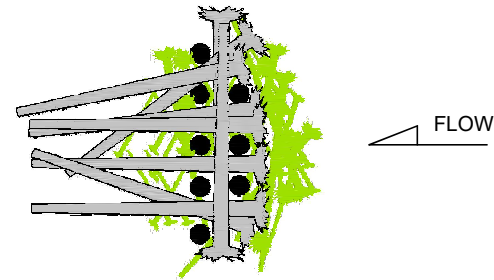


**NOTES/ DESCRIPTION**

1. IMPROVE LOCAL ACCES FOR HEAVY EQUIPMENT
2. CONSTRUCT BAR APEX JAMS AT HEAD OF LOWER SIDE CHANNEL (3 TOTAL)
3. PERFORM MINOR EXCAVATION ALONG SIDE CHANNEL TO RESTORE FLOW CONNECTIVITY
4. PLACE LARGE WOODY DEBRIS ALONG SIDE CHANNEL EVERY 50' - 200'

**DETAIL #1 BAR APEX JAM**



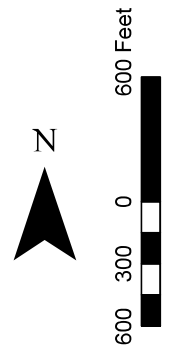
**COST SUMMARY**

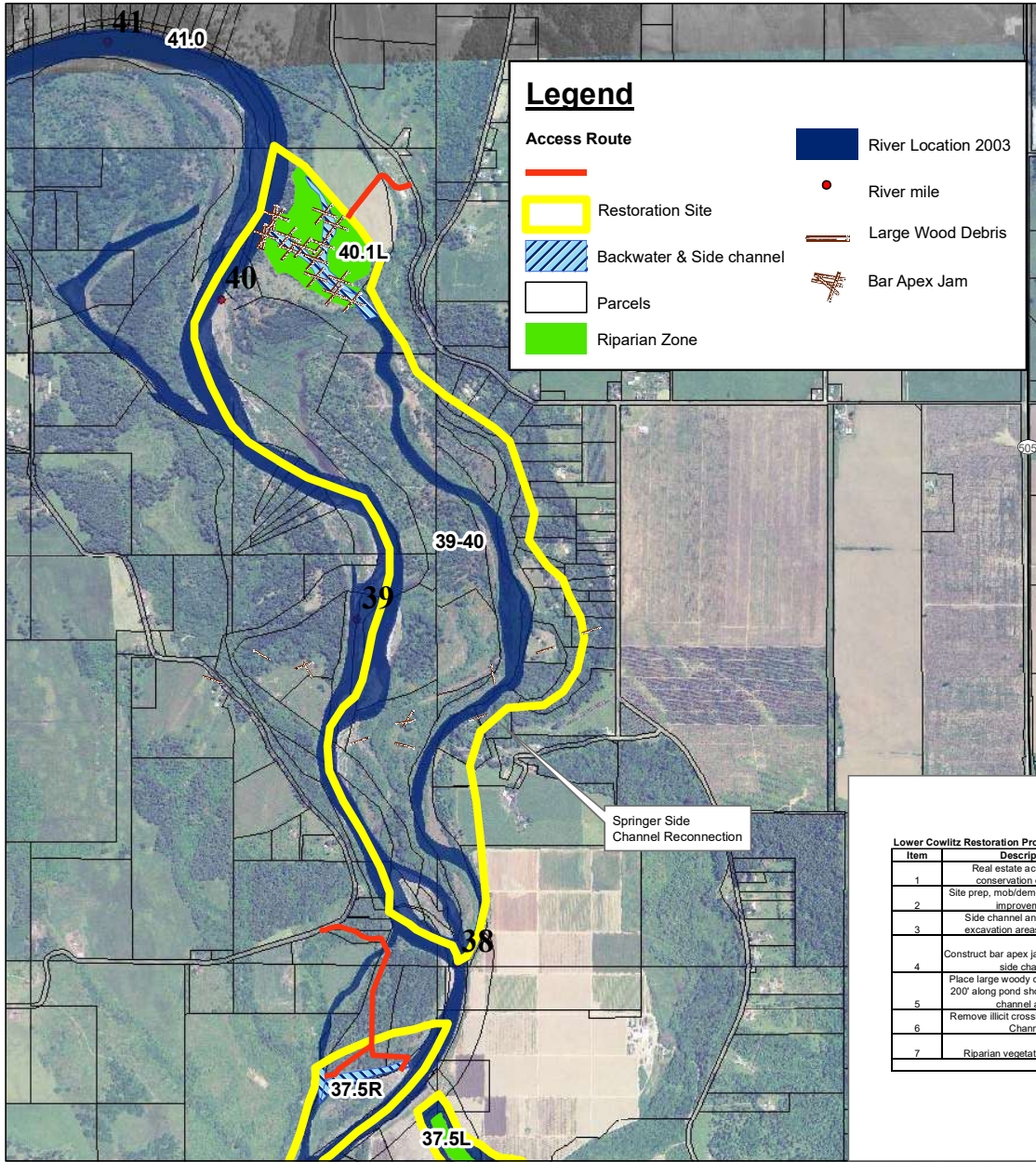
Lower Cowlitz Restoration Project Site 37.5R

Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Engineering Design, Permitting, Administration	EA	17%		\$ 50,876	Engineering Design 12%, Permitting 2%, Administration 3%
2	Site prep, mobil/demob, access road improvements	LS	\$ 20,000	1	\$ 20,000	
3	Side channel and backwater excavation areas to 5ft deep	CY	\$ 3.09	3,000	\$ 9,270	Minor side channel and backwater excavations associated w/ large wood debris placement
4	Construct bar apex jams near head of side channel	EA	\$ 50,000	3	\$ 150,000	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	50	\$ 100,000	Place large wood debris using log loader from land based operations.
6	Riparian vegetation plantings	AC	\$ 10,000	2	\$ 20,000	Plant along construction access areas after project completion
<b>Total</b>					<b>\$ 350,146</b>	



**FIGURE 50. CONCEPT DESIGN SITE 37.5R**

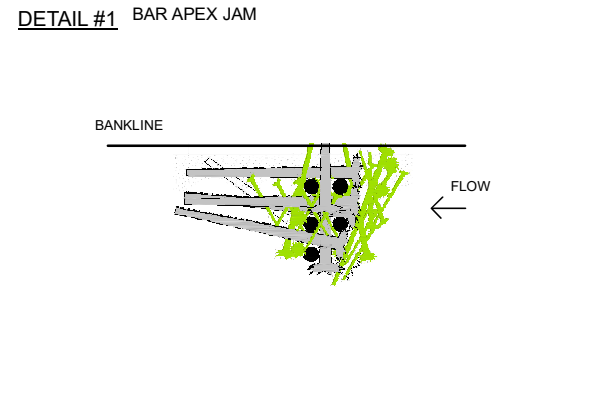




**Legend**

Access Route	River Location 2003
Restoration Site	River mile
Backwater & Side channel	Large Wood Debris
Parcels	Bar Apex Jam
Riparian Zone	

- NOTES/ DESCRIPTION**  
(PROJECT 40.1- SPRINGER SIDE CHANNEL RECONNECTION)
- EXCAVATE CONNECTION W/ UPPER END OF SPRINGER SIDE CHANNEL
  - CONSTRUCT EITHER BAR APEX OR BARB JAMS ON EITHER SIDE OF SPRINGER CHANNEL TO STABILIZE SPRINGER CHANNEL RECONNECTION ENTRANCE
  - PLANT RIPARIAN VEGETATION ALONG UPPER END OF SPRINGER SIDE CHANNEL RECONNECTION IN CLEARED AREA
  - REMOVE OR REPLACE ILLICIT CULVERTS AND EARTHEN CROSSINGS MIDWAY ALONG SIDE CHANNEL
  - PLACE LARGE WOODY DEBRIS EVERY 100' - 200' ALONG EXCAVATED SIDE CHANNEL



**COST SUMMARY**

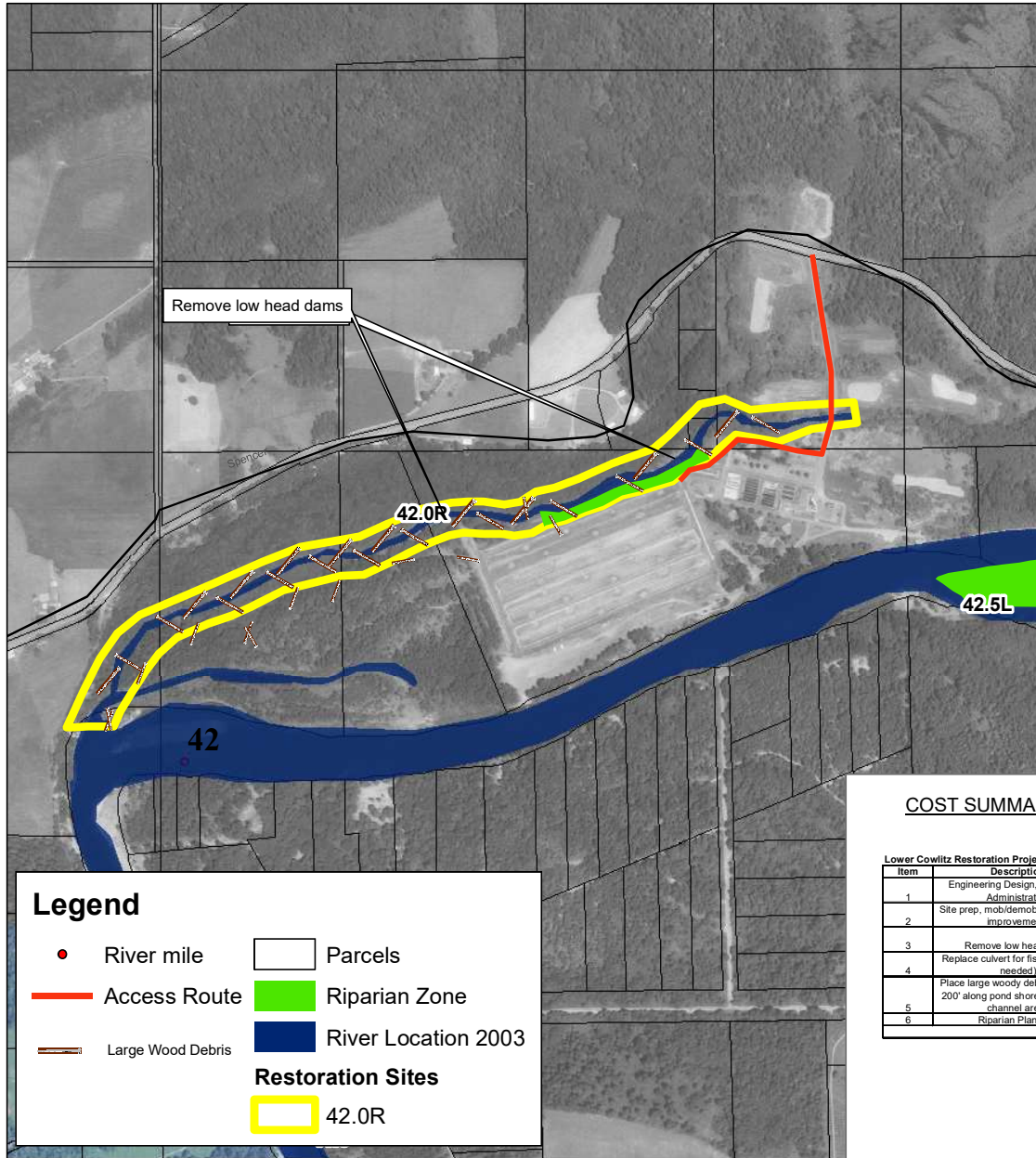
Lower Cowlitz Restoration Project Site 40.1L

Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	\$5,000 - \$10,000	50	\$ 250,000	Assume 50 acre conservation easement (\$5k/acre)
2	Site prep, mobil/demob, access road improvements	LS	\$ 20,000	1	\$ 20,000	
3	Side channel and backwater excavation areas to 5ft deep	CY	\$ 3.09	72,000	\$ 222,480	Major side channel and backwater excavations to reconnect Springer Channel
4	Construct bar apex jams near head of side channel	EA	\$ 50,000	2	\$ 100,000	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	200	\$ 400,000	Place large wood debris using log loader from land based operations.
6	Remove illicit crossings of Springer Channel	EA	\$ 10,000	5	\$ 50,000	Excavate fill material and dispose of crossing structures
7	Riparian vegetation plantings	AC	\$ 10,000	26	\$ 262,000	Plant along construction access areas after project completion
<b>Total</b>					<b>\$ 1,304,480</b>	



**FIGURE 51. CONCEPT DESIGN SITE 40.1L**





**NOTES/ DESCRIPTION**

1. REMOVE (2) LOW HEAD DAMS ALONG BLUE CREEK.
2. PLANT RIPARIAN ZONE ALONG HATCHERY.
3. PLACE LWD ALONG LOWER 2,600 FT AREA OF BLUE CREEK.
4. REPLACE CULVERT CROSSING FOR HATCHERY IF NECESSARY.

**DETAIL #1**



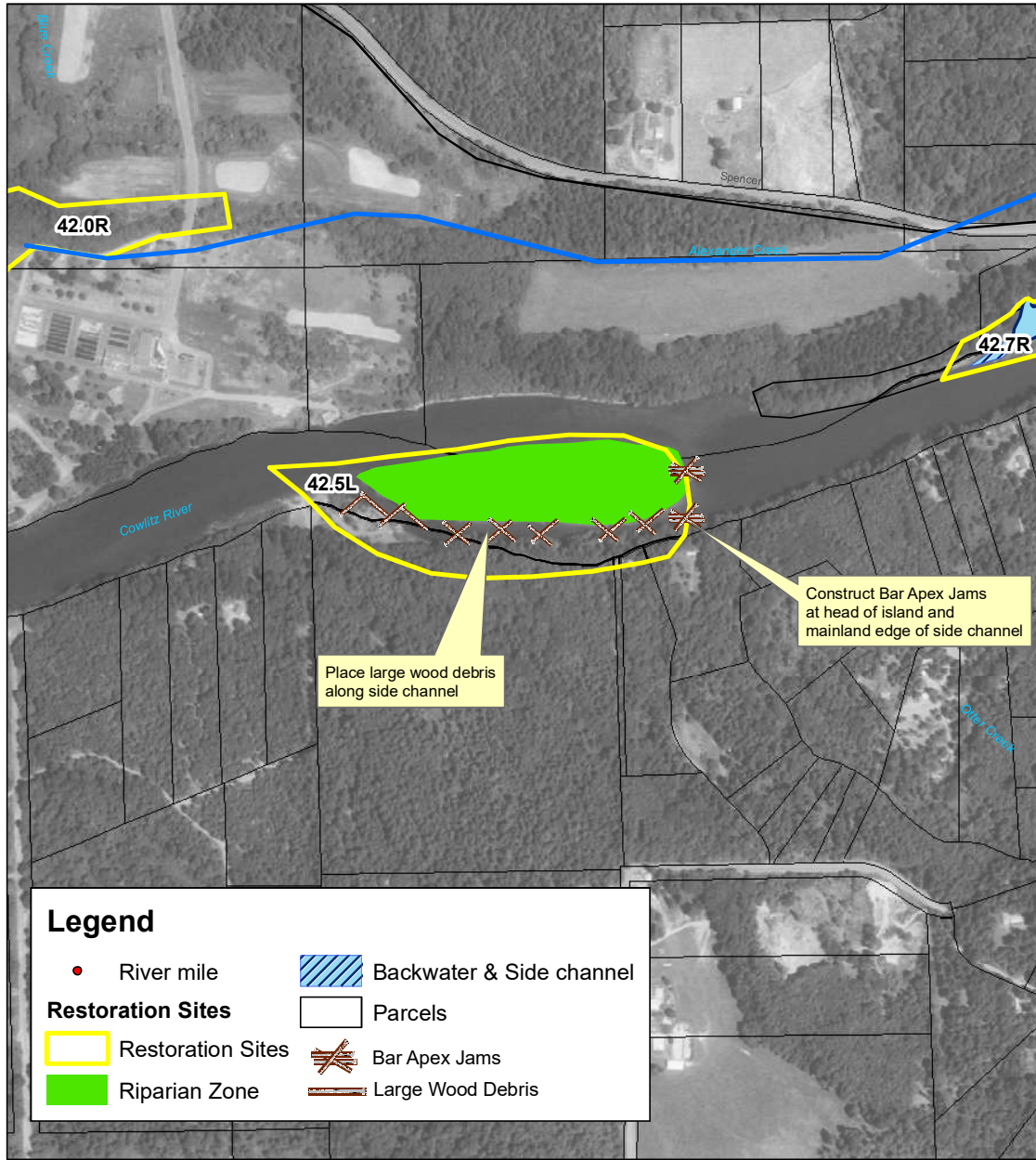
**FIGURE 52. CONCEPT DESIGN  
SITE 42.0R**

**COST SUMMARY**

**Lower Cowlitz Restoration Project Site 42.0R**

Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Engineering Design, Permitting, Administration	EA	17%		\$ 52,700	Engineering Design 12%, Permitting 2%, Administration 3%
2	Site prep, mob/demob, access road improvements	LS	\$ 20,000	1	\$ 20,000	
3	Remove low head dams	EA	\$ 15,000	2	\$ 30,000	Remove 2 low head dams along lower segment of Blue Creek
4	Replace culvert for fish passage (if needed)	EA	\$ 50,000	1	\$ 50,000	Replace Cowlitz Hatchery culvert for fish passage (if necessary)
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 Plantings	AC	\$ 10,000	1	\$ 10,000	Plant riparian zone along hatchery area.
<b>Total</b>					<b>\$ 362,700</b>	



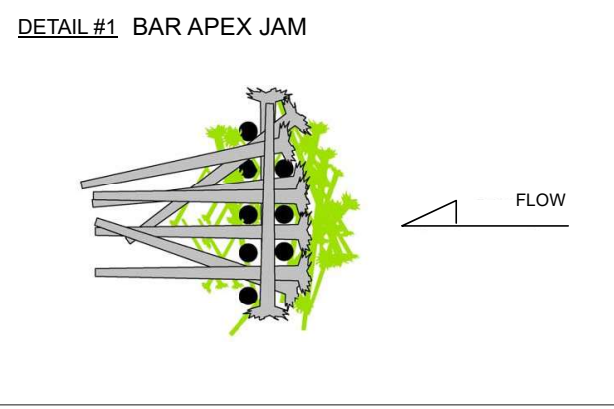


**Legend**

- River mile
- Backwater & Side channel
- Restoration Sites
- Riparian Zone
- Parcels
- Bar Apex Jams
- Large Wood Debris

**NOTES/ DESCRIPTION**

1. PLACE LWD AT ENTRANCE TO AND IN SIDE-CHANNEL
2. REMOVE INVASIVE SPECIES ON BAR & DO SUPPLEMENTAL RIPARIAN PLANTINGS

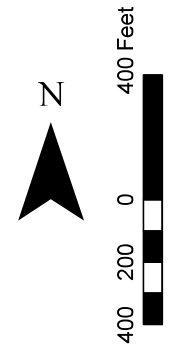


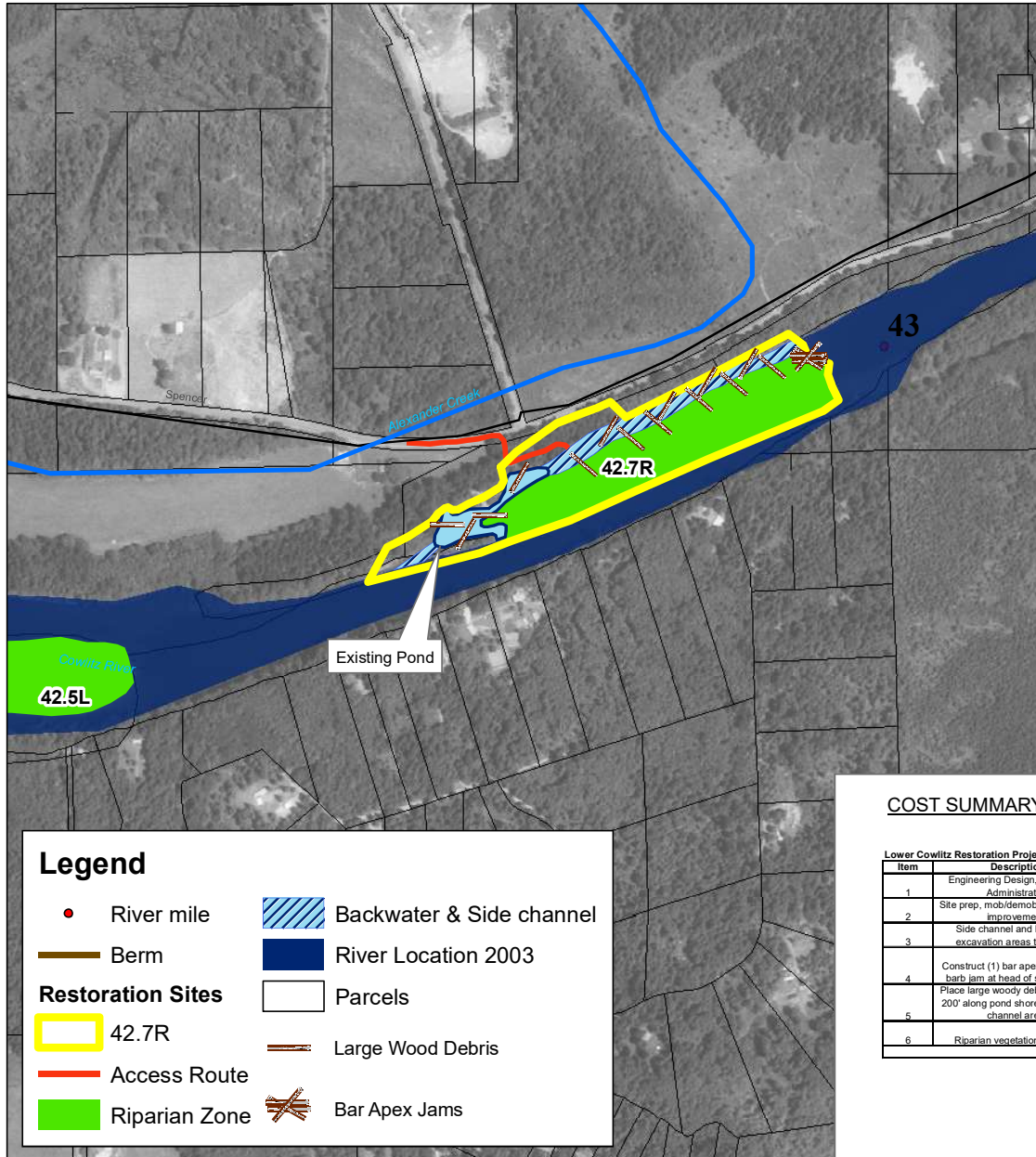
**COST SUMMARY**

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, mobil/demob, access road improvements	LS	\$ 10,000	1	\$ 10,000	1,600ft access road
3	Construct bar apex jams near head of side channel	EA	\$ 50,000	2	\$ 100,000	Assume medium size bar apex jam construction using pile drivers and tracked log loader
4	Place large woody debris every 50'-200' along pond shoreline and side channel apex	EA	\$ 2,000	20	\$ 40,000	Place large wood debris using log loader from land based operations
5	Riparian vegetation plantings	AC	\$ 10,000	9	\$ 91,800	Plant along bar area
<b>Total</b>					<b>\$</b>	<b>251,800</b>



**FIGURE 53. CONCEPT DESIGN SITE 42.5L**

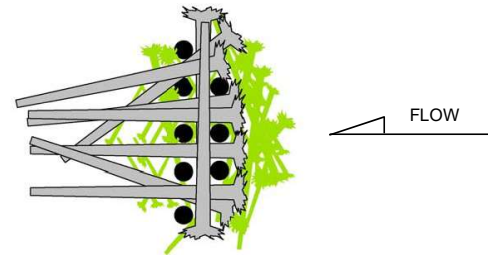




**NOTES/ DESCRIPTION**

1. EXCAVATE SIDE CHANNEL CONNECTION THROUGH D/S POND AREA
2. CONSTRUCT BAR APEX JAM AT HEAD OF BAR (ISLAND) TO PROMOTE FLOW THROUGH SIDE CHANNEL AND DEVELOPMENT OF SCOUR HOLE FOR FISH HABITAT
3. PLANT RIPARIAN AREA ALONG BAR (ISLAND)
4. PLACE LARGE WOOD DEBRIS ALONG SIDE CHANNEL, ALEXANDER CREEK REALIGNMENT AND POND AREAS

**DETAIL #1 BAR APEX JAM**

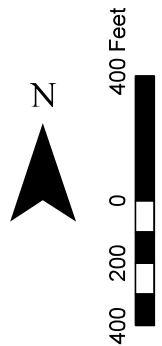


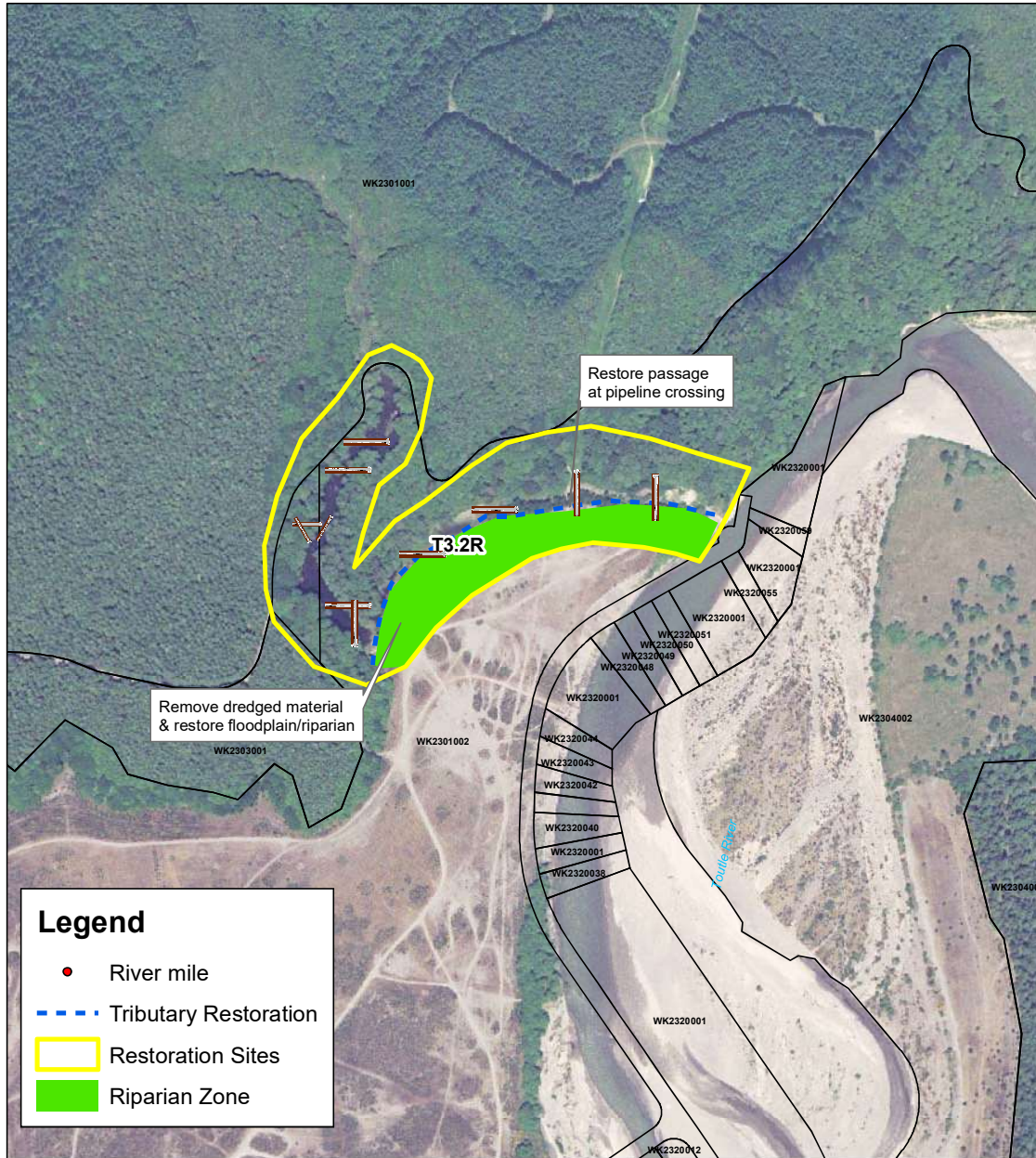
**COST SUMMARY**

Lower Cowlitz Restoration Project Site 42.7R							
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes	
1	Engineering Design, Permitting, Administration	EA	17%		\$ 59,973	Engineering Design 12%, Permitting 2%, Administration 3%	
2	Site prep, mobil/demob, access road improvements	LS	\$ 20,000	1	\$ 20,000		
3	Side channel and backwater excavation areas to 5ft deep	CY	\$ 3.09	18,700	\$ 57,783	Minor side channel and backwater excavations associated w/ large wood debris placement	
4	Construct (1) bar apex jam and (1) barb jam at head of side channel	EA	\$ 75,000	1	\$ 75,000	Assume medium size bar apex jam and barb jam construction using pile drivers and tracked log loader. BAJ cost of \$50k. Barb cost of \$25k	
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	10	\$ 100,000	Plant along construction access areas after project completion.	
<b>Total</b>					<b>\$</b>	<b>\$ 412,796</b>	



**FIGURE 54. CONCEPT DESIGN SITE 42.7R**

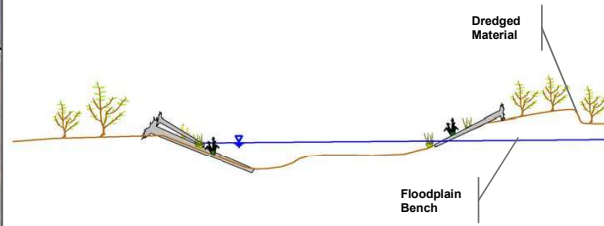




**NOTES/ DESCRIPTION**

1. REMOVE DREDGED MATERIAL ALONG RIGHT BANK & REVEGETATE WITH NATIVE SPECIES.
2. ENSURE PASSAGE AT PIPELINE CROSSING BY RAISING CHANNEL BED & PLACING STEP WEIRS AS NECESSARY.
3. ENHANCE POND & CHANNEL BY PLACING WOOD & SUPPLEMENTAL RIPARIAN PLANTINGS.

**DETAIL #1 CROSS-SECTION**

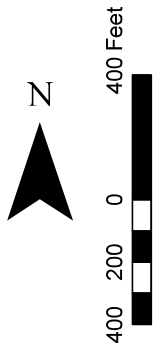


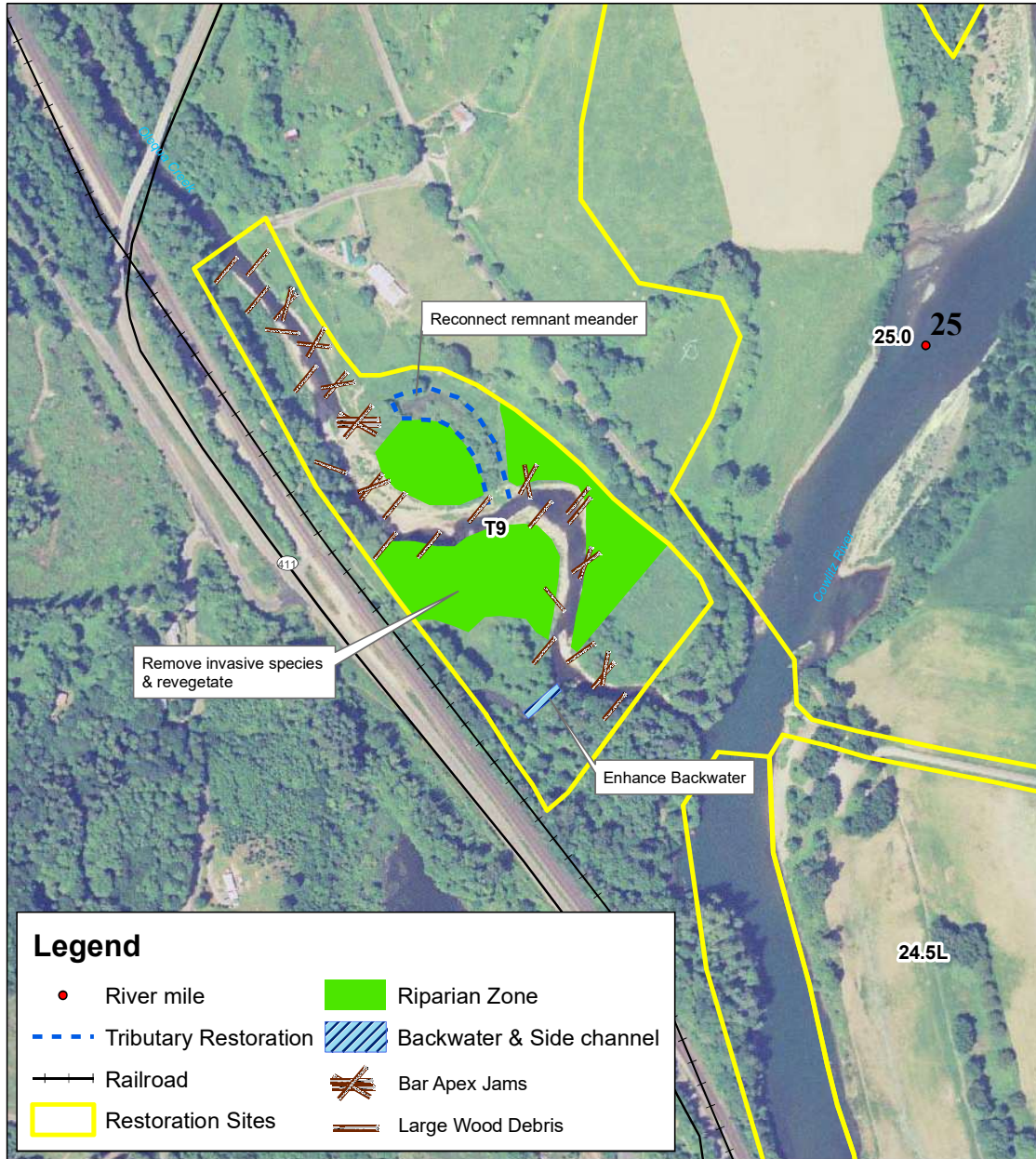
**COST SUMMARY**

Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Real estate acquisition or conservation easement	AC	\$5,000 - \$10,000	20	\$ 102,000	Assume 50 acre conservation easement (650/acre)
2	Site prep, mobil/demob, access road improvements	LS	\$ 20,000	1	\$ 20,000	Single mobil/demob for site. Current access to site along dredge material area.
3	Excavate dredge materials	CY	\$ 3.09	82,000	\$ 253,380	Major floodplain excavation and removal (1,300FT L x 160R W x 10R D)
4	Place large woody debris every 50' 200' along pond shoreline and side channel areas	EA	\$ 2,000	12	\$ 24,000	Place large wood debris using log loader from land based operations.
5	Riparian vegetation plantings	AC	\$ 10,000	5	\$ 50,000	Plant along dredge pile excavation and restoration areas.
<b>Total</b>					<b>\$ 449,380</b>	



**FIGURE 55. CONCEPT DESIGN SITE T3.2R**

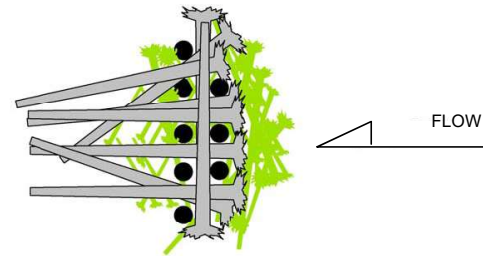




**NOTES/ DESCRIPTION**

1. REMOVE INVASIVE SPECIES THROUGHOUT SITE (JAPANESE KNOTWEED, BLACKBERRIES, ETC.).
2. RECONNECT REMNANT SIDE-CHANNEL.
3. PLACE LWD ALONG CREEK & IN FLOODPLAIN.
4. REVEGETATE WITH NATIVE RIPARIAN SPECIES.
5. ENHANCE ACCESS TO EXISTING BACKWATER.

**DETAIL #1 BAR APEX JAM**



**COST SUMMARY**

Lower Cowlitz Restoration Project Site T9						
Item	Description	Unit	Unit Cost	Quantity	Cost	Notes
1	Site prep, muck/ditch, access road improvements	L.S	\$ 10,000	1	\$ 10,000	
2	Side channel and backwater excavation areas to 5ft deep	CY	\$ 3.09	2,000	\$ 6,180	Minor backwater excavations
3	Meander bend excavation areas to 10ft deep	CY	\$ 3.09	20,000	\$ 61,800	Major meander bend excavations
4	Place large woody debris every 50'-200' along pond shoreline and side channel areas	EA	\$ 2,000	30	\$ 60,000	Place large wood debris using log loader from land based operations.
5	Remove mossy weeds	AC	\$ 5,000	20	\$ 100,000	
6	Riparian vegetation plantings	AC	\$ 10,000	20	\$ 200,000	Plant along construction access areas after project completion
<b>Total</b>					<b>\$ 437,880</b>	



**FIGURE 56. CONCEPT DESIGN SITE T9**

