

Addendum

to the October, 2002

Draft

Green River Pipeline Cost Analysis

Utah Division of Water Resources

October, 2003

Introduction

In October 2002, the Division of Water Resources prepared the document entitled *Draft Green River Pipeline Cost Analysis*. This draft document investigated, at the feasibility level, the cost of delivering water from the Green River to the Bear and Weber Basins. The report included 16 alternatives, comparing the costs associated with different withdrawal locations (Fontanelle Reservoir, and Flaming Gorge Reservoir), different delivery destinations, (Bear River, Weber River at Echo Reservoir, and Weber River at Rockport) and differing pipeline alignments.

The study investigated the delivery of Green River water to Echo Reservoir and/or Rockport reservoir via Echo Canyon. Since then, however, the presence of the railroad alignment and Interstate 80 in Echo Canyon has prompted the exploration for an alternative to this potentially problematic alignment. This addendum investigates the feasibility of routing the pipeline through the Chalk Creek Drainage instead of Echo Canyon.

The alignments investigated here followed the original C and D alignments to a point approximately 3 miles east of Evanston. From there the pipeline would run south into the Bear River watershed, cross the Bear River, ascend Bernard Hollow in a southwesterly direction, cross Coyote Creek and Sage Creek, then turn south and ascends the Yellow Creek drainage to a saddle point of elevation 7340. The Pipeline would then descend the Chalk Creek drainage of the Weber River watershed. See Figure 2.

Within the Chalk Creek drainage three alignments were considered. First, the pipeline could extend all the way down the Chalk Creek drainage and into Echo Reservoir. This option has been called Alignment E and includes two alternatives: Alternative 17 (following Alignment C and E) and Alternative 18 (following Alignment D and E). Secondly, it was discovered that if the pipeline were to turn south and extend up the South Fork of Chalk Creek, a three-mile tunnel could be employed to deliver water directly to the Weber River. This alignment would not only deliver water above Rockport Reservoir, but also above the Weber/Provo diversion canal. Thus, with relatively little additional cost, Green River water could be delivered to the entire Wasatch Front via the Provo River and/or the Weber River. This option has been called Alignment G and includes two alternatives: Alternative 21 (following Alignment C and G) and Alternative 22 (following Alignment D and G).

Finally, as an alternative to tunneling it may be possible to exit the Chalk Creek drainage and maintain a high elevation alignment above the Weber River and Rockport Reservoir, thus reaching the Weber/Provo diversion canal without a tunnel. This alignment was called Alignment F and includes two alternatives: Alternative 19 (following Alignments C and F) and Alternative 20 (following Alignments D and F). See Figure 2 for more detailed information on the location of Alternatives 17 through 22 and Alignments E, F, and G.

Assumptions

All of the same basic design parameters and assumptions used in the *Draft Green River Pipeline Cost Analysis* apply to this addendum. The initial investigation included a cost estimate

alternative for one and two pump stations for each possible alignment. In every case the two-pump station approach was the most cost effective. It has been assumed here that the two-pump station alternative is the most cost effective approach. Single pump station alternatives have not been investigated. For tunneling costs a dialog with Bureau of Reclamation CUP project managers resulted in the following suggested figures: \$5 million for mobilization and \$10 million per mile of tunnel. These figures could vary up or down significantly depending upon a number of factors. Consequently, an alternative to tunneling has also been included here.

Discussion of Cost Estimates

A summary of the costs associated with each of the alternatives is given in the tables that follow. Table 6 compares the cost of delivering water to Echo Reservoir: Alternatives 17 and 18 are compared with previously investigated Alternatives 10 and 14. The total project cost for Alternative 17, at just over \$227 million, was about 1% lower than the \$229 million for Alternative 10, while the total project costs of \$255 million for Alternative 18, represented about a 4% reduction compared to \$265 million for Alternative 14.

Table 6
Cost Estimate Summary for Delivery to Echo Reservoir

Alternative	Alignment	Total Project Cost	Annualized Cost	Yearly O&M Cost	Unit Cost
10	C	\$229,227,000	\$13,902,000	\$3,413,000	\$232
17	C-E	\$227,522,000	\$14,108,000	\$3,698,000	\$235
14	D	\$264,701,000	\$15,990,000	\$3,878,000	\$266
18	D-E	\$255,018,000	\$15,755,000	\$4,087,000	\$263

Table 7 compares the cost of delivering water to Rockport Reservoir. Alternatives 19 and 21 were compared to Alternative 12. Alternatives 20 and 22 were compared to Alternative 16. Actually, while Alternatives 12 and 16 were computed to estimate the cost of delivering the water directly to Rockport Reservoir; Alternatives 19 through 22 would actually deliver water to a point above Rockport at the Weber/Provo canal diversion.

The total project cost for Alternative 19 of just under \$248 million is about a 4% reduction in cost compared to Alternative 12, while the total project costs for Alternative 21, at just under \$260 million, represented a less than 1% increase in total project costs. The unit cost for these two alternatives, however, showed an increase of 4% and 8% respectively. The increases in unit cost are a function of hydropower benefits. For Alternatives 12 and 16, a significant portion of the head required to lift water from Flaming Gorge Reservoir could be used for hydropower generation. For alternatives 19 through 22, however, the Weber/Provo diversion canal is 453 feet above Rockport Reservoir. This reduction in available head greatly reduces the hydropower benefit that can be expected with these alternatives.

The total project cost for Alternative 20 was just over \$275 million, a reduction of just over 7% compared with alternative 16. The total project costs for Alternative 22 was \$289 million, a reduction of 2.6% compared to Alternative 16. For both of these alternatives though the reduced hydropower benefit resulted in an increase of the Unit Cost. The Unit Cost for Alternative 20, at 314 dollars per acre-foot, was less than a 1% increase, while the Unit Cost for

Alternative 22, at \$328 per acre-foot was a 4.8% increase over the \$313 per acre-foot for Alternative 16.

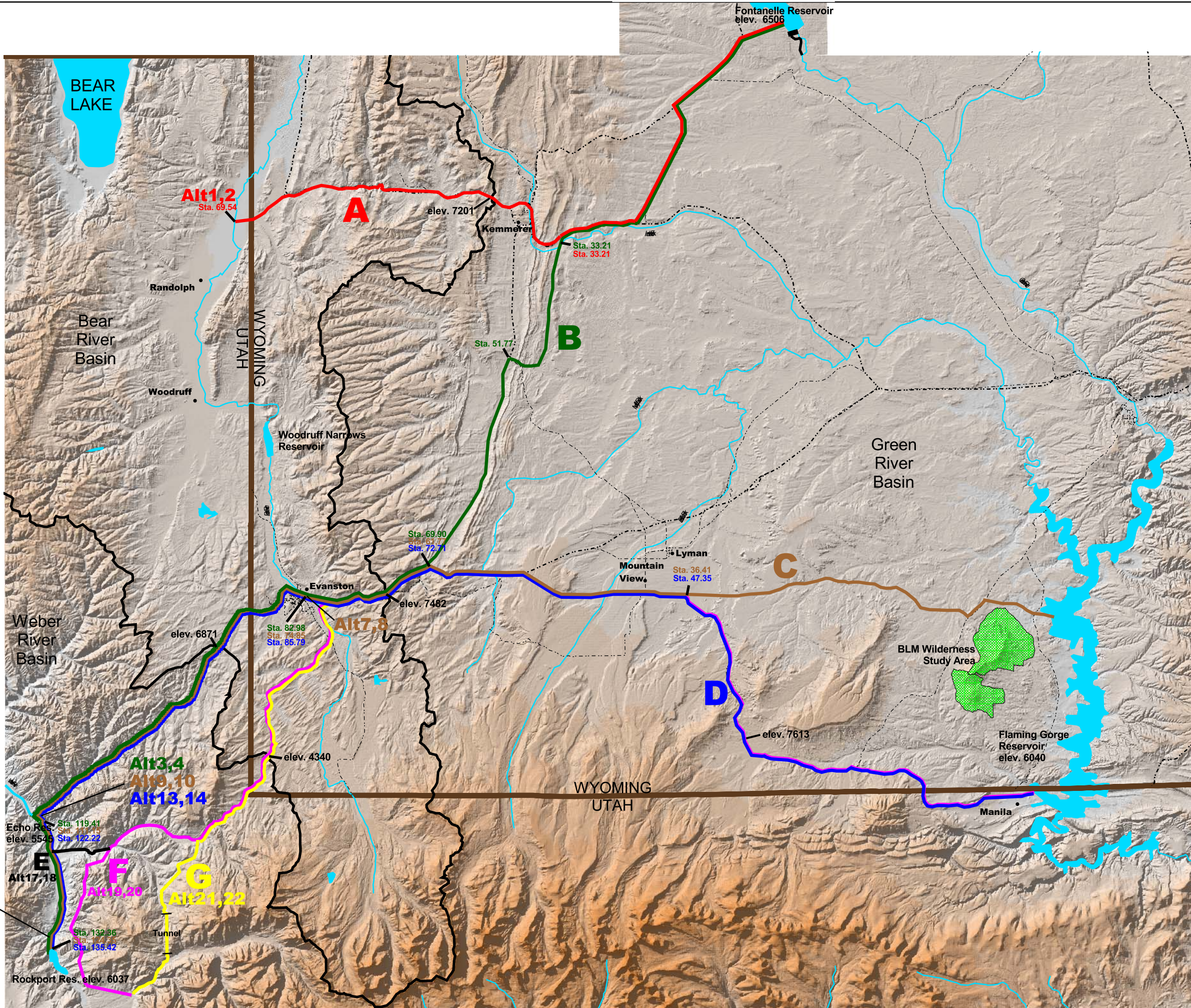
Table 7
Cost Estimate Summary for Delivery to Rockport Reservoir

Alternative	Alignment	Total Project Cost	Annualized Cost	Yearly O&M Cost	Unit Cost
12	C	\$258,618,000	\$16,566,000	\$4,733,000	\$276
19	C-F	\$247,669,000	\$17,196,000	\$5,964,000	\$287
21	C-G	\$259,603,000	\$17,871,000	\$5,993,000	\$298
16	D	\$296,834,000	\$18,779,000	\$5,198,000	\$313
20	D-F	\$275,444,000	\$18,856,000	\$6,253,000	\$314
22	D-G	\$289,119,000	\$19,657,000	\$6,428,000	\$328








Conclusions

- The pump lift used in the initial Green River Pipeline D-alignment is adequate to move water over the saddle point of 7340 and into the Chalk Creek drainage. The C-Alignment however, required an additional 30-feet of lift. Consequently, it is feasible to deliver water to the Weber via Chalk Creek rather than Echo Canyon.
- The Chalk Creek drainage alignment to Echo Reservoir would be about 8 miles longer than the more direct route down Echo Canyon. However, by avoiding Interstate 80 and the railroad alignment there appears to be a slight reduction in total project costs.
- By means of a three-mile long tunnel Green River water could be moved from the Chalk Creek drainage directly to the Weber River above the Weber/Provo diversion canal making Green River water available throughout the entire Wasatch Front. Should tunneling cost prove to be prohibitively high, it may be possible to maintain a high line alignment above the Weber River and Rockport Reservoir and deliver water to the Weber/Provo Diversion Canal without a tunnel.
- Delivery of water to a point on the Weber River above the Weber/Provo Diversion Canal rather than Rockport Reservoir or Echo Reservoir will greatly reduce the potential hydropower benefits associated with the earlier investigated alignments.

Figure 2
Green River Pipeline
 Alignments and Alternatives



Legend

-  Alignment A
-  Alignment B
-  Alignment C
-  Alignment D
-  Alignment E
-  Alignment F
-  Alignment G



Alt5,6
 Alt11,12
 Alt15,16

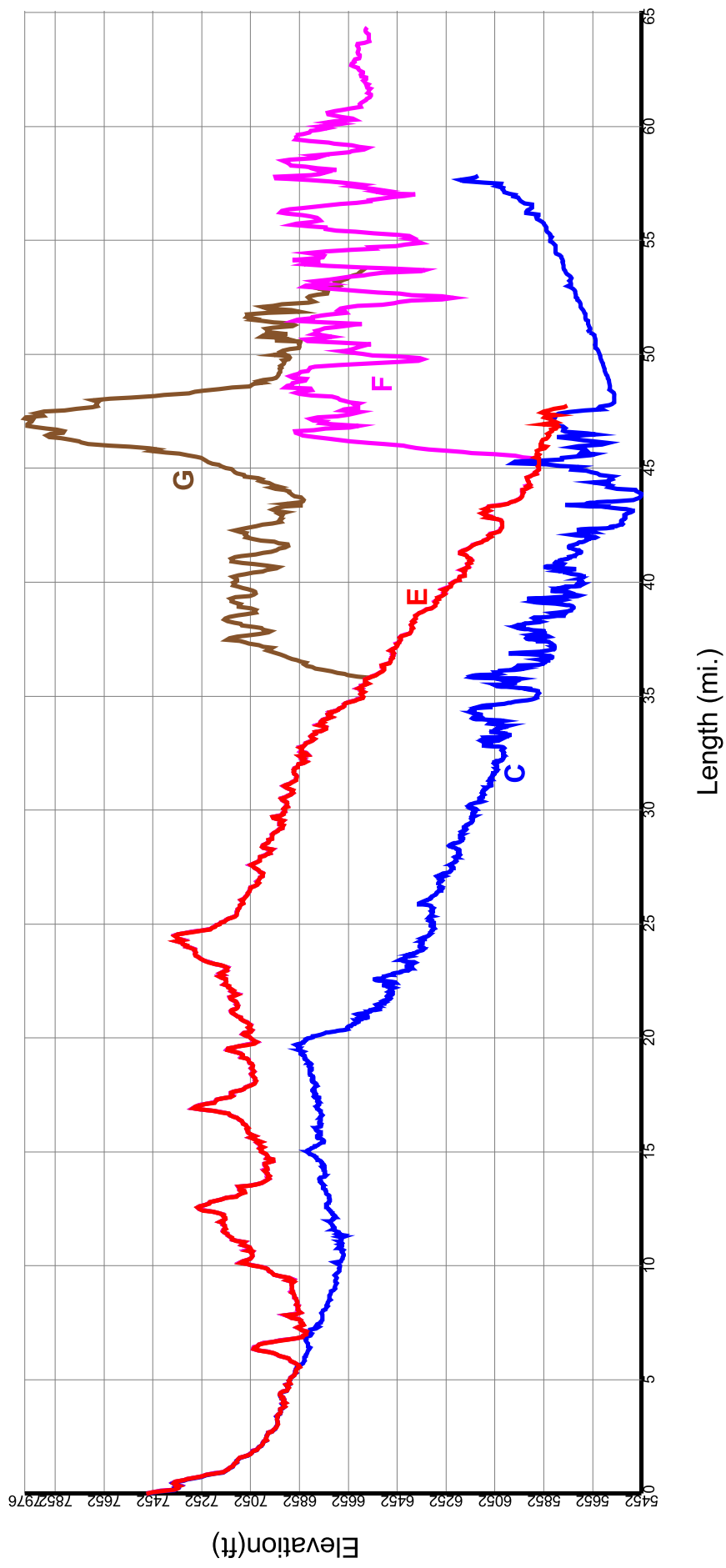
Alt3,4
 Alt9,10
 Alt13,14

Alt7,8

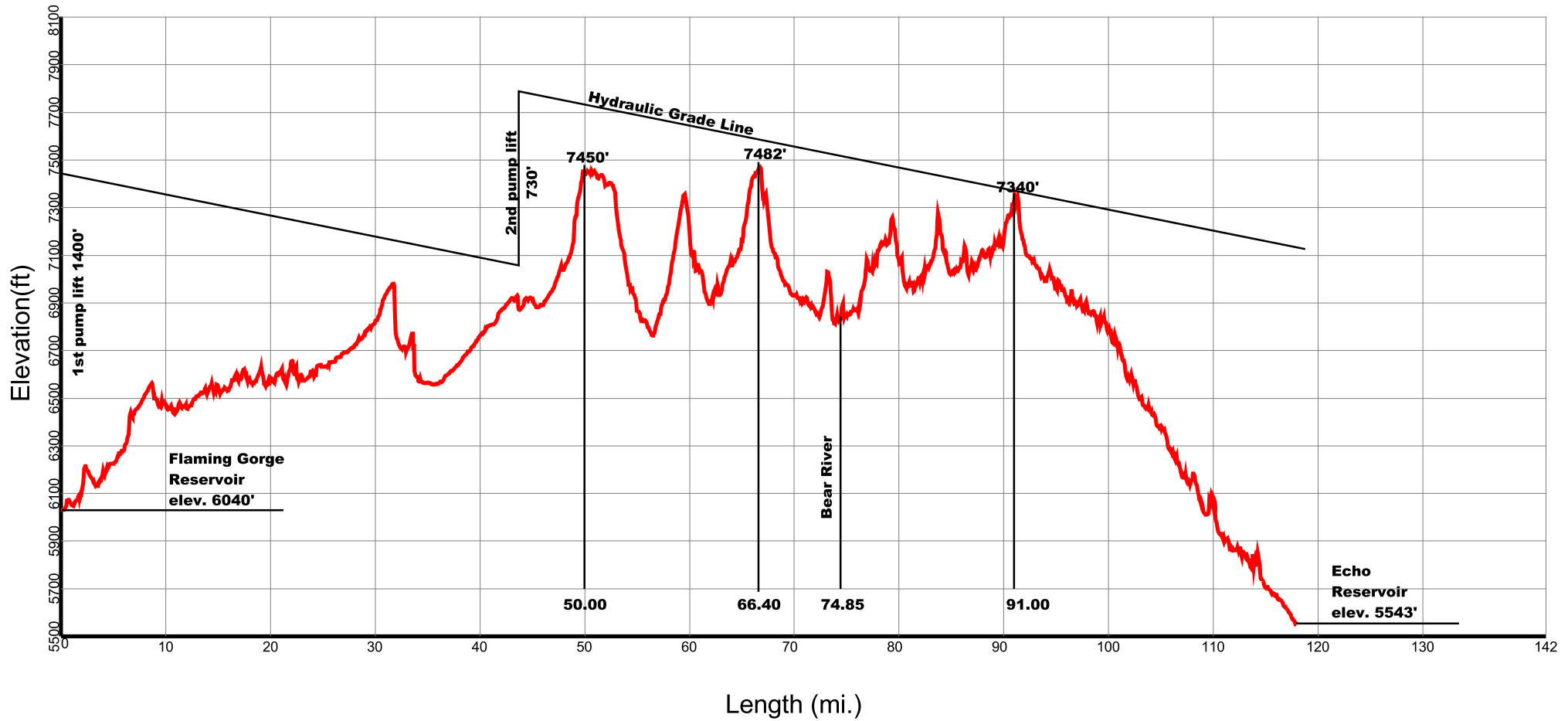
Alt17,18
 Alt19,20

Alt21,22

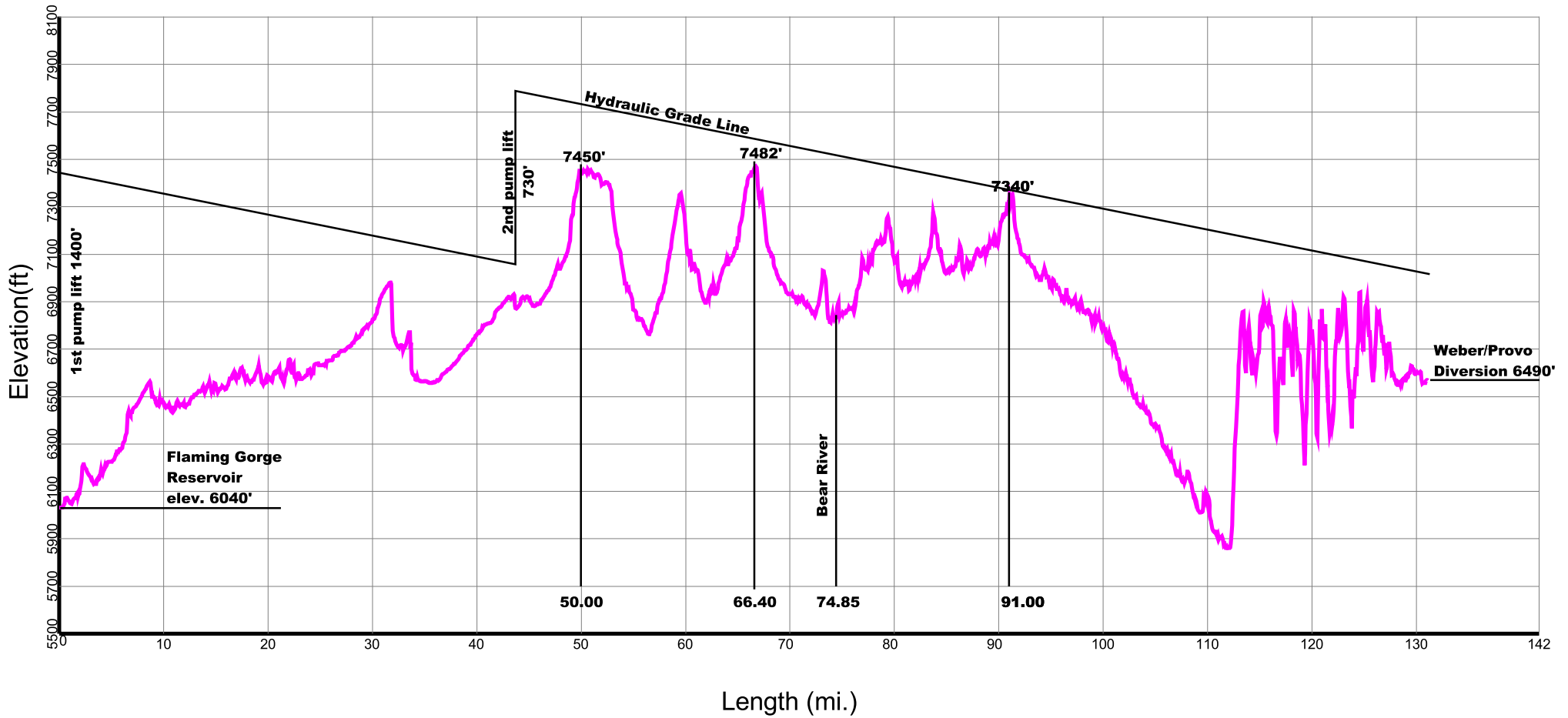
Alignments C, E, F, and G



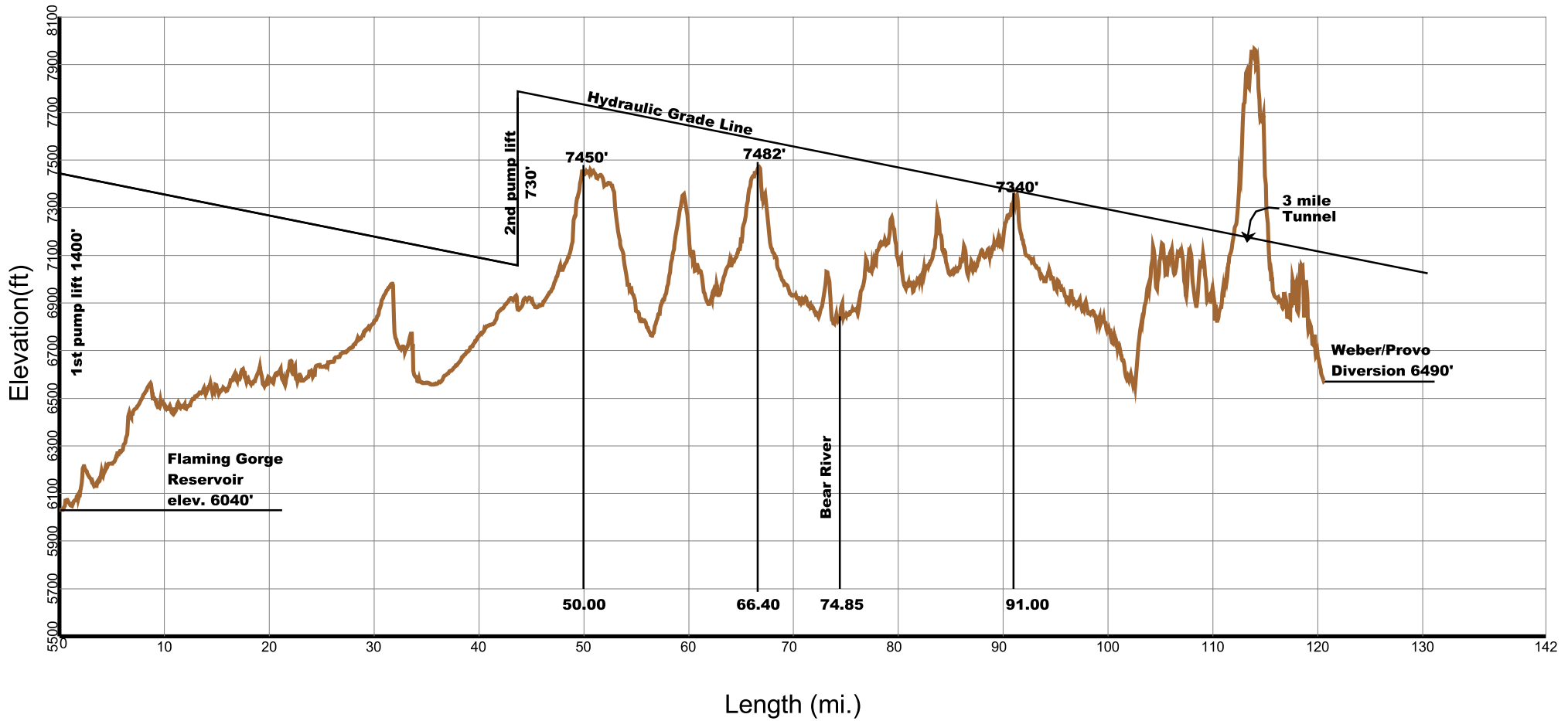
Alignments C - E



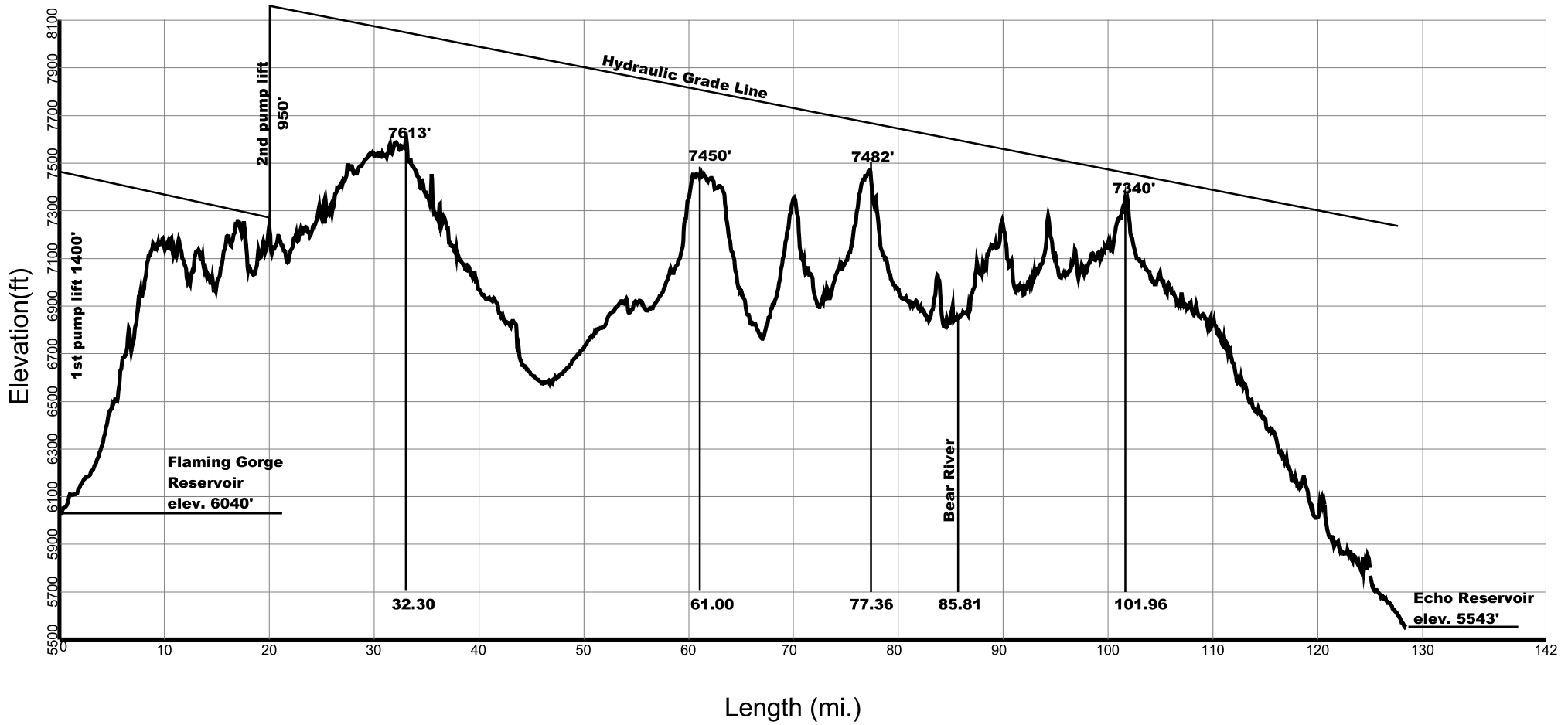
Alignments C - F



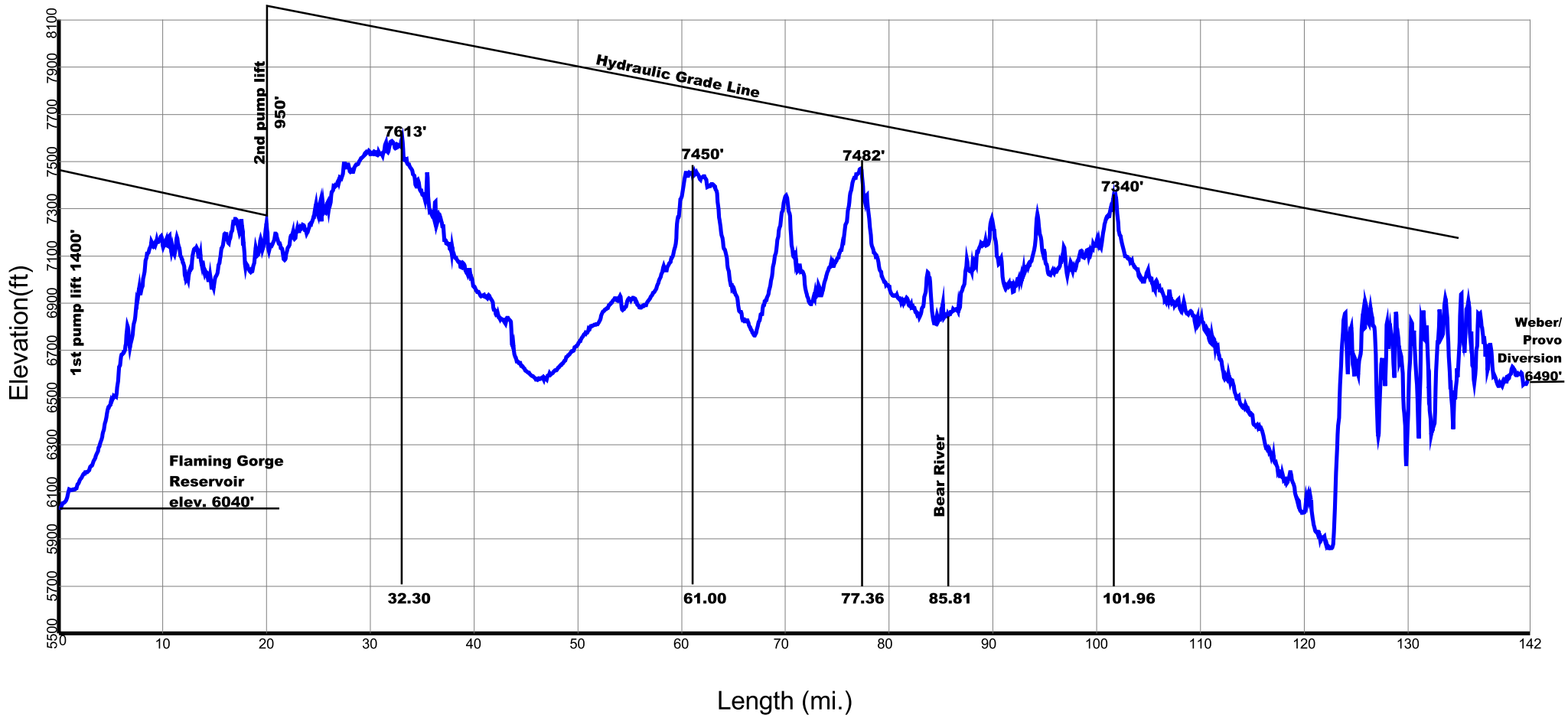
Alignments C - G



Alignments D - E



Alignments D - F



Alignments D - G

