APPENDIX E

ALTERNATIVE COST SUMMARIES

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 1
DRAINAGEWAY : Boulder Creek
REACH : 1A
JURISDICTION : City of Longmont
REACH ID: BCM-Reach1A | Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Estimated New Stream	<----User Defined Items	1400	L.F.	$133.00	$186,200.00	
ERC Estimated Riparian Restoration	<----User Defined Items	6	AC	$36,000.00	$224,977.00	100 ft. each side of river

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$411,177.00
Subtotal Capital Improvement Costs					**$411,177.00**
Additional Capital Improvement Costs					
Dewatering		$4,111.77	L.S.		$4,112.00
Mobilization		5%			$20,559.00
Traffic Control		$10,279.43	L.S.		$10,279.00
Utility Coordination/Relocation		$10,279.43	L.S.		$10,279.00
Stormwater Management/Erosion Control		5%			$20,559.00
Subtotal Additional Capital Improvement Costs					**$65,788.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$71,545.00
Legal/Administrative		5%			$23,848.00
Contract Admin/Construction Management		10%			$47,697.00
Contingency		25%			$119,241.00
Subtotal Other Costs					**$262,331.00**
Total Capital Improvement Costs					**$739,296.00**

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)		1400	L.F.	$2.00	$560.00
Total Annual Operation and Maintenance Cost					**$560.00**
Effective Interest Rate					1.50%
Total Operation and Maintenance Costs Over 50 Years					**$19,600.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 1
DRAINAGEWAY : Boulder Creek
REACH : 1B
JURISDICTION : City of Longmont
REACH ID: BCM-Reach1B | Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverside Spillway	<----User Defined Items	1	L.S.	$225,000.00	$225,000.00	

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$225,000.00
Subtotal Capital Improvement Costs					**$225,000.00**
Additional Capital Improvement Costs					
Dewatering		$2,250.00	L.S.		$2,250.00
Mobilization		5%			$11,250.00
Traffic Control		$5,625.00	L.S.		$5,625.00
Utility Coordination/Relocation		$5,625.00	L.S.		$5,625.00
Stormwater Management/Erosion Control		5%			$11,250.00
Subtotal Additional Capital Improvement Costs					**$36,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$39,150.00
Legal/Administrative		5%			$13,050.00
Contract Admin/Construction Management		10%			$26,100.00
Contingency		25%			$65,250.00
Subtotal Other Costs					**$143,550.00**
Total Capital Improvement Costs					**$404,550.00**

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)		1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost					**$122.00**
Effective Interest Rate					1.50%
Total Operation and Maintenance Costs Over 50 Years					**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 2
DRAINAGEWAY : Boulder Creek
REACH : 2A
JURISDICTION : Weld County
REACH ID: BCM-Reach2A Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
180 ft. span bridge at CO Rd 20.5	<----User Defined Items	5400	SF	$250.00	$1,350,000.00	30 ft width bridge
Removal of old bridge	<----User Defined Items	3900	SF	$50.00	$195,000.00	130 ft x 30 ft

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$1,545,000.00
Subtotal Capital Improvement Costs				**$1,545,000.00**
Additional Capital Improvement Costs				
Dewatering	$15,450.00	L.S.		$15,450.00
Mobilization	5%			$77,250.00
Traffic Control	$38,625.00	L.S.		$38,625.00
Utility Coordination/Relocation	$38,625.00	L.S.		$38,625.00
Stormwater Management/Erosion Control	5%			$77,250.00
Subtotal Additional Capital Improvement Costs				**$247,200.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$268,830.00
Legal/Administrative	5%			$89,610.00
Contract Admin/Construction Management	10%			$179,220.00
Contingency	25%			$448,050.00
Subtotal Other Costs				**$985,710.00**
Total Capital Improvement Costs				**$2,777,910.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	30	L.F.	$2.00	$12.00
Total Annual Operation and Maintenance Cost				**$12.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$420.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 2
DRAINAGEWAY : Boulder Creek
REACH : 2B
JURISDICTION : Weld County
REACH ID: BCM-Reach2B Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Diversion for Aquatic Passage	<----User Defined Items	1	L.S.	$205,000.00	$205,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$205,000.00
Subtotal Capital Improvement Costs				**$205,000.00**
Additional Capital Improvement Costs				
Dewatering	$2,050.00	L.S.		$2,050.00
Mobilization	5%			$10,250.00
Traffic Control	$5,125.00	L.S.		$5,125.00
Utility Coordination/Relocation	$5,125.00	L.S.		$5,125.00
Stormwater Management/Erosion Control	5%			$10,250.00
Subtotal Additional Capital Improvement Costs				**$32,800.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$35,670.00
Legal/Administrative	5%			$11,890.00
Contract Admin/Construction Management	10%			$23,780.00
Contingency	25%			$59,450.00
Subtotal Other Costs				**$130,790.00**
Total Capital Improvement Costs				**$368,590.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost				**$122.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 2
DRAINAGEWAY :	Boulder Creek
REACH :	2C
JURISDICTION :	Weld County
REACH ID:	BCM-Reach2C

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$250,000.00	
Subtotal Capital Improvement Costs					**$250,000.00**	
Additional Capital Improvement Costs						
Dewatering		$2,500.00	L.S.		$2,500.00	
Mobilization		5%			$12,500.00	
Traffic Control		$6,250.00	L.S.		$6,250.00	
Utility Coordination/Relocation		$6,250.00	L.S.		$6,250.00	
Stormwater Management/Erosion Control		5%			$12,500.00	
Subtotal Additional Capital Improvement Costs					**$40,000.00**	
Land / Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$43,500.00	
Legal/Administrative		5%			$14,500.00	
Contract Admin/Construction Management		10%			$29,000.00	
Contingency		25%			$72,500.00	
Subtotal Other Costs					**$159,500.00**	
Total Capital Improvement Costs					**$449,500.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 2
DRAINAGEWAY :	Boulder Creek
REACH :	2D
JURISDICTION :	Weld County
REACH ID:	BCM-Reach2D

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$250,000.00	
Subtotal Capital Improvement Costs					**$250,000.00**	
Additional Capital Improvement Costs						
Dewatering		$2,500.00	L.S.		$2,500.00	
Mobilization		5%			$12,500.00	
Traffic Control		$6,250.00	L.S.		$6,250.00	
Utility Coordination/Relocation		$6,250.00	L.S.		$6,250.00	
Stormwater Management/Erosion Control		5%			$12,500.00	
Subtotal Additional Capital Improvement Costs					**$40,000.00**	
Land / Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$43,500.00	
Legal/Administrative		5%			$14,500.00	
Contract Admin/Construction Management		10%			$29,000.00	
Contingency		25%			$72,500.00	
Subtotal Other Costs					**$159,500.00**	
Total Capital Improvement Costs					**$449,500.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 2
DRAINAGEWAY :	Boulder Creek
REACH :	2E
JURISDICTION :	Weld County
REACH ID:	BCM-Reach2E

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
180 ft span bridge	<-----User Defined Items	5400	SF	$250.00	$1,350,000.00	30 ft width bridge
Removal of old bridge	<-----User Defined Items	3900	SF	$50.00	$195,000.00	130 ft x 30 ft

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$1,545,000.00
Subtotal Capital Improvement Costs					**$1,545,000.00**
Additional Capital Improvement Costs					
Dewatering		$15,450.00	L.S.		$15,450.00
Mobilization		5%			$77,250.00
Traffic Control		$38,625.00	L.S.		$38,625.00
Utility Coordination/Relocation		$38,625.00	L.S.		$38,625.00
Stormwater Management/Erosion Control		5%			$77,250.00
Subtotal Additional Capital Improvement Costs					**$247,200.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$268,830.00
Legal/Administrative		5%			$89,610.00
Contract Admin/Construction Management		10%			$179,220.00
Contingency		25%			$448,050.00
Subtotal Other Costs					**$985,710.00**
Total Capital Improvement Costs					**$2,777,910.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	30	L.F.	$2.00	$12.00
Total Annual Operation and Maintenance Cost				**$12.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$420.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 2
DRAINAGEWAY :	Boulder Creek
REACH :	2F
JURISDICTION :	Weld County
REACH ID:	BCM-Reach2F

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverbank Spillway	<-----User Defined Items	20	L.S.	$225,000.00	$4,500,000.00	
Lateral Spillway	<-----User Defined Items	1	L.S.	$225,000.00	$225,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$4,725,000.00
Subtotal Capital Improvement Costs					**$4,725,000.00**
Additional Capital Improvement Costs					
Dewatering		$47,250.00	L.S.		$47,250.00
Mobilization		5%			$236,250.00
Traffic Control		$118,125.00	L.S.		$118,125.00
Utility Coordination/Relocation		$118,125.00	L.S.		$118,125.00
Stormwater Management/Erosion Control		5%			$236,250.00
Subtotal Additional Capital Improvement Costs					**$756,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$822,150.00
Legal/Administrative		5%			$274,050.00
Contract Admin/Construction Management		10%			$548,100.00
Contingency		25%			$1,370,250.00
Subtotal Other Costs					**$3,014,550.00**
Total Capital Improvement Costs					**$8,495,550.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	21	EA	$608.00	$2,554.00
Total Annual Operation and Maintenance Cost				**$2,554.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$89,389.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 2
DRAINAGEWAY : Boulder Creek
REACH : 2G
JURISDICTION : Weld County
REACH ID: BCM-Reach2G Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Stream Restoration	<-----User Defined Items	2000	L.F.	$133.00	$266,000.00	
ERC Riparian Restoration	<-----User Defined Items	18	AC	$35,000.00	$642,792.00	200 ft. on each side of river

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$908,792.00
Subtotal Capital Improvement Costs					**$908,792.00**
Additional Capital Improvement Costs					
Dewatering		$9,087.92	L.S.		$9,088.00
Mobilization		5%			$45,440.00
Traffic Control		$22,719.80	L.S.		$22,720.00
Utility Coordination/Relocation		$22,719.80	L.S.		$22,720.00
Stormwater Management/Erosion Control		5%			$45,440.00
Subtotal Additional Capital Improvement Costs					**$145,408.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$158,130.00
Legal/Administrative		5%			$52,710.00
Contract Admin/Construction Management		10%			$105,420.00
Contingency		25%			$263,550.00
Subtotal Other Costs					**$579,810.00**
Total Capital Improvement Costs					**$1,634,010.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2000	L.F.	$2.00	$800.00
Total Annual Operation and Maintenance Cost				**$800.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$28,000.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 3
DRAINAGEWAY : Boulder Creek
REACH : 3A
JURISDICTION : Weld County
REACH ID: BCM-Reach3A Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Stream Restoration	<-----User Defined Items	2000	L.F.	$135.00	$270,000.00	
ERC Riparian Restoration	<-----User Defined Items	18	AC	$35,000.00	$642,792.00	200 ft. on each side of stream

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$912,792.00
Subtotal Capital Improvement Costs					**$912,792.00**
Additional Capital Improvement Costs					
Dewatering		$9,127.92	L.S.		$9,128.00
Mobilization		5%			$45,640.00
Traffic Control		$22,819.80	L.S.		$22,820.00
Utility Coordination/Relocation		$22,819.80	L.S.		$22,820.00
Stormwater Management/Erosion Control		5%			$45,640.00
Subtotal Additional Capital Improvement Costs					**$146,048.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$158,826.00
Legal/Administrative		5%			$52,942.00
Contract Admin/Construction Management		10%			$105,884.00
Contingency		25%			$264,710.00
Subtotal Other Costs					**$582,362.00**
Total Capital Improvement Costs					**$1,641,202.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2000	L.F.	$2.00	$800.00
Total Annual Operation and Maintenance Cost				**$800.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$28,000.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 3
DRAINAGEWAY :	Boulder Creek
REACH :	3B
JURISDICTION :	Weld County
REACH ID:	BCM-Reach3B

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverside Spillway	<----User Defined Items	1	EA	$225,000.00	$225,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$225,000.00	
Subtotal Capital Improvement Costs					**$225,000.00**	
Additional Capital Improvement Costs						
Dewatering		$2,250.00	L.S.		$2,250.00	
Mobilization		5%			$11,250.00	
Traffic Control		$5,625.00	L.S.		$5,625.00	
Utility Coordination/Relocation		$5,625.00	L.S.		$5,625.00	
Stormwater Management/Erosion Control		5%			$11,250.00	
Subtotal Additional Capital Improvement Costs					**$36,000.00**	
Land / Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$39,150.00	
Legal/Administrative		5%			$13,050.00	
Contract Admin/Construction Management		10%			$26,100.00	
Contingency		25%			$65,250.00	
Subtotal Other Costs					**$143,550.00**	
Total Capital Improvement Costs					**$404,550.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4A
JURISDICTION :	Weld County
REACH ID:	BCM-Reach4A

Jeremy Deischer | DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains				$0.00	
Concrete Box Culverts				$0.00	
Hydraulic Structures				$0.00	
Channel Improvements				$0.00	
Detention/Water Quality Facilities				$0.00	
Removals				$0.00	
Landscaping and Maintenance Improvements				$0.00	
Special Items (User Defined)				$250,000.00	
Subtotal Capital Improvement Costs				**$250,000.00**	
Additional Capital Improvement Costs					
Dewatering		$2,500.00	L.S.	$2,500.00	
Mobilization		5%		$12,500.00	
Traffic Control		$6,250.00	L.S.	$6,250.00	
Utility Coordination/Relocation		$6,250.00	L.S.	$6,250.00	
Stormwater Management/Erosion Control		5%		$12,500.00	
Subtotal Additional Capital Improvement Costs				**$40,000.00**	
Land / Acquisition Costs					
ROW/Easements				$0.00	
Subtotal Land Acquisition Costs				**$0.00**	
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%		$43,500.00	
Legal/Administrative		5%		$14,500.00	
Contract Admin/Construction Management		10%		$29,000.00	
Contingency		25%		$72,500.00	
Subtotal Other Costs				**$159,500.00**	
Total Capital Improvement Costs				**$449,500.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 4
DRAINAGEWAY : Boulder Creek
REACH : 4B
JURISDICTION : Boulder County
REACH ID: BCM-Reach4B | Jeremy Deischer | DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Soil Riprap, Type M		178	C.Y.	$85.00	$15,111.00	400 L.F. of Right Bank stabilization
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)		0	ACRE	$1,217.00	$304.00	
Special Items (User Defined)						
180 ft. span bridge at County Line road	<----User Defined Items	7200	S.F.	$250.00	$1,800,000.00	40 ft width
Old bridge removal	<----User Defined Items	4800	S.F.	$50.00	$240,000.00	120 ft x 40 ft.

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$15,111.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$304.00
Special Items (User Defined)				$2,040,000.00
Subtotal Capital Improvement Costs				**$2,055,415.00**
Additional Capital Improvement Costs				
Dewatering	$20,554.15	L.S.		$20,554.00
Mobilization	5%			$102,771.00
Traffic Control	$51,385.38	L.S.		$51,385.00
Utility Coordination/Relocation	$51,385.38	L.S.		$51,385.00
Stormwater Management/Erosion Control	5%			$102,771.00
Subtotal Additional Capital Improvement Costs				**$328,866.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$357,642.00
Legal/Administrative	5%			$119,214.00
Contract Admin/Construction Management	10%			$238,428.00
Contingency	25%			$596,070.00
Subtotal Other Costs				**$1,311,354.00**
Total Capital Improvement Costs				**$3,695,635.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	40	L.F.	$2.00	$16.00
Total Annual Operation and Maintenance Cost				**$16.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$560.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 4
DRAINAGEWAY : Boulder Creek
REACH : 4B-100yr
JURISDICTION : Boulder County
REACH ID: BCM-Reach4B-100yr | Jeremy Deischer | DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		9458	C.Y.	$29.00	$274,282.00	Fill required to raise roadway
Soil Riprap, Type M		178	C.Y.	$85.00	$15,111.00	400 L.F. RB Stabilization
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)		0	ACRE	$1,217.00	$304.00	
Special Items (User Defined)						
220 ft span bridge at County Line Road	<----User Defined Items	8800	S.F.	$250.00	$2,200,000.00	40 ft. width
Asphalt for roadway	<----User Defined Items	7022	S.Y.	$60.00	$421,333.00	1580 ft. of roadway construction (N side)
Old bridge removal	<----User Defined Items	4800	S.F.	$50.00	$240,000.00	120 ft. x 40 ft.

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$289,393.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$304.00
Special Items (User Defined)				$2,861,333.00
Subtotal Capital Improvement Costs				**$3,151,030.00**
Additional Capital Improvement Costs				
Dewatering	$31,510.30	L.S.		$31,510.00
Mobilization	5%			$157,552.00
Traffic Control	$78,775.75	L.S.		$78,776.00
Utility Coordination/Relocation	$78,775.75	L.S.		$78,776.00
Stormwater Management/Erosion Control	5%			$157,552.00
Subtotal Additional Capital Improvement Costs				**$504,166.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$548,279.00
Legal/Administrative	5%			$182,760.00
Contract Admin/Construction Management	10%			$365,520.00
Contingency	25%			$913,799.00
Subtotal Other Costs				**$2,010,358.00**
Total Capital Improvement Costs				**$5,665,554.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	40	L.F.	$2.00	$16.00
Total Annual Operation and Maintenance Cost				**$16.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$560.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4C-Boulder
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach4C-Boulder

Jeremy Deischer | DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverbank Spillway	<----User Defined Items	11	L.S.	$225,000.00	$2,475,000.00	
Lateral Spillway	<----User Defined Items	2	L.S.	$225,000.00	$450,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$2,925,000.00
Subtotal Capital Improvement Costs					**$2,925,000.00**
Additional Capital Improvement Costs					
Dewatering		$29,250.00	L.S.		$29,250.00
Mobilization		5%			$146,250.00
Traffic Control		$73,125.00	L.S.		$73,125.00
Utility Coordination/Relocation		$73,125.00	L.S.		$73,125.00
Stormwater Management/Erosion Control		5%			$146,250.00
Subtotal Additional Capital Improvement Costs					**$468,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$508,950.00
Legal/Administrative		5%			$169,650.00
Contract Admin/Construction Management		10%			$339,300.00
Contingency		25%			$848,250.00
Subtotal Other Costs					**$1,866,150.00**
Total Capital Improvement Costs					**$5,259,150.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	13	EA	$608.00	$1,581.00
Total Annual Operation and Maintenance Cost				**$1,581.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$55,335.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4C-Weld
JURISDICTION :	Weld County
REACH ID:	BCM-Reach4C-Weld

Jeremy Deischer | DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverbank spillway	<----User Defined Items	2	L.S.	$225,000.00	$450,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$450,000.00
Subtotal Capital Improvement Costs					**$450,000.00**
Additional Capital Improvement Costs					
Dewatering		$4,500.00	L.S.		$4,500.00
Mobilization		5%			$22,500.00
Traffic Control		$11,250.00	L.S.		$11,250.00
Utility Coordination/Relocation		$11,250.00	L.S.		$11,250.00
Stormwater Management/Erosion Control		5%			$22,500.00
Subtotal Additional Capital Improvement Costs					**$72,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$78,300.00
Legal/Administrative		5%			$26,100.00
Contract Admin/Construction Management		10%			$52,200.00
Contingency		25%			$130,500.00
Subtotal Other Costs					**$287,100.00**
Total Capital Improvement Costs					**$809,100.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	2	EA	$608.00	$243.00
Total Annual Operation and Maintenance Cost				**$243.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$8,505.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4D
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach4D
Jeremy Deischer	DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Soil Riprap, Type M		102	C.Y.	$85.00	$8,670.00	230 ft. x 6 ft. x 2 ft.
Excavation, Mid Range		188	C.Y.	$29.00	$5,452.00	Fill required in addition to soil riprap
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)		1	ACRE	$1,217.00	$609.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$14,122.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$609.00
Special Items (User Defined)				$0.00
Subtotal Capital Improvement Costs				**$14,731.00**
Additional Capital Improvement Costs				
Dewatering	$147.31	L.S.		$147.00
Mobilization	5%			$737.00
Traffic Control	$368.28	L.S.		$368.00
Utility Coordination/Relocation	$368.28	L.S.		$368.00
Stormwater Management/Erosion Control	5%			$737.00
Subtotal Additional Capital Improvement Costs				**$2,357.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$2,563.00
Legal/Administrative	5%			$854.00
Contract Admin/Construction Management	10%			$1,709.00
Contingency	25%			$4,272.00
Subtotal Other Costs				**$9,398.00**
Total Capital Improvement Costs				**$26,486.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	230	L.F.	$2.00	$92.00
Total Annual Operation and Maintenance Cost				**$92.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$3,220.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4E
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach4E
Jeremy Deischer	DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Remove washed out bridge	<----User Defined Items	1200	S.F.	$50.00	$60,000.00	15 ft. x 80 ft.

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$60,000.00
Subtotal Capital Improvement Costs				**$60,000.00**
Additional Capital Improvement Costs				
Dewatering	$600.00	L.S.		$600.00
Mobilization	5%			$3,000.00
Traffic Control	$1,500.00	L.S.		$1,500.00
Utility Coordination/Relocation	$1,500.00	L.S.		$1,500.00
Stormwater Management/Erosion Control	5%			$3,000.00
Subtotal Additional Capital Improvement Costs				**$9,600.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$10,440.00
Legal/Administrative	5%			$3,480.00
Contract Admin/Construction Management	10%			$6,960.00
Contingency	25%			$17,400.00
Subtotal Other Costs				**$38,280.00**
Total Capital Improvement Costs				**$107,880.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 4
DRAINAGEWAY : Boulder Creek
REACH : 4F
JURISDICTION : Boulder County
REACH ID: BCM-Reach4F Jeremy Deischer DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Estimate - New Stream	<----User Defined Items	1	L.S.	$1,130,000.00	$1,130,000.00	
ERC Estimate - Riparian Restoration	<----User Defined Items	1	L.S.	$2,730,000.00	$2,730,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$3,860,000.00
Subtotal Capital Improvement Costs					**$3,860,000.00**
Additional Capital Improvement Costs					
Dewatering		$38,600.00	L.S.		$38,600.00
Mobilization		5%			$193,000.00
Traffic Control		$96,500.00	L.S.		$96,500.00
Utility Coordination/Relocation		$96,500.00	L.S.		$96,500.00
Stormwater Management/Erosion Control		5%			$193,000.00
Subtotal Additional Capital Improvement Costs					**$617,600.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$671,640.00
Legal/Administrative		5%			$223,880.00
Contract Admin/Construction Management		10%			$447,760.00
Contingency		25%			$1,119,400.00
Subtotal Other Costs					**$2,462,680.00**
Total Capital Improvement Costs					**$6,940,280.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	8500	L.F.	$2.00	$3,400.00
Total Annual Operation and Maintenance Cost				**$3,400.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$118,999.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 4
DRAINAGEWAY : Boulder Creek
REACH : 4G
JURISDICTION : Boulder County
REACH ID: BCM-Reach4G Jeremy Deischer DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		804	C.Y.	$29.00	$23,316.00	Cut & Haul
Excavation, Low Range		368	C.Y.	$13.00	$4,784.00	Cut & Fill Onsite
Soil Riprap, Type M		778	C.Y.	$85.00	$66,130.00	1050 ft. x 2 ft. x 5 ft.
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$94,230.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$250,000.00
Subtotal Capital Improvement Costs					**$344,230.00**
Additional Capital Improvement Costs					
Dewatering		$3,442.30	L.S.		$3,442.00
Mobilization		5%			$17,212.00
Traffic Control		$8,605.75	L.S.		$8,606.00
Utility Coordination/Relocation		$8,605.75	L.S.		$8,606.00
Stormwater Management/Erosion Control		5%			$17,212.00
Subtotal Additional Capital Improvement Costs					**$55,078.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$59,896.00
Legal/Administrative		5%			$19,965.00
Contract Admin/Construction Management		10%			$39,931.00
Contingency		25%			$99,827.00
Subtotal Other Costs					**$219,619.00**
Total Capital Improvement Costs					**$618,927.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	230	L.F.	$2.00	$92.00
Total Annual Operation and Maintenance Cost				**$214.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$7,490.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4H
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach4H

Jeremy Deischer | DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
180 ft. span bridge at Kenosha Road	<----User Defined Items	7200	S.F.	$250.00	$1,800,000.00	40 ft. Bridge width
Old bridge removal	<----User Defined Items	3600	S.F.	$50.00	$180,000.00	90 ft. x 40 ft.

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$1,980,000.00
Subtotal Capital Improvement Costs					**$1,980,000.00**
Additional Capital Improvement Costs					
Dewatering		$19,800.00	L.S.		$19,800.00
Mobilization		5%			$99,000.00
Traffic Control		$49,500.00	L.S.		$49,500.00
Utility Coordination/Relocation		$49,500.00	L.S.		$49,500.00
Stormwater Management/Erosion Control		5%			$99,000.00
Subtotal Additional Capital Improvement Costs					**$316,800.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$344,520.00
Legal/Administrative		5%			$114,840.00
Contract Admin/Construction Management		10%			$229,680.00
Contingency		25%			$574,200.00
Subtotal Other Costs					**$1,263,240.00**
Total Capital Improvement Costs					**$3,560,040.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	40	L.F.	$2.00	$16.00
Total Annual Operation and Maintenance Cost				**$16.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$560.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4I
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach4I

Jeremy Deischer | DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Grade Control for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$205,000.00	$205,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$205,000.00
Subtotal Capital Improvement Costs					**$205,000.00**
Additional Capital Improvement Costs					
Dewatering		$2,050.00	L.S.		$2,050.00
Mobilization		5%			$10,250.00
Traffic Control		$5,125.00	L.S.		$5,125.00
Utility Coordination/Relocation		$5,125.00	L.S.		$5,125.00
Stormwater Management/Erosion Control		5%			$10,250.00
Subtotal Additional Capital Improvement Costs					**$32,800.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$35,670.00
Legal/Administrative		5%			$11,890.00
Contract Admin/Construction Management		10%			$23,780.00
Contingency		25%			$59,450.00
Subtotal Other Costs					**$130,790.00**
Total Capital Improvement Costs					**$368,590.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost				**$122.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4J
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach4J — Jeremy Deischer — DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
180 ft. span bridge at 109th St.	<----User Defined Items	5400	S.F.	$250.00	$1,350,000.00	30 ft. bridge width
Old bridge removal	<----User Defined Items	2400	S.F.	$50.00	$120,000.00	80 ft. x 30 ft.
Stream Restoration	<----User Defined Items	1	Mile	$575,000.00	$350,750.00	Average of New and Existing Stream Restoration
Riparian Restoration	<----User Defined Items	18	ACRE	$35,000.00	$623,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$2,443,750.00
Subtotal Capital Improvement Costs					**$2,443,750.00**
Additional Capital Improvement Costs					
Dewatering		$24,437.50	L.S.		$24,438.00
Mobilization		5%			$122,188.00
Traffic Control		$61,093.75	L.S.		$61,094.00
Utility Coordination/Relocation		$61,093.75	L.S.		$61,094.00
Stormwater Management/Erosion Control		5%			$122,188.00
Subtotal Additional Capital Improvement Costs					**$391,002.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$425,213.00
Legal/Administrative		5%			$141,738.00
Contract Admin/Construction Management		10%			$283,475.00
Contingency		25%			$708,688.00
Subtotal Other Costs					**$1,559,114.00**
Total Capital Improvement Costs					**$4,393,866.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	30	L.F.	$2.00	$12.00
Total Annual Operation and Maintenance Cost				**$12.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$420.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 4
DRAINAGEWAY :	Boulder Creek
REACH :	4K
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach4K — Jeremy Deischer — DATE : 04-22-2015

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Stream Restoration	<----User Defined Items	4600	L.F.	$133.00	$611,800.00	
ERC Riparian Restoration	<----User Defined Items	42	AC	$35,000.00	$1,478,421.00	200 ft on each side of stream

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$2,090,221.00
Subtotal Capital Improvement Costs					**$2,090,221.00**
Additional Capital Improvement Costs					
Dewatering		$20,902.21	L.S.		$20,902.00
Mobilization		5%			$104,511.00
Traffic Control		$52,255.53	L.S.		$52,256.00
Utility Coordination/Relocation		$52,255.53	L.S.		$52,256.00
Stormwater Management/Erosion Control		5%			$104,511.00
Subtotal Additional Capital Improvement Costs					**$334,436.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$363,699.00
Legal/Administrative		5%			$121,233.00
Contract Admin/Construction Management		10%			$242,466.00
Contingency		25%			$606,164.00
Subtotal Other Costs					**$1,333,562.00**
Total Capital Improvement Costs					**$3,758,219.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	4600	L.F.	$2.00	$1,840.00
Total Annual Operation and Maintenance Cost				**$1,840.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$64,399.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 5
DRAINAGEWAY : Boulder Creek
REACH : 5A
JURISDICTION : Boulder County
REACH ID: BCM-Reach5A Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Estimated New Stream	<----User Defined Items	1	L.S.	$600,000.00	$600,000.00	
ERC Estimated Riparian Restoration	<----User Defined Items	1	L.S.	$1,450,000.00	$1,450,000.00	

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$2,050,000.00
Subtotal Capital Improvement Costs					**$2,050,000.00**
Additional Capital Improvement Costs					
Dewatering		$20,500.00	L.S.		$20,500.00
Mobilization		5%			$102,500.00
Traffic Control		$51,250.00	L.S.		$51,250.00
Utility Coordination/Relocation		$51,250.00	L.S.		$51,250.00
Stormwater Management/Erosion Control		5%			$102,500.00
Subtotal Additional Capital Improvement Costs					**$328,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$356,700.00
Legal/Administrative		5%			$118,900.00
Contract Admin/Construction Management		10%			$237,800.00
Contingency		25%			$594,500.00
Subtotal Other Costs					**$1,307,900.00**
Total Capital Improvement Costs					**$3,685,900.00**

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)		4500	L.F.	$2.00	$1,800.00
Total Annual Operation and Maintenance Cost					**$1,800.00**
Effective Interest Rate					1.50%
Total Operation and Maintenance Costs Over 50 Years					**$62,999.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 5
DRAINAGEWAY : Boulder Creek
REACH : 5B
JURISDICTION : Boulder County
REACH ID: BCM-Reach5B Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$250,000.00
Subtotal Capital Improvement Costs					**$250,000.00**
Additional Capital Improvement Costs					
Dewatering		$2,500.00	L.S.		$2,500.00
Mobilization		5%			$12,500.00
Traffic Control		$6,250.00	L.S.		$6,250.00
Utility Coordination/Relocation		$6,250.00	L.S.		$6,250.00
Stormwater Management/Erosion Control		5%			$12,500.00
Subtotal Additional Capital Improvement Costs					**$40,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$43,500.00
Legal/Administrative		5%			$14,500.00
Contract Admin/Construction Management		10%			$29,000.00
Contingency		25%			$72,500.00
Subtotal Other Costs					**$159,500.00**
Total Capital Improvement Costs					**$449,500.00**

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)		1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost					**$122.00**
Effective Interest Rate					1.50%
Total Operation and Maintenance Costs Over 50 Years					**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 5
DRAINAGEWAY : Boulder Creek
REACH : 5C
JURISDICTION : Boulder County
REACH ID: BCM-Reach5C Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverbank spillway	<----User Defined Items	5	L.S.	$225,000.00	$1,125,000.00	
Lateral spillway	<----User Defined Items	0	L.S.	$225,000.00	$0.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$1,125,000.00
Subtotal Capital Improvement Costs				**$1,125,000.00**
Additional Capital Improvement Costs				
Dewatering	$11,250.00	L.S.		$11,250.00
Mobilization	5%			$56,250.00
Traffic Control	$28,125.00	L.S.		$28,125.00
Utility Coordination/Relocation	$28,125.00	L.S.		$28,125.00
Stormwater Management/Erosion Control	5%			$56,250.00
Subtotal Additional Capital Improvement Costs				**$180,000.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$195,750.00
Legal/Administrative	5%			$65,250.00
Contract Admin/Construction Management	10%			$130,500.00
Contingency	25%			$326,250.00
Subtotal Other Costs				**$717,750.00**
Total Capital Improvement Costs				**$2,022,750.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	5	EA	$608.00	$608.00
Total Annual Operation and Maintenance Cost				**$608.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$21,280.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 5
DRAINAGEWAY : Boulder Creek
REACH : 5D
JURISDICTION : Boulder County
REACH ID: BCM-Reach5D Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Grade Control for Acquatic & Habitat Passage	<----User Defined Items	1	L.S.	$205,000.00	$205,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$205,000.00
Subtotal Capital Improvement Costs				**$205,000.00**
Additional Capital Improvement Costs				
Dewatering	$2,050.00	L.S.		$2,050.00
Mobilization	5%			$10,250.00
Traffic Control	$5,125.00	L.S.		$5,125.00
Utility Coordination/Relocation	$5,125.00	L.S.		$5,125.00
Stormwater Management/Erosion Control	5%			$10,250.00
Subtotal Additional Capital Improvement Costs				**$32,800.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$35,670.00
Legal/Administrative	5%			$11,890.00
Contract Admin/Construction Management	10%			$23,780.00
Contingency	25%			$59,450.00
Subtotal Other Costs				**$130,790.00**
Total Capital Improvement Costs				**$368,590.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost				**$122.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 5
DRAINAGEWAY :	Boulder Creek
REACH :	5E
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach5E

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Grade Control for Acquatic & Habitat Passage	<----User Defined Items	1	L.S.	$205,000.00	$205,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$205,000.00	
Subtotal Capital Improvement Costs					**$205,000.00**	
Additional Capital Improvement Costs						
Dewatering		$2,050.00	L.S.		$2,050.00	
Mobilization		5%			$10,250.00	
Traffic Control		$5,125.00	L.S.		$5,125.00	
Utility Coordination/Relocation		$5,125.00	L.S.		$5,125.00	
Stormwater Management/Erosion Control		5%			$10,250.00	
Subtotal Additional Capital Improvement Costs					**$32,800.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$35,670.00	
Legal/Administrative		5%			$11,890.00	
Contract Admin/Construction Management		10%			$23,780.00	
Contingency		25%			$59,450.00	
Subtotal Other Costs					**$130,790.00**	
Total Capital Improvement Costs					**$368,590.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 5
DRAINAGEWAY :	Boulder Creek
REACH :	5F
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach5F

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC New Stream Restoration	<----User Defined Items	2000	L.F.	$133.00	$266,000.00	
ERC Riparian Restoration	<----User Defined Items	18	Acre	$35,000.00	$642,792.00	200 ft on each side of stream

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$908,792.00	
Subtotal Capital Improvement Costs					**$908,792.00**	
Additional Capital Improvement Costs						
Dewatering		$9,087.92	L.S.		$9,088.00	
Mobilization		5%			$45,440.00	
Traffic Control		$22,719.80	L.S.		$22,720.00	
Utility Coordination/Relocation		$22,719.80	L.S.		$22,720.00	
Stormwater Management/Erosion Control		5%			$45,440.00	
Subtotal Additional Capital Improvement Costs					**$145,408.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$158,130.00	
Legal/Administrative		5%			$52,710.00	
Contract Admin/Construction Management		10%			$105,420.00	
Contingency		25%			$263,550.00	
Subtotal Other Costs					**$579,810.00**	
Total Capital Improvement Costs					**$1,634,010.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2000	L.F.	$2.00	$800.00	
Total Annual Operation and Maintenance Cost				**$800.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$28,000.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 5
DRAINAGEWAY :	Boulder Creek
REACH :	5G
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach5G
	Jeremy Deischer
DATE :	2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Old bridge removal	<----User Defined Items	4800	S.F.	$50.00	$240,000.00	120 ft. x 40 ft.
180 ft. span bridge	<----User Defined Items	7200	S.F.	$250.00	$1,800,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$2,040,000.00
Subtotal Capital Improvement Costs				**$2,040,000.00**
Additional Capital Improvement Costs				
Dewatering	$20,400.00	L.S.		$20,400.00
Mobilization	5%			$102,000.00
Traffic Control	$51,000.00	L.S.		$51,000.00
Utility Coordination/Relocation	$51,000.00	L.S.		$51,000.00
Stormwater Management/Erosion Control	5%			$102,000.00
Subtotal Additional Capital Improvement Costs				**$326,400.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$354,960.00
Legal/Administrative	5%			$118,320.00
Contract Admin/Construction Management	10%			$236,640.00
Contingency	25%			$591,600.00
Subtotal Other Costs				**$1,301,520.00**
Total Capital Improvement Costs				**$3,667,920.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	40	L.F.	$2.00	$16.00
Total Annual Operation and Maintenance Cost				**$16.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$560.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 5
DRAINAGEWAY :	Boulder Creek
REACH :	5G-100yr
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach5G-100yr
	Jeremy Deischer
DATE :	2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		14304	C.Y.	$29.00	$414,816.00	Fill Required for roadway reconstruction
Special Items (User Defined)						
Removal of old 120 ft. bridge	<----User Defined Items	4800	S.F.	$50.00	$240,000.00	40 ft. width
220' span bridge	<----User Defined Items	8800	S.F.	$250.00	$2,200,000.00	40 ft. width
Asphalt Remove and Replace	<----User Defined Items	6711	S.Y.	$60.00	$402,667.00	1510 ft. of roadway reconstruction

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$414,816.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$2,842,667.00
Subtotal Capital Improvement Costs				**$3,257,483.00**
Additional Capital Improvement Costs				
Dewatering	$32,574.83	L.S.		$32,575.00
Mobilization	5%			$162,874.00
Traffic Control	$81,437.08	L.S.		$81,437.00
Utility Coordination/Relocation	$81,437.08	L.S.		$81,437.00
Stormwater Management/Erosion Control	5%			$162,874.00
Subtotal Additional Capital Improvement Costs				**$521,197.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$566,802.00
Legal/Administrative	5%			$188,934.00
Contract Admin/Construction Management	10%			$377,868.00
Contingency	25%			$944,670.00
Subtotal Other Costs				**$2,078,274.00**
Total Capital Improvement Costs				**$5,856,954.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	40	L.F.	$2.00	$16.00
Total Annual Operation and Maintenance Cost				**$16.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$560.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 5
DRAINAGEWAY :	Boulder Creek
REACH :	5H
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach5H

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Stream Restoration	<----User Defined Items	4500	L.F.	$133.00	$598,500.00	
ERC Riparian Restoration	<----User Defined Items	41	AC	$35,000.00	$1,446,281.00	200 ft. on each side of stream

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$2,044,781.00
Subtotal Capital Improvement Costs					**$2,044,781.00**
Additional Capital Improvement Costs					
Dewatering		$20,447.81	L.S.		$20,448.00
Mobilization		5%			$102,239.00
Traffic Control		$51,119.53	L.S.		$51,120.00
Utility Coordination/Relocation		$51,119.53	L.S.		$51,120.00
Stormwater Management/Erosion Control		5%			$102,239.00
Subtotal Additional Capital Improvement Costs					**$327,166.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$355,792.00
Legal/Administrative		5%			$118,597.00
Contract Admin/Construction Management		10%			$237,195.00
Contingency		25%			$592,987.00
Subtotal Other Costs					**$1,304,571.00**
Total Capital Improvement Costs					**$3,676,518.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	4500	L.F.	$2.00	$1,800.00
Total Annual Operation and Maintenance Cost				**$1,800.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$62,999.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 6
DRAINAGEWAY :	Boulder Creek
REACH :	6A
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach6A

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$250,000.00
Subtotal Capital Improvement Costs					**$250,000.00**
Additional Capital Improvement Costs					
Dewatering		$2,500.00	L.S.		$2,500.00
Mobilization		5%			$12,500.00
Traffic Control		$6,250.00	L.S.		$6,250.00
Utility Coordination/Relocation		$6,250.00	L.S.		$6,250.00
Stormwater Management/Erosion Control		5%			$12,500.00
Subtotal Additional Capital Improvement Costs					**$40,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$43,500.00
Legal/Administrative		5%			$14,500.00
Contract Admin/Construction Management		10%			$29,000.00
Contingency		25%			$72,500.00
Subtotal Other Costs					**$159,500.00**
Total Capital Improvement Costs					**$449,500.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost				**$122.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 6
DRAINAGEWAY :	Boulder Creek
REACH :	6B
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach6B — Jeremy Deischer — DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
180 ft. span bridge at 75th St.	<-----User Defined Items	7200	S.F.	$250.00	$1,800,000.00	40 ft width at 75th St.
Old bridge removal	<-----User Defined Items	4400	S.F.	$50.00	$220,000.00	110 x 40 ft

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$2,020,000.00
Subtotal Capital Improvement Costs				**$2,020,000.00**
Additional Capital Improvement Costs				
Dewatering	$20,200.00	L.S.		$20,200.00
Mobilization	5%			$101,000.00
Traffic Control	$50,500.00	L.S.		$50,500.00
Utility Coordination/Relocation	$50,500.00	L.S.		$50,500.00
Stormwater Management/Erosion Control	5%			$101,000.00
Subtotal Additional Capital Improvement Costs				**$323,200.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$351,480.00
Legal/Administrative	5%			$117,160.00
Contract Admin/Construction Management	10%			$234,320.00
Contingency	25%			$585,800.00
Subtotal Other Costs				**$1,288,760.00**
Total Capital Improvement Costs				**$3,631,960.00**

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	40	L.F.	$2.00	$16.00	
Total Annual Operation and Maintenance Cost				**$16.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$560.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 6
DRAINAGEWAY :	Boulder Creek
REACH :	6B-100yr
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach6B-100yr — Jeremy Deischer — DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		7242	C.Y.	$29.00	$210,018.00	Fill required for roadway improvement
Special Items (User Defined)						
180 ft span bridge at 75th St.	<-----User Defined Items	7200	S.F.	$250.00	$1,800,000.00	40 ft. width at 75th
Remove and Replace Asphalt	<-----User Defined Items	7333	S.Y.	$60.00	$440,000.00	1650 feet of roadway reconstruction (South Side)
Old bridge removal	<-----User Defined Items	4400	S.F.	$50.00	$220,000.00	110 ft x 40 ft

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$210,018.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$2,460,000.00
Subtotal Capital Improvement Costs				**$2,670,018.00**
Additional Capital Improvement Costs				
Dewatering	$26,700.18	L.S.		$26,700.00
Mobilization	5%			$133,501.00
Traffic Control	$66,750.45	L.S.		$66,750.00
Utility Coordination/Relocation	$66,750.45	L.S.		$66,750.00
Stormwater Management/Erosion Control	5%			$133,501.00
Subtotal Additional Capital Improvement Costs				**$427,202.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$464,583.00
Legal/Administrative	5%			$154,861.00
Contract Admin/Construction Management	10%			$309,722.00
Contingency	25%			$774,305.00
Subtotal Other Costs				**$1,703,471.00**
Total Capital Improvement Costs				**$4,800,691.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	40	L.F.	$2.00	$16.00
Total Annual Operation and Maintenance Cost				**$16.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$560.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 6
DRAINAGEWAY :	Boulder Creek
REACH :	6C
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach6C
Jeremy Deischer	DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverside spillway	<----User Defined Items	4	L.S.	$225,000.00	$900,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$900,000.00	
Subtotal Capital Improvement Costs					**$900,000.00**	
Additional Capital Improvement Costs						
Dewatering		$9,000.00	L.S.		$9,000.00	
Mobilization		5%			$45,000.00	
Traffic Control		$22,500.00	L.S.		$22,500.00	
Utility Coordination/Relocation		$22,500.00	L.S.		$22,500.00	
Stormwater Management/Erosion Control		5%			$45,000.00	
Subtotal Additional Capital Improvement Costs					**$144,000.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$156,600.00	
Legal/Administrative		5%			$52,200.00	
Contract Admin/Construction Management		10%			$104,400.00	
Contingency		25%			$261,000.00	
Subtotal Other Costs					**$574,200.00**	
Total Capital Improvement Costs					**$1,618,200.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	4	EA	$608.00	$486.00
Total Annual Operation and Maintenance Cost				**$486.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$17,010.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 7
DRAINAGEWAY :	Boulder Creek
REACH :	7A
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach7A
Jeremy Deischer	DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverside Spillway	<----User Defined Items	4	LS	$225,000.00	$900,000.00	
Lateral Spillway	<----User Defined Items	3	LS	$225,000.00	$675,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$1,575,000.00	
Subtotal Capital Improvement Costs					**$1,575,000.00**	
Additional Capital Improvement Costs						
Dewatering		$15,750.00	L.S.		$15,750.00	
Mobilization		5%			$78,750.00	
Traffic Control		$39,375.00	L.S.		$39,375.00	
Utility Coordination/Relocation		$39,375.00	L.S.		$39,375.00	
Stormwater Management/Erosion Control		5%			$78,750.00	
Subtotal Additional Capital Improvement Costs					**$252,000.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$274,050.00	
Legal/Administrative		5%			$91,350.00	
Contract Admin/Construction Management		10%			$182,700.00	
Contingency		25%			$456,750.00	
Subtotal Other Costs					**$1,004,850.00**	
Total Capital Improvement Costs					**$2,831,850.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	7	EA	$608.00	$851.00
Total Annual Operation and Maintenance Cost				**$851.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$29,785.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 7
DRAINAGEWAY :	Boulder Creek
REACH :	7B
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach7B

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Riverside Spillway	<----User Defined Items	5	LS	$225,000.00	$1,125,000.00	
Lateral Spillway	<----User Defined Items	2	LS	$225,000.00	$450,000.00	

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$1,575,000.00
Subtotal Capital Improvement Costs					**$1,575,000.00**
Additional Capital Improvement Costs					
Dewatering		$15,750.00	L.S.		$15,750.00
Mobilization		5%			$78,750.00
Traffic Control		$39,375.00	L.S.		$39,375.00
Utility Coordination/Relocation		$39,375.00	L.S.		$39,375.00
Stormwater Management/Erosion Control		5%			$78,750.00
Subtotal Additional Capital Improvement Costs					**$252,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$274,050.00
Legal/Administrative		5%			$91,350.00
Contract Admin/Construction Management		10%			$182,700.00
Contingency		25%			$456,750.00
Subtotal Other Costs					**$1,004,850.00**
Total Capital Improvement Costs					**$2,831,850.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	7	EA	$608.00	$851.00
Total Annual Operation and Maintenance Cost				**$851.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$29,785.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 7
DRAINAGEWAY :	Boulder Creek
REACH :	7C
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach7C

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$250,000.00
Subtotal Capital Improvement Costs				**$250,000.00**
Additional Capital Improvement Costs				
Dewatering	$2,500.00	L.S.		$2,500.00
Mobilization	5%			$12,500.00
Traffic Control	$6,250.00	L.S.		$6,250.00
Utility Coordination/Relocation	$6,250.00	L.S.		$6,250.00
Stormwater Management/Erosion Control	5%			$12,500.00
Subtotal Additional Capital Improvement Costs				**$40,000.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$43,500.00
Legal/Administrative	5%			$14,500.00
Contract Admin/Construction Management	10%			$29,000.00
Contingency	25%			$72,500.00
Subtotal Other Costs				**$159,500.00**
Total Capital Improvement Costs				**$449,500.00**

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost				**$122.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 7
DRAINAGEWAY :	Boulder Creek
REACH :	7D
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach7D

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$250,000.00	
Subtotal Capital Improvement Costs					**$250,000.00**	
Additional Capital Improvement Costs						
Dewatering		$2,500.00	L.S.		$2,500.00	
Mobilization		5%			$12,500.00	
Traffic Control		$6,250.00	L.S.		$6,250.00	
Utility Coordination/Relocation		$6,250.00	L.S.		$6,250.00	
Stormwater Management/Erosion Control		5%			$12,500.00	
Subtotal Additional Capital Improvement Costs					**$40,000.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$43,500.00	
Legal/Administrative		5%			$14,500.00	
Contract Admin/Construction Management		10%			$29,000.00	
Contingency		25%			$72,500.00	
Subtotal Other Costs					**$159,500.00**	
Total Capital Improvement Costs					**$449,500.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 7
DRAINAGEWAY :	Boulder Creek
REACH :	7E
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach7E

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
180 ft. span bridge at 61st St.	<----User Defined Items	5400	S.F.	$250.00	$1,350,000.00	30 ft width bridge at 61st St.
Old bridge removal	<----User Defined Items	2700	S.F.	$50.00	$135,000.00	90 ft x 30 ft

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$1,485,000.00	
Subtotal Capital Improvement Costs					**$1,485,000.00**	
Additional Capital Improvement Costs						
Dewatering		$14,850.00	L.S.		$14,850.00	
Mobilization		5%			$74,250.00	
Traffic Control		$37,125.00	L.S.		$37,125.00	
Utility Coordination/Relocation		$37,125.00	L.S.		$37,125.00	
Stormwater Management/Erosion Control		5%			$74,250.00	
Subtotal Additional Capital Improvement Costs					**$237,600.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$258,390.00	
Legal/Administrative		5%			$86,130.00	
Contract Admin/Construction Management		10%			$172,260.00	
Contingency		25%			$430,650.00	
Subtotal Other Costs					**$947,430.00**	
Total Capital Improvement Costs					**$2,670,030.00**	

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	30	L.F.	$2.00	$12.00	
Total Annual Operation and Maintenance Cost				**$12.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$420.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 7
DRAINAGEWAY :	Boulder Creek
REACH :	7E-100yr
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach7E-100yr

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		9180	C.Y.	$29.00	$266,220.00	Fill required for roadway reconstruction
Special Items (User Defined)						
220 ft. span bridge	<----User Defined Items	6600	S.F.	$250.00	$1,650,000.00	30 ft width bridge at 61st St.
Remove and replace asphalt	<----User Defined Items	6667	S.Y.	$60.00	$400,000.00	2000 ft of roadway reconstruction (N and S Side)
Old bridge removal	<----User Defined Items	2700	S.F.	$50.00	$135,000.00	90 ft x 30 ft

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$266,220.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$2,185,000.00
Subtotal Capital Improvement Costs					**$2,451,220.00**
Additional Capital Improvement Costs					
Dewatering		$24,512.20	L.S.		$24,512.00
Mobilization		5%			$122,561.00
Traffic Control		$61,280.50	L.S.		$61,281.00
Utility Coordination/Relocation		$61,280.50	L.S.		$61,281.00
Stormwater Management/Erosion Control		5%			$122,561.00
Subtotal Additional Capital Improvement Costs					**$392,196.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$426,512.00
Legal/Administrative		5%			$142,171.00
Contract Admin/Construction Management		10%			$284,342.00
Contingency		25%			$710,854.00
Subtotal Other Costs					**$1,563,879.00**
Total Capital Improvement Costs					**$4,407,295.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	30	L.F.	$2.00	$12.00
Total Annual Operation and Maintenance Cost				**$12.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$420.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 7
DRAINAGEWAY :	Boulder Creek
REACH :	7F
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach7F

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Remove pedestrian bridge	<----User Defined Items	2250	S.F.	$50.00	$112,500.00	Existing 75ft x 30 ft
180 ft span pedestrain bridge	<----User Defined Items	2700	S.F.	$300.00	$810,000.00	180 ft x 15 ft

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$922,500.00
Subtotal Capital Improvement Costs					**$922,500.00**
Additional Capital Improvement Costs					
Dewatering		$9,225.00	L.S.		$9,225.00
Mobilization		5%			$46,125.00
Traffic Control		$13,837.50	L.S.		$13,838.00
Utility Coordination/Relocation		$80,000.00	L.S.		$80,000.00
Stormwater Management/Erosion Control		5%			$46,125.00
Subtotal Additional Capital Improvement Costs					**$195,313.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$167,672.00
Legal/Administrative		5%			$55,891.00
Contract Admin/Construction Management		10%			$111,781.00
Contingency		25%			$279,453.00
Subtotal Other Costs					**$614,797.00**
Total Capital Improvement Costs					**$1,732,610.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	15	L.F.	$2.00	$6.00
Total Annual Operation and Maintenance Cost				**$6.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$210.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 7
DRAINAGEWAY : Boulder Creek
REACH : 7G
JURISDICTION : Boulder County
REACH ID: BCM-Reach7G Jeremy Deischer DATE : 2015-04-22

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	Length (ft)	No. of Barrels					
54-inch	600	1	600	L.F.	$263.00	$157,800.00	
Headwalls							
Diameter (in)	Applicable	No. of Barrels					
54-inch	Yes	1	2	EA	$1,756.60	$3,513.00	
Wingwalls (includes concrete apron)							
Diameter (in)		No. of Barrels					
54-inch		1	2	EA	$10,706.24	$21,412.00	
Special Items (User Defined)							
Remove existing diversion structure	<----User Defined Items		1	L.S.	$20,000.00	$20,000.00	

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$182,725.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$20,000.00
Subtotal Capital Improvement Costs					**$202,725.00**
Additional Capital Improvement Costs					
Dewatering			$2,027.25	L.S.	$2,027.00
Mobilization			5%		$10,136.00
Traffic Control			$5,068.13	L.S.	$5,068.00
Utility Coordination/Relocation			$5,068.13	L.S.	$5,068.00
Stormwater Management/Erosion Control			5%		$10,136.00
Subtotal Additional Capital Improvement Costs					**$32,435.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering			15%		$35,274.00
Legal/Administrative			5%		$11,758.00
Contract Admin/Construction Management			10%		$23,516.00
Contingency			25%		$58,790.00
Subtotal Other Costs					**$129,338.00**
Total Capital Improvement Costs					**$364,498.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs,	600	L.F.	$1.00	$120.00
Total Annual Operation and Maintenance Cost				**$120.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$4,200.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 7
DRAINAGEWAY : Boulder Creek
REACH : 7H
JURISDICTION : Boulder County
REACH ID: BCM-Reach7H Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Soil Riprap, Type M		356	C.Y.	$85.00	$30,222.00	Protection for Sanitary near Boulder Creek (400 LF)
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)		0	ACRE	$1,217.00	$304.00	
Special Items (User Defined)						
Grade Control Structure to Protect Sanitary	<----User Defined Items	2	L.S.	$205,000.00	$410,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$30,222.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$304.00
Special Items (User Defined)				$410,000.00
Subtotal Capital Improvement Costs				**$440,526.00**
Additional Capital Improvement Costs				
Dewatering	$4,405.26	L.S.		$4,405.00
Mobilization	5%			$22,026.00
Traffic Control	$11,013.15	L.S.		$11,013.00
Utility Coordination/Relocation	$11,013.15	L.S.		$11,013.00
Stormwater Management/Erosion Control	5%			$22,026.00
Subtotal Additional Capital Improvement Costs				**$70,483.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$76,651.00
Legal/Administrative	5%			$25,550.00
Contract Admin/Construction Management	10%			$51,101.00
Contingency	25%			$127,752.00
Subtotal Other Costs				**$281,054.00**
Total Capital Improvement Costs				**$792,063.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	2	EA	$608.00	$243.00
Total Annual Operation and Maintenance Cost				**$243.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$8,505.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 7
DRAINAGEWAY : Boulder Creek
REACH : 7I
JURISDICTION : Boulder County
REACH ID: BCM-Reach7I Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Stream Restoration	<----User Defined Items	6250	L.F.	$133.00	$831,250.00	
ERC Riparian Restoration	<----User Defined Items	14	AC	$35,000.00	$502,181.00	50 ft on each side of stream

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$1,333,431.00
Subtotal Capital Improvement Costs					**$1,333,431.00**
Additional Capital Improvement Costs					
Dewatering		$13,334.31	L.S.		$13,334.00
Mobilization		5%			$66,672.00
Traffic Control		$33,335.78	L.S.		$33,336.00
Utility Coordination/Relocation		$33,335.78	L.S.		$33,336.00
Stormwater Management/Erosion Control		5%			$66,672.00
Subtotal Additional Capital Improvement Costs					**$213,350.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$232,017.00
Legal/Administrative		5%			$77,339.00
Contract Admin/Construction Management		10%			$154,678.00
Contingency		25%			$386,695.00
Subtotal Other Costs					**$850,729.00**
Total Capital Improvement Costs					**$2,397,510.00**

Master Plan Operation and Maintenance Cost Summary					
Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	6250	L.F.	$2.00	$2,500.00	
Total Annual Operation and Maintenance Cost				**$2,500.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$87,499.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 8
DRAINAGEWAY : Boulder Creek
REACH : 8A
JURISDICTION : Boulder County
REACH ID: BCM-Reach8A Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Estimate New Stream	<----User Defined Items	1	L.S.	$230,000.00	$230,000.00	
ERC Estimate Riparian Restoration	<----User Defined Items	1	L.S.	$140,000.00	$140,000.00	

Master Plan Capital Improvement Cost Summary					
Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$370,000.00
Subtotal Capital Improvement Costs					**$370,000.00**
Additional Capital Improvement Costs					
Dewatering		$3,700.00	L.S.		$3,700.00
Mobilization		5%			$18,500.00
Traffic Control		$9,250.00	L.S.		$9,250.00
Utility Coordination/Relocation		$9,250.00	L.S.		$9,250.00
Stormwater Management/Erosion Control		5%			$18,500.00
Subtotal Additional Capital Improvement Costs					**$59,200.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$64,380.00
Legal/Administrative		5%			$21,460.00
Contract Admin/Construction Management		10%			$42,920.00
Contingency		25%			$107,300.00
Subtotal Other Costs					**$236,060.00**
Total Capital Improvement Costs					**$665,260.00**

Master Plan Operation and Maintenance Cost Summary					
Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	1700	L.F.	$2.00	$680.00	
Total Annual Operation and Maintenance Cost				**$680.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$23,800.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 8
DRAINAGEWAY :	Boulder Creek
REACH :	8B
JURISDICTION :	Boulder County
REACH ID:	BCM-Reach8B

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Estimate New Stream	<-----User Defined Items	1	L.S.	$640,000.00	$640,000.00	
ERC Estimate Riparian Restoration	<-----User Defined Items	1	L.S.	$390,000.00	$390,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$1,030,000.00
Subtotal Capital Improvement Costs					**$1,030,000.00**
Additional Capital Improvement Costs					
Dewatering		$10,300.00	L.S.		$10,300.00
Mobilization		5%			$51,500.00
Traffic Control		$25,750.00	L.S.		$25,750.00
Utility Coordination/Relocation		$25,750.00	L.S.		$25,750.00
Stormwater Management/Erosion Control		5%			$51,500.00
Subtotal Additional Capital Improvement Costs					**$164,800.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$179,220.00
Legal/Administrative		5%			$59,740.00
Contract Admin/Construction Management		10%			$119,480.00
Contingency		25%			$298,700.00
Subtotal Other Costs					**$657,140.00**
Total Capital Improvement Costs					**$1,851,940.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	4800	L.F.	$2.00	$1,920.00
Total Annual Operation and Maintenance Cost				**$1,920.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$67,199.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 8
DRAINAGEWAY :	Boulder Creek
REACH :	8C
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach8C

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
220 ft railroad replacement	<-----User Defined Items	4000	S.F.	$450.00	$1,800,000.00	20 ft width
Temp Bridge	<-----User Defined Items	1500	S.F.	$350.00	$525,000.00	75 ft x 50 ft

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$2,325,000.00
Subtotal Capital Improvement Costs					**$2,325,000.00**
Additional Capital Improvement Costs					
Dewatering		$23,250.00	L.S.		$23,250.00
Mobilization		5%			$116,250.00
Traffic Control		$58,125.00	L.S.		$58,125.00
Utility Coordination/Relocation		$58,125.00	L.S.		$58,125.00
Stormwater Management/Erosion Control		5%			$116,250.00
Subtotal Additional Capital Improvement Costs					**$372,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$404,550.00
Legal/Administrative		5%			$134,850.00
Contract Admin/Construction Management		10%			$269,700.00
Contingency		25%			$674,250.00
Subtotal Other Costs					**$1,483,350.00**
Total Capital Improvement Costs					**$4,180,350.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	20	L.F.	$2.00	$8.00
Total Annual Operation and Maintenance Cost				**$8.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$280.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 8
DRAINAGEWAY :	Boulder Creek
REACH :	8D
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach8D

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Estimate New Stream	<----User Defined Items	1	L.S.	$340,000.00	$340,000.00	
ERC Estimate Stream Restoration	<----User Defined Items	1	L.S.	$210,000.00	$210,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs					
Pipe Culverts and Storm Drains					$0.00
Concrete Box Culverts					$0.00
Hydraulic Structures					$0.00
Channel Improvements					$0.00
Detention/Water Quality Facilities					$0.00
Removals					$0.00
Landscaping and Maintenance Improvements					$0.00
Special Items (User Defined)					$550,000.00
Subtotal Capital Improvement Costs					**$550,000.00**
Additional Capital Improvement Costs					
Dewatering		$5,500.00	L.S.		$5,500.00
Mobilization		5%			$27,500.00
Traffic Control		$13,750.00	L.S.		$13,750.00
Utility Coordination/Relocation		$13,750.00	L.S.		$13,750.00
Stormwater Management/Erosion Control		5%			$27,500.00
Subtotal Additional Capital Improvement Costs					**$88,000.00**
Land Acquisition Costs					
ROW/Easements					$0.00
Subtotal Land Acquisition Costs					**$0.00**
Other Costs (percentage of Capital Improvement Costs)					
Engineering		15%			$95,700.00
Legal/Administrative		5%			$31,900.00
Contract Admin/Construction Management		10%			$63,800.00
Contingency		25%			$159,500.00
Subtotal Other Costs					**$350,900.00**
Total Capital Improvement Costs					**$988,900.00**

Master Plan Operation and Maintenance Cost Summary

Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2600	L.F.	$2.00	$1,040.00
Total Annual Operation and Maintenance Cost				**$1,040.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$36,400.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 8
DRAINAGEWAY :	Boulder Creek
REACH :	8E
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach8E

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		133	C.Y.	$29.00	$3,867.00	30 ft x 40 ft x 3 ft
Special Items (User Defined)						
Roadway Surface (Concrete)	<----User Defined Items	43	C.Y.	$730.00	$31,543.00	25 ft x 70 ft x 8 in
Landscaping	<----User Defined Items	700	S.F.	$2.00	$1,400.00	2 of 70 ft x 5 ft
Trees	<----User Defined Items	2	EA	$500.00	$1,000.00	
Signage / Barriers	<----User Defined Items	2	EA	$1,500.00	$3,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$3,867.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$36,943.00
Subtotal Capital Improvement Costs				**$40,810.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$2,041.00
Traffic Control	$1,020.25	L.S.		$1,020.00
Utility Coordination/Relocation	$1,020.25	L.S.		$1,020.00
Stormwater Management/Erosion Control	5%			$2,041.00
Subtotal Additional Capital Improvement Costs				**$6,122.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$7,040.00
Legal/Administrative	5%			$2,347.00
Contract Admin/Construction Management	10%			$4,693.00
Contingency	25%			$11,733.00
Subtotal Other Costs				**$25,813.00**
Total Capital Improvement Costs				**$72,745.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 8
DRAINAGEWAY : Boulder Creek
REACH : 8F
JURISDICTION : Boulder County
REACH ID: BCM-Reach8F Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Master Plan Capital Improvement Cost Summary						
Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$0.00	
Subtotal Capital Improvement Costs					**$0.00**	
Additional Capital Improvement Costs						
Dewatering		$0.00	L.S.		$0.00	
Mobilization		5%			$0.00	
Traffic Control		$0.00	L.S.		$0.00	
Utility Coordination/Relocation		$0.00	L.S.		$0.00	
Stormwater Management/Erosion Control		5%			$0.00	
Subtotal Additional Capital Improvement Costs					**$0.00**	
Land Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$0.00	
Legal/Administrative		5%			$0.00	
Contract Admin/Construction Management		10%			$0.00	
Contingency		25%			$0.00	
Subtotal Other Costs					**$0.00**	
Total Capital Improvement Costs					**$0.00**	

Master Plan Operation and Maintenance Cost Summary					
Description		**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Sediment Removal (4 locations 1x annually)	<----User Defined Items	800	C.Y.	$30.00	$24,000.00
Total Annual Operation and Maintenance Cost					**$24,000.00**
Effective Interest Rate					1.50%
Total Operation and Maintenance Costs Over 50 Years					**$839,993.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 9
DRAINAGEWAY : Boulder Creek
REACH : 9A
JURISDICTION : City of Boulder
REACH ID: BCM-Reach9A Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		1303	C.Y.	$29.00	$37,773.00	Estimated cut
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)		1	ACRE	$1,219.00	$1,219.00	
Trail/Path, Concrete (10' Width)		325	L.F.	$54.00	$17,550.00	
Land Acquisition						
Easement/ROW Acquisition		0.30	ACRE	$550,000.00	$165,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$0.00	
Channel Improvements			$37,773.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$18,769.00	
Special Items (User Defined)			$0.00	
Subtotal Capital Improvement Costs			**$56,542.00**	
Additional Capital Improvement Costs				
Dewatering	$565.42	L.S.	$565.00	
Mobilization	5%		$2,827.00	
Traffic Control	$1,413.55	L.S.	$1,414.00	
Utility Coordination/Relocation	$1,413.55	L.S.	$1,414.00	
Stormwater Management/Erosion Control	5%		$2,827.00	
Subtotal Additional Capital Improvement Costs			**$9,047.00**	
Land Acquisition Costs				
ROW/Easements			$165,000.00	
Subtotal Land Acquisition Costs			**$165,000.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$9,838.00	
Legal/Administrative	5%		$3,279.00	
Contract Admin/Construction Management	10%		$6,559.00	
Contingency	25%		$16,397.00	
Subtotal Other Costs			**$36,073.00**	
Total Capital Improvement Costs			**$266,662.00**	

Master Plan Operation and Maintenance Cost Summary				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**
Trail Maintenance (e.g. structural repairs, crusher fines, etc.)	325	L.F.	$6.00	$390.00
Total Annual Operation and Maintenance Cost				**$390.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$13,650.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 9
DRAINAGEWAY :	Boulder Creek
REACH :	9B
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach9B

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Excavation, Mid Range		21201	C.Y.	$29.00	$614,829.00	Cut required
Landscaping and Maintenance Improvements						
Reclamation & seeding (native grasses)		7	ACRE	$1,217.00	$8,519.00	
Trail/Path, Concrete (10' W/dth)		250	L.F.	$54.00	$13,500.00	
Special Items (User Defined)						
Tennis Court Reconstruction	<----User Defined Items	7	EA	$65,000.00	$455,000.00	
Basketball Court Relocation	<----User Defined Items	1	EA	$30,000.00	$30,000.00	
Acquisition of Homes (3)	<----User Defined Items	5594	S.F.	$100.00	$559,400.00	
Removal of Homes (3)	<----User Defined Items	3	EA	$40,000.00	$120,000.00	
Asphalt Remove and Replace	<----User Defined Items	5640	S.Y.	$60.00	$338,400.00	
Land Acquisition						
Easement/ROW Acquisition		7.00	ACRE	$1,132,560.00	$7,927,920.00	$26 per S.F.

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$614,829.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$22,019.00
Special Items (User Defined)				$1,502,800.00
Subtotal Capital Improvement Costs				**$2,139,648.00**
Additional Capital Improvement Costs				
Dewatering	$21,396.48	L.S.		$21,396.00
Mobilization	5%			$106,982.00
Traffic Control	$53,491.20	L.S.		$53,491.00
Utility Coordination/Relocation	$53,491.20	L.S.		$53,491.00
Stormwater Management/Erosion Control	5%			$106,982.00
Subtotal Additional Capital Improvement Costs				**$342,342.00**
Land Acquisition Costs				
ROW/Easements				$7,927,920.00
Subtotal Land Acquisition Costs				**$7,927,920.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$372,299.00
Legal/Administrative	5%			$124,100.00
Contract Admin/Construction Management	10%			$248,199.00
Contingency	25%			$620,498.00
Subtotal Other Costs				**$1,365,096.00**
Total Capital Improvement Costs				**$11,775,006.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 9
DRAINAGEWAY :	Boulder Creek
REACH :	9C
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach9C

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Boulder Creek Pedestrian Bridges	<----User Defined Items	2	EA	$1,520,000.00	$3,040,000.00	

Master Plan Capital Improvement Cost Summary

Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$3,040,000.00
Subtotal Capital Improvement Costs				**$3,040,000.00**
Additional Capital Improvement Costs				
Dewatering	$30,400.00	L.S.		$30,400.00
Mobilization	5%			$152,000.00
Traffic Control	$45,600.00	L.S.		$45,600.00
Utility Coordination/Relocation	$76,000.00	L.S.		$76,000.00
Stormwater Management/Erosion Control	5%			$152,000.00
Subtotal Additional Capital Improvement Costs				**$456,000.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$524,400.00
Legal/Administrative	5%			$174,800.00
Contract Admin/Construction Management	10%			$349,600.00
Contingency	25%			$874,000.00
Subtotal Other Costs				**$1,922,800.00**
Total Capital Improvement Costs				**$5,418,800.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 9
DRAINAGEWAY :	Boulder Creek
REACH :	9D
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach9D

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Pipe Culverts and Storm Drains							
Circular Pipes							
Diameter (in)	Length (ft)	No. of Barrels					
48-inch	750	1	750	L.F.	$175.00	$131,250.00	
Flare End Sections							
Diameter (in)	Applicable	No. of Barrels					
48-inch	Yes	1	1	EA	$2,506.00	$2,506.00	
Channel Improvements							
Excavation, Low Range			2010	C.Y.	$13.00	$26,130.00	Earthwork
Special Items (User Defined)							
Asphalt Remove and Replace	<----User Defined Items		2060	S.Y.	$60.00	$123,600.00	14th Street
Manhole Box Base	<----User Defined Items		3	EA	$7,000.00	$21,000.00	
Concrete for Weir Diversion	<----User Defined Items		48	CY	$730.00	$35,186.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$133,756.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$26,130.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$179,786.00
Subtotal Capital Improvement Costs				**$339,672.00**
Additional Capital Improvement Costs				
Dewatering		$3,396.72	L.S.	$3,397.00
Mobilization		5%		$16,984.00
Traffic Control		$8,491.80	L.S.	$8,492.00
Utility Coordination/Relocation		$100,000.00	L.S.	$100,000.00
Stormwater Management/Erosion Control		5%		$16,984.00
Subtotal Additional Capital Improvement Costs				**$145,857.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering		15%		$72,829.00
Legal/Administrative		5%		$24,276.00
Contract Admin/Construction Management		10%		$48,553.00
Contingency		25%		$121,382.00
Subtotal Other Costs				**$267,040.00**
Total Capital Improvement Costs				**$752,569.00**

Master Plan Operation and Maintenance Cost Summary					
Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs, e	750	L.F.	$1.00	$150.00	
Manhole and Inlet Maintenance (e.g. sediment & debris removal, structural repairs, etc.)	3	EA	$61.00	$37.00	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$309.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$10,815.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 9
DRAINAGEWAY :	Boulder Creek
REACH :	9E
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach9E

Jeremy Deischer | DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	
Additional Improvements	<----User Defined Items	1	L.S.	$100,000.00	$100,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$350,000.00
Subtotal Capital Improvement Costs				**$350,000.00**
Additional Capital Improvement Costs				
Dewatering		$3,500.00	L.S.	$3,500.00
Mobilization		5%		$17,500.00
Traffic Control		$8,750.00	L.S.	$8,750.00
Utility Coordination/Relocation		$8,750.00	L.S.	$8,750.00
Stormwater Management/Erosion Control		5%		$17,500.00
Subtotal Additional Capital Improvement Costs				**$56,000.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering		15%		$60,900.00
Legal/Administrative		5%		$20,300.00
Contract Admin/Construction Management		10%		$40,600.00
Contingency		25%		$101,500.00
Subtotal Other Costs				**$223,300.00**
Total Capital Improvement Costs				**$629,300.00**

Master Plan Operation and Maintenance Cost Summary					
Description	Quantity	Unit	Unit Cost	Total Annual Cost	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 9
DRAINAGEWAY :	Boulder Creek
REACH :	9F
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach9F
Jeremy Deischer	DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Master Plan Capital Improvement Cost Summary						
Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$0.00	
Subtotal Capital Improvement Costs					**$0.00**	
Additional Capital Improvement Costs						
Dewatering		$0.00	L.S.		$0.00	
Mobilization		5%			$0.00	
Traffic Control		$0.00	L.S.		$0.00	
Utility Coordination/Relocation		$0.00	L.S.		$0.00	
Stormwater Management/Erosion Control		5%			$0.00	
Subtotal Additional Capital Improvement Costs					**$0.00**	
Land / Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$0.00	
Legal/Administrative		5%			$0.00	
Contract Admin/Construction Management		10%			$0.00	
Contingency		25%			$0.00	
Subtotal Other Costs					**$0.00**	
Total Capital Improvement Costs					**$0.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Sediment Removal (6 locations - 1x annually) <----User Defined Items	1200	C.Y.	$30.00	$36,000.00	
Total Annual Operation and Maintenance Cost				**$36,000.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$1,259,989.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT :	Boulder Creek MDP - Reach 10
DRAINAGEWAY :	Boulder Creek
REACH :	10A
JURISDICTION :	City of Boulder
REACH ID:	BCM-Reach10A
Jeremy Deischer	DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
Modify Ditch for Aquatic & Habitat Passage	<----User Defined Items	1	L.S.	$250,000.00	$250,000.00	
Master Plan Capital Improvement Cost Summary						
Capital Improvement Costs						
Pipe Culverts and Storm Drains					$0.00	
Concrete Box Culverts					$0.00	
Hydraulic Structures					$0.00	
Channel Improvements					$0.00	
Detention/Water Quality Facilities					$0.00	
Removals					$0.00	
Landscaping and Maintenance Improvements					$0.00	
Special Items (User Defined)					$250,000.00	
Subtotal Capital Improvement Costs					**$250,000.00**	
Additional Capital Improvement Costs						
Dewatering		$12,500.00	L.S.		$12,500.00	
Mobilization		5%			$12,500.00	
Traffic Control		$6,250.00	L.S.		$6,250.00	
Utility Coordination/Relocation		$6,250.00	L.S.		$6,250.00	
Stormwater Management/Erosion Control		5%			$12,500.00	
Subtotal Additional Capital Improvement Costs					**$50,000.00**	
Land / Acquisition Costs						
ROW/Easements					$0.00	
Subtotal Land Acquisition Costs					**$0.00**	
Other Costs (percentage of Capital Improvement Costs)						
Engineering		15%			$45,000.00	
Legal/Administrative		5%			$15,000.00	
Contract Admin/Construction Management		10%			$30,000.00	
Contingency		25%			$75,000.00	
Subtotal Other Costs					**$165,000.00**	
Total Capital Improvement Costs					**$465,000.00**	

Master Plan Operation and Maintenance Cost Summary					
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Annual Cost**	
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00	
Total Annual Operation and Maintenance Cost				**$122.00**	
Effective Interest Rate				1.50%	
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek MDP - Reach 10
DRAINAGEWAY : Boulder Creek
REACH : 10B
JURISDICTION : Boulder County
REACH ID: BCM-Reach10B Jeremy Deischer DATE : 2015-04-22

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Special Items (User Defined)						
ERC Estimate Enhanced Stream	<----User Defined Items	1	L.S.	$410,000.00	$410,000.00	
ERC Estimate Riparian Restoration	<----User Defined Items	1	L.S.	$190,000.00	$190,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$0.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$600,000.00
Subtotal Capital Improvement Costs				**$600,000.00**
Additional Capital Improvement Costs				
Dewatering	$6,000.00	L.S.		$6,000.00
Mobilization	5%			$30,000.00
Traffic Control	$15,000.00	L.S.		$15,000.00
Utility Coordination/Relocation	$15,000.00	L.S.		$15,000.00
Stormwater Management/Erosion Control	5%			$30,000.00
Subtotal Additional Capital Improvement Costs				**$96,000.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$104,400.00
Legal/Administrative	5%			$34,800.00
Contract Admin/Construction Management	10%			$69,600.00
Contingency	25%			$174,000.00
Subtotal Other Costs				**$382,800.00**
Total Capital Improvement Costs				**$1,078,800.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	4800	L.F.	$2.00	$1,920.00
Total Annual Operation and Maintenance Cost				**$1,920.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$67,199.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek - Modify Ditch Diversion for Aquatic and Habitat Passage
DRAINAGEWAY : Boulder Creek
REACH : DitchForAquatic
JURISDICTION : Weld County
REACH ID: BCM-ReachDitchForAquatic Jeremy Deischer DATE : 2015-04-27

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Grouted Boulders, 36"		763	S.Y.	$231.00	$176,253.00	
12-inch Riprap, Type M		37	C.Y.	$73.00	$2,682.00	
Excavation, Low Range		821	C.Y.	$13.00	$10,673.00	
Special Items (User Defined)						
Concrete Seepage Cutoff Wall	<----User Defined Items	21	CY	$730.00	$15,009.00	
Improvements to Diversion Structure	<----User Defined Items	1	L.S.	$45,000.00	$45,000.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains				$0.00
Concrete Box Culverts				$0.00
Hydraulic Structures				$0.00
Channel Improvements				$189,608.00
Detention/Water Quality Facilities				$0.00
Removals				$0.00
Landscaping and Maintenance Improvements				$0.00
Special Items (User Defined)				$60,009.00
Subtotal Capital Improvement Costs				**$249,617.00**
Additional Capital Improvement Costs				
Dewatering		L.S.		$0.00
Mobilization	5%			$12,481.00
Traffic Control		L.S.		$0.00
Utility Coordination/Relocation		L.S.		$0.00
Stormwater Management/Erosion Control	5%			$12,481.00
Subtotal Additional Capital Improvement Costs				**$24,962.00**
Land Acquisition Costs				
ROW/Easements				$0.00
Subtotal Land Acquisition Costs				**$0.00**
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%			$41,187.00
Legal/Administrative	5%			$13,729.00
Contract Admin/Construction Management	10%			$27,458.00
Contingency	25%			$68,645.00
Subtotal Other Costs				**$151,019.00**
Total Capital Improvement Costs				**$425,598.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)	1	EA	$608.00	$122.00
Total Annual Operation and Maintenance Cost				**$122.00**
Effective Interest Rate				1.50%
Total Operation and Maintenance Costs Over 50 Years				**$4,270.00**

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek - Modify Ditch Diversion for Aquatic and Habitat Passage
DRAINAGEWAY : Boulder Creek
REACH : GradeControl
JURISDICTION : Weld County
REACH ID: BCM-ReachGradeControl | Jeremy Deischer | DATE : 2015-04-27

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Grouted Boulders, 36"		763	S.Y.	$231.00	$176,253.00	
12-Inch Riprap, Type M		37	C.Y.	$73.00	$2,682.00	
Excavation, Low Range		821	C.Y.	$13.00	$10,673.00	
Special Items (User Defined)						
Concrete Seepage Cutoff	<----User Defined Items	21	CY	$730.00	$15,330.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$0.00	
Channel Improvements			$189,608.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$15,330.00	
Subtotal Capital Improvement Costs			**$204,938.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$10,247.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$10,247.00	
Subtotal Additional Capital Improvement Costs			**$20,494.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$33,815.00	
Legal/Administrative	5%		$11,272.00	
Contract Admin/Construction Management	10%		$22,543.00	
Contingency	25%		$56,358.00	
Subtotal Other Costs			**$123,988.00**	
Total Capital Improvement Costs			**$349,420.00**	

MASTER PLAN COST ESTIMATE FOR INDIVIDUAL REACH

PROJECT : Boulder Creek Gravel Spillway
DRAINAGEWAY : Boulder Creek
REACH : MineralRd
JURISDICTION : Boulder County
REACH ID: BCM-ReachMineralRd | JKD | DATE : 2015-03-23

DESCRIPTION		QUANTITY	UNIT	UNIT COST	TOTAL COST	USER COMMENTS
Channel Improvements						
Grouted Boulders, 36"		540	S.Y.	$231.00	$124,740.00	
Excavation, Mid Range		880	C.Y.	$29.00	$25,532.00	Haul Required (Autocad Estimate)
Soil Riprap, Type M		289	C.Y.	$85.00	$24,557.00	
Excavation, Low Range		712	C.Y.	$13.00	$9,256.00	Excavate and Backfill (CAD Estimate)
Special Items (User Defined)						
Concrete for Cutoff Walls	<----User Defined Items	56	CY	$730.00	$40,588.00	

Master Plan Capital Improvement Cost Summary				
Capital Improvement Costs				
Pipe Culverts and Storm Drains			$0.00	
Concrete Box Culverts			$0.00	
Hydraulic Structures			$0.00	
Channel Improvements			$184,085.00	
Detention/Water Quality Facilities			$0.00	
Removals			$0.00	
Landscaping and Maintenance Improvements			$0.00	
Special Items (User Defined)			$40,588.00	
Subtotal Capital Improvement Costs			**$224,673.00**	
Additional Capital Improvement Costs				
Dewatering		L.S.	$0.00	
Mobilization	5%		$11,234.00	
Traffic Control		L.S.	$0.00	
Utility Coordination/Relocation		L.S.	$0.00	
Stormwater Management/Erosion Control	5%		$11,234.00	
Subtotal Additional Capital Improvement Costs			**$22,468.00**	
Land Acquisition Costs				
ROW/Easements			$0.00	
Subtotal Land Acquisition Costs			**$0.00**	
Other Costs (percentage of Capital Improvement Costs)				
Engineering	15%		$37,071.00	
Legal/Administrative	5%		$12,357.00	
Contract Admin/Construction Management	10%		$24,714.00	
Contingency	25%		$61,785.00	
Subtotal Other Costs			**$135,927.00**	
Total Capital Improvement Costs			**$383,068.00**	

APPENDIX F

RIPARIAN ZONE AND THREATENED AND ENDANGERED SPECIES SUMMARY

Ecological Resource Consultants, Inc.
35715 US Hwy. 40, Suite D204 ~ Evergreen, CO ~ 80439 ~ (303) 679-4820

Technical Memorandum

Date: July 14, 2015

To: ICON Engineering

From: Dave Blauch, Diane Krzysztof (Ecological Resource Consultants, Inc.)

Re: **Boulder Creek Watershed Master Plan**
Riparian Zone and Threatened and Endangered Species Summary

During the historic regional flood event in September 2013, Boulder Creek experienced high peak flows for an extended duration which resulted in not only damages to infrastructure, but also widespread damages to the stream corridor. Roads and bridges overtopped, channel avulsions occurred, and questions arose regarding the best approach to rebuild infrastructure and restore Boulder Creek.

This memo, as part of the Boulder Creek Master Plan, specifically addresses the general condition of the existing riparian communities within the Boulder Creek corridor after the flooding and provides recommendations for re-establishment (or restoration) of the riparian zone as flood recovery efforts continue within the project area.

During the initial flood recovery efforts, emergency stabilization measures focused more on hardened methods such as riprap, grout, boulders and infrastructure repair. As the focus shifts towards long-term recovery, measures must also consider restoration of critical natural riparian and aquatic ecosystem function.

The importance of a well-developed riparian corridor is well documented. Well vegetated riparian corridors provide important terrestrial wildlife habitat, provide instream aquatic habitat benefits, stabilize soils and reduce problems from erosion, flooding and excessive nutrients. A properly functioning riparian corridor protects the physical integrity of the aquatic environment.

As part of ICON's team, ERC completed a cursory baseline assessment of the existing post-flood riparian corridor within the project area. The general condition of the existing riparian corridor was assessed including dominant vegetation community types remaining, species composition and primary vegetation strata that remain or that may have been damaged or lost. In addition, the assessment defined a typical "reference condition" riparian community or in other words the ideal natural riparian vegetation community that existed prior to the flood event and in an undisturbed state that should be the focus for

riparian restoration during long-term recovery efforts. **Section 1.0** of this memo summarizes the riparian corridor existing conditions and long-term recovery recommendations.

The riparian corridor of the Boulder Creek project area also provides critical habitat that should be considered during flood recovery efforts. **Section 2.0** of this memo includes a cursory screening of potential federal and state threatened and endangered species that may occur on or immediately surrounding the project area. Also included in this section is a summary of additional data reviewed for the project area including migratory birds, aquatic and macroinvertebrate data, wildlife closures and other important habitat management areas. This data is provided for reference, as-needed.

SECTION 1.0 RIPARIAN ZONE ASSESSMENT

1.1 IMPORTANCE OF THE RIPARIAN ZONE

A riparian corridor or "riparian zone" is defined as the transitional area or interface between upland terrestrial and aquatic habitats. A riparian zone is generally considered that portion of the landscape from the ordinary high water mark towards the adjoining uplands that affect or are affected by the presence of water (**Figure 1**). The riparian zone is often unique within a watershed containing notably different vegetation communities from the surrounding upland habitat. Properly functioning riparian zones of high ecological integrity contain an unfragmented, structurally diverse vegetation community, typically composed of three strata that includes trees, shrubs and grasses that are native to the region and that are adapted to the climatic, soil, and hydrologic conditions. The riparian zone has a variety of functions important to the stream or aquatic environment. Well vegetated riparian zones provide important terrestrial wildlife habitat, provide aquatic habitat benefits (shading, decreased water temperatures, biomass and instream cover), soil stabilization, and reduced problems from erosion, sedimentation and nutrients. Riparian vegetation also contributes to bank stability by dissipating the energy of moving water and reducing velocity, which is imperative during typical flood events. In an ideal situation, natural stream flows are able to access a broad floodplain. A properly functioning riparian zone protects not only water quality but also the physical integrity of the aquatic environment.

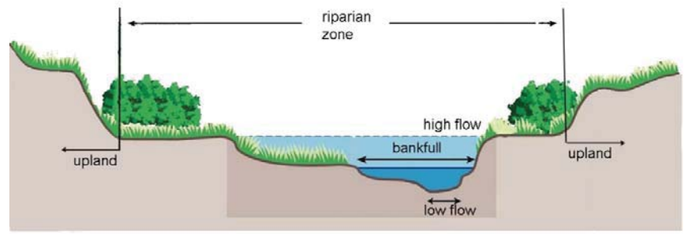


FIGURE 1. COMPONENTS OF A PROPERLY FUNCTIONING RIPARIAN ZONE.
(IMAGE MODIFIED FROM FISRWG 1998.)

In general, the riparian zone width necessary to provide a particular level of function depends on the functions of the stream, the characteristics of the riparian zone, topography, intensity of adjacent land use, and overall watershed characteristics. The riparian zone is also often considered as a protective buffer to the aquatic system.

The City of Boulder prepared a report entitled *Wetland and Stream Buffers: A review of the Science and Regulatory Approaches to Protection* (April 2007) which summarizes that riparian zone or stream buffers adjacent to active stream channels provide important hydrological and ecological "rights-of-ways." Stream buffers maintain lateral connectivity between the streams and adjacent floodplains and uplands, as well as longitudinal connectivity up and down stream. The buffer width, length and vegetation composition are key features essential to establishing and maintaining health aquatic systems. Generally buffers that are wider, longer and more densely vegetated with herbaceous, shrub and tree layers provide more benefits than buffers that are narrower, shorter and sparsely vegetated with only herbaceous species. The report provides a summary of buffer widths recommended by the USEPA for various functions which indicates a minimum width should be at least 50 feet and extend upwards of 200 feet from the stream edge. Error! Reference source not found. illustrates riparian buffer widths correlated to ecological function. Other scientific research has specifically evaluated the size of a riparian zone or buffer needed to adequately remove specific sediments, phosphorous, nitrogen, and other pollutants as well as provide effective wildlife protection (Environmental Law Institute 2008). Riparian zone widths for wildlife protection are typically the broadest and are based on how far individuals range from the waterbody for breeding or other life-cycle needs which can range from 33 feet to 5,000 feet, depending on the species (Environmental Law Institute 2003, Fischer 2000).

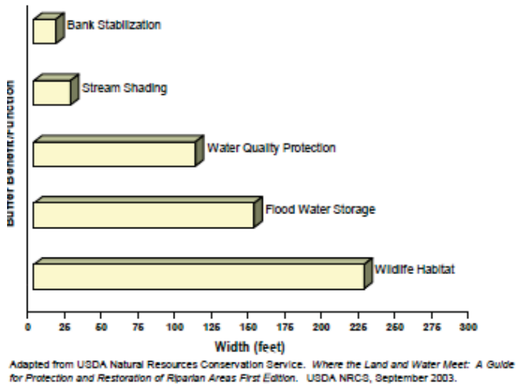


FIGURE 2. RIPARIAN BUFFER WIDTH CORRELATED TO ECOLOGICAL FUNCTION (FROM CITY OF BOULDER 2007).

1.2 PROJECT AREA SETTING

The project area comprises nearly 24 miles along Boulder Creek, extending from the confluence with Fourmile Creek, located within Boulder Canyon upstream of the City of Boulder, downstream to the confluence with the St. Vrain River, in the City of Longmont. The project area encompasses Boulder Creek and its adjacent floodplain through Boulder and Weld Counties.

The Boulder Creek project area generally lies within the South Central Semi-Arid Prairie ecoregion of the Great Plains; while a small portion of the upstream project reach occurs within the Northwestern Forested Mountain ecoregion of the Southern Rockies (USEPA Level III Ecoregions). The topographic elevation

ranges from approximately 5,700 feet above mean sea level (AMSL) at the confluence with Four Mile Creek within Boulder Canyon to approximately 4,800 feet AMSL at the downstream (east) end of the project area.

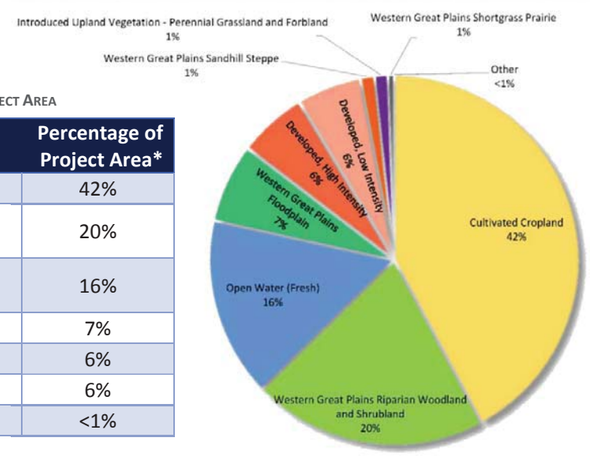
1.2.1 LAND USE AND VEGETATION COVER TYPES

Boulder Creek is a perennial stream which generally flows from west to northeast through the project area. The FEMA mapped 100-year floodplain has been used to generally define the project area boundary, which varies in width from approximately 150 feet wide at the upstream end to approximately 6,500 feet wide at the downstream confluence with the Saint Vrain River.

Existing land use and vegetation cover types were evaluated within the project area using mapping from the US Geological Survey (USGS) Southwest Regional Gap Analysis Project (SWReGAP) (2001). The predominant land cover type of the project area is cultivated cropland (42% of land) which includes grazing, alfalfa and other crop production. Aggregate mining of sand and gravel since the mid 1950's has visibly shaped the project area landscape as open water ponds scatter the floodplain, occupying approximately 16% of project area. Natural vegetation cover types within the riparian zone occupy only 27% of the project area and are mainly classified as Western Great Plains Riparian Woodland and Shrubland and to a lesser degree Western Great Plains Floodplain. Other land mapped within the project includes high and low density developed areas (12%) such as land within the City of Boulder, larger paved roads and other miscellaneous developments. **Table 1** summarizes all land use types and vegetation communities mapped within the project area.

TABLE 1-LANDCOVER TYPES MAPPED WITHIN THE PROJECT AREA

Land cover Types	Percentage of Project Area*
Cultivated Cropland	42%
Western Great Plains Riparian Woodland and Shrubland	20%
Open Water (Fresh) *(i.e., abandoned gravel ponds)*	16%
Western Great Plains Floodplain	7%
Developed, High Intensity	6%
Developed, Low Intensity	6%
Other	<1%



Source: SWReGAP 2001

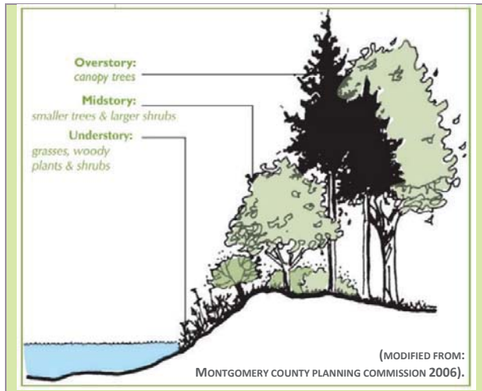
*Project Area defined by FEMA 100-year floodplain.

1.2.2 RIPARIAN ZONE VEGETATION COMMUNITY AND REFERENCE STANDARD

Of the vegetation cover types identified within the project area (SWReGAP 2001), the primary natural riparian zone vegetation community type that occurs within the project area is the Western Great Plains Riparian Woodland and Shrubland. This vegetation community type is most characteristic of habitats within the project area thus would be considered the reference standard or ideal natural community.

The Western Great Plains Riparian Woodland and Shrubland community type is found widely in the Great Plains of Colorado and occurs in wide river corridors that have low-gradient and primarily sandy/gravelly beds (becoming cobbly with increasing gradients). The type is most often found proximal to perennial rivers on low sidebars and streambanks near stream bankfull levels (NatureServe 2004). Because of its low position, the type is flooded frequently (average recurrence interval is 5 years). Dominant communities within this streamside system range from floodplain forests to wet meadows where properly functioning systems are linked by underlying soils and the flooding regime (FGDC 2008).

Within the project area, this reference standard community would occur on low terraces and along the immediate streambanks of Boulder Creek through the riparian zone. The unconfined, active stream channel would frequently inundate vegetation through the riparian zone and active floodplain forming a complexity of habitats which support a variety of plant communities. In a more undisturbed condition, vegetation would be continuous along the entire corridor and occupy three strata (i.e., overstory, midstory and understory). The riparian zone vegetation community would be dominated by open to moderately open tree canopy of plains cottonwood (25-50% cover) with thickets of narrowleaf willow in the mid-story. A dense herbaceous understory layer comprised of graminoids would be present along portions the streambanks above the ordinary high water mark. The overall herbaceous diversity would be high and predominantly native in composition. Subirrigated areas may support tallgrass meadow understory. The presence of narrowleaf willow indicates that the water table is relatively high and the community floods at least occasionally (E. Muldavin et al. 2006). **Figure 3** depicts the components of a properly functioning and structurally diverse riparian community for Boulder Creek.



(MODIFIED FROM: MONTGOMERY COUNTY PLANNING COMMISSION 2006).

FIGURE 3. NATURAL RIPARIAN CORRIDORS OF HIGH ECOLOGICAL INTEGRITY TYPICALLY CONTAIN THREE DISTINCT LAYERS OF VEGETATION – OVERSTORY FOREST CANOPY OF TREES, MIDSTORY SHRUBS AND AN UNDERSTORY OF GRASSES.

BOULDER CREEK: EXAMPLE OF REFERENCE STANDARD RIPARIAN FOREST HABITAT – DOMINATED BY COTTONWOOD OVERSTORY WITH WILLOW MIDSTORY AND GRASS UNDERSTORY.

1.2.3 PROJECT AREA VEGETATION

Within the project area, the existing riparian vegetation community is generally characteristic of the Western Great Plains Riparian Woodland and Shrubland community; however, the community is largely modified in vegetation structure, diversity and hydrologic regime from the ideal or reference standard community. The specific plant associations within the project area's riparian vegetation community can include dryer species typically associated with upland forests and cultivated fields/pastures to mesic species associated with scrub-shrub fringe wetlands, wet meadows or emergent marshes. Some locations within the project area can also differ from the reference standard in the number of vegetation strata present, the amount of non-native species and overall percent cover.

The riparian vegetation community of the project area is generally dominated by plains cottonwood (*Populous deltoides*) in the overstory layer, narrowleaf willow (*Salix exigua*) in the midstory layer and mixed mesic graminoids form the understory layer. In some areas, scattered shrubs such as snowberry (*Symphoricarpos occidentalis*), chokecherry (*Prunus virginiana*) or golden currant (*Ribes aureum*) can also found in the midstory. The herbaceous stratum is variable. Native grasses such as needle-and-thread grass (*Stipa comata*), wild licorice (*Glycyrrhiza lepidota*) occur in dryer areas, while sedge (*Carex spp.*) and rushes species (*Juncus spp.*) can occupy the understory near the immediate streambank. Introduced prairie grasses such as smooth brome (*Bromus inermis*), orchard grass (*Dactylis glomerata*) and meadow fescue (*Festuca pratensis*) are common in the project area. Non-native or weedy plants are common within the project area include Russian olive (*Elaeagnus angustifolia*), crackwillow (*Salix fragilis*), crested wheatgrass (*Agropyron cristatum*), reed canarygrass (*Phalaris arundinacea*) and cheatgrass (*Bromus tectorum*).

1.2.4 PROJECT AREA WETLANDS

A variety of wetland habitats do exist within the riparian zone of Boulder Creek. Wetlands and other waters of the US are regulated under Section 404 of the Clean Water Act (CWA). Future restoration and recovery efforts which result in disturbances to regulated areas may be subject to permitting and approval by the US Army Corps of Engineers (USACE), the US Environmental Protection Agency, and/or the US Fish and Wildlife Service (USFWS). A formal wetland delineation, by a qualified wetland consultant, and coordination with the USACE Denver Regulatory Office is recommended prior to implementation of any future restoration and recovery efforts to ensure CWA compliance. In addition, any future restoration and recovery efforts must comply with local wetland, stream and wildlife regulations.

1.3 RIPARIAN ZONE POST-FLOOD

The existing condition of the riparian zone both pre- and post- flood varies across the project area and is largely influenced by historic and current land use practices. In general, the overall extent and condition of riparian habitat and value has been impacted more from historic land use practices than direct impacts from the flood. Land use including riparian vegetation removal, urban development, grazing, mining, stream channelization and establishment of non-native invasive vegetation have significantly shaped the character of the riparian corridor. In addition, land leveling, stream channelization, water diversions and levees reduce the extent and frequency of floodplain inundation, which further diminishes the quality and quantity of riparian vegetation (Anderson & Company Consulting Team 1998).

In these historically degraded areas, the riparian zone is narrow (<50 feet wide), fragmented and often dominated by non-native or weedy species. Higher quality riparian areas typically occur within the project in areas less impacted by human land use. In these areas, Boulder Creek's riparian zone is wide, stable and densely vegetated extending well over 500 feet across the floodplain. Refer to **Figure 4.** Example of varying riparian zone widths through the project area. The narrow riparian zone (left) is limited by land use and bisected by a railroad; the more naturalized downstream section (right) is wide and less confined.

FIGURE 4. EXAMPLE OF VARYING RIPARIAN ZONE WIDTHS THROUGH THE PROJECT AREA. THE NARROW RIPARIAN ZONE (LEFT) IS LIMITED BY LAND USE AND BISECTED BY A RAILROAD; THE MORE NATURALIZED DOWNSTREAM SECTION (RIGHT) IS WIDE AND LESS CONFINED. (NOTE: EXAMPLE IS PROVIDED FOR RIPARIAN WIDTH CHARACTERISTICS ONLY - SITE SPECIFIC VEGETATION COMMUNITIES AND SPECIES MAY NOT REPRESENT AN APPROPRIATE RESTORATION TARGET.)

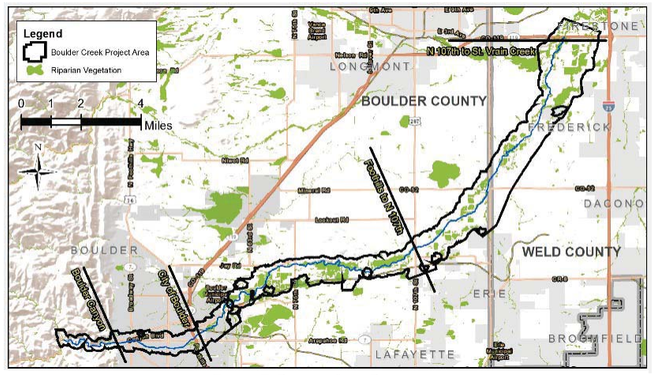


FIGURE 5. PROJECT AREA REACHES.

The overall development and extent of the riparian zone through the project area is closely correlated with existing landforms, land use practices and geomorphic processes. Therefore the structure of the riparian zone (shape/width) within the project area varies across topographic gradients from the steep canyon slopes to the level landscape across the plains. The Boulder Creek riparian zone through the project area is characterized by four distinct reaches: Boulder Canyon, City of Boulder, Foothills to N 107th Street and N 107th Street to Saint Vrain Creek (**Figure 5**).

1.3.1 DISTURBANCES TO THE RIPARIAN ZONE

Riparian zones by nature require regular flooding cycles to maintain their function. Certain vegetation species such as plains cottonwoods rely on regular flooding cycles for regeneration. However, extreme flood events can result in significant changes.

Floods can interact with vegetation in complex ways, both influencing and influenced by the structure and composition of the riparian zone (Johnson et al. 1999). The intensity of vegetation disturbance can be variable and influenced by factors such as pre-flood site conditions (i.e., type of vegetation present and channel constraints) and the interaction with flood dynamics (i.e., magnitude of flow and delivery of wood/sediment to a channel). Flood damage to riparian zone vegetation can occur by sediment and debris impact, scour or erosion of substrate or long-lasting change of hydrological conditions caused by changes in floodplain morphology and channel displacement. A less evident negative impact is a general decrease in plant vigor associated with post-stress reaction of plants to erosion (Toda et al. 2005). Flooding can damage trees indirectly by modifying soil characteristics. Extreme stream flows can wash away soil, exposing roots or deposit soil around a tree, smothering the roots. Generally, most trees and riparian vegetation damaged from flooding can recover in as little as one growing season; however, in other situations there may be no recovery at all. In addition, stressed trees can become more susceptible to secondary problems such as insect infestation or windthrow from the damaged root and trunk systems.

In several drainages effected by the 2013 flood event, the riparian zone was completely lost with removal of all soils and vegetation down to the underlying substrate. For example, the Little Thompson River, as described in the Little Thompson Watershed Restoration Master Plan (December 2014), exhibited some of the highest flow per square mile resulting in areas with almost total riparian zone loss. **Figure 6** below depicts an example of nearly complete riparian zone loss on the Little Thompson River as a result of the 2013 flood event.

FIGURE 6. EXAMPLE OF NEARLY COMPLETE RIPARIAN ZONE LOSS: *FROM* LITTLE THOMPSON WATERSHED RESTORATION MASTER PLAN (DECEMBER 2014) [*FIGURE 1.2 LITTLE THOMPSON RIVER AT BLUE MOUNTAIN NEIGHBORHOOD (FORMERLY X-BAR 7) BEFORE AND AFTER THE SEPTEMBER 2013 FLOOD.*]

1.3.2 PROJECT AREA DISTURBANCES

The existing (post-flood) riparian zone was evaluated within the project area reaches to determine the general overall effects from the September 2013 regional flood event. Overall, direct damage and loss to the riparian zone appears to be much less devastating than in other drainages affected by the flood event. For the most part, the riparian corridor of Boulder Creek remains intact and generally functioning with only relatively minor to moderate disturbance to the riparian zone.

Observed disturbance to the riparian zone varied throughout the project area reaches from minor or no impact within the more urban reaches which are designed to withstand higher peak flood flows; to more significant, moderate disturbances within downstream reaches which received higher volume of floodwater and debris flow from the upstream watershed. The effects included debris flows from the steep canyon reaches upstream that caused both bank erosion and sediment deposition in downstream riparian areas, along with conveyance and deposition of significant debris including boulders, trees, and household materials throughout the stream corridor. Within Boulder's city limits, significant maintenance was conducted post-flood to stabilize critically failing stream banks and to remove debris/sediment therefore these impacts appeared to be less severe through the project area.

The most significant impacts to the riparian zone observed in the project reaches are those areas where flood flows caused the stream to breach into nearby gravel ponds, completely abandoning the existing channel. This occurrence has altered the stream's connection to the original floodplain and riparian zone which will likely, over time, effect species diversity, abundance, structure, and functional characteristics of the riparian community.

Because the riparian zone is characterized by a distinct vegetation community that is physiologically adapted to a greater amount of available water (soil moisture, base flows, seasonal high flows and groundwater) than upland species, in areas where the available water has been altered, the reduced available water will eventually cause riparian succession to a dryer, more xeric (upland) plant community. Species composition can change dramatically over a gradient of available water frequency and depths: existing vegetation along the stream channel that is adapted to wetter conditions can be replaced by species that are tolerant of drier conditions causing habitat community shifts and in some cases complete loss of riparian species (Stomberg et al. 1996) (**Figure 7**).

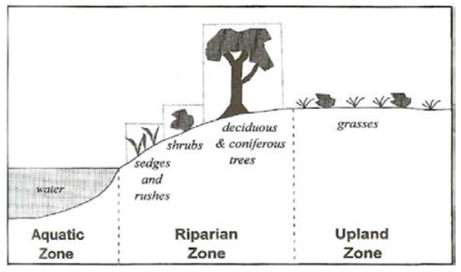


FIGURE 7. EXAMPLE OF SPECIES COMPOSITION THROUGH THE RIPARIAN ZONE.

Specifically within the project area, the Western Great Plains Riparian Woodland and Shrubland community is both propagated by and maintained by, periodic flooding (Drake and Rolfsmeier 1995). Cottonwood trees which dominate the existing riparian zone are particularly dependent on shallow alluvial groundwater and stream flows and exhibit a range of drought-stress responses including morphological responses, die-back and in severe cases, mortality occurs (Rood et al. 2003, Williams and Cooper 2005). Studies suggest

that without frequent flood events, this riparian community type would likely transition into a grassland community type within 30 years post-flood, as the cottonwood and willow species would not regenerate (Bellah and Hulbert 1974). Conversely, in areas where the active channel may be re-aligned, existing vegetation which is accustomed to less available water (xeric conditions) may transition to species more tolerant of increased available water.

Under both scenarios, even slight changes in the channel alignment or flow patterns can alter the composition and quality of both riparian and upland vegetation communities. During restoration and recovery efforts special consideration should be taken to thoroughly understand the interaction and dependence of vegetation communities on any proposed changes to the channel alignment and flow patterns.

A summary of riparian zone post-flood conditions within the project area is presented as follows by reach.

Boulder Canyon Reach

In this reach, the riparian zone is narrow (<100 feet wide) and confined between steep canyon walls and the adjacent Boulder Canyon Drive (Hwy 119) (**Figure 8**). Vegetation is largely comprised of one strata of trees or shrubs in the overstory with little or no understory vegetation present. The stream banks are steep and stable but armored with cobble/rock/riprap therefore lack mid- and understory strata.

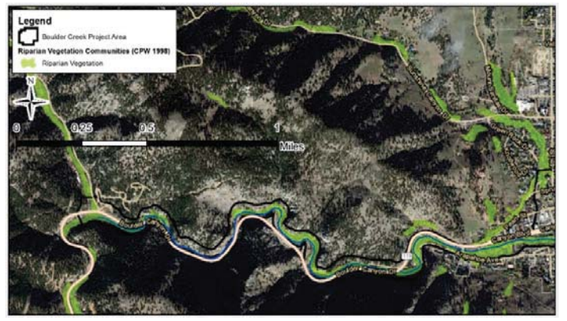


FIGURE 8. BOULDER CANYON REACH OVERVIEW.

Through the Boulder Canyon reach, fast moving floodwaters inundated the narrow but armored riparian zone which resulted in only low disturbances including tree/shrub damage/loss, localized bank erosion and steep slope failure and debris accumulation. The original channel retains a relatively stable (armored) stream bank. Overall, the limited existing riparian zone remains intact and functioning. Characteristics of the Boulder Canyon reach are shown in **Photos 1-2**.

Photo 1. Boulder Canyon reach. The existing riparian zone is characterized by one vegetation strata including either trees or shrubs with no mid- or understory present. Flood damages to the riparian zone are low. Much of the riparian zone remains intact with little change the pre-flood condition.

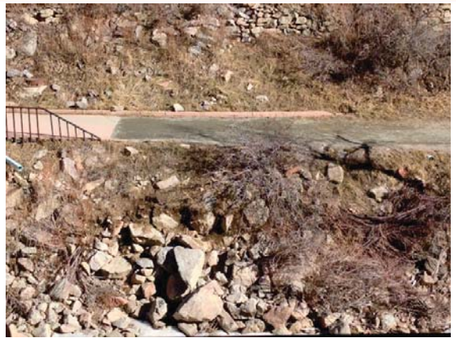


Photo 2. Boulder Canyon reach example of low post-flood disturbances which includes only minor bank erosion and shrub damage.

City of Boulder Reach

This reach extends through the City of Boulder from approximately 5th Avenue to Foothills Parkway (**Figure 9**). High recreational use and an urban landscape setting characterize this reach, which limits the overall existing riparian habitat. The riparian zone varies in width from approximately 50-100 feet and is confined on both the north and south sides by commercial and residential development. Vegetation is typical of an urban corridor and is largely comprised of mixed deciduous overstory trees with little or no understory vegetation present. Turf grass is common along portions of this reach. Stream access structures constructed of grouted riprap are present and reinforced cobble banks are common through this reach. For the most part Boulder Creek has been channelized and "locked in place" from urbanization.

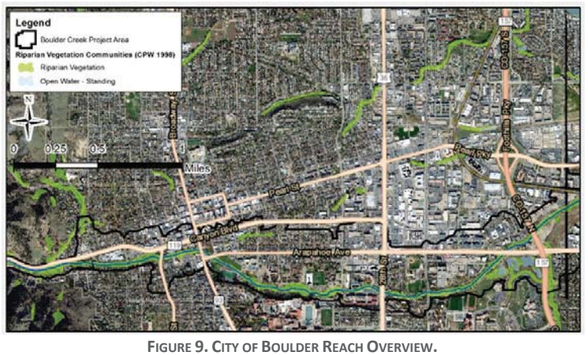


FIGURE 9. CITY OF BOULDER REACH OVERVIEW.

Through this reach, Boulder Creek overtopped its banks and inundated the existing riparian zone. Disturbances to the riparian zone are generally low and include minor tree damage/loss, minor localized bank erosion and relatively moderate sediment and debris deposition. Much of the deposition has been removed through City of Boulder flood recovery efforts and therefore is less pronounced at this time. Post-flood the riparian zone remains intact with little change the pre-flood condition therefore is anticipated to continue to function properly with little long-term adverse effects. Characteristics of the City of Boulder reach are shown in **Photos 3-4**.

Photo 3. Highly urbanized area within City of Boulder reach characterized by overstory trees and armored stream banks. Through this reach, Boulder Creek overtopped its banks and inundated the existing riparian zone. After the flood event, the riparian zone remains relatively intact with little change from the pre-flood condition.

Photo 4. City of Boulder reach example of low-disturbance: debris accumulation and riparian zone tree damage (trunk damage and bark removal) as a result of the flood. For the most part, while damaged, a majority of the riparian vegetation community will persist and continue to function.

Foothills to N 107th Street

This reach is comprised of mixed land ownership including private, City of Boulder and Boulder County. The majority of land within this reach is City and County designated open space including conservation easement lands. Abandoned gravel ponds characterize the landscape within this reach which historically altered the channel alignment and riparian corridor. Overall, the riparian corridor is less confined and wider than the canyon and City of Boulder reaches (extending 100 feet to over 1,000 feet across the floodplain), but existing conditions vary widely throughout this reach (**Figure 10**).

The overall extent and quality of riparian habitat through this reach varies greatly with the degree of historic land use disturbance, specifically stream channelization. Likewise, the amount of flood disturbance to the riparian zone also ranges from low to moderate through this reach based on the degree of floodplain connectivity associated with historic stream channelization.

In less disturbed sections of this reach where the stream channel is not confined and able to access the active floodplain, the riparian zone is well developed and comprised of cottonwood trees in the overstory with willow species in the midstory and a mixed herbaceous understory. In these areas, the stream was able to access the floodplain and riparian zone dissipating flood energy and lowering erosion potential; therefore,

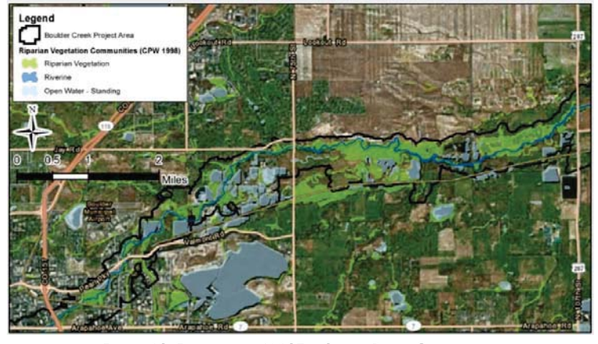


FIGURE 10. FOOTHILLS TO N 107TH STREET REACH OVERVIEW.

the post-flood disturbance to the riparian zone is low and includes only localized stream bank erosion/failure and/or tree damage/loss. In these low disturbance areas, the existing riparian zone remains intact and functioning.

In other areas where the stream is slightly modified (entrenched) but still able to access the bankfull stage, low terraces are present and dominated by one strata of trees/shrubs or herbaceous sedges/rushes/mesic grasses. In these sections of this reach, higher streamflows caused moderate disturbances including significant sediment deposition/vegetation burial, localized bank erosion, tree damage/loss and significant accumulation of debris from dead/downed trees through the riparian zone. For the most part, a majority of the riparian vegetation community remains intact and, while damaged, will persist and continue to function.

More degraded portions of this reach, which are confined by steep levees or significantly entrenched banks with no access to the active floodplain, are characterized by non-vegetated channel only with sparse overstory trees and upland herbaceous species present along the stream banks. In several locations, flood flows breached the original pre-flood channel and riparian zone resulting in new channel creation and flood flows through gravel ponds. In a few localized areas, specifically where the flood flows had eroded and breached the stream banks, the riparian vegetation is completely lost. In addition to the immediate disturbance to localized riparian vegetation, potential long-term impacts may occur within the abandoned channel and within overal associated riparian zone from alteration of stream flow which may result in vegetation community shifts or complete loss of riparian species. Characteristics of the Foothills to N 107th Street reach are shown in **Photos 5-6**.

Photo 5. Boulder Creek east from 61rd Street. Example of wide, well vegetated riparian zone with only moderate post-flood disturbance to the riparian zone. At this location, flood flows deposited significant amounts of cobble material within the existing overly wide stream channel which resulted in altered stream flow. The riparian zone is now disconnected from stream flow which can result in long-term habitat community shifts or complete loss of riparian species.

Photo 6. Boulder Creek near Valmont Road. Example of moderate post-flood disturbance to the riparian zone including: significant sediment deposition/vegetation burial, tree damage/loss and significant accumulation of debris from dead/downed trees. While moderate disturbance has occurred in this reach, a majority of the riparian vegetation remains intact and will continue to function.

N 107th Street to St. Vrain Creek Reach

This reach extends from N 107th Street in Boulder County to the confluence with St. Vrain Creek in Weld County (**Figure 11**). Within Boulder County (N 107th Street to County Line Road), land ownership is predominantly Boulder County open space including conservation easement lands. Land use throughout the reach is largely cultivated cropland with some abandoned gravel ponds throughout. Existing conditions vary throughout this reach however disturbance from historic land use practices and other channel alterations is generally widespread.

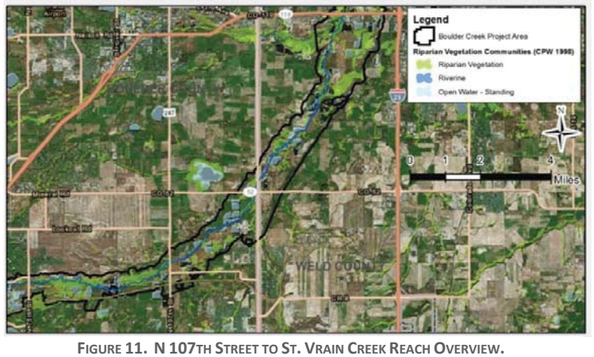


FIGURE 11. N 107TH STREET TO ST. VRAIN CREEK REACH OVERVIEW.

Throughout most of the reach, the riparian corridor is narrow, less than 50 feet wide and confined between upland leveed berms with limited floodplain connection. Riparian vegetation occurs along a narrow stream bench and is comprised of midstory shrubs and herbaceous sedges/rushes/mesic grasses in the understory. Sparse clusters of cottonwood trees occur sporadically along the riparian corridor. Non-native or invasive species are common in these channelized areas. In other areas where the stream is less confined, the reach is characterized by a meandering stream channel, wide floodplain and a dense riparian community dominated by overstory cottonwood trees, midstory willow species and an understory of herbaceous sedges/rushes/mesic grasses. The downstream portion of this reach near the confluence with Saint Vrain Creek exhibits these characteristics of high quality habitat or the reference standard comprised of a dense vegetation community with three strata, stable stream banks, a wide floodplain and little human disturbance thus was considered to be a more typical reference standard habitat for the project.

Disturbance to the riparian zone varies widely through this reach. Overall, areas where the stream is less confined, well vegetated and able to access the floodplain exhibited less disturbance to the riparian zone. In these areas, the riparian zone remains intact and functioning. In more confined sections of this reach, impacts are moderate and include significant sediment deposition/vegetation burial, localized bank erosion, tree damage/loss and significant accumulation of debris from dead/downed trees through the riparian zone. For the most part, while moderate disturbances to the riparian zone occurred, a majority of the riparian vegetation community will persist and continue to function.

Additional disturbances associated with stream channel breaches that occurred through more confined sections of this reach as a result of extreme flood flows. In several locations, Boulder Creek breached its original pre-flood channel and riparian zone and now flows through gravel ponds. In the far downstream portion of this reach, Saint Vrain Creek also breached it's existing pre-flood channel resulting in flow alteration into gravel ponds and flow back into Boulder Creek, abandoning the historic channel. Where the breaches occured, immediate post-flood disturbance to the riparian zone includes localized riparian

vegetation loss. In addition, potential long-term impacts may occur within the abandoned channel or even within other adjacent riparian areas from alteration of hydrology (increase or decrease in available water) which may result in vegetation community shifts or complete loss of riparian species. Characteristics of the N 107th Street to St. Vrain Creek reach are shown in **Photos 7-8**.

Photo 7. Confluence with St. Vrain Creek. Example of reference standard riparian habitat which includes dense vegetation community with three strata, stable stream banks, a wide floodplain and little human disturbance. Here flood flows resulted in minimal damage to the riparian corridor.

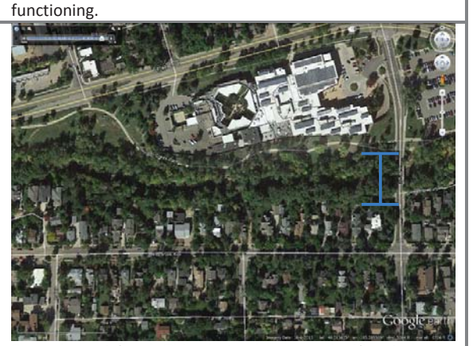
Photo 8. N 107th Street to St. Vrain Creek reach. Here flood flows resulted in abandonment of the pre-flood channel and riparian corridor. Herbaceous vegetation has begun to establish in the previous active channel bottom, indicative of an altered hydrologic regime.

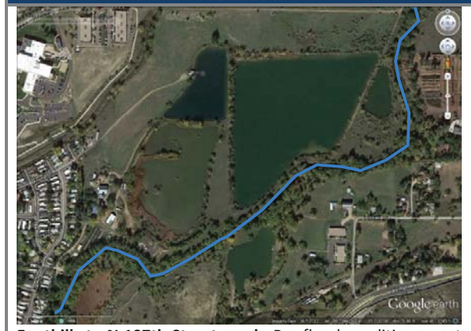
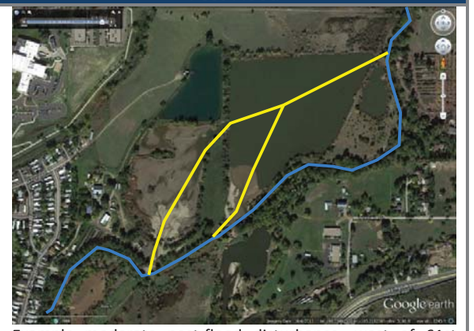
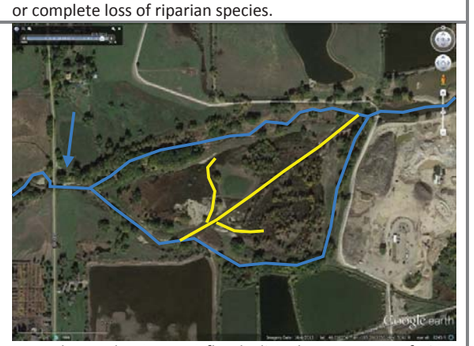
1.3.3 SUMMARY RIPARIAN ZONE POST-FLOOD

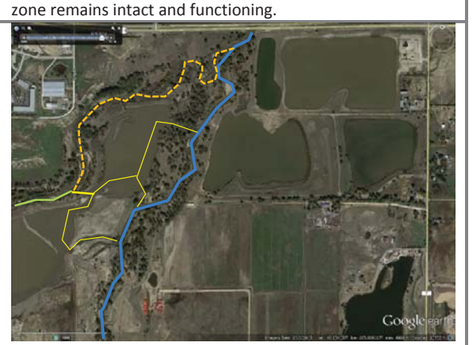
Specific impacts to the riparian zone reaches through the project area include:

REACH	2013 REGIONAL FLOOD DAMAGE – RIPARIAN ZONE
Boulder Canyon	*Low Disturbance* • Stable armored stream banks. • Minor tree/shrub damage/loss. • Minor localized bank erosion and steep slope failure. • Debris accumulation. • Channel remains in original alignment and connected to riparian zone. • Limited existing riparian zone remains relatively intact.
City of Boulder	*Low Disturbance* • Stable armored stream banks. • Minor tree damage/loss. • Minor localized bank erosion. • Debris and sediment deposition removed by City of Boulder, CDOT and UDFCD. • Channel remains in original alignment and connected to riparian zone. • Limited existing riparian zone remains relatively intact.
Foothills to N 107th Street	*Low to Moderate Disturbance* • Significant sediment deposition/vegetation burial. • Localized bank erosion. • Significant accumulation of debris from dead/downed trees. • Stream breach into gravel ponds – alteration of hydrology (channel and riparian zone abandoned). • Stream breach areas subject to potential long-term impacts to riparian species diversity, abundance, structure, and functional characteristics from alteration of hydrology.
N 107th Street to St. Vrain Creek	*Low to Moderate Disturbance* • Significant sediment deposition/vegetation burial. • Localized bank erosion. • Significant accumulation of debris from dead/downed trees. • Stream breach into gravel ponds – alteration of hydrology (channel and riparian zone abandon). • Stream breach area subject to potential long-term impacts to riparian species diversity, abundance, structure, and functional characteristics from alteration of hydrology.

Following are examples of pre- and post-flood conditions through the project area with examples of disturbances to the riparian zone.

Pre-Flood	Post-Flood
	
Boulder Canyon reach pre-flood: narrow riparian zone confined between steep canyon walls and Boulder Canyon Drive (Hwy 119).	Example of low post-flood disturbance. In this area, localized stream bank erosion/slope failure occurred due to the narrow and confined riparian zone. A relatively small portion of the riparian corridor has been damaged while other portions remain intact. Overall, the riparian zone remains intact and functioning.
	
City of Boulder reach pre-flood: riparian zone is confined on both the north and south sides by commercial and residential development. The stream channel is connected to the riparian zone which is vegetated by deciduous, riparian trees.	Example post-flood: This photo shows no significant change to the riparian zone post-flood, through a highly urbanized section through downtown Boulder. The stream was able to access the floodplain; armored stream banks and riparian tree root system functioned to withstand extreme flood flows limiting significant disturbances. The limited existing riparian zone remains relatively intact.

Pre-Flood	Post-Flood
	
Foothills to N 107th Street reach. Pre-flood conditions west of 61st Street. The blue line indicates the approximate pre-flood flow path of Boulder Creek. Through this section, the narrow riparian zone is confined by existing gravel ponds on either side.	Example moderate post-flood disturbance, west of 61st Street. As a result of the flood, this section of Boulder Creek breached (yellow line) into an existing gravel pond. The historic riparian corridor is now disconnected from stream flow which can result in long-term habitat community shifts or complete loss of riparian species.
	
Foothills to N 107th Street reach. Pre-flood conditions east of 61st Street. The blue line indicates the approximate pre-flood flow path of Boulder Creek.	Example moderate post-flood disturbance, east of 61st Street. Extreme flood flows resulted in altered stream hydrology including a channel breach through an existing pond (yellow line) and abandoned side channel (blue arrow). Alterations in stream flow can result in long-term habitat community shifts or complete loss of riparian species.

Pre-Flood	Post-Flood
	
Foothills to N 107th Street reach. Pre-flood conditions east of 75th Street. In this less disturbed section of the reach, Boulder Creek is not confined, the riparian zone is well developed and able to access the active floodplain.	Example low post-flood disturbance, east of 75th Street. In this section, the riparian zone had functioned properly by allowing flood flows to dissipate on the floodplain; therefore, the post-flood disturbance to the riparian zone is low and includes only localized stream bank erosion/failure and/or tree damage/loss. In these low disturbance areas, the riparian zone remains intact and functioning.
	
N 107th Street to St. Vrain Creek reach. Pre-flood conditions south of Hwy 119. Variable conditions along Boulder Creek (right, blue line). Saint Vrain Creek is shown on the left (green line). Portions of this reach are well vegetated and able to access the floodplain, while other areas are narrow and more confined as a result of historic gravel mining.	Example moderate post-flood disturbance, south of Hwy 119. Extreme flood flows through historically confined sections of Boulder Creek resulted in channel breach through existing gravel ponds (yellow line). A breach also occurred on Saint Vrain Creek (left, green line) which resulted in channel abandonment (orange line). As a result of the flood, the existing well vegetated riparian zone through this reach is threatened from altered stream flow which can result in long-term habitat community shifts or complete loss of riparian species.

1.4 RIPARIAN ZONE RESTORATION GUIDELINES

The framework for any successful riparian zone restoration effort is understanding the local (reference standard) community that is either present or known to have existed in the local area, in order to restore the functional integrity and biodiversity of the riparian zone. As stated in the previous section, the reference community or primary habitat type recommended for restoration within this project area which is locally native and appropriate for the environmental setting is the Western Great Plains Riparian Woodland and Shrubland.

Replicating the natural characteristics of the local Western Great Plains Riparian Woodland and Shrubland habitat type including re-establishment of cottonwood tree overstory and a willow shrub mid-story with a mixed grassland understory that properly interacted with the channel flow should be the primary objective for natural restoration efforts.

Successful riparian zone restoration is dependent on a thorough understanding of numerous environmental factors and site-specific conditions. Stream flow, soil moisture, groundwater table, soil chemistry and sun-orientation are all critical elements to consider. Any restoration efforts should carefully consider such factors which should generally be defined by an expert to ensure greater success.

A number of references and guidance documents are available for restoration activities in Colorado and Boulder County. Please refer to the following for further guidance on riparian zone restoration and suggested native plants for revegetation within the project area:

Suggested Native Plants for Horticultural Use on the Front Range of Colorado. Boulder County Land Use Department Publications.
http://www.bouldercounty.org/doc/landuse/p11nativeplants.pdf

City of Boulder Wetlands Protection Program Best Management Practices.
City of Boulder Planning Department. May, 1995. Rule Adopted July, 1995.
https://www-static.bouldercolorado.gov/docs/wetlands-proptection-program-best-management-practices-1-201308011515.pdf

Native Seed Mixes.
Boulder County Land Use Department Publications.
http://www.bouldercounty.org/doc/landuse/p18nativeseedmix.pdf

Revegetation. Boulder County Land Use Department Publications.
http://www.bouldercounty.org/doc/landuse/revegetationpacket.pdf

Native Plant Revegetation Guide for Colorado.
Colorado Natural Areas Program; Colorado State Parks, Colorado Department of Natural Resources. October 1998.
https://cpw.state.co.us/Documents/CNAP/RevegetationGuide.pdf

Site-specific restoration plans can be developed which specify planting locations, soil amendments and appropriate species types. While site specific plans should be developed by experts, the following provides some generalized guidelines for restoration of the riparian zone within the project area.

Riparian Zone Restoration Guideline Summary

- Natural riparian zone vegetation community type within the project area is characteristic of the *Western Great Plains Riparian Woodland and Shrubland;*
- A properly functioning riparian zone should have routine interaction with stream flows;
- In a more undisturbed condition, vegetation would be continuous along the entire corridor and occupy three strata (i.e., overstory, midstory and understory);
- Relatively dense native vegetation extending from the water's edge (bankfull) outward;
- Buffers that are wider, longer and more densely vegetated with herbaceous, shrub and tree layers provide more benefits. A minimum width should be at least 50 feet and extend upwards of 200 feet from the stream edge.

OVERSTORY – FOREST CANOPY ESTABLISHMENT

Restoration or planting efforts should focus on re-establishing the overstory or forest canopy that has been lost. The plains cottonwood tree is one of the primary species of the forest canopy regionally as well as the largest tree reaching heights of up to 60 feet with trunk diameters of 2.5 feet. Cottonwoods are now primarily found along drainages and streams of the region. Cottonwood stands provide habitat for 82% of all bird species breeding in northeastern Colorado (Simonin 2001). This species establishes quickly under ideal conditions and is tolerant of frequent and prolonged flooding as well as seasonal low water conditions. Reproduction by seed is a primary means of cottonwood establishment (Hines 1999). The best conditions for establishment include moist, unvegetated mineral soils where the seedlings are not subject to significant erosion/deposition or prolonged flooding during the first growing season (Friedman et al., 1992) (Borman and Larson 2002) (Scott et al. 1997).

Other trees species that are appropriate in conjunction with cottonwoods may include those species listed in **Table 2** below. The re-establishment of the forest canopy will provide significant bank stabilization benefits due to binding of soil with their roots and can also block or deflect high flow stream currents. Many of the large mature cottonwoods of the project area appear to be relatively stable after the September 2013 flooding, however many have been damaged and populations may start to decline over time. The planting of second generation stands of cottonwood and other species during recovery efforts will ensure the continued existence of this valuable habitat type. Special care should be taken during restoration to protect cottonwood seedlings that are newly established on flood exposed flats or deposits.

TABLE 2. REPRESENTATIVE NATIVE RIPARIAN ZONE TREE SPECIES.

Tree Species	
Scientific Name	**Common Name**
Acer glabrum	Rocky Mountain maple
Acer negundo	box elder
Alnus incana	thinleaf alder
Populus deltoides	plains cottonwood
Salix amygdaloides	peachleaf willow

*All tree species should only be planted above the ordinary high water mark where moist soil conditions are present during a majority of the growing season.

Tree species are generally obtained from a commercial nursery as potted containers or balled and burlapped and are ideally planted during the latter part of the dormant season between February 1 and April 1, one to two weeks before budding stage. Tree planting efforts should also consider a monitoring and maintenance program that includes temporary irrigation, weed management and herbivory prevention.

MIDSTORY - SHRUBS ESTABLISHMENT

Shrubs are considered one of the most valuable strata in a natural riparian zone. Shrubs generally form dense thickets with extensive root systems immediately along the water's edge and can tolerate fluctuating flows.

Willows are a widely-distributed shrub species throughout lower montane habitats in the region. Species can range from 6.5 to 20 feet tall forming large colonies with up to 95% cover. Roots of willows are wide and spreading, forming and extensive root system, especially with the development of large clones. Willow can be both drought resistant and very tolerant of flooding. The ability to generate new roots on the original root or submerged stem is important to riparian restoration. Narrowleaf willow, particularly, colonizes rocky, gravelly, and sandy stream edges, moist, well-drained alluvial terraces, and recently deposited sand and gravel bars that are below the high-water mark, where it is subject to annual flooding, and associated scouring and deposition (Anderson 2006). Where cottonwoods are not present, other willows may become the climax vegetation as narrowleaf willow communities promote bank building and soil development, preparing hospitable sites for other species (Anderson 2006). Midstory shrub species not only provide bank stability but also increased biomass, structural habitat and complexity for wildlife. Shrub species that are considered appropriate for native riparian zone restoration are listed in **Table 3** below.

TABLE 3. REPRESENTATIVE NATIVE RIPARIAN ZONE SHRUB SPECIES.

Shrub Species	
Scientific Name	**Common Name**
Alnus incana	thinleaf alder
Amelanchier alnifolia	western serviceberry
Symphoricarpos occidentalis	western snowberry
Prunus americana	wild plum

Shrub Species	
Scientific Name	**Common Name**
Rosa woodsii	Woods' rose
Ribes aureum	golden currant
Salix exigua	narrowleaf willow

*All shrub species should be planted above the ordinary high water mark where moist soil conditions are present during a majority of the growing season.

Shrub species are generally obtained from a commercial nursery in varying pot sizes from 1-quart to 5-gallons and ideally planted during the latter part of the dormant season between February 1 and April 1, one to two weeks before budding stage. Shrub planting efforts should also consider a monitoring and maintenance program that includes temporary irrigation, weed management and herbivory prevention.

Willows species also have a unique ability to be harvested from onsite sources and installed as live stakes. Willow live staking consists of harvesting a cutting or single stem of a willow shrub. The stake is then inserted into the ground then will naturally root and develop above ground shoots.

UNDERSTORY - NATIVE HERBACEOUS

An established understory community provides numerous environmental benefits including soil stabilization, overland runoff filtration as well as forage and cover for wildlife. During restoration efforts native seeding should focus on quickly establishing a groundcover to stabilize soil, minimize establishment of invasive species and promote long-term successional development. In restoration areas, the ground surface should be seeded with specialized riparian seed mix that promotes species diversity, contains locally native species that germinate rapidly and provides complete groundcover over a wide variety of hydrologic conditions. Generally in areas to be seeded, a minimum of 3 to 6 inches of suitable topsoil is recommended.

Refer to the following references for examples of native seed mixes.

Native grass seed mix specs from Boulder County NRCS - for loamy to clayey soils:
http://www.coopext.colostate.edu/boulder/sam/pdf/BCLOAMY1.pdf

Native grass seed mix specs from Boulder County NRCS - for sandy soils:
http://www.coopext.colostate.edu/boulder/sam/pdf/BCSANDY1.pdf

Native Seed Mixes. Samples for Boulder County:
http://www.bouldercounty.org/doc/landuse/p18nativeseedmix.pdf

TABLE 4. REPRESENTATIVE NATIVE RIPARIAN ZONE HERBACEOUS SPECIES.

Seed Mix		
Scientific Name	**Common Name**	**Comments**
Achnatherum hymenoides	Indian ricegrass	Sandy, p/f, (FACU)
Sporobolus airoides	alkali sacaton	Damp, alkaline, p/f, (FAC)
Elymus canadensis	Canada wildrye	Disturbed sites, p/f, (FACU)
Panicum virgatum	switchgrass	Marshes, prairies, foothills, p/f, (FAC)
Pascopyrum smithii	western wheatgrass	Adaptable to variety of habitats, p,f, (FACU)

Notes:
Life Zones: p = Plains 4,000-6,000 feet; f = Foothills 6,000-8,000 feet;
USACE Wetland Indicator Status: (FAC) = Facultative; (FACU) = Facultative Upland

1.5 NATIVE PLANT STOCK NURSERIES AND SEED SUPPLIER

Following is a list of native riparian zone plant stock nurseries and seed suppliers considered appropriate for the project area. This list is not inclusive of all regionally available native plant suppliers.

A list of Colorado plant vendors can also be found on the Colorado Native Plant Society web page: http://conps.org/horticulture_and_restoration.html.

North Fork Native Plants
1499 S 6000 W
Rexburg, ID 83440
Phone: (208) 354-3691
http://www.northforknativeplants.com/

Conservation Seeding & Restoration, Inc. dba Rocky Mountain Native Plants
3780 County Rd. 233
Rifle, CO 81650-8740
Phone: (208) 423-4835
Toll-Free: (877) 423-4835
http://www.csr-inc.com/

Little Valley Wholesale Nursery
13022 E 136th Ave
Brighton, CO 80601
Phone: (303) 659-6708
https://www.lvwn.com/

Arkansas Valley Seed
4333 Hwy 68
Longmont, CO 80504
Phone: (877) 907-3337
www.avseeos.com

Pawnee Buttes Seed
805 25th Street
Greeley, CO 80632
Phone: (970) 782-5947
www.pawneebuttesseed.com

Western Native Seed
P.O. Box 188
Coaldale, CO 81222
Phone: (719) 942-3935
www.westernnativesed.com

SECTION 2.0 THREATENED AND ENDANGERED SPECIES

ERC conducted a preliminary screening for federal and state threatened and endangered species within the project area. It will be important during long-term recovery and restoration efforts that protected species and habitats are considered. Close coordination with the agencies mentioned below is recommended.

Federal or state listed threatened and endangered species and/or habitat protected under the Endangered Species Act (ESA) or by the Colorado Parks and Wildlife (CPW) under Colorado Statute Title 33 are summarized as follows. Raptor nest sites are further protected by the US Fish and Wildlife Service (UFWS)/CPW under the Migratory Bird Treaty Act (MBTA) therefore the applicable regulatory requirements are also summarized subsequently.

Additionally, ERC review aquatic habitat data for the project area from the CPW and macroinvertebrate data from the City of Boulder: Boulder Habitat Assessment Report (CDM Smith 2014) City of Boulder which are briefly summarized in the following section.

The City of Boulder Open Space and Mountain Parks (OSMP) maintains land restrictions and seasonal wildlife closures throughout the project area pursuant to City Municipal Code, B.R.C. 1981. Additionally, Boulder County has identified important environmental resources and habitat areas that should be considered in land use decisions and preserved through management practices as summarized in the Boulder County Comprehensive Plan (BCCP) (Second Addition 1996, As Amended). These ecologically-significant areas are utilized by reference in the Boulder County Land Use Code are protected through administration of the Code and in conformance with applicable federal and state law. A summary of these areas follows.

2.1 SPECIES PROTECTED UNDER THE ENDANGERED SPECIES ACT (ESA) OF 1973

The ESA of 1973 was enacted by the United States to conserve endangered and threatened species and the ecosystems that they depend on. Under the ESA, species may be listed as either “endangered” or “threatened”; both designations are protected by law. The ESA is administered by the USFWS. The USFWS has developed project specific species lists, available online by request, identifying threatened, endangered, and proposed species, designated critical habitat, and candidate species protected under the ESA that may occur within the boundary of the proposed project and/or may be affected by the proposed project (USFWS 2014). Eleven species are identified to occur or historically occur within range of the project area in Boulder County (USFWS 2014). No USFWS critical habitat is present within or near the potential project areas. Further evaluation of the eleven species’ distribution and habitat requirements indicates that three species potentially occur within range of the project area (**Table 5**). During restoration and recovery efforts coordination with the USFWS is recommended.

US Fish and Wildlife Service – Ecological Services Field Office
P.O. Box 25486
Denver Federal Center (MS 65412)
Denver, Colorado 80225

Telephone: (303) 236-4773
Colorado Field Supervisor: Susan Linner
Email: Susan_Linner@fws.gov
http://www.fws.gov/coloradoes/

Table 5. Federal Threatened or Endangered Species.

Common Name	Scientific Name	*Status	Occurrence
Canada lynx	*Lynx canadensis*	FT	Suitable habitat not present.
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	FT	Suitable habitat not present.
Mexican spotted owl	*Strix occidentalis lucida*	FT	Suitable habitat not present.
Interior Least tern	*Sternula antillarium*	FE	Water depletion species.
Pallid sturgeon	*Scaphirhycchus albus*	FE	Water depletion species.
Piping Plover	*Charadrius melodus*	FT	Water depletion species.
Western prairie fringed orchid	*Platanthera praeclara*	FT	Water depletion species.
Whooping crane	*Grus americana*	FE	Water depletion species.
Preble’s Meadow Jumping Mouse	*Zapus hudsonius preblei*	FT	Suitable habitat may be present.
Ute Ladies’-tresses	*Spiranthes diluvialis*	FT	Suitable habitat may be present.
Colorado Butterfly Plant	*Guara neomexicana spp.*	FT	Suitable habitat may be present.

*Status:
FT - Federally Listed Threatened
FE - Federally Listed Endangered

Suitable habitat not present. These federally listed threatened and endangered species are identified to occur within the Boulder/Weld Counties. However, these species are not known to exist within the specific vicinity of the project area and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the project area. The species are not likely to occur within the project area and therefore, restoration and recovery efforts would not likely adversely affect the continued existence or available habitat of the species.

Water depletion species. The USFWS under the ESA has determined that water depletions in the South Platte River Basin are considered an adverse effect to these species. The project area is considered to be located within the South Platte River Basin; therefore, coordination with the USFWS would be necessary to determine whether a project would fall under a water-related activity/use.

Suitable habitat may be present. Within the project area along Boulder Creek, potential suitable habitat may be present for these species. Potential habitat includes well-developed riparian vegetation along Boulder Creek. The project area is not designated as Critical Habitat by the USFWS (CPW 2013).

PMJM: The project area does not occur within the PMJM Block Clearance Zone. PMJM are not known to occur within the project area (UDFCD 2010) and the nearest known population of PMJM occurs to the south of the project area on South Boulder Creek; however, the riparian corridor of the project area may provide suitable habitat for this species.

Colorado Butterfly Plant: This plant species is a short-lived, perennial herb endemic to moist soils in mesic or wet meadows of floodplain areas in southeastern Wyoming, north central Colorado, and extreme western Nebraska. Potential habitat for this species exists along the Boulder Creek stream channel and in the mesic or wet meadow floodplain areas.

Ute Ladies'-tresses: The Ute ladies-tresses occurs in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated floodplains below 6,500 feet in elevation in certain areas of Utah, Colorado, Idaho, Wyoming, and Nevada. Potential habitat for this species exists along the riparian corridor of Boulder Creek.

It is recommended that before a project is commenced, site specific surveys and more detailed analysis are conducted to determine the existence of potential habitat for the species.

In support of flood recovery efforts, the USFWS recommends implementation of conservation measures from the Recommended Conservation Measures to Avoid and Minimize Impacts to the Preble's Meadow Jumping Mouse, the Ute Ladies'-tresses, and the Colorado butterfly plant from Emergency Flood Response Activities Along Streams, Rivers, or Transportation Corridors. Information can be found online at: http://www.fws.gov/endangered/esa-library/index.html#consultations.

STATE THREATENED AND ENDANGERED SPECIES

Species identified as state threatened or endangered are protected by the CPW under Colorado Statute Title 33. State regulations prohibit "*any person to take, possess, transport, export, process, sell or offer for sale, or ship and for any common or contract carrier to knowingly transport or receive for shipment*" any species or subspecies listed as state endangered or threatened. State listed threatened and endangered species were screened as potential inhabitants of the project area based on general habitat requirements and CPW information (CPW 2014), *Colorado Listing of Endangered, Threatened, and Wildlife Species of Special Concern*. Seventeen species are identified to occur or historically occur within the project area (CPW 2014). Further evaluation of the seventeen species' distribution and habitat requirements indicates that five species (PMJM, Ute ladies'-tresses, Colorado butterfly plant, burrowing owl and river otter) potentially occur within range of the project area. Three of these species are also federally listed by the USFWS therefore are summarized in the previous section (**Table 5**). State listed species which also occur on the USFWS federal list, as screened above, were not duplicated below.

Colorado Parks and Wildlife – Northeast Region Office
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http://cpw.state.co.us/aboutus/Pages/ContactUs.aspx

TABLE 6. STATE THREATENED OR ENDANGERED SPECIES.

Common Name	Scientific Name	*Status	Occurrence
Boreal Toad	*Bufo boreas*	SE	Suitable habitat not present.
Burrowing owl	*Athene cunicularia*	ST	Suitable habitat may be present.
Southwestern willow flycatcher	*Empidonax traillii extimus*	SE	Suitable habitat not present.
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	ST	Suitable habitat not present.
Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	SE	Suitable habitat not present.
Arkansas darter	*Etheostoma cragini*	ST	Suitable habitat not present.
Bonytail	*Gila elegans*	SE	Suitable habitat not present.
Brassy minnow	*Hybognathus hankinsoni*	ST	Suitable habitat not present.
Colorado pikeminnow	*Ptychocheilus lucius*	ST	Suitable habitat not present.
Common shiner	*Luxilus cornutus*	ST	Suitable habitat not present.
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	ST	Suitable habitat not present.
Humpback chub	*Gila cypha*	ST	Suitable habitat not present.
Lake chub	*Couesius plumbeus*	SE	Suitable habitat not present.
Northern redbelly dace	*Phoxinus eos*	SE	Suitable habitat not present.
Plains minnow	*Hybognathus placitus*	SE	Suitable habitat not present.
Razorback sucker	*Xyrauchen texanus*	SE	Suitable habitat not present.
Rio grande sucker	*Catostomus plebeius*	SE	Suitable habitat not present.
Southern redbelly dace	*Phoxinus erythrogaster*	SE	Suitable habitat not present.
Suckermouth minnow	*Phenacobius mirabilis*	SE	Suitable habitat not present.
Black-footed ferret	*Mustela nigripes*	SE	Suitable habitat not present.
Gray wolf	*Canis lupus*	SE	Suitable habitat not present.
Grizzly bear	*Ursus arctos*	SE	Suitable habitat not present.
Kit fox	*Vulpes macrotis*	SE	Suitable habitat not present.
Lynx	*Lynx canadensis*	SE	Suitable habitat not present.
River otter	*Lontra canadensis*	ST	Suitable habitat may be present.
Wolverine	*Gulo gulo*	SE	Suitable habitat not present.

*Status:
ST - State Listed Threatened
SE - State Listed Endangered

Suitable habitat not present. These state listed threatened and endangered species are identified to occur within the state. However, these species are not known to exist within the specific vicinity of the project area and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the project area. The species are not likely to occur within the project area and therefore, restoration and recovery efforts would not likely adversely affect the continued existence or available habitat of the species.

Suitable habitat may be present. Within the project area along Boulder Creek, potential suitable habitat may be present for these species.

Burrowing owl: The burrowing owl is a breeding species across the plains of eastern Colorado. Potential nesting habitat for the burrowing owl includes abandoned burrows, especially prairie dog colonies, located in grassland or agricultural lands from late March through October. The presence of prairie dog colonies (although active) within the project area exhibits general characteristics that are considered potential burrowing owl habitat. Any land use changes that disturb prairie dog colonies from March 1st through October 31st should ensure burrowing owls are not adversely affected.

River otter: Otters live in riparian habitat. Populations of this species have been historically rare in Colorado however since the 1970's, the CPW has focused on reintroduction efforts. Within the project area, the first river otter in approximately 100 years was documented on Boulder Creek, east of downtown Boulder on March 7, 2014. Therefore, segments of Boulder Creek maybe considered potential habitat for the otter. During restoration and recovery efforts coordination with the CPW is recommended.

2.1 MIGRATORY BIRD TREATY ACT

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 730-712). The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase barter, or offer for sale, purchase, or barter any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. In Colorado, all birds except for the European starling (*Sturna vulgaris*), house sparrow (*Passer domesticus*), rock dove (*Columba livia*) and common grouse/pheasant species (*Order Galliformes*) are protected under the MBTA. A total of 523 migratory bird species are known to occur in the Mountain-Prairie Region (USFWS Region 6, Montana, Wyoming, Utah, North Dakota, South Dakota, Nebraska, Kansas and Colorado); 320 of the 523 migratory bird species are known to breed in USFWS Region 6.

- Based upon literature review and an onsite assessment of the project area, ERC has determined that some migratory birds likely utilize the project area. These birds are protected under the MBTA, and killing or possession of these birds is prohibited. Future recovery and restoration efforts which remove vegetation should first ensure that active nests are not disturbed. Generally, the active nesting season for most migratory birds in this region of Colorado occurs between April 1 and August 31.

- In addition, disturbance to raptor nest sites is further protected by the CPW. The CPW guidance document (Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors) provides recommended tolerance limits or buffer zones for various species of raptors in addition to seasonal restrictions in response to human activity. Within the project area, available CPW Species Activity Mapping (SAM) depicts known mapped buffer zones within the project area for bald eagle (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) (NDIS 2013). Seasonal restrictions for these species can be obtained from the CPW (2008) guidance document: https://cpw.state.co.us/Documents/WildlifeSpecies/LivingWithWildlife/RaptorBufferGuidelines2008.pdf. Future recovery and restoration efforts should also be aware of any new raptor nest sites and consult with the CPW.

- CPW SAM mapping depicts great blue heron (*Ardea herodias*) nesting areas throughout the project area. The great blue heron is considered a Colorado species of special concern, protected under the MBTA. The rookery (nesting) areas are considered important habitat features for conservation within the project area.

- Refer to **Figure 12** in Section 2.4 for a map which depicts CPW nest sites within vicinity of the project area.

2.2 AQUATIC LIFE

Boulder Creek throughout the project area is classified as Water Supply Recreation 1A Agriculture Aquatic Life Warm 1 by CDPHE. Aquatic Life Warm 1 classification indicates the waters are currently capable of sustaining a wide variety of warm water biota, including sensitive species. Waters shall be considered capable of sustaining such biota where physical habitat and, water flows or levels and water quality conditions result in no substantial impairment of the abundance and diversity of species.

Informal discussions with local Colorado Parks and Wildlife (CPW) staff indicates that the project reach of Boulder Creek is a transitional zone between a cold water fishery (extending upstream of Boulder Canyon) dominated by trout to a warm water fishery (downstream of Boulder Canyon) dominated by native minnow species. Brown trout are present through the Canyon and City reaches, however east of 75th Street small bodied native fish become more dominate. CPW also indicated that future restoration efforts in the project reach and in particular east of 75th Street should focus on native small bodied native fish species and not typical trout habitat. CPW's most recent fish population survey (2014), identified the following dominant species: brown trout, common carp, creek chub, fathead minnows, green sunfish, largemouth bass, longnose dace, longnose sucker and white sucker. Of the 17 species collected, 9 species were non-native and 8 species were native to South Platte River basin.

CDM Smith completed a City of Boulder - Boulder Creek Habitat Data Review (Draft 2014) in anticipation of: a) the inclusion of habitat and biological data in future assessments and potential impairment determinations, and b) the importance of understanding habitat quality as part of the biological assessment process. The primary objective of the study was to organize the city's habitat data in a manner that supports meaningful evaluation of macroinvertebrate data that may be used to support aquatic life

use attainment determinations in the Boulder Creek watershed. This study was also used to develop recommendations for streamlining future habitat characterization efforts so that in the future, monitoring resources are expended on the collection of the most useful habitat data. The Review study area begins in the canyon at the west end of the urban core and extends to the confluence of Boulder Creek and Coal Creek near the Boulder/Weld County line. The Review concluded that datasets show lower habitat quality through the City as seen in the habitat scores below the canyon through 28th Street. Associated biological indices also follow the general pattern of lower scores at 28th Street. Urban density begins to decrease east of Foothills Parkway and habitat scores and biological metrics generally improve as the area becomes more rural. Habitat subcategory scores show that the overall habitat results are driven by habitat scores related to riparian quality. Of particular note is habitat parameter 10, which scores vegetative riparian zone width. Scores are lower through the urban corridor where the riparian zone is most confined.

2.4 CITY OF BOULDER'S OPEN SPACE & MOUNTAIN PARKS (OSMP) CLOSURES

The City of Boulder's Open Space & Mountain Parks land has been set aside for preservation and the protection of the natural environment. Within the project area, the Open Space and Mountain Parks (OSMP) division maintains the following closures (**Figure 12**).

- Bald Eagle Closures Nov. 1 - July 31. One area on OSMP land is closed from Nov. 1 to July 31 every year to protect bald eagle nesting and roosting activity.
- New Zealand Mudsnail Closures Year Round. Portions of Boulder Creek downstream of Valmont Road are closed year round because of the non-native, invasive New Zealand Mudsnail.

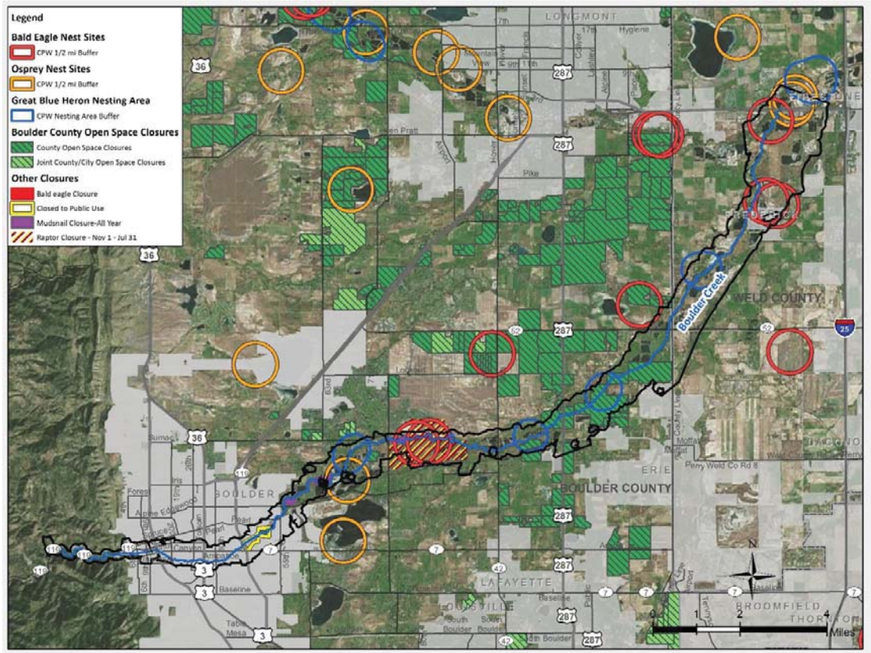

FIGURE 12. CPW NEST SITES AND OTHER CLOSURES.

2.5 BOULDER COUNTY OPEN SPACE (BCPOS) COMPREHENSIVE PLAN

The Boulder County Comprehensive Plan (BCCP) identifies important environmental resources and habitat areas that should be considered in land use decisions and preserved through management practices (Second Addition 1996, As Amended). The designated areas include areas: environmental conservation areas, wetlands, critical wildlife habitat, rare plant areas, habitat connectors and natural areas/landmarks. A map depicting key habitat areas from the BCCP update is provided below as **Figure 13**. These ecologically-significant areas are referenced in the Boulder County Land Use Code and should be considered in future project planning. The BCCP Update can be accessed online:
http://www.bouldercounty.org/property/build/pages/bccpupdate.aspx

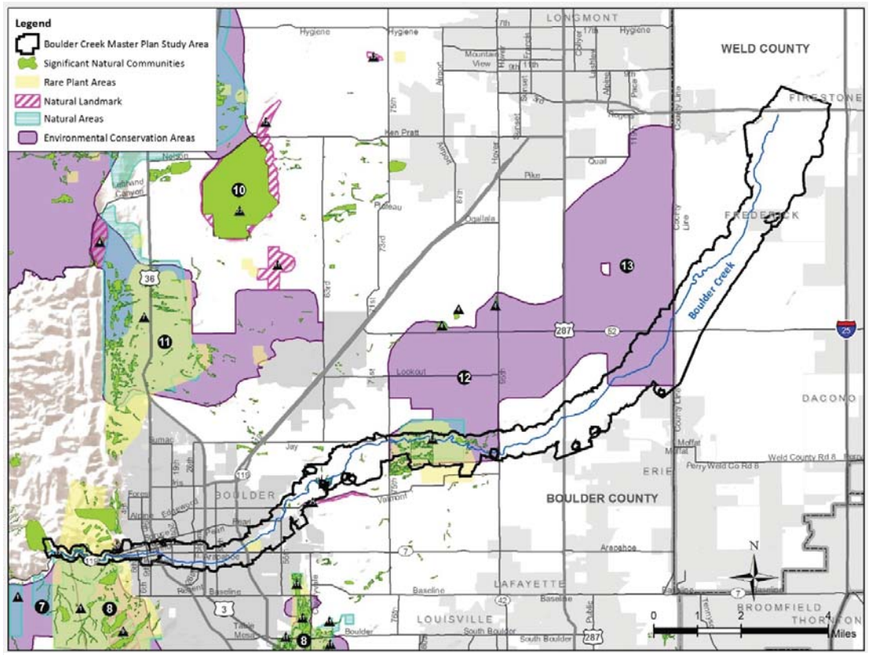

FIGURE 13. BOULDER COUNTY COMPREHENSIVE PLAN UPDATE - KEY HABITAT AREAS.

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