfy irrigation requirements at the new diversion and screw gate elevations without creating a seasonal backwater or barrier to fish movement. The upper 1,462 feet of stream that is channelized and entrenched will be widened to the approximate dimensions that occur in the middle 10,500 feet of Poindexter Slough and a flood plain will be constructed. The lower 13,104 feet of stream that is over-widened (up to 80 feet wide) and unable to effectively transport fine sediment will be narrowed to the approximate dimensions (about 30 feet wide) that occur in the middle 10,500 feet of Poindexter Slough. One hundred seventy-nine pools will be deepened and narrowed throughout the 25,066 foot length of Poindexter Slough such that fine sediment will be effectively transported and adequate depth maintained to improve adult trout habitat. All constructed stream banks will be revegetated and stabilized with locally salvaged and transplanted sod mats and willows. Channel dimensions, habitat improvement and revegetation locations, and irrigation infrastructure specifications are described in Appendix 1. A Flow Management Plan that describes desired magnitude and duration of habitat maintenance flows is contained in Appendix 2. Project construction may be phased into two reaches (above and including Dillon Canal and below Dillon Canal) over consecutive winters contingent on funding.

The ultimate success of this project will be quantified by improvements in fish abundances, angler use, and angler ratings of their quality of experience on Poindexter Slough. It is FWP's expectation that this project will result in a return to fish abundances and levels of angler use and satisfaction comparable to pre-sedimentation levels. Because the majority of this project occurs on lands administered by FWP and accessible to anglers, we expect the proposed improvements to irrigation infrastructure, fisheries habitat, and fish abundances will provide a direct and clear public benefit and improved recreational fishing opportunity.

10. Description and analysis of reasonable alternatives:

Alternative A: No Action
Implementation of the No Action alternative would leave the existing infrastructure and channel dimensions in place. Fine sediment would continue to be imported into Poindexter Slough from the Beaverhead River without a mechanism to remove it or for the channel to maintain its pools and riffles. A seasonal backwater and barrier to fish movements would remain in place. Relatively low quality habitat for adult trout would persist and result in continued depressed adult trout abundances, angler use, angler satisfaction ratings, and angler expenditures in Beaverhead County.

Alternative B: Proposed Action
The Proposed Action would replace existing irrigation infrastructure, modify channel dimensions, transplant riparian vegetation to improve fisheries habitat, eliminate a seasonal backwater and barrier to fish movement, and restore natural processes of habitat formation and maintenance to Poindexter Slough as described above and in Appendix 1 and 2. It is our expectation that this project will result in a return to fish abundances and levels of angler use and satisfaction comparable to pre-sedimentation levels.

Alternative C: Replace irrigation infrastructure without channel restoration
This alternative would allow natural habitat maintenance processes and sediment mobilization to effectively occur over the 42% of Poindexter Slough that is appropriately sized to accommodate habitat maintenance flows provided by the proposed infrastructure.

Pools within this reach would be of higher quality than they presently are, but of lower quality than if selectively narrowed and deepened as proposed in Alternative B. The lower 52% of Poindexter Slough that is presently too large in dimension to most effectively accommodate the proposed habitat maintenance flows would not have habitat maintenance processes and sediment mobilization fully restored and habitat would remain comparable to the present state. Failure to regrade the reach of stream above the Dillon Canal would disallow lowering of the diversion structure, irrigation pump, and screw gate and result in continued existence of a seasonal backwater and barrier to fish movement. Fish abundances, angler use, and angler satisfaction will likely be higher than present levels but lower than pre-sedimentation levels under this alternative.

Alternative D: Channel restoration without replacing irrigation infrastructure
This alternative would remove silt from pools and temporarily improve adult trout habitat; however, habitat quality would revert back to the present condition in the absence of infrastructural changes that allow habitat maintenance and sediment flushing flows. Failure to replace irrigation infrastructure at the Dillon Canal would result in continued existence of a seasonal backwater and barrier to fish movement. Fish abundances, angler use, and angler satisfaction would likely increase to pre-sedimentation levels for several years and then revert back to the present condition as habitat quality declined from sedimentation.

11. Evaluation and listing of mitigation, stipulation, or other control measures enforceable by the agency or another government agency: The Beaverhead Conservation District and Watershed Committee, Dillon Canal, FWP, and adjacent private landowners will develop a mutually agreed upon operation plan that will detail roles, responsibilities, and flow management of Poindexter Slough prior to project implementation. A copy of the draft Flow Management Plan and associated monitoring is attached as Appendix 2.

PART II. ENVIRONMENTAL REVIEW CHECKLIST

Evaluation of the impacts of the Proposed Action including secondary and cumulative impacts on the Physical and Human Environment.

A. PHYSICAL ENVIRONMENT

1. LAND RESOURCES Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil, which would reduce productivity or fertility?			X		Yes	1b.
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?			X		Yes	1d.
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

1b. Donor sites for transplanted vegetation will experience minor short-term effects but will be revegetated using an appropriate native seed mix and be widely dispersed to avoid significant impacts to a localized area.

1d. The specific purpose of this project is to modify a stream channel to reduce siltation, sediment deposition, and erosion. Following the project chronic deposition of silts will be alleviated and stream habitats substantially improved. Donor sites for transplanted vegetation will experience minor short-term effects but will be revegetated using an appropriate native seed mix and be widely dispersed to avoid impacts to a localized area.

2. AIR Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Emission of air pollutants or deterioration of ambient air quality? (Also see 13 (c).)		X				
b. Creation of objectionable odors?		X				
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. For P-R/D-J projects, will the project result in any discharge, which will conflict with federal or state air quality regulations? (Also see 2a.)		X				

3. WATER Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?			X		Yes	3a.
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of floodwater or other flows?			X		Yes	3c.
d. Changes in the amount of surface water in any water body or creation of a new water body?			X		Yes	3d.
e. Exposure of people or property to water related hazards such as flooding?		X			NA	See 3c.
f. Changes in the quality of groundwater?		X				
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?		X				
i. Effects on any existing water right or reservation?		X			NA	3i.
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. For P-R/D-J, will the project affect a designated floodplain? (Also see 3c.)			X		Yes	3l.
m. For P-R/D-J, will the project result in any discharge that will affect federal or state water quality regulations? (Also see 3a.)			X		Yes	See 3a.

3a. A short term increase in turbidity will occur during stream bank construction, removal of silts from pools, and installation of irrigation infrastructure. A 318 Authorization from Montana Department of Environmental Quality will be obtained and all turbidity requirements specified therein will be followed such that the Short Term Water Quality Standard for Turbidity Related to Construction Activity is met. Normal short-term increases in turbidity will occur when habitat maintenance flows are staged. All sediment that is mobilized will originate from and return to the Beaverhead River; there will be no external sediment generated by construction or operation of this project.

3c. This project will increase the quantity of water that can be routed into Poindexter Slough for the purpose of improving and maintaining habitat quality and removing fine sediment from pools as described in Appendix 2. Because channel capacities have been calculated and quantity of flow can be precisely regulated this project will not cause or increase the risk of flooding.

3d. Poindexter Slough is a channel of the Beaverhead River. Although the project will route more water down this channel it will all remain contained in the Beaverhead River system such that there is no net change of surface water in the Beaverhead River. All diverted flow not legally removed to satisfy a water right will return to the main channel of the Beaverhead River after flowing through Poindexter Slough. Specific quantity and duration of flow diversion are described in Appendix 2.

3e. See 3c.

3i. Implementation of this project will not affect existing water rights in Poindexter Slough or the Beaverhead River. Poindexter Slough is a channel of the Beaverhead River. Although the project will route more water down this channel it will all remain contained in the Beaverhead River system such that net change of surface water in the Beaverhead River will not occur. All diverted flow not legally removed to satisfy a water right will return to the main channel of

the Beaverhead River after flowing through Poindexter Slough. Irrigation infrastructure will be designed, constructed, and operated such that it delivers all full legal water rights in Poindexter Slough and the adjacent mainstem Beaverhead River channel. Specific quantity and duration of flow diversion are described in Appendix 2. The Beaverhead Conservation District and Watershed Committee, Dillon Canal, FWP, and adjacent private landowners will develop a mutually agreed upon operation plan that will detail roles, responsibilities, and flow management of Poindexter Slough prior to project implementation.

3l. Channel restoration and revegetation work will increase capacity and quantity of the Poindexter Slough floodplain using approaches and materials that emulate existing functional floodplain condition such that no negative consequences will result. A total of 4.2 acres of emergent wetland floodplain will be constructed over the 4.7 mile length of Poindexter Slough at sites where pools are narrowed and deepened. New flood plain will also be constructed in upper reaches to improve channel capacity and reduce erosion at high flows. The channel and all infrastructure will be sized to adequately convey the controlled flow regime described in Appendix 2. No constrictions or impediments will be placed in the floodplain by this project.

3m. See 3a.

4. VEGETATION **Will the proposed action result in?**	**IMPACT**					
	Unknown	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X		Yes	4a.
b. Alteration of a plant community?			X		Yes	See 4a.
c. Adverse effects on any unique, rare, threatened, or endangered species?		X			NA	4c.
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X			NA	4e.
f. For P-R/D-J, will the project affect wetlands, or prime and unique farmland?			X		NA	4f.
g. Other:		X				

4a. Abundances of willows along the stream bank will be increased following transplanting of this vegetation type as specified in Appendix 1. Because only local vegetation will be used for willow and sod transplants a change in diversity is not expected and a net change in abundance will not occur during construction. Donor sites within the FAS where vegetation is removed will be re-seeded using an appropriate native seed mix, which will result in an ultimate increase in abundance of vegetation.

4b. See 4a.

4c. Species of Concern that have been observed in the project area include bald eagle, boblink, great blue heron, and hory bat. No bald eagle nests or great blue heron rookeries occur within the project area. The planned construction periods (early spring or late fall) occur outside of the nesting periods of bobolink. No disturbance of cottonwood or other deciduous trees will occur as part of the proposed project so potential roosting areas for hory bats will not be affected.

4e. Vegetation from donor sites will be monitored and maintained to prevent establishments of noxious weeds.

4f. This project will create about 4.2 acres of emergent wetland habitat over the 4.7 mile length of Poindexter Slough as pools are narrowed and deepened.

5. FISH/WILDLIFE Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Deterioration of critical fish or wildlife habitat?		X			NA	5a.
b. Changes in the diversity or abundance of game animals or bird species?			X		NA	5b.
c. Changes in the diversity or abundance of nongame species?			X		NA	5c.
d. Introduction of new species into an area?		X				
e. Creation of a barrier to the migration or movement of animals?		X			NA	5e.
f. Adverse effects on any unique, rare, threatened, or endangered species?		X				
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				
h. For P-R/D-J, will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f.)		X				
i. For P-R/D-J, will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d.)		X				

5a. Substantial improvements to fish habitat will result from this project by reducing sedimentation of riffles and pools.

5b. Substantial increases of adult trout abundances in Poindexter Slough are expected to result from this project. It is our expectation that this project will result in a return to fish abundances comparable to pre-sedimentation levels (> 2,000 adult trout per mile). This project will also improve the quality and quantity of spawning habitats in Poindexter Slough, which may result in increased trout abundances in the adjacent mainstem channel of the Beaverhead River.

5c. Improvements in habitat quality may also result in increased abundances of native non-game species such as Rocky Mountain sculpin and white sucker that are present in Poindexter Slough.

5e. This project will eliminate a seasonal barrier to upstream fish movements. An existing irrigation diversion and associated conveyance will be lowered such that its full water right can be diverted and delivered without creating an impoundment and resultant fish barrier.

B. HUMAN ENVIRONMENT

6. NOISE/ELECTRICAL EFFECTS Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Increases in existing noise levels?			X		Yes	6a.
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

6a. A minor and short-term increase in noise caused by the operation of normal construction equipment (i.e., tracked excavators, dump trucks, etc.) is expected. Construction will be limited to daylight hours during the non-irrigation season and periods of relatively low use (early spring, late fall) to limit impacts.

7. LAND USE Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X			NA	7a.
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?		X			NA	See 7a.
d. Adverse effects on or relocation of residences?		X				

7a. The majority of Poindexter Slough occurs on a FWP Fishing Access Site managed specifically to provide angling opportunity. This project will improve angling opportunity (i.e., angler use and satisfaction) by improving adult trout habitat and abundances, which is consistent with existing land use and management goals for this FAS.

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?		X			NA	8a.
b. Affect an existing emergency response or emergency evacuation plan, or create a need for a new plan?		X				
c. Creation of any human health hazard or potential hazard?		X				
d. For P-R/D-J, will any chemical toxicants be used? (Also see 8a)		X				

8a. All machinery and equipment operated near flowing waters will be required to be inspected daily for leaks of any fluids and power washed before be mobilized to the construction site. FWP would continue to monitor for and control the noxious weeds within the FAS through the use of herbicides and mechanical means per the methods described in FWP's Statewide Integrated Weed Management Plan. Application of herbicides would be in compliance with application guidelines and applied by trained applicators to reduce the risk of chemical spills or water contamination.

9. COMMUNITY IMPACT Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?			X		NA	9c.
d. Changes in industrial or commercial activity?			X		NA	See 9c.
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

9c. Increased direct expenditures at Beaverhead County businesses by anglers fishing Poindexter Slough are expected to result from this project. Amount of angler use of Beaverhead County fisheries is directly and positively correlated with expenditures in Beaverhead County businesses; more expenditures are made as angler use increases. Because of its accessibility and close proximity to the city of Dillon, Poindexter Slough is a heavily frequented sport fishery that has accommodated up to 4,095 angler days per year. Poindexter Slough is also important to the local economy of Dillon; during periods of high angler use it is estimated that over $433,000 of direct expenditures are made annually in Beaverhead County by anglers fishing Poindexter Slough. Following sedimentation of habitat and declines in fish abundances annual angler use declined from over 4,000 angler days to a low of 610 angler days and average angler satisfaction rating transitioned from "excellent" to "poor." Average angler expenditures are estimated to have declined by over $368,000 to less than $65,000 associated with reduced habitat quality and fish abundances. It is our expectation that habitat improvements resulting from this project will result in a return to fish abundances, levels of angler use and satisfaction, and, ultimately, angler expenditures comparable to pre-sedimentation levels.

9d. See 9c.

10. PUBLIC SERVICES/TAXES/UTILITIES Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify:		X				
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased use of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs.			X		NA	10f

10f. Periodic execution of habitat maintenance flows as described in Appendix 2 will occur. Short-term monitoring and maintenance for noxious weeds in vegetation donor sites will also occur as specified by MCA 23-1-27. Because all maintenance activities are minor and typical of those presently required of existing staff and for FASs they will be accomplished without the need for additional funding or allocation of resources.

11. AESTHETICS/RECREATION Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report.)			X		NA	11c.
d. For P-R/D-J, will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c.)		X				

11c. Angler use and quality of experience are expected to increase to previously documented levels resulting from implementation of this project. Following sedimentation of habitat and declines in fish abundances annual angler use declined from over 4,000 angler days to a low of 610 angler days and average angler satisfaction rating transitioned from "excellent" to "poor." It is our expectation that habitat improvements resulting from this project will result in a return to fish abundances and levels of angler use and satisfaction comparable to pre-sedimentation levels.

12. CULTURAL/HISTORICAL RESOURCES Will the proposed action result in:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?	X				Yes	12a.
b. Physical change that would affect unique cultural values?	X				Yes	See 12a.
c. Effects on existing religious or sacred uses of a site or area?	X				Yes	See 12a.
d. For P-R/D-J, will the project affect historic or cultural resources? Attach SHPO letter of clearance. (Also see 12.a.)	X				Yes	See 12a.

12a. A cultural inventory is being completed synchronously with this EA, although no impacts are anticipated. A SHPO letter of clearance and any mitigation measures will be included in the Decision Notice for this EA.

SIGNIFICANCE CRITERIA

13. SUMMARY EVALUATION OF SIGNIFICANCE Will the proposed action, considered as a whole:	IMPACT					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources that create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects, which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?		X				
f. For P-R/D-J, is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e.)		X				
g. For P-R/D-J, list any federal or state permits required.			X			13g.

13g. A 404, 318, 124, and floodplain permit are required as described in Part 1, Section 8a above. These permits will be obtained prior to project implementation.

PART III. NARRATIVE EVALUATION AND COMMENT

Most identified effects were positive and an intended outcome of the proposed action. The primary effects of the project are 1) a reduction in siltation, sediment deposition, and erosion in Poindexter Slough and 2) a resultant increase of adult trout abundances, which are the goals of this project. It is expected that these actions are likely to result because of the ability to closely regulate flow into this channel and trout abundances that were previously supported by habitats in Poindexter Slough prior to sedimentation. It is also likely that this project will have minor positive effects on trout fisheries in the Beaverhead River, native non-game species in Poindexter Slough, and economic activity in Beaverhead County.

The scope of work and physical alterations associated with the proposed action are minor relative to the present condition. Improvements to irrigation infrastructure and habitats in Poindexter Slough will cause no fundamental changes to the stream course, water rights, irrigation, or allocation of flow into this channel of the Beaverhead River. The proposed action will result in the ability to stage a habitat maintenance flow of up to 200 cfs for a short duration (5 to 7 days) once every 2 to 5 years. About 4.2 acres of emergent wetlands will be created by narrowing and deepening existing pools, eliminating a backwater associated with an irrigation diversion, creating a larger floodplain in upper reaches, and narrowing the channel in lower reaches.

The proposed project will have only short-term and minor negative effects primarily related to construction. These include increases in turbidity not to exceed the Short Term Water Quality Standard for Turbidity Related to Construction Activity and removal of vegetation from donor sites for transplanting to newly created floodplain. These activities will be mitigated by obtaining and adhering to all relevant permits, reseeding vegetation donor sites, and monitoring and maintaining against establishment of noxious weeds.

PART IV. PUBLIC PARTICIPATION

1. Public involvement:

The public will be notified in the following manners to comment on this current EA, the proposed action and alternatives:

- Two public notices in each of these papers: Dillon Tribune, Montana Standard
- One statewide press release;
- Public notice on the Fish, Wildlife & Parks web page: *http://fwp.mt.gov*.

Copies of this environmental assessment will be distributed to the neighboring landowners and interested parties to ensure their knowledge of the proposed project.

This level of public notice and participation is appropriate for a project of this scope having limited impacts, many of which can be mitigated.

2. Duration of comment period:

The public comment period will extend for (30) thirty days following the publication of the second legal notice in area newspapers. Written comments will be accepted until 5:00 p.m., February 17, 2014 and can be mailed to the address below:

Matt Jaeger
Montana Fish, Wildlife & Parks
730 ½ N. Montana
Dillon, MT 59725
Phone: 406-988-0321
Email: mattjaeger@mt.gov

PART V. EA PREPARATION

1. Based on the significance criteria evaluated in this EA, is an EIS required? (YES/NO)?
If an EIS is not required, explain why the EA is the appropriate level of analysis for this proposed action.

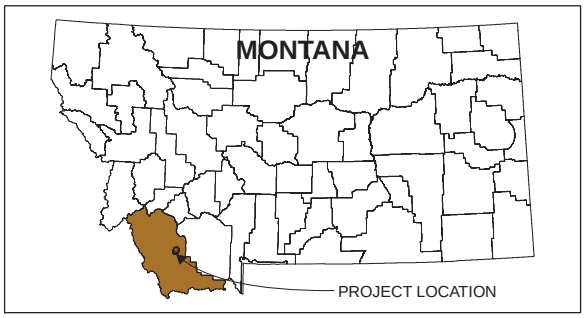
No. Most identified effects were positive and an intended outcome of the proposed action. The scope of work and physical alterations associated with the proposed action are minor relative to the present condition. Improvements to irrigation infrastructure and habitats in Poindexter Slough will cause no fundamental changes to the stream course, water rights, irrigation, or allocation of flow into this channel of the Beaverhead River. The proposed project will have only short-term and minor negative effects primarily related to construction, all of which can be easily mitigated as described.

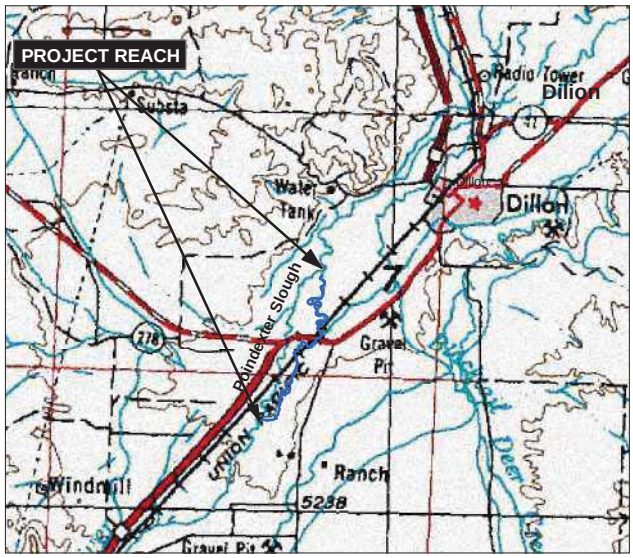
2. Person(s) responsible for preparing the EA:

Matt Jaeger
Montana Fish, Wildlife & Parks
730 ½ N. Montana
Dillon, MT 59725
Phone: 406-988-0321
Email: mattjaeger@mt.gov

3. List of agencies or offices consulted during preparation of the EA:

Beaverhead Watershed Committee, Dillon MT
Confluence Consulting, Bozeman MT
Beaverhead County Floodplain Coordinator, Dillon MT
Montana DEQ, Helena MT
U.S. Army Corps of Engineers, Helena MT
Montana State Historic Preservation Office, Helena MT





PROJECT VICINITY MAP

Poindexter Slough

Fish Habitat Improvement Project
Beaverhead County, Montana

Design Plans

PREPARED FOR:

BEAVERHEAD WATERSHED COMMITTEE

PREPARED BY:

CONFLUENCE CONSULTING, INC.

P.O. BOX 1133
BOZEMAN, MT 59771
(406) 585-9500

CONFLUENCE

SHEET INDEX

SHEET #	SHEET DESCRIPTION
1	COVER SHEET
2	PROJECT SITE MAP
3	PLAN VIEW (0+00 - 43+00)
4	PLAN VIEW (43+00 - 90+00)
5	PLAN VIEW (90+00 - 126+00)
6	PLAN VIEW (126+00 - 188+00)
7	PLAN VIEW (188+00 - 251+04)
8	CHANNEL BED PROFILE (0 - 125+00)
9	CHANNEL BED PROFILE (125+00 - 251+04)
10	DESIGN CROSS SECTIONS
11	DESIGN CROSS SECTIONS
12	DESIGN POOL / GLIDE PLAN AND CROSS SECTION
13	TYPICAL CHANNEL NARROWING METHOD - PLAN VIEW
14	SITE PLAN - POINDEXTER SLOUGH HEADGATE AT BEAVERHEAD
15	STRUCTURE DETAILS - POINDEXTER SLOUGH HEADGATE
16	STRUCTURE DETAILS - POINDEXTER SLOUGH HEADGATE
17	STRUCTURE DETAILS - POINDEXTER SLOUGH HEADGATE
18	SITE PLAN - DILLON CANAL HEADGATE AT POINDEXTER SLOUGH
19	STRUCTURE DETAILS - DILLON CANAL HEADGATE
20	STRUCTURE DETAILS - DILLON CANAL HEADGATE
21	STRUCTURE DETAILS - DILLON CANAL HEADGATE
22	SWPPP AND ACCESS AND STAGING PLAN

DATE: 05/24/13

COVER SHEET

SHEET: 1

Table 1: Quantities and Areas of Impact Table

Phase	Reach	Station Begin (ft)	Station End (ft)	Length (ft)	No. Pools	Avg Pool Volume Excavated (yd^3)	Total Pool Volume Excavated (yd^3)	Channel Regrading Excavated (yd^3)	Channel Regrading Fill (yd^3)	Volume of Fill Constructed Point Bars\Constructed Bank (yds^3)	Net Channel Material Quantities (+ =Surplus, - = Deficit)	Volume of Sod Mats\Topsoil (yds^3)	Area of Impact (Channel Regrading Fill) (acres)	Area of Impact (Point Bars-Constructed Bank) (acres)*	Area of Sod Mats (acres)*	Transplant Willows (# Willows)
1	Reach 1	38	1,500	1,462	13	26	339	4,344		339	4,344	700		0.103	0.434	121
	Reach 2a	1,500	8,000	6,500	47	63	2,944	278		2,944	278	931		1.246	0.577	36
2	Reach 2b	8,000	12,000	4,000	30	63	1,879	0		1,879	0	1,046		0.313	0.648	9
	Reach 3	12,000	13,973	1,973	14	57	797	0	1,834	1,787	-2,823	955	0.905		0.673	13
3	Reach 4A	13,973	19,490	5,517	29	65	1,894	0		2,341	-447	1,226		1.267	0.760	24
	Reach 4B	19,490	25,104	5,614	46	43	1,985	1,873		2,384	1,474	1,247		1.289	0.773	0
				25,066	179		9,837	6,495		11,672	2,826	6,106	0.905	4.217	3.866	203

* Sod Mats are placed on point bars, thus impact area for sod mat is redundant

DRAWN BY: T.T.
DATE: 8/2013
DESIGNED BY: L.A., N.S.
CAD DWG: 8020001
REVISED BY: L.A., N.S.
FILENAME: Poindexter Sheet 2.dwg

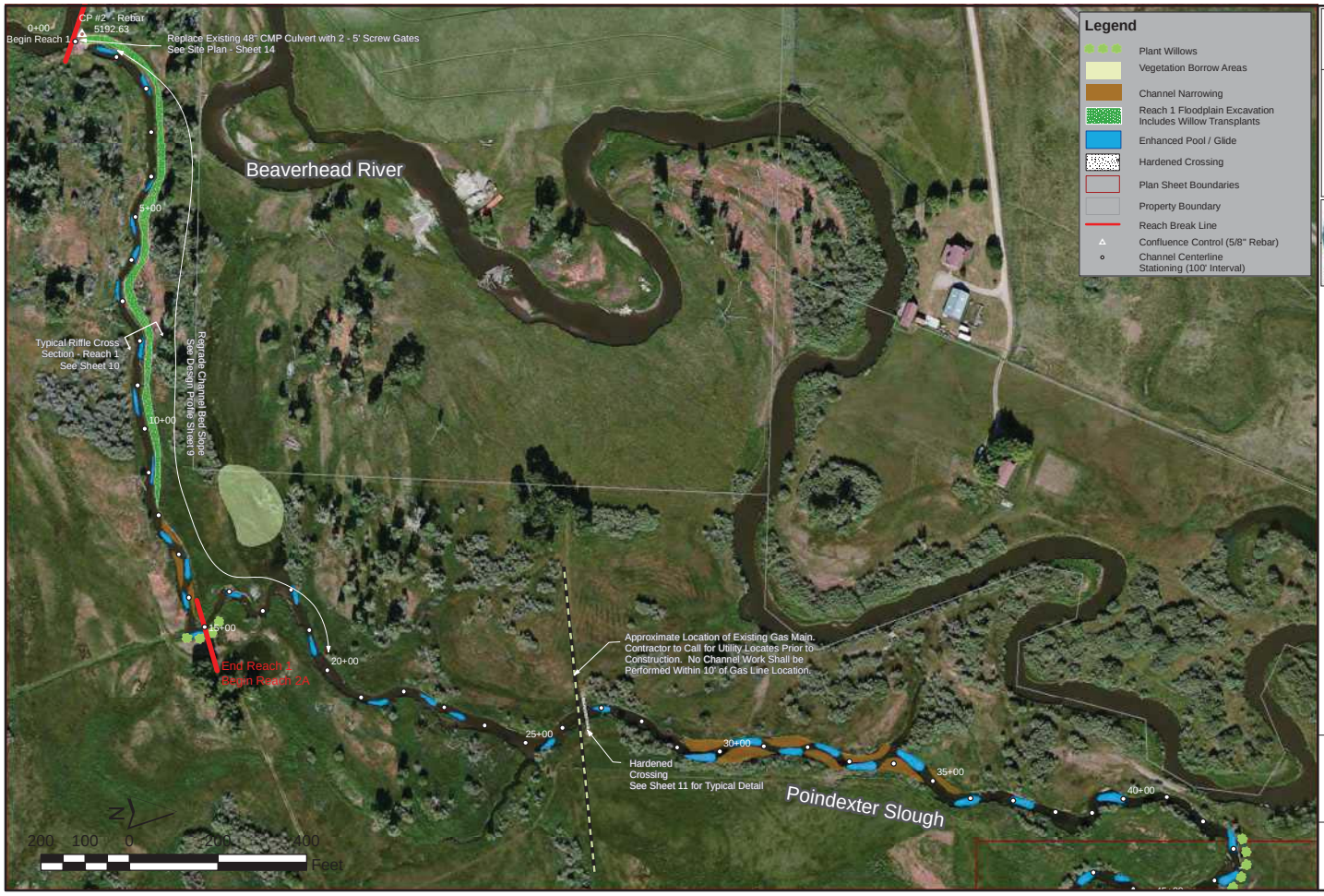
NO.	DATE	DESCRIPTION	BY	APPD.

CONFLUENCE
ENGINEERING & RESTORATION

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

PROJECT SITE MAP

SHEET: 2



DATE	DESCRIPTION	BY	APPD.
01/13/2010	PLAN SET		
02/23/2010	PLAN SET - CONSTRUCTION		
04/16/2010	PLAN SET - CONSTRUCTION		

DRAWN BY: T.T.
DESIGNED BY: J.L., S.S.
CHECKED BY: J. L., S.S.

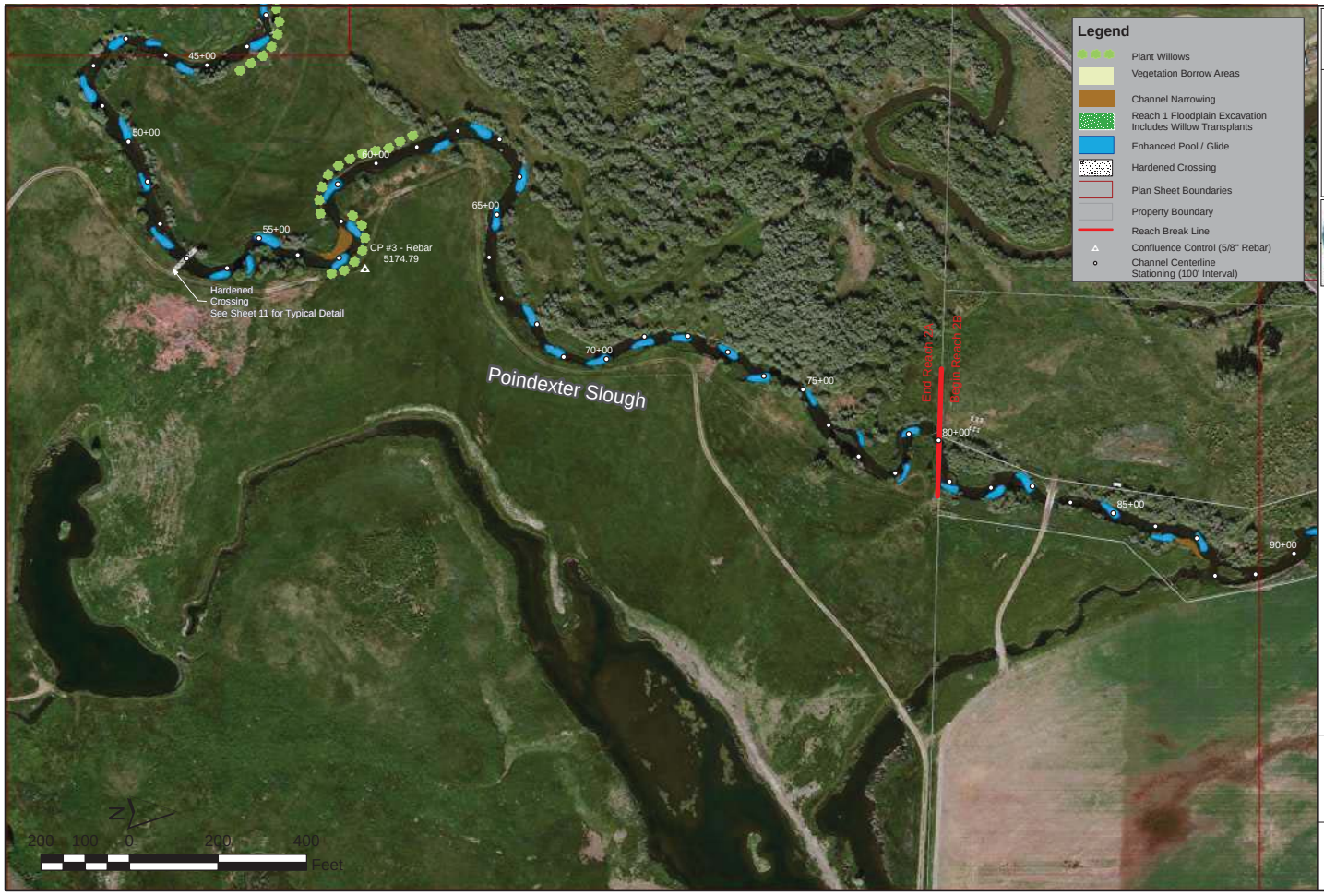
JOB: CHK:

CONFLUENCE
CONSULTING INCORPORATED

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

PLAN VIEW
STATION
0+00 - 43+00

SHEET: 3



DATE	DESCRIPTION	BY	APPD
10/15/2021	90% DESIGN		
11/15/2021	100% DESIGN		

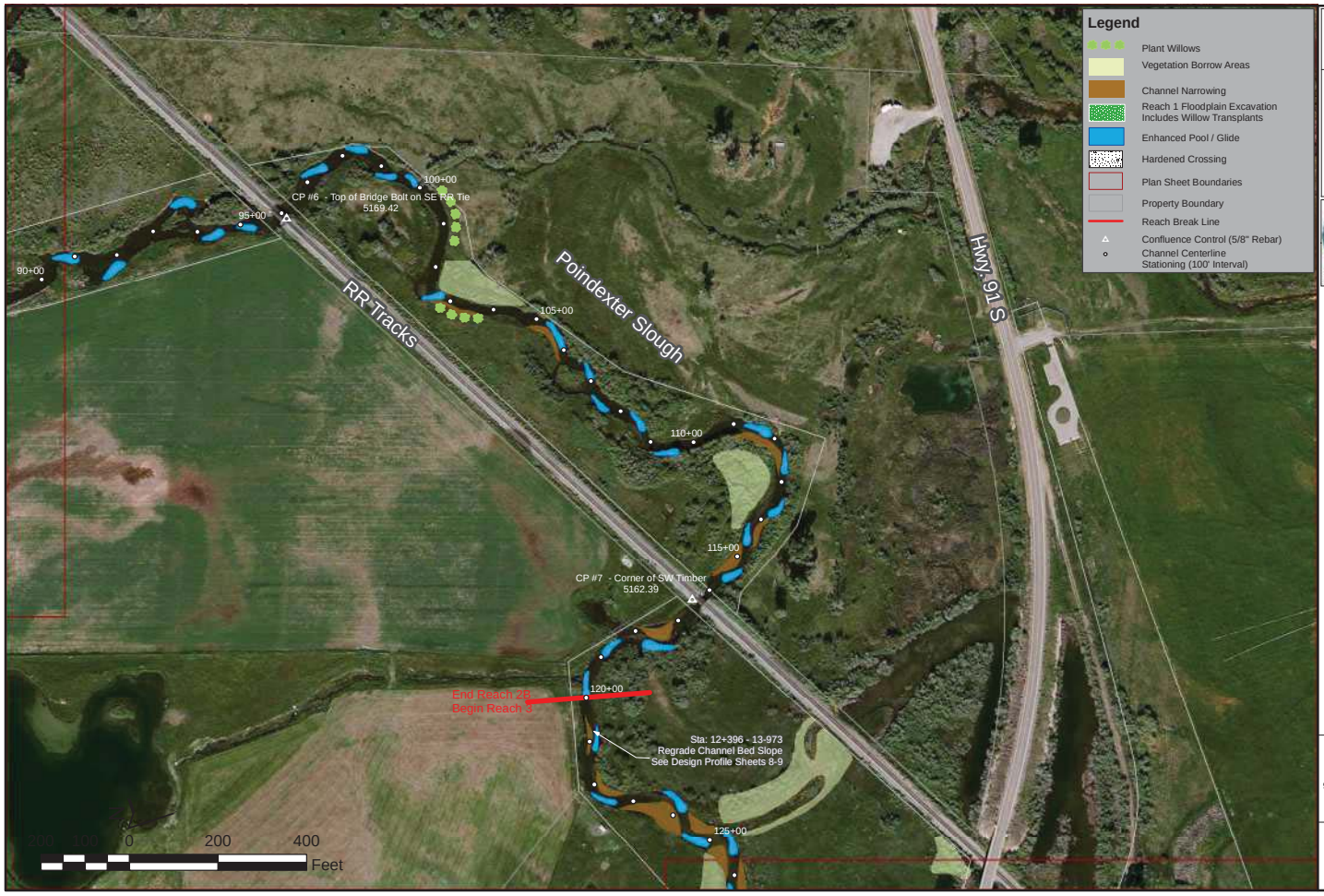
DRAWN BY: T.T.
DESIGNED BY: J.L., S.S.
CHECKED BY: K.L.H.
FILENAME: Poindexter_Sheet_04.dwg

CONFLUENCE
DESIGN & ENGINEERING

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

PLAN VIEW
STATION
43+00 - 90+00

SHEET: 4



DATE ISSUED	
DRAWN BY: A.T.	DATE: 12/20/2010
DESIGNED BY: A.L.K., B.S.	CHECKED BY:
R. COUNE:	

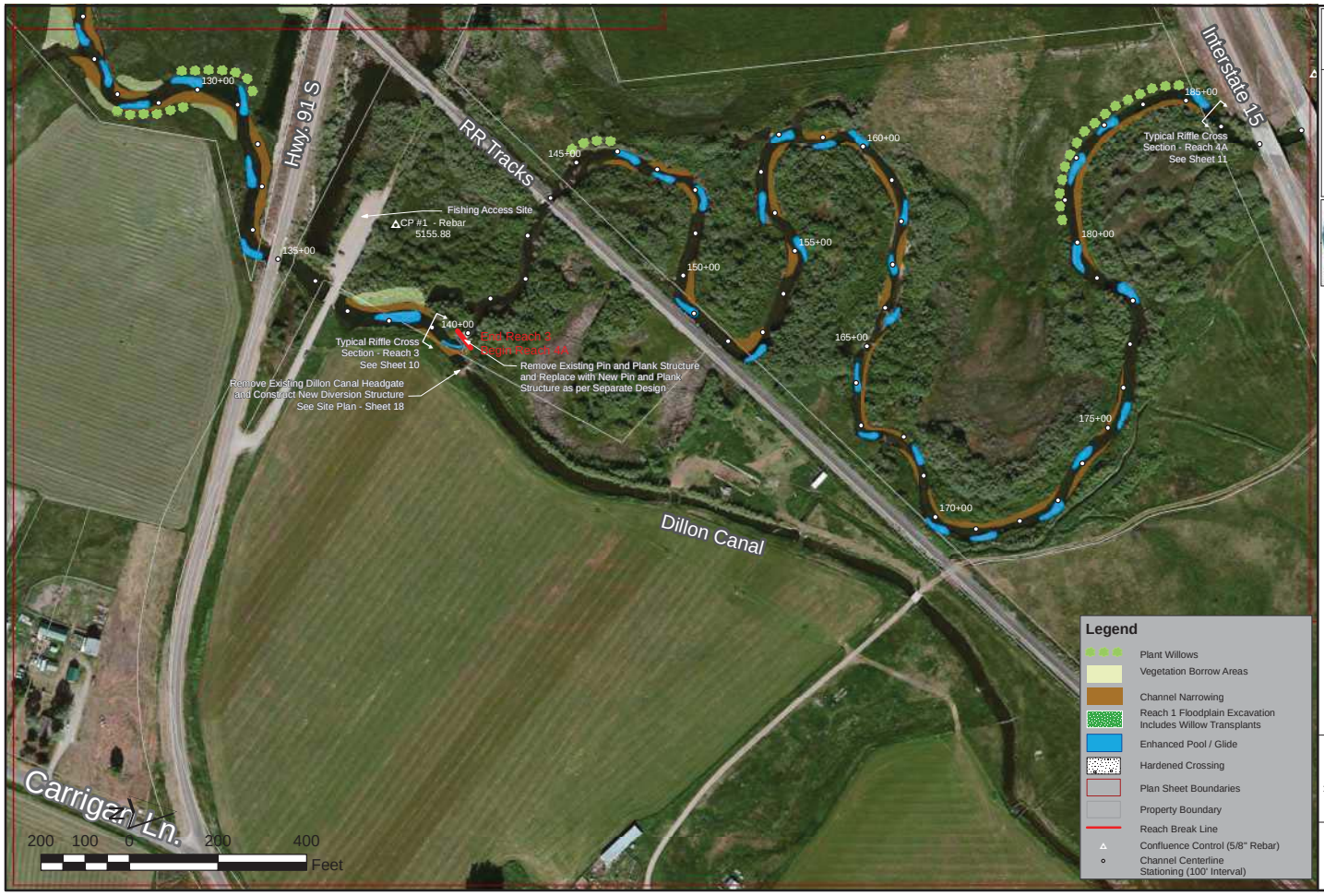
NO.	DATE	DESCRIPTION	BY	APPD.

CONFLUENCE
CONSULTING INCORPORATED

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

PLAN VIEW
STATION
90+00 - 126+00

SHEET: 5



DATE ISSUED	
DRAWN BY: T.T.	DATE: 12/20/2010
DESIGNED BY: A.L.L., K.S.	
REVIEWED BY: A.L.L., K.S.	FILENAME: Poindexter_Slough_Final.dwg

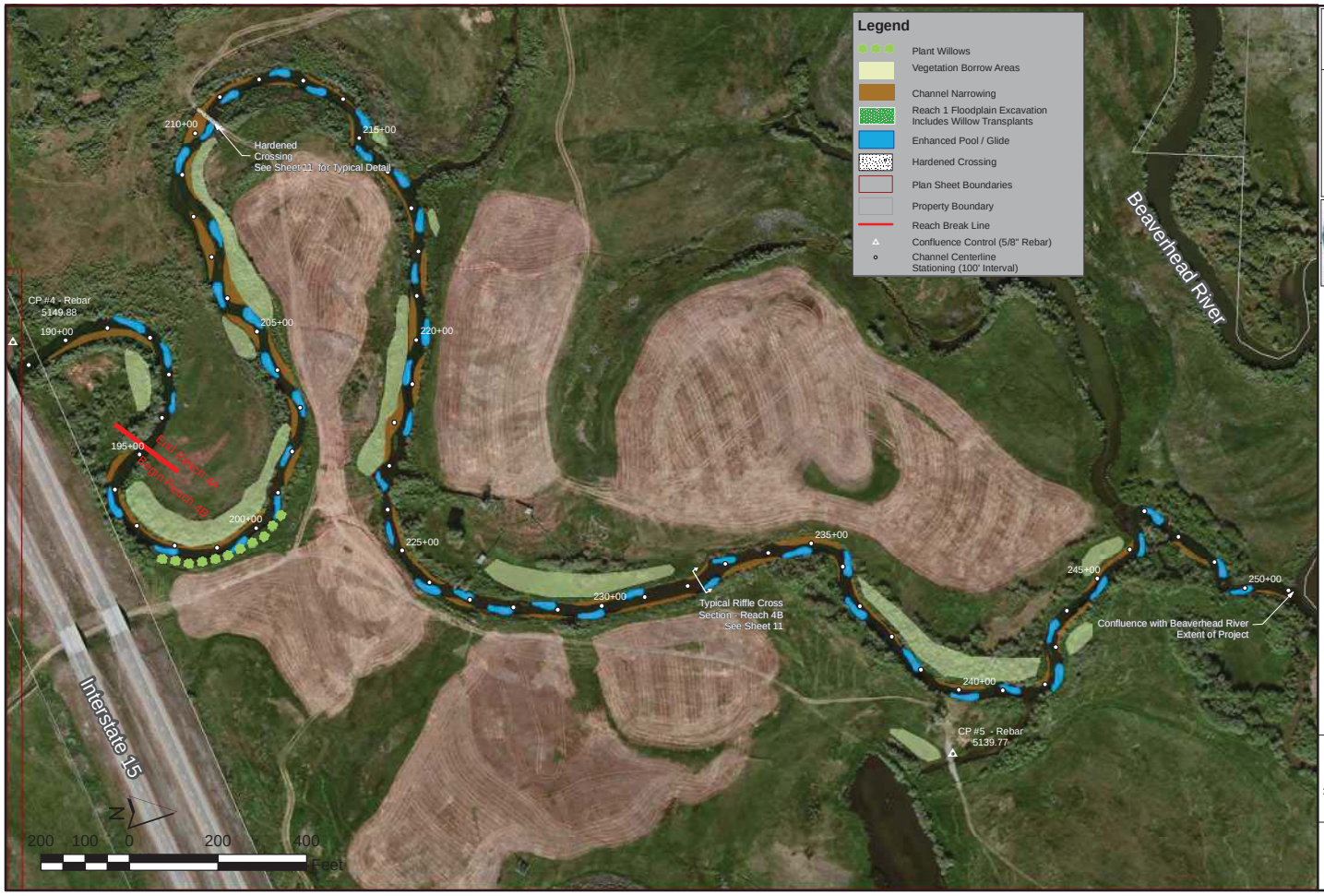
NO.	DATE	DESCRIPTION	BY	APPD.

CONFLUENCE
CONSULTING INCORPORATED

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

PLAN VIEW
STATION
126+00 - 188+00

SHEET: 6



DATE 2/23/2011	
DRAWN BY: T.T.	CHECKED BY: J.L., K.S.
DESIGNED BY: J.L., K.S.	R. CHAIR: Kenneth Stanford

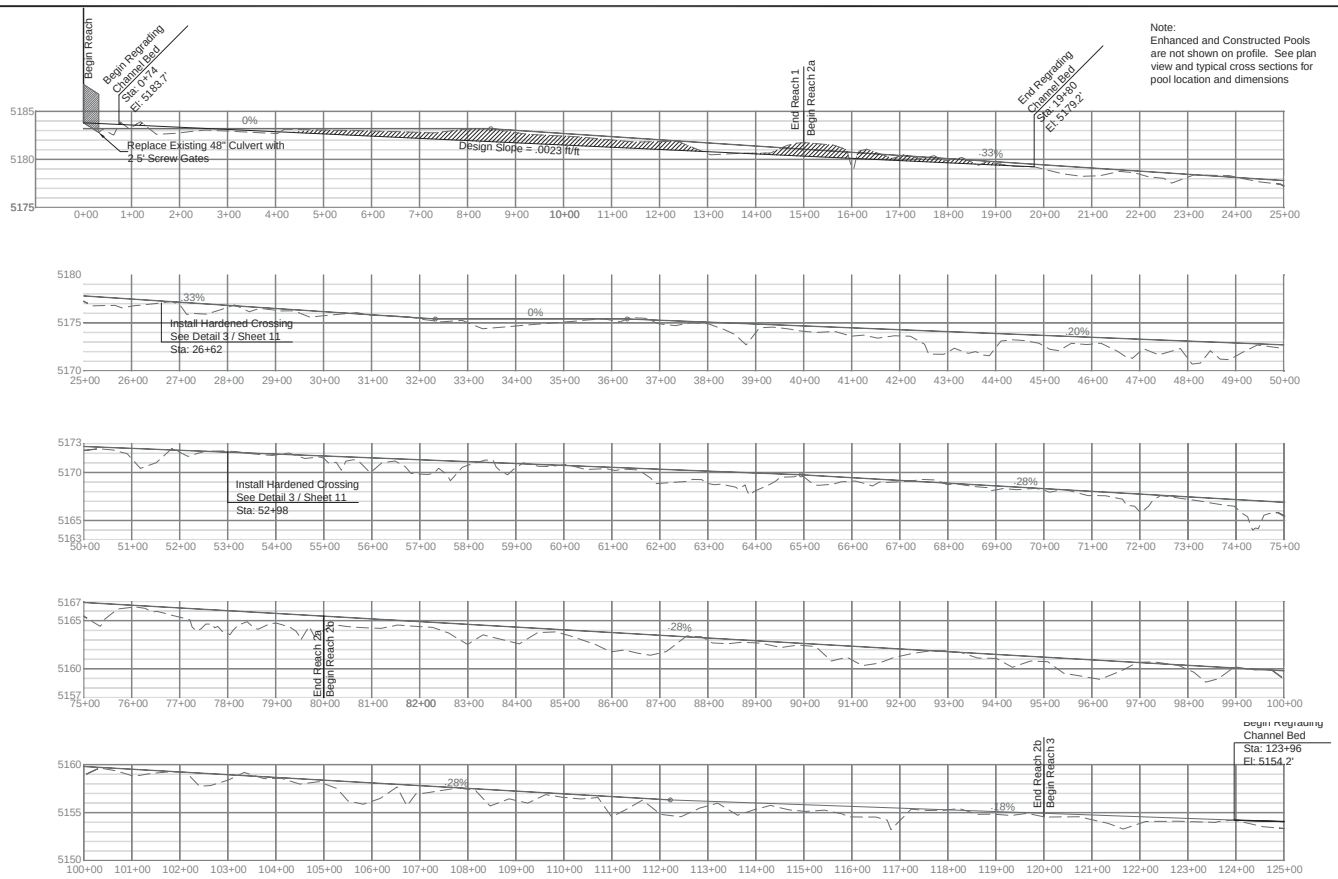
NO.	DATE	DESCRIPTION	BY	APPD.

CONFLUENCE
DESIGN INC.

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

PLAN VIEW
STATION
188+00 - 251+04

SHEET: 7



Design Channel Bed Profile (0+00- 125+00)

HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1"= 10'

DRAWN BY: T.T.
DESIGNED BY: T.T., D.J., K.S.
CHECKED BY: M.S., T.T.

DATE ISSUED
CO FILE REFERENCE
FILE NAME: PROJECT REFERENCE/DWG

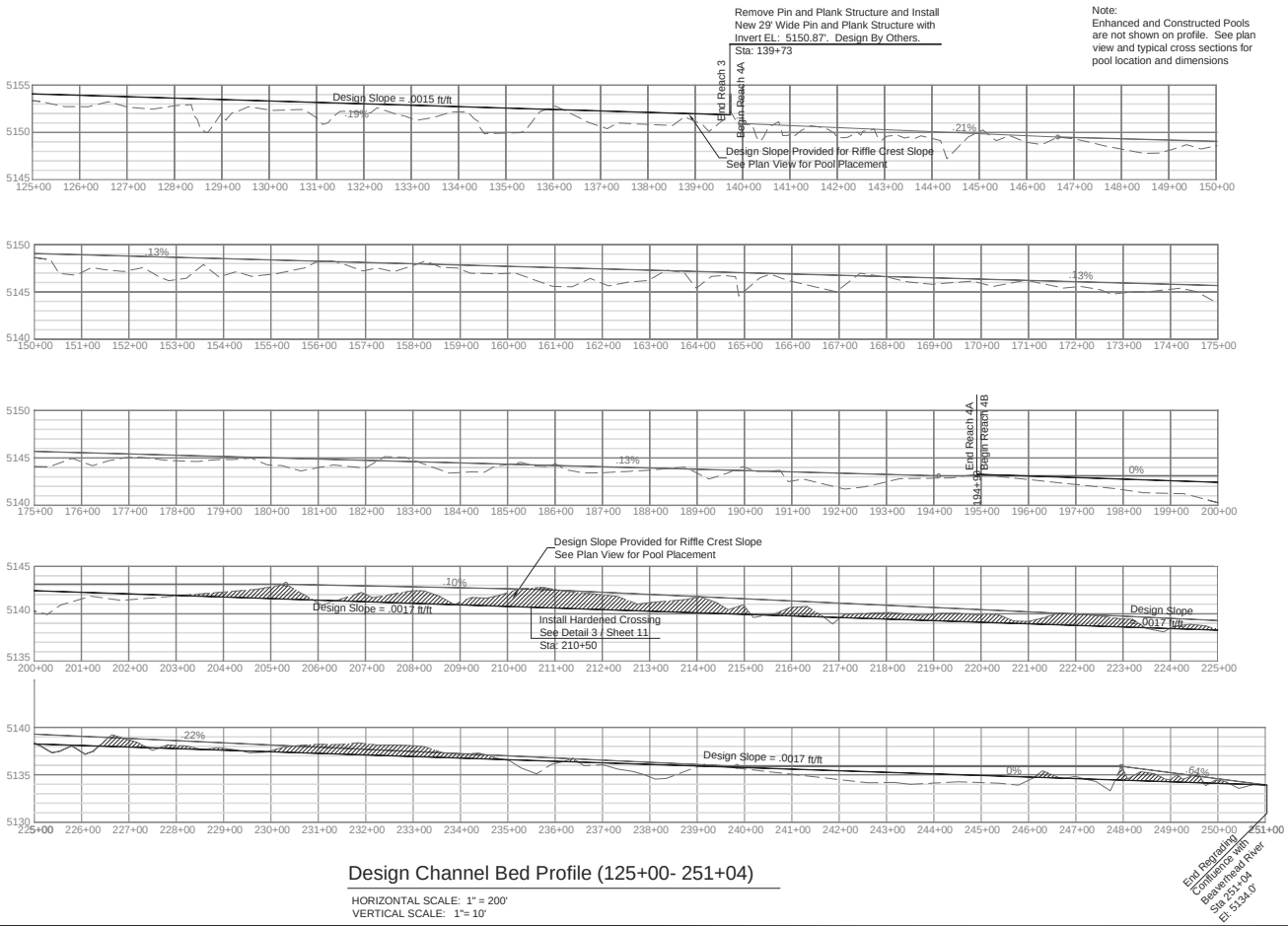
REV	DATE	DESCRIPTION	BY	APPD

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

DESIGN CHANNEL BED PROFILE (0+00 - 125+00)

SHEET: 8



Design Channel Bed Profile (125+00- 251+04)

HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1"= 10'

DRAWN BY: T.T.	DATE: 03/12/10
DESIGNED BY: T.T., D.J., K.S.	CO FILE: 02.02.02.0103
CHECKED BY: M.S., T.C.	FILE NAME: 2009-0103-DESIGN.DWG

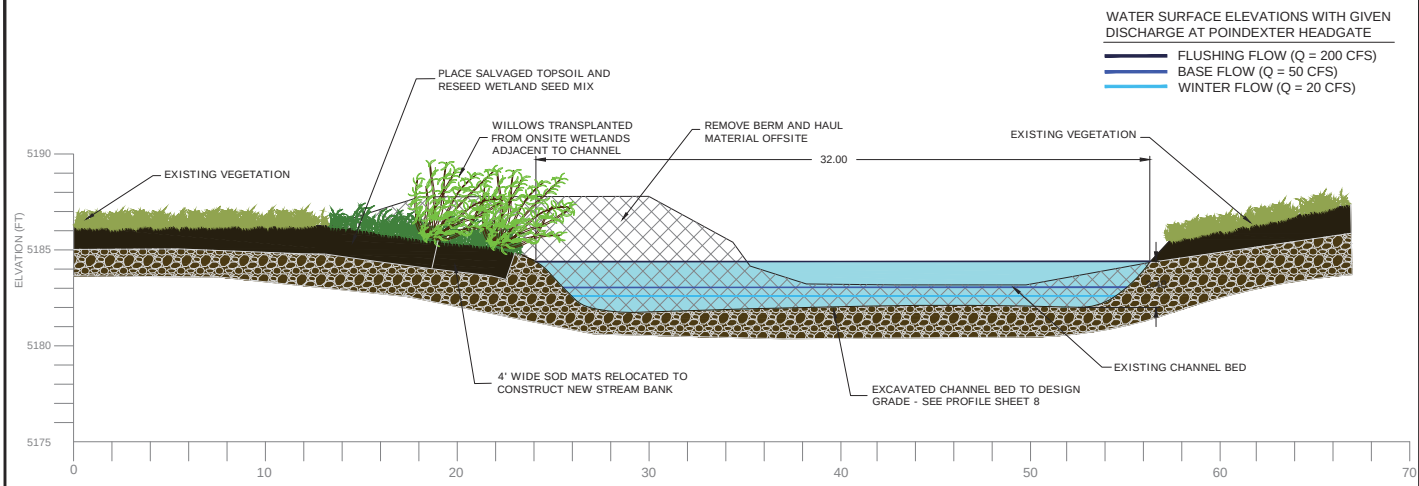
REV	DATE	DESCRIPTION	BY	APPD

CONFLUENCE consulting incorporated

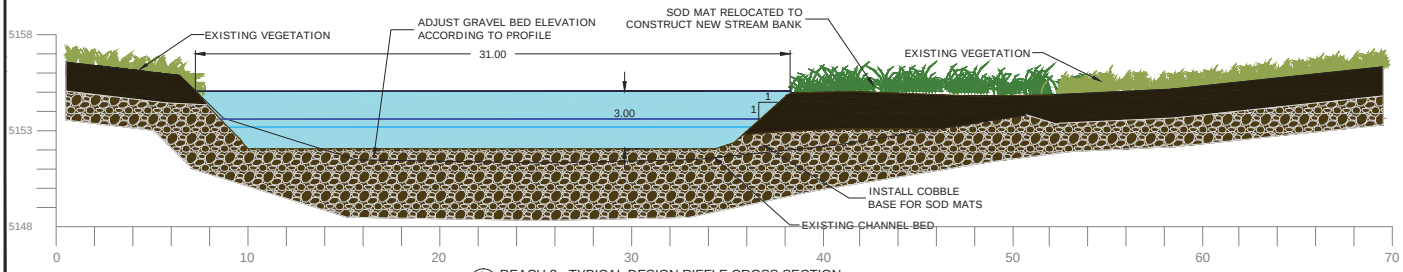
POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

DESIGN CHANNEL BED PROFILE (125+00 - 251+04)

SHEET: 9



1/10 REACH 1 - TYPICAL DESIGN RIFFLE CROSS SECTION
SCALE - 1":5'



2/10 REACH 3 - TYPICAL DESIGN RIFFLE CROSS SECTION
SCALE - 1":5'

DATE: 7-13-11
DRAWN BY: T.T.
CHECKED BY: T.T.J.L. NA.
APPROVED BY: MA. JL
FILE NAME: 2010-0103-0000-0000-0000-0000.DWG
CLIENT: SOLID GOLD

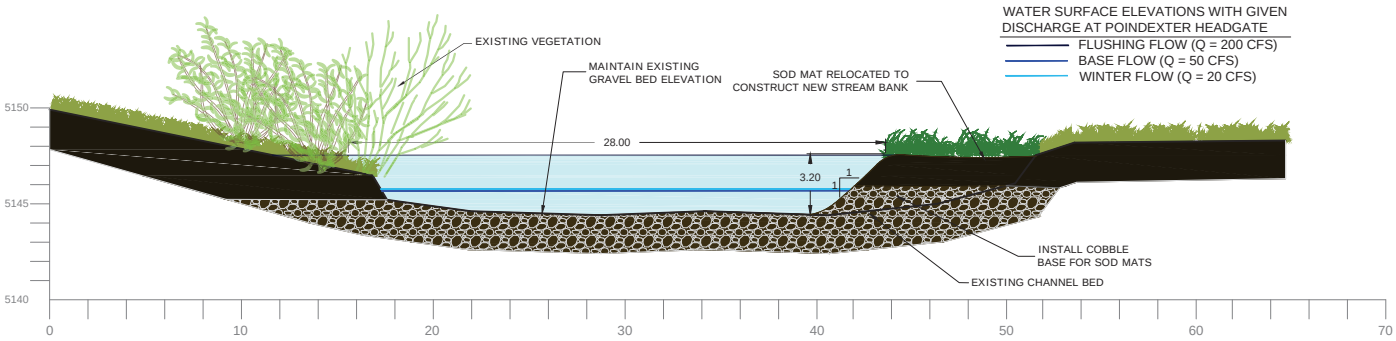
REV.	DATE	DESCRIPTION	BY	APPD

CONFLUENCE consulting incorporated

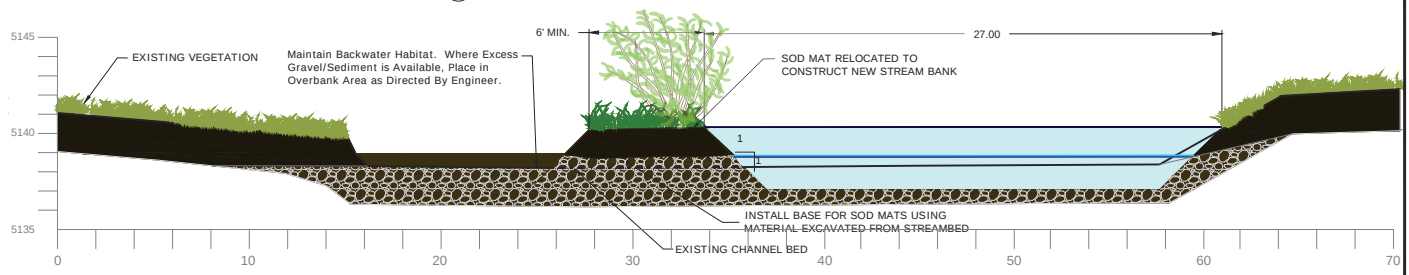
POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT
BEAVERHEAD COUNTY, MONTANA

DESIGN RIFFLE CROSS SECTIONS

SHEET: 10



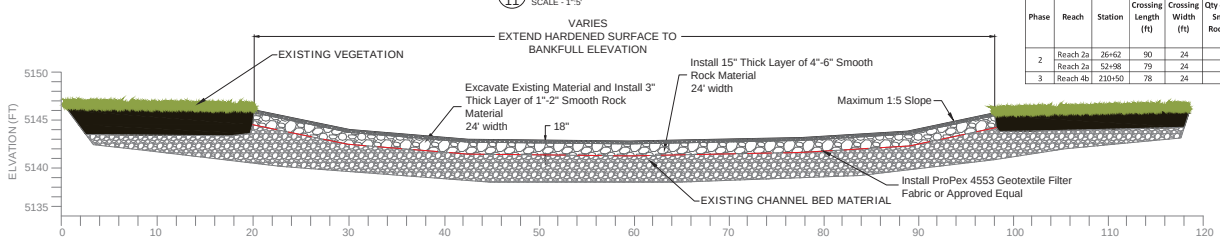
1/11 REACH 4A - TYPICAL DESIGN RIFFLE CROSS SECTION
SCALE - 1":5'



2/11 REACH 4B - TYPICAL DESIGN RIFFLE CROSS SECTION
SCALE - 1":5'

Table 1: Quantities and Areas of Impact Table for Hardened Crossings

Phase	Reach	Station	Crossing Length (ft)	Crossing Width (ft)	Qty of 1"-2" Smooth Rock (yd³)	Qty of 4"-6" Smooth Rock (yd³)	Qty of Propex Geotextile Filter Fabric (ft²)	Area of Impact (ft²)
2	Reach 2a	26+62	90	24	20	100	2,160	2,160
	Reach 2a	52+98	79	24	18	88	1,896	1,896
3	Reach 4b	210+50	78	24	17	87	1,872	1,872
					55	274	5,928	5,928



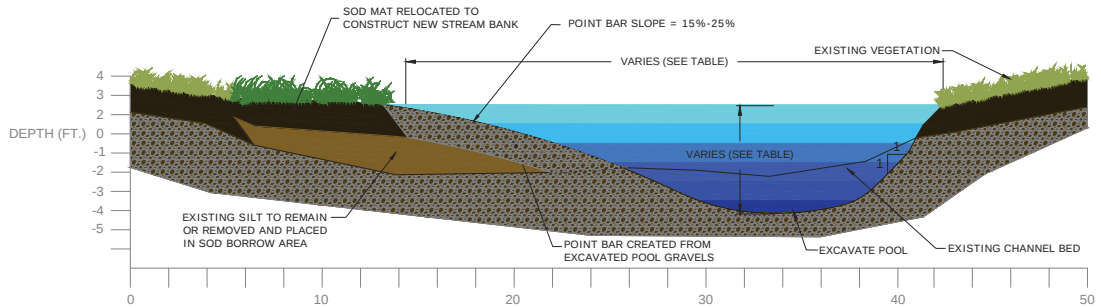
3/11 TYPICAL HARDENED CROSSING CROSS SECTION
NOT TO SCALE

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT
BEAVERHEAD COUNTY, MONTANA

DESIGN RIFFLE CROSS SECTIONS

SHEET: 11



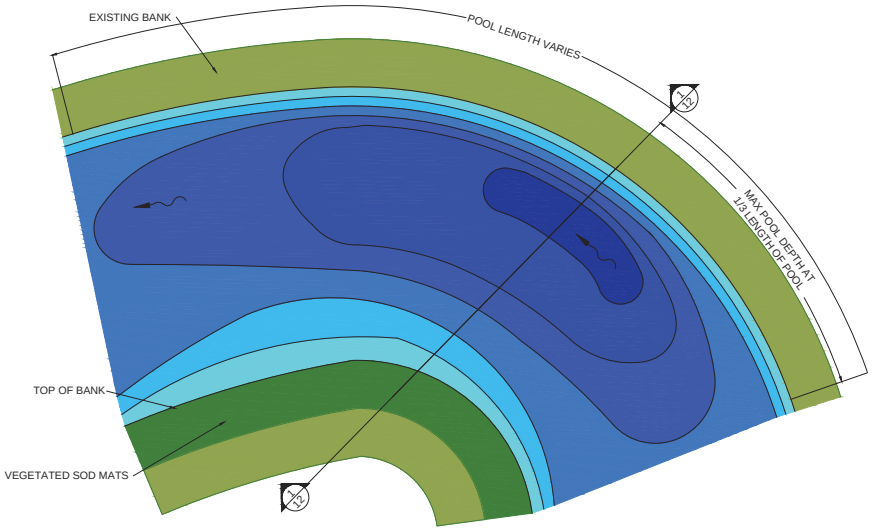
1/12 POINDEXTER SLOUGH POOL / GLIDE DETAIL - CROSS SECTION VIEW

HORIZONTAL SCALE - 1":5'

POOL DIMENSIONS

REACH	AVG. TOP WIDTH (FT.)	MAX DEPTH (FT.)	LENGTH OF POOL/GLIDE COMPLEX (FT.)
1	26'	6.0	67
2	33'	4.9	89
3	25'	7.5	124
4A	23'	8.0	116
4B	22'	7.0	100

* POOL DIMENSIONS PROVIDED AS GUIDANCE. DIMENSIONS MAY VARY ± 10%



2/12 POINDEXTER SLOUGH POOL/GLIDE DETAIL - PLAN VIEW

HORIZONTAL SCALE - 1":10'

DATE: 7/2/2013
CLIENT: MDFWP
CLIENT JOB NO:
FILE NAME: J:\2010\2010-0000\2010-0000.dwg
DESIGNED BY: T.T., J.L., M.S.
DRAWN BY: M.S., T.L.
CHECKED BY: T.T.

REV.	DATE	DESCRIPTION	BY	APPD

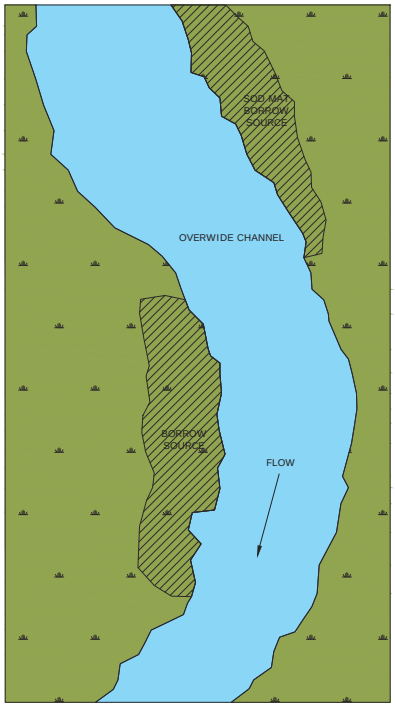
CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

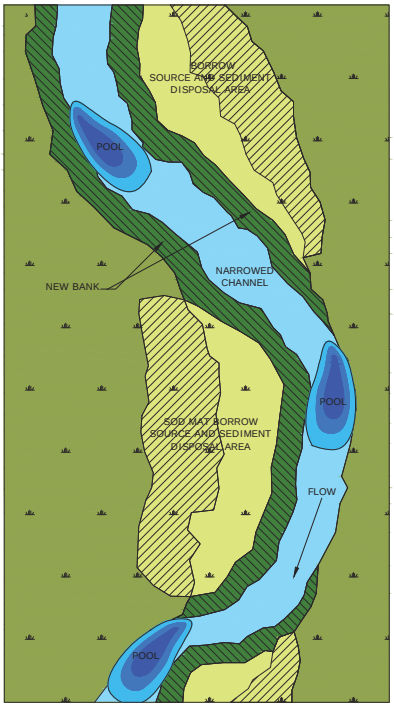
DESIGN POOL / GLIDE PLAN AND CROSS SECTION

SHEET: 12

PLAN VIEW 1: TYPICAL EXISTING CONDITIONS



PLAN VIEW 2: TYPICAL RESTORATION CONCEPTS



1/13 TYPICAL CHANNEL NARROWING METHOD (REACHES 2,3,4) - PLAN VIEW
NOT TO SCALE

DATE: 5/2/2011	
DESIGNED BY: T.T.J., S.S.	
DRAWN BY: M.S., T.L.	FILE NAME: J:\2010\110-010\CAD\DWG\
CLIENT: MDOLI	

REV.	DATE	DESCRIPTION	BY	APPD

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

TYPICAL CHANNEL NARROWING METHOD - PLAN VIEW

SHEET: 13

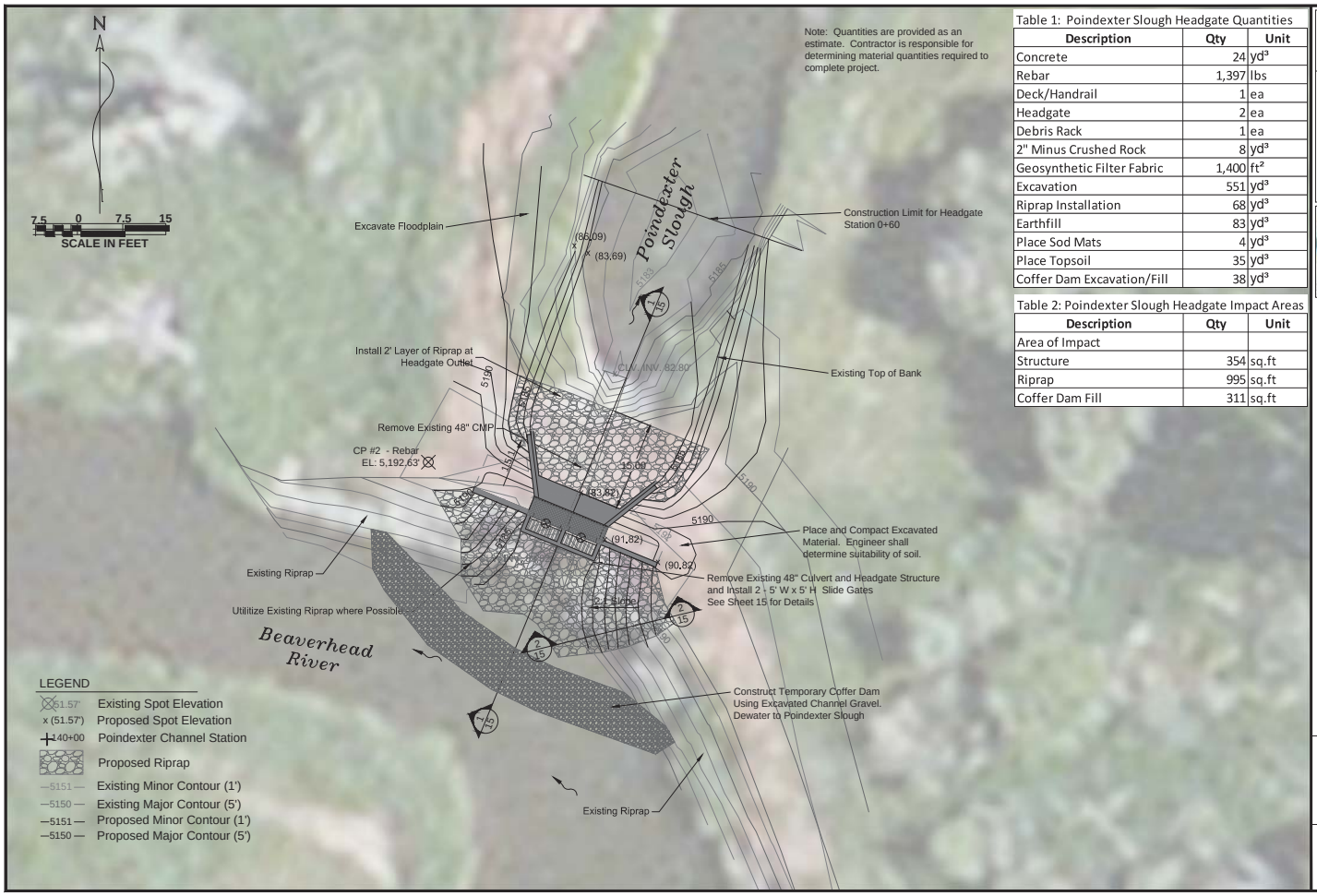


Table 1: Poindexter Slough Headgate Quantities

Description	Qty	Unit
Concrete	24	yd^3
Rebar	1,397	lbs
Deck/Handrail	1	ea
Headgate	2	ea
Debris Rack	1	ea
2" Minus Crushed Rock	8	yd^3
Geosynthetic Filter Fabric	1,400	ft^2
Excavation	551	yd^3
Riprap Installation	68	yd^3
Earthfill	83	yd^3
Place Sod Mats	4	yd^3
Place Topsoil	35	yd^3
Coffer Dam Excavation/Fill	38	yd^3

Table 2: Poindexter Slough Headgate Impact Areas

Description	Qty	Unit
Area of Impact		
Structure	354	sq.ft
Riprap	995	sq.ft
Coffer Dam Fill	311	sq.ft

DESIGNED BY: T.T.
DRAWN BY: T.T., J.L., M.S.
CHECKED BY: M.S., J.L.
P.E. NAME: MICHAEL S. ROBERTS
DATE: 7/2/2020
P.E. EXP. 31/12/2020

REV.	DATE	DESCRIPTION	BY	APPD

CONFLUENCE consulting incorporated

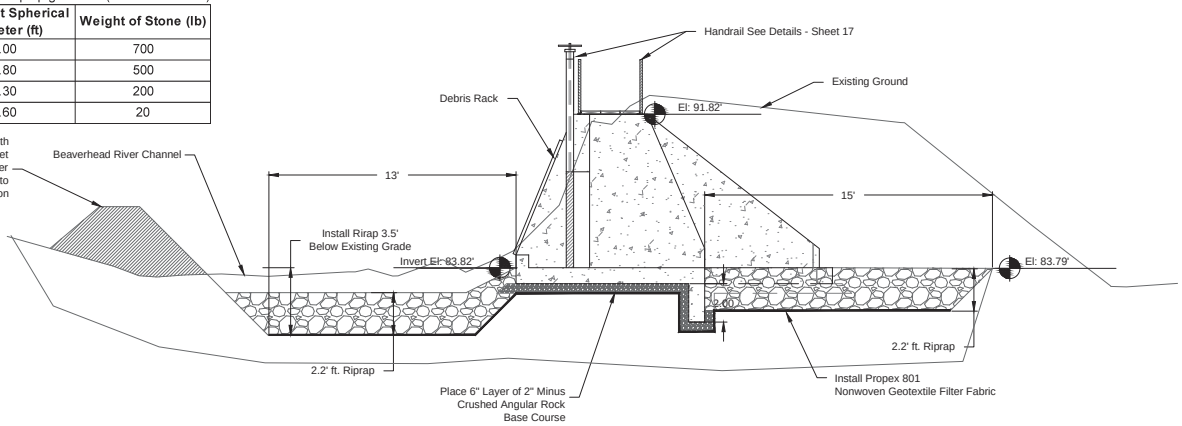
POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT PROJECT
BEAVERHEAD COUNTY, MONTANA

SITE PLAN
POINDEXTER SLOUGH HEADGATE AT BEAVERHEAD RIVERSite Plan

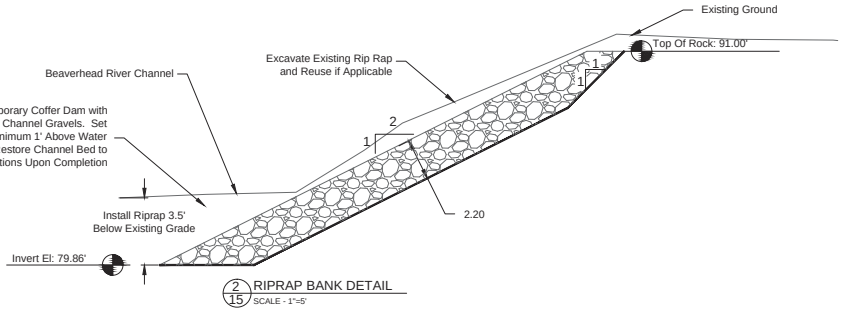
SHEET: 14

Class II Riprap Gradation - MT DOT riprap gradation (MT 2006 manual)

Riprap Gradation	Equivalent Spherical Diameter (ft)	Weight of Stone (lb)
D_{100} =	2.00	700
D_{85} =	1.80	500
D_{50} =	1.30	200
D_{20} =	0.60	20



1/15 HEADGATE CROSS SECTION - POINDEXTER SLOUGH AT BEAVERHEAD RIVER
SCALE - 1"=5'

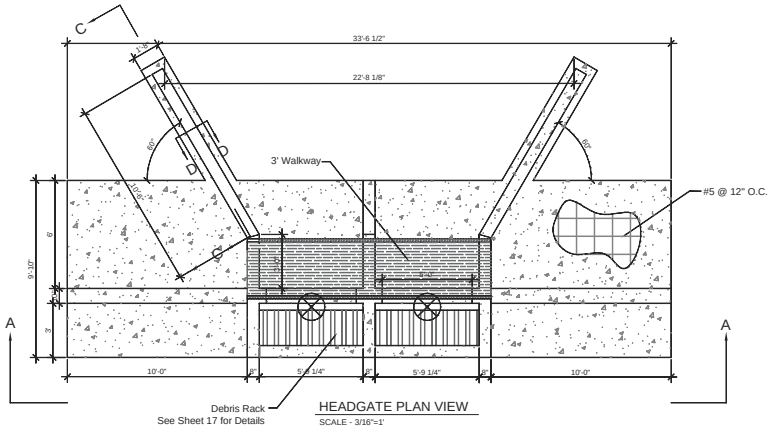


2/15 RIPRAP BANK DETAIL
SCALE - 1"=5'

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

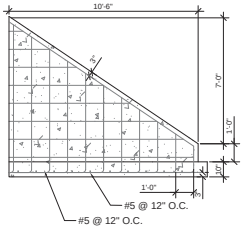
STRUCTURE DETAILS - POINDEXTER SLOUGH HEADGATE

SHEET: 15



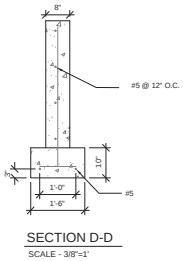
HEADGATE PLAN VIEW

SCALE - 3/16"=1'



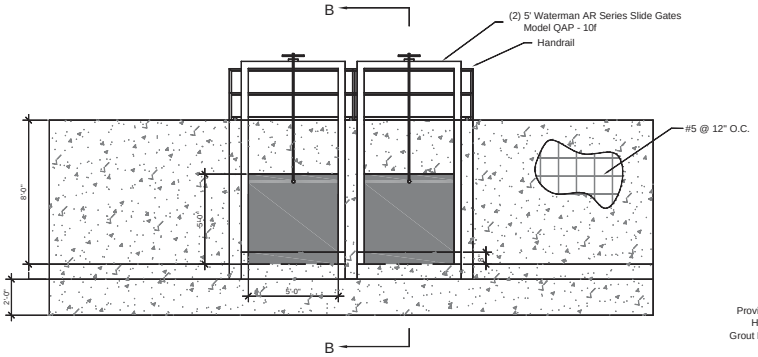
SECTION C-C

SCALE - 3/16"=1'



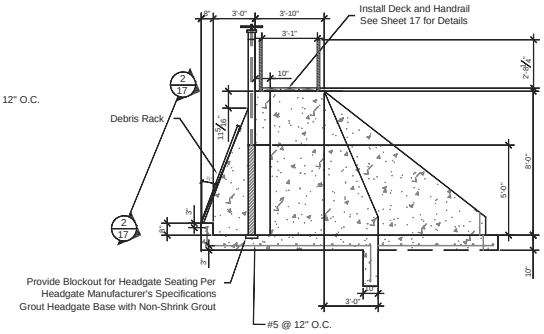
SECTION D-D

SCALE - 3/8"=1'



SECTION A-A

SCALE - 3/16"=1'



SECTION B-B

SCALE - 3/16"=1'

REV.	DATE	DESCRIPTION	BY	APPD

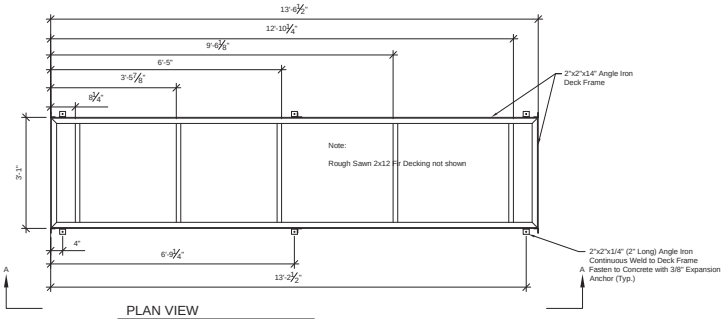
DRAWN BY: T.T.
DESIGNED BY: T.T., D., S.S.
CHECKED BY: W.S., T.T.
DATE: 11/2011
CO 1 FOR SOL & BIDD
REVISIONS: 2011-12 REVISIONS/ASBUILT

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

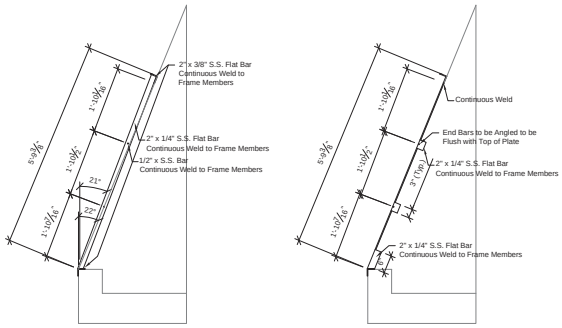
STRUCTURE DETAILS - POINDEXTER SLOUGH HEADGATE

SHEET: 16



PLAN VIEW

SCALE - 3/8"=1'

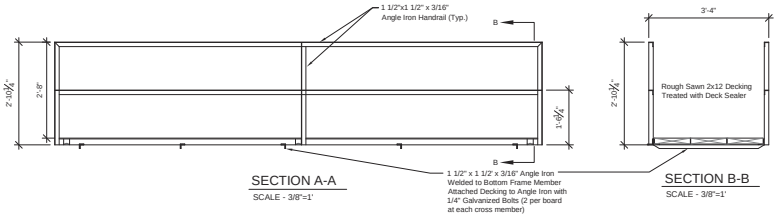


SECTION A-A

SCALE - 3/8"=1'

SECTION B-B

SCALE - 3/8"=1'



SECTION A-A

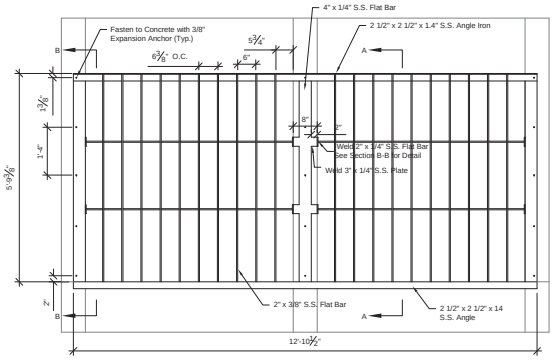
SCALE - 3/8"=1'

SECTION B-B

SCALE - 3/8"=1'

1/17 HANDRAIL/DECK DETAILS

SCALE - 3/8"=1'



2/17 DEBRIS RACK DETAILS

SCALE - 3/8"=1'

REV.	DATE	DESCRIPTION	BY	APPD

DRAWN BY: T.T.
DESIGNED BY: T.L.D., S.S.
CHECKED BY: W.S., T.C.
DATE: 11/2/07
CO-ORD. BY: D.D.
REVISIONS: PRELIMINARY
FILE NAME: 2007-11-02 DEBRIS RACK

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

STRUCTURE DETAILS - POINDEXTER SLOUGH HEADGATE

SHEET: 17

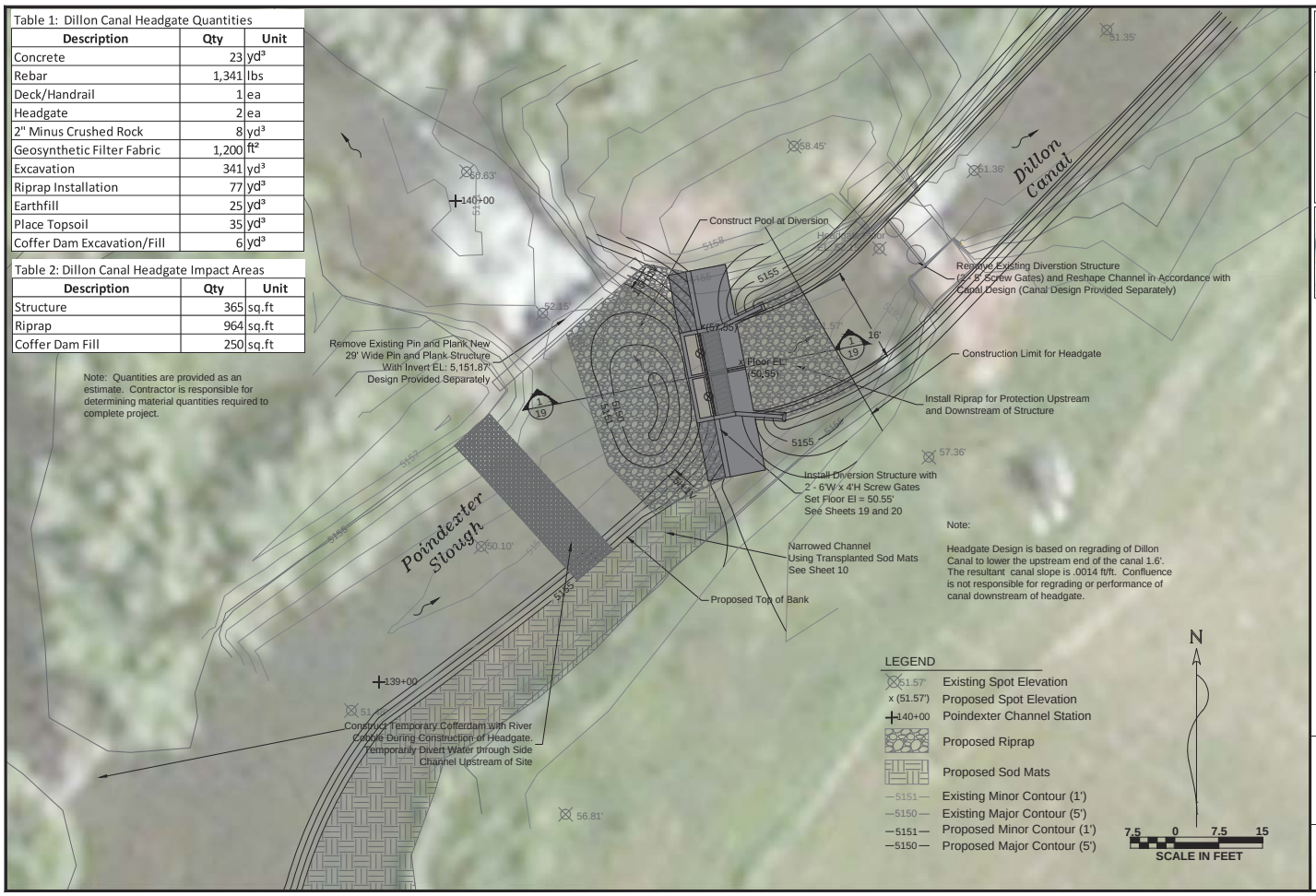
Table 1: Dillon Canal Headgate Quantities

Description	Qty	Unit
Concrete	23	yd^3
Rebar	1,341	lbs
Deck/Handrail	1	ea
Headgate	2	ea
2" Minus Crushed Rock	8	yd^3
Geosynthetic Filter Fabric	1,200	ft^2
Excavation	341	yd^3
Riprap Installation	77	yd^3
Earthfill	25	yd^3
Place Topsoil	35	yd^3
Coffer Dam Excavation/Fill	6	yd^3

Table 2: Dillon Canal Headgate Impact Areas

Description	Qty	Unit
Structure	365	sq.ft
Riprap	964	sq.ft
Coffer Dam Fill	250	sq.ft

Note: Quantities are provided as an estimate. Contractor is responsible for determining material quantities required to complete project.



CONFLUENCE consulting incorporated

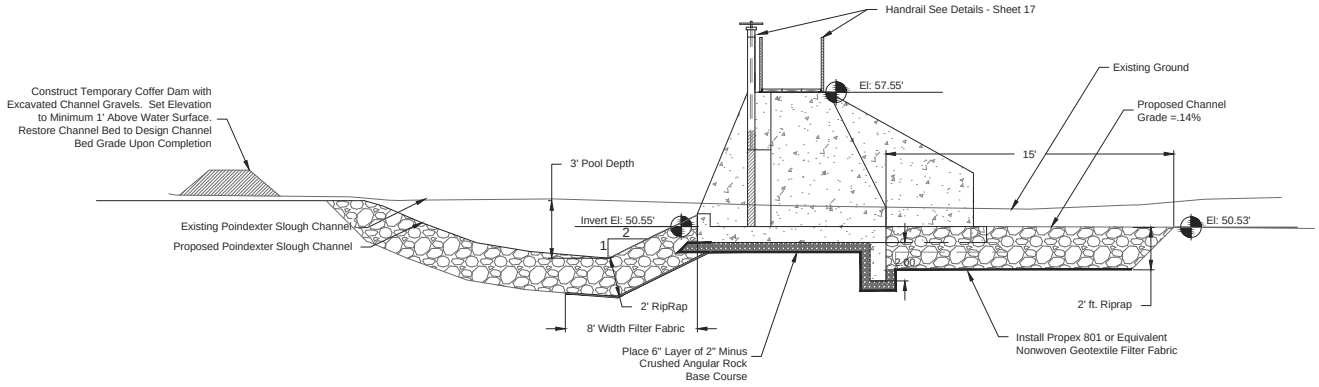
POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

SITE PLAN
DILLON CANAL
HEADGATE AT
POINDEXTER
SLOUGH

SHEET: 18

Class II Riprap Gradation - MT DOT riprap gradation (MT 2006 manual)

Riprap Gradation	Equivalent Spherical Diameter (ft)	Weight of Stone (lb)
D_{100} =	2.00	700
D_{85} =	1.80	500
D_{50} =	1.30	200
D_{20} =	0.60	20



1/19 HEADGATE CROSS SECTION - DILLON CANAL HEADGATE
SCALE - 1"=5'

DRAWN BY: T.T.
DESIGNED BY: T.T.,J.L., M.S.
CHECKED BY: M.S., T.L.

FILE NAME: J:\2005\05-0000\05-0000.dwg
CLIENT NO: 05-0000

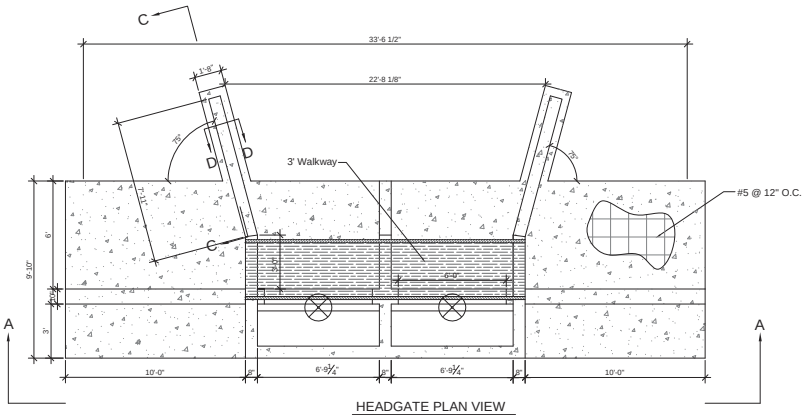
NO.	DATE	DESCRIPTION	BY	APPD

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

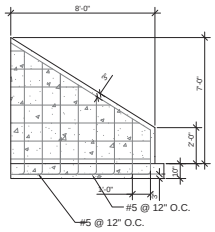
STRUCTURE DETAILS - DILLON CANAL HEADGATE

SHEET: 19



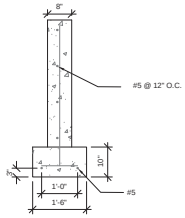
HEADGATE PLAN VIEW

SCALE - 3/16"=1'



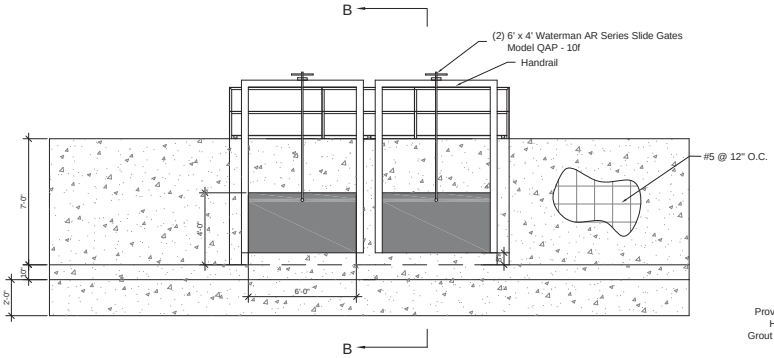
SECTION C-C

SCALE - 3/16"=1'



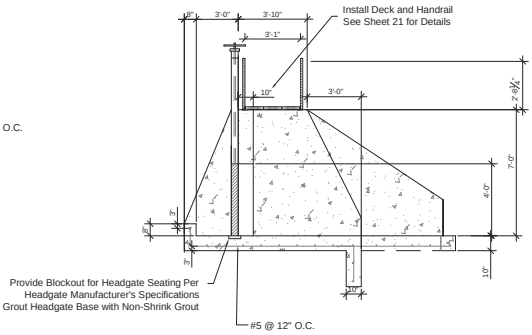
SECTION D-D

SCALE - 3/8"=1'



SECTION A-A

SCALE - 3/16"=1'



SECTION B-B

SCALE - 3/16"=1'

REV	DATE	DESCRIPTION	BY	APPD

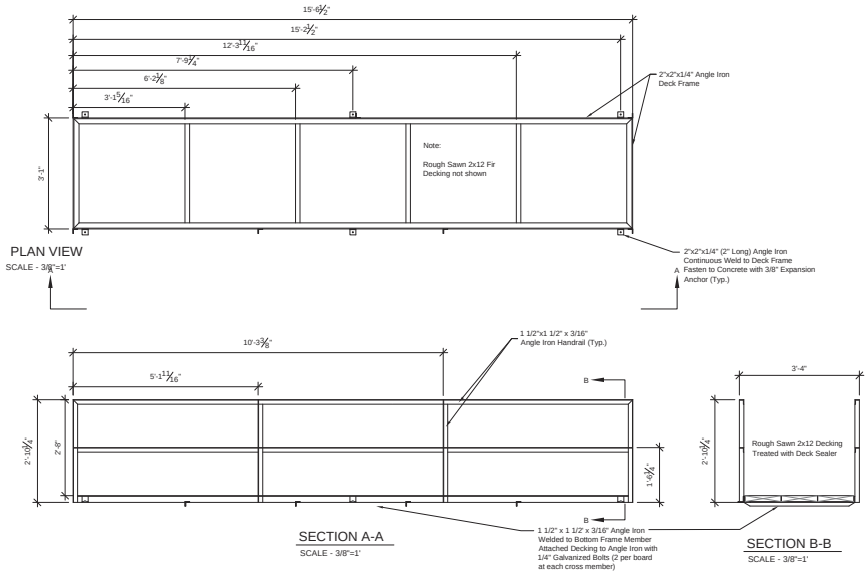
DRAWN BY: T.T.
DESIGNED BY: T.T., D., S.S.
CHECKED BY: W.S., T.C.
DATE: 11/2/07
CO CDR SET #2 ISSUED
FOR CONSTRUCTION
FILE NAME: 2007-11-02 CDR SET 2.DWG

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

STRUCTURE DETAILS - DILLON CANAL HEADGATE

SHEET: 20



PLAN VIEW
SCALE - 3/8"=1'

SECTION A-A
SCALE - 3/8"=1'

SECTION B-B
SCALE - 3/8"=1'

1/21 HANDRAIL/DECK DETAILS
SCALE - 3/8"=1'

DRAWN BY: T.T.
DESIGNED BY: T.T., D., S.S.
CHECKED BY: W.S., T.C.

DATE: 7/2/07
C:\1 FISH SLT 3D.DWG
PROJECT NO: 2006-0111

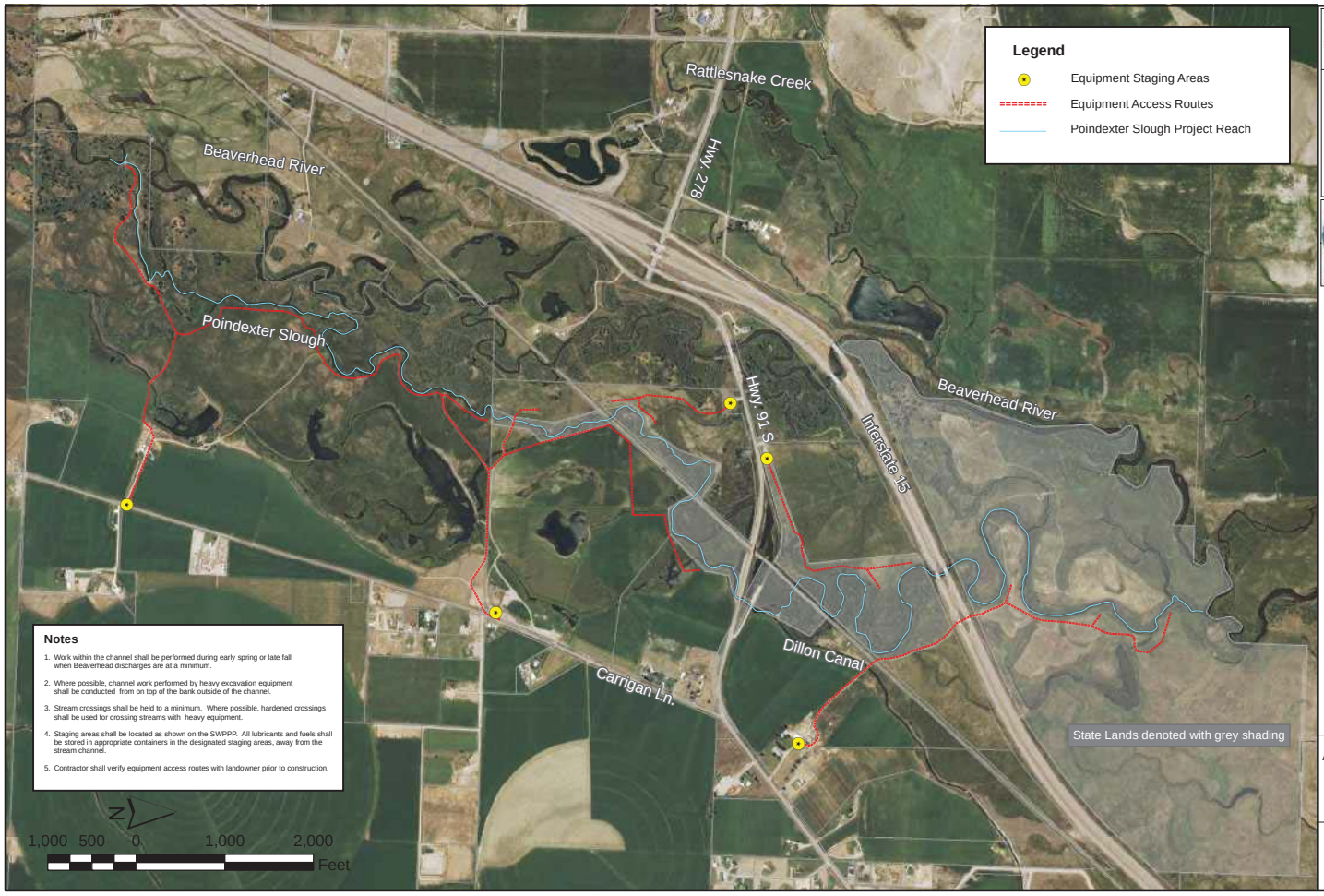
REV.	DATE	DESCRIPTION	BY	APPD

CONFLUENCE consulting incorporated

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT PROJECT
BEAVERHEAD COUNTY, MONTANA

STRUCTURE DETAILS - DILLON CANAL HEADGATE

SHEET: 21



DRAWN BY: T.T.
DATE: 05/09/13
DESIGNED BY: J.L., B.S.
CO-DRAW: 05/09/13
REVISED BY: J.L., B.S.
R. CHAR: 05/09/13

NO.	DATE	DESCRIPTION	BY	APPD.

CONFLUENCE
CONSULTING INCORPORATED

POINDEXTER SLOUGH
FISH HABITAT IMPROVEMENT
BEAVERHEAD COUNTY, MONTANA

ACCESS, STAGING & STORMWATER POLLUTION PREVENTION PLAN

SHEET: 22

POINDEXTER SLOUGH FISH HABITAT IMPROVEMENT PROJECT

FLOW MANAGEMENT PLAN

PREPARED FOR:

Beaverhead Watershed Committee
201 North Parkview Court
Dillon, MT 59725

PREPARED BY:

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

October 2013

Table of Contents

Introduction 1
Project Goals and Objectives 1
Poindexter Slough Design Criteria 2
Groundwater Influence and Hydrology of Poindexter Slough 3
Proposed Flow Management Scenarios for Poindexter Slough 6
Adaptive Management Recommendations 9

Tables

Table 1. Hydrologic scenarios necessary to divert 200 cfs into Poindexter Slough. 8
Table 2. Summary of proposed flow scenarios for Poindexter Slough 8

Figures

Figure 1. Location of synoptic flows in Poindexter Slough, 2012 4
Figure 2. Synoptic flow monitoring results, Poindexter Slough 5
Figure 3. Estimated discharge in the Beaverhead River at the Poindexter Slough headgate 5
Figure 4. Poindexter Slough discharge as a function of Beaverhead River discharge 7

Introduction

The Poindexter Slough Fishery Restoration project is a local restoration effort aimed at improving water quantity, habitat quality, sediment transport, and the fishery throughout the 4.73 mile length of Poindexter Slough, a side channel to the Beaverhead River. Poindexter Slough is located approximately 3 miles south of Dillon, MT. This project will restore and protect the stream and riparian corridor and will emphasize expanding fishery benefits.

The following flow management plan (FMP) is to be utilized in conjunction with infrastructure and in-stream channel improvement components of the Poindexter Slough Fish Habitat Improvement Project. Design criteria for the channel and irrigation infrastructure improvements were developed by Confluence Consulting, Montana Fish Wildlife and Parks (MFWP), the Beaverhead Watershed Committee (BWC), and the Dillon Canal Company.

The FMP provides guidelines for operating water control structures at the head of Poindexter Slough and the Dillon Canal to support habitat improvement goals while maintaining adequate irrigation supply to the Dillon Canal. The FMP has been developed merely as a guideline for flow management in Poindexter Slough. It is anticipated the FMP will evolve with future flow monitoring efforts and on-site observations of the channel's hydrogeomorphic responses to varying flow regimes. This FMP includes the project's goals and objectives, the design criteria developed to support those goals, hydrologic data to support the FMP, flow management scenarios, and monitoring recommendations to support an adaptive management strategy.

Project Goals and Objectives

Specific goals and objectives for the Poindexter Slough Habitat Improvement Project were developed by MFWP, the BWC, and the Dillon Canal Company to address fishery and irrigation project components. The following provides project goals and objectives as they pertain to the FMP.

Project Goals:

- Improve water quality/fish habitat by reducing sedimentation
- Reduce water temperature
- Improve spawning habitat
- Provide thermal refuge for brown trout
- Improve fish passage
- Improve recreational opportunity

Project Objectives:

- Creation of diverse self-maintaining trout habitat
- Reduced channel width-to depth ratio
- Vegetative bank stabilization where appropriate
- Improved sediment transport
- Modified headgate at head of Poindexter Slough to allow for flushing flows
- Modified headgate and diversion at head of the Dillon Canal to reduce backwatering and improve fish passage

Poindexter Slough Design Criteria

Several criteria were developed to support the project goals and objectives, help guide the design process, and provide a basis for post-project monitoring. Major project design components and the criteria include:

Physical Channel Parameters

The existing channel dimensions and hydrologic regime of Poindexter Slough do not support pool habitat formation and sustainable spawning features. The lack of periodic flushing flows through the slough has resulted in low pool density, shallow pools, fine sediment accumulation, and reduced habitat complexity. Specific channel parameter design criteria to support improved sediment transport, pool formation, and resorting of spawning gravels include:

1. Channel dimensions (width, depth, and slope) will be capable of mobilizing fine grained bed materials during base flows (20-50 cfs) to reduce fine sediment accumulation and maintain habitat features.
2. Channel dimensions will be sized to mobilize gravels <1.2” during flushing flows.
3. Channel dimensions will vary along the length of Poindexter Slough, taking into consideration approximately 30-45 cfs of anticipated groundwater and surface water inputs, and 35 cfs of irrigation outputs to the Dillon Canal during the irrigation season.

Hydrologic Parameters

Hydrologic design criteria to support improved sediment transport, pool formation, and resorting of spawning gravels include:

1. Base flows will be 20-50 cfs as measured at the head of Poindexter Slough.
2. Flushing flows will be approximately 200 cfs as measured at the head of Poindexter Slough.
3. Flushing flows will be generated every 2-5 years to mimic a natural hydrologic regime.
4. Flushing flows will be maintained for 7-10 days.

Channel Hydraulics

Hydraulic design parameters, including velocity and water depth are important to consider in areas where spawning activity is anticipated. In order to improve channel conditions during spawning seasons, the following hydraulic design criteria have been developed at riffle features:

1. Channel velocity at riffles during base flows will range from 0.33 to 2.95 ft/sec.
2. Channel depth at riffles during base flows will be >0.5 ft.

Dillon Canal Irrigation Demands

A primary goal of the project is to ensure delivery of irrigation water to the Dillon Canal while improving fisheries habitat in Poindexter Slough. The following criteria were utilized to develop channel and infrastructure designs to ensure delivery of irrigation water to the Dillon Canal during the irrigation season (approx. May 1 to Nov 1).

1. Typical irrigation demand is 35 cfs.
2. Up to 60 cfs can be diverted down the canal during irrigation season.

Groundwater Influence and Hydrology of Poindexter Slough

Synoptic Flow Monitoring

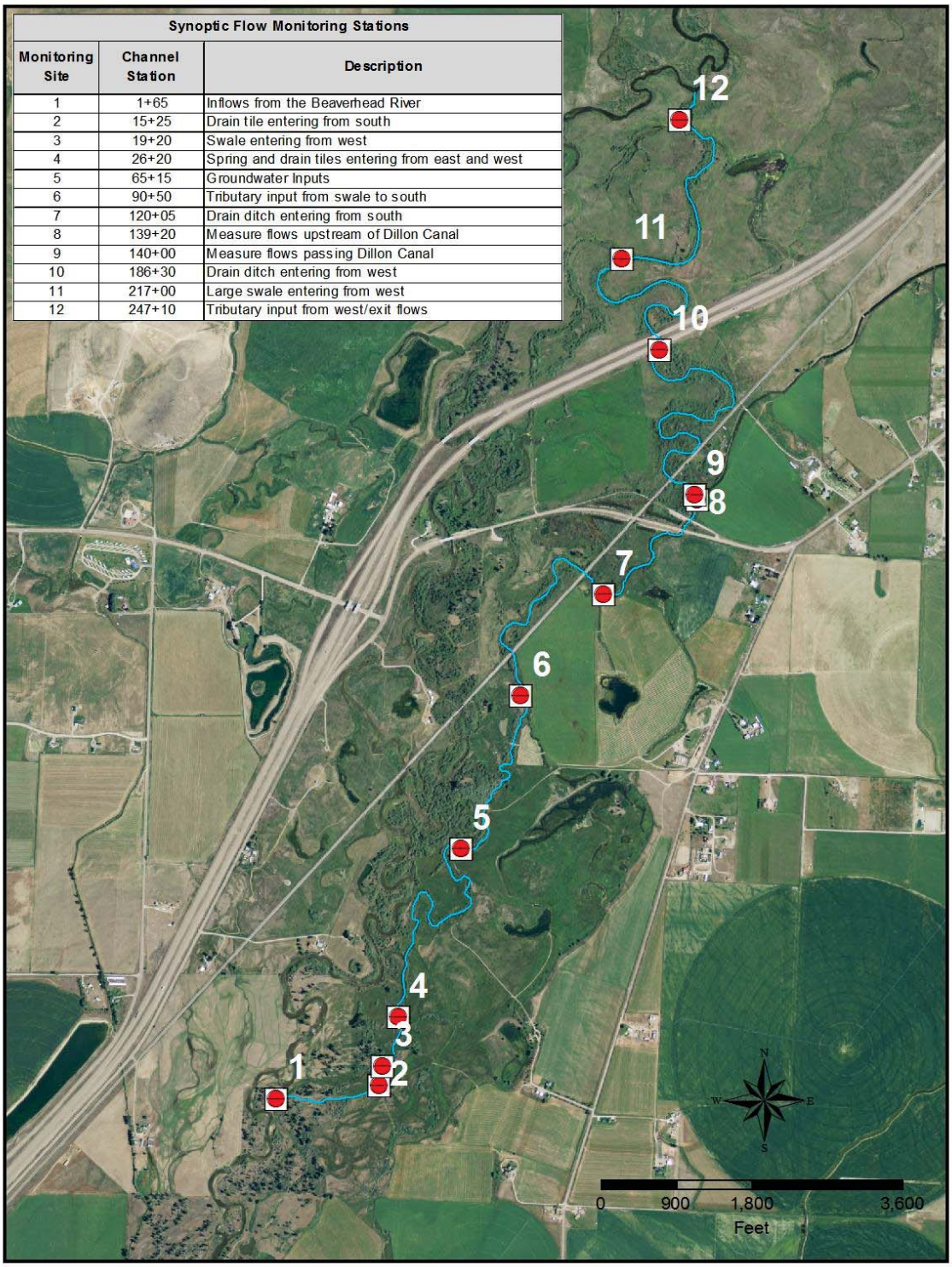
Discharges in Poindexter Slough are highly influenced by surface and groundwater inputs and irrigation withdraws. In an attempt to quantify the influence of these factors prior to designing the restoration project, Confluence performed a series of synoptic flow measurements along the length of Poindexter Slough in 2012 (Figure 1). Results of these data were combined with flow data collected by FWP in 2010 and 2011 (Figure 2) to develop a prediction of discharge along the length of Poindexter Slough, and to assist in developing appropriate channel dimensions to satisfy the design criteria.

Results of the synoptic flow monitoring indicate in general, Poindexter Slough gains approximately 17-32 cfs between the upstream headgate and the Dillon Canal and gains 13-14 cfs between the Dillon Canal and the mouth of Poindexter Slough at the Beaverhead River. Total gains along the length of Poindexter Slough ranged from 30-47 cfs. The synoptic flow results indicate a withdrawal of between 22 and 32 cfs from Poindexter Slough to the Dillon Canal. Although the Dillon Canal has legal water rights for up to approximately 65 cfs, a normal operating discharge of 35 cfs was utilized to develop this Flow Management Plan.

Beaverhead River and Poindexter Slough Hydrology

Figure 3 provides an estimated hydrograph of the Beaverhead River at the Poindexter Slough headgate. The discharge values were formulated by subtracting the mean daily discharge of the East Bench Irrigation Canal from the mean daily discharge on Beaverhead River obtained from USGS Stream Gage Data from Barrett's Gage #06016000. The mean daily discharge at Clark Canyon Dam is also illustrated in Figure 3. It is assumed that no additional significant gains or losses occur between the East Bench Irrigation District's headgate and the Poindexter Slough headgate. The hydrograph is based on gage data from 1997 to 2012.

Low flow discharges from November to March were not available from gage data. Historical average discharge data for the Clark Canyon Reservoir was obtained from the Bureau of Reclamation to provide estimated low flow discharges. Forty cfs was added to the low flow discharges obtained from the Bureau of Reclamation based on anecdotal evidence that the Beaverhead is a gaining stream through this reach. This value was determined based on mean daily discharges recorded at the beginning and end of the gaged data. The operating plan for the Clark Canyon Reservoir states that whenever an adequate water supply is available, releases from the Dam will be maintained between 100-200 cfs During below normal years, dam releases may be reduced to as low as 25-30 cfs.



Synoptic Flow Monitoring Stations		
Monitoring Site	Channel Station	Description
1	1+65	Inflows from the Beaverhead River
2	15+25	Drain tile entering from south
3	19+20	Swale entering from west
4	26+20	Spring and drain tiles entering from east and west
5	65+15	Groundwater Inputs
6	90+50	Tributary input from swale to south
7	120+05	Drain ditch entering from south
8	139+20	Measure flows upstream of Dillon Canal
9	140+00	Measure flows passing Dillon Canal
10	186+30	Drain ditch entering from west
11	217+00	Large swale entering from west
12	247+10	Tributary input from west/exit flows

Figure 1. Location of synoptic flows in Poindexter Slough, 2012

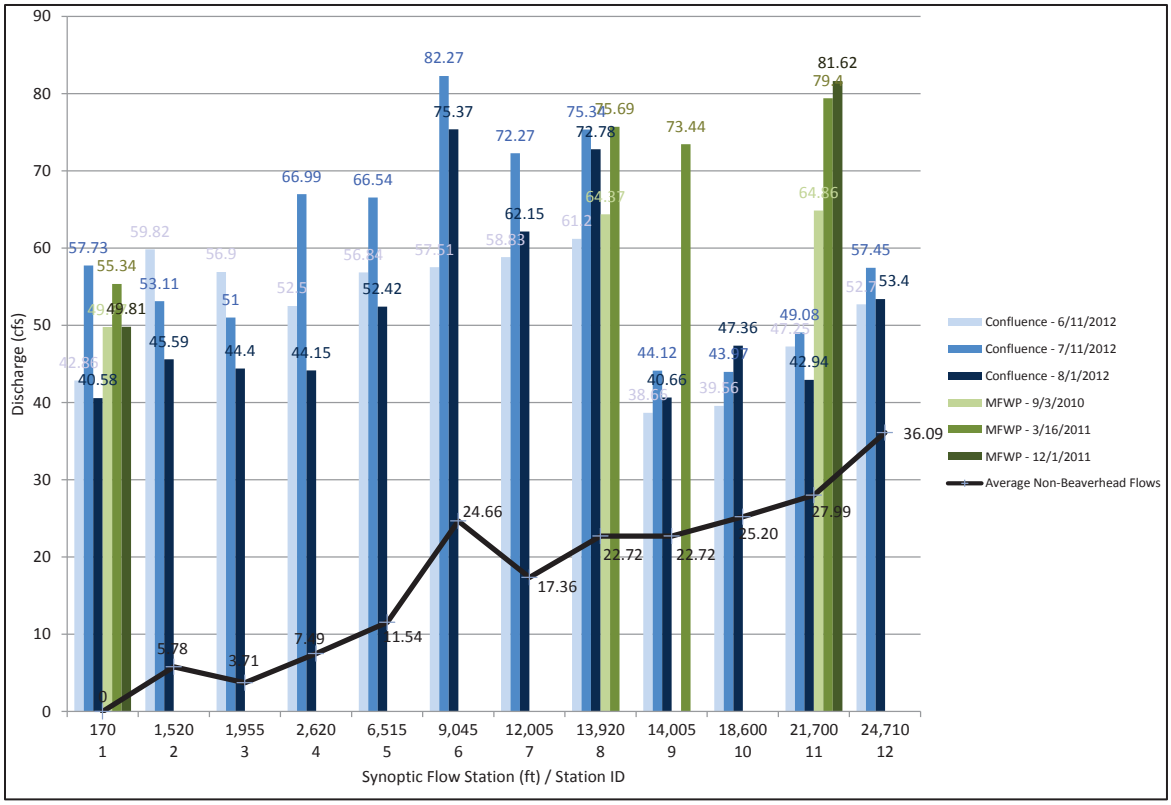


Figure 2. Synoptic flow monitoring results, Poindexter Slough

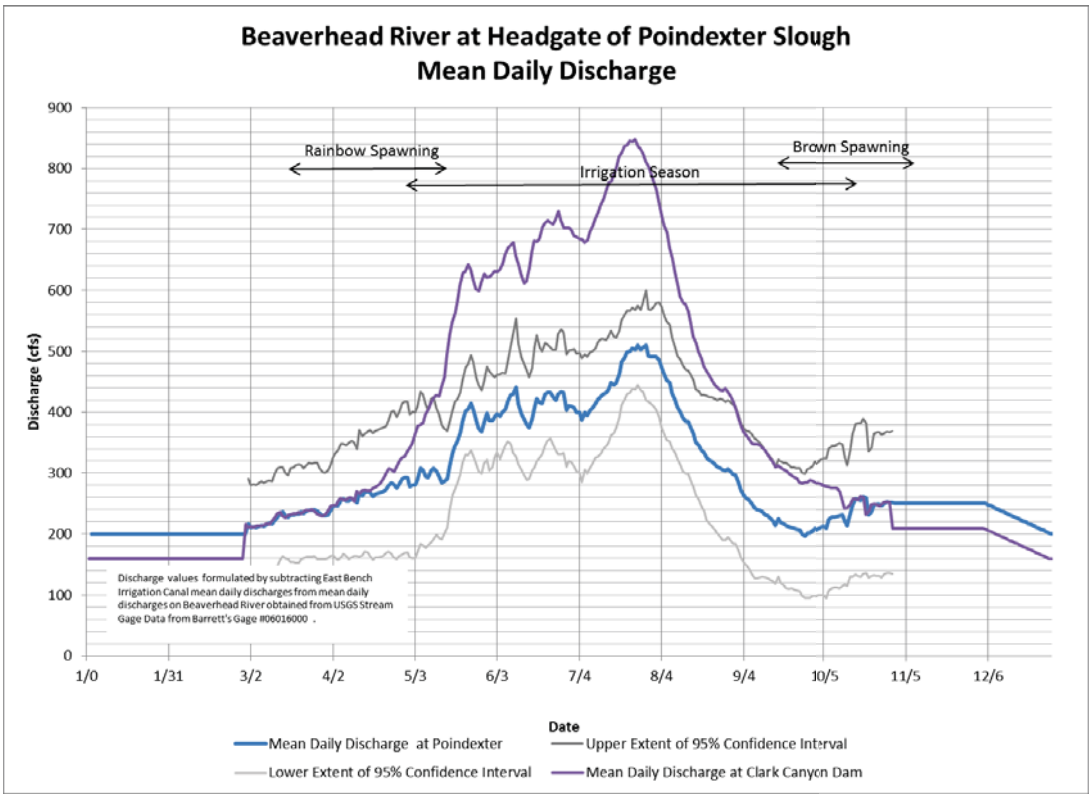


Figure 3. Estimated discharge in the Beaverhead River at the Poindexter Slough headgate

Proposed Flow Management Scenarios for Poindexter Slough

The FMP proposes two distinct flow regimes for Poindexter Slough including base and flushing flows. Descriptions of each flow regime and the recommended timing and discharges for each flow regime are included below.

Base Flows

Typical base flows should range from 20-50 cfs as measured at the head of Poindexter Slough. This range of flows provides adequate velocities to transport fine sediments and maintain pool/riffle features, provides suitable spawning habitat for trout (velocity and depth at riffles) and maintains recreational fishing opportunity throughout the stream. A base flow of 50 cfs in Poindexter Slough should be maintained whenever flows in the Beaverhead River allow. Base flows may be reduced from 50 cfs to as low as 20 cfs, but should only occur if Beaverhead River discharges cannot support diverting 50 cfs into Poindexter Slough without compromising habitat in the mainstem Beaverhead River. Flows should not fall below 50 cfs during the irrigation season (May 1 – October 15) to meet water right demands in the Dillon Canal. It is recommended that base flows not be reduced below 20 cfs at any time as measured at the head of Poindexter Slough to maintain suitable fish habitat and sediment transport.

Flushing Flows

Flushing flows should be provided with a frequency of once every 2-5 years to mimic a natural hydrologic regime and to meet habitat goals of the enhancement project. The ability to provide a flushing flow in Poindexter Slough will depend on the available discharge in the Beaverhead River, as the capacity of the gates at the head of the slough is dependent on the stage of the river. Figure 4 provides a discharge relationship between the Beaverhead River and Poindexter Slough at the headgate with newly developed operating scenarios based on replacement of the existing headgate. The figure indicates that in order to divert 200 cfs down Poindexter Slough (with new irrigation structure in place), the Beaverhead River must have approximately 530 cfs at the Poindexter Slough headgate. The estimated 2-year return interval in the Beaverhead River at the Poindexter Slough headgate is 630 cfs; therefore, it is reasonable to assume that the hydrologic conditions necessary to produce a 200 cfs flushing flow should occur regularly.

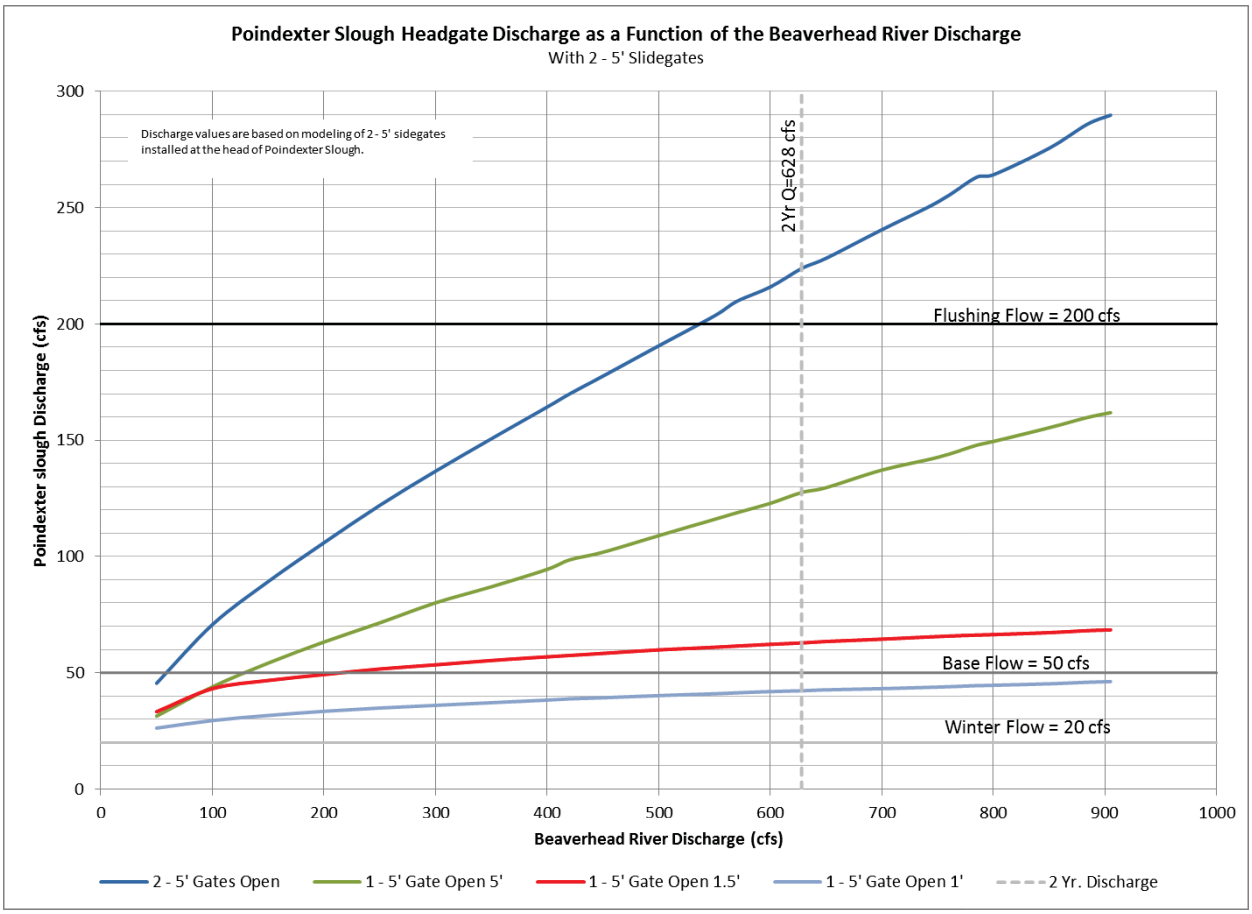


Figure 4. Poindexter Slough discharge as a function of Beaverhead River discharge

Timing of Flushing Flows

Diverting 200 cfs down Poindexter Slough will be possible when the combination of Clark Canyon dam releases, East Bench Irrigation withdraws, and groundwater inputs provide a discharge of approximately 530 cfs at the Poindexter Slough headgate (general scenarios provided in Table 1). Gage records indicate the timing of when these scenarios typically occur is not necessarily predictable. For example, since 1997, peak releases from the Clark Canyon Dam have occurred in May, June, July, and August, and are highly dependent on annual snowpack, summer precipitation, and resulting irrigation demands. Moreover, real-time gage data is currently not available for the East Bench Canal diversion to allow for easy estimation of the Beaverhead River discharge at Poindexter Slough. As a result of these factors, the appropriate timing of flushing flows will require knowledge of dam releases and East Bench Irrigation withdraws.

The ideal timing of a flushing flow in Poindexter Slough would occur in late April through early June to mimic a natural hydrograph and encourage spring spawning activity. However, the current schedule of dam releases and use of the East Bench Canal may often preclude the potential for a flushing flow in Poindexter Slough during this timeframe. If the a flushing flow scenario is to occur between April and early June, Poindexter Slough managers may wish to coordinate with Clark Canyon Dam and East Bench Canal operators to determine a suitable hydrologic plan to meet various irrigation and flow management goals.

Table 1. Hydrologic scenarios necessary to divert 200 cfs into Poindexter Slough.

Clark Canyon Dam Release (cfs)	East Bench Irrigation Withdraw (cfs)	Estimated Groundwater Inputs between Clark Canyon and Poindexter Slough (cfs)	Estimated Discharge of Beaverhead River at Poindexter Slough
490	0	40	530
600	Up to 110	40	530
700	Up to 210	40	530
800	Up to 310	40	530
900	Up to 410	40	530

Duration of Flushing Flows

The duration of flushing flows should vary depending on the discharge and the timeline following the previous flushing flow event. It is recommended the flushing flow be increased from the base flows incrementally, but fairly rapidly over the course of 1-2 days. Flushing flows should be maintained to mobilize sediment and flush fines for approximately 3 days. Alternatively, daily turbidity readings should be taken at the downstream extent of Poindexter Slough during the flushing flow. Once the turbidity readings begin to decrease, flows should be incrementally reduced by closing one of the two gates at the head of the slough. Discharge should be incrementally reduced from flushing to base flows over the course of approximately 3-5 days. Total flushing flow duration should be approximately 7-10 days.

If successfully implemented, a flushing flow of approximately 200 cfs as measured at the head of Poindexter Slough will help to rejuvenate spawning gravels and flush fine sediments from pools. It is anticipated that a 200 cfs flushing flow will be adequate to mobilize most spawning-sized gravels while maintaining pool/riffle features. It is recommended that the initial flushing flow not be implemented until at least one growing season following completion of the stream work, and the first flushing flow be limited to 150 cfs to observe the channel's hydrogeomorphic response to an initial flushing event. Guidance for monitoring the channel's response is included in the following section.

Table 2 illustrates the timing and magnitude of each proposed flow regime and the range of anticipated discharges at the head of the slough, above the Dillon Canal, below the Canal, and at the mouth of the slough.

Table 2. Summary of proposed flow scenarios for Poindexter Slough

Upstream Headgate Discharge Scenario (cfs)	Period of Operation	Discharge Above Dillon Canal Headgate (cfs)	Canal Discharge Scenario (cfs)	Discharge Below Dillon Canal Headgate (cfs)	Discharge at Downstream Confluence with Beaverhead (cfs)
Base Flow (Typical) Q = 50	Spring through Fall (March - October)	68 - 82	Normal Operating Discharge Q = -35	33 - 47	45 - 61
			Closed Q = 0	68 - 82	80 - 96
Base Flow (Minimum) Q = 20	Winter* (November - March)	38 - 52	Closed Q = 0	38 - 52	50 - 66
Flushing Flow Q = 200	Spring (April - June) 7-10 days	218 - 232	Normal Operating Discharge Q = -35	183 - 197	195 - 211
			Closed Q = 0	218 - 232	230 - 246

* Base flows should remain as close to 50 cfs as possible and should only be reduced if Beaverhead River flows do not support diverting 50 cfs into Poindexter Slough

Adaptive Management Recommendations

In order to meet the goals of this project, an adaptive management plan should be implemented that will optimize flow management in Poindexter Slough. The followings steps are recommended to effectively monitor discharges and the resulting influences on the channel.

1. Install Staff Gages

USGS Style C staff gages should be installed to monitor discharges at key locations in Poindexter Slough. Following gage installation, a stage/discharge relationship should be developed for each gage by measuring flows at a range of discharges and recording the corresponding stage during each flow measurement. Recommended locations for staff gages include:

- Immediately downstream of the new headgate at the upstream end of Poindexter Slough.
- Immediately upstream of the Dillon Canal Headgate in a riffle of Poindexter Slough.
- Immediately downstream of the Dillon Canal Headgate in the Dillon Canal.
- In a riffle at the downstream extent of Poindexter Slough.

2. Measure influence of groundwater/surface water inputs to Poindexter Slough

The anticipated range of flows and resultant channel design dimensions along the length of Poindexter Slough are based on relatively few synoptic flow measurements. Additional flow measurements will help to provide a more comprehensive understanding of groundwater influence on the stream over several years, and may help to advise flow management decisions in the future. This may be conducted by:

- Monitoring discharge in Poindexter Slough throughout the year at the locations specified in this FMP to determine the influence of groundwater and surface water along the entire channel.
- Monitoring results may be used to modify the anticipated discharges at the Dillon Canal headgate during various gate operation scenarios at the head of the slough.

3. Optimize aquatic habitat during base flows

Depth and velocity in riffle habitats should be monitored at riffle habitats to determine a range of base flows that provide optimal spawning conditions. This may be conducted by:

- Measuring depth and velocity at a minimum of 10 reference riffle cross sections throughout the project. Log location, results, and discharge in Poindexter Slough at the head of the channel.
- Adjusting gates at head of Poindexter Slough and record depth and velocity at same riffle cross sections again.
- Following determination of optimal base flows, adjust flows at headgate until optimal habitat conditions (see design criteria for optimal spawning conditions) are obtained.

4. Monitor channel response following flushing flows

It will be imperative to monitor the channel's response to periodic flushing flows to assess whether the habitat improvement goals and objectives of the project are met. Monitoring results may be used to revise the magnitude and duration of subsequent flushing flows. The following steps are recommended to establish a monitoring program for this purpose. Post-flushing flow channel parameters may be monitored by:

- Selecting a minimum of 10 pools and surveying cross sections at each pool before and after flushing flows. Document differences in pool depth and length.
- Performing pebble counts in areas where spawning is anticipated (pool tails and riffles) to document the percentage of the bed composed of suitable spawning gravels as well as changes in substrate composition over time.
- Determining the percentage of the stream bed, if any, that is embedded and unsuitable for spawning.
- Performing stream-wide inventory of channel bed and banks after flushing flows to note locations of bank instability, fine sediment accumulation, and coarse sediment accumulation.