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May 3, 2006

MEMO TO: Mr. Keith Wilkins, Director, Neighborhood & Environmental Services Department
THRU: Mr. Doyle Butler, Chief, Environmental Quality Division
Mr. Timothy Day, Environmental Quality Division

FROM: David McGehee, P.E., M.Oc.E., Manager

SUBJECT: Perdido Key Dune: Final Status Report

Project Management

1. I have completed analysis of the surveys provided by Hatch Mott MacDonald April 27, 2006, of the Emergency Dune (EED) which I assume, together with the surveys provided in February 2006, can be considered the As Built surveys for the entire project. A summary of the results of the analyses follows.

A. Figure 1 shows an overlay plot of all of the cross sections and the design template for the EED for the Eastern Portion of the Project. If the baseline for the survey data is the 1975 CCCL (as requested of HMM) the first impression is that the dune meanders significantly around its design position. Disregarding the easternmost 1000 ft (stations 94+00 to 104+00) where the design crest line was deliberately moved as far north as practical, only 5 out of 22 profiles, representing about 25 % of the Eastern Portion, have the north edge of the crest within ± 4 ft of the design location (26 ft south of the 1975 CCCL).

B. Figure 2 shows the average of all of the cross sections for the EED, the average pre and post Hurricane Ivan cross section, the average post Hurricane Dennis cross section, and the design template for the Eastern Portion of the Project. In general, the foreshore has recovered slightly above the pre Ivan condition, while the back shore and dune are roughly 1 ft below the pre Ivan profile. The crest of the average profile of the EED has a peak elevation near +12.2 ft NAVD, is about 8 ft wide, and is displaced 4 ft landward from the design position.

C. Figure 3 shows each profile of the Eastern Portion of the Project manually realigned to place the north edge of the crest at the design position in order to evaluate constructed dune shape, regardless of position, and the EED design template. It is obvious that most of the profiles are significantly lower and much wider than the design.

D. Figure 4 shows the average of all of the realigned cross sections for the EED, the average pre and post Hurricane Ivan cross section, the average post Hurricane Dennis cross section, and the design template for the Eastern Portion of the Project. The average crest elevation of the realigned dune is very near + 14 ft NAVD (it slopes from + 14 ft at the north edge to + 13.7 ft at the design south, or seaward edge). The average foreslope is considerably flatter than the design.

E. Figure 5 shows an overlay plot of all of the cross sections and the design template for the EED for the Western Portion of the Project. The dune on the this portion also meanders significantly around its design position; only 7 out of 49 profiles, representing about 18 % of the Western Portion, have the north edge of the crest within ± 4 ft of the design location (26 ft south of the 1975 CCCL).

F. Figure 6 shows the average of all of the cross sections for the EED, the average pre and post Hurricane Ivan cross section, and the design template for the Western Portion of the Project. (There were insufficient post Hurricane Dennis cross sections collected from the western Portion to warrant inclusion.) In general, the entire profile is significantly higher than the pre Ivan condition. The crest of the average profile of the EED has a peak elevation near +13.3 ft NAVD, is about 8 ft wide, but is displaced 12 ft seaward from the design position.

G. Figure 7 shows each profile of the Western Portion of the Project manually realigned to place the north edge of the crest at the design position in order to evaluate constructed dune shape, regardless of position, and the EED design template. It is obvious that most of the profiles are significantly lower and much wider than the design.

H. Figure 8 shows the average of all of the realigned cross sections for the EED, the average pre and post Hurricane Ivan cross section, the average post Hurricane Dennis cross section, and the design template for the Western Portion of the Project. The average crest elevation of the realigned dune is about + 13.6 ft NAVD (it slopes from + 13.7 ft at the north edge to + 13.5 ft at the design south, or seaward edge). The average foreslope is considerably flatter than the design.

I. The overall conformance of the entire EED project (East and West Portions combined) with the design regarding 10 criteria is summarized in the Table below and in Figures 9 and 10.

As Built EED Conformance Criterion	Length Meeting Criterion (ft)	Percent of Total Project Length Meeting Criterion
Met min 14.5 ft NAVD for min 8' width at design location	600	3%
Met min 13.5 ft NAVD for min 8' width at design location	3,600	16%
Met min 14.5 ft NAVD for min 1' width at design location	1,250	5%
Met min 14.5 ft NAVD for min 1' width at design location	1,250	5%
Met min 14.5 ft NAVD for min 8' width somewhere	3,640	16%
Met min 13.5 ft NAVD for min 8' width somewhere	12,265	54%
Met min 14.5 ft NAVD for min 1' width somewhere	5,890	26%
Met min 13.5 ft NAVD for min 1' width somewhere	15,565	68%
Did not exceed 14.5 ft NAVD	9,475	41%

anywhere		
Did not exceed 13.5 ft NAVD anywhere	7,360	32%

2. While the conformance of the As Built EED with the design template of the Enhanced Emergency Dune (8 ft crest width at + 15 ft NAVD) or even the original FEMA Emergency Berm ((8 ft crest width at + 14 ft NAVD) within the allowed $\pm$ 0.5 ft tolerance is poor by most any metric, this does not necessarily indicate poor performance of the project for its intended purpose. In fact, the total quantity of sand currently on the beach exceeds the design template by a significant amount, due to a combination of natural recovery processes occurring mostly on the fore beach and artificial placement occurring mostly on the back beach. Whether a lower, wider dune provides better protection than a higher, narrower dune depends upon the characteristics of a particular storm and is a secondary factor compared to the total volume of dry sand on the beach. In most locations, the current ability of the beach to protect upland property meets or exceeds the pre-Hurricane Ivan beach.

3. One exception to this general statement is the section from station 64 +00 to 66+00. Not only are these two profiles (see dashed lines on Figure 5) displaced 70’ to 80’ seaward, they are much steeper than other profiles both on the backshore and foreshore, and the + 3 ft contour moves 75 to 150 ft landward at this location compared to most of the rest of the Western Portion.

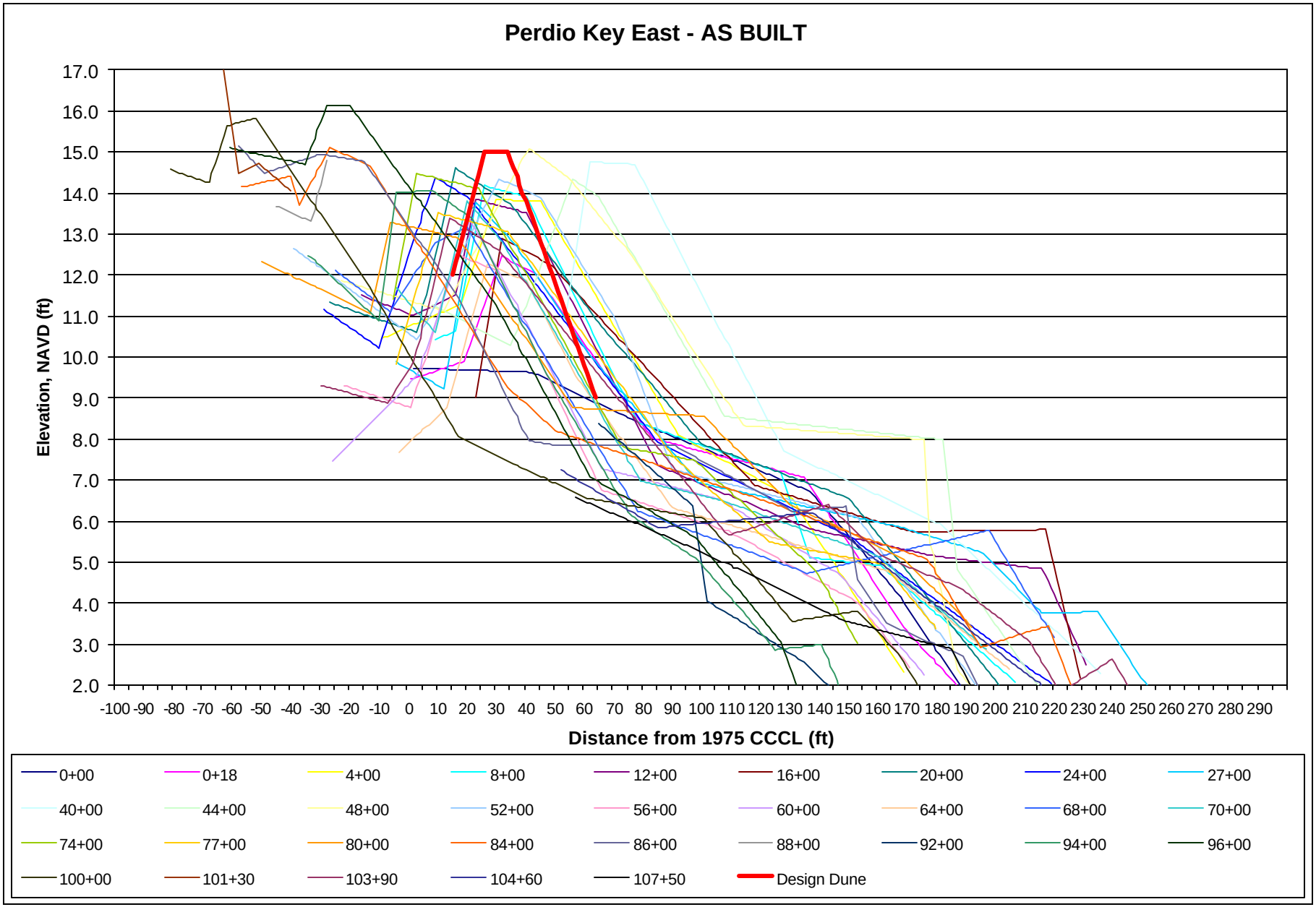

Figure 1 – As Built profiles of Eastern Portion of EED, as measured, and the Design Template

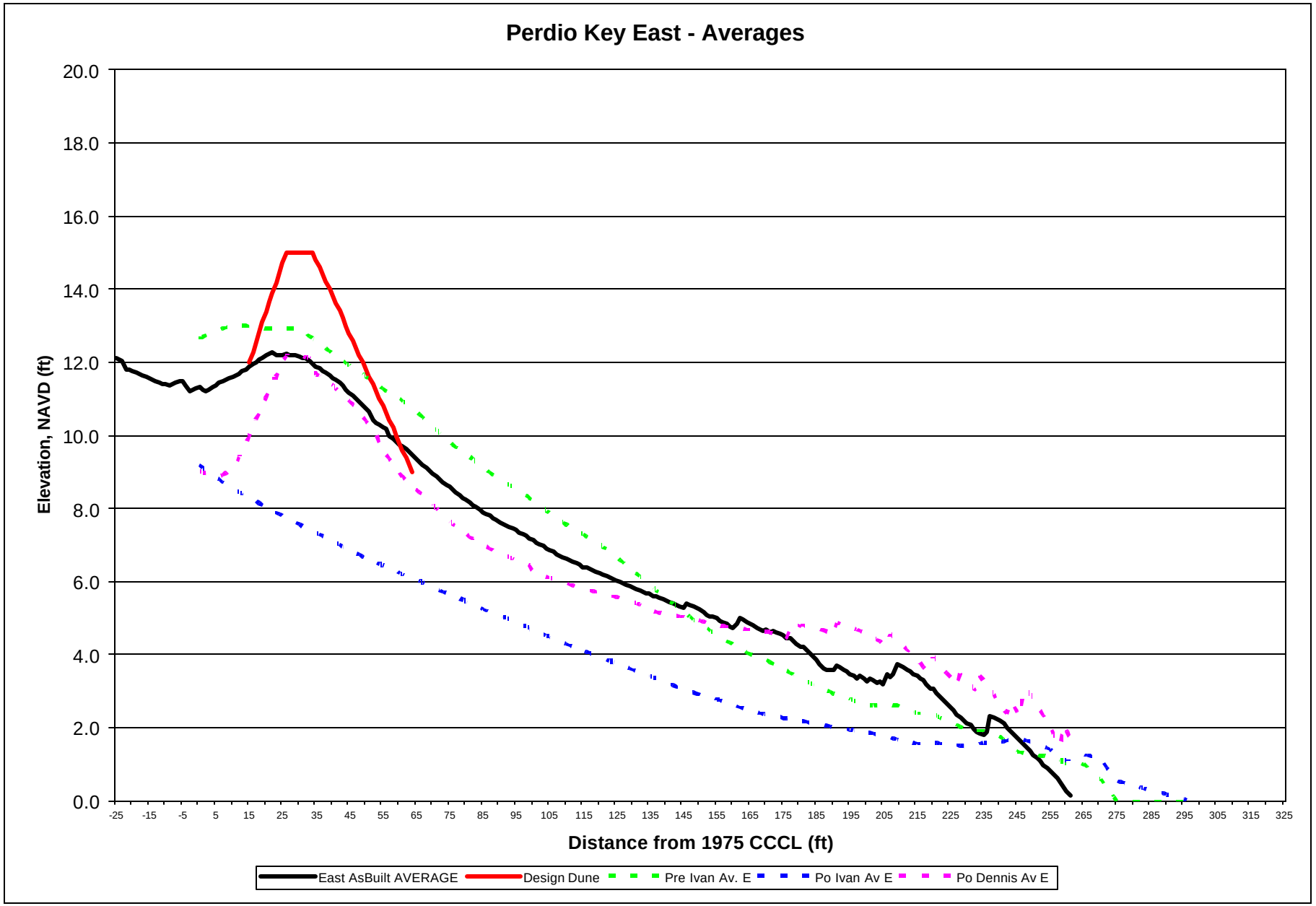

Figure 2 – Averages of the As Built EED, Pre and Post Ivan, Post Dennis profiles, and the Design Template for the Eastern Portion of the Project

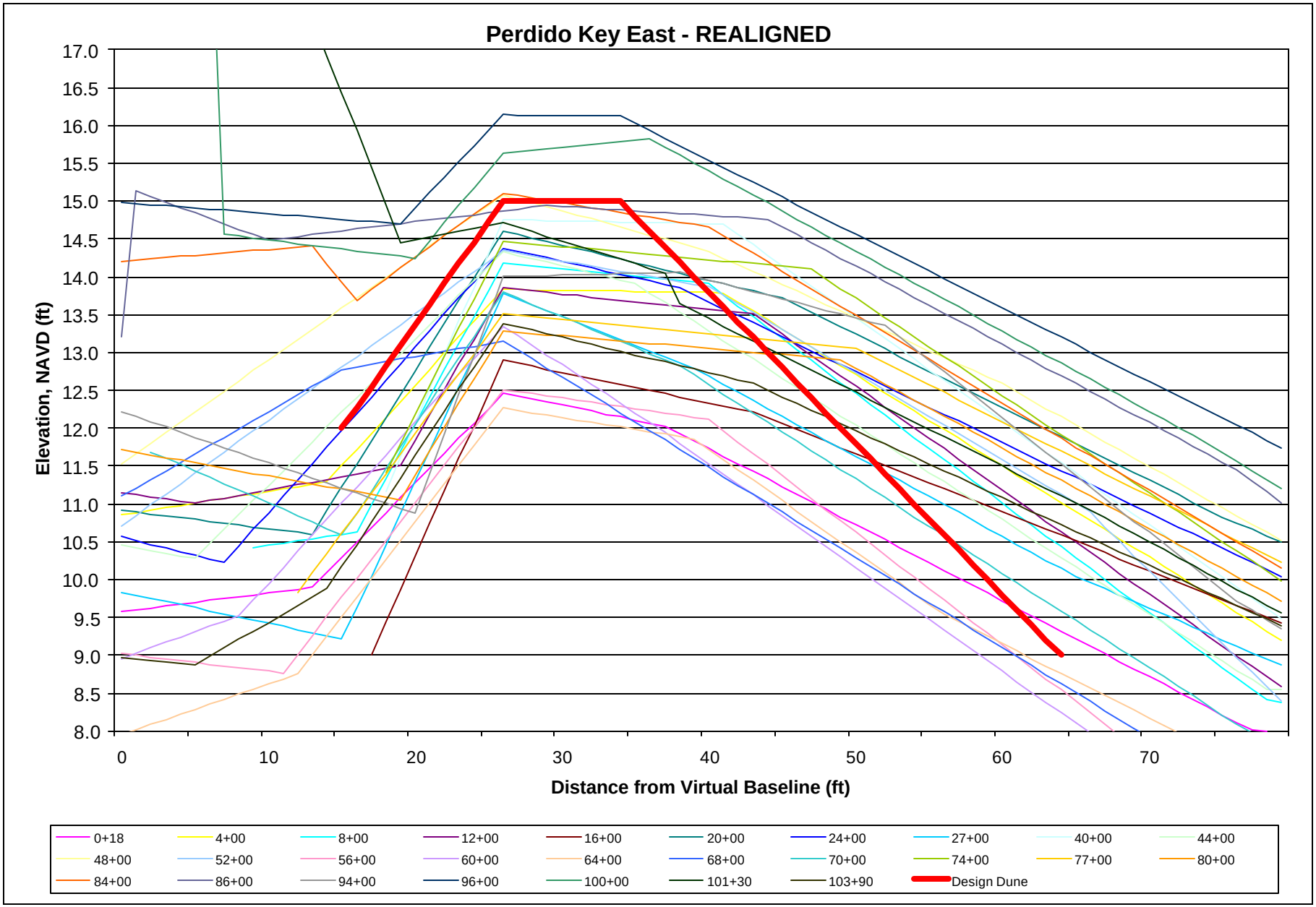

Figure 3 – Realigned profiles of Eastern Portion of EED and the Design Template

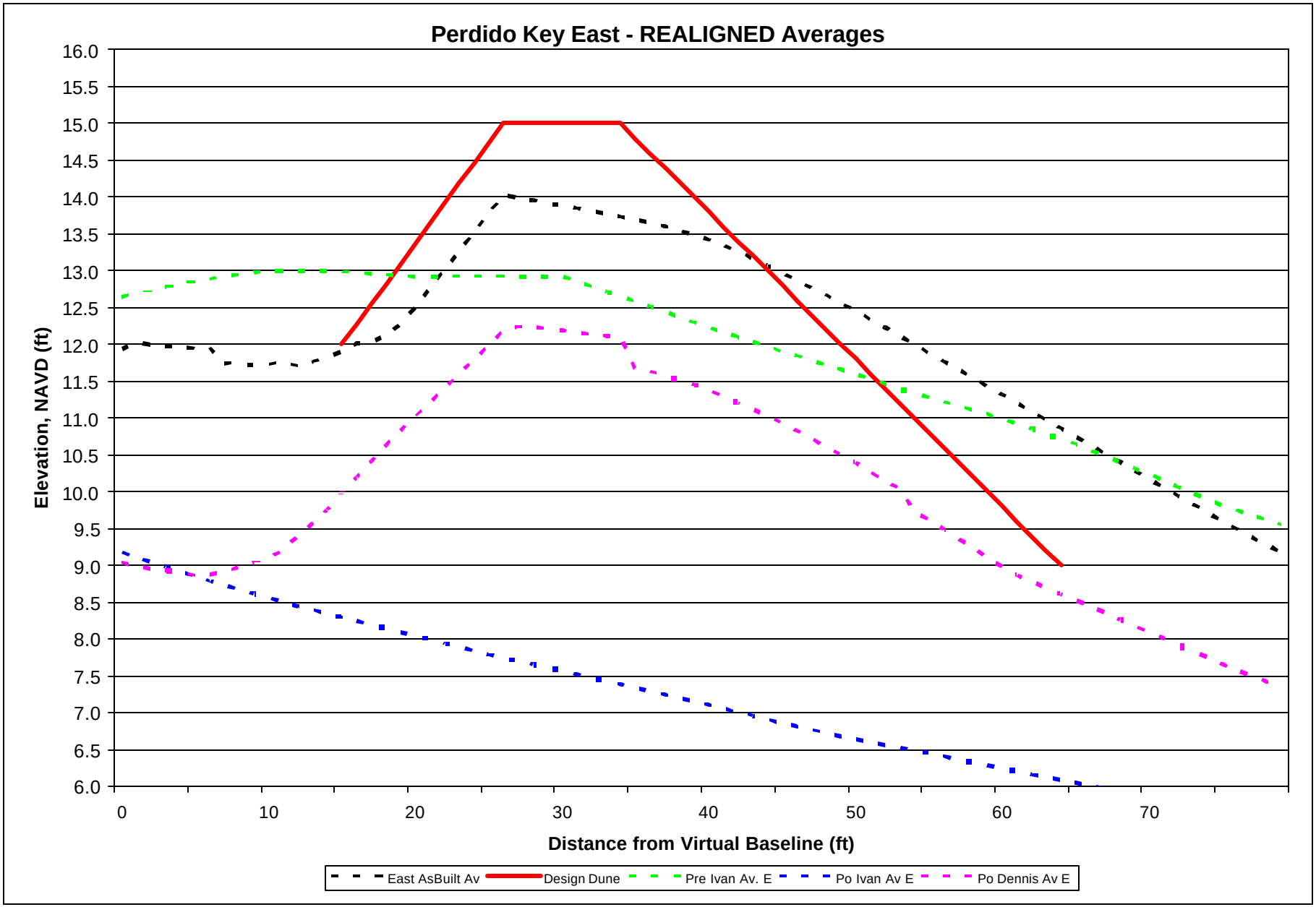

Figure 4 - Averages of the realigned EED profiles with Pre and Post Ivan, Post Dennis profiles, and the Design Template for the Eastern Portion of the Project

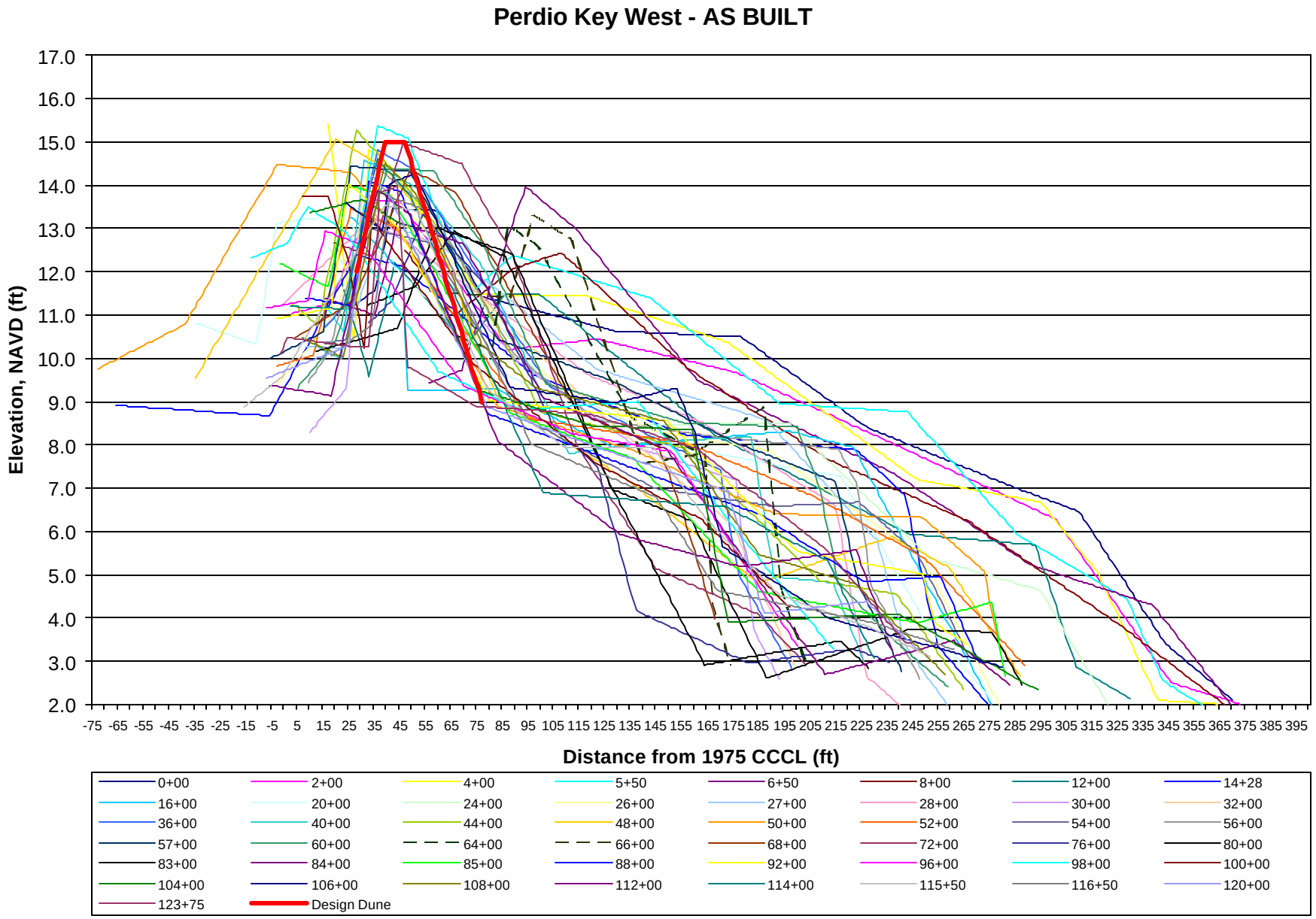

Figure 5 - As Built profiles of Western Portion of EED, as measured, and the Design Template

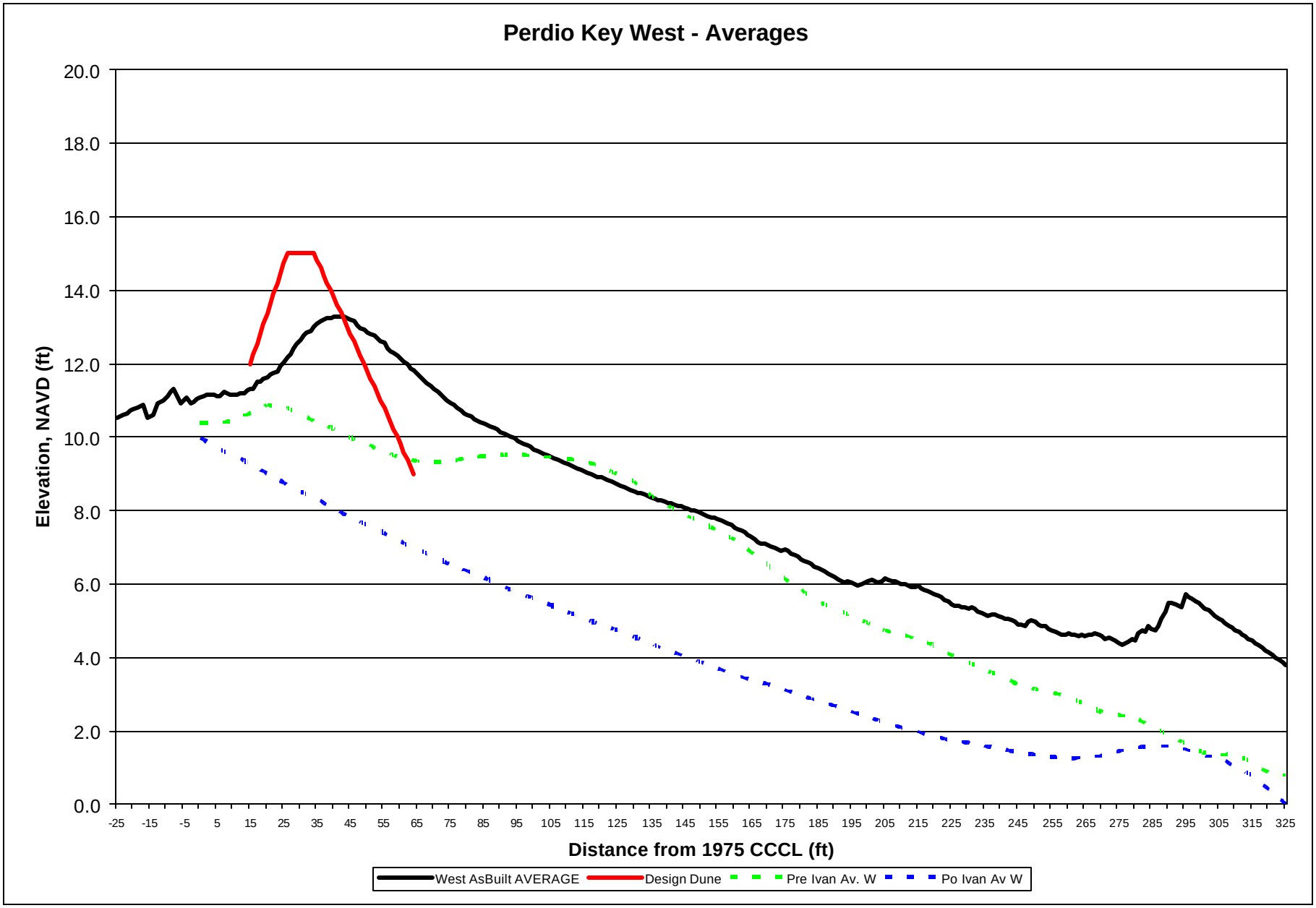

Figure 6 - Averages of the As Built EED, Pre and Post Ivan profiles, and the Design Template for the Western Portion of the Project

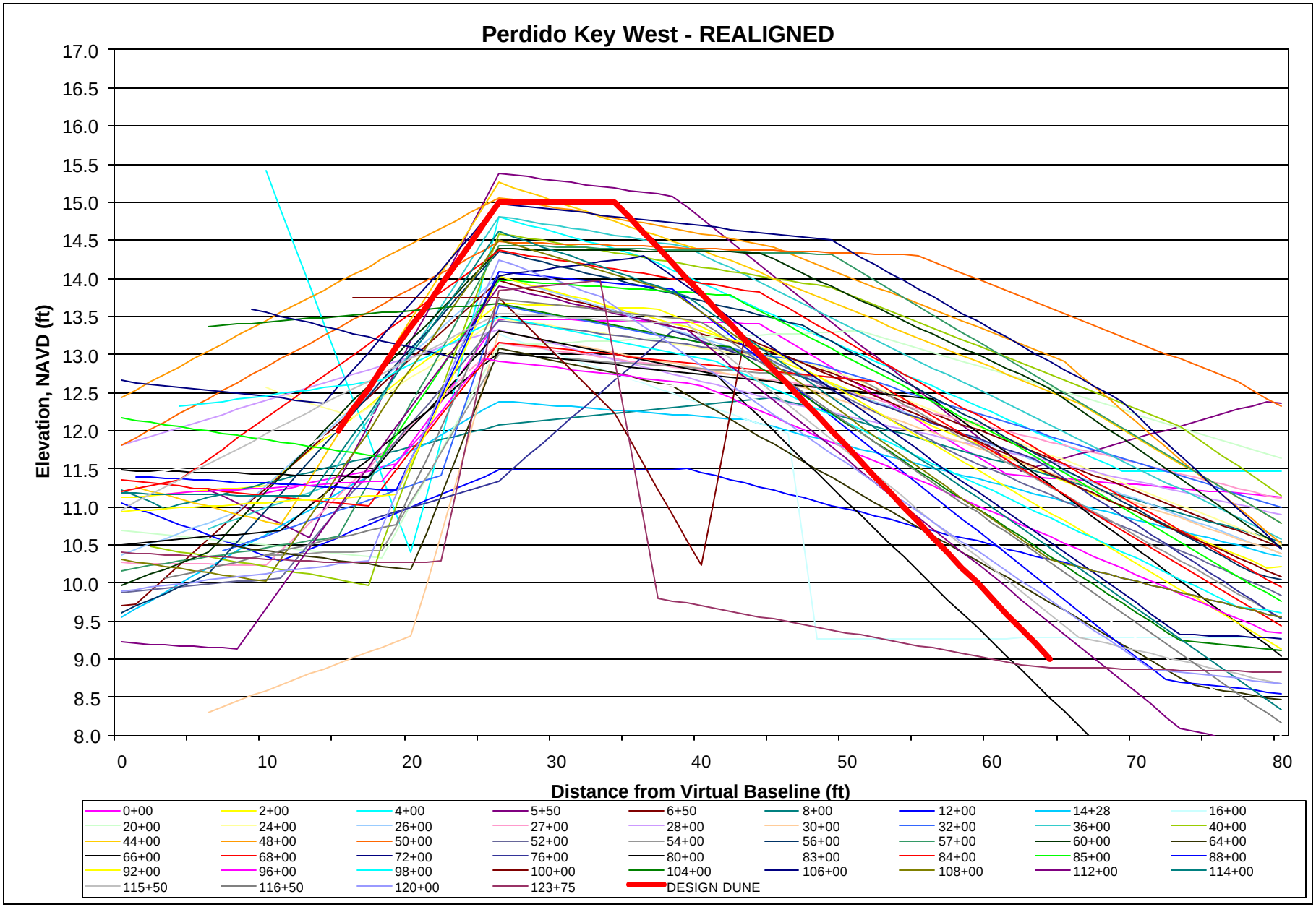

Figure 7 - Realigned profiles of Western Portion of EED and the Design Template

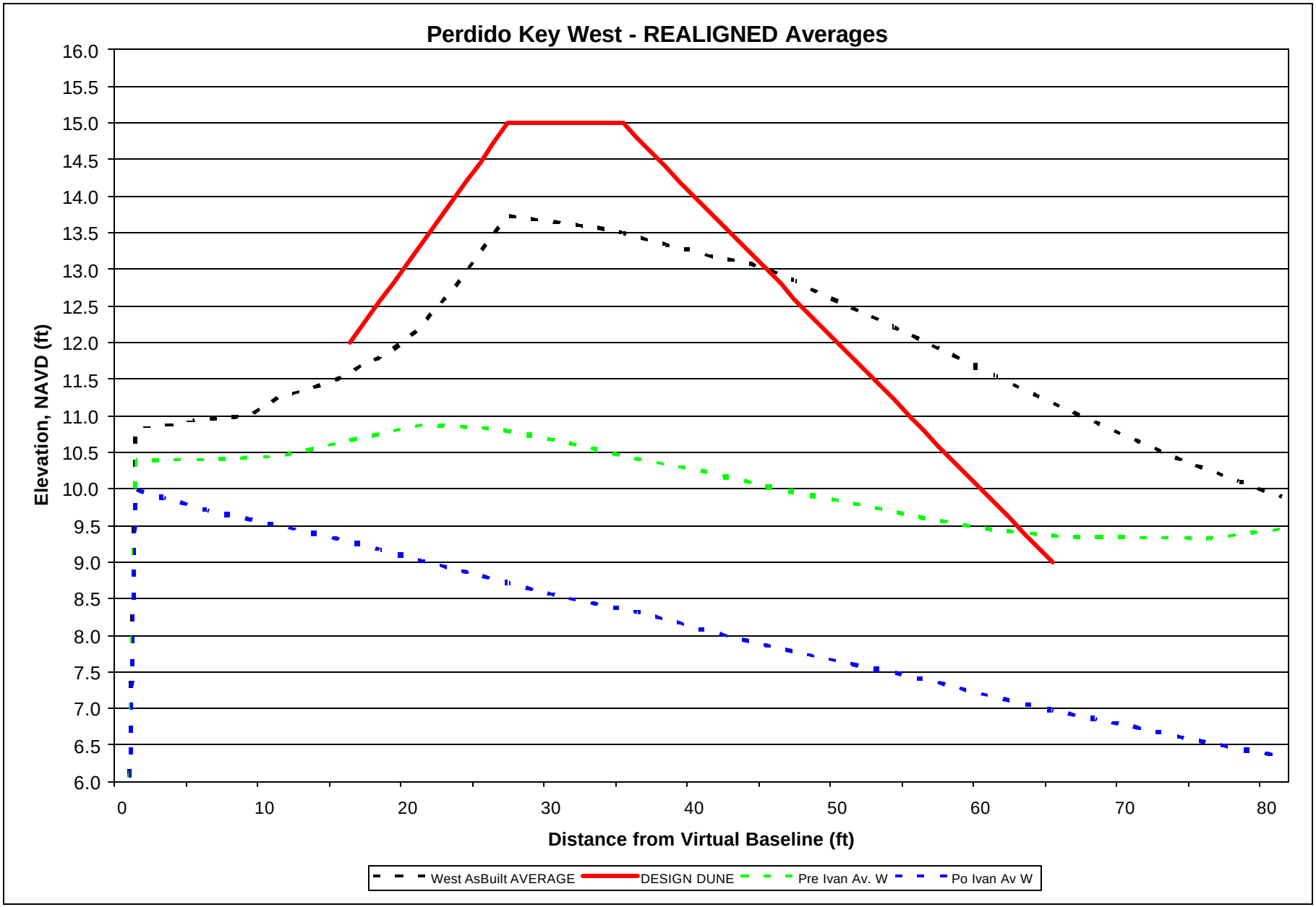

Figure 8 - Averages of the realigned EED profiles with Pre and Post Ivan, and the Design Template for the Western Portion of the Project

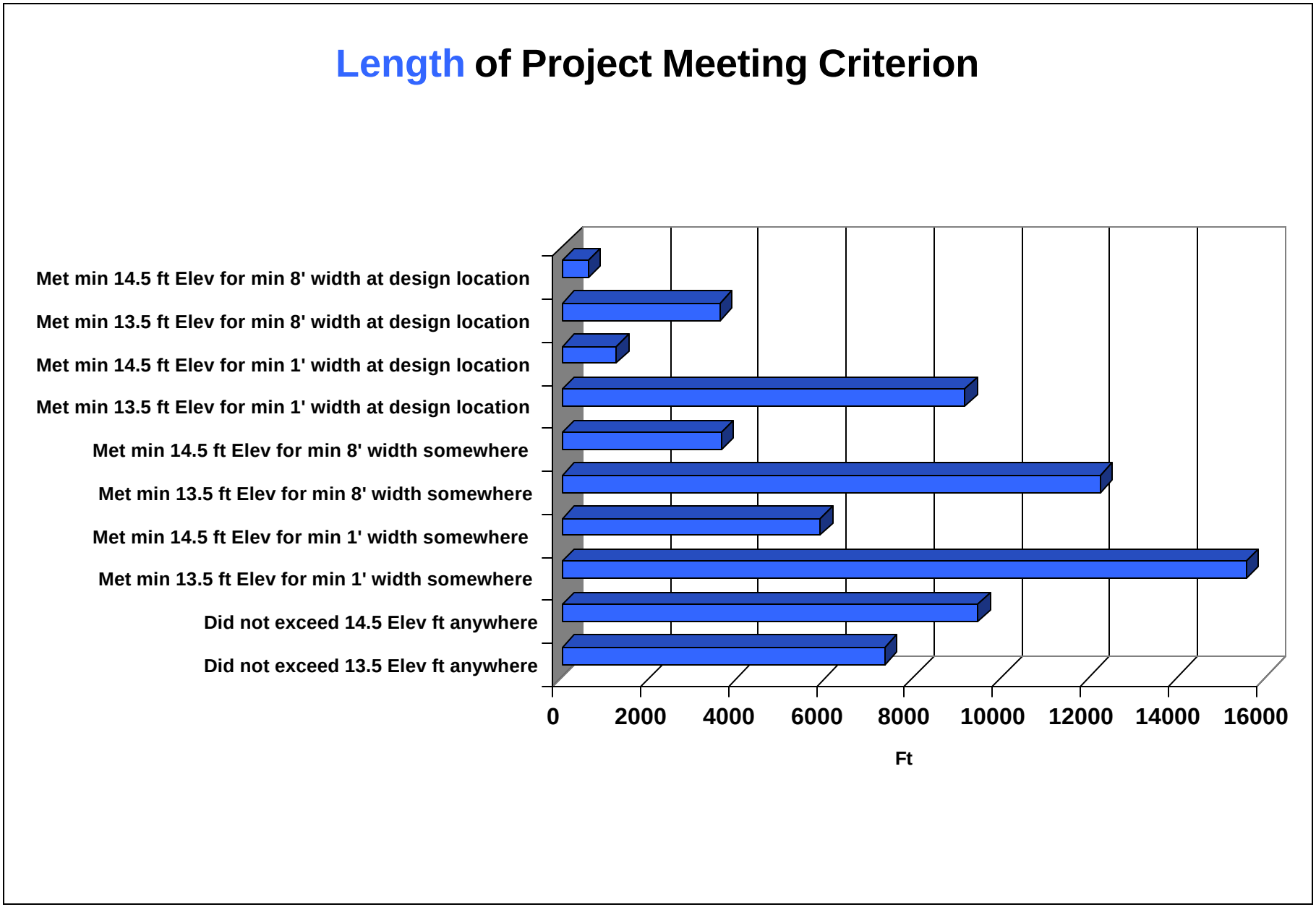

Figure 9 – Conformance Criteria of As Built EED by length (ft)

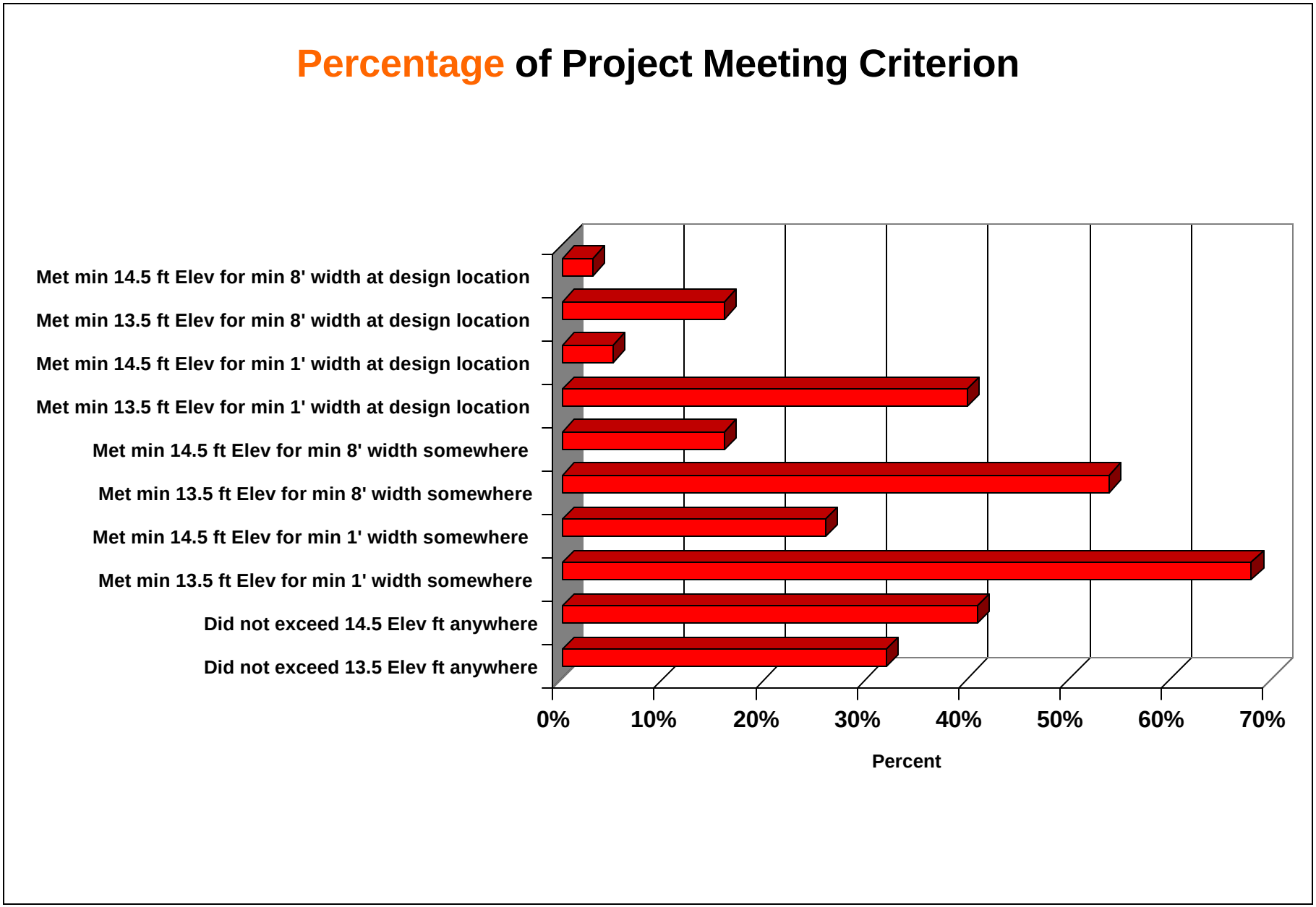

Figure 10 - Conformance Criteria of As Built EED by Percentage