

## **Northern Integrated Supply Project**

## **Route Alternatives Analysis**

## for

# **Pipelines within Larimer County**

## Introduction DRAFT

May 2019

Prepared by:

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#### **DECISION MODEL AND CRITERIA**

Dewberry/HDR and Northern Water (NW) developed a decision model to evaluate alternative pipeline routes for all of the alignments within Larimer County that will comprise the Northern Integrated Supply Project. These pipelines include: Northern Tier, Poudre Delivery, and County Line Pipelines. The general location of these three alignments can be seen in **Figure 1**.

The decision model considers multiple criteria including cost and non-cost criteria to determine a preferred alignment. The non-cost criteria considered include the following:

- Conduit Length
- Easement Difficulty
- Right-of-Way Impact
- Landowner Impact
- Proximity to Occupied Dwellings
- Environmental Impacts
- Existing Utilities
- Hazardous/Permitted Crossings
- Surface and Street Impacts
- Traffic Impacts
- Water Storage Reservoirs Impacts
- Construction Durations and Relative Constructability
- Required Trenchless Crossings
- Development Pressure
- Operation and Maintenance (O&M) Access
- O&M Requirements
- Natural Resources Impacts

Dewberry/HDR and NW established the criteria based on the project scope, key differentiators, and relative importance to NW. After identifying and defining criteria, a relative performance system was established where alternative alignments were evaluated against the criteria and given a rating of "Green" for good performance, "Yellow" for moderate performance and "Red" for poor performance under the criteria. **Table 1** lists the evaluation criteria applied as well as a description of the criteria and its performance metrics.



Figure 1 - Overview of alignments located in Larimer County: Northern Tier, Poudre Delivery and County Line



	Table 1 – Matrix	Evaluation	Criteria,	Descri	ption.	and	Metrics
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Evaluation Criteria	Description	Performance Metrics - Green	Performance Metrics - Yellow	Performance Metrics - Red
Capital Cost	Construction cost for the proposed route, including tunneling, surface improvements, appurtenances, and type of roadway etc. Based on cost curves developed by the project team using similar projects. Additional costs were estimated for specific construction elements such as major dewatering, tunnels, or major crossings	Significantly less expensive alignments	Mid-range or moderately more expensive than lowest cost alignment	Significantly higher cost alignments
Conduit Length	Total length of pipeline	Alignment with the shortest total length in each project area	Alignment with length between the shortest and longest value for each project area	Alignment with the longest total length in each project area
Easement Difficulty	Relative difficulty of acquiring a 100 foot wide easement and the relative quantity of easements required	Alignment crosses the least amount of parcels and/or most of the parcels are rural	Crosses between the least and most amount of parcels and/or a mix of urban and rural parcels	Alignment crosses the most amount of parcels and/or most of the parcels are urban
Right-of-Way Impact	Use of public right-of-way vs private easement for alignments	Alignment uses a relatively low amount of public right-of-way for pipeline	Alignment uses a relatively moderate amount of public right- of-way for pipeline	Alignment uses a relatively high amount of public right-of-way for pipeline
Land Owner Impact	Level of anticipated land owner impact, including land interference and roadway access	Alignment near parcel perimeter, no access impacts	Alignment causes minor parcel division, minor access impacts	Alignment causes major parcel division and/or requires temporarily blocking access
Proximity to Occupied Dwellings	Proximity of alignment to all occupied dwellings	Alignment is less than 100 feet from the least number of occupied dwellings	Alignment is between less than 100 feet from the least and most number of occupied dwellings	Alignment is less than 100 feet from the most number of occupied dwellings
Environmental Impacts	Number and length of 404 crossings (streams, wetlands, etc.) and proximity to riparian areas. National databases were used for wetland and riparian boundaries, site surveys have not been performed	Alignment has relatively low amount of environmental/cultural impacts	Alignment causes relatively low amount of environmental/cultural impacts	Alignment has relatively high amount of environmental/cultural impacts
Existing Utilities	Anticipated utility relocations and level of coordination required with adjacent and crossing utilities	Alignment expected to affect the least amount of utilities due to amount of street crossings	Alignments with relatively moderate amounts of utilities due to number of streets crossed	Alignment expected to affect the most amount of utilities due to amount of street crossings
Hazardous/ Permitted Crossings	Known or anticipated groundwater or soil remediation requirements based on publicly available databases of known sites and their areas of influence	Relatively low number of hazardous/permitted crossing	Relatively moderate number of hazardous/permitted crossings	Relatively high number of hazardous/permitted crossings

raple = matrix Evaluation Ortena, Description, and metrics	Table 1 – Matrix	Evaluation	Criteria,	<b>Description</b>	and Metrics
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Evaluation Criteria	Description	Performance Metrics - Green	Performance Metrics - Yellow	Performance Metrics - Red
Surface and Street Impacts	Level of impact to public infrastructure (street crossings/cuts, use of public roads for haul)	Alignment crosses the least amount of streets	Alignment crosses between the least and most amount of streets	Alignment crosses the most amount of streets
Traffic Impacts	Anticipated impacts to flow of traffic and level of traffic control needed	Relatively minor traffic impacts	Relatively moderate traffic impacts	Relatively major traffic impacts
Water Storage Reservoirs Impacts	Mitigation requirements for proximity to reservoir conduits, dam toe drains and other hydraulic structures	Alignment impacts the smallest number of water storage reservoirs	Alignment is between the least and most of water storage reservoir impacts	Alignment impacts the greatest number of water storage reservoirs
Construction Duration and Relative Constructability	Route complexity due to Length, available construction corridor/access and terrain challenges. Based on similar projects, a daily production rate was estimated	Alignment creates the lowest number of specific construction challenges/shortest construction duration	Alignment creates between the lowest and highest number of specific construction challenges	Alignment creates the highest number of specific construction challenges
Required Trenchless Crossings	Relative quantity and anticipated difficulty of tunneled crossings	Alignment requires the least amount of trenchless crossings in each project area	Alignment requires between the least and the most amount of trenchless crossings in each project area	Alignment requires the most amount of trenchless crossings in each project area
Development Pressure	Presence of current or near term (within 2 years) development within corridor	Alignment with lowest number of development areas nearby or crossed in each project area	Alignment is between the lowest and highest number of development areas nearby or crossed in each project area	Alignment with highest number of development areas nearby or crossed in each project area
Operation and Maintenance (O&M) Access	Accessibility to the pipeline corridor to maintain appurtenances and make repairs and additional cathodic protection required to protect the line due to foreign crossings	Relatively easy O&M access	Relatively moderate O&M access	Relatively difficult O&M access
O&M Requirements	Length of pipeline relative to other alternatives and quantity of anticipated AV/AR and BO facilities relative to other alignments	Alignment contains the least number of air vac and blow off pairs (10 foot sawtooth elevation change)	Alignment contains between least and most number of air vac and blow off pairs	Alignment contains the most number of air vac and blow off pairs (10 foot sawtooth elevation change)
Natural Resources Impacts	Amount of natural areas (ex: trees, wildlife areas) that are impacted due to the specified alignment	Alignment causes the least amount of natural area impacts	Alignment causes between the least and most natural area impacts	Alignment causes the most amount of natural area impacts

#### **DEVELOPMENT OF ALIGNMENT ALTERNATIVES FOR ANALYSIS**

Dewberry/HDR utilized multiple resources to develop GIS based mapping to begin identifying potential pipeline routes for the project. Resources used included:

- Publicly available aerial imagery
- Property boundary information available from Larimer County
- National Databases for wetland and riparian areas
- Publicly available topography information
- Local databases for existing underground utilities

Alternative routes for each alignment were developed following detailed review of aerial mapping and multiple site visits. The following paragraphs provide additional information regarding key issues impacting development of routes for analysis.

#### Private Easement vs Public Right-of-Way

Public ROW is used extensively for distribution of local drinking water, natural gas, wastewater conveyance, telephone, cable TV and fiber optic lines. These local utilities are excavated and modified with some frequency and each time one of these utilities is modified or extended, the utilities surrounding them are put at elevated risk of damage. Unlike local water distribution pipe networks, the NW system does not have a redundant pathways for system conveyance, so it is imperative that the pipelines be located in privately owned easements where NW can better control when and how excavations near their pipelines are performed. This added layer of safety not only protects NW's pipelines but also the general public.

NW's pipeline infrastructure is typically larger in diameter and operates at higher pressures than typical municipal underground utilities. Damage to a NW pipeline by a contractor modifying small local underground utilities will result in greater local collateral damage than would occur with typical municipal water distribution pipelines.

Additional benefits associated with locating NW's pipelines in private easements include:

- NW strives to be a good neighbor and preserving public Rights-of-Way for local infrastructure is in line with that objective.
- Provides for simpler and safer maintenance and operations access for NW staff.
- Since public ROW is heavily utilized for local buried infrastructure, there is typically inadequate space to accommodate construction of the large diameter pipelines required by this project.
- It is preferable to impact specific landowners, as opposed to impacting an entire community with extensive roadway reconstruction, utility relocations and traffic detours.

For the above noted reasoning, NW generally considers acquiring private easements to be preferable to acquiring/constructing in public Rights-of-Way.

#### **Fatal Flaw Analysis and Construction Corridor**

If a proposed alignment alternative contained an issue which was determined to be a "fatal flaw" then a complete analysis was not carried out. Examples of fatal flaws include crossing an excessive number of parcels, bisecting natural areas, extensive length in public Right-of-Way, and excessive pipeline length, which would be detrimental to pipeline hydraulics.

When assessing these criteria, a 100 foot construction corridor was considered. This is made up of a 60 foot permanent easement and a 40 foot temporary construction easement. For example, when assessing impacts to parcels in close proximity to the alignment, a distance of 100 feet was measured from the alignment to the occupied dwelling to determine if it would or would not be affected.

#### **Reconciliation of End Points**

It was also decided that a correction factor would be used to reconcile differences in end points. This applies to alignments with multiple project areas. An initial assessment would be performed and if the winning alternatives in different project areas required reconciliation in order to connect, then the additional length/other criteria would be applied to the alternatives in both area and the analysis re-run with the connecting pipelines considered in the analysis.

#### **IMPACTS MINIMIZATION PLAN**

A comprehensive Impacts Minimization Plan was utilized for this analysis. This plan included steps to decrease impacts on public and private resources. When developing the criteria in **Table 1**, emphasis was placed on mitigating negative impacts and enhancing the area if possible throughout the construction process. The specific steps taken were as follows:

- 1. Identifying pipeline alignment alternatives within private Right-of-Way as much as possible to minimize general public impact (road closures and blocked access)
- 2. Developing pipeline alignments that are adjacent property lines and avoid splitting a property
- 3. Routing alignment options to avoid occupied dwellings/homes
- 4. Assessing environmental impacts to wetlands and adjusting routes to cause as little disturbance as possible
- 5. Routing alignment options to minimize number of street crossings, potential utility conflicts, and traffic disturbances
- 6. Routing alignment options to minimize impacts to water storage reservoirs by avoiding dam toes
- 7. Pipeline alignments were drawn to avoid or minimize conflicts with future developments
- 8. Promote pipeline routing that minimizes construction impact on trees and other natural resources



## **Northern Integrated Supply Project**

## Northern Tier Delivery Pipeline Alternatives Analysis

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#### **ROUTE COMPARISONS**

Each of the alternatives developed was subjected to the evaluation criteria and metrics described in **Table 1** in the Introduction. The Northern Tier segment was broken into 3 Project Areas, which made for easier comparison of alternatives. The Project Areas also enabled the project team to look at combinations of alternatives for each Project Area and facilitated a thorough analysis for the final Preferred Alignment.

An overview of all of the Project Areas and the alternative options can be seen in **Figure N.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternate with the best overall performance (least reds, most greens) was chosen to be the Preferred Alternate. This Preferred Northern Tier Alignment can be seen in **Figure N.17** at the end of this document.

In total, three (3) alternates were assessed for Project Area 1, three (3) alignment alternates were assessed for Project Area 2, and four (4) alignment alternates were assessed for Project Area 3. However, additional alignment options for each project area are present in **Figure N.1** and are shaded different colors of grey. These alignments were considered to contain a "fatal flaw" and a complete analysis was not completed. These alignments still have their own map and fact sheet which explain in more detail the reasons why they were not selected or evaluated further.

There is also a segment called "Common Segment" which can be seen on the individual alignment alternative maps, as well as on the overall maps. This segment is symbolized as a dashed red line and is not included in the matrix comparisons as it is shared by every alternate. The "Common Segment" connects the Proposed Glade Reservoir with the alignment alternates in Project Area 1.



Figure N.1 – Northern Tier Project Areas and Alternatives

Sewberry PS



Alternative Name	N-1.1			
Alternative Location & Description	This a northw side of the co reloca Home Union and St	lignment begir vest of the inte f Hwy 14 until ncrete plant. tion. It continu s of Distinctior Pacific Railroa torage Reserve	is on the north side of Hwy 14 approximately 1,500 feet rsection with CR 54E. Alignment N-1.1 parallels the north it turns to the southwest over a ridge and passes through This alignment follows the proposed ROW of the Hwy 287 use east passing diagonally until reaching the back of a development. From there, it turns east and crosses the ad before paralleling the southern edge of Water Supply oir 3.	
Criteria		Ranking	Comments	
Capital Cost		Green	Estimated cost \$19,048,000	
Conduit Length		Green	Estimated 6.01 miles, 31,732 feet	
Easement Difficulty		Yellow	Estimated 18 parcels crossed	
Right-of-Way Impact		Yellow	Alignment is in Hwy 14 ROW for significant portion	
Land Owner Impact		Yellow	About 4 parcels are split. One is expected to amenable to diagonal crossing	
Proximity to Occupied Dwellings		Green	Less than 100 feet from an estimated 1 dwelling	
Environmental Impacts		Yellow	Six (6) wetland crossings	
Existing Utilities		Yellow	Moderate impact to utilities due to location in ROW for a portion and street crossings	
Hazardous/Permitted Crossings		Yellow	Crosses old cement plant which is indicated to be a "Solid Waste Facility"	
Surface and Street Im	pacts	Yellow	Estimated 7 road crossings.	
Traffic Impacts		Yellow	Moderate traffic impacts for section in ROW and road crossings	
Water Storage Reserv Impacts	voirs	Green	Not in the vicinity(less than 100 feet) of water storage reservoir toe dam	
Construction Duration and Relative Constructability		Green	Estimated Total Active Days: 186 days Estimated Total Days: 266 days	
Required Trenchless Crossing		Yellow	Highway 14 and UP RR twice	
Development Pressur	e	Green	No significant development pressure identified	
Operation and Maintenance Access		Yellow	Moderate access, both close and far proximity to roadways	
O&M Requirements		Yellow	Significant elevation changes to be resolved with re- routing of Hwy 287. Decent elevation change around Hwy 14. About 2 pairs	
Natural Resources Im	pacts	Green	Minimal impacts. Some trees impacted along roadway and in wetland crossing	



Alternative Name	N-1.2	N-1.2			
Alternative Location & Description	This a northy alignm concre reside Railro Storag Storag alignm	lignment begi vest of the inte nents. Alignm nent, however ete plant. It fo intial property ad. After cross ge Reservoir 4 ge Reservoir 4 nent.	ns on the north side of Hwy 14 approximately 1,500 feet ersection with CR 54E, at the same location as the other ent N-1.2 begins following the same route as the previous continues south before skirting the southern edge of the llows up the eastern side of the plant, where it then follows lines, while heading east until crossing Union Pacific sing, it ends south, then east towards Water Supply and where it crosses a channel between Kluver Reservoir and before ending in the same location as the previous		
Criteria		Ranking	Comments		
Capital Cost		Yellow	Estimated cost \$20,380,000		
Conduit Length		Red	Estimated 6.51 miles. 34,362 feet		
Easement Difficulty		Yellow	Estimated 20 parcels crossed		
Right-of-Way Impact		Yellow	Alignment is in Hwy 14 ROW for significant portion		
Land Owner Impact		Yellow	About 3 parcels are split		
Proximity to Occupied Dwellings		Yellow	Less than 100 feet from an estimated 2 dwellings		
Environmental Impacts		Yellow Five (5) wetland crossings			
Existing Utilities		Red	Relatively high impact to utilities due to location in ROW for large portion and high number of street crossings		
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings		
Surface and Street Ir	npacts	Red	Estimated 9 road crossings.		
Traffic Impacts		Red	Relatively high due to amount of road crossings		
Water Storage Reservoirs Impacts		Yellow	Not in the vicinity(less than 100 feet) of water storage reservoir toe dam. Alignment does pass through deep connection channel between Kluver Reservoir and Water Supply and Storage Reservoir 4		
Construction Duration and Relative Constructability		Green	Estimated Total Active Days: 184 days Estimated Total Days: 264 days		
Required Trenchless Crossing		Yellow	Highway 14 and UP RR once. Possibly one additional tunnel, if one needed for deep reservoir connection		
Development Pressu	re	Green	No significant development pressure identified		
Operation and Maintenance Access		Yellow	Moderate access, both close and far proximity to roadways		
O&M Requirements		Red	Decent elevation change around HW 14. Moderate need for air vac and blow off pairs. Also, longer length for more maintenance	I	
Natural Resources In	npacts	Green	Minimal impacts. Some trees impacted along roadway and in wetland crossing		





Alternative Name	N-1.3	N-1.3			
Alternative Location & Description	This alignment begins on the north side of Hwy 14 approximately 1,500 feet northwest of the intersection with CR 54E. Alignment N-1.3 parallels the north side of Hwy 14 until it crosses the highway just west of the intersection with Green Mile Drive. It then parallels the south side of Hwy 14 until it turns east and southeast through rural residential parcels. It passes over a large rocky hillside which would likely require a long tunnel to make it hydraulically feasible. The alignment then crosses Hwy 14 again as it passes through the steep ridge along current CR 56E, south of the concrete plant and then continues to the north along the east side of CR 56. It continues east paralleling the north side of the Union Pacific Railroad ROW to Taft Hill Road. From there, it heads north and then east where it ends between Water Supply and Storage Reservoir 3 and Reservoir 4.				
Criteria		Ranking	Comments		
Capital Cost		Red	Estimated cost \$23,634,000		
Conduit Length		Yellow	Estimated 6.30 miles, 33,261 feet		
Easement Difficulty		Red	Estimated 25 parcels crossed		
Right-of-Way Impact		Yellow	Alignment is in Hwy 14 ROW for portion		
Land Owner Impact		Yellow	About 5 parcels are split.		
Proximity to Occupied Dwellings		Yellow	Less than 100 feet from an estimated 2 dwellings		
Environmental Impacts		Yellow	Six (6) wetland crossings		
Existing Utilities		Yellow	Moderate impact to utilities due to location in ROW for a portion and street crossings		
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings		
Surface and Street In	npacts	Yellow	Estimated five (5) road crossings.		
Traffic Impacts		Yellow	Moderate traffic impacts for section in ROW and road crossings		
Water Storage Reser Impacts	voirs	Green	Not in the vicinity(less than 100 feet) of water storage reservoir toe dam		
Construction Duration and Relative Constructability		Red	Estimated Total Active Days: 380 days Estimated Total Days: 460 days		
Required Trenchless Crossing		Red	Five (5) tunnels needed. Highway 14 three times, Rocky ridge and UP RR twice		
Development Pressu	re	Green	No significant development pressure identified		
Operation and Maintenance Access		Red	Alignment passes through hard to access areas and is not near roadways for much of the length		
O&M Requirements		Red	Significant elevation change through rocky ridge. Tunnel needed. Moderate need for air vac and blow off pairs.		
Natural Resources In	pacts	Green	Minimal impacts. Some trees impacted along roadway and in wetland crossing		



Figure N.4 – Alternative N-1.3

Alternative Name	N-1.4			
Alternative Location & Description	This alignn northwest turns to the and then tu it reaches east parall other align Reservoir This alignn within the I continuatio roadway, t definitely g alternative	nent begir of the inte e east at C urns south what woul eling Doug ment, betw 4. nent was i Douglas R on of this a raffic and jetting rem as it does	as on the north side of Hwy 14 approximately 1,500 feet resection with CR 54E. It runs parallel to Hwy 14 until it CR 56E through the steep ridge, south of the concrete plant back to Hwy 14. It parallels the north side of Hwy 14 until d be an extension of Douglas Road and continues to the glas Road until it ends at the same longitude as the as the ween Water Supply and Storage Reservoir 3 and removed in the initial screening process. This alignment is load Right-of-Way for the portion of the length. The lignment in Project Area 2 impacts an extensive amount of landowners. Since the continuation of this alignment is noved from screening, there was no purpose to assess this a not connect to any other proposed alignment options.	ALT: N-1.4
Criteria	Ra	inking	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				Highway 14 14 Curtis Lake
Land Owner Impact				
Proximity to Occupie Dwellings	d			RUTERS DR 2 PREMIUS
Environmental Impac	ts			
Existing Utilities				REEN AND
Hazardous/Permitted Crossings				
Surface and Street Ir	npacts			
Traffic Impacts				
Water Storage Reser Impacts	voirs			
Construction Duration Relative Constructab	n and ility			Solid Waste Facility
Required Trenchless Crossing				NWI Wetlands
Development Pressu	re			Riparian Corridor
Operation and Maintenance Access				
O&M Requirements				Figure N.5 – Alternative N-1.4
Natural Resources In	npacts			



Alternative Name	N-1.5		
Alternative Location & Description	This alignment b northwest of the side of Hwy 14 f CR 23E before t through the opei Humble Road pa alignment veers lines surroundin alignments, betw This alignment v fact that it is sign means negative continuation of t roadway, traffic alignment is defit to assess this al options.	begins on the north side of Hwy 14 approximately 1,500 feet intersection with CR 54E. Alignment N-1.5 parallels the north for a section. It turns to the north and follows the east side of turning to the east through the steep ridge. It continues east n space north of Curtis Lake and follows along the north side of ast Taft Hill Road. About a half mile past Taft Hill Road, the north and then northeast to skirt the edges of the property g the reservoirs. It ends at the same longitude as previous ween Water Supply and Storage Reservoir 3 and Reservoir 4. was removed in the initial screening process. This is due to the nificantly longer than other viable alternatives. A longer length hydraulic impacts and more maintenance in the future. The this alignment is also not considered further due to its excessive and landowner impacts. Since the continuation of this initely getting removed from screening, there was no purpose Iternative as it does not connect to other proposed alignment	ALT: N-1.5 ALT: N-1.5 DALISST DALISST BIE (1) (2) (2) (2) (2) (2) (2) (2) (2
Criteria	Ranking	g Comments	
Capital Cost			
Conduit Length			
Easement Difficulty			
Right-of-Way Impact			
Land Owner Impact			Curtis Lake
Proximity to Occupied Dwellings	d		
Environmental Impac	its		
Existing Utilities			
Hazardous/Permitted Crossings			The second secon
Surface and Street In	npacts		
Traffic Impacts			
Water Storage Reser Impacts	voirs		Parcel
Construction Duration Relative Constructab	n and ility		NWI Wetlands
Required Trenchless Crossing			Riparian Corridor Glade Reservoir (future)
Development Pressu	re		
Operation and Maintenance Access			Figure N.6 – Alternative N.1.5
O&M Requirements			
Natural Resources In	npacts		



Alternative Name	N-1.6			
Alternative Location & Description	This alignm northwest of the south s the South F turning to th space north Taft Hill Ro and then no reservoirs. Water Supp This alignm largely the	nent begir of the inte ide of Wil Poudre Ca he east th h of Curtis oad. Abou ortheast to It ends at ply and Si nent was i same as	is on the north side of Hwy 14 approximately 1,500 feet rsection with CR 54E. Alignment N-1.6 begins following low Nook Road then continues to the northeast paralleling anal to CR 23E. It follows the east side of CR 23 E before irough the steep ridge. It continues east through open s Lake and follows along the north side of Humble Road to at a half mile past Taft Hill Road, the alignment veers north o skirt the edges of the property lines surrounding the t the same longitude as previous alignments, between torage Reservoir 3 and Reservoir 4. removed in the initial screening process. The reasons are Alternate N-1.5 due to the similarities in their location.	ALT: N-1.6
Criteria	Rai	nking	Comments	
Capital Cost				
Conduit Length				287
Easement Difficulty				
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			
Environmental Impac	cts			HIGHWAY 14 14 Curtis Lake
Existing Utilities				
Hazardous/Permitteo Crossings	t			
Surface and Street Ir	mpacts			
Traffic Impacts				REEN AND REEN AND
Water Storage Reser	rvoirs			
Construction Duratio Relative Constructab	n and bility			
Required Trenchless Crossing	5			Parcel
Development Pressu	ıre			NWI Wetlands
Operation and Maintenance Access	;			Glade Reservoir (future)
O&M Requirements				
Natural Resources Ir	npacts			Figure N.7 – Alternative N-1.6



Alternative Name	N-2.1		
Alternative Location & Description	Alignment N-2.1 begins in-between Kulver Reservoir and Water Supply Reservoir #4 and then heads northeast in-between Water Supply Reservoir #3 and #4 and north of Dixon Reservoir. It turns south east of Dixon Reservoir before heading east at CR 56. It continues southeast through rural residential and agricultural properties, adjacent to Annex Reservoir #8 to Grey Rock Drive. It turns east and parallels Grey Rock Drive until it crosses Thornton farm diagonally, and then follows CR 54 until the intersection with Giddings Rd.		
Criteria		Ranking	Comments
Capital Cost		Green	Estimated cost \$13,083,000
Conduit Length		Green	Estimated 4.36 miles, 23,012 feet
Easement Difficulty		Yellow	Estimated 26 parcels crossed
Right-of-Way Impact		Green	Not in ROW for almost all of the alignment, except street crossings and small portion if CR 56 to avoid residences
Land Owner Impact		Yellow	Close to parcels on Eagle Lake Ct and CR 15. Splits parcels north of Dixon Reservoir. Only one parcel with diagonal crossing. Landowner amenable to diagonal crossing
Proximity to Occupied Dwellings		Yellow	Less than 100 feet from an estimated 8 parcels (Eagle Lake Court, CR 15, Grey Rock Dr)
Environmental Impacts		Green	One (1) wetland crossing
Existing Utilities		Green	Minimal impacts to existing utilites because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings expected
Surface and Street Impacts		Yellow	Estimated eight (8) road crossings and in CR 56 for small portion to avoid residences.
Traffic Impacts		Yellow	Moderate traffic impacts from small section in ROW and road crossings
Water Storage Reser Impacts	voirs	Green	Close to the side of Annex Reservoir 8
Construction Duration and Relative Constructability		Green	Estimated Total Active Days: 94 Estimated Total Days: 174
Required Trenchless Crossing		Yellow	One (1) (Highway 1)
Development Pressure		Green	No development pressure expected
Operation and Maintenance Access		Yellow	Moderate access, both close and far proximity to roadways
O&M Requirements		Green	Relatively moderate amount of air vac and blow off pairs
Natural Resources In	npacts	Green	Minimal-moderate impact. A few tree areas affected



Alternative Name	N-2.2			Your A Part
Alternative Location & Description	Alignment N-2.2 begins between the toe of Water Supply Reservoir #3 dam and the north shore of Water Supply Reservoir #4. It then turns north along the east shore of Reservoir #3 and the back of rural residential lots. It turns east beyond the residential lots to Hood Lane and heads south on the west side of Hood Lane. It turns to the east in between Windsor Reservoir #8 dam and the north shore of Annex Reservoir Number 8 to CR 56. It continues east down CR 56 until the intersection with Giddings Road.		ins between the toe of Water Supply Reservoir #3 dam of Water Supply Reservoir #4. It then turns north along the roir #3 and the back of rural residential lots. It turns east al lots to Hood Lane and heads south on the west side of to the east in between Windsor Reservoir #8 dam and the Reservoir Number 8 to CR 56. It continues east down section with Giddings Road.	ALT: N-2.2
Criteria	R	anking	Comments	
Capital Cost	Ye	ellow	Estimated cost \$13,435,000	ACCY RIDGE IN THE CH
Conduit Length	Ye	ellow	Estimated 4.44 miles, 23,417 feet	Rocky
Easement Difficulty	G	Breen	Estimated 17 parcels crossed	BUCK DR Ridge Lake
Right-of-Way Impact	G	Green	Not in ROW for almost all of the alignment, except street crossings	
Land Owner Impact	Ye	ellow	Estimated 2 parcels split. In backyard of residences	
Proximity to Occupied Dwellings	d Gi	Green	Less than 100 feet from an estimated 2 parcels (Eagle Lake Drive)	
Environmental Impac	ts Ye	ellow	Two (2) wetland crossings	Windsor Reservior
Existing Utilities	G	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings	No 8
Hazardous/Permitted Crossings	G	Green	No hazardous/permitted crossings expected	Reservoir Reservoir Motor
Surface and Street In	npacts Ye	ellow	Estimated seven (7) road crossings.	Supply 2 A A A A A A A A A A A A A A A A A A
Traffic Impacts	Ye	ellow	Moderate traffic impacts from road crossings	KIN CREY ROCK DR
Water Storage Reser Impacts	voirs	ellow	Less than 100 feet from side of Storage Reservoir 3. Less than 100 feet from edge of Annex Reservoir 8	
Construction Duration Relative Constructab	n and ility	ellow	Estimated Total Active Days: 99 Estimated Total Days: 179	
Required Trenchless Crossing	Ye	ellow	1 (Highway 1)	
Development Pressu	re G	Breen	No development pressure expected	
Operation and Maintenance Access	Ye	ellow	Moderate access, both close and far proximity to roadways	Parcel Terry Lake
O&M Requirements	G	Green	Relatively moderate amount of air vac and blow off pairs	Riparian Corridor
Natural Resources In	npacts Ye	ellow	Moderate impact, some trees affected	Figure N.9 – Alternative N-2.2



Alternative Name	N-2.3						
Alternative Location & Description	Alignm from H evalua	nent N-2.3 to lood Lane to tion criteria.	very similar to N-2.2 with modifications to the alignment Windsor Reservoir to achieve better performance in the				
Criteria		Ranking	Comments				
Capital Cost Yellow		Yellow	Estimated cost \$13,116,000				
Conduit Length		Green	Estimated 4.32 miles, 22,819 feet				
Easement Difficulty		Green	Estimated 15 parcels crossed				
Right-of-Way Impact		Green	Not in ROW for almost all of the alignment, except street crossings				
Land Owner Impact		Yellow	Estimated 3 parcels split. In backyard of residences				
Proximity to Occupie Dwellings	d	Green	Less than 100 feet from an estimated 2 parcels (Eagle Lake Drive)				
Environmental Impac	cts	Green	1 wetland crossing				
Existing Utilities Green		Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings				
Hazardous/Permittec Crossings	ł	Green	No hazardous/permitted crossings expected				
Surface and Street Ir	npacts	Yellow	7 road crossings. 21 crew days for crossings				
Traffic Impacts		Yellow	Moderate traffic impacts from road crossings				
Water Storage Reser	rvoirs	Yellow	Less than 100 feet from side of Storage Reservoir 3. Less than 100 feet from edge of Annex Reservoir 8. Close to North Poudre Reservoir 10				
Construction Duration Relative Constructab	n and ility	Yellow	Estimated Total Active Days: 97 Estimated Total Days: 177				
Required Trenchless Crossing		Yellow	1 (Highway 1)				
Development Pressu	re	Green	No development pressure expected				
Operation and Maintenance Access		Yellow	Moderate access, both close and far proximity to roadways				
O&M Requirements		Green	Relatively moderate amount of air vac and blow off pairs				
Natural Resources Ir	npacts	Yellow	Moderate impact, some trees affected				



ALT: N-2.3

16

HIGHWAY

Windsor Reservior No 8

ROOB

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1)

Annex Reservoir No 8

GREY ROCK DR

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BRADLEY DR

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LAMESADR

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HIGHLAND PLACE RD

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State of Lot of

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5 1 

3

Alternative Name	N-2.4		
Alternative Location & Description	Alignment N-2.4 be between Water Sup south, along Dougla Giddings Road. This alignment was within the Douglas causes an extensiv it is nearby and roa due to extended co dwellings, cost of e	gins at the same longitude as previous alignments ended, oply and Storage Reservoir 3 and Reservoir 4, but further as Road. It continues east following Douglas Road to removed in the initial screening process. This alignment is Road Right-of-Way for the majority of the length. It also e amount of landowner impact due to the number of parcels d closures. It would be much more expensive to construct nstruction duration caused by proximity to existing asements and utility relocation.	HUMBLE RD HUMBLE
Criteria	Ranking	Comments	
Capital Cost			
Conduit Length			Water Water Reservoir
Easement Difficulty			Supply Res # 4
Right-of-Way Impact			
Land Owner Impact			MISTY CREEK IN ENDURANCH
Proximity to Occupied Dwellings			
Environmental Impac	ts		
Existing Utilities			
Hazardous/Permitted Crossings			BLUE HE POVIAN WATH 100 BALL AND
Surface and Street In	npacts		Terry Lake
Traffic Impacts			
Water Storage Reser Impacts	voirs		
Construction Duration Relative Constructab	n and ility		
Required Trenchless Crossing			
Development Pressu	re		Parcel
Operation and Maintenance Access			NWI Wetlands
O&M Requirements			PRISTLE CONE DE CONE D
Natural Resources In	npacts		Figure N.11 – Alternative N-2.4



Alternative Name	N-2.5			
Alternative Location & Description	Alignment N between Wa north, north around Rocł to Terry Lak the south be turns south a through agri This alignme has a signifil The alignme also contribu would contri this alternati impact less	I-2.5 beg ater Supp of Rocky ky Ridge e Road. efore turn at CR 11 icultural a ent was r cantly lo ent also p uted to th ibute to h ive furthe landown	ins at the same longitude as previous alignments ended, bly and Storage Reservoir 3 and Reservoir 4, but further r Ridge Lake Reservoir 1. It then begins by turning east Lake through rural residential and agricultural properties It continues to follow the west side of Terry Lake Road to ing east at CR 58. It continues east down CR 58 and then . It continues south down CR 11 and then south east and rural residential properties to Giddings Road. emoved in the initial screening process. This alignment nger length than any other alternative in this Project Area. wasses through a highly urban area along CR 58, which the fatal flaw assessment. Additionally, the extended length igher maintenance costs. There was no need to consider or when there are other shorter, viable options which will ers and require less maintenance.	ALT: N-2.5
Criteria	Ran	king	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				Windsor Reservior
Land Owner Impact				
Proximity to Occupie Dwellings	d			Kulver Reservoir
Environmental Impac	ts			Water No 8
Existing Utilities				
Hazardous/Permitted Crossings	I			
Surface and Street Ir	npacts			MESA DO EL TODO
Traffic Impacts				
Water Storage Reser Impacts	rvoirs			
Construction Duration Relative Constructab	n and ility			Parcel
Required Trenchless Crossing				NWI Wetlands Binarian Corridor
Development Pressu	re			Pond CKEEL CV MANSALL
Operation and Maintenance Access				Figure N.12 – Alternative N-2.5
O&M Requirements				
Natural Resources Ir	npacts			



Alternative Name	N-3.1								
Alternative Location & Description	Alignn contin agricu until th	Alignment N-3.2 begins at the Giddings Road and CR 54 intersection and continues east following CR 54 for a mile before heading southeast through agricultural property. It then heads south until reaching CR 52, which it follows until the intersection with CR 1.							
Criteria		Ranking	Comments	AL DE DE DE					
Capital Cost		Green	Estimated cost \$14,203,000	En					
Conduit Length		Green	4.64 miles, 24,515 feet						
Easement Difficulty		Green	Estimated 11 parcels crossed. Majority rural						
Right-of-Way Impact		Yellow	CR 52 ROW for small section to avoid residences						
Land Owner Impact		Yellow	Only one parcel with diagonal crossing. Landowner amenable to diagonal crossing. Close to residences on CR 52						
Proximity to Occupie Dwellings	d	Yellow	Less than 100 feet from an estimated 4 dwellings (CR 52)	C					
Environmental Impac	ts	Green	No wetland crossings						
Existing Utilities Green			Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings						
Hazardous/Permitted Crossings Green			No hazardous/permitted crossings expected						
Surface and Street Ir	npacts	Yellow	Five (5) road crossings. In CR 52 ROW for small section to avoid residences. 15 crew days for crossings	P					
Traffic Impacts		Yellow	Moderate traffic impacts from small section in ROW and road crossings						
Water Storage Reser Impacts	voirs	Green	No impact to water storage reservoir expected						
Construction Duration Relative Constructab	n and ility	Green	Estimated Total Active Days: 119 days Estimated Total Days: 199 days						
Required Trenchless Crossing			Two (2) (I-25 and BNSF), 375 LF						
Development Pressure Green			No development pressure expected						
Operation and Maintenance Access Green			Decent access. Near roadways for large portions						
O&M Requirements		Green	Between 3-5 pairs						
Natural Resources Impacts Green			Minimal impacts. Some residential trees impacted	Figure N					



Alternative Name	N-3.2							
Alternative Location & Description	Alignmen continues east throu then sout developm CR 1.	Alignment N-3.2 begins at the Giddings Road and CR 56 intersection and continues east following CR 56 for a half mile before heading south and then east through agricultural property toward Cobb Lake. It then heads south and then southeast through rural residential parcels in a currently expanding development to CR 52. It turns east following CR 52 until it intersects with CR 1.						
Criteria	R	lanking	Comments					
Capital Cost	R	Red	Estimated cost \$16,828,000					
Conduit Length	R	Red	5.49 miles, 28,978 feet					
Easement Difficulty	Y	ellow	Estimated 15 parcels crossed. Passes through development					
Right-of-Way Impact	Y	ellow	Not in ROW, but would likely need to be for sections to avoid residences					
Land Owner Impact	R	Red	Passes through development. Very close or in parcels. Close to residences on CR 52					
Proximity to Occupied Dwellings	Y	ellow	Less than 100 feet from an estimated 3 dwellings (CR 52)					
Environmental Impact	is G	Green	No wetland crossings					
Existing Utilities	G	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings					
Hazardous/Permitted Crossings	G	Green	No hazardous/permitted crossings expected					
Surface and Street Im	pacts Y	ellow/	5 road crossings. Two to be constructed. 15 crew days for crossings					
Traffic Impacts	Y	ellow	Moderate traffic impacts from small section likely to be in ROW and road crossings					
Water Storage Reserv Impacts	voirs G	Green	No impact to water storage reservoir expected					
Construction Duration Relative Constructabi	and R	Red	Estimated Total Active Days: 141 days Estimated Total Days: 221 days					
Required Trenchless Crossing	Y	ellow	2 (I-25 and BNSF), 375 LF					
Development Pressur	e Y	ellow	Passes through development					
Operation and Maintenance Access	R	Red	Difficult access. Not near major roadways for large portions					
O&M Requirements	R	Red	Between 3-5 pairs. Significantly longer length equates to more maintenance					
Natural Resources Im	pacts G	Green	Minimal impacts. Some residential trees impacted					



Alternative Name	N-3.3							
Alternative Location & Description	Alignm heads House followi	nent N-3.3 beg east following Lane through ng CR 52 to th	gins at the Giddings Road and CR 54 intersection. It then g CR 54 toward Cobb Lake. It turns south at Blossom a gricultural properties to CR 52. It then heads east ne intersection with CR 1.					
Criteria		Ranking	Comments					
Capital Cost		Yellow	Estimated cost \$14,842,000					
Conduit Length		Yellow	4.84 miles, 25,538 feet					
Easement Difficulty		Green	Estimated 12 parcels crossed. Majority rural					
Right-of-Way Impact		Yellow	Not in ROW, but would likely need to be for sections to avoid residences					
Land Owner Impact		Yellow	Close to residences on CR 52					
Proximity to Occupied Dwellings	b	Yellow	Less than 100 feet from an estimated 4 dwellings (CR 52)					
Environmental Impac	ts	Green	No wetland crossings					
Existing Utilities	sting Utilities Green		Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings					
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings expected					
Surface and Street In	npacts	Yellow	6 road crossings. 18 crew days for crossings					
Traffic Impacts		Yellow	Moderate traffic impacts from small section likely to be in ROW and road crossings					
Water Storage Reser Impacts	voirs	Green	No impact to water storage reservoir expected					
Construction Duratior Relative Constructabi	n and ility	Yellow	Estimated Total Active Days: 124 days Estimated Total Days: 204 days					
Required Trenchless Crossing		Yellow	2 (I-25 and BNSF), 375 LF					
Development Pressu	re	Green	No development pressure expected					
Operation and Maintenance Access Yellow			Moderate access, both close and far proximity to roadways					
O&M Requirements Green			Between 3-5 pairs					
Natural Resources Im	npacts	Green	Minimal impacts. Some residential trees impacted					



Alternative Name	N-3.4		(COTA )			
Alternative Location & Description	Alignment 3D begins at the Giddings Road a half of a mile south of the CR 54 intersection and continues east through agricultural properties toward Cobb Lake. A half mile east of I-25 it heads south and then south east through agricultural properties to CR 50. It turns east at CR 50 through State of Colorado property to CR1. From there, it heads north to end at the same intersection as the previous alignments, CR 1 and CR 52.					
Criteria	Ranking Comments					
Capital Cost	Red	Estimated cost \$17,460,000				
Conduit Length	Red	5.90 miles, 31,148 feet				
Easement Difficulty	Green	Estimated 11 parcels crossed. Majority rural				
Right-of-Way Impact	Green	Avoids public ROW for almost entire length	7			
Land Owner Impact	Yellow	Splits two parcels near canal. Would need to avoid pig farm	1			
Proximity to Occupie Dwellings	d Green	Less than 100 feet from an estimated 1 dwellings (pig farm)	- TO			
Environmental Impac	ts Yellow	1 wetland crossing	V			
Existing Utilities	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings				
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected	- 10			
Surface and Street Ir	npacts Green	2 road crossings. 6 crew days for crossings	43.99.			
Traffic Impacts	Green	Minimal to no traffic impacts				
Water Storage Reser Impacts	voirs Green	No impact to water storage reservoir expected				
Construction Duration Relative Constructab	n and ility Red	Estimated Total Active Days: 139 Estimated Total Days: 219				
Required Trenchless Crossing	Yellow	Two (2) (I-25 and BNSF), 375 LF	13			
Development Pressu	re Green	No development pressure expected	177			
Operation and Maintenance Access	Red	Difficult access. Not near major roadways				
O&M Requirements	Red	Between 3-5 pairs. Significantly longer length equates to more maintenance				
Natural Resources In	npacts Green	Minimal impacts. Some residential trees impacted	Figure N.16			



**Table N.1** is a visual summary of the score given to every alternative for each criteria. **Table N.2** tabulates the number of greens, yellows, and reds given to each alternative.

Evaluation Criteria	N-1.1	N-1.2	N-1.3	N-1.4	N-1.5	N-1.6	N-2.1	N-2.2	N-2.3	N-2.4	N-2.5	N-3.1	N-3.2	N-3.3	N-3.4
Capital Cost															
Conduit Length															
Easement Difficulty/Cost															
Use of Right-of-Way															
Land Owner Impact															
Proximity to Occupied Dwelling															
Environmental Impacts															
Existing Utilities															
Hazardous/Permitted Crossings															
Surface and Street Impacts															
Traffic Impacts															
Impacts to Water Storage Reservoirs															
Construction Duration and Relative Constructability															
Required Trenchless Crossings															
Development Pressure															
Operation and Maintenance (O&M) Access															
O&M Requirements															
Natural Area Impacts															

#### Table N.1 – Visual Summary of Alternative Scoring



Table N.2 – Numeric Summary of Alternative Scoring

Evaluation Criteria	N-1.1	N-1.2	N-1.3	N-1.4	N-1.5	N-1.6	N-2.1	N-2.2	N-2.3	N-2.4	N-2.5	N-3.1	N-3.2	N-3.3	N-3.4
Red	0	5	6	-	-	-	0	0	0	-	-	0	6	0	5
Yellow	11	9	8	-	-	-	7	11	9	-	-	6	7	10	3
Green	7	4	4	-	-	-	11	7	9	-	-	12	5	8	10

#### **PREFERRED ALIGNMENT**

The preferred alignment consists of a combination of Alternate N-1.1, N-2.1 and N-3.1. **Table N.3** below summarizes the estimated features of the overall Preferred Alignment, broken down by Project Area segments. In the case of a tie, alternates were evaluated and the winner was selected based upon prioritization of factors, mainly cost and length.

#### Table N.3 – Preferred Alignment Characteristics

Characteristic	Common Segment	N-1.1	N-2.1	N-3.1	TOTAL
Pipe Diameter (inches)	54	54	54	54	54
Pipe Material	Mortar Lined Steel				
Total Distance (miles)	2.1	6.0	4.4	4.6	17.0
Approximate Pipe Cost	\$6,000,000	\$19,048,000	\$13,083,000	\$14,203,000	\$52,334,000
Length Tunnel (feet)	0	800	150	350	1,300
Estimated Number of Landowners	14	18	26	11	69
Number of Wetland Crossings	2	6	1	0	9



Figure N.17 – Northern Tier Preferred Alignment





## **Northern Integrated Supply Project**

## County Line Road Delivery Pipeline Alternatives Analysis

May 2019

Prepared by:

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#### **ROUTE COMPARISONS**

Each of the alternatives developed was subjected to the evaluation criteria and metrics described in **Table 1** in the introduction. The County Line segment was broken into 5 Project Areas, which made for easier comparison of alternatives. The Project Areas also enabled the project team to look at combinations of alternatives for each Project Area and facilitated a thorough analysis for the final Preferred Alignment.

An overview of all of the Project Areas and the alternative options can be seen in **Figure C.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternate with the best overall performance (least reds, most greens) was chosen to be the Preferred Alternate. This Preferred County Line Alignment can be seen in **Figure C.17** at the end of this document.

In total, two (2) alternates were assessed for Project Area 1, one (1) alignment alternate was assessed for Project Areas 2 and 3, and two (2) alignment alternates were assessed for Project Areas 4 and 5. Project Areas 2 and 3 are two pieces of the same alignment that has no compatible alternative and were broken in two for readability/resolution for discussion in this report. Similarly, Project Areas 4 and 5 are also two pieces of the same alignment that were broken in two for readability/resolution, but contain two different alternatives for each area.







Figure C.1 – County Line Road Delivery Pipeline Project Areas and Alternatives

Sewberry PS

Alternative Name	C-1.1	C-1.1							
Alternative Location & Description	Count and he combi crossi crosse 13 and	County Line Alternative C-1.1 begins at the intersection of CR 52 and CR 13 and heads south paralleling the west side of CR 13. It traverses through a combination of agricultural, rural residential, and subdivision properties, crossing CR 13 three times throughout this reach. Moving south the alignment crosses Hwy 14, passes Timnath Reservoir, and ends at the intersection of CR 13 and CR 40.							
Criteria		Ranking	Comments						
Capital Cost		Green	\$17,745,200	9					
Conduit Length		Green	6.10 miles, 32,205 feet	7					
Easement Difficulty		Yellow	28 parcels crossed, 0 split parcels						
Right-of-Way Impact		Green	Mostly in private easements, traverses ROW at 8 road crossings						
Land Owner Impact		Yellow	6 driveway crossings, 2 split parcels	Ų					
Proximity to Occupied Dwellings	b	Green	Minimal, within 100-feet of 2 occupied dwellings						
Environmental Impac	ts	Red	2,460 LF of wetlands						
Existing Utilities		Yellow	More CR 13 road utilities, will cause more alignment shift into developed land						
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings known	L					
Surface and Street In	npacts	Green	Minimal construction under roadways, impact at 8 road crossings expected						
Traffic Impacts		Yellow	Moderate traffic impacts expected due proximity to CR 13, additional impact likely at 8 road crossings	College -					
Water Storage Reser Impacts	voirs	Yellow	Possible impacts to Timnath Reservoir outfall infrastructure						
Construction Duration Relative Constructab	n and ility	Yellow	Traverses more constrained areas which will impact production rates. High groundwater in Timnath Reservoir area						
Required Trenchless Crossing		Yellow	Hwy 14 (CDOT), 7 paved (county road) crossings						
Development Pressure		Red	Moderate, high development pressure expected from subdivisions construction	Fig					
Operation and Maintenance Access		Green	Convenient access due to proximity to roads						
O&M Requirements		Yellow	Equal amounts of air vac and blow off pairs required						
Natural Resources In	pacts	Green	Minimal, land mostly subdivisions or agriculture avoiding natural areas						



Alternative Name	C-1.2			
Alternative Location & Description	County I and runs heading south the canal un continue then turr intersect	Line Alterna s east parall south throu e alignment ntil it approa es through m ns west para tion of CR 1	tive C-1.2 begins at the intersection of CR 52 and CR 13 eling the south side of CR 52 for about 2,500 feet before gh agricultural fields along parcel boundaries. Continuing runs into a canal near Smith Reservoir, it parallels the ches CR 78 where it crosses to the south side and hore agricultural fields until it meets CR 40. The alignment alleling the north side of CR 40 until ending at the 3 and CR 40.	
Criteria	1	Ranking	Comments	
Capital Cost	I	Red	\$19,266,800	
Conduit Length	`	Yellow	7.38 miles, 38,991 feet	
Easement Difficulty	(	Green	20 parcels crossed, 0 split parcels	
Right-of-Way Impact	(	Green	Mostly in private easements, traverses ROW at 6 road crossings	
Land Owner Impact	`	Yellow	2 driveway crossings, 3 split parcels	
Proximity to Occupied Dwellings	) t	Green	Minimal, within 100-feet of 2 occupied dwellings	
Environmental Impac	ts	Yellow	1,565 LF of wetlands	
Existing Utilities	(	Green	Less utilities expected due to proximity to roadways	
Hazardous/Permitted Crossings	(	Green	No hazardous/permitted crossings known	
Surface and Street In	npacts	Green	Minimal construction under roadways, impact at 6 road crossings expected	
Traffic Impacts	(	Green	Minimal traffic impacts expected, most impact expected at 6 road crossings	
Water Storage Reser Impacts	voirs	Green	No impacts expected	C-1.2 C-1.1 C-1.3
Construction Duration Relative Constructabi	n and , ility	Yellow	Alignment is longer in length but traverses more rural/open areas for higher production rates	
Required Trenchless Crossing	(	Green	Hwy 14 (CDOT), 5 paved (county road) crossings	Parcel
Development Pressu	re (	Green	Minimal	Figure C.3 – Alternative C-1.2
Operation and Maintenance Access	1	Red	Difficult access, does not parallel roads	
O&M Requirements	`	Yellow	Equal amounts of air vac and blow off pairs required	
Natural Resources Im	npacts (	Green	Minimal, land mostly agriculture avoiding natural areas	



Alternative Name	C-1.3			
Alternative Location & Description	County Line Alternative C-1.3 generally parallels the ROW of E. County Road 52/Weld County Road 88, Weld County Road 15, and Weld County Road 78. It begins at the southwest corner of the intersection of E. County Road 52/Weld County Road 88 and N. County Road 1/Weld County Road 13. The alignment crosses N. County Road 1/Weld County Road 13 on the south side of E. County Road 52/Weld County Road 88 eastwardly to the intersection of Weld County Road 88 and Weld County Road 15. The alignment turns south and parallels Weld County Road 15, crossing several county roads and Hwy 14, to the northwest corner of the intersection of Weld County Road 78. The alignment turns west along the north side of Weld County Road 78. The alignment turns west along the north side of Weld County Road 78. The alignment turns west along the north side of Weld County Road 78. The alignment turns set of the intersection the alignment turns southwest and bisects a parcel east of S. County Road 1/Weld County Road 13, intersecting with previous alternatives approximately halfway between Weld County Road 78 and Weld County Road 76 along N. County Road 1./Weld County Road 13. This alignment was removed in the initial screening process due to the fact that it is significantly longer than other viable alternatives described. A longer length means higher construction costs and maintenance costs. The east and west traverses of Weld County Road 88 and Weld County Road 78 resulted in a greater amount of ROW disturbance compared to other viable alternatives described.			
Criteria	Ran	nking	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			
Environmental Impac	its			
Existing Utilities				
Hazardous/Permitted Crossings				
Surface and Street Ir	npacts			Riparian Corridor Fort Collins
Traffic Impacts				
Water Storage Reser	voirs			Figure C.4 – Alternative C-1.3
Construction Duration Relative Constructab	n and ility			]
Required Trenchless Crossing				
Development Pressu	re			
Operation and Maintenance Access				
O&M Requirements				
Natural Resources In	npacts			



Alternative Name	C-1.4			
Alternative Location & Description	County 3/S. Cou at the so Road 3 across s intersec Lake. T small po the aligr of E. Co intersec This alig propose intersec 1/Weld pipeline creating increasi other via	Line Alterna unty Road 3 outhwest con and traverse several coun tion of S. Co the alignmer prition of the ment contin ounty Road 4 its with previ- gnment was ed water trea tion of E. Co County Road parallel to th o complicatio ng the length able alternat	tive C-1.4 generally parallels the ROW of N. County Road and E. Prospect Road, and E. County Road 44. It begins ner of the intersection of E. County Road 52 and N. County as south parallel to N. County Road 3/S. County Road 3, ty roads and Hwy 14 to the northwest corner of the unty Road 3 and E. Prospect Road north of Deadman it turns east and parallels E. Prospect Road, around a lake. As E. Prospect Road turns into E. County Road 44, nues east paralleling E. County Road 44 to the intersection 14 and S. County Road 1/Weld County Road 13 where it ous alternatives. removed in the initial screening process due to the itment plant being located north of the intersection of punty Road 52/Weld County Road 88 and N. County Road d 13. To connect to the water treatment plant additional he proposed Northern Tier pipeline would be needed ins in coordinating the pipeline systems and significantly h of the pipeline, making the alignment less favorable that tives.	
Criteria		Ranking	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			
Environmental Impac	ots			
Existing Utilities				
Hazardous/Permitted Crossings	ł			
Surface and Street Ir	mpacts			NWI Wetlands         Severance           Riparian Corridor         Fort Collins
Traffic Impacts				Parcel Timnath
Water Storage Reser Impacts	rvoirs			Figure C.5 – Alternative C-1.4
Construction Duratio Relative Constructab	n and bility			
Required Trenchless Crossing	;			
Development Pressu	ire			
Operation and Maintenance Access	;			
O&M Requirements				
Natural Resources Ir	npacts			



Alternative Name C-2.1			
Alternative Location & Description	Count and ru southe throug prope three rough the Ra	y Line Alternai ins south para erly direction c jh a combination rties. Heading reservoirs, and ly 5,600 feet so aindance Subc	tive C-2.1 begins at the intersection of CR 40 and CR 13 lleling CR 13 beginning on the west side. It travels in a rossing CR 13 six times throughout this reach. It traverses on of agricultural, rural residential, and subdivision south it enters a confined area where it crosses Hwy 392, d the Poudre River. Continuing south the alignment ends outh of the Poudre River on the east side of CR 13 near livision.
Criteria		Ranking	Comments
Capital Cost		Green	\$16,832,900
Conduit Length		Green	5.64 miles, 29,801 feet
Easement Difficulty		Green	20 parcels crossed, 0 split parcels
Right-of-Way Impact		Green	Mostly in private easements, traverses ROW at 10 road crossings
Land Owner Impact		Green	3 driveway crossings, 0 split parcels
Proximity to Occupied Dwellings	pied Green Minimal, within 100-feet of 3 occupied dwellings		
Environmental Impac	ts	Yellow 1,025 LF of wetlands	
Existing Utilities		Yellow More CR 13 utilities, will cause more alignment shift in developed land	
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossing known
Surface and Street In	npacts	Green	Minimal construction under roadways, impact at 10 road crossings expected
Traffic Impacts		Yellow	Moderate traffic impacts expected due to proximity to CR 13, most impact expected at 10 road crossings
Water Storage Reser Impacts	voirs	Red	Near multiple water bodies (names unknown), relatively high number of nearby reservoirs.
Construction Duration Relative Constructab	n and ility	Yellow	Alignment is shorter, but contains multiple constrained areas impacting production rates
Required Trenchless Crossing		Yellow	Hwy 392 (CDOT), 1 Railroad (OmniTRAX), 9 paved (county road) crossings
Development Pressu	re	Red	Development pressure expected from subdivisions construction
Operation and Maintenance Access		Green	Convenient access due to proximity to roads
O&M Requirements		Green	Relatively few air vac and blow off pairs required
Natural Resources In	npacts	Yellow	Vegetation/natural areas may be impacted near Cache la Poudre River, and water bodies near CR 68/CR 13



### Bewberry HOS

Alternative Name	C-2.2			
Alternative Location & Description	County Lin- alignments the intersect the Weld C 78 to a par- intersection the pipeline Weld Coun Road 17 to intersection the intersect alignment of This alignm it is signific length mea of the conti which were	e Alternat s identified ction of W County Ro- rcel bound n of Weld e turns so nty Road 1 o the inters n, the aligi- ction of S. connects f nent was r cantly long ans higher inuation o e more fav	ive C-2.2 beginning for this alignment intersects l in the previous reach, approximately 2,440 feet west of /eld County Road 78 and Weld County Road 15, north of ad 78 ROW. The alignment parallels Weld County Road lary south of the road approximately 2,640 feet east of the County Road 78 and Weld County Road 15. From there uth and follows the parcel boundary south and then east to 17. The alignment turns south and parallels Weld County section of Weld County Road 72. Southeast of the nment turns west and parallels Weld County Road 72 to County Road 1/Weld County Road 13 where the to previously discussed alternatives. removed in the initial screening process due to the fact that ler than other viable alternatives described. A longer construction costs and maintenance costs. A large portion f this alignment overlaps previously described alignments vorable over the greater length of Alternative C-2.2.	
Criteria	Ra	nking	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			
Environmental Impac	ots			
Existing Utilities				
Hazardous/Permitted Crossings	ł			
Surface and Street Ir	mpacts			C-2.1 C-2.3 Windsor
Traffic Impacts				NWI Wetlands Severance Fort Collins
Water Storage Reser	rvoirs			Parcel Timnath
Construction Duration Relative Constructab	n and bility			Figure C.7 – Alternative C-2.2
Required Trenchless Crossing				
Development Pressu	ire			
Operation and Maintenance Access				
O&M Requirements				
Natural Resources In	npacts			



Alternative Name	C-2.3		
Alternative Location & Description	County Line Alterna 1/Weld County Roa where the alignmer alignment parallels southwest side of th 3. From the interse Road 3 to the north County Road 32/HV until it turns south a approximately 1,39 County Road 32/HV south and east ultir subdivisions. The a with previously des Road 13. This alignment was it is significantly lon length means highe the portion parallel roadway and traffic overlaps previously greater length and	ative C-2.3 begins at the intersection of S. County Road ad 13 and E. County Road 32E/Weld County Road 68 1/2, nt intersects with previously described alignments. The E. County Road 32E to the west across the Poudre River he intersection of E. County Road 32E and S. County Road action the alignment turns south and parallels S. County west side of the intersection of S. County Road 3 and E. wy 392. The alignment turns east and parallels the highway at a parcel boundary south of E. County Road 32/Hwy 392 0 feet east of the intersection of S. County Road 3 and E. WY 392. The alignment follows several parcel boundaries nately ending up between Bison Ridge and High Pointe alignments ends on an easterly bearing at the intersection cribed alternatives along S. County Road 1/Weld County e removed in the initial screening process due to the fact that the county road 32/HWY 392 could potentially impact the c. A large portion of the continuation of this alignment of described alignments which were more favorable over the potential impacts of Alternative C-2.3.	
Criteria	Ranking	Comments	
Capital Cost			
Conduit Length			
Easement Difficulty			
Right-of-Way Impact			
Land Owner Impact			
Proximity to Occupie Dwellings	ł		
Environmental Impac	ts		
Existing Utilities			
Hazardous/Permitted Crossings			C-2.1 — C-2.2 Windsor
Surface and Street Ir	npacts		NWI Wetlands Severance Riparian Corridor Fort Collins
Traffic Impacts			Parcel Timnath
Water Storage Reser Impacts	voirs		Figure C.8 – Alternative C-2.3
Construction Duration Relative Constructab	n and lity		
Required Trenchless Crossing			
Development Pressu	re		
Operation and Maintenance Access			
O&M Requirements			
Natural Resources In	pacts		



Alternative Name	C-3.1			
Alternative Location & Description	Count 2,600 paralle this re and su tracks contin	bunty Line Alternative C-3.1 begins along the east side of CR 13 roughly 600 feet north of CR 64, near the Raindance subdivision. It travels south iralleling the east side of CR 13 and crossing it a total of six times throughout is reach. It traverses through a combination of agricultural, rural residential, ind subdivision properties. Heading south it crosses Hwy 34, three railroad acks, and the Big Thompson River. South of the railroad tracks the line ontinues ending at the intersection of CR 54 and CR 13.		
Criteria		Ranking	Comments	
Capital Cost		Green	\$17,148,600	
Conduit Length		Green	5.66 miles, 29,875 feet	
Easement Difficulty		Yellow	28 parcels crossed, 0 split parcels	
Right-of-Way Impact		Green	Mostly in private easements, traverses ROW at 11 road crossings	
Land Owner Impact		Yellow	6 driveway crossings, 0 split parcels	
Proximity to Occupie Dwellings	d	Green Minimal, within 100-feet of 2 occupied dwellings		
Environmental Impac	ts	Green 455 LF of wetlands		
Existing Utilities		Yellow	More CR 13 utilities, will cause more alignment shift into developed land	
Hazardous/Permitted Crossings		Green No hazardous/permitted crossing known		
Surface and Street Ir	npacts	s Green Minimal construction under roadways, impact at 11 road crossings expected		
Traffic Impacts		Yellow Moderate traffic impacts expected due to proximity to ( 13, most impact expected at 11 road crossings		
Water Storage Reser Impacts	ervoirs Green		No reservoir impacts	
Construction Duration Relative Constructab	n and ility	Green	Alignment is shortest distance, but contains some constrained areas impacting production rates	
Required Trenchless Crossing		Yellow	3 Railroads (OmniTRAX, Union Pacific), HWY 34 (CDOT), 8 paved (county road) crossings	
Development Pressu	re	Red	Pressure from subdivision construction	
Operation and Maintenance Access Green			Convenient access due to proximity to roads	
O&M Requirements		Green	Relatively few air vac and blow off pairs required	
Natural Resources In	npacts	Yellow	May have some natural area impact near Big Thompson River	



Alternative Name	C-3.2						Alter	
Alternative Location & Description	Count 1/Weld the alig paralle approv Weld 0 bound crossii road a passe Road alignm paralle interse turns v of the alignm where Count previo This a that it length the alt favora would resulte C-3.2.	y Line Alterna d County Roa gnment inters els Weld Cour kimately 530 f County Road ary south ther ng Weld Cour icross several d the dead en 54 along parc nent continues el Weld Court west and para intersection o west and para intersection o usly described lignment was is significantly means highe ernative trave ble in Project add unnecess ed in the other	tive C-3.2 begins at the intersection of S. County Road d 13 and Crossroads Blvd/Weld County Road 62, where ects with previously described alignments. The alignment ty Road 62 east to parcel boundary south of the road eet west of the intersection of Weld County Road 62 and 15. The alignment turns south and follows the parcel in southeast, where it crosses Weld County Road 15. After ty Road 15 the alignment turns south and parallels the county roads and Hwy 34. The alignment continues south d intersection of Weld County Road 15 with Weld County el boundaries and crosses the Big Thompson River. The south of the river along parcel boundaries until it beings to y Road 15, north of Weld County Road 15 the alignment llels Weld County Road 52. At the County Road 52 and Weld County Road 15 the alignment llels Weld County Road 52. Approximately 2,600 feet west f Weld County Road 52. Approximately 2,600 feet west f Weld County Road 52. And Weld County Road 50, t turns west and terminates at the intersection of Weld d Colorado Blvd, where the alignment intersects with d alignments. removed in the initial screening process due to the fact 'longer than other viable alternatives described. A longer r construction costs and maintenance costs. Additionally, rses into Project Area 4. Since the alternative was not Area 3, connecting favorable Project Area 4 alternatives sary length and costs to the pipeline. These factors 'viable alternatives being more favorable than Alternative					
Criteria		Ranking	Comments					
Capital Cost						16		
Conduit Length						0		
Easement Difficulty								
Right-of-Way Impact								
Land Owner Impact								
Proximity to Occupie Dwellings	d							
Environmental Impac	cts			C-3.1	Windsor			65
Existing Utilities				NWI Wetlands	Greeley			
Hazardous/Permitteo Crossings	1			Riparian Corridor Parcel	Johnstown			
Surface and Street In	npacts			Figure C.10 – Alternativ	/e C-3.2			
Traffic Impacts				]	· - ··-			
Water Storage Rese Impacts	rvoirs							
Construction Duratio Relative Constructab	n and ility							
Required Trenchless Crossing	i							
Development Pressu	ire							
Operation and Maintenance Access	i							
O&M Requirements								
Natural Resources Ir	npacts							



Alternative Name	C-4.1				
Alternative Location & Description	Count and ru directi travers subdiv parcel contin track, interse	County Line Alternative C-4.1 begins at the intersection of CR 13 and CR 54 and runs south paralleling the west side of CR 13. It travels in a southerly direction crossing CR 13 a total of eight times throughout this reach. It traverses through a combination of agricultural, rural residential, and subdivision properties. Headed south the alignment crosses CR 14, follows a parcel boundary, and then continues paralleling CR 13 to the south. The line continues passing through the Town of Johnstown, crossing Hwy 60, a railroad track, The Little Thompson River, and finally ending on the west side of the intersection of CR 13 and CR 42.			
Criteria		Ranking	Comments		
Capital Cost		Green	\$18,616,400		
Conduit Length		Green	6.20 miles, 32,728 feet		
Easement Difficulty		Green	23 parcels crossed, 0 split parcels		
Right-of-Way Impac	t	Yellow	Mostly in private easements, in ROW at 15 road crossings		
Land Owner Impact		Yellow	5 driveway crossings, 0 split parcels		
Proximity to Occupie Dwellings	ed	d Green Minimal, within 100-feet of 5 occupied dwellings			
Environmental Impa	icts	ts Green 760 LF of wetlands			
Existing Utilities		Yellow More CR 13 utilities, will cause more alignment shif developed land			
Hazardous/Permitte Crossings	d	Green No hazardous/permitted crossing known			
Surface and Street Impacts		Yellow	Minimal construction under roadways, most impact expected at 15 road crossings		
Traffic Impacts		Yellow	Moderate traffic impacts expected due to proximity to CR 13, most impact expected at 15 road crossings		
Water Storage Reservoirs Impacts		Green	No impacts expected		
Construction Duration and Relative Constructability	on	Yellow	Length shorter but traverses more constrained areas which will impact production rates, narrow section through Johnstown may be difficult for materials and equipment		
Required Trenchles Crossing	s	Red	1 Railroad (OmniTRAX), HWY 60 (CDOT), 11 paved (county road) crossings		
Development Press	ure	Red	Multiple areas along the alignment have plans for development in near future		
Operation and Maintenance Acces	s	Green	Convenient access due to proximity to roads		
O&M Requirements		Green	Relatively few air vac and blow off pairs required, roughly equal requirements at other alternative		
Natural Resources Impacts		Yellow	Moderate due to natural areas near Little Thompson River		



Attentive Description         Construction Attention Unit Provide Section Unit For mode of provide Section Provide Section Unit Section Description Provide Section Provide Section Provide Section Provide Section Provide Section Provide Section Provide Section Provide Section Provide Section Provide Section Provide Section Provide Section Provide Sectin Provide Sec	Alternative Name	C-4.2		
CriteriaRenkingCommentaCinplial Cost.Red\$21,079,200Candul LengthRed8.30 mikes, 43,832 feetEssement DifficultyValuov32 parcels coste.0, 6 pit parcelsRight of Way InpartGreenMostly in private essenents, in ROW at 7 road crossingsLand Owner ImpactYellow4 diversay crossings, 0 spit parcelsProcentify to OccupiedRedModeratehigh, within 100-feet of 19 occupied dwellingsEnvironmental ImpactsGreen310 LF of wetandsEnvironmental ImpactsGreenNo hazardouspermitted orossing incomSurface and Street ImpactsGreenNo hazardouspermitted orossing incomSurface and Street ImpactsGreenMinimal trafic impacts especied, most impact espec	Alternative Location & Description	County Line Alter and runs west pa turning south thro along parcel bour Johnstown. The a turns south cross paralleling the so before continuing Thompson River, agricultural fields	native C-4.2 begins at the intersection of CR 13 and CR 54 ralleling the north side of CR 54 for about 2,800 feet before ugh an agricultural field. It travels in a southerly direction daries until reaching existing subdivisions in the Town of dignment turns west until reaching High Plains Blvd. where it ing HWY 60 followed by a railroad track. It then turns east uth side of the railroad tracks for approximately 5,200 feet south through more agricultural fields, crossing the Little and finally ending at CR 42. The alignment traverses as well as existing and planned developments.	
Capital CostRod\$21 / 30 / 30 / 30 / 30 / 30 / 30 / 30 / 3	Criteria	Ranking	Comments	
Conduit Langhh       Red       8.30 miles, 43.832 feel         Easement Difficulty       Yellow       32 parcels crossed, 0 spilt parcels         Right-of-Way Impact       Green       Mostly in private easements, in ROW at 7 road crossings         Land Ower Impact       Yellow       4 diveway crossings, 0 spilt parcels         Provinity to Occupied       Red       Moderate/high, within 100-feet of 19 occupied dwellogs         Environmental Impacts       Green       310 LF of wetands         Existing Utilities       Green       10 Les utilities expected due to proximity to roadways         Strafec and Street Impacts       Green       No hozardous/permitted crossing known         Strafec and Street Impacts       Green       Minimal effer impacts expected, most impact expected         Paraticonon Durition and Impacts       Green       Minimal effer impacts expected, most impact expected         Regulied Trenchless       Green       1 faiload (Omnit TRAX), Hwy 60 (CDDT), S paved         Operation and Construction Durition and Chaineman Concessing       None         Development Pressure       Velow       Difficult excess, does not parallel neads         Odwards mind       Difficult excess, does not parallel neads       Difficult excess, does not parallel neads         Odwards mand       Nator       Difficult excess, does on parallel neads       Disoregre signment	Capital Cost	Red	\$21,679,300	
Easement DifficulyYellow2 Japraels crossed. 0 gill parcelsRight-of-Way lingactGreenMadiy in private assements, in ROW al 7 raad crossingsLand Owner ImpactYolkow4 dreway crossings. 0 gill parcelsDrowing to CoccupiedRodModerate/high, within 100-feet of 19 occupied dweilingsEnvironmental ImpactsGreenLes utilles expected due to proximity to raadwaysEdiardo UtiltesGreenIsea utilles expected due to proximity to raadwaysEdiardo Sargen FreidiedGreenNonacardouxpermited crossingsStafface and Steel ImpactsGreenNonacardouxpermited crossingsTarific ImpactsGreenNonacardouxpermited crossingsRoden Sargen Sarg	Conduit Length	Red	8.30 miles, 43,832 feet	
Right-of-Way ImpactGreenMostly in private easements. In ROW at 7 road crossingsLind Owner ImpactValue4 driveway crossings, 0 split parcelsDrowning 10 OccupiedRedModerate/high, within 100-det of 19 occupied dwellingsEnvironmental ImpactsGreen3 10 L of valuadsEnvironmental ImpactsGreen10 L of valuadsBazardous/PermittedGreenNa bazardous/permitted crossing KnownBazardous/PermittedGreenNa bazardous/permitted crossingsTraffic ImpactsGreenMinimal traffic Impacts expected, most Impact ex	Easement Difficulty	Yellow	32 parcels crossed, 0 split parcels	
Land Owner ImpactYellow4 driveway crossings. 0 split parcelsProximplity to OccupiedRedModerata/high, within 100-faet of 19 occupied dwillingsEnvironmental ImpactsGreen310 LF of wetaindsExisting UltiticasGreen130 LF of wetaindsExisting UltiticasGreenLess ultities expected due to proximity to roadwaysHazardous/PermittedGreenMinimal construction under roadways, most impactSurface and Street ImpactsGreenMinimal traffic impacts expected, most impact expectedWater Storage ReservoirsGreenMinimal traffic impacts expected, most impact expectedWater Storage ReservoirsGreenAlignment is significantly longer leading to motionRequired TimochessGreenInalignation thrassing flooring to provide reading to motionDevelopment PressureNederJulicipa case along the alignment have plans for development In early fund (cossings)Operation and Maintenance AccessRedIndivid construction time eratification to operation to the required to the longer alignment have plans for development In early fund) crossingsOperation and Maintenance AccessRedDifficult access, does not parallel roadsOperation and Maintenance AccessRedBeltity fervi air van and blow off para required to two longer alignment length it will require with more plansNatural Resources ImpactYelowModerate due to natural areas near Little ThompsonNatural Resources ImpactYelowModerate due to natural areas near Little Thompson	Right-of-Way Impact	Green	Mostly in private easements, in ROW at 7 road crossings	
Provinity to Occupied WealingsRedModerate/high, within 100-/eet of 19 occupied dweilingsEnvironmental ImpactsGreen101 LF of wetlandsExisting UtilitiesGreenLess utilities expected due to proximity to readwaysExisting UtilitiesGreenNo hazardous/permitted crossingsBurdace and Street ImpactsGreenMinimal caffic impacts expected, most impact expected at 7 rand crossingsTraffic ImpactsGreenMinimal traffic impacts expected, most impact expected at 7 rand crossingsNater DorspaceGreenAlignment is significantly longer leading to much long durator timesRequire TrenchiesGreen1 Railcoad (ComTRAX), Hwy 60 (CDOT), 5 pavedDevelopment PressureYellowMultiple areas along the alignment have plans for development In near future, but has fewer plans in nearOperation and aliantenance AccessRedDiffout access, does not parallel roadsOwnerNoteNatural Resources ImpactsYellowModerate due to natural areas near Little ThompsonNatural Resources ImpactsYellowModerate due to natural areas near Little ThompsonNatural Resources ImpactsYellowModerate due to natural areas near Little Thompson	Land Owner Impact	Yellow	4 driveway crossings, 0 split parcels	
Environmental ImpactsGreen310 LF of wetlandsExisting UtilitiesGreenLess utilities expected due to proximity to noadwaysHazardous/Permitted CrossingsGreenNo hazardous/permitted crossing knownSurface and Street ImpactsGreenMinimal construction under roadways, most impact expected at 7 road crossingsTraffic ImpactsGreenMinimal traffic impacts expected, most impact expected at 7 road crossingsTraffic ImpactsGreenNoneConstruction Duration and Pelative Construction timesNoneConstruction Duration and Reduited TrenchlessGreenNaneDevelopment PressureYellowMultiple areas along the alignment have plans for errmOperation and Aliantenance AccessRedDifficut access, does not parallel roadsOAM RequirementsYellowRoder to along of alignment larges near Little Thompson (wer errorNatural Resources ImpactsYellowModerate due to natural areas near Little ThompsonNatural Resources ImpactsYellowModerate due to natural areas near Little ThompsonNatural Resources ImpactsYellowModerate due to natural areas near Little ThompsonNatural Resources ImpactsYellowModerate due to natural areas near Little ThompsonNatural Resources ImpactsYellowModerate areas near curve and blow off pairs required but due to wer errorNatural Resources ImpactsYellowModerate due to natural areas near Little ThompsonNatural Resources ImpactsYellowModerate areas near Little ThompsonNatural	Proximity to Occupied Dwellings	Red	Moderate/high, within 100-feet of 19 occupied dwellings	
Existing UtilitiesGreenLess utilities expected due to proximity to roadwaysHazardous/Permitted CrossingsGreenNo hazardous/permitted crossing knownSurface and Street ImpactsGreenMinimal construction under roadways, most impact expected at 7 road crossingsTraffic ImpactsGreenMinimal traffic impacts expected, most impact expected at 7 road crossingsWater Storage Reservoirs 	Environmental Impact	nvironmental Impacts Green 310 LF of wetlands		
Hazardous/Permitted CrossingsGreenNo hazardous/permitted crossing knownSurface and Street ImpactsGreenMinimal construction under roadways, most impact expected at 7 road crossingsTraffic ImpactsGreenMinimal traffic impacts expected, most impact expected at 7 road crossingsWater Storage Reservoirs ImpactsGreenMinimal traffic impacts expected, most impact expected at 7 road crossingsConstruction Duration and Required TrenchlessGreenAlignment is significantly longer leading to much long duration timesDevelopment Pressure Operation and Maintenance AccessGreenI. Ralitoad (OmniTRAX), Hwy 60 (CDOT), 5 paved (county road) crossingsOperation and Maintenance AccessRedDifficult access, does not parallel roadsOseM RequirementsYellowRelatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairsNatural Resources ImpactsYellowModerate due to natural areas near Little Thompson River	Existing Utilities	ng Utilities Green Less utilities expected due to proximity to roadways		
Surface and Street ImpactsGreenMinimal construction under roadways, most impact expected at 7 road crossingsTraffic ImpactsGreenMinimal traffic Impacts expected, most impact expected at 7 road crossingsImpactWater Storage Reservoirs mpactsGreenNoneConstruction Duration and Readiative Construction United Construction Constr	Hazardous/Permitted Crossings	Green	No hazardous/permitted crossing known	
Traffic ImpactsGreenMinimal traffic impacts expected, most impact expected at 7 road crossingsWater Storage Reservoirs ImpactsGreenNoneConstruction Duration and Reduired TrenchlessAlignment is significantly longer leading to much long 	Surface and Street Im	pacts Green	Minimal construction under roadways, most impact expected at 7 road crossings	
Water Storage Reservoirs Impacts       Green       None         Construction Duration and Relative Constructability       Red       Alignment is significantly longer leading to much long duration times       Multiple areas along the alignment have plans for development Pressure       Green       1 Railroad (OrmiTRAX), Hwy 60 (CDOT), 5 paved (county road) crossings       Multiple areas along the alignment have plans for development in near future, but has fewer plans in near term       Figure C.12 – Alternative C-4.2         Operation and Maintenance Access       Red       Difficult access, does not parallel roads       Figure C.12 – Alternative C-4.2         O&M Requirements       Yellow       Relatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairs Natural Resources Impacts       Yellow         Yellow       Moderate due to natural areas near Little Thompson River       Moderate due to natural areas near Little Thompson River	Traffic Impacts	Green	Minimal traffic impacts expected, most impact expected at 7 road crossings	
Construction Duration and Relative ConstructabilityRedAlignment is significantly longer leading to much long duration timesMignment is significantly longer leading to much long duration timesRequired Trenchless CrossingGreen1 Railroad (OmniTRAX), Hwy 60 (CDOT), 5 paved (county road) crossingsMiltiple areas along the alignment have plans for development in near future, but has fewer plans in near termMiltiple areas along the alignment have plans for development in near future, but has fewer plans in near termFigure C.12 - Alternative C-4.2Operation and Maintenance AccessRedDifficult access, does not parallel roadsFigure C.12 - Alternative C-4.2O&M RequirementsYellowRelatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairsModerate due to natural areas near Little Thompson RiverNatural Resources ImpactsYellowModerate due to natural areas near Little Thompson River	Water Storage Reserv Impacts	/oirs Green	None	C4.2 C4.1
Required Trenchless CrossingGreen1 Railroad (OmniTRAX), Hwy 60 (CDOT), 5 paved (ounty road) crossingsPercelBerthoudDevelopment PressureYellowMultiple areas along the alignment have plans for development in near future, but has fewer plans in near fermFercelBerthoudOperation and Maintenance AccessRedDifficult access, does not parallel roadsFercelBerthoud0&M RequirementsYellowRelatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairsHercelNatural Resources ImpactYellowModerate due to natural areas near Little Thompson 	Construction Duration Relative Constructabil	and Red	Alignment is significantly longer leading to much long duration times	C-4.3 NWI Wetlands Riparian Corridor
Development PressureYellowMultiple areas along the alignment have plans for development in near future, but has fewer plans in near fermFigure C.12 – Alternative C-4.2Operation and Maintenance AccessRedDifficult access, does not parallel roadsFigure C.12 – Alternative C-4.2O&M RequirementsYellowRelatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairsFigure C.12 – Alternative C-4.2Natural Resources ImpactsYellowModerate due to natural areas near Little Thompson RiverFigure C.12 – Alternative C-4.2	Required Trenchless Crossing	Green	1 Railroad (OmniTRAX), Hwy 60 (CDOT), 5 paved (county road) crossings	Parcel Berthoud
Operation and Maintenance AccessRedDifficult access, does not parallel roadsO&M RequirementsYellowRelatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairsNatural Resources ImpactsYellowModerate due to natural areas near Little Thompson River	Development Pressur	e Yellow	Multiple areas along the alignment have plans for development in near future, but has fewer plans in near term	Figure C.12 – Alternative C-4.2
O&M RequirementsYellowRelatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairsNatural Resources ImpactsYellowModerate due to natural areas near Little Thompson River	Operation and Maintenance Access	Red	Difficult access, does not parallel roads	
Natural Resources Impacts Yellow Moderate due to natural areas near Little Thompson River	O&M Requirements	Yellow	Relatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairs	
	Natural Resources Im	pacts Yellow	Moderate due to natural areas near Little Thompson River	



Alternative Name	C-4.3			
Alternative Location & Description	County I intersect of the in Road 1// a parcel Road 18 direction Johnston describe the Clea This alig corridor amounts Johnston Road 14 areas ea overlaps beyond	Line Alternat tion of previo tersection of Weld County boundary so and S. Coun along parce wn. The alig wn Reservoi ed alternative arview Subdi gnment was east of John s of buried do wn Reservoi 4 is significar ast of the res s other viable the initial sci	tive C-4.3 begins along E. County Road 18, at the busly described alignments, approximately 2,740 feet west E. County Road 18/Weld County Road 54 and S. County y Road 13. The alignment traverses east from this point to buth of E. County Road 18 at the intersection of E. County inty Road 3. The alignment traverses in a southerly el boundaries until reaching existing subdivisions in gnment turns south and traverses passed the east end of ir, across Hwy 60 where it intersects with previously es approximately 2,640 feet west of the southwest corner of vision. removed in the initial screening process because the astown Reservoir is not a constructible corridor. Large ebris have been indicated within the corridor near ir. The length between E. County Road 18 and E. County htly longer than other viable alternatives. Outside of the servoir and between the county roads, the alignment e alternatives. Therefore the alternative was not moved reening process.	
Criteria	1	Ranking	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			
Environmental Impac	ts			
Existing Utilities				
Hazardous/Permitted Crossings				C-4.1
Surface and Street Ir	npacts			NWI Wetlands
Traffic Impacts				Riparian Corridor Parcel Berthoud
Water Storage Reser Impacts	voirs			Figure C.13 – Alternative C-4.3
Construction Duration Relative Constructab	n and ility			
Required Trenchless Crossing				
Development Pressu	re			
Operation and Maintenance Access				
O&M Requirements				
Natural Resources In	npacts			



Alternative Name	C-5.1			
Alternative Location & Description	Count and ru directi traver subdiv Thom 2,600	y Line Alternative C-5.1 begins at the intersection of CR 13 and CR 42 ins south paralleling the west side of CR 13. It travels in a southerly on crossing CR 13 a total of three times throughout this reach. It ses through a combination of agricultural, rural residential, and <i>vision</i> properties. Headed south the alignment runs adjacent to Lake as Dam on the east side of CR 13, and continues until ending about feet south of CR 32 where it ties in to the Fort Lupton/Hudson Pipeline.		
Criteria		Ranking	Comments	
Capital Cost		Green	\$15,687,600	
Conduit Length		Green	5.57 miles, 29,417 feet	
Easement Difficulty		Green	22 parcels crossed, 0 split parcels	
Right-of-Way Impact		Green	Mostly in private easements, in ROW at 8 road crossings	
Land Owner Impact		Yellow	12 driveway crossings, 0 split parcels	
Proximity to Occupied Dwellings	Yellow Moderate, within 100-feet of 9 occupied dwellings		o'un	
Environmental Impac	ts Green 955 LF of wetlands			
Existing Utilities	Yellow More CR 13 utilities, will cause more alignment shift into developed land			
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossing known	
Surface and Street In	npacts	Green	Minimal construction under roadways, most impact expected at 8 road crossings	
Traffic Impacts		Yellow Moderate traffic impacts expected due to proximity to CF 13, most impact expected at 8 road crossings		A
Water Storage Reser Impacts	ervoirs Yellow		Alignment in close proximity (across CR 13) to Lake Thomas Dam	185
Construction Duration Relative Constructab	ion and ability Green		Length is shorter but traverses a few confined areas which will impact production rates	
Required Trenchless Crossing		Yellow	1 Railroad (OmniTRAX), 5 paved (county road) crossings	
Development Pressure Green			Minimal new development pressure in near term expected	Figure
Operation and Maintenance Access Green			Convenient access due to proximity to roads	
O&M Requirements		Green	Least amount of air vac and blow off pairs required	
Natural Resources In	npacts	Green	Minimal, land mostly in subdivisions or agriculture avoiding natural areas	



### Bewberry HOS

Alternative Name	C-5.2							
Alternative Location & Description	County of CR 4 bounda again s to the w CR 32	Line Alterna 2 and CR 13 aries until it tu outh through vest, and the where it ties i	tive C-5.2 begins roughly 2,600 feet west of the intersection B. It travels south through agricultural fields along parcel trns west at CR 40 for approximately 2,700 feet, and then more agricultural fields. Approaching Lake Thomas it jogs in continues south ending approximately 2,600 feet south of in to the Fort Lupton/Hudson Pipeline.					
Criteria		Ranking	Comments					
Capital Cost		Yellow	\$16,057,700					
Conduit Length		Yellow	6.25 miles, 33,018 feet					
Easement Difficulty		Green	21 parcels crossed, 1 split parcel					
Right-of-Way Impact		Green	Mostly in private easements, in ROW at 5 road crossings					
Land Owner Impact		Green	0 driveways crossed, 1 split parcel					
Proximity to Occupie Dwellings	d	Green	Minimal, within 100-feet of 2 occupied dwellings					
Environmental Impac	al Impacts Yellow 1,075 LF of wetlands		1,075 LF of wetlands					
Existing Utilities		Green	Less utilities expected due to proximity to roadways					
Hazardous/Permitted Crossings	ł	Green	No hazardous/permitted crossing known					
Surface and Street Ir	npacts	Green	Minimal construction under roadways, impact at 5 road crossings expected					
Traffic Impacts		Green	Minimal traffic impacts expected, most impact occurring at 5 road crossings					
Water Storage Reser Impacts	rvoirs	Yellow	Alignment runs near upper end of Lake Thomas opposite side of dam, some impacts are possible					
Construction Duration Relative Constructab	n and vility	Green	Alignment is longer, but work traverses more rural areas increasing production rates					
Required Trenchless Crossing	;	Green	1 Railroad (OmniTRAX), 3 paved (county road) crossings	C-5.3 NWI Wetlands Ribarian Corridor				
Development Pressu	ire	Green	Minimal new development pressure in near term expected	Parcel Berthoud				
Operation and Maintenance Access		Red	Difficult access, does not parallel roads	Figure C.15 – Alternative C-5.2				
O&M Requirements		Yellow	Most amount of air vac and blow off pairs required					
Natural Resources In	npacts	Green	Minimal, land mostly agricultural fields avoiding natural areas					



Alternative Name	C-5.3			
Alternative Location & Description	County Line southwest cc described alt boundaries a east at Weld 2,600 feet ea around the w parcel bound the last road the alignmen described alt This alignme amount of pc County Road than the othe The greater p maintenance other viable a	Alternation price of the construction of the c	ve C-5.3 begins approximately 2,640 feet west of the he Clearview Subdivision where it intersects previously s. The alignment traverses south parallel to parcel e Little Thompson River and several county roads, turning Road 40. It parallels Weld County Road 40 approximately e it turns south and parallels parcel boundaries, routing southeast of Davis Reservoir, and continuing south along ross several county roads, Weld County Road 34 being . Approximately 1,400 feet south of Weld County Road 34 es east and southeast to the intersection of previously s parallel to Colorado Blvd. north of Lake Thomas. emoved in the initial screening process due to the large conflicting existing oil and gas facilities north of Weld lditionally, the alignment is significantly longer in length alternatives to which the alignment ultimately connects. for existing utility conflicts and higher construction and esulted in the alignment being far less favorable than the ves.	
Criteria	Rank	king	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			
Environmental Impac	ots			
Existing Utilities				
Hazardous/Permitted Crossings				C-5.3
Surface and Street Ir	npacts			
Traffic Impacts				Riparian Corridor Johnstown
Water Storage Reser Impacts	rvoirs			Figure C.16 - Alternative C-5.3
Construction Duration Relative Constructab	n and ility			
Required Trenchless Crossing				
Development Pressu	re			
Operation and Maintenance Access				
O&M Requirements				
Natural Resources In	npacts			



**Table c.1** is a visual summary of the score given to every alternative for each criteria. **Table C.2** tabulates the number of greens, yellows, and reds given to each alternative.

Evaluation Criteria	C-1.1	C-1.2	C-1.3	C-1.4	C-2.1	C-2.2	C-2.3	C-3.1	C-3.2	C-4.1	C-4.2	C-4.3	C-5.1	C-5.2	C-5.3
Capital Cost															
Conduit Length															
Easement Difficulty															
Right-of-Way Impact															
Land Owner Impact															
Proximity to Occupied Dwellings															
Environmental Impacts															
Existing Utilities															
Hazardous/Permitted Crossings															
Surface and Street Impacts															
Traffic Impacts															
Water Storage Reservoirs Impacts															
Construction Duration and Relative Constructability															
Required Trenchless Crossings															
Development Pressure															
Operation and Maintenance (O&M) Access															
O&M Requirements															
Natural Resources Impacts															

#### Table C.1 – Visual Summary of Alternative Scoring



Table C.2 – Numeric Summary of Alternative Scoring

Evaluation Criteria	C-1.1	C-1.2	C-1.3	C-1.4	C-2.1	C-2.2	C-2.3	C-3.1	C-3.2	C-4.1	C-4.2	C-4.3	C-5.1	C-5.2	C-5.3
Red	2	2	-	-	2	-	-	1	-	2	5	-	0	1	-
Yellow	8	5	-	-	6	-	-	6	-	7	5	-	6	5	-
Green	8	11	-	-	10	-	-	11	-	9	8	-	12	12	-

#### **PREFERRED ALIGNMENT**

The preferred alignment consists of a combination of Alternative 1A, 2A, 3A, 4A and 5A and is presented in **Figure C.17**. **Table C.3** below summarizes the estimated features of the overall Preferred Alignment, broken down by Project Area segments. In the case of a tie, alternates were evaluated and the preferred alignment was selected based upon prioritization of factors, mainly cost and length.

Characteristic	C-1.1	C-2.1	C-3.1	C-4.1	C-5.1	TOTAL
Pipe Diameter (inches)	48	48	48	48	48	48
Pipe Material	Mortar Lined Steel					
Total Distance (miles)	6.1	5.6	5.7	6.2	5.6	29.2
Pipe Cost	\$17,745,200	\$16,832,900	\$17,148,600	\$18,616,400	\$15,687,600	\$86,030,700
Length Tunnel (feet)	875	1,175	1,400	1,350	600	5,400
Number of Landowners	20	20	28	23	22	113
Wetland Crossings (feet)	2,460	1,025	455	760	955	5,655

#### Table C.3 – Preferred Alignment Characteristics







Figure C.17 – County Line Road Delivery Pipeline Preferred Alignment

Sewberry PS



## **Northern Integrated Supply Project**

## Poudre Delivery Pipeline Alternatives Analysis

May 2019

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#### **ROUTE COMPARISONS**

Each of the alternatives developed for the Poudre Delivery segment were subjected to the evaluation criteria and metrics described in Table 1 in the introduction. The Poudre Delivery segment was assessed as a single project area. This was due to the fact that there were far fewer feasible alignment options than segments such as Northern Tier, so breaking up project areas did not allow for increased evaluation opportunities.

An overview of all of the alternative options can be seen in **Figure P.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternate with the best overall performance (least reds, most greens) was chosen to be the Preferred Alternate. This Preferred Poudre Delivery Alignment can be seen in **Figure P.7** at the end of this document.

In total, two (2) alignment alternatives were fully assessed for the Poudre Delivery segment. However, three (3) additional alignments are present in **Figure P.1** and are shaded different colors of grey. These three alignments were considered to contain a "fatal flaw" and a complete analysis was not completed. These alignments still have their own map and fact sheet which explain in more detail the reasons why they were not selected or evaluated further.



Figure P.1 – Poudre Delivery Alignment Alternates Overview



Alternative Name	P-1			
Alternative Location & Description Alternative follow the al Dead endin in with		e Delivery Alto on, just southe e River, passe rline Rd. Fron nces and the s the canal un ernative stays nan Lake. It c g at the interse the proposed	ernative P-1 begins at the approximate pump station tast of the canal. The alignment then stays north of the es through the garden center property before crossing in there, it follows the curve between the backs of ponds in the Fort Collins Natural Areas. The alternate then til it crosses the canal before tunneling I-25. East of I-25, s on the north side of the canal, follows the bend around rossed Prospect Rd twice to avoid residences before ection of Prospect Rd and County Line Road, where it ties d County Line Alignment.	
Criteria		Ranking	Comments	4 Z LENNIE DR
Capital Cost		Green	Estimated cost \$10,031,000	5 1 2 91 CO 194 S 2 10 15
Conduit Length		Green	About 5.89 miles, or 31,100 feet	DOMAE BOOM
Easement Difficulty		Yellow	Estimated 36 parcels	
Right-of-Way Impact		Green	Very little, if any, public ROW disturbance	COLUMN F MULBERRY ST
Land Owner Impact		Yellow	Impact to garden center. Near large number of properties on Cherly St. Will need to be careful to avoid trees on property by canal. Impacting parcel by Deadman Lake.	
Proximity to Occupied Dwellings		Red	Less than 100 feet from an estimated 48 dwellings	Michillo Al
Environmental Impacts		Green	Four (4) wetland crossings	MIG
Existing Utilities		Green	Minimal impact to existing utilities because not in public ROW	A ST
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings	MIDO ON MIDO
Surface and Street In	npacts	Yellow	Estimated 10 street crossings (3 to be built).	
Traffic Impacts		Yellow	Moderate traffic impacts. Impacts are due to street crossings. Minimal parallel construction.	NANCK BE NANCK
Water Storage Reser Impacts	voirs	Green	Not in the vicinity of water storage reservoir toe dam	TEWOODDR HKRISRONRD
Construction Duration Relative Constructab	n and ility	Green	Estimated Total Active Days: 126 days Estimated Total Days: 206 days	Solid Waste Facility
Required Trenchless Crossing		Yellow	Two (Timberline Rd and I-25)	Parcel         R DR           NWI Wetlands         NWI Wetlands
Development Pressu	re	Yellow	Passes through two future developments and one potential development parcel	Riparian Corridor Fort Collins City Limits
Operation and Maintenance Access		Green	Relatively good access from existing trail system and ditch roads. East of I-25, proximity to Prospect makes for relatively easy access.	Figure P.2 – Alternative P-1
O&M Requirements		Green	Fewest number of air vac and blow off pairs.	
Natural Resources Impacts		Green	Minimal to moderate impacts through the Natural Areas. Does not cross the Poudre River	



Alternative Name P-2								
Alternative Location & Description	Poudre Delivery Alternative P-2 begins at the same approximate pump station location as the other alternatives. The alignment then crosses the Poudre River and continues through Fort Collins Natural Areas for a while where it crosses the Poudre River again continues through the Natural Areas, until it veers east and crosses Summit View Drive. From there, the alternate attempts to follow property lines before tunneling I-25 The alignment then follows the same path east of I-25 as the other alignments.							
Criteria		Ranking	Comments					
Capital Cost		Yellow	Estimated cost \$10,755,000					
Conduit Length		Yellow	About 5.98 miles, or 31,574 feet					
Easement Difficulty		Yellow	Estimated 35 parcels					
Right-of-Way Impact		Green	Very little, if any, public ROW disturbance					
Land Owner Impact		Green	Less impact to private parcels due to higher Natural Areas impact. Splitting parcel near Buckeye St. Impacting parcel by Deadman Lake.					
Proximity to Occupied Dwellings	ł	Yellow	Less than 100 feet from an estimated 15 dwellings					
Environmental Impac	ts	Red	Five (5) wetland crossings, Poudre River Crossings (twice) and additional length in the Natural Areas					
Existing Utilities		Green	Minimal impact to existing utilities because not in public ROW					
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings					
Surface and Street In	npacts	Yellow	Estimated 8 street crossings (3 to be built).					
Traffic Impacts		Yellow	Moderate traffic impacts. Impacts are due to street crossings. Minimal parallel construction.					
Water Storage Reser Impacts	voirs	Green	Not in the vicinity of water storage reservoir toe dam					
Construction Duratior Relative Constructabi	struction Duration and tive Constructability		Estimated Total Active Days: 154 Estimated Total Days: 234					
Required Trenchless Crossing		Yellow	Two (Timberline Rd and I-25)					
Development Pressu	re	Yellow	Passed through two future developments and one potential development parcel					
Operation and Maintenance Access		Yellow	Relatively good access with existing trail system and existing two-track west of Summit View Drive. May require new trails in natural areas some of which may be seasonally difficult to access due to mud. East of I-25, proximity to Prospect makes for relatively easy access.					
O&M Requirements		Yellow	Relatively more air vac and blow off pairs due to river crossings					
Natural Resources Im	pacts	Red	Moderate impacts through the Natural Areas. Does cross the Poudre River.					



#### Figure P.3 – Alternative P-2

Alternative Name	P-3			
Alternative Location & Description	Poudre locatior perpen- then ve Prospe then fol This alt The ma	Delivery Alte n as the othe dicular angle ers east thro ct Rd and the lows the san ernative was ain issues wit Location par traffic impac Blocked acc Public health Large impac Significantly	ernative P-3 begins at the same approximate pump station r alternatives. This option crosses the Poudre River at a and follows straight down Timberline Rd. Alternative P-3 bugh the parking lot of medical offices before following en tunneling beneath I-25 and on/off ramps. The alignment ne path east of I-25 as the other alignments. In ot evaluated further to the presence of a few "fatal flaws". In this alignment are: allel or very near multiple roadways causing significant ts. ess to offices/businesses along Prospect in and safety risk due to construction through medical center t to significant amount of existing utilities longer tunnel crossing for I-25 and difficult tunnel staging	EVINE DR ALT: P-3 ALT: P
Criteria		Ranking	Comments	
Capital Cost				E MULBERRY ST E MULBERRY ST 44 CL S ST S
Conduit Length				CHAST 2 B B
Easement Difficulty				L'CHERLINGT CHERLINGT
Right-of-Way Impact				
Land Owner Impact				Record Strand Strand Strand DR 25 KRICHELLWAY
Proximity to Occupied Dwellings	d			BUCKEYE ST
Environmental Impac	ts			
Existing Utilities				
Hazardous/Permitted Crossings	I			
Surface and Street In	npacts			
Traffic Impacts				× ×wood DR IKRISRA
Water Storage Reser	voirs			
Construction Duration Relative Constructab	n and ility			Parcel
Required Trenchless Crossing				Riparian Corridor
Development Pressu	re			Fort Collins City Limits
Operation and Maintenance Access				Figure P.4 – Alternative P-3
O&M Requirements				
Natural Resources In	npacts			



Alternative Name	P-4			CELTICEN
Alternative Location & Description	Poudre location continu crossir the oth This al The ma	e Delivery Alt n as the othe les through th og under I-25 er alignment ternative was ain issues with Extensive im Extensive pu Prohibitive c	ernative P-4 begins at the same approximate pump station r alternatives. This option crosses the Poudre River and he City of Fort Collins Natural Areas until a tunneled The alignment then follows the same path east of I-25 as s. e not evaluated further to the presence of a few "fatal flaws". h this alignment are: upact to the Natural Resource/Environmental Areas ublic impact due to trail closures during construction onstruction dewatering	E VINE DR COLEMAN ST SYKES DR COMET ST REDMAN DR COMET ST COMET ST
Criteria		Ranking	Comments	
Capital Cost				
Conduit Length				
Easement Difficulty				
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			The state of the s
Environmental Impac	sts			
Existing Utilities				
Hazardous/Permitteo Crossings	1			
Surface and Street Ir	npacts			
Traffic Impacts				
Water Storage Reser	rvoirs			E DRAKE RD
Construction Duration Relative Constructab	n and ility			Solid Waste Facility
Required Trenchless Crossing				Parcel
Development Pressu	re			Riparian Corridor
Operation and Maintenance Access				Fort Collins City Limits
O&M Requirements				Figure P.5 – Alternative P-4
Natural Resources In	npacts			



Alternative Name	P-5			
Alternative Location & Description	Poudi locati and ir contir it tunr 25 as This a The n • •	re Delivery Alton as the other internation of the other istead heads internative want of the other alig alternative want in issues with Significant r road Limited con duration Congested negatively in Safety of Other	ernative P-5 begins at the same approximate pump station r alternatives. This option does not cross the Poudre River north, towards Highway 14. The alignment alternative r the Frontage Road South, following the curve south before th I-25. The alignment then follows the same path east of I- nments. s not evaluated further to the presence of a few "fatal flaws". th this alignment are: negative economic impact due to businesses along service struction corridor resulting in significantly longer construction utilities in service road requiring relocation. Relocation mpacts business operations until completed &M staff servicing pipeline along busy street	ALT: P-5
Criteria	1	Ranking	Comments	
Capital Cost				
Conduit Length				THEASANT ACRESOR TO STATE STATE STATE
Easement Difficulty				L' CHERLY ELOCUST ST
Right-of-Way Impact				
Land Owner Impact				
Proximity to Occupie Dwellings	d			
Environmental Impac	cts			
Existing Utilities				
Hazardous/Permitted Crossings	Ł			
Surface and Street Ir	mpacts			KATAHON RAY P
Traffic Impacts				
Water Storage Reser	rvoirs			Parcel SPOR
Construction Duration Relative Constructab	n and oility			NWI Wetlands
Required Trenchless Crossing	;			Fort Collins City Limits
Development Pressu	ire			Figure P.6 – Alternative P-5
Operation and Maintenance Access				
O&M Requirements				
Natural Resources In	npacts			



**Table P.1** is a visual summary of the score given to every alternative for each criteria. **Table P.2** tabulates the number of greens, yellows, and reds given to each alternative.

Table P.1 – Visual Summar	y of Alternative Scoring
---------------------------	--------------------------

Evaluation Criteria	P-1	P-2	P-3	P-4	P-5
Capital Cost					
Conduit Length					
Easement Difficulty					
Right-of-Way Impact					
Land Owner Impact					
Proximity to Occupied Dwellings					
Environmental Impacts					
Existing Utilities					
Hazardous/Permitted Crossings					
Surface and Street Impacts					
Traffic Impacts					
Water Storage Reservoirs Impacts					
Construction Duration and Relative Constructability					
Required Trenchless Crossings					
Development Pressure					
Operation and Maintenance (O&M) Access					
O&M Requirements					
Natural Resources Impacts					

#### Table P.2 – Numeric Summary of Alternative Scoring

Evaluation Criteria	P-1	P-2	P-3	P-4	P-5
Red	1	2	-	-	-
Yellow	6	11	-	-	-
Green	11	5	-	-	-

#### **PREFERRED ALIGNMENT**

From analysis, it can be determined that the optimal/preferred alignment is alignment P-1. **Table P.3** below summarizes the estimated features of the overall Preferred Alignment. In the case of a tie, alternates were evaluated and the winner was selected based upon prioritization of factors, mainly conduit length, constructability and land-owner/environmental impacts. Preferred Alignment P-1 can be seen in **Figure P.7** on the following page.

 Table P.3 – Preferred Alignment Characteristics

Characteristic	P-1
Pipe Diameter (inches)	32
Pipe Material	Mortar Lined Steel
Total Distance (miles)	5.9
Approximate Pipe Cost	\$10,031,000
Length Tunnel (feet)	350
Number of Landowners	35
Number of Wetland Crossings	4



Figure P.7 – Poudre Delivery Pipeline Preferred Alignment

Bewberry HOS



## **Northern Integrated Supply Project**

## Poudre West Pipeline Alternatives Analysis

May 2019

Prepared by:

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#### **ROUTE COMPARISONS**

Each of the alternatives developed was subjected to the evaluation criteria and metrics described in **Table 1** in the introduction. The Poudre West Pipeline segment was assessed as a single project area. This was due to the fact that the alignment is relatively short compared to other pipeline segments, allowing for easy readability/resolution with just one project area. As such, splitting up project areas did not allow Poudre increased evaluation opportunities for the final Preferred Alignment.

An overview of the Project Area and the alternative options can be seen in **Figure PW.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternative with the best overall performance (least reds, most greens) was selected to be the Preferred Alternative. This preferred Poudre West Pipeline Alignment can be seen in **Figure PW.4** at the end of this document.

In total, two (2) alternatives were assessed for the Poudre West Pipeline segment all within a single project area. No alternatives were identified that contain a "fatal flaw" as seen in other route comparisons.



Figure PW.1 – Poudre West Pipeline Alternatives

Alternative Name	PW-1.1		
Alternative Location & Description	Alignment Alternative PW-1.1 begins at the proposed diversion structure just northeast of the City of Fort Collins Mulberry wastewater facility and routes northeast away from the Poudre River. It turns southeast, paralleling the Poudre River, until reaching the proposed pump station. It then turns east, crosses S. Lemay Ave., and continues along Frontage Rd North until reaching Air Park Dr. From this point the alignment turns south across HWY 14, to its termination at the Timnath Reservoir Inlet Canal.		
Criteria		Ranking	Comments
Capital Cost		Yellow	\$ 2,762,800
Conduit Length		Yellow	5,050 feet
Easement Difficulty		Yellow	6 parcels crossed
Right-of-Way Impact		Yellow	Mostly in public ROW, roughly equal amounts with each alternative
Land Owner Impact		Green	Less business impacts expected due to frontage road access point availability, most businesses also have access from north side of proposed construction
Proximity to Occupie Dwellings	d	Yellow	Moderate, within 100-feet of an estimated 12 occupied businesses
Environmental Impac	:ts	Green	No wetlands crossed
Existing Utilities		Yellow	Numerous existing utilities expected due to urban construction in urban area and location of alignment in road right-of-way
Hazardous/Permitted Crossings	I	Green	No hazardous/permitted crossings known
Surface and Street Ir	npacts	Red	Roughly equal lengths of pipe being constructed under/near roadways
Traffic Impacts		Yellow	Roughly equal amount of traffic impact expected due to proximity to major roadways, traffic impacts likely to be limited to frontage roads
Water Storage Reser Impacts	voirs	Green	No impacts expected
Construction Duration Relative Constructab	n and ility	Yellow	Slightly longer construction duration expected due to longer overall length and one additional trenchless crossing
Required Trenchless Crossing		Yellow	HWY 14 (CDOT), Lemay Ave, 12th Street
Development Pressu	re	Green	Some development pressure possible at northwest corner of HWY 14 and Lemay Ave, no other new developments known/expected
Operation and Maintenance Access		Green	Similar access due to proximity to roadways
O&M Requirements		Green	Equal amount of air vac and blow off pairs required
Natural Resources In	npacts	Green	Minimal, majority of alignment routed through urban setting with few natural areas



Alternative Name	PW-1.2		
Alternative Location & Description	Alignment Alternative PW-1.2 begins at the proposed diversion structure just northeast of the City of Fort Collins Mulberry wastewater facility and routes northeast away from the Poudre River. It turns southeast, paralleling the Poudre River, until reaching the proposed pump station. It then turns east, until just past the pump station, where it then turns south crossing HWY 14. From this point the alignment turns east, crosses S. Lemay Ave., and continues along Frontage Rd. S. for approximately 2,600 feet before turning south towards its termination at the Timnath Reservoir Inlet Canal.		
Criteria		Ranking Comments	
Capital Cost		Green	\$2,420,800
Conduit Length		Green	4,790 feet
Easement Difficulty		Green	5 parcels crossed
Right-of-Way Impact		Yellow	Mostly in public ROW, roughly equal amounts with each alternative
Land Owner Impact		Yellow	More business impacts expected due to lack of available options to access locations other than frontage road, a few businesses also located at dead end of frontage road
Proximity to Occupie Dwellings	d	Yellow	Moderate, within 100-feet of an estimated 8 occupied businesses
Environmental Impac	ts	Green	No wetlands crossed
Existing Utilities		Yellow	Numerous existing utilities expected due to urban construction in urban area and location of alignment in road right-of-way
Hazardous/Permitted Crossings		Green	No hazardous/permitted crossings known
Surface and Street In	npacts	Red	Roughly equal lengths of pipe being constructed under/near roadways
Traffic Impacts		Yellow	Roughly equal amount of traffic impact expected due to proximity to major roadways, traffic impacts likely to be limited to frontage roads
Water Storage Reser Impacts	voirs	Green	No impacts expected
Construction Duration Relative Constructab	n and ility	Green	Alignment is slightly shorter and has one less trenchless crossing resulting in shorter duration and better constructability
Required Trenchless Crossing		Green	HWY 14 (CDOT), Lemay Ave
Development Pressu	re	Green	Some development pressure possible at northwest corner of HWY 14 and Lemay Ave, no other new developments known/expected
Operation and Maintenance Access		Green	Similar access due to proximity to roadways
O&M Requirements		Green	Equal amount of air vac and blow off pairs required
Natural Resources In	npacts	Green	Minimal, majority of alignment routed through urban setting with few natural areas



**Table PW.1** is a visual summary of the score given to the two alternatives for each criteria. **Table PW.2** tabulates the number of greens, yellows, and reds given to each alternative.

Evaluation Criteria	PW-1.1	PW-1.2
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossings		
Development Pressure		
Operation and Maintenance (O&M) Access		
O&M Requirements		
Natural Resources Impacts		

Table PW.1 – Visual Summary of Alternative Scoring

Table PW.2 – Numeric Summary of Alternative Scoring

Evaluation Criteria	PW-1.1	PW-1.2
Red	1	1
Yellow	9	5
Green	8	12

### PREFERRED ALIGNMENT

From analysis, it can be determined that the optimal/preferred alignment is alignment PW-1.2. **Table PW.3** below summarizes the estimated features of the overall preferred alignment. In the case of a tie, alternates were evaluated and the preferred alignment was selected based upon prioritization of factors, mainly conduit length, constructability and land-owner/environmental impacts. Preferred Alignment PW-1.2 can be seen in **Figure PW.4** on the following page.

Characteristic	PW-1.2
Pipe Diameter (inches)	32
Pipe Material	Mortar Lined Steel
Total Distance (feet)	4,790
Pipe Cost	\$2,420,800
Length Tunnel (feet)	455
Number of Landowners	5
Wetland Crossings (feet)	0

Table PW.3 – Preferred Alignment Characteristics



#### POUDRE WEST PIPELINE PREFERRED ALIGNMENT

Poudre West Pipeline Alternative PW-1.2 Pump Station NWI Wetlands Riparian Corridor Larimer County Parcels



Figure PW.4 – Poudre West Diversion Pipeline Preferred Alignment

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Fort Collins

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