APPENDIX D: COST ESTIMATES FOR STUDY REACHES

This appendix provides approximate quantity and cost information for the improvement measures identified in the reach tables in Appendix C. These estimates are for materials and installation costs only. They are approximate and should be considered order-of-magnitude level estimates. Project implementation will entail expenses for site-level plan design, engineering, permitting, monitoring, and maintenance in addition to the costs provided below. Additionally, the improvement measures included in the following tables are not intended to be exhaustive. It is anticipated that quantities and approaches may vary once site-specific design work is initiated for a given project or study reach.

Cost Assumptions

Estimates for each study reach are based on the unit cost assumptions listed in Table D1. The Table D1 values were derived from the unit costs listed in Table 4.6. Unit cost and quantity assumptions for specific improvement measures are described below.

Stream Cleanup

The unit costs listed in Table D1 assume that cleanup events are completed using volunteer labor; the listed unit cost values are intended to partially cover the cost of supplies, disposal/landfill fees, and mileage to/from disposal sites. Low, moderate, and high cost values are provided to reflect the difference in expected disposal costs for reaches assessed as having low, moderate, or high amounts of trash.

Mechanized Trash Removal

The unit costs listed in Table D1 assume the use of paid labor; costs could be reduced via the use of in-kind government labor/equipment, or donated supplies. The "low" cost value reflects efforts that could be completed in less than 1 day and would not involve significant disturbance for access. The "moderate" cost value reflects efforts that would require 2–3 work days to complete, involve use of heavy equipment, and require a moderate level of disturbance and revegetation. The "high" cost value reflects efforts that would require up to 1 week of work, extensive heavy equipment use, and extensive revegetation/stabilization measures after accessing the channel.

Invasive Plant Removal/Control

The average per-acre unit cost from Table 4.6 ($750/acre) was used for the "moderate" cost value in Table D1. This cost was assumed to be appropriate for vegetation communities mapped as having a "moderate" invasive species class. Lower and higher costs ($600/acre and $900/acre, respectively) were assigned for use in areas with mapped invasive species classes of low or high/majority, respectively. Unit costs represent per-acre costs assuming three site visits (i.e., three separate mechanical and/or chemical treatments), which would cover 1 year of invasive plant removal/control work. Successful invasive plant removal and control typically requires 5–10 years of annual treatments.

Table D1. Unit cost assumptions used to generate cost estimates for each study reach.

IMPROVEMENT MEASURE	UNIT	UNIT COST			SOURCE OF COST INFORMATION [a]
		Low	Moderate	High	
Invasive plant removal/control	acre	$600	$750	$900	BIO-WEST (2009)
Revegetation (seed)	acre	N/A	$3,000	N/A	BIO-WEST (2009)
Revegetation (erosion control blanket)	square yard	N/A	$3	N/A	UDOT [b] 2008
Revegetation - live plant stakes	per stake	N/A	$3	N/A	BIO-WEST (2009)
Revegetation - 1-gallon containerized plants	per plant	N/A	$12	N/A	UDOT [b] 2008
Revegetation - 5-gallon containerized plants	per plant	N/A	$75	N/A	UDOT [b] 2008
Revegetation - 2-inch caliper trees	per plant	N/A	$250	N/A	UDOT [b] 2008
Slope flattening or terracing	square yard	N/A	$5	N/A	UDOT [b] 2008
Vegetated soil lifts	linear foot	N/A	$45	N/A	DPU [c] (2009)
Vegetated rock revetment	linear foot	N/A	$65	N/A	DPU [c] (2009)
Stream cleanup	per event	$125	$250	$500	BIO-WEST (2009)
Mechanized trash removal	per event	$500	$3,000	$7,500	DPU [c] (2009)
Storm drain improvement (rock outlet and swale)	per outfall	$900	$1,800	$2,800	DPU [c] (2009)
Runoff management (vegetated rock-lined swale)	linear foot	N/A	$77	N/A	DPU [c] (2009)
Runoff management (grading)	cubic yard	N/A	$10	N/A	UDOT [b] 2008
Pre-fabricated bridge (30 to 45 feet long, 6 to 15 feet wide)	each	N/A	$70,000	N/A	supplier estimate, BIO-WEST (2009)
Open-bottom box culvert (12 feet wide or greater)	linear foot	N/A	$4,500	N/A	DPU [c] (2009)
Rock-lined tailwater pool	each	N/A	$20,000	N/A	DPU [c] (2009)
Rock step pool	each	N/A	$4,000	N/A	Schueler and Brown 2004
No-trespassing signage	each sign	N/A	$200	N/A	UDOT [b] 2008, BIO-WEST (2009)
Stream daylighting	linear foot	N/A	$200	N/A	Schueler and Brown 2004
Bank stabilization	linear foot	$35	$75	$110	DPU [c], BIO-WEST (2009)
Grade control (1 vortex rock weir every 100 linear feet)	each	N/A	$2,100	N/A	Schueler and Brown 2004
Floodplain re-establishment	cubic yard	N/A	$10	N/A	UDOT [b] 2008
Access control (split rail fence)	linear foot	N/A	$10	N/A	supplier estimate, BIO-WEST (2009)
Access trail stabilization (steps)	linear foot	N/A	$50	N/A	BIO-WEST (2009)

[a] See Table 4.6 and text above for more details.
[b] Utah Department of Transportation.
[c] Salt Lake City Department of Public Utilities.

Storm Drain Improvement

The Table 4.6 unit costs for "outlet protection using vegetated rock" and "vegetated rock-lined swale" were used to calculate approximate per-outfall costs for low, moderate, and high-cost storm drain improvements. For each outfall, the relevant per-outfall cost was assigned based on the assessed size and condition of the outfall. A low-cost

outfall improvement includes 10 linear feet of swale and 1.25 square yards of vegetated rock outlet protection; a moderate-cost improvement includes 20 linear feet of swale and 2.5 square yards of vegetated rock outlet protection; a high-cost outlet improvement includes about 30 linear feet of swale and 5 square yards of vegetated rock outlet protection.

Pre-fabricated Bridge

The materials-only cost for either a railroad flatcar (89 feet long x 8.5 feet wide) or pre-fabricated pedestrian truss bridge (30 feet long x 6 feet wide) is about $23,000; this value was multiplied by three to provide an approximate order-of-magnitude estimate for materials and installation of this type of bridge. This value ($70,000/bridge) also includes removal of the old culvert, fill dirt excavation, and needed channel and bank work associated with bridge installation.

Open-bottom Box Culvert

Based on price estimates from suppliers, the materials-only cost for a 12-foot by 6-foot box culvert is about $625/linear foot. However, based on the experience of DPU engineering staff with a 2009 culvert replacement project on Emigration Creek, material costs tend to be a relatively minor proportion of the total project cost relative to installation costs. Installation costs at most crossings will be very high due to the depth of the existing culvert pipes; amount of fill material; challenging access conditions; and constraints associated with existing sewer lines, storm drain pipes, water lines, and other infrastructure. Therefore, based on input from DPU, a materials and installation unit cost of $4,500/linear foot was used for culvert replacement cost estimates (Table D1).

Rock-lined Tailwater Pool

The Table 4.6 per-cubic-yard costs for "rock-lined tailwater pool" and "vegetated rock revetment" were used to calculate an approximate per-pool cost for this improvement measure. The Table D1 value of $20,000 per pool assumes installation of 60 linear feet of vegetated rock revetment and about 170 cubic yards of excavation and rock installation (adequate for a rock-lined tailwater pool approximately 30 feet long and wide). For culvert outlets assessed as having particularly high outlet velocities and scour/erosion problems, one to two additional rock step-pools at $4,000/step-pool (Table 4.6) were included in the culvert outlet protection cost estimate for the reach.

Bank Stabilization

Bank stabilization projects should be implemented at a reach-scale and require site-specific design and engineering to select the most appropriate combination of techniques. Selection of specific techniques is beyond the scope of this study; therefore, some general assumptions were used to generate the cost estimates provided in Table D1. For reaches identified as having relatively minor stability problems that do not threaten infrastructure, a "low" unit cost value of $35/linear foot was used, and it was assumed that 10% of the total bank length (left plus right banks) would require stabilization measures. The $35/linear foot value is in the cost range for "softer" stabilization techniques such as soil lifts or slope terracing. For reaches assessed as having moderate stability problems that would likely require incorporation of "harder" techniques such as toe protection, a "moderate" unit cost value of $75/linear foot was used, and it was assumed that 25% of the total bank length would require stabilization measures. For reaches where infrastructure is threatened by bank erosion and stability is compromised by high-velocity urban storm flows, a "high" unit cost value of $110/linear foot applied to half of the total bank length was used. This value is in the cost range for techniques such as vegetated gabion basket or modular block retaining walls (Table 4.6).

Cost Estimates by Reach

The following tables (D2–D12) provide approximate cost information for each study reach. As discussed above, the cost values provided in this appendix include materials and initial installation but do not include site-specific design, engineering, permitting, monitoring, or maintenance costs. Maintenance and monitoring costs can be significant, particularly for projects involving invasive species control and revegetation (see Table 4.8). The tables below provide costs for each type of improvement measure and are also totaled for each reach. For reaches where replacement of stream crossing culverts is recommended, total costs are provided with and without the culvert replacement costs included.

Table D2. Estimated approximate costs for Reach URB_R09 (upper Red Butte Garden).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Invasive plant removal	6.41	acres	$4,480
Removal of concrete/asphalt on bank	1	event (moderate cost)	$3,000
Biotechnical slope stabilization (terracing)	200	square yards	$1,000
Biotechnical slope stabilization (rock revetment)	40	linear feet	$2,600
Revegetation of low bank at picnic area	20	1-gallon plants	$240
		TOTAL	$11,320

Table D3. Estimated approximate costs for Reach LRB_R01 (lower Red Butte Garden).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Stream cleanup	1	event (low cost)	$125
Monitor/protect riparian corridor	N/A	N/A	N/A
		TOTAL	$125

Table D4. Estimated approximate costs for Reach LRB_R02 (below Red Butte Garden).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Access control (fence)	450	linear feet	$4,500
Access trail stabilization (steps)	30	linear feet	$1,500
Revegetation - understory layer (seed)	0.96	acre	$2,880
Revegetation - understory layer (erosion control blanket)	300	square yards	$900
Revegetation - shrub layer	140	1-gallon plants	$1,680
Bank and slope stabilization	450	linear feet	$49,500
Mechanized trash removal (concrete pieces)	1	event (low cost)	$500
Stream cleanup	1	event (low cost)	$125
Invasive plant removal/control	0.28	acre	$170
Culvert replacement with bridge (trail crossing)	1	pre-fabricated bridge	$70,000
		TOTAL (with culvert replacement)	$131,755
		TOTAL (no culvert replacement)	$61,755

Table D5. Estimated approximate costs for Reach LRB_R03 (University - above Chipeta Way).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Invasive plant removal	2.86	acres	$1,720
Removal/improvements to gravel bank area (seed)	0.02	acre	$60
Removal/improvements to gravel bank area (erosion control blanket)	80	square yards	$240
Revegetation - canopy layer	7	trees	$1,750
Removal/improvements to concrete brick wall	1	event (high cost)	$7,500
Bank stabilization	520	linear feet	$39,000
Grade control	10	vortex rock weirs	$21,000
Culvert replacement/improvement (Chipeta Way)	108	linear feet	see Table D6
Avoid placing yard waste on banks	N/A	N/A	N/A
Establish "no mow" buffer at edge of turf	N/A	N/A	N/A
		TOTAL	$71,270

Table D6. Estimated approximate costs for Reach LRB_R04A (University - below Chipeta Way).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Stream cleanup	1	event (high cost)	$500
Mechanized trash removal	1	event (high cost)	$7,500
Storm drain improvement	1	outfall	$1,800
Culvert replacement with open box (Chipeta Way crossing)	108	linear feet	$486,000
Revegetation to increase total forested width	40	trees	$10,000
Invasive plant removal	0.74	acres	$560
Bank stabilization	480	linear feet	$36,000
Grade control	9	vortex rock weirs	$18,900
		TOTAL (with culvert replacement)	$561,260
		TOTAL (no culvert replacement)	$75,260

Table D7. Estimated approximate costs for Reach LRB_R04B (University -near tennis courts).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Storm drain improvement	3	outfalls	$6,400
Culvert replacement with open box (crossing near tennis courts) [a]	90	linear feet	$405,000
Revegetation - understory (seed)	0.17	acre	$510
Revegetation - understory (erosion control blanket)	790	square yards	$2,370
Bank and slope stabilization	300	linear feet	$22,500
Grade control	6	vortex rock weirs	$12,600
		TOTAL (with culvert replacement)	$449,380
		TOTAL (no culvert replacement)	$44,380

[a] Complete removal of culvert recommended if possible.

Table D8. Estimated approximate costs for Reach LRB_R04C (University - above Foothill Drive).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Restoration of native understory plants (seed)	1.0	acre	$3,000
Invasive plant removal	1.98	acres	$1,780
Mechanized trash removal	1	event (moderate cost)	$3,000
Stream cleanup	1	event (moderate cost)	$250
Revegetation - canopy layer	50	trees	$12,500
Storm drain improvement	2	outfalls	$4,600
Culvert replacement with open box (crossing near Marriot) [a]	72	linear feet	$324,000
Biotechnical slope stabilization (terracing)	40	square yards	$200
Biotechnical slope stabilization (erosion control blanket)	40	square yards	$120
Bank stabilization	650	linear feet	$48,750
Grade control	13	vortex rock weirs	$27,300
		TOTAL (with culvert replacement)	$425,500
		TOTAL (no culvert replacement)	$101,500

[a] Complete removal of culvert recommended if possible.

Table D9. Estimated approximate costs for Reach LRB_R05A (VA Medical Center - below Foothill Drive).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Invasive plant removal	1.04	acres	$3,120
Revegetation - shrub layer	170	1-gallon plants	$2,040
Stream cleanup	1	event (low cost)	$125
Mechanized trash/obsolete concrete structure removal	1	event (high cost)	$7,500
Replace obsolete concrete structure	1	step-pool	$4,000
Bank stabilization	430	linear feet	$47,300
Grade control	4	vortex rock weirs	$8,400
Culvert replacement with open box (Foothill Drive crossing)	192	linear feet	$864,000
Culvert outlet protection (no replacement)	1	rock-lined tailwater pool plus 1 step-pool	$24,000
		TOTAL (with culvert replacement)	$936,485
		TOTAL (culvert outlet protection only)	$96,485

Table D10. Estimated approximate costs for Reach LRB_R05B (VA Medical Center - above Sunnyside Park).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Storm drain improvement	3	outfalls	$3,600
Revegetation - shrub layer	220	1-gallon plants	$2,640
Revegetation - understory (seed)	0.43	acre	$1,290
Revegetation - understory (erosion control blanket)	720	square yards	$2,160
Invasive plant removal	1.72	acres	$1,100
Bank stabilization	540	linear feet	$40,500
Grade control	11	vortex rock weirs	$23,100
Biotechnical slope stabilization (soil lifts)	30	linear feet	$1,350
Removal of clogged arch culvert (crossing within VA complex)	1	removal	$7,500
Culvert replacement with open box (Hall Street crossing)	128	linear feet	$576,000
Culvert outlet protection (no replacement)	1	rock-lined tailwater pool	$20,000
		TOTAL (with Hall Street culvert replacement)	$659,240
		TOTAL (Hall Street culvert outlet protection only)	$103,240

Table D11. Estimated approximate costs for Reach LRB_R05C (Sunnyside Park).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Scour protection at diversion weir	1	rock-lined tailwater pool	$20,000
Revegetation - understory (seed)	1.10	acres	$3,300
Revegetation - understory (erosion control blanket)	850	square yards	$2,550
Restoration of native understory plants (seed)	0.66	acres	$1,980
Access trail stabilization (steps)	40	linear feet	$2,000
Access control (fence)	200	linear feet	$2,000
Invasive plant removal	2.55	acres	$1,910
Remove broken trash grate	1	event (high cost)	$7,500
Establish/maintain "no mow" buffer at edge of turf	N/A	N/A	N/A
Bank stabilization	440	linear feet	$33,000
Grade control	9	vortex rock weirs	$18,900
Culvert replacement with open box (Sunnyside Avenue crossing)	180	linear feet	$810,000
		TOTAL (with culvert replacement)	$903,140
		TOTAL (no culvert replacement)	$93,140

Table D12. Estimated approximate costs for Reach LRB_R07 (Miller Park/Bonneville Glen).

IMPROVEMENT MEASURE	QUANTITY	UNIT	APPROXIMATE COST
Invasive plant removal	5.07	acres	$4,563
Restoration of native understory plants (seed)	5.07	acres	$15,210
Restoration of native understory plants (erosion control blanket)	1,390	square yards	$4,170
Revegetation - shrub layer	250	1-gallon plants	$3,000
Access control (fence)	4,170	linear feet	$41,700
Access trail stabilization (steps)	150	linear feet	$7,500
Bank stabilization	2,084	linear feet	$229,240
Grade control	20	vortex rock weirs	$42,000
Mechanized trash removal	1	event (low cost)	$500
Remove partial rock wall	1	event (moderate cost)	$3,000
Culvert replacement with open-bottom box (900 South crossing)	210	linear feet	$945,000
Culvert outlet protection (900 South crossing)	1	rock-lined tailwater pool plus 1 step-pool	$24,000
Culvert replacement with open-bottom box (1500 East crossing) [a]	400	linear feet	$1,800,000
		TOTAL (with replacement of culverts)	$3,095,883
		TOTAL (culvert outlet protection only)	$374,883

[a] Culvert length and cost would be reduced if it were possible to daylight part of existing culvert.

Cost Summaries

Total costs for each reach are summarized in Table D13. Table D14 provides a summary of stream crossing culvert replacement costs and priorities for the Red Butte Creek corridor.

Table D13. Summary of estimated approximate costs for improvement measures by reach.

REACH NUMBER	REACH DESCRIPTION	REACH LENGTH (feet)	APPROXIMATE COST ESTIMATE FOR INITIAL IMPLEMENTATION OF IMPROVEMENT MEASURES [a]	
			With Culvert Replacement and/or Daylighting	Without Culvert Replacement and/or Daylighting [b]
URB_R09	Upper Red Butte Garden	2,297	N/A	$11,320
URB_R10	Middle Red Butte Garden	827	reach not fully assessed	reach not fully assessed
LRB_R01	Lower Red Butte Garden	281	N/A	$125
LRB_R02	University - Below Red Butte Garden	451	$131,755	$61,755
LRB_R03	University - Above Chipeta Way	1,041	N/A	$71,270
LRB_R04A	University - Below Chipeta Way	961	$561,260	$75,260
LRB_R04B	University - Near Tennis Courts	595	$449,380	$44,380
LRB_R04C	University - Above Foothill Drive	1,294	$425,500	$101,500
LRB_R05A	VA Medical Center - Below Foothill Drive	433	$936,485	$96,485
LRB_R05B	VA Medical Center - Above Sunnyside Park	1,081	$659,240	$103,240
LRB_R05C	Sunnyside Park	887	$903,140	$93,140
LRB_R06	Sunnyside Avenue to 900 South	492	reach not fully assessed	reach not fully assessed
LRB_R07	Miller Park/ Bonneville Glen	2,084	$3,095,883	$374,883
LRB_R08	Below 1500 East	1,059	reach not assessed	reach not assessed
LRB_R09	Above 1300 E ast	633	reach not fully assessed	reach not fully assessed
LRB_R10	1300 East to 1100 East	1,449	reach not fully assessed	reach not fully assessed
LRB_R11	Below 1100 East	301	reach not fully assessed	reach not fully assessed
	TOTAL FOR RED BUTTE CREEK CORRIDOR		$7,162,643	$1,033,358

[a] Estimated cost values include materials and installation but do not include site-specific design, engineering, permitting, monitoring, or maintenance costs.

[b] If culvert outlets are protected but culverts are not removed or replaced with wider-span/open-bottom structures, stream stability is expected to improve but the additional benefits associated with replacement (improved connectivity, habitat, conveyance, reduced risk of clogging, etc.) will not be gained.

Table D14. Relative priorities and estimated costs for stream crossing culvert replacement/improvement projects in the Red Butte Creek riparian corridor.

CROSSING LOCATION/ DESCRIPTION	REACH NUMBER(S)	CULVERT LENGTH (feet)	RELATIVE PRIORITY FOR REPLACEMENT/ IMPROVEMENT	TYPE OF REPLACEMENT STRUCTURE	ESTIMATED REPLACEMENT COST [a]	PRIMARY BENEFITS OF REPLACEMENT	ALTERNATIVE TYPE OF IMPROVEMENT	ESTIMATED COST FOR ALTERNATIVE MEASURE [a]	PRIMARY BENEFITS OF ALTERNATIVE MEASURE	POTENTIAL TO DAYLIGHT/ REDUCE LENGTH OF CULVERT
Trail at south end of Red Butte Garden	between LRB_R01 and LRB_R02	50	low	full-span pre-fabricated bridge	$70,000	improved connectivity; reduced risk of clogging	N/A	N/A	N/A	no
Chipeta Way	between LRB_R03 and LRB_R04A	108	low	bridge or open-bottom box culvert	$486,000	improved connectivity, habitat, conveyance; reduced risk of clogging/ flooding/ structure failure	N/A	N/A	N/A	no
Crossing near tennis courts	between LRB_R04A and LRB_R04B	90	medium	bridge or open-bottom box culvert	$405,000	improved connectivity, habitat, conveyance; reduced risk of clogging/ flooding/ structure failure	remove [b]	$50,000	improved connectivity, habitat, conveyance; reduced risk of clogging/ flooding/ structure failure	maybe - crossing not part of trail or road network
Crossing near Marriot	between LRB_R04B and LRB_R04C	72	medium	bridge or open-bottom box culvert	$324,000	improved connectivity, habitat, conveyance; reduced risk of clogging/ flooding/ structure failure	remove [b]	$35,000	improved connectivity, habitat, conveyance; reduced risk of clogging/ flooding/ structure failure	maybe - crossing not part of trail or road network
Foothill Drive	between LRB_R04C and LRB_R05A	192	high	open-bottom box culvert	$864,000	improved connectivity, habitat, stream stability, conveyance	install outlet protection	$24,000	improved stream stability	no
Hall Street	between LRB_R05A and LRB_R05B	128	medium	bridge or open-bottom box culvert	$576,000	improved connectivity, habitat, stream stability, conveyance	install outlet protection	$20,000	improved stream stability	no

Table D14. Relative priorities and estimated costs for stream crossing culvert replacement/improvement projects in the Red Butte Creek riparian corridor (cont.).

CROSSING LOCATION/ DESCRIPTION	REACH NUMBER(S)	CULVERT LENGTH (feet)	RELATIVE PRIORITY FOR REPLACEMENT/ IMPROVEMENT	TYPE OF REPLACEMENT STRUCTURE	ESTIMATED REPLACEMENT COST [a]	PRIMARY BENEFITS OF REPLACEMENT	ALTERNATIVE TYPE OF IMPROVEMENT	ESTIMATED COST FOR ALTERNATIVE MEASURE [a]	PRIMARY BENEFITS OF ALTERNATIVE MEASURE	POTENTIAL TO DAYLIGHT/ REDUCE LENGTH OF CULVERT
Crossing within VA Medical Center complex	near downstream end of LRB_R05B	20	high	bridge or open-bottom box culvert	$90,000	improved connectivity, habitat, conveyance; reduced risk of clogging/ flooding/ structure failure	remove [b]	$7,500	improved connectivity, habitat, conveyance; reduced risk of clogging/ flooding/ structure failure	maybe - crossing not part of trail or road network
Sunnyside Avenue	between LRB_R05C and LRB_R06	180	low [c]	open-bottom box culvert	$810,000	improved connectivity, habitat, conveyance	N/A	unknown - outlet condition not assessed	unknown - outlet condition not assessed	no
900 South	between LRB_R06 and LRB_R07	210	medium-high [d]	open-bottom box culvert	$945,000	improved connectivity, habitat, stream stability, conveyance	install outlet protection	$24,000	improved stream stability	maybe (downstream side) - currently developed trailhead area
Trail in Miller Park	middle of LRB_R07	16	no improvements needed	N/A	N/A	N/A	N/A	N/A	N/A	no
1500 East	between LRB_R07 and LRB_R08	400	low [c]	open-bottom box culvert	$1,800,000	improved connectivity, habitat, conveyance	install outlet protection	unknown - outlet condition not assessed	unknown - outlet condition not assessed	maybe (upstream side) - currently parking area
1300 East	between LRB_R09 and LRB_R10	260	unknown [c / d]	open-bottom box culvert	$1,170,000	unknown - inlet/ outlet not assessed	install outlet protection	unknown - outlet condition not assessed	unknown - outlet condition not assessed	no
1100 East	between LRB_R10 and LRB_R11	90	no improvements recommended	N/A	N/A	N/A	N/A	N/A	N/A	no
				TOTAL	$7,540,000					

[a] Estimated cost values include materials and installation but do not include site-specific design, engineering, permitting, monitoring, or maintenance costs.
[b] Removal recommended instead of culvert replacement, if possible.
[c] Outlet condition not assessed.
[d] Inlet condition not assessed.