# Annual Progress Report for 2014

## MONITORING THE EFFECTIVENESS AND VALIDATING RESPONSE TO THE ROAD RELATED MITIGATION PRACTICES IMPLEMENTED ON THE PIKES PEAK HIGHWAY

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West Fork Beaver Creek, Pikes Peak, Colorado. Photo by Josh VonLoh, METI Inc.

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# Executive Summary

## Monitoring the Effectiveness and Validating Response to the Road Related Mitigation Practices Implemented on the Pikes Peak Highway

**C.A. Troendle, S. Winkler, J. VonLoh, and H. Karlsson**

This is the twelfth report documenting the annual monitoring efforts on the Pikes Peak Highway as part of the Settlement Agreement between the Sierra Club and the United States Department of Agriculture, Forest Service in Sierra Club v. Veneman, Civil Action No. 98-M-662 (D. Colo.), (U.S. Department of Justice 2002). The original monitoring plan and subsequent amendments call for effectiveness monitoring, designed to determine how well the mitigation practices implemented contribute to meeting their objectives; and validation monitoring, designed to determine how the mitigation practices affect the riparian, wetland, and aquatic systems within the area of influence of the Pikes Peak Highway (USDA Forest Service 2002 and 2003).

Effectiveness monitoring for the Pikes Peak Highway is focused on the 14-mile-long, 300-foot-wide highway corridor (150-feet each side of the highway centerline), starting at mile marker seven and continuing to the summit. The only resurfacing treatment used on the highway for mitigation purposes was asphalt paving which was completed in 2011. In 2014, a private contractor for the City of Colorado Springs installed a pipe back above rock weir 234RW (Basin 3: Severy and Ski Creek Watersheds) to divert water under the highway to a shotcrete ditch above sediment pond 237RW. This diverted drainage from Severy Creek Watershed to Ski Creek Watershed. Drainage ditch 205DD at the Halfway Picnic Area (Basin 2: North Fork of Crystal and Ski Creek Watersheds) was lined with shotcrete. The highway crew also reinforced the concrete blocks below drainage ditch 188DD pipe back at the Halfway Picnic Area (Basin 2). The runoff exiting the culvert had shown signs of breaching the shotcrete drainage ditch and conveying discharge into the channel below. In addition, 830 tons of gravel was used to repair highway shoulders and potholes at the summit, while a total of 85 yards of material was removed from seventeen rock weirs and one sediment pond (237RW) during clean-out. Eleven rock weirs were refaced with ¾-inch rock (thirty-six yards) after clean-out to improve efficiency (personal communication with Dave Jordan, City of Colorado Springs, Skilled Maintenance Supervisor).

The U.S. Forest Service, Crystal Creek Fuels Reduction Project completed tree remediation on one linear mile within the highway corridor in Basin 1 (Lower North Fork of Crystal Creek Watershed) during the 2014 field season. The silvicultural practices implemented included a combination of partial tree removal and clearcuttings as well as slash and understory removal. The disturbance associated with the vegetation treatments potentially compromised several monitoring sites and may affect the integrity as well as the ability to obtain future measurements at these sites.

Precipitation measurements from the three electronic rain gauges (Onset Computer Corp.) and the NRCS Snotel site, located at Glen Cove indicated that precipitation was average for 2014. In addition to the electronic rain gauges, standard non-recording rain gauges (All-Weather) were installed at each monitoring site as described in the 2010 Annual Report. The estimate of total precipitation for electronic rain gauge 075RG was available from August 30 through September

8, 2014, but daily precipitation for the period was not, as the daily file was corrupted. Standard rain gauge 076RG was vandalized in July and data was lost from July 1 through July 8, 2014 when it was replaced. Electronic rain gauge 077RG was not installed until June 2, 2014. Rain gauge 077RG malfunctioned during the pre-season calibration and was sent to Onset Computer Corp. for repairs. Prior to the 2015 field season, three new HOBO Data Logging Rain Gauges (RG3) will be purchased.

Silt fences were not exposed to high runoff and erosion activities in 2014. The field crew completed periodic site visits to 56 sites. The upper fence at cut slope site 059CS in Basin 7 (Glen Cove, Ski, and North Fork of Crystal Creek Watersheds) was removed in 2012 after highway construction limited access and relocated large boulders preventing fence material from being reliably fastened. The upper fences at five fill slope sites (048FS, 052FS, 055FS, 083FS, and 086FS) in Basin 7 were damaged during highway construction in 2011. As a result, the upper fences were removed from the sampling in 2012 and not replaced, and the lower fences continue to be monitored. In addition, silt fences were removed from fill slope site 196FS and conveyance channel 245CC was established in 2009. Silt fences from 13 cut slope, 28 fill slope, and 15 rock weir sites were monitored in 2014. In addition, one of the cut slope silt fences was breached during the 2014 field season. All silt fence sites were visited periodically, sediment volume measured, and silt fences evaluated for repair or replacement.

Four of the original 20 drainage ditches selected for monitoring were surveyed in 2014. Sixteen of the original 20 drainage ditches have been paved or lined with shotcrete since monitoring began, including drainage ditch 205DD (Basin 2) which was lined with shotcrete in 2014. This eliminates the need for further monitoring unless visual inspection provides evidence of failure, in which case cross sections will be re-established and surveys completed to document change. The four remaining drainage ditches located in Basins 1 and 2 are lined with erosion control fabric and will continue to be surveyed annually.

Eighty-eight of 117 conveyance channels were surveyed in 2014. In addition, six conveyance channels (027CC, 099CC, 111CC, 112CC, 118CC, and 119CC) were documented using photographic and observation monitoring. These sites were not surveyed due to the exposure of large boulders and the general instability of the slope following past rock weir failures. Conveyance channels 109CC and 110CC were also documented using photographic and observation monitoring as weather conditions didn’t allow for an end of season survey. Conveyance channel 212CC, which was lined with rip rap in 2011 was surveyed as the channel had breached immediately below the contributing culvert. The highway crew was notified and the channel was repaired. Conveyance channel 064CC was damaged by a vehicle crash during the Pikes Peak International Hill Climb. There was significant impact to the site; boulders and trees where moved downslope from cross section B to just above cross section C and several benchmarks were destroyed. The field crew was able to re-establish this site and extended cross section B by 4-feet to capture any activity on the de-vegetated hill slope. Although the original intent of the survey site may be compromised, there is still value in continuing to survey 064CC.

Thirty-six sediment traps were monitored in 2014, including 24 rock weirs, seven sediment ponds and five cutoff walls with riprap aprons below. Nineteen sites were surveyed at least twice to monitor their effectiveness in trapping sediment from winter and summer runoff. The rock weirs were surveyed and sediment volume was measured in the silt fences located down slope of the rock weirs (15 rock weirs have associated silt fences). In 2012, the highway crew removed five breached rock weirs (236RW, 238RW, 240RW, 242RW, and 243RW) in the switchbacks (Basins 3 and 4: Upper Ski and North French Creeks) and replaced them with cutoff walls with riprap aprons below. Photographic and observation monitoring were used to document changes at these sites along with three sediment ponds (258RW, 260RW, and 262RW). Eight of the 24 rock weir sites demonstrated some degree of failure, where water and sediment were seen piping under or through the sediment trap, the sediment trap was overtopped, or the sediment trap was breached. Four of these weirs (202RW, 250RW, 252RW, and 254RW) were observed and photographed overtopping during a storm event on July 8, 2014. This storm event was not notable in terms of volume, but a five minute hailstorm preceded the weirs overtopping. It is important to note that all of these weirs were mostly empty of sediment before the storm event. Rock weir 176RW was lined with shotcrete in 2013. As a result, the weir is full of standing water and overtops during most storm events. Many of the rock weirs were full of sediment rendering them ineffective, resulting in an inability of the field crew to effectively monitor these structures. The highway crew cleaned-out seventeen rock weirs and one sediment pond (237RW) this field season. The field crew completed surveys of these sites shortly after clean-out.

The primary focus of the validation monitoring is to address the condition of the riparian wetland and aquatic systems along the Pikes Peak Highway. Surveys were completed on all stream reaches (Boehmer, East Fork of Beaver, Glen Cove, North Catamount, North Fork of Crystal, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks). A pebble count and grab sample were completed on all streams except North Fork Crystal Creek as the stream bed is dry, inactive, and vegetation is encroaching into the channel. In the past, stream channel surveys have included planview surveys, profile surveys, cross section surveys, thalweg surveys, bankfull surveys, bank erosion surveys, vegetation surveys, pebble counts, and grab samples. In 2014, stream channel surveys included only cross section surveys, thalweg surveys, vegetation surveys, pebble counts, and grab samples except as noted above.

Numerous grab samples were collected from the cut slope and fill slope silt fences, the rock weirs and their associated silt fences, and from the stream bars throughout the 2014 field season. A subset of these was selected to be analyzed in the laboratory for particle size distribution. The balance of samples will be analyzed only if the variability in the particle size distribution of the subset of samples chosen for initial analysis warrants additional analysis. Laboratory analyses for the 2014 field season have been completed on the grab samples and a summary of particle size distributions and graphs are presented in this report. Comparing the distribution of material captured in traps near the highway to sediment deposits (bars) in the streams will validate response to highway mitigation practices.

Included with the full report is a data DVD containing all survey data (field and post processing) plus digital photographs (recommended viewing) for all sites for the 2014 field season. The annual reports and data may also be accessed from:

http://www.fs.fed.us/emc/rig/pikespeak/index.shtml

## INTRODUCTION

The proposed actions presented in the Pikes Peak Highway Drainage, Erosion and Sediment Control Plan Environmental Assessment (Hydrosphere Resource Consultants 1999) were designed to achieve the following goals:

- Stabilize road surface materials, cut slopes, and fill slopes
- Reduce runoff velocities and dissipate erosive energy
- Collect runoff in armored ditches and conveyance channels
- Reduce erosion and sediment deposition in drainage channels
- Retain sediment in traps and ponds to reduce downstream sedimentation

In May 2001, a monitoring plan was approved as part of the Settlement Agreement between the Sierra Club and the United States Department of Agriculture, Forest Service in Sierra Club v. Venneman, Civil Action No. 98-M-662 (D. Colo.), (U.S. Department of Justice 2002). The monitoring plan outlines appropriate procedures for monitoring and documenting the effectiveness of mitigation practices in achieving the above desired goals (USDA Forest Service 2002). The monitoring effort, which includes implementation monitoring, effectiveness monitoring, and validation monitoring, began in 2003 and ends in 2017.

Implementation monitoring verifies that mitigation practices are properly implemented. Staffs from both the city of Colorado Springs and the U.S. Forest Service are responsible for this aspect of the monitoring program. Because all parties assume that mitigation practices will be properly implemented, successes or failures in design or implementation will be addressed in the annual monitoring reports only to the extent that they impact subsequent monitoring.

Effectiveness monitoring is intended to document whether or not the properly implemented mitigation practice is effective in achieving the desired goal(s) or purpose(s) for that practice. Effectiveness monitoring for the Pikes Peak Highway is focused on the 14-mile-long, 300-foot-wide highway corridor (150-feet each side of the highway centerline), starting at mile marker seven and continuing to the summit, and is intended to document how effective the mitigation practices are in reducing erosion and sedimentation from features such as the road surface, cut and fill slopes, drainage ditches and conveyance channels. Precipitation is also monitored to provide an index to the amount and erosive energy of rainfall events. Effectiveness monitoring is the cornerstone of the monitoring effort described in this report.

An equally critical component in the monitoring program is validation monitoring, which is intended to document the degree to which the properly implemented and effective mitigation practices ultimately influence the resource of concern. In this report, validation monitoring addresses the condition of the riparian, wetland, and aquatic systems adjacent to the Pikes Peak Highway and attempts to provide data to validate that discharge management and reductions in sedimentation from the highway do in fact result in improvements in the channel and riparian environment below.

Subsequent changes in the proposed action plan for road mitigation (Burke 2002) required amendment of the approved monitoring plan (USDA Forest Service 2003). Initially, a variety of highway surface stabilization practices were proposed for road mitigation. Those were reduced to a single surfacing procedure, asphalt paving, eliminating the need for a monitoring design that incorporated multiple surface treatments. Rock weirs to detain the water and sediment exiting the highway corridor from all events up to the magnitude of the design storm are completed or under construction in selected locations. By design, sediment should settle out in the rock weir, where it can be measured directly, while water percolates through a porous berm. The addition of rock weirs eliminated the need to sample sediment concentrations in pond inflow and outflow as well as measure material trapped in the pond as originally stated in the monitoring plan. Additional revisions in the mitigation design concentrate road drainage from very long segments or reaches (as long as two miles) of both pavement and ditch line into fewer diversion points and conveyance channels, reducing the number of diversions off the highway and the number of proposed sampling sites.

The entire highway has been paved with asphalt, rather than surfaced using a variety of treatments, which should significantly reduce or eliminate the potential for continued surface erosion to occur from the road surface. Erosion rates from the gravel portion of the highway were monitored as described in the approved monitoring plan, but since paving of the entire highway was completed in 2011, it is assumed that erosion from the road surface has been reduced to zero. As noted above, sediment pond design has been altered but monitoring will still focus on quantifying total sediment exported in the discharge water and the effectiveness of the mitigation practices in reducing that export. This report includes a brief description of the current monitoring protocol for each metric of concern and documents any changes in the monitoring protocol that may have occurred since the previous annual report.

The U.S. Forest Service oversees monitoring of the streams draining the basins below the highway to validate that discharge management and reductions in sedimentation from the highway result in improvements in the channel and riparian environment. A suite of tributaries in the Pikes Peak Watershed has been identified as either impacted or non-impacted by the presence and maintenance of the Pikes Peak Highway. North Catamount, South Catamount, Glen Cove, Oil, and Boehmer Creeks represent previously non-impacted streams. Ski, Severy, East Fork of Beaver, North Fork of Crystal, and West Fork of Beaver Creeks are all considered stream systems impacted by the highway. Depending on the magnitude of the reduction in the amount of sediment delivered to the stream system and changes in discharge amount and energy, it may be possible to document changes in channel morphology and riparian condition that occur as a consequence of highway management.

## Discharge Points

The mitigation practices implemented on the Pikes Peak Highway have five inherent goals, three of which relate to managing, or controlling, road related discharge. As a result, numerous modifications in the road side drainage network were made over the course of the paving process. Drainage ditches were lengthened and discharge points were altered, resulting in discharge water being diverted from one watershed to another. In the case of Severy Creek, for example, discharge into the watershed from the road prism has been virtually eliminated, reducing the erosive energy of flow as well as decreasing sediment supply. In contrast, discharge into South Catamount Creek, previously an “non-impacted” watershed has been increased. Increases or decreases in flow diverted off the road prism and into the conveyance channels draining to the stream channels can alter channel response and should be considered in any analysis of treatment effect. Table 1 lists the changes in the road drainage network and diversion points that have occurred during the course of the paving project. It should be noted that no attempt is made to quantify the amount of water diverted, only to document that water exiting at one point was diverted to another point.

Table 1. Changes in road drainage network and discharge points including year treated, treatments for drainage ditches, and reason for change, Pikes Peak 2014.

| Site ID | Basin # | Change in Watershed | Year Treated | Ditch Treatment | Comment |
|---|---|---|---|---|---|
| 234RW | 3 | SVRY>SKIC | 2014 | Shotcrete, Pipe Back | Rock Weir 234RW breached in 2011. In 2014, weir was rebuilt and a pipe back installed to divert discharge from 234RW (SVRY) to sediment pond 237RW (SKIC). |
| 188DD | 2 | NCRY>SCAT | 2013 | Shotcrete, Pipe Back | Historically 188DD drained into 176RW, 178RW, 179RW, 180RW, 181RW NCRY. In 2013, ditch lined with shotcrete eliminated drainage into all weirs except 176RW. Pipe back diverted water to SCAT. |
| 080DD | 7 | GLEN>SKIC | 2011 | Shotcrete, Pipe Back | Drainage ditches 080DD, 082DD, and 085DD combined into one continuous drainage ditch, lined with shotcrete in 2011. Watershed for 080DD, 082DD changed to SKIC. Watershed for 085DD did not change as it was always SKIC. |
| 082DD | 7 | GLEN>SKIC | 2011 | Shotcrete, Pipe Back | |
| 085DD | 7 | SKIC | 2011 | Shotcrete, Pipe Back | |
| 109CC | 3 | SVRY>SKIC | 2007 | Shotcrete, Culvert | Discharge from conveyance channels 109CC and 110CC originally drained into 100CC (SVRY). The culvert for 100CC was plugged in 2007 diverting drainage from 109CC and 110CC into 238RW (SCAT). |
| 110CC | 3 | SVRY>SKIC | 2007 | Shotcrete, Culvert | |
| 236RW | 3 | SKIC>GLEN | 2003 | Shotcrete, Cut-off wall, rip rap | Ski Creek diversion diverted all alpine runoff to Glen Cove Watershed in 2003. |
| 238RW | 3 | SKIC>GLEN | 2003 | Shotcrete, Cut-off wall, rip rap | |
| 242RW | 4 | SKIC>GLEN | 2003 | Shotcrete, Cut-off wall, rip rap | |
| 243RW | 4 | SKIC>GLEN | 2003 | Shotcrete, Cut-off wall, rip rap | |
| 115CC | 4 | SKIC>GLEN | 2003 | Shotcrete, Cut-off wall, rip rap | |
| 116CC | 4 | SKIC>GLEN | 2003 | Shotcrete, Cut-off wall, rip rap | |
| 117CC | 4 | SKIC>GLEN | 2003 | Shotcrete, Cut-off wall, rip rap | |

## Multiple-Use

The highway corridor is managed for multiple use and some of these activities have the potential to compromise long established study sites as well as the outcome of the monitoring study. Some of these activities are described below.

The U.S. Forest Service, Crystal Creek Fuels Reduction Project completed tree remediation on one linear mile within the highway corridor in Basin 1 (Lower North Fork of Crystal Creek

Watershed) during the 2014 field season. The silvicultural practices implemented included a combination of partial tree removal and clearcuttings as well as slash and understory removal. The disturbance associated with the vegetation treatments may potentially alter sediment movement at several monitoring sites. Rock weir 009RA had been compromised by an access road. The fabric-lined ditch adjacent to the highway that delivers water and sediment into 009RA had been filled with material to provide access to a road constructed from the shotcrete ditch to the top of a knoll. Once tree remediation was completed in September, the fill material was removed and the ditch was graded to its original contours (Figure 1).

The access road was also decommissioned and restored. Five successional rolling dips were built on the road bed to decelerate and divert runoff onto the adjacent hill slope. The soil on the road was agitated to promote new vegetation growth. The field crew replaced three benchmarks damaged by logging equipment and completed a post restoration survey of 009RA once the highway crew completed repairs.

In addition to the clear cut units, clear-cut breaks, or swaths, were also created. The breaks parallel the highway and cross monitoring sites as most of the conveyance channels and rock weirs are perpendicular to the highway (Figure 2). This compromises the integrity of some monitoring sites and may compromise the ability to obtain valid measurements at some of those sites. A list of the rock weir and conveyance channel cross sections potentially compromised by the silvicultural activities and associated disturbances can be found in Table 2. The designation directly impacted implies disturbance has occurred on or near the monitoring site, while the designation potentially impacted refers to sites not located in the disturbance area but close enough that they may be compromised.

Rock weirs in the start of Basin 1 (002RW, 003RW, 006RW, and 202RW) may be impacted by the parking, camping, and spectator areas for the 2015 Pikes Peak International Hill Climb. That impact may be extended to nearby survey cross sections. In previous years, spectators built wooden structures in the weirs. Also, trampling within weirs may compromise future measurements. At the least, sites will need to be surveyed prior to and after the race by the field crew.

Work in 2014 completed by the Rocky Mountain Field Institute (RMFI) continued previous year's work at two ongoing wetland restoration sites; Severy Creek and Tin Barn Wetlands. Touch-up work was also completed at Glen Cove Creek and within the Ski Creek drainage near the Glen Cove Inn. RMFI used Youth Corps crews and community volunteers to complete the 2014 projects. Restoration activities such as these are often environmentally positive, but can be at cross-purpose if they compromise the long-term monitoring sites assessing the impacts of the highway treatments. The stream channel stabilization completed on Severy Creek included; installation of eight contour logs, construction of log and rock retaining wall to reinforce stream bank, and sediment removal (.5-cubic yards) to encourage water flow to the wetland. It appears that this work was completed between monitoring sites Severy Creek reach 1 and 2 and may result in questionable data from Reach 1. The field crew will visit the site in 2015 to determine potential risk.

Figure 1. Rock weir 009RA with temporary access road crossing contributing ditch (top) and drainage ditch after removal of material at the end of the field season (bottom), Pikes Peak 2014.

Figure 2. Clear cut break below rock weir 009RA encompassing cross sections of conveyance channel 223CC, Pikes Peak 2014.

## Site Location and Identification

A 15-year study requires that monitoring sites be uniquely identified and periodically relocated. Each precipitation gauge, cut slope and fill slope, road reach, drainage ditch and conveyance channel, rock weir and sediment pond, and stream channel reach monitored as part of this study has been uniquely identified and located. Each site is marked as a waypoint in a geographic information system (GIS) platform with attributes for latitude, longitude, and elevation, as well as a unique code, to distinguish it in the field. The coding convention used for the effectiveness monitoring sites is a five-character alpha-numeric code comprised of a three-digit feature number followed by a two-letter feature identifier (e.g., for site 001FS where 001 is the feature number and FS identifies the feature, a fill slope). The validation monitoring sites also use a five-character coding convention in which four letters identify the stream name and the last digit identifies the stream reach (e.g., OILC1 = Oil Creek, Reach 1).

Table 2. Directly impacted and potentially impacted monitoring sites from the Crystal Creek Fuels Reduction Project, Pikes Peak 2014.

| Directly Impacted | Associated Sites | Potentially Impacted | Associated Sites |
|---|---|---|---|
| 002RW | 218CC | 001FS | NA |
| 003RW | 219CC | 011CS | 010DD |
| 006RW | 220CC, 005DD | 177FS | NA |
| 009RA | 223CC | | |
| 004CC | NA | | |

Every feature being monitored has at least three benchmarks or control points used to locate the feature and obtain repeated, spatially similar, three-dimensional surveys, as appropriate. The benchmarks or control points are monumented by 2.5-foot lengths of 0.5-inch rebar pounded into the ground and topped with plastic yellow caps. Aluminum nursery tags wired to the rebar identify the individual benchmarks or control points (e.g., CP01). Every feature surveyed has at least three points with which to register the survey, although some features in close proximity may share control points.

In 2014, no new monitoring sites were established. Site names, locations, and feature descriptions can be found in Appendix A. Note that Appendix A provides a complete list of all waypoints established since the project began in 2003; not all of the sites listed were sampled during the 2014 monitoring season. A USGS topographic map that documents the location of each monitoring site is presented in Appendix B.

## OBJECTIVE

The objective of this report is to document the data collected and progress made in the effectiveness and validation monitoring of the mitigation practices implemented on the Pikes Peak Highway during the 2014 field season. Each annual report beginning in 2007 follows a consistent format that provides a description of the protocol used to monitor each metric of concern as defined by the monitoring plan or its amendment, and a summary of the data collected for that particular year. It should be realized that, by design, not all metrics or monitoring locations will be sampled every year. As a result, some reports will contain site data not presented in other reports. A full data set from all years is available in the data archive. It should also be noted that it was not the intent of the settlement agreement to include analysis of the data beyond a quality assurance and quality control assessment of the monitoring effort. Therefore the annual report will state the intended purpose for collecting the data and present the data in a format useful for subsequent analysis.

## EFFECTIVENESS MONITORING

The road mitigation practices implemented by the City of Colorado Springs are intended to control erosion and manage the erosive energy of surface water discharge from the Pikes Peak Highway. Effectiveness monitoring consists of documenting the impact that various mitigation practices have on the erosion and sedimentation processes that occur within the road corridor. Erosion rates and sediment volumes are primarily indexed using a combination of survey techniques and sediment traps (silt fences, rock weirs and sediment ponds). Grab samples of sediment and water are analyzed to document particle size distributions of deposited material and sediment concentration in discharge water leaving the site. Precipitation is also monitored to provide an index to the amount and erosive energy of rainfall events.

The following sections describe the metrics being monitored and the data collected in order to document the effectiveness of mitigation. The standard protocol for identifying and numbering the various sample sites is presented up front, followed by a description of the monitoring sites and metrics.

## Precipitation

Three tipping bucket rain gauges (Onset Computer Corp.) equipped with event data loggers (HOBO) were installed at the beginning of the field season to index precipitation over the elevational range of the monitored portion of the highway. Although precipitation is not a response variable, it is a significant causal variable in evaluating the effectiveness of mitigation. Rain gauge 075RG is located just uphill from the Halfway Picnic Area near mile marker 10 at an elevation of 10,109-feet. This is at the upper end of Basin 2 (North Fork of Crystal and Ski Creek Watersheds), in the subalpine zone. Rain gauge 076RG is located near the Elk Park Trailhead (No. 652) at the boundary between the subalpine and the alpine zones at 11,810-feet elevation. Rain gauge 077RG is located near the Devil's Playground and well into the alpine area at 13,069-feet elevation. Rain gauges installed for this study operate from early May, or as soon as the field crew starts for the season, until late September or early October when the crew finishes for the year. Data loggers record a date-time stamp for each tip of the rain gauge bucket (1 tip = 0.01 inches) from which volume, duration, and intensity (or rate) of each rainfall event can be determined.

In 2014, two of the three tipping bucket rain gauges were installed by May 6 and rain gauge 077RG was installed by June 2. Rain gauge 077RG malfunctioned during the pre-season calibration and was sent to Onset Computer Corp. for repairs. In addition, to avoid loss of data should a tipping bucket rain gauge fail, a standard, non-recording rain gauge (All-Weather) was also installed at each site as described in the 2010 Annual Report. The standard rain gauges provide a second index of precipitation amount for the sampling interval.

Total seasonal precipitation (May 6 – September 29, 2014) for the three monitoring sites for both the electronic and standard rain gauges is listed in Table 3. The estimate of total precipitation of .55-inches from August 30 through September 8, 2014 for electronic rain gauge 075RG appears to be correct, but daily precipitation for the period was not, as the daily file was corrupted. Standard rain gauge 076RG was vandalized in July and data was lost from July 1 through July 8, 2014 when it was replaced. Precipitation in the electronic rain gauge 076RG measured .24-inches for that period. As mentioned earlier, electronic rain gauge 077RG was not installed until June 2, 2014. Precipitation in the standard rain gauge 077RG measured 1.1-inches from May 6 through June 1, 2014. When appropriate, total precipitation was adjusted for the rain gauges to account for missing data (Table 3).

Table 3. Location, measured and adjusted precipitation accumulation, and dates of operation for electronic and standard rain gauges, Pikes Peak 2014.

| Gauge ID | Latitude (hddd˚mm.mmm) | Longitude (hddd˚mm.mmm) | Elevation (ft) | Total Precipitation Electronic (in) | | Total Precipitation Standard (in) | | Dates of Operation 2014 |
|---|---|---|---|---|---|---|---|---|
| | | | | Measured | Adjusted | Measured | Adjusted | |
| 075RG | N38 53.797 | W105 03.890 | 10,109 | 10.95 | N/A | 10.89 | N/A | 5/6 – 9/29 |
| 076RG | N38 52.582 | W105 03.970 | 11,810 | 12.97 | N/A | 14.22† | 14.46 | 5/6 – 9/29 |
| 077RG | N38 51.783 | W105 03.999 | 13,069 | 9.52† | 10.62 | 10.99 | N/A | 5/6∞ – 9/29 |

*† Indicates missing data due to equipment malfunction and/or damage to the rain gauge.*
*∞ Electronic rain gauge 077RG installed June 2, 2014.*

The maximum rainfall intensity that the electronic rain gauge smart sensor can accurately measure is one inch of rain per hour. If intensity exceeds one inch per hour, precipitation may be under estimated (Onset Computer Corp.). This may cause a disparity between the electronic and standard rain gauge measurements, especially during intense storm events. Prior to the 2015 field season, three new HOBO Data Logging Rain Gauges (RG3) will be purchased. The maximum rainfall intensity that the RG3 electronic rain gauge smart sensor can accurately measure is five inches of rain per hour (Onset Computer Corp.). This should decrease the disparity in measurement between the electronic and standard rain gauges.

In 2014, seasonal totals varied between the three sites with the mid-elevation receiving the most precipitation (Figures 3 and 4). Daily and periodic precipitation is presented in Appendix C and the basic rain gauge data (date-time stamp) is presented on the data DVD accompanying the report.

In addition to the three sites established as part of this study, a Natural Resources Conservation Service (NRCS) Snotel site located at Glen Cove, between rain gauges 075RG and 076RG at an elevation of 11,469-feet, has precipitation data available for the entire year. Data for the NRCS Snotel site can be accessed from:

http://www.wcc.nrcs.usda.gov/snotel/snotel.pl?sitenum=1057&state=co

## Highway Surface Stabilization

Historically, thousands of cubic yards of gravel material had been added to the Pikes Peak Highway road surface annually as part of the continuing maintenance program. Most of this material has since migrated elsewhere; either washed down the ditch line during snowmelt or following rainfall events or cast over the side onto the fill slope and the hillside below during road grading procedures. This material has been perceived to be the primary source for the sediment deposited in the streams (Chavez et al. 1993). The primary emphasis in the road mitigation practices was to reduce the volume of material available to be eroded (supply) and to manage the discharge water (energy) to reduce sediment transport. Initially a variety of alternate surfacing options were proposed.

As noted earlier, and as documented in amendments to the monitoring plan, the design of the monitoring protocol, appropriate for estimating road erosion, was significantly modified to reflect changes to the road bed stabilization practices implemented on the highway. The entire highway has been paved with asphalt, rather than surfaced using a variety of treatments, which should significantly reduce or eliminate the potential for continued surface erosion to occur from the road surface. Prior to 2011, erosion rates from the gravel portion of the highway were monitored as described in the approved monitoring plan, but since paving of the entire highway was completed in 2011, it is assumed that erosion from the paved road surface is zero and road surface surveys have been discontinued.

As a surrogate for estimating actual erosion rates, road surface elevation for selected road reaches prior to paving was monitored over time to document erosion rates, or changes in the volume of material stored on untreated road segments. Uniform road reaches were selected with survey cross sections permanently established at five intervals along each selected road reach (i.e., approximately one cross section per 20 meters of road). The road cross sections were periodically surveyed to provide the basis for estimating the degree of erosion or deposition

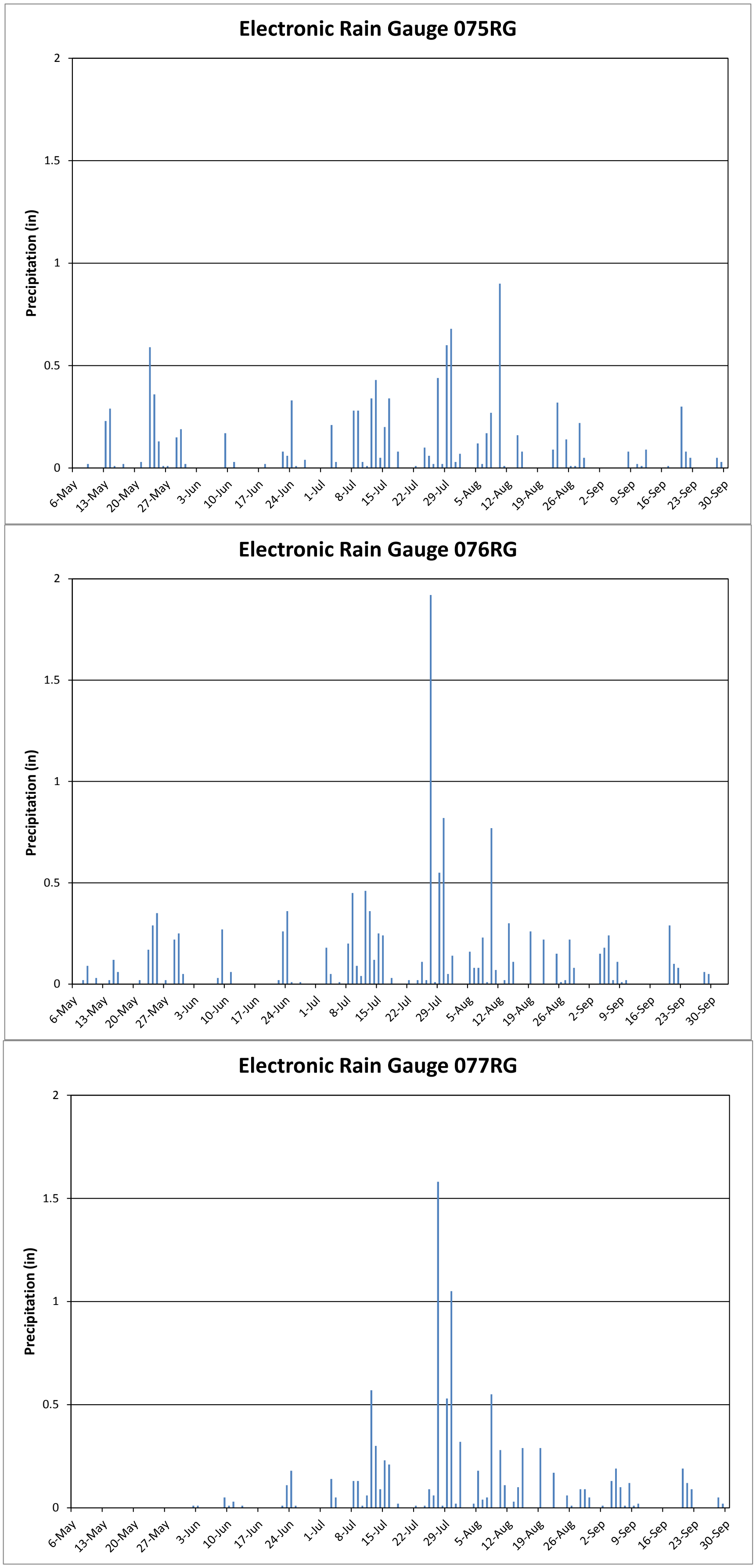


Figure 3. Daily precipitation for three electronic rain gauges, Pikes Peak 2014.

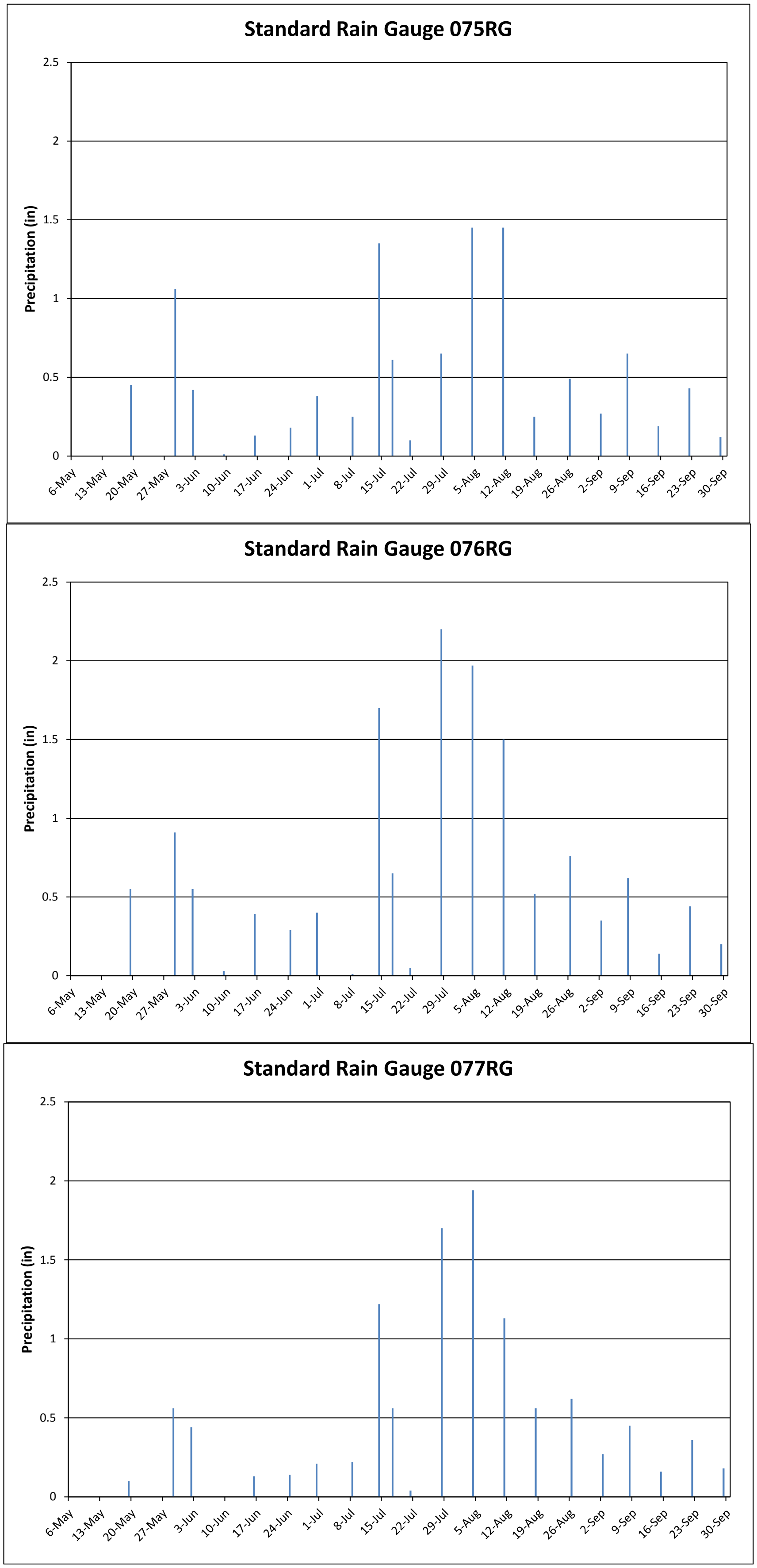


Figure 4. Precipitation by measurement date for the three standard rain gauges, Pikes Peak 2014.

occurring in the road reach they represent. Individual road cross sections were monumented using a 2.5-foot piece of rebar driven into the road surface at the upper edge of the fill slope. In addition, permanently monumented baseline elevation points (benchmarks) were established for each road reach and were used as references for each cross section. Monitoring consisted of surveying the surface elevation of the road cross sections, relative to the benchmark for the road reach. Either the average elevation of the cross section, or the survey transect, can be compared for different surveys to determine changes in the volume of material stored, or changes in surface configuration that may have occurred between measurements. Averaging the response for the five cross sections and multiplying that by the area of the road reach (estimated as average length times average width) yields an estimate of the change in the volume of material stored on the road reach during the interval between measurements.

## Stabilizing Cut and Fill Slopes

Erosion from cut and fill slopes along the highway may provide a continuous source of sediment to wetland, riparian, and aquatic systems. It is expected that highway mitigation practices will reduce sediment movement from these slopes in two ways. First, stabilizing the road bed through paving should also stabilize the angle of repose of adjacent cut and fill slopes, eliminating the constant adjustments that occur in the angle of repose of those slopes following changes to the plane of the road bed. Second, paving has eliminated the need for the continual addition of road base material, the primary source of material that had eroded onto fill slopes and hillsides. Effectiveness will be estimated by comparing changes in the amount and timing of sediment trapped in silt fences at the base of the cut and fill slopes following paving.

A 30-foot silt fence placed at the base of the slope of interest is used to trap sediment. Periodic measurements of the volume of material trapped behind the fence (i.e., after spring snowmelt and again after each large rainfall event) provide an index of the amount of material being eroded from the slope above the fence. Each silt fence is routinely visited to ensure timely measurement and maintenance. Should the silt fence fill to the point of reduced efficiency or fail during the period between measurements, the fence is either repaired, replaced, cleaned-out, or relocated to a new monitoring site. Initially (2003 and 2004), the volume trapped was determined from surveys of the surface behind the fence before and after the sediment was removed. Since then, the volume of trapped sediment behind the silt fence has been estimated by removing the accumulated material and measuring the amount removed by placing it in graduated containers for a measure of total volume. A sub-sample of the material removed is collected for laboratory analysis to determine total weight per unit volume and particle size distribution.

On cut slopes, erosion is monitored using two silt fences per site: one is placed across the base of the cut slope just above the ditch line to capture the sediment coming off the cut slope (lower fence); a second is placed on the upper edge of the cut slope to intercept and trap the sediment delivered to the cut slope from the undisturbed hill slope above (upper fence). This partitioning allows separation of the contribution of the cut slope to the road or ditch line from that of the undisturbed hill slope above. The latter measurement also provides an index of natural erosion rates. The contributing area of the lower fence is represented by a rectangle above the fence that spans the width of the fence and extends to just below the upper fence at the toe of the undisturbed slope. The contributing area of the upper fence is more difficult to define and depends on the topographic features of the hill slope above. Contributing area for both lower and upper fences has been determined and measured for all cut slope monitoring sites. Currently, 22 cut slope silt fences have been installed at 13 sites. Initially, they were proportionally divided between the treated (paved) and untreated portions of the highway. The sampling design included cut slopes located in road segments that were treated at differing times, ensuring a wide range in the variability of conditions sampled both before and after highway mitigation. Paving of the entire highway was completed in 2011 resulting in all portions of the highway being treated.

Cut slope silt fences were not exposed to high runoff and erosion activity in 2014 reducing the need for cleaning. The upper fence at cut slope site 059CS (Basin 7: Glen Cove, Ski, and North Fork of Crystal Creek Watersheds) was damaged during highway construction in 2012. As a result, the upper fence from this site was removed from the sampling and not replaced, and the lower fence continues to be monitored. In addition, one of the 22 cut slope silt fences was breached during the 2014 field season. The condition of each silt fence was documented following each site visit. In the *SiteSummary.xls file* on the data DVD, site visit dates are annotated with the condition of the silt fence, any repairs or replacements that were completed to maintain the silt fence, and an indication if the fence was breached prior to the survey date. The sediment volume for each cut slope silt fence was recorded in the *SiteSummary.xls file* if there was sediment removed from the cut slope silt fence. It can be assumed that there was zero sediment removed on all other silt fence site visits. A summary of cut slope site visits, and sediment removed from cut slope silt fences for the 2014 monitoring season are presented in Appendix D. All cut slope data and photographs for the 2014 season are available on the accompanying data DVD.

A similar design has been implemented for monitoring the effectiveness of mitigation practices intended to minimize erosion from fill slopes. The design includes the use of two silt fences per site: one is placed at the base of the fill slope to trap what originates from the fill slope (upper fence); a second is placed at the base of the hill slope on which the fill slope resides or at the boundary of the 150-foot corridor associated with the road right-of-way, whichever is the shorter distance (lower fence). The second lower fence is offset from the first fence and presumably not influenced by the upper fence. This design allows for trapping the eroded material in the upper fence as it leaves the fill slope as well as estimating the sediment being delivered off-site or down slope as indexed by the lower fence. Material trapped in the lower fence includes natural erosion from the slope below the fill slope as well as material contributed from the fill slope and transported downslope to the boundary of the corridor. In this way, not only will the on-site effectiveness of the mitigation practice as it effects fill slope erosion be evaluated, but an estimate of the amount of eroded material from the fill slope that is attenuated downslope will also be obtained. The contributing area of the upper fill slope fence spans the width of the fence and extends upslope to the edge of the road bed. The contributing area of the lower fence is defined by the width of the lower fence and the distance to the upper fence. However, like the fences above cut slopes, the actual contributing area of the lower fence is influenced by the topographic features of the hill slope. Contributing area for both the lower and upper fences has been determined and measured for all fill slope monitoring sites. Currently, 50 fill slope silt fences have been installed at 28 sites. Again, the sites were initially distributed between treated and untreated sections of the highway. Paving of the entire highway was completed in 2011 resulting in all sections of the highway being treated. Estimating the volume of material trapped behind the fill slope silt fences is accomplished in the same manner as that for the cut slope fences.

As with the cut slope silt fences, accumulation in the fill slope silt fences did not exhibit high runoff and erosion activity in 2014, reducing the need for cleaning. The upper fences at five fill slope sites (048FS, 052FS, 055FS, 083FS, and 086FS) in Basin 7 were damaged during highway construction in 2011. The upper fence at fill slope site 088FS (Basin 3: Severy and Ski Creek Watersheds) was damaged during highway construction in 2009. As a result, the upper fences from these six sites were removed from the sampling and not replaced, and the lower fences continue to be monitored. In addition, silt fences were removed from fill slope site 196FS and conveyance channel 245CC was established in 2009. Notes were taken in the field to document the condition of the silt fence during each site visit. In the *SiteSummary.xls file* on the data DVD, site visit dates are annotated with the condition of the silt fence, any repairs or replacements that were completed to maintain the silt fence, and an indication if the fence was breached prior to the survey date. The sediment volume for the fill slope silt fences was recorded in the *SiteSummary.xls file* only if there was sediment removed from the fill slope silt fence. It can be assumed that there was zero sediment removed on all other silt fence site visits. A summary of fill slope site visits and sediment removed from fill slope silt fences for the 2014 monitoring season can be found in Appendix E. All fill slope data and photographs for 2014 are available on the accompanying data DVD.

Numerous grab samples were collected from material trapped in the cut and fill slope silt fences throughout the 2014 field season. A subset of these was selected to be analyzed in the laboratory for particle size distribution. The balance of samples will be analyzed only if the variability in the particle size distribution of the subset of samples chosen for initial analysis warrants additional analysis. Laboratory analyses for the 2014 grab samples have been completed and a summary of particle size distributions and graphs are presented in Appendix F and on the accompanying data DVD.

Initially, the monitoring plan anticipated taking measurements of the accumulation behind all silt fences two to three times per year. The actual number of measurements taken is dependent on many factors including; winter snowpack, soil moisture, number and size of rainfall events, and availability of crew members to clean-out silt fences while completing other tasks. Estimates of human induced erosion and sediment delivery (from cut slope, fill slope, and silt fences located down slope near the streamside or boundary of the 150-foot corridor), can be compared with estimates of "natural movement" estimated from what is trapped in the silt fencing placed above cut slopes for periods before and after mitigation to determine the effectiveness of the practice and other best management practices (BMPs) intended to reduce human induced erosion.

Using silt fences to monitor sediment transport has proven to be difficult where silt fences cross rock surfaces—frequent breaching and fence failure had occurred over the course of the study. Silt fences fail most frequently where fence material cannot be reliably fastened to rock surfaces, particularly at the base of cut slopes at higher elevations. As a corrective measure, the sampling protocol was revised for three cut slope monitoring sites (102CS, 123CS, and 141CS) that cross rock surfaces. The lower cut slope silt fences on each of these sites were replaced with two permanent survey cross sections (labeled A and B), one established at the vegetation line just below the upper fence and a second established 1/3 of the distance between the top of the cut slope and the road. The cross sections are the same length as the original fence and are monumented with rebar at each end. Monitoring consists of surveying the surface elevation, relative to the benchmark, of the cut slope cross section. The silt fence at the top of the cut slope has been maintained at all three sites. This procedural change is intended to provide a qualitative estimate of cut slope erosion in situations where a quantitative estimate is not feasible.

Cross section graphs for the three surveyed cut slope monitoring sites that correspond to the survey dates presented in Table 4 can be found in Appendix G. Photographs and survey data for all sites are available on the accompanying data DVD.

Table 4. Management practices implemented below cut slope monitoring sites, and cut slope monitoring site survey dates, Pikes Peak 2014.

| Site ID | Basin # | Watershed | Management Practice | Survey Dates | |
|---|---|---|---|---|---|
| 102CS | 6 | WBVR | Asphalt Road, Shotcrete Ditch | 7/3/2014 | 9/15/2014 |
| 123CS | 6 | FRENCH | Asphalt Road, Shotcrete Ditch | 7/3/2014 | 9/15/2014 |
| 141CS | 6 | WBVR | Asphalt Road, Shotcrete Ditch | 7/3/2014 | 9/15/2014 |

## Armoring Drainage Channels

Drainage channels, which include both the drainage ditches along roads and the conveyance channels below culverts, were to be lined (armored) with riprap or concrete to control further erosion and deposition of sediment as mitigation progressed. However, all reaches except those meeting the criteria stated in the latest U.S. Forest Service Design Review (Burke 2002) are paved or lined with shotcrete, lined with erosion control fabric, or left untreated.

Effectiveness monitoring consists of monitoring the fabric-lined and unlined drainage ditches only, by establishing cross sections in the channels to be periodically surveyed, so that measured changes in cross sectional area could be used to determine if erosion or deposition was reduced or increased. Once drainage ditches were paved or lined with shotcrete, they were no longer surveyed. If visual inspection provides evidence of failure in the pavement or shotcrete, cross sections will be re-established and surveys completed to document change.

Conveyance channels are those features that drain water away from the road system to the streams below. For the most part, they are not physically treated or stabilized as part of the road mitigation effort, but road management practices may greatly alter the amount of discharge and sediment delivered to the conveyance channels. The monitoring technique is similar for both ditches and conveyance channels, but the sample size differs.

### Drainage Ditches

Most of the drainage ditches selected for monitoring were aligned with the road reaches previously selected to monitor changes in road surface. Additional drainage ditches were selected independently of the road reaches, as needed, to complete the desired road slope/contributing area/armoring material matrix defined in the monitoring plan. As with the road surface erosion transects, five cross sectional transects per segment of drainage channel (lined, not lined) were established (labeled A–E except for site 188DD, which had eight cross sections labeled A–H). For each cross section, a reference pin was located at the base of the cut slope on the inside of the ditch; a second pin was located on the edge of the road surface, if possible. Asphalt nails were used in the paved road surfaces to mark the end point if road conditions prohibited installation of rebar. The effectiveness of the lining methods in reducing erosion and deposition can be determined by obtaining cross section information at control sites for several years prior to, and then after, treatment. This information will be useful in the future as new drainage ditch segments are lined.

Four of the original 20 drainage ditches selected for monitoring had not been paved or lined with shotcrete and were surveyed in 2014. Sixteen of the original 20 drainage ditches had been paved or lined with shotcrete since monitoring began, including drainage ditch 205DD (Basin 2) which was lined with shotcrete in 2014. The shotcrete treatment eliminates the need for further monitoring unless visual inspection provides evidence of failure, in which case cross sections will be re-established and surveys completed to document change. The four remaining drainage ditches located in Basins 1 and 2 are lined with erosion control fabric and will continue to be surveyed annually. As noted earlier, drainage ditch 005DD may have been impacted by the Crystal Creek Fuels Reduction Project, which may compromise future measurements at this site. Drainage ditch survey cross sections that correspond to the survey dates presented in Table 5 can be found in Appendix H. Drainage ditch survey data and photographs for 2014 are available on the accompanying data DVD.

Table 5. Drainage ditches surveyed including description of road treatments above drainage ditches, treatments for drainage ditches, and drainage ditch survey dates, Pikes Peak 2014.

| Site ID | Basin # | Watershed | Road Treatment | Ditch Treatment | Survey Date |
|---|---|---|---|---|---|
| 005DD | 1 | SCAT | Asphalt | Erosion Control Fabric | 9/25/2014 |
| 010DD | 1 | SCAT | Asphalt | Erosion Control Fabric | 9/25/2014 |
| 182DD | 2 | SCAT | Asphalt | Erosion Control Fabric | 6/9/2014 |
| 195DD | 2 | SCAT | Asphalt | Erosion Control Fabric | 9/25/2014 |

## Conveyance Channels

Monitoring the effectiveness of mitigation practices on conveyance channels also represents a critical component in the monitoring program. Many of these channels have eroded into gullies and have contributed to the sediment load of the wetland, riparian, and aquatic systems below. From mile marker seven to the summit, 115 conveyance channels were identified and surveyed during the first three years of monitoring. Two additional channels were identified and surveyed in 2009 and four additional channels were identified and surveyed in 2011. Two conveyance channel monitoring sites were eliminated during construction of sediment ponds in Basin 5 (Boehmer and East Fork of Beaver Creek Watersheds) and Basin 6 (East Fork and West Fork of Beaver Creek Watersheds). Conveyance channel 014CC was originally identified as a monitoring site, but was never surveyed. Conveyance channel 015CC located above sediment pond 199RW was lined with shotcrete in 2003 and is no longer surveyed. Conveyance channel 212CC was lined with rip rap in 2011. However, it continues to be monitored as the channel is exhibiting signs of failure. In 2012, two additional sites in Basin 7 (263CC and 265CC) were established in the channels below the new sediments ponds (262RW and 264RW).

It is not possible to survey all 117 conveyance channels every year. Instead, as many conveyance channels as possible are surveyed each year. Although, the entire highway has been paved, the fixed sub-sample of 13 conveyance channels that were initially selected to compare paved (7) and un-paved (6) road sections are surveyed annually, with the assumption that erosion, or changes in storage, from the paved segments will be zero. Conveyance channels located below the rock weirs are also surveyed annually. If the rock weirs fail (as has been observed), changes in conveyance channel geometry may occur. Effectiveness of the rock weirs in mitigating sediment transport can be evaluated in part by comparing the erosion rate in the conveyance channels located or initiated below the rock weirs with erosion rates observed in other conveyance channels located in proximity to treated and untreated road segments. Every conveyance channel is surveyed using a series of three cross sections located within the 150-foot boundary of the highway corridor (labeled A–C except for site 053CC, which has four cross sections labeled A–D and site 232CC, which has five cross sections labeled A–E).

Eighty-eight of 117 conveyance channels were surveyed in 2014 (Table 6). In addition, six conveyance channels (027CC, 099CC, 111CC, 112CC, 118CC, and 119CC) were documented using photographic and observation monitoring. These sites were not surveyed due to the exposure of large boulders and the general instability of the slope following past rock weir failure. Conveyance channels 109CC and 110CC were also documented using photographic and observation monitoring as weather conditions didn't allow for an end of season survey. Conveyance channel 212CC, which was lined with rip rap in 2011 was surveyed as the channel had breached immediately below the contributing culvert. The highway crew was notified and the channel was repaired. Conveyance channel 064CC was damaged by a vehicle crash and the subsequent removal of the vehicle during the Pikes Peak International Hill Climb (Figure 5). There was significant impact to the site; boulders and trees where moved downslope from cross section B to just above cross section C and several benchmarks were destroyed. The field crew was able to re-establish this site and extended cross section B by 4-feet to capture any future activity from the de-vegetated hill slope. Although the original intent of the survey site may be compromised, there is still value in continuing to survey 064CC. As noted earlier, conveyance channels 004CC, 218CC, 219CC, 220CC, and 223CC may have been compromised by the Crystal Creek Fuels Reduction Project, which may affect the integrity of future measurements at these sites.

Cross sections for the conveyance channels listed in Table 6 are presented in Appendix I. At first glance, graphs of the conveyance channel cross sections presented in Appendix I may appear counter intuitive, as the low point in the cross section may be at the right or left end pin. This presentation is not an error. Not all conveyance channels were formed as a result of natural drainage processes. Many were formed as the result of road related discharges and the flow path is across the slope rather than downslope, thus causing rills to form across the slope. The comparison of successive measurements provides the most useful information. Conveyance channel survey data and photographs for 2014 are available on the accompanying data DVD.

## Sediment Traps (Sediment Ponds, Rock Weirs, and Cut-Off Walls)

The original mitigation plan called for building sediment ponds designed to trap sediment while allowing water to exit as a stream. Initially, the proposed monitoring consisted of periodic pond

Table 6. Road and drainage ditch treatments associated with conveyance channels, treatments applied to conveyance channels, and conveyance channel survey dates, Pikes Peak 2014.

| Site ID | Basin # | Watershed | Road Treatment | Ditch Treatment | Channel Treatment | Survey Date |
|---|---|---|---|---|---|---|
| 004CC | 1 | NCRY | Asphalt | Fabric | Culvert, Rip Rap | 9/29/2014 |
| 012CC | 2 | SCAT | Asphalt | Fabric | Rock Weir | 6/5/2014 |
| 013CC | 2 | SCAT | Asphalt | Fabric | Rock Weir | 6/5/2014 |
| 016CC | 2 | NCRY | Asphalt | Shotcrete | Culvert Removed | 8/5/2014 |
| 017CC | 2 | SCAT | Asphalt | Fabric | Culvert Removed | 8/5/2014 |
| 018CC | 2 | NCRY | Asphalt | Shotcrete | Untreated | 7/22/2014 |
| 019CC | 2 | SCAT | Asphalt | Fabric | Culvert Removed | 7/8/2014 |
| 021CC | 2 | NCRY | Asphalt | Shotcrete | Culvert Removed | 7/8/2014 |
| 023CC | 2 | NCRY | Asphalt | Shotcrete | Culvert Removed | 7/1/2014 |
| 025CC | 2 | SCAT | Asphalt | Shotcrete | Untreated | 7/1/2014 |
| 026CC | 2 | NCRY | Asphalt | Shotcrete | Culvert Removed | 8/7/2014 |
| 027CC† | 2 | NCRY | Asphalt | Shotcrete | Culvert Removed | 9/2/2014 |
| 029CC | 2 | NCRY | Asphalt | Shotcrete | Pipe Back, Rock Weir | 8/27/2014 |
| 032CC | 2 | SCAT | Asphalt | Shotcrete | Culvert Removed | 7/1/2014 |
| 034CC | 2 | NCRY | Asphalt | Shotcrete | Pipe Back, Rock Weir | 7/2/2014 |
| 035CC | 7 | SKIC | Asphalt | Shotcrete | Rip Rap | 6/11/2014 |
| 036CC | 7 | NCRY | Asphalt | Shotcrete | Culvert | 7/2/2014 |
| 037CC | 7 | NCRY | Asphalt | Shotcrete | Culvert, Rip Rap | 6/3/2014 |
| 040CC | 1 | NCRY | Asphalt, Asphalt Curb | Fabric | Straw Wattle | 6/24/2014 |
| 053CC | 7 | SKIC | Asphalt | Shotcrete | Rip Rap | 6/18/2014 |
| 054CC | 7 | SKIC | Asphalt | Shotcrete | Untreated | 6/18/2014 |
| 058CC | 7 | SKIC | Asphalt | Shotcrete | Culvert, Rip Rap | 7/21/2014 |
| 063CC | 7 | SKIC | Asphalt | Shotcrete | Rock Weir | 6/11/2014 |
| 064CC | 7 | SKIC | Asphalt | Shotcrete | Culvert, Rip Rap | 8/13/2014 |
| 070CC | 7 | SKIC | Asphalt | Shotcrete | Culvert Removed | 6/30/2014 |
| 081CC | 7 | GLEN | Asphalt | Shotcrete | Pipe Back, Culvert Removed | 6/30/2014 |
| 084CC | 7 | GLEN | Asphalt | Shotcrete | Culvert Removed | 6/10/2014 |
| 089CC | 3 | SCAT | Asphalt | Shotcrete | Rock Weir | 8/6/2014 |
| 091CC | 3 | SKIC | Asphalt | Shotcrete | Untreated | 8/12/2014 |
| 094CC | 3 | SKIC | Asphalt | Shotcrete | Culvert Removed | 8/12/2014 |
| 099CC† | 3 | SKIC/SCAT | Asphalt | Shotcrete | Cut-Off Wall, Rip Rap | 8/13/2014 |
| 104CC | 6 | WBVR | Asphalt | Shotcrete | Culvert, Rip Rap | 7/3/2014 |
| 108CC | 3 | FRENCH | Asphalt | Shotcrete | Rock Weir | 8/12/2014 |

| Site ID | Basin # | Watershed | Road Treatment | Ditch Treatment | Channel Treatment | Survey Date |
|---|---|---|---|---|---|---|
| 109CC† | 3 | SVRY/SCAT | Asphalt | Shotcrete | Culvert | 9/2/2014 |
| 110CC† | 3 | SVRY/SCAT | Asphalt | Shotcrete | Culvert | 9/2/2014 |
| 111CC† | 3 | SKIC/SCAT | Asphalt | Shotcrete | Cutoff Wall, Rip Rap | 7/31/2014 |
| 112CC† | 3 | SCAT | Asphalt | Shotcrete | Culvert Removed | 9/2/2014 |
| 114CC | 4 | FRENCH | Asphalt | Shotcrete | Rock Weir | 7/21/2014 |
| 118CC† | 4 | SKIC/SCAT | Asphalt | Shotcrete | Cutoff Wall, Rip Rap | 7/31/2014 |
| 119CC† | 4 | SKIC/SCAT | Asphalt | Shotcrete | Cutoff Wall, Rip Rap | 7/31/2014 |
| 120CC | 6 | WBVR | Asphalt | Shotcrete | Sediment Pond | 8/7/2014 |
| 121CC | 6 | WBVR | Asphalt | Shotcrete | Culvert, Rip Rap | 7/14/2014 |
| 122CC | 6 | WBVR | Asphalt | Shotcrete | Culvert, Rip Rap | 7/14/2014 |
| 125CC | 6 | WBVR | Asphalt | Shotcrete | Culvert, Rip Rap | 7/10/2014 |
| 126CC | 6 | WBVR | Asphalt | Shotcrete | Culvert, Rip Rap | 7/10/2014 |
| 130CC | 6 | FRENCH | Asphalt | Shotcrete | Pipe Back | 8/12/2014 |
| 132CC | 6 | WBVR | Asphalt | Shotcrete | Culvert, Rip Rap | 7/23/2014 |
| 133CC | 6 | EBVR | Asphalt | Shotcrete | Culvert, Rip Rap | 7/23/2014 |
| 137CC | 5 | EBVR | Asphalt | Shotcrete | Untreated | 7/24/2014 |
| 138CC | 5 | BHMR | Asphalt | Shotcrete | Untreated | 7/24/2014 |
| 139CC | 6 | EBVR | Asphalt | Shotcrete | Rock Apron | 7/23/2014 |
| 140CC | 6 | EBVR | Asphalt | Shotcrete | Untreated | 7/23/2014 |
| 175CC | 1 | NCRY | Asphalt, Asphalt Curb | Untreated | Rock Apron | 8/19/2014 |
| 184CC | 2 | SCAT | Asphalt | Shotcrete | Sediment Pond | 6/3/2014 |
| 189CC | 2 | NCRY | Asphalt | Shotcrete | Pipe Back, Rock Apron | 7/2/2014 |
| 208CC | 7 | SKIC | Asphalt | Shotcrete | Untreated | 8/6/2014 |
| 210CC | 2 | SKIC | Asphalt | Shotcrete | Untreated | 7/2/2014 |
| 211CC | 2 | SKIC | Asphalt | Shotcrete | Untreated | 7/1/2014 |
| 212CC | 7 | SKIC | Asphalt | Shotcrete | Culvert, Rip Rap | 6/10/2014 |
| 213CC | 6 | FRENCH | Asphalt | Shotcrete | Untreated | 8/7/2014 |
| 214CC | 5 | EBVR | Asphalt | Shotcrete | Untreated | 7/24/2014 |
| 215CC | 5 | EBVR | Asphalt | Shotcrete | Untreated | 7/24/2014 |
| 216CC | 1 | NCRY | Asphalt, Asphalt Curb | Asphalt | Rock Weir | 9/29/2014 |
| 217CC | 1 | NCRY | Asphalt, Asphalt Curb | Asphalt | Rock Weir | 9/29/2014 |
| 218CC | 1 | SCAT | Asphalt | Untreated | Rock Weir | 9/10/2014 |
| 219CC | 1 | SCAT | Asphalt | Shotcrete | Rock Weir | 9/23/2014 |
| 220CC | 1 | SCAT | Asphalt | Fabric | Rock Weir | 9/10/2014 |
| 221CC | 1 | NCRY | Asphalt | Shotcrete | Rock Weir | 9/22/2014 |
| 222CC | 1 | NCRY | Asphalt | Shotcrete | Rock Weir | 9/22/2014 |
| 223CC | 1 | SCAT | Asphalt | Fabric | Rock Weir | 9/8/2014 |
| 224CC | 2 | NCRY | Asphalt | Asphalt | Rock Weir | 6/9/2014 |
| 225CC | 2 | SCAT | Asphalt | Fabric | Rock Weir, Straw Wattles | 6/9/2014 |
| 226CC | 2 | NCRY | Asphalt, Asphalt Curb | Fabric | Rock Weir | 9/17/2014 |
| 227CC | 2 | NCRY | Asphalt, Asphalt Curb | Asphalt | Rock Weir | 6/30/2014 |

| Site ID | Basin # | Watershed | Road Treatment | Ditch Treatment | Channel Treatment | Survey Date |
|---|---|---|---|---|---|---|
| 228CC | 2 | SCAT | Asphalt | Fabric, Straw Wattles | Rock Weir | 6/5/2014 |
| 229CC | 2 | NCRY | Asphalt | Shotcrete | Pipe Back, Rock Weir | 8/27/2014 |
| 230CC | 2 | NCRY | Asphalt | Shotcrete | Pipe Back, Rock Weir | 7/2/2014 |
| 231CC | 2 | NCRY | Asphalt | Shotcrete | Pipe Back, Rock Weir | 7/2/2014 |
| 232CC | 7 | SCAT | Asphalt | Shotcrete | Untreated | 7/22/2014 |
| 235CC | 3 | SVRY/SKIC | Asphalt | Shotcrete | Pipe Back, Rock Weir | 8/20/2014 |
| 244CC | 2 | NCRY | Asphalt | Shotcrete | Untreated | 7/16/2014 |
| 245CC | 2 | NCRY | Asphalt | Asphalt | Untreated | 8/7/2014 |
| 246CC | 5 | EBVR | Asphalt | Shotcrete | Sediment Pond | 7/15/2014 |
| 247CC | 6 | WBVR | Asphalt | Shotcrete | Sediment Pond | 7/15/2014 |
| 251CC | 7 | NCRY | Asphalt | Shotcrete | Rock Weir | 7/16/2014 |
| 253CC | 7 | SKIC | Asphalt, | Shotcrete | Rock Weir | 7/16/2014 |
| 263CC | 7 | SKIC | Asphalt | Shotcrete | Sediment Pond | 6/10/2014 |
| 265CC | 7 | SKIC | Asphalt | Shotcrete | Sediment Pond | 6/2/2014 |
| *† Photographic and observation monitoring only.* | | | | | | |

surveys to index sediment accumulation as well as measurement of the suspended sediment concentrations in discharge entering and exiting the pond. The combination of sediment accumulation in the pond plus the sediment exiting the pond in the outflow was intended to provide an estimate of total sediment transport. In accordance with the revised mitigation design, rock weirs presumably capable of detaining all the water and sediment discharged from the road segment for events up to the design storm have been constructed. The monitoring strategy assumes that the rock weirs detain all discharge long enough for the sediment to settle out, while the water percolates out of the rock weir through the porous berm. Measuring sediment accumulation in the rock weir presumably indexes total sediment movement. In the event the rock weir does not detain all the storm discharge delivered to it (actual discharge exceeds the design discharge or the rock weirs fail to function properly), silt fences have been installed on the downhill side of the rock weirs to trap sediment carried in surface discharge passing over or through the berm. A silt fence is preferred over grab samples of discharge because any overflow or through flow that occurs is most likely to be diffused and not concentrated. Also, using a silt fence to trap the sediment provides a measure of total transport. The measurement protocol for these silt fences is the same as that employed for the cut and fill slope silt fences.

As with the road surface erosion transects, four sediment ponds (199RW, 237RW, 256RW, and 264RW) are surveyed using a series of cross sections (labeled A–C except for site 256RW, which has four cross sections labeled A–D and site 199RW, which has five cross sections labeled A–E) to estimate volumetric changes in sediment accumulation. Three sediment ponds (258RW, 260RW, and 262RW) are monitored by recording observations in the field notes and using photographic monitoring to document changes. In those few cases where there is a defined inflow and outflow to a pond, water samples to estimate trap efficiency can be grab sampled from the inlet and outlet of the ponds as originally planned. Surveys of the sediment traps should be completed after spring snowmelt and again after significant rainfall events, perhaps a total of four times per year. In addition, surveys taken before and after rock weir cleaning can be used to estimate the total volume or amount of material removed and this cumulative estimate can be used to verify appropriateness or adjust estimates based on the incremental surveys.

Figure 5. Conveyance channel 064CC showing boulders and trees above cross section C after vehicle crash during the Hill Climb, Pikes Peak 2014.

As noted above, any conveyance channels that appear to be present below the rock weirs are monitored. If the rock weirs fail, as many did in 2014, any changes in the conveyance channel geometry that may result should be documented by the surveys. If the rock weirs are effective in reducing the erosive energy of the discharge, the reduction in erosion in the conveyance channels can be documented by comparing response in channels draining treated and untreated road segments.

In 2014, a private contractor for the City of Colorado Springs installed a pipe back system above rock weir 234RW (Basin 3) to divert water under the highway to a shotcrete ditch above sediment pond 237RW (Figure 6). This diverted drainage from Severy Creek Watershed to Ski Creek Watershed. In 2012, the highway crew removed five breached rock weirs (236RW, 238RW, 240RW, 242RW, and 243RW) in the switchbacks (Basins 3 and 4: Upper Ski and North French Creeks) and replaced them with cutoff walls with riprap aprons below (Figure 7). Photographic and observation monitoring are used to document changes at these sites along with three sediment ponds (258RW, 260RW, and 262RW). As noted earlier, rock weirs 002RW, 003RW, 006RW, and 009RA may have been compromised by the Crystal Creek Fuels

Figure 6. Pipe back under the highway above rock weir 234RW which diverts water entering Severy Creek to a shotcrete ditch above sediment pond 237RW which flows into Ski Creek, Pikes Peak 2014.

Figure 7. Rock weir 243RW was removed and replaced with cutoff wall with riprap apron below, Pikes Peak 2012.

Reduction Project, which may affect the integrity of future measurements at these sites.

Thirty-six sediment traps were monitored in 2014, including 24 rock weirs, seven sediment ponds, and five cutoff walls with riprap aprons below. Nineteen sites were surveyed at least twice to monitor their effectiveness in trapping sediment from winter and summer runoff. The rock weirs were surveyed and sediment volume was measured in the silt fences located down slope of the rock weirs (15 rock weirs have associated silt fences). Eight of the 24 rock weir sites demonstrated some degree of failure, where water and sediment were seen piping under or through the sediment trap, the sediment trap was overtopped, or the sediment trap was breached. Four of these weirs (202RW, 250RW, 252RW, and 254RW) were observed and photographed overtopping during a storm event on July 8, 2014 (Figure 8). This storm event was not notable in terms of volume, but a five minute hailstorm preceded the weirs overtopping. It is important to note that all of these weirs were mostly empty of sediment before the storm event. Rock weir 176RW was lined with shotcrete in 2013. As a result, the weir is full of standing water and overtops during most storm events rendering it ineffective in dissipating energy (Figure 9). Many of the rock weirs were full of sediment rendering them ineffective, in mitigating both sediment transport and energy. The highway crew cleaned-out seventeen rock weirs and one sediment pond (237RW) this field season. The field crew completed surveys of these sites shortly after clean-out.

Figure 8. Rock weir 202RW overtopping during storm event on July 8, Pikes Peak 2014.

Figure 9. Rock weir 176RW lined with shotcrete and filled with standing water. The high flow is causing the shotcrete to be undercut, Pikes Peak 2014.

As noted earlier for silt fences on the cut and fill slopes, volume data from the breached rock weirs or sediment fences below rock weirs may under estimate total sediment production. Survey dates for the rock weirs and sediment ponds are presented in Table 7. A summary of rock weir silt fence site visits, and sediment accumulation in rock weir silt fences and the rock weirs for the 2014 monitoring season, as well as rock weir and sediment pond cross sections from 2014 are presented in Appendix J.

The average elevations for the rock weir surfaces were obtained by determining the average elevation of the survey points. The volumetric change between the two surveys was then estimated by multiplying the difference in the average geo-referenced elevations for the two surveys by the area of the rock weir (Appendix J). As noted earlier, the negative values imply a decrease in sediment accumulation between two surveys. Sediment trap data and photographs for 2014 are available on the accompanying data DVD.

Grab samples of the sediment retained in both the rock weirs and silt fences below the weirs were collected each time the weirs were surveyed or the fences cleaned. As noted earlier, a subset of these grab samples was selected for analysis of particle size distribution. The balance of samples will be analyzed only if the variability in the particle size distribution of the subset of samples chosen for initial analysis warrants additional analysis. In addition, water samples to determine suspended sediment were collected from the inflow and outflow of the sediment ponds 199RW, 237RW, and 262RW. Laboratory analyses for the 2014 grab samples have been completed and a summary of particle size distributions and graphs are presented in Appendix K and on the accompanying data DVD. Laboratory analyses on the suspended sediment samples for the 2014 field season are presented in Appendix L and on the accompanying data DVD.

Table 7. Management practices implemented above sediment traps, and sediment trap survey dates, Pikes Peak 2014.

| Site ID | Basin # | Watershed | Management Practice | Survey Dates | |
|---|---|---|---|---|---|
| 002RW | 1 | SCAT | Untreated Ditch | 6/17/2014 | 9/10/2014 |
| 003RW | 1 | SCAT | Shotcrete Ditch | 6/17/2014 | 9/10/2014 |
| 006RW | 1 | SCAT | Fabric Ditch | 5/30/2014 | 9/10/2014 |
| 008RW | 1 | NCRY | Shotcrete Ditch | 5/29/2014 | 9/22/2014 |
| 009RA | 1 | SCAT | Fabric Ditch | 5/29/2014 | 9/8/2014 |
| 152RW | 2 | SCAT | Fabric Ditch | 6/9/2014 | 9/25/2014 |
| 153RW | 2 | SCAT | Fabric Ditch | 6/5/2014 | 9/23/2014 |
| 161RW | 2 | NCRY | Asphalt Curb and Ditch | 5/20/2014 | 9/11/2014 |
| 162RW | 2 | NCRY | Asphalt Ditch | 5/20/14 | 9/22/2014 |
| 176RW | 2 | NCRY | Shotcrete Ditch | 5/30/2014 | 9/17/2014 |
| 199RW | 2 | SCAT | Shotcrete Ditch, Pipe Back | 6/3/2014 | 9/23/2014 |
| 200RW | 1 | NCRY | Asphalt Curb and Ditch | 6/16/2014 | 9/29/2014 |
| 201RW | 2 | NCRY | Asphalt Curb and Ditch | 6/17/2014 | 9/17/2014 |
| 202RW | 2 | SCAT | Asphalt Ditch | 5/20/2014 | 9/11/2014 |
| 233RW | 3 | SCAT | Shotcrete Ditch | 5/30/2014 | 9/17/2014 |
| 234RW† | 3 | SVRY/SKIC | Shotcrete Ditch, Pipe Back | 8/20/2014 | |
| 236RW∞ | 3 | SKIC/SCAT | Shotcrete Ditch, Cutoff Wall, Rip Rap | 8/21/2014 | |
| 237RW | 3 | SKIC | Shotcrete Ditch, Culvert Removed | 6/12/2014 | 9/17/2014 |
| 238RW∞ | 3 | SKIC/SCAT | Shotcrete Ditch, Cutoff Wall, Rip Rap | 8/21/2014 | |
| 239RW | 3 | FRENCH | Shotcrete Ditch | 7/21/2014 | |
| 240RW∞ | 3 | SKIC | Shotcrete Ditch, Cutoff Wall, Rip Rap | 7/31/2014 | |
| 241RW | 4 | FRENCH | Shotcrete Ditch | 7/21/2014 | |
| 242RW∞ | 4 | SKIC/SCAT | Shotcrete Ditch, Cutoff Wall, Rip Rap | 7/31/2014 | |
| 243RW∞ | 4 | SKIC/SCAT | Shotcrete Ditch, Cutoff Wall, Rip Rap | 7/31/2014 | |
| 250RW | 7 | NCRY | Shotcrete Ditch | 6/2/2014 | 9/11/2014 |
| 252RW | 7 | SKIC | Shotcrete Ditch | 5/30/2014 | |
| 254RW | 7 | SKIC | Shotcrete Ditch | 6/11/2014 | 9/17/2014 |
| 256RW | 6 | WBVR | Shotcrete Ditch, Culvert | 7/10/2014 | |
| 258RW† | 6 | WBVR | Shotcrete Ditch, Culvert | 7/15/2014 | |
| 260RW† | 5 | EBVR | Shotcrete Ditch | 7/15/2014 | |
| 262RW† | 7 | SKIC | Shotcrete Ditch | 6/10/2014 | |
| 264RW | 7 | SKIC | Shotcrete Ditch | 6/2/2014 | 9/11/2014 |

*† Photographic and observation monitoring only.*
*∞Rock weir removed in 2012 and replaced with cutoff wall and riprap apron below. Photographic and observation monitoring only.*

## VALIDATION MONITORING

Validating the effect of road restoration practices on aquatic, wetland, and riparian conditions is more difficult than determining the effectiveness of mitigation practices in reducing erosion and sedimentation at specific locations on site or close to the highway. On-site response to the mitigation practices should be direct, dramatic, and occur in real time. Off-site response, such as in the stream channels, is likely to be more diffused, less dramatic, cumulative in nature, and subject to changes in condition elsewhere in the watershed, all of which make validation of response to mitigation complex. The watersheds of concern have been subject to road related impacts for more than 80 years. Any road-related degradation in the channel systems is the aggregate result of long-term, road-related discharge and sediment pulses. The interruption of those pulses as a result of road mitigation practices may be too subtle to be detectable in the near term, therefore creating a challenge in selecting the most appropriate indicator metric.

The scale chosen for validation monitoring is that of the stream channel reach. Within each stream reach selected, channel morphology, bed and bank particle size distribution, bank erosion, and vegetation diversity is monitored and characterized. A suite of tributaries in the Pikes Peak Watershed were identified as either impacted or non-impacted by the presence of the Pikes Peak Highway (Chavez et al. 1993). North Catamount, South Catamount, Glen Cove, Oil, and Boehmer Creeks represent previously non-impacted streams. Ski, Severy, East Fork of Beaver, North Fork of Crystal, and West Fork of Beaver Creeks are all considered stream systems impacted by the highway. Study reaches have been selected in each of the 10 streams, and periodic monitoring will be conducted in each stream reach for the entire 15-year study period. Oil Creek has only one monitored stream reach because the upper portion of the stream is on private land and not accessible. Glen Cove Creek has only one stream reach because it is a small tributary of South Catamount Creek, which has three stream reaches. All other streams have two stream reaches. Because response can be expected to be gradual, it is not necessary that all streams be measured every year; however, annual measurement is completed if time permits.

The monitoring assumption is that stream channel adjustments that might occur in the impacted stream reaches following road mitigation practices will not occur on either the reference stream reaches (those not influenced by the highway ) or in the impacted streams draining the portions of highway that have not received mitigation. However, this does not imply that differences that may have existed at the start of the monitoring program between the five reference and the five impacted stream systems were the consequence of road-related impacts. Rather, any long-term trends in convergence or divergence in the comparison of conditions in the impacted and the control stream reaches following road mitigation will be evaluated as potential indicators of stream channel response to highway mitigation practices.

The techniques proposed by Harrelson et al. (1994) were used to establish the stream channel reference sites. Selected stream reaches are at least 100 meters in length and contain several meander lengths or riffle-pool-riffle complexes. In 2005, two additional reaches were established in response to the diversion wall built on Ski Creek to divert all alpine runoff into Glen Cove Creek. Glen Cove Creek is a tributary to South Catamount Creek, and enters upstream from the two reference stream reaches on South Catamount Creek. The diversion on Ski Creek increased discharge into both Glen Cove and South Catamount Creeks and additional monitoring seemed warranted, since what were considered non-impacted streams are now being impacted.

## Stream Channel Cross Sections

Five channel cross sections have been located and permanently referenced in each of the stream reaches, following the selection and installation criteria in Harrelson et al. (1994). The purpose for the cross sections is to document changes in channel cross sectional geometry that may occur over time. Five cross sections in a 100-meter stream reach should be adequate to provide an indication of change in channel cross section geometry, should it occur naturally or as the consequence of mitigation. In addition to the cross sections, longitudinal surveys of the channel thalweg through the stream reach are conducted to document surface water and thalweg slope and location (Harrelson et al. 1994). Over time, changes in geometry such as width to depth ratios in the cross sections, thalweg elevation and location in the floodplain, longitudinal profile, or channel gradient may reflect a response to road mitigation impacts on sediment supply or discharge energy when compared to responses in the control reaches. If possible, cross sections are surveyed each fall so that changes in channel geometry can be documented on an annual basis. Because it can be expected that channel responses to the road mitigation practices will not be as robust as other metrics, it is not critical that each stream be surveyed each year.

Surveys were completed on all stream reaches (Boehmer, East Fork of Beaver, Glen Cove, North Catamount, North Fork of Crystal, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks). Stream channel cross sections from the 2014 monitoring season can be found in Appendix M. Stream channel cross section and thalweg survey data for 2014 are available on the accompanying data DVD.

## Bank Erosion

Bank erosion is being documented primarily through the channel cross section surveys. If the channel is actively down cutting or migrating laterally, the change is an index to bank erosion. Additional bed and bank features are also displayed in a map of the stream reach (Harrelson et al., 1994) and through the use of permanent photo points. In each stream reach, measuring and comparing the lengths of bank that are stable versus lengths of bank that are actively eroding also provides an index of the proportion of eroding banks. If the stream reach contains areas of significant bank erosion, bank pins will be installed to measure the lateral rate of erosion.

Installation of such pins is only warranted if erosion appears to be active and severe in certain locations within the stream reach or if the onset of bank erosion begins to occur during the monitoring period. Over the long-term, the five cross sections located within a 100-meter stream reach should index channel and bank stability by documenting changes in channel geometry and location. Secondary measures such as thalweg surveys and bank erosion monitoring should help document any further change.

In 2014, measurements specific to bank erosion consisted of channel cross section surveys, thalweg surveys, and photographic documentation. There were no visual indications that bank erosion was significant enough to warrant installation of bank pins to measure the lateral rate of erosion.

## Particle Size Distribution

Assuming that road mitigation practices are effective in reducing discharge energy and sediment delivery to the channel system, and that no offsetting responses occur, the percentage of fine particles in the stream channel bed can be expected to decrease over time. A greater percentage of the stream bed is likely to be composed of larger particles as the fine particles are winnowed out and not replaced. This assumes that the resulting flow regime is adequate to carry the sediment supply, as a severe reduction in flow without a reduction in available sediment could cause aggradation. The composition of the sediment trapped behind silt fences, and deposited in rock weirs and in bars on the stream reaches is assessed through the collection of grab samples and analyzed in the laboratory for particle size distribution. Comparing the particle size distribution in material captured in traps near the highway with sediment deposits (bars) in the streams and pebble counts taken in the stream channel should validate response to highway mitigation practices.

### Pebble Counts

Pebble counts in each stream reach are conducted during each survey using the Bevenger and King Pebble Count Procedure (Bevenger and King, 1995). The procedure calls for a zigzag sampling pattern that passes through the stream reach, crossing from bank to bank. Three-hundred particles are sampled in each survey and one survey per field season is completed in each of the stream reaches. To help support this aspect of the validation monitoring, the particle size distribution of the material caught in silt fences and in the rock weir sediment traps is available for comparison to the bed material in the streams.

Stream pebble counts were completed on Boehmer, East Fork of Beaver, Glen Cove, North Catamount, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks. A pebble count was not completed on North Fork Crystal Creek as the stream bed is dry, inactive, and vegetation is encroaching into the channel. A summary of the stream channel particle size distribution from the pebble counts is presented in Table 8. Stream pebble count particle size distribution graphs from the 2014 monitoring season can be found in Appendix N and on the accompanying data DVD.

### Grab Samples

Sediment grab samples were collected from bars on all streams surveyed in 2014 except North Fork Crystal Creek. As mentioned above, this stream bed is dry, inactive, and vegetation is encroaching into the channel. A photograph showing the encroaching vegetation was taken of the stream bar where grab samples had been collected in previous years (Figure 10). Comparing the distribution of material captured in traps near the highway to sediment deposits (bars) in the streams may be useful in validating response to highway mitigation practices. Laboratory analyses for the 2014 grab samples have been completed and a summary of stream channel particle size distributions and graphs for 2014 are presented in Appendix O and on the accompanying data DVD.

Table 8. Summary of particle size distribution of pebble counts in stream channels, Pikes Peak 2014.

| Site Name | Site ID | Date | Particle Size Distribution (mm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | D15 | D35 | D50 | D84 | D95 | D100 |
| Boehmer Creek Reach 1 | BHMR1 | 9/18/2014 | 0.034 | 0.509 | 0.630 | 1.063 | 1.681 | 5.0 |
| Boehmer Creek Reach 2 | BHMR2 | 9/18/2014 | 0.079 | 0.689 | 1.074 | 2.582 | 3.899 | 16.0 |
| East Fork Beaver Creek Reach 1 | EBVR1 | 9/18/2014 | 1.581 | 3.192 | 3.989 | 8.846 | 18.270 | 25.0 |
| East Fork Beaver Creek Reach 2 | EBVR2 | 9/18/2014 | 2.851 | 3.785 | 5.325 | 8.248 | 10.755 | 12.0 |
| Glen Cove Creek Reach 1 | GLEN1 | 9/9/2014 | 1.005 | 2.758 | 4.349 | 11.398 | 16.831 | 20.0 |
| North Catamount Creek Reach 1 | NCAT1 | 8/21/2014 | 0.654 | 1.380 | 2.095 | 4.773 | 7.351 | 13.0 |
| North Catamount Creek Reach 2 | NCAT2 | 8/21/2014 | 1.285 | 3.680 | 6.151 | 11.512 | 16.279 | 20.0 |
| Oil Creek Reach 1 | OILC1 | 9/3/2014 | 2.541 | 4.926 | 6.849 | 14.713 | 23.651 | 32.0 |
| Severy Creek Reach 1 | SVRY1 | 9/24/2014 | 0.510 | 1.393 | 2.361 | 6.561 | 10.289 | 13.0 |
| Severy Creek Reach 2 | SVRY2 | 9/24/2014 | 0.723 | 2.155 | 3.471 | 13.607 | 24.764 | 32.0 |
| Ski Creek Reach 1 | SKIC1 | 8/20/2014 | 0.220 | 1.343 | 2.347 | 7.978 | 14.687 | 24.0 |
| Ski Creek Reach 2 | SKIC2 | 8/18/2014 | 0.213 | 1.425 | 3.272 | 16.998 | 25.386 | 31.0 |
| South Catamount Creek Reach 1 | SCAT1 | 8/20/2014 | 0.084 | 0.995 | 3.794 | 15.505 | 23.141 | 29.0 |
| South Catamount Creek Reach 2 | SCAT2 | 9/9/2014 | 1.685 | 6.889 | 11.105 | 19.684 | 22.381 | 32.0 |
| South Catamount Creek Reach 3 | SCAT3 | 9/9/2014 | 20.890 | 7.509 | 8.268 | 9.435 | 11.899 | 12.0 |
| West Fork Beaver Creek Reach 1 | WBVR1 | 9/16/2014 | 0.806 | 2.805 | 3.815 | 10.514 | 14.634 | 21.0 |
| West Fork Beaver Creek Reach 2 | WBVR2 | 9/16/2014 | 0.538 | 1.858 | 3.124 | 7.886 | 15.839 | 19.0 |

## Vegetation

Vegetation photo points established at the top of the left and right banks (facing downstream) at each cross section have been monumented and are intended to document changes in vegetation type, density, and percent cover over time as riparian and wetland areas recover (Hall 2002). Vegetation is grouped into general categories of moss, grass, sedge, forb, or shrub to document vegetation presence. Percent cover is estimated for the top of bank area 1.5-feet on either side of the center line of the cross section. This monitoring is not intended to determine the degree of departure that current conditions might reflect relative to a reference value. Monitoring will document the evolution or transition that occurs as the disturbed streams respond to the effects of road mitigation and will allow for comparison of any trends to those that occur in the control stream reaches.

Vegetation photo points were completed for Boehmer, East Fork of Beaver, Glen Cove, North Catamount, North Fork of Crystal, Oil, South Catamount, Ski, Severy, and West Fork of Beaver Creeks. The riparian vegetation summary from the 2014 monitoring season is presented in Appendix P. Vegetation data and photographs from 2014 are available on the accompanying data DVD.


Figure 10. North Fork Crystal Creek Reach 2 showing re-vegetation of stream bed and stream bar at cross section E, Pikes Peak 2014.

## SUMMARY

The 2014 monitoring season was successful with regard to the number of sites visited, the amount of data collected, and the quality of the data. A total of 186 sites were monitored during the 2014 field season, many of which were visited more than once. Precipitation measurements from the rain gauges and the NRCS Snotel site, located at Glen Cove indicated that precipitation was average for 2014.

The rock weirs exhibited a greater degree of failure in 2014 than in previous years. Many of the weirs were full of sediment from the previous year rendering them ineffective, resulting in an inability of the field crew to effectively monitor these structures. In some cases (176RW, 202RW, 250RW, 252RW, and 254RW) it appears that a design modification is warranted and in those cases has or is being identified to address perceived deficiencies. It is important to note that these weirs were cleaned-out before a storm event resulted in their failure. Subsequent analysis of the data will indicate if rainfall events were larger, more intense, and more frequent and also contributed to observed problems. The City of Colorado Springs Highway Department did clean-out seventeen rock weirs and one sediment pond this field season. The field crew completed surveys of these sites shortly after clean-out.

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# Appendix A

# Site Locations for
# Effectiveness and Validation Monitoring

# 2014

**Site Locations for Effectiveness and Validation Monitoring, Pikes Peak 2014†**

| Site ID | Latitude (hddd°mm.mmm) | Longitude (hddd°mm.mmm) | Altitude (ft) | Feature Description |
|---|---|---|---|---|
| 001FS | N38 55.211 | W105 02.238 | 9410 | Fill Slope |
| 002RW | N38 55.224 | W105 02.264 | 9410 | Rock Weir |
| 003RW | N38 55.200 | W105 02.258 | 9416 | Rock Weir |
| 004CC | N38 55.132 | W105 02.278 | 9431 | Conveyance Channel |
| 005DD | N38 55.087 | W105 02.415 | 9447 | Drainage Ditch |
| 006RW | N38 55.109 | W105 02.482 | 9415 | Rock Weir |
| 007FS | N38 55.094 | W105 02.520 | 9414 | Fill Slope |
| 008RW | N38 55.075 | W105 02.554 | 9417 | Rock Weir |
| 009RA | N38 55.046 | W105 02.655 | 9443 | Rock Apron |
| 010DD | N38 54.907 | W105 02.734 | 9457 | Drainage Ditch |
| 011CS | N38 54.909 | W105 02.730 | 9459 | Cut Slope |
| 012CC | N38 54.748 | W105 03.060 | 9528 | Conveyance Channel |
| 013CC | N38 54.730 | W105 03.068 | 9525 | Conveyance Channel |
| 015CC | N38 54.603 | W105 03.174 | 9547 | Conveyance Channel |
| 016CC | N38 54.602 | W105 03.111 | 9525 | Conveyance Channel |
| 017CC | N38 54.510 | W105 03.246 | 9565 | Conveyance Channel |
| 018CC | N38 54.472 | W105 03.298 | 9576 | Conveyance Channel |
| 019CC | N38 54.457 | W105 03.384 | 9599 | Conveyance Channel |
| 020CC | N38 54.345 | W105 03.383 | 9637 | Conveyance Channel |
| 021CC | N38 54.299 | W105 03.461 | 9668 | Conveyance Channel |
| 022CC | N38 54.288 | W105 03.552 | 9692 | Conveyance Channel |
| 023CC | N38 54.272 | W105 03.583 | 9701 | Conveyance Channel |
| 024CC | N38 54.289 | W105 03.638 | 9715 | Conveyance Channel |
| 025CC | N38 54.258 | W105 03.697 | 9744 | Conveyance Channel |
| 026CC | N38 54.232 | W105 03.643 | 9752 | Conveyance Channel |
| 027CC | N38 54.183 | W105 03.652 | 9771 | Conveyance Channel |
| 028CC | N38 54.149 | W105 03.714 | 9818 | Conveyance Channel |
| 029CC | N38 54.145 | W105 03.816 | 9856 | Conveyance Channel |
| 030CC | N38 54.134 | W105 03.828 | 9855 | Conveyance Channel |
| 031CC | N38 54.130 | W105 03.829 | 9861 | Conveyance Channel |
| 032CC | N38 54.159 | W105 03.836 | 9858 | Conveyance Channel |
| 033CC | N38 54.106 | W105 03.854 | 9886 | Conveyance Channel |
| 034CC | N38 54.037 | W105 03.896 | 9940 | Conveyance Channel |
| 035CC | N38 53.909 | W105 04.000 | 10060 | Conveyance Channel |
| 036CC | N38 53.866 | W105 03.875 | 10126 | Conveyance Channel |
| 037CC | N38 53.821 | W105 03.855 | 10217 | Conveyance Channel |
| 038CC | N38 53.759 | W105 03.787 | 10254 | Conveyance Channel |
| 039FS | N38 54.910 | W105 02.812 | 9455 | Fill Slope |
| 040CC | N38 54.914 | W105 02.789 | 9464 | Conveyance Channel |
| 041CP | N38 53.807 | W105 03.893 | 10072 | Road Survey Control Point |
| 042DD | N38 53.719 | W105 03.746 | 10161 | Drainage Ditch |
| 043FS | N38 53.726 | W105 03.764 | 10180 | Fill Slope |
| 044RX | N38 53.726 | W105 03.763 | 10183 | Road Cross Section |
| 045CS | N38 53.657 | W105 03.868 | 10266 | Cut Slope |

| Site ID | Latitude (hddd°mm.mmm) | Longitude (hddd°mm.mmm) | Altitude (ft) | Feature Description |
|---|---|---|---|---|
| 046DD | N38 53.658 | W105 03.868 | 10268 | Drainage Ditch |
| 047RX | N38 53.658 | W105 03.868 | 10268 | Road Cross Section |
| 048FS | N38 53.651 | W105 03.880 | 10275 | Fill Slope |
| 049CS | N38 53.592 | W105 04.020 | 10406 | Cut Slope |
| 050RX | N38 53.593 | W105 04.020 | 10404 | Road Cross Section |
| 051DD | N38 53.593 | W105 04.021 | 10397 | Drainage Ditch |
| 052FS | N38 53.593 | W105 04.021 | 10401 | Fill Slope |
| 053CC | N38 53.560 | W105 04.127 | 10478 | Conveyance Channel |
| 054CC | N38 53.579 | W105 04.148 | 10448 | Conveyance Channel |
| 055FS | N38 53.612 | W105 04.095 | 10445 | Fill Slope |
| 056RX | N38 53.614 | W105 04.096 | 10442 | Road Cross Section |
| 057DD | N38 53.613 | W105 04.095 | 10445 | Drainage Ditch |
| 058CC | N38 53.513 | W105 04.057 | 10512 | Conveyance Channel |
| 059CS | N38 53.353 | W105 04.222 | 10697 | Cut Slope |
| 060RX | N38 53.354 | W105 04.219 | 10691 | Road Cross Section |
| 061DD | N38 53.221 | W105 04.381 | 10808 | Drainage Ditch |
| 062RX | N38 53.216 | W105 04.381 | 10805 | Road Cross Section |
| 063CC | N38 53.223 | W105 04.394 | 10803 | Conveyance Channel |
| 064CC | N38 53.448 | W105 04.155 | 10634 | Conveyance Channel |
| 065CC | N38 53.382 | W105 04.192 | 10679 | Conveyance Channel |
| 066CC | N38 53.336 | W105 04.243 | 10701 | Conveyance Channel |
| 067CC | N38 53.297 | W105 04.299 | 10736 | Conveyance Channel |
| 068CC | N38 53.251 | W105 04.305 | 10841 | Conveyance Channel |
| 069CC | N38 53.019 | W105 04.287 | 10989 | Conveyance Channel |
| 070CC | N38 52.956 | W105 04.276 | 11028 | Conveyance Channel |
| 071DD | N38 52.972 | W105 04.285 | 11017 | Drainage Ditch |
| 072RX | N38 52.972 | W105 04.285 | 11015 | Road Cross Section |
| 073ST | N38 52.879 | W105 04.311 | 11062 | Sediment Trap |
| 074FS | N38 52.927 | W105 04.272 | 11053 | Fill Slope |
| 075RG | N38 53.797 | W105 03.890 | 10109 | Precipitation Gauge |
| 076RG | N38 52.582 | W105 03.970 | 11810 | Precipitation Gauge |
| 077RG | N38 51.783 | W105 03.999 | 13069 | Precipitation Gauge |
| 078CS | N38 53.331 | W105 04.275 | 10478 | Cut Slope |
| 079FS | N38 52.882 | W105 04.382 | 11254 | Fill Slope |
| 080DD | N38 52.865 | W105 04.391 | 11256 | Drainage Ditch |
| 081CC | N38 52.943 | W105 04.415 | 11194 | Conveyance Channel |
| 082DD | N38 52.787 | W105 04.376 | 11284 | Drainage Ditch |
| 083FS | N38 52.777 | W105 04.362 | 11288 | Fill Slope |
| 084CC | N38 52.796 | W105 04.471 | 11360 | Conveyance Channel |
| 085DD | N38 52.786 | W105 04.410 | 11313 | Drainage Ditch |
| 086FS | N38 52.602 | W105 04.390 | 11447 | Fill Slope |
| 087CS | N38 52.435 | W105 04.432 | 11542 | Cut Slope |
| 088FS | N38 52.388 | W105 04.549 | 11590 | Fill Slope |
| 089CC | N38 52.391 | W105 04.555 | 11580 | Conveyance Channel |
| 090CS | N38 52.366 | W105 04.540 | 11604 | Cut Slope |
| 091CC | N38 52.402 | W105 04.414 | 11643 | Conveyance Channel |

| Site ID | Latitude (hddd°mm.mmm) | Longitude (hddd°mm.mmm) | Altitude (ft) | Feature Description |
|---|---|---|---|---|
| 092DD | N38 52.432 | W105 04.204 | 11781 | Drainage Ditch |
| 093FS | N38 52.399 | W105 04.401 | 11642 | Fill Slope |
| 094CC | N38 52.540 | W105 04.069 | 11873 | Conveyance Channel |
| 095CC | N38 52.452 | W105 04.205 | 11787 | Conveyance Channel |
| 096CC | N38 52.379 | W105 04.217 | 11746 | Conveyance Channel |
| 097CC | N38 52.381 | W105 04.310 | 11678 | Conveyance Channel |
| 098FS | N38 52.265 | W105 03.995 | 12242 | Fill Slope |
| 099CC | N38 52.131 | W105 04.046 | 12319 | Conveyance Channel |
| 100CC | N38 52.133 | W105 03.936 | 12353 | Conveyance Channel |
| 101FS | N38 52.097 | W105 03.875 | 12390 | Fill Slope |
| 102CS | N38 51.641 | W105 04.063 | 12963 | Cut Slope |
| 103FS | N38 51.491 | W105 04.021 | 12950 | Fill Slope |
| 104CC | N38 51.444 | W105 03.894 | 12923 | Conveyance Channel |
| 105FS | N38 51.062 | W105 03.694 | 13083 | Fill Slope |
| 106CC | N38 52.082 | W105 03.858 | 12251 | Conveyance Channel |
| 107DD | N38 52.044 | W105 03.824 | 12312 | Drainage Ditch |
| 108CC | N38 51.994 | W105 03.769 | 12362 | Conveyance Channel |
| 109CC | N38 52.027 | W105 03.825 | 12393 | Conveyance Channel |
| 110CC | N38 52.062 | W105 03.914 | 12448 | Conveyance Channel |
| 111CC | N38 52.051 | W105 03.992 | 12511 | Conveyance Channel |
| 112CC | N38 52.049 | W105 03.933 | 12531 | Conveyance Channel |
| 113CC | N38 52.002 | W105 03.873 | 12577 | Conveyance Channel |
| 114CC | N38 51.956 | W105 03.840 | 12601 | Conveyance Channel |
| 115CC | N38 51.977 | W105 03.995 | 12692 | Conveyance Channel |
| 116CC | N38 51.940 | W105 04.080 | 12736 | Conveyance Channel |
| 117CC | N38 51.925 | W105 04.141 | 12777 | Conveyance Channel |
| 118CC | N38 51.912 | W105 04.177 | 12797 | Conveyance Channel |
| 119CC | N38 51.914 | W105 04.032 | 12850 | Conveyance Channel |
| 120CC | N38 51.823 | W105 04.090 | 12876 | Conveyance Channel |
| 121CC | N38 51.439 | W105 03.804 | 12877 | Conveyance Channel |
| 122CC | N38 51.347 | W105 03.789 | 12920 | Conveyance Channel |
| 123CS | N38 51.361 | W105 03.782 | 12920 | Cut Slope |
| 124FS | N38 51.362 | W105 03.788 | 12931 | Fill Slope |
| 125CC | N38 51.238 | W105 03.806 | 12986 | Conveyance Channel |
| 126CC | N38 51.158 | W105 03.789 | 13031 | Conveyance Channel |
| 127CC | N38 51.032 | W105 03.697 | 13064 | Conveyance Channel |
| 128FS | N38 50.930 | W105 03.732 | 13072 | Fill Slope |
| 129CC | N38 50.897 | W105 03.662 | 13068 | Conveyance Channel |
| 130CC | N38 50.900 | W105 03.177 | 13183 | Conveyance Channel |
| 131CC | N38 50.940 | W105 03.382 | 13088 | Conveyance Channel |
| 132CC | N38 50.840 | W105 03.274 | 13217 | Conveyance Channel |
| 133CC | N38 50.768 | W105 03.213 | 13282 | Conveyance Channel |
| 134CC | N38 50.671 | W105 03.035 | 13401 | Conveyance Channel |
| 135CC | N38 50.285 | W105 02.872 | 13677 | Conveyance Channel |
| 136CC | N38 50.299 | W105 02.931 | 13624 | Conveyance Channel |
| 137CC | N38 50.260 | W105 02.755 | 13733 | Conveyance Channel |

| Site ID | Latitude (hddd°mm.mmm) | Longitude (hddd°mm.mmm) | Altitude (ft) | Feature Description |
|---|---|---|---|---|
| 138CC | N38 50.221 | W105 02.605 | 13805 | Conveyance Channel |
| 139CC | N38 50.774 | W105 03.110 | 13370 | Conveyance Channel |
| 140CC | N38 50.730 | W105 03.195 | 13327 | Conveyance Channel |
| 141CS | N38 51.043 | W105 03.690 | 13103 | Cut Slope |
| 152RW | N38 54.912 | W105 02.837 | 9444 | Rock Weir |
| 153RW | N38 54.741 | W105 03.066 | 9457 | Rock Weir |
| 154RX | N38 52.040 | W105 03.817 | 12112 | Road Cross Section |
| 155DD | N38 51.245 | W105 03.803 | 12917 | Drainage Ditch |
| 156RX | N38 51.244 | W105 03.799 | 12922 | Road Cross Section |
| 157DD | N38 51.074 | W105 03.684 | 13100 | Drainage Ditch |
| 158RX | N38 51.074 | W105 03.683 | 13099 | Road Cross Section |
| 159DD | N38 51.610 | W105 04.072 | 13091 | Drainage Ditch |
| 160RX | N38 51.611 | W105 04.072 | 13066 | Road Cross Section |
| 161RW | N38 54.720 | W105 03.055 | 9516 | Rock Weir |
| 162RW | N38 54.887 | W105 02.854 | 9518 | Rock Weir |
| 163RA | N38 54.665 | W105 03.115 | 9528 | Rock Weir |
| 175CC | N38 55.104 | W105 02.532 | 9437 | Conveyance Channel |
| 176RW | N38 54.146 | W105 03.795 | 9838 | Rock Weir |
| 177FS | N38 55.302 | W105 02.224 | 9323 | Fill Slope |
| 178RW | N38 54.142 | W105 03.821 | 9839 | Rock Weir |
| 179RW | N38 54.127 | W105 03.852 | 9851 | Rock Weir |
| 180RW | N38 54.055 | W105 03.903 | 9906 | Rock Weir |
| 181RW | N38 54.025 | W105 03.918 | 9919 | Rock Weir |
| 182DD | N38 54.895 | W105 02.860 | 9430 | Drainage Ditch |
| 183FS | N38 54.675 | W105 03.109 | 9453 | Fill Slope |
| 184CC | N38 54.708 | W105 03.363 | 9308 | Conveyance Channel |
| 185CS | N38 54.536 | W105 03.246 | 9532 | Cut Slope |
| 186FS | N38 54.524 | W105 03.242 | 9538 | Fill Slope |
| 187FS | N38 54.281 | W105 03.658 | 9711 | Fill Slope |
| 188DD | N38 54.075 | W105 03.892 | 9894 | Drainage Ditch |
| 189CC | N38 54.073 | W105 03.886 | 9887 | Conveyance Channel |
| 190CC | N38 54.095 | W105 03.869 | 9871 | Conveyance Channel |
| 191CC | N38 54.117 | W105 03.854 | 9855 | Conveyance Channel |
| 192CS | N38 54.183 | W105 03.677 | 9786 | Cut Slope |
| 193FS | N38 54.821 | W105 02.983 | 9507 | Fill Slope |
| 194FS | N38 54.811 | W105 03.004 | 9506 | Fill Slope |
| 195DD | N38 54.827 | W105 02.983 | 9505 | Drainage Ditch |
| 196FS | N38 54.872 | W105 02.900 | 9497 | Fill Slope |
| 197CS | N38 54.364 | W105 03.383 | 9640 | Cut Slope |
| 198FS | N38 54.497 | W105 03.254 | 9560 | Fill Slope |
| 199RW | N38 54.688 | W105 03.389 | 9326 | Sediment Pond |
| 200RW | N38 55.261 | W105 02.246 | 9418 | Rock Weir |
| 201RW | N38 54.805 | W105 03.021 | 9522 | Rock Weir |
| 202RW | N38 54.619 | W105 03.132 | 9450 | Rock Weir |
| 203FS | N38 54.603 | W105 03.139 | 9517 | Fill Slope |
| 204FS | N38 54.273 | W105 03.572 | 9707 | Fill Slope |

| Site ID | Latitude (hddd°mm.mmm) | Longitude (hddd°mm.mmm) | Altitude (ft) | Feature Description |
|---|---|---|---|---|
| 205DD | N38 54.022 | W105 03.927 | 9983 | Drainage Ditch |
| 206CC | N38 54.689 | W105 03.097 | 9506 | Conveyance Channel |
| 207CC | N38 51.664 | W105 04.062 | 12962 | Conveyance Channel |
| 208CC | N38 52.754 | W105 04.445 | 11172 | Conveyance Channel |
| 209CC | N38 52.647 | W105 04.411 | 11365 | Conveyance Channel |
| 210CC | N38 54.059 | W105 03.916 | 9849 | Conveyance Channel |
| 211CC | N38 54.130 | W105 03.844 | 9853 | Conveyance Channel |
| 212CC | N38 53.149 | W105 04.311 | 10893 | Conveyance Channel |
| 213CC | N38 50.964 | W105 03.391 | 13046 | Conveyance Channel |
| 214CC | N38 50.234 | W105 02.661 | 13198 | Conveyance Channel |
| 215CC | N38 50.356 | W105 02.792 | 13375 | Conveyance Channel |
| 216CC | N38 55.263 | W105 02.236 | 9289 | Conveyance Channel |
| 217CC | N38 55.255 | W105 02.232 | 9284 | Conveyance Channel |
| 218CC | N38 55.226 | W105 02.268 | 9359 | Conveyance Channel |
| 219CC | N38 55.202 | W105 02.262 | 9371 | Conveyance Channel |
| 220CC | N38 55.108 | W105 02.482 | 9411 | Conveyance Channel |
| 221CC | N38 55.107 | W105 02.482 | 9305 | Conveyance Channel |
| 222CC | N38 55.070 | W105 02.554 | 9319 | Conveyance Channel |
| 223CC | N38 55.048 | W105 02.657 | 9394 | Conveyance Channel |
| 224CC | N38 54.878 | W105 02.852 | 9493 | Conveyance Channel |
| 225CC | N38 54.917 | W105 02.840 | 9441 | Conveyance Channel |
| 226CC | N38 54.796 | W105 03.010 | 9431 | Conveyance Channel |
| 227CC | N38 54.706 | W105 03.053 | 9480 | Conveyance Channel |
| 228CC | N38 54.746 | W105 03.078 | 9431 | Conveyance Channel |
| 229CC | N38 54.140 | W105 03.788 | 9774 | Conveyance Channel |
| 230CC | N38 54.028 | W105 03.912 | 9902 | Conveyance Channel |
| 231CC | N38 54.050 | W105 03.908 | 9910 | Conveyance Channel |
| 232CC | N38 52.583 | W105 04.557 | 11399 | Conveyance Channel |
| 233RW | N38 52.383 | W105 04.560 | 11074 | Rock Weir |
| 234RW | N38 52.502 | W105 03.924 | 11915 | Rock Weir |
| 235CC | N38 52.504 | W105 03.920 | 11928 | Conveyance Channel |
| 236RW | N38 52.185 | W105 04.066 | 12177 | Rock Weir |
| 237RW | N38 52.398 | W105 04.393 | 11219 | Sediment Pond |
| 238RW | N38 52.131 | W105 04.048 | 12340 | Rock Weir |
| 239RW | N38 52.008 | W105 03.774 | 12517 | Rock Weir |
| 240RW | N38 52.048 | W105 03.990 | 12644 | Rock Weir |
| 241RW | N38 51.976 | W105 03.834 | 12686 | Rock Weir |
| 242RW | N38 51.903 | W105 04.176 | 12851 | Rock Weir |
| 243RW | N38 51.919 | W105 04.043 | 12900 | Rock Weir |
| 244CC | N38 54.487 | W105 03.232 | 9569 | Conveyance Channel |
| 245CC | N38 54.872 | W105 02.900 | 9497 | Conveyance Channel |
| 246CC | N38 50.709 | W105 03.090 | 13423 | Conveyance Channel |
| 247CC | N38 50.709 | W105 03.499 | 13080 | Conveyance Channel |
| 250RW | N38 53.724 | W105 03.710 | 10232 | Rock Weir |
| 251CC | N38 53.723 | W105 03.712 | 10229 | Conveyance Channel |
| 252RW | N38 53.456 | W105 03.998 | 10598 | Rock Weir |

| Site ID | Latitude (hddd°mm.mmm) | Longitude (hddd°mm.mmm) | Altitude (ft) | Feature Description |
|---|---|---|---|---|
| 253CC | N38 53.462 | W105 03.998 | 10582 | Conveyance Channel |
| 254RW | N38 53.226 | W105 04.396 | 10836 | Rock Weir |
| 256RW | N38 51.832 | W105 04.112 | 12923 | Sediment Pond |
| 258RW | N38 50.938 | W105 03.394 | 13091 | Sediment Pond |
| 260RW | N38 50.682 | W105 03.043 | 13415 | Sediment Pond |
| 262RW | N38 52.890 | W105 04.297 | 11086 | Sediment Pond |
| 263CC | N38 52.919 | W105 04.258 | 11056 | Conveyance Channel |
| 264RW | N38 53.201 | W105 04.228 | 10864 | Sediment Pond |
| 265CC | N38 53.209 | W105 04.206 | 10843 | Conveyance Channel |
| BHMR1 | N38 48.951 | W105 03.040 | 11885 | Boehmer Creek 1 |
| BHMR2 | N38 49.061 | W105 03.027 | 11995 | Boehmer Creek 2 |
| EBVR1 | N38 49.832 | W105 03.612 | 12156 | East Fork Beaver Creek 1 |
| EBVR2 | N38 49.907 | W105 03.598 | 12190 | East Fork Beaver Creek 2 |
| GLEN1 | N38 54.457 | W105 04.690 | 9519 | Glen Cove Creek 1 |
| NCAT1 | N38 54.746 | W105 05.994 | 9415 | North Catamount Creek 1 |
| NCAT2 | N38 54.402 | W105 06.106 | 9519 | North Catamount Creek 2 |
| NCRY1∞ | N38 54.418 | W105 03.199 | 9453 | North Fork Crystal Creek 1 & 2 |
| OILC1 | N38 48.449 | W105 06.511 | 10505 | Oil Creek 1 |
| SCAT1 | N38 55.035 | W105 04.112 | 9368 | South Catamount Creek 1 |
| SCAT2 | N38 54.974 | W105 04.181 | 9345 | South Catamount Creek 2 |
| SCAT3 | N38 54.316 | W105 04.899 | 9412 | South Catamount Creek 3 |
| SKIC1 | N38 54.975 | W105 04.078 | 9418 | Ski Creek 1 |
| SKIC2 | N38 53.767 | W105 03.987 | 10035 | Ski Creek 2 |
| SVRY1 | N38 52.467 | W105 03.039 | 10732 | Severy Creek 1 |
| SVRY2 | N38 52.472 | W105 03.339 | 10926 | Severy Creek 2 |
| WBVR1 | N38 48.181 | W105 05.710 | 10726 | West Fork Beaver Creek 1 |
| WBVR2 | N38 48.349 | W105 05.591 | 10698 | West Fork Beaver Creek 2 |

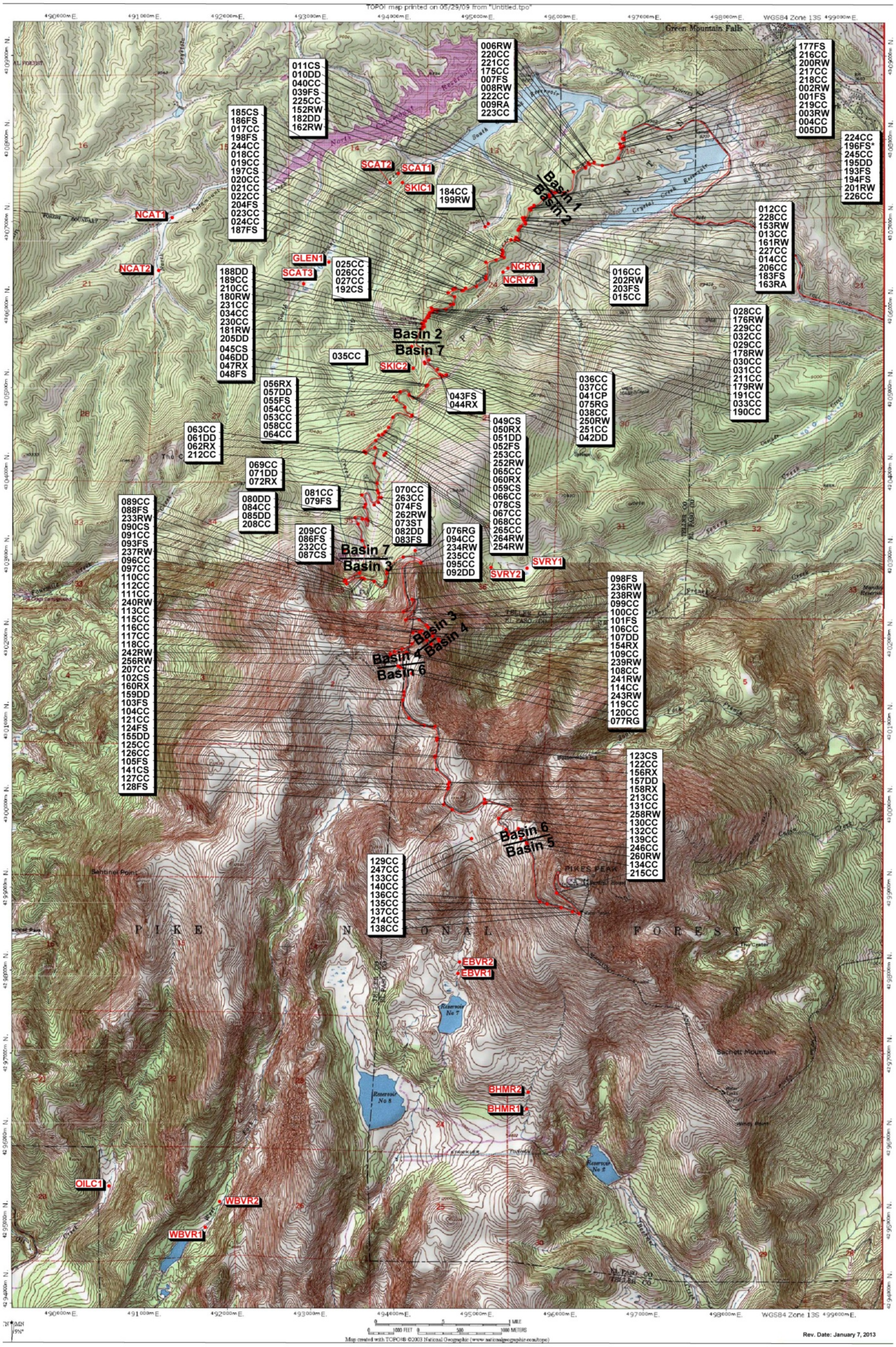
*† Not all sites were sampled during the 2014 field season.*
*∞ North Fork Crystal Creek Reach 2 (NCRY2) is located 200ft upstream from NCRY1.*

# Appendix B

# USGS Topographic Map

# Site Locations for
# Effectiveness and Validation Monitoring

# 2014


TOPO! map printed on 05/29/09 from "Untitled.tpo"
WGS84 Zone 13S
Green Mountain Falls
011CS 010DD 040CC 039FS 225CC 152RW 182DD 162RW
006RW 220CC 221CC 175CC 007FS 008RW 222CC 009RA 223CC
177FS 216CC 200RW 217CC 218CC 002RW 001FS 219CC 003RW 004CC 005DD
224CC 196FS* 245CC 195DD 193FS 194FS 201RW 226CC
185CS 186FS 017CC 198FS 244CC 018CC 019CC 197CS 020CC 021CC 022CC 204FS 023CC 024CC 187FS
SCAT2
SCAT1
SKIC1
184CC 199RW
Basin 1
Basin 2
Crystal Creek Reservoir
NCAT1
NCAT2
012CC 228CC 153RW 013CC 161RW 227CC 014CC 206CC 183FS 163RA
GLEN1
SCAT3
025CC 026CC 027CC 192CS
NCRY1
NCRY2
016CC 202RW 203FS 015CC
188DD 189CC 210CC 180RW 231CC 034CC 230CC 181RW 205DD 045CS 046DD 047RX 048FS
028CC 176RW 229CC 032CC 029CC 178RW 030CC 031CC 211CC 179RW 191CC 033CC 190CC
Basin 2
Basin 7
035CC
SKIC2
056RX 057DD 055FS 054CC 053CC 058CC 064CC
043FS 044RX
036CC 037CC 041CP 075RG 038CC 250RW 251CC 042DD
049CS 050RX 051DD 052FS 253CC 252RW 065CC 060RX 059CS 066CC 078CS 067CC 068CC 265CC 264RW 254RW
063CC 061DD 062RX 212CC
069CC 071DD 072RX
081CC 079FS
080DD 084CC 085DD 208CC
070CC 263CC 074FS 262RW 073ST 082DD 083FS
089CC 088FS 233RW 090CS 091CC 093FS 237RW 096CC 097CC 110CC 112CC 111CC 240RW 113CC 115CC 116CC 117CC 118CC 242RW 256RW 207CC 102CS 160RX 159DD 103FS 104CC 121CC 124FS 155DD 125CC 126CC 105FS 141CS 127CC 128FS
209CC 086FS 232CC 087CS
Basin 7
Basin 3
076RG 094CC 234RW 235CC 095CC 092DD
SVRY1
SVRY2
098FS 236RW 238RW 099CC 100CC 101FS 106CC 107DD 154RX 109CC 239RW 108CC 241RW 114CC 243RW 119CC 120CC 077RG
Basin 3
Basin 4
Basin 4
Basin 6
123CS 122CC 156RX 157DD 158RX 213CC 131CC 258RW 130CC 132CC 139CC 246CC 260RW 134CC 215CC
Basin 6
Basin 5
PIKES PEAK
Sentinel Point
129CC 247CC 133CC 140CC 136CC 135CC 137CC 214CC 138CC
PIKE NATIONAL FOREST
EBVR2
EBVR1
Reservoir No 7
Sachett Mountain
BHMR2
BHMR1
Reservoir No 8
Reservoir No 5
OILC1
WBVR2
WBVR1
EL PASO CO
TELLER CO
WGS84 Zone 13S
1 MILE
1000 FEET
1000 METERS
Map created with TOPO! ©2003 National Geographic (www.nationalgeographic.com/topo)
Rev. Date: January 7, 2013

# Appendix C

# Daily Precipitation
# and
# Periodic Precipitation

# 2014

## Daily Precipitation for Electronic Rain Gauges, Pikes Peak 2014

| Date | 075RG (Elevation 10,109’) Precipitation (in) | 076RG (Elevation 11,810’) Precipitation (in) | 077RG (Elevation 13,069’) Precipitation (in) |
|---|---|---|---|
| 5/6/2014 | 0 | 0 | Missing† |
| 5/7/2014 | 0 | 0 | Missing† |
| 5/8/2014 | 0 | 0.02 | Missing† |
| 5/9/2014 | 0.02 | 0.09 | Missing† |
| 5/10/2014 | 0 | 0 | Missing† |
| 5/11/2014 | 0 | 0.03 | Missing† |
| 5/12/2014 | 0 | 0 | Missing† |
| 5/13/2014 | 0.23 | 0 | Missing† |
| 5/14/2014 | 0.29 | 0.02 | Missing† |
| 5/15/2014 | 0.01 | 0.12 | Missing† |
| 5/16/2014 | 0 | 0.06 | Missing† |
| 5/17/2014 | 0.02 | 0 | Missing† |
| 5/18/2014 | 0 | 0 | Missing† |
| 5/19/2014 | 0 | 0 | Missing† |
| 5/20/2014 | 0 | 0 | Missing† |
| 5/21/2014 | 0.03 | 0.02 | Missing† |
| 5/22/2014 | 0 | 0 | Missing† |
| 5/23/2014 | 0.59 | 0.17 | Missing† |
| 5/24/2014 | 0.36 | 0.29 | Missing† |
| 5/25/2014 | 0.13 | 0.35 | Missing† |
| 5/26/2014 | 0.01 | 0 | Missing† |
| 5/27/2014 | 0.01 | 0.02 | Missing† |
| 5/28/2014 | 0 | 0 | Missing† |
| 5/29/2014 | 0.15 | 0.22 | Missing† |
| 5/30/2014 | 0.19 | 0.25 | Missing† |
| 5/31/2014 | 0.02 | 0.05 | Missing† |
| 6/1/2014 | 0 | 0 | Missing† |
| 6/2/2014 | 0 | 0 | 0.01 |
| 6/3/2014 | 0 | 0 | 0.01 |
| 6/4/2014 | 0 | 0 | 0 |
| 6/5/2014 | 0 | 0 | 0 |
| 6/6/2014 | 0 | 0 | 0 |
| 6/7/2014 | 0 | 0 | 0 |
| 6/8/2014 | 0 | 0.03 | 0 |
| 6/9/2014 | 0.17 | 0.27 | 0.05 |
| 6/10/2014 | 0 | 0 | 0.01 |
| 6/11/2014 | 0.03 | 0.06 | 0.03 |
| 6/12/2014 | 0 | 0 | 0 |
| 6/13/2014 | 0 | 0 | 0.01 |
| 6/14/2014 | 0 | 0 | 0 |
| 6/15/2014 | 0 | 0 | 0 |
| 6/16/2014 | 0 | 0 | 0 |

| Date | 075RG (Elevation 10,109') Precipitation (in) | 076RG (Elevation 11,810') Precipitation (in) | 077RG (Elevation 13,069') Precipitation (in) |
|---|---|---|---|
| 6/17/2014 | 0 | 0 | 0 |
| 6/18/2014 | 0.02 | 0 | 0 |
| 6/19/2014 | 0 | 0 | 0 |
| 6/20/2014 | 0 | 0 | 0 |
| 6/21/2014 | 0 | 0 | 0 |
| 6/22/2014 | 0.08 | 0.02 | 0.01 |
| 6/23/2014 | 0.06 | 0.26 | 0.11 |
| 6/24/2014 | 0.33 | 0.36 | 0.18 |
| 6/25/2014 | 0.01 | 0.01 | 0.01 |
| 6/26/2014 | 0 | 0 | 0 |
| 6/27/2014 | 0.04 | 0.01 | 0 |
| 6/28/2014 | 0 | 0 | 0 |
| 6/29/2014 | 0 | 0 | 0 |
| 6/30/2014 | 0 | 0 | 0 |
| 7/1/2014 | 0 | 0 | 0 |
| 7/2/2014 | 0 | 0 | 0 |
| 7/3/2014 | 0.21 | 0.18 | 0.14 |
| 7/4/2014 | 0.03 | 0.05 | 0.05 |
| 7/5/2014 | 0 | 0 | 0 |
| 7/6/2014 | 0 | 0.01 | 0 |
| 7/7/2014 | 0 | 0 | 0 |
| 7/8/2014 | 0.28 | 0.2 | 0.13 |
| 7/9/2014 | 0.28 | 0.45 | 0.13 |
| 7/10/2014 | 0.03 | 0.09 | 0.01 |
| 7/11/2014 | 0.01 | 0.04 | 0.06 |
| 7/12/2014 | 0.34 | 0.46 | 0.57 |
| 7/13/2014 | 0.43 | 0.36 | 0.3 |
| 7/14/2014 | 0.05 | 0.12 | 0.09 |
| 7/15/2014 | 0.20 | 0.25 | 0.23 |
| 7/16/2014 | 0.34 | 0.24 | 0.21 |
| 7/17/2014 | 0 | 0 | 0 |
| 7/18/2014 | 0.08 | 0.03 | 0.02 |
| 7/19/2014 | 0 | 0 | 0 |
| 7/20/2014 | 0 | 0 | 0 |
| 7/21/2014 | 0 | 0 | 0 |
| 7/22/2014 | 0.01 | 0.02 | 0.01 |
| 7/23/2014 | 0 | 0 | 0 |
| 7/24/2014 | 0.10 | 0.02 | 0.01 |
| 7/25/2014 | 0.06 | 0.11 | 0.09 |
| 7/26/2014 | 0.02 | 0.02 | 0.06 |
| 7/27/2014 | 0.44 | 1.92 | 1.58 |
| 7/28/2014 | 0.02 | 0.01 | 0.01 |
| 7/29/2014 | 0.60 | 0.55 | 0.53 |

| Date | 075RG (Elevation 10,109') Precipitation (in) | 076RG (Elevation 11,810') Precipitation (in) | 077RG (Elevation 13,069') Precipitation (in) |
|---|---|---|---|
| 7/30/2014 | 0.68 | 0.82 | 1.05 |
| 7/31/2014 | 0.03 | 0.05 | 0.02 |
| 8/1/2014 | 0.07 | 0.14 | 0.32 |
| 8/2/2014 | 0 | 0 | 0 |
| 8/3/2014 | 0 | 0 | 0 |
| 8/4/2014 | 0 | 0 | 0.02 |
| 8/5/2014 | 0.12 | 0.16 | 0.18 |
| 8/6/2014 | 0.02 | 0.08 | 0.04 |
| 8/7/2014 | 0.17 | 0.08 | 0.05 |
| 8/8/2014 | 0.27 | 0.23 | 0.55 |
| 8/9/2014 | 0 | 0.01 | 0 |
| 8/10/2014 | 0.90 | 0.77 | 0.28 |
| 8/11/2014 | 0.01 | 0.07 | 0.11 |
| 8/12/2014 | 0 | 0 | 0 |
| 8/13/2014 | 0 | 0.02 | 0.03 |
| 8/14/2014 | 0.16 | 0.3 | 0.1 |
| 8/15/2014 | 0.08 | 0.11 | 0.29 |
| 8/16/2014 | 0 | 0 | 0 |
| 8/17/2014 | 0 | 0 | 0 |
| 8/18/2014 | 0 | 0 | 0 |
| 8/19/2014 | 0 | 0.26 | 0.29 |
| 8/20/2014 | 0 | 0 | 0 |
| 8/21/2014 | 0 | 0 | 0 |
| 8/22/2014 | 0.09 | 0.22 | 0.17 |
| 8/23/2014 | 0.32 | 0 | 0 |
| 8/24/2014 | 0 | 0 | 0 |
| 8/25/2014 | 0.14 | 0.15 | 0.06 |
| 8/26/2014 | 0.01 | 0.01 | 0.01 |
| 8/27/2014 | 0.01 | 0.02 | 0 |
| 8/28/2014 | 0.22 | 0.22 | 0.09 |
| 8/29/2014 | 0.05 | 0.08 | 0.09 |
| 8/30/2014 | Missing† | 0 | 0.05 |
| 8/31/2014 | Missing† | 0 | 0 |
| 9/1/2014 | Missing† | 0 | 0 |
| 9/2/2014 | Missing† | 0 | 0.01 |
| 9/3/2014 | Missing† | 0 | 0 |
| 9/4/2014 | Missing† | 0.15 | 0.13 |
| 9/5/2014 | Missing† | 0.18 | 0.19 |
| 9/6/2014 | Missing† | 0.24 | 0.1 |
| 9/7/2014 | Missing† | 0.02 | 0.01 |
| 9/8/2014 | 0.55∞ | 0.11 | 0.12 |
| 9/9/2014 | 0 | 0.01 | 0.01 |
| 9/10/2014 | 0.02 | 0.02 | 0.02 |

| Date | 075RG (Elevation 10,109') Precipitation (in) | 076RG (Elevation 11,810') Precipitation (in) | 077RG (Elevation 13,069') Precipitation (in) |
|---|---|---|---|
| 9/11/2014 | 0.01 | 0 | 0 |
| 9/12/2014 | 0.09 | 0 | 0 |
| 9/13/2014 | 0 | 0 | 0 |
| 9/14/2014 | 0 | 0 | 0 |
| 9/15/2014 | 0 | 0 | 0 |
| 9/16/2014 | 0 | 0 | 0 |
| 9/17/2014 | 0.01 | 0 | 0 |
| 9/18/2014 | 0 | 0 | 0 |
| 9/19/2014 | 0 | 0 | 0 |
| 9/20/2014 | 0.30 | 0.29 | 0.19 |
| 9/21/2014 | 0.08 | 0.1 | 0.12 |
| 9/22/2014 | 0.05 | 0.08 | 0.09 |
| 9/23/2014 | 0 | 0 | 0 |
| 9/24/2014 | 0 | 0 | 0 |
| 9/25/2014 | 0 | 0 | 0 |
| 9/26/2014 | 0 | 0 | 0 |
| 9/27/2014 | 0 | 0 | 0 |
| 9/28/2014 | 0.05 | 0.06 | 0.05 |
| 9/29/2014 | 0.03 | 0.05 | 0.02 |
| 9/30/2014 | 0 | 0 | 0 |
| **Total** | **10.95*†*** | **12.97** | **9.52*†*** |

*† Indicates missing data due to equipment malfunction and/or damage to the rain gauge.*
*∞ Total precipitation for August 30 through September 8, 2014, but daily file corrupted.*

**Periodic Precipitation for Standard Rain Gauges, Pikes Peak 2014**

| Date | 075RG (Elevation 10,109') Precipitation (in) | 076RG (Elevation 11,810') Precipitation (in) | 077RG (Elevation 13,069') Precipitation (in) |
|---|---|---|---|
| 5/19/2014 | 0.45 | 0.55 | 0.10 |
| 5/29/2014 | 1.06 | 0.91 | 0.56 |
| 6/2/2014 | 0.42 | 0.55 | 0.44 |
| 6/9/2014 | 0.01 | 0.03 | 0.00 |
| 6/16/2014 | 0.13 | 0.39 | 0.13 |
| 6/24/2014 | 0.18 | 0.29 | 0.14 |
| 6/30/2014 | 0.38 | 0.40 | 0.21 |
| 7/8/2014 | 0.25 | Missing† | 0.22 |
| 7/14/2014 | 1.35 | 1.70 | 1.22 |
| 7/17/2014 | 0.61 | 0.65 | 0.56 |
| 7/21/2014 | 0.10 | 0.05 | 0.04 |
| 7/28/2014 | 0.65 | 2.20 | 1.70 |
| 8/4/2014 | 1.45 | 1.97 | 1.94 |
| 8/11/2014 | 1.45 | 1.50 | 1.13 |
| 8/18/2014 | 0.25 | 0.52 | 0.56 |
| 8/26/2014 | 0.49 | 0.76 | 0.62 |
| 9/2/2014 | 0.27 | 0.35 | 0.27 |
| 9/8/2014 | 0.65 | 0.62 | 0.45 |
| 9/15/2014 | 0.19 | 0.14 | 0.16 |
| 9/22/2014 | 0.43 | 0.44 | 0.36 |
| 9/29/2014 | 0.12 | 0.2 | 0.18 |
| **Total** | **10.89** | **14.22†** | **10.99** |
| *† Indicates missing data due to damage to the rain gauge.* | | | |

# Appendix D

# Cut Slope

# Site Visit Dates
# and
# Sediment Accumulation

# 2014

**Site Visit Dates of Cut Slope Silt Fences, Pikes Peak 2014**

| Site ID | Cut Slope Site Visit Dates 2014 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 5/19 | 6/4 | 6/10 | 6/17 | 7/3 | 7/8 | 7/17 | 8/11 | 8/27 | 9/15 |
| 011CS | X | X | | X | | X | X | X | X | X |
| 045CS | X | X | | X | | X | X | X | X | X |
| 049CS | X | X | | X | | X | X | X | X | X |
| 059CS | X | X | | X | | X | X | X | X | X |
| 078CS | X | X | | X | | X | X | X | X | X |
| 087CS | X | X | | X | | X | X | X | X | X |
| 090CS | X | X | X | X | | X | X | X | X | X |
| 102CS | X | X | | X | X | X | X | X | X | X |
| 123CS | X | X | | X | X | X | X | X | X | X |
| 141CS | X | X | X | X | X | X | X | X | X | X |
| 185CS | X | X | | X | | X | X | X | X | X |
| 192CS | X | X | | X | | X | X | X | X | X |
| 197CS | X | X | | X | | X | X | X | X | X |

## Sediment Accumulation in Cut Slope Silt Fences, Pikes Peak 2014

| Site ID | Location | Date | Volume ($ft^3$) | Grab Sample |
|---|---|---|---|---|
| 011CS | Upper Fence | 5/19/14 | 0.13 | Yes |
| 192CS | Lower Fence | 5/19/14 | 0.74 | Yes |
| 197CS | Lower Fence | 5/19/14 | 0.20 | Yes |
| 197CS | Upper Fence | 5/19/14 | 0.74 | Yes |
| 045CS | Lower Fence | 6/4/14 | 0.07 | Yes |
| 049CS | Lower Fence | 6/4/14 | 0.47 | Yes |
| 087CS | Lower Fence | 6/4/14 | 0.34 | Yes |
| 059CS | Lower Fence | 6/17/14 | 0.07 | Yes |
| 102CS | Upper Fence | 6/17/14 | 0.07 | Yes |
| 123CS | Upper Fence | 6/17/14 | 0.40 | Yes |
| 049CS | Lower Fence | 7/8/14 | 0.07 | Yes |
| 059CS | Lower Fence | 7/8/14 | 0.13 | Yes |
| 192CS | Lower Fence | 7/8/14 | 0.40 | Yes |
| 011CS† | Lower Fence | 7/17/14 | 0.40 | Yes |
| 011CS† | Upper Fence | 7/17/14 | 0.07 | Yes |
| 087CS | Lower Fence | 7/17/14 | 0.07 | Yes |
| 192CS | Lower Fence | 7/17/14 | 0.33 | Yes |
| 197CS† | Lower Fence | 7/17/14 | 0.53 | Yes |
| 197CS† | Upper Fence | 7/17/14 | 0.33 | Yes |
| 045CS | Lower Fence | 8/11/14 | 0.27 | Yes |
| 087CS | Lower Fence | 8/11/14 | 0.27 | Yes |
| 090CS† | Lower Fence | 8/11/14 | 0.07 | Yes |
| 090CS† | Upper Fence | 8/11/14 | 0.07 | Yes |
| 185CS | Lower Fence | 8/11/14 | 0.07 | Yes |
| 185CS | Upper Fence | 8/11/14 | 0.07 | Yes |
| 192CS† | Lower Fence | 8/11/14 | 0.53 | Yes |
| 011CS | Lower Fence | 8/27/14 | 0.47 | Yes |
| 011CS | Upper Fence | 8/27/14 | 0.07 | Yes |
| 078CS† | Lower Fence | 8/27/14 | 0.20 | Yes |
| 192CS | Lower Fence | 8/27/14 | 0.53 | Yes |
| 123CS† | Upper Fence | 9/15/14 | 0.13 | Yes |
| 141CS | Upper Fence | 9/15/14 | 0.07 | Yes |
| 197CS | Lower Fence | 9/15/14 | 0.33 | Yes |
| *† Grab samples selected for lab analyses.* | | | | |

# Appendix E

# Fill Slope

## Site Visit Dates
## and
## Sediment Accumulation

## 2014

## Site Visit Dates of Fill Slope Silt Fences, Pikes Peak 2014

| Site ID | Fill Slope Site Visit Dates 2014 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 5/19 | 6/4 | 6/17 | 7/8 | 7/17 | 8/11 | 8/27 | 9/15 |
| 001FS | X | X | X | X | X | X | X | X |
| 007FS | X | X | X | X | X | X | X | X |
| 039FS | X | X | X | X | X | X | X | X |
| 043FS | X | X | X | X | X | X | X | X |
| 048FS | X | X | X | X | X | X | X | X |
| 052FS | X | X | X | X | X | X | X | X |
| 055FS | X | X | X | X | X | X | X | X |
| 074FS | X | X | X | X | X | X | X | X |
| 079FS | X | X | X | X | X | X | X | X |
| 083FS | X | X | X | X | X | X | X | X |
| 086FS | X | X | X | X | X | X | X | X |
| 088FS | X | X | X | X | X | X | X | X |
| 093FS | X | X | X | X | X | X | X | X |
| 098FS | X | X | X | X | X | X | X | X |
| 101FS | X | X | X | X | X | X | X | X |
| 103FS | X | X | X | X | X | X | X | X |
| 105FS | X | X | X | X | X | X | X | X |
| 124FS | X | X | X | X | X | X | X | X |
| 128FS | X | X | X | X | X | X | X | X |
| 177FS | X | X | X | X | X | X | X | X |
| 183FS | X | X | X | X | X | X | X | X |
| 186FS | X | X | X | X | X | X | X | X |
| 187FS | X | X | X | X | X | X | X | X |
| 193FS | X | X | X | X | X | X | X | X |
| 194FS | X | X | X | X | X | X | X | X |
| 198FS | X | X | X | X | X | X | X | X |
| 203FS | X | X | X | X | X | X | X | X |
| 204FS | X | X | X | X | X | X | X | X |

**Sediment Accumulation in Fill Slope Silt Fences, Pikes Peak 2014**

| Site ID | Location | Date | Volume ($ft^3$) | Grab Sample |
|---|---|---|---|---|
| 039FS† | Upper Fence | 5/19/14 | 0.13 | Yes |
| 039FS† | Lower Fence | 5/19/14 | 0.13 | Yes |
| 186FS | Upper Fence | 5/19/14 | 0.13 | Yes |
| 186FS | Lower Fence | 5/19/14 | 0.27 | Yes |
| 198FS | Upper Fence | 5/19/14 | 0.27 | Yes |
| 203FS | Upper Fence | 5/19/14 | 0.07 | Yes |
| 204FS† | Upper Fence | 5/19/14 | 0.47 | Yes |
| 043FS | Upper Fence | 6/4/14 | 0.67 | Yes |
| 052FS | Lower Fence | 6/4/14 | 0.13 | Yes |
| 074FS† | Upper Fence | 6/4/14 | 0.67 | Yes |
| 187FS | Upper Fence | 6/4/14 | 2.01 | Yes |
| 001FS | Upper Fence | 6/17/14 | 0.87 | Yes |
| 079FS | Upper Fence | 6/17/14 | 1.00 | Yes |
| 093FS | Upper Fence | 6/17/14 | 0.80 | Yes |
| 098FS | Upper Fence | 6/17/14 | 1.74 | Yes |
| 101FS† | Upper Fence | 6/17/14 | 2.41 | Yes |
| 128FS† | Upper Fence | 6/17/14 | 0.07 | Yes |
| 001FS | Upper Fence | 7/8/14 | 0.40 | Yes |
| 043FS | Upper Fence | 7/8/14 | 0.20 | Yes |
| 079FS† | Upper Fence | 7/8/14 | 0.53 | Yes |
| 083FS | Lower Fence | 7/8/14 | 0.33 | Yes |
| 088FS | Lower Fence | 7/8/14 | 0.13 | Yes |
| 001FS† | Upper Fence | 7/17/14 | 1.14 | Yes |
| 098FS | Upper Fence | 7/17/14 | 0.33 | Yes |
| 193FS | Upper Fence | 7/17/14 | 0.67 | Yes |
| 198FS† | Upper Fence | 7/17/14 | 0.94 | Yes |
| 203FS | Upper Fence | 7/17/14 | 1.07 | Yes |
| 204FS | Upper Fence | 7/17/14 | 0.20 | Yes |
| 001FS | Upper Fence | 8/11/14 | 0.67 | Yes |
| 039FS | Upper Fence | 8/11/14 | 0.27 | Yes |
| 039FS | Lower Fence | 8/11/14 | 0.07 | Yes |
| 043FS† | Upper Fence | 8/11/14 | 0.33 | Yes |
| 074FS | Upper Fence | 8/11/14 | 0.27 | Yes |
| 074FS | Lower Fence | 8/11/14 | 0.07 | Yes |
| 079FS | Upper Fence | 8/11/14 | 1.20 | Yes |
| 086FS | Lower Fence | 8/11/14 | 0.40 | Yes |
| 093FS | Upper Fence | 8/11/14 | 0.67 | Yes |
| 098FS | Upper Fence | 8/11/14 | 0.94 | Yes |

| Site ID | Location | Date | Volume ($ft^3$) | Grab Sample |
|---|---|---|---|---|
| 098FS | Lower Fence | 8/11/14 | 0.07 | Yes |
| 101FS† | Upper Fence | 8/11/14 | 6.15 | Yes |
| 101FS† | Lower Fence | 8/11/14 | 0.94 | Yes |
| 124FS† | Upper Fence | 8/11/14 | 0.07 | Yes |
| 124FS† | Lower Fence | 8/11/14 | 0.07 | Yes |
| 177FS† | Upper Fence | 8/11/14 | 0.14 | Yes |
| 183FS† | Upper Fence | 8/11/14 | 1.74 | Yes |
| 186FS | Upper Fence | 8/11/14 | 0.14 | Yes |
| 186FS | Lower Fence | 8/11/14 | 0.07 | Yes |
| 193FS | Upper Fence | 8/11/14 | 0.40 | Yes |
| 203FS | Upper Fence | 8/11/14 | 0.40 | Yes |
| 055FS | Lower Fence | 8/27/14 | 0.07 | Yes |
| 093FS | Upper Fence | 8/27/14 | 0.27 | Yes |
| 001FS | Upper Fence | 8/27/14 | 0.20 | Yes |
| 098FS | Upper Fence | 8/27/14 | 0.40 | Yes |
| 183FS | Upper Fence | 8/27/14 | 0.27 | Yes |
| 187FS | Upper Fence | 8/27/14 | 0.27 | Yes |
| 101FS† | Upper Fence | 9/15/14 | 0.80 | Yes |
| 101FS† | Lower Fence | 9/15/14 | 0.20 | Yes |
| *† Grab samples selected for lab analyses.* | | | | |

# Appendix F

# Cut and Fill Slope

# Particle Size Distribution Summary
# and
# Graphs

# 2014

## Summary of Cut Slope Particle Size Distribution from Sieve Analysis of Grab Samples, Pikes Peak 2014

| | | | Particle Size Distribution (mm)–Grab Samples 2014 | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Site Name** | **ID** | **Date** | **D15** | **D35** | **D50** | **D84** | **D95** | **D100** |
| Pikes Peak Highway - Cut Slope | 011CS - Upper Fence | 7/17/2014 | 0.012 | 0.058 | 0.185 | 2.122 | 3.485 | 6.0 |
| Pikes Peak Highway - Cut Slope | 011CS - Lower Fence | 7/17/2014 | 0.933 | 2.765 | 4.569 | 10.558 | 15.215 | 20.0 |
| Pikes Peak Highway - Cut Slope | 078CS - Lower Fence | 8/27/2014 | 0.050 | 0.725 | 1.553 | 5.006 | 7.801 | 13.0 |
| Pikes Peak Highway - Cut Slope | 087CS - Lower Fence | 6/4/2014 | 0.774 | 6.931 | 32.464 | 47.508 | 49.882 | 51.0 |
| Pikes Peak Highway - Cut Slope | 090CS - Upper Fence | 8/11/2014 | 0.017 | 0.115 | 0.492 | 2.589 | 5.187 | 12.0 |
| Pikes Peak Highway - Cut Slope | 090CS - Lower Fence | 8/11/2014 | 0.141 | 0.992 | 1.702 | 3.990 | 7.232 | 11.0 |
| Pikes Peak Highway - Cut Slope | 123CS - Upper Fence | 9/15/2014 | 0.809 | 1.873 | 2.769 | 5.887 | 10.458 | 25.0 |
| Pikes Peak Highway - Cut Slope | 192CS - Lower Fence | 5/19/2014 | 0.041 | 0.649 | 1.601 | 5.152 | 8.817 | 20.0 |
| Pikes Peak Highway - Cut Slope | 192CS - Lower Fence | 8/11/2014 | 0.042 | 0.677 | 1.570 | 6.981 | 13.975 | 19.0 |
| Pikes Peak Highway - Cut Slope | 197CS - Upper Fence | 7/17/2014 | 0.122 | 1.299 | 2.305 | 6.781 | 10.416 | 21.0 |
| Pikes Peak Highway - Cut Slope | 197CS - Lower Fence | 7/17/2014 | 1.906 | 5.476 | 8.326 | 20.445 | 28.042 | 32.0 |

## Summary of Fill Slope Particle Size Distribution from Sieve Analysis of Grab Samples, Pikes Peak 2014

| | | | Particle Size Distribution (mm)–Grab Samples 2014 | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Site Name** | **ID** | **Date** | **D15** | **D35** | **D50** | **D84** | **D95** | **D100** |
| Pikes Peak Highway - Fill Slope | 001FS - Upper Fence | 7/17/2014 | 0.039 | 0.592 | 1.160 | 3.525 | 7.085 | 12.0 |
| Pikes Peak Highway - Fill Slope | 039FS - Upper Fence | 5/19/2014 | 0.056 | 0.714 | 1.380 | 5.855 | 13.483 | 32.0 |
| Pikes Peak Highway - Fill Slope | 039FS - Lower Fence | 5/19/2014 | 0.060 | 0.726 | 1.306 | 3.668 | 7.183 | 13.0 |
| Pikes Peak Highway - Fill Slope | 043FS - Upper Fence | 8/11/2014 | 0.466 | 1.143 | 1.895 | 5.450 | 10.709 | 13.0 |
| Pikes Peak Highway - Fill Slope | 074FS - Upper Fence | 6/4/2014 | 0.239 | 1.312 | 2.328 | 6.290 | 19.800 | 28.0 |
| Pikes Peak Highway - Fill Slope | 079FS - Upper Fence | 7/8/2014 | 0.102 | 0.919 | 1.777 | 6.740 | 13.377 | 20.0 |
| Pikes Peak Highway - Fill Slope | 101FS - Upper Fence | 6/17/2014 | 1.303 | 2.570 | 3.287 | 7.481 | 11.020 | 18.0 |
| Pikes Peak Highway - Fill Slope | 101FS - Upper Fence | 8/11/2014 | 1.036 | 2.684 | 3.803 | 10.950 | 21.869 | 28.0 |
| Pikes Peak Highway - Fill Slope | 101FS - Lower Fence | 8/11/2014 | 2.158 | 3.641 | 6.075 | 24.446 | 32.983 | 34.0 |
| Pikes Peak Highway - Fill Slope | 101FS - Upper Fence | 9/15/2014 | 1.471 | 5.540 | 9.367 | 19.728 | 23.012 | 24.0 |
| Pikes Peak Highway - Fill Slope | 101FS - Lower Fence | 9/15/2014 | 1.225 | 3.791 | 5.381 | 21.430 | 27.899 | 31.0 |
| Pikes Peak Highway - Fill Slope | 124FS - Upper Fence | 8/11/2014 | 0.980 | 2.544 | 3.466 | 12.626 | 34.408 | 38.0 |
| Pikes Peak Highway - Fill Slope | 124FS - Lower Fence | 8/11/2014 | 1.867 | 3.313 | 4.351 | 8.753 | 17.936 | 30.0 |
| Pikes Peak Highway - Fill Slope | 128FS - Upper Fence | 6/17/2014 | 1.364 | 3.368 | 5.110 | 10.499 | 15.103 | 21.0 |
| Pikes Peak Highway - Fill Slope | 177FS - Upper Fence | 8/11/2014 | 0.543 | 1.520 | 3.063 | 12.867 | 23.687 | 26.0 |
| Pikes Peak Highway - Fill Slope | 183FS - Upper Fence | 8/11/2014 | 0.123 | 0.910 | 1.552 | 4.607 | 7.941 | 21.0 |
| Pikes Peak Highway - Fill Slope | 198FS - Upper Fence | 7/17/2014 | 0.250 | 1.171 | 2.098 | 4.938 | 7.235 | 14.0 |
| Pikes Peak Highway - Fill Slope | 204FS - Upper Fence | 5/19/2014 | 0.028 | 0.400 | 0.921 | 3.258 | 6.154 | 15.0 |

**Sieve Analysis Worksheet**

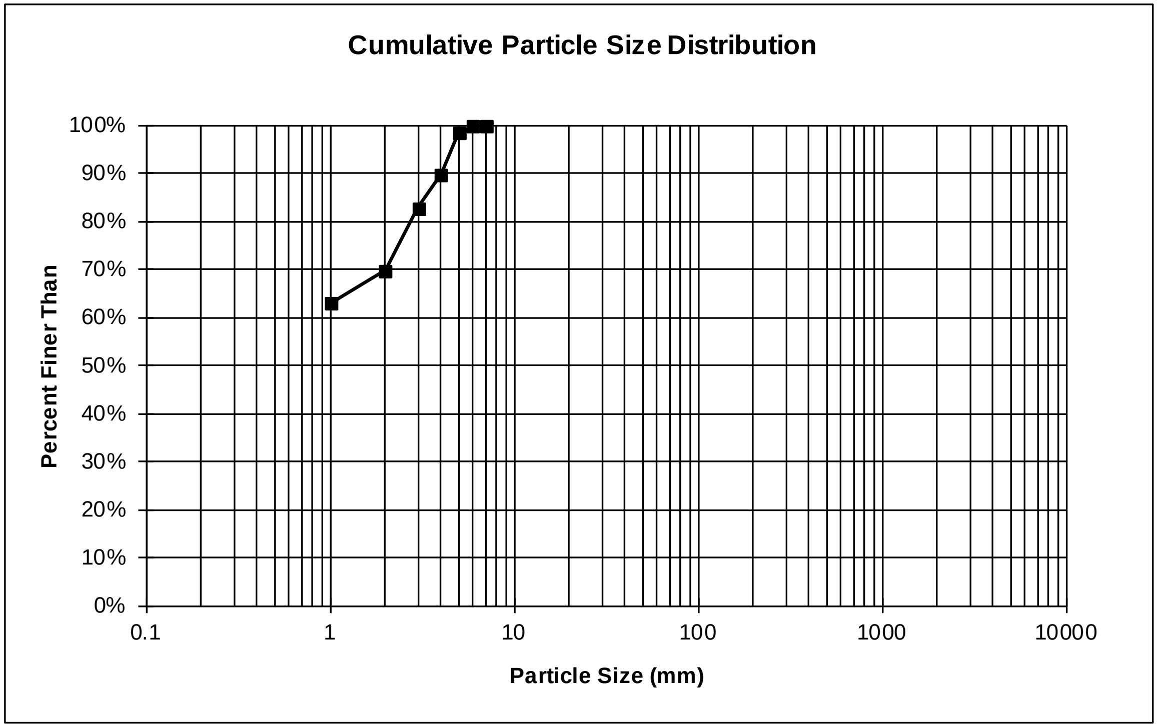
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 374.60 | 62.9% | |
| 0.5 | 40.90 | 6.9% | 62.9% |
| 1.0 | 77.40 | 13.0% | 69.8% |
| 2.0 | 41.70 | 7.0% | 82.8% |
| 2.8 | 50.70 | 8.5% | 89.8% |
| 4.0 | 8.20 | 1.4% | 98.3% |
| 5.6 | 2.00 | 0.3% | 99.7% |
| 6.0 | * | | 100.0% |
| 11.2 | | | - |
| 16.0 | | | |
| 22.4 | | | |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 595.50 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 011CS - Upper Fence
DATE: 7/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.012** | **0.058** | **0.185** | **2.122** | **3.485** | **6.0** |



**Sieve Analysis Worksheet**

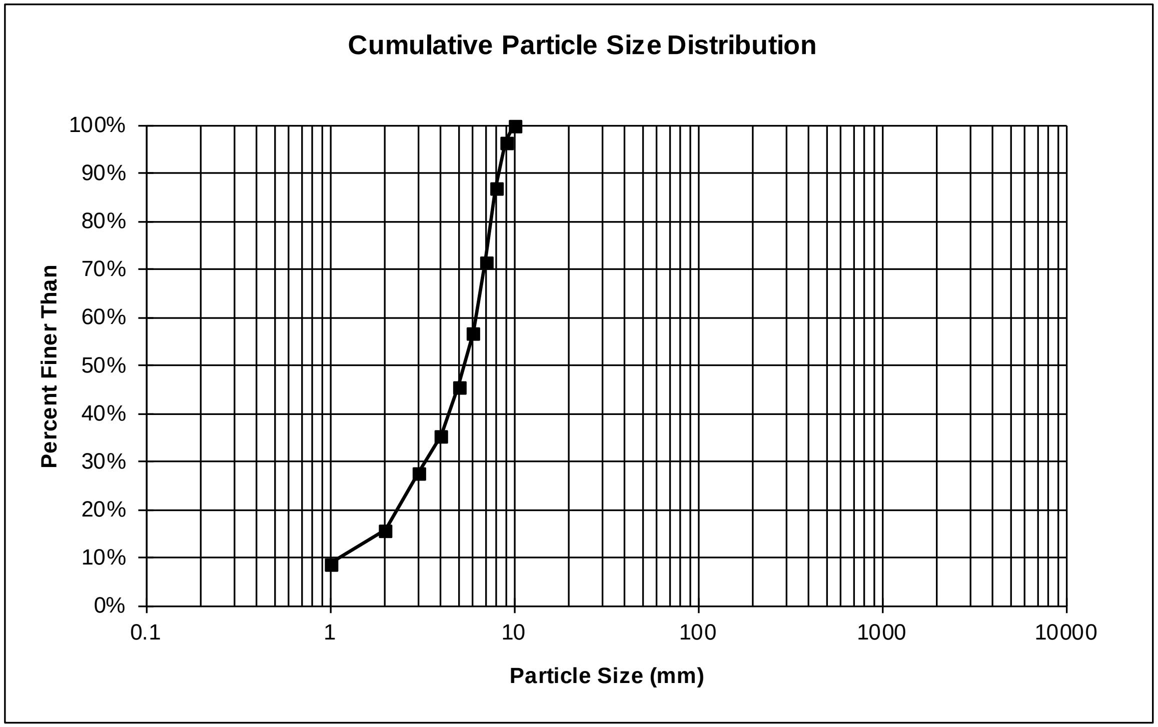
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 57.50 | 8.7% | |
| 0.5 | 46.70 | 7.0% | 8.7% |
| 1.0 | 77.70 | 11.7% | 15.7% |
| 2.0 | 52.20 | 7.9% | 27.4% |
| 2.8 | 68.40 | 10.3% | 35.3% |
| 4.0 | 73.70 | 11.1% | 45.6% |
| 5.6 | 97.60 | 14.7% | 56.7% |
| 8.0 | 101.10 | 15.2% | 71.4% |
| 11.2 | 64.30 | 9.7% | 86.7% |
| 16.0 | 24.10 | 3.6% | 96.4% |
| 20.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 663.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 011CS - Lower Fence
DATE: 7/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.933 | 2.765 | 4.569 | 10.558 | 15.215 | 20.0 |



**Sieve Analysis Worksheet**

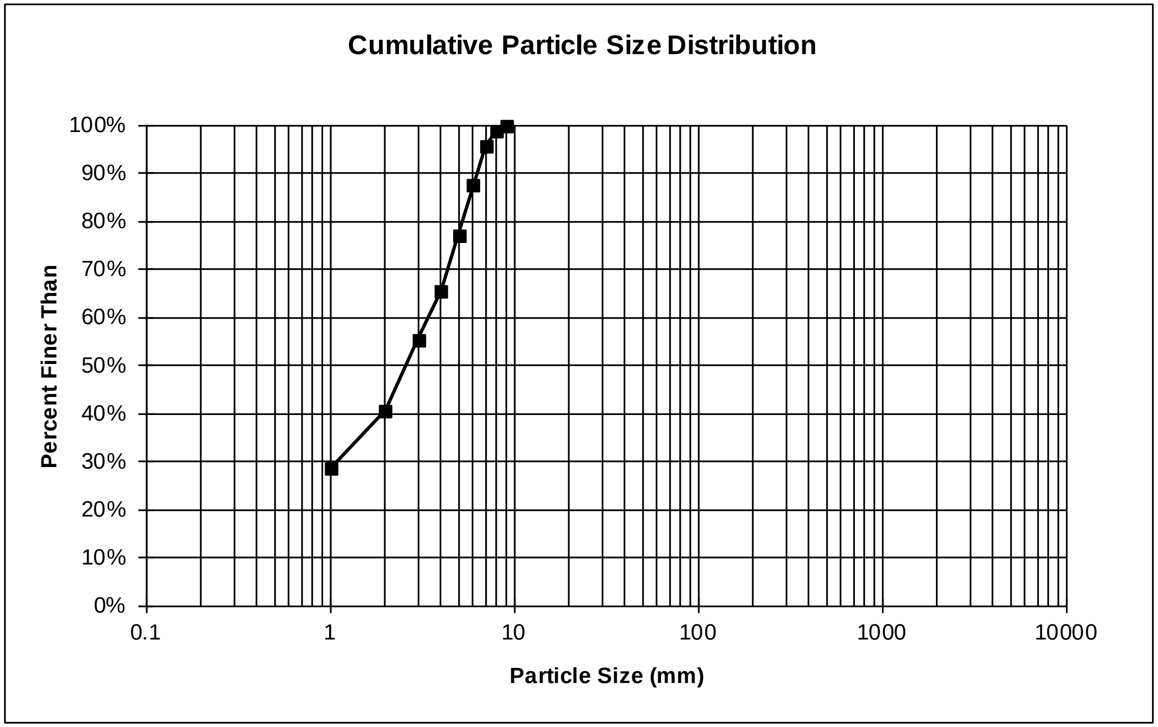
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 146.50 | 28.6% | |
| 0.5 | 61.50 | 12.0% | 28.6% |
| 1.0 | 76.10 | 14.8% | 40.6% |
| 2.0 | 52.30 | 10.2% | 55.4% |
| 2.8 | 58.80 | 11.5% | 65.6% |
| 4.0 | 53.20 | 10.4% | 77.1% |
| 5.6 | 41.60 | 8.1% | 87.5% |
| 8.0 | 16.30 | 3.2% | 95.6% |
| 11.2 | 6.40 | 1.2% | 98.8% |
| 13.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 512.70 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 078CS - Lower Fence
DATE: 8/27/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.050 | 0.725 | 1.553 | 5.006 | 7.801 | 13.0 |



**Sieve Analysis Worksheet**

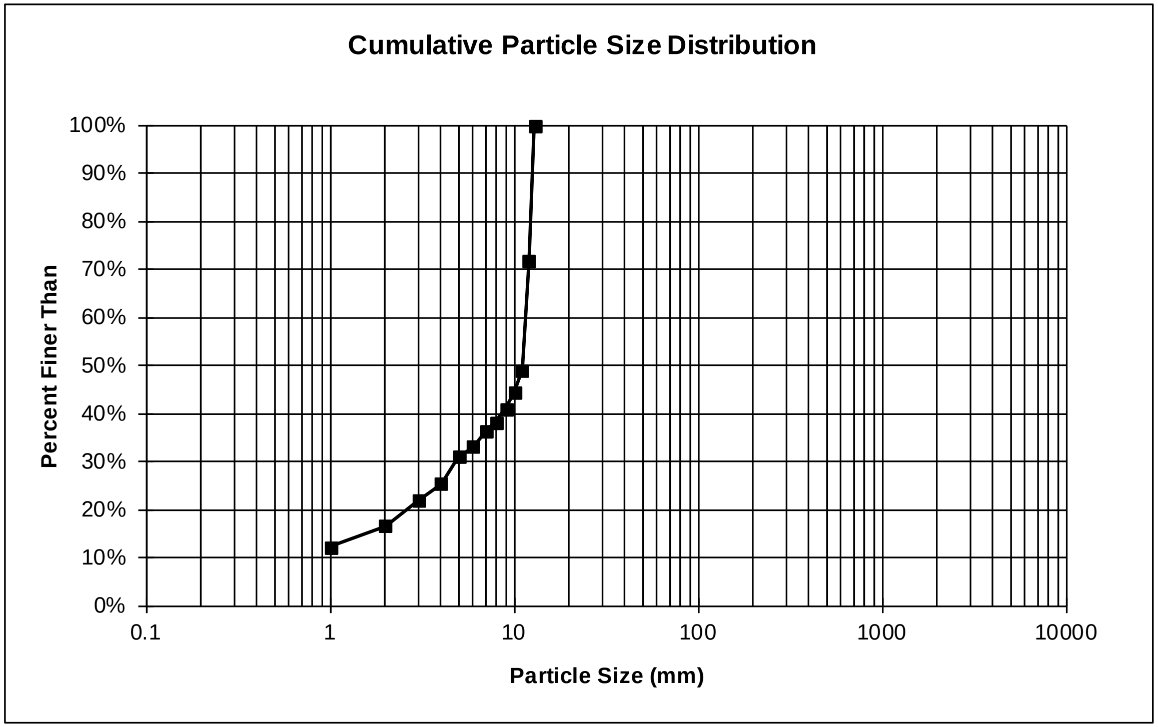
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 105.20 | 12.2% | |
| 0.5 | 37.70 | 4.4% | 12.2% |
| 1.0 | 45.60 | 5.3% | 16.6% |
| 2.0 | 29.80 | 3.5% | 21.9% |
| 2.8 | 47.90 | 5.6% | 25.4% |
| 4.0 | 18.80 | 2.2% | 31.0% |
| 5.6 | 26.70 | 3.1% | 33.1% |
| 8.0 | 17.10 | 2.0% | 36.2% |
| 11.2 | 24.20 | 2.8% | 38.2% |
| 16.0 | 27.30 | 3.2% | 41.1% |
| 22.4 | 41.40 | 4.8% | 44.2% |
| 32.0 | 195.40 | 22.7% | 49.0% |
| 45.0 | 242.80 | 28.2% | 71.8% |
| 51.0 | * | | 100.0% |
| 90 | | | - |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 859.90 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 087CS - Lower Fence
DATE: 6/4/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.774** | **6.931** | **32.464** | **47.508** | **49.882** | **51.0** |



**Sieve Analysis Worksheet**

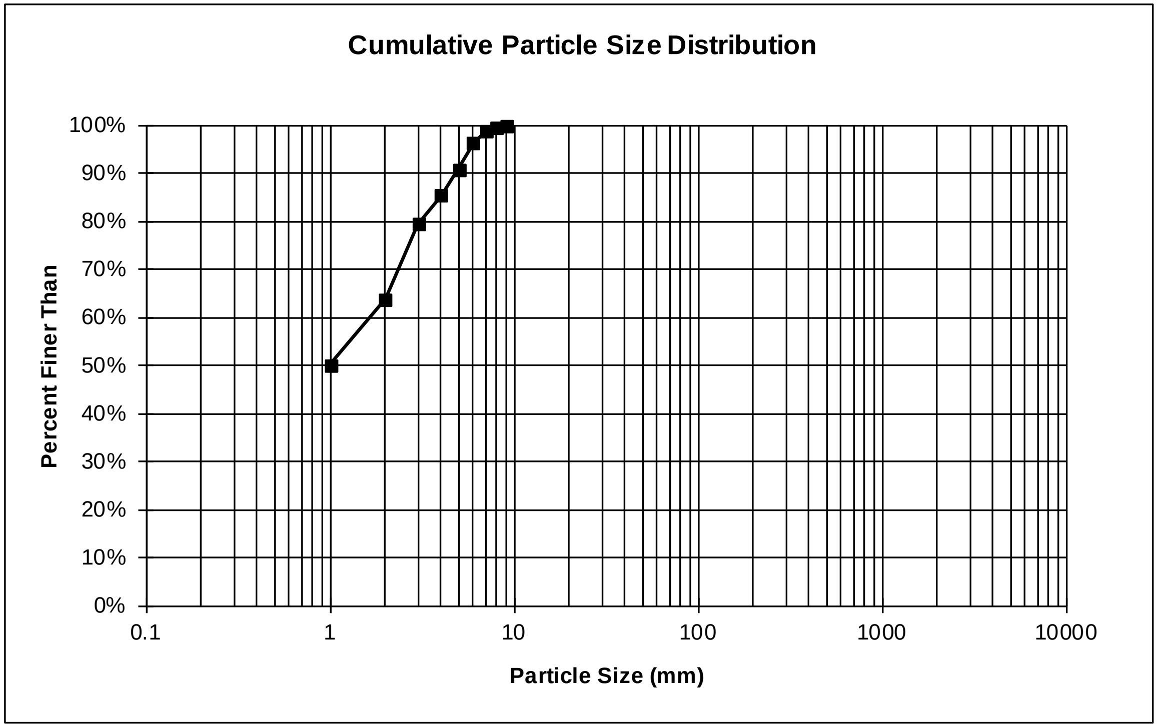
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 395.80 | 50.2% | |
| 0.5 | 107.10 | 13.6% | 50.2% |
| 1.0 | 124.10 | 15.7% | 63.7% |
| 2.0 | 46.70 | 5.9% | 79.5% |
| 2.8 | 42.20 | 5.3% | 85.4% |
| 4.0 | 43.70 | 5.5% | 90.7% |
| 5.6 | 18.50 | 2.3% | 96.3% |
| 8.0 | 8.20 | 1.0% | 98.6% |
| 11.2 | 2.80 | 0.4% | 99.6% |
| 12.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 789.10 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 090CS - Upper Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.017 | 0.115 | 0.492 | 2.589 | 5.187 | 12.0 |



**Sieve Analysis Worksheet**

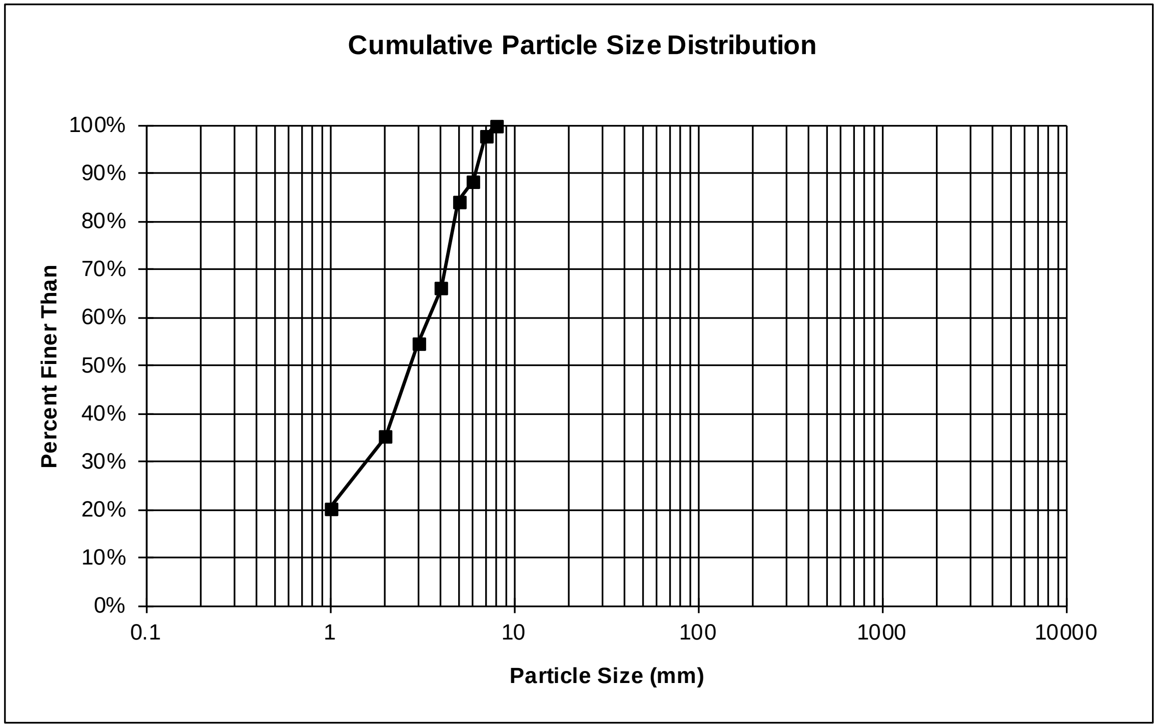
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 108.50 | 20.3% | |
| 0.5 | 79.60 | 14.9% | 20.3% |
| 1.0 | 103.40 | 19.3% | 35.2% |
| 2.0 | 62.00 | 11.6% | 54.5% |
| 2.8 | 96.40 | 18.0% | 66.1% |
| 4.0 | 22.30 | 4.2% | 84.1% |
| 5.6 | 50.00 | 9.3% | 88.3% |
| 8.0 | 12.60 | 2.4% | 97.6% |
| 11.0 | * | | 100.0% |
| 16.0 | | | - |
| 22.4 | | | |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 534.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 090CS - Lower Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.141** | **0.992** | **1.702** | **3.990** | **7.232** | **11.0** |



**Sieve Analysis Worksheet**

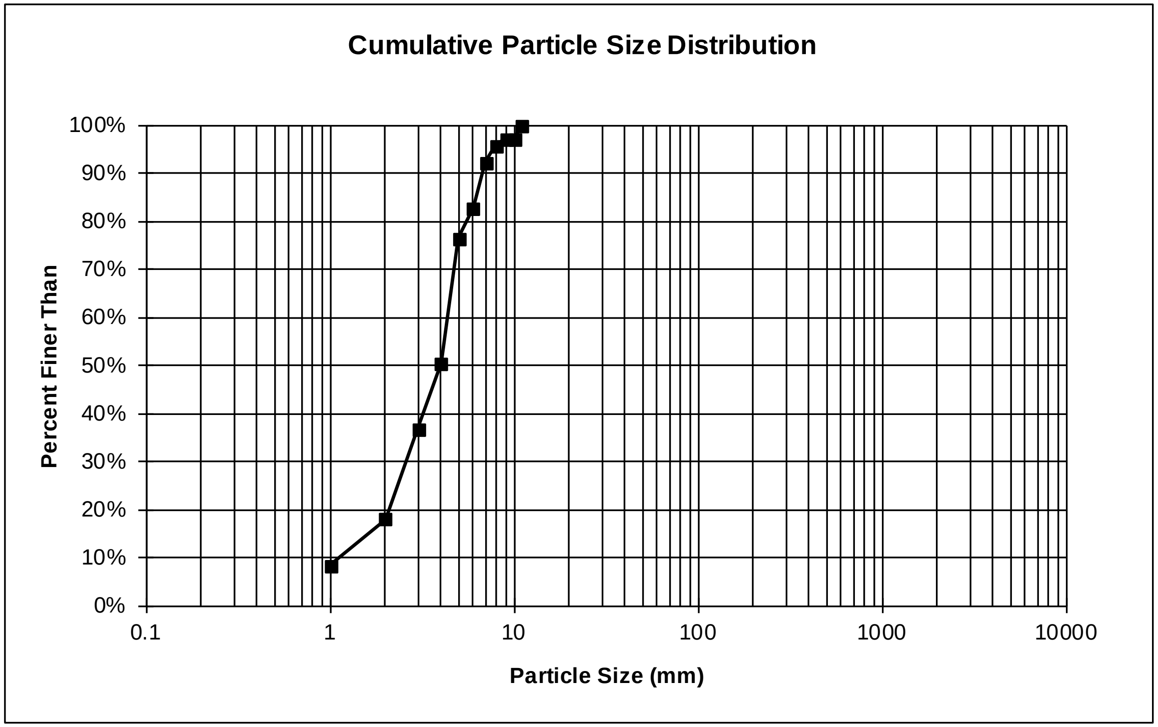
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 64.00 | 8.4% | |
| 0.5 | 72.20 | 9.5% | 8.4% |
| 1.0 | 143.50 | 18.9% | 17.9% |
| 2.0 | 103.90 | 13.7% | 36.8% |
| 2.8 | 197.30 | 25.9% | 50.4% |
| 4.0 | 47.60 | 6.3% | 76.4% |
| 5.6 | 73.10 | 9.6% | 82.7% |
| 8.0 | 26.10 | 3.4% | 92.3% |
| 11.2 | 10.30 | 1.4% | 95.7% |
| 16.0 | 0.00 | 0.0% | 97.1% |
| 22.4 | 22.40 | 2.9% | 97.1% |
| 25.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 760.40 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 123CS - Upper Fence
DATE: 9/15/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.809 | 1.873 | 2.769 | 5.887 | 10.458 | 25.0 |



**Sieve Analysis Worksheet**

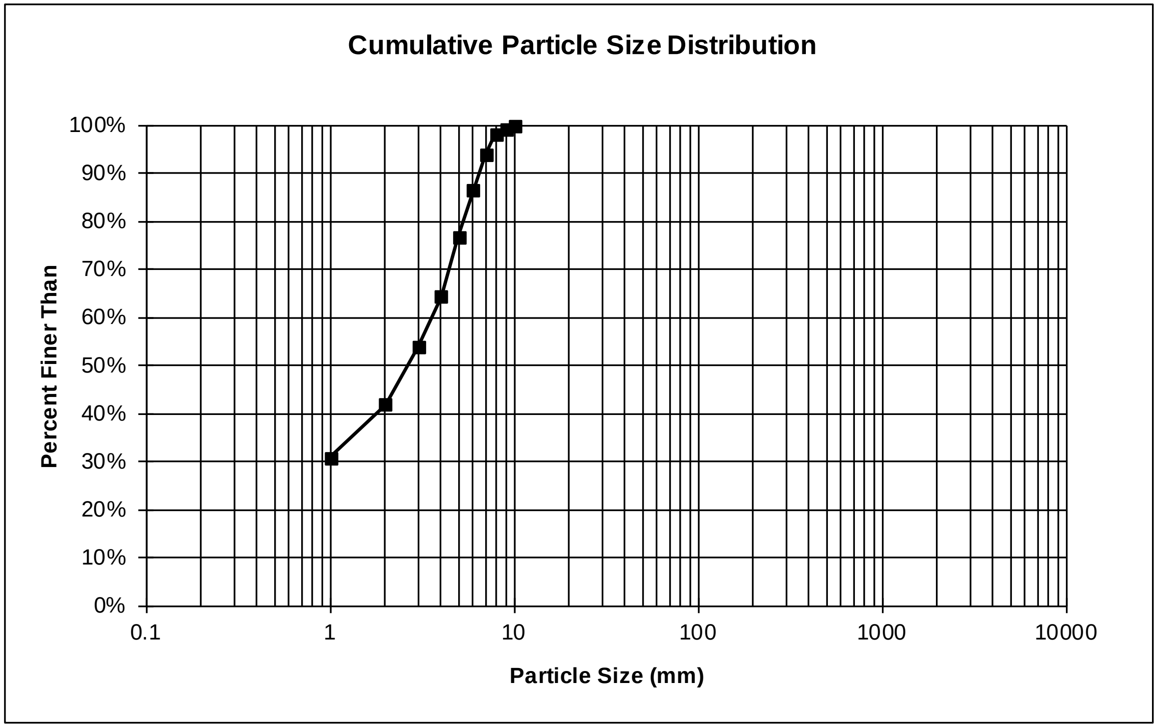
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 205.50 | 30.8% | |
| 0.5 | 73.80 | 11.1% | 30.8% |
| 1.0 | 79.40 | 11.9% | 41.9% |
| 2.0 | 70.00 | 10.5% | 53.8% |
| 2.8 | 83.10 | 12.5% | 64.3% |
| 4.0 | 63.80 | 9.6% | 76.8% |
| 5.6 | 48.90 | 7.3% | 86.4% |
| 8.0 | 29.70 | 4.5% | 93.7% |
| 11.2 | 6.30 | 0.9% | 98.2% |
| 16.0 | 5.90 | 0.9% | 99.1% |
| 20.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 666.40 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 192CS - Lower Fence
DATE: 5/19/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.041 | 0.649 | 1.601 | 5.152 | 8.817 | 20.0 |



**Sieve Analysis Worksheet**

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 205.30 | 30.7% | |
| 0.5 | 65.40 | 9.8% | 30.7% |
| 1.0 | 97.50 | 14.6% | 40.5% |
| 2.0 | 46.60 | 7.0% | 55.1% |
| 2.8 | 53.60 | 8.0% | 62.1% |
| 4.0 | 58.30 | 8.7% | 70.1% |
| 5.6 | 56.10 | 8.4% | 78.8% |
| 8.0 | 35.70 | 5.3% | 87.2% |
| 11.2 | 26.40 | 4.0% | 92.5% |
| 16.0 | 23.40 | 3.5% | 96.5% |
| 19.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 668.30 | | |

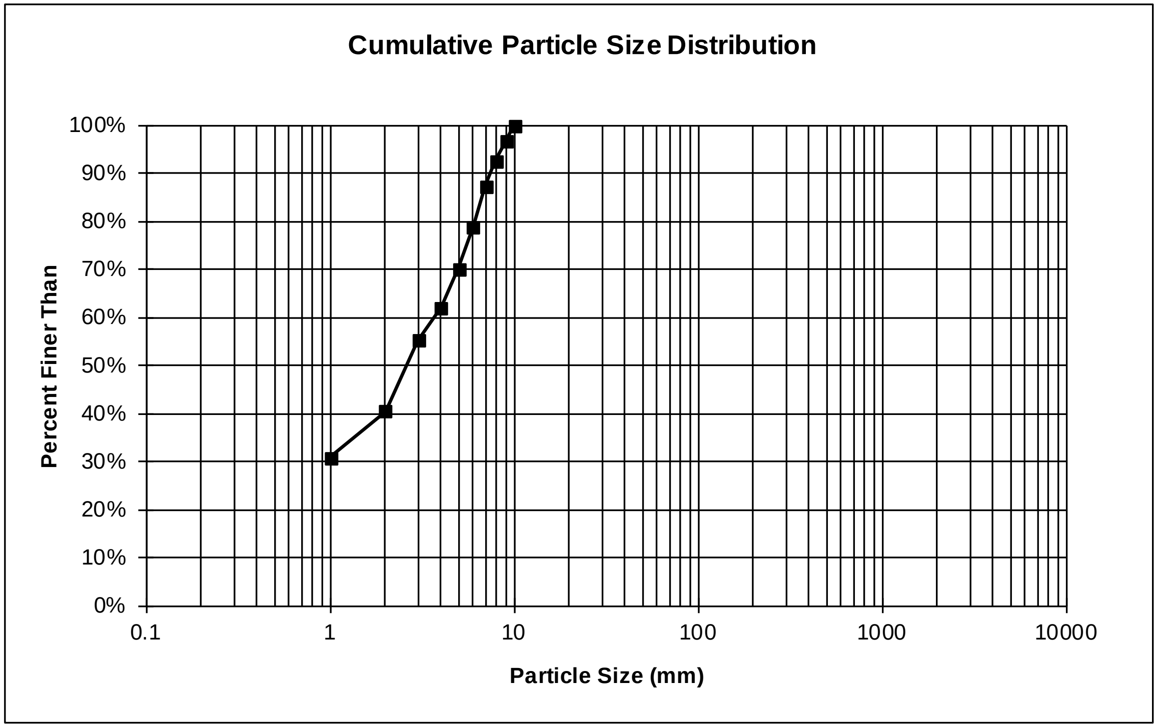
*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 192CS - Lower Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

**Particle Size Distribution (mm)**

| D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|
| 0.042 | 0.677 | 1.570 | 6.981 | 13.975 | 19.0 |



**Sieve Analysis Worksheet**

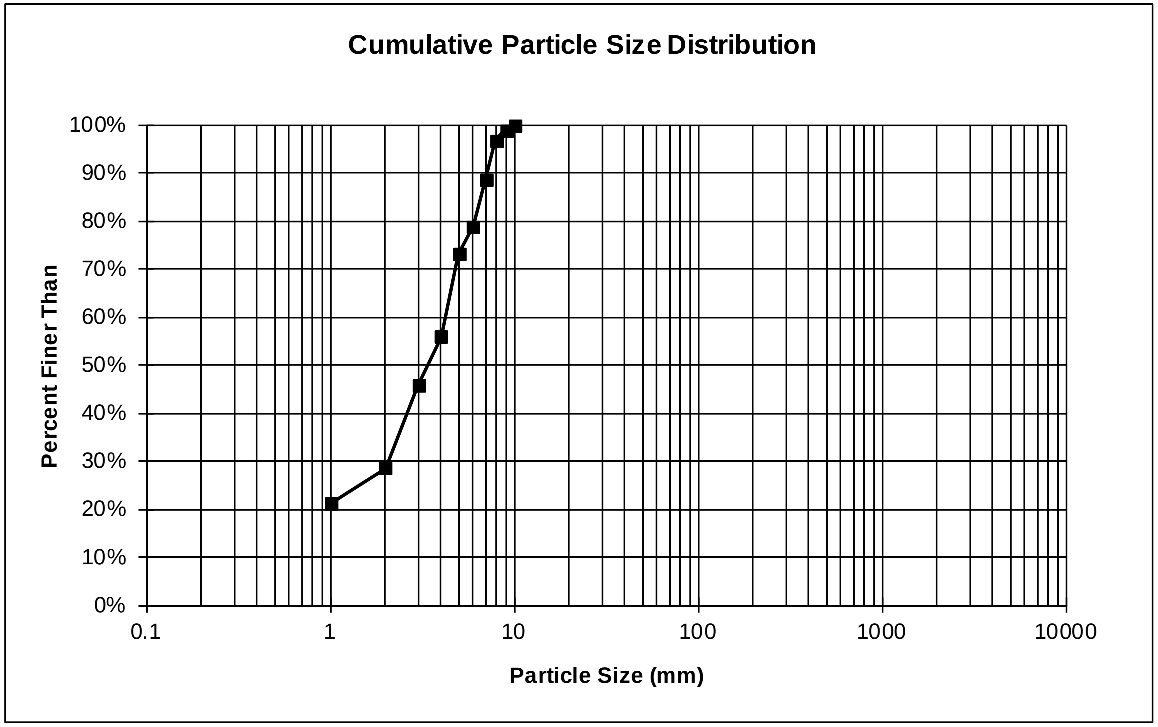
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 121.60 | 21.1% | |
| 0.5 | 42.30 | 7.4% | 21.1% |
| 1.0 | 99.40 | 17.3% | 28.5% |
| 2.0 | 57.80 | 10.0% | 45.8% |
| 2.8 | 99.50 | 17.3% | 55.8% |
| 4.0 | 32.70 | 5.7% | 73.1% |
| 5.6 | 56.00 | 9.7% | 78.8% |
| 8.0 | 47.60 | 8.3% | 88.5% |
| 11.2 | 11.70 | 2.0% | 96.8% |
| 16.0 | 6.80 | 1.2% | 98.8% |
| 21.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 575.40 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 197CS - Upper Fence
DATE: 7/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.122 | 1.299 | 2.305 | 6.781 | 10.416 | 21.0 |



**Sieve Analysis Worksheet**

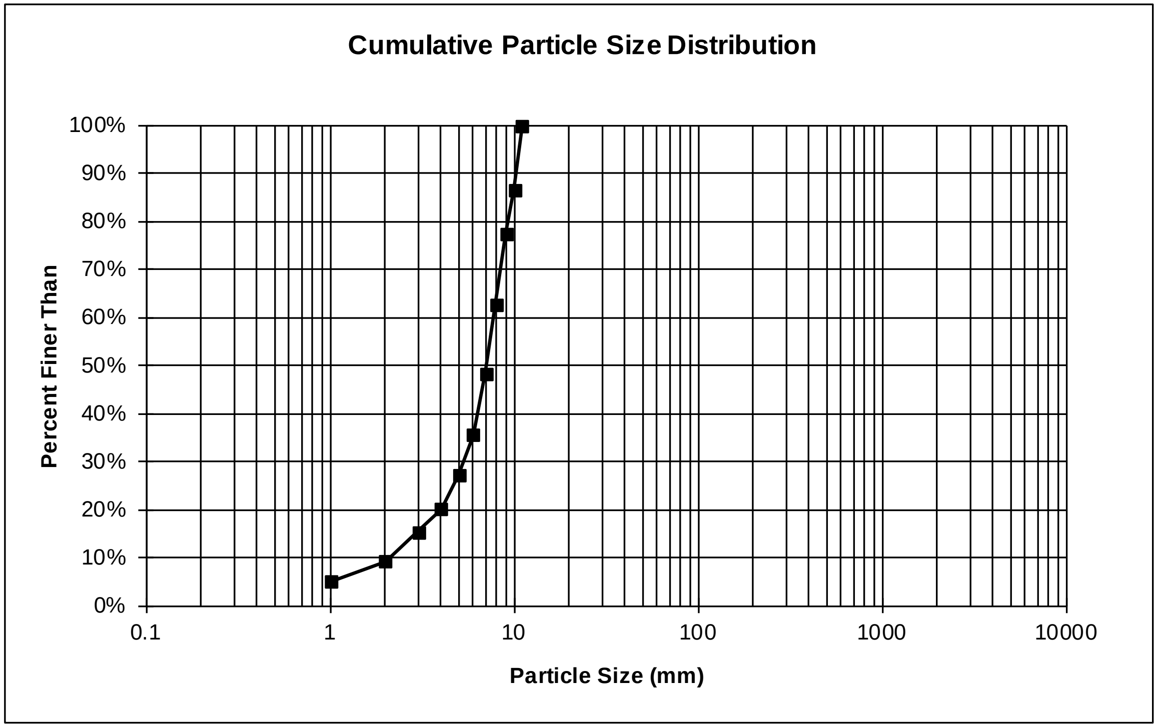
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 36.90 | 5.0% | |
| 0.5 | 30.60 | 4.2% | 5.0% |
| 1.0 | 46.20 | 6.3% | 9.2% |
| 2.0 | 34.50 | 4.7% | 15.4% |
| 2.8 | 51.50 | 7.0% | 20.1% |
| 4.0 | 62.30 | 8.5% | 27.1% |
| 5.6 | 93.80 | 12.7% | 35.6% |
| 8.0 | 105.70 | 14.3% | 48.3% |
| 11.2 | 108.00 | 14.7% | 62.6% |
| 16.0 | 67.70 | 9.2% | 77.3% |
| 22.4 | 99.50 | 13.5% | 86.5% |
| 32.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 736.70 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway Cut Slope
ID NUMBER: 197CS - Lower Fence
DATE: 7/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **1.906** | **5.476** | **8.326** | **20.445** | **28.042** | **32.0** |



**Sieve Analysis Worksheet**

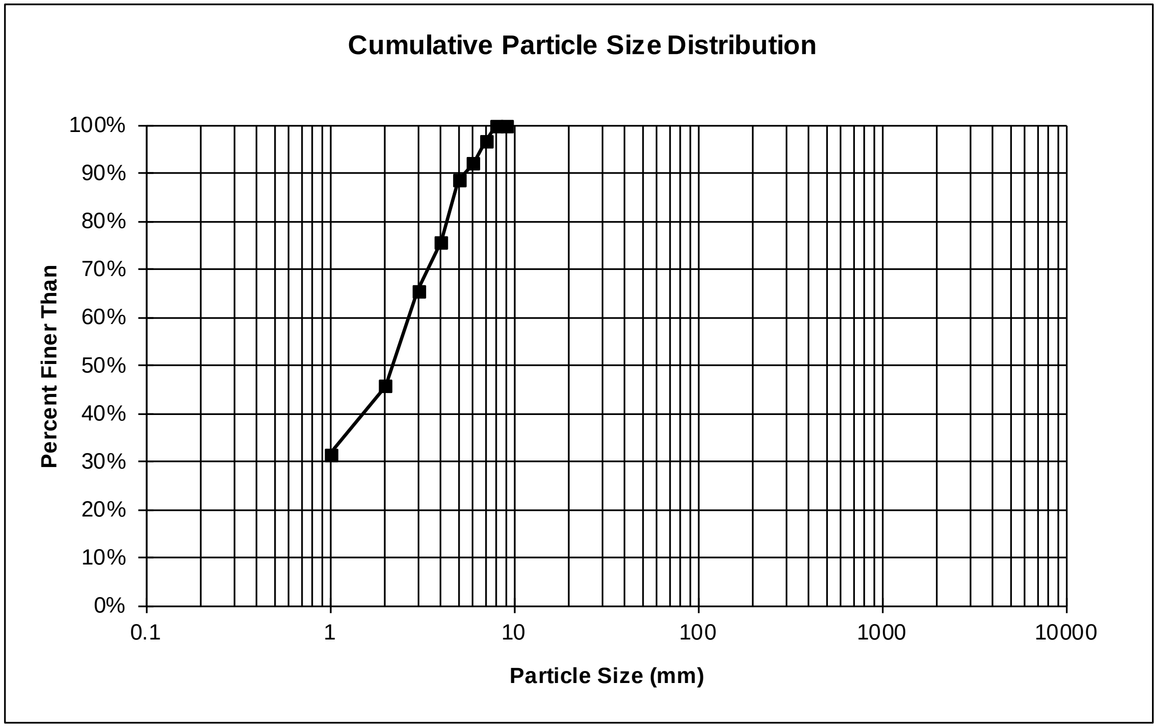
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 219.60 | 31.5% | |
| 0.5 | 99.20 | 14.2% | 31.5% |
| 1.0 | 137.90 | 19.8% | 45.8% |
| 2.0 | 70.90 | 10.2% | 65.6% |
| 2.8 | 89.00 | 12.8% | 75.8% |
| 4.0 | 24.30 | 3.5% | 88.5% |
| 5.6 | 31.50 | 4.5% | 92.0% |
| 8.0 | 22.20 | 3.2% | 96.5% |
| 11.2 | 1.90 | 0.3% | 99.7% |
| 12.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 696.50 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 001FS - Upper Fence
DATE: 7/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.039 | 0.592 | 1.160 | 3.525 | 7.085 | 12.0 |



**Sieve Analysis Worksheet**

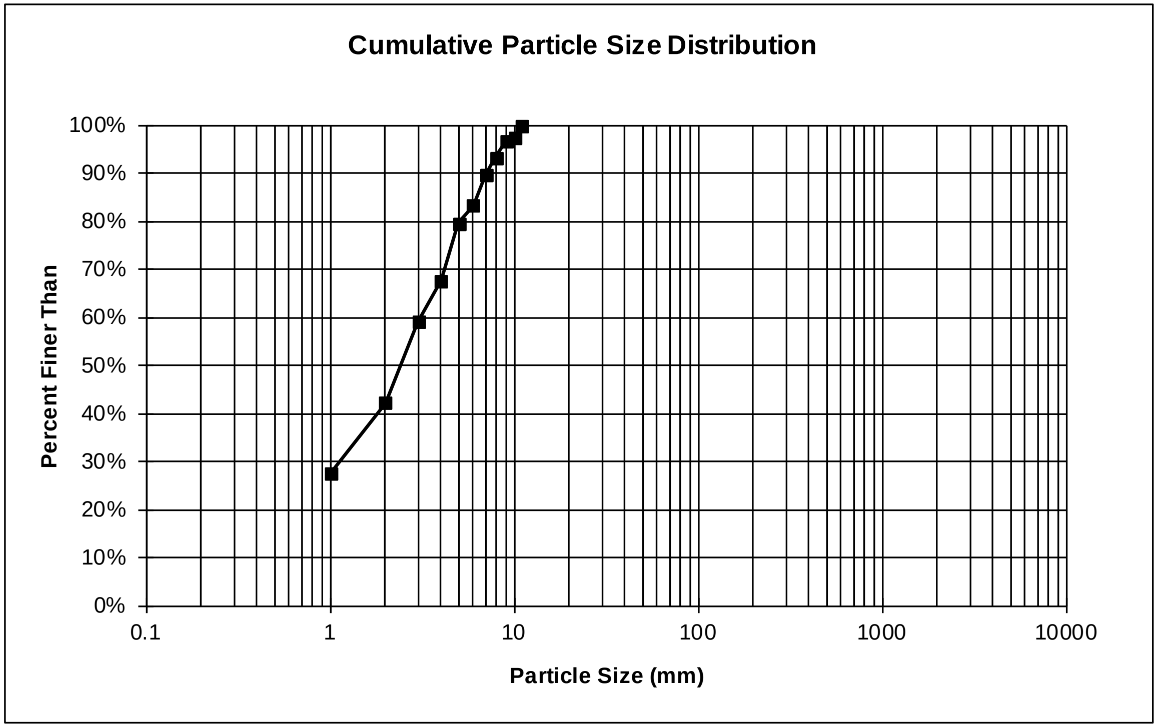
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 220.90 | 27.4% | |
| 0.5 | 118.70 | 14.7% | 27.4% |
| 1.0 | 136.20 | 16.9% | 42.1% |
| 2.0 | 68.90 | 8.6% | 59.0% |
| 2.8 | 97.10 | 12.1% | 67.6% |
| 4.0 | 28.70 | 3.6% | 79.6% |
| 5.6 | 51.00 | 6.3% | 83.2% |
| 8.0 | 29.50 | 3.7% | 89.5% |
| 11.2 | 27.90 | 3.5% | 93.2% |
| 16.0 | 7.00 | 0.9% | 96.7% |
| 22.4 | 19.90 | 2.5% | 97.5% |
| 32.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 805.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 039FS - Upper Fence
DATE: 5/19/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.056 | 0.714 | 1.380 | 5.855 | 13.483 | 32.0 |



**Sieve Analysis Worksheet**

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 203.60 | 26.6% | |
| 0.5 | 118.50 | 15.5% | 26.6% |
| 1.0 | 155.70 | 20.4% | 42.2% |
| 2.0 | 83.70 | 11.0% | 62.5% |
| 2.8 | 106.10 | 13.9% | 73.5% |
| 4.0 | 26.60 | 3.5% | 87.4% |
| 5.6 | 45.40 | 5.9% | 90.9% |
| 8.0 | 21.80 | 2.9% | 96.8% |
| 11.2 | 2.70 | 0.4% | 99.6% |
| 13.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 764.10 | | |

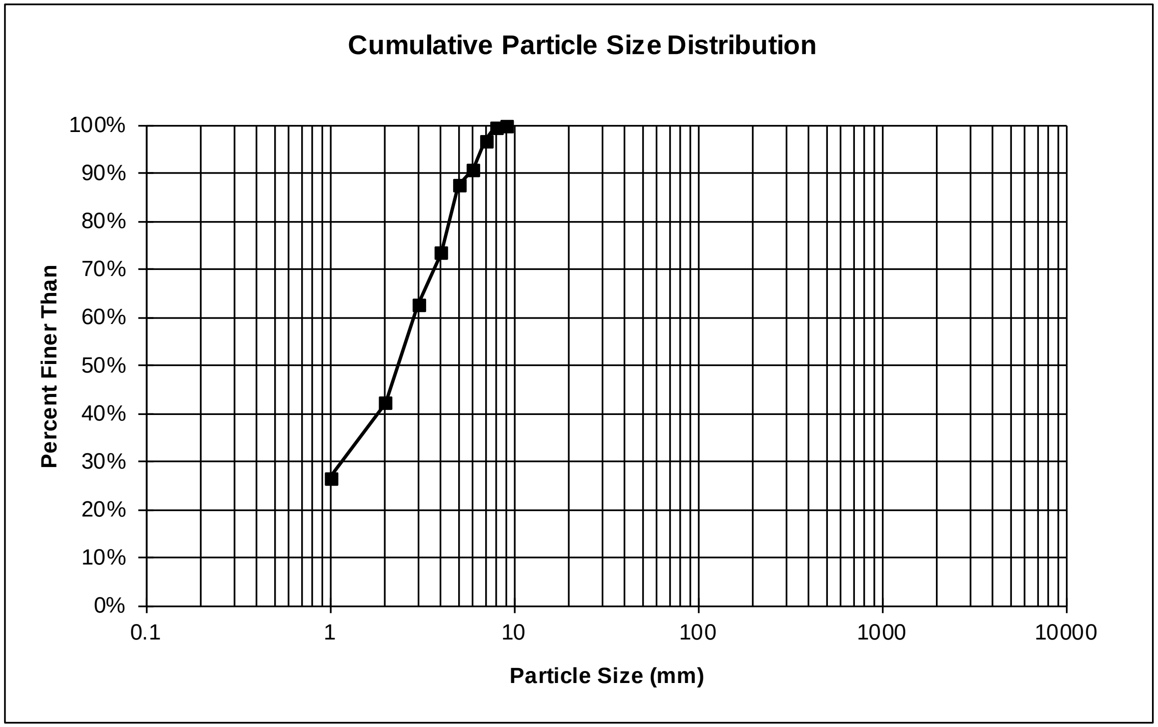
*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 039FS - Lower Fence
DATE: 5/19/2014
CREW: Karlsson, VonLoh

**Particle Size Distribution (mm)**

| D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|
| 0.060 | 0.726 | 1.306 | 3.668 | 7.183 | 13.0 |



**Sieve Analysis Worksheet**

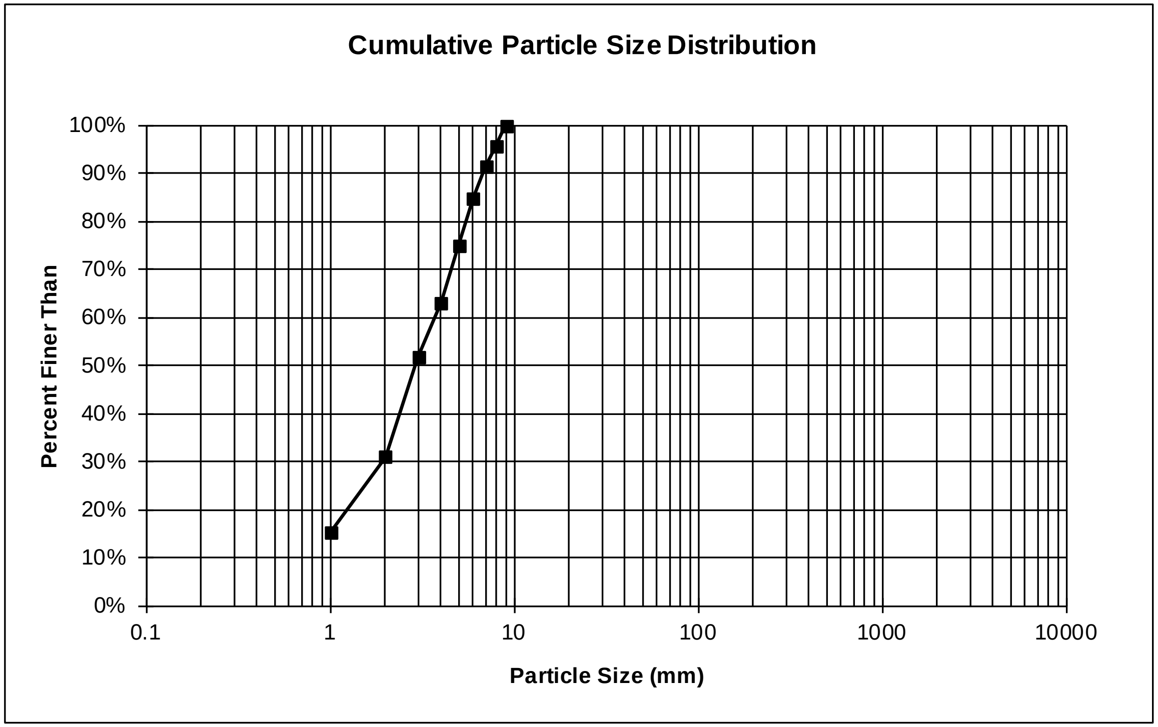
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 129.90 | 15.2% | |
| 0.5 | 134.90 | 15.8% | 15.2% |
| 1.0 | 175.60 | 20.6% | 31.0% |
| 2.0 | 98.50 | 11.5% | 51.6% |
| 2.8 | 99.10 | 11.6% | 63.1% |
| 4.0 | 85.80 | 10.1% | 74.8% |
| 5.6 | 55.90 | 6.6% | 84.8% |
| 8.0 | 35.80 | 4.2% | 91.4% |
| 11.2 | 37.90 | 4.4% | 95.6% |
| 13.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 853.40 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 043FS - Upper Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.466 | 1.143 | 1.895 | 5.450 | 10.709 | 13.0 |



**Sieve Analysis Worksheet**

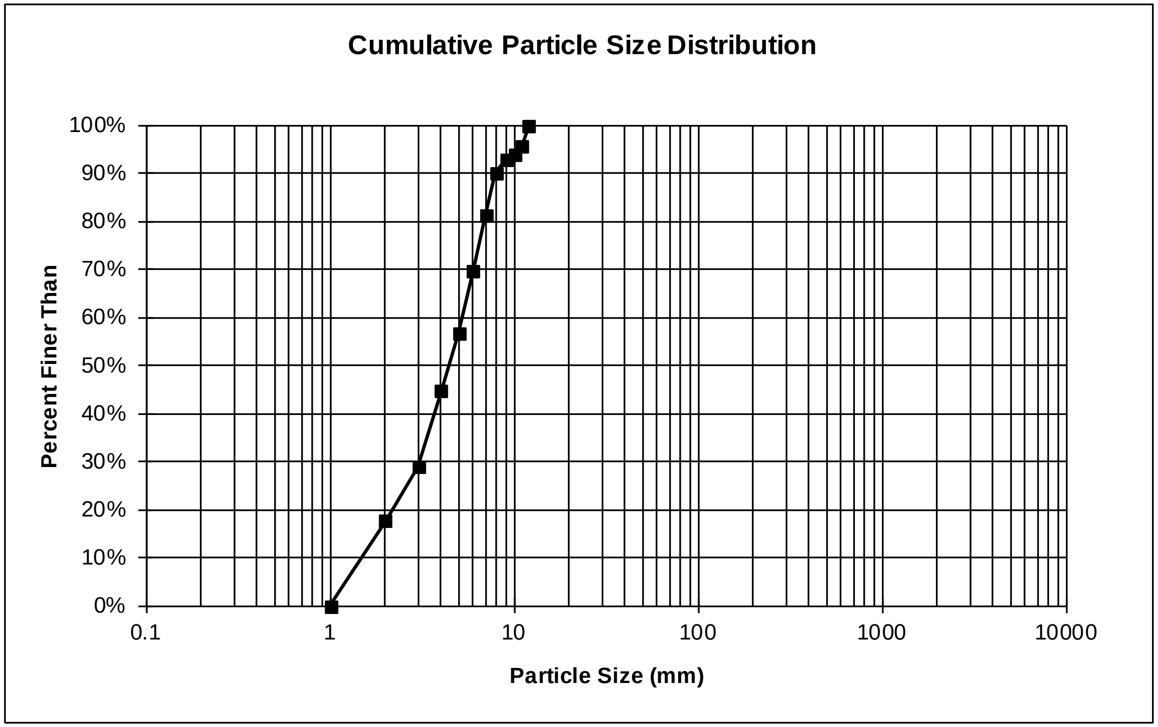
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 133.40 | 17.7% | |
| 0.5 | 83.70 | 11.1% | 17.7% |
| 1.0 | 119.40 | 15.8% | 28.8% |
| 2.0 | 89.40 | 11.9% | 44.6% |
| 2.8 | 99.70 | 13.2% | 56.5% |
| 4.0 | 85.60 | 11.4% | 69.7% |
| 5.6 | 67.50 | 9.0% | 81.1% |
| 8.0 | 19.60 | 2.6% | 90.0% |
| 11.2 | 8.50 | 1.1% | 92.6% |
| 16.0 | 14.70 | 2.0% | 93.8% |
| 22.4 | 32.30 | 4.3% | 95.7% |
| 28.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 753.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 074FS - Upper Fence
DATE: 6/4/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.239 | 1.312 | 2.328 | 6.290 | 19.800 | 28.0 |



**Sieve Analysis Worksheet**

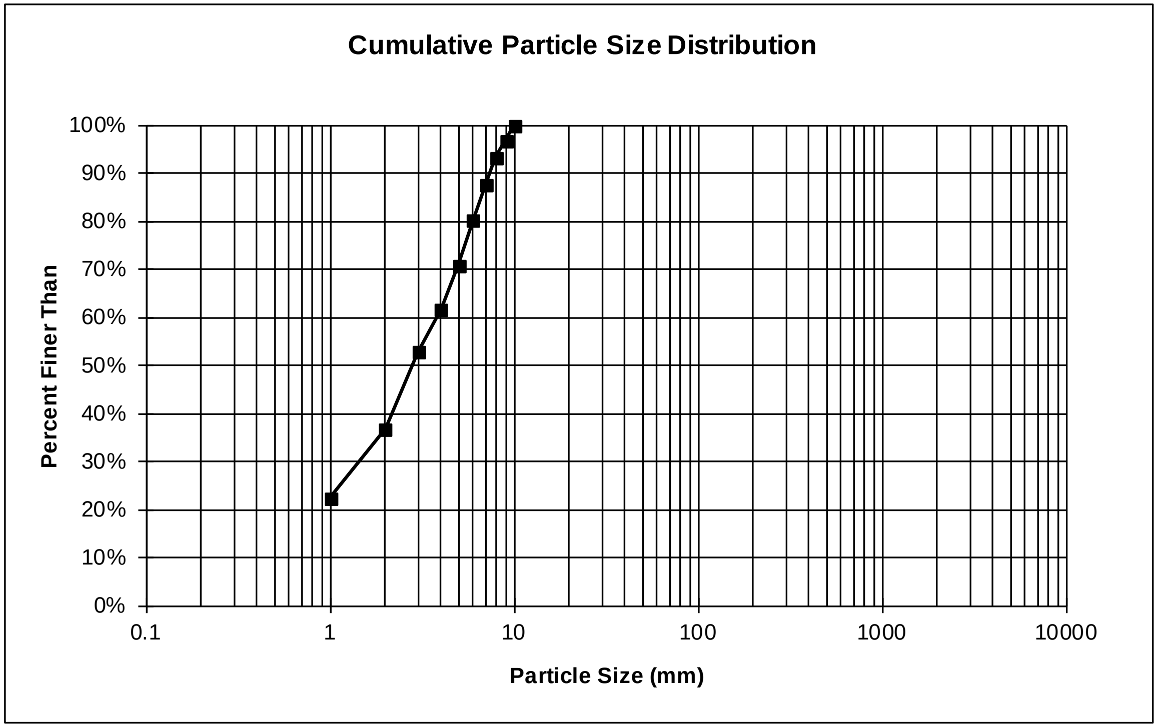
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 180.20 | 22.3% | |
| 0.5 | 116.80 | 14.5% | 22.3% |
| 1.0 | 129.00 | 16.0% | 36.8% |
| 2.0 | 73.00 | 9.0% | 52.7% |
| 2.8 | 73.20 | 9.1% | 61.7% |
| 4.0 | 75.90 | 9.4% | 70.8% |
| 5.6 | 59.10 | 7.3% | 80.2% |
| 8.0 | 46.70 | 5.8% | 87.5% |
| 11.2 | 27.70 | 3.4% | 93.3% |
| 16.0 | 26.50 | 3.3% | 96.7% |
| 20.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 808.10 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 079FS - Upper Fence
DATE: 7/8/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.102 | 0.919 | 1.777 | 6.740 | 13.377 | 20.0 |



**Sieve Analysis Worksheet**

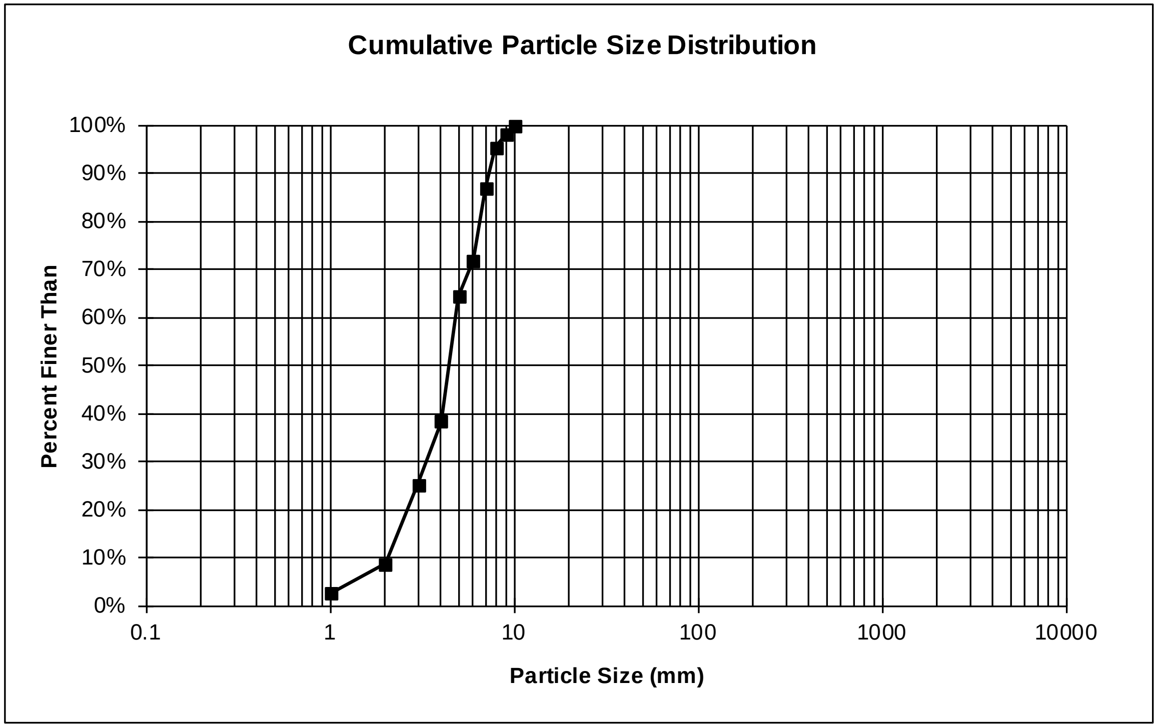
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 21.60 | 2.5% | |
| 0.5 | 53.50 | 6.2% | 2.5% |
| 1.0 | 140.90 | 16.4% | 8.7% |
| 2.0 | 113.60 | 13.2% | 25.1% |
| 2.8 | 222.50 | 25.9% | 38.4% |
| 4.0 | 64.80 | 7.5% | 64.3% |
| 5.6 | 129.00 | 15.0% | 71.8% |
| 8.0 | 73.80 | 8.6% | 86.8% |
| 11.2 | 22.10 | 2.6% | 95.4% |
| 16.0 | 17.30 | 2.0% | 98.0% |
| 18.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 859.10 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 101FS - Upper Fence
DATE: 6/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.303 | 2.570 | 3.287 | 7.481 | 11.020 | 18.0 |



**Sieve Analysis Worksheet**

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

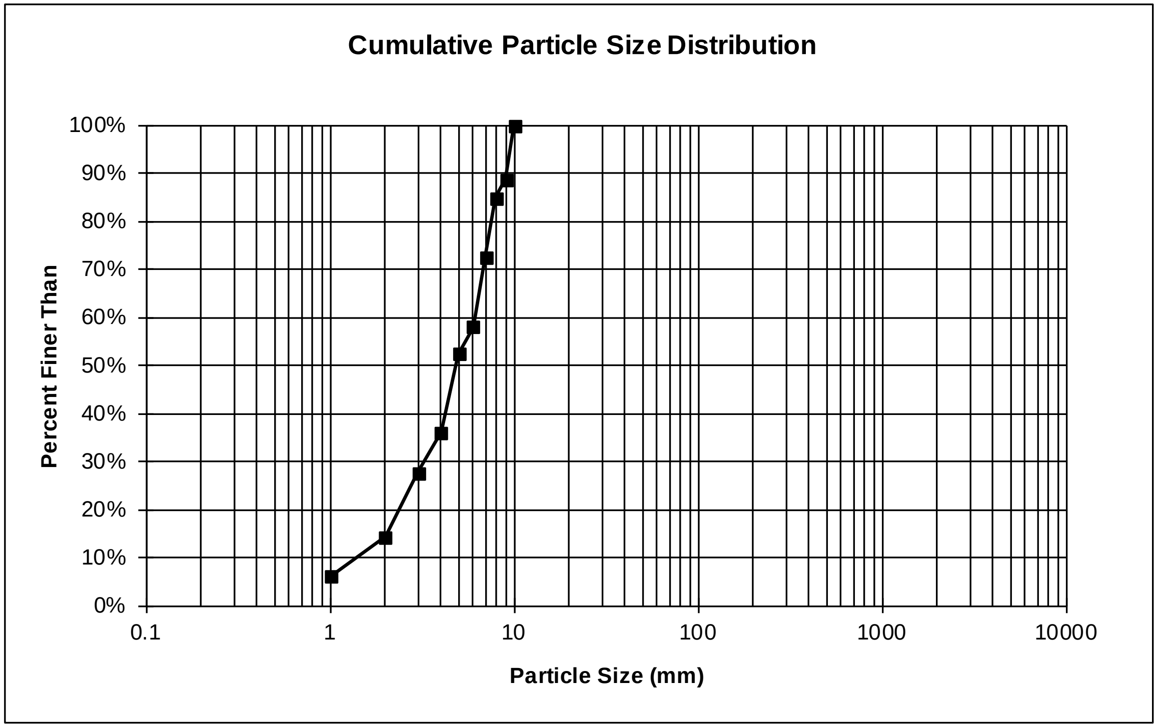
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 45.90 | 6.1% | |
| 0.5 | 61.30 | 8.2% | 6.1% |
| 1.0 | 99.10 | 13.2% | 14.3% |
| 2.0 | 63.50 | 8.5% | 27.6% |
| 2.8 | 121.40 | 16.2% | 36.1% |
| 4.0 | 42.40 | 5.7% | 52.3% |
| 5.6 | 108.60 | 14.5% | 58.0% |
| 8.0 | 92.40 | 12.4% | 72.5% |
| 11.2 | 28.80 | 3.8% | 84.8% |
| 16.0 | 84.70 | 11.3% | 88.7% |
| 28.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 748.10 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 101FS - Upper Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

**Particle Size Distribution (mm)**

| D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|
| 1.036 | 2.684 | 3.803 | 10.950 | 21.869 | 28.0 |



**Sieve Analysis Worksheet**

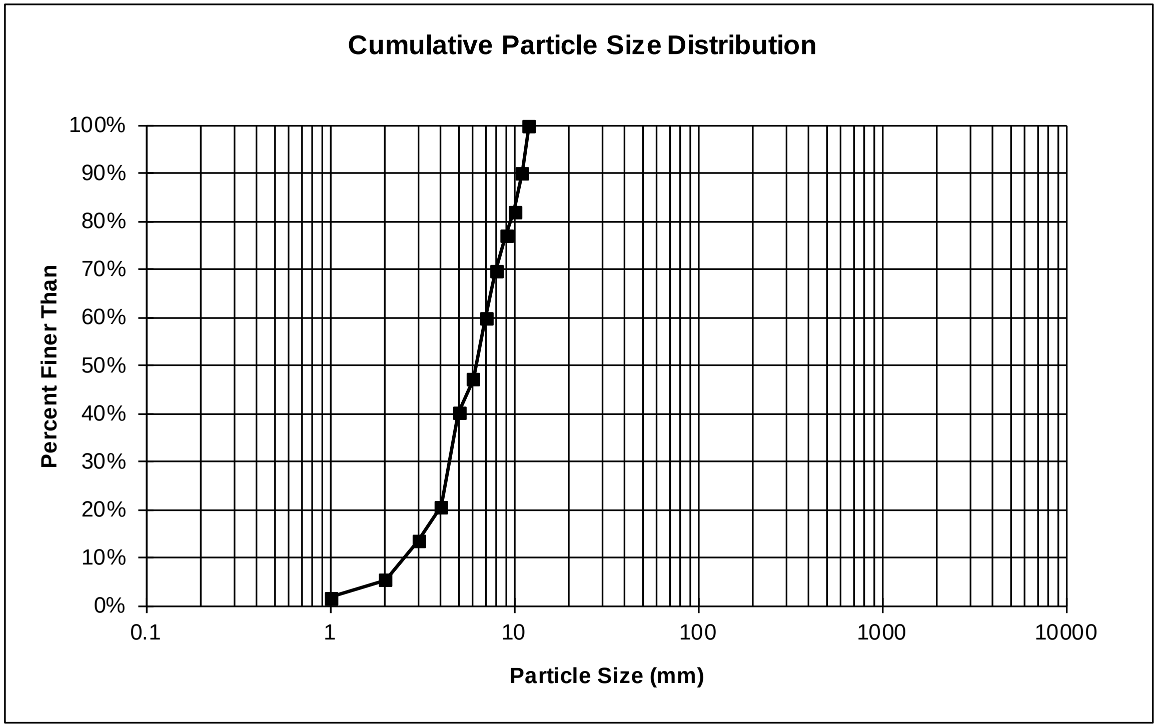
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 11.30 | 1.7% | |
| 0.5 | 24.70 | 3.6% | 1.7% |
| 1.0 | 55.30 | 8.1% | 5.3% |
| 2.0 | 49.70 | 7.3% | 13.4% |
| 2.8 | 133.40 | 19.5% | 20.6% |
| 4.0 | 47.50 | 7.0% | 40.2% |
| 5.6 | 86.80 | 12.7% | 47.1% |
| 8.0 | 66.30 | 9.7% | 59.8% |
| 11.2 | 50.60 | 7.4% | 69.5% |
| 16.0 | 35.10 | 5.1% | 76.9% |
| 22.4 | 54.50 | 8.0% | 82.0% |
| 32.0 | 68.20 | 10.0% | 90.0% |
| 34.0 | * | | 100.0% |
| 64.0 | | | - |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 683.40 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 101FS - Lower Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 2.158 | 3.641 | 6.075 | 24.446 | 32.983 | 34.0 |



**Sieve Analysis Worksheet**

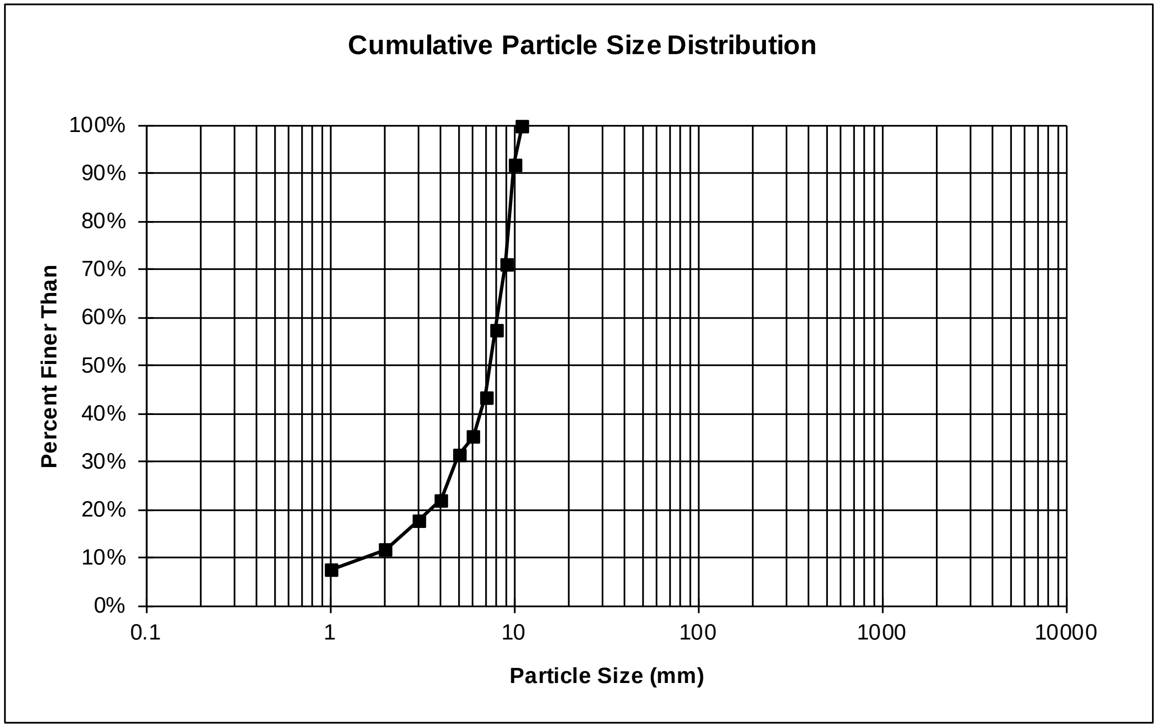
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 52.00 | 7.5% | |
| 0.5 | 28.40 | 4.1% | 7.5% |
| 1.0 | 42.40 | 6.1% | 11.6% |
| 2.0 | 30.30 | 4.4% | 17.7% |
| 2.8 | 64.10 | 9.2% | 22.1% |
| 4.0 | 26.30 | 3.8% | 31.3% |
| 5.6 | 57.40 | 8.3% | 35.1% |
| 8.0 | 97.60 | 14.1% | 43.4% |
| 11.2 | 94.80 | 13.7% | 57.5% |
| 16.0 | 143.10 | 20.6% | 71.2% |
| 22.4 | 56.90 | 8.2% | 91.8% |
| 24.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 693.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 101FS - Upper Fence
DATE: 9/15/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.471 | 5.540 | 9.367 | 19.728 | 23.012 | 24.0 |



**Sieve Analysis Worksheet**

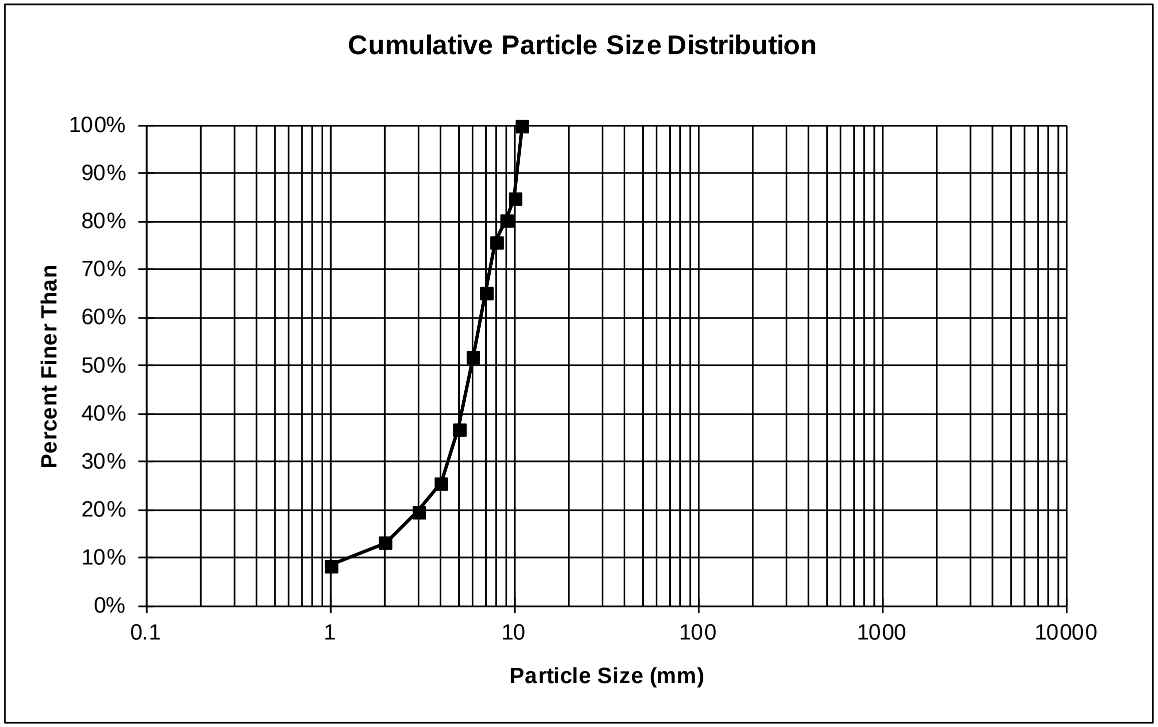
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 51.70 | 8.3% | |
| 0.5 | 29.90 | 4.8% | 8.3% |
| 1.0 | 40.70 | 6.5% | 13.1% |
| 2.0 | 37.20 | 6.0% | 19.6% |
| 2.8 | 69.10 | 11.1% | 25.6% |
| 4.0 | 94.30 | 15.1% | 36.7% |
| 5.6 | 82.00 | 13.2% | 51.8% |
| 8.0 | 67.00 | 10.7% | 65.0% |
| 11.2 | 27.70 | 4.4% | 75.7% |
| 16.0 | 27.70 | 4.4% | 80.1% |
| 22.4 | 96.10 | 15.4% | 84.6% |
| 31.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 623.40 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 101FS - Lower Fence
DATE: 9/15/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.225 | 3.791 | 5.381 | 21.430 | 27.899 | 31.0 |



**Sieve Analysis Worksheet**

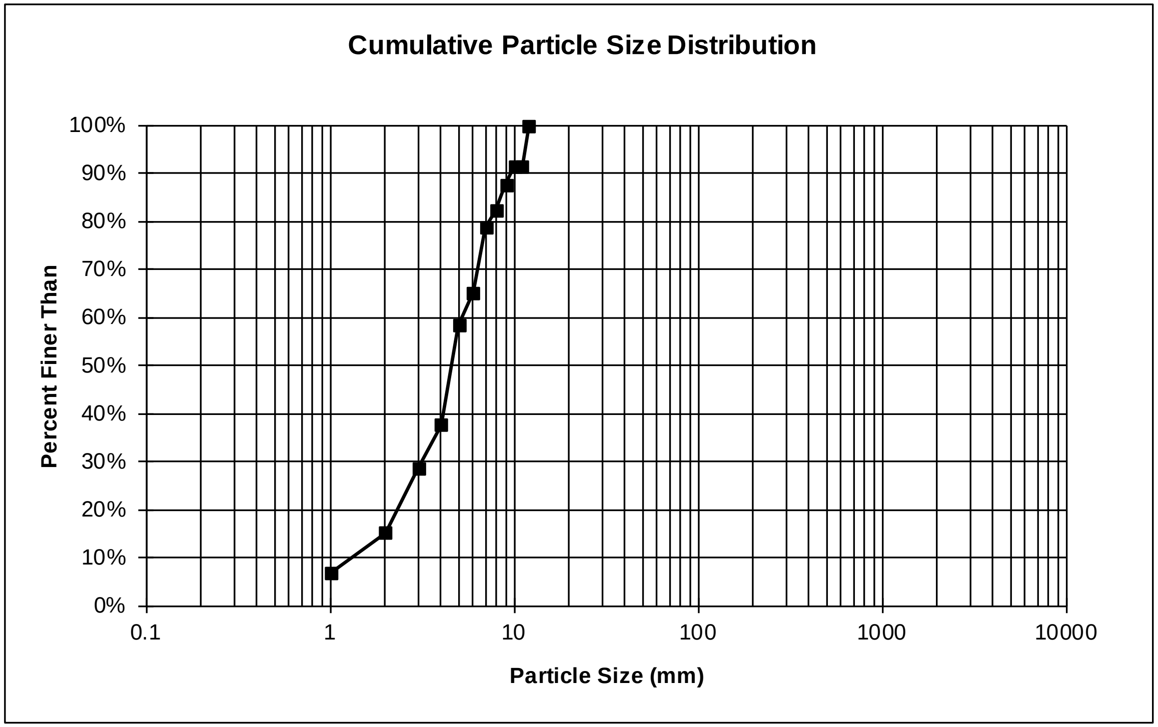
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 43.80 | 6.7% | |
| 0.5 | 55.60 | 8.5% | 6.7% |
| 1.0 | 86.50 | 13.3% | 15.3% |
| 2.0 | 59.00 | 9.1% | 28.5% |
| 2.8 | 135.40 | 20.8% | 37.6% |
| 4.0 | 44.80 | 6.9% | 58.4% |
| 5.6 | 88.10 | 13.5% | 65.2% |
| 8.0 | 22.30 | 3.4% | 78.7% |
| 11.2 | 35.50 | 5.4% | 82.2% |
| 16.0 | 24.30 | 3.7% | 87.6% |
| 22.4 | 0.00 | 0.0% | 91.3% |
| 32.0 | 56.40 | 8.7% | 91.3% |
| 38.0 | * | | 100.0% |
| 64.0 | | | - |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 651.70 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 124FS - Upper Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.980 | 2.544 | 3.466 | 12.626 | 34.408 | 38.0 |



**Sieve Analysis Worksheet**

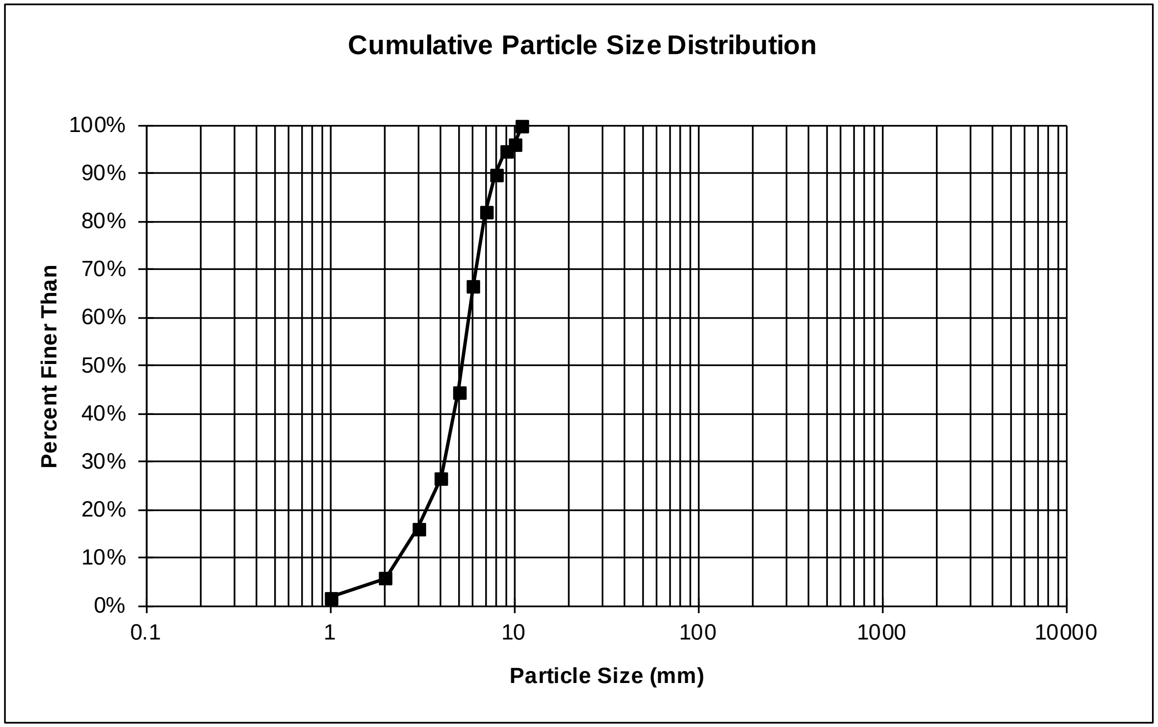
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 11.80 | 1.7% | |
| 0.5 | 26.40 | 3.9% | 1.7% |
| 1.0 | 70.10 | 10.4% | 5.7% |
| 2.0 | 71.10 | 10.5% | 16.0% |
| 2.8 | 121.00 | 17.9% | 26.6% |
| 4.0 | 149.70 | 22.2% | 44.5% |
| 5.6 | 103.10 | 15.3% | 66.6% |
| 8.0 | 53.50 | 7.9% | 81.9% |
| 11.2 | 32.20 | 4.8% | 89.8% |
| 16.0 | 8.60 | 1.3% | 94.6% |
| 22.4 | 28.10 | 4.2% | 95.8% |
| 30.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 675.60 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 124FS - Lower Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.867 | 3.313 | 4.351 | 8.753 | 17.936 | 30.0 |



**Sieve Analysis Worksheet**

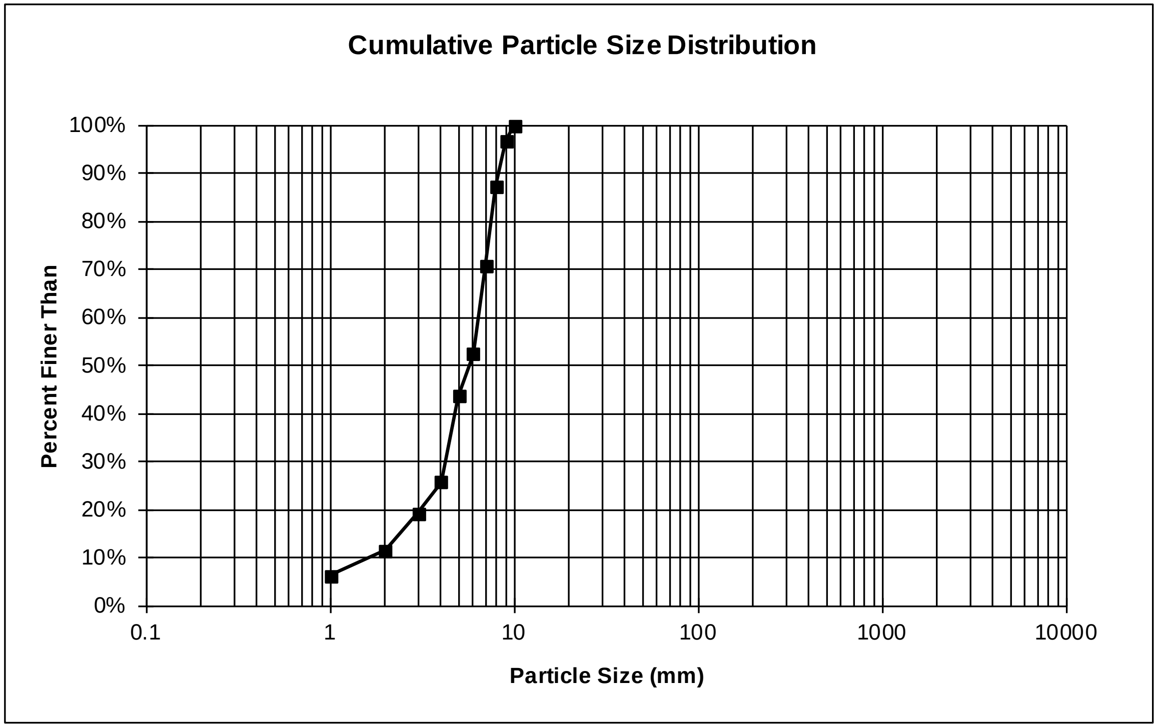
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 35.40 | 6.1% | |
| 0.5 | 30.90 | 5.4% | 6.1% |
| 1.0 | 44.80 | 7.8% | 11.5% |
| 2.0 | 36.80 | 6.4% | 19.3% |
| 2.8 | 103.60 | 18.0% | 25.7% |
| 4.0 | 50.00 | 8.7% | 43.7% |
| 5.6 | 105.10 | 18.3% | 52.4% |
| 8.0 | 95.40 | 16.6% | 70.6% |
| 11.2 | 53.70 | 9.3% | 87.2% |
| 16.0 | 20.10 | 3.5% | 96.5% |
| 21.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 575.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 128FS - Upper Fence
DATE: 6/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.364 | 3.368 | 5.110 | 10.499 | 15.103 | 21.0 |



**Sieve Analysis Worksheet**

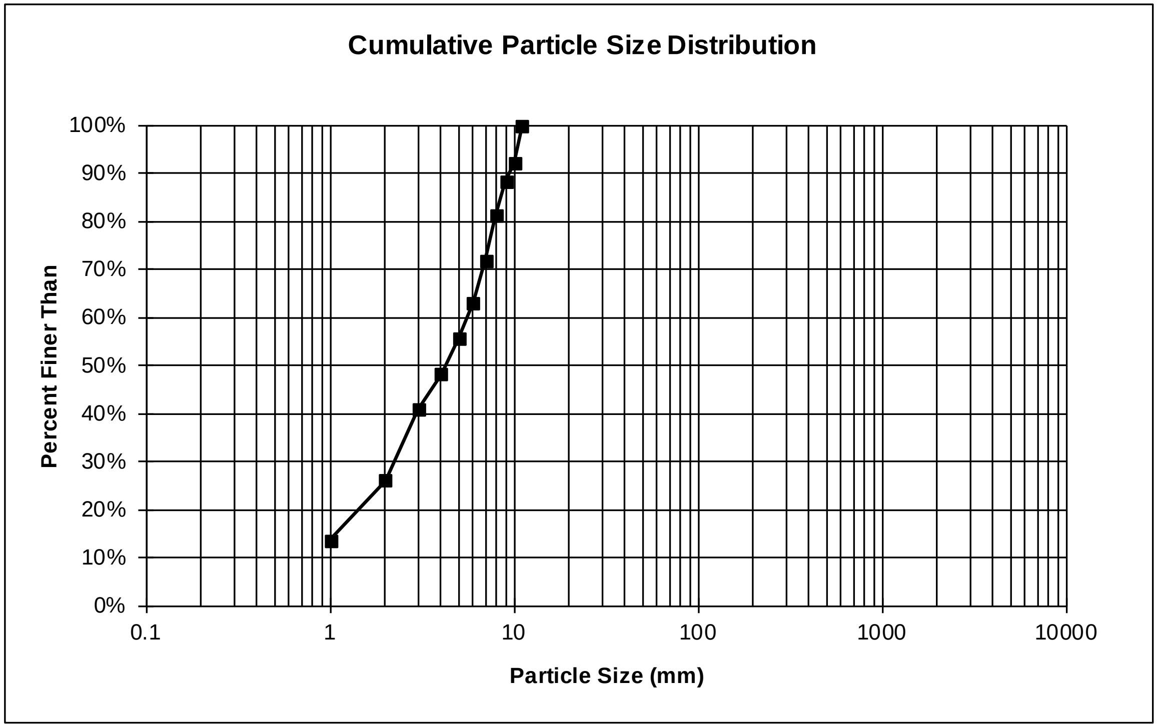
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 89.70 | 13.5% | |
| 0.5 | 83.10 | 12.5% | 13.5% |
| 1.0 | 98.50 | 14.8% | 26.0% |
| 2.0 | 48.30 | 7.3% | 40.9% |
| 2.8 | 48.90 | 7.4% | 48.1% |
| 4.0 | 50.00 | 7.5% | 55.5% |
| 5.6 | 58.90 | 8.9% | 63.0% |
| 8.0 | 61.60 | 9.3% | 71.9% |
| 11.2 | 47.80 | 7.2% | 81.2% |
| 16.0 | 23.90 | 3.6% | 88.4% |
| 22.4 | 53.10 | 8.0% | 92.0% |
| 26.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 663.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 177FS - Upper Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.543 | 1.520 | 3.063 | 12.867 | 23.687 | 26.0 |



**Sieve Analysis Worksheet**

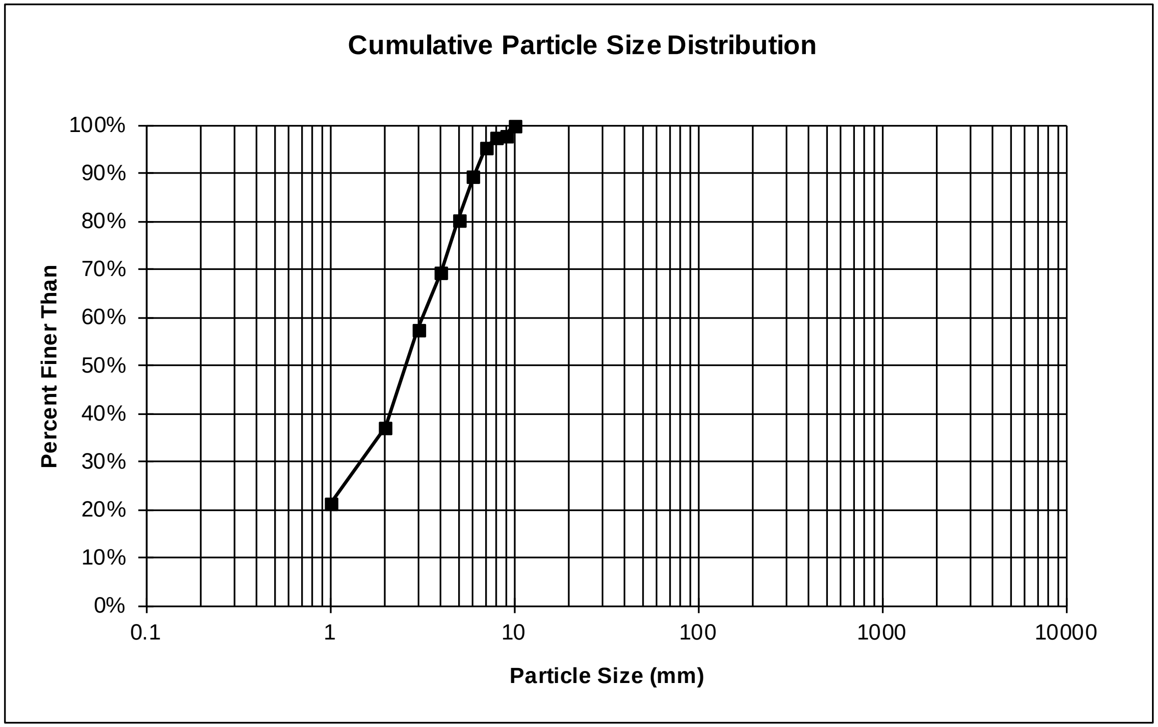
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 156.00 | 21.1% | |
| 0.5 | 119.20 | 16.1% | 21.1% |
| 1.0 | 149.70 | 20.2% | 37.2% |
| 2.0 | 89.10 | 12.0% | 57.4% |
| 2.8 | 79.90 | 10.8% | 69.4% |
| 4.0 | 66.40 | 9.0% | 80.2% |
| 5.6 | 43.80 | 5.9% | 89.2% |
| 8.0 | 16.40 | 2.2% | 95.1% |
| 11.2 | 4.10 | 0.6% | 97.3% |
| 16.0 | 15.60 | 2.1% | 97.9% |
| 21.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 740.20 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 183FS - Upper Fence
DATE: 8/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.123** | **0.910** | **1.552** | **4.607** | **7.941** | **21.0** |



**Sieve Analysis Worksheet**

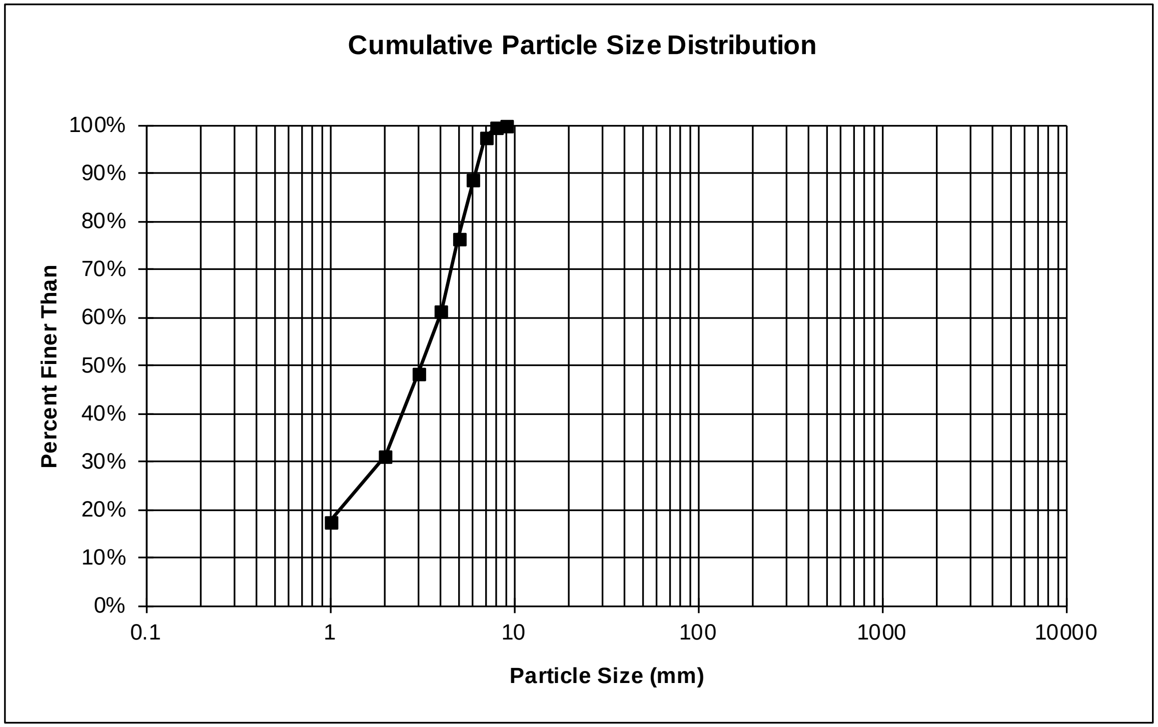
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 147.30 | 17.5% | |
| 0.5 | 114.60 | 13.6% | 17.5% |
| 1.0 | 143.50 | 17.0% | 31.1% |
| 2.0 | 109.40 | 13.0% | 48.2% |
| 2.8 | 128.00 | 15.2% | 61.2% |
| 4.0 | 102.70 | 12.2% | 76.4% |
| 5.6 | 75.50 | 9.0% | 88.6% |
| 8.0 | 15.40 | 1.8% | 97.5% |
| 11.2 | 5.40 | 0.6% | 99.4% |
| 14.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 841.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 198FS - Upper Fence
DATE: 7/17/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.250 | 1.171 | 2.098 | 4.938 | 7.235 | 14.0 |



**Sieve Analysis Worksheet**

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 193.50 | 36.7% | |
| 0.5 | 79.60 | 15.1% | 36.7% |
| 1.0 | 93.70 | 17.8% | 51.8% |
| 2.0 | 49.90 | 9.5% | 69.6% |
| 2.8 | 61.80 | 11.7% | 79.0% |
| 4.0 | 17.20 | 3.3% | 90.7% |
| 5.6 | 19.80 | 3.8% | 94.0% |
| 8.0 | 6.00 | 1.1% | 97.8% |
| 11.2 | 5.80 | | 98.9% |
| 15.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 527.30 | | |

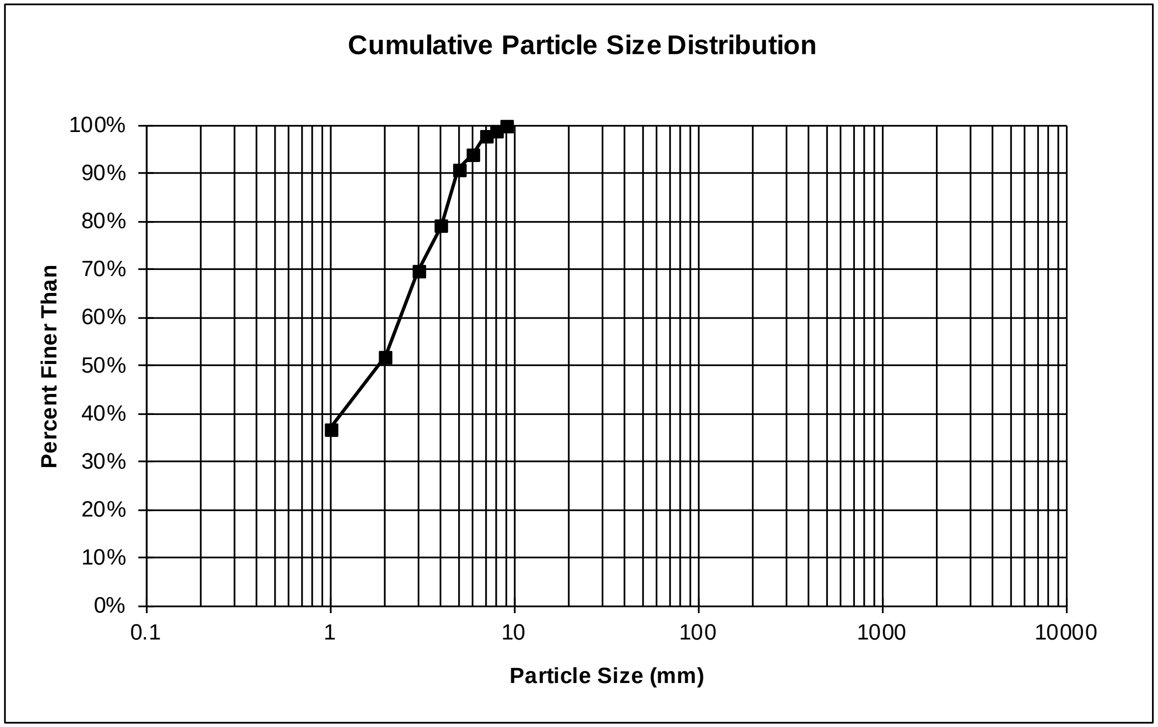
*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 204FS - Upper Fence
DATE: 5/19/2014
CREW: Karlsson, VonLoh

**Particle Size Distribution (mm)**

| D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|
| 0.028 | 0.400 | 0.921 | 3.258 | 6.154 | 15.0 |

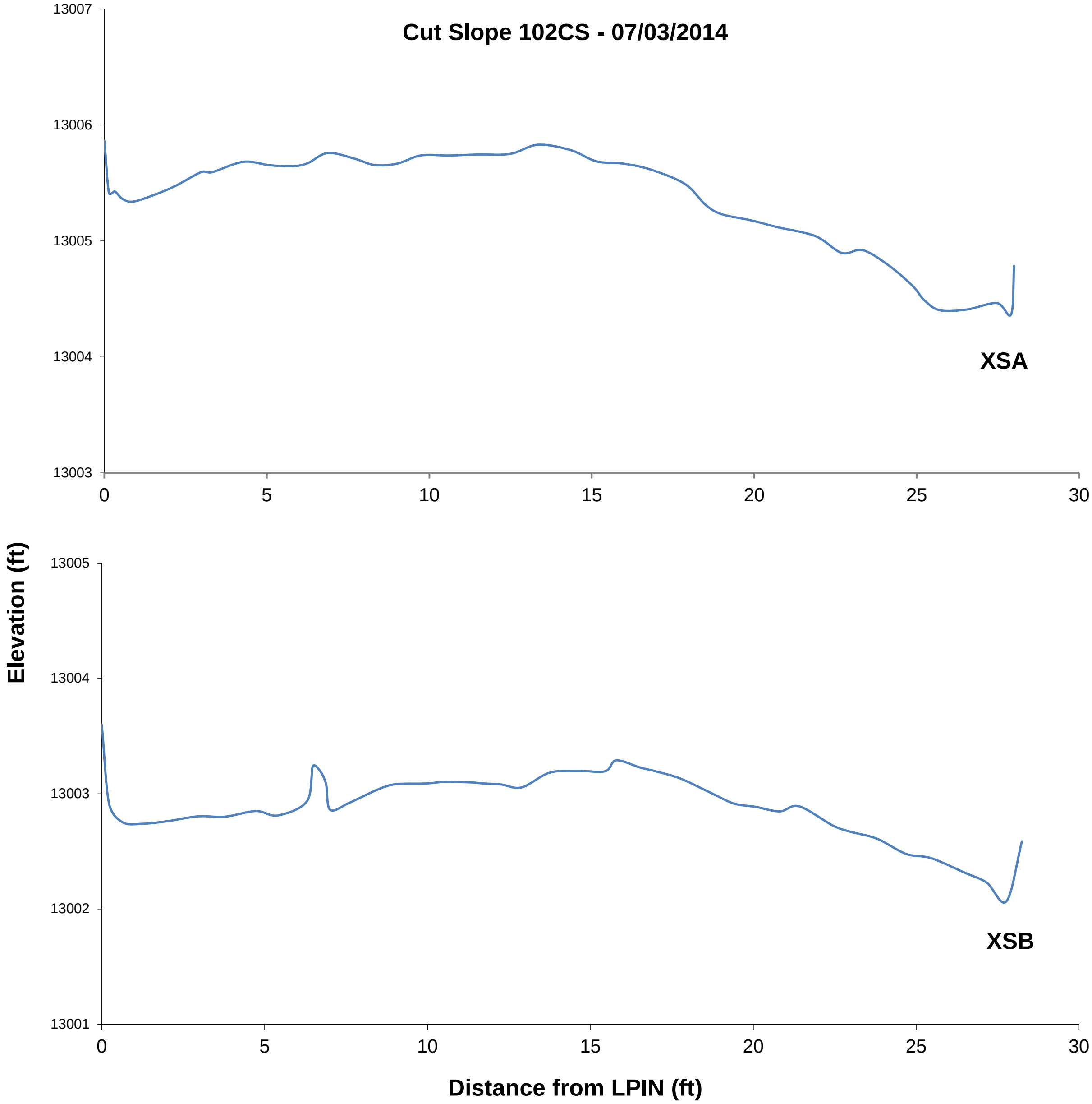


# Appendix G

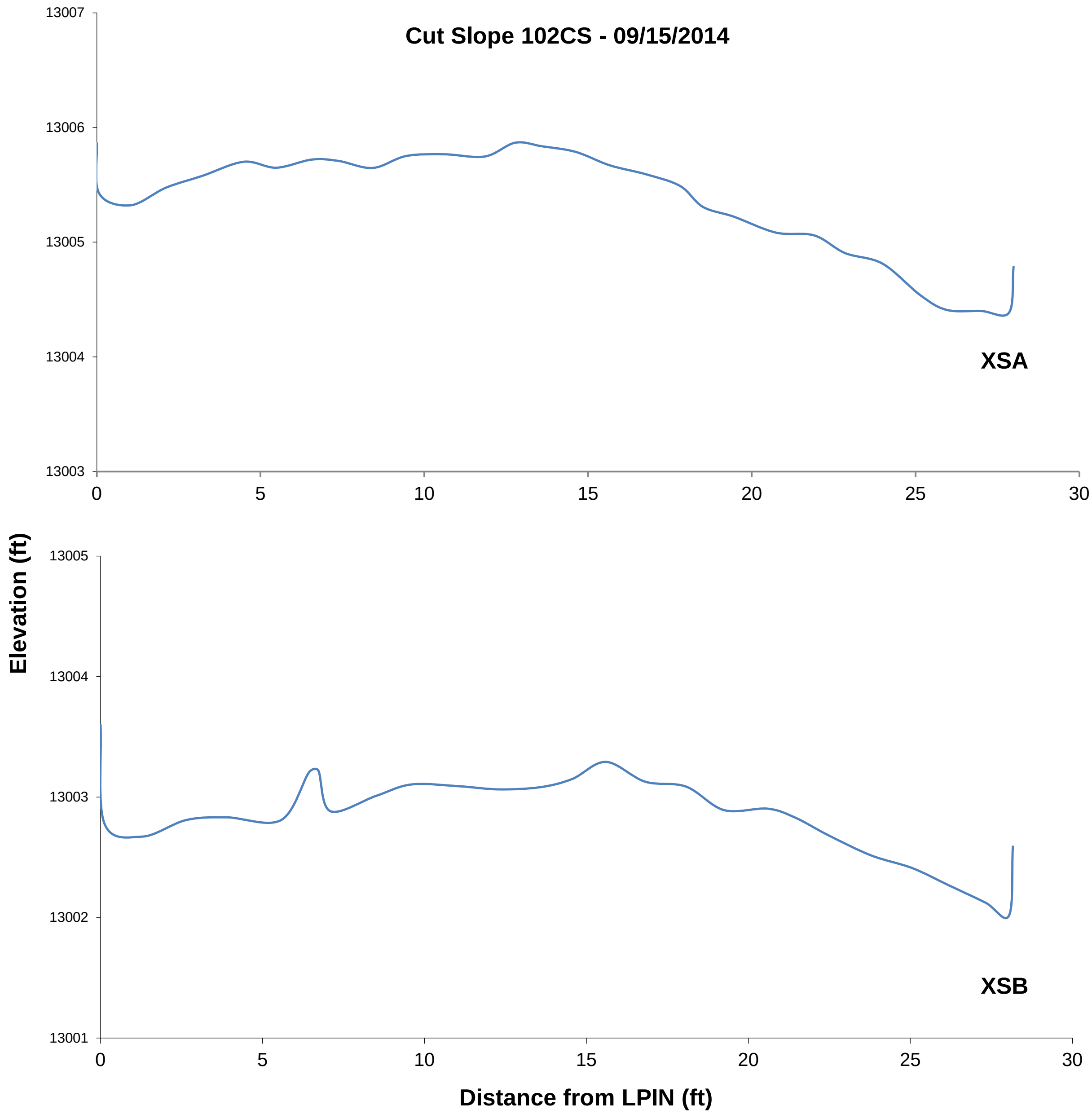
# Cut Slope

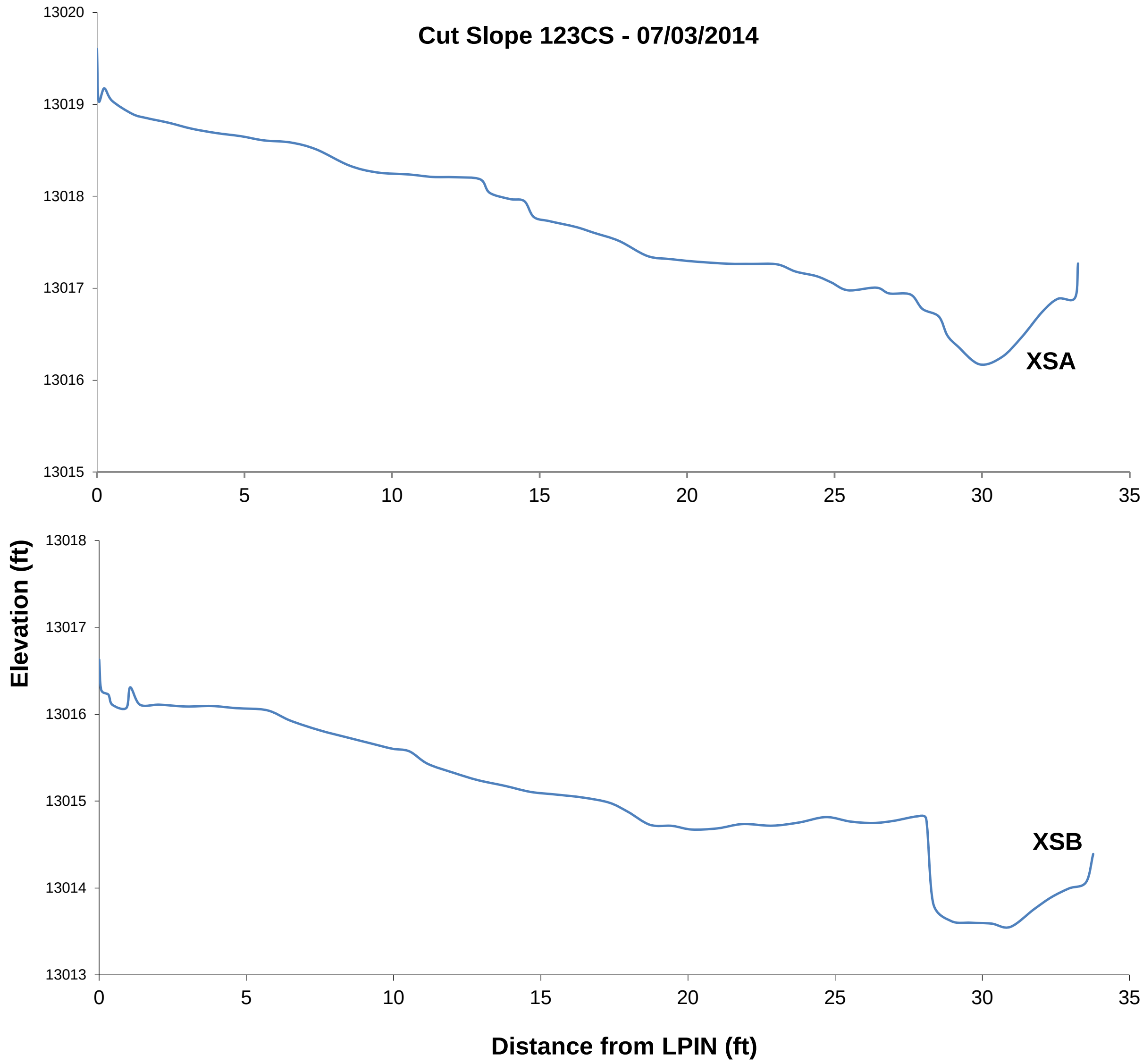
# Cross Section Graphs

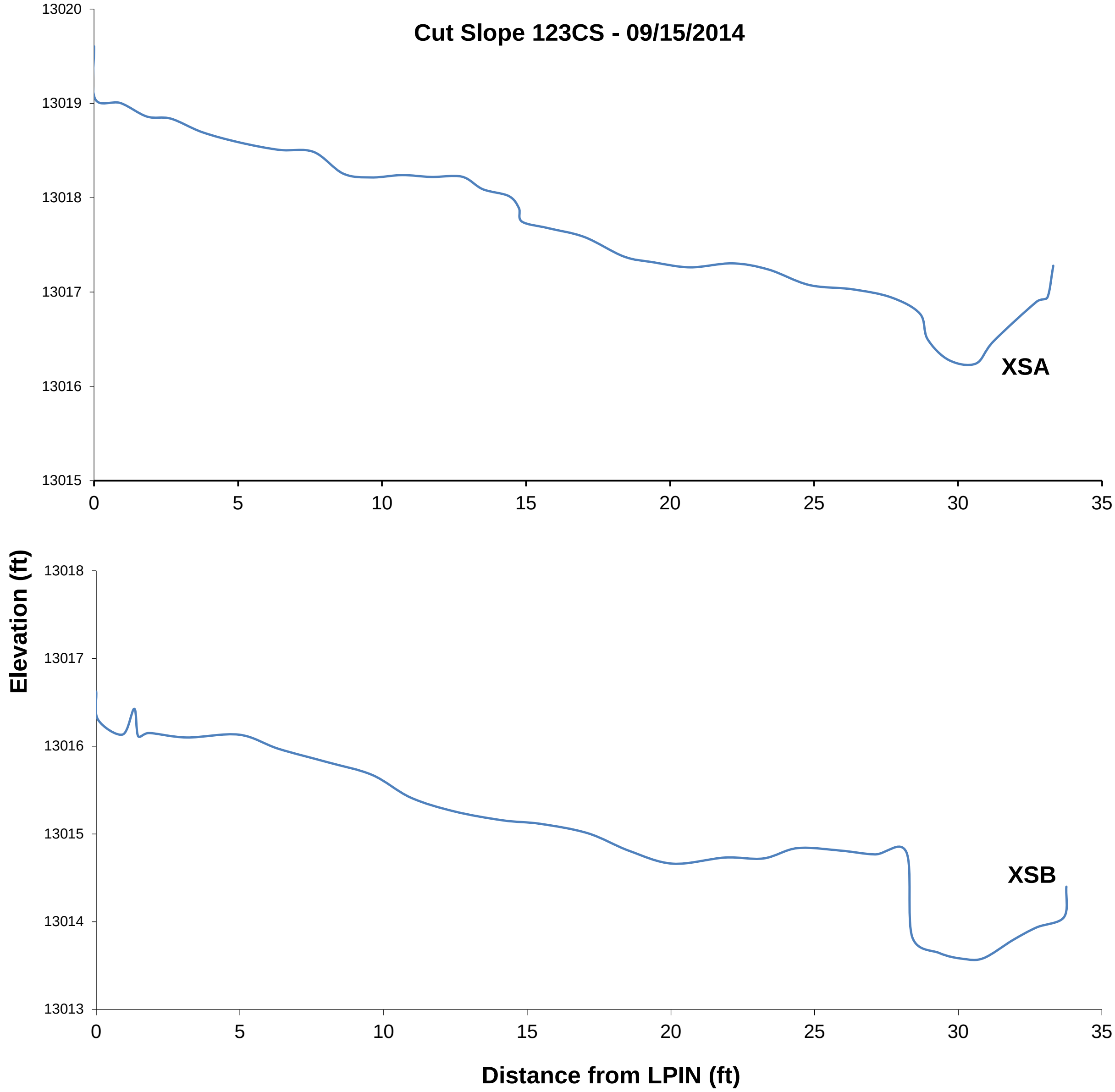
# 2014

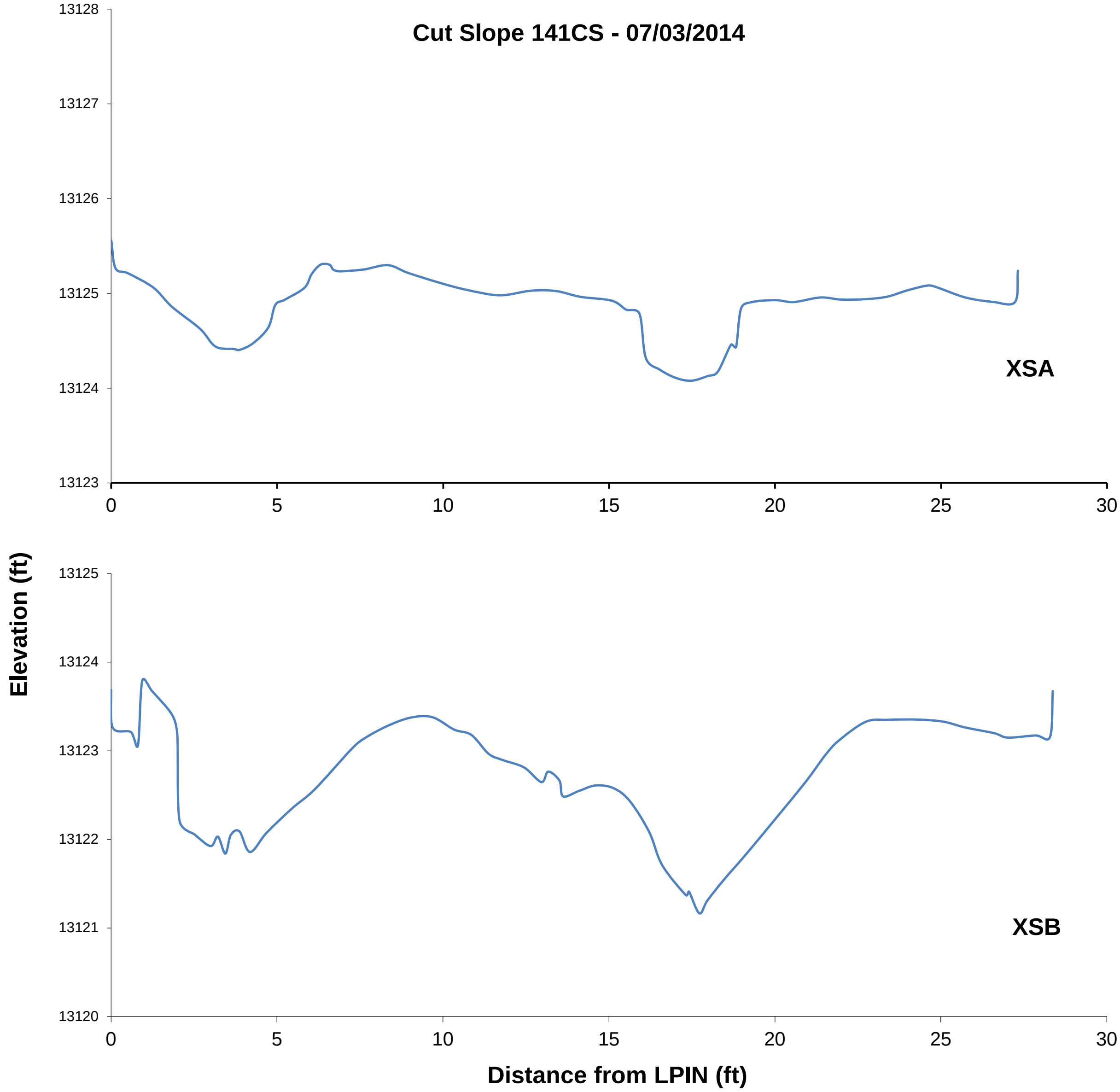


Cut Slope 102CS - 07/03/2014
13007
13006
13005
13004
13003
0
5
10
15
20
25
30
XSA
Elevation (ft)
13005
13004
13003
13002
13001
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

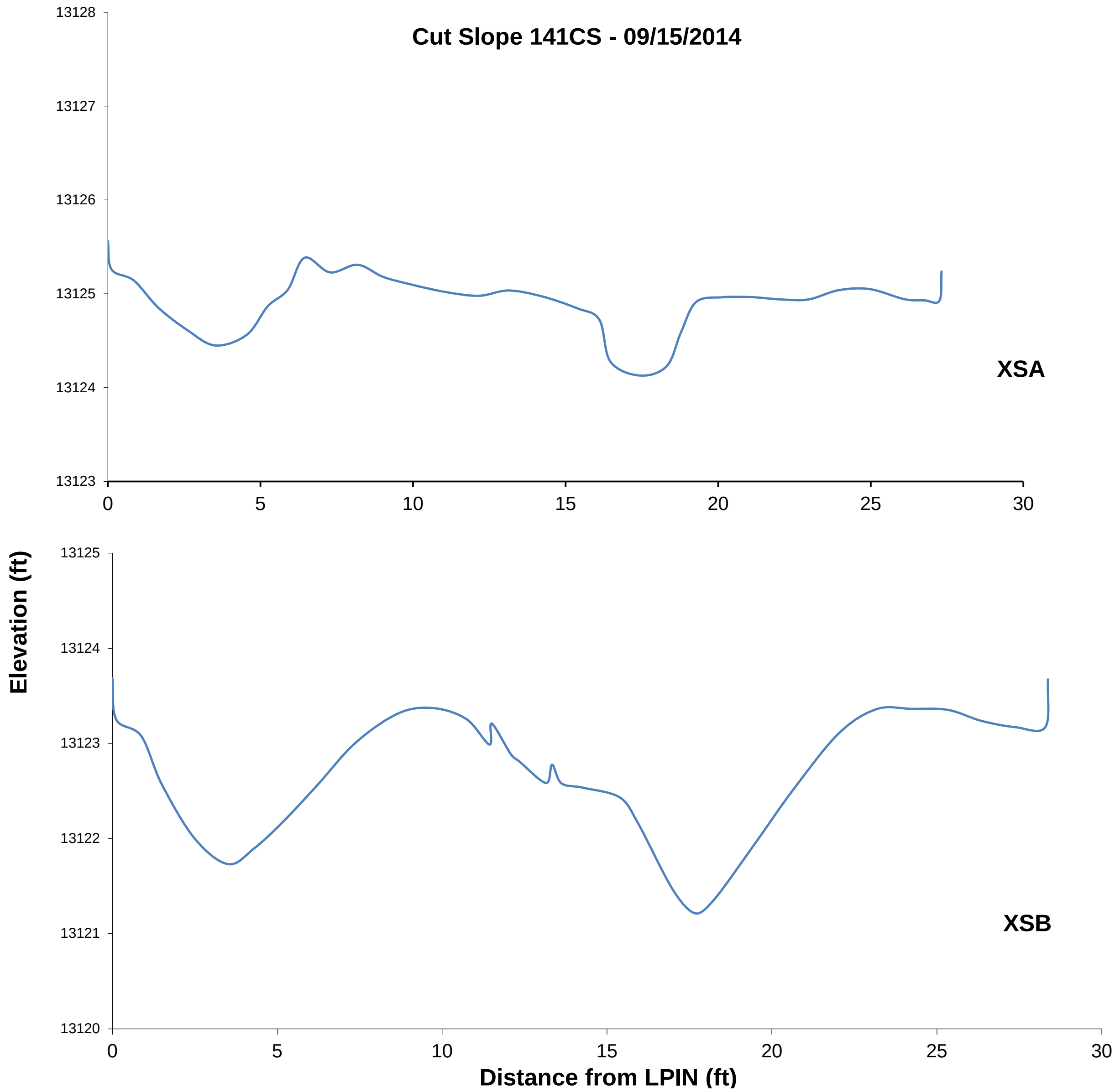

Cut Slope 102CS - 09/15/2014
13007
13006
13005
13004
13003
0
5
10
15
20
25
30
XSA
Elevation (ft)
13005
13004
13003
13002
13001
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)


Cut Slope 123CS - 07/03/2014
13020
13019
13018
13017
13016
13015
0
5
10
15
20
25
30
35
XSA
Elevation (ft)
13018
13017
13016
13015
13014
13013
XSB
Distance from LPIN (ft)


Cut Slope 123CS - 09/15/2014
XSA
XSB
Elevation (ft)
Distance from LPIN (ft)
13020
13019
13018
13017
13016
13015
13014
13013
0
5
10
15
20
25
30
35



Cut Slope 141CS - 07/03/2014
Elevation (ft)
13128
13127
13126
13125
13124
13123
XSA
0
5
10
15
20
25
30
13125
13124
13123
13122
13121
13120
XSB
Distance from LPIN (ft)



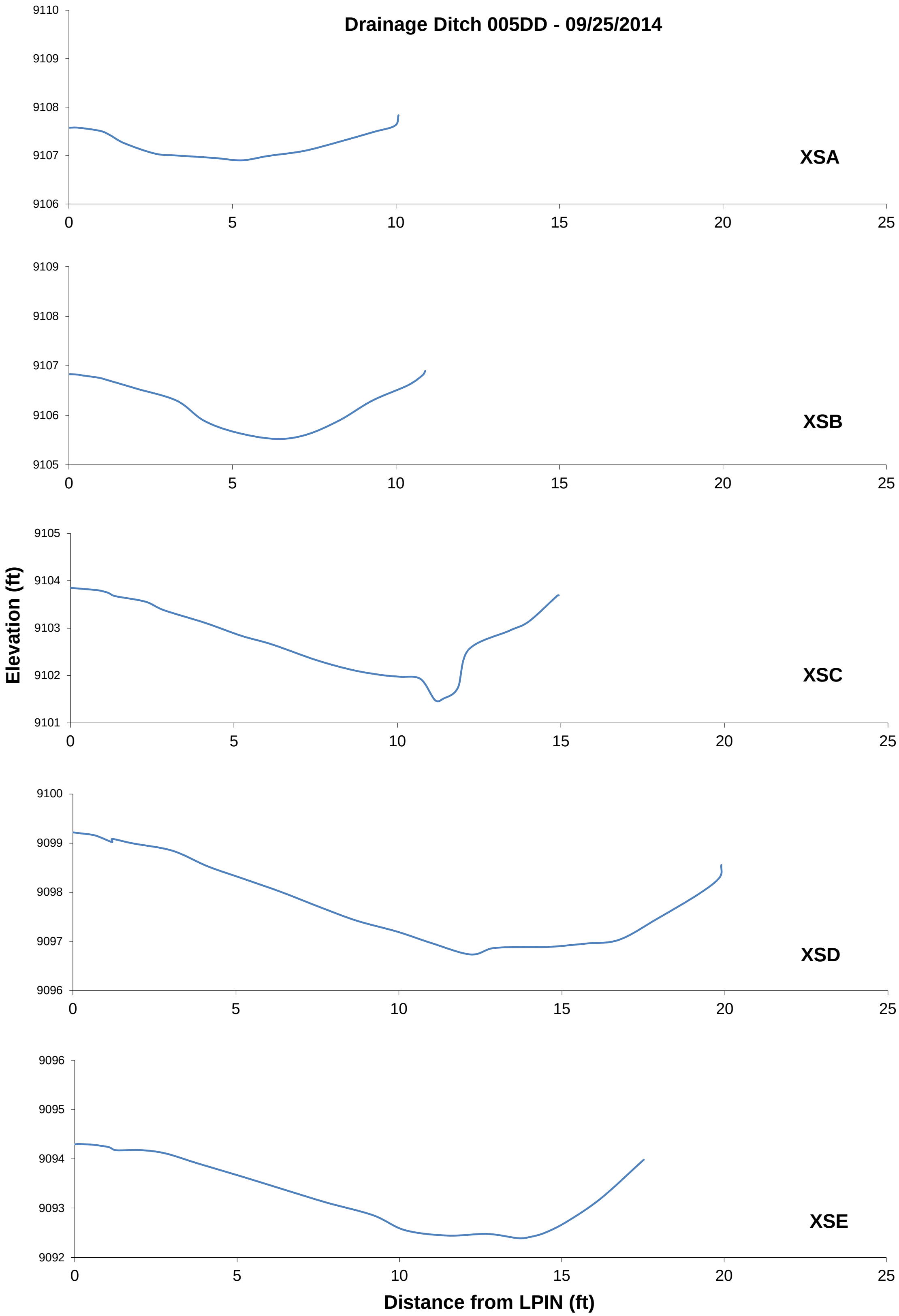
Cut Slope 141CS - 09/15/2014
13128
13127
13126
13125
13124
13123
0
5
10
15
20
25
30
XSA
Elevation (ft)
13125
13124
13123
13122
13121
13120
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

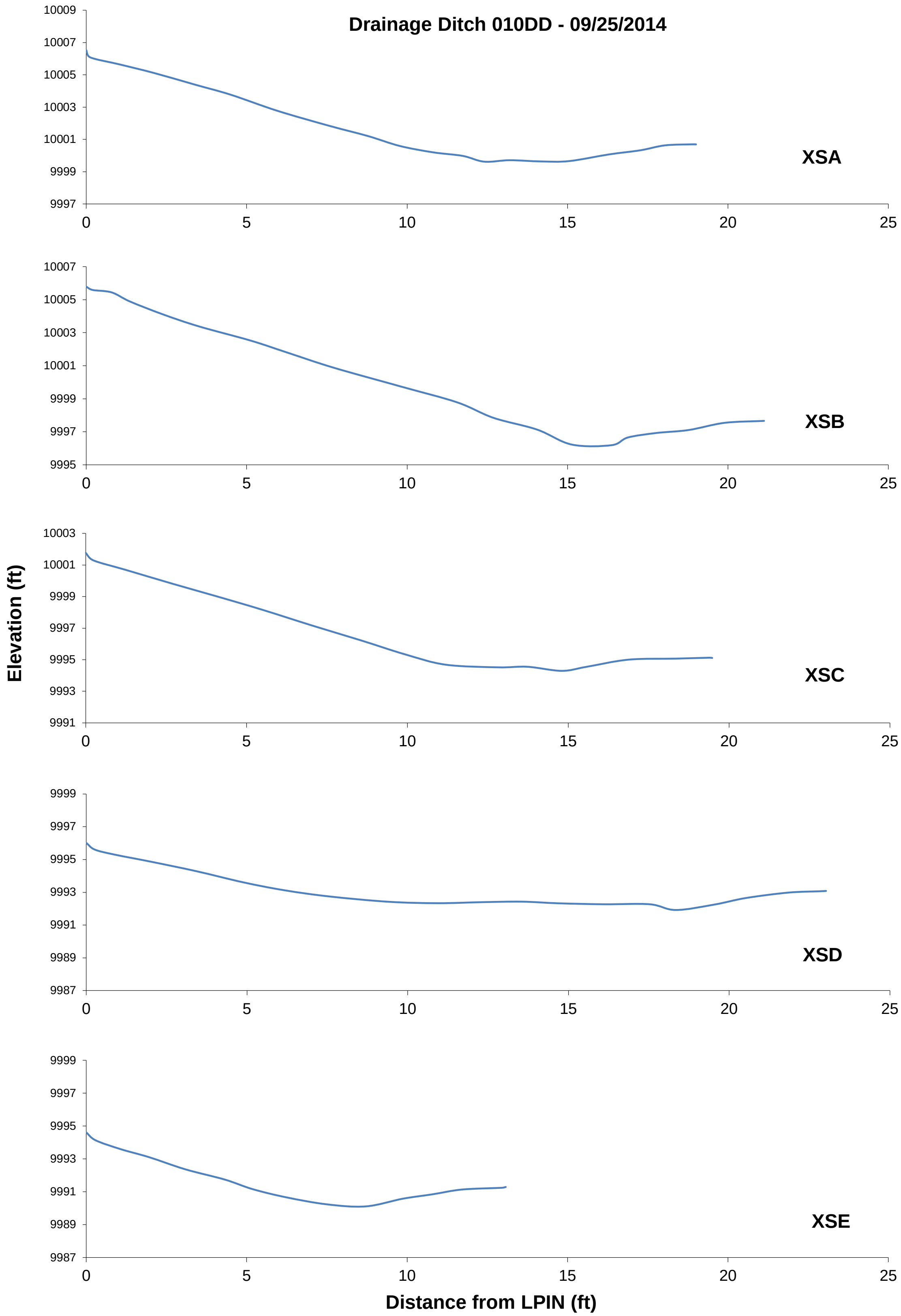
# Appendix H

# Drainage Ditch

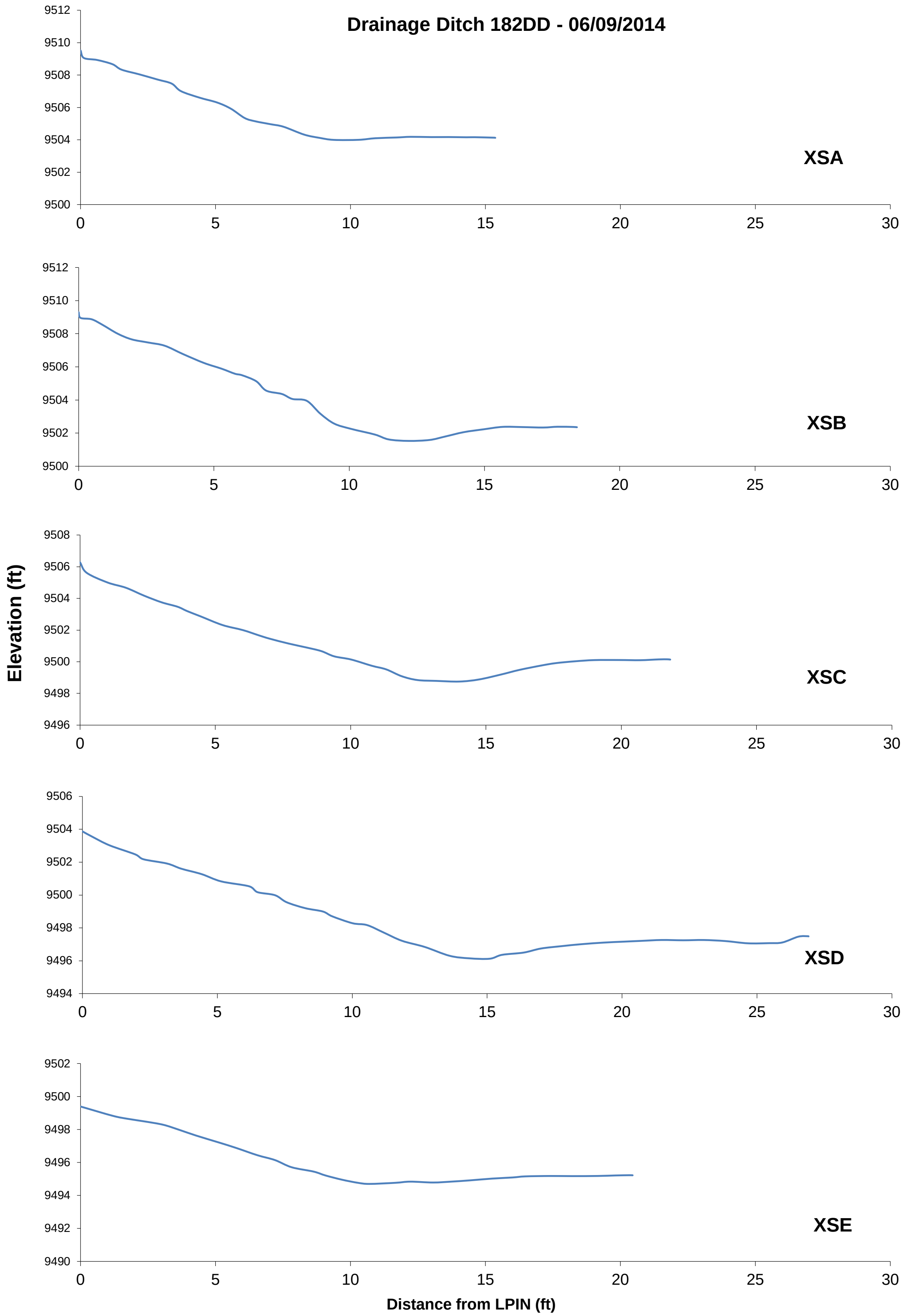
# Cross Section Graphs

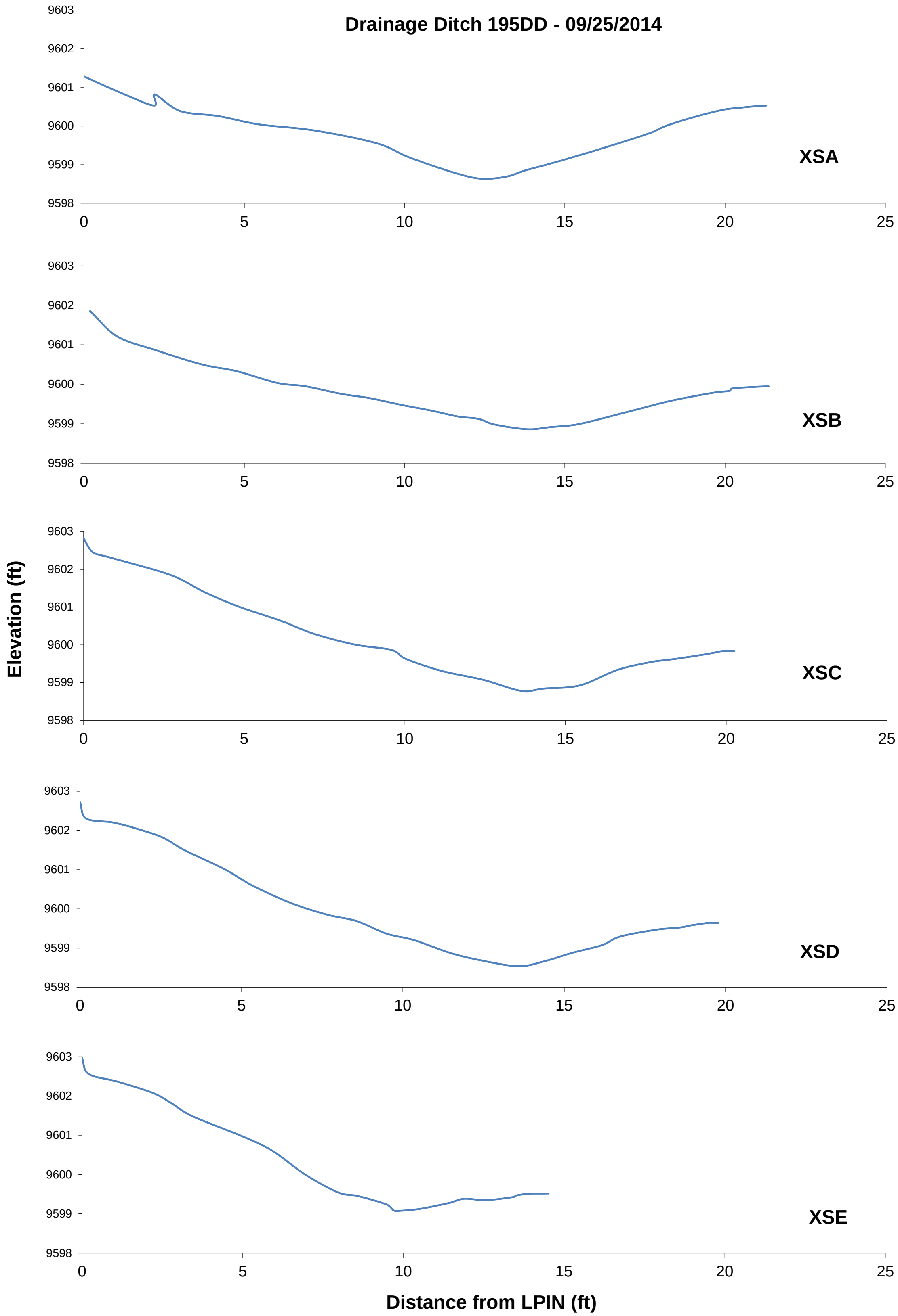
# 2014


Drainage Ditch 005DD - 09/25/2014
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)
9110
9109
9108
9107
9106
9105
9104
9103
9102
9101
9100
9099
9098
9097
9096
9095
9094
9093
9092
0
5
10
15
20
25



Drainage Ditch 010DD - 09/25/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE


Drainage Ditch 182DD - 06/09/2014
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)



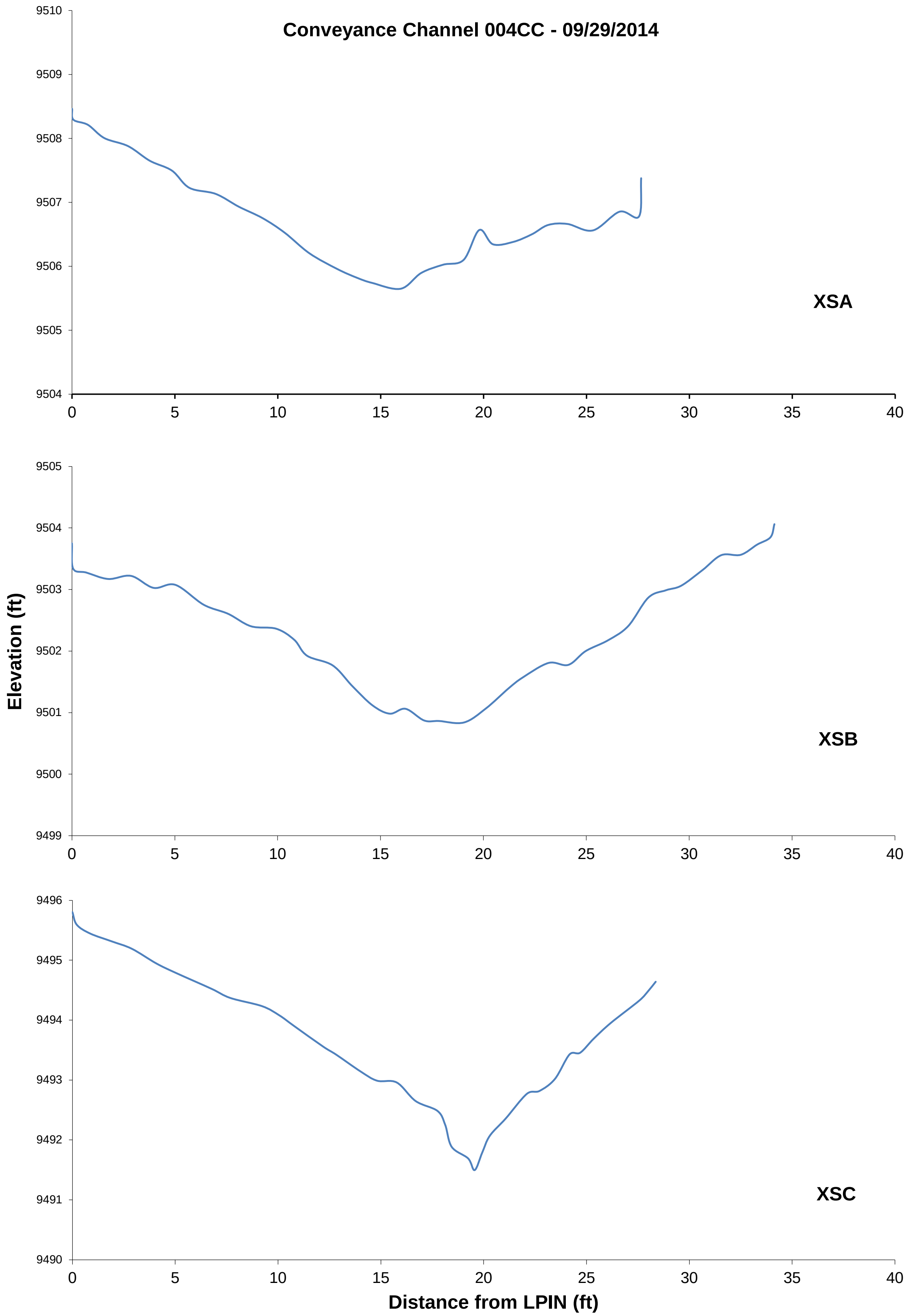
Drainage Ditch 195DD - 09/25/2014
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)
9603
9602
9601
9600
9599
9598
0
5
10
15
20
25

# Appendix I

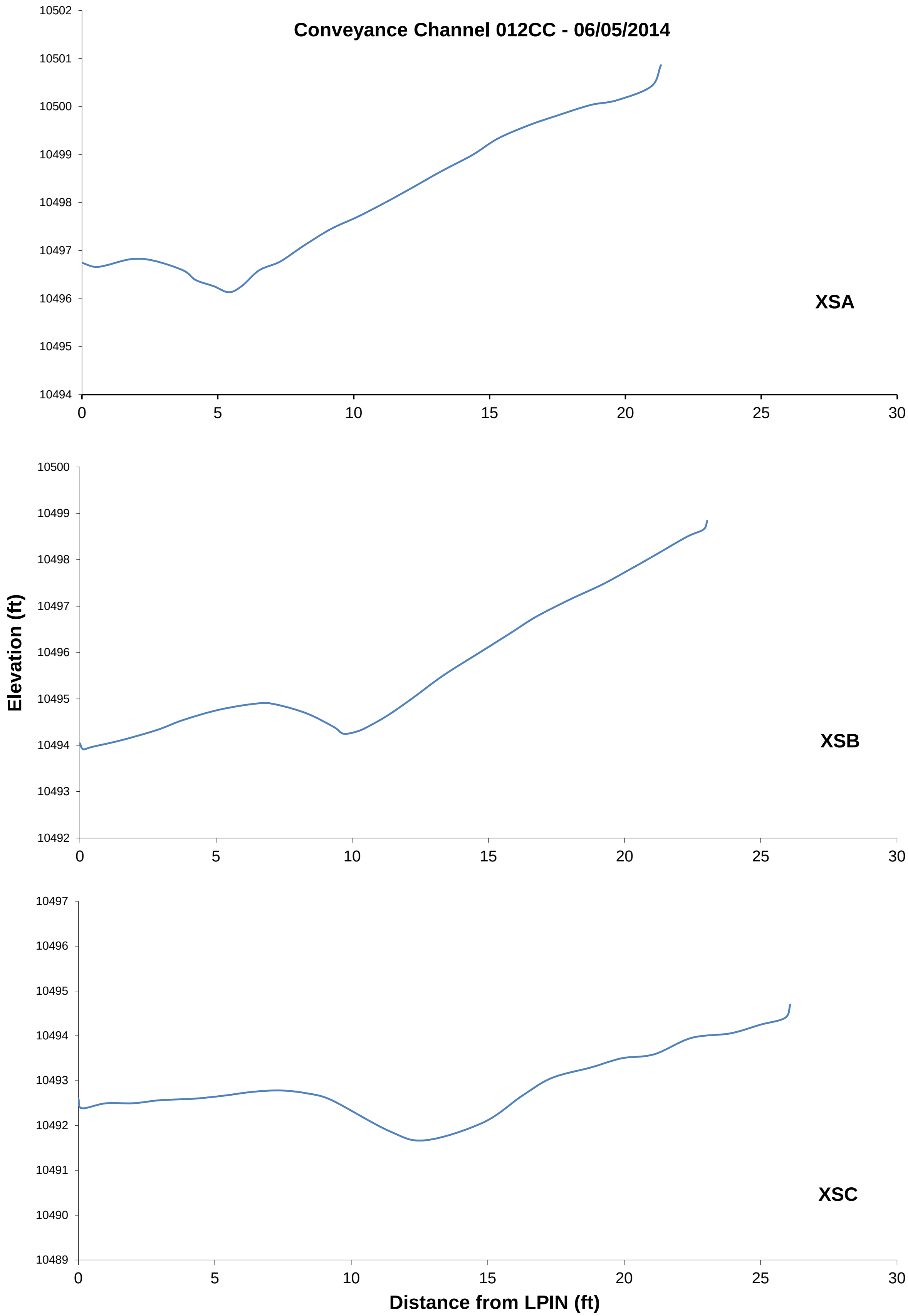
# Conveyance Channel

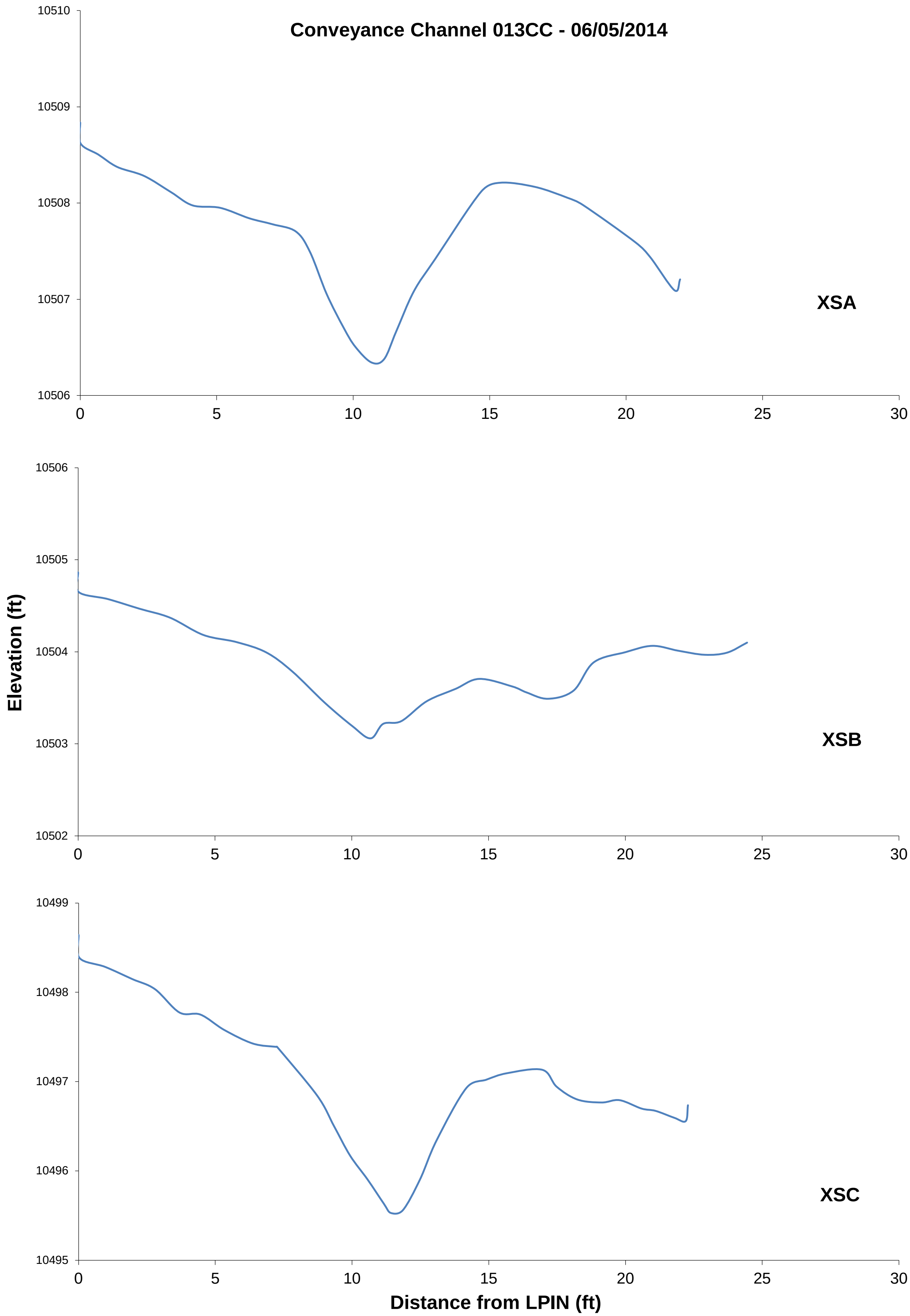
# Cross Section Graphs

# 2014

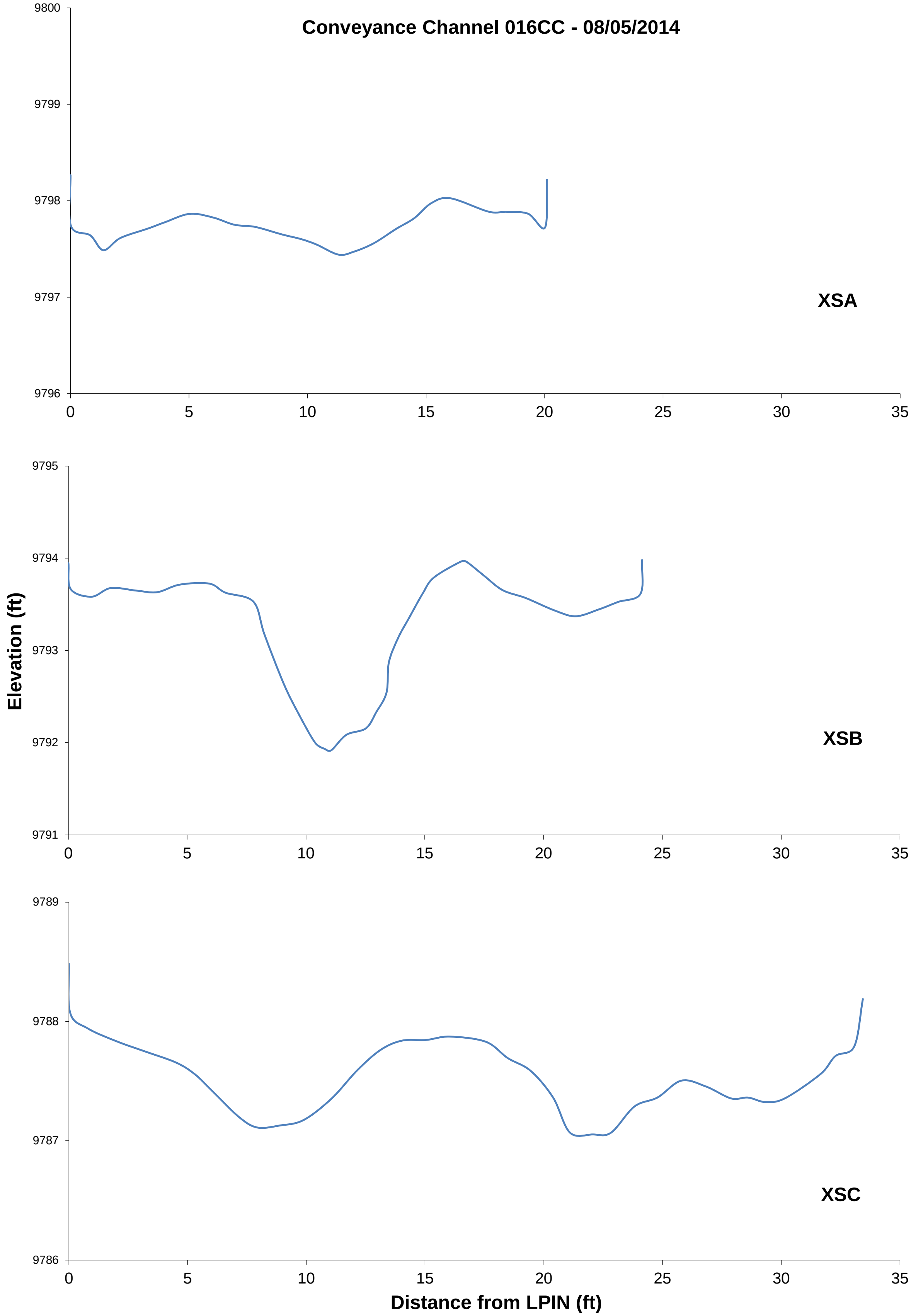


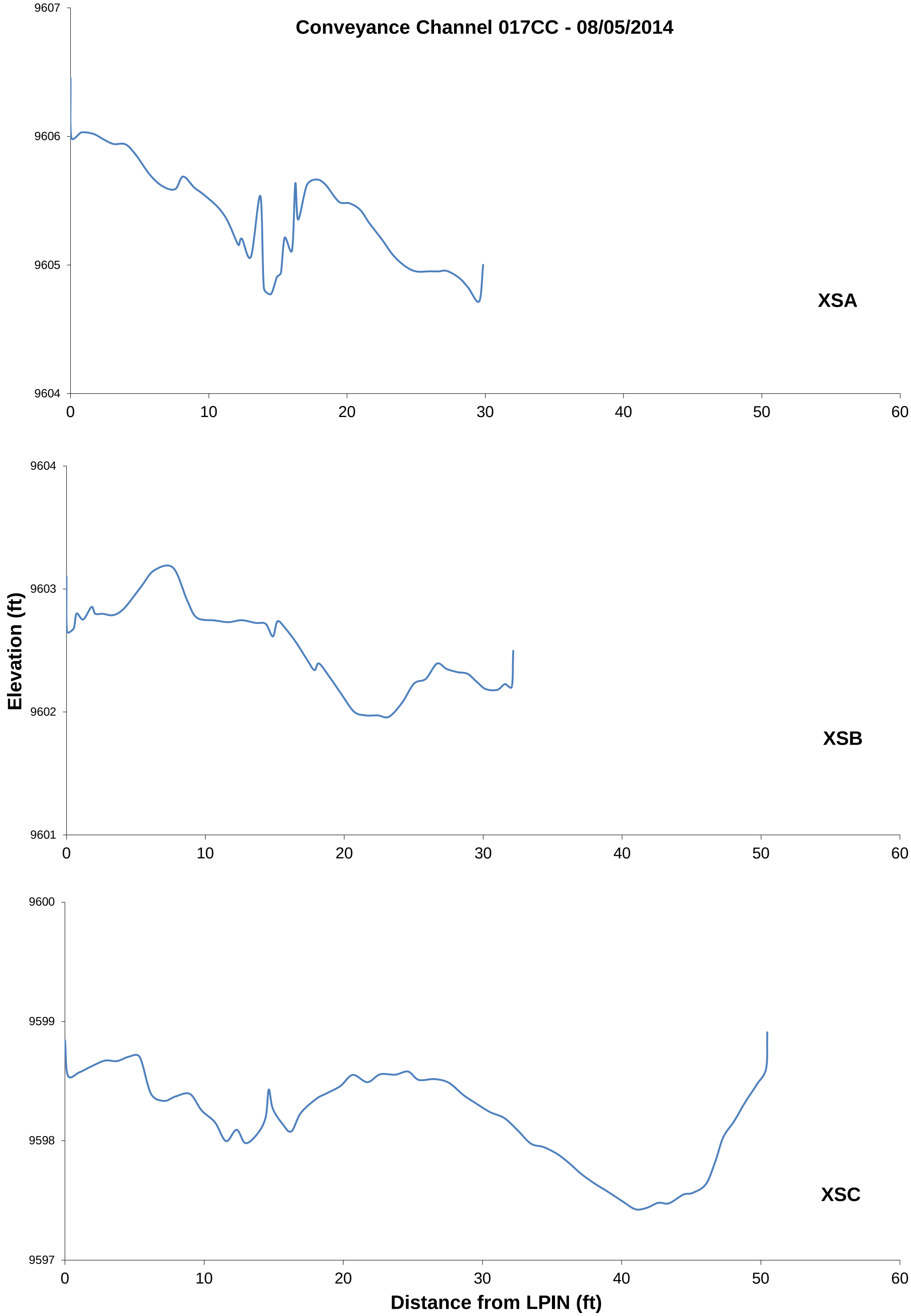
Conveyance Channel 004CC - 09/29/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
9510
9509
9508
9507
9506
9505
9504
9503
9502
9501
9500
9499
9496
9495
9494
9493
9492
9491
9490
0
5
10
15
20
25
30
35
40

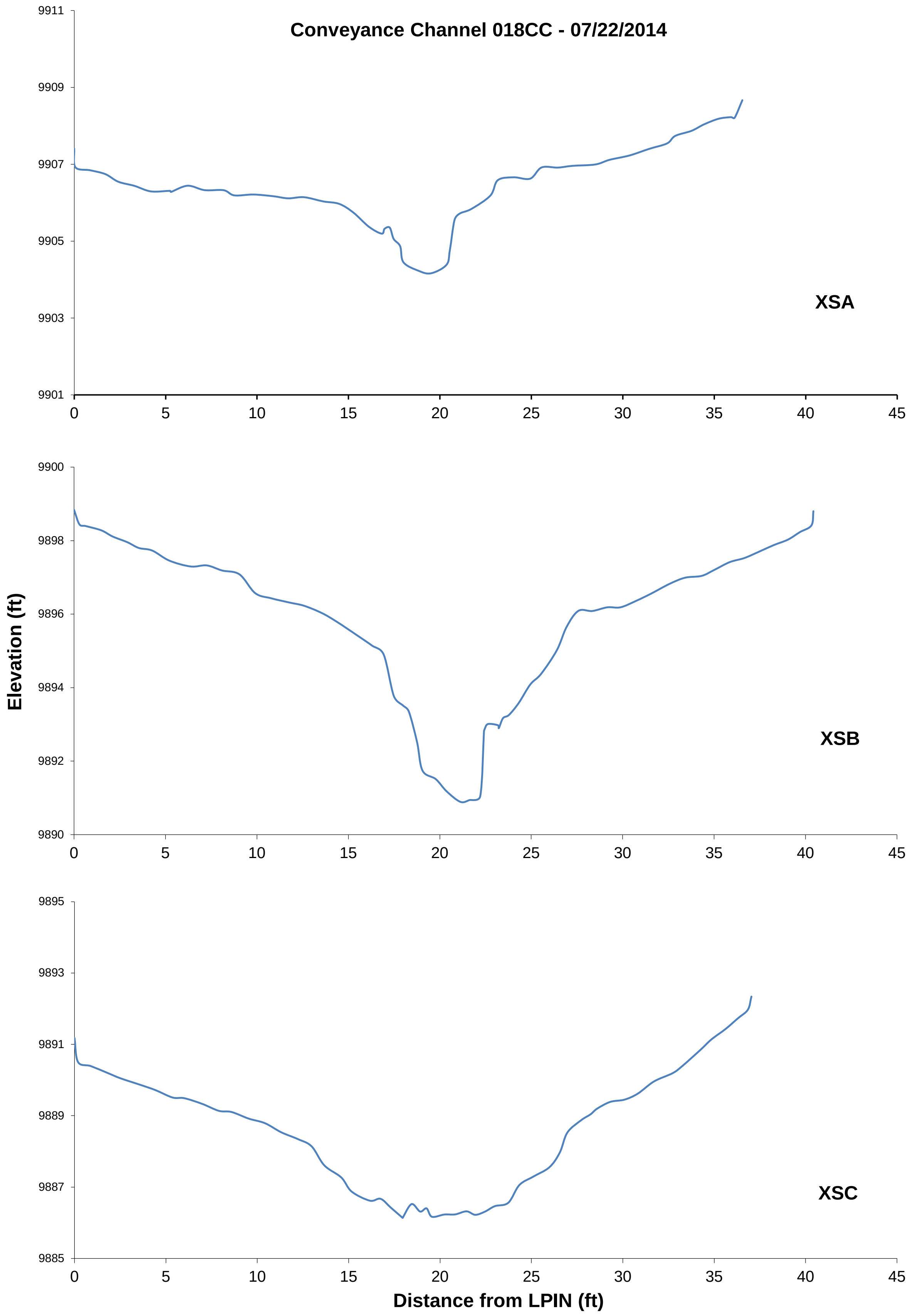

Conveyance Channel 012CC - 06/05/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10502
10501
10500
10499
10498
10497
10496
10495
10494
10493
10492
10491
10490
10489
0
5
10
15
20
25
30



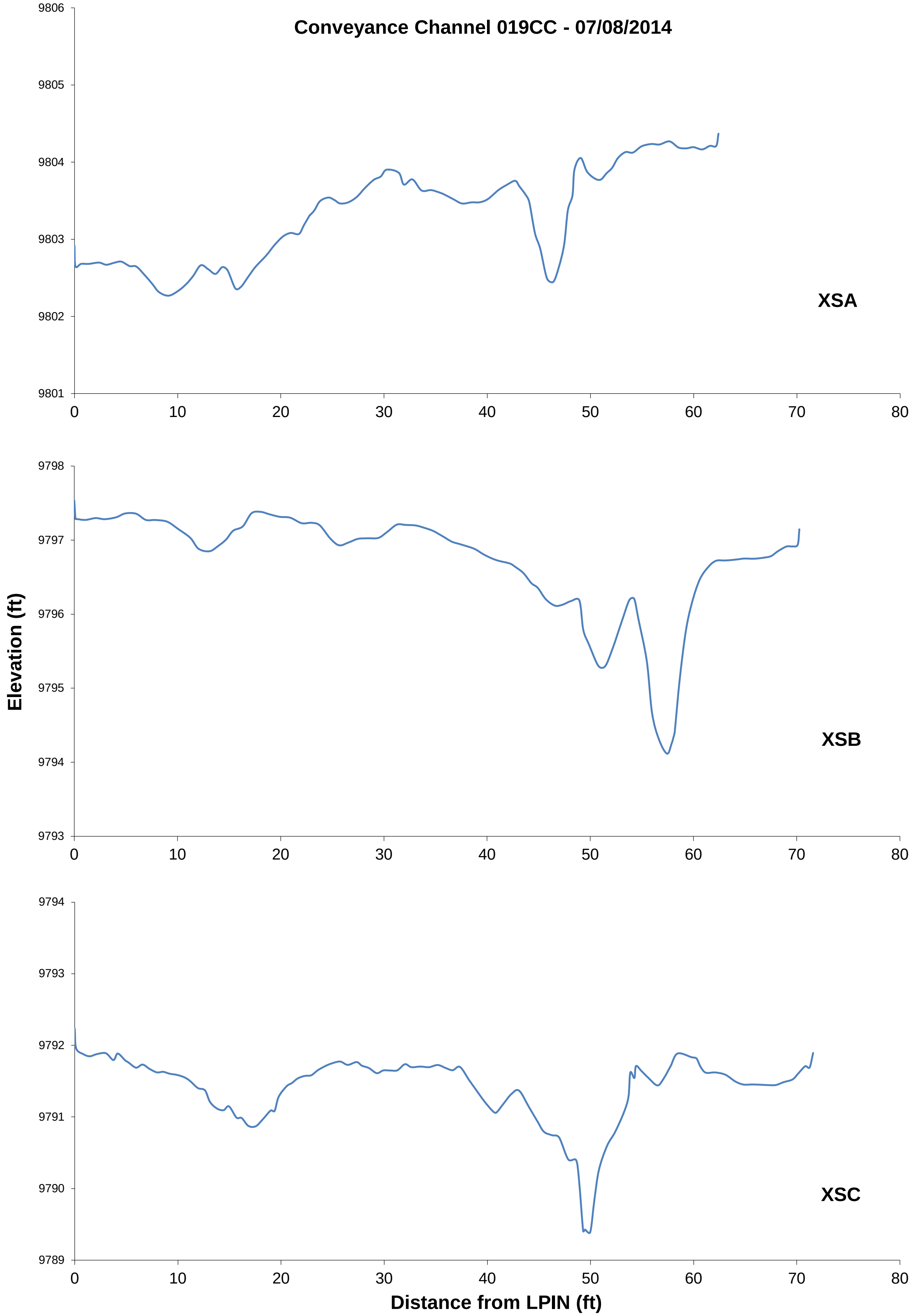
Conveyance Channel 013CC - 06/05/2014
Elevation (ft)
10510
10509
10508
10507
10506
0
5
10
15
20
25
30
XSA
10506
10505
10504
10503
10502
0
5
10
15
20
25
30
XSB
10499
10498
10497
10496
10495
0
5
10
15
20
25
30
XSC
Distance from LPIN (ft)

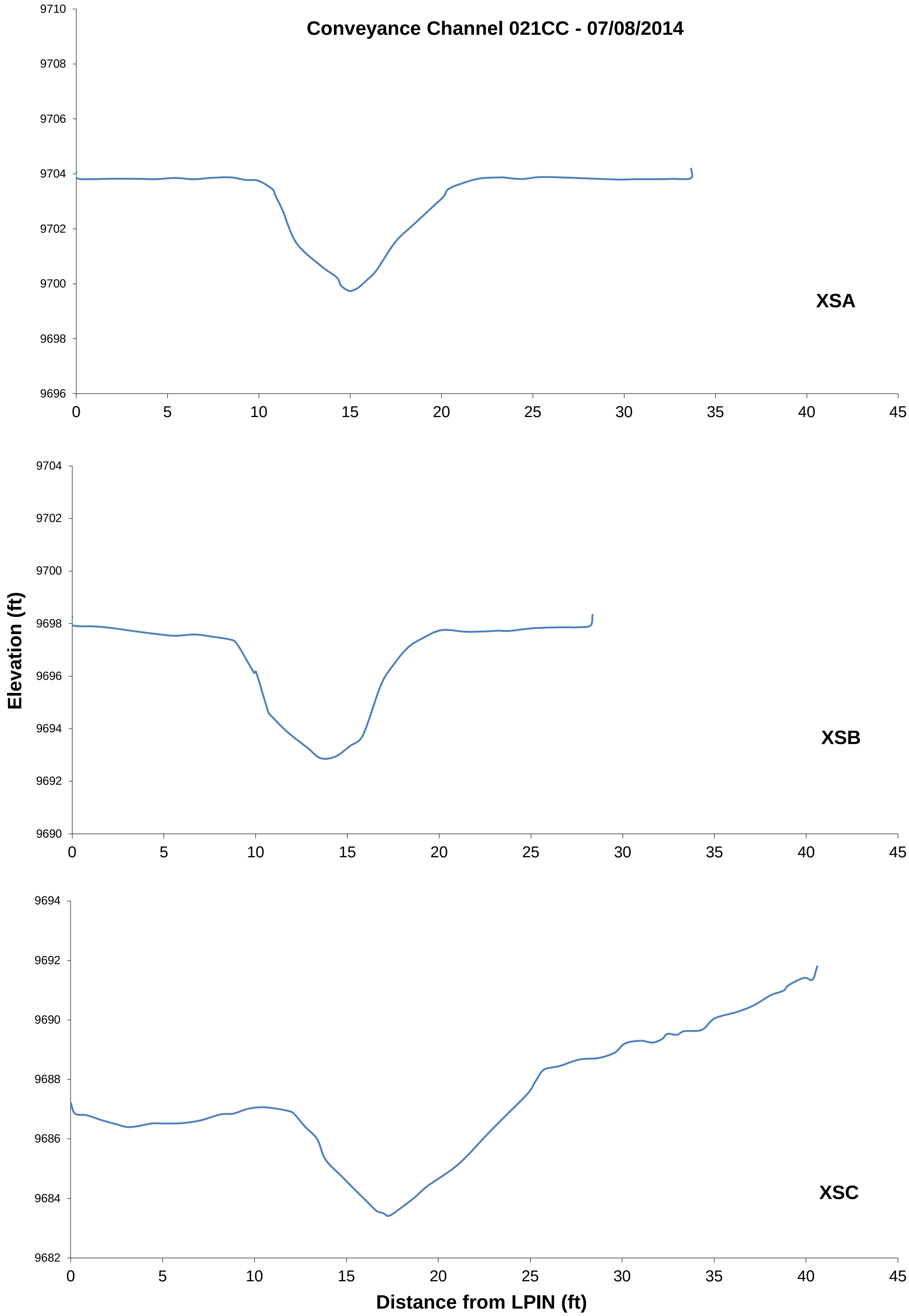

Conveyance Channel 016CC - 08/05/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9800
9799
9798
9797
9796
9795
9794
9793
9792
9791
9789
9788
9787
9786
0
5
10
15
20
25
30
35

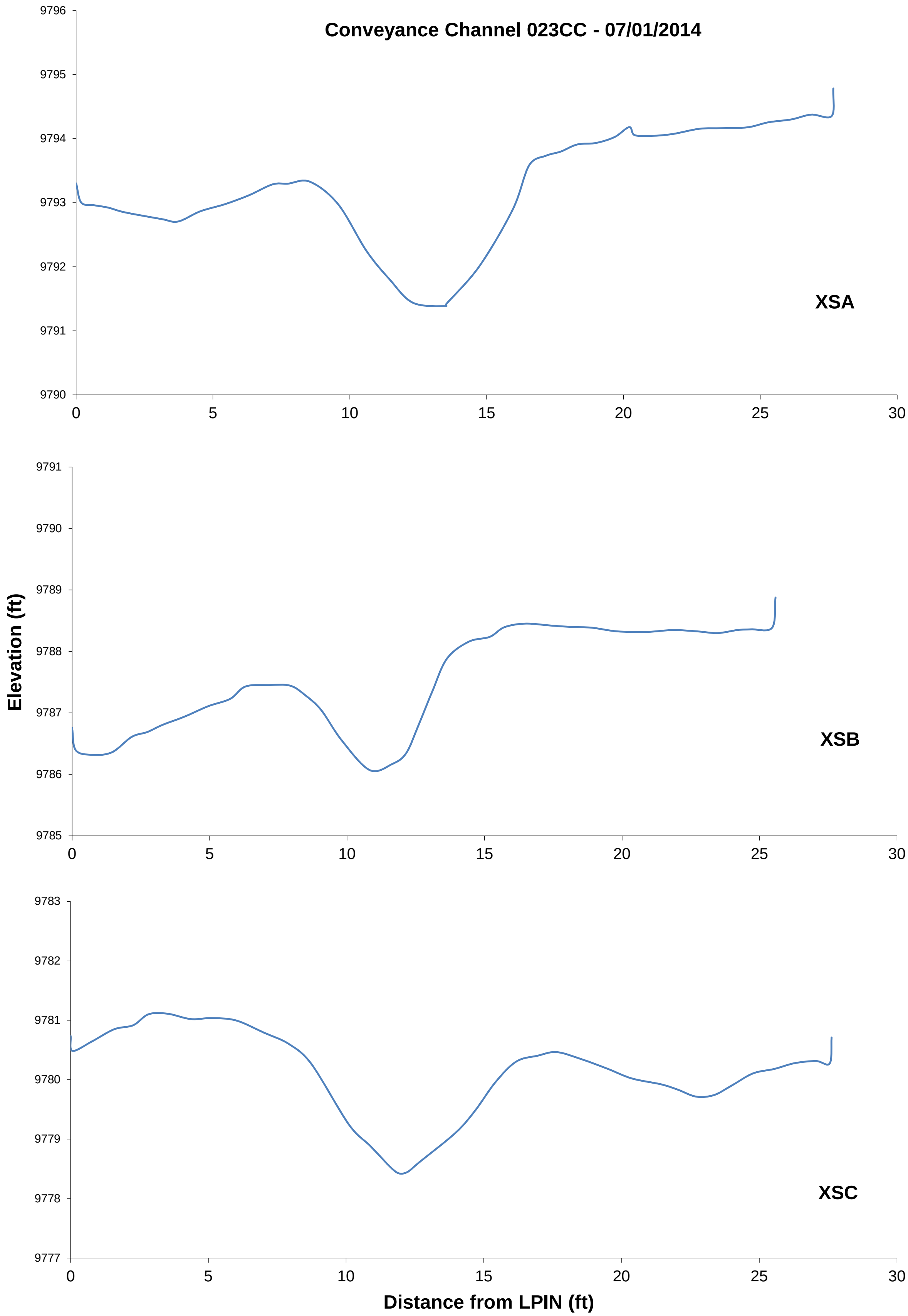

Conveyance Channel 017CC - 08/05/2014
9607
9606
9605
9604
0
10
20
30
40
50
60
XSA
9604
9603
9602
9601
XSB
9600
9599
9598
9597
XSC
Elevation (ft)
Distance from LPIN (ft)

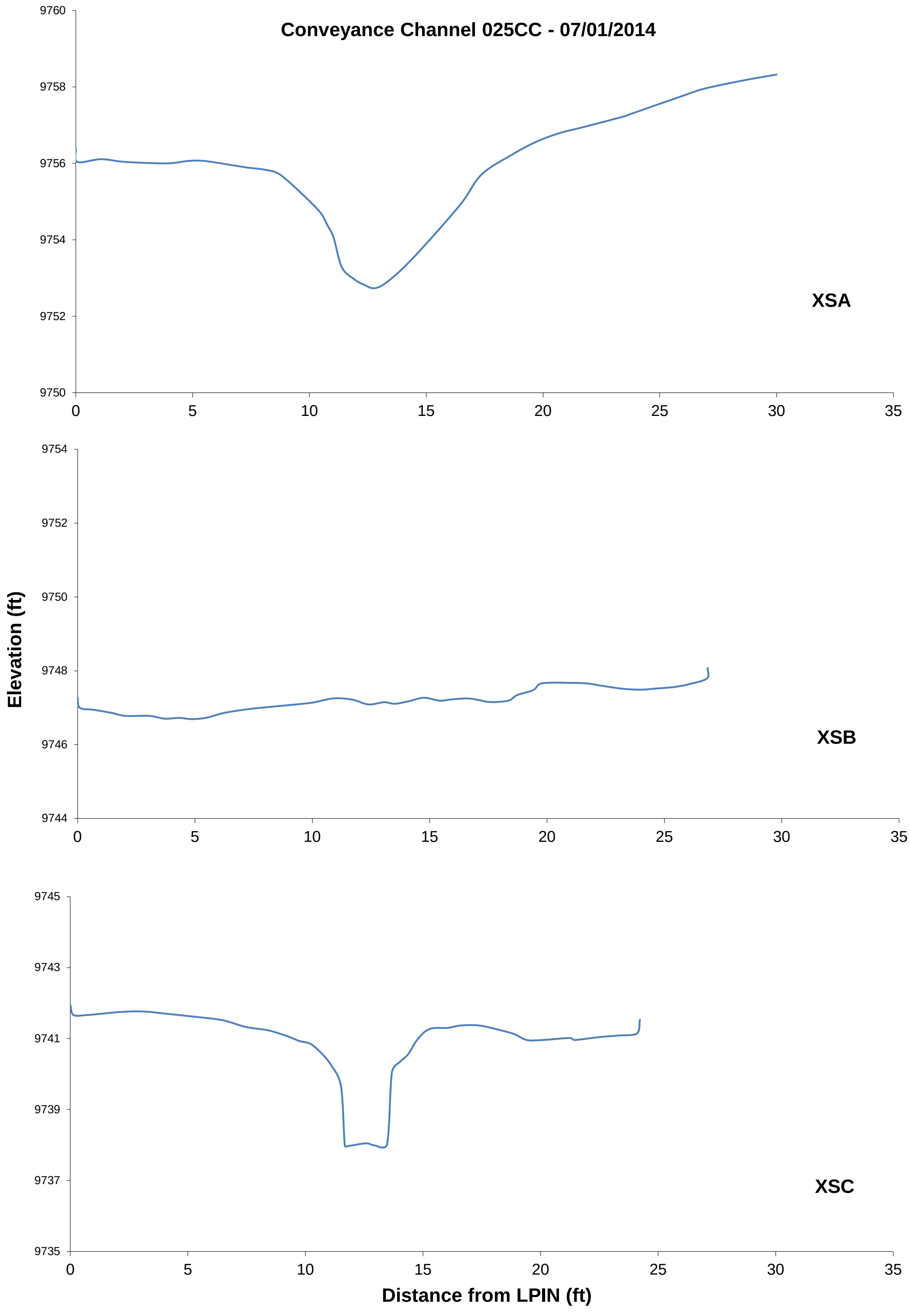


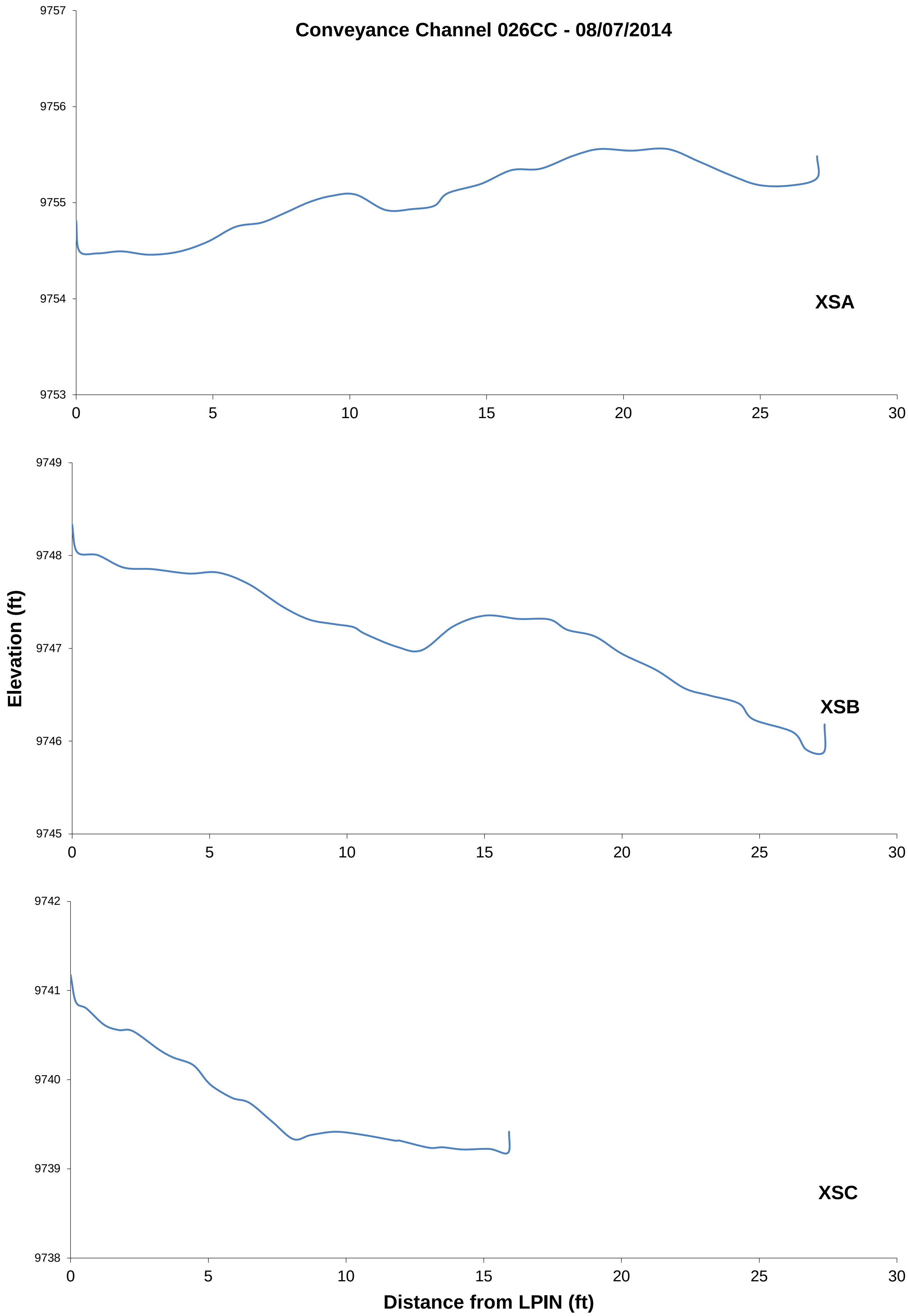
Conveyance Channel 018CC - 07/22/2014
9911
9909
9907
9905
9903
9901
0 5 10 15 20 25 30 35 40 45
XSA
9900
9898
9896
9894
9892
9890
0 5 10 15 20 25 30 35 40 45
XSB
Elevation (ft)
9895
9893
9891
9889
9887
9885
0 5 10 15 20 25 30 35 40 45
XSC
Distance from LPIN (ft)

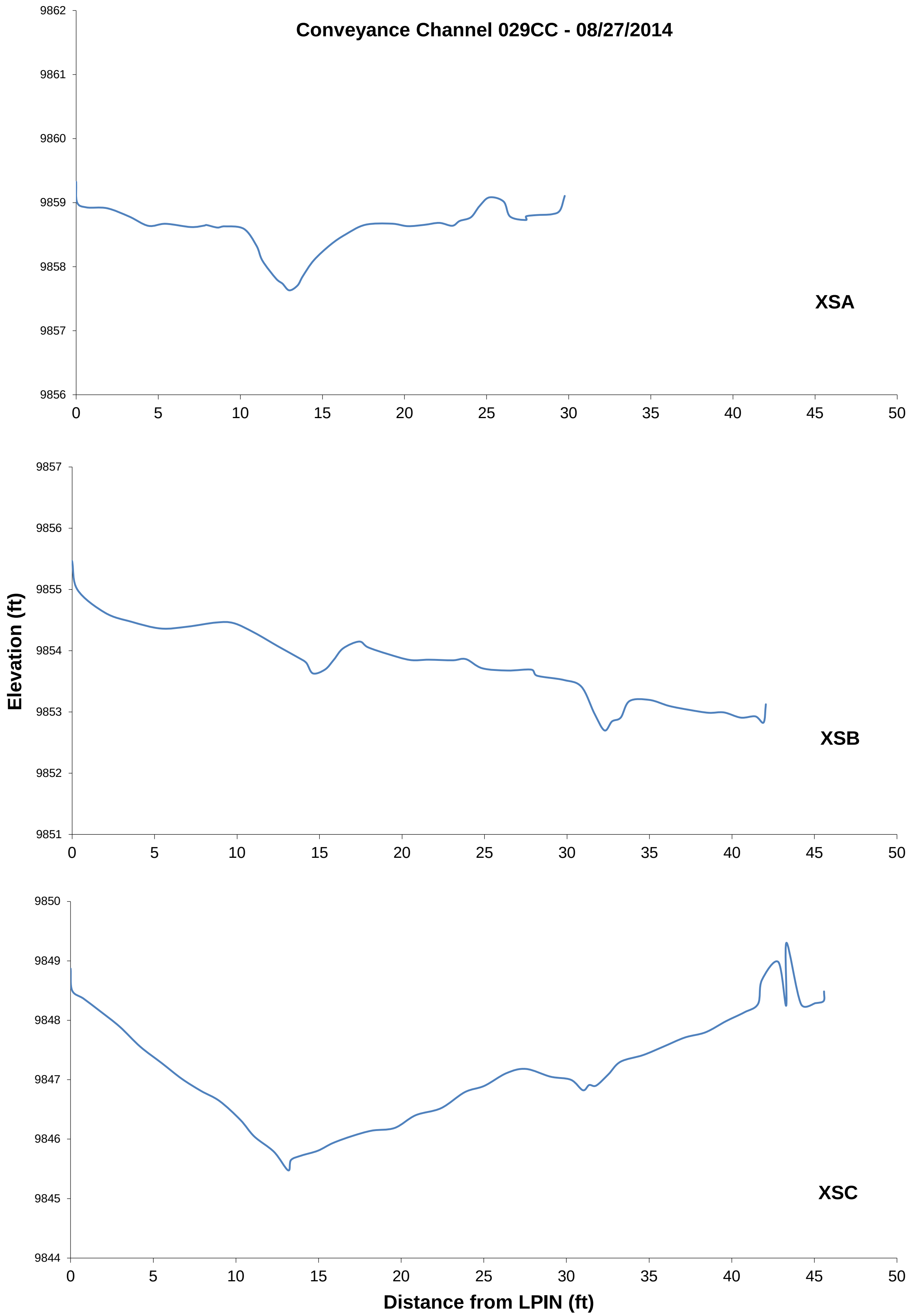

Conveyance Channel 019CC - 07/08/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9806
9805
9804
9803
9802
9801
9798
9797
9796
9795
9794
9793
9794
9793
9792
9791
9790
9789
0
10
20
30
40
50
60
70
80


Conveyance Channel 021CC - 07/08/2014
9710
9708
9706
9704
9702
9700
9698
9696
0 5 10 15 20 25 30 35 40 45
XSA
9704
9702
9700
9698
9696
9694
9692
9690
0 5 10 15 20 25 30 35 40 45
XSB
Elevation (ft)
9694
9692
9690
9688
9686
9684
9682
0 5 10 15 20 25 30 35 40 45
XSC
Distance from LPIN (ft)


Conveyance Channel 023CC - 07/01/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9796
9795
9794
9793
9792
9791
9790
9791
9790
9789
9788
9787
9786
9785
9783
9782
9781
9780
9779
9778
9777
0
5
10
15
20
25
30


Conveyance Channel 025CC - 07/01/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9760
9758
9756
9754
9752
9750
9754
9752
9750
9748
9746
9744
9745
9743
9741
9739
9737
9735
0
5
10
15
20
25
30
35


Conveyance Channel 026CC - 08/07/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9757
9756
9755
9754
9753
9749
9748
9747
9746
9745
9742
9741
9740
9739
9738
0
5
10
15
20
25
30


Conveyance Channel 029CC - 08/27/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9862
9861
9860
9859
9858
9857
9856
9855
9854
9853
9852
9851
9850
9849
9848
9847
9846
9845
9844
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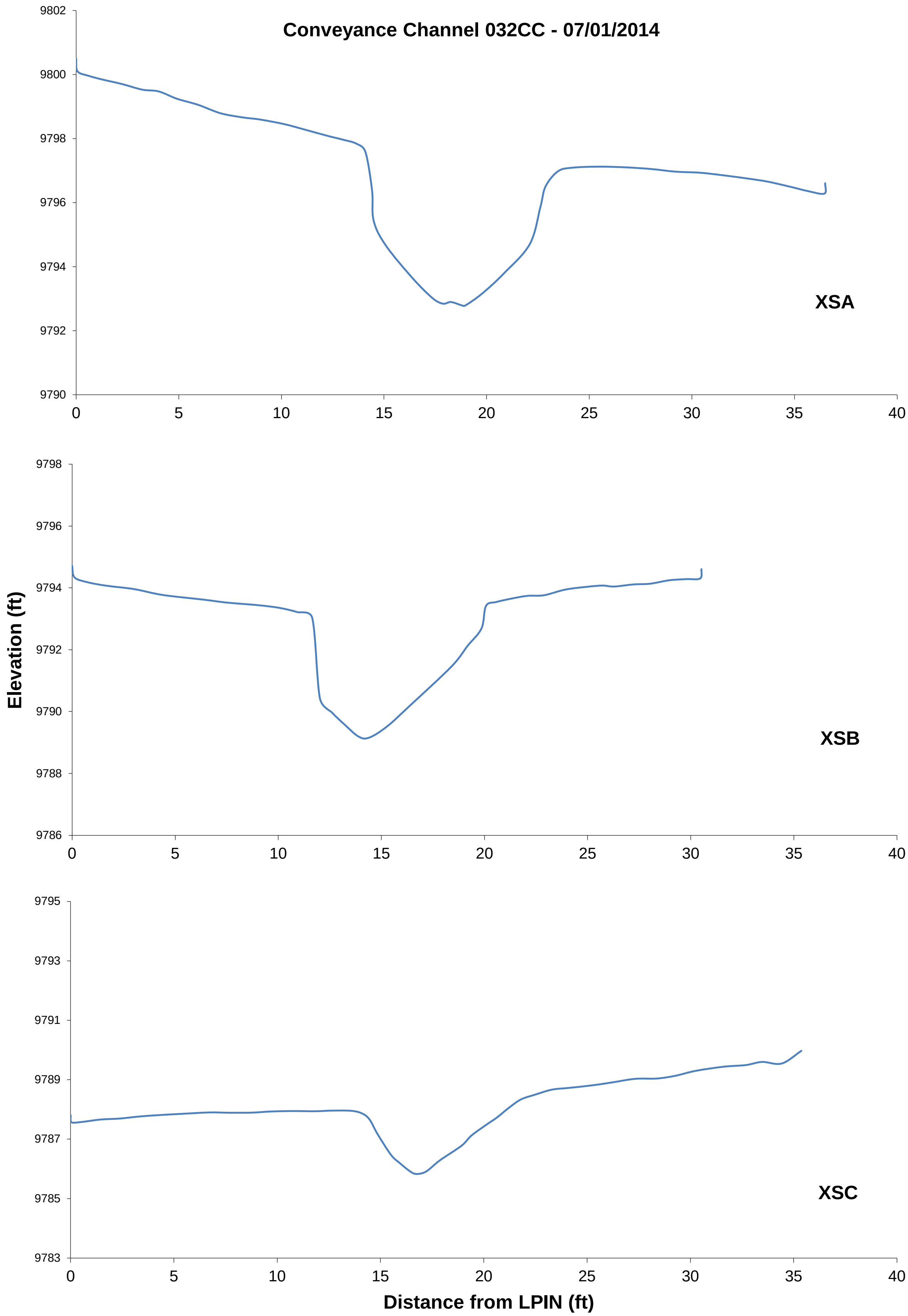
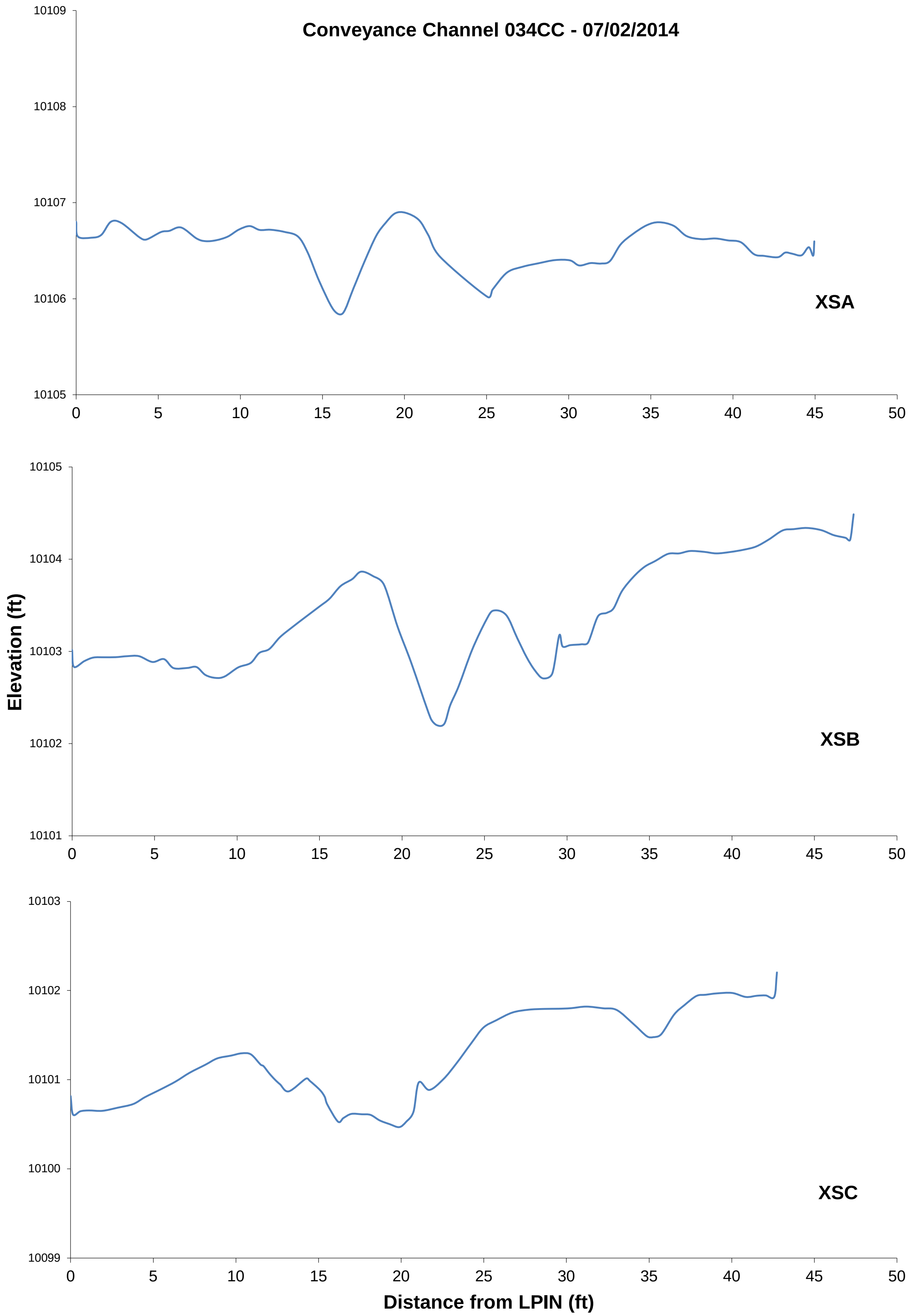
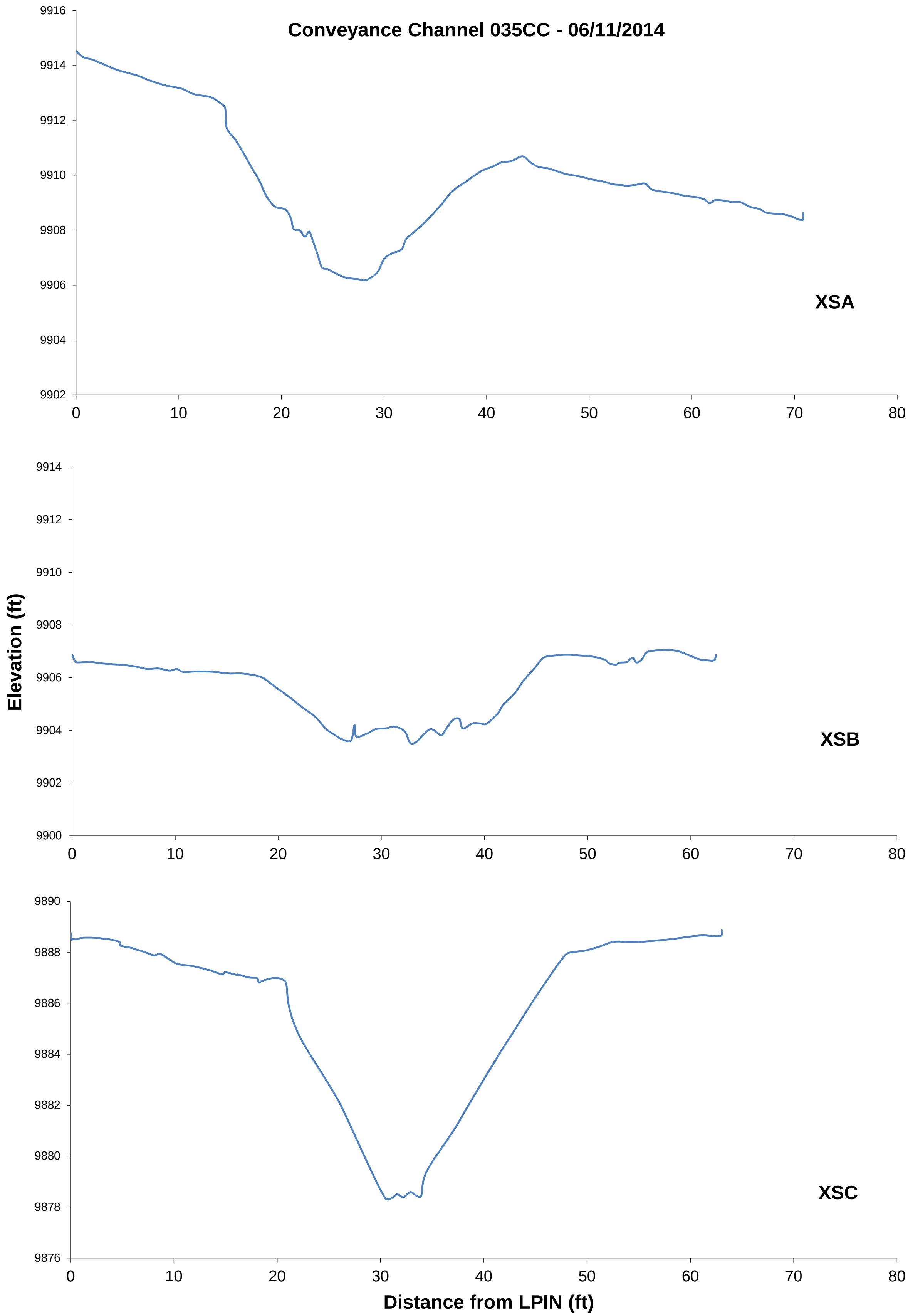
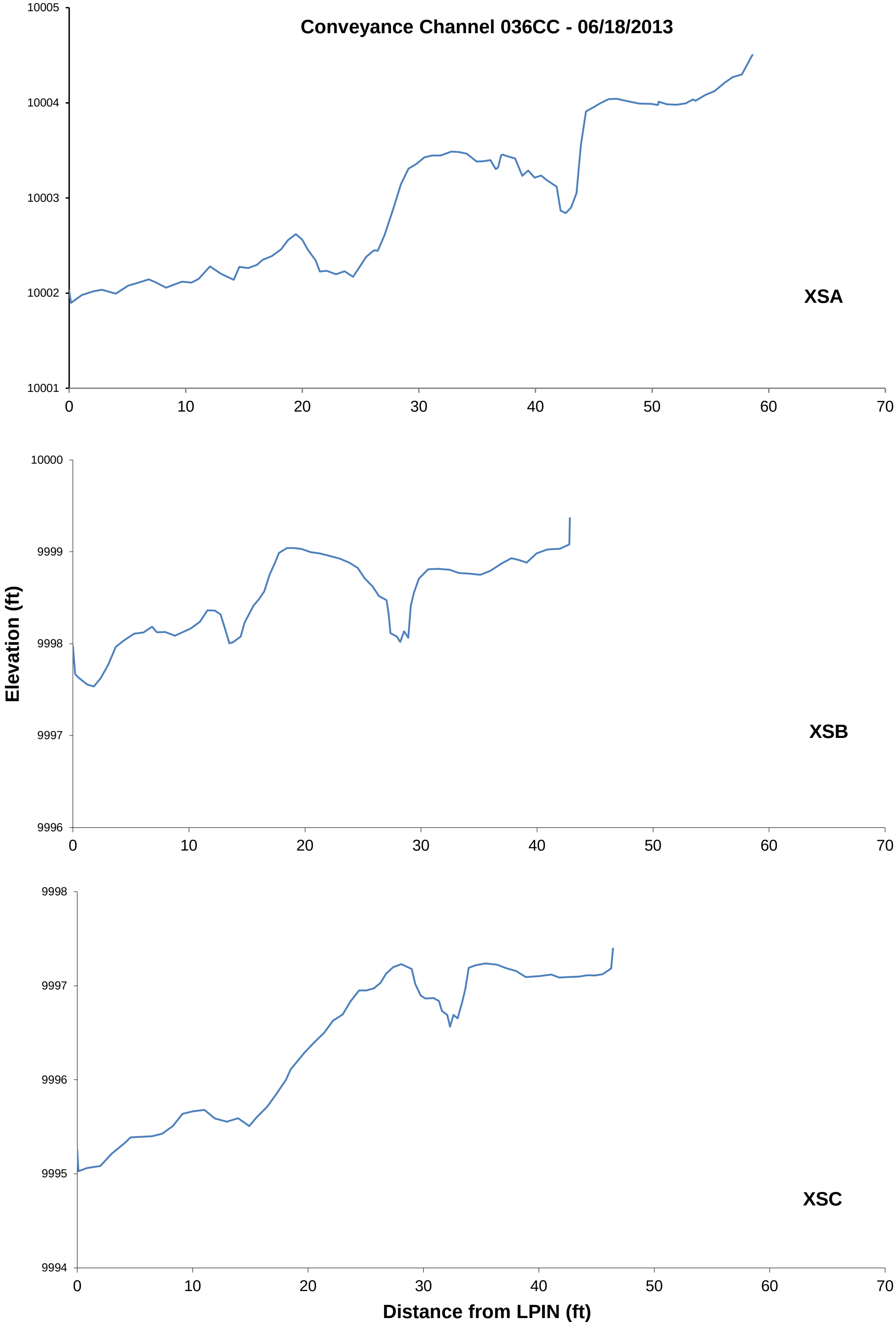
20
25
30
35
40
45
50


Conveyance Channel 032CC - 07/01/2014
9802
9800
9798
9796
9794
9792
9790
0
5
10
15
20
25
30
35
40
XSA
9798
9796
9794
9792
9790
9788
9786
XSB
Elevation (ft)
9795
9793
9791
9789
9787
9785
9783
XSC
Distance from LPIN (ft)

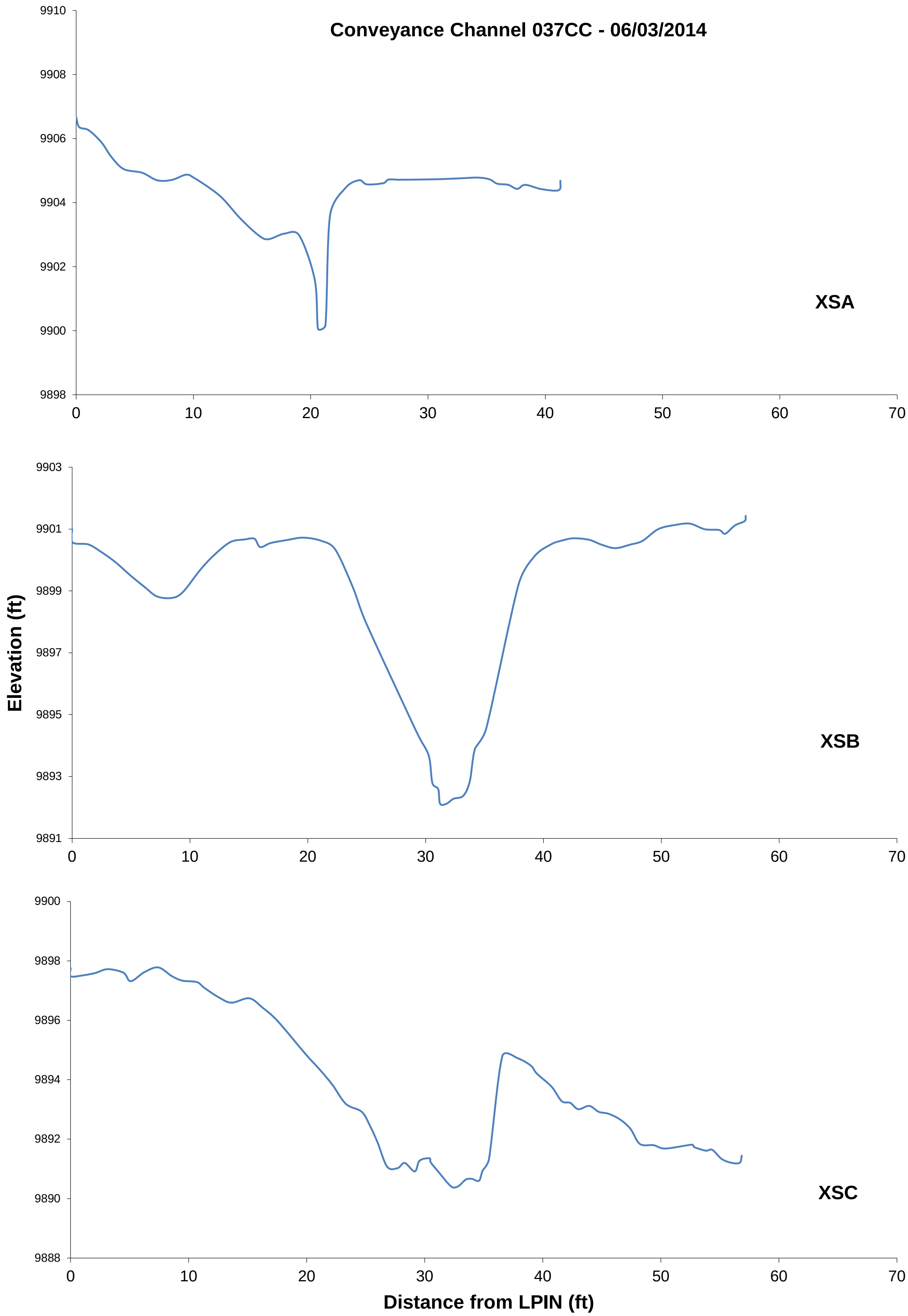

Conveyance Channel 034CC - 07/02/2014
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
10109
10108
10107
10106
10105
10104
10103
10102
10101
10100
10099
0
5
10
15
20
25
30
35
40
45
50

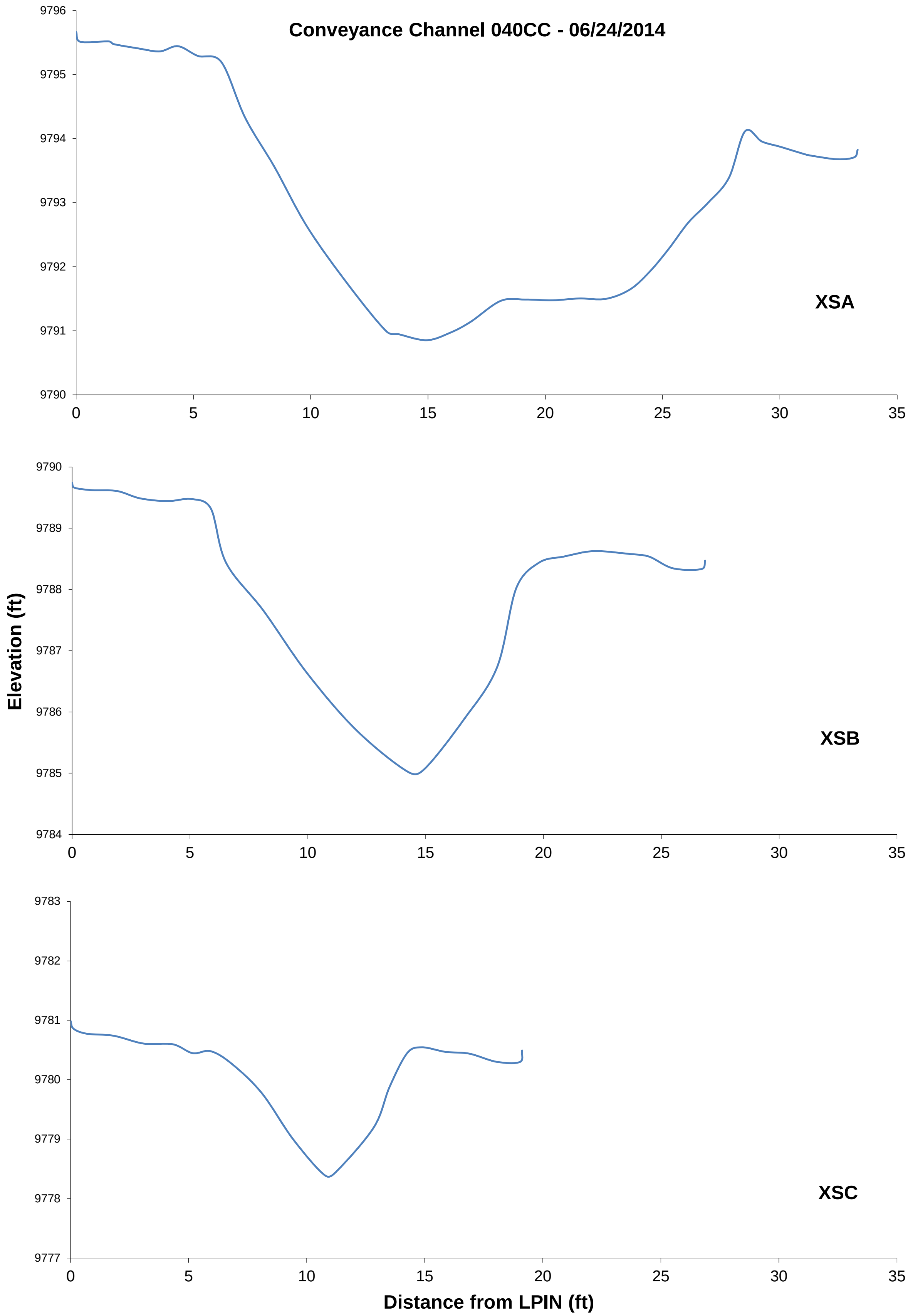


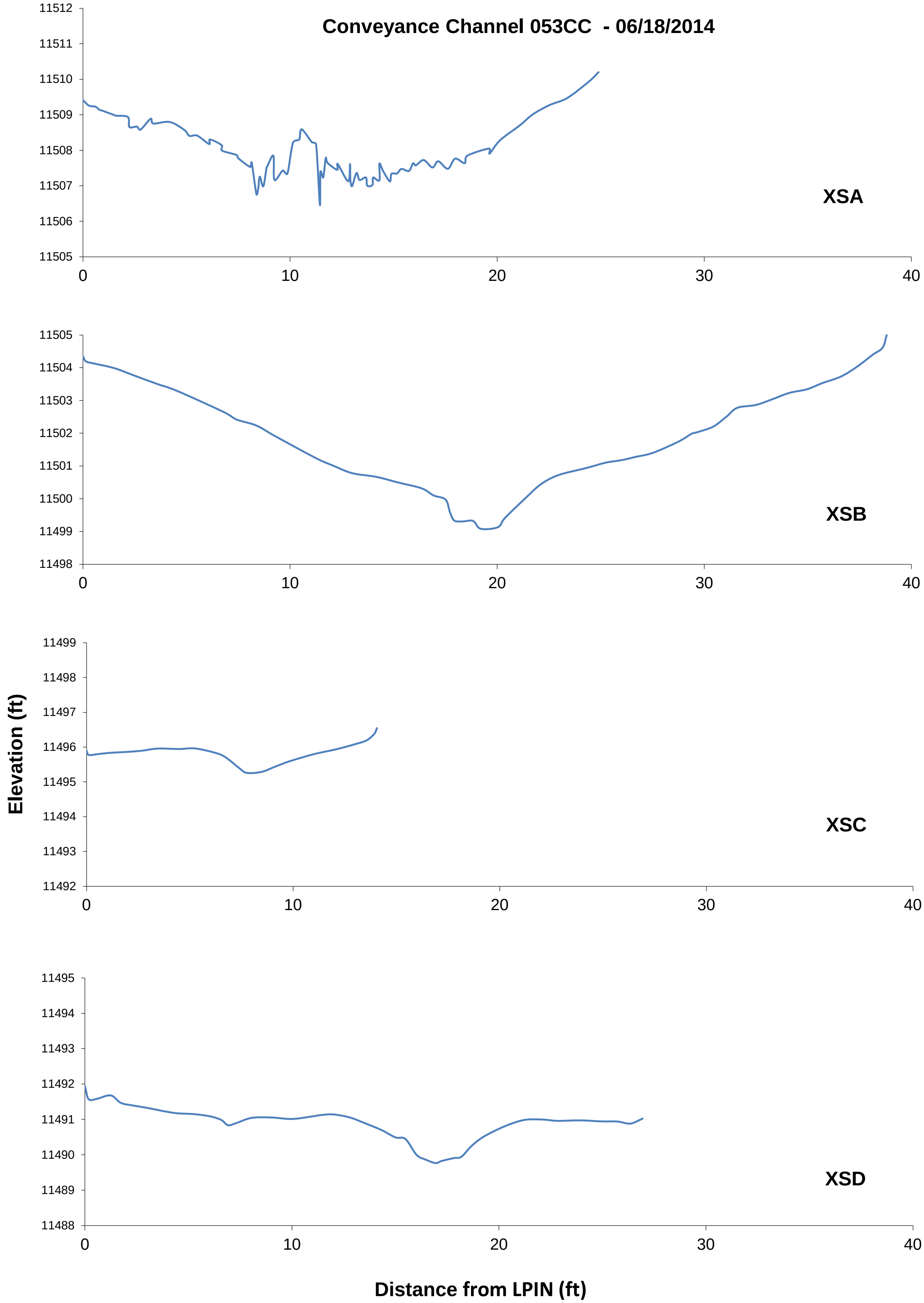
Conveyance Channel 035CC - 06/11/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9916
9914
9912
9910
9908
9906
9904
9902
9900
9890
9888
9886
9884
9882
9880
9878
9876
0
10
20
30
40
50
60
70
80

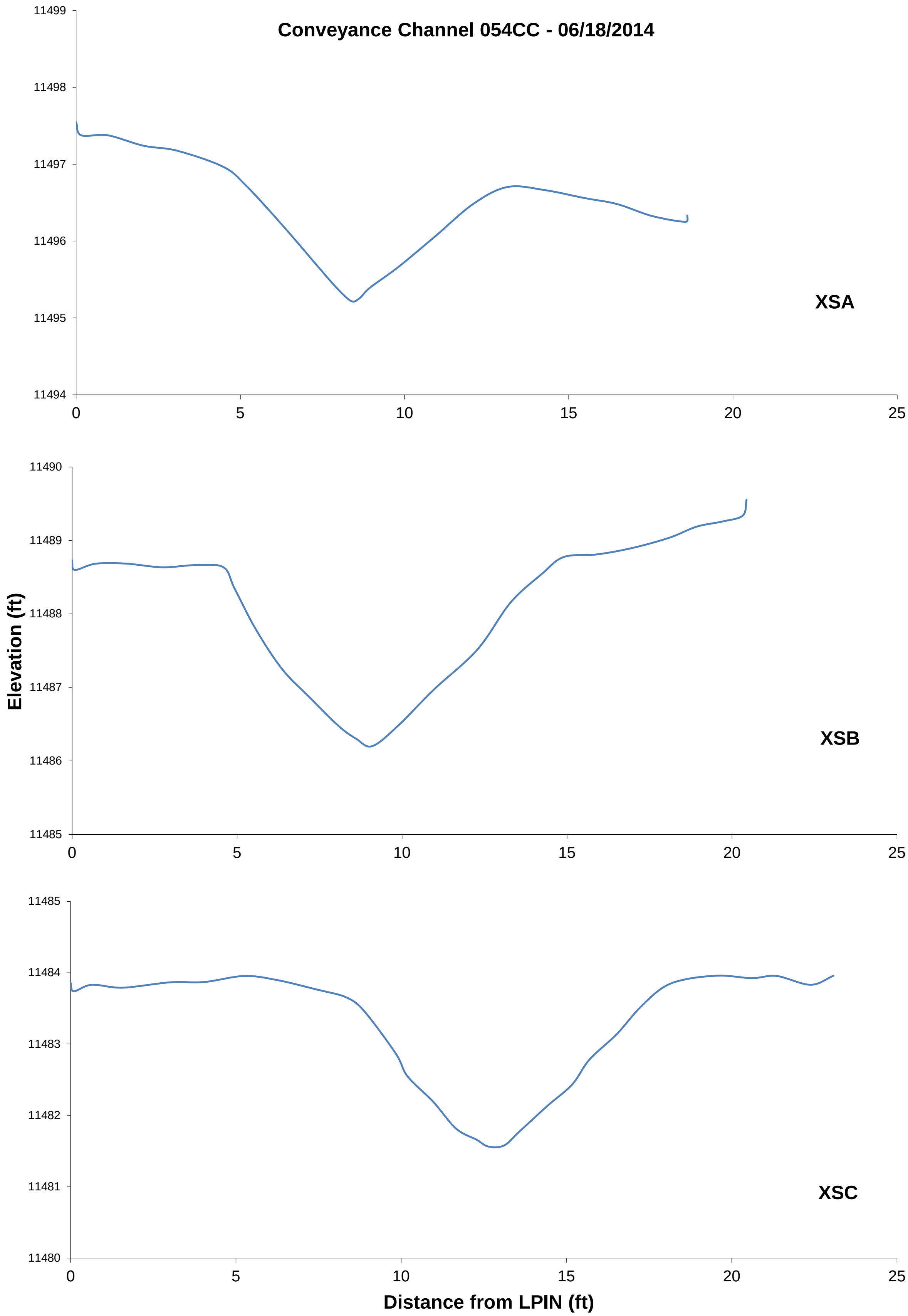


Conveyance Channel 036CC - 06/18/2013
Elevation (ft)
10005
10004
10003
10002
10001
XSA
10000
9999
9998
9997
9996
XSB
9998
9997
9996
9995
9994
XSC
0
10
20
30
40
50
60
70
Distance from LPIN (ft)

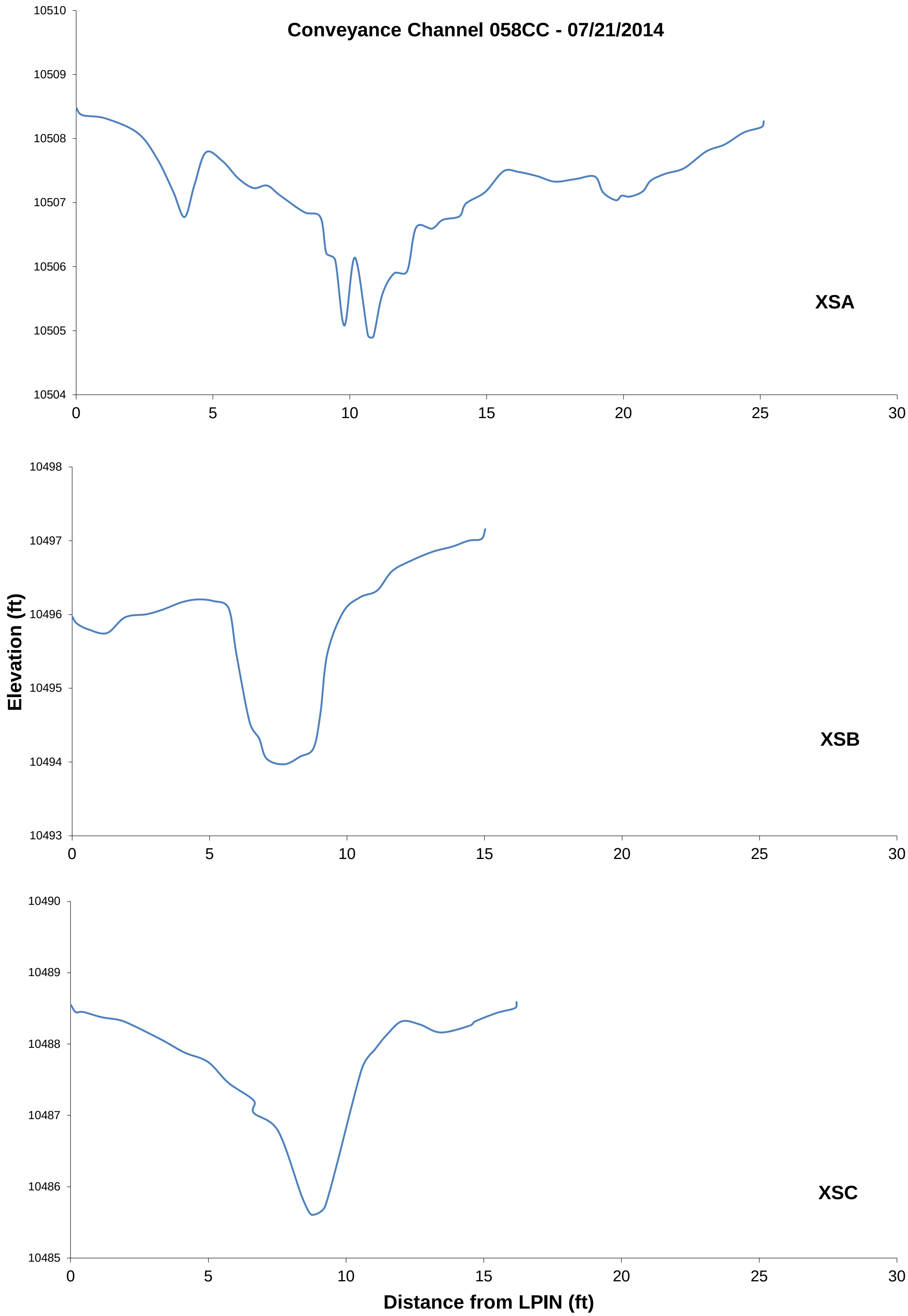

Conveyance Channel 037CC - 06/03/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9910
9908
9906
9904
9902
9900
9898
9903
9901
9899
9897
9895
9893
9891
9900
9898
9896
9894
9892
9890
9888
0
10
20
30
40
50
60
70

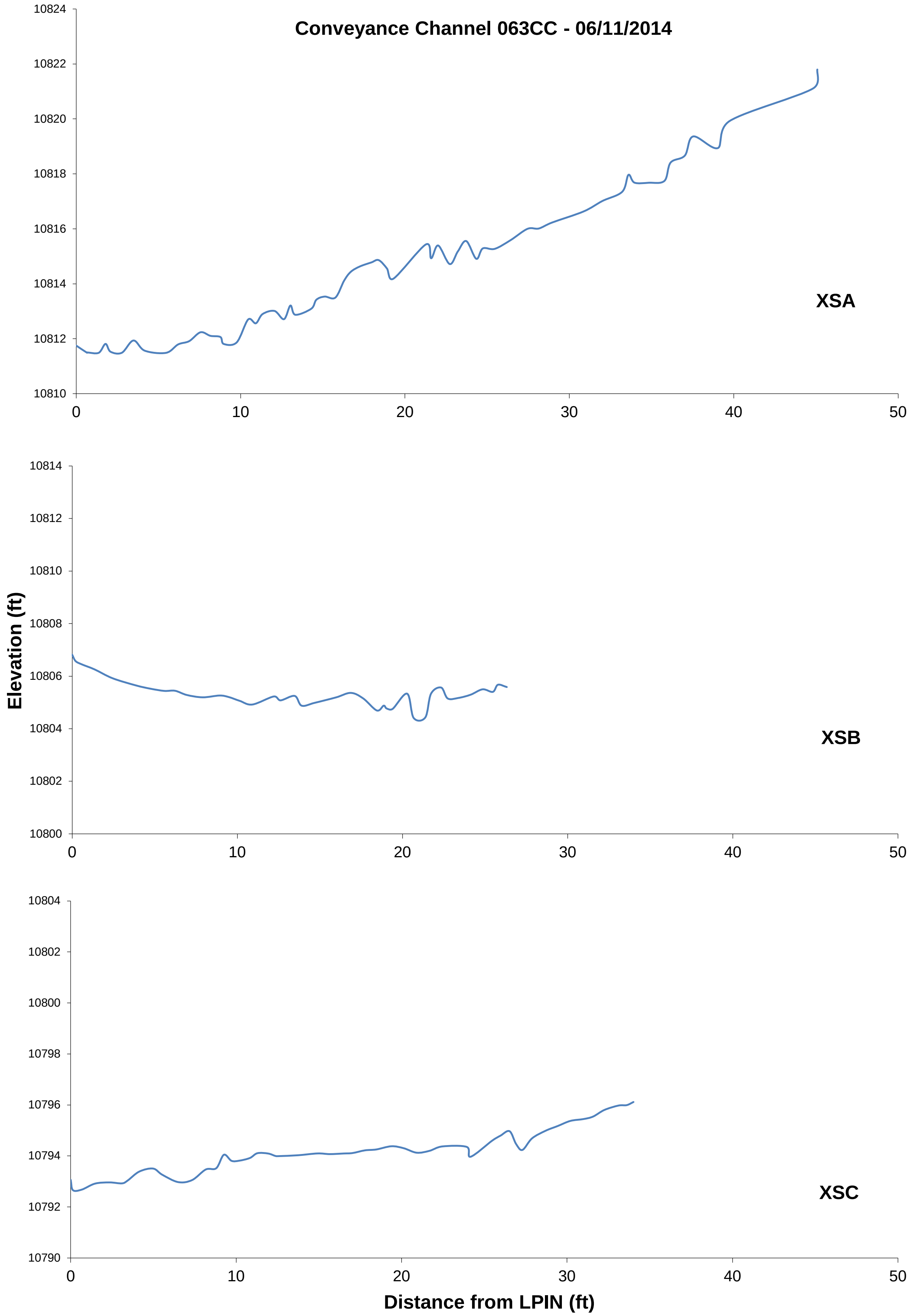

Conveyance Channel 040CC - 06/24/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9796
9795
9794
9793
9792
9791
9790
9789
9788
9787
9786
9785
9784
9783
9782
9781
9780
9779
9778
9777
0
5
10
15
20
25
30
35

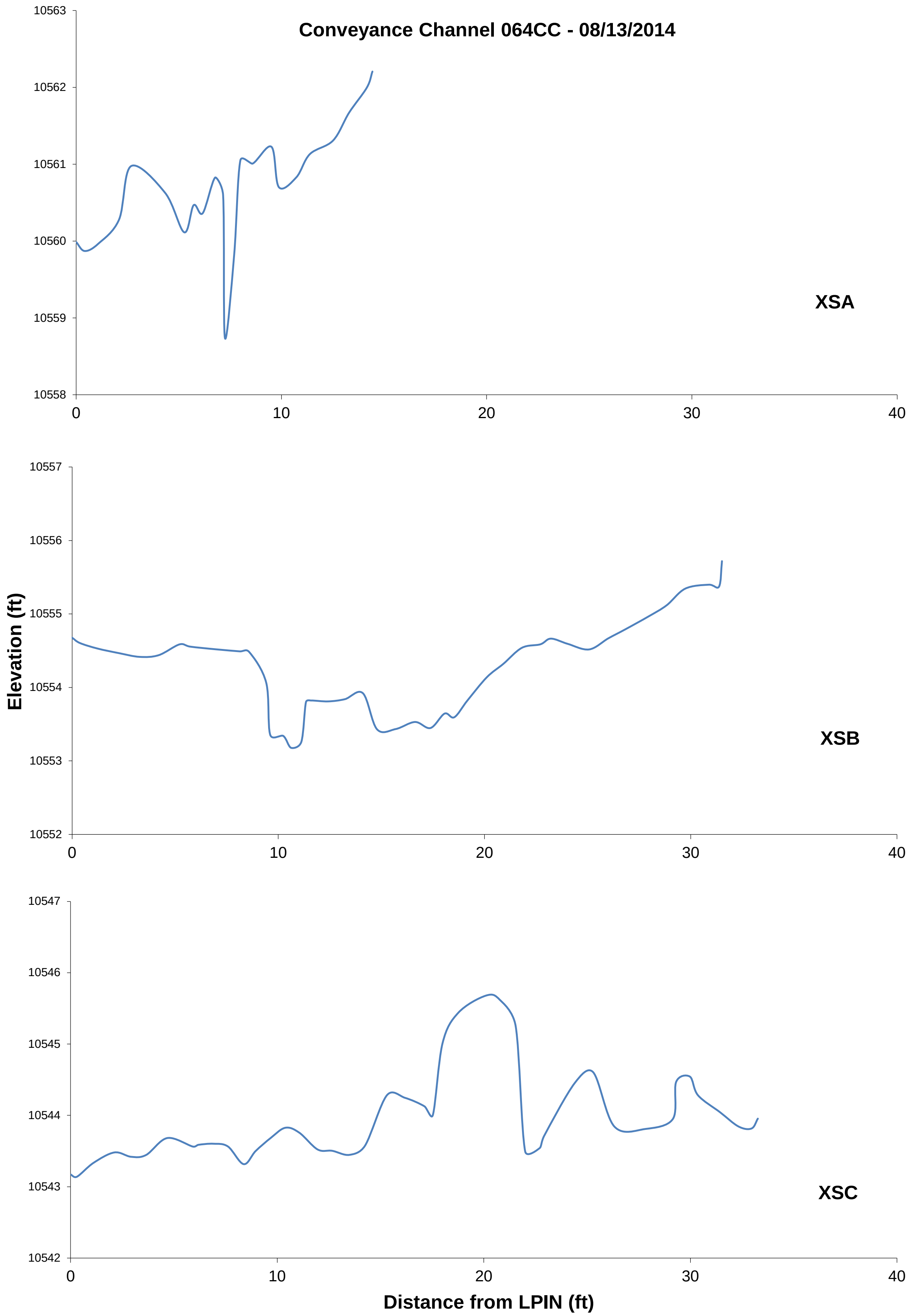

Conveyance Channel 053CC - 06/18/2014
XSA
XSB
XSC
XSD
Elevation (ft)
Distance from LPIN (ft)
11512
11511
11510
11509
11508
11507
11506
11505
11504
11503
11502
11501
11500
11499
11498
11497
11496
11495
11494
11493
11492
11491
11490
11489
11488
0
10
20
30
40



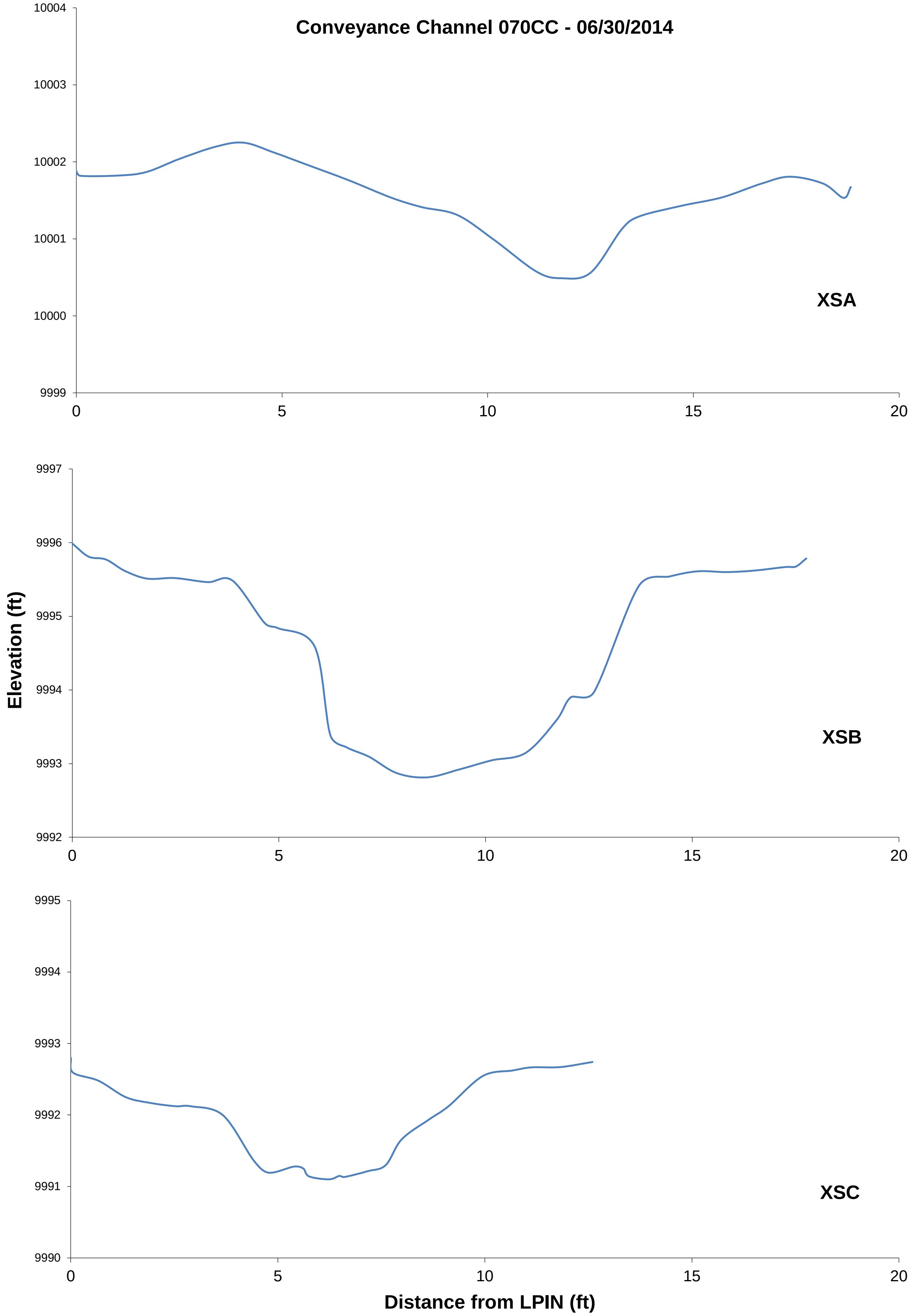
Conveyance Channel 054CC - 06/18/2014
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
11499
11498
11497
11496
11495
11494
11490
11489
11488
11487
11486
11485
11484
11483
11482
11481
11480
0
5
10
15
20
25


Conveyance Channel 058CC - 07/21/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10510
10509
10508
10507
10506
10505
10504
10498
10497
10496
10495
10494
10493
10490
10489
10488
10487
10486
10485
0
5
10
15
20
25
30

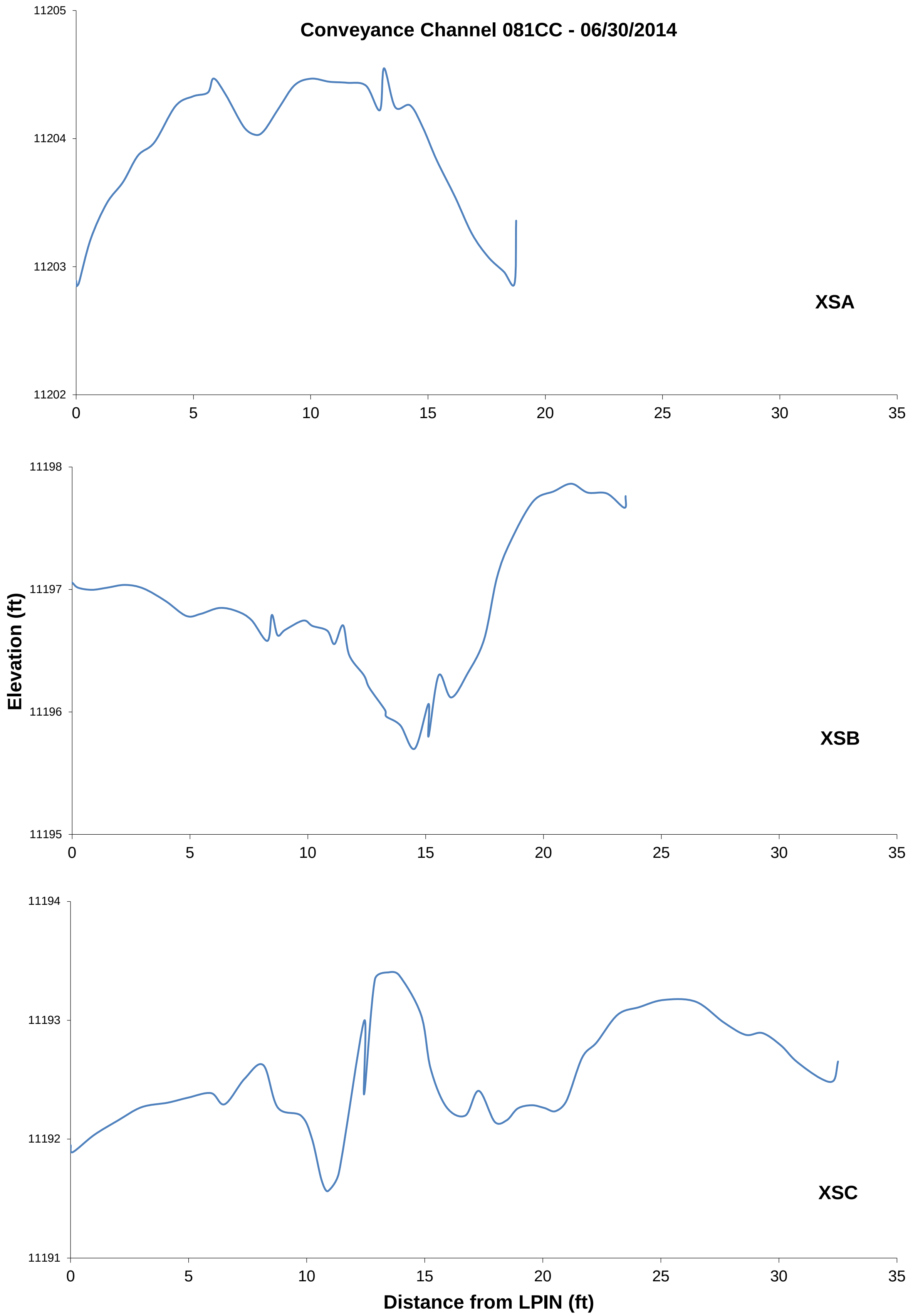

Conveyance Channel 063CC - 06/11/2014
10824
10822
10820
10818
10816
10814
10812
10810
0
10
20
30
40
50
XSA
10814
10812
10810
10808
10806
10804
10802
10800
0
10
20
30
40
50
XSB
Elevation (ft)
10804
10802
10800
10798
10796
10794
10792
10790
0
10
20
30
40
50
XSC
Distance from LPIN (ft)

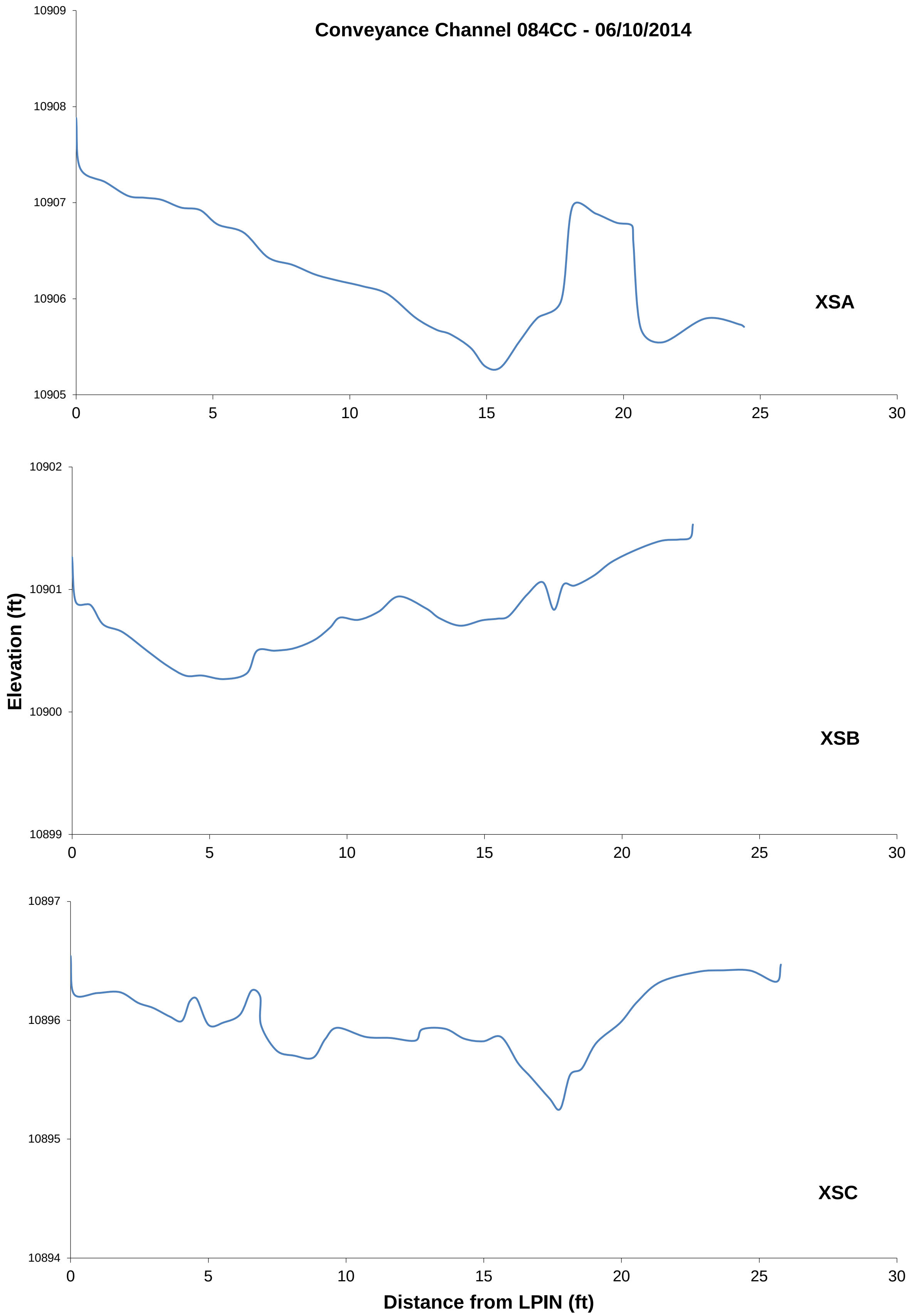


Conveyance Channel 064CC - 08/13/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10563
10562
10561
10560
10559
10558
10557
10556
10555
10554
10553
10552
10547
10546
10545
10544
10543
10542
0
10
20
30
40

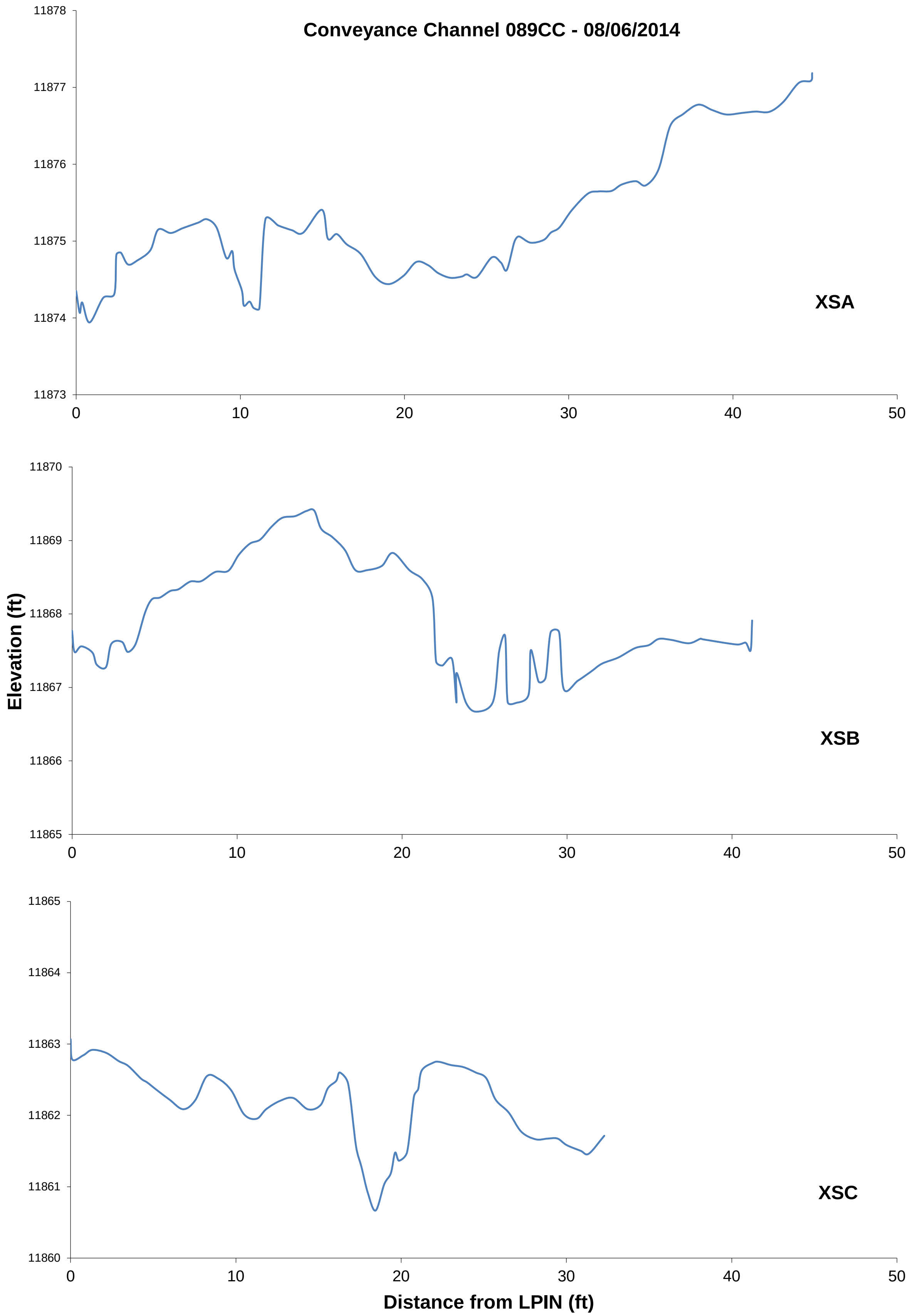


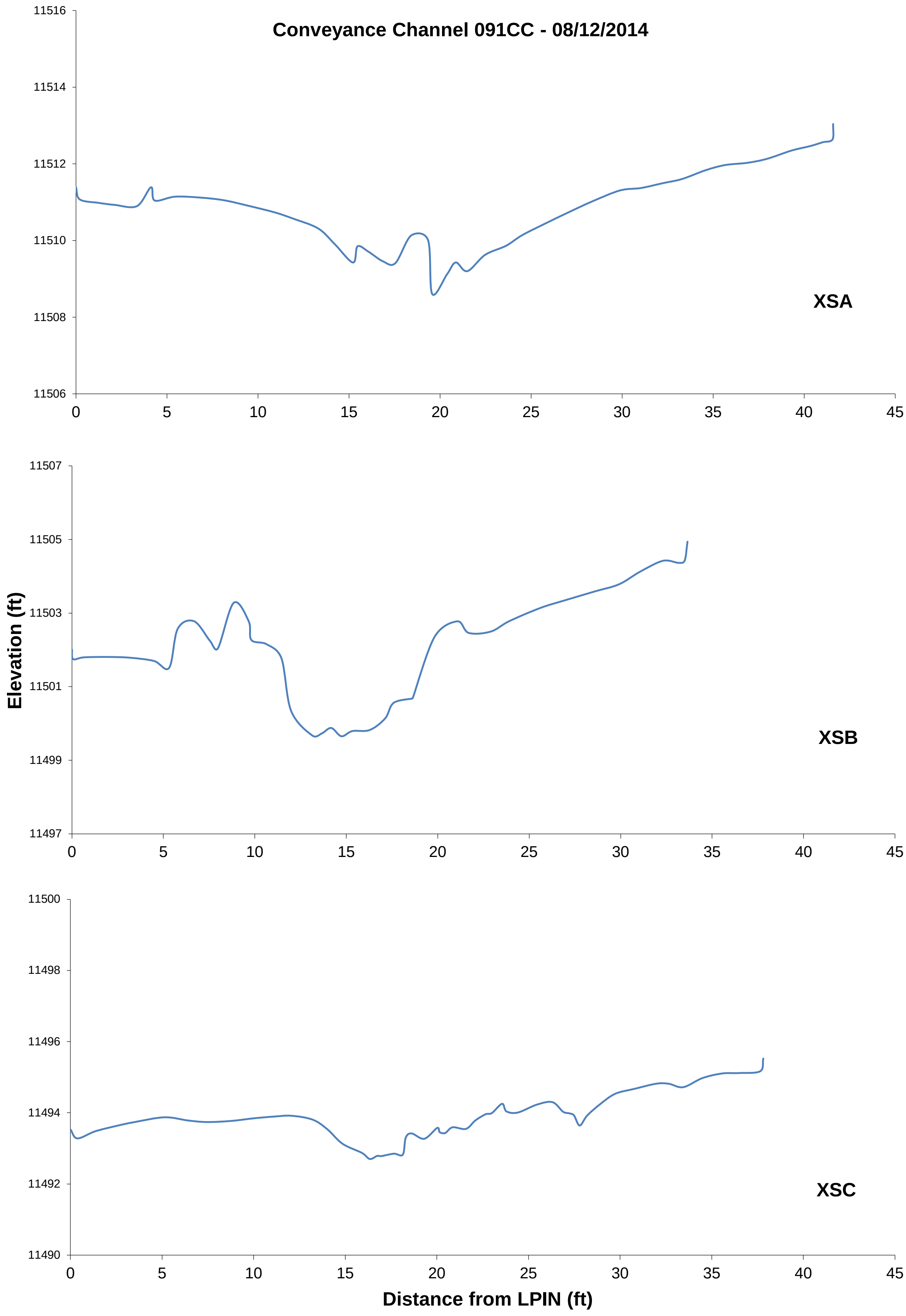
Conveyance Channel 070CC - 06/30/2014
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
10004
10003
10002
10001
10000
9999
9997
9996
9995
9994
9993
9992
9995
9994
9993
9992
9991
9990
0
5
10
15
20

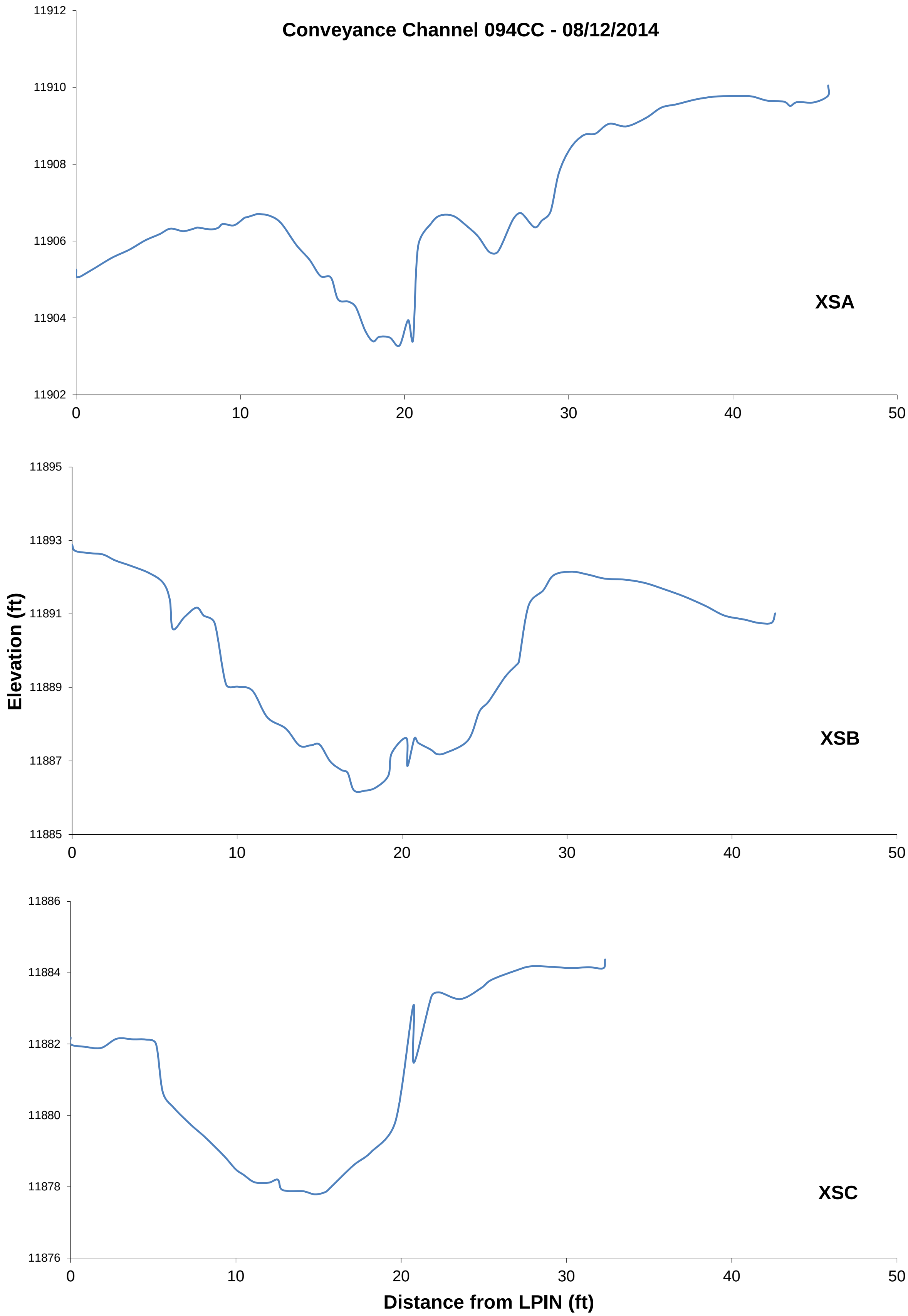

Conveyance Channel 081CC - 06/30/2014
11205
11204
11203
11202
XSA
0
5
10
15
20
25
30
35
11198
11197
11196
11195
XSB
Elevation (ft)
11194
11193
11192
11191
XSC
Distance from LPIN (ft)



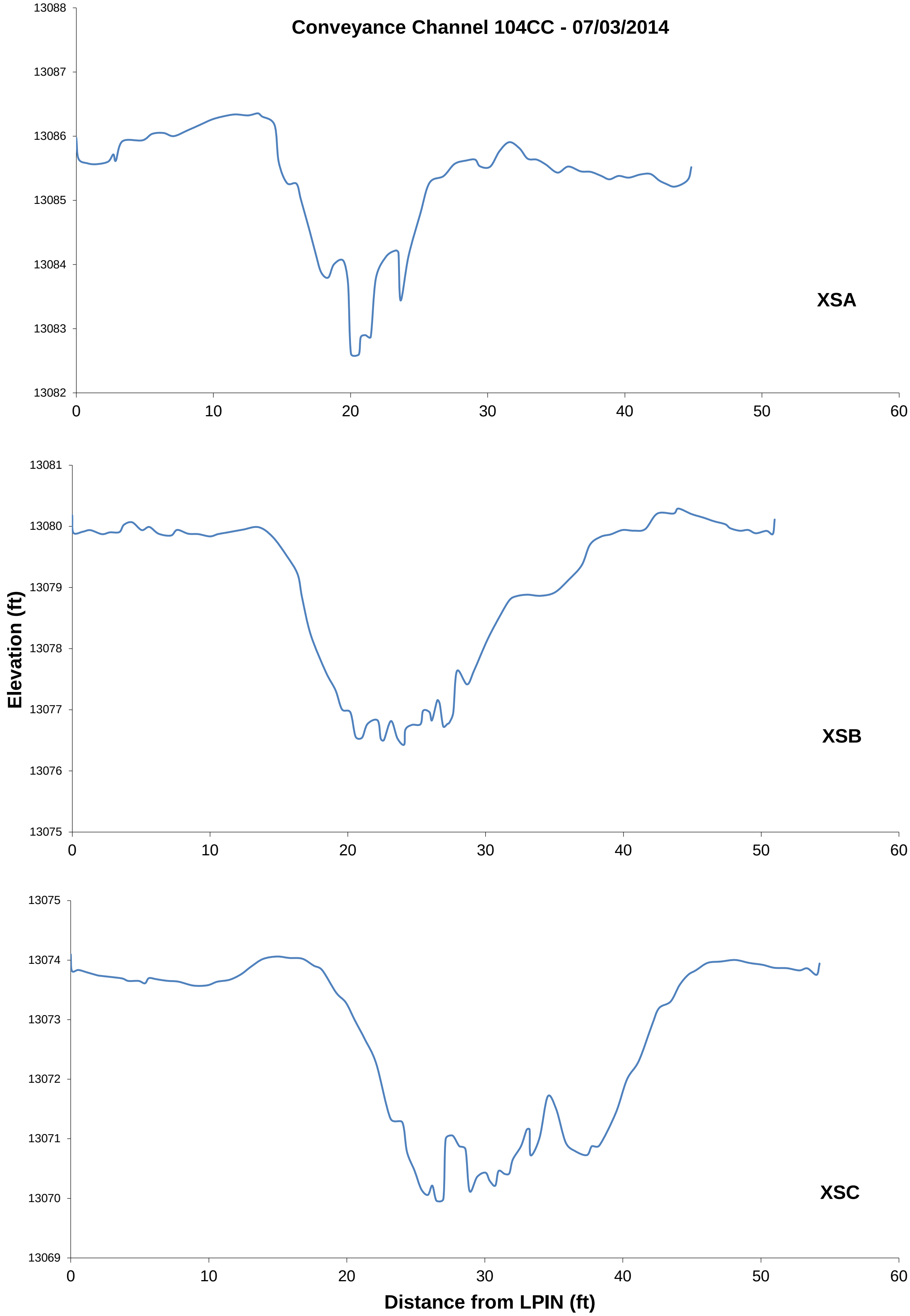
Conveyance Channel 084CC - 06/10/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10909
10908
10907
10906
10905
10902
10901
10900
10899
10897
10896
10895
10894
0
5
10
15
20
25
30


Conveyance Channel 089CC - 08/06/2014
11878
11877
11876
11875
11874
11873
0
10
20
30
40
50
XSA
Elevation (ft)
11870
11869
11868
11867
11866
11865
0
10
20
30
40
50
XSB
11865
11864
11863
11862
11861
11860
0
10
20
30
40
50
XSC
Distance from LPIN (ft)

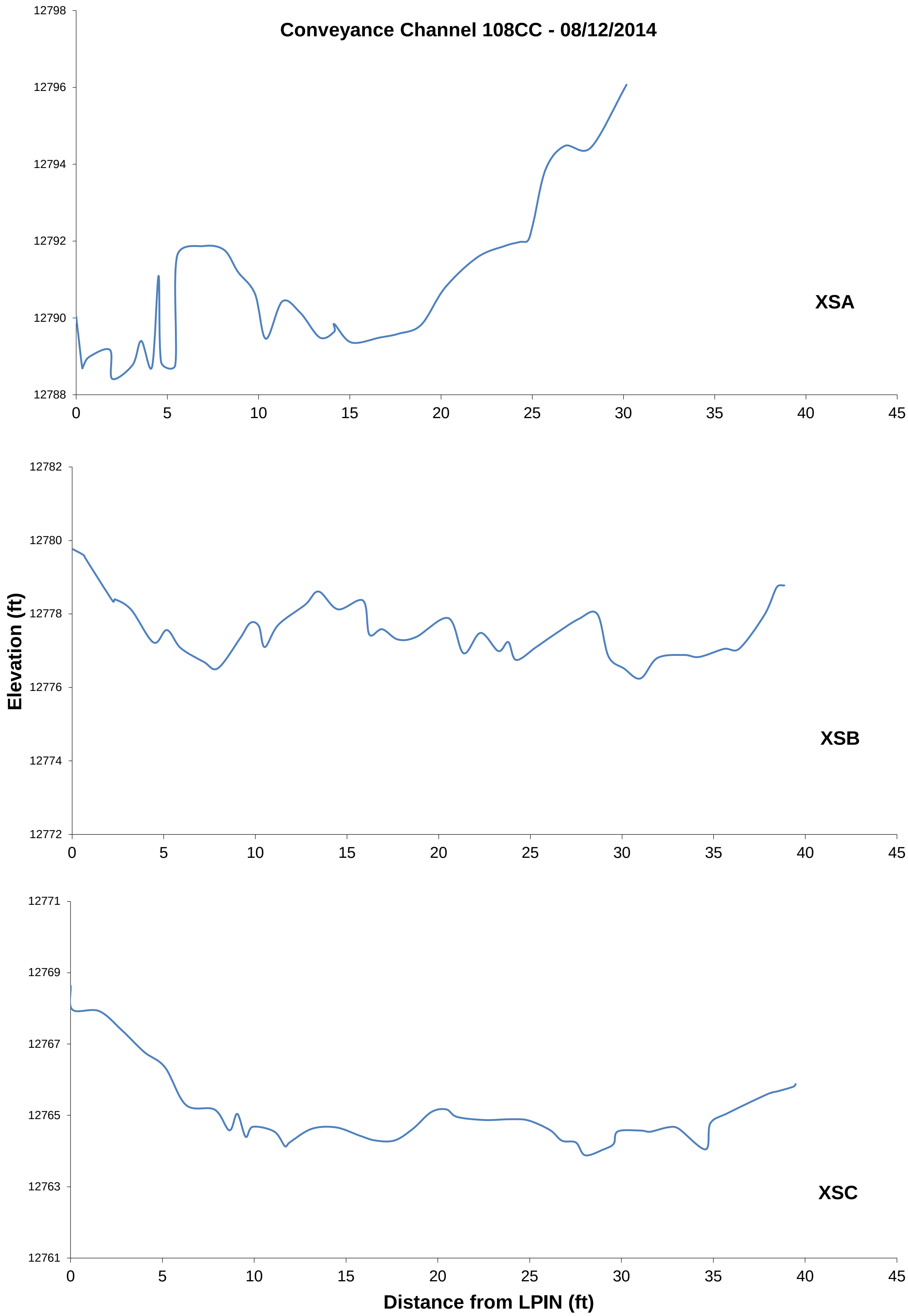

Conveyance Channel 091CC - 08/12/2014
11516
11514
11512
11510
11508
11506
0
5
10
15
20
25
30
35
40
45
XSA
Elevation (ft)
11507
11505
11503
11501
11499
11497
XSB
11500
11498
11496
11494
11492
11490
XSC
Distance from LPIN (ft)



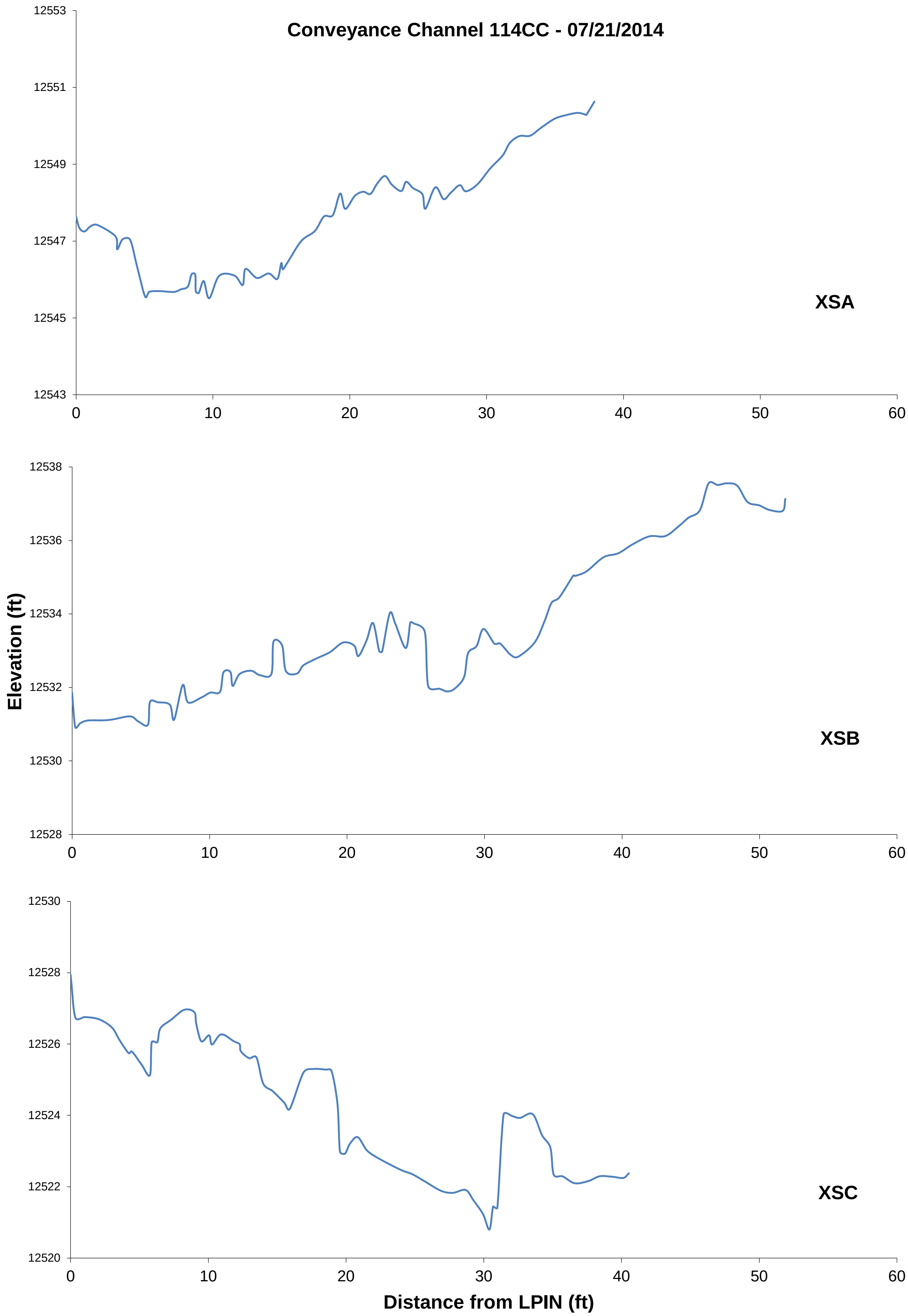
Conveyance Channel 094CC - 08/12/2014
XSA
11912
11910
11908
11906
11904
11902
0
10
20
30
40
50
XSB
11895
11893
11891
11889
11887
11885
0
10
20
30
40
50
Elevation (ft)
XSC
11886
11884
11882
11880
11878
11876
0
10
20
30
40
50
Distance from LPIN (ft)

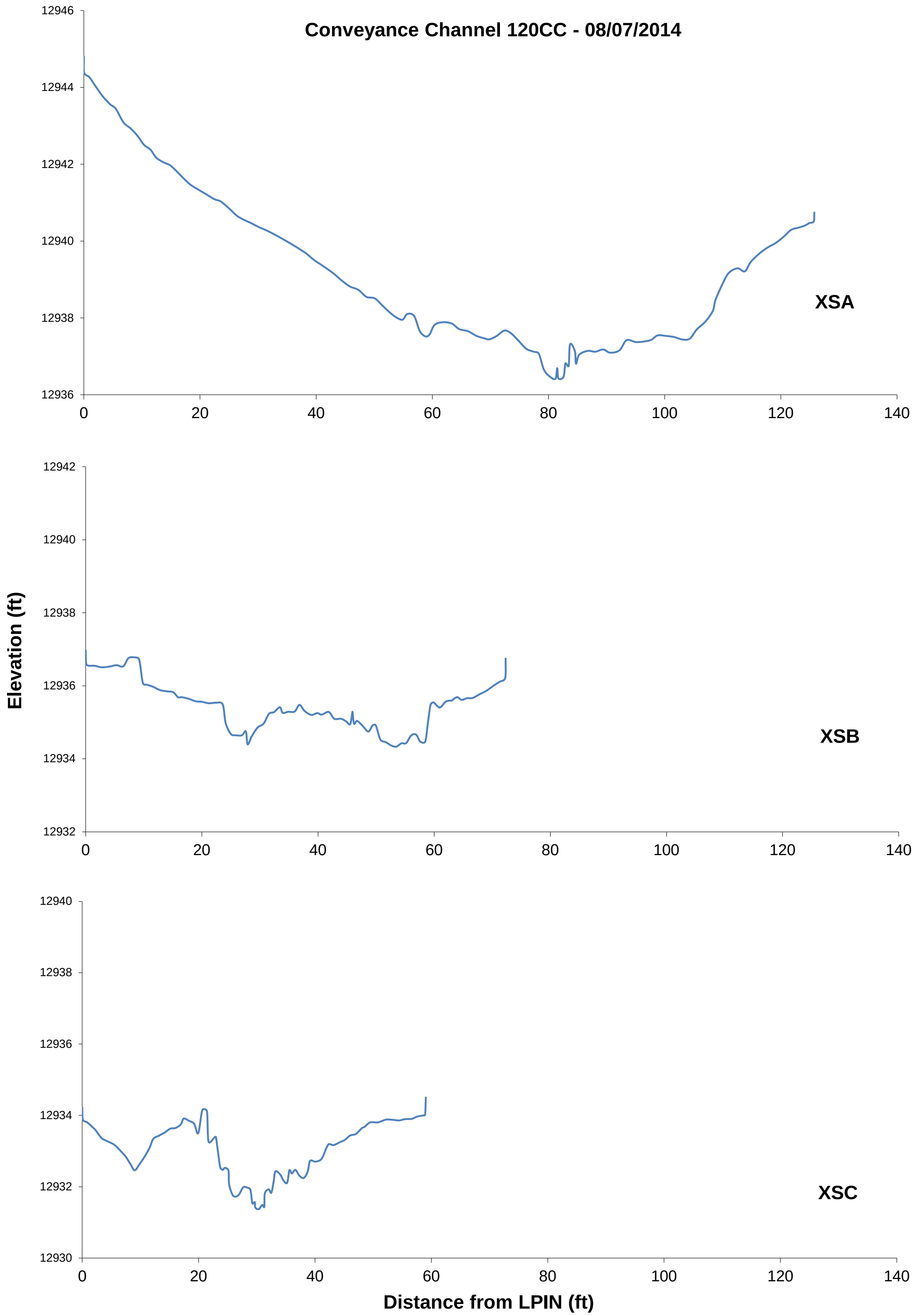


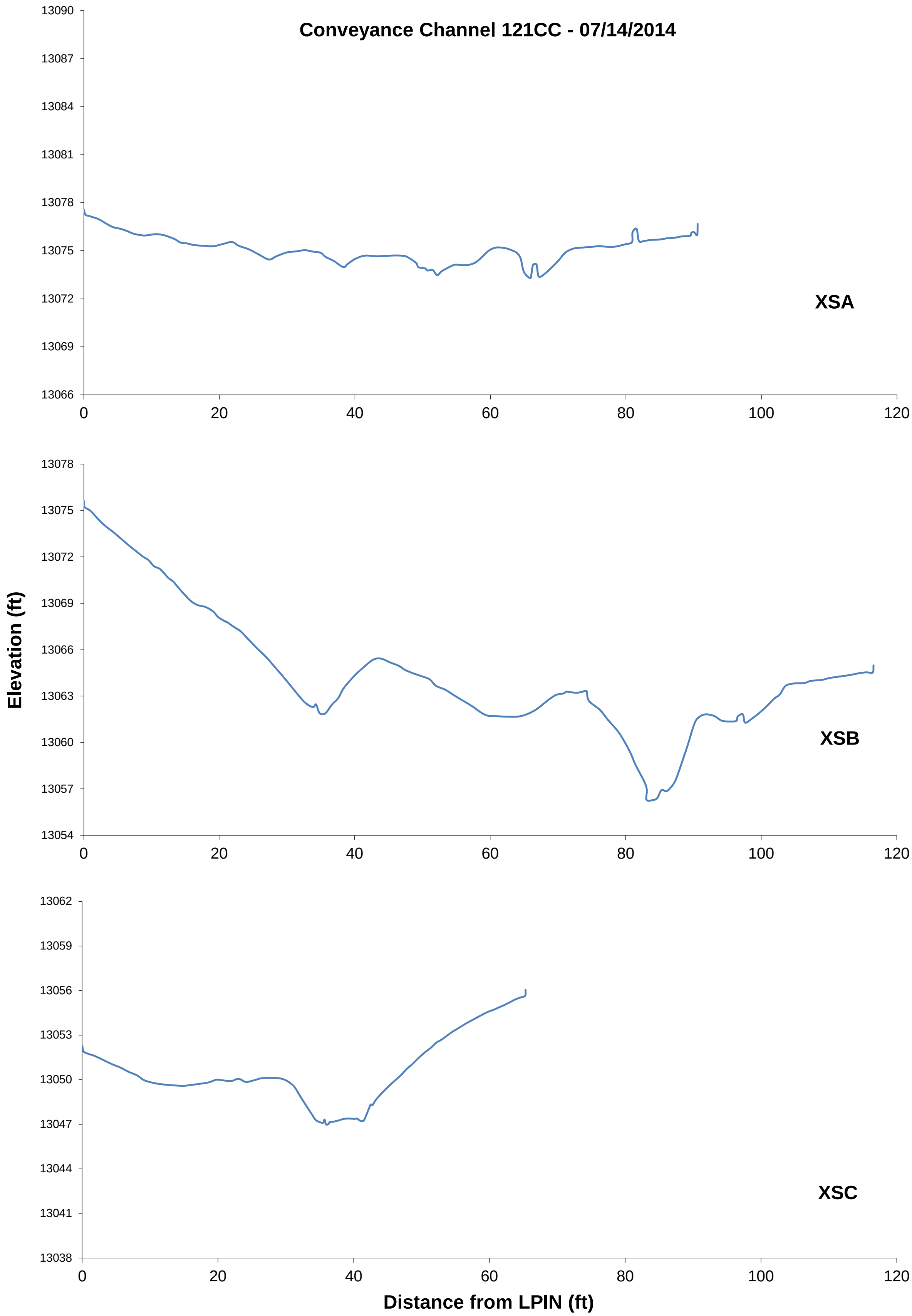
Conveyance Channel 104CC - 07/03/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13088
13087
13086
13085
13084
13083
13082
13081
13080
13079
13078
13077
13076
13075
13074
13073
13072
13071
13070
13069
0
10
20
30
40
50
60

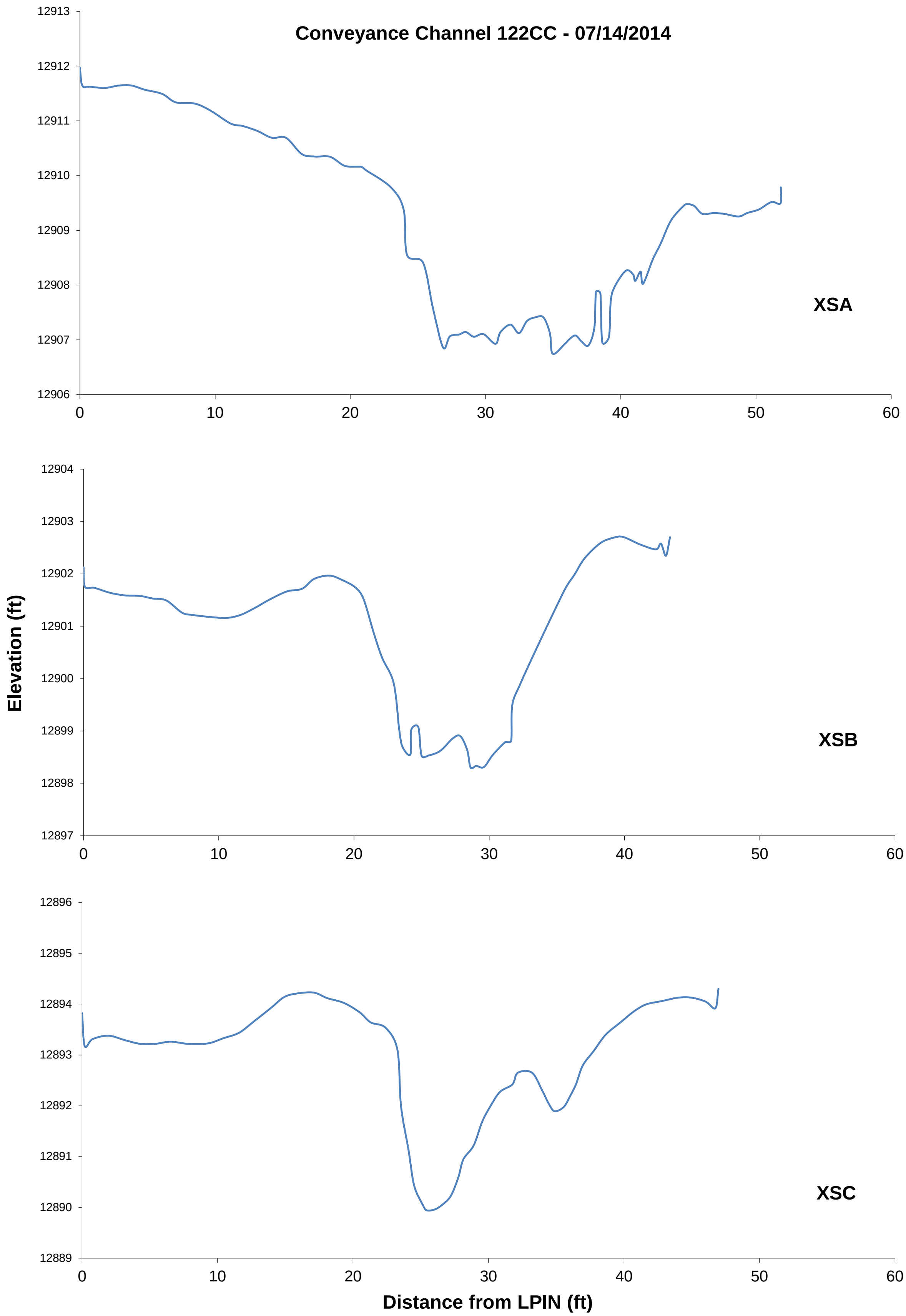


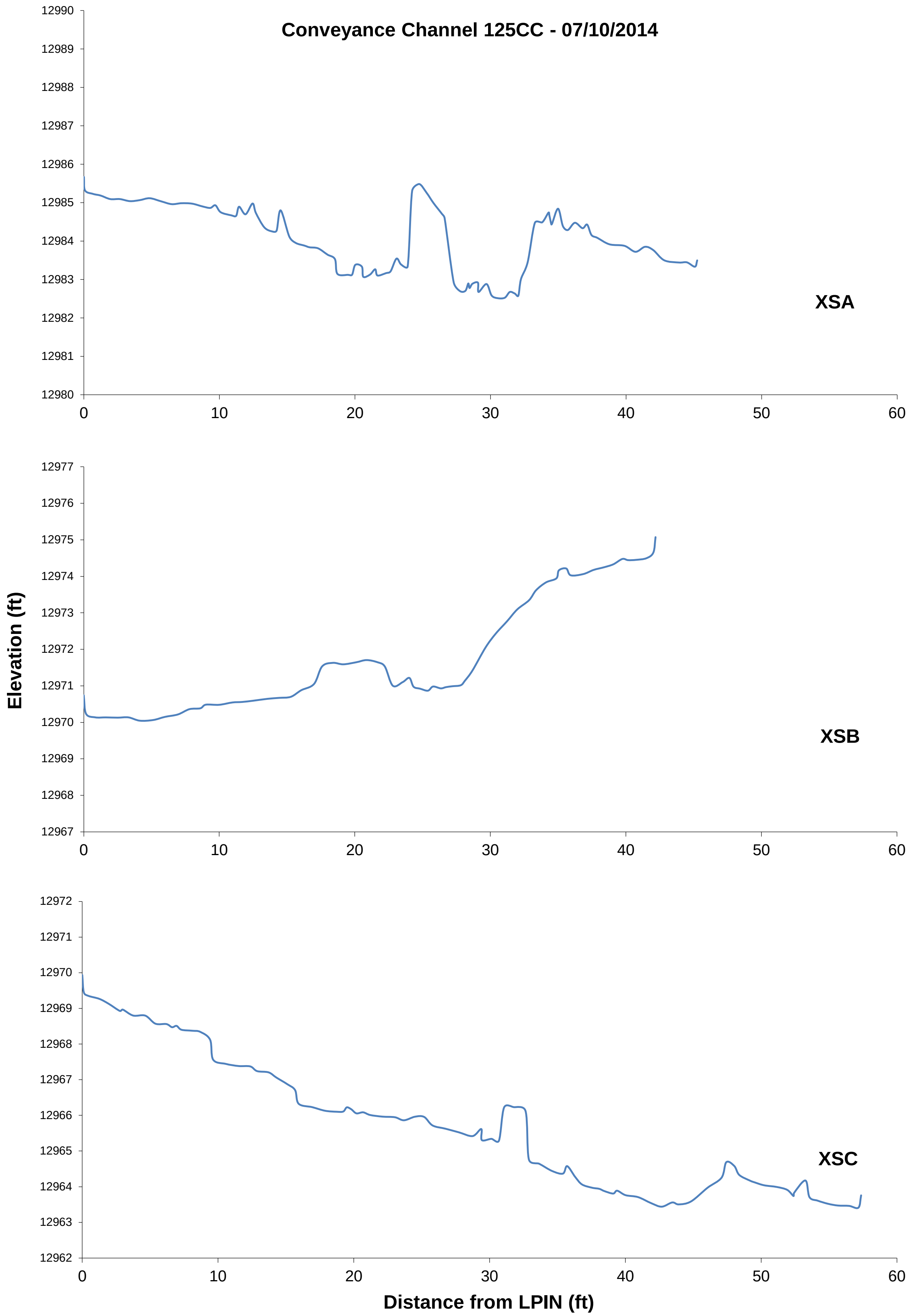
Conveyance Channel 108CC - 08/12/2014
Elevation (ft)
12798
12796
12794
12792
12790
12788
0
5
10
15
20
25
30
35
40
45
XSA
12782
12780
12778
12776
12774
12772
XSB
12771
12769
12767
12765
12763
12761
XSC
Distance from LPIN (ft)


Conveyance Channel 114CC - 07/21/2014
12553
12551
12549
12547
12545
12543
0
10
20
30
40
50
60
XSA
12538
12536
12534
12532
12530
12528
0
10
20
30
40
50
60
XSB
Elevation (ft)
12530
12528
12526
12524
12522
12520
0
10
20
30
40
50
60
XSC
Distance from LPIN (ft)

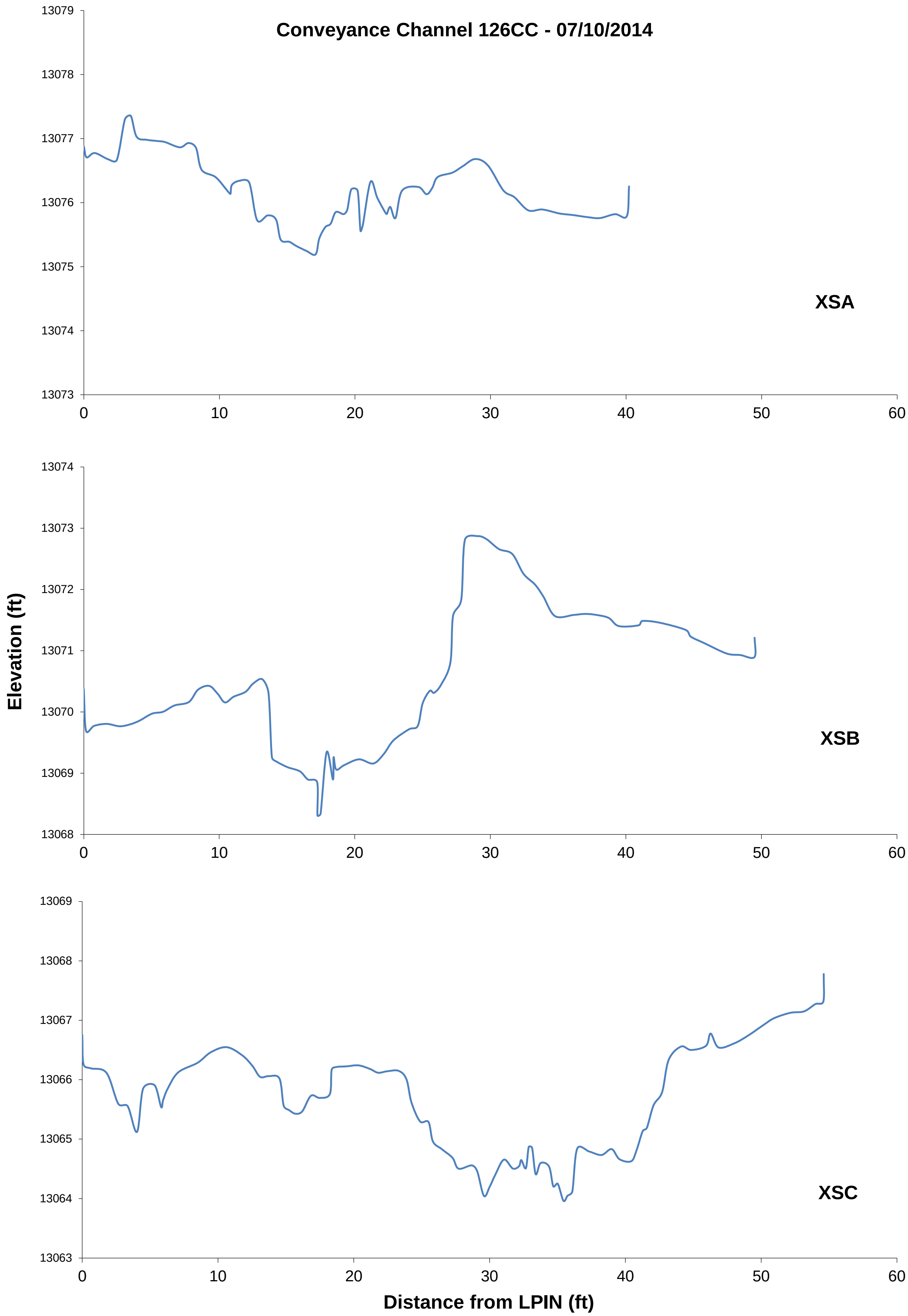

Conveyance Channel 120CC - 08/07/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12946
12944
12942
12940
12938
12936
12934
12932
12930
0
20
40
60
80
100
120
140


Conveyance Channel 121CC - 07/14/2014
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
13090
13087
13084
13081
13078
13075
13072
13069
13066
13063
13060
13057
13054
13062
13059
13056
13053
13050
13047
13044
13041
13038
0
20
40
60
80
100
120

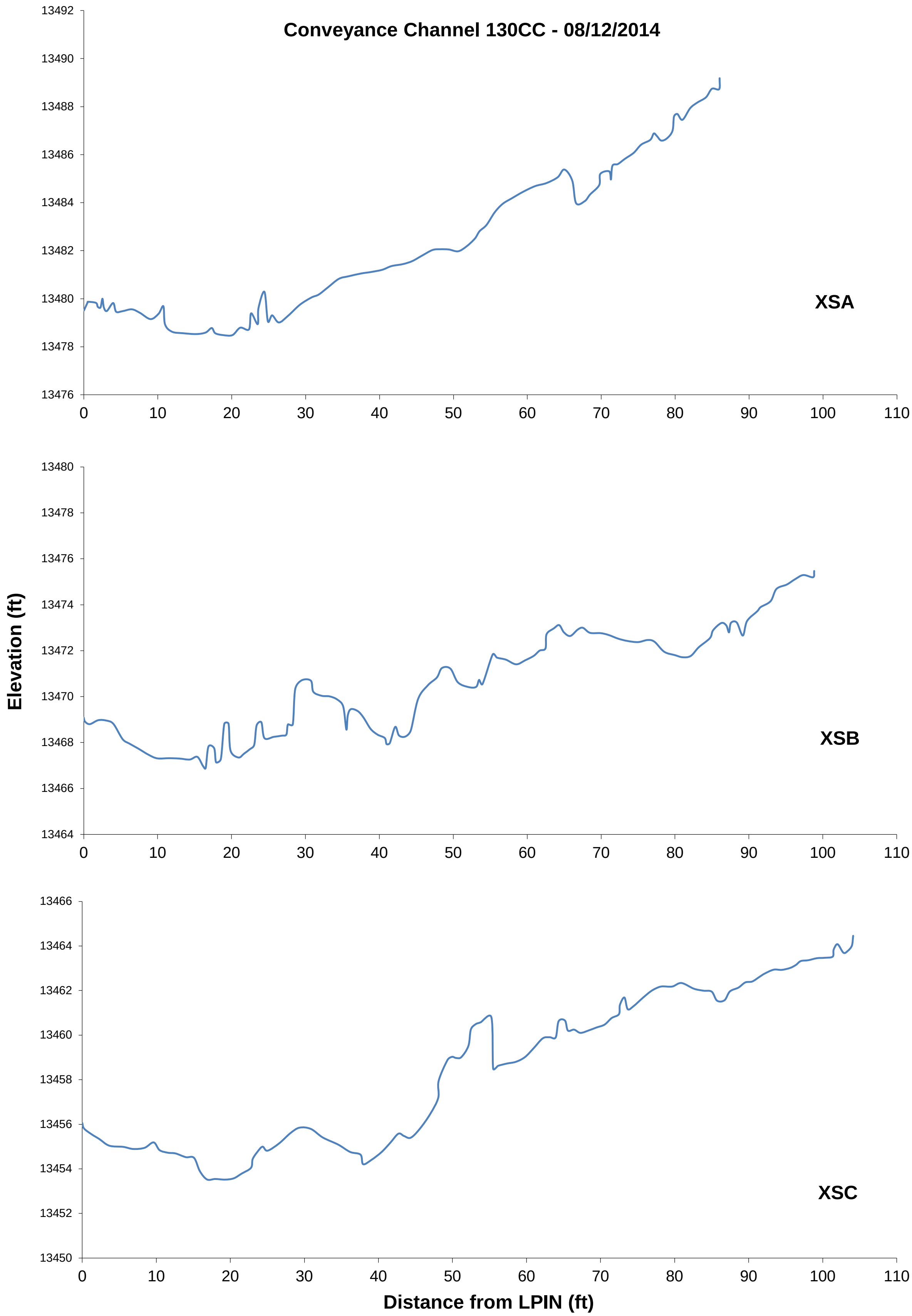

Conveyance Channel 122CC - 07/14/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)

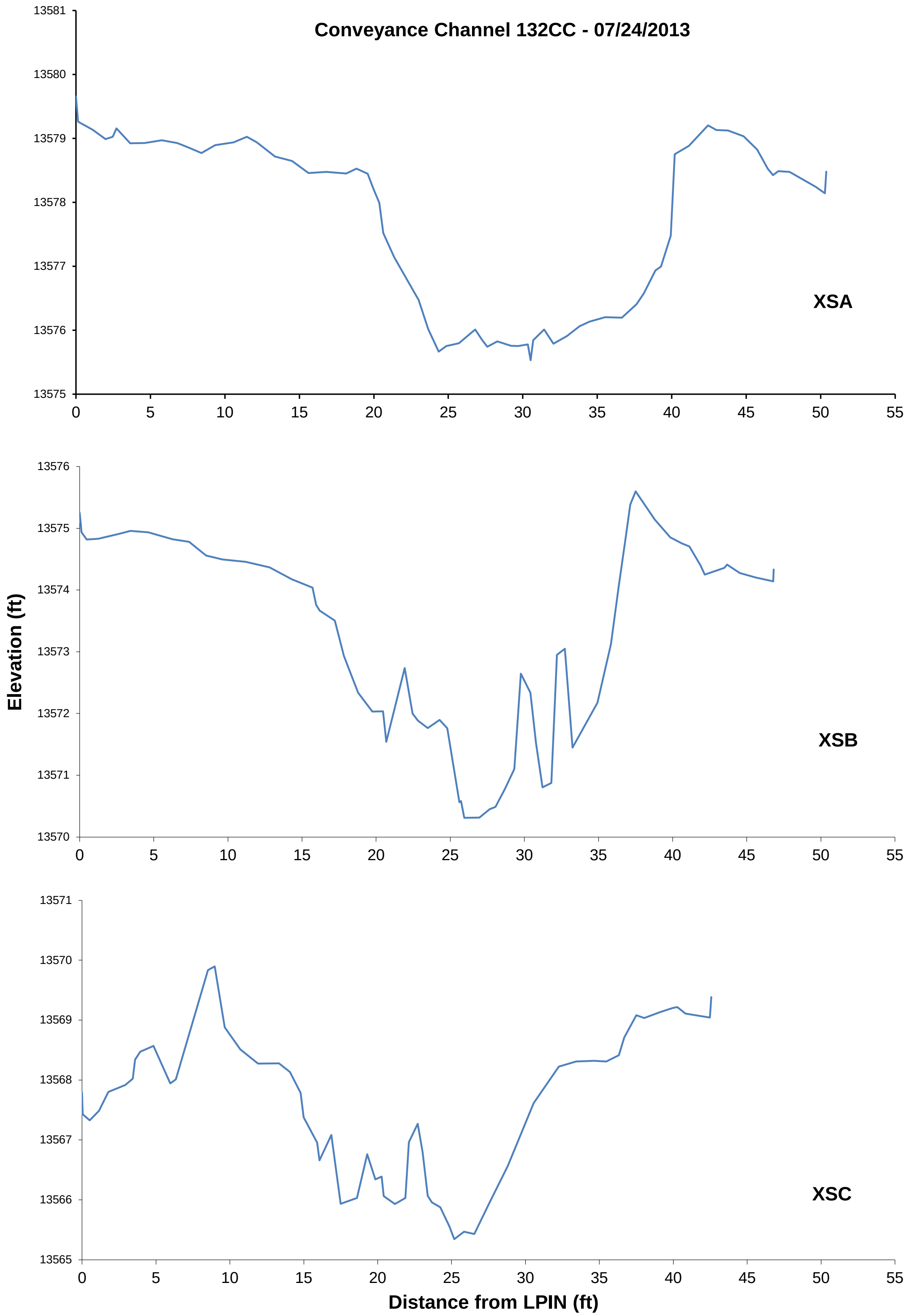


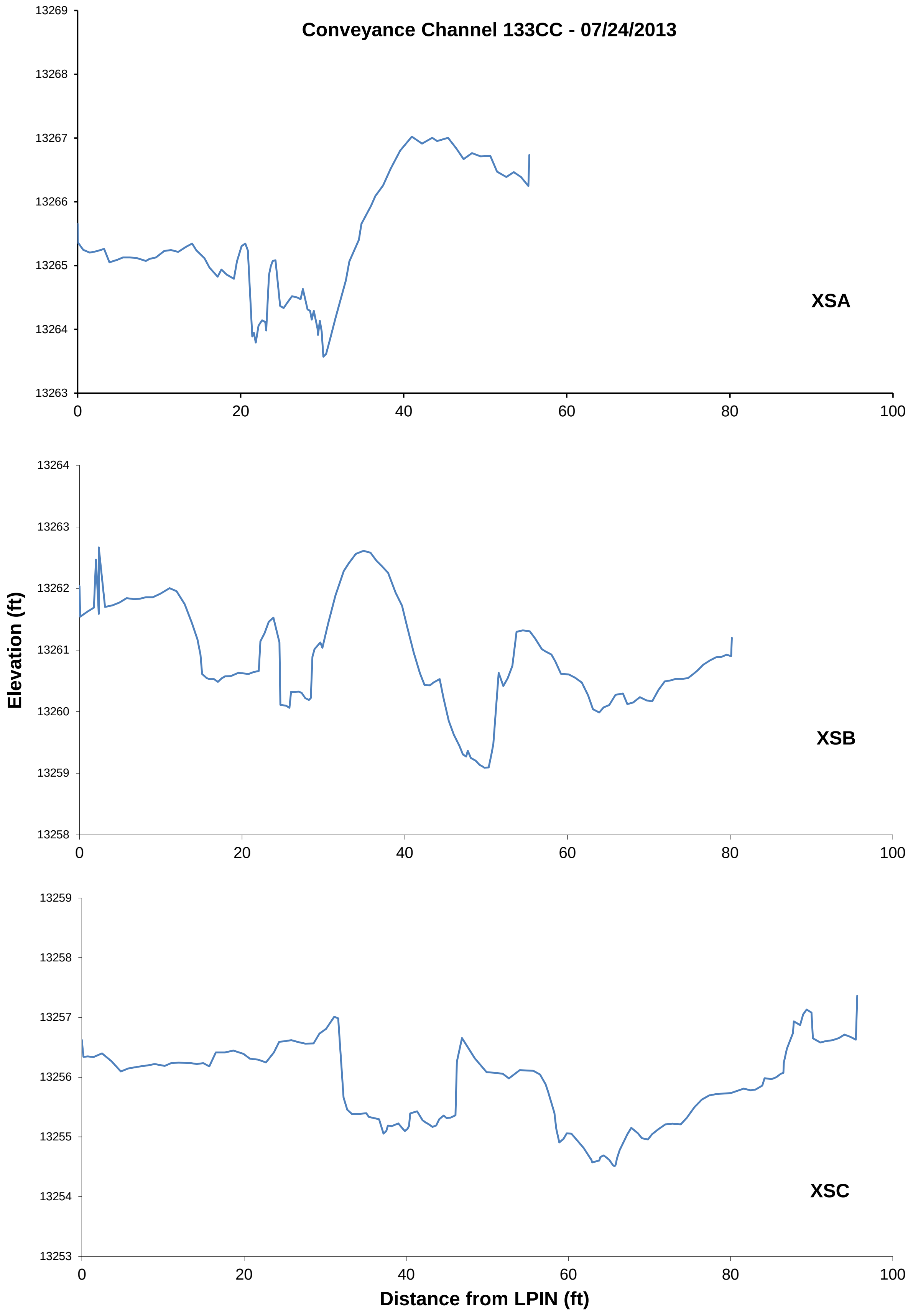
Conveyance Channel 125CC - 07/10/2014
12990
12989
12988
12987
12986
12985
12984
12983
12982
12981
12980
0
10
20
30
40
50
60
XSA
12977
12976
12975
12974
12973
12972
12971
12970
12969
12968
12967
XSB
Elevation (ft)
12972
12971
12970
12969
12968
12967
12966
12965
12964
12963
12962
XSC
Distance from LPIN (ft)

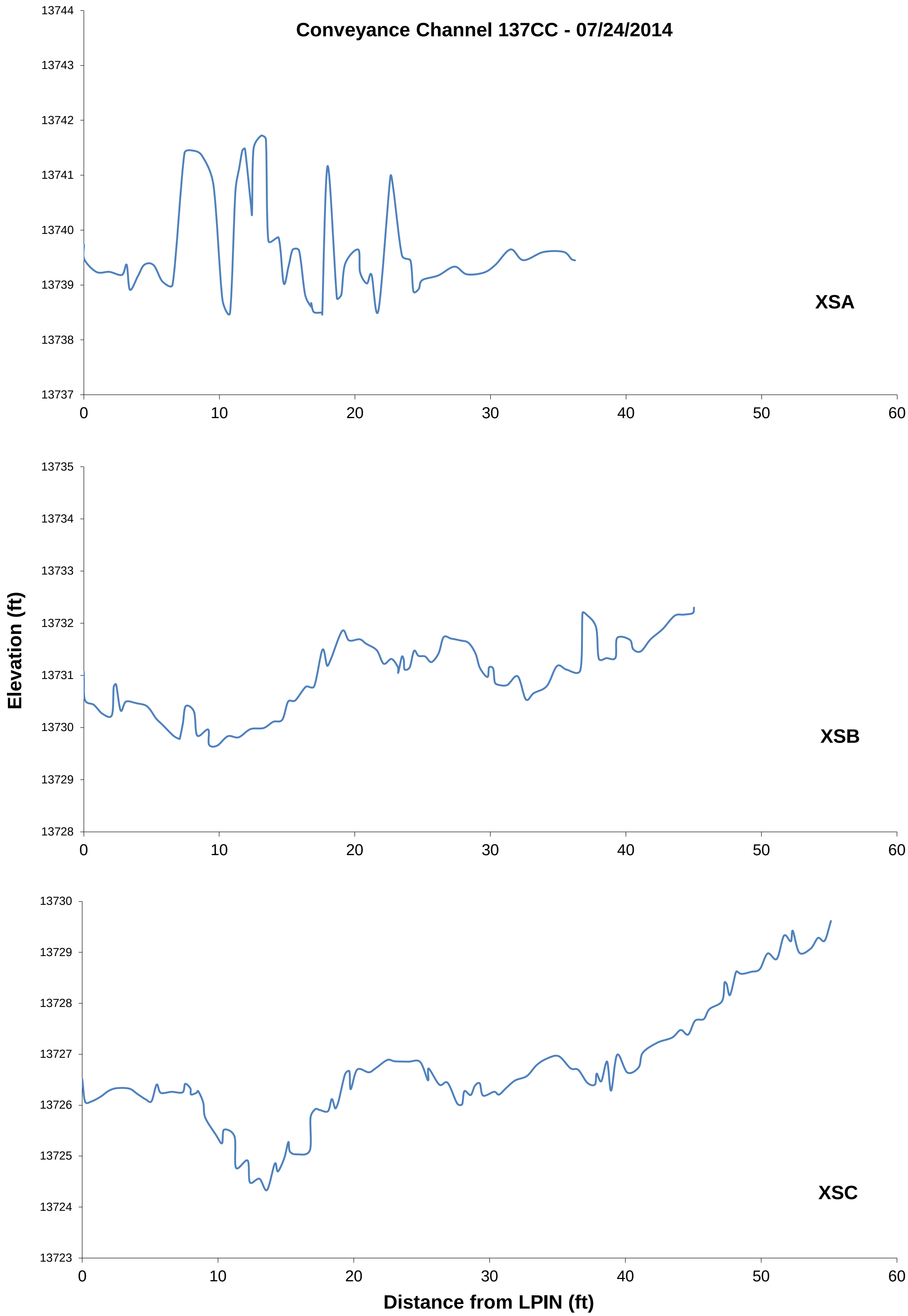


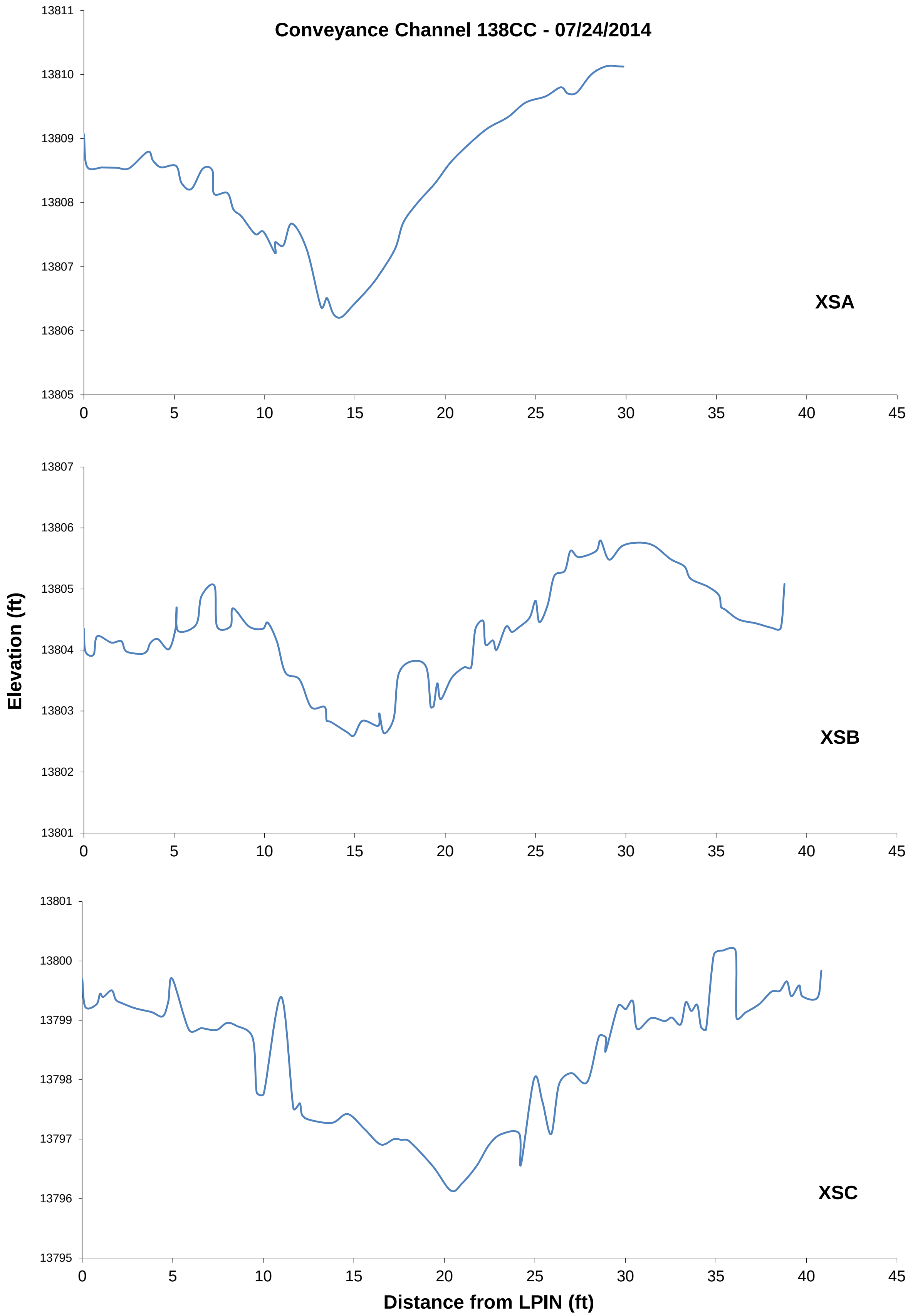
Conveyance Channel 126CC - 07/10/2014
XSA
13079
13078
13077
13076
13075
13074
13073
0
10
20
30
40
50
60
XSB
13074
13073
13072
13071
13070
13069
13068
0
10
20
30
40
50
60
XSC
13069
13068
13067
13066
13065
13064
13063
0
10
20
30
40
50
60
Elevation (ft)
Distance from LPIN (ft)

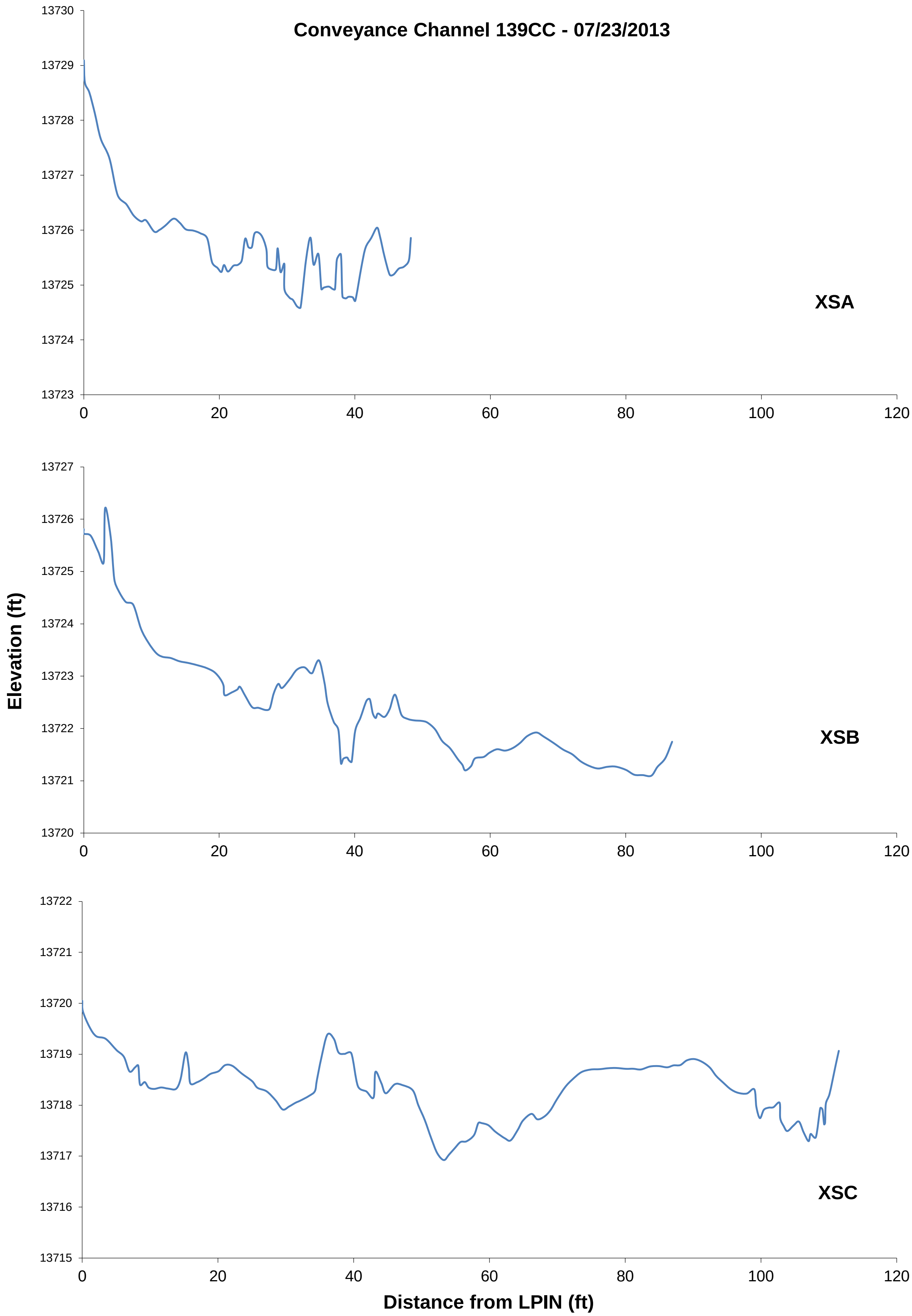

Conveyance Channel 130CC - 08/12/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
13492
13490
13488
13486
13484
13482
13480
13478
13476
13474
13472
13470
13468
13466
13464
13462
13460
13458
13456
13454
13452
13450
0
10
20
30
40
50
60
70
80
90
100
110


Conveyance Channel 132CC - 07/24/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13581
13580
13579
13578
13577
13576
13575
13574
13573
13572
13571
13570
13569
13568
13567
13566
13565
0
5
10
15
20
25
30
35
40
45
50
55

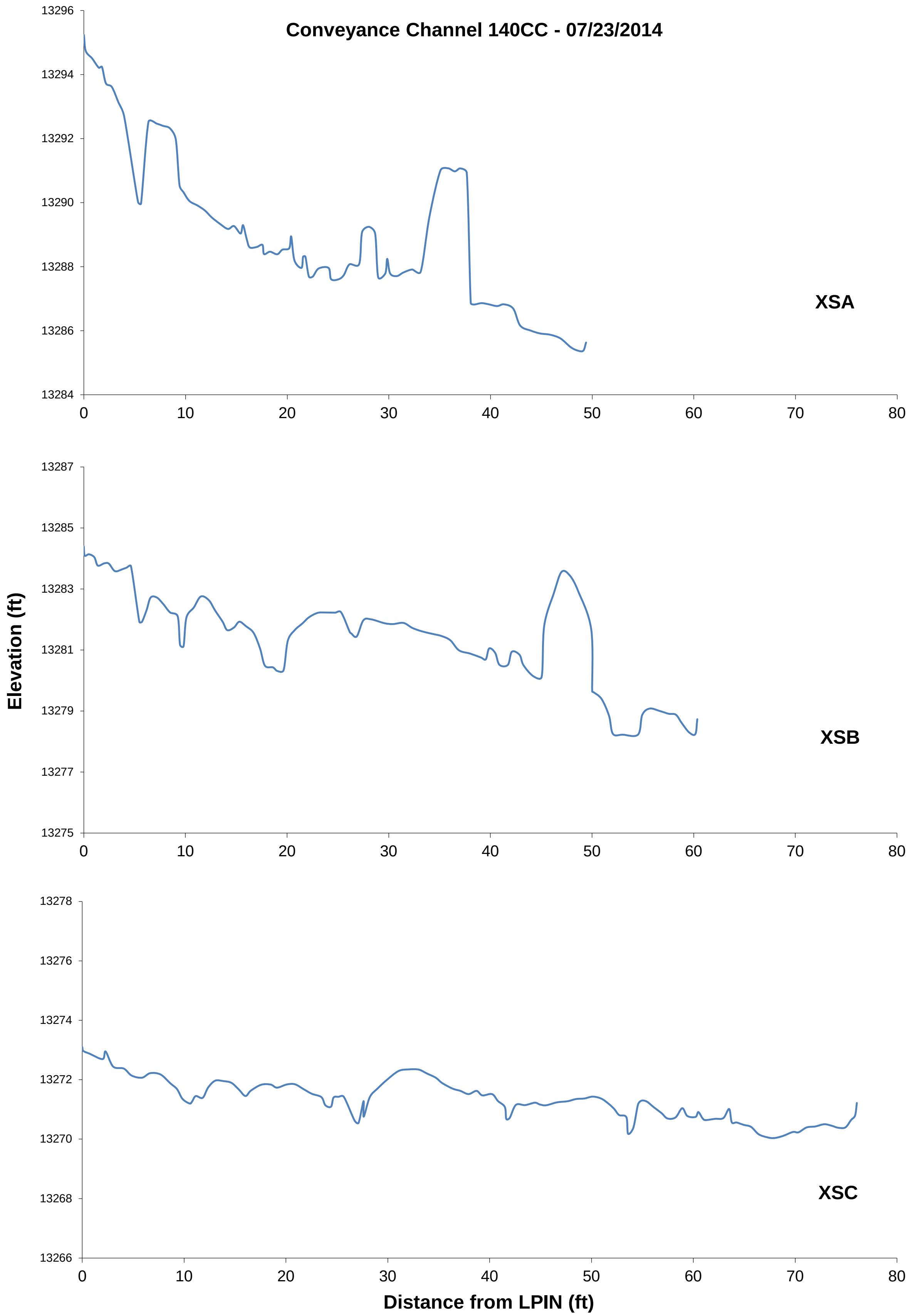

Conveyance Channel 133CC - 07/24/2013
13269
13268
13267
13266
13265
13264
13263
0
20
40
60
80
100
XSA
13264
13263
13262
13261
13260
13259
13258
0
20
40
60
80
100
XSB
Elevation (ft)
13259
13258
13257
13256
13255
13254
13253
0
20
40
60
80
100
XSC
Distance from LPIN (ft)


Conveyance Channel 137CC - 07/24/2014
Elevation (ft)
13744
13743
13742
13741
13740
13739
13738
13737
XSA
13735
13734
13733
13732
13731
13730
13729
13728
XSB
13730
13729
13728
13727
13726
13725
13724
13723
XSC
0
10
20
30
40
50
60
Distance from LPIN (ft)

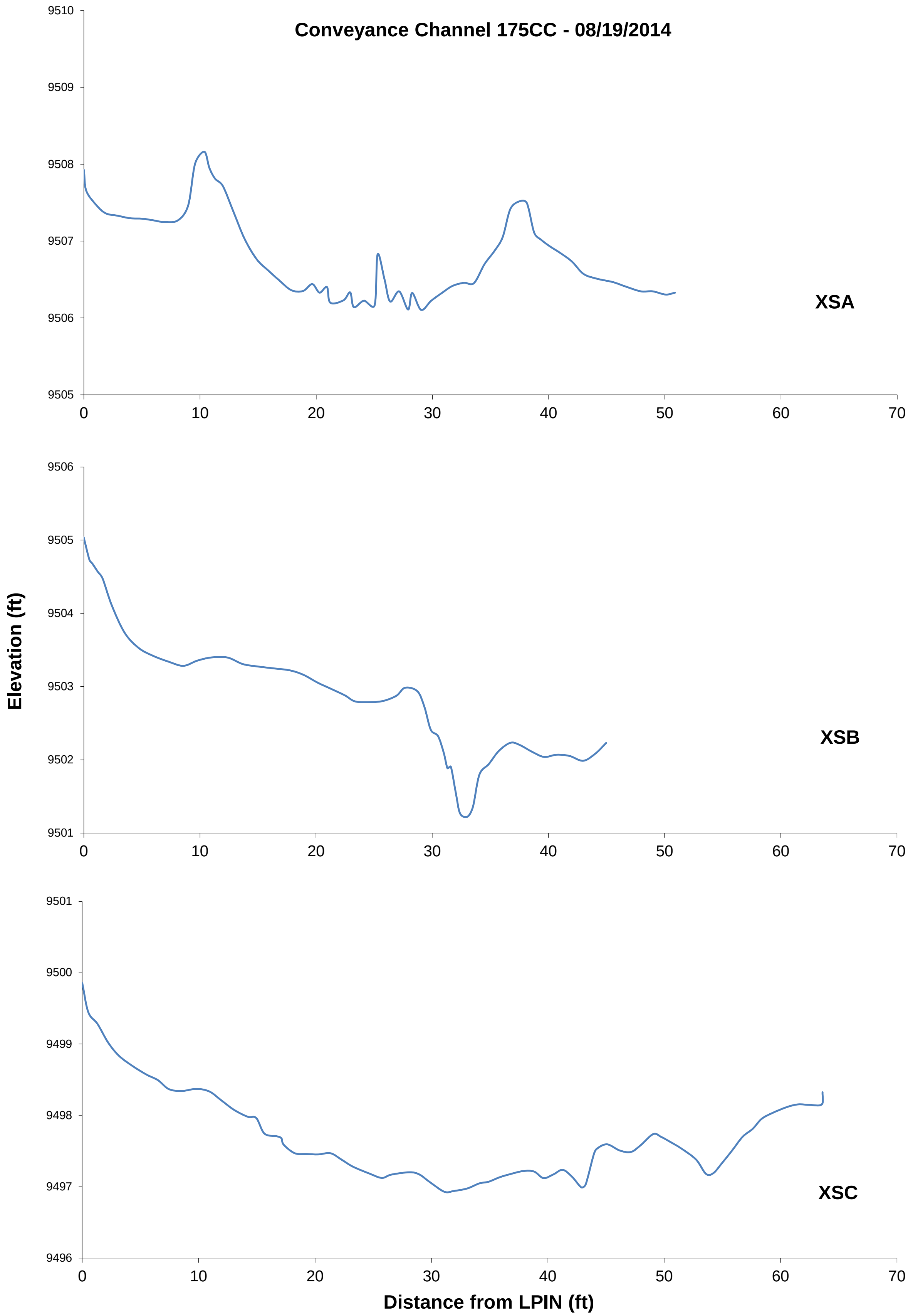

Conveyance Channel 138CC - 07/24/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13811
13810
13809
13808
13807
13806
13805
13807
13806
13805
13804
13803
13802
13801
13801
13800
13799
13798
13797
13796
13795
0
5
10
15
20
25
30
35
40
45



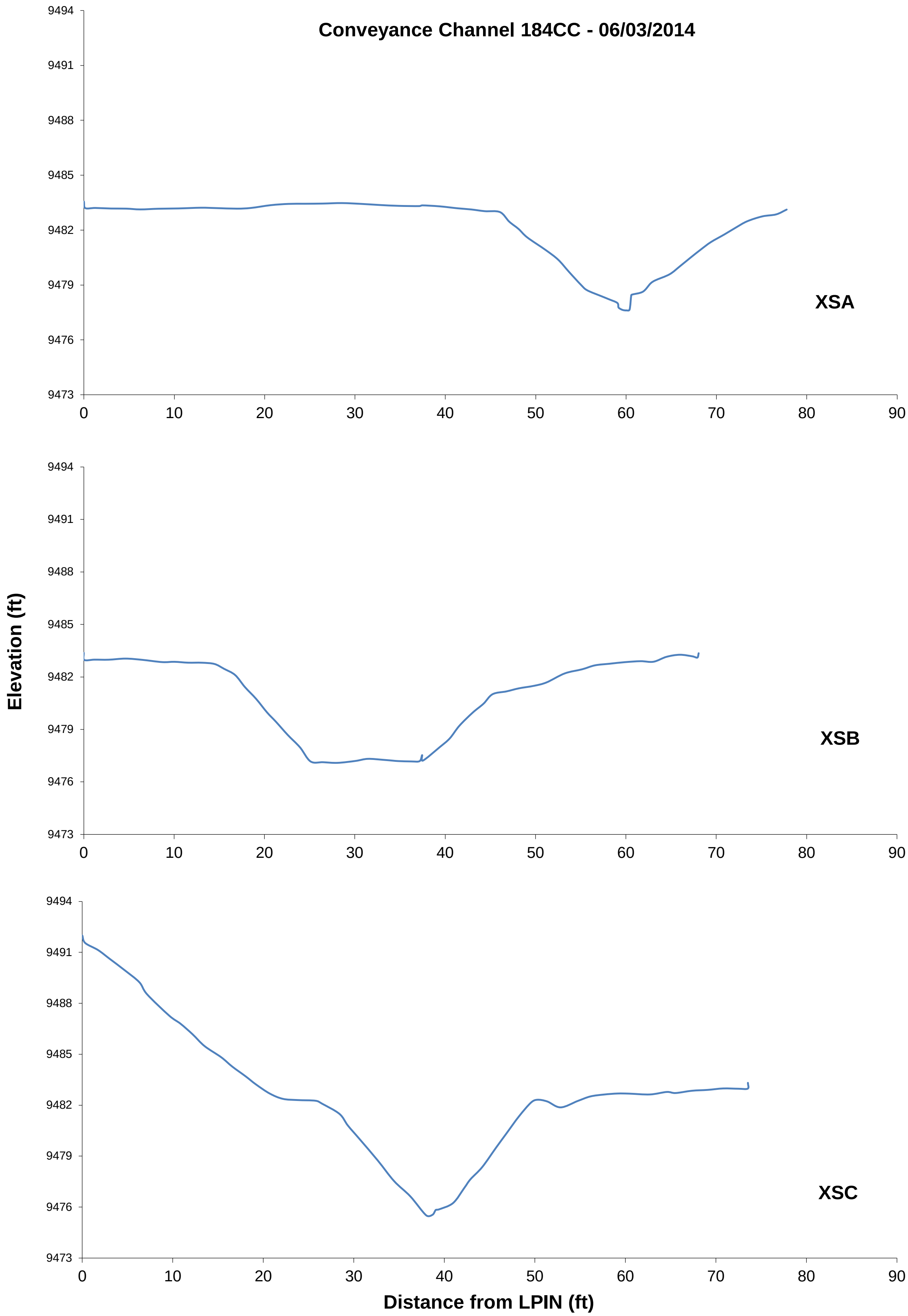
Conveyance Channel 139CC - 07/23/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
13730
13729
13728
13727
13726
13725
13724
13723
13722
13721
13720
13719
13718
13717
13716
13715
0
20
40
60
80
100
120

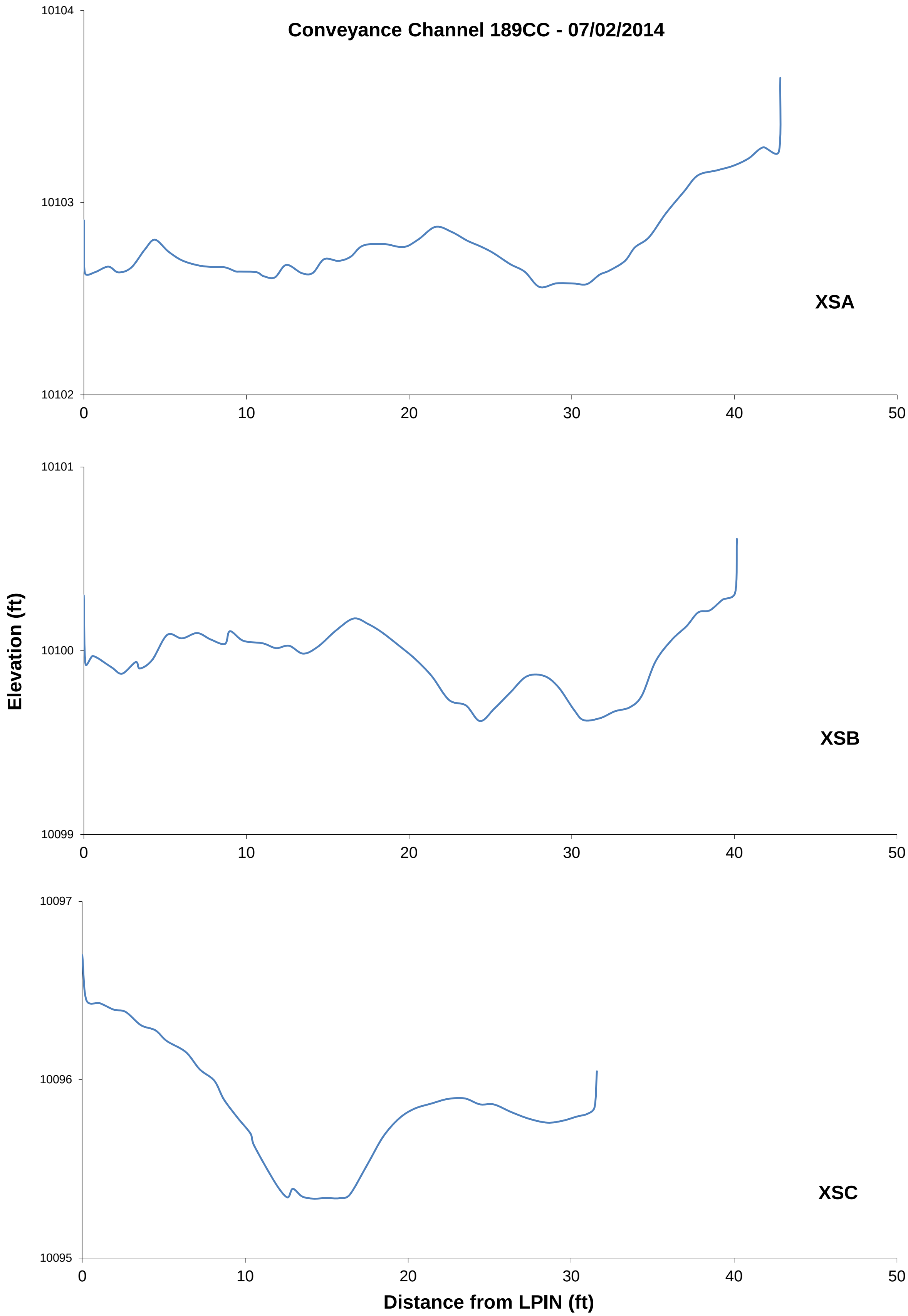


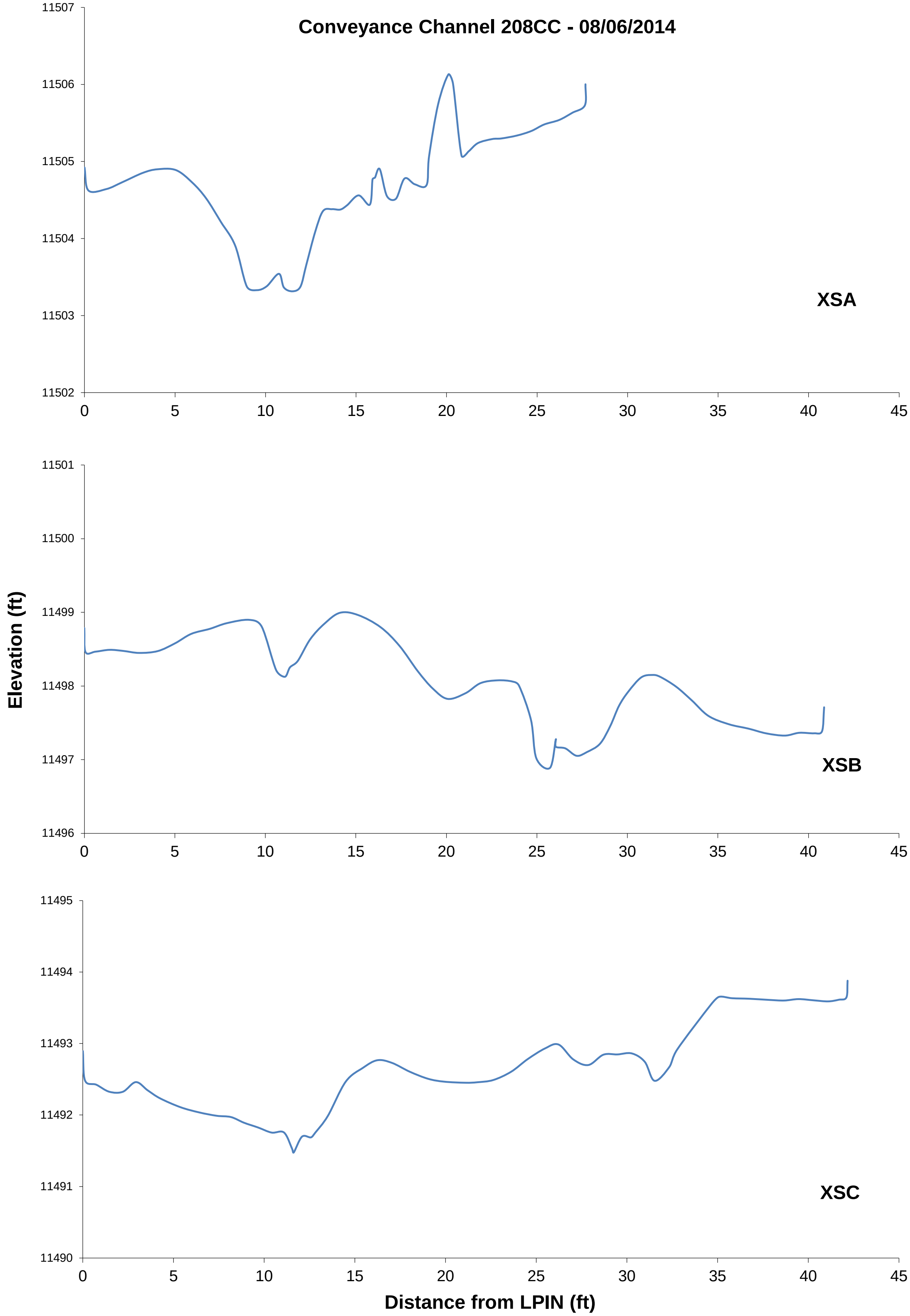
Conveyance Channel 140CC - 07/23/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13296
13294
13292
13290
13288
13286
13284
13287
13285
13283
13281
13279
13277
13275
13278
13276
13274
13272
13270
13268
13266
0
10
20
30
40
50
60
70
80

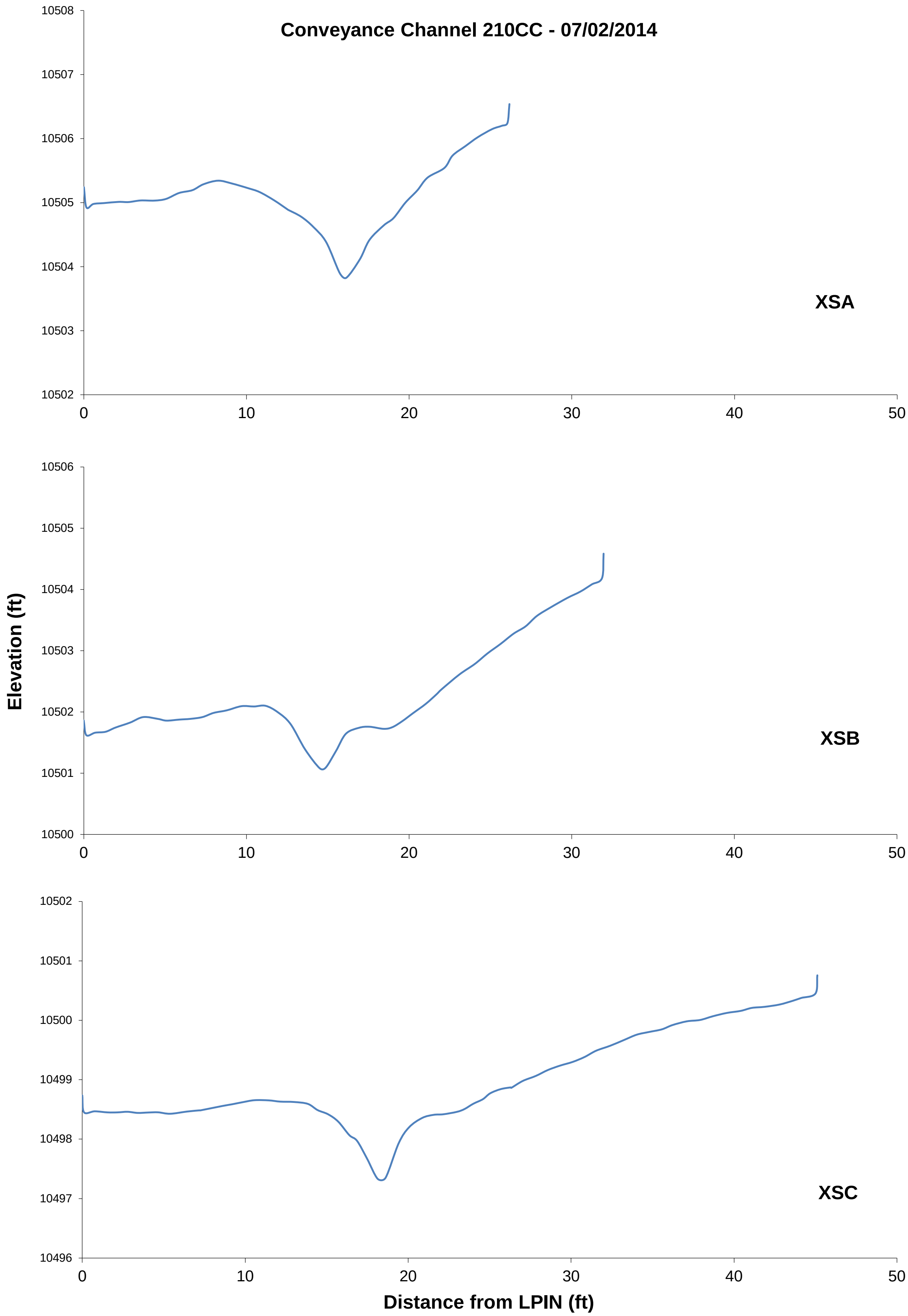


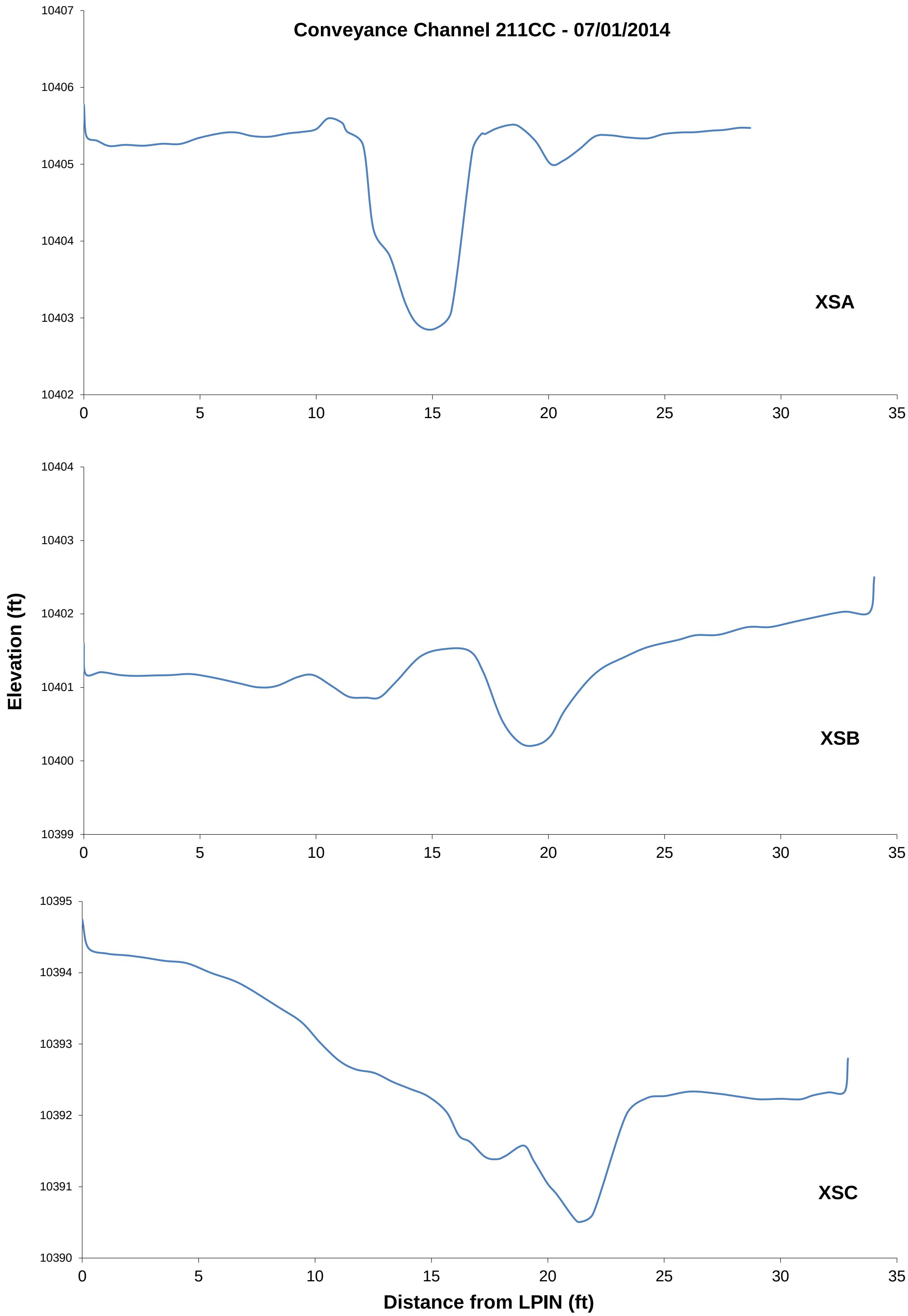
Conveyance Channel 175CC - 08/19/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)

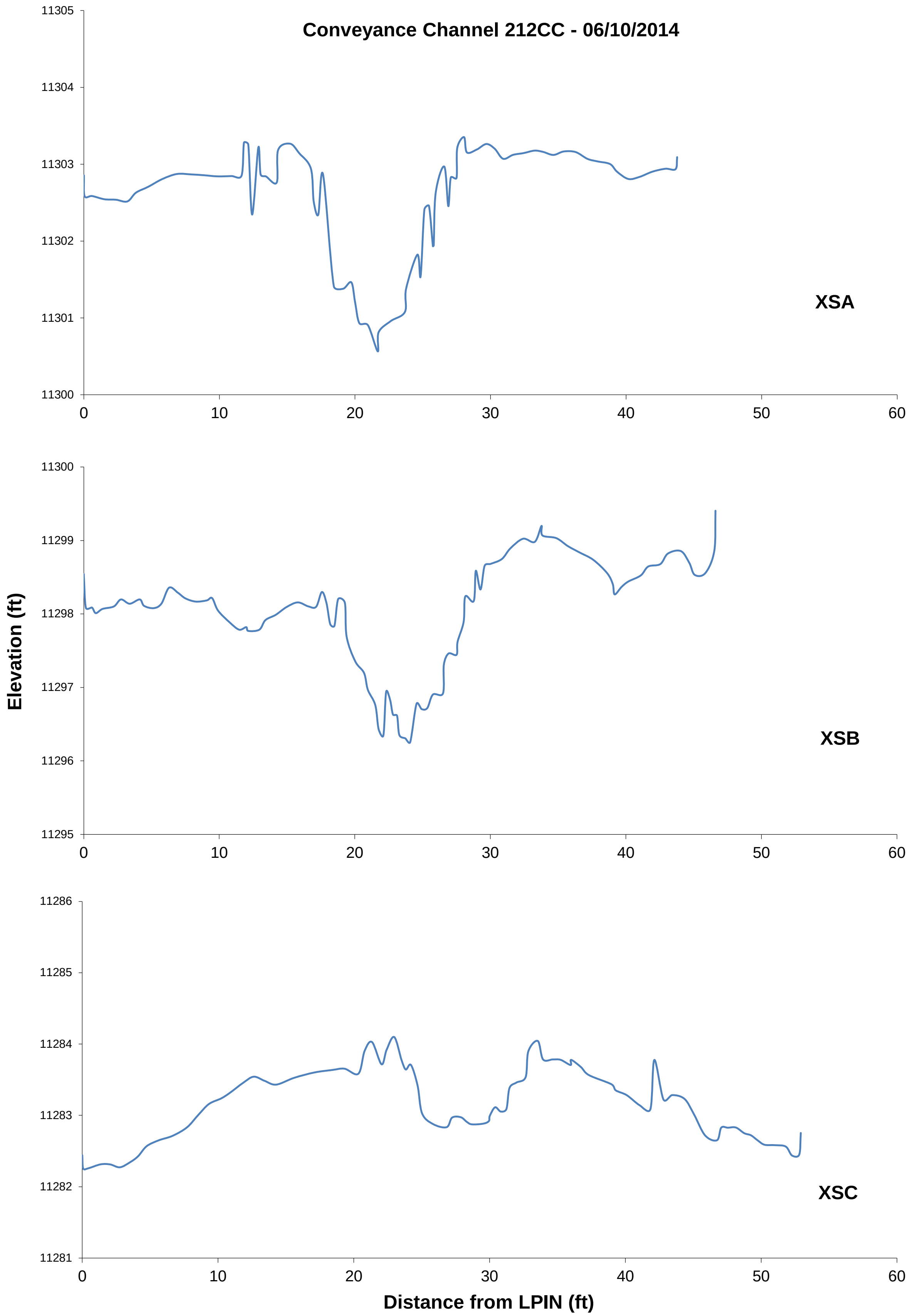

Conveyance Channel 184CC - 06/03/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9494
9491
9488
9485
9482
9479
9476
9473
0
10
20
30
40
50
60
70
80
90


Conveyance Channel 189CC - 07/02/2014
10104
10103
10102
0
10
20
30
40
50
XSA
10101
10100
10099
XSB
10097
10096
10095
XSC
Elevation (ft)
Distance from LPIN (ft)

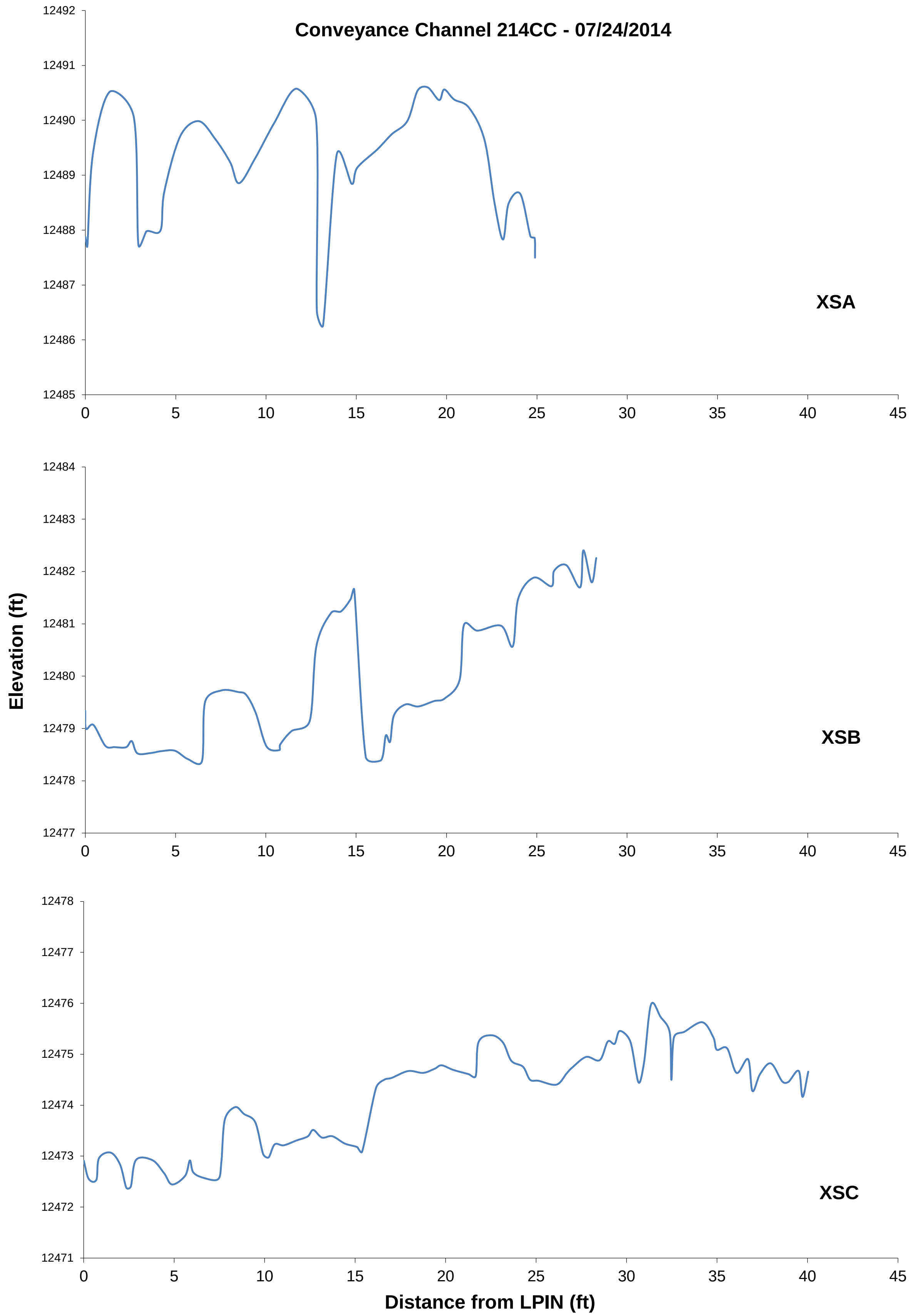

Conveyance Channel 208CC - 08/06/2014
11507
11506
11505
11504
11503
11502
0
5
10
15
20
25
30
35
40
45
XSA
11501
11500
11499
11498
11497
11496
XSB
Elevation (ft)
11495
11494
11493
11492
11491
11490
XSC
Distance from LPIN (ft)

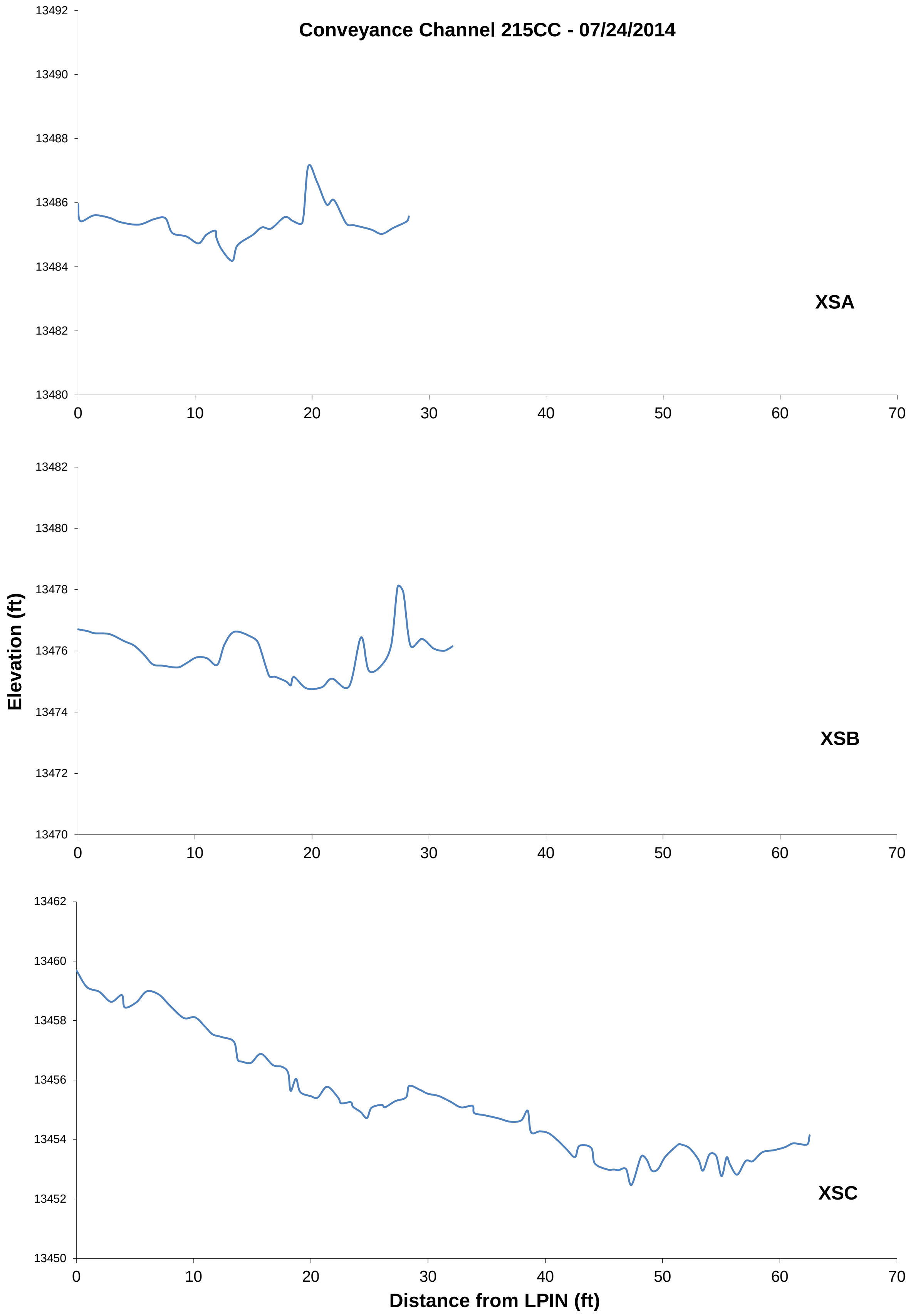

Conveyance Channel 210CC - 07/02/2014
10508
10507
10506
10505
10504
10503
10502
0
10
20
30
40
50
XSA
10506
10505
10504
10503
10502
10501
10500
0
10
20
30
40
50
XSB
Elevation (ft)
10502
10501
10500
10499
10498
10497
10496
0
10
20
30
40
50
XSC
Distance from LPIN (ft)


Conveyance Channel 211CC - 07/01/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
10407
10406
10405
10404
10403
10402
10404
10403
10402
10401
10400
10399
10395
10394
10393
10392
10391
10390
0
5
10
15
20
25
30
35

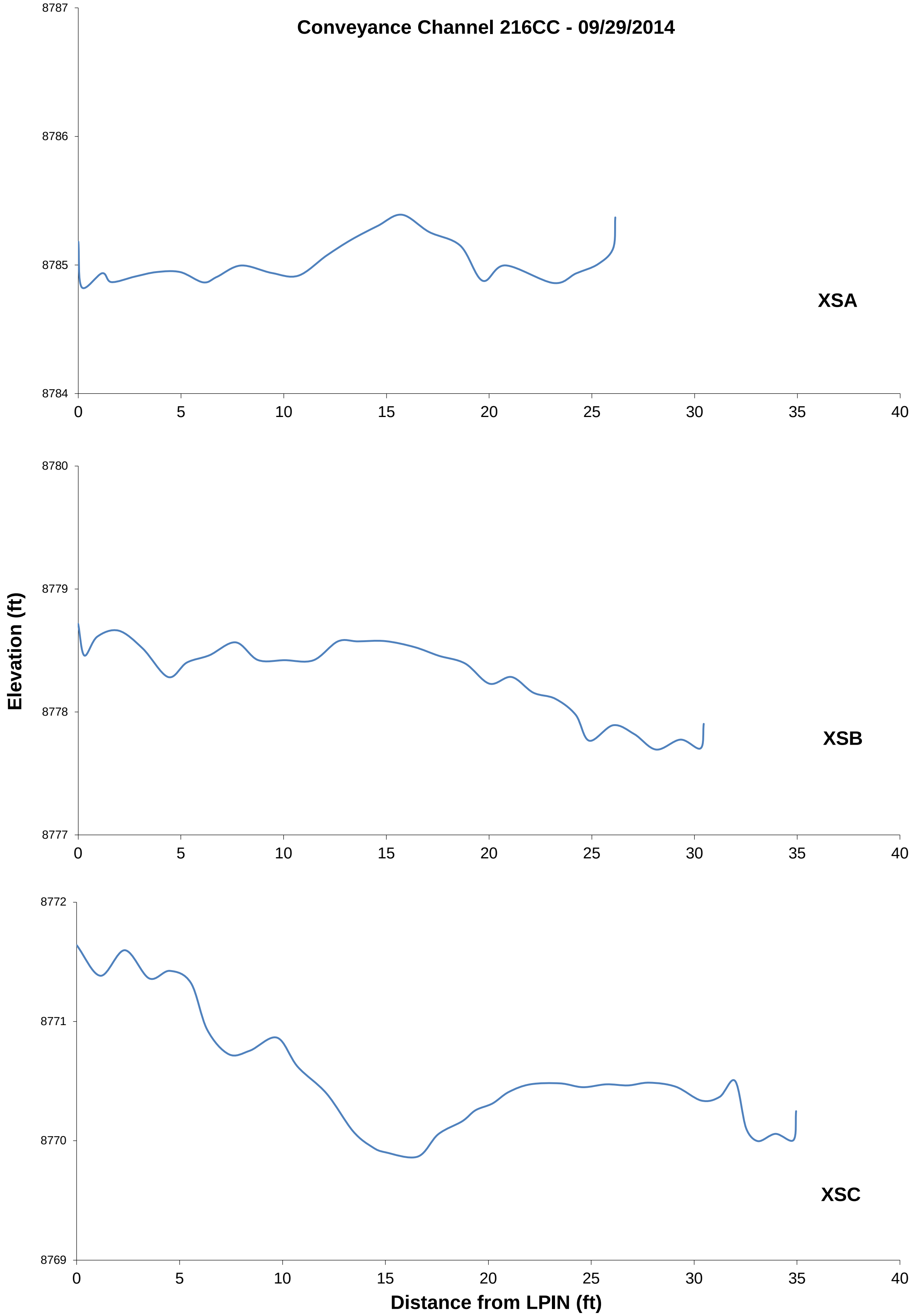

Conveyance Channel 212CC - 06/10/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11305
11304
11303
11302
11301
11300
11299
11298
11297
11296
11295
11286
11285
11284
11283
11282
11281
0
10
20
30
40
50
60

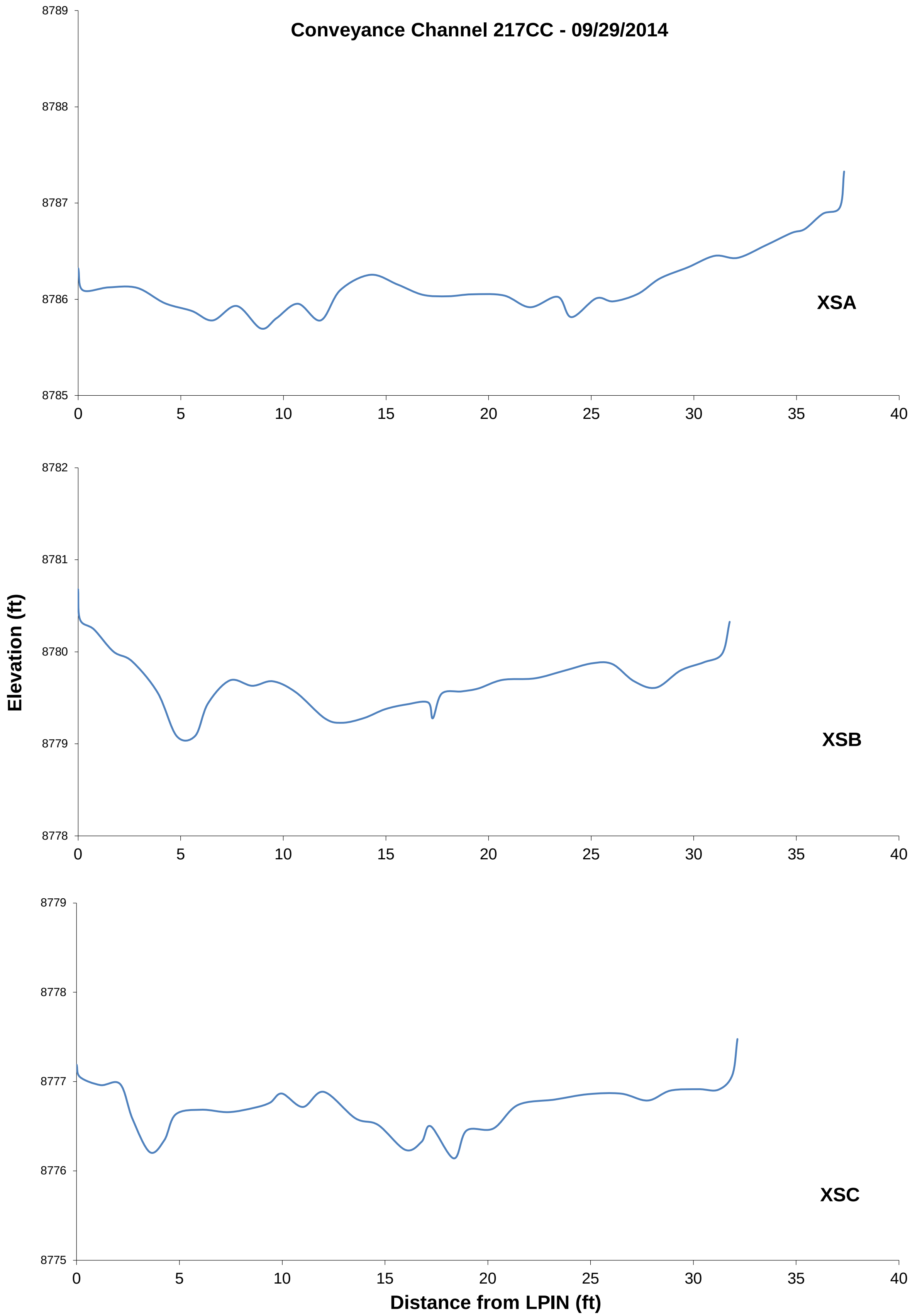

Conveyance Channel 213CC - 08/07/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13414
13412
13410
13408
13406
13404
13402
13400
13398
13396
0
20
40
60
80
100
120
140
160
180
200

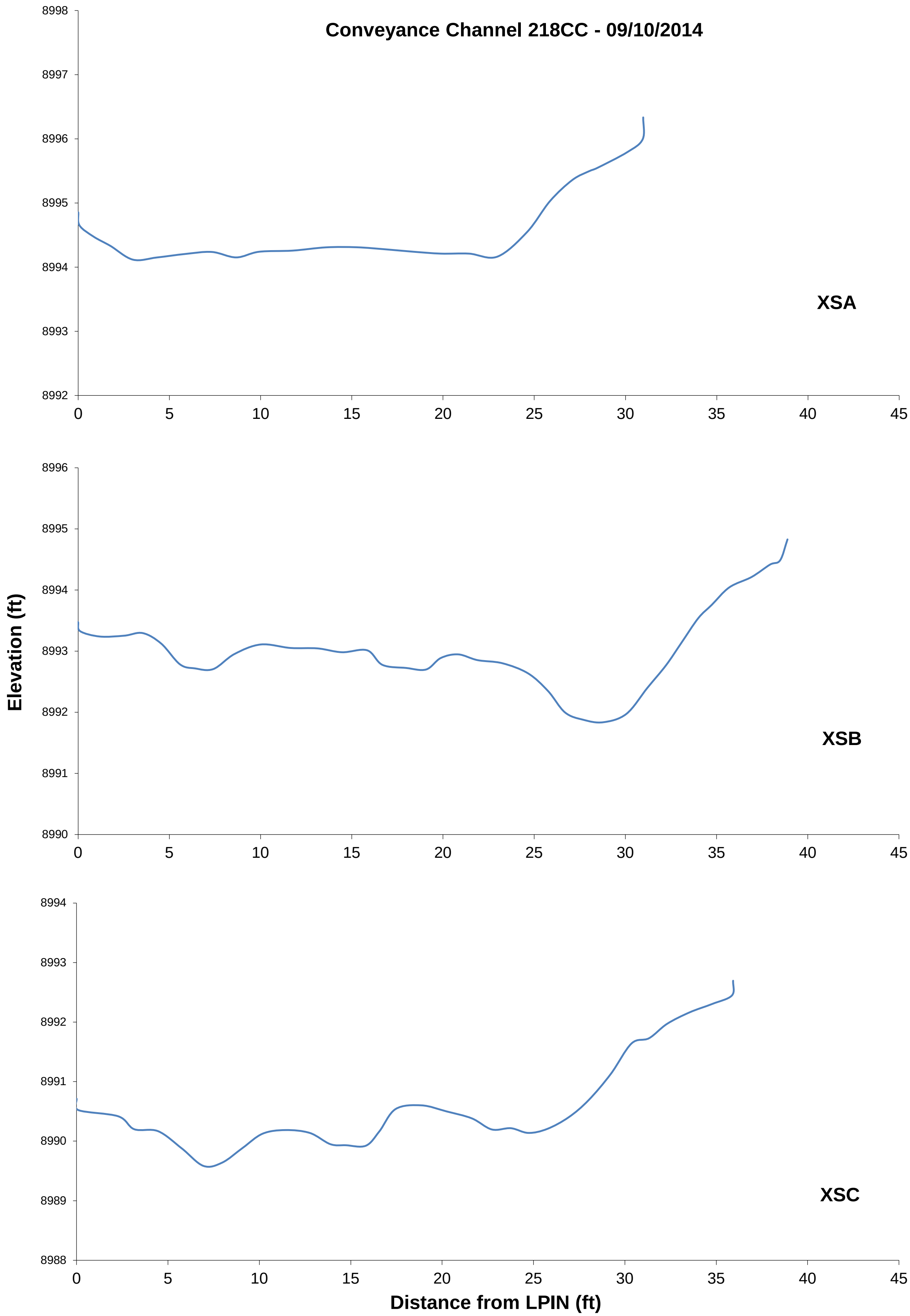

Conveyance Channel 214CC - 07/24/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12492
12491
12490
12489
12488
12487
12486
12485
12484
12483
12482
12481
12480
12479
12478
12477
12476
12475
12474
12473
12472
12471
0
5
10
15
20
25
30
35
40
45

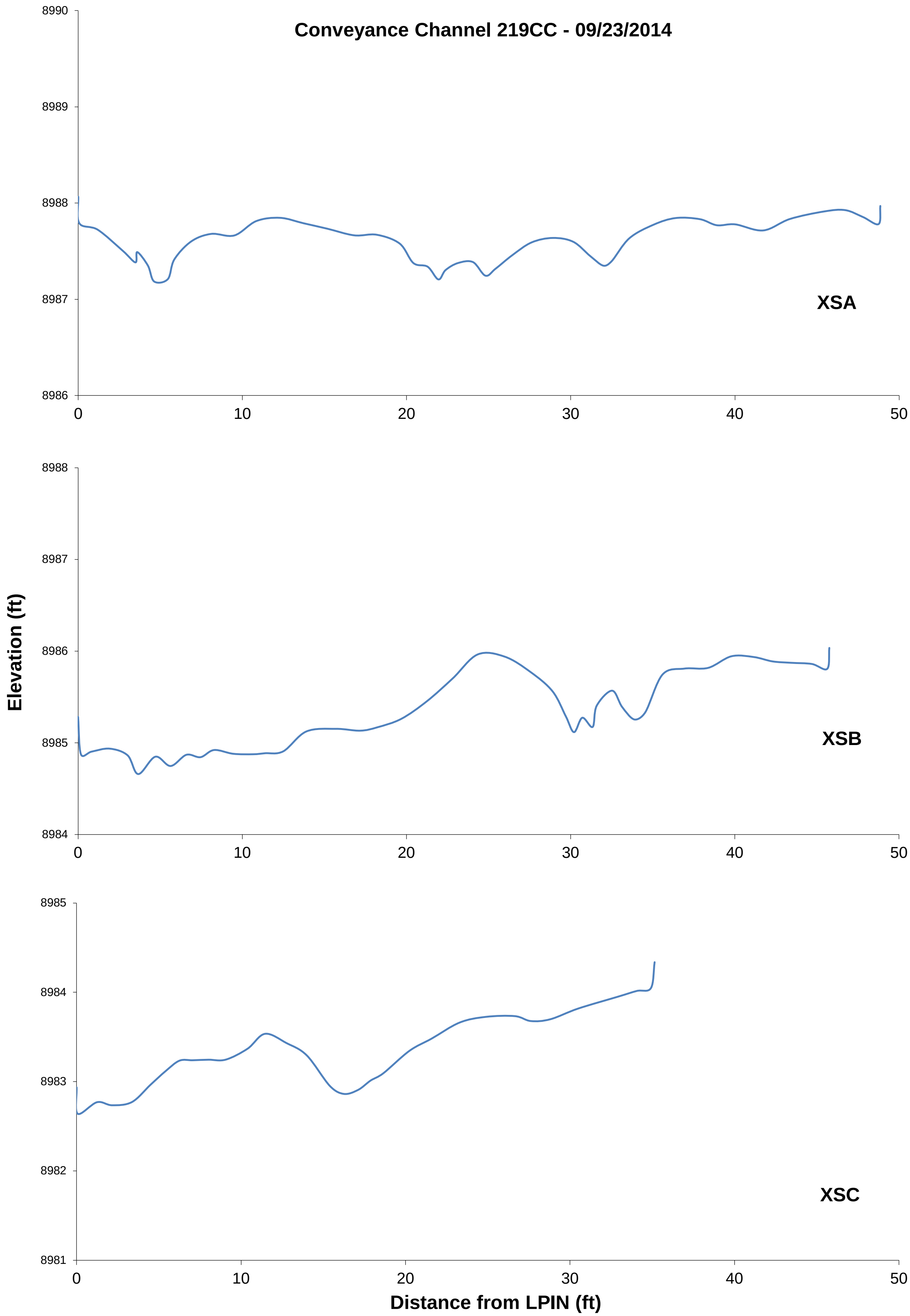


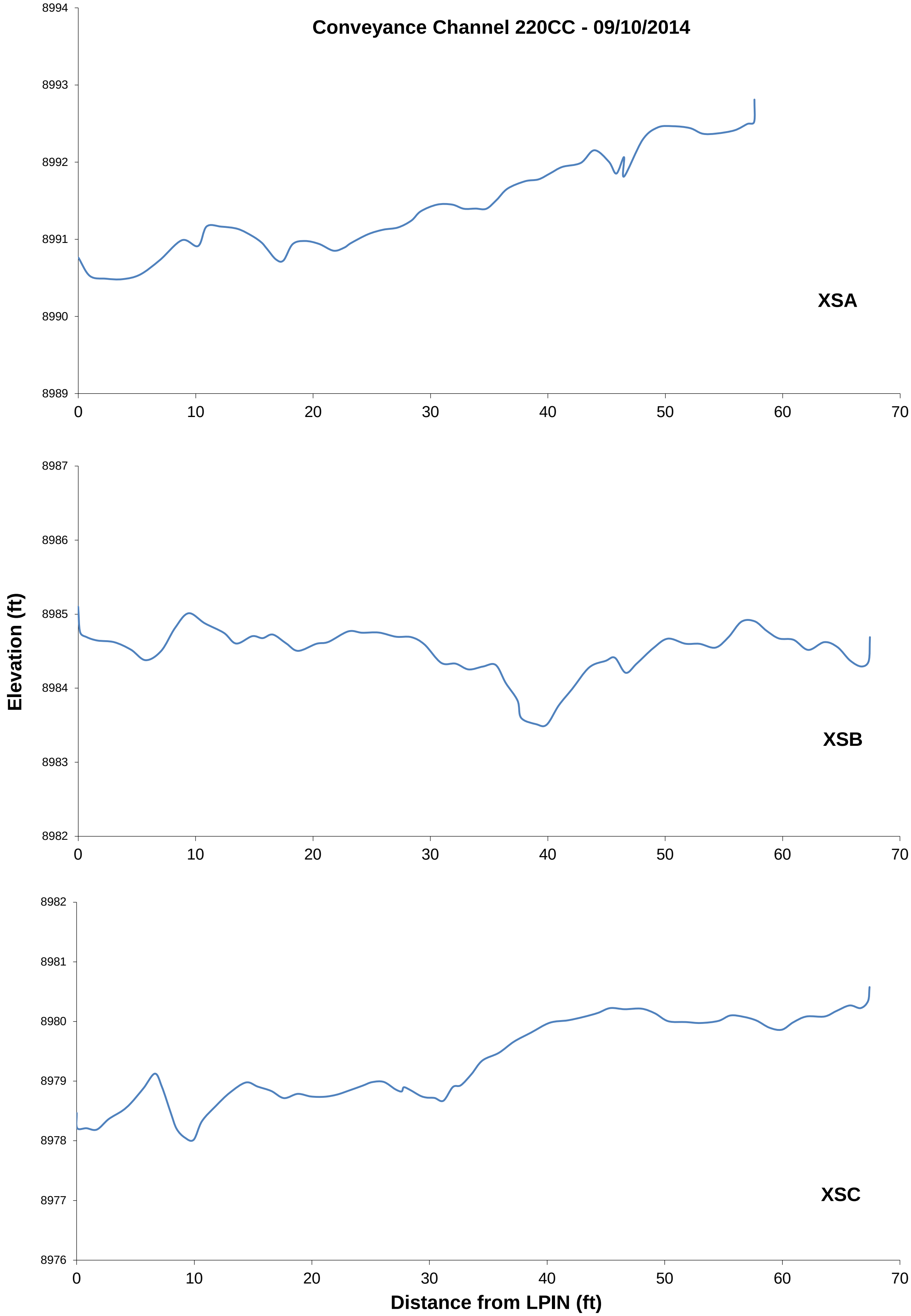
Conveyance Channel 215CC - 07/24/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13492
13490
13488
13486
13484
13482
13480
13478
13476
13474
13472
13470
13462
13460
13458
13456
13454
13452
13450
0
10
20
30
40
50
60
70


Conveyance Channel 216CC - 09/29/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
8787
8786
8785
8784
8780
8779
8778
8777
8772
8771
8770
8769
0
5
10
15
20
25
30
35
40

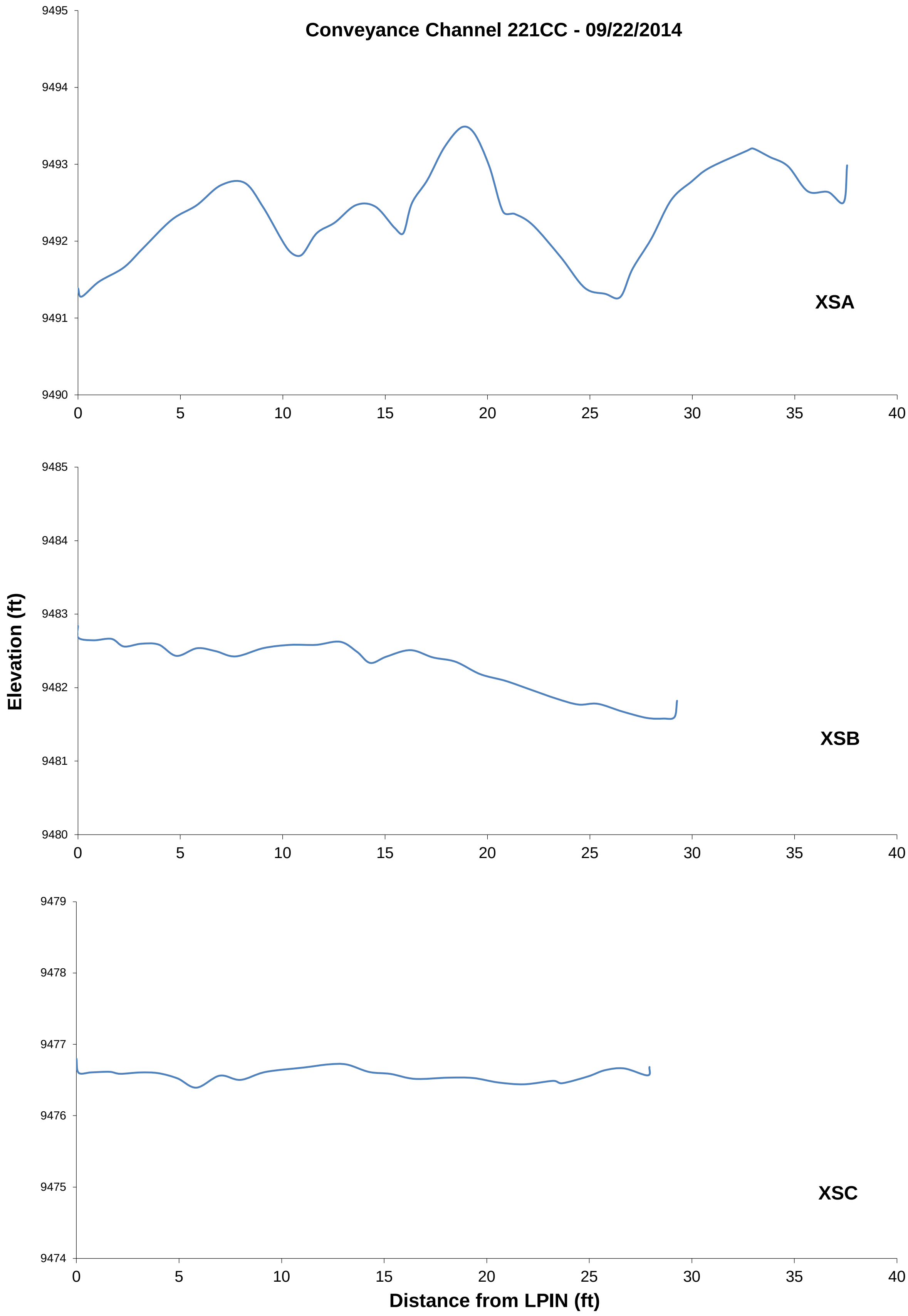

Conveyance Channel 217CC - 09/29/2014
8789
8788
8787
8786
8785
XSA
0
5
10
15
20
25
30
35
40
8782
8781
8780
8779
8778
XSB
Elevation (ft)
8779
8778
8777
8776
8775
XSC
Distance from LPIN (ft)

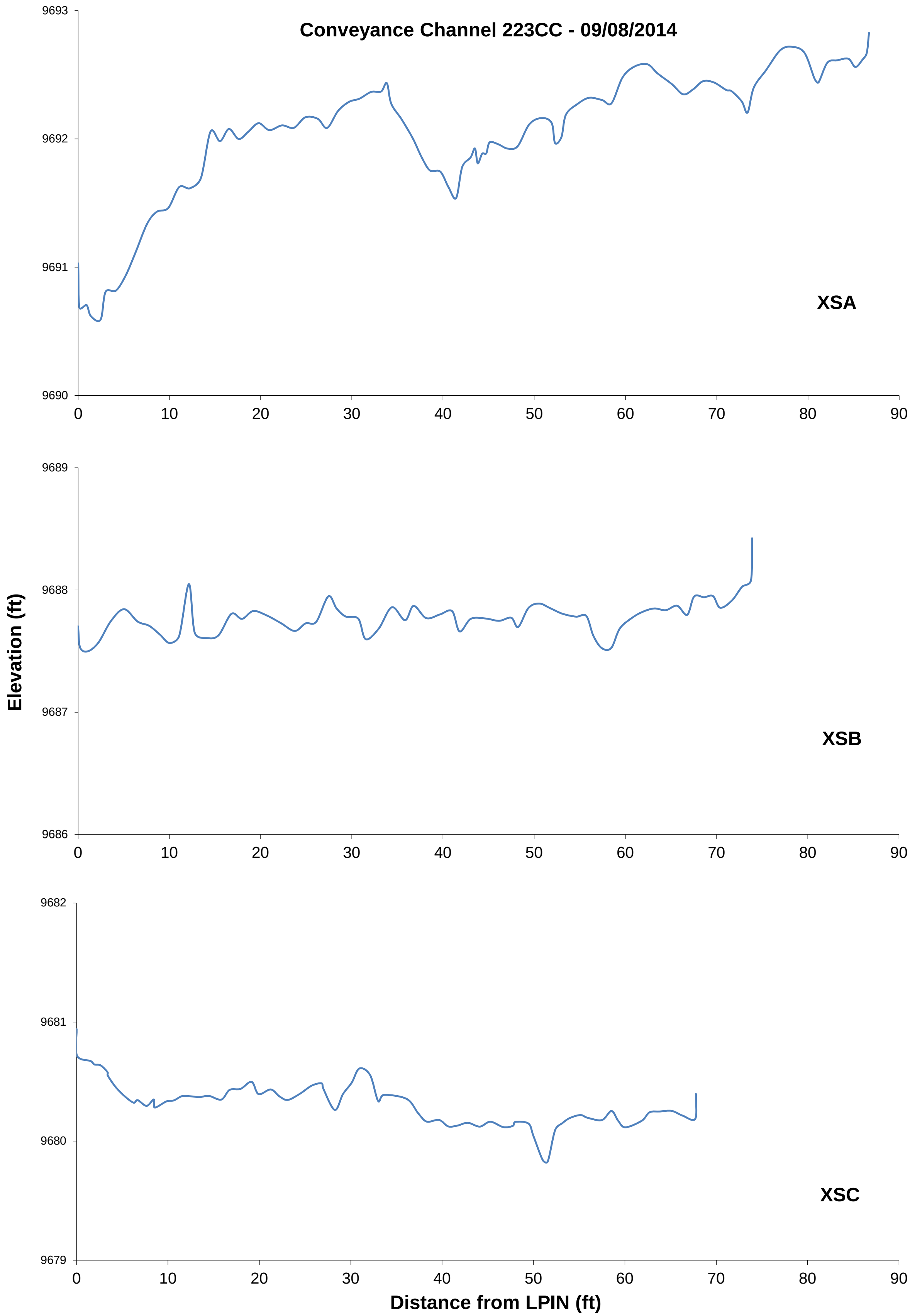

Conveyance Channel 218CC - 09/10/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
8998
8997
8996
8995
8994
8993
8992
XSB
8996
8995
8994
8993
8992
8991
8990
XSC
8994
8993
8992
8991
8990
8989
8988
0
5
10
15
20
25
30
35
40
45


Conveyance Channel 219CC - 09/23/2014
Elevation (ft)
8990
8989
8988
8987
8986
0
10
20
30
40
50
XSA
8988
8987
8986
8985
8984
XSB
8985
8984
8983
8982
8981
XSC
Distance from LPIN (ft)

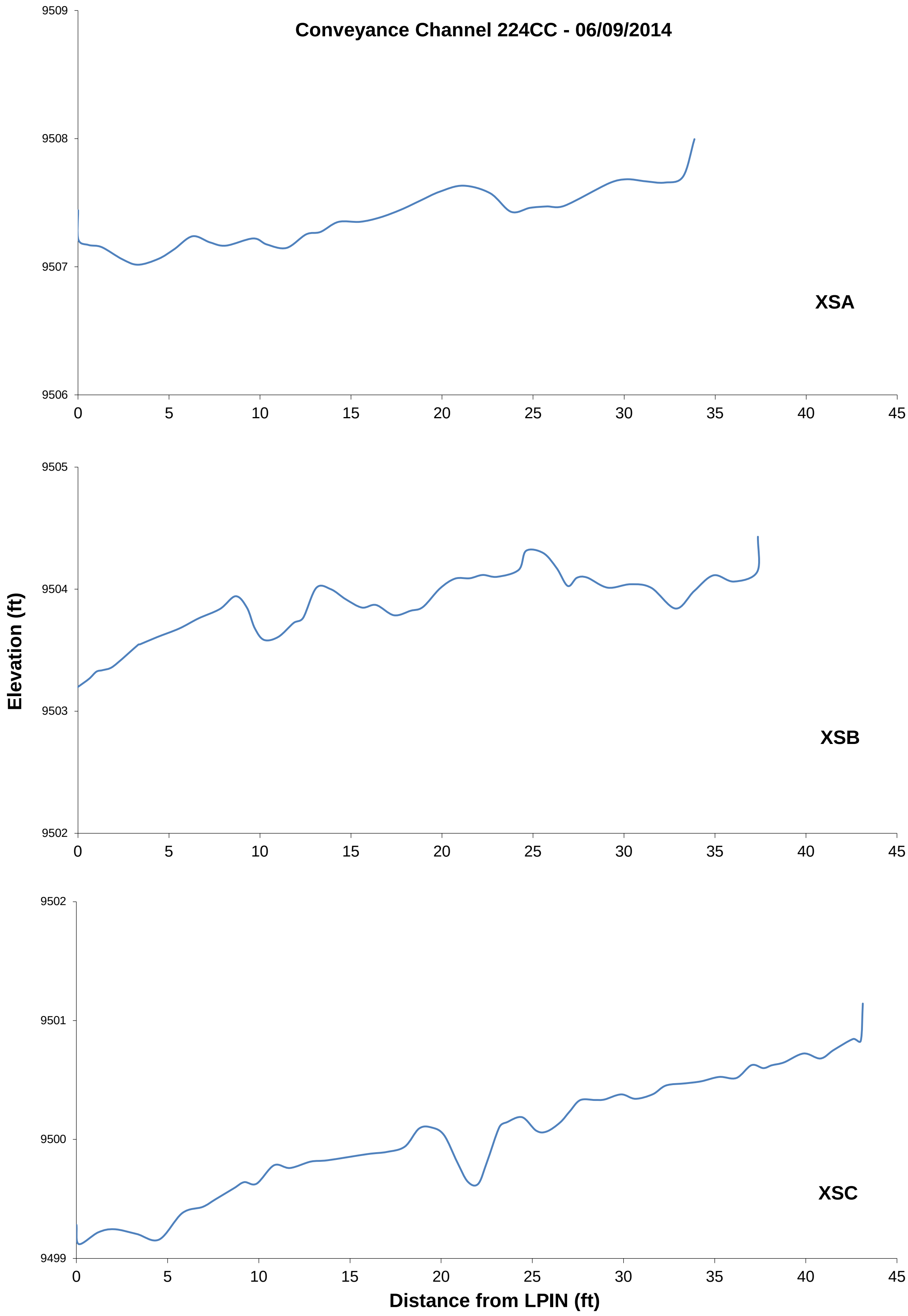


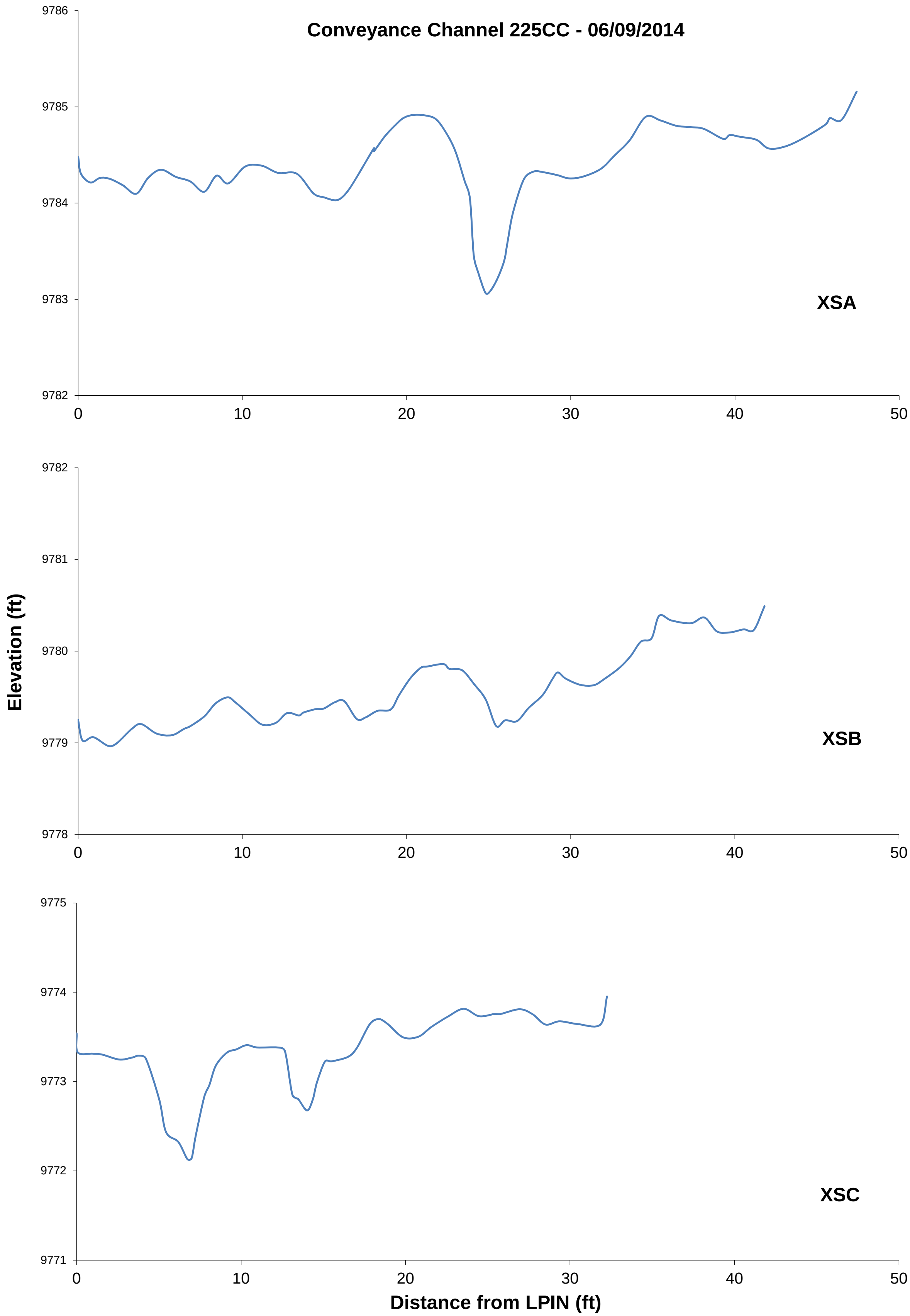
Conveyance Channel 220CC - 09/10/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
8994
8993
8992
8991
8990
8989
8987
8986
8985
8984
8983
8982
8981
8980
8979
8978
8977
8976
0
10
20
30
40
50
60
70


Conveyance Channel 221CC - 09/22/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9495
9494
9493
9492
9491
9490
9485
9484
9483
9482
9481
9480
9479
9478
9477
9476
9475
9474
0
5
10
15
20
25
30
35
40

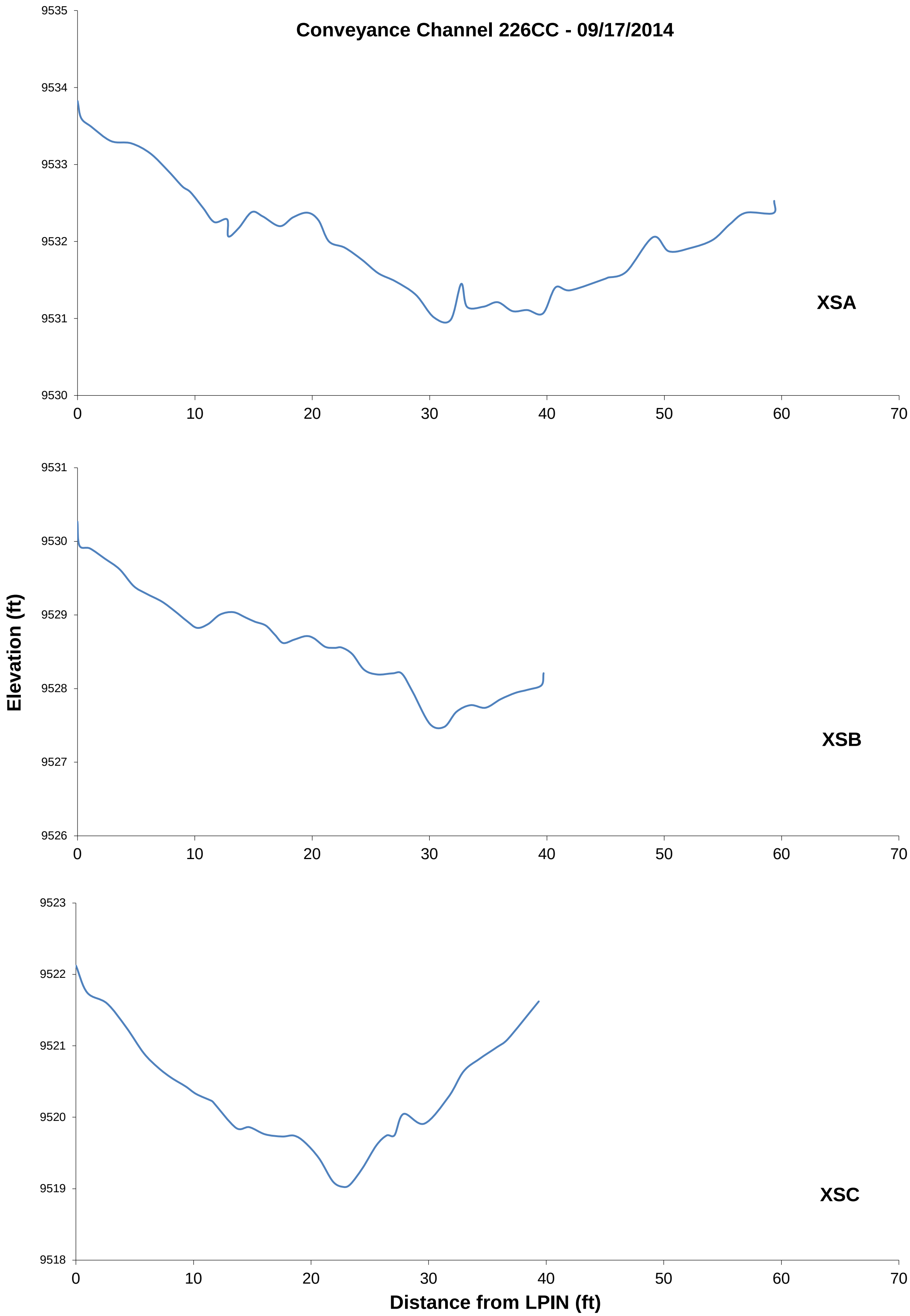


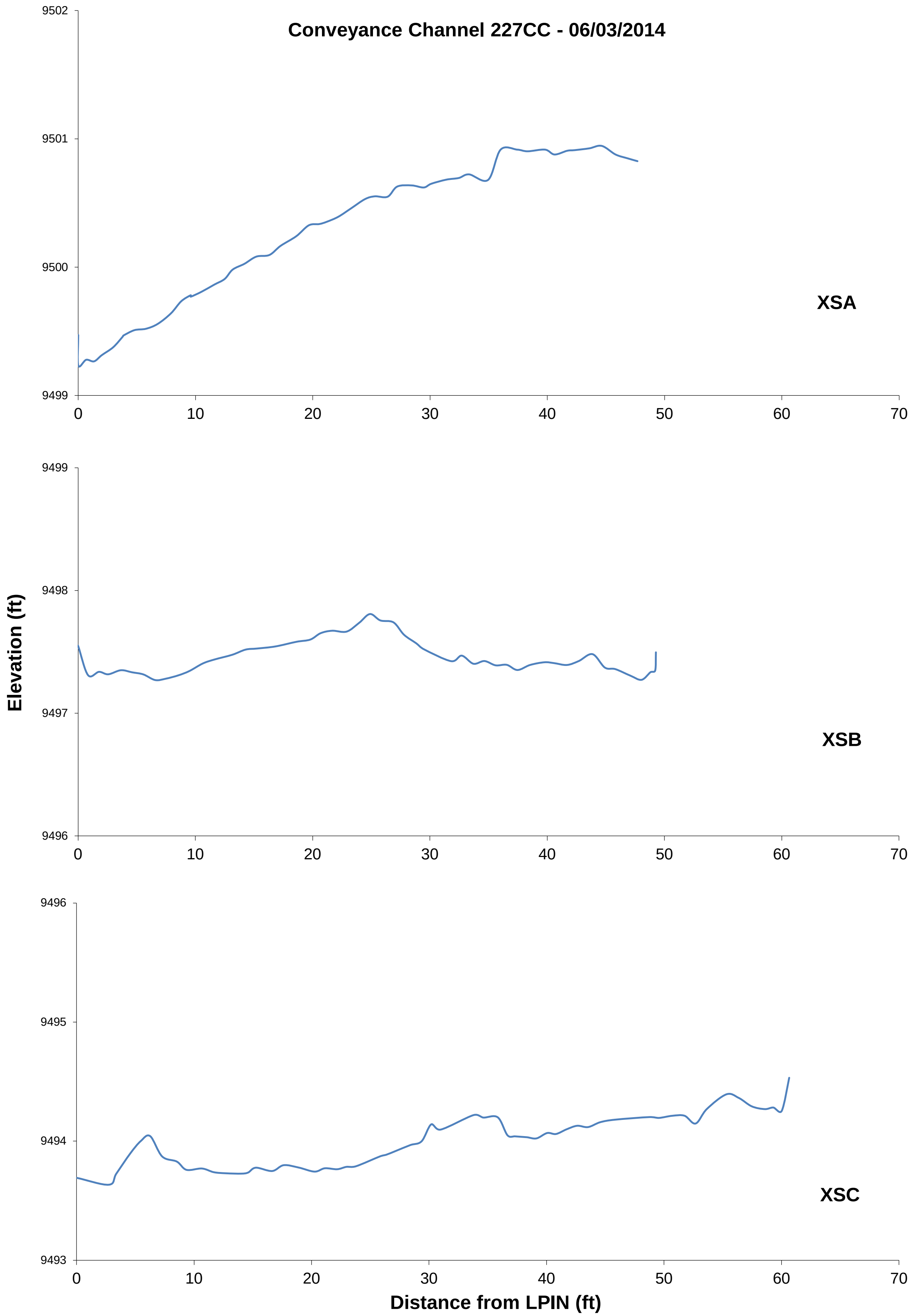
Conveyance Channel 223CC - 09/08/2014
9693
9692
9691
9690
0
10
20
30
40
50
60
70
80
90
XSA
9689
9688
9687
9686
XSB
Elevation (ft)
9682
9681
9680
9679
XSC
Distance from LPIN (ft)

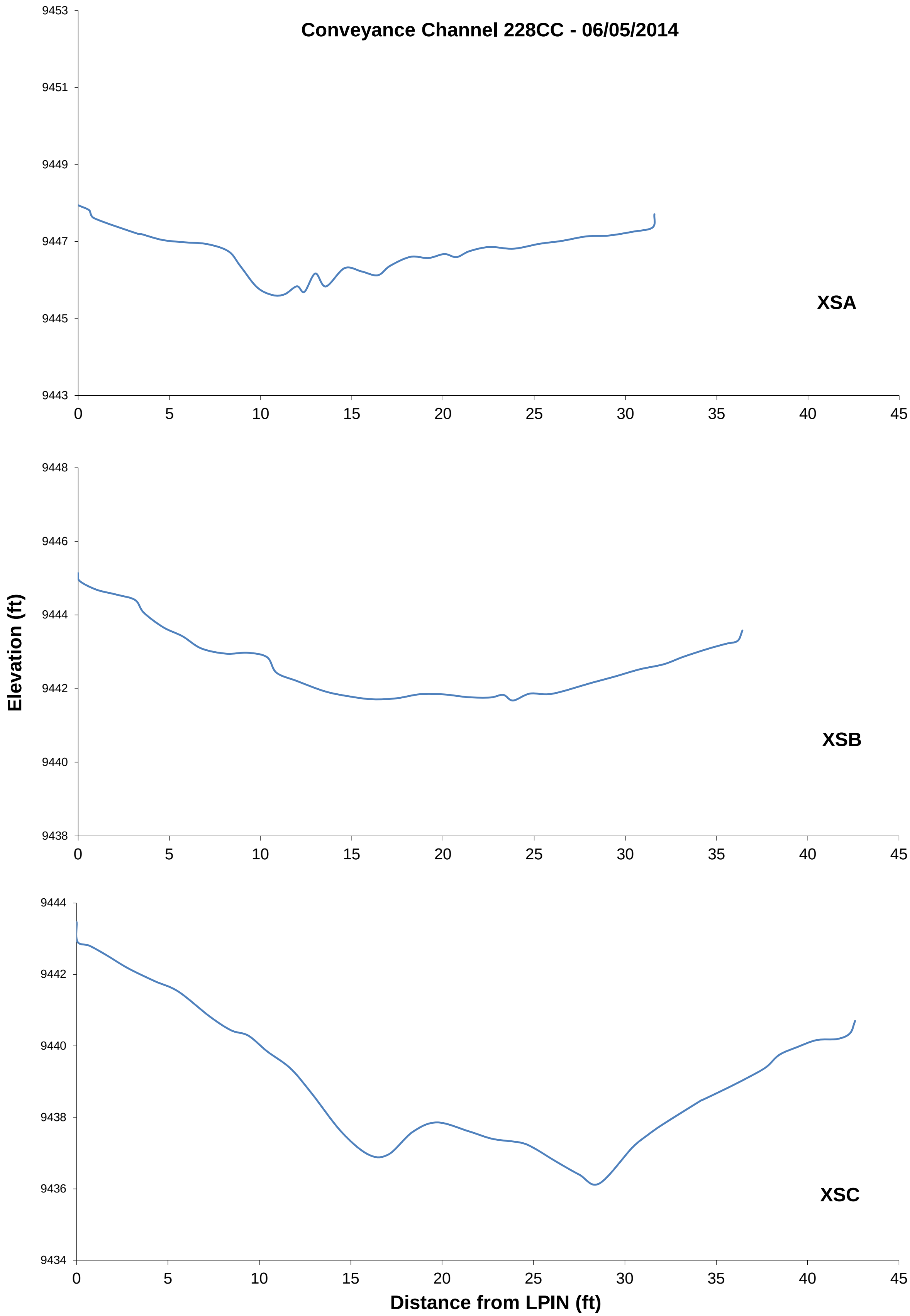

Conveyance Channel 224CC - 06/09/2014
9509
9508
9507
9506
XSA
0
5
10
15
20
25
30
35
40
45
9505
9504
9503
9502
XSB
9502
9501
9500
9499
XSC
Elevation (ft)
Distance from LPIN (ft)



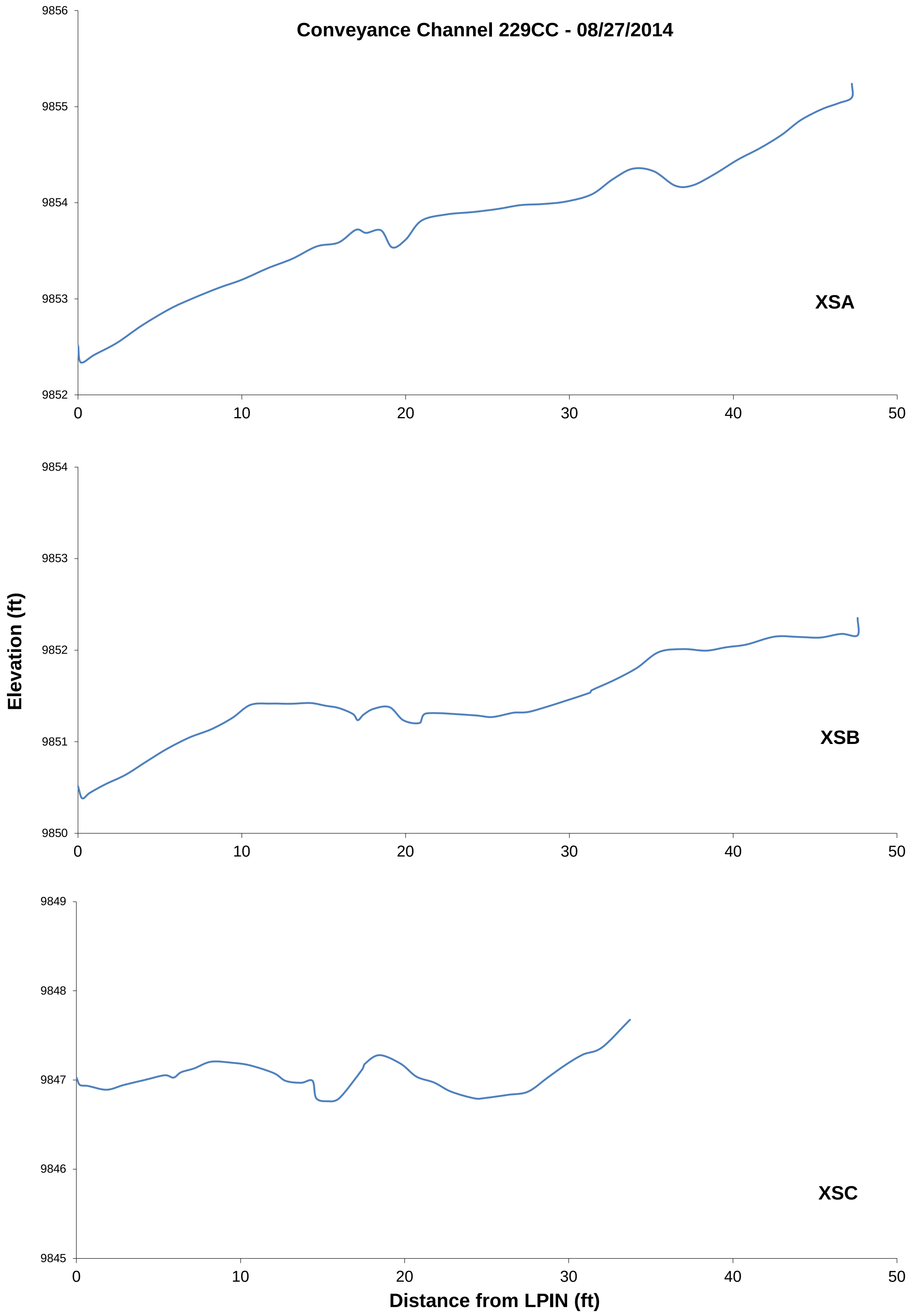
Conveyance Channel 225CC - 06/09/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9786
9785
9784
9783
9782
9781
9780
9779
9778
9775
9774
9773
9772
9771
0
10
20
30
40
50


Conveyance Channel 226CC - 09/17/2014
9535
9534
9533
9532
9531
9530
0
10
20
30
40
50
60
70
XSA
9531
9530
9529
9528
9527
9526
0
10
20
30
40
50
60
70
XSB
Elevation (ft)
9523
9522
9521
9520
9519
9518
0
10
20
30
40
50
60
70
XSC
Distance from LPIN (ft)

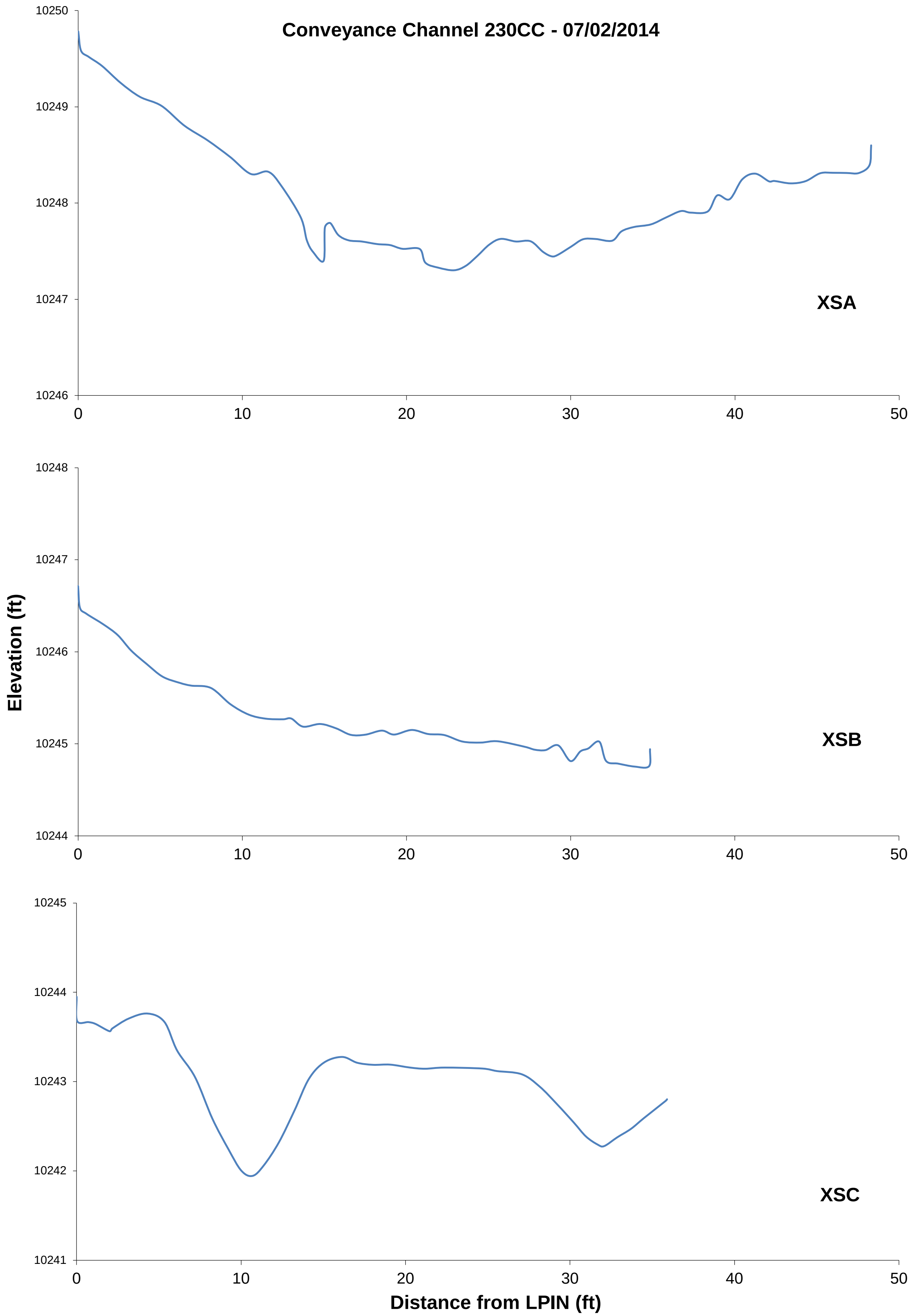

Conveyance Channel 227CC - 06/03/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9502
9501
9500
9499
9498
9497
9496
9495
9494
9493
0
10
20
30
40
50
60
70



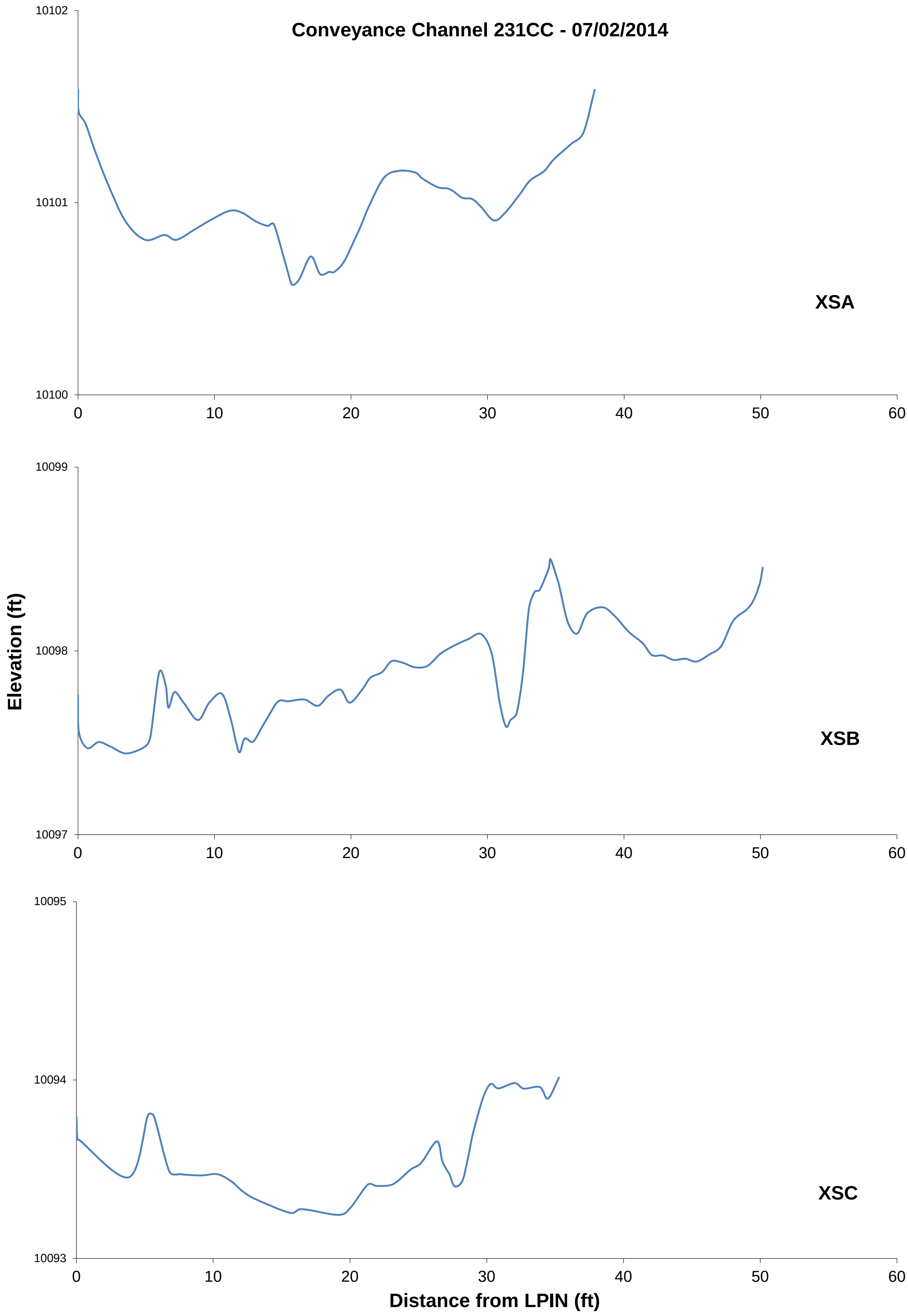
Conveyance Channel 228CC - 06/05/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
9453
9451
9449
9447
9445
9443
9448
9446
9444
9442
9440
9438
9444
9442
9440
9438
9436
9434
0
5
10
15
20
25
30
35
40
45

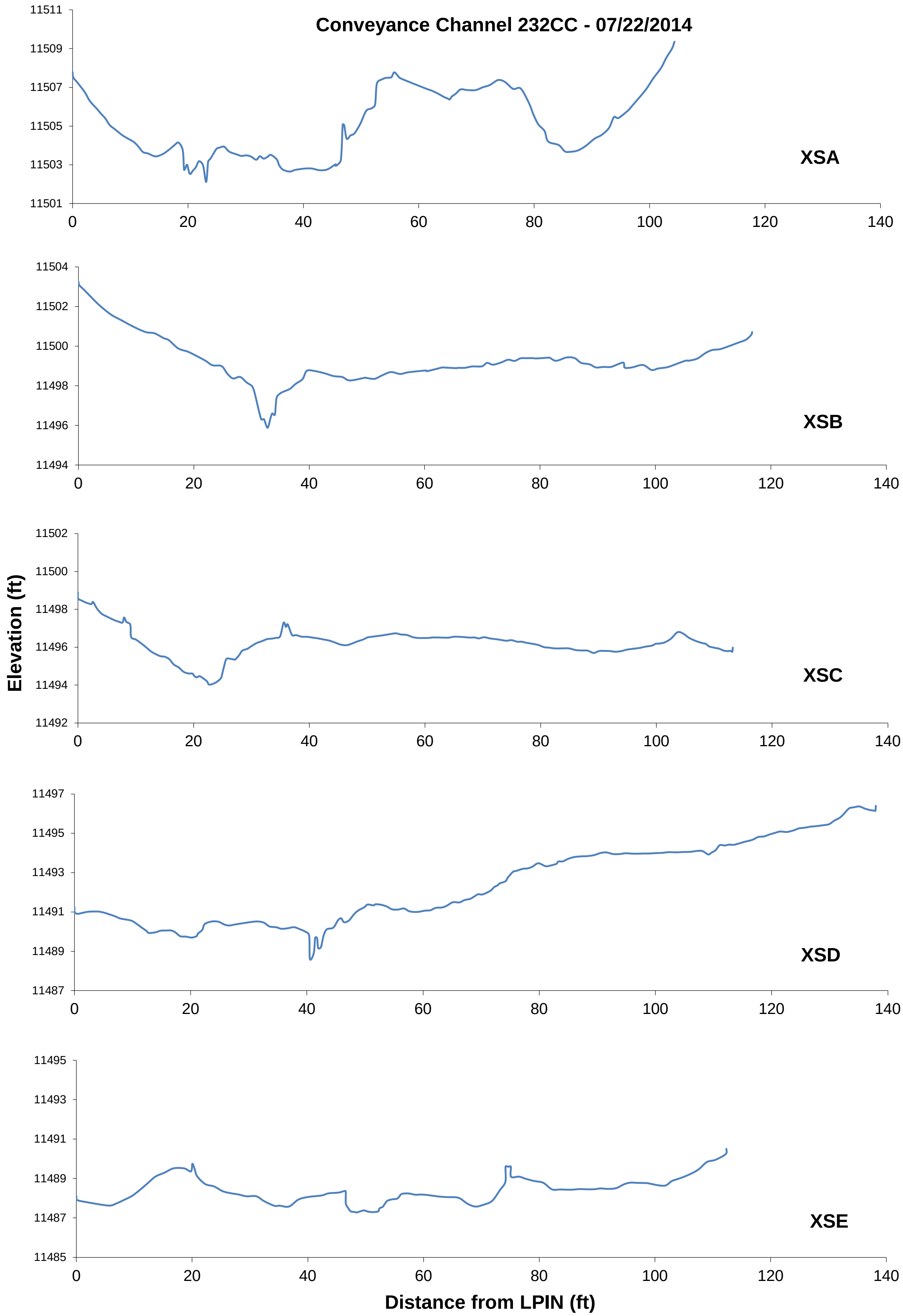


Conveyance Channel 229CC - 08/27/2014
Elevation (ft)
9856
9855
9854
9853
9852
0
10
20
30
40
50
XSA
9854
9853
9852
9851
9850
0
10
20
30
40
50
XSB
9849
9848
9847
9846
9845
0
10
20
30
40
50
XSC
Distance from LPIN (ft)

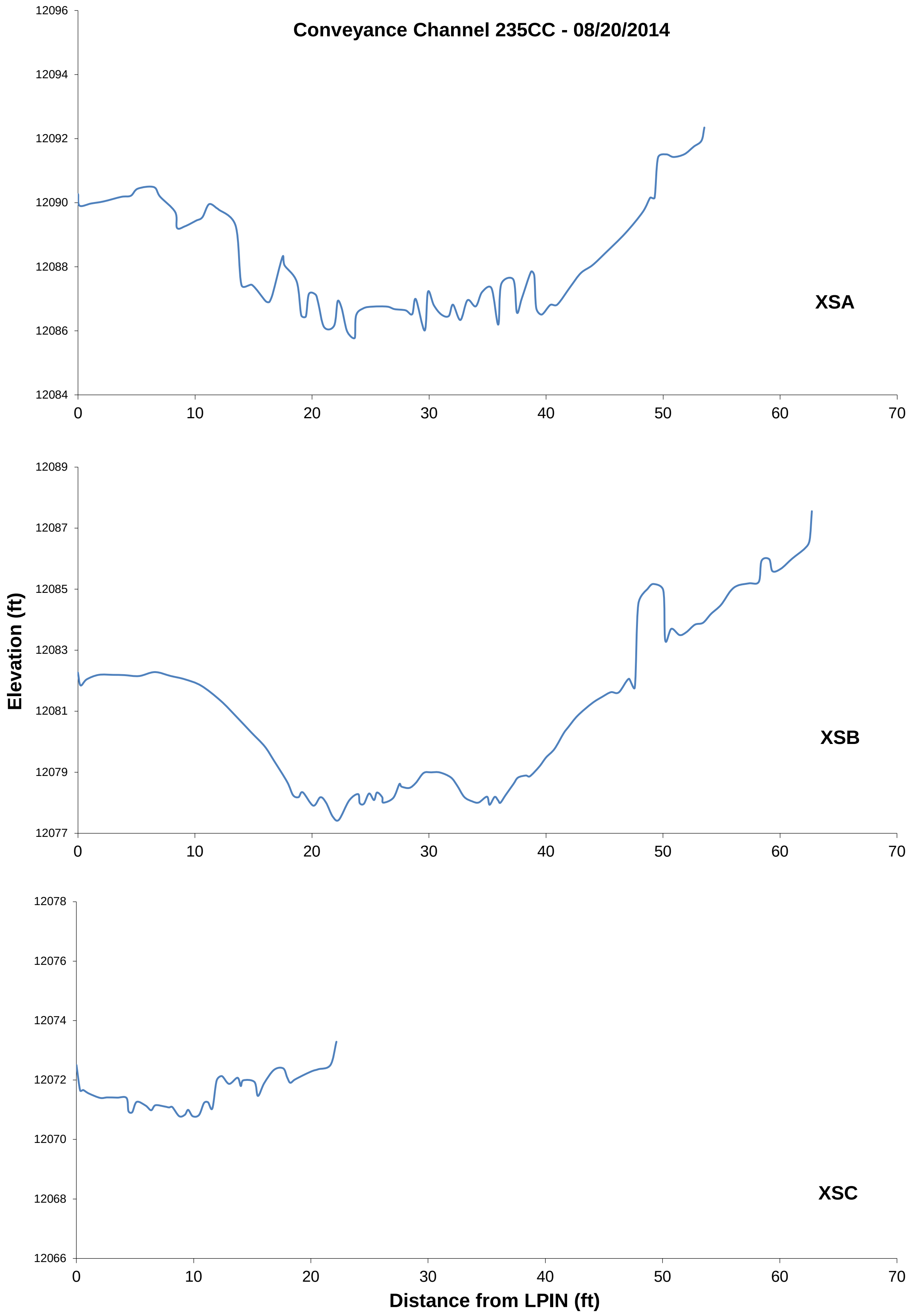


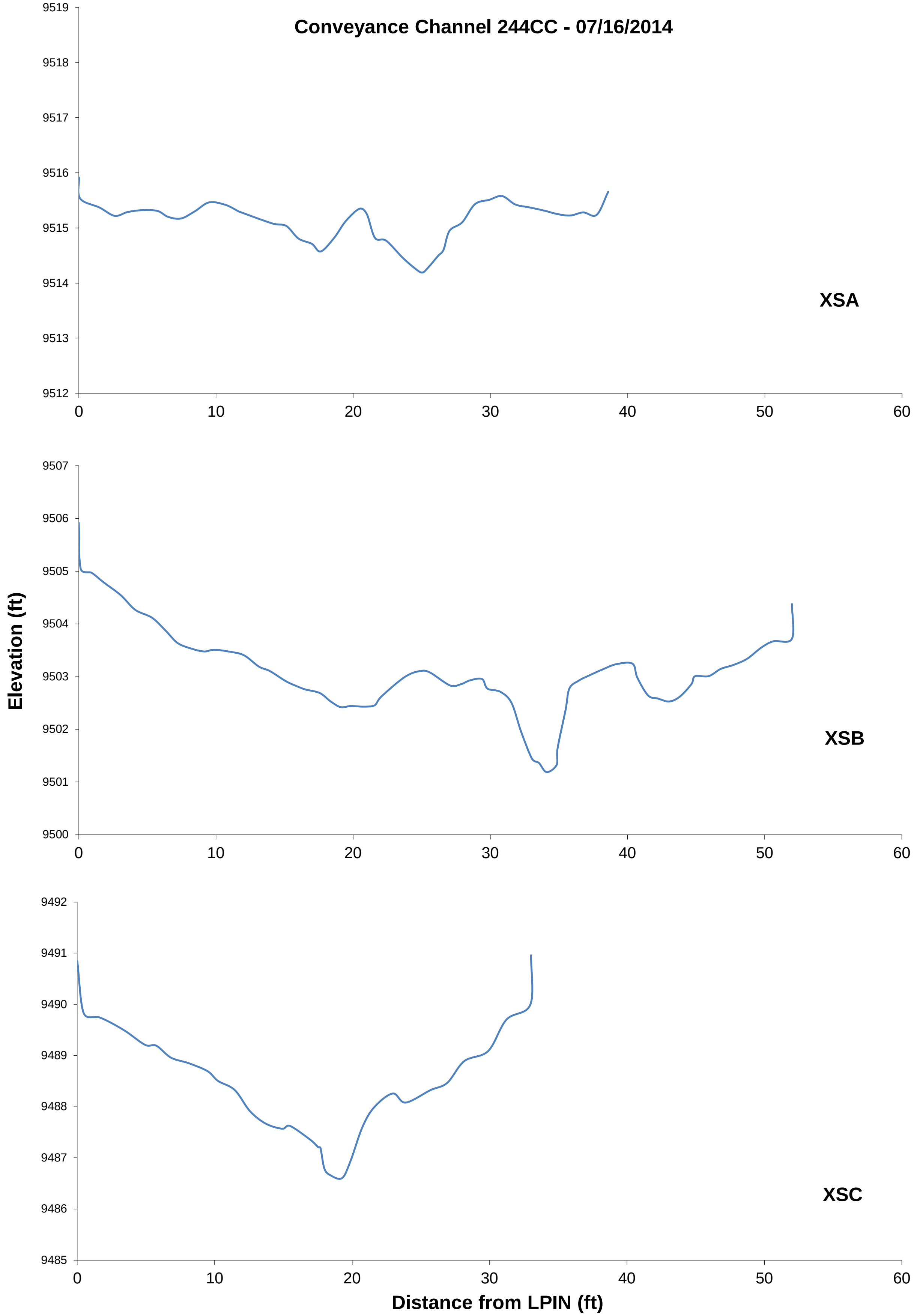
Conveyance Channel 230CC - 07/02/2014
Elevation (ft)
10250
10249
10248
10247
10246
0
10
20
30
40
50
XSA
10248
10247
10246
10245
10244
XSB
10245
10244
10243
10242
10241
XSC
Distance from LPIN (ft)


Conveyance Channel 231CC - 07/02/2014
Elevation (ft)
XSA
10102
10101
10100
XSB
10099
10098
10097
XSC
10095
10094
10093
0
10
20
30
40
50
60
Distance from LPIN (ft)



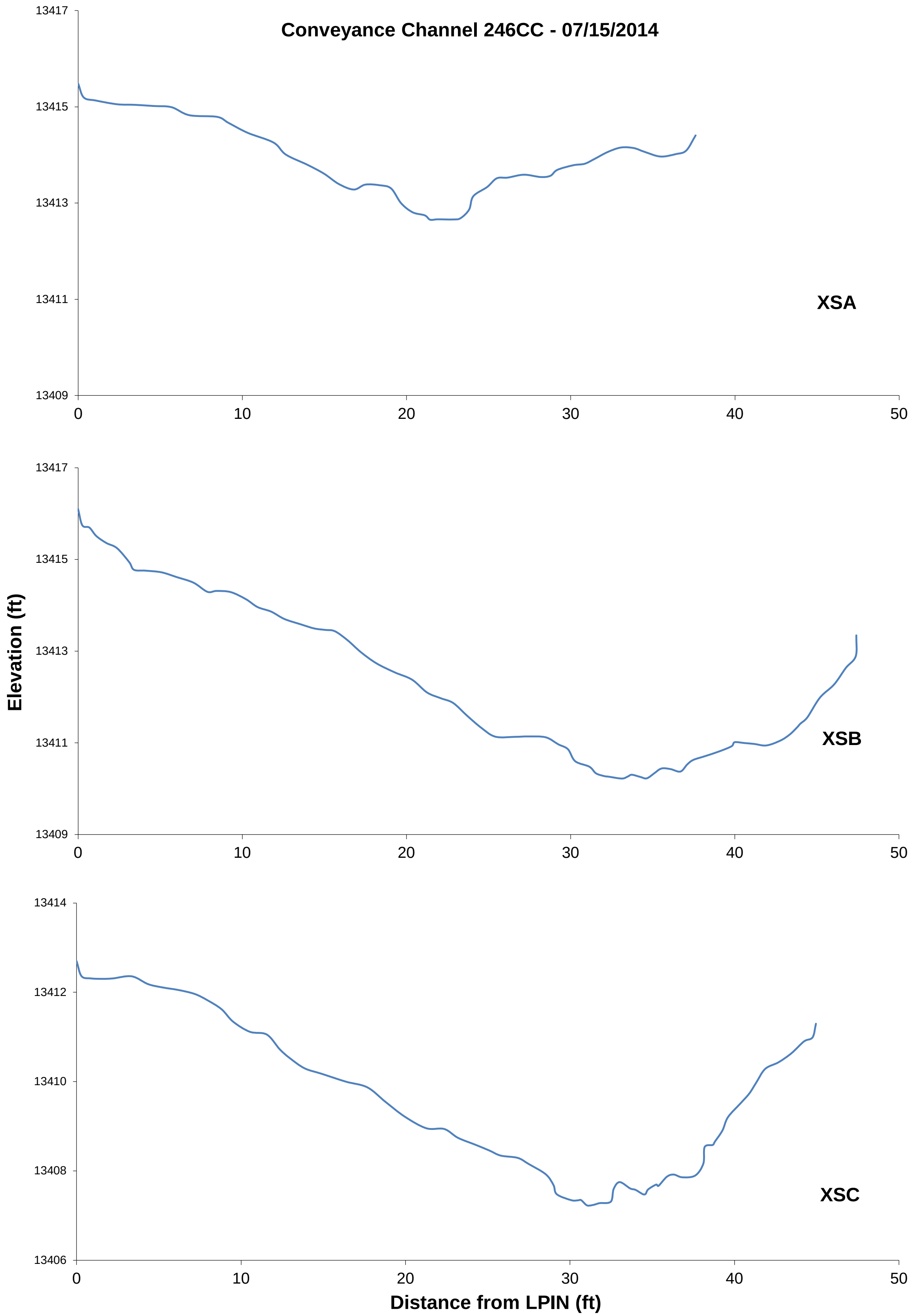
Conveyance Channel 232CC - 07/22/2014
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)
11511
11509
11507
11505
11503
11501
11504
11502
11500
11498
11496
11494
11502
11500
11498
11496
11494
11492
11497
11495
11493
11491
11489
11487
11495
11493
11491
11489
11487
11485
0
20
40
60
80
100
120
140

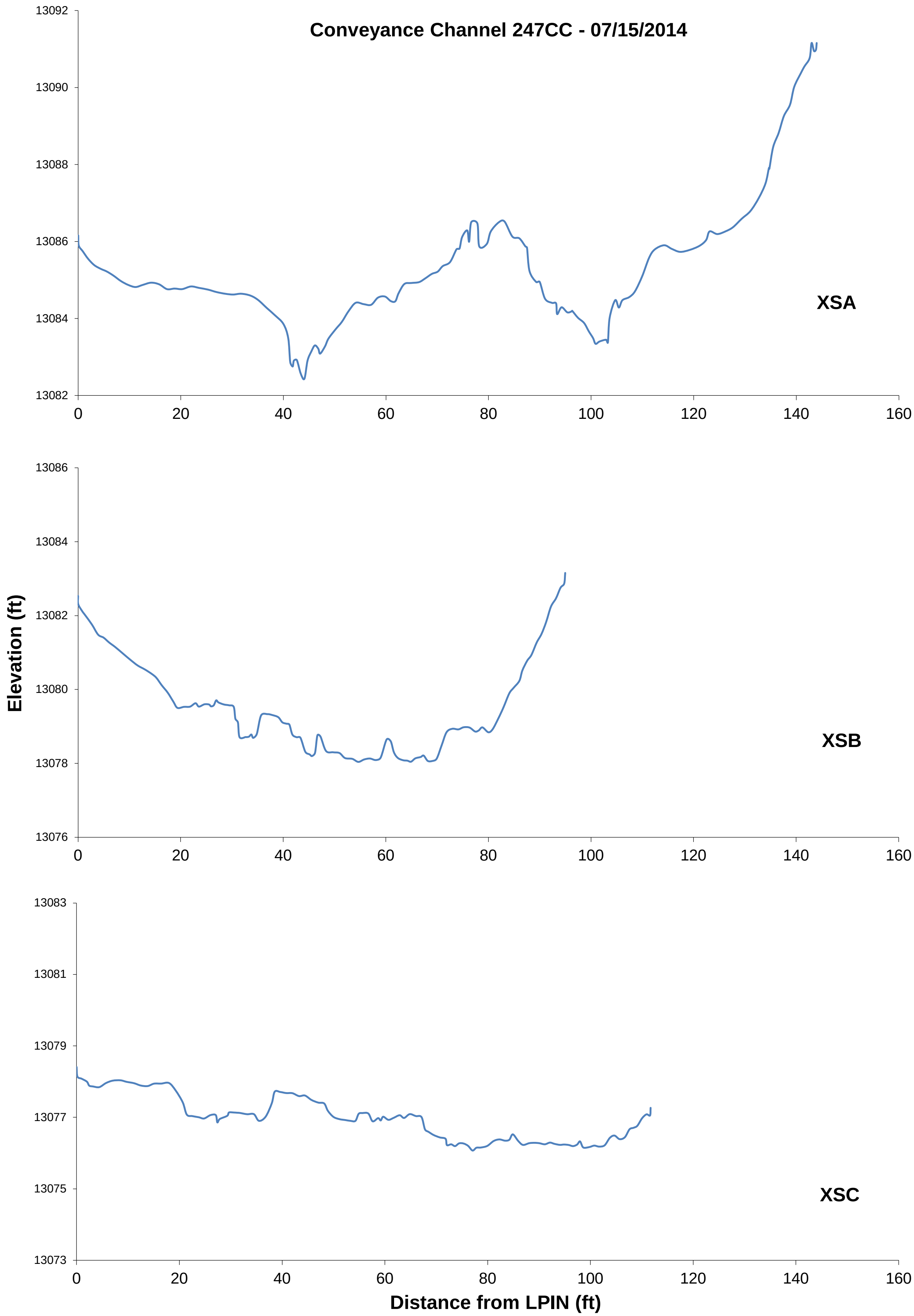

Conveyance Channel 235CC - 08/20/2014
Elevation (ft)
XSA
12096
12094
12092
12090
12088
12086
12084
0
10
20
30
40
50
60
70
XSB
12089
12087
12085
12083
12081
12079
12077
XSC
12078
12076
12074
12072
12070
12068
12066
Distance from LPIN (ft)



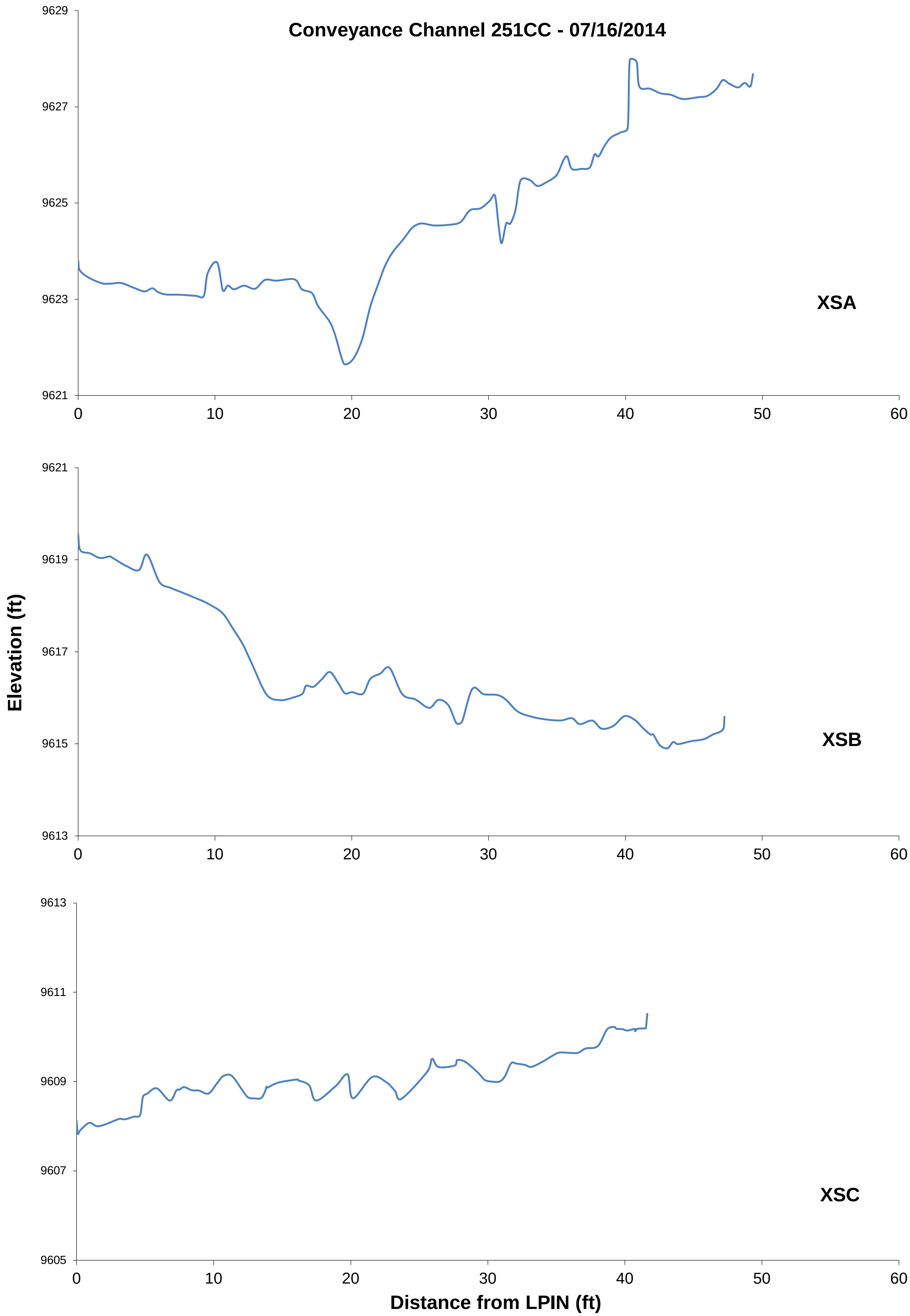
Conveyance Channel 244CC - 07/16/2014
9519
9518
9517
9516
9515
9514
9513
9512
0
10
20
30
40
50
60
XSA
9507
9506
9505
9504
9503
9502
9501
9500
XSB
9492
9491
9490
9489
9488
9487
9486
9485
XSC
Elevation (ft)
Distance from LPIN (ft)

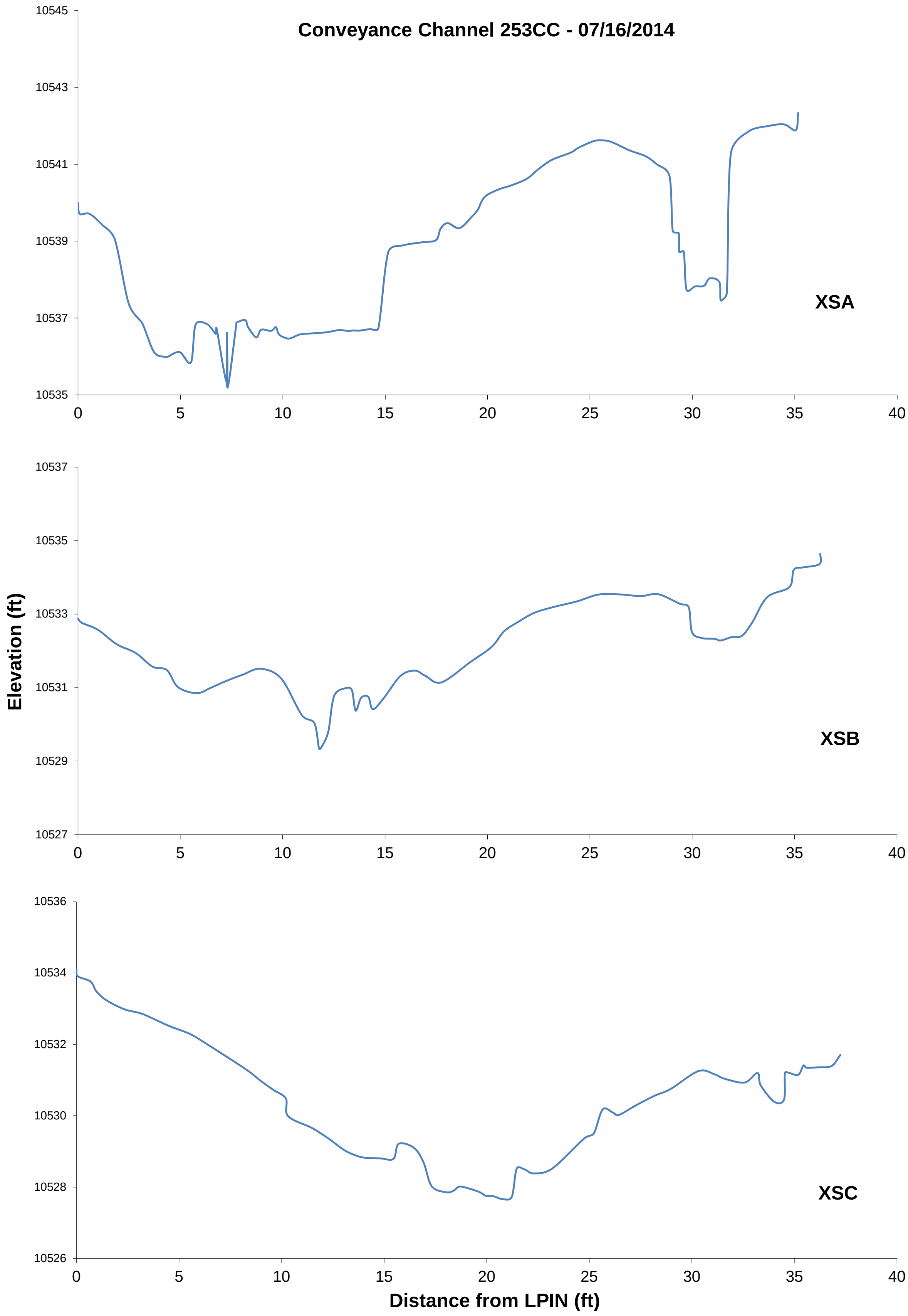

Conveyance Channel 245CC - 08/07/2014
XSA
9085
9084
9083
9082
9081
9080
9079
XSB
9073
9072
9071
9070
9069
9068
9067
XSC
9068
9067
9066
9065
9064
9063
9062
0
10
20
30
40
50
60
70
80
90
Elevation (ft)
Distance from LPIN (ft)

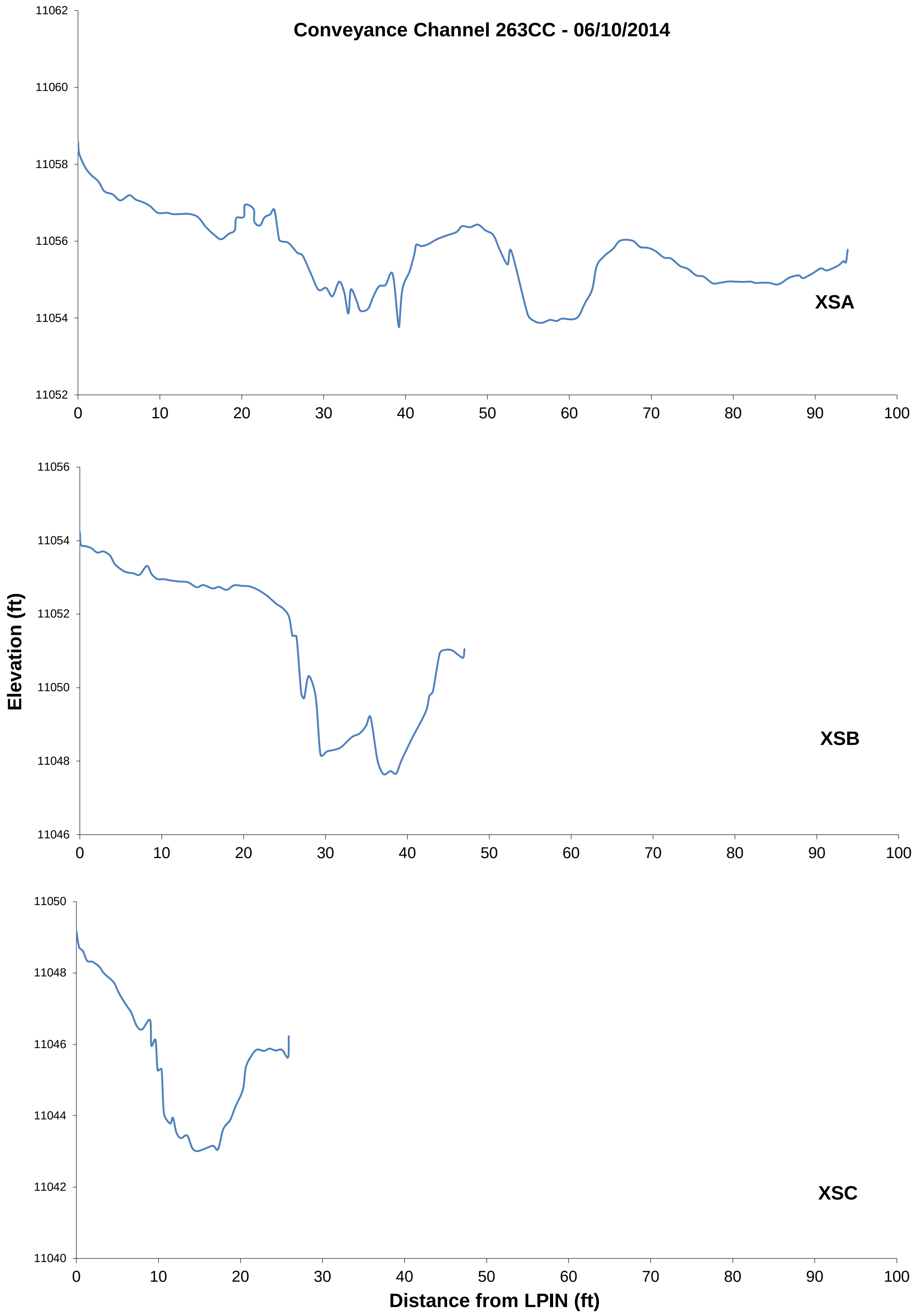

Conveyance Channel 246CC - 07/15/2014
XSA
XSB
XSC
13417
13415
13413
13411
13409
13414
13412
13410
13408
13406
0
10
20
30
40
50
Elevation (ft)
Distance from LPIN (ft)

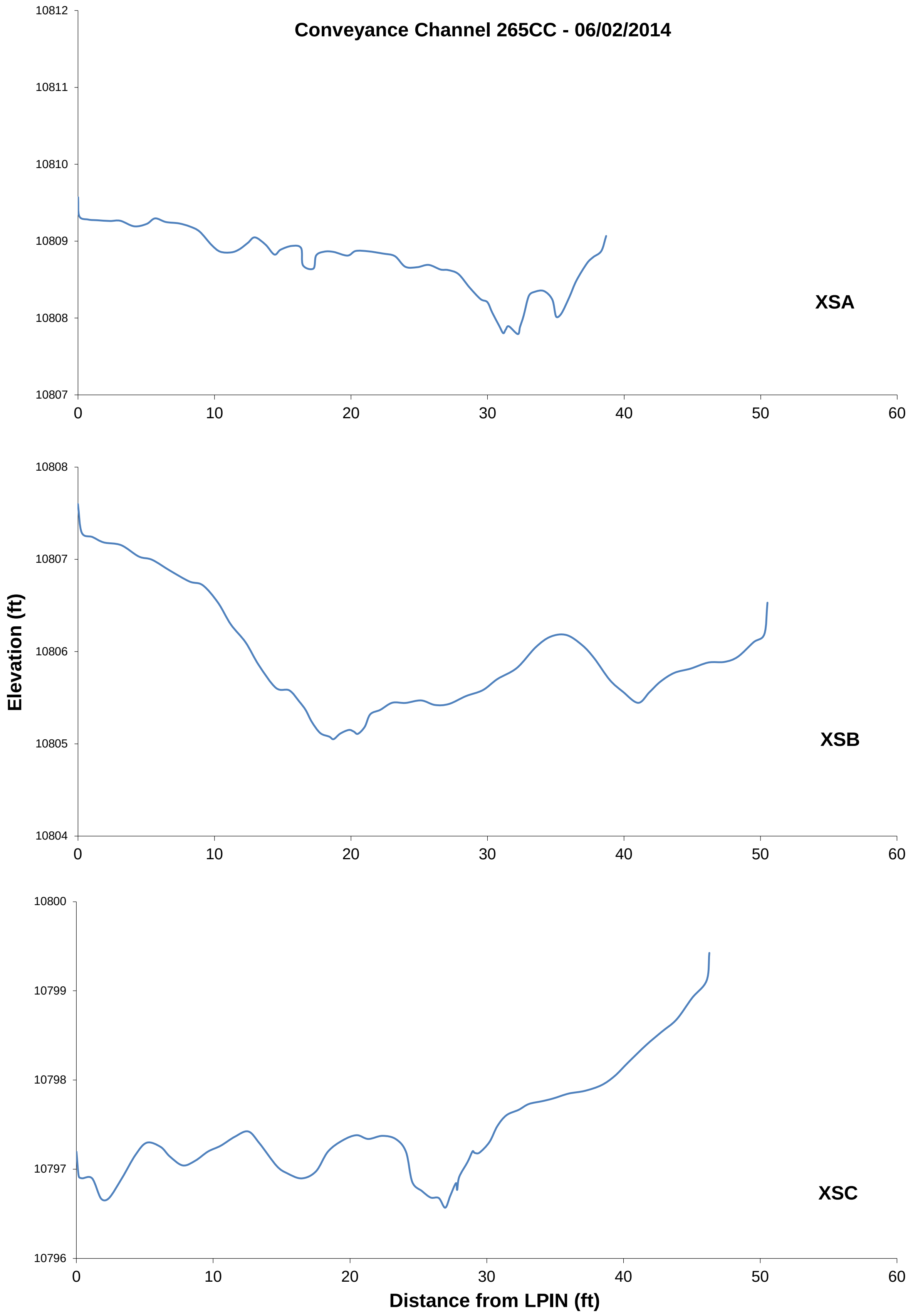


Conveyance Channel 247CC - 07/15/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13092
13090
13088
13086
13084
13082
13080
13078
13076
13083
13081
13079
13077
13075
13073
0
20
40
60
80
100
120
140
160


Conveyance Channel 251CC - 07/16/2014
9629
9627
9625
9623
9621
XSA
9621
9619
9617
9615
9613
XSB
9613
9611
9609
9607
9605
XSC
0
10
20
30
40
50
60
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 253CC - 07/16/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10545
10543
10541
10539
10537
10535
10533
10531
10529
10527
10536
10534
10532
10530
10528
10526
0
5
10
15
20
25
30
35
40


Conveyance Channel 263CC - 06/10/2014
11062
11060
11058
11056
11054
11052
0
10
20
30
40
50
60
70
80
90
100
XSA
11056
11054
11052
11050
11048
11046
0
10
20
30
40
50
60
70
80
90
100
XSB
Elevation (ft)
11050
11048
11046
11044
11042
11040
0
10
20
30
40
50
60
70
80
90
100
XSC
Distance from LPIN (ft)



Conveyance Channel 265CC - 06/02/2014
10812
10811
10810
10809
10808
10807
0
10
20
30
40
50
60
XSA
10808
10807
10806
10805
10804
XSB
Elevation (ft)
10800
10799
10798
10797
10796
XSC
Distance from LPIN (ft)

# Appendix J

# Rock Weir and Sediment Pond

## Site Visit Dates
## Sediment Accumulation
## and
## Cross Section Graphs

## 2014

## Site Visit Dates of Rock Weir Silt Fences, Pikes Peak 2014

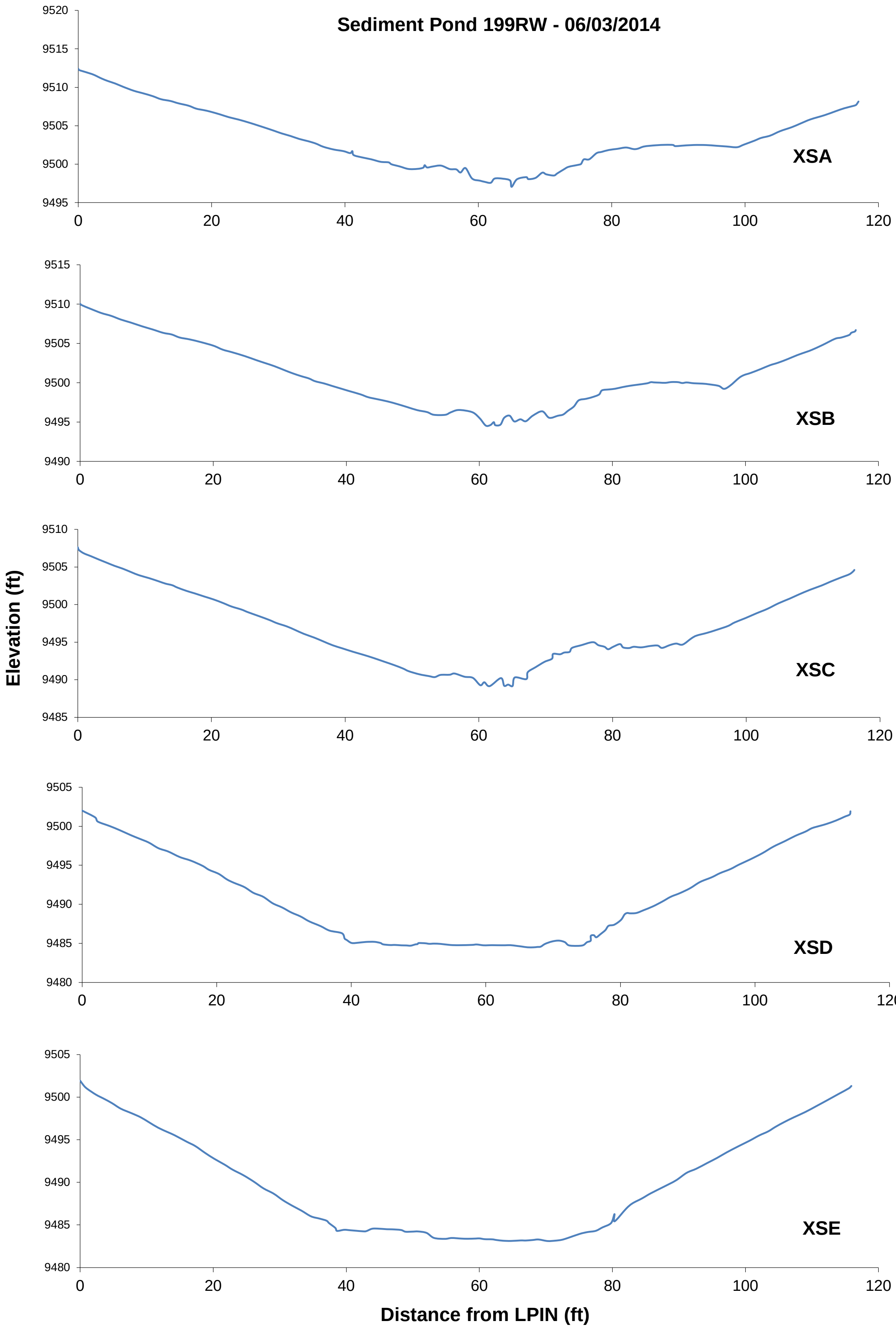
| **Site ID** | | **Site Visit Dates of Rock Weir Silt Fences on Pikes Peak, 2014** | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5/19 | 5/20 | 5/29 | 5/30 | 6/4 | 6/16 | 6/17 | 6/30 | 7/8 | 7/16 | 7/17 | 8/11 | 8/27 | 9/8 | 9/10 | 9/11 | 9/15 | 9/17 | 9/22 | 9/29 |
| 002RW | X | | | | X | | X | X | X | | X | X | X | | X | | X | | | |
| 003RW | X | | | | X | | X | X | X | | X | X | X | | X | | X | | | |
| 006RW | X | X | X | X | X | | X | X | X | | X | X | X | | X | | X | | | |
| 008RW | X | | X | X | X | | X | X | X | | X | X | X | | X | | X | | X | |
| 009RA | X | X | X | | X | | X | | X | | X | X | X | X | | | X | | X | |
| 161RW | X | X | | | X | | X | | X | | X | | X | | | X | X | | | |
| 162RW | X | X | | | X | | X | | X | X | X | X | X | | | | X | | X | |
| 176RW | X | | X | X | X | | X | | X | X | X | X | X | | | | X | X | | |
| 178RW | X | | | | X | | X | | | | | | | | | | X | | | |
| 179RW | X | | | | X | | X | | | | | | | | | | X | | | |
| 180RW | X | | | | X | | X | | | | | | | | | | X | | | |
| 181RW | X | | | | X | | X | | | | | | | | | | X | | | |
| 200RW | X | | | | X | X | X | | X | | X | X | X | | | | X | | | X |
| 201RW | X | | | | X | | X | | X | | X | | X | | | | X | X | | |
| 202RW | X | X | | | X | | X | | X | X | X | | X | | | X | X | | | |

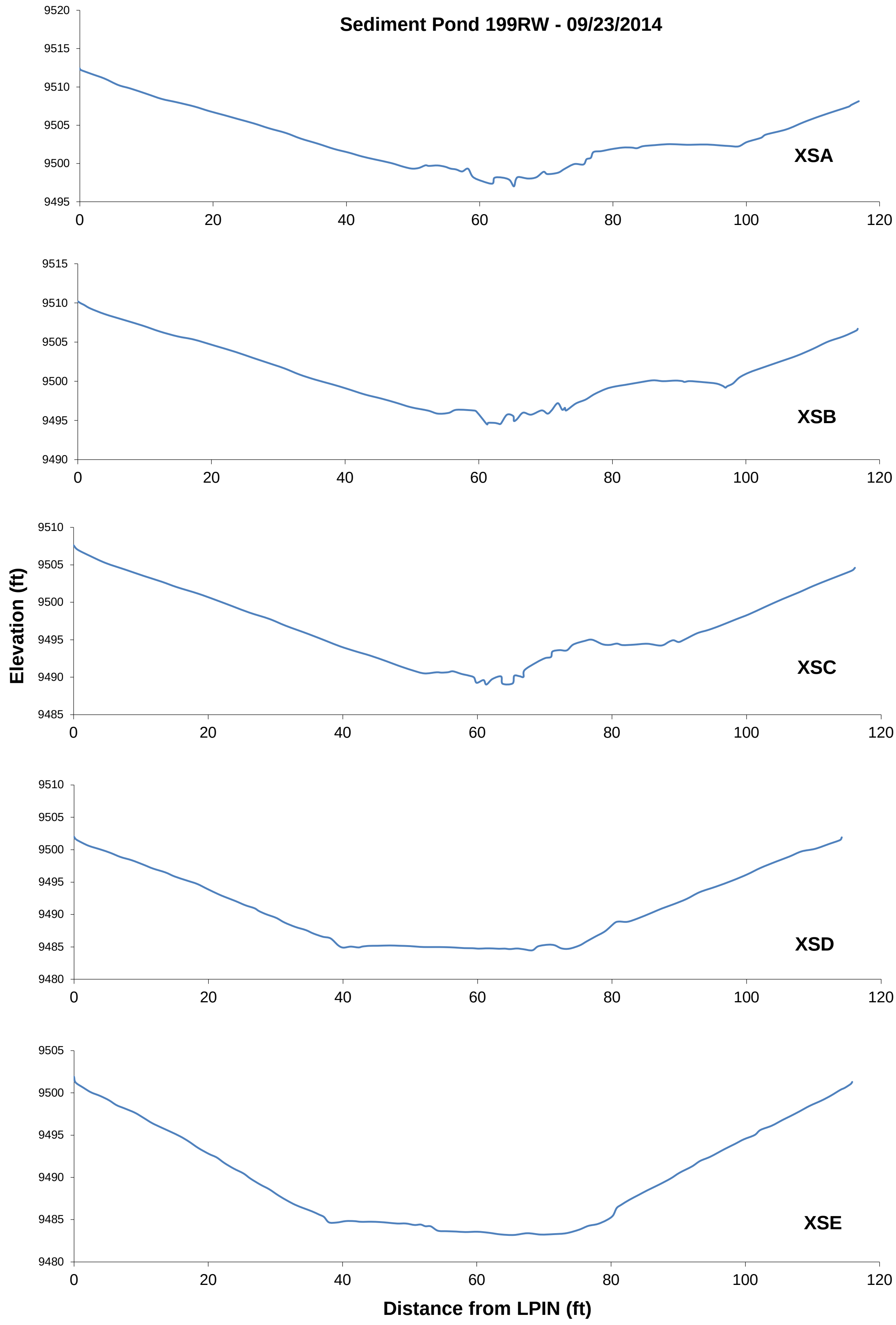
**Sediment Accumulation in Rock Weir Silt Fences, Pikes Peak 2014**

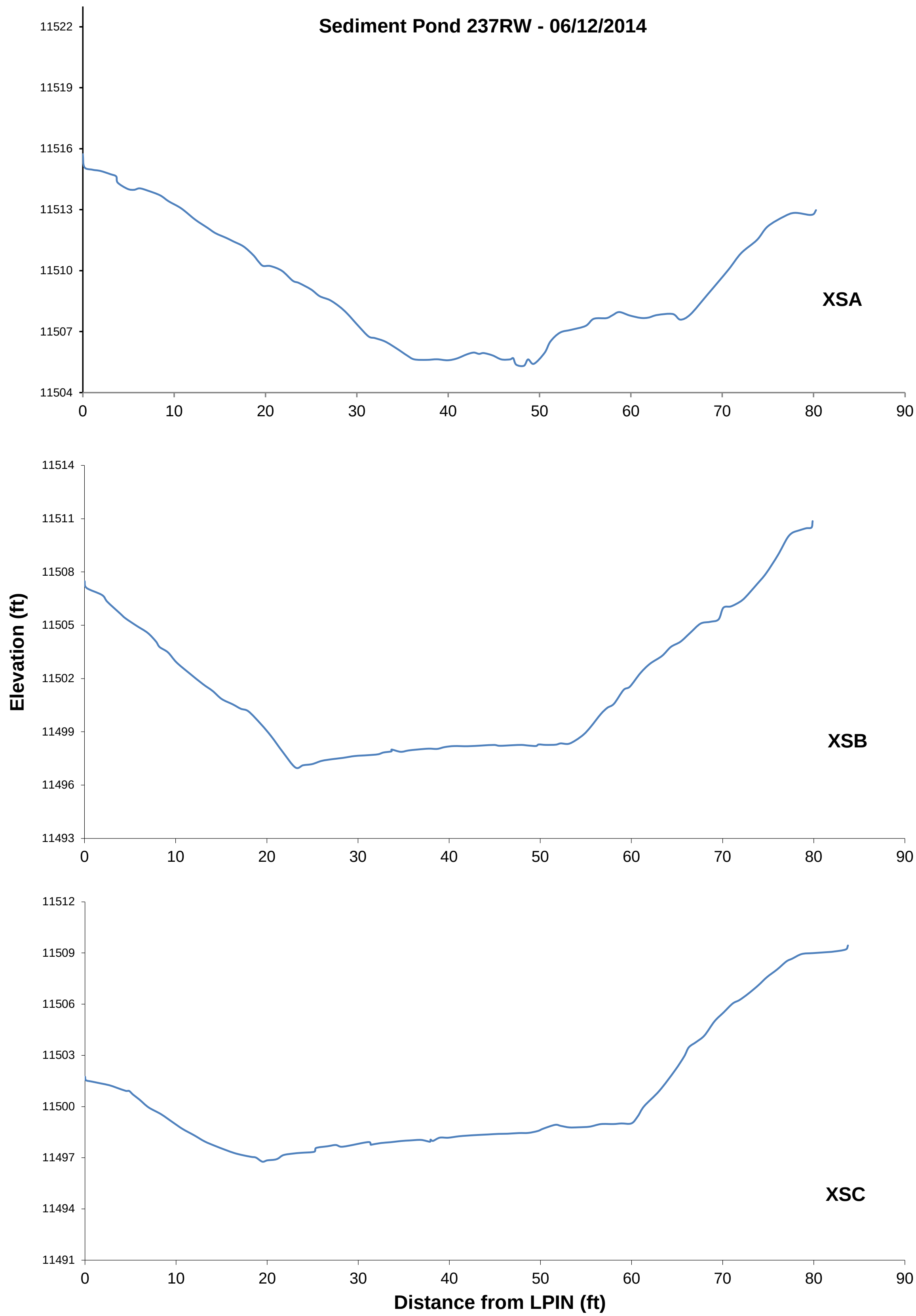
| Site ID | Location | Date | Volume ($ft^3$) | Grab Sample |
|---|---|---|---|---|
| 162RW | Silt Fence | 5/19/14 | 0.13 | Yes |
| 202RW | Silt Fence | 5/21/14 | 0.13 | Yes |
| 162RW | Silt Fence | 7/17/14 | 0.07 | Yes |
| 176RW | Silt Fence | 7/17/14 | 0.07 | Yes |
| 202RW | Silt Fence | 9/11/14 | 0.13 | Yes |

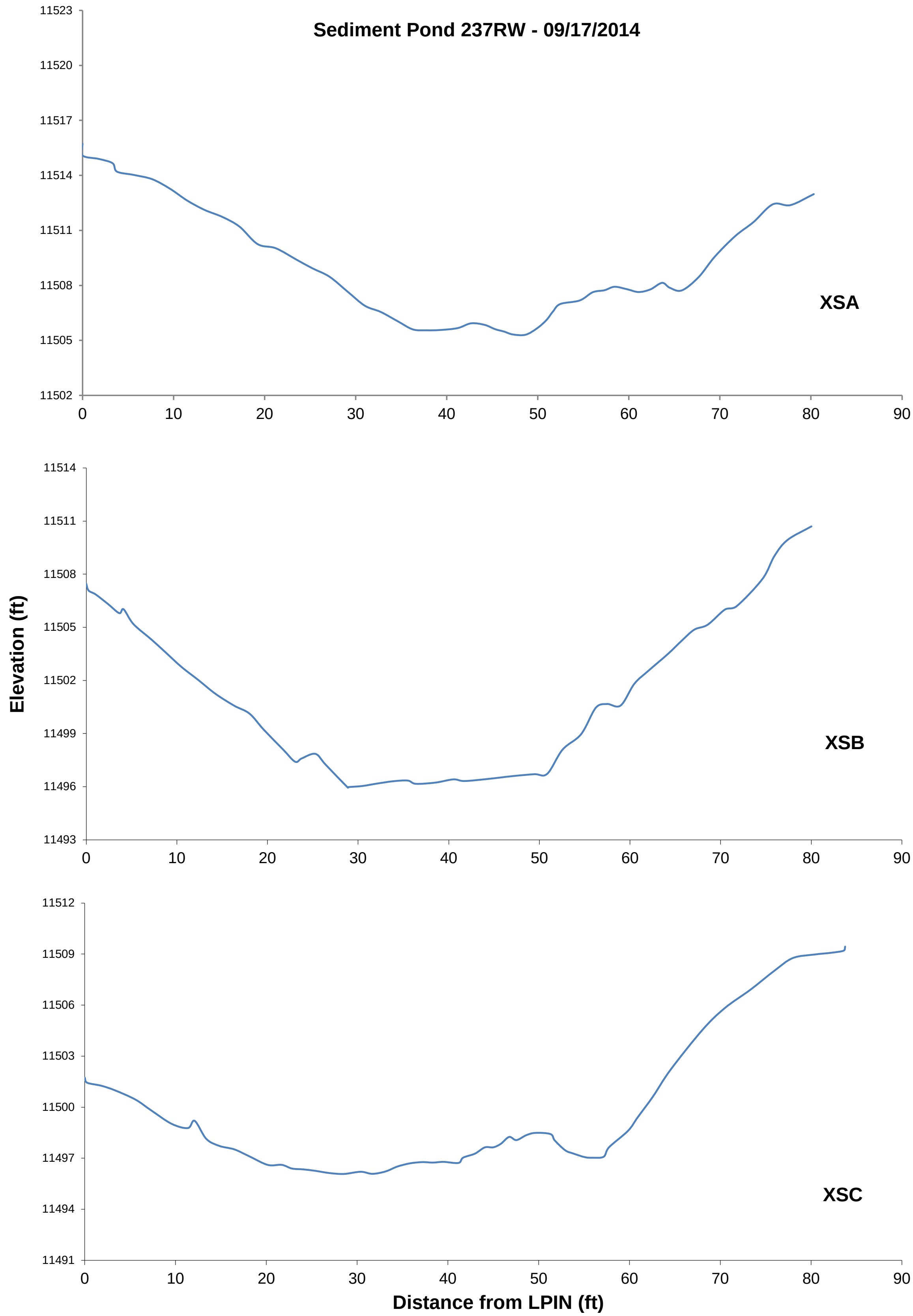
## Rock Weir Sediment Accumulation Values, Pikes Peak 2014

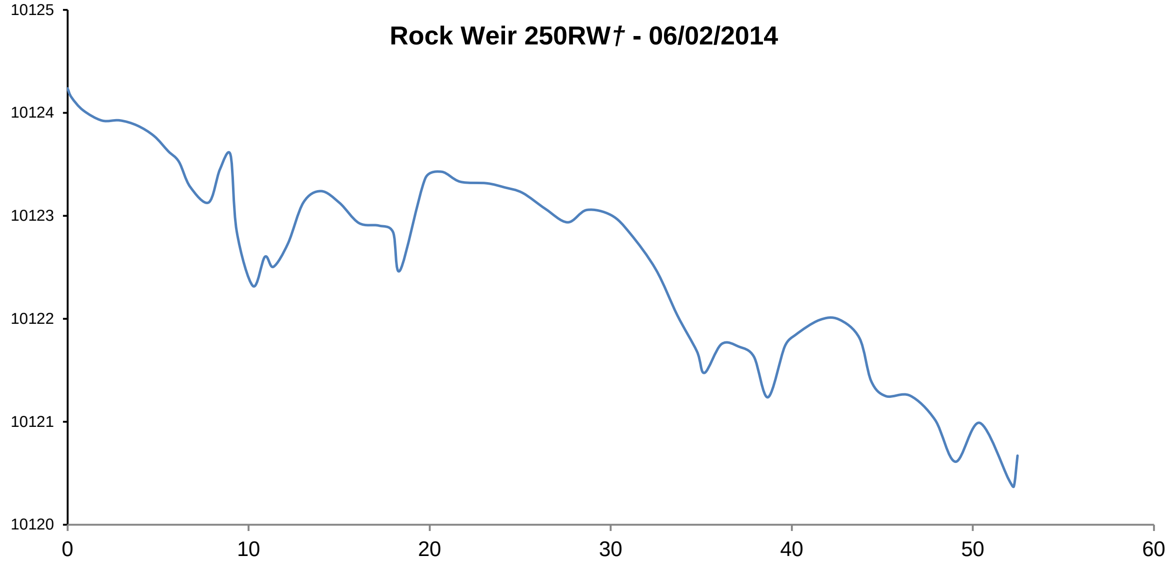
| Site ID | Area (sq ft) | Survey1 | | Survey 2 | | | |
|---|---|---|---|---|---|---|---|
| | | Date | Average Elevation (ft) | Date | Average Elevation (ft) | Elevation Change (ft) | Volume Change ($ft^3$) |
| 002RW | 1679 | 6/17/14 | 8998.03 | 9/10/14 | 8997.99 | -0.04 | -62.91 |
| 003RW | 521 | 6/17/14 | 8991.26 | 9/10/14 | 8991.18 | -0.08 | -43.50 |
| 006RW | 798 | 5/30/14 | 8997.20 | 9/10/14 | 8997.11 | -0.09 | -70.64 |
| 008RW | 1044 | 5/29/14 | 9499.14 | 9/22/14 | 9498.96 | -0.19 | -194.56 |
| 009RA | 905 | 5/29/14 | 9695.90 | 9/8/14 | 9695.70 | -0.21 | -186.39 |
| 152RW | 817 | 6/9/14 | 9791.88 | 9/25/14 | 9791.67 | -0.22 | -176.15 |
| 153RW | 1568 | 6/5/14 | 9523.48 | 9/23/14 | 9523.40 | -0.08 | -124.21 |
| 161RW | 263 | 5/20/14 | 9504.96 | 9/11/14 | 9504.59 | -0.37 | -96.58 |
| 162RW | 130 | 5/20/14 | 9512.14 | 9/22/14 | 9511.91 | -0.23 | -29.55 |
| 176RW | 372 | 5/30/14 | 10193.77 | 9/17/14 | 10193.81 | 0.04 | 16.16 |
| 200RW | 412 | 6/16/14 | 9194.71 | 9/29/14 | 9194.67 | -0.04 | -15.85 |
| 201RW | 183 | 6/17/14 | 9588.68 | 9/17/14 | 9588.47 | -0.21 | -38.44 |
| 202RW | 179 | 5/20/14 | 9690.20 | 9/11/14 | 9689.68 | -0.52 | -93.63 |
| 233RW | 359 | 5/30/14 | 11902.50 | 9/17/14 | 11902.14 | -0.36 | -129.72 |
| 239RW | 381 | 7/21/14 | 12799.10 | | | | |
| 241RW | 1015 | 7/21/14 | 12551.78 | | | | |
| 250RW | 598 | 6/2/14 | 10117.57 | 9/11/14 | 10117.40 | -0.18 | -105.87 |
| 252RW | 448 | 5/30/14 | 10524.88 | | | | |

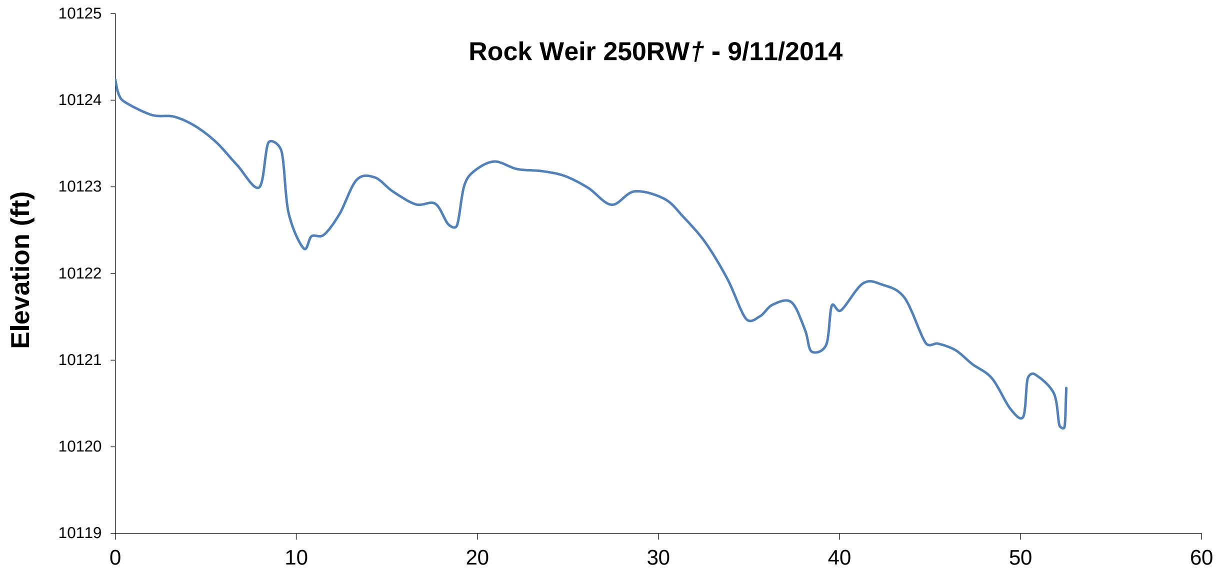

Sediment Pond 199RW - 06/03/2014
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)


Sediment Pond 199RW - 09/23/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
9520
9515
9510
9505
9500
9495
9490
9485
9480
0
20
40
60
80
100
120

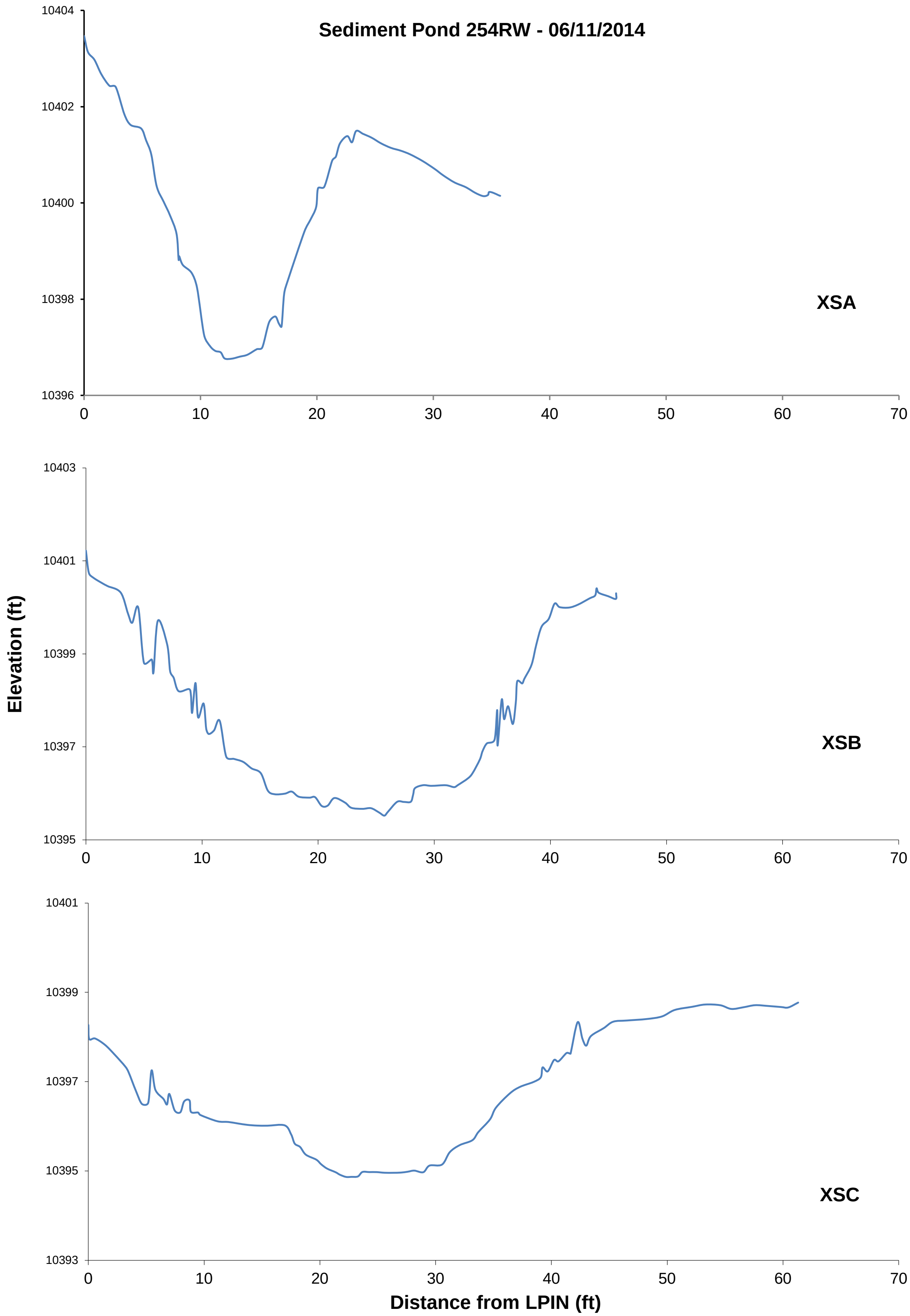

Sediment Pond 237RW - 06/12/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
11522
11519
11516
11513
11510
11507
11504
11514
11511
11508
11505
11502
11499
11496
11493
11512
11509
11506
11503
11500
11497
11494
11491
0
10
20
30
40
50
60
70
80
90


Sediment Pond 237RW - 09/17/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11523
11520
11517
11514
11511
11508
11505
11502
11514
11511
11508
11505
11502
11499
11496
11493
11512
11509
11506
11503
11500
11497
11494
11491
0
10
20
30
40
50
60
70
80
90

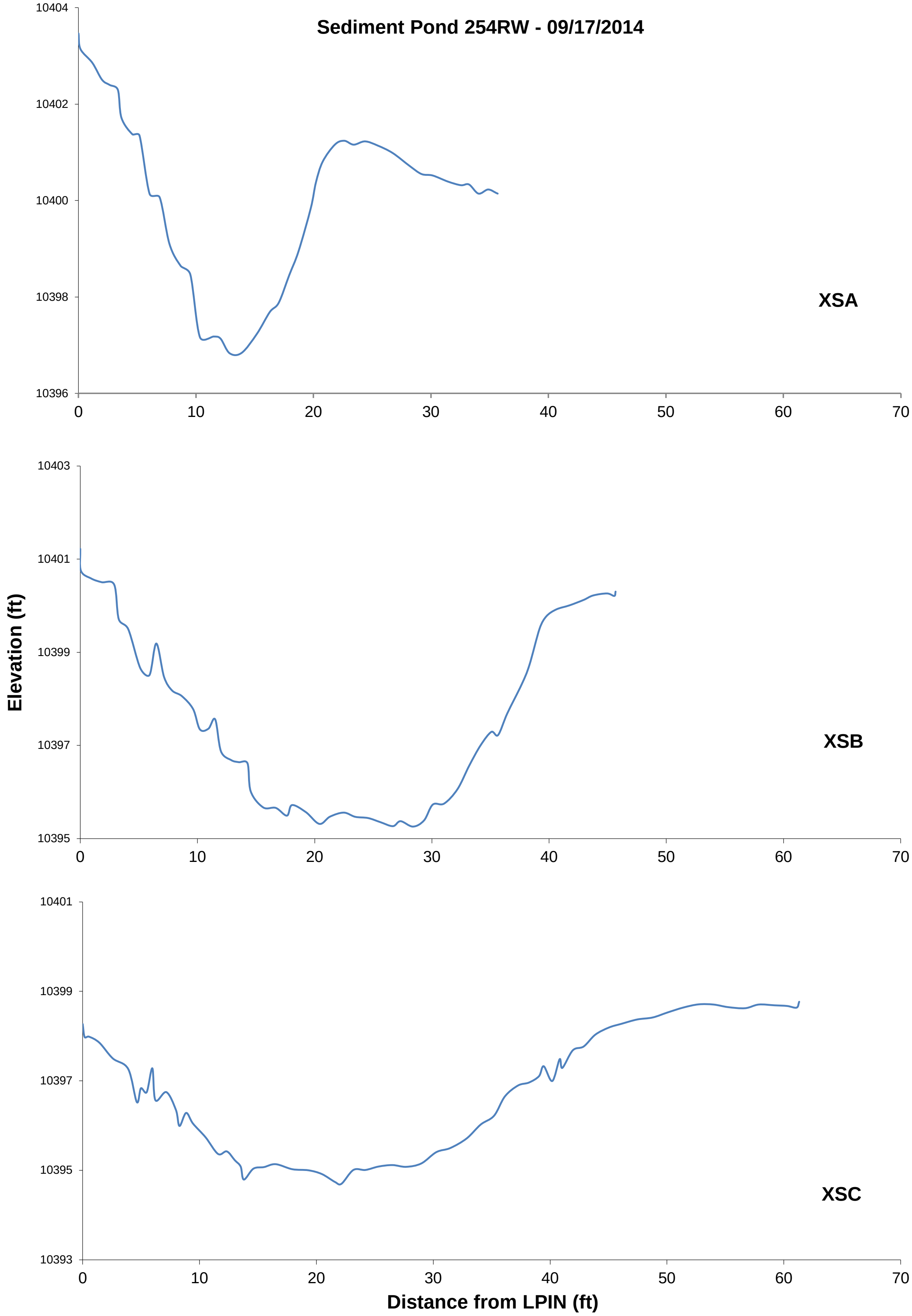


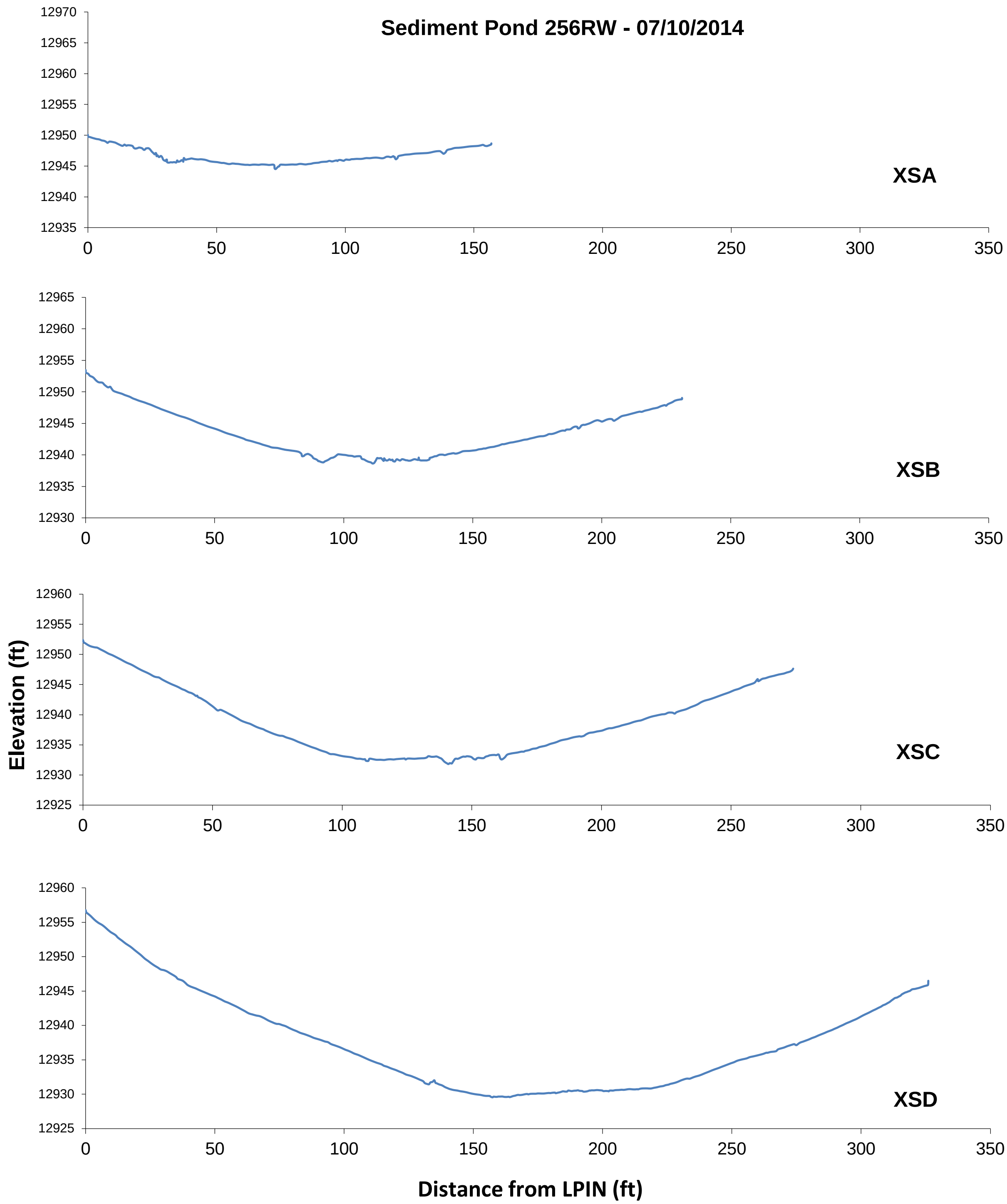

*† Cross section placed on cut slope above rock weir*

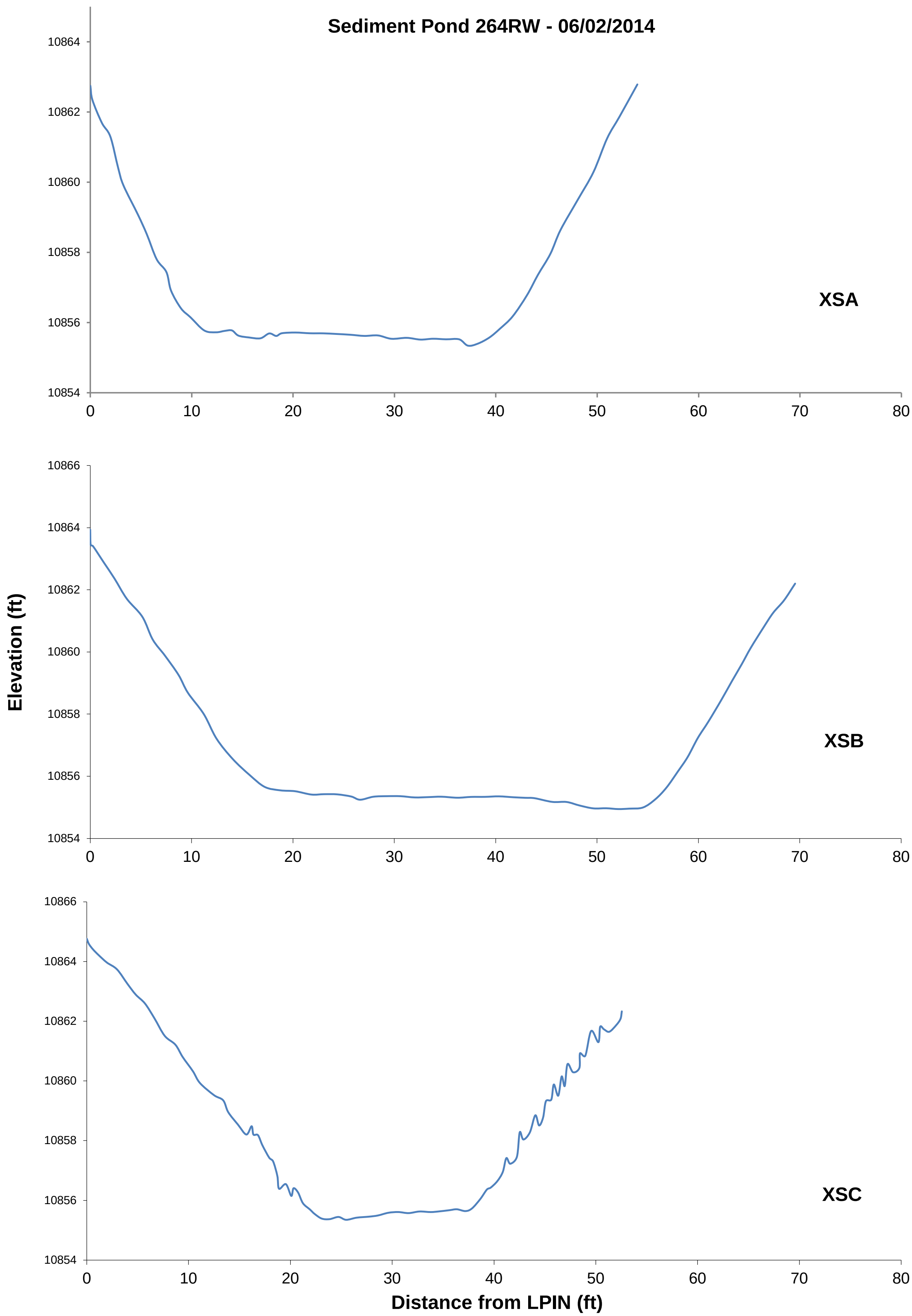


Sediment Pond 254RW - 06/11/2014
Elevation (ft)
XSA
10404
10402
10400
10398
10396
0
10
20
30
40
50
60
70
XSB
10403
10401
10399
10397
10395
0
10
20
30
40
50
60
70
XSC
10401
10399
10397
10395
10393
0
10
20
30
40
50
60
70
Distance from LPIN (ft)

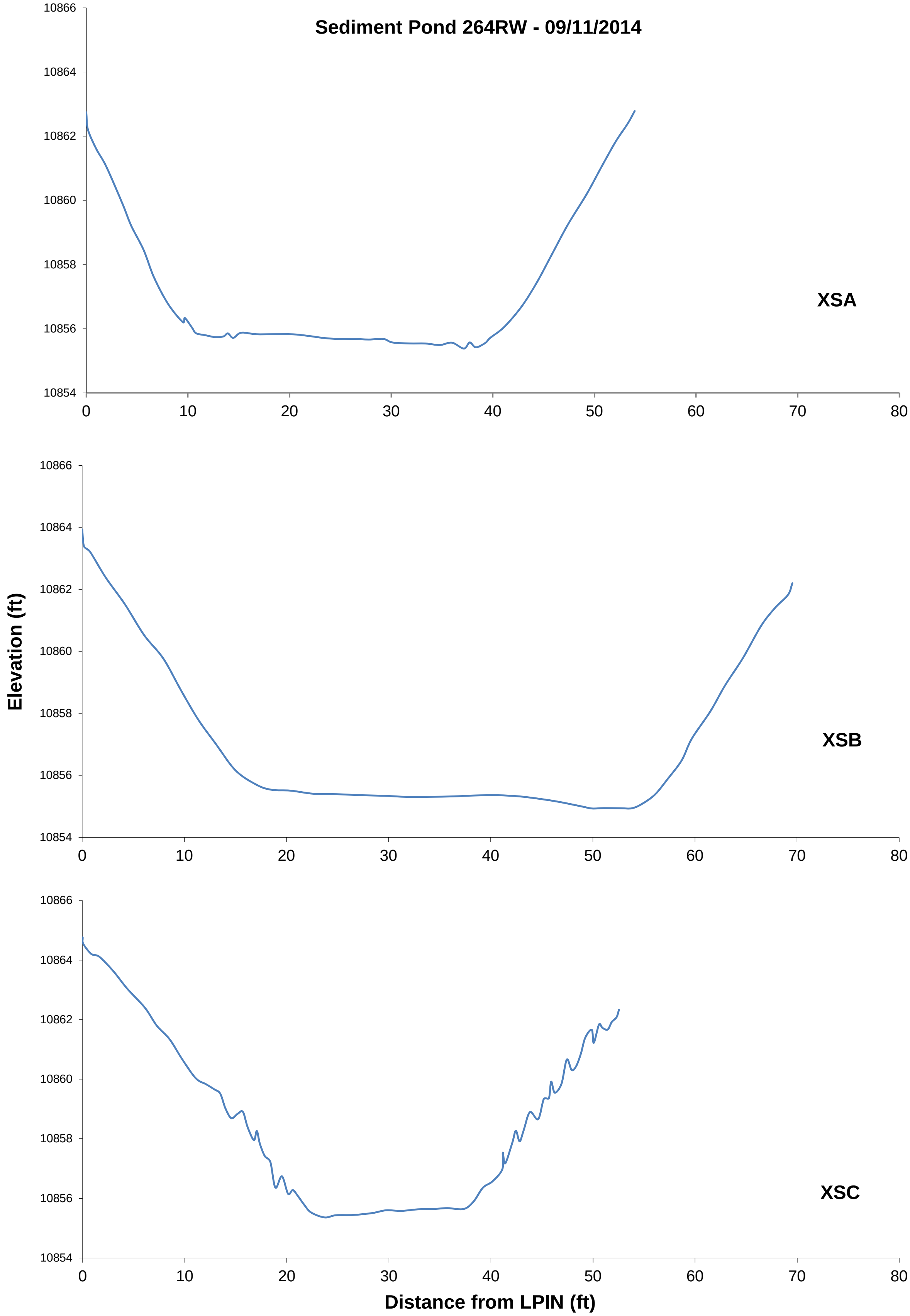


Sediment Pond 254RW - 09/17/2014
10404
10402
10400
10398
10396
0
10
20
30
40
50
60
70
XSA
10403
10401
10399
10397
10395
XSB
10401
10399
10397
10395
10393
XSC
Elevation (ft)
Distance from LPIN (ft)


Sediment Pond 256RW - 07/10/2014
XSA
XSB
XSC
XSD
Elevation (ft)
Distance from LPIN (ft)



Sediment Pond 264RW - 06/02/2014
Elevation (ft)
XSA
XSB
XSC
10854
10856
10858
10860
10862
10864
10866
0
10
20
30
40
50
60
70
80
Distance from LPIN (ft)


Sediment Pond 264RW - 09/11/2014
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
10866
10864
10862
10860
10858
10856
10854
0
10
20
30
40
50
60
70
80

# Appendix K

# Rock Weir and Sediment Pond

# Particle Size Distribution Summary
# and
# Graphs

# 2014

**Summary of Rock Weir and Silt Fence Particle Size Distribution from Sieve Analysis of Grab Samples, Pikes Peak 2014**

| | | | Particle Size Distribution (mm)–Grab Samples 2014 | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Site Name** | **ID** | **Date** | **D15** | **D35** | **D50** | **D84** | **D95** | **D100** |
| Pikes Peak Highway - Rock Weir | 008RW - Rock Weir | 5/29/2014 | 0.310 | 1.454 | 2.885 | 13.069 | 18.184 | 21.0 |
| Pikes Peak Highway - Rock Weir | 153RW - Rock Weir | 6/5/2014 | 3.118 | 6.350 | 8.444 | 15.670 | 20.868 | 28.0 |
| Pikes Peak Highway - Rock Weir | 199RW - Sed Pond | 6/3/2014 | 0.034 | 0.549 | 1.318 | 4.243 | 8.585 | 13.0 |
| Pikes Peak Highway - Rock Weir | 241RW - Rock Weir | 7/21/2014 | 0.110 | 0.969 | 1.606 | 4.850 | 14.415 | 18.0 |
| Pikes Peak Highway - Rock Weir | 250RW - Rock Weir | 9/11/2014 | 0.150 | 1.443 | 3.119 | 12.067 | 17.126 | 22.0 |
| Pikes Peak Highway - Rock Weir | 256RW - Sed Pond | 7/10/2014 | 0.093 | 1.320 | 2.668 | 7.275 | 14.488 | 29.0 |

**Sieve Analysis Worksheet**

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 92.00 | 16.6% | |
| 0.5 | 61.70 | 11.2% | 16.6% |
| 1.0 | 73.70 | 13.3% | 27.8% |
| 2.0 | 43.10 | 7.8% | 41.1% |
| 2.8 | 70.00 | 12.7% | 48.9% |
| 4.0 | 22.20 | 4.0% | 61.6% |
| 5.6 | 35.50 | 6.4% | 65.6% |
| 8.0 | 38.50 | 7.0% | 72.0% |
| 11.2 | 63.90 | 11.6% | 79.0% |
| 16.0 | 52.20 | 9.4% | 90.6% |
| 21.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 552.80 | | |

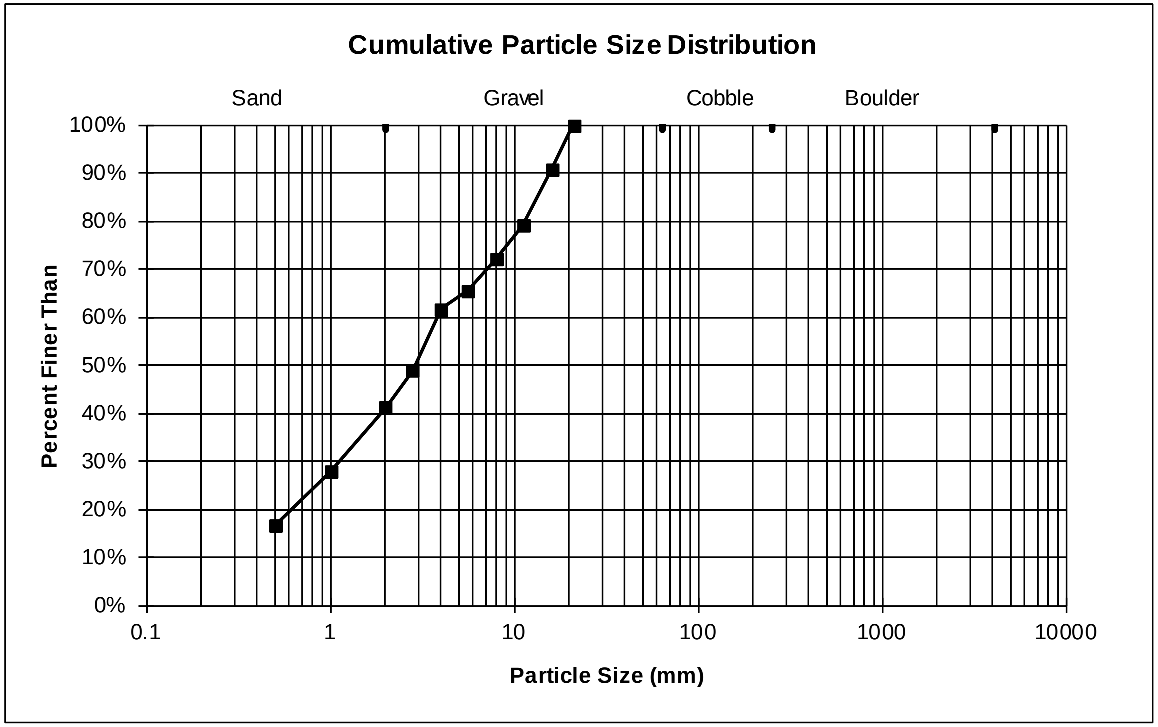
*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 008RW Rock Weir
DATE: 5/29/2014
CREW: Karlsson. VonLoh

**Particle Size Distribution (mm)**

| D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|
| 0.310 | 1.454 | 2.885 | 13.069 | 18.184 | 21.0 |



**Sieve Analysis Worksheet**

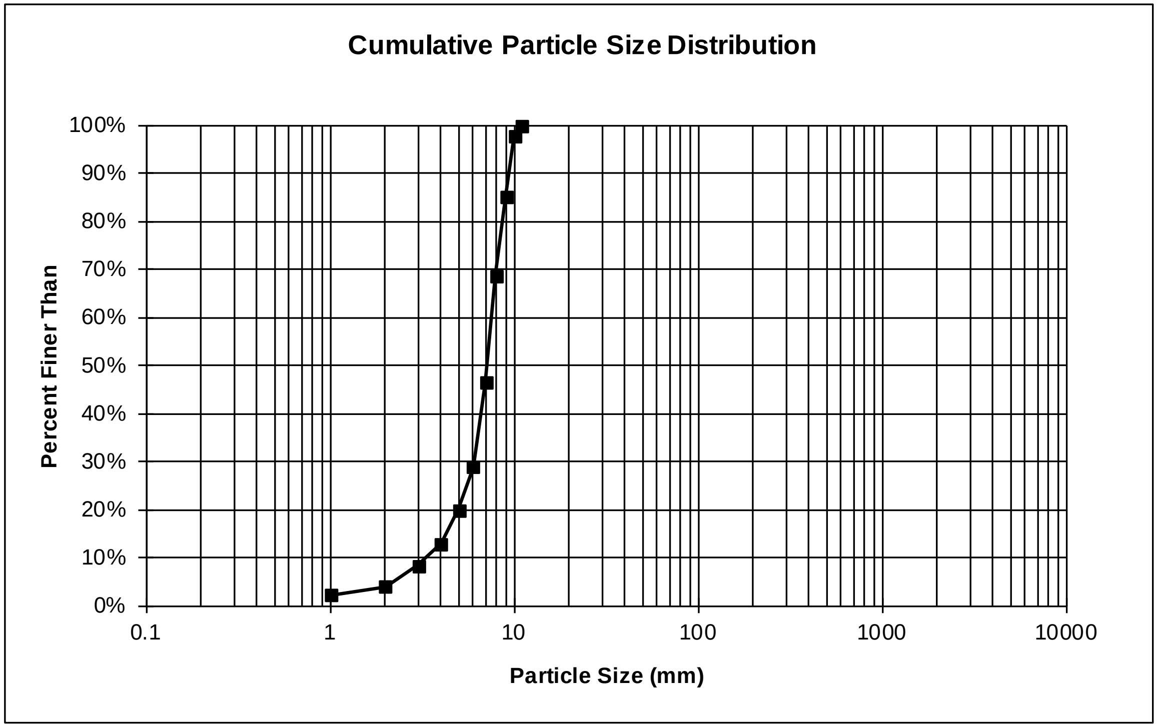
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 13.40 | 2.2% | |
| 0.5 | 10.70 | 1.7% | 2.2% |
| 1.0 | 27.20 | 4.4% | 3.9% |
| 2.0 | 28.50 | 4.6% | 8.3% |
| 2.8 | 44.30 | 7.1% | 12.8% |
| 4.0 | 54.70 | 8.8% | 20.0% |
| 5.6 | 109.50 | 17.6% | 28.8% |
| 8.0 | 138.70 | 22.3% | 46.4% |
| 11.2 | 100.60 | 16.2% | 68.7% |
| 16.0 | 79.10 | 12.7% | 84.9% |
| 22.4 | 14.40 | 2.3% | 97.7% |
| 28.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 621.10 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 153RW Rock Weir
DATE: 6/5/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 3.118 | 6.350 | 8.444 | 15.670 | 20.868 | 28.0 |



**Sieve Analysis Worksheet**

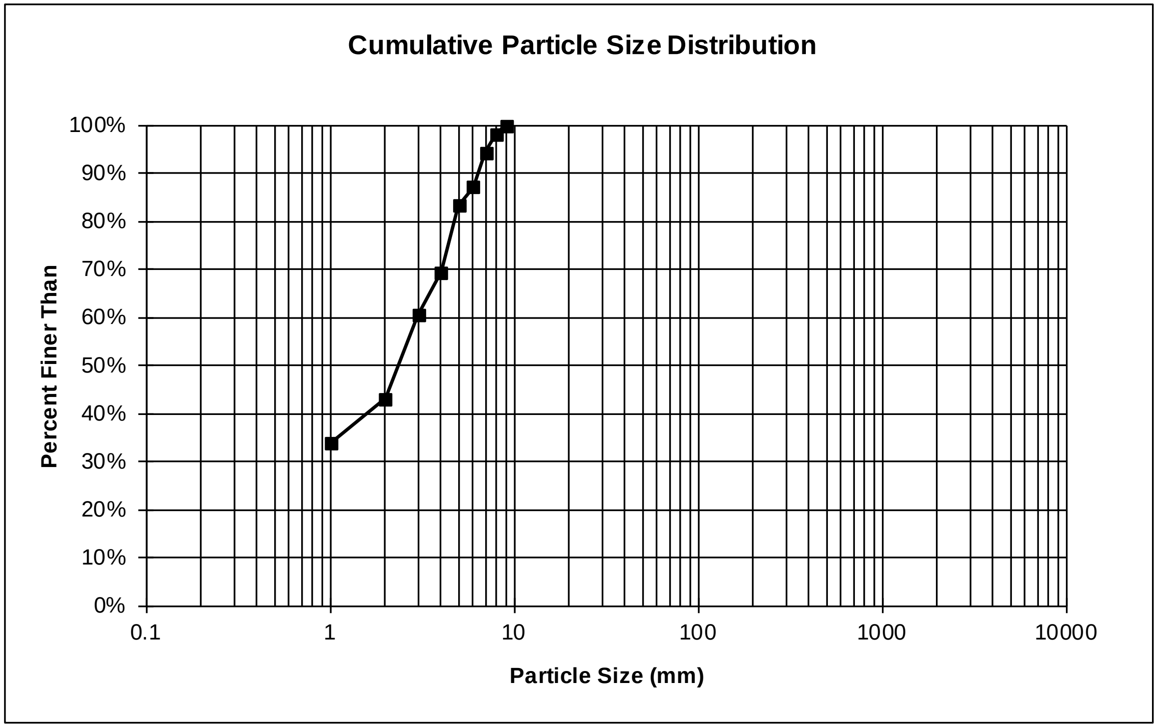
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 242.50 | 33.7% | |
| 0.5 | 67.50 | 9.4% | 33.7% |
| 1.0 | 123.90 | 17.2% | 43.1% |
| 2.0 | 65.30 | 9.1% | 60.4% |
| 2.8 | 99.80 | 13.9% | 69.4% |
| 4.0 | 27.30 | 3.8% | 83.3% |
| 5.6 | 51.00 | 7.1% | 87.1% |
| 8.0 | 26.50 | 3.7% | 94.2% |
| 11.2 | 15.00 | 2.1% | 97.9% |
| 13.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 718.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 199RW Sediment Pond
DATE: 6/3/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.034 | 0.549 | 1.318 | 4.243 | 8.585 | 13.0 |



**Sieve Analysis Worksheet**

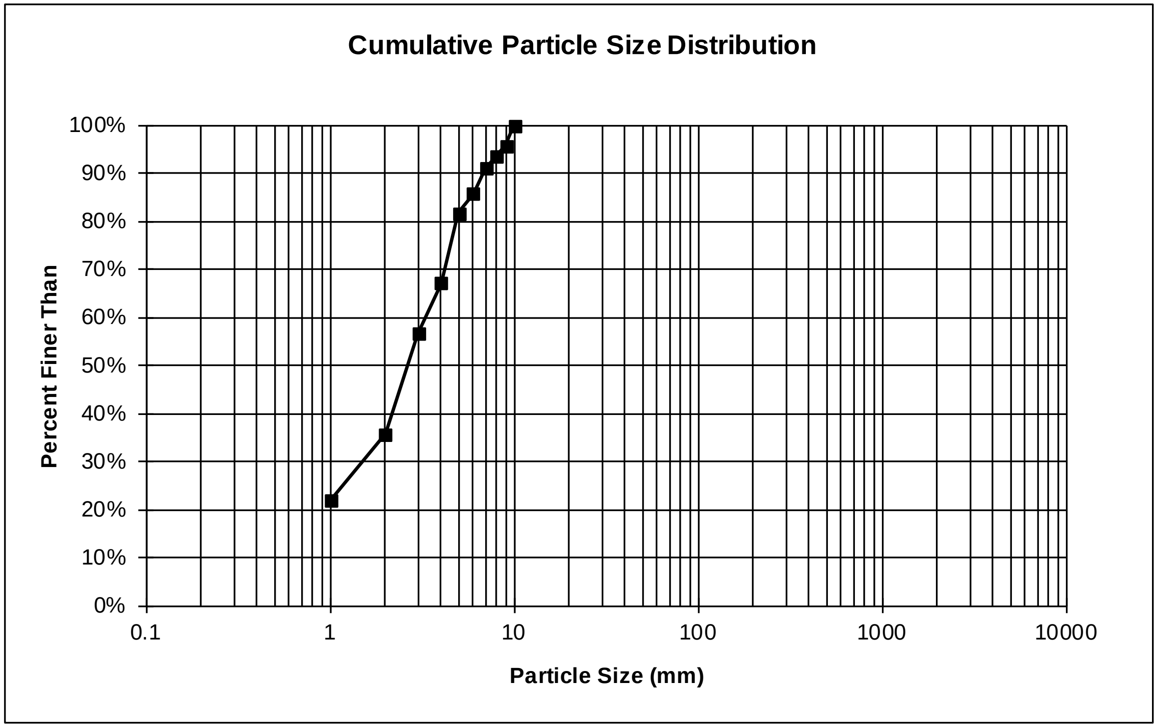
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 122.30 | 21.8% | |
| 0.5 | 77.80 | 13.9% | 21.8% |
| 1.0 | 118.10 | 21.0% | 35.6% |
| 2.0 | 58.50 | 10.4% | 56.6% |
| 2.8 | 82.30 | 14.7% | 67.1% |
| 4.0 | 22.40 | 4.0% | 81.7% |
| 5.6 | 29.70 | 5.3% | 85.7% |
| 8.0 | 13.60 | 2.4% | 91.0% |
| 11.2 | 12.60 | 2.2% | 93.4% |
| 16.0 | 24.40 | 4.3% | 95.7% |
| 18.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 561.70 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 241RW Rock Weir
DATE: 7/21/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.110 | 0.969 | 1.606 | 4.850 | 14.415 | 18.0 |



**Sieve Analysis Worksheet**

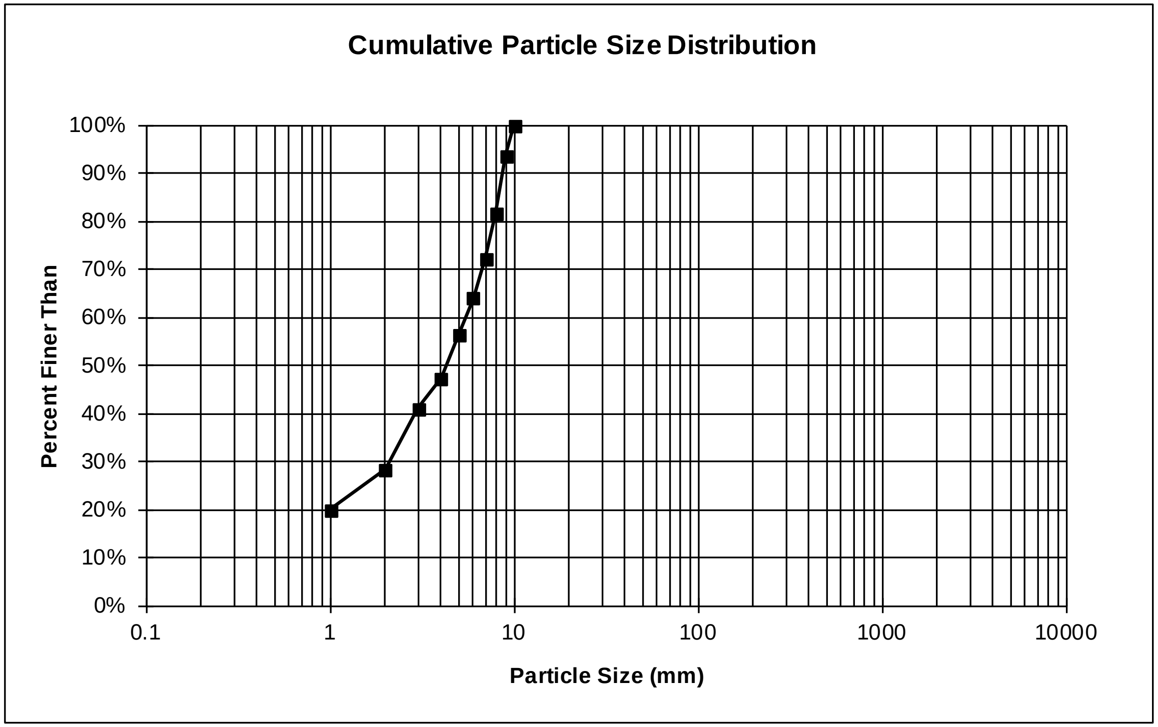
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 155.90 | 19.9% | |
| 0.5 | 64.90 | 8.3% | 19.9% |
| 1.0 | 99.80 | 12.8% | 28.2% |
| 2.0 | 48.90 | 6.3% | 41.0% |
| 2.8 | 70.60 | 9.0% | 47.3% |
| 4.0 | 60.20 | 7.7% | 56.3% |
| 5.6 | 64.70 | 8.3% | 64.0% |
| 8.0 | 71.70 | 9.2% | 72.3% |
| 11.2 | 95.30 | 12.2% | 81.5% |
| 16.0 | 49.70 | 6.4% | 93.6% |
| 22.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 781.70 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 250RW Rock Weir
DATE: 9/11/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.150 | 1.443 | 3.119 | 12.067 | 17.126 | 22.0 |



**Sieve Analysis Worksheet**

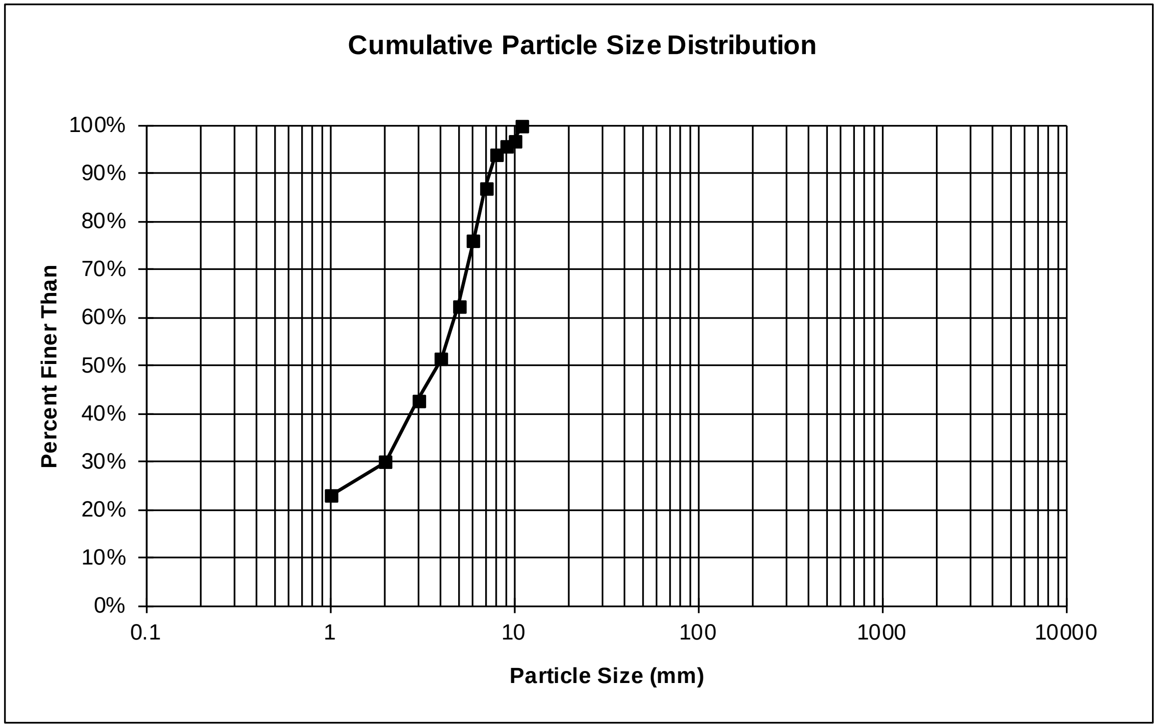
**COMMENTS:** Grab Sample of 2014 Sediment Accumulation

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 166.20 | 23.0% | |
| 0.5 | 49.90 | 6.9% | 23.0% |
| 1.0 | 92.90 | 12.8% | 29.9% |
| 2.0 | 61.80 | 8.5% | 42.7% |
| 2.8 | 80.60 | 11.1% | 51.2% |
| 4.0 | 98.20 | 13.6% | 62.4% |
| 5.6 | 79.60 | 11.0% | 75.9% |
| 8.0 | 49.10 | 6.8% | 86.9% |
| 11.2 | 12.90 | 1.8% | 93.7% |
| 16.0 | 8.80 | 1.2% | 95.5% |
| 22.4 | 23.80 | 3.3% | 96.7% |
| 29.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 723.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 256RW Sediment Pond
DATE: 7/10/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.093 | 1.320 | 2.668 | 7.275 | 14.488 | 29.0 |



# Appendix L

# Sediment Pond

# Suspended Sediment Data

# 2014

**Summary of Sediment Pond Suspended Sediment Analysis of Grab Samples, Pikes Peak 2014**

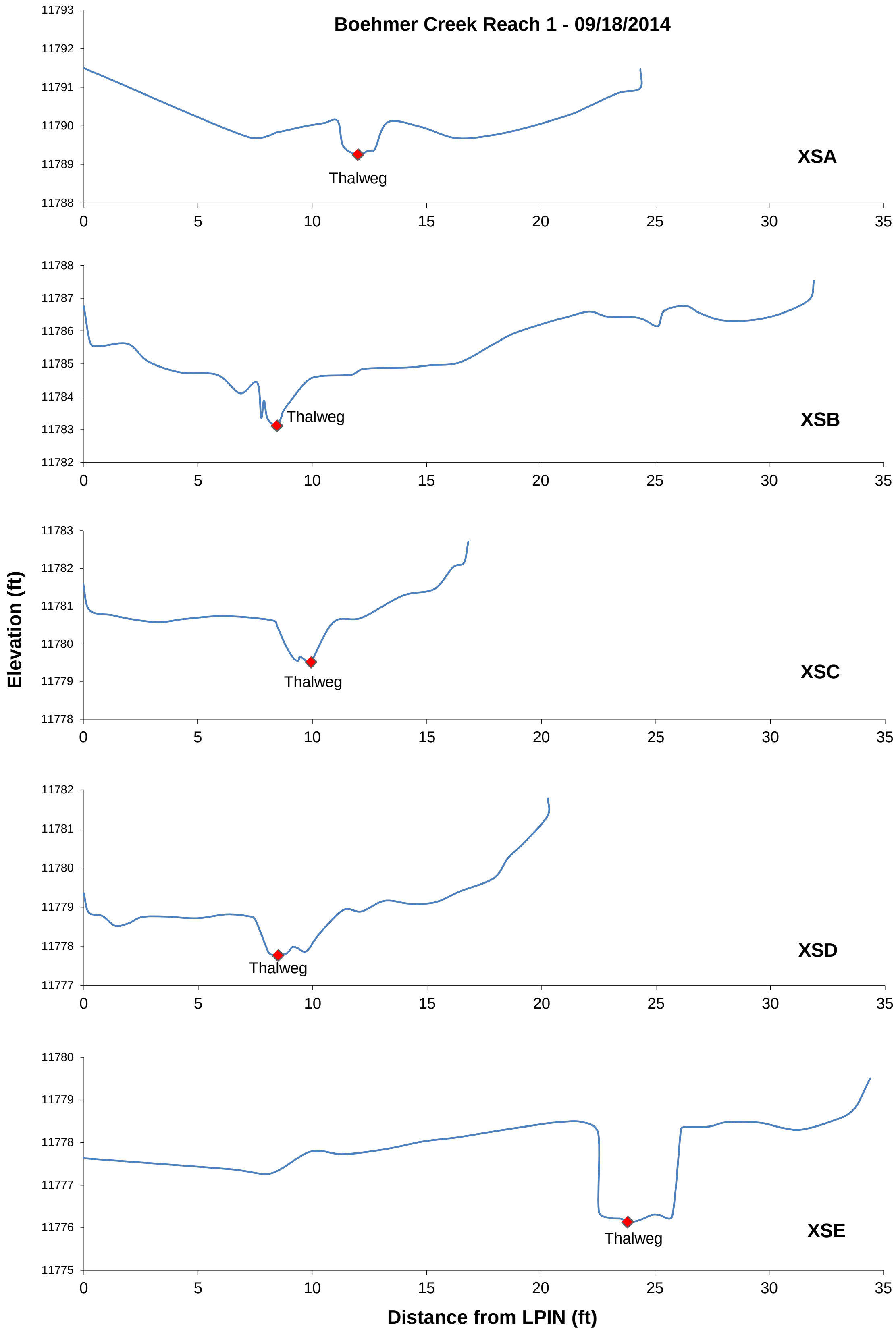
| Site ID | Date | Volume of Sample (L) | Dried Sediment Weight (mg) | Sediment Sample Total (mg/L) |
|---|---|---|---|---|
| **199RW Entrance Culvert** | **05/30/14** | **0.94** | **98.7** | **105.0** |
| **199RW Above Sed Pond** | **05/30/14** | **1.03** | **96.4** | **93.6** |
| **199RW Exit Culvert** | **05/30/14** | **0.99** | **86.3** | **87.2** |
| 199RW Entrance Culvert | 07/08/14 | 0.96 | 653.8 | 681.0 |
| 199RW Above Sed Pond | 07/08/14 | 0.96 | 597.8 | 622.7 |
| 199RW Exit Culvert | 07/08/14 | 1.00 | 99.1 | 99.1 |
| **199RW Entrance Culvert** | **07/13/14** | **0.90** | **35.1** | **39.0** |
| **199RW Above Sed Pond** | **07/13/14** | **1.07** | **52.3** | **50.4** |
| **199RW Exit Culvert** | **07/13/14** | **0.96** | **60.8** | **63.3** |
| 199RW Entrance Culvert | 07/16/14 | 1.05 | 1717.4 | 1635.6 |
| 199RW Above Sed Pond | 07/16/14 | 0.97 | 2427.9 | 2503.0 |
| 199RW Exit Culvert | 07/16/14 | 0.91 | 616.7 | 677.7 |
| **199RW Entrance Culvert** | **09/22/14** | **1.00** | **25.5** | **25.5** |
| **199RW Above Sed Pond** | **09/22/14** | **0.93** | **18.1** | **19.6** |
| **199RW Exit Culvert** | **09/22/14** | **0.99** | **4.6** | **4.6** |
| 237RW Entrance Culvert | 05/30/14 | 0.91 | 1041.5 | 1144.5 |
| 237RW Exit Culvert | 05/30/14 | 0.86 | 237.3 | 275.9 |
| **237RW Entrance Culvert** | **06/11/14** | **0.98** | **447.5** | **456.6** |
| **237RW Exit Culvert** | **06/11/14** | **1.00** | **399.9** | **399.9** |
| 237RW Entrance Culvert | 07/08/14 | 1.05 | 241.3 | 229.8 |
| 237RW Exit Culvert | 07/08/14 | 1.04 | 66.5 | 63.9 |
| **237RW Entrance Culvert** | **07/13/14** | **0.95** | **3944.4** | **4152.0** |
| **237RW Exit Culvert** | **07/13/14** | **1.06** | **43.5** | **41.0** |
| 237RW Entrance Culvert | 07/10/14 | 1.10 | 948.4 | 862.1 |
| 237RW Exit Culvert | 07/10/14 | 1.00 | 118.1 | 118.1 |
| **237RW Entrance Culvert** | **07/15/14** | **0.53** | **254.7** | **478.7** |
| **237RW Exit Culvert** | **07/15/14** | **0.59** | **90.3** | **153.1** |
| 262RW Entrance Culvert | 05/30/14 | 1.00 | 176.9 | 176.9 |
| 262RW Above Sed Pond | 05/30/14 | 1.00 | 186.6 | 186.6 |
| 262RW Exit Culvert | 05/30/14 | 1.03 | 124.6 | 120.9 |
| **262RW Entrance Culvert** | **06/11/14** | **1.06** | **202.5** | **191.0** |
| **262RW Above Sed Pond** | **06/11/14** | **1.02** | **265.5** | **260.3** |
| **262RW Exit Culvert** | **06/11/14** | **1.00** | **5.6** | **5.6** |
| 262RW Entrance Culvert | 07/08/14 | 1.05 | 4615.4 | 4395.6 |
| 262RW Above Sed Pond | 07/08/14 | 1.05 | 2970.5 | 2829.0 |
| 262RW Exit Culvert | 07/08/14 | 1.00 | 1147.5 | 1147.5 |
| **262RW Entrance Culvert** | **07/13/14** | **1.01** | **923.4** | **914.3** |
| **262RW Above Sed Pond** | **07/13/14** | **0.93** | **930.6** | **100.6** |
| **262RW Exit Culvert** | **07/13/14** | **1.02** | **169.0** | **165.7** |
| 262RW Entrance Culvert | 07/15/14 | 0.96 | 147.5 | 153.6 |
| 262RW Above Sed Pond | 07/15/14 | 0.94 | 169.4 | 180.2 |
| 262RW Exit Culvert | 07/15/14 | 0.95 | 31.9 | 33.6 |
| **262RW Entrance Culvert** | **09/10/14** | **0.93** | **5.7** | **6.1** |
| **262RW Above Sed Pond** | **09/10/14** | **1.00** | **6.1** | **6.1** |
| **262RW Exit Culvert** | **09/10/14** | **1.04** | **6.1** | **5.9** |

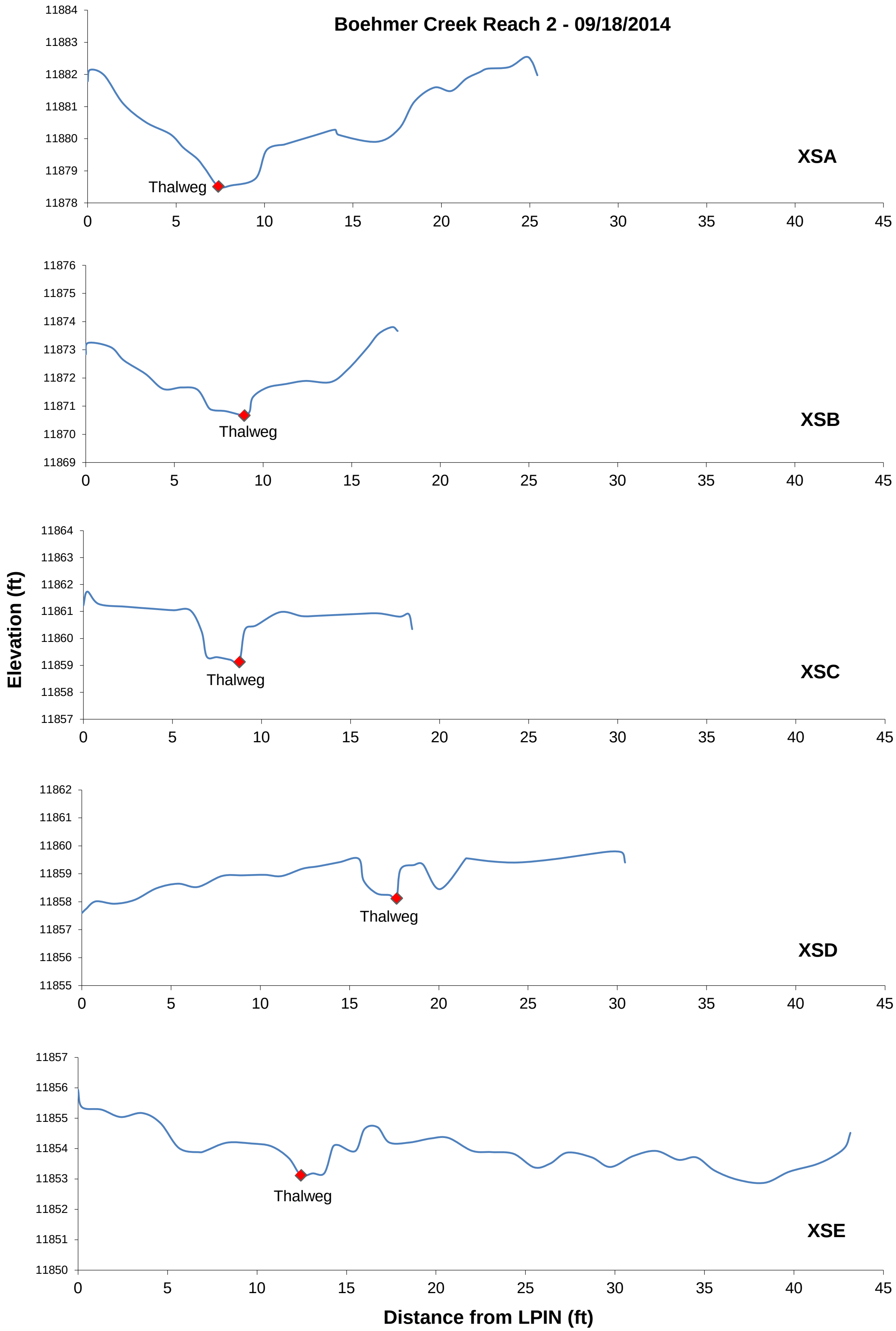
# Appendix M

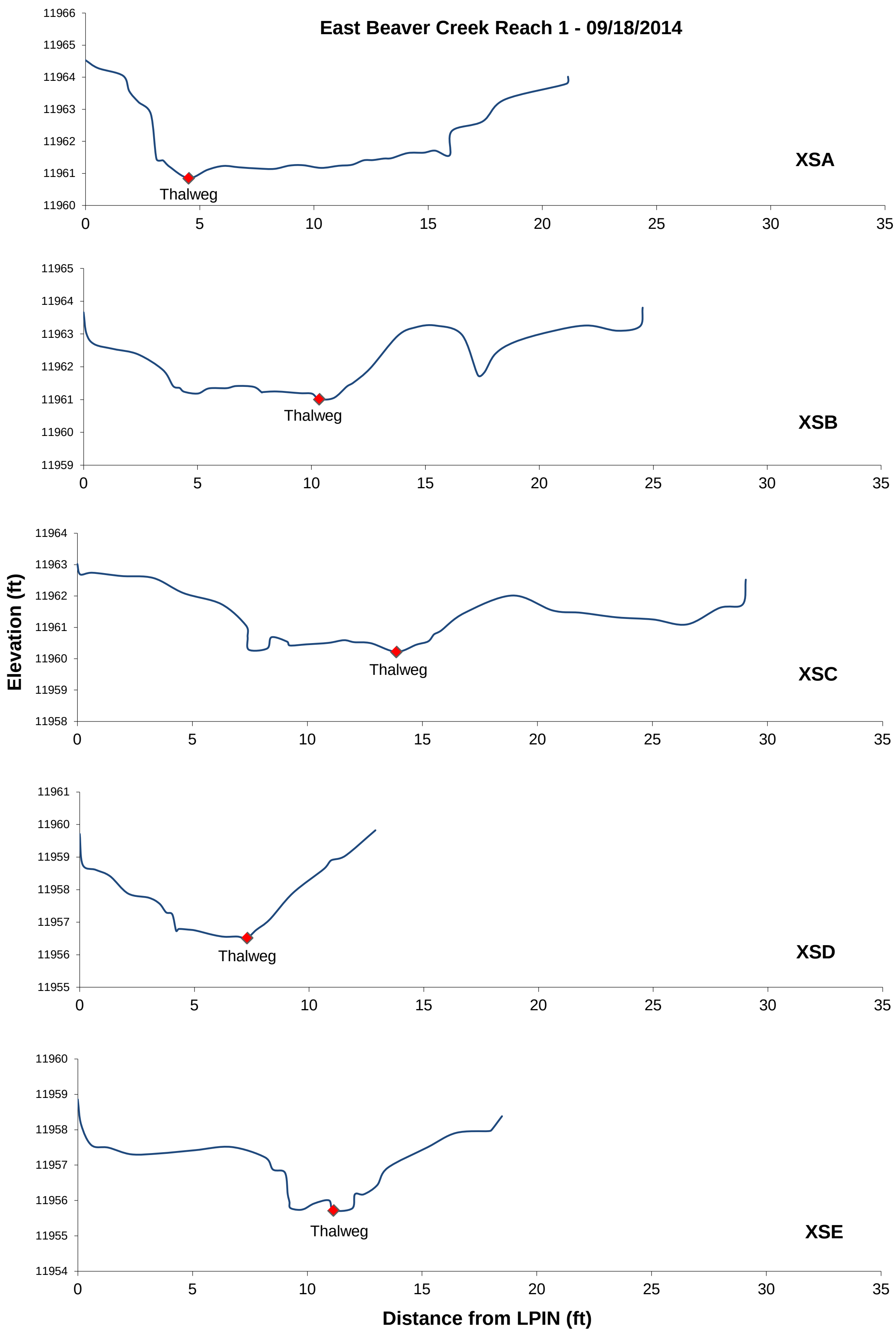
# Stream Channel

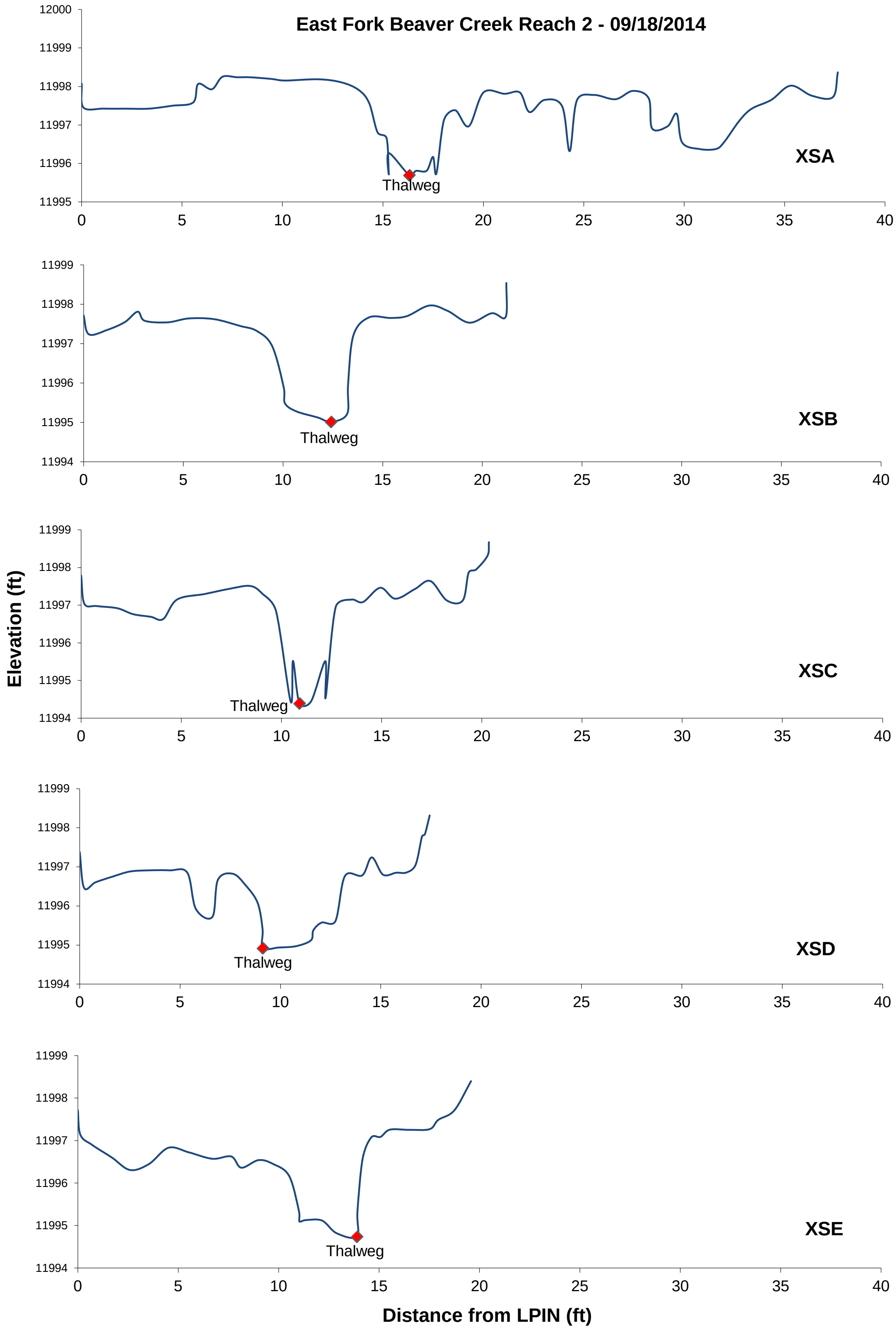
# Cross Section Graphs

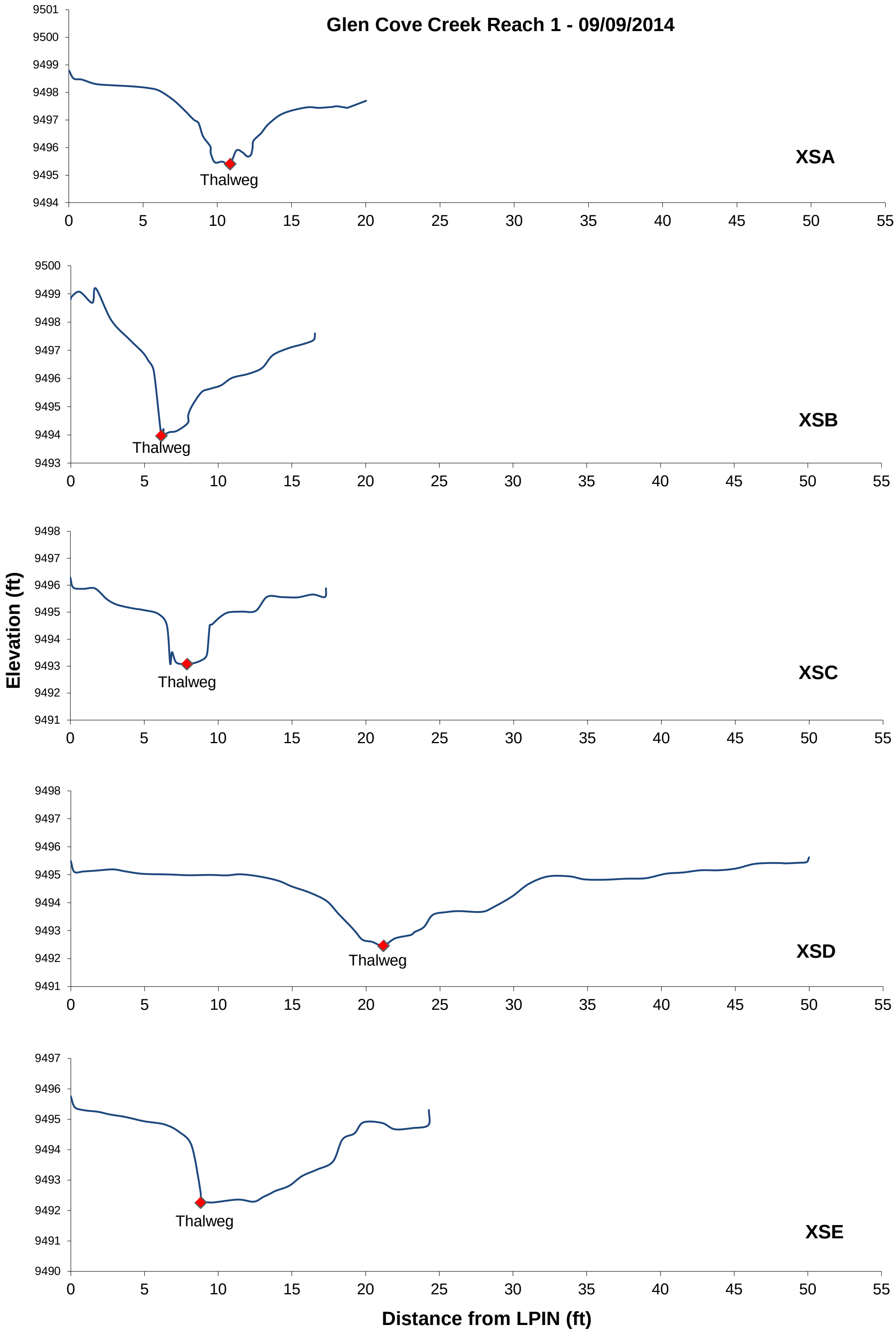
# 2014

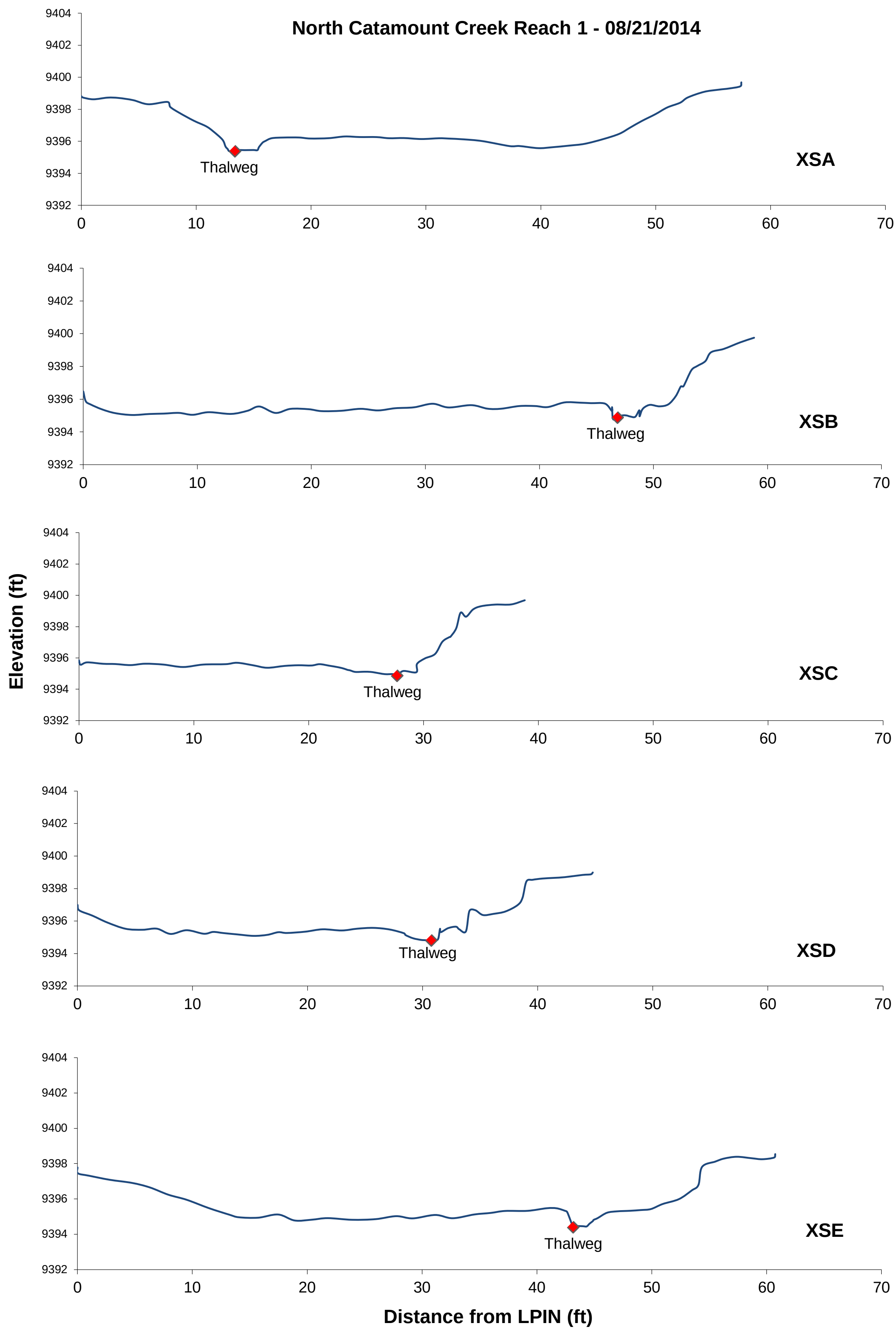

Boehmer Creek Reach 1 - 09/18/2014
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
11793
11792
11791
11790
11789
11788
11787
11786
11785
11784
11783
11782
11781
11780
11779
11778
11777
11776
11775
0
5
10
15
20
25
30
35

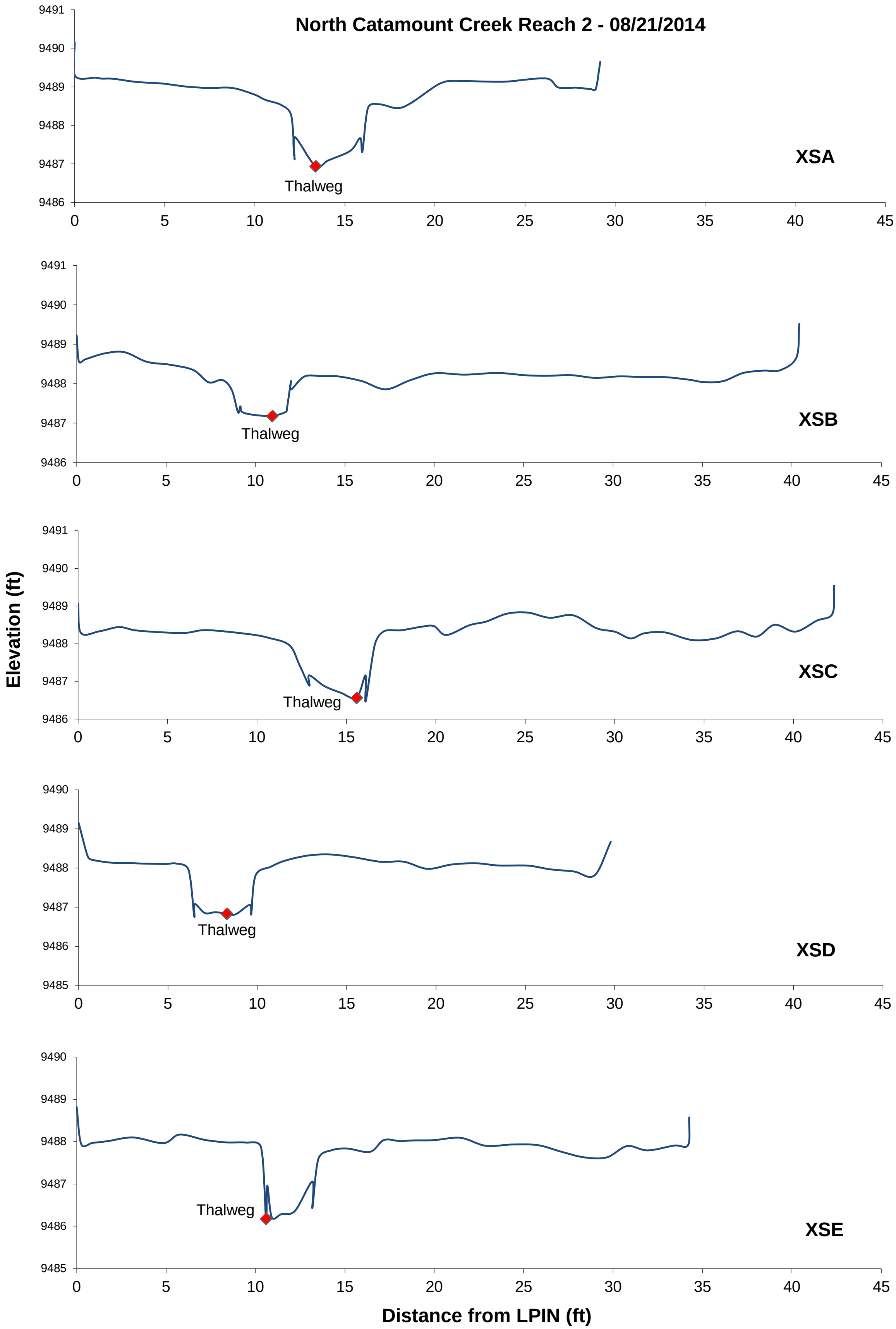

Boehmer Creek Reach 2 - 09/18/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg

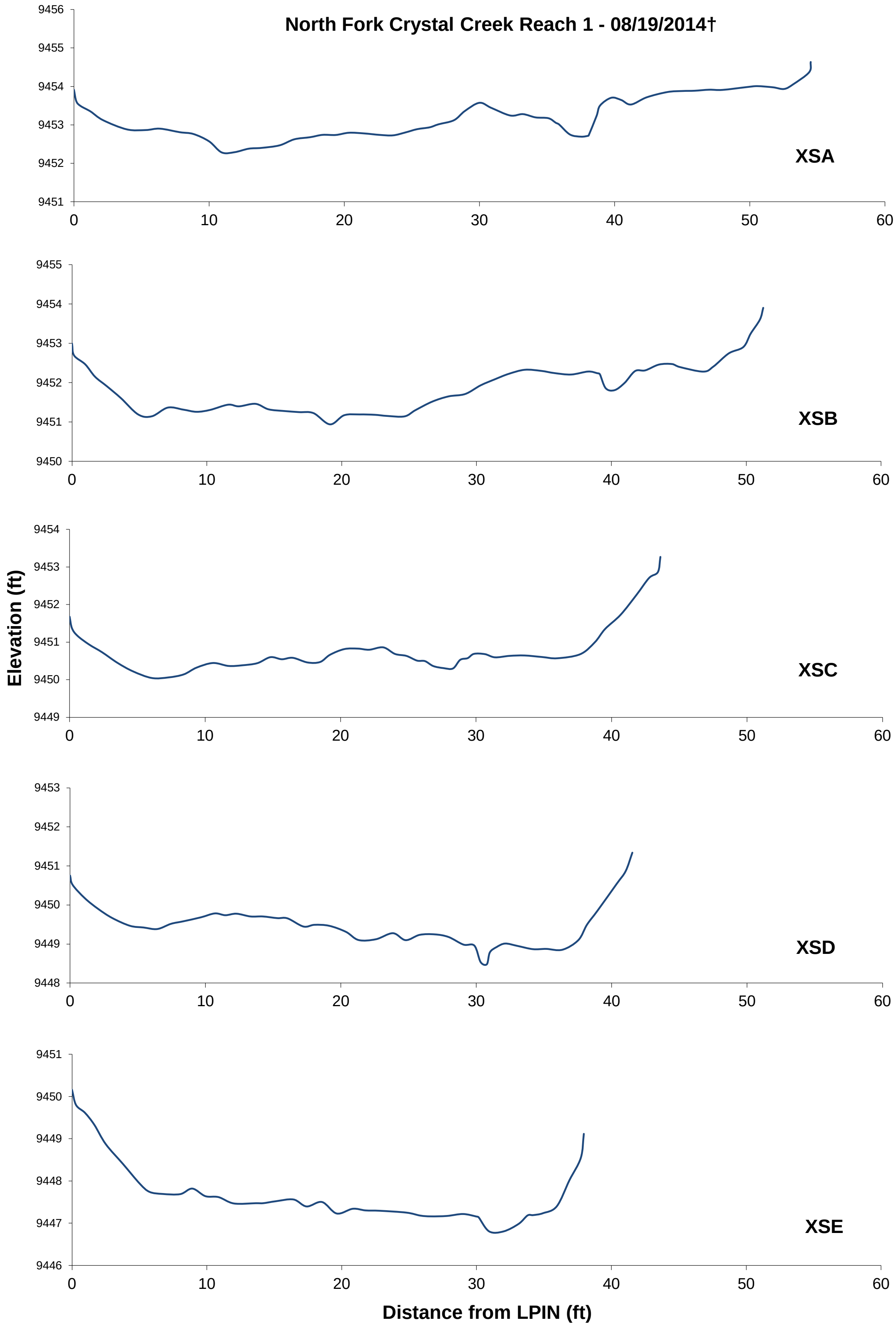

East Beaver Creek Reach 1 - 09/18/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
11966
11965
11964
11963
11962
11961
11960
11959
11958
11957
11956
11955
11954
0
5
10
15
20
25
30
35


East Fork Beaver Creek Reach 2 - 09/18/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
12000
11999
11998
11997
11996
11995
11994
0
5
10
15
20
25
30
35
40

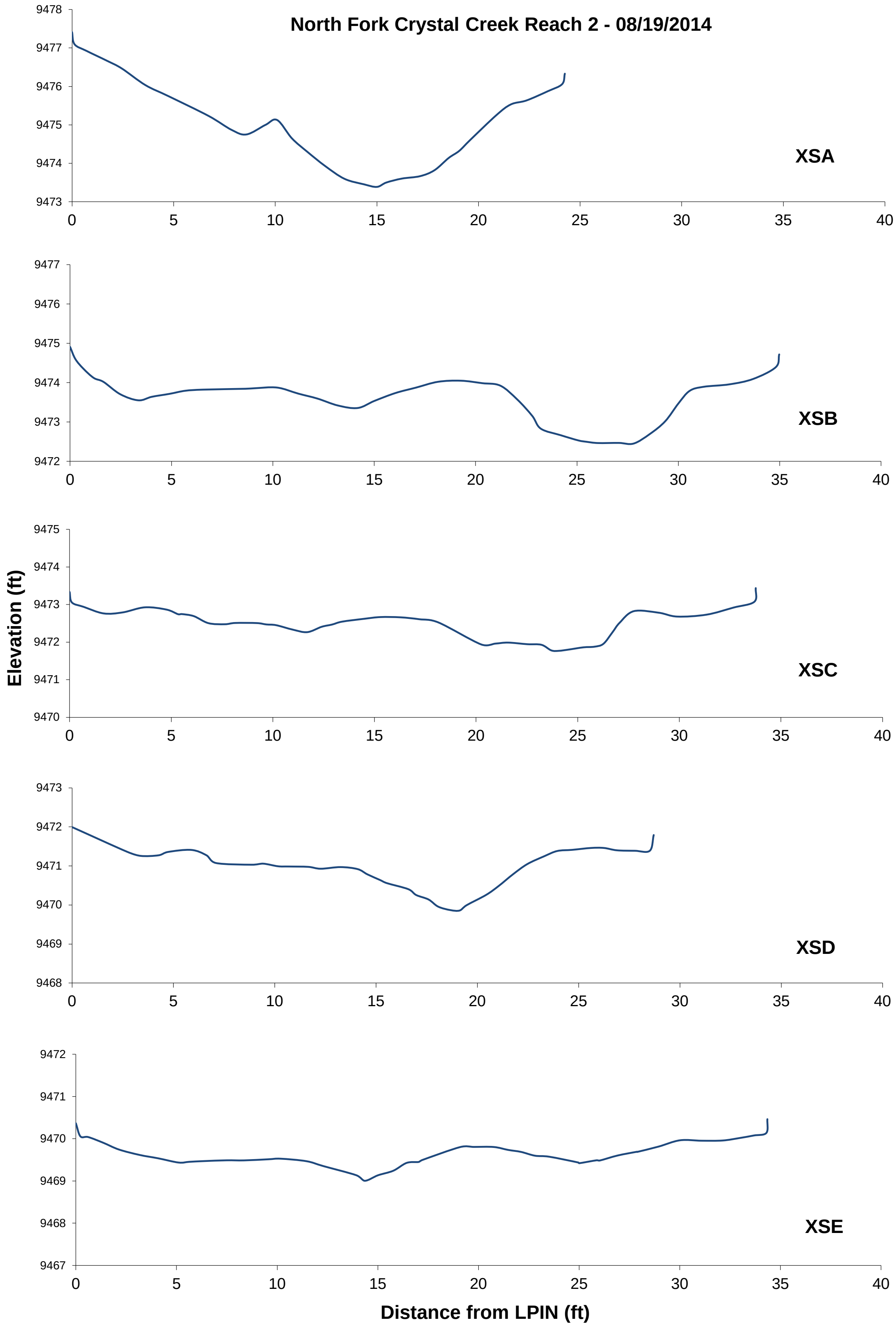

Glen Cove Creek Reach 1 - 09/09/2014
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
9501
9500
9499
9498
9497
9496
9495
9494
9493
9492
9491
9490
0
5
10
15
20
25
30
35
40
45
50
55


North Catamount Creek Reach 1 - 08/21/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
9404
9402
9400
9398
9396
9394
9392
0
10
20
30
40
50
60
70

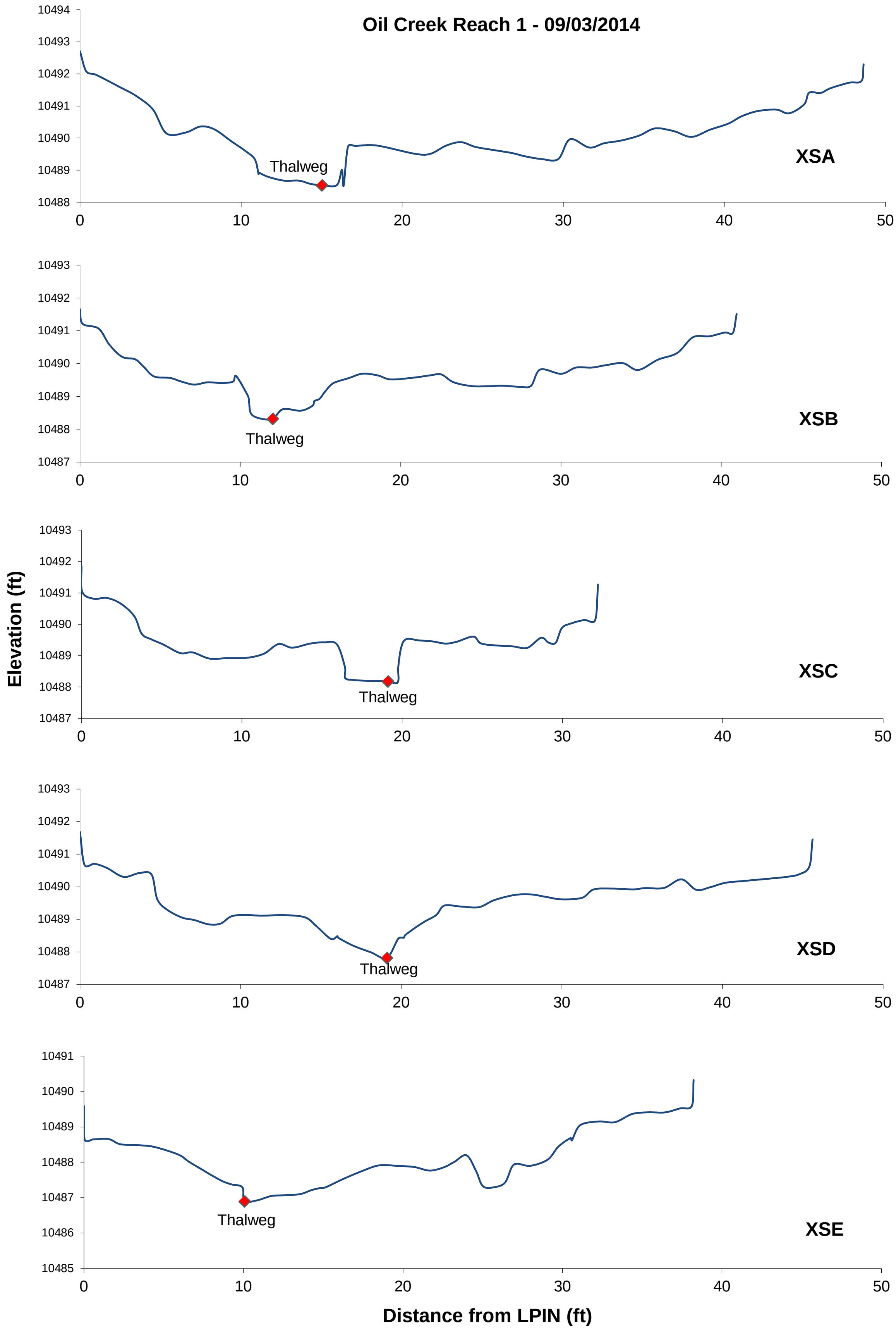

North Catamount Creek Reach 2 - 08/21/2014
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
9485
9486
9487
9488
9489
9490
9491
0
5
10
15
20
25
30
35
40
45

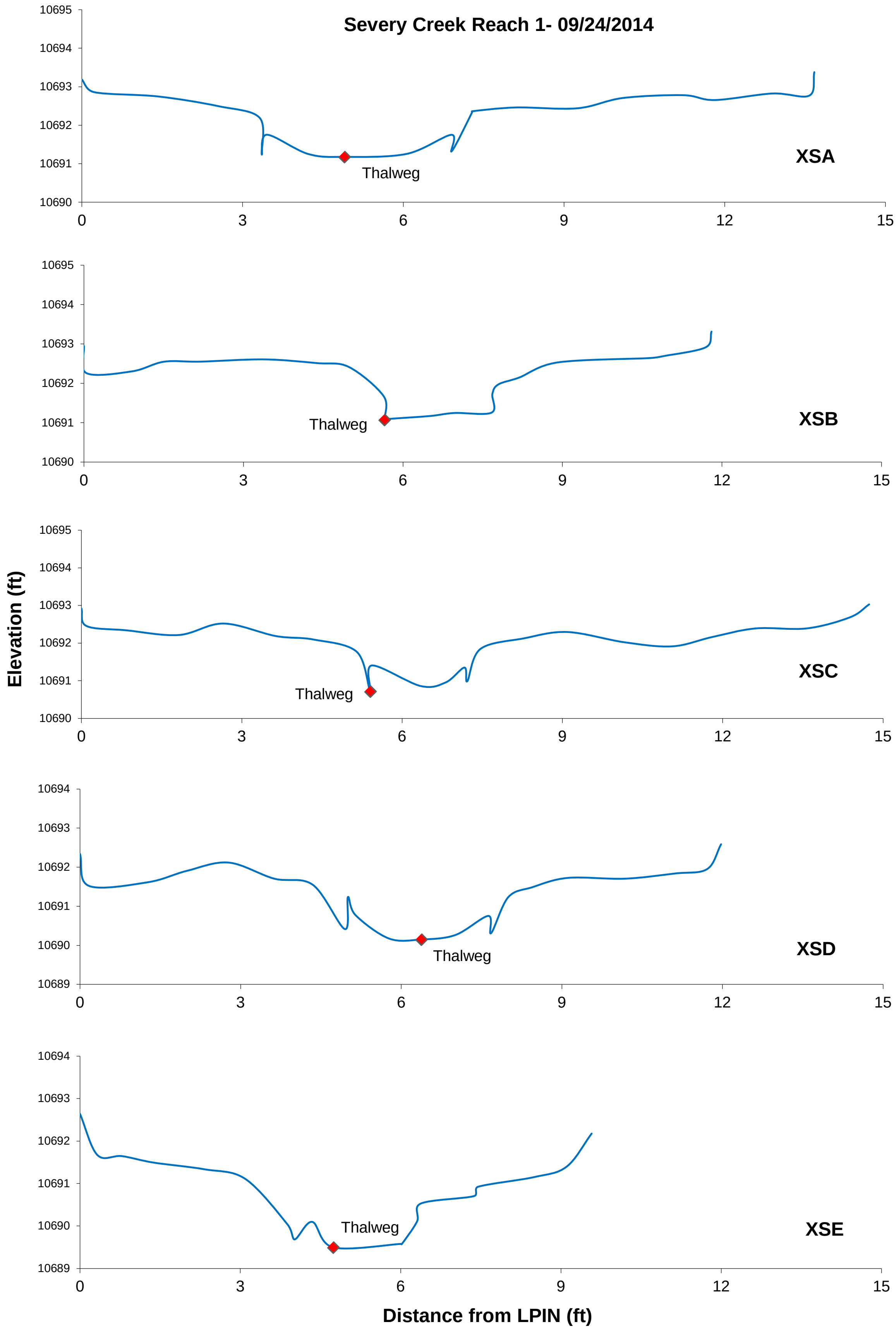


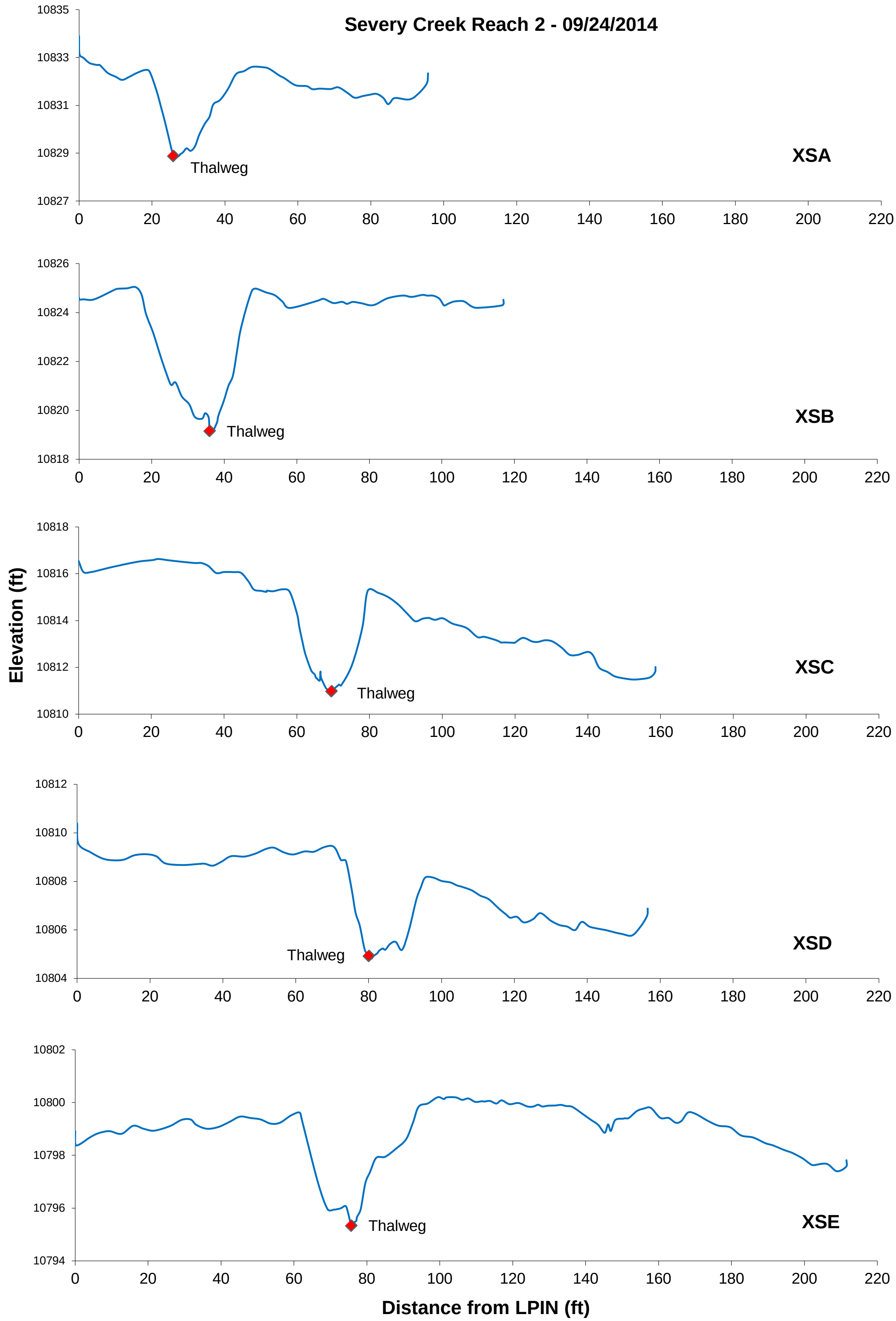

*†Thalweg not surveyed as stream bed is dry.*



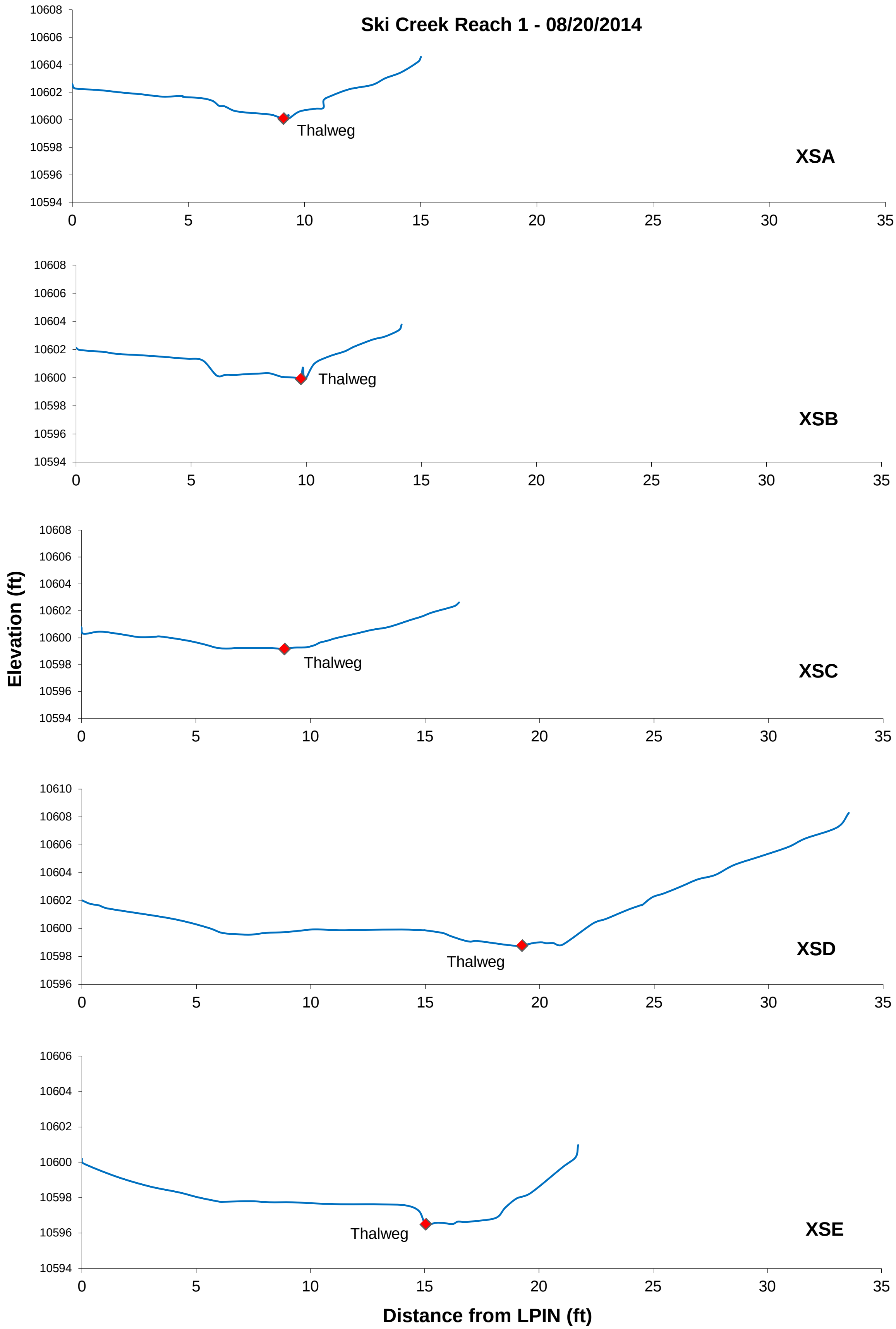

*†Thalweg not surveyed as stream bed is dry.*

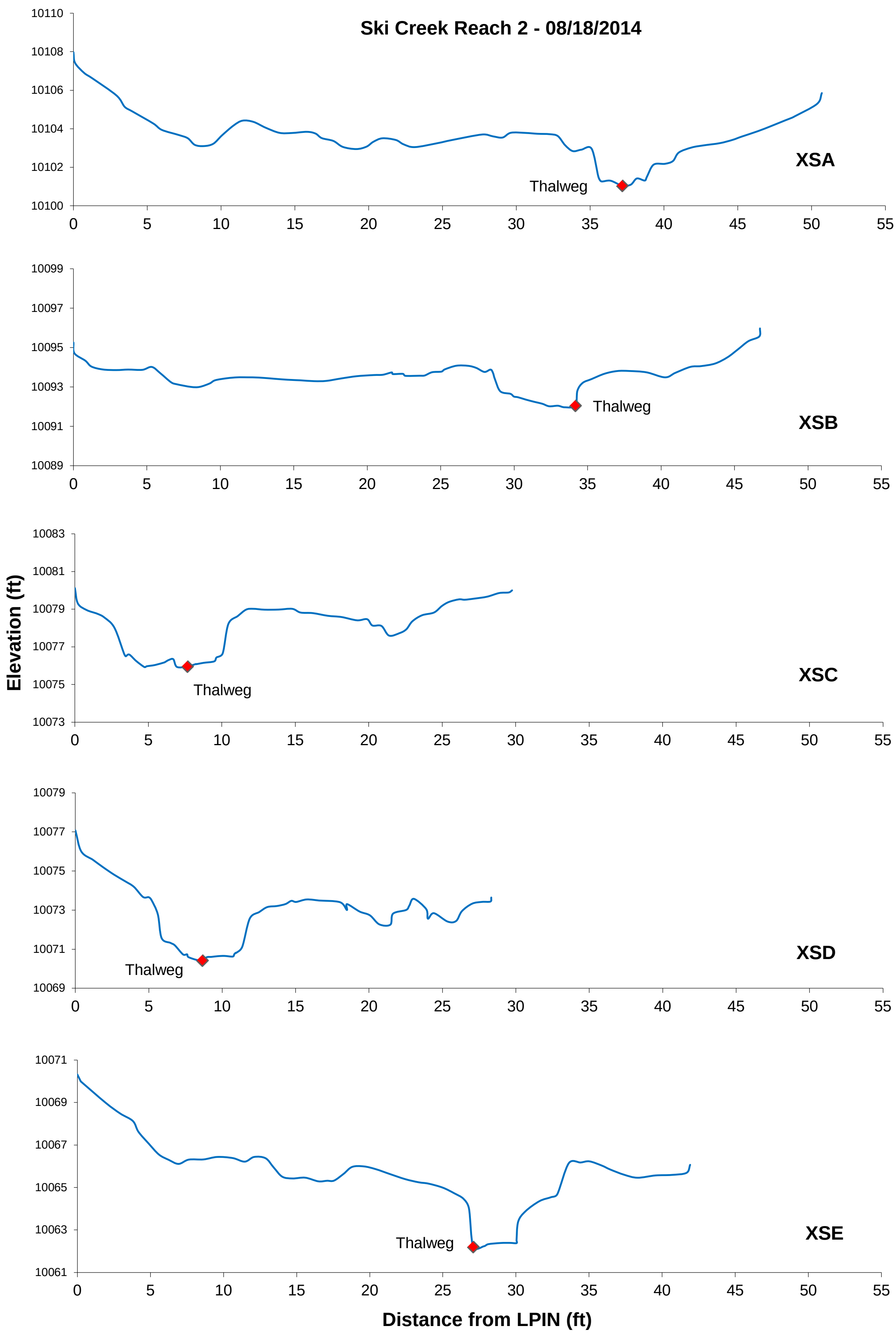

Oil Creek Reach 1 - 09/03/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg

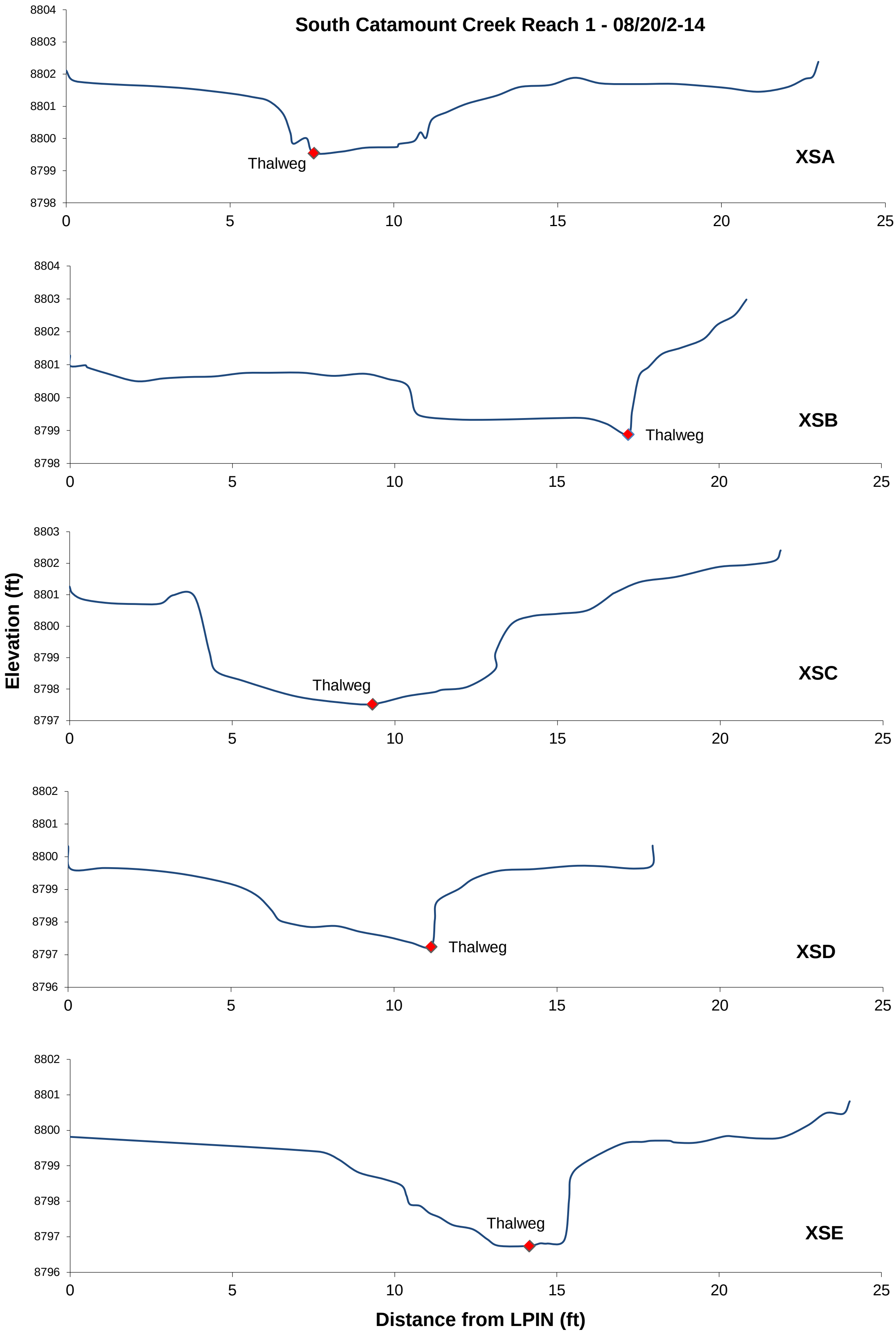

Severy Creek Reach 1- 09/24/2014
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
10689
10690
10691
10692
10693
10694
10695
0
3
6
9
12
15

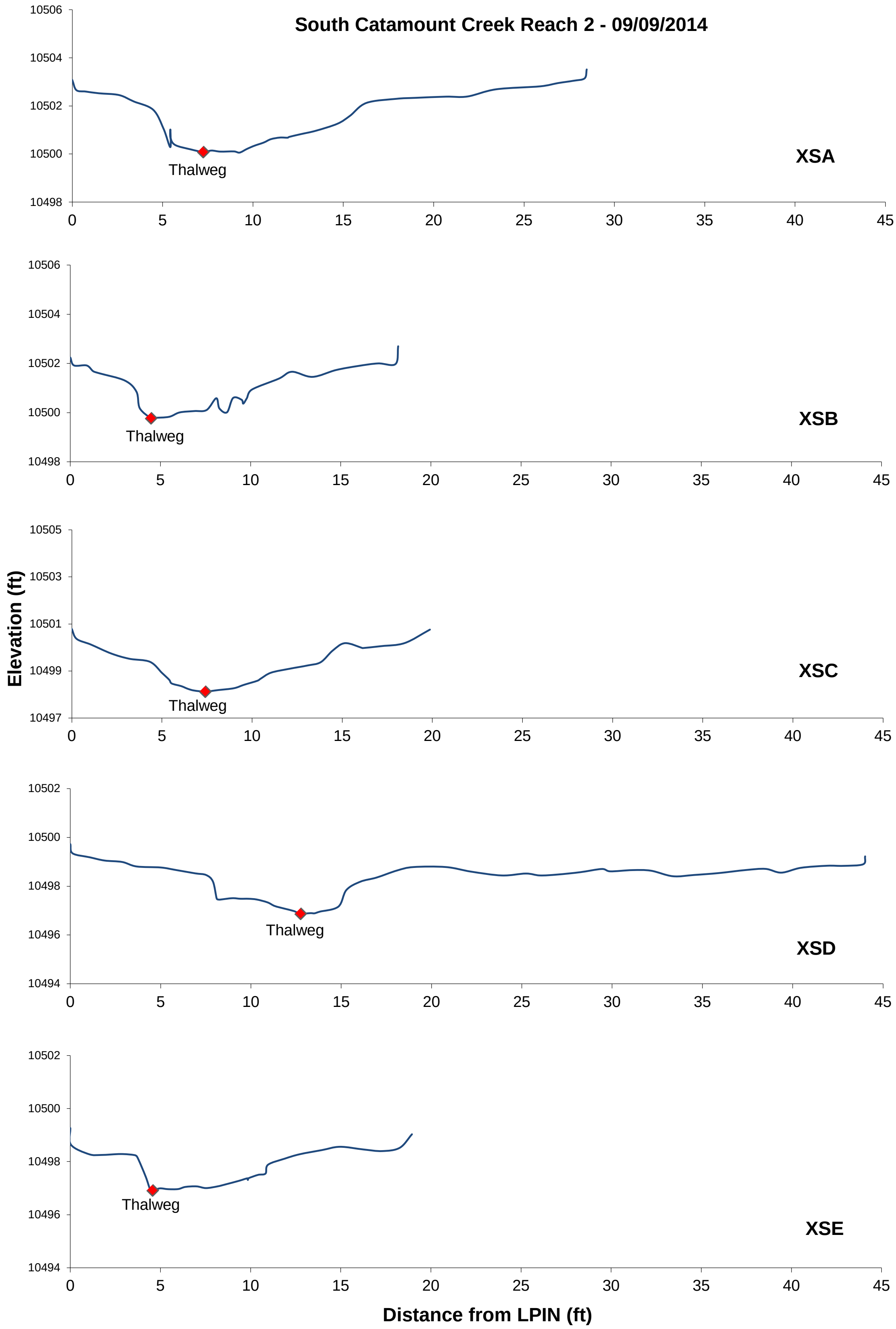


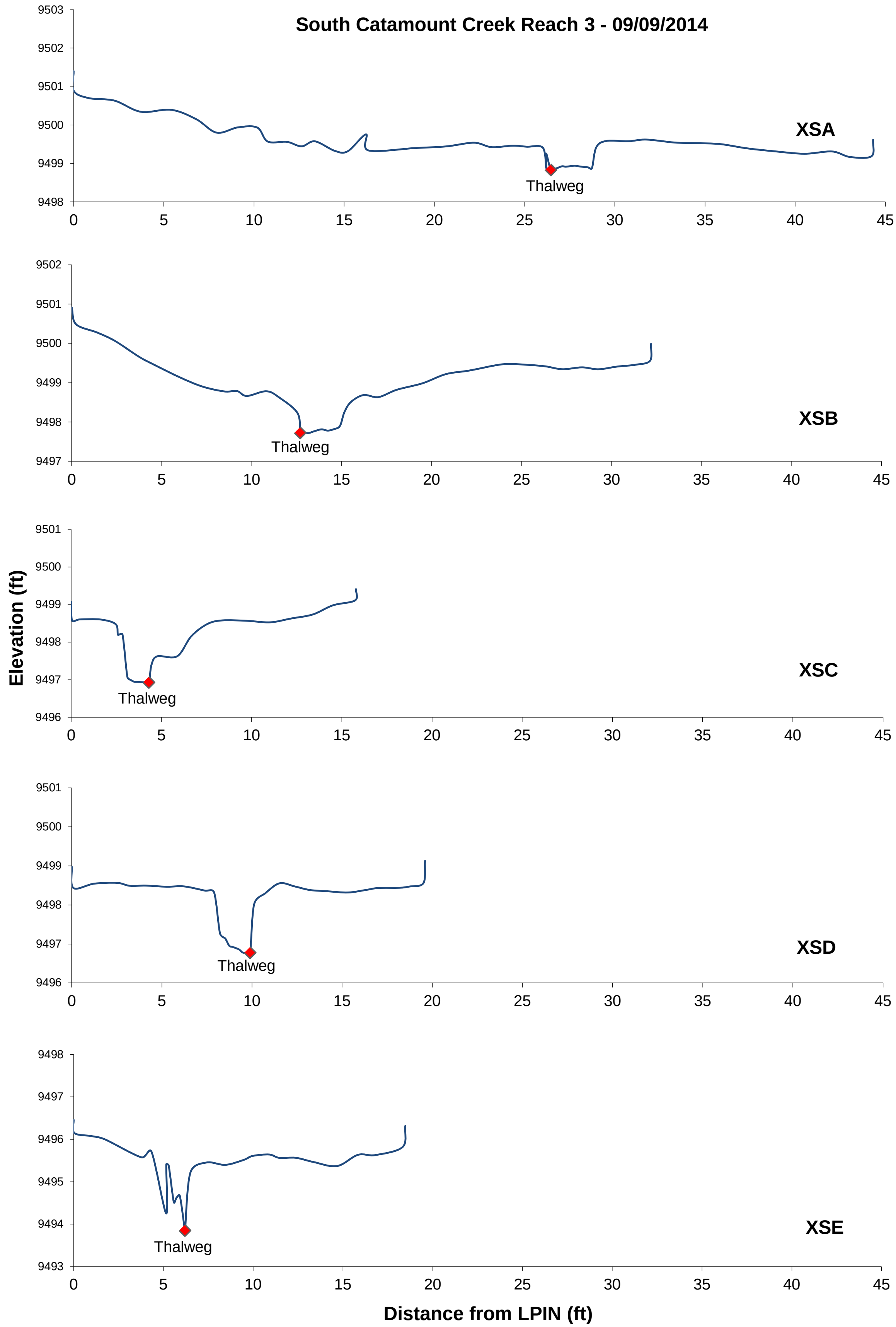
Severy Creek Reach 2 - 09/24/2014
Elevation (ft)
XSA
Thalweg
10835
10833
10831
10829
10827
XSB
Thalweg
10826
10824
10822
10820
10818
XSC
Thalweg
10818
10816
10814
10812
10810
XSD
Thalweg
10812
10810
10808
10806
10804
XSE
Thalweg
10802
10800
10798
10796
10794
0
20
40
60
80
100
120
140
160
180
200
220
Distance from LPIN (ft)

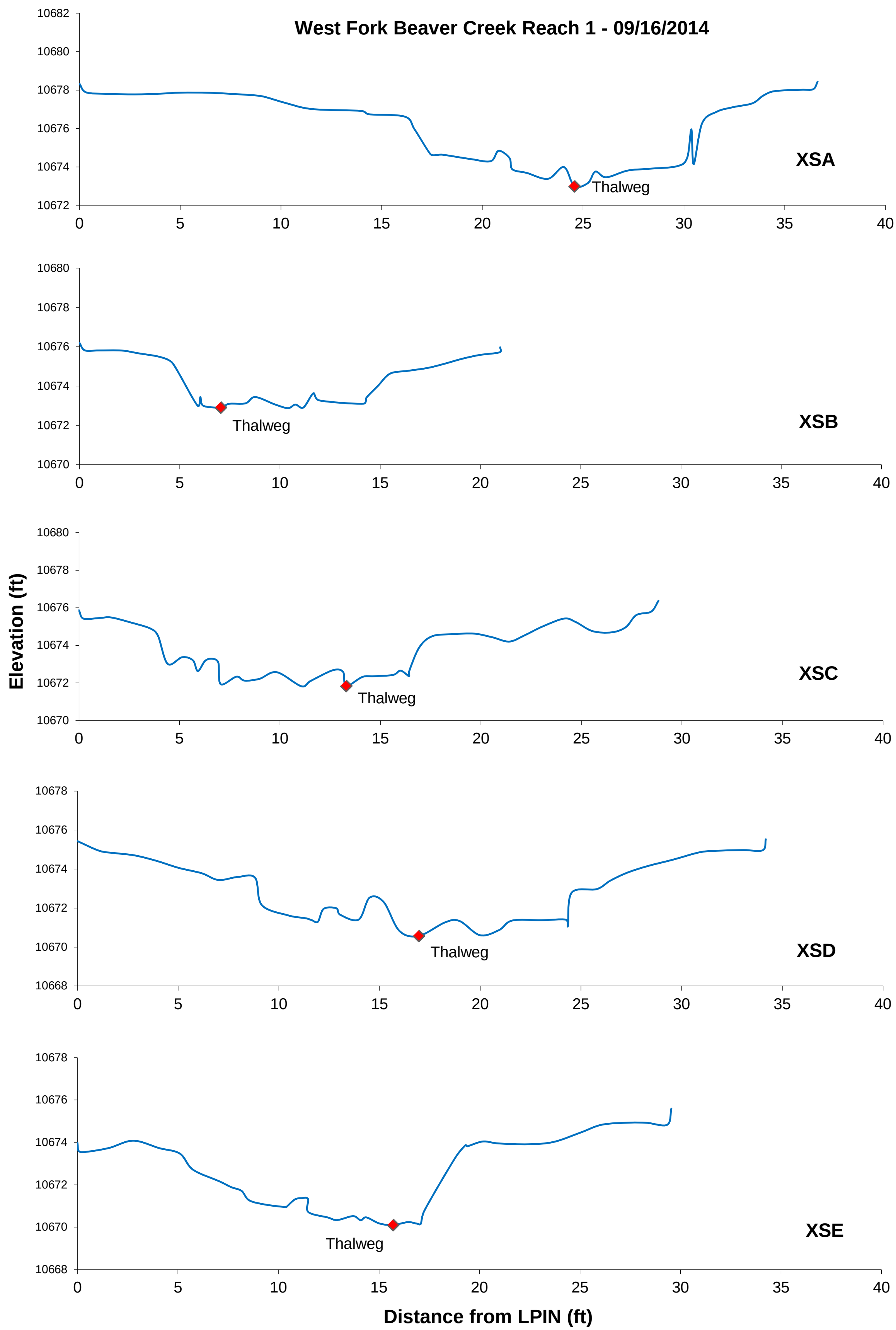

Ski Creek Reach 1 - 08/20/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
10594
10596
10598
10600
10602
10604
10606
10608
10610
0
5
10
15
20
25
30
35

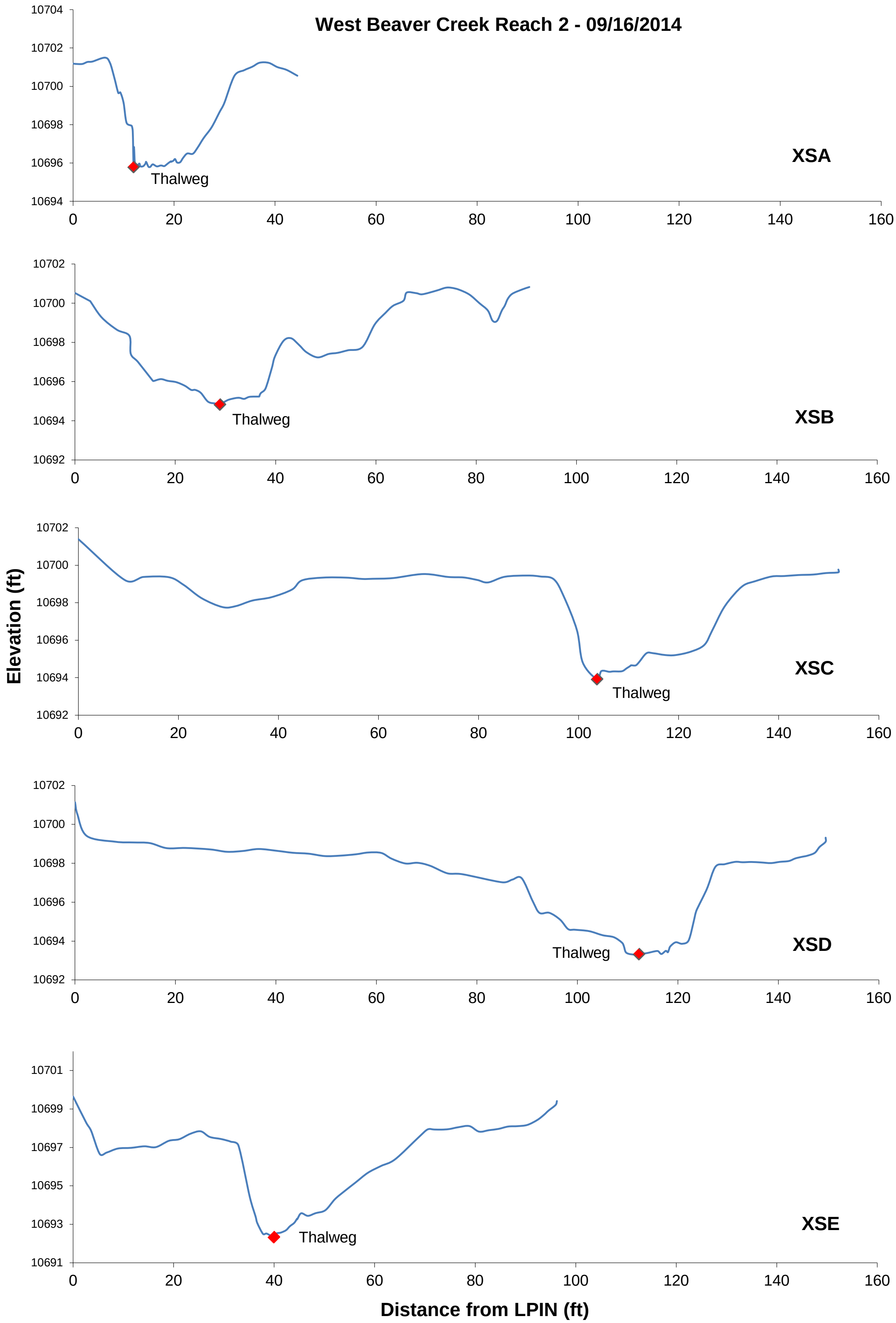

Ski Creek Reach 2 - 08/18/2014
XSA
Thalweg
10110
10108
10106
10104
10102
10100
XSB
Thalweg
10099
10097
10095
10093
10091
10089
XSC
Thalweg
10083
10081
10079
10077
10075
10073
XSD
Thalweg
10079
10077
10075
10073
10071
10069
XSE
Thalweg
10071
10069
10067
10065
10063
10061
0 5 10 15 20 25 30 35 40 45 50 55
Elevation (ft)
Distance from LPIN (ft)


South Catamount Creek Reach 1 - 08/20/2-14
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
8804
8803
8802
8801
8800
8799
8798
8797
8796
0
5
10
15
20
25


South Catamount Creek Reach 2 - 09/09/2014
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
10506
10504
10502
10500
10498
10505
10503
10501
10499
10497
10496
10494
0
5
10
15
20
25
30
35
40
45


South Catamount Creek Reach 3 - 09/09/2014
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)


West Fork Beaver Creek Reach 1 - 09/16/2014
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
10682
10680
10678
10676
10674
10672
10670
10668
0
5
10
15
20
25
30
35
40


West Beaver Creek Reach 2 - 09/16/2014
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
10704
10702
10700
10698
10696
10694
10692
10701
10699
10697
10695
10693
10691
0
20
40
60
80
100
120
140
160

# Appendix N

# Stream Pebble Count

# Particle Size Distribution Graphs

# 2014

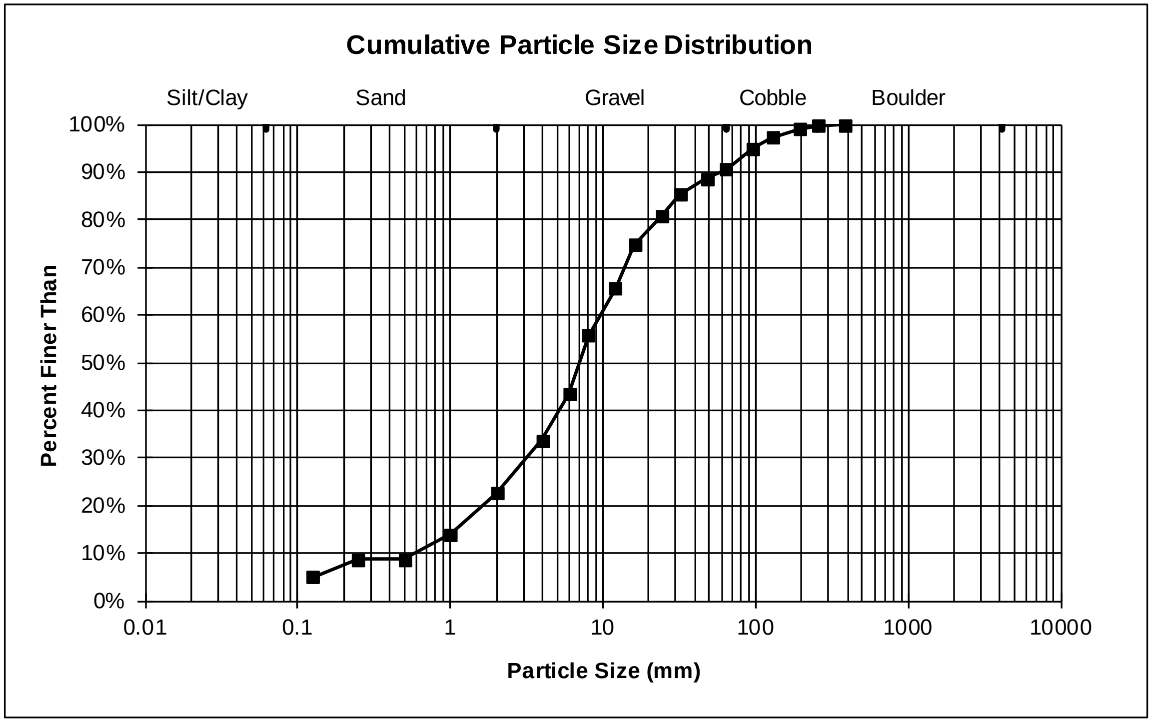
**Pebble Count Worksheet**

**COMMENTS:** ERO Reach established in South Slope Watershed

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 15 | 5.0% | |
| 0.062 - 0.125 | 0 | 0.0% | 5% |
| 0.125 - 0.25 | 11 | 3.7% | 9% |
| 0.25 - .5 | 0 | 0.0% | 9% |
| 0.5 - 1.0 | 16 | 5.3% | 14% |
| 1 - 2 | 26 | 8.7% | 23% |
| 2 - 4 | 33 | 11.0% | 34% |
| 4 - 6 | 29 | 9.7% | 43% |
| 6 - 8 | 37 | 12.3% | 56% |
| 8 - 12 | 30 | 10.0% | 66% |
| 12 - 16 | 27 | 9.0% | 75% |
| 16 - 24 | 18 | 6.0% | 81% |
| 24 - 32 | 14 | 4.7% | 85% |
| 32 - 48 | 10 | 3.3% | 89% |
| 48 - 64 | 6 | 2.0% | 91% |
| 64 - 96 | 13 | 4.3% | 95% |
| 96 - 128 | 7 | 2.3% | 97% |
| 128 - 192 | 5 | 1.7% | 99% |
| 192 - 256 | 2 | | 100% |
| 256 - 384 | 1 | | 100% |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - Boehmer Creek Reach 1
ID NUMBER: BHMR1
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.083 | 4.230 | 7.009 | 29.475 | 96.000 | 270.0 |



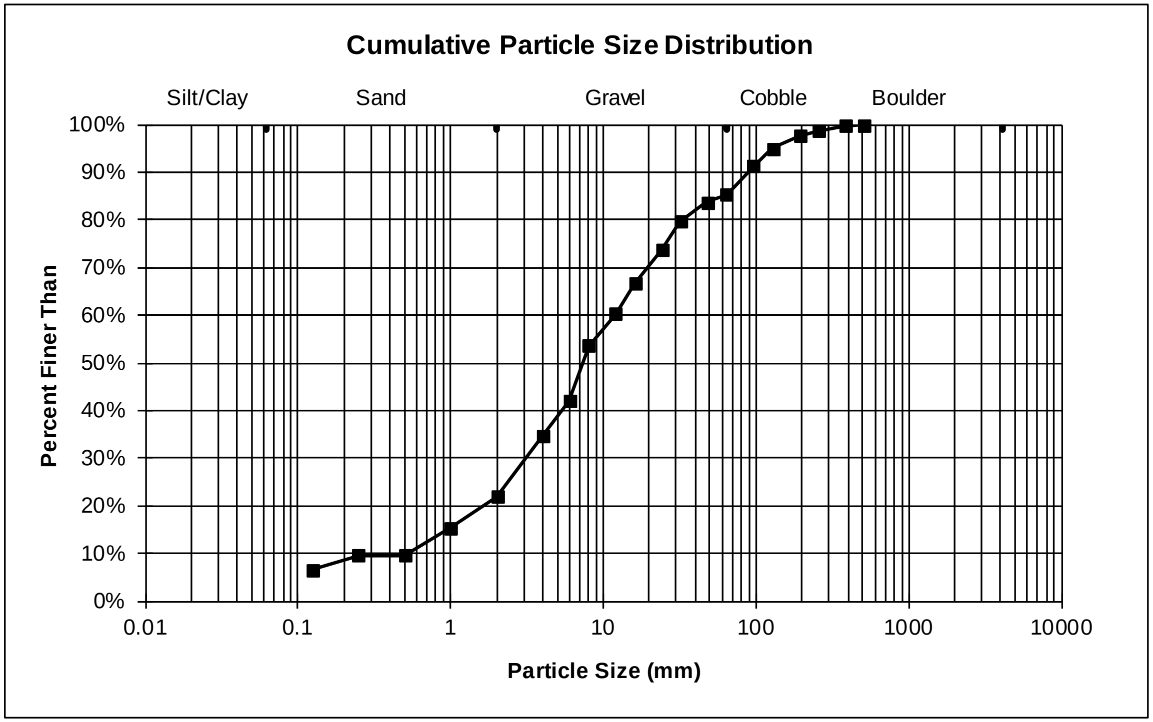
**Pebble Count Worksheet**

**COMMENTS:** Second reach 500 ft upstream of ERO Reach

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 20 | 6.7% | |
| 0.062 - 0.125 | 0 | 0.0% | 7% |
| 0.125 - 0.25 | 9 | 3.0% | 10% |
| 0.25 - .5 | 0 | 0.0% | 10% |
| 0.5 - 1.0 | 17 | 5.7% | 15% |
| 1 - 2 | 20 | 6.7% | 22% |
| 2 - 4 | 38 | 12.7% | 35% |
| 4 - 6 | 22 | 7.3% | 42% |
| 6 - 8 | 35 | 11.7% | 54% |
| 8 - 12 | 20 | 6.7% | 60% |
| 12 - 16 | 19 | 6.3% | 67% |
| 16 - 24 | 21 | 7.0% | 74% |
| 24 - 32 | 18 | 6.0% | 80% |
| 32 - 48 | 12 | 4.0% | 84% |
| 48 - 64 | 5 | 1.7% | 85% |
| 64 - 96 | 18 | 6.0% | 91% |
| 96 - 128 | 11 | 3.7% | 95% |
| 128 - 192 | 8 | 2.7% | 98% |
| 192 - 256 | 3 | | 99% |
| 256 - 384 | 3 | | 100% |
| 384 - 512 | 1 | | 100% |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pike's Peak Highway - Boehmer Creek Reach 2
ID NUMBER: BHMR2
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.960** | **4.074** | **7.308** | **50.843** | **128.000** | **410.0** |



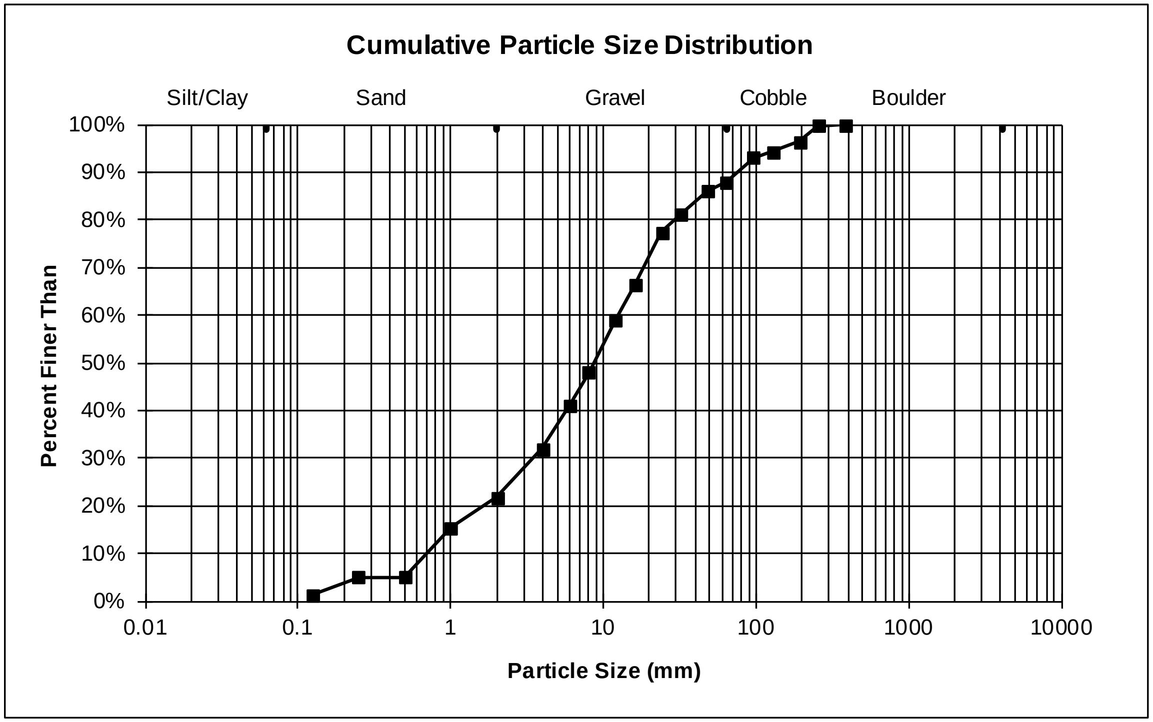
**Pebble Count Worksheet**

**COMMENTS:** ERO Reach established in South Slope Watershed

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 4 | 1.3% | |
| 0.062 - 0.125 | 0 | 0.0% | 1% |
| 0.125 - 0.25 | 11 | 3.7% | 5% |
| 0.25 - .5 | 0 | 0.0% | 5% |
| 0.5 - 1.0 | 31 | 10.3% | 15% |
| 1 - 2 | 19 | 6.3% | 22% |
| 2 - 4 | 31 | 10.3% | 32% |
| 4 - 6 | 27 | 9.0% | 41% |
| 6 - 8 | 21 | 7.0% | 48% |
| 8 - 12 | 33 | 11.0% | 59% |
| 12 - 16 | 22 | 7.3% | 66% |
| 16 - 24 | 33 | 11.0% | 77% |
| 24 - 32 | 11 | 3.7% | 81% |
| 32 - 48 | 15 | 5.0% | 86% |
| 48 - 64 | 6 | 2.0% | 88% |
| 64 - 96 | 15 | 5.0% | 93% |
| 96 - 128 | 4 | 1.3% | 94% |
| 128 - 192 | 6 | 2.0% | 96% |
| 192 - 256 | 10 | | 100% |
| 256 - 384 | 1 | | 100% |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - East Fork Beaver Creek Reach 1
ID NUMBER: EBVR1
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.978 | 4.579 | 8.612 | 40.814 | 146.523 | 450.0 |



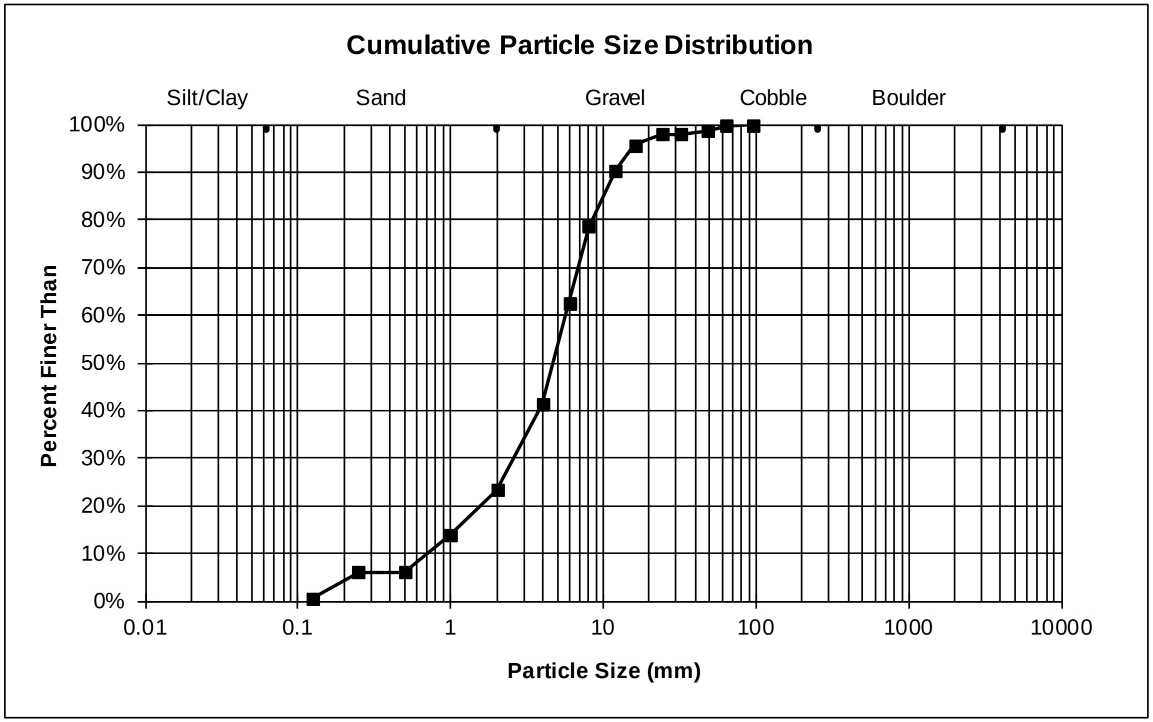
**Pebble Count Worksheet**

**COMMENTS:** Second reach 500 ft upstream of ERO Reach

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 2 | 0.7% | |
| 0.062 - 0.125 | 0 | 0.0% | 1% |
| 0.125 - 0.25 | 16 | 5.3% | 6% |
| 0.25 - .5 | 0 | 0.0% | 6% |
| 0.5 - 1.0 | 24 | 8.0% | 14% |
| 1 - 2 | 28 | 9.3% | 23% |
| 2 - 4 | 54 | 18.0% | 41% |
| 4 - 6 | 64 | 21.3% | 63% |
| 6 - 8 | 48 | 16.0% | 79% |
| 8 - 12 | 35 | 11.7% | 90% |
| 12 - 16 | 16 | 5.3% | 96% |
| 16 - 24 | 7 | 2.3% | 98% |
| 24 - 32 | 0 | 0.0% | 98% |
| 32 - 48 | 2 | 0.7% | 99% |
| 48 - 64 | 3 | 1.0% | 100% |
| 64 - 96 | 1 | 0.3% | 100% |
| 96 - 128 | | | |
| 128 - 192 | | | |
| 192 - 256 | | | |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - East Fork Beaver Creek Reach 2
ID NUMBER: EBVR2
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.077 | 3.134 | 4.716 | 9.629 | 15.435 | 82.0 |



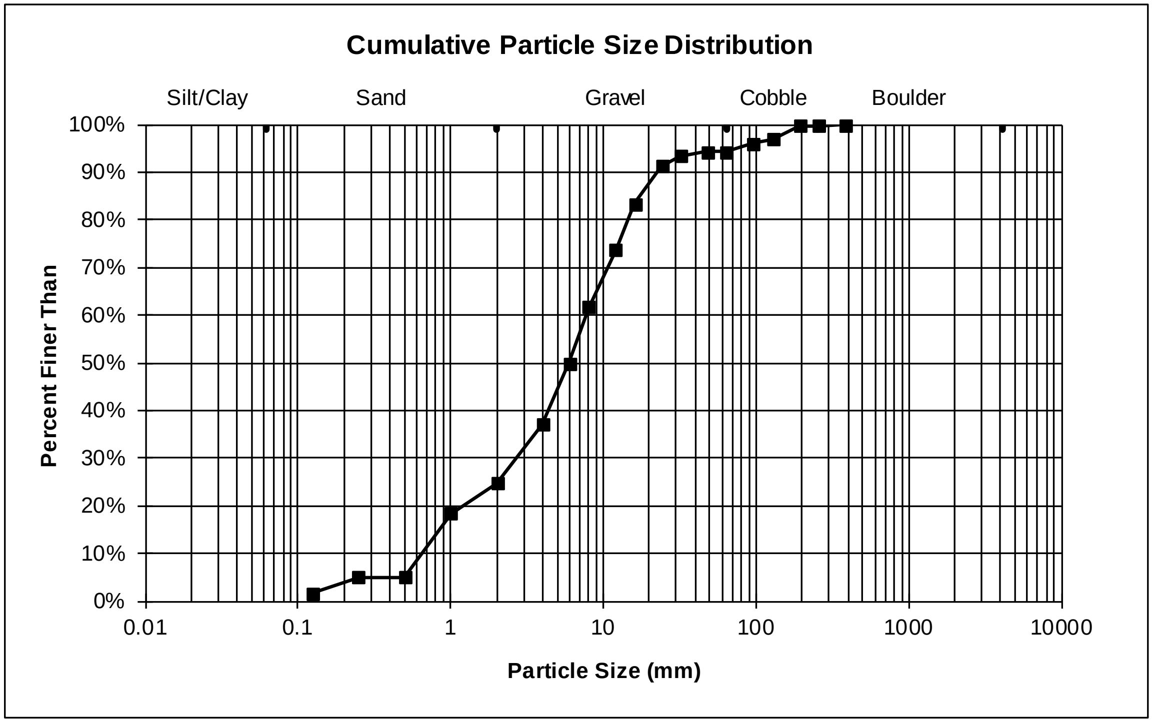
**Pebble Count Worksheet**

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 5 | 1.7% | |
| 0.062 - 0.125 | 0 | 0.0% | 2% |
| 0.125 - 0.25 | 10 | 3.3% | 5% |
| 0.25 - .5 | 0 | 0.0% | 5% |
| 0.5 - 1.0 | 40 | 13.3% | 18% |
| 1 - 2 | 19 | 6.3% | 25% |
| 2 - 4 | 37 | 12.3% | 37% |
| 4 - 6 | 39 | 13.0% | 50% |
| 6 - 8 | 35 | 11.7% | 62% |
| 8 - 12 | 36 | 12.0% | 74% |
| 12 - 16 | 29 | 9.7% | 83% |
| 16 - 24 | 24 | 8.0% | 91% |
| 24 - 32 | 6 | 2.0% | 93% |
| 32 - 48 | 3 | 1.0% | 94% |
| 48 - 64 | 0 | 0.0% | 94% |
| 64 - 96 | 5 | 1.7% | 96% |
| 96 - 128 | 3 | 1.0% | 97% |
| 128 - 192 | 8 | 2.7% | 100% |
| 192 - 256 | 0 | 0.0% | 100% |
| 256 - 384 | 1 | 0.3% | 100% |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

**COMMENTS:** Reach established upstream from confluence with South Catamount Creek because of the transbasin diversion installed in Ski Creek

STREAM NAME: Pikes Peak Highway - Glen Cove Creek Reach 1
ID NUMBER: GLEN1
DATE: 9/9/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.841 | 3.575 | 6.000 | 16.550 | 75.269 | 325.0 |



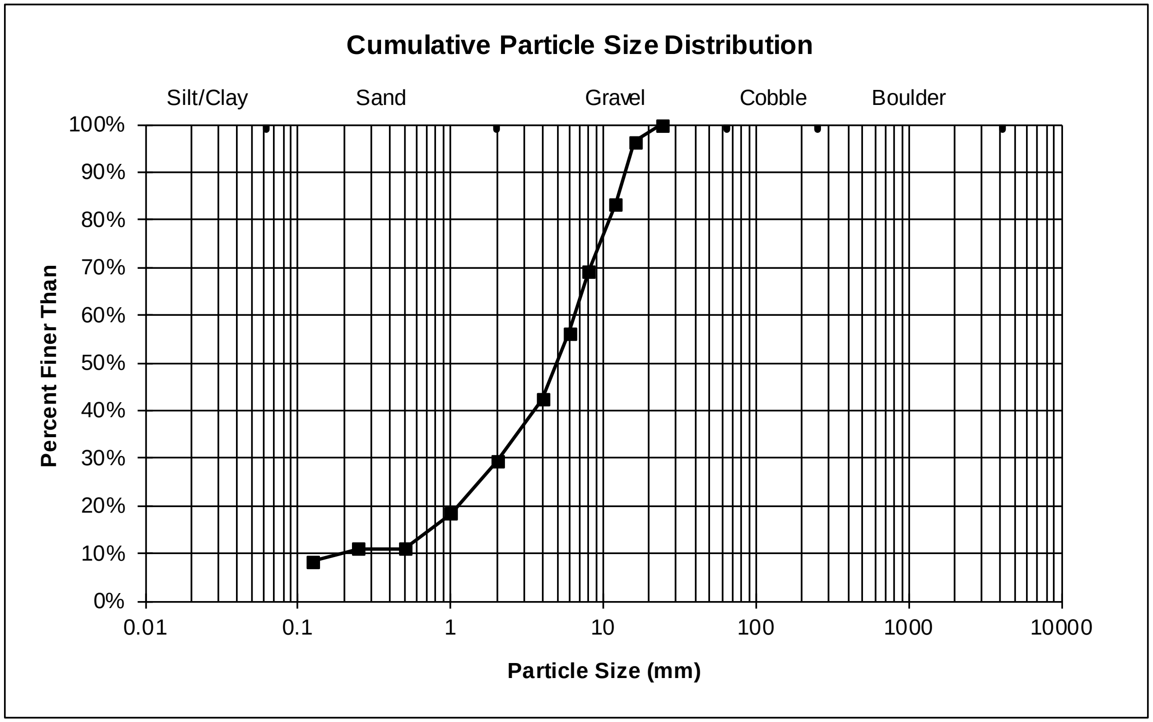
**Pebble Count Worksheet**

**COMMENTS:** ERO Study Site

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 25 | 8.3% | |
| 0.062 - 0.125 | 0 | 0.0% | 8% |
| 0.125 - 0.25 | 8 | 2.7% | 11% |
| 0.25 - .5 | 0 | 0.0% | 11% |
| 0.5 - 1.0 | 22 | 7.3% | 18% |
| 1 - 2 | 33 | 11.0% | 29% |
| 2 - 4 | 39 | 13.0% | 42% |
| 4 - 6 | 42 | 14.0% | 56% |
| 6 - 8 | 39 | 13.0% | 69% |
| 8 - 12 | 42 | 14.0% | 83% |
| 12 - 16 | 39 | 13.0% | 96% |
| 16 - 24 | 11 | 3.7% | 100% |
| 24 - 32 | | | |
| 32 - 48 | | | |
| 48 - 64 | | | |
| 64 - 96 | | | |
| 96 - 128 | | | |
| 128 - 192 | | | |
| 192 - 256 | | | |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - North Catamount Creek Reach 1
ID NUMBER: NCAT1
DATE: 8/21/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.730 | 2.706 | 4.994 | 12.178 | 15.535 | 22.0 |



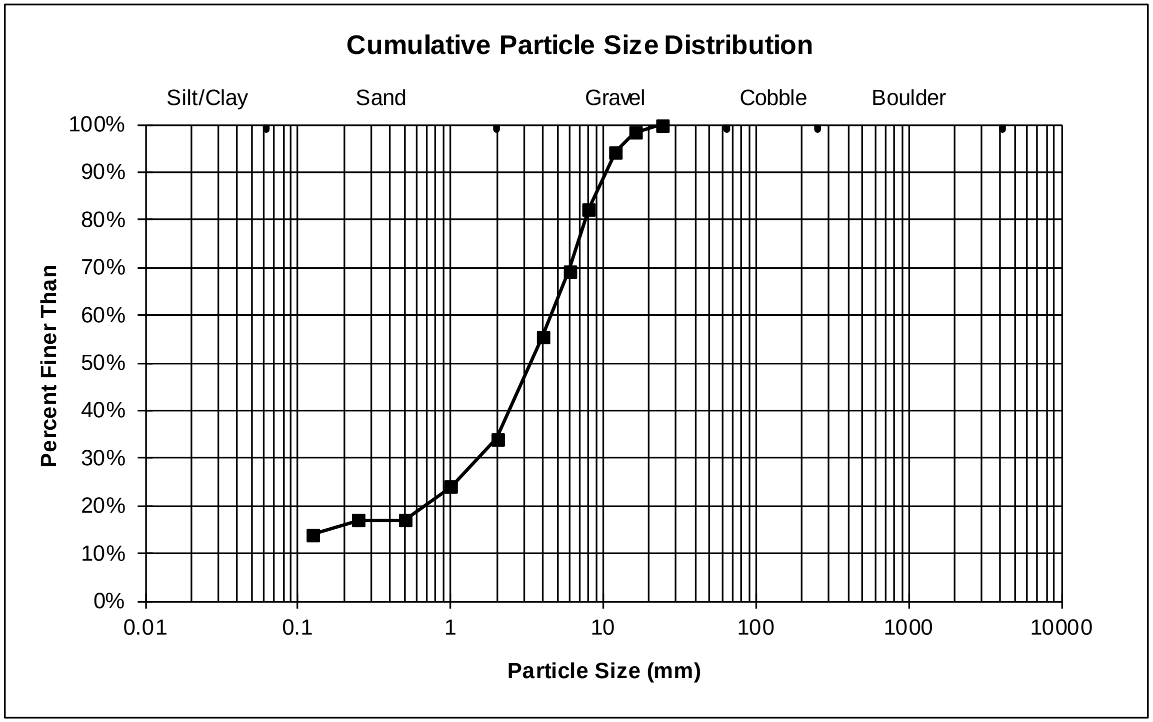
**Pebble Count Worksheet**

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 42 | 14.0% | |
| 0.062 - 0.125 | 0 | 0.0% | 14% |
| 0.125 - 0.25 | 9 | 3.0% | 17% |
| 0.25 - .5 | 0 | 0.0% | 17% |
| 0.5 - 1.0 | 21 | 7.0% | 24% |
| 1 - 2 | 30 | 10.0% | 34% |
| 2 - 4 | 64 | 21.3% | 55% |
| 4 - 6 | 42 | 14.0% | 69% |
| 6 - 8 | 39 | 13.0% | 82% |
| 8 - 12 | 36 | 12.0% | 94% |
| 12 - 16 | 12 | 4.0% | 98% |
| 16 - 24 | 5 | 1.7% | 100% |
| 24 - 32 | | | |
| 32 - 48 | | | |
| 48 - 64 | | | |
| 64 - 96 | | | |
| 96 - 128 | | | |
| 128 - 192 | | | |
| 192 - 256 | | | |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

**COMMENTS:** Second reach 0.5 miles upstream from ERO Study Site

STREAM NAME: Pikes Peak Highway - North Catamount Creek Reach 2
ID NUMBER: NCAT2
DATE: 8/21/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.157 | 2.066 | 3.364 | 8.463 | 12.589 | 21.0 |



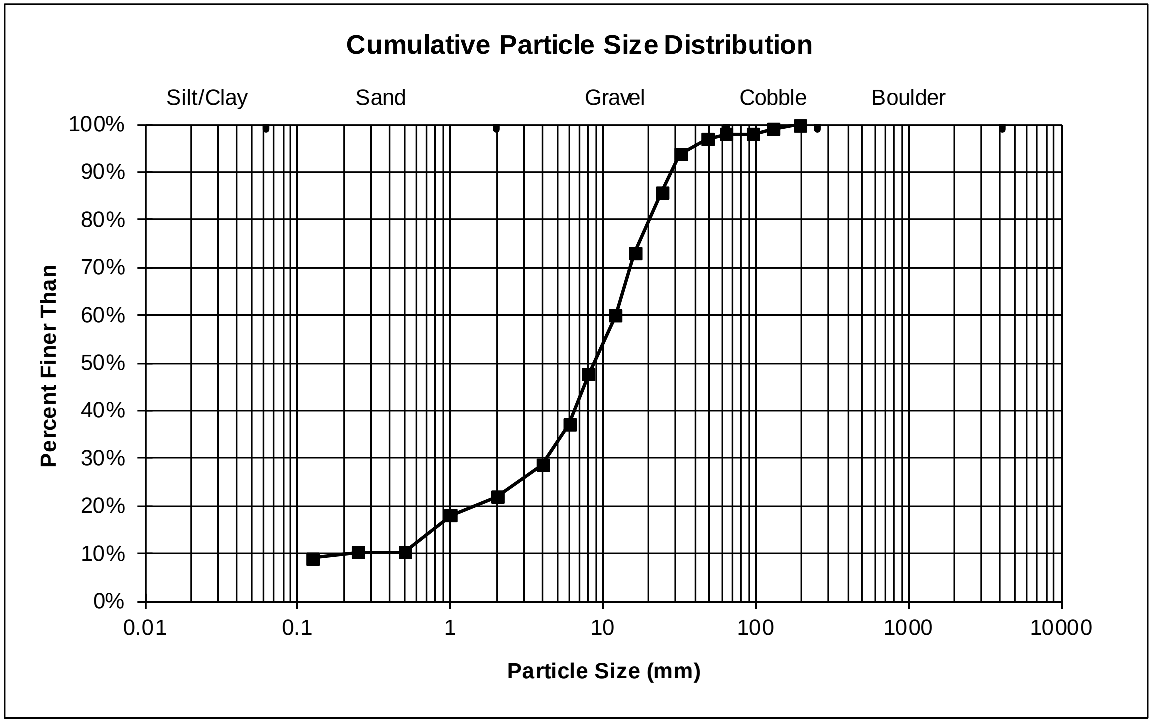
**Pebble Count Worksheet**

**COMMENTS:** ERO Reach accessed by private gate off of HWY 67

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 27 | 9.0% | |
| 0.062 - 0.125 | 0 | 0.0% | 9% |
| 0.125 - 0.25 | 4 | 1.3% | 10% |
| 0.25 - .5 | 0 | 0.0% | 10% |
| 0.5 - 1.0 | 23 | 7.7% | 18% |
| 1 - 2 | 12 | 4.0% | 22% |
| 2 - 4 | 20 | 6.7% | 29% |
| 4 - 6 | 25 | 8.3% | 37% |
| 6 - 8 | 32 | 10.7% | 48% |
| 8 - 12 | 37 | 12.3% | 60% |
| 12 - 16 | 39 | 13.0% | 73% |
| 16 - 24 | 38 | 12.7% | 86% |
| 24 - 32 | 24 | 8.0% | 94% |
| 32 - 48 | 10 | 3.3% | 97% |
| 48 - 64 | 3 | 1.0% | 98% |
| 64 - 96 | 0 | 0.0% | 98% |
| 96 - 128 | 3 | 1.0% | 99% |
| 128 - 192 | 3 | 1.0% | 100% |
| 192 - 256 | | | |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - Oil Creek Reach 1
ID NUMBER: OILC1
DATE: 9/3/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.762 | 5.444 | 8.638 | 22.753 | 37.635 | 190.0 |



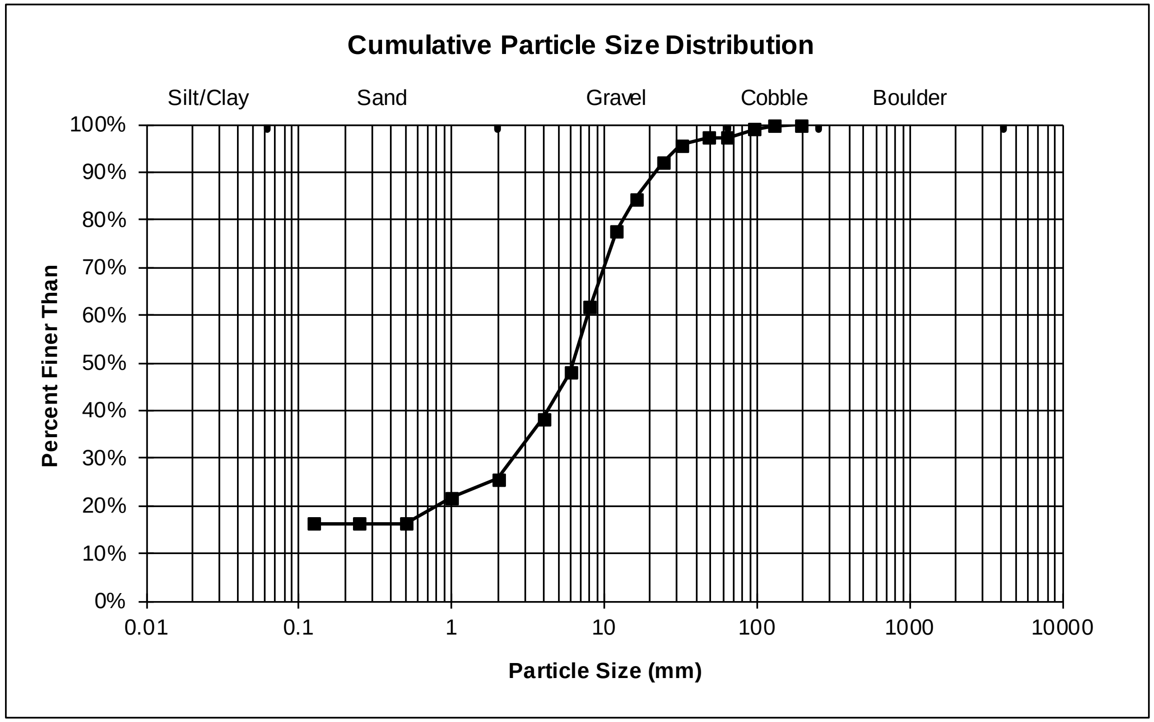
**Pebble Count Worksheet**

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 49 | 16.3% | |
| 0.062 - 0.125 | 0 | 0.0% | 16% |
| 0.125 - 0.25 | 0 | 0.0% | 16% |
| 0.25 - .5 | 0 | 0.0% | 16% |
| 0.5 - 1.0 | 16 | 5.3% | 22% |
| 1 - 2 | 12 | 4.0% | 26% |
| 2 - 4 | 38 | 12.7% | 38% |
| 4 - 6 | 29 | 9.7% | 48% |
| 6 - 8 | 41 | 13.7% | 62% |
| 8 - 12 | 48 | 16.0% | 78% |
| 12 - 16 | 20 | 6.7% | 84% |
| 16 - 24 | 23 | 7.7% | 92% |
| 24 - 32 | 11 | 3.7% | 96% |
| 32 - 48 | 5 | 1.7% | 97% |
| 48 - 64 | 0 | 0.0% | 97% |
| 64 - 96 | 5 | 1.7% | 99% |
| 96 - 128 | 2 | 0.7% | 100% |
| 128 - 192 | 1 | 0.3% | 100% |
| 192 - 256 | | | |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

**COMMENTS:** ERO Reach in wetland

STREAM NAME: Pikes Peak Highway - Severy Creek Reach 1
ID NUMBER: SVRY1
DATE: 9/24/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.000 | 3.333 | 6.258 | 15.772 | 30.369 | 130.0 |



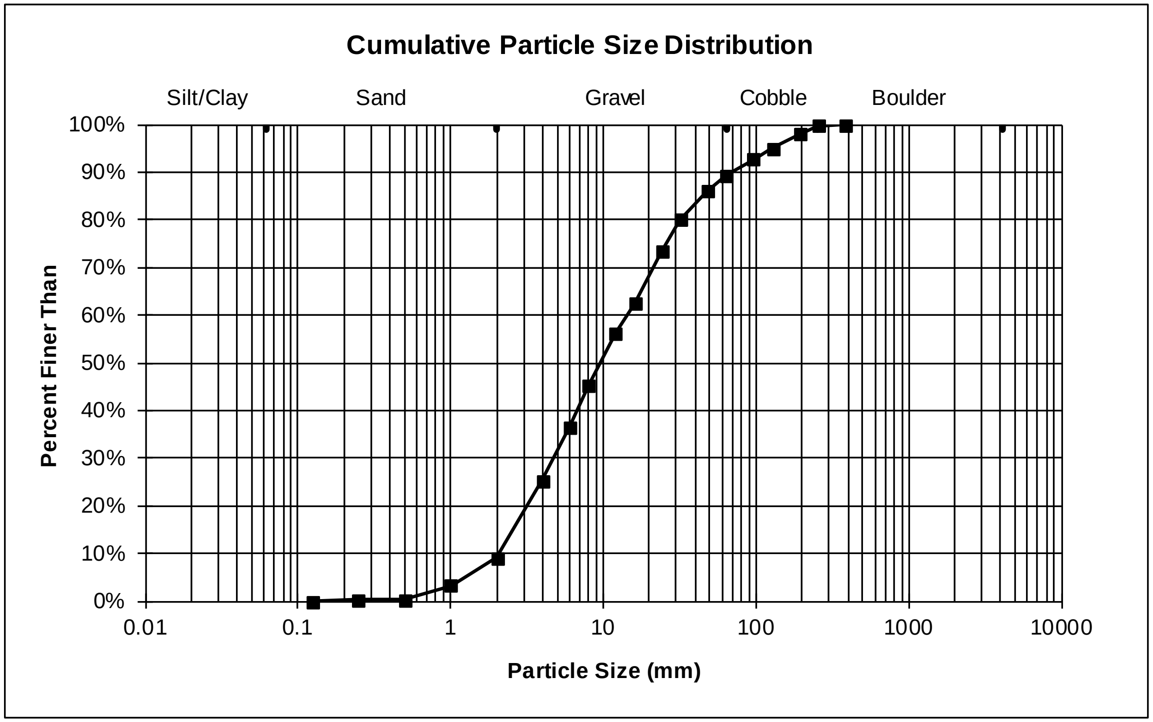
**Pebble Count Worksheet**

**COMMENTS:** Second reach 1000 ft upstream from ERO Reach

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 0 | 0.0% | |
| 0.062 - 0.125 | 0 | 0.0% | 0% |
| 0.125 - 0.25 | 1 | 0.3% | 0% |
| 0.25 - .5 | 0 | 0.0% | 0% |
| 0.5 - 1.0 | 9 | 3.0% | 3% |
| 1 - 2 | 17 | 5.7% | 9% |
| 2 - 4 | 49 | 16.3% | 25% |
| 4 - 6 | 33 | 11.0% | 36% |
| 6 - 8 | 27 | 9.0% | 45% |
| 8 - 12 | 33 | 11.0% | 56% |
| 12 - 16 | 18 | 6.0% | 62% |
| 16 - 24 | 33 | 11.0% | 73% |
| 24 - 32 | 20 | 6.7% | 80% |
| 32 - 48 | 18 | 6.0% | 86% |
| 48 - 64 | 10 | 3.3% | 89% |
| 64 - 96 | 10 | 3.3% | 93% |
| 96 - 128 | 7 | 2.3% | 95% |
| 128 - 192 | 9 | 3.0% | 98% |
| 192 - 256 | 5 | | 100% |
| 256 - 384 | 1 | | 100% |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - Severy Creek Reach 2
ID NUMBER: SVRY2
DATE: 9/24/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 2.580 | 5.712 | 9.502 | 41.932 | 128.000 | 350.0 |



**Sieve Analysis Worksheet**

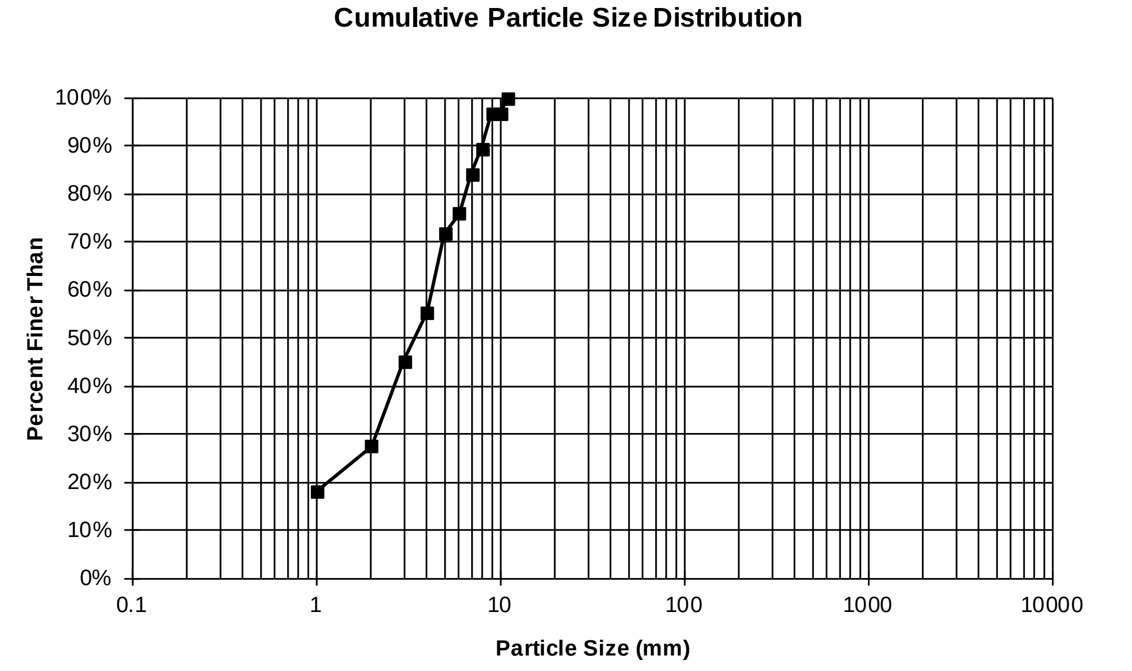
**COMMENTS:** Bar Sample taken 10' downstream from Cross Section D

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 83.40 | 18.1% | |
| 0.5 | 43.60 | 9.4% | 18.1% |
| 1.0 | 81.40 | 17.6% | 27.5% |
| 2.0 | 47.30 | 10.2% | 45.1% |
| 2.8 | 75.50 | 16.3% | 55.4% |
| 4.0 | 19.30 | 4.2% | 71.7% |
| 5.6 | 37.70 | 8.2% | 75.9% |
| 8.0 | 24.90 | 5.4% | 84.1% |
| 11.2 | 33.70 | 7.3% | 89.5% |
| 16.0 | 0.00 | 0.0% | 96.8% |
| 22.4 | 15.00 | 3.2% | 96.8% |
| 24.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 461.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Ski Creek Reach 1
ID NUMBER: SKIC1
DATE: 8/20/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.220 | 1.343 | 2.347 | 7.978 | 14.687 | 24.0 |



**Sieve Analysis Worksheet**

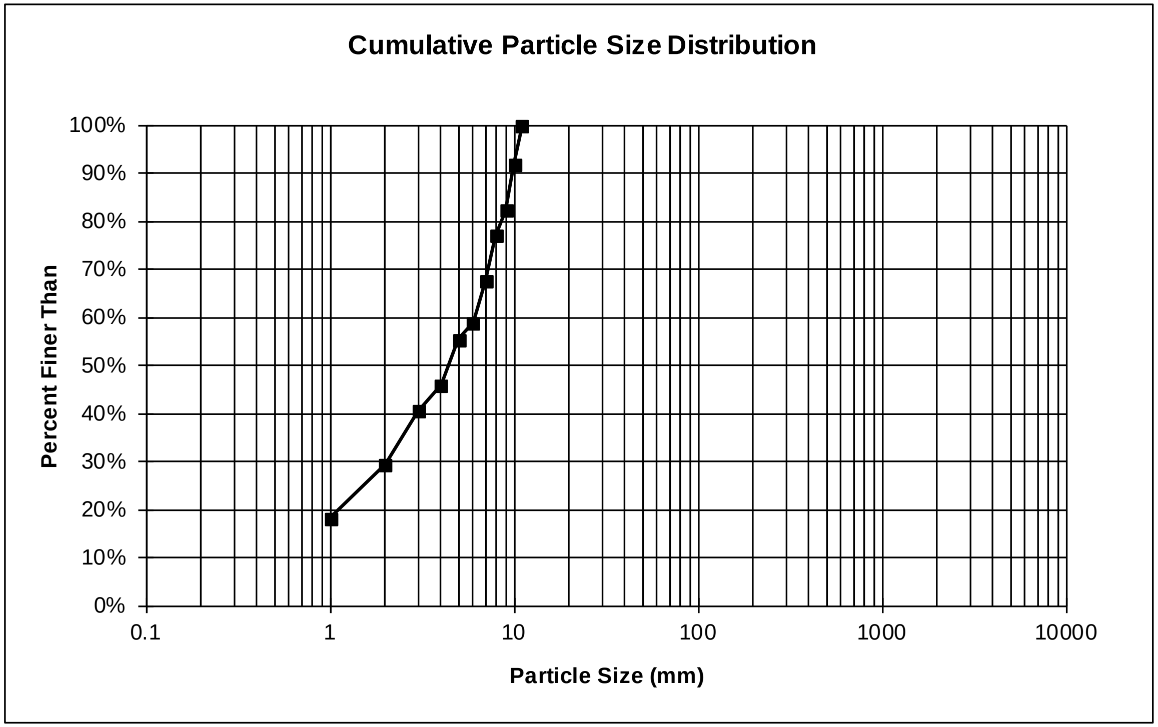
**COMMENTS:** Bar Sample taken 6' upstream from Cross Section A left bank

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 139.60 | 18.2% | |
| 0.5 | 85.60 | 11.2% | 18.2% |
| 1.0 | 84.90 | 11.1% | 29.3% |
| 2.0 | 42.10 | 5.5% | 40.4% |
| 2.8 | 72.00 | 9.4% | 45.9% |
| 4.0 | 26.90 | 3.5% | 55.3% |
| 5.6 | 66.70 | 8.7% | 58.8% |
| 8.0 | 72.20 | 9.4% | 67.5% |
| 11.2 | 41.30 | 5.4% | 76.9% |
| 16.0 | 73.60 | 9.6% | 82.3% |
| 22.4 | 62.40 | 8.1% | 91.9% |
| 31.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 767.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pikes Peak Highway - Ski Creek Reach 2
ID NUMBER: SKIC2
DATE: 8/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.213 | 1.425 | 3.272 | 16.998 | 25.386 | 31.0 |



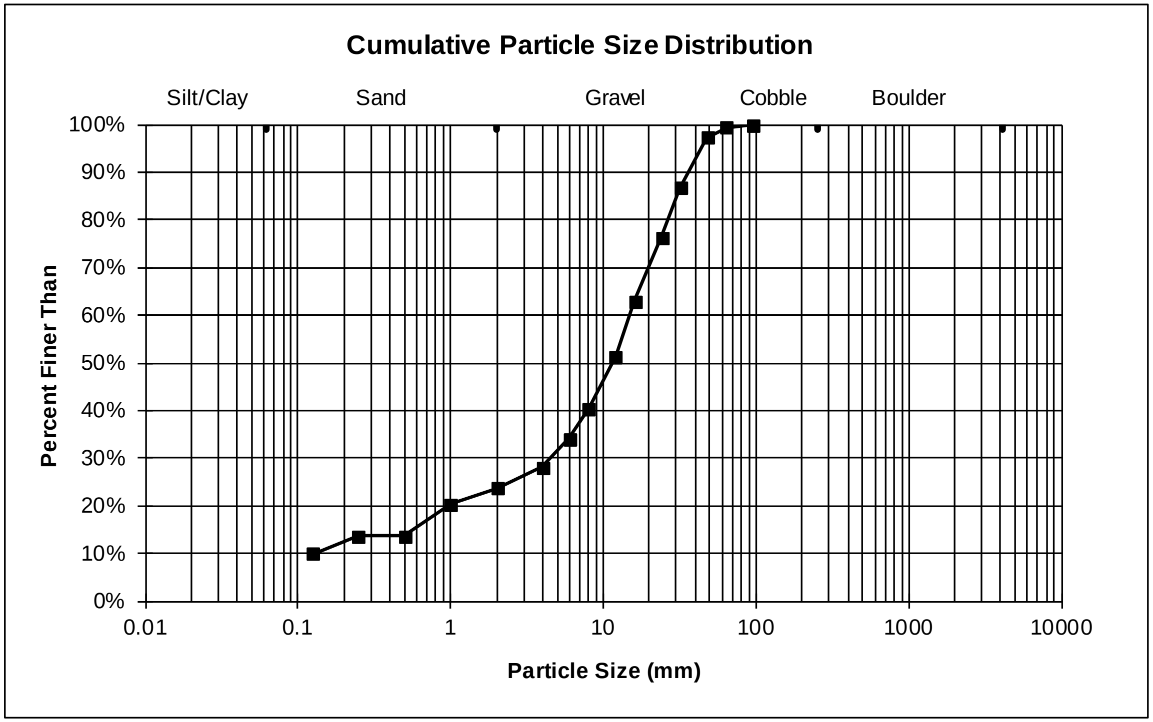
**Pebble Count Worksheet**

**COMMENTS:** ERO Study Site. Located 1500 ft upstream from parking area.

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 30 | 10.0% | |
| 0.062 - 0.125 | 0 | 0.0% | 10% |
| 0.125 - 0.25 | 11 | 3.7% | 14% |
| 0.25 - .5 | 0 | 0.0% | 14% |
| 0.5 - 1.0 | 20 | 6.7% | 20% |
| 1 - 2 | 10 | 3.3% | 24% |
| 2 - 4 | 13 | 4.3% | 28% |
| 4 - 6 | 18 | 6.0% | 34% |
| 6 - 8 | 19 | 6.3% | 40% |
| 8 - 12 | 33 | 11.0% | 51% |
| 12 - 16 | 35 | 11.7% | 63% |
| 16 - 24 | 40 | 13.3% | 76% |
| 24 - 32 | 31 | 10.3% | 87% |
| 32 - 48 | 32 | 10.7% | 97% |
| 48 - 64 | 6 | 2.0% | 99% |
| 64 - 96 | 2 | 0.7% | 100% |
| 96 - 128 | | | |
| 128 - 192 | | | |
| 192 - 256 | | | |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 1
ID NUMBER: SCAT1
DATE: 8/20/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.574 | 6.279 | 11.424 | 29.710 | 43.926 | 83.0 |



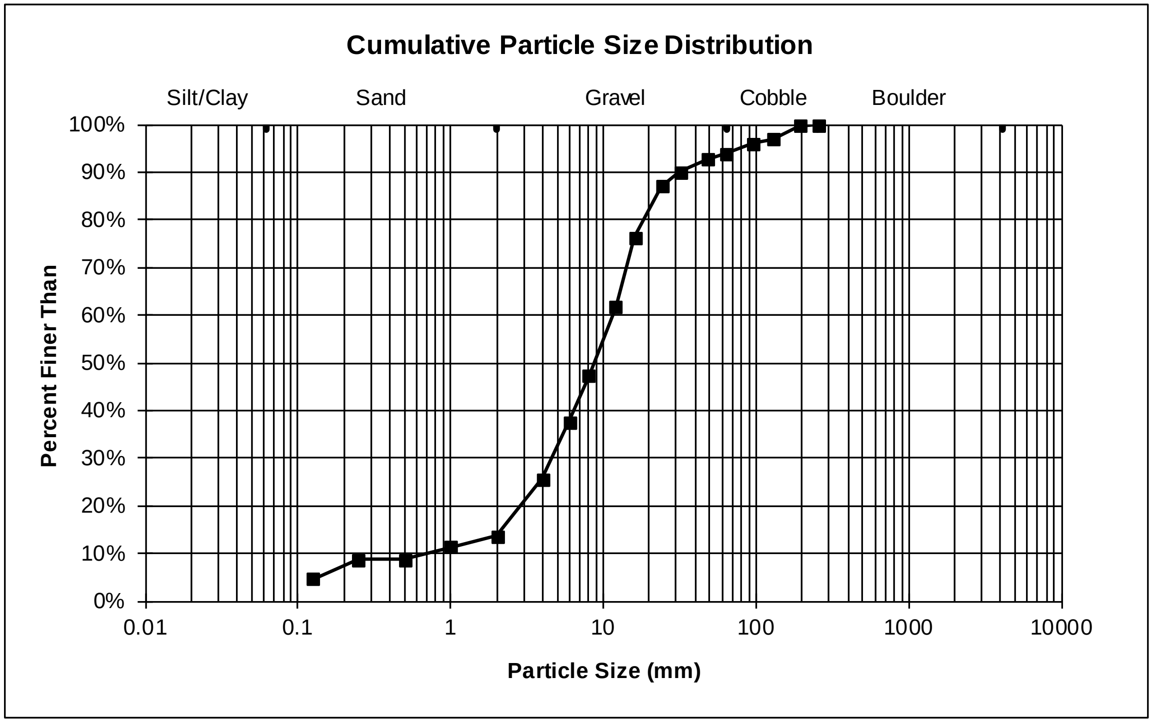
**Pebble Count Worksheet**

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 14 | 4.7% | |
| 0.062 - 0.125 | 0 | 0.0% | 5% |
| 0.125 - 0.25 | 12 | 4.0% | 9% |
| 0.25 - .5 | 0 | 0.0% | 9% |
| 0.5 - 1.0 | 8 | 2.7% | 11% |
| 1 - 2 | 7 | 2.3% | 14% |
| 2 - 4 | 36 | 12.0% | 26% |
| 4 - 6 | 36 | 12.0% | 38% |
| 6 - 8 | 29 | 9.7% | 47% |
| 8 - 12 | 43 | 14.3% | 62% |
| 12 - 16 | 44 | 14.7% | 76% |
| 16 - 24 | 32 | 10.7% | 87% |
| 24 - 32 | 9 | 3.0% | 90% |
| 32 - 48 | 8 | 2.7% | 93% |
| 48 - 64 | 4 | 1.3% | 94% |
| 64 - 96 | 6 | 2.0% | 96% |
| 96 - 128 | 3 | 1.0% | 97% |
| 128 - 192 | 8 | 2.7% | 100% |
| 192 - 256 | 1 | 0.3% | 100% |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

**COMMENTS:** Second reach 500 ft upstream from ERO Study Site

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 2
ID NUMBER: SCAT2
DATE: 9/9/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 2.160 | 5.483 | 8.627 | 21.413 | 78.384 | 231.0 |



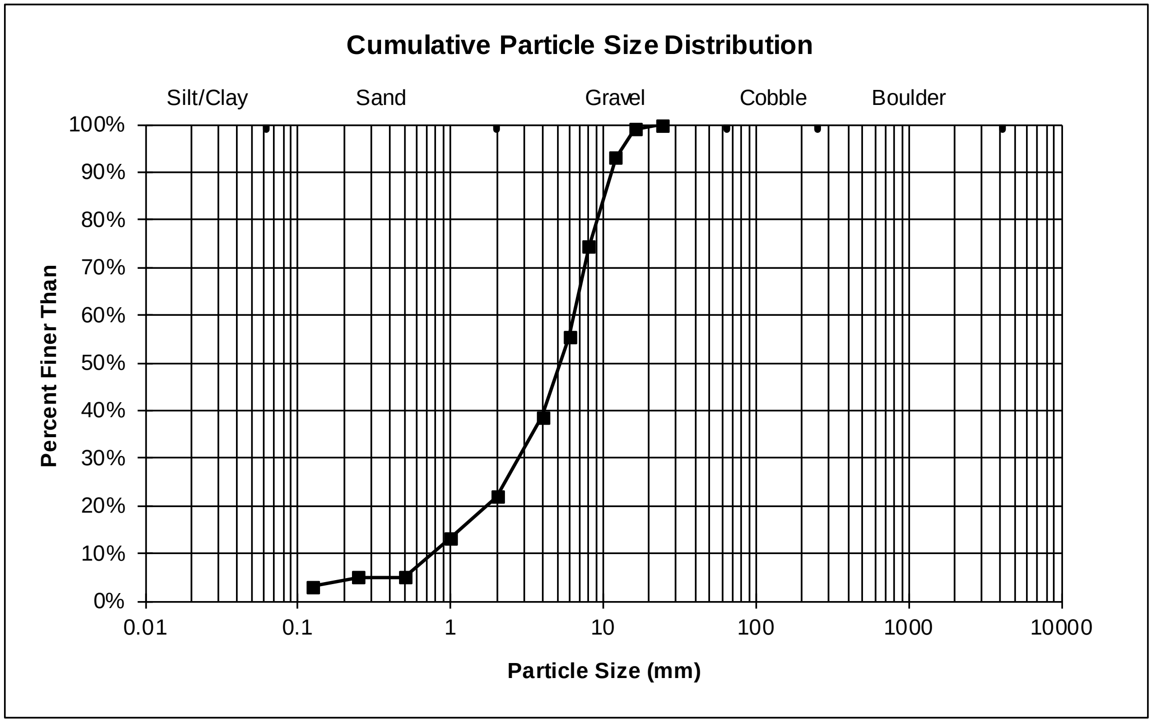
**Pebble Count Worksheet**

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 9 | 3.0% | |
| 0.062 - 0.125 | 0 | 0.0% | 3% |
| 0.125 - 0.25 | 6 | 2.0% | 5% |
| 0.25 - .5 | 0 | 0.0% | 5% |
| 0.5 - 1.0 | 25 | 8.3% | 13% |
| 1 - 2 | 26 | 8.7% | 22% |
| 2 - 4 | 50 | 16.7% | 39% |
| 4 - 6 | 50 | 16.7% | 55% |
| 6 - 8 | 57 | 19.0% | 74% |
| 8 - 12 | 56 | 18.7% | 93% |
| 12 - 16 | 18 | 6.0% | 99% |
| 16 - 24 | 3 | 1.0% | 100% |
| 24 - 32 | | | |
| 32 - 48 | | | |
| 48 - 64 | | | |
| 64 - 96 | | | |
| 96 - 128 | | | |
| 128 - 192 | | | |
| 192 - 256 | | | |
| 256 - 384 | | | |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

**COMMENTS:** Reach established upstream from confluence with Glen Cove Creek because of the transbasin diversion installed in Ski Creek

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 3
ID NUMBER: SCAT3
DATE: 9/9/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **1.143** | **3.434** | **5.270** | **9.869** | **13.208** | **19.0** |



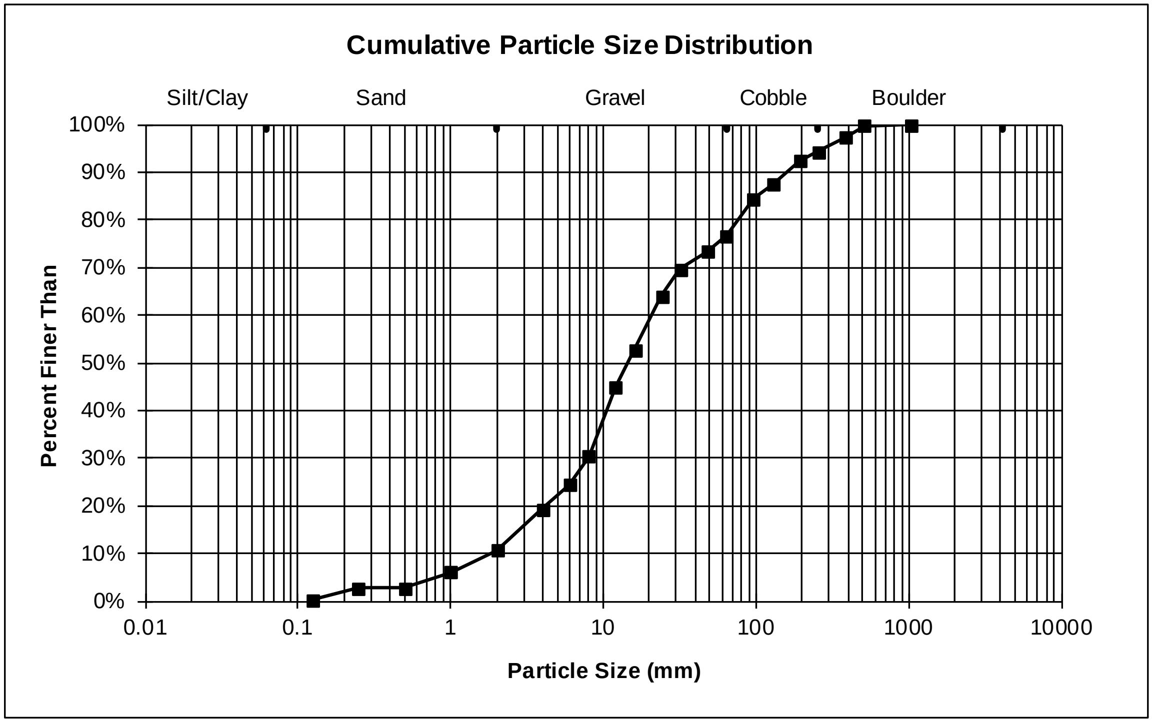
**Pebble Count Worksheet**

**COMMENTS:** ERO Reach 0.25 miles upstream of Cripple Creek Reservoir

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 1 | 0.3% | |
| 0.062 - 0.125 | 0 | 0.0% | 0% |
| 0.125 - 0.25 | 7 | 2.3% | 3% |
| 0.25 - .5 | 0 | 0.0% | 3% |
| 0.5 - 1.0 | 10 | 3.3% | 6% |
| 1 - 2 | 14 | 4.7% | 11% |
| 2 - 4 | 26 | 8.7% | 19% |
| 4 - 6 | 15 | 5.0% | 24% |
| 6 - 8 | 18 | 6.0% | 30% |
| 8 - 12 | 44 | 14.7% | 45% |
| 12 - 16 | 23 | 7.7% | 53% |
| 16 - 24 | 34 | 11.3% | 64% |
| 24 - 32 | 17 | 5.7% | 70% |
| 32 - 48 | 11 | 3.7% | 73% |
| 48 - 64 | 10 | 3.3% | 77% |
| 64 - 96 | 23 | 7.7% | 84% |
| 96 - 128 | 9 | 3.0% | 87% |
| 128 - 192 | 15 | 5.0% | 92% |
| 192 - 256 | 6 | | 94% |
| 256 - 384 | 9 | | 97% |
| 384 - 512 | 7 | | 100% |
| 512 - 1024 | 1 | | 100% |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

STREAM NAME: Pikes Peak Highway - West Fork Beaver Creek Reach 1
ID NUMBER: WBVR1
DATE: 9/16/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.000 | 9.102 | 14.476 | 94.322 | 280.138 | 600.0 |



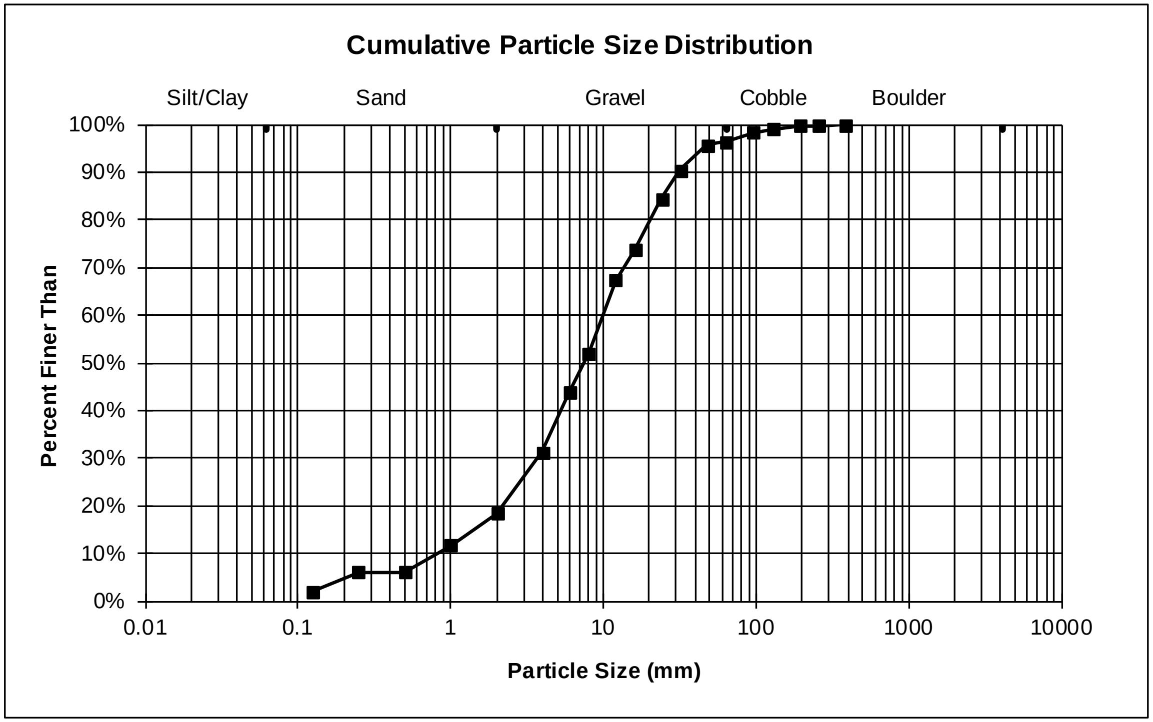
**Pebble Count Worksheet**

| Particle Size (mm) | # in Size Class | % of Total | % Finer Than |
|---|---|---|---|
| <0.062 | 6 | 2.0% | |
| 0.062 - 0.125 | 0 | 0.0% | 2% |
| 0.125 - 0.25 | 12 | 4.0% | 6% |
| 0.25 - .5 | 0 | 0.0% | 6% |
| 0.5 - 1.0 | 17 | 5.7% | 12% |
| 1 - 2 | 20 | 6.7% | 18% |
| 2 - 4 | 39 | 13.0% | 31% |
| 4 - 6 | 37 | 12.3% | 44% |
| 6 - 8 | 25 | 8.3% | 52% |
| 8 - 12 | 46 | 15.3% | 67% |
| 12 - 16 | 19 | 6.3% | 74% |
| 16 - 24 | 32 | 10.7% | 84% |
| 24 - 32 | 18 | 6.0% | 90% |
| 32 - 48 | 16 | 5.3% | 96% |
| 48 - 64 | 2 | 0.7% | 96% |
| 64 - 96 | 6 | 2.0% | 98% |
| 96 - 128 | 2 | 0.7% | 99% |
| 128 - 192 | 2 | 0.7% | 100% |
| 192 - 256 | 0 | | 100% |
| 256 - 384 | 1 | | 100% |
| 384 - 512 | | | |
| 512 - 1024 | | | |
| 1024 - 2048 | | | |
| 2044 - 4096 | | | |
| Total | 300.00 | | |

**COMMENTS:** Second reach 0.25 miles upstream of ERO Reach

STREAM NAME: Pikes Peak Highway - West Fork Beaver Creek Reach 2
ID NUMBER: WBVR2
DATE: 9/16/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.414 | 4.512 | 7.466 | 23.698 | 45.628 | 258.0 |



# Appendix O

# Stream Bar Sample

# Particle Size Distribution Summary
# and
# Graphs

# 2014

## Summary of Stream Channel Particle Size Distribution from Sieve Analysis of Bar Samples, Pikes Peak 2014

| Site Name | Site ID | Date | Particle Size Distribution (mm)–Grab Samples 2014 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | D15 | D35 | D50 | D84 | D95 | D100 |
| Boehmer Creek Reach 1 | BHMR1 | 9/18/2014 | 0.034 | 0.509 | 0.630 | 1.063 | 1.681 | 5.0 |
| Boehmer Creek Reach 2 | BHMR2 | 9/18/2014 | 0.079 | 0.689 | 1.074 | 2.582 | 3.899 | 16.0 |
| East Fork Beaver Creek Reach 1 | EBVR1 | 9/18/2014 | 1.581 | 3.192 | 3.989 | 8.846 | 18.270 | 25.0 |
| East Fork Beaver Creek Reach 2 | EBVR2 | 9/18/2014 | 2.851 | 3.785 | 5.325 | 8.248 | 10.755 | 12.0 |
| Glen Cove Creek Reach 1 | GLEN1 | 9/9/2014 | 1.005 | 2.758 | 4.349 | 11.398 | 16.831 | 20.0 |
| North Catamount Creek Reach 1 | NCAT1 | 8/21/2014 | 0.654 | 1.380 | 2.095 | 4.773 | 7.351 | 13.0 |
| North Catamount Creek Reach 2 | NCAT2 | 8/21/2014 | 1.285 | 3.680 | 6.151 | 11.512 | 16.279 | 20.0 |
| Oil Creek Reach 1 | OILC1 | 9/3/2014 | 2.541 | 4.926 | 6.849 | 14.713 | 23.651 | 32.0 |
| Severy Creek Reach 1 | SVRY1 | 9/24/2014 | 0.510 | 1.393 | 2.361 | 6.561 | 10.289 | 13.0 |
| Severy Creek Reach 2 | SVRY2 | 9/24/2014 | 0.723 | 2.155 | 3.471 | 13.607 | 24.764 | 32.0 |
| Ski Creek Reach 1 | SKIC1 | 8/20/2014 | 0.220 | 1.343 | 2.347 | 7.978 | 14.687 | 24.0 |
| Ski Creek Reach 2 | SKIC2 | 8/18/2014 | 0.213 | 1.425 | 3.272 | 16.998 | 25.386 | 31.0 |
| South Catamount Creek Reach 1 | SCAT1 | 8/20/2014 | 0.084 | 0.995 | 3.794 | 15.505 | 23.141 | 29.0 |
| South Catamount Creek Reach 2 | SCAT2 | 9/9/2014 | 1.685 | 6.889 | 11.105 | 19.684 | 22.381 | 32.0 |
| South Catamount Creek Reach 3 | SCAT3 | 9/9/2014 | 20.890 | 7.509 | 8.268 | 9.435 | 11.899 | 12.0 |
| West Fork Beaver Creek Reach 1 | WBVR1 | 9/16/2014 | 0.806 | 2.805 | 3.815 | 10.514 | 14.634 | 21.0 |
| West Fork Beaver Creek Reach 2 | WBVR2 | 9/16/2014 | 0.538 | 1.858 | 3.124 | 7.886 | 15.839 | 19.0 |

**Sieve Analysis Worksheet**

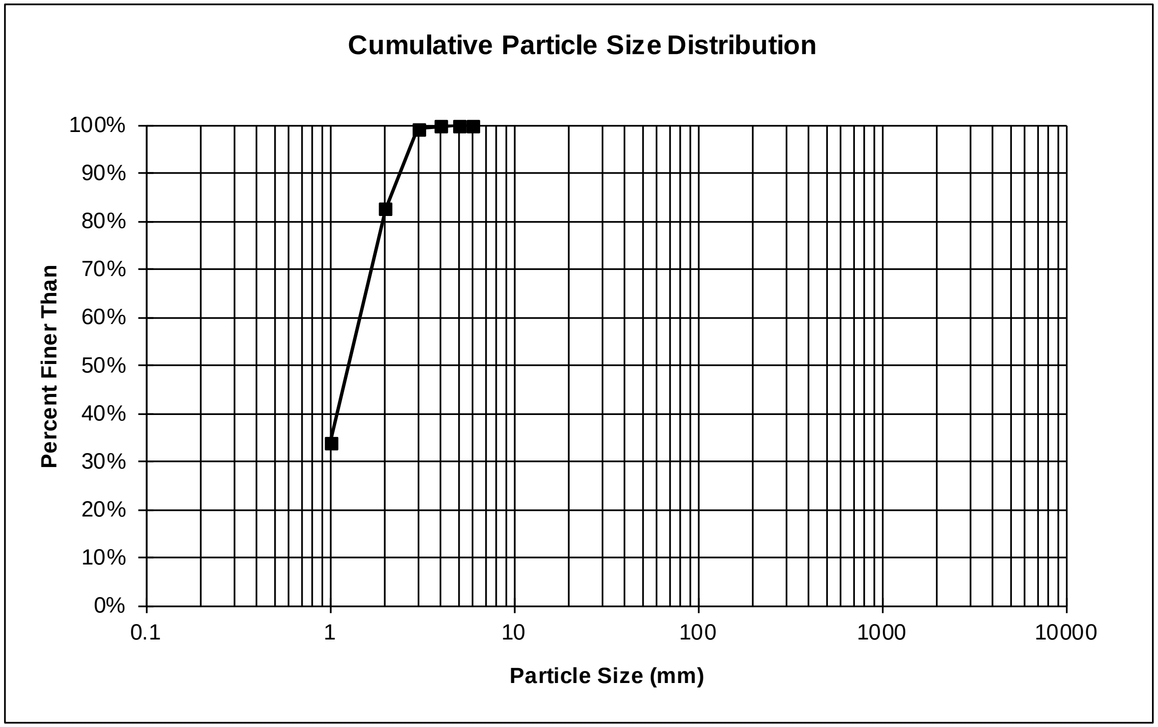
**COMMENTS:** ERO Reach on Colorado Springs Utilities South Slope Watershed

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 266.70 | 33.7% | |
| 0.5 | 386.00 | 48.8% | 33.7% |
| 1.0 | 131.60 | 16.6% | 82.5% |
| 2.0 | 4.60 | 0.6% | 99.2% |
| 2.8 | 1.30 | 0.2% | 99.7% |
| 4.0 | 0.70 | 0.1% | 99.9% |
| 5.0 | * | | 100.0% |
| 8.0 | | | - |
| 11.2 | | | |
| 16.0 | | | |
| 22.4 | | | |
| 29.0 | | | |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 790.90 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pikes Peak Highway - Boehmer Creek Reach 1
ID NUMBER: BHMR1
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.034** | **0.509** | **0.630** | **1.063** | **1.681** | **5.0** |



**Sieve Analysis Worksheet**

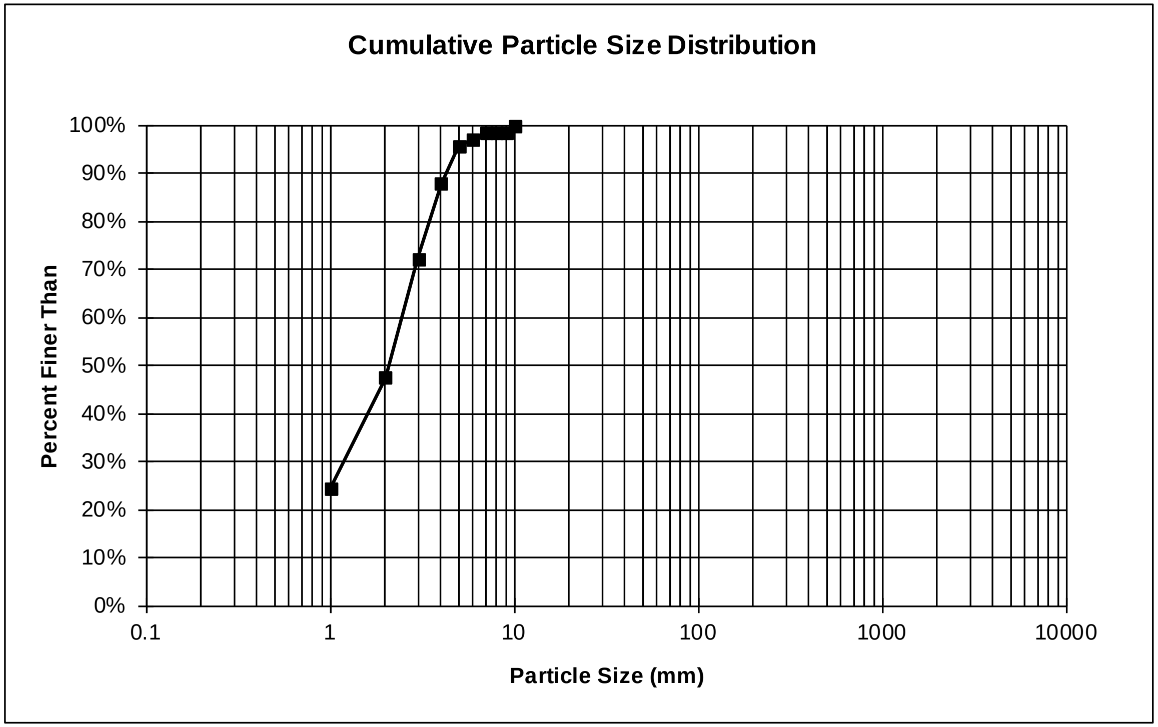
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 139.90 | 24.3% | |
| 0.5 | 133.90 | 23.2% | 24.3% |
| 1.0 | 142.90 | 24.8% | 47.5% |
| 2.0 | 89.40 | 15.5% | 72.2% |
| 2.8 | 45.20 | 7.8% | 87.7% |
| 4.0 | 9.30 | 1.6% | 95.6% |
| 5.6 | 6.60 | 1.1% | 97.2% |
| 8.0 | 1.60 | 0.3% | 98.3% |
| 11.2 | 0.00 | 0.0% | 98.6% |
| 16.0 | 8.10 | 1.4% | 98.6% |
| 16.0 | * | | 100.0% |
| 29.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 576.90 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken 18' upstream from Cross Section B

SITE NAME: Pikes Peak Highway - Boehmer Creek Reach 2
ID NUMBER: BHMR2
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.079 | 0.689 | 1.074 | 2.582 | 3.899 | 16.0 |



**Sieve Analysis Worksheet**

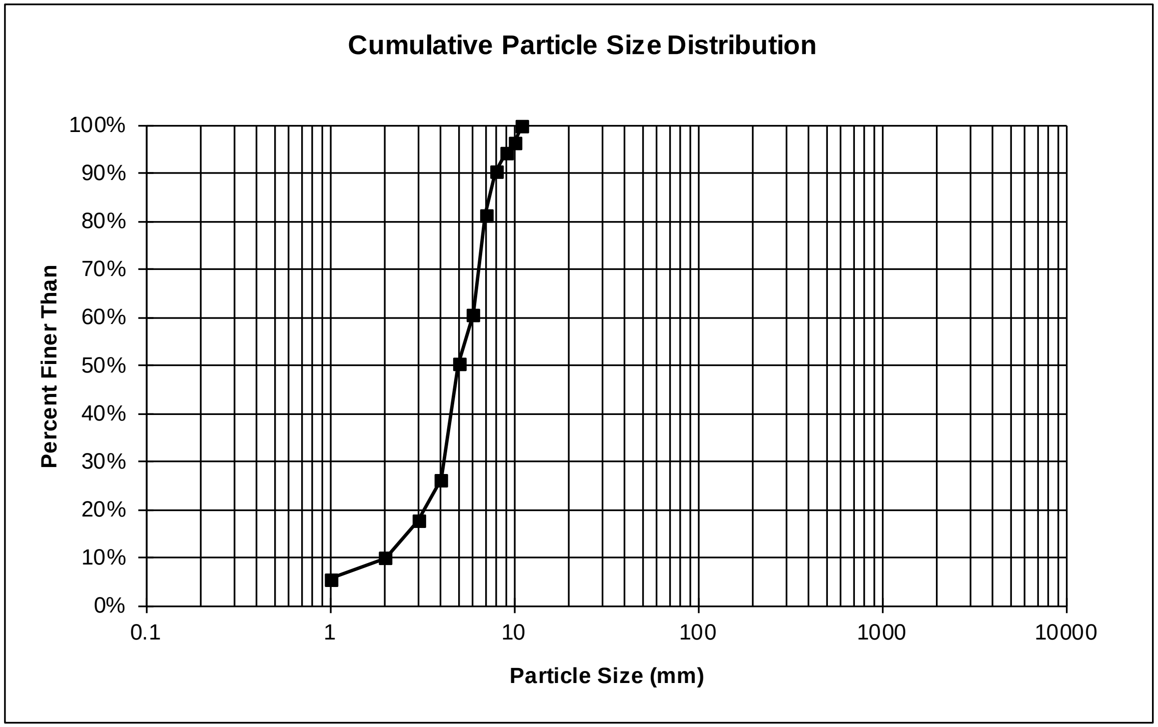
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 31.70 | 5.5% | |
| 0.5 | 25.70 | 4.4% | 5.5% |
| 1.0 | 44.30 | 7.7% | 9.9% |
| 2.0 | 49.60 | 8.6% | 17.6% |
| 2.8 | 138.70 | 24.0% | 26.2% |
| 4.0 | 60.70 | 10.5% | 50.2% |
| 5.6 | 119.20 | 20.6% | 60.7% |
| 8.0 | 51.70 | 8.9% | 81.3% |
| 11.2 | 22.50 | 3.9% | 90.3% |
| 16.0 | 12.20 | 2.1% | 94.2% |
| 22.4 | 21.50 | 3.7% | 96.3% |
| 25.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 577.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** ERO Reach in Colorado Springs Utilities' South Slope Watershed

SITE NAME: Pikes Peak Highway - East Fork Beaver Creek Reach
ID NUMBER: EBVR1
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.581 | 3.192 | 3.989 | 8.846 | 18.270 | 25.0 |



**Sieve Analysis Worksheet**

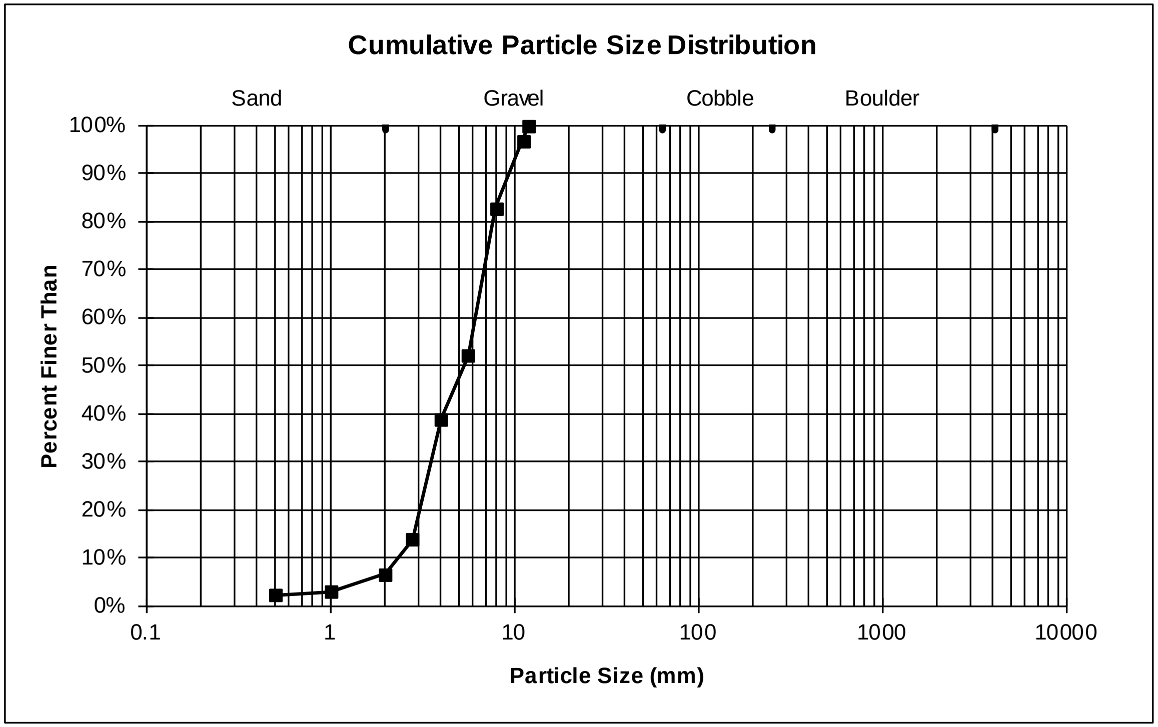
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 8.20 | 2.2% | |
| 0.5 | 2.50 | 0.7% | 2.2% |
| 1.0 | 13.90 | 3.7% | 2.9% |
| 2.0 | 26.70 | 7.1% | 6.6% |
| 2.8 | 94.00 | 25.2% | 13.7% |
| 4.0 | 48.80 | 13.1% | 38.9% |
| 5.6 | 115.00 | 30.8% | 52.0% |
| 8.0 | 52.10 | 13.9% | 82.7% |
| 11.2 | 12.40 | 3.3% | 96.7% |
| 12.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 373.60 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken 6' upstream from Cross Section E

SITE NAME: Pikes Peak Highway - East Fork Beaver Creek Reach 2
ID NUMBER: EBVR2
DATE: 9/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 2.851 | 3.785 | 5.325 | 8.248 | 10.755 | 12.0 |



**Sieve Analysis Worksheet**

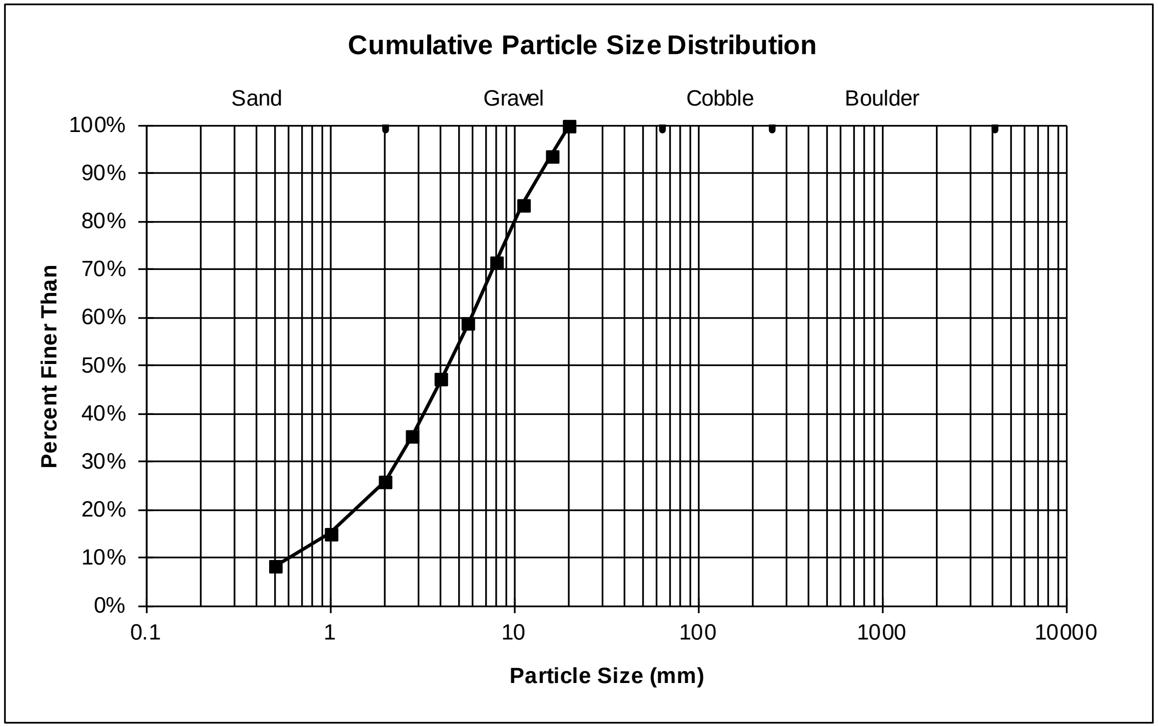
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 47.20 | 8.1% | |
| 0.5 | 40.00 | 6.8% | 8.1% |
| 1.0 | 63.80 | 10.9% | 14.9% |
| 2.0 | 56.10 | 9.6% | 25.8% |
| 2.8 | 68.20 | 11.7% | 35.4% |
| 4.0 | 68.20 | 11.7% | 47.1% |
| 5.6 | 73.70 | 12.6% | 58.8% |
| 8.0 | 70.90 | 12.1% | 71.4% |
| 11.2 | 58.60 | 10.0% | 83.5% |
| 16.0 | 37.80 | 6.5% | 93.5% |
| 20.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 584.50 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken at Cross Section E

SITE NAME: Pikes Peak Highway - Glen Cove Creek Reach 1
ID NUMBER: GLEN1
DATE: 9/9/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.005 | 2.758 | 4.349 | 11.398 | 16.831 | 20.0 |



**Sieve Analysis Worksheet**

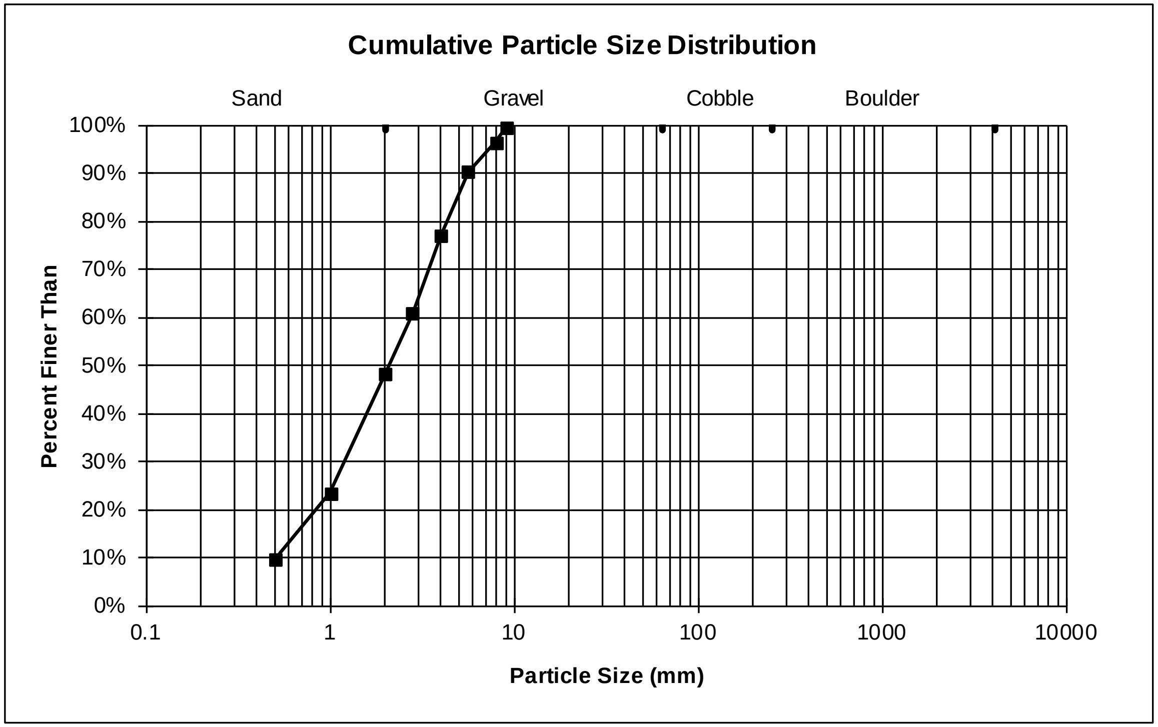
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 38.40 | 9.6% | |
| 0.5 | 55.00 | 13.8% | 9.6% |
| 1.0 | 98.90 | 24.8% | 23.4% |
| 2.0 | 49.80 | 12.5% | 48.3% |
| 2.8 | 64.70 | 16.2% | 60.8% |
| 4.0 | 52.90 | 13.3% | 77.0% |
| 5.6 | 24.50 | 6.2% | 90.3% |
| 8.0 | 11.60 | 2.9% | 96.5% |
| 9.0 | 2.50 | | 99.4% |
| 13.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 398.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken beetwenn Cross Section B and C right bank

SITE NAME: Pikes Peak Highway - North Catamount Creek Reach 1
ID NUMBER: NCAT1
DATE: 8/21/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.654 | 1.380 | 2.095 | 4.773 | 7.351 | 13.0 |



**Sieve Analysis Worksheet**

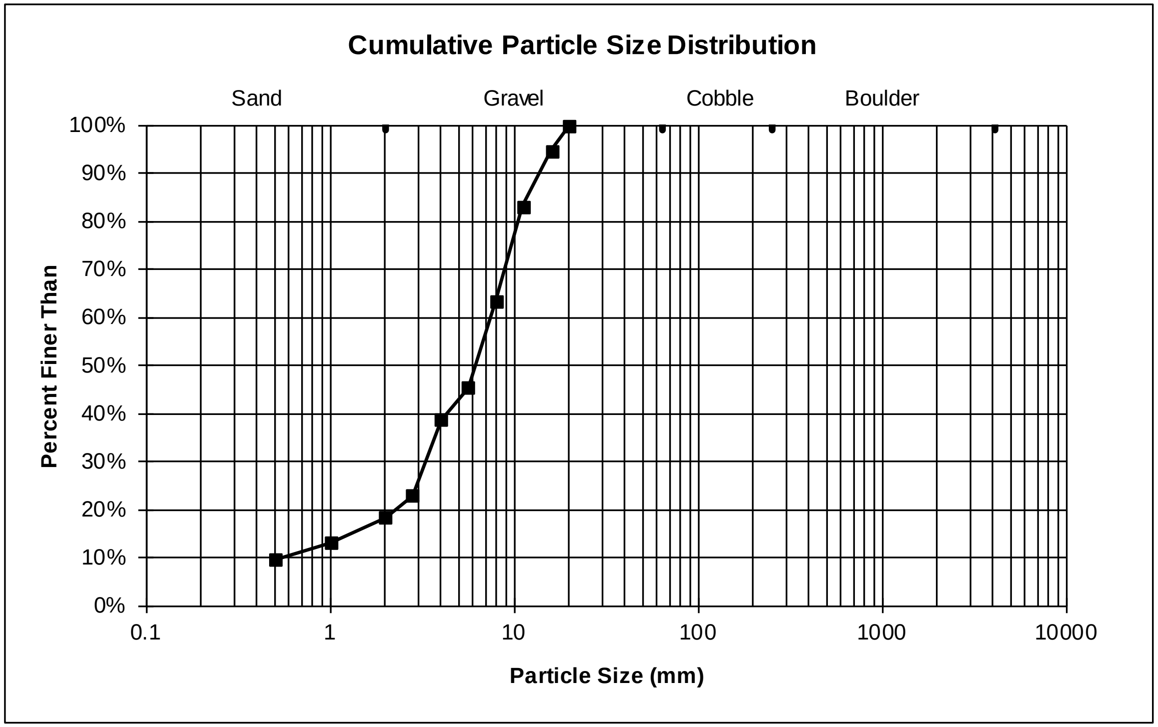
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 36.70 | 9.6% | |
| 0.5 | 13.70 | 3.6% | 9.6% |
| 1.0 | 19.80 | 5.2% | 13.1% |
| 2.0 | 17.40 | 4.5% | 18.3% |
| 2.8 | 61.00 | 15.9% | 22.8% |
| 4.0 | 25.20 | 6.6% | 38.7% |
| 5.6 | 68.80 | 17.9% | 45.3% |
| 8.0 | 76.40 | 19.9% | 63.2% |
| 11.2 | 44.00 | 11.5% | 83.1% |
| 16.0 | 20.80 | 5.4% | 94.6% |
| 20.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 383.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken 3' downstream from Cross Section B

SITE NAME: Pikes Peak Highway - North Catamount Creek Reach 2
ID NUMBER: NCAT2
DATE: 8/21/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.285 | 3.680 | 6.151 | 11.512 | 16.279 | 20.0 |



**Sieve Analysis Worksheet**

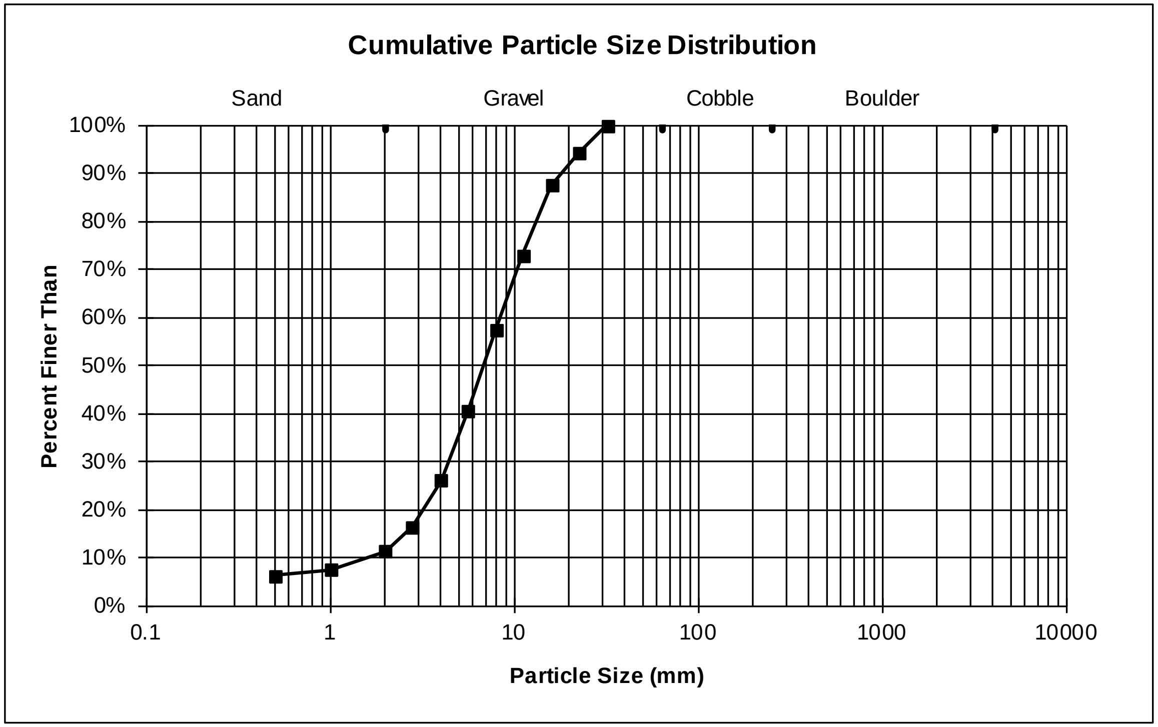
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 54.80 | 6.2% | |
| 0.5 | 11.40 | 1.3% | 6.2% |
| 1.0 | 34.10 | 3.9% | 7.5% |
| 2.0 | 44.50 | 5.1% | 11.4% |
| 2.8 | 83.80 | 9.5% | 16.5% |
| 4.0 | 128.20 | 14.6% | 26.0% |
| 5.6 | 147.30 | 16.7% | 40.6% |
| 8.0 | 137.50 | 15.6% | 57.3% |
| 11.2 | 127.50 | 14.5% | 72.9% |
| 16.0 | 58.90 | 6.7% | 87.4% |
| 22.4 | 51.90 | 5.9% | 94.1% |
| 32.0 | | | 100.0% |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 879.90 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Grab Sample of 2014 Sediment Accumulation at XSD

SITE NAME: Pike's Peak Highway - Oil Creek Reach 1
ID NUMBER: OILC1
DATE: 9/3/2014
CREW: Karlsson. VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 2.541 | 4.926 | 6.849 | 14.713 | 23.651 | 32.0 |



**Sieve Analysis Worksheet**

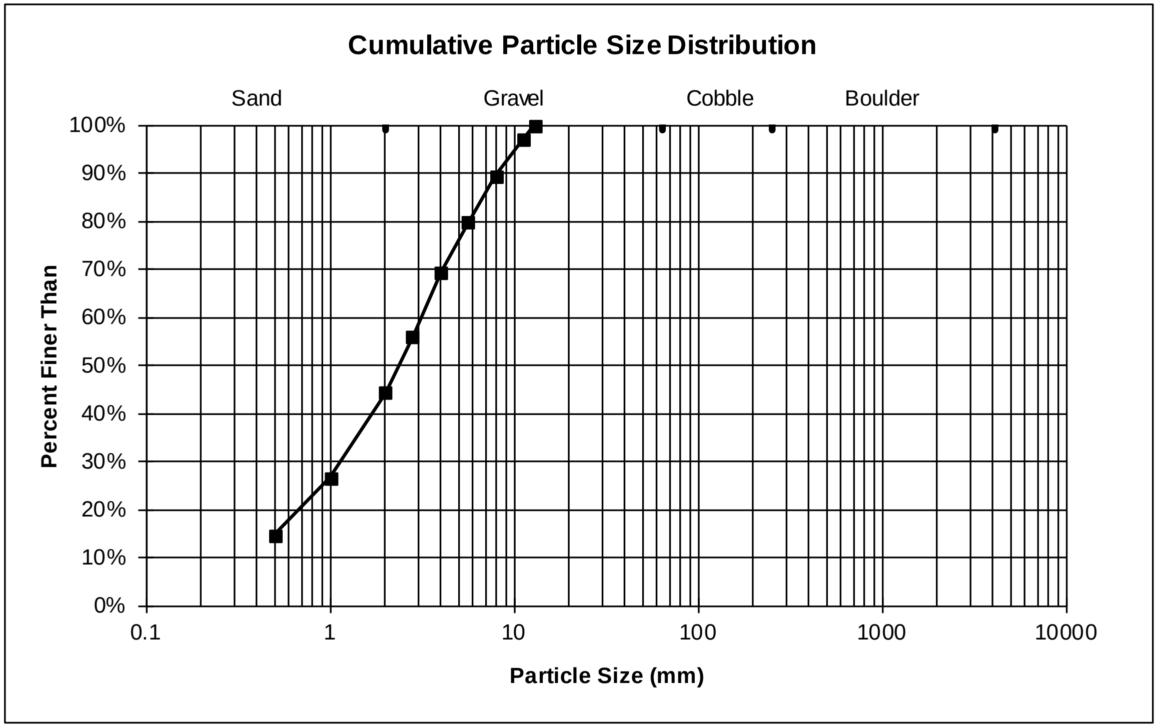
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 72.00 | 14.7% | |
| 0.5 | 58.10 | 11.8% | 14.7% |
| 1.0 | 87.00 | 17.7% | 26.5% |
| 2.0 | 57.20 | 11.7% | 44.3% |
| 2.8 | 65.80 | 13.4% | 55.9% |
| 4.0 | 51.00 | 10.4% | 69.3% |
| 5.6 | 47.30 | 9.6% | 79.7% |
| 8.0 | 37.00 | 7.5% | 89.4% |
| 11.2 | 15.20 | 3.1% | 96.9% |
| 13.0 | * | | 100.0% |
| 22.4 | | | - |
| 32.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 490.60 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken at Cross Section A

SITE NAME: Pikes Peak Highway - Severy Creek Reach 1
ID NUMBER: SVRY1
DATE: 9/24/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.510 | 1.393 | 2.361 | 6.561 | 10.289 | 13.0 |



**Sieve Analysis Worksheet**

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 58.80 | 10.1% | |
| 0.5 | 54.00 | 9.3% | 10.1% |
| 1.0 | 77.80 | 13.3% | 19.3% |
| 2.0 | 61.50 | 10.5% | 32.7% |
| 2.8 | 65.90 | 11.3% | 43.2% |
| 4.0 | 55.40 | 9.5% | 54.5% |
| 5.6 | 49.40 | 8.5% | 64.0% |
| 8.0 | 46.30 | 7.9% | 72.4% |
| 11.2 | 38.70 | 6.6% | 80.4% |
| 16.0 | 35.20 | 6.0% | 87.0% |
| 22.4 | 40.60 | 7.0% | 93.0% |
| 32.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 583.60 | | |

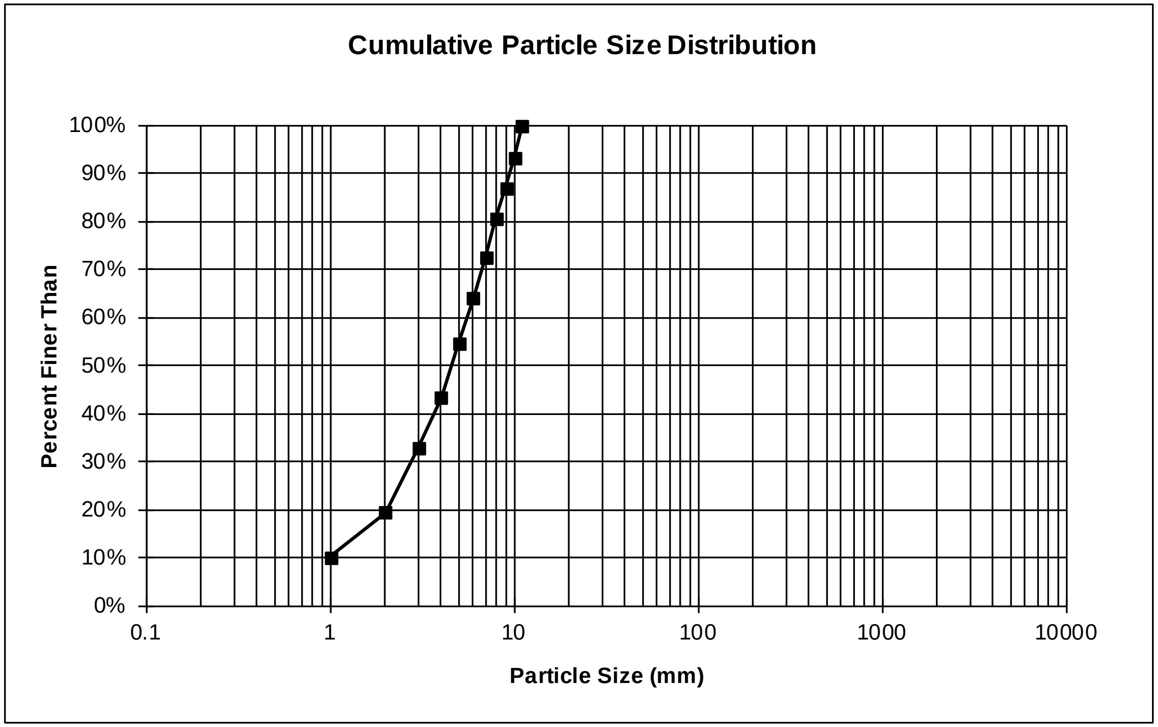
*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken downstream from Cross Section E

SITE NAME: Pike's Peak Highway - Severy Creek Reach 2
ID NUMBER: SVRY2
DATE: 9/20/2012
CREW: Karlsson, VonLoh

**Particle Size Distribution (mm)**

| D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|
| 0.723 | 2.155 | 3.471 | 13.607 | 24.764 | 32.0 |



**Sieve Analysis Worksheet**

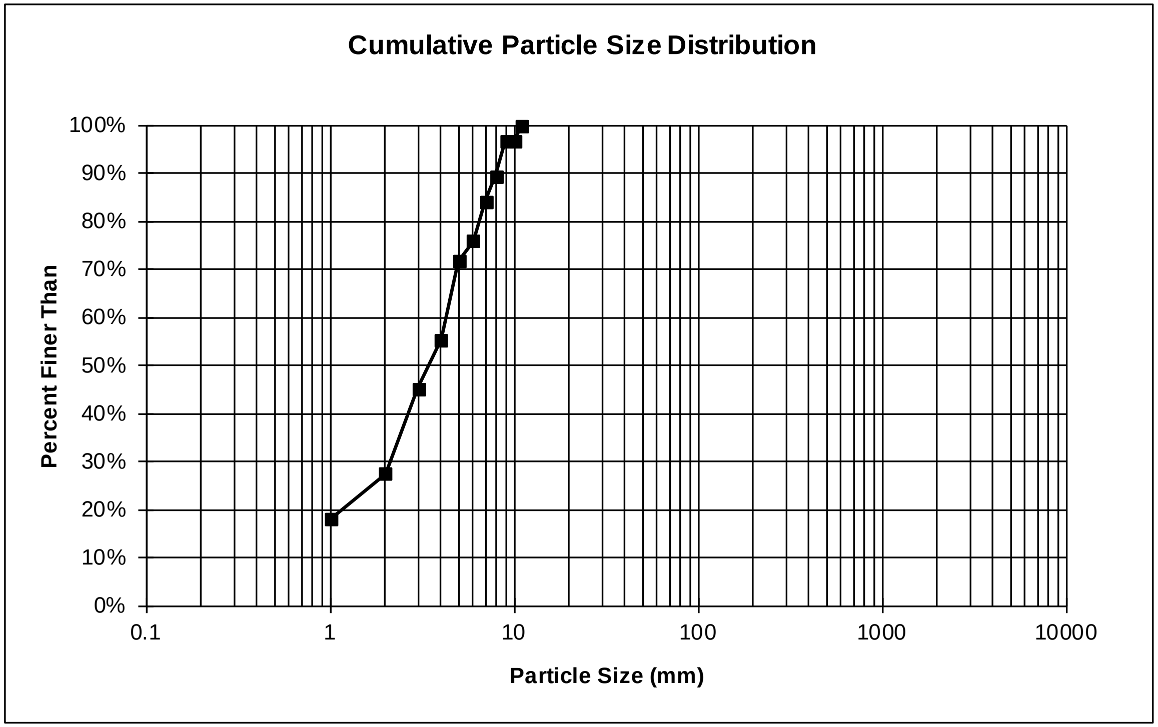
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 83.40 | 18.1% | |
| 0.5 | 43.60 | 9.4% | 18.1% |
| 1.0 | 81.40 | 17.6% | 27.5% |
| 2.0 | 47.30 | 10.2% | 45.1% |
| 2.8 | 75.50 | 16.3% | 55.4% |
| 4.0 | 19.30 | 4.2% | 71.7% |
| 5.6 | 37.70 | 8.2% | 75.9% |
| 8.0 | 24.90 | 5.4% | 84.1% |
| 11.2 | 33.70 | 7.3% | 89.5% |
| 16.0 | 0.00 | 0.0% | 96.8% |
| 22.4 | 15.00 | 3.2% | 96.8% |
| 24.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 461.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken 10' downstream from Cross Section D

SITE NAME: Pike's Peak Highway - Ski Creek Reach 1
ID NUMBER: SKIC1
DATE: 8/20/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.220 | 1.343 | 2.347 | 7.978 | 14.687 | 24.0 |



**Sieve Analysis Worksheet**

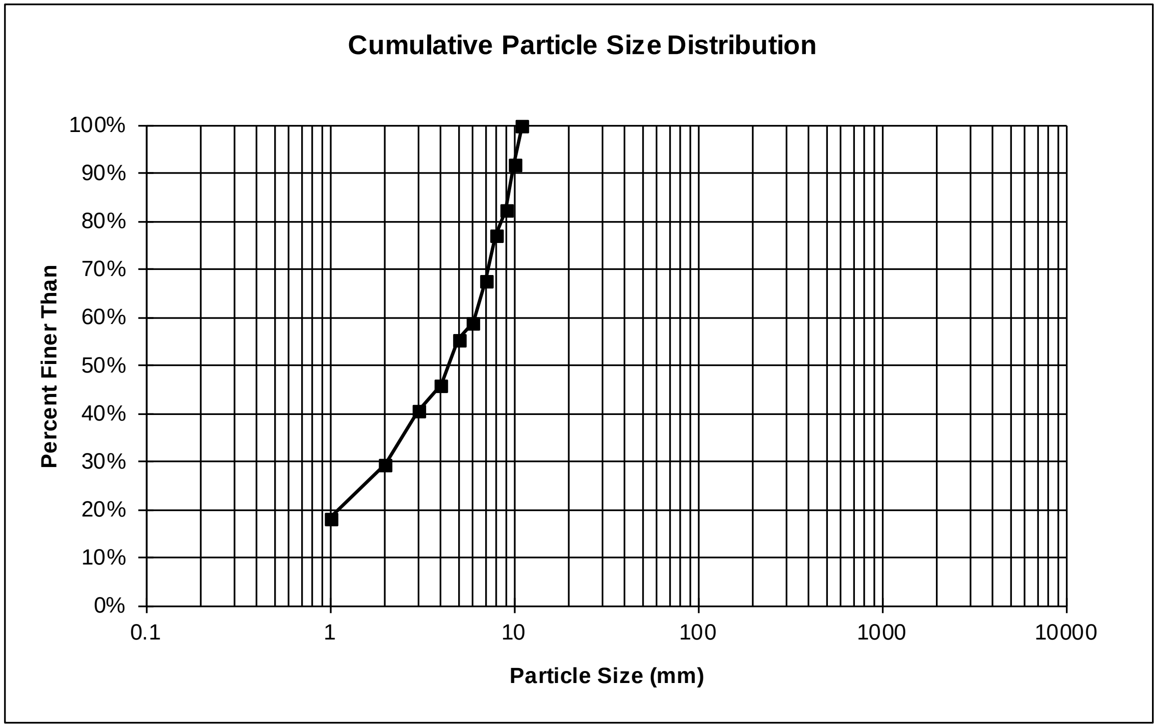
**COMMENTS:** Bar Sample taken 6' upstream from Cross Section A left bank

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 139.60 | 18.2% | |
| 0.5 | 85.60 | 11.2% | 18.2% |
| 1.0 | 84.90 | 11.1% | 29.3% |
| 2.0 | 42.10 | 5.5% | 40.4% |
| 2.8 | 72.00 | 9.4% | 45.9% |
| 4.0 | 26.90 | 3.5% | 55.3% |
| 5.6 | 66.70 | 8.7% | 58.8% |
| 8.0 | 72.20 | 9.4% | 67.5% |
| 11.2 | 41.30 | 5.4% | 76.9% |
| 16.0 | 73.60 | 9.6% | 82.3% |
| 22.4 | 62.40 | 8.1% | 91.9% |
| 31.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 767.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pikes Peak Highway - Ski Creek Reach 2
ID NUMBER: SKIC2
DATE: 8/18/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.213 | 1.425 | 3.272 | 16.998 | 25.386 | 31.0 |



**Sieve Analysis Worksheet**

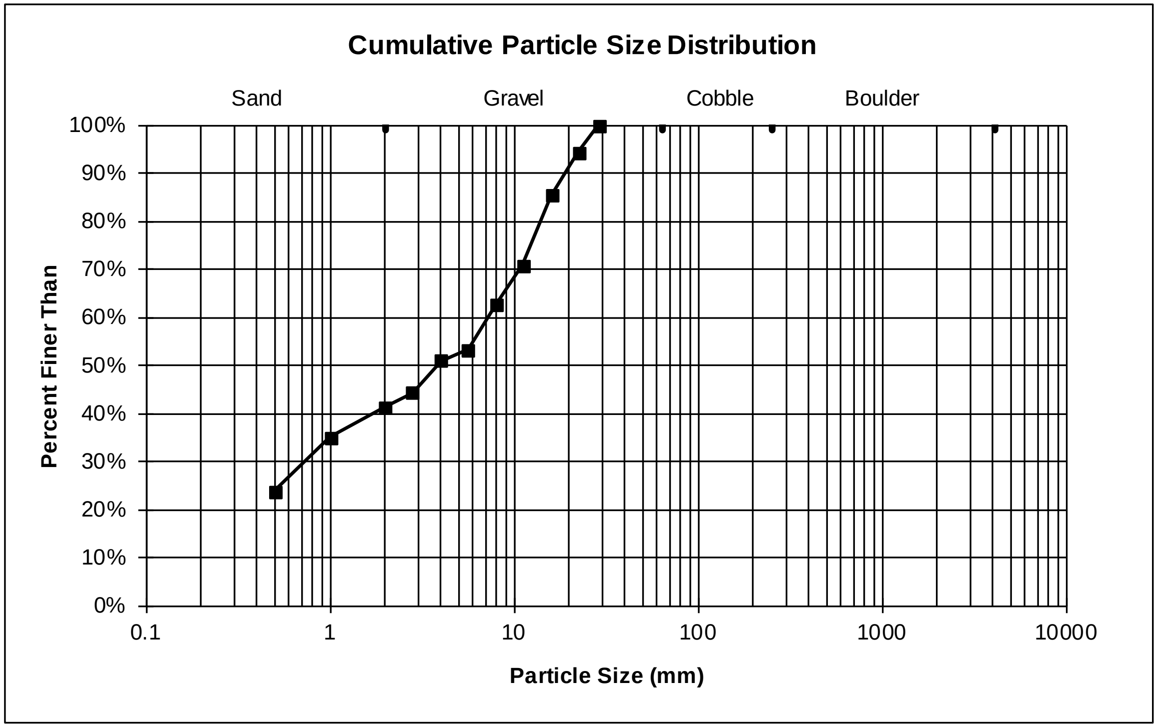
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 149.10 | 23.7% | |
| 0.5 | 71.70 | 11.4% | 23.7% |
| 1.0 | 38.70 | 6.1% | 35.1% |
| 2.0 | 19.80 | 3.1% | 41.2% |
| 2.8 | 41.50 | 6.6% | 44.4% |
| 4.0 | 14.30 | 2.3% | 51.0% |
| 5.6 | 58.80 | 9.3% | 53.2% |
| 8.0 | 52.10 | 8.3% | 62.6% |
| 11.2 | 90.60 | 14.4% | 70.9% |
| 16.0 | 56.70 | 9.0% | 85.3% |
| 22.4 | 36.00 | 5.7% | 94.3% |
| 29.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 629.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken 3' upstream from Cross Section B

SITE NAME: Pikes Peak Highway - South Catamount Creek Reach 1
ID NUMBER: SCAT1
DATE: 8/20/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.084** | **0.995** | **3.794** | **15.505** | **23.141** | **29.0** |



**Sieve Analysis Worksheet**

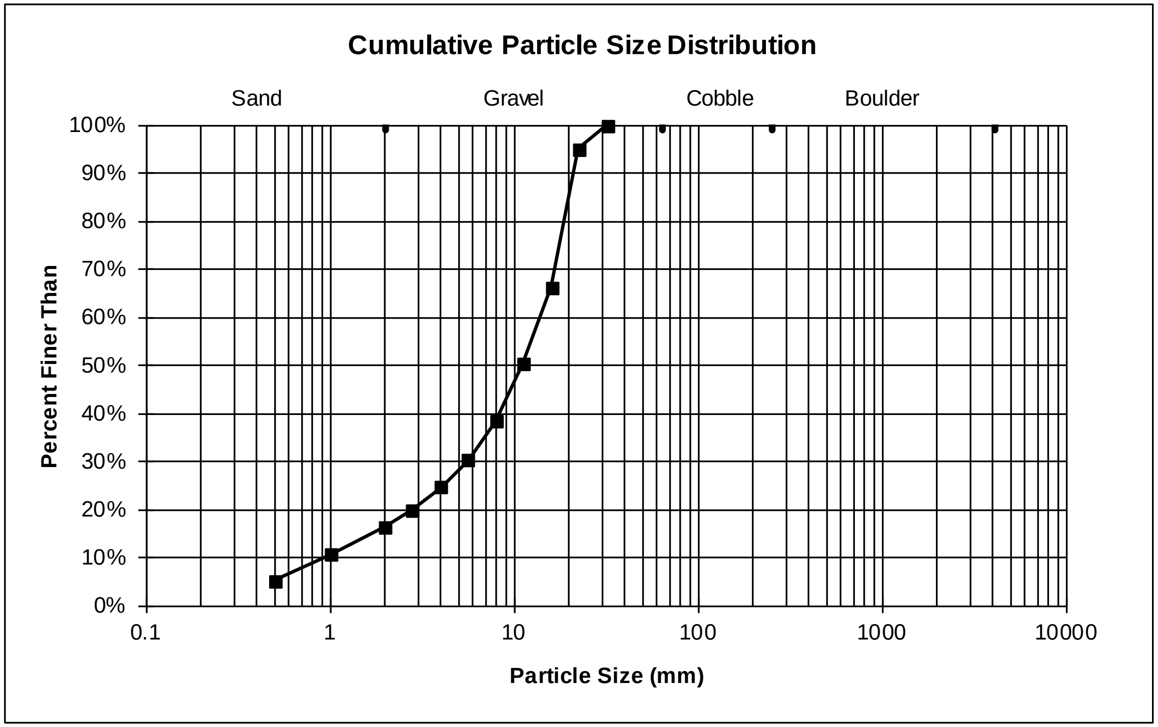
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 37.90 | 5.2% | |
| 0.5 | 40.10 | 5.5% | 5.2% |
| 1.0 | 42.00 | 5.7% | 10.7% |
| 2.0 | 25.90 | 3.5% | 16.4% |
| 2.8 | 34.10 | 4.7% | 20.0% |
| 4.0 | 41.80 | 5.7% | 24.6% |
| 5.6 | 58.50 | 8.0% | 30.4% |
| 8.0 | 87.30 | 11.9% | 38.4% |
| 11.2 | 116.50 | 15.9% | 50.3% |
| 16.0 | 210.70 | 28.8% | 66.2% |
| 22.4 | 36.00 | 4.9% | 95.1% |
| 32.0 | * | | 100.0% |
| 45.0 | | | - |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 730.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken 10' upstream from Cross Section E left bank

SITE NAME: Pikes Peak Highway - South Catamount Creek Reach 2
ID NUMBER: SCAT2
DATE: 9/9/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 1.685 | 6.889 | 11.105 | 19.684 | 22.381 | 32.0 |



**Sieve Analysis Worksheet**

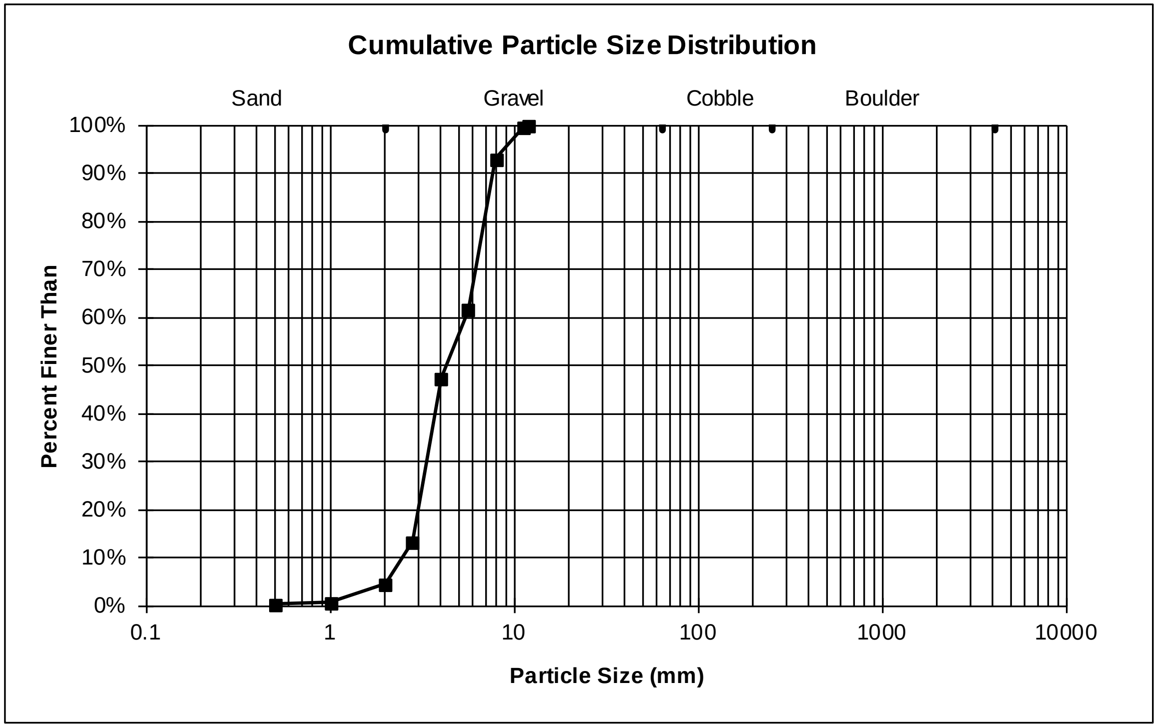
**COMMENTS:** Bar Sample taken 10' downstream from Cross Section D right bank

| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 1.10 | 0.2% | |
| 0.5 | 2.70 | 0.5% | 0.2% |
| 1.0 | 20.70 | 3.8% | 0.7% |
| 2.0 | 47.80 | 8.7% | 4.5% |
| 2.8 | 187.10 | 34.1% | 13.2% |
| 4.0 | 77.80 | 14.2% | 47.3% |
| 5.6 | 172.00 | 31.4% | 61.5% |
| 8.0 | 35.40 | 6.5% | 92.9% |
| 11.2 | 3.70 | 0.7% | 99.3% |
| 12.0 | * | | 100.0% |
| 22.4 | | | - |
| 28.0 | | | |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 548.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - South Catamount Creek Reach 3
ID NUMBER: SCAT3
DATE: 9/9/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 20.890 | 7.509 | 8.268 | 9.435 | 11.899 | 12.0 |



**Sieve Analysis Worksheet**

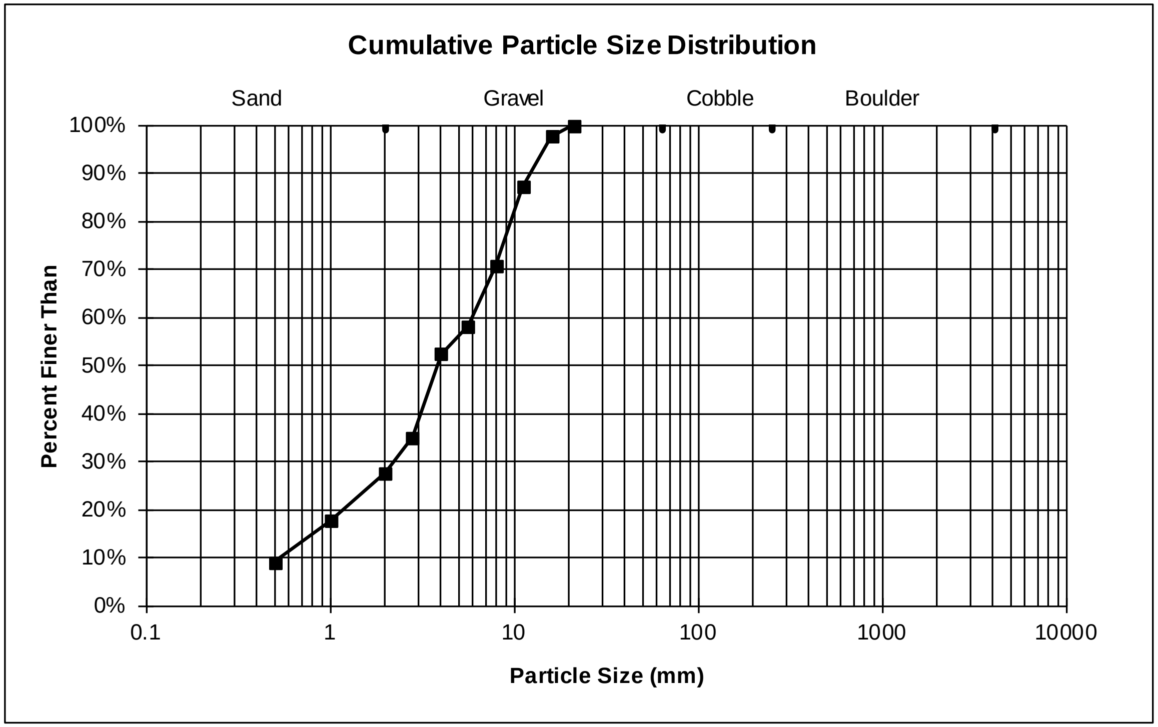
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 73.20 | 9.1% | |
| 0.5 | 69.30 | 8.6% | 9.1% |
| 1.0 | 80.30 | 10.0% | 17.7% |
| 2.0 | 58.70 | 7.3% | 27.6% |
| 2.8 | 140.30 | 17.4% | 34.9% |
| 4.0 | 47.80 | 5.9% | 52.3% |
| 5.6 | 99.10 | 12.3% | 58.2% |
| 8.0 | 133.70 | 16.6% | 70.5% |
| 11.2 | 84.80 | 10.5% | 87.1% |
| 16.0 | 19.10 | 2.4% | 97.6% |
| 21.0 | * | | 100.0% |
| 30.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 806.30 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken between Cross Section B and C left bank

SITE NAME: Pikes Peak Highway - West Fork Beaver Creek Reach 1
ID NUMBER: WBVR1
DATE: 9/16/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | 0.806 | 2.805 | 3.815 | 10.514 | 14.634 | 21.0 |



**Sieve Analysis Worksheet**

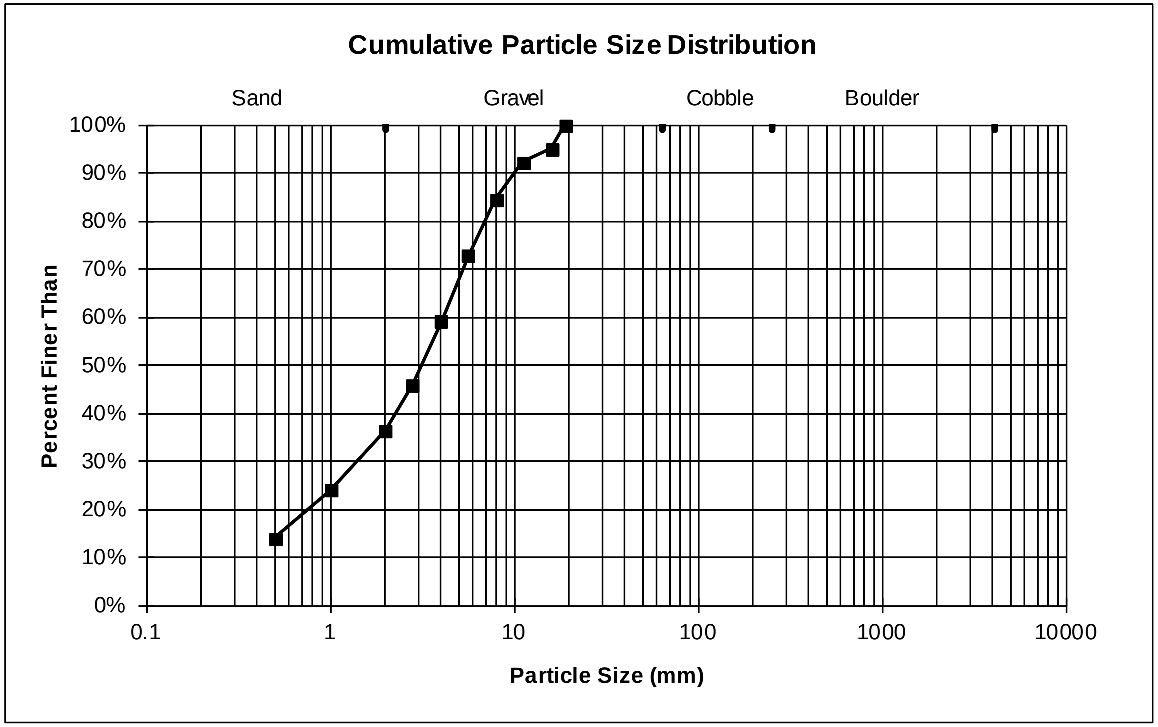
| Size Finer Than (mm) | Wt. on Sieve | % of Total | % Finer Than |
|---|---|---|---|
| Pan | 73.20 | 13.9% | |
| 0.5 | 52.40 | 10.0% | 13.9% |
| 1.0 | 65.00 | 12.4% | 23.9% |
| 2.0 | 50.60 | 9.6% | 36.3% |
| 2.8 | 69.00 | 13.1% | 46.0% |
| 4.0 | 71.50 | 13.6% | 59.1% |
| 5.6 | 61.60 | 11.7% | 72.7% |
| 8.0 | 40.20 | 7.7% | 84.5% |
| 11.2 | 15.50 | 3.0% | 92.1% |
| 16.0 | 25.80 | 4.9% | 95.1% |
| 19.0 | * | | 100.0% |
| 32.0 | | | - |
| 45.0 | | | |
| 64.0 | | | |
| 90 | | | |
| 128 | | | |
| 181 | | | |
| 256 | | | |
| 362 | | | |
| 512 | | | |
| 1024 | | | |
| 2048 | | | |
| 4096 | | | |
| Total | 524.80 | | |

*Measured value of the largest particle in the sample and not a sieve weight

**COMMENTS:** Bar Sample taken between Cross Section D and E

SITE NAME: Pikes Peak Highway - West Fork Beaver Creek Reach 2
ID NUMBER: WBVR2
DATE: 9/16/2014
CREW: Karlsson, VonLoh

| Particle Size Distribution (mm) | D15 | D35 | D50 | D84 | D95 | Lpart |
|---|---|---|---|---|---|---|
| | **0.538** | **1.858** | **3.124** | **7.886** | **15.839** | **19.0** |



# Appendix P

# Riparian Vegetation Summary

# 2014

## Riparian Vegetation Summary, Pikes Peak 2014

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| BHMR1 | 09/18/2014 | Olympus Stylus 400 | A (24.36) | Downstream from XSE | Left | 11.2 | 14.0 | 30 | Grass, Sedge, Forb |
| BHMR1 | | Olympus Stylus 400 | A | | Right | 13.4 | 10.5 | 35 | Grass, Sedge |
| BHMR1 | | Olympus Stylus 400 | B (31.95) | | Left | 6.5 | 10.8 | 20 | Grass, Sedge, Forb |
| BHMR1 | | Olympus Stylus 400 | B | | Right | 9.9 | 5.8 | 20 | Grass, Sedge |
| BHMR1 | | Olympus Stylus 400 | C (16.81) | | Left | 8.2 | 13.0 | 15 | Grass, Sedge, Forb |
| BHMR1 | | Olympus Stylus 400 | C | | Right | 11.8 | 7.5 | 20 | Sedge, Forb |
| BHMR1 | | Olympus Stylus 400 | D (20.28) | | Left | 7.4 | 11.0 | 25 | Grass, Sedge, Forb |
| BHMR1 | | Olympus Stylus 400 | D | | Right | 10.6 | 7.0 | 25 | Grass, Sedge, Forb |
| BHMR1 | | Olympus Stylus 400 | E (34.42) | | Left | 21.8 | 27.0 | 35 | Sedge, Forb |
| BHMR1 | | Olympus Stylus 400 | E | | Right | 27.6 | 22.5 | 30 | Grass, Sedge |
| BHMR2 | 9/18/2014 | Olympus Stylus 400 | A (25.43) | 10' downstream from XSE | Left | 6.0 | 11.0 | 15 | Sedge, Forb |
| BHMR2 | | Olympus Stylus 400 | A | | Right | 10.0 | 6.0 | 20 | Sedge, Forb |
| BHMR2 | | Olympus Stylus 400 | B (17.59) | | Left | 6.9 | 10.0 | 25 | Grass, Sedge, Forb |
| BHMR2 | | Olympus Stylus 400 | B | | Right | 10.0 | 6.0 | 20 | Grass, Sedge, Forb |
| BHMR2 | | Olympus Stylus 400 | C (18.46) | | Left | 6.0 | 10.0 | 20 | Sedge, Forb, Shrub |
| BHMR2 | | Olympus Stylus 400 | C | | Right | 9.4 | 6.0 | 15 | Sedge, Forb |
| BHMR2 | | Olympus Stylus 400 | D (30.44) | | Left | 15.5 | 19.0 | 25 | Grass, Sedge, Forb |
| BHMR2 | | Olympus Stylus 400 | D | | Right | 18.6 | 15.0 | 30 | Sedge |
| BHMR2 | | Olympus Stylus 400 | E (43.02) | | Left | 11.0 | 16.0 | 15 | Sedge, Forb |
| BHMR2 | | Olympus Stylus 400 | E | | Right | 14.7 | 11.5 | 20 | Sedge |
| EBVR1 | 09/18/2014 | Olympus Stylus 400 | A (20.70) | 2' downstream from XSB right bank | Left | 1.3 | 5.0 | 0 | Rock |
| EBVR1 | | Olympus Stylus 400 | A | | Right | 17.1 | 16.6 | 5 | Grass, Sedge, Shrub |
| EBVR1 | | Olympus Stylus 400 | B (24.53) | | Left | 3.0 | 5.0 | 20 | Grass, Sedge, Forb |
| EBVR1 | | Olympus Stylus 400 | B | | Right | 13.5 | 9.0 | 35 | Grass, Forb |

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| EBVR1 | | Olympus Stylus 400 | C (29.05) | | Left | 6.8 | 11.0 | 30 | Grass, Sedge, Forb |
| EBVR1 | | Olympus Stylus 400 | C | | Right | 17.0 | 12.0 | 15 | Moss, Sedge, Shrub |
| EBVR1 | | Olympus Stylus 400 | D (12.77) | | Left | 3.5 | 6.0 | 45 | Moss, Forb, Shrub |
| EBVR1 | | Olympus Stylus 400 | D | | Right | 9.0 | 5.0 | 40 | Moss, Forb, Shrub |
| EBVR1 | | Olympus Stylus 400 | E (18.48) | | Left | 8.3 | 11.0 | 35 | Moss, Forb, Shrub |
| EBVR1 | | Olympus Stylus 400 | E | | Right | 13.6 | 10.0 | 75 | Moss, Shrub |
| EBVR2 | 9/18/2014 | Olympus Stylus 400 | A (37.63) | 5' upstream from XSE left bank | Left | 14.3 | 20.0 | 25 | Grass, Sedge |
| EBVR2 | | Olympus Stylus 400 | A | | Right | 20.0 | 16.0 | 30 | Grass, Sedge |
| EBVR2 | | Olympus Stylus 400 | B (21.24) | | Left | 9.2 | 15.0 | 25 | Grass, Sedge, Forb |
| EBVR2 | | Olympus Stylus 400 | B | | Right | 14.3 | 11.0 | 25 | Grass, Sedge, Forb |
| EBVR2 | | Olympus Stylus 400 | C (20.46) | | Left | 9.2 | 13.0 | 15 | Grass, Forb |
| EBVR2 | | Olympus Stylus 400 | C | | Right | 13.4 | 11.0 | 20 | Grass, Sedge, Forb |
| EBVR2 | | Olympus Stylus 400 | D (17.45) | | Left | 7.7 | 12.5 | 15 | Grass, Sedge, Forb |
| EBVR2 | | Olympus Stylus 400 | D | | Right | 13.2 | 10.0 | 15 | Grass, Forb |
| EBVR2 | | Olympus Stylus 400 | E (19.66) | | Left | 9.8 | 14.0 | 20 | Grass, Sedge, Forb |
| EBVR2 | | Olympus Stylus 400 | E | | Right | 14.6 | 11.0 | 20 | Sedge |
| GLEN1 | 9/09/2014 | Olympus Stylus 400 | A (20.03) | Downstream from XSE right bank | Left | 9.0 | 12.0 | 25 | Moss, Grass, Sedge, Forb, Shrub |
| GLEN1 | | Olympus Stylus 400 | A | | Right | 13.0 | 8.5 | 75 | Moss, Sedge, Forb, Shrub, Tree |
| GLEN1 | | Olympus Stylus 400 | B(16.57) | | Left | 6.3 | 9.5 | 5 | Grass, Sediment |
| GLEN1 | | Olympus Stylus 400 | B | | Right | 9.0 | 5.7 | 15 | Grass, Forb, Shrub |
| GLEN1 | | Olympus Stylus 400 | C (17.31) | | Left | 5.9 | 9.9 | 15 | Sedge, Shrub |
| GLEN1 | | Olympus Stylus 400 | C | | Right | 9.6 | 6.0 | 30 | Grass, Sedge |
| GLEN1 | | Olympus Stylus 400 | D (49.99) | | Left | 18.5 | 23.0 | 10 | Moss, Grass, Shrub, Tree |
| GLEN1 | | Olympus Stylus 400 | D | | Right | 24.0 | 20.0 | 15 | Grass, Sedge, Forb |
| GLEN1 | | Olympus Stylus 400 | E (24.29) | | Left | 8.0 | 16.5 | 20 | Sedge, Forb, Shrub |
| GLEN1 | | Olympus Stylus 400 | E | | Right | 14.7 | 12.0 | 10 | Grass, Forb |

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| NCAT1 | 8/21/2014 | Olympus Stylus 400 | A (57.53) | XSC right bank | Left | 12.0 | 17.0 | 15 | Grass, Sedge, Forb |
| NCAT1 | | Olympus Stylus 400 | A | | Right | 16.5 | 12.0 | 20 | Grass, Sedge, Forb |
| NCAT1 | | Olympus Stylus 400 | B (58.83) | | Left | 46.0 | 50.0 | 35 | Grass, Sedge |
| NCAT1 | | Olympus Stylus 400 | B | | Right | 50.5 | 47.0 | 35 | Grass, Sedge, Shrub |
| NCAT1 | | Olympus Stylus 400 | C (38.85) | | Left | 16.7 | 21.5 | 35 | Grass, Sedge, Shrub |
| NCAT1 | | Olympus Stylus 400 | C | | Right | 30.3 | 26.0 | 20 | Grass, Sedge, Forb, |
| NCAT1 | | Olympus Stylus 400 | D (44.77) | | Left | 28.5 | 30.0 | 45 | Sedge, Forb, Shrub |
| NCAT1 | | Olympus Stylus 400 | D | | Right | 32.5 | 29.3 | 50 | Sedge, Shrub |
| NCAT1 | | Olympus Stylus 400 | E (60.78) | | Left | 42.8 | 47.0 | 35 | Grass, Sedge, Shrub |
| NCAT1 | | Olympus Stylus 400 | E | | Right | 45.5 | 41.0 | 35 | Moss, Grass, Sedge |
| NCAT2 | 8/21/2014 | Olympus Stylus 400 | A (29.17) | 6' upstream from XSB right bank | Left | 12.0 | 16.5 | 30 | Sedge, Forb, Shrub |
| NCAT2 | | Olympus Stylus 400 | A | | Right | 16.2 | 12.0 | 30 | Sedge, Forb, Shrub |
| NCAT2 | | Olympus Stylus 400 | B (40.59) | | Left | 8.8 | 13.0 | 30 | Sedge, Forb |
| NCAT2 | | Olympus Stylus 400 | B | | Right | 11.8 | 8.0 | 25 | Grass, Sedge, Forb, Shrub |
| NCAT2 | | Olympus Stylus 400 | C (42.34) | | Left | 11.5 | 17.0 | 25 | Grass, Sedge, Forb |
| NCAT2 | | Olympus Stylus 400 | C | | Right | 16.4 | 11.5 | 30 | Grass, Sedge, Forb |
| NCAT2 | | Olympus Stylus 400 | D (29.78) | | Left | 6.0 | 10.5 | 35 | Sedge, Forb, Shrub |
| NCAT2 | | Olympus Stylus 400 | D | | Right | 9.7 | 5.0 | 25 | Sedge, Forb |
| NCAT2 | | Olympus Stylus 400 | E (34.25) | | Left | 10.0 | 15.0 | 50 | Moss, Grass, Sedge, Forb, Shrub |
| NCAT2 | | Olympus Stylus 400 | E | | Right | 13.1 | 2.5 | 25 | Sedge, Forb |
| NCRY1 | 8/19/2014 | Olympus Stylus 400 | A (54.53) | None collected | Left | 35.5 | 39.0 | 15 | Grass, Sedge, Forb |
| NCRY1 | | Olympus Stylus 400 | A | | Right | 38.5 | 36.0 | 10 | Grass, Forb, Tree |
| NCRY1 | | Olympus Stylus 400 | B (51.31) | | Left | 38.8 | 42.0 | 25 | Moss, Grass, Forb, Tree |
| NCRY1 | | Olympus Stylus 400 | B | | Right | 41.5 | 38.0 | 15 | Grass, Shrub |
| NCRY1 | | Olympus Stylus 400 | C (43.61) | | Left | 26.3 | 29.0 | 75 | Moss, Grass, Forb, Tree |
| NCRY1 | | Olympus Stylus 400 | C | | Right | 28.7 | 25.0 | 80 | Moss, Grass, Forb, Tree |
| NCRY1 | | Olympus Stylus 400 | D (41.53) | | Left | 29.6 | 32.8 | 15 | Grass, Forb |

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| NCRY1 | | Olympus Stylus 400 | D | | Right | 31.5 | 29.5 | 10 | Moss, Grass, Forb |
| NCRY1 | | Olympus Stylus 400 | E (37.98) | | Left | 30.0 | 33.7 | 40 | Grass |
| NCRY1 | | Olympus Stylus 400 | E | | Right | 34.3 | 31.0 | 90 | Moss, Grass, Forb |
| NCRY2 | 8/19/2014 | Olympus Stylus 400 | A (24.23) | None collected | Left | 10.5 | 15.5 | 20 | Moss, Grass, Forb |
| NCRY2 | | Olympus Stylus 400 | A | | Right | 20.6 | 15.0 | 10 | Grass, Forb |
| NCRY2 | | Olympus Stylus 400 | B (35.00) | | Left | 21.4 | 25.0 | 10 | Moss, Forb |
| NCRY2 | | Olympus Stylus 400 | B | | Right | 30.5 | 26.0 | 10 | Moss, Forb |
| NCRY2 | | Olympus Stylus 400 | C (33.82) | | Left | 19.3 | 24.0 | 30 | Grass, Forb |
| NCRY2 | | Olympus Stylus 400 | C | | Right | 27.4 | 23.0 | 20 | Moss, Grass, Forb |
| NCRY2 | | Olympus Stylus 400 | D (28.71) | | Left | 14.5 | 18.3 | 5 | Grass, Tree |
| NCRY2 | | Olympus Stylus 400 | D | | Right | 22.9 | 19.3 | 0 | Sediment |
| NCRY2 | | Olympus Stylus 400 | E (34.35) | | Left | 5.3 | 7.1 | 5 | Grass, Tree |
| NCRY2 | | Olympus Stylus 400 | E | | Right | 18.4 | 15.6 | 60 | Moss, Grass, Tree |
| OILC1 | 9/3/2014 | Olympus Stylus 400 | A (43.95) | 8' downstream from XSD right bank | Left | 10.5 | 13.5 | 30 | Moss, Grass, Sedge, Forb |
| OILC1 | | Olympus Stylus 400 | A | | Right | 16.6 | 14.0 | 25 | Sedge, Shrub |
| OILC1 | | Olympus Stylus 400 | B (41.34) | | Left | 9.8 | 12.0 | 20 | Grass, Sedge |
| OILC1 | | Olympus Stylus 400 | B | | Right | 15.0 | 13.0 | 5 | Grass, Sedge |
| OILC1 | | Olympus Stylus 400 | C (32.67) | | Left | 16.2 | 19.0 | 15 | Sedge |
| OILC1 | | Olympus Stylus 400 | C | | Right | 20.0 | 17.5 | 40 | Sedge |
| OILC1 | | Olympus Stylus 400 | D (33.98) | | Left | 13.9 | 18.0 | 5 | Grass, Sedge, Sediment |
| OILC1 | | Olympus Stylus 400 | D | | Right | 21.0 | 17.5 | 30 | Sedge |
| OILC1 | | Olympus Stylus 400 | E (38.35) | | Left | 8.9 | 12.0 | 45 | Grass, Sedge, Shrub |
| OILC1 | | Olympus Stylus 400 | E | | Right | 15.6 | 11.0 | 55 | Moss, Sedge |
| SCAT1 | 8/20/2014 | Olympus Stylus 400 | A (22.96) | XSA <> XSB left bank | Left | 6.4 | 11.5 | 25 | Moss, Grass, Forb |
| SCAT1 | | Olympus Stylus 400 | A | | Right | 11.2 | 8.9 | 85 | Moss, Grass, Forb, Shrub |
| SCAT1 | | Olympus Stylus 400 | B (20.83) | | Left | 10.5 | 14.0 | 75 | Moss, Grass, Forb, Tree |

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| SCAT1 | | Olympus Stylus 400 | B | | Right | 18.3 | 14.0 | 25 | Moss, Fungi, Grass, Forb |
| SCAT1 | | Olympus Stylus 400 | C (21.86) | | Left | 4.0 | 10.0 | 10 | Moss, Grass, Forb, Tree |
| SCAT1 | | Olympus Stylus 400 | C | | Right | 13.7 | 9.6 | 20 | Grass, Forb |
| SCAT1 | | Olympus Stylus 400 | D (18.12) | | Left | 5.5 | 12.0 | 35 | Moss, Fungi, Grass, Forb |
| SCAT1 | | Olympus Stylus 400 | D | | Right | 11.7 | 6.0 | 70 | Moss, Grass, Forb |
| SCAT1 | | Olympus Stylus 400 | E (24.02) | | Left | 10.0 | 16.0 | 25 | Moss, Grass, Forb, Shrub |
| SCAT1 | | Olympus Stylus 400 | E | | Right | 15.5 | 10.0 | 75 | Moss, Fungi, Grass, Forb, Shrub |
| SCAT2 | 9/9/2014 | Olympus Stylus 400 | A (28.57) | 4' downstream from XSE | Left | 4.2 | 9.0 | 35 | Moss, Grass, Sedge, Forb |
| SCAT2 | | Olympus Stylus 400 | A | | Right | 15.0 | 9.5 | 20 | Moss, Grass, Tree |
| SCAT2 | | Olympus Stylus 400 | B (17.05) | | Left | 3.0 | 7.0 | 5 | Sedge, Forb, Tree |
| SCAT2 | | Olympus Stylus 400 | B | | Right | 11.3 | 7.0 | 25 | Moss, Forb |
| SCAT2 | | Olympus Stylus 400 | C (19.81) | | Left | 4.0 | 6.0 | 30 | Moss, Grass, Forb |
| SCAT2 | | Olympus Stylus 400 | C | | Right | 13.2 | 9.0 | 10 | Moss, Grass |
| SCAT2 | | Olympus Stylus 400 | D (38.50) | | Left | 7.6 | 11.0 | 25 | Moss, Grass, Forb |
| SCAT2 | | Olympus Stylus 400 | D | | Right | 15.4 | 12.7 | 30 | Moss, Grass, Forb, Tree |
| SCAT2 | | Olympus Stylus 400 | E (18.95) | | Left | 3.3 | 7.0 | 25 | Moss, Grass, Forb |
| SCAT2 | | Olympus Stylus 400 | E | | Right | 11.2 | 8.0 | 35 | Moss, Grass, Forb |
| SCAT3 | 9/9/2014 | Olympus Stylus 400 | A (44.32) | Downstream from XSA right bank | Left | 26.0 | 29.4 | 20 | Moss, Grass, Sedge, Forb |
| SCAT3 | | Olympus Stylus 400 | A | | Right | 29.0 | 25.2 | 35 | Moss, Grass, Forb |
| SCAT3 | | Olympus Stylus 400 | B (32.19) | | Left | 12.3 | 16.0 | 25 | Moss, Grass, Tree |
| SCAT3 | | Olympus Stylus 400 | B | | Right | 15.5 | 12.7 | 25 | Grass, Sedge, Forb |
| SCAT3 | | Olympus Stylus 400 | C (15.79) | | Left | 2.6 | 6.8 | 40 | Moss, Grass, Forb |
| SCAT3 | | Olympus Stylus 400 | C | | Right | 6.2 | 3.1 | 30 | Moss, Grass, Sedge, Forb |
| SCAT3 | | Olympus Stylus 400 | D (19.60) | | Left | 8.0 | 11.6 | 30 | Grass, Forb |
| SCAT3 | | Olympus Stylus 400 | D | | Right | 10.0 | 8.1 | 30 | Grass, Forb |
| SCAT3 | | Olympus Stylus 400 | E (18.48) | | Left | 4.6 | 8.2 | 35 | Grass, Forb, Shrub |

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| SCAT3 | | Olympus Stylus 400 | E | | Left | 6.5 | 3.8 | 20 | Grass, Forb |
| SKIC1 | 8/20/2014 | Olympus Stylus 400 | A (15.04) | 5' downstream from XSC | Left | 6.2 | 8.0 | 25 | Moss, Grass, Forb |
| SKIC1 | | Olympus Stylus 400 | A | | Right | 11.1 | 8.5 | 40 | Moss, Grass, Forb |
| SKIC1 | | Olympus Stylus 400 | B (14.15) | | Left | 5.1 | 7.0 | 5 | Moss, Forb |
| SKIC1 | | Olympus Stylus 400 | B | | Right | 10.5 | 7.5 | 15 | Moss, Forb |
| SKIC1 | | Olympus Stylus 400 | C (16.60) | | Left | 4.1 | 9.0 | 35 | Moss, Grass, Forb |
| SKIC1 | | Olympus Stylus 400 | C | | Right | 11.0 | 7.0 | 30 | Moss, Grass, Forb, Tree |
| SKIC1 | | Olympus Stylus 400 | D (33.57) | | Left | 16.0 | 19.5 | 55 | Moss, Grass, Forb |
| SKIC1 | | Olympus Stylus 400 | D | | Right | 23.2 | 19.5 | 5 | Moss, Grass, Forb |
| SKIC1 | | Olympus Stylus 400 | E (21.78) | | Left | 14.5 | 17.5 | 35 | Moss, Grass, Forb |
| SKIC1 | | Olympus Stylus 400 | E | | Right | 19.2 | 15.0 | 60 | Moss, Grass, Forb |
| SKIC2 | 8/20/2014 | Olympus Stylus 400 | A (50.70) | 6' upstream from XSA left bank | Left | 32.8 | 36.0 | 20 | Moss, Grass, Forb, Shrub |
| SKIC2 | | Olympus Stylus 400 | A | | Right | 40.7 | 35.0 | 35 | Moss, Grass, Forb, Tree |
| SKIC2 | | Olympus Stylus 400 | B (46.73) | | Left | 28.5 | 35.5 | 40 | Moss |
| SKIC2 | | Olympus Stylus 400 | B | | Right | 34.5 | 32.5 | 10 | Moss, Grass, Forb, Shrub |
| SKIC2 | | Olympus Stylus 400 | C (29.76) | | Left | 2.6 | 6.0 | 20 | Moss, Grass, Forb, Shrub |
| SKIC2 | | Olympus Stylus 400 | C | | Right | 10.6 | 7.0 | 5 | Forb |
| SKIC2 | | Olympus Stylus 400 | D (28.31) | | Left | 4.3 | 11.0 | 25 | Moss, Forb |
| SKIC2 | | Olympus Stylus 400 | D | | Right | 12.5 | 8.0 | 5 | Grass, Forb |
| SKIC2 | | Olympus Stylus 400 | E (41.90) | | Left | 24.9 | 31.0 | 25 | Lichen, Moss, Grass, Forb |
| SKIC2 | | Olympus Stylus 400 | E | | Right | 31.1 | 26.0 | 5 | Moss, Grass |
| SVRY1 | 9/24/2014 | Olympus Stylus 400 | A (13.70) | Upstream from XSA | Left | 2.0 | 7.0 | 35 | Grass, Sedge, Forb |
| SVRY1 | | Olympus Stylus 400 | A | | Right | 7.8 | 4.0 | 25 | Grass, Sedge, Forb |
| SVRY1 | | Olympus Stylus 400 | B (11.83) | | Left | 5.0 | 8.0 | 20 | Sedge, Forb, Shrub |
| SVRY1 | | Olympus Stylus 400 | B | | Right | 5.0 | 5.0 | 25 | Sedge, Shrub |
| SVRY1 | | Olympus Stylus 400 | C (14.82) | | Left | 4.9 | 8.0 | 35 | Sedge, Forb, Shrub |

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| SVRY1 | | Olympus Stylus 400 | C | | Right | 7.8 | 5.0 | 20 | Sedge, Forb, Shrub |
| SVRY1 | | Olympus Stylus 400 | D (12.09) | | Left | 4.6 | 8.0 | 30 | Grass, Sedge, Forb, Shrub |
| SVRY1 | | Olympus Stylus 400 | D | | Right | 8.6 | 4.0 | 80 | Moss, Grass, Forb, Shrub |
| SVRY1 | | Olympus Stylus 400 | E (9.57) | | Left | 2.7 | 7.0 | 45 | Grass, Sedge, Shrub |
| SVRY1 | | Olympus Stylus 400 | E | | Right | 6.6 | 4.0 | 80 | Moss, Grass, Sedge |
| SVRY2 | 09/24/2014 | Olympus Stylus 400 | A (95.72) | Downstream from XSE | Left | 20.2 | 28.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | A | | Right | 37.0 | 32.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | B (116.96) | | Left | 29.5 | 35.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | B | | Right | 48.0 | 41.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | C (158.61) | | Left | 59.2 | 65.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | C | | Right | 79.5 | 73.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | D (156.58) | | Left | 74.8 | 79.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | D | | Right | 91.5 | 87.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | E (211.52) | | Left | 62.5 | 72.0 | 0 | Sediment |
| SVRY2 | | Olympus Stylus 400 | E | | Right | 81.5 | 71.0 | 0 | Sediment |
| WBVR1 | 9/16/2014 | Olympus Stylus 400 | A (36.64) | XSD <> XSE left bank | Left | 15.9 | 20.0 | 15 | Moss, Grass, Shrub |
| WBVR1 | | Olympus Stylus 400 | A | | Right | 31.0 | 27.0 | 5 | Grass, Shrub |
| WBVR1 | | Olympus Stylus 400 | B (20.98) | | Left | 4.3 | 10.0 | 20 | Grass, Forb, Shrub |
| WBVR1 | | Olympus Stylus 400 | B | | Right | 15.5 | 11.0 | 10 | Grass, Shrub |
| WBVR1 | | Olympus Stylus 400 | C (28.83) | | Left | 3.8 | 9.0 | 70 | Moss, Shrub |
| WBVR1 | | Olympus Stylus 400 | C | | Right | 17.0 | 11.0 | 25 | Grass, Shrub |
| WBVR1 | | Olympus Stylus 400 | D (34.18) | | Left | 9.0 | 14.0 | 30 | Grass, Shrub |
| WBVR1 | | Olympus Stylus 400 | D | | Right | 25.0 | 20.0 | 15 | Grass, Shrub |
| WBVR1 | | Olympus Stylus 400 | E (29.56) | | Left | 6.0 | 12.0 | 60 | Grass, Forb, Shrub |
| WBVR1 | | Olympus Stylus 400 | E | | Right | 20.0 | 16.0 | 20 | Moss, Grass, Shrub |
| WBVR2 | 9/16/2014 | Olympus Stylus 400 | A (44.40) | XSB <> XSC left bank | Left | 7.5 | 16.0 | 35 | Moss, Shrub |
| WBVR2 | | Olympus Stylus 400 | A | | Right | 25.0 | 19.0 | 5 | Grass, Sedge |
| WBVR2 | | Olympus Stylus 400 | B (90.60) | | Left | 14.0 | 21.0 | 5 | Grass, Shrub |

| Site ID | Date | Camera | Cross Section and Pin to Pin Distance in (ft) | Bar Sample | Bank | Bank Distance from LPIN (ft) | Camera Distance from LPIN (ft) | Percent Cover | Comments |
|---|---|---|---|---|---|---|---|---|---|
| WBVR2 | | Olympus Stylus 400 | B | | Right | 42.3 | 37.0 | 0 | Sediment |
| WBVR2 | | Olympus Stylus 400 | C (151.93) | | Left | 100.5 | 107.0 | 5 | Grass |
| WBVR2 | | Olympus Stylus 400 | C | | Right | 126.0 | 119.0 | 25 | Grass, Shrub |
| WBVR2 | | Olympus Stylus 400 | D (149.43) | | Left | 97.0 | 108.0 | 0 | Sediment |
| WBVR2 | | Olympus Stylus 400 | D | | Right | 127.5 | 123.0 | 0 | Sediment |
| WBVR2 | | Olympus Stylus 400 | E (96.25). | | Left | 32.2 | 38.0 | 35 | Moss, Grass, Shrub, Tree |
| WBVR2 | | Olympus Stylus 400 | E | | Right | 54.5 | 43.0 | 0 | Sediment |