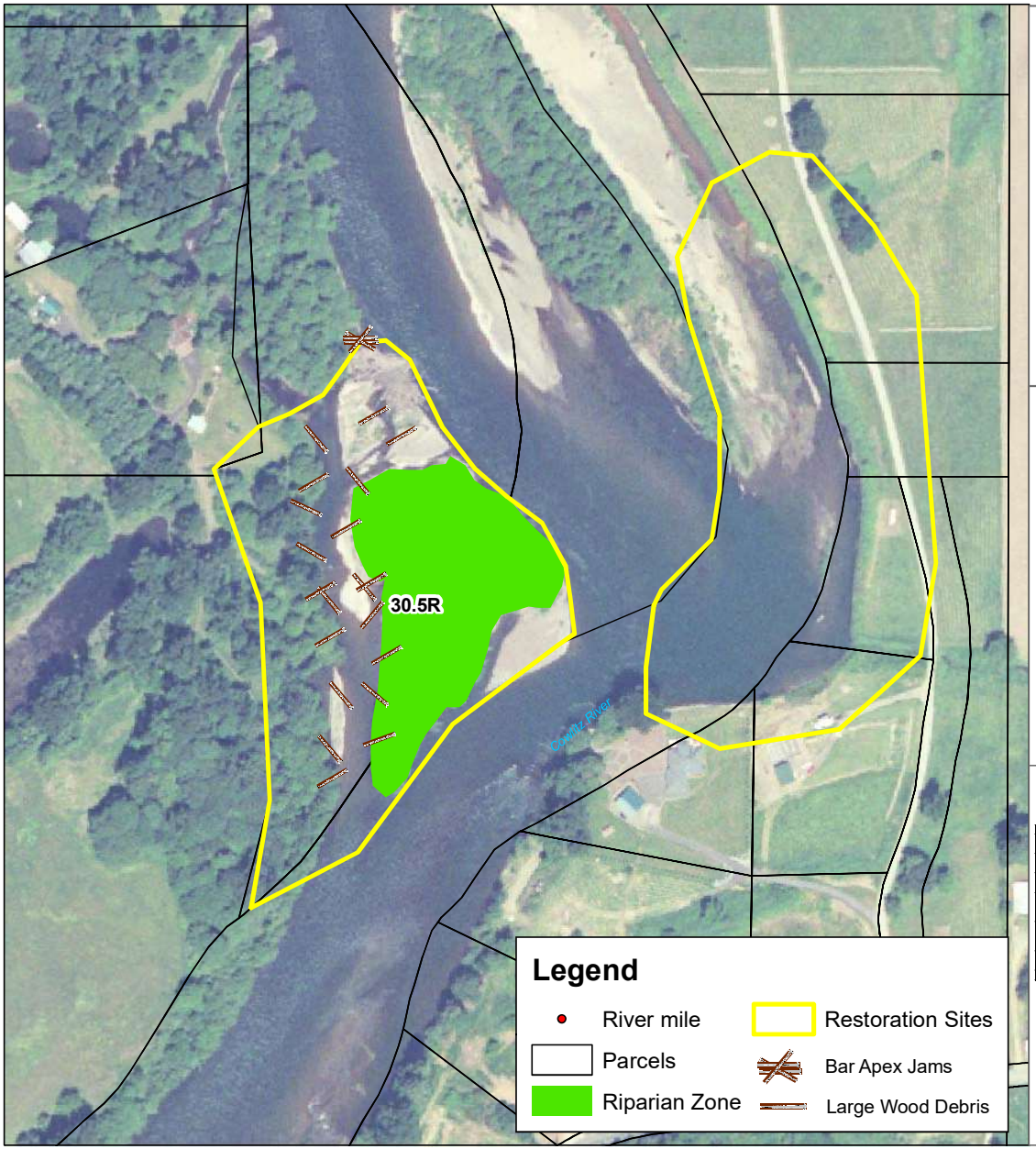


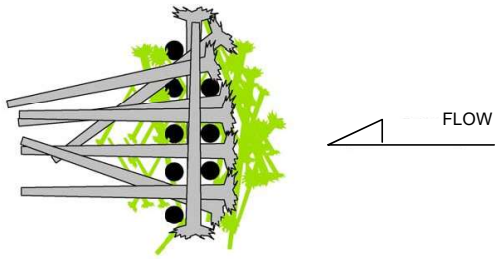
NOTES/ DESCRIPTION

1. CONSTRUCT BAR APEX JAM ENHANCEMENT AT HEAD OF BAR (ISLAND) TO PROMOTE FLOW THROUGH SIDE CHANNEL & DEVELOPMENT OF SCOUR HOLE FOR FISH ACCESS.

2. PLACE LWD ALONG SIDE CHANNEL & ON BAR.

3. PLANT RIPARIAN AREA ALONG BAR.

DETAIL #1 BAR APEX JAM



COST SUMMARY

Lower Cowlitz Restoration Project Site 30.5R

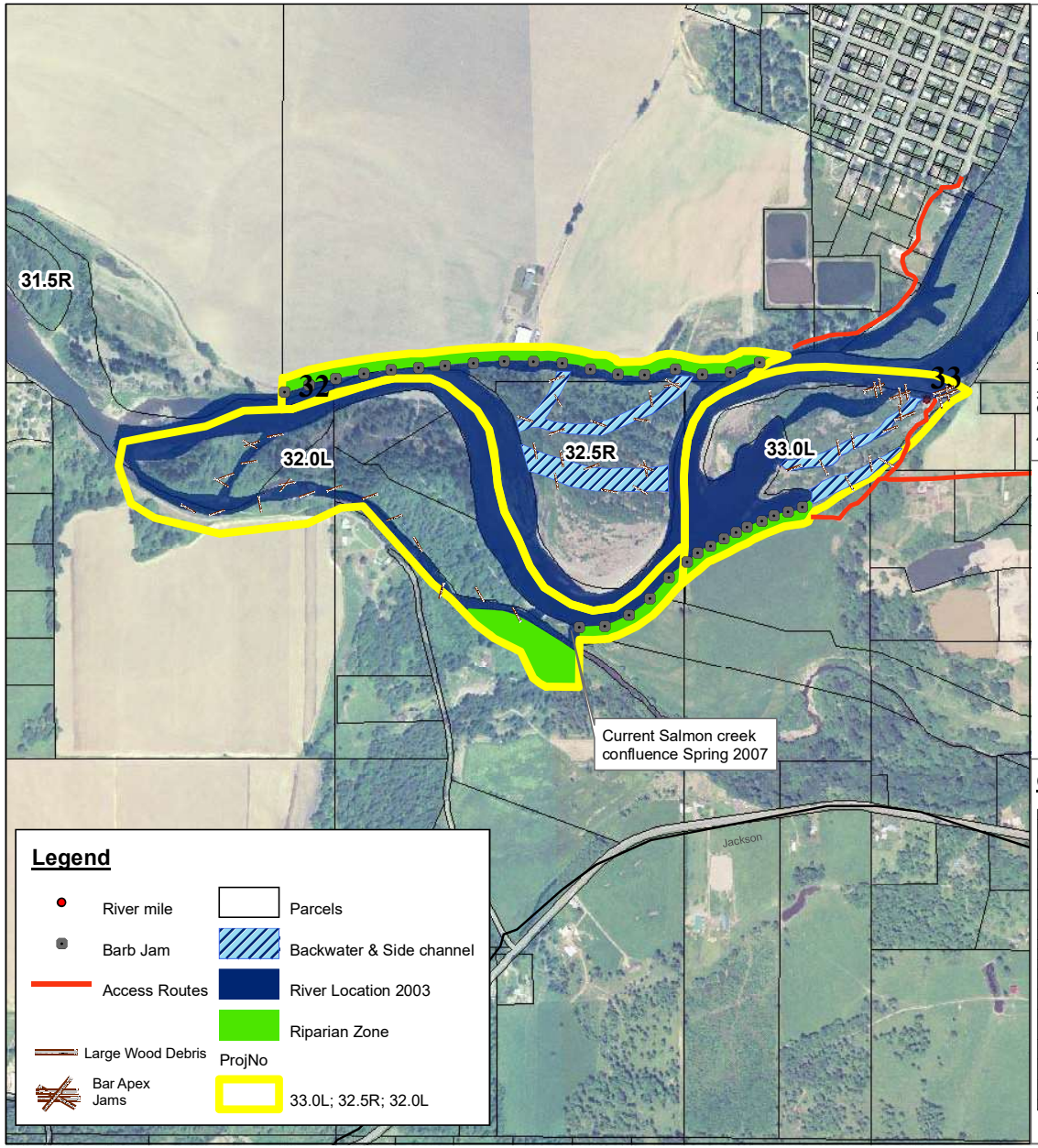
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	$ 1,250	8	$ 10,000	Assume WDNR land easement
2	Site prep, mob/demob, access road improvements	LS	$ 10,000	1	$ 10,000	
3	Side channel and backwater excavation areas to 5ft deep	CY	$ 3.09	2,300	$ 7,107	Major side channel and backwater excavations to reconnect Springer Channel
4	Construct bar apex jams near head of side channel	EA	$ 50,000	1	$ 50,000	Assume medium size bar apex jam construction using pile drivers and tracked log loader
5	Place large woody debris every 50'-200' along pond shoreline and side channel areas	EA	$ 2,000	20	$ 40,000	Place large wood debris using log loader from land based operations.
6	Riparian vegetation plantings	AC	$ 10,000	3	$ 30,000	Plant along construction access areas after project completion
	Total				$ 147,107	

TETRA TECH

FIGURE 43. CONCEPT DESIGN
SITE 30.5R

N

400 Feet
400 200 0



NOTES/ DESCRIPTION

32.0 L

1. WORK W/LANDOWNERS TO ACQUIRE CHANNEL MIGRATION ZONE EASEMENTS ALONG LEFT SIDE COWLITZ (LOOKING DOWNSTREAM) NEAR SALMON CREEK CONFLUENCE

2. CONSTRUCT BARB JAMS EVERY 100' ALONG LEFT BANK. REMOVE RIP RAP AND CAR BODIES

3. PLANT 100' RIPARIAN BUFFER

4. INTEGRATE PROJECT W/ 32.5R AND 33.0L WORK

5. SELECTIVE LWD PLACEMENT (ANCHORED) IN SIDE CHANNELS AND DOWNSTREAM SALMON CREEK AREA.

32.5 R

1. CONSTRUCT BARB JAMS EVERY 250' (APPROXIMATELY) TO PROTECT FROM BANK EROSION, ALONG RIGHT BANK OF WALLACE CHANNEL.

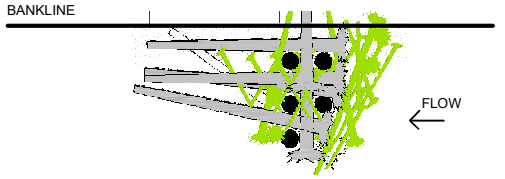
2. PLANT 100' RIPARIAN BUFFER ALONG RIGHT BANK OF WALLACE CHANNEL

3. EXCAVATE OVERFLOW CHANNELS ALONG ISLAND ADJACENT TO WALLACE CHANNEL. PLACE ANCHORED LWD ALONG EDGES OF OVERFLOW CHANNELS.

4. SELECTIVE PLACEMENT OF (ANCHORED) LWD IN OVERFLOW SIDE CHANNELS ON ISLAND.

DETAIL #1

BARB JAM WITH PILE ANCHORS DETAIL



COST SUMMARY

Lower Cowlitz Restoration Project Site 32.0L

Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	$5,000 - $10,000	70	$ 315,000	Assumed 1/3 acquisition ($10k/Acre), 1/3 conservation easement ($5k/Acre), 1/3 donation
2	Site prep, mob/demob, access road improvements	LS	$ 20,000	1	$ 20,000	
3	Place large wood debris	EA	$ 2,500	50	$ 125,000	Assume placement of 50ft pieces of LWD by helicopter along side channels
4	Install barb log jams along left bank	EA	$ 10,000	10	$ 100,000	Assume medium size barb jam every 100ft construction using pile drivers and tracked log loader
5	Riparian vegetation plantings	AC	$ 10,000	6	$ 60,000	Plant 100ft riparian buffer in denuded areas along river and creek banklines
Total					$ 620,000	

Lower Cowlitz Restoration Project Site 32.5R

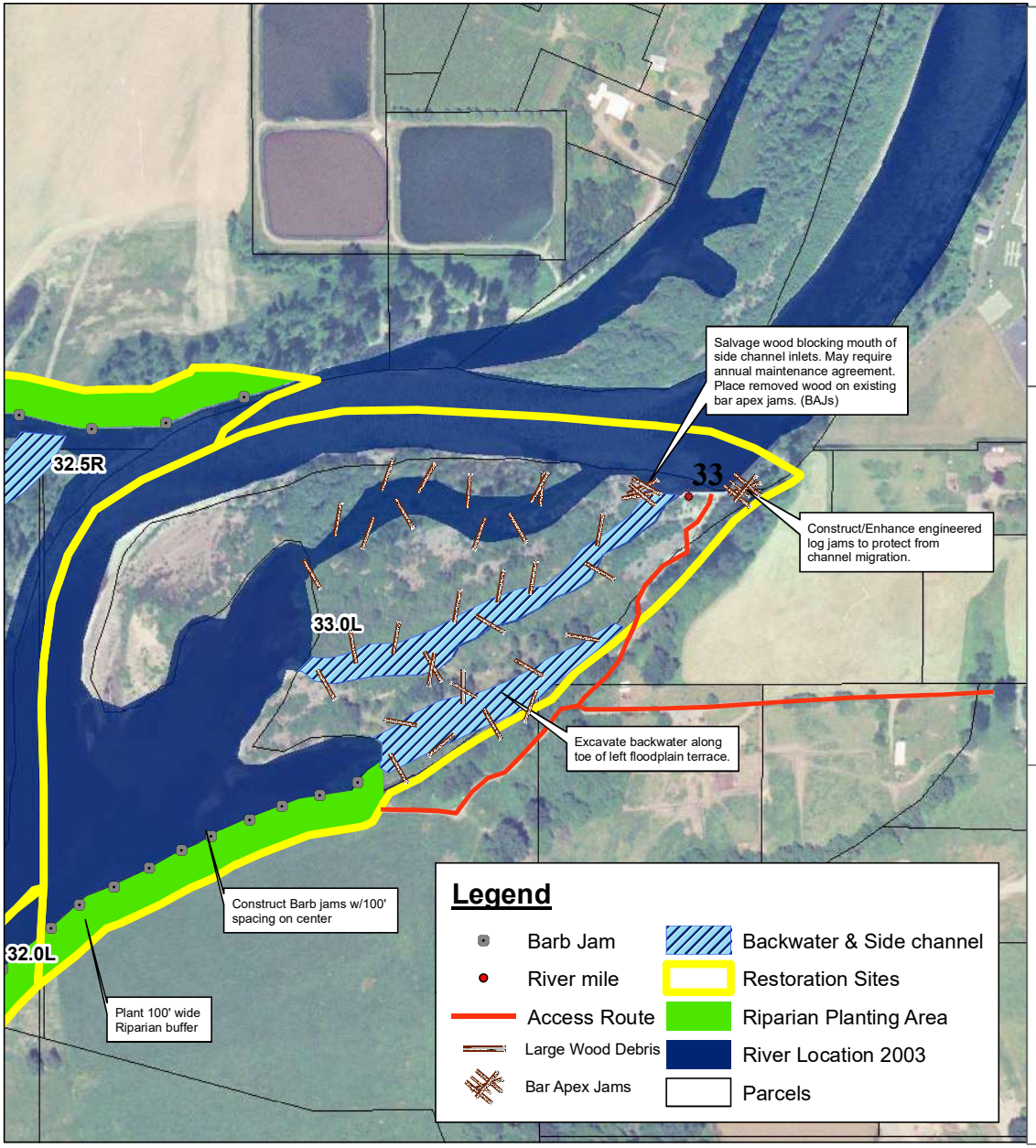
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	$5,000 - $10,000	7	$ 70,000	Assume 7 acres acquisition or easement purchase along north bankline area
2	Site prep, mob/demob, access road improvements	LS	$ 20,000	1	$ 20,000	
3	Install barb log jams along left bank	EA	$ 10,000	36	$ 360,000	Assume medium size barb jam construction every 100ft using pile drivers and tracked log loader
4	Place large wood debris	EA	$ 2,500	100	$ 250,000	Assume placement of 50ft pieces of LWD by helicopter along side channels
5	Excavate breaches, side channels and backwater areas on island	CY	$ 3.09	10,000	$ 30,900	Assume construction using pile drivers and tracked log loader
6	Riparian vegetation plantings	AC	$ 10,000	7	$ 70,000	Plant 100ft riparian buffer in denuded areas along river and creek banklines
Total					$ 800,900	

TETRA TECH

FIGURE 44. CONCEPT DESIGNS, SITES 32.0L, 32.5R, & 33.0L

N

800 400 0 800 Feet



NOTES/ DESCRIPTION

1. ACQUIRE/NEGOTIATE CONSTRUCTION AND MAINTENANCE ACCESS EASMENT WITH PROPERTY OWNERS.

2. CONSTRUCT ELJs AND EXISTING JAMS AT HEAD OF ISLANDS AND SIDE CHANNEL ON LEFT SIDE OF RIVER.

3. EXCAVATE BACKWATER AREA ALONG TOE OF FLOODPLAIN.

4. EXCAVATE AND RECONNECT MIDDLE SIDE CHANNEL.

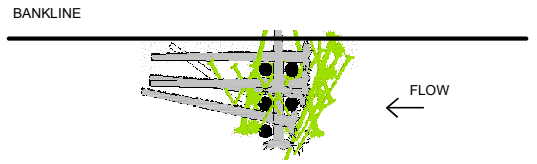
5. PLACE AND ANCHOR LARGE WOOD DEBRIS EVERY 50' TO 100' IN SIDE CHANNELS AND BACKWATER AREAS.

6. CONSTRUCT BARB JAMS ALONG LEFT BANK.

8. PLANT 100' WIDE RIPARIAN BUFFER.

DETAIL #1

BARB JAM WITH PILE ANCHORS DETAIL



COST SUMMARY

Lower Cowlitz Restoration Project Site 33.0L

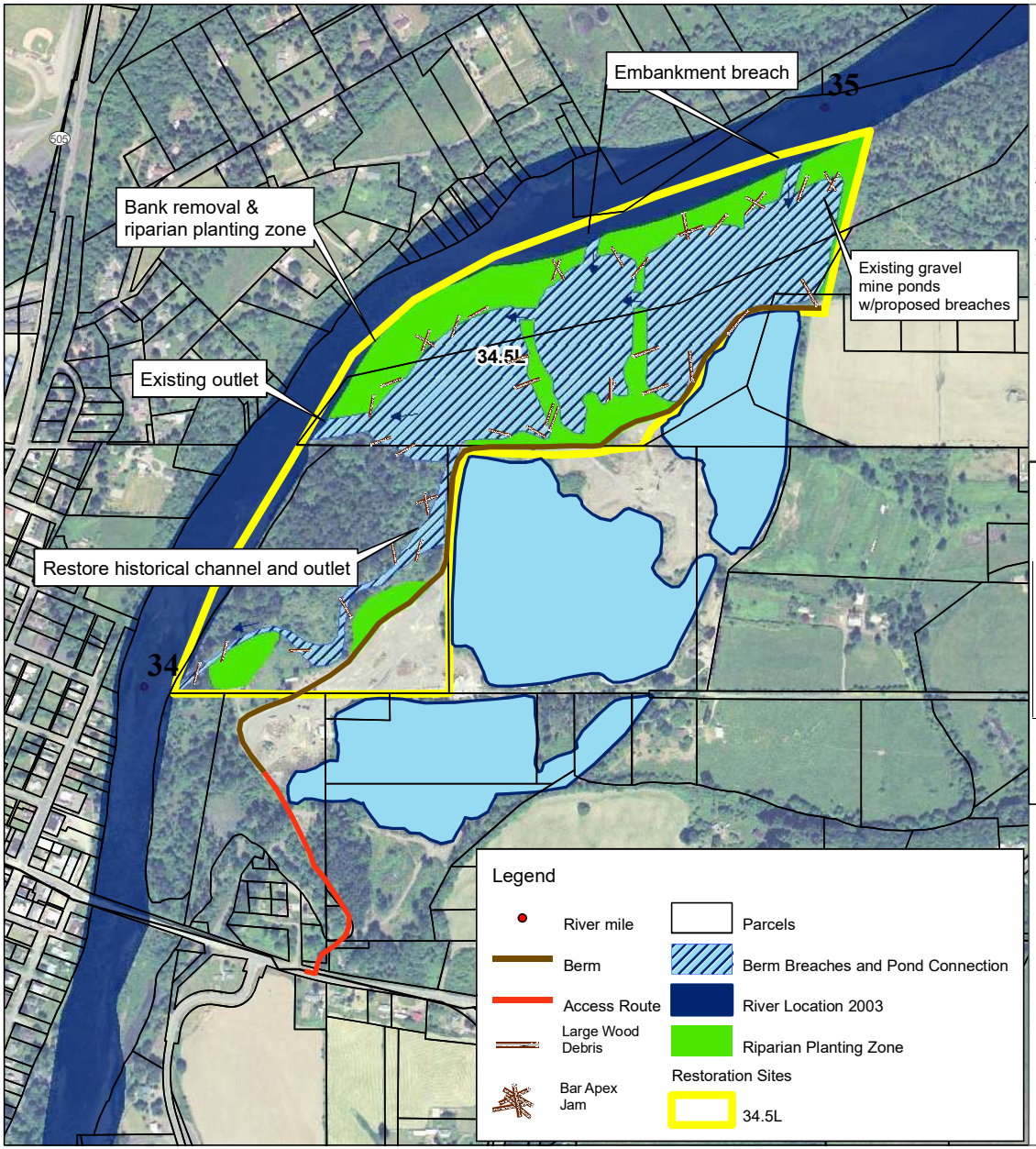
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	$5,000 - $10,000	2.3	$ 201,500	Assume 2.3 acre conservation easement ($5k/acre) along bankline and 19 acre acquisition ($10k/acre) along side channel and backwater areas.
2	Site prep, mob/demob, access road improvements	LS	$ 20,000	1	$ 20,000	
3	Install barb log jams along left bank and upstream areas at head of island and side channels	EA	$ 10,000	13	$ 130,000	Assume medium size barb jam construction every 100ft using pile drivers and tracked log loader
4	Place large wood debris	EA	$ 2,500	50	$ 125,000	Assume placement of 50ft pieces of LWD by helicopter along side channels
5	Excavate breaches, side channels and backwater areas on island	CY	$ 3.09	25,000	$ 77,250	Excavating channels 2.5 to 5.0 ft deep along length shown on plan
6	Riparian vegetation plantings	AC	$ 10,000	2.3	$ 23,000	Plant 100ft riparian buffer in denuded areas along river and creek banklines
	Total				$ 576,750	

TETRA TECH

FIGURE 45. CONCEPT DESIGN SITE 33.0L

N

300 Feet 0 150 300



NOTES/ DESCRIPTION

34.5L

1. EXCAVATE BREACHES (2) IN EXISTING HIGH BANK TO PROVIDE FLOW ACCESS TO GRAVEL MINE PONDS DURING ORDINARY HIGH WATER.

2. LOWER PORTION OF BANK AND REGRADE MATERIAL ALONG SHORELINE AREAS OF GRAVEL MINE PONDS. PLANT NATIVE RIPARIAN VEGETATION.

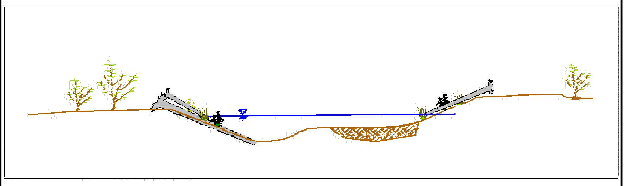
3. RECONNECT HISTORICAL OUTLET CHANNEL.

4. PLACE LARGE WOOD DEBRIS AS BOTH INDIVIDUAL PIECES AND CLUSTERS EVERY 50' - 200' ALONG POND SHORELINE AND STREAM CHANNEL AREAS.

5. CONSTRUCT BERM TO PROTECT (3) GRAVEL MINE PONDS TO SOUTH AND EAST

DETAIL #1

POND/SHORELINE DETAIL



COST SUMMARY

Lower Cowlitz Restoration Project Site 34.5L

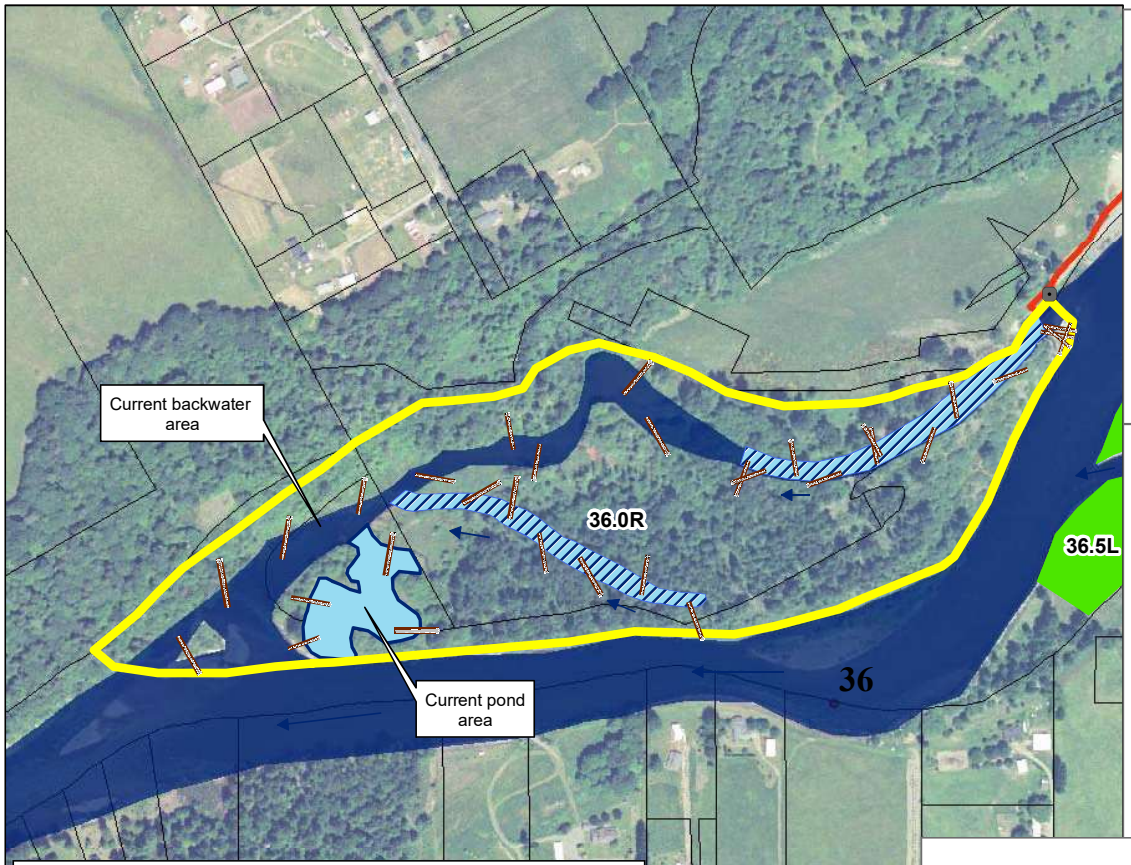
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	$5,000 - $10,000	90	$ 450,000	Assume 90 acre conservation easement ($5k/acre)
2	Site prep, mob/demob, access road improvements	LS	$ 20,000	1	$ 20,000	
3	Breach levees and gravel mine pond berms to reconnect w/ river	CY	$ 1.65	7000	$ 11,550	Assume medium size barb jam construction every 100ft using pile drivers and tracked log loader
4	Remove upper 1/2 of bank and regrade materials into pond shoreline areas	CY	$ 6.08	50000	$ 304,000	Use levee removal materials either for shoreline regrading of ponds, or reconstruction of proposed protective levee
5	Construct protective berm for ponds to east and south	CY	$ 8.06	50000	$ 403,000	Levee construction unit costs account for placement of soil as compacted layers with variety of equipment
5	Place large woody debris every 50'-200' along pond shoreline and side channel areas	EA	$ 2,000	100	$ 200,000	Place large wood debris using log loader from land based operations.
6	Riparian vegetation plantings	AC	$ 10,000	21	$ 210,000	Plant denuded areas along levee removal, pond shorelines and creek banklines
	Total				$ 1,598,550	

TETRA TECH

FIGURE 46. CONCEPT DESIGN
SITE 34.5

N

600 300 0 600 Feet



Legend

- River mile
- Barb Jam
- Access Route
- Berm
- Large Wood Debris
- Bar Apex Jam
- Parcels
- Backwater & Side channel
- Riparian Zone
- Ponds
- River Location 2003

Restoration Sites

- 36.0R

NOTES/ DESCRIPTION

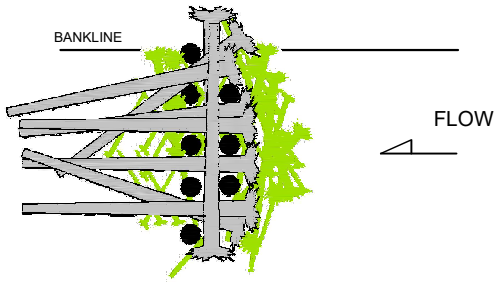
1. CONSTRUCT SEVERAL OVERFLOW SIDE CHANNELS ALONG BAR AREA. EXCAVATE APPROXIMATELY 5 FT DEEP, OR UNTIL THE GROUNDWATER TABLE, DURING SPRING AND SUMMER LOW FLOWS ARE REACHED. WORK DOWNSTREAM TO UPSTREAM AND BREACH AFTER LWD PLACEMENT AND ELJ CONSTRUCTION IS COMPLETE.

2. PLACE RANDOM, ANCHORED PIECES OF LARGE WOOD DEBRIS ALONG CURRENT BACKWATER AND POND AREAS, AS WELL AS ALONG NEW OVERFLOW SIDE CHANNEL AREAS.

3. CONSTRUCT (2) ENGINEERED LOG JAMS (ELJs) AT HEAD OF BAR. REMOVE WOOD DEBRIS FROM CURRENT JAM AND SALVAGE IN NEW ELJ CONSTRUCTION.

DETAIL #1

BARB JAM DETAIL



COST SUMMARY

Lower Cowlitz Restoration Project Site 36.0R

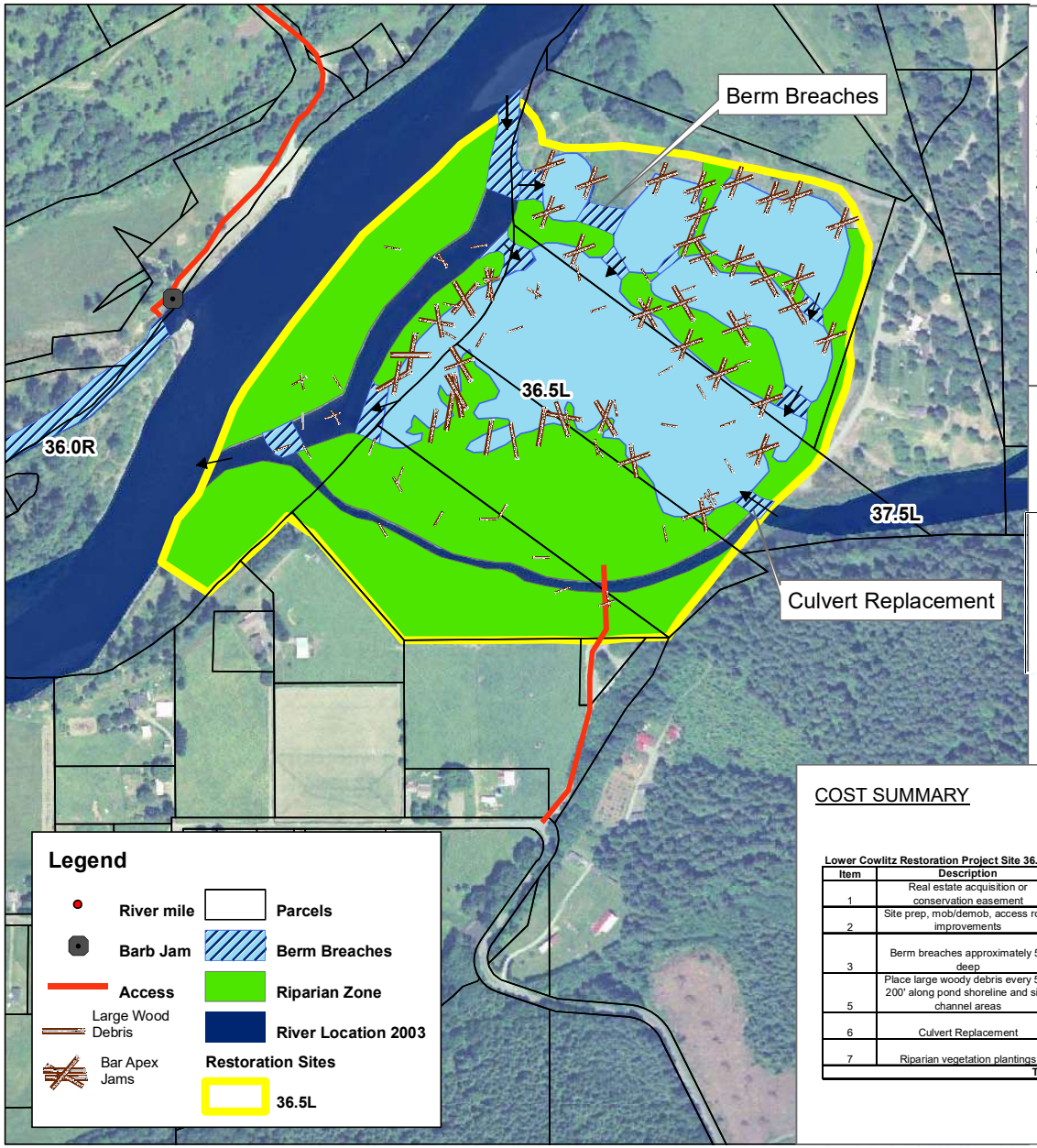
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Engineering Design, Permitting, Administration	EA	17%		$ 43,118	Engineering Design 12%, Permitting 2%, Administration 3%
2	Site prep, mob/demob, access road improvements	LS	$ 20,000	1	$ 20,000	
3	Excavate side channel and backwater approximately 5ft deep	CY	$ 3.09	28,685	$ 88,637	Assume medium size barb jam construction every 100ft using pile drivers and tracked log loader
4	Construct barb jam and bar apex jam at head of island	EA	$10,000 - $25,000	2	$ 35,000	Use levee removal materials either for shoreline regrading of ponds, or reconstruction of proposed protective levee
5	Place large woody debris every 50'-200' along pond shoreline and side channel areas	EA	$ 2,000	50	$ 100,000	Place large wood debris using log loader from land based operations.
6	Riparian vegetation plantings	AC	$ 10,000	1	$ 10,000	Plant along construction access areas after project completion
	Total				$ 296,755	

TETRA TECH

FIGURE 47. CONCEPT DESIGN SITE 36.0R

N

400 200 0 400 Feet

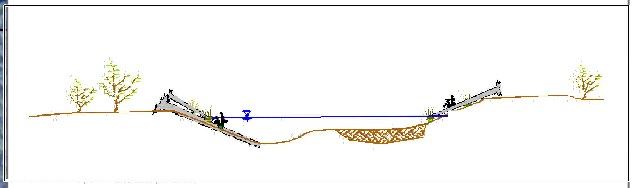


NOTES/ DESCRIPTION

1. BREACH BERM TO PROVIDE FLOW THROUGH TO PONDS
2. BREACH POND BERMS IN SEVERAL LOCATION TO CONNECT ALL PONDS
3. REGRADE AND PLANT REMAINING BERM AREAS AS RIPARIAN ISLANDS
4. CONNECT MAIN POND W/ 37.5R, NURSERY SIDE CHANNEL
5. PLANT RIPARIAN AREAS
6. PLACE LARGE WOODY DEBRIS ALONG SHORELINE AND SIDE CHANNEL AREAS

DETAIL #1

POND DETAIL W/ LARGE WOOD DEBRIS



COST SUMMARY

Lower Cowlitz Restoration Project Site 36.5L

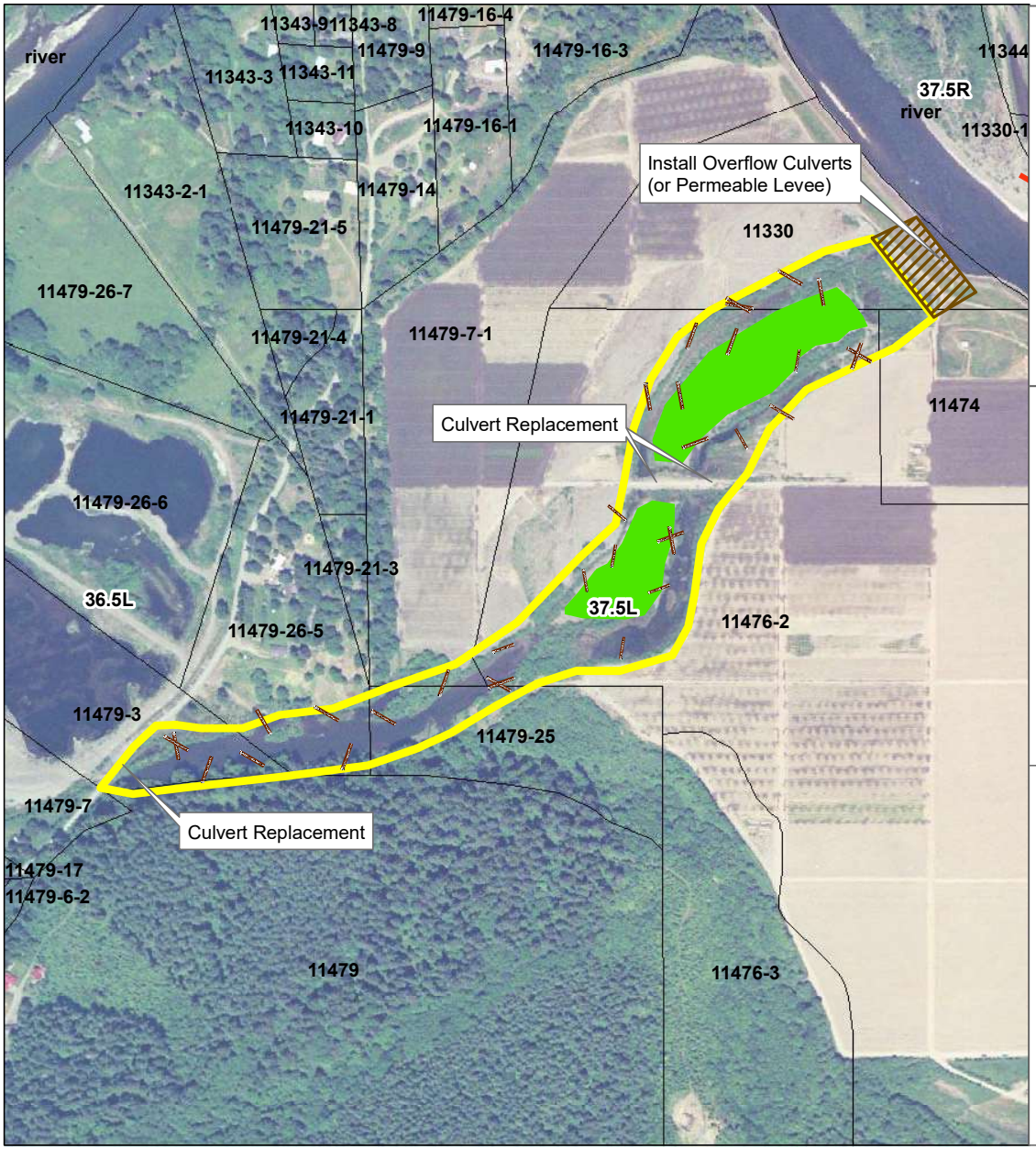
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	$5,000 - $10,000	62	$ 310,000	Assume 90 acre conservation easement ($5k/acre)
2	Site prep, mob/demob, access road improvements	LS	$ 20,000	1	$ 20,000	
3	Berm breaches approximately 5ft deep	CY	$ 3.09	3,000	$ 9,270	Assume medium size barb jam construction every 100ft using pile drivers and tracked log loader
5	Place large woody debris every 50'-200' along pond shoreline and side channel areas	EA	$ 2,000	200	$ 400,000	Place large wood debris using log loader from land based operations.
6	Culvert Replacement	EA	$50,000-$100,000	1	$ 100,000	Place large wood debris using log loader from land based operations.
7	Riparian vegetation plantings	AC	$ 10,000	40	$ 400,000	Plant along construction access areas after project completion
	Total				$ 1,239,270	

TETRA TECH

FIGURE 48. CONCEPT DESIGN SITE 36.5L

N

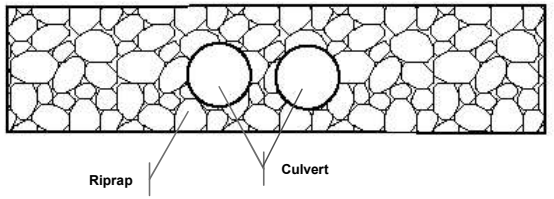
400 200 0 400 Feet



NOTES/ DESCRIPTION

1. INSTALL OVERFLOW CULVERTS (OR PERMEABLE LEVEE)
2. REPLACE/ INSTALL CULVERT ON D/S END OF PROJECT CONNECTING W/ MAIN POND FOR PROJECT 36.5 L
3. PLANT RIPARIAN VEGETATION
4. PLACE LARGE WOOD DEBRIS ALONG SIDE CHANNEL EVERY 50' - 200'

DETAIL #1 (2) 72" LEVEE OVERFLOW CULVERTS W/ GATE CONTROLS



COST SUMMARY

Lower Cowlitz Restoration Project Site 37.5L

Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	$5,000 - $10,000	25	$ 125,000	Assume 50 acre conservation easement ($5k/acre)
2	Site prep, mob/demob, access road improvements	LS	$ 20,000	1	$ 20,000	Large mob/demob due to several culvert structures.
3	Levee overflow culvert replacements	LF	$ 231	400	$ 92,400	(2) 72-inch x 200ft culverts
4	Levee overflow slide gates	EA	$ 18,000	2	$ 36,000	(2) 72-inch vertical slide gates
5	Levee overflow excavation	CY	$ 3.09	5,000	$ 15,450	Removal and replacement of levee fill material
6	Levee overflow rock protection	CY	$ 30	1,000	$ 30,000	Removal and replacement of rock surfaces
7	Nursery culvert replacement	LF	$ 200	130	$ 26,000	Replacement w/ assumed (2) 72-inch equivalent bottomless arch culverts
8	Nursery culvert replacement earthwork	CY	$ 3.09	1,000	$ 3,090	Trench excavation for culvert replacement
9	Nursery culvert replacement disposal	CY	$ 20.00	100	$ 2,000	Disposal of old culverts
9	Gravel mine culvert replacement	LF	$ 200	130	$ 26,000	Replacement w/ assumed (2) 72-inch equivalent bottomless arch culverts
10	Gravel mine culvert replacement earthwork	CY	$ 3.09	1,000	$ 3,090	Trench excavation for culvert replacement
10	Gravel mine culvert replacement disposal	CY	$ 20.00	100	$ 2,000	Disposal of old culverts
11	Place large woody debris every 50'-200' along pond shoreline and side channel areas	EA	$ 2,000	50	$ 100,000	Place large wood debris using log loader from land based operations.
12	Riparian vegetation plantings	AC	$ 10,000	6	$ 58,000	Plant along construction access areas after project completion
	Total				$ 539,030	

TETRA TECH

FIGURE 49. CONCEPT DESIGN SITE 37.5L

N

400 200 0 400 Feet