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Subject: Uinta Basin Railway Alternatives Analysis
Attachments: UBRY_Supplemental Route Selection Information_013120 .pdf

Josh,

Please find attached a supplemental information paper regarding the route selection process that was performed in developing the proposed alternatives for the Uinta Basin Railway project. Please let us know if you have any questions.

Have a nice weekend.

Thanks,
Amanda

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Supplemental Route Selection Information

Uinta Basin Railway

Seven County Infrastructure Coalition

January 31, 2020

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1.0 Introduction

The Seven County Infrastructure Coalition (Coalition), a governmental entity comprising Carbon, Daggett, Duchesne, Emery, San Juan, Sevier, and Uintah Counties, is proposing a new railway that would connect the Uinta Basin's various industries to the national rail network. This report provides detailed information regarding the Coalition's route selection process and explains the Coalition's rationale for recommending that certain routes be eliminated from further evaluation through the National Environmental Policy Act (NEPA) process. This report expands on the evaluation provided in previous documents, including the following:

- *Route Selection Memorandum*, May 27, 2019. This memorandum discussed the evaluation of potential alternatives. The Coalition and HDR identified certain objectives that a railway route would have to meet to be considered feasible. These objectives include operational feasibility; economic feasibility, urban, and residential area avoidance; and minimization of environmental impacts.
- *Response to Information Request #4*, November 30, 2019. Specifically, this response provided additional information regarding the feasibility analysis for the Avintaquin Canyon route. The current report (*Supplemental Route Selection Information*) discusses the previously completed feasibility analyses for the Westwater, Mack, East Rifle, and West Rifle routes.

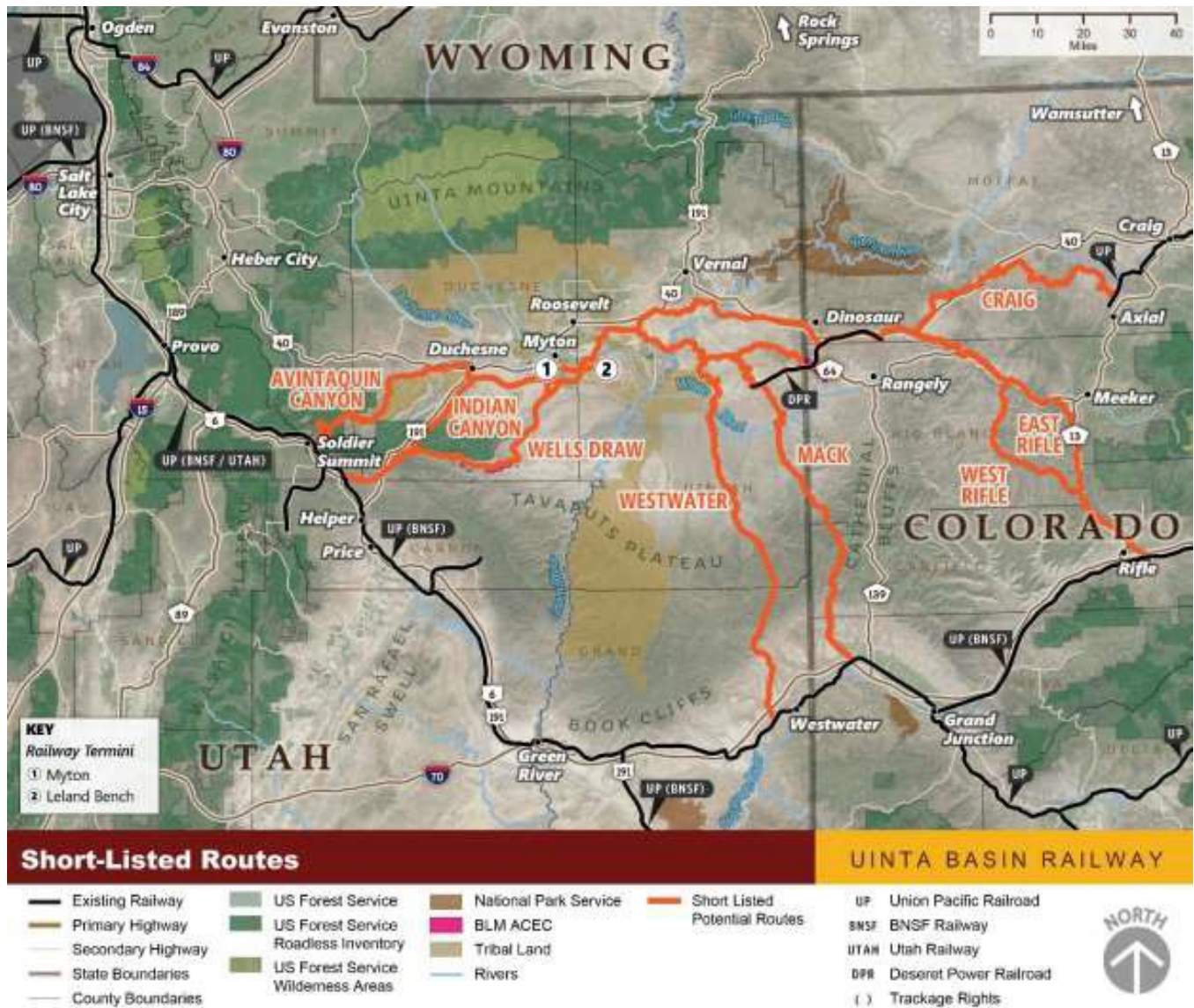
2.0 Evaluation of “Short-listed” Routes

The Coalition identified 29 potential routes by reviewing previous studies and project goals. The *Route Selection Memorandum* documented the Coalition's initial evaluation of these 29 routes and identified eight “short-listed” routes to be carried forward for further evaluation. The eight short-listed routes (Figure 1), as described in the *Route Selection Memorandum*, are:

1. Avintaquin Canyon
2. Indian Canyon
3. Wells Draw
4. Westwater
5. Mack
6. Craig
7. West Rifle
8. East Rifle

Of the eight short-listed routes, five (Indian Canyon, Westwater, Mack, West Rifle, and East Rifle) were identified by the Utah Department of Transportation (UDOT) in its 2014 *Uinta Basin Railroad Environmental Study*, one (Craig) was developed by HDR in 2017 for a private industrial client and modified at the request of the Coalition in 2019, one (Wells Draw) was developed to minimize impacts to land managed by land management agencies, and one (Avintaquin Canyon) was developed in 2019 through discussions with Jones and DeMille Engineering.

Figure 1. Map of “Short-listed” Routes



HDR evaluated these eight short-listed routes using the following two-step process, as documented in the *Route Selection Memorandum*:

1. Evaluate using non-construction-cost criteria
2. Evaluate using construction cost

2.1 Step 1: Evaluate Using Non-construction-cost Criteria

HDR evaluated the eight short-listed routes using the following non-construction-cost criteria:

- Ability to connect to both BNSF Railway (BNSF) and Union Pacific Railroad (UP) trackage, with a preference for accessing the trackage of both of these Class 1 railroads
- The total route mileage, with a preference for shorter routes
- Feasibility of Clean Water Act permitting, with a preference for routes that would have fewer crossings of water bodies and impacts to wetlands
- Whether the route crosses tribal land, with the acknowledgement that a memorandum of understanding with affected tribes would be necessary to cross tribal land
- Whether the route crosses U.S. Department of Agriculture (USDA) Forest Service land designated as “inventoried roadless areas,” with an understanding that coordination with the USDA Forest Service could be necessary for routes crossing these areas
- Whether the route crosses U.S. Bureau of Land Management (BLM) Special Designation Lands, including areas of critical concern, with a preference for routes that do not

Table 1 lists the results of the step 1 evaluation. For more information about how these numbers were determined, refer to the *Route Selection Memorandum* updated September 27, 2019.

Table 1. Results of the Step 1 Evaluation

Route	Land Ownership (acres)			Parks, Refuges, and Recreation Areas (acres)	Number of Water Body Crossings	Wetlands (acres)	Wetland Banks (acres)	Number of Historic Properties	Limiting Soils ^a (acres)
	Federal	State	Tribal						
Indian Canyon	3,260	950	2,230	2,850 ^b	157	200	0.00	1	1,016
Craig	19,880	3,900	0 ^c	520	300	235	0.00	0	3,375
Wells Draw	13,570	2,000	0 ^c	620	171	160	0.00	3	10,130
Avintaquin Canyon	3,760	418	5,420	355	185	310	0.00	1	1,135
East Rifle	20,480	1,523	0	600	375	561	0.16	5	13,775
West Rifle	22,360	2,480	0	1,910	370	776	0.16	5	13,270
Mack	18,622	2,336	0	461	260	326	0.16	2	7,580
Westwater	22,480	4,700	0	1,866	287	252	0.00	2	6,660

^a Includes prime farmland, farmland of statewide importance, and land that is farmland if irrigated.

^b Includes land in the USDA Forest Service's Ashley National Forest.

^c The corridor for the route was narrowed to remove tribal land.

2.2 Step 2: Evaluate Using Construction Cost

HDR also evaluated the eight short-listed routes in terms of their construction cost, with a preference for less costly routes. Table 2 lists the estimated construction cost, with associated inputs, for each route.

Table 2. Results of the Step 2 Evaluation

Dollar figures are in billions

Route	Mileage					Costs					
	Total Mileage	Open Terrain Miles	Moderate Terrain Miles	Difficult Terrain Miles	Tunnel Miles	Open Terrain Cost	Moderate Terrain Cost	Difficult Terrain Cost	Tunnel Cost	Sales Tax of 6.2%	Opinion of Total Cost
Indian Canyon	80.5	60.3	0.0	17.0	3.2	\$0.42	\$0.00	\$0.37	\$0.42	\$0.08	\$1.29
Craig	185.3	155.3	30.0	0.0	0.0	\$1.09	\$0.27	\$0.00	\$0.00	\$0.08	\$1.44
Wells Draw	111.0	33.9	41.0	30.5	5.6	\$0.24	\$0.37	\$0.67	\$0.74	\$0.13	\$2.14
Avintaquin Canyon	97.3	34.4	0.0	59.0	3.9	\$0.24	\$0.00	\$1.30	\$0.51	\$0.13	\$2.18
East Rifle	196.8	132.1	0.0	63.5	1.2	\$0.92	\$0.00	\$1.40	\$0.16	\$0.15	\$2.63
West Rifle	201.6	136.9	0.0	63.5	1.2	\$0.96	\$0.00	\$1.40	\$0.16	\$0.16	\$2.67
Mack	155.0	90.4	0.0	59.5	5.1	\$0.63	\$0.00	\$1.31	\$0.67	\$0.16	\$2.78
Westwater	159.7	94.9	0.0	59.5	5.3	\$0.66	\$0.00	\$1.31	\$0.70	\$0.17	\$2.84

Costs have been rounded to the nearest \$10 million and might not sum accurately due to rounding. Costs exclude signals, sidings, shipper facilities, and improvements to UP trackage, improvements to Deseret Power Railroad trackage, environmental mitigation, and right-of-way acquisition. This opinion of costs is subject to change based on further analysis of the routes and additional geotechnical investigation, survey, environmental assessment, and negotiations with stakeholders.

2.3 Outcomes of the Two-step Evaluation

The *Route Selection Memorandum* was originally delivered to the Coalition for Task Order 1 (Subsequently Revised) on May 27, 2019, and was updated on September 27, 2019. The updated memorandum included much of the following information. HDR's recommendation, agreed to by the Coalition, was to recommend withdrawal of five routes from further evaluation based on the results of the two-step evaluation process, and to carry forward the Indian Canyon, Wells Draw, and Craig routes for further environmental analysis through the NEPA process.

As general engineering background, construction costs increase exponentially with increasing ruggedness of the terrain. The greater the relief (typically indicated by heavier shading in maps) in the terrain, the greater the amount of the earthwork required to construct the track roadbed. Rugged terrains often require tunnels, the most expensive element to construct, in order avoid grades in excess of operational baseline, as well as long bridges and significant numbers of retaining walls to go through areas of greater relief. For economical construction and operation, rail routes need as much gentle terrain and modest grade variation as possible and should avoid tunnels wherever practical.

In order to help minimize both construction costs and project footprint for rail routes traversing mountainous terrain, tracks often follow steep grades that more closely align to the natural terrain features, in lieu of tunneling. Grades steeper than 2.5% on existing tracks pose operational limitations and restrictions. Steep grades often require the use of multiple additional locomotives to power the train, and might also require separating long unit trains into multiple smaller trains to safely ascend or descend the grades. This

separation into multiple trains significantly increases the operating costs and reduces the capacity of a railroad, thereby hindering its economic feasibility by requiring additional locomotives, losing time due to separating and combining trains and meeting additional sections of trains, and constructing additional double or passing tracks that increase construction costs and the project footprint.

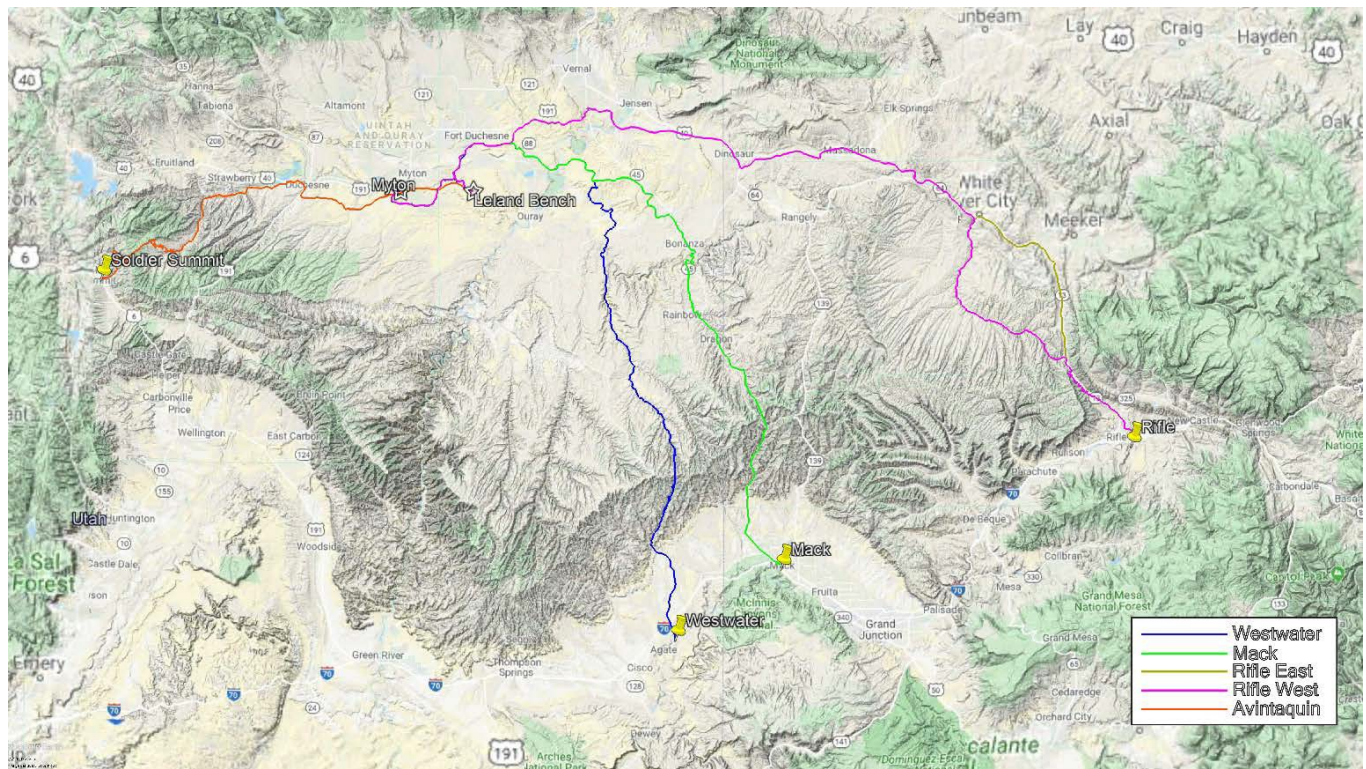
3.0 Route Descriptions for the Five Routes Not Carried Forward for Further Evaluation

3.1 Basic Descriptions of the Five Routes

This section provides basic descriptions of the five routes that were not carried forward for further evaluation (refer to Figure 2). Section 3.2 provides additional details for each route.

- **Westwater.** Starting at the UP Green River Subdivision main line near Agate, Utah, this route heads northerly across the Green River Desert to the base of the Book Cliffs. It enters the Book Cliffs and follows Westwater Wash, and then East Westwater Canyon to the canyon's end. A summit tunnel passes through the East Tavaputs Plateau. Then route then follows Sweetwater and Bitter Creek canyons northerly to the White River. After crossing the White River, the route turns westward and northward to reach the proposed terminus in the Uinta Basin. This route does not enter Colorado. Portions of this route were identified in the 2014 UDOT *Uinta Basin Railroad Environmental Study*. Compared to the route in the 2014 UDOT study, the Westwater route was horizontally realigned to reduce the estimated tunnel length and avoid tribal land. The current Westwater route does not cross tribal land.

- **Mack.** Starting at the UP Green River Subdivision main line near Mack, Colorado, this route heads northerly across the Grand Valley to the base of the Book Cliffs. It enters the Book Cliffs and follows Atchee Wash to reach a summit tunnel through the East Tavaputs Plateau in the vicinity of Baxter Pass. After the summit tunnel near Baxter Pass, the route follows Evacuation Creek Canyon to the White River. Crossing the White River, the route passes Bonanza and the Bonanza Power Plant before turning west to reach the proposed terminus in the Uinta Basin. Portions of this route were identified in the 2014 UDOT *Uinta Basin Railroad Environmental Study*. HDR modified the route as appropriate to achieve proposed design standards for the Uinta Basin Railway. Compared to the route in the 2014 UDOT study, the Mack route was horizontally and vertically realigned to reduce the estimated tunnel length and reduce overall track mileage. This route does not cross tribal land.
- **East Rifle.** Starting at the UP Glenwood Springs Subdivision main line near Rifle, Colorado, the East Rifle route heads northerly toward the summit of Government Creek Canyon, continues to a point west of Meeker, Colorado, then turns northward and connects to the Deseret Power Railroad (DPR) tracks about 2 miles west of the Deserado Mine. After following the DPR alignment for 12.7 miles, the East Rifle route departs the DPR alignment and proceeds northwesterly, crossing the Green River about 5 miles south of Jensen, Utah. It then proceeds westward to reach the proposed terminus in the Uinta Basin. Portions of this route were identified in the 2014 UDOT *Uinta Basin Railroad Environmental Study*. Compared to the route in the 2014 UDOT study, the East Rifle route was horizontally and vertically realigned to reduce the estimated tunnel length and reduce overall track mileage. This route does not cross tribal land.
- **West Rifle.** Starting at the UP Glenwood Springs Subdivision main line near Rifle, Colorado, the West Rifle route heads northwesterly to the summit of Government Creek Canyon, then uses Piceance Creek Canyon to reach the White River. After following the DPR alignment for 12.7 miles, the West Rifle route departs the DPR alignment and proceeds northwesterly, crossing the Green River about 5 miles south of Jensen, Utah. It then proceeds westward to reach the proposed terminus in the Uinta Basin. Portions of this route were identified in the 2014 UDOT *Uinta Basin Railroad Environmental Study*. Compared to the route in the 2014 UDOT study, the West Rifle route was horizontally and vertically realigned to reduce the estimated tunnel length and reduce overall track mileage. This route does not cross tribal land.
- **Avintaquin Canyon.** Information regarding the Avintaquin Canyon route is provided as a separate memorandum in the Coalition's response to Information Request #4.

Figure 2. Map of Routes Not Carried Forward for Further Evaluation

3.2 Additional Details for the Five Routes

The following descriptions focus on the engineering, construction, and operational constraints associated with each of the routes that was **not** carried forward for further evaluation.

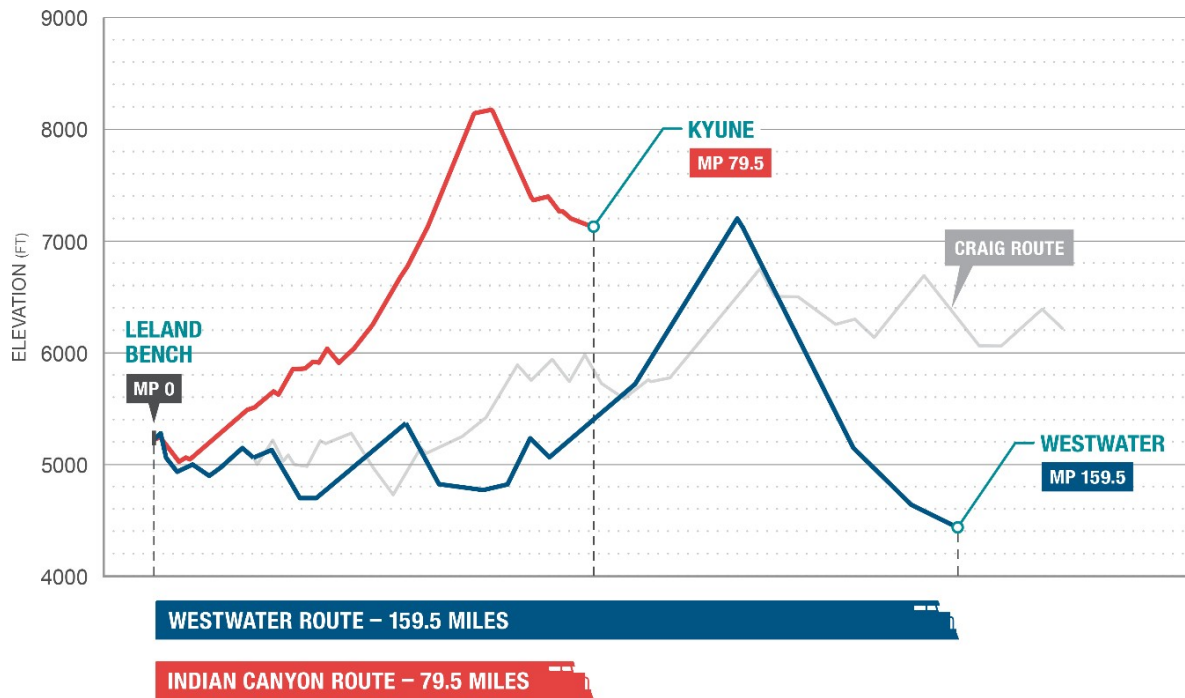
3.2.1 Westwater

The Westwater route is shown in Figure 2 in blue. To achieve design standards and avoid difficult terrain and an excessive length, this southerly route originates at the UP main line west of Westwater, Utah, and moves northward on a long, gradual ascent through Grand County, Utah, and the Tavaputs Plateau. It traverses curvy and rugged terrain as it enters the Uinta Basin.

The Westwater route would allow access to BNSF trackage in addition to UP trackage. It connects to the UP main line near Westwater where BNSF has trackage rights, does not enter Colorado at any point, and does not cross tribal land.

The Westwater route complies with the Operating Basis of Design. However, from an engineering perspective, the route is not preferred in terms of its construction and maintenance cost. The following analysis provides HDR's rationale for recommending removal of this route from further evaluation despite the route having passed initial screening in terms of meeting the project's purpose.

The total mileage of the Westwater route is about 159.5 miles (Figure 3). Of this length, about 59.5 miles, or over one-third of the total route, traverses rugged terrain classified in the screening process as "difficult." Additionally, the Westwater route would require an estimated 5.3 miles of tunnel, the most of any of the routes carried forward for further evaluation.

Figure 3. Length and Elevation of the Westwater Route

The curvy nature of portions of the Westwater route through the mountains south of the Uinta Basin yields a lower operational train speed than what would be achievable by other routes, since trains need to slowly traverse the combination of curves and steep ascent on their approach into the basin from the east. The Westwater route is also longer than other routes (at 80.5 miles, it is almost double the length of the shortest route, Indian Canyon) without providing any reduction in estimated. The additional curves, cuts, and fills through this rugged terrain, in comparison to other routes (such as Indian Canyon's 17.0 miles of rugged terrain), would be more expensive to construct, would be more expensive to maintain, and would limit operational efficiencies. Due to the need for cuts and fills, retaining walls, and bridges associated with the steep ascent and curves, the overall area of potential impact associated with the Westwater right-of-way is also greater than that of other routes analyzed, thereby creating a larger footprint for environmental impacts.

The following specific and unique challenges are also associated with the Westwater route:

- The proposed Westwater route would be co-located with a new road that is being constructed, and co-locating the road and the rail line within the rugged East Canyon would be difficult from an engineering and construction perspective.

Additionally, HDR inventoried the land ownership and environmental features for all potential routes. This inventory indicated that the Westwater route study area contains high numbers of wetland acres in comparison to other routes carried forward for further evaluation. The Westwater route was designated through screening as having a lower likelihood of being permitted under the Clean Water Act compared to other routes.

The Westwater route does not cross USDA Forest Service land, any BLM-designated areas of critical environmental concern, or any tribal land.

In comparison to other alternatives carried forward, the Westwater route has markedly higher construction costs and anticipated operational and maintenance costs. Westwater's estimated cost based on conceptual

engineering is \$2.84 billion, more than double that of the lowest-cost route (Indian Canyon). Westwater has the highest estimated construction cost of all the eight short-listed routes carried forward. During HDR's comparison analysis between Westwater and other short-listed routes carried forward, HDR determined that the following primary factors resulted in higher expected construction costs and other impacts:

- Significantly more miles of construction in rugged terrain (Westwater's approximately 60 miles compared to Indian Canyon's 17 miles)
 - Rugged terrain has a much higher construction cost than does moderate or gentle terrain.
 - Rugged terrain requires widening the right-of-way to accommodate cuts and fills, thereby increasing the potential for impacts.
- Longer route distance (Westwater's 159.5 miles compared to Indian Canyon's 80.5 miles at the time)
 - A longer route distance typically means more challenges and higher costs.
 - A longer route distance presents more opportunities for project impacts to different communities and environmental resources.
- More wetland acres in the project study area (Westwater's 252 acres to Indian Canyon's 200 acres) and a greater number of water body crossings (Westwater's 287 to Indian Canyon's 157) yield a greater potential for impacts requiring avoidance, minimization, or mitigation.

Ongoing operational costs are expected to be higher for the Westwater route than for other routes carried forward because of the route's undulating grade resulting in frequent steep grades as well as the length of track being nearly double that of Indian Canyon.

3.2.2 Mack

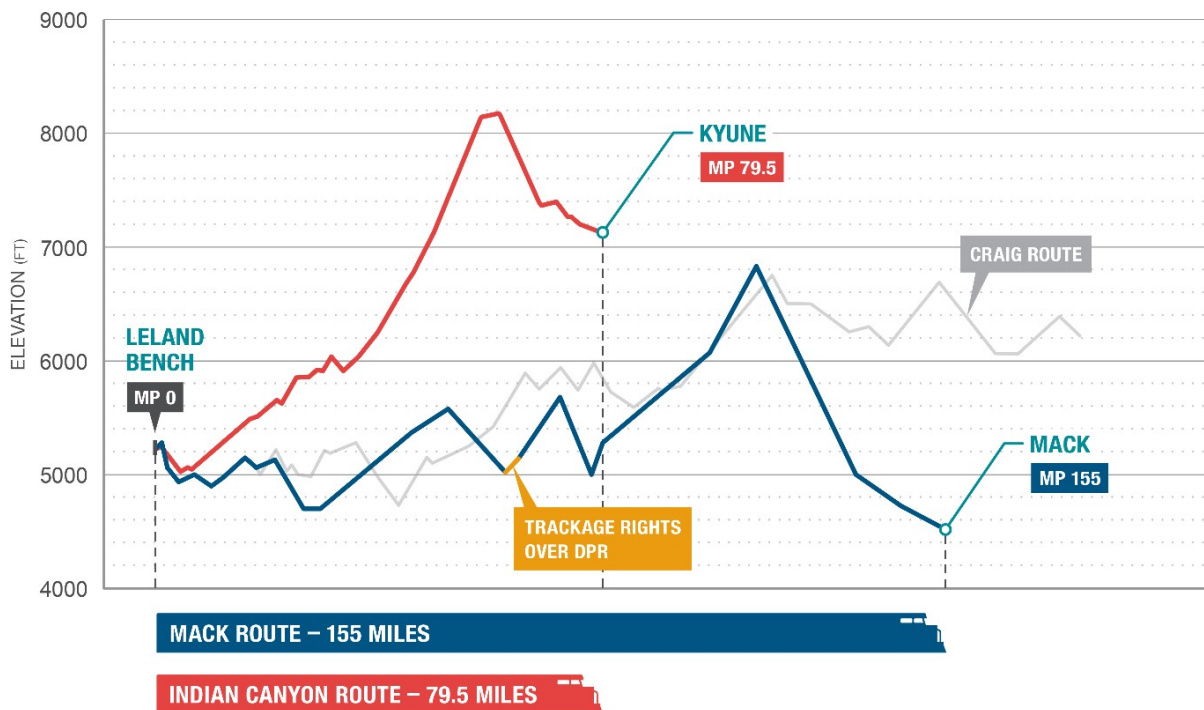
The Mack route is shown in Figure 2 in green. The route originates on the UP main line near Mack, Colorado. To achieve design standards as the route traverses the mountains near Baxter Pass, the route follows a curvy path with multiple curves and steep ascents as it enters the Uinta Basin. This curvy path is necessary to avoid both areas of great relief and tunneling, and it also reaches the maximum allowable grade requirements in order to enter the Uinta Basin.

The Mack Route would allow access to BNSF trackage in addition to UP trackage. It ties into the UP main line near Mack, Colorado, where BNSF has trackage rights. The route does not cross tribal land.

The Mack route complies with the Operating Basis of Design. However, from an engineering perspective, the route is not preferred in terms of its construction and maintenance cost. The following analysis provides HDR's rationale for recommending removal of this route from further evaluation despite the route having passed initial screening in terms of meeting the project's purpose.

The total mileage of the Mack route is about 155 miles (Figure 4). Of this length, about 59.5 miles, or over one-third of the total route, traverses rugged terrain classified in the screening process as "difficult." Additionally, the Mack route would require an estimated 5.1 miles of tunnel.

Figure 4. Length and Elevation of the Mack Route



HDR inventoried the land ownership and environmental features for all potential routes. This inventory indicated that the Mack route study area contains high numbers of wetland acres in comparison to other routes carried forward for further evaluation. The Mack route was designated through screening as having a lower likelihood of being permitted under the Clean Water Act compared to other routes.

The curvy nature of portions of the Mack route yields a lower operational train speed than what would be achievable by other routes, since trains need to slowly traverse the combination of curves and steep ascent on the approach entering the Uinta Basin from the east. The Mack route is also longer than other routes without providing any reduction in impact. The Mack route's estimated 59.5 miles of construction in rugged terrain would present design and engineering challenges and associated additional costs and feasibility concerns. The additional curves, cuts, and fills through this rugged terrain, in comparison to other routes, would be more expensive to construct, would be more expensive to maintain, and would limit operational efficiencies. Due to the need for cuts and fills, retaining walls, and bridges associated with the steep ascent

and curves, the overall area of potential impact associated with the Mack right-of-way is also greater than that of other routes analyzed, thereby creating a larger footprint for environmental impacts.

The following specific challenges are also associated with the Mack route:

- **Deseret Power Railroad access:** The Mack route uses a short segment of the DPR track. Access agreements would be required for the Uinta Basin Railroad to access DPR tracks, thereby adding uncertainty and costs to project development.

Although the Mack route does not cross USDA Forest Service land, it does traverse BLM-designated areas of critical environmental concern, further reducing the likelihood of being permitted compared to other routes that do not cross special designation land.

In comparison to other routes carried forward, the Mack route has markedly higher construction costs and anticipated operational and maintenance costs. Mack's estimated cost based on conceptual engineering is \$2.78 billion, the second-highest estimated cost and more than double that of the lowest-cost route (Indian Canyon). During HDR's comparison analysis between Mack and other routes carried forward, HDR determined that the following primary factors resulted in higher expected construction costs and other impacts:

- Significantly more miles of construction in rugged terrain (Mack's approximately 60 miles compared to Indian Canyon's 17 miles)
 - Rugged terrain has a much higher construction cost than does moderate or gentle terrain.
- Longer route distance (Mack's 155 miles compared to Indian Canyon's 80.5 miles at the time)
 - A longer route distance typically means more challenges and higher costs.
- More wetland acres in the project study area (Mack's 326 acres to Indian Canyon's 200 acres) and a greater number of water body crossings (Mack's 260 to Indian Canyon's 157) yield a greater potential for impacts requiring avoidance, minimization, or mitigation.

Ongoing operational costs are expected to be higher with the Mack route than with other routes carried forward because of the longer track length and the undulating grade resulting in frequent uphill grades.

3.2.3 East Rifle

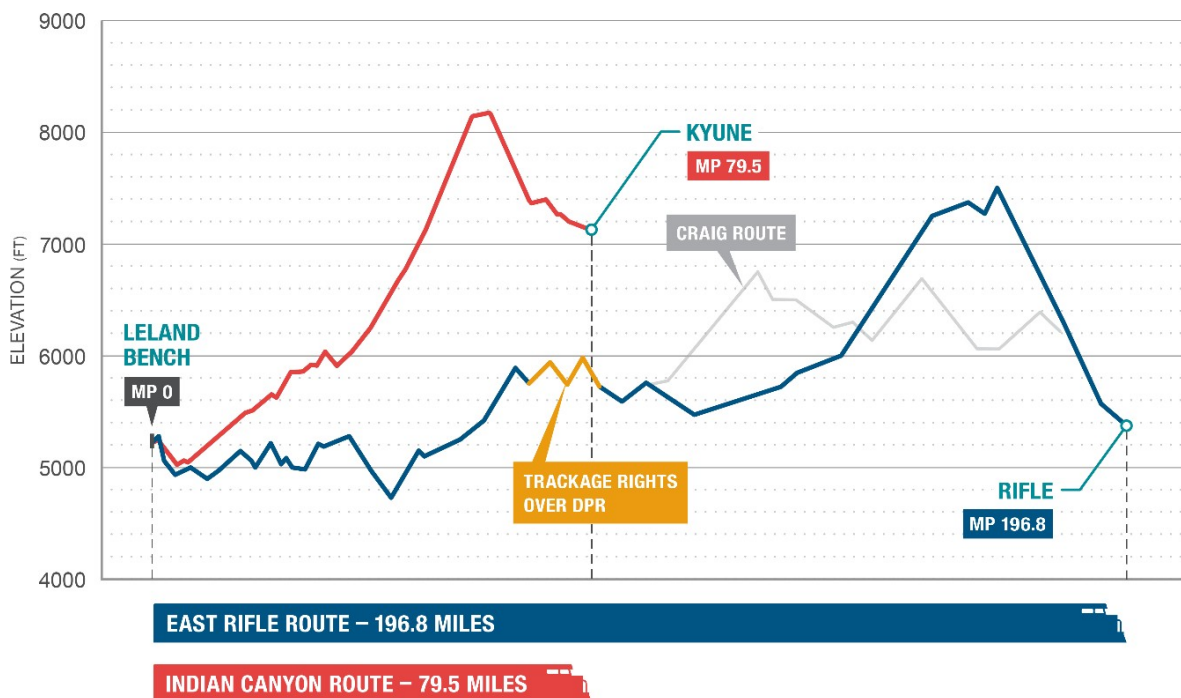
The East Rifle route is shown in Figure 2 in gold. The route originates near Rifle, Colorado, at the UP Glenwood Springs Subdivision. To achieve design standards as the route traverses the mountains near the summit of Government Creek Canyon, the route follows a curvy path via Meeker, Utah, with multiple curves and steep ascents as it enters the Uinta Basin. The East Rifle route's approach to enter the Uinta Basin also relies on the access to and use of 12.7 miles of track owned and operated by DPR. This curvy path is necessary to avoid both areas of great relief and tunneling, and it also reaches the maximum allowable grade requirements in order to reach the connection in the Uinta Basin.

The East Rifle route would allow access to BNSF trackage in addition to UP trackage by tying into the UP main line near Rifle, Colorado. The route does not cross tribal land.

The East Rifle route complies with the Operating Basis of Design. However, from an engineering perspective, the route is not preferred in terms of its construction and maintenance cost. The following analysis provides HDR's rationale for recommending removal of this route from further evaluation despite the route having passed initial screening in terms of meeting the project's purpose.

The total mileage of the East Rifle route is about 196.8 miles (Figure 5), the second-longest of the eight short-listed routes. Of this length, about 63.5 miles traverses rugged terrain classified in the screening process as "difficult," tying with West Rifle as the route with the most miles of construction required in difficult terrain. The East Rifle route would require 1.2 miles of tunnel.

Figure 5. Length and Elevation of the East Rifle Route



HDR inventoried the land ownership and environmental features for all potential routes. This inventory indicated that the East Rifle route study area contains high numbers of wetland acres of all the eight short-listed routes.. The number of wetland acres in the East Rifle study area is more than double that of any of the three routes carried forward for further evaluation. The East Rifle route was designated through screening as having a lower likelihood of being permitted under the Clean Water Act compared to other routes.

The curvy nature of portions of the East Rifle route yields a lower operational train speed than what would be achievable by other routes, since trains need to slowly traverse the combination of curves and steep ascent on the approach entering the Uinta Basin from the east. The East Rifle route is also longer than other routes without providing any reduction in estimated impacts. Because East Rifle requires an estimated 63.5 miles of construction in rugged terrain, it presents design and engineering challenges and associated additional costs and feasibility concerns. The additional curves, cuts, and fills through this rugged terrain, in comparison to other routes, would be more expensive to construct, would be more expensive to maintain,

and would limit operational efficiencies. Due to the need for cuts and fills, retaining walls, and bridges associated with the steep ascent and curves, the overall area of potential impact associated with the East Rifle right-of-way is also greater than that of other routes analyzed, thereby creating a larger footprint for environmental impacts.

The following specific challenges are also associated with the East Rifle route:

- **Deseret Power Railroad access:** The East Rifle route uses a segment of the DPR track. Access agreements would be required for the Uinta Basin Railroad to access DPR tracks, thereby adding uncertainty and costs to project development.

Although the East Rifle route does not cross USDA Forest Service land, it does traverse BLM-designated areas of critical environmental concern, further reducing the likelihood of being permitted compared to other routes that do not cross special designation lands.

In comparison to other routes carried forward, the East Rifle route has carried markedly higher construction costs and anticipated operational and maintenance costs. East Rifle's estimated cost based on conceptual engineering is \$2.63 billion, more than double that of the lowest-cost route (Indian Canyon). During HDR's comparison analysis between East Rifle and other routes carried forward, HDR determined that the following primary factors resulted in higher expected construction costs and other impacts:

- Significantly more miles of construction in rugged terrain (East Rifle's approximately 63.5 miles compared to Indian Canyon's 17 miles)
 - Rugged terrain has a much higher construction cost than does moderate or gentle terrain.
- Significantly longer route distance (East Rifle's 196.8 miles compared to Indian Canyon's 80.5 miles at the time; the route is more than double the length of the shortest route that was carried forward)
 - A longer route distance typically means more challenges and higher costs.
- More wetland acres in the project study area (East Rifle's 561 acres to Indian Canyon's 200 acres) and a greater number of water body crossings (East Rifle's 375 to Indian Canyon's 157) yield a greater potential for impacts requiring avoidance, minimization, or mitigation.

Ongoing operational costs are expected to be higher with the East Rifle route than with other routes carried forward because of the undulating grade and longer track length, resulting in frequent uphill grades.

3.2.4 West Rifle

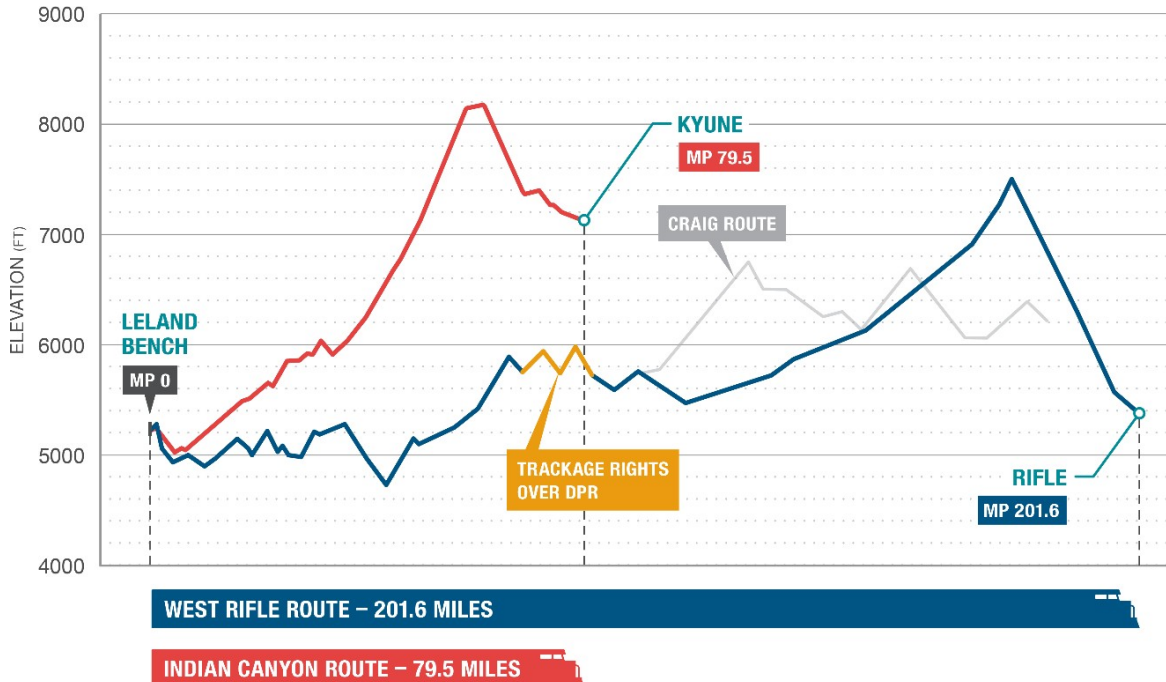
The West Rifle route is shown in Figure 2 in magenta. The route originates near Rifle, Colorado, at the UP Glenwood Springs Subdivision. To achieve design standards as the route traverses the mountains near the summit of Government Creek Canyon, the route follows a curvy path via Piceance Creek Canyon with multiple curves and steep ascents as it enters the Uinta Basin. The West Rifle route's approach to enter the Uinta Basin also relies on the access to and use of 12.7 miles of track owned and operated by DPR. This curvy path is necessary to avoid both areas of great relief and tunneling, and also to meet maximum grade requirements in order to reach the connection in the Uinta Basin.

The West Rifle route would allow access to BNSF trackage in addition to UP trackage by tying into the UP main line near Rifle, Colorado. The route does not cross tribal land.

The West Rifle route complies with the Operating Basis of Design. However, from an engineering perspective, the route is not preferred in terms of its construction and maintenance cost. The following analysis provides HDR's rationale for recommending removal of this route from further evaluation despite the route having passed initial screening in terms of meeting the project's purpose.

The total mileage of the West Rifle route is about 201.6 miles (Figure 6). Of this length, about 63.5 miles traverses rugged terrain classified in the screening process as "difficult," tying with East Rifle as the route with the most miles of construction required in difficult terrain. The West Rifle route would require 1.2 miles of tunnel.

Figure 6. Length and Elevation of the West Rifle Route



HDR inventoried the land ownership and environmental features for all potential routes. This inventory indicates that the West Rifle route study area contains high numbers of wetland acres of the eight short-listed routes. The number of wetland acres in the West Rifle study area is more than double that of any of the three routes carried forward for further evaluation. The West Rifle route was designated through

screening as having a lower likelihood of being permitted under the Clean Water Act compared to other routes.

The curvy nature of portions of the West Rifle route yields a lower operational train speed than what would be achievable by other routes, since trains need to slowly traverse the combination of curves and steep ascent on the approach entering the Uinta Basin from the east. The West Rifle route is also longer than other routes without providing any reduction in estimated impacts. Because West Rifle requires an estimated 63.5 miles of construction in rugged terrain, it presents design and engineering challenges and associated additional costs and feasibility concerns. The additional curves, cuts, and fills through this rugged terrain, in comparison to other routes, would be more expensive to construct, would be more expensive to maintain, and would limit operational efficiencies. Due to the need for cuts and fills, retaining walls, and bridges associated with the steep ascent and curves, the overall area of potential impact associated with the West Rifle right-of-way is also greater than that of other routes analyzed, thereby creating a larger footprint for environmental impacts.

The following specific challenges are also associated with the West Rifle route:

- **Desert Power Railroad access:** The West Rifle route uses a segment of the DPR track. Access agreements would be required for the Uinta Basin Railroad to access DPR tracks, thereby adding uncertainty and costs to project development.

Although the West Rifle route does not cross USDA Forest Service land, it does traverse BLM-designated areas of critical environmental concern, further reducing the likelihood of being permitted compared to other routes that do not cross special designation lands.

In comparison to other routes carried forward, the West Rifle route has markedly higher construction costs and anticipated operational and maintenance costs. West Rifle's estimated cost based on conceptual engineering is \$2.67 billion, more than double that of the lowest-cost route (Indian Canyon). During HDR's comparison analysis between West Rifle and other routes carried forward, HDR determined that the following primary factors resulted in higher expected construction costs and other impacts:

- Significantly more miles of construction in rugged terrain (West Rifle's approximately 63.5 miles compared to Indian Canyon's 17 miles)
 - Rugged terrain has a much higher construction cost than does moderate or gentle terrain.
- Significantly longer route distance (West Rifle's 201.6 miles compared to Indian Canyon's 80.5 miles at the time; the route is more than double the length of the shortest route that was carried forward)
 - A longer route distance typically means more challenges and higher costs.
- More wetland acres in the project study area (West Rifle's 776 acres to Indian Canyon's 200 acres) and a greater number of water body crossings (West Rifle's 370 to Indian Canyon's 157) yield a greater potential for impacts requiring avoidance, minimization, or mitigation.

Ongoing operational costs are expected to be higher with the West Rifle route than with other routes carried forward.

3.2.5 Avintaquin Canyon

Information regarding the Avintaquin Canyon route is provided as a separate memorandum in the Coalition's response to Information Request #4.