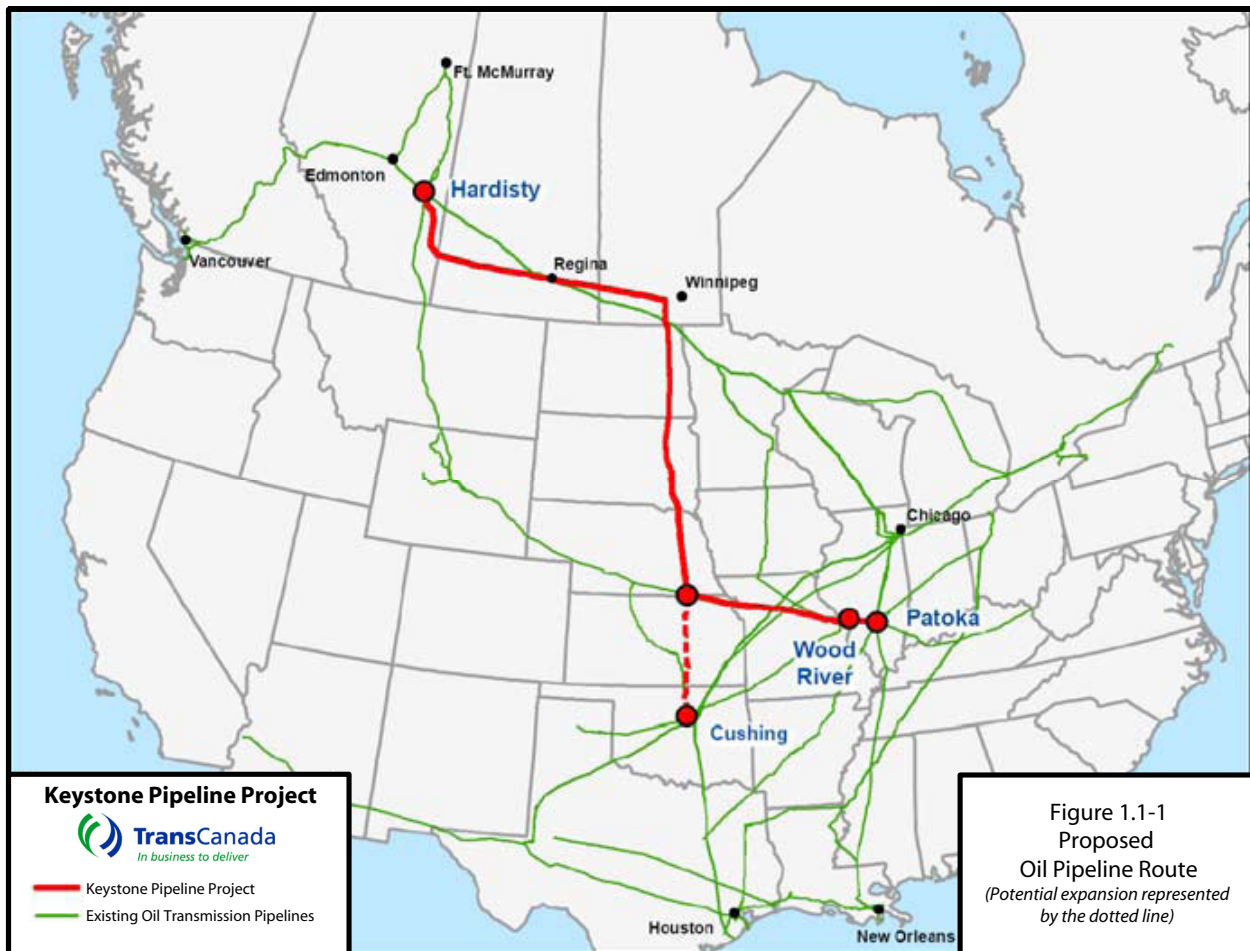
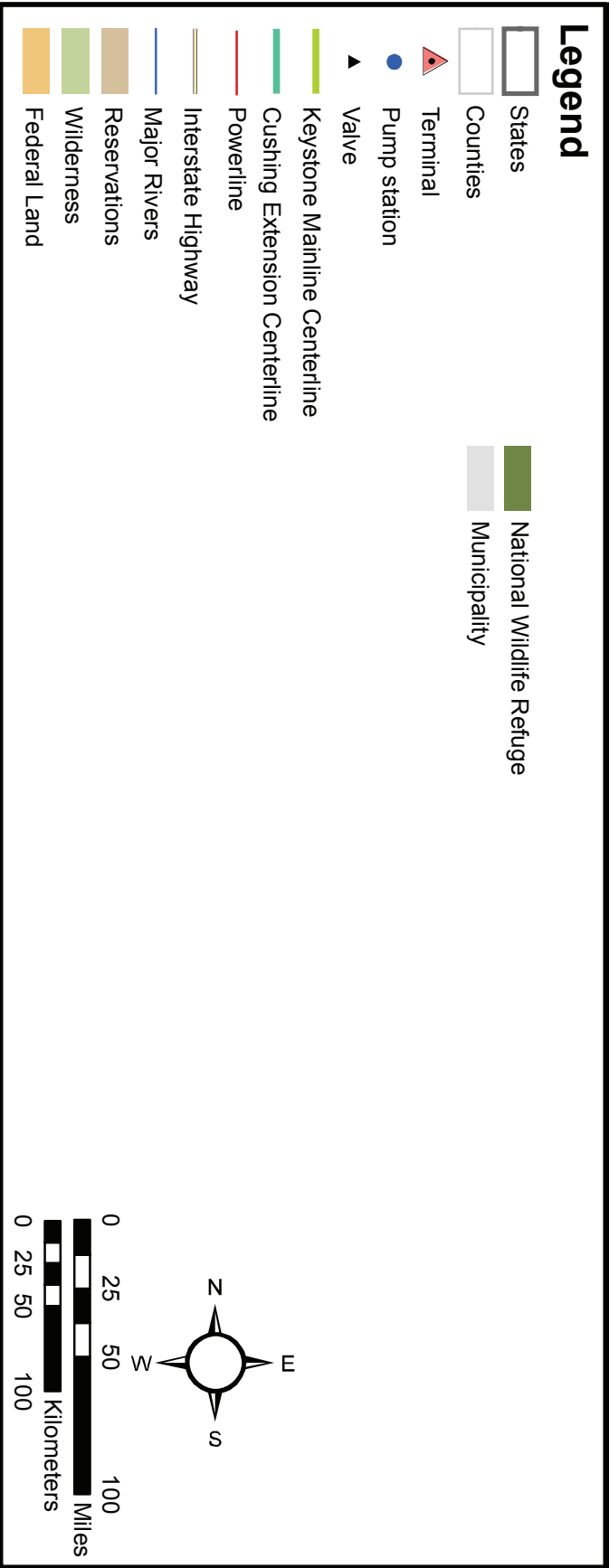




Source: ENSR 2006a

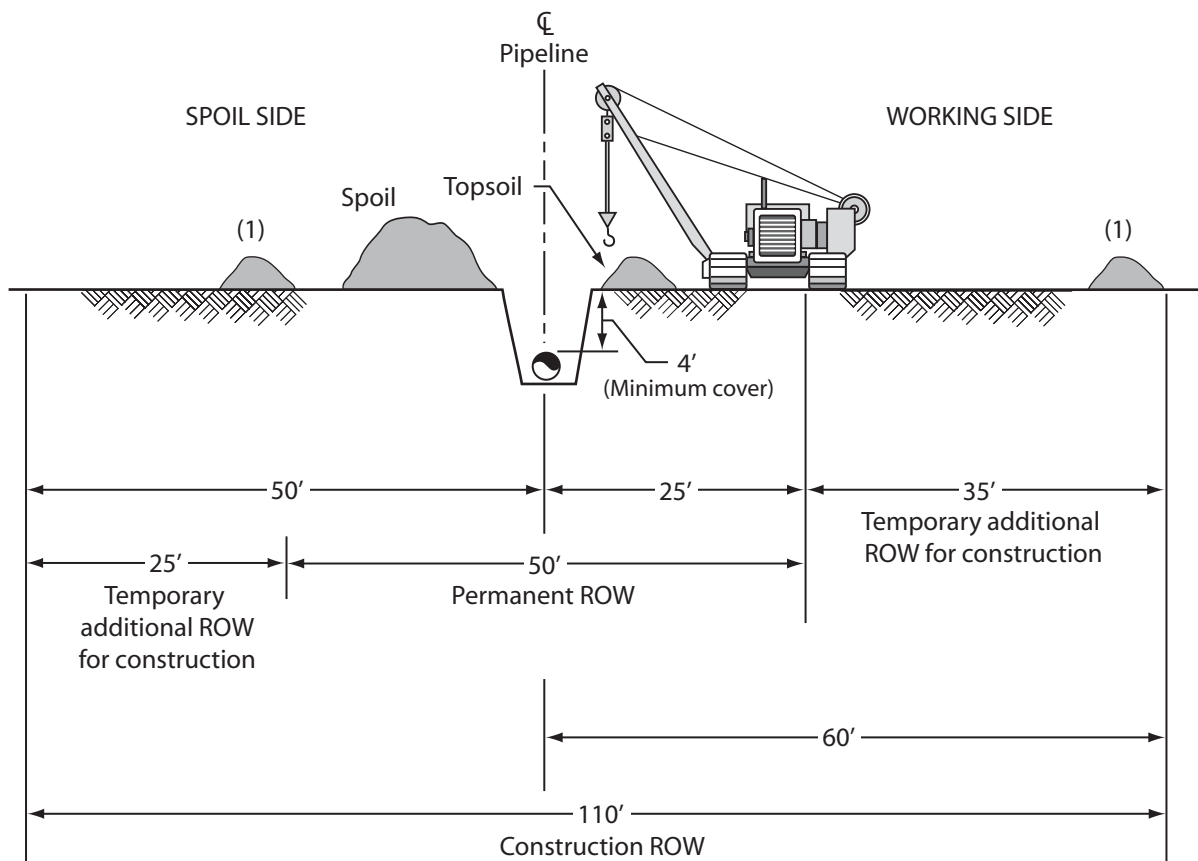


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Figure 2.1-1  
Project Overview

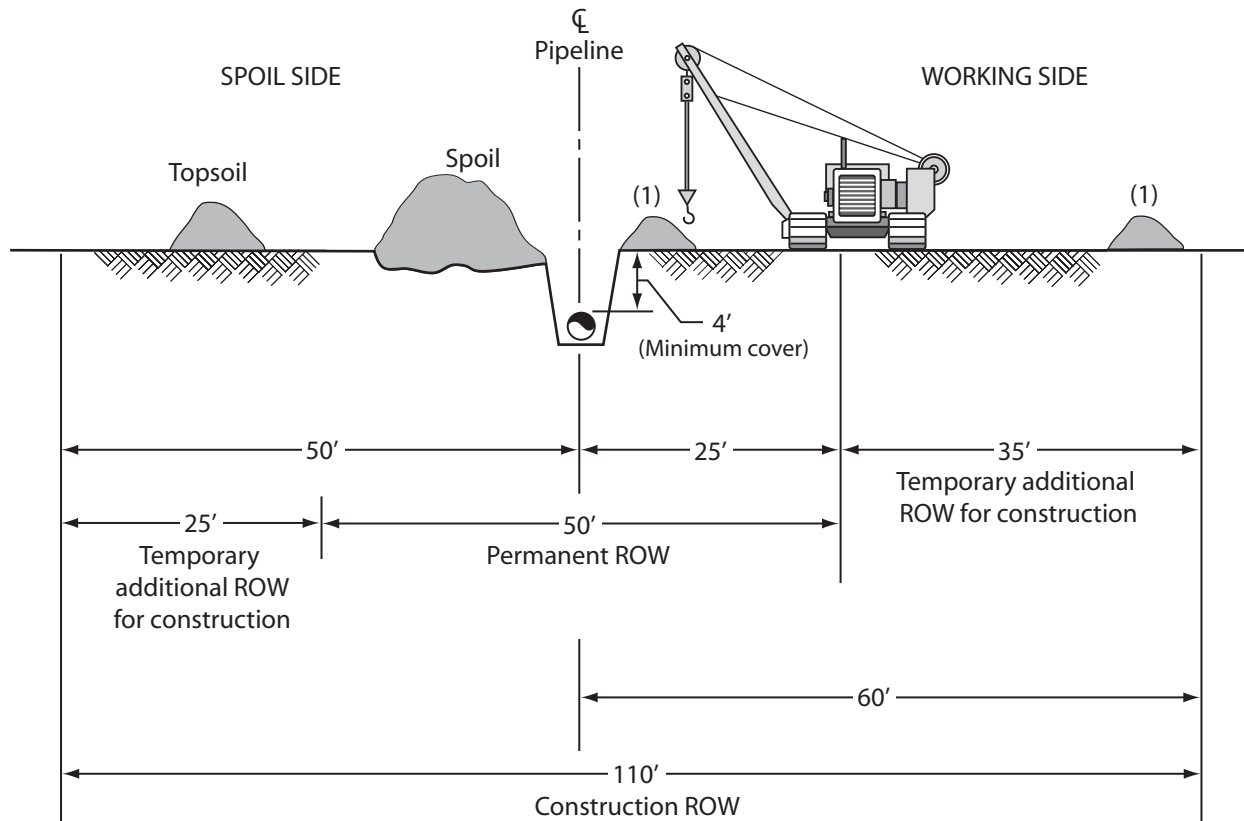




(1) Alternate topsoil placement locations

# KEYSTONE PIPELINE PROJECT

Figure 2.1-2  
Typical 110-Foot-Wide Construction  
Right-of-Way  
(30- or 36-inch Pipeline)  
with Topsoil Removal Only  
over Trench Line

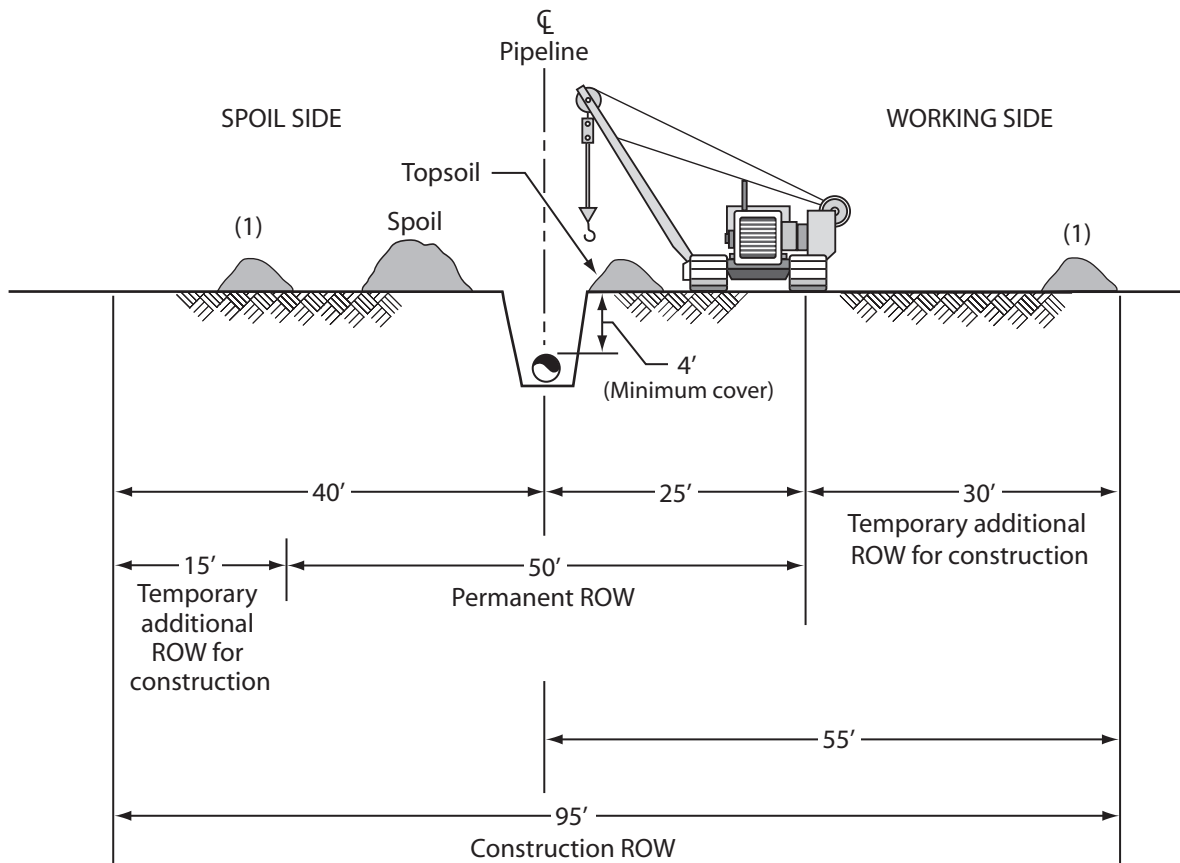


(1) Alternate topsoil placement locations

# KEYSTONE PIPELINE PROJECT

Figure 2.1-3  
Typical 110-Foot-Wide Construction  
Right-of-Way  
(30- or 36-inch Pipeline)  
with Topsoil Removal over  
Trench Line and Spoil Side

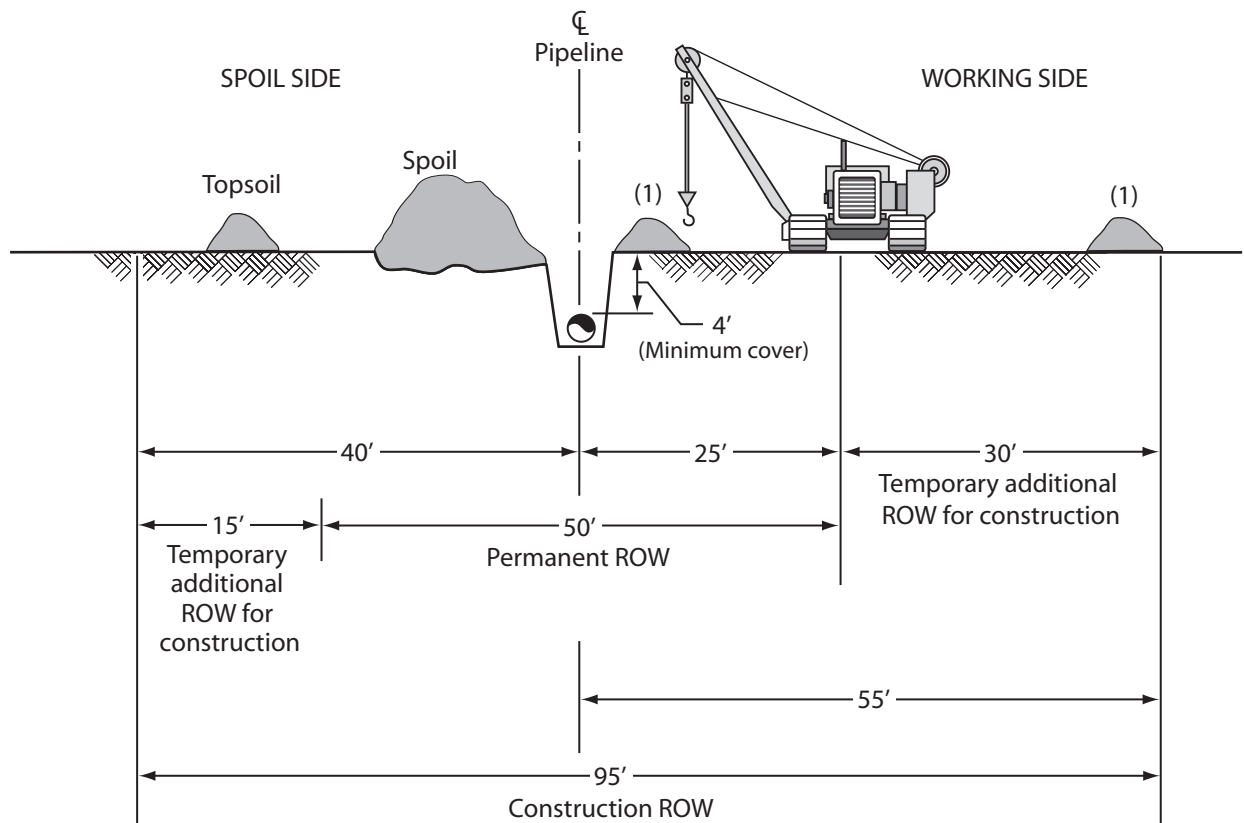




(1) Alternate topsoil placement locations

# KEYSTONE PIPELINE PROJECT

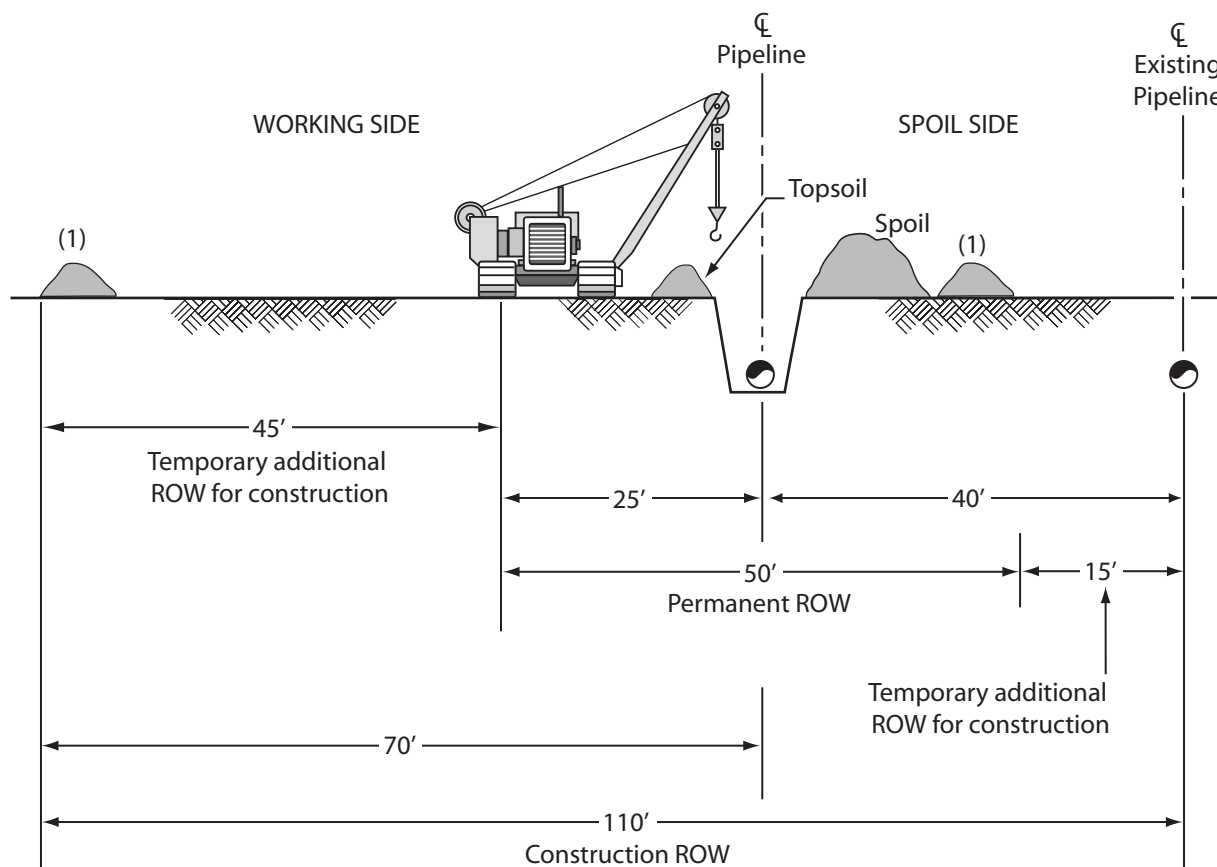
Figure 2.1-4  
Typical 95-Foot-Wide  
Construction Right-of-Way  
(30- or 36-inch Pipeline)  
with Topsoil Removal Only  
over Trench Line



(1) Alternate topsoil placement locations

# KEYSTONE PIPELINE PROJECT

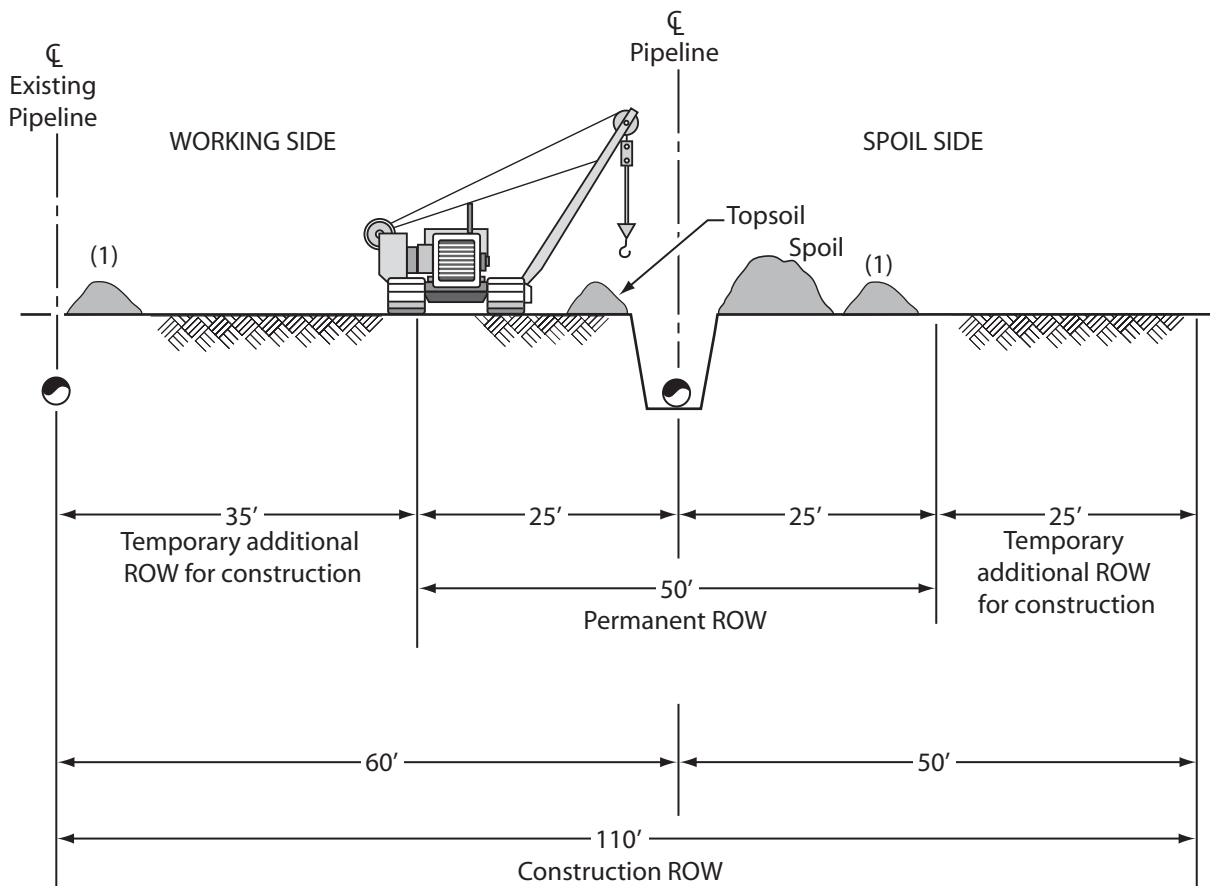
Figure 2.1-5  
Typical 95-Foot-Wide  
Construction Right-of-Way  
(30- or 36-inch Pipeline)  
with Topsoil Removal  
over Trench Line and Spoil Side



(1) Alternate topsoil placement locations

#### KEYSTONE PIPELINE PROJECT

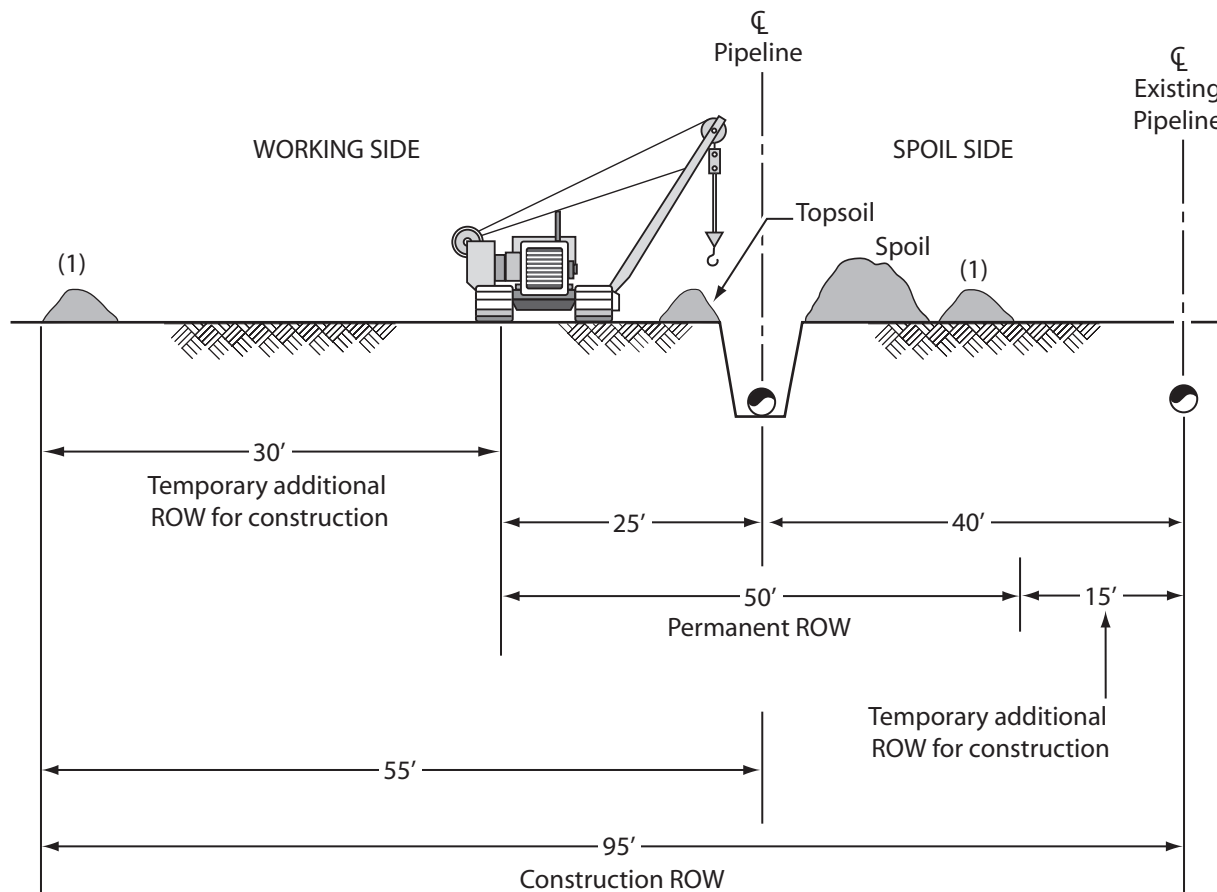
Figure 2.1-6  
Typical 110-Foot-Wide Construction  
Right-of-Way  
(30- or 36-inch Pipeline)  
- Spoil Side Adjacent and  
Parallel to Existing Pipeline



(1) Alternate topsoil placement locations

#### KEYSTONE PIPELINE PROJECT

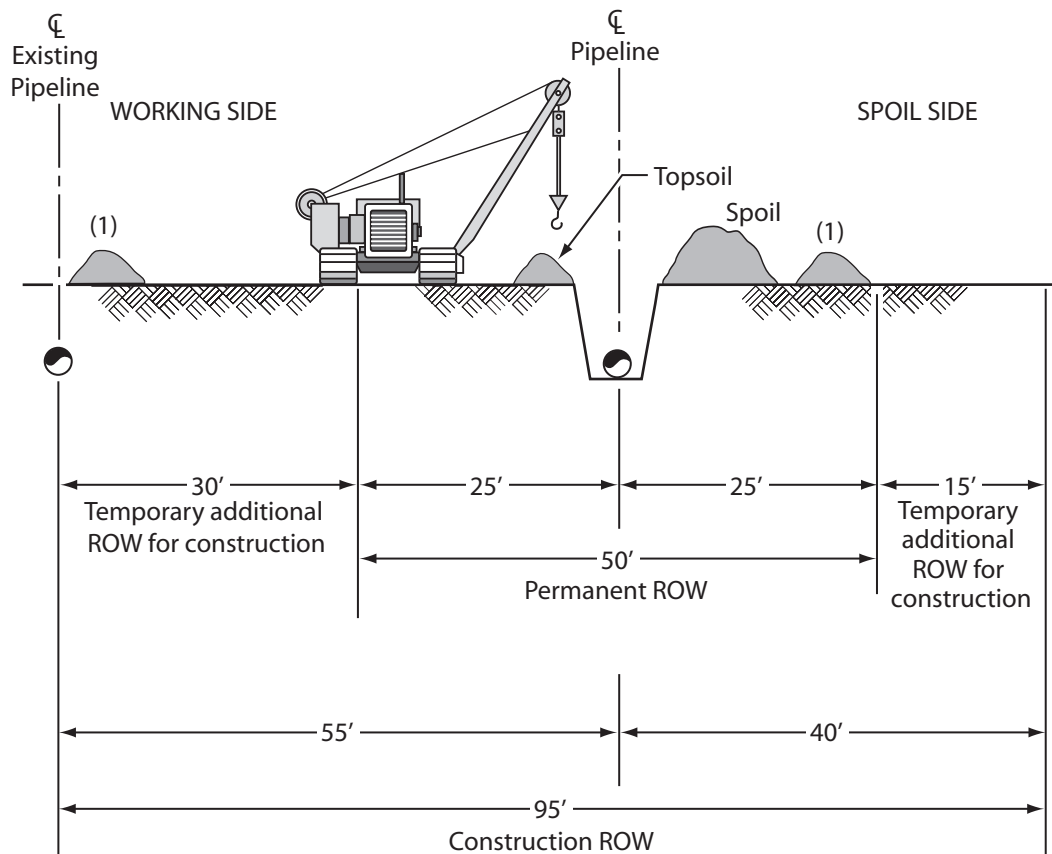
Figure 2.1-7  
Typical 110-Foot-Wide Construction  
Right-of-Way  
(30- or 36-inch Pipeline)  
- Working Side Adjacent and  
Parallel to Existing Pipeline



(1) Alternate topsoil placement locations

#### KEYSTONE PIPELINE PROJECT

Figure 2.1-8  
Typical 95-Foot-Wide  
Construction Right-of-Way  
(30- or 36-inch Pipeline)  
- Spoil Side Adjacent and  
Parallel to Existing Pipeline

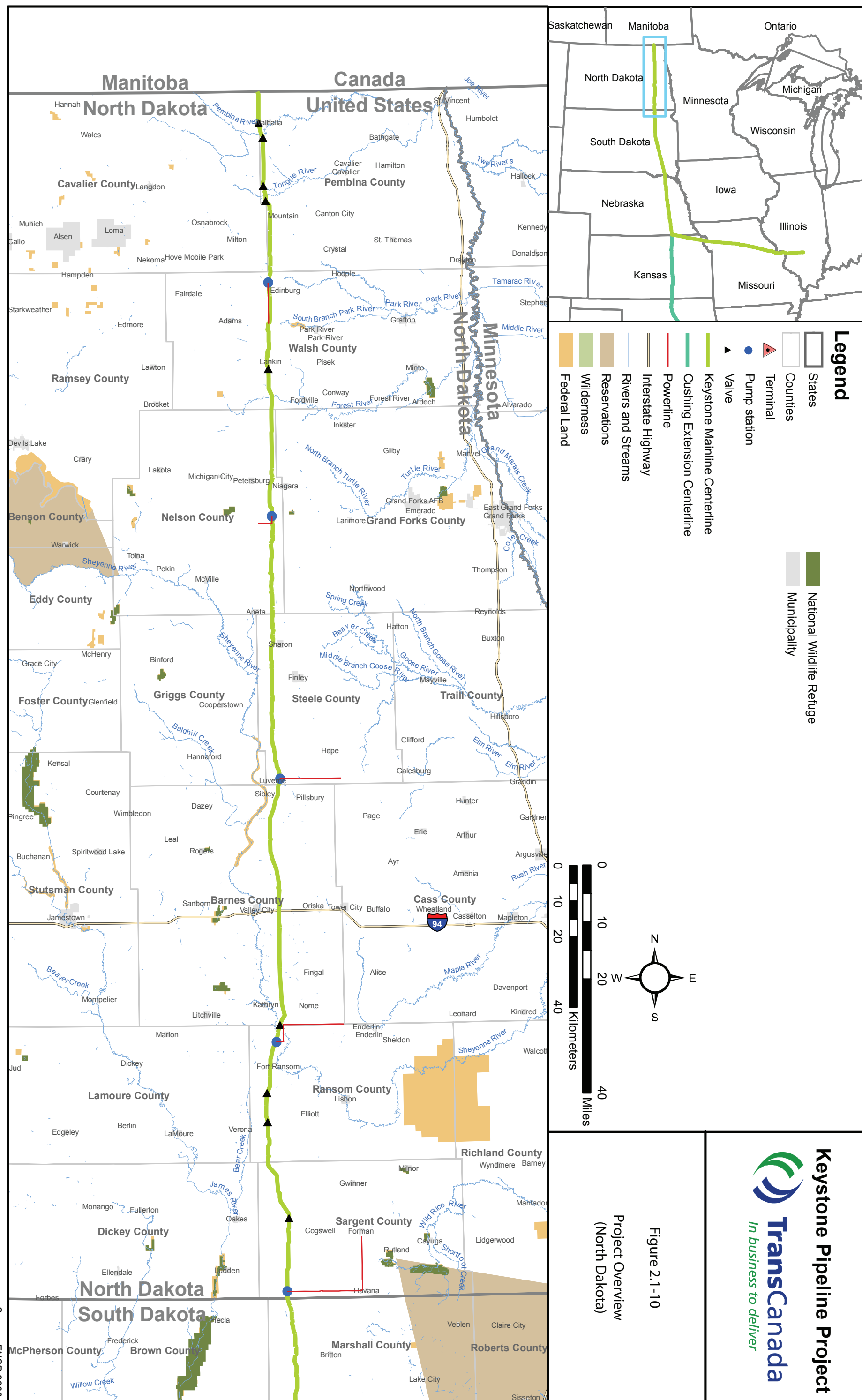


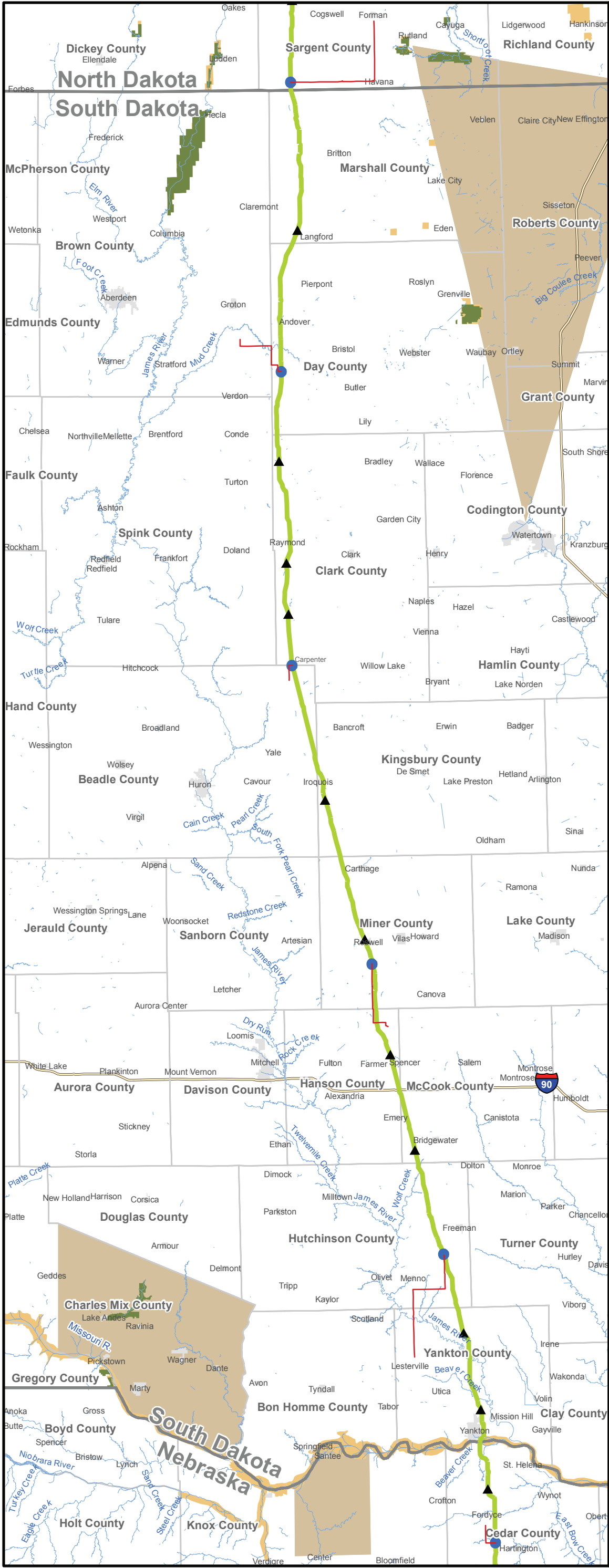
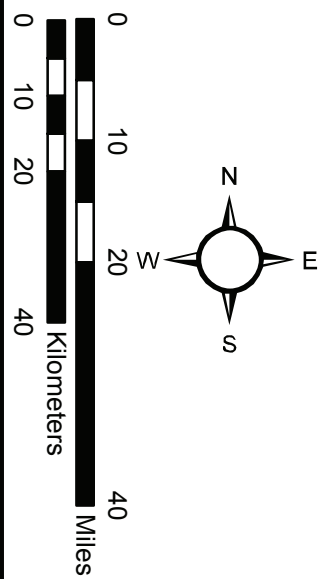
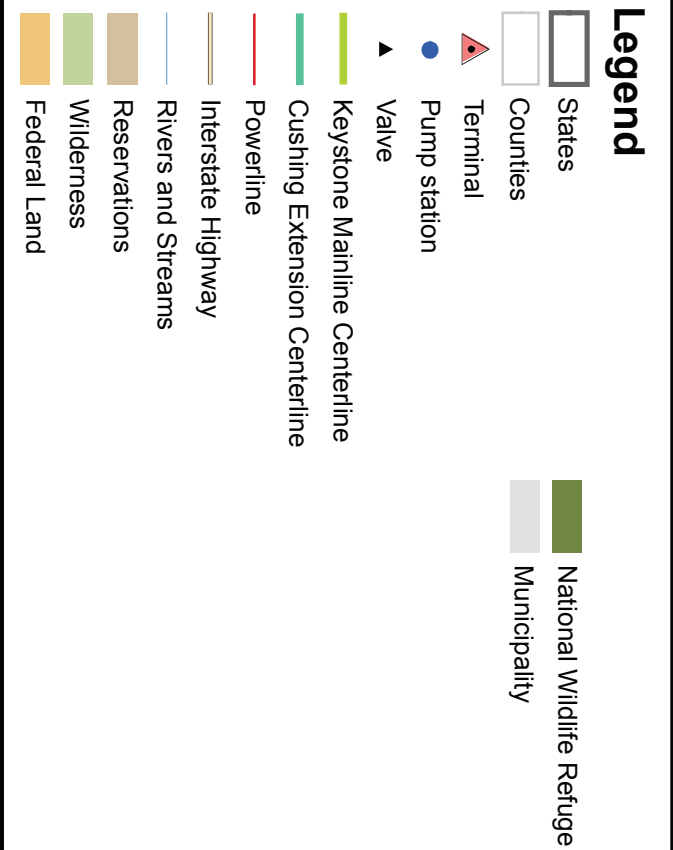
(1) Alternate topsoil placement locations

# KEYSTONE PIPELINE PROJECT

Figure 2.1-9  
Typical 95-Foot-Wide  
Construction Right-of-Way  
(30- or 36-inch Pipeline)  
- Working Side Adjacent and  
Parallel to Existing Pipeline







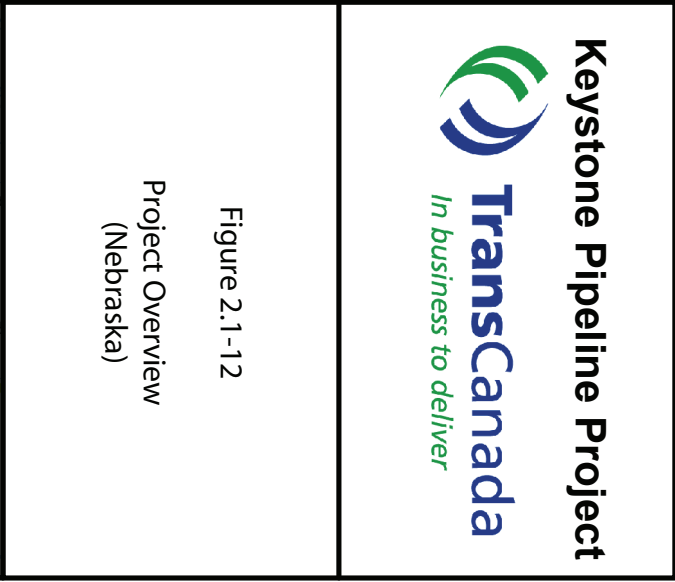
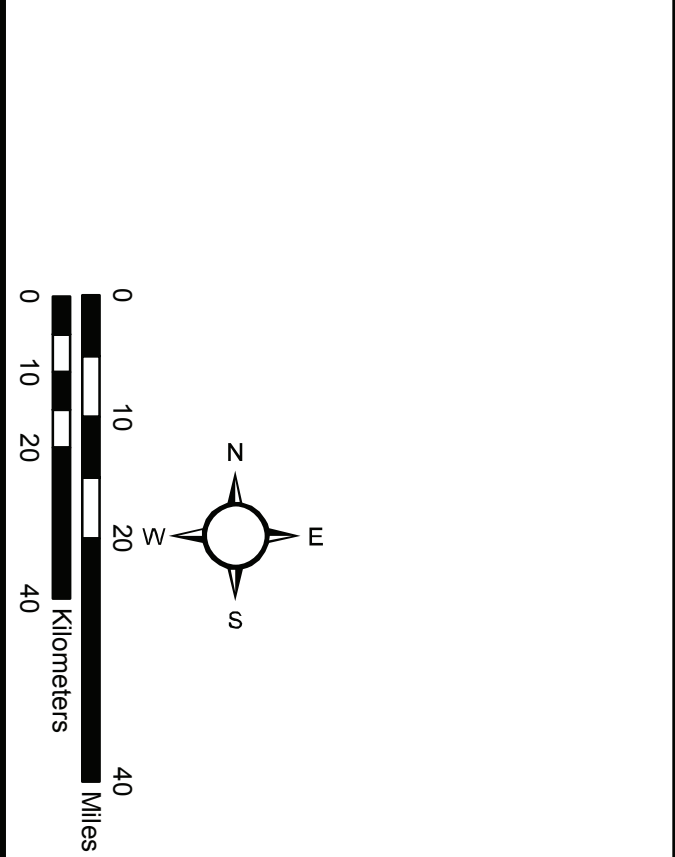
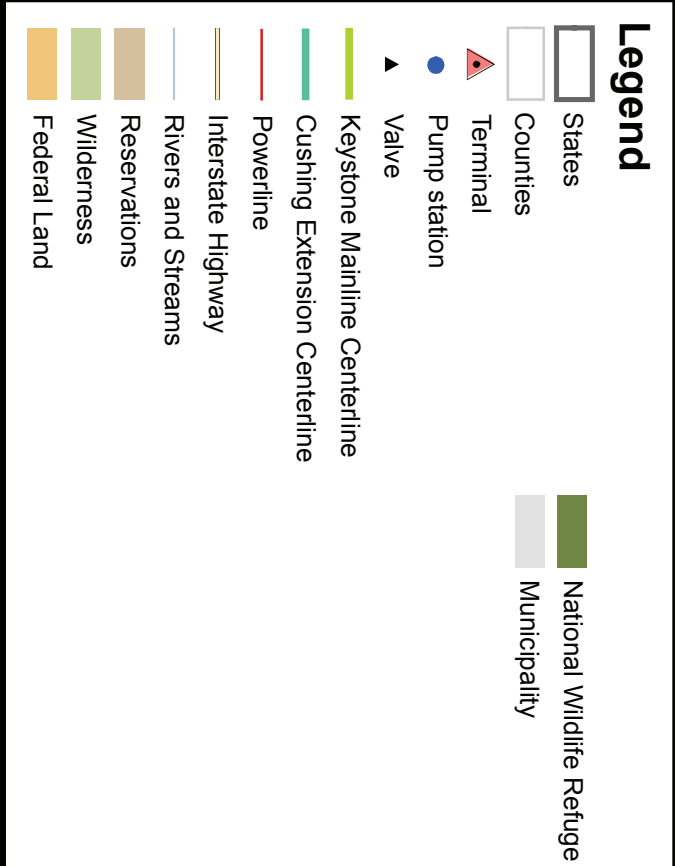
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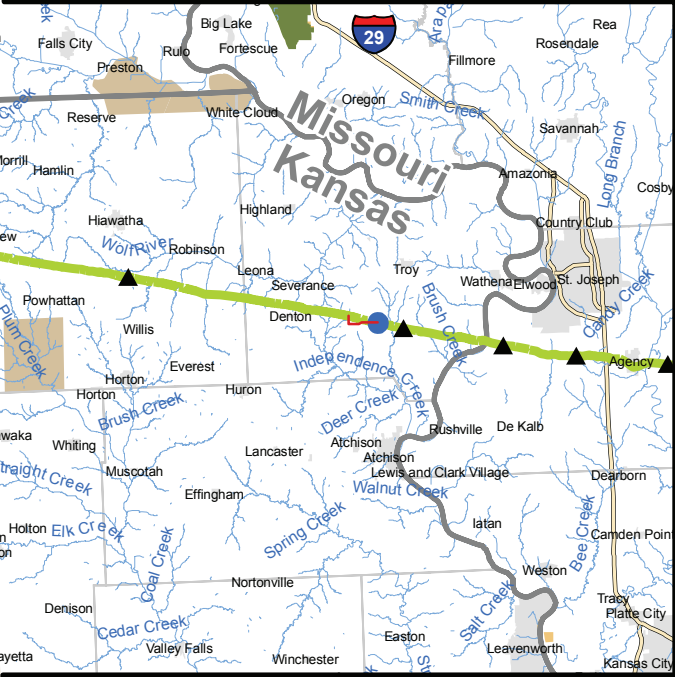
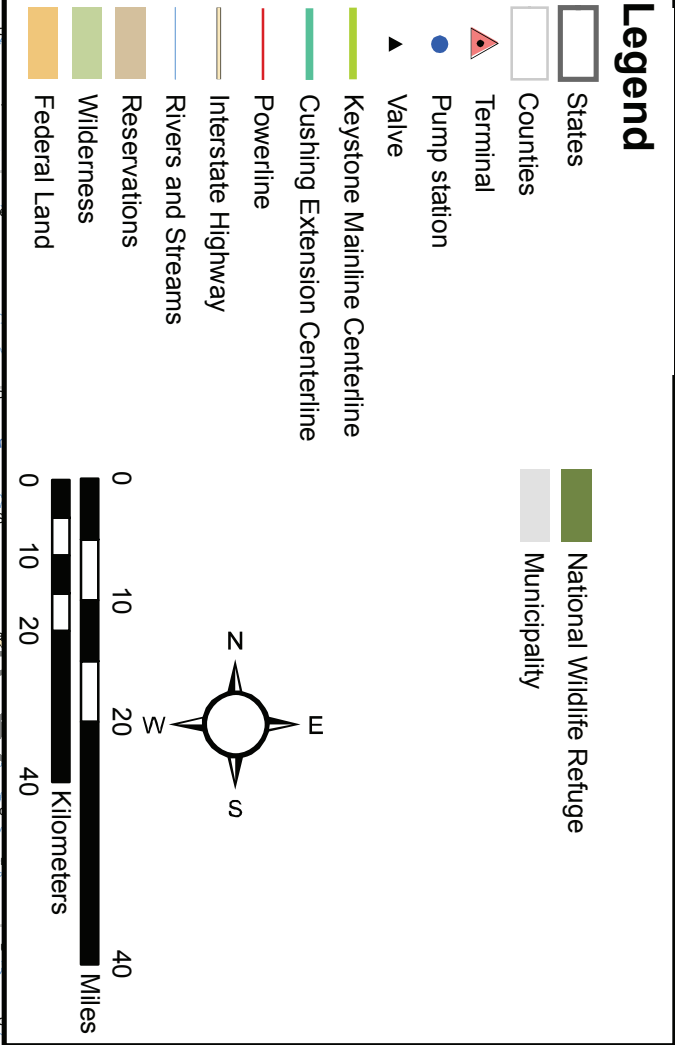
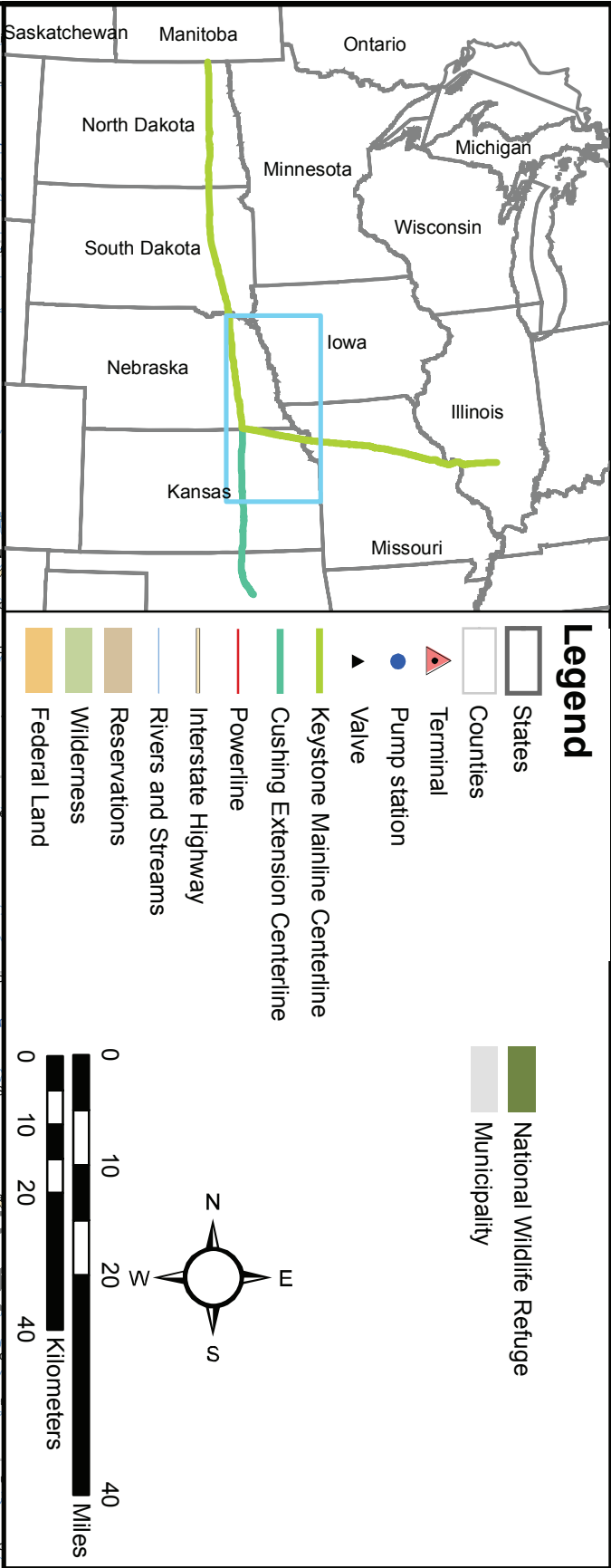
Figure 2.1-11

Project Overview  
(South Dakota)









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**Figure 2.1-13**

**Project Overview**  
(Kansas - Mainline Project)



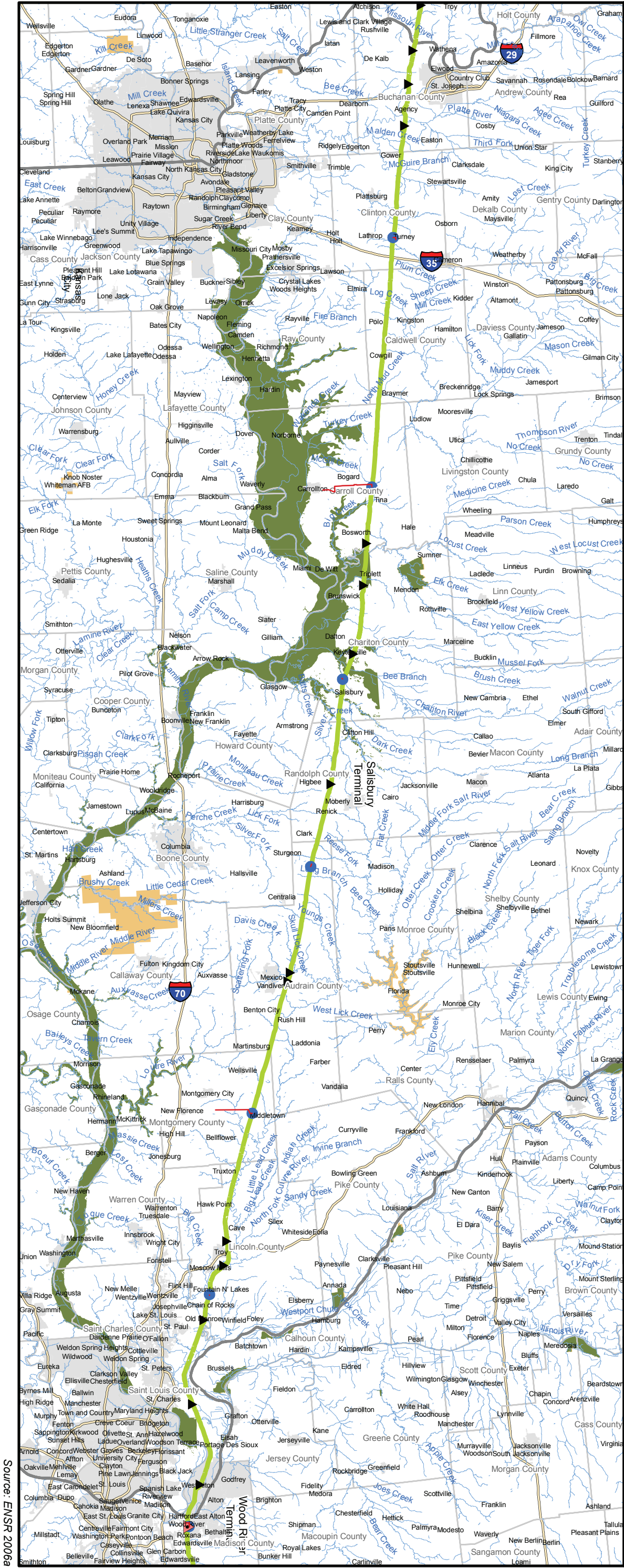




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**Figure 2.1-14**  
**Project Overview**  
(Missouri)



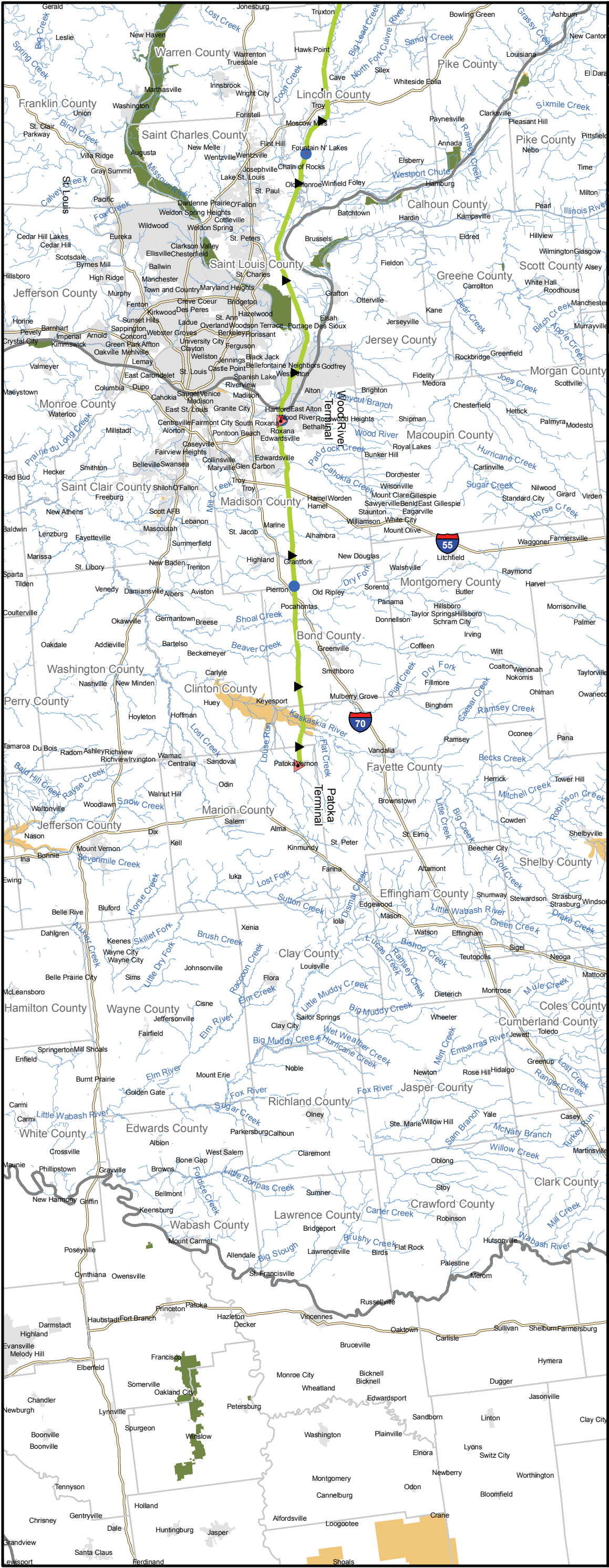


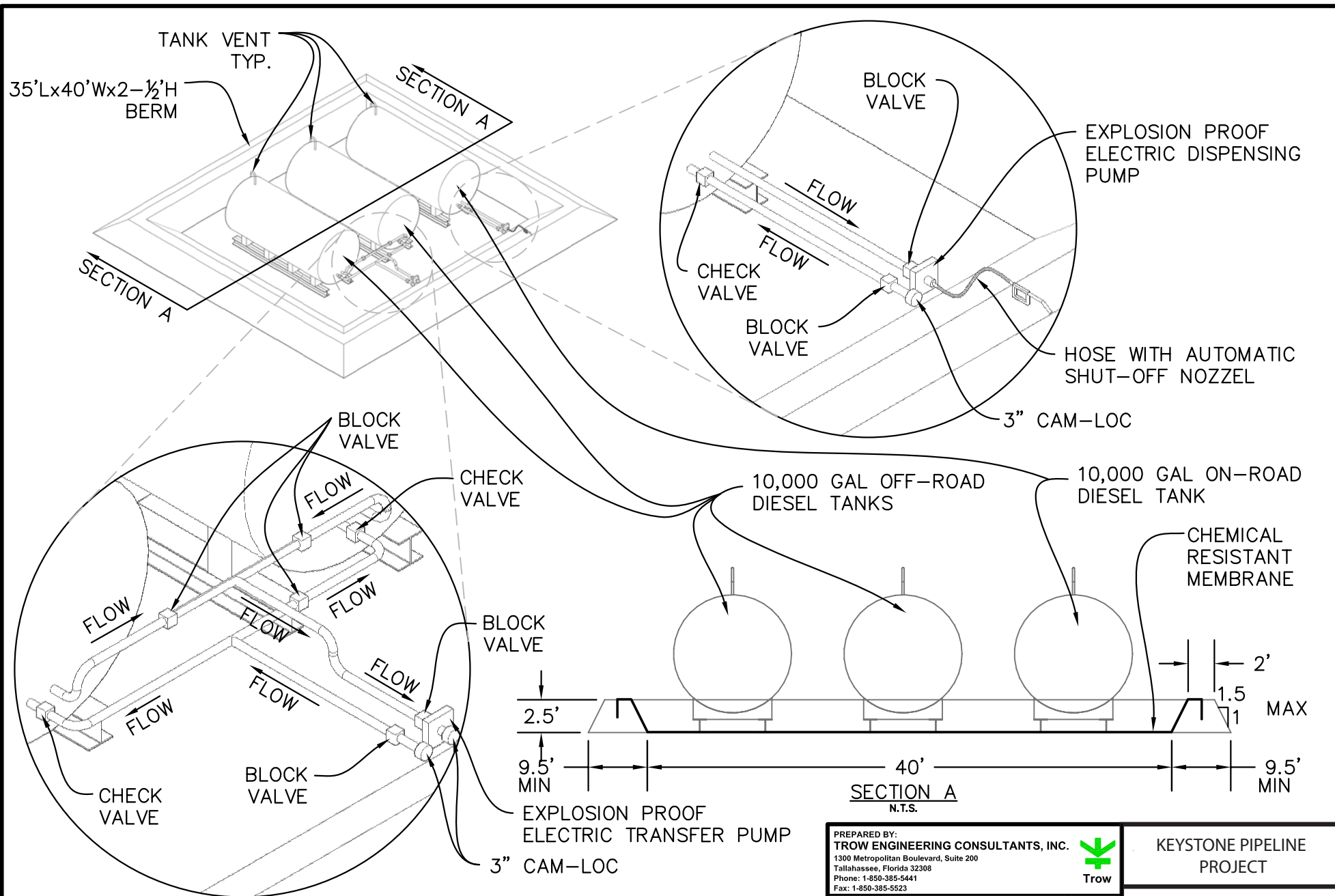


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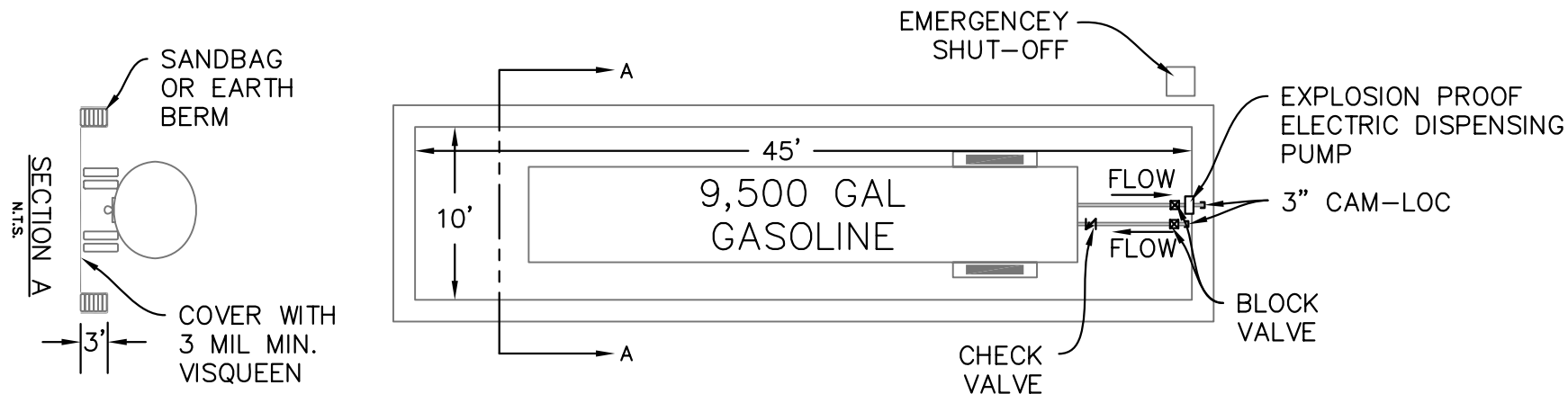
Figure 2.1-15  
Project Overview  
(Illinois)





NOTES:  
 1. ALL DIMENSIONS ARE APPROXIMATE AND MAY BE MODIFIED AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS

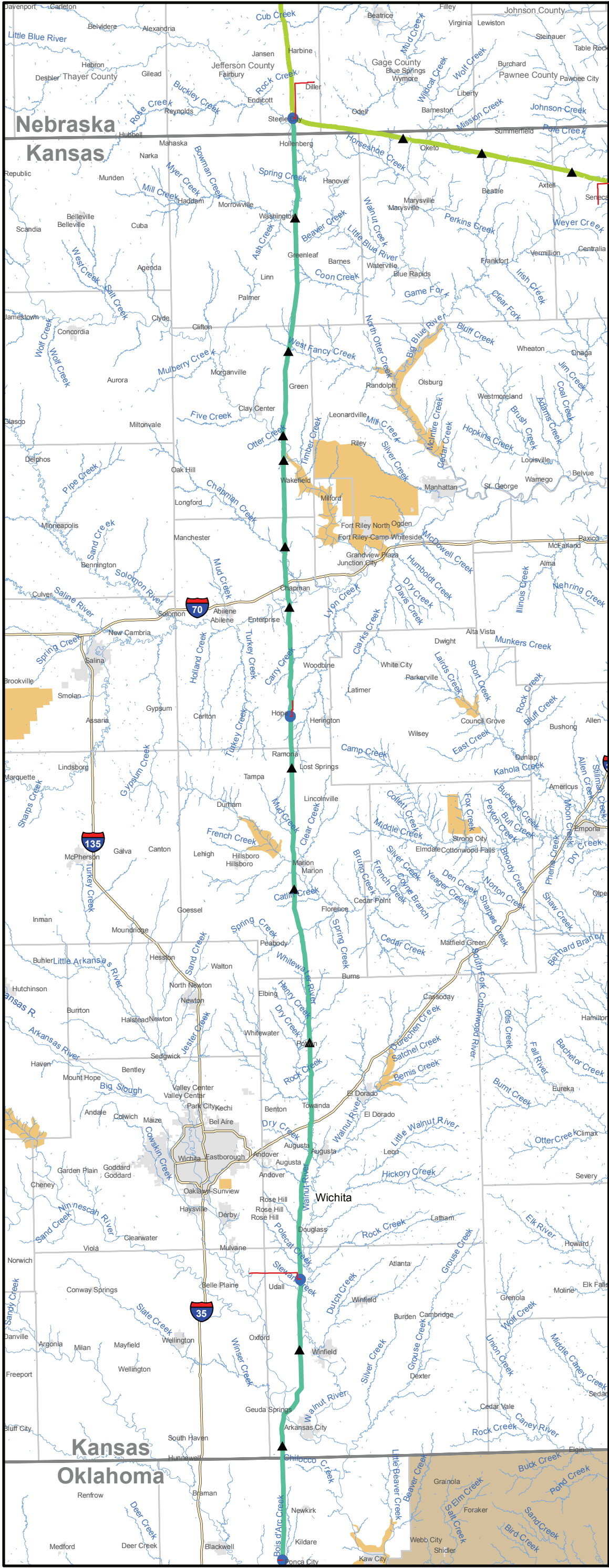
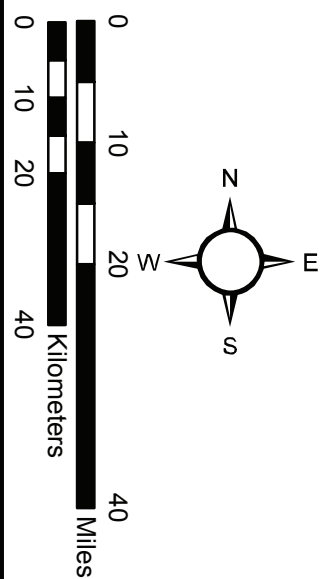
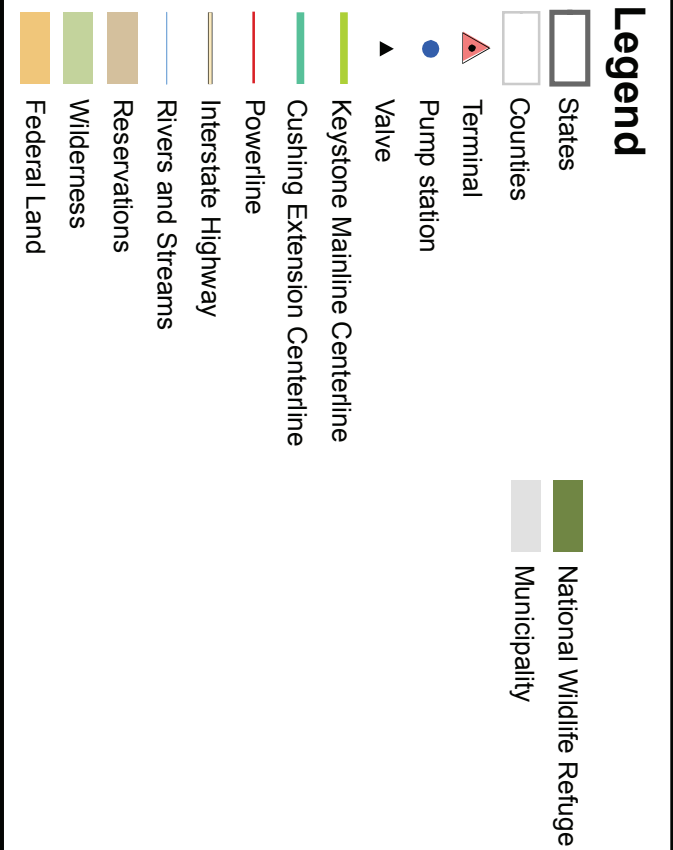
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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--------------------------------------------------|--|
| PREPARED BY:<br><b>TROW ENGINEERING CONSULTANTS, INC.</b><br>1300 Metropolitan Boulevard, Suite 200<br>Tallahassee, Florida 32308<br>Phone: 1-850-385-5441<br>Fax: 1-850-385-5523 |  |  | <b>KEYSTONE PIPELINE PROJECT</b>                 |  |
| NO.      REVISION      DATE                                                                                                                                                       |  |  | Figure 2.1-16<br>Typical Diesel Transfer Station |  |
| 0      ISSUED FOR DEPARTMENT OF STATE FILING      MAR.10.2006                                                                                                                     |  |  | APPROVED BY                                      |  |
| DRAWING NUMBER      DRAWN BY      CHECKED BY                                                                                                                                      |  |  | LAST PLOT DATE:                                  |  |
| K-00-P-7000-809      ABH                                                                                                                                                          |  |  | Wed, 28 Mar 2007 - 3:51pm                        |  |



1. TANK WILL BE APPROXIMATELY 9,500 GALLONS
2. CONTAINMENT DIMENSIONS ARE 10'x35' AND WILL PROVIDE 110% FOR VOLUMES BEING STORED
3. SHUT-OFF SWITCH WILL BE LOCATED AT EACH PUMP WITH AN EMERGENCY SWITCH OUTSIDE OF EACH BERM. A SECONDARY SHUT-OFF SWITCH WILL BE LOCATED REMOTELY IN THE WAREHOUSE OFFICE OVER 100' AWAY. SIGNS WILL INDICATE EMERGENCY SHUT-OFF INFORMATION.
4. THE PUMPS WILL BE LOCATED APPROXIMATELY 5' AWAY FROM THE TANKS AND PETROLEUM RATED HOSES WILL BE INSTALLED WITH AUTOMATIC SHUT-OFF NOZZLES.
5. THE PRODUCT TO BE DISPENSED WILL BE GASOLINE AND OR DIESEL TO BE CONSUMED BY ON-ROAD VEHICLES
6. IT SHOULD BE NOTED THAT THESE INSTALLATIONS ARE TEMPORARY AND WILL MEET THE REQUIREMENTS AND STANDARDS OF ALL FEDERAL, STATE AND LOCAL AGENCIES.
7. ALL DIMENSIONS ARE APPROXIMATE AND MAY BE MODIFIED AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS

| PREPARED BY:<br><b>TROW ENGINEERING CONSULTANTS, INC.</b><br>1300 Metropolitan Boulevard, Suite 200<br>Tallahassee, Florida 32308<br>Phone: 1-850-385-5441<br>Fax: 1-850-385-5523                                                                                                                                             |          |                        | <br><b>Trow</b> |             | <b>KEYSTONE PIPELINE PROJECT</b> |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                       |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|------------------------------------------------------------------------------------------------------|-------------|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------------------------------------|--|--|
| <table border="1"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table> |          |                        | NO.                                                                                                  | REVISION    | DATE                             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Figure 2.1-17<br>Typical Gasoline<br>Transfer Station |  |  |
| NO.                                                                                                                                                                                                                                                                                                                           | REVISION | DATE                   |                                                                                                      |             |                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                       |  |  |
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| 0 ISSUED FOR DEPARTMENT OF STATE FILING MAR.10.2006                                                                                                                                                                                                                                                                           |          |                        | APPROVED BY:                                                                                         |             |                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                       |  |  |
| DRAWING NUMBER<br><b>K-00-P-7000-810</b>                                                                                                                                                                                                                                                                                      |          | DRAWN BY<br><b>ABH</b> |                                                                                                      | CHECKED BY: |                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                       |  |  |
| LAST PLOT DATE:<br>Wed, 28 Mar 2007 - 4:07pm                                                                                                                                                                                                                                                                                  |          |                        |                                                                                                      |             |                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                       |  |  |



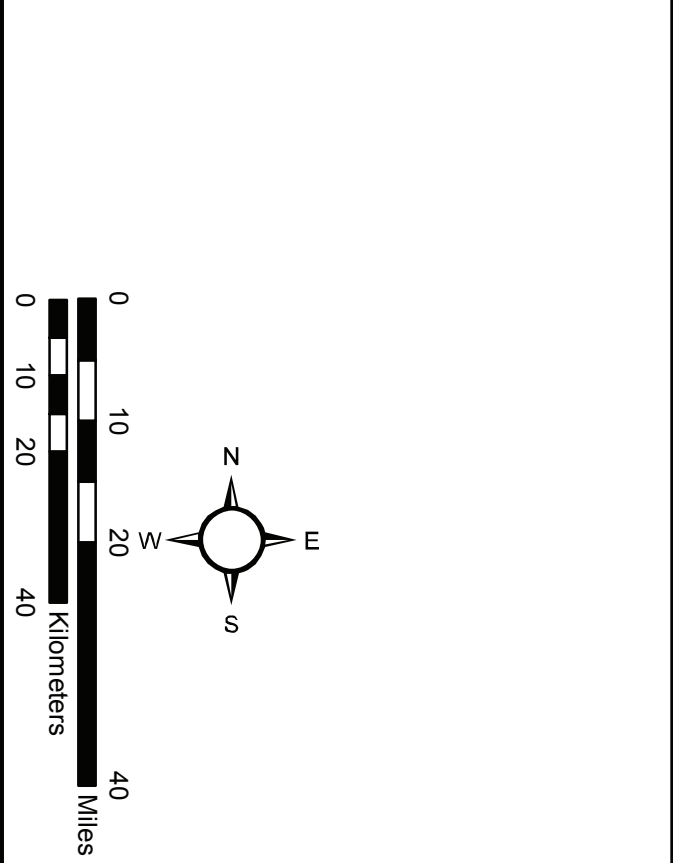
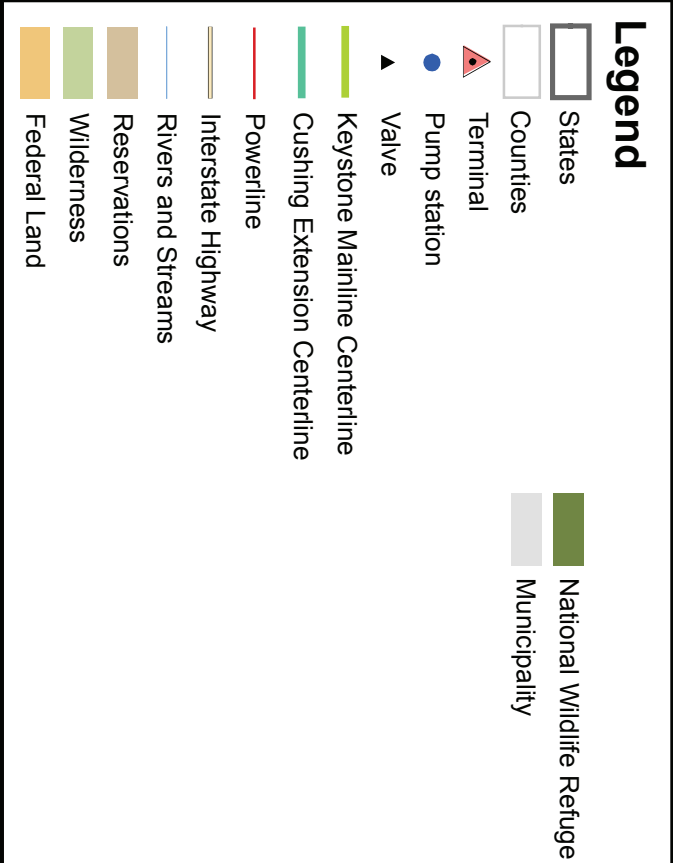


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**Keystone Pipeline Project**

Figure 2.1-18

Project Overview  
(Kansas - Cushing Extension)



**Keystone Pipeline Project**

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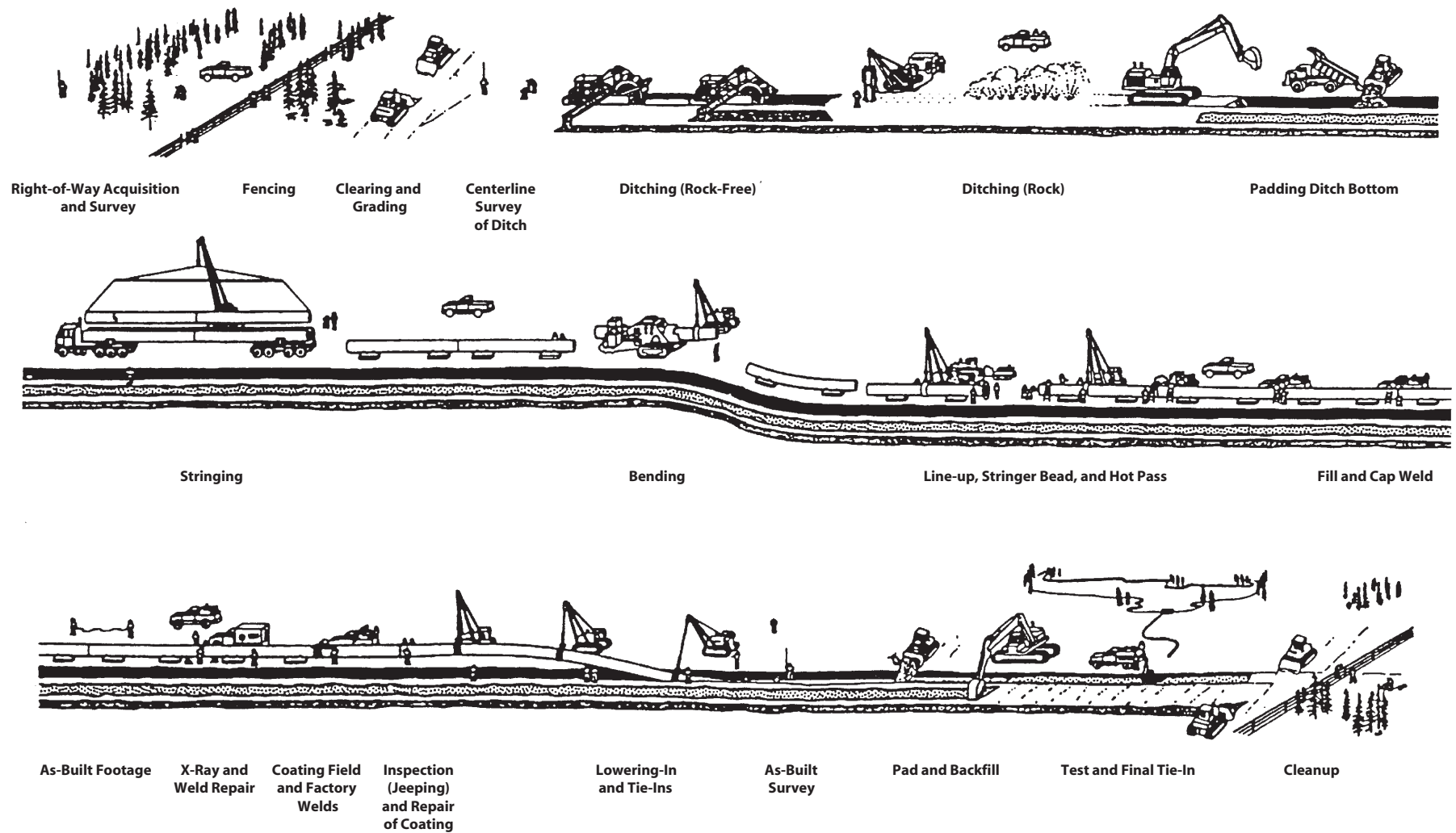
Figure 2.1-19

Project Overview

(Oklahoma - Cushing Extension)



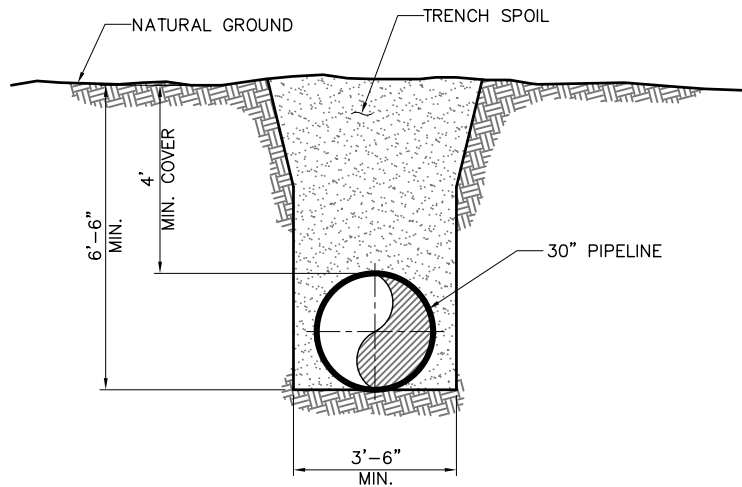




Not to Scale

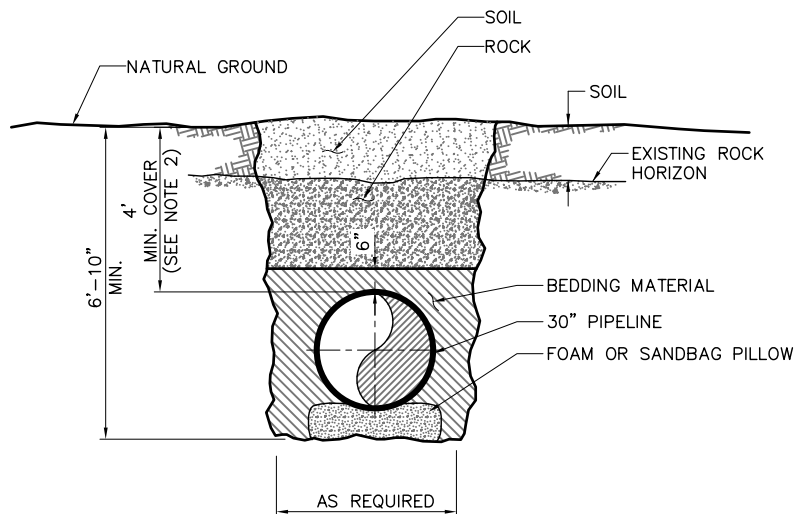
KEYSTONE PIPELINE  
PROJECT

Figure 2.2-1  
Typical Pipeline  
Construction Sequence



### TRENCH IN SOILS

SCALE: 1/4" = 1'



### TRENCH IN ROCK

SCALE: 1/4" = 1'

#### NOTES:

1. ADDITIONAL DEPTH OF COVER REQUIRED AT WATER BODY, DRY STREAM, ROAD AND RAILROAD CROSSING
2. DEPTH OF COVER MAY BE REDUCED TO 3' IN CONSOLIDATED ROCK.
3. CONFIGURATIONS ARE TYPICAL AND SUBJECT TO MODIFICATION DURING CONSTRUCTION TO SUIT ACTUAL SITE CONDITIONS.

PREPARED BY:  
**TROW ENGINEERING CONSULTANTS, INC.**  
1300 Metropolitan Boulevard, Suite 200  
Tallahassee, Florida 32308  
Phone: 1-850-385-5441  
Fax: 1-850-385-5523



**KEYSTONE PIPELINE  
PROJECT**

**Figure 2.2-2  
Typical Pipeline Trench Profile**

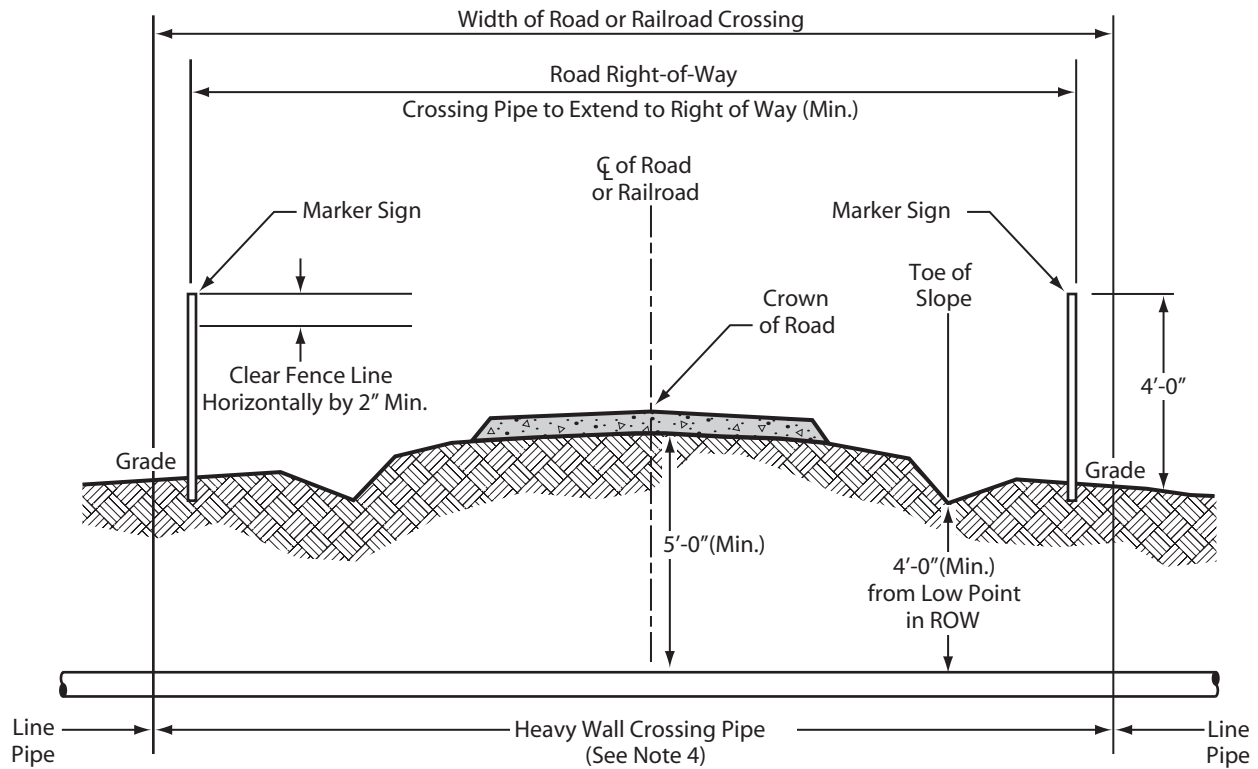
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|-----|-------------------|------------|
| 1   | ADDED NOTE 3      | 01.19.2007 |
| 0   | ISSUED FOR REVIEW | 01.10.2007 |

| DRAWING NUMBER  | DRAWN BY | CHECKED BY |
|-----------------|----------|------------|
| K-00-P-7000-400 | ALS      | BS         |

| APPROVED BY | LAST PLOT DATE:           |
|-------------|---------------------------|
| BS          | Fri, 19 Jan 2007 - 2:04pm |

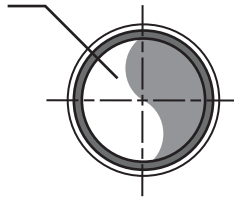
Source: TransCanada 2007c





**TYPICAL UNCASSED ROAD CROSSING - BORED**

Bore Annulus to be no Larger than 1" Greater than Coated Line Pipe

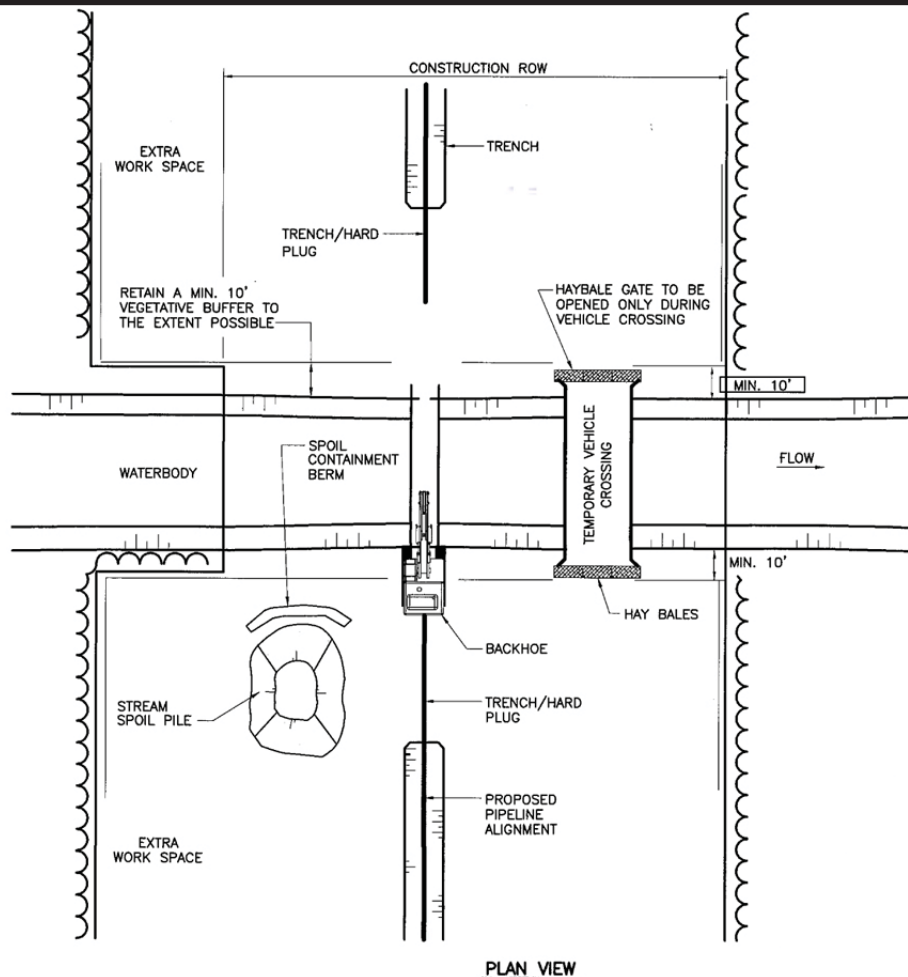


**Notes:**

1. Crossings shall be in accordance with applicable permit.
2. Road crossing pipe shall extend at minimum to right-of-way line.
3. The type and minimum required length of pipe for crossings of roads shall be as specified on alignment sheets.
4. Pipe for bored crossings to include abrasion-resistant (ARB) coating.
5. Pipeline marker and test stations to be installed on ROW line next to fence if possible.
6. The crossing pipe shall be straight with no vertical or horizontal bends within the road right-of-way.

KEYSTONE PIPELINE  
PROJECT

Figure 2.2-3  
Typical Uncased  
Road or Railroad  
Crossing - Bored

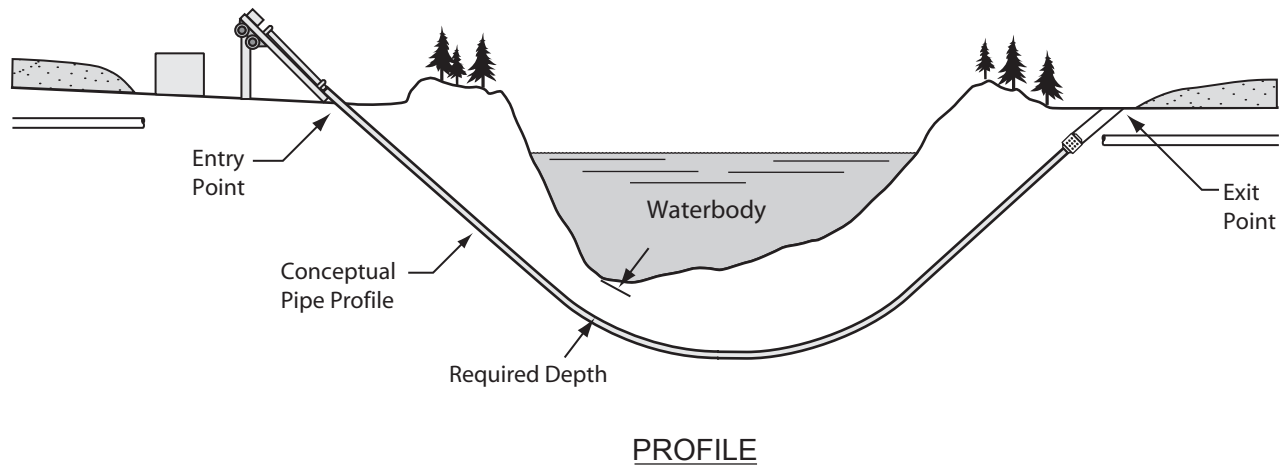


#### CONSTRUCTION PROCEDURES:

1. RIGHT-OF-WAY BOUNDARIES AND WORK SPACE LIMITS SHALL BE CLEARLY DELINEATED. STAGING FOR MAKEUP SHALL BE LOCATED A MINIMUM OF 10 FEET FROM WATERBODY.
2. CLEARING LIMITS WILL BE CLEARLY DELINEATED AND A 10 FOOT VEGETATIVE BUFFER STRIP BETWEEN DISTURBED AREA AND THE WATERBODY SHALL BE MAINTAINED TO THE EXTENT POSSIBLE. ALL CLEARING SHALL BE MINIMIZED TO THE EXTENT POSSIBLE AND TO ONLY THAT NECESSARY FOR CONSTRUCTION. WOODY VEGETATION SHALL BE CUT AT GROUND LEVEL AND THE STUMPS/ROOTS LEFT IN PLACE TO THE EXTENT POSSIBLE.
3. TOPSOIL SHALL BE STRIPPED FROM THE DITCH LINE IN ALL WETLANDS RIPARIAN.
4. CONTRACTOR SHALL INSTALL SIGNS APPROXIMATELY 100 FEET MINIMUM FROM EACH WATERBODY AND WETLAND TO IDENTIFY THE HAZARDOUS MATERIALS EXCLUSION AREA.
5. EROSION AND SEDIMENT CONTROL
  - A. CONTRACTOR SHALL SUPPLY, INSTALL AND MAINTAIN SEDIMENT CONTROL STRUCTURES, AS DEPICTED OR ALONG DOWN GRADIENT SIDES OF WORK AREAS AND STAGING AREAS SUCH THAT NO HEAVILY SILT LADEN WATER ENTERS WATERBODY OR WETLAND.
  - B. NO HEAVILY SILT LADEN WATER SHALL BE DISCHARGED DIRECTLY OR INDIRECTLY INTO THE WATERBODY. ALL EROSION AND SEDIMENT CONTROL STRUCTURE LOCATIONS AS DEPICTED ARE APPROXIMATE AND MAY BE ADJUSTED AS DIRECTED BY THE COMPANY INSPECTOR TO SUIT ACTUAL SITE CONDITIONS. SILT FENCE OR STRAW BALE INSTALLATIONS SHALL INCLUDE REMOVABLE SECTIONS TO FACILITATE ACCESS DURING CONSTRUCTION.
  - C. SEDIMENT LADEN WATER FROM TRENCH DEWATERING SHALL BE DISCHARGED TO A WELL VEGETATED UPLAND AREA, INTO A STRAW BALE DEWATERING STRUCTURE OR GEOTEXTILE FILTER BAG. SEDIMENT CONTROL STRUCTURES MUST BE IN PLACE AT ALL TIMES ACROSS THE DISTURBED CONSTRUCTION RIGHT OF WAY EXCEPT DURING EXCAVATION/INSTALLATION OF THE CROSSING PIPE.
  - D. SOFT DITCH PLUGS MUST REMAIN IN PLACE AT CONVENIENT LOCATIONS TO SEPARATE MAINLINE DITCH FROM THE WATERBODY CROSSING UNTIL THE WATER CROSSING IS INSTALLED AND BACKFILLED.
  - E. TRENCH BREAKERS ARE TO BE INSTALLED AT THE SAME SPACING AND IMMEDIATELY UPSLOPE OF PERMANENT SLOPE BREAKERS, OR AS DIRECTED BY THE COMPANY.
6. CONTRACTOR SHALL MAINTAIN HARD PLUGS IN THE DITCH AT THE WATERBODY UNTIL JUST PRIOR TO PIPE INSTALLATION. CONTRACTOR SHALL EXCAVATE TRENCH AND INSTALL PIPE AS EXPEDIENTLY AS PRACTICAL TO REDUCE THE DURATION OF WORK ACTIVITIES IN THE WATERBODY BED.
7. CONTRACTOR SHALL PLACE TRENCH SPOIL ONLY IN CERTIFICATED WORK SPACE AND A MINIMUM OF 10 FEET FROM THE WATERBODY BANKS TO PREVENT ENTRY OF SPOIL INTO THE WATERBODY. SPOIL SHALL BE CONTAINED AS NECESSARY USING EITHER A STRAW BALE BARRIER OR AN EARTH/ROCK BERM.
8. CONTRACTOR SHALL RESTORE THE WATERBODY AND BANKS TO APPROXIMATE PRECONSTRUCTION CONTOURS, UNLESS OTHERWISE APPROVED BY THE COMPANY. CONTRACTOR SHALL INSTALL PERMANENT EROSION AND SEDIMENT CONTROL STRUCTURES AS INDICATED. ANY MATERIALS PLACED IN THE WATERBODY TO FACILITATE CONSTRUCTION SHALL BE REMOVED DURING RESTORATION. BANKS SHALL BE STABILIZED AND TEMPORARY SEDIMENT BARRIERS INSTALLED AS SOON AS POSSIBLE AFTER CROSSING, BUT WITHIN 24 HOURS OF COMPLETING THE CROSSING. MAINTAIN A SILT FENCE OR STRAW BALE BARRIER ALONG THE WATERBODY AND WETLAND BOUNDARIES UNTIL VEGETATION IS ESTABLISHED IN ADJACENT DISTURBED AREAS.
9. VEHICLE CROSSING CAN BE CONSTRUCTED USING EITHER A FLUME CROSSING OR A TEMPORARY BRIDGE. VEHICLE CROSSING ONLY REQUIRED IF STREAM SUPPORTS A STATE DESIGNATED FISHERY.

#### KEYSTONE PIPELINE PROJECT

Figure 2.2-4  
Typical Water Body Crossing  
Open-Cut Trench

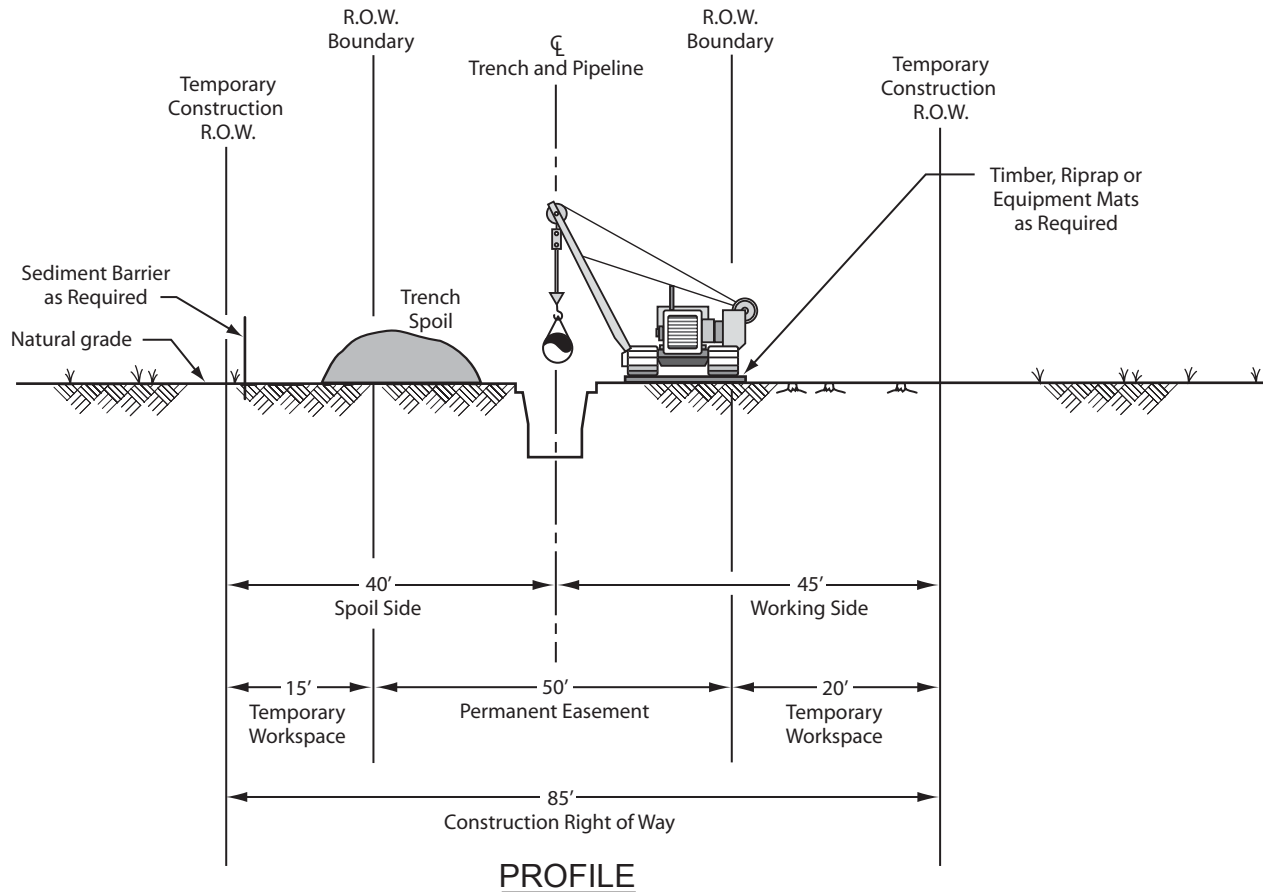


Notes:

1. Set up drilling equipment a minimum of 100 feet from the edge of the watercourse. Limit clearing between drill entry and exit point to brush clearing of a 10-foot wide strip as necessary to monitor drilling activities and obtain water for hydrostatic testing and drilling mud.
2. Ensure that only bentonite-based drilling mud is used.
3. Install suitable drilling mud tanks or sumps to prevent contamination of watercourse.
4. Install berms downslope from the drill entry and anticipated exit points to contain any release of drilling mud.
5. Dispose of drilling mud in accordance with the appropriate regulatory authority requirements.

KEYSTONE PIPELINE  
PROJECT

Figure 2.2-5  
Typical Water Body Crossing  
Horizontal Directional Drill



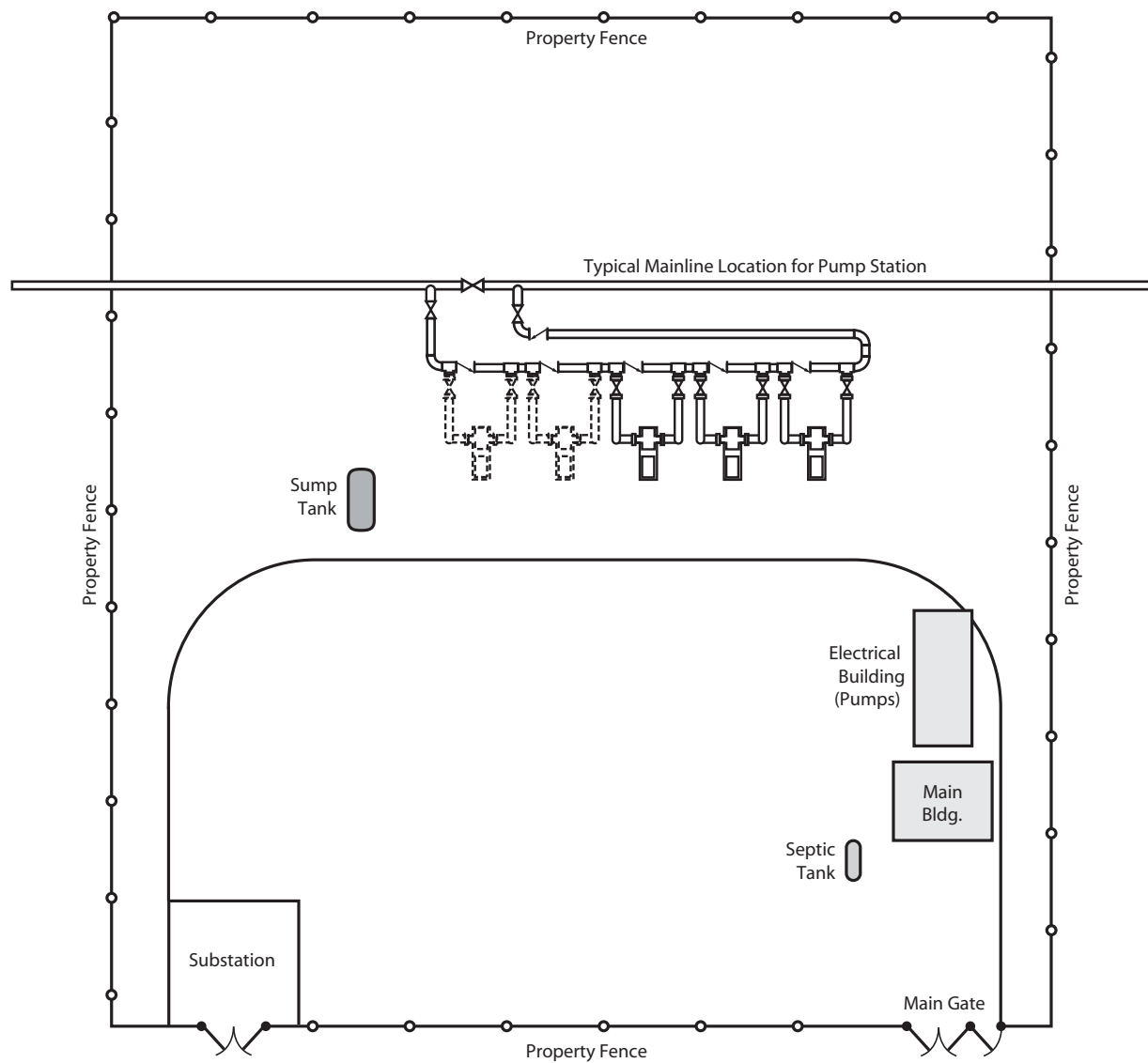
**Notes:**

1. Flag wetland boundaries prior to clearing.
2. No refueling of mobile equipment is allowed within 100 feet of wetland. Place "No Fueling" sign posts 100 feet back from wetland boundary. Refuel stationary equipment as per Keystone's spill prevention procedures.
3. Install temporary slope breaker upslope within 100 feet of wetland boundary if directed by Keystone.
4. Install timber mats/riprap through entire wetland area. Equipment necessary for right-of-way clearing may make one (1) pass through the wetland before mats are installed.
5. Avoid adjacent wetlands. Install sediment barriers (straw bales and/or silt fence) at downslope edge of right-of-way and along wetland edge as required.
6. Restrict root grubbing to only that area over the ditchline and ditch spoil areas and remove from wetland for disposal.
7. Topsoil stripping shall not be required in saturated soil conditions
8. Leave hard plugs at edge of wetland until just prior to trenching.
9. Pipe section may be fabricated within the wetland and adjacent to alignment, or in staging area outside the wetland and walked in.
10. Trench through wetland.
11. Lower-in pipe, install trench plugs at wetland edges as required and backfill immediately.
12. Remove timber mats or prefabricated mats from wetland upon completion.
13. Restore grade to near pre-construction topography, replace topsoil, and install permanent erosion control.

KEYSTONE PIPELINE  
PROJECT

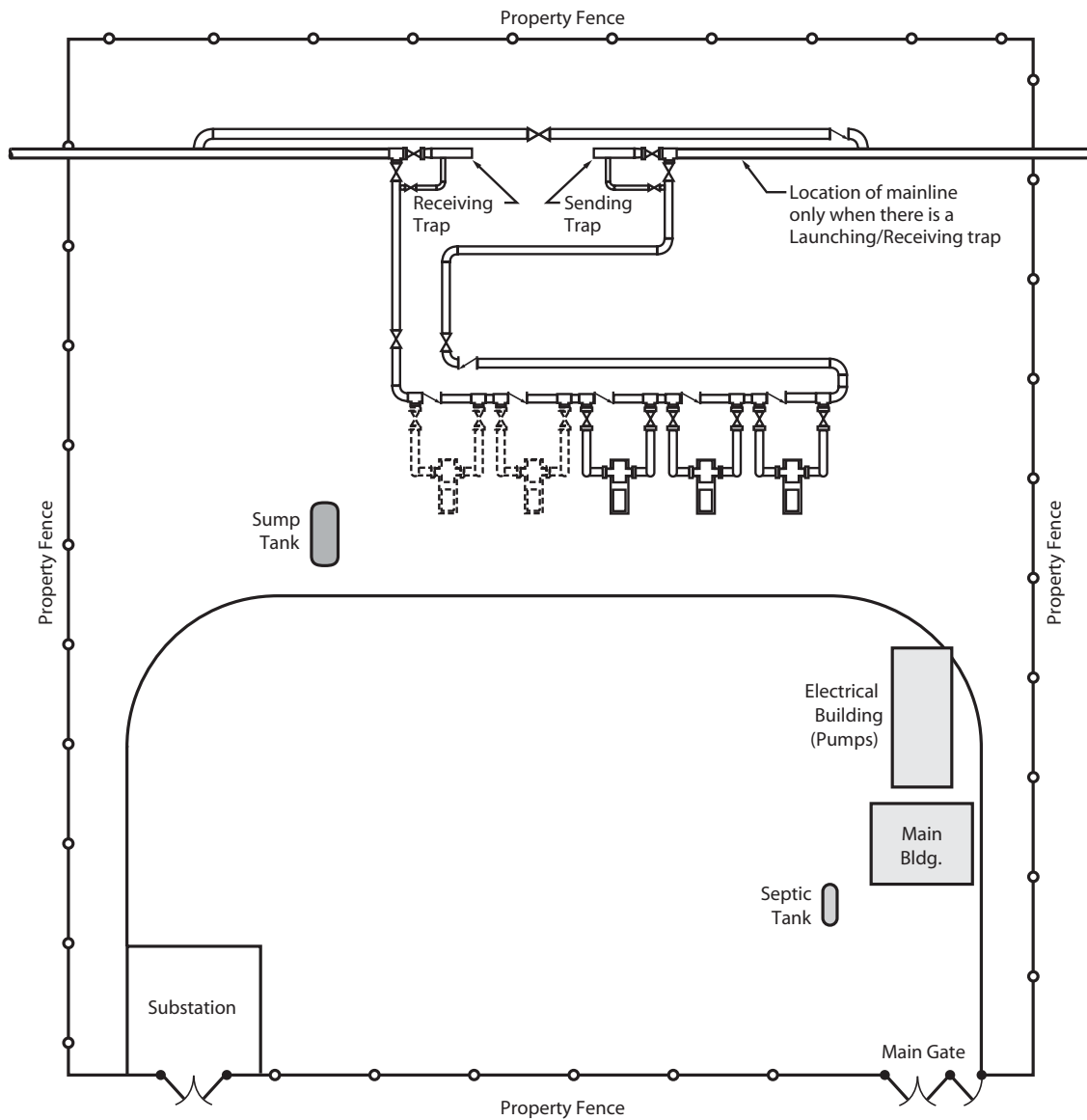
Figure 2.2-6  
Typical Standard  
Wetland Crossing





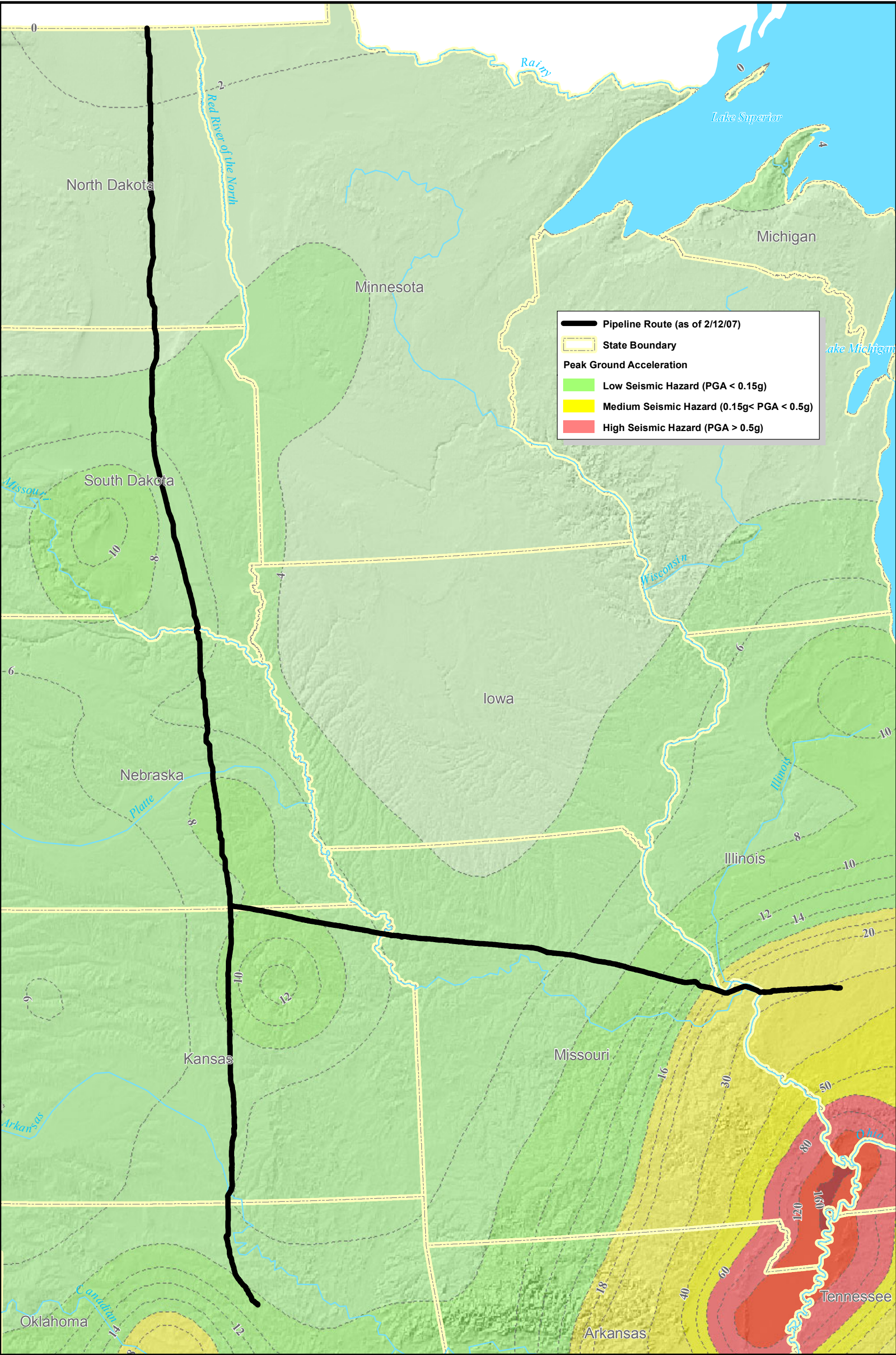
KEYSTONE PIPELINE  
PROJECT

Figure 2.2-7  
Typical Pump Station  
without Pigging  
Facilities



KEYSTONE PIPELINE  
PROJECT

Figure 2.2-8  
Typical Pump Station  
with Pigging  
Facilities



Data sources:  
1) USGS. 2002. National Seismic Hazard Map. Earthquake Hazards Program website, [http://earthquake.usgs.gov/research/hazmaps/products\\_data/48\\_States/index.php](http://earthquake.usgs.gov/research/hazmaps/products_data/48_States/index.php)  
2) American Lifelines Alliance. 2005. Guideline for Assessing the Performance of Oil and Natural Gas Pipeline Systems in Natural Hazard and Human Threat Events. [www.americanlifelinesalliance.org/pdf/PipeguideFinalPosted061705.pdf](http://www.americanlifelinesalliance.org/pdf/PipeguideFinalPosted061705.pdf)

0 100 Miles



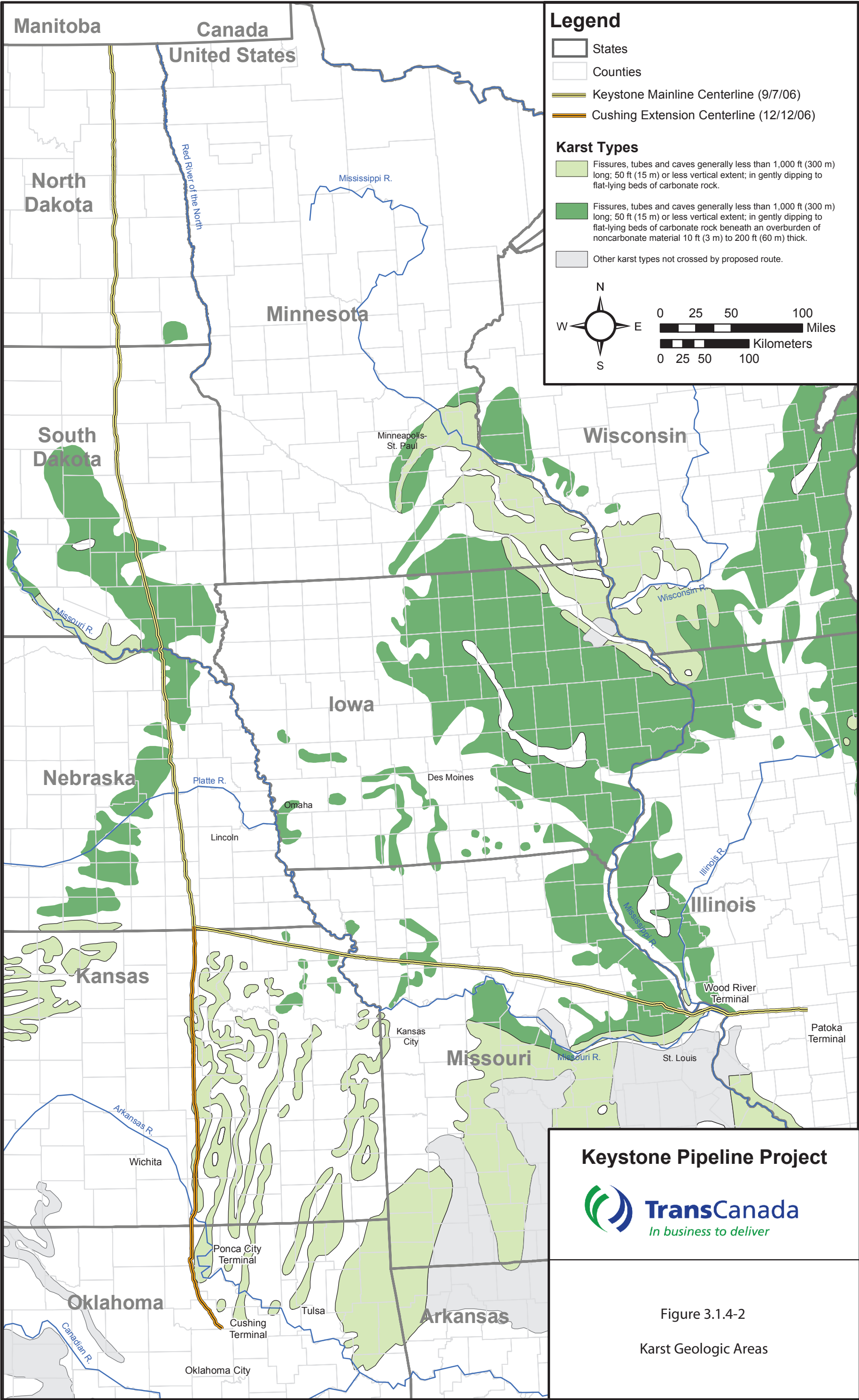
Keystone Pipeline Project



Figure 3.1.4-1

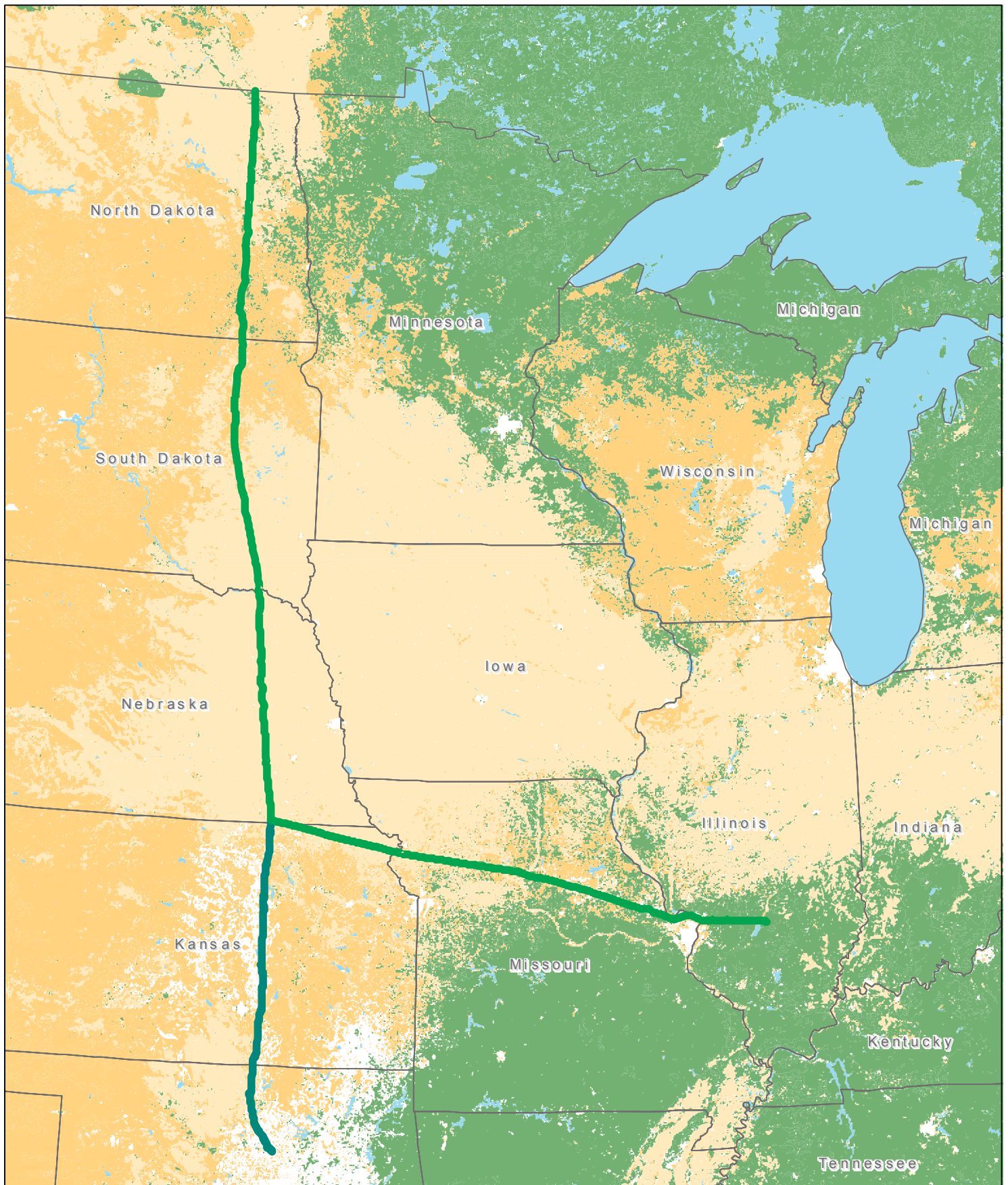
Seismic Hazard Map





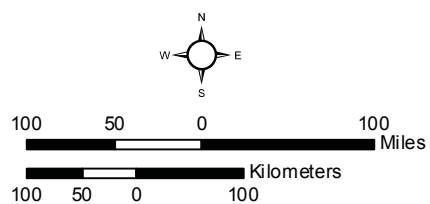
Source: ENSR 2006a from Tobin, B. and Weary, D. 2005. "karst0p075.shp" shapefile accessed from NationalAtlas.gov.





#### 1 km USGS Landcover

- Cropland and Pasture
- Grassland and Prairie
- Forest
- Water
- Mainline Project Centerline
- Cushing Extension Centerline



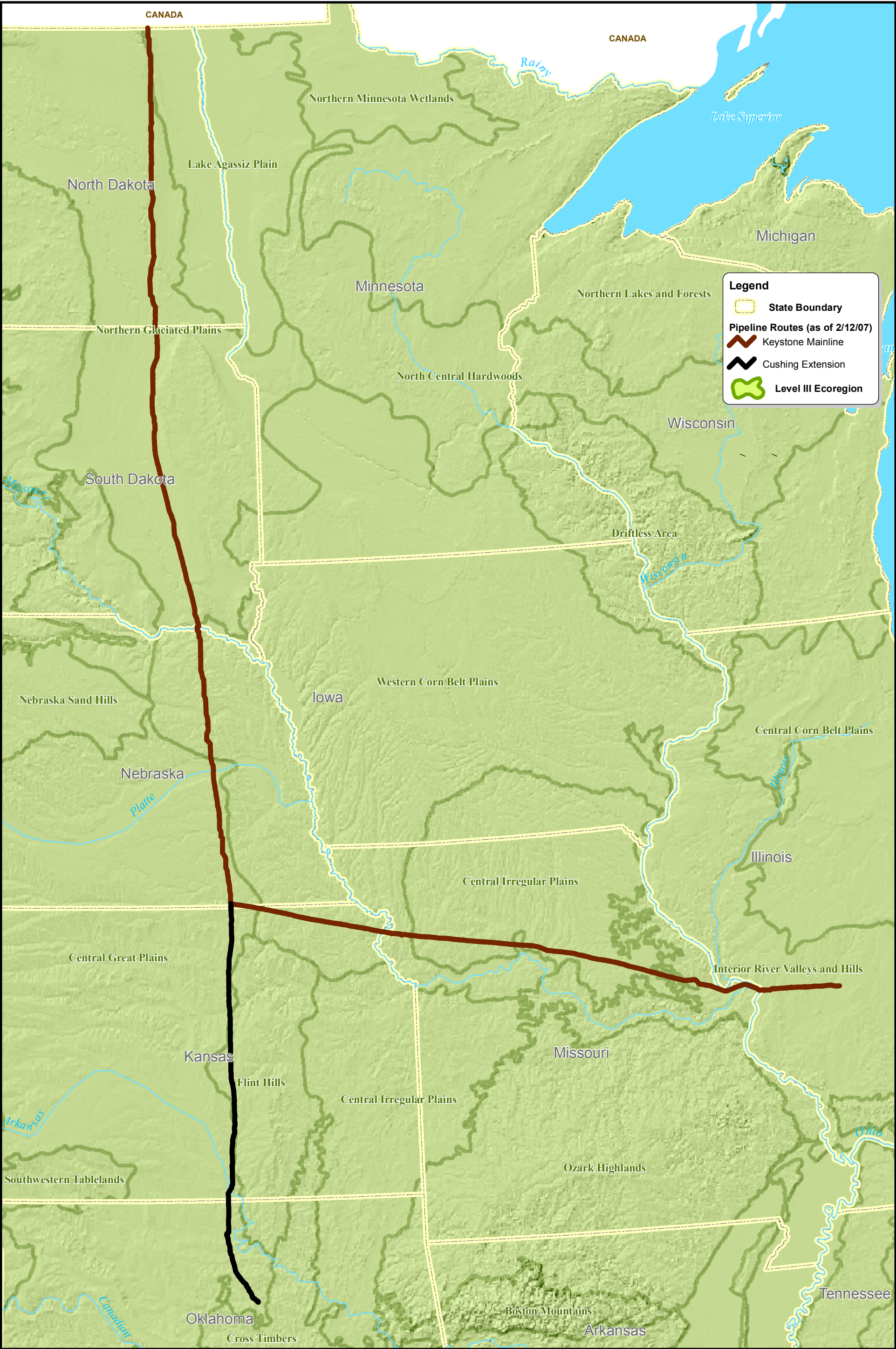
#### Keystone Pipeline Project



Figure 3.5.2-1

Grassland and Forest Cover within States  
Crossed by the Keystone Project





Data sources:  
U.S. Environmental Protection Agency (EPA). 2006. Level III Ecoregions of the Continental United States. National Health and Environmental Effects Research Laboratory. [Available online at: [http://www.epa.gov/wed/pages/ecoregions/level\\_iii.htm](http://www.epa.gov/wed/pages/ecoregions/level_iii.htm)] Accessed 16 February 2007.

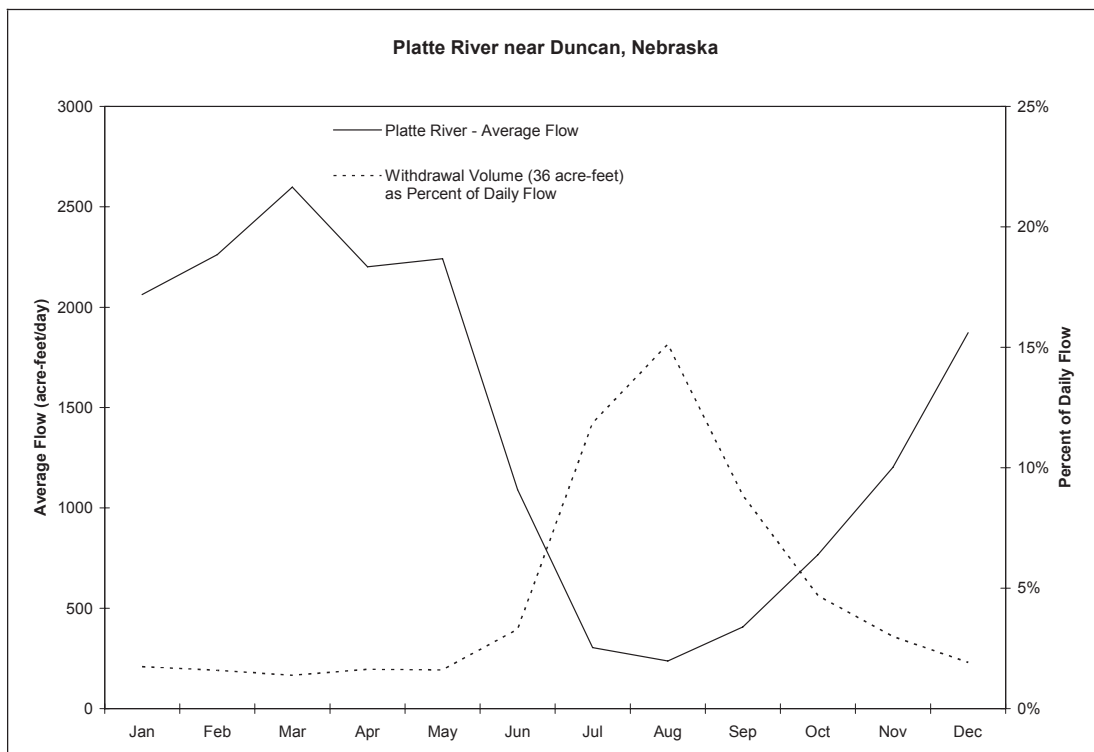
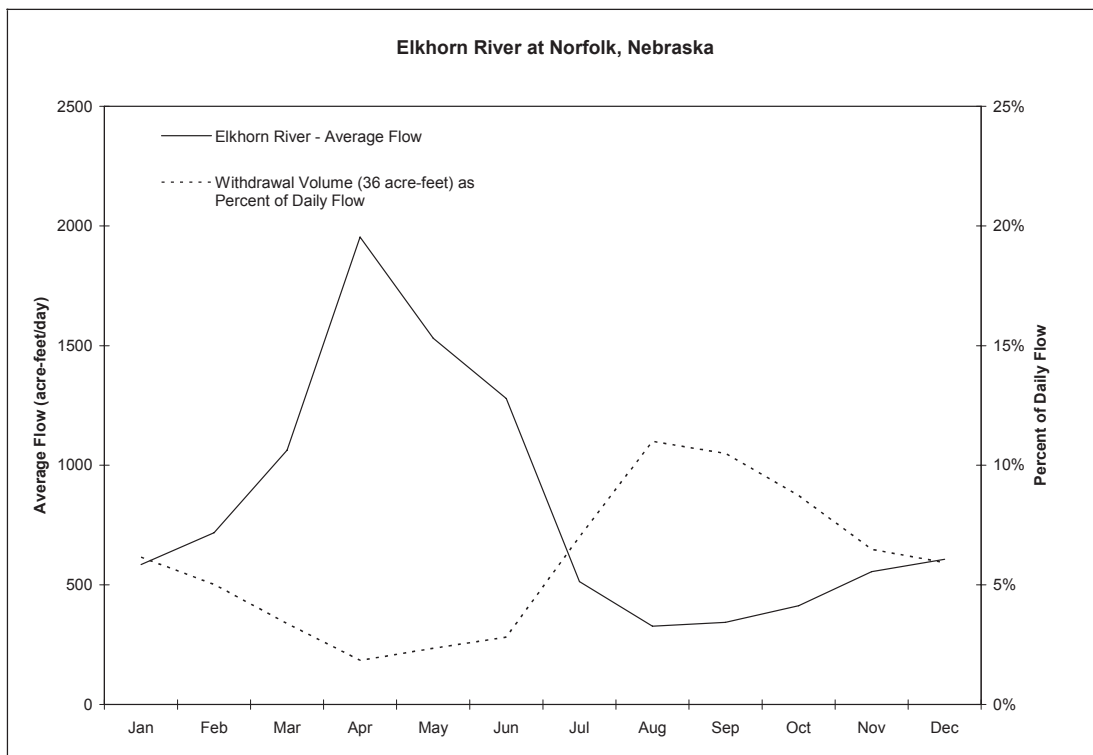
0 100 Miles



### Keystone Pipeline Project



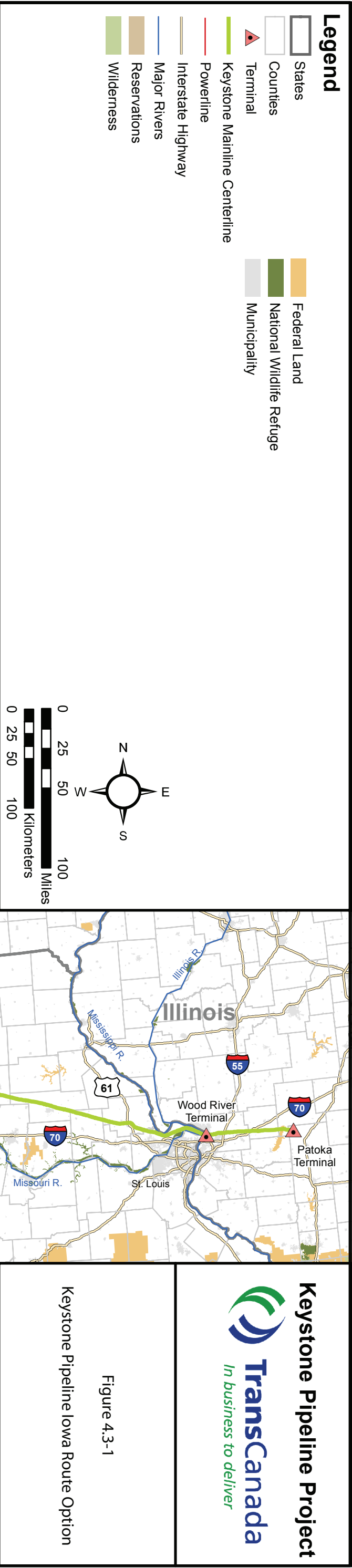
Figure 3.5-1  
EPA Level III Ecoregions  
Crossed by the Keystone  
Project



#### KEYSTONE PIPELINE PROJECT

Figure 3.8.1-1  
Average Flow and  
Test Water Withdrawal Volume  
as a Percent of Daily Flow at  
Two Locations near the Proposed Route



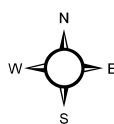






### Legend

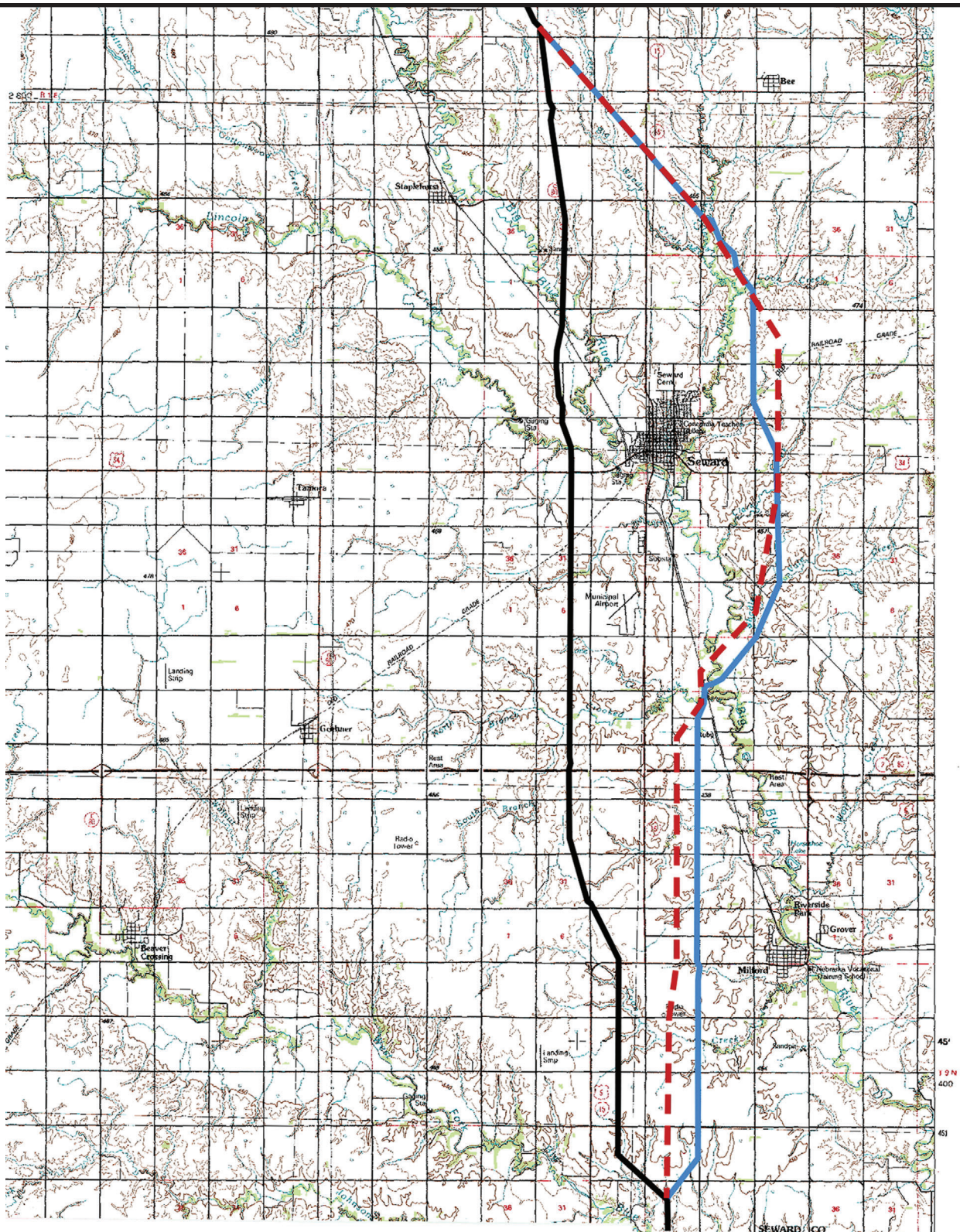
- Proposed Project Route
- Direct Alternative Route



100 50 0 100 Miles

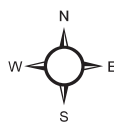
### KEYSTONE PIPELINE PROJECT

Figure 4.3-2  
Keystone Pipeline  
Proposed and Alternative Routes



### Legend

- Proposed Project Route
- Seward alternative #1
- - - Seward alternative #2



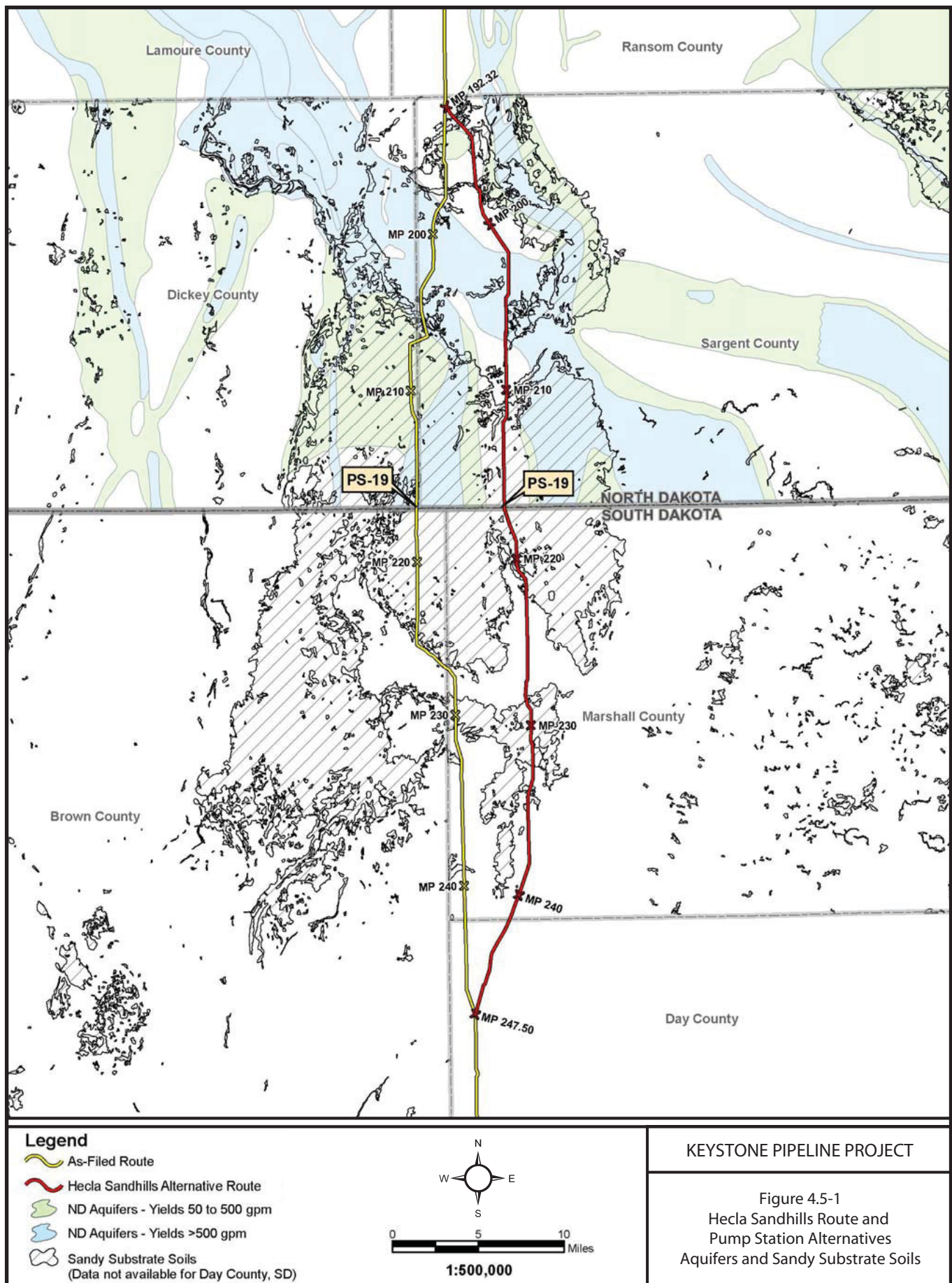
2 1 0 2 Miles

### KEYSTONE PIPELINE PROJECT

Figure 4.4-1  
Proposed and Alternative Alignments  
in the Vicinity of Seward, NE

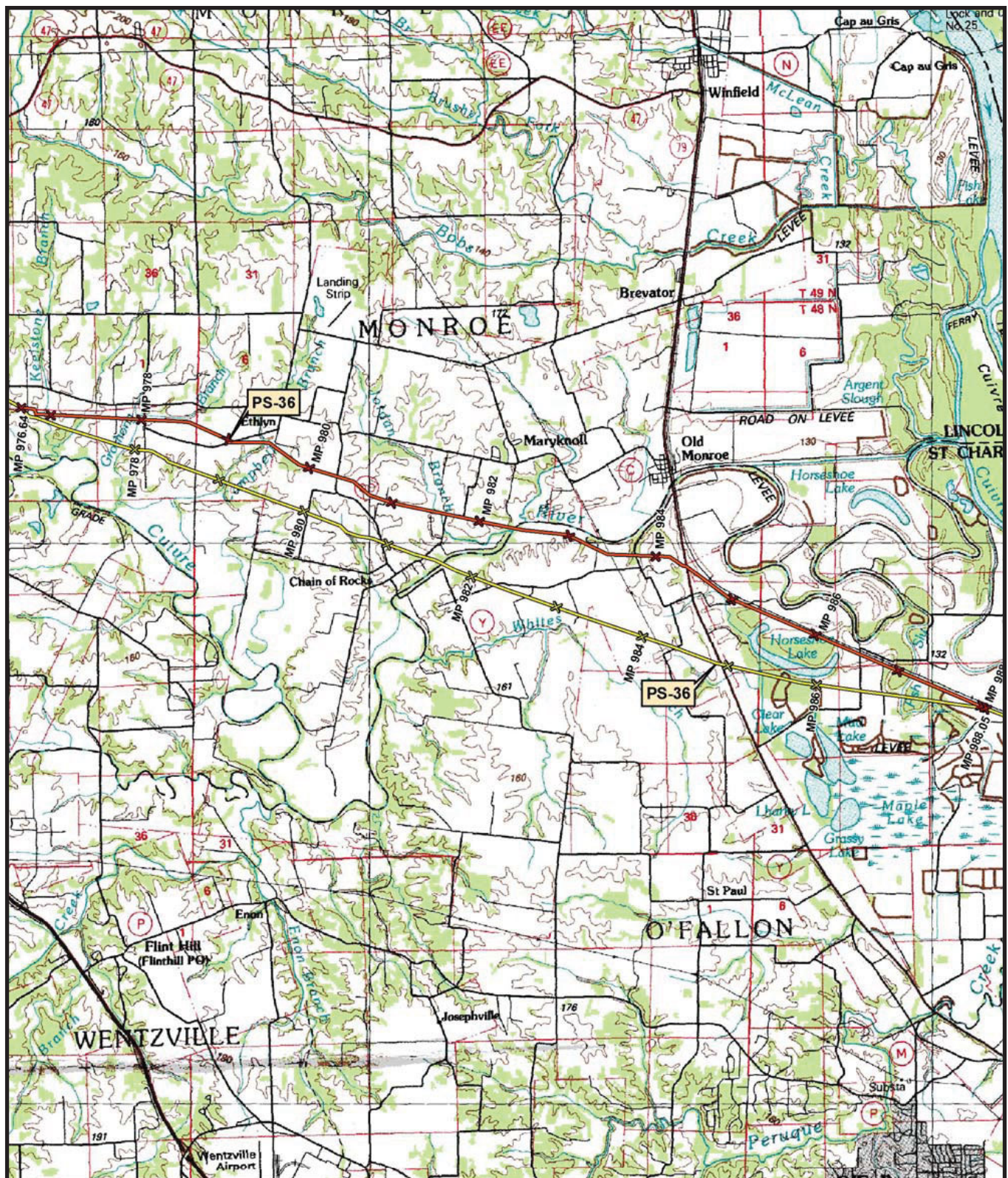
Sources: USGS (York quadrangle, Nebraska, 30'x60' series) and Keystone





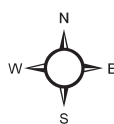
Source: ENSR 2006a





#### Legend

- As-Filed Route
- Chain of Rocks Alternative Route



0 1 2 Miles

1:100,000

#### KEYSTONE PIPELINE PROJECT

Figure 4.5-2  
Chain of Rocks Route and  
Pump Station Alternatives



