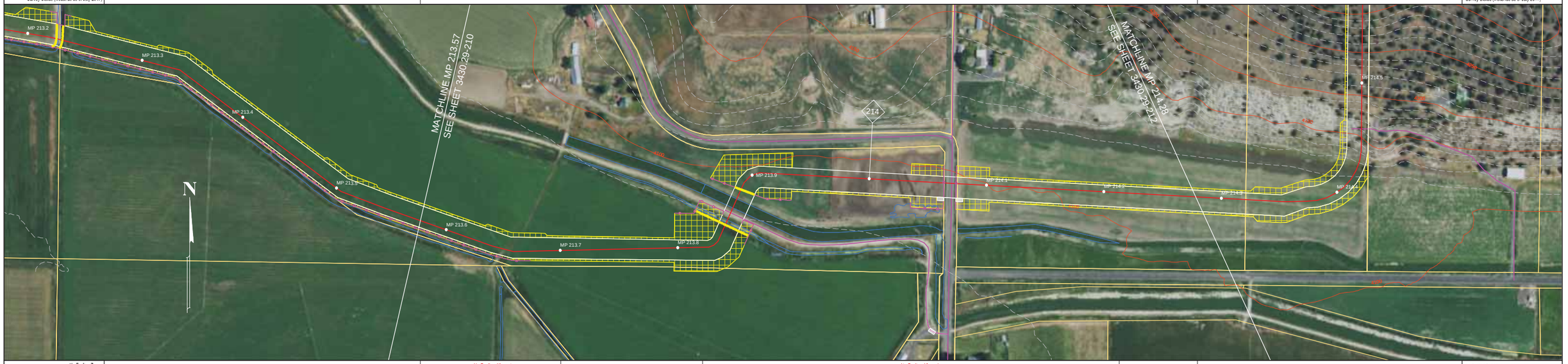
APPENDIX F.10

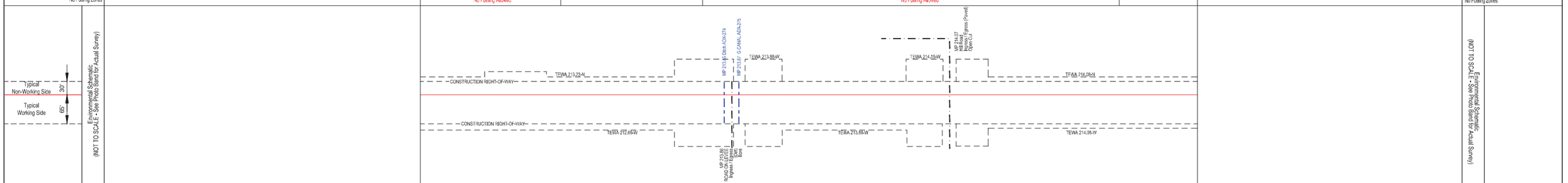
Plan of Development

(continued)

Legal Location		SEC 26, T40S, R10E		SEC 25, T40S, R10E		Legal Location
Ownership / Management		KH-774.000	BOR G CANAL CANAL	HILL ROAD	KH-777.000	Ownership / Management
Jurisdiction		KLAMATH COUNTY	BOR	KLAMATH COUNTY		Jurisdiction
Federal Landuse Allocation						Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)		MAR - SEP				Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody		Ditch	G Canal			Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]		Dry Open-Cut				Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)						Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk						Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential						Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)						Survey Status (wetlands as of July 2017)



No Fueling Zones		No Fueling Allowed	No Fueling Allowed		No Fueling Zones



PUBLIC

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LEGEND
- Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way (Shown white on photography)
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal
- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

Note: BMP type and placement to be determined by Environmental Inspector based on site-specific conditions.
- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
- Silt Fence (SF)
- Safety Fence (SAF)
- Slash Filter Window (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

2a - District Designated Reserve (No Harvest)
2b - District Designated Reserve (Non-Forest)
3a - Late-Successional Reserve (Dry Forest)
3b - Late-Successional Reserve (Moist Forest)
4a - Riparian Reserve (Dry Forest)
4b - Riparian Reserve (Moist Forest)
5 - Ecosystem Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
8 - Harvest Land Base (Moderate Intensity Timber Area)

FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

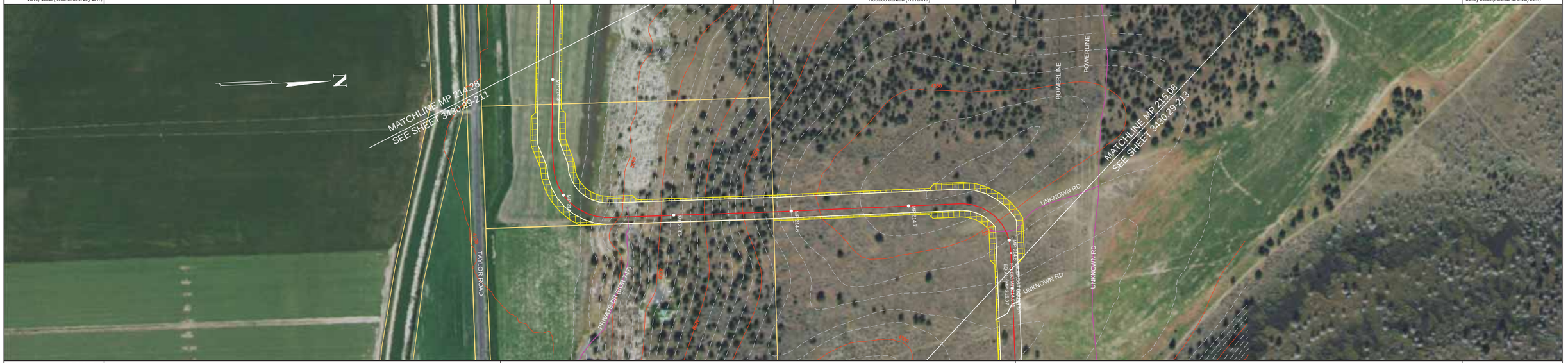
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 213.57 TO 214.28
KLAMATH COUNTY, OREGON

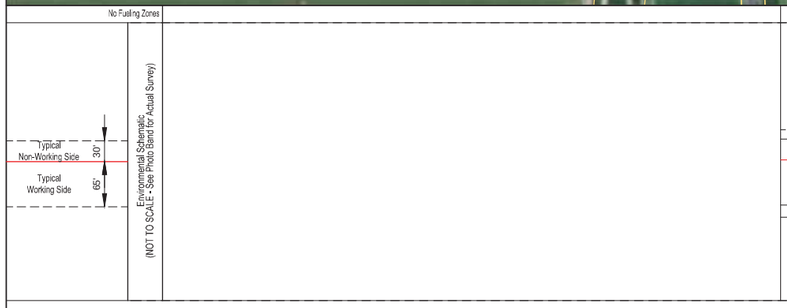
Pacific Connector GAS PIPELINE

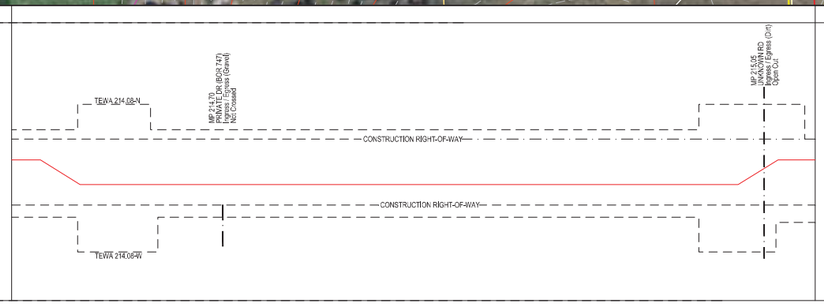
DRAWN BY:	EE	DATE: AUG-2019	ISSUED FOR BID:		24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:		11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-211	SHEET 211 OF 226	

Legal Location		SEC 25, T40S, R10E			
Ownership / Management		KH-777.000	KH-779.000	KH-781.000	
Jurisdiction		KLAMATH COUNTY			
Federal Landuse Allocation					
Areas of High Groundwater (Potential Trench Dewatering)					
Wetland / Waterbody					
Crossing Method[1] Instream Construction Window[2]					
Biological Seasonal Construction Window (as of September 2017)					
Topsoil Salvage / Federal Lands Soil Risk					
Hydrostatic Test Water Release / Aboveground Facilities / Residential					
Survey Status (wetlands as of July 2017)				ACCESS DENIED (WETLAND)	



No Fueling Zones





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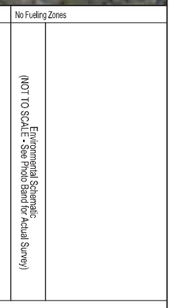

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REVISIONS

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200 0 200 400 FEET

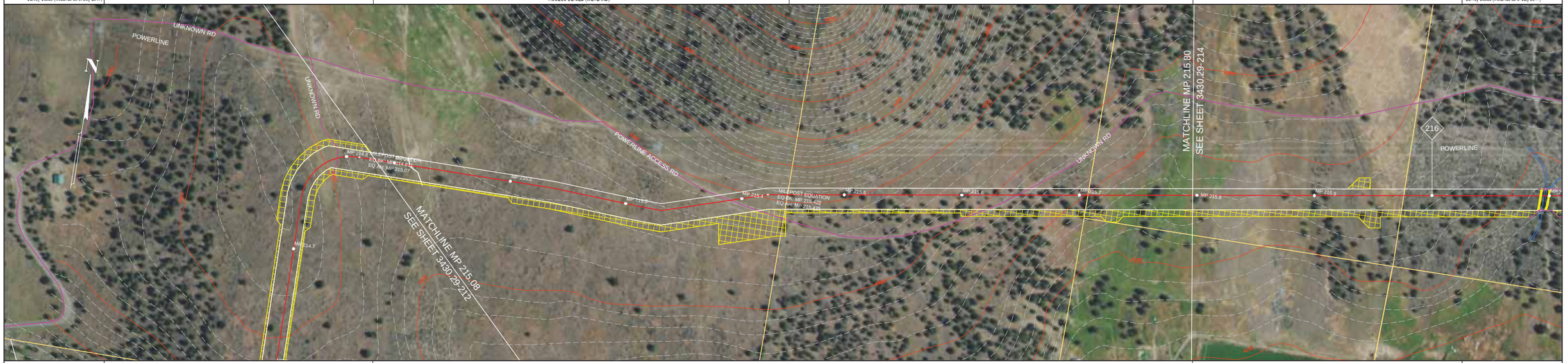
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 214.28 TO 215.08
KLAMATH COUNTY, OREGON

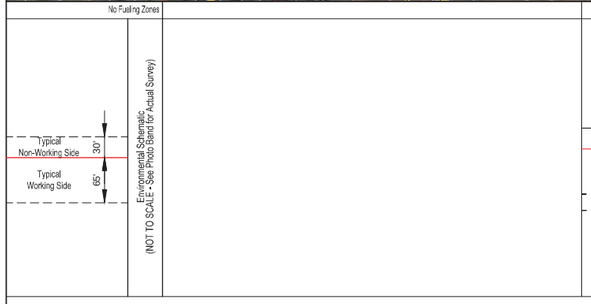
Pacific Connector GAS PIPELINE

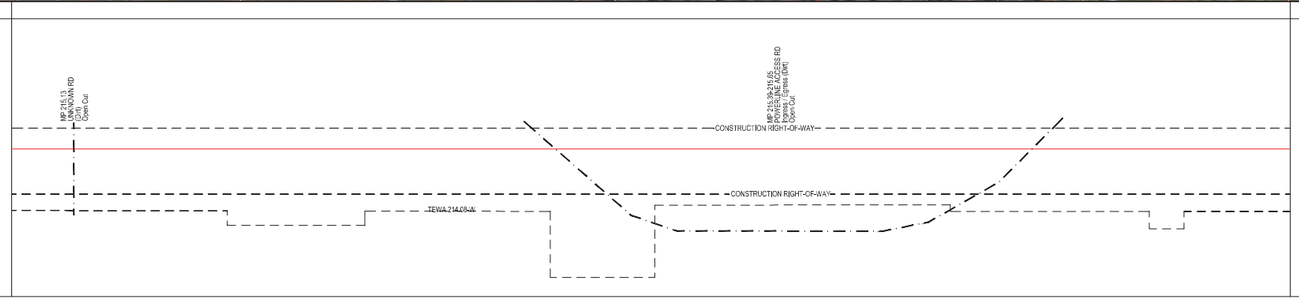
DRAWN BY:	EE	DATE:	AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE:	AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE:	AUG-2019	DRAWING NUMBER: 3430.29-212	SHEET 212 OF 226

Legal Location		SEC 25, T40S, R10E		SEC 30, T40S, R11E		Legal Location
Ownership / Management		KH-781.000	KH-782.000	KH-783.000		Ownership / Management
Jurisdiction		KLAMATH COUNTY				Jurisdiction
Federall Landuse Allocation						Federall Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)						Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody						Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]						Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)						Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk						Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential						Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)		ACCESS DENIED (WETLAND)				Survey Status (wetlands as of July 2017)



No Fueling Zones





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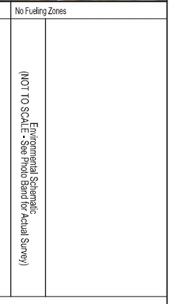

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200 0 200 400 FEET

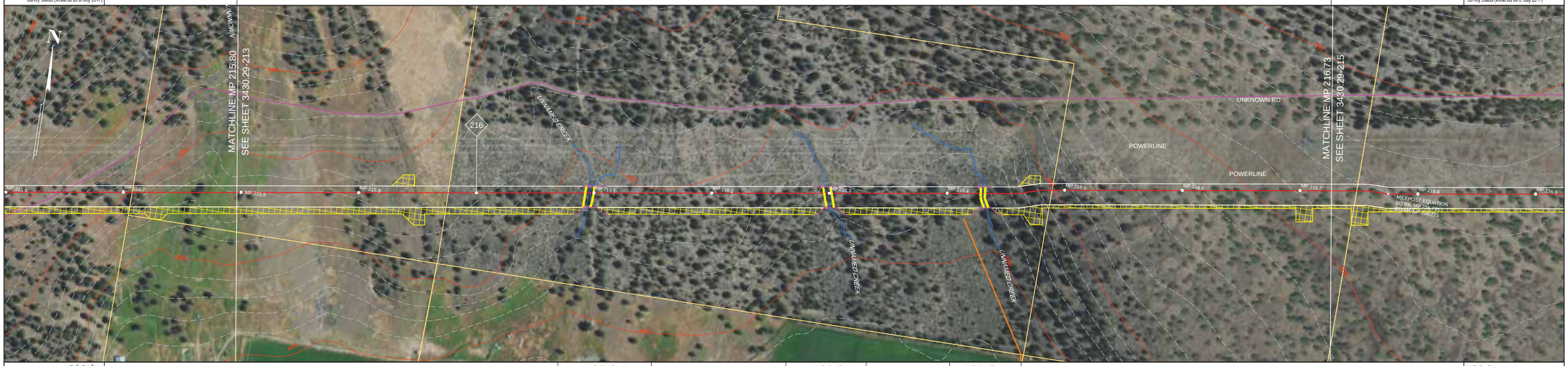
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 215.08 TO 215.80
KLAMATH COUNTY, OREGON

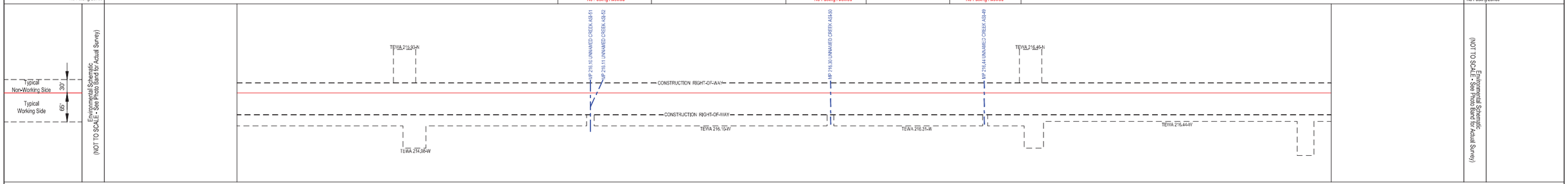
Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE:	AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE:	AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE:	AUG-2019	DRAWING NUMBER: 3430.29-213	SHEET 213 OF 226

Legal Location		SEC 30, T40S, R11E				Legal Location
Ownership / Management		KH-783,000	KH-785,000	KH-787,000		Ownership / Management
Jurisdiction		KLAMATH COUNTY		BLM - LAKEVIEW DISTRICT		Jurisdiction
Federal Landuse Allocation				Eastside Management Lands		Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)						Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody		Ditches	Ditch	Ditch		Wetland / Waterbody
Crossing Method[1] Instream Construction Window[2]		Dry Open-Cut	Dry Open-Cut	Dry Open-Cut		Crossing Method[1] Instream Construction Window[2]
Biological Seasonal Construction Window (as of September 2017)						Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk				2		Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential						Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)						Survey Status (wetlands as of July 2017)



No Fueling Zones		No Fueling Allowed		No Fueling Allowed		No Fueling Allowed		No Fueling Zones



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REVISIONS

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200 0 200 400 FEET

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 215.80 TO 216.73
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE: AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet	
CHECKED BY:	EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet	
APPROVED BY:	EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-214	SHEET 214 OF 226	

Legal Location		SEC 29, T40S, R11E											Legal Location
Ownership / Management		KH-792.600	KH-786.000		UNKNOWN ROAD	KH-793.000	DODDS HOLLOW ROAD	KH-793.100	KH-797.000				Ownership / Management
Jurisdiction		BLM	KLAMATH COUNTY										Jurisdiction
Federal Landuse Allocation		E.M.L.											Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)													Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody			AW-48										Wetland / Waterbody
Crossing Method[1] Instream Construction Window[2]													Crossing Method[1] Instream Construction Window[2]
Biological Seasonal Construction Window (as of September 2017)													Biological Seasonal Construction Window (as of September 2017)
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Survey Status (wetlands as of July 2017)			ACCESS DENIED (WETLAND)										Survey Status (wetlands as of July 2017)

No Fueling Zones			No Fueling Allowed		No Fueling Zones
Typical Non-Working Side 30' / Typical Working Side 65'	Environmental Schematic (NOT TO SCALE - See Photo Sheet for Actual Survey)	CONSTRUCTION RIGHT-OF-WAY CONSTRUCTION RIGHT-OF-WAY TEWA 216.44-W TEWA 217.46-N TEWA 217.54-W TEWA 217.55-N TEWA 217.50-W MP 217.50 UNKNOWN RD (Dirt) Access Cut Open Cut MP 217.54 UNKNOWN RD (Dirt) Access Cut Open Cut MP 217.67 DODDS HOLLOW RD (Gravel) Access Cut Open Cut		Environmental Schematic (NOT TO SCALE - See Photo Sheet for Actual Survey)	

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200 0 200 400 FEET

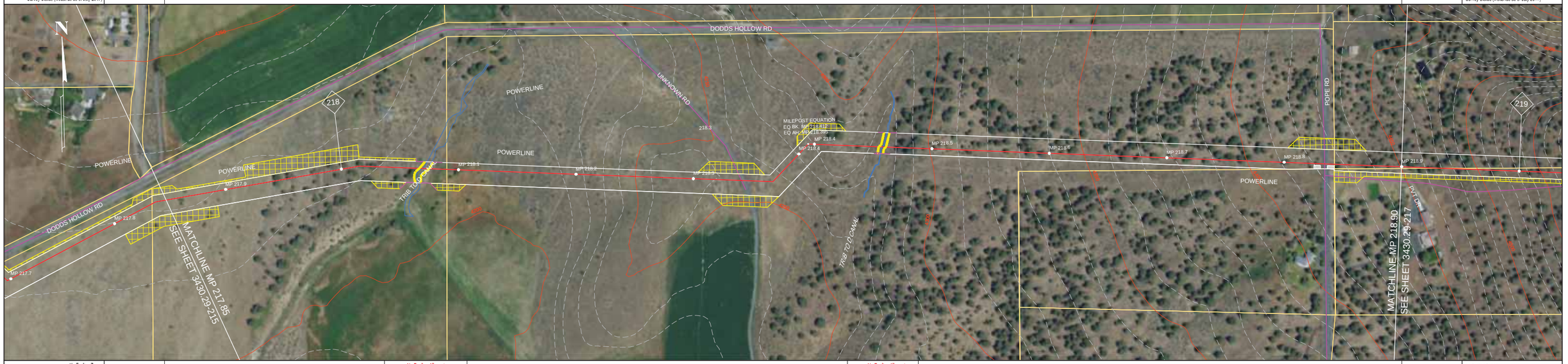
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

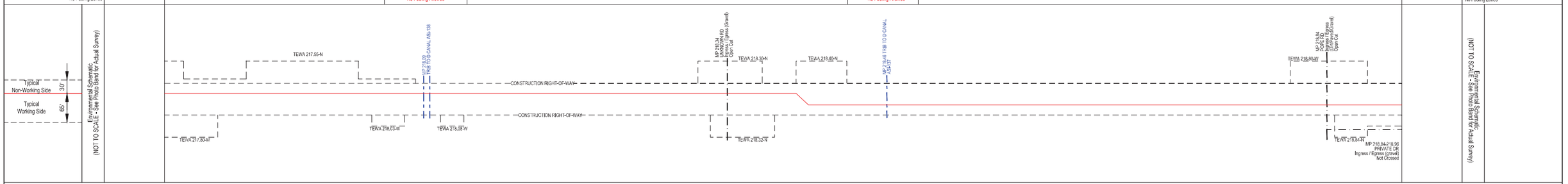
SPREAD #7
MP 216.73 TO 217.85
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE: AUG-2019	ISSUED FOR BID:		24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:		11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-215	SHEET 215 OF 226	

Legal Location		SEC 28, T40S, R11E		SEC 27, T40S, R11E		Legal Location
Ownership / Management		KH-797.000	KH-798.000	POPE ROAD KH-801.000RD / KH-799.000 / KH-800.000		Ownership / Management
Jurisdiction		KLAMATH COUNTY				Jurisdiction
Federal Landuse Allocation						Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)						Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody		Trib. to D Canal	Trib. to D Canal			Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]		Dry Open-Cut / July 1 - March 31	Dry Open-Cut / July 1 - March 31			Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)		GOLDEN EAGLE (JANUARY 1 - AUGUST 31 (No Activity))				Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk						Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential						Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)						Survey Status (wetlands as of July 2017)





PUBLIC

NOTES:
1: In wetlands cut vegetation off at ground level, leaving existing root systems in place and remove the vegetation from the wetland for disposal.
2: In wetlands limit pulling of tree stumps and grading activities to directly over the trench line. Do not grade or remove stumps or root systems from the rest of the construction right-of-way.
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8: Pacific Connector understands that fisheries' construction windows only apply to those waterbodies flowing at the time of construction and that the windows do not apply to HDD crossings.

LEGEND

- Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way (Shown white on photography)
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal
- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

Note: BMP type and placement to be determined by Environmental Inspector based on site-specific conditions.
- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
- Silt Fence (SF)
- Safety Fence (SAF)
- Slash Filter Windrow (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

2a - District Designated Reserve (No Harvest)
2b - District Designated Reserve (Non-Forest)
3a - Late-Successional Reserve (Dry Forest)
3b - Late-Successional Reserve (Moist Forest)
4a - Riparian Reserve (Dry Forest)
4b - Riparian Reserve (Moist Forest)
5 - Eastside Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
8 - Harvest Land Base (Moderate Intensity Timber Area)

FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

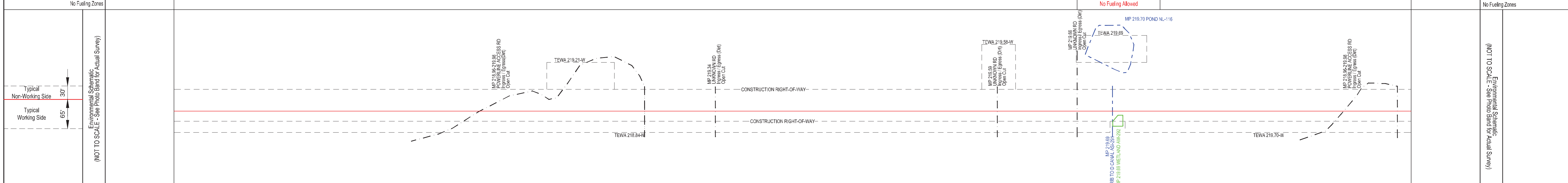
SPREAD #7
MP 217.85 TO 218.90
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE:	AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE:	AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE:	AUG-2019	DRAWING NUMBER: 3430.29-216	SHEET 216 OF 226

Legal Location		SEC 27, T40S, R11E					SEC 26, T40S, R11E		Legal Location
Ownership / Management		KH-799.000 / KH-800.000	KH-802.000	KH-803.000	KH-804.000	KH-805.000	KH-806.000		Ownership / Management
Jurisdiction		KLAMATH COUNTY							Jurisdiction
Federal Landuse Allocation									Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)									Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody						Pond Trib. to D Canal AW-292			Wetland / Waterbody
Crossing Method[1] / Instream Construction Window[8]						Dry Open-Cut / July 1 - March 31			Crossing Method[1] / Instream Construction Window[8]
Biological Seasonal Construction Window (as of September 2017)									Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk									Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential									Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)						ACCESS DENIED (WETLAND)			Survey Status (wetlands as of July 2017)

No Fueling Zones | No Fueling Allowed | No Fueling Zones



PUBLIC

NOTES:

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LEGEND

- Proposed Pipeline
- Construction Right-of-Way
  - Temporary Construction Right-of-Way (Shown white on photography)
  - Temporary Extra Work Area
  - Uncleared Storage Area
  - Pipe Yard
  - Aboveground Facility
  - Rock Source/Disposal
- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

Note: BMP type and placement to be determined by Environmental Inspector based on site-specific conditions.

- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
- Silt Fence (SF)
- Safety Fence (SAF)
- Slash Filter Windrow (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

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5 - Eastside Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
8 - Harvest Land Base (Moderate Intensity Timber Area)

FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

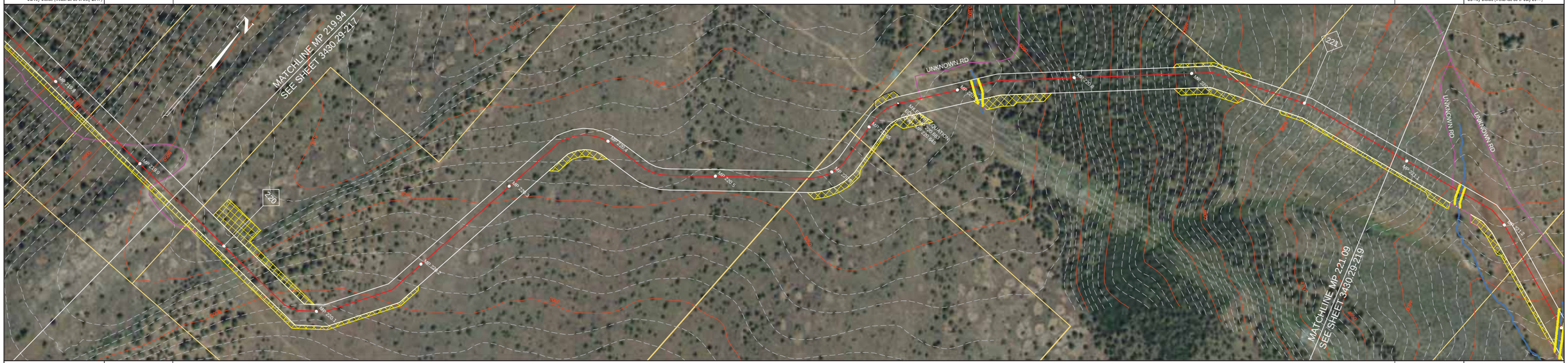
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 218.90 TO 219.94
KLAMATH COUNTY, OREGON

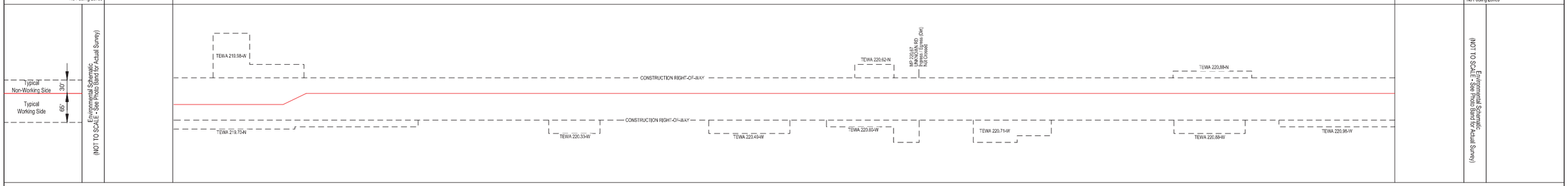
Pacific Connector GAS PIPELINE

DRAWN BY: EE	DATE: AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY: EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY: EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-217	SHEET 217 OF 226

Legal Location		SEC 26, T40S, R11E			SEC 23, T40S, R11E					Legal Location
Ownership / Management		KH-806.000	KH-807.000	KH-810.000UT	KH-811.000		KH-807.000	KH-811.000		Ownership / Management
Jurisdiction		KLAMATH COUNTY								Jurisdiction
Federal Landuse Allocation										Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)										Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody										Wetland / Waterbody
Crossing Method[1] Instream Construction Window[2]										Crossing Method[1] Instream Construction Window[2]
Biological Seasonal Construction Window (as of September 2017)										Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk										Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential										Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)										Survey Status (wetlands as of July 2017)



No Fueling Zones				No Fueling Zones



PUBLIC

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LEGEND

- Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way *(Shown white on photography)*
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal

- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

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- Silt Fence (SF)
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BLM LANDUSE - 2016 RMP

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2s - District Designated Reserve (Non-Forest)
3a - Late-Successional Reserve (Dry Forest)
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FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

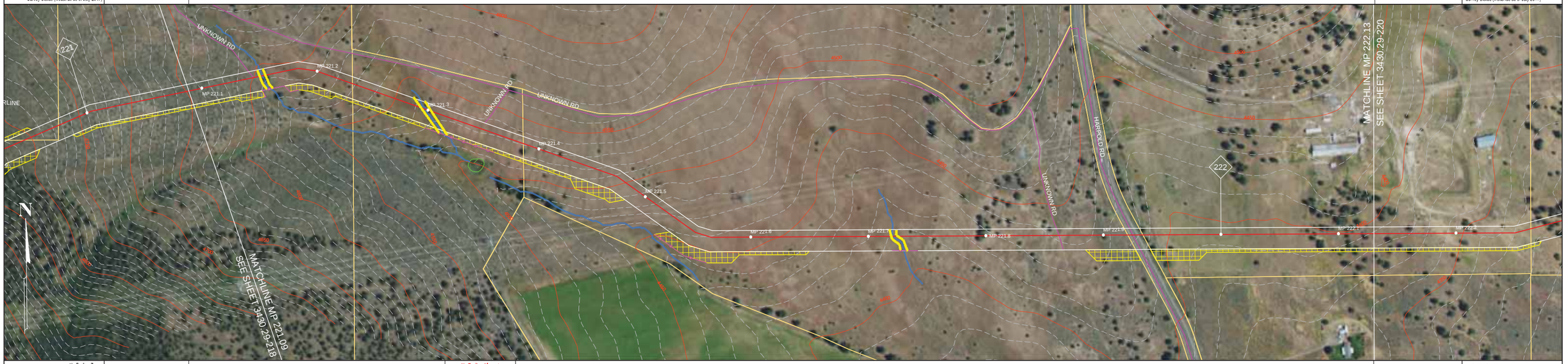
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 219.94 TO 221.09
KLAMATH COUNTY, OREGON

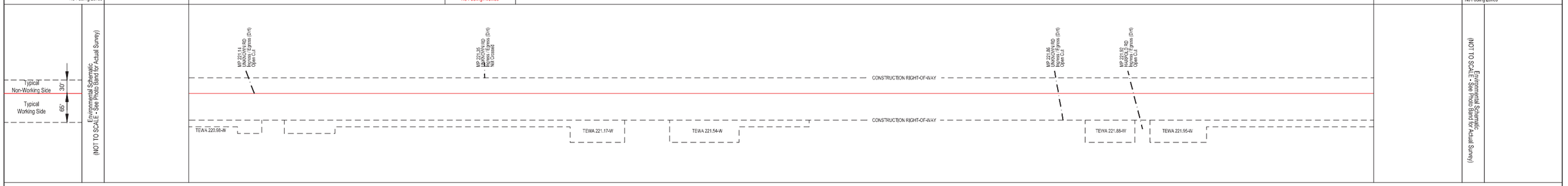
Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE:	AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE:	AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE:	AUG-2019	DRAWING NUMBER: 3430.29-218	SHEET 218 OF 226

Legal Location		SEC 23, T40S, R11E		SEC 24, T40S, R11E				Legal Location
Ownership / Management		KH-811.000	KH-811.300	KH-814.300	HAROLD ROAD CROSSING KH-814.301	KH-814.301		Ownership / Management
Jurisdiction		KLAMATH COUNTY						Jurisdiction
Federal Landuse Allocation								Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)								Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody								Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]								Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)								Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk								Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential								Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)								Survey Status (wetlands as of July 2017)



No Fueling Zones			No Fueling Allowed		No Fueling Zones	



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LEGEND

- Proposed Pipeline

Construction Right-of-Way
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- Rock Source/Disposal

- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
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BLM LANDUSE - 2016 RMP

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FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK	APP
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2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

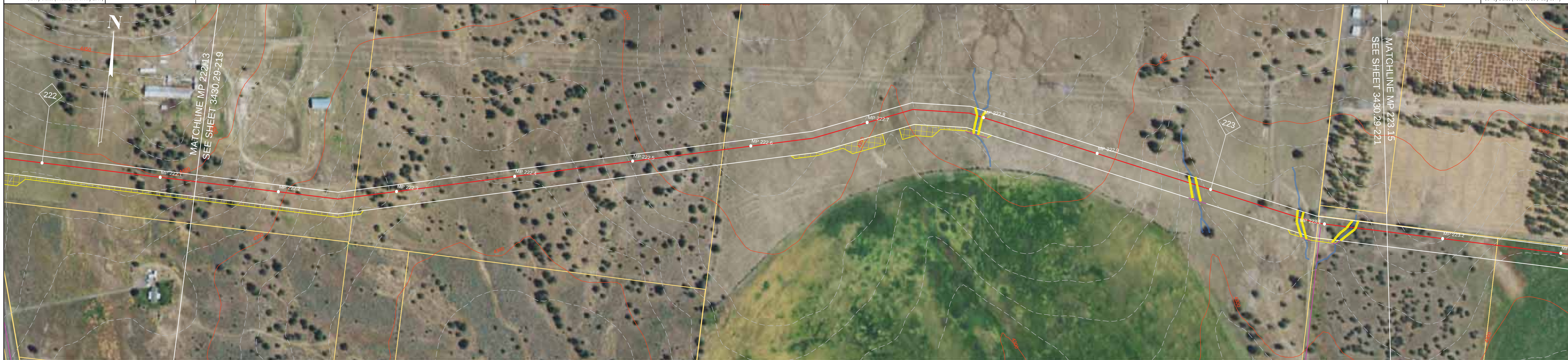
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 221.09 TO 222.13
KLAMATH COUNTY, OREGON

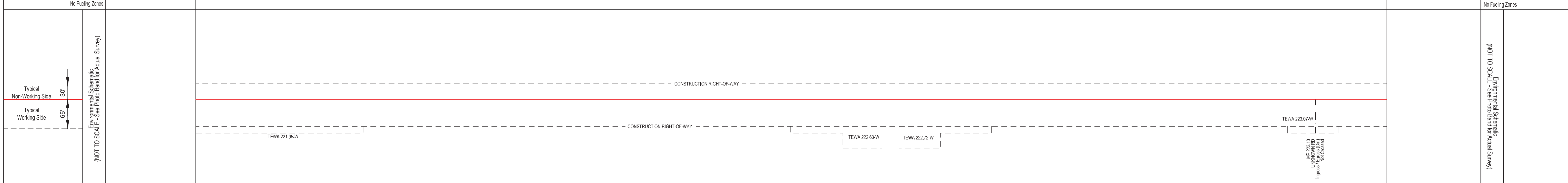
Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE: AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet	
CHECKED BY:	EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet	
APPROVED BY:	EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-219	SHEET 219 OF 226	

Legal Location	SEC 24, T40S, R11E	SEC 30, T40S, R12E	SEC 32, T40S, R12E	SEC 29, T40S, R12E
Ownership / Management	KH-814.301	KH-814.302	KH-820.300	KH-820.307
Jurisdiction	KLAMATH COUNTY			
Federal Landuse Allocation				
Areas of High Groundwater (Potential Trench Dewatering)				
Wetland / Waterbody				
Crossing Method[5]/ Instream Construction Window[8]				
Biological Seasonal Construction Window (as of September 2017)				
Topsoil Salvage / Federal Lands Soil Risk				
Hydrostatic Test Water Release / Aboveground Facilities / Residential				
Survey Status (wetlands as of July 2017)				



No Fueling Zones



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FEDERAL LANDS SOIL RISK SENSITIVITY RANK
- 1-Very Low
- 2-Low
- 3-Moderate
- 4-High
- 5-Very High

REVISIONS

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2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

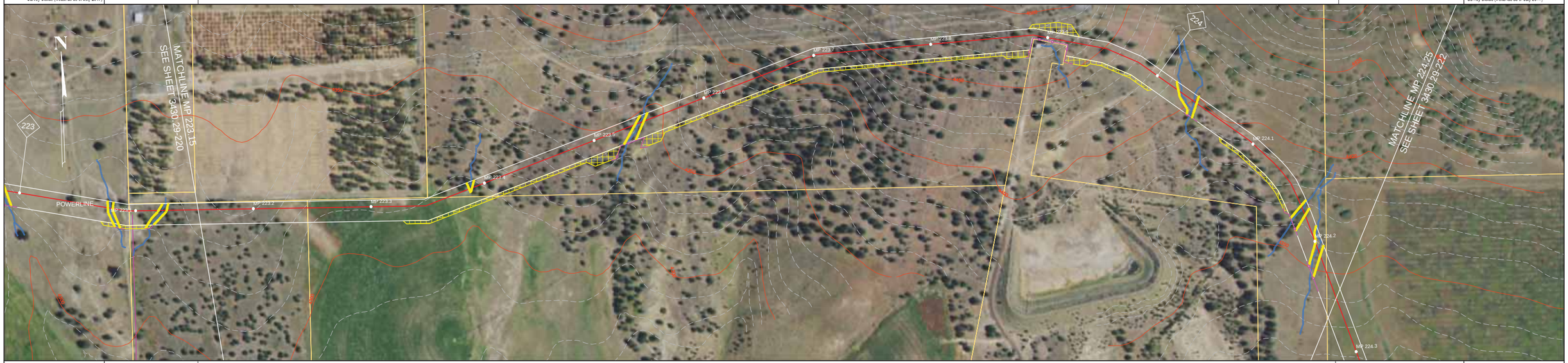
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 222.13 TO 223.15
KLAMATH COUNTY, OREGON

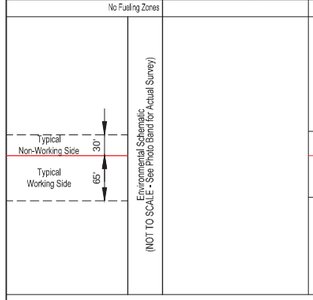
Pacific Connector GAS PIPELINE

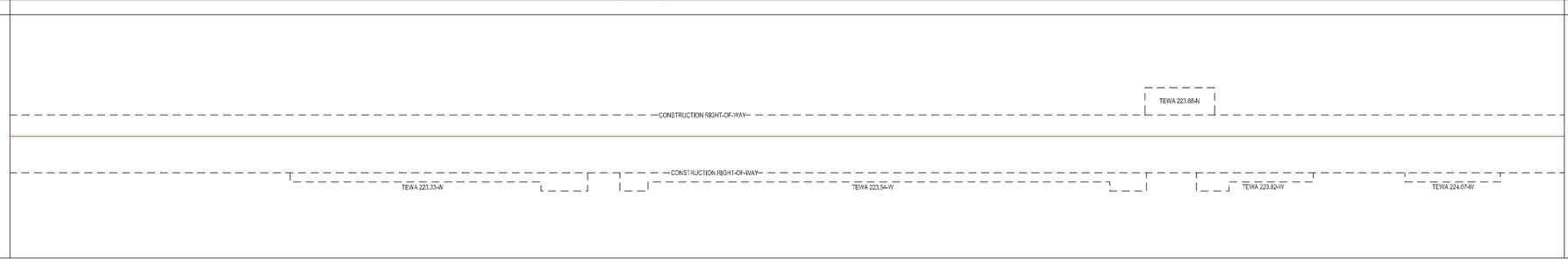
DRAWN BY: EE	DATE: AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY: EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY: EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-220	SHEET 220 OF 226

Legal Location		SEC 32, T40S, R12E		SEC 28, T40S, R12E	Legal Location
Ownership / Management	KH-820.307	KH-820.303		KH-827.300	Ownership / Management
Jurisdiction	KLAMATH COUNTY				Jurisdiction
Federal Landuse Allocation					Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)					Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody					Wetland / Waterbody
Crossing Method[1] Instream Construction Window[2]					Crossing Method[1] Instream Construction Window[2]
Biological Seasonal Construction Window (as of September 2017)					Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk					Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential					Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)					Survey Status (wetlands as of July 2017)

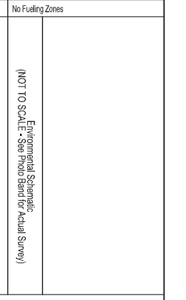


No Fueling Zones





No Fueling Zones



PUBLIC

NOTES:
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LEGEND

- Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way *(Shown white on photography)*
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal
- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

Note: BMP type and placement to be determined by Environmental Inspector based on site-specific conditions.
- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
- Silt Fence (SF)
- Safety Fence (SAF)
- Slash Filter Windrow (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

2a - District Designated Reserve (No Harvest)
2s - District Designated Reserve (Non-Forest)
3a - Late-Successional Reserve (Dry Forest)
3s - Late-Successional Reserve (Moist Forest)
4a - Riparian Reserve (Dry Forest)
4b - Riparian Reserve (Moist Forest)
5 - Ecsitvite Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
8 - Harvest Land Base (Moderate Intensity Timber Area)

FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

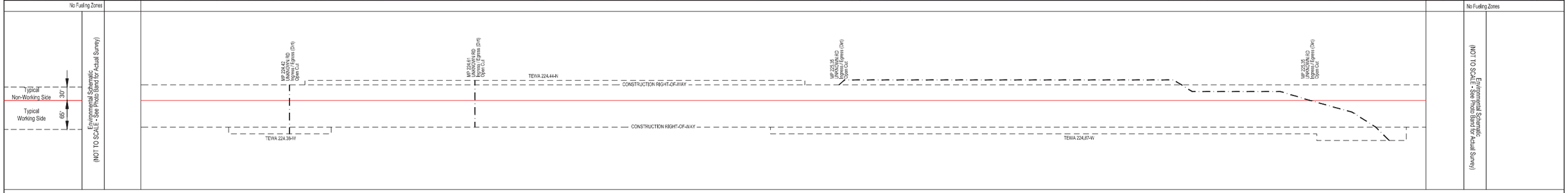
SPREAD #7
MP 223.15 TO 224.25
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE:	AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE:	AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE:	AUG-2019	DRAWING NUMBER: 3430.29-221	SHEET 221 OF 226

Legal Location		SEC 28, T40S, R12E			Legal Location
Ownership / Management		KH-827.300	KH-830.500		Ownership / Management
Jurisdiction		KLAMATH COUNTY			Jurisdiction
Federal Landuse Allocation					Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)					Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody					Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]					Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)					Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk					Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential					Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)					Survey Status (wetlands as of July 2017)

No Fueling Zones					No Fueling Zones



No Fueling Zones					No Fueling Zones

PUBLIC

NOTES:
1: In wetlands cut vegetation off at ground level, leaving existing root systems in place and remove the vegetation from the wetland for disposal.
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8: Pacific Connector understands that fisheries' construction windows only apply to those waterbodies flowing at the time of construction and that the windows do not apply to HDD crossings.

LEGEND

- Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way *(Shown white on photography)*
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal

- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

Note: BMP type and placement to be determined by Environmental Inspector based on site-specific conditions.
- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
- Silt Fence (SF)
- Safety Fence (SAF)
- Slash Filter Windrow (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

2a - District Designated Reserve (No Harvest)
2s - District Designated Reserve (Non-Forest)
3a - Late-Successional Reserve (Dry Forest)
3s - Late-Successional Reserve (Moist Forest)
4a - Riparian Reserve (Dry Forest)
4s - Riparian Reserve (Moist Forest)
5 - Ecistivte Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
8 - Harvest Land Base (Moderate Intensity Timber Area)

FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

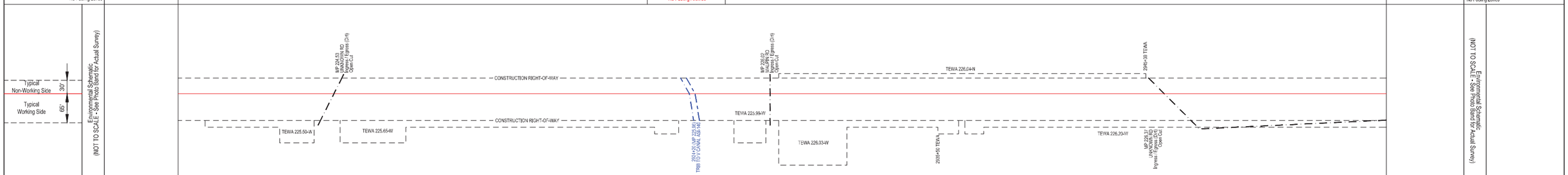
SPREAD #7
MP 224.25 TO 225.46
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE: AUG-2019	ISSUED FOR BID:		24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:		11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-222	SHEET	222
				OF	226

Legal Location		SEC 27, T40S, R12E											Legal Location
Ownership / Management		KH-830.500	KH-831.502	KH-831.000	KH-831.000	MAUPIN RD	KH-833.000	KH-835.000					Ownership / Management
Jurisdiction		KLAMATH COUNTY											Jurisdiction
Federal Landuse Allocation													Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)													Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody		Trib to V Canal ASI-140											Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]		Dry Open-Cut / July 1 - March 31											Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)													Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk													Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential													Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)													Survey Status (wetlands as of July 2017)

No Fueling Zones		No Fueling Allowed											No Fueling Zones



PUBLIC

NOTES:
1: In wetlands cut vegetation off at ground level, leaving existing root systems in place and remove the vegetation from the wetland for disposal.
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LEGEND

Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way *(Shown white on photography)*
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal

- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

Note: BMP type and placement to be determined by Environmental Inspector based on site-specific conditions.
- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
- Silt Fence (SF)
- Safety Fence (SAF)
- Slash Filter Windrow (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

2a - District Designated Reserve (No Harvest)
2b - District Designated Reserve (Non-Forest)
3a - Late-Successional Reserve (Dry Forest)
3b - Late-Successional Reserve (Moist Forest)
4a - Riparian Reserve (Dry Forest)
4b - Riparian Reserve (Moist Forest)
5 - Ecosystem Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
8 - Harvest Land Base (Moderate Intensity Timber Area)

FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

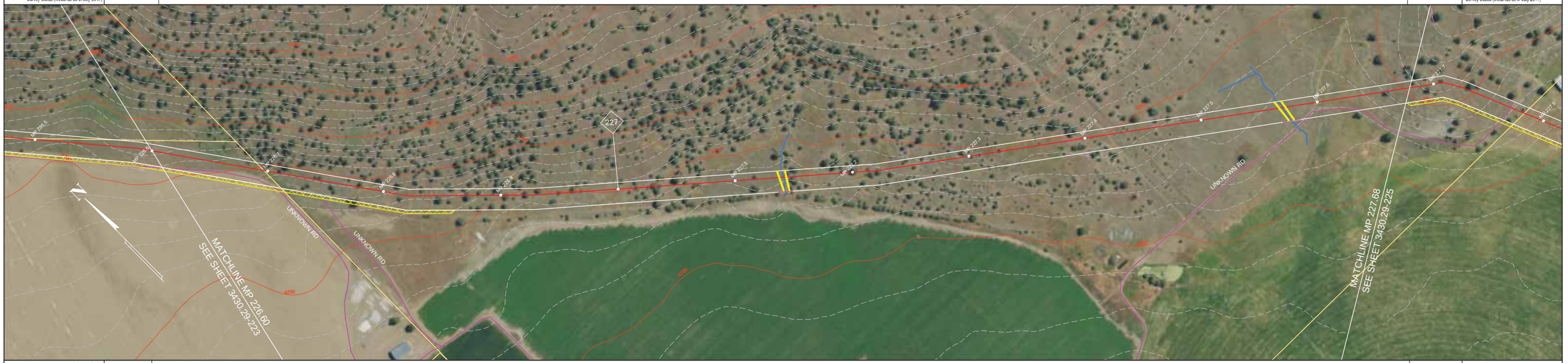
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 225.46 TO 226.60
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE: AUG-2019	ISSUED FOR BID:		24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:		11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-223	SHEET 223 OF 226	

Legal Location		SEC 35, T40S, R12E			Legal Location
Ownership / Management		KH-833,000	KH-835,080		Ownership / Management
Jurisdiction		KLAMATH COUNTY			Jurisdiction
Federal Landuse Allocation					Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)					Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody					Wetland / Waterbody
Crossing Method[1] Instream Construction Window[2]					Crossing Method[1] Instream Construction Window[2]
Biological Seasonal Construction Window (as of September 2017)					Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk					Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential					Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)					Survey Status (wetlands as of July 2017)



No Fueling Zones					No Fueling Zones
Typical Non-Working Side 30' / Typical Working Side 65'	Environmental Schematic (NOT TO SCALE - See Photo Barb for Actual Survey)	CONSTRUCTION RIGHT-OF-WAY CONSTRUCTION RIGHT-OF-WAY TEWA 226.20-W MP 226.37 UNKNOWN RD Ingress / Egress (Dirt) Open Cut MP 226.74 UNKNOWN RD Ingress / Egress (Dirt) Not Constructed MP 227.68 UNKNOWN RD Ingress / Egress (Dirt) Not Constructed		Environmental Schematic (NOT TO SCALE - See Photo Barb for Actual Survey)	

PUBLIC

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LEGEND

- Proposed Pipeline

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- Aboveground Facility
- Rock Source/Disposal

- Tax Parcel Boundaries
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- Stream
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5 - Ecclesiastical Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
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FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

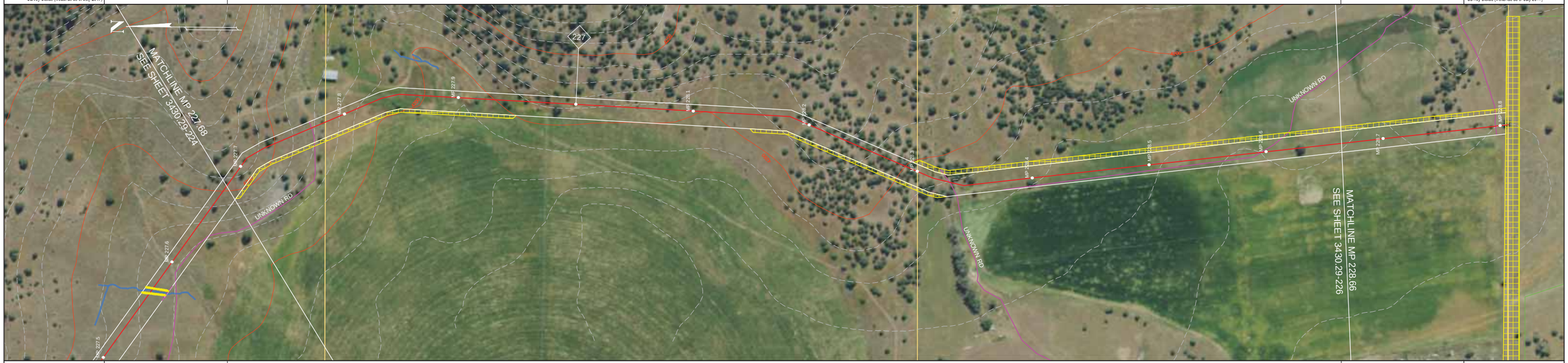
PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 226.60 TO 227.68
KLAMATH COUNTY, OREGON

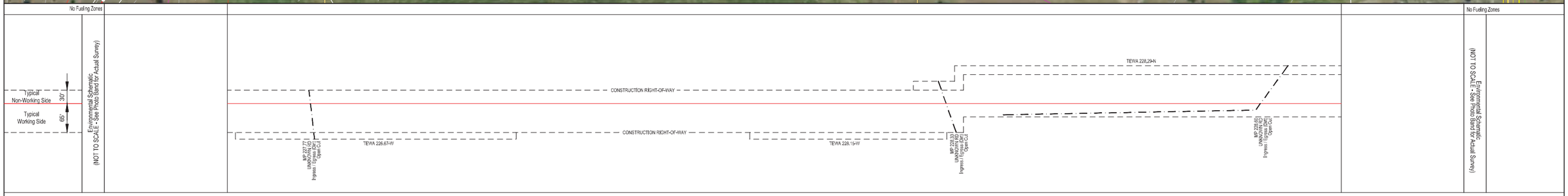
Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE:	AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE:	AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE:	AUG-2019	DRAWING NUMBER: 3430.29-224	SHEET 224 OF 226

Legal Location		SEC 2, T41S, R12E		Legal Location
Ownership / Management		KH-835.080 / KH-848.024		Ownership / Management
Jurisdiction		KLAMATH COUNTY		Jurisdiction
Federal Landuse Allocation				Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)				Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody				Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]				Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)				Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk				Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential				Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)				Survey Status (wetlands as of July 2017)



No Fueling Zones				No Fueling Zones



PUBLIC

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LEGEND

- Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way *(Shown white on photography)*
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal

- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

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- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
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- Slash Filter Windrow (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

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7 - Harvest Land Base (Low Intensity Timber Area)
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FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

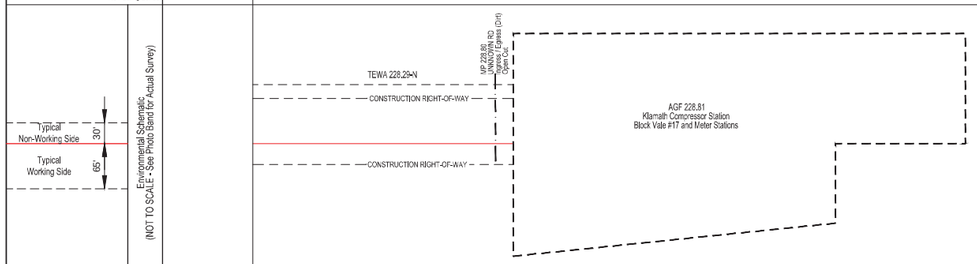
SPREAD #7
MP 227.68 TO 228.66
KLAMATH COUNTY, OREGON

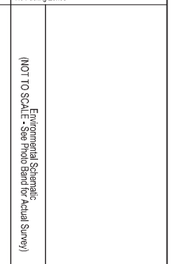
Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE: AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet	
CHECKED BY:	EE	DATE: AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet	
APPROVED BY:	EE	DATE: AUG-2019	DRAWING NUMBER: 3430.29-225	SHEET 225 OF 226	

Legal Location		SEC 11, T41S, R12E					Legal Location
Ownership / Management		KH-848.024	KH-848.000	KH-848.011AB	MAIN LOOP ROAD KH-850.000D		Ownership / Management
Jurisdiction							Jurisdiction
Federal Landuse Allocation							Federal Landuse Allocation
Areas of High Groundwater (Potential Trench Dewatering)							Areas of High Groundwater (Potential Trench Dewatering)
Wetland / Waterbody							Wetland / Waterbody
Crossing Method[1] Instream Construction Window[4]							Crossing Method[1] Instream Construction Window[4]
Biological Seasonal Construction Window (as of September 2017)							Biological Seasonal Construction Window (as of September 2017)
Topsoil Salvage / Federal Lands Soil Risk							Topsoil Salvage / Federal Lands Soil Risk
Hydrostatic Test Water Release / Aboveground Facilities / Residential		BVA #17, KLAMATH COMPRESSOR STATION, METER STATIONS AND LAUNCHER RESIDENTIAL - 3430,33-X-0007 (OUTSIDE OF PHOTO BAND)					Hydrostatic Test Water Release / Aboveground Facilities / Residential
Survey Status (wetlands as of July 2017)							Survey Status (wetlands as of July 2017)

No Fueling Zones							No Fueling Zones





PUBLIC

NOTES:
1: In wetlands cut vegetation off at ground level, leaving existing root systems in place and remove the vegetation from the wetland for disposal.
2: In wetlands limit pulling of tree stumps and grading activities to directly over the trench line. Do not grade or remove stumps or root systems from the rest of the construction right-of-way.
3: In wetlands segregate the top one foot of topsoil from the trench line, except in areas where standing water or saturated soils are present.
4: Topsoil will be stripped from the trench line and spoil storage area only in croplands, hayfields, pastures and residential areas. Topsoil may be imported in residential areas as necessary to assure adequate reclamation.
5: If streams proposed to be open cut are flowing at the time of construction, they will be crossed using a dry open cut method (i.e., flume, dam & pump, etc.). If streams proposed to be dry open cut are not flowing at the time of construction, they will be open cut.
6: Right-of-way grading or vegetation clearing will occur as necessary.
7: Seed mixes in the ECRP or according to landowner agreements or as directed by E.I.
8: Pacific Connector understands that fisheries' construction windows only apply to those waterbodies flowing at the time of construction and that the windows do not apply to HDD crossings.

LEGEND

- Proposed Pipeline

Construction Right-of-Way
- Temporary Construction Right-of-Way *(Shown white on photography)*
- Temporary Extra Work Area
- Uncleared Storage Area
- Pipe Yard
- Aboveground Facility
- Rock Source/Disposal

- Tax Parcel Boundaries
- Wetland
- Stream
- Access Road
- Permanent / Temporary Access Road (PAR / TAR)

Note: BMP type and placement to be determined by Environmental Inspector based on site-specific conditions.
- Drivable Berm or Sediment Barrier / Portable Bridge / Wetland Crossing (DB) (SB) (PB) (WC)
- Silt Fence (SF)
- Safety Fence (SAF)
- Slash Filter Windrow (SFW)
- Construction Entrance Pad (CE)

BLM LANDUSE - 2016 RMP

2a - District Designated Reserve (No Harvest)
2s - District Designated Reserve (Non-Forest)
3a - Late-Successional Reserve (Dry Forest)
3s - Late-Successional Reserve (Moist Forest)
4a - Riparian Reserve (Dry Forest)
4s - Riparian Reserve (Moist Forest)
5 - Ecsitivite Management Area
6 - Harvest Land Base (Uneven-Aged Timber Area)
7 - Harvest Land Base (Low Intensity Timber Area)
8 - Harvest Land Base (Moderate Intensity Timber Area)

FEDERAL LANDS SOIL RISK SENSITIVITY RANK

1-Very Low
2-Low
3-Moderate
4-High
5-Very High

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK.	APP.
	Sept-2017	EE	Issued for FERC Certificate Application	EE	EE
2	Aug-2019	EE	Issued for FERC DEIS Response	EE	EE

200 0 200 400 FEET

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

SPREAD #7
MP 228.66 TO 288.81
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

DRAWN BY:	EE	DATE:	AUG-2019	ISSUED FOR BID:	24x36 SCALE:1 Inch = 200 Feet
CHECKED BY:	EE	DATE:	AUG-2019	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch = 450 Feet
APPROVED BY:	EE	DATE:	AUG-2019	DRAWING NUMBER: 3430.29-226	SHEET 226 OF 226

Pacific Connector Gas Pipeline, LP

Wetland and Waterbody Crossing Plan (WWCP)

Pacific Connector Gas Pipeline Project

September 2019

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1.0 INTRODUCTION

This Wetland and Waterbody Crossing Plan (WWCP) outlines the construction methods, restoration procedures, and Best Management Practices (BMPs) that Pacific Connector Gas Pipeline, LP (PCGP) will utilize during construction of its pipeline that will obtain gas from interconnections with the Ruby pipeline and the Gas Transmission Northwest pipeline near Malin, Oregon and transport the gas approximately 229 miles (Pipeline) to a proposed liquefied natural gas terminal to be built on the North Spit of Coos Bay, Oregon by Jordan Cove Energy Project, LP. The measures set out in this WWCP will be employed to avoid, minimize, and restore potential impacts associated with wetland and waterbody crossings, as well as to minimize potential effects to aquatic resources.

These measures will also be described in the Federal Energy Regulatory Commission's (FERC's) Environmental Impact Statement (EIS) for the Pipeline and are included in PCGP's Joint Permit Application (JPA) submitted to the Oregon Department of Environmental Quality (DEQ) and the Army Corps of Engineers (COE) to obtain permits under Sections 401 and 404 of the Clean Water Act (CWA). The JPA was also submitted to the Oregon Department of State Lands (DSL) to apply for a Removal/Fill permit. Additionally, PCGP's applicant-prepared Draft Biological Assessment (APDBA) describes the measures in this WWCP as implementation of these measures will mitigate potential impacts stemming crossing of wetland and waterbodies during construction of the Pipeline. PCGP would comply with conditions contained in any permits issued by the COE and DEQ.

The POD includes many plans that incorporate construction methods, restoration procedures, and BMPs to minimize potential impacts that may occur during wetland and waterbody crossings. These plans include: Erosion Control and Revegetation Plan (Appendix I); Fish Salvage Plan (Appendix L); Klamath Project Facilities Crossing Plan (Appendix O); Leave Tree Protection Plan (Appendix P); Right-of-Way Clearing Plan (Appendix U); Spill Prevention, Containment, and Countermeasures Plan (Appendix X), and Environmental Alignment Sheets (Appendix AA).

To reduce redundancy, this Plan references other POD Plans where the mitigating measures are described. Sections 2.0 and 3.0 list the waterbodies and wetlands that are crossed by the Pipeline on federally-managed lands.

FERC developed the Wetland and Waterbody Construction and Mitigation Procedures (FERC's Procedures) with the intent to minimize the extent and duration of project-related disturbance on wetlands and waterbodies. FERC's Procedures have been developed with the participation of other federal, state and local agencies, industry, and the public nationwide specifically to mitigate potential impacts from pipeline projects. FERC's Procedures are provided in Attachment B to the ECRP (Appendix I to the POD). PCGP has adopted FERC's Procedures and incorporated them into the Pipeline's design, construction, restoration procedures and BMPs, unless a site-specific modification has been requested and approved. Modifications and their associated rationales for areas on federally-managed lands are included in Attachment 1 to this Plan.

2.0 WATERBODY CROSSINGS (adapted from Section 5.0 of the ECRP)

Due to the linear nature of the Pipeline, it is impossible to avoid crossing wetlands and waterbodies along its approximate 229-mile length; however, overall impacts to waterbodies from construction of the Pipeline have been significantly avoided by routing efforts. Although the proposed alignment crosses large waterbodies and drainages, the Pipeline's cross-country route primarily follows ridgelines and watershed boundaries as it traverses the Coast, Klamath, and Cascade Mountains and foothills. This ridgeline alignment provides the most stable landscape position for the Pipeline and minimizes the number of waterbodies and wetlands crossed as the route proceeds in a southeasterly direction from Coos Bay over the mountain ranges toward the interconnections with the Ruby and Gas Transmission Northwest pipelines near Malin, Oregon. Many of the unnamed waterbodies that are crossed by the Pipeline are intermittent headwater streams that are expected to be dry during the summer construction activities. Table 2-1 provides the waterbodies crossed by the Pipeline on federally-managed lands. Table 2-2 provides the canals crossed by the Pipeline that are administered by the U.S. Bureau of Reclamation.

To minimize the extent of disturbance, PCGP will verify and clearly mark (with flagging) the construction limits and boundaries of all sensitive areas (including waterbodies and wetlands) prior to clearing for construction (see Right-of-Way Marking Plan in Appendix T of the POD). Flagged boundaries will be maintained during construction. PCGP will ensure that all construction activities are confined to the certificated work limits authorized for construction. As described in the Leave Tree Protection Plan (Appendix P of the POD), prior to clearing operations and before or concurrently with timber cruising, the Environmental Inspector (EI) or PCGP's authorized representative in conjunction with the construction contractor will identify and flag existing snags and large trees on the edges of the construction right-of-way or TEWAs where it is feasible to save/conserve them from project clearing operations.

Waterbody crossings will generally be completed using a dry crossing method (typically flume or dam and pump) (see Drawing 3430.34-X-0006 and 3430.34-X-0007 in Attachment C to the ECRP – Appendix I to the POD) consistent with the requirements of federal, state, and local agencies with specific authority to regulate the Pipeline's waterbody crossings. Attachments 2 and 3 provide a detailed description of the BMPs that will be utilized during flumed and dam and pump waterbody crossings to minimize potential water quality impacts. Waterbody crossings would be scheduled to occur during Oregon Department of Fish and Wildlife (ODFW) recommended in-water work windows (see Table 2-1.)

Waterbody crossings will be made nearly perpendicular to the axis of the waterbody channel, where practicable, based on engineering and routing constraints to minimize parallel stream alignments and multiple stream crossings. In most cases, PCGP has been successful in designing each crossing such that temporary extra work areas (TEWAs) are not closer than 50 feet from waterbody boundaries, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Where TEWAs are located closer than 50 feet from a waterbody and the adjacent upland does not support cultivated or rotated cropland or other disturbed land, a modification from FERC's Procedures (Section V.B.2.a.& b.) was requested (see Attachment 1 to this Plan).

Table 2-1
Waterbodies Crossed by the Pipeline Project on Federally-Managed Lands and Fish Utilization, EFH, Crossing Techniques/Rationales, In-Water Work Windows, and Bridges
(updated based on 2019 DEIS Resource Table Revisions)

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Coast Range Ecoregion, Coquille Sub-basin (HUC 17100305), North Fork Coquille River (HUC 1710030504) Fifth field Watershed [8] Coos County, Oregon												
Steinnon Creek (SS-500-003; BR-S-63)	17100305000361 BLM- Coos Bay District	20.20BR	Perennial Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small non-fish tributary. Steep topographic conditions prevent a conventional bore because of bore pit grading/excavation requirements on both sides of the crossing.	None	Unknown	Assumed	None	None	Jul 1 to Sep 15	Y
Trib. to Middle Creek (BSI-137)	BLM- Coos Bay District	27.01	Intermittent Intermediate	Dry Open-Cut	Intermittent tributary to be crossed at the same time as the crossing of Middle Creek at MP 27.04 using dry open-cut. Tributary expected to be dry at the time of construction.	None	Unknown	Unknown	None	None	Jul 1 to Sep 15	Y*
Trib. to Middle Creek (BSI-135)	BLM- Coos Bay District	27.03	Intermittent Minor	Adjacent to centerline within ROW Level 2	Intermittent tributary not crossed by centerline.	None	Unknown	Unknown	None	None	Jul 1 to Sep 15	N
Middle Creek (BSP-133)	17100305000323 BLM- Coos Bay District	27.04	Perennial Intermediate	Dry Open-Cut Level 2 [11]	Dry open-cut methods feasible/practical on creek during low flow period within fish window. A conventional bore crossing is not feasible because of topographic constraints on west side of creek because of grading/excavation requirements for bore pit. An HDD is not feasible because of topographic/geometry conditions.	• Oregon Coast ESU Coho, rearing, migration habitat T, CH	Fall Chinook, Coho, Winter Steelhead, Pacific Lamprey	Cutthroat Trout	Chinook, Coho	Fall Chinook, Coho Rearing, Migration	Jul 1 to Sep 15	Y-1i
Coast Range Ecoregion, Coquille Sub-basin (HUC 17100305), East Fork Coquille River (HUC 1710030503) Fifth field Watershed [8], Coos County, Oregon												
Trib. To E. Fork Coquille (BSI-70)	17100305018097 BLM- Coos Bay District	31.64	Intermittent Minor	Dry Open-Cut	Small 1-wide intermittent headwater tributary, dry open-cut methods feasible/practical, if flowing at time of construction.	None	Unknown	Unknown	None	None	Jul 1 to Sep 15	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	**Equipment Bridges** Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. To S. Fork Elk Creek (BSI-251)	17100305021783 BLM-Coos Bay District	35.51	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 4' wide intermittent headwater tributary, if flowing at time of construction. Crossing will occur adjacent to road where existing culvert is in place. This waterbody is located within an occupied MAMU-stand (C3093). Conflicts with ODFW-recommended in-water work periods are not expected based on the proposed two-year construction schedule. However, the proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing installation to minimize the duration of instream work and the installation of flumes or dams/pumps.	None	None	None	None	None	Jul 1 to Sep 15	N (In existing road)
Coast Range Ecoregion, Coquille Sub-basin (HUC 17100305), Middle Fork Coquille River (HUC 1710030501) Fifth field Watershed [8], Coos County, Oregon												

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. to Big Creek (BLM 35.87 (CSP-2))	17100305025781 BLM-Coos Bay District	35.87	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small intermittent headwater tributary, if flowing at time of construction. Crossing occurs within Elk Creek Road (BLM 28-11-29-0) and flows through a 12" culvert which will be replaced. Waterbody is within the ¼ mile buffer of MAMU-occupied stand (C3093). Conflicts with ODFW-recommended in-water work periods are not expected based on proposed two year construction schedule. However, proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing installation to minimize the duration of instream work and to allow the removal of road culvert, installation of flumes or dams/pumps, and replacement of the road culvert	None	None	Unknown	None	None	Jul 1 to Sep 15	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	**Equipment Bridges** **Y=Yes,** **Y* = Yes if flowing at time of construction,** **1o = 1 pass required outside fish window** **1i = 1 pass required inside fish window,** **i = set inside fish window,** **N=None**
Trib. To Big Creek (BLM 36.48)	17100305026477 BLM-Coos Bay District	36.48	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small intermittent headwater tributary, if flowing at time of construction. This waterbody is located adjacent to an occupied MAMU-stand (C3073). Conflicts with ODFW-recommended in-water work periods are not expected based on the proposed two-year construction schedule. However, the proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing to facilitate the crossing and allow the installation/removal of flumes or dams/pumps and to minimize the duration of instream work.	None	None	Unknown	None	None	Jul 1 to Sep 15	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. To Big Creek (GSI-25/BSI-253)	17100305004068 BLM-Coos Bay District	36.54	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 4' wide intermittent headwater tributary, if flowing at time of construction. No additional workspace required. ODFW fish passage barrier data reports a downstream boulder canyon with a 10-foot falls at upper end (RecordID 52488). StreamNet data indicates anadromy below crossing (~ 0.5 mile) at ODFW barrier 52488. This waterbody is located within an occupied MAMU-stand (C3073). Conflicts with ODFW-recommended in-water work periods are not expected based on the proposed two-year construction schedule. However, the proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing installation to minimize the duration of instream work and the installation of flumes or dams/pumps.	None	None	Unknown	None	None	Jul 1 to Sep 15	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. To Big Creek (BLM 36.85)	17100305025748 BLM-Coos Bay District	36.85	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small intermittent headwater tributary, if flowing at time of construction. Crossing occurs within Elk Creek Road (BLM 28-11-29-0) and flows through a 12-18" culvert which will be replaced. This waterbody is located within an occupied MAMU-stand (C3073). Conflicts with ODFW-recommended in-water work periods are not expected based on the proposed two-year construction schedule. However, the proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing to facilitate the crossing and allow the installation/removal of flumes or dams/pumps and to minimize the duration of instream work.	None	None	Unknown	None	None	Jul 1 to Sep 15	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. To Big Creek (BSI-252)	17100305004061 BLM-Coos Bay District	36.92	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 3' wide intermittent headwater tributary, if flowing at time of construction. No additional workspace required. Alignment and trib. crossing along existing road. ODFW fish passage barrier data reports a downstream boulder canyon with a 10 foot falls at upper end (RecordID 52488). StreamNet data indicates anadromy below crossing (~ 1 mile) at ODFW barrier 52488. This waterbody is located within an occupied MAMU-stand (C3073). Conflicts with ODFW-recommended in-water work periods are not expected based on the proposed two-year construction schedule. However, the proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing installation to minimize the duration of instream work and the installation of flumes or dams/pumps.	None	None	Unknown	None	None	Jul 1 to Sep 15	N (In existing road)

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	**Equipment Bridges** **Y=Yes,** **Y* = Yes if flowing at time of construction,** **1o = 1 pass required outside fish window** **1i = 1 pass required inside fish window,** **i = set inside fish window,** **N=None**
Trib. To Big Creek (ESI-19)	17100305026126 BLM-Coos Bay District	37.32	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 3' wide intermittent headwater tributary, if flowing at time of construction. No additional workspace required. ODFW fish passage barrier data reports a downstream boulder canyon with a 10 foot falls at upper end (RecordID 52488). StreamNet data indicates anadromy below crossing (~ 1 mile) at ODFW barrier 52488. StreamNet data indicates anadromy below crossing (~ 1 mile) at ODFW barrier 52488. This waterbody is located within an occupied MAMU-stand (C3090). Conflicts with ODFW-recommended in-water work periods are not expected based on the proposed two-year construction schedule. However, the proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing installation to minimize the duration of instream work and the installation of flumes or dams/pumps.	None	None	Unknown	None	None	Jul 1 to Sep 15	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. To Big Creek (ESP-20)	17100305000606 BLM-Coos Bay District	37.35	Perennial Intermediate	Dry Open-Cut Level 1 [11]	Dry open-cut methods feasible/practical on stream. Dam and pump crossing method most logical dry open-cut method based on topographic conditions to eliminate difficulties of threading pipe string under flume with associated safety risks including upsetting flume during process. Steep topography on both sides of stream prevents conventional bore crossing methods because of grading/excavation requirements for bore pits. No additional workspace proposed. ODFW fish passage barrier data reports a downstream boulder canyon with a 10 foot falls at upper end (RecordID 52488). StreamNet data indicates anadromy below crossing (~ 1 mile) at ODFW barrier 52488. This waterbody is located within an occupied MAMU-stand (C3090). Conflicts with ODFW-recommended in-water work periods are not expected based on the proposed two-year construction schedule. However, the proposed Year Two daily timing restrictions during construction to minimize impacts to MAMU should be waived during the stream crossing installation to minimize the duration of instream work and the installation of flumes or dams/pumps.	None	None	Unknown	None	None	Jul 1 to Sep 15	Y

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Big Creek	17100305000272 BLM-Coos Bay District	37.41	Perennial Intermediate	Adjacent riparian zone	Adjacent riparian zone overlaps construction ROW	• Oregon Coast ESU Coho, assumed habitat T	Winter Steelhead	Assumed	Coho Assumed	Unknown	Jul 1 to Sep 15	N
Klamath Mountains Ecoregion, Coquille Sub-basin (HUC 17100305), Middle Fork Coquille River (HUC 1710030501) Fifth field Watershed [8], Douglas County, Oregon												
Deep Creek (BSP-257)	17100305005863 BLM-Roseburg District	48.27	Perennial Intermediate	Dry Open-Cut Level 1	Dry open-cut methods feasible/practical on broad stream and associated wetlands. ODFW fish passage barrier data (Recordid 56033) reports downstream falls on the Middle Fork Coquille River restrict anadromy at crossing.	None	None	Cutthroat Trout	None	None	Jul 1 to Sep 15	Y-1i
Cascades Ecoregion, South Umpqua (HUC 17100302) Sub-basin, Days Creek-South Umpqua River (HUC 1710030205) Fifth field Watershed [8, 9], Douglas County, Oregon												
Trib. to South Umpqua (ASI-190)	17100302038007 BLM-Roseburg District	98.46	Intermittent Minor	Dry Open-Cut (Streambed-bedrock) [12]	Dry open-cut methods feasible/practical on small 2-4' wide intermittent tributary (ditch) if flowing at the time of construction	None	None	None	None	None	Jul 1 to Sep 15	Y*
Cascades Ecoregion, South Umpqua (HUC 17100302) Sub-basin, Upper Cow Creek (HUC 1710030206) Fifth field Watershed [8], Douglas County, Oregon												
Ditch (Beaver Creek) (CDX-50)	Forest Service – Umpqua NF	105.41	Intermittent Intermediate	Dry Open-Cut	Dry open-cut methods feasible/practical on small 1-4' wide intermittent roadside ditch within right-of-way if flowing at the time of construction.	None	None	None	None	None	N/A	Y*
Ditch (CDX-49)	Forest Service – Umpqua NF	106.77	Intermittent N/A	Adjacent to centerline within ROW	N/A - small 1-4' wide intermittent roadside ditch within right-of-way if flowing at the time of construction.	None	None	None	None	None	N/A	Y*
Roadside Ditch (CDX-47)	Forest Service – Umpqua NF	108.08	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 1-3' wide intermittent roadside ditch within right-of-way if flowing at the time of construction.	None	None	None	None	None	N/A	Y*
Roadside Ditch (CDX-48)	Forest Service – Umpqua NF	108.40	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 1-3' wide intermittent roadside ditch within right-of-way if flowing at the time of construction.	None	None	None	None	None	N/A	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Ditch (GDX-15)	17100302034497 Forest Service – Umpqua NF	109.13	Intermittent Intermediate	Adjacent to centerline within TEWA	Dry open-cut methods feasible/practical on small headwater wetland/tributary-if flowing at the time of construction.	None	None	None	None	None	Jul 1 to Sep 15	Y*
Trib. to East Fork Cow Creek (GSI-16/FS-HF-F)	17100302013838 Forest Service – Umpqua NF	109.33	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 3' wide headwater intermittent tributary if flowing at the time of construction.	None	None	None	None	None	Jul 1 to Sep 15	Y*
East Fork Cow Creek (GSP-19/ASP-297/FS-HF-G)	17100302013839 Forest Service – Umpqua NF	109.47	Perennial Intermediate	Dry Open-Cut (Streambed-bedrock) [12]	Dry open-cut methods feasible/practical on small headwater stream during low flow periods within ODFW in-water work period. No additional work areas proposed.	None	Unknown	Unknown	None	None	Jul 1 to Sep 15	Y
East Fork Cow Creek S-T09-002 (GSP-22 ASP-297/FS-HF-M)	17100302013839Forest Service – Umpqua NF	109.68	Perennial Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small headwater stream during low flow periods within ODFW in-water work period. No additional work areas proposed	None	None	Unknown	None	None	Jul 1 to Sep 15	Y
Trib to East Fork Cow Creek S-T09-001(FS-HF-M)	17100302013840 Forest Service – Umpqua NF	109.74	Perennial Minor	Dry-Open Cut	Dry open-cut methods feasible/practical on small 2-4' wide headwater stream during low flow periods within ODFW in- water work period. No additional work areas proposed	None	None	Unknown	None	None	Jul 1 to Sep 15	Y
Cascades Ecoregion, Upper Rogue (HUC 17100307) Sub-basin, Trail Creek (HUC 1710030706) Fifth field Watershed [8], Jackson County, Oregon												
Pond Trib. to W. Fork Trail Creek (EW-69)	Forest Service – Umpqua NF	110.57	Intermittent Pond	Within Pevine Quarry TEWA 110.73	Small ponded area within Peavine Quarry and TEWA; drainage expected to be dry during construction.	None	None	None	None	None	N/A	N
Trib. to W. Fork Trail Creek (ESI-68) (EW-68)	17100307018629 Forest Service – Umpqua NF	110.57	Intermittent Minor	Within Pevine Quarry Adjacent to centerline within TEWA 110.73	Small 1-2' wide ephemeral drainage located Peavine Quarry within TEWA; drainage to be avoided by construction; drainage expected to be dry during construction.	None	None	None	None	None	N/A	N –to be avoided
Cascades Ecoregion, South Umpqua Sub-basin (HUC 17100302), Upper Cow Creek (HUC 1710030206) Fifth field Watershed [8], Jackson County, Oregon												

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. to W. Fork Trail Creek (FS-HF-N /ESI-68)	17100302034587 Forest Service – Umpqua NF	110.96	Intermittent Intermediate	Dry Open-Cut	Dry open-cut methods feasible/practical on small 2-4' headwater tributary. Right-of-way necked down to 75' and no TEWAs utilized to minimize riparian impacts.	None	None	None	None	None	Jun 15 to Sep 15	Y*
Klamath Mountains Ecoregion, Upper Rogue (HUC 17100307) Sub-basin, Trail Creek (HUC 1710030706) Fifth field Watershed [8], Jackson County, Oregon												
Canyon Creek (NSP-11)	17100307000501 BLM-Medford District	120.45	Perennial Minor	Dry Open-Cut (Streambed-bedrock) [12] Level 1	Dry open-cut methods feasible/practical on small 7' wide tributary during low flow periods within ODFW in-water work window. Only UCSAs utilized at crossing to minimize impacts to riparian areas.	• SONCC Coho, spawning, rearing habitat T, CH	Coho, Summer Steelhead	Trout, unspecified	Coho	Coho Spawning, Rearing	Jun 15 to Sep 15	Y
Klamath Mountains Ecoregion, Upper Rogue (HUC 17100307) Sub-basin, Shady Cove-Rogue River (HUC 1710030707) Fifth field Watershed [8], Jackson County, Oregon												
Trib. to Indian Creek (RS-4)	17100307008662 BLM-Medford District	126.53	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 1' wide intermittent headwater tributary if flowing at the time of construction.	None	None	None	None	None	Jun 15 to Sep 15	Y*
Trib. to Indian Creek (ASI-221)	17100307008662 BLM-Medford District	126.56	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 5' wide intermittent headwater tributary if flowing at the time of construction.	None	None	None	None	None	Jun 15 to Sep 15	Y*
Trib. To Indian Creek (ASI-400)	BLM-Medford District	129.13	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 3-4' wide intermittent headwater trib. if flowing at the time of construction.	None	Unknown	Unknown	None	None	Jun 15 to Sep 15	Y*
Trib. To Indian Creek (ASI-306)	BLM-Medford District	129.21	Intermittent N/A	Adjacent to centerline within ROW	Not crossed by centerline. Small headwater tributary expected to be dry at the time of construction and would be restored to approximate original contour and grade during restoration.	None	Unknown	Unknown	None	None	Jun 15 to Sep 15	N
Klamath Mountains Ecoregion, Upper Rogue (HUC 17100307) Sub-basin, Big Butte Creek (HUC 1710030704) Fifth field Watershed [8], Jackson County, Oregon												
Trib. to Neil Creek (ASI-251)	17100307018233 BLM-Medford District	131.37	Intermittent N/A	Adjacent to within TEWA	Small tributary expected to be dry at the time of construction and would be restored to approximate original contour and grade during restoration.	None	None	None	None	None	Jun 15 to Sep 15	N - avoided

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib. to Quartz Creek (ASP-241)	BLM-Medford District	133.35	Perennial Intermediate	Dry Open-Cut	Tributary, which originates from seepage from the Medford Aqueduct, will likely be crossed with the bore of the Medford Aqueduct.	None	Unknown	Unknown	None	None	Jun 15 to Sep 15	Y*
Medford Aqueduct - Ditch 3 (ASP-240)	17100307006008 BLM-Medford District	133.38	Perennial Intermediate	Conventional Bore	Proposed conventional bore feasible/practical based on flow volume, channel geometry and potential risk in disturbing man-made aqueduct. Dry open cut feasible	None	None	None	None	None	N/A	Y
Klamath Mountains Ecoregion, Upper Rogue (HUC 17100307) Sub-basin, Little Butte Creek (HUC 1710030708) Fifth field Watershed [8], Jackson County, Oregon												
Trib. to Lick Creek (SS-GM-19)	Private/BLM-Medford District	139.91	Intermittent Minor	Adjacent to centerline within ROW	Not crossed by centerline. Small headwater tributary expected to be dry at the time of construction and would be restored to approximate original contour and grade during restoration..	None	None	Unknown	None	None	Jun 15 to Sep 15	Y*
Lick Creek (ASI-233)	17100307000130 BLM-Medford District	140.27	Intermittent Intermediate	Dry Open-Cut Level 1	Dry open-cut methods feasible/practical on intermittent drainage if flowing at the time of construction. Dam and pump crossing method most logical dry open-cut method based on topographic conditions to eliminate difficulties of threading pipe string under flume with associated safety risks including upsetting flume during process. ROW necked down to 75' and TEWAs set back to minimize riparian impacts. StreamNet data indicates anadromy below crossing (~ 2 miles)	None	None	Trout, unspecified	None	None	Jun 15 to Sep 15	Y*
Ditch Trib. to Lick Creek (ADX-234)	17100307001378 BLM-Medford District	140.32	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 1-2' wide intermittent road ditch if flowing at the time of construction.	None	None	Unknown	None	None	Jun 15 to Sep 15	

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	**Equipment Bridges** Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Ditch Trib. to Lick Creek (ADX-186)	17100307001383 BLM-Medford District	140.94	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 1-2' wide intermittent ditch if flowing at the time of construction.	None	None	None	None	None	N/A	Y*
Trib. to Salt Creek (ASI-187)	17100307014303 BLM-Medford District	141.18	Intermittent Minor	Dry Open-Cut (Streambed-bedrock) [12]	Dry open-cut methods feasible/practical on small 3' wide intermittent headwater trib. if flowing at the time of construction. No additional workspace required.	None	None	None	None	None	Jun 15 to Sep 15	Y*
Trib. to Salt Creek (ASI-188)	17100307004291 BLM-Medford District	141.48	Intermittent IMinor	Dry Open-Cut (Streambed-bedrock) [12]	Dry open-cut methods feasible/practical on small intermittent headwater trib. if flowing at the time of construction.	None	None	None	None	None	Jun 15 to Sep 15	Y*
Trib. to Salt Creek (RS-17)	17100307004291 BLM-Medford District	141.49	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small 4' wide intermittent headwater trib., if flowing at the time of construction.	None	None	None	None	None	Jun 15 to Sep 15	Y*
Cascades Ecoregion, Upper Rogue (HUC 17100307) Sub-basin, Little Butte Creek (HUC 1710030708) Fifth field Watershed [8, 9], Jackson County, Oregon												
South Fork Little Butte Creek (ASP-165)	17100307000108 Forest Service- Rogue River-Siskiyou NF	162.45	Perennial Intermediate	Dry Open-Cut Level 1	Dry-open cut feasible and practical on creek. ODFW fish passage barrier data (RecordID 51163) indicates that downstream irrigation diversion dam/barrier (~ 0.5 miles): is unladdered and impassible. USGS Gage Station 14339500 – located below diversion reports monthly mean flow of 14, 12 and 11 cfs, respectively for Jul, Aug & Sep. ROW necked down to 75 feet and TEWAs set back to minimize riparian impacts.	None	None	Trout, unspecified	None	None	Jun 15 to Sep 15	Y-1i with mid-stream support
Daley Creek (ESI-76)	17100307000107 Forest Service- Rogue River-Siskiyou NF	166.21	Intermittent Intermediate	Dry Open-Cut	Dry open-cut methods feasible/practical on small headwater intermittent trib. if flowing at the time of construction.	None	None	Trout, Unspecified	None	None	Jun 15 to Sep 15	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None
Trib to Little Butte Creek (S-T08-006)	17100307005730 Forest Service- Rogue River-Siskiyou NF	167.80	Intermittent Minor	Bore	Trenchless (bore) crossing proposed to avoid stream and Pacific Crest Trail Crossing	None	None	Unknown	None	None	Jun 15 to Sep 15	N/A
Eastern Cascades Slopes and Foothills Ecoregion, Upper Klamath River (HUC 18010206) Sub-basin, Spencer Creek (HUC 1801020601) Fifth field Watershed [8, 9], Klamath County, Oregon												
Spencer Creek WW-001-013 (EW-85)	18010206000968 Forest Service-Winema NF	171.07	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small < 10' wide stream with associated wetland. ROW necked down 75 feet and TEWAs set back or located to the edge of existing road disturbance to minimize riparian and wetland impacts. Conventional bore not practical because of topographic conditions and grading/excavation requirements on the south side of creek.	None	None	Unknown	None	None	Aug 1 to Sep 30	Y
Trib. to Spencer Creek SS-201-001 (GSP-7)	18010206005900 Forest Service-Winema NF	171.57	Intermittent Intermediate	Dry Open-Cut	Dry open-cut methods feasible/practical on small < 2' wide intermittent trib/wetland. if flowing at the time of construction.	None	None	Unknown	None	None	Aug 1 to Sep 30	Y*
Trib. to Spencer Creek (ESI-106a)	18010206000678 Forest Service-Winema NF	173.74	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small < 5' wide ephemeral trib. if flowing at the time of construction.	None	None	Unknown	None	None	Aug 1 to Sep 30	Y
Trib. to Spencer Creek (ESI-69)	18010206000677 BLM-Lakeview District	176.54	Intermittent Minor	Dry Open-Cut	Dry open-cut methods feasible/practical on small < 4' wide intermittent trib. if flowing at the time of construction.	None	None	Unknown	None	None	Aug 1 to Sep 30	Y*
Trib. to Spencer Creek (GSI-10)	18010206000677 BLM-Lakeview District	176.56	Intermittent N/A	Adjacent to centerline within ROW	Not crossed by centerline. Small headwater tributary expected to be dry at the time of construction and would be restored to approximate original contour and grade during restoration.	None	None	Unknown	None	None	Aug 1 to Sep 30	Y*

Waterbodies Crossed and Waterbody ID	NHD Waterbody Reach Code [1] and Jurisdiction	Approximate Pipeline Milepost (MP)	Waterbody Type Size [2]	Proposed Crossing Method Scour Level [3]	Waterbody Crossing Rationale[4]	ESA Species Present/Habitat[5]	Anadromous Species Present [6]	Resident Coldwater Species Present	EFH Species Present [7]	EFH Component Present [7]	Fishery Construction Window [6]	Equipment Bridges Y=Yes, Y* = Yes if flowing at time of construction, 1o = 1 pass required outside fish window 1i = 1 pass required inside fish window, i = set inside fish window, N=None

[1] FERC waterbody definitions:
Minor = less than or equal to 10 feet wide
Intermediate = greater than 10 feet wide but less than or equal to 100 feet wide
Major = greater than 100 feet wide

[2] Level 1 and 2 waterbodies have been identified; all others are Level 0. According to GeoEngineers 2013 Channel Migration and Scour Analysis for the PCGP Project, channel migration is defined as the lateral movement, over time, of an entire channel segment perpendicular to the direction of stream flow; channel avulsion is the sudden abandonment of an active channel for a newly created or previously abandoned channel located on the floodplain; channel widening is defined as erosion and subsequent recession of one or both stream banks that widens the channel without changing the channel location; streambed scour is erosion of the streambed resulting in the development of deep pools and/or the systematic lowering of the channel floor elevation.
Level 0 = streams not likely subject to migration, avulsion and/or scour
Level 1 = streams with a moderate potential for migration, avulsion and/or scour
Level 2 = streams with a high potential for migration, avulsion and/or scour

[3] Dry open-cut crossing methods include Flume or Dam and Pump procedures. Dam and Pump methods would be utilized where streambed blasting is anticipated to eliminate blasting around the flume. The Dam and Pump crossing method is the preferred crossing procedure in steep incised drainage valleys where worker safety may be compromised when placing ("threading") the pipe string under the flume pipe and where there is a risk of upsetting the flume during this operation. The Dam and Pump crossing method is also the preferred crossing method on small streams under low flow conditions during the ODFW recommended in-water work period. PCGP requests permission for temporary/short-term fish passage restriction when completing Dam and Pump crossings within the ODFW recommended in-water work period.

[4] FWS, NMFS, and StreamNet. T = Threatened, E = Endangered, CH = Critical Habitat

[5] ODFW, 2012 (Oregon Department of Fish and Wildlife. 2012. Fish Distribution Data, 1:24,000 Scale. Oregon Department of Fish and Wildlife Natural Resources Information Management Program. Online: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata).

[6] PFMC, 1999; ODFW, 2012.

[7] PCGP understands that fisheries' construction windows only apply to those waterbodies flowing at the time of construction and that the windows do not apply to HDD crossings.

[8] USGS Hydrologic Unit Codes.

[9] Key Watershed.

[10a] ODFW's recommended in-water work window is from October 1 through February 15. Because PCGP's Coos Bay HDD footprint overlaps with the LNG Terminal facilities, the HDD needs to be completed prior to construction of the LNG terminal to prevent construction conflicts and delays; therefore PCGP may complete the HDD outside the ODFW recommended in-water work window.

[10b] ODFW's recommended in-water work window is from October 1 through February 15. Because of the extensive wetland located on the east side of Coos Bay within Kentuck Slough, PCGP plans to schedule the HDD outside the in-water work window to minimize surface impacts within the saturated floodplain wetland.

[10c] ODFW's recommended in-water work window is from October 1 through February 15. Because of the extensive wetland location on the south side of the Coos River, PCGP has scheduled the HDD during the dry season outside the in-water work window between August 1 and September 30 to minimize surface impacts within the saturated floodplain wetland.

[11] These sites were field reviewed and analyzed for potential migration, avulsion and/or scour (see GeoEngineers 2013 Channel Migration and Scour Analysis).

[12] Streambed bedrock based on PCGP's Wetland and Waterbody delineation surveys. Streambed bedrock may require special construction techniques to ensure pipeline design depth. Special construction techniques may include rock hammering, drilling and hammering, or blasting. The need for blasting would be determined by the contractor and would only be initiated after ODFW blasting permits are obtained.

Table 2-2
U.S Bureau of Reclamation Administered Lands and Canals

U.S Bureau of Reclamation (Reclamation) Jurisdictional Facilities (Easement Width) [1]	Approximate Pipeline Milepost	Length of Pipeline Crossing (feet)	Index No. Easement Width	Waterbody ID [2]	QQ	Township	Range	Section
C-4-E Lateral [3]	NA	Not Crossed [3]	KO-20-080 30-feet	ADX293	SWNE	39S	9E	20
Withdrawn Land	NA	Not Crossed	KO-20	N/A	SWNE	39S	9E	20
No. 1 Drain	200.54	14.59	KO-20-276 60-feet	ADX294	SWNE	39S	9E	20
C-4-E Lateral	201.63	15.49	KO-20-164 40-feet	ADX096	NENW	39S	9E	28
C-4 Lateral	204.12	48.18	KO-09-013 50-feet	ADX100	NWNE	40S	9E	3
C-4-F Lateral	204.33	12.91	KO-09-013 50-feet	ADX101	NWNE	40S	9E	3
No. 3 Drain	204.74	17.80	KO-09-14 60-feet	ADX105	NWNW	40S	9E	2
C-4-C Lateral	205.50	18.28	KO-09-018 60-feet	ADX109	SWNE	40S	9E	2
C Canal	205.96	54.90	KO-09-027 75-feet [4]	ADX111	NWSW	40S	9E	1
D-2 Lateral	206.51	23.76	KO-09-050 60-feet	ADX113	NWNE	40S	9E	12
5-A-1 Drain	207.11	4.00	KO-09-053 60-feet	AW-114	NESE	40S	9E	12
5-A Drain	207.26	28.61	KO-09-054 50-feet [4]	ADX115	NESE	40S	9E	12
C-4-7 Lateral	207.40	15.20	KO-10-031 60-feet	ADX116	NWSW	40S	10E	7
5-A Drain	207.42	16.84	KO-10-032 50-feet	ADX117	NWSW	40S	10E	7
5-A Drain	207.60	61.56	KO-10-032 50-feet	ADX118	SWSW	40S	10E	7
5-A Drain	207.99	25.26	KO-10-034 50-feet	ADX119	NENW	40S	10E	18
5-A Drain	208.18	19.94	KO-10-034	ADX123	SENW	40S	10E	18

U.S Bureau of Reclamation (Reclamation) Jurisdictional Facilities (Easement Width) [1]	Approximate Pipeline Milepost	Length of Pipeline Crossing (feet)	Index No. Easement Width	Waterbody ID [2]	QQ	Township	Range	Section
			50-feet					
5-K Drain	209.02	24.95	KO-10-048 30-feet [4]	ADX130	SESE	40S	10E	18
C-9 Lateral	209.15	16.03	KO-10-047 30-feet	ADX134	NWNW	40S	10E	20
No. 5 Drain	210.26	17.90	KO-10-061 50-feet	ADX143	SESE	40S	10E	20
5-H Drain	210.85	10.71	KO-10-074 20-feet	ADX260	SWNW	40S	10E	28
G Canal	213.87	43.90	KO-10-086 165-feet	ADX275	SESE	40S	10E	26
	Total	**490.81**						

[1] Reclamation Facility Name, (easement width) Reclamation ID, and Index No included as attributes in Bureau of Reclamation PCGP-Crossing Shapefile provided to PCGP - January 7, 2009. Easement widths determined from scanned easement plats provided by Reclamation.
[2] Waterbody ID from PCGP wetland and waterbody surveys as shown on the Environmental Alignment Sheets in Appendix AA to the POD.
[3] The C-4-E Lateral is not crossed by the centerline but the easement for the lateral is within the construction right-of-way for approximately 270 feet.
[4] Canal easement widths not provided on easement plats provided by Bureau of Reclamation; therefore crossing widths estimated based on photography and similar canal easements on adjacent canals.

PCGP has developed a Spill Prevention, Control, and Countermeasures (SPCC) Plan that describes measures to prevent and control any inadvertent spill of hazardous materials such as fuels, lubricants, and solvents that could contaminate soils and affect water quality (see Appendix X to the POD). The SPCC Plan will be updated with site-specific information prior to construction. All employees and contractors who will construct the Pipeline will receive SPCC training. The SPCC Plan restricts the storage of hazardous substances, chemicals, fuels, or lubricating oils, including the parking of all equipment overnight or during times of non-use and refueling to at least 150 feet from waterbodies and wetland boundaries on federally-managed lands. On federally-managed lands, any variance would require prior approval from the authorized representative.

PCGP will utilize temporary construction bridges during all phases of construction to cross waterbodies. These structures will be designed according to FERC's Procedures, as well as any conditions included in any applicable state or federal permits. The temporary equipment bridges will be constructed to maintain unrestricted flow and to maintain flow and to prevent soil from entering the waterbody. Soil will not be used to stabilize equipment bridges. Bridges will be constructed to withstand and pass the highest flow expected to occur while the bridge is in place, and, where feasible, bridges will be designed to span the entire Ordinary High Water Mark (OHWM) of the waterbody. The highest flow expected will be determined during the season of construction and will take into account an evaluation of regional climate and physical conditions as well as existing historic stream-flow data and peak discharge statistics from nearby USGS gauging stations. If it is not possible to span the OHWM with the bridge, a temporary culvert or pier may be required. These culverts/piers would be installed to minimize flow restrictions that may deflect stream flow to banks to prevent streambank erosion or scour. The temporary bridges may include:

- equipment mats and culvert(s);
- equipment mats or railroad car bridges without culverts;
- clean rock fill and culvert(s); and
- flexi-float or portable bridges.

PCGP may utilize other alternatives for equipment bridges that achieve the same performance and objective. Drawing 3430.34-X-0010 in Attachment C to the ECRP (Appendix I to the POD) provides a typical drawing of a temporary crossing bridge. Temporary bridge materials, such as equipment mats, will be inspected and cleaned prior to being brought to the right-of-way to ensure they are free of potential noxious weed propagules. All stream crossings on National Forest System (NFS) lands (whether intermittent or perennial, wet or dry) will have either: 1) a bridge; 2) a temporary culvert with temporary road fill to be removed after work is completed; or 3) a low water ford with a rock mat. Temporary bridges will be set during clearing operations in Year One construction as well as during mainline construction in Year Two. The temporary bridges set during clearing operations would be temporarily removed after clearing is complete and will not be left in place across a waterbody over the Year One/Year Two winter. During mainline construction in Year Two, the temporary bridges will be reset and will be removed as soon as possible after permanent seeding. If there will be more than one month between final cleanup and the beginning of permanent seeding and reasonable alternate access to the right-of-way is available, equipment bridges will be removed as soon as possible after final cleanup as required by FERC's Procedures (Section V.B.5.f.).

Although FERC's Procedures (see Section V.B.5.a.) allow clearing equipment and equipment necessary for installation of the temporary bridges to cross waterbodies prior to bridge installation, PCGP will not allow clearing equipment to cross waterbodies prior to bridge

placement. Furthermore, where feasible, PCGP's contractors will attempt to lift, span, and set the bridges from the streambanks. However, where it is not feasible to install or safely set the temporary bridges from the streambanks, only the equipment necessary to install the bridge or temporary support pier will cross the waterbody. Any equipment required to enter a waterbody to set a bridge will be inspected to ensure it is clean and free of dirt or hydrocarbons. Table 2-1 provides information whether it is necessary for equipment to cross the waterbody to install a temporary bridge. On BLM and NFS lands if it is not feasible to install a bridge for crossing a waterbody, the means by which the equipment will crossing water body will be approved by the appropriate federal agency prior to any crossing.

Sediment barriers will be installed immediately after clearing and prior to initial ground disturbance (i.e., grading). Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas. The contours of the streambed, shoreline and streambanks will be restored to preconstruction configurations (i.e., contour/elevations) to restore the physical integrity/conditions of these features. At some stream crossings, steep, eroding streambanks may need to be regraded to a stable slope (3:1) to ensure physical integrity as shown on drawing 3430.34-X-0014 in Attachment C to the ECRP. PCGP's Stream Crossing Risk Analysis Addendum (GeoEngineers, 2018) provides site-specific BMPs to restore stream beds and banks for long-term stability and to restore aquatic habitat (see excerpt in Table 2-3). The Risk Assessment also provides a stream crossing monitoring plan to ensure long-term success of stream restoration, maintenance of fish passage, and to identify channel erosion, scour or migration that could destabilize the site or expose the pipeline. Appropriate restoration BMPs, outlined in the Site-Specific Stream Crossing Prescriptions for the following streams on BLM and NFS lands (North State Resources, 2014 and Stantec, 2019), will also be incorporated during construction and restoration in consultation with the agencies' authorized representative(s) and PCGP's EI or authorized representative:

- Middle Creek (MP 27.04, BSP-133)
- Tributary of Big Creek (MP 37.35, ESP-20)
- Deep Creek (MP 48.27, BSP-257)
- East Fork Cow Creek Tributary (MP 109.17, WW-111-001/GW014/Hydrofeature C)
- East Fork Cow Creek (MP 109.47, GSP019/Hydrofeature G)
- East Fork Cow Creek (MP 109.68, S-T09-002/GSP-22/EFCC-1)
- East Fork Cow Creek Tributary (MP 109.74, S-T09-001/FS-HF-M/EFCC-2)
- South Fork Little Butte Creek (MP 162.45, ASP 165)

Clean gravel or cobbles will be also be placed in the upper one-foot of trench backfill on all fish bearing streams using specifications provided by the ODFW or authorized agency representative on federal lands or the trench will be backfilled with native streambed materials. PCGP will also install erosion control fabric (such as jute or excelsior) on streambanks at the time of recontouring (see Drawing 3430.34-X-0009 in Attachment C to the ECRP – Appendix I to the POD). The fabric will be anchored using staples or other appropriate devices. The erosion control fabric to be used on streambanks and steep slopes will be designed for the proposed use and will be approved by the EI, and authorized agency representative on federal lands. On federal lands, PCGP will treat all intermittent streams that are not flowing at the time of construction as perennial streams and will stabilize them with temporary sediment barriers.

Table 2-3
Site Specific Rankings and Management Categories
(excerpted from GeoEngineers' April 6, 2018 Stream Crossing Risk Analysis Addendum/Table A-1)

Milepost	Waterbody Name	Waterbody ID	Desktop Risk Management Category	Sites Evaluated by GeoEngineers in 2014	Post Survey Management Category	Justification for Change in Management Category
20.20BR	Steinnon Creek	SS-500-003 (BR-S-63)	Y			
24.32	Steinnon Creek	BR-S-63	Y			
27.04	Middle Creek	BSP-133	Y	X	O	Observations of 12-15 ft high erodible banks upgrades risk.
37.32	Trib. to Big Creek	ESI-19	Y	X	Y	Active incision was observed at this site.
37.35	Trib. to Big Creek	ESP-20	Y	X	O	Channel is incised with steep erodible banks. High quality habitat should be retained.
48.27	Deep Creek	BSP-257(MOD)	Y	X	Y	
109.17	Trib to East Cow Creek (wetland)	GW-14 (FS-HF-C)	Y		Y	
109.47	East Fork Cow Creek	GSP-19 (ASP-297/FS-HF-G)	Y	X	O	Large boulder cascade just downstream of crossing should not be disturbed to prevent headcutting.
109.69	East Fork Cow Creek	GSP-22 (ASP-297/FS-HF-M)	B	X*	B	
109.69	East Fork Cow Creek	FS-HF-J	B	X*	Y	A large Log jam near crossing raises risk designation as it should not be disturbed and gradient should be maintained.
109.78	Trib. to East Fork Cow Creek	FS-HF-K	Y	X	Y	
110.96	Trib. to East Fork Cow Creek	FS-HF-N (ESI068)	Y	X	Y	
120.45	Canyon Creek	NSP-11	Y			
140.27	Lick Creek	ASI-233	Y	X	Y	
162.45	South Fork Little Butte Creek	ASP-165	Y	X	O	Several high flow channels present a risk for avulsion at this site. High quality habitat should be retained.
166.21	Daley Creek	ESI-76 (ESI-84)	Y	X	B	No defined Stream Channel was identified in the vicinity of the crossing.
171.07	Spencer Creek	WW-001-013 (EW-85)	Y	X	B	No defined Stream Channel was identified in the vicinity of the crossing.
173.74	Trib. to Spencer Creek	ESI-106a	Y	X	B	No defined Stream Channel was identified in the vicinity of the crossing.

Milepost	Waterbody Name	Waterbody ID	Desktop Risk Management Category	Sites Evaluated by GeoEngineers in 2014	Post Survey Management Category	Justification for Change in Management Category
176.54	Trib. to Spencer Creek	ESI-69	Y	X	Y	
176.56	Trib. to Spencer Creek	GSI-10	Y	X	Y	

General Note:
Trenchless crossings (i.e., HDD, conventional bore, span) that are not expected to disturb the streambed and streambank surfaces are not included in the risk analysis. Streams with extreme headwater location, or no defined channel within the LiDAR and aerial data, or a low risk rating are excluded from this table.

* Site visited to verify rankings of a greater subset of crossings that include the lower risk crossings or visited based on professional judgment indicating potential fluvial processes at the site

Color coding:

- "B" blue shading = Pacific Connector Project Typical Construction
- "G" green shading = Pacific Connector Project Typical Construction with Habitat Enhancement BMPs
- "Y" yellow shading = Pacific Connector Project Typical Construction with BMPs for sensitive bed, bank, or riparian revegetation conditions to be selected by Environmental Inspector during construction
- "O" orange shading = Pacific Connector Project Typical Construction with BMPs for sensitive bed, bank or riparian vegetation conditions selected by qualified professional prior to construction based on site-specific information from pre-construction evaluation

3.0 WETLAND CROSSINGS (adapted from Section 6.0 of the ECRP)

All wetlands will be crossed in accordance with FERC's Procedures (see Attachment B to the ECRP – Appendix I to the POD). Drawing 3430.34-X-0005 in Attachment C to the ECRP shows the typical wetland crossing methods that will be utilized during construction. Wetlands crossed by or in close proximity to the Pipeline are shown on the Environmental Alignment Sheets (Appendix AA to the POD). Table 3-1 provides a list of the wetlands that are crossed on federally-managed lands. At most wetland crossings the construction right-of-way has been limited to 75 feet in width from the normal 95-foot width of the right-of-way to limit disturbance to wetlands, consistent with FERC's Procedures (see Section VI.A.3.). In most cases, except where topographical or other constraints occur, TEWAs have been located at least 50 feet away from waterbody and wetland boundaries as required by FERC's (see Sections VI. A. 3. and VI. B. 1. a). Where "neck-downs" or setbacks from waterbodies or wetlands could not be achieved based on site-specific constraints, modifications have been requested from FERC's Procedures (see Attachment 1). Grading and stump removal will be performed only over the trench line, except where otherwise required for safety, as determined by a PCGP Chief Inspector.

Where clearing is required, PCGP will cut, mow, or shear woody vegetation so that the roots are left intact, consistent with Section VI.B.2.f. of FERC's Procedures. This will facilitate the sprouting of tree and shrub species so that the recovery time following construction is minimized. The roots will also help hold the soils so that erosion is minimized.

To further promote reestablishment of native wetland species, 12 inches of topsoil will be salvaged in all unsaturated wetlands over the trenchline. The salvaged topsoil will be stockpiled to prevent mixing with subsoils or spoil materials and returned to the top of the trench after construction. Topsoil salvaging will promote reestablishment of wetland species by preserving the vegetative propagules (seeds, roots, tubers, rhizomes, bulbs) present in the soil. Propagules potentially promote reestablishment of native wetland vegetation by germinating or sprouting from replaced topsoil.

Sediment barriers will be installed immediately after clearing and prior to initial ground disturbance (i.e., grading). Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Where necessary, sediment barriers will be installed across the entire construction right-of-way immediately upslope of the wetland boundary to prevent sediment flow into the wetland. Where wetlands are adjacent to the construction right-of-way, sediment barriers will be installed along the edge of the construction right-of-way, as necessary, to prevent sediment flow into the wetland. These sediment barriers will be removed after restoration is complete and revegetation has stabilized the disturbed areas.

In wetlands where standing water or saturated soils are present or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, PCGP will use low-ground-weight construction equipment or will operate normal equipment on timber riprap or standard prefabricated equipment mats. Equipment mats are comprised of wood and serve to distribute the weight of the equipment. Rocks, soil imported from outside the wetland, tree stumps, or brush riprap will not be used to support equipment on the construction right-of-way. If trees are utilized as timber riprap or equipment mats to support equipment in saturated areas on the construction right-of-way, they will be obtained from clearing operations and will not be cut outside of the approved construction work areas. All materials utilized to support equipment on the construction right-of-way will be removed after construction.

Table 3-1
Wetlands Impacted by the Pipeline Project on Federally-Managed Lands

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Acres Within Pipeline Survey Corridor	Width of Crossing (feet)	Excavated Volume at Crossing[10] (cubic yds)	Acres of Construction ROW in Wetland	Acres of Temporary Extra Work Area in Wetland	Acres of Temporary Access Road in Wetland	Total Construction Disturbance in Wetland (acres)	Total Permanent Wetland Vegetation Type Conversion[6] (or fill) (acres)	Wetland Description[7]
Coast Range Ecoregion, Coquille Sub-basin (HUC 17100305), North Fork Coquille River (HUC 1710030504) Fifth field Watershed [3], Coos County, Oregon													
WW-500-003	20.99BR	BLM – Coos Bay District	PEM/PSS	Slope/Flats	0.04	-	-	0.00	0.03[6]	0.00	0.03[6]	0.00	Emergent and scrub-shrub wetland
WW-222-009 (CW-10)	23.38	BLM - Coos Bay District	PFOC	Slope/Flats	0.62	173.67	289.45	0.38	0.00	0.00	0.38	**0.12**	Red alder dominated low area
WW-222-005 (BW-134)	27.02	BLM - Coos Bay District	PEMC	Slope/Flats	0.06	-	-	0.03	<0.01	0.00	0.03	0.00	Flat area; intermittent stream outfalls from wetland
				Total		**173.67**	**289.45**	**0.41**	0.03[6]	**0.00**	**0.44[6]**	**0.12**	
Cascades Ecoregion, South Umpqua Sub-basin (HUC 17100302), Upper Cow Creek (HUC 1710030206) Fifth field Watershed [3], Douglas County, Oregon													
WW-111-001 (GW-14 (FS-HF-C))	109.15	Forest Service - Umpqua NF	PSS	Slope	0.25	36.18	60.30	0.07	0.01	0.00	0.08	0.01	Seep wetland with shrubs, crosses road and continues on. USFS considers this wetland as a perennial stream.
WW-111-001	109.17	Forest Service - Umpqua NF	PSS	Slopes/Flats	0.27	11.03	18.83	0.04	0.04	0.00	0.08	<0.01	Connects to GW-14. Seep wetland on USFS
				Total		**47.21**	**79.13**	**0.12**	**0.05**	**0.00**	**0.16**	**0.01**	
Klamath Mountains Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Upper Cow Creek (HUC 1710030206) Fifth field Watershed [3], Douglas County, Oregon													
WW-111-005 (GW-21 (FS-HF-H))	109.47	Forest Service - Umpqua NF	PEM/R3UB1	Slopes/Flats	0.28	-	-	0.01	0.00	0.00	0.01	0.00	Emergent wetland seep, connects to GSP019
				Total		**-**	**-**	**0.01**	**0.00**	**0.00**	**0.01**	**0.00**	
Klamath Mountains Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Shady Cove-Rogue River (HUC 1710030707) Fifth field Watershed [3], Jackson County, Oregon													
AW-309 Trib. to Indian Creek	128.89	BLM - Medford District	PEM	Slope/Flats	0.27	30.00	50.00	0.07	0.00	0.00	0.07	**0.00**	Forested wetland/stream
				Total		**30.00**	**50.00**	**0.07**	**0.00**	**0.00**	**0.07**	**0.00**	
Eastern Cascades Slopes and Foothills Ecoregion, Upper Klamath R. Sub-basin (HUC 18010206), Spencer Creek (HUC 1801020601) Fifth field Watershed [3, 4], Klamath County, Oregon													
WW-001-013 (EW-85)	171.06	Forest Service - Fremont-Winema NF	PFO/PSS	Slope/Flats	1.46	147.34	245.57	0.26	0.00	0.00	0.26	**0.10**	Wetland swale, culverted under road
						147.34	**245.57**	**0.26**	**0.00**	**0.00**	**0.26**	**0.10**	
				Total Wetland and Waterbody Impacts		**398.22**	**664.15**	**0.86**	**0.05**	**0.00**	**0.91**	**0.23**	

[1] Ecology and Environment. 2017. Pacific Connector Gas Pipeline Updated Wetland Delineation Report. September 2017. National Hydrography Dataset, Jones and Stokes Field Surveys from 2006, 2007, and 2009, StreamNet, LIDAR photo interpretation, and consultation with BLM and Forest Service.
[2] Pacific Northwest Hydrography Database and ICF Jones & Stokes or Ecology and Environment Field Survey.
[3] USGS Hydrologic Unit Codes.
[4] Key Watershed.
[5] Impacts avoided by HDD, Direct Pipe or Conventional Bored Crossing Methods
[6] Includes acres of uncleared storage area, hydrostatic test water discharge, and rock source and disposal.
[7] ICF Jones & Stokes or Ecology and Environment survey description of wetland and waterbody.
[8] Acres of disturbance for associated with culverted crossing of PAR 132.46
[9] Wetlands delineated by David Evans and Associates within the Jordan Cove Energy Project (FERC Docket CP13-483-000) associated with the Linerboard Mill Site
[10] Excavated volume calculated using 3 feet of cover for wetland crossings, trapezoidal trench, slope = 0.75:1

The duration of construction-related disturbance within wetlands will be minimized and construction equipment operating in wetland areas limited to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipe, backfill the trench, and restore the construction right-of-way. All other construction equipment will use access roads located in upland areas to the maximum extent practicable. Where access roads in upland areas do not provide reasonable access, PCGP will limit all other construction equipment to one pass through wetlands that cannot be appropriately stabilized using the construction right-of-way. To allow multiple passes through wetlands, PCGP will stabilize the right-of-way through wetlands as prescribed in Section VI.B.d. of FERC's Procedures by using timber riprap, prefabricated equipment mats, or terra mats. Stabilization will not occur where wetland soils are firm enough to avoid rutting.

4.0 STREAMBANK AND WETLAND RESTORATON AND REVEGETATION

After completion of construction and during final clean-up, original topographic conditions and contours of uplands, wetlands, and streambeds will be restored to the extent practicable to reestablish drainage patterns and wetland hydrology. Any excess backfill will be spread over upland areas and stabilized during cleanup. Where the pipeline trench may drain a wetland, PCGP will install trench breakers and/or seal the trench bottom as necessary to maintain the original wetland hydrology. A permanent slope breaker and a trench breaker will be installed through wetlands at the base of slopes near boundaries between the wetland and adjacent upland area. The trench breaker will be located immediately upslope of the slope breaker. Trench breakers will also be installed on either side of waterbody crossings to ensure hydrological conditions are maintained. A diagram of a trench breaker is provided in Attachment C to the ECRP in Appendix I to the POD (see Drawing 3430-34-0011).

Streambank restoration and revegetation measures are outlined in Section 10.0 of the ECRP. Revegetation measures include seeding with native grasses and supplemental riparian planting with native trees and shrubs. Typical planting schemes that will apply to forested or scrub-shrub wetlands and riparian areas are provided as Drawings 3430.34-X-0015 and 3430.34-X-0016 in the ECRP (see Attachment C to Appendix I to the POD). The proposed plant species and spacings are provided in Table 10.12-1 in the ECRP. PCGP will contract with a restoration contactor to provide and install the plantings. The contractor will be familiar with wetland and riparian ecological conditions in the area. Based on site-specific conditions, the restoration contractor may substitute or add native species to those provided in Table 10.12-1 in the ECRP.

In consultation with landowners, PCGP may place LWD at appropriate areas in the waterbody within the construction right-of-way to mitigate for potential short-term impacts that may occur to aquatic species from an open cut crossing and instream construction. LWD placement would occur after the pipe has been installed across the waterbody, during ODFW instream construction windows and during the time when the flume or dam and pump controls are in place to minimize turbidity associated with the installation of the LWD. Other possibilities include placing LWD immediately downstream from the lower flume dam (to create a depositional rather than potential scouring environment at the pipeline crossing) either during or after the flume has been removed. LWD could be placed across a stream channel with minimal or no generation of sediment after construction, as well. Such decisions will be made on a site-by-site basis. Installation of the LWD without the flume or dam and pump control measures in place would only occur with the approval of the appropriate permitting agencies. As noted in Section 2.0, appropriate restoration BMPs, outlined in the Site-Specific Stream Crossing Prescriptions for the streams on BLM and NFS lands (North State Resources, 2014 and

Stantec, 2019), will also be incorporated during construction and restoration in consultation with the agencies' authorized representative(s) and PCGP's EI or authorized representative.

Guidelines for LWD placement, provided by ODF and ODFW (1995), suggest using 1) larger diameter wood pieces because they are more effective at creating pools and complex channels that improve fish populations (see Table 4-1 below for minimum diameter LWD per bankfull width); 2) LWD that are at least twice the length of the waterbody bankfull width (1.5 times the bankfull width if rootwad attached) to increase the likelihood that the LWD will remain in place; and 3) conifer logs, especially western red cedars or redwoods if available, since they are more durable. In larger waterbodies, smaller diameter, shorter LWD could be used if bundled and anchored together to provide the same benefits of the longer, larger diameter LWD. Attachment 3 to PCGP's Compensatory Mitigation Plan (Appendix O to the ADBA) describes the LWD placement in more detail.

Table 4-1
Minimum Diameter LWD for Placement in Waterbody Based on Bankfull Width

Bankfull Width (feet)	Minimum Diameter LWD (inches)
0 to 10	10
10 to 20	16
20 to 30	18
Over 30	22

Source: ODF and ODFW, 1995
Proposed schedule for applying LWD to different waterbody types, subject to landowner approval:
• 4 pieces for each perennial stream crossed with riparian forest removed (2 pieces instream, 2 pieces within riparian zone on the bank);
• 2 pieces for each intermittent stream and unknown stream crossed with riparian forest removed (one or both pieces placed instream or on bank);
• 2 pieces for each perennial, intermittent, and unknown stream crossed but with no riparian forest removed (one or both pieces paced instream or on bank).
• 1 piece each for perennial, intermittent, and unknown stream not crossed but adjacent to ROW with or without riparian forest removed (piece placed on bank).

5.0 MONITORING

An "As-Built" Report documenting the final design of the restoration areas will be prepared when site construction and planting are completed. The report will include the following:

i. Site vicinity map;

ii. Drawings that identify the boundaries of the restoration areas;

iii. The installed planting scheme providing quantities, densities, sizes, and approximate locations of plants, as well as plant sources and the time of planting; and

vii. General notes indicating site conditions, concerns or other issues that might affect site planting success.

A copy of the "As-Built" Report will be provided to the COE and DSL and federal land managing agencies by December 31st of the year in which the work is completed or as agreed to in writing between the federal land managing agencies and PCGP.

Consistent with FERC's Procedures, monitoring of wetlands restored on the construction right-of-way will be conducted annually for three years following construction or until wetland revegetation is determined to be successful. A qualified biologist will conduct monitoring during the growing season by collecting information on plant survival, percent vegetative cover (including invasive species), as well as hydrologic conditions. Photographs will be taken each year to support the monitoring efforts. Wetland revegetation shall be considered successful based on Oregon Department of State Lands Revegetation Performance Criteria for Wetlands and Riparian Areas (Oregon Performance Criteria) which provides specific criteria for native plant, invasive species and bare ground cover, species diversity, prevalence index and riparian composition.

Reports will be prepared after each monitoring period to document collected data. The reports will be submitted to the COE as well as to the DSL and federal land managing agencies by December 31st of the year in which the monitoring is conducted unless otherwise agreed to in writing by the state and federal agencies and PCGP. If the results of the monitoring after the third year show that the restored areas do not satisfy the Oregon Performance Criteria additional monitoring and mitigation may be required (e.g., replanting, soil amendments, selection of alternative species, etc.). Any additional monitoring or mitigation measures are subject to review and approval by the appropriate federal and state agencies. Section 10.12 of the ECRP also provides monitoring/maintenance requirements specific to the hydrofeatures on the Umpqua National Forest. Further, PCGP's Stream Crossing Risk Analysis (GeoEngineers, 2018), provides the long-term monitoring plan for stream crossings to ensure long term success of the restoration and maintenance of fish passage, and to identify channel erosion, scour or migration that could destabilize the site or expose the pipeline.

Vegetation cover will be estimated (ocular) within a 1- to 2-meter plot that is randomly selected by habitat type. Metric measures will include species occurrence, their indicator status, native status, vegetation strata, species foliar cover, and bare substrate. Species foliar cover will be aggregated to total plant foliar cover, herbaceous plant foliar cover, woody foliar cover, and invasive plant foliar cover. Hydrologic conditions will be monitored by visual inspection to determine if the wetland hydrology has been reestablished. Monitoring will note presence of surface water or if groundwater is present in soil pits. Hydrologic indicators will also be noted (i.e., water marks or drift lines, sediment deposits, evidence of ponding, etc.).

PCGP will be responsible for maintaining the restoration sites to meet the required performance standards. Maintenance may include, among others, removal of invasive species, removal of trash, and replacement of dead plants.

6.0 REFERENCES

GeoEngineers 2018. Stream Crossing Risk Analysis Addendum, Pacific Connector Gas Pipeline Project Coos, Douglas, Jackson and Klamath Counties, Oregon. File No. 22708-001-00, April, 2018.

North State Resources, Inc. 2014. Site-Specific Stream Crossing Prescriptions Perennial Streams on BLM and National Forest System Lands, Pacific Connector Gas Pipeline Project. Task 14. File No. 29128-2-14. Prepared for USDI Bureau of Land Management/USDA Forest Service, North State Resources, Inc. Redding, California, December 2014.

Stantec Consulting Services, Inc. 2019. Technical Memorandum for Site Specific Stream Crossing Prescriptions for Two Proposed Perennial Stream Crossings Associated with the East Fork Cow Creek Realignment. Redding, CA. October.

Attachment 1

Modification Requests to FERC's Procedures on Federally-Managed Lands

Table A.1-1
Site-Specific Modifications to FERC's Wetland and Waterbody Procedures and Upland Plan
(to be updated based on FEIS)

MP	Wetland	Cowardin Type	TEWA	Environmental Alignment Sheet	Modification Rationale
Modifications Requested for Temporary Extra Work Areas (TEWAs) Located within or within 50 feet of Wetlands or Waterbodies and Areas Where the Construction Right-of-Way is Greater than 75 feet Wide					
23.38	WW-222-009 (CW-10)	PFOC	TEWA 23.09-W Construction ROW >75 feet	25	The construction right-of-way could not be necked down through this wetland because the side hill alignment requires the full 95-foot construction right-of-way, Although TEWAs were removed from the wetland, TEWAs 23.09-W could not set back 50 feet from the wetland to accommodate the necessary cut and fills and contain all trench/right-of-way spoil. Disturbed areas in this forested wetland would be replanted as described in the ECRP, which includes reestablishment with tree and shrub species, and appropriate BMPs would be installed to minimize potential sedimentation.
31.64	BSI-70	R4UB1C	TEWA 31.01-W	32	The TEWA was not set back from this incised 1' wide intermittent headwater stream because the alignment traverses side slopes requiring additional grading and spoil storage requirements. The alignment is also co-located with a road with the spoil storage (non-working) side of the construction right-of-way paralleling and overlapping the road in some areas, which restricts the area for spoil storage. During construction staking, the EI will determine if the TEWA can be removed from the drainage crossing to minimize tree clearing based on the site-specific topographic conditions. The EI will also implement appropriate, erosion control and restoration BMPs, as outlined in the ECRP, to minimize potential project effects.
35.87	BLM 35-87 (CSP-2)	R4SB	TEWA 35.79-N	36	To minimize effects to an Occupied MAMU stand, the alignment is co-located with a road, traversing sidesloping topography. TEWA 35.79-N was extended across the intermittent drainage to accommodate staging for the in-road lay construction area between MPs 35.34 and 36.12, and to replace/repair the existing culverted crossing of the drainage. PCGP will utilize the measures outlined in the ECRP to minimize potential sedimentation impacts and to ensure that disturbed riparian areas are appropriately revegetated with woody riparian species.
37.32	ESP-19	R4UB1J	TEWA 37.15-N	37	The alignment in this area follows a narrow ridge line to the crossing of ESI-19. Although TEWA 37.15-N was set back 50 feet from ESI-19 at the crossing, the upstream channel alignment of ESI-19 meanders to the west and flows parallel through regenerating forest habitat within 50 feet of TEWA 37.15-N. TEWA 37.15-N is important to facilitate the crossing of both ESI-19 and ESP-20 (Trib to Big Creek) as well as construction/grading requirements for traversing the narrow ridgeline which will encounter sideslopes. During construction staking, the EI will ensure that TEWA 37.15-N is setback at least 10 feet from ESI-19 and will ensure that appropriate BMPs, outlined in the ECRP, are implemented to minimize potential sedimentation and to ensure that disturbed riparian areas

MP	Wetland	Cowardin Type	TEWA	Environmental Alignment Sheet	Modification Rationale
					are appropriately revegetated with woody riparian species.
109.13 to 109.17	GDX-15 WW-111-001 (GW-14 (FS-HF-C) WW-111-001	R4 PSS	TEWA 109.10-W Construction ROW >75 feet	109	The side hill alignment, location of the road crossing (FS 3200500), and PI prevent eliminating TEWA 109.10-W and narrowing of the construction right-of-way to 75 feet at the crossing of Wetland GW-14 and road side ditch (GDX-5). These conditions also prevent a 50-foot setback. The road crossing (minimum 5 feet of cover), side hill construction and PI will require additional excavation and spoil storage. To minimize potential impacts to the wetland, the EI and Chief Inspector will determine at the time of construction what measures can be accommodated in the TEWA configuration based on site-specific conditions (i.e., topographic, slope grading requirements).
109.33	GSI-16 (FS-HF-F)	R4	TEWA 109.19-N	110	TEWA 109.19-N is located within 50 feet of this intermittent drainage that is expected to be dry at the time of construction. The alignment traverses side slopes requiring the TEWA for additional grading and spoil storage. To minimize riparian effects associated with the intermittent drainage, the EI and Chief Inspector will determine at the time of construction what measures can be accommodated in the TEWA configuration/setback based on site-specific conditions (i.e., topographic, slope grading requirements). PCGP will use the measures outlined in the ECRP to minimize potential sedimentation impacts to the drainage and to ensure that the area is appropriately restored and reforested.
109.69	GSP-22 (ASP-297/FS-HF-M)	R2	TEWA 109.68-N	110	TEWA 109.68-N is located along FS Road 3200500 and across the culverted crossing of East Fork Cow Creek (GSP-22) and is necessary for parking/staging during construction. The TEWA was aligned to minimize impacts to riparian vegetation. The configuration of TEWA 109.68-N was also designed to allow the removal of the culvert for potential restoration purposes if the road is not required for future use by the Forest Service. PCGP and the Forest Service discussed the potential removal of the culvert for mitigation purposes during an on-site meeting in the summer of 2008.
109.78	FS-HF-K	R4	TEWA 109.73-N	110	A small portion of TEWA 109.73-N is within 50 feet of FS-HF-K and is required to facilitate safe construction in the narrow sloping area between the sharp PIs and stream crossings. PCGP will use the measures outlined in the ECRP to minimize potential sedimentation impacts to the drainage and to ensure that the area is appropriately restored and reforested.
110.57	EW-69 ESI-68	PUB3C R4SB1H	TEWA 110.73 Peavine Quarry	111	**Previously Disturbed Area – Quarry** This TEWA encompasses an existing quarry on the Umpqua National Forest. Although wetland features EW-69 and ESI-68 are located in the quarry and were created by quarry activities, PCGP Project activities will not disturb these features.
110.96	FS-HF-N (ESI-68)	R4SB1H	TEWA 110.96-N	111	The project alignment was modified in this area to minimize impacts to this intermittent drainage and its upstream source. The alignment modification moved the alignment down slope adjacent to the road to minimize the sideslope cuts. The right-of-way was necked down on the working side and TEWA 110.96-N on the non-working side adjacent to the road to provide

MP	Wetland	Cowardin Type	TEWA	Environmental Alignment Sheet	Modification Rationale
					ingress/egress and to facilitate installation of the PIs at MPs 110.95 and 110.98. PCGP will use the measures outlined in the ECRP to minimize potential sedimentation impacts to the drainage and to ensure that the area is appropriately restored and reforested.
128.89	AW-309	PEM	Construction ROW >75 feet	129	Wetland AW 309 is an emergent wetland that requires verification. If present, the EI during construction staking will determine the feasibility of necking in the construction right-of-way to 75 feet based on site-specific conditions. The EI will also ensure that appropriate BMPs are utilized to minimize sedimentation, reduce impacts, and ensure restoration of this emergent wetland as outlined in the ECRP.
133.09	AW-263	PEMC	Construction ROW > 75’	133	The 95-foot construction right-of-way was maintained through this emergent wetland so that added TEWAs were not required in the forested areas adjacent to the wetlands which would have greater long-term habitat impacts. PCGP will use low-ground-weight equipment or operate equipment off of mats to minimize rutting and compaction impacts. The measures outlined in the ECRP will be used to ensure that the wetland is appropriately restored.
133.35	ASP-241	R3UB3H	TEWA 133.24-N TEWA 133.28-W	134	Waterbody ASP-241 is formed from leakage from the Medford Aqueduct (ASP-240) which is to be crossed by conventional boring. TEWA 133.24-N is required for the bore pit installation and boring operations. The TEWA cannot be moved back to avoid the intermittent drainage considering the bore length (~300 feet) and the topography in this area. If the waterbody is flowing at the time of construction, the flow will be diverted around activities as necessary to avoid water quality impacts. TEWA 133.28-W cannot be set back 50 feet from the waterbodies because it is critical to minimize the length of the bore to minimize boring risk/failure.
140.94 141.08	ADX-186 EW-76 EW-77 EW-78 (EW-82)	R4SB1 PEMC	TEWA 140.98 TEWA 140.85-W	141	**Previously Disturbed Area – Reservoir Dam** TEWA 140.98 is required for water withdrawal proposed at Star Lake Reservoir. Water withdrawal activities for dust or fire control would not require any excavation or ground disturbance at this site. Where traffic is required across these emergent wetlands, the travel route will be matted if the wetlands are saturated to minimize potential compaction impacts.
141.48	ASI-188	R4SB1	TEWA 141.44-W TEWA 141.52-W	142	The route in this area was slightly modified to avoid the parallel alignment of the intermittent drainage ASI 188 within the construction right-of-way, and the right-of-way (working sides) was reconfigured because of sideslopes. To accomplish this alignment/right-of-way modification, two PI were included at MPs 141.46 and 141.5, which required TEWAs to store spoil for the side sloping alignment. Although the TEWAs were set back from the intermittent drainage, which is not expected to be flowing at the time of construction, a 50-feet setback could not be maintained. PCGP will use the measures outlined in the ECRP to minimize potential sedimentation and to ensure that the disturbed areas are appropriately revegetated.
152.33	AL-169	PUBFx	TEWA 152.29-N	153	**Previously Disturbed Area – Excavated pond** This man made pond may be used as a water source for dust/fire control if

MP	Wetland	Cowardin Type	TEWA	Environmental Alignment Sheet	Modification Rationale
					allowed by the landowner.
171.06	WW-001-013 (EW-85)	PFO/PSS R4UBC	TEWA 171.08-N TEWA 171.08-W	171	**Previously Disturbed Area - Existing Road** TEWA 171.08-N and TEWA 171.08-W were not placed 50 feet back from wetland EW085 because an existing road is located along the southern edge of the wetland. These TEWAs were located on the northern edge of the road shoulder adjacent to the wetland in the previously disturbed road area. Sediment barriers would be placed along the TEWAs adjacent to the wetland to ensure that sediment is contained within the construction right-of-way.
176.54	ESI-69	R4SB2	TEWA 176.49-N	176	TEWA 176.49-N was located across intermittent drainage (ESI-69) because of the side slope construction requirements, and required PI locations in this area. The PIs (pipe bend angles) are required based on the slope contours. Prior to clearing, the EI will flag trees for salvage/saving trees within TEWA 176.38-N, where feasible, to minimize riparian disturbance.
Project-wide	Waterbodies and Wetlands	Various	Various Uncleared Storage Areas (UCSAs)	1 - 226	PCGP requests a modification for the location of the uncleared storage areas (UCSAs) to be allowed within 50 feet of wetlands or waterbodies so that large woody debris can be stored on site and in close proximity to where it will be redistributed during restoration efforts. As defined in Resource Report 1 (Section 1.5.1) the UCSAs will be used to store forest slash, stumps, and dead and downed log materials that will be scattered across the right-of-way after construction. PCGP requests this modification because forest and vegetation clearing and ground disturbance will not occur in these areas, therefore the potential for sedimentation to a wetland or waterbody is greatly minimized. PCGP requests that the UCSAs be used to store large wood debris such as dead and downed logs and stumps which will be scattered over the right-of-way after construction. Other than large woody debris, woody material generally less than 8 inches in diameter would not be stored in the UCSA's within 50 feet of a wetland or waterbody. PCGP expects that most of the existing large woody debris material may be sufficiently decayed, therefore minimizing the moving and handling of this material would be important so this material is not lost through the handling process.
Project-wide	Various ditches and intermittent streams		Various	1 - 226	The project crosses numerous road ditches and intermittent streams that are not expected to be flowing at the time of construction. As defined by Section I. B.1. of FERC's Wetland and Waterbody Procedures, these features are not considered waterbodies and are therefore protected under FERC's Upland Plan. PCGP will comply with this definition, except for intermittent streams on federal lands covered under the Northwest Forest Plan. PCGP has generally provided minimum setbacks from these types of features and the TEWAs have been located outside these features where practical.
Project-wide but concentrated in the Klamath	Numerous agricultural irrigation canals ditches and canals	R4UB3x PEM	Various	192 - 226	A significant number of agricultural ditches and canals are traversed by the Pipeline in the Klamath Basin within agricultural croplands, pastures, and hayfields. These canals and ditches do not support riparian vegetation and adjacent areas are disturbed emergent and actively cultivated hayfields and pastures. Therefore, consistent with FERC's Wetland and Waterbody

MP	Wetland	Cowardin Type	TEWA	Environmental Alignment Sheet	Modification Rationale
Basin 191 to 230.9					Procedures (Section V. B. 2. a.), the locations of TEWAs have been located immediately adjacent to these waterbodies without a 50-foot setback to facilitate these crossings.
Project-wide	Various Hydrostatic/Dust Water Source Withdrawal TEWAs	Various	Various	1-226	Various TEWAs at the potential water source locations for hydrostatic test or dust control (see Table 1.6-2 in Resource Report 1 and Table 2.2-12) have been located within 50 feet of the source water to allow staging of necessary pumping equipment. Procedures outlined in the SPCC Plan would be implemented to ensure pumping equipment is adequately contained and refueling operations are properly controlled. Appropriate sediment control measures, as outlined in the ECRP will also be appropriately implemented, if necessary during these activities.

Treatment of Forest Slash and Modification From Section IV. F. 3. e. of FERC's Upland Plan

Slash from timber clearing will be salvaged on or at the edge of the right-of-way and scattered/redistributed across the right-of-way during final cleanup and reclamation according to BLM and Forest Service fuel loading specifications to minimize fire hazard risks. This material will be pulled back onto the right-of-way during final cleanup after seeding. **If during final redistribution significant disturbance occurs to seeded areas the EIs will ensure that supplemental hand broadcast seeding occurs to ensure adequate seed coverage for erosion control.** Where it is not feasible to pull the slash back onto the right-of-way after seeding and it is redistributed before seeding, seeding in these areas (broadcast or hydroseeding) will occur with specifications to ensure adequate seed coverage. Scattering the slash across the right-of-way will hinder Off Road Vehicle (ORV) traffic on the right-of-way and will act as a natural mulch to minimize erosion.

Because more than 1 ton per acre of woody material (logs, slash and chips) may be scattered across the right-of-way during final cleanup in many areas, **PCGP requests a modification from Section IV. F. 3. e. of FERC's Upland Plan.** PCGP will utilize the fuel loading standards of the BLM and the Forest Service as the limit for the quantity of woody debris that will be distributed across the right-of-way to minimize fire hazard risks for this modification request. **Section IV. F. 3. e. of FERC's Upland Plan** states that if wood chips are used as mulch to not use more than 1 ton per acre of chips and to add an equivalent of 11 lbs of available nitrogen where chips are used as mulch. The purpose of Section IV.F.3.e. of FERC's Upland Plan is to ensure that revegetation efforts are not hindered due to the decaying process of large amounts of wood chips which can bind-up soil nitrogen and impede revegetation. PCGP requests this modification because it will be impractical and infeasible to remove this woody slash material from the right-of-way and it is a typical sivilcultural practice in the project area (i.e., forest slash left in logged areas). Furthermore, it is expected that the woody slash material will not deplete soil nitrogen in the short-term, during revegetation establishment, because the size of the woody material that will be scattered on the right-of-way will be large and will not readily decay in the short-term to bind-up soil nitrogen. The Forest Service and BLM fuel loading requirements that PCGP would follow are provided in Section 1.6.1 of Resource Report 1.

Danger/Hazard Trees

To ensure safety during construction, PCGP requests a **modification to Section IV.A.1. of FERC's Upland Plan,** associated with confining activities to FERC's approved construction limits, in the event PCGP's professional forester and/or certified arborist designates a danger/hazard tree outside of the approved construction limits, as required by OSHA regulations during forest activities.[1] Hazard trees will be identified based on standard OSHA practices and guidelines (Filip, et. al., 2014; USDA, Forest Health Protection Pacific Northwest Region Portland, OR R6 NIR-TP-021-2013) and mitigated according to these guidelines based on site-specific conditions. Additionally, in some situations during right-of-way clearing/timber felling operations, it may not be possible for specific trees or portions of trees to be completely felled within the construction right-of-way limits (i.e., alignment ascends/descends steep slopes with mature

MP	Wetland	Cowardin Type	TEWA	Environmental Alignment Sheet	Modification Rationale

trees [some more than 200 feet tall]; diseased/decayed trees are present; trees are leaning in unmanageable directions or degrees; or other site-specific conditions, based on OSHA safety guidance).

Where danger/hazard trees are felled or where tree/woody material inadvertently falls outside the construction right-of-way limits, PCGP will compensate the landowner or the land-managing agency for the value of the danger/hazard tree, or for any tree damage that may result from felling activities. This modification request complies with best management forest practices and with OSHA regulations.[1] Because timber clearing will be conducted within appropriate seasonal windows to protect sensitive species, this modification will ensure worker safety and will minimize effects to sensitive resources.

[1] OAR 437, Division 7 Forest Activities - Oregon OSHA: Danger tree – A standing tree, alive or dead, that presents a hazard to personnel due to deterioration or physical damage to the root system, trunk (stem), or limbs, and the degree and direction of lean.

Landowner Requested Logs

Where landowners request non-merchantable logs be salvaged for personal use/fire wood, PCGP requests that this material be allowed to be stockpiled within the PCGP Project's survey corridor (i.e., cultural, wetlands, biological) adjacent to but outside of the PCGP construction right-of-way and TEWAs in areas acceptable to the landowner. The EI will ensure that the adjacent offsite areas are consistent with FERC's Upland Plan (Section III.A.1., 2 and E. and IV.A.1.) and will not affect other landowners or sensitive environmental resource areas.

Topsoil Salvaging on Forest Lands Where Requested by Landowner

Along the alignment where topsoil segregation is proposed on level terrain, PCGP has requested 10 feet of temporary extra work area in addition to the 95-foot construction right-of-way to effectively conduct topsoil salvaging from the trenchline and spoil storage area. Where topsoil salvage from the full construction right-of-way is requested, PCGP will utilize up to a 25-foot wide temporary extra work area. The purpose of this temporary extra work area is to ensure that the topsoil is segregated and kept separate from the trench subsoil. In steep forested landscapes, it is impractical to salvage topsoil based on topographic and vegetation conditions (i.e., large trees/stumps that would have to be removed in order to accomplish the task). The Forest Service previously requested that topsoil be salvaged on NFS lands. However, PCGP is **requesting a modification from Section IV.B.1 (4) of FERC's Upland Plan which specifies that topsoil be salvaged according to landowner requests.** PCGP requests this modification on all forest lands managed by the Forest Service, BLM, or private landowners. The purpose of the modification is to prevent the need for additional temporary extra work areas (and associated disturbance) on NFS lands to conduct the topsoil segregation. The alignment mainly traverses forested habitats through NFS lands which are primarily designated as LSR. Resource Report 8 provides a more detailed discussion of LSRs.

According to Forest Service Standards and Guidelines, LSRs are managed with an objective to protect and enhance habitat for late-successional and old-growth related species. Limited silvicultural treatments are permitted in LSRs. It is PCGP's opinion that widening the proposed 95-foot construction right-of-way to 105 feet (i.e., topsoil salvage from trench line and spoil storage), and likely even more on steep terrain, to accommodate topsoil salvaging, would create more long-term impacts in these habitats than is practical or warranted. The construction footprint has been purposefully restricted in LSRs to minimize overall project disturbance. This has been accomplished by reducing the total number of temporary extra work areas in LSRs and limiting these work areas to the minimum size necessary.

In forested habitats, the temporary extra work area that would be required to segregate the topsoil on NFS lands would be considered a long-term impact because of the time required to reestablish LSR forest stand characteristics. In forested areas, topsoil would be segregated from the trench line and spoil

MP	Wetland	Cowardin Type	TEWA	Environmental Alignment Sheet	Modification Rationale
storage areas, and this topsoil would be returned to the same area after trench backfilling. This topsoil segregation area would coincide with the 50-foot permanent easement and the 30-foot corridor centered over the pipeline that would be maintained in a shrub or herbaceous state to facilitate corrosion and leak surveys and for aerial surveillance according to DOT regulations (192.705 Transmission lines: Patrolling and 192.706 Transmission lines: Leakage surveys). Creating long-term impacts to LSR habitats by enlarging the construction right-of-way to segregate topsoil does not provide a benefit compared to the habitat lost. This is because the topsoil that would be segregated occurs in the area that would become the permanent easement. This area will be maintained in a shrub or herbaceous state. Again, PCGP believes that creating long-term impacts from cutting additional forested areas and causing added disturbance in order to segregate topsoil is not reasonable or advantageous. PCGP will comply with Section VI. B. 2. h. of the FERC Procedures that specifies that the topsoil will be segregated in wetlands, except in areas where standing water is present or soils are saturated. PCGP will comply with this measure in all wetlands crossed by the project including those in forested areas. PCGP acknowledges and understands the importance of the soil and topsoil resource and would comply with the Forest Service and BLM's request to salvage topsoil if practical on forestlands. However, for the reasons stated above, this request is unreasonable. PCGP would apply the measure outlined in the ECRP to minimize adverse impacts to soil resources, minimize erosion and potential sedimentation, and to appropriately revegetate or reforest all disturbed areas. PCGP will only maintain the 30-foot area centered over the pipeline during long-term operations with these activities typically occurring about every 3 to 5 years. PCGP believes that by utilizing the measures outlined in the ECRP that impacts to site productivity will be minimized and the disturbed areas associated with the right-of-way will restored. The 30 foot area centered over the pipeline, would be converted to a non-forested condition through project maintenance activities. This area would coincide with the typical topsoil salvaging area, therefore, any loss of soil productivity in this area from soil mixing should not inhibit the vegetation communities that PCGP would maintain on the right-of-way (i.e., herbaceous and shrub vegetation). Further, as described in the Resource Reports and the ECRP, slash from forest clearing operations including dead and downed logs and other woody material that occur within the right-of-way would be salvaged on the edge of the construction right-of-way for redistribution during restoration. This material would provide effective ground cover for erosion control, provide important organic matter for nutrient cycling and provide habitat for all forest species including moss, lichen, fungi and mollusks species, among others.					
The use of clean gravel or native cobbles in coldwater fisheries According to Section V.C.1. of FERC's Wetland and Waterbody Procedures, clean gravel or native cobbles for the upper 1 foot of trench backfill is required in all waterbodies that contain coldwater fisheries, regardless of stream substrate materials. PCGP requests a modification from this Section of the Wetland and Waterbody Procedures in fish bearing streams that do not have gravel, cobble or other rock substrates. Many of these streams crossed by the project are remote and steep valley or ravine bottoms therefore hauling rock to these steams would create more disturbance and is impractical, especially where these streams do not have these substrate characteristics. In these waterbodies, PCGP would backfill the trench with the native material excavated from the trench.					

Attachment 2

Fluming Procedures

Pacific Connector Gas Pipeline, LP

Stream Fluming Procedures

Pacific Connector Gas Pipeline Project

September 2017

STREAM FLUMING PROCEDURES

During construction various local, state and federal permits will require that flowing streams with coldwater fisheries be crossed utilizing a "dry crossing" technique. Fluming is one of the methods which may be utilized to achieve a dry crossing of a flowing stream. The purpose of this appendix is to outline the techniques that will be utilized to flume stream crossings during construction of the project. These guidelines are subject to change based on permits issued by regulatory agencies.

1.0 Purpose of Flumed Stream Crossings

The primary purpose of fluming a stream is to assure that in-stream construction activities comply with water quality standards for turbidity that have been established by the state to protect aquatic life and other beneficial uses. Overall, a properly installed and maintained flume can be very effective in reducing turbidity during in-stream construction. In most cases, detectable increases in turbidity are limited to short durations when the flume is installed and when the flume is removed from the streambed.

However, installation of a flume does not guarantee that compliance with water quality standards will occur. Flumes require monitoring and occasional repair during the crossing period to ensure the integrity of the structure(s). Adequate pumps play an integral role in a successful flumed crossing.

2.0 Where Flumes Will Be Installed

Any minor or intermediate waterbody with water flowing in the streambed at the time of construction, which has a coldwater fishery as defined by the Oregon Department of Fish and Wildlife (ODFW), may be flumed. A list of streams where dry open cut crossing methods (fluming, dam and pump or diverted open cut) may be utilized is provided as part of Resource Report 2.

3.0 General Layout of a Typical Flumed Stream Crossing

Figure 1 shows a plan view of a typical flumed stream crossing. The primary components of a flumed crossing include:

- flume pipe or multiple flume pipes;
- sandbag/plastic dams;
- spoil storage and staging areas;
- pumps and pump containment structure (s);
- dewater structure(s);
- erosion control structures; and
- spill containment and cleanup materials.

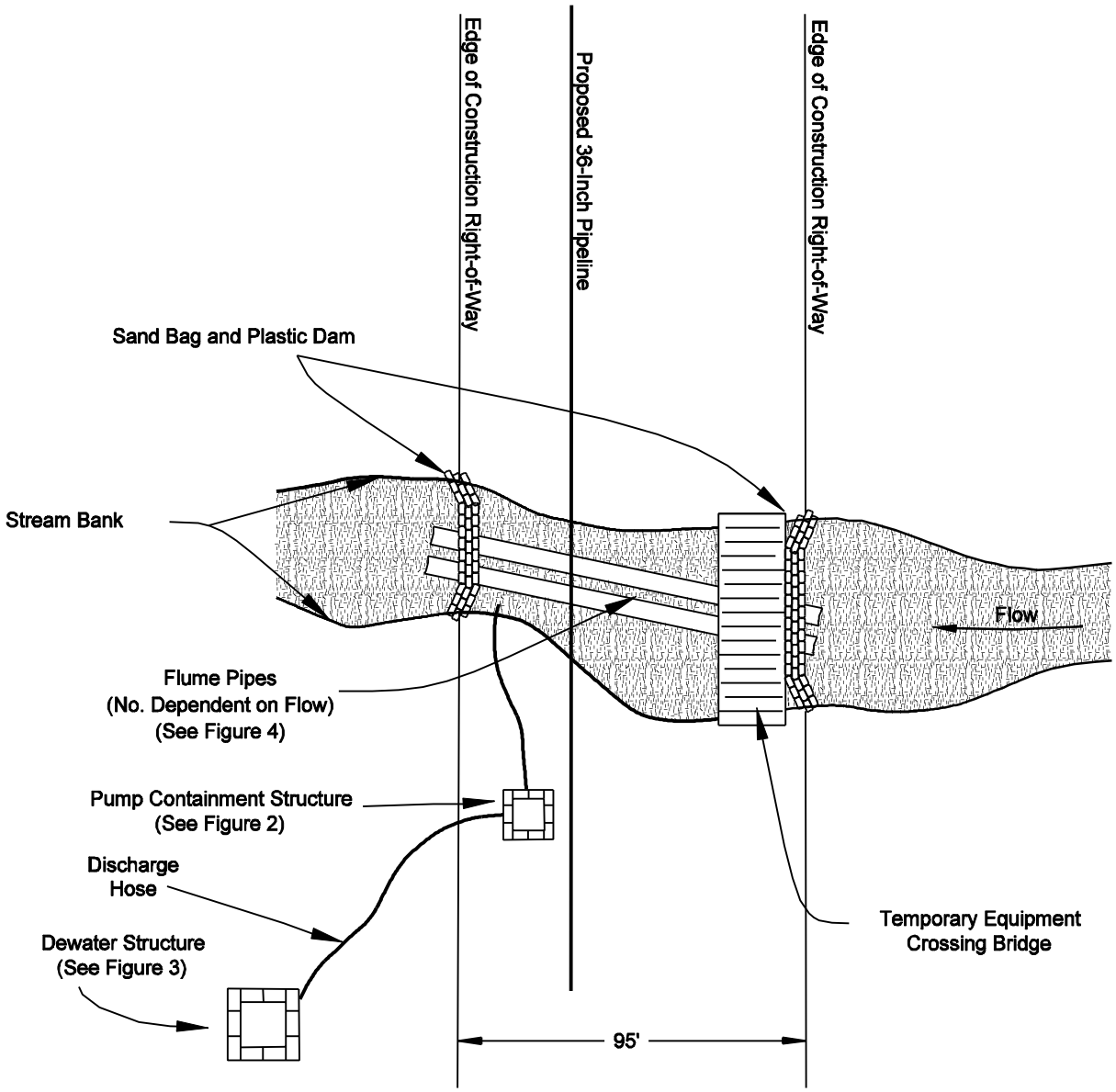


FIGURE 1
PLAN VIEW OF TYPICAL FLUMED STREAM CROSSING

A single or multiple flume pipe(s) are used to temporarily convey the stream flow over the construction area, thereby reducing the introduction of sediments into the water column during ditching and backfilling. The sandbag/plastic dams are used to support and seal the ends of the flume pipe(s) and to direct stream flow into the flume pipe and over the construction area. These structures are also utilized to prevent downstream water from flowing upstream into the construction area. They also serve to contain water that infiltrates into the construction area before it can be removed by the pumps and discharged to an upland area. Finally, the downstream structure serves to contain turbid water, which rises quickly in the construction area during backfilling of the trench.

All waterbodies with water in the streambed at the time of construction must have an equipment crossing bridge.

The temporary spoil storage area is where spoil trenched from the streambed will be stored until backfilling is completed. These temporary extra work areas are identified on the Environmental Alignment Sheets. FERC's Wetland and Waterbody Procedures prohibit the location of staging areas or additional right-of-way within 50 feet of the stream banks or edge of adjacent wetlands unless site-specific conditions such as topography prevent the setback and a variance is approved. Trench spoil must be placed at least 10 feet away from stream banks at all flowing stream crossings. In addition, these areas must be enclosed with silt fence and/or straw bales to prevent runoff of the spoil into the stream.

Adequate pumps are essential for the successful completion of flumed stream crossings. During several phases of the crossing process, it will be necessary to quickly remove large quantities of water from the construction area to prevent overflow or leakage of the sandbag/plastic dams or the temporary equipment crossing bridge. The most effective means of quickly removing water from the construction area is by utilizing well-maintained pumps with adequate pumping rates. In addition, backup pumps will be located on-site, hooked up and maintained as fully operational during the entire crossing process. Backup pumps will be tested prior to the start of construction. Pumps will be located in a spill containment structure that is designed to fully contain any spills of fuel or oil (see Figure 2).

Dewater structures (see Figure 3) will be utilized to reduce the velocity of pump discharge water and subsequent erosion of upland areas. These structures are essential in preventing erosion and the flow of turbid water overland and back into the stream - such overflow effectively defeats the purpose of the flumed crossing by introducing turbid water into the stream.

Runoff control structures are utilized to prevent runoff from the spoil piles or from drainage of water from the trackhoe bucket from flowing around the sandbag/plastic dams or temporary equipment crossing bridges and adding sediment to the stream. Containment and control materials are necessary to respond to any spills of fuel or lubricating oils from operating equipment. A Spill Prevention, Containment, and Countermeasures (SPCC) Plan will be implemented by the contractor in accordance with the provisions of that plan. Erosion control structures address the prevention of runoff from the right-of-way into the stream during and after construction is complete.

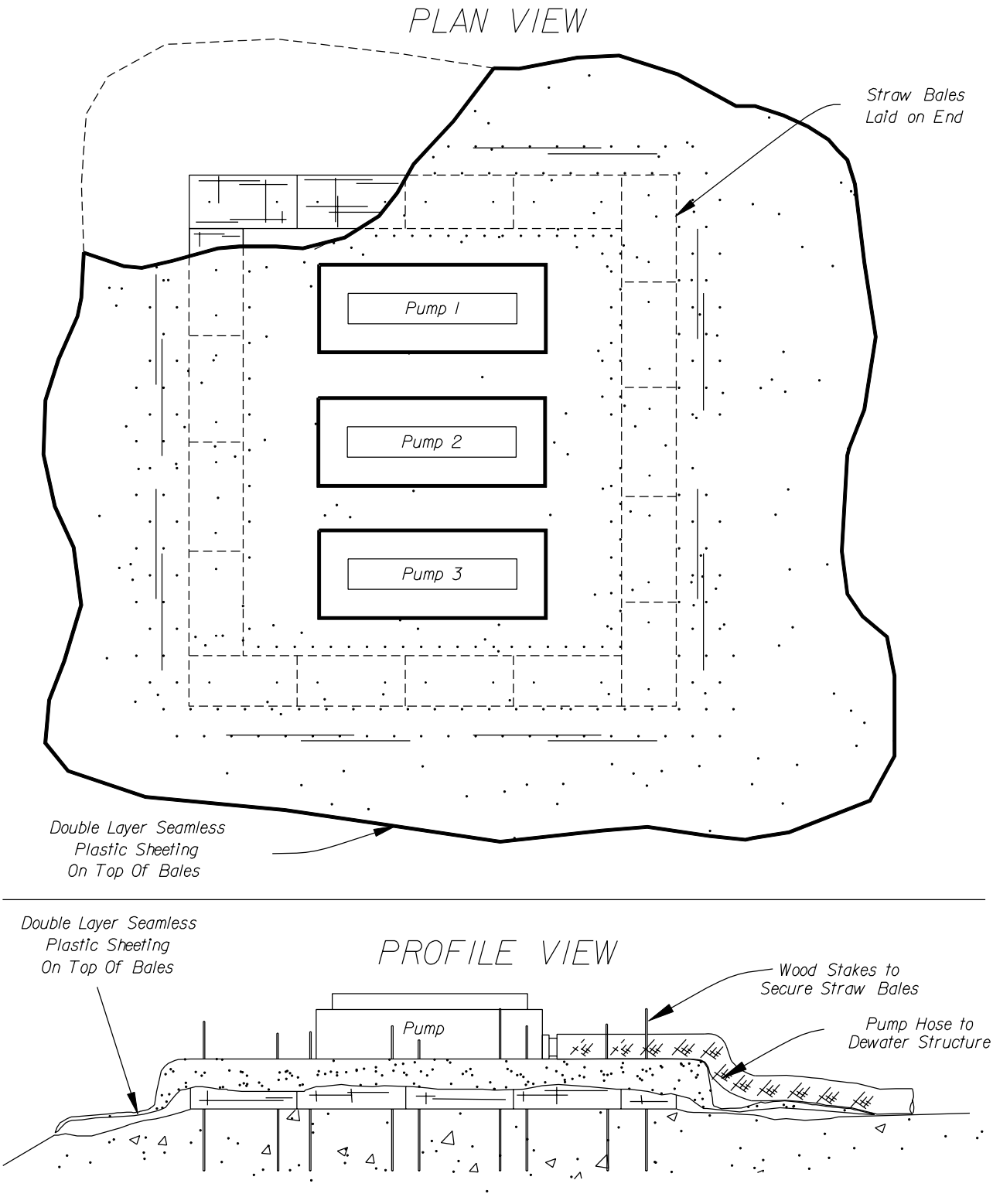
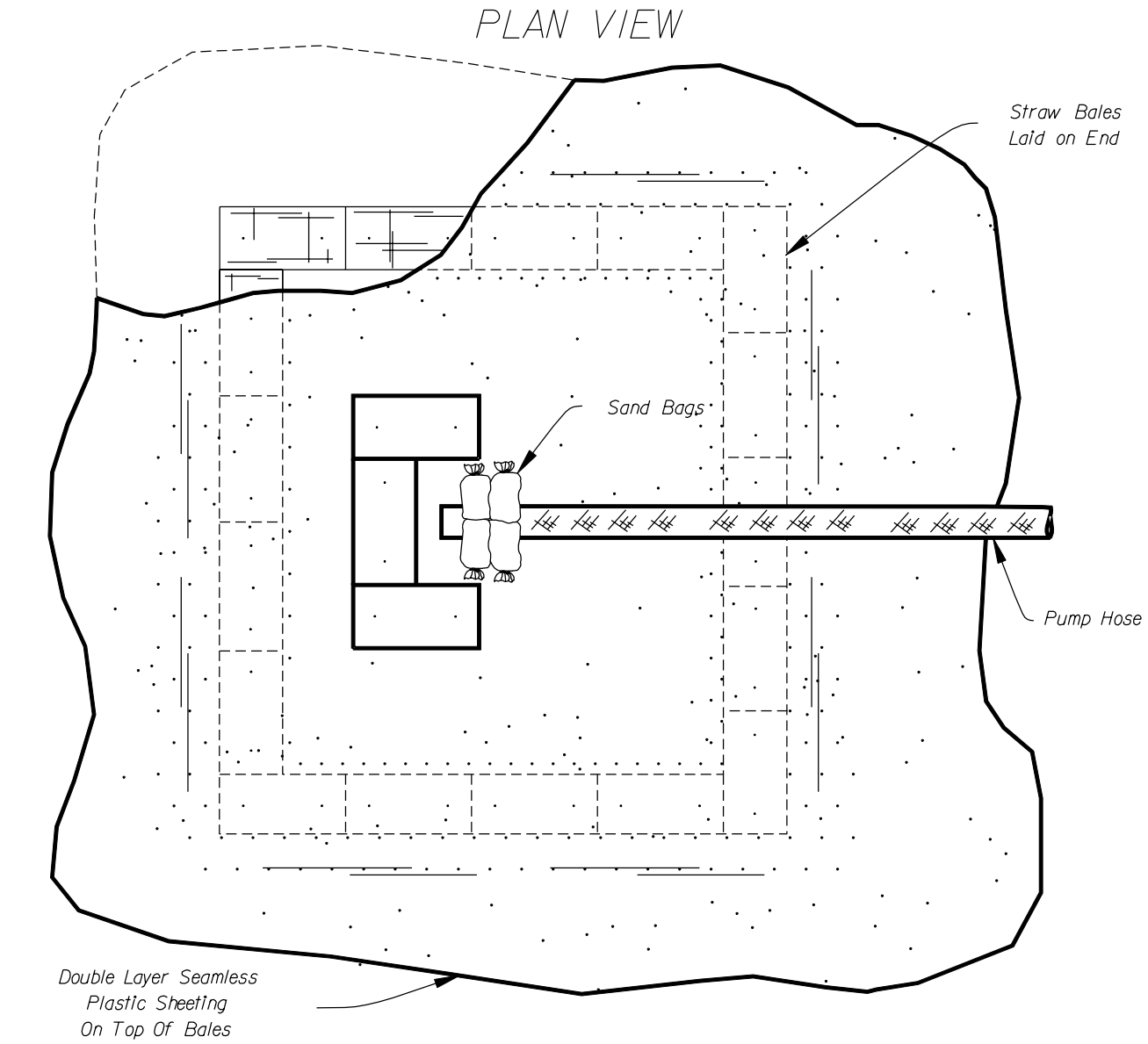


Figure 2
Typical Pump Containment Structure



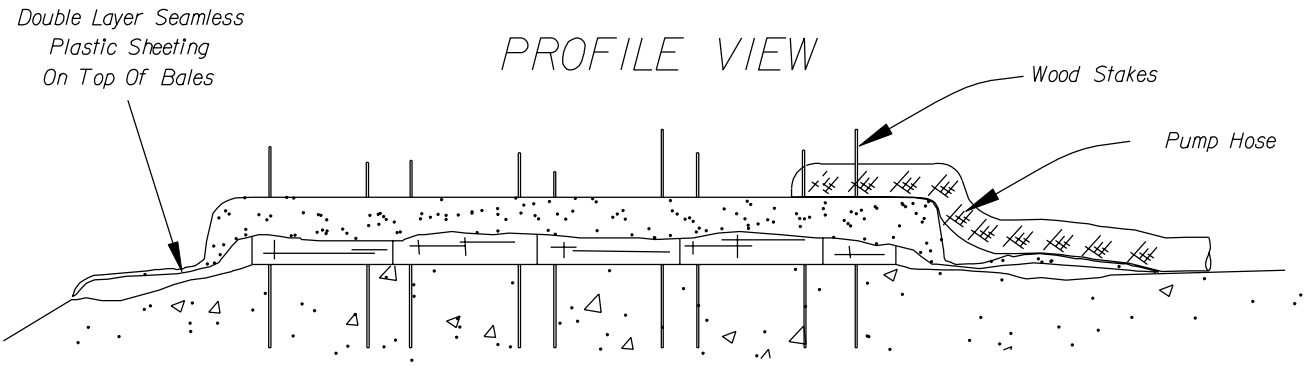


Figure 3
Typical Dewater Structure

4.0 Materials Required to Install and Maintain a Flumed Stream Crossing

The materials discussed below will accommodate most stream crossings. However, certain situations will arise where additional materials are required. Those streams that require additional materials will be addressed on a case-by-case basis.

Typically, scrap steel pipe will be utilized to construct the flume. Before the flume pipe is installed in the stream, it will be inspected to assure that it is free of grease, oil or other pollutants. In addition, excessive dirt will be removed from the flume pipe. If oil or grease is present on the flume pipe, it will be steam-cleaned before the flume pipe is placed in the stream.

Both the inlet and outlet of the flume pipe will be sandbagged and lined with plastic to create a proper seal (see Figure 4). The reason for sandbagging the downstream end of the flume is to create a contained area where turbid water is trapped and to prevent downstream water from flowing up the streambed and flooding the trench.

Sandbags will be filled with a non-leachable material such as clean, pre-washed sand. Sandbags are most effective if they are only filled to approximately 2/3 their capacity. Bags filled to capacity conform poorly to the adjacent bags and make creation of a seal more difficult. The bags must be tied securely before they are installed. If the bags are left un-tied, they tend to spill upon removal from the streambed and are nearly impossible to remove with a trackhoe. It is preferable to utilize burlap sandbags to construct the upstream and downstream dams. Plastic bags tend to rip when removed from the stream and are often too porous to adequately contain small grain sand.

Sandbags alone are often not sufficient to completely seal the upstream and downstream ends of the flume pipes. The dams are typically more effective when sheets of thick plastic are interwoven within the sandbags (see Figure 5). The plastic, when applied as shown on Figure 5, will effectively seal the dams and will greatly reduce the amount of water leaking into the construction area from behind the upstream and downstream sandbag dam.

5.0 Flume Pipe Design

A number of flume pipe designs have been used with varying degrees of success. To improve success, flume pipes with wings welded to the front end of the pipe provide for better conveyance of stream flow into the mouth of the flume (see Figure 6). The most effective wings extend to each stream bank and are angled slightly upstream. Where the bottom of the stream is other than rock, the wings extend approximately 12 inches below the bottom of the flume pipe and are pushed into the stream substrate utilizing a trackhoe during installation. The upstream and downstream portions of the wings are then sandbagged and overlain with plastic as needed to prevent leaks as shown in Figure 7.

The flume pipe(s) installed at the crossing will be of sufficient length so that the integrity of the upstream and downstream sandbag dams are not jeopardized by excessive top of ditch widths within the stream or adjacent stream banks. It is tempting to restrict the flumed width to an area smaller than the actual construction right-of-way. However, experience has shown that the contractor often needs to utilize the majority of the construction right-of-way to complete the crossing. Therefore, the flume pipes must be long enough to span the entire construction right-of-way through the stream (see Figure 4).

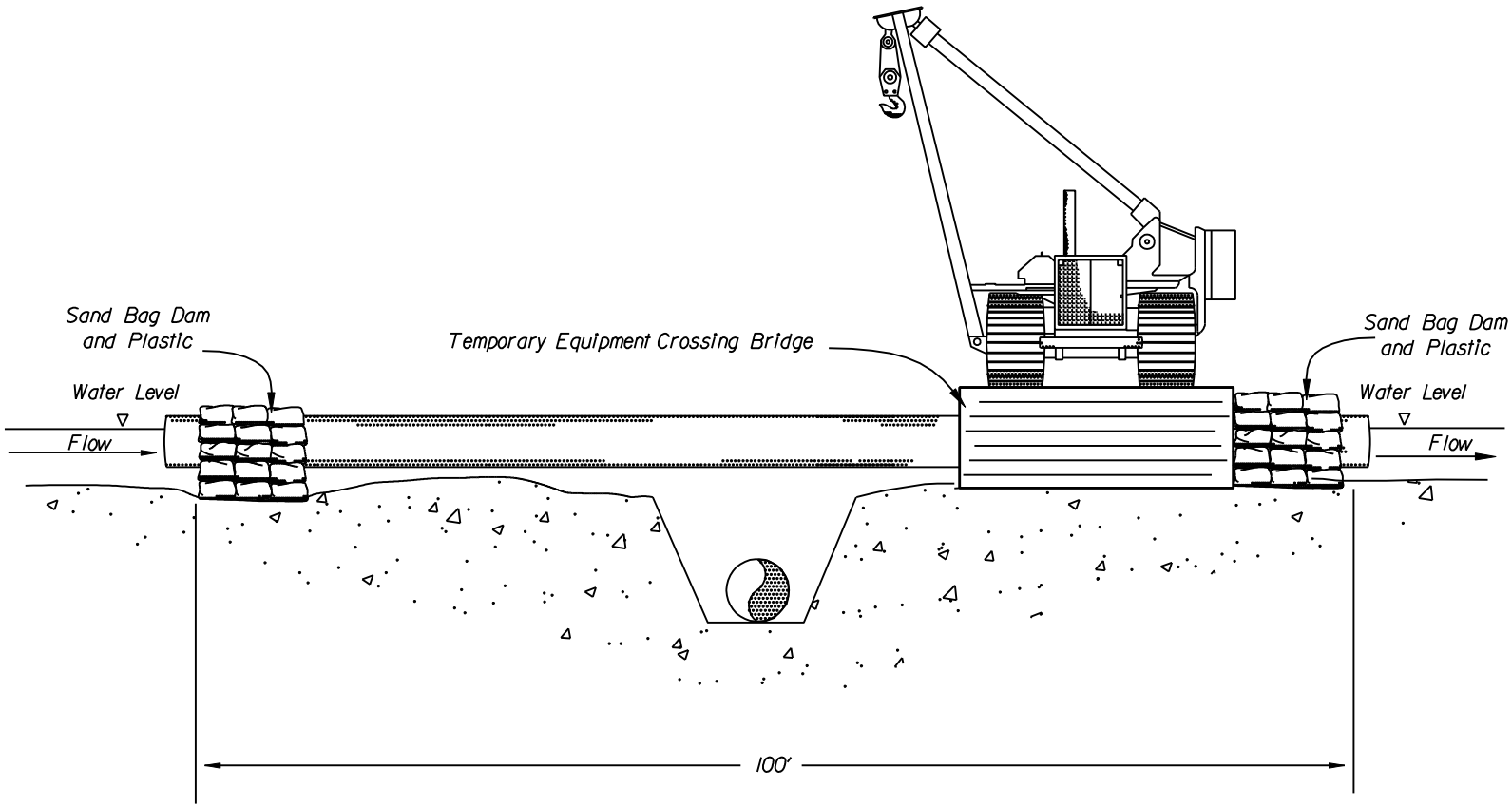


FIGURE 4
FLUME PIPE PLACEMENT ACROSS RIGHT-OF-WAY

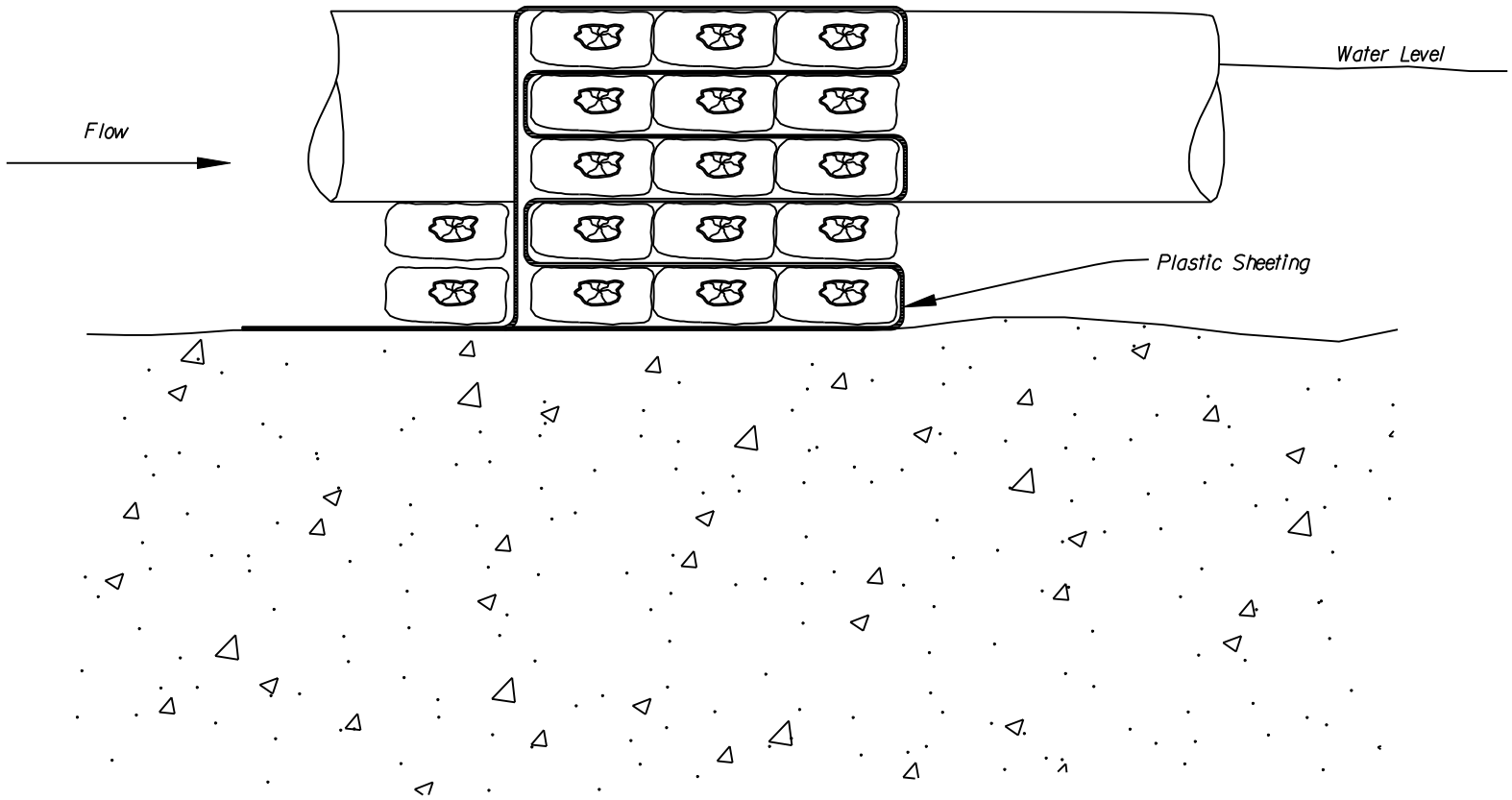


FIGURE 5
PLASTIC SHEETING INTERWOVEN INTO A SAND BAG DAM

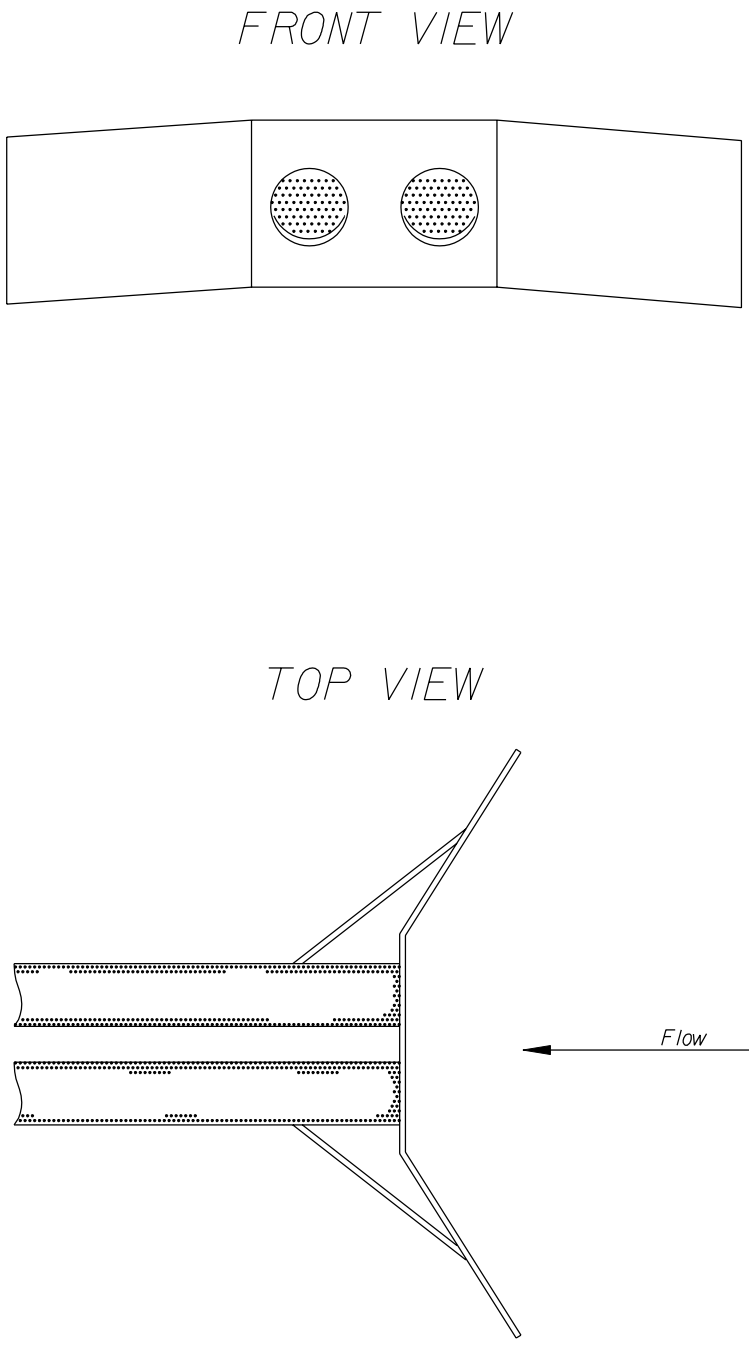


Figure 6
Upstream Flume Wings

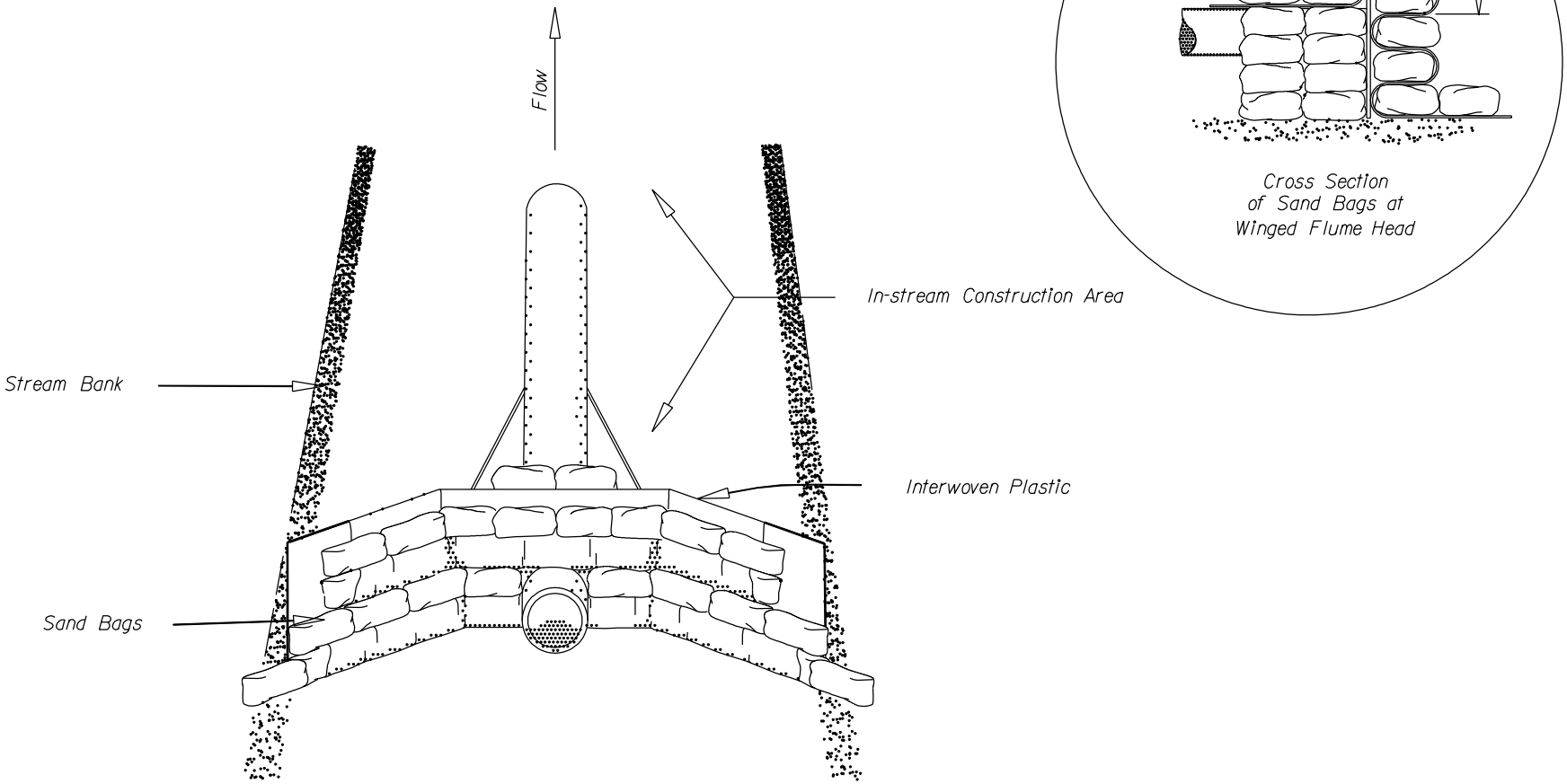


Figure 7
Sand Bag and Plastic Dam

As a general rule, a flume pipe of at least 80 feet in length will be utilized for crossings. The diameter of the flume pipe (s) will depend on the stream discharge at the time of the crossing. However, in all cases the flume pipe diameter will be oversized to accommodate any storm events that might occur during the crossing period.

6.0 Installation of the Flume Pipe

Short-term elevated levels of turbidity are expected to occur during installation of the flume pipe. However, several measures can be taken to minimize the increased turbidity. Before the contractor attempts to install the flume pipe, all materials necessary to complete the installation process will be located on-site. Installation of the flume cannot begin until all of the precautions outlined in the SPCC Plan have been undertaken. Turbidity sampling will be conducted during all flumed crossings in accordance with the Stormwater Pollution Prevention Plan.

Installing the Flume Utilizing Only Sandbag/Plastic Dams

The first step in installing the flume pipe is to clear away any large rocks and boulders from the sandbag/plastic dam area and under the flume pipe that will prohibit placement of the flume pipe or affect the integrity of the sandbag/plastic dam. It may be necessary to utilize a trackhoe to assist in removing these rocks. However, under no circumstances will the bucket be allowed to dig into the streambed to remove rocks. Rather, the edge of the bucket should be utilized to roll the rocks to the side or a thumb on the bucket will be used to pick up and move rock obstacles.

Before the flume pipe is installed, the contractor will lay at least three rows of sandbags on the streambed (at least two sandbag layers tall) to support the upstream and downstream portions of the flume pipe (see Figure 5). The sandbags may be laid on top of the plastic sheeting that will be used to help seal the sandbag dam. The plastic will be laid such that when it is wrapped around the sandbag dam, the plastic sheeting lays on the upstream face of the dam so that water pressure holds the plastic firmly against the sandbag dam face. The sandbags will be properly seated over the plastic and onto the stream bottom and packed as tightly together as possible.

Once the first rows of sandbags are in place, the flume pipe can be lowered into position. The flume pipe will be lifted over the stream and carefully aligned before it is lowered onto the sandbags over the streambed. The contractor will not push or pull the flume pipe over the stream banks and into the water. Rather, the flume pipe will be suspended over the crossing and lowered into place.

After the flume pipe is laid on the sandbags, the contractor will begin to construct the upstream sandbag/plastic dam. First, the winged upstream portion of the flume pipe will be pushed into the streambed substrate, where possible. Sandbags will be installed upstream and downstream of the wings and interwoven with plastic sheeting to form a tight seal. Typically, the sandbag/plastic dam will extend at least three feet above the water level of the stream to accommodate increased stream discharge during the crossing period (see Figure 7).

After the upstream sandbag/plastic dam is complete, the contractor will immediately begin installation of the downstream dam. The downstream sandbag/plastic dam will be constructed to a height at least three feet above the downstream water level.

7.0 Maintenance of the Flume During Construction

Flumed crossings require constant monitoring and occasional repair during the crossing process. The longer the flume remains in the water, the greater the probability that the dams will begin to leak and that water will invade the construction area in significant quantities. Therefore, it is imperative that once trenching within the stream begins that the construction process is carried to completion non-stop. Typically, this involves installing the flume on the day immediately proceeding construction of the crossing. Ditching of the stream channel should begin early the following morning and the pipe pulled under the flume pipe immediately following completion of the trench. Backfilling should commence immediately following the stringing of the drag section. For most streams it typically, requires 3 to 7 days to install the flume, dig the trench, install the pipe drag section under the flume, backfill the trench and restore and stabilize the stream banks. Smaller streams (less than 10 feet in width) generally require less time to cross using fluming procedures.

While the flume is in place, the contractor will provide a sufficient crew that will be responsible for maintaining the flumed crossing. The crew will apply additional plastic to the dams and add additional sandbags as necessary. In addition, the crew will be responsible for operating the pumps and maintaining the discharge structures. When the crossing is complete, the crew will immediately install the erosion control structures pursuant to FERC's Wetland and Waterbody Procedures.

To be adequately prepared to repair the flume, the contractor must have on-site rolls of thick plastic sheeting and extra filled and tied sandbags. These materials need to be stored directly adjacent to the stream crossing so that they are readily accessible should the need to repair the flume arise.

8.0 Length of the Drag Section

One of the biggest problems encountered during construction of flumed stream crossings is the installation of extremely long drag sections across the stream in a single drag section. The extra length requires that the flume be in place longer than necessary which increases the probability of serious problems with the integrity of the sandbag/plastic dams. In addition, the extra time required to dig additional ditch to accommodate long drag sections can result in integrity problems with the flume dams.

Segments must be kept short and extend only the distance necessary to allow for later tie-in to the upland portions of the pipeline. On most streams the drag section to be pulled under the flume should only be long enough to incorporate the sag bends. In other locations, it may be necessary to install additional pipe to complete the crossing.

The entire drag section must be made up prior to the start of in-stream trenching. Once the drag section is complete (welds x-rayed and joints coated), the drag section can be installed immediately following trenching.

9.0 Trenching Under the Flume Pipes

At some point prior to initiating trenching, chains should be hung from the flume pipe over the ditch line. These chains will be utilized to hang the pump heads or intake pipe into the ditch.

Digging the ditch under the flume requires careful preparation and execution. Two trackhoes will begin trenching from each stream bank at the same time. The trackhoes will begin by trenching under the flume pipe(s) and dig back to the stream banks. Finally, the trackhoes will dig the upland portion of the ditch necessary to install the drag section.

Generally, pumping water from the construction area is not necessary during trenching as the amount of spoil removed from the streambed generally exceeds the volume of water that infiltrates the construction area. However, at times the water flow into the construction area becomes excessive, pumping is necessary to avoid overflow or leakage from the downstream dam.

10.0 Spoil Storage During Trenching

Spoil must be stored in a manner such that runoff from the spoil does not flow into the stream or off the right-of-way. For streams in flat topography, runoff from the spoil storage pile is not typically a problem. However, on steep sloping stream banks water can run back down the right-of-way and enter the stream upstream or downstream of the dams creating a water quality problem. The problem can be compounded as the trackhoes working on the stream banks lift water saturated spoil from the stream and lay it on the right-of-way adjacent to the stream bank before it can be conveyed uphill by additional equipment. To accomplish runoff control during trenching, diversion structures or trenches will be dug within the right-of-way to direct the runoff back into the construction area as shown on Figure 8.

11.0 Spoil Transfer During Construction

Some of the stream crossings may occur adjacent to steep upland areas. In these cases, it will be necessary to utilize additional equipment (trackhoes, dozers, loaders) to transfer spoil dug by the trackhoes at each stream bank to the temporary spoil storage area.

In most cases, the contractor will utilize dozers to push the spoil to the temporary storage area. In other areas, trackhoes will be required to transfer spoil dug by the trackhoe working on the stream bank uphill to a flatter area where it can be moved by dozers. When two trackhoes are utilized to transfer spoil uphill, the trackhoe working on the stream bank places the spoil into a pit (see Figure 9). The spoil from the pit is then picked up by the second trackhoe and lifted further uphill. The pit will significantly reduce the amount of water from the spoil that runs downhill. The pit can be maintained and dug by the trackhoe working uphill from the crossing.

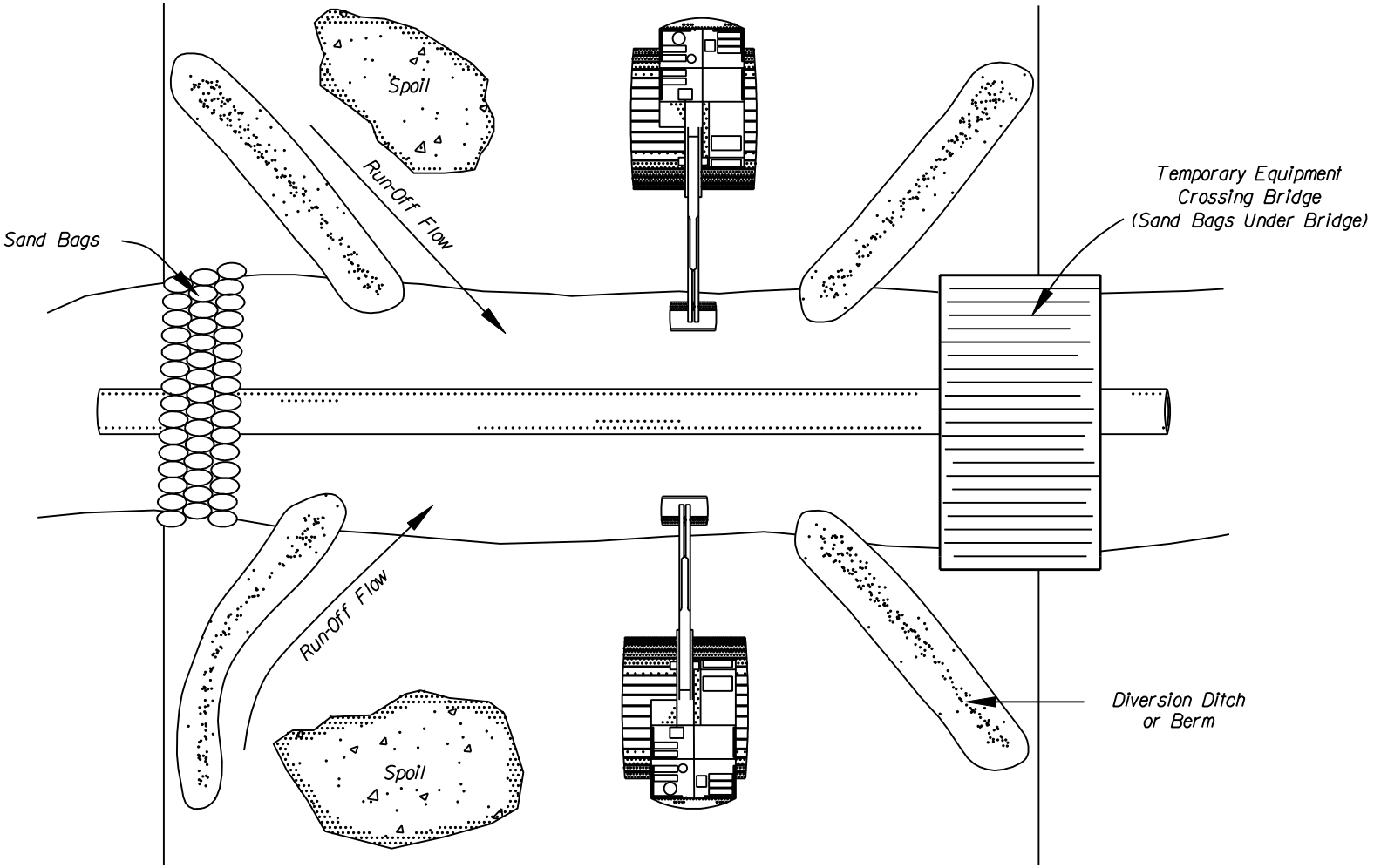


FIGURE 8
DIVERSION DITCH OR BERMS

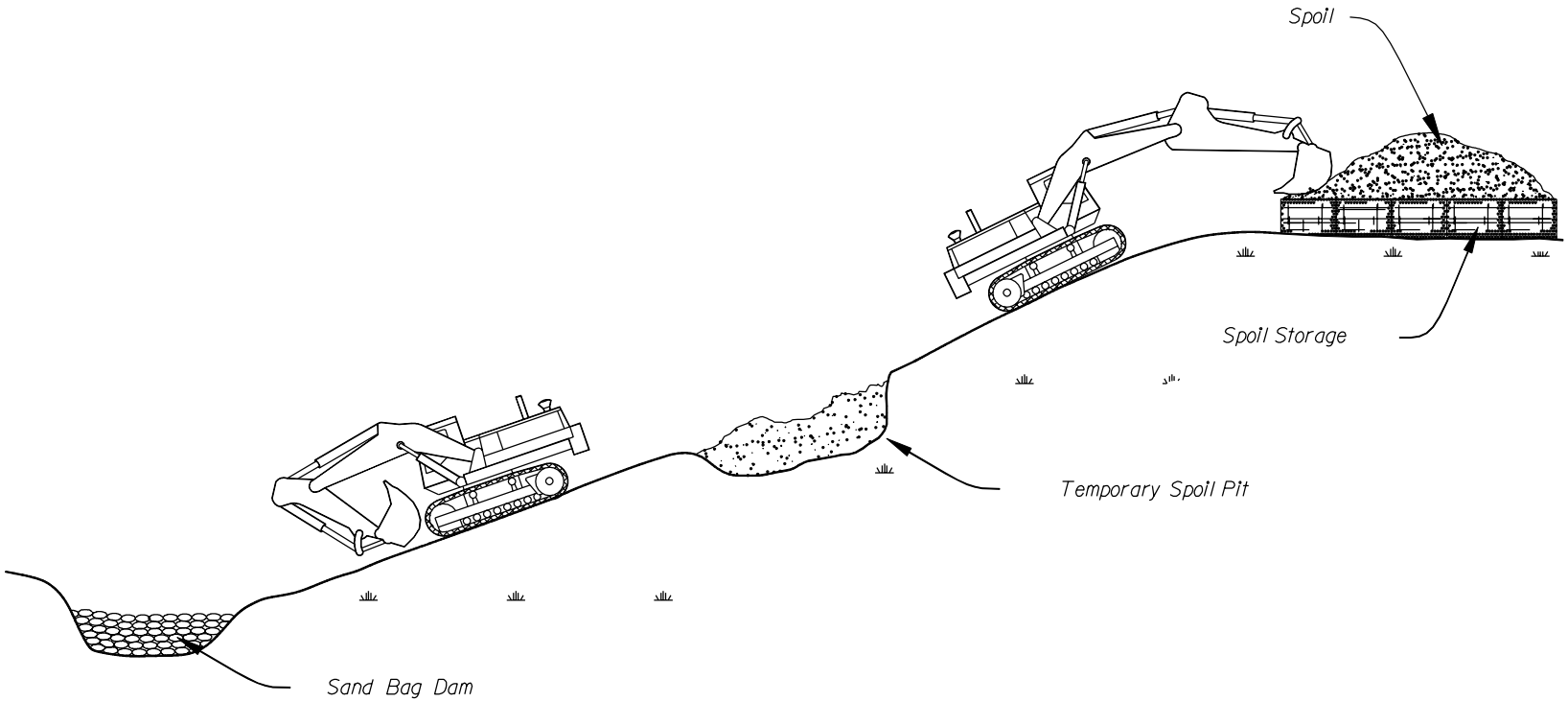


Figure 9
Uphill Slope Transfer

12.0 Installing the Pipe

While trenching is being conducted, the contractor will hook up the drag section to the sideboom tractors so that the pipe may be installed as soon as trenching is completed. It will be necessary at many crossings to float the pipe across the trench (i.e., it may not be feasible to completely dewater the ditch). While the drag section is being slid under the flume pipe, it is essential that pumps be operated to assure that turbid water does not leak through or flow over the dams. The contractor will operate the pumps at a rate so that water displaced by the pipe is immediately removed and discharged to the dewater site.

13.0 Dewatering the Construction Area

Proper operation of pumps is essential to the successful completion of a flumed stream crossing. Pumps will be utilized by the contractor as necessary to control the level of water in the construction area. The purpose of the pumps is not to completely dewater the trench.

If the water level in the construction area exceeds the upstream or downstream level of the dams, the environmental inspectors will notice small amounts of turbid water escaping into the stream either upstream or downstream of the dams. This is known as "bleeding" and the problem can be quickly resolved by increasing the pumping rate and reducing the water level within the construction area. Although bleeding will not typically result in a violation of water quality standards downstream, if left unchecked it can quickly result in erosion of the dams and serious downstream water quality problems.

The contractor will utilize pumps at each crossing to control the water level in the construction area. The contractor will also install backup pumps that will be tested and fully functional prior to the start of the crossing process. Pumps will be installed and tested and the dewater sites constructed the day prior to any in-stream construction. For most crossings, the contractor will setup three pumps. Additional pumps may be required at a few of the stream crossings. Two of the pumps will serve to remove water from the construction area and the third pump will serve as a backup should one of the primary pumps fail.

The pumps will be set in a containment area as shown on Figure 2. The primary purpose of the containment area is to fully contain any fuel or lubricating oil spills. If hydraulic pumps are used, the hose couplings on the side of the pump body will be oriented in the containment area such that they point perpendicularly away from the stream banks. The purpose of orienting the couplings away from the stream is to protect the stream should one of these couples fail and hydraulic fluid escape.

The contractor will carefully inspect each pump prior to its delivery to the crossing site. In particular, any frayed hoses or apparent leaks will be repaired before the pumps are delivered to the crossing site. Pump heads and the hoses will be cleaned of any free hydraulic oil prior to placing the pump heads into the stream.

All pumps will be installed with individual intake hoses or hydraulic heads, trash filters and discharge hoses. All three hydraulic heads will remain in the water during the entire construction process including backfill. In this manner, the backup pump can be immediately employed should one of the primary pumps fail.

Each of the pumps (including the backup pump) will be equipped with a minimum of 300 feet of discharge hose. It is important to stretch the hose on the backup pump and install a dewater structure for that pump at the same time the primary pumps are installed. Hoses should be free of leaks and in good operating condition.

In many cases, it is difficult to locate dewater sites where water will flow away from wetlands or streams. In these cases, careful attention will be paid to the dewater sites and alternative sites (which require additional discharge hose) selected prior to the start of in-stream construction. Often it is necessary to move the location of the dewater site several times during construction of the stream crossing to avoid dewater from reaching sensitive areas.

Dewater structures will be constructed of straw bales and plastic and wooden stakes as shown on Figure 3. The intent of the design provided on Figure 3 is to allow the water to fill the dewater structure and flow evenly over the tops of the bales. Straw bales will be securely staked to the ground utilizing wooden stakes. Alternative structures are also provided in the Erosion Control and Revegetation Plan.

14.0 Backfilling the Ditch

The highest potential for water quality problems during a flumed crossing is during backfilling of the ditch. Quick backfilling into the ditch by the contractor can cause the water level in the construction area to overflow or leak through the downstream dam. Pumps must be carefully managed during backfilling to control the water level in the construction area. The contractor must carefully monitor the effectiveness of the pumps and control the rate of backfill to preclude bleeding through the downstream dam. If backfilling occurs too quickly, the pumps will not be capable of removing the water from the construction area quick enough to prevent the escape of turbid water.

To prevent turbidity, backfilling of the ditch will be conducted in a slow, well-planned manner. Backfilling will begin in the center of the stream directly under the flume pipes and proceed toward each bank simultaneously. In this manner, much of the water in the ditch will be pushed to the ditch outside of the stream channel. If upland portions of the trench are backfilled first, the water in the ditch is pushed into the stream channel and will inevitably leak through or overflow the downstream dam.

Once backfilling of the entire stream channel is complete, the contractor will compact the streambed and construct solid plugs on both banks. Water will remain trapped in the ditch outside of the stream channel. This water will be pumped from the ditch at a later time in the manner described for dewatering the construction area (see Section 13).

15.0 Flume Removal

After the ditch is backfilled, clean gravel fill is placed on the top one foot of the ditch (where necessary). Plugs will be installed at each stream bank and the stream banks stabilized and the flume will be removed from the crossing. To prevent excessive increases in turbidity during flume removal, the contractor will remove all of the sandbags from the downstream dam. A trackhoe can be utilized to remove the top layers of the sandbags as long as the operator takes great care not to dig into the streambed or to increase turbidity.

After the downstream sandbags are completely removed from the streambed (except those few left directly under the flume), the contractor will begin removing the sandbags from the upstream dam. The top rows of sandbags should be removed by hand until the water begins to overflow the top of the dam and flows slowly over the construction area. For the first 10 to 30 minutes, turbidity downstream of the crossing area could increase considerably. However, the streambed portion of the construction area will be flushed clean of sediments left over from construction and the water will flow clear over the disturbed stream bed area. After the turbidity level has decreased to acceptable levels or that of upstream levels, the contractor can proceed with removing the remainder of the upstream dam sandbags.

Once the majority of the sandbags are removed, the flume pipe will be removed. The flume pipe will be raised directly from the streambed in a single movement. Under no circumstances will the contractor drag the flume pipe from the streambed. Rather, it will be lifted and then carried from the crossing area. After the flume is removed, the remaining few sandbags, which were laid directly under the flume pipe, can be removed by hand.

Attachment 3

Dam and Pump Procedures

Pacific Connector Gas Pipeline, LP

Dam & Pump Procedures

Pacific Connector Gas Pipeline Project

September 2017

DAM & PUMP PROCEDURES

During construction various local, state and federal permits will require that flowing streams with coldwater fisheries be crossed utilizing a "dry crossing" technique. Dam & pump is one of the methods which may be utilized to achieve a dry crossing of a flowing stream. The purpose of this appendix is to outline the techniques that will be utilized to temporarily dam stream crossings and pump the flowing water around the site during construction of the project. These guidelines are subject to change based on permits issued by regulatory agencies.

1.0 Purpose of Dam & Pump Stream Crossings

The primary purpose of damming a stream is to assure that in-stream construction activities comply with water quality standards for turbidity that have been established by the state to protect aquatic life and other beneficial uses. Overall, properly installed and maintained dams can be very effective in reducing turbidity during in-stream construction. In most cases, detectable increases in turbidity are limited to only the short duration when the dams are installed or removed from the streambed.

However, simply installing the dams is no guarantee that compliance with water quality standards will occur. Dams require monitoring and occasional repair during the crossing period to ensure the integrity of the structure(s). Adequate pumps play an integral role in a successful dam & pump crossing.

2.0 Where Dams & Pumps Will Be Installed

Any minor or intermediate waterbody with water flowing in the streambed at the time of construction, which has a coldwater fishery as defined by the Oregon Department of Fish and Wildlife (ODFW), may be dammed & pumped. A list of streams where dry open cut crossing methods (fluming, dam and pump or diverted open cut) may be utilized is provided in Resource Report 2.

3.0 General Layout of a Typical Dam & Pump Stream Crossing

Figure 1 shows a plan view of a typical dam & pump stream crossing. The primary components of a dam & pump crossing include:

- sandbag/plastic dams or other functional designs (e.g., metal plates, water bladders, etc.);
- spoil storage and staging areas;
- pumps and pump containment structure (s);
- dewater structure(s);
- erosion control structures; and
- spill containment and cleanup materials.

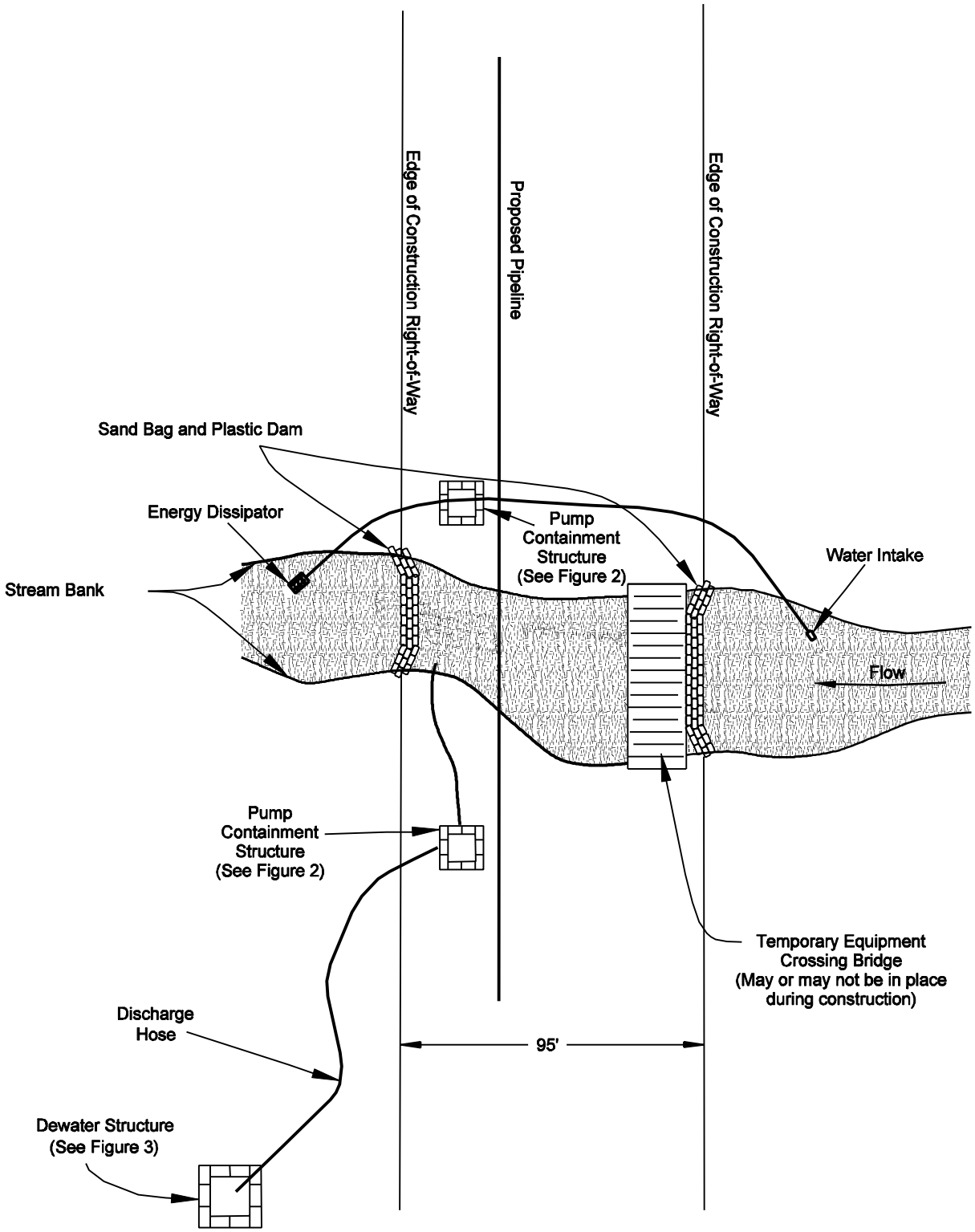


FIGURE 1
PLAN VIEW OF TYPICAL DAM & PUMP STREAM CROSSING

The sandbag/plastic dams (or other functional designs such as metal plates or water bladders) are used to isolate the stream flow from the area of construction. A single pump or multiple pumps are used to temporarily convey the stream flow around the construction area, thereby reducing the introduction of sediments into the water column during ditching and backfilling. These structures are also utilized to prevent downstream water from flowing upstream into the construction area. They also serve to contain water that infiltrates into the construction area before it can be removed by pumps and discharged to an upland area. Finally, the downstream structure serves to contain turbid water, which rises quickly in the construction area during backfilling of the trench.

All waterbodies with water in the streambed at the time of construction must have an equipment crossing bridge.

The temporary spoil storage area is where spoil trenched from the streambed will be stored until backfilling is completed. These temporary extra work areas are identified on the Environmental Alignment Sheets. FERC's Wetland and Waterbody Procedures prohibit the location of staging areas or additional right-of-way within 50 feet of the stream banks or edge of adjacent wetlands unless site-specific conditions such as topography prevent the setback and a variance is approved. Trench spoil must be placed at least 10 feet away from stream banks at all flowing stream crossings. In addition, these areas must be enclosed with silt fence and/or straw bales to prevent runoff of the spoil into the stream.

Adequate pumps are essential for the successful completion of dam & pump stream crossings. During several phases of the crossing process, it will be necessary to quickly remove large quantities of water from the construction area to prevent overflow or leakage of the sandbag/plastic dams. In order to quickly and effectively remove water from the construction area, well-maintained pumps with adequate pumping rates must be utilized. In addition, backup pumps will be located on-site, hooked up and maintained as fully operational during the entire crossing process. Backup pumps will be tested prior to the start of construction. Pumps will be located in a spill containment structure that is designed to fully contain any spills of fuel or oil (see Figure 2).

Dewater structures (see Figure 3) will be utilized to reduce the velocity of pump discharge water and subsequent erosion of upland areas. These structures are essential in preventing erosion and the flow of turbid water overland and back into the stream - such overflow defeats the purpose of the dam & pump crossing by introducing turbid water into the stream.

Runoff control structures are utilized to prevent runoff from the spoil piles or from drainage of water from the trackhoe bucket from flowing around the sandbag/plastic dams or temporary equipment crossing bridges and adding sediment to the stream. Containment and control materials are necessary to respond to any spills of fuel or lubricating oils from operating equipment. A Spill Prevention, Containment, and Countermeasures (SPCC) Plan will be implemented by the contractor in accordance with the provisions of that plan. Erosion control structures address the prevention of runoff from the right-of-way into the stream during and after construction is complete.

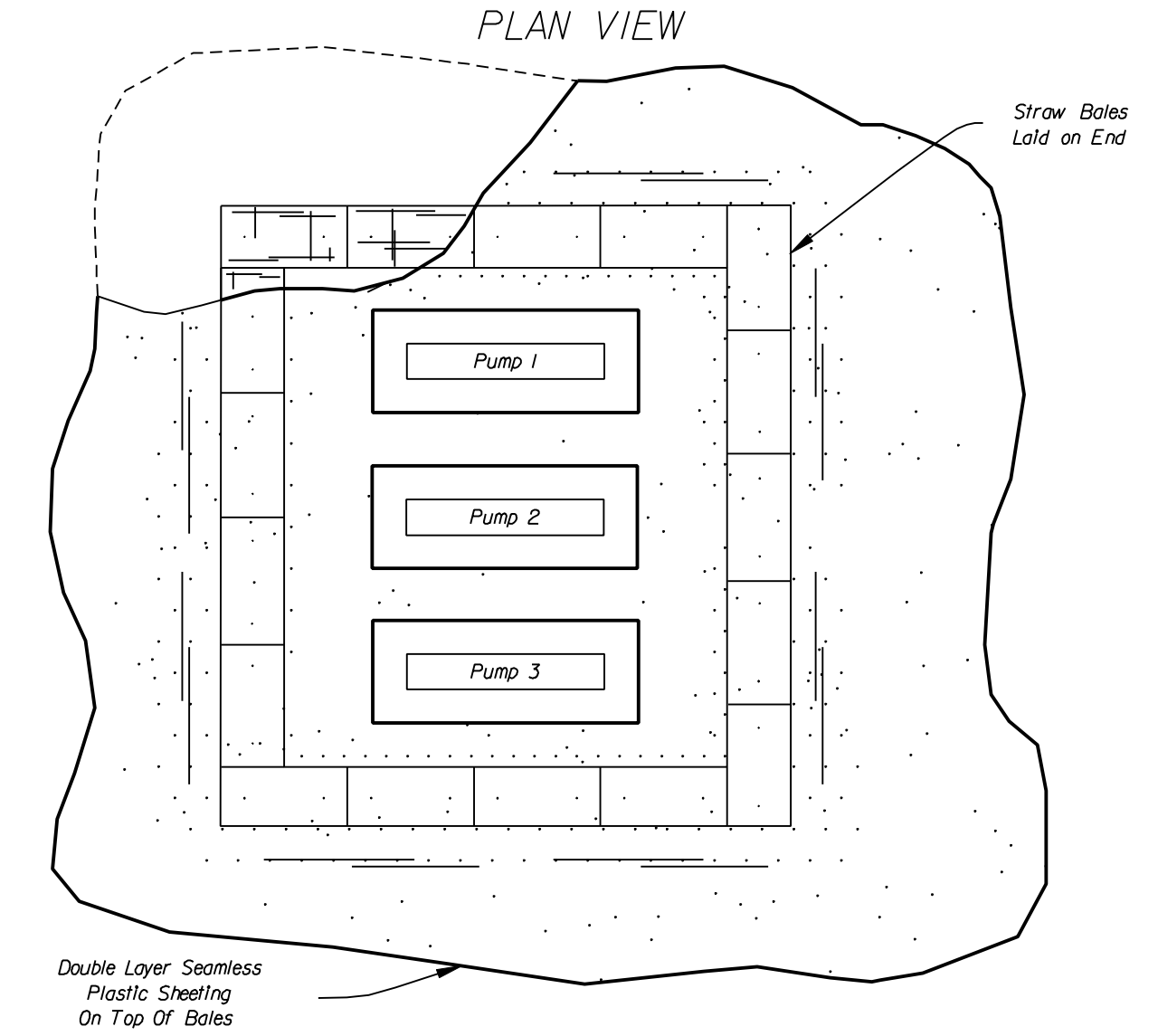
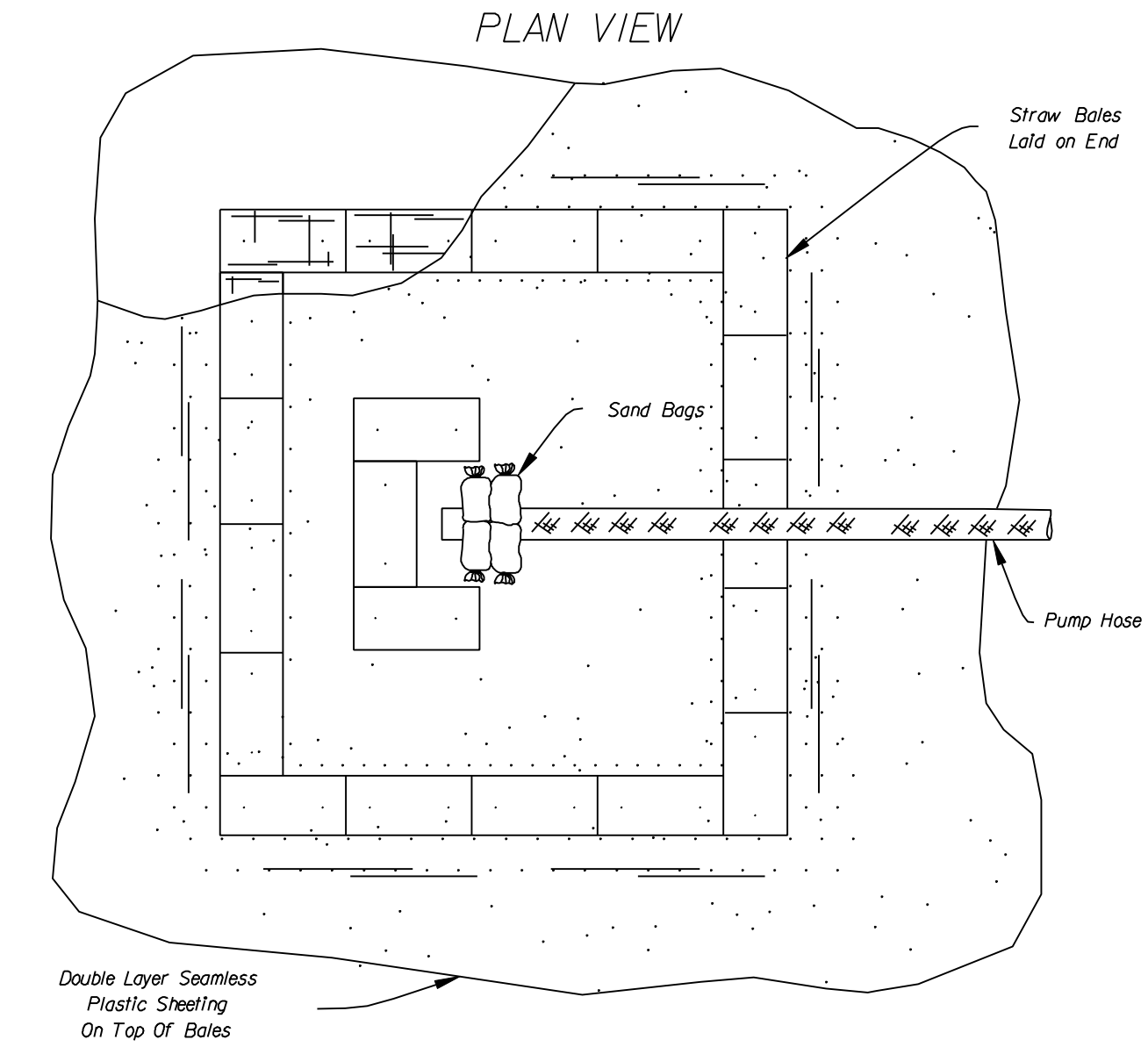


FIGURE 2
TYPICAL PUMP CONTAINMENT STRUCTURE



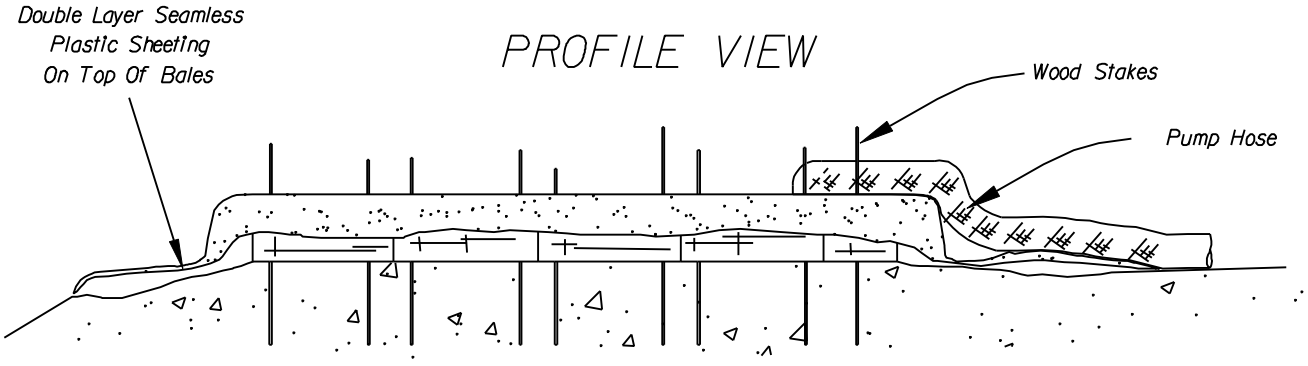


FIGURE 3
TYPICAL DEWATER STRUCTURE

4.0 Materials Required to Install and Maintain a Dam & Pump Stream Crossing

The materials discussed below will accommodate most stream crossings. However, certain situations will arise where additional materials are required. Those streams that require additional materials are site specific and will be addressed on a case-by-case basis.

Sandbags will be filled with a non-leachable material such as clean, pre-washed sand. Sandbags are most effective if they are only filled to approximately 2/3 their capacity. Bags filled to capacity conform poorly to the adjacent bags and make creation of a seal more difficult. The bags must be tied securely before they are installed. If the bags are left un-tied, they tend to spill upon removal from the streambed and are nearly impossible to remove with a trackhoe. It is preferable to utilize burlap sandbags to construct the upstream and downstream dams. Plastic bags tend to rip when removed from the stream and are often too porous to adequately contain small grain sand.

Sandbags alone may not completely seal the upstream and downstream ends of the construction area. The dams are typically more effective when sheets of thick plastic are interwoven within the sandbags (see Figures 4 and 5). The plastic, when applied as shown on Figure 4, will effectively seal the dams and will greatly reduce the amount of water leaking into the construction area from behind the upstream and downstream sandbag dams.

5.0 Installation of the Dams

Short-term elevated levels of turbidity are expected to occur during installation of the dams. However, several measures can be taken to minimize the increased turbidity. Before the contractor attempts to install the dams, all materials necessary to complete the installation process will be located on-site. Installation of the dams cannot begin until all of the precautions outlined in the SPCC Plan have been undertaken. Turbidity sampling will be conducted during all dam & pump crossings in accordance with the Stormwater Pollution Prevention Plan.

Installing the Sandbag/Plastic Dams

The first step in installing the dams is to clear away any large rocks and boulders from the sandbag/plastic dam area that may affect the integrity of the sandbag/plastic dams. It may be necessary to utilize a trackhoe to assist in removing these rocks. However, the bucket will not dig into the streambed to remove rocks. Rather, the edge of the bucket will be utilized to roll the rocks to the side or a thumb on the bucket will be used to pick up and move rock obstacles.

The sandbags may be laid on top of the plastic sheeting that will be used to help seal the sandbag dam. The plastic will be laid such that when it is wrapped around the sandbag dam, the plastic sheeting lays on the upstream face of the dam so that water pressure holds the plastic firmly against the sandbag dam face. The sandbags will be properly seated over the plastic and onto the stream bottom and packed as tightly together as possible.

Sandbags will be installed upstream and downstream and interwoven with plastic sheeting to form a tight seal. Typically, the sandbag/plastic dams will extend at least three feet above the water level of the stream to accommodate increased stream discharge during the crossing period (see Figures 4 and 5).

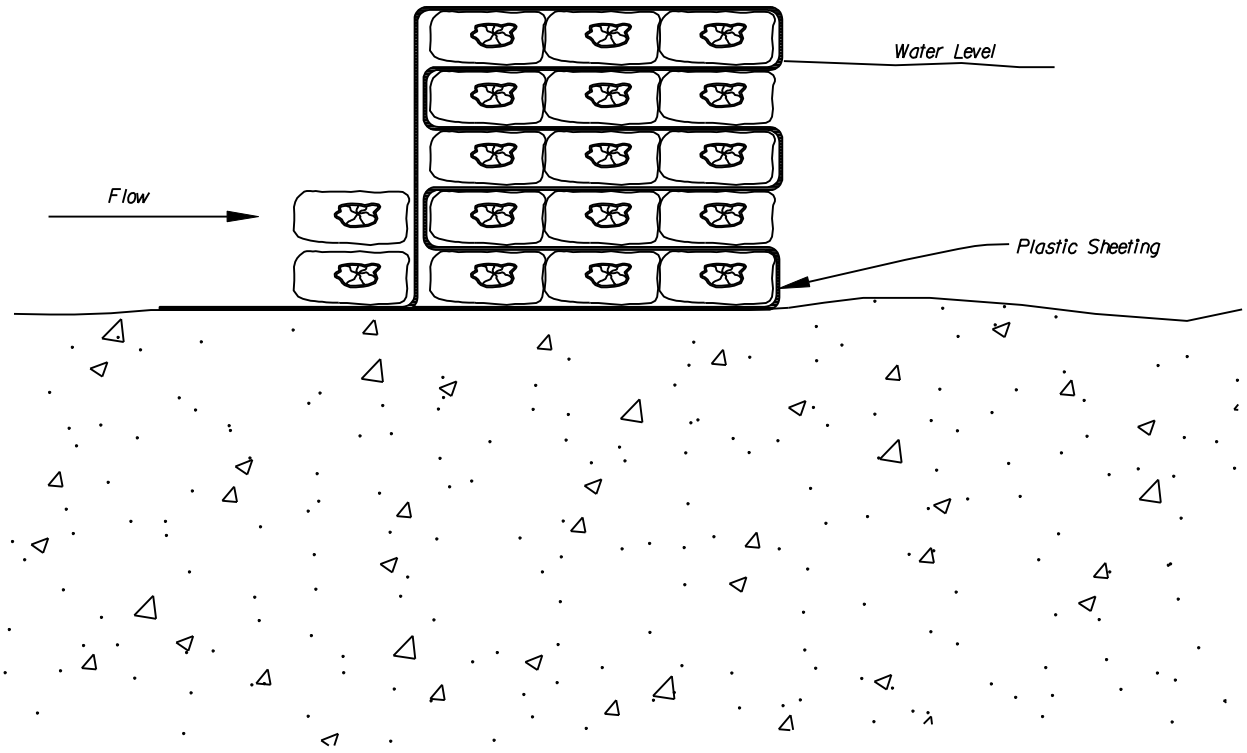


FIGURE 4
PLASTIC SHEETING INTERWOVEN INTO A SAND BAG DAM

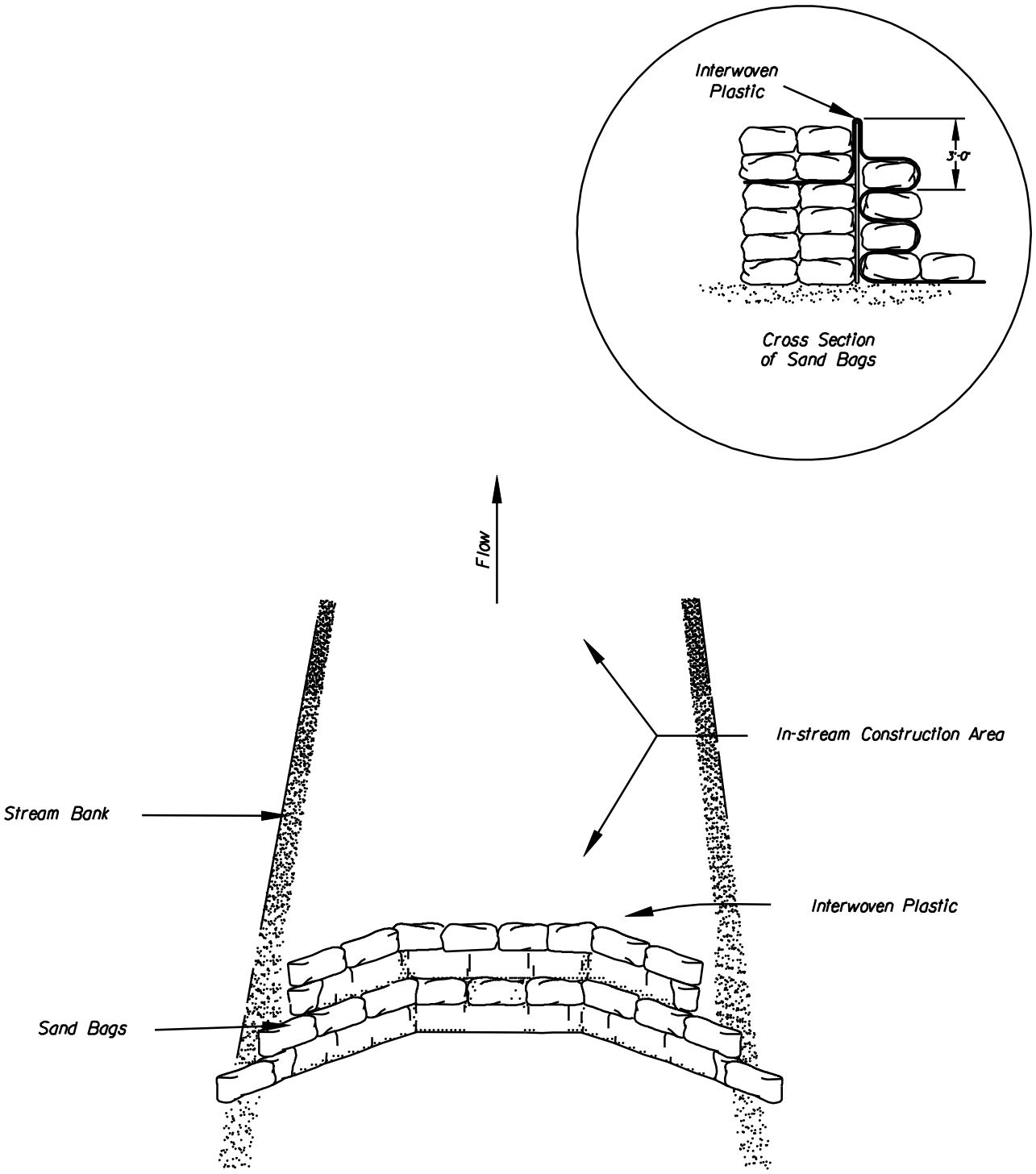


FIGURE 5
SAND BAG AND PLASTIC DAM

While the upstream dam is being installed a properly sized pump(s) will be operating to move stream flow around the dam to prevent stream erosion or bank scour. After the upstream sandbag/plastic dam is complete, the contractor will immediately begin installation of the downstream dam. The pump(s) will continue operating to divert stream flow around the dams throughout installation of the dams and completion of the crossing. The downstream sandbag/plastic dam will be constructed to a height at least three feet above the downstream water level.

6.0 Maintenance of the Dams and Pumps During Construction

Dam & pump crossings may require constant monitoring and occasional repair during the crossing process. The longer the dams remain in the water, the greater the probability they will begin to leak and that water will invade the construction area in potentially significant quantities. Therefore, it is imperative that once trenching within the stream begins that the construction process is carried to completion non-stop. Typically, this involves installing the dams on the day immediately preceding construction of the crossing. Ditching of the stream channel should begin early the following morning and the pipe pulled immediately following completion of the trench. Backfilling should commence immediately following the stringing of the drag section. Most stream crossings typically require approximately 7 - 14 days to install the dams, dig the trench, install the pipe drag section, backfill the trench and restore and stabilize the stream banks depending on site conditions. Smaller streams (less than 10 feet in width) generally require less time to cross using dam & pump procedures.

While the dams are in place, the contractor will provide a sufficient crew that will be responsible for maintaining the dam & pump crossing. That crew will apply additional plastic to the dams and add additional sandbags as necessary. In addition, this crew will be responsible for operating, maintaining and fueling the pumps and maintaining the discharge structures. When the crossing is complete, this crew will immediately install the erosion control structures pursuant to FERC's Wetland and Waterbody Procedures.

To be adequately prepared to repair the dams, the contractor will have on-site rolls of thick plastic sheeting and extra filled and tied sandbags. These materials will be stored directly adjacent to the stream crossing so that they are readily accessible should the need to repair the dams arise.

7.0 Length of the Drag Section

One of the biggest problems encountered during construction of dam & pump stream crossings is the installation of extremely long drag sections across the stream in a single drag section. The extra length requires that the dams be in place longer than necessary which increases the probability of serious problems with the integrity of the sandbag/plastic dams. In addition, the extra time required to dig additional ditch to accommodate long drag sections can result in integrity problems with the sandbag/plastic dams.

Segments must be kept short and extend only the distance necessary to allow for later tie-in to the upland portions of the pipeline. On most streams the drag section should only be long enough to incorporate the sag bends. In other locations, it may be necessary to install additional pipe to complete the crossing.

The entire drag section must be made up prior to the start of in-stream trenching. Once the drag section is complete (welds x-rayed and joints coated), the drag section can be installed immediately following trenching.

8.0 Spoil Storage During Trenching

Spoil must be stored in a manner such that runoff from the spoil does not flow into the stream or off the right-of-way. For streams in flat topography, runoff from the spoil storage pile is not typically a problem. However, on steep sloping stream banks water can run back down the right-of-way and enter the stream upstream or downstream of the dams creating a serious water quality problem. The problem can be compounded as the trackhoes working on the stream banks lift water saturated spoil from the stream and lay it on the right-of-way adjacent to the stream bank before it can be conveyed uphill by additional equipment. To accomplish runoff control during trenching, diversion structures or trenches will be dug within the right-of-way to direct the runoff back into the construction area as shown on Figure 6.

9.0 Spoil Transfer During Construction

Some of the stream crossings may occur adjacent to steep upland areas. In these cases, it will be necessary to utilize additional equipment (trackhoes, dozers, loaders) to transfer spoil by the trackhoes at each stream bank to the temporary spoil storage area.

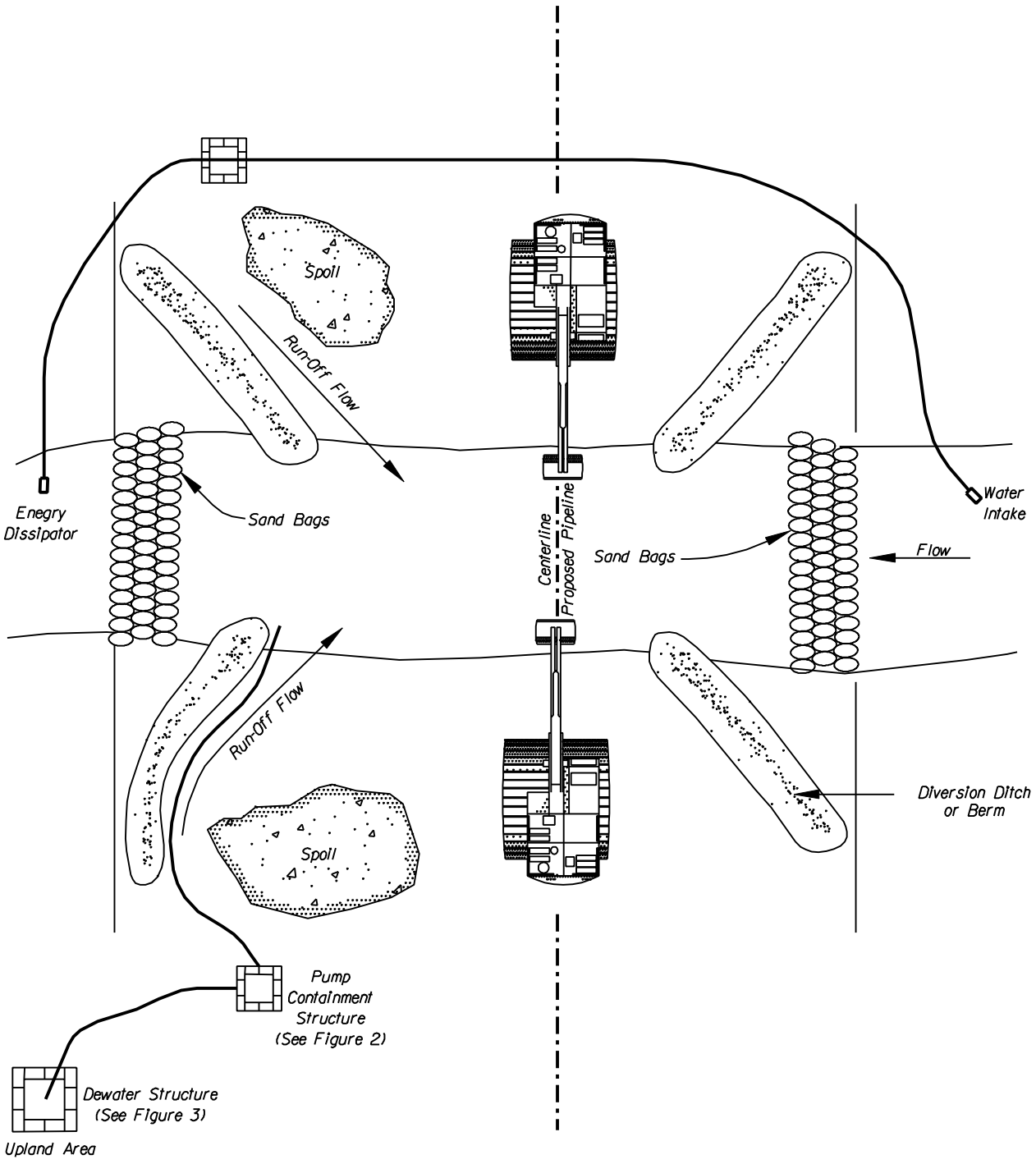
In most cases, the contractor will utilize dozers to push the spoil to the temporary storage area. In other areas, trackhoes will be required to transfer spoil dug by the trackhoe working on the stream bank uphill to a flatter area where it can be moved by dozers. Where two trackhoes are utilized to transfer spoil uphill, it is often desirable to have the trackhoe working on the stream bank place the spoil into a pit (see Figure 7). The spoil from the pit is then picked up by the second trackhoe and lifted further uphill. The pit will significantly reduce the amount of water from the spoil that runs downhill. The pit can be maintained and dug by the trackhoe working uphill from the crossing.

10.0 Installing the Pipe

While trenching is being conducted, the contractor will hook up the drag section to the sideboom tractors so that the pipe may be installed as soon as trenching is completed. It will be necessary at many crossings to float the pipe across the trench (i.e., it may not be feasible to completely dewater the ditch). While the drag section is being lowered into the trench, it is essential that pumps be operated to assure that turbid water does not leak through or flow over the dams. The contractor will operate the pumps at a rate so that water displaced by the pipe is immediately removed and discharged to the dewater site.

11.0 Dewatering the Construction Area

Proper operation of pumps to dewater the construction area is essential to the successful completion of a dam & pump stream crossing. Pumps will be utilized by the contractor as necessary to control the level of water in the construction area. The purpose of the pumps is not to completely dewater the trench.



NOTE:

Temporary Bridge may or may not be in place during trenching operations.

FIGURE 6
DIVERSION DITCH OR BERMS

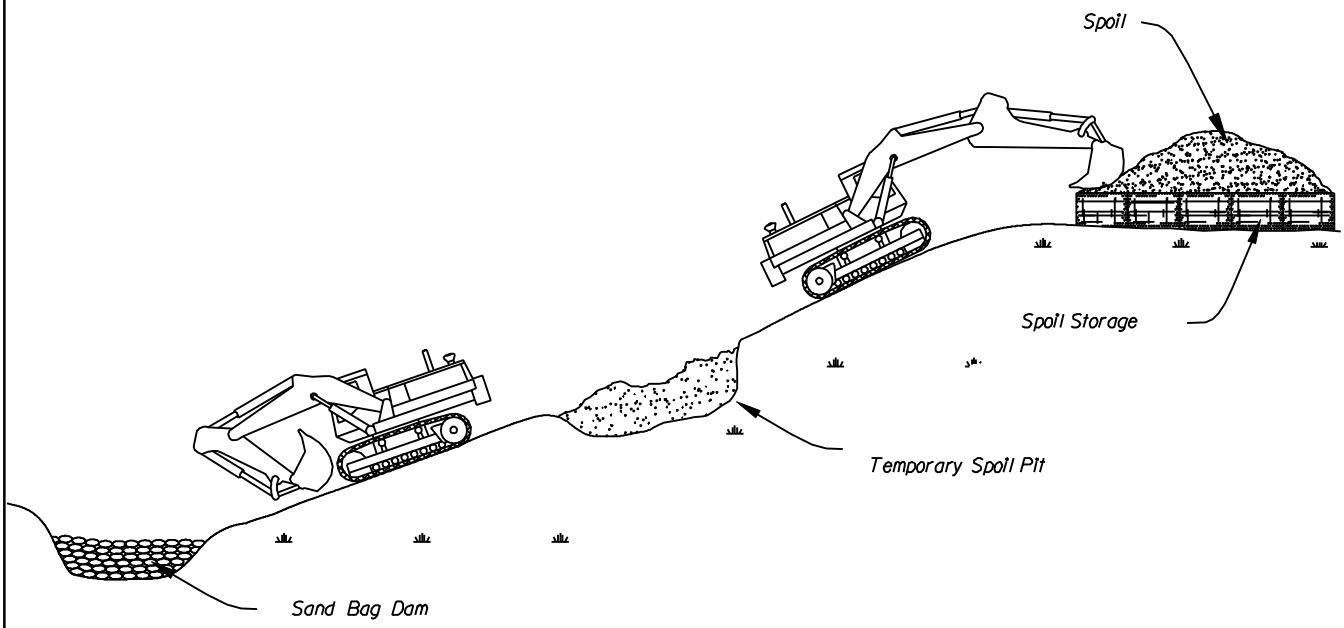


FIGURE 7
UPHILL SPOIL TRANSFER

If the water level in the construction area exceeds the upstream or downstream level of the dams, environmental inspectors will notice small amounts of turbid water escaping into the stream either upstream or downstream of the dams. This is known as "bleeding" and the problem can be quickly resolved by increasing the pumping rate and reducing the water level within the construction area. Although bleeding will not typically result in a violation of water quality standards downstream, if left unchecked it can quickly result in erosion of the dams and serious downstream water quality problems.

The contractor will utilize pumps at each crossing to control the water level in the construction area. The contractor will also install backup pumps that will be tested and fully functional prior to the start of the crossing process. Pumps will be installed and tested and the dewater sites constructed the day prior to any in-stream construction. For most crossings, the contractor will setup three pumps. Additional pumps may be required at a few of the stream crossings. Two of the pumps will serve to remove water from the construction area and the third pump will serve as a backup should one of the primary pumps fail.

The pumps will be set in a containment area as shown on Figure 2. The primary purpose of the containment area is to fully contain any fuel or lubricating oil spills. If hydraulic pumps are used, the hose couplings on the side of the pump body will be oriented in the containment area such that they point perpendicularly away from the stream banks. The purpose of orienting the couplings away from the stream is to protect the stream should one of these couples fail and hydraulic fluid escape.

The contractor will carefully inspect each pump prior to its delivery to the crossing site. In particular, any frayed hoses or apparent leaks will be repaired before the pumps are delivered to the crossing site. Pump heads and the hoses will be cleaned of any free hydraulic oil prior to placing the pump heads into the stream.

All pumps will be installed with individual intake hoses or hydraulic heads, trash filters and discharge hoses. All hydraulic heads will remain in the water during the entire construction process including backfill. In this manner, the backup pump can be immediately employed should one of the primary pumps fail.

Each of the pumps (including the backup pump) will be equipped with a minimum of 300 feet of discharge hose. It is important to stretch the hose on the backup pump and install a dewater structure for that pump at the same time the primary pumps are installed. Hoses should be free of leaks and in good operating condition.

In many cases, it is difficult to locate dewater sites where water will flow away from wetlands or streams. In these cases, careful attention will be paid to the dewater sites and alternative sites (which require additional discharge hose) selected prior to the start of in-stream construction. Often it is necessary to move the location of the dewater site several times during construction of the stream crossing to avoid dewater from reaching sensitive areas.

Dewater structures will be constructed of straw bales and plastic and wooden stakes as shown on Figure 3. The intent of the design provided on Figure 3 is to allow the water to fill the dewater structure and flow evenly over the tops of the bales. Straw bales will be securely staked to the ground utilizing wooden stakes. Alternative structures are also provided in the Erosion Control and Revegetation Plan.

12.0 Backfilling the Ditch

The highest potential for water quality problems during a dam & pump crossing is during backfilling of the ditch. Quick backfilling into the ditch by the contractor can cause the water level in the construction area to overflow or leak through the downstream dam. Pumps must be carefully managed during backfilling to control the water level in the construction area. The contractor must carefully monitor the effectiveness of the pumps and control the rate of backfill to preclude bleeding through the downstream dam. If backfilling occurs too quickly, the pumps will not be capable of removing the water from the construction area quick enough to prevent the escape of turbid water.

To prevent turbidity, backfilling of the ditch will be conducted in a slow, well-planned manner. Backfilling will begin in the center of the stream and proceed toward each bank simultaneously. In this manner, much of the water in the ditch will be pushed to the ditch outside of the stream channel. If upland portions of the trench are backfilled first, the water in the ditch is pushed into the stream channel and will inevitably leak through or overflow the downstream dam.

Once backfilling of the entire stream channel is complete, the contractor will compact the streambed and construct solid plugs on both banks. Water will remain trapped in the ditch outside of the stream channel. This water will be pumped from the ditch at a later time in the manner described for dewatering the construction area (see Section 11).

13.0 Removal of Dams

After the ditch is backfilled, clean gravel fill will be placed on the top one foot of the ditch (where necessary). Plugs will be installed at each stream bank and the stream banks stabilized and the dams will be removed from the crossing. To prevent excessive increases in turbidity during dam removal, the contractor will remove all of the sandbags from the downstream dam. A trackhoe can be utilized to remove the top layers of the sandbags as long as the operator takes great care not to dig into the streambed or to increase turbidity.

After the downstream sandbags are completely removed from the streambed, the contractor will begin removing the sandbags from the upstream dam. The top rows of sandbags should be removed by hand until the water begins to overflow the top of the dam and flows slowly over the construction area. For the first 10 to 30 minutes, turbidity downstream of the crossing area could increase considerably. However, the streambed portion of the construction area will be flushed clean of sediments left over from construction and the water will flow clear over the disturbed stream bed area. After the turbidity level has decreased to acceptable levels or that of upstream levels, the contractor can proceed with removing the remainder of the upstream dam sandbags.