Annual Progress Report for 2013

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

May 2, 2014

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

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This is the eleventh 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 2013, the highway crew lined drainage ditch 188DD (Basin 2: North Fork of Crystal and Ski Creek Watersheds) with shotcrete and installed a pipe back to divert water under the highway to the shotcrete ditch above sediment pond 199RW. This diverted drainage from North Fork of Crystal Creek Watershed to South Catamount Creek Watershed. Rock weir 176RW was also lined with shotcrete and is the only remaining active rock weir along drainage ditch 188DD. Construction of a *RediRock* wall in Basin 3 (Severy and Ski Creek Watersheds) was also completed. Re-vegetation work included hydro mulching disturbed areas once construction was completed along drainage ditch 188DD and the *RediRock* wall. The design for the breached rock weir 234RW in the switchbacks (corner just above Elk Park in Basin 3) has been completed and construction will begin in August-early September, 2014 (personal communication with Jack Glavan, City of Colorado Springs, Capital Projects Manager). In addition, one ton of gravel was removed from rock weir 202RW (Basin 2) and three tons of gravel was removed from shotcrete drainage ditches in Basin 2 (personal communication with Dave Jordan, City of Colorado Springs, Skilled Maintenance Supervisor).

The 2013 field season was characterized by weather extremes. The entire mountain was affected by higher than normal temperatures in June and July, with less than average rainfall. By mid-August, the monsoon season arrived resulting in several intense storm events and eventually the flood in September, 2013. As a result, not all stream channels were surveyed during the 2013 field season, but several stream reaches were surveyed both pre and post flooding to document changes resulting from higher than normal precipitation.

A major challenge for the field crew was the flash flood potential on Highway 24 as a result of the Waldo Canyon Fire of 2012. During all rain events through October, Highway 24 was closed by the Colorado Department of Transportation. This will likely be an ongoing occurrence until the burn scar becomes stabilized and the flash flood risk reduced.

September brought Hollywood to Pikes Peak. Filming of the movie *Fast and Furious 7* took place in multiple locations on the highway. Due to the high volume of film related traffic along the highway, survey emphasis focused on stream channels (off the highway). In addition, two weeks of field work was lost due to the furlough in October. Despite these limiting factors, 2013 was a successful year with the majority of sites surveyed.

Precipitation measurements from the three electronic rain gauges (Onset Computer Corp.) and the NRCS Snotel site, located at Glen Cove indicated that precipitation was above average for 2013. 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. Electronic rain gauge 075RG was struck by lightning near the end of the season and did not record data after August 26, 2013. In addition, data from the shuttle was lost from September 18-24, 2013 for electronic rain gauges 076RG and 077RG due to an equipment malfunction. Standard rain gauge 077RG was tampered with (vandalized) in June and did not record data from May 29 through June 10, 2013 when it was replaced.

Silt fences were not exposed to high runoff and erosion activities in 2013 except during the flood event. The field crew completed site visits periodically on 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 continued to be monitored. Silt fences from 13 cut slope, 28 fill slope, and 15 rock weir sites were monitored in 2013. In addition, one of the fill slope silt fences was breached during the 2013 field season. All silt fence sites were visited periodically, sediment volume measured, and silt fences evaluated for repair or replacement.

Six of the original 20 drainage ditches selected for monitoring were surveyed in 2013. As noted earlier, drainage ditch 188DD (Basin 2) was lined with shotcrete in 2013 and a pipe back was installed to divert water under the highway to the shotcrete ditch above sediment pond 199RW. Fifteen of the original drainage ditches have been paved or lined with shotcrete since monitoring began, including nine drainage ditches in Basin 7 that were treated in 2011. 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 five drainage ditches located in Basins 1 (Lower North Fork of Crystal Creek Watershed) and 2 are lined with erosion control fabric and will continue to be surveyed annually.

Ninety-seven of 118 conveyance channels were surveyed in 2013. In addition, five conveyance channels (024CC, 112CC, 117CC, 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 channel 212CC, which was lined with rip rap in 2011 was surveyed as treatment is failing. Three conveyance channels (111CC, 114CC, and 115CC) which were previously monitored through observation and photographs only were also surveyed. Conveyance channels 111CC, 118CC, and 119CC below rock weirs in the switchbacks (Basins 3 and 4: Upper Ski and North French Creek Watersheds) were disturbed by the highway crew during removal of existing rock weirs and construction of cutoff walls with riprap aprons below in 2012. In 2013, the field crew was able to monitor these sites, as well as document activity in the channels during rain events.

Thirty-six sediment traps were monitored in 2013; 24 rock weirs, five cutoff walls with riprap aprons below, and seven sediment ponds. Six 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) 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). Eleven of the 24 rock weir sites and two of the sediment ponds (258RW and 260RW) 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. Some of the rock weirs are full of sediment rendering them ineffective, resulting in an inability of the field crew to effectively monitor these structures.

The primary focus of the validation monitoring is to address the condition of the riparian wetland and aquatic systems along the Pikes Peak Highway. As a result of the flood, not all stream channels were surveyed during the 2013 field season, but several stream reaches were surveyed both pre and post flooding to document changes resulting from higher than normal precipitation. Surveys were completed (pre flood) on Glen Cove, North Catamount, North Fork of Crystal, Ski, and South Catamount Creeks. Additional surveys were completed after the flood event on North Catamount, Oil, Ski (Reach1), and South Catamount (Reach 2) Creeks. Surveys were not completed on Boehmer and East Fork Beaver Creeks as the access road was washed out during the flood. Oil Creek which was photographic and observation monitoring only as a result of an active beaver dam inundating the cross sections was surveyed (post flood) in 2013. The beaver dam was breached during the flood and stream water levels returned to normal. Due to staffing and time constraints, surveys were not completed on Severy and West Fork Beaver Creeks. Photographic and observation monitoring was completed on Severy and West Fork Beaver (Reach 2) Creeks. 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 2013, stream channel surveys included only cross section surveys, thalweg surveys, vegetation surveys, pebble counts, and grab samples.

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 2013 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 2013 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 2013 field season. The annual reports and data may also be accessed from:

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

As the Pikes Peak Highway Monitoring Project approaches its end date in 2017, it is time to consider which components of the monitoring program should be amended to meet the core requirements of the ongoing National BMP Monitoring Program.

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.

In 2013, the highway crew lined drainage ditch 188DD (Basin 2: North Fork of Crystal and Ski Creek Watersheds) with shotcrete and installed a pipe back to divert water under the highway to the shotcrete ditch above sediment pond 199RW. This diverted drainage from North Fork of Crystal Creek Watershed to South Catamount Creek Watershed. Rock weir 176RW was also lined with shotcrete and is the only remaining active rock weir along drainage ditch 188DD. Construction of a *RediRock* wall in Basin 3 (Severy and Ski Creek Watersheds) was also completed. The design for the breached rock weir 234RW in the switchbacks (corner just above Elk Park in Basin 3) has been completed and construction will begin in August-early September, 2014 (personal communication with Jack Glavan, City of Colorado Springs, Capital Projects Manager).

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 altitude, 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).

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 2013, 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 2013 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 2013 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 sampling locations will be monitored 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, 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 2013, the three tipping bucket rain gauges were installed by May 6. 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 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 30, 2013) for the three monitoring sites for both the electronic and standard rain gauges is listed in Table 1. Electronic rain gauge 075RG was struck by lightning near the end of the season and did not record data after August 26, 2013. Precipitation in the standard rain gauge 075RG for that period measured 7.91 inches. In addition, data from the shuttle was lost from September 18 - 24, 2013 for electronic rain gauges 076RG and 077RG due to equipment malfunction. Precipitation in the standard rain gauges 076RG and 077RG for that period measured .98 inches and .19 inches respectively. Standard rain gauge 077RG was tampered with (vandalized) in June and data was lost from May 29 through June 10, 2013 when it was replaced. Precipitation in the electronic rain gauge 077RG measured .09 inches for that period. Where appropriate total precipitation for the rain gauges was adjusted (Table 1). 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 be the cause of the disparity between the electronic and standard rain gauge measurements, especially during intense storm events. Prior to the 2014 field season, the tipping buckets for all electronic rain gauges will be re-calibrated.

In 2013, seasonal totals varied between the three sites with the lower elevation receiving the most precipitation (Figure 1). 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.

Table 1. Location, measured and adjusted precipitation accumulation, and dates of operation for electronic and standard rain gauges on Pikes Peak, 2013.

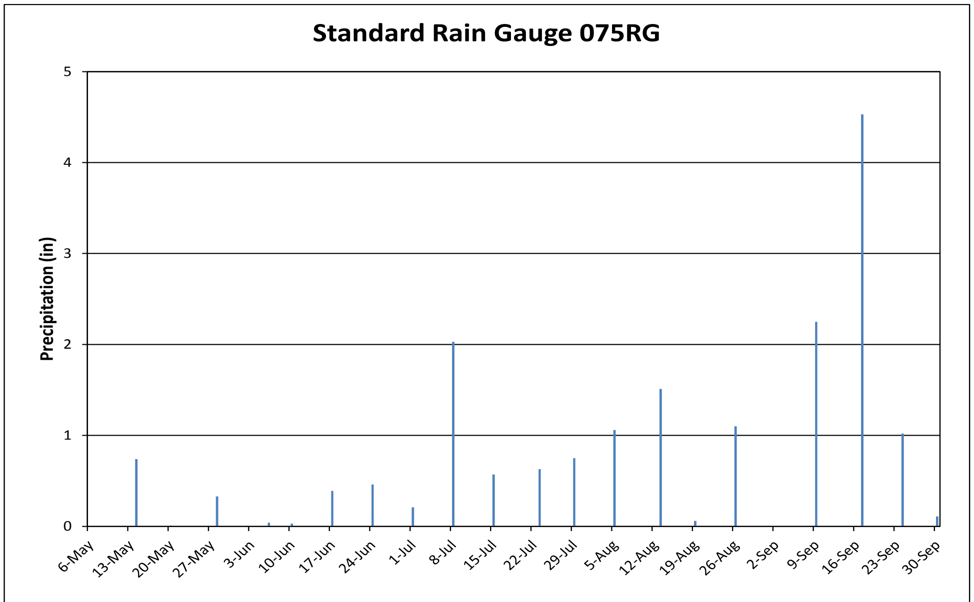
Gauge ID	Latitude (hddd˚mm.mmm)	Longitude (hddd˚mm.mmm)	Altitude (ft)	Total Precipitation Electronic (in)		Total Precipitation Standard (in)		Dates of Operation 2013
				Measured	Adjusted	Measured	Adjusted	
075RG	N38 53.797	W105 03.890	10,109	8.19†	16.10	17.83	N/A	5/6 – 9/30
076RG	N38 52.582	W105 03.970	11,810	13.53†	14.51	17.26	N/A	5/6 – 9/30
077RG	N38 51.783	W105 03.999	13,069	12.82†	13.01	14.04†	14.13	5/6 – 9/30

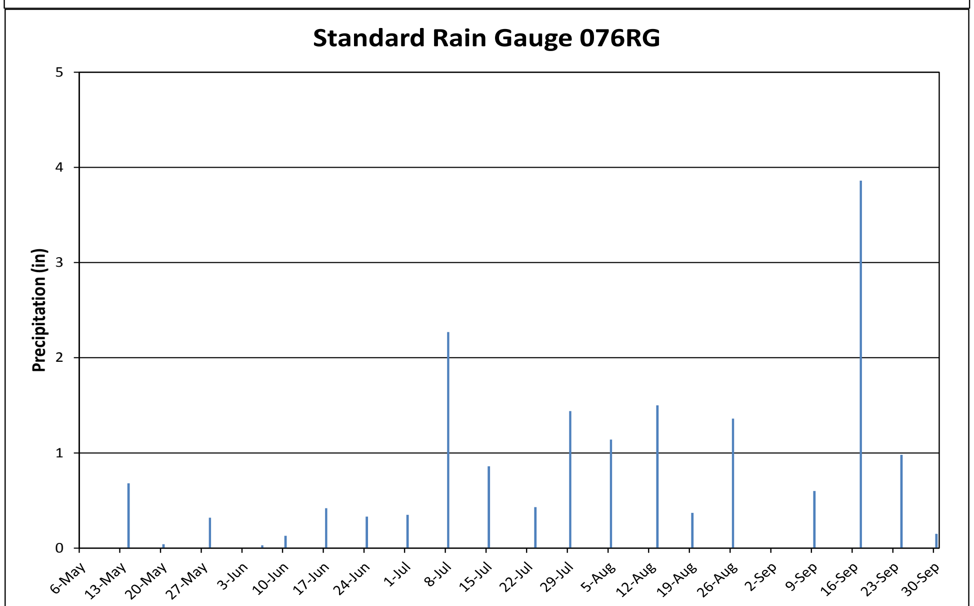
† Indicates missing data due to equipment malfunction and/or damage to the rain gauge.

The 2013 Colorado flood (September 9 through 16, 2013) was a natural disaster resulting in heavy rain and catastrophic flooding along Colorado's Front Range from Colorado Springs north to Fort Collins. Daily and total precipitation accumulation for electronic rain gauges 076RG and 077RG during the flood are listed in Table 2. The most precipitation occurred on September 12, 2013 (Figure 2).

Table 2. Daily and total precipitation accumulation, during the Colorado flood (September 9 through 16, 2013) for electronic rain gauges 076RG and 077RG on Pikes Peak, 2013.

Date	076RG Total Precipitation Electronic (in)	077RG Total Precipitation Electronic (in)
5/9/2013	0.02	0
5/10/2013	0.11	0.13
5/11/2013	0.92	0.40
5/12/2013	1.26	1.35
5/13/2013	0.44	0.47
5/14/2013	0.05	0.05
5/15/2013	0.41	0.31
5/16/2013	0.12	0.11
Total	**3.33**	**2.82**





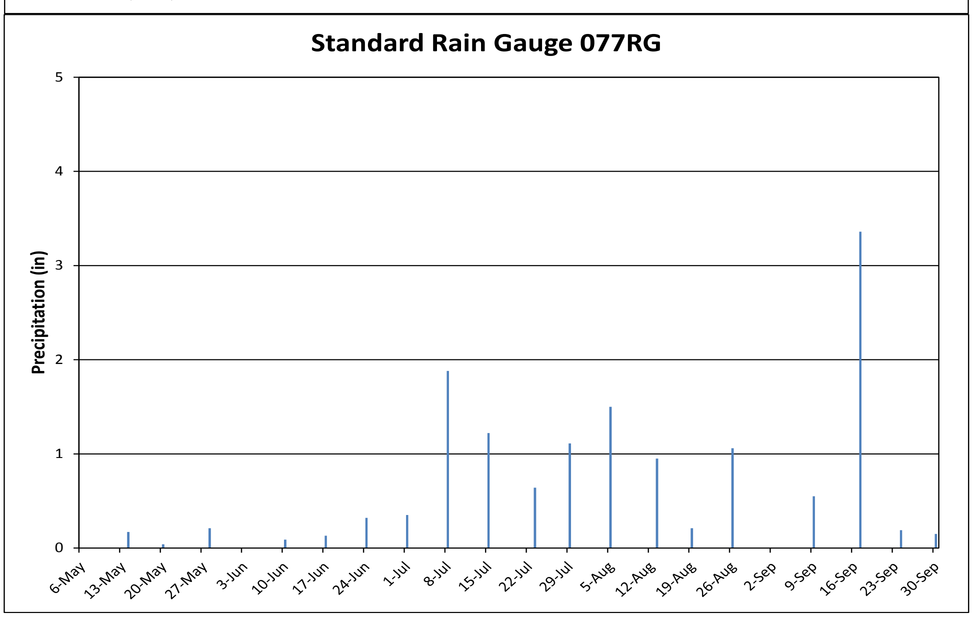


Figure 1. Precipitation by measurement date for the three standard rain gauges on Pikes Peak, 2013.

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

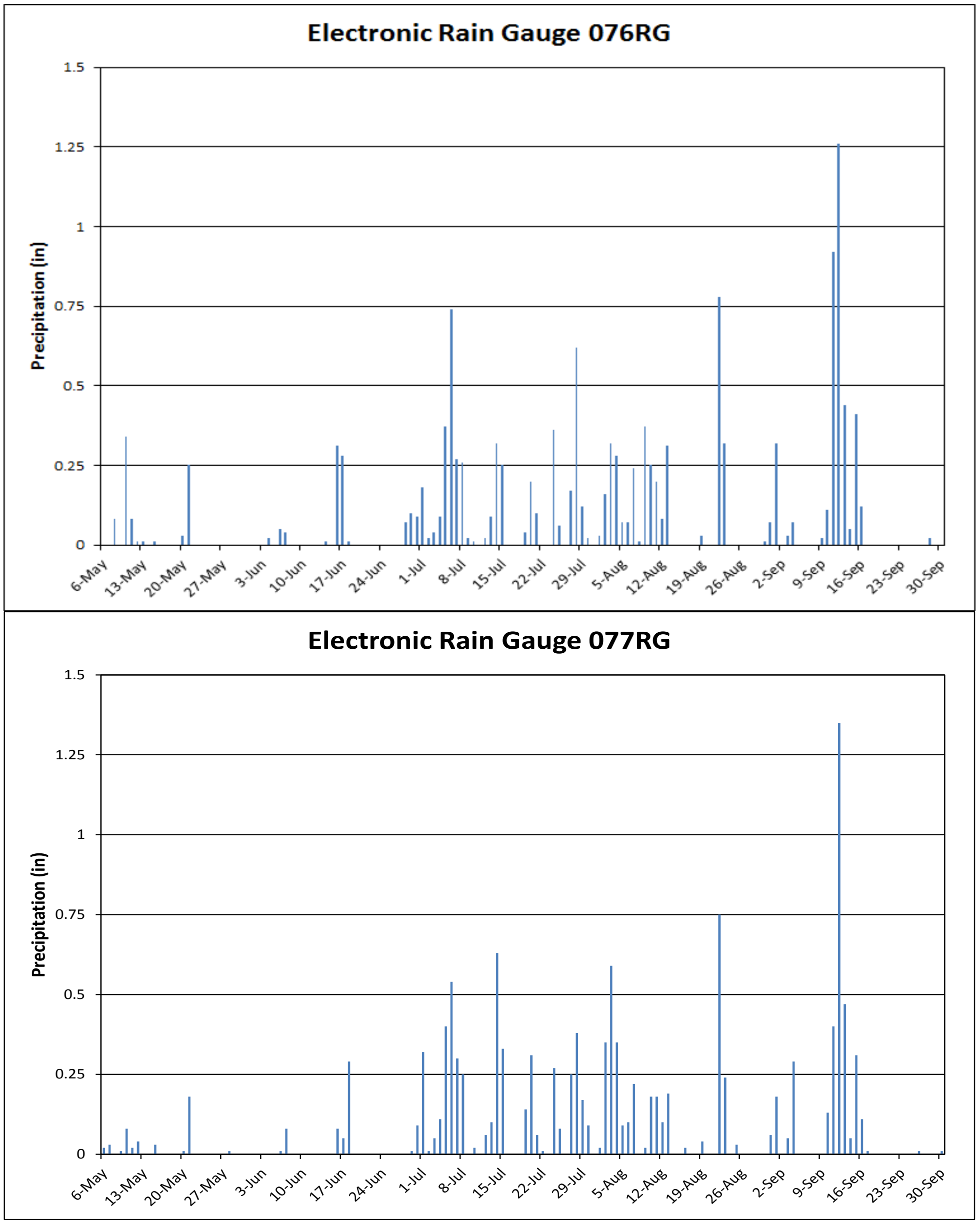


Figure 2. Daily precipitation for two electronic rain gauges on Pikes Peak, 2013.

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.

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 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.

Road surface data were not gathered during the 2013 monitoring season. The highway crew completed the last three miles of paving on the Pikes Peak Highway in 2011 eliminating the need for further monitoring of the road reaches.

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 2013 except during the flood event. The sediment volume measured immediately after the flood in the lower fence of cut slope sites 192CS and 197CS (Basin 2) was 2.6 and 1.40 cubic feet respectively. This represents a depth of .09 inches for 192CS and .05 inches for 197CS of eroded material from the contributing area.

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. 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 and survey dates are annotated with the condition of the silt fence, any repairs or replacements that were done 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 2013 monitoring season are presented in Appendix D. All cut slope data and photographs for the 2013 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 2013, except during the flood event. The sediment volume measured immediately after the flood in the upper fence of fill slope sites 203FS and 204FS (Basin 2) was 1.6 and 2.07 cubic feet respectively. This represents a depth of .06 inches for 203FS and .05 inches for 204FS of eroded material from the contributing area. In contrast, the sediment volume measured in the lower fence of fill slope site 204FS was .34 cubic feet, which represents a depth of .0001 inches from the contributing area.

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, one of the 50 fill slope silt fences was breached during the 2013 field season. 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 and survey dates are annotated with the condition of the silt fence, any repairs or replacements that were done 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 2013 monitoring season can be found in Appendix E. All fill slope data and photographs for 2013 are available on the accompanying data DVD.

Numerous grab samples were collected from material trapped in the cut slope and fill slope silt fences throughout the 2013 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 2012 and 2013 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 have 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 3 can be found in Appendix G. Photographs and survey data for all sites are available on the accompanying data DVD.

Table 3. Management practices implemented below cut slope monitoring sites, and cut slope monitoring site survey dates on Pikes Peak, 2013.

Site ID	Basin #	Watershed	Management Practice	Survey Dates	
102CS	6	WBVR	Asphalt Road, Shotcrete Ditch	6/10/2013	9/30/2013
123CS	6	WBVR	Asphalt Road, Shotcrete Ditch	6/10/2013	9/30/2013
141CS	6	WBVR	Asphalt Road, Shotcrete Ditch	6/10/2013	9/26/2013

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, instead of armoring roadside drainage ditches, all reaches except those meeting the criteria stated in the latest U.S. Forest Service Design Review (Burke 2002) are lined with shotcrete, lined with erosion control fabric, or left untreated.

Effectiveness monitoring consists of sampling the fabric-lined and unlined drainage ditches, 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 in armored channels relative to unarmored channels. Once drainage ditches are paved or lined with shotcrete, they are 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 for monitoring. Additional drainage ditches were selected independently of the road reaches, as needed, to complete the desired road slope/contributing area/armoring material matrix. 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 treatment. This information will be useful in the future as new drainage ditch segments are lined.

Six of the original 20 drainage ditches selected for monitoring were surveyed in 2013. Drainage ditch 188DD (Basin 2) was lined with shotcrete in 2013 and a pipe back was installed to divert water under the highway to the shotcrete ditch above sediment pond 199RW. This diverted drainage from rock weirs 178RW, 179RW, 180RW, and 181RW (North Fork of Crystal Creek Watershed) to South Catamount Creek Watershed, a previously non-impacted stream. Rock weir 176RW was also lined with shotcrete and is the only remaining active rock weir along drainage ditch 188DD. Fifteen of the original drainage ditches have been paved or lined with shotcrete since monitoring began, including nine drainage ditches in Basin 7 that were treated in 2011. 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 five drainage ditches located in Basins 1 (Lower North Fork of Crystal Creek Watershed) and 2 are lined with erosion control fabric and will continue to be surveyed annually. Drainage ditch survey cross sections that correspond to the survey dates presented in Table 4 can be found in Appendix H. Drainage ditch survey data and photographs for 2013 are available on the accompanying data DVD.

Table 4. Drainage ditches surveyed including description of road treatments above drainage ditches, treatments for drainage ditches, and drainage ditch survey dates on Pikes Peak, 2013.

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Survey Date
005DD	1	Lower SKIC	Asphalt	Erosion Control Fabric	7/8/2013
010DD	1	Lower SKIC	Asphalt	Erosion Control Fabric	7/8/2013
182DD	2	SKIC	Asphalt	Erosion Control Fabric	7/10/2013
188DD	2	SCAT	Asphalt	Shotcrete, Culvert	6/20/2013†
195DD	2	SKIC	Asphalt	Erosion Control Fabric	7/8/2013
205DD	2	SKIC	Asphalt	Erosion Control Fabric	7/10/2013

†Drainage ditch surveyed prior to ditch treatment.

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 channels 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 always possible to survey all 118 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 measured specifically to compare paved (7) and un-paved (6) road sections will continue to be 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 surveyed annually. If the rock weirs fail (as has been observed), changes in conveyance channel geometry may occur. Effectiveness of the rock weir 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).

Ninety-seven of 118 conveyance channels were surveyed in 2013 (Table 5). In addition, five conveyance channels (024CC, 112CC, 117CC, 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 channel 212CC, which was lined with rip rap in 2011 was surveyed as treatment is failing. Three conveyance channels (111CC, 114CC, and 115CC) which were previously monitored through observation and photographs only were also surveyed. Conveyance channels 111CC, 118CC, and 119CC below rock weirs in the switchbacks (Basins 3 and 4: Upper Ski and North French Creek Watersheds) were disturbed by the highway crew during removal of existing rock weirs and construction of cutoff walls with riprap aprons below in 2012. In 2013, the field crew was able to monitor these sites, as well as document activity in the channels during rain events.

Cross sections for the conveyance channels listed in Table 5 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 2013 are available on the accompanying data DVD.

Sediment Traps (Sediment Ponds and Rock Weirs)

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 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 capable of detaining all the water and sediment discharged from the road

Table 5. Road and drainage ditch treatments associated with conveyance channels, treatments applied to conveyance channels, and conveyance channel survey dates on Pikes Peak, 2013.

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Channel Treatment	Survey Date
004CC	1	NCRY	Asphalt	Fabric	Rock Apron	8/27/13
012CC	2	SCAT	Asphalt	Fabric	Rock Weir	5/30/13
013CC	2	SCAT	Asphalt	Fabric	Rock Weir	7/25/13
016CC	2	NCRY	Asphalt	Shotcrete	Culvert Plugged	8/27/13
019CC	2	SCAT	Asphalt	Fabric	Culvert Plugged	7/29/13
021CC	2	NCRY	Asphalt	Shotcrete	Culvert Plugged	8/14/2013
024CC†	2	SCAT	Asphalt	Fabric	Culvert Plugged	8/1/2013
025CC	2	SCAT	Asphalt	Shotcrete	Culvert Plugged	7/15/2013
028CC	2	NCRY	Asphalt	Shotcrete	Culvert Plugged	7/18/2013
029CC	2	NCRY	Asphalt	Shotcrete	Rock Weir	6/17/2013
030CC	2	NCRY	Asphalt	Shotcrete	Rock Weir	7/1/2013
031CC	2	NCRY	Asphalt	Shotcrete	Rock Weir	5/21/2013
034CC	2	NCRY	Asphalt	Shotcrete	Rock Weir	8/19/2013
035CC	7	SKIC	Asphalt	Shotcrete	Rip Rap	6/17/2013
036CC	7	NCRY	Asphalt	Shotcrete	Culvert Plugged	6/18/2013
037CC	7	NCRY	Asphalt	Shotcrete	Culvert	7/1/2013
038CC	7	NCRY	Asphalt	Shotcrete	Culvert	7/15/2013
040CC	1	NCRY	Asphalt, Asphalt Curb	Fabric	Straw Logs	5/21/2013
053CC	7	SKIC	Asphalt	Shotcrete	Rip Rap	6/6/2013
054CC	7	SKIC	Asphalt	Shotcrete	Untreated	6/6/2013
058CC	7	SKIC	Asphalt	Shotcrete	Culvert	7/30/2013
063CC	7	SKIC	Asphalt	Shotcrete	Rock Weir	7/2/2013
064CC	7	SKIC	Asphalt	Shotcrete	Untreated	8/15/2013
065CC	7	SKIC	Asphalt	Shotcrete	Untreated	8/20/2013
066CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/30/2013
067CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/30/2013
068CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/18/2013
069CC	7	SKIC	Asphalt	Shotcrete	Untreated	8/8/2013
070CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/24/2013
081CC	7	GLEN	Asphalt	Shotcrete	Culvert Plugged	6/18/2013
084CC	7	GLEN	Asphalt	Shotcrete	Culvert Plugged	6/18/2013
089CC	3	SKIC	Asphalt	Shotcrete	Rock Weir	6/12/2013
091CC	3	SKIC	Asphalt	Shotcrete	Culvert Plugged	6/19/2013
094CC	3	SKIC	Asphalt	Shotcrete	Culvert Plugged	7/18/2013
095CC	3	SKIC	Asphalt	Shotcrete	Culvert Plugged	6/19/2013
096CC	3	SKIC	Asphalt	Shotcrete	Culvert Plugged	6/19/2013
097CC	3	SKIC	Asphalt	Shotcrete	Culvert Plugged	6/19/2013
100CC	3	SVRY	Asphalt	Shotcrete	Culvert Plugged	6/25/2013
104CC	6	WBVR	Asphalt	Shotcrete	Untreated	7/31/2013
111CC	3	SKIC	Asphalt	Shotcrete	Rock Weir	8/6/2013
112CC†	3	FRENCH	Asphalt	Shotcrete	Culvert Plugged	8/6/2013
114CC	4	FRENCH	Asphalt	Shotcrete	Rock Weir	8/6/2013
115CC	4	FRENCH	Asphalt	Shotcrete	Untreated	8/20/2013
116CC	4	SKIC	Asphalt	Shotcrete	Culvert Plugged	8/20/2013
117CC†	4	SKIC	Asphalt	Shotcrete	Culvert Plugged	8/20/2013
118CC†	4	SKIC	Asphalt	Shotcrete	Rock Weir	8/5/2013
119CC†	4	GLEN	Asphalt	Shotcrete	Rock Weir	8/19/2013
120CC	6	WBVR	Asphalt	Shotcrete	Sediment Pond	7/11/2013

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Channel Treatment	Survey Date
121CC	6	WBVR	Asphalt	Shotcrete	Untreated	7/31/2013
122CC	6	WBVR	Asphalt	Shotcrete	Untreated	8/15/2013
125CC	6	WBVR	Asphalt	Shotcrete	Untreated	8/15/2013
126CC	6	WBVR	Asphalt	Shotcrete	Untreated	7/10/2013
127CC	6	WBVR	Asphalt	Shotcrete	Untreated	8/5/2013
129CC	6	EBVR	Asphalt	Shotcrete	Untreated	8/15/2013
130CC	6	EBVR	Asphalt	Shotcrete	Culvert Plugged	7/24/2013
132CC	6	EBVR	Asphalt	Shotcrete	Untreated	7/24/2013
133CC	6	EBVR	Asphalt	Shotcrete	Untreated	7/24/2013
135CC	5	BHMR	Asphalt	Shotcrete	Untreated	7/23/2013
136CC	5	BHMR	Asphalt	Shotcrete	Untreated	7/23/2013
137CC	5	BHMR	Asphalt	Shotcrete	Untreated	7/23/2013
138CC	5	BHMR	Asphalt	Shotcrete	Untreated	7/10/2013
139CC	6	EBVR	Asphalt	Shotcrete	Rock Apron, Dissipaters	7/10/2013
140CC	6	EBVR	Asphalt	Shotcrete	Untreated	7/23/2013
175CC	1	NCRY	Asphalt, Asphalt Curb	None	Rock Apron	7/2/2013
184CC	2	SKIC	Asphalt	Shotcrete	Sediment Pond	7/25/2013
189CC	2	NCRY	Asphalt	Shotcrete	Rock Apron, Dissipaters	8/19/2013
190CC	2	NCRY	Asphalt	Shotcrete	Rock Apron, Dissipaters	8/19/2013
206CC	2	NCRY	Asphalt, Asphalt Curb	Fabric	Untreated	8/27/2013
207CC	6	WBVR	Asphalt	Shotcrete	Untreated	8/15/2013
208CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/25/2013
209CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/25/2013
210CC	2	SKIC	Asphalt	Fabric	Untreated	7/18/2013
211CC	2	SKIC	Asphalt	Fabric	Untreated	5/21/2013
212CC	7	SKIC	Asphalt	Shotcrete	Rip Rap	6/6/2013
213CC	6	FRENCH	Asphalt	Shotcrete	Untreated	8/1/2013
214CC	5	BHMR	Asphalt	Shotcrete	Untreated	7/23/2013
215CC	5	BHMR	Asphalt	Shotcrete	Untreated	8/1/2013
216CC	1	Lower NCRY	Asphalt, Asphalt Curb	Asphalt	Rock Weir	5/29/2013
217CC	1	Lower NCRY	Asphalt, Asphalt Curb	Asphalt	Rock Weir	5/29/2013
218CC	1	Lower SKIC	Asphalt	Untreated	Rock Weir	5/28/2013
219CC	1	Lower SKIC	Asphalt	Shotcrete	Rock Weir	5/20/2013
220CC	1	Lower SKIC	Asphalt	Fabric	Rock Weir	7/2/2013
221CC	1	Lower NCRY	Asphalt	Shotcrete	Rock Weir	5/22/2013
222CC	1	Lower NCRY	Asphalt	Shotcrete	Rock Weir	5/22/2013
223CC	1	Lower SKIC	Asphalt	Fabric	Rock Weir	7/2/2013
224CC	2	NCRY	Asphalt	Asphalt	Rock Weir	5/16/2013
225CC	2	SKIC	Asphalt	Fabric	Rock Weir	5/16/2013
226CC	2	NCRY	Asphalt, Asphalt Curb	Fabric	Rock Weir	5/29/2013
227CC	2	NCRY	Asphalt, Asphalt Curb	Asphalt	Rock Weir	5/13/2013

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Channel Treatment	Survey Date
228CC	2	SKIC	Asphalt	Fabric	Rock Weir	7/25/2013
229CC	2	NCRY	Asphalt	Shotcrete	Rock Weir	7/1/2013
230CC	2	NCRY	Asphalt	Shotcrete	Rock Weir	5/21/2013
231CC	2	NCRY	Asphalt	Shotcrete	Rock Weir	8/19/2013
232CC	7	GLEN	Asphalt	Shotcrete	Untreated	6/26/2013
235CC	3	SVRY	Asphalt	Shotcrete	Rock Weir	8/5/2013
245CC	2	NCRY	Asphalt	Asphalt	Untreated	7/16/2013
246CC	5	EBVR	Asphalt	Shotcrete	Sediment Pond	6/25/2013
247CC	6	WBVR	Asphalt	Shotcrete	Sediment Pond	6/25/2013
251CC	7	NCRY	Asphalt	Shotcrete	Sediment Pond	6/24/2013
253CC	7	SKIC	Asphalt,	Shotcrete	Sediment Pond	6/24/2013
263CC	7	SKIC	Asphalt	Shotcrete	Sediment Pond	6/6/2013
265CC	7	SKIC	Asphalt	Shotcrete	Sediment Pond	6/12/2013

† Site no longer surveyed due to instability of conveyance channel. Photographic and observation monitoring only.

segment for events up to the design storm have been constructed. The current 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 will index 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 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.

The field procedure for monitoring sediment accumulation in the rock weirs was modified in 2008 to simplify both instrument requirements for the survey and software requirements for subsequent data reduction and analysis as well as to allow for a more consistent comparison of volumetric change from survey to survey. A fixed area was defined and monumented within each rock weir to be surveyed each time, and compared from survey to survey or year to year. Prior to 2008, the area surveyed within each rock weir had not been predefined. Although the criteria for selecting the area to be surveyed within each rock weir was well defined in the survey protocol, the area actually surveyed as well as the number and distribution of survey points within that area were not necessarily consistent from one survey to the next. Much was left to the discretion of the field crew. As part of each survey (spring, fall, and as needed during the summer), the field crew would identify areas of sediment accumulation within the rock weirs and, although virtually all of the rock weir area was surveyed, sampling points were concentrated in the vicinity of the areas of deposition and more widely spaced over the balance of the rock weir area. The survey capabilities of the Trimble Robotics Total Station, which is used for all surveying on the Pikes Peak Project, records the geospatially correct location of survey points for virtually any survey pattern, so utilizing a variable sampling scheme did not create a problem. In order to compensate for the variable distribution of survey points, an AutoCAD package was used to develop a 0.5-foot Digital Terrain Model (DTM) for the surface of the sediment pond based on the survey points. This provided a very high resolution description of the topographic variability in the survey data collected in the vicinity of active deposition without requiring similar resolution (and sample size) in areas perceived to have had little or no activity. This DTM could then be intersected with the DTM for earlier or subsequent surveys to obtain an estimate of volumetric change between surveys. The procedure called for any non-overlapping areas to be clipped from either survey as needed, and resulted in two overlapping surfaces of equal size. The volumetric difference between the two intersected surfaces represented the estimate of the volumetric change in sediment accumulation that occurred in the rock weir during the interval between surveys. Although valid, it became apparent that this protocol had several drawbacks specific to this study that included: 1) dependence on the Trimble Robotics Total Station, 2) risk of inconsistent survey data, and 3) dependence on an AutoCAD package and associated technical skills that may or may not be available in the future.

First, the choice of survey tools was limited to automated systems such as the Trimble Robotics Total Station, limiting alternative instrument choices while requiring a specific level of technical expertise in the field crew. Second, because the area to be surveyed within each rock weir had not been predefined, the perimeter of the DTM's for individual surveys were not necessarily identical when intersected. Therefore, the clipping process that became necessary introduced the risk of inconsistent or lost information. Fortunately, the field crew leader was the same for each year of monitoring up to 2007 so disparities in survey areas are in fact minimal. Lastly, the protocol required the use of an AutoCAD package to develop and intersect the three dimensional surfaces used to estimate sediment accumulation. This required software and technical skills not readily available within the project, requiring that the data reduction be outsourced to other consultants.

In 2008 the field procedures for surveying the rock weirs were modified. First, each rock weir was visited and the perimeter of the critical portion of the sediment accumulating pond was identified and monumented with rebar. These monumented locations were then referenced to the three benchmark locations (control points) already established for each rock weir. An attempt was made to define the area to be surveyed in rectangular form, but sometimes five or six sides were needed to most efficiently define the perimeter of the area of interest. In every case, the area selected for a given rock weir encompassed all the areas surveyed prior to 2008. It should be noted that all unstable areas identified to be within the rock weir were also included in the survey area to ensure that migration of material from one location within the rock weir to another were balanced out in the survey and not construed to be additions or losses in accumulation between surveys. Because the permanent survey area defined for each rock weir encompasses the area of every previous survey, no loss of historic data occurred as a result of the change in procedure.

After the survey perimeter was defined, one side was arbitrarily selected as the baseline for the survey. Depending on the size and shape of the rock weir area of interest, a rectangular survey grid system was established that originates from the baseline, and uniformly and consistently covers the rock weir area. Survey lines initiate from the baseline at uniform intervals, and cross the rock weir perpendicular to the baseline, and extend to the opposite boundary line. Survey points along each line are also uniformly spaced. The spacing of both survey lines and survey points on a survey line vary with rock weir size. An example schematic for rock weir 008RW is shown in Figure 3. Lines located perpendicular to the baseline and survey points along the line

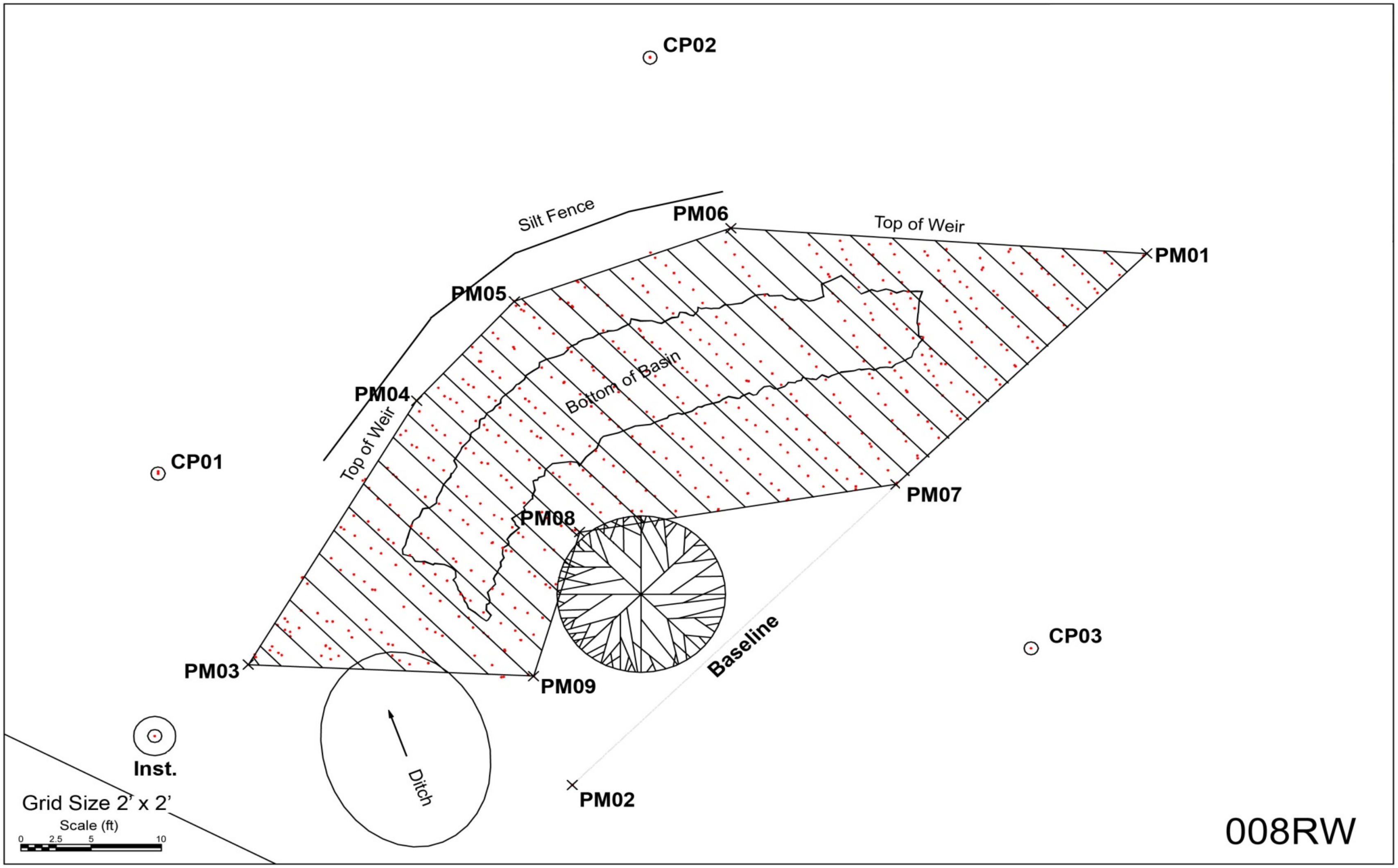


Figure 3. Schematic map of rock weir 008RW defining a fixed area, baseline, perimeter points and survey grid on Pikes Peak, 2008.

resulted in a 1 X 1, 1 X 2, 2 X 1, 2 X 2, or comparable survey grid depending on the area and shape of the rock weir. The objective was to locate several hundred survey points, uniformly distributed in each rock weir that would be revisited at each survey. This approach has several advantages over the original survey protocol. First, surveying using a fixed grid system allows obtaining a simple estimate of elevation of the rock weir area relative to the control points for each survey. Following this protocol is not particularly instrument specific, nor is data reduction as software or skill dependent as the initial protocol. Second, because the area to be surveyed is fixed, repeated measures allow for a more uniform comparison of volumetric change from survey to survey and surveys are not biased by field crew changes or interpretations.

Changing the survey protocol may result in some loss of resolution (sampling intensity) in the areas of most active accumulation. However, because the current rock weir area is fixed and the same approximate points are surveyed each time, that loss should be minimal and offset by greater consistency from survey to survey. Changing the field procedure does not preclude the use of AutoCAD packages for data analysis. However, if an AutoCAD package is not used to process the data, the average elevation of the rock weir surface can be obtained by determining the average elevation of the survey points. The volumetric change between any two surveys can be estimated by multiplying the difference in the average geo-referenced elevations for the two surveys by the area of the rock weir.

Presented in the 2009 and 2010 Annual Reports, as part of the process of changing a protocol, several quality control and quality assurance checks were implemented as a means of better defining errors that might be associated with the survey procedure. The concerns were; 1) whether or not the initial survey grid system selected for each rock weir was adequate to define the average elevation of the surface, 2) whether or not observed discrepancies in the total number of points observed in the successive surveys of the same pond were significant, and 3) whether or not measurement error associated with defining the reference elevation used for the feature of interest caused a significant error.

As noted in earlier reports, there is an additional error in the surveys of the rock weirs (and all other surveys as well) that is associated with defining the reference benchmarks for each feature. The benchmarks are used to orient the Trimble Robotics Total Station as to the elevation and the geospatial location of the feature being surveyed. Field experience in the use of the Total Station indicates that the measurement error in defining the reference elevation for the feature of interest, based on the use of three benchmarks, is 0.01 feet or less.

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.

As noted above, any conveyance channels that appear to be present below the rock weirs are monitored. If the rock weirs fail, as some did in 2013, any changes in the conveyance channel geometry that may result will be documented. 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 2013, the highway crew lined drainage ditch 188DD (Basin 2) with shotcrete and installed a pipe back to divert water under the highway to the shotcrete ditch above sediment pond 199RW. This diverted drainage from rock weirs 178RW, 179RW, 180RW, and 181RW (North Fork of Crystal Creek Watershed) to South Catamount Creek Watershed. Rock weir 176RW was also lined with shotcrete and is the only remaining active rock weir along drainage ditch 188DD. In 2012, the highway crew removed five breached rock weirs (236RW, 238RW, 240RW, 242RW, and 243RW) in the switchbacks (Basins 3 and 4) and replaced them with cutoff walls with riprap aprons below (Figure 4). Photographic and observation monitoring are used to document changes at these sites along with three sediment ponds (258RW, 260RW, and 262RW). The design for the breached rock weir 234RW in the switchbacks (corner just above Elk Park in Basin 3) has been completed and construction will begin in August-early September, 2014 (personal communication with Jack Glavan, City of Colorado Springs, Capital Projects Manager).

Thirty-six sediment traps were monitored in 2013, including 24 rock weirs, five cutoff walls with riprap aprons below, and seven sediment ponds. Six 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). Eleven of the 24 rock weir sites and two of the sediment ponds (258RW and 260RW) 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. Some of the rock weirs are full of sediment rendering them ineffective, resulting in an inability of the field crew to effectively monitor these structures. As noted earlier for silt fences on the cut and fill slopes, the 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 6. A summary of rock weir silt fence site visits, and sediment accumulation in rock weir silt fences and the rock weirs for the 2013 monitoring season, as well as rock weir and sediment pond cross sections from 2013 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 2013 are available on the accompanying data DVD.

Figure 4. Rock weir 243RW was removed and replaced with cutoff wall with riprap apron below Pikes Peak, 2012.

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 2012 and 2013 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 2013 field season are presented in Appendix L and on the accompanying data DVD.

Table 6. Management practices implemented above sediment traps, and sediment trap survey dates on Pikes Peak, 2013.

Site ID	Basin #	Watershed	Management Practice	Survey Dates	
002RW	1	Lower SKIC	Untreated Ditch	5/28/2013	
003RW	1	Lower SKIC	Shotcrete Ditch	5/28/2013	
006RW	1	Lower SKIC	Fabric Ditch	5/15/2013	
008RW	1	Lower NCRY	Shotcrete Ditch	5/22/2013	
009RA	1	Lower SKIC	Fabric Ditch	5/14/2013	
152RW	2	SKIC	Fabric Ditch	5/16/2013	
153RW	2	SKIC	Fabric Ditch	5/14/2013	

Site ID	Basin #	Watershed	Management Practice	Survey Dates	
161RW	2	NCRY	Asphalt Curb and Ditch	5/13/2013	
162RW	2	NCRY	Asphalt Ditch	5/16/2013	
176RW	2	NCRY	Shotcrete Ditch	5/15/2013	9/18/2013
178RW	2	NCRY	Shotcrete Ditch	5/15/2013	
179RW	2	NCRY	Shotcrete Ditch	5/15/2013	
180RW†	2	NCRY	Shotcrete Ditch	5/6/2013	
181RW	2	NCRY	Shotcrete Ditch	6/25/2013	
199RW	2	SKIC	Shotcrete Ditch	6/20/2013	9/9/2013
200RW	1	Lower NCRY	Asphalt Curb and Ditch	5/29/2013	9/17/2013
201RW	2	NCRY	Asphalt Curb and Ditch	5/29/2013	
202RW	2	SKIC	Asphalt Ditch	5/22/2013	9/18/2013
233RW	3	SKIC	Shotcrete Ditch	6/12/2013	
234RW†	3	SKIC	Shotcrete Ditch	7/30/2013	
236RW∞	3	SKIC	Shotcrete Ditch	6/17/2013	
237RW	3	SKIC	Shotcrete Ditch	6/11/2013	
238RW∞	3	SKIC	Shotcrete Ditch	6/17/2013	
239RW†	3	French	Shotcrete Ditch	7/30/2013	
240RW∞	3	SKIC	Shotcrete Ditch	6/17/2013	
241RW	4	FRENCH	Shotcrete Ditch	8/6/2013	
242RW∞	4	SKIC	Shotcrete Ditch	7/30/2013	
243RW∞	4	SKIC	Shotcrete Ditch	7/30/2013	
250RW	7	NCRY	Shotcrete Ditch	5/28/2013	9/26/2013
252RW†	7	SKIC	Shotcrete Ditch	6/17/2013	
254RW	7	SKIC	Shotcrete Ditch	6/11/2013	9/26/2013
256RW	6	WBVR	Shotcrete Ditch	7/11/2013	
258RW†	6	WBVR	Shotcrete Ditch	9/17/2013	
260RW†	5	EBVR	Shotcrete Ditch	7/15/2013	
262RW†	7	SKIC	Shotcrete Ditch	6/17/2013	
264RW	7	SKIC	Shotcrete Ditch	6/12/2013	

† 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.

As a result of the flood, not all stream channels were surveyed during the 2013 field season, but several stream reaches were surveyed both pre and post flooding to document changes resulting from higher than normal precipitation. Surveys were completed (pre flood) on Glen Cove, North Catamount, North Fork of Crystal, Ski, and South Catamount Creeks. Additional surveys were completed after the flood event on North Catamount, Oil, Ski (Reach1), and South Catamount (Reach 2) Creeks. Surveys were not completed on Boehmer and East Fork Beaver Creeks as the access road was washed out during the flood. In 2012, a beaver dam was constructed across Oil Creek and the resultant beaver pond inundated the monumented cross sections. Since then, monitoring has been reduced to qualitative observations documented by photographs. High flows in September of 2013 caused the dam to breach and flow returned to a single channel (Figure 5), allowing the original cross sections to be surveyed for the first time since 2012. Due to staffing and time constraints, surveys were not completed on Severy and West Fork Beaver Creeks. Photographic and observation monitoring was completed on Severy and West Fork Beaver (Reach 2) Creeks. Stream channel cross sections from the 2013 monitoring season can be found in Appendix M. Stream channel cross section and thalweg survey data for 2013 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.

Figure 5. Comparison of Oil Creek in 2012 (top) showing the beaver pond and 2013 (bottom) post flood showing a single stream channel Pikes Peak, 2013.

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 2013, 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 Glen Cove, North Catamount, North Fork of Crystal, Oil, Ski, and South Catamount Creeks. Lower water levels allowed a pebble count to be completed on Oil Creek for the first time since 2010. Stream pebble counts were not completed on Boehmer, East Fork of Beaver, Severy, and West Fork of Beaver Creeks. A summary of the stream channel particle size distribution from the pebble counts is presented in Table 7. Stream pebble count particle size distribution graphs from the 2013 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 2013. In addition, grab samples were collected from Severy and West Fork of Beaver Creeks during photographic and observation monitoring. Comparing the distribution of material captured in traps near the highway to sediment deposits (bars) in the streams might be useful in validating response to highway mitigation practices. Laboratory analyses for the 2013 grab samples have been completed and a summary of stream channel particle size distributions and graphs for 2013 are presented in Appendix O and on the accompanying data DVD.

Table 7. Summary of particle size distribution of pebble counts in stream channels on Pikes Peak, 2013.

Site Name	Site ID	Date	Particle Size Distribution					
			D15	D35	D50	D84	D95	D100
Glen Cove Reach 1	GLEN1	8/28/2013	0.189	6.496	9.612	19.978	40.085	302.0
North Catamount Creek Reach 1	NCAT1	9/3/2013	0.108	3.317	5.483	10.551	14.119	21.0
North Catamount Creek Reach 2	NCAT2	9/3/2013	0.108	2.611	4.899	11.183	15.251	24.0
North Fork Crystal Creek Reach 1	NCRY1	8/21/2013	0.642	2.862	5.671	14.000	21.162	34.0
North Fork Crystal Creek Reach 2	NCRY2	8/21/2013	0.132	2.959	6.188	14.333	20.615	33.0
Oil Creek Reach 1	OILC1	9/25/2013	0.587	5.241	9.025	24.582	40.998	148.0
Ski Creek Reach 1	SKIC1	8/26/2013	0.157	2.828	6.385	14.182	23.131	152.0
Ski Creek Reach 2	SKIC2	8/22/2013	1.163	6.265	11.171	36.986	83.864	175.0
South Catamount Creek Reach 1	SCAT1	9/9/2013	1.532	6.272	9.842	24.537	46.093	103.0
South Catamount Creek Reach 2	SCAT2	8/26/2013	1.656	6.159	9.389	29.585	117.900	275.0
South Catamount Creek Reach 3	SCAT3	8/28/2013	1.091	4.124	5.819	11.471	15.686	160.0

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 Glen, North Catamount, North Fork of Crystal, Ski, and South Catamount Creeks prior to the 2013 flood. Vegetation photo points were completed for Oil, Severy, and West Fork of Beaver (Reach 2) Creeks post flood event. Vegetation photo points were not completed for Boehmer and East Fork Beaver Creeks as the access road was washed out during the flood and West Fork Beaver (Reach 1) Creek as water levels were dangerously high. The riparian vegetation summary from the 2013 monitoring season is presented in Appendix P. Vegetation data and photographs from 2013 are available on the accompanying data DVD.

SUMMARY

The 2013 monitoring season was characterized by weather extremes. The entire mountain was affected by higher than normal temperatures in June and July, with less than average rainfall. By mid-August, the monsoon season arrived resulting in several intense storm events and eventually the flood September, 2013. As a result, not all stream channels were surveyed during the 2013 field season, but several stream reaches were surveyed both pre and post flooding to document changes resulting from higher than normal precipitation.

A total of 196 sites were monitored during the 2013 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 above average for 2013 as a result of the flood.

As the Pikes Peak Highway Monitoring Project approaches its end date in 2017, it is time to consider which components of the monitoring program should be amended to meet the core requirements of the ongoing National BMP Monitoring Program. An amendment of the current monitoring would address the following two of three objectives stated in the National Best Management Practices (BMP's) for Water Quality Management on National Forest System Lands (USDA Forest Service 2012):

- To establish a consistent Process to monitor and evaluate Forest Service efforts to implement BMP's and the effectiveness of those BMP's at protecting water quality at national, regional, and forest scales
- To establish a creditable process to document and report agency BMP implementation and effectiveness.

Based on pages 111-114 in the Core BMP's it could be assumed that extension of BMP monitoring on the Pikes Peak Highway would focus primarily on the proper functioning of the sediment detention structures, ditches, diversions, surfacing, etc. implemented as part of the road restoration project. This would assess whether or not the structures installed to mitigate the initial problem are properly managed, maintained, and functioning. In the current Pikes Peak Highway Monitoring Study effectiveness as addressed in this report has been measured in both quantitative and qualitative terms. Significant emphasis has been placed on quantifying sediment and water movement in an attempt to account for or quantify sources and sinks of sediment and energy potentially responsible for stream degradation. Significant effort has also been expended on qualitatively documenting the function and stability of the mitigation practices to provide a context in which to evaluate and analyze the quantitative metrics. The current Pikes Peak Highway monitoring study is very quantitative and was intended to provide a basis for determining if what was thought to be the cause of the stream degradation was in-fact the cause and if so, did the restoration of the highway mitigate the problem. The same degree of monitoring rigor would not be needed into the future. If it can be assumed that the BMP's implemented on the highway corridor are effective and appropriate for mitigating the perceived stream degradation problem, extended monitoring could be far more qualitative than the quantitative techniques implemented as the core monitoring in the current Pikes Peak Highway Project.

As part of the current monitoring program, visual inspection of the BMP infrastructures are visually assessed frequently to determine if sediment storage features are full, breached, cleaned out or if conveyance channels and ditches are properly functioning. The annual reports have well documented the successes and failures of these structures and this documentation should in turn be related to the quantitative response in erosion and sedimentation documented by the physical measurements. Starting in 2018 and beyond, spring and fall "windshield tours" could assess whether the structures are being maintained and functioning properly, compromised, full, etc. and the appropriate recommendations made to the city. Visual inspections, supported by text and photographs, would be sufficient to document if sediment traps are cleaned and maintained as required and the conveyance channels and ditches appear stable and non-erosive. Specific protocols could be established for the surveys and measurements that would be most effective should they be warranted to document failure or change. It would be advisable to retain all reference survey sites, but not plan to complete the surveys unless it seemed appropriate. The point being that if the proper BMP's have been implemented, simply documenting that they are properly functioning should meet the core BMP monitoring requirements. Over the next few years, an effort can be made to identify the most efficient way to qualitatively assess the effectiveness of the structures and thus define the protocol for extended monitoring. It should not be necessary to maintain the quantitative rigor currently being implemented because the objectives of the Pikes Peak Highway Monitoring Project differ from those of the core BMP Monitoring objectives.

Doing the above should meet the objectives of BMP monitoring with respect to highway mitigation, regardless of whether or not the BMP's implemented were effective in mitigating issues in the channels below.

Extended validation that the properly implemented BMP's are effective in mitigating the channel degradation issues is more complex. If, as part of the analysis of data currently being collected, it can be determined that the BMP's implemented on the highway have resulted in an "improved aquatic environment", one can argue that it would be appropriate to eliminate the stream channel measurements and depend solely on documenting the proper implementation/maintenance of the road BMP's. If, at the conclusion of the current Pikes Peak Highway Monitoring Study in 2017, it cannot be validated that the BMP's were or were not beneficial, then extended monitoring of some of the channel parameters is warranted under the core BMP effectiveness requirements. Initially, continuation of the cross section surveys, including thalweg measurements, every two or three years would be warranted. It should not be necessary to continue the pebble counts, vegetation surveys, etc. Again, the recommended protocol could be further refined over the next two or three years.

Extending the monitoring beyond 2017, even in skeletal fashion, would represent an investment with a very high return simply because of the linkage with the long term intensive monitoring that has already been done on the site.

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Appendix A

Site Locations for Effectiveness and Validation Monitoring

2013

Site Locations for Effectiveness and Validation Monitoring on Pikes Peak, 2013†

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/Apron
003RW	N38 55.200	W105 02.258	9416	Rock Weir/Apron
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/Apron
007FS	N38 55.094	W105 02.520	9414	Fill Slope
008RW	N38 55.075	W105 02.554	9417	Rock Weir/Apron
009RA	N38 55.046	W105 02.655	9443	Rock Weir/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/Apron
153RW	N38 54.741	W105 03.066	9457	Rock Weir/Apron
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/Apron
162RW	N38 54.887	W105 02.854	9518	Rock Weir/Apron
163RA	N38 54.665	W105 03.115	9528	Rock Weir/Apron
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

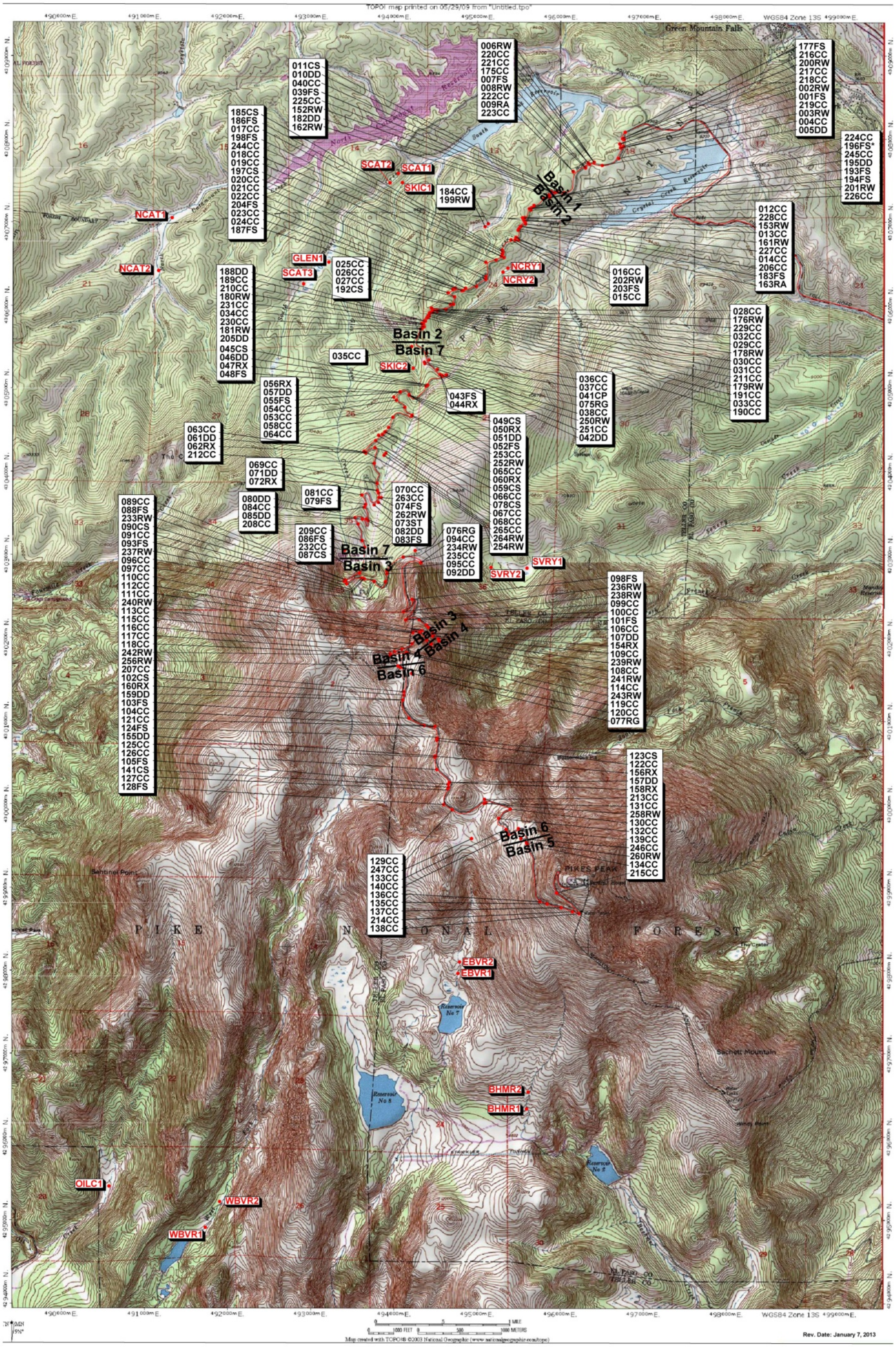
† Not all sites were sampled during the 2013 field season.
∞ North Fork Crystal Creek Reach 2 (NCRY2) is located 200ft upstream from NCRY1.

Appendix B

USGS Topographic Map

Site Locations for Effectiveness and Validation Monitoring

2013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WGS84 Zone 13S
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006RW 220CC 221CC 175CC 007FS 008RW 222CC 009RA 223CC
011CS 010DD 040CC 039FS 225CC 152RW 182DD 162RW
177FS 216CC 200RW 217CC 218CC 002RW 001FS 219CC 003RW 004CC 005DD
185CS 186FS 017CC 198FS 244CC 018CC 019CC 197CS 020CC 021CC 022CC 204FS 023CC 024CC 187FS
224CC 196FS* 245CC 195DD 193FS 194FS 201RW 226CC
SCAT2
SCAT1
SKIC1
184CC 199RW
Basin 1
Basin 2
NCAT1
012CC 228CC 153RW 013CC 161RW 227CC 014CC 206CC 183FS 163RA
GLEN1
SCAT3
NCAT2
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
063CC 061DD 062RX 212CC
049CS 050RX 051DD 052FS 253CC 252RW 065CC 060RX 059CS 066CC 078CS 067CC 068CC 265CC 264RW 254RW
069CC 071DD 072RX
070CC 263CC 074FS 262RW 073ST 082DD 083FS
081CC 079FS
080DD 084CC 085DD 208CC
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
129CC 247CC 133CC 140CC 136CC 135CC 137CC 214CC 138CC
Sentinel Point
PIKE NATIONAL FOREST
EBVR2
EBVR1
Reservoir No 7
Sachett Mountain
BHMR2
BHMR1
Reservoir No 8
Reservoir No 5
OILC1
WBVR2
WBVR1
1 MILE
1000 FEET
1000 METERS
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Rev. Date: January 7, 2013

Appendix C

Daily Precipitation
and
Periodic Precipitation

2013

Daily Precipitation for Electronic Rain Gauges on Pikes Peak, 2013

Date	075RG† (Altitude 10,109') Precipitation (in)	076RG† (Altitude 11,810') Precipitation (in)	077RG† (Altitude 13,069') Precipitation (in)
5/6/2012	0	0	0.02
5/7/2012	0.01	0	0.03
5/8/2013	0.22	0.08	0
5/9/2013	0.28	0	0.01
5/10/2013	0.16	0.34	0.08
5/11/2013	0.02	0.08	0.02
5/12/2013	0	0.01	0.04
5/13/2013	0.01	0.01	0
5/14/2013	0.01	0	0
5/15/2013	0	0.01	0.03
5/16/2013	0	0	0
5/17/2013	0	0	0
5/18/2013	0	0	0
5/19/2013	0	0	0
5/20/2013	0.06	0.03	0.01
5/21/2013	0.22	0.25	0.18
5/22/2013	0.02	0	0
5/23/2013	0	0	0
5/24/2013	0	0	0
5/25/2013	0	0	0
5/26/2013	0	0	0
5/27/2013	0	0	0
5/28/2013	0	0	0.01
5/29/2013	0	0	0
5/30/2013	0	0	0
5/31/2013	0	0	0
6/1/2013	0	0	0
6/2/2013	0	0	0
6/3/2013	0	0	0
6/4/2013	0.03	0.02	0
6/5/2013	0	0	0
6/6/2013	0.03	0.05	0.01
6/7/2013	0	0.04	0.08
6/8/2013	0	0	0
6/9/2013	0	0	0
6/10/2013	0	0	0
6/11/2013	0	0	0
6/12/2013	0	0	0
6/13/2013	0	0	0
6/14/2013	0.02	0.01	0
6/15/2013	0	0	0
6/16/2013	0.27	0.31	0.08

Date	075RG† (Altitude 10,109’) Precipitation (in)	076RG† (Altitude 11,810’) Precipitation (in)	077RG† (Altitude 13,069’) Precipitation (in)
6/17/2013	0.45	0.28	0.05
6/18/2013	0	0.01	0.29
6/19/2013	0	0	0
6/20/2013	0	0	0
6/21/2013	0	0	0
6/22/2013	0	0	0
6/23/2013	0	0	0
6/24/2013	0	0	0
6/25/2013	0	0	0
6/26/2013	0	0	0
6/27/2013	0	0	0
6/28/2013	0.04	0.07	0
6/29/2013	0.05	0.1	0.01
6/30/2013	0.06	0.09	0.09
7/1/2013	0.1	0.18	0.32
7/2/2013	0	0.02	0.01
7/3/2013	0.04	0.04	0.05
7/4/2013	0.07	0.09	0.11
7/5/2013	0.35	0.37	0.4
7/6/2013	0.58	0.74	0.54
7/7/2013	0.29	0.27	0.3
7/8/2013	0.13	0.26	0.25
7/9/2013	0.02	0.02	0
7/10/2013	0.01	0.01	0.02
7/11/2013	0	0	0
7/12/2013	0	0.02	0.06
7/13/2013	0.06	0.09	0.1
7/14/2013	0.27	0.32	0.63
7/15/2013	0.13	0.25	0.33
7/16/2013	0	0	0
7/17/2013	0	0	0
7/18/2013	0.13	0	0
7/19/2013	0.1	0.04	0.14
7/20/2013	0.16	0.2	0.31
7/21/2013	0.1	0.1	0.06
7/22/2013	0.01	0	0.01
7/23/2013	0	0	0
7/24/2013	0.23	0.36	0.27
7/25/2013	0.12	0.06	0.08
7/26/2013	0	0	0
7/27/2013	0.1	0.17	0.25
7/28/2013	0.15	0.62	0.38
7/29/2013	0.12	0.12	0.17

Date	075RG† (Altitude 10,109') Precipitation (in)	076RG† (Altitude 11,810') Precipitation (in)	077RG† (Altitude 13,069') Precipitation (in)
7/30/2013	0	0.02	0.09
7/31/2013	0	0	0
8/1/2013	0.03	0.03	0.02
8/2/2013	0.1	0.16	0.35
8/3/2013	0.23	0.32	0.59
8/4/2013	0.33	0.28	0.35
8/5/2013	0	0.07	0.09
8/6/2013	0.05	0.07	0.1
8/7/2013	0.23	0.24	0.22
8/8/2013	0.02	0.01	0
8/9/2013	0.51	0.37	0.02
8/10/2013	0.15	0.25	0.18
8/11/2013	0.25	0.2	0.18
8/12/2013	0.1	0.08	0.1
8/13/2013	0.06	0.31	0.19
8/14/2013	0	0	0
8/15/2013	0	0	0
8/16/2013	0	0	0.02
8/17/2013	0	0	0
8/18/2013	0	0	0
8/19/2013	0.05	0.03	0.04
8/20/2013	0	0	0
8/21/2013	0	0	0
8/22/2013	0.73	0.78	0.75
8/23/2013	0.12	0.32	0.24
8/24/2013	0	0	0
8/25/2013	0	0	0.03
8/26/2013	0	0	0
8/27/2013	Missing	0	0
8/28/2013	Missing	0	0
8/29/2013	Missing	0	0
8/30/2013	Missing	0.01	0
8/31/2013	Missing	0.07	0.06
9/1/2013	Missing	0.32	0.18
9/2/2013	Missing	0	0
9/3/2013	Missing	0.03	0.05
9/4/2013	Missing	0.07	0.29
9/5/2013	Missing	0	0
9/6/2013	Missing	0	0
9/7/2013	Missing	0	0
9/8/2013	Missing	0	0
9/9/2013	Missing	0.02	0
9/10/2013	Missing	0.11	0.13

Date	075RG† (Altitude 10,109') Precipitation (in)	076RG† (Altitude 11,810') Precipitation (in)	077RG† (Altitude 13,069') Precipitation (in)
9/11/2013	Missing	0.92	0.4
9/12/2013	Missing	1.26	1.35
9/13/2013	Missing	0.44	0.47
9/14/2013	Missing	0.05	0.05
9/15/2013	Missing	0.41	0.31
9/16/2013	Missing	0.12	0.11
9/17/2013	Missing	0	0.01
9/18/2013	Missing	Missing	Missing
9/19/2013	Missing	Missing	Missing
9/20/2013	Missing	Missing	Missing
9/21/2013	Missing	Missing	Missing
9/22/2013	Missing	Missing	Missing
9/23/2013	Missing	Missing	Missing
9/24/2013	Missing	Missing	Missing
9/25/2013	Missing	0	0
9/26/2013	Missing	0	0.01
9/27/2013	Missing	0	0
9/28/2013	Missing	0.02	0
9/29/2013	Missing	0	0
9/30/2013	Missing	0	0.01
Total	**8.19†**	**13.53†**	**12.82†**
† Indicates missing data due to equipment malfunction and/or damage to the rain gauge.			

Periodic Precipitation for Standard Rain Gauges on Pikes Peak, 2013

Date	075RG (Altitude 10,109’) Precipitation (in)	076RG (Altitude 11,810’) Precipitation (in)	077RG† (Altitude 13,069’) Precipitation (in)
5/6/13	0.33	0.34	0.08
5/14/13	0.74	0.68	0.17
5/20/13	0.01	0.04	0.04
5/28/13	0.33	0.32	0.21
6/6/13	0.04	0.03	Missing
6/10/13	0.03	0.13	Missing
6/17/13	0.39	0.42	0.13
6/24/13	0.46	0.33	0.32
7/1/13	0.21	0.35	0.35
7/8/13	2.03	2.27	1.88
7/15/13	0.57	0.86	1.22
7/23/13	0.63	0.43	0.64
7/29/13	0.75	1.44	1.11
8/5/13	1.06	1.14	1.50
8/13/13	1.51	1.50	0.95
8/19/13	0.06	0.37	0.21
8/26/13	1.10	1.36	1.06
9/9/13	2.25	0.60	0.55
9/17/13	4.53	3.86	3.36
9/24/13	1.02	0.98	0.19
9/30/13	0.11	0.15	0.15
Total	**18.16**	**17.60**	**14.12†**
† Indicates missing data due to damage to the rain gauge.			

Appendix D

Cut Slope

Site Visit Dates
and
Sediment Accumulation

2013

Site Visit Dates of Cut Slope Silt Fences on Pikes Peak, 2013

Site ID	Cut Slope Site Visit Dates 2013											
	5/6	5/7	5/20	5/30	6/10	7/2	7/16	7/29	8/12	9/17	9/26	9/30
011CS		X	X		X	X	X	X	X	X		X
045CS	X		X		X	X	X	X	X	X		X
049CS		X	X		X	X	X	X	X	X		X
059CS	X		X		X	X	X	X	X	X		X
078CS	X		X		X	X	X	X	X	X		X
087CS	X		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		X
141CS	X		X	X	X	X	X	X	X	X	X	X
185CS	X		X		X	X	X	X	X	X		X
192CS	X		X		X	X	X	X	X	X		X
197CS	X		X		X	X	X	X	X	X		X

Sediment Accumulation in Cut Slope Silt Fences on Pikes Peak, 2013

Site ID	Location	Date	Volume (ft^3)	Grab Sample
185CS	Lower Fence	5/6/13	0.13	Yes
192CS	Lower Fence	5/6/13	1.14	Yes
197CS	Lower Fence	5/6/13	1.74	Yes†
197CS	Upper Fence	5/6/13	0.13	Yes†
049CS	Lower Fence	5/7/13	0.13	Yes
045CS	Lower Fence	5/20/13	0.20	Yes†
059CS	Lower Fence	5/20/13	0.07	Yes
087CS	Lower Fence	6/10/13	0.27	Yes
090CS	Lower Fence	6/10/13	0.07	Yes†
123CS	Upper Fence	6/10/13	0.53	Yes†
141CS	Upper Fence	6/10/13	0.27	Yes
049CS	Lower Fence	7/16/13	0.13	Yes
078CS	Lower Fence	7/16/13	0.27	Yes†
123CS	Upper Fence	7/16/13	0.07	Yes
192CS	Lower Fence	7/29/13	1.20	Yes†
197CS	Lower Fence	7/29/13	0.13	Yes
197CS	Upper Fence	7/29/13	0.13	Yes
141CS	Upper Fence	8/12/13	0.07	Yes†
087CS	Lower Fence	9/17/13	0.40	Yes
192CS	Lower Fence	9/17/13	2.61	Yes†
197CS	Lower Fence	9/17/13	1.40	Yes†

† Grab samples selected for lab analyses.

Appendix E

Fill Slope

Site Visit Dates
and
Sediment Accumulation

2013

Site Visit Dates of Fill Slope Silt Fences on Pikes Peak, 2013

Site ID	Fill Slope Site Visit Dates 2013										
	5/6	5/7	5/20	6/10	6/24	7/2	7/16	7/29	8/12	9/17	9/30
001FS	X		X	X		X	X	X	X	X	X
007FS	X	X	X	X		X	X	X	X	X	X
039FS	X		X	X		X	X	X	X	X	X
043FS	X		X	X		X	X	X	X	X	X
048FS	X		X	X		X	X	X	X	X	X
052FS		X	X	X		X	X	X	X	X	X
055FS	X		X	X		X	X	X	X	X	X
074FS	X		X	X		X	X	X	X	X	X
079FS	X		X	X	X	X	X	X	X	X	X
083FS	X		X	X	X	X	X	X	X	X	X
086FS	X		X	X		X	X	X	X	X	X
088FS	X		X	X		X	X	X	X	X	X
093FS	X		X	X		X	X	X	X	X	X
098FS	X		X	X		X	X	X	X	X	X
101FS	X		X	X		X	X	X	X	X	X
103FS	X		X	X		X	X	X	X	X	X
105FS	X		X	X		X	X	X	X	X	X
124FS	X		X	X		X	X	X	X	X	X
128FS	X		X	X		X	X	X	X	X	X
177FS	X	X	X	X		X	X	X	X	X	X
183FS	X		X	X		X	X	X	X	X	X
186FS	X		X	X		X	X	X	X	X	X
187FS	X		X	X		X	X	X	X	X	X
193FS	X		X	X		X	X	X	X	X	X
194FS	X		X	X		X	X	X	X	X	X
198FS	X		X	X		X	X	X	X	X	X
203FS	X		X	X		X	X	X	X	X	X
204FS	X		X	X		X	X	X	X	X	X

Sediment Accumulation in Fill Slope Silt Fences on Pikes Peak, 2013

Site ID	Location	Date	Volume (ft^3)	Grab Sample
039FS	Upper Fence	5/6/13	2.01	Yes†
039FS	Lower Fence	5/6/13	0.13	Yes†
177FS	Upper Fence	5/6/13	0.20	Yes
183FS	Upper Fence	5/6/13	0.27	Yes
186FS	Upper Fence	5/6/13	0.13	Yes
186FS	Lower Fence	5/6/13	0.13	Yes
193FS	Upper Fence	5/6/13	0.33	Yes
198FS	Upper Fence	5/6/13	0.33	Yes
198FS	Lower Fence	5/6/13	0.07	Yes
204FS	Upper Fence	5/6/13	0.60	Yes†
204FS	Lower Fence	5/6/13	0.27	Yes†
052FS	Lower Fence	5/7/13	0.07	Yes
043FS	Upper Fence	5/20/13	0.13	Yes†
088FS	Lower Fence	6/10/13	0.07	Yes
093FS	Upper Fence	6/10/13	1.00	Yes
098FS	Upper Fence	6/10/13	2.14	Yes†
105FS	Upper Fence	6/10/13	0.13	Yes†
105FS	Lower Fence	6/10/13	0.60	Yes†
128FS	Upper Fence	6/10/13	0.07	Yes
083FS	Lower Fence	6/24/13	0.07	Yes†
086FS	Lower Fence	7/2/13	0.20	Yes
093FS	Upper Fence	7/2/13	0.33	Yes†
187FS	Upper Fence	7/2/13	0.47	Yes
001FS	Upper Fence	7/16/13	0.53	Yes
074FS	Upper Fence	7/16/13	1.40	Yes
074FS	Lower Fence	7/16/13	0.07	Yes
183FS	Upper Fence	7/16/13	0.27	Yes
186FS	Lower Fence	7/16/13	0.07	Yes
001FS	Upper Fence	7/29/13	1.34	Yes†
043FS	Upper Fence	7/29/13	0.47	Yes
088FS	Lower Fence	7/29/13	0.07	Yes
093FS	Upper Fence	7/29/13	0.27	Yes
098FS	Upper Fence	7/29/13	0.80	Yes
177FS	Upper Fence	7/29/13	0.20	Yes
203FS	Upper Fence	7/29/13	1.07	Yes†
128FS	Upper Fence	8/12/13	0.20	Yes†
105FS	Lower Fence	8/12/13	0.47	Yes
101FS	Lower Fence	8/12/13	0.74	Yes†

Site ID	Location	Date	Volume (ft^3)	Grab Sample
093FS	Upper Fence	8/12/13	0.07	Yes
183FS	Upper Fence	8/12/13	0.60	Yes
186FS	Upper Fence	8/12/13	0.27	Yes†
186FS	Lower Fence	8/12/13	0.27	Yes†
039FS	Upper Fence	9/17/13	0.34	Yes†
098FS	Upper Fence	9/17/13	0.47	Yes
183FS	Upper Fence	9/17/13	0.81	Yes
198FS	Upper Fence	9/17/13	1.60	Yes
203FS	Upper Fence	9/17/13	1.60	Yes
204FS	Upper Fence	9/17/13	2.07	Yes†
204FS	Lower Fence	9/17/13	0.34	Yes†
† Grab samples selected for lab analyses.				

Appendix F

Cut and Fill Slope

Particle Size Distribution Summary
and
Graphs

2012 and 2013

Summary of Cut Slope Particle Size Distribution from Sieve Analysis of Grab Samples on Pikes Peak, 2012 and 2013

			Particle Size Distribution–Grab Samples 2012 and 2013					
Site Name	**ID**	**Date**	**D15**	**D35**	**D50**	**D84**	**D95**	**D100**
Pikes Peak Highway - Cut Slope	011CS - Lower Fence	7/30/2012	0.088	0.755	1.234	4.991	12.953	19.0
Pikes Peak Highway - Cut Slope	011CS - Upper Fence	7/30/2012	0.011	0.040	0.107	0.864	1.840	13.0
Pikes Peak Highway - Cut Slope	049CS - Upper Fence	9/4/2012	0.017	0.122	0.512	1.917	3.680	12.0
Pikes Peak Highway - Cut Slope	059CS - Lower Fence	5/4/2012	0.032	0.508	1.079	3.886	10.348	18.0
Pikes Peak Highway - Cut Slope	090CS - Lower Fence	6/18/2012	0.094	1.004	2.069	33.668	37.249	39.0
Pikes Peak Highway - Cut Slope	123CS - Upper Fence	9/4/2012	1.284	3.089	4.333	8.561	14.088	19.0
Pikes Peak Highway - Cut Slope	141CS - Upper Fence	8/20/2012	1.018	2.232	3.158	6.011	7.906	15.0
Pikes Peak Highway - Cut Slope	192CS - Lower Fence	5/4/2012	0.048	0.770	1.947	8.108	11.945	20.0
Pikes Peak Highway - Cut Slope	192CS - Upper Fence	5/4/2012	0.036	0.588	1.550	7.132	13.704	18.0
Pikes Peak Highway - Cut Slope	045CS - Lower Fence	5/20/2013	2.877	11.615	15.025	25.578	30.474	33.0
Pikes Peak Highway - Cut Slope	078CS - Lower Fence	7/16/2013	0.379	2.193	4.040	10.308	13.830	16.0
Pikes Peak Highway - Cut Slope	090CS - Lower Fence	6/10/2013	0.016	0.113	0.477	3.533	10.382	16.0
Pikes Peak Highway - Cut Slope	123CS - Upper Fence	6/10/2013	1.228	2.525	3.516	7.944	14.350	19.0
Pikes Peak Highway - Cut Slope	141CS - Upper Fence	8/12/2013	1.073	2.144	2.874	5.463	7.695	14.0
Pikes Peak Highway - Cut Slope	192CS - Lower Fence	7/29/2013	0.025	0.286	0.977	4.674	9.755	14.0
Pikes Peak Highway - Cut Slope	192CS - Upper Fence	9/17/2013	0.145	1.125	2.007	4.966	8.772	15.0
Pikes Peak Highway - Cut Slope	197CS - Lower Fence	5/6/2013	0.280	1.679	3.109	10.731	22.923	28.0
Pikes Peak Highway - Cut Slope	197CS - Lower Fence	9/17/2013	0.037	0.587	1.301	4.741	7.800	12.0

Summary of Fill Slope Particle Size Distribution from Sieve Analysis of Grab Samples on Pikes Peak, 2012 and 2013

			Particle Size Distribution–Grab Samples 2012 and 2013					
Site Name	**ID**	**Date**	**D15**	**D35**	**D50**	**D84**	**D95**	**D100**
Pikes Peak Highway - Fill Slope	001FS - Upper Fence	6/4/2012	0.020	0.186	0.633	2.671	5.413	16.0
Pikes Peak Highway - Fill Slope	001FS - Upper Fence	9/4/2012	0.031	0.495	1.064	3.721	6.933	20.0
Pikes Peak Highway - Fill Slope	043FS - Upper Fence	6/4/2012	0.032	0.509	0.950	3.928	9.890	18.0
Pikes Peak Highway - Fill Slope	074FS - Upper Fence	7/16/2012	0.104	0.909	1.505	4.128	7.791	14.0
Pikes Peak Highway - Fill Slope	079FS - Upper Fence	5/21/2012	1.251	5.741	11.576	22.224	22.805	23.0
Pikes Peak Highway - Fill Slope	083FS - Lower Fence	8/7/2012	0.105	0.943	1.541	4.084	6.456	10.0
Pikes Peak Highway - Fill Slope	086FS - Lower Fence	9/4/2012	0.540	1.291	2.023	4.675	7.277	10.0
Pikes Peak Highway - Fill Slope	088FS - Lower Fence	8/7/2012	0.048	0.622	1.062	3.157	5.438	9.0
Pikes Peak Highway - Fill Slope	093FS - Upper Fence	9/4/2012	2.029	6.112	9.559	23.894	27.297	29.0
Pikes Peak Highway - Fill Slope	098FS - Upper Fence	7/16/2012	0.847	2.536	4.088	10.905	20.217	28.0
Pikes Peak Highway - Fill Slope	101FS - Upper Fence	6/4/2012	0.398	1.250	2.127	6.007	10.076	18.0
Pikes Peak Highway - Fill Slope	101FS - Lower Fence	6/4/2012	1.726	3.822	5.650	17.878	28.992	37.0
Pikes Peak Highway - Fill Slope	103FS - Upper Fence	9/4/2012	1.602	7.843	18.801	27.708	30.592	32.0
Pikes Peak Highway - Fill Slope	124FS - Upper Fence	7/30/2012	1.727	4.026	5.398	12.220	22.531	25.0
Pikes Peak Highway - Fill Slope	128FS - Upper Fence	6/4/2012	0.447	1.941	4.148	10.122	14.756	21.0
Pikes Peak Highway - Fill Slope	128FS - Lower Fence	6/4/2012	0.889	2.192	3.254	7.855	12.433	18.0
Pikes Peak Highway - Fill Slope	177FS - Upper Fence	5/3/2012	0.092	1.047	2.179	12.518	23.212	26.0
Pikes Peak Highway - Fill Slope	186FS - Upper Fence	7/17/2012	0.044	0.630	1.211	3.991	7.962	16.0
Pikes Peak Highway - Fill Slope	187FS - Upper Fence	8/20/2012	0.032	0.508	1.156	4.166	7.209	16.0
Pikes Peak Highway - Fill Slope	193FS - Upper Fence	5/3/2012	0.089	0.965	1.674	4.519	7.132	11.0
Pikes Peak Highway - Fill Slope	193FS - Upper Fence	5/21/2012	0.056	0.769	1.529	7.076	11.681	21.0
Pikes Peak Highway - Fill Slope	194FS - Upper Fence	9/4/2012	0.121	1.092	1.960	5.640	9.855	13.0
Pikes Peak Highway - Fill Slope	204FS - Upper Fence	6/4/2012	0.037	0.579	1.215	4.406	7.602	17.0
Pikes Peak Highway - Fill Slope	204FS - Lower Fence	6/4/2012	0.021	0.191	0.764	3.558	7.272	12.0
Pikes Peak Highway - Fill Slope	001FS - Upper Fence	7/29/2013	0.054	0.742	1.432	3.929	6.268	13.0
Pikes Peak Highway - Fill Slope	039FS - Upper Fence	5/6/2013	0.563	1.596	2.684	8.099	14.916	19.0
Pikes Peak Highway - Fill Slope	039FS - Lower Fence	5/6/2013	0.176	1.157	1.971	5.079	8.294	14.0
Pikes Peak Highway - Fill Slope	039FS - Upper Fence	9/17/2013	0.104	0.928	1.663	5.274	16.738	21.0
Pikes Peak Highway - Fill Slope	043FS - Upper Fence	5/20/2013	0.516	1.617	3.236	22.789	28.158	31.0
Pikes Peak Highway - Fill Slope	083FS - Lower Fence	6/24/2013	0.238	1.018	1.551	3.627	5.418	12.0

			Particle Size Distribution–Grab Samples 2012 and 2013					
Site Name	**ID**	**Date**	**D15**	**D35**	**D50**	**D84**	**D95**	**D100**
Pikes Peak Highway - Fill Slope	093FS - Upper Fence	7/2/2013	1.174	4.496	11.029	33.407	39.738	43.0
Pikes Peak Highway - Fill Slope	098FS - Upper Fence	6/10/2013	2.518	6.220	23.121	47.411	51.848	54.0
Pikes Peak Highway - Fill Slope	101FS - Lower Fence	8/12/2013	0.532	1.022	1.557	6.534	21.165	29.0
Pikes Peak Highway - Fill Slope	105FS - Upper Fence	6/10/2013	2.417	8.233	12.884	23.261	28.964	32.0
Pikes Peak Highway - Fill Slope	105FS - Lower Fence	6/10/2013	1.296	2.626	3.452	7.203	12.369	22.0
Pikes Peak Highway - Fill Slope	128FS - Upper Fence	8/12/2013	1.778	4.092	5.771	14.049	23.240	27.0
Pikes Peak Highway - Fill Slope	186FS - Upper Fence	8/12/2013	0.088	0.814	1.435	6.401	25.879	33.0
Pikes Peak Highway - Fill Slope	186FS - Lower Fence	8/12/2013	0.050	0.671	1.291	4.479	8.473	16.0
Pikes Peak Highway - Fill Slope	203FS - Upper Fence	7/29/2013	0.054	0.698	1.313	4.534	14.334	23.0
Pikes Peak Highway - Fill Slope	204FS - Upper Fence	5/6/2013	0.145	1.125	2.007	4.966	8.772	13.0
Pikes Peak Highway - Fill Slope	204FS - Lower Fence	5/6/2013	0.020	0.182	0.633	2.901	6.279	12.0
Pikes Peak Highway - Fill Slope	204FS - Upper Fence	9/17/2013	0.061	0.768	1.401	3.652	5.334	11.0
Pikes Peak Highway - Fill Slope	204FS - Lower Fence	9/17/2013	0.075	1.004	1.855	4.959	7.498	12.0

Sieve Analysis Worksheet

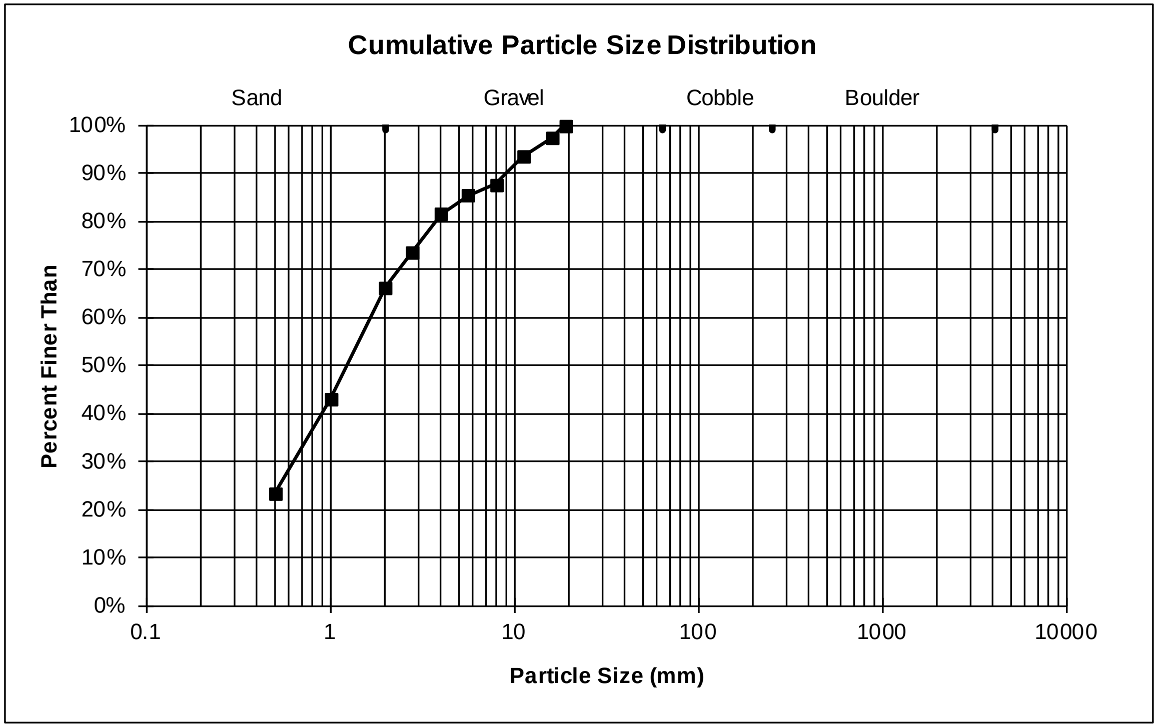
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	154.50	23.3%	
0.5	129.90	19.6%	23.3%
1.0	153.80	23.2%	42.9%
2.0	49.20	7.4%	66.2%
2.8	52.20	7.9%	73.6%
4.0	25.30	3.8%	81.5%
5.6	15.00	2.3%	85.3%
8.0	39.00	5.9%	87.6%
11.2	25.00	3.8%	93.5%
16.0	18.30	2.8%	97.2%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	662.20		

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

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 011CS Lower Fence
DATE: 7/30/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.088	**0.755**	**1.234**	**4.991**	**12.953**	**19.0**



Sieve Analysis Worksheet

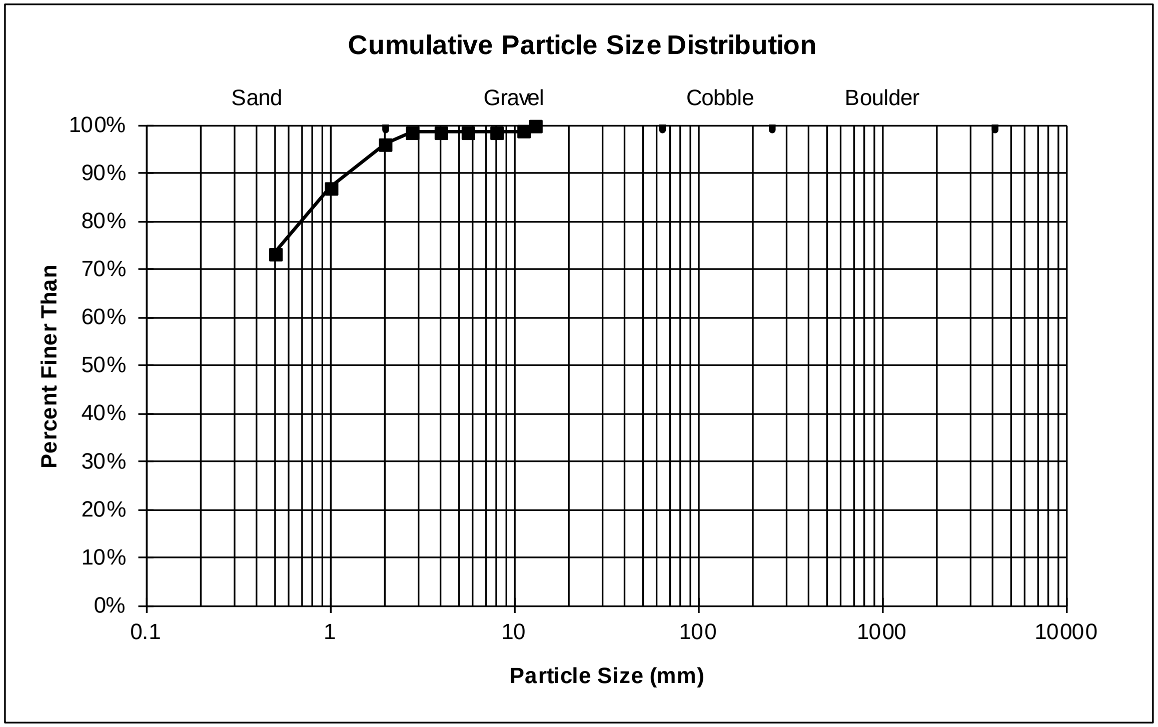
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	625.20	73.2%	
0.5	116.70	13.7%	73.2%
1.0	78.70	9.2%	86.9%
2.0	20.20	2.4%	96.1%
2.8	0.00	0.0%	98.5%
4.0	0.00	0.0%	98.5%
5.6	0.00	0.0%	98.5%
8.0	1.70	0.2%	98.5%
11.2	11.30	1.3%	98.7%
13.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	853.80		

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

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 011CS Upper Fence
DATE: 7/30/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.011	0.040	0.107	0.864	1.840	13.0



Sieve Analysis Worksheet

COMMENTS: Grab Sample of 2012 Sediment Accumulation

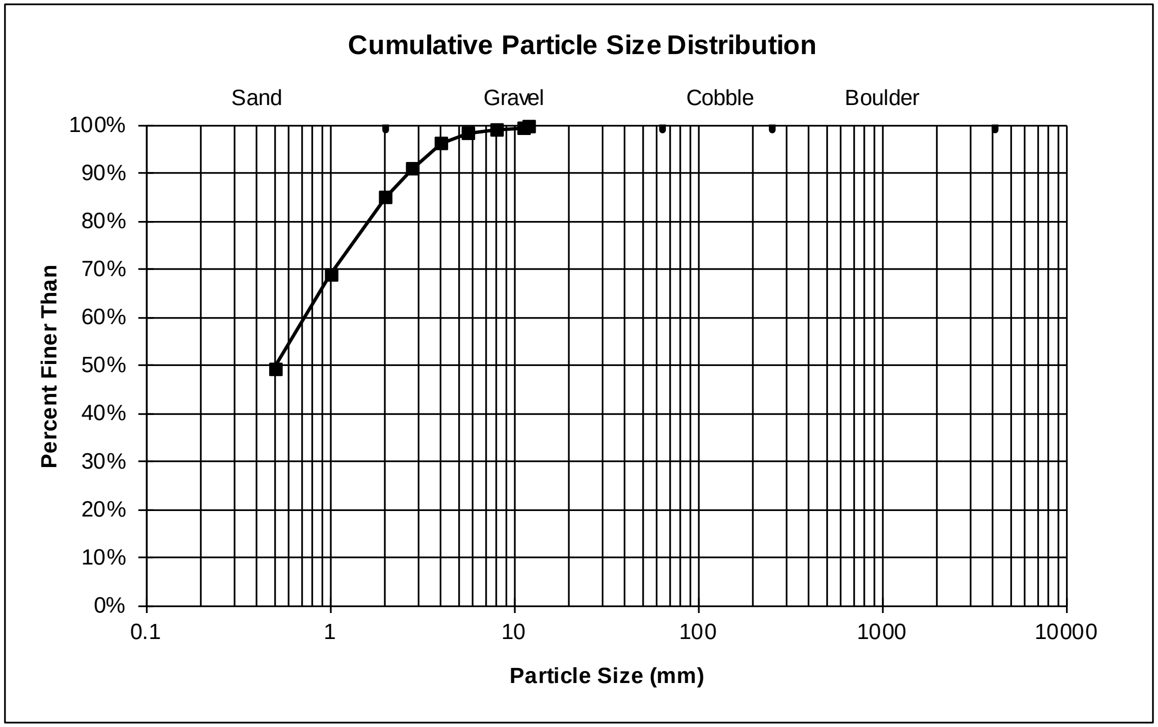
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	204.60	49.3%	
0.5	80.80	19.5%	49.3%
1.0	67.20	16.2%	68.8%
2.0	25.00	6.0%	85.0%
2.8	21.60	5.2%	91.0%
4.0	8.60	2.1%	96.2%
5.6	3.40	0.8%	98.3%
8.0	1.30	0.3%	99.1%
11.2	2.40	0.6%	99.4%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	414.90		

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

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 049CS Upper Fence
DATE: 9/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
0.017	0.122	0.512	1.917	3.680	12.0



Sieve Analysis Worksheet

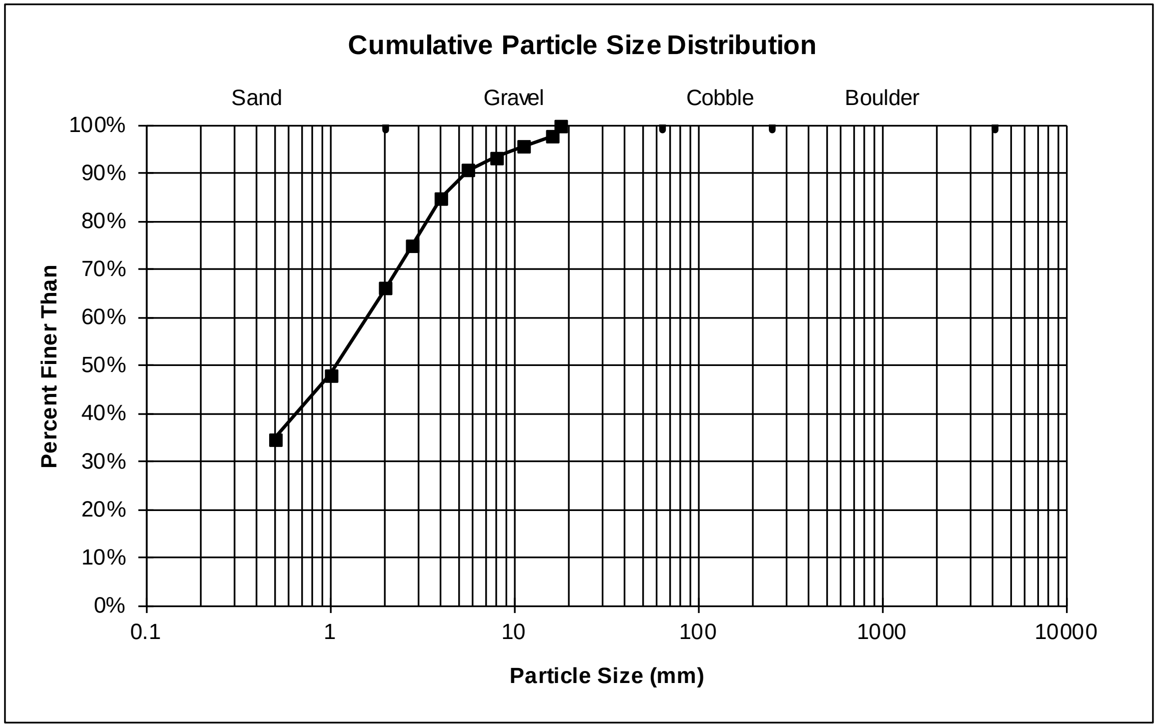
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	224.30	34.7%	
0.5	86.20	13.3%	34.7%
1.0	116.10	18.0%	48.0%
2.0	58.40	9.0%	66.0%
2.8	63.10	9.8%	75.0%
4.0	37.20	5.8%	84.8%
5.6	17.00	2.6%	90.5%
8.0	15.40	2.4%	93.2%
11.2	13.00	2.0%	95.6%
16.0	15.70	2.4%	97.6%
18.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	646.40		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 059CS Lower Fence
DATE: 5/4/2012
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.032	0.508	1.079	3.886	10.348	18.0



Sieve Analysis Worksheet

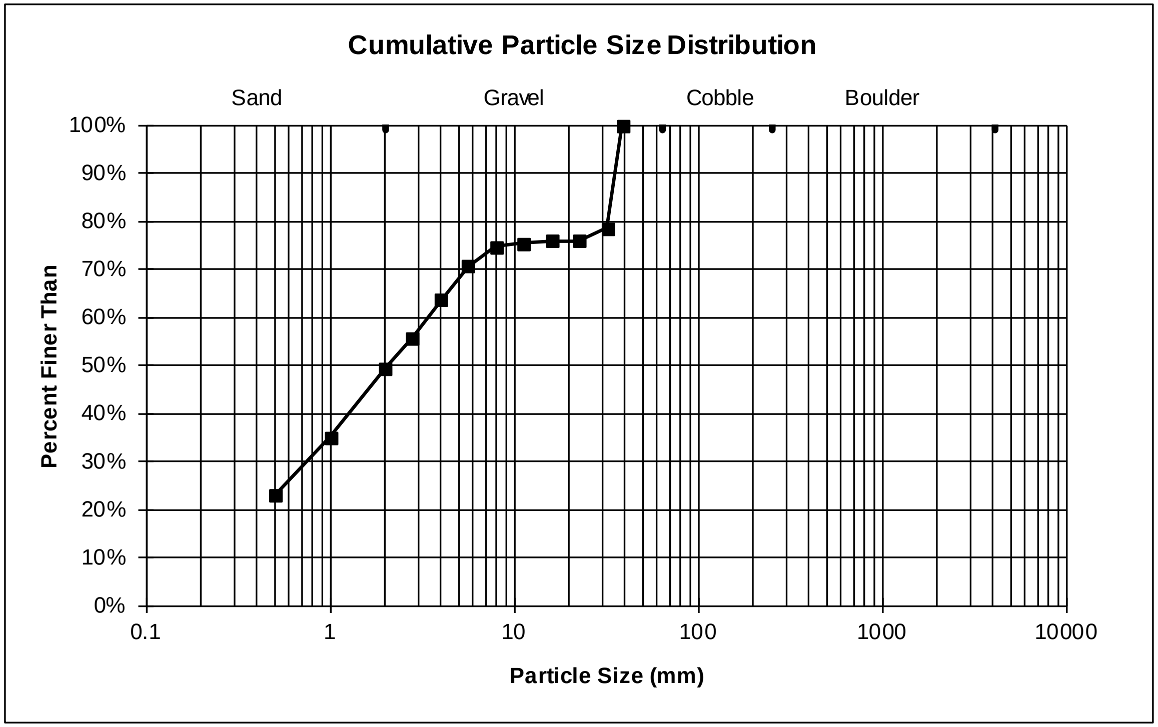
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	193.80	22.8%	
0.5	102.50	12.1%	22.8%
1.0	122.60	14.4%	34.9%
2.0	53.00	6.2%	49.4%
2.8	68.30	8.0%	55.6%
4.0	59.00	7.0%	63.7%
5.6	34.80	4.1%	70.6%
8.0	5.00	0.6%	74.7%
11.2	4.30	0.5%	75.3%
16.0	0.00	0.0%	75.8%
22.4	22.50	2.7%	75.8%
32.0	182.70	21.5%	78.5%
39.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	848.50		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 090CS Lower Fence
DATE: 6/18/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.094	**1.004**	**2.069**	**33.668**	**37.249**	**39.0**



Sieve Analysis Worksheet

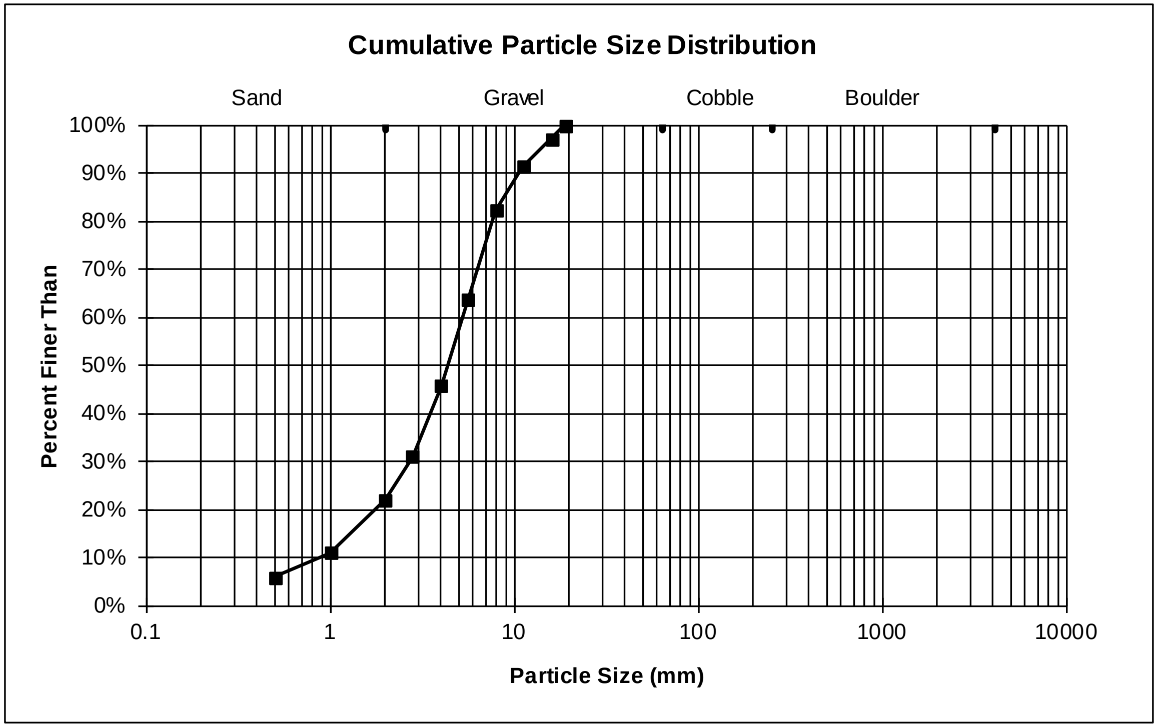
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	43.00	5.8%	
0.5	37.90	5.2%	5.8%
1.0	81.70	11.1%	11.0%
2.0	65.00	8.8%	22.1%
2.8	108.50	14.7%	30.9%
4.0	133.50	18.1%	45.7%
5.6	134.80	18.3%	63.8%
8.0	67.50	9.2%	82.2%
11.2	42.00	5.7%	91.3%
16.0	21.80	3.0%	97.0%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	735.70		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 123CS Upper Fence
DATE: 9/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.284	3.089	4.333	8.561	14.088	19.0



Sieve Analysis Worksheet

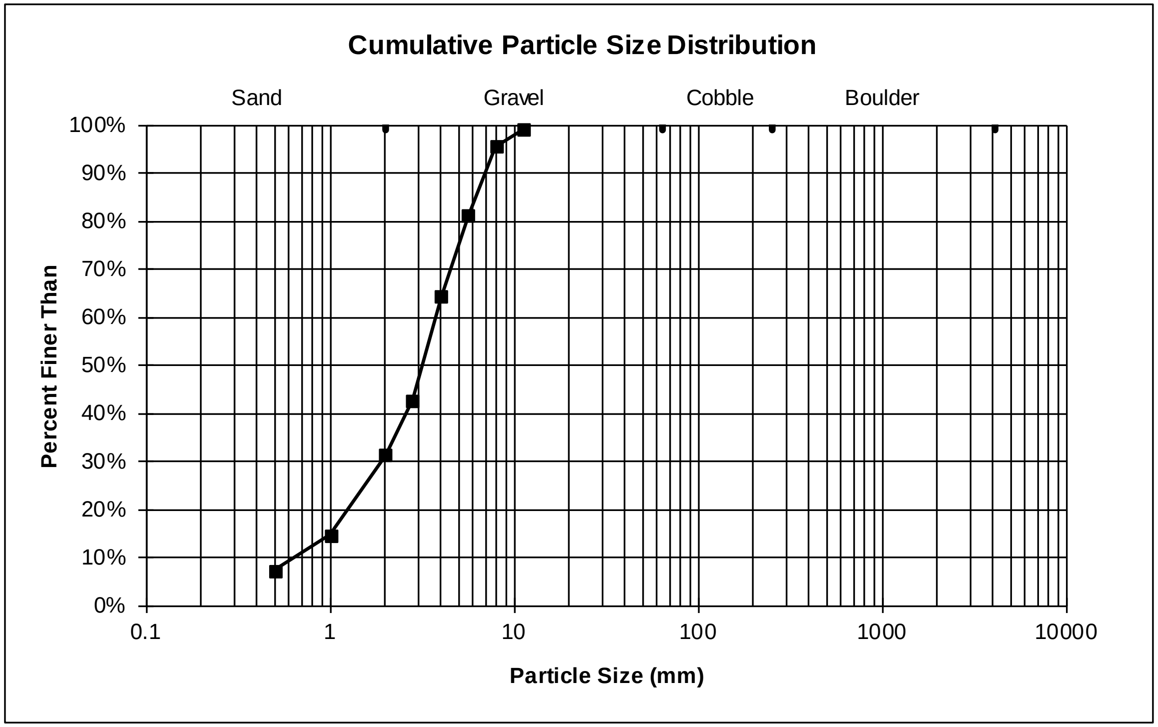
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	43.40	7.2%	
0.5	44.50	7.4%	7.2%
1.0	100.60	16.7%	14.6%
2.0	69.20	11.5%	31.3%
2.8	129.90	21.5%	42.7%
4.0	101.80	16.9%	64.3%
5.6	86.30	14.3%	81.2%
8.0	21.60	3.6%	95.5%
11.2	5.70	0.9%	99.1%
15.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	603.00		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 141CS Upper Fence
DATE: 8/20/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.018	2.232	3.158	6.011	7.906	15.0



Sieve Analysis Worksheet

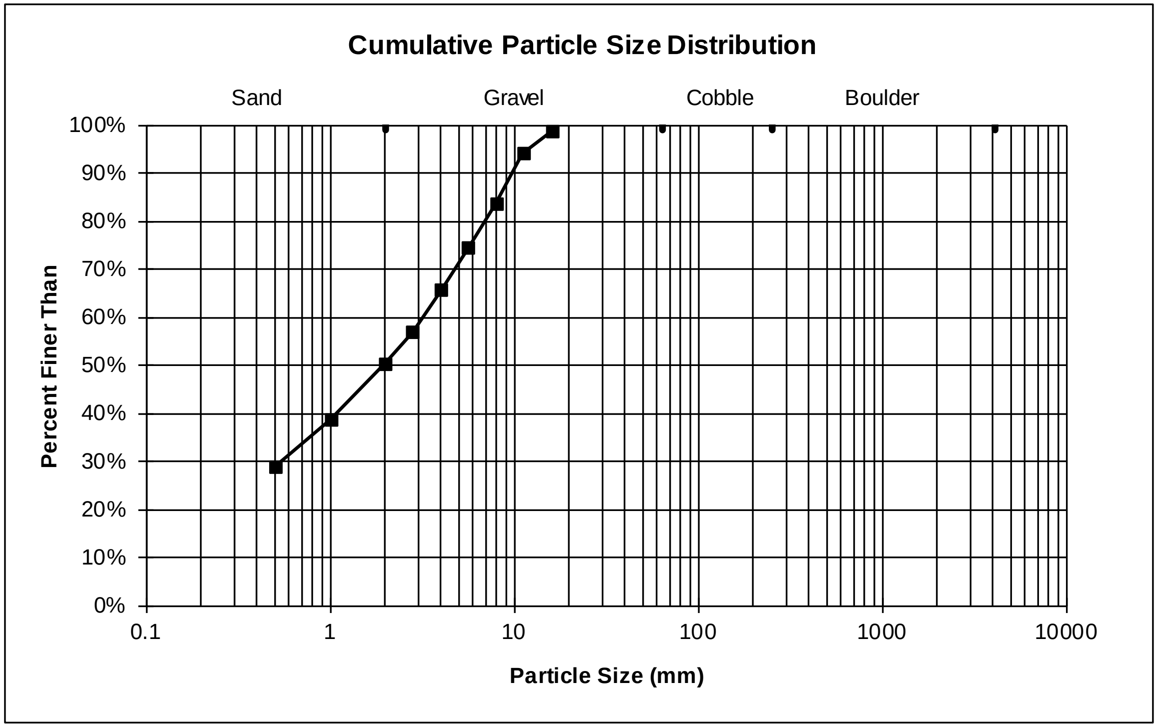
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	182.30	28.9%	
0.5	61.50	9.8%	28.9%
1.0	74.20	11.8%	38.7%
2.0	41.20	6.5%	50.5%
2.8	55.40	8.8%	57.0%
4.0	54.60	8.7%	65.8%
5.6	57.60	9.1%	74.4%
8.0	66.80	10.6%	83.6%
11.2	28.70	4.6%	94.2%
16.0	8.00	1.3%	98.7%
20.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	630.30		

*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: 5/4/2012
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.048	0.770	1.947	8.108	11.945	20.0



Sieve Analysis Worksheet

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	134.30	32.7%	
0.5	39.90	9.7%	32.7%
1.0	49.00	11.9%	42.4%
2.0	24.20	5.9%	54.4%
2.8	37.40	9.1%	60.3%
4.0	36.00	8.8%	69.4%
5.6	35.30	8.6%	78.2%
8.0	20.60	5.0%	86.8%
11.2	23.30	5.7%	91.8%
16.0	10.40	2.5%	97.5%
18.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	410.40		

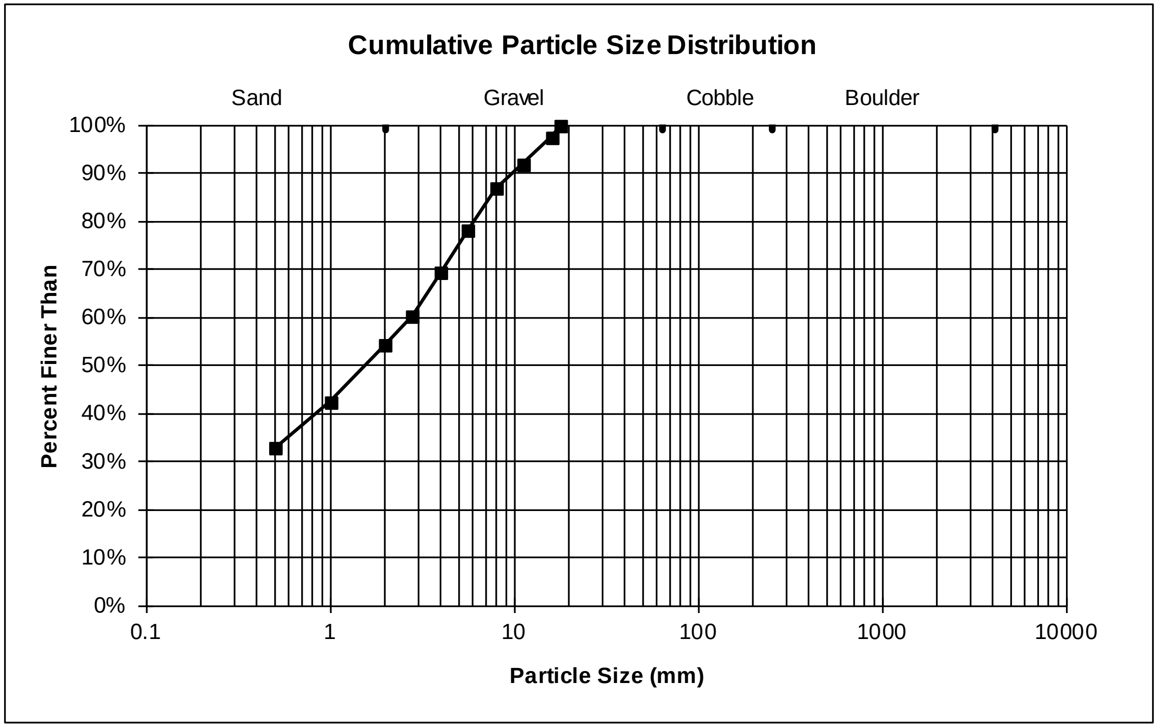
*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 192CS Upper Fence
DATE: 5/4/2012
CREW: VonLoh

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
0.036	0.588	1.550	7.132	13.704	18.0



Sieve Analysis Worksheet

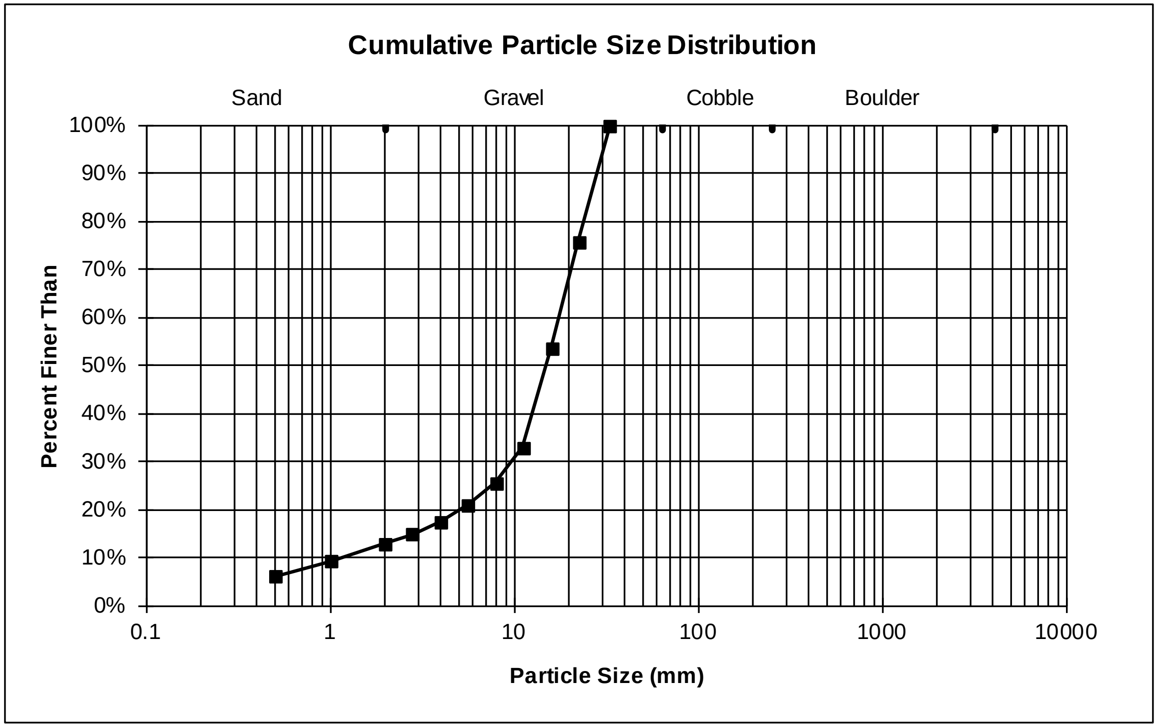
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	36.00	6.0%	
0.5	18.60	3.1%	6.0%
1.0	22.00	3.7%	9.1%
2.0	11.80	2.0%	12.8%
2.8	16.30	2.7%	14.8%
4.0	20.50	3.4%	17.5%
5.6	27.60	4.6%	21.0%
8.0	43.70	7.3%	25.6%
11.2	124.20	20.8%	32.9%
16.0	131.50	22.0%	53.7%
22.4	145.40	24.3%	75.7%
33.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	597.60		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 045CS Lower Fence
DATE: 5/20/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.877	11.615	15.025	25.578	30.474	33.0



Sieve Analysis Worksheet

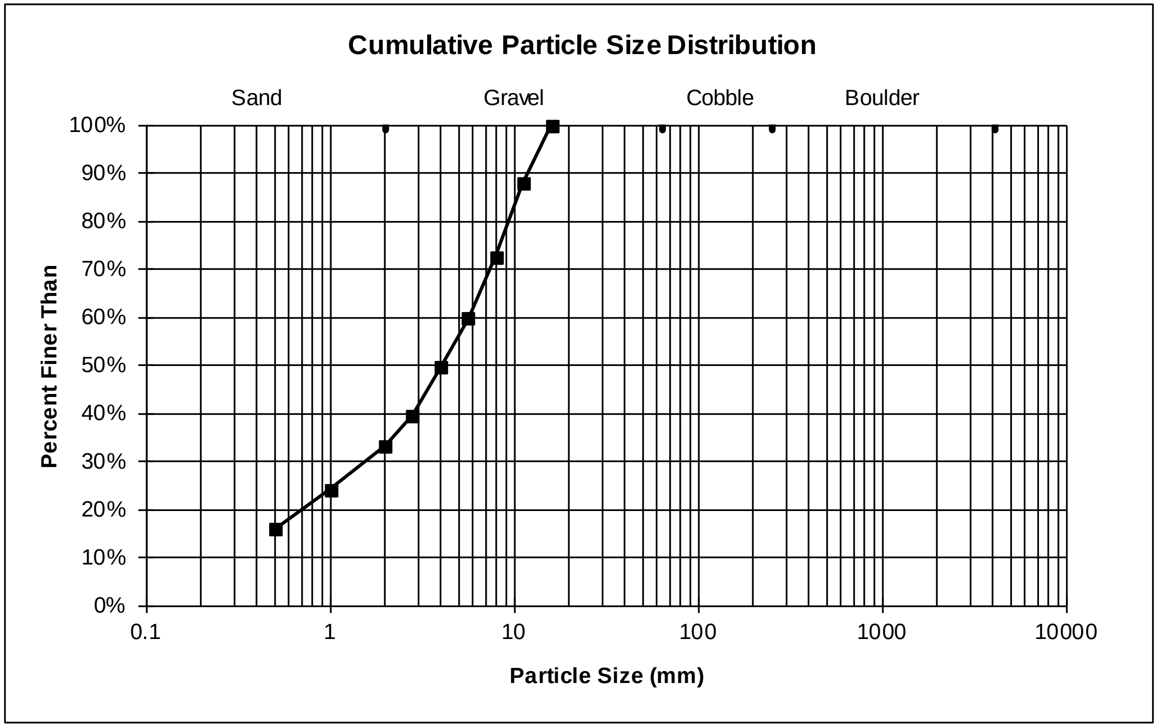
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	67.60	15.9%	
0.5	34.80	8.2%	15.9%
1.0	39.10	9.2%	24.1%
2.0	26.30	6.2%	33.3%
2.8	43.40	10.2%	39.5%
4.0	42.40	10.0%	49.7%
5.6	54.50	12.8%	59.7%
8.0	64.80	15.3%	72.5%
11.2	52.00	12.2%	87.8%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	424.90		

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

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 078CS Lower Fence
DATE: 7/16/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.379	**2.193**	**4.040**	**10.308**	**13.830**	**16.0**



Sieve Analysis Worksheet

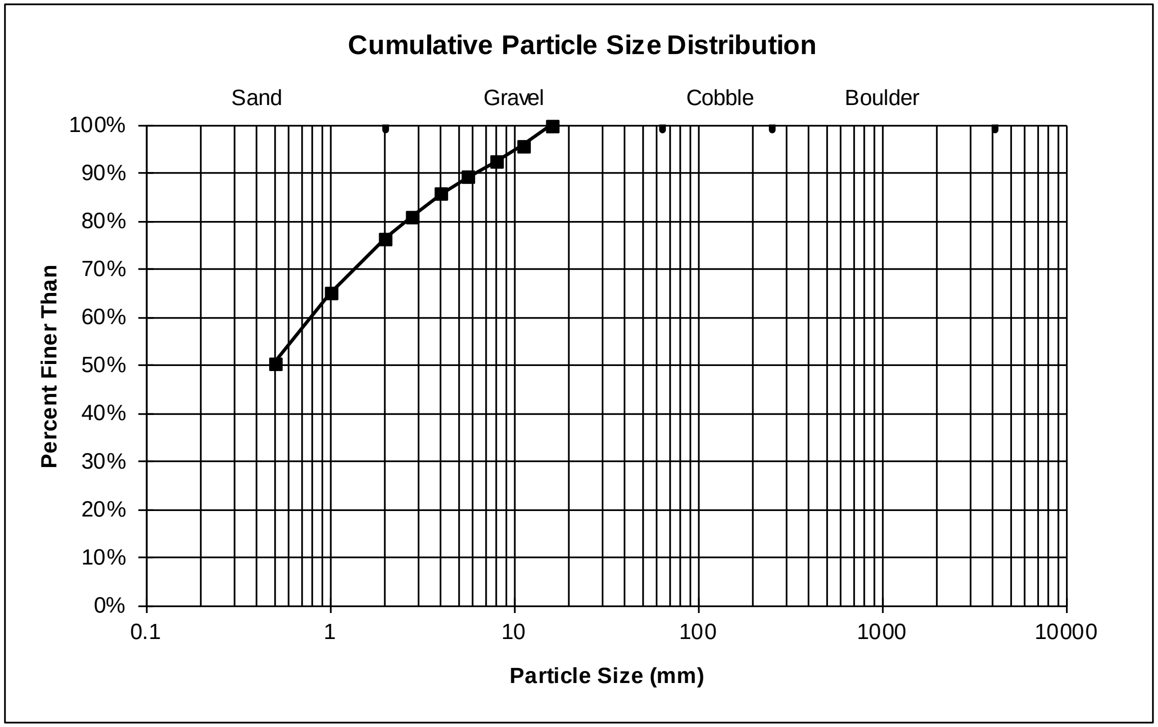
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	150.00	50.5%	
0.5	43.10	14.5%	50.5%
1.0	33.80	11.4%	65.0%
2.0	13.60	4.6%	76.4%
2.8	13.90	4.7%	80.9%
4.0	10.50	3.5%	85.6%
5.6	9.60	3.2%	89.2%
8.0	10.00	3.4%	92.4%
11.2	12.60	4.2%	95.8%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	297.10		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 090CS Lower Fence
DATE: 6/10/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.016	0.113	0.477	3.533	10.382	16.0



Sieve Analysis Worksheet

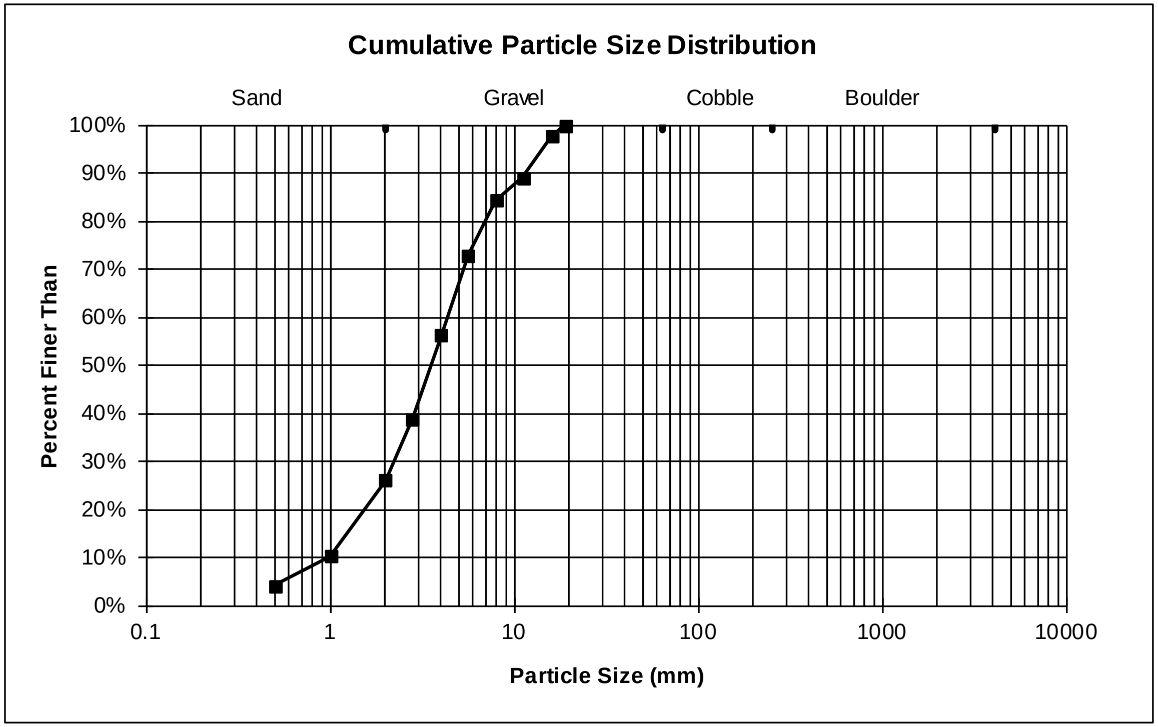
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	26.90	4.1%	
0.5	40.10	6.2%	4.1%
1.0	102.80	15.8%	10.3%
2.0	83.10	12.8%	26.1%
2.8	112.60	17.3%	38.9%
4.0	108.10	16.6%	56.3%
5.6	73.50	11.3%	72.9%
8.0	30.90	4.8%	84.2%
11.2	56.30	8.7%	89.0%
16.0	15.30	2.4%	97.6%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	649.60		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 123CS Upper Fence
DATE: 6/10/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.228	2.525	3.516	7.944	14.350	19.0



Sieve Analysis Worksheet

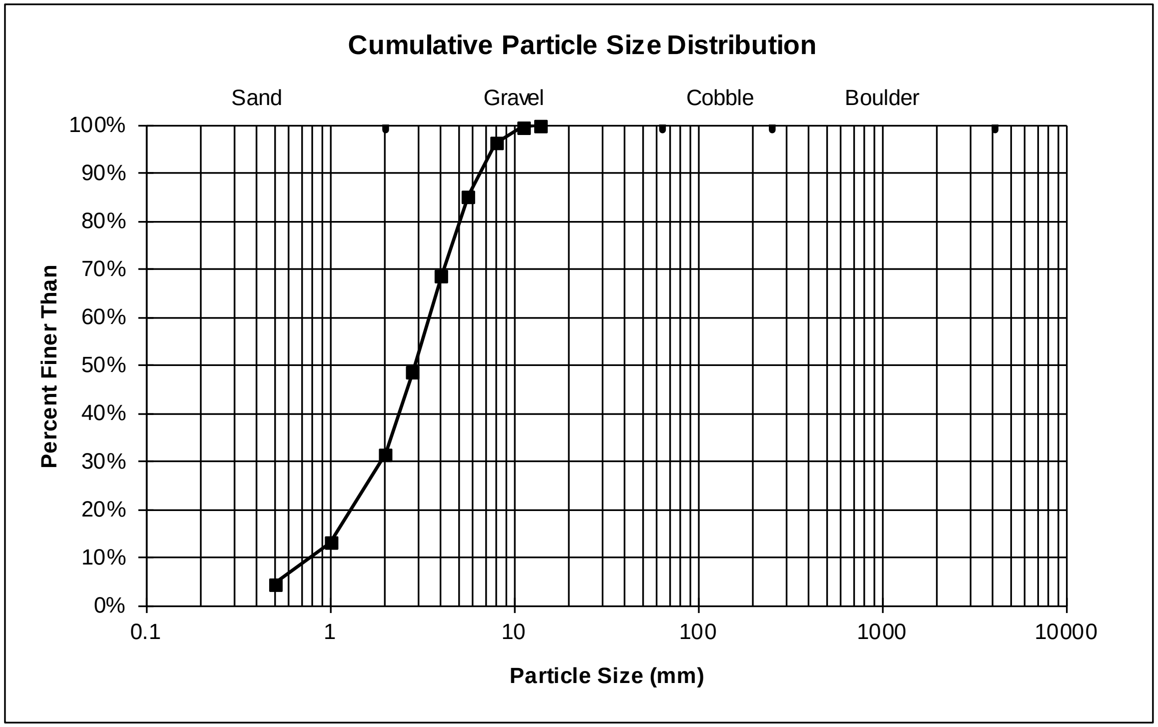
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	24.20	4.5%	
0.5	46.60	8.7%	4.5%
1.0	98.70	18.3%	13.1%
2.0	91.90	17.1%	31.5%
2.8	107.10	19.9%	48.5%
4.0	90.50	16.8%	68.4%
5.6	59.00	11.0%	85.2%
8.0	18.60	3.5%	96.2%
11.2	1.90	0.4%	99.6%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	538.50		

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

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 141CS Upper Fence
DATE: 8/12/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.073	**2.144**	**2.874**	**5.463**	**7.695**	**14.0**



Sieve Analysis Worksheet

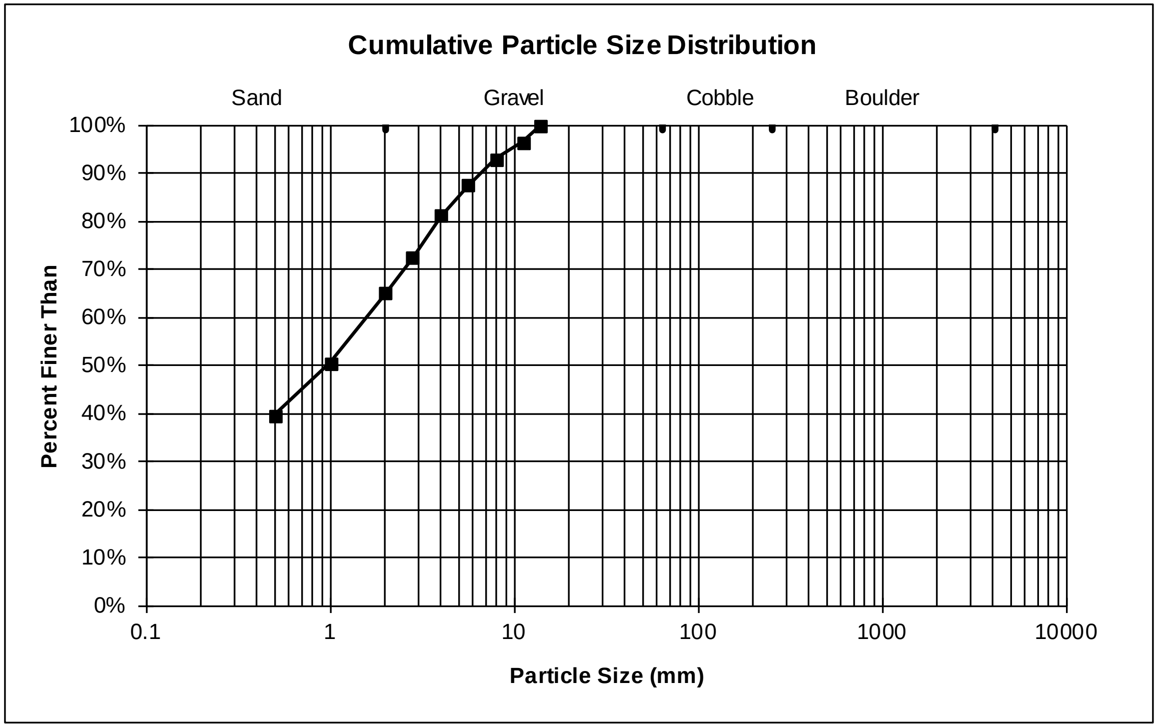
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	133.00	39.6%	
0.5	36.30	10.8%	39.6%
1.0	49.00	14.6%	50.4%
2.0	25.00	7.4%	64.9%
2.8	29.30	8.7%	72.4%
4.0	21.20	6.3%	81.1%
5.6	18.40	5.5%	87.4%
8.0	12.20	3.6%	92.9%
11.2	11.80	3.5%	96.5%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	336.20		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 192CS Lower Fence
DATE: 7/29/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.025	0.286	0.977	4.674	9.755	14.0



Sieve Analysis Worksheet

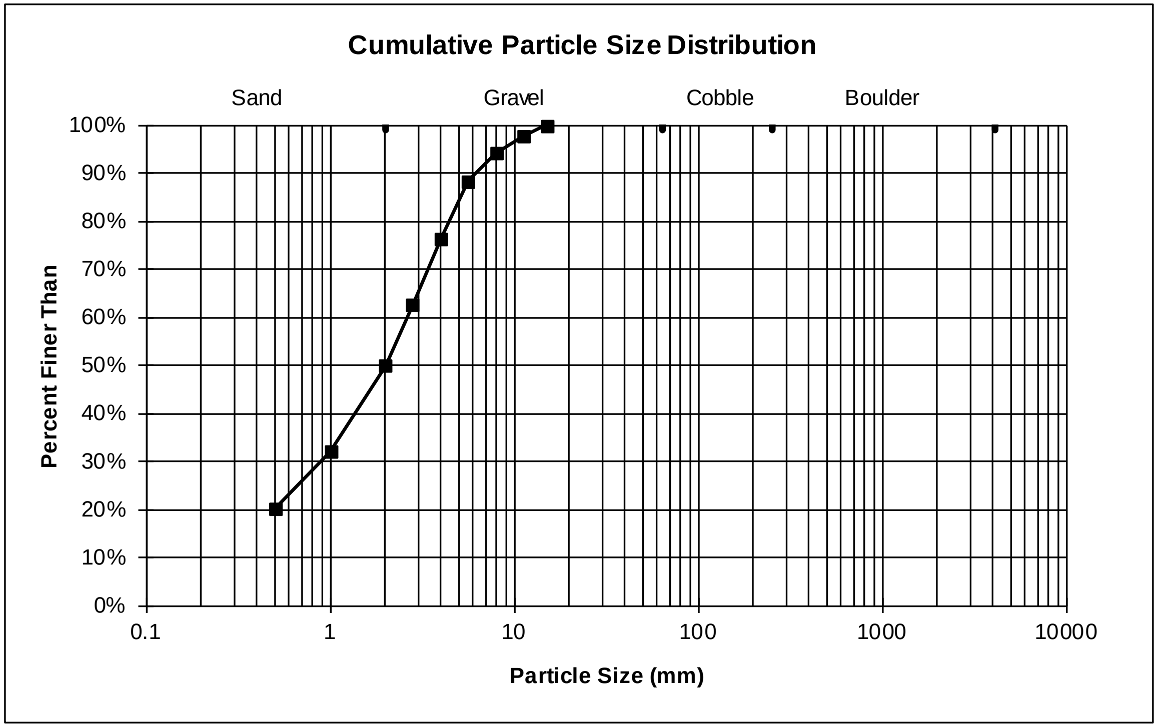
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	105.10	20.1%	
0.5	61.60	11.8%	20.1%
1.0	93.50	17.9%	31.9%
2.0	65.70	12.6%	49.9%
2.8	72.50	13.9%	62.5%
4.0	62.10	11.9%	76.4%
5.6	30.20	5.8%	88.3%
8.0	18.30	3.5%	94.0%
11.2	12.80	2.5%	97.5%
15.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	521.80		

*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 Upper Fence
DATE: 9/17/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.145	1.125	2.007	4.966	8.772	15.0



Sieve Analysis Worksheet

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	97.10	17.0%	
0.5	47.50	8.3%	17.0%
1.0	73.50	12.9%	25.4%
2.0	51.70	9.1%	38.2%
2.8	52.20	9.2%	47.3%
4.0	66.20	11.6%	56.5%
5.6	52.10	9.1%	68.1%
8.0	44.30	7.8%	77.2%
11.2	34.20	6.0%	85.0%
16.0	19.60	3.4%	91.0%
22.4	31.80	5.6%	94.4%
28.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	570.20		

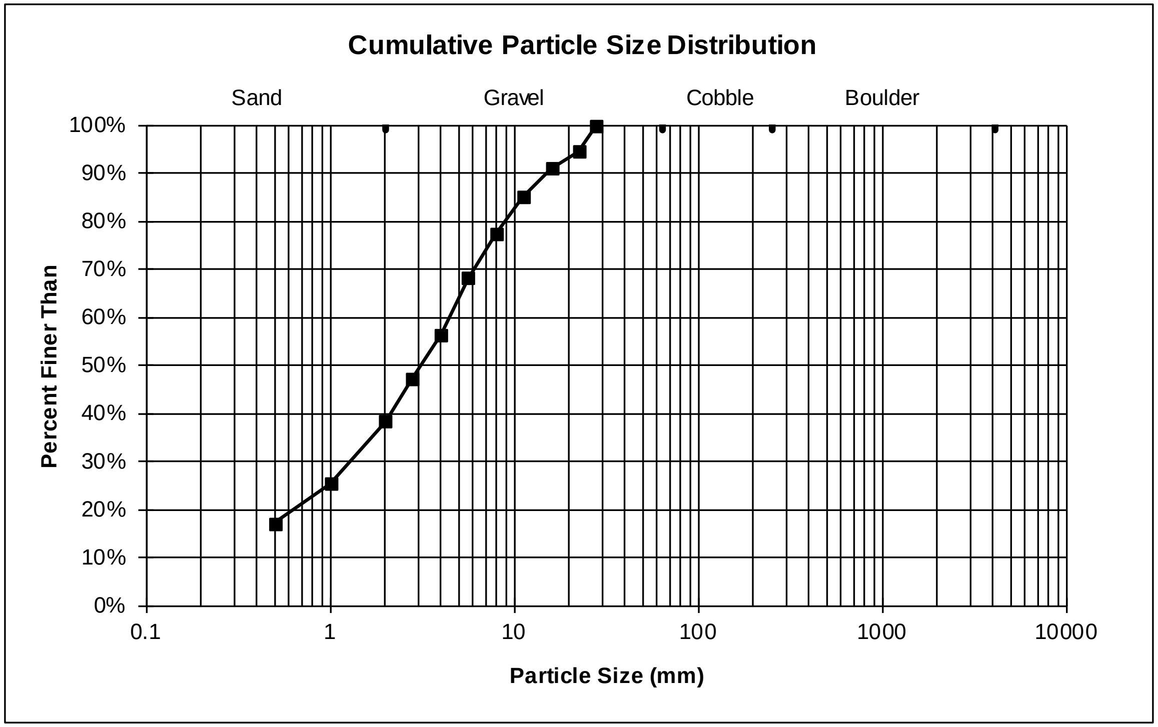
*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 197CS Lower Fence
DATE: 5/6/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
0.280	1.679	3.109	10.731	22.923	28.0



Sieve Analysis Worksheet

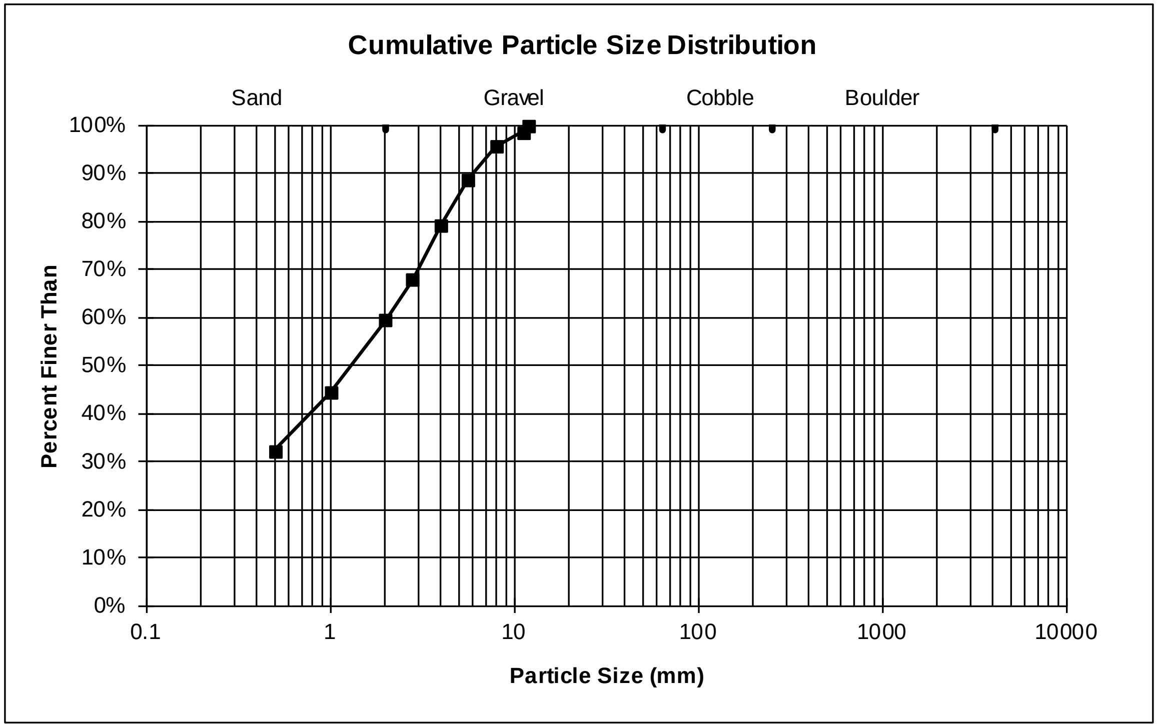
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	196.80	32.2%	
0.5	73.90	12.1%	32.2%
1.0	92.20	15.1%	44.3%
2.0	51.30	8.4%	59.4%
2.8	70.40	11.5%	67.7%
4.0	57.40	9.4%	79.3%
5.6	41.80	6.8%	88.6%
8.0	18.90	3.1%	95.5%
11.2	8.70	1.4%	98.6%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	611.40		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 197CS Lower Fence
DATE: 9/17/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.037	0.587	1.301	4.741	7.800	12.0



Sieve Analysis Worksheet

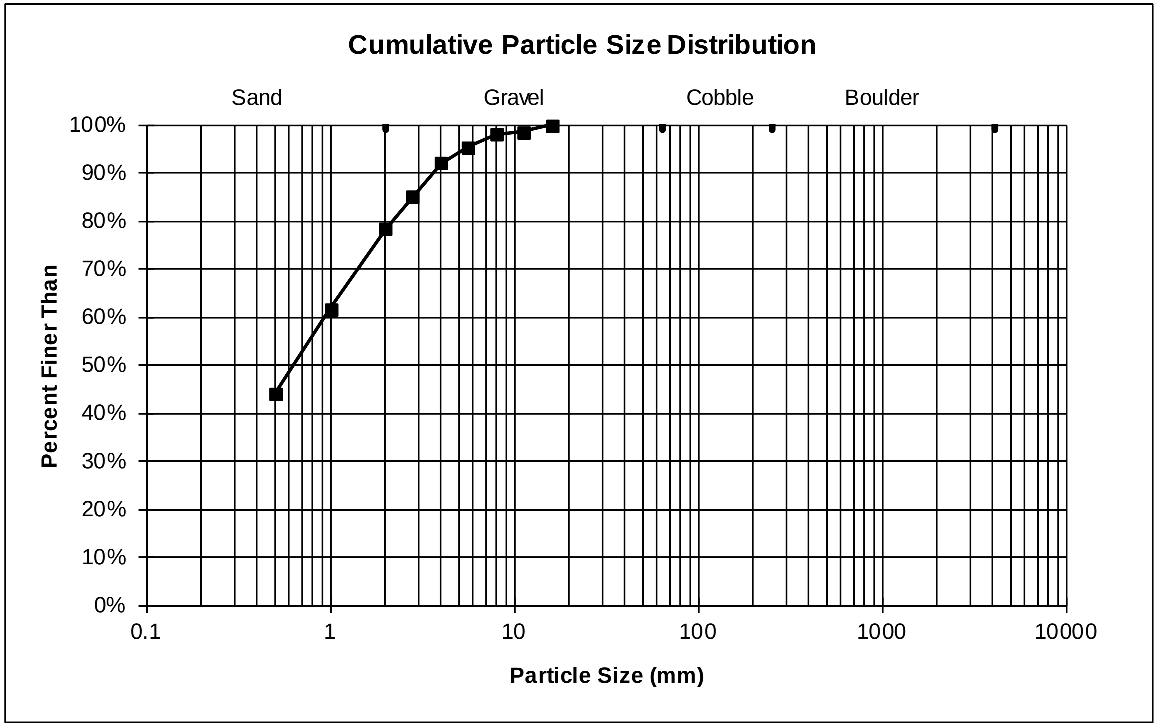
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	167.00	44.0%	
0.5	67.00	17.6%	44.0%
1.0	63.10	16.6%	61.6%
2.0	25.40	6.7%	78.2%
2.8	26.80	7.1%	84.9%
4.0	12.70	3.3%	92.0%
5.6	10.30	2.7%	95.3%
8.0	1.70	0.4%	98.1%
11.2	5.70	1.5%	98.5%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	379.70		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 001FS Upper Fence
DATE: 6/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.020	0.186	0.633	2.671	5.413	16.0



Sieve Analysis Worksheet

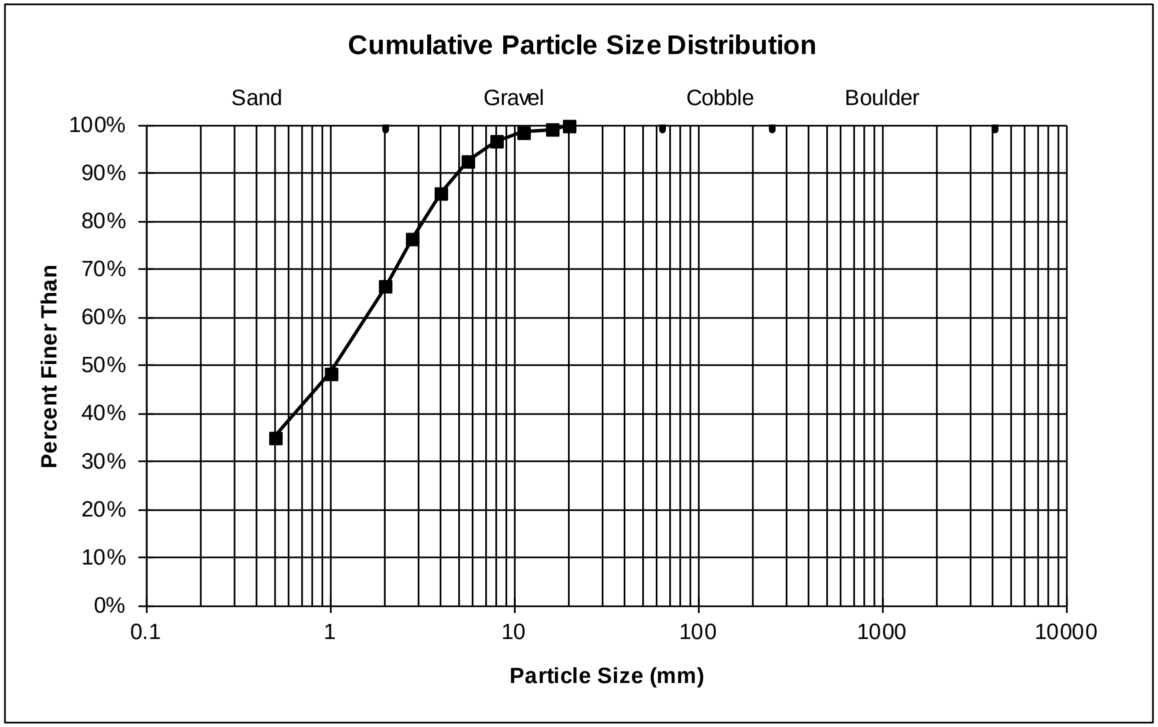
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	260.10	35.1%	
0.5	98.70	13.3%	35.1%
1.0	133.30	18.0%	48.4%
2.0	74.00	10.0%	66.4%
2.8	71.30	9.6%	76.3%
4.0	49.10	6.6%	85.9%
5.6	30.10	4.1%	92.6%
8.0	13.60	1.8%	96.6%
11.2	3.60	0.5%	98.5%
16.0	7.80	1.1%	98.9%
20.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	741.60		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 001FS Upper Fence
DATE: 9/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.031	0.495	1.064	3.721	6.933	20.0



Sieve Analysis Worksheet

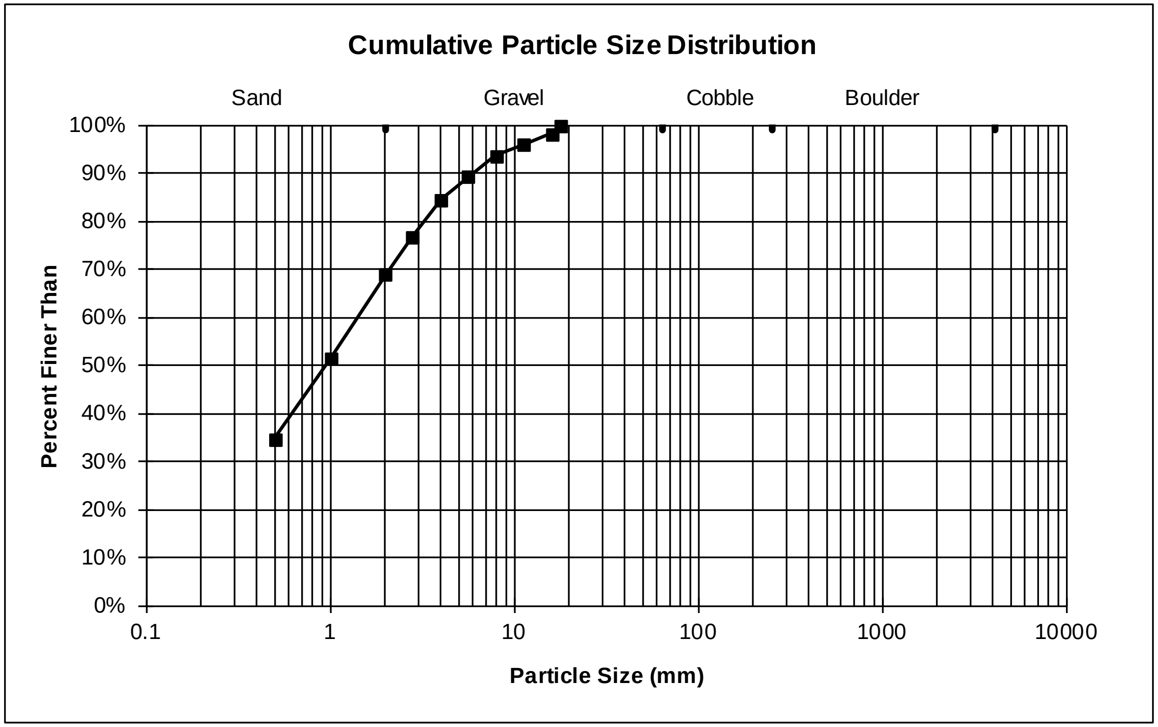
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	243.30	34.6%	
0.5	117.00	16.6%	34.6%
1.0	124.30	17.7%	51.2%
2.0	55.70	7.9%	68.9%
2.8	53.20	7.6%	76.8%
4.0	34.50	4.9%	84.4%
5.6	30.30	4.3%	89.3%
8.0	15.60	2.2%	93.6%
11.2	16.80	2.4%	95.8%
16.0	12.60	1.8%	98.2%
18.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	703.30		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 043FS Upper Fence
DATE: 6/4/2012
CREW: Vonloh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.032	0.509	0.950	3.928	9.890	18.0



Sieve Analysis Worksheet

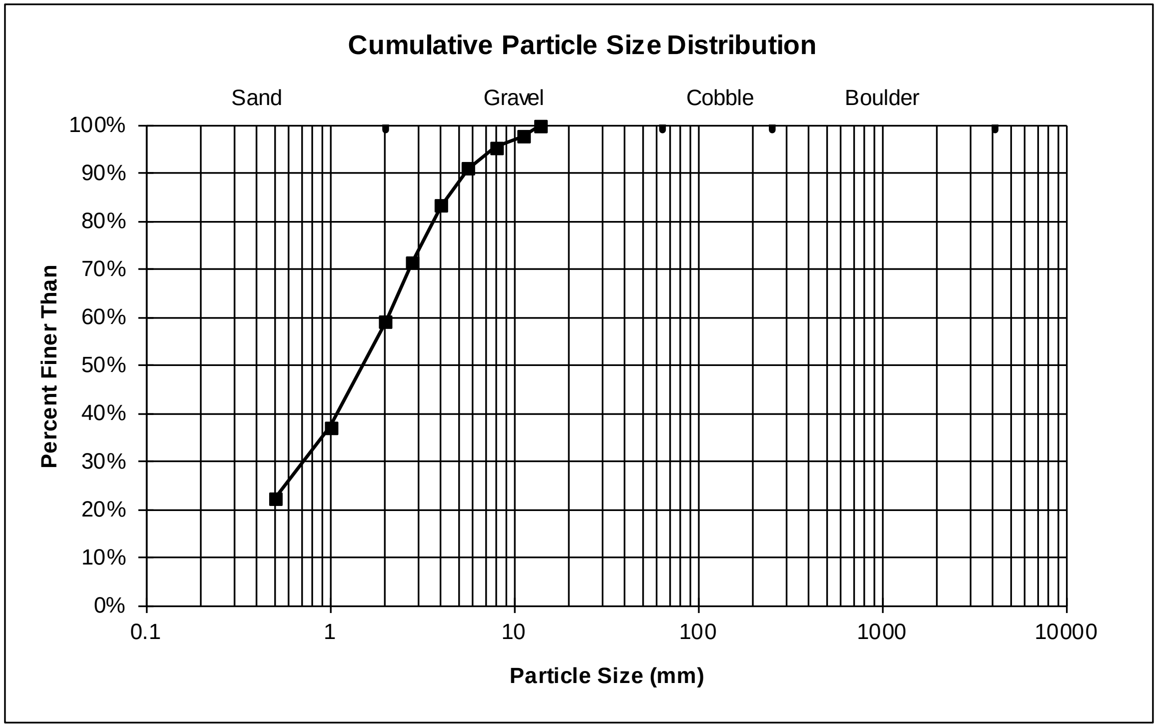
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	204.10	22.2%	
0.5	136.40	14.8%	22.2%
1.0	202.20	22.0%	37.0%
2.0	115.20	12.5%	59.0%
2.8	107.80	11.7%	71.6%
4.0	70.60	7.7%	83.3%
5.6	40.10	4.4%	91.0%
8.0	21.10	2.3%	95.3%
11.2	21.90	2.4%	97.6%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	919.40		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 074FS Upper Fence
DATE: 7/16/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.104	**0.909**	**1.505**	**4.128**	**7.791**	**14.0**



Sieve Analysis Worksheet

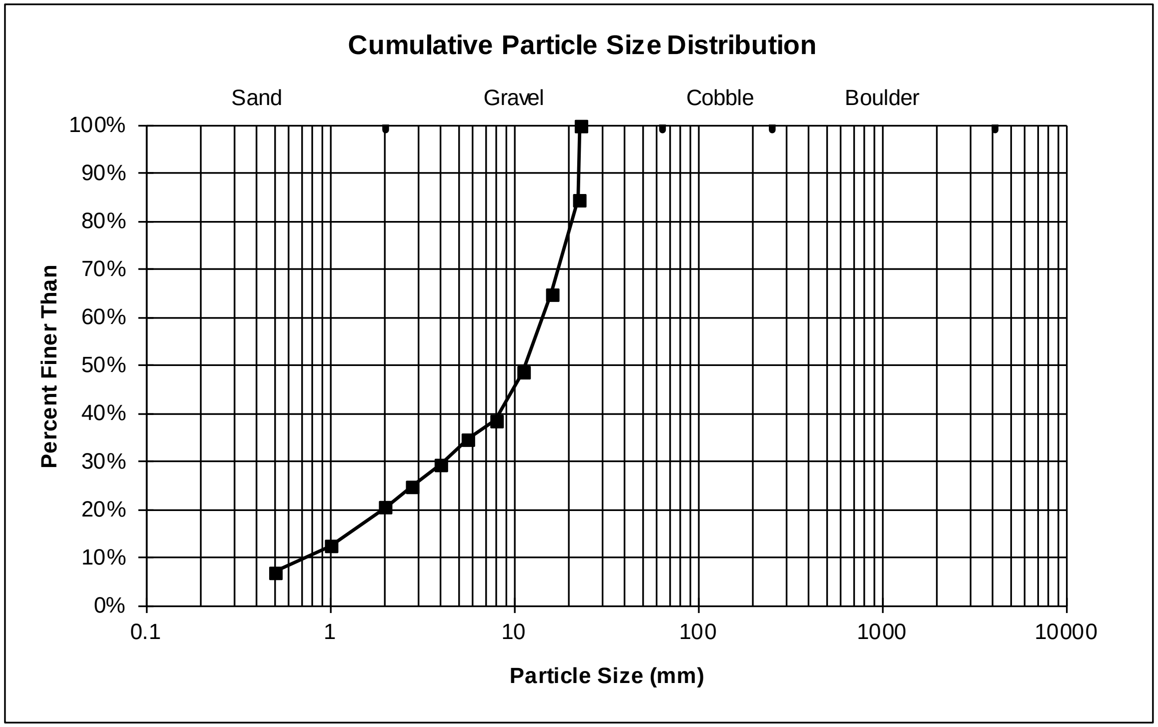
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	62.20	6.9%	
0.5	48.90	5.4%	6.9%
1.0	72.80	8.1%	12.4%
2.0	39.00	4.3%	20.5%
2.8	41.40	4.6%	24.8%
4.0	47.50	5.3%	29.4%
5.6	34.40	3.8%	34.7%
8.0	89.10	9.9%	38.6%
11.2	146.20	16.3%	48.5%
16.0	176.70	19.7%	64.8%
22.4	139.50	15.5%	84.5%
23.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	897.70		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 079FS Upper Fence
DATE: 5/21/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.251	5.741	11.576	22.224	22.805	23.0



Sieve Analysis Worksheet

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	157.30	22.1%	
0.5	100.10	14.1%	22.1%
1.0	157.30	22.1%	36.2%
2.0	81.60	11.5%	58.3%
2.8	96.90	13.6%	69.8%
4.0	68.40	9.6%	83.4%
5.6	35.20	4.9%	93.0%
8.0	14.40	2.0%	98.0%
10.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	711.20		

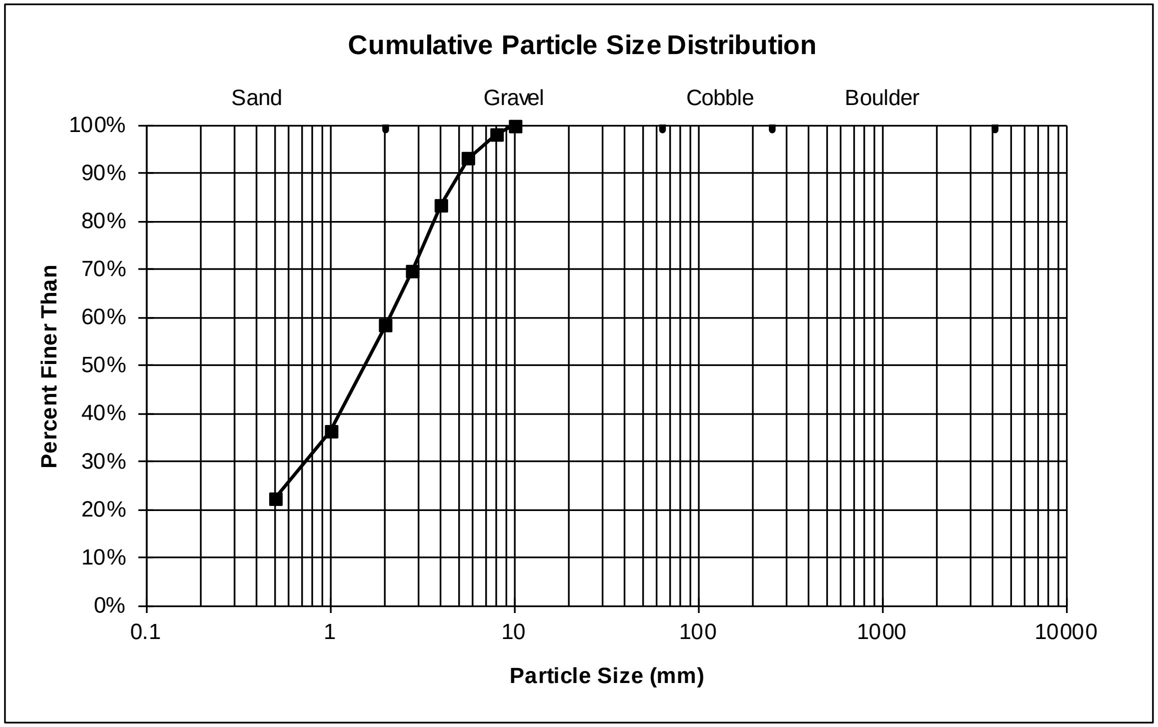
*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 083FS Lower Fence
DATE: 8/7/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
0.105	0.943	1.541	4.084	6.456	10.0



Sieve Analysis Worksheet

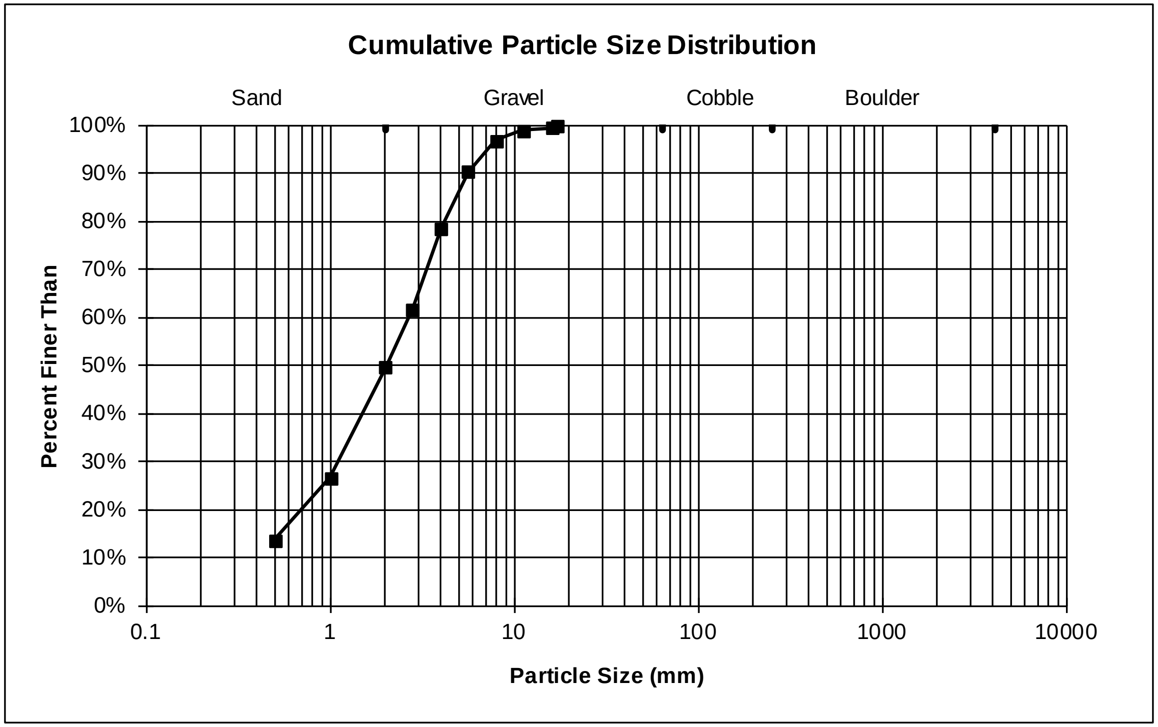
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	131.10	13.6%	
0.5	125.10	12.9%	13.6%
1.0	223.20	23.1%	26.5%
2.0	117.30	12.1%	49.6%
2.8	163.10	16.9%	61.7%
4.0	113.00	11.7%	78.6%
5.6	62.30	6.4%	90.3%
8.0	20.80	2.2%	96.7%
11.2	5.40	0.6%	98.9%
16.0	5.60	0.6%	99.4%
17.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	966.90		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 086FS Lower Fence
DATE: 9/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.540	1.291	2.023	4.675	7.277	10.0



Sieve Analysis Worksheet

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	190.30	28.9%	
0.5	126.60	19.3%	28.9%
1.0	138.00	21.0%	48.2%
2.0	79.80	12.1%	69.2%
2.8	52.50	8.0%	81.3%
4.0	41.10	6.3%	89.3%
5.6	22.40	3.4%	95.5%
8.0	6.90	1.0%	99.0%
9.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	657.60		

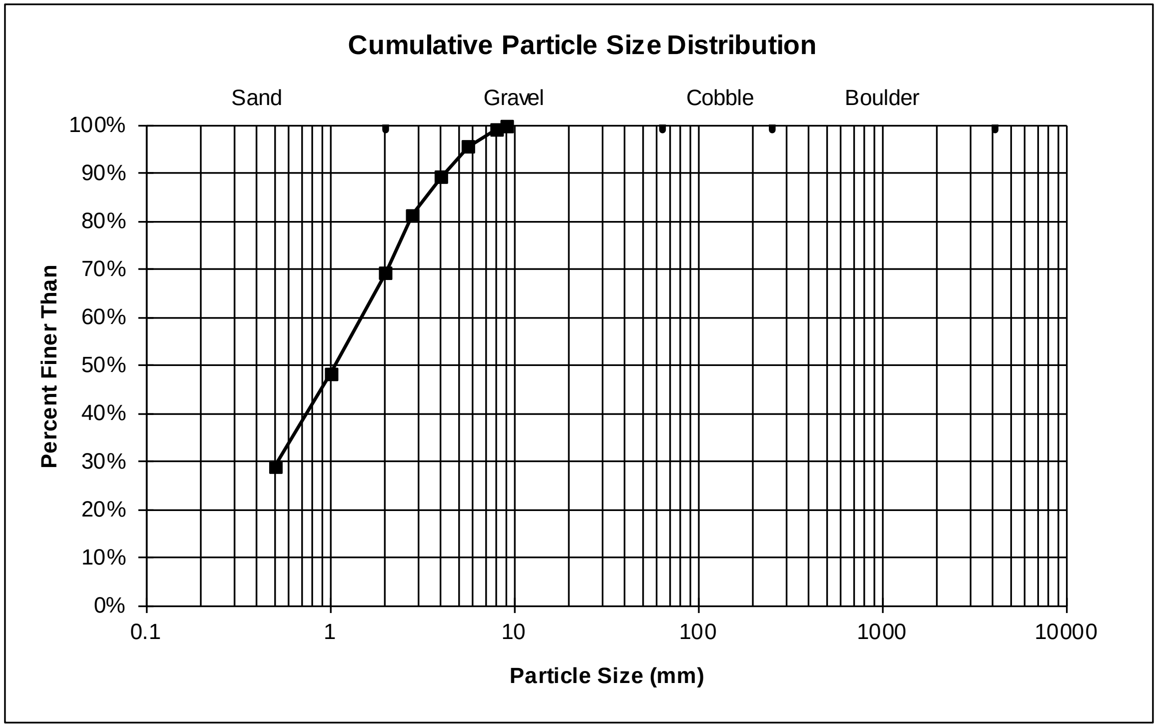
*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 088FS Lower Fence
DATE: 8/7/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
0.048	0.622	1.062	3.157	5.438	9.0



Sieve Analysis Worksheet

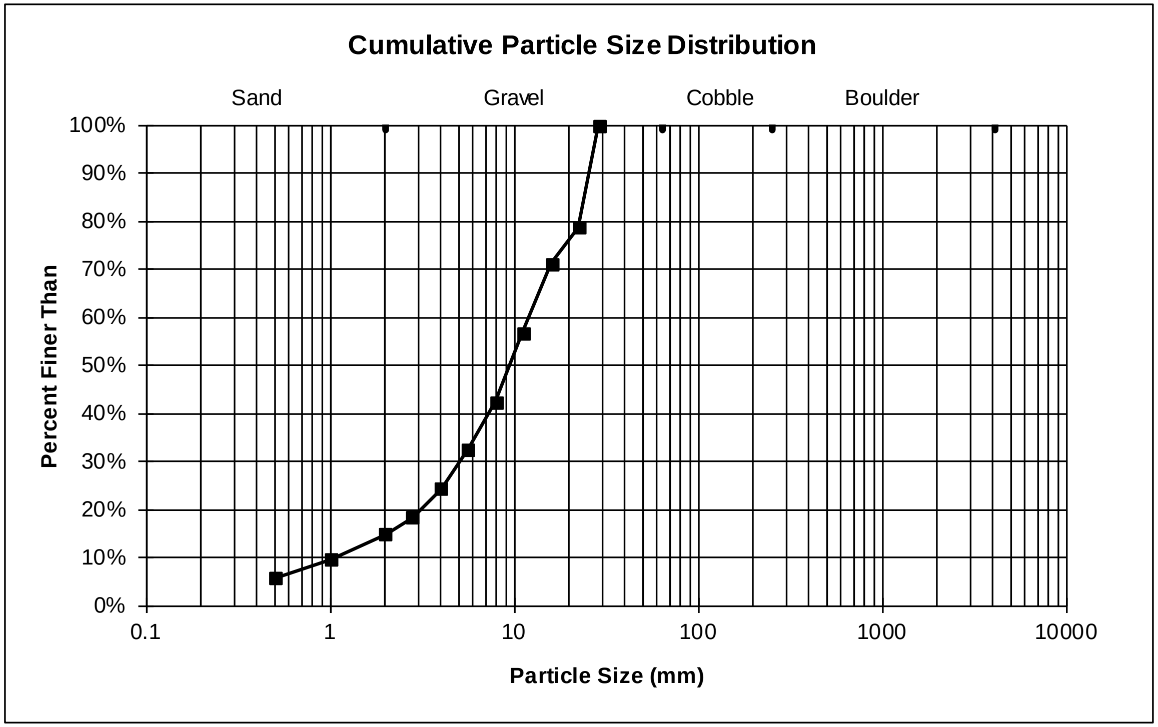
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	35.40	5.7%	
0.5	23.50	3.8%	5.7%
1.0	33.40	5.4%	9.5%
2.0	21.90	3.5%	14.8%
2.8	36.40	5.9%	18.4%
4.0	52.00	8.4%	24.2%
5.6	61.00	9.8%	32.6%
8.0	89.20	14.4%	42.4%
11.2	89.50	14.4%	56.8%
16.0	46.70	7.5%	71.2%
22.4	132.60	21.3%	78.7%
29.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	621.60		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 093FS Upper Fence
DATE: 9/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.029	6.112	9.559	23.894	27.297	29.0



Sieve Analysis Worksheet

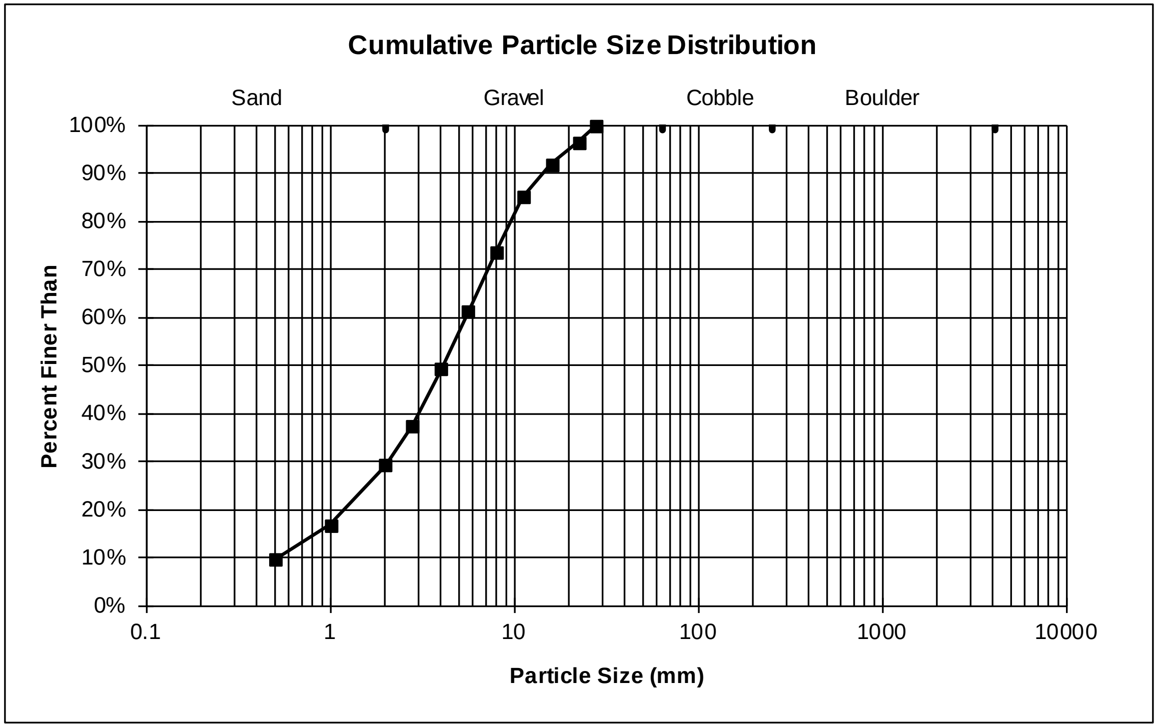
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	65.60	9.6%	
0.5	47.90	7.0%	9.6%
1.0	85.50	12.6%	16.7%
2.0	55.40	8.1%	29.3%
2.8	80.50	11.8%	37.4%
4.0	81.50	12.0%	49.2%
5.6	82.60	12.1%	61.2%
8.0	78.70	11.6%	73.3%
11.2	47.10	6.9%	84.9%
16.0	30.90	4.5%	91.8%
22.4	24.60	3.6%	96.4%
28.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	680.30		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 098FS Upper Fence
DATE: 7/16/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.847	2.536	4.088	10.905	20.217	28.0



Sieve Analysis Worksheet

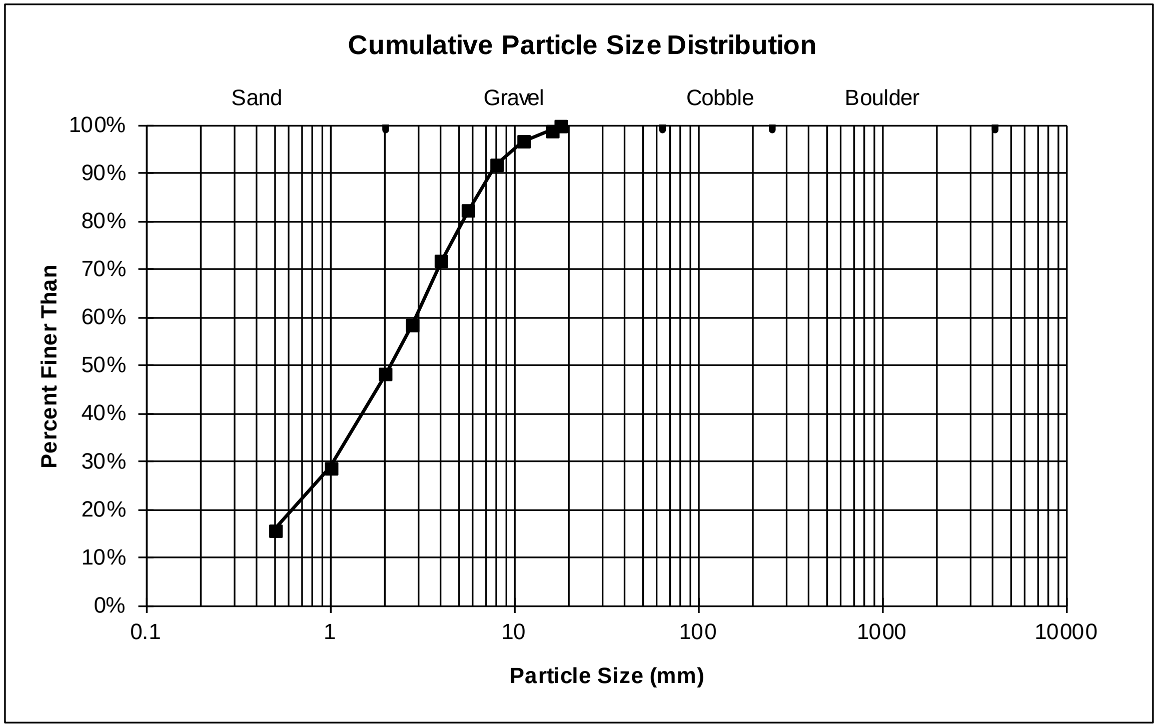
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	125.00	15.7%	
0.5	103.50	13.0%	15.7%
1.0	153.60	19.3%	28.8%
2.0	81.90	10.3%	48.1%
2.8	105.30	13.3%	58.4%
4.0	82.80	10.4%	71.7%
5.6	76.40	9.6%	82.1%
8.0	37.90	4.8%	91.7%
11.2	19.40	2.4%	96.5%
16.0	8.40		98.9%
18.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	794.20		

*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: 6/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.398	1.250	2.127	6.007	10.076	18.0



Sieve Analysis Worksheet

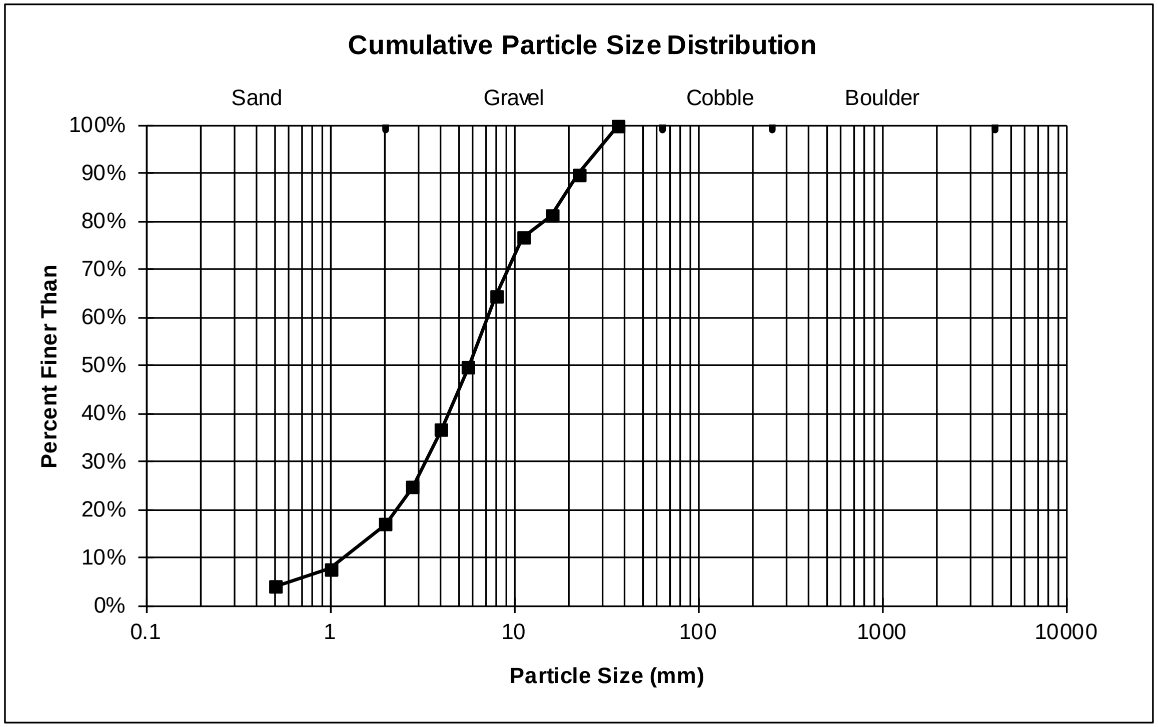
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	20.80	3.9%	
0.5	19.80	3.8%	3.9%
1.0	48.80	9.3%	7.7%
2.0	40.90	7.8%	17.0%
2.8	62.00	11.8%	24.7%
4.0	69.20	13.1%	36.5%
5.6	76.80	14.6%	49.6%
8.0	64.70	12.3%	64.2%
11.2	24.70	4.7%	76.5%
16.0	44.90	8.5%	81.2%
22.4	54.20	10.3%	89.7%
37.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	526.80		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 101FS Lower Fence
DATE: 6/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.726	3.822	5.650	17.878	28.992	37.0



Sieve Analysis Worksheet

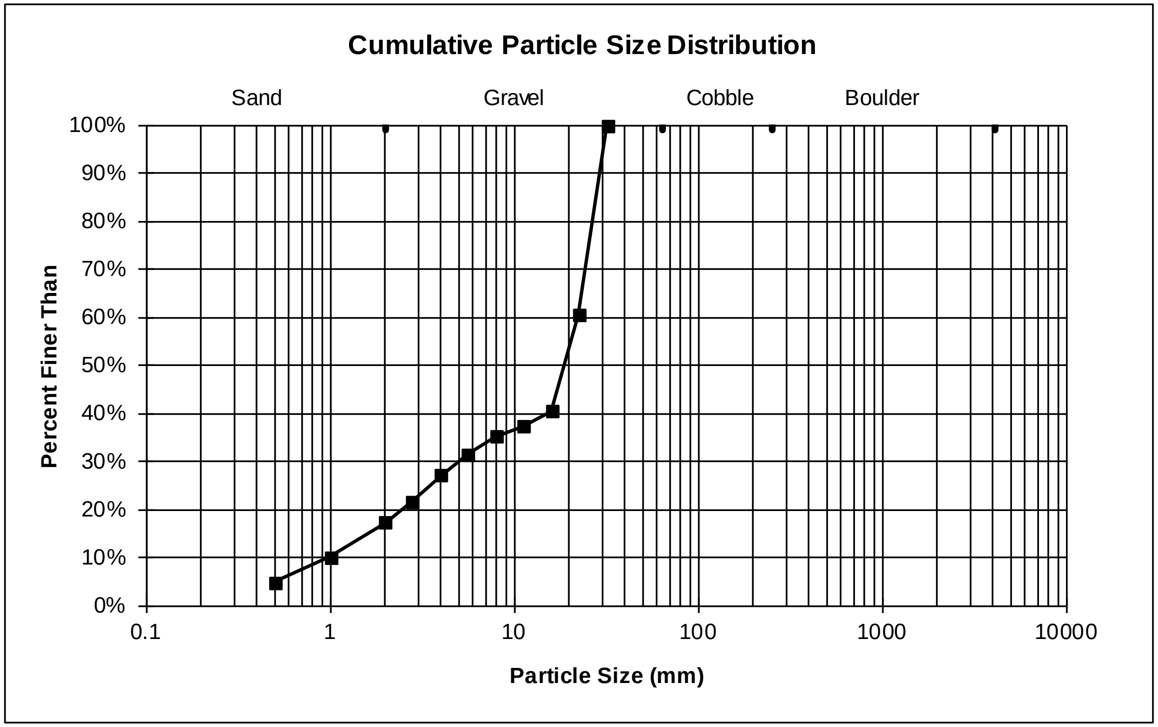
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	48.20	4.9%	
0.5	51.50	5.2%	4.9%
1.0	72.00	7.3%	10.1%
2.0	43.80	4.4%	17.3%
2.8	52.60	5.3%	21.8%
4.0	44.40	4.5%	27.1%
5.6	36.30	3.7%	31.5%
8.0	20.10	2.0%	35.2%
11.2	31.80	3.2%	37.2%
16.0	197.50	19.9%	40.4%
22.4	392.60	39.6%	60.4%
32.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	990.80		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 103FS Upper Fence
DATE: 9/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.602	7.843	18.801	27.708	30.592	32.0



Sieve Analysis Worksheet

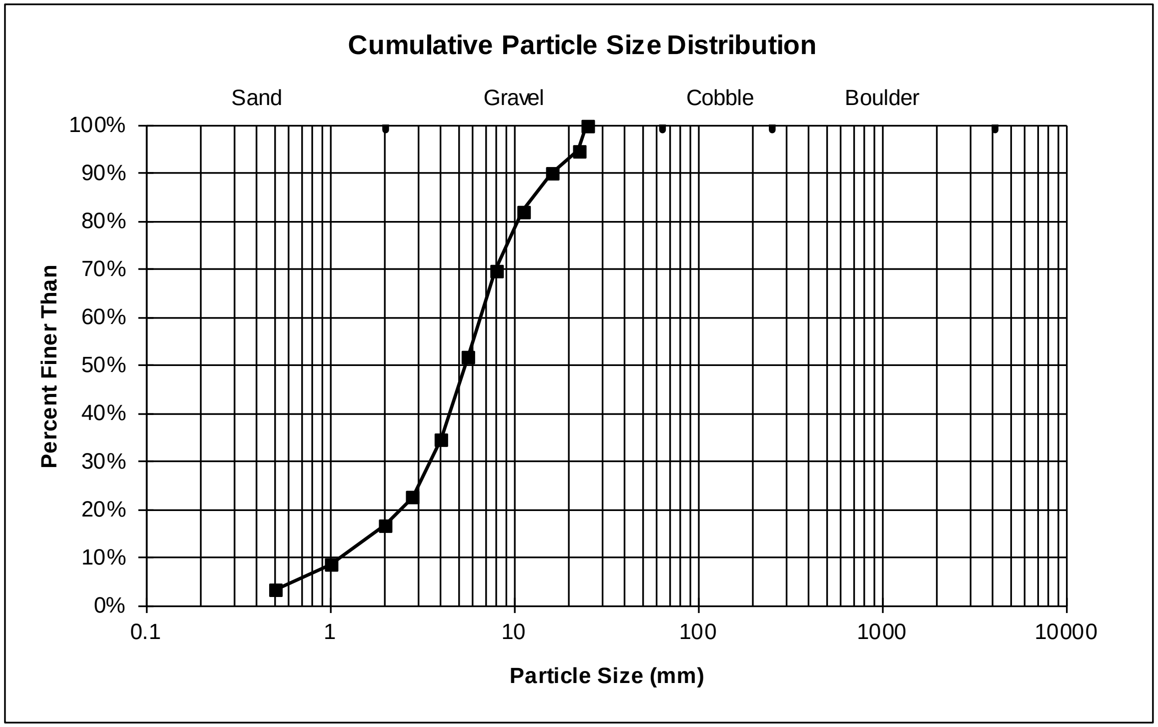
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	31.50	3.2%	
0.5	51.40	5.3%	3.2%
1.0	80.80	8.3%	8.5%
2.0	55.80	5.7%	16.8%
2.8	119.20	12.2%	22.5%
4.0	168.20	17.2%	34.7%
5.6	174.60	17.9%	51.9%
8.0	120.70	12.4%	69.7%
11.2	76.00	7.8%	82.1%
16.0	47.30	4.8%	89.9%
22.4	51.60	5.3%	94.7%
25.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	977.10		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 124FS Upper Fence
DATE: 7/30/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.727	4.026	5.398	12.220	22.531	25.0



Sieve Analysis Worksheet

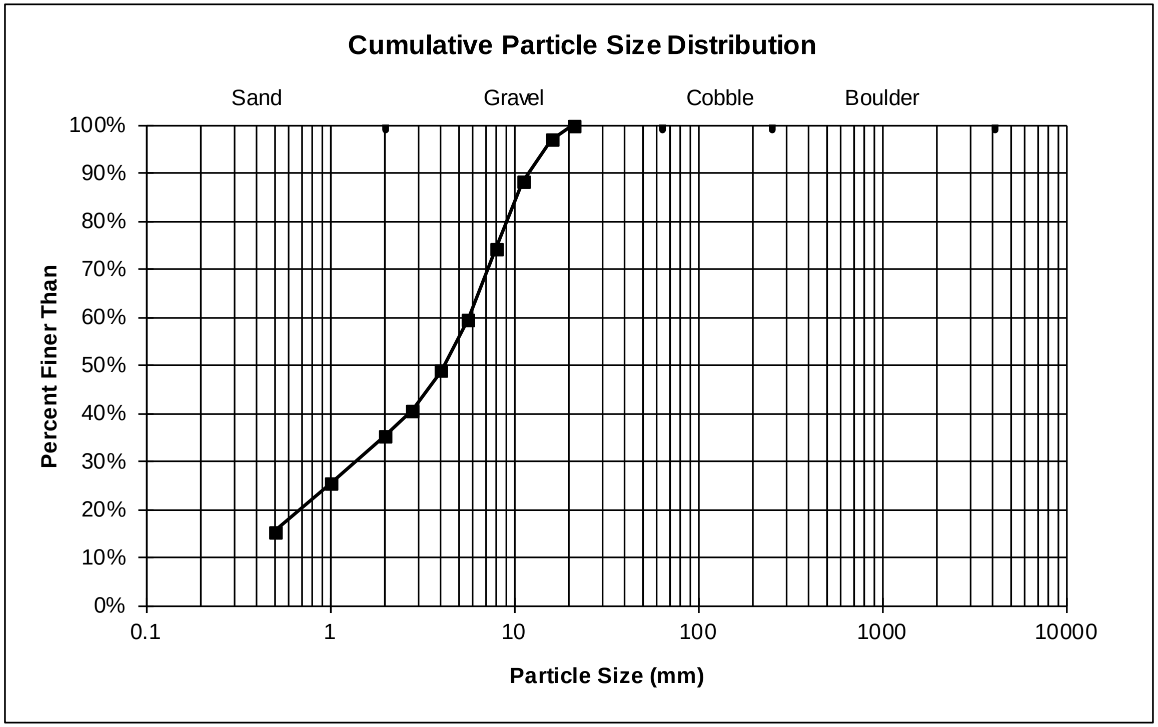
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	126.90	15.4%	
0.5	82.60	10.0%	15.4%
1.0	83.40	10.1%	25.3%
2.0	43.50	5.3%	35.4%
2.8	67.30	8.1%	40.7%
4.0	89.20	10.8%	48.8%
5.6	120.20	14.5%	59.6%
8.0	116.20	14.1%	74.2%
11.2	72.40	8.8%	88.2%
16.0	24.90	3.0%	97.0%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	826.60		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 128FS Upper Fence
DATE: 6/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.447	1.941	4.148	10.122	14.756	21.0



Sieve Analysis Worksheet

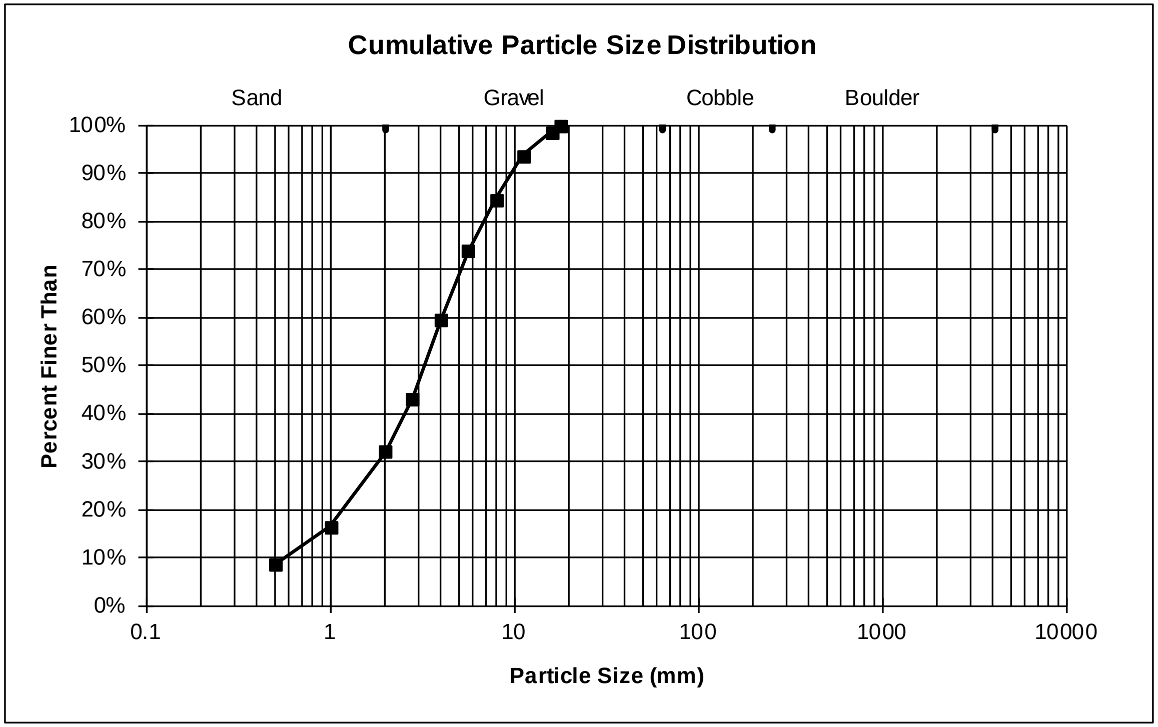
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	69.20	8.4%	
0.5	64.80	7.9%	8.4%
1.0	128.30	15.7%	16.3%
2.0	90.50	11.0%	32.0%
2.8	135.60	16.5%	43.0%
4.0	115.70	14.1%	59.6%
5.6	89.10	10.9%	73.7%
8.0	73.90	9.0%	84.6%
11.2	40.00	4.9%	93.6%
16.0	12.70	1.5%	98.5%
18.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	819.80		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 128FS Lower Fence
DATE: 6/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.889	**2.192**	**3.254**	**7.855**	**12.433**	**18.0**



Sieve Analysis Worksheet

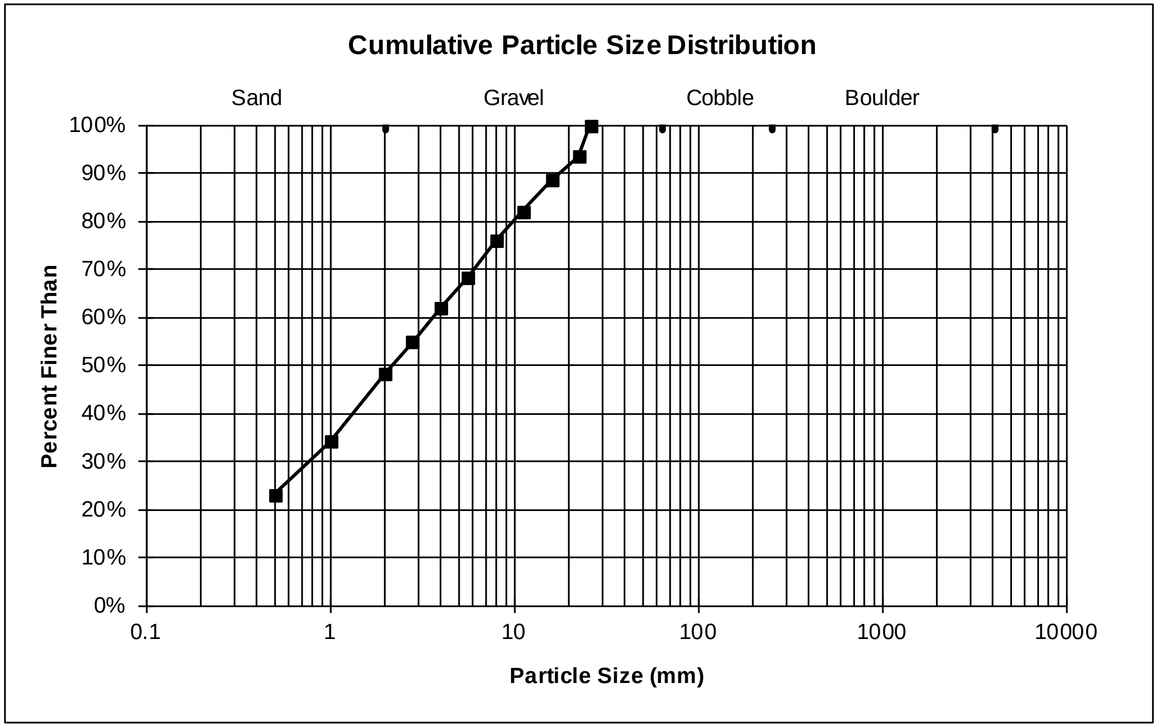
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	123.00	23.0%	
0.5	58.90	11.0%	23.0%
1.0	76.30	14.3%	34.1%
2.0	34.90	6.5%	48.3%
2.8	38.10	7.1%	54.9%
4.0	33.60	6.3%	62.0%
5.6	40.20	7.5%	68.3%
8.0	33.00	6.2%	75.8%
11.2	34.40	6.4%	82.0%
16.0	26.70	5.0%	88.4%
22.4	35.10	6.6%	93.4%
26.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	534.20		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: 177FS Upper Fence
DATE: 5/3/2012
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.092	1.047	2.179	12.518	23.212	26.0



Sieve Analysis Worksheet

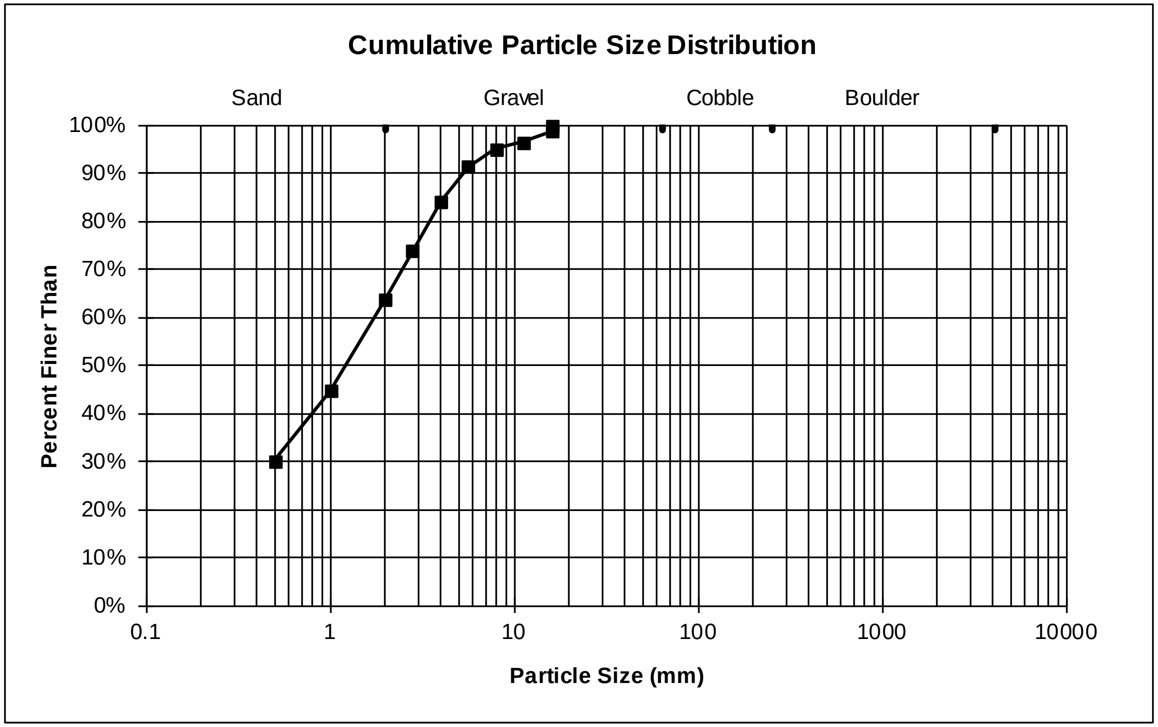
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	229.60	30.1%	
0.5	111.00	14.6%	30.1%
1.0	145.60	19.1%	44.7%
2.0	76.30	10.0%	63.8%
2.8	77.90	10.2%	73.8%
4.0	54.60	7.2%	84.1%
5.6	29.10	3.8%	91.2%
8.0	9.90	1.3%	95.1%
11.2	18.10	2.4%	96.4%
16.0	9.70	1.3%	98.7%
16.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	761.80		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 186FS Upper Fence
DATE: 7/17/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.044	0.630	1.211	3.991	7.962	16.0



Sieve Analysis Worksheet

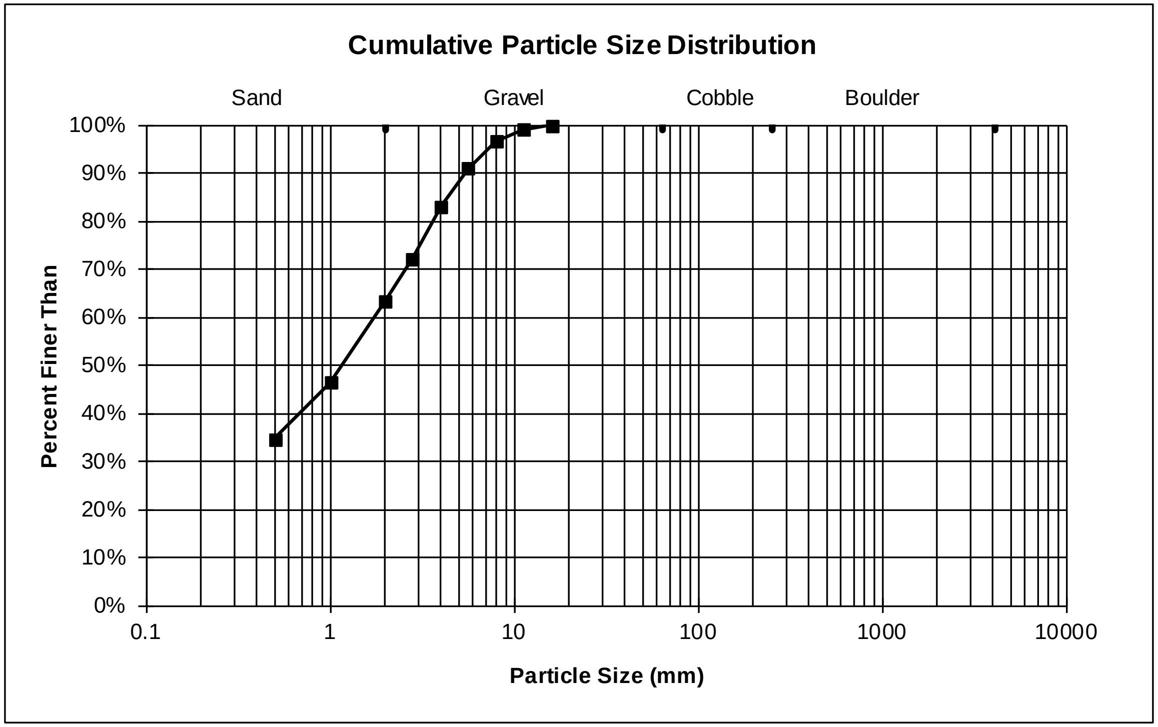
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	395.70	34.7%	
0.5	133.70	11.7%	34.7%
1.0	193.30	17.0%	46.4%
2.0	99.70	8.7%	63.4%
2.8	124.00	10.9%	72.2%
4.0	91.10	8.0%	83.0%
5.6	64.00	5.6%	91.0%
8.0	27.40	2.4%	96.6%
11.2	10.90	1.0%	99.0%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	1139.80		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 187FS Upper Fence
DATE: 8/20/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.032	0.508	1.156	4.166	7.209	16.0



Sieve Analysis Worksheet

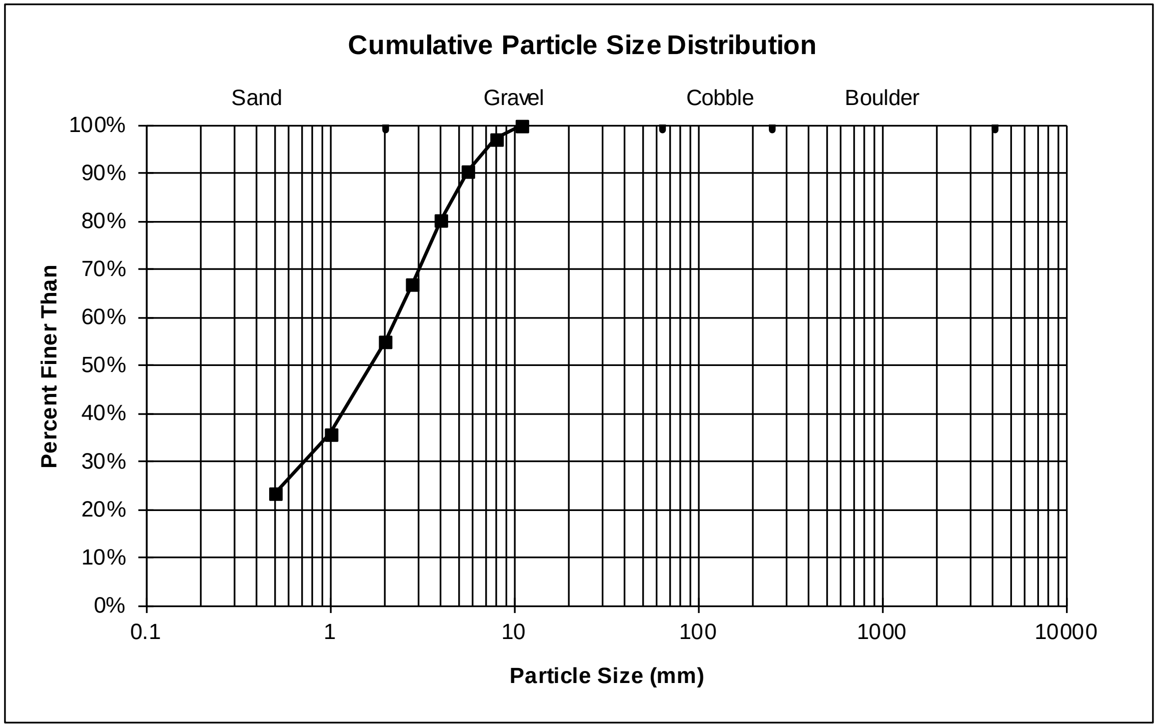
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	243.70	23.3%	
0.5	129.50	12.4%	23.3%
1.0	202.50	19.3%	35.6%
2.0	125.90	12.0%	55.0%
2.8	139.70	13.3%	67.0%
4.0	106.50	10.2%	80.3%
5.6	69.80	6.7%	90.5%
8.0	29.90	2.9%	97.1%
11.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	1047.50		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 193FS Upper Fence
DATE: 5/3/2012
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.089	0.965	1.674	4.519	7.132	11.0



Sieve Analysis Worksheet

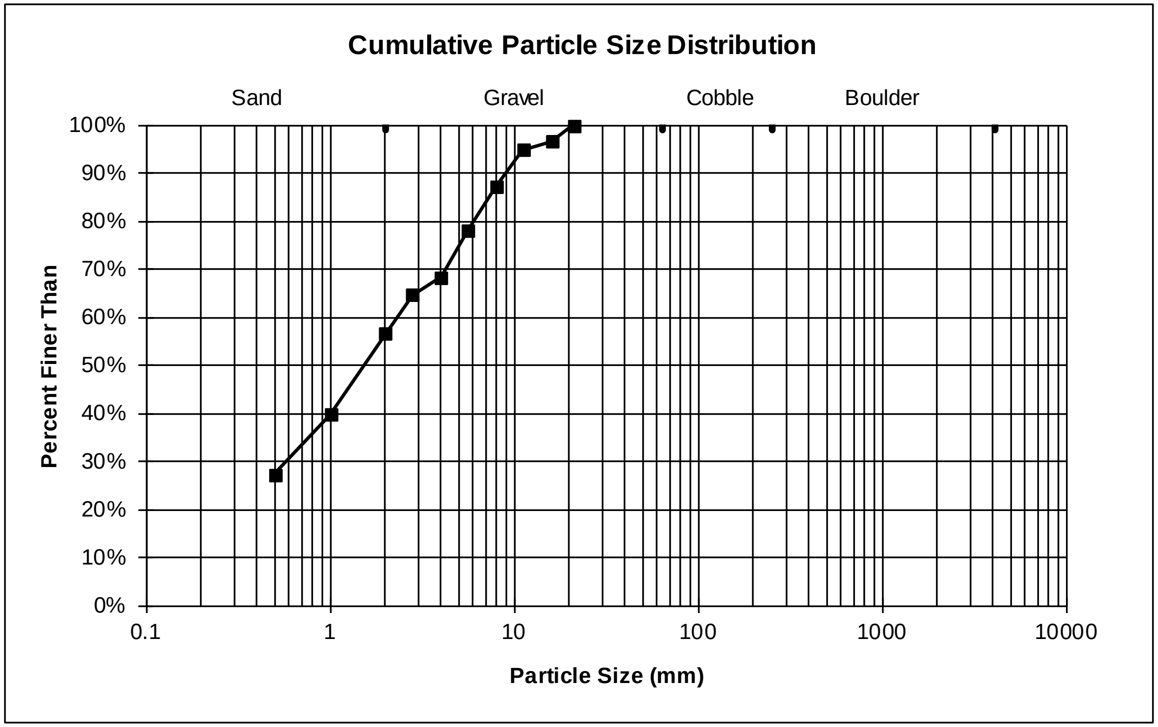
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	223.50	27.3%	
0.5	101.60	12.4%	27.3%
1.0	137.70	16.8%	39.7%
2.0	67.30	8.2%	56.5%
2.8	30.20	3.7%	64.7%
4.0	79.90	9.8%	68.4%
5.6	72.70	8.9%	78.2%
8.0	63.30	7.7%	87.1%
11.2	14.90	1.8%	94.8%
16.0	27.80	3.4%	96.6%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	818.90		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 193FS Upper Fence
DATE: 5/21/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.056	0.769	1.529	7.076	11.681	21.0



Sieve Analysis Worksheet

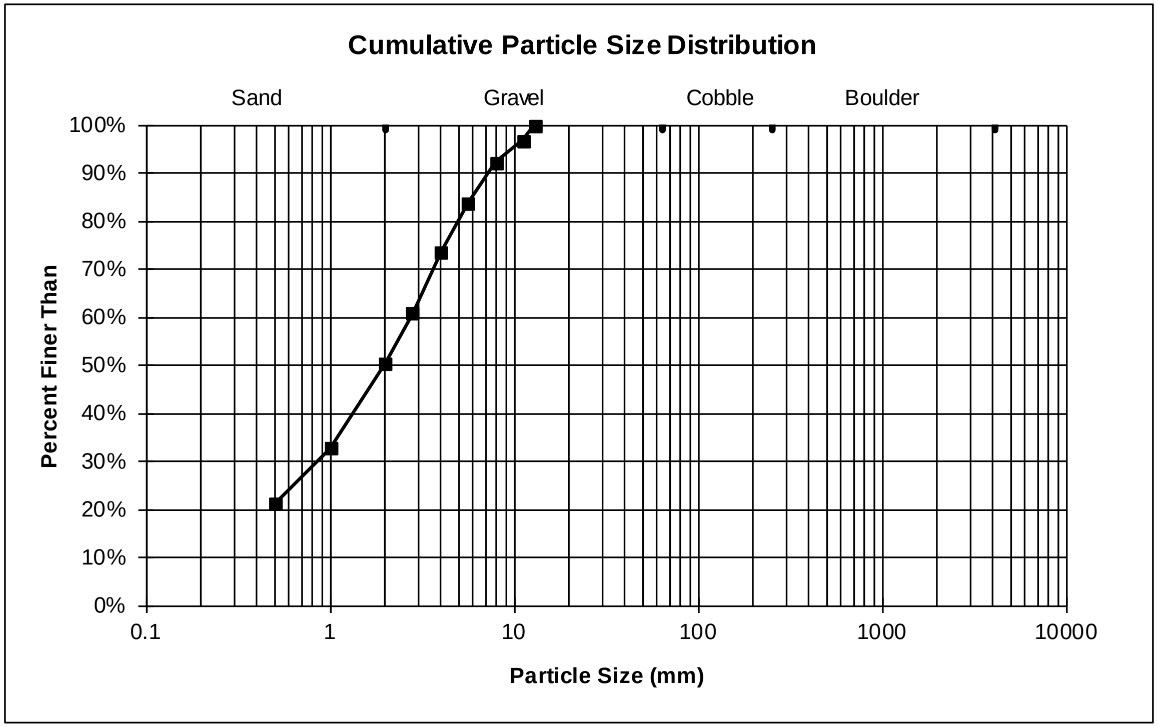
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	153.60	21.2%	
0.5	83.70	11.5%	21.2%
1.0	129.00	17.8%	32.7%
2.0	74.10	10.2%	50.5%
2.8	93.00	12.8%	60.7%
4.0	74.40	10.3%	73.6%
5.6	60.00	8.3%	83.8%
8.0	33.80	4.7%	92.1%
11.2	23.40	3.2%	96.8%
13.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	725.00		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 194FS Upper Fence
DATE: 9/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.121	1.092	1.960	5.640	9.855	13.0



Sieve Analysis Worksheet

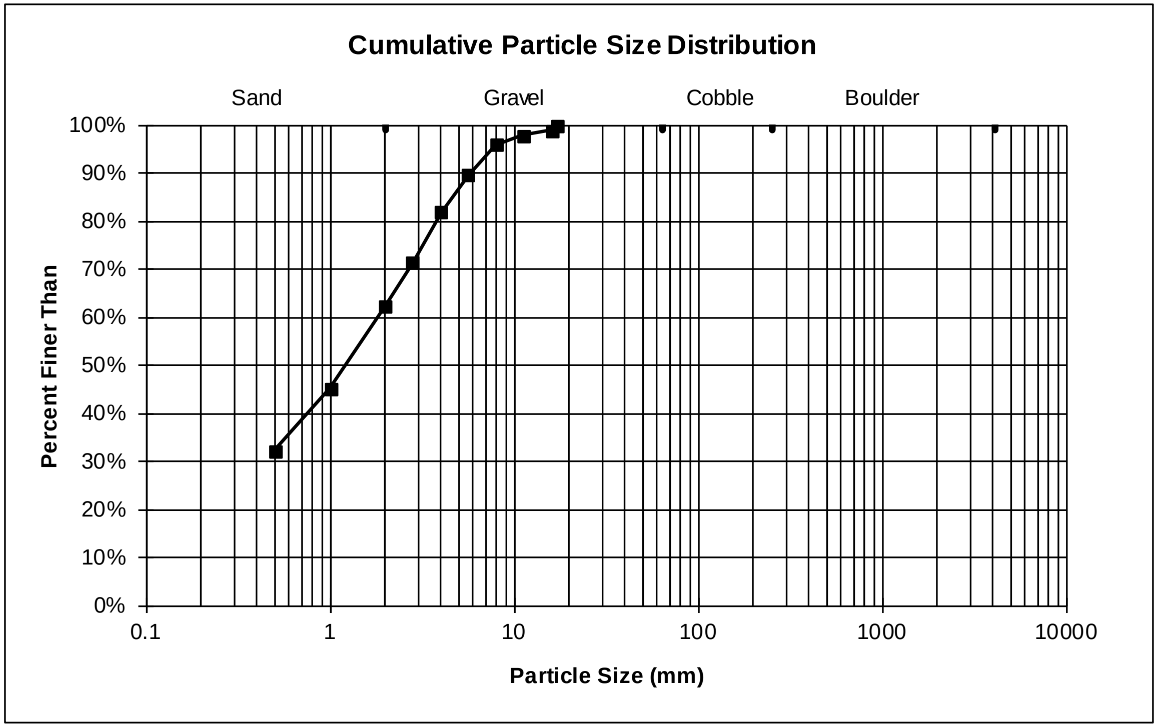
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	206.90	32.2%	
0.5	83.00	12.9%	32.2%
1.0	109.80	17.1%	45.2%
2.0	57.40	8.9%	62.3%
2.8	67.60	10.5%	71.2%
4.0	49.60	7.7%	81.8%
5.6	41.10	6.4%	89.5%
8.0	12.40	1.9%	95.9%
11.2	7.00	1.1%	97.8%
16.0	6.80	1.1%	98.9%
17.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	641.60		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 204FS Upper Fence
DATE: 6/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.037	0.579	1.215	4.406	7.602	17.0



Sieve Analysis Worksheet

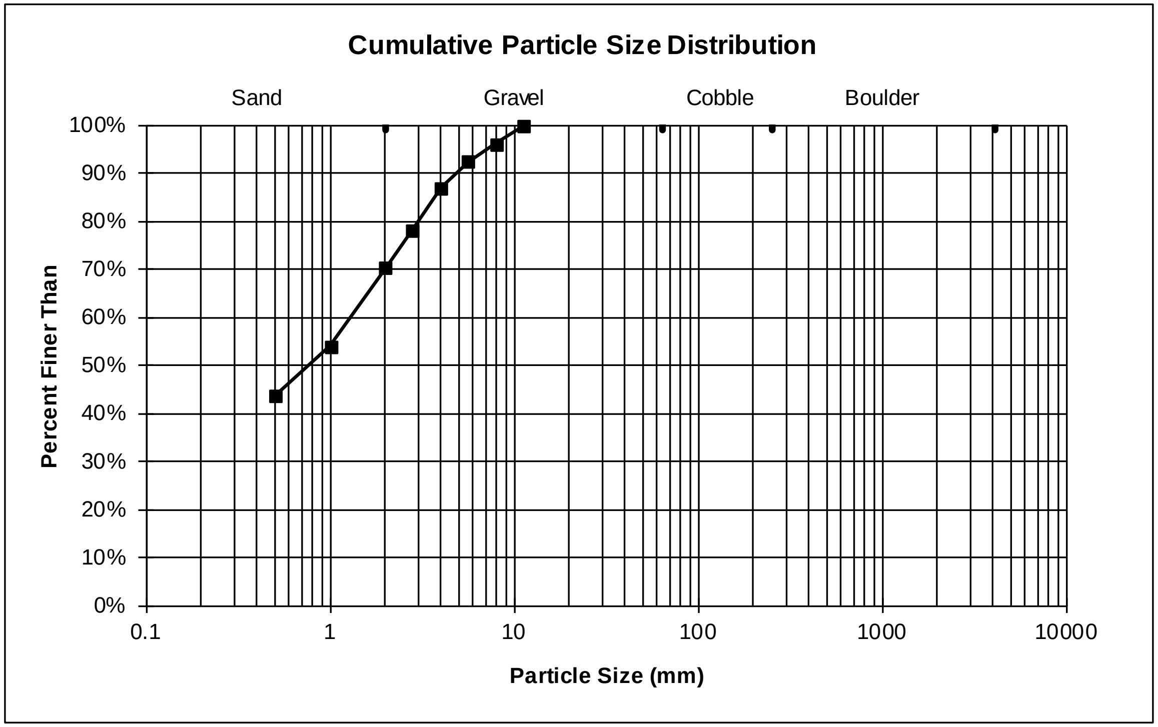
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	291.00	43.7%	
0.5	69.10	10.4%	43.7%
1.0	108.00	16.2%	54.0%
2.0	52.60	7.9%	70.2%
2.8	58.40	8.8%	78.1%
4.0	36.30	5.4%	86.9%
5.6	24.40	3.7%	92.3%
8.0	24.90	3.7%	96.0%
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	666.60		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 204FS Lower Fence
DATE: 6/4/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.021	0.191	0.764	3.558	7.272	12.0



Sieve Analysis Worksheet

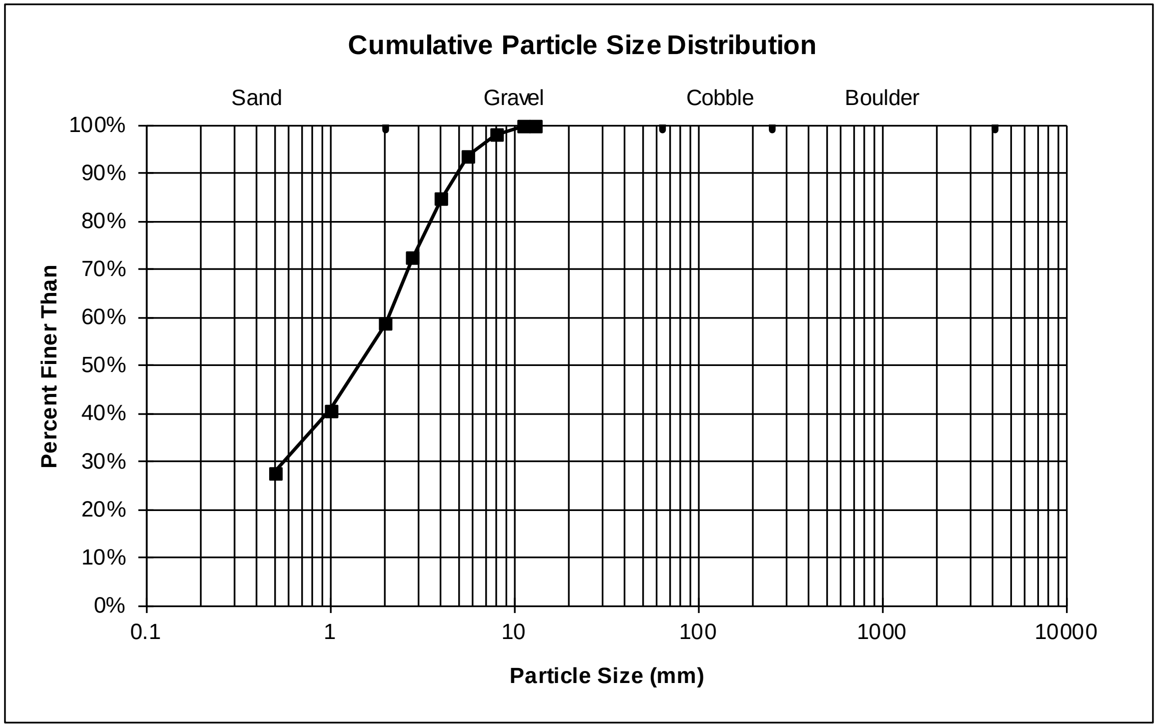
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	162.10	27.6%	
0.5	75.80	12.9%	27.6%
1.0	106.70	18.2%	40.6%
2.0	79.30	13.5%	58.8%
2.8	72.30	12.3%	72.3%
4.0	52.60	9.0%	84.6%
5.6	26.20	4.5%	93.6%
8.0	10.10	1.7%	98.1%
11.2	1.30	0.2%	99.8%
13.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	586.40		

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

SITE NAME: Pike's Peak Highway -Fill Slope
ID NUMBER: 001FS Upper Fence
DATE: 7/29/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.054	0.742	1.432	3.929	6.268	13.0



Sieve Analysis Worksheet

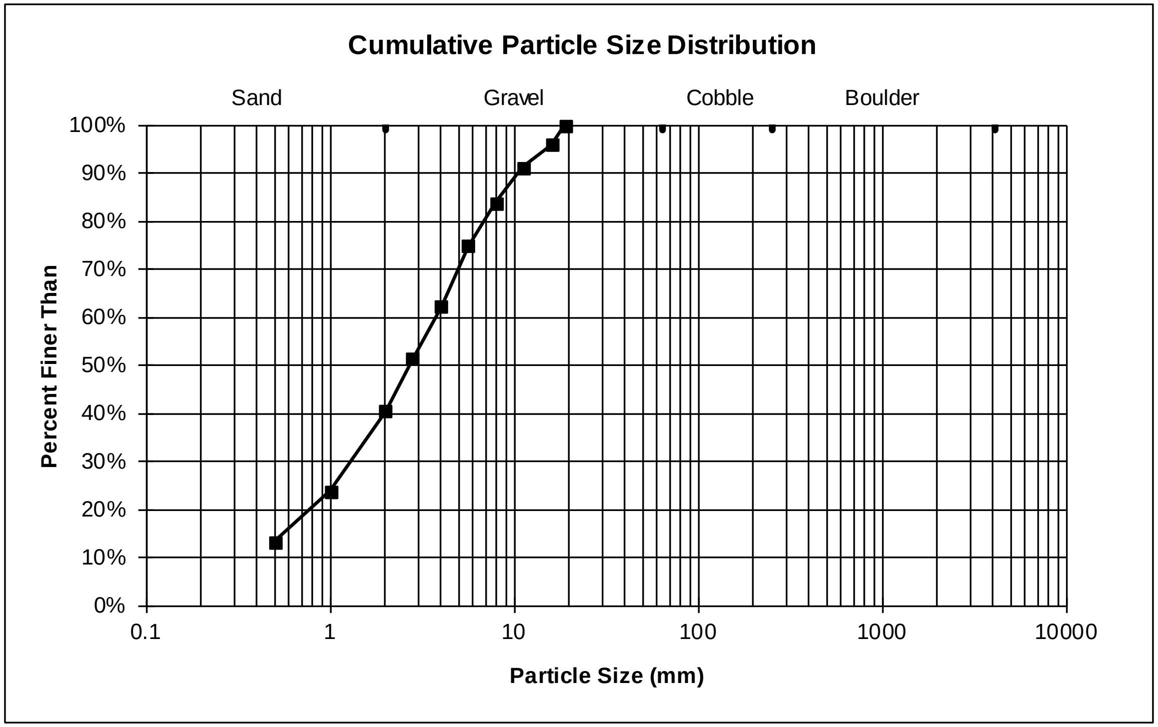
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	80.80	13.2%	
0.5	64.40	10.5%	13.2%
1.0	102.30	16.7%	23.7%
2.0	67.00	10.9%	40.4%
2.8	66.50	10.9%	51.4%
4.0	76.60	12.5%	62.2%
5.6	54.90	9.0%	74.8%
8.0	45.70	7.5%	83.7%
11.2	29.00	4.7%	91.2%
16.0	24.90	4.1%	95.9%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	612.10		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 039FS Upper Fence
DATE: 5/6/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.563	1.596	2.684	8.099	14.916	19.0



Sieve Analysis Worksheet

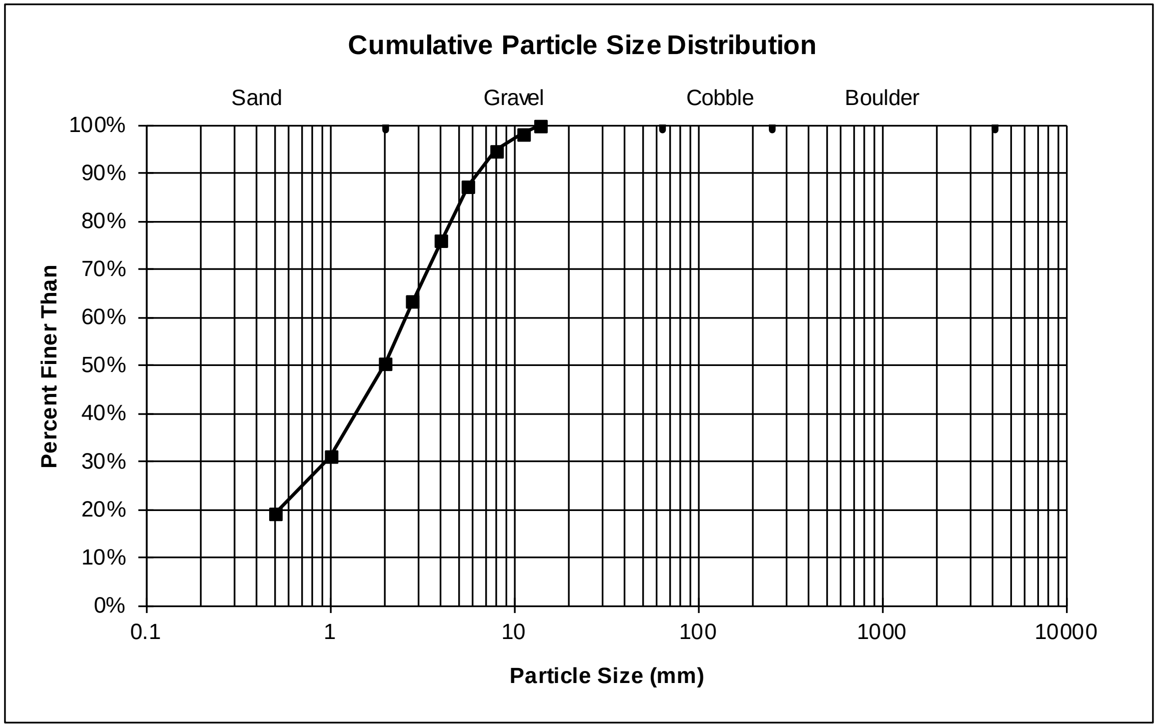
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	112.20	19.1%	
0.5	69.10	11.8%	19.1%
1.0	114.50	19.5%	30.9%
2.0	75.00	12.8%	50.4%
2.8	74.50	12.7%	63.2%
4.0	67.10	11.4%	75.9%
5.6	42.80	7.3%	87.3%
8.0	21.10	3.6%	94.6%
11.2	10.50	1.8%	98.2%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	586.80		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 039FS Lower Fence
DATE: 5/6/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.176	1.157	1.971	5.079	8.294	14.0



Sieve Analysis Worksheet

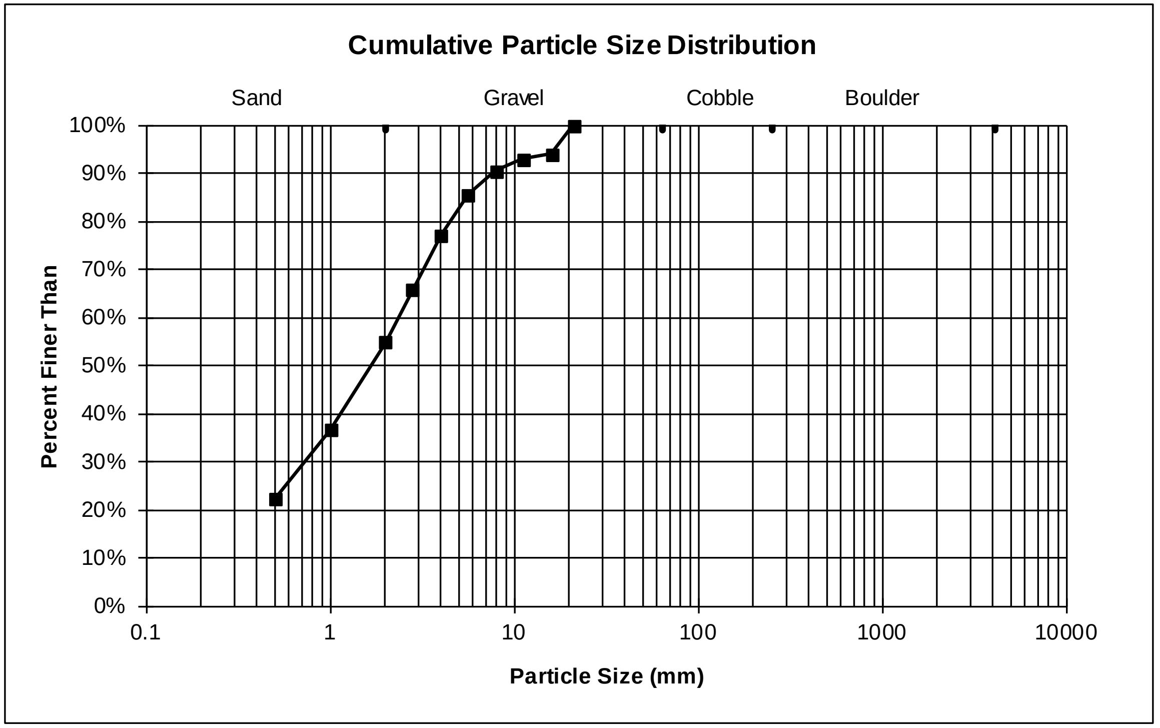
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	110.10	22.1%	
0.5	71.60	14.4%	22.1%
1.0	91.20	18.3%	36.5%
2.0	53.70	10.8%	54.9%
2.8	56.70	11.4%	65.7%
4.0	41.80	8.4%	77.1%
5.6	24.30	4.9%	85.5%
8.0	12.40	2.5%	90.4%
11.2	5.60	1.1%	92.9%
16.0	29.80	6.0%	94.0%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	497.20		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 039FS Upper fence
DATE: 9/17/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.104	0.928	1.663	5.274	16.738	21.0



Sieve Analysis Worksheet

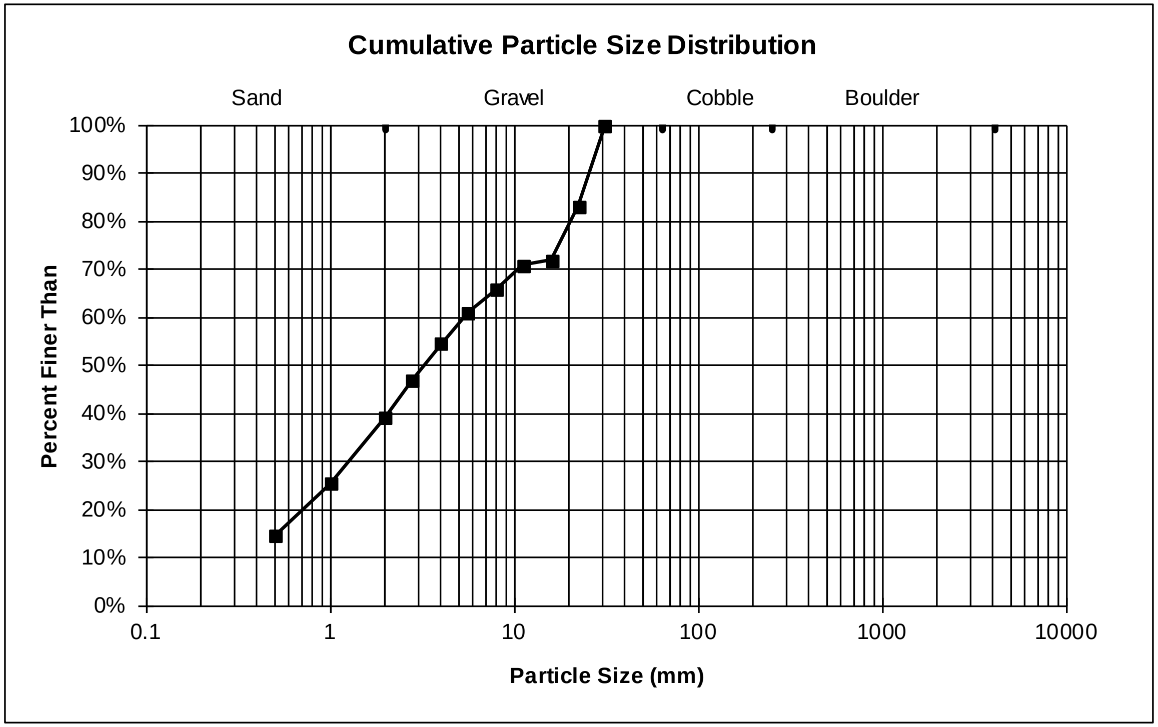
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	89.30	14.5%	
0.5	66.70	10.8%	14.5%
1.0	85.80	13.9%	25.3%
2.0	47.00	7.6%	39.3%
2.8	46.80	7.6%	46.9%
4.0	40.20	6.5%	54.5%
5.6	28.90	4.7%	61.0%
8.0	30.80	5.0%	65.7%
11.2	7.10	1.2%	70.7%
16.0	69.00	11.2%	71.9%
22.4	104.00	16.9%	83.1%
31.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	615.60		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 043FS Upper Fence
DATE: 5/20/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.516	1.617	3.236	22.789	28.158	31.0



Sieve Analysis Worksheet

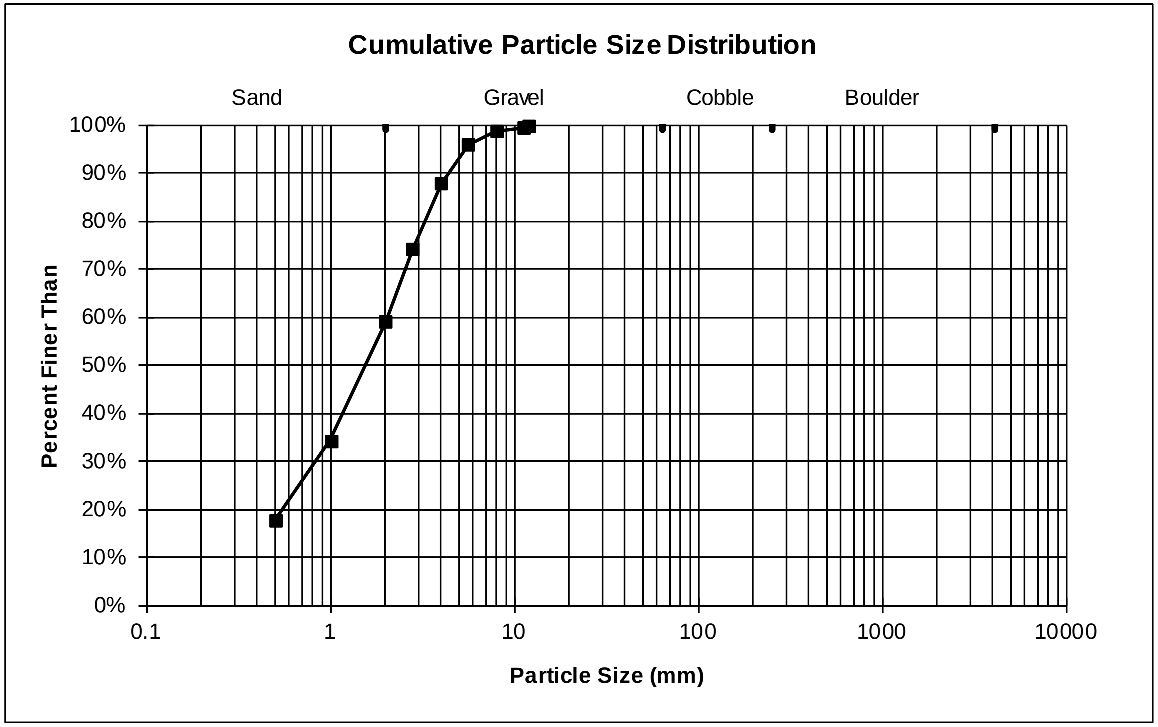
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	62.70	17.7%	
0.5	58.90	16.6%	17.7%
1.0	87.50	24.7%	34.4%
2.0	53.30	15.1%	59.1%
2.8	48.20	13.6%	74.1%
4.0	28.50	8.1%	87.7%
5.6	10.50	3.0%	95.8%
8.0	2.40	0.7%	98.8%
11.2	2.00	0.6%	99.4%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	354.00		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 083FS Lower Fence
DATE: 6/24/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.238	**1.018**	**1.551**	**3.627**	**5.418**	**12.0**



Sieve Analysis Worksheet

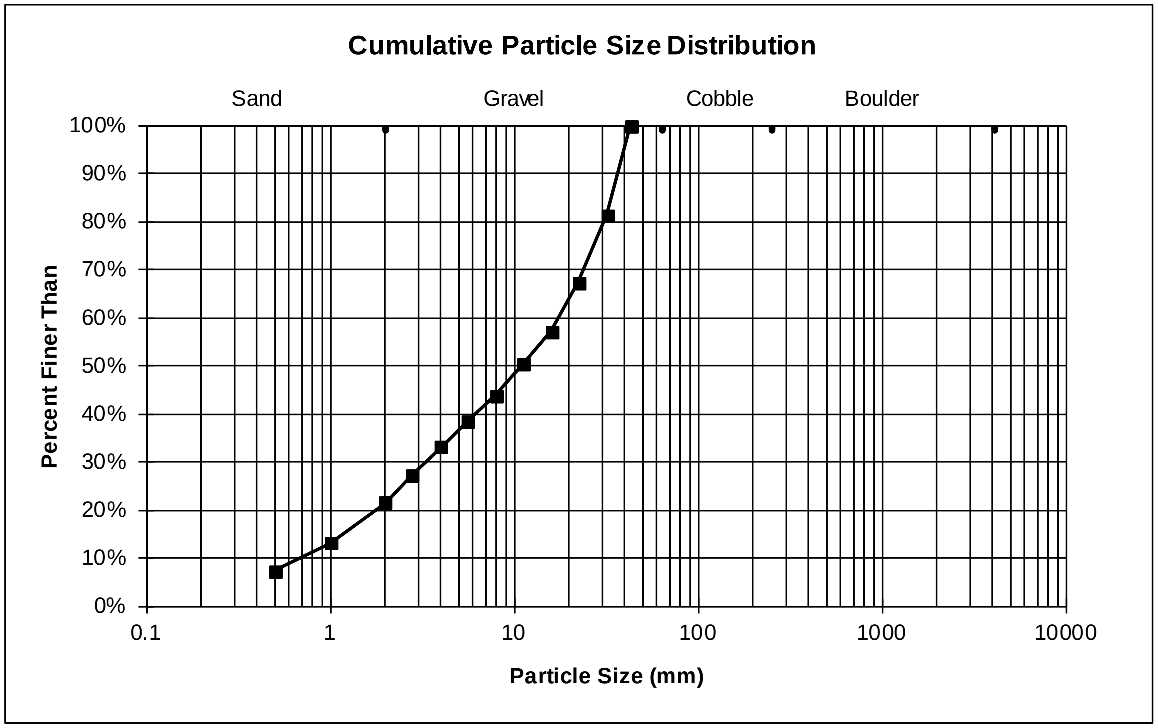
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	53.60	7.2%	
0.5	43.00	5.8%	7.2%
1.0	61.90	8.4%	13.1%
2.0	43.50	5.9%	21.4%
2.8	43.10	5.8%	27.3%
4.0	39.60	5.4%	33.1%
5.6	39.20	5.3%	38.5%
8.0	48.10	6.5%	43.8%
11.2	51.00	6.9%	50.3%
16.0	74.80	10.1%	57.2%
22.4	103.30	14.0%	67.3%
32.0	138.50	18.7%	81.3%
43.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	739.60		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 093FS Upper Fence
DATE: 7/2/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.174	**4.496**	**11.029**	**33.407**	**39.738**	**43.0**



Sieve Analysis Worksheet

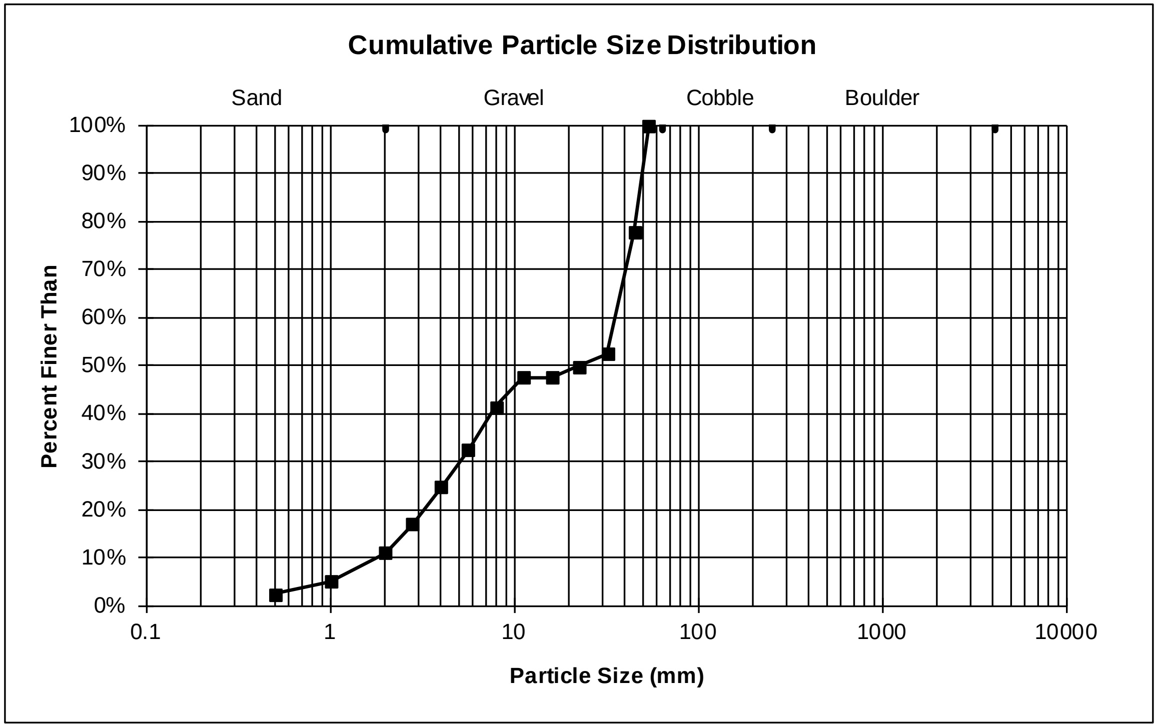
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	17.70	2.4%	
0.5	18.40	2.5%	2.4%
1.0	44.40	6.0%	4.9%
2.0	43.30	5.9%	11.0%
2.8	57.00	7.8%	16.9%
4.0	57.10	7.8%	24.6%
5.6	64.90	8.8%	32.4%
8.0	46.10	6.3%	41.2%
11.2	0.00	0.0%	47.5%
16.0	16.50	2.2%	47.5%
22.4	19.70	2.7%	49.8%
32.0	184.60	25.1%	52.4%
45.0	164.60	22.4%	77.6%
54.0	*		100.0%
90			-
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	734.30		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 098FS Upper Fence
DATE: 6/10/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.518	6.220	23.121	47.411	51.848	54.0



Sieve Analysis Worksheet

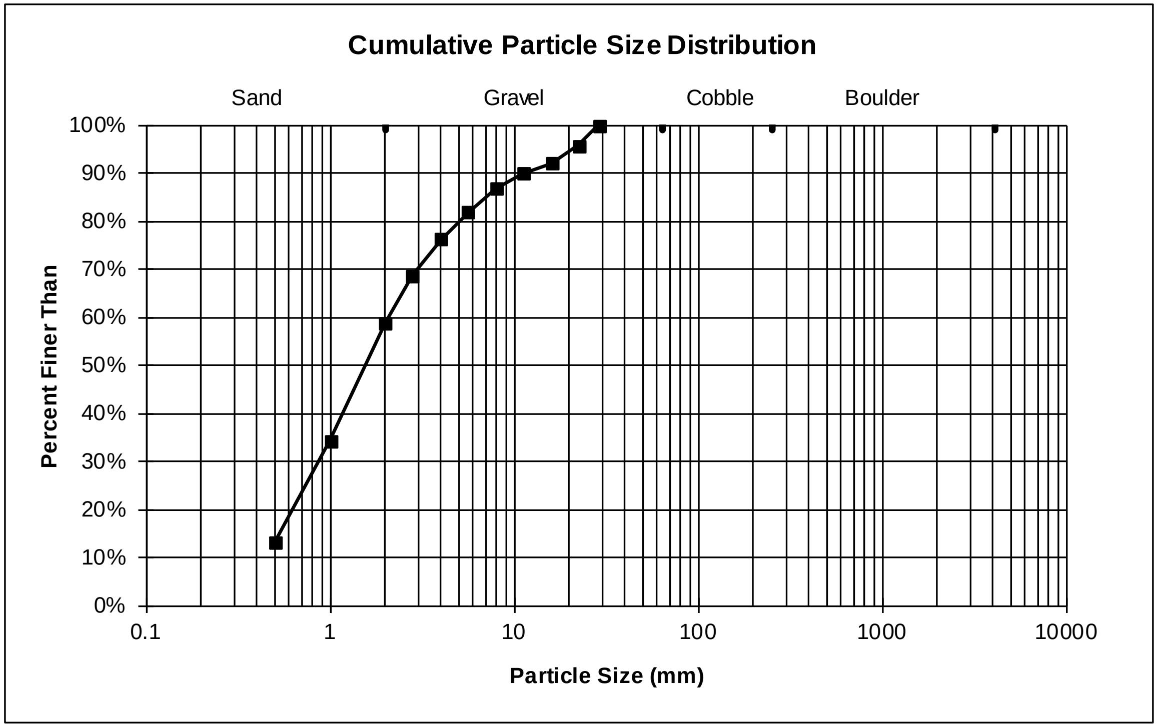
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	86.10	13.1%	
0.5	139.00	21.1%	13.1%
1.0	162.40	24.7%	34.2%
2.0	63.70	9.7%	58.9%
2.8	50.00	7.6%	68.6%
4.0	37.00	5.6%	76.2%
5.6	32.80	5.0%	81.8%
8.0	20.40	3.1%	86.8%
11.2	13.20	2.0%	89.9%
16.0	24.20	3.7%	91.9%
22.4	28.80	4.4%	95.6%
29.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	657.60		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 101FS Lower Fence
DATE: 8/12/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.532	1.022	1.557	6.534	21.165	29.0



Sieve Analysis Worksheet

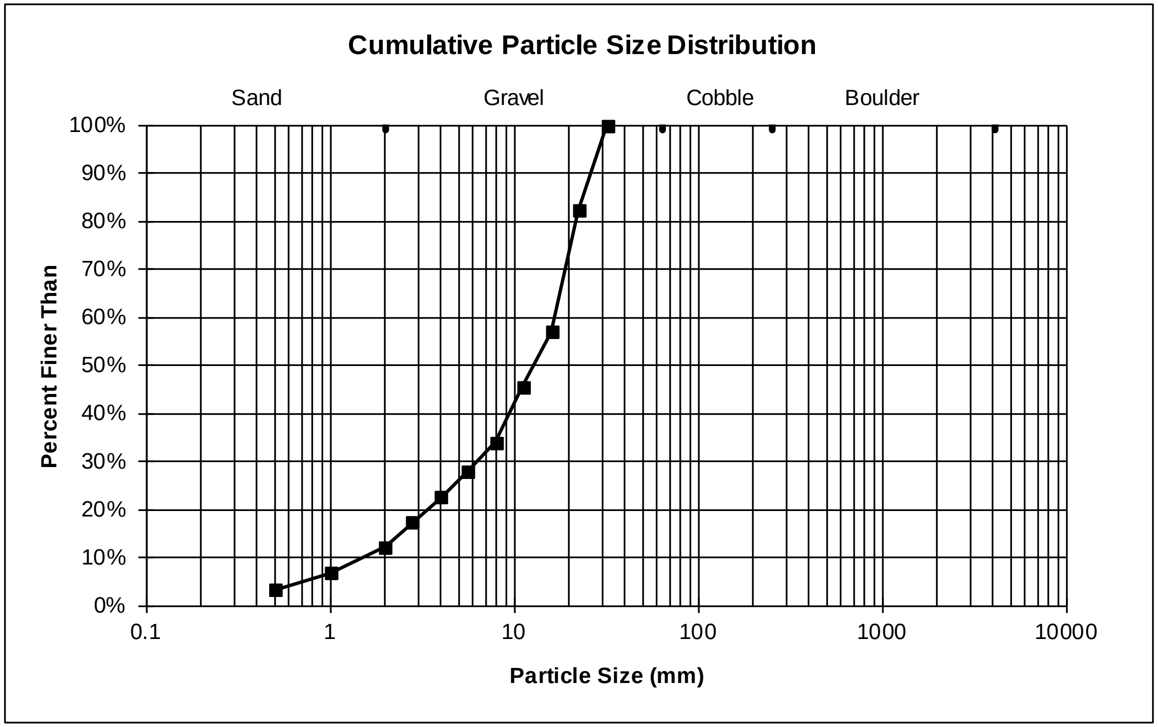
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	18.50	3.3%	
0.5	19.50	3.4%	3.3%
1.0	30.90	5.5%	6.7%
2.0	28.60	5.0%	12.2%
2.8	30.30	5.3%	17.2%
4.0	30.50	5.4%	22.6%
5.6	34.50	6.1%	27.9%
8.0	65.10	11.5%	34.0%
11.2	64.80	11.4%	45.5%
16.0	142.60	25.2%	56.9%
22.4	101.40	17.9%	82.1%
32.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	566.70		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 105FS Upper Fence
DATE: 6/10/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.417	8.233	12.884	23.261	28.964	32.0



Sieve Analysis Worksheet

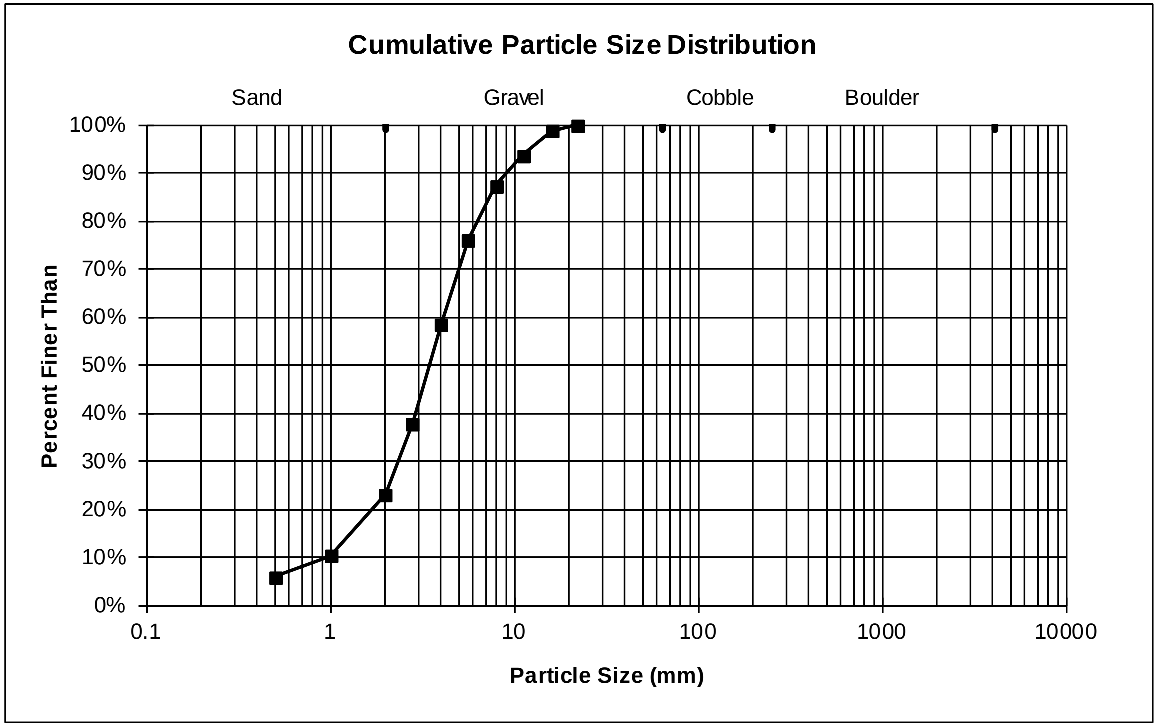
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	32.90	5.8%	
0.5	24.70	4.4%	5.8%
1.0	72.40	12.8%	10.2%
2.0	83.50	14.8%	23.0%
2.8	117.10	20.7%	37.8%
4.0	98.40	17.4%	58.6%
5.6	64.00	11.3%	76.0%
8.0	35.20	6.2%	87.3%
11.2	29.00	5.1%	93.6%
16.0	7.30	1.3%	98.7%
22.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	564.50		

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

SITE NAME: Pike's Peak Highway -Fill Slope
ID NUMBER: 105FS Lower Fence
DATE: 6/10/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.296	2.626	3.452	7.203	12.369	22.0



Sieve Analysis Worksheet

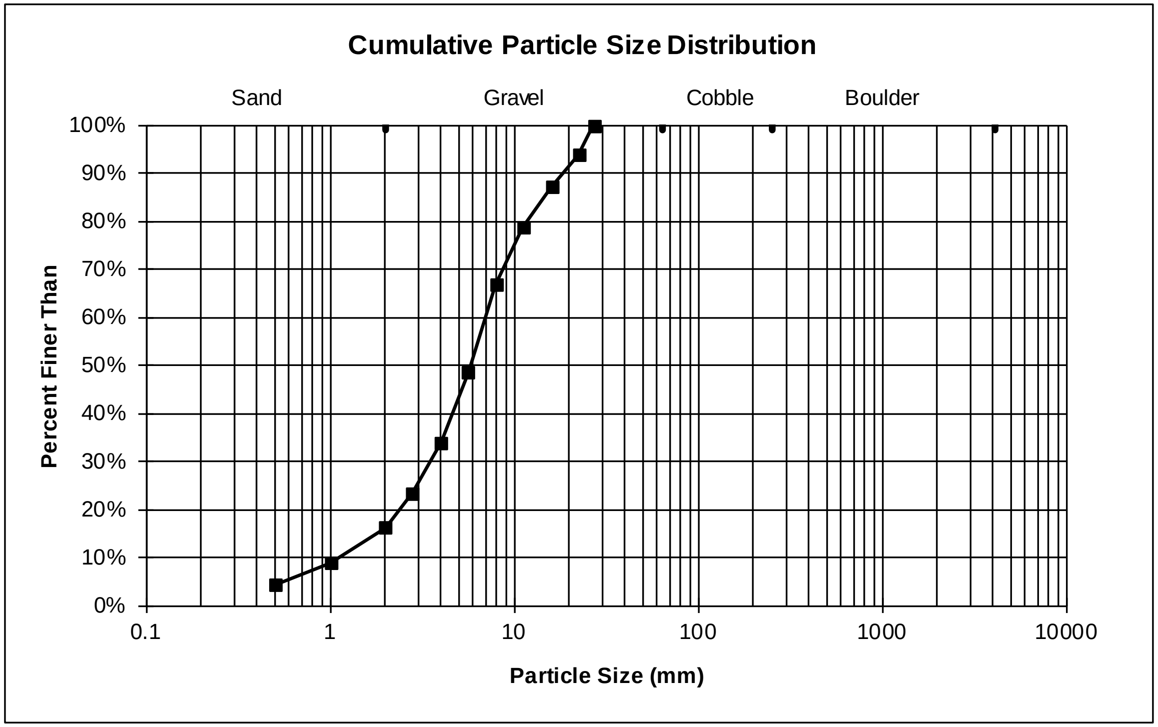
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	22.00	4.3%	
0.5	23.30	4.5%	4.3%
1.0	38.00	7.4%	8.8%
2.0	36.60	7.1%	16.3%
2.8	54.40	10.6%	23.4%
4.0	74.00	14.4%	34.0%
5.6	93.30	18.2%	48.5%
8.0	61.60	12.0%	66.7%
11.2	42.70	8.3%	78.7%
16.0	34.50	6.7%	87.0%
22.4	31.90	6.2%	93.8%
27.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	512.30		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 128FS Upper Fence
DATE: 8/12/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.778	4.092	5.771	14.049	23.240	27.0



Sieve Analysis Worksheet

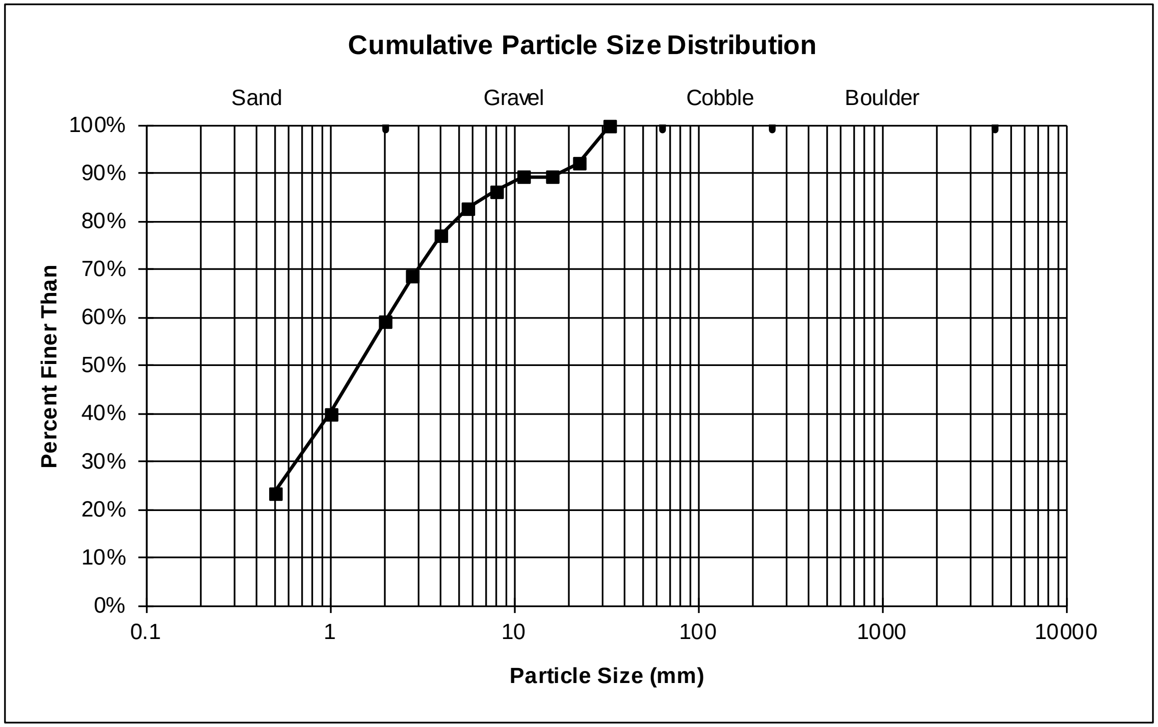
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	142.40	23.4%	
0.5	101.10	16.6%	23.4%
1.0	117.80	19.3%	39.9%
2.0	56.00	9.2%	59.2%
2.8	52.70	8.6%	68.4%
4.0	34.40	5.6%	77.1%
5.6	20.90	3.4%	82.7%
8.0	18.20	3.0%	86.1%
11.2	0.00	0.0%	89.1%
16.0	17.70	2.9%	89.1%
22.4	48.60	8.0%	92.0%
33.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	609.80		

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

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 186FS Upper fence
DATE: 8/12/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.088	0.814	1.435	6.401	25.879	33.0



Sieve Analysis Worksheet

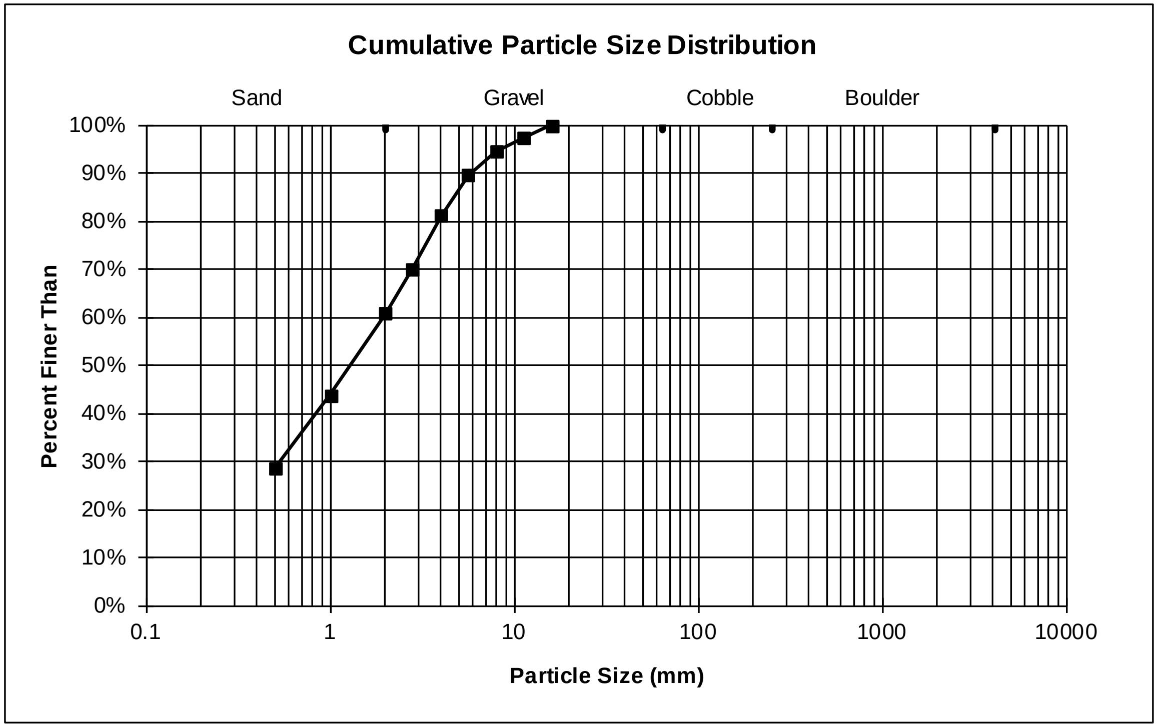
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	121.80	28.6%	
0.5	64.60	15.2%	28.6%
1.0	72.80	17.1%	43.7%
2.0	39.40	9.2%	60.8%
2.8	47.60	11.2%	70.0%
4.0	35.60	8.3%	81.2%
5.6	21.30	5.0%	89.5%
8.0	11.60	2.7%	94.5%
11.2	11.70	2.7%	97.3%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	426.40		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 186FS Lower Fence
DATE: 8/12/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.050	**0.671**	**1.291**	**4.479**	**8.473**	**16.0**



Sieve Analysis Worksheet

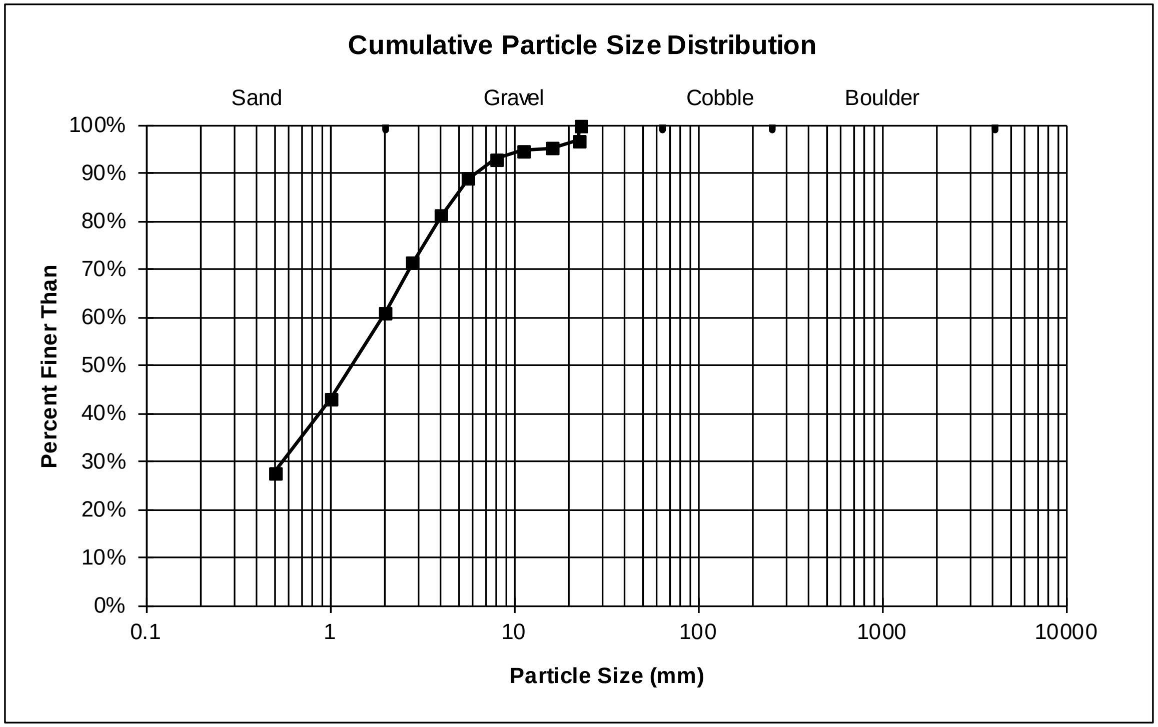
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	178.90	27.7%	
0.5	98.10	15.2%	27.7%
1.0	117.30	18.2%	42.9%
2.0	66.90	10.4%	61.0%
2.8	63.20	9.8%	71.4%
4.0	49.40	7.6%	81.2%
5.6	26.00	4.0%	88.8%
8.0	11.60	1.8%	92.8%
11.2	3.60	0.6%	94.6%
16.0	10.70	1.7%	95.2%
22.4	20.50	3.2%	96.8%
23.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	646.20		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 203FS Upper Fence
DATE: 7/29/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.054	0.698	1.313	4.534	14.334	23.0



Sieve Analysis Worksheet

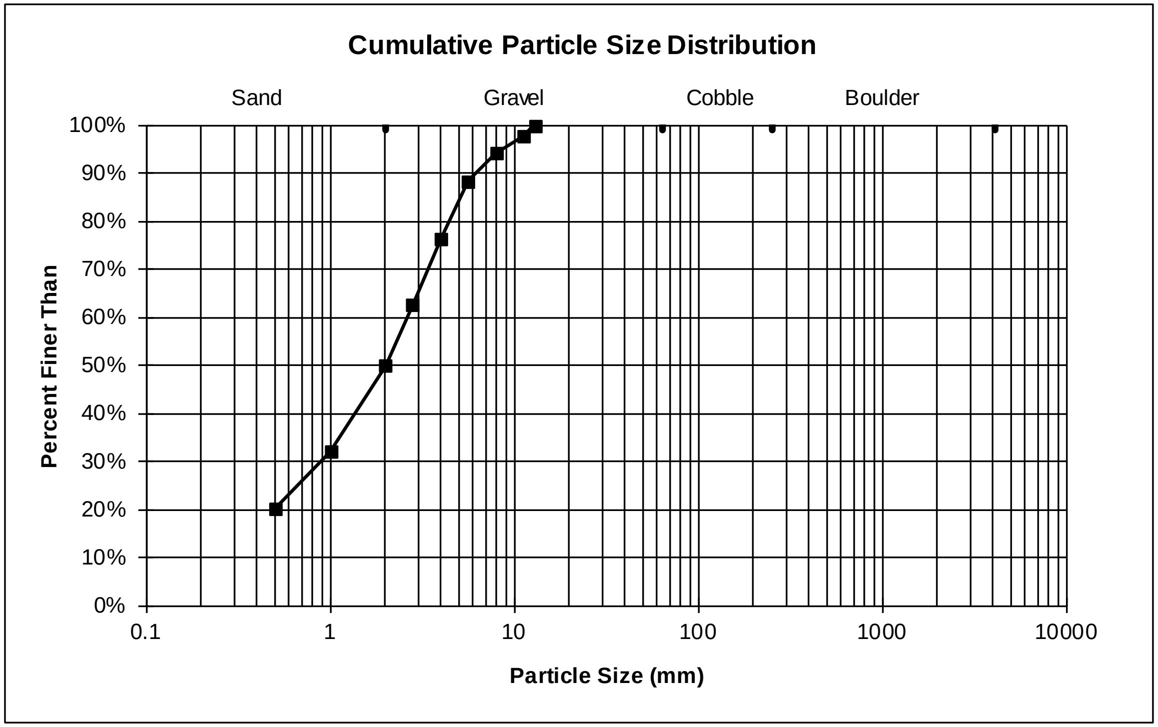
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	105.10	20.1%	
0.5	61.60	11.8%	20.1%
1.0	93.50	17.9%	31.9%
2.0	65.70	12.6%	49.9%
2.8	72.50	13.9%	62.5%
4.0	62.10	11.9%	76.4%
5.6	30.20	5.8%	88.3%
8.0	18.30	3.5%	94.0%
11.2	12.80	2.5%	97.5%
13.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	521.80		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 204FS Upper Fence
DATE: 5/6/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.145	1.125	2.007	4.966	8.772	13.0



Sieve Analysis Worksheet

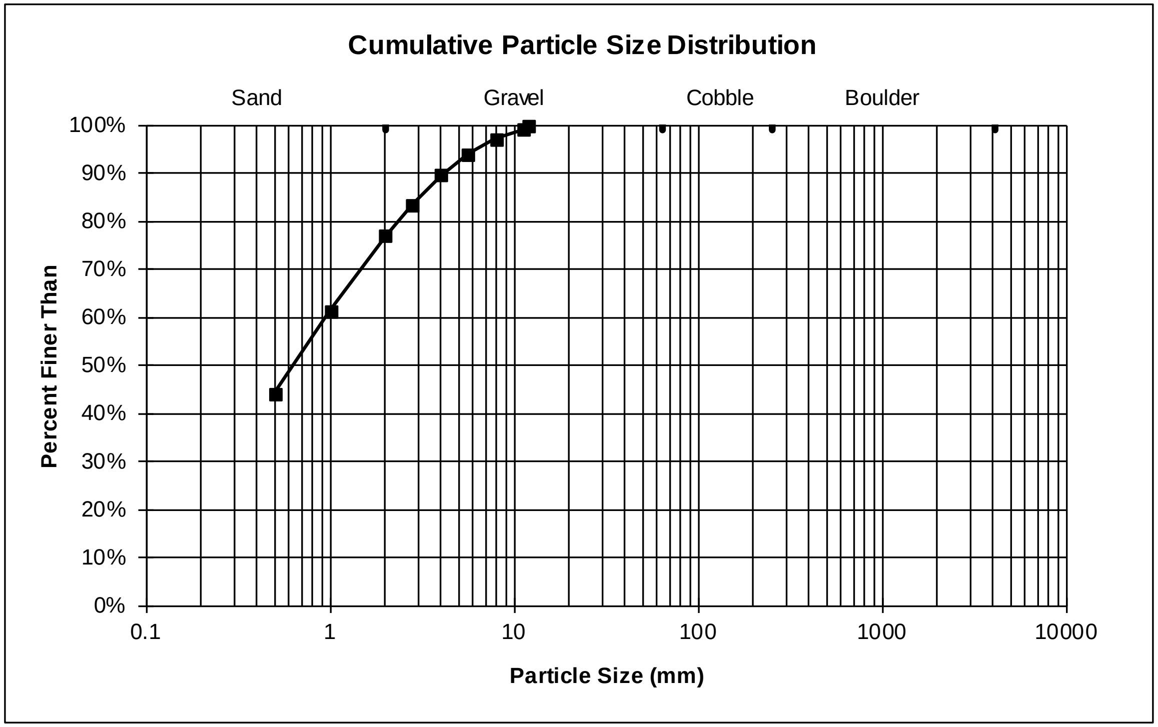
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	228.90	44.2%	
0.5	88.40	17.1%	44.2%
1.0	81.40	15.7%	61.3%
2.0	33.20	6.4%	77.0%
2.8	31.60	6.1%	83.4%
4.0	23.40	4.5%	89.5%
5.6	15.90	3.1%	94.0%
8.0	10.10	2.0%	97.1%
11.2	5.00	1.0%	99.0%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	517.90		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 204FS Lower Fence
DATE: 5/6/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.020	0.182	0.633	2.901	6.279	12.0



Sieve Analysis Worksheet

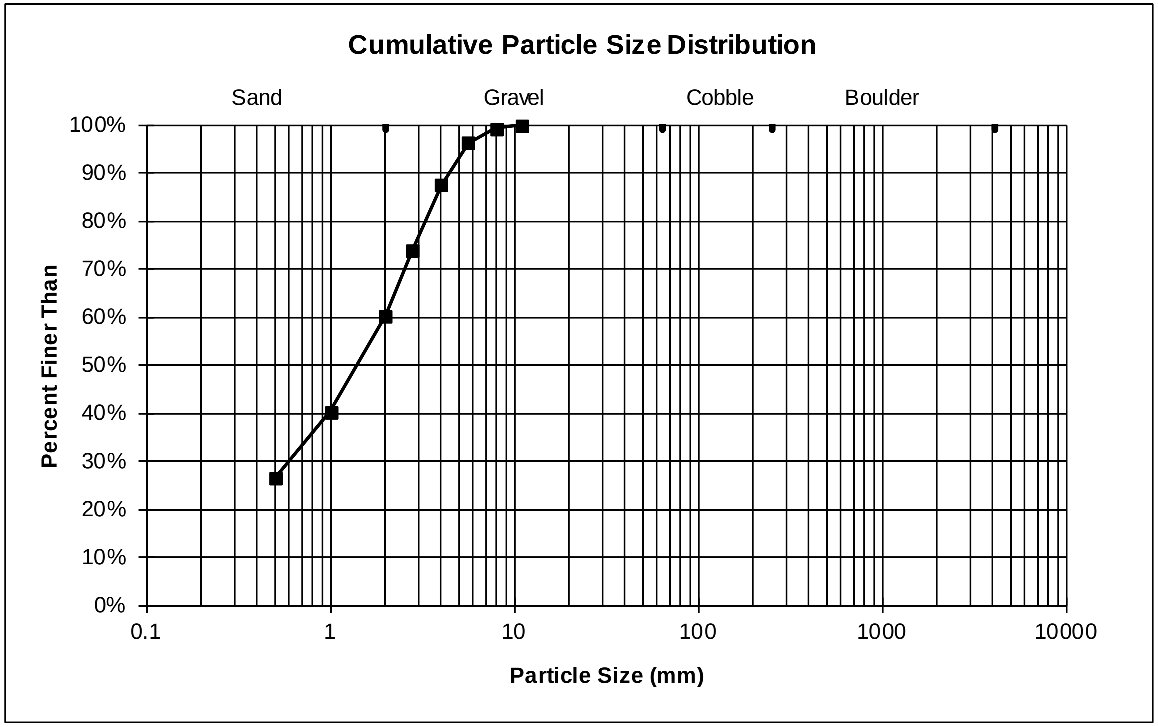
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	117.30	26.4%	
0.5	61.50	13.9%	26.4%
1.0	88.70	20.0%	40.3%
2.0	61.00	13.7%	60.3%
2.8	59.60	13.4%	74.0%
4.0	39.30	8.9%	87.4%
5.6	12.80	2.9%	96.3%
8.0	3.70	0.8%	99.2%
11.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	443.90		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 204FS Upper Fence
DATE: 9/17/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.061	0.768	1.401	3.652	5.334	11.0



Sieve Analysis Worksheet

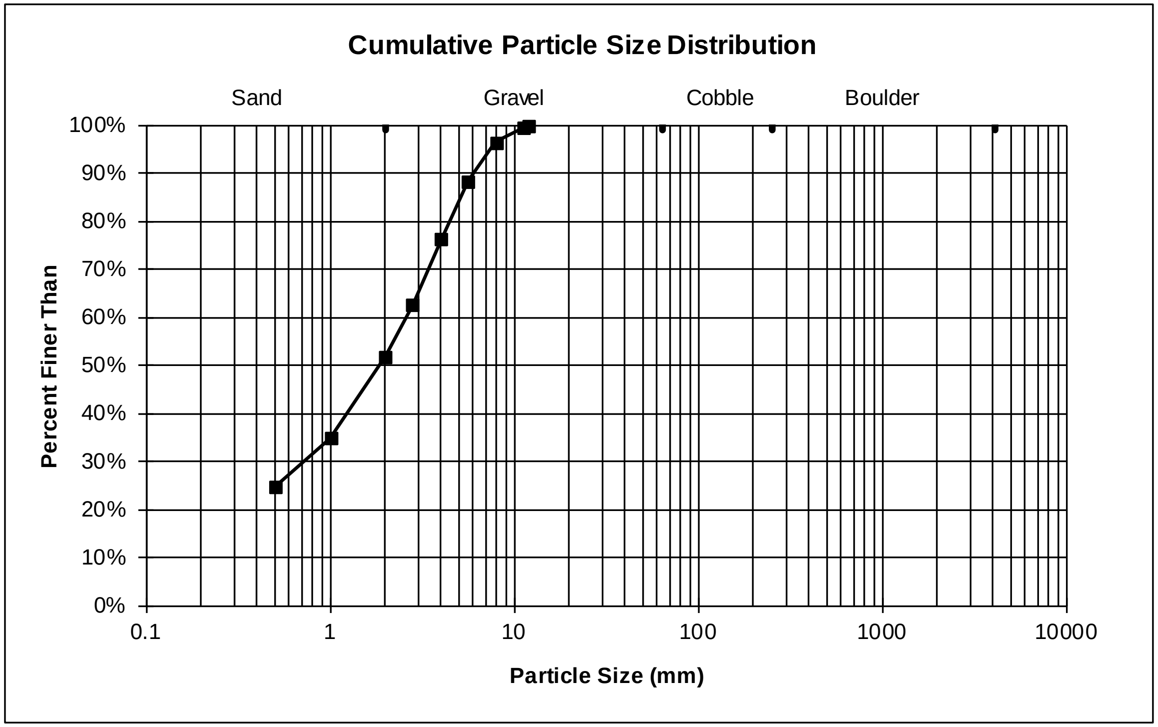
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	107.30	24.6%	
0.5	44.90	10.3%	24.6%
1.0	73.80	16.9%	34.9%
2.0	46.60	10.7%	51.8%
2.8	59.80	13.7%	62.5%
4.0	53.00	12.2%	76.2%
5.6	35.20	8.1%	88.4%
8.0	13.10	3.0%	96.5%
11.2	2.30	0.5%	99.5%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	436.00		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: 204FS Lower Fence
DATE: 9/17/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.075	1.004	1.855	4.959	7.498	12.0

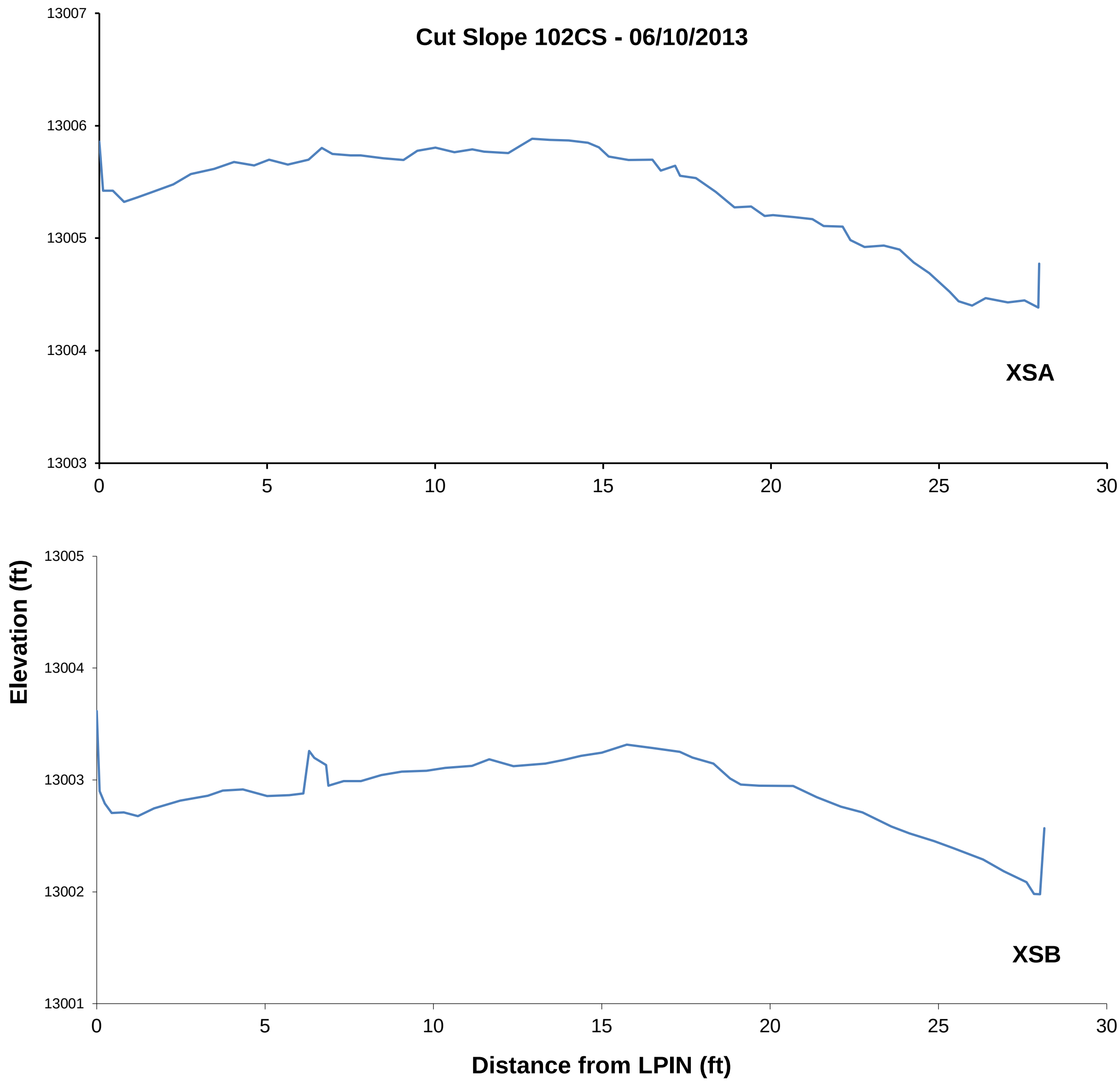


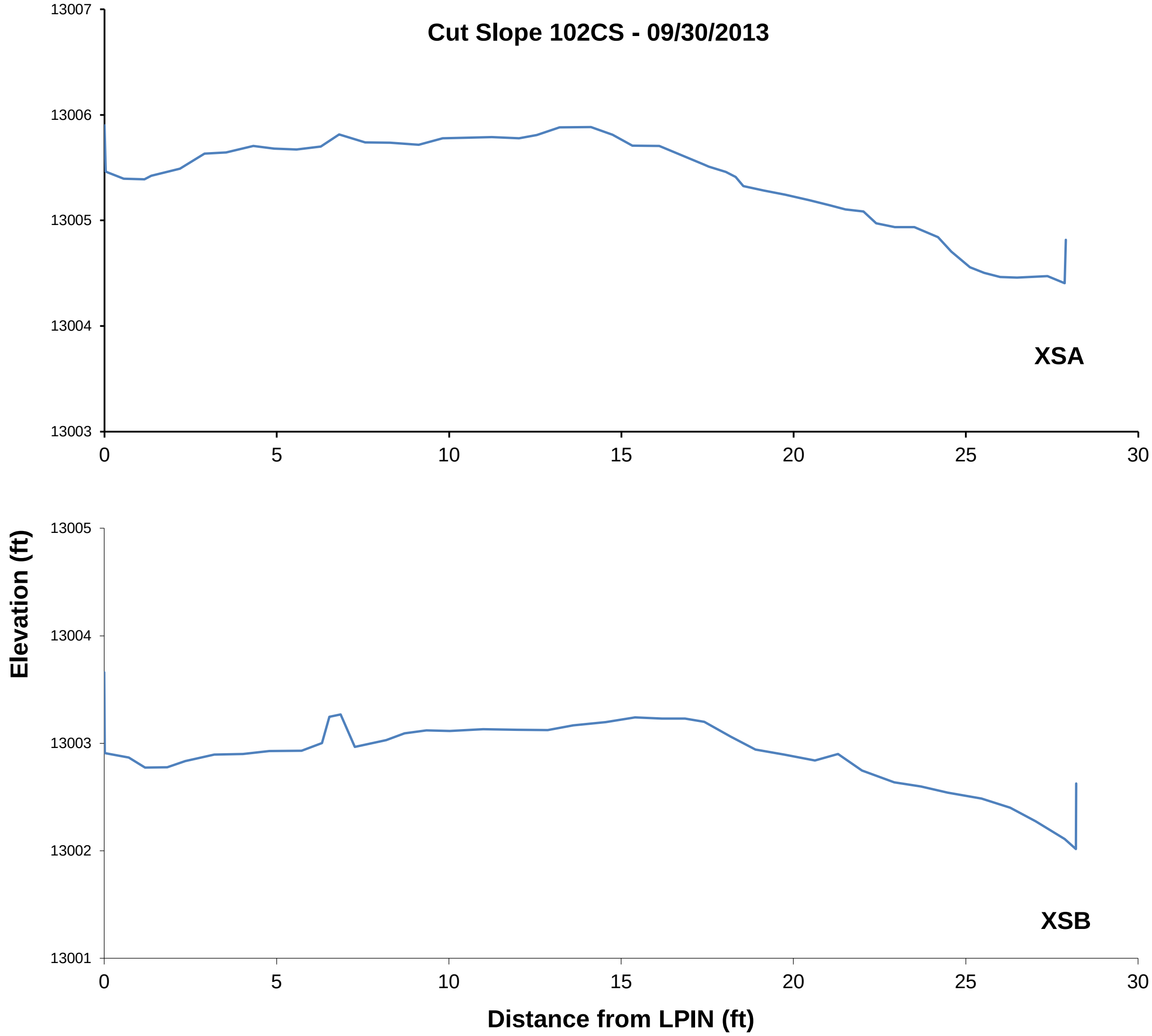
Appendix G

Cut Slope

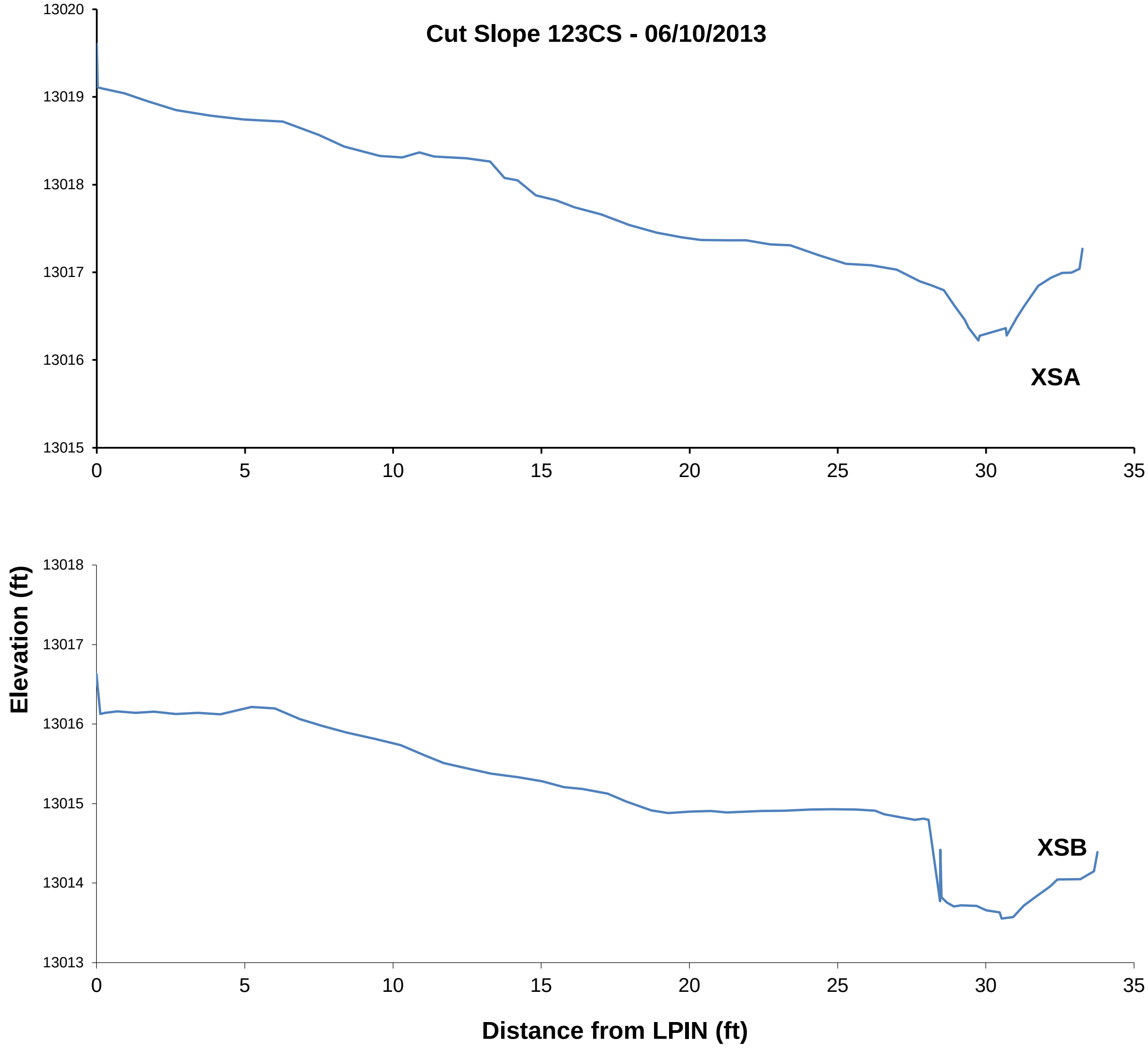
Cross Section Graphs

2013

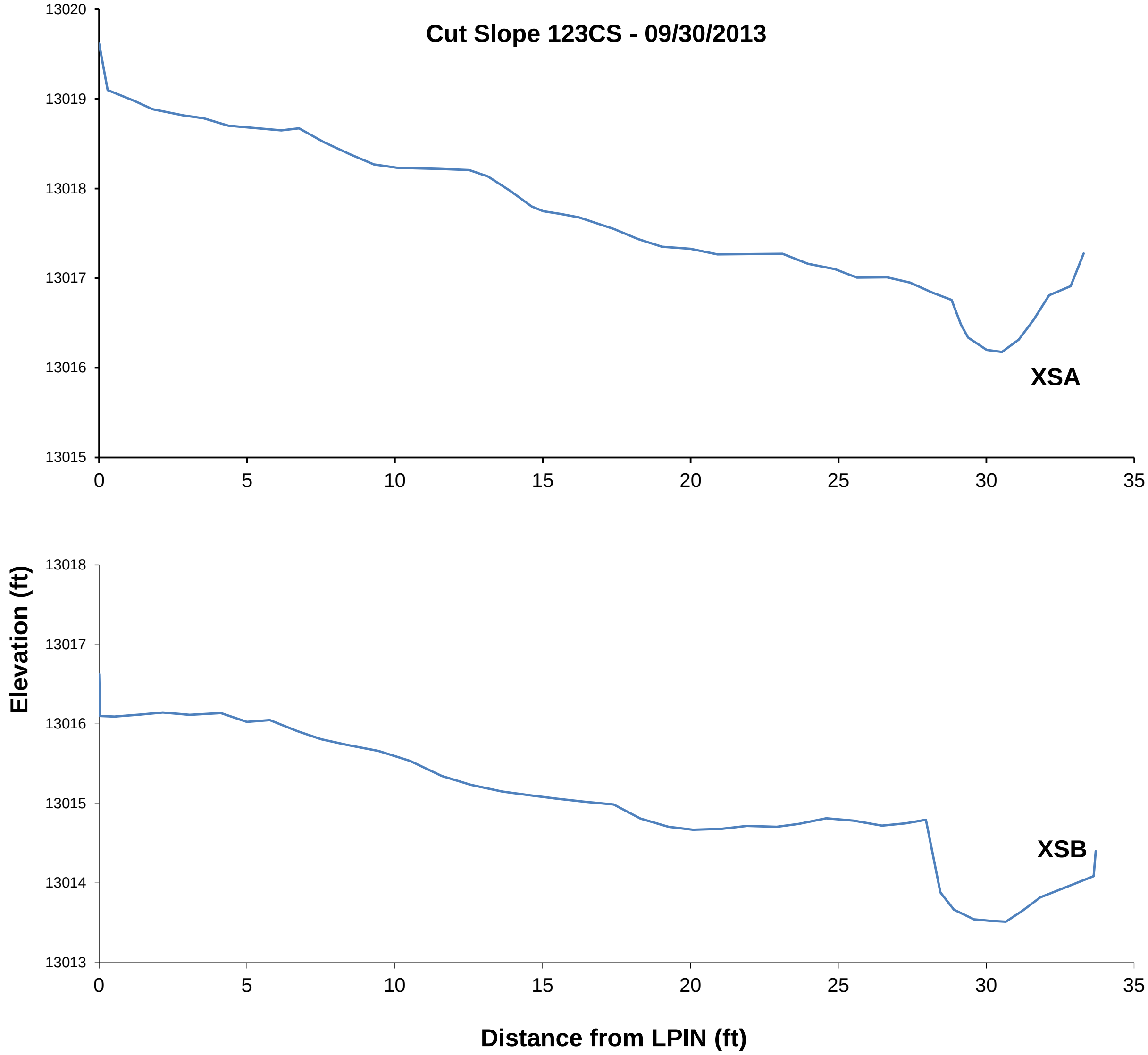

Cut Slope 102CS - 06/10/2013
13007
13006
13005
13004
13003
0
5
10
15
20
25
30
XSA
Elevation (ft)
13005
13004
13003
13002
13001
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

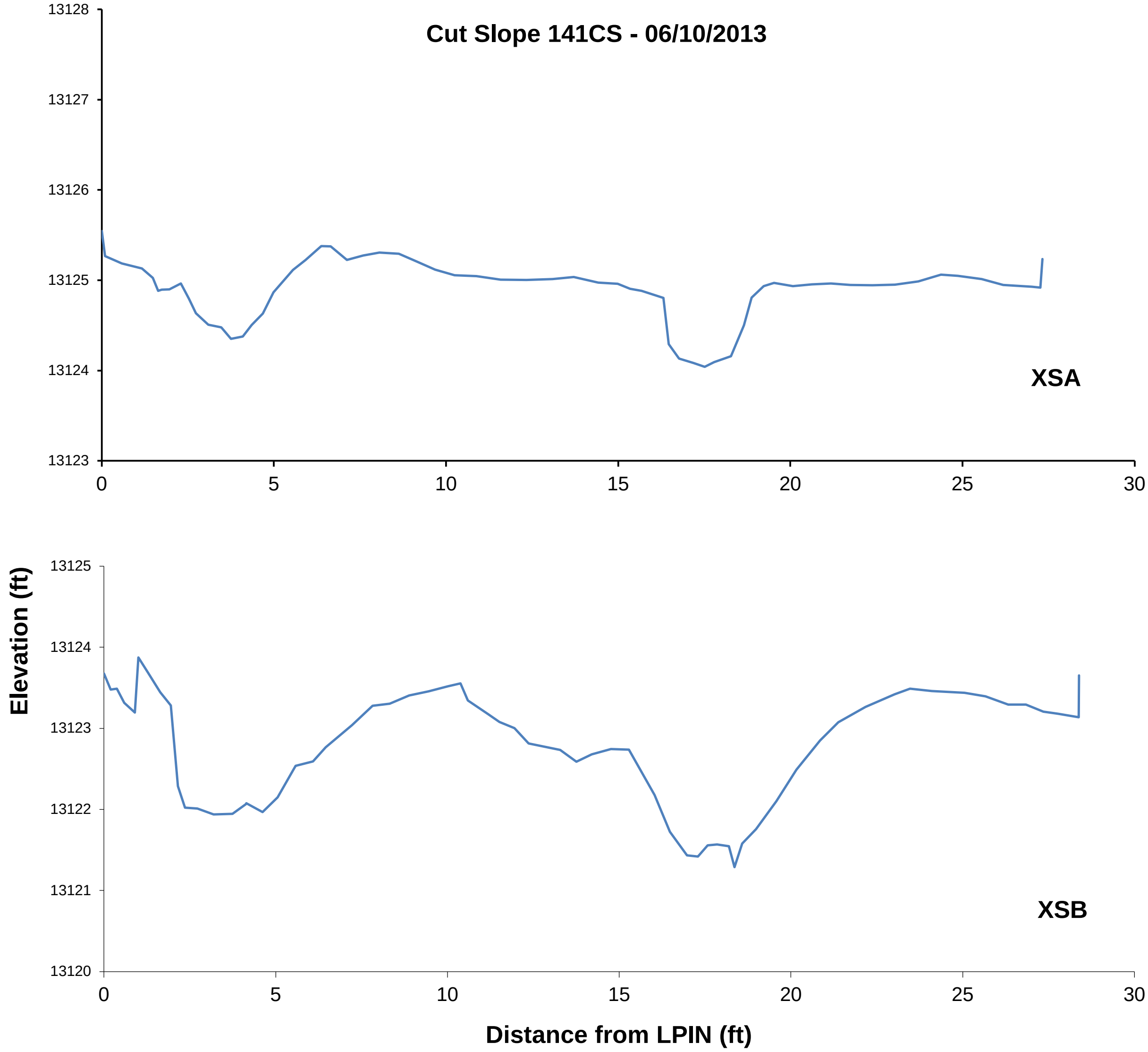


Cut Slope 102CS - 09/30/2013
13007
13006
13005
13004
13003
0
5
10
15
20
25
30
XSA
Elevation (ft)
13005
13004
13003
13002
13001
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

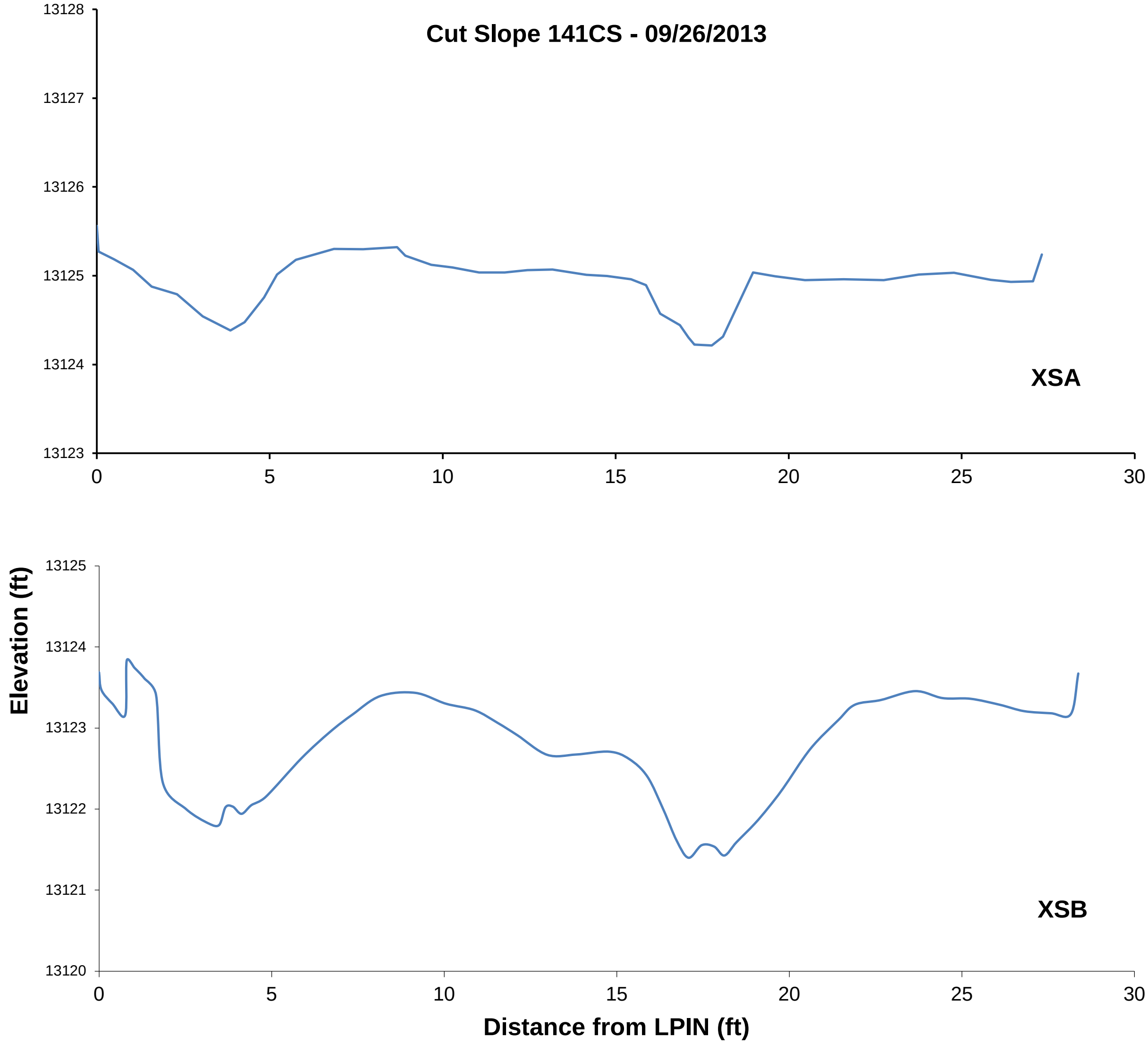


Cut Slope 123CS - 06/10/2013
XSA
XSB
Elevation (ft)
Distance from LPIN (ft)
13020
13019
13018
13017
13016
13015
13014
13013
0
5
10
15
20
25
30
35


Cut Slope 123CS - 09/30/2013
13020
13019
13018
13017
13016
13015
0
5
10
15
20
25
30
35
XSA
Elevation (ft)
13018
13017
13016
13015
13014
13013
0
5
10
15
20
25
30
35
XSB
Distance from LPIN (ft)



Cut Slope 141CS - 06/10/2013
13128
13127
13126
13125
13124
13123
0
5
10
15
20
25
30
XSA
Elevation (ft)
13125
13124
13123
13122
13121
13120
XSB
Distance from LPIN (ft)



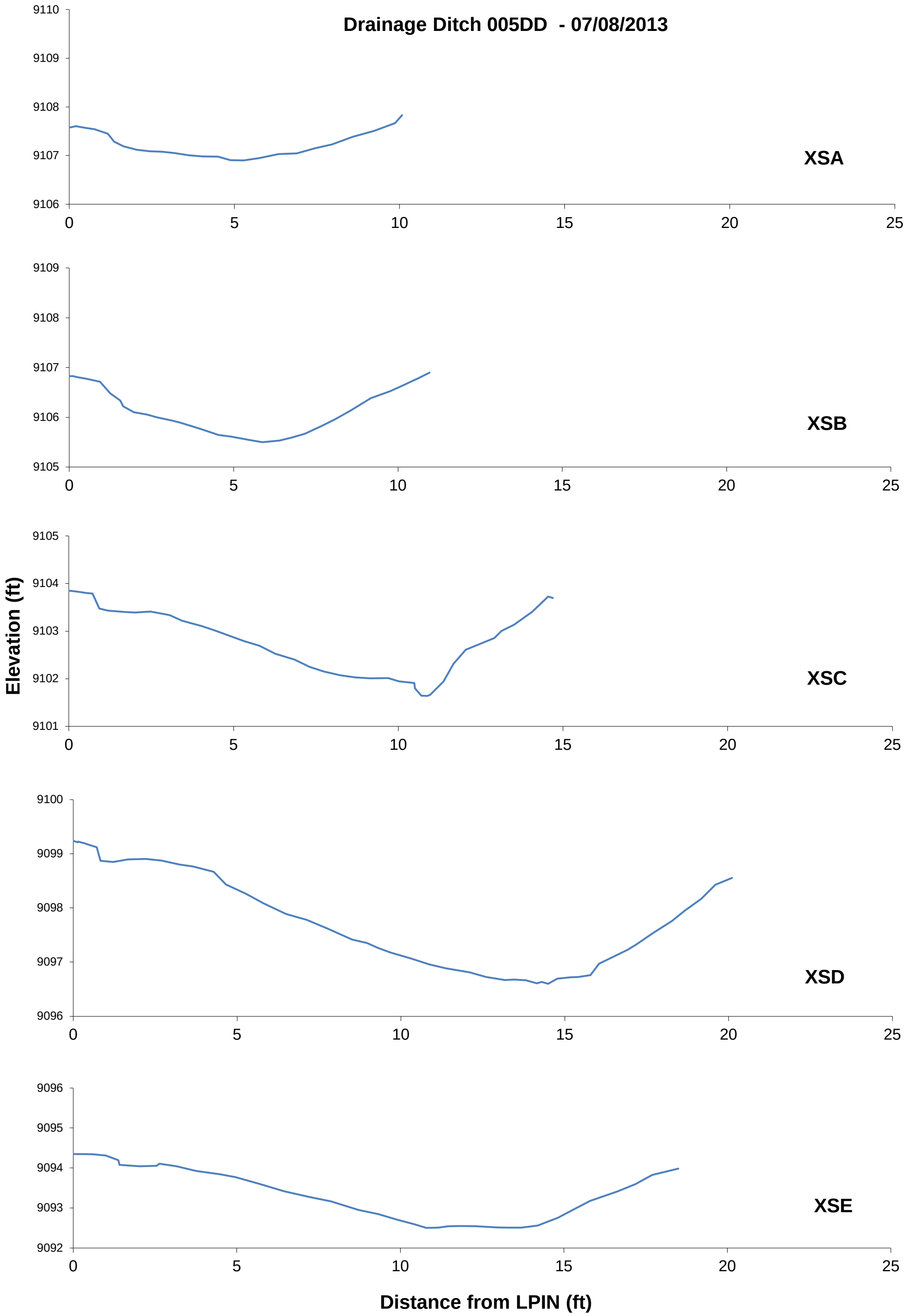
Cut Slope 141CS - 09/26/2013
13128
13127
13126
13125
13124
13123
0
5
10
15
20
25
30
XSA
Elevation (ft)
13125
13124
13123
13122
13121
13120
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

Appendix H

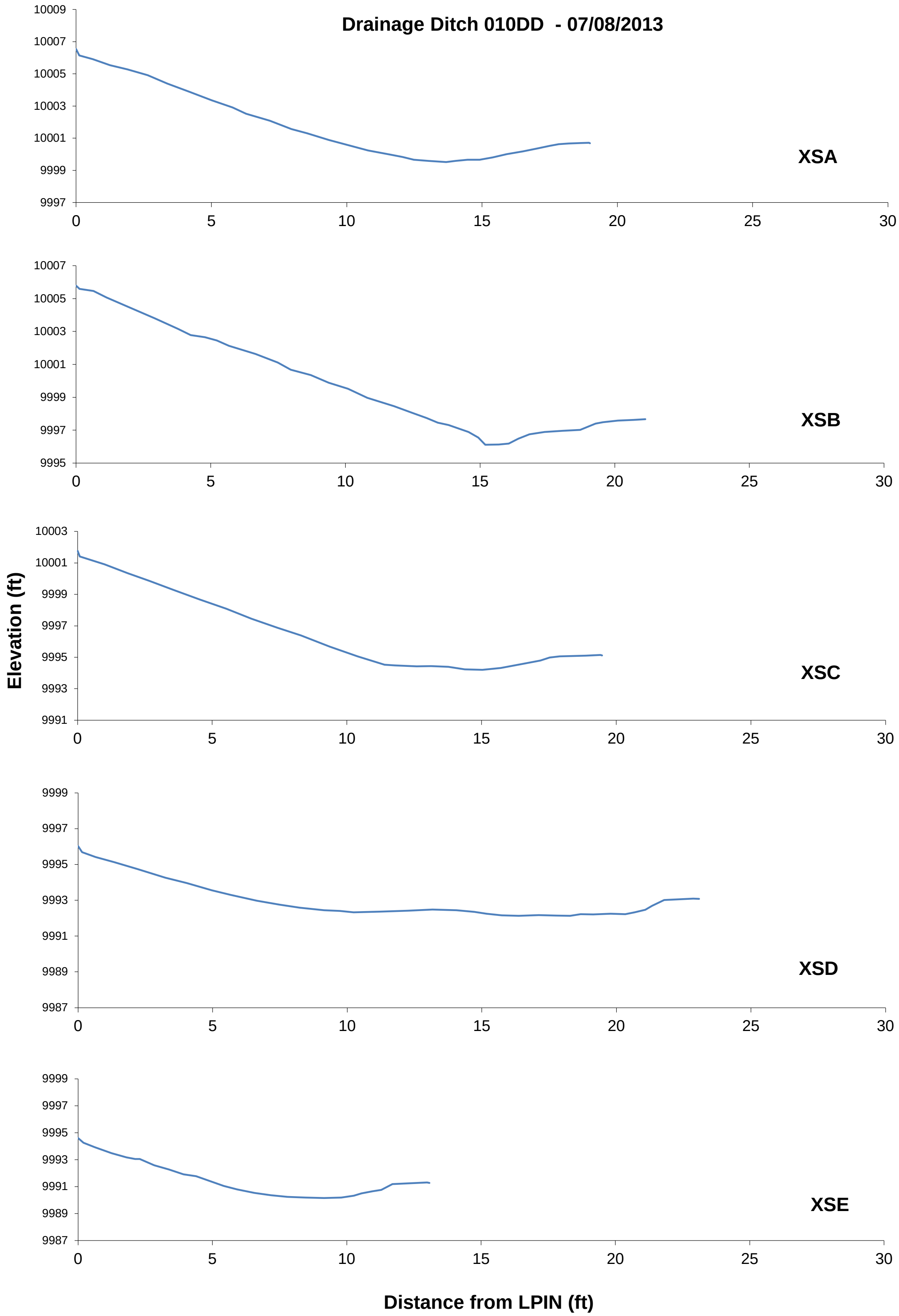
Drainage Ditch

Cross Section Graphs

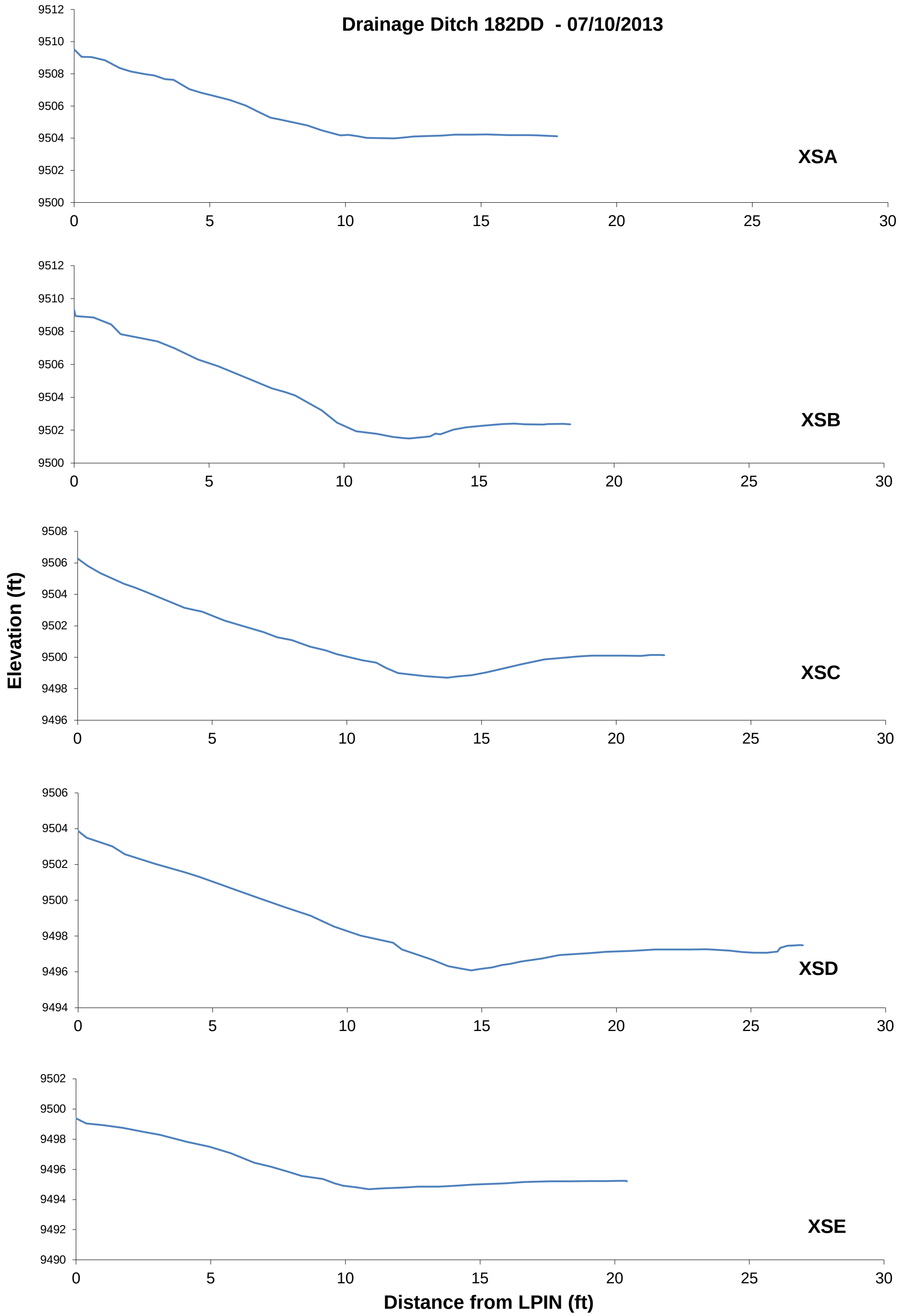
2013



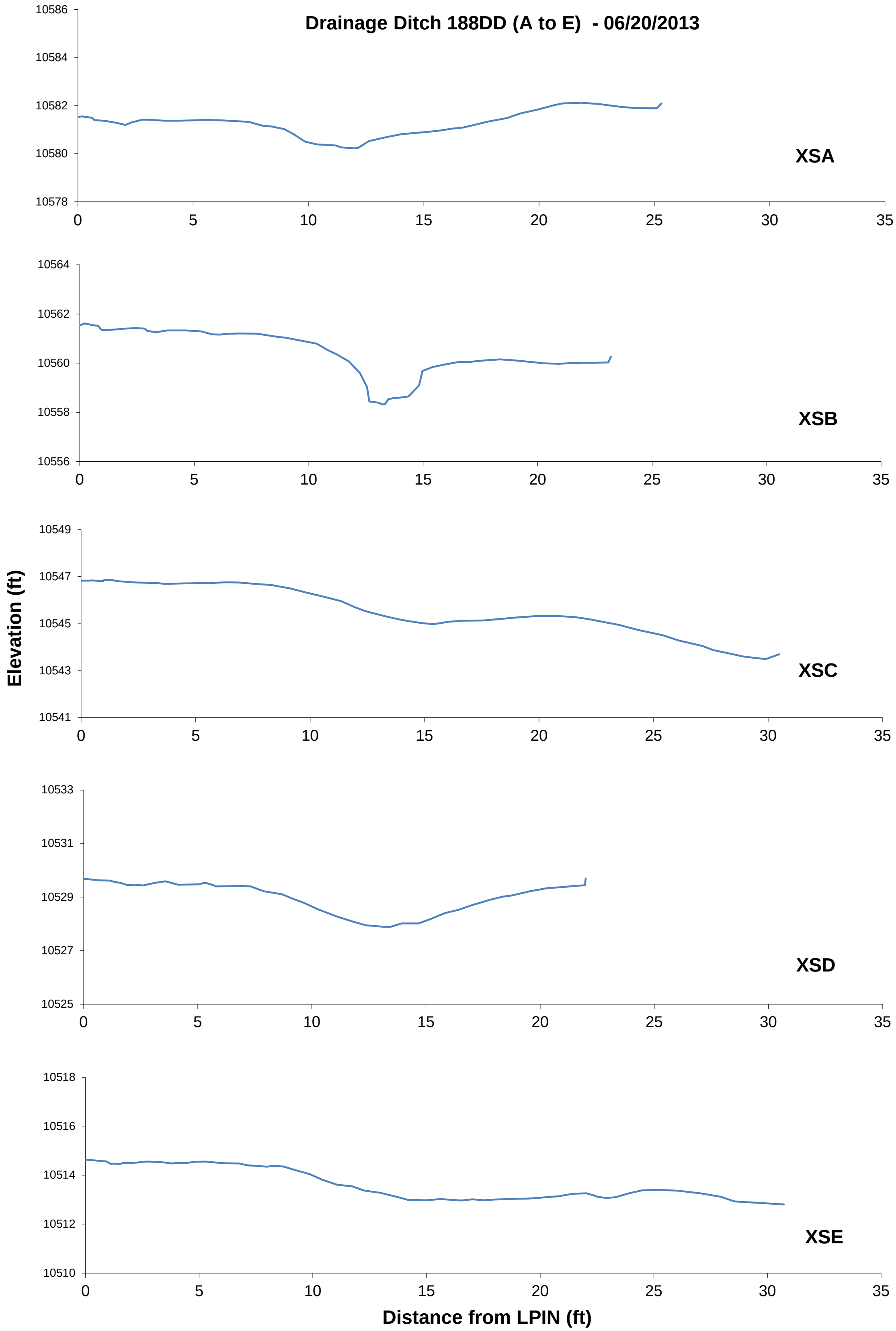
Drainage Ditch 005DD - 07/08/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
9110
9109
9108
9107
9106
9105
9104
9103
9102
9101
9100
9099
9098
9097
9096
9095
9094
9093
9092
0
5
10
15
20
25

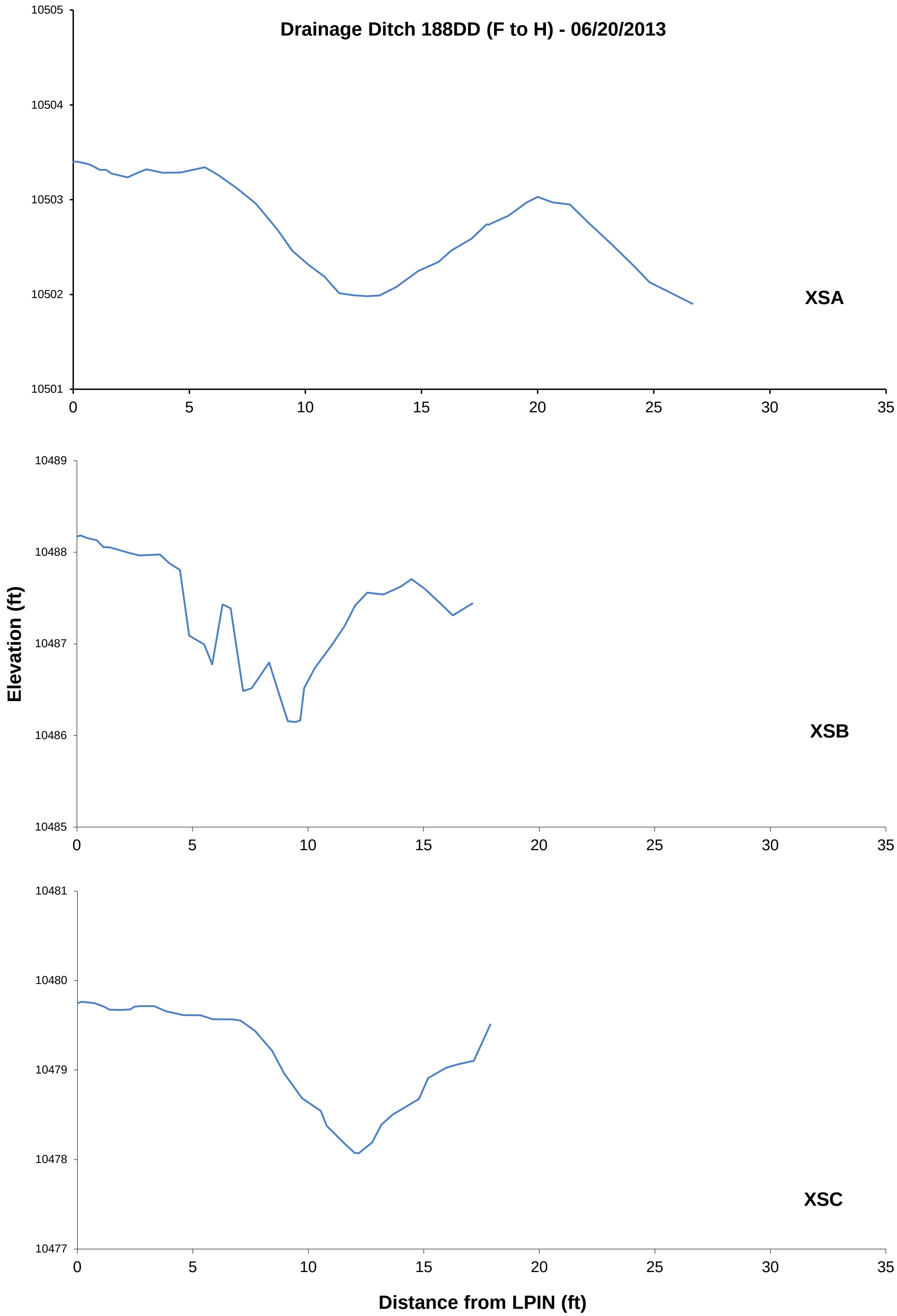


Drainage Ditch 010DD - 07/08/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
10009
10007
10005
10003
10001
9999
9997
9995
9993
9991
9989
9987
0
5
10
15
20
25
30

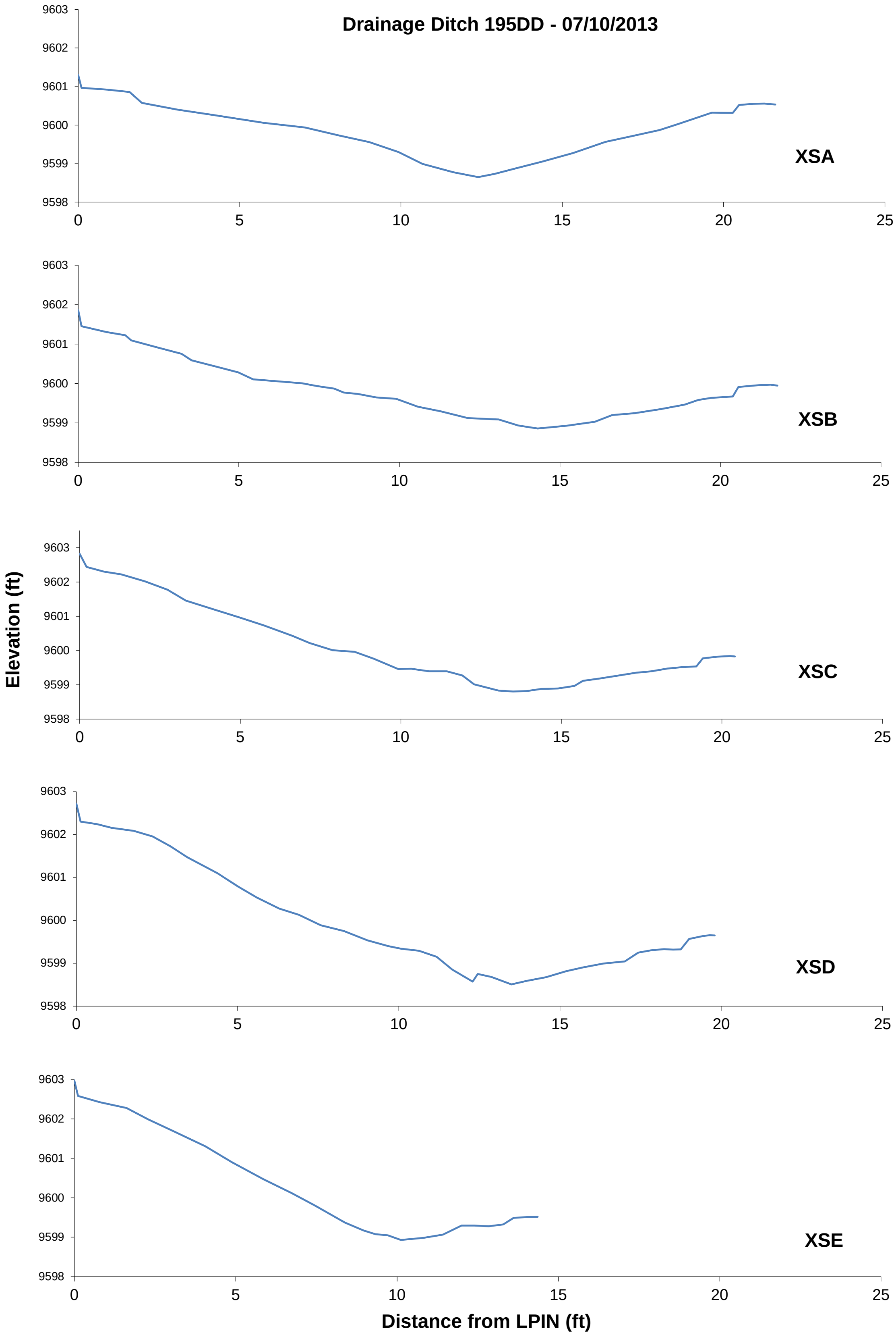


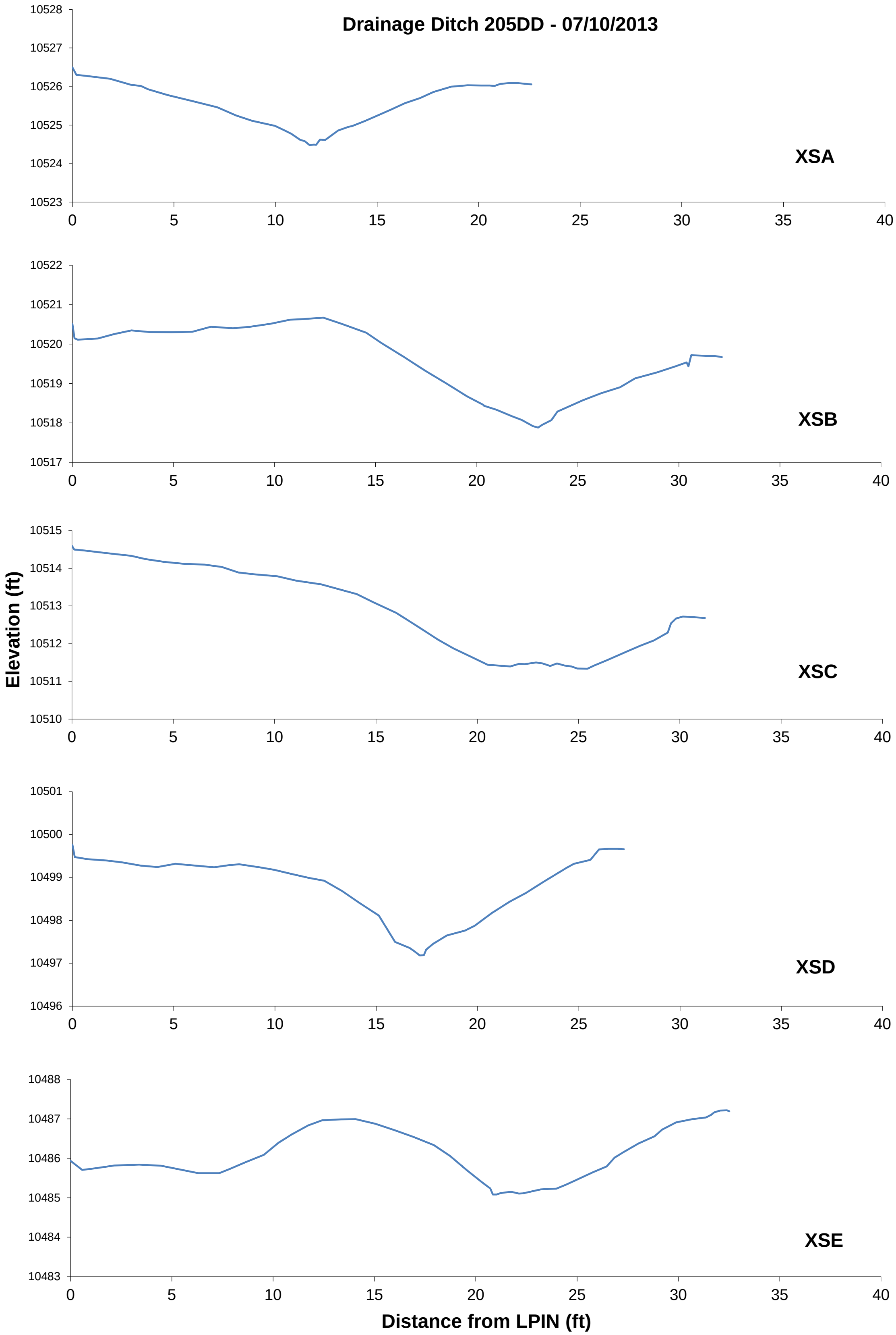
Drainage Ditch 182DD - 07/10/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
9512
9510
9508
9506
9504
9502
9500
9498
9496
9494
9492
9490
0
5
10
15
20
25
30


Drainage Ditch 188DD (A to E) - 06/20/2013
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)
10586
10584
10582
10580
10578
10564
10562
10560
10558
10556
10549
10547
10545
10543
10541
10533
10531
10529
10527
10525
10518
10516
10514
10512
10510
0
5
10
15
20
25
30
35



Drainage Ditch 188DD (F to H) - 06/20/2013
Elevation (ft)
10505
10504
10503
10502
10501
XSA
10489
10488
10487
10486
10485
XSB
10481
10480
10479
10478
10477
XSC
0
5
10
15
20
25
30
35
Distance from LPIN (ft)


Drainage Ditch 195DD - 07/10/2013
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)
9603
9602
9601
9600
9599
9598
0
5
10
15
20
25

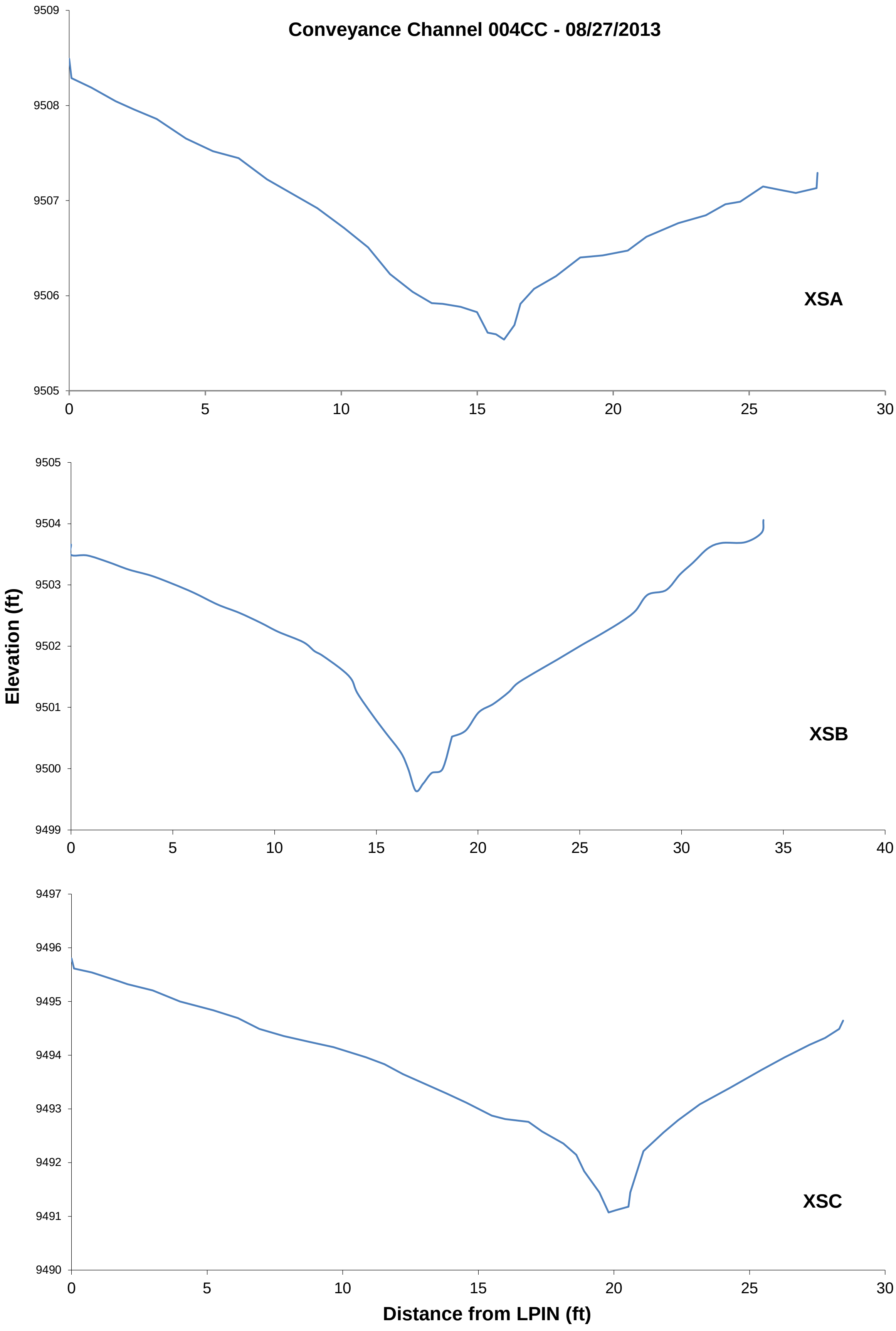

Drainage Ditch 205DD - 07/10/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
10528
10527
10526
10525
10524
10523
10522
10521
10520
10519
10518
10517
10515
10514
10513
10512
10511
10510
10501
10500
10499
10498
10497
10496
10488
10487
10486
10485
10484
10483
0
5
10
15
20
25
30
35
40

Appendix I

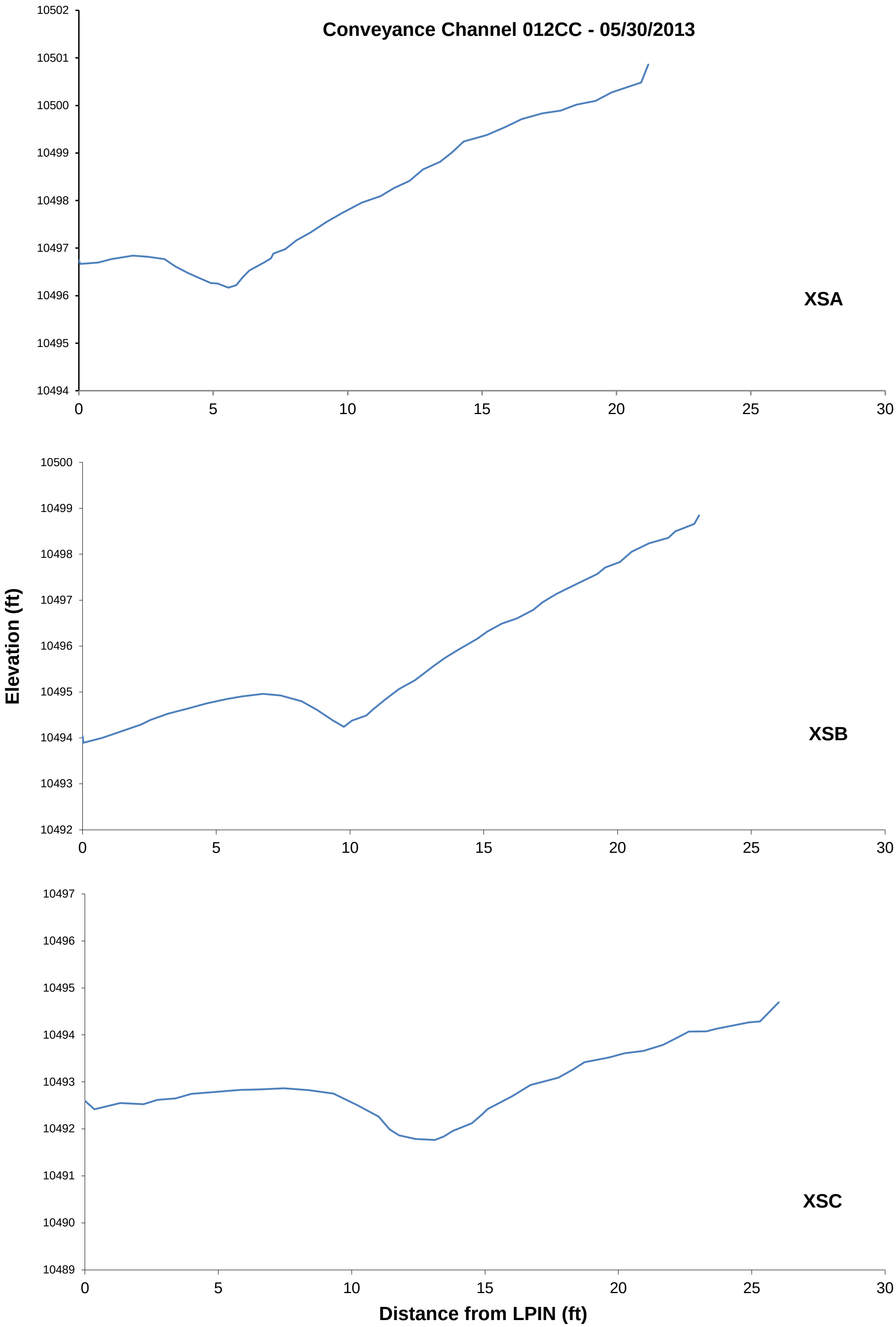
Conveyance Channel

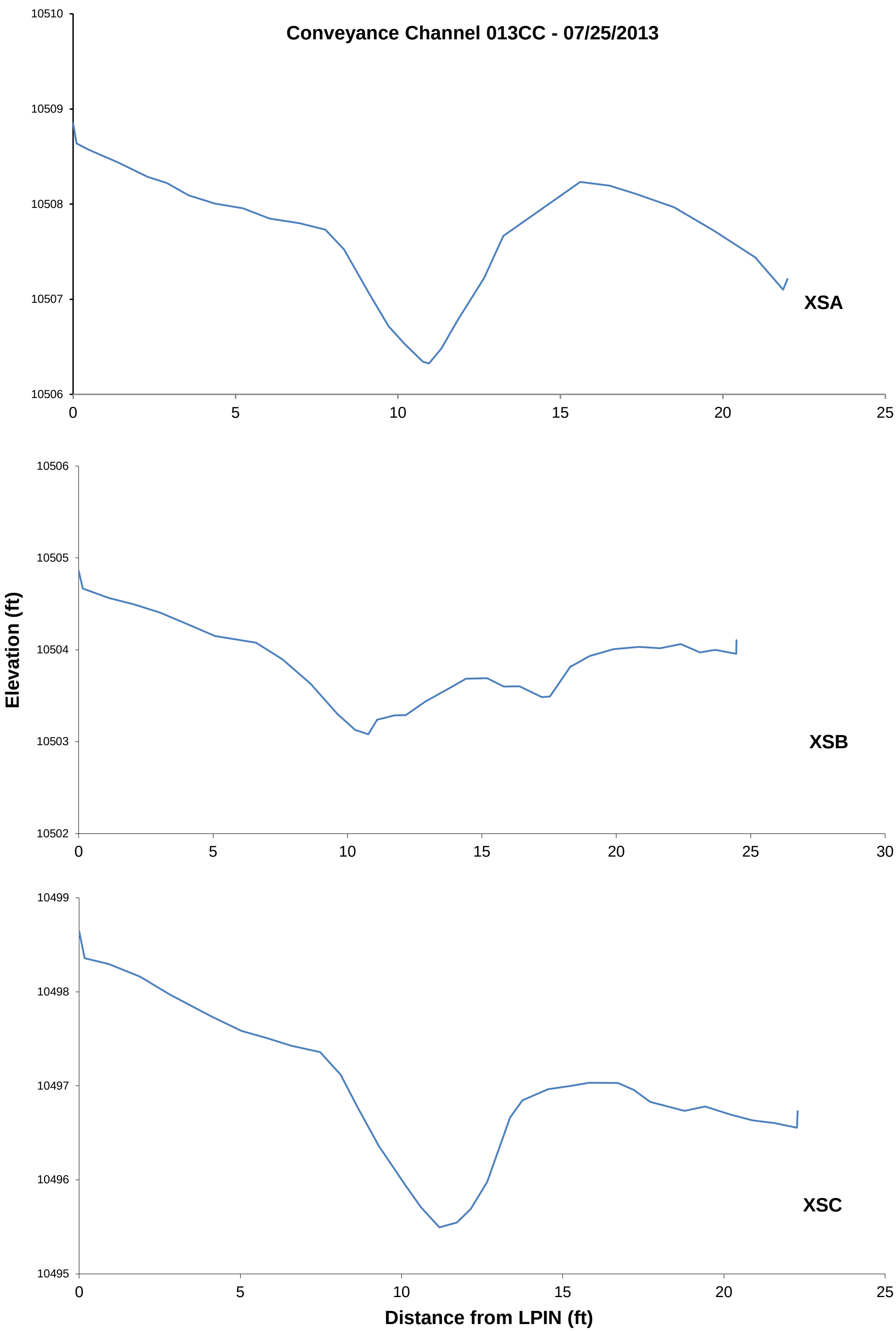
Cross Section Graphs

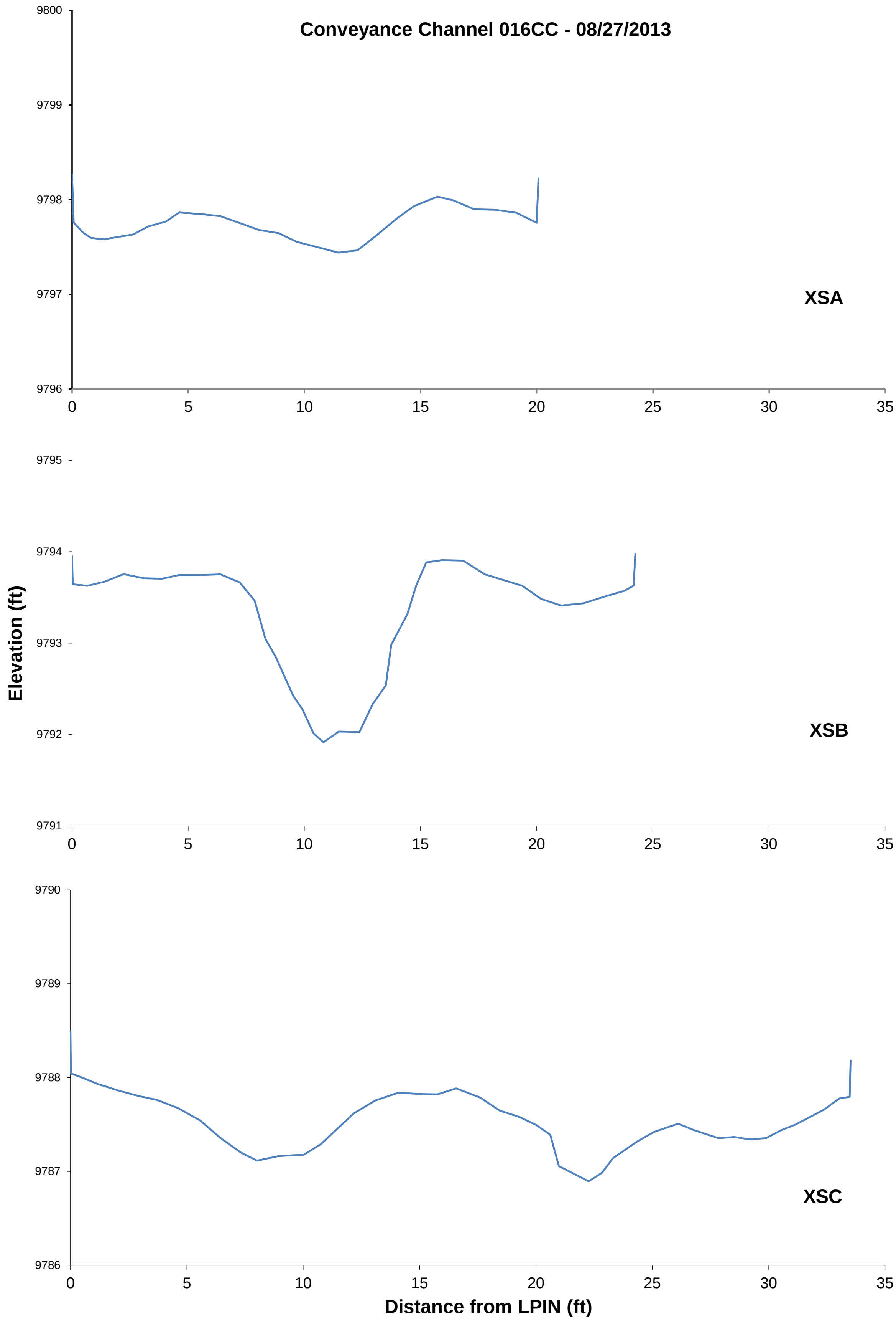
2013



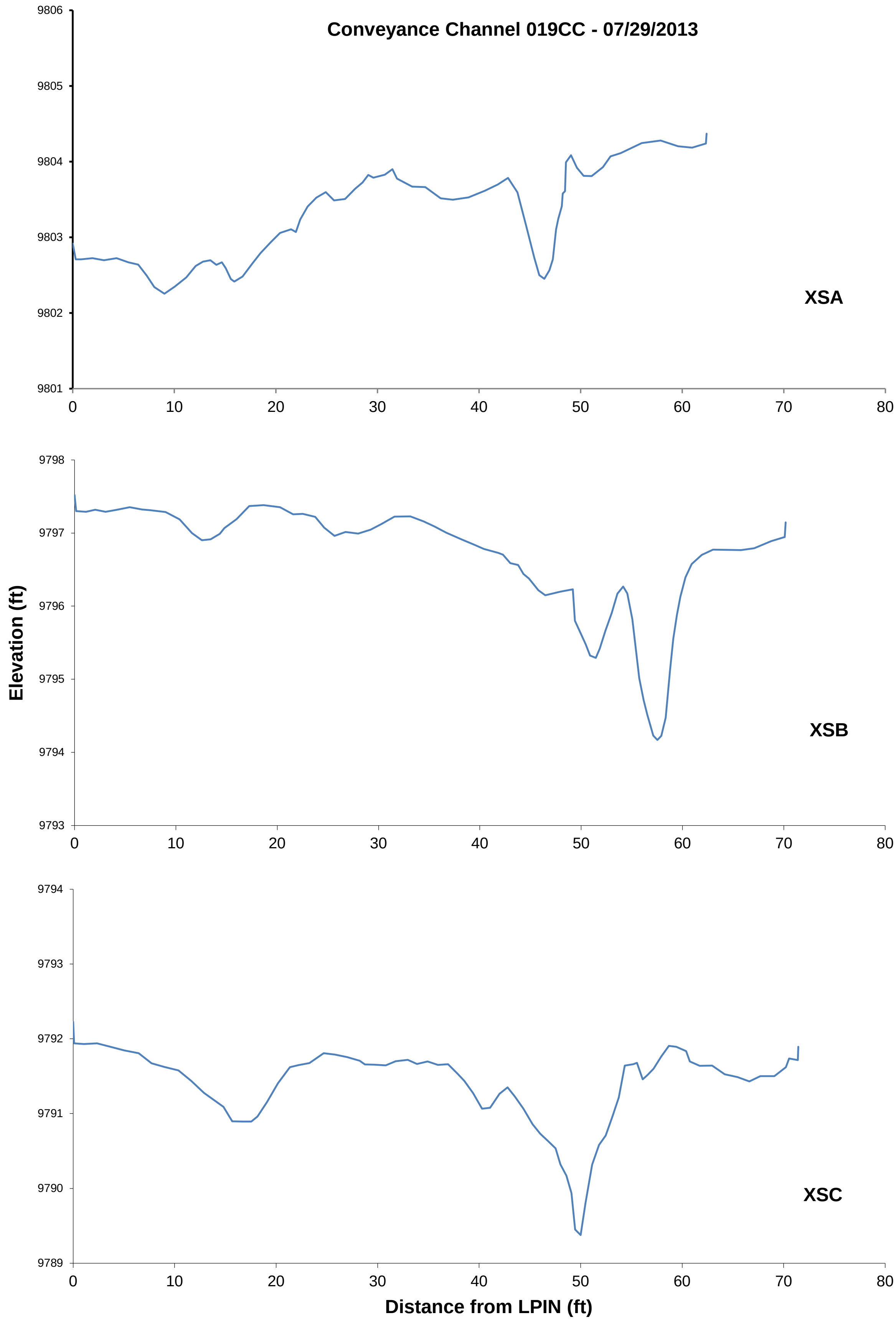
Conveyance Channel 004CC - 08/27/2013
9509
9508
9507
9506
9505
0
5
10
15
20
25
30
XSA
9505
9504
9503
9502
9501
9500
9499
0
5
10
15
20
25
30
35
40
XSB
Elevation (ft)
9497
9496
9495
9494
9493
9492
9491
9490
0
5
10
15
20
25
30
XSC
Distance from LPIN (ft)

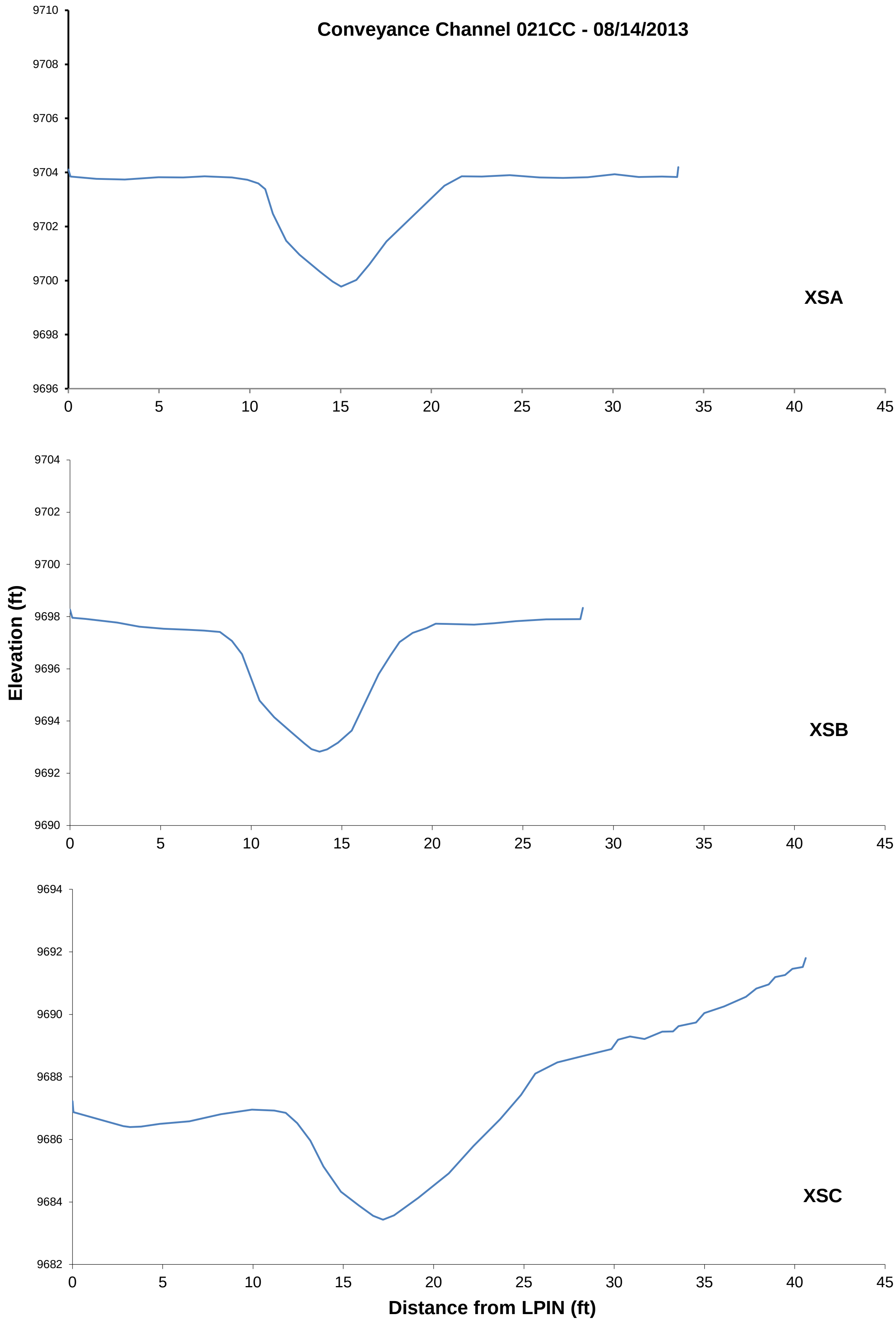

Conveyance Channel 012CC - 05/30/2013
XSA
10502
10501
10500
10499
10498
10497
10496
10495
10494
0 5 10 15 20 25 30
XSB
10500
10499
10498
10497
10496
10495
10494
10493
10492
0 5 10 15 20 25 30
XSC
10497
10496
10495
10494
10493
10492
10491
10490
10489
0 5 10 15 20 25 30
Elevation (ft)
Distance from LPIN (ft)

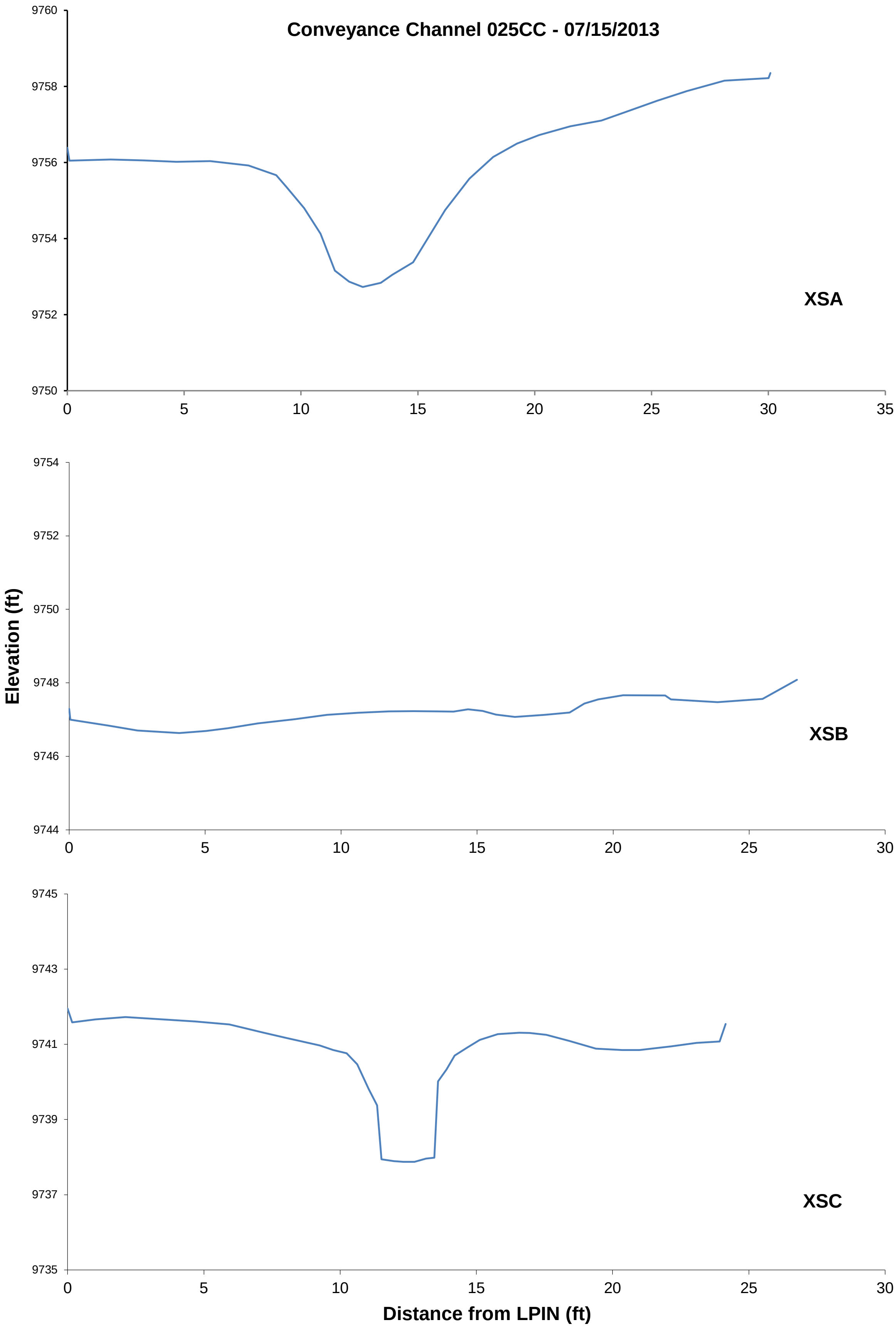

Conveyance Channel 013CC - 07/25/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
10510
10509
10508
10507
10506
10505
10504
10503
10502
10499
10498
10497
10496
10495
0
5
10
15
20
25
30



Conveyance Channel 016CC - 08/27/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9800
9799
9798
9797
9796
9795
9794
9793
9792
9791
9790
9789
9788
9787
9786
0
5
10
15
20
25
30
35


Conveyance Channel 019CC - 07/29/2013
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 - 08/14/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9710
9708
9706
9704
9702
9700
9698
9696
9694
9692
9690
9688
9686
9684
9682
0
5
10
15
20
25
30
35
40
45


Conveyance Channel 025CC - 07/15/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
9760
9758
9756
9754
9752
9750
0
5
10
15
20
25
30
35
9754
9752
9750
9748
9746
9744
0
5
10
15
20
25
30
9745
9743
9741
9739
9737
9735
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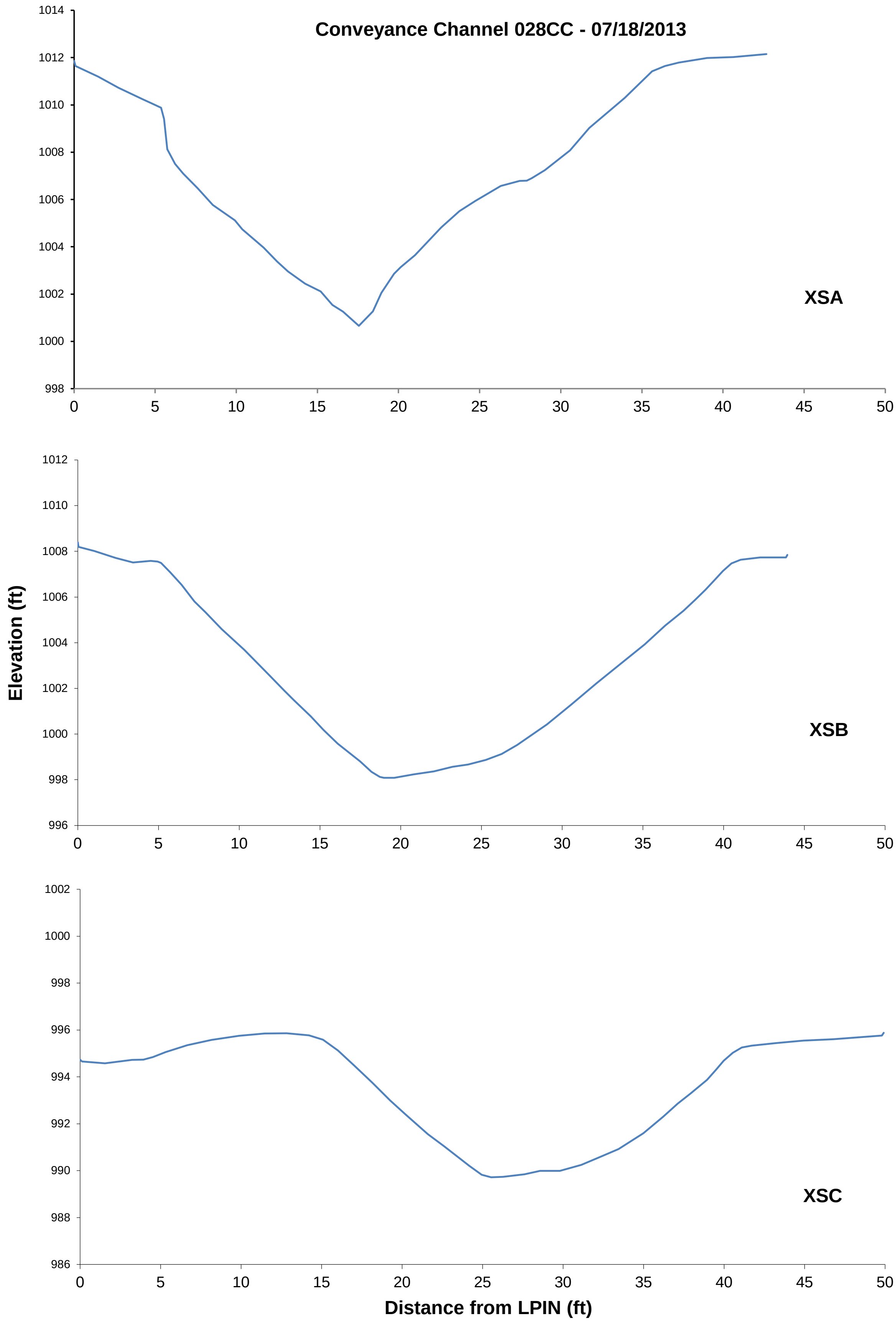
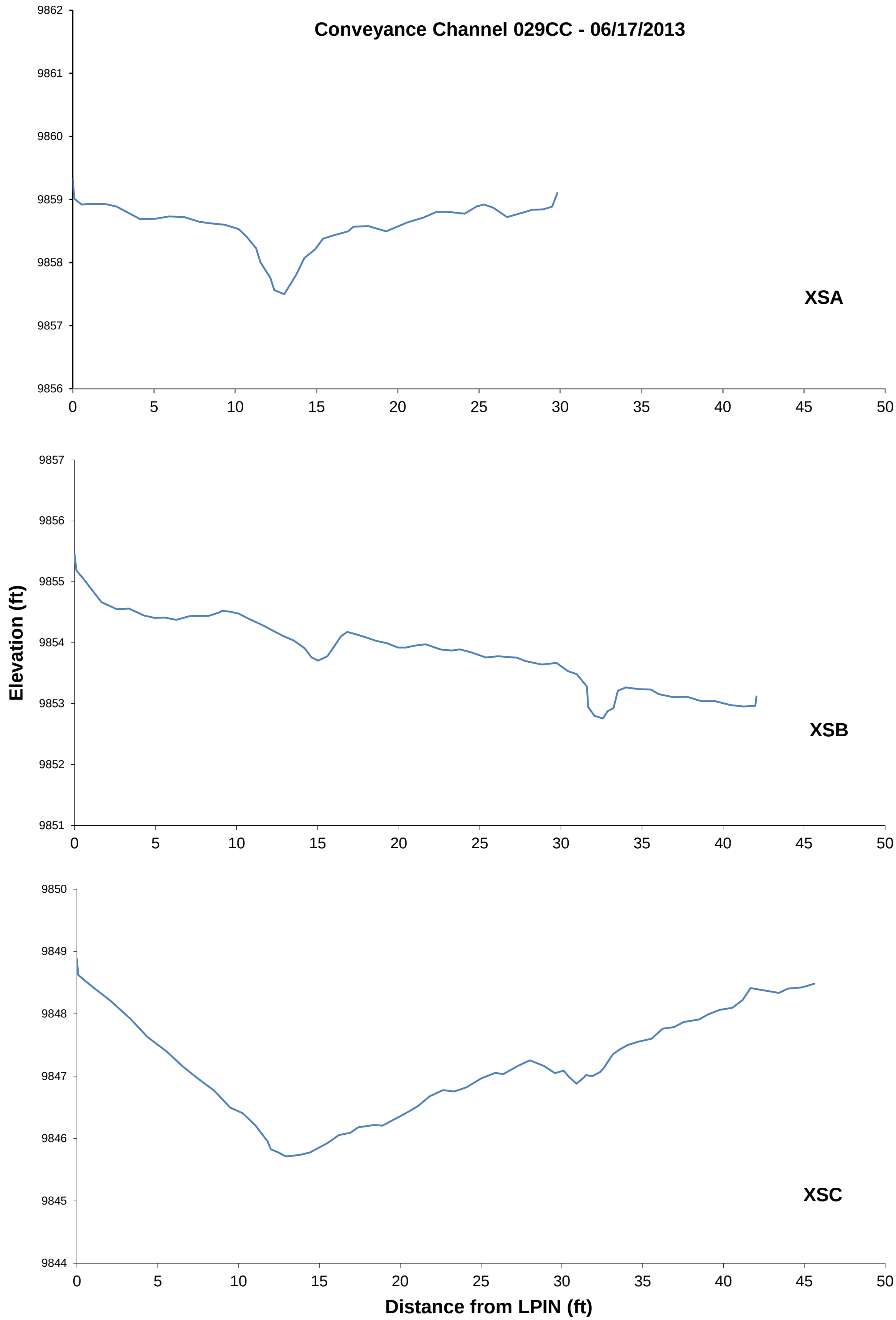
5
10
15
20
25
30



Conveyance Channel 028CC - 07/18/2013
1014
1012
1010
1008
1006
1004
1002
1000
998
0 5 10 15 20 25 30 35 40 45 50
XSA
Elevation (ft)
1012
1010
1008
1006
1004
1002
1000
998
996
0 5 10 15 20 25 30 35 40 45 50
XSB
1002
1000
998
996
994
992
990
988
986
0 5 10 15 20 25 30 35 40 45 50
XSC
Distance from LPIN (ft)


Conveyance Channel 029CC - 06/17/2013
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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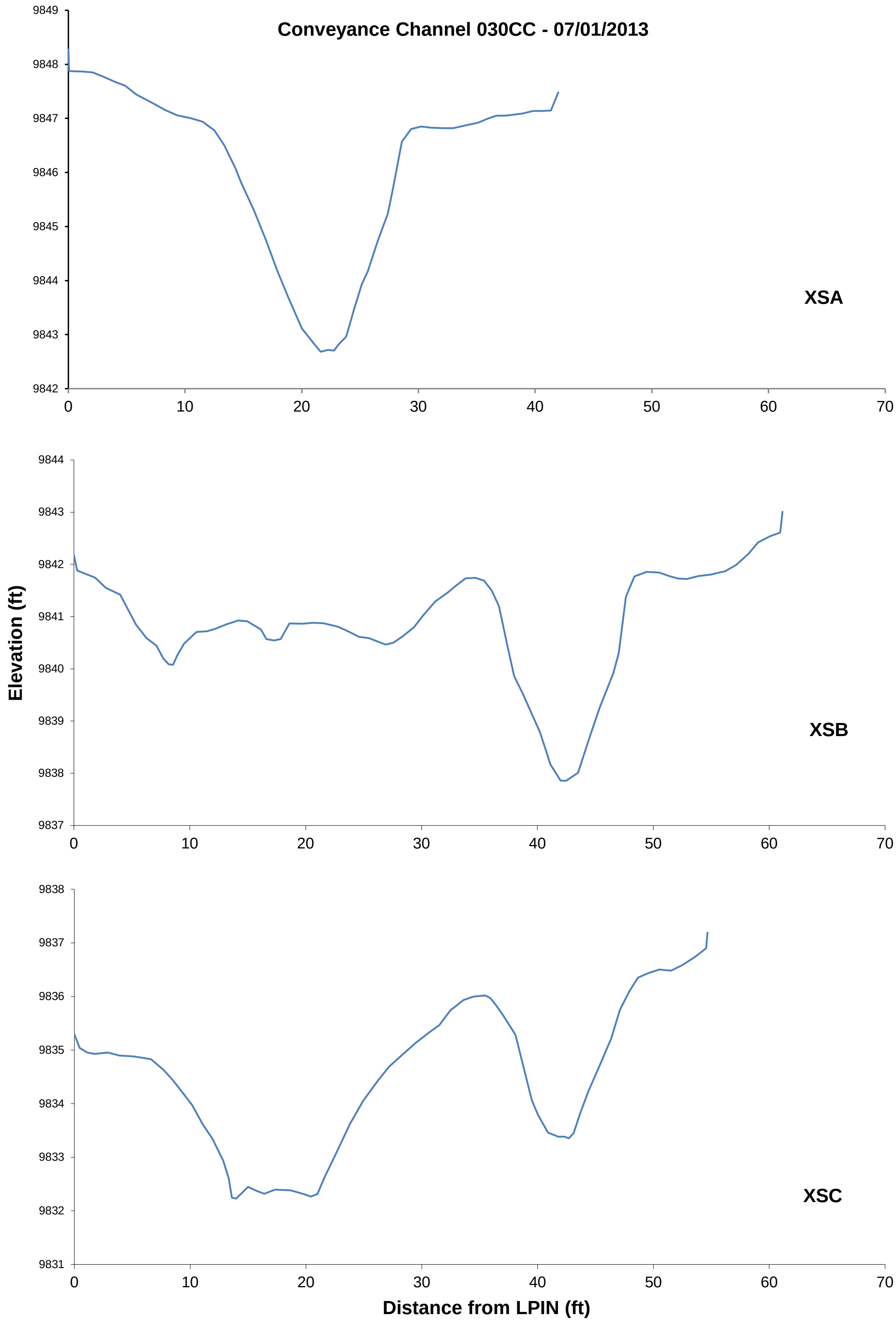
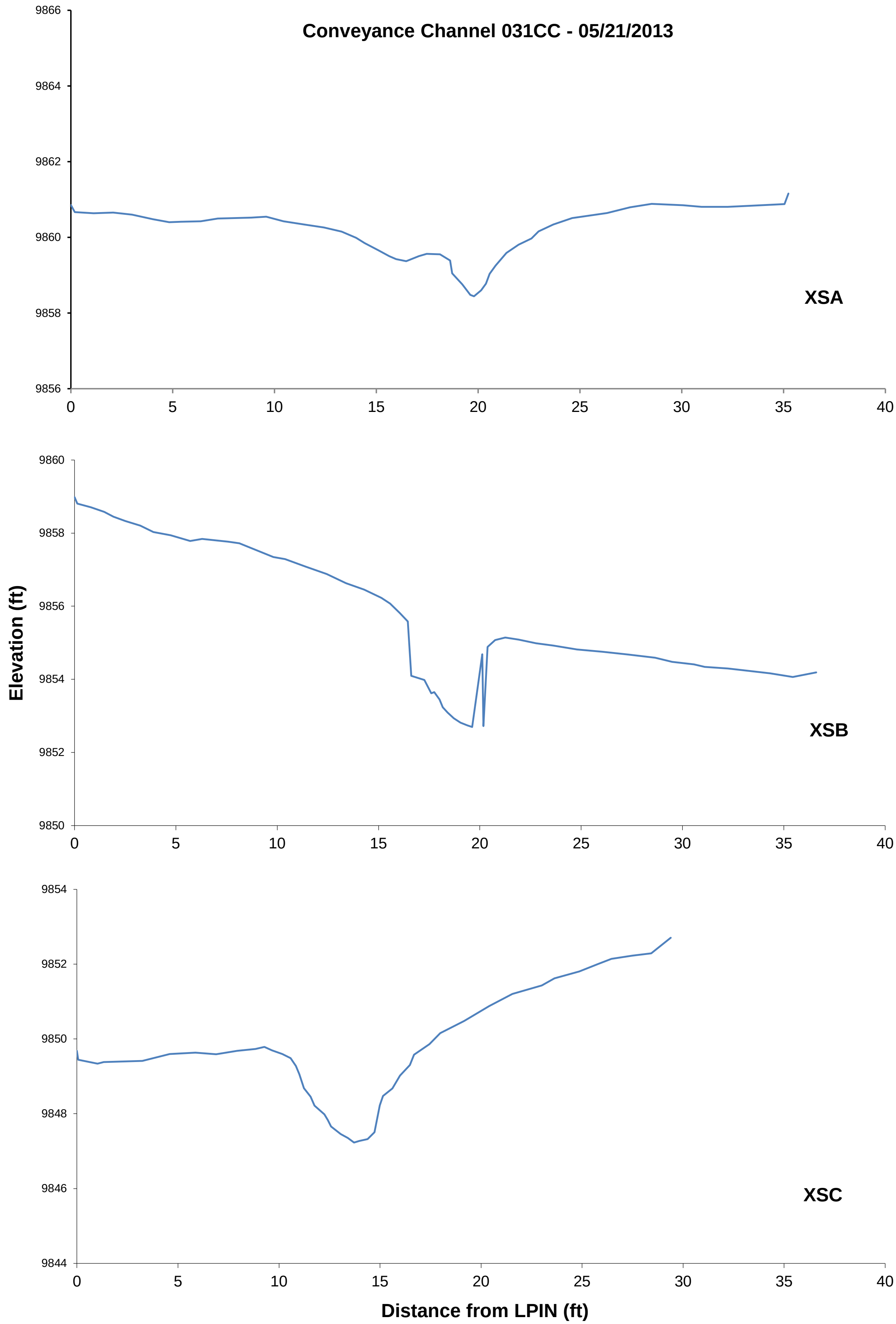
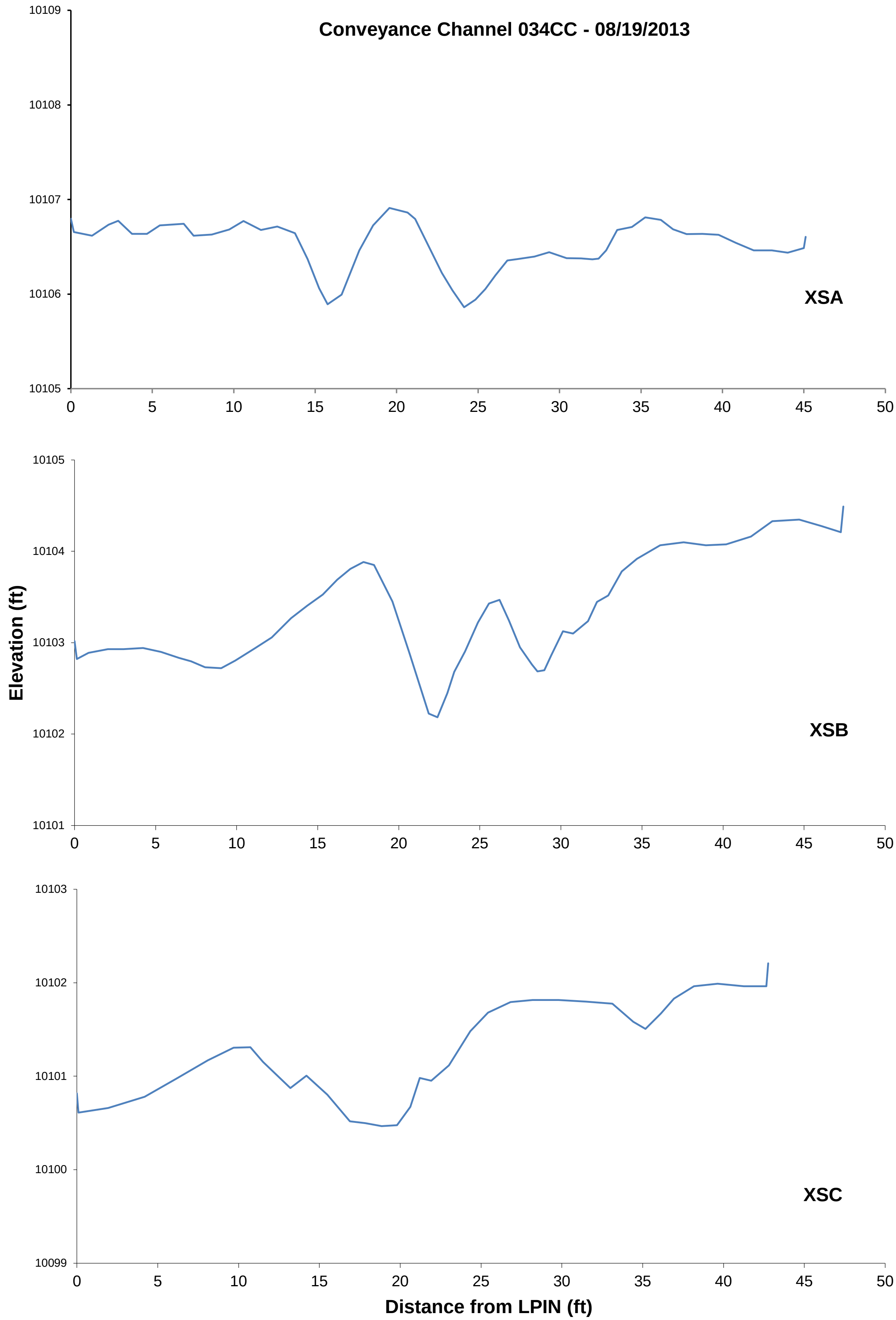
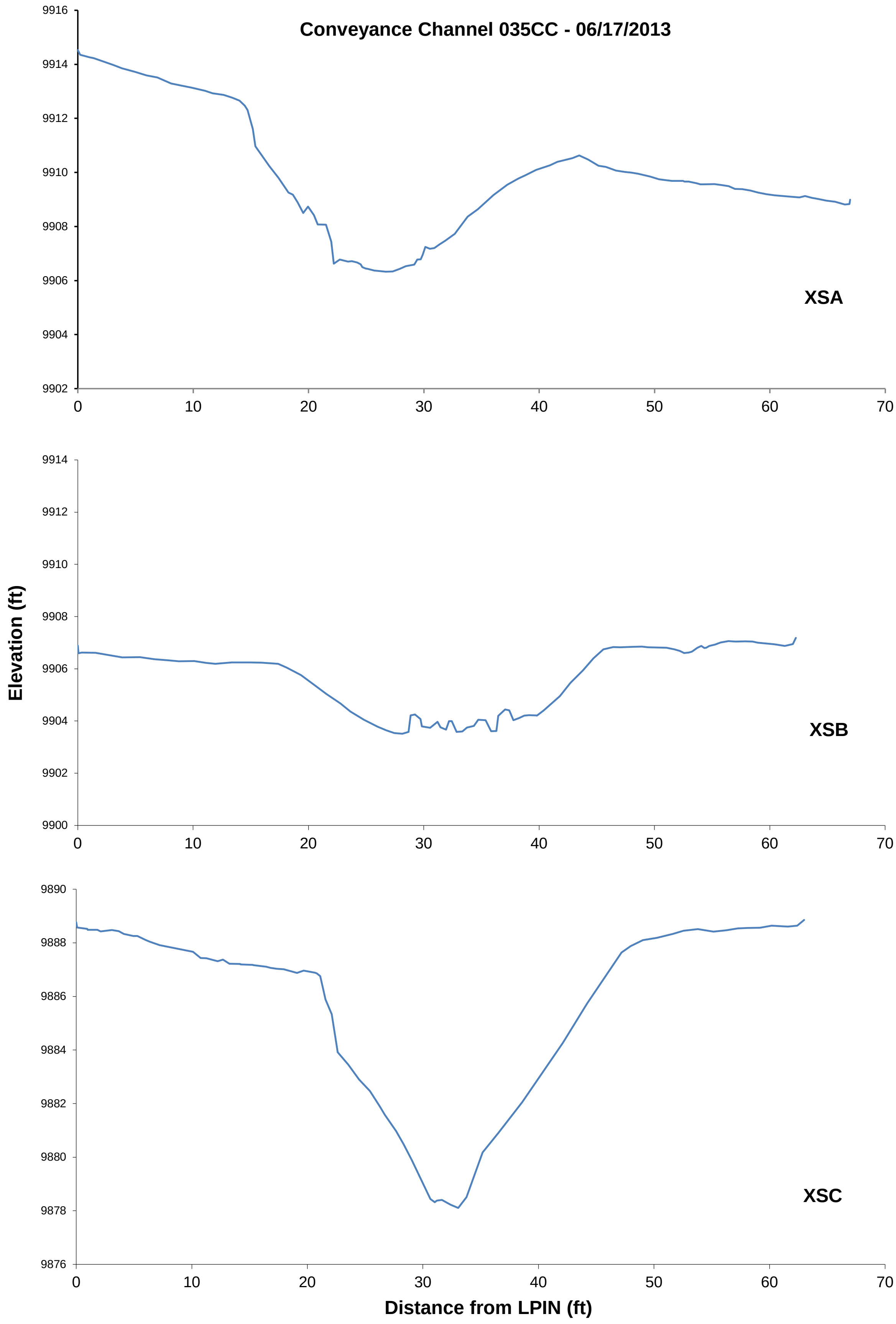
5
10
15
20
25
30
35
40
45
50

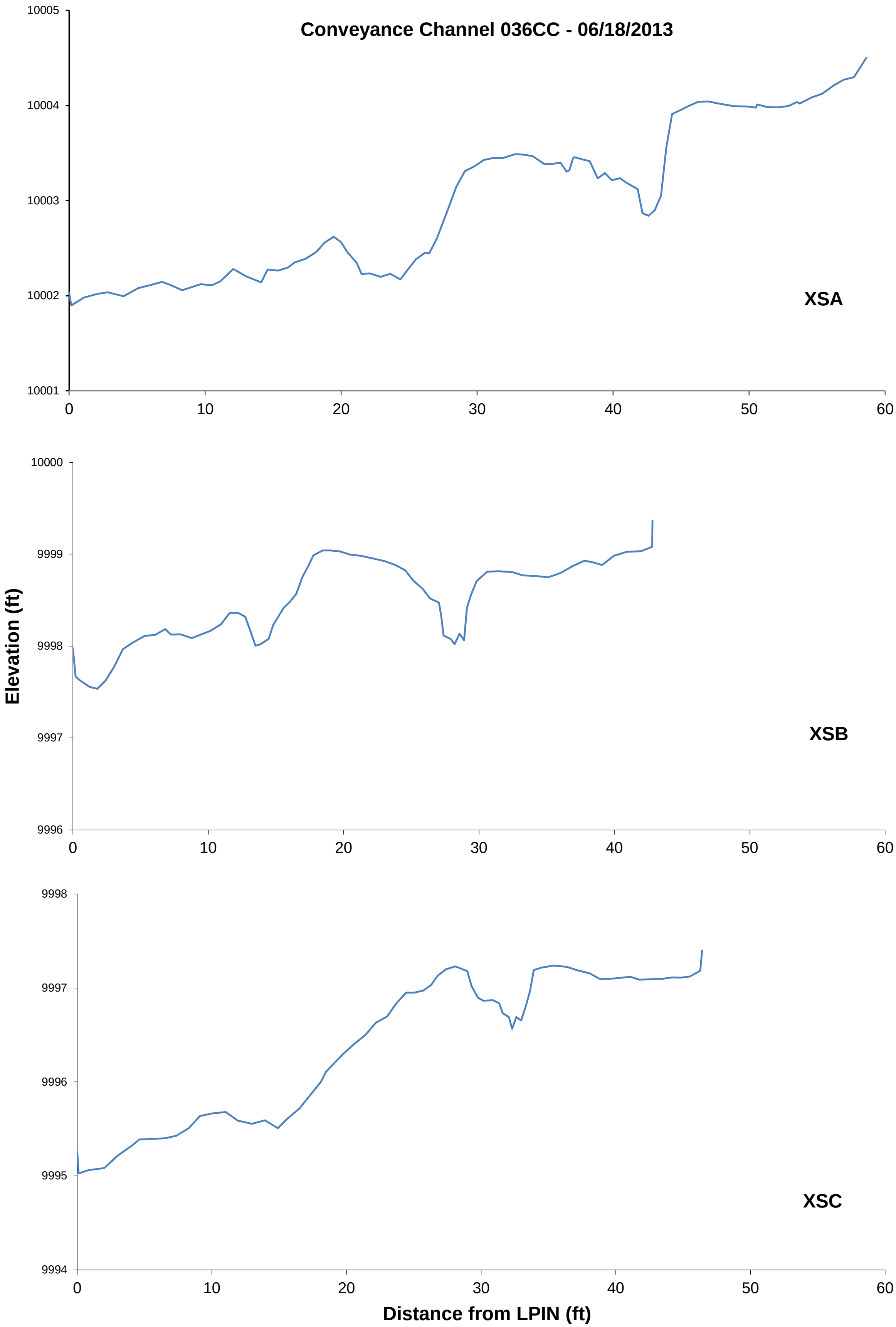

Conveyance Channel 030CC - 07/01/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9849
9848
9847
9846
9845
9844
9843
9842
9841
9840
9839
9838
9837
9836
9835
9834
9833
9832
9831
0
10
20
30
40
50
60
70

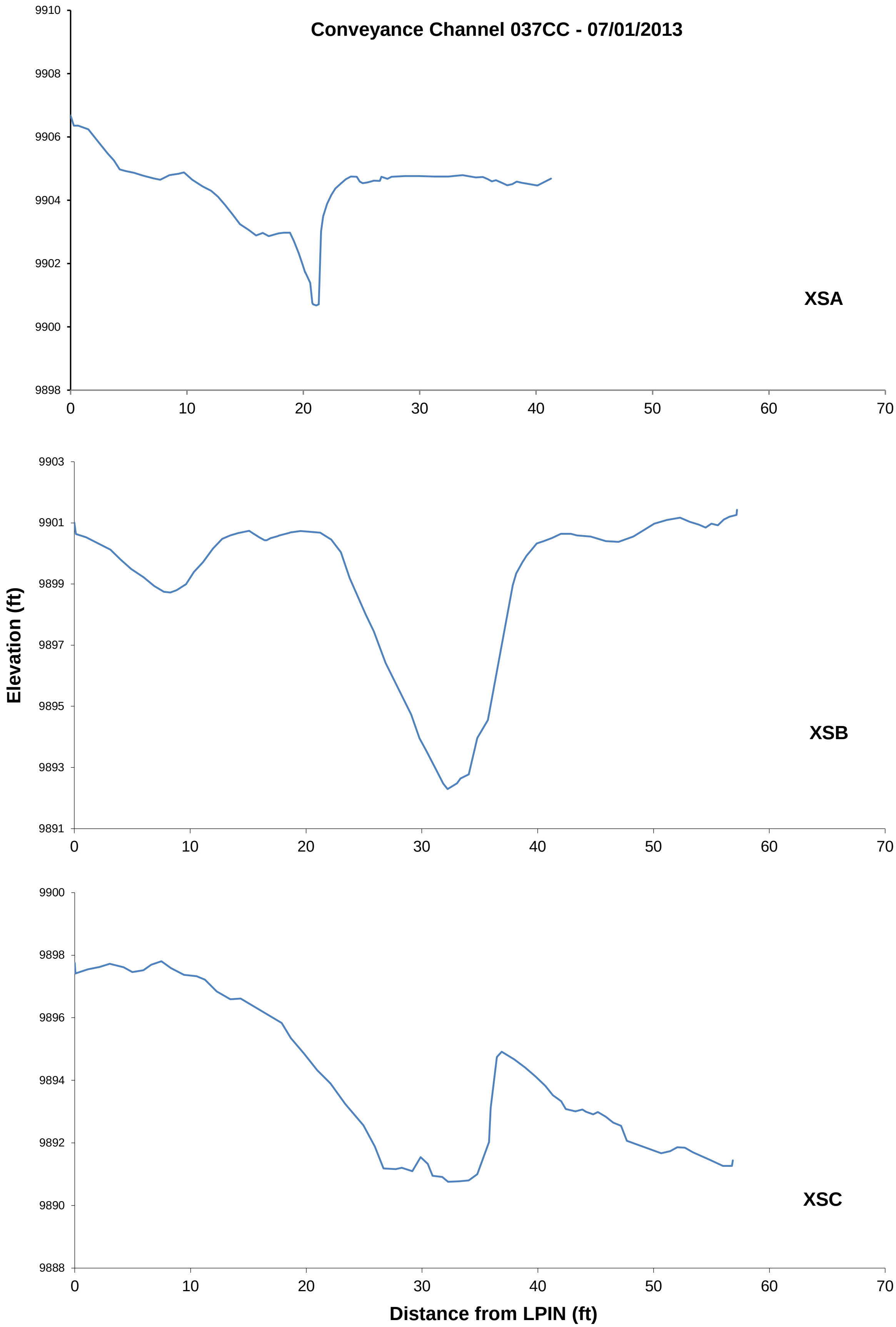


Conveyance Channel 031CC - 05/21/2013
9866
9864
9862
9860
9858
9856
0
5
10
15
20
25
30
35
40
XSA
9860
9858
9856
9854
9852
9850
XSB
Elevation (ft)
9854
9852
9850
9848
9846
9844
XSC
Distance from LPIN (ft)

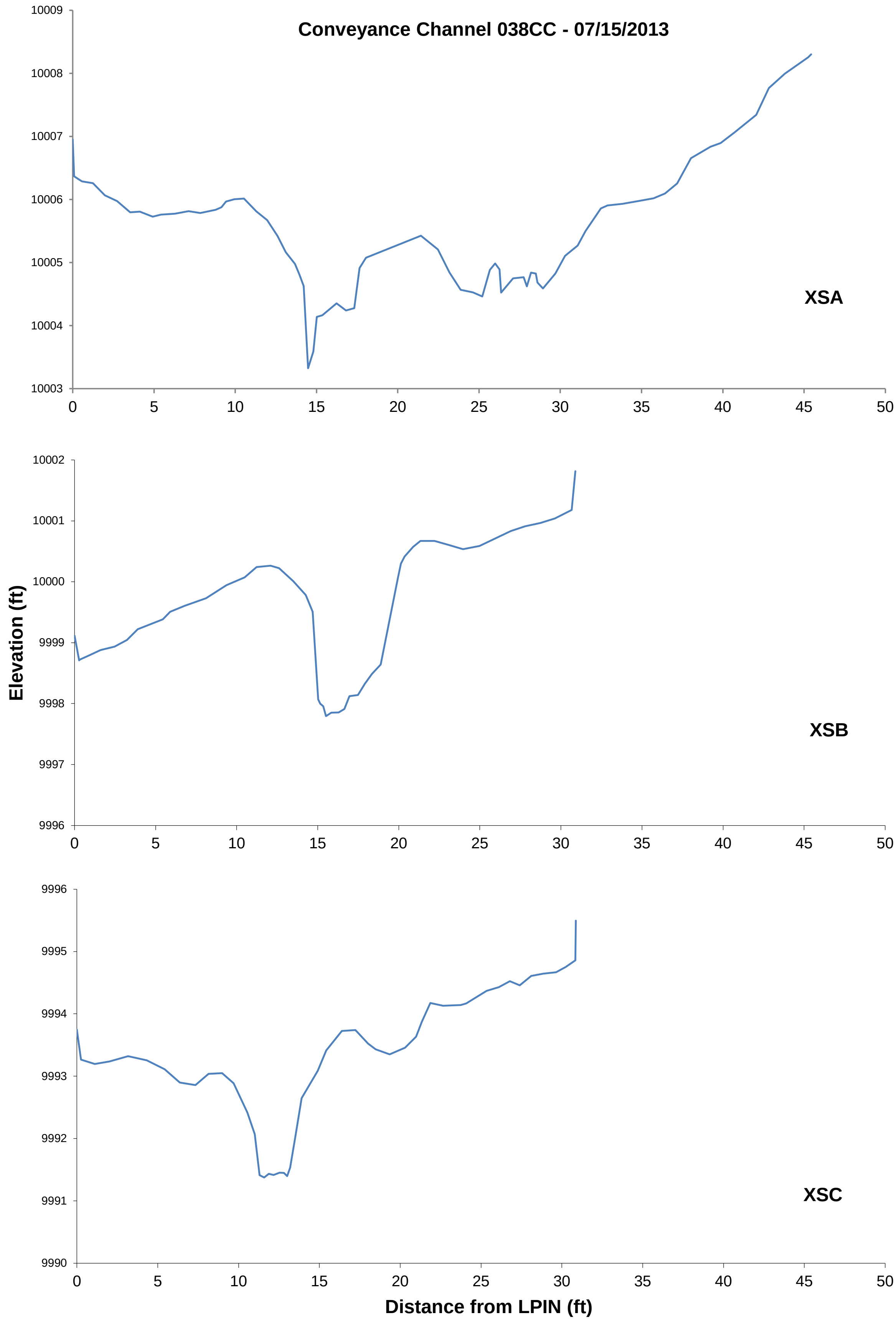

Conveyance Channel 034CC - 08/19/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10109
10108
10107
10106
10105
10104
10103
10102
10101
10100
10099
0
5
10
15
20
25
30
35
40
45
50

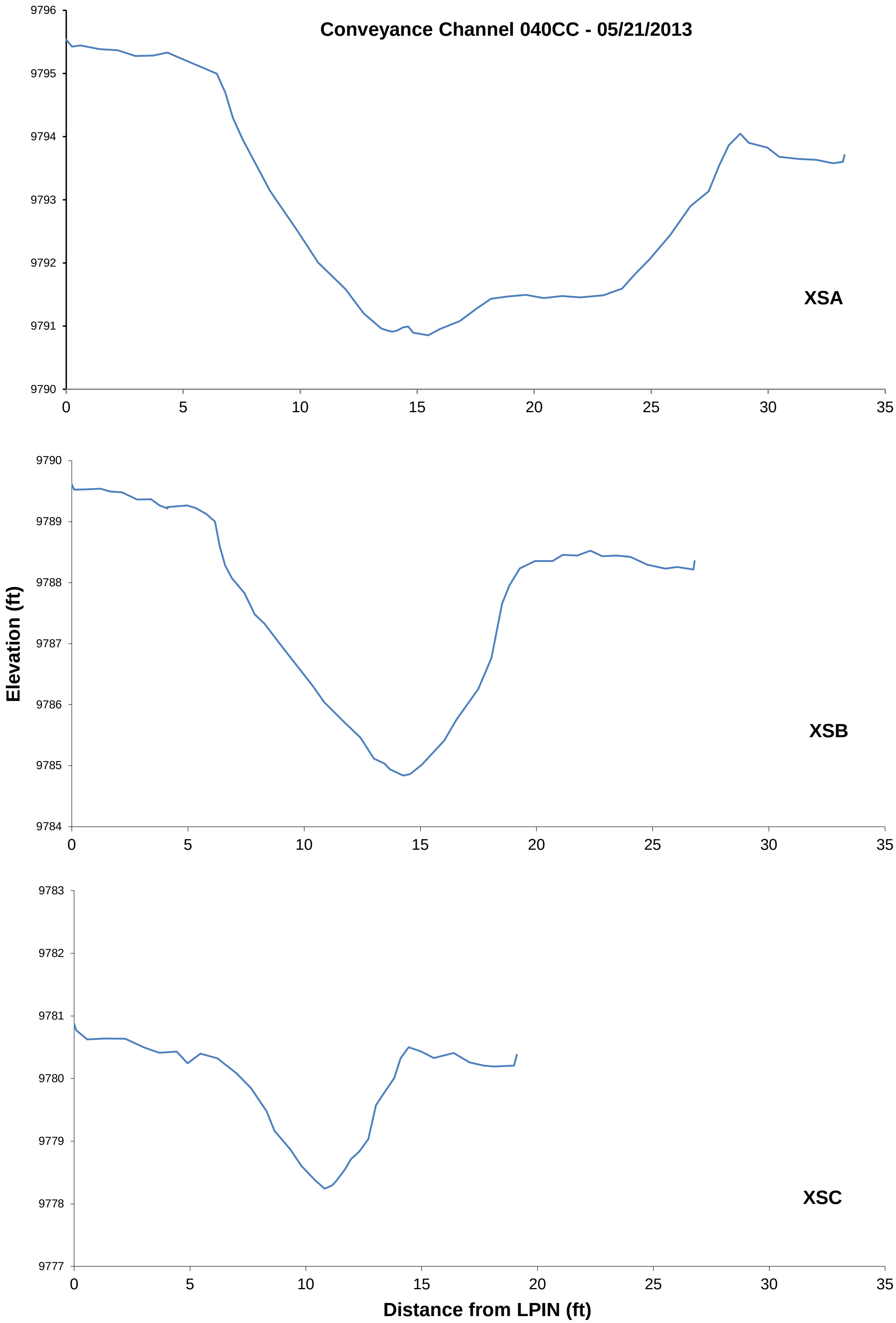

Conveyance Channel 035CC - 06/17/2013
XSA
9916
9914
9912
9910
9908
9906
9904
9902
XSB
9914
9912
9910
9908
9906
9904
9902
9900
XSC
9890
9888
9886
9884
9882
9880
9878
9876
0
10
20
30
40
50
60
70
Elevation (ft)
Distance from LPIN (ft)

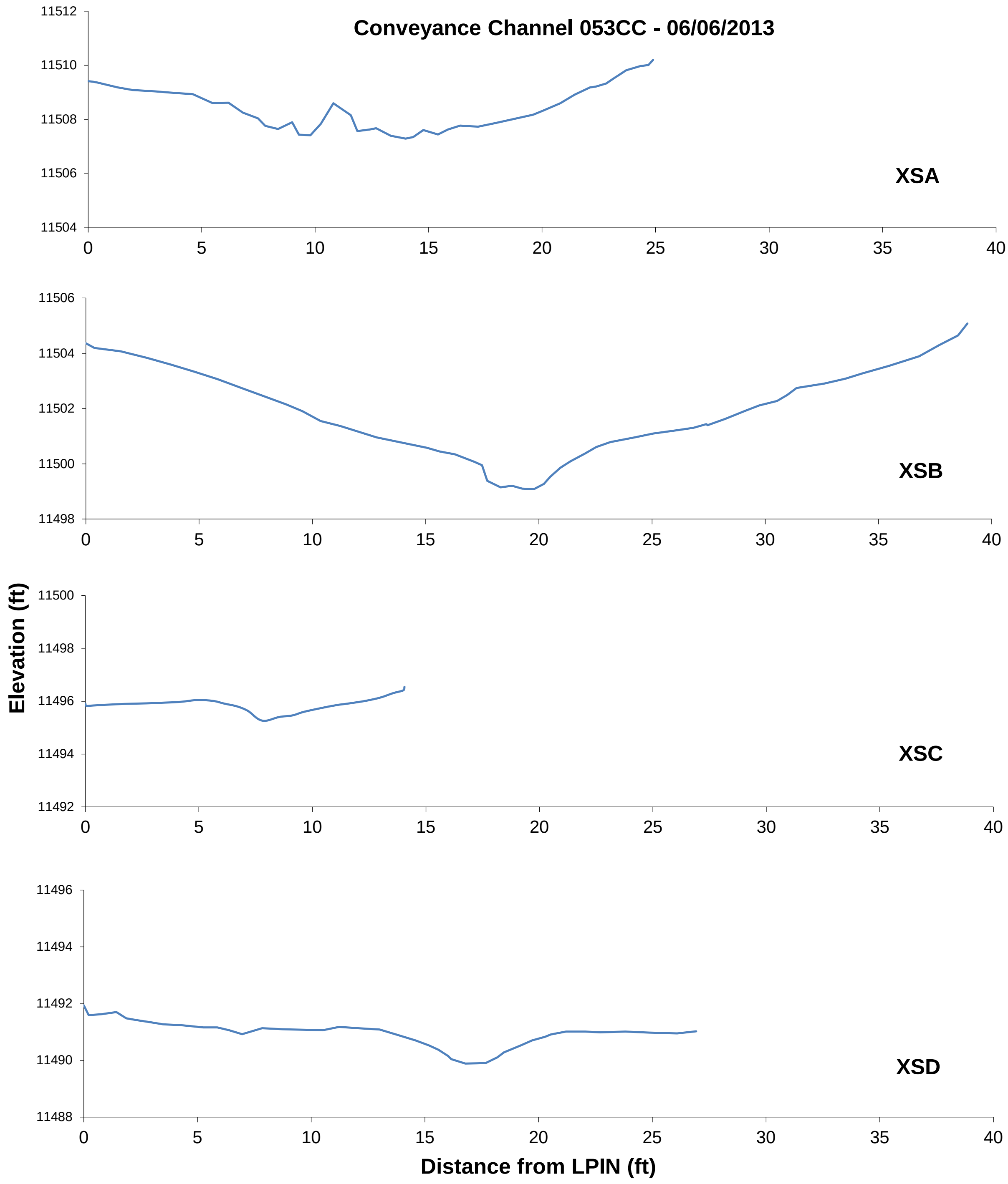

Conveyance Channel 036CC - 06/18/2013
Elevation (ft)
10005
10004
10003
10002
10001
0
10
20
30
40
50
60
XSA
10000
9999
9998
9997
9996
XSB
9998
9997
9996
9995
9994
XSC
Distance from LPIN (ft)

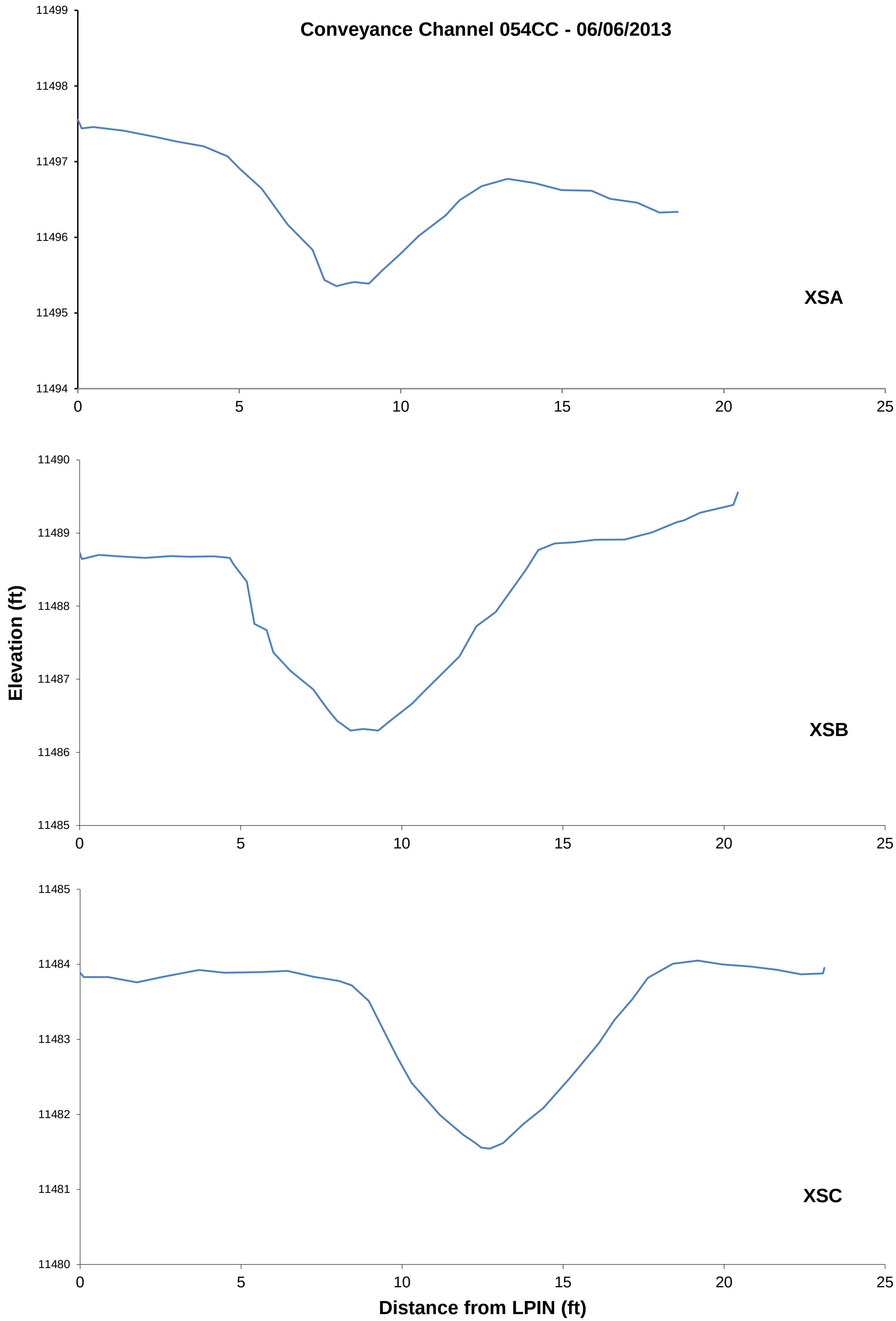


Conveyance Channel 037CC - 07/01/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9910
9908
9906
9904
9902
9900
9898
9903
9901
9899
9897
9895
9893
9891
9900
9898
9896
9894
9892
9890
9888
0
10
20
30
40
50
60
70

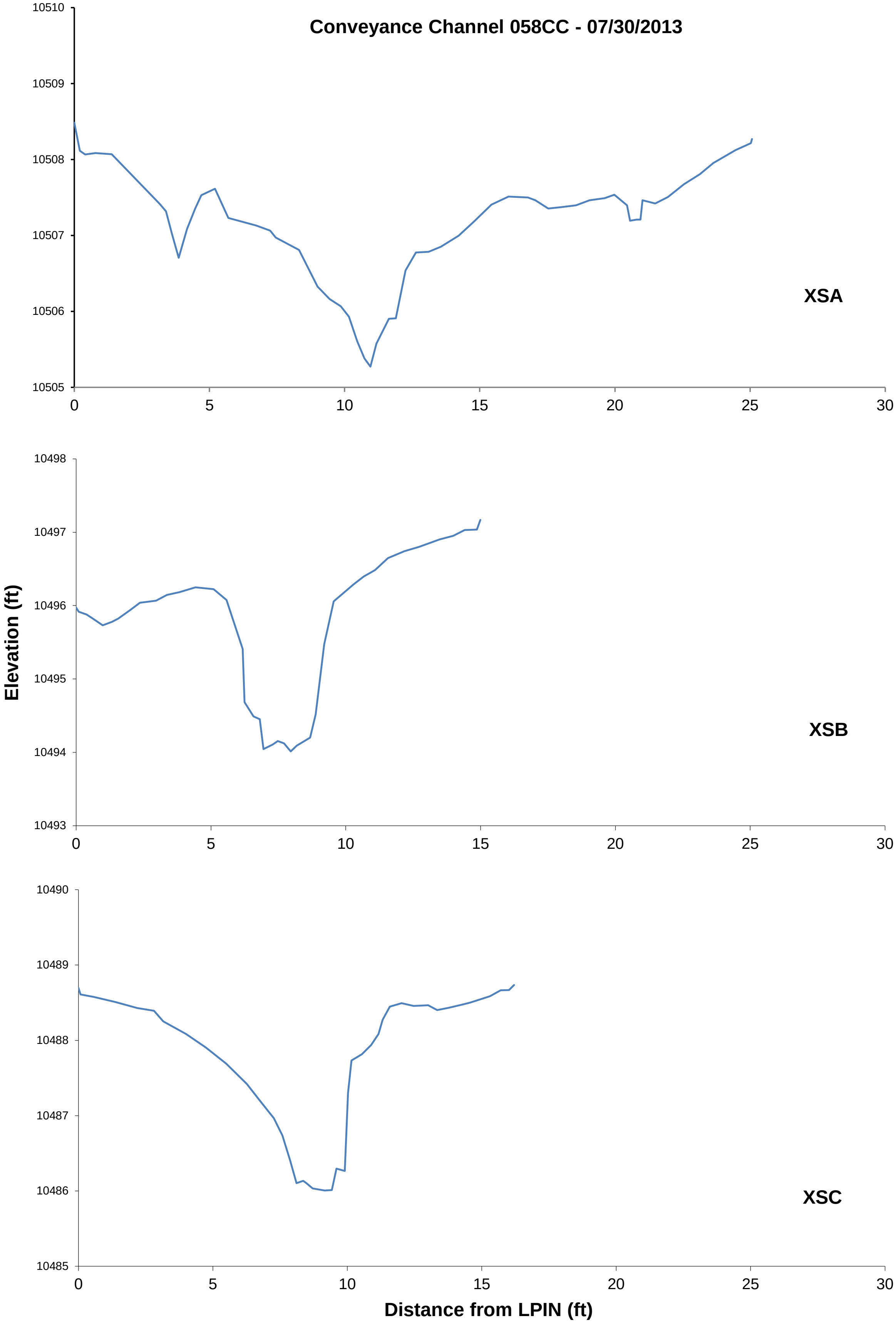

Conveyance Channel 038CC - 07/15/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10009
10008
10007
10006
10005
10004
10003
10002
10001
10000
9999
9998
9997
9996
9995
9994
9993
9992
9991
9990
0
5
10
15
20
25
30
35
40
45
50


Conveyance Channel 040CC - 05/21/2013
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

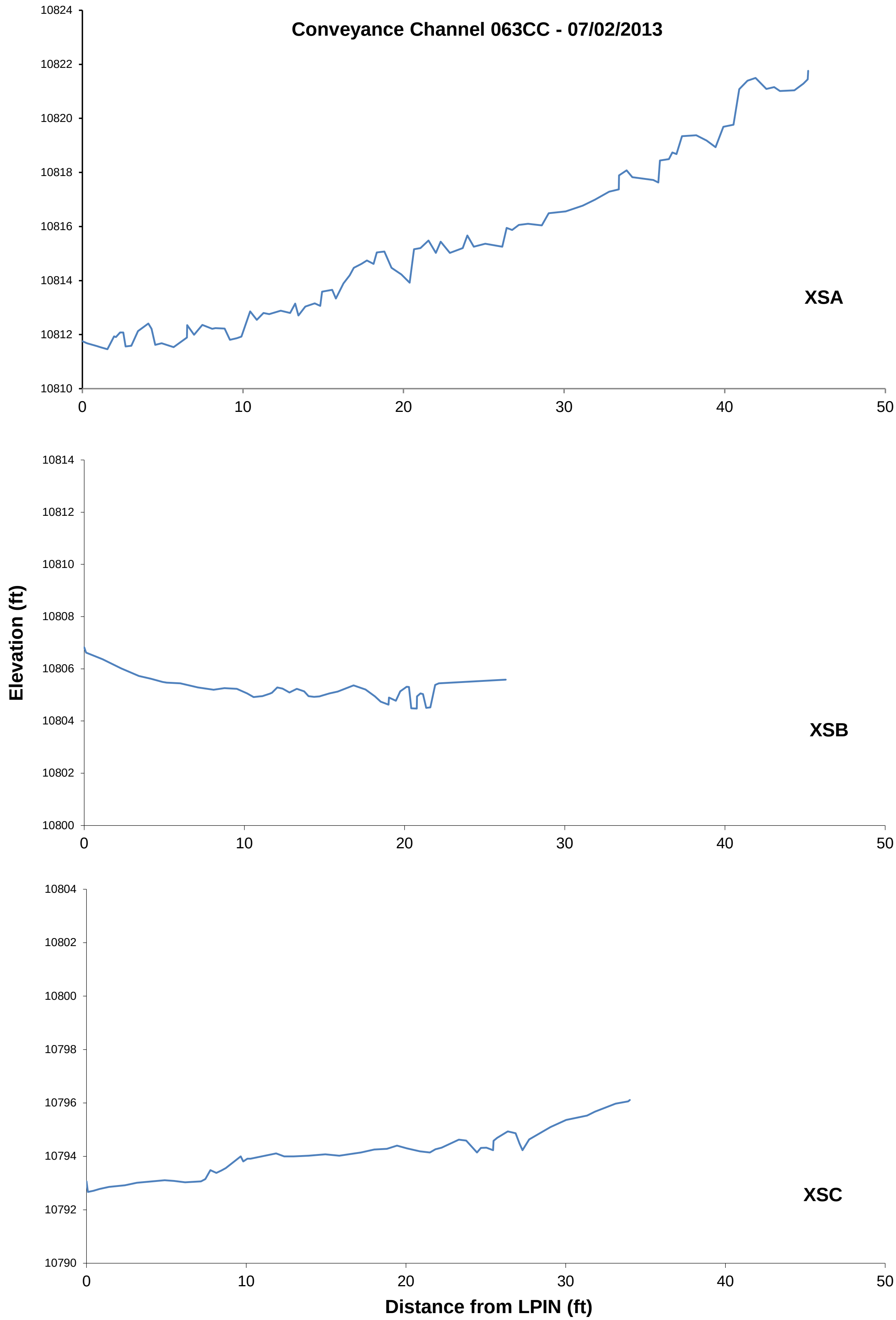

Conveyance Channel 053CC - 06/06/2013
11512
11510
11508
11506
11504
0
5
10
15
20
25
30
35
40
XSA
11506
11504
11502
11500
11498
XSB
11500
11498
11496
11494
11492
XSC
11496
11494
11492
11490
11488
XSD
Elevation (ft)
Distance from LPIN (ft)

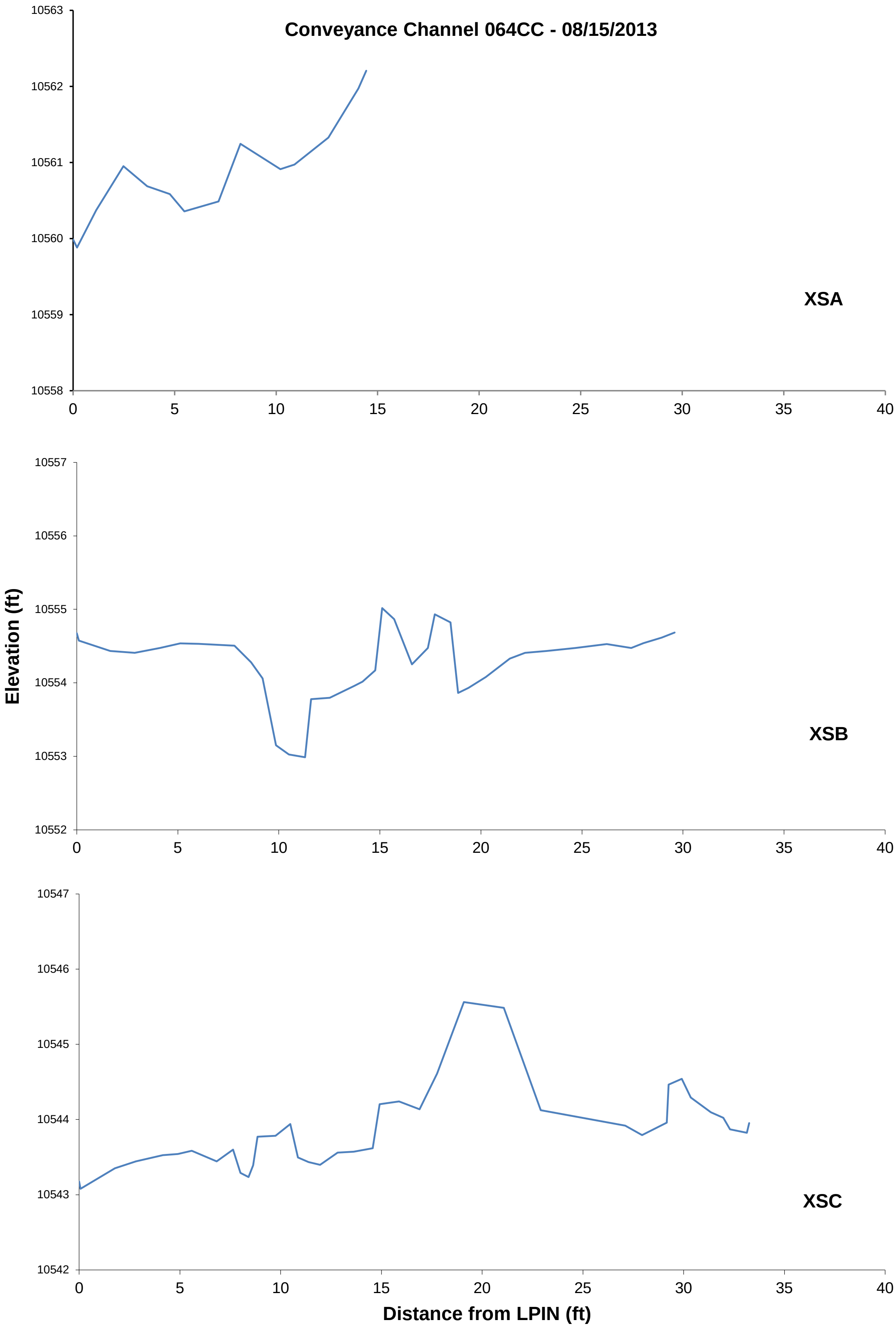


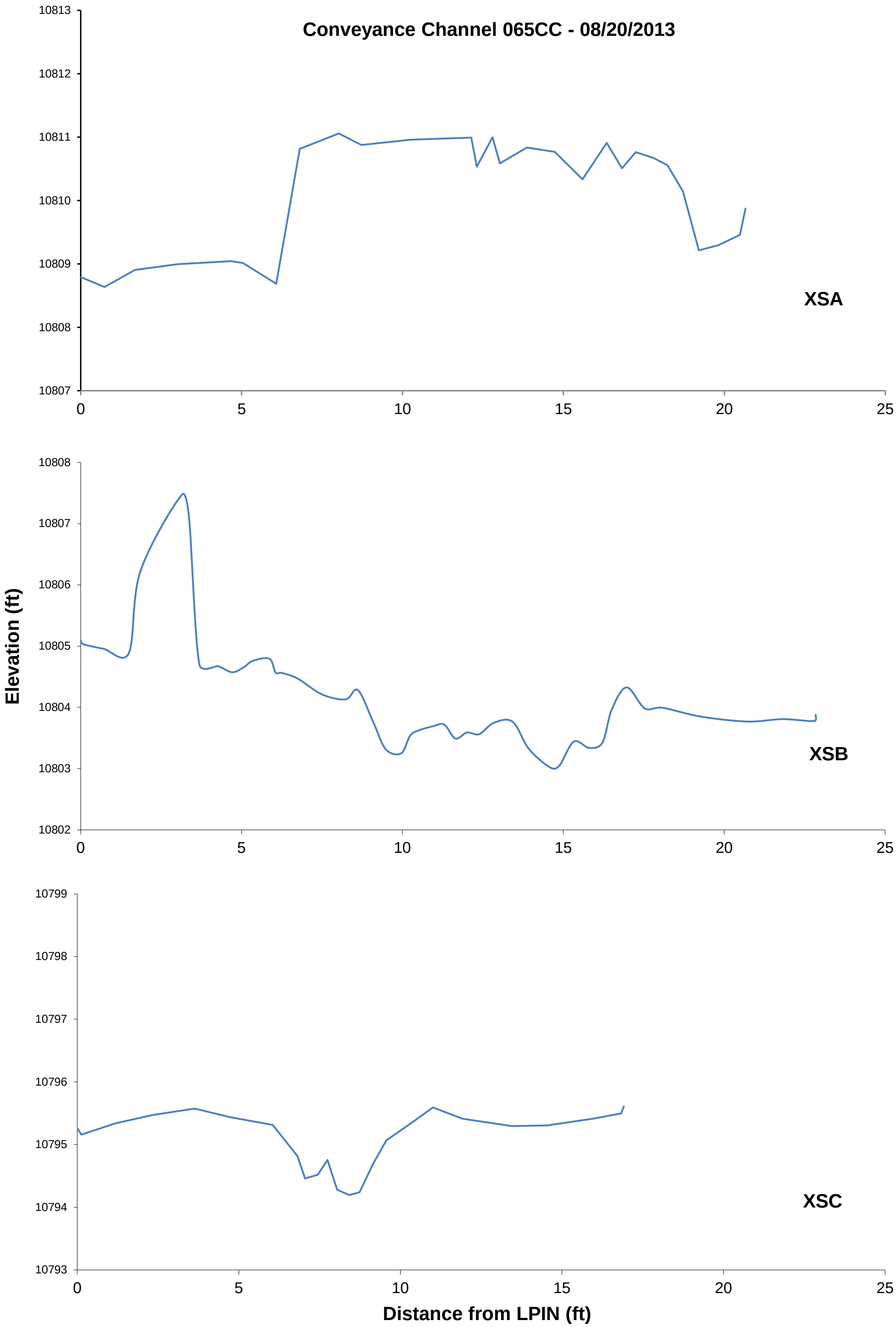
Conveyance Channel 054CC - 06/06/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
11499
11498
11497
11496
11495
11494
11490
11489
11488
11487
11486
11485
11484
11483
11482
11481
11480
0
5
10
15
20
25

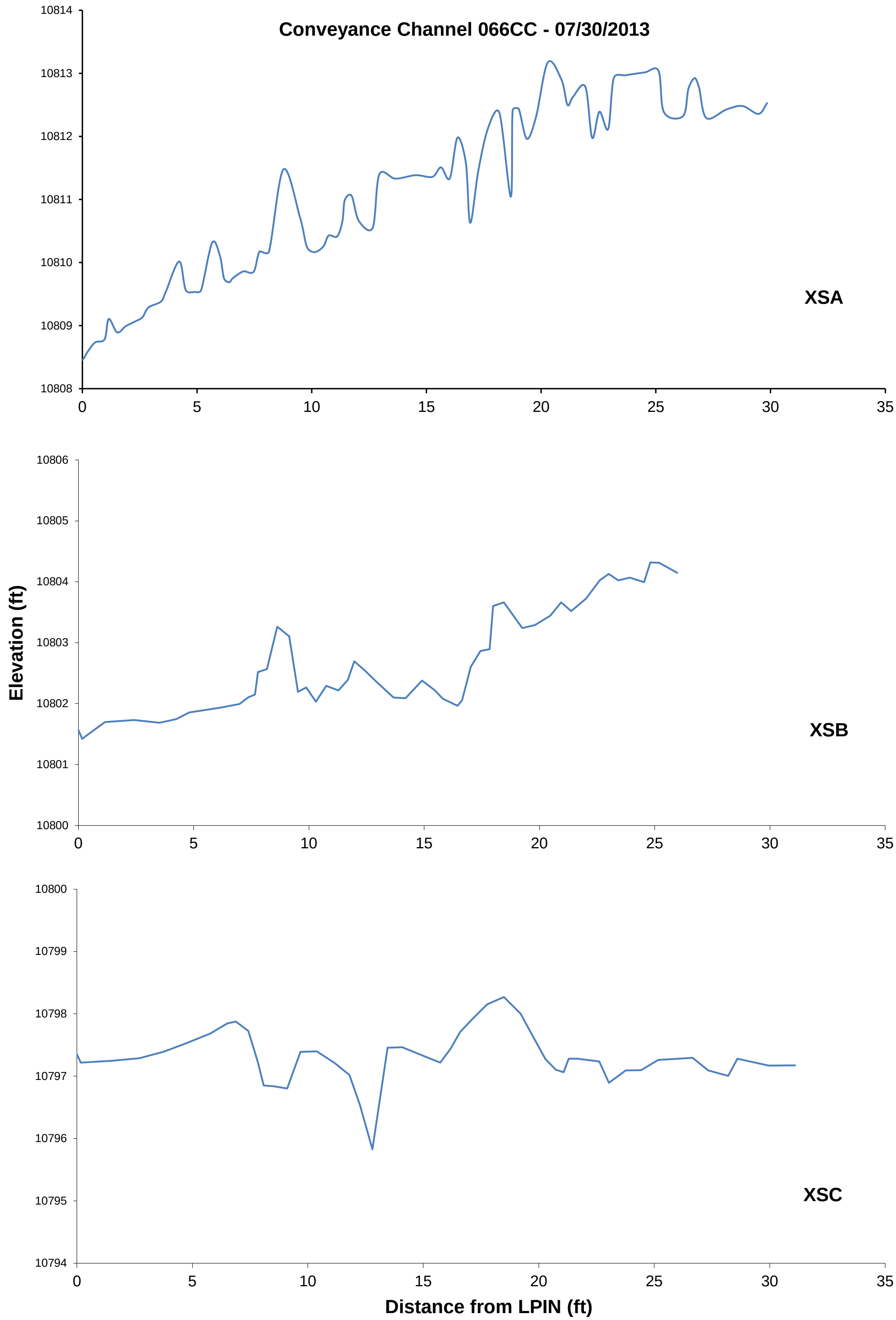


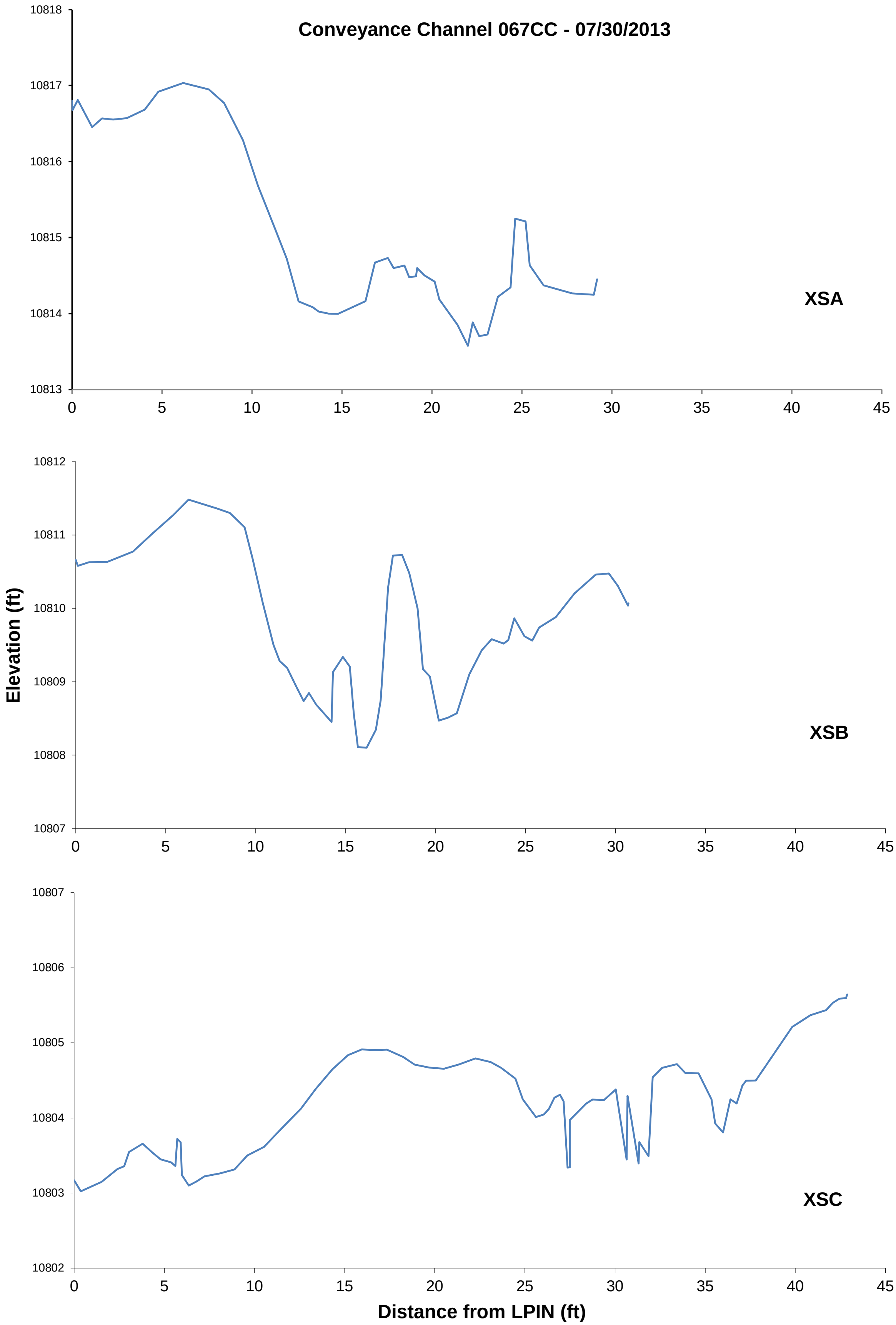
Conveyance Channel 058CC - 07/30/2013
10510
10509
10508
10507
10506
10505
0
5
10
15
20
25
30
XSA
10498
10497
10496
10495
10494
10493
0
5
10
15
20
25
30
XSB
10490
10489
10488
10487
10486
10485
0
5
10
15
20
25
30
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 063CC - 07/02/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
10824
10822
10820
10818
10816
10814
10812
10810
10814
10812
10810
10808
10806
10804
10802
10800
10804
10802
10800
10798
10796
10794
10792
10790
0
10
20
30
40
50

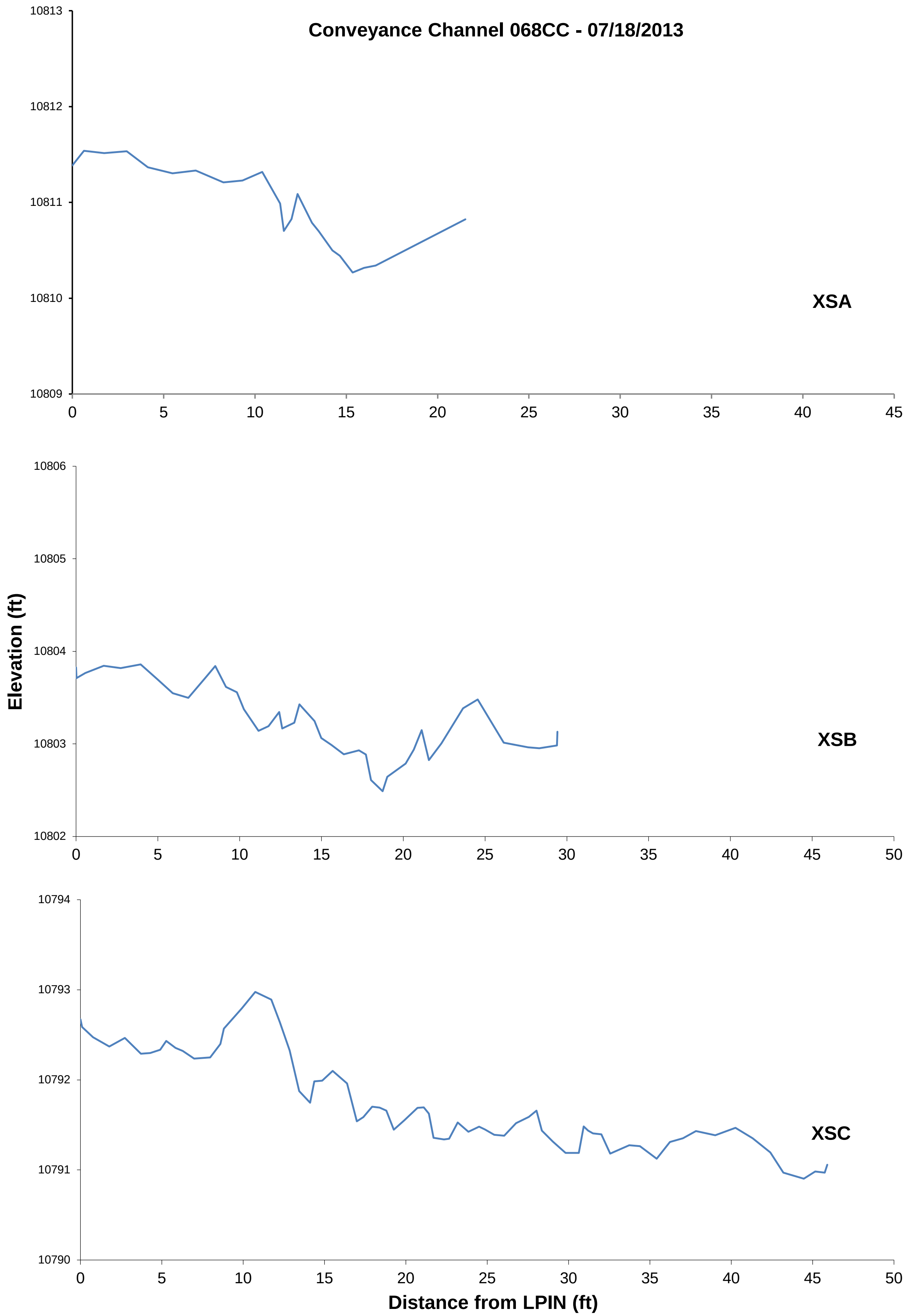

Conveyance Channel 064CC - 08/15/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10563
10562
10561
10560
10559
10558
10557
10556
10555
10554
10553
10552
10547
10546
10545
10544
10543
10542
0
5
10
15
20
25
30
35
40


Conveyance Channel 065CC - 08/20/2013
10813
10812
10811
10810
10809
10808
10807
0
5
10
15
20
25
XSA
Elevation (ft)
10808
10807
10806
10805
10804
10803
10802
XSB
10799
10798
10797
10796
10795
10794
10793
XSC
Distance from LPIN (ft)

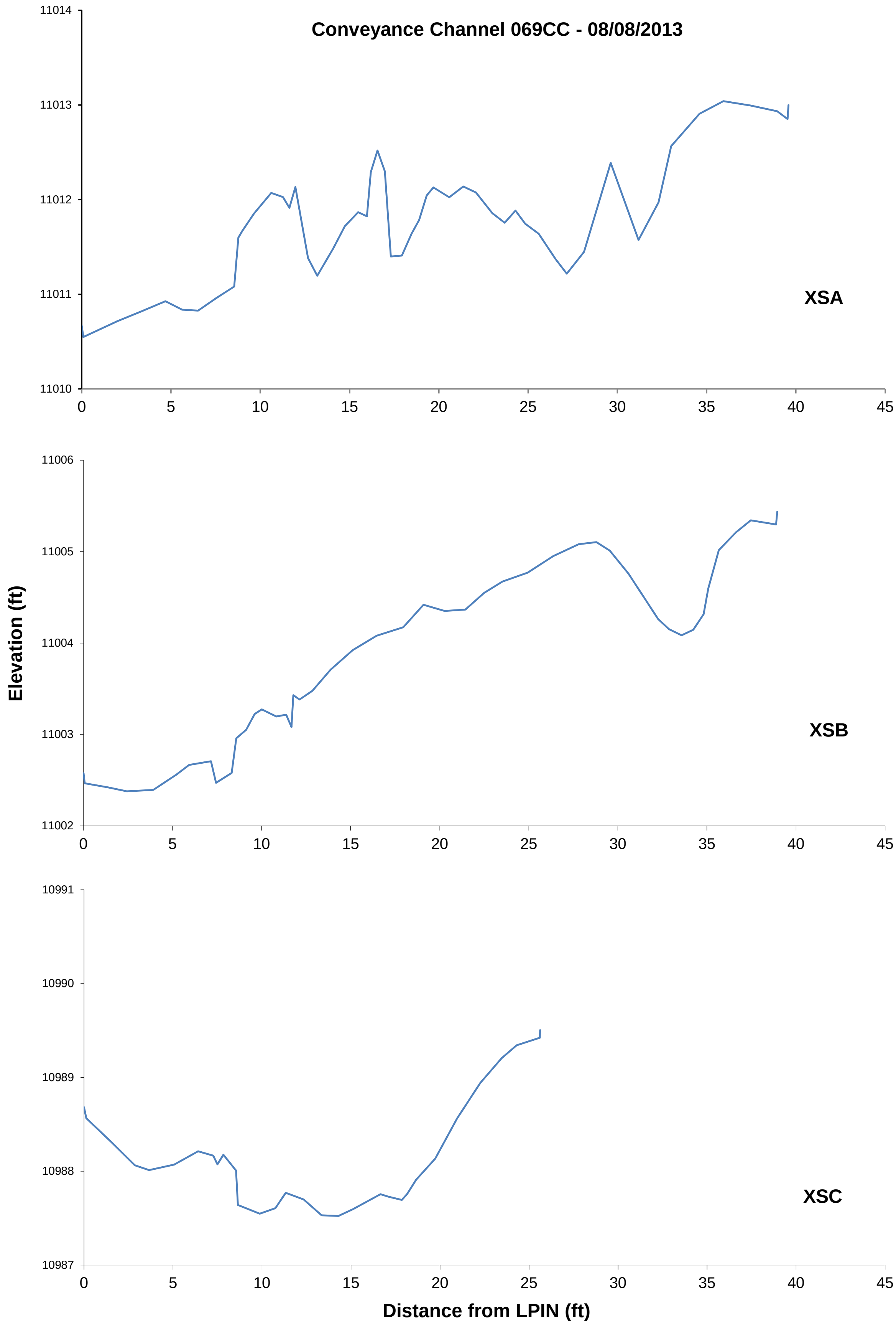

Conveyance Channel 066CC - 07/30/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10814
10813
10812
10811
10810
10809
10808
10806
10805
10804
10803
10802
10801
10800
10799
10798
10797
10796
10795
10794
0
5
10
15
20
25
30
35

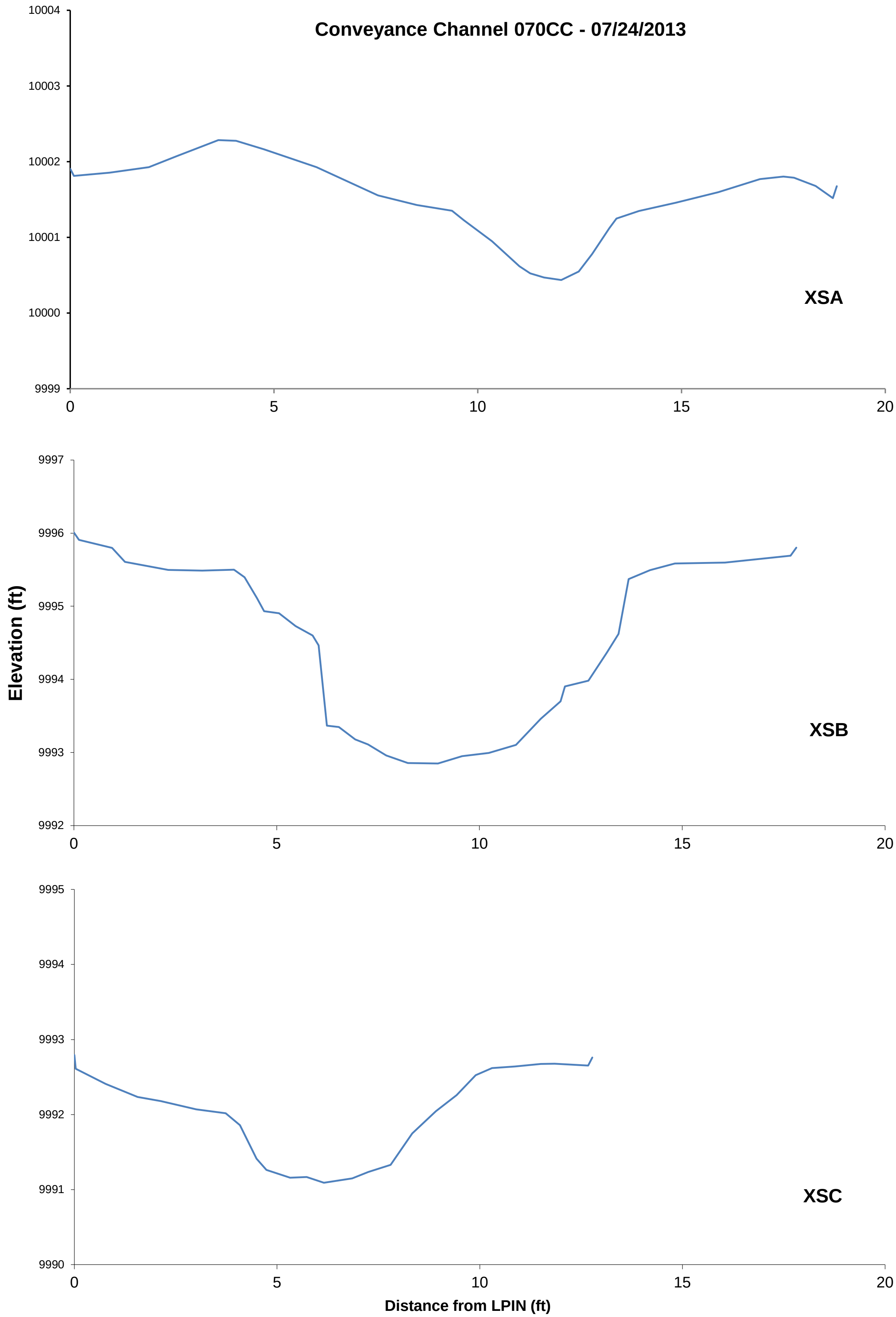


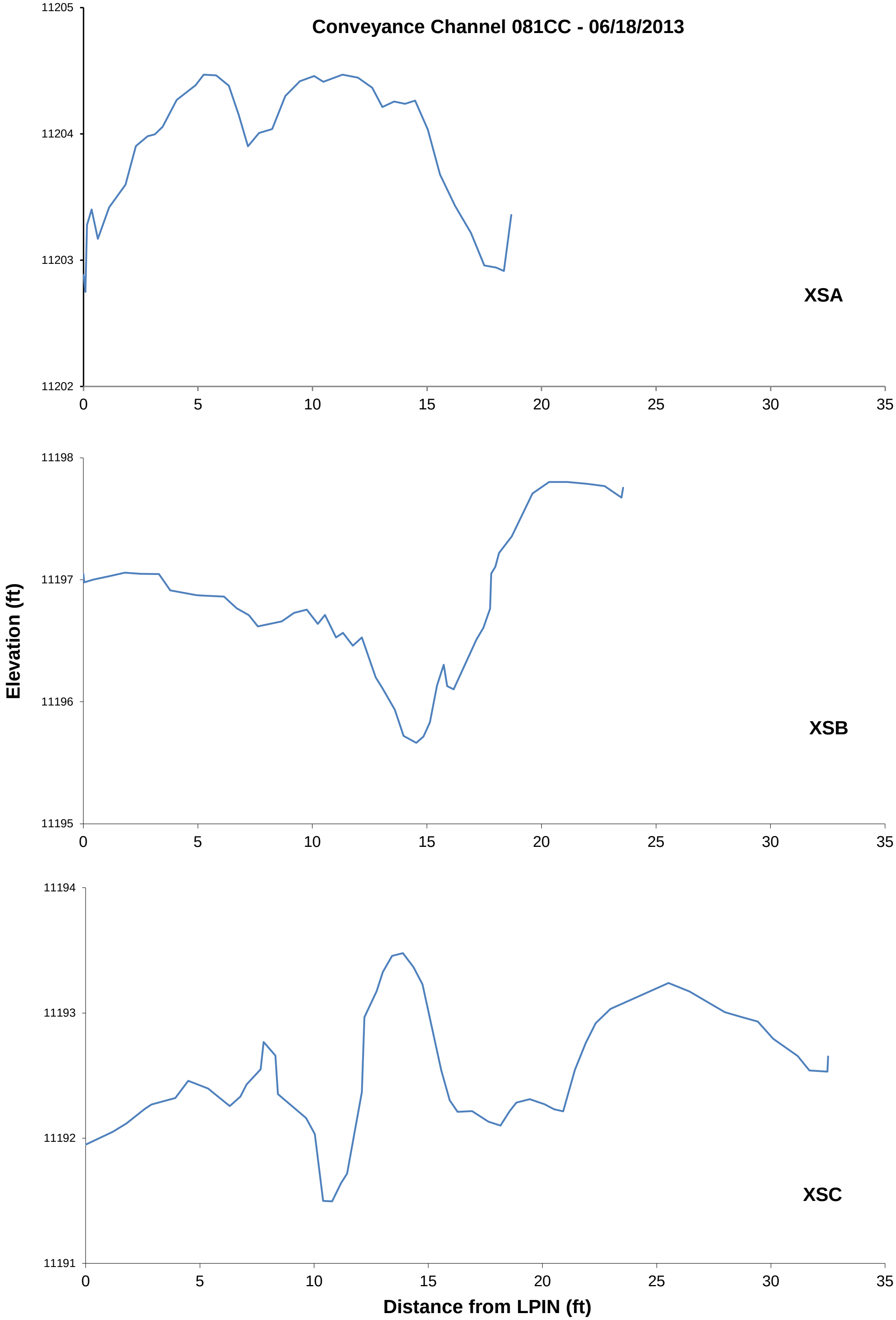
Conveyance Channel 067CC - 07/30/2013
10818
10817
10816
10815
10814
10813
0
5
10
15
20
25
30
35
40
45
XSA
10812
10811
10810
10809
10808
10807
0
5
10
15
20
25
30
35
40
45
XSB
Elevation (ft)
10807
10806
10805
10804
10803
10802
0
5
10
15
20
25
30
35
40
45
XSC
Distance from LPIN (ft)

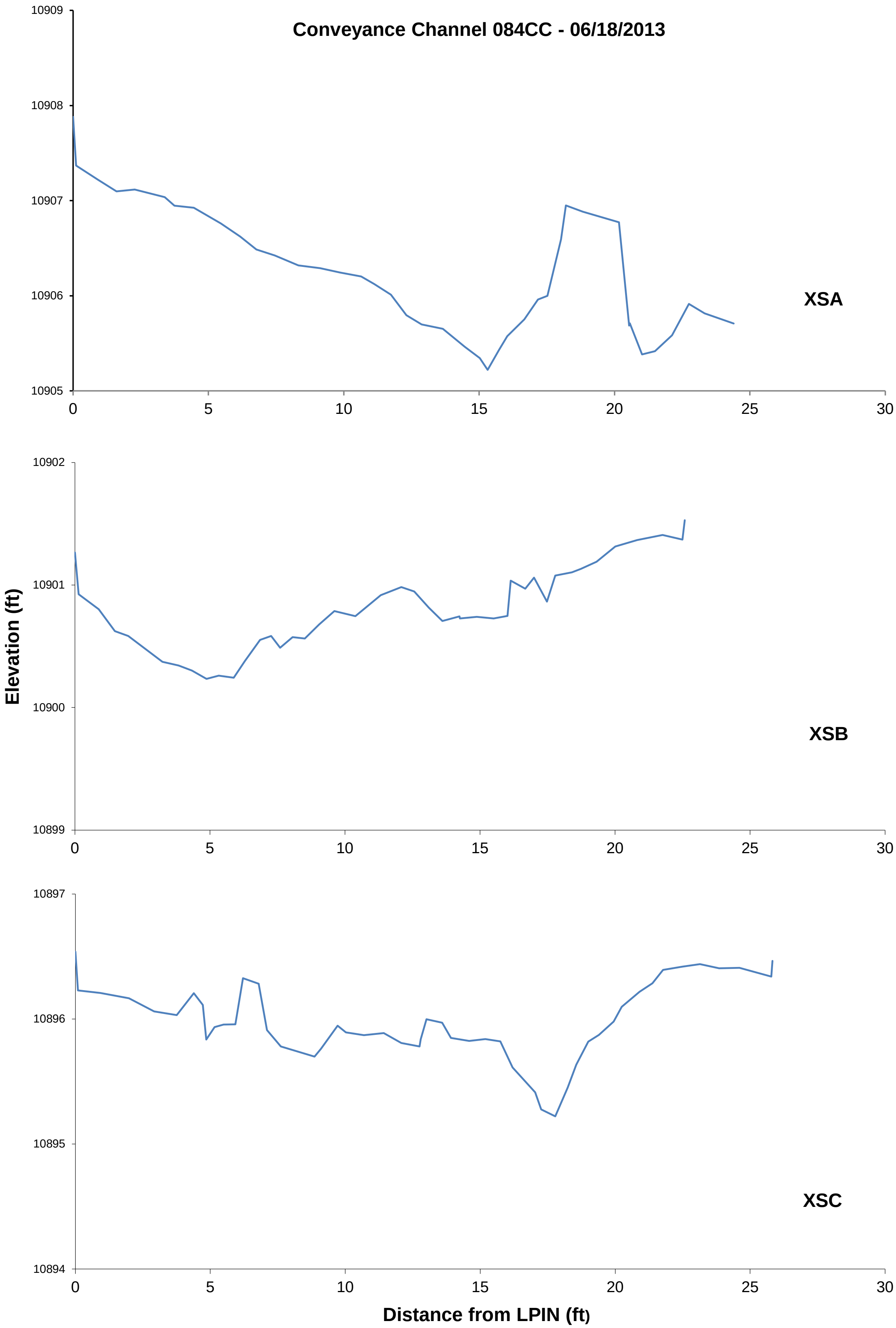


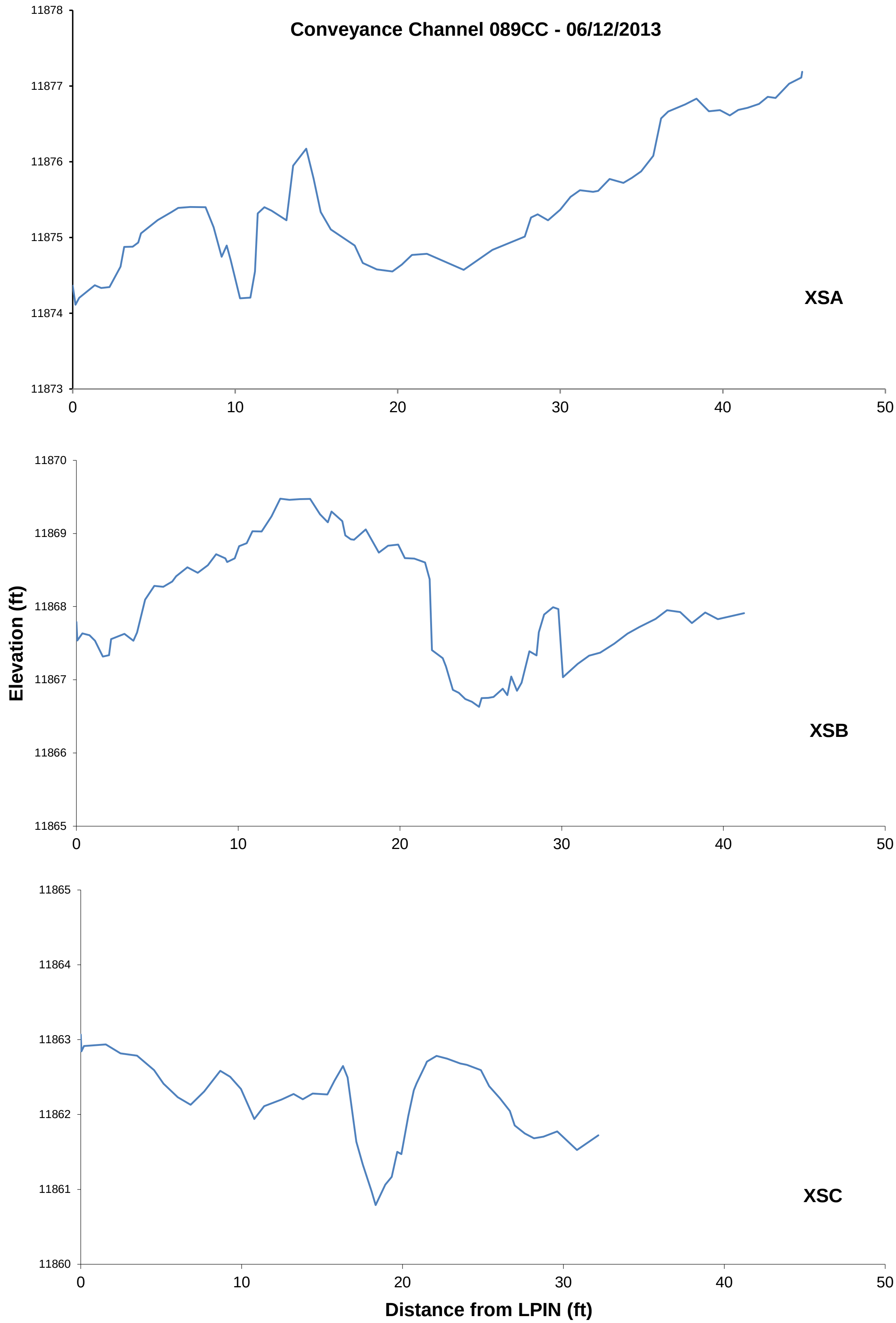
Conveyance Channel 068CC - 07/18/2013
10813
10812
10811
10810
10809
0
5
10
15
20
25
30
35
40
45
XSA
Elevation (ft)
10806
10805
10804
10803
10802
0
5
10
15
20
25
30
35
40
45
50
XSB
10794
10793
10792
10791
10790
0
5
10
15
20
25
30
35
40
45
50
XSC
Distance from LPIN (ft)

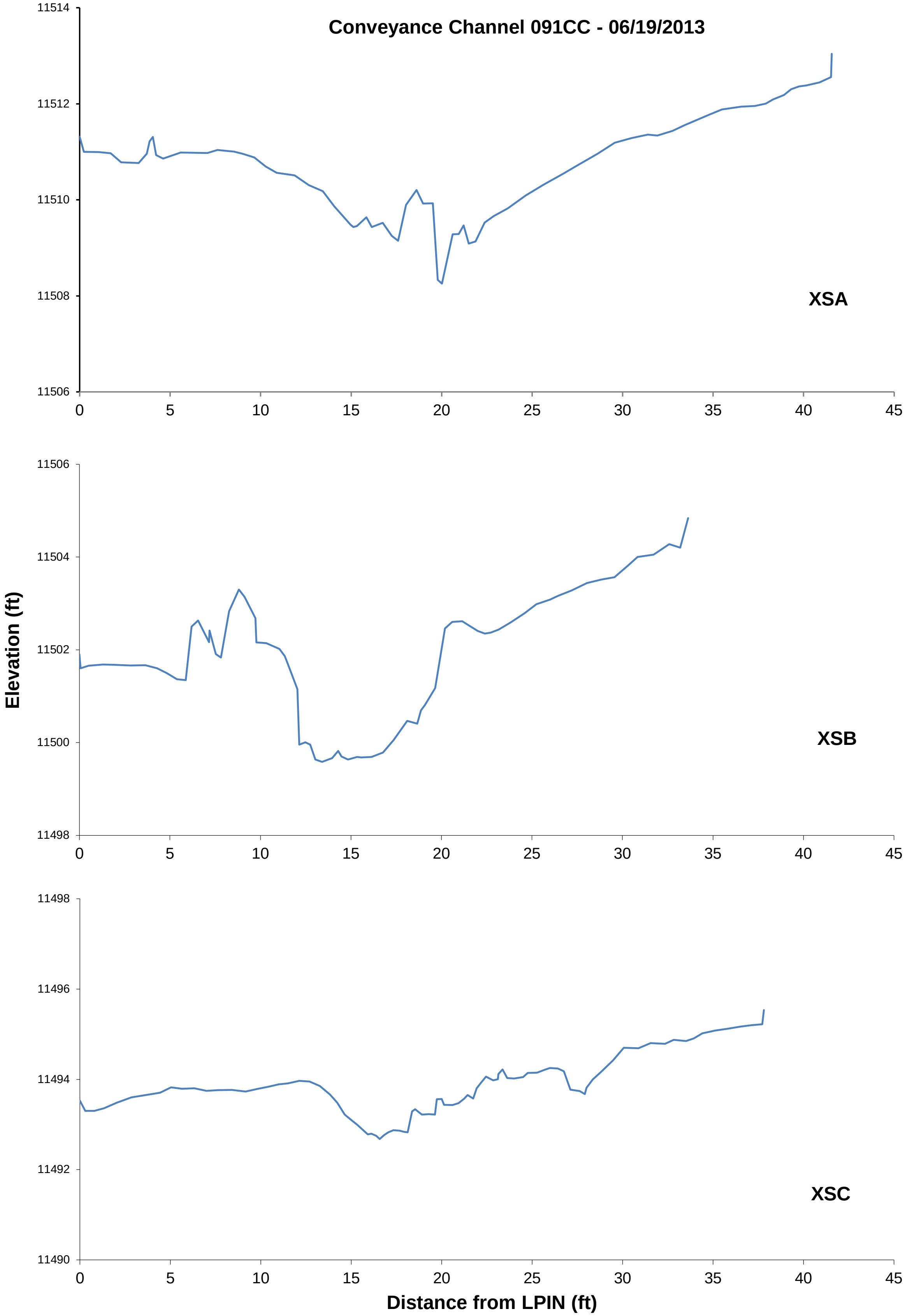

Conveyance Channel 069CC - 08/08/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11014
11013
11012
11011
11010
11006
11005
11004
11003
11002
10991
10990
10989
10988
10987
0
5
10
15
20
25
30
35
40
45

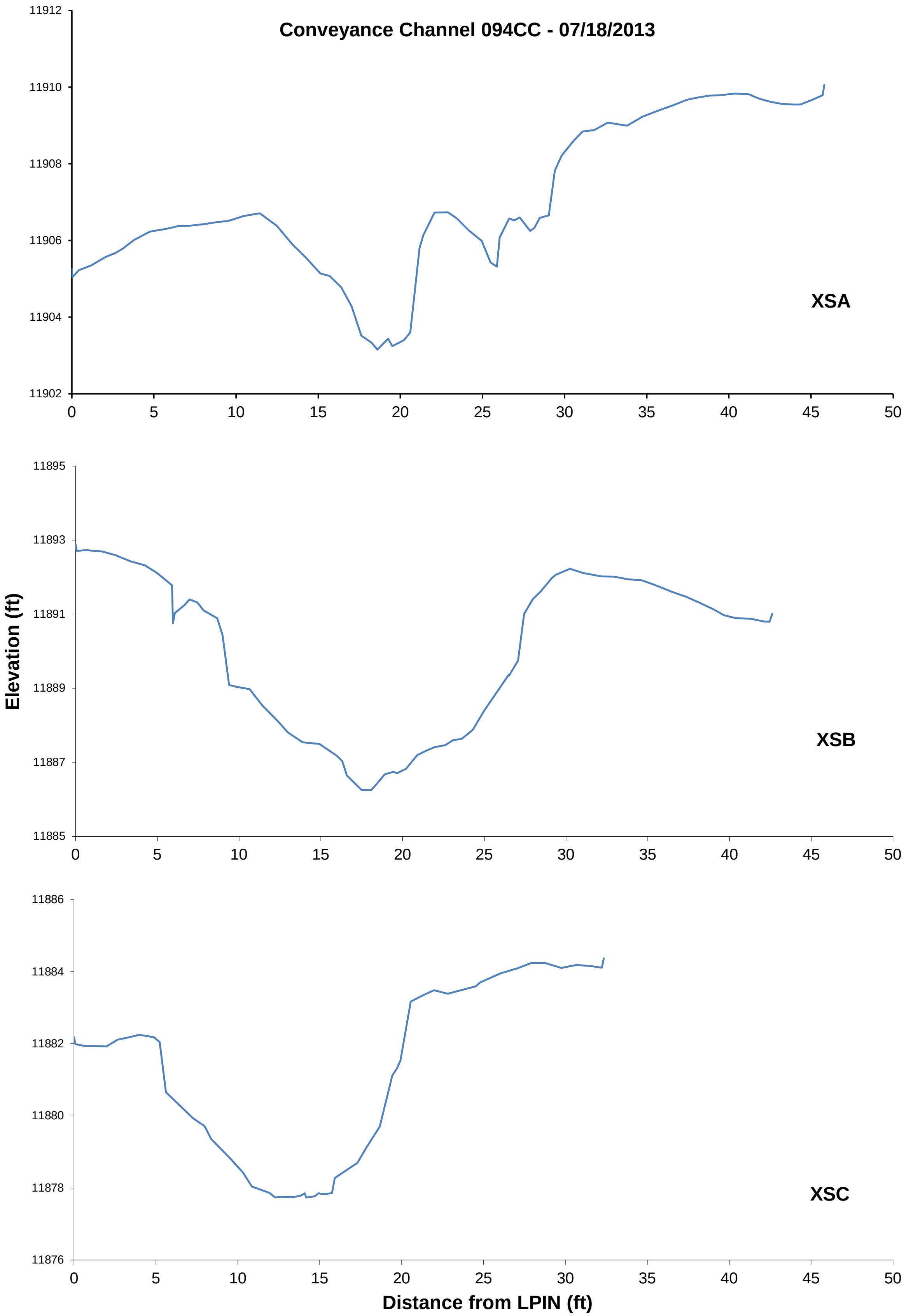

Conveyance Channel 070CC - 07/24/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10004
10003
10002
10001
10000
9999
9997
9996
9995
9994
9993
9992
9991
9990
0
5
10
15
20


Conveyance Channel 081CC - 06/18/2013
Elevation (ft)
11205
11204
11203
11202
XSA
11198
11197
11196
11195
XSB
11194
11193
11192
11191
XSC
0
5
10
15
20
25
30
35
Distance from LPIN (ft)

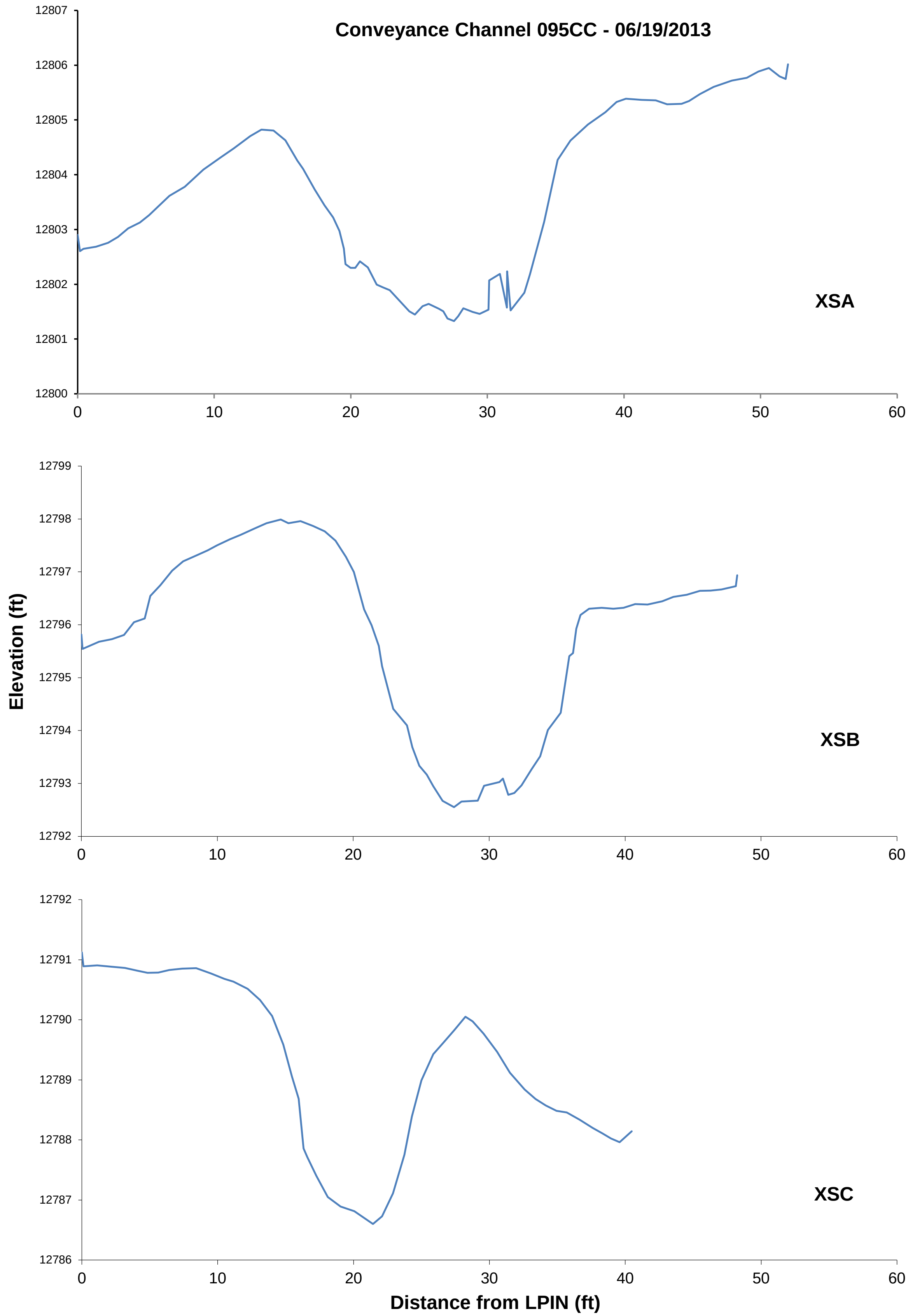

Conveyance Channel 084CC - 06/18/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10909
10908
10907
10906
10905
10902
10901
10900
10899
10897
10896
10895
10894
0
5
10
15
20
25
30

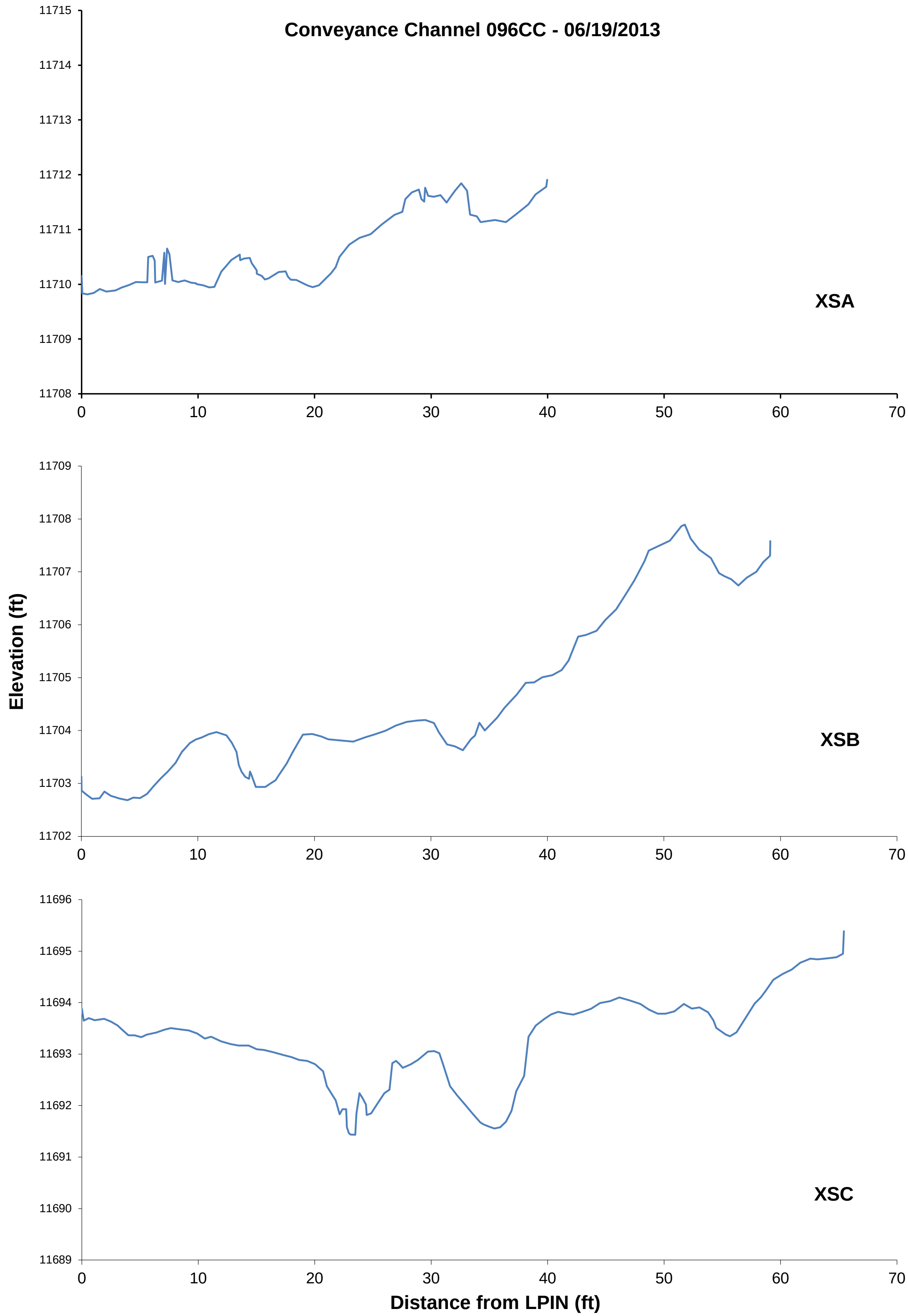

Conveyance Channel 089CC - 06/12/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11878
11877
11876
11875
11874
11873
11870
11869
11868
11867
11866
11865
11864
11863
11862
11861
11860
0
10
20
30
40
50

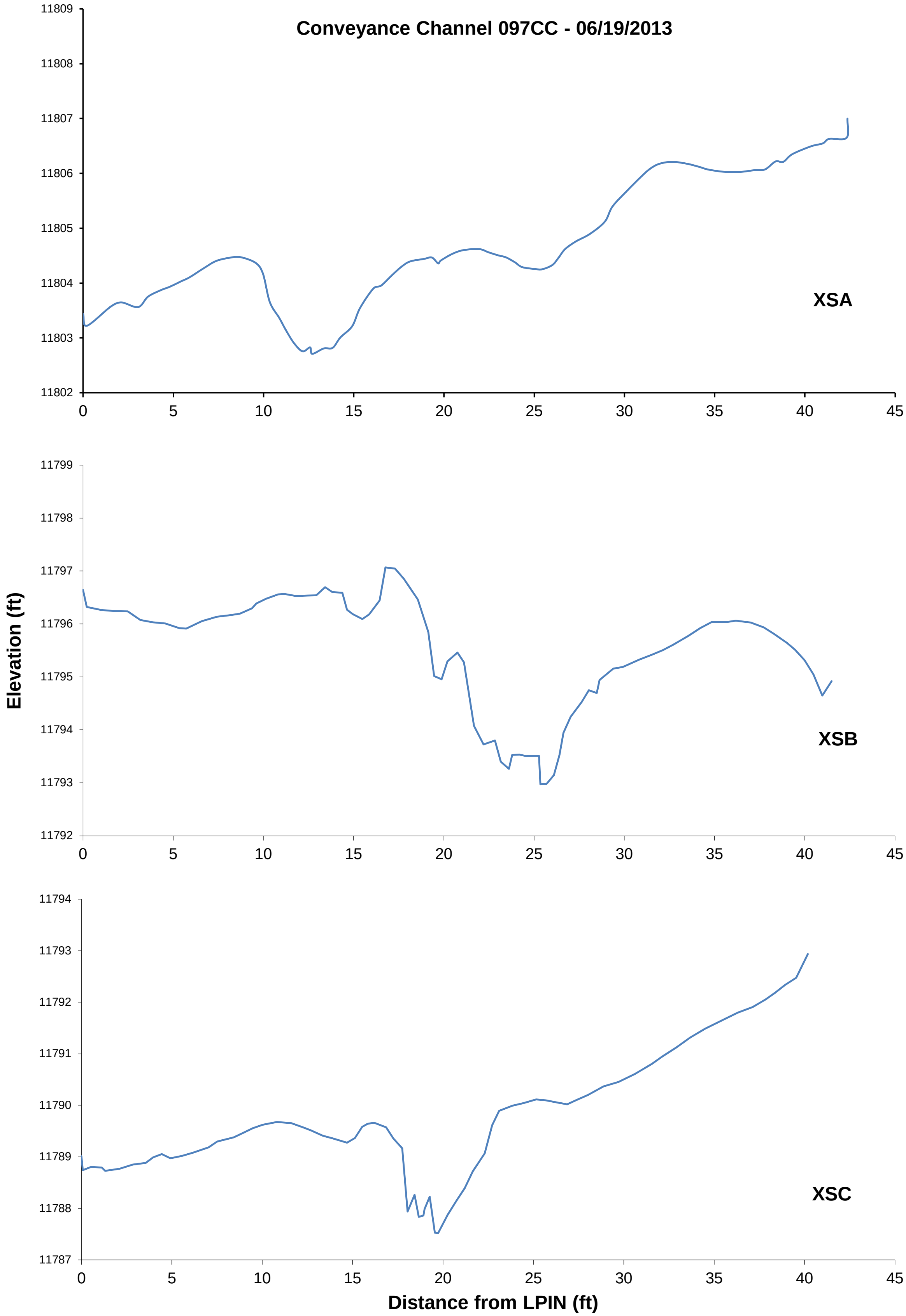

Conveyance Channel 091CC - 06/19/2013
Elevation (ft)
11514
11512
11510
11508
11506
XSA
11506
11504
11502
11500
11498
XSB
11498
11496
11494
11492
11490
XSC
0
5
10
15
20
25
30
35
40
45
Distance from LPIN (ft)

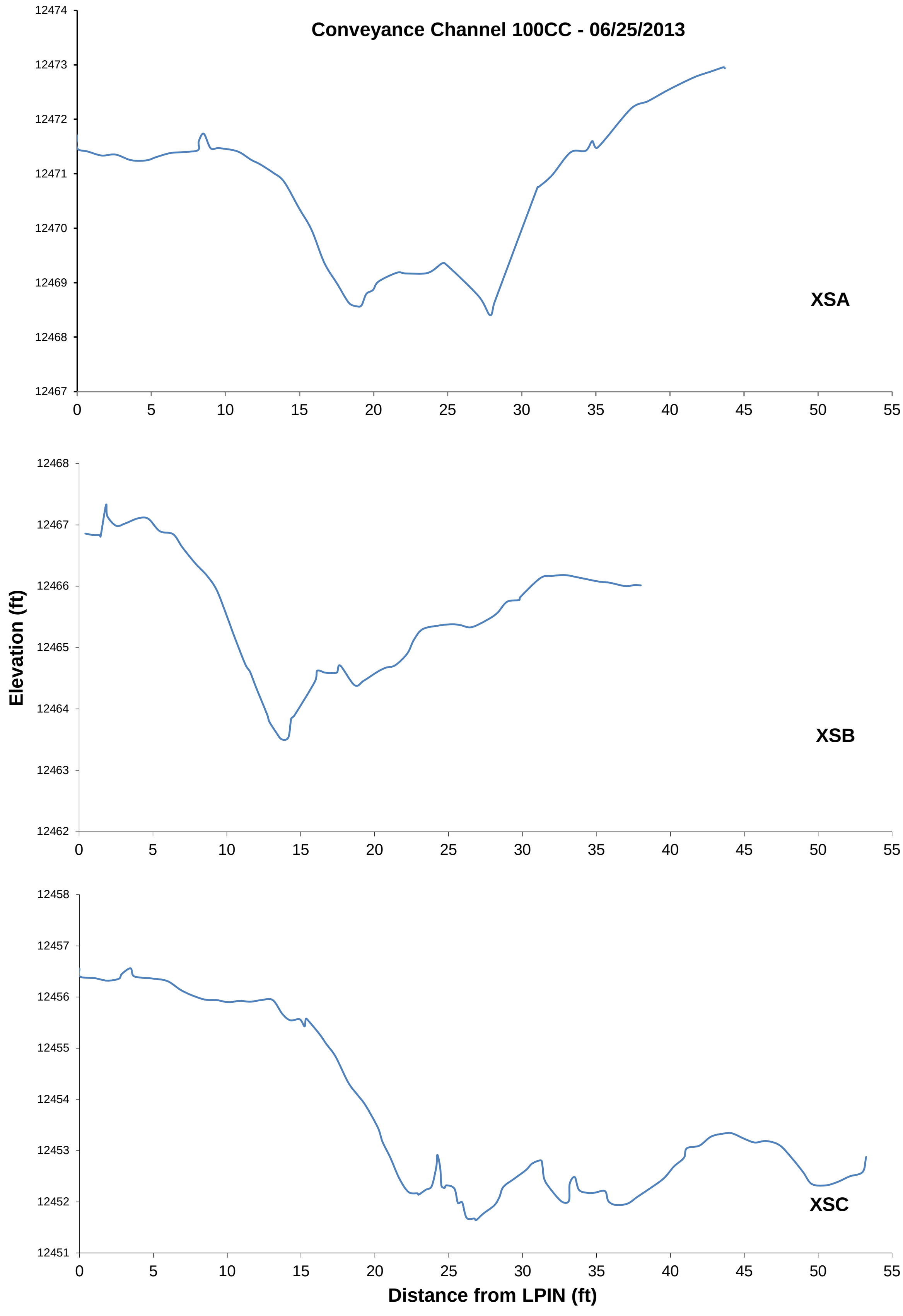


Conveyance Channel 094CC - 07/18/2013
Elevation (ft)
11912
11910
11908
11906
11904
11902
0
5
10
15
20
25
30
35
40
45
50
XSA
11895
11893
11891
11889
11887
11885
XSB
11886
11884
11882
11880
11878
11876
XSC
Distance from LPIN (ft)

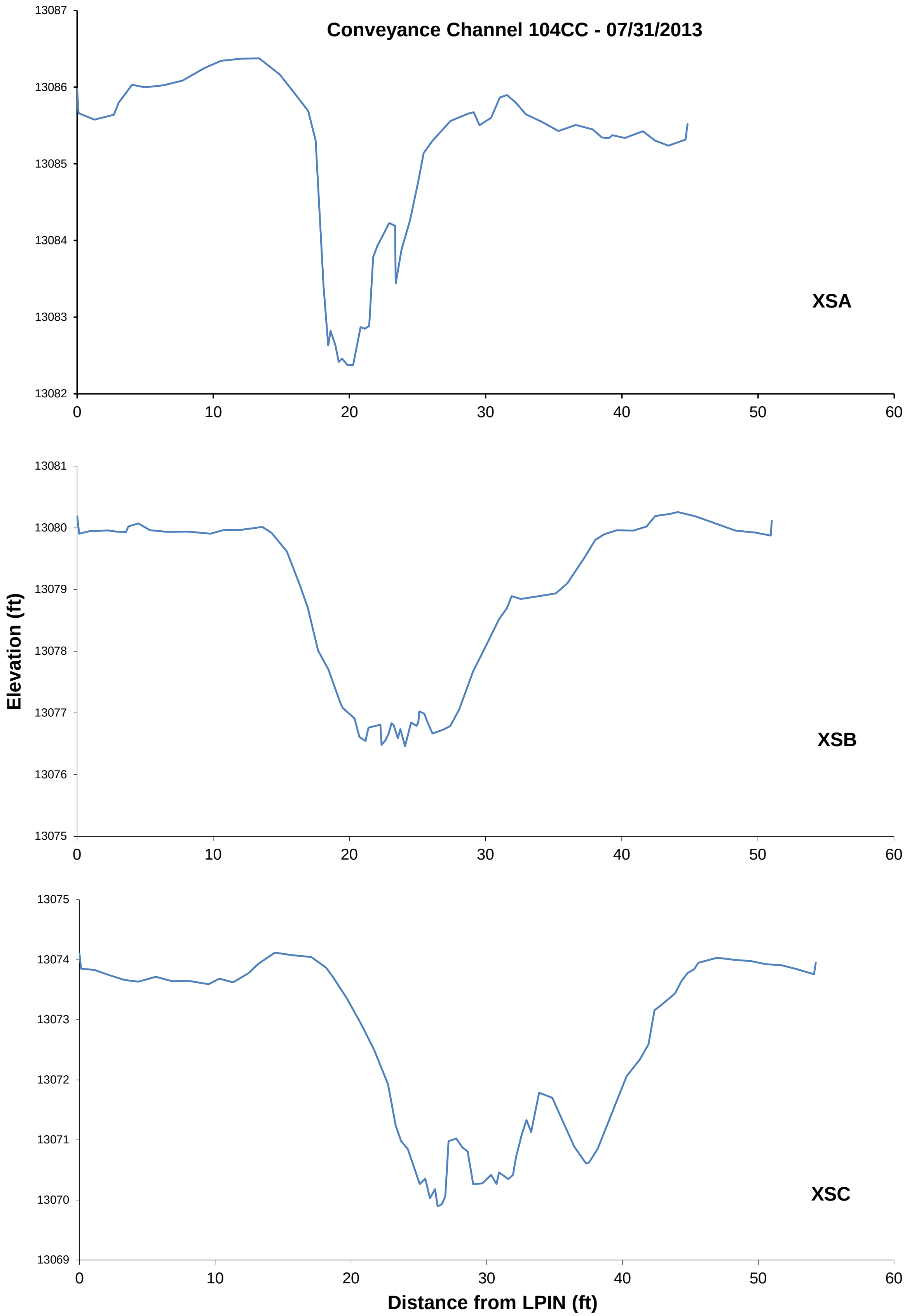

Conveyance Channel 095CC - 06/19/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12807
12806
12805
12804
12803
12802
12801
12800
12799
12798
12797
12796
12795
12794
12793
12792
12791
12790
12789
12788
12787
12786
0
10
20
30
40
50
60


Conveyance Channel 096CC - 06/19/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
11715
11714
11713
11712
11711
11710
11709
11708
11709
11708
11707
11706
11705
11704
11703
11702
11696
11695
11694
11693
11692
11691
11690
11689
0
10
20
30
40
50
60
70

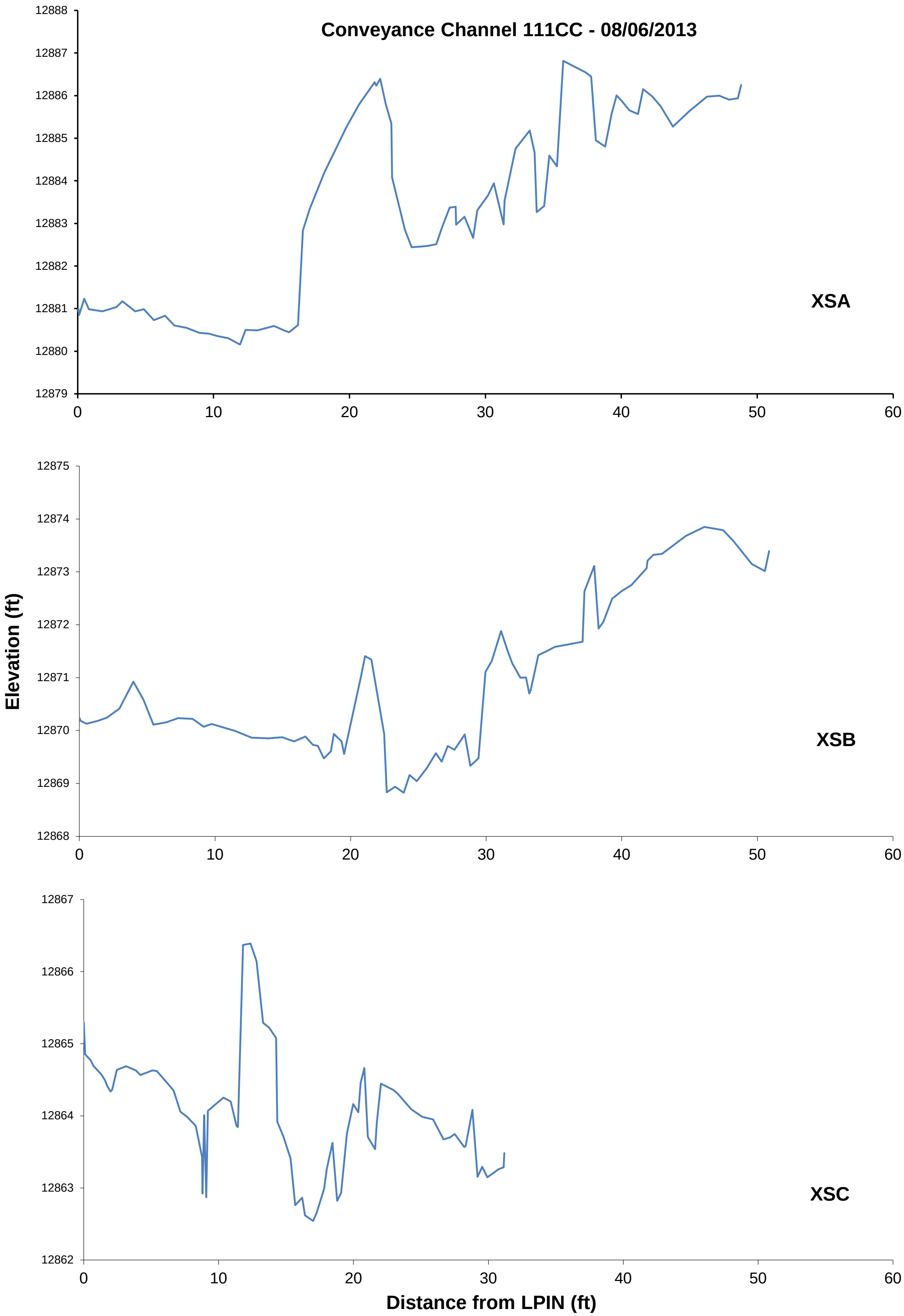

Conveyance Channel 097CC - 06/19/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
11809
11808
11807
11806
11805
11804
11803
11802
11799
11798
11797
11796
11795
11794
11793
11792
11794
11793
11792
11791
11790
11789
11788
11787
0
5
10
15
20
25
30
35
40
45

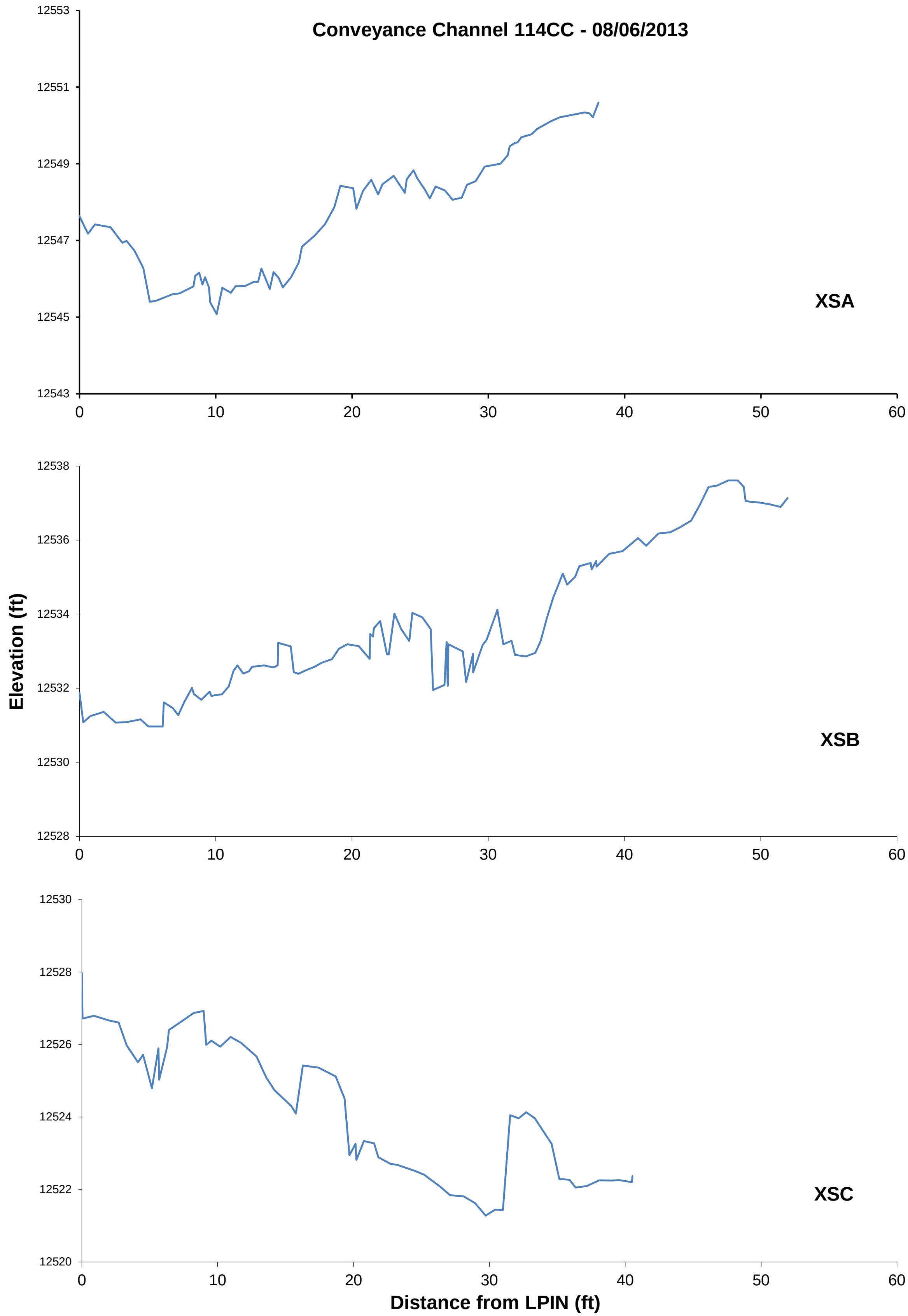


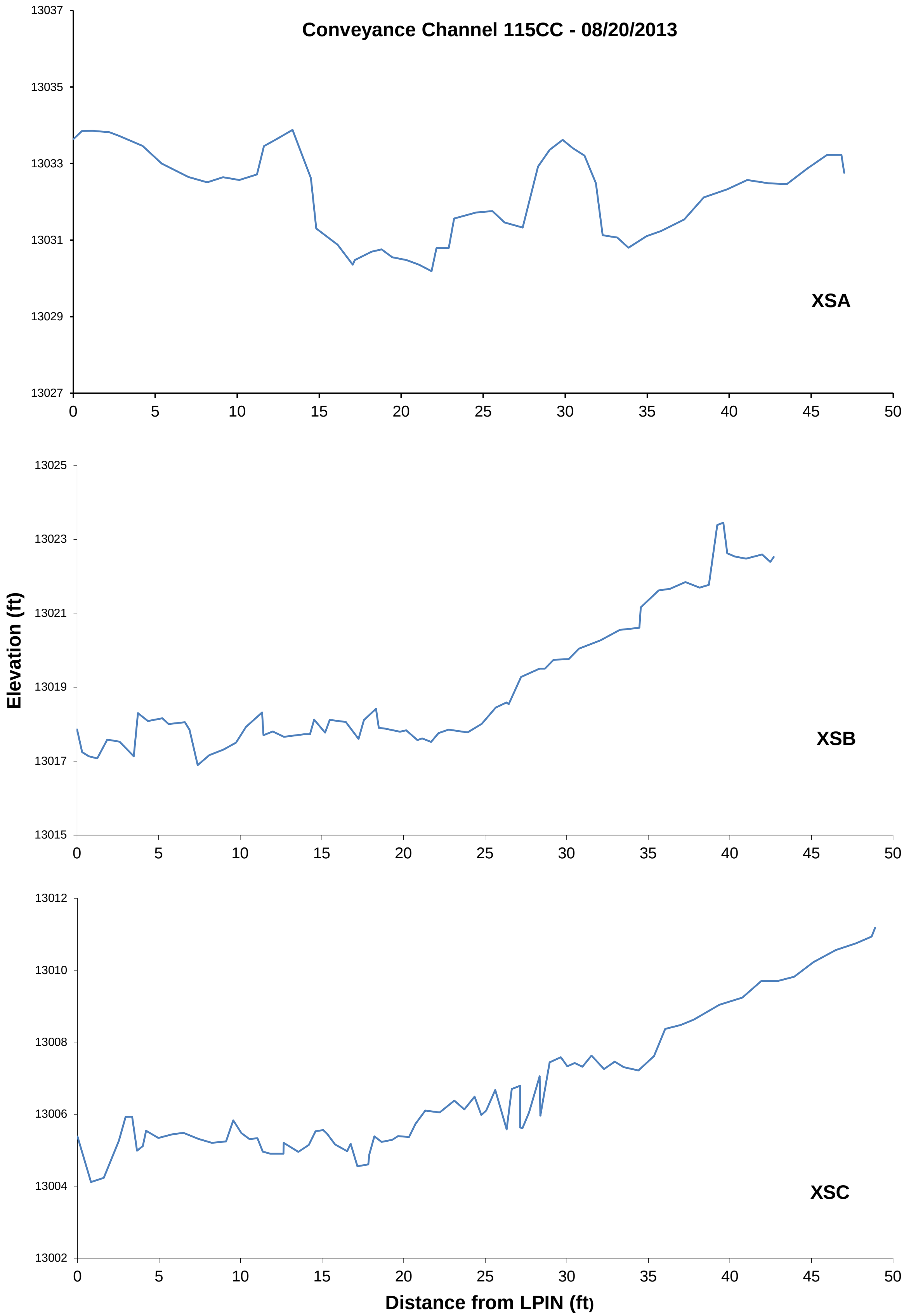
Conveyance Channel 100CC - 06/25/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)



Conveyance Channel 104CC - 07/31/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
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 111CC - 08/06/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12888
12887
12886
12885
12884
12883
12882
12881
12880
12879
12875
12874
12873
12872
12871
12870
12869
12868
12867
12866
12865
12864
12863
12862
0
10
20
30
40
50
60


Conveyance Channel 114CC - 08/06/2013
12553
12551
12549
12547
12545
12543
XSA
0
10
20
30
40
50
60
12538
12536
12534
12532
12530
12528
XSB
Elevation (ft)
12530
12528
12526
12524
12522
12520
XSC
Distance from LPIN (ft)


Conveyance Channel 115CC - 08/20/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13037
13035
13033
13031
13029
13027
13025
13023
13021
13019
13017
13015
13012
13010
13008
13006
13004
13002
0
5
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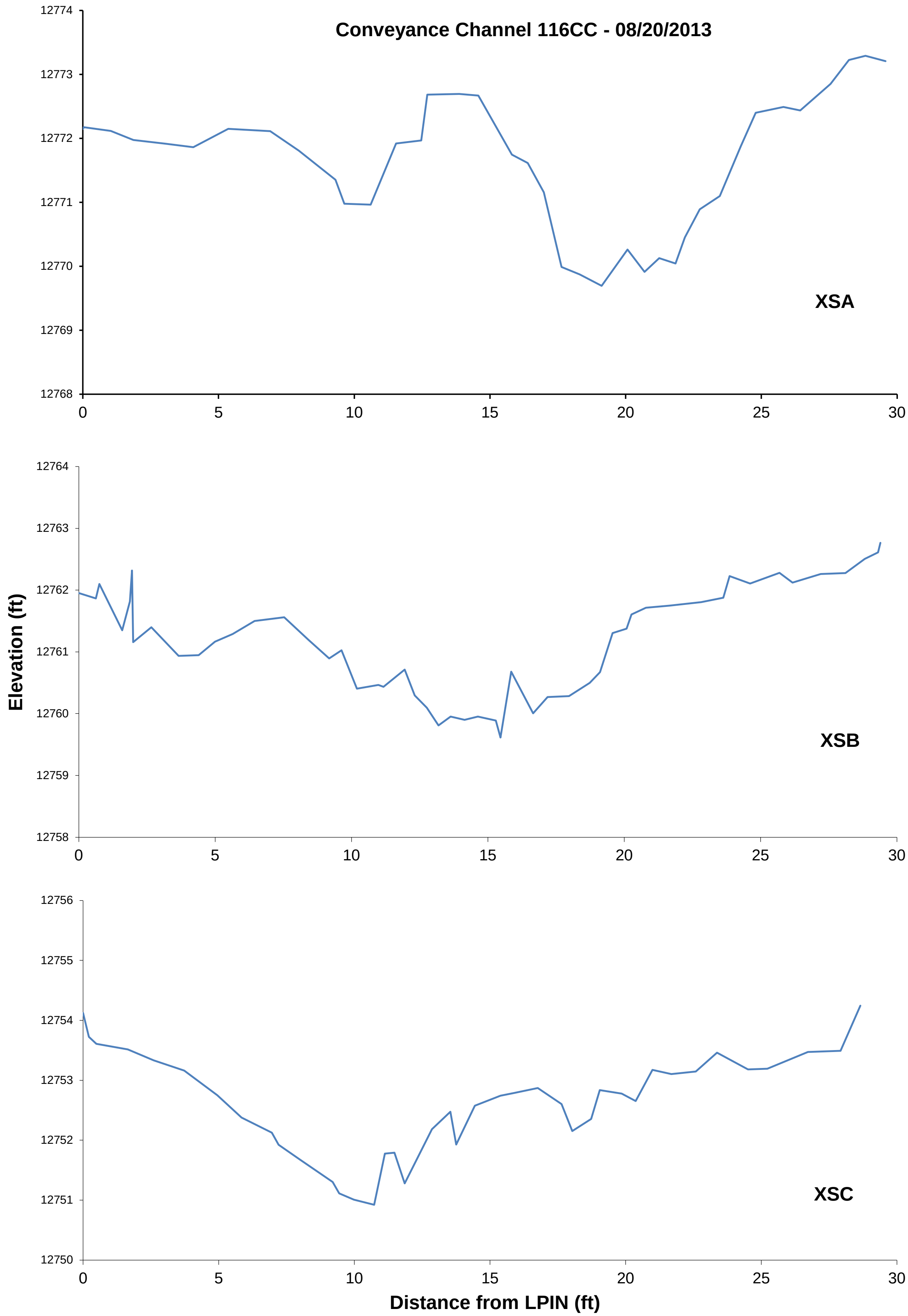
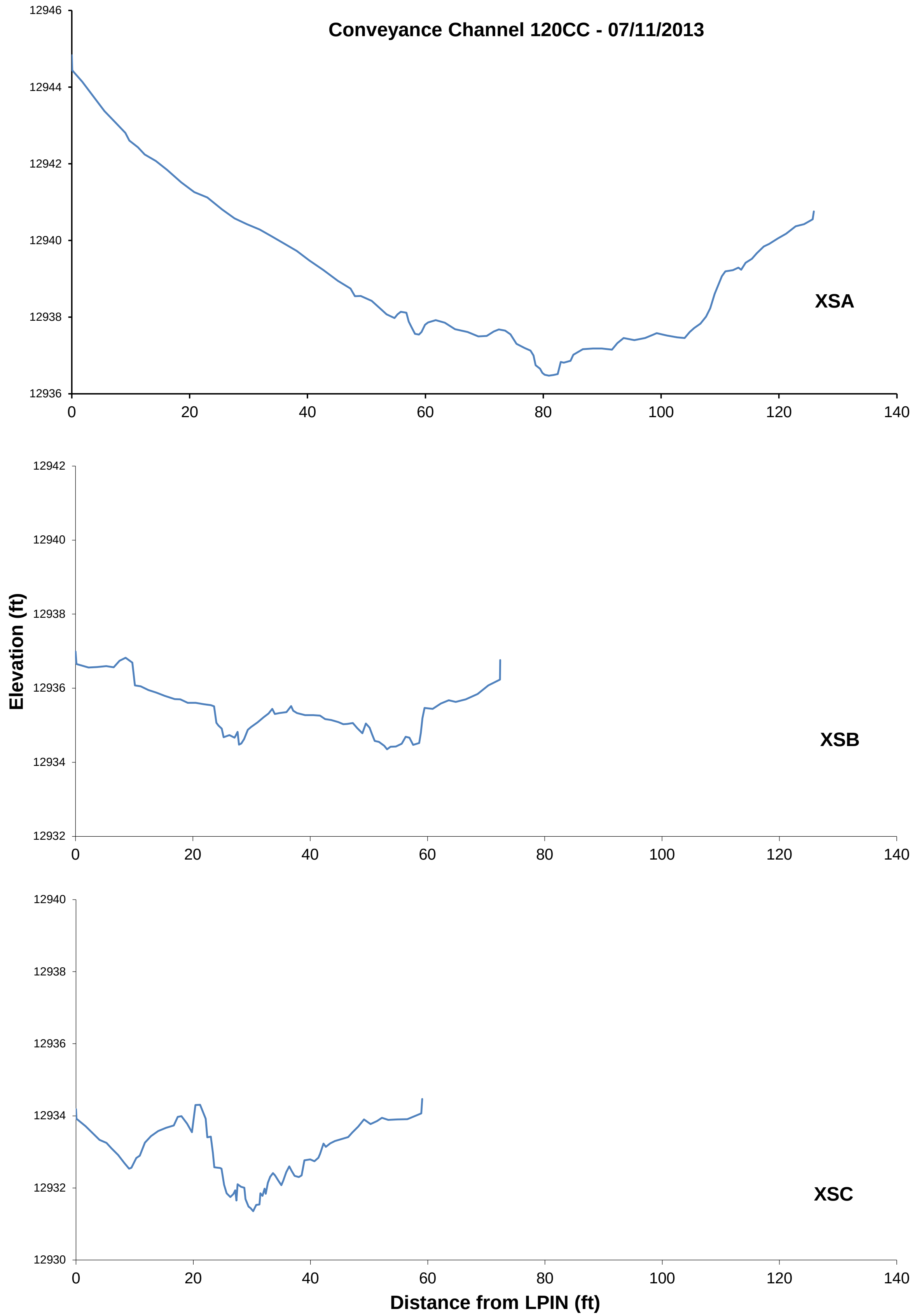
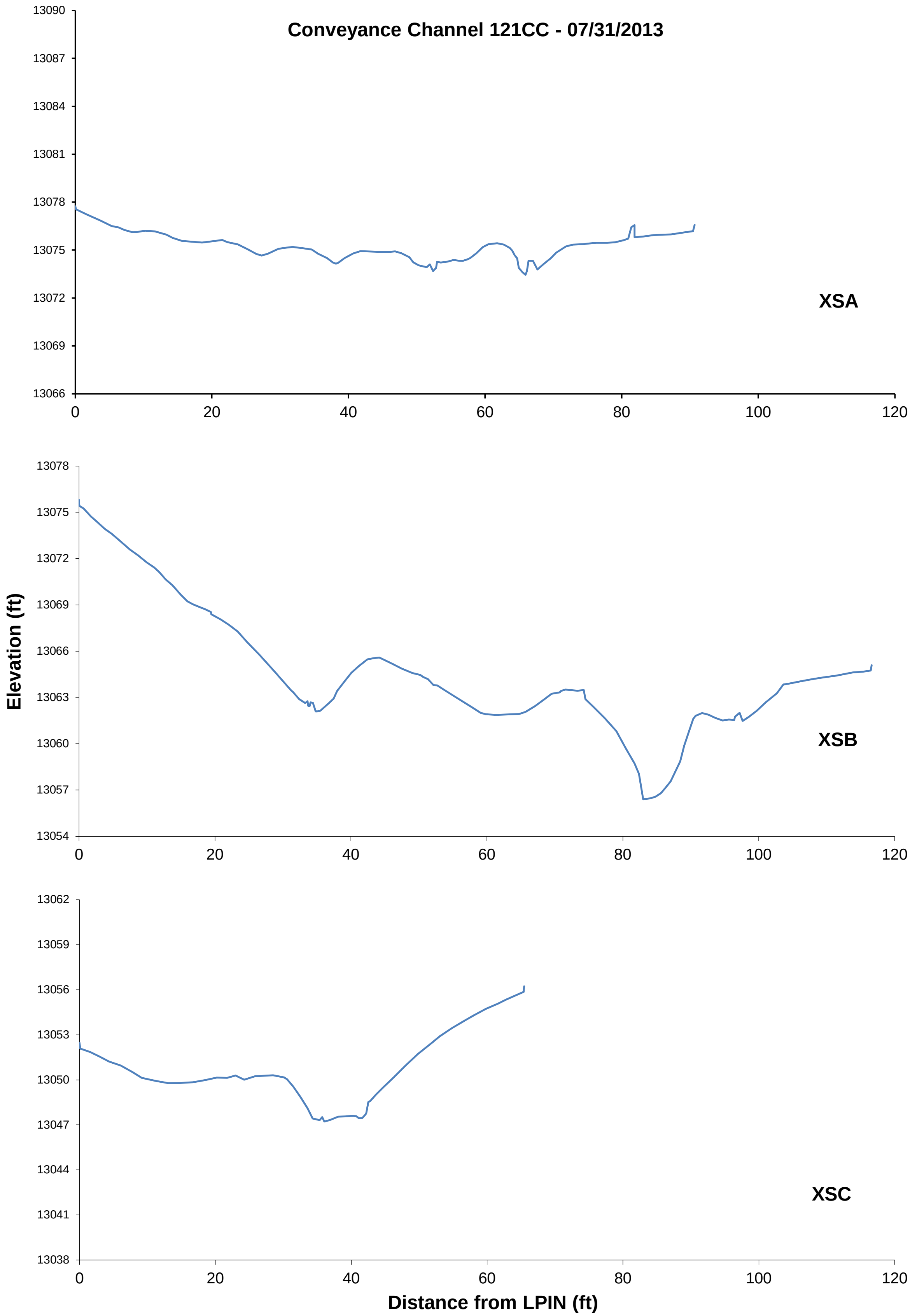
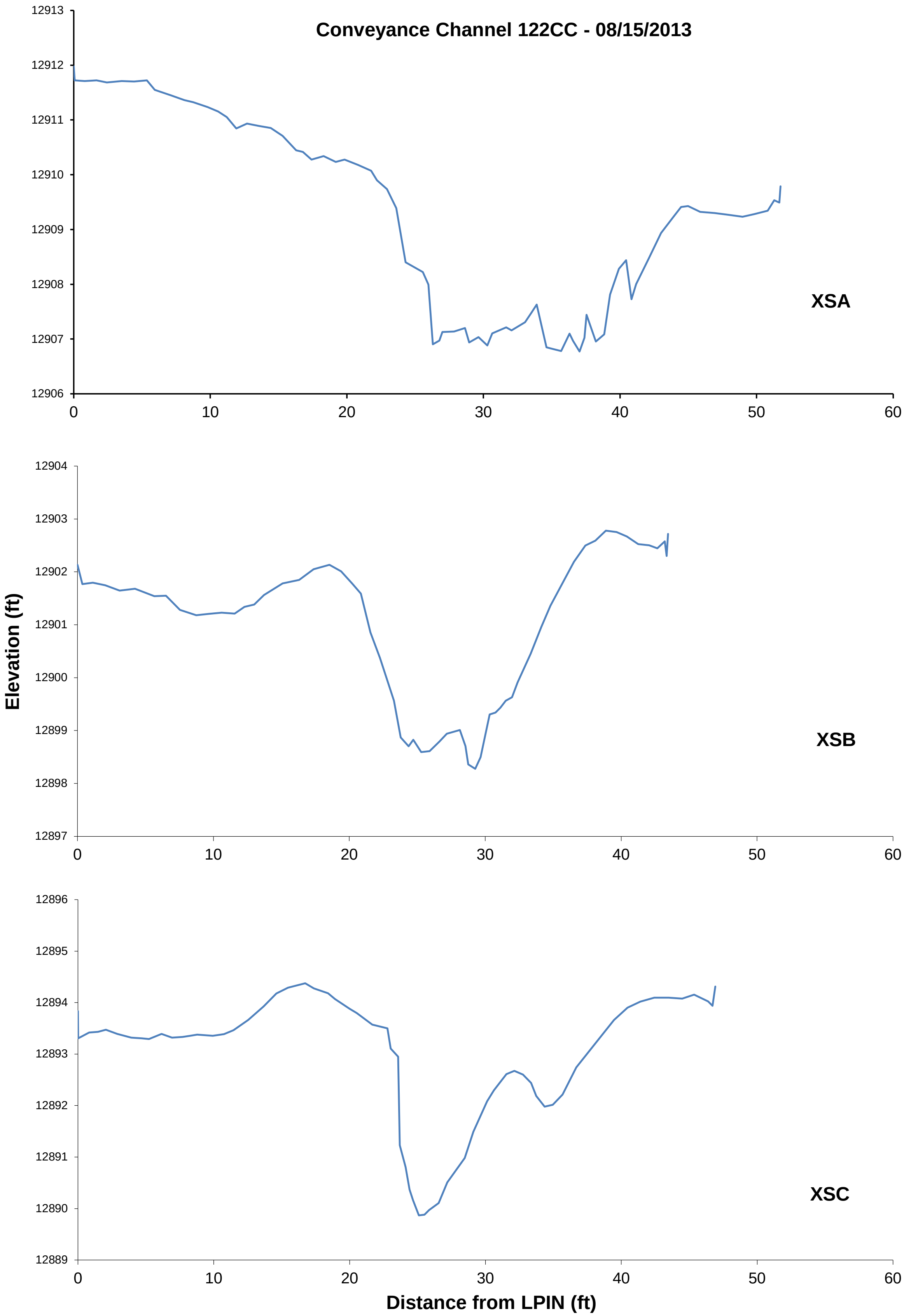
25
30
35
40
45
50

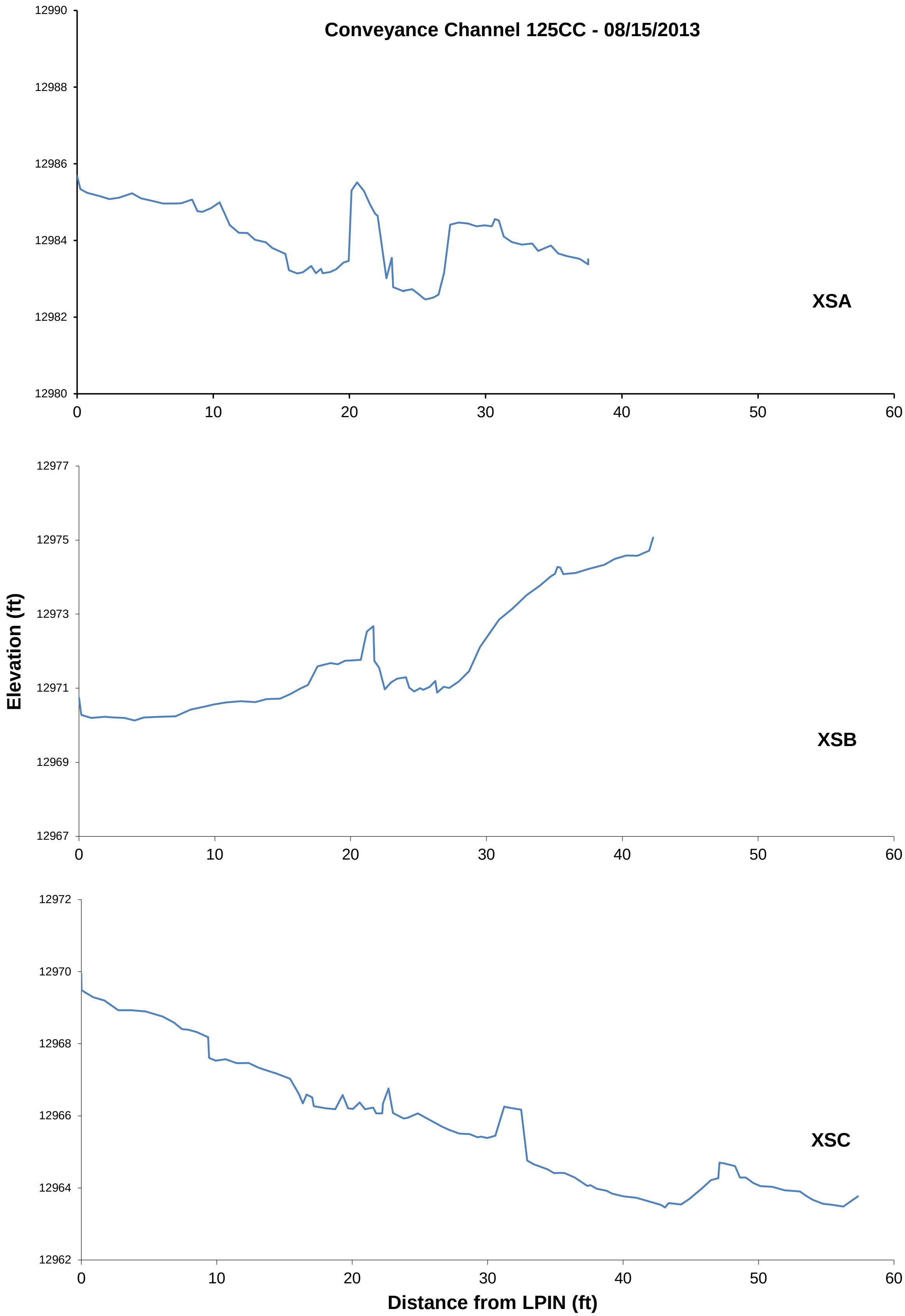

Conveyance Channel 116CC - 08/20/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12774
12773
12772
12771
12770
12769
12768
12764
12763
12762
12761
12760
12759
12758
12756
12755
12754
12753
12752
12751
12750
0
5
10
15
20
25
30

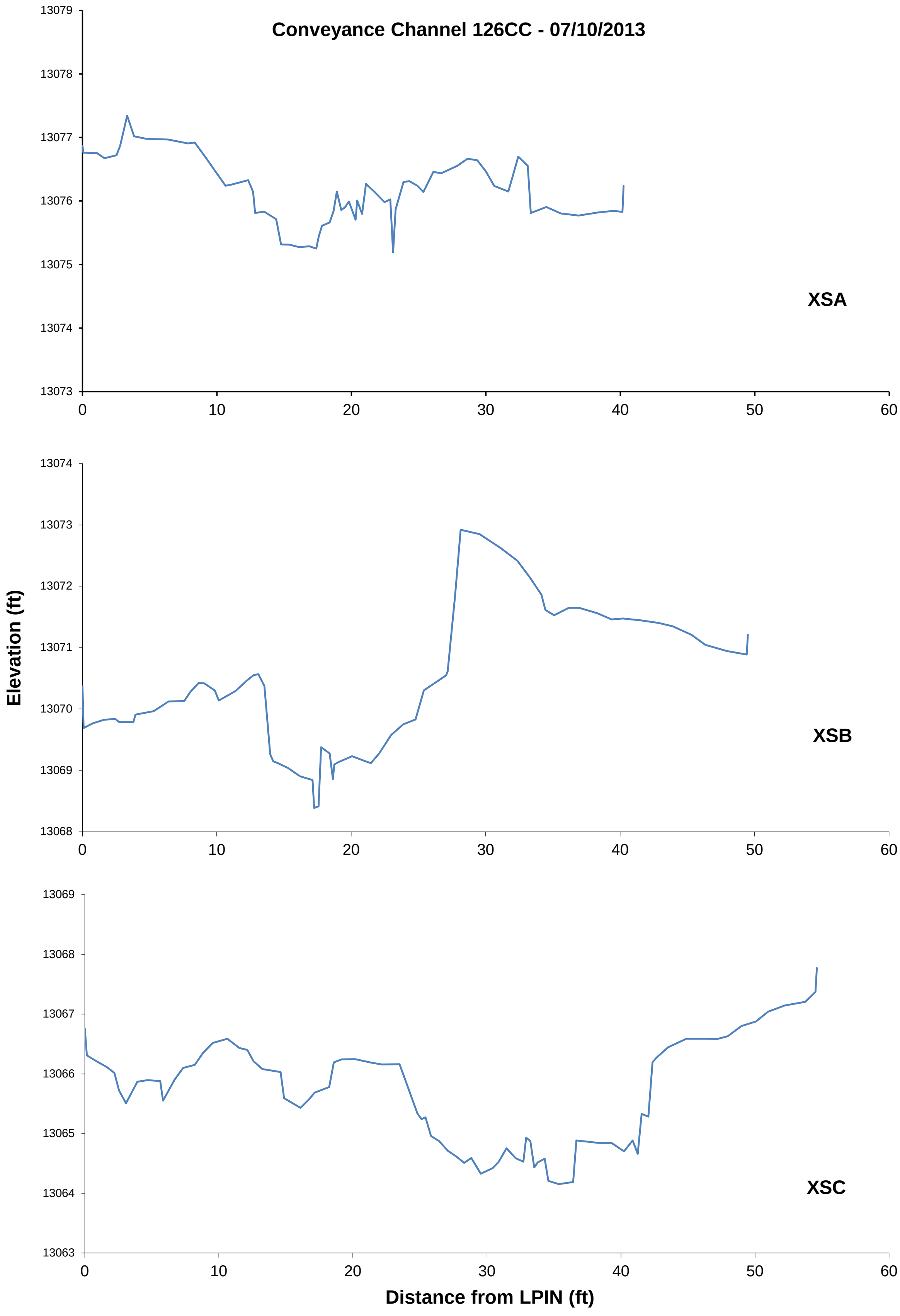

Conveyance Channel 120CC - 07/11/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12946
12944
12942
12940
12938
12936
12934
12932
12930
0
20
40
60
80
100
120
140

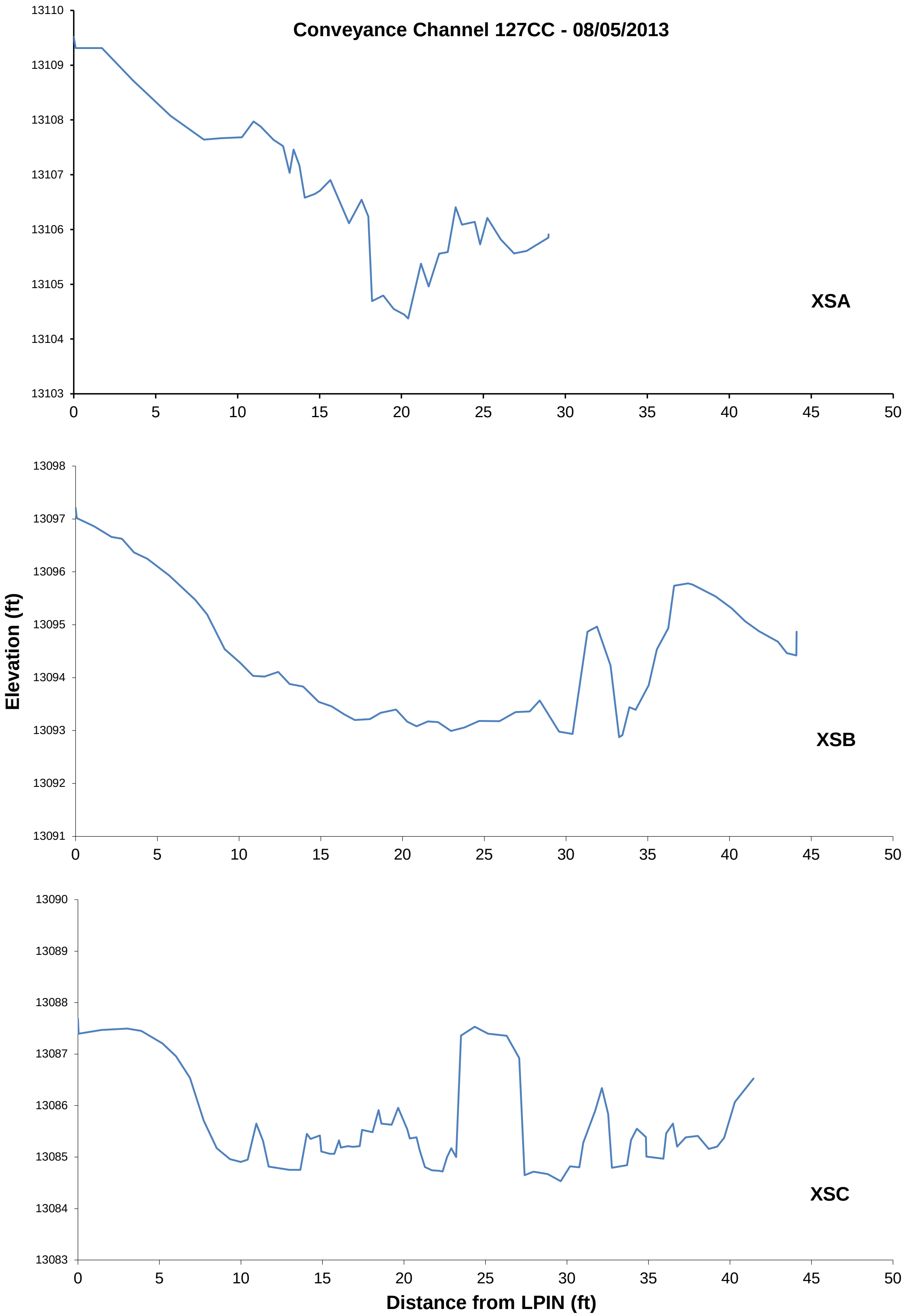


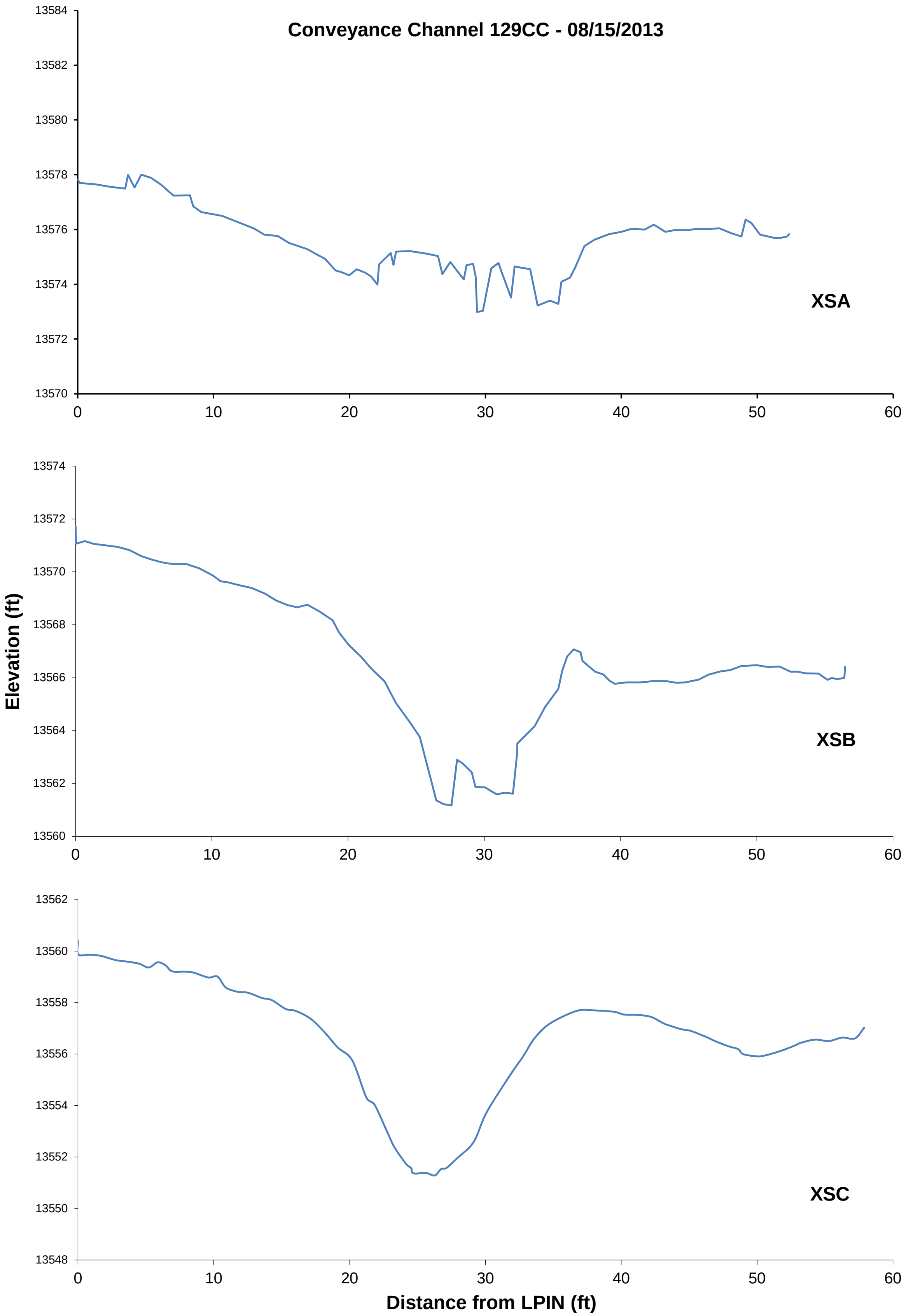
Conveyance Channel 121CC - 07/31/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13090
13087
13084
13081
13078
13075
13072
13069
13066
13063
13060
13057
13054
13062
13059
13056
13053
13050
13047
13044
13041
13038
0
20
40
60
80
100
120


Conveyance Channel 122CC - 08/15/2013
12913
12912
12911
12910
12909
12908
12907
12906
XSA
0
10
20
30
40
50
60
12904
12903
12902
12901
12900
12899
12898
12897
XSB
0
10
20
30
40
50
60
Elevation (ft)
12896
12895
12894
12893
12892
12891
12890
12889
XSC
0
10
20
30
40
50
60
Distance from LPIN (ft)

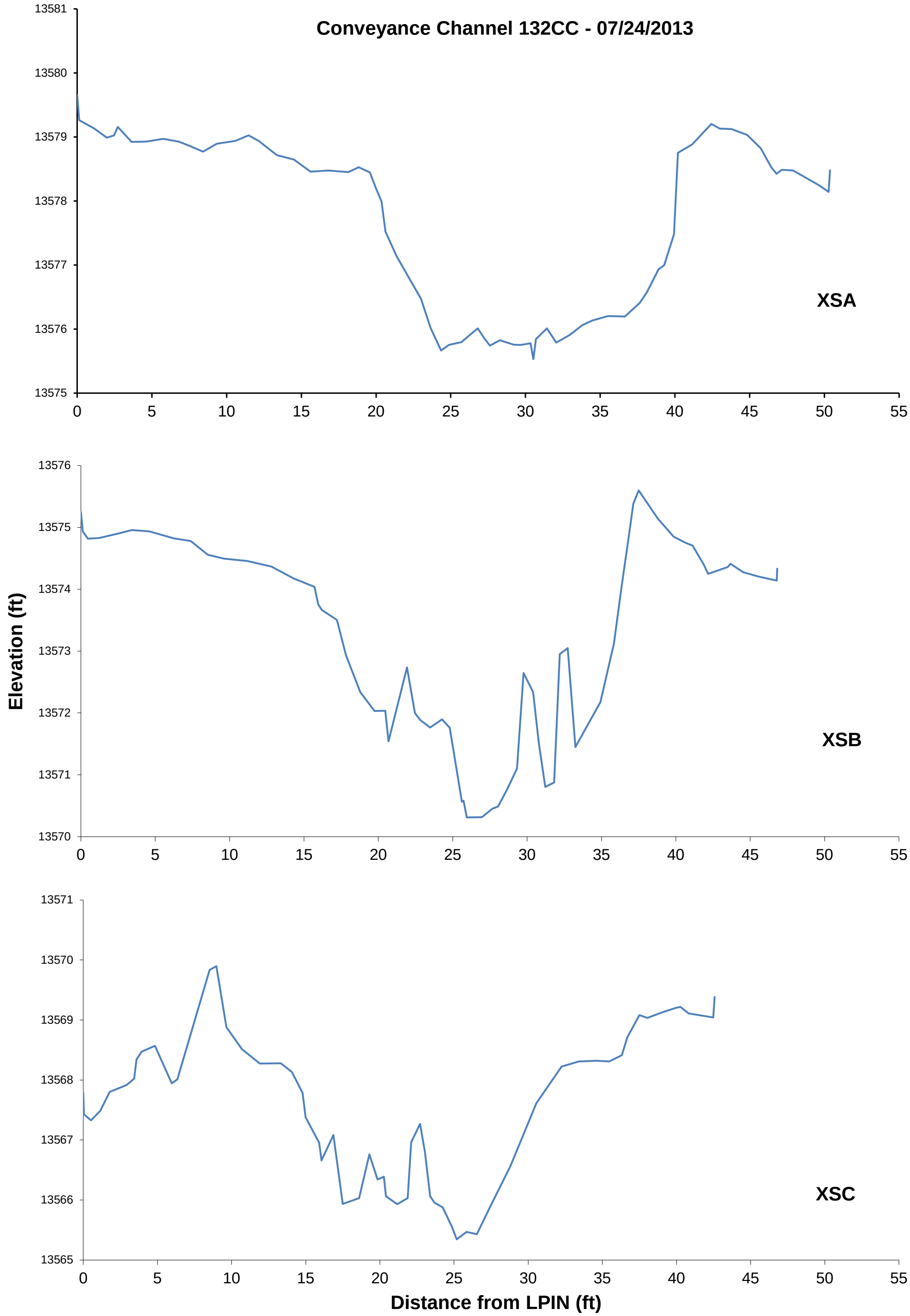

Conveyance Channel 125CC - 08/15/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12990
12988
12986
12984
12982
12980
12977
12975
12973
12971
12969
12967
12972
12970
12968
12966
12964
12962
0
10
20
30
40
50
60

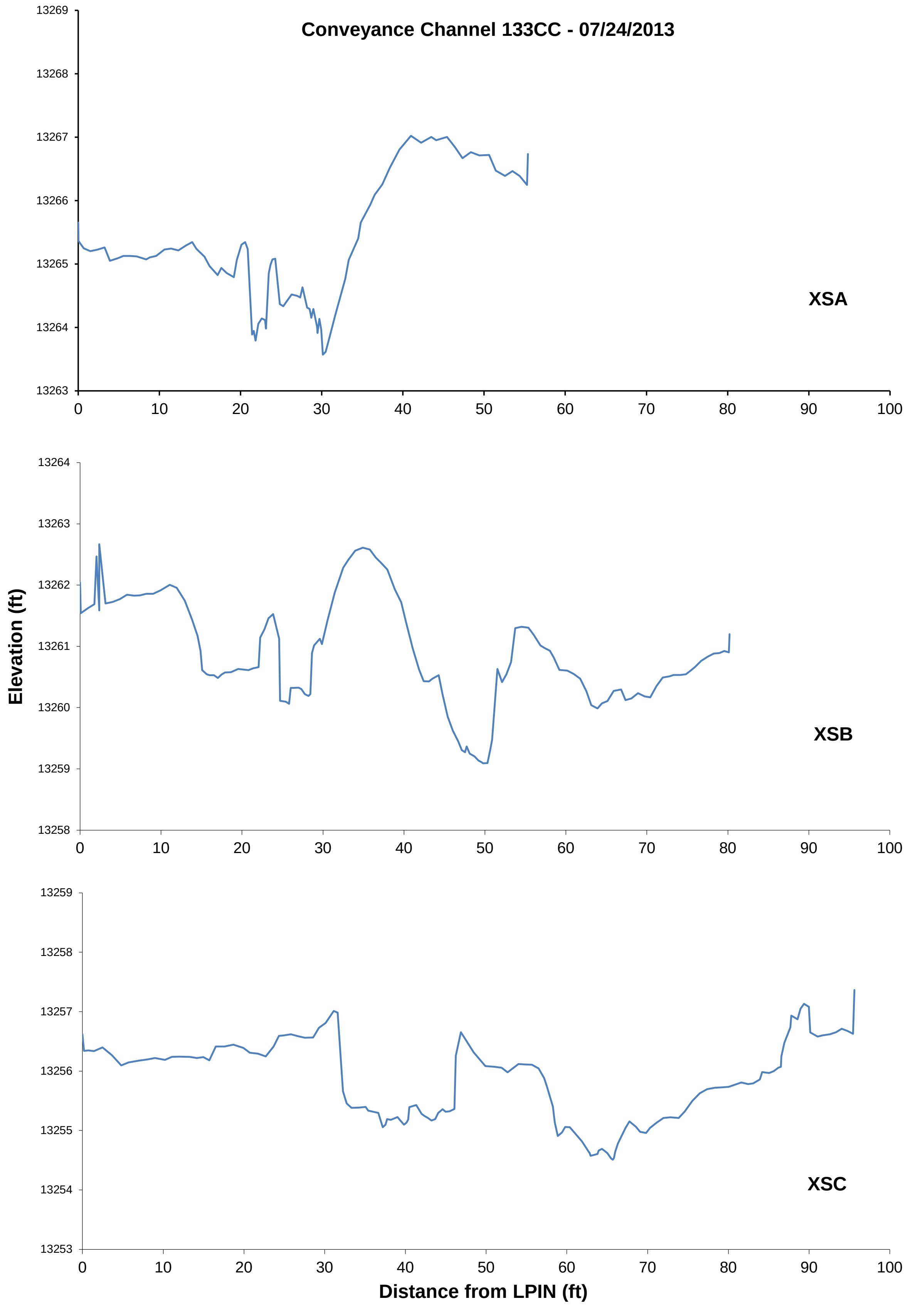

Conveyance Channel 126CC - 07/10/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13079
13078
13077
13076
13075
13074
13073
13072
13071
13070
13069
13068
13067
13066
13065
13064
13063
0
10
20
30
40
50
60


Conveyance Channel 127CC - 08/05/2013
Elevation (ft)
XSA
13110
13109
13108
13107
13106
13105
13104
13103
0
5
10
15
20
25
30
35
40
45
50
XSB
13098
13097
13096
13095
13094
13093
13092
13091
0
5
10
15
20
25
30
35
40
45
50
XSC
13090
13089
13088
13087
13086
13085
13084
13083
0
5
10
15
20
25
30
35
40
45
50
Distance from LPIN (ft)

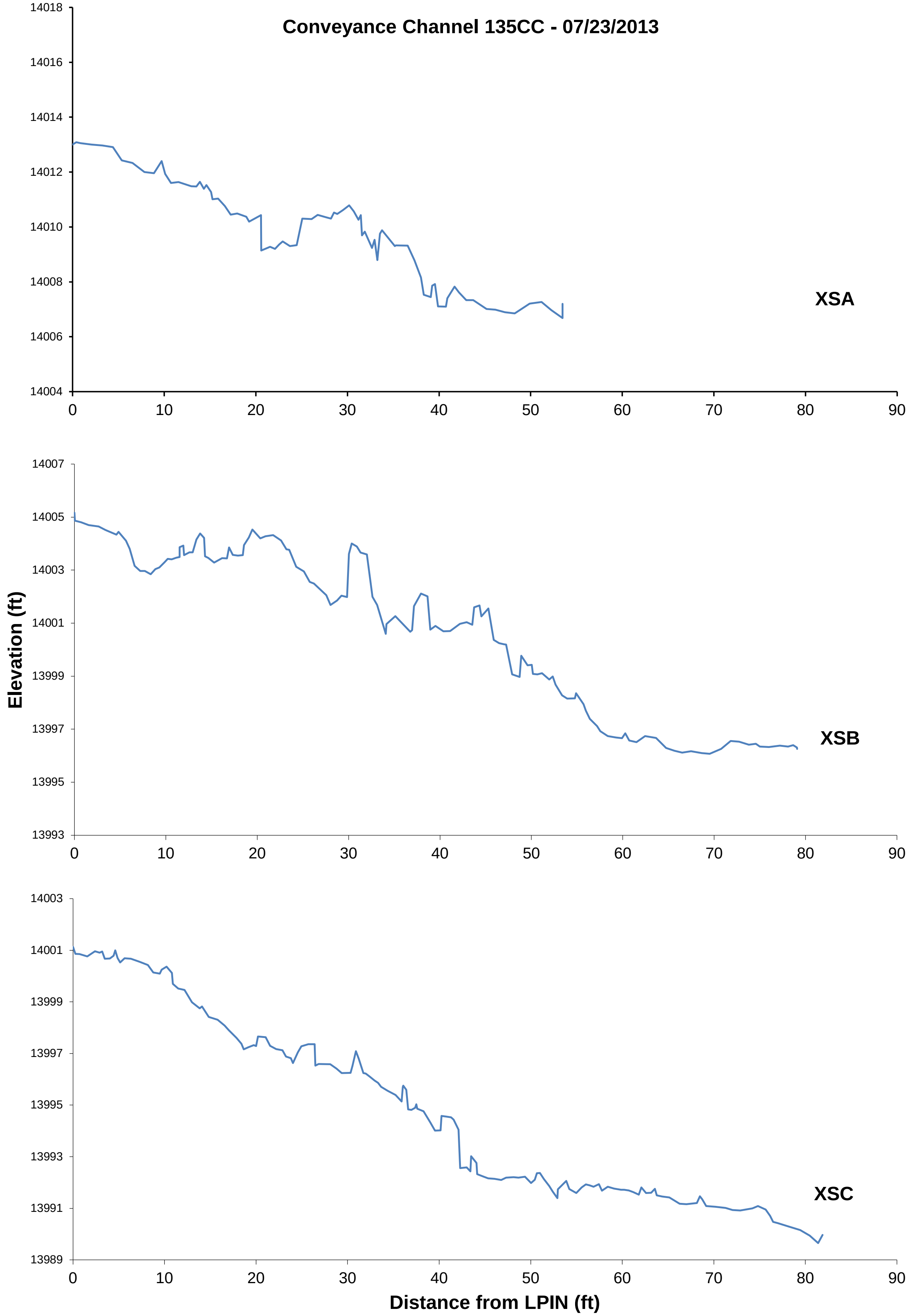

Conveyance Channel 129CC - 08/15/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13584
13582
13580
13578
13576
13574
13572
13570
13568
13566
13564
13562
13560
13558
13556
13554
13552
13550
13548
0
10
20
30
40
50
60

Conveyance Channel 130CC - 07/24/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)

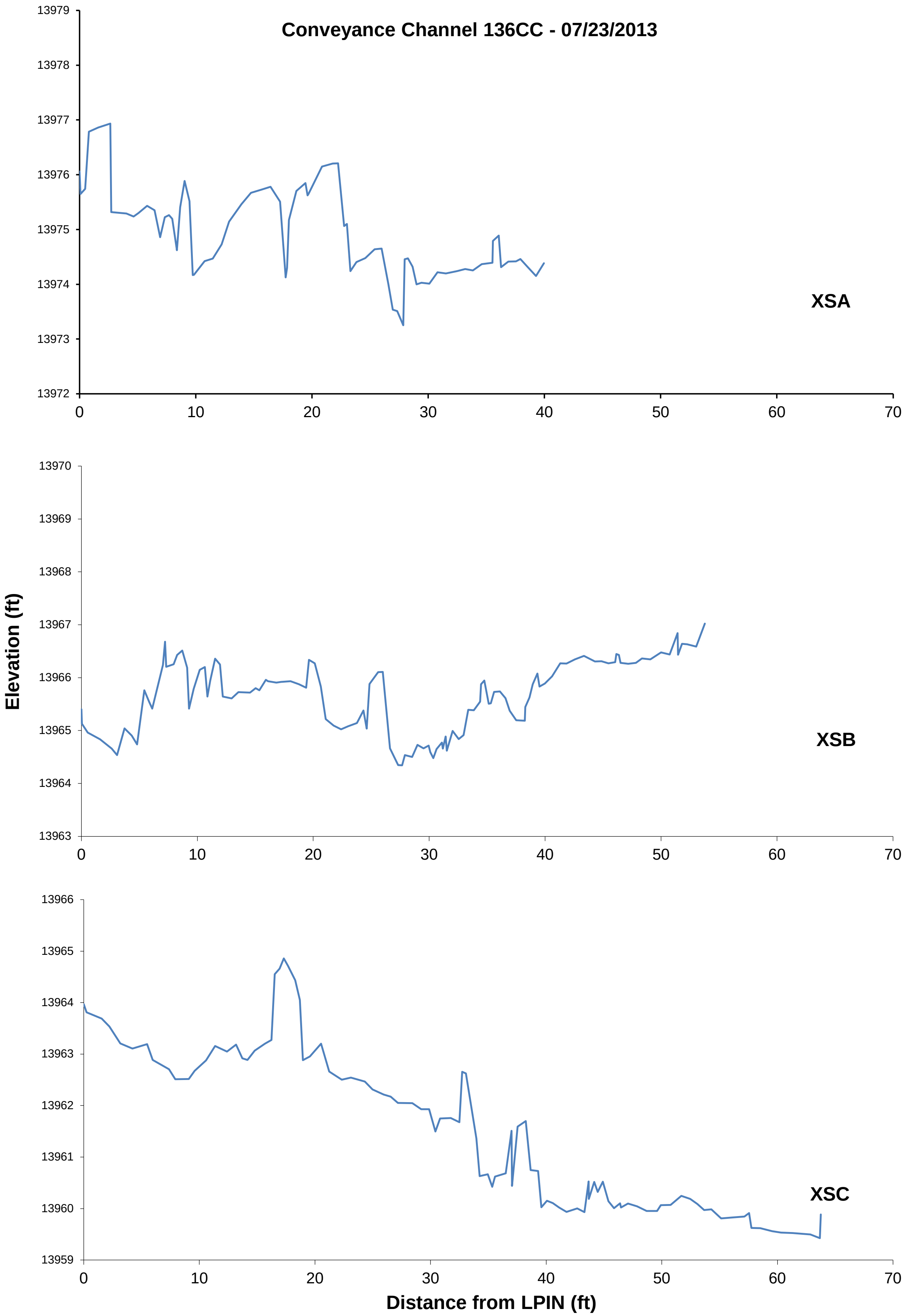

Conveyance Channel 132CC - 07/24/2013
13581
13580
13579
13578
13577
13576
13575
XSA
13576
13575
13574
13573
13572
13571
13570
XSB
13571
13570
13569
13568
13567
13566
13565
XSC
0 5 10 15 20 25 30 35 40 45 50 55
Elevation (ft)
Distance from LPIN (ft)

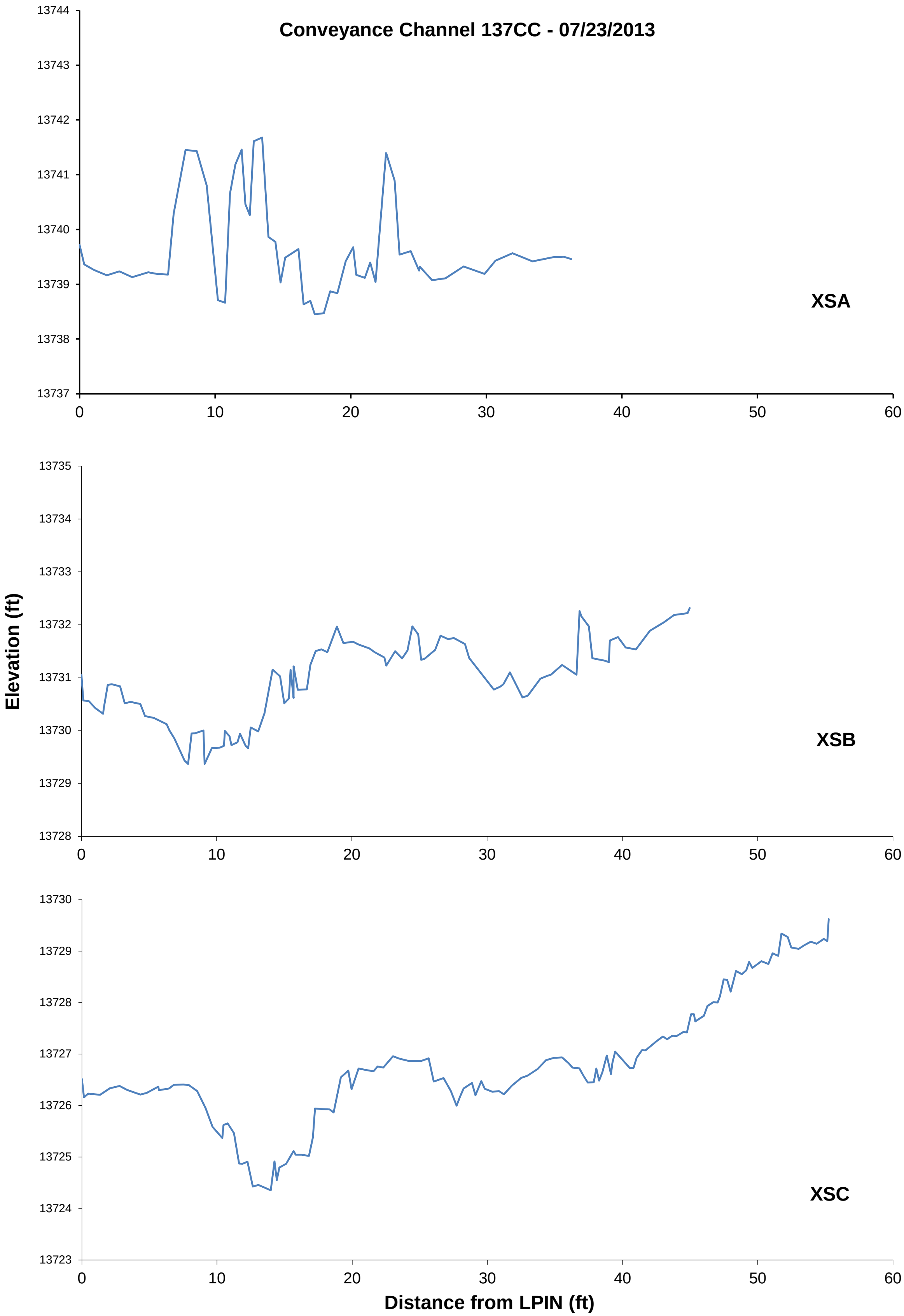


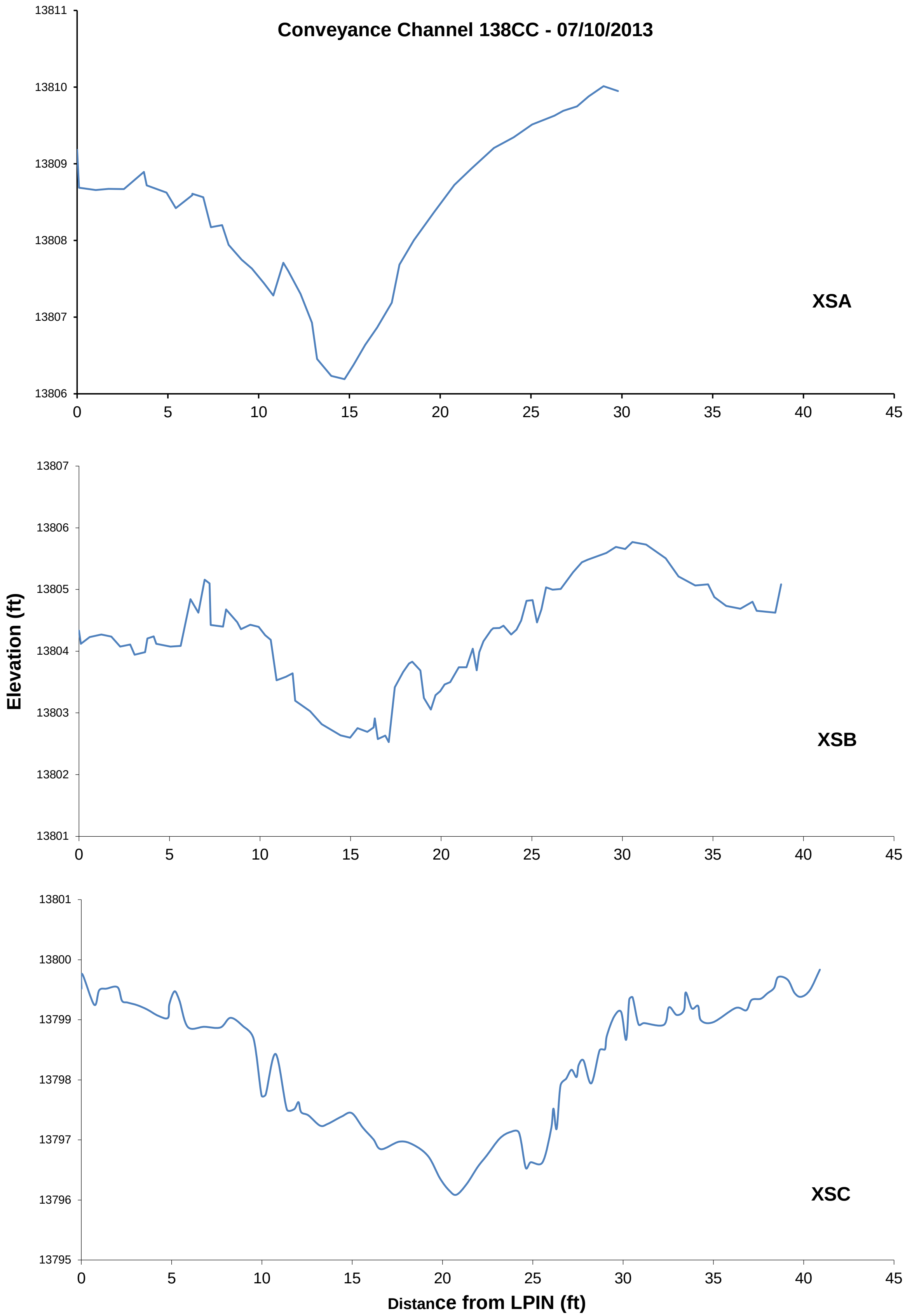
Conveyance Channel 133CC - 07/24/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
13269
13268
13267
13266
13265
13264
13263
13264
13263
13262
13261
13260
13259
13258
13259
13258
13257
13256
13255
13254
13253
0
10
20
30
40
50
60
70
80
90
100

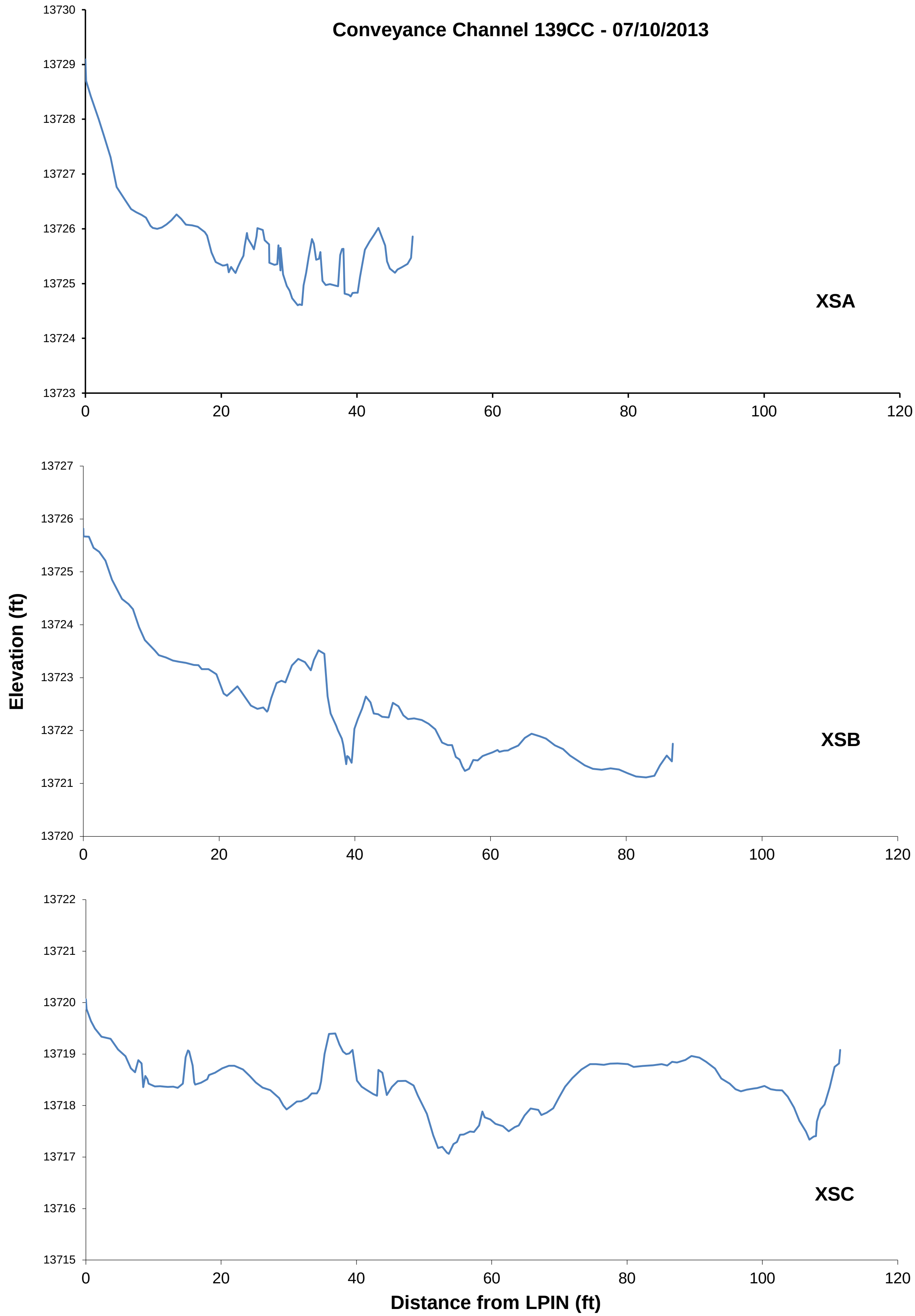


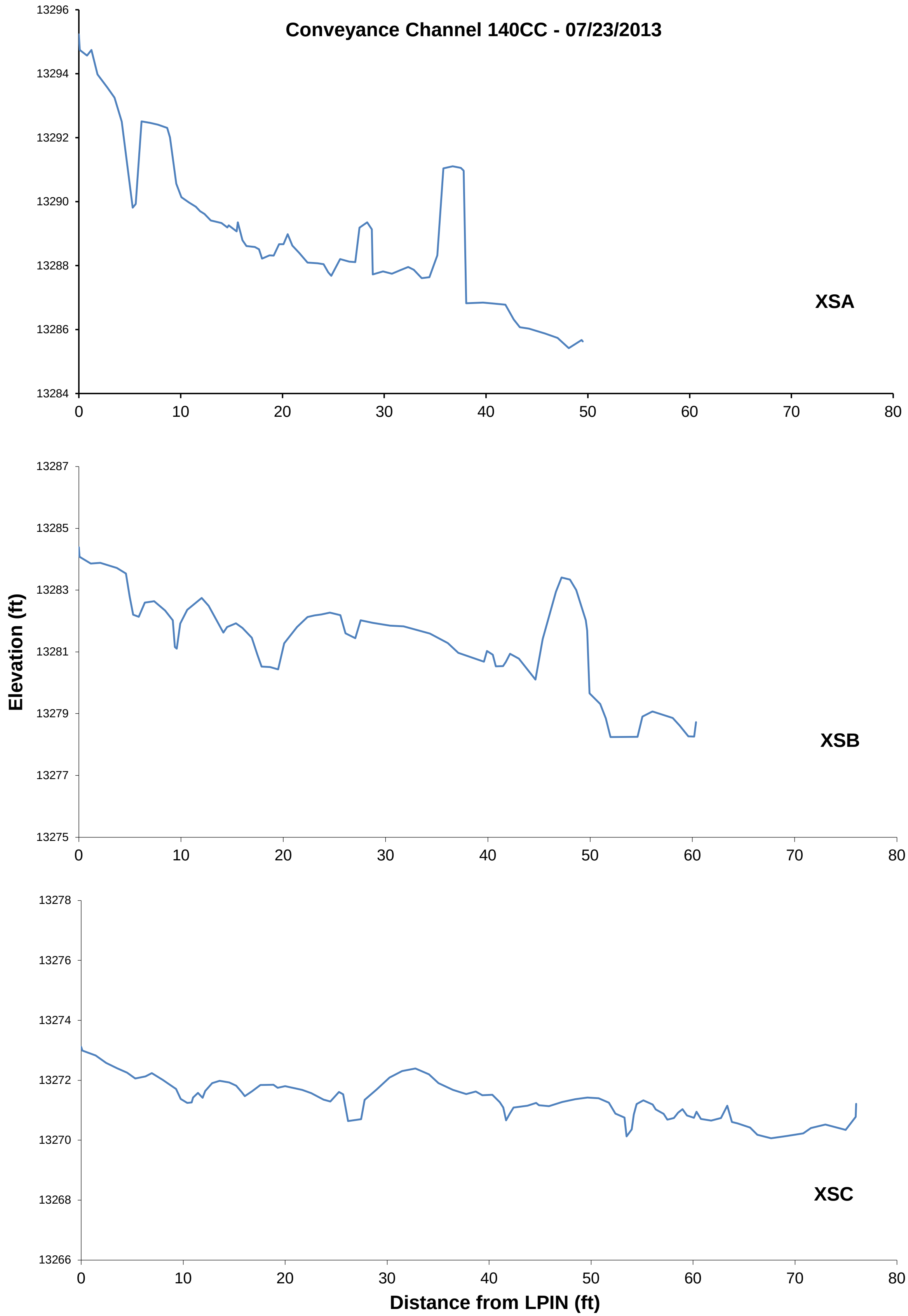
Conveyance Channel 135CC - 07/23/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)

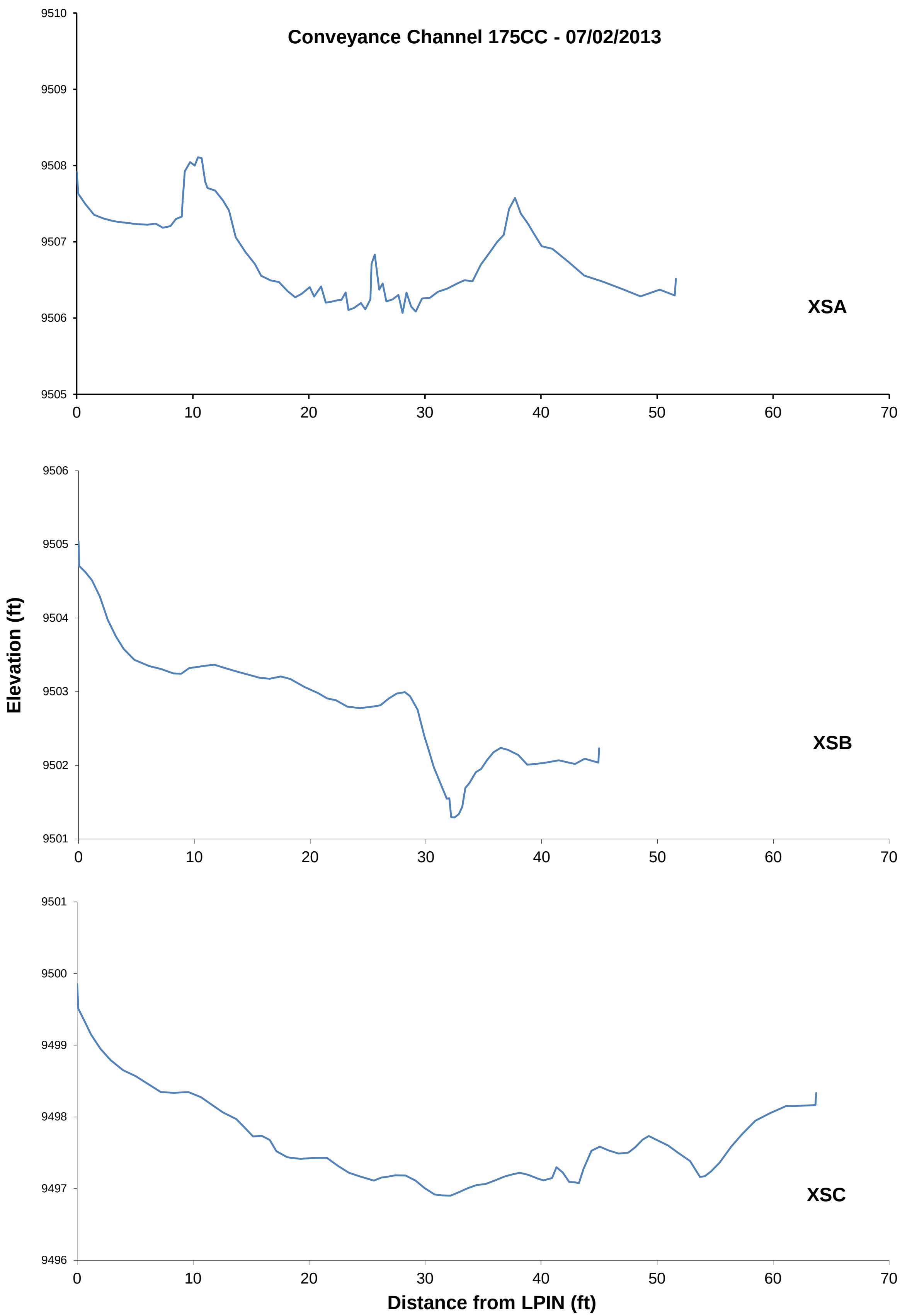

Conveyance Channel 136CC - 07/23/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
13979
13978
13977
13976
13975
13974
13973
13972
13970
13969
13968
13967
13966
13965
13964
13963
13966
13965
13964
13963
13962
13961
13960
13959
0
10
20
30
40
50
60
70

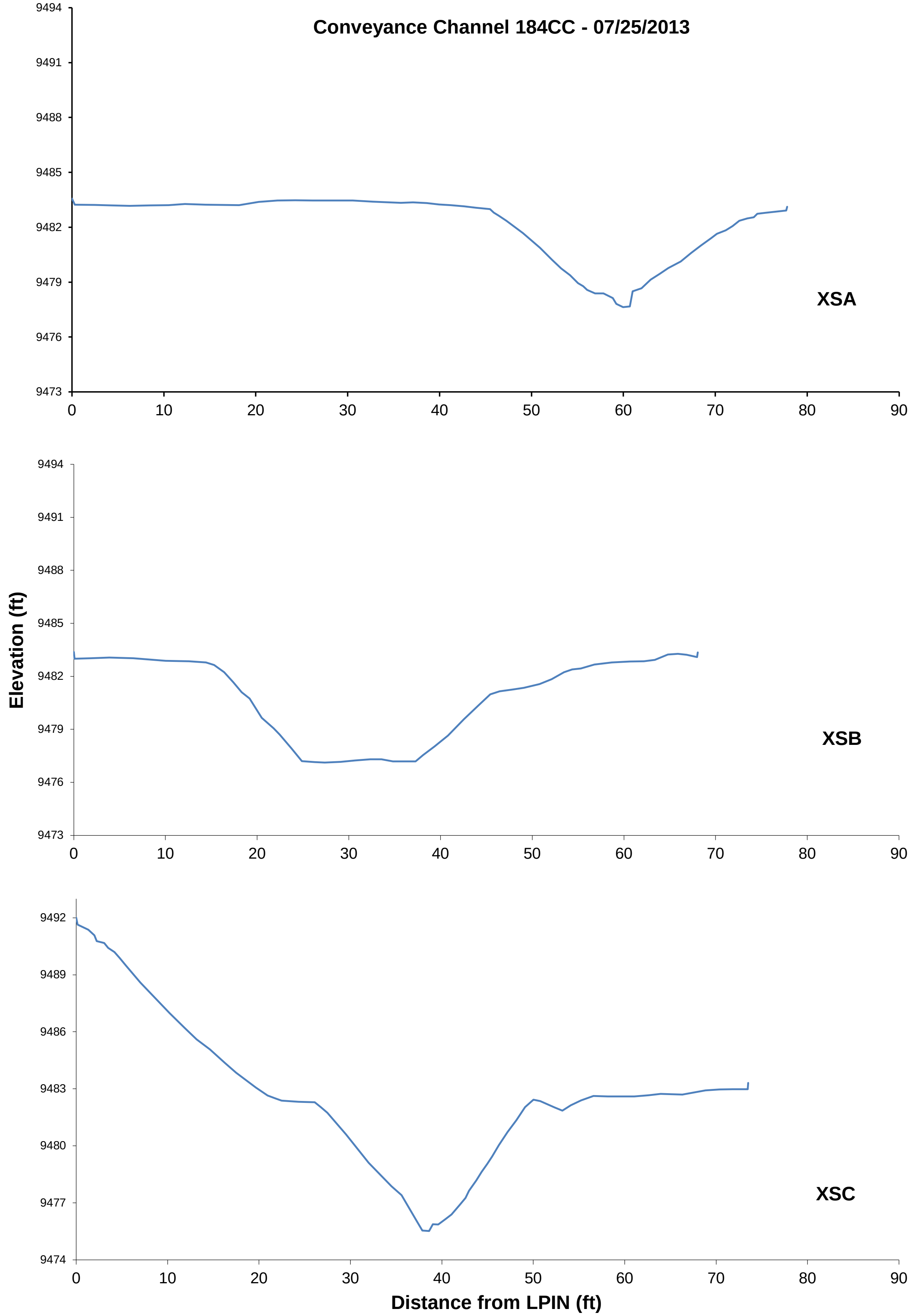

Conveyance Channel 137CC - 07/23/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
13744
13743
13742
13741
13740
13739
13738
13737
13735
13734
13733
13732
13731
13730
13729
13728
13730
13729
13728
13727
13726
13725
13724
13723
0
10
20
30
40
50
60

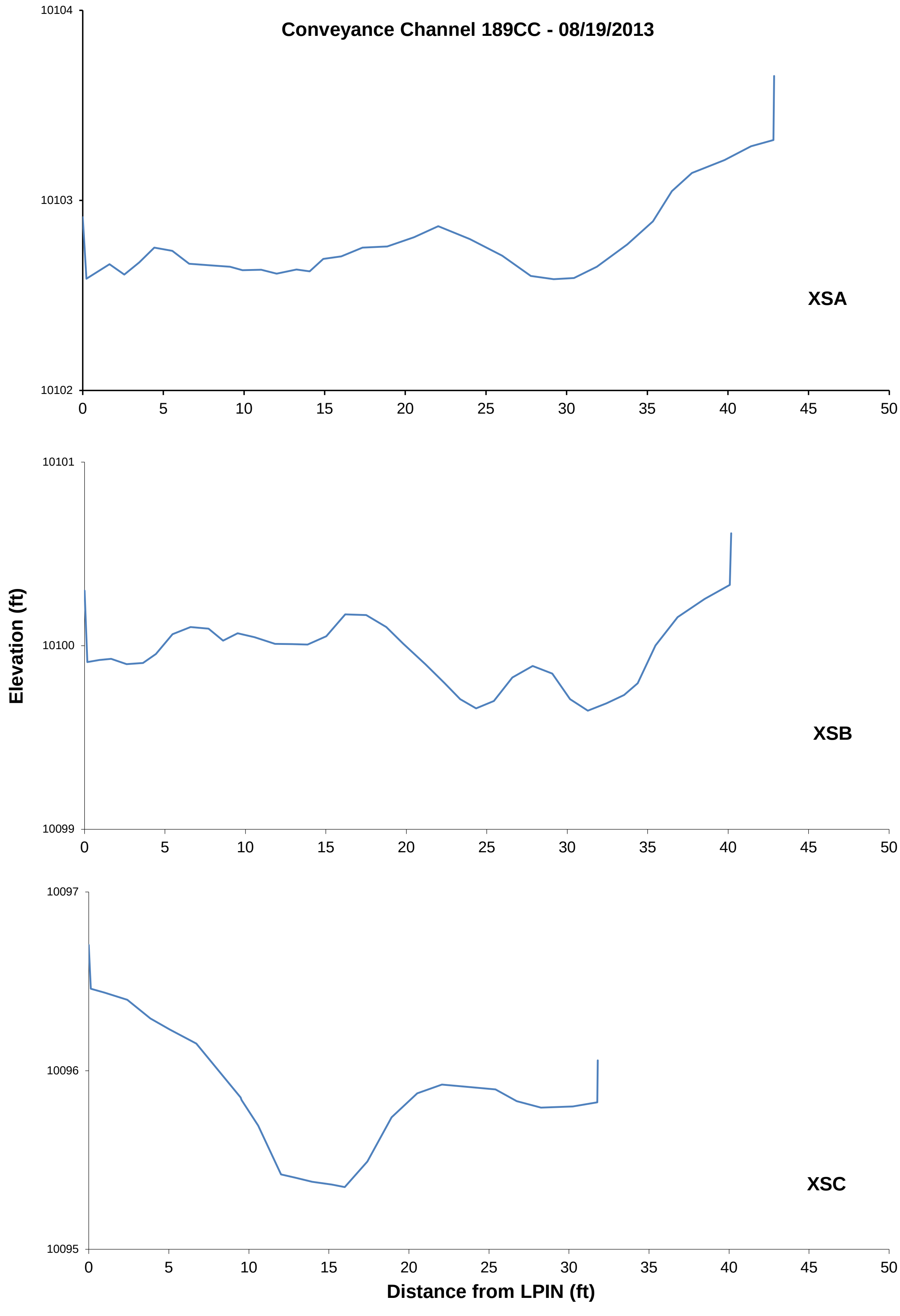

Conveyance Channel 138CC - 07/10/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13811
13810
13809
13808
13807
13806
13805
13804
13803
13802
13801
13800
13799
13798
13797
13796
13795
0
5
10
15
20
25
30
35
40
45

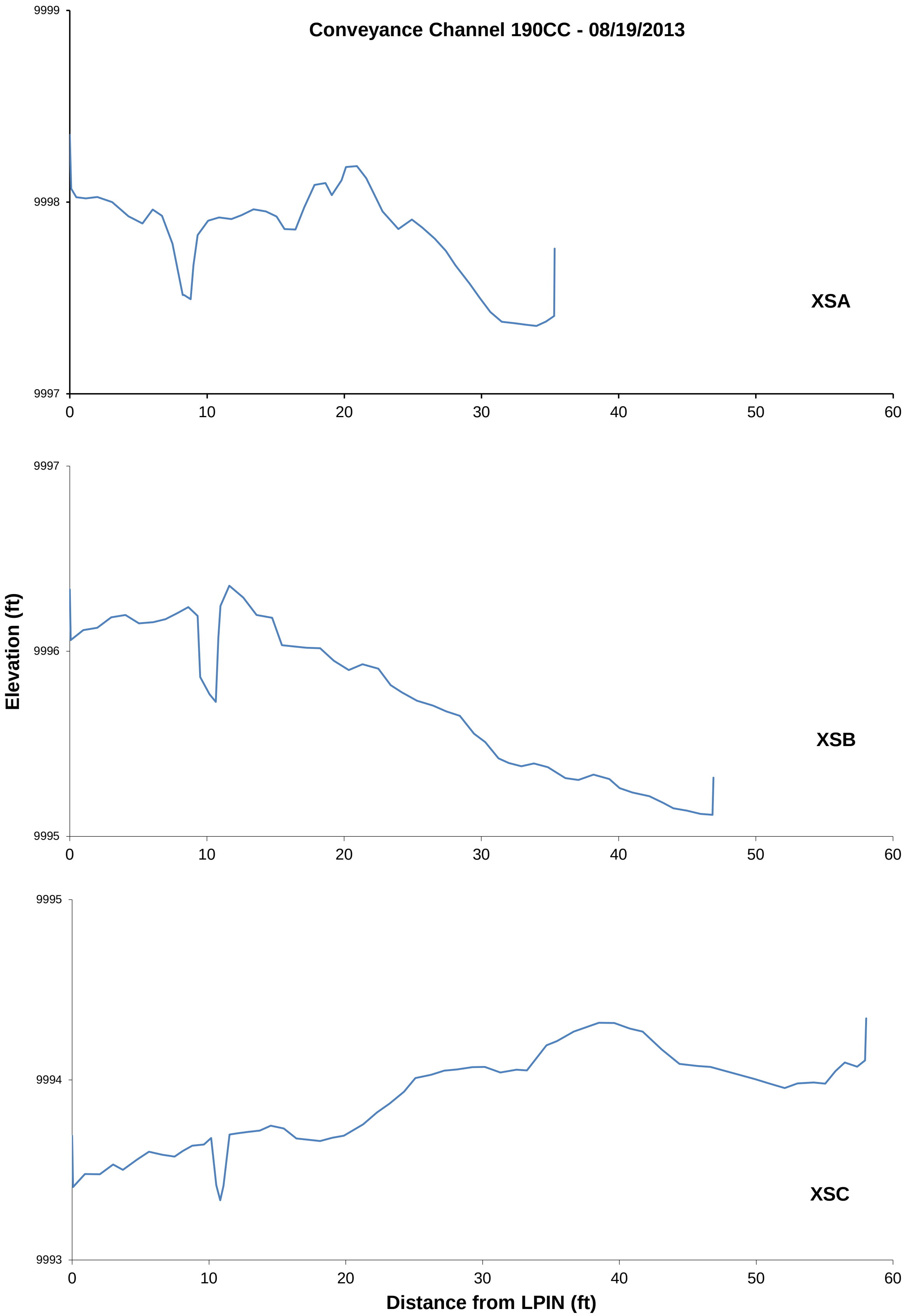

Conveyance Channel 139CC - 07/10/2013
13730
13729
13728
13727
13726
13725
13724
13723
0
20
40
60
80
100
120
XSA
13727
13726
13725
13724
13723
13722
13721
13720
XSB
13722
13721
13720
13719
13718
13717
13716
13715
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 140CC - 07/23/2013
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

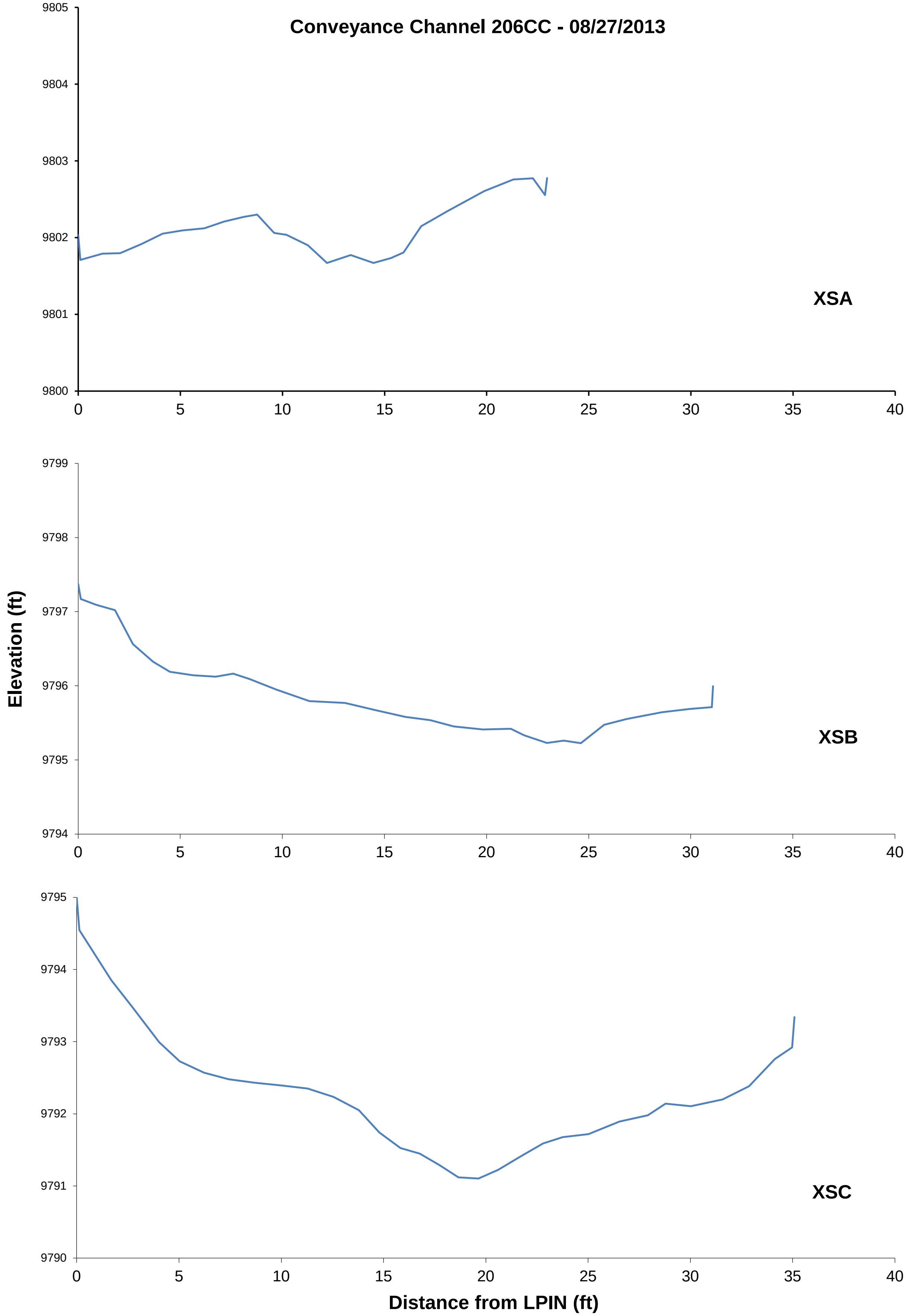

Conveyance Channel 175CC - 07/02/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9510
9509
9508
9507
9506
9505
9504
9503
9502
9501
9500
9499
9498
9497
9496
0
10
20
30
40
50
60
70


Conveyance Channel 184CC - 07/25/2013
Elevation (ft)
XSA
XSB
XSC
9494
9491
9488
9485
9482
9479
9476
9473
9492
9489
9486
9483
9480
9477
9474
0
10
20
30
40
50
60
70
80
90
Distance from LPIN (ft)

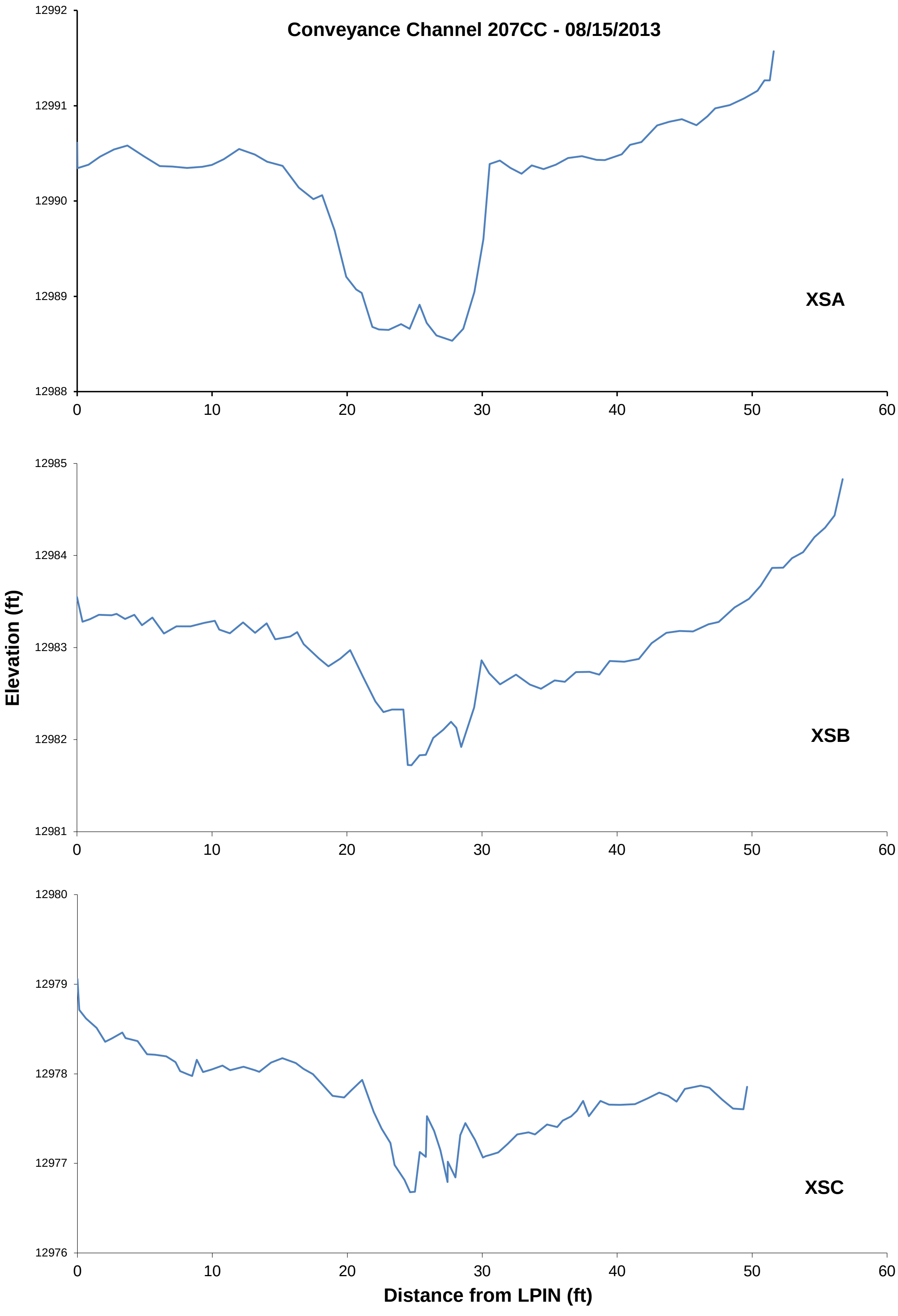

Conveyance Channel 189CC - 08/19/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10104
10103
10102
10101
10100
10099
10097
10096
10095
0 5 10 15 20 25 30 35 40 45 50



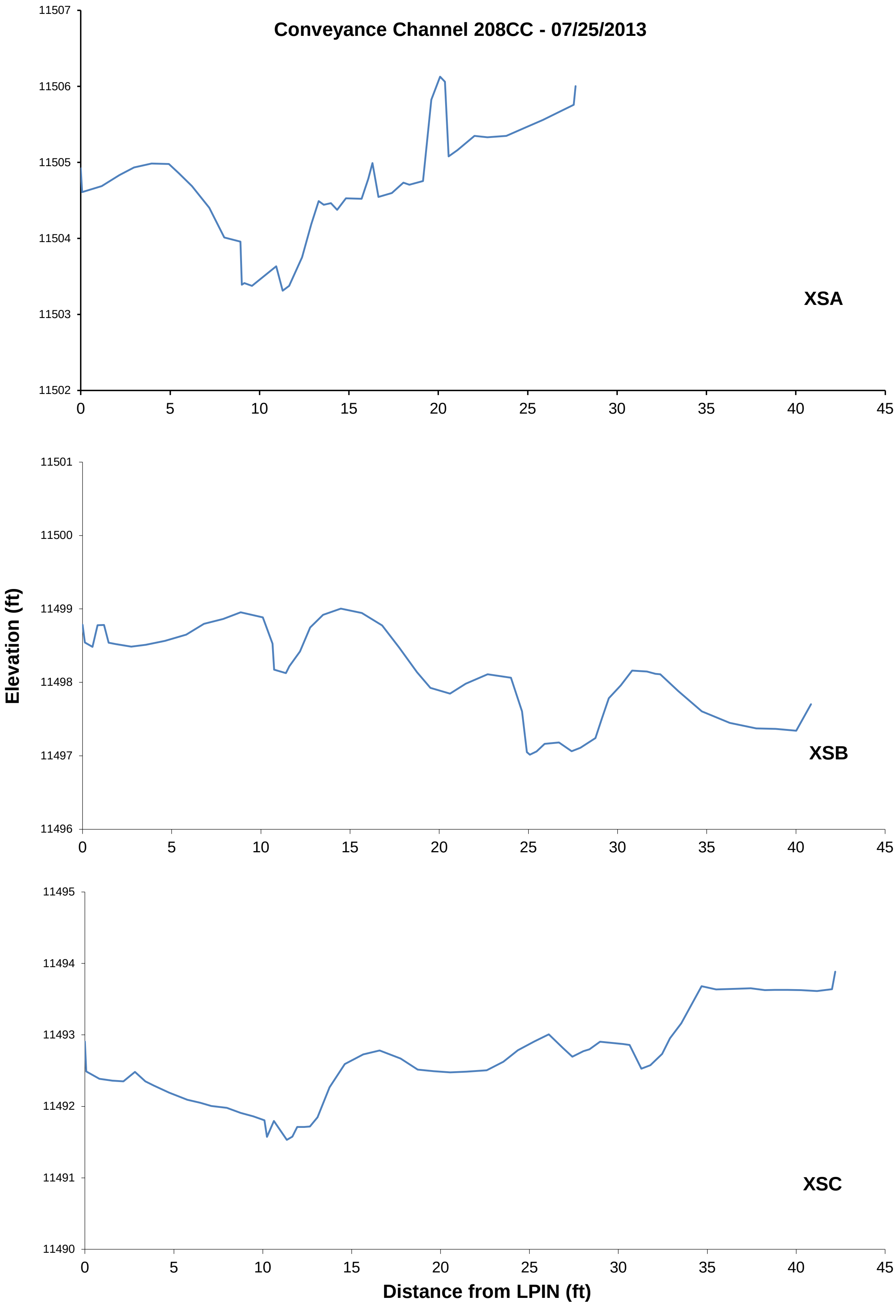
Conveyance Channel 190CC - 08/19/2013
Elevation (ft)
9999
9998
9997
XSA
0
10
20
30
40
50
60
9997
9996
9995
XSB
0
10
20
30
40
50
60
9995
9994
9993
XSC
0
10
20
30
40
50
60
Distance from LPIN (ft)

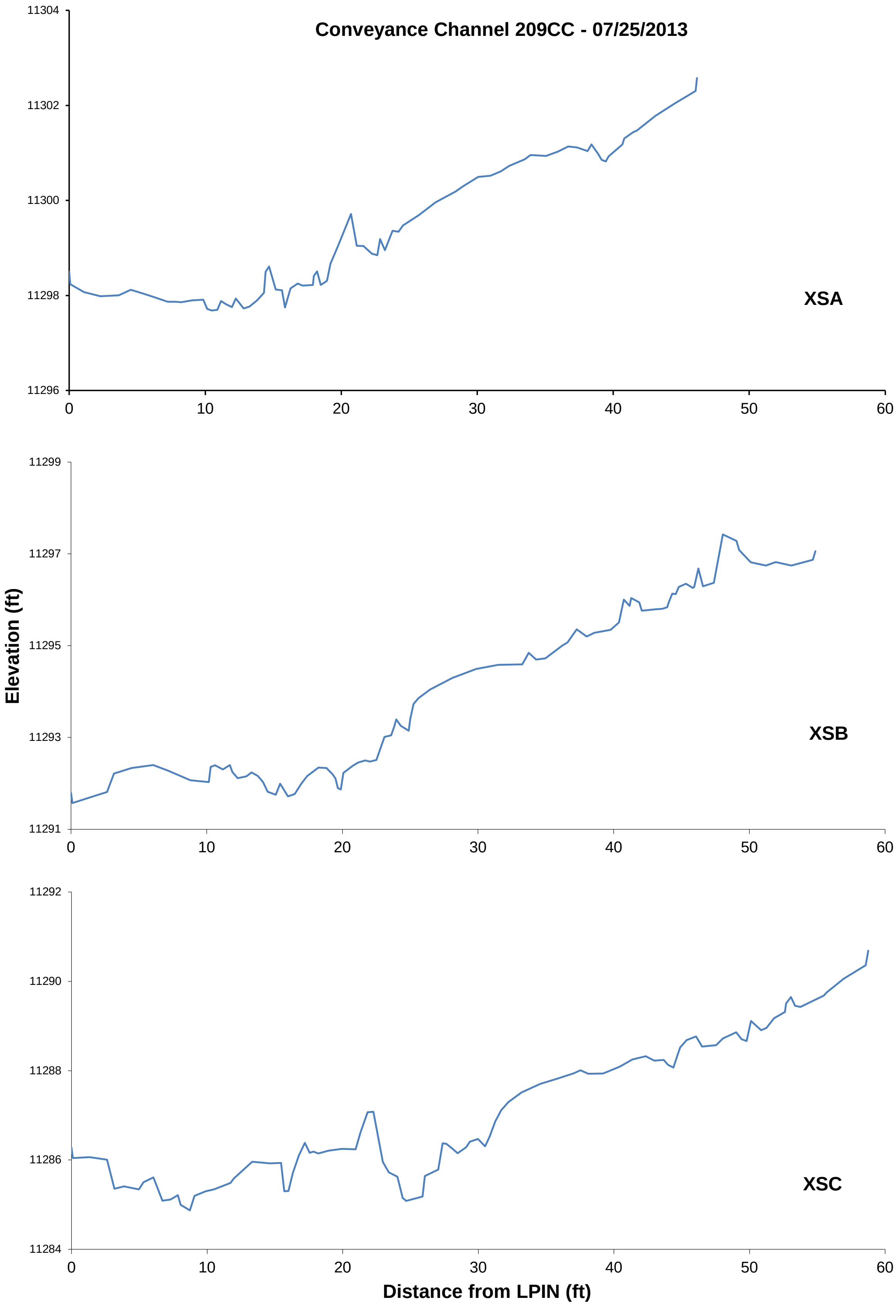


Conveyance Channel 206CC - 08/27/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9805
9804
9803
9802
9801
9800
9799
9798
9797
9796
9795
9794
9793
9792
9791
9790
0
5
10
15
20
25
30
35
40

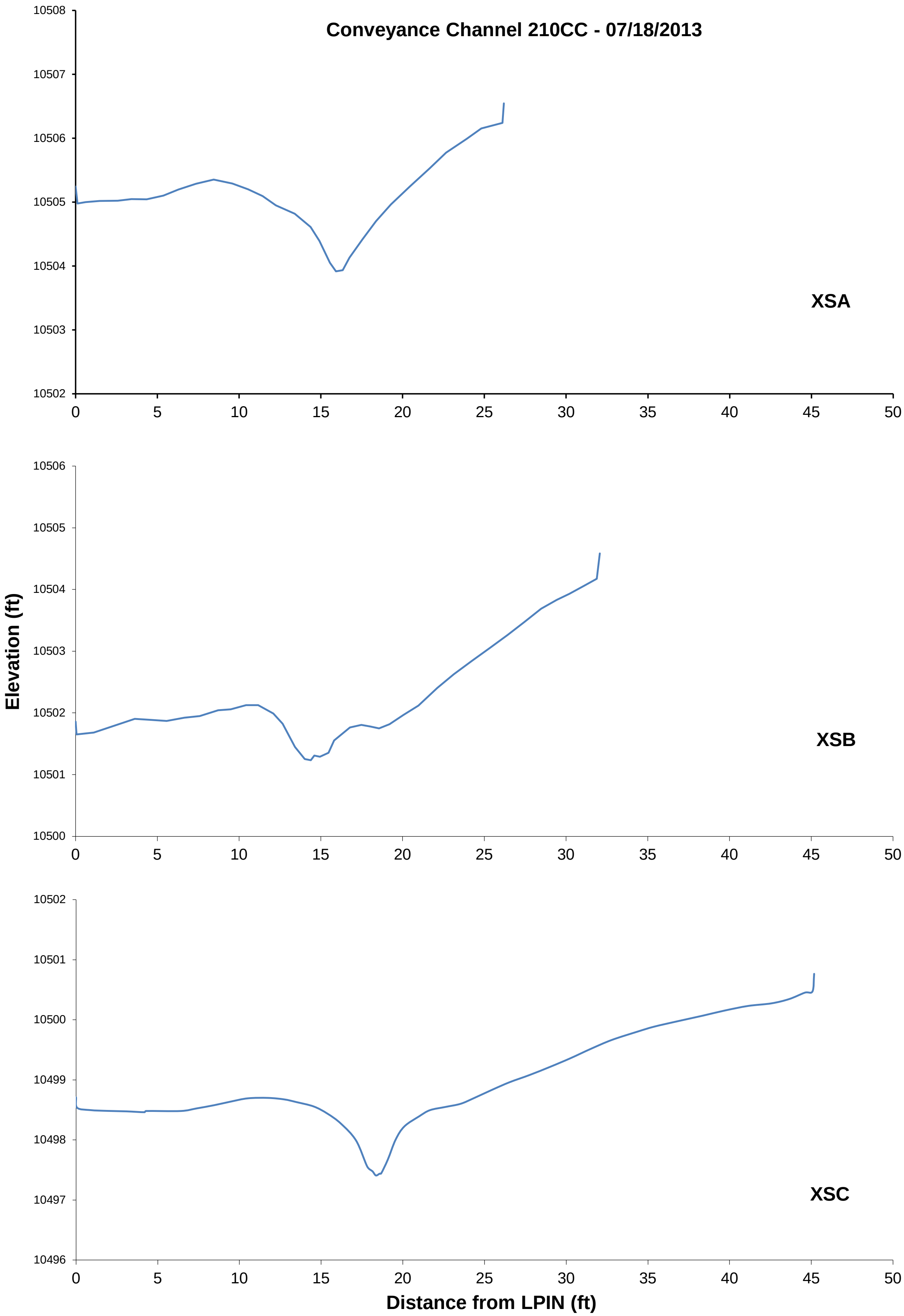


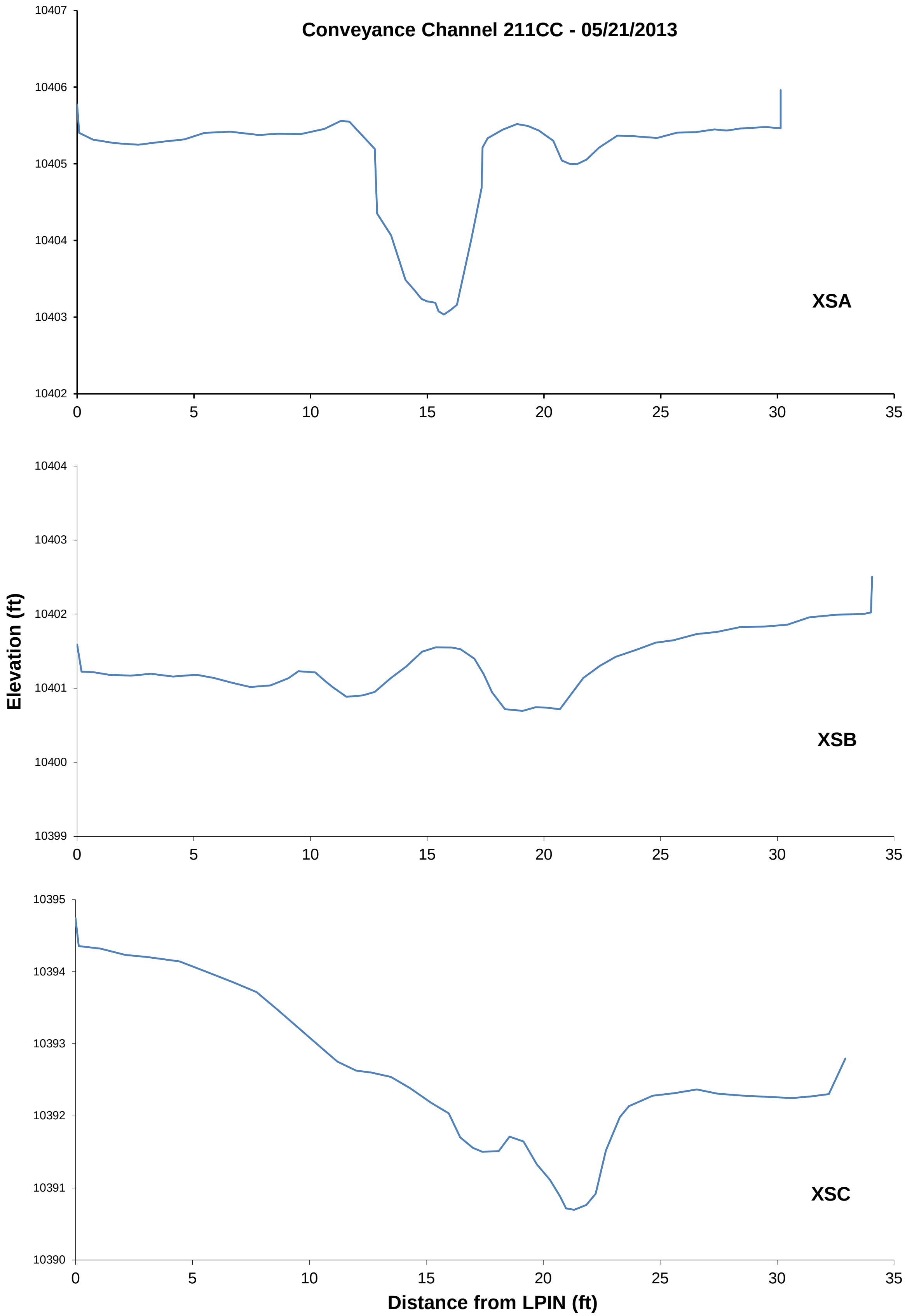
Conveyance Channel 207CC - 08/15/2013
Elevation (ft)
XSA
XSB
XSC
12992
12991
12990
12989
12988
12985
12984
12983
12982
12981
12980
12979
12978
12977
12976
0
10
20
30
40
50
60
Distance from LPIN (ft)

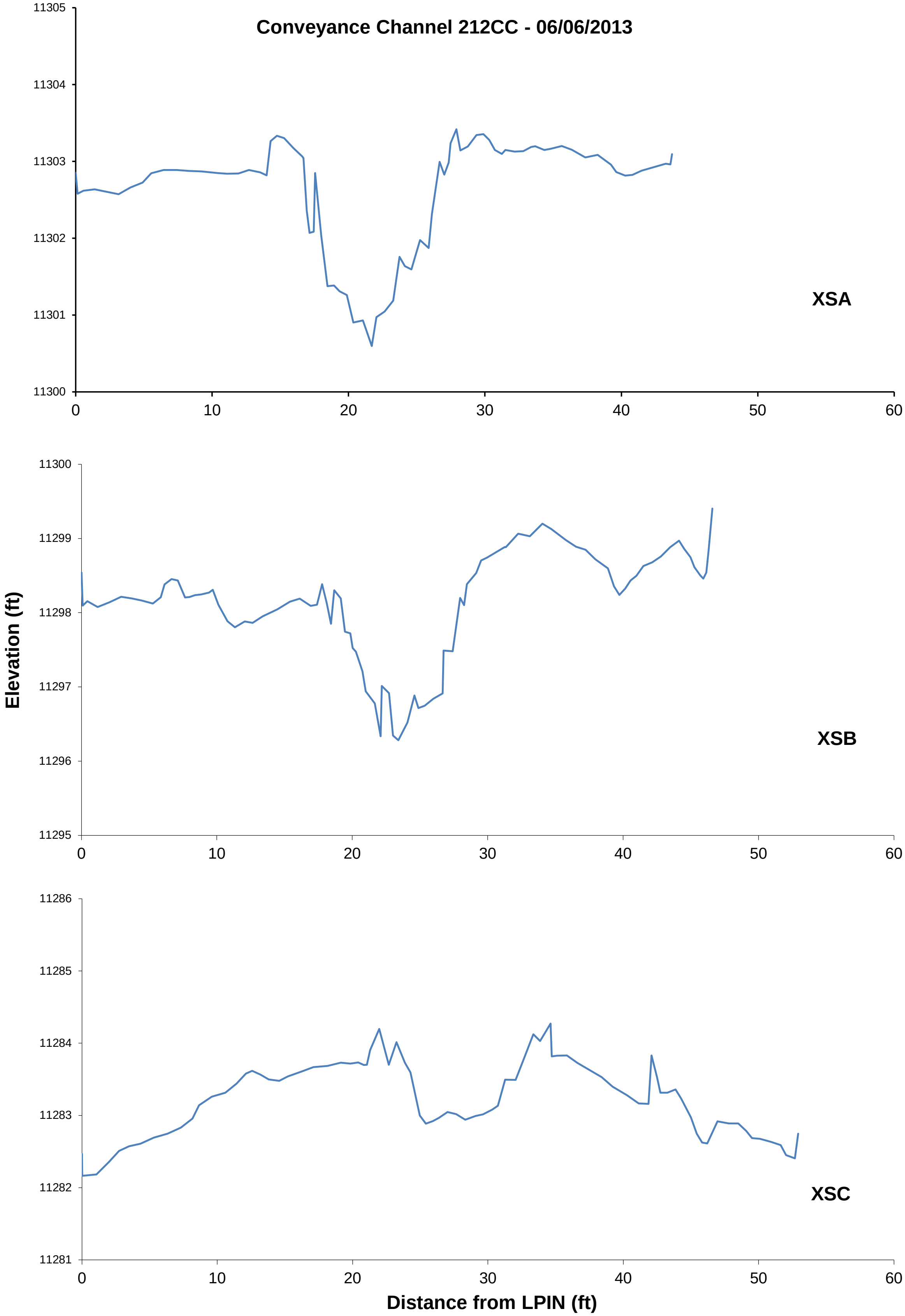

Conveyance Channel 208CC - 07/25/2013
11507
11506
11505
11504
11503
11502
0
5
10
15
20
25
30
35
40
45
XSA
11501
11500
11499
11498
11497
11496
XSB
Elevation (ft)
11495
11494
11493
11492
11491
11490
XSC
Distance from LPIN (ft)

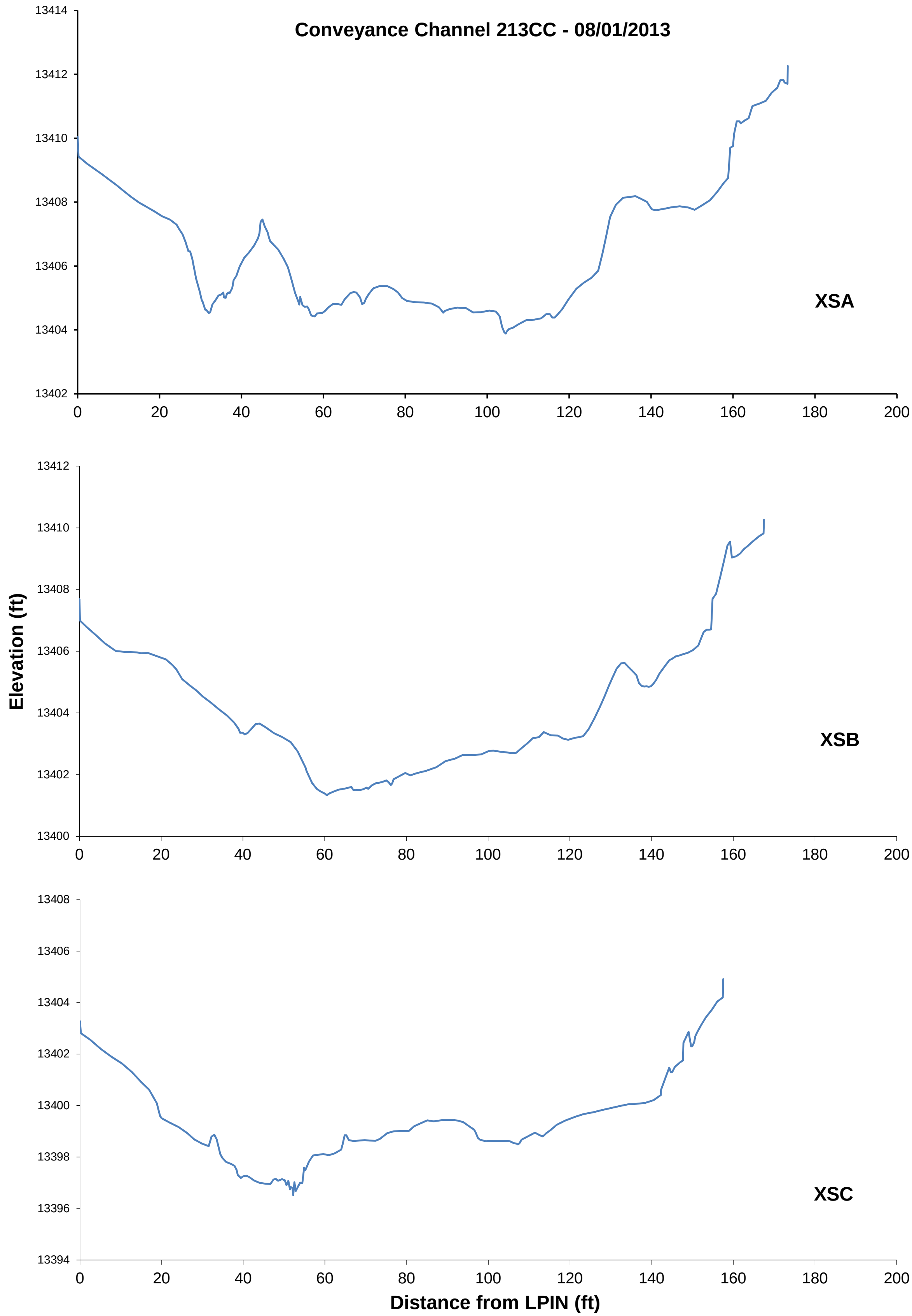


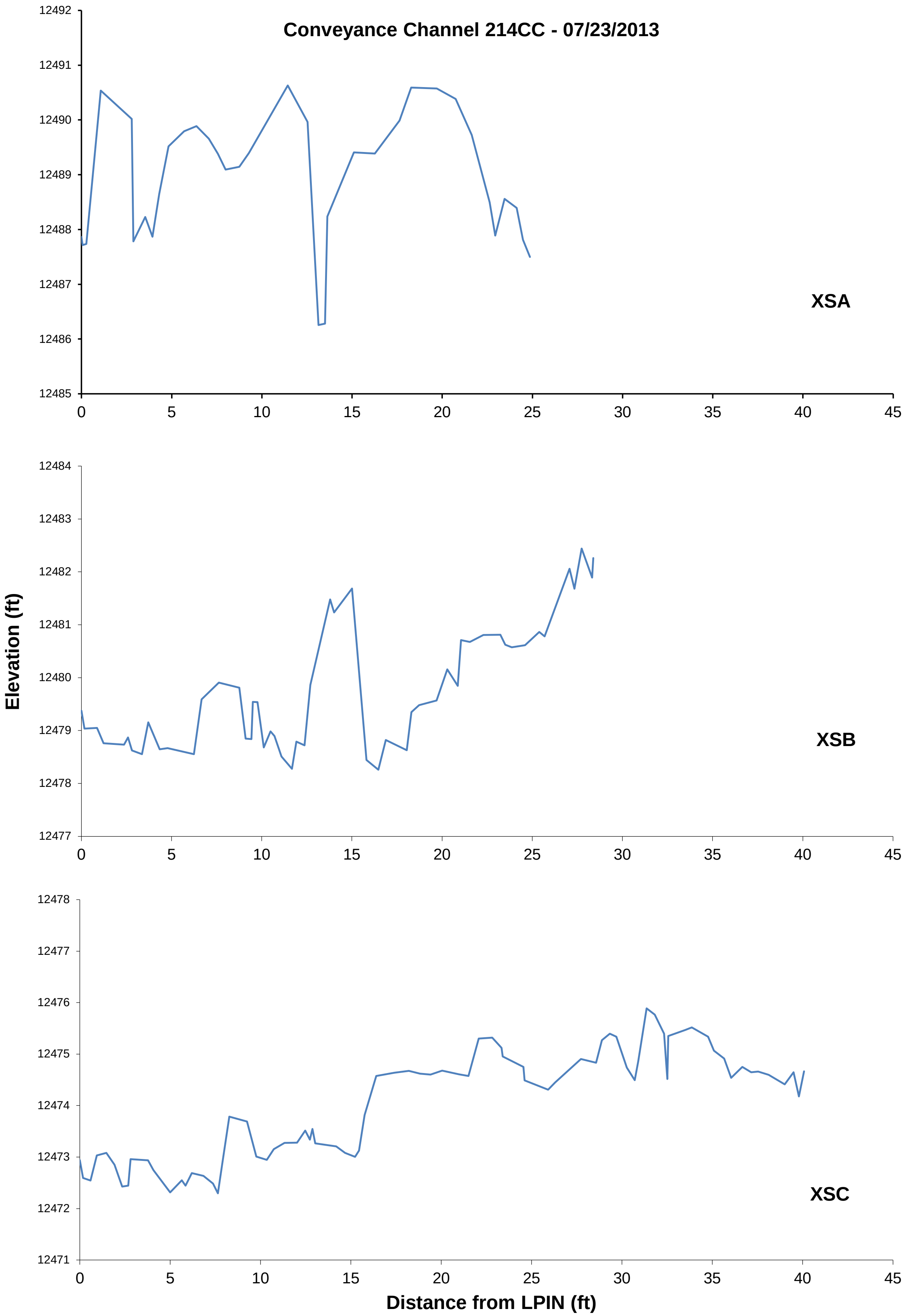
Conveyance Channel 209CC - 07/25/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11304
11302
11300
11298
11296
11299
11297
11295
11293
11291
11292
11290
11288
11286
11284
0
10
20
30
40
50
60

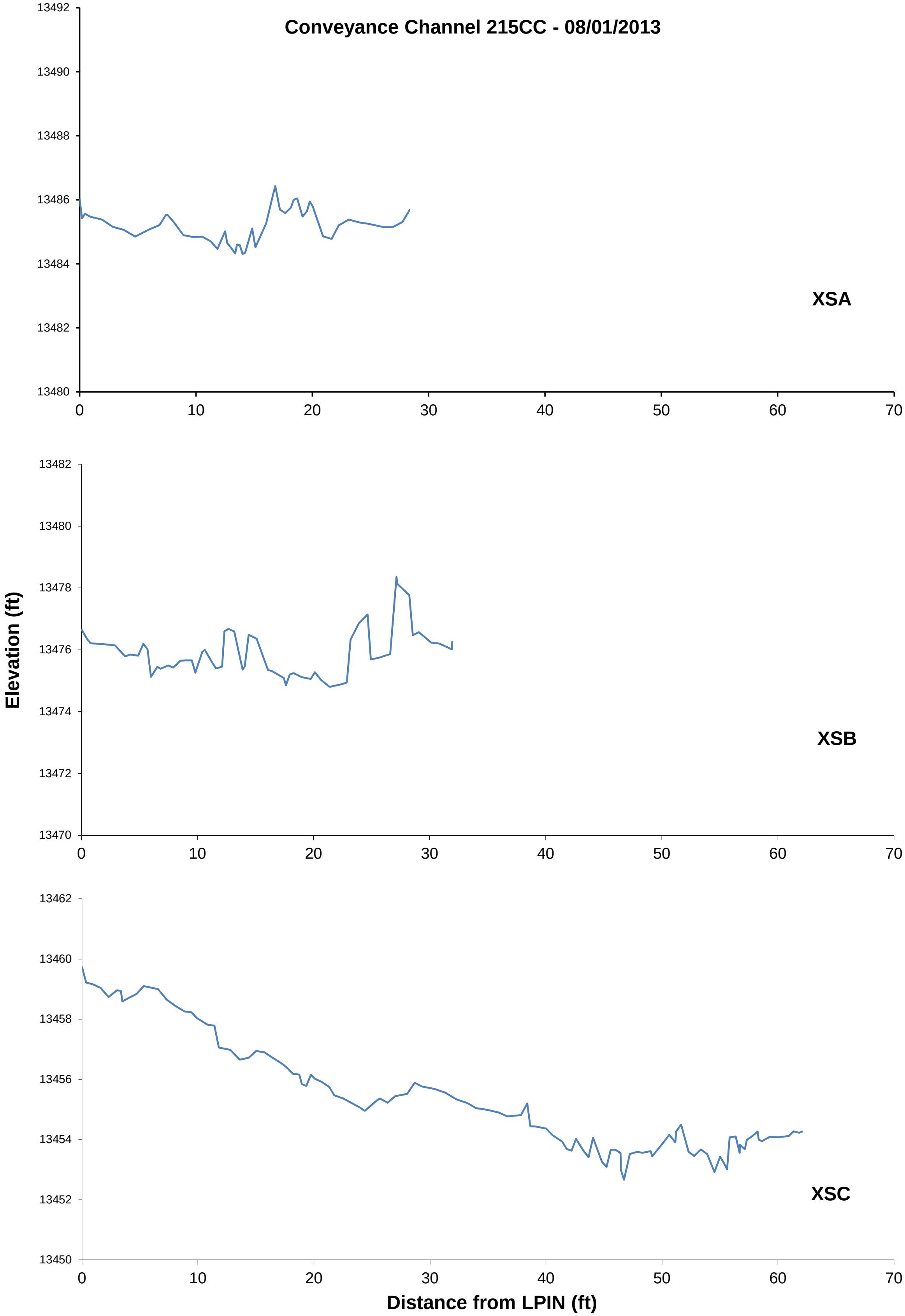

Conveyance Channel 210CC - 07/18/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10508
10507
10506
10505
10504
10503
10502
10500
10501
10499
10498
10497
10496
0
5
10
15
20
25
30
35
40
45
50

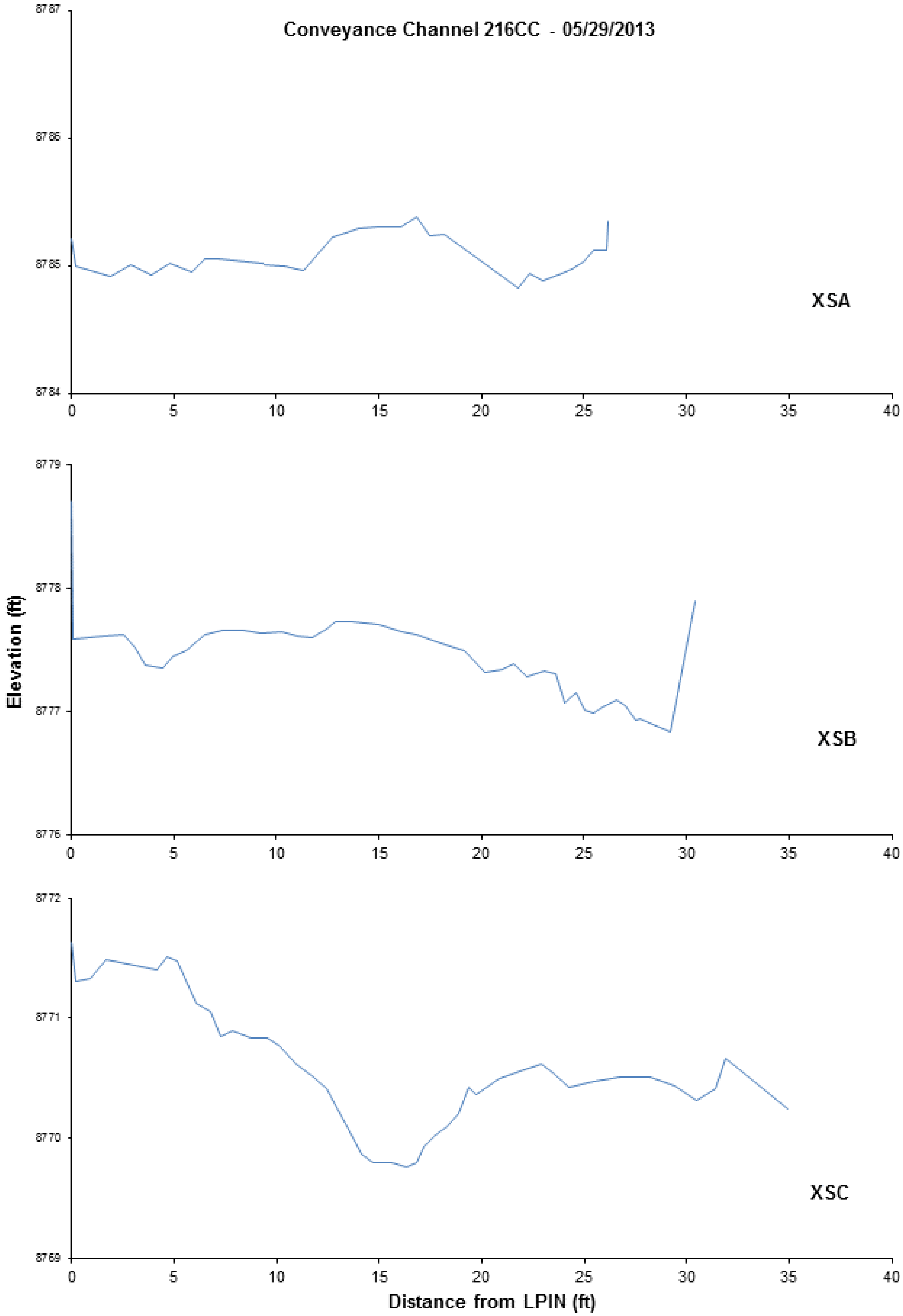

Conveyance Channel 211CC - 05/21/2013
Elevation (ft)
10407
10406
10405
10404
10403
10402
XSA
10404
10403
10402
10401
10400
10399
XSB
10395
10394
10393
10392
10391
10390
XSC
0
5
10
15
20
25
30
35
Distance from LPIN (ft)

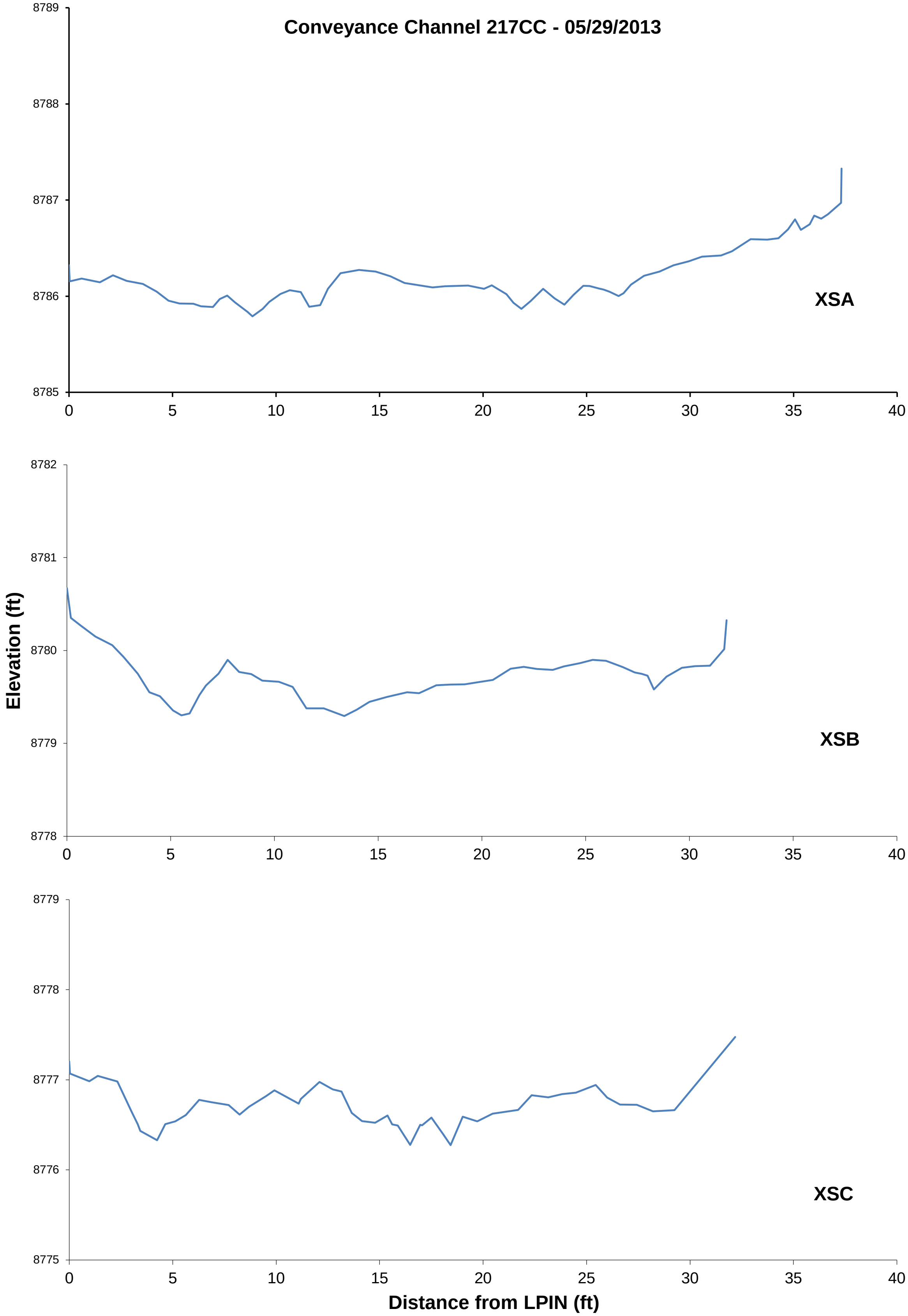

Conveyance Channel 212CC - 06/06/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11305
11304
11303
11302
11301
11300
11299
11298
11297
11296
11295
11286
11285
11284
11283
11282
11281
0
10
20
30
40
50
60


Conveyance Channel 213CC - 08/01/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13414
13412
13410
13408
13406
13404
13402
13400
13398
13396
13394
0
20
40
60
80
100
120
140
160
180
200

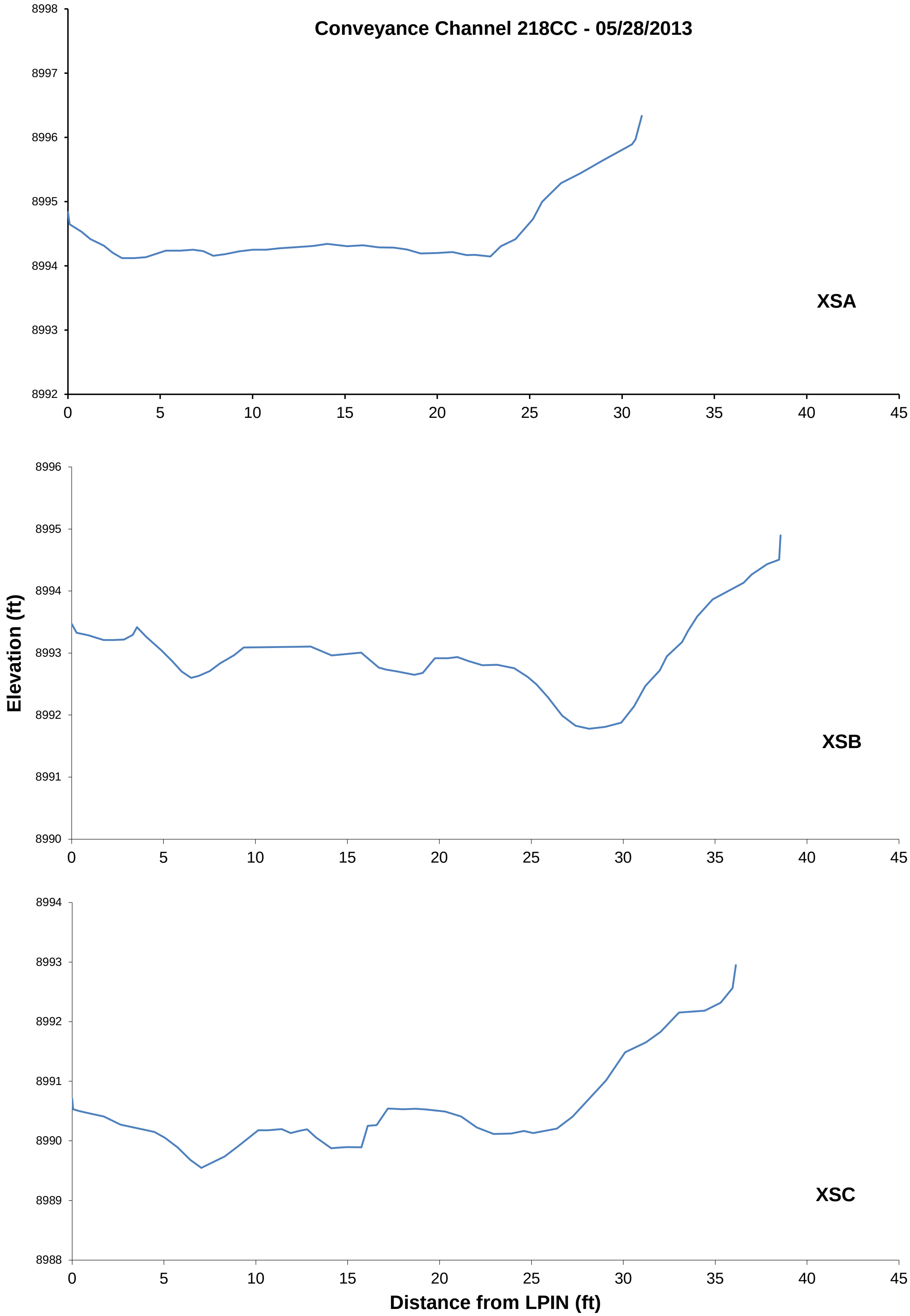

Conveyance Channel 214CC - 07/23/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
12492
12491
12490
12489
12488
12487
12486
12485
12484
12483
12482
12481
12480
12479
12478
12477
12476
12475
12474
12473
12472
12471
0
5
10
15
20
25
30
35
40
45

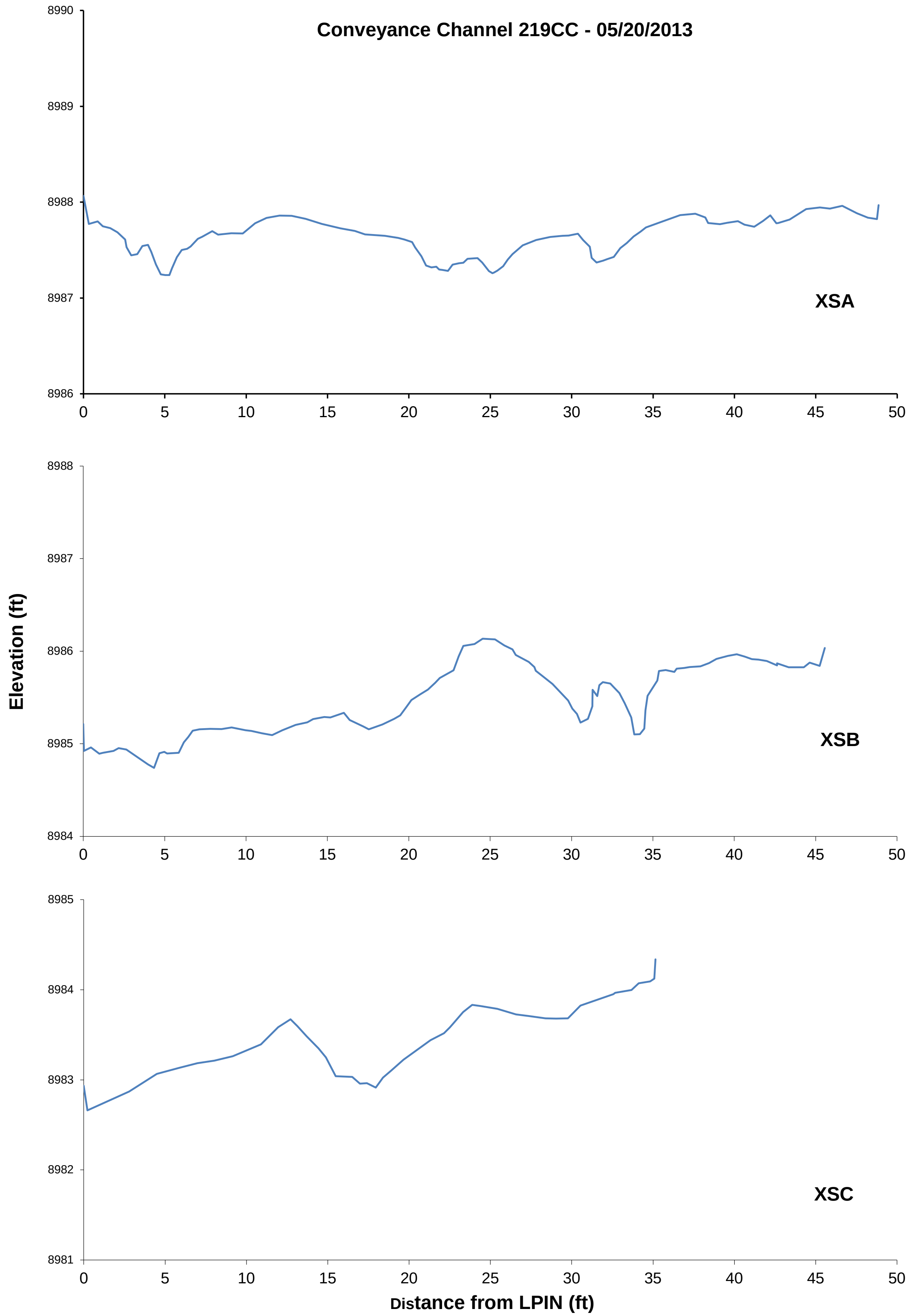

Conveyance Channel 215CC - 08/01/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
13492
13490
13488
13486
13484
13482
13480
13478
13476
13474
13472
13470
13462
13460
13458
13456
13454
13452
13450
0
10
20
30
40
50
60
70

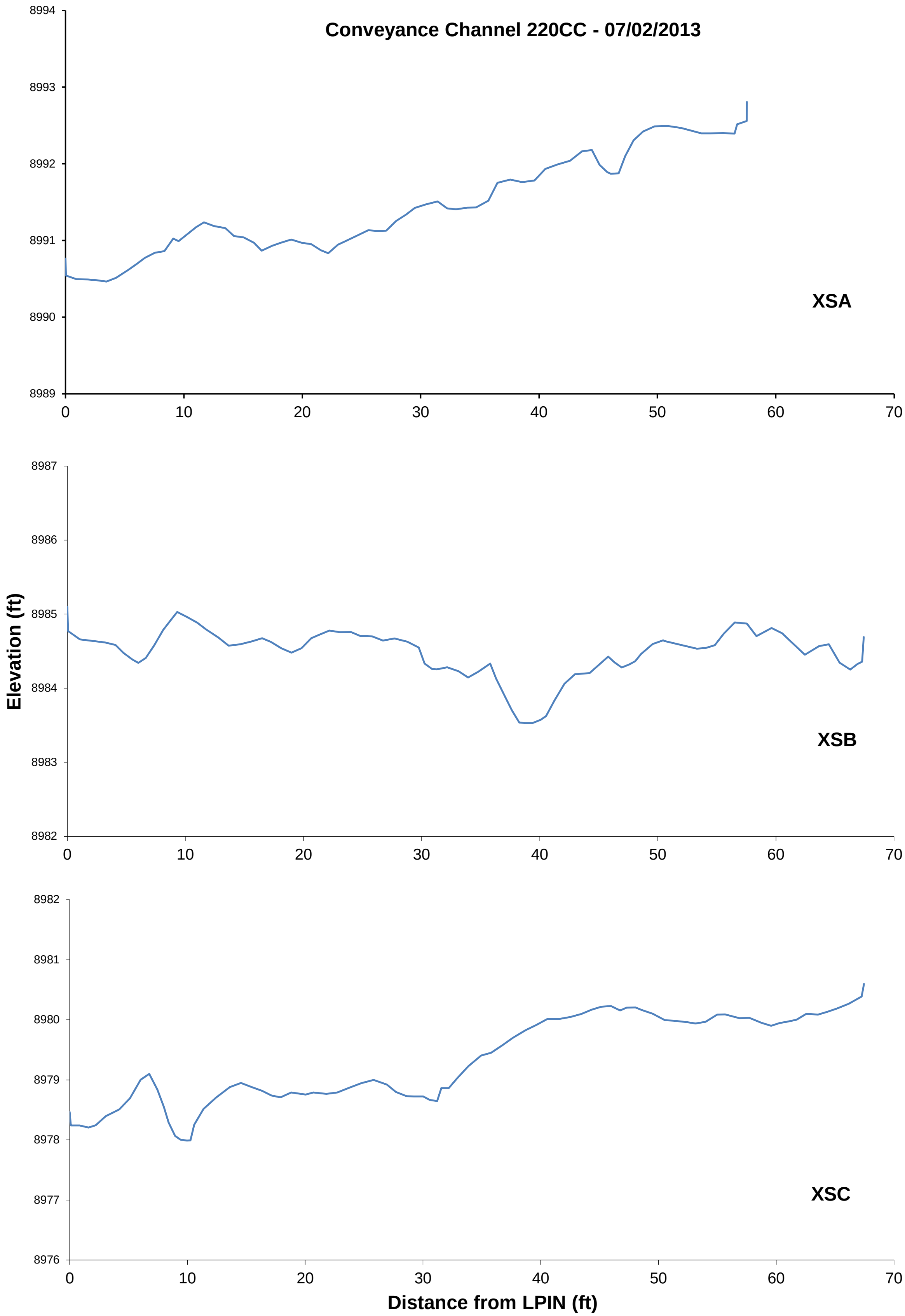

Conveyance Channel 216CC - 05/29/2013
8787
8786
8785
8784
XSA
8779
8778
8777
8776
XSB
8772
8771
8770
8769
XSC
0
5
10
15
20
25
30
35
40
Elevation (ft)
Distance from LPIN (ft)



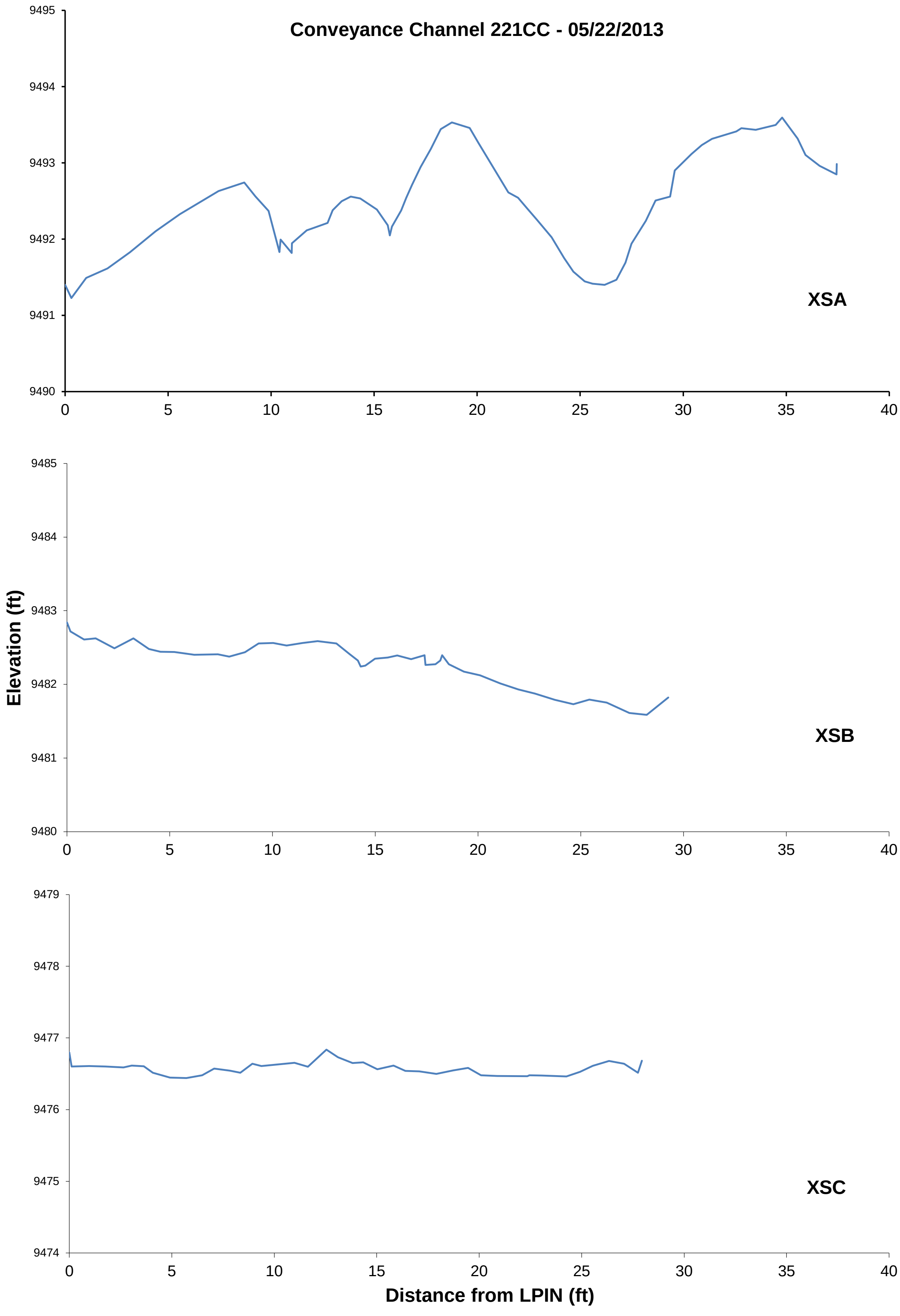
Conveyance Channel 217CC - 05/29/2013
8789
8788
8787
8786
8785
XSA
8782
8781
8780
8779
8778
XSB
8779
8778
8777
8776
8775
XSC
0
5
10
15
20
25
30
35
40
Elevation (ft)
Distance from LPIN (ft)

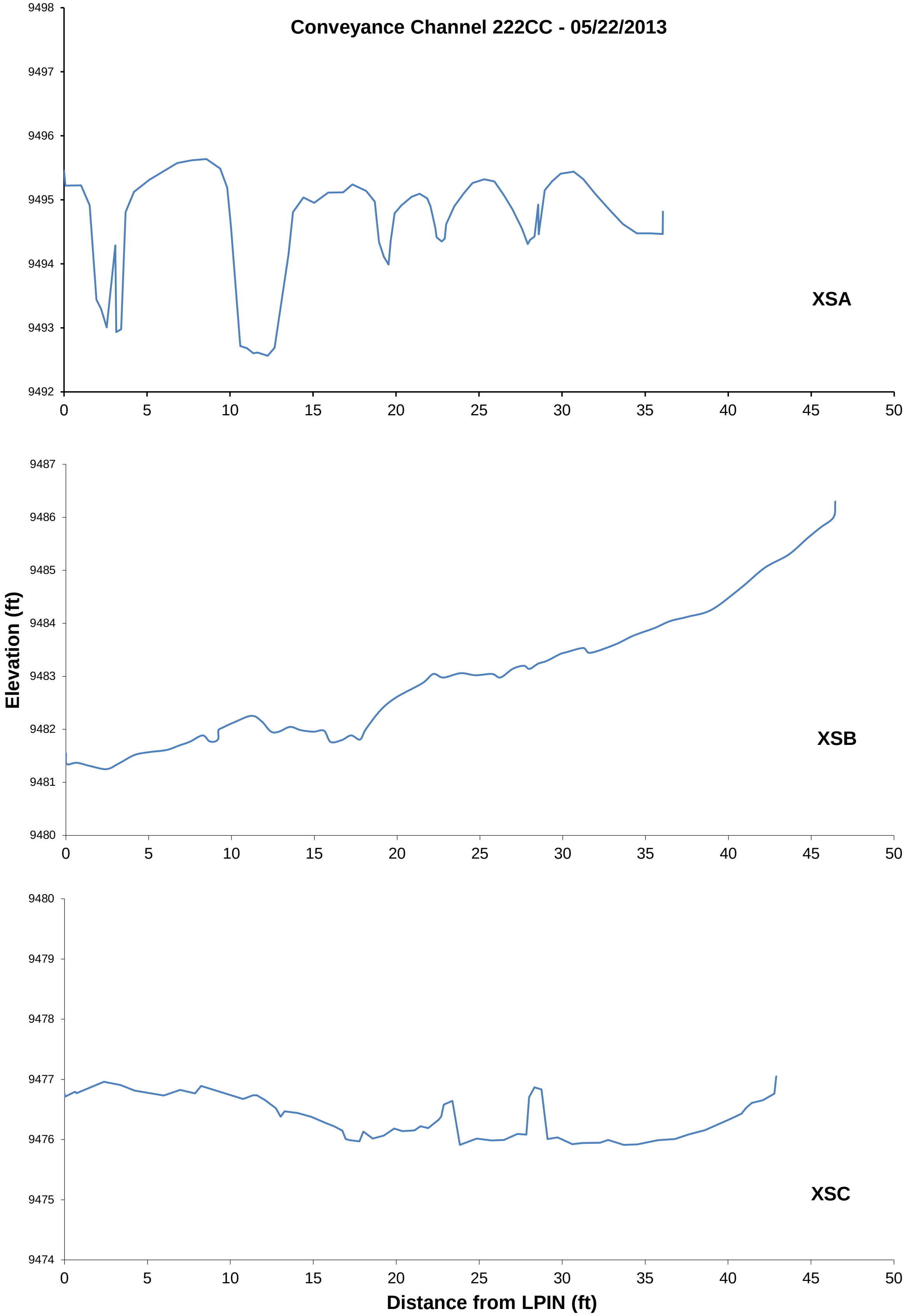

Conveyance Channel 218CC - 05/28/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
8998
8997
8996
8995
8994
8993
8992
8991
8990
8989
8988
0
5
10
15
20
25
30
35
40
45

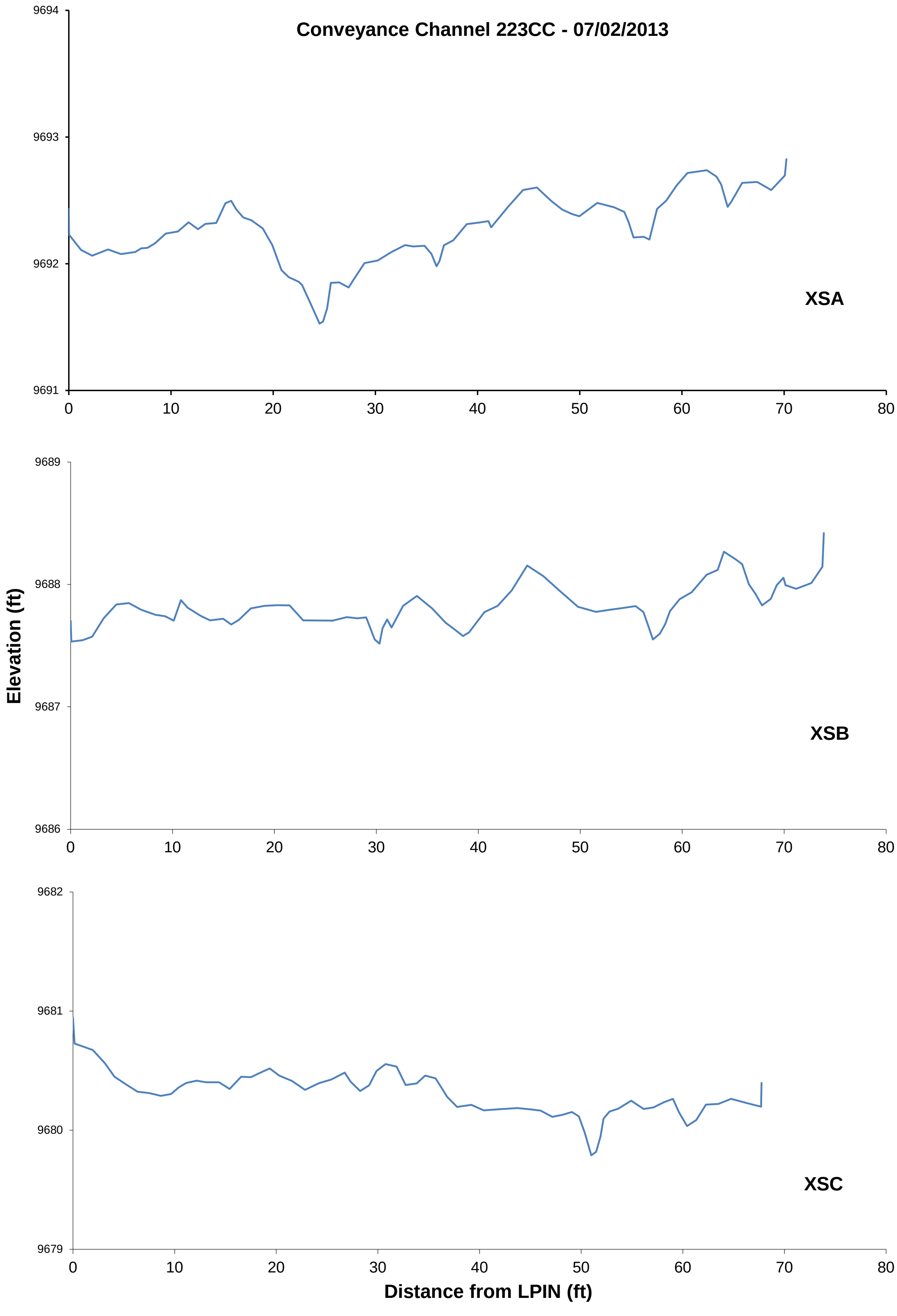

Conveyance Channel 219CC - 05/20/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)

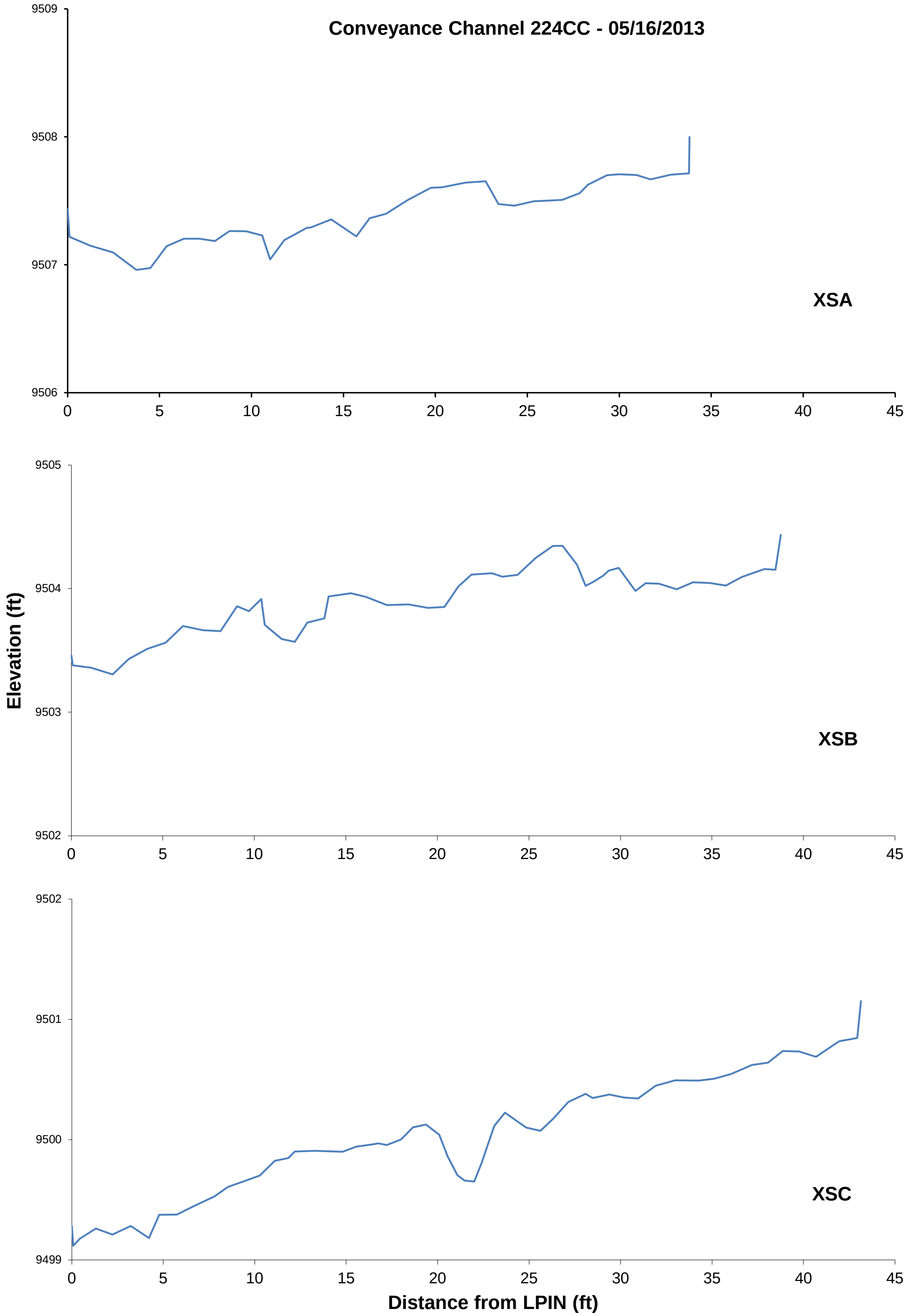


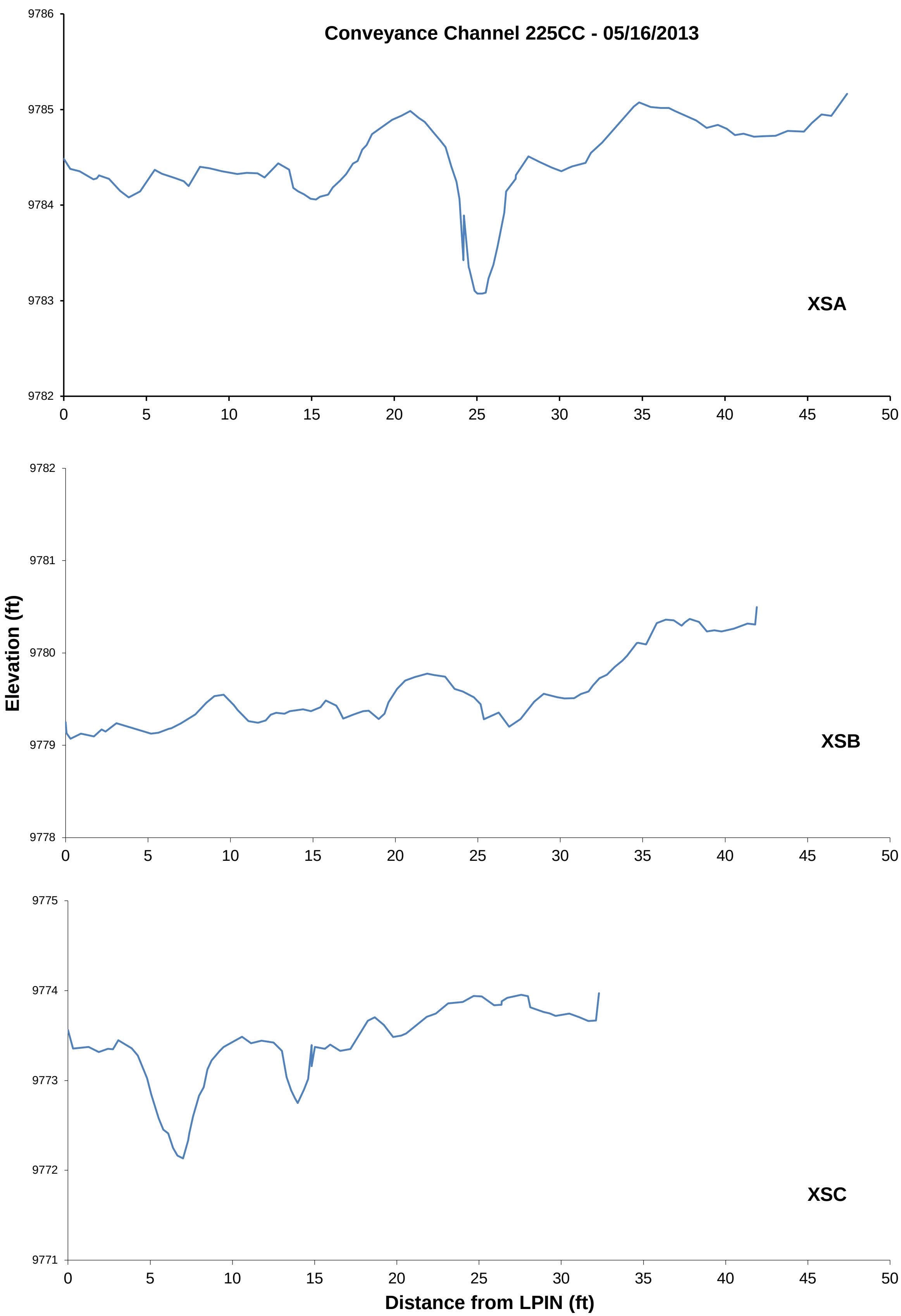
Conveyance Channel 220CC - 07/02/2013
XSA
8994
8993
8992
8991
8990
8989
0
10
20
30
40
50
60
70
XSB
8987
8986
8985
8984
8983
8982
Elevation (ft)
XSC
8982
8981
8980
8979
8978
8977
8976
Distance from LPIN (ft)

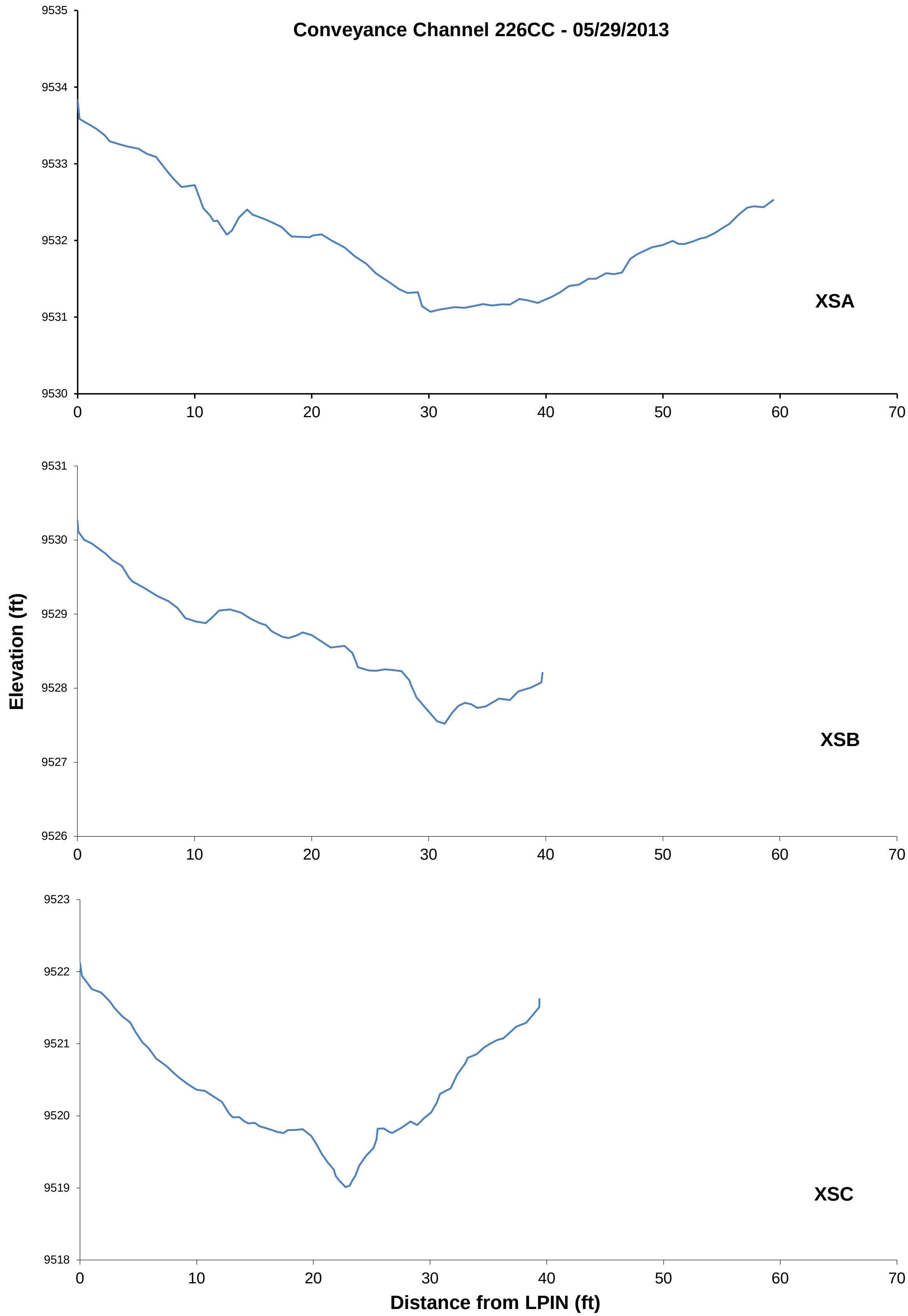

Conveyance Channel 221CC - 05/22/2013
9495
9494
9493
9492
9491
9490
0
5
10
15
20
25
30
35
40
XSA
9485
9484
9483
9482
9481
9480
XSB
9479
9478
9477
9476
9475
9474
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 222CC - 05/22/2013
9498
9497
9496
9495
9494
9493
9492
XSA
9487
9486
9485
9484
9483
9482
9481
9480
XSB
9480
9479
9478
9477
9476
9475
9474
XSC
0
5
10
15
20
25
30
35
40
45
50
Elevation (ft)
Distance from LPIN (ft)

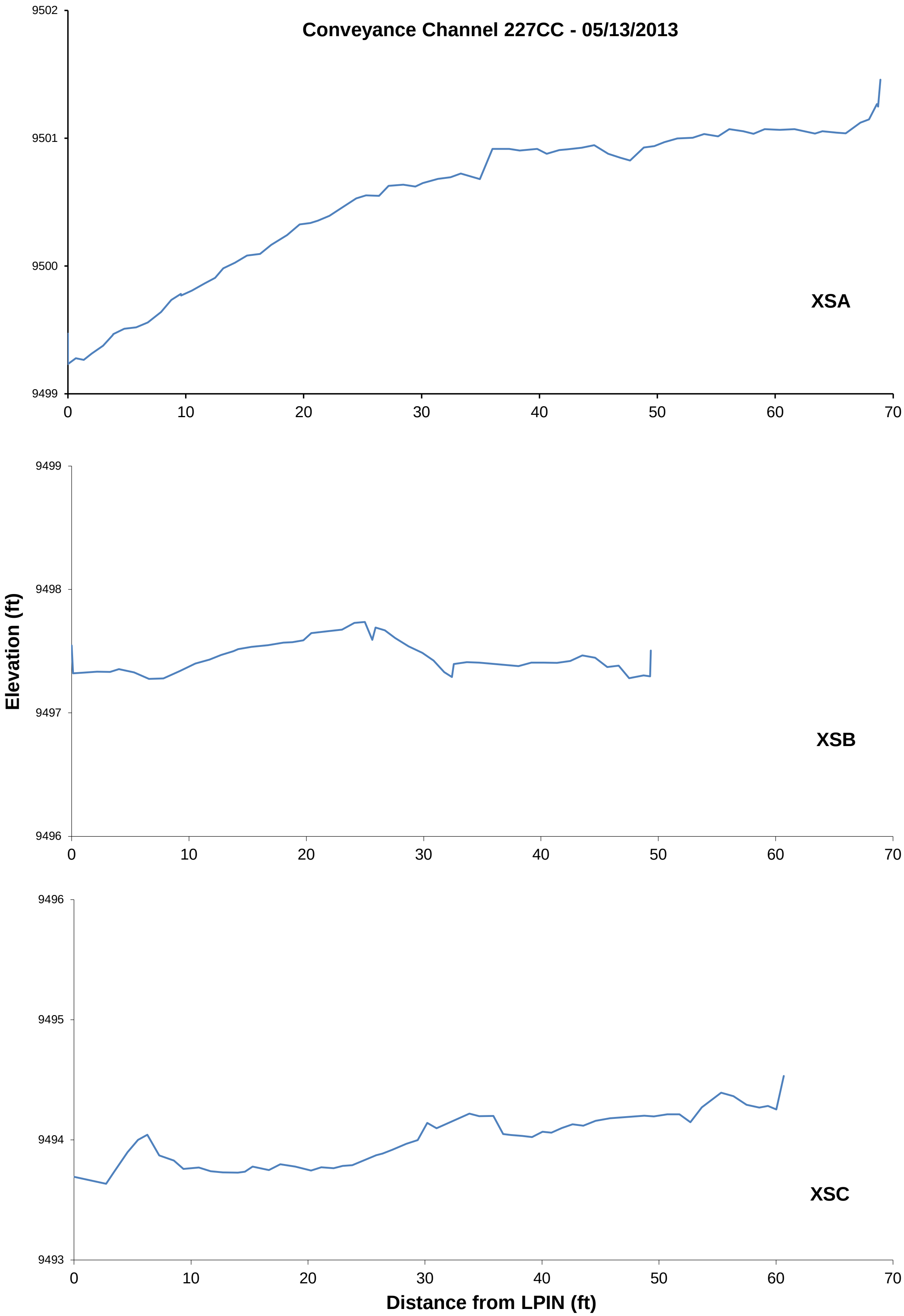

Conveyance Channel 223CC - 07/02/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9694
9693
9692
9691
9689
9688
9687
9686
9682
9681
9680
9679
0
10
20
30
40
50
60
70
80

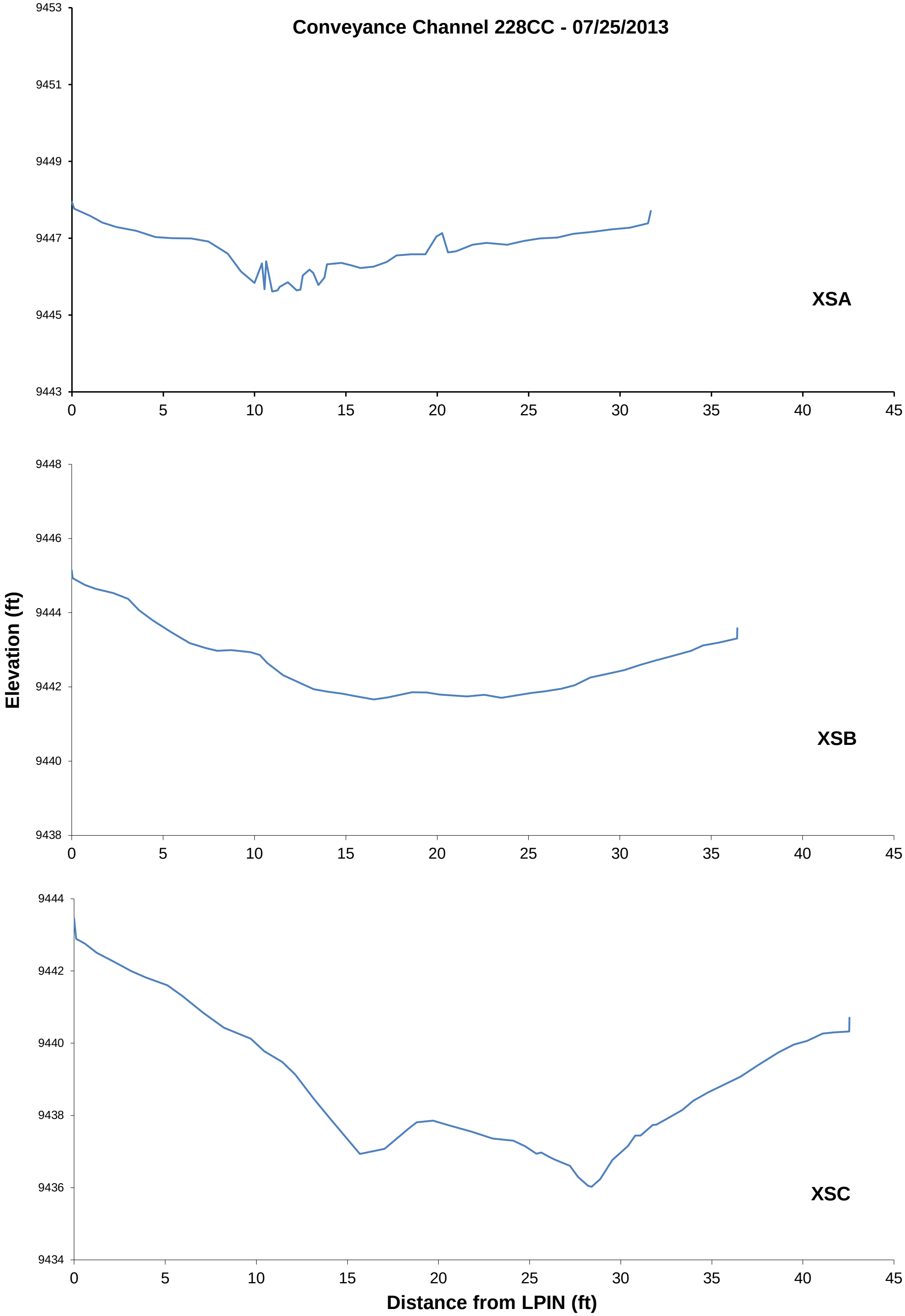

Conveyance Channel 224CC - 05/16/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9509
9508
9507
9506
9505
9504
9503
9502
9501
9500
9499
0
5
10
15
20
25
30
35
40
45

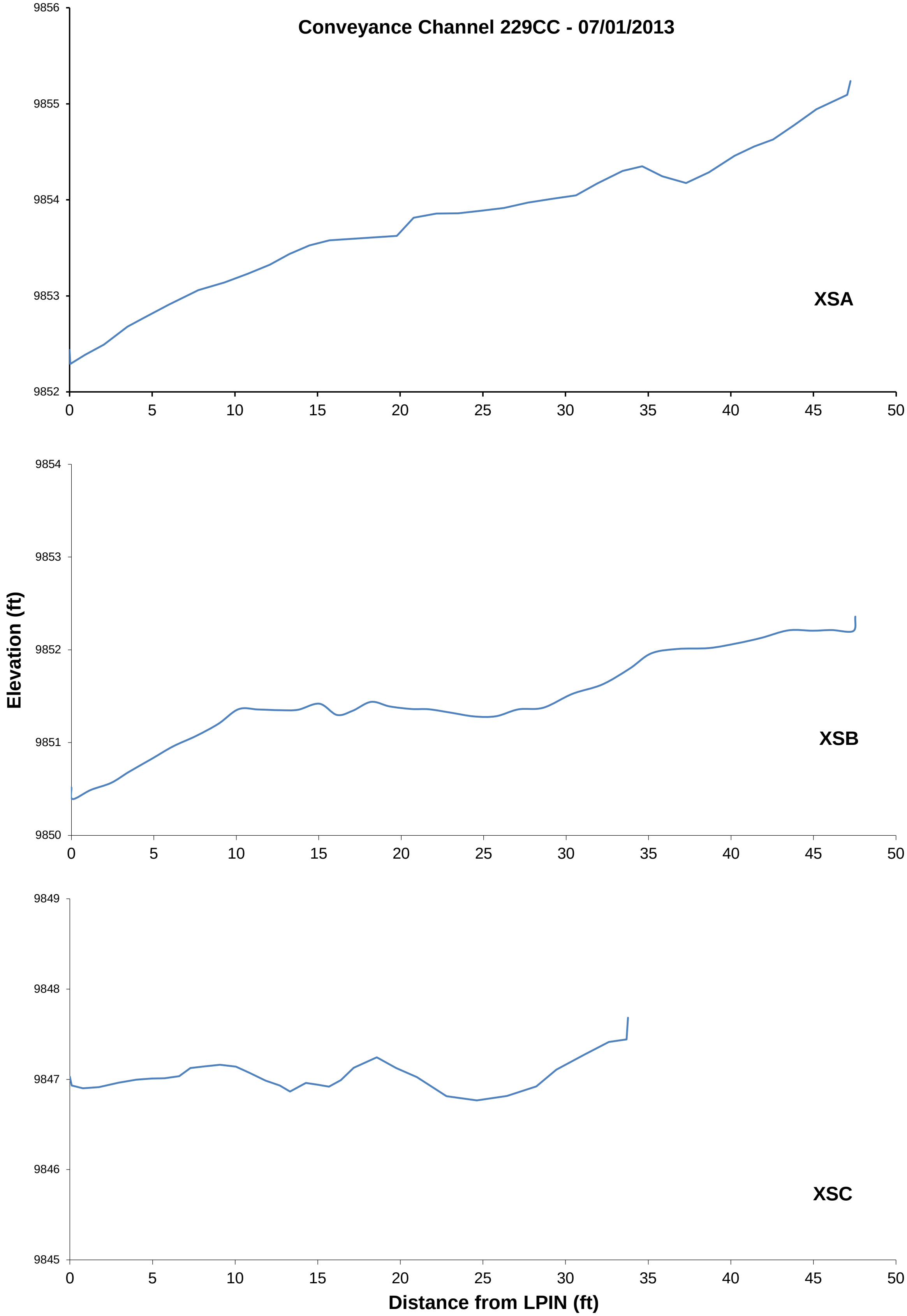

Conveyance Channel 225CC - 05/16/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9786
9785
9784
9783
9782
9781
9780
9779
9778
9775
9774
9773
9772
9771
0
5
10
15
20
25
30
35
40
45
50

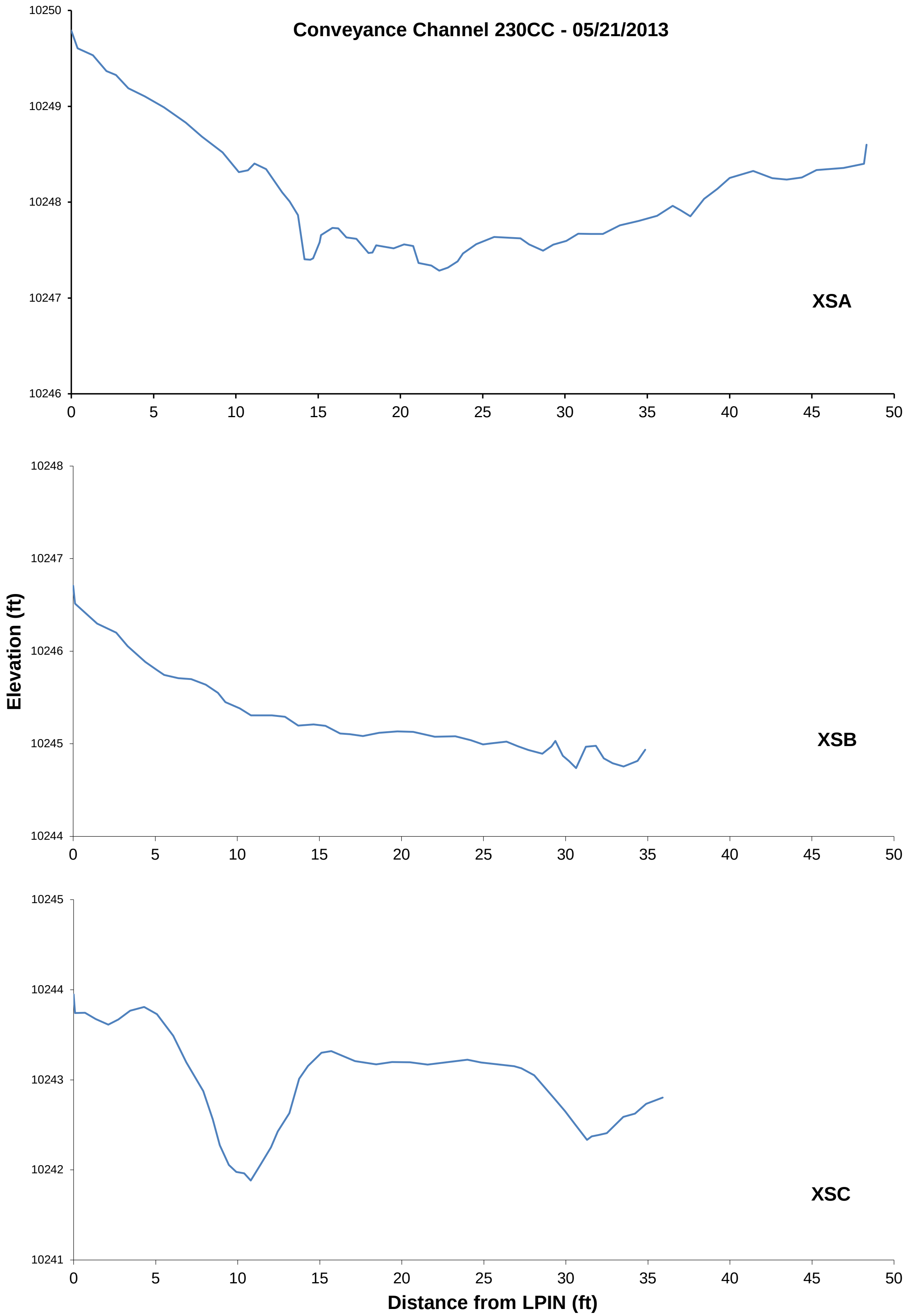


Conveyance Channel 226CC - 05/29/2013
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
9535
9534
9533
9532
9531
9530
9529
9528
9527
9526
9523
9522
9521
9520
9519
9518
0
10
20
30
40
50
60
70

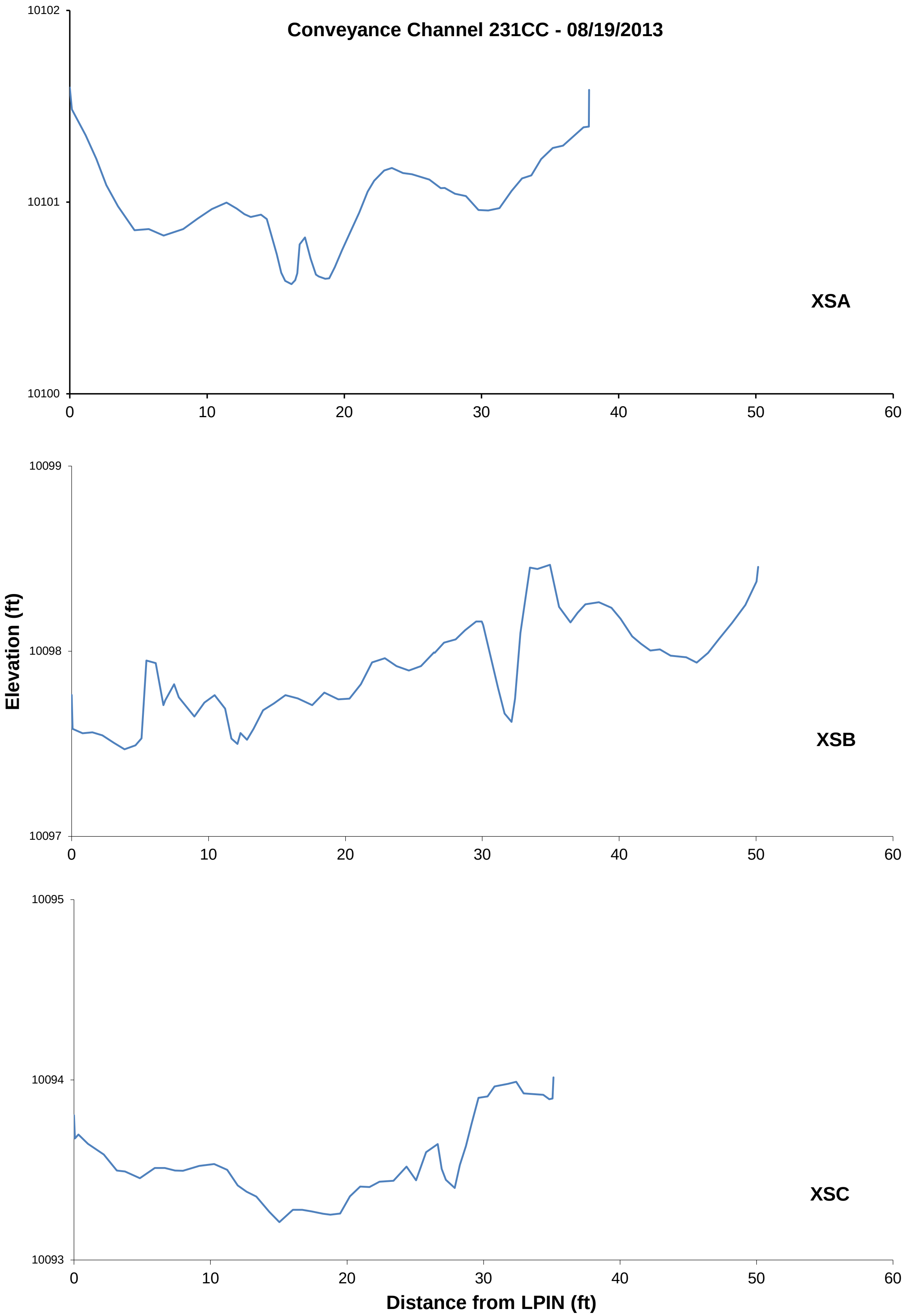

Conveyance Channel 227CC - 05/13/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9502
9501
9500
9499
9498
9497
9496
9495
9494
9493
0
10
20
30
40
50
60
70

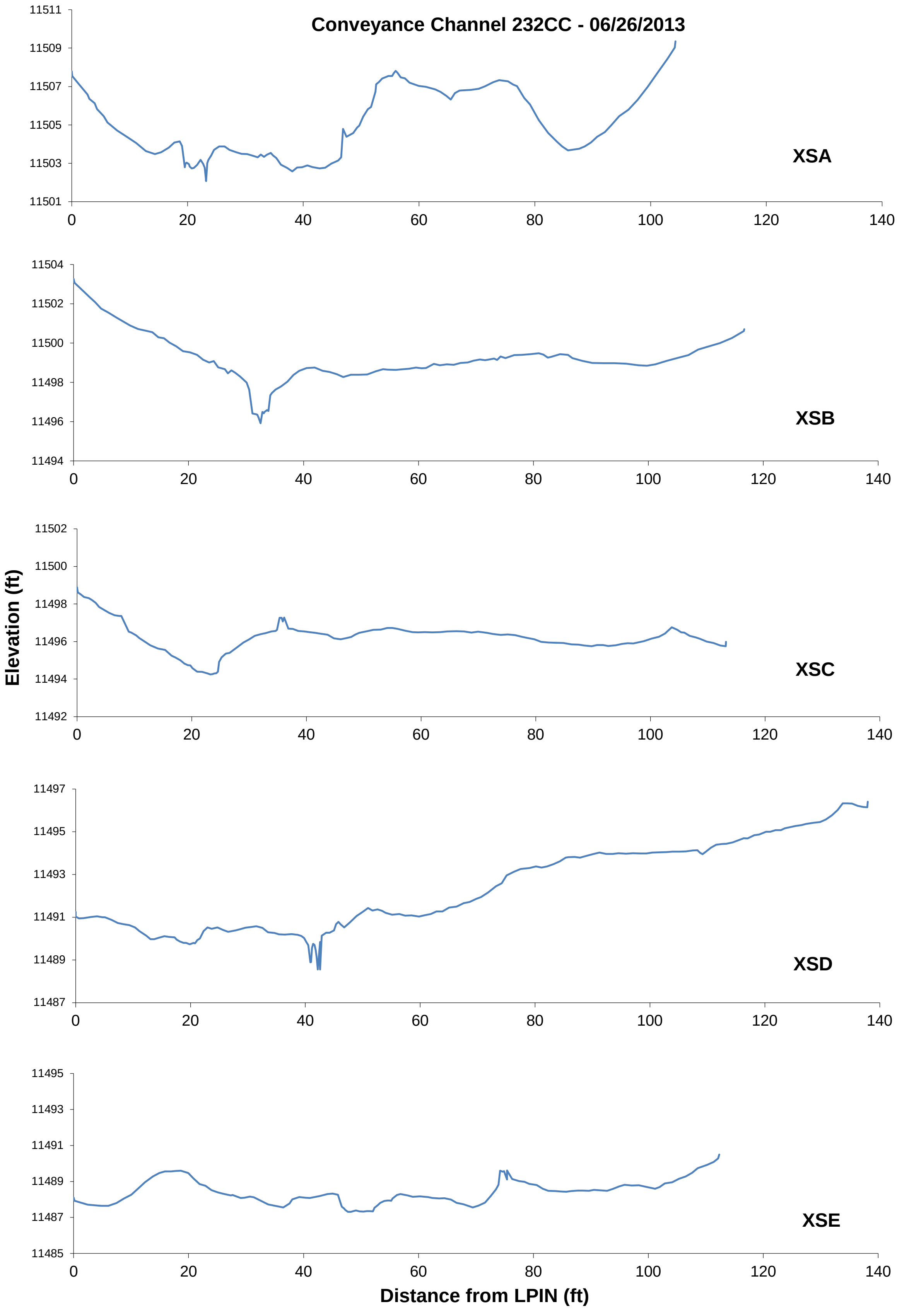

Conveyance Channel 228CC - 07/25/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9453
9451
9449
9447
9445
9443
9448
9446
9444
9442
9440
9438
9444
9442
9440
9438
9436
9434
0
5
10
15
20
25
30
35
40
45

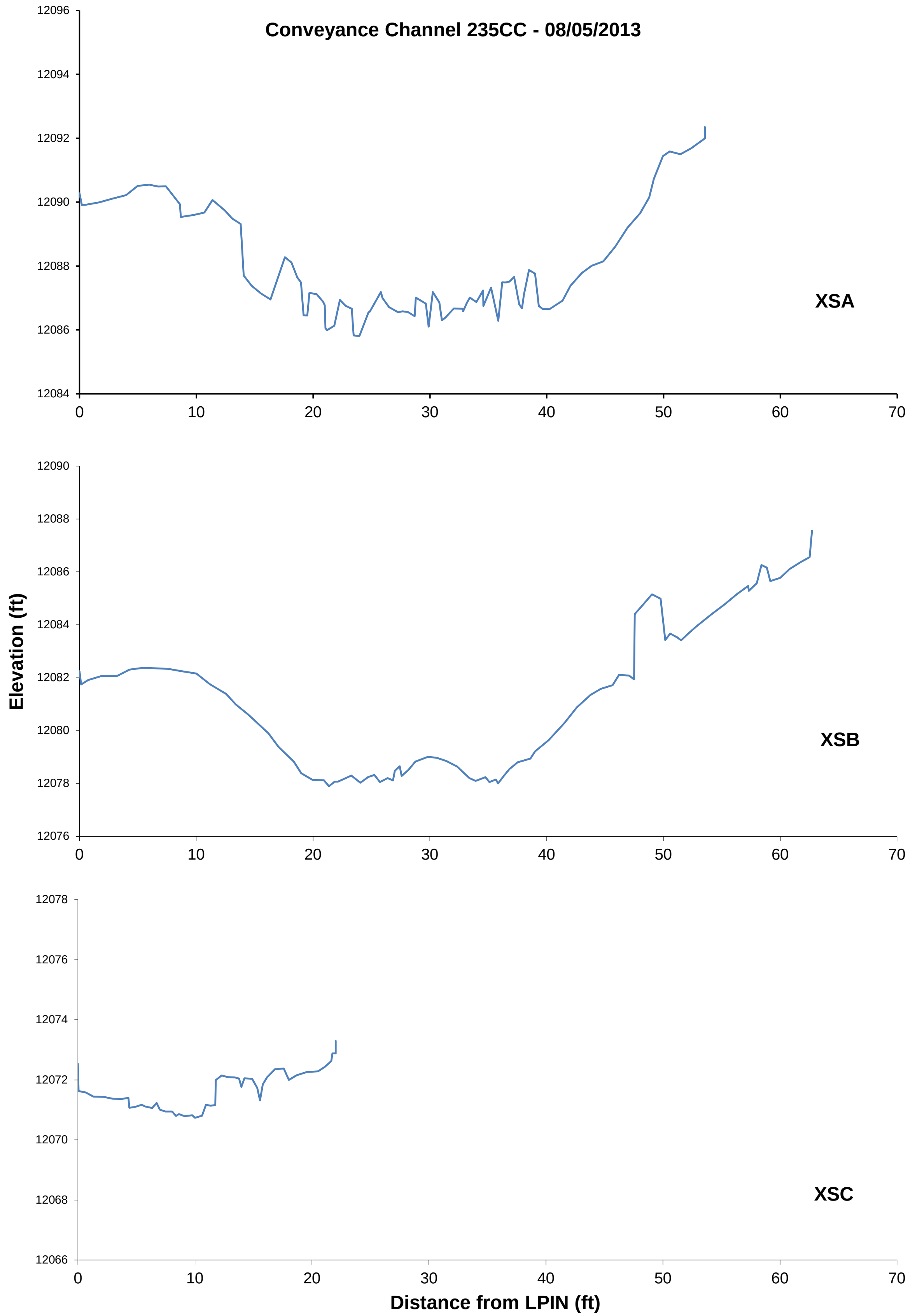

Conveyance Channel 229CC - 07/01/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9856
9855
9854
9853
9852
9850
9851
9849
9848
9847
9846
9845
0
5
10
15
20
25
30
35
40
45
50

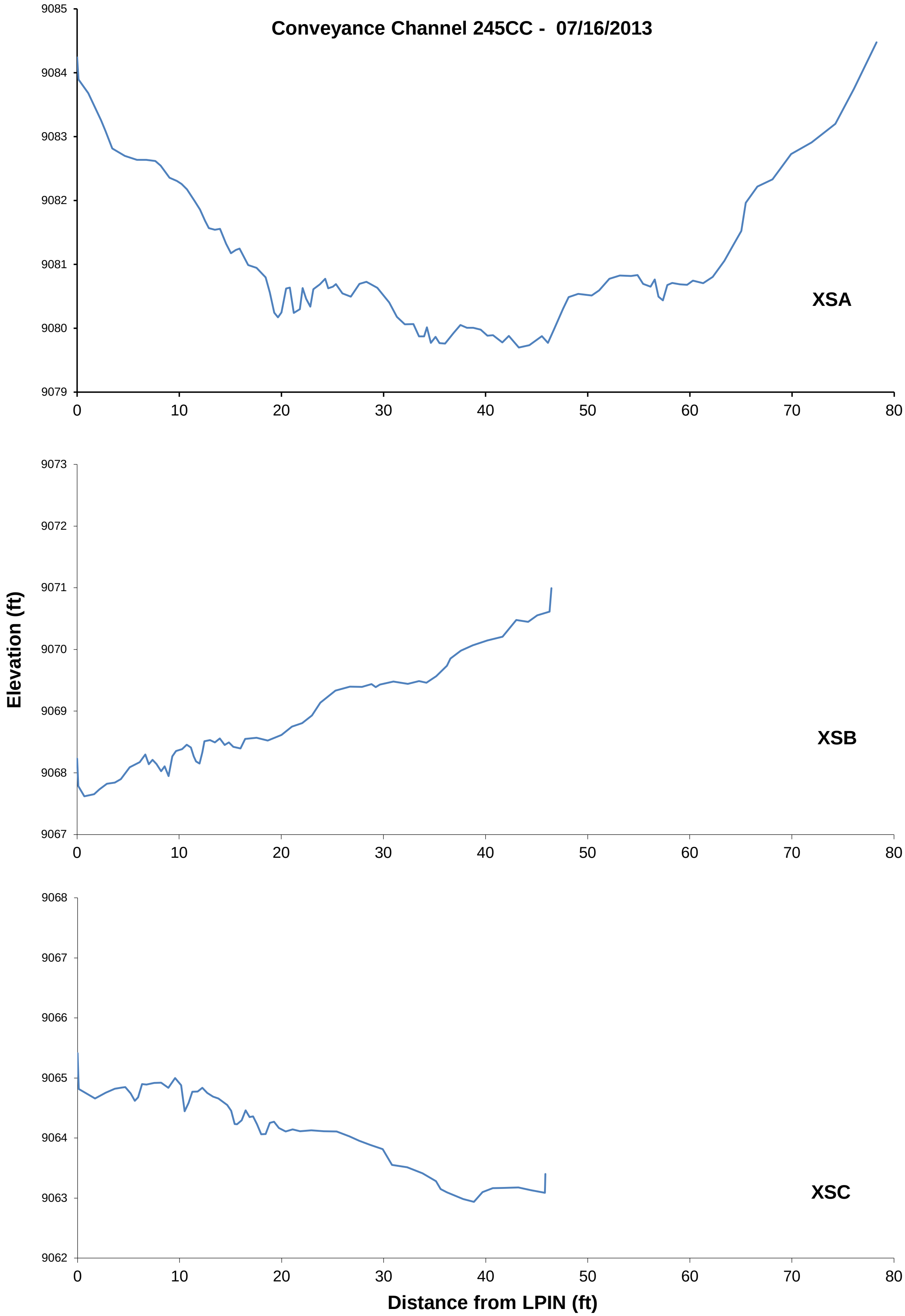


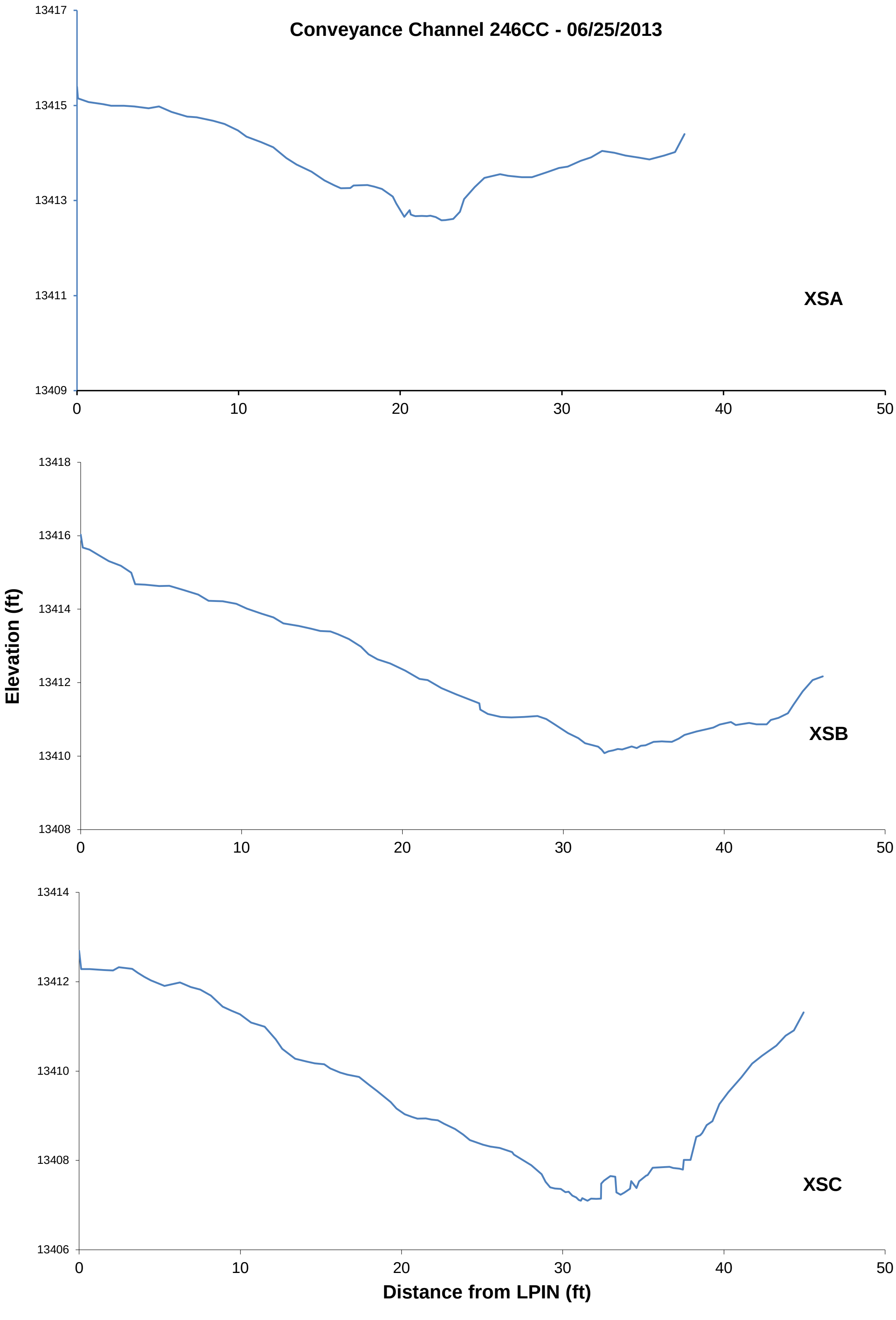
Conveyance Channel 230CC - 05/21/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10250
10249
10248
10247
10246
10248
10247
10246
10245
10244
10245
10244
10243
10242
10241
0
5
10
15
20
25
30
35
40
45
50

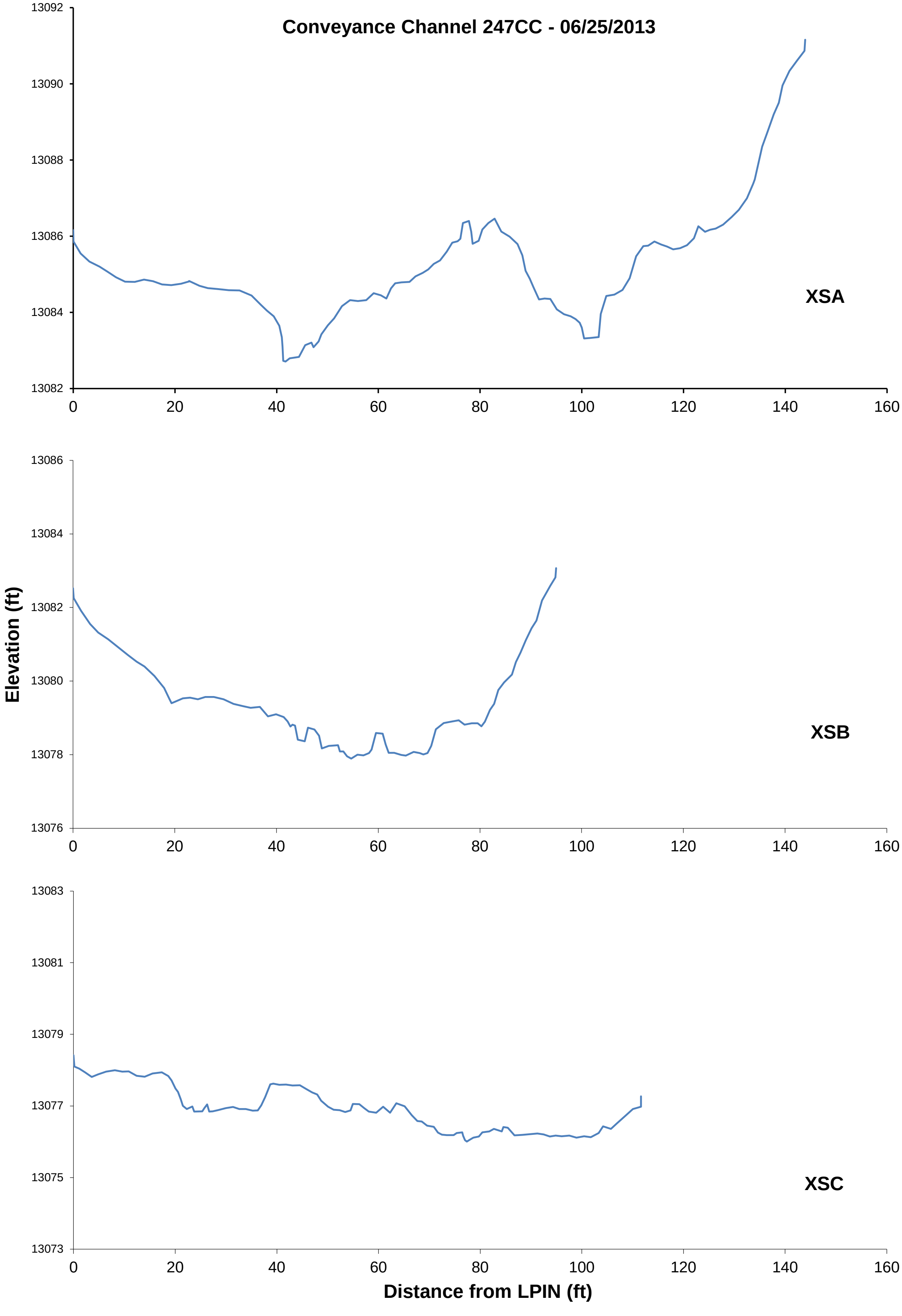

Conveyance Channel 231CC - 08/19/2013
10102
10101
10100
0
10
20
30
40
50
60
XSA
10099
10098
10097
XSB
10095
10094
10093
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 232CC - 06/26/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
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

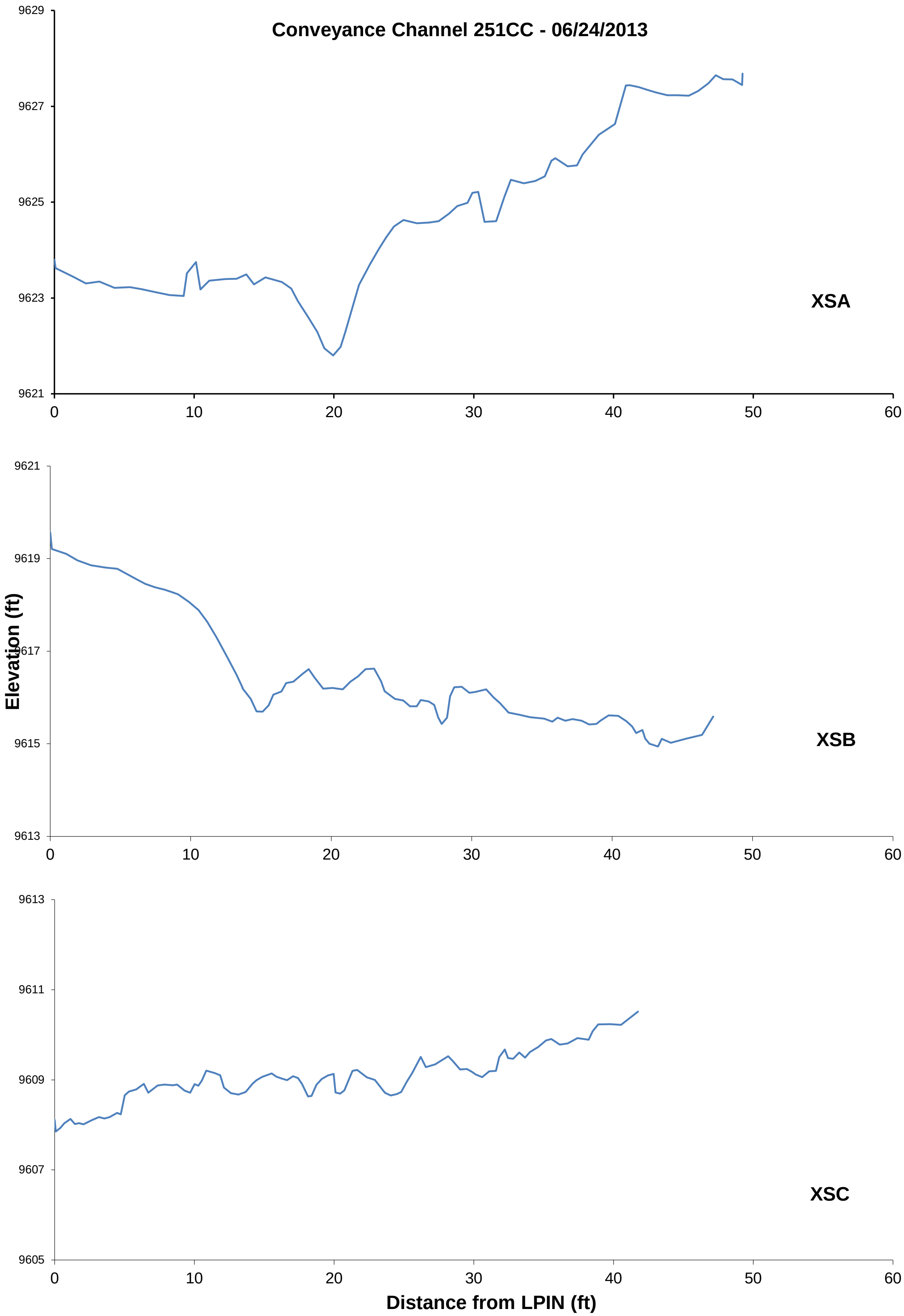

Conveyance Channel 235CC - 08/05/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12096
12094
12092
12090
12088
12086
12084
12082
12080
12078
12076
12074
12072
12070
12068
12066
0
10
20
30
40
50
60
70

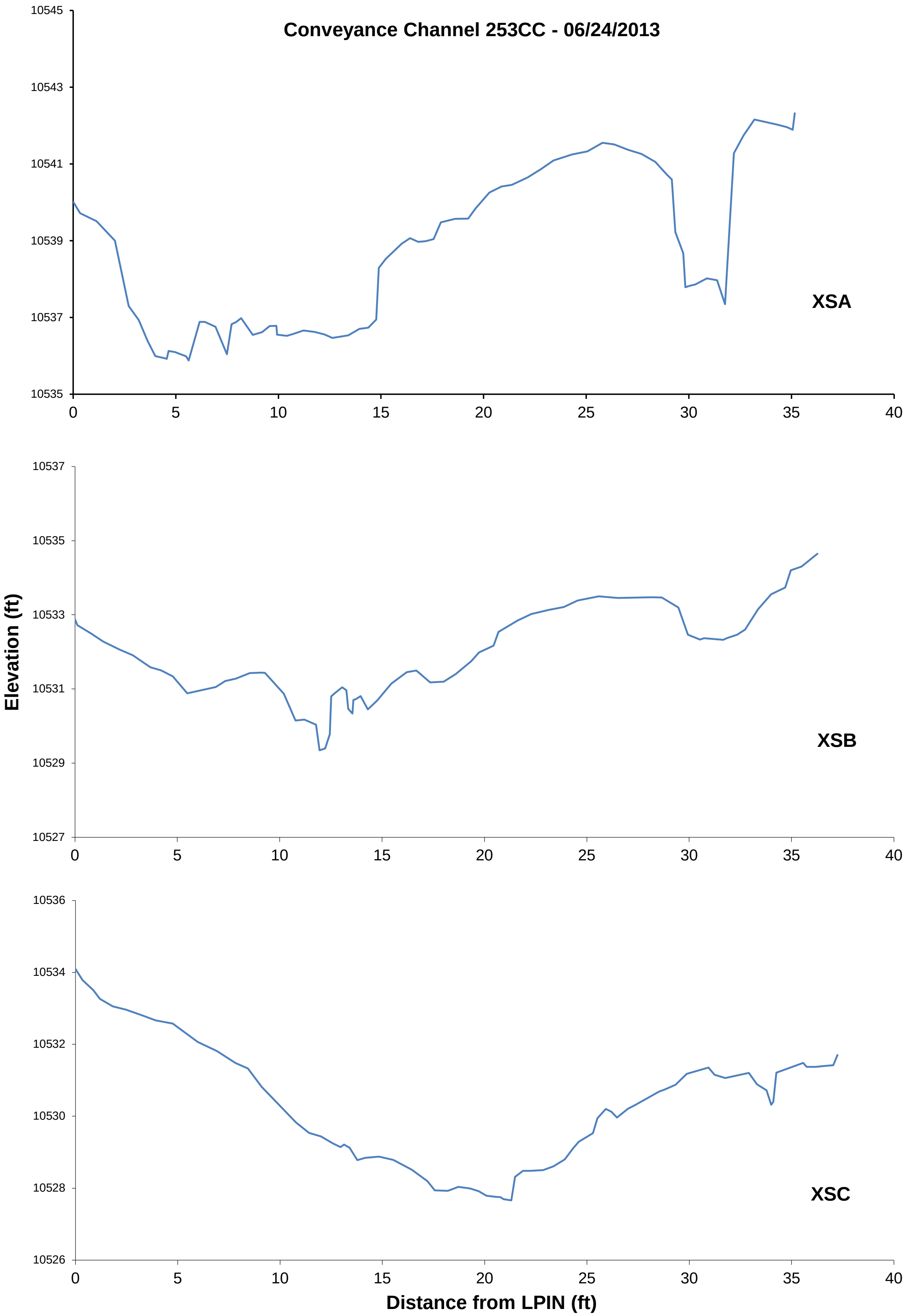

Conveyance Channel 245CC - 07/16/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
9085
9084
9083
9082
9081
9080
9079
9073
9072
9071
9070
9069
9068
9067
9068
9067
9066
9065
9064
9063
9062
0
10
20
30
40
50
60
70
80

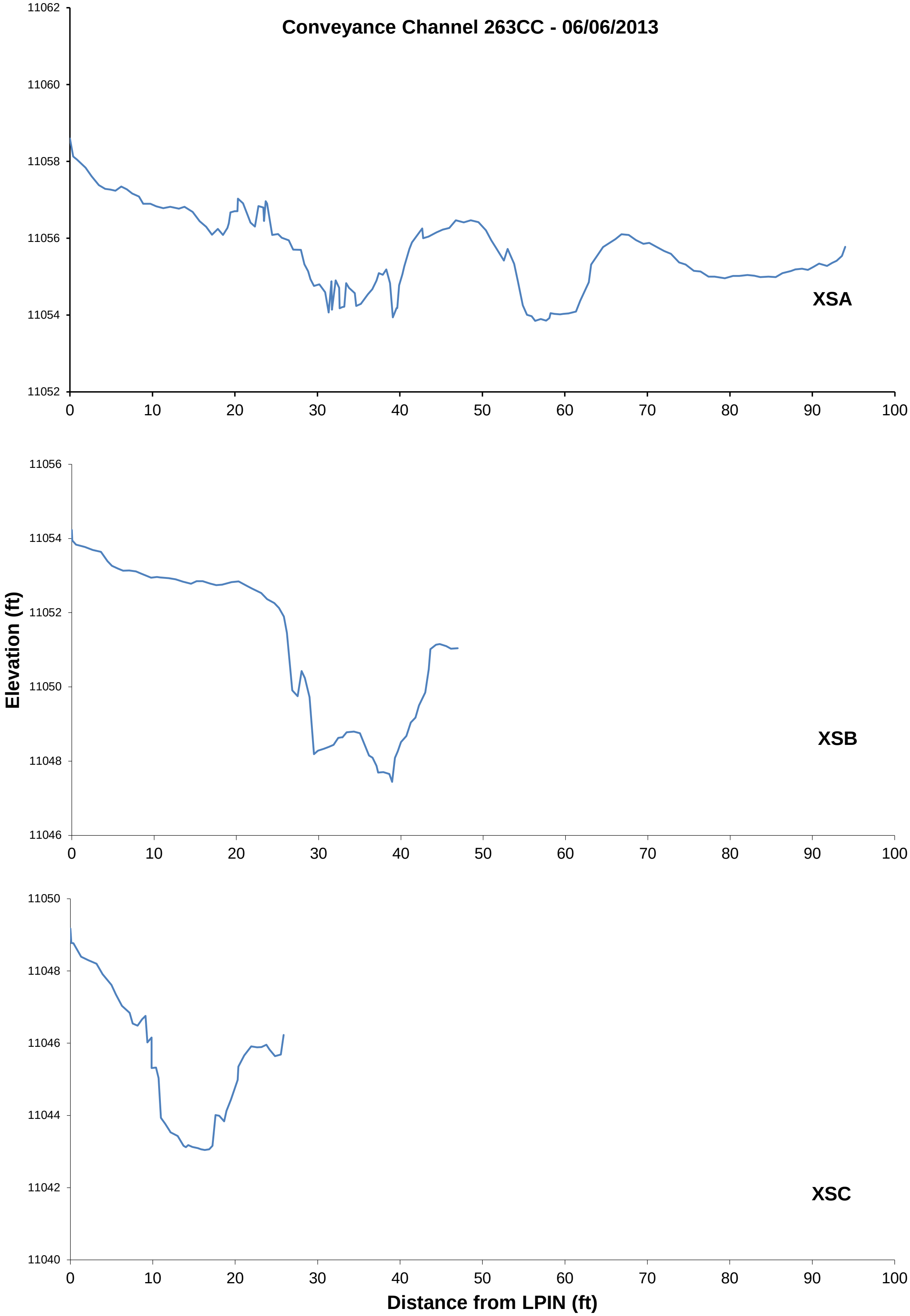

Conveyance Channel 246CC - 06/25/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
13417
13415
13413
13411
13409
13418
13416
13414
13412
13410
13408
13406
0
10
20
30
40
50

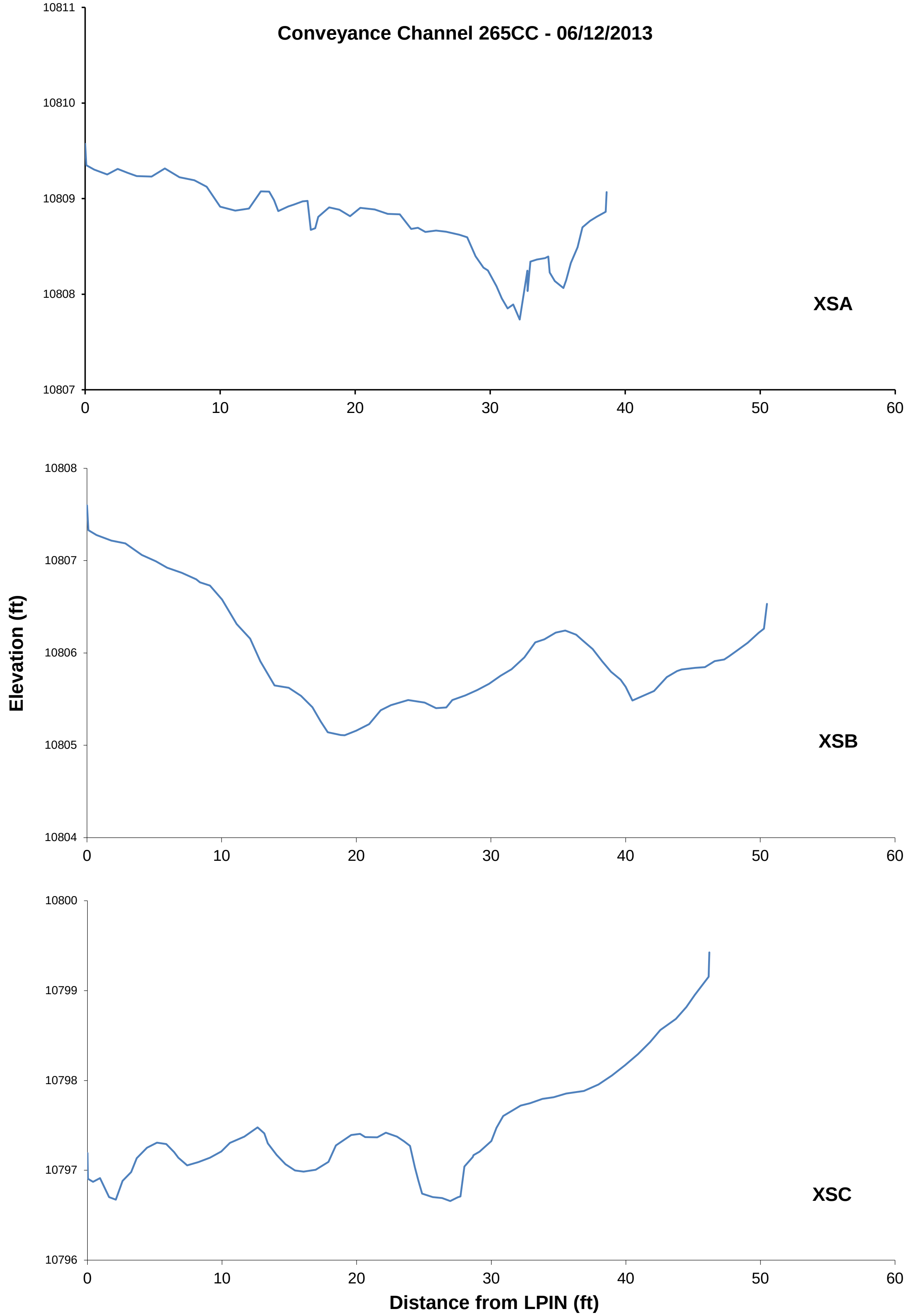


Conveyance Channel 247CC - 06/25/2013
Elevation (ft)
13092
13090
13088
13086
13084
13082
0
20
40
60
80
100
120
140
160
XSA
13086
13084
13082
13080
13078
13076
XSB
13083
13081
13079
13077
13075
13073
XSC
Distance from LPIN (ft)


Conveyance Channel 251CC - 06/24/2013
9629
9627
9625
9623
9621
0
10
20
30
40
50
60
XSA
9621
9619
9617
9615
9613
0
10
20
30
40
50
60
XSB
9613
9611
9609
9607
9605
0
10
20
30
40
50
60
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 253CC - 06/24/2013
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 - 06/06/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11062
11060
11058
11056
11054
11052
11050
11048
11046
11044
11042
11040
0
10
20
30
40
50
60
70
80
90
100



Conveyance Channel 265CC - 06/12/2013
Elevation (ft)
XSA
10811
10810
10809
10808
10807
0
10
20
30
40
50
60
XSB
10808
10807
10806
10805
10804
0
10
20
30
40
50
60
XSC
10800
10799
10798
10797
10796
0
10
20
30
40
50
60
Distance from LPIN (ft)

Appendix J

Rock Weir and Sediment Pond

Site Visit Dates
Sediment Accumulation
and
Cross Section Graphs

2013

Site Visit Dates of Rock Weir Silt Fences on Pikes Peak, 2013

Site ID	**Site Visit Dates of Rock Weir Silt Fences on Pikes Peak, 2013**																		
	5/6	5/13	5/14	5/15	5/16	5/20	5/22	5/28	5/29	6/3	6/10	6/25	7/2	7/16	7/29	8/12	9/17	9/18	9/30
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
008RW	X					X	X				X		X	X	X	X	X		X
009RA	X		X			X					X		X	X	X	X	X		X
161RW	X	X				X					X		X	X	X	X	X		X
162RW					X						X		X	X	X	X			
176RW	X			X		X					X		X	X	X	X	X	X	X
178RW	X			X		X					X		X	X	X	X			
179RW	X			X		X					X		X	X	X	X			
180RW	X					X				X	X		X	X	X	X			
181RW	X					X					X	X	X	X	X	X			
200RW	X					X			X		X		X	X	X	X	X		X
201RW	X					X			X		X		X	X	X	X	X		X
202RW	X						X				X		X	X	X	X	X	X	X

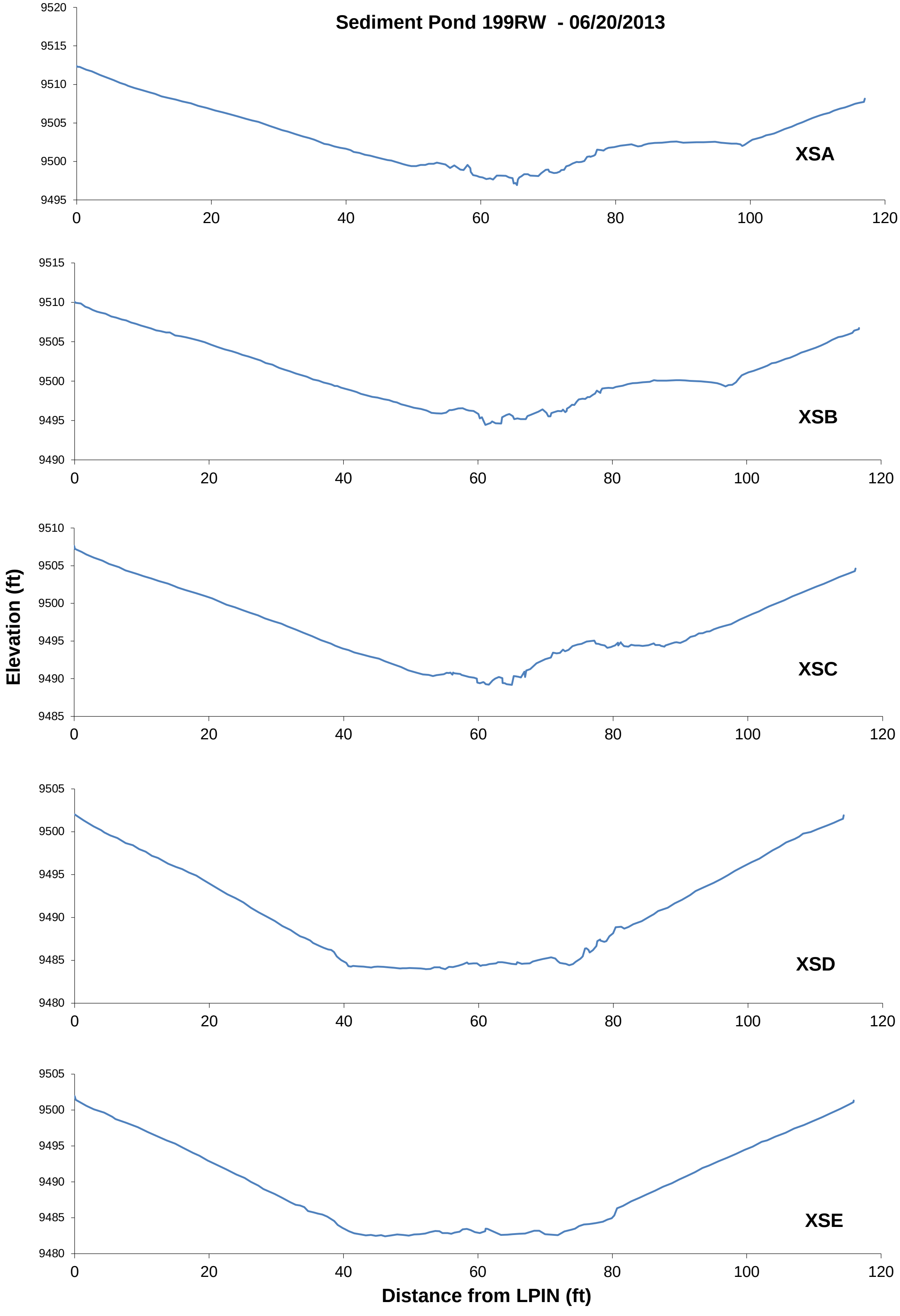
Sediment Accumulation in Rock Weir Silt Fences on Pikes Peak, 2013

Site ID	Location	Date	Volume (ft^3)	Grab Sample
180RW	Silt Fence	5/6/13	0.13	Yes
161RW	Silt Fence	5/6/13	0.07	Yes†
181RW	Silt Fence	5/20/13	0.20	Yes
180RW	Silt Fence	5/20/13	0.13	Yes
162RW	Silt Fence	7/16/13	0.07	Yes
181RW	Silt Fence	7/16/13	0.47	Yes†
181RW	Silt Fence	8/12/13	0.13	Yes

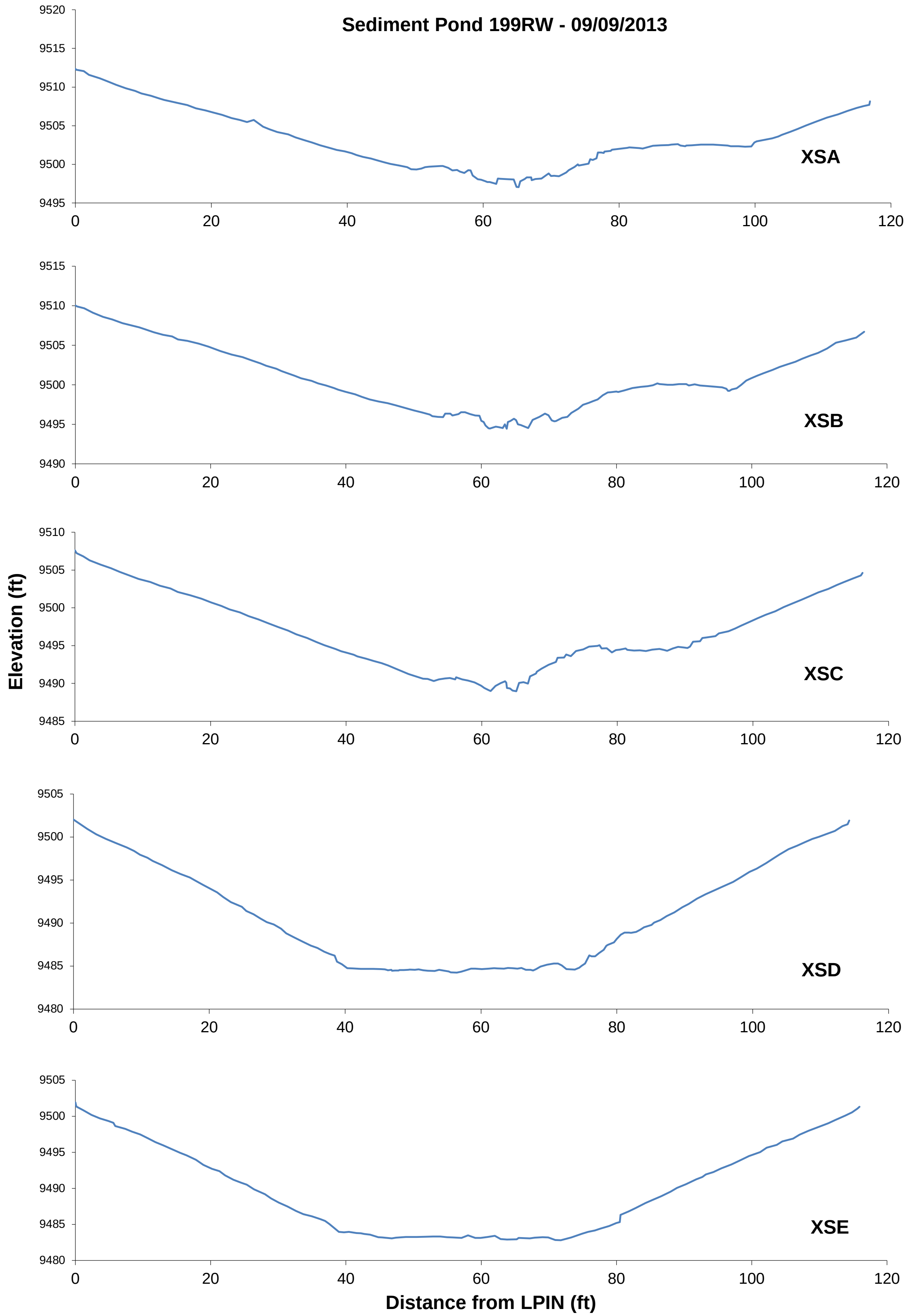
† Grab samples selected for lab analysis.

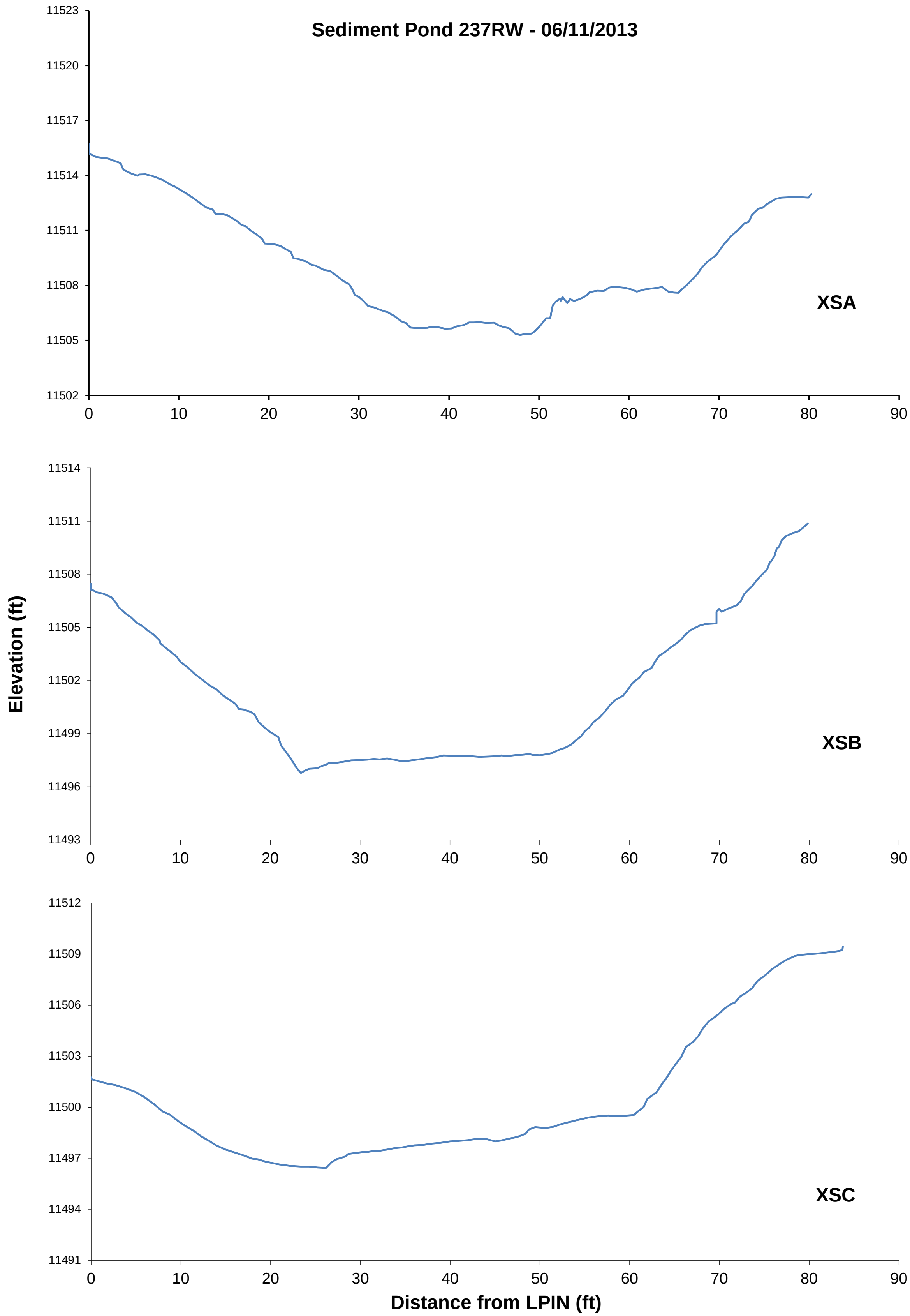
Rock Weir Sediment Accumulation Values on Pikes Peak, 2013

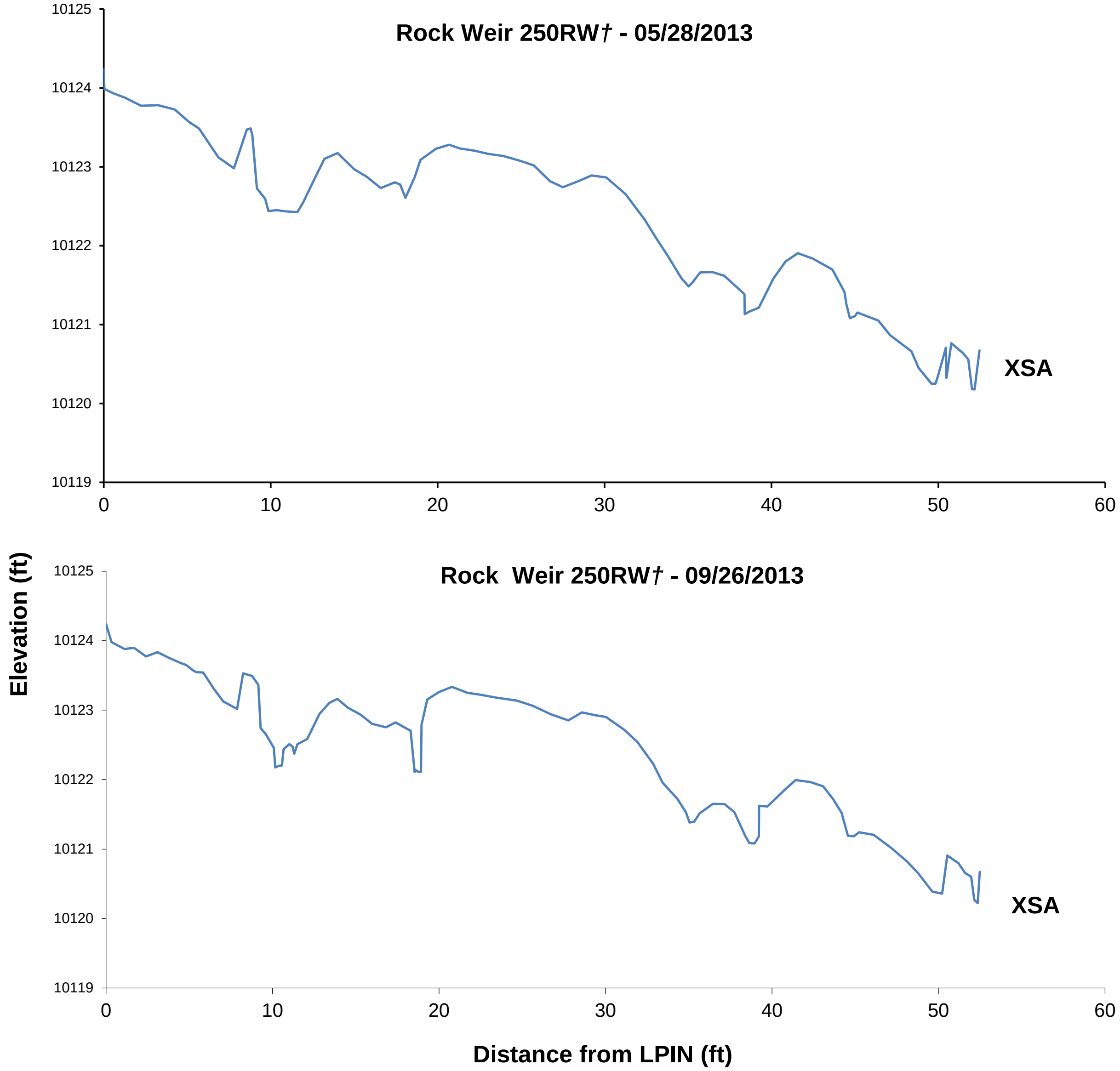
Site ID	Area (sq ft)	Survey1		Survey 2			
		Date	Average Elevation (ft)	Date	Average Elevation (ft)	Elevation Change (ft)	Volume Change (ft^3)
002RW	1679	5/28/13	8998.10				
003RW	521	5/28/13	8992.40				
006RW	798	5/15/13	8997.15				
008RW	1044	5/22/13	9499.06				
009RA	905	5/14/13	9695.90				
152RW	817	5/16/13	9791.95				
153RW	1568	5/14/13	9523.39				
161RW	263	5/13/13	9504.89				
162RW	130	5/16/13	9512.15				
176RW	372	5/15/13	10193.88	9/18/13	10193.84	-0.04	-14.35
178RW	377	5/15/13	10202.36				
179RW	792	5/15/13	10214.67				
181RW	1299	6/25/13	10252.94				
200RW	412	5/29/13	9194.57	9/17/13	9194.71	0.14	56.56
201RW	183	5/29/13	9588.58				
202RW	179	5/22/13	9690.61	9/18/13	9690.20	-0.41	-73.73
233RW	359	6/12/13	11902.43				
241RW	1015	8/6/13	12551.61				
250RW	598	5/28/13	10117.27	9/26/13	10117.38	0.11	63.10



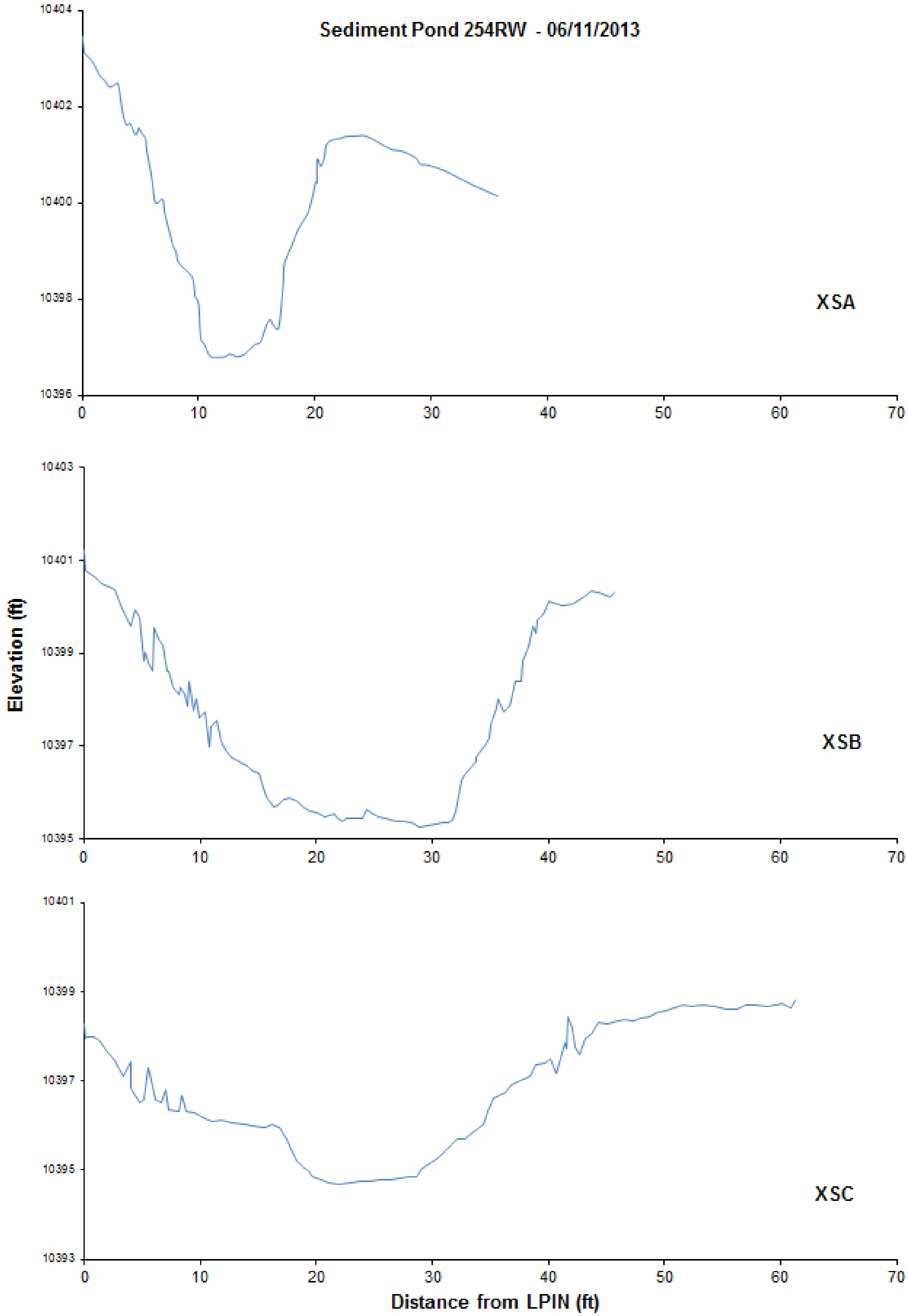
Sediment Pond 199RW - 06/20/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE

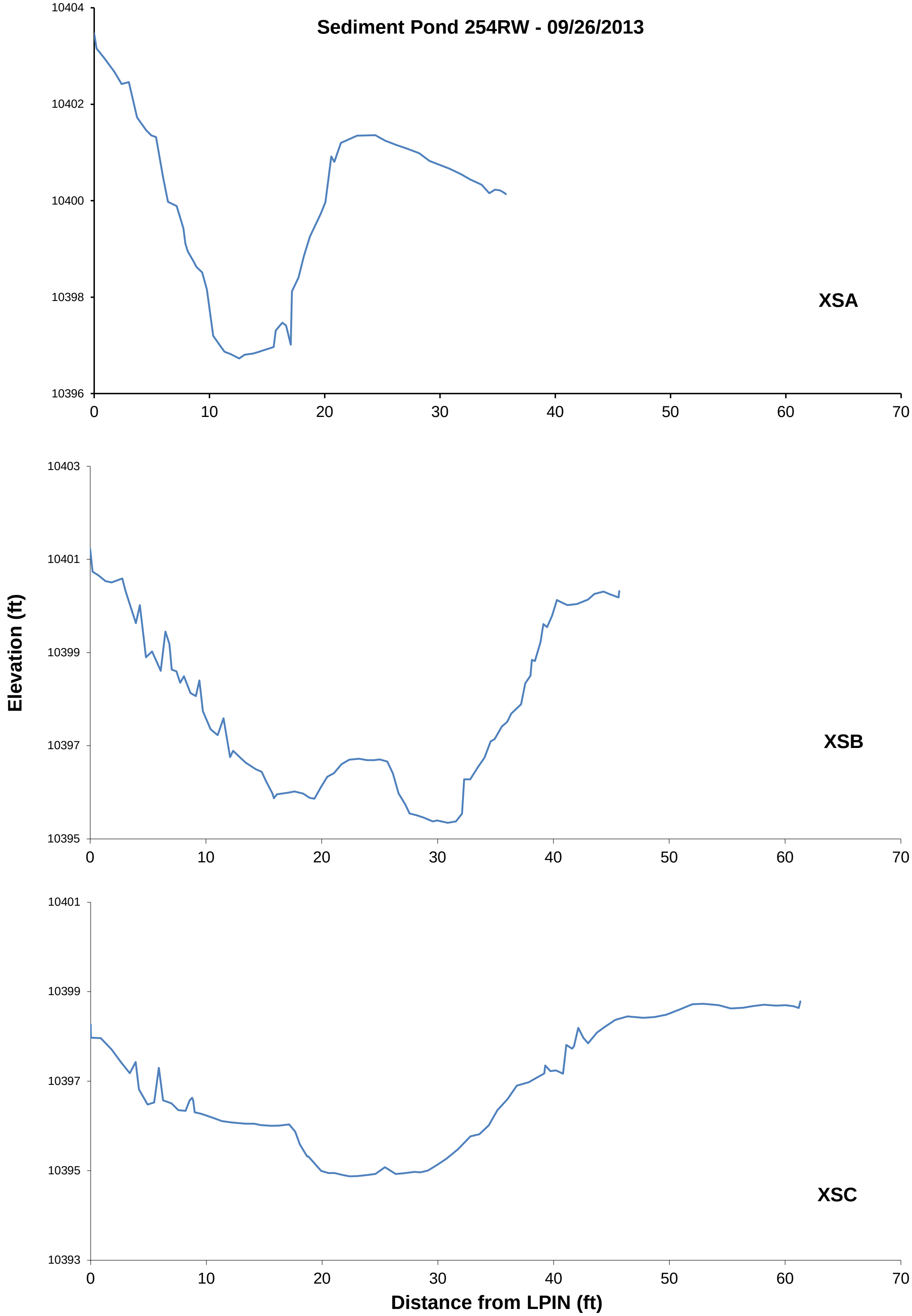

Sediment Pond 199RW - 09/09/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
9520
9515
9510
9505
9500
9495
9490
9485
9480
0
20
40
60
80
100
120

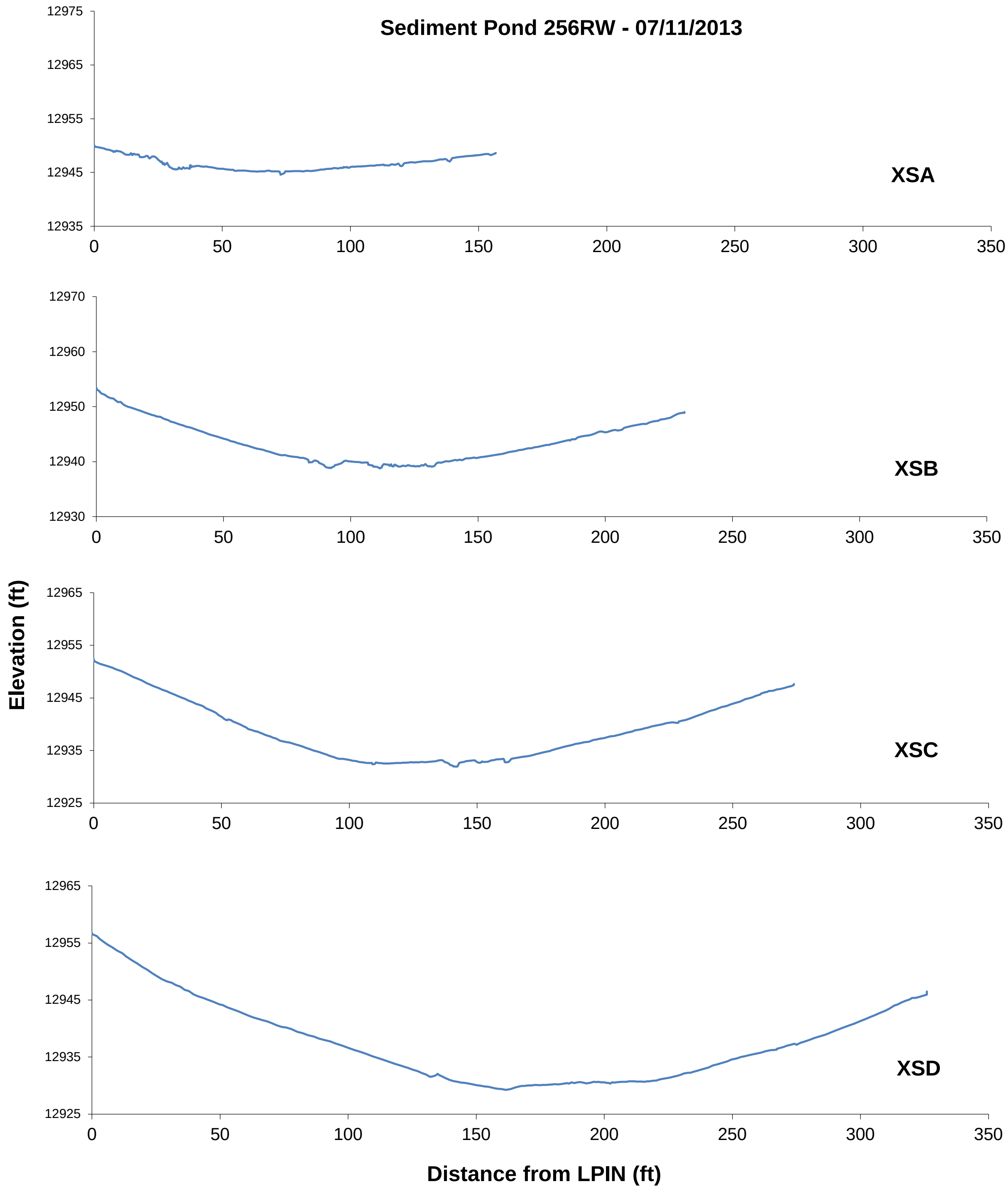

Sediment Pond 237RW - 06/11/2013
11523
11520
11517
11514
11511
11508
11505
11502
0
10
20
30
40
50
60
70
80
90
XSA
11514
11511
11508
11505
11502
11499
11496
11493
XSB
11512
11509
11506
11503
11500
11497
11494
11491
XSC
Elevation (ft)
Distance from LPIN (ft)



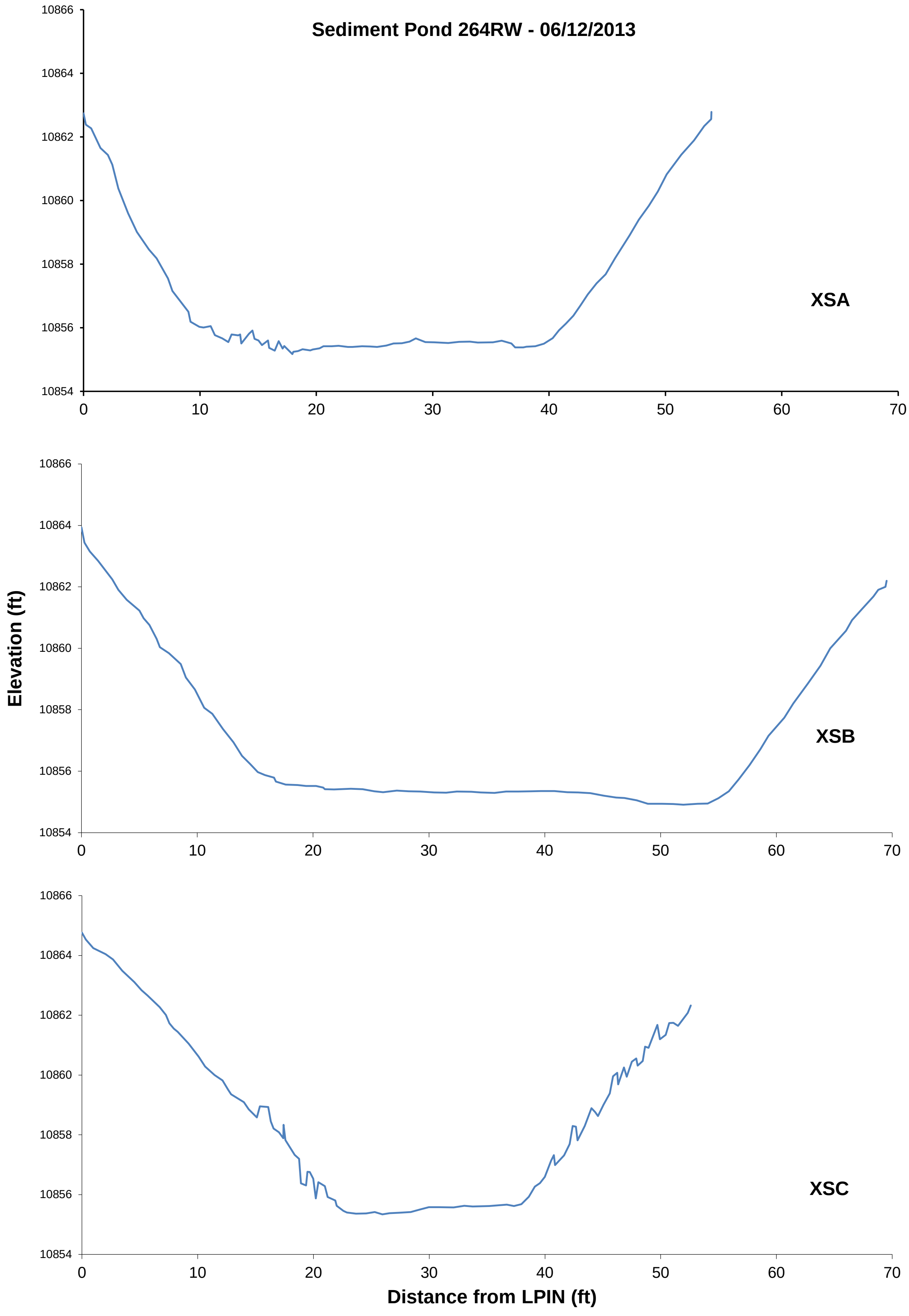
† Cross section placed on cut slope above rock weir


Sediment Pond 254RW - 06/11/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10404
10402
10400
10398
10396
10403
10401
10399
10397
10395
10393
0
10
20
30
40
50
60
70


Sediment Pond 254RW - 09/26/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10404
10402
10400
10398
10396
10403
10401
10399
10397
10395
10401
10399
10397
10395
10393
0
10
20
30
40
50
60
70



Sediment Pond 256RW - 07/11/2013
Elevation (ft)
12975
12965
12955
12945
12935
0
50
100
150
200
250
300
350
XSA
12970
12960
12950
12940
12930
XSB
12965
12955
12945
12935
12925
XSC
XSD
Distance from LPIN (ft)



Sediment Pond 264RW - 06/12/2013
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10866
10864
10862
10860
10858
10856
10854
0
10
20
30
40
50
60
70

Appendix K

Rock Weir and Sediment Pond

Particle Size Distribution Summary
and
Graphs

2012 and 2013

Summary of Rock Weir and Silt Fence Particle Size Distribution from Sieve Analysis of Grab Samples on Pikes Peak, 2012 and 2013

			Particle Size Distribution–Grab Samples 2012 and 2013					
Site Name	**ID**	**Date**	**D15**	**D35**	**D50**	**D84**	**D95**	**D100**
Pikes Peak Highway - Rock Weir	008RW - Silt Fence	8/20/2012	0.039	0.602	1.342	6.375	11.279	15.0
Pikes Peak Highway - Rock Weir	176RW - Silt Fence	8/20/2012	0.017	0.116	0.499	1.635	3.596	14.0
Pikes Peak Highway - Rock Weir	199RW - Rock Weir	9/13/2012	0.084	1.043	2.046	5.524	9.087	15.0
Pikes Peak Highway - Rock Weir	202RW - Rock Weir	6/11/2012	0.082	0.804	1.376	3.873	6.965	21.0
Pikes Peak Highway - Rock Weir	237RW - Rock Weir	5/23/2012	0.048	0.722	1.462	4.335	8.802	12.0
Pikes Peak Highway - Rock Weir	252RW - Rock Weir	5/23/2012	0.067	0.653	1.003	3.106	5.277	14.0
Pikes Peak Highway - Rock Weir	256RW - Rock Weir	7/3/2012	0.029	0.408	0.938	4.363	7.322	21.0
Pikes Peak Highway - Rock Weir	161RW - Silt Fence	5/6/2013	0.069	0.748	1.422	6.235	14.674	22.0
Pikes Peak Highway - Rock Weir	161RW - Rock Weir	5/13/2013	0.119	1.008	1.856	5.346	9.687	16.0
Pikes Peak Highway - Rock Weir	181RW - Silt Fence	7/16/2013	0.139	1.388	2.463	5.339	9.120	15.0
Pikes Peak Highway - Rock Weir	241RW - Rock Weir	8/6/2013	0.691	2.142	4.035	33.142	39.003	42.0
Pikes Peak Highway - Rock Weir	254RW - Rock Weir	9/26/2013	0.035	0.532	0.883	3.027	7.264	22.0
Pikes Peak Highway - Rock Weir	264RW - Rock Weir	6/12/2013	0.015	0.085	0.320	2.257	4.224	10.0

Sieve Analysis Worksheet

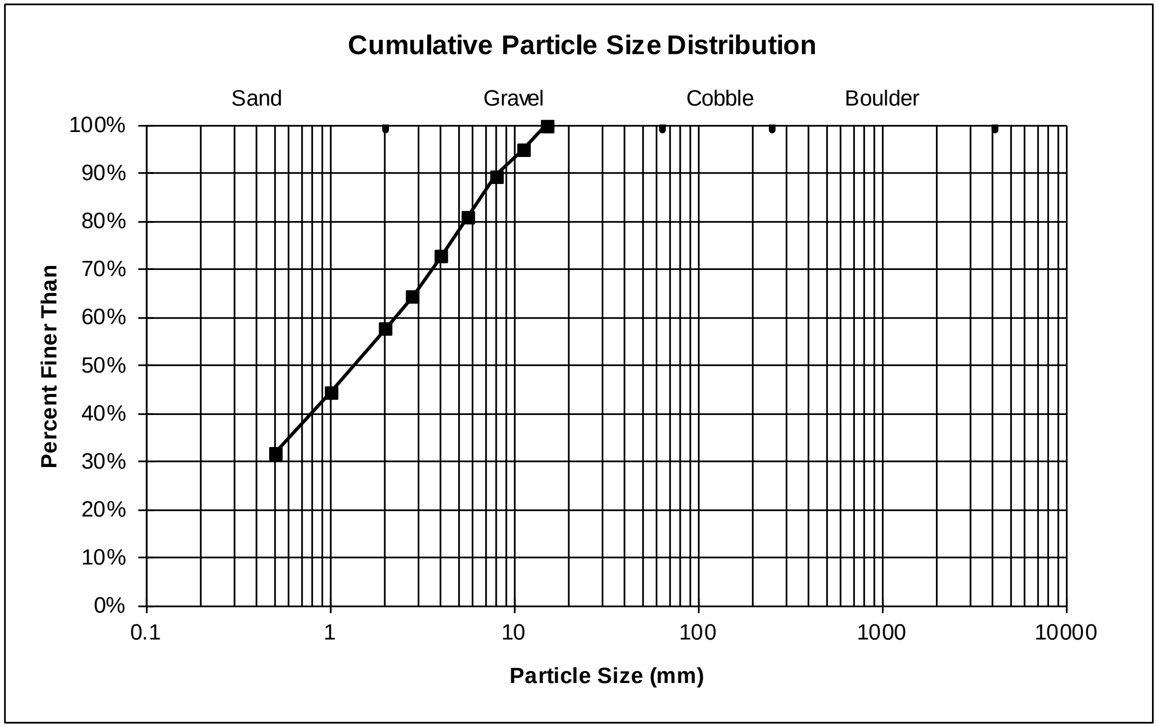
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	207.70	31.6%	
0.5	83.80	12.7%	31.6%
1.0	87.90	13.4%	44.3%
2.0	43.40	6.6%	57.7%
2.8	55.70	8.5%	64.3%
4.0	53.70	8.2%	72.8%
5.6	55.80	8.5%	80.9%
8.0	36.00	5.5%	89.4%
11.2	33.70	5.1%	94.9%
15.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	657.70		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 008RW Silt fence
DATE: 8/20/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.039	0.602	1.342	6.375	11.279	15.0



Sieve Analysis Worksheet

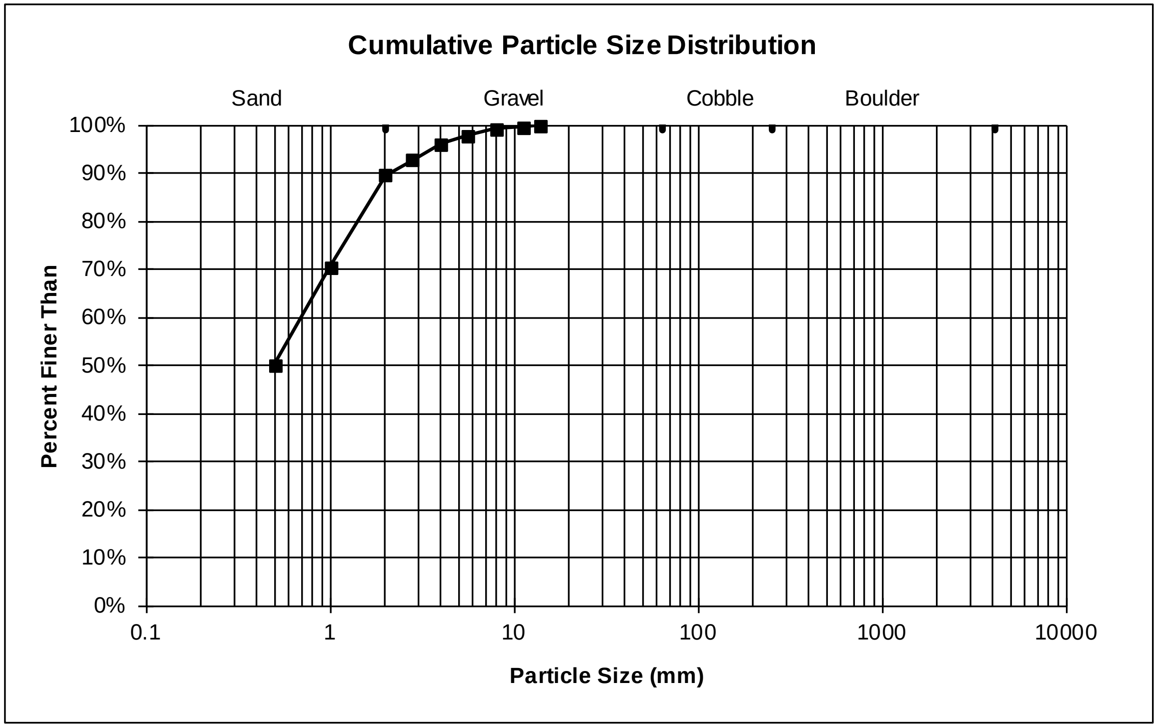
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	265.40	50.0%	
0.5	108.00	20.4%	50.0%
1.0	102.00	19.2%	70.4%
2.0	16.60	3.1%	89.6%
2.8	17.20	3.2%	92.7%
4.0	10.00	1.9%	96.0%
5.6	7.60	1.4%	97.9%
8.0	1.70	0.3%	99.3%
11.2	2.10	0.4%	99.6%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	530.60		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 176RW Silt Fence
DATE: 8/20/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.017	**0.116**	**0.499**	**1.635**	**3.596**	**14.0**



Sieve Analysis Worksheet

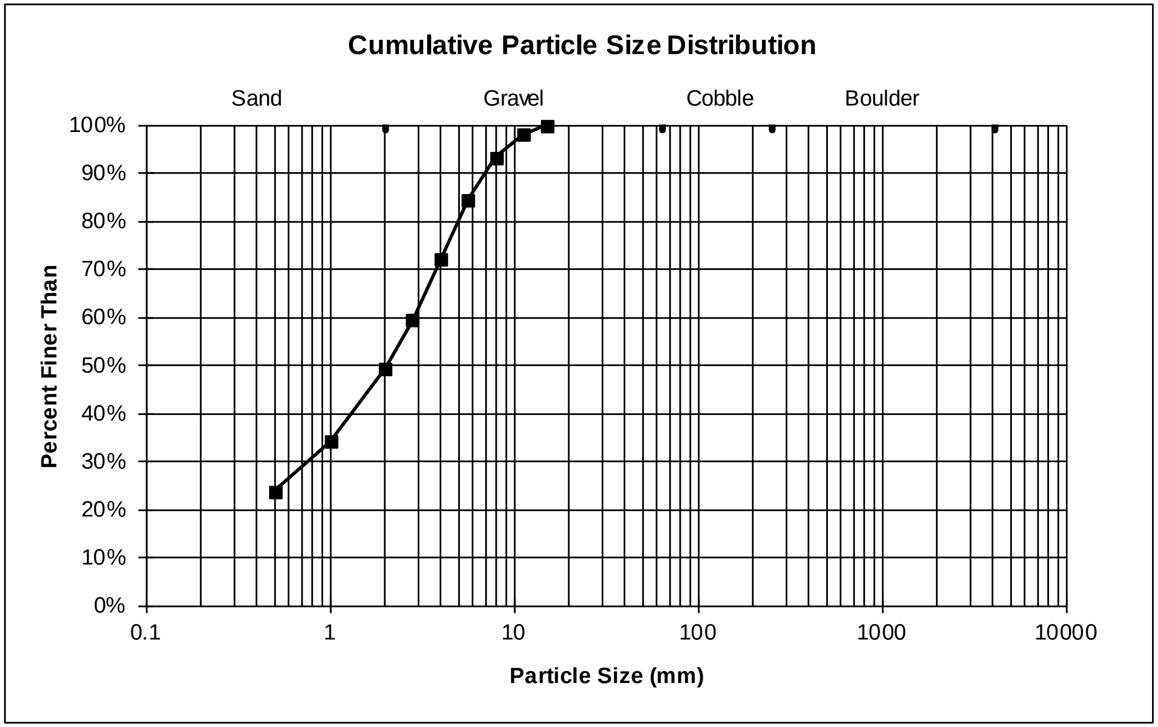
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	200.80	23.7%	
0.5	87.80	10.4%	23.7%
1.0	129.30	15.3%	34.1%
2.0	84.50	10.0%	49.3%
2.8	109.20	12.9%	59.3%
4.0	104.20	12.3%	72.2%
5.6	73.50	8.7%	84.5%
8.0	40.80	4.8%	93.2%
11.2	17.00	2.0%	98.0%
15.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	847.10		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Sediment Pond
ID NUMBER: 199RW Weir Sample
DATE: 9/13/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.084	1.043	2.046	5.524	9.087	15.0



Sieve Analysis Worksheet

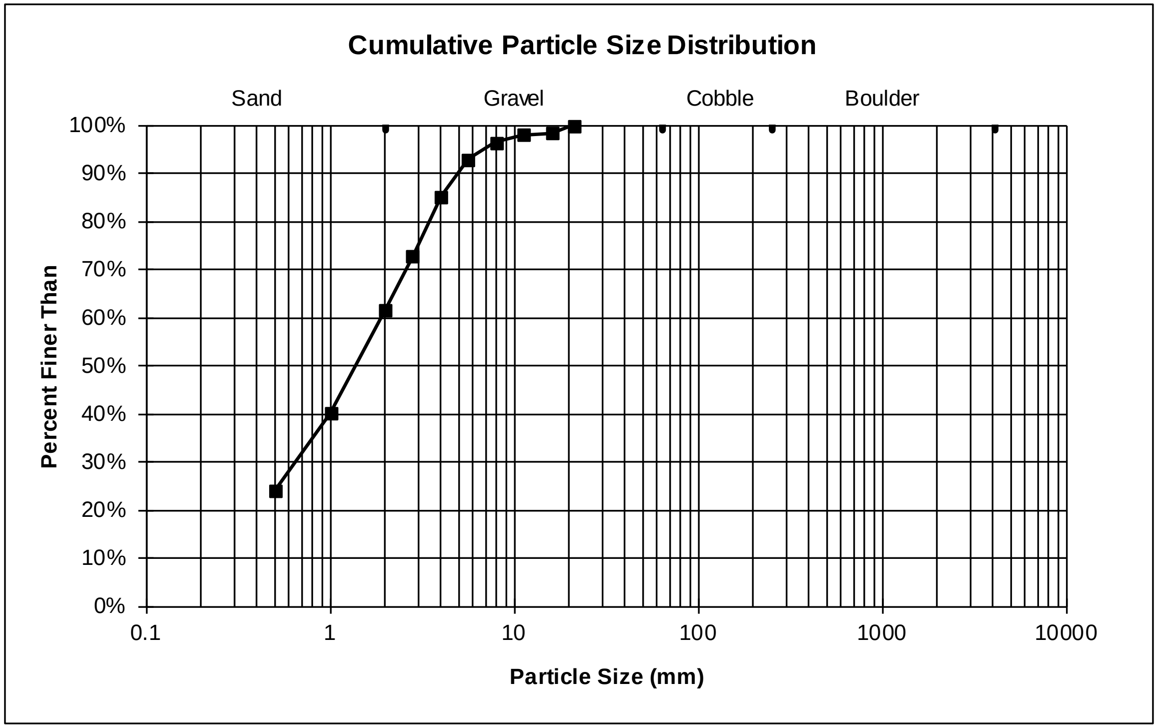
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	193.70	23.9%	
0.5	130.60	16.1%	23.9%
1.0	174.40	21.5%	40.1%
2.0	89.90	11.1%	61.6%
2.8	100.30	12.4%	72.7%
4.0	62.50	7.7%	85.1%
5.6	28.50	3.5%	92.8%
8.0	13.40	1.7%	96.4%
11.2	2.50	0.3%	98.0%
16.0	13.50	1.7%	98.3%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	809.30		

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

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 202RW Weir Sample
DATE: 6/11/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.082	0.804	1.376	3.873	6.965	21.0



Sieve Analysis Worksheet

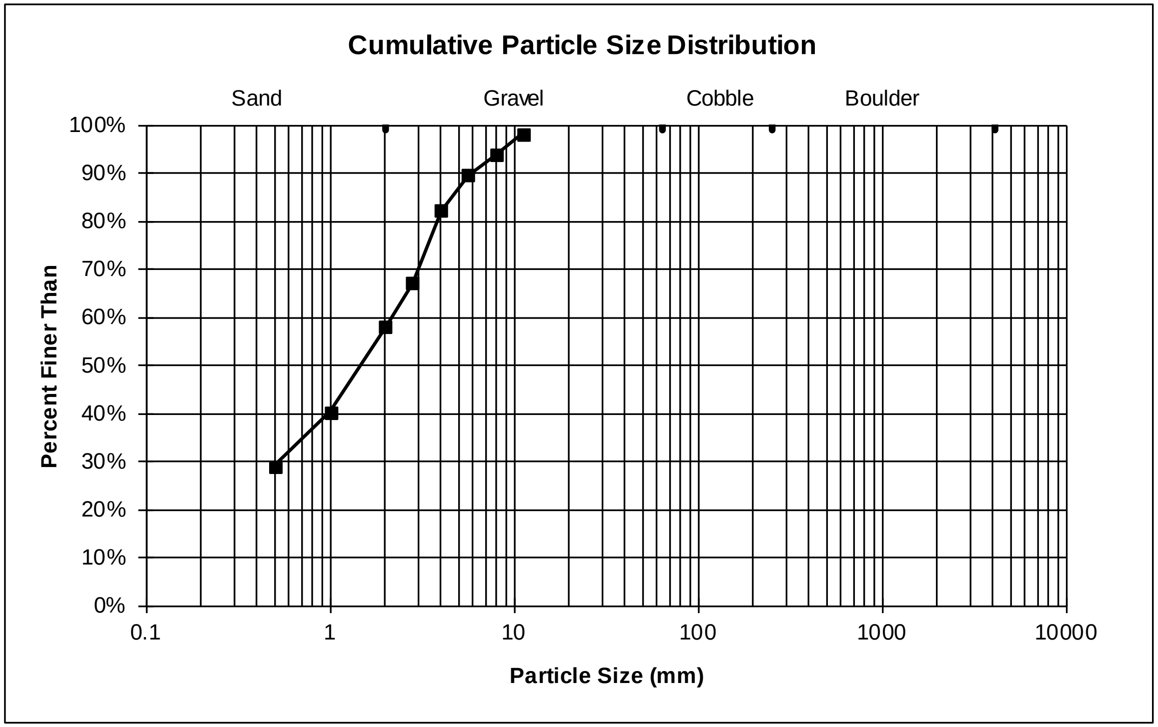
COMMENTS: Grab Sample of 2012 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	218.10	29.1%	
0.5	84.20	11.2%	29.1%
1.0	133.20	17.7%	40.3%
2.0	68.50	9.1%	58.0%
2.8	113.30	15.1%	67.1%
4.0	55.20	7.4%	82.2%
5.6	31.20	4.2%	89.6%
8.0	33.00	4.4%	93.8%
11.2	13.90	1.9%	98.1%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	750.60		

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

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 237RW Weir Sample
DATE: 5/23/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.048	0.722	1.462	4.335	8.802	12.0



Sieve Analysis Worksheet

COMMENTS: Grab Sample of 2012 Sediment Accumulation

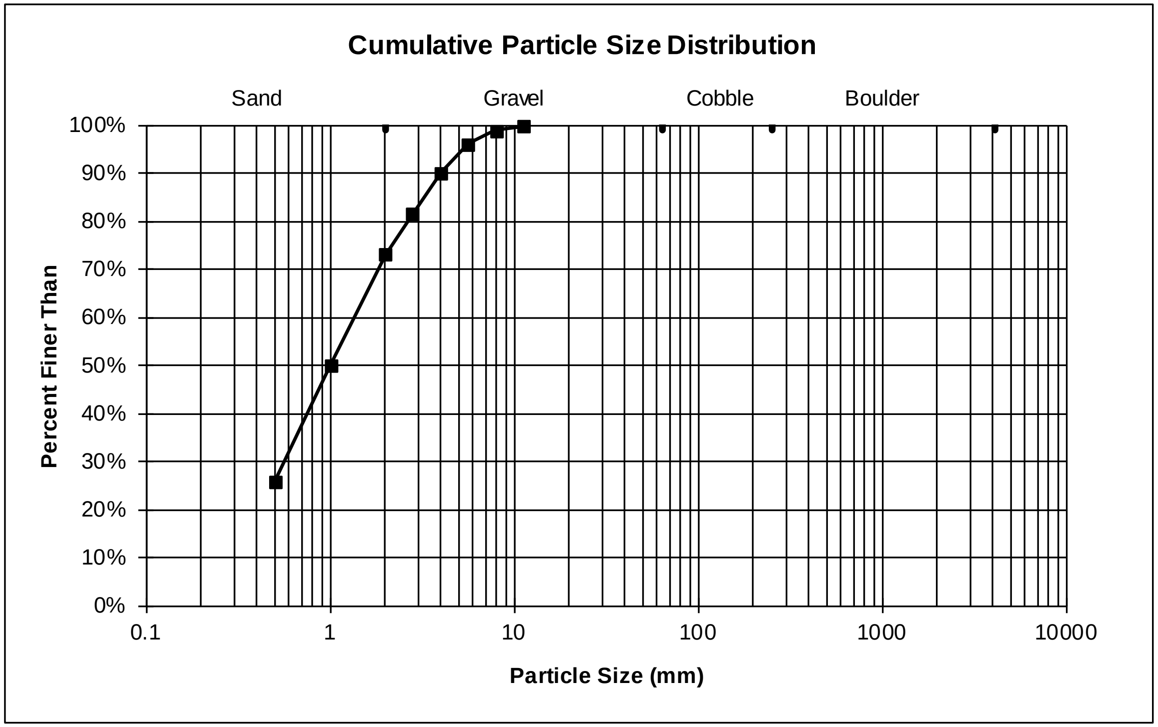
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	224.60	25.7%	
0.5	212.10	24.2%	25.7%
1.0	202.50	23.1%	49.9%
2.0	74.20	8.5%	73.0%
2.8	74.80	8.5%	81.5%
4.0	52.50	6.0%	90.1%
5.6	24.00	2.7%	96.1%
8.0	8.30	0.9%	98.8%
11.2	2.20	0.3%	99.7%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	875.20		

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

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 252RW Weir Sample
DATE: 5/23/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
0.067	0.653	1.003	3.106	5.277	14.0



Sieve Analysis Worksheet

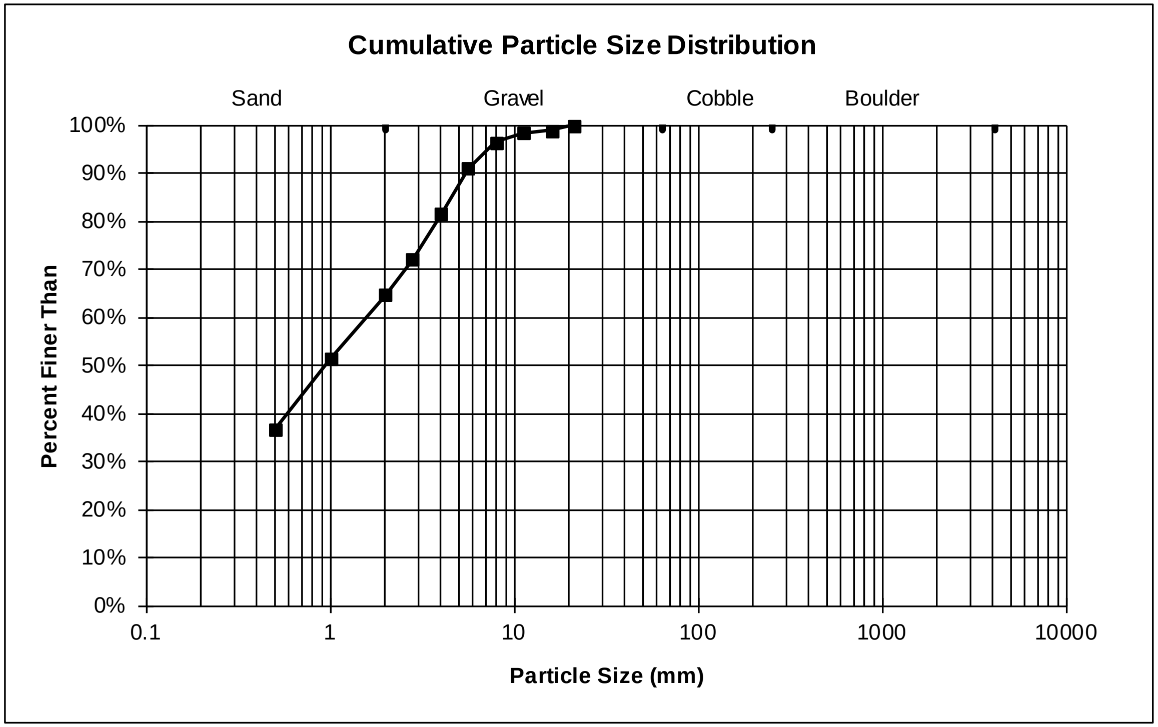
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	313.60	36.5%	
0.5	127.40	14.8%	36.5%
1.0	113.70	13.2%	51.4%
2.0	64.10	7.5%	64.6%
2.8	81.30	9.5%	72.1%
4.0	81.10	9.4%	81.6%
5.6	45.60	5.3%	91.0%
8.0	16.60	1.9%	96.3%
11.2	4.60	0.5%	98.3%
16.0	10.40	1.2%	98.8%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	858.40		

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

COMMENTS: Grab Sample of 2012 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 256RW Weir Sample
DATE: 7/3/2012
CREW: VonLoh, Willis

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.029	0.408	0.938	4.363	7.322	21.0



Sieve Analysis Worksheet

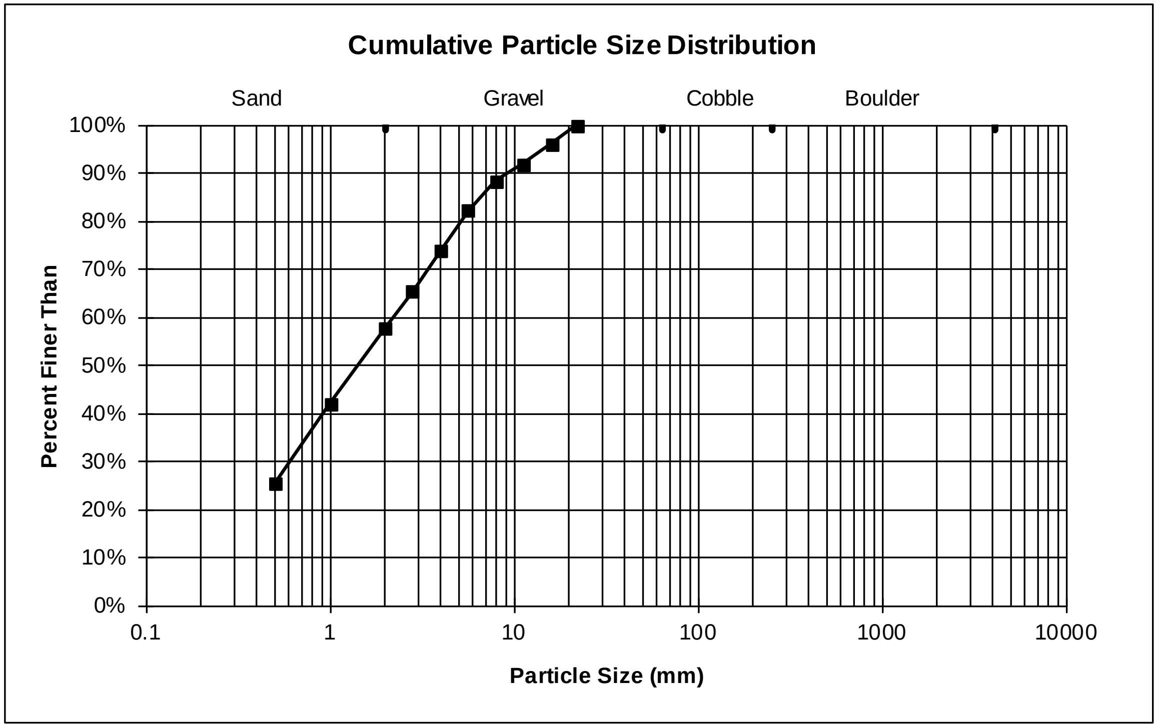
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	172.50	25.3%	
0.5	114.10	16.7%	25.3%
1.0	107.60	15.8%	42.0%
2.0	51.30	7.5%	57.8%
2.8	59.20	8.7%	65.3%
4.0	55.90	8.2%	74.0%
5.6	41.90	6.1%	82.2%
8.0	24.80	3.6%	88.3%
11.2	27.70	4.1%	91.9%
16.0	27.40	4.0%	96.0%
22.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	682.40		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 161RW Silt Fence
DATE: 5/6/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.069	0.748	1.422	6.235	14.674	22.0



Sieve Analysis Worksheet

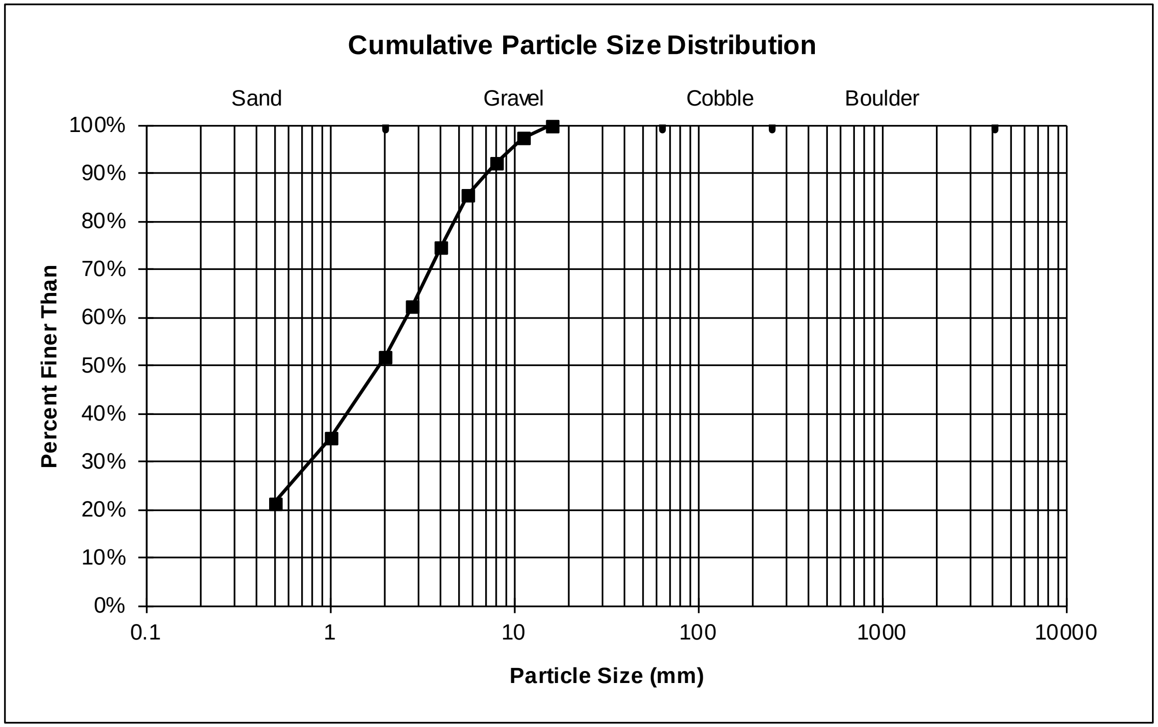
COMMENTS: Grab Sample of 2013 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	135.30	21.3%	
0.5	85.80	13.5%	21.3%
1.0	108.20	17.0%	34.8%
2.0	67.00	10.5%	51.8%
2.8	78.20	12.3%	62.4%
4.0	68.50	10.8%	74.7%
5.6	41.50	6.5%	85.5%
8.0	33.30	5.2%	92.0%
11.2	17.40	2.7%	97.3%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	635.20		

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

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 161RW Weir
DATE: 5/13/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.119	1.008	1.856	5.346	9.687	16.0



Sieve Analysis Worksheet

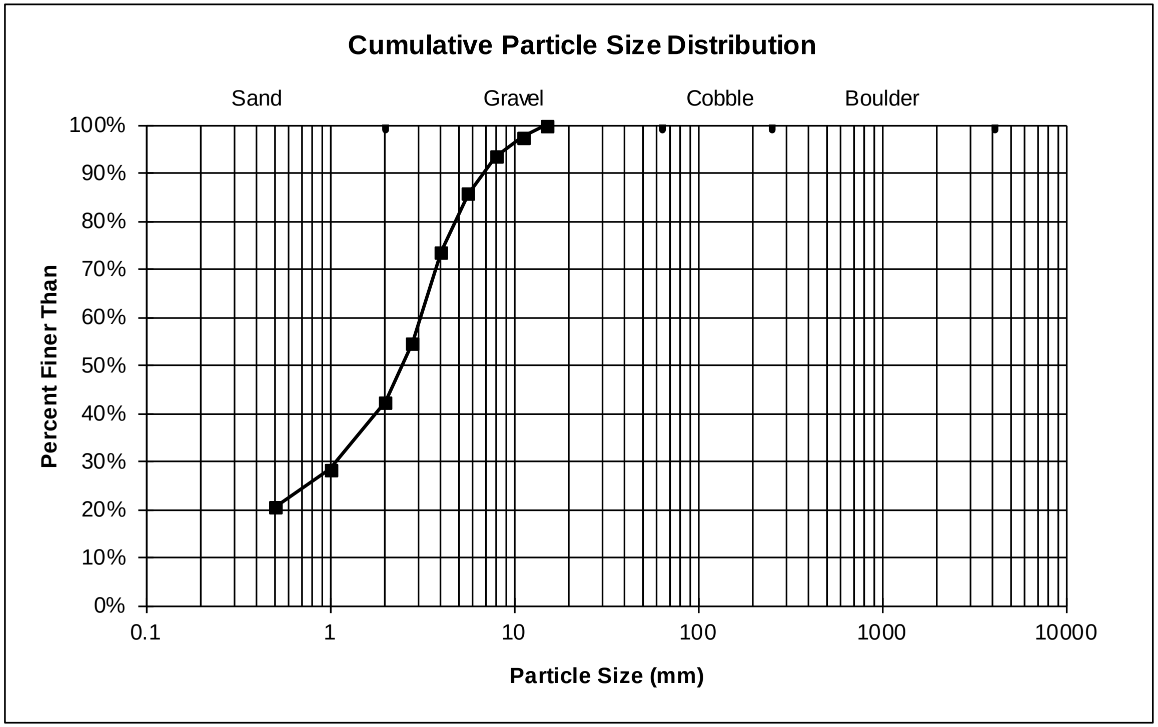
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	123.50	20.4%	
0.5	48.70	8.0%	20.4%
1.0	84.30	13.9%	28.4%
2.0	75.10	12.4%	42.3%
2.8	114.30	18.9%	54.7%
4.0	73.50	12.1%	73.6%
5.6	46.90	7.7%	85.7%
8.0	23.90	3.9%	93.5%
11.2	15.70	2.6%	97.4%
15.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	605.90		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 181RW Silt Fence
DATE: 7/16/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.139	1.388	2.463	5.339	9.120	15.0



Sieve Analysis Worksheet

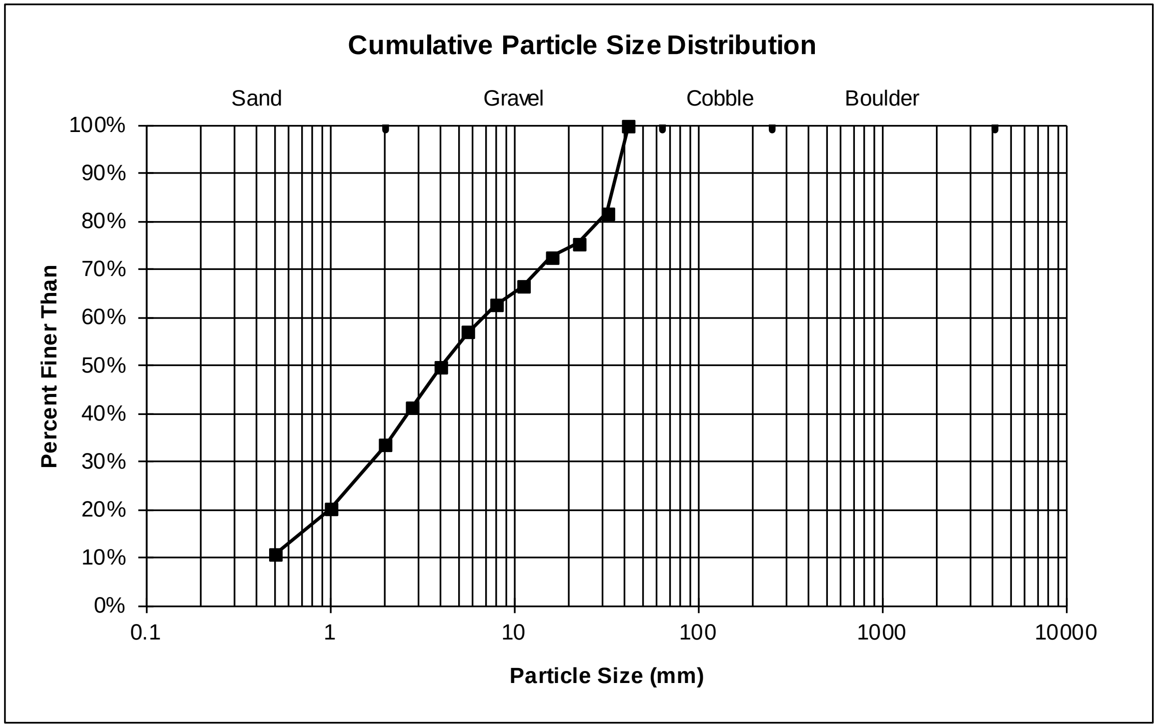
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	72.60	10.6%	
0.5	64.40	9.4%	10.6%
1.0	91.30	13.3%	20.0%
2.0	54.80	8.0%	33.4%
2.8	57.80	8.4%	41.4%
4.0	48.10	7.0%	49.8%
5.6	39.40	5.8%	56.8%
8.0	25.90	3.8%	62.6%
11.2	42.50	6.2%	66.4%
16.0	19.30	2.8%	72.6%
22.4	42.50	6.2%	75.4%
32.0	125.70	18.4%	81.6%
42.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	684.30		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 241RW Weir
DATE: 8/6/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.691	2.142	4.035	33.142	39.003	42.0



Sieve Analysis Worksheet

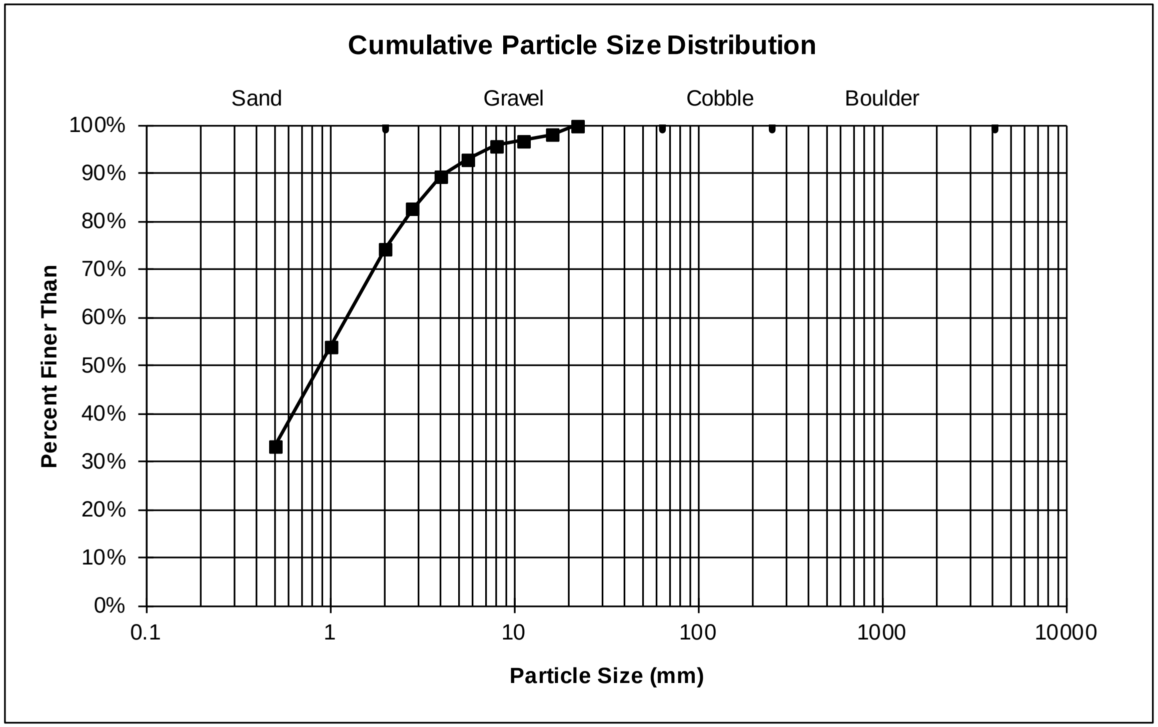
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	204.10	33.2%	
0.5	126.40	20.5%	33.2%
1.0	127.30	20.7%	53.7%
2.0	50.00	8.1%	74.4%
2.8	42.50	6.9%	82.5%
4.0	21.90	3.6%	89.4%
5.6	17.30	2.8%	92.9%
8.0	5.90	1.0%	95.8%
11.2	7.80	1.3%	96.7%
16.0	12.40	2.0%	98.0%
22.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	615.60		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: 254RW Weir
DATE: 9/26/2013
CREW: VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.035	**0.532**	**0.883**	**3.027**	**7.264**	**22.0**



Sieve Analysis Worksheet

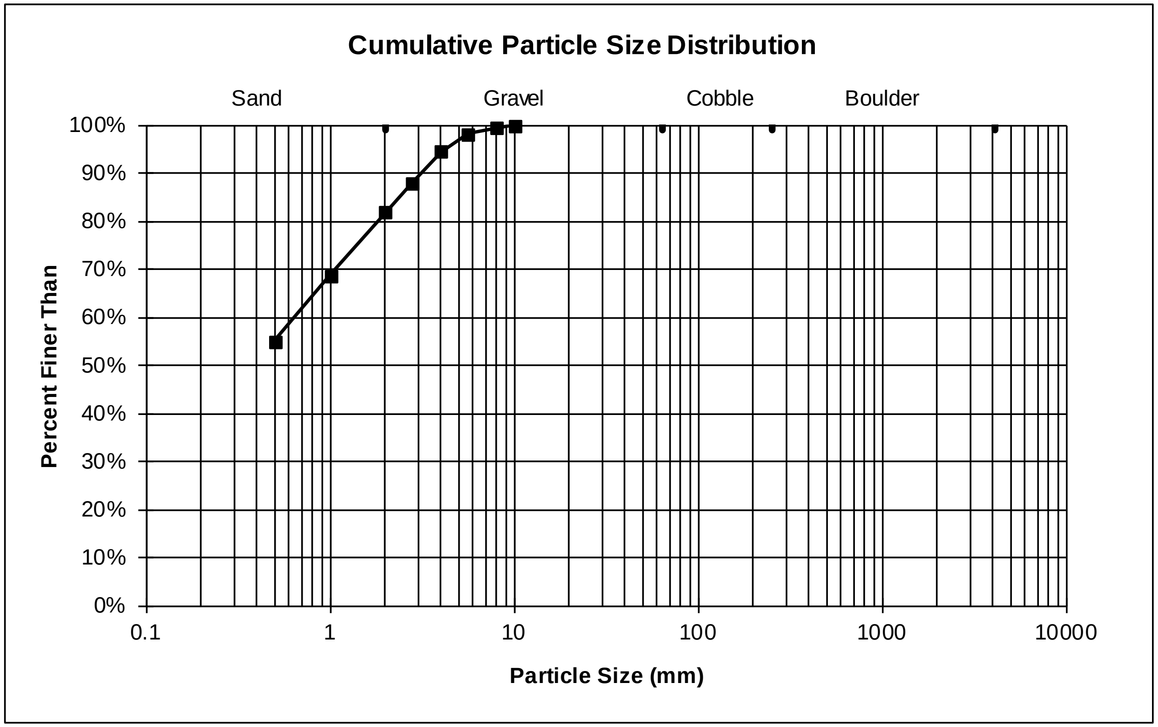
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	360.60	55.1%	
0.5	89.70	13.7%	55.1%
1.0	85.40	13.0%	68.7%
2.0	40.40	6.2%	81.8%
2.8	42.20	6.4%	88.0%
4.0	24.40	3.7%	94.4%
5.6	8.40	1.3%	98.1%
8.0	3.90	0.6%	99.4%
10.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	655.00		

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

COMMENTS: Grab Sample of 2013 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Sediment Pond
ID NUMBER: 264RW Weir
DATE: 6/12/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.015	0.085	0.320	2.257	4.224	10.0



Appendix L

Sediment Pond

Suspended Sediment Data

2013

Summary of Sediment Pond Suspended Sediment Analysis of Grab Samples on Pikes Peak, 2013

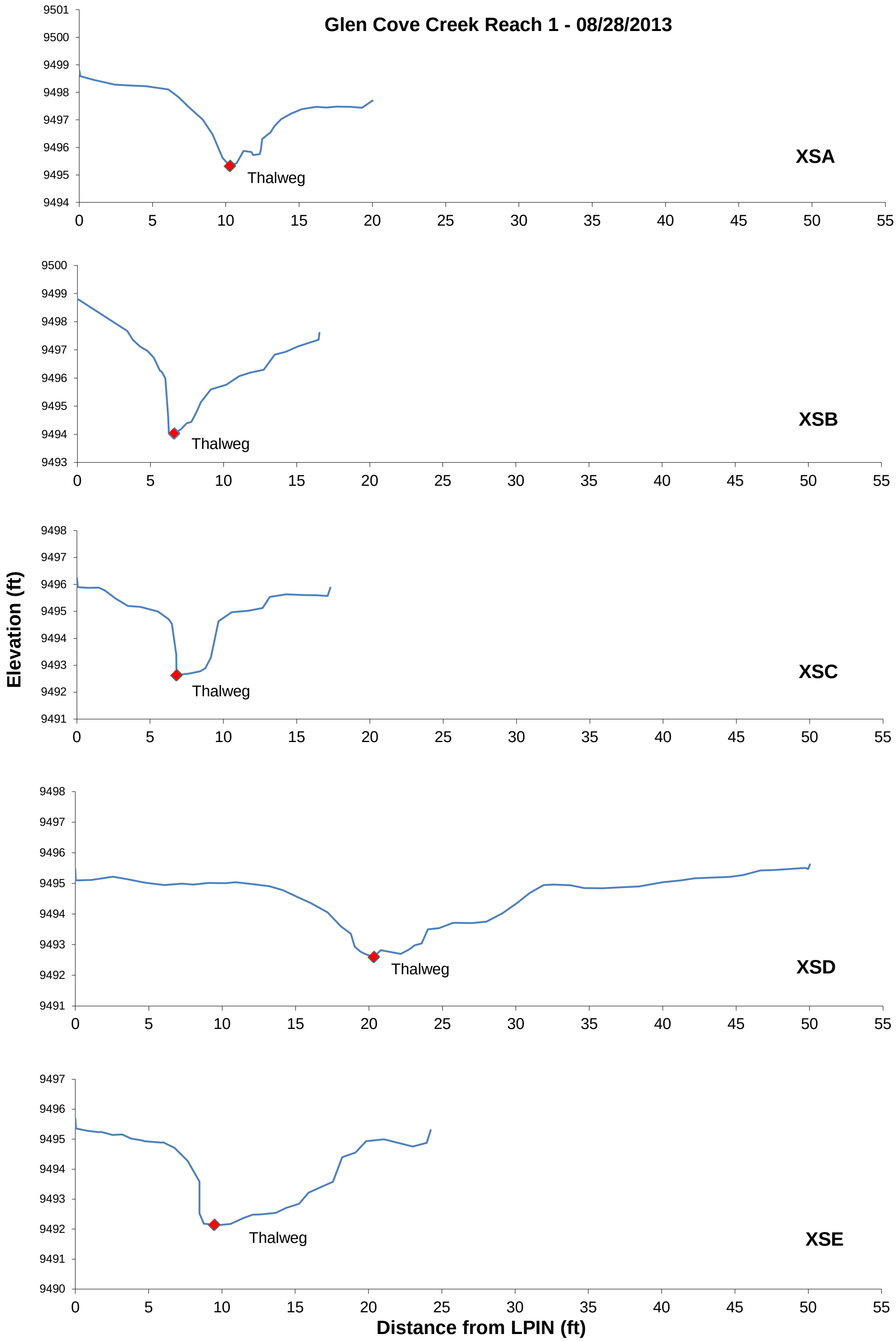
Site ID	Date	Volume of Sample (L)	Dried Sediment Weight (mg)	Sediment Sample Total (mg/L)
199RW Entrance Culvert	**5/8/2013**	**0.99**	**40.00**	**40.40**
199RW Above Sed Pond	**5/8/2013**	**1.04**	**35.00**	**33.70**
199RW Exit Culvert	**5/8/2013**	**1.00**	**0.70**	**0.70**
199RW Entrance Culvert	7/1/2013	0.98	78.70	80.30
199RW Above Sed Pond	7/1/2013	0.90	113.40	126.00
199RW Exit Culvert	7/1/2013	0.96	5.40	5.60
199RW Entrance Culvert	**7/10/2013**	**1.05**	**30.80**	**29.33**
199RW Above Sed Pond	**7/10/2013**	**1.05**	**31.70**	**30.19**
199RW Exit Culvert	**7/10/2013**	**0.97**	**15.40**	**15.87**
199RW Entrance Culvert	7/15/2013	1.00	19.60	19.60
199RW Above Sed Pond	7/15/2013	1.04	26.60	25.57
199RW Exit Culvert	7/15/2013	1.00	25.10	25.10
199RW Entrance Culvert	**7/29/2013**	**1.10**	**124.60**	**113.27**
199RW Above Sed Pond	**7/29/2013**	**1.15**	**101.30**	**88.08**
199RW Exit Culvert	**7/29/2013**	**0.96**	**5.80**	**6.04**
199RW Entrance Culvert	8/12/2013	1.06	185.60	175.09
199RW Above Sed Pond	8/12/2013	1.00	200.50	200.50
199RW Exit Culvert	8/12/2013	0.97	10.30	10.61
199RW Entrance Culvert	**9/11/2013**	**0.99**	**37.80**	**38.18**
199RW Above Sed Pond	**9/11/2013**	**0.99**	**23.80**	**24.04**
199RW Exit Culvert	**9/11/2013**	**1.01**	**36.00**	**35.64**
199RW Entrance Culvert	9/23/2013	1.04	2.80	2.69
199RW Above Sed Pond	9/23/2013	1.02	10.70	10.49
199RW Exit Culvert	9/23/2013	0.98	7.10	7.24
237RW Entrance Culvert	**7/1/2013**	**1.01**	**249.50**	**247.00**
237RW Exit Culvert	**7/1/2013**	**1.00**	**8.20**	**8.20**
237RW Entrance Culvert	7/15/2013	0.96	62.00	64.58
237RW Exit Culvert	7/15/2013	0.96	10.70	11.14
237RW Entrance Culvert	**8/5/2013**	**1.00**	**420.60**	**420.60**
237RW Exit Culvert	**8/5/2013**	**1.05**	**8.60**	**8.19**
237RW Entrance Culvert	9/11/2013	1.00	21.80	21.80
237RW Exit Culvert	9/11/2013	1.01	13.00	12.87
262RW Entrance Culvert	**7/1/2013**	**1.05**	**597.60**	**569.10**
262RW Above Sed Pond	**7/1/2013**	**0.97**	**501.30**	**516.80**
262RW Exit Culvert	**7/1/2013**	**1.00**	**93.50**	**93.50**
262RW Entrance Culvert	7/15/2013	1.03	11.10	10.77
262RW Above Sed Pond	7/15/2013	1.00	18.30	18.30
262RW Exit Culvert	7/15/2013	0.98	63.50	64.79
262RW Entrance Culvert	**8/5/2013**	**1.00**	**81.10**	**81.10**
262RW Above Sed Pond	**8/5/2013**	**1.05**	**68.50**	**65.23**
262RW Exit Culvert	**8/5/2013**	**1.05**	**23.60**	**22.47**
262RW Entrance Culvert	9/11/2013	0.97	20.20	20.82
262RW Above Sed Pond	9/11/2013	1.00	23.90	23.90
262RW Exit Culvert	9/11/2013	1.02	30.60	30.00

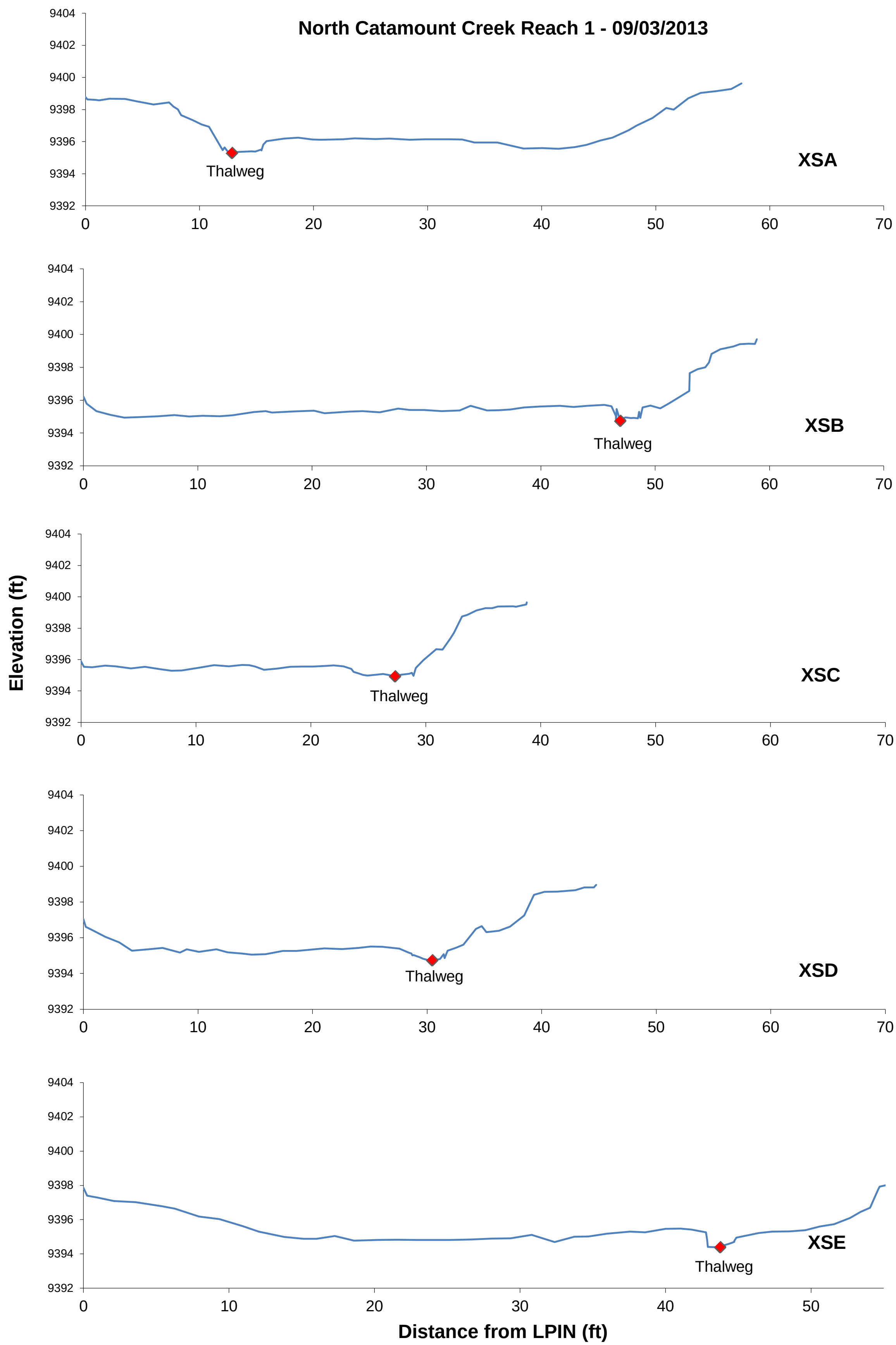
Appendix M

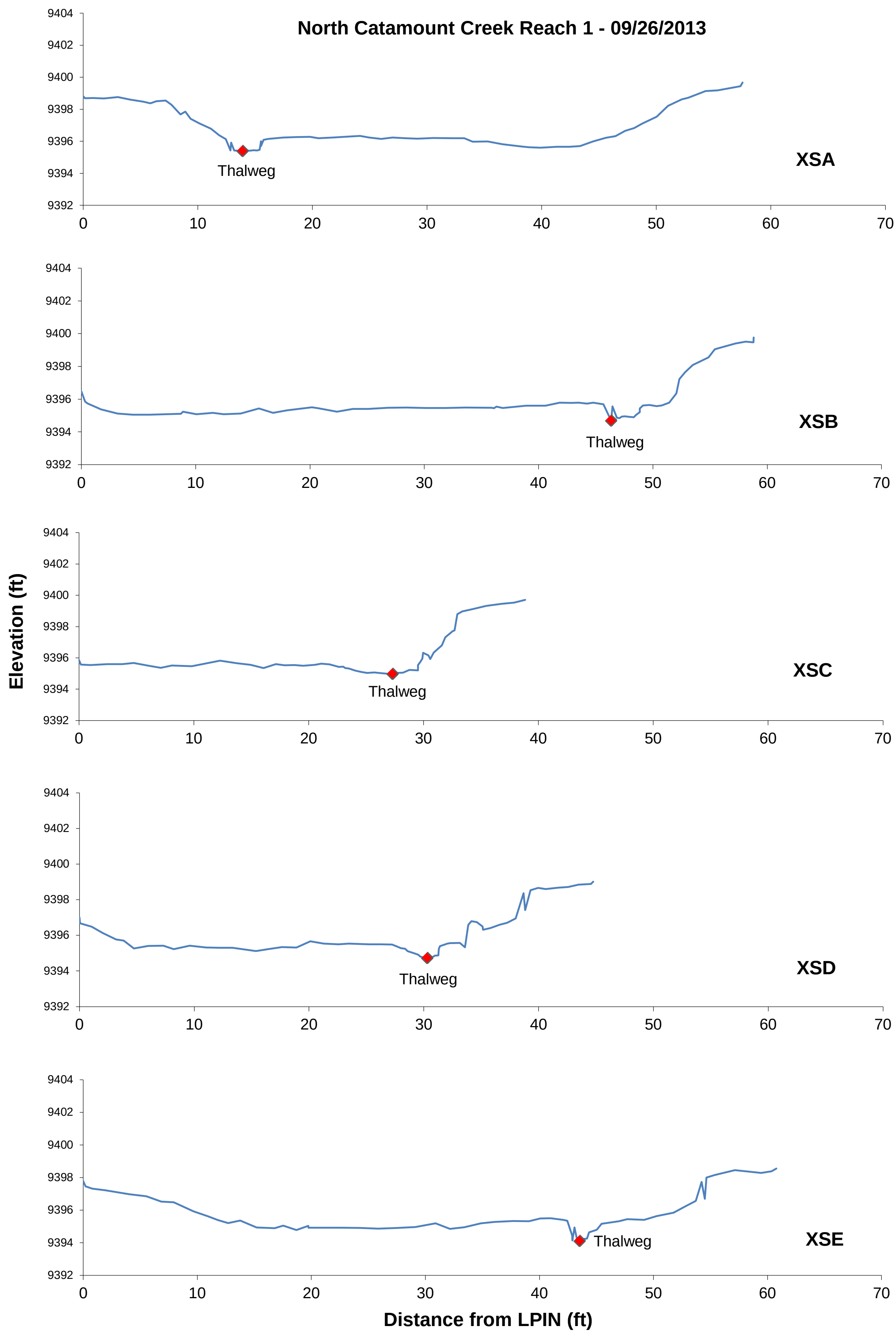
Stream Channel

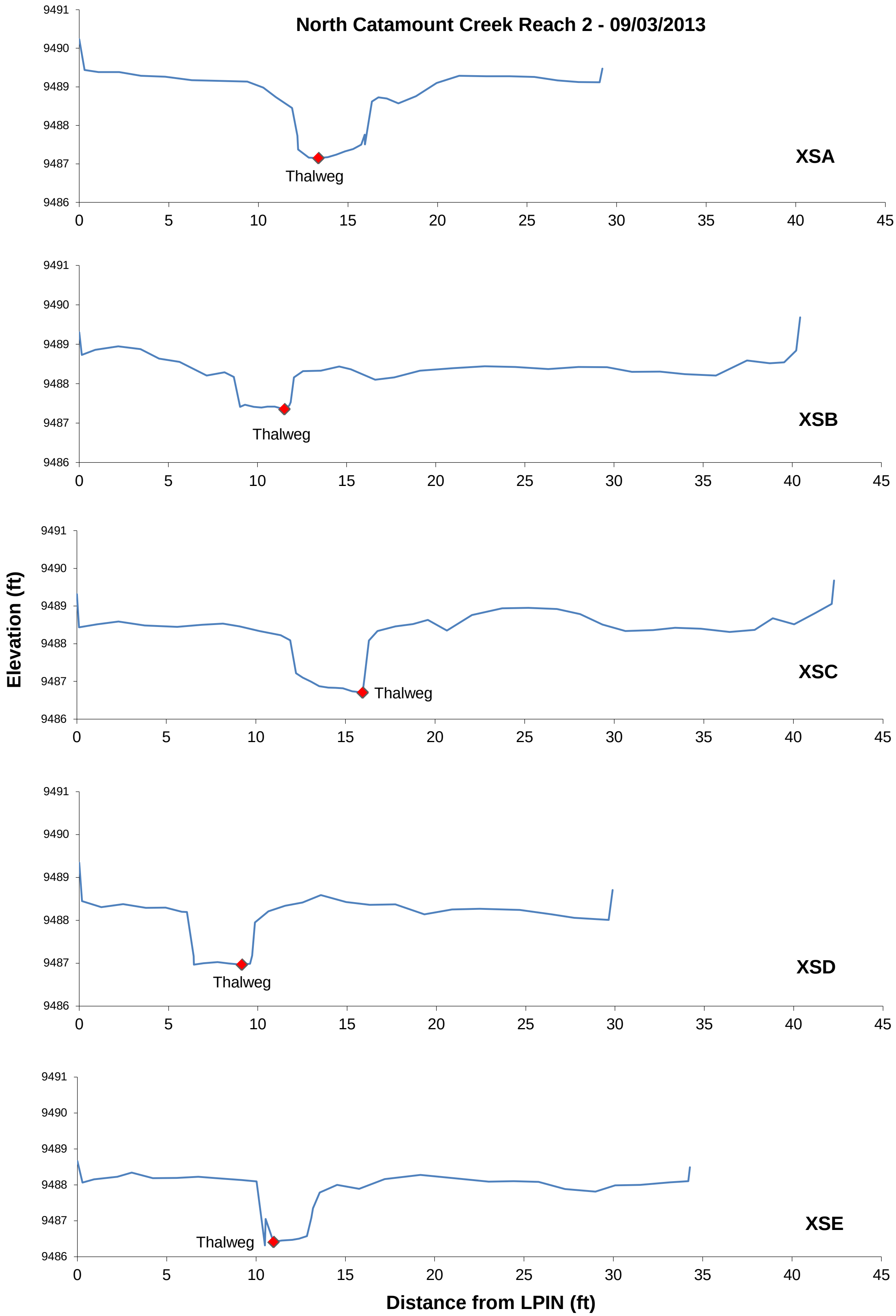
Cross Section Graphs

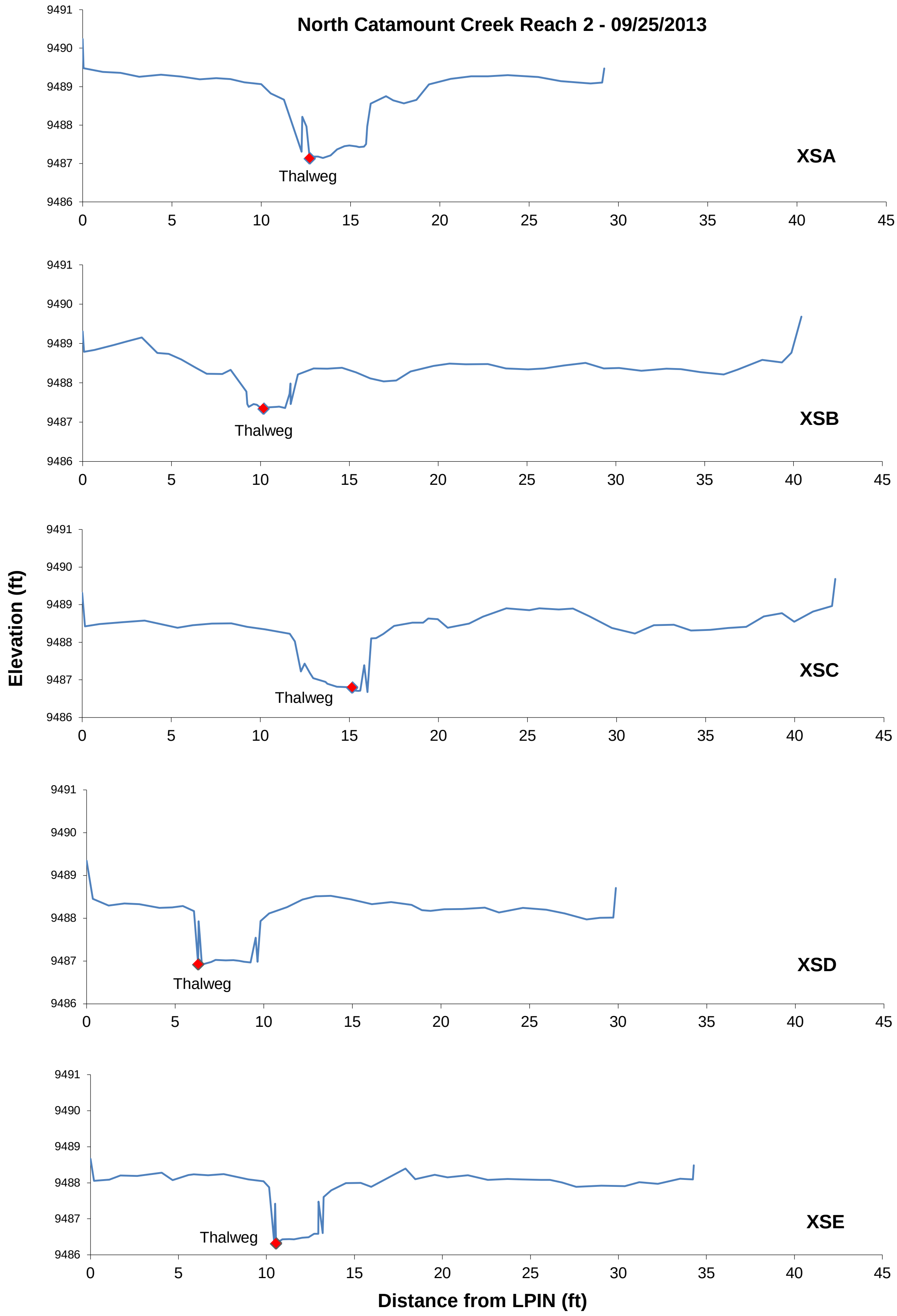
2013

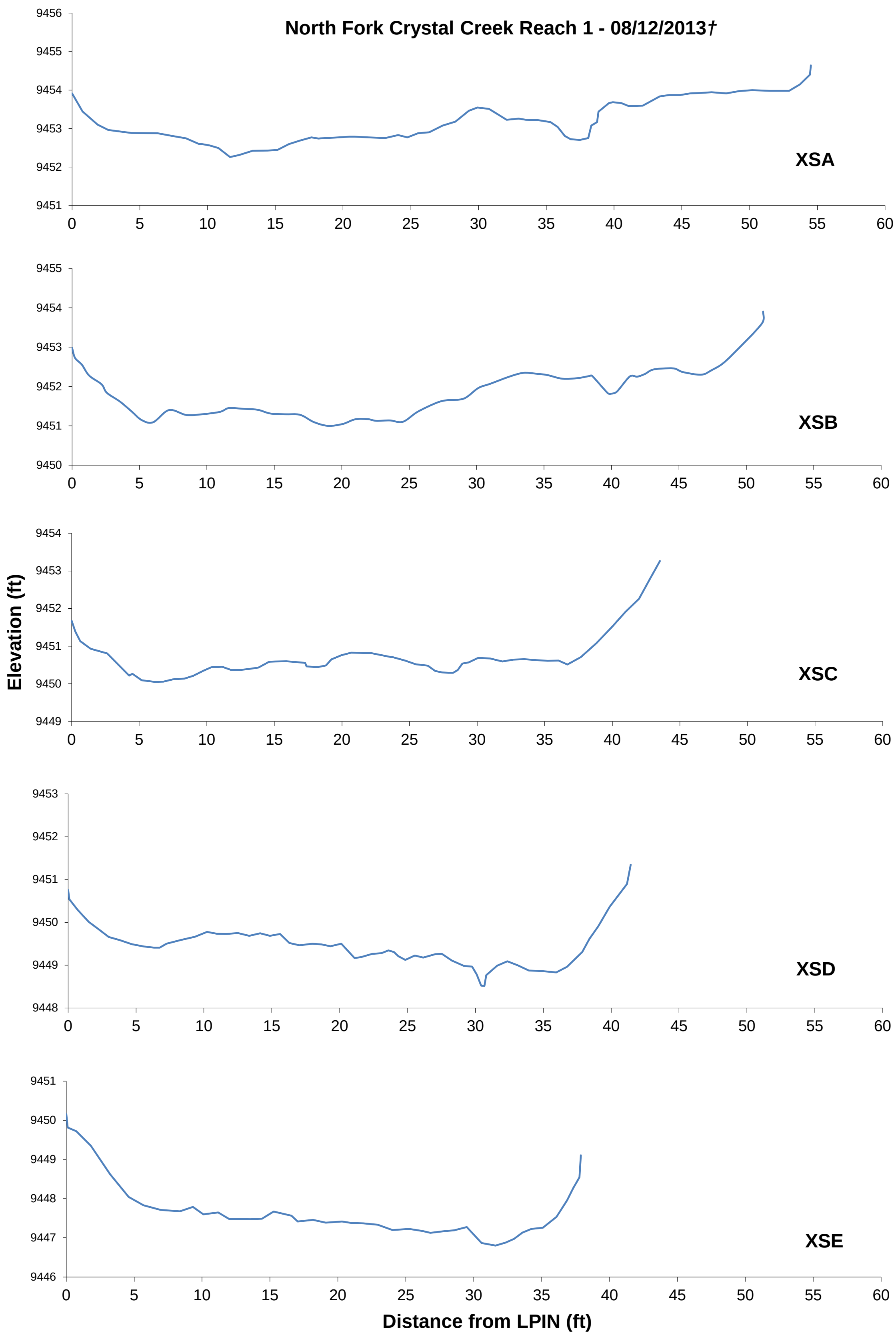

Glen Cove Creek Reach 1 - 08/28/2013
XSA
Thalweg
9501
9500
9499
9498
9497
9496
9495
9494
0
5
10
15
20
25
30
35
40
45
50
55
XSB
Thalweg
9500
9499
9498
9497
9496
9495
9494
9493
XSC
Thalweg
9498
9497
9496
9495
9494
9493
9492
9491
XSD
Thalweg
9498
9497
9496
9495
9494
9493
9492
9491
XSE
Thalweg
9497
9496
9495
9494
9493
9492
9491
9490
Elevation (ft)
Distance from LPIN (ft)


North Catamount Creek Reach 1 - 09/03/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
9404
9402
9400
9398
9396
9394
9392
0
10
20
30
40
50
60
70

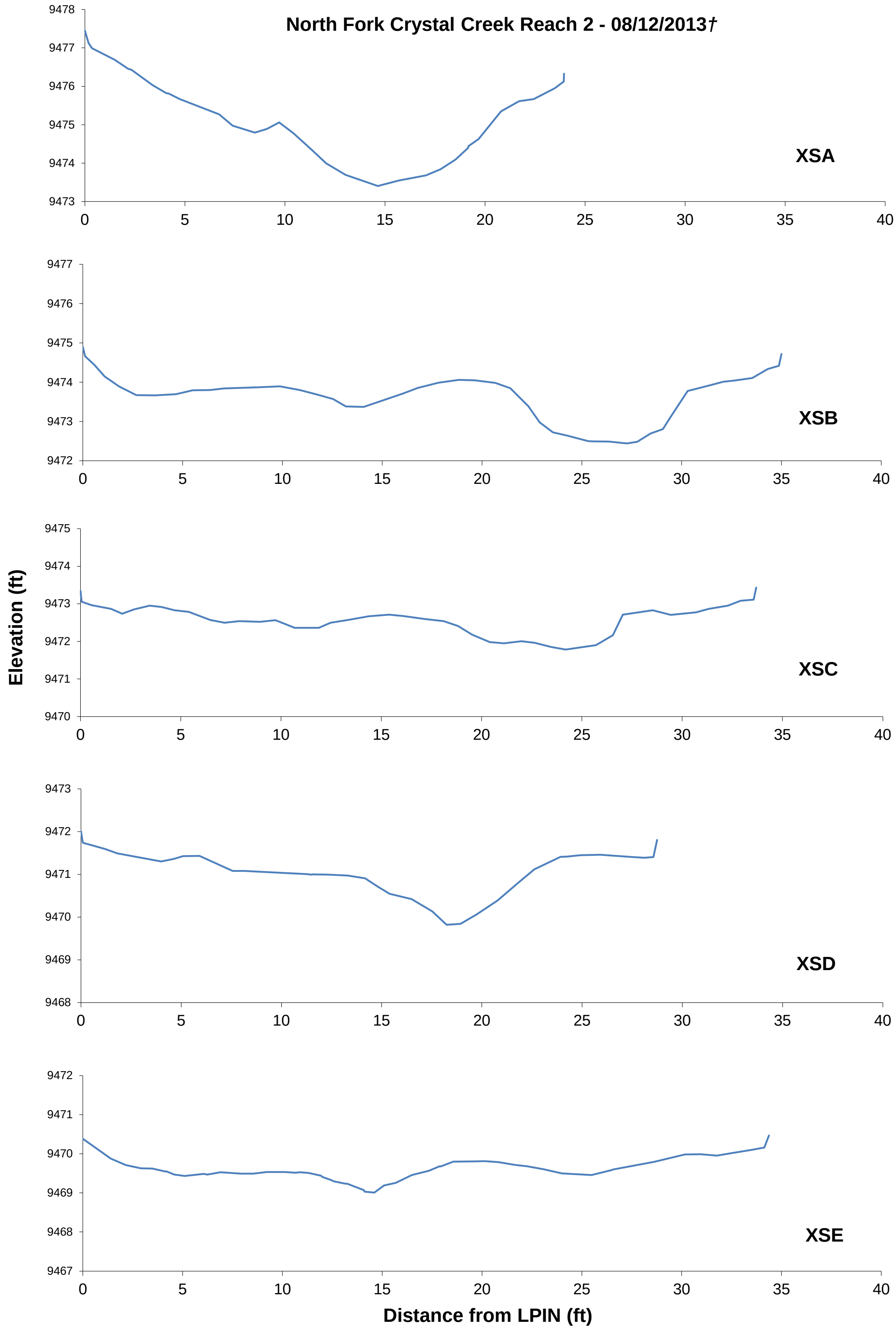

North Catamount Creek Reach 1 - 09/26/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
9404
9402
9400
9398
9396
9394
9392
0
10
20
30
40
50
60
70


North Catamount Creek Reach 2 - 09/03/2013
XSA
Thalweg
XSB
Thalweg
XSC
Thalweg
XSD
Thalweg
XSE
Thalweg
Elevation (ft)
9486
9487
9488
9489
9490
9491
0
5
10
15
20
25
30
35
40
45
Distance from LPIN (ft)

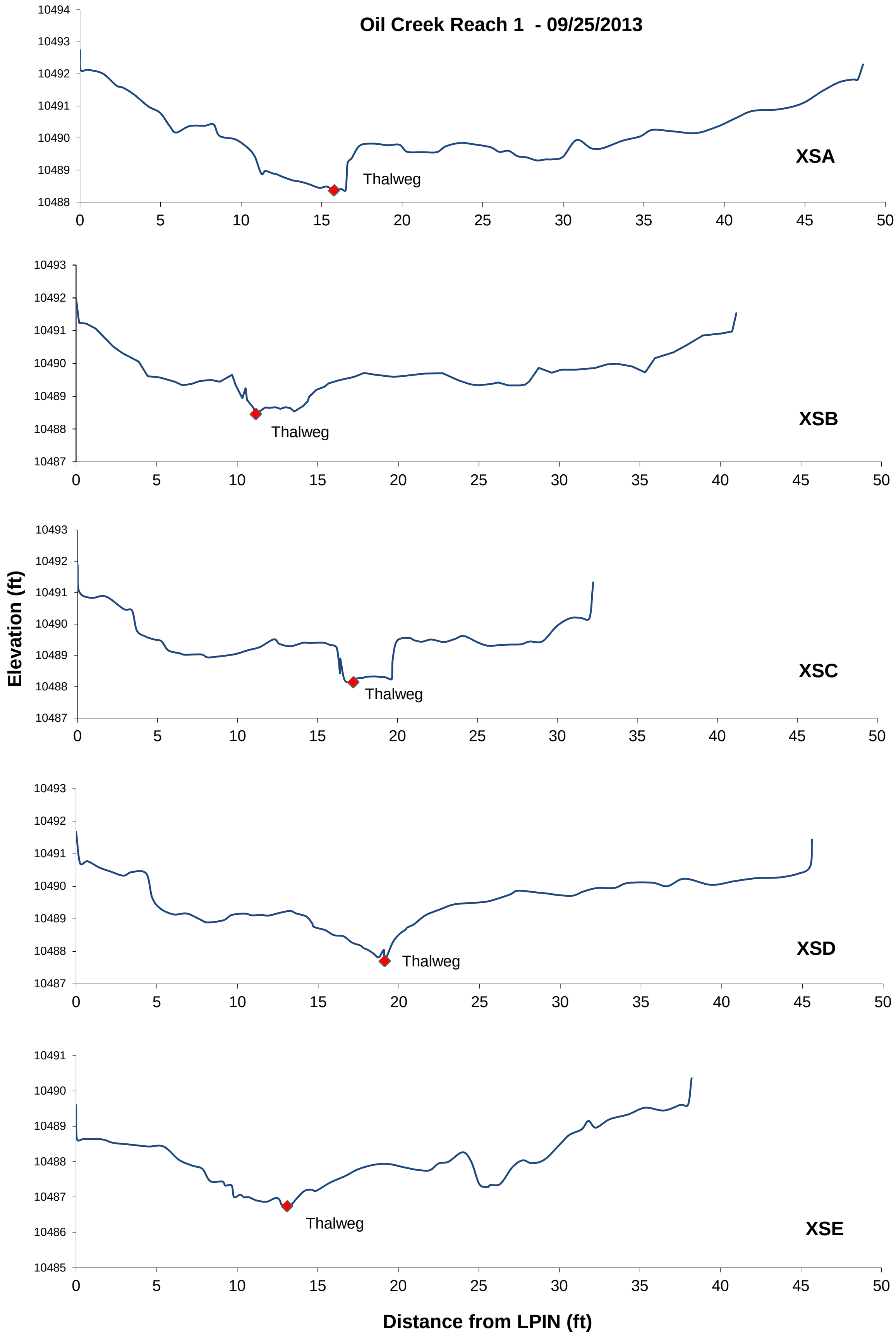

North Catamount Creek Reach 2 - 09/25/2013
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
Elevation (ft)
Distance from LPIN (ft)
9491
9490
9489
9488
9487
9486
0
5
10
15
20
25
30
35
40
45

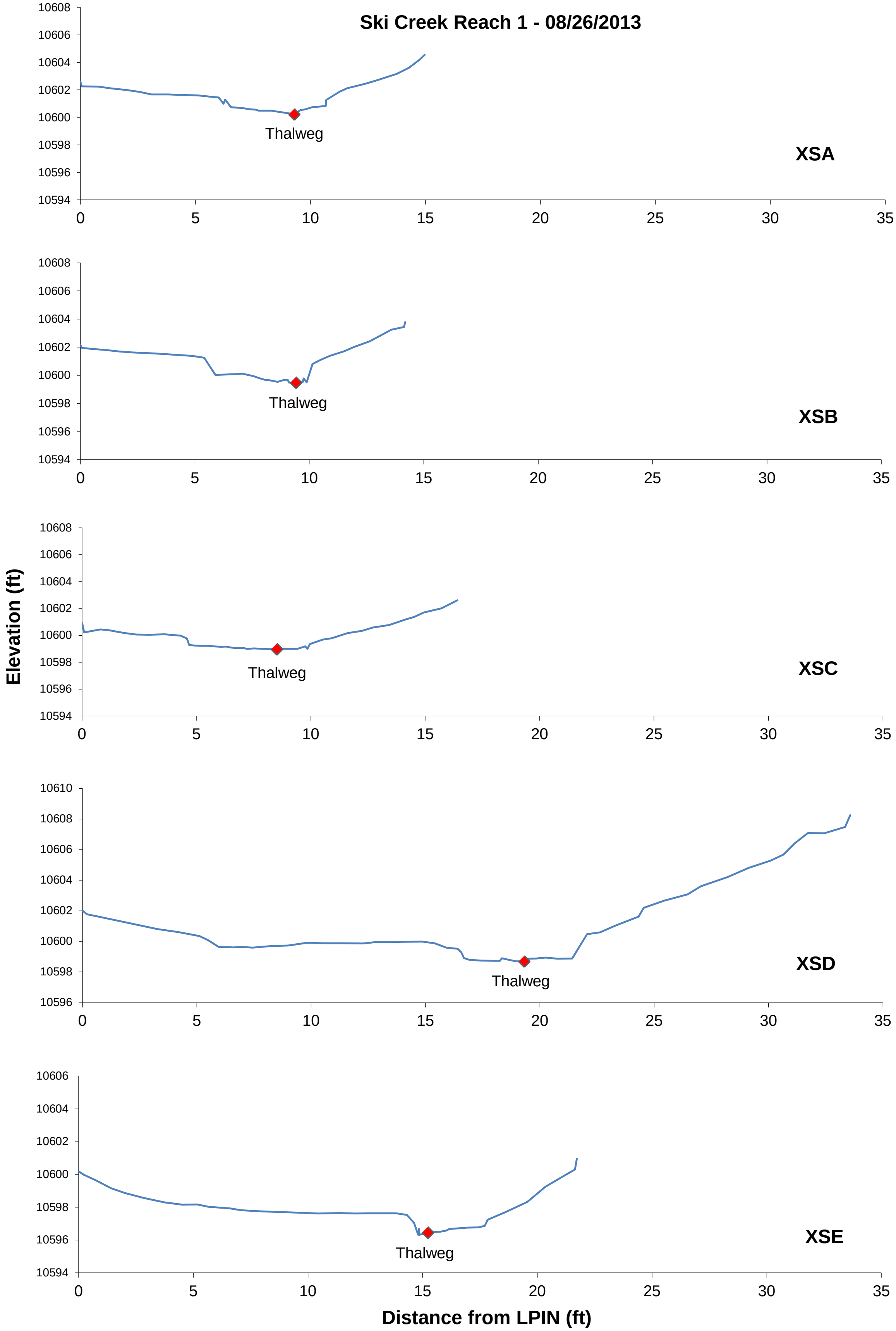


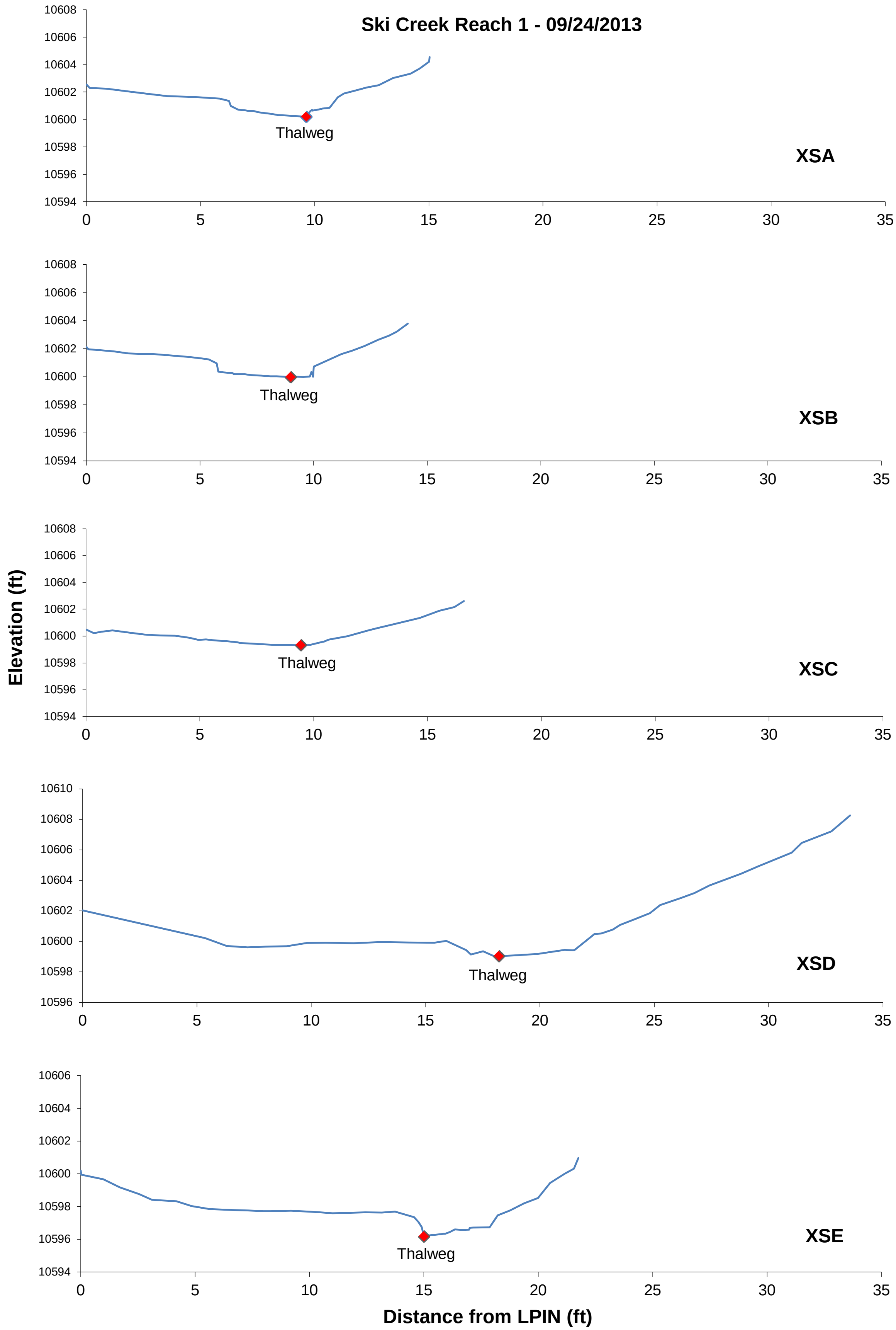
†Thalweg not surveyed as stream bed is dry.

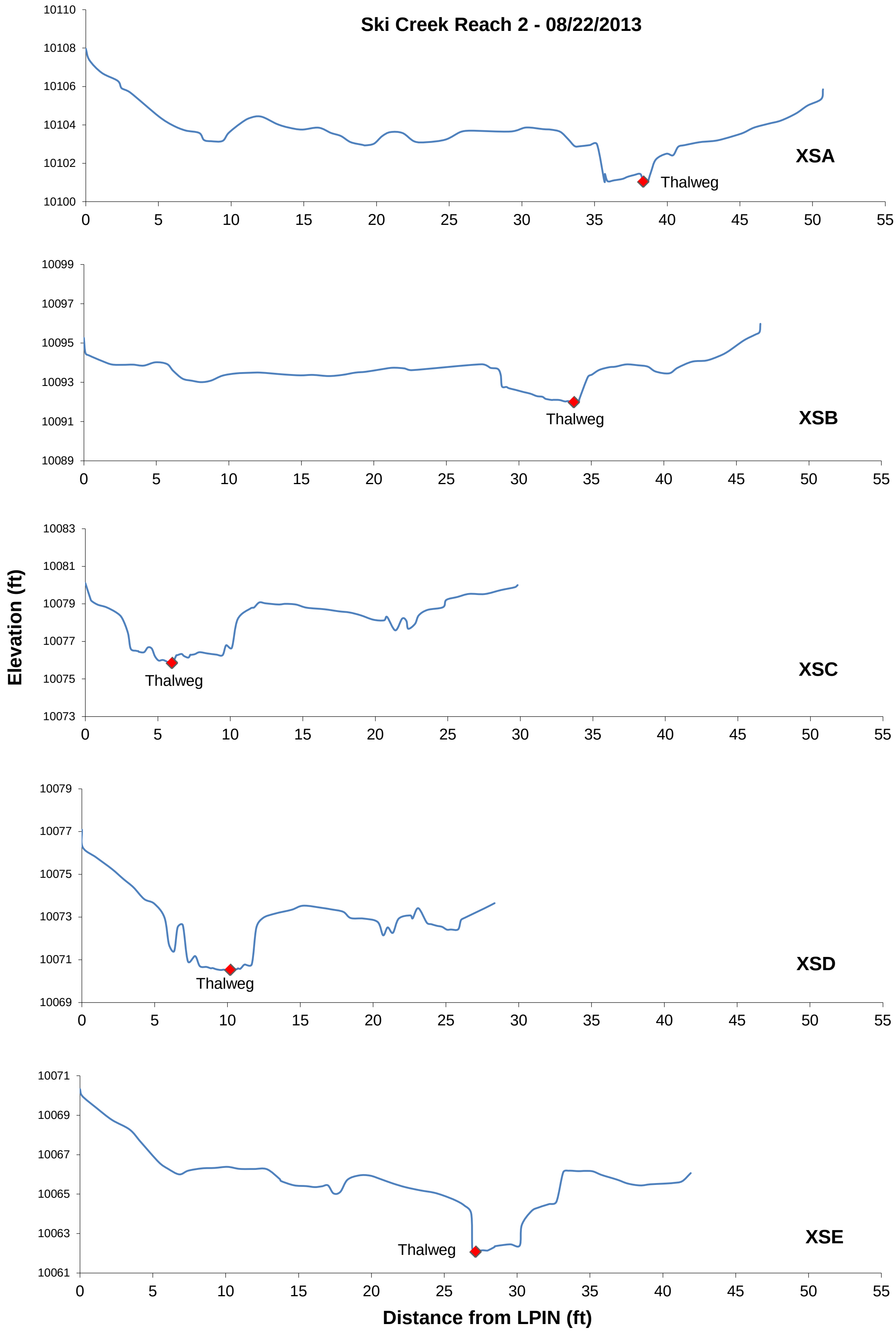


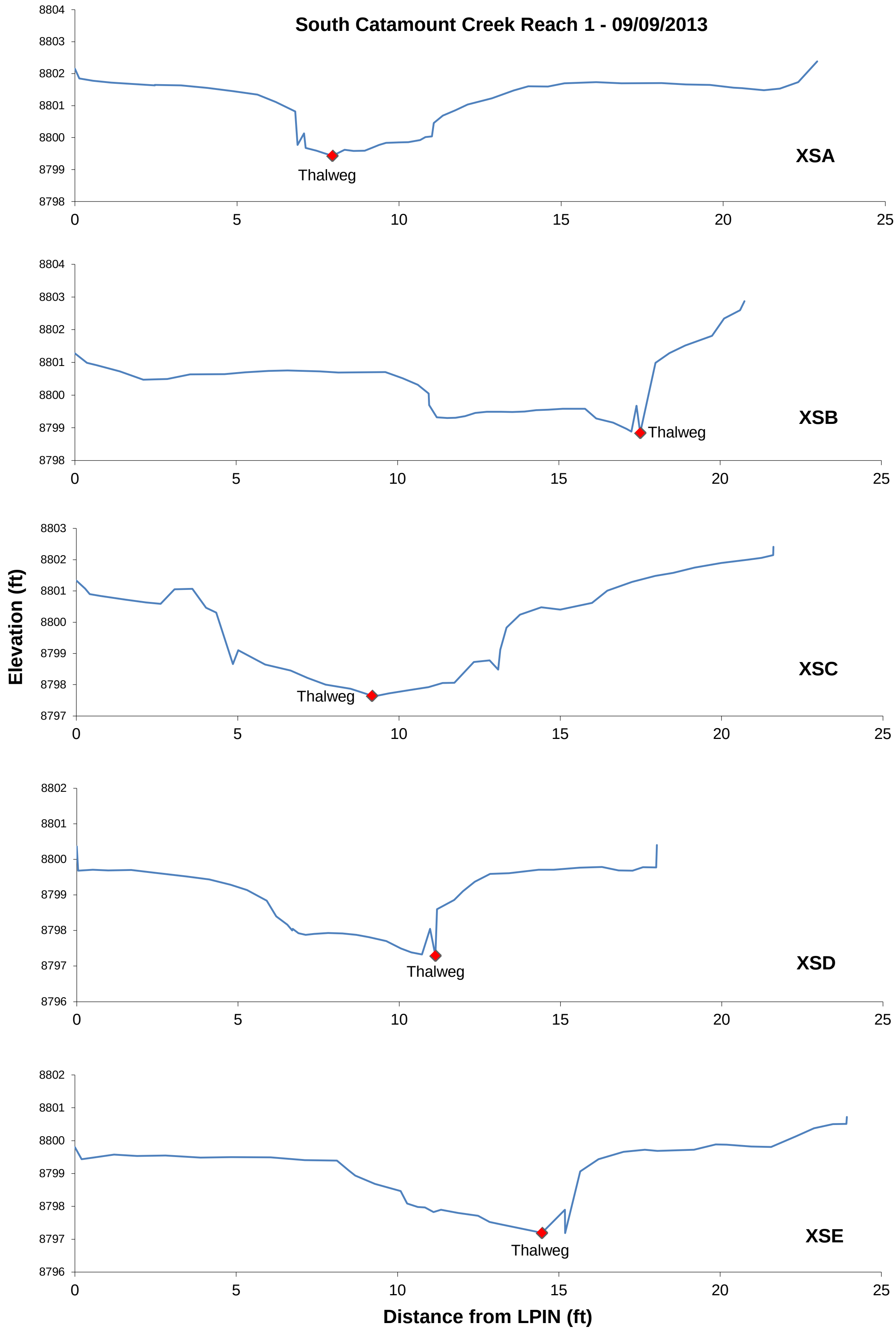
†Thalweg not surveyed as stream bed is dry.

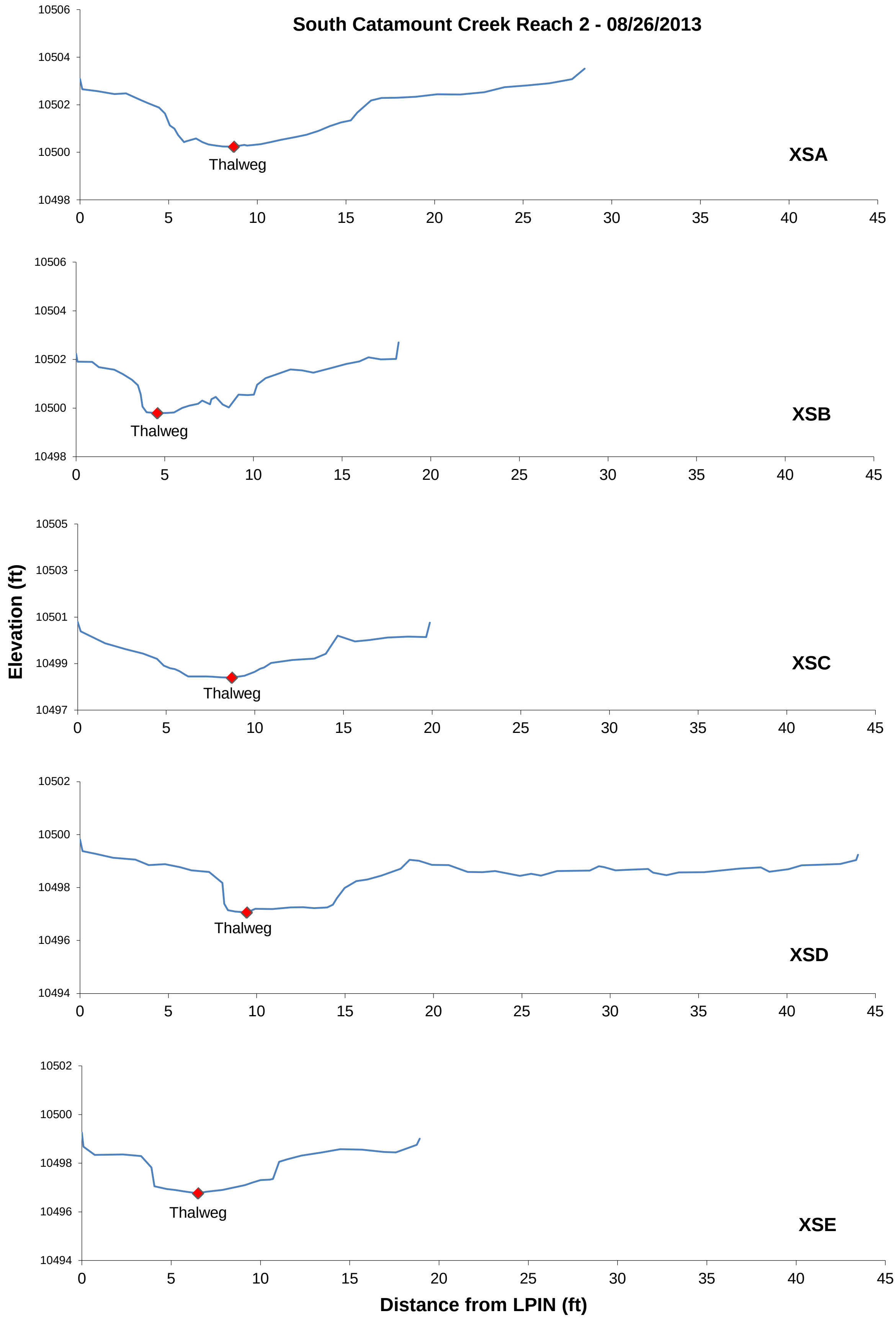

Oil Creek Reach 1 - 09/25/2013
XSA
Thalweg
XSB
Thalweg
XSC
Thalweg
XSD
Thalweg
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)

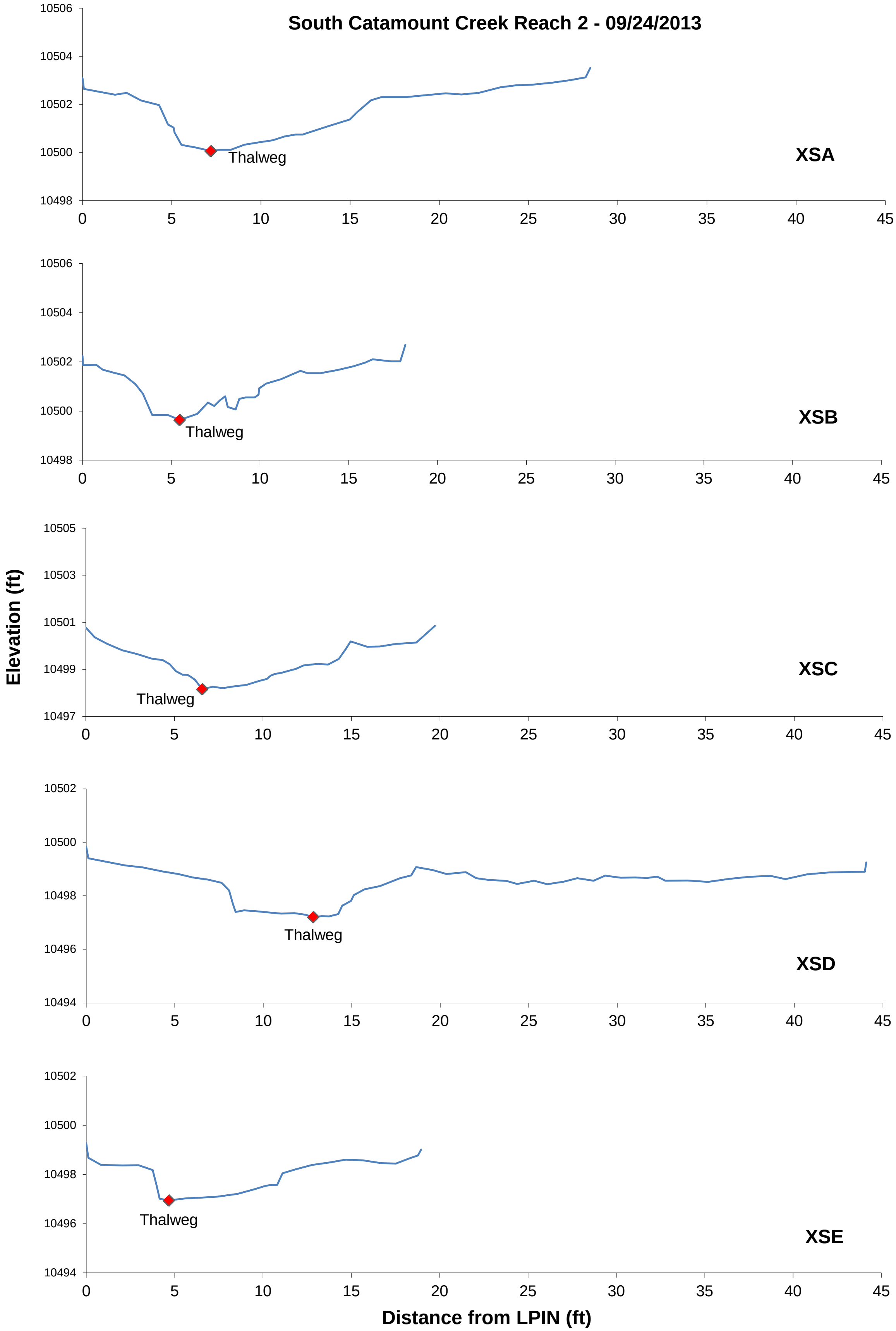

Ski Creek Reach 1 - 08/26/2013
Elevation (ft)
10608
10606
10604
10602
10600
10598
10596
10594
Thalweg
XSA
0
5
10
15
20
25
30
35
Thalweg
XSB
Thalweg
XSC
10610
Thalweg
XSD
Thalweg
XSE
Distance from LPIN (ft)

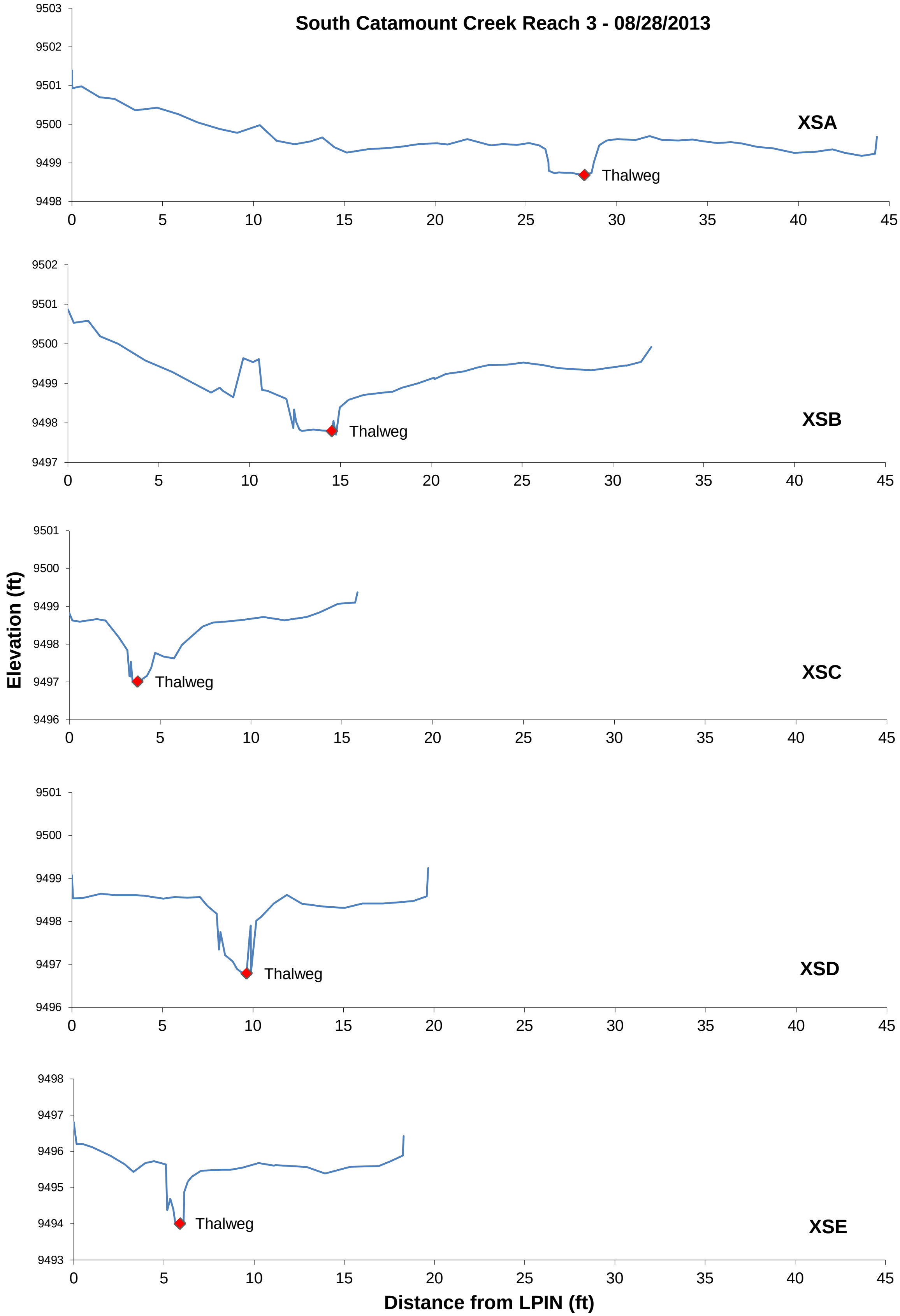

Ski Creek Reach 1 - 09/24/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
10594
10596
10598
10600
10602
10604
10606
10608
10610
0
5
10
15
20
25
30
35


Ski Creek Reach 2 - 08/22/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
10110
10108
10106
10104
10102
10100
10099
10097
10095
10093
10091
10089
10083
10081
10079
10077
10075
10073
10079
10077
10075
10073
10071
10069
10071
10069
10067
10065
10063
10061
0 5 10 15 20 25 30 35 40 45 50 55


South Catamount Creek Reach 1 - 09/09/2013
XSA
Thalweg
XSB
Thalweg
XSC
Thalweg
XSD
Thalweg
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)


South Catamount Creek Reach 2 - 08/26/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
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 2 - 09/24/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
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 - 08/28/2013
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
9503
9502
9501
9500
9499
9498
9497
9496
9495
9494
9493
0
5
10
15
20
25
30
35
40
45

Appendix N

Stream Pebble Count

Particle Size Distribution Graphs

2013

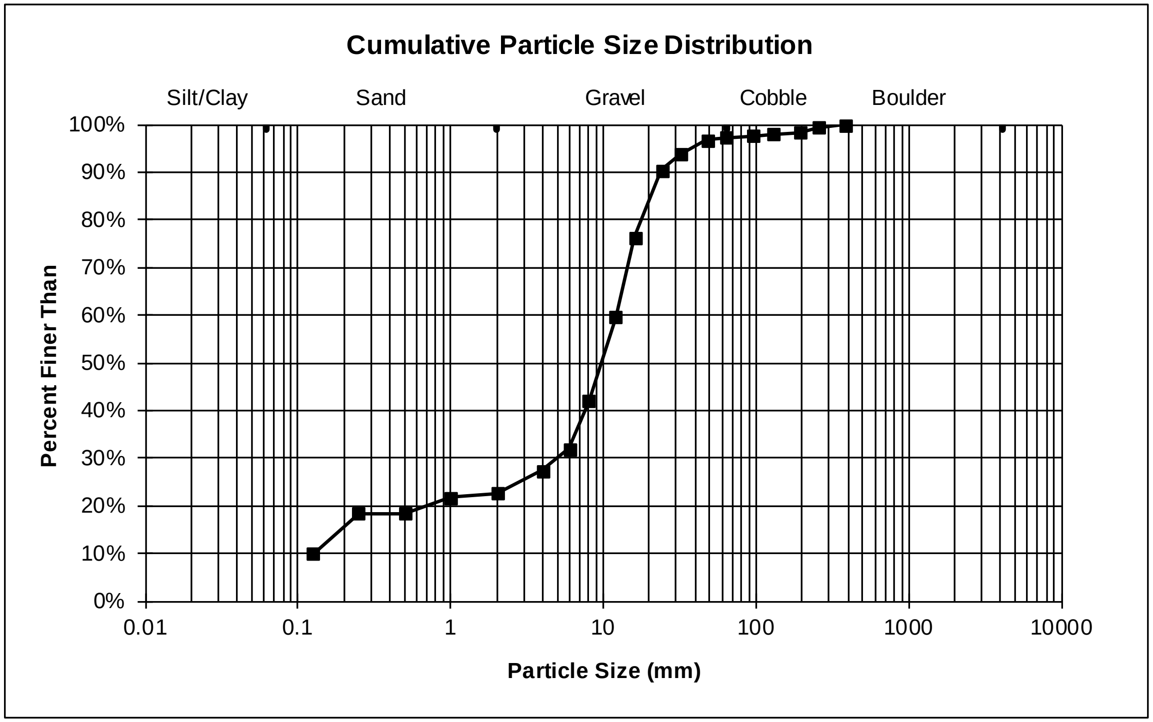
Pebble Count Worksheet

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	25	8.3%	18%
0.25 - .5	0	0.0%	18%
0.5 - 1.0	10	3.3%	22%
1 - 2	3	1.0%	23%
2 - 4	14	4.7%	27%
4 - 6	14	4.7%	32%
6 - 8	30	10.0%	42%
8 - 12	53	17.7%	60%
12 - 16	50	16.7%	76%
16 - 24	42	14.0%	90%
24 - 32	10	3.3%	94%
32 - 48	9	3.0%	97%
48 - 64	2	0.7%	97%
64 - 96	1	0.3%	98%
96 - 128	1	0.3%	98%
128 - 192	1	0.3%	98%
192 - 256	3	1.0%	99%
256 - 384	2	0.7%	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: 8/28/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.189	6.541	9.612	19.978	38.319	302.0



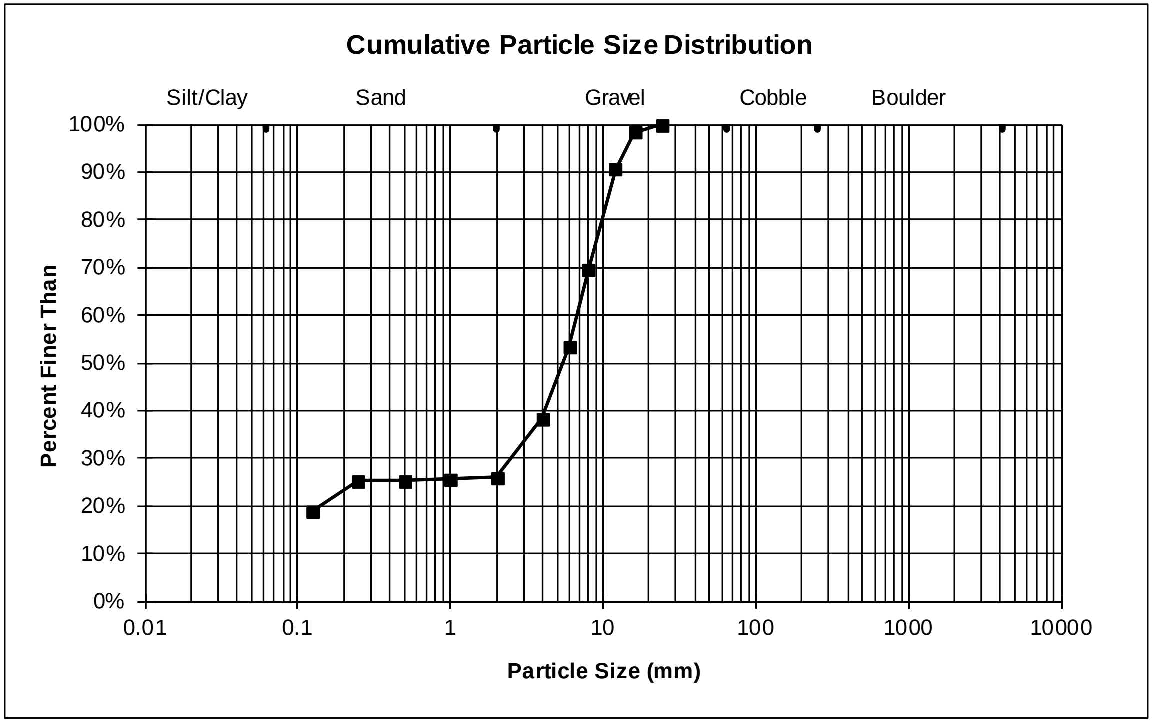
Pebble Count Worksheet

COMMENTS: ERO Study Site

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	57	19.0%	
0.062 - 0.125	0	0.0%	19%
0.125 - 0.25	19	6.3%	25%
0.25 - .5	0	0.0%	25%
0.5 - 1.0	1	0.3%	26%
1 - 2	1	0.3%	26%
2 - 4	37	12.3%	38%
4 - 6	45	15.0%	53%
6 - 8	49	16.3%	70%
8 - 12	63	21.0%	91%
12 - 16	23	7.7%	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		

STREAM NAME: Pikes Peak Highway - North Catamount Creek Reach 1
ID NUMBER: NCAT1
DATE: 9/3/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.108	3.317	5.483	10.551	14.119	21.0



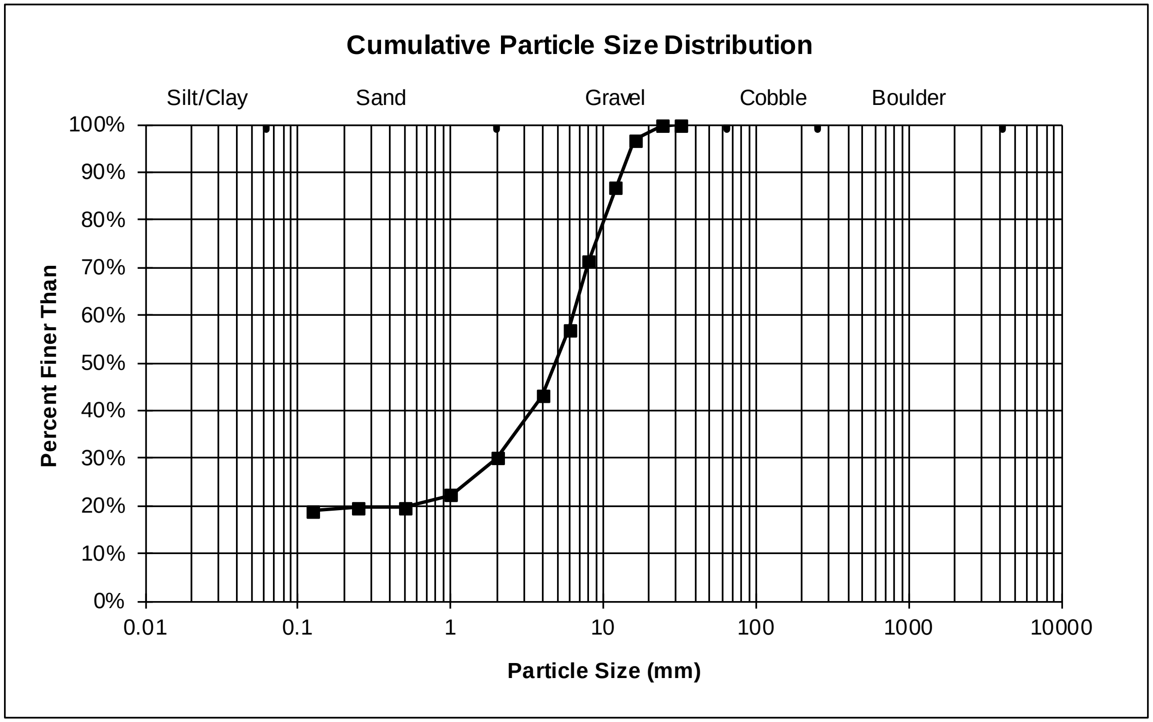
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	57	19.0%	
0.062 - 0.125	0	0.0%	19%
0.125 - 0.25	2	0.7%	20%
0.25 - .5	0	0.0%	20%
0.5 - 1.0	8	2.7%	22%
1 - 2	23	7.7%	30%
2 - 4	39	13.0%	43%
4 - 6	42	14.0%	57%
6 - 8	43	14.3%	71%
8 - 12	46	15.3%	87%
12 - 16	30	10.0%	97%
16 - 24	9	3.0%	100%
24 - 32	1	0.3%	100%
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: 9/3/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.108	**2.611**	**4.899**	**11.183**	**15.251**	**24.0**



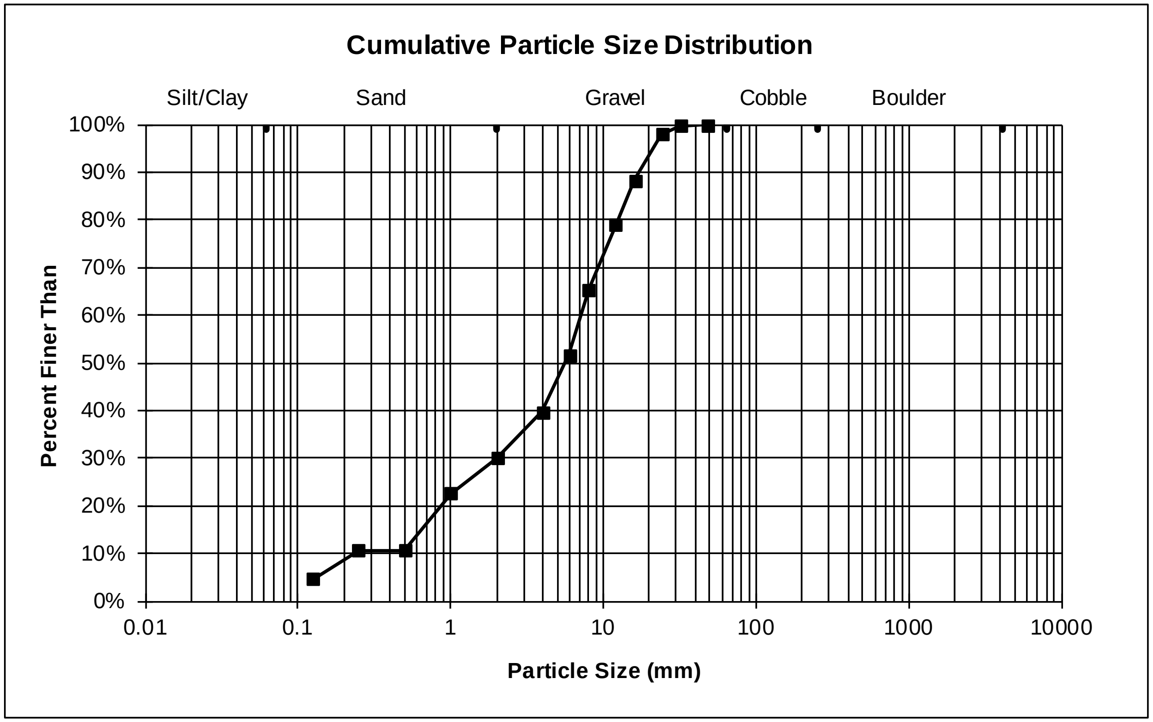
Pebble Count Worksheet

COMMENTS: ERO Study Site

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	18	6.0%	11%
0.25 - .5	0	0.0%	11%
0.5 - 1.0	36	12.0%	23%
1 - 2	22	7.3%	30%
2 - 4	29	9.7%	40%
4 - 6	36	12.0%	52%
6 - 8	41	13.7%	65%
8 - 12	41	13.7%	79%
12 - 16	28	9.3%	88%
16 - 24	29	9.7%	98%
24 - 32	5	1.7%	100%
32 - 48	1	0.3%	100%
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 Fork Crystal Creek Reach 1
ID NUMBER: NCRY1
DATE: 8/21/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.642	2.862	5.671	14.000	21.162	34.0



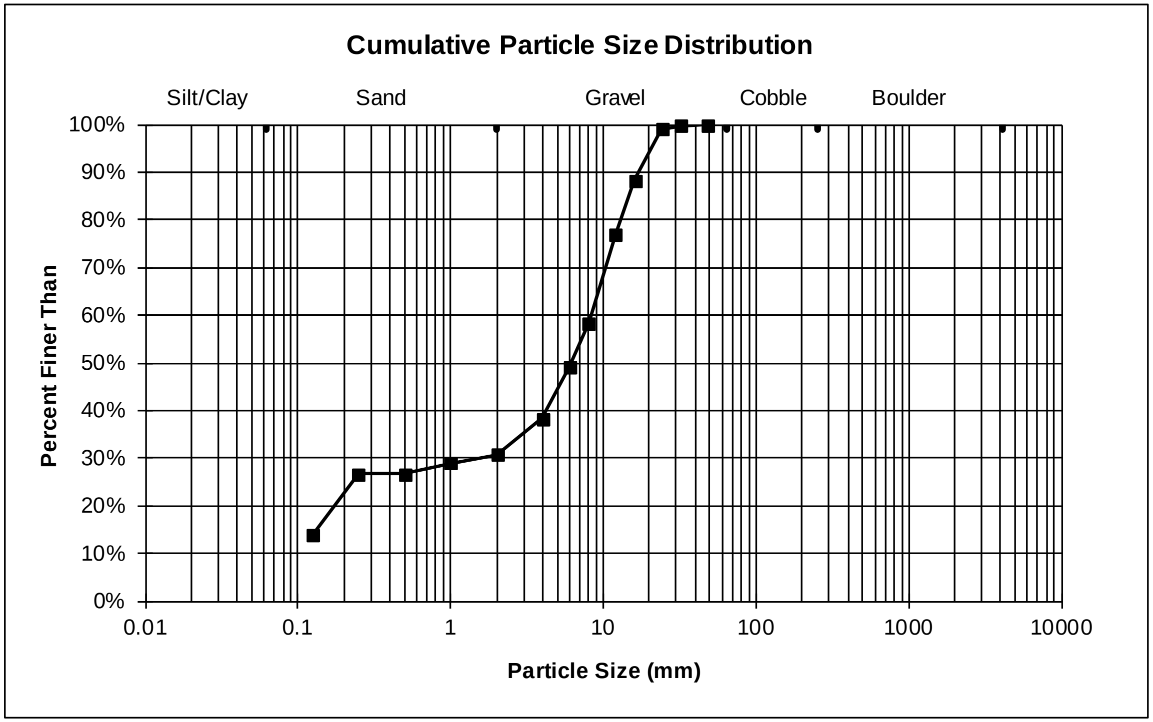
Pebble Count Worksheet

COMMENTS: Second reach 500 ft upstream from ERO Study Site

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	38	12.7%	27%
0.25 - .5	0	0.0%	27%
0.5 - 1.0	7	2.3%	29%
1 - 2	5	1.7%	31%
2 - 4	23	7.7%	38%
4 - 6	32	10.7%	49%
6 - 8	28	9.3%	58%
8 - 12	56	18.7%	77%
12 - 16	34	11.3%	88%
16 - 24	32	10.7%	99%
24 - 32	2	0.7%	100%
32 - 48	1	0.3%	100%
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 Fork Crystal Creek Reach 2
ID NUMBER: NCRY2
DATE: 8/21/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.132	2.959	6.188	14.333	20.615	33.0



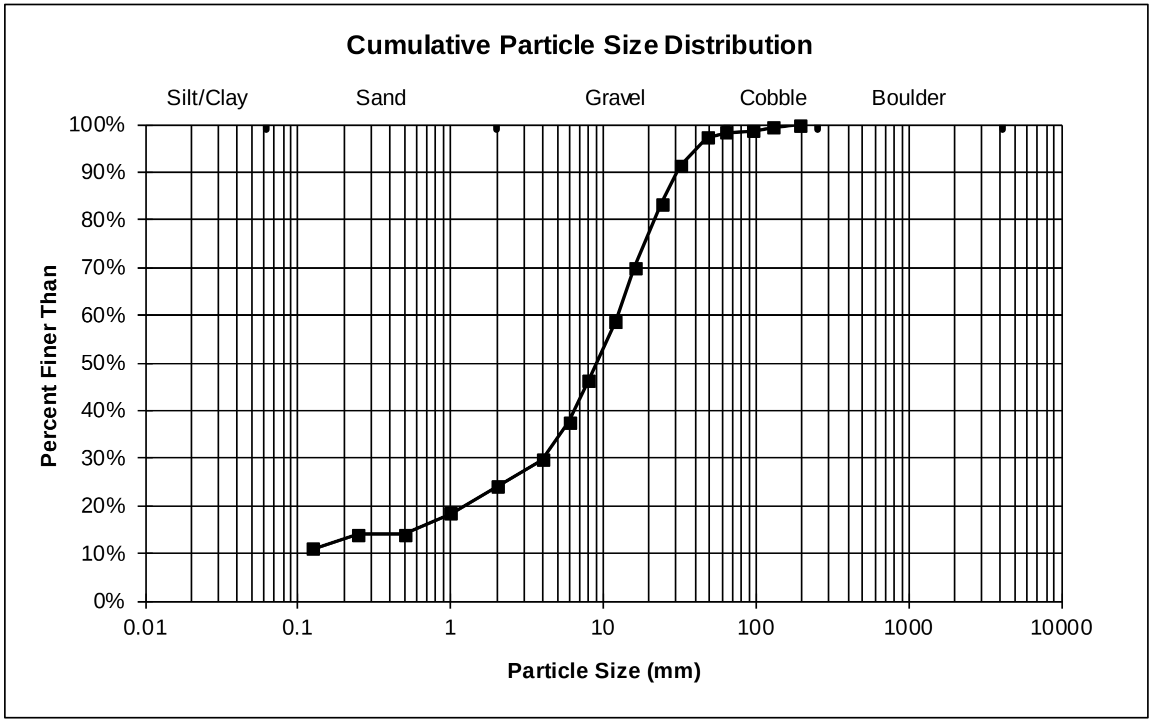
Pebble Count Worksheet

COMMENTS: ERO Reach

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	33	11.0%	
0.062 - 0.125	0	0.0%	11%
0.125 - 0.25	9	3.0%	14%
0.25 - .5	0	0.0%	14%
0.5 - 1.0	13	4.3%	18%
1 - 2	17	5.7%	24%
2 - 4	17	5.7%	30%
4 - 6	24	8.0%	38%
6 - 8	26	8.7%	46%
8 - 12	37	12.3%	59%
12 - 16	34	11.3%	70%
16 - 24	40	13.3%	83%
24 - 32	24	8.0%	91%
32 - 48	18	6.0%	97%
48 - 64	3	1.0%	98%
64 - 96	1	0.3%	99%
96 - 128	2	0.7%	99%
128 - 192	2	0.7%	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: 9/25/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.587	5.241	9.025	24.582	40.998	148.0



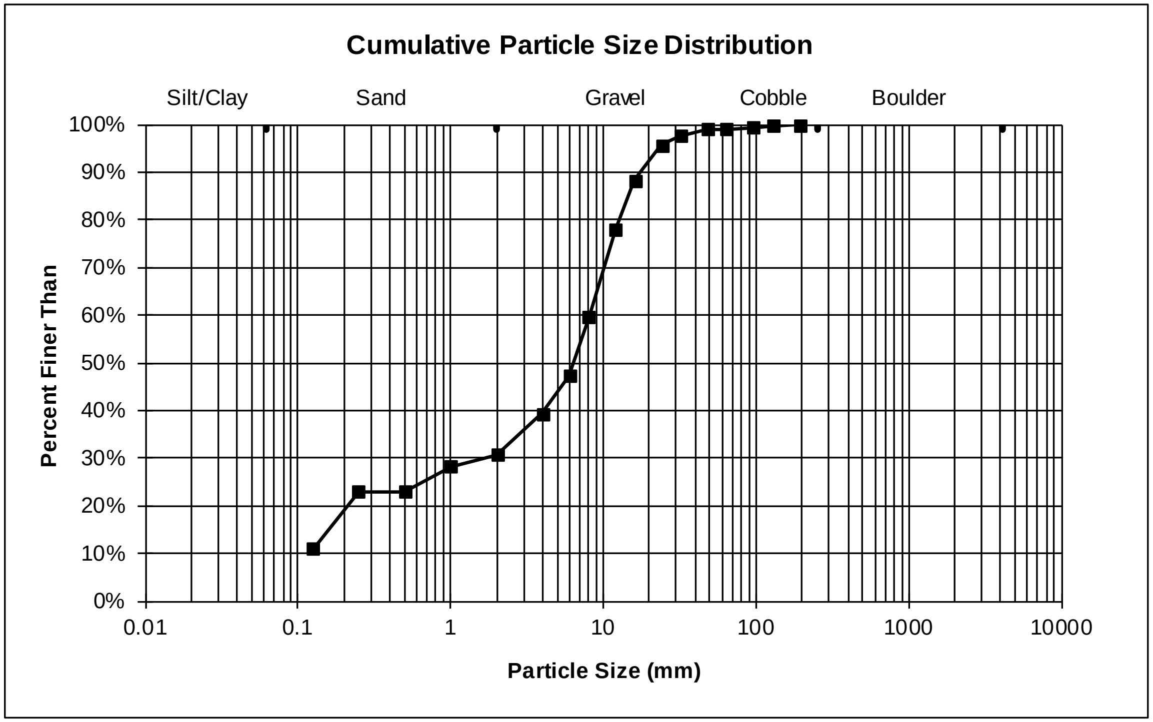
Pebble Count Worksheet

COMMENTS: About 0.2 miles upstream form ERO Study Site

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	33	11.0%	
0.062 - 0.125	0	0.0%	11%
0.125 - 0.25	36	12.0%	23%
0.25 - .5	0	0.0%	23%
0.5 - 1.0	16	5.3%	28%
1 - 2	7	2.3%	31%
2 - 4	26	8.7%	39%
4 - 6	24	8.0%	47%
6 - 8	37	12.3%	60%
8 - 12	55	18.3%	78%
12 - 16	31	10.3%	88%
16 - 24	22	7.3%	96%
24 - 32	6	2.0%	98%
32 - 48	4	1.3%	99%
48 - 64	0	0.0%	99%
64 - 96	1	0.3%	99%
96 - 128	1		100%
128 - 192	1		100%
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - Ski Creek Reach 1
ID NUMBER: SKIC1
DATE: 8/26/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.157	2.828	6.385	14.182	23.131	152.0



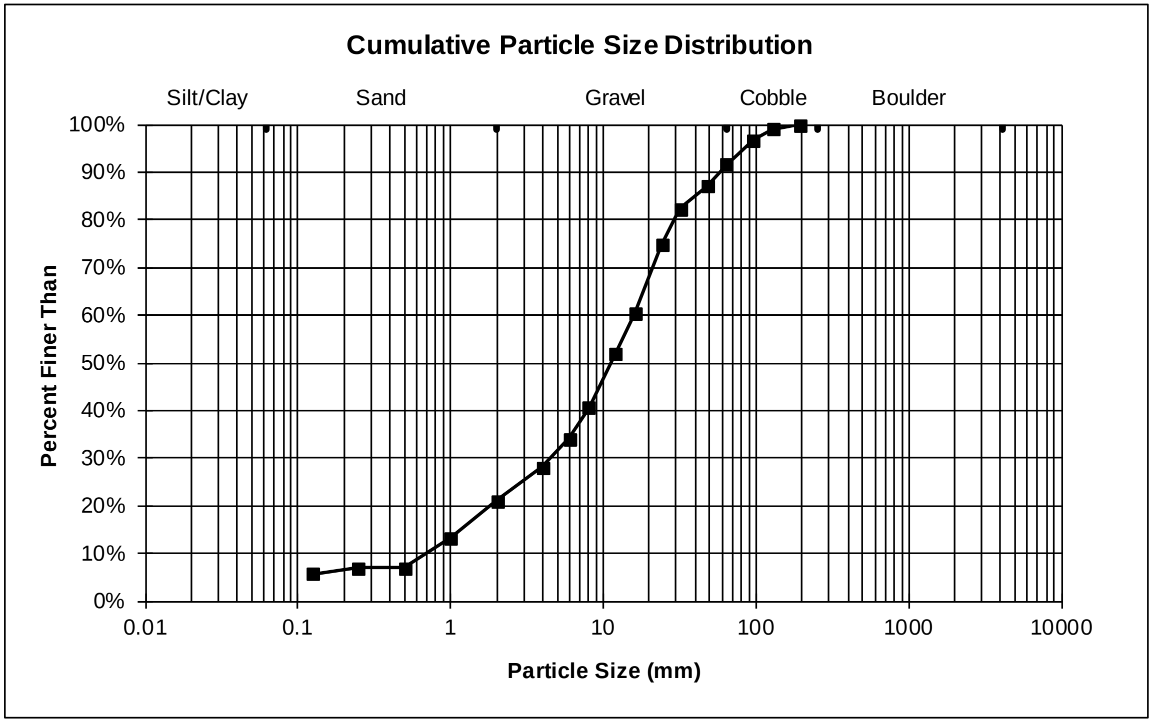
Pebble Count Worksheet

COMMENTS: Second reach near mile marker 10 on Pike's Peak Highway

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	17	5.7%	
0.062 - 0.125	0	0.0%	6%
0.125 - 0.25	4	1.3%	7%
0.25 - .5	0	0.0%	7%
0.5 - 1.0	19	6.3%	13%
1 - 2	23	7.7%	21%
2 - 4	21	7.0%	28%
4 - 6	18	6.0%	34%
6 - 8	20	6.7%	41%
8 - 12	34	11.3%	52%
12 - 16	25	8.3%	60%
16 - 24	43	14.3%	75%
24 - 32	23	7.7%	82%
32 - 48	14	4.7%	87%
48 - 64	14	4.7%	92%
64 - 96	15	5.0%	97%
96 - 128	7	2.3%	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 - Ski Creek Reach 2
ID NUMBER: SKIC2
DATE: 8/22/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.163	6.265	11.171	36.986	83.864	175.0



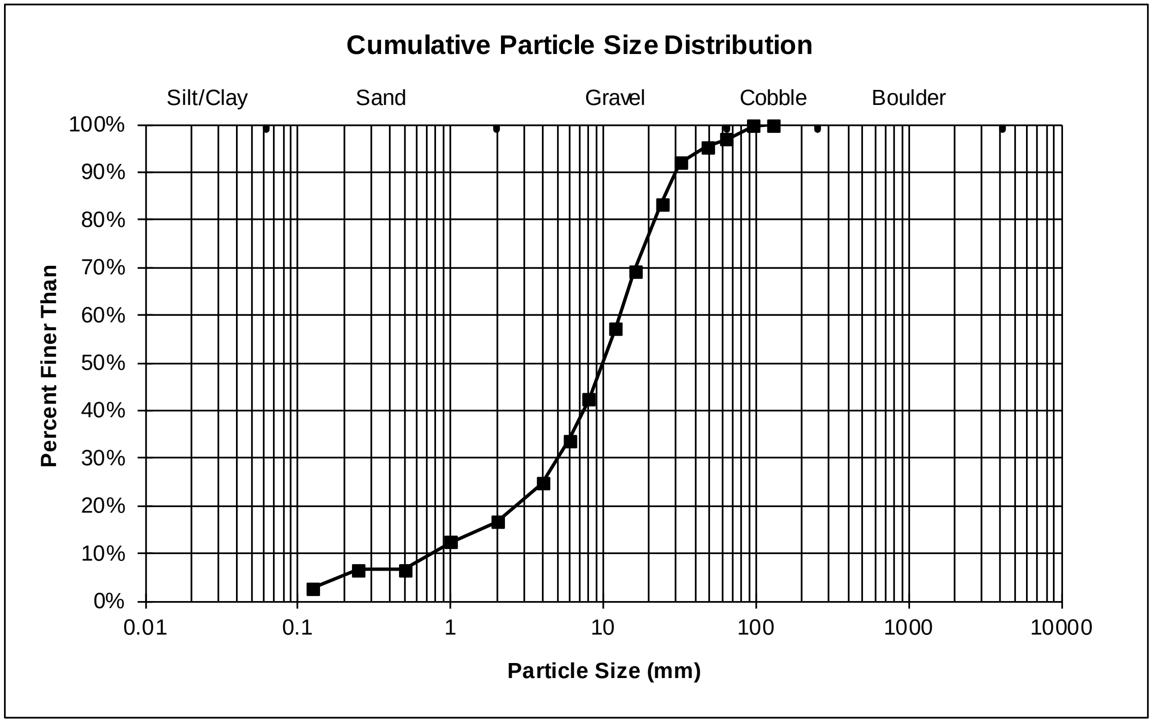
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	8	2.7%	
0.062 - 0.125	0	0.0%	3%
0.125 - 0.25	12	4.0%	7%
0.25 - .5	0	0.0%	7%
0.5 - 1.0	17	5.7%	12%
1 - 2	13	4.3%	17%
2 - 4	24	8.0%	25%
4 - 6	27	9.0%	34%
6 - 8	26	8.7%	42%
8 - 12	45	15.0%	57%
12 - 16	36	12.0%	69%
16 - 24	42	14.0%	83%
24 - 32	26	8.7%	92%
32 - 48	10	3.3%	95%
48 - 64	5	1.7%	97%
64 - 96	8	2.7%	100%
96 - 128	1		100%
128 - 192			
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

COMMENTS: ERO Study Site

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 1
ID NUMBER: SCAT1
DATE: 9/9/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.532	6.272	9.842	24.537	46.093	103.0



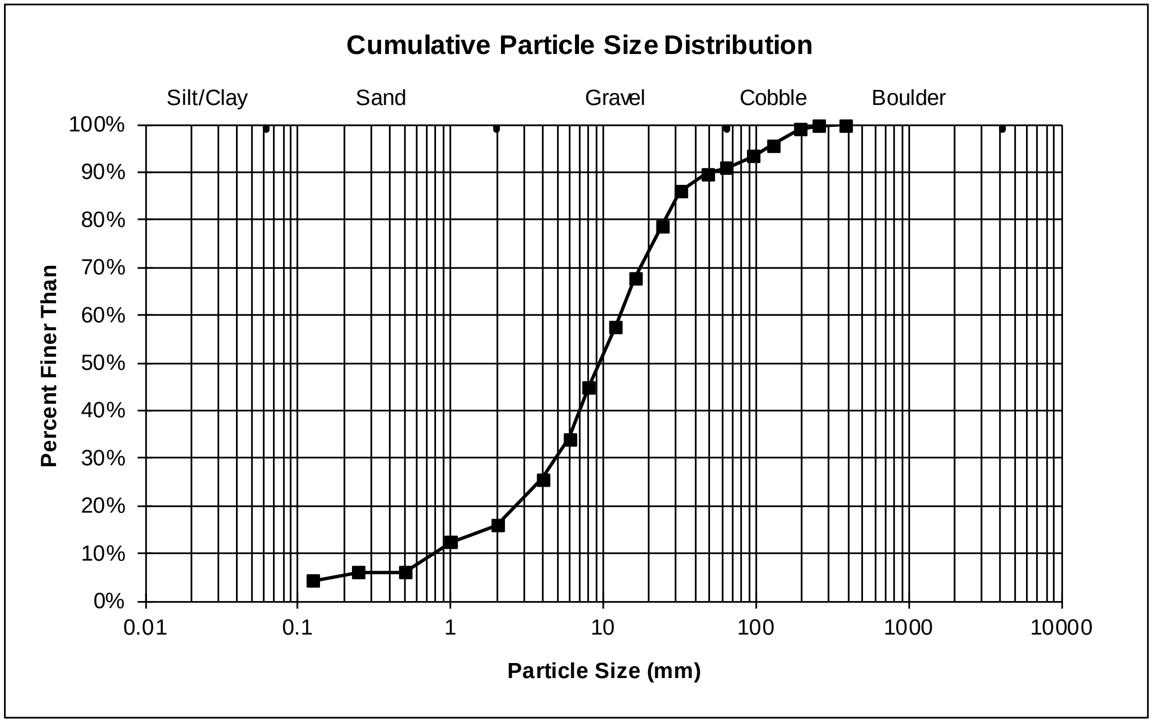
Pebble Count Worksheet

COMMENTS: Second reach 500 ft upstream from ERO Study Site

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	13	4.3%	
0.062 - 0.125	0	0.0%	4%
0.125 - 0.25	5	1.7%	6%
0.25 - .5	0	0.0%	6%
0.5 - 1.0	19	6.3%	12%
1 - 2	11	3.7%	16%
2 - 4	29	9.7%	26%
4 - 6	25	8.3%	34%
6 - 8	33	11.0%	45%
8 - 12	38	12.7%	58%
12 - 16	30	10.0%	68%
16 - 24	33	11.0%	79%
24 - 32	22	7.3%	86%
32 - 48	11	3.7%	90%
48 - 64	4	1.3%	91%
64 - 96	7	2.3%	93%
96 - 128	7	2.3%	96%
128 - 192	10	3.3%	99%
192 - 256	2	0.7%	100%
256 - 384	1	0.3%	100%
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 2
ID NUMBER: SCAT2
DATE: 8/26/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.656	6.159	9.389	29.585	117.900	275.0



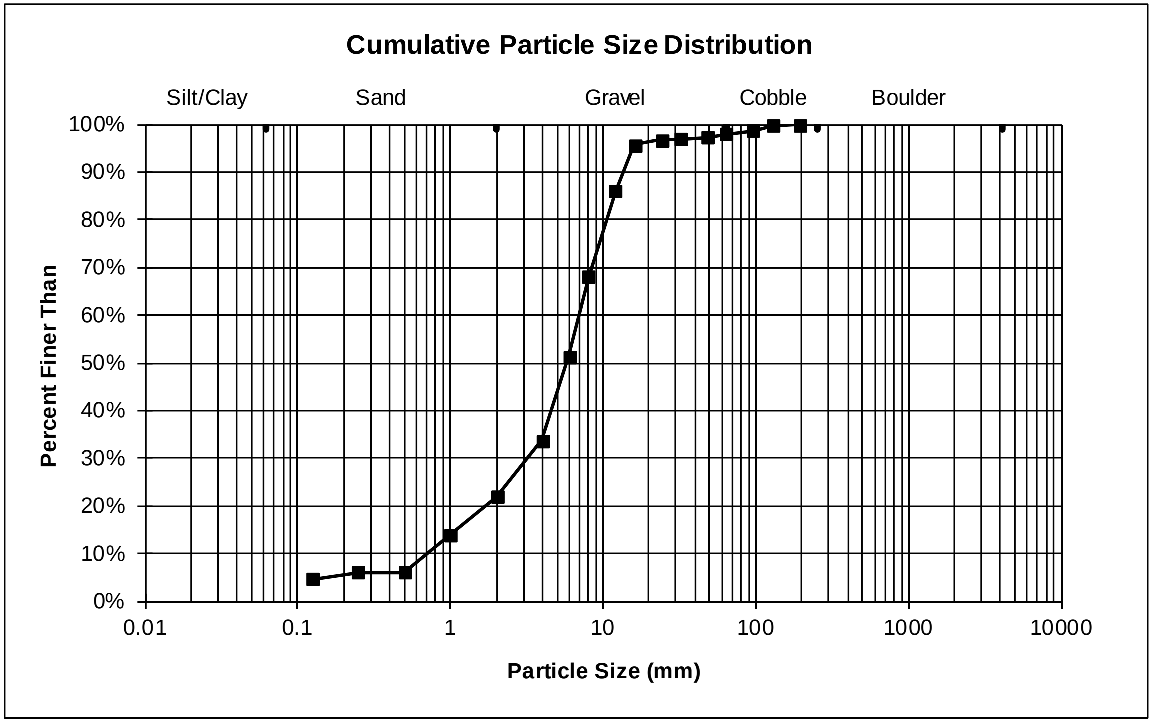
Pebble Count Worksheet

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	4	1.3%	6%
0.25 - .5	0	0.0%	6%
0.5 - 1.0	24	8.0%	14%
1 - 2	24	8.0%	22%
2 - 4	35	11.7%	34%
4 - 6	53	17.7%	51%
6 - 8	50	16.7%	68%
8 - 12	54	18.0%	86%
12 - 16	29	9.7%	96%
16 - 24	3	1.0%	97%
24 - 32	1	0.3%	97%
32 - 48	1	0.3%	97%
48 - 64	2	0.7%	98%
64 - 96	2	0.7%	99%
96 - 128	3	1.0%	100%
128 - 192	1	0.3%	100%
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: 8/28/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.091	4.124	5.819	11.471	15.686	160.0



Appendix O

Stream Bar Sample

Particle Size Distribution Summary
and
Graphs

2013

Summary of Stream Channel Particle Size Distribution from Sieve Analysis of Bar Samples on Pikes Peak, 2013

Site Name	Site ID	Date	Particle Size Distribution					
			D15	D35	D50	D84	D95	D100
Glen Cove Creek Reach 1	GLEN1	8/28/2013	0.666	2.840	5.491	19.951	27.751	32.0
North Catamount Creek Reach 1	NCAT1	9/3/2013	1.082	2.549	3.527	6.639	9.390	14.0
North Catamount Creek Reach 1	NCAT1†	9/25/2013	0.671	1.537	2.305	4.352	5.707	9.0
North Catamount Creek Reach 2	NCAT2	9/3/2013	2.806	4.401	5.516	9.534	13.479	19.0
North Catamount Creek Reach 2	NCAT2†	9/25/2013	1.092	2.839	4.098	8.635	11.738	14.0
North Fork Crystal Creek Reach 1	NCRY1	8/21/2013	1.186	2.915	4.564	12.932	24.409	30.0
North Fork Crystal Creek Reach 2	NCRY2	8/21/2013	0.203	1.134	1.804	4.034	7.105	21.0
Oil Creek Reach 1	OILC1	9/25/2013	1.146	4.064	5.990	13.516	26.971	30.0
South Catamount Creek Reach 1	SCAT1	9/9/2013	0.668	3.014	4.559	13.823	26.213	31.0
South Catamount Creek Reach 2	SCAT2	8/26/2013	0.901	3.089	5.424	15.447	34.429	37.0
South Catamount Creek Reach 2	SCAT2†	9/24/2013	1.034	2.145	3.029	6.913	11.828	16.0
South Catamount Creek Reach 3	SCAT3	8/28/2013	1.255	2.965	4.156	8.421	11.404	17.0
Ski Creek Reach 1	SKIC1	8/26/2013	0.460	1.847	3.375	13.496	24.061	30.0
Ski Creek Reach 1	SKIC1†	9/24/2013	0.676	2.091	3.200	9.575	17.013	21.0
Ski Creek Reach 2	SKIC2	8/22/2013	0.087	1.050	2.059	6.077	15.030	24.0
Severy Creek Reach 1	SVRY1	11/11/2013	0.044	0.832	2.194	8.418	15.56	21.0
Severy Creek Reach 2	SVRY2	11/11/2013	0.725	1.575	2.409	5.546	9.755	12.0
West Fork Beaver Creek Reach 2	WBVR2	9/17/2013	1.087	4.382	7.306	20.223	33.017	35.0
†Second survey post flood event.								

Sieve Analysis Worksheet

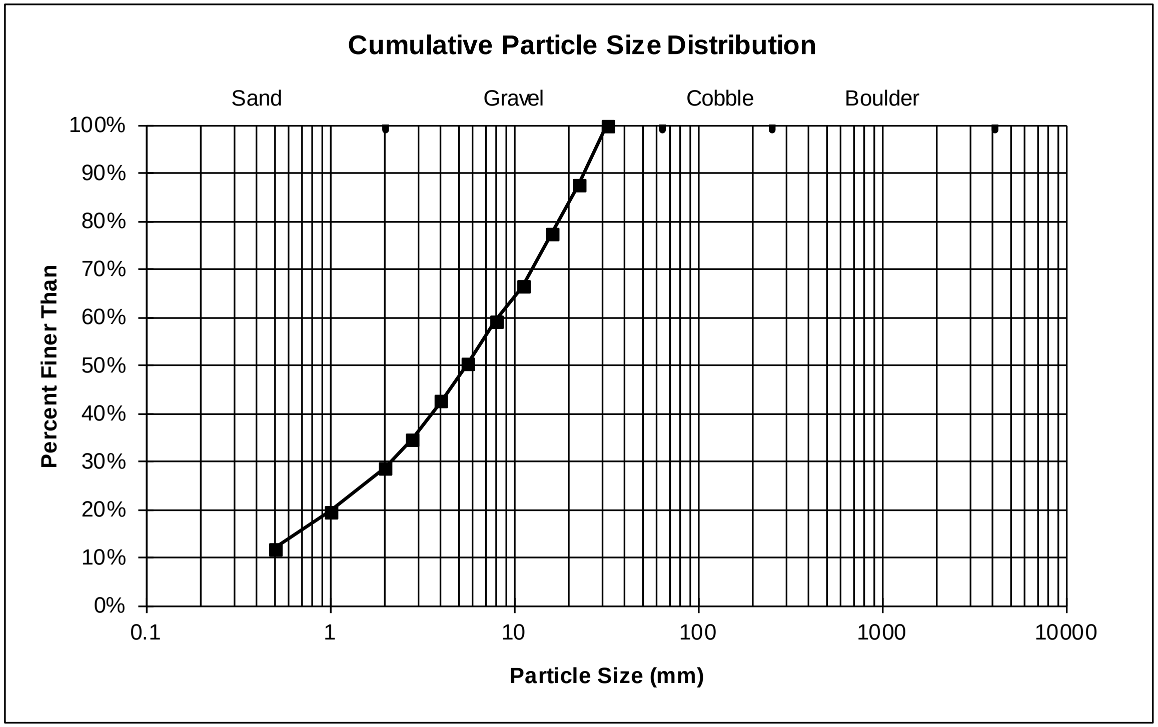
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	60.30	11.8%	
0.5	39.10	7.7%	11.8%
1.0	47.20	9.3%	19.5%
2.0	30.20	5.9%	28.8%
2.8	40.00	7.8%	34.7%
4.0	40.40	7.9%	42.5%
5.6	44.40	8.7%	50.5%
8.0	37.30	7.3%	59.2%
11.2	55.40	10.9%	66.5%
16.0	51.60	10.1%	77.4%
22.4	63.80	12.5%	87.5%
32.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	509.70		

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

COMMENTS: Bar Sample taken at Cross Section E

SITE NAME: Pike's Peak Highway - Glen Cove Creek Reach 1
ID NUMBER: GLEN1
DATE: 8/28/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.666	2.840	5.491	19.951	27.751	32.0



Sieve Analysis Worksheet

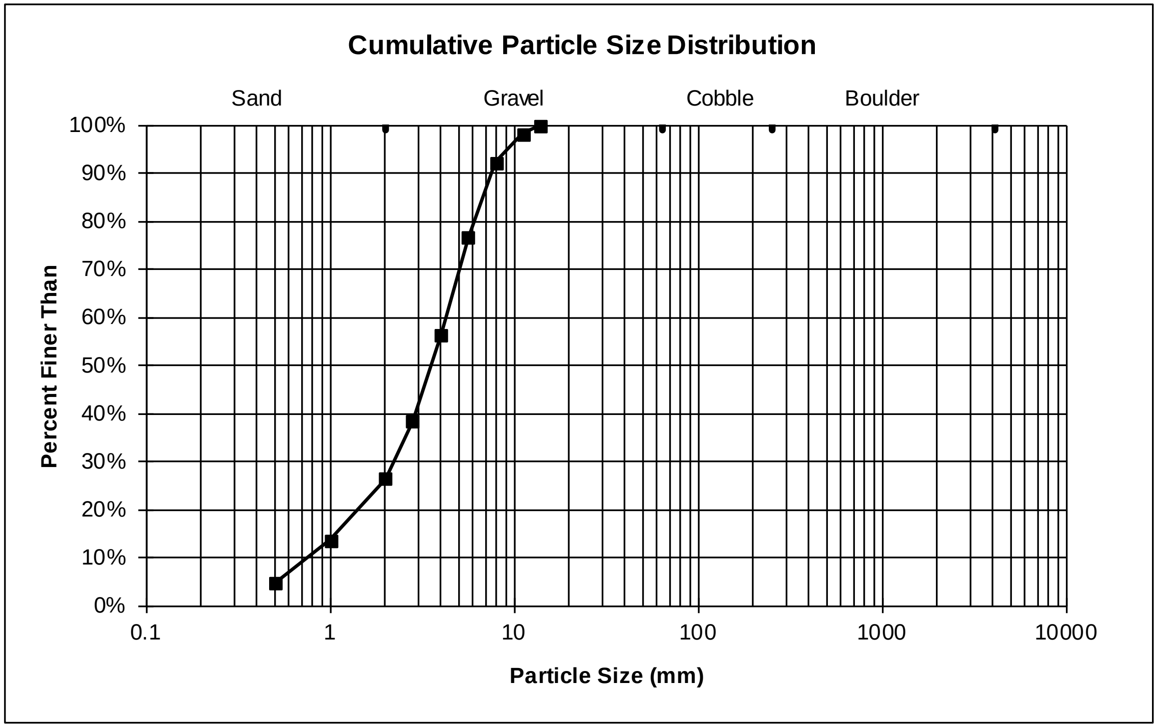
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	24.70	4.7%	
0.5	46.20	8.8%	4.7%
1.0	67.80	12.9%	13.5%
2.0	62.10	11.8%	26.5%
2.8	94.60	18.0%	38.3%
4.0	105.90	20.2%	56.4%
5.6	81.60	15.6%	76.6%
8.0	31.50	6.0%	92.1%
11.2	9.70	1.9%	98.1%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	524.10		

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

COMMENTS: Bar Sample taken between Cross Section B and C on right bank

SITE NAME: Pike's Peak Highway - North Catamount Creek Reach 1
ID NUMBER: NCAT1
DATE: 9/3/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.082	2.549	3.527	6.639	9.390	14.0



Sieve Analysis Worksheet

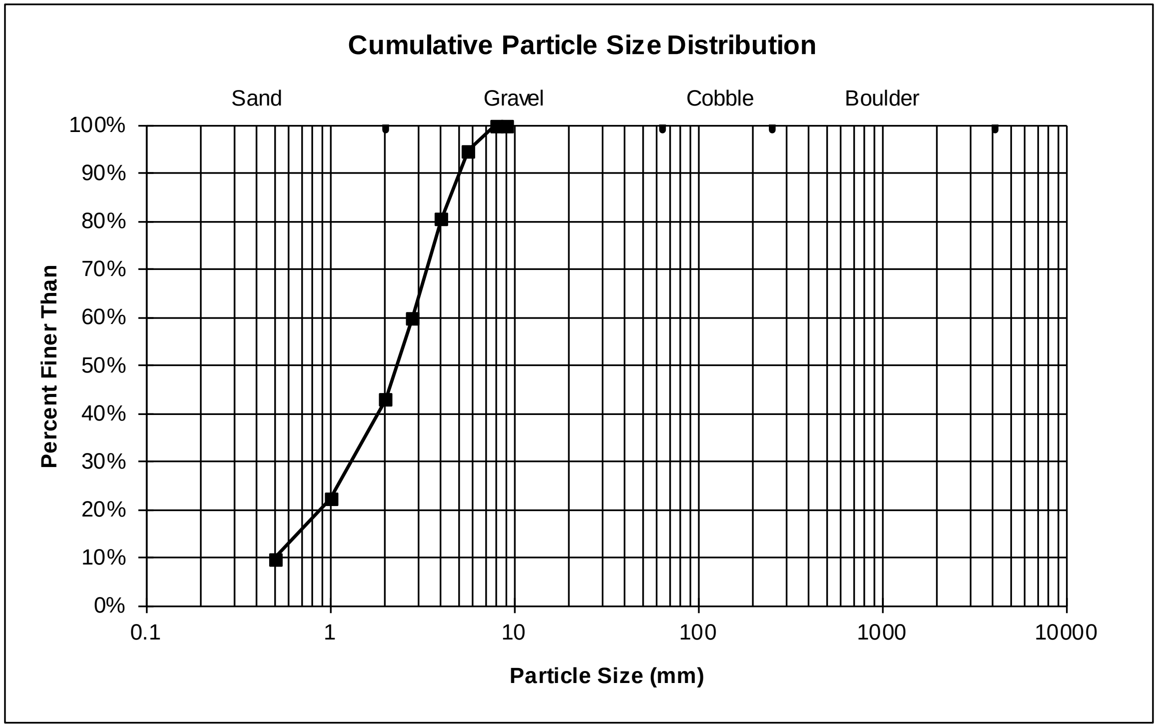
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	52.90	9.7%	
0.5	68.40	12.5%	9.7%
1.0	112.60	20.6%	22.2%
2.0	92.90	17.0%	42.8%
2.8	112.40	20.6%	59.8%
4.0	78.20	14.3%	80.4%
5.6	28.00	5.1%	94.7%
8.0	0.80	0.1%	99.9%
9.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	546.20		

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

COMMENTS: Bar Sample taken between Cross Section B and C on right bank

SITE NAME: Pike's Peak Highway - North Catamount Creek Reach 1
ID NUMBER: NCAT1
DATE: 9/25/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.671	1.537	2.305	4.352	5.707	9.0



Sieve Analysis Worksheet

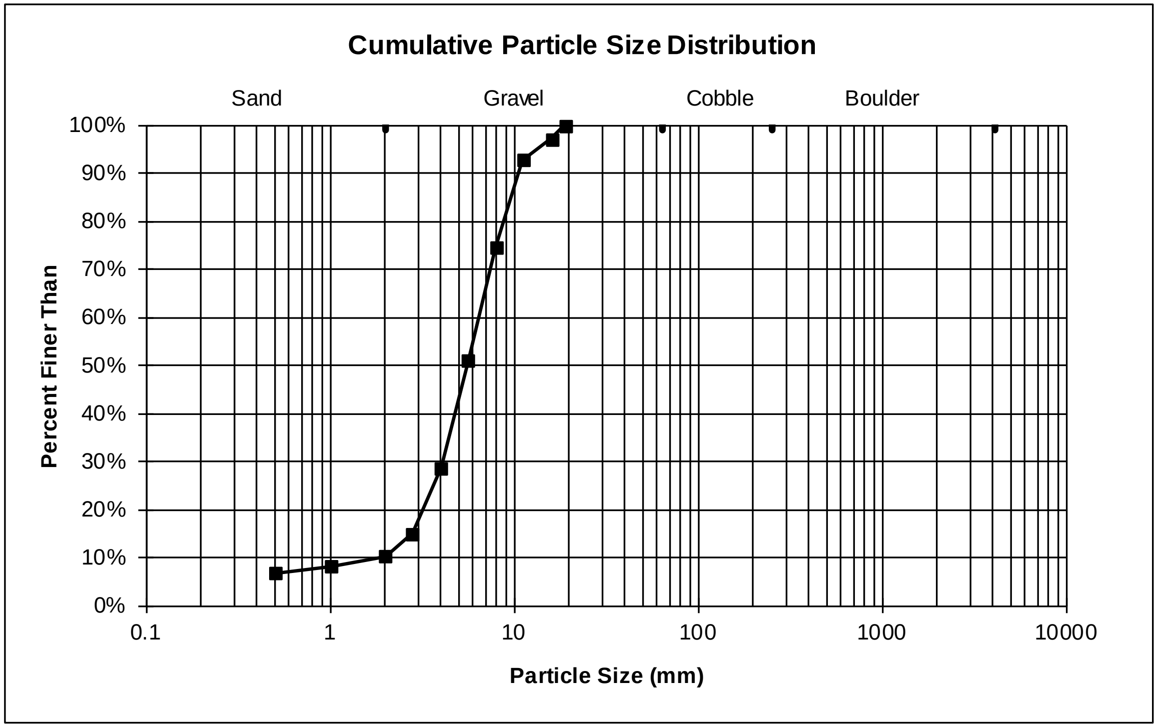
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	28.40	6.8%	
0.5	5.90	1.4%	6.8%
1.0	8.30	2.0%	8.2%
2.0	19.60	4.7%	10.2%
2.8	57.30	13.7%	14.9%
4.0	93.20	22.4%	28.7%
5.6	97.90	23.5%	51.0%
8.0	76.10	18.2%	74.5%
11.2	18.20	4.4%	92.7%
16.0	12.10	2.9%	97.1%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	417.00		

*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: Pike's Peak Highway - North Catamount Creek Reach 2
ID NUMBER: NCAT2
DATE: 9/3/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.806	**4.401**	**5.516**	**9.534**	**13.479**	**19.0**



Sieve Analysis Worksheet

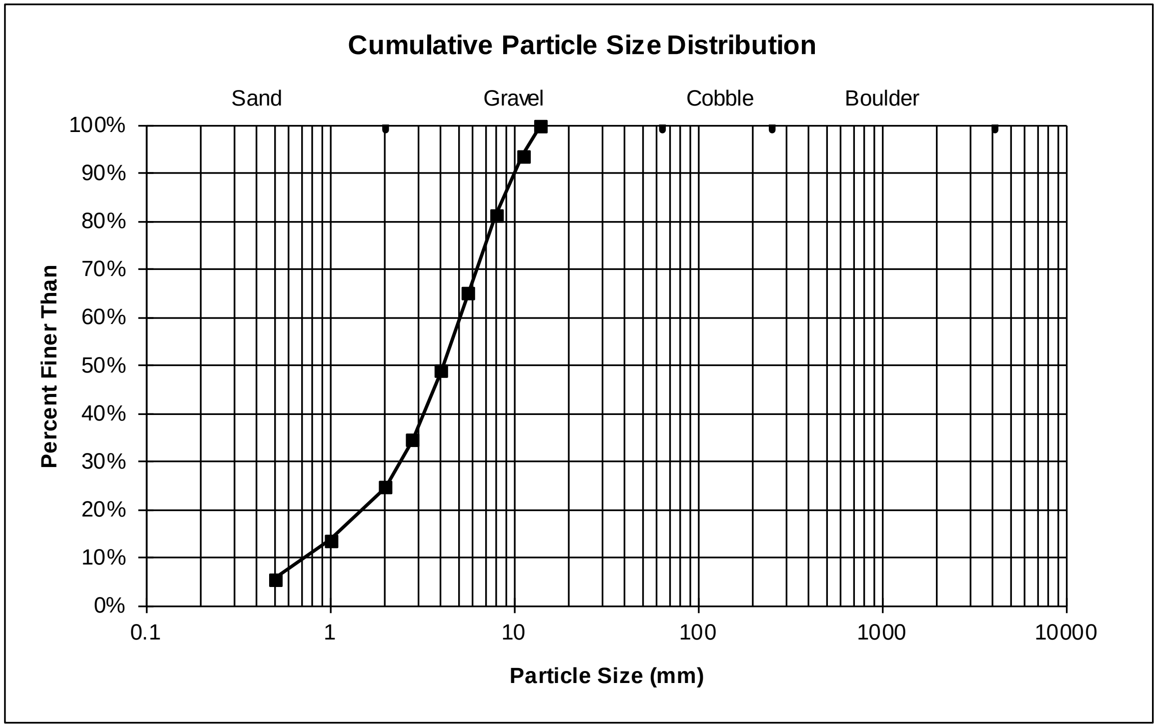
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	32.50	5.5%	
0.5	48.30	8.1%	5.5%
1.0	65.10	11.0%	13.6%
2.0	58.70	9.9%	24.6%
2.8	85.50	14.4%	34.4%
4.0	96.20	16.2%	48.8%
5.6	95.80	16.1%	65.0%
8.0	74.30	12.5%	81.2%
11.2	37.60	6.3%	93.7%
14.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	594.00		

*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: Pike's Peak Highway -North Catamount Creek Reach 2
ID NUMBER: NCAT2
DATE: 9/25/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.092	2.839	4.098	8.635	11.738	14.0



Sieve Analysis Worksheet

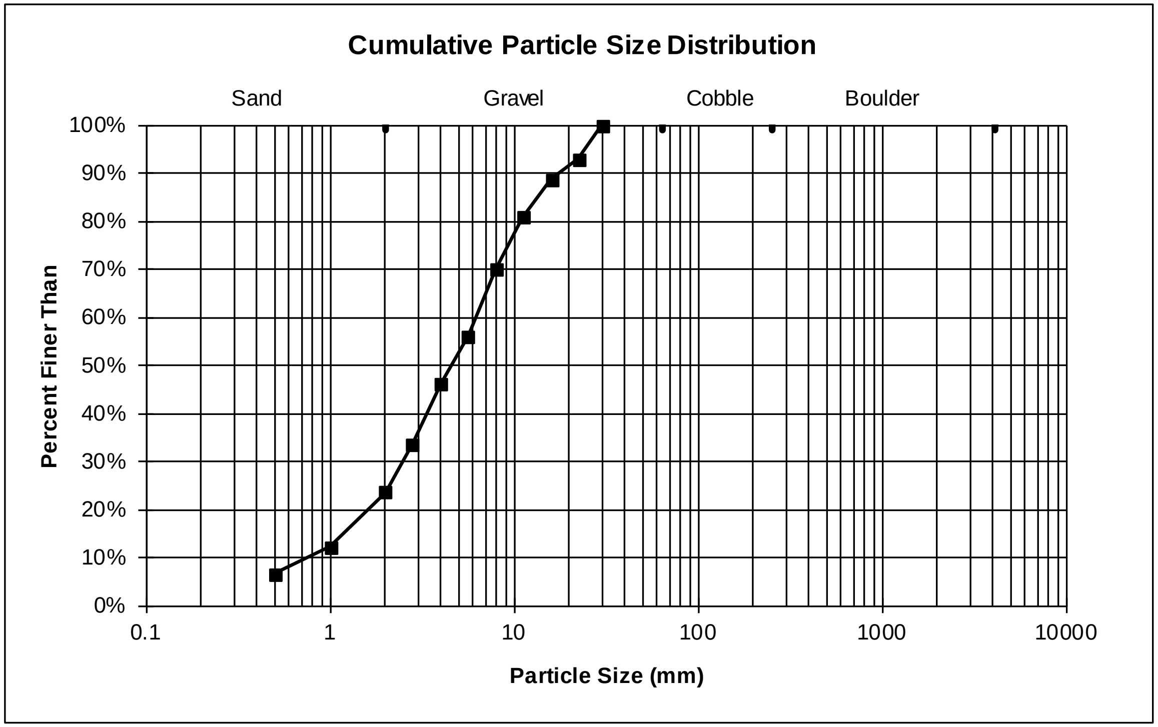
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	39.40	6.6%	
0.5	33.70	5.6%	6.6%
1.0	68.60	11.4%	12.2%
2.0	59.80	10.0%	23.6%
2.8	75.40	12.6%	33.6%
4.0	59.10	9.8%	46.1%
5.6	83.80	14.0%	56.0%
8.0	65.30	10.9%	70.0%
11.2	47.10	7.8%	80.8%
16.0	25.40	4.2%	88.7%
22.4	42.50	7.1%	92.9%
30.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	600.10		

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

COMMENTS: Bar Sample taken upstream from Cross Section E

SITE NAME: Pike's Peak Highway - North Fork Crystal Creek Reach 1
ID NUMBER: NCRY1
DATE: 8/21/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.186	2.915	4.564	12.932	24.409	30.0



Sieve Analysis Worksheet

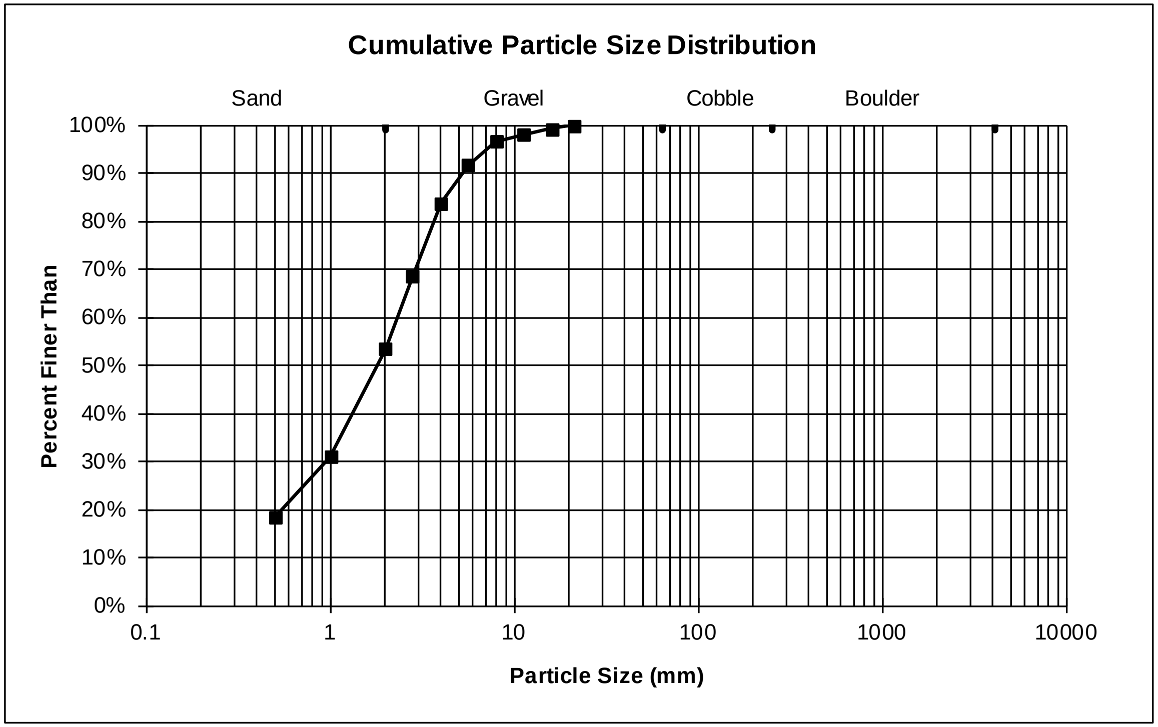
COMMENTS: Bar Sample taken at Cross Section A on left bank

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	134.70	18.4%	
0.5	91.60	12.5%	18.4%
1.0	163.90	22.4%	30.9%
2.0	110.40	15.1%	53.3%
2.8	112.40	15.4%	68.4%
4.0	57.50	7.9%	83.8%
5.6	36.60	5.0%	91.7%
8.0	10.00	1.4%	96.7%
11.2	8.30	1.1%	98.0%
16.0	6.10	0.8%	99.2%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	731.50		

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

SITE NAME: Pike's Peak Highway - North Fork Crystal Creek Reach 2
ID NUMBER: NCRY2
DATE: 8/21/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.203	**1.134**	**1.804**	**4.034**	**7.105**	**21.0**



Sieve Analysis Worksheet

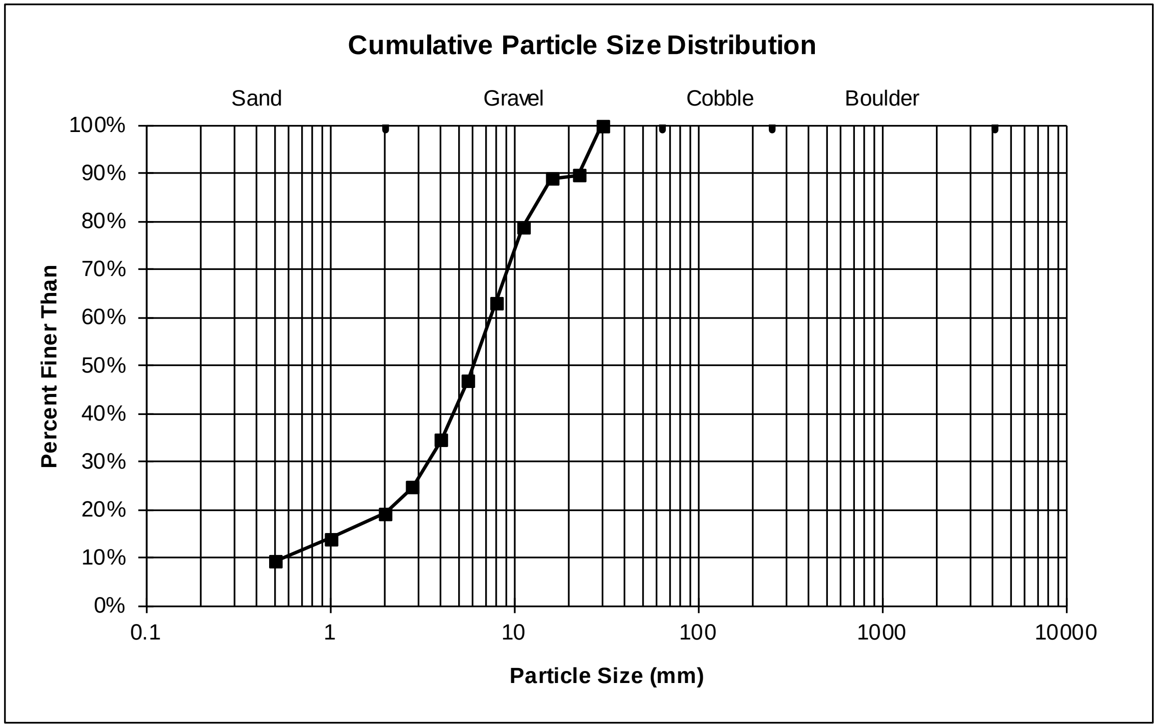
COMMENTS: Bar Sample taken below XSD on right bank

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	71.60	9.1%	
0.5	37.70	4.8%	9.1%
1.0	41.70	5.3%	14.0%
2.0	42.60	5.4%	19.3%
2.8	75.90	9.7%	24.7%
4.0	98.70	12.6%	34.4%
5.6	124.20	15.9%	47.0%
8.0	123.30	15.7%	62.9%
11.2	80.20	10.2%	78.6%
16.0	5.70	0.7%	88.8%
22.4	81.70	10.4%	89.6%
30.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	783.30		

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

SITE NAME: Pike's Peak Highway - Oil Creek Reach 1
ID NUMBER: OILC1
DATE: 9/25/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.146	4.064	5.990	13.516	26.080	30.0



Sieve Analysis Worksheet

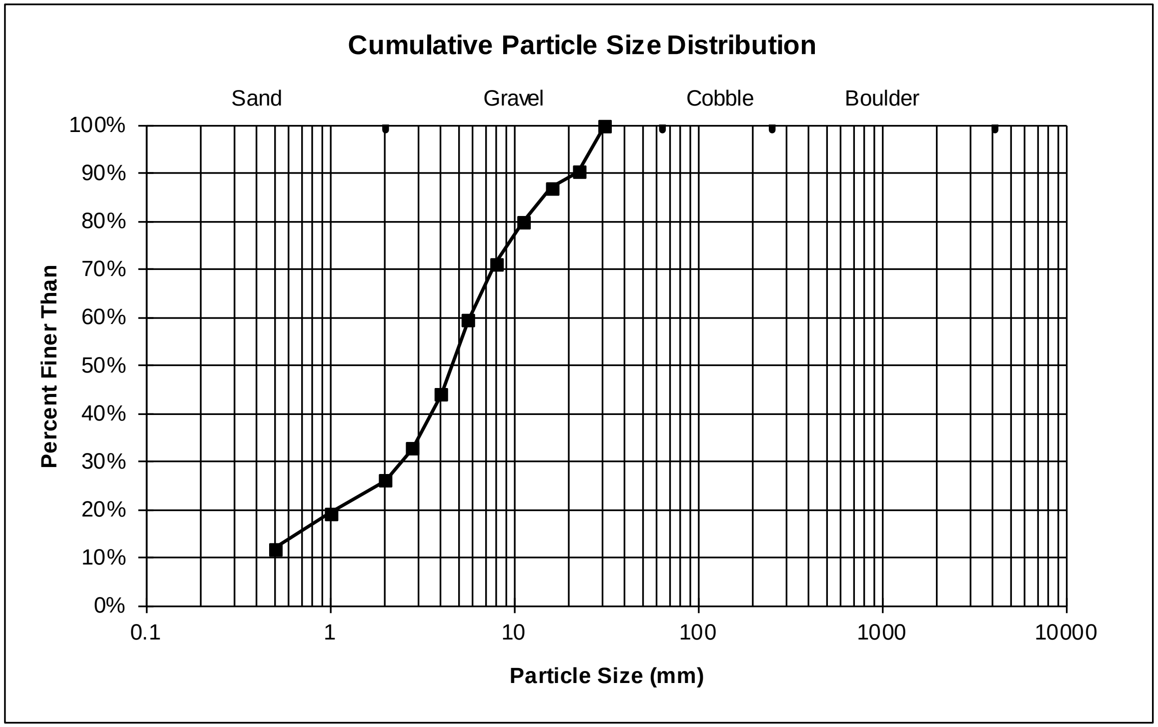
COMMENTS: Bar Sample taken 3' upstream from Cross Section B

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	68.50	11.9%	
0.5	42.40	7.4%	11.9%
1.0	38.40	6.7%	19.3%
2.0	38.50	6.7%	26.0%
2.8	65.10	11.3%	32.7%
4.0	89.00	15.5%	44.0%
5.6	67.10	11.7%	59.5%
8.0	49.10	8.5%	71.1%
11.2	42.20	7.3%	79.7%
16.0	19.00	3.3%	87.0%
22.4	55.70	9.7%	90.3%
31.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	575.00		

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

SITE NAME: Pike's Peak Highway - South Catamount Creek Reach 1
ID NUMBER: SCAT1
DATE: 9/9/2013
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.668	**3.014**	**4.559**	**13.823**	**26.213**	**31.0**



Sieve Analysis Worksheet

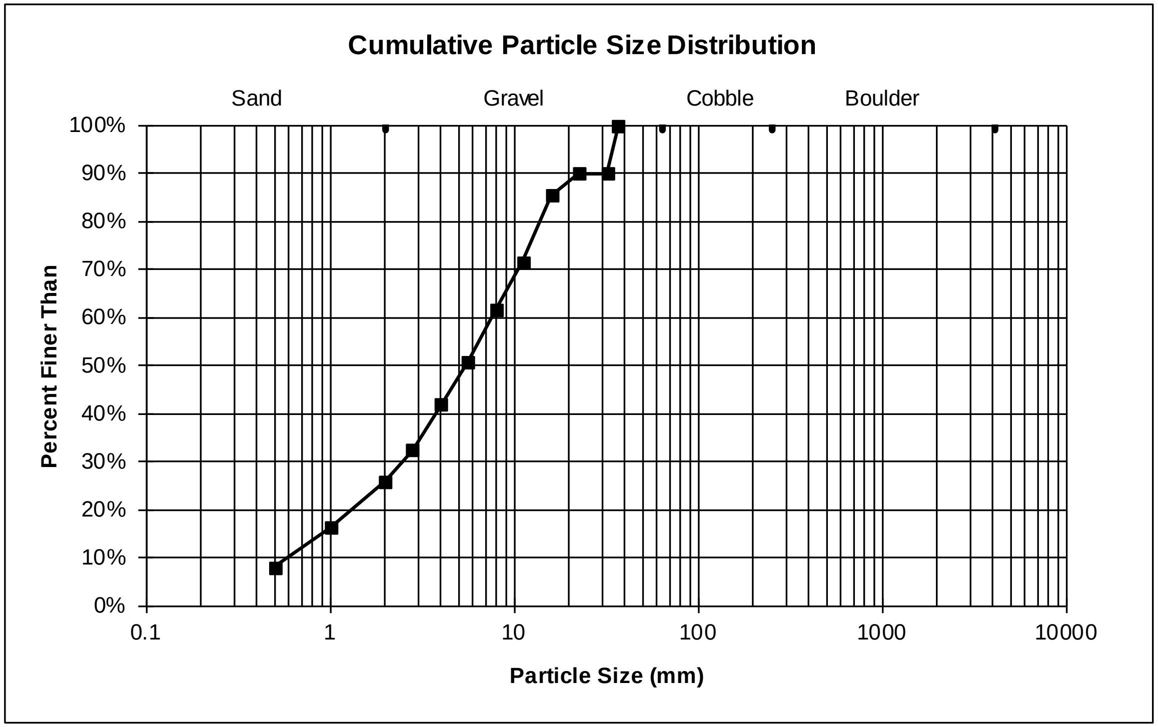
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	46.10	7.9%	
0.5	48.60	8.3%	7.9%
1.0	56.10	9.6%	16.3%
2.0	38.00	6.5%	25.9%
2.8	54.70	9.4%	32.4%
4.0	52.70	9.0%	41.8%
5.6	62.00	10.6%	50.9%
8.0	58.10	10.0%	61.5%
11.2	80.90	13.9%	71.5%
16.0	26.50	4.6%	85.4%
22.4	0.00	0.0%	89.9%
32.0	58.70	10.1%	89.9%
37.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	582.40		

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

COMMENTS: Bar Sample taken 10' downstream from Cross Section E on left bank

SITE NAME: Pike's Peak Highway - South Catamount Creek Reach 2
ID NUMBER: SCAT2
DATE: 8/26/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.901	3.089	5.424	15.447	34.429	37.0



Sieve Analysis Worksheet

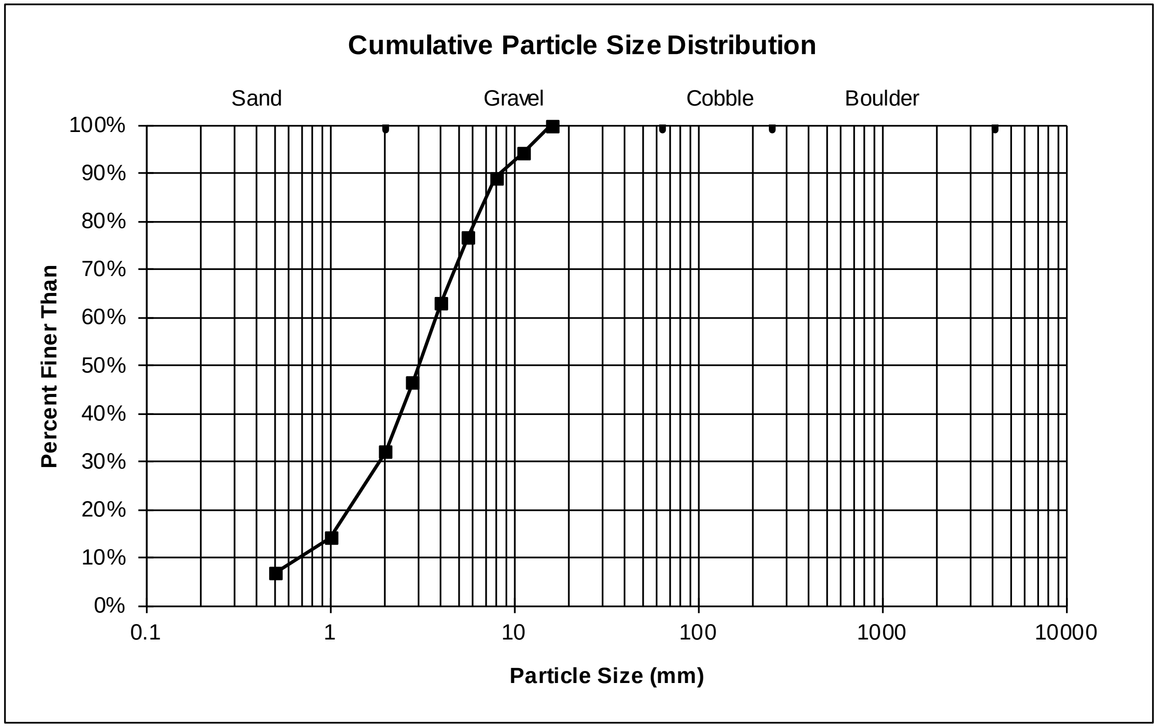
COMMENTS: Bar Sample taken 10' downstream from Cross Section E on left bank

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	32.80	6.7%	
0.5	36.20	7.4%	6.7%
1.0	87.30	17.9%	14.1%
2.0	69.70	14.3%	32.0%
2.8	81.60	16.7%	46.3%
4.0	66.50	13.6%	63.0%
5.6	60.50	12.4%	76.7%
8.0	24.50	5.0%	89.1%
11.2	28.80	5.9%	94.1%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	487.90		

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

SITE NAME: Pike's Peak Highway - South Catamount Creek Reach 2
ID NUMBER: SCAT2
DATE: 9/24/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.034	2.145	3.029	6.913	11.828	16.0



Sieve Analysis Worksheet

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	29.90	4.6%	
0.5	44.00	6.7%	4.6%
1.0	75.40	11.5%	11.2%
2.0	64.40	9.8%	22.7%
2.8	101.30	15.4%	32.5%
4.0	119.10	18.1%	47.9%
5.6	105.10	16.0%	66.1%
8.0	83.70	12.7%	82.1%
11.2	26.60	4.0%	94.8%
16.0	7.60	1.2%	98.8%
17.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	657.10		

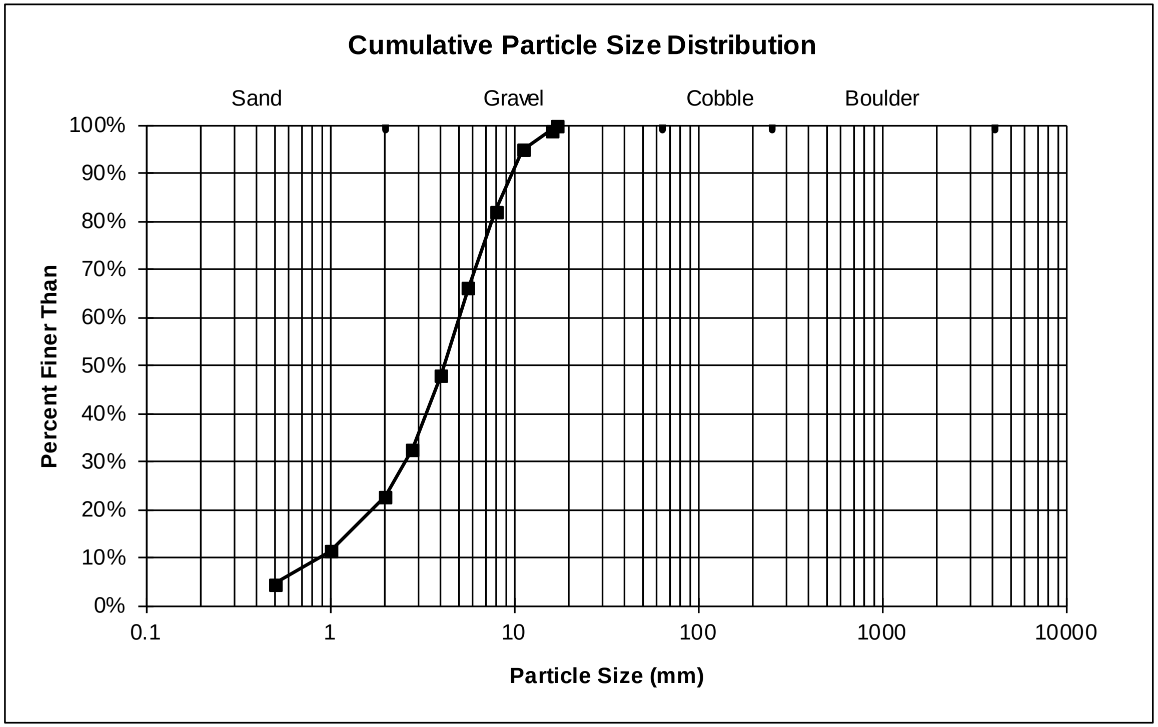
*Measured value of the largest particle in the sample and not a sieve weight

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

SITE NAME: Pike's Peak Highway - South Catamount Creek Reach 3
ID NUMBER: SCAT3
DATE: 8/28/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
1.255	2.965	4.156	8.421	11.404	17.0



Sieve Analysis Worksheet

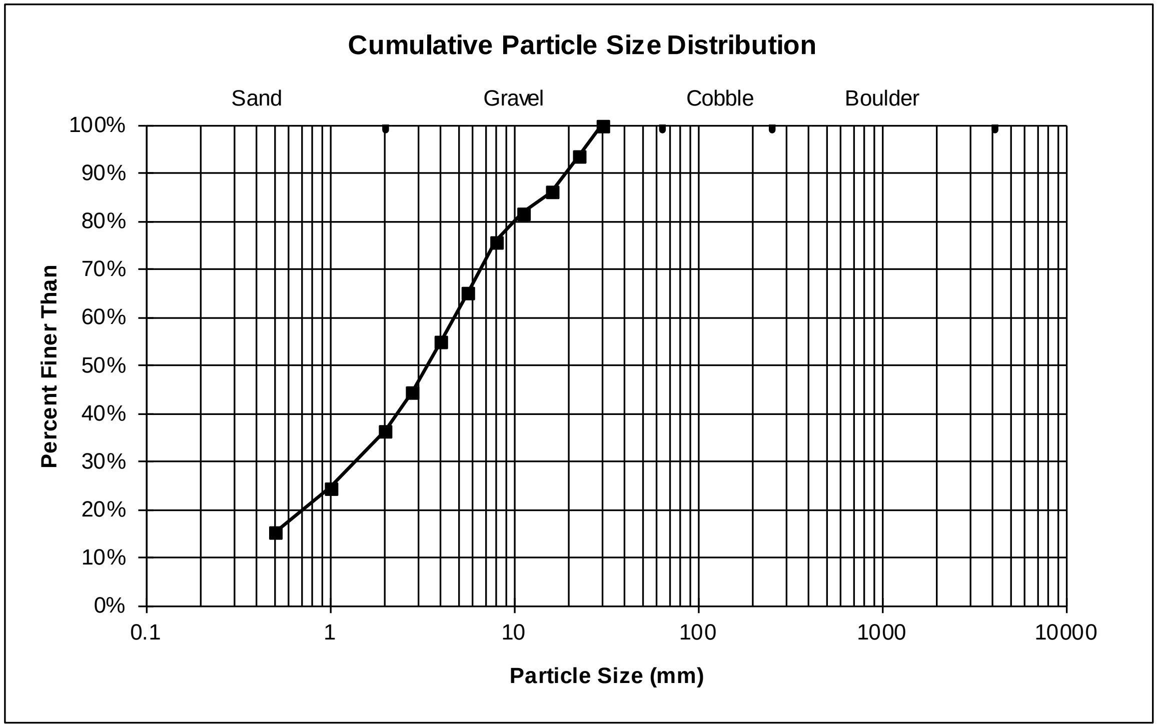
COMMENTS: Bar Sample taken 10' downstream from Cross Section D

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	95.90	15.3%	
0.5	58.30	9.3%	15.3%
1.0	74.20	11.8%	24.5%
2.0	51.50	8.2%	36.4%
2.8	65.40	10.4%	44.5%
4.0	64.00	10.2%	55.0%
5.6	66.00	10.5%	65.1%
8.0	38.20	6.1%	75.6%
11.2	27.30	4.3%	81.7%
16.0	45.90	7.3%	86.1%
22.4	41.60	6.6%	93.4%
30.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	628.30		

*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: 8/26/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.460	1.847	3.375	13.496	24.061	30.0



Sieve Analysis Worksheet

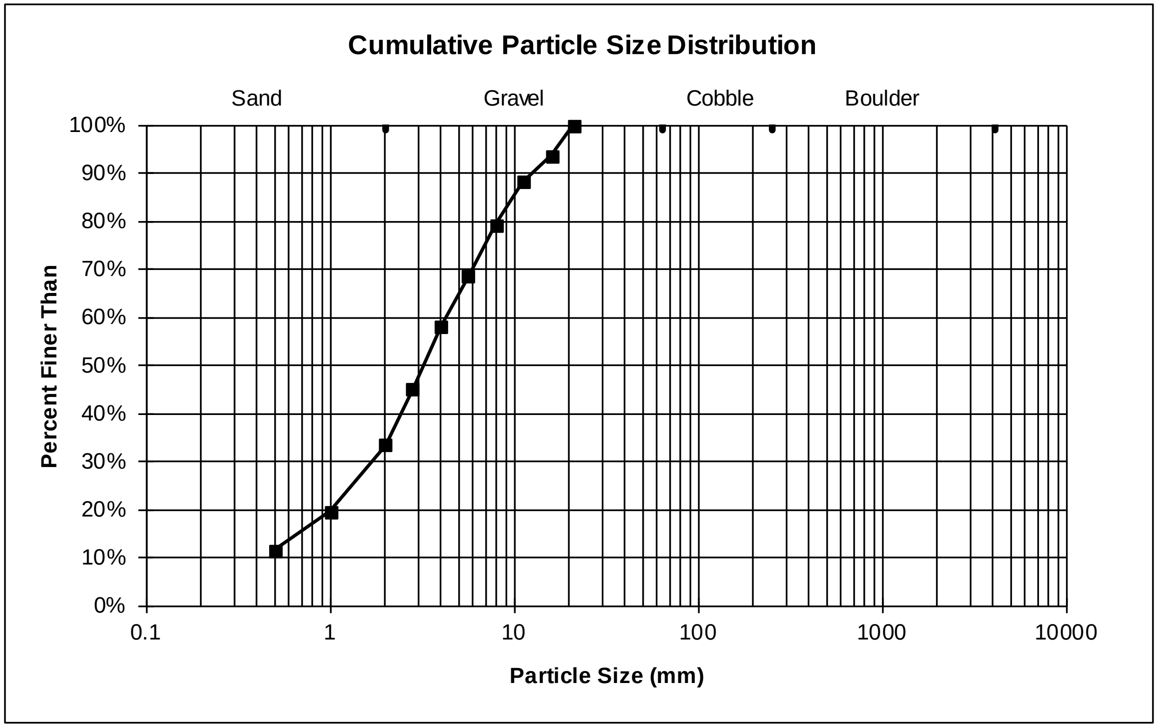
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	53.00	11.6%	
0.5	36.30	7.9%	11.6%
1.0	64.10	14.0%	19.5%
2.0	53.20	11.6%	33.5%
2.8	60.30	13.2%	45.1%
4.0	47.20	10.3%	58.2%
5.6	49.00	10.7%	68.5%
8.0	41.10	9.0%	79.2%
11.2	24.60	5.4%	88.2%
16.0	29.60	6.5%	93.5%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	458.40		

*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: 9/24/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.676	2.091	3.200	9.575	17.013	21.0



Sieve Analysis Worksheet

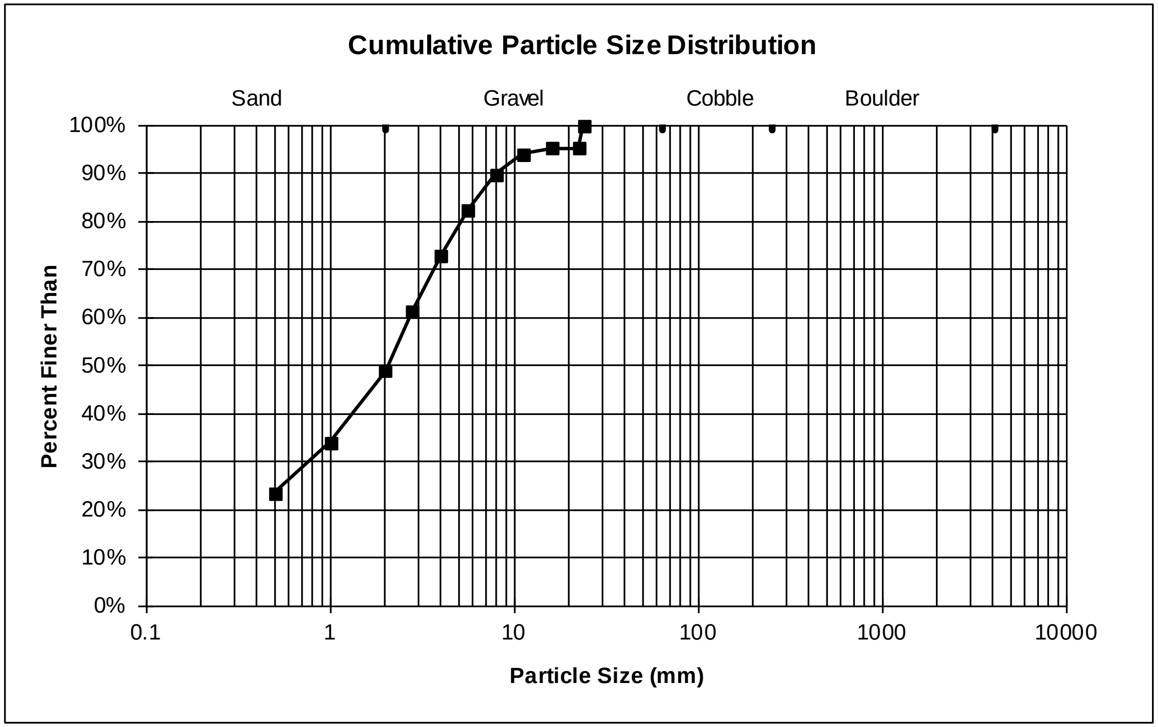
COMMENTS: Bar Sample taken 6' upstream from Cross Section A left bank

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	115.50	23.4%	
0.5	51.80	10.5%	23.4%
1.0	73.80	15.0%	33.9%
2.0	61.40	12.5%	48.9%
2.8	56.30	11.4%	61.4%
4.0	46.70	9.5%	72.8%
5.6	36.90	7.5%	82.3%
8.0	20.40	4.1%	89.8%
11.2	6.50	1.3%	93.9%
16.0	0.00	0.0%	95.2%
22.4	23.50	4.8%	95.2%
24.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	492.80		

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

SITE NAME: Pike's Peak Highway - Ski Creek Reach 2
ID NUMBER: SKIC2
DATE: 8/22/2013
CREW: Hauser, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.087	1.050	2.059	6.077	15.030	24.0



Sieve Analysis Worksheet

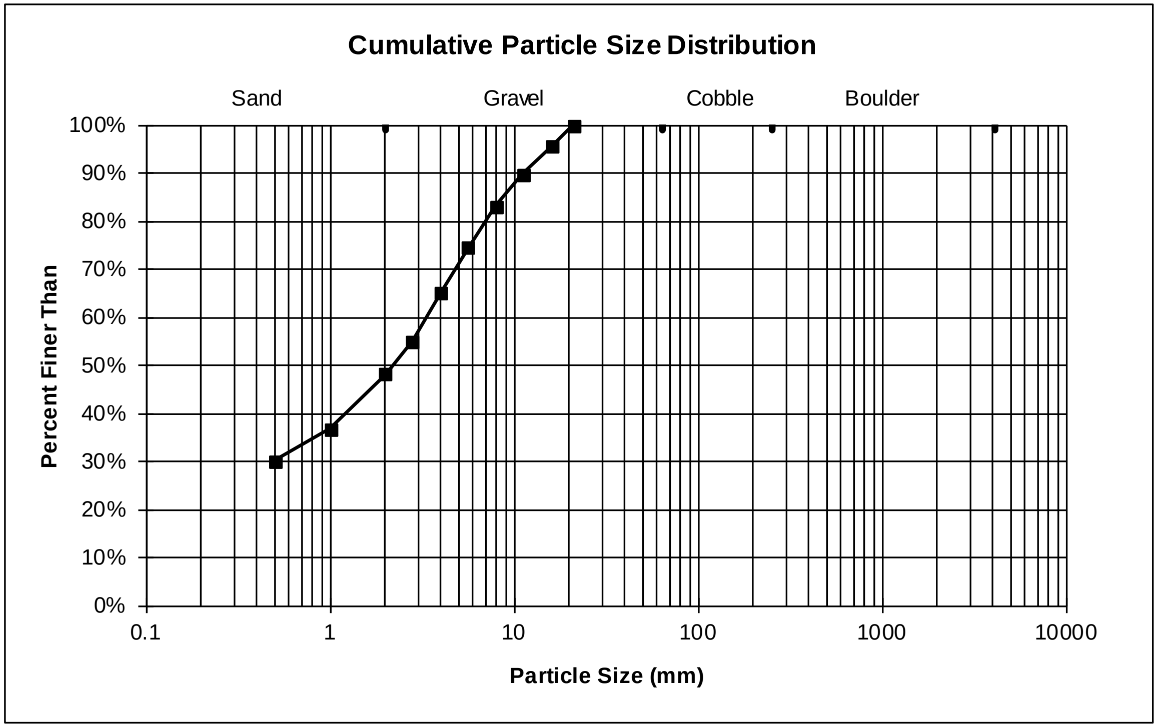
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	146.10	30.0%	
0.5	32.70	6.7%	30.0%
1.0	55.20	11.4%	36.8%
2.0	33.00	6.8%	48.1%
2.8	49.90	10.3%	54.9%
4.0	45.60	9.4%	65.2%
5.6	41.00	8.4%	74.6%
8.0	32.40	6.7%	83.0%
11.2	28.20	5.8%	89.7%
16.0	22.10	4.5%	95.5%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	486.20		

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

COMMENTS: Bar Sample taken at Cross Section A

SITE NAME: Pike's Peak Highway - Severy Creek Reach 1
ID NUMBER: SVRY1
DATE: 11/11/2013
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.044	0.833	2.194	8.418	15.559	21.0



Sieve Analysis Worksheet

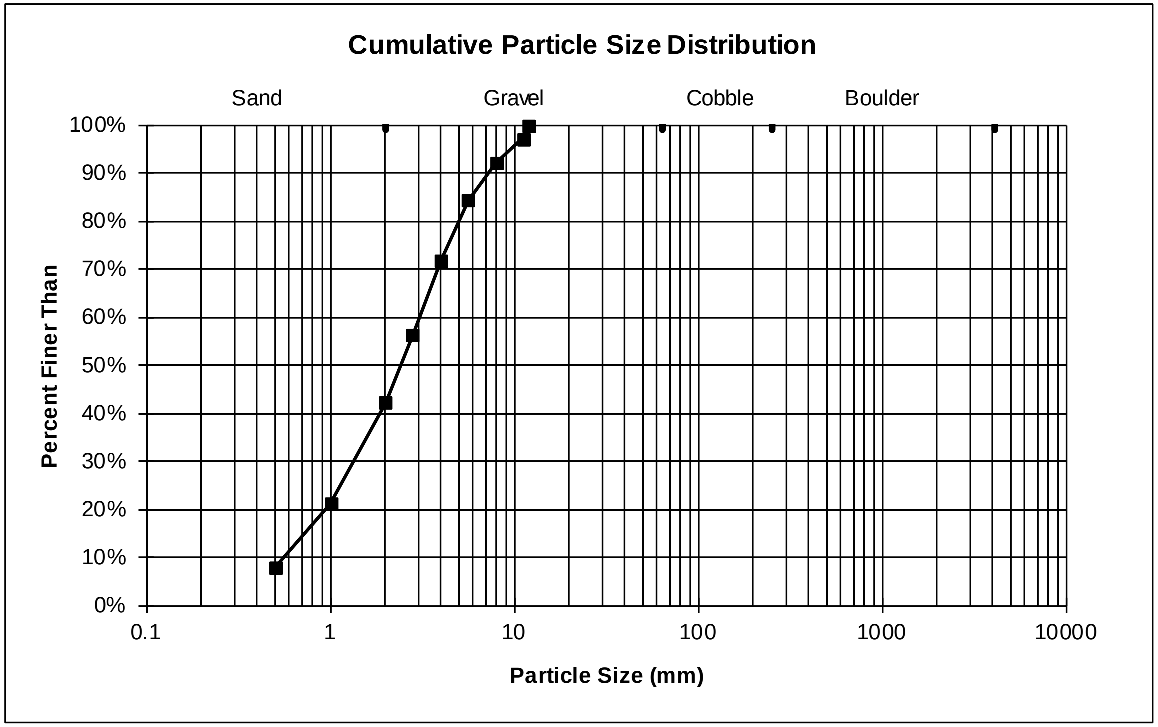
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	32.90	7.8%	
0.5	56.00	13.4%	7.8%
1.0	88.30	21.1%	21.2%
2.0	58.70	14.0%	42.3%
2.8	65.20	15.5%	56.3%
4.0	52.60	12.5%	71.8%
5.6	32.20	7.7%	84.4%
8.0	21.10	5.0%	92.0%
11.2	12.30	2.9%	97.1%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	419.30		

*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: 11/11/2013
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.725	**1.575**	**2.409**	**5.547**	**9.755**	**12.0**



Sieve Analysis Worksheet

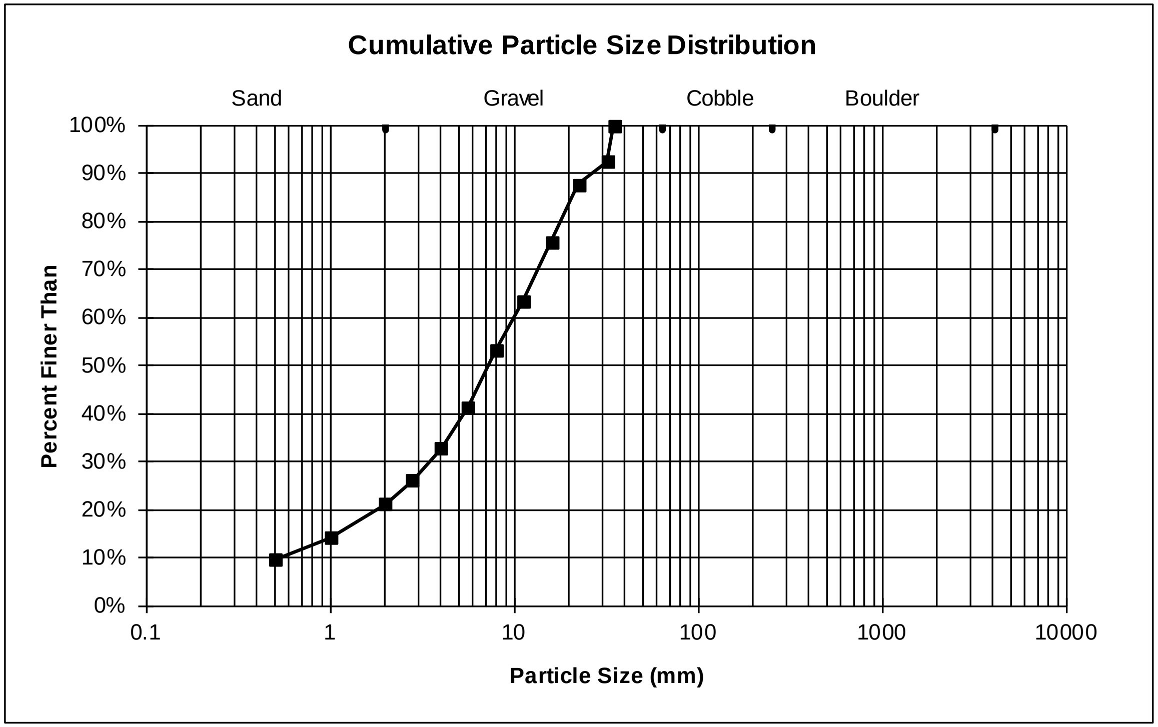
COMMENTS: Bar Sample taken between Cross Section D and E

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	73.10	9.5%	
0.5	35.60	4.6%	9.5%
1.0	53.50	7.0%	14.2%
2.0	37.60	4.9%	21.1%
2.8	51.10	6.7%	26.0%
4.0	65.80	8.6%	32.7%
5.6	90.20	11.7%	41.2%
8.0	79.40	10.3%	53.0%
11.2	94.90	12.4%	63.3%
16.0	91.70	11.9%	75.7%
22.4	36.00	4.7%	87.6%
32.0	59.00	7.7%	92.3%
35.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	767.90		

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

SITE NAME: Pike's Peak Highway - West Fork Beaver Creek Reach 2
ID NUMBER: WBVR2
DATE: 9/17/2013
CREW: VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.088	4.383	7.306	20.223	33.017	35.0



Appendix P

Riparian Vegetation Summary

2013

Riparian Vegetation Summary Pikes Peak, 2013

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
GLEN1	8/28/2013	Olympus Stylus 400	A (20.03)	At XSE right bank	Left	9	12	10	Sedge, Forb, Shrub
GLEN1		Olympus Stylus 400	A		Right	13	8.5	60	Moss, Sedge, Forb, Shrub
GLEN1		Olympus Stylus 400	B(16.57)		Left	6.3	9.5	5	Grass, Shrub
GLEN1		Olympus Stylus 400	B		Right	9	5.7	10	Grass, Sedge, Forb, shrub
GLEN1		Olympus Stylus 400	C (17.31)		Left	5.9	9.9	10	Sedge
GLEN1		Olympus Stylus 400	C		Right	9.6	6	20	Sedge, Forb
GLEN1		Olympus Stylus 400	D (49.99)		Left	16.8	21	5	Shrub
GLEN1		Olympus Stylus 400	D		Right	29	27.2	5	Grass, Forb, Shrub, Tree
GLEN1		Olympus Stylus 400	E (24.29)		Left	8	15.5	15	Sedge, Forb, Shrub
GLEN1		Olympus Stylus 400	E		Right	19.7	12	20	Grass, Forb, Shrub
NCAT1	9/3/2013	Olympus Stylus 400	A (57.53)	At XSC right bank	Left	12	17	10	Grass, Sedge, Forb
NCAT1		Olympus Stylus 400	A		Right	16.5	12	20	Grass, Sedge, Forb
NCAT1		Olympus Stylus 400	B (58.83)		Left	46	50	30	Grass, Sedge
NCAT1		Olympus Stylus 400	B		Right	50.5	47	25	Grass, Sedge, Forb
NCAT1		Olympus Stylus 400	C (38.85)		Left	16.7	21.5	30	Grass, Sedge, Forb, Shrub
NCAT1		Olympus Stylus 400	C		Right	30.3	26	15	Grass, Sedge, Forb
NCAT1		Olympus Stylus 400	D (44.77)		Left	28.5	30	40	Sedge, Forb, Shrub
NCAT1		Olympus Stylus 400	D		Right	32.5	29.3	50	Sedge, Forb
NCAT1		Olympus Stylus 400	E (60.78)		Left	42.8	47	20	Grass, Sedge, Shrub
NCAT1		Olympus Stylus 400	E		Right	45.5	41	30	Grass, Sedge
NCAT2	9/3/2013	Olympus Stylus 400	A (29.17)	3' downstream from XSB	Left	12	16.5	30	Grass, Sedge, Shrub
NCAT2		Olympus Stylus 400	A		Right	16.2	12	35	Grass, Sedge
NCAT2		Olympus Stylus 400	B (40.59)		Left	8.8	13	30	Grass, Sedge
NCAT2		Olympus Stylus 400	B		Right	11.8	8	20	Grass, Sedge
NCAT2		Olympus Stylus 400	C (42.34)		Left	11.5	17	25	Grass, Sedge

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
NCAT2		Olympus Stylus 400	C		Right	16.4	11.5	30	Grass, Sedge, Forb
NCAT2		Olympus Stylus 400	D (29.78)		Left	6	10.5	35	Grass, Sedge, Forb, Shrub
NCAT2		Olympus Stylus 400	D		Right	9.7	5	30	Grass, Sedge, Forb
NCAT2		Olympus Stylus 400	E (34.25)		Left	10	15	50	Moss, Sedge, Forb, Shrub
NCAT2		Olympus Stylus 400	E		Right	13.1	2.5	25	Grass, Sedge
NCRY1	8/21/2013	Olympus Stylus 400	A (54.53)	At XSA left bank	Left	35.5	39	15	Grass, Sedge, Forb
NCRY1		Olympus Stylus 400	A		Right	38.8	36	20	Grass, Sedge, forb
NCRY1		Olympus Stylus 400	B (51.31)		Left	38.8	42	15	Sedge, Tree
NCRY1		Olympus Stylus 400	B		Right	41.5	38	20	Moss, Sedge, Shrub
NCRY1		Olympus Stylus 400	C (43.61)		Left	26.3	29	80	Moss, Grass, Forb, Tree
NCRY1		Olympus Stylus 400	C		Right	28.7	25	60	Moss, Sedge, Forb
NCRY1		Olympus Stylus 400	D (41.53)		Left	29.6	32.8	15	Sedge
NCRY1		Olympus Stylus 400	D		Right	31.5	29.5	10	Sedge, Shrub
NCRY1		Olympus Stylus 400	E (37.98)		Left	30	33.7	45	Sedge
NCRY1		Olympus Stylus 400	E		Right	34.3	31	75	Moss, Grass, Forb, Shrub
NCRY2	8/21/2013	Olympus Stylus 400	A (24.23)	Upstream from XSE	Left	10.5	15.5	20	Grass, Shrub
NCRY2		Olympus Stylus 400	A		Right	20.6	15	10	Moss, Grass, Forb
NCRY2		Olympus Stylus 400	B (35.00)		Left	21.4	25	15	Grass, Forb, Shrub
NCRY2		Olympus Stylus 400	B		Right	30.5	26	10	Moss, Forb, Shrub
NCRY2		Olympus Stylus 400	C (33.82)		Left	19.3	24	30	Grass, Shrub
NCRY2		Olympus Stylus 400	C		Right	27.4	23	15	Grass, Forb, Shrub
NCRY2		Olympus Stylus 400	D (28.71)		Left	14.5	18.3	5	Grass, Forb
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	Shrub
NCRY2		Olympus Stylus 400	E		Right	18.4	15.6	50	Moss
OILC1	9/25/2013	Olympus Stylus 400	A (48.75)	4' downstream from XSA right bank	Left	10.5	13.5	5	Moss, Grass, Shrub
OILC1		Olympus Stylus 400	A		Right	16.6	14	20	Sedge, 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
OILC1		Olympus Stylus 400	B (41.34)		Left	9.8	12	5	Moss, Sedge
OILC1		Olympus Stylus 400	B		Right	15.5	13	5	Moss, Forb, Sedge
OILC1		Olympus Stylus 400	C (32.67)		Left	16.2	19	20	Sedge
OILC1		Olympus Stylus 400	C		Right	20	17.5	30	Sedge
OILC1		Olympus Stylus 400	D (45.68)		Left	13.9	18	0	Sediment
OILC1		Olympus Stylus 400	D		Right	21	17.5	10	Moss, Sedge
OILC1		Olympus Stylus 400	E (38.35)		Left	8.9	12	40	Moss, Grass, Sedge, Forb
OILC1		Olympus Stylus 400	E		Right	15.6	11	20	Moss, Sedge
SKIC1	8/26/2013	Olympus Stylus 400	A (15.04)	10' downstream from XSD	Left	6.2	8	20	Moss, Grass, Forb
SKIC1		Olympus Stylus 400	A		Right	11.1	8.5	40	Lichen, Moss, Grass, Forb
SKIC1		Olympus Stylus 400	B (14.15)		Left	4.9	7	5	Moss, Forb
SKIC1		Olympus Stylus 400	B		Right	10.5	7.5	5	Forb, Tree
SKIC1		Olympus Stylus 400	C (16.60)		Left	4.1	7	35	Grass, Forb
SKIC1		Olympus Stylus 400	C		Right	11	9	25	Moss, Grass, Forb
SKIC1		Olympus Stylus 400	D (33.57)		Left	16	19.5	60	Moss, Grass, Forb, Shrub
SKIC1		Olympus Stylus 400	D		Right	23.2	19.5	5	Forb, Shrub
SKIC1		Olympus Stylus 400	E (21.78)		Left	14.5	17.5	35	Grass, Forb, Shrub
SKIC1		Olympus Stylus 400	E		Right	19.2	15	55	Moss, Grass, Forb, Tree
SKIC2	8/22/2013	Olympus Stylus 400	A (50.70)	6' upstream from XSA left bank	Left	32.8	36	20	Moss, Grass, Forb, Shrub
SKIC2		Olympus Stylus 400	A		Right	40.7	35	35	Moss, Grass, Forb, Tree
SKIC2		Olympus Stylus 400	B (46.73)		Left	28.5	35.5	5	Moss
SKIC2		Olympus Stylus 400	B		Right	34.5	32.5	15	Moss, Grass, Forb, Shrub
SKIC2		Olympus Stylus 400	C (29.76)		Left	2.6	6	15	Moss, Grass, Forb, Shrub
SKIC2		Olympus Stylus 400	C		Right	10.6	7	5	Moss, Forb
SKIC2		Olympus Stylus 400	D (28.31)		Left	4.3	11	35	Moss, Forb, Shrub
SKIC2		Olympus Stylus 400	D		Right	12.5	8	5	Grass, Forb
SKIC2		Olympus Stylus 400	E (41.90)		Left	24.9	31	35	Lichen, Moss, Grass, Forb
SKIC2		Olympus Stylus 400	E		Right	31.1	26	5	Moss, Grass

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	11/11/2013	Olympus Stylus 400	A (13.70)	At XSA	Left	2	7	35	Moss, Grass, Sedge, Forb
SVRY1		Olympus Stylus 400	A		Right	7.8	4	25	Sedge
SVRY1		Olympus Stylus 400	B (11.83)		Left	5	8	20	Sedge
SVRY1		Olympus Stylus 400	B		Right	5	5	25	Sedge, Shrub
SVRY1		Olympus Stylus 400	C (14.82)		Left	4.9	8	30	Sedge
SVRY1		Olympus Stylus 400	C		Right	7.8	5	20	Sedge, Shrub
SVRY1		Olympus Stylus 400	D (12.09)		Left	4.6	8	30	Sedge, Shrub
SVRY1		Olympus Stylus 400	D		Right	8.6	4	80	Moss, Forb, Shrub
SVRY1		Olympus Stylus 400	E (9.57)		Left	2.7	7	45	Grass, Sedge
SVRY1		Olympus Stylus 400	E		Right	6.6	4	80	Moss, Sedge, Forb, Shrub
SVRY2	11/11/2013	Olympus Stylus 400	A (95.72)	Downstream from XSE	Left	20.2	28	0	Sediment
SVRY2		Olympus Stylus 400	A		Right	37	32	0	Sediment
SVRY2		Olympus Stylus 400	B (116.96)		Left	29.5	35	0	Sediment
SVRY2		Olympus Stylus 400	B		Right	47.2	41	0	Sediment
SVRY2		Olympus Stylus 400	C (158.61)		Left	59.2	65	0	Sediment
SVRY2		Olympus Stylus 400	C		Right	79.5	73	0	Sediment
SVRY2		Olympus Stylus 400	D (156.58)		Left	74.8	79	0	Sediment
SVRY2		Olympus Stylus 400	D		Right	91.5	87	0	Sediment
SVRY2		Olympus Stylus 400	E (211.52)		Left	62.5	72	0	Sediment
SVRY2		Olympus Stylus 400	E		Right	81	71	0	Sediment
SCAT1	9/9/2013	Olympus Stylus 400	A (22.96)	3' upstream from XSB	Left	6.4	11.5	25	Grass, Sedge, Forb
SCAT1		Olympus Stylus 400	A		Right	11.2	8.9	75	Moss, Grass, Sedge
SCAT1		Olympus Stylus 400	B (20.83)		Left	10.5	14	80	Moss, Grass, Forb
SCAT1		Olympus Stylus 400	B		Right	18.3	14	20	Moss, Grass, Sedge, Forb
SCAT1		Olympus Stylus 400	C (21.86)		Left	4	10	10	Grass, Sedge
SCAT1		Olympus Stylus 400	C		Right	13.7	9.6	15	Grass, Sedge
SCAT1		Olympus Stylus 400	D (18.12)		Left	5.5	12	30	Grass, Sedge, 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
SCAT1		Olympus Stylus 400	D		Right	11.7	6	75	Moss, Grass, Sedge, Forb
SCAT1		Olympus Stylus 400	E (24.02)		Left	10	16	30	Grass, Sedge, Forb
SCAT1		Olympus Stylus 400	E		Right	15.5	10	60	Moss, Grass, Sedge
SCAT2	8/26/2013	Olympus Stylus 400	A (28.57)	10' upstream from XSE left bank	Left	3.9	9	35	Moss, Grass, Forb, Tree
SCAT2		Olympus Stylus 400	A		Right	15	9.5	15	Moss, Grass, Forb, Tree
SCAT2		Olympus Stylus 400	B (17.05)		Left	3	7	5	Grass, Sedge
SCAT2		Olympus Stylus 400	B		Right	11.3	7	25	Moss, Sedge, Forb
SCAT2		Olympus Stylus 400	C (19.81)		Left	4	6	30	Moss, Sedge, Forb
SCAT2		Olympus Stylus 400	C		Right	13.2	9	10	Moss, Sedge, Forb
SCAT2		Olympus Stylus 400	D (38.50)		Left	7.6	11	10	Sedge, Forb
SCAT2		Olympus Stylus 400	D		Right	15.4	12.7	25	Moss, Grass, Sedge
SCAT2		Olympus Stylus 400	E (18.95)		Left	3.3	7	15	Sedge, Forb
SCAT2		Olympus Stylus 400	E		Right	11.2	8	35	Moss, Sedge, Forb
SCAT3	8/29/2013	Olympus Stylus 400	A (44.32)	10' downstream from XSD right bank	Left	26	29.4	15	Grass, Sedge, Forb, Shrub
SCAT3		Olympus Stylus 400	A		Right	29.2	25.2	35	Moss, Sedge, Forb
SCAT3		Olympus Stylus 400	B (32.19)		Left	12.1	16	5	Sedge
SCAT3		Olympus Stylus 400	B		Right	15.5	12.7	25	Grass, Sedge
SCAT3		Olympus Stylus 400	C (15.79)		Left	2.6	6.8	35	Sedge
SCAT3		Olympus Stylus 400	C		Right	6.2	3.1	25	Moss, Sedge
SCAT3		Olympus Stylus 400	D (19.60)		Left	8	11.6	25	Sedge
SCAT3		Olympus Stylus 400	D		Right	10	8.1	25	Sedge
SCAT3		Olympus Stylus 400	E (18.48)		Left	4.6	8.2	30	Moss, Sedge, Forb
SCAT3		Olympus Stylus 400	E		Right	6.5	3.8	10	Sedge, Forb, Shrub
WBVR2	9/17/2013	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

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 (90.60)		Left	14.0	21.0	5	Grass, Shrub
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