

2 ALTERNATIVES ANALYSIS

Two route corridors—Alternative A and Alternative B—were evaluated to connect to the Valley Crossing Pipeline System, the nearest pipeline project capable of providing feed gas to the Annova LNG Brownsville Project. After selecting the most feasible corridor of the two alternatives, the proposed Lateral route was further refined to avoid environmentally sensitive areas and other constraints (Figure 2-1).

Alternative A originates at the existing Valley Crossing Pipeline System’s Brownsville compressor station, terminates at the Annova LNG Brownsville Project, and is approximately 9 miles in length (Figure 2-1). Starting at the compressor station, Alternative A is co-located within the Valley Crossing Pipeline System for the first mile. From there, Alternative A diverges from the Valley Crossing Pipeline System and extends south across State Highway (SH) 48 and crosses the BSC, turning east to a BND dredge material placement area. The alignment turns south and east around the BND dredged material placement area. From that point, the route extends east-northeast across BND land to a point where it is co-located with an existing unpaved road. The permanent new access road for the Annova LNG Brownsville Project will parallel and partially overlay the existing graded but unpaved road. Alternative A would locate the proposed Lateral adjacent to the electric transmission line and potable water pipeline in a planned BND utility corridor on the south side of the BSC. Alternative A would enter the BND utility corridor after crossing the BSC and up to the Annova LNG Brownsville Project.

Alternative B originates at the existing Valley Crossing Pipeline System’s Brownsville compressor station, terminates at the Annova LNG Brownsville Project, and is approximately 6.8 miles in length (Figure 2-1). The majority of Alternative B is co-located with the Valley Crossing Pipeline System and SH 48 ROW. Alternative B is co-located with the Valley Crossing Pipeline System from the compressor station to SH 48, then remains co-located with the Valley Crossing Pipeline System and SH 48 as it extends east to a point north of the Annova LNG Brownsville Project on the north side of the BSC. From there, it diverges from the Valley Crossing Pipeline System and crosses the BSC to the Annova LNG Brownsville Project. From the point where Alternative B crosses SH 48 to the point where it diverges from the highway and turns south to the Annova LNG Brownsville Project, Alternative B would be within the BND utility corridor on the north side of the BSC. The existing Valley Crossing Pipeline System is currently located in the planned north side utility corridor. Applications for authorization have been filed with the USACE for three additional large-diameter pipelines in the north side utility corridor: two Rio Bravo Pipeline 42-inch-diameter pipelines and one Texas LNG 30-inch-diameter pipeline. The intent of the BND utility corridor is to provide space for utilities necessary for the development of BND land along the BSC.

Table 2-1 provides the results of the desktop analysis conducted for the two corridors evaluated.

Table 2-1 Lateral Alternatives Analysis

Environmental Features	Unit	Alternative A	Alternative B
Length			
	Miles	8.0	6.8
Public Lands			
Texas Parks and Wildlife Department (TPWD) Wildlife Management Areas	Miles along centerline	0.0	0.0
Texas State Forest	Miles along centerline	0.0	0.0

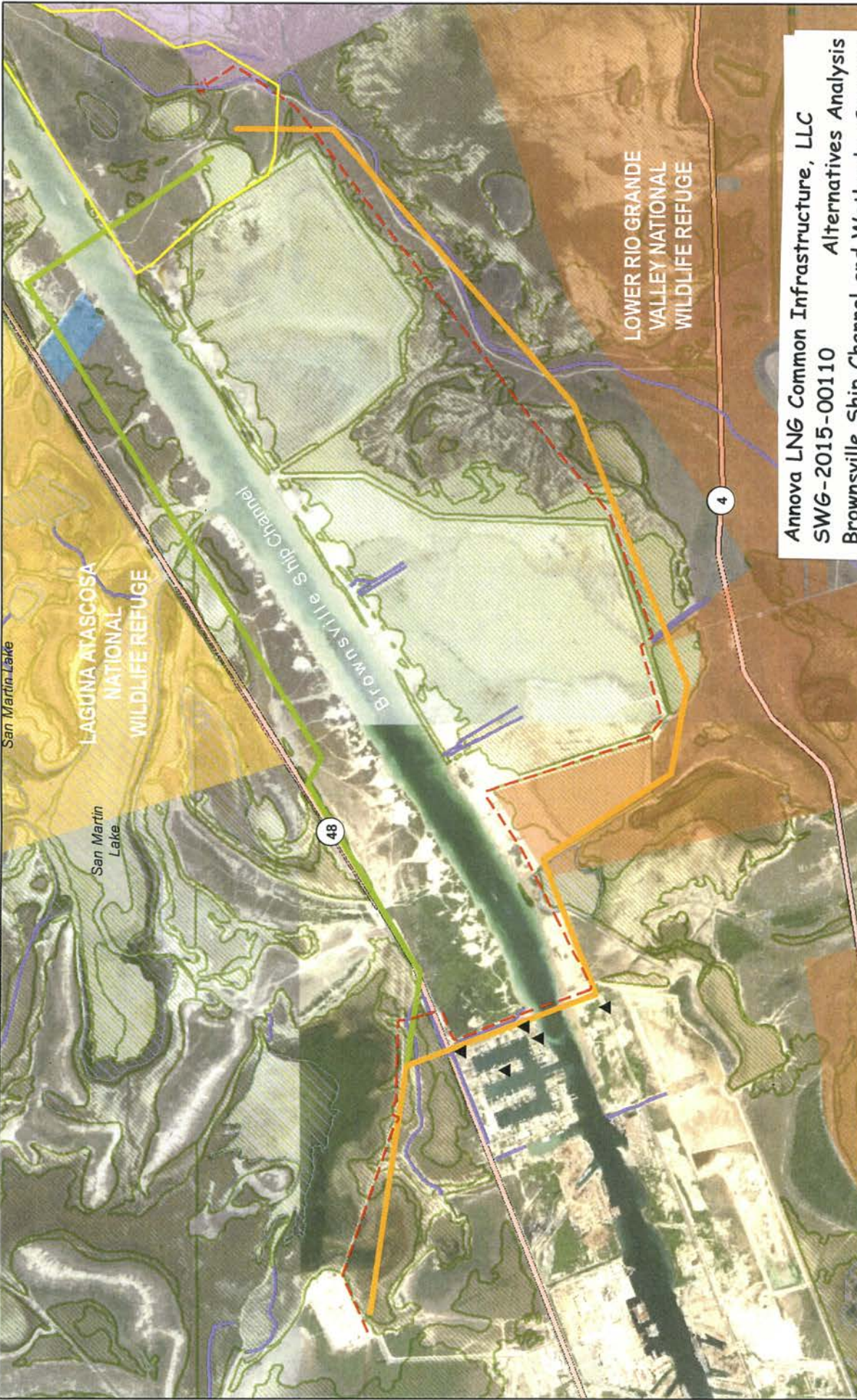
Table 2-1 Lateral Alternatives Analysis

Environmental Features	Unit	Alternative A	Alternative B
Texas State Parks	Miles along centerline	0.0	0.0
National Park Service (NPS) National Parks	Miles along centerline	0.0	0.0
National Scenic Trails	Number crossed by the centerline	0.0	0.0
United States Fish and Wildlife (USFWS) National Wildlife Refuge (NWR)	Miles along centerline	1.3 ¹	0.2 ²
Total Public Lands Crossed	Miles along centerline	1.3	0.2
Land Use/Land Cover			
Agricultural and Open Lands ³	Miles along the centerline	0.8	0.3
Forested Lands	Miles along the centerline	0.6	0.7
Open Water	Miles along the centerline	0.1	<0.1
Urban/Developed Areas	Miles along the centerline	3.0	1.9
Woody Wetlands (mangroves)	Miles along the centerline	2.9	3.1
Shrub/Scrub	Miles along the centerline	0.4	0.4
Unclassified	Miles along the centerline	0.2	0.3
Water Resources			
Wild and Scenic Rivers	Number crossed by the centerline	0	0
Major Channel Crossings Requiring Horizontal Directional Drilling (HDD)	Number crossed by the centerline (Total count)	1 ⁴	2 ⁵
National Wetlands Inventory (NWI) Wetlands Crossed			
Emergent Wetlands (EEM)	Acres along the centerline	14.4	17.4
Open Water Wetlands (E1, E2, L, PUB, PAB, PUS)	Acres along the centerline	22.5	18.9
Other	Acres along the centerline	4.1	6.0
Scrub/Shrub (ESS) ⁶	Acres along the centerline	0.0	0.0
Total NWI Acreage	Total Acres Per Route	41.0	42.3
Biological Resources			
USFWS-Designated Critical Habitat	Miles along the centerline	0.0	0.0
Coastal Migratory Pelagic Resources, Reef Fish, Shrimp, and Red Drum Essential Fish Habitat (EFH)	Miles along centerline	0.0	0.1
Texas Natural Diversity Database (TXNDD) Threatened or Endangered Species Occurrences ⁷	Number Per Route	9.0	4.0
Soil, Geology, and Topography			
Fault Lines ⁸	Number crossed by the centerline	2.0	2.0
Potential Contamination			
United States Environmental Protection Agency (USEPA) Environmentally Regulated Sites ⁹	Number within 0.25 mile	5.0	0.0

Notes:

¹ Lower Rio Grande Valley NWR.² Redhead Ridge Conservation Easement is land owned by the Brownsville Navigation District (BND) but leased to USFWS for a conservation easement.³ NLCD 2011⁴ This is the Brownsville Ship Channel (BSC).⁵ These consist of the BSC and the inlet between San Martin Lake and the BSC.⁶ While NWI maps do not indicate the presence of shrub/scrub wetlands along the routes; field observations indicate the presence of shrub/scrub wetlands (mangroves) exist along both routes.⁷ These occurrences represent areas of varying size where species have been observed or are known to occur. This data are for planning purposes only. This occurrence data indicate species could be within or adjacent to the proposed route, but do not necessarily indicate species will be directly impacted by the route.⁸ <https://txpub.usgs.gov/dss/texasgeology>⁹ USEPA FRS

Annova LNG Common Infrastructure, LLC
 SWG-2015-00110 Alternatives Analysis
 Brownsville Ship Channel and Wetlands, Cameron
 County, Texas. Sheet 2 of 5.



Annova LNG Common Infrastructure, LLC
SWG-2015-00110
Brownsville Ship Channel and Wetlands, Cameron
County, Texas.

- Proposed Lateral
- Alternative A
- Alternative B
- Annova Facility
- Gas Meter Station
- ▲ EPA Regulated Sites
- NHD Stream/Canal
- NHD Waterbody
- NWI Wetland
- State Highway
- Laguna Atascosa National Wildlife Refuge, Owned in Fee
- Laguna Atascosa National Wildlife Refuge, Memorandum
- Lower Rio Grande Valley National Wildlife Refuge, Owned in Fee
- Lower Rio Grande Valley National Wildlife Refuge, Lease
- Lower Rio Grande Valley National Wildlife Refuge, Unknown Interest

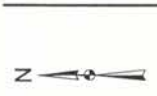


Figure 2-1
 Alternatives
 Proposed Lateral

Sheet 3 of 5

Annova LNG Common Infrastructure, LLC
SWG-2015-00110 Alternatives Analysis
Brownsville Ship Channel and Wetlands, Cameron
County, Texas. Sheet 4 of 5.

Alternative A crosses fewer wetlands and fewer major channels than Alternative B. Based on the desktop analysis (Table 2-1), Alternative A contains fewer NWI wetlands and mangrove wetlands. Alternative B would cross the BSC, the wide perennial channel, and associated wetlands and flats between the BSC and San Martin Lake. Additionally, the BSC crossing for Alternative B will require the horizontal directional drill (HDD) rig to be located in wetlands/mudflats on the north side of the BSC. The Alternative B BSC crossing will also require extensive temporary workspace south of the BSC and within the Annova LNG facility's project boundary.

Alternative A potentially crosses more conservation lands than the Alternative B Corridor; however, feasible minor route adjustments were identified to avoid the conservation lands completely (see Section 2.3). The conservation lands along the Alternative A Corridor could be avoided only by adding an additional HDD bore under the conservation lands.

Two National Historic Landmarks (NHLs) are located in the region; however, these resources will not be affected. The sites are the Palmito Ranch Battlefield NHL and the Palo Alto Battlefield NHL. Construction impacts will be temporary and primarily on herbaceous vegetative communities, and the ROW will be restored to preconstruction contours; therefore, no long-term visual impacts on these NHLs are anticipated.

The United States Environmental Protection Agency (USEPA) Facility Registry System (FRS) identified five facilities within 0.25 mile of Alternative A; however, these sites will not be affected. Additionally, a facility's listing on the USEPA FRS directory does not indicate that contamination exists at the site. Further desktop evaluation indicates that these sites generally hold National Pollutant Discharge Elimination System (NPDES) permits, air permits, and/or are listed as Resource Conservation and Recovery Act (RCRA) hazardous waste small-quantity generators. Of note, the Brownsville Fishing Harbor Waste Water Treatment Plant was listed in the enforcement and compliance database. Though the particular issue for listing was not identified, the issue is likely in relation to effluent from the treatment plant and will not affect lands traversed.

Alternative B is shorter in length, but it requires two major channel crossings (the BSC and the channel between the BSC and San Martin Lake), while Alternative A requires only one major channel crossing (the BSC). Additionally, the channel between the BSC and San Martin Lake has tidally influenced, unvegetated flats and wetlands adjacent to the channel that will increase the distance of the crossing. The channel is approximately 175 feet wide, but the HDD crossing would need to be approximately 1,800 feet long. The HDD crossing of the BSC for Alternative B has limited space on the north side of the BSC. As a result, the drill rig/drill entry hole will have to be located on the north side of the BSC within existing wetlands and mudflats, adding an additional temporary impact. In addition, Alternative B would cross the Redhead Ridge Conservation Easement, unless the easement is avoided by using an additional HDD bore.

Based on the advantages of Alternative A and the disadvantages of Alternative B, further refinements were made to develop the proposed Lateral route. These refinements were made to reduce impacts on sensitive resources and conservation areas, minimize the number of affected landowners, and address constructability. These refinements included the following:

- Rerouting around a portion of land not controlled by the BND eliminated an additional affected landowner.

- Moving the centerline closer to the BSC to minimize the number of affected landowners south of the BSC and to shorten the HDD as much as practicable. Shortening the HDD also shortened the area necessary for HDD pipe stringing for pullback, resulting in avoidance of impacts on an area of dense loma vegetation (ocelot [*Leopardus pardalis*] habitat) south of the current HDD stringing and pullback area.
- Shifting the centerline and associated workspaces north toward the BSC and east toward the dredged material placement area (MP 3.5 to 5.3) to avoid crossing any conservation lands owned by the USFWS.
- Moving the majority of the eastern half of the route slightly to the north and straightening it. This resulted in avoidance of an area (MP 6.6 to 6.7) of dense loma vegetation (potential ocelot habitat), reduced the number of existing road crossings, and generally aided constructability.
- Shifting the last 0.5 mile of the eastern end of the route to the east to avoid dense loma vegetation and minimize impacts on a wildlife corridor established at the Annova LNG Brownsville Project.

Annova LNG Common Infrastructure, LLC
SWG-2015-00110 Alternatives Analysis
Brownsville Ship Channel and Wetlands, Cameron
County, Texas. Sheet 5 of 5.