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Baseline Geomorphic Conditions at Sediment Transport Mitigation Sites in the Los Alamos and Pueblo Canyon Watersheds

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Attachment 1

Attachment 1 Survey Data (on CD included with this document)

1.0 INTRODUCTION

This report presents survey data obtained in 2009 and 2010 from both above and below sediment transport mitigation sites in the Los Alamos and Pueblo Canyon watersheds, within and near the Los Alamos National Laboratory (LANL or the Laboratory). The survey data document the baseline geomorphic conditions at these mitigation sites prior to the 2010 monsoon season, as specified in the Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project (LANL 2009, 107457). The New Mexico Environment Department (NMED) issued an Approval with Modifications for this plan (NMED 2010, 108444) and approved the submittal of a baseline geomorphic conditions report by May 30, 2010. This report satisfies that requirement. These surveys will be repeated after the 2010 monsoon season and the results presented in a report to NMED by May 30, 2011. That report will include estimates of net sediment deposition in each area since the previous surveys and will evaluate if any unintended geomorphic changes have occurred, such as net sediment erosion.

1.1 Surveys at Sediment Transport Mitigation Sites

Surveys were conducted at all sediment transport mitigation sites specified in LANL (2009, 107457) and at the LA-SMA-2 retention basins, as requested by NMED (2010, 108444). Surveys were conducted using a combination of a differentially corrected global-positioning system (GPS) and a total station tied to GPS control points, depending on tree cover. The general locations of all survey areas are shown in Figure 1, and these surveys are discussed below. Surveyed cross sections are shown in figures with a vertical exaggeration (VE) of 2.5 times, and channel thalweg profiles are shown with a VE of 5 times, 15 times, or 20 times. Raw survey data (*x* and l coordinates using the New Mexico State Plane coordinate system and elevations of all survey points) for all cross sections and thalweg profiles are included electronically as Attachment 1 (on CD).

Pueblo Canyon Cross-Vane Structures. Two cross sections were surveyed in the vicinity of each of the three Pueblo Canyon cross-vane structures (CVSs) in April and May 2010. One is 50 ft upcanyon, and one is 50 ft downcanyon of the apex rock of each structure. Channel thalweg profiles were also surveyed over these 100-ft distances. Cross-section and thalweg-profile locations are shown in Figure 2, and the cross sections and thalweg profiles for the upper, middle, and lower CVSs are shown in Figures 3, 4, and 5, respectively. Irregularities in the thalweg profiles partially reflect construction-related disturbance and are expected to be smoothed out after the first runoff events.

Upper Pueblo Canyon Willow-Planting Area. A total of 18 cross sections were surveyed in October 2009 in the area of Pueblo Canyon downstream from the new Los Alamos wastewater treatment plant (WWTP) outfall and upstream from the access road to the WWTP, where willows were planted in spring 2008 and spring 2009. These cross sections were divided into groups of six within the upper (UW), middle (MW), and lower (LW) thirds of the willow-planting area, and within each group, the cross sections were spaced at 100-ft intervals. Longitudinal channel thalweg profiles were also surveyed over 500-ft intervals through each of these three areas. Cross-section and thalweg-profile locations are shown in Figure 6. The cross sections in the UW, MW, and LW thirds of the willow-planting area are shown in Figures 7, 8, and 9, respectively, and the thalweg profiles are shown in Figure 10.

Pueblo Canyon Wing Ditch. Five cross sections were surveyed at 100-ft intervals downcanyon from the Pueblo Canyon wing ditch in November 2009. Longitudinal thalweg profiles of the active channel and an abandoned channel to the south, where the wing ditch will direct water, were also surveyed over this distance. Cross-section and thalweg-profile locations are shown in Figure 11. The cross sections are shown in Figure 12, and the thalweg profiles are shown in Figure 13.

Lower Pueblo Canyon Willow-Planting Area. A total of 23 cross sections were surveyed in September and October 2009 at 100-ft intervals within reaches P-3FE and P-4W in an area where willows were planted in spring 2009. The surveys extended for 1100 ft above and below a transition area separating a broad upcanyon wetland (P-3FE) from a narrower downcanyon wetland within incised geomorphic surfaces (P-4W). The cross sections are labeled with negative numbers above this transition area (e.g., PU-100 ft), and with positive numbers below this transition area (e.g., PU+100 ft). A longitudinal channel thalweg profile was also surveyed over this 2200-ft interval. Cross-section and thalweg-profile locations are shown in Figure 14, cross sections are shown in Figure 15, and the channel thalweg profile is shown in Figure 16.

Pueblo Canyon Grade-Control Structure. A total of 15 cross sections were surveyed in April 2010 at 100-ft intervals upstream of the Pueblo Canyon grade control structure (GCS), and 3 cross sections were surveyed at 100-ft intervals downstream from the GCS. A longitudinal channel thalweg profile was also surveyed over this 1800-ft interval, and was extended downstream past the new E060.1 gaging station. Cross-section and thalweg-profile locations are shown in Figure 17, cross sections are shown in Figure 18, and the channel thalweg profile is shown in Figure 19. The cross sections are labeled with negative numbers above the GCS and with positive numbers below the GCS. Some ground disturbance associated with site restoration has occurred downstream from the GCS after the surveys were completed, and another survey of the area of disturbance is planned before the 2010 monsoon season.

LA-SMA-2 Sediment Retention Basins. A general topographic survey was conducted that encompassed the area of the LA-SMA-2 sediment retention basins in March 2010. The topography of this area is presented in Figure 20. A general topographic survey will be repeated annually, documenting both the maximum thickness of accumulated sediment and total sediment volume deposited since the previous survey.

DP Canyon Grade-Control Structure. A total of 11 cross sections were surveyed in April and May 2010 at 100-ft intervals upstream of the DP Canyon GCS, and 3 cross sections were surveyed at 100-ft intervals downstream from the GCS and downstream from the new E039.1 gaging station. A longitudinal channel thalweg profile was also surveyed over this 1500-ft interval. Cross-section and thalweg-profile locations are shown in Figure 21, cross sections are shown in Figure 22, and the channel thalweg profile is shown in Figure 23. The cross sections are labeled with negative numbers above the GCS and with positive numbers below the GCS.

Los Alamos Canyon Low-Head Weir. A general topographic survey was conducted that encompassed the sediment retention basins above the Los Alamos Canyon low-head weir in July 2009. The topography of this area is presented in Figure 24. Because water had ponded in the basins prior to the survey, and has remained in the basins continuously since that time, it has not been possible to survey the deepest parts of the basins. The Laboratory plans to drain these basins after cessation of 2010 snowmelt runoff to allow surveying of the deepest parts of the basins. This survey will be presented in the May 30, 2011 report. A general topographic survey will be repeated annually, documenting both the maximum thickness of accumulated sediment and total sediment volume deposited since the previous survey.

2.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), October 2009. "Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project," Los Alamos National Laboratory document LA-UR-09-6563, Los Alamos, New Mexico. (LANL 2009, 107457)

NMED (New Mexico Environment Department), January 11, 2010. "Approval with Modifications, Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 108444)

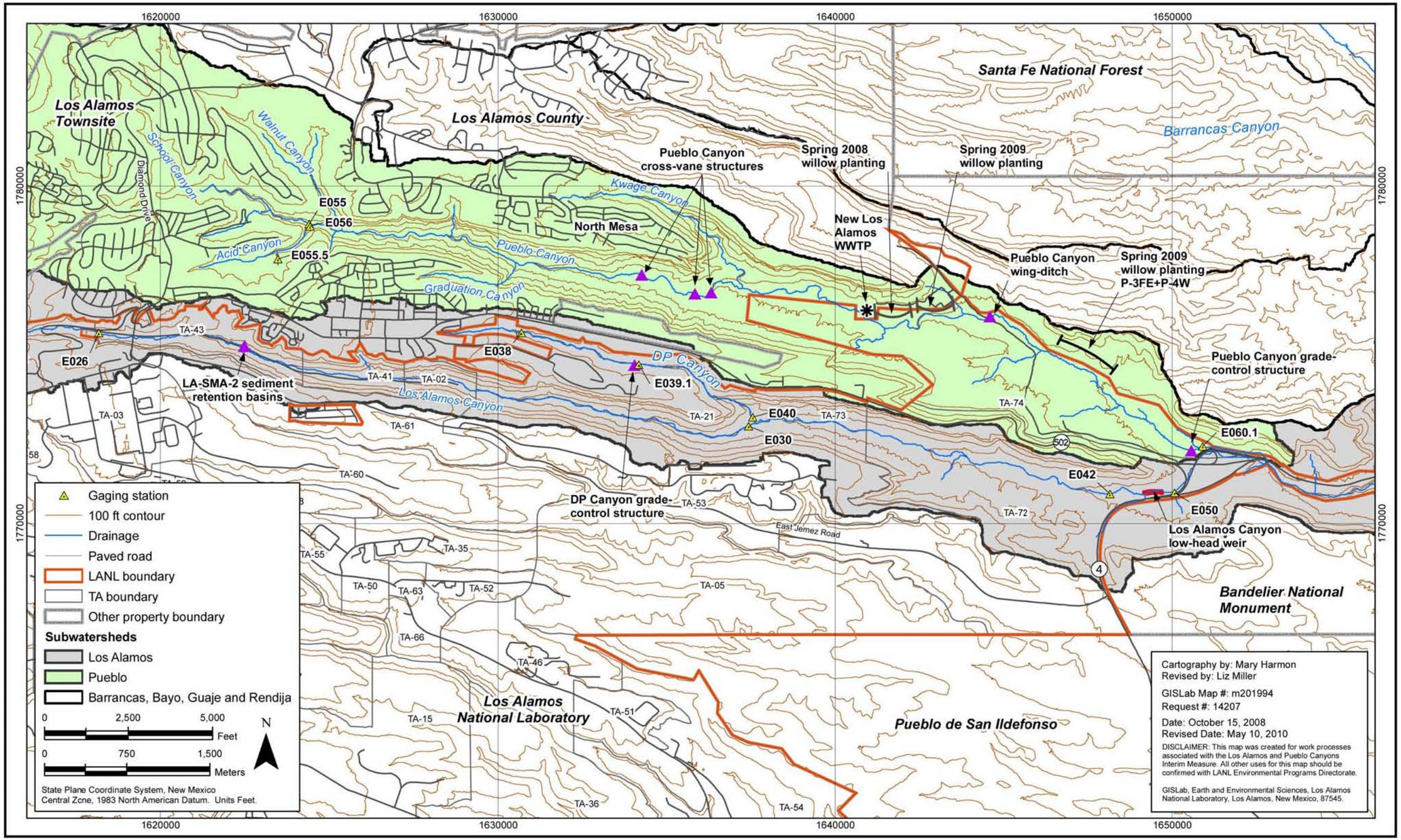


Figure 1 **Map of the Los Alamos and Pueblo Canyon watersheds showing sediment transport mitigation sites**

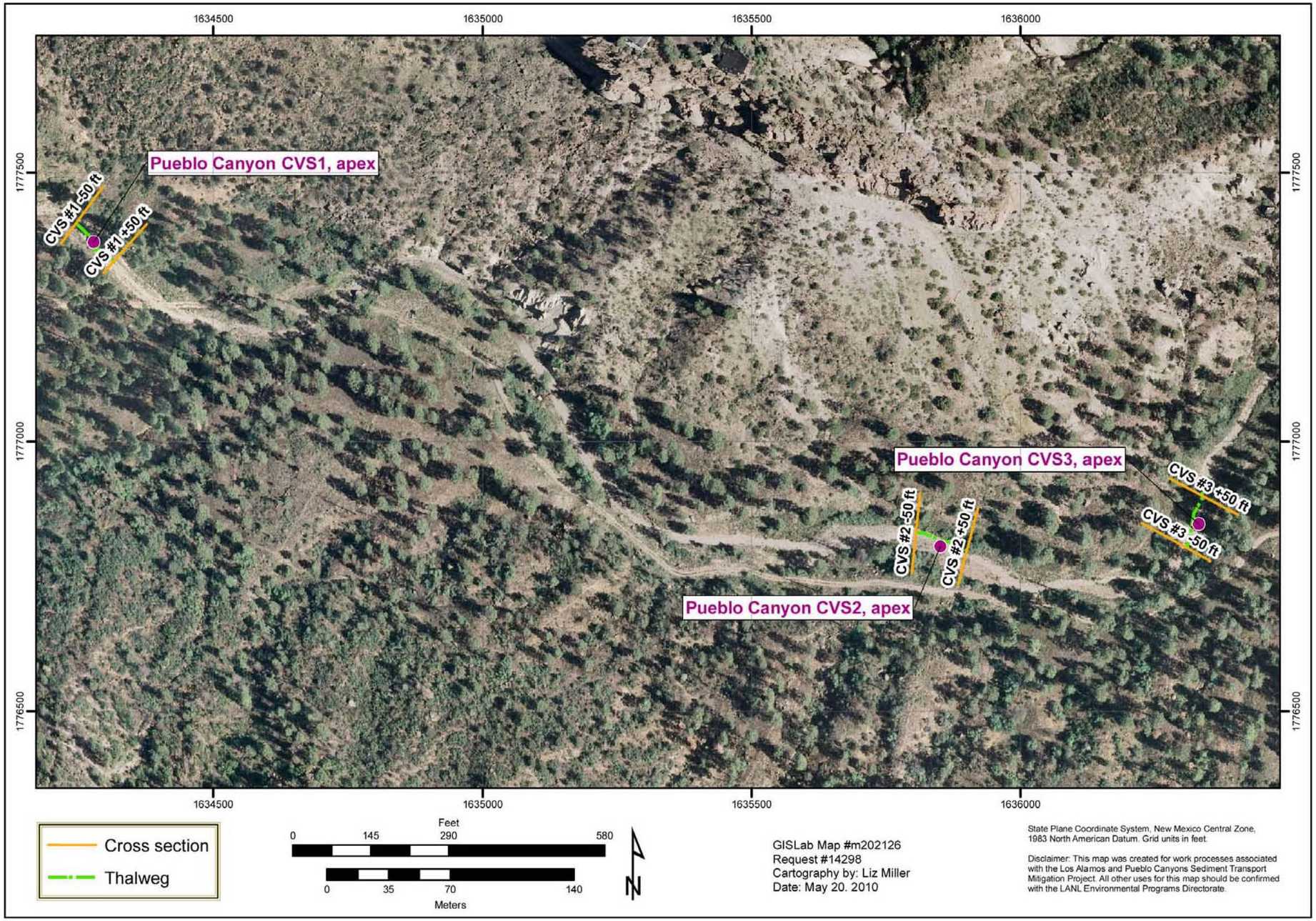


Figure 2 **Orthophoto showing the locations of surveyed cross sections and thalweg profiles at the Pueblo Canyon CVSs**

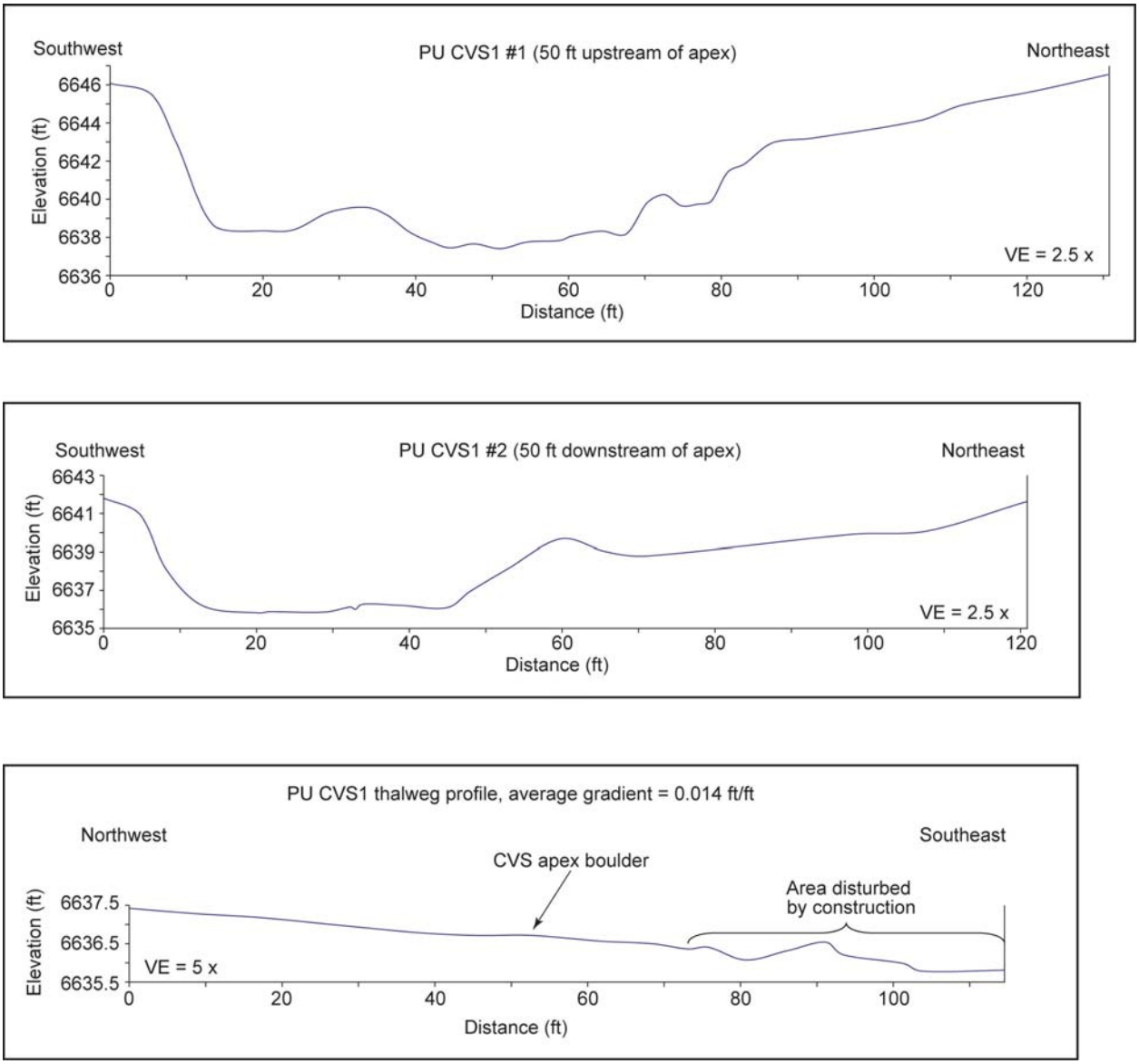


Figure 3 Cross sections and thalweg profile at upper CVS in Pueblo Canyon

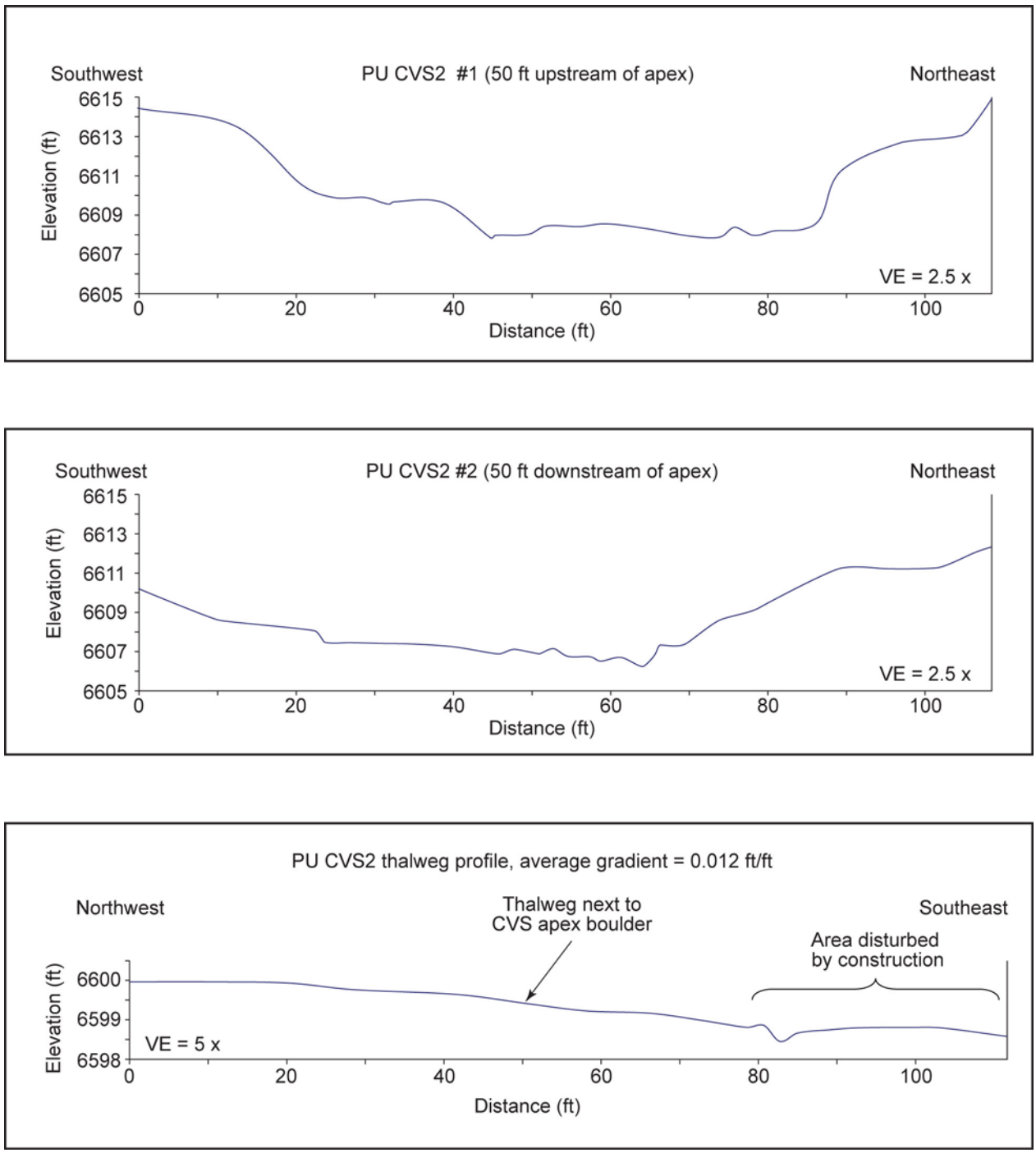


Figure 4 Cross sections and thalweg profile at middle CVS in Pueblo Canyon

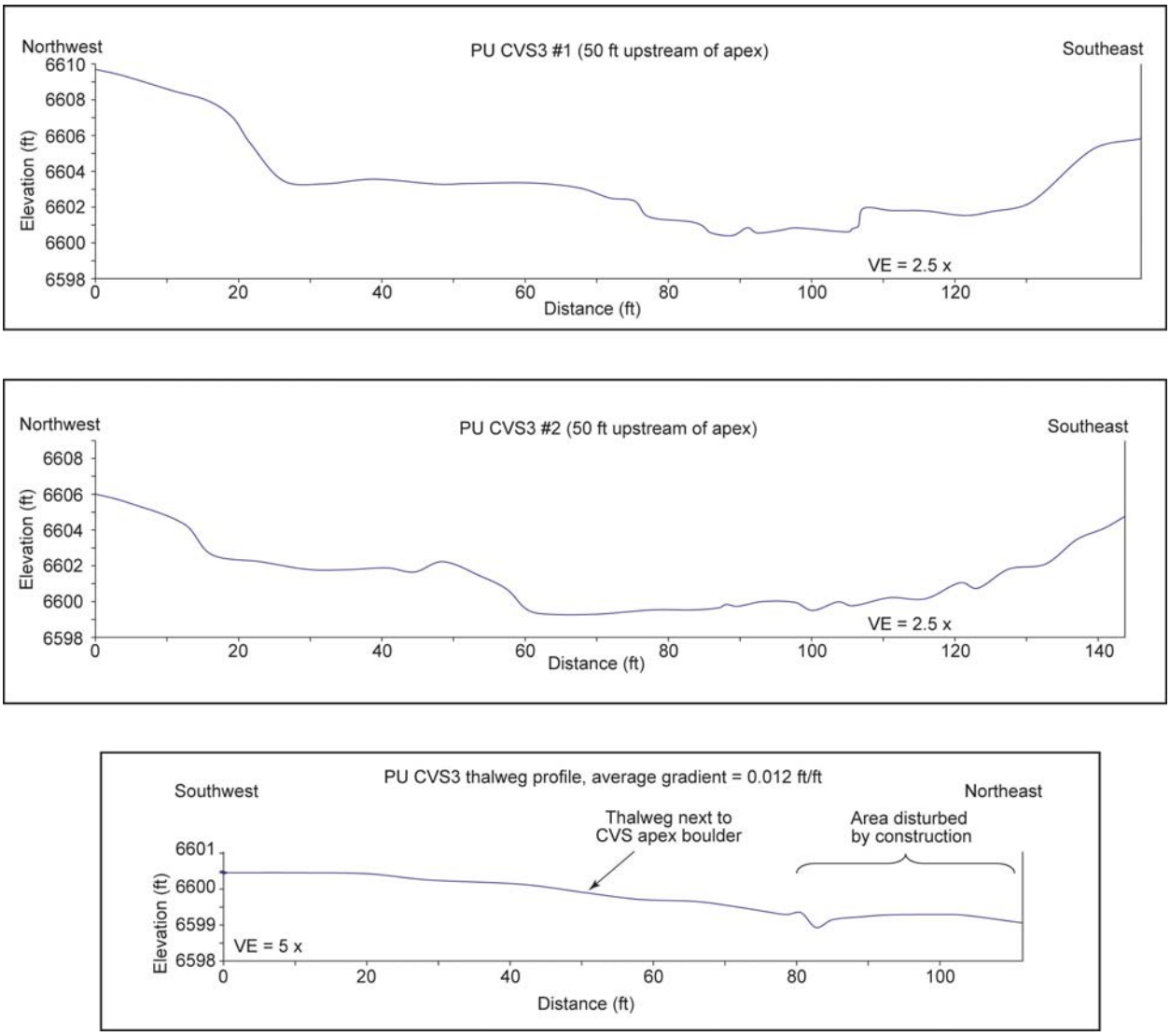


Figure 5 Cross sections and thalweg profile at lower CVS in Pueblo Canyon

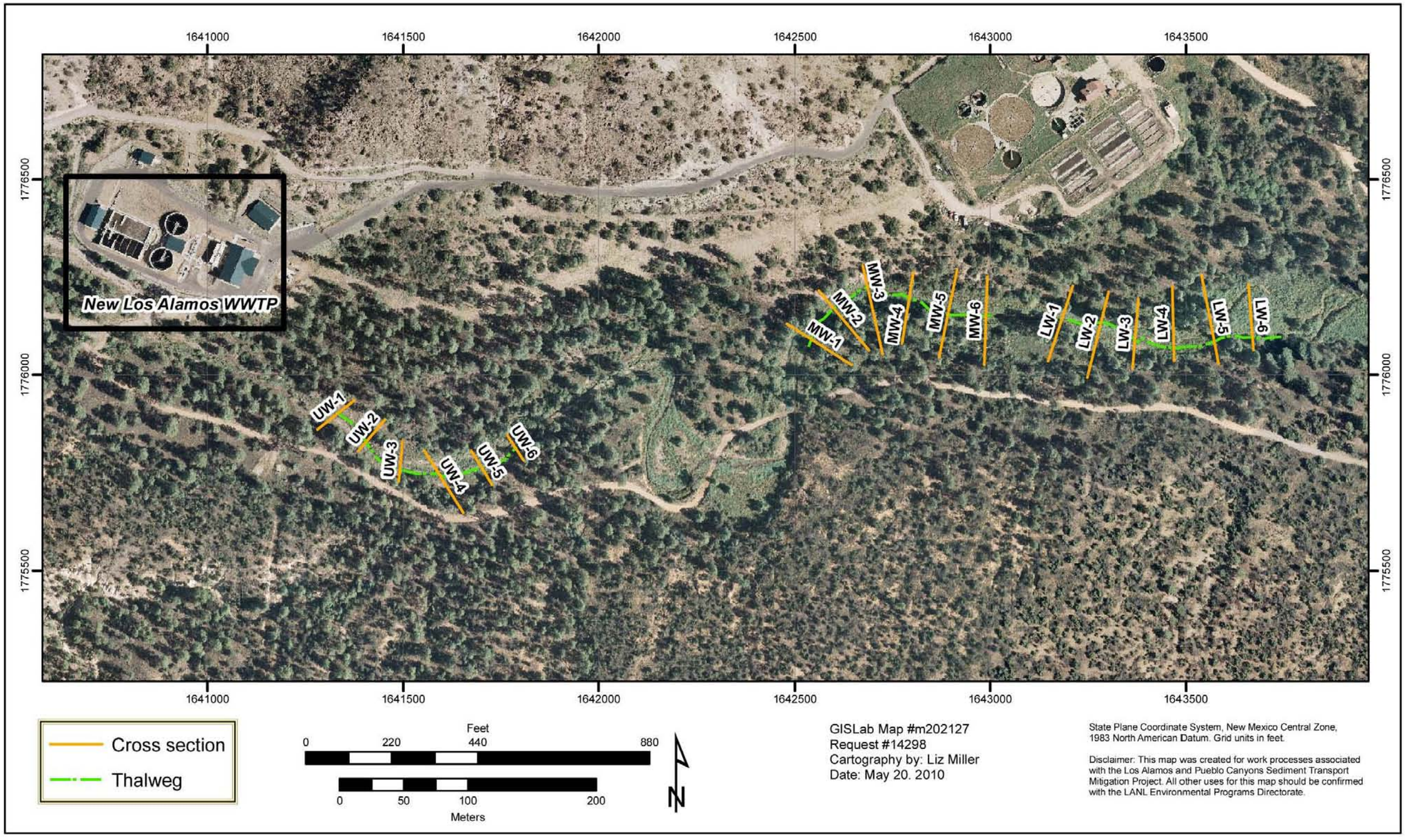


Figure 6 **Orthophoto showing the locations of surveyed cross sections and thalweg profiles in the upper Pueblo Canyon willow-planting area**

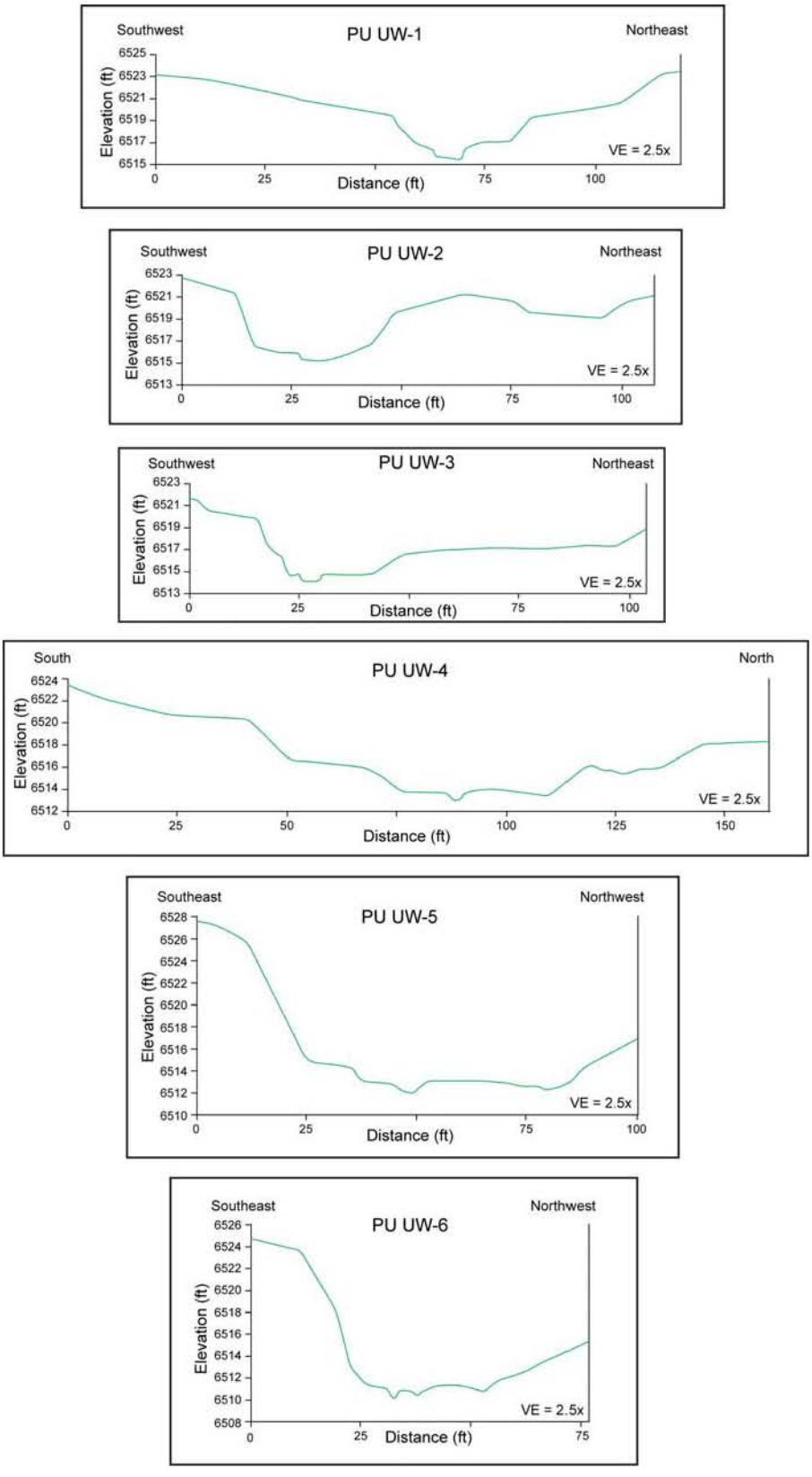


Figure 7 Cross sections in upper third of upper Pueblo Canyon willow-planting area

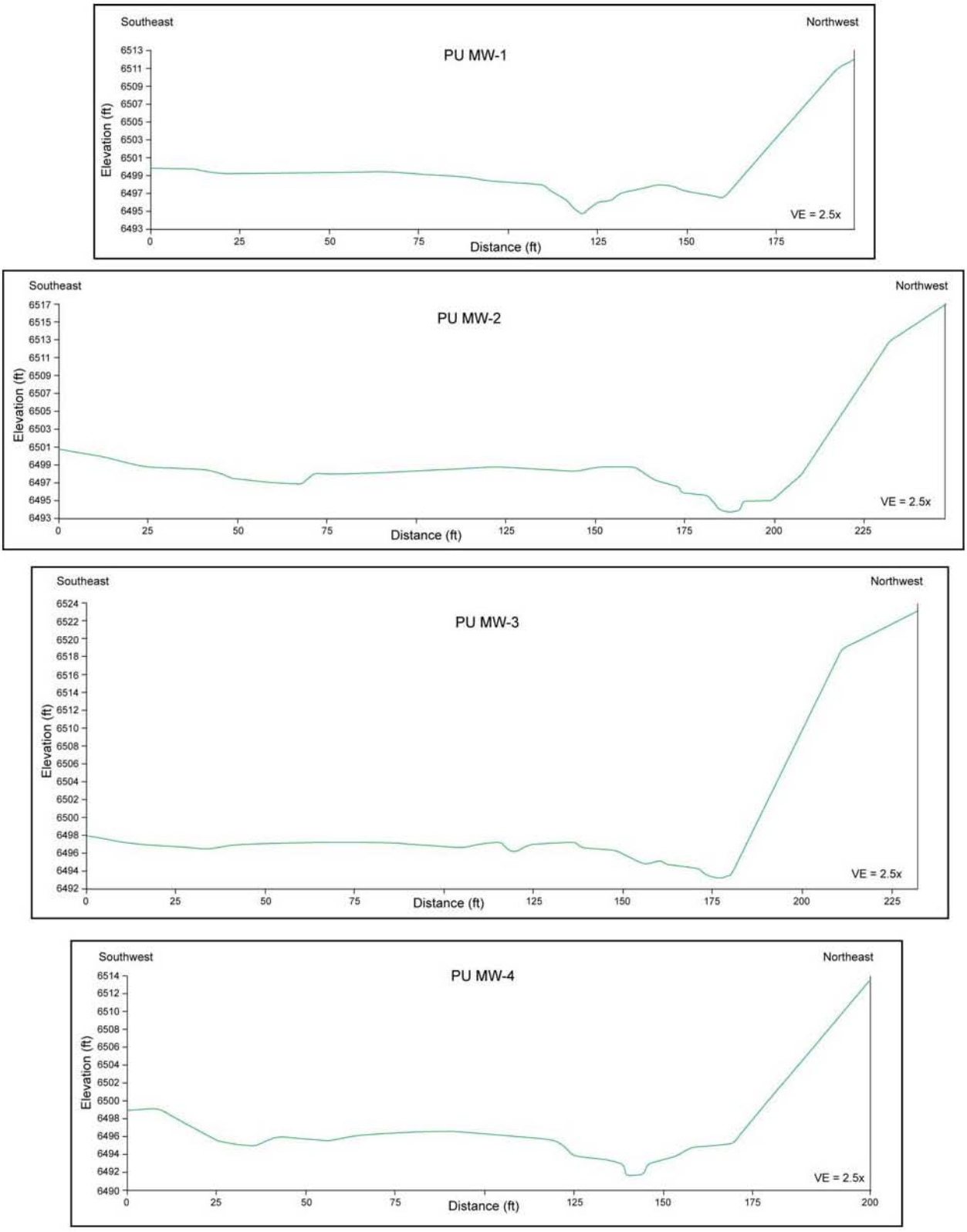
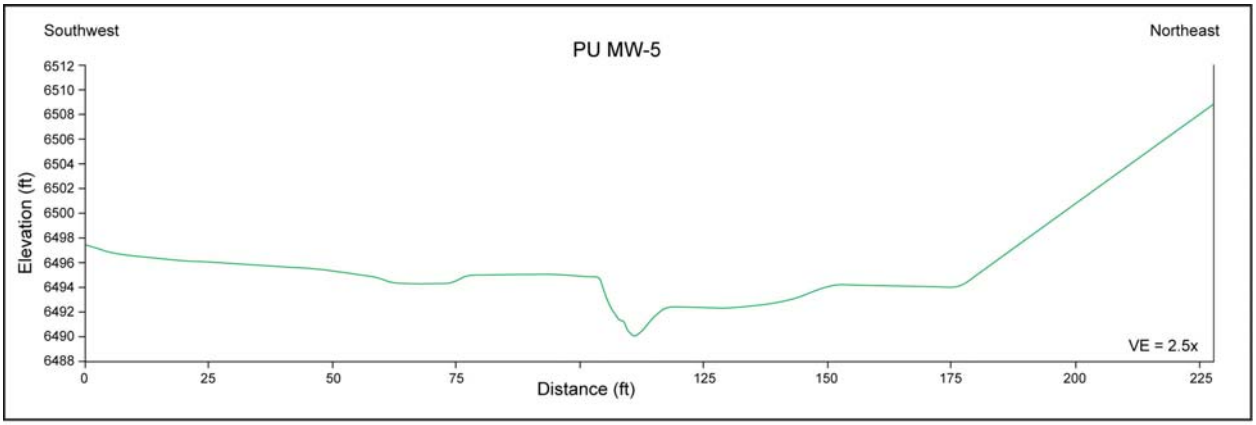
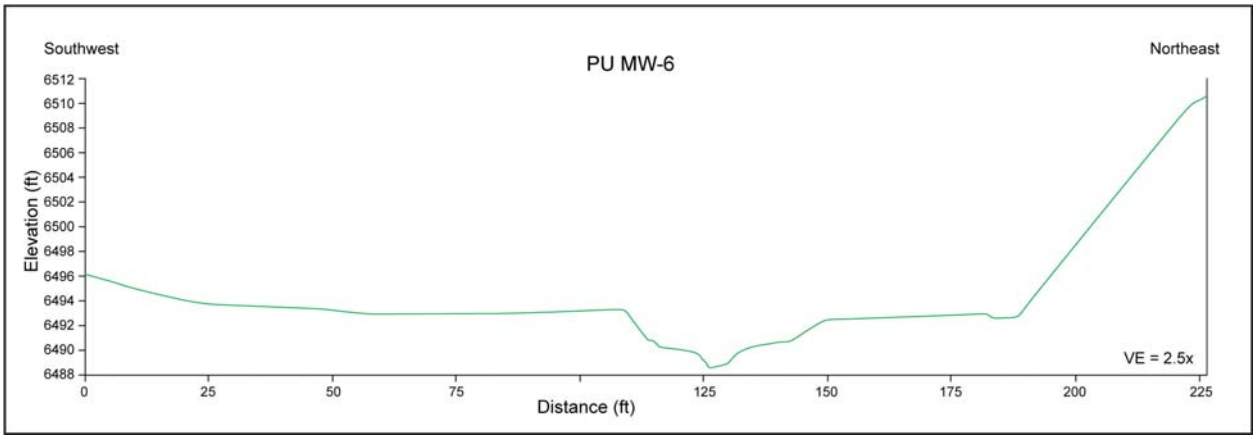


Figure 8 Cross sections in middle third of upper Pueblo Canyon willow-planting area





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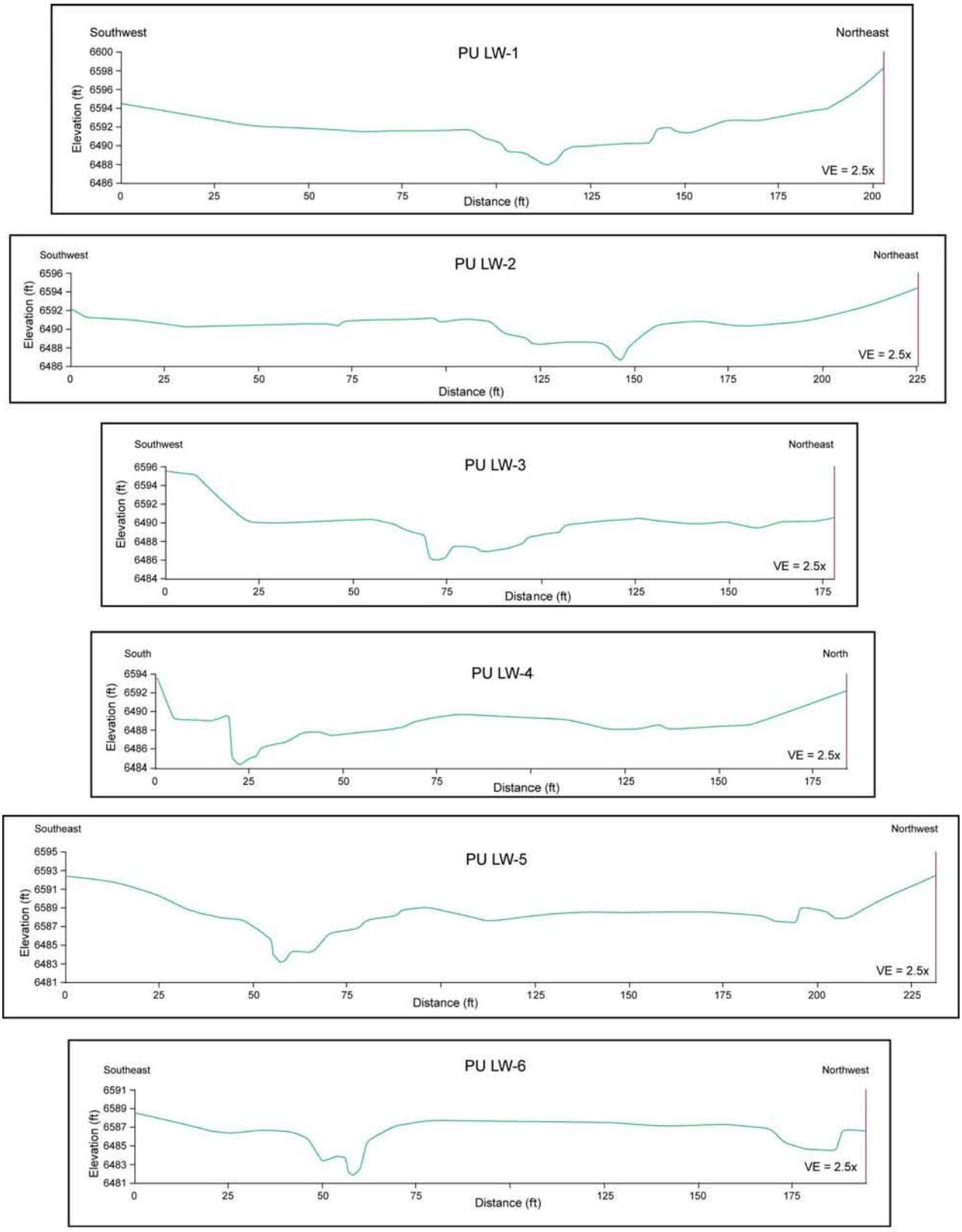


Figure 9 Cross sections in lower third of upper Pueblo Canyon willow-planting area

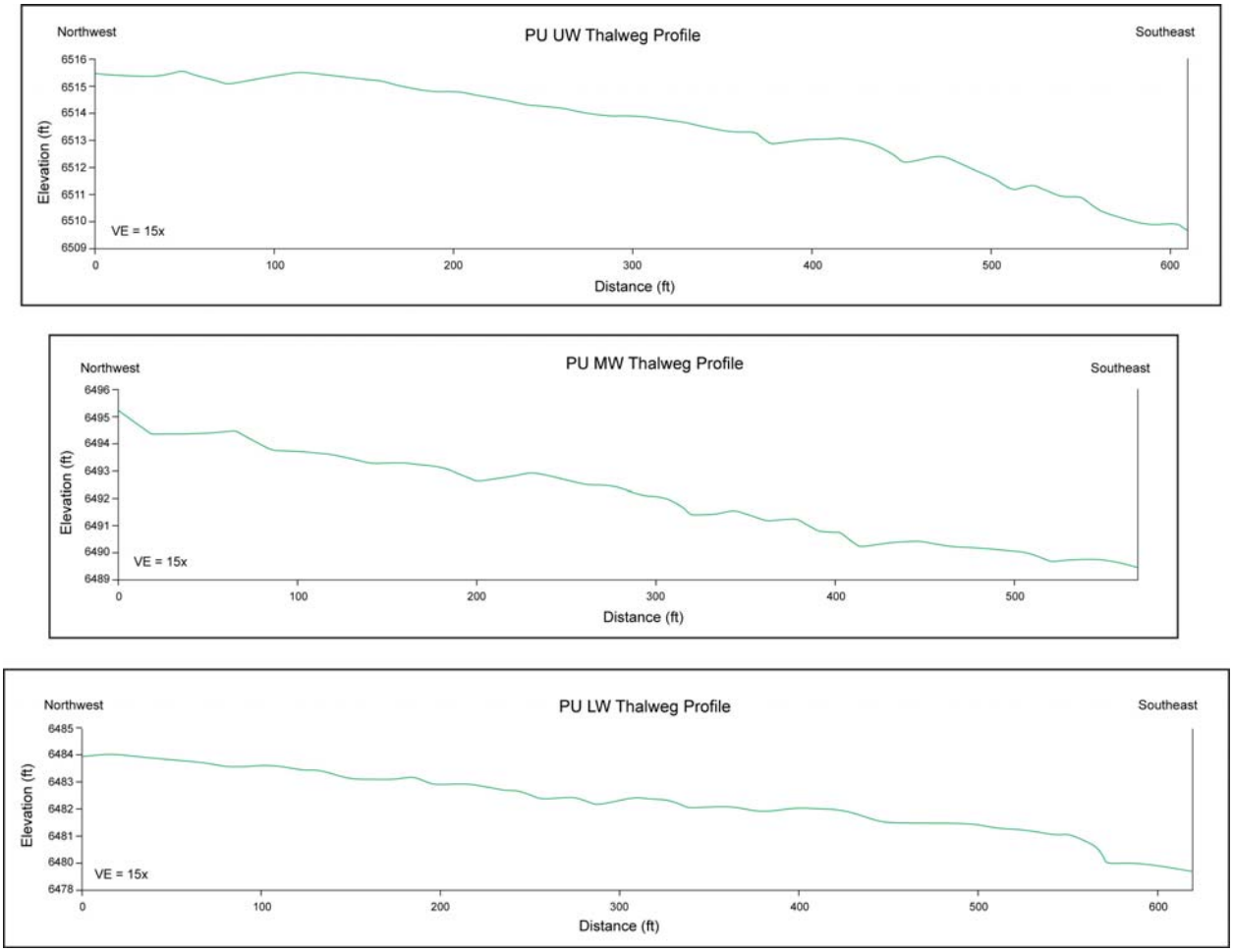


Figure 10 Thalweg profiles in the upper Pueblo Canyon willow-planting area

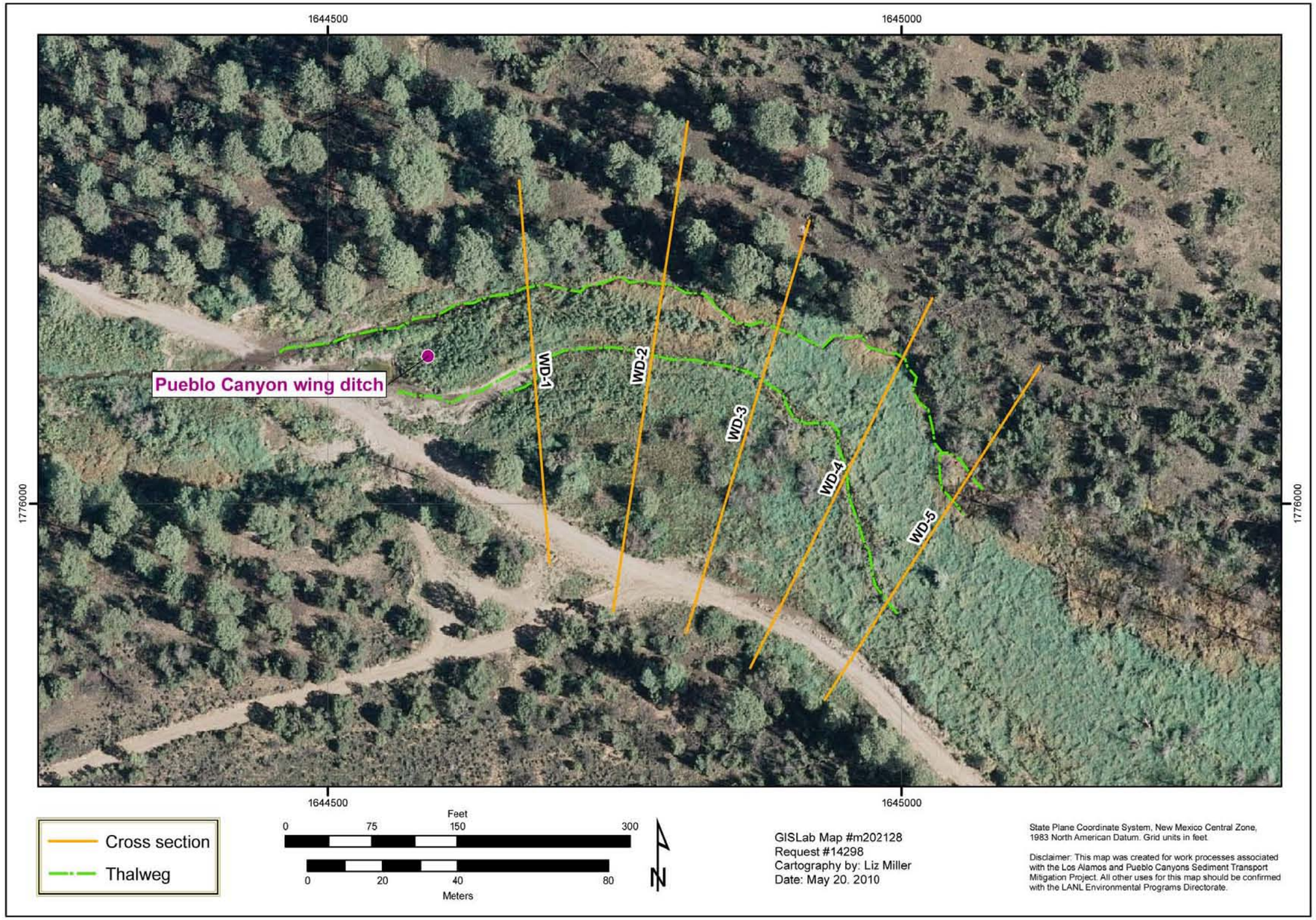
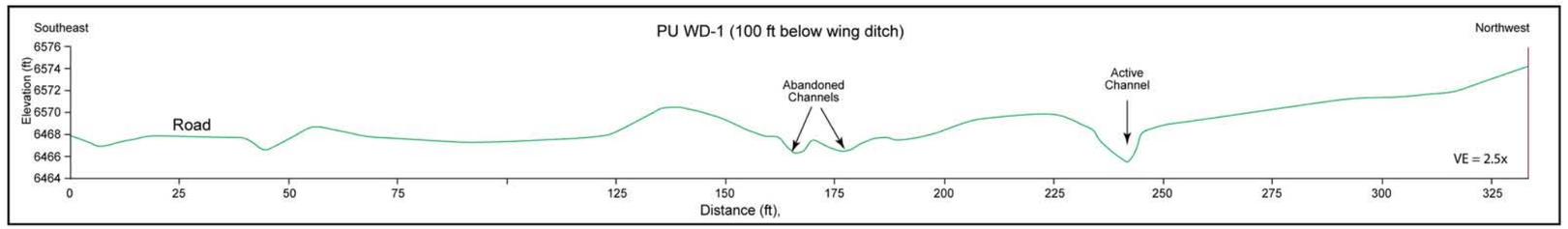
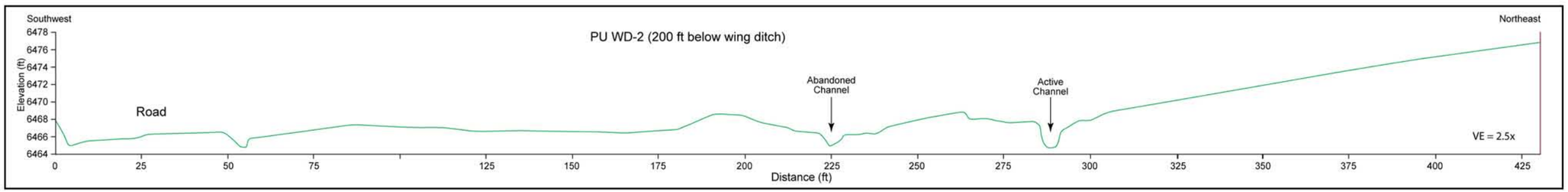
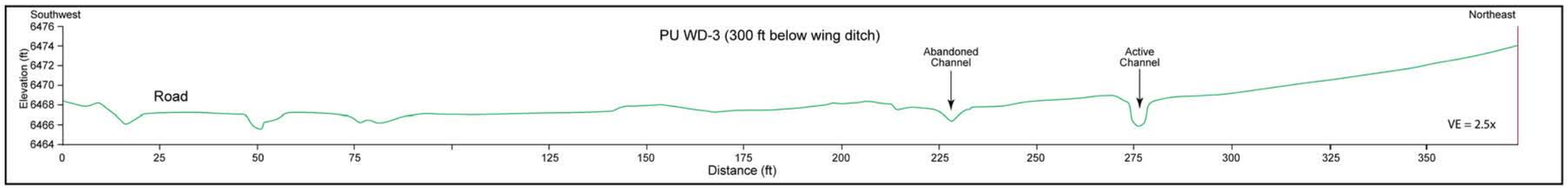
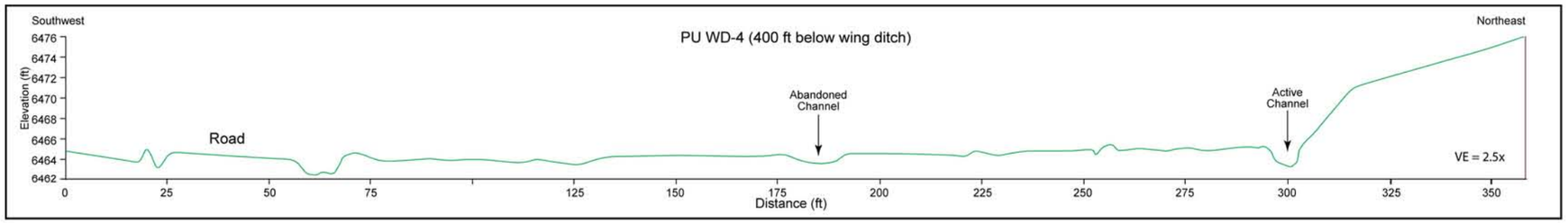


Figure 11 **Orthophoto showing the locations of surveyed cross sections and thalweg profiles near the Pueblo Canyon wing ditch**









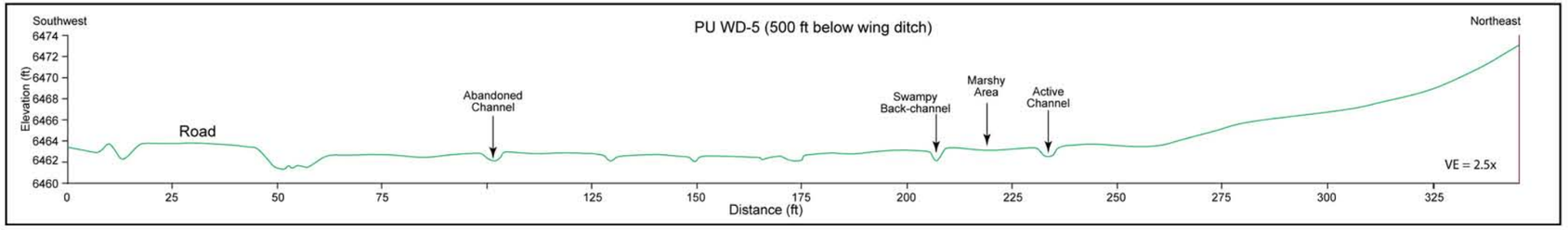
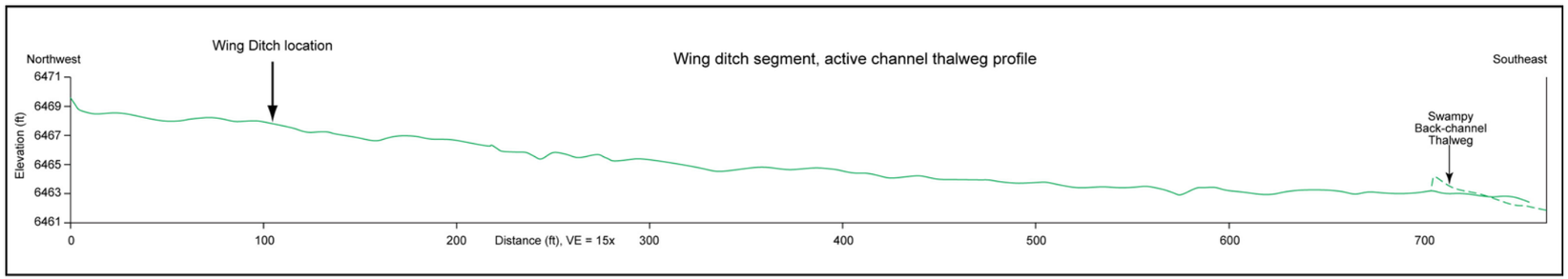


Figure 12 Cross sections below the Pueblo Canyon wing ditch



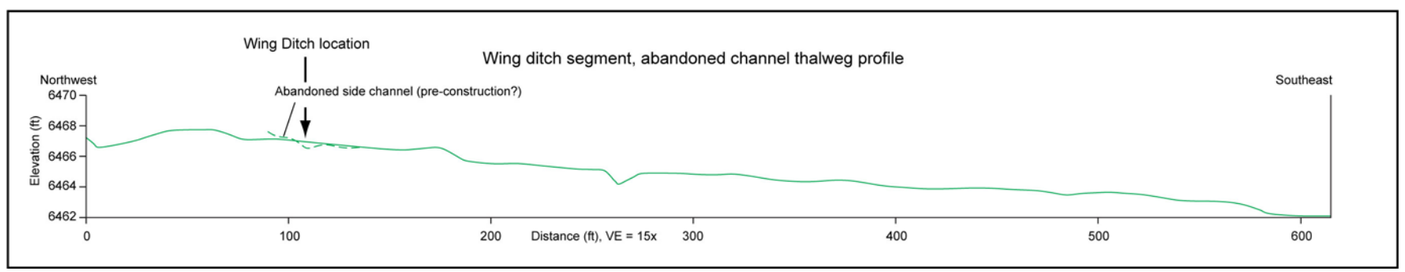


Figure 13 Thalweg profiles near the Pueblo Canyon wing ditch

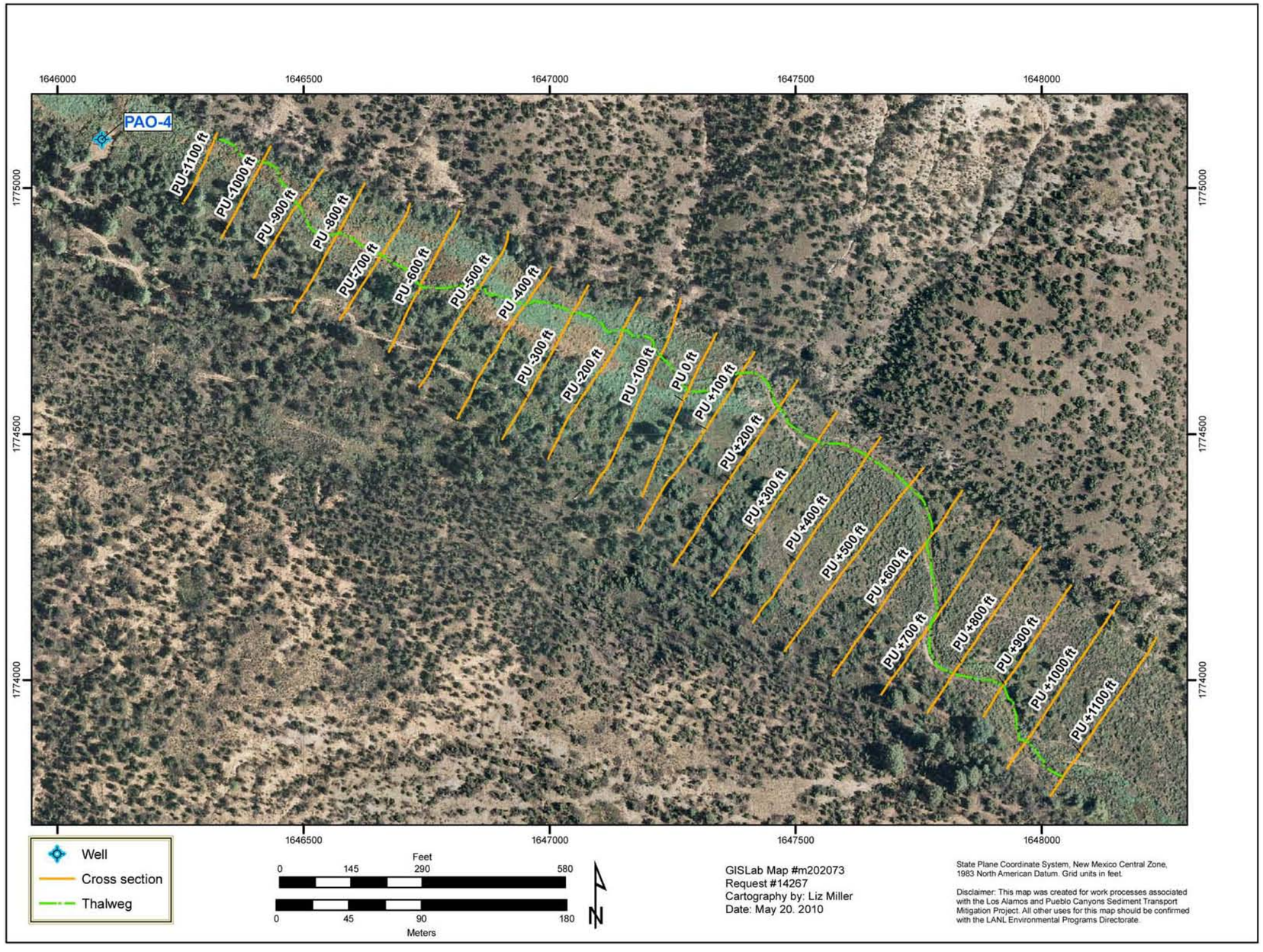
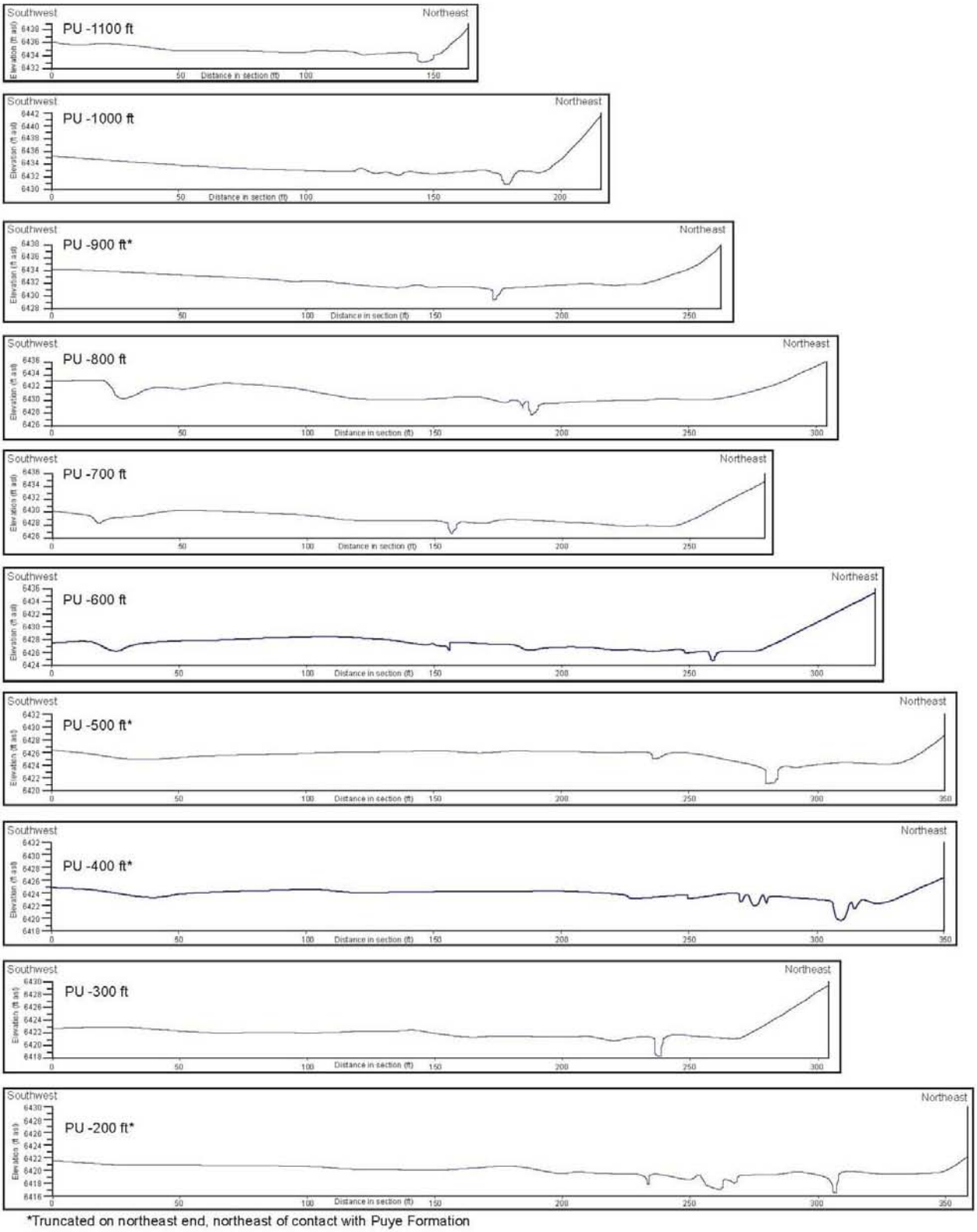


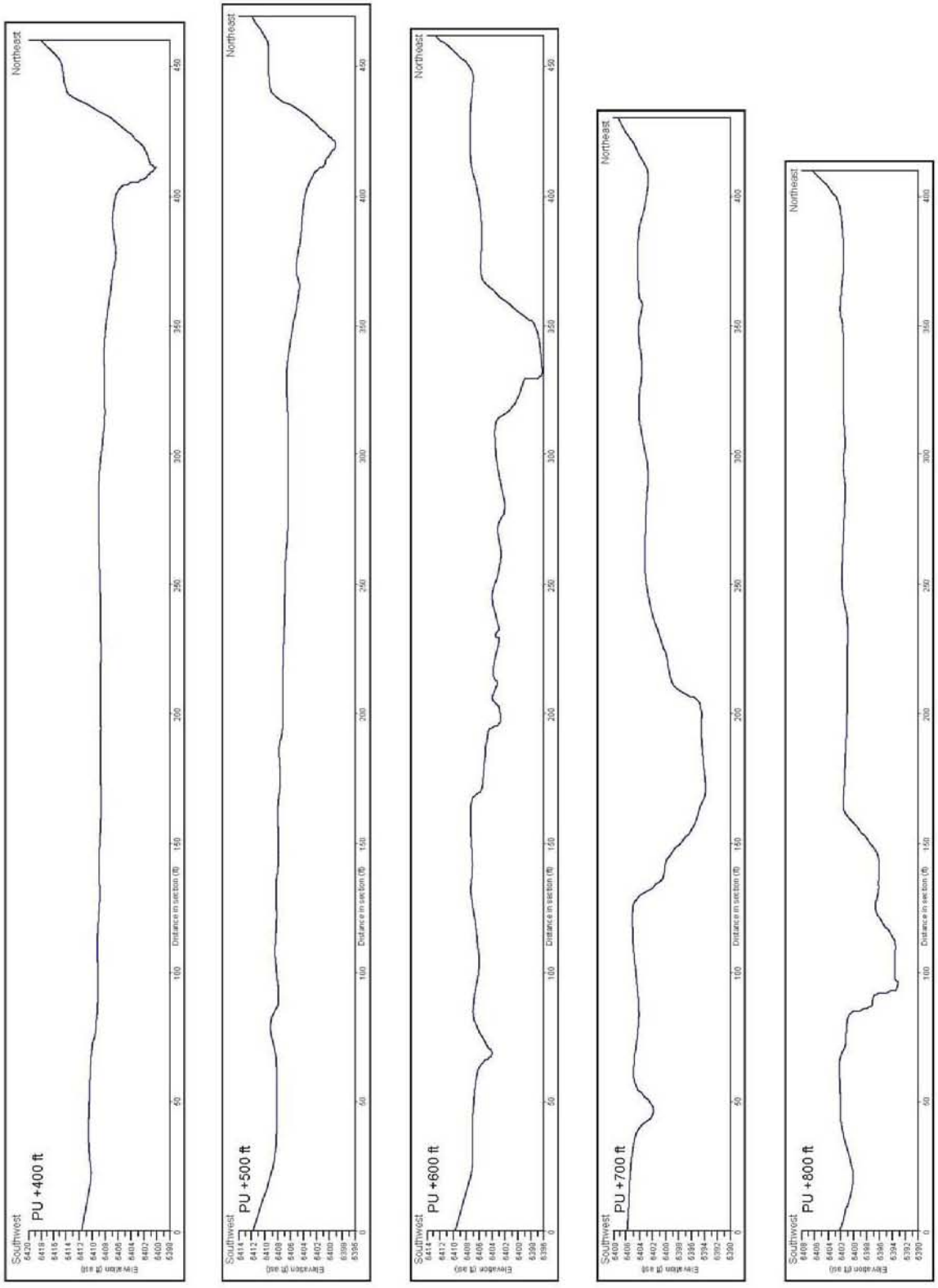
Figure 14 **Orthophoto showing the locations of surveyed cross sections and thalweg profiles in the lower Pueblo Canyon willow-planting area**



*Truncated on northeast end, northeast of contact with Puye Formation

Figure 15 Cross sections in the lower Pueblo Canyon willow-planting area

Figure 15 (continued)



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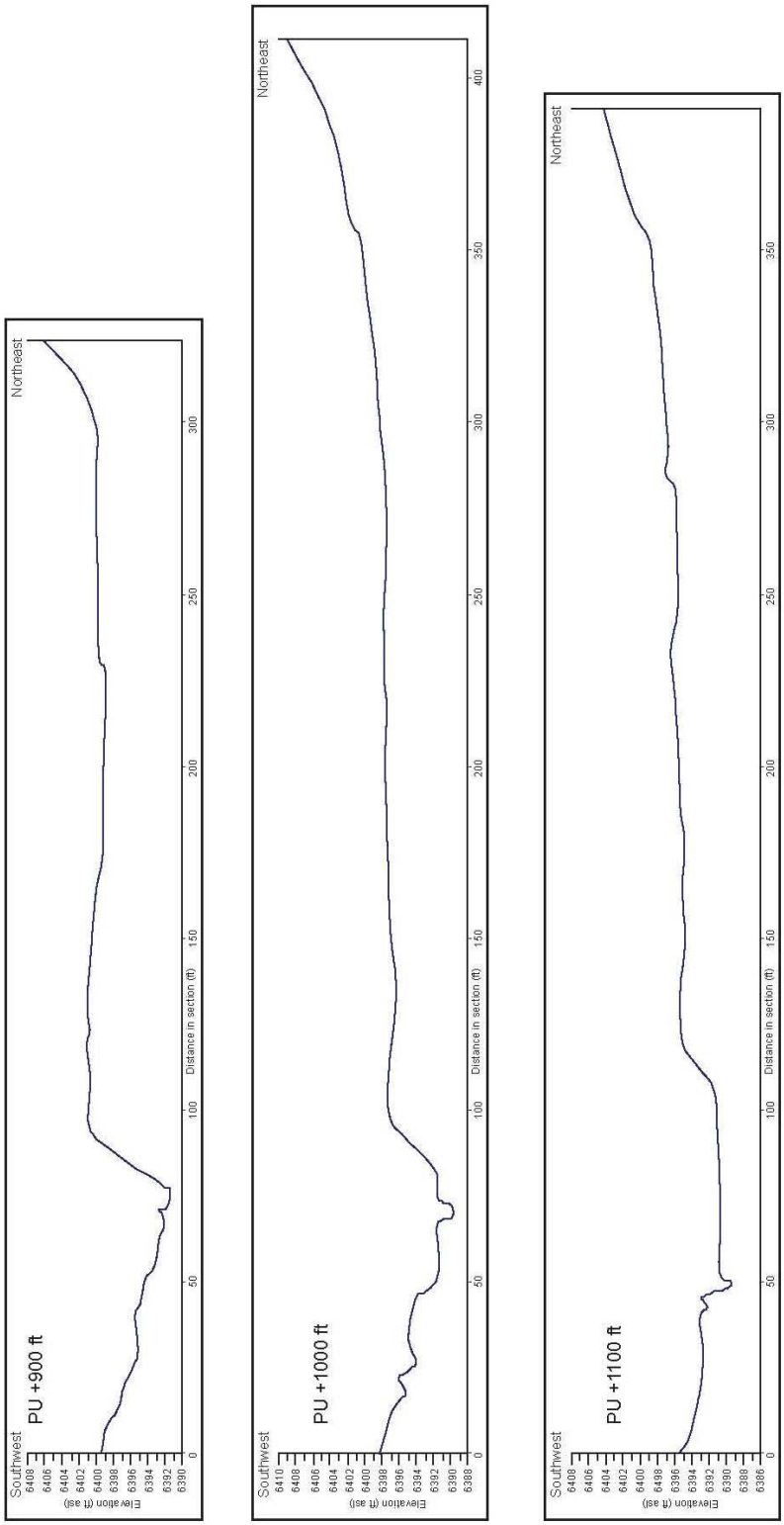

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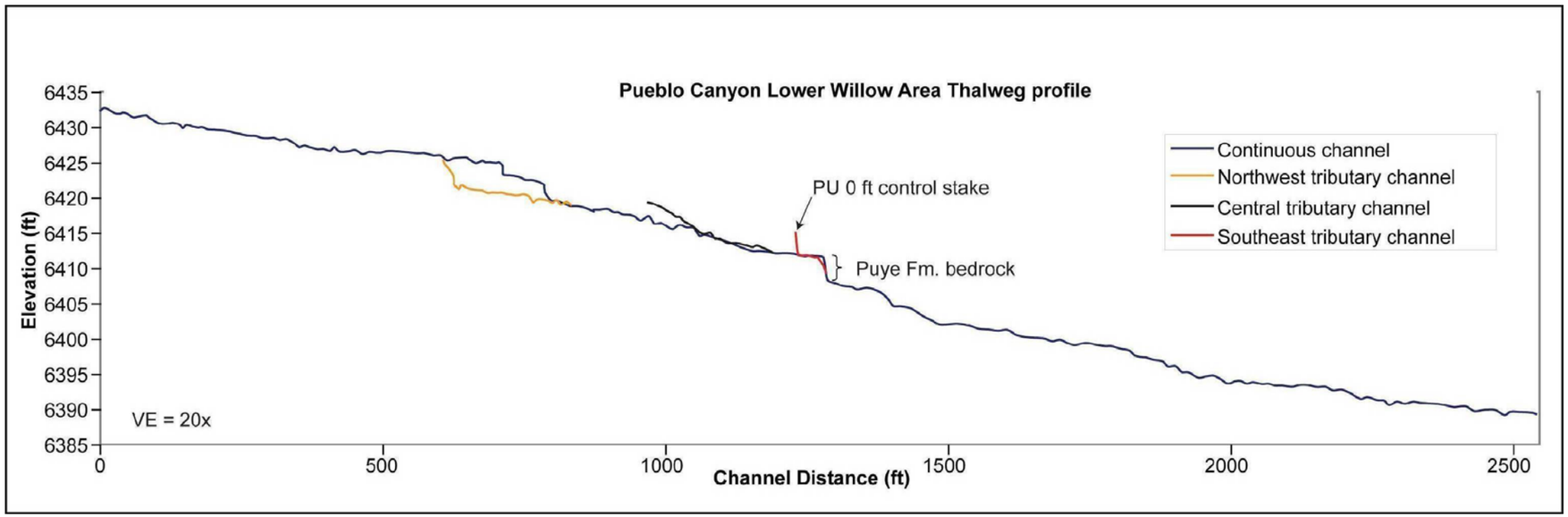


Figure 16 **Thalweg profile in the lower Pueblo Canyon willow-planting area**

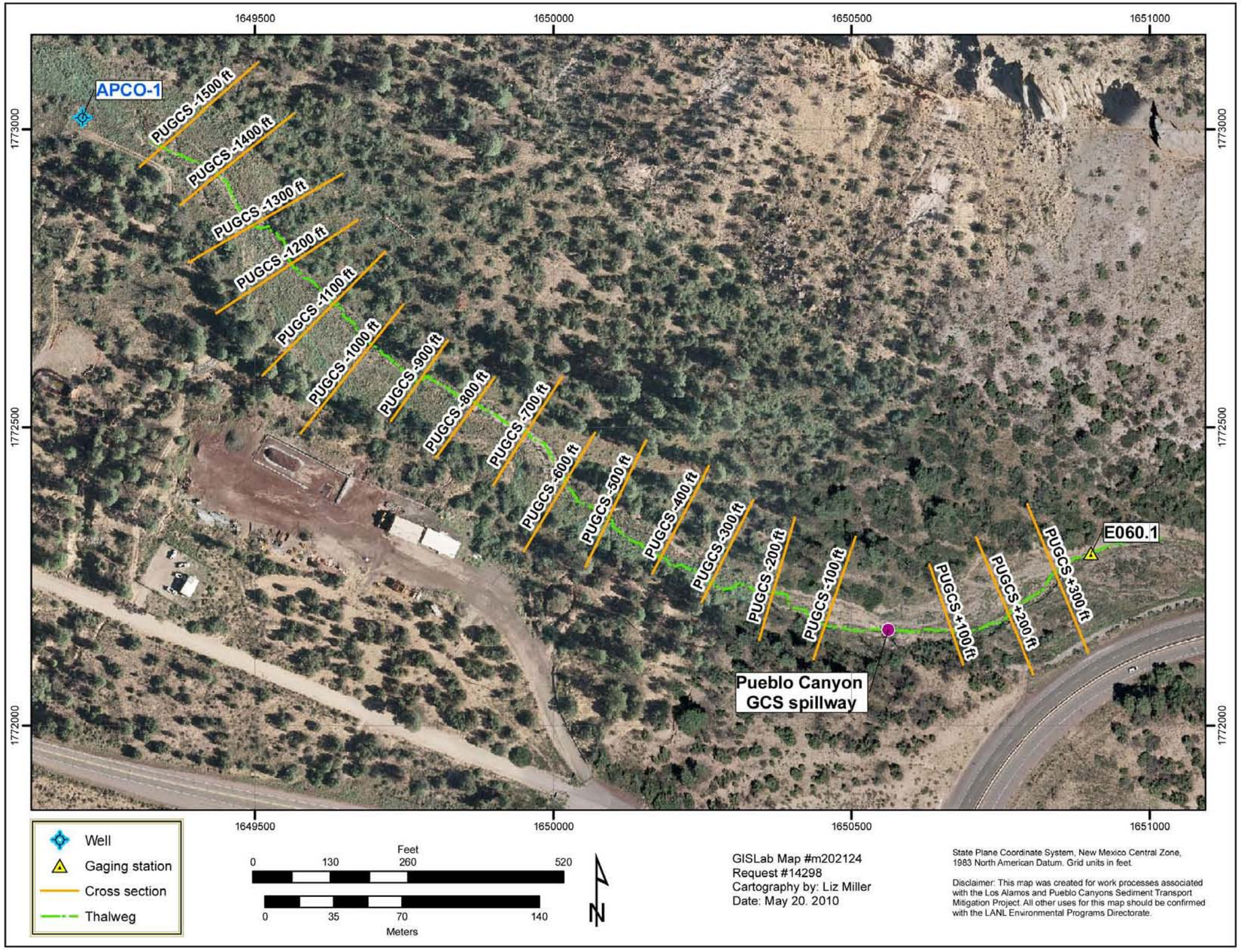


Figure 17 **Orthophoto showing the locations of surveyed cross sections and thalweg profiles near the Pueblo Canyon GCS**

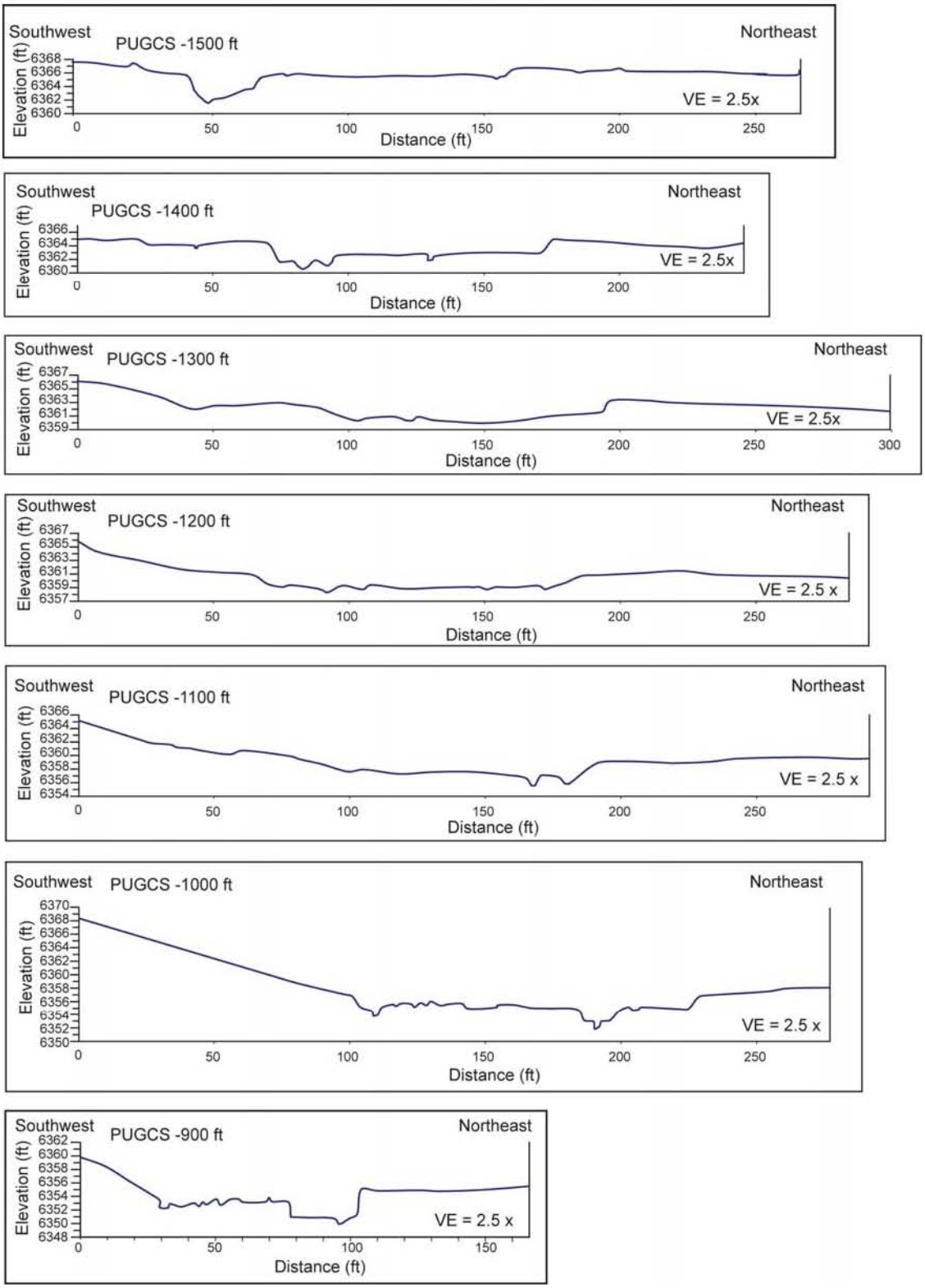
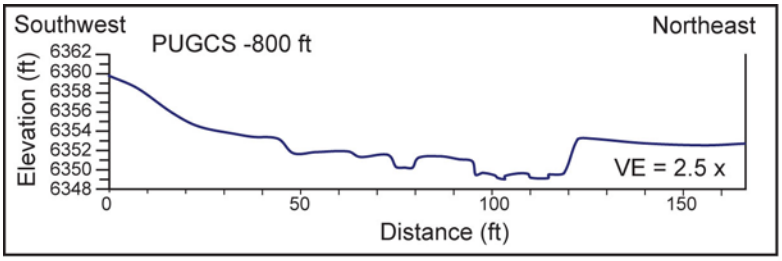
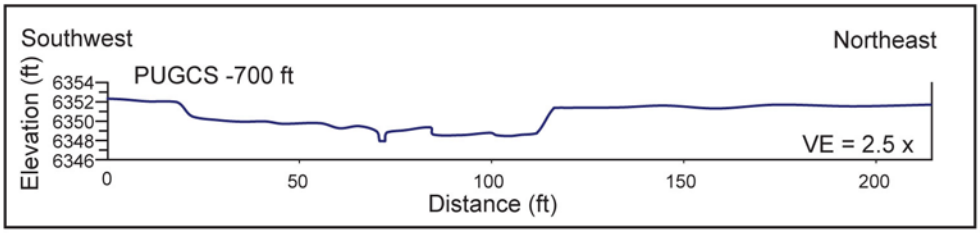
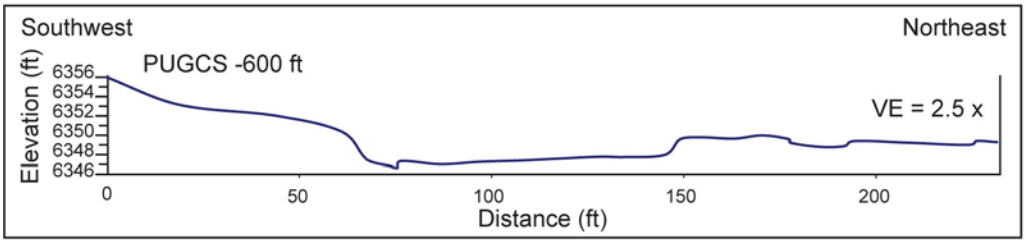
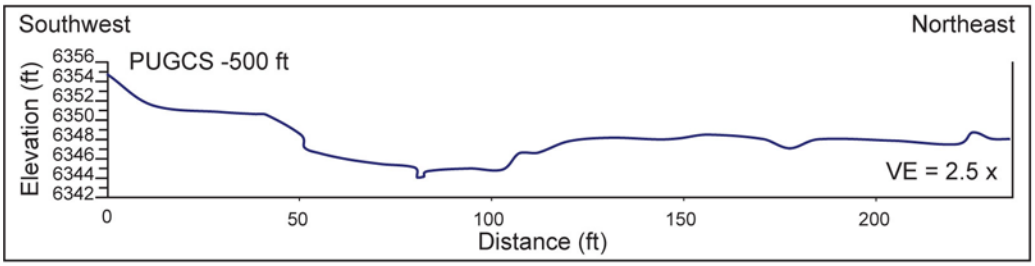


Figure 18 Cross sections near the Pueblo Canyon GCS









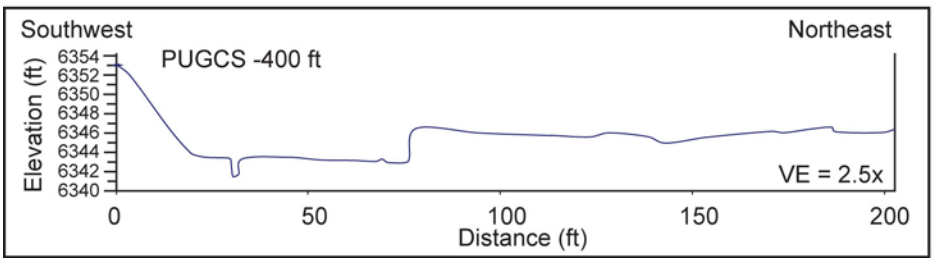


Figure 18 (continued)

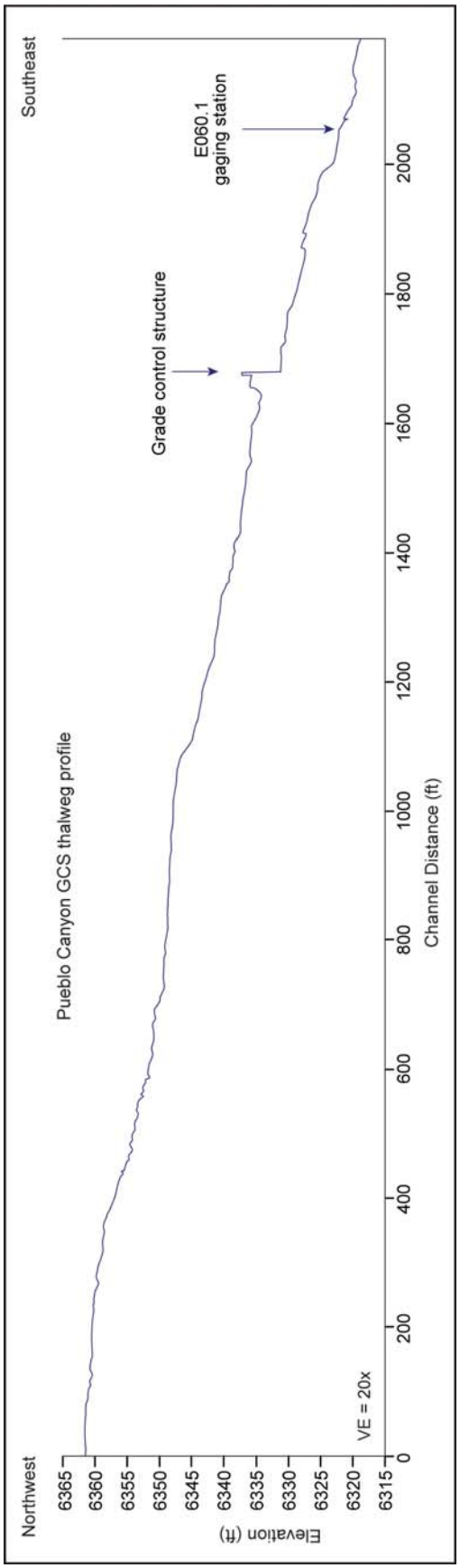


Figure 19 Thalweg profile at the Pueblo Canyon GCS

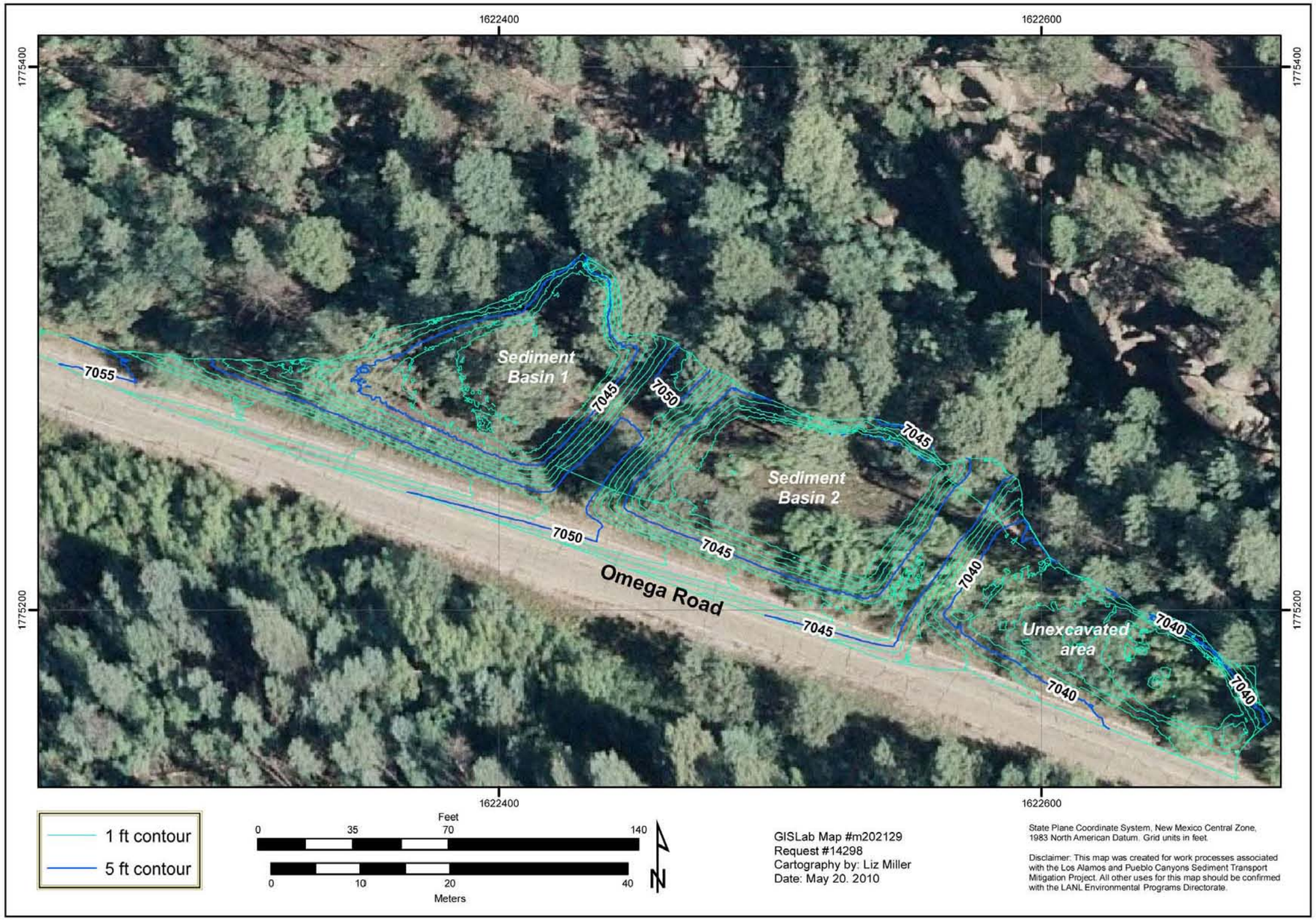


Figure 20 Post-construction topography at the LA-SMA-2 sediment retention basins, overlain on a pre-construction orthophotograph

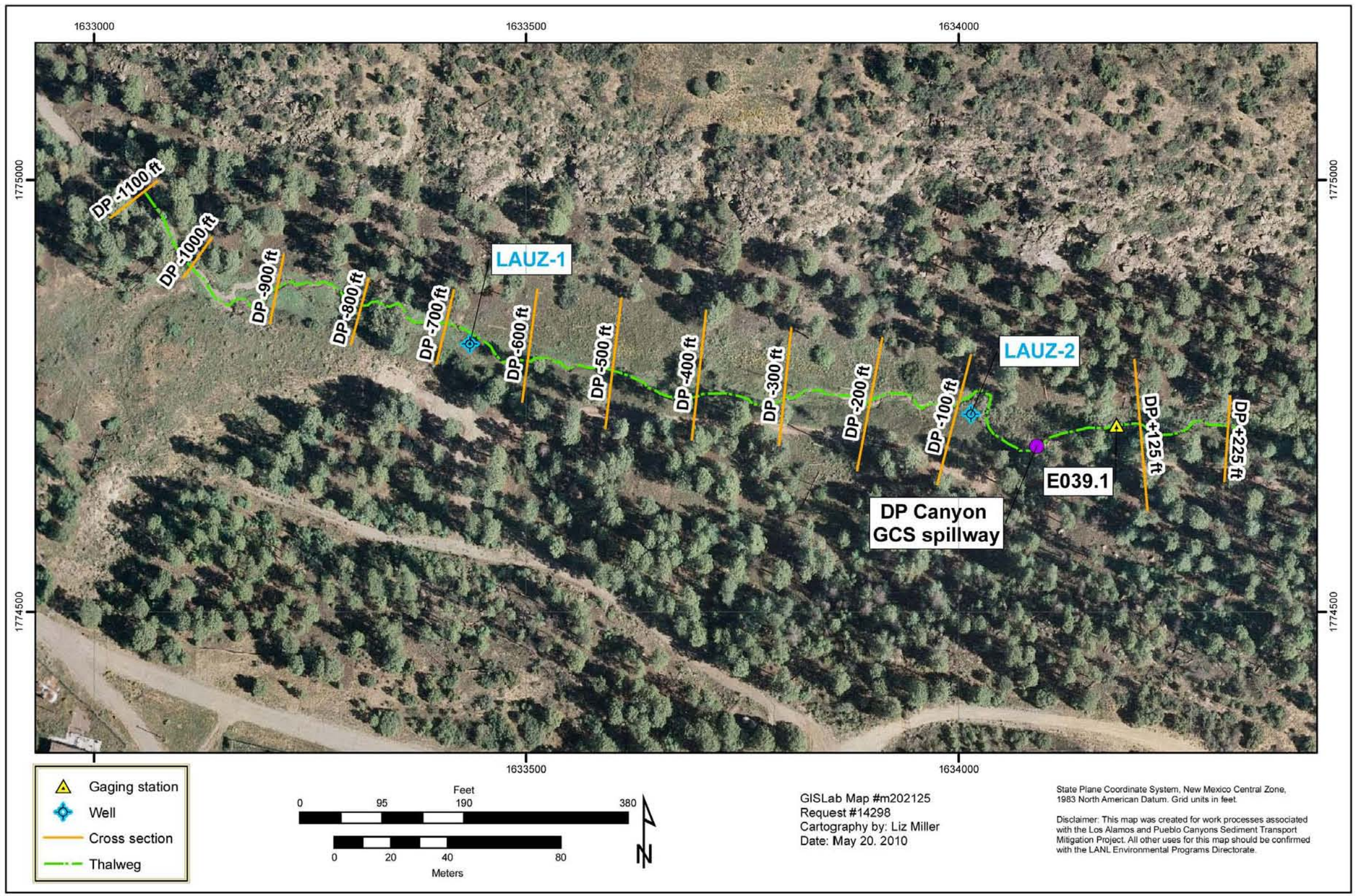


Figure 21 **Orthophoto showing the locations of surveyed cross sections and thalweg profiles near the DP Canyon GCS**

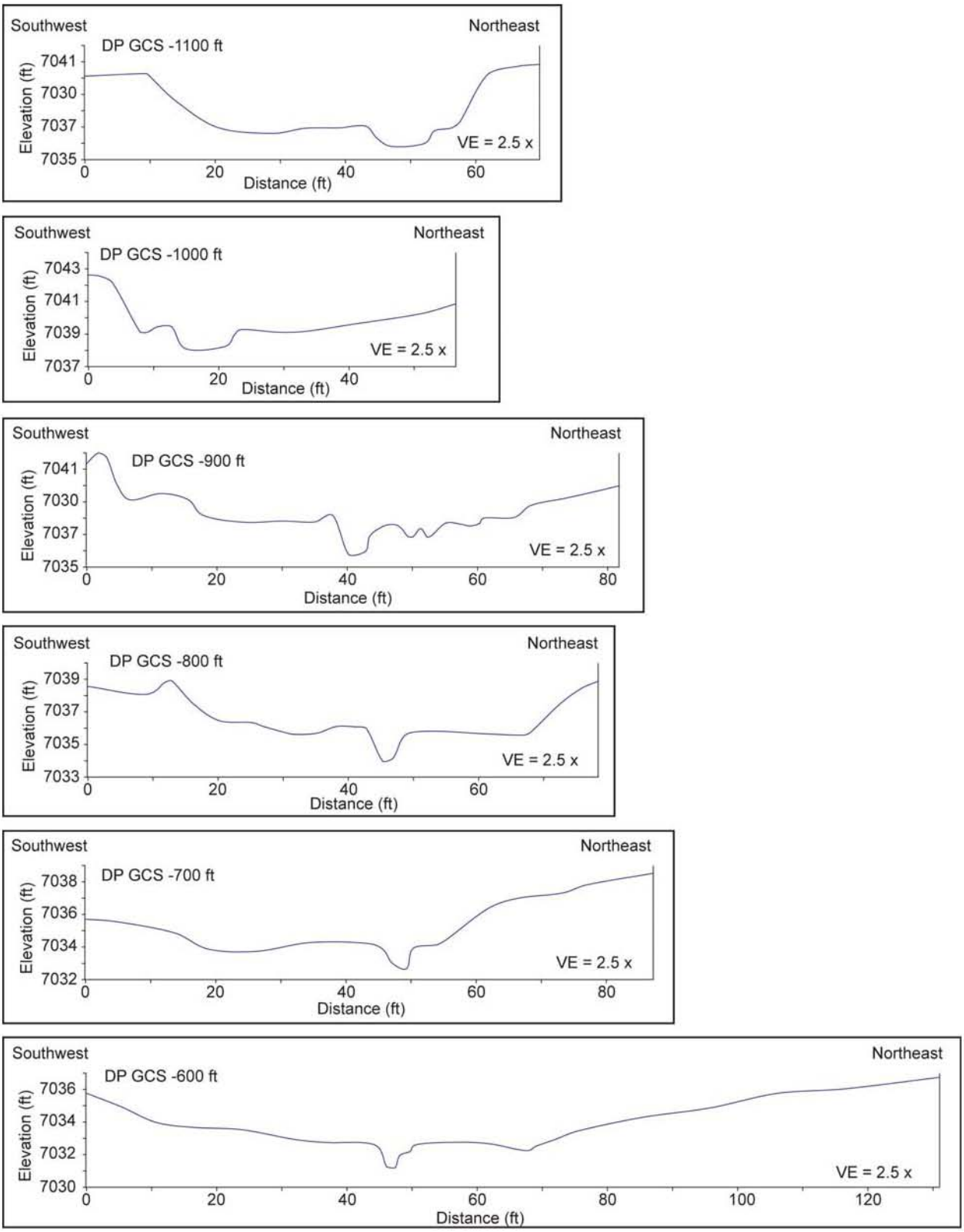
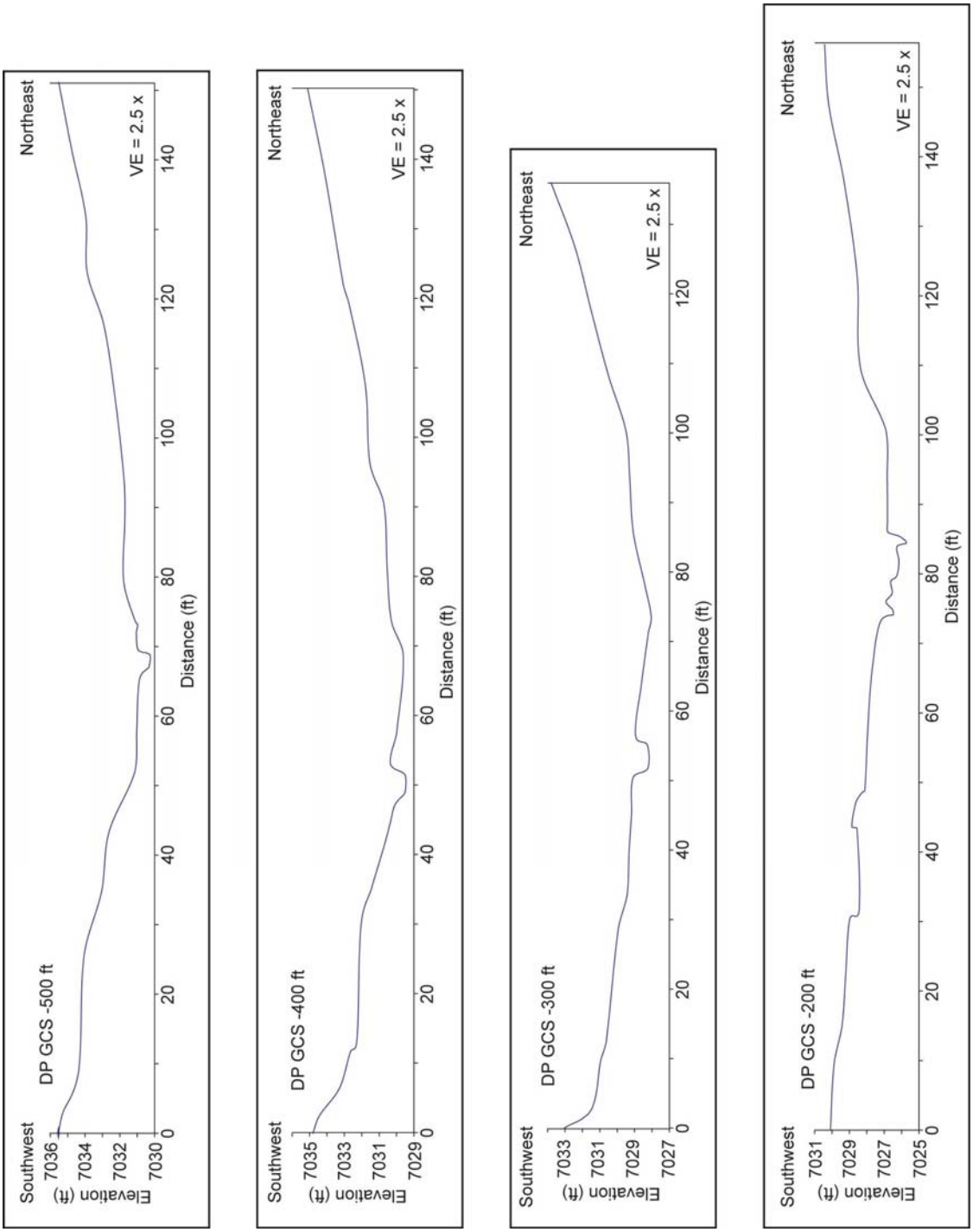


Figure 22 Cross sections near the DP Canyon GCS



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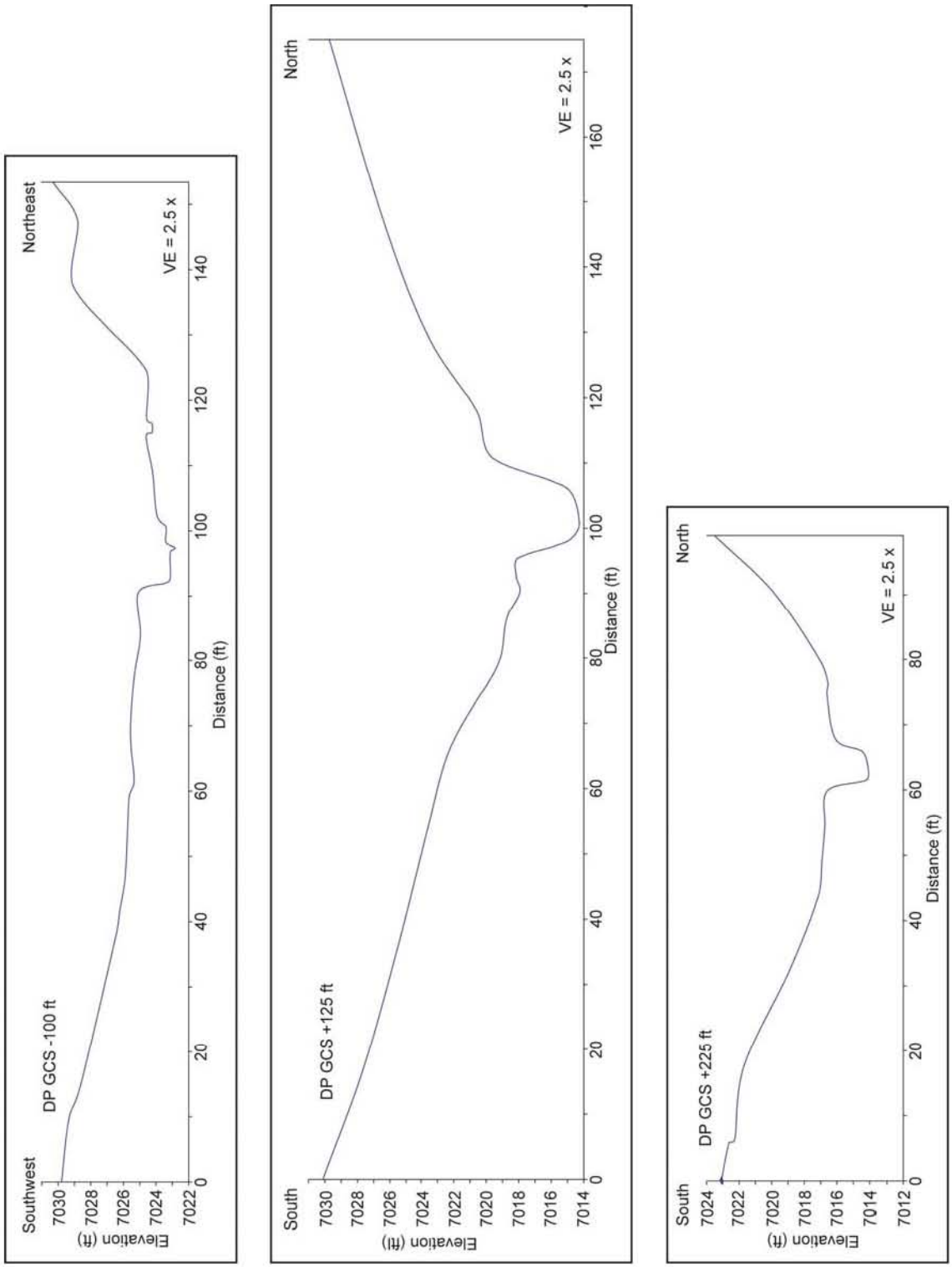

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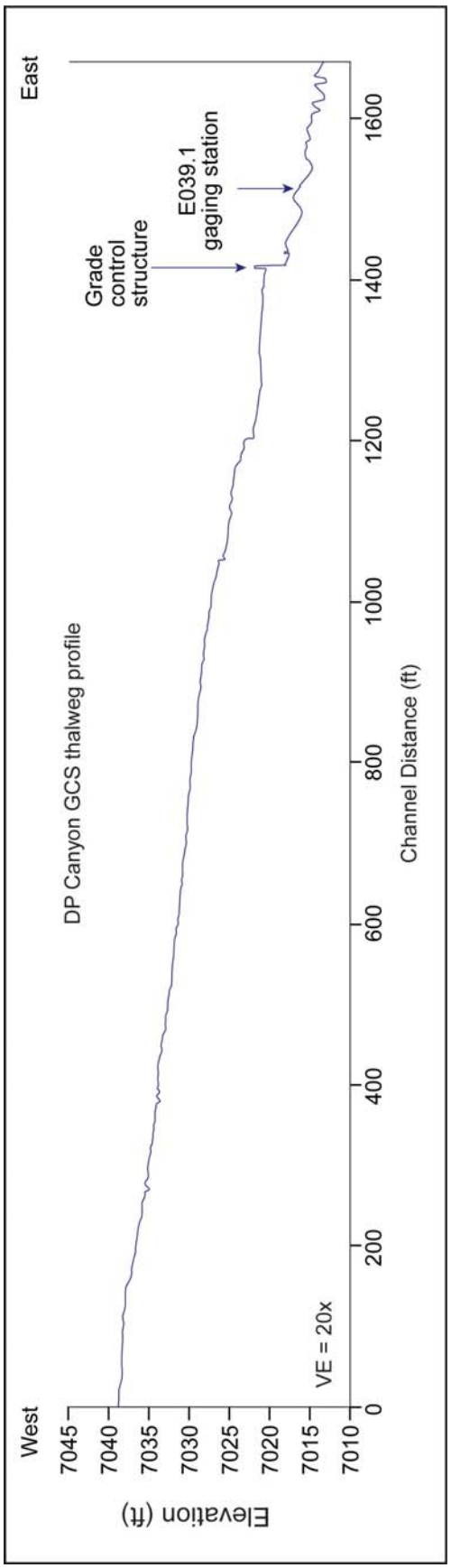

Figure 23 Thalweg profile at the DP Canyon GCS

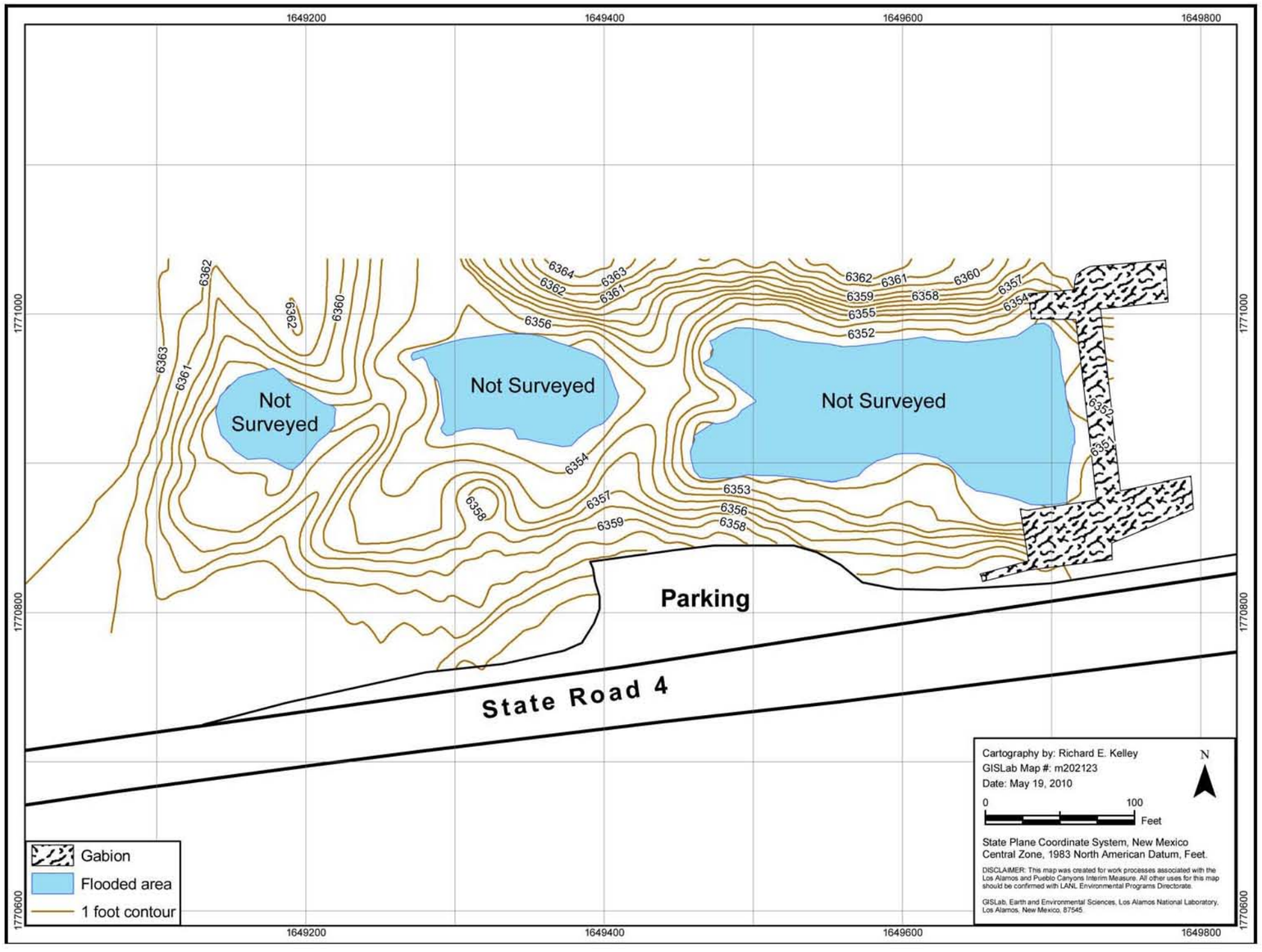

Figure 24 Post-construction topographic map of sediment retention basins above the Los Alamos Canyon low-head weir