

Date: February 5, 2020

To: Larimer County Planning Department

From: Randy Parks and Derek Nelson - Dewberry Engineers Inc.

Subject: Northern Integrated Supply Project - Conveyance Pipeline Floodplain Report



The Northern Integrated Supply Project has four (4) pipeline reaches that run through Larimer County. The reaches are known as the County Line, Poudre Intake, Glade Release Pipeline, and Northern Tier Pipelines.

Floodplain Crossings

Where the pipelines need to cross wetlands or open waters, or where work would impact wetlands or open waters, the construction limits will be reduced from the typical 120 feet width. At the majority of wetland and open water features, the reduced impact width will be 60 feet wide (30 feet on either side of center) (**Figure 1**). However, where wetlands or open water features are over 500 feet in length, the reduced impact width will be 80 feet wide (40 feet on either side of center) (**Figure 1**). Additional BMPs, such as using equipment mats and implementing erosion control measures, will be used to further minimize impacts (**Figure 2**).

Using data obtained from the Larimer County GIS website it was determined where the anticipated floodplain crossings are expected. Below, this section breaks down the four conveyance reaches and where the alignment crosses the floodplain and whether it is in unincorporated Larimer County. All floodplain crossings that occur in unincorporated Larimer County will be subject to the county's floodplain regulations and permitting. Additionally, for pipeline crossings in unincorporated Larimer County the required floodplain permits for those crossings will be acquired prior to construction in those floodplains.

- Northern Tier Pipeline
 - Adjacent to West State Highway 14 near Glade Reservoir (unincorporated)
 - Northwest of Kluver Reservoir (unincorporated)
 - East of Interstate 25 between County Road 54 and County Road 52 (unincorporated)
- Glade Release Pipeline
 - South of West State Highway 14, approximately 1,300 feet west of the intersection of West State Highway 14 and North County Road 29C (unincorporated)
- Poudre Intake Pipeline
 - From the intake structure off of the Poudre River to Mulberry Street (Fort Collins)
 - South of Mulberry Street between South Lemay Ave and South Timberline Road (unincorporated)
 - East of South Timberline Drive until just west of South Summit View Drive (Fort Collins)
 - East of I-25 and north of the canal between Sherry Drive and I-25 (Fort Collins)

MEMORANDUM

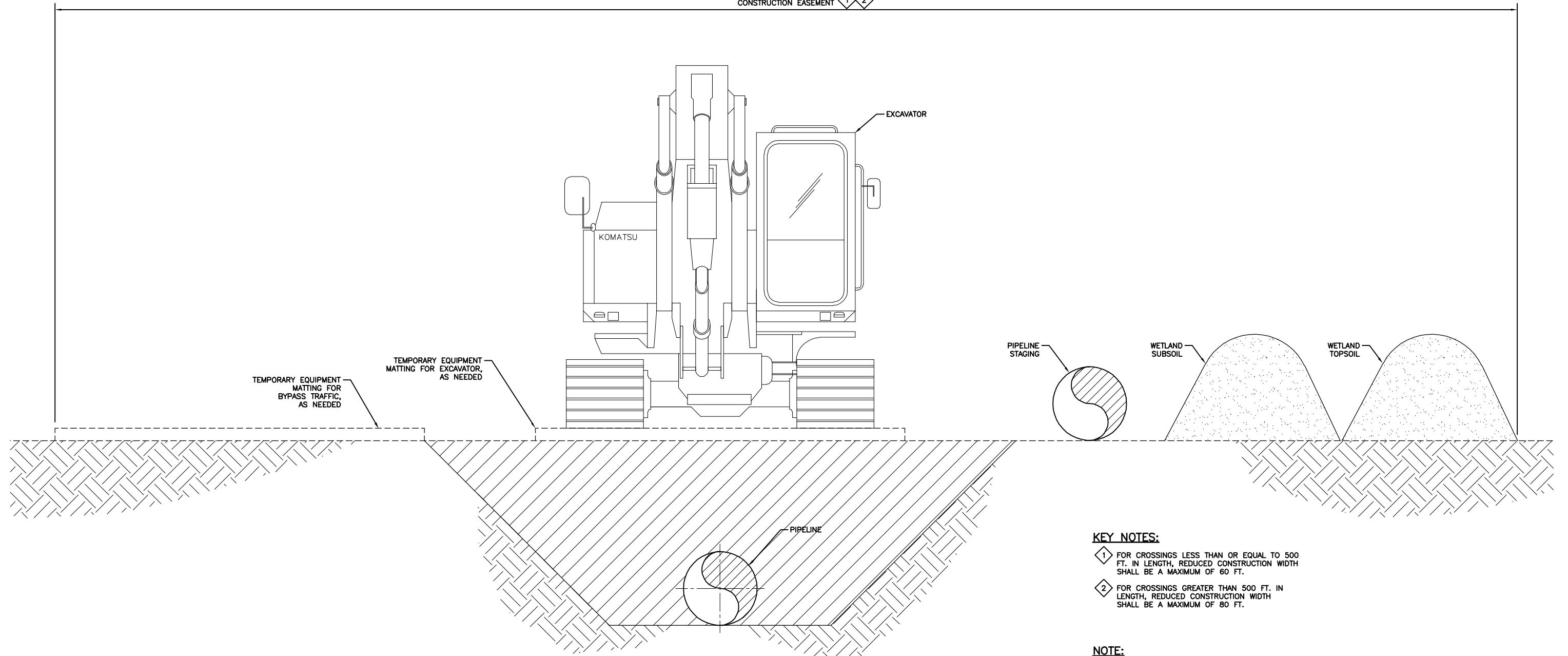
- West of I-25 and south of the canal between I-25 and McLaughlin Lane (Fort Collins)
- County Line Pipeline
 - Along County Road 13 from just north of Larimer County Road 32E/ Weld County Road 68 1/2 to the Poudre River (Windsor)

While floodplains can pose risks to any conveyance system (pipelines, roadways, conduits and even supports for aerial systems) they are frequently unavoidable and must be a major consideration in design. Several approaches to crossing active channels are conceptually depicted in **Figures 3, 4, and 5**. Floodplains are not considered a significant risk to this pipeline due to the following practices:

- Use of double-lap-welded steel pipelines, which increases pipeline strength and provides a double seal at the joint
- Performance of a scour analysis for each major crossing to ensure that pipeline burial depth is adequate
- Siting of critical appurtenances outside of floodplains
- Restoring to existing grades after pipeline construction to avoid any changes to the floodplain to obtain a “no rise” finding

It is important to note that Northern Water’s welded-steel Southern Water Supply Pipeline (SWSP) remained operational throughout and after the September 2013 floods even though it traversed four of the major affected floodplains (Big Thomson, St Vrain, Left Hand Creek, and Boulder Creek). Additionally, of the City of Longmont’s five raw water delivery systems (3 pipelines and 2 canals), the SWSP was their only operational supply following the September 2013 floods.

CONSTRUCTION EASEMENT 1 2



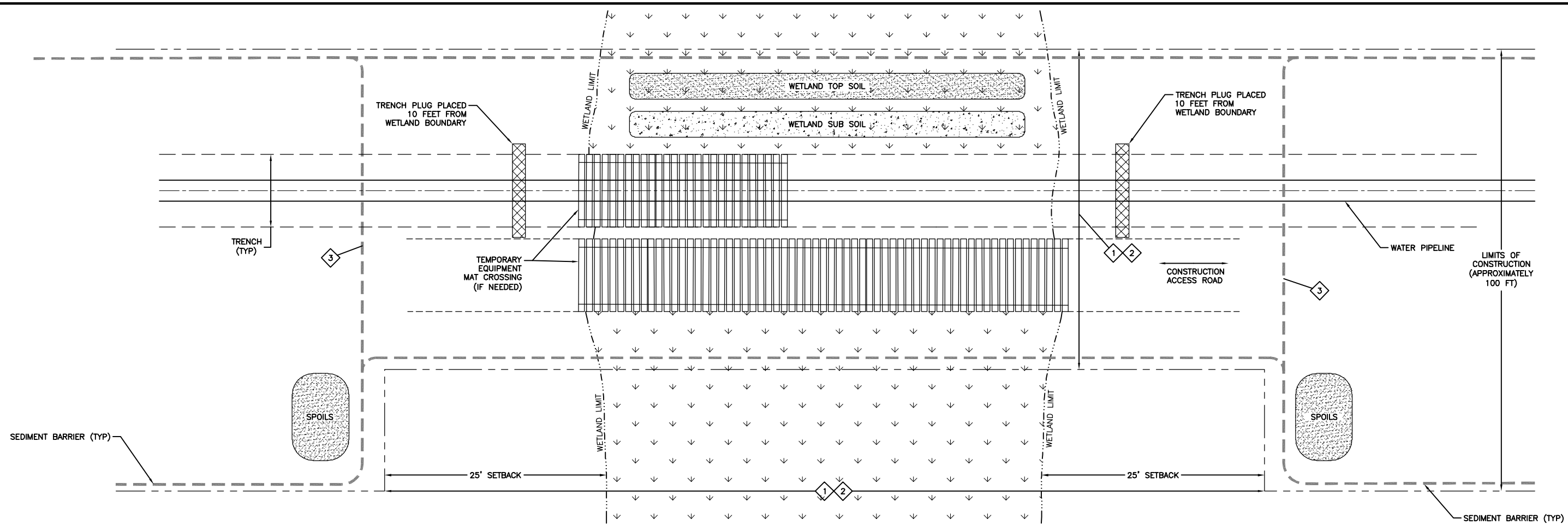
KEY NOTES:

- 1 FOR CROSSINGS LESS THAN OR EQUAL TO 500 FT. IN LENGTH, REDUCED CONSTRUCTION WIDTH SHALL BE A MAXIMUM OF 60 FT.
- 2 FOR CROSSINGS GREATER THAN 500 FT. IN LENGTH, REDUCED CONSTRUCTION WIDTH SHALL BE A MAXIMUM OF 80 FT.

NOTE:

- 1. WETLAND TOPSOIL TO BE STORED IN CLOSE PROXIMITY TO TRENCH.

RESTRICTED CONSTRUCTION CORRIDOR
NOT TO SCALE

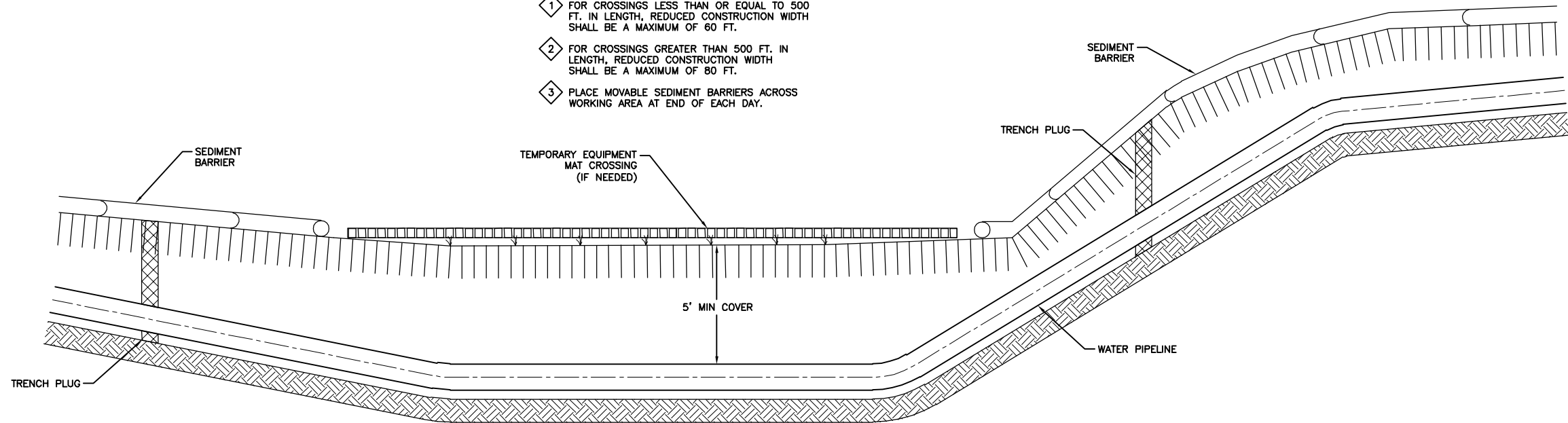


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- 2 FOR CROSSINGS GREATER THAN 500 FT. IN LENGTH, REDUCED CONSTRUCTION WIDTH SHALL BE A MAXIMUM OF 80 FT.
- 3 PLACE MOVABLE SEDIMENT BARRIERS ACROSS WORKING AREA AT END OF EACH DAY.

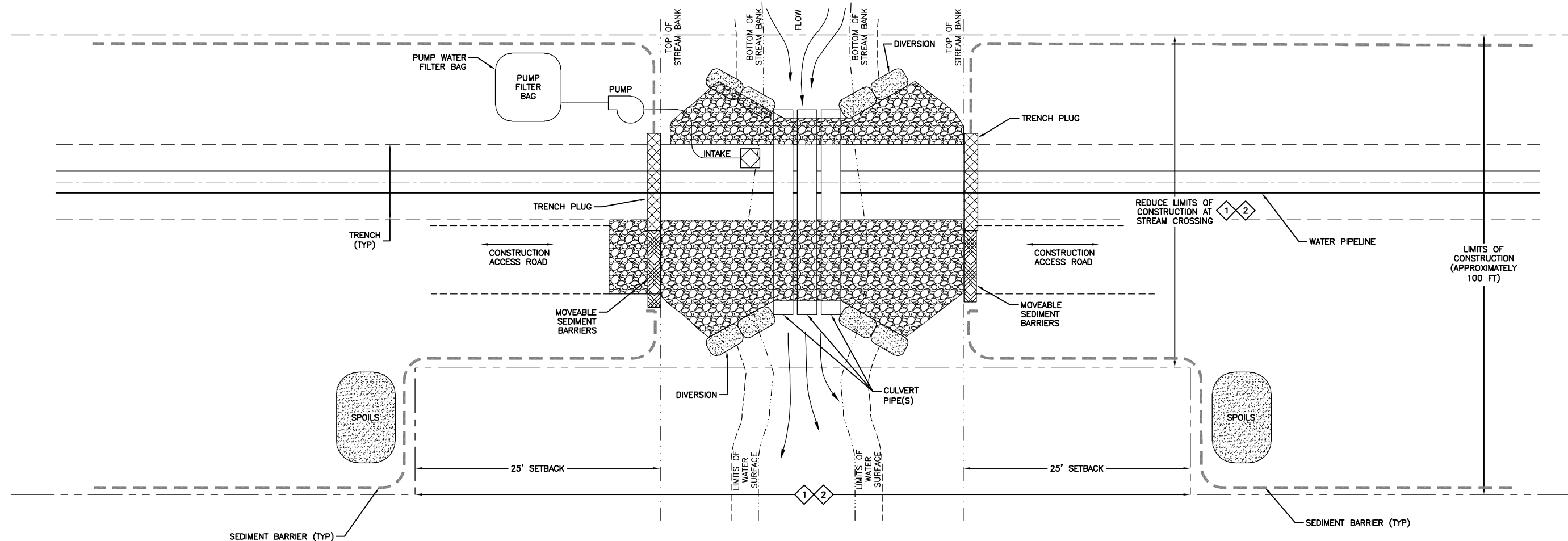
EROSION & SEDIMENT CONTROL & SITE RESTORATION PLAN NOTES

1. MARK THE LIMITS OF THE WETLAND WITH HIGH VISIBILITY FLAGGING. LIMITS OF CONSTRUCTION FENCING AND ALL INITIAL EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO GROUND DISTURBANCE AT ALL WETLAND CROSSINGS.
2. INSTALL DELINEATION FENCE BETWEEN LIMITS OF DISTURBANCE (LOD) AND ADJACENT WETLANDS.
3. STABILIZE CONSTRUCTION ACCESS ROAD APPROACH TO WETLAND AREAS AS REQUIRED TO REDUCE RUTTING.
4. HAZARDOUS OR POLLUTANT MATERIAL STORAGE AREAS SHALL BE LOCATED AT LEAST 100 FEET FROM WETLAND BOUNDARIES.
5. PRIOR TO COMMENCING WORK IN WETLAND AREAS, TOPOGRAPHIC ELEVATIONS SHALL BE SURVEYED SO THAT ORIGINAL CONTOURS CAN BE ACHIEVED DURING RESTORATION. UNNATURAL FEATURES AND UNSTABLE GRADES SHALL BE NOTED BY THE CONTRACTOR.
6. IF STREAMS ARE PRESENT, IMPLEMENT APPLICABLE CROSSING METHODS.
7. MINIMIZE CLEARING TO ONLY WHAT IS NECESSARY TO SAFELY CONSTRUCT THE PIPELINE. LIMIT GROUND DISTURBANCE TO THE AREAS DIRECTLY OVER THE TRENCH LINE, EXCEPT WHERE TOPOGRAPHY REQUIRES ADDITIONAL GRADING FOR SAFETY REASONS. WHEN GRADING IS REQUIRED, TOPSOIL WITH THE VEGETATIVE ROOT MASS WILL BE STRIPPED, SEGREGATED AND RETURNED AS AN EVEN LAYER TO ALL GRADED AREAS.
8. INSTALL TEMPORARY EQUIPMENT MATS ALONG CONSTRUCTION ACCESS ROAD (IF NEEDED) TO REDUCE RUTTING.
9. STAGE AND PREPARE PIPE FOR INSTALLATION IN UPLAND AREAS UNLESS WETLAND IS DRY ENOUGH TO ADEQUATELY SUPPORT SKIDS AND PIPE.
10. TRENCHING THROUGH WETLANDS MAY PROCEED WHEN THE PIPE SECTION IS FABRICATED AND ON-SITE READY TO INSTALL.
11. SEGREGATE WETLAND TOPSOIL FROM SUBSOILS WITHIN THE AREA DISTURBED BY TRENCHING WITHIN WETLAND AREAS.
12. ADDITIONAL TRENCH PLUGS SHALL BE INSTALLED FOR LONG OPEN-CUT WETLAND CROSSINGS.
13. ANY EXCESS SPOIL MATERIALS MUST BE REMOVED AND NOT SPREAD WITHIN THE WETLAND AREA.
14. RESTORE WETLANDS TO THE ORIGINAL CONTOURS AND SURFACE FLOW.
15. NO SOIL AMENDMENTS SUCH AS AGRICULTURAL LIME OR FERTILIZER WILL BE USED WITHIN WETLAND AREAS.
16. CONTRACTOR SHALL PERMANENTLY STABILIZE UPLAND AREAS NEAR WETLANDS AS SOON AS POSSIBLE AFTER BACKFILLING.



TYPICAL PIPELINE INSTALLATION WETLAND CROSSING DETAIL

NOT TO SCALE

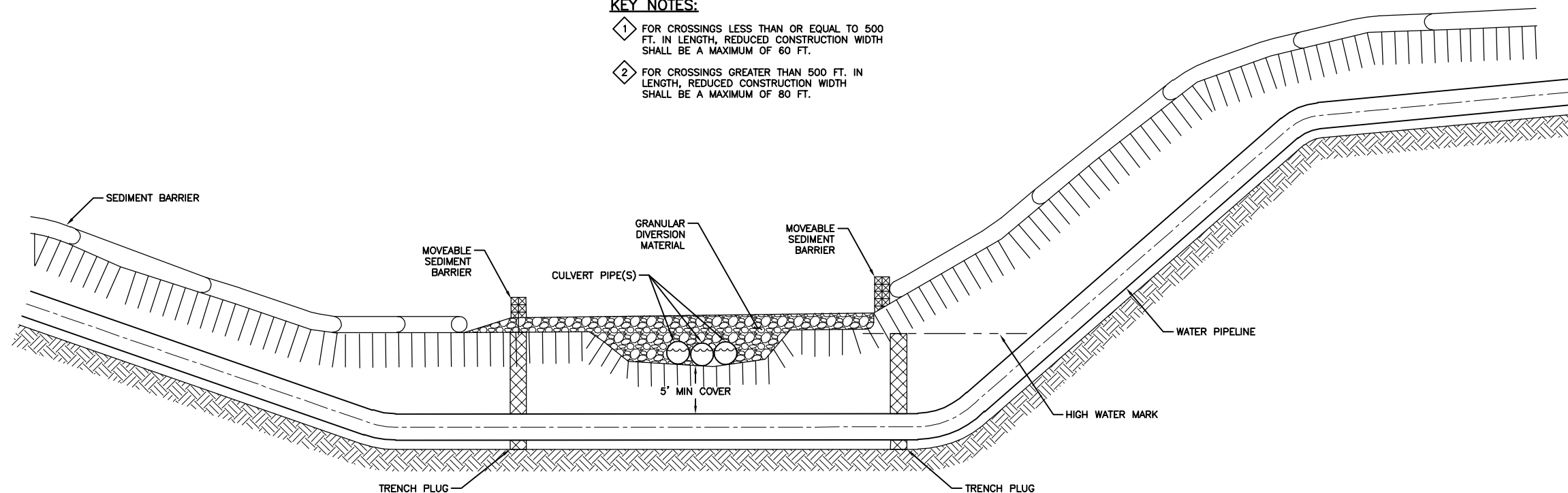


EROSION & SEDIMENT CONTROL & SITE RESTORATION PLAN NOTES

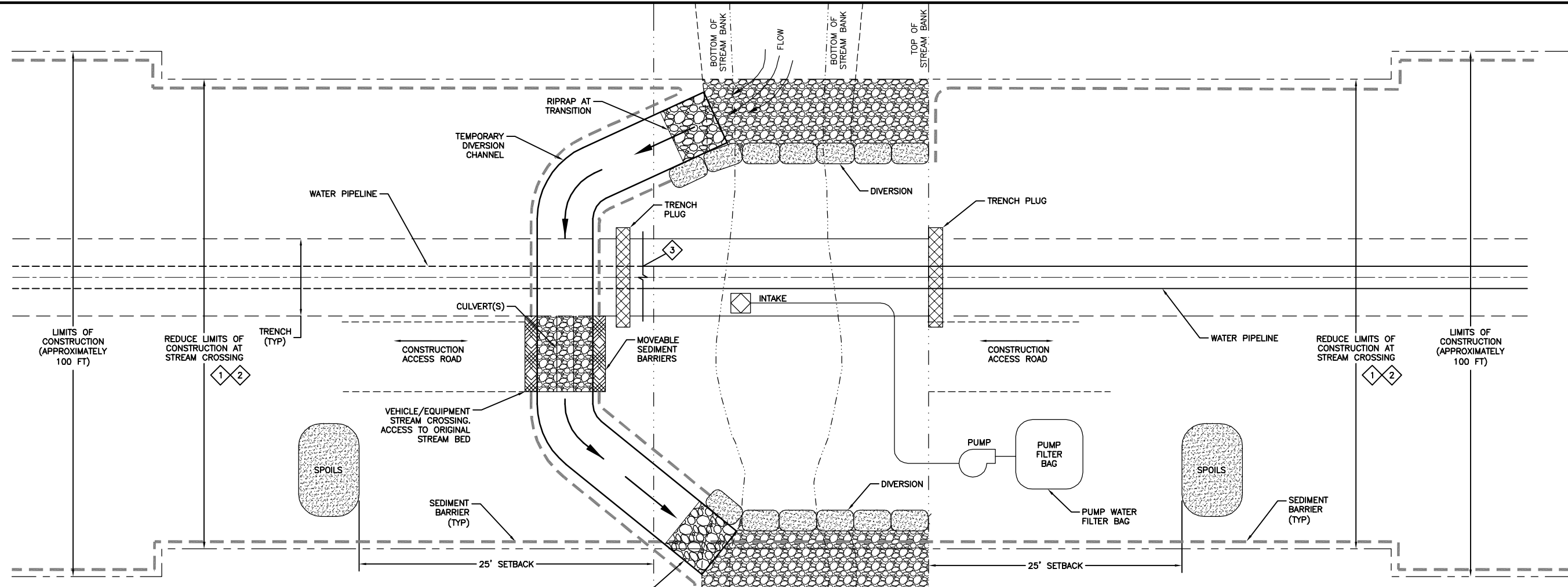
1. THE CULVERT(S) SHOULD BE OF SUFFICIENT SIZE TO CONVEY NORMAL STREAM FLOW OVER THE OPEN TRENCH.
2. CULVERT PIPE MUST BE ONE CONTINUOUS PIPE LONG ENOUGH TO ACCOUNT FOR THE POSSIBILITY OF THE TRENCH WIDENING UNEXPECTEDLY DURING THE EXCAVATION (DUE TO SLOUGHING).
3. CULVERT(S) SHALL BE INSTALLED PRIOR TO TRENCH EXCAVATION.
4. AN EFFECTIVE SEAL MUST BE CREATED AROUND THE CULVERT(S). ONCE IN PLACE, THE CULVERTS ARE NOT REMOVED UNTIL THE PIPELINE HAS BEEN INSTALLED AND THE STREAM BED AND BANKS HAVE BEEN RESTORED.
5. MARK THE TOP OF STREAM BANK WITH HIGH VISIBILITY FLAGGING.
6. HAZARDOUS OR POLLUTANT MATERIAL STORAGE AND REFUELING AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM TOP OF STREAM BANK.
7. CONSTRUCT DAMS WITH SAND BAGS OR GRANULAR MATERIAL EXTENDED TO THE STREAM BOTTOM. MAINTAIN AMBIENT DOWNSTREAM FLOW RATES.
8. NATURAL STREAM BED MATERIAL TO BE STRIPPED AND SEGREGATED FROM SUBSURFACE MATERIAL FOR FINAL STREAMBED RESTORATION. EXCAVATION PORTION OF NATIVE STREAM BEDS COMPRISED OF ROCK, COBBLE, OR GRAVEL ARE TO BE STRIPPED AND SEGREGATED AND USED DURING STREAM RESTORATION.
9. REMOVE ALL CONSTRUCTION MATERIAL AND STRUCTURES FROM THE WATER BODY AFTER CONSTRUCTION.
10. RESTORE STREAM CHANNELS AND BOTTOMS TO THEIR PRECONSTRUCTION CONTOURS, AND STABILIZE THE STREAM CHANNEL PRIOR TO REESTABLISHING FLOW.
11. ALL EXCESS EXCAVATED MATERIAL SHALL BE REMOVED FROM THE STREAM FLOODWAY PRIOR TO PERMANENTLY STABILIZING STREAM BANKS.
12. KEEP ALL CHEMICALS AND FERTILIZERS OUT OF STREAM.
13. TEMPORARY CROSSINGS SHALL STAY IN PLACE FOR THE MINIMUM AMOUNT OF TIME REQUIRED TO INSTALL PIPE THROUGH THE STREAM CROSSING.
14. PRIOR TO COMMENCING WORK FOR STREAM CROSSING AREAS, TOPOGRAPHIC ELEVATIONS AT THE CROSSING WITHIN THE CONSTRUCTION LIMITS (INCLUDING THE BOTTOM OF THE STREAM CHANNEL) SHALL BE SURVEYED SO THAT ORIGINAL CONTOURS CAN BE ACHIEVED DURING RESTORATION.

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- 2 FOR CROSSINGS GREATER THAN 500 FT. IN LENGTH, REDUCED CONSTRUCTION WIDTH SHALL BE A MAXIMUM OF 80 FT.



**TYPICAL PIPELINE INSTALLATION STREAM CROSSING
CULVERT(S) BYPASS**
NOT TO SCALE

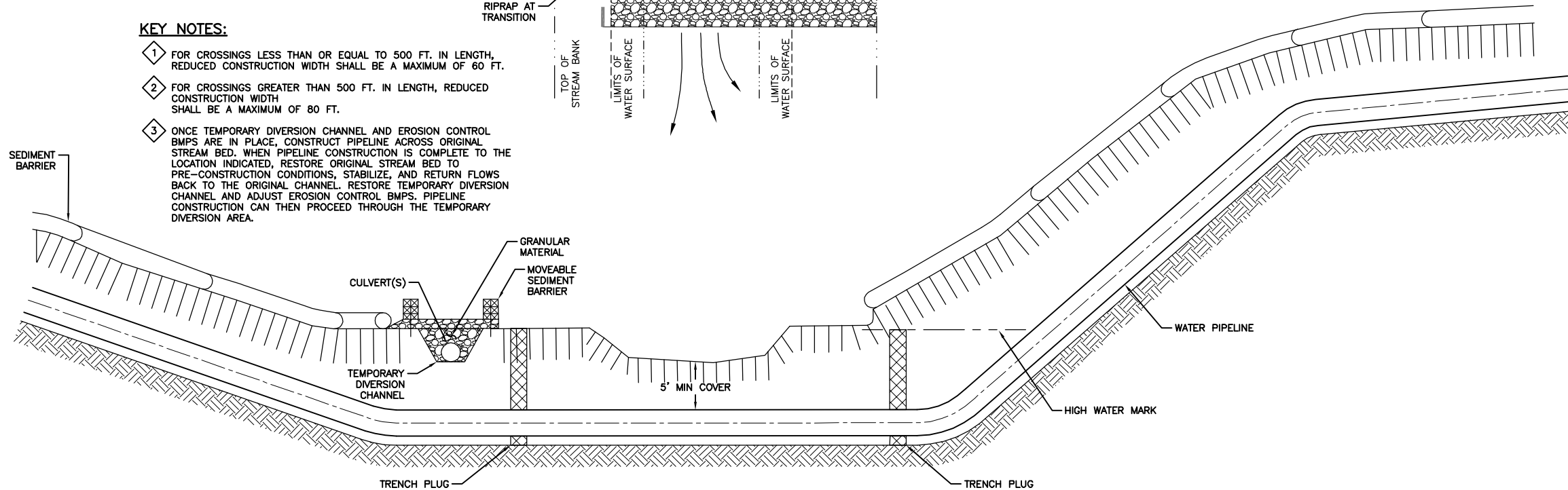


EROSION & SEDIMENT CONTROL & SITE RESTORATION PLAN NOTES

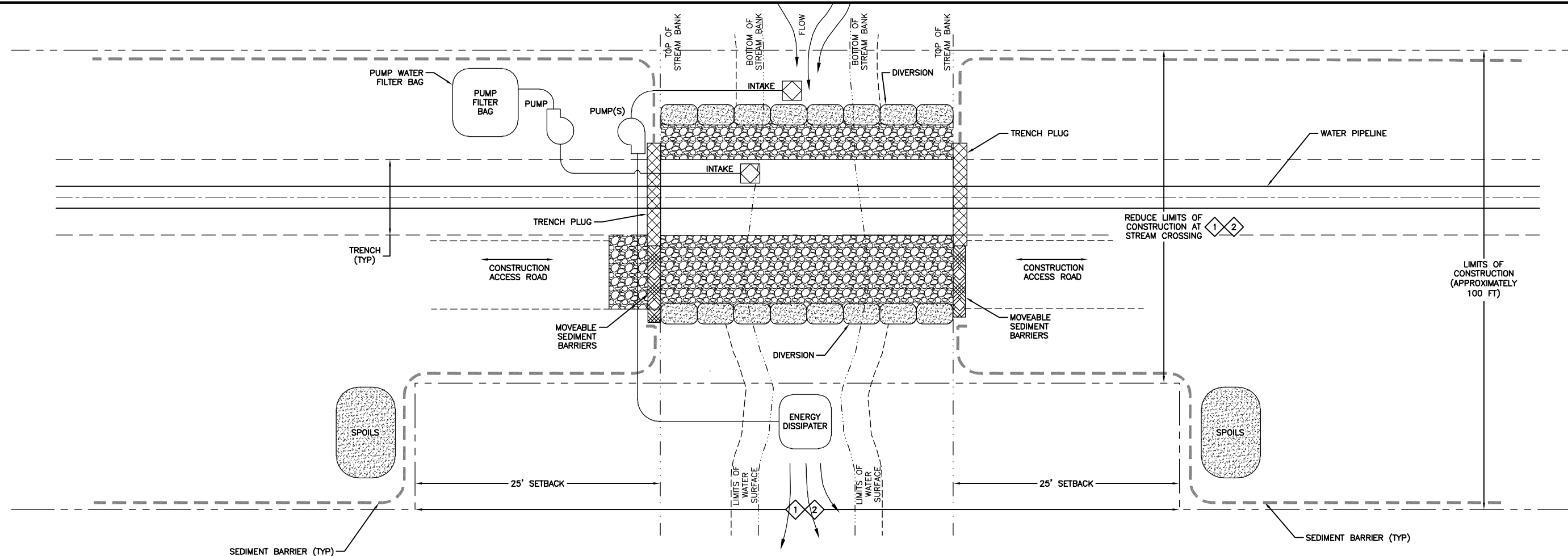
1. THE TEMPORARY DIVERSION CHANNEL SHOULD BE OF SUFFICIENT SIZE TO CONVEY NORMAL STREAM FLOW AROUND THE CONSTRUCTION AREA. TEMPORARY DIVERSION CHANNEL MAY REQUIRE LINING WITH PLASTIC OR GRANULAR MATERIAL, DEPENDING ON NATIVE SOIL CHARACTERISTICS.
2. TEMPORARY DIVERSION CHANNEL SHALL BE INSTALLED PRIOR TO TRENCH EXCAVATION.
3. AN EFFECTIVE SEAL MUST BE CREATED AT THE DIVERSION. ONCE IN PLACE, THE TEMPORARY DIVERSION CHANNEL IS NOT TO BE REMOVED UNTIL THE PIPELINE HAS BEEN INSTALLED AND THE ORIGINAL STREAM BED AND BANKS HAVE BEEN RESTORED.
4. MARK THE TOP OF STREAM BANK WITH HIGH VISIBILITY FLAGGING.
5. HAZARDOUS OR POLLUTANT MATERIAL STORAGE AND REFUELING AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM TOP OF STREAM BANK.
6. CONSTRUCT DAMS WITH SAND BAGS OR GRANULAR MATERIAL EXTENDED TO THE STREAM BOTTOM. MAINTAIN AMBIENT DOWNSTREAM FLOW RATES.
7. NATURAL STREAM BED MATERIAL TO BE STRIPPED AND SEGREGATED FROM SUBSURFACE MATERIAL FOR FINAL STREAMBED RESTORATION. EXCAVATION PORTION OF NATIVE STREAM BEDS COMPRISED OF ROCK, COBBLE, OR GRAVEL ARE TO BE STRIPPED AND SEGREGATED AND USED DURING STREAM RESTORATION.
8. REMOVE ALL CONSTRUCTION MATERIAL AND STRUCTURES FROM THE WATER BODY AFTER CONSTRUCTION.
9. RESTORE STREAM CHANNELS AND BOTTOMS TO THEIR PRECONSTRUCTION CONTOURS, AND STABILIZE THE STREAM CHANNEL PRIOR TO REESTABLISHING FLOW.
10. ALL EXCESS EXCAVATED MATERIAL SHALL BE REMOVED FROM THE STREAM FLOODWAY PRIOR TO PERMANENTLY STABILIZING STREAM BANKS.
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- 3 ONCE TEMPORARY DIVERSION CHANNEL AND EROSION CONTROL BMPs ARE IN PLACE, CONSTRUCT PIPELINE ACROSS ORIGINAL STREAM BED. WHEN PIPELINE CONSTRUCTION IS COMPLETE TO THE LOCATION INDICATED, RESTORE ORIGINAL STREAM BED TO PRE-CONSTRUCTION CONDITIONS, STABILIZE, AND RETURN FLOWS BACK TO THE ORIGINAL CHANNEL. RESTORE TEMPORARY DIVERSION CHANNEL AND ADJUST EROSION CONTROL BMPs. PIPELINE CONSTRUCTION CAN THEN PROCEED THROUGH THE TEMPORARY DIVERSION AREA.



**TYPICAL PIPELINE INSTALLATION STREAM CROSSING
TEMPORARY DIVERSION CHANNEL**
NOT TO SCALE

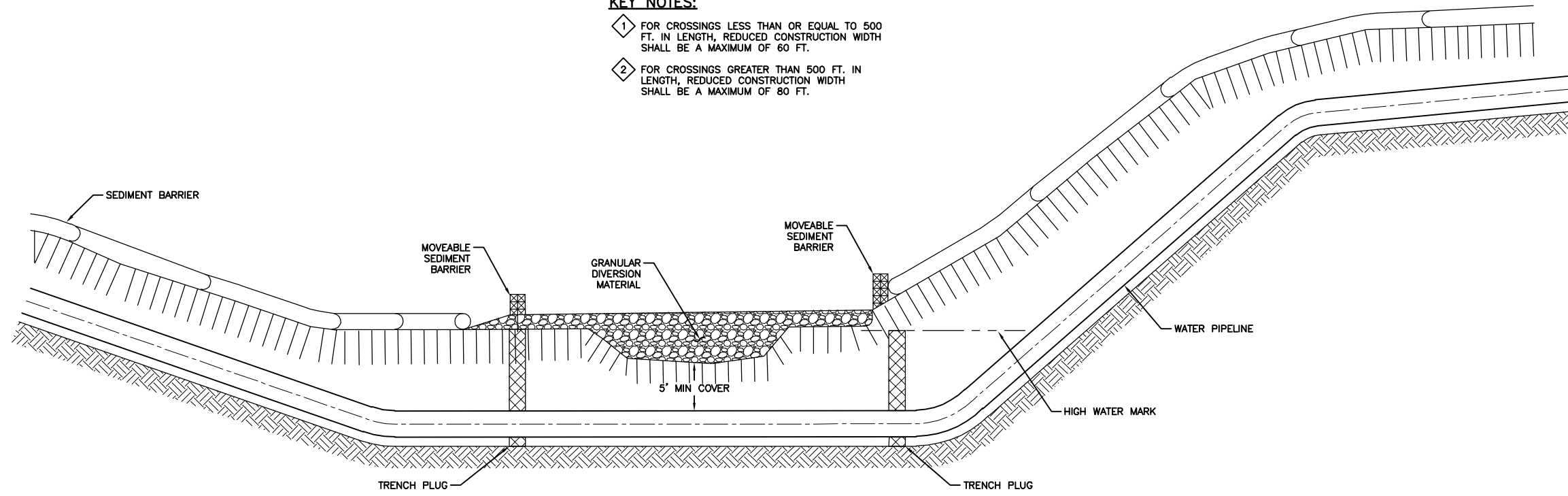


EROSION & SEDIMENT CONTROL & SITE RESTORATION PLAN NOTES

1. THE PUMPED DIVERSION SHOULD BE OF SUFFICIENT SIZE AND CAPACITY TO CONVEY NORMAL STREAM FLOW OVER THE OPEN TRENCH.
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