AN ABSRACT OF THE THESIS OF

Ann M. Arsenault for the degree of Master of Science in Geology presented on April 6, 2004.
Title: Contribution of Deep-Seated Bedrock Landslides to Denudation of a Glaciated Basin in Southern Alaska.

Abstract approved:

Andrew J. Meigs

The role of bedrock landslides in the denudation of fluvial catchments has received considerable attention, whereas the relative contribution of deep-seated bedrock landslides to the erosion of glaciated basins is less well known. A glaciated basin in the Chugach-St. Elias Range of southern Alaska was chosen to investigate the contribution of bedrock landslides because the debris from four major landslides on the surface of a glacier is easily distinguished from moraines and other supraglacial material. The sediment in the landslides was derived entirely from the hillslopes, as evidenced by large scars visible on the basin walls.

A series of aerial and satellite photos from 1978 to 2000 and field observations in 2001 and 2002 indicate that three of the four landslides have fallen onto the surface of the glacier since ~1978. The landslides originated from the steeply dipping (60-70°) bedrock walls and were deposited onto the glacier in the ablation zone. Landslide material is currently being transported downstream supraglacially. Valley walls are composed of high-grade metamorphic rock, have a steep north-dipping foliation, are fractured by numerous large joints, and have an average relief of ~400 meters. A total landslide volume of ~ 2.3 x 10^5 m^3 was determined by combining surface profiles, area, and thickness from high-resolution survey data. This volume indicates that deep-seated landslides resulted in a basin-scale erosion rate of 0.4 mm yr^{-1}. Other investigations that have attempted to quantify the sediment contribution from supraglacial sources, report that sediment derived from the basin walls could represent 24-60% of the overall erosion. If correct, the total landslide volume can be used to infer an overall, basin-scale erosion rate of 0.7 to 1.7 mm yr^{-1}.

Additionally, a mean rockwall retreat rate of 6.7 mm yr^{-1} was calculated. This rate is considerably higher than published rates, which range from 0.04 – 4.0 mm yr^{-1}. These rates were averaged over timescales of 10^5 years, therefore the most likely reason for the discrepancy is the short temporal scale of this study, 25 years.

Contribution of Deep-Seated Bedrock Landslides to Denudation of a Glaciated Basin in Southern Alaska

by
Ann M. Arsenault

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APPROVED:

Major Professor, representing Geology

Chair of the Department of Geosciences

Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Ann M. Arsenault, Author

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Introduction

Glaciated alpine basins represent complex drainage systems involving multiple sediment production mechanisms, sources, and transportation methods. Sediment production mechanisms include mass wasting, glacial and fluvial erosion, and chemical and physical weathering. Sediment source areas include primary bedrock erosion of the cirque or valley walls and the ice-bed interface (Figure 1). Once produced, sediment is transported through the system supraglacially, englacially, or subglacially (Fenn, 1987), and subsequently removed by proglacial streams and rivers, and/or deposited as moraines (Figure 1). Sediment volumes delivered from alpine basins represent an integrated signal from various sources. Sediment exported from a basin is typically measured as fluvially transported sediments in glacial streams and outwash channels and from estimates of sediment volumes stored in fjords and lakes (e.g. Hallet et al., 1996; Hammer and Smith, 1983; Hunter et al., 1996; Stravers and Syvitski, 1991). Though these techniques provide good estimates of the total amount of sediment being eroded out of a basin, the process-specific, source-specific, or time-specific contributions to sediment outputs are not readily determined (Fenn, 1987). That is, how was the sediment produced, where was it produced, and how long does it take to pass through the system?

Paraglacial processes are earth-surface processes in which sediments, landforms, and landscapes are directly conditioned by glaciers and deglaciation (Ballantyne, 2002). In mountain environments slope failure is both a significant paraglacial erosion process and an important delivery mechanism by which debris from the valley walls and cirque is

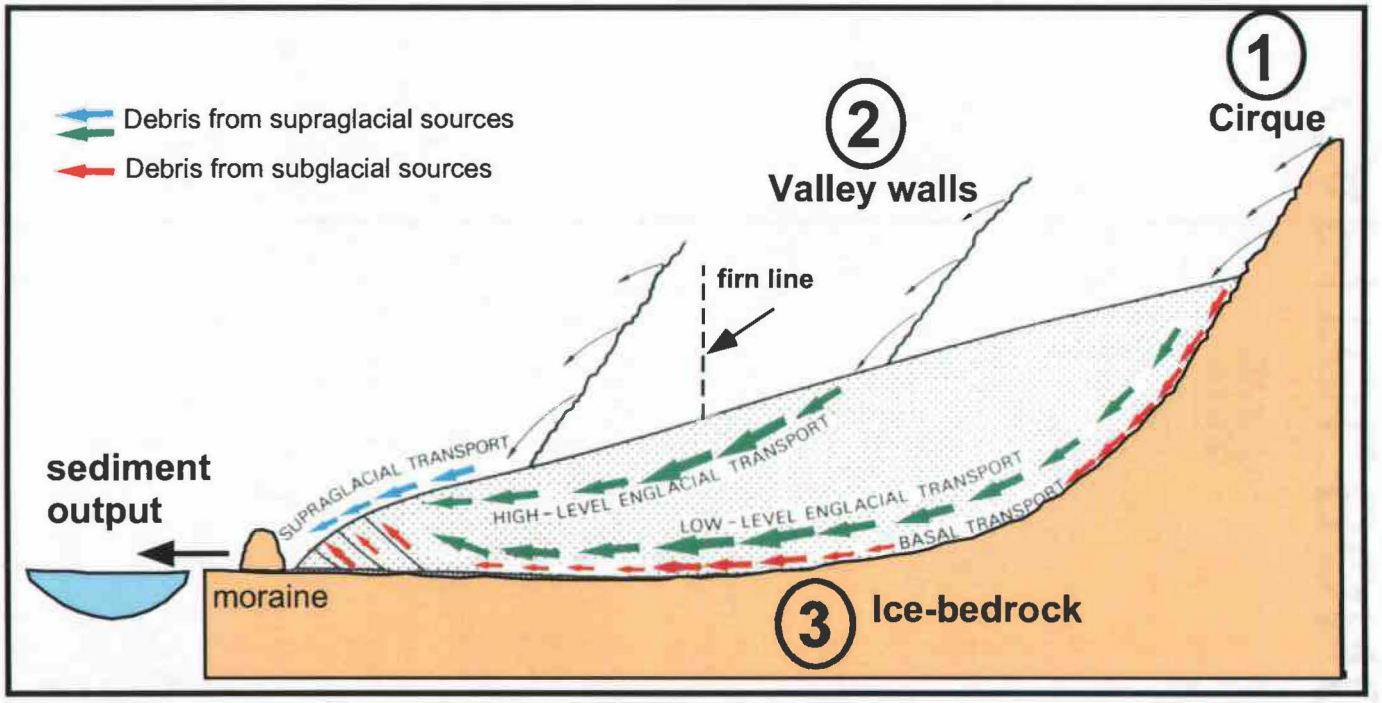


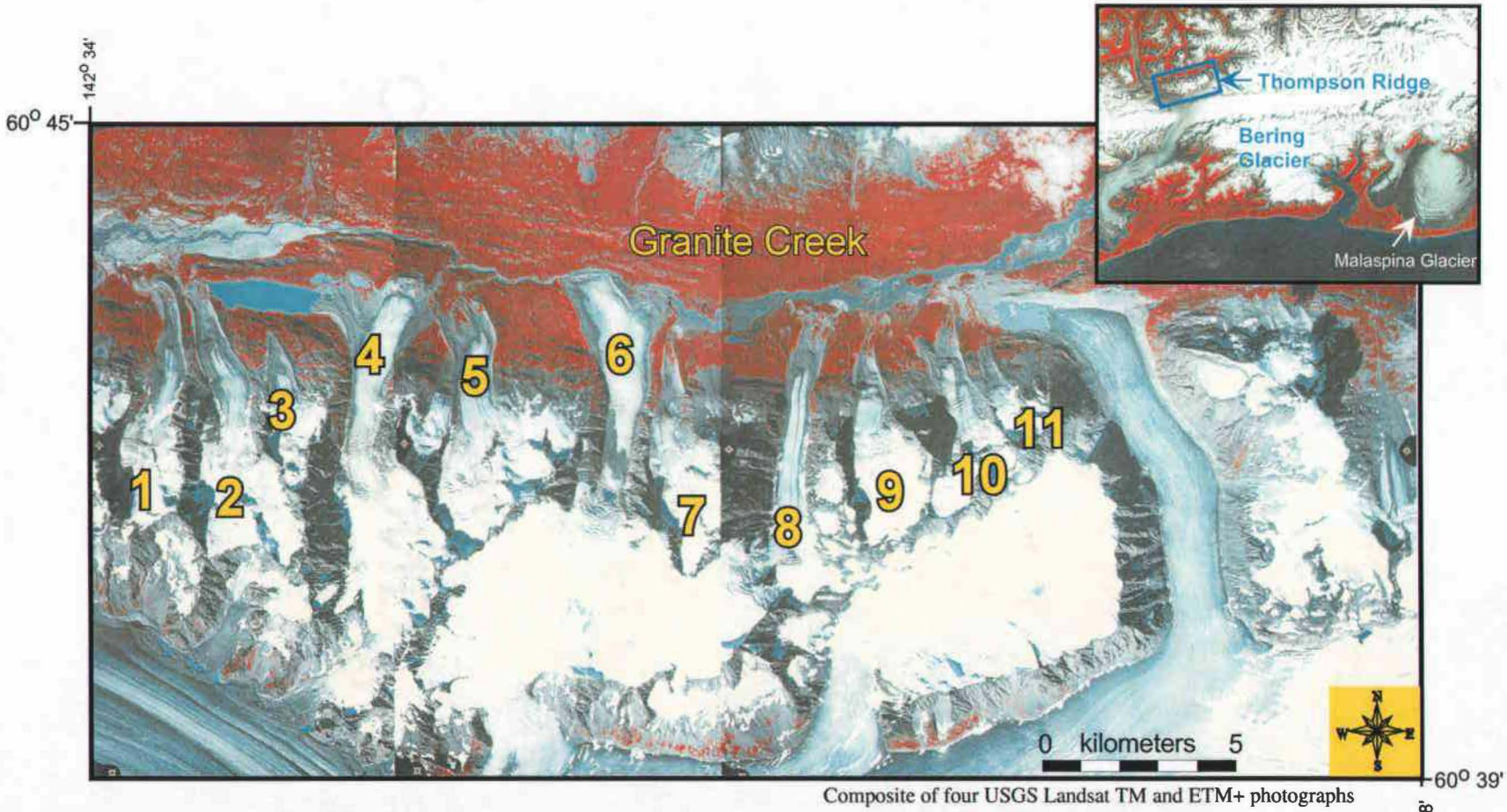
Figure 1. Glacial transport system. Sources of sediment in a glacial basin include the cirque headwall, the valley walls, and the ice-bed interface. Transport of sediment occurs supraglacially (blue arrows), englacially (green arrows) and/or subglacially (red arrows). The firn line marks the division between the accumulation and ablation zone for a given year and typically lies at the same elevation as the ELA. Sediment supplied to the glacier below the firn line is transported supraglacially, such as is observed on the study glacier (After Small, 1987).

transported to glaciers. Factors that contribute to slope failure in alpine environments include debutressing of valley walls, steep slopes, high relief, lithology, rock strength, climate regime, temperature, and seismic activity (Gardner, 1977).

Three general types of slope failure are recognized: 1) large-scale catastrophic failure, such as landslides or debris flows; 2) rock-mass deformation, or creep; and 3) rockfall (Ballantyne, 2002). Classification of slope failures varies as some nomenclature is based on magnitude whereas others are based on genesis and mechanics (Gardner, 1977). Large-scale catastrophic failures are generally understood to describe bedrock falls or landslides ranging in size from 100 m^3 to 1 x 10^6 m^3 (Whalley, 1974). Rockfalls or debris falls are typically described as discrete events that result in talus accumulation (Ballantyne, 2002). Although the magnitude of rockfall is not well defined, generally it ranges in volume from 10 m^3 to 50 m^3 (Whalley, 1974). Low- volume rockfall is the most frequent form of slope failure whereas large-scale landslides are less frequent but of a much higher volume (Selby, 1993). The relative importance of low vs. high magnitude events and their contribution to rates of hillslope erosion is not well constrained, and likely varies with location (Benn and Evans, 1998).

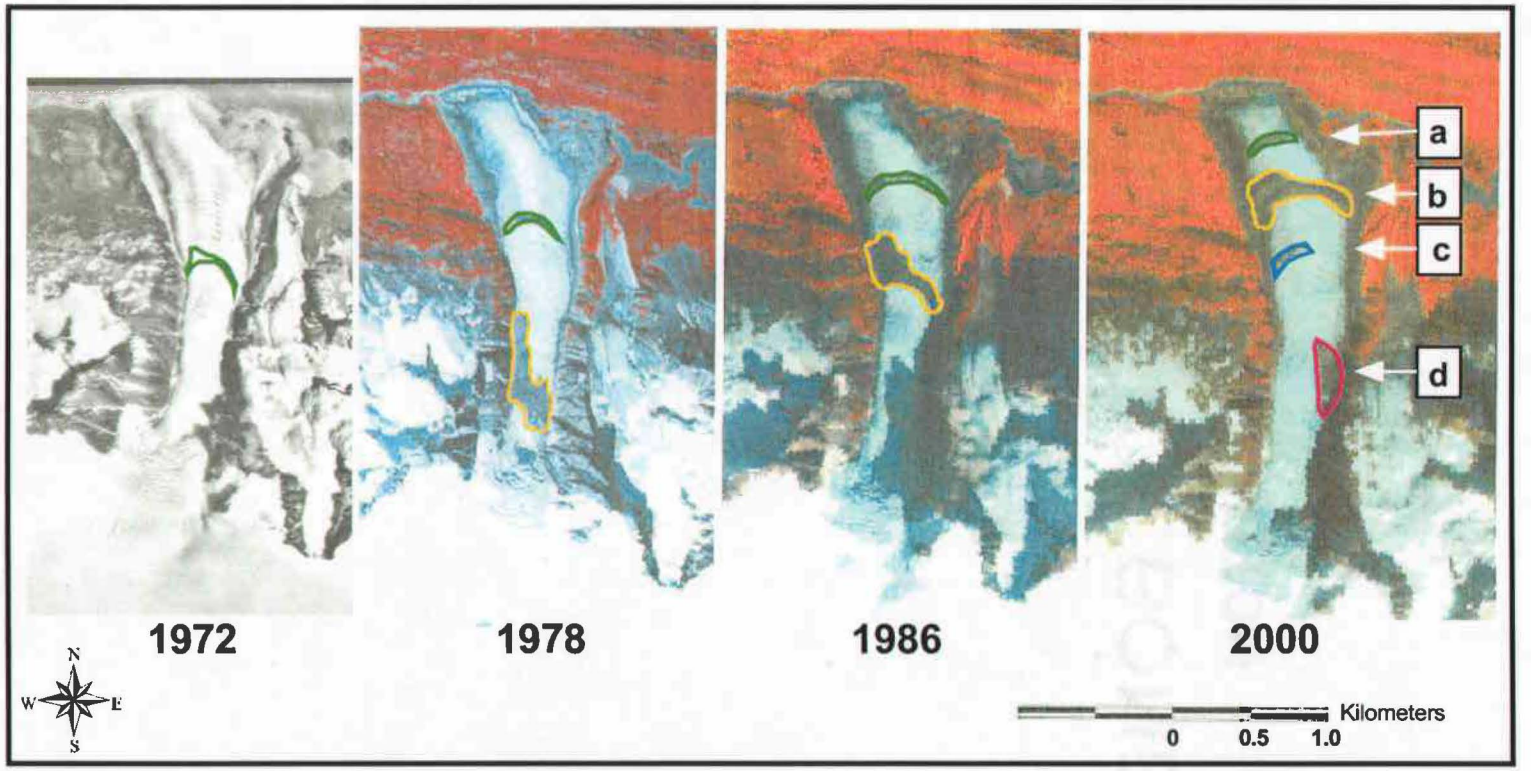
Large-scale catastrophic failure in the form of deep-seated bedrock landslides is the subject of this study. Three large landslides have been deposited onto the ice surface of an alpine glacier located in the Chugach-St. Elias Mountains in southern Alaska (Figure 2). A series of aerial photos and satellite images from 1972 to the present constrain the interval of deposition to the last 25 years (Figure 3). Because the landslides fell onto the ice surface in the ablation zone the deposits have not been incorporated into the ice; instead they are being carried down-valley as supraglacial deposits and have

remained relatively intact (Figure 4). Thus, these landslides provide a unique opportunity to isolate sediment from a single source and to measure the sediment flux, equivalent bedrock erosion rate, and rockwall retreat occurring over a well-constrained interval of time.



Composite of four USGS Landsat TM and ETM+ photographs

Figure 2. Thompson Ridge, Chugach-St.Elias Mountains, Southern Alaska. Thompson Ridge is an east-west trending ridge approximately 30 km long, with eleven north facing glaciated basins. The glaciers flow northward and drain into Granite Creek.



1972 image, USGS aerial photo; 1978 & 1986, USGS Landsat 5 TM: 2000, USGS Landsat 7 ETM+

Figure 3. Evolution of four landslides on the surface of Glacier # 6 from 1972 to present. The landslides occurred in the ablation area and are being transported supraglacially down stream . The eastern wall of the basin is the proposed source area for landslides "a" (green), "b" (yellow), and "d" (purple). Landslide "c" (blue) appears to have originated from the western wall of the basin. Also apparent in the series of images is the lack of retreat experienced by the glacier. The toe of the glacier has remained in approximately the same position during the 30 year interval.

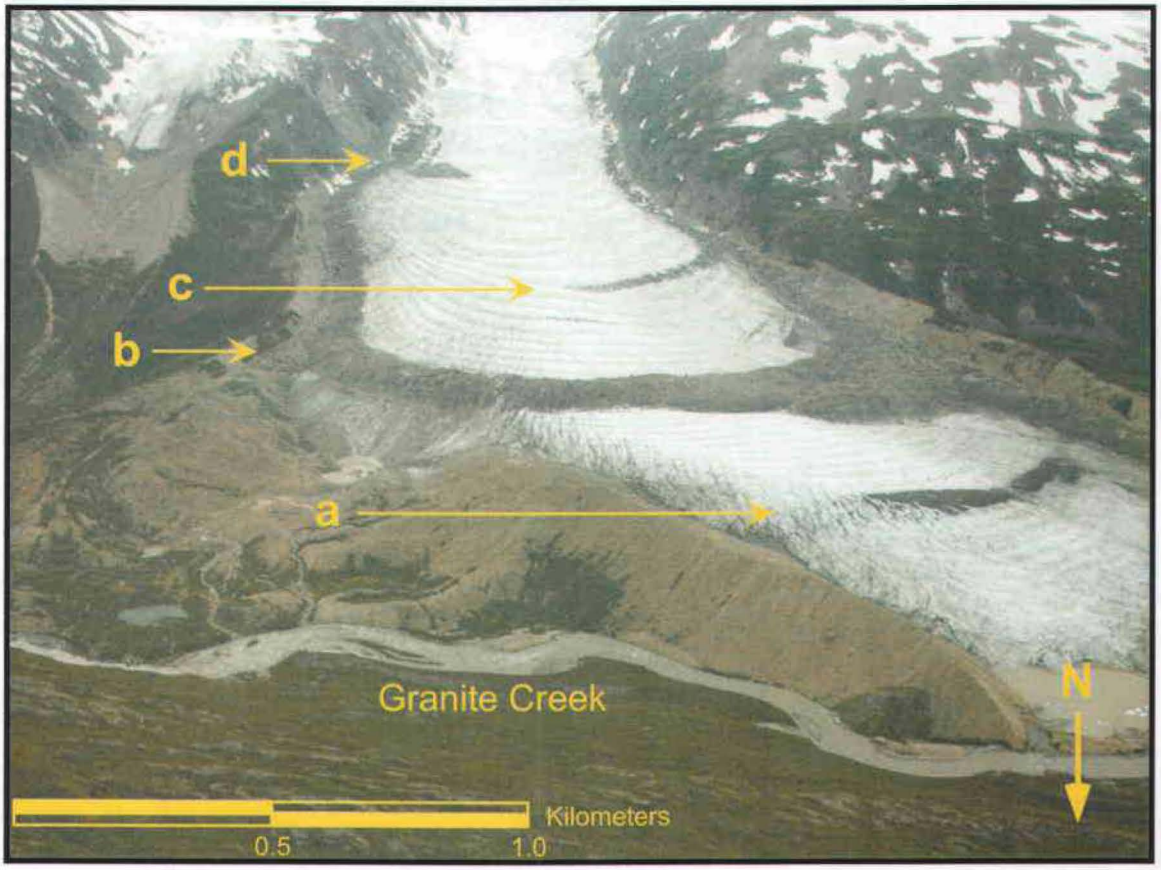


Figure 4. Glacier # 6, Thompson Ridge, southern AK. Four landslides are present on the surface of glacier # 6 (a, b, c, and d). Landslide "a" is the oldest, having occurred before 1972; landslide "b" occurred between 1972 and 1978; landslide "c" occurred between 1978 and 1986, and landslide "d" is the youngest having occurred sometime between 1986 and 2000.

Geologic setting

The Chugach-St. Elias Mountain Range is an active orogenic belt located in Southern Alaska. The range is approximately 1100 km long and trends east-west along the Pacific-North American plate boundary. Geologically, the range is an exotic terrain: a bedrock assemblage of flysch and metamorphosed basalt accreted to the continent during the Mesozoic and Cenozoic by the subduction of the Pacific plate underneath the North American Plate (Winkler, 2000). The Chugach-St. Elias Range is extensively glaciated and exhibits high relief, rising from sea level to 5000 m over a distance of ~20 km (Meigs and Sauber, 2000). The high relief creates a substantial rainshadow, whereby the windward (south) side of the mountain range receives approximately 2-3 m of precipitation per year, and the lee side (north) receives less than 1 m per year (Østrem et al., 1981). Precipitation amounts dictate glaciation levels or mean equilibrium line altitude (ELA), which in turn affects the erosional regime. The windward side of the mountain range receives more precipitation and experiences greater fluctuations in glaciation levels than the leeward side.

Thompson Ridge is an east-west trending ridge located on the leeward side of the Chugach-St. Elias Mountains and is approximately 30 km long. Precipitation on the ridge is low and ranges from 750 mm to 1000 mm yr^{-1} (Østrem et al., 1981). The ridge contains eleven north-south trending glaciated basins. The glaciers flow from south to north and terminate in Granite Creek, which bounds the north flank of the ridge (Figure 2). The basins range in size from ~5.2 x 10^5 m^2 to ~1.9 x $10^7 m^2$ and each basin is bounded on either side by steeply dipping (37° to ~75°) bedrock walls. Glacier # 6, the study area, (Figure 3) has an area of ~1.9 x 10^7 m^2.

Bedrock of the basin walls is composed of high-grade metamorphic rock with a steeply north-dipping foliation. Large joints are present in the cliffs above Glacier # 6 (Figure 5) and may be a contributing factor to valley-wall stability.

Figure 5. Valley-wall parallel jointing observed in the basin walls of Glacier # 6. Large joints are found in the steep basin walls and are thought to be a contributing factor to the deep-seated bedrock landslides. (Photo courtesy Doug Burbank, 2001).

Background and significance

Denudation

Mass wasting is the downslope movement of soil or rock material under the influence of gravity (Selby, 1993) and landslides are just one of many types of mass wasting. Recent studies (Hovius et al., 1997) highlight the importance of landslides to hillslope erosion in fluvial basins. Though there have been a number of studies that have addressed the magnitude and frequency of rockfalls and landslides in alpine environments (e.g. Hinchcliffe and Ballantyne, 1999; Holm et al., 2004; Curry et al., 2001; Evans and Clague, 1994), few studies have compared the volume of sediment contributed by landslides to the total volume of sediment.

An understanding of sediment production and corresponding erosion rates in glaciated basins is fundamental to understanding range-scale denudation, yet many questions remain unanswered: What role do landslides play in the broad context of surface processes in glaciated environments? How significant are landslides and rockfall to the overall denudation in a glaciated terrain? What linkages exist between glacial erosion, climate, and tectonics? In order to understand the overall contribution of rockfall and landslides to overall glacial erosion, it is necessary to have a dataset of erosion rates with which to compare. However, reported glacial erosion rates vary greatly from 1.0-5.0 mm yr^{-1} (Selby, 1993) to 5-70 mm yr^{-1} (Hallet et al., 1996). The variance is due to many factors. These data, for example, were generated in various geomorphic and geographic settings such as southeast Alaska (Carlson, 1989; Powell, 1991; Hunter et al., 1996), Norway (Bogen, 1996), the Swiss Alps (Bezinge, 1989), and Canada (Andrews et al., 1994; Hicks, 1990; Stravers and Syvitski, 1991). With some exceptions, the majority of

these studies report erosion rates for tidewater glaciers, which are temperate, warm-based, water-terminating glaciers, commonly associated with fast flow and higher erosion rates (Benn and Evans, 1998). Moreover, the aforementioned studies employed various methods to calculate sediment flux and represent denudation rates for different timescales and different basin areas. Methods used to calculate the sediment flux include measurement of water and sediment output from glacial streams (Hallet et al., 1996; Hammer and Smith, 1983), bathymetric analysis of sediment trapped in glacial lakes and inlets (Jordan, 1962; Powell, 1991), and measurements of sediment released from hydro-electric dams (Bezinge, 1989).

Sampling problems inherent in glacial environments make it difficult to obtain data with regard to erosion rates. Access to the ice-bed interface is limited, thus it is difficult to directly measure erosion at the bed. Inaccessibility makes it difficult to determine the role of sediment storage to overall glacial erosion rates. Also, contribution of sediment from multiple sources adds complexity to the calculation of erosion rates (Hallet et al., 1996). Typically, glacial erosion rates are calculated from the volume of material deposited in moraines, carried by proglacial streams, or stored in fjords and other sediment sinks. The sources of this material include primary bedrock erosion at the ice-bed interface, evacuation of sediments from subglacial storage (Koppes and Hallet, 2002), and/or hillslope failure.

A study of tidewater glaciers in southern Alaska (Koppes and Hallet, 2002) argued that primary bedrock erosion at the ice-bed interface is the dominant process of erosion and that the contribution from evacuation of subglacially transported and stored sediment was small. Sediment contribution from hillslope failure was considered to be

minor. Studies conducted in the Southern Alps (Hicks, 1990) estimated that approximately 60% of the total sediment flux was contributed from non-glacial erosion of the valley walls, while only 40% came from glacial scour of the basin floor. In contrast, another study (Hammer and Smith, 1983) conducted in a small cirque glacier in Alberta, Canada determined that 24% of the total sediment supply originated through supraglacial and/or high englacial sources, (i.e. cirque or valley wall), whereas the remaining 76% of the sediment was supplied in equal amounts by bedrock erosion and channel-bank erosion.

There have been many investigations of rockfall on cirque and valley glaciers (Gardner, 1977; Whalley, 1983; Evans and Clague, 1994; Matsuoka and Sakai, 1999; Curry et al., 2001; Matsuoka and Abe, 2002; Holm et al., 2004). In contrast to landslides, volume contribution by rockfall is considered to be a low magnitude-high frequency process, operating on a continuous basis. The aforementioned studies have employed various methods to determine sediment volume including audial observations (Matsuoka and Sakai, 1999), natural traps such as large flat-topped boulders (Luckman, 1988), artificial traps such as screens (Church et al., 1979; Douglas, 1980; Fahey and Lefebure, 1988), and snowfields below cliffs (Gray, 1973b; Ono and Watanabe, 1986; Rapp, 1960). In general, these studies have provided data on volumetrically small rockfalls, up to ~20m^3.

Cliff Retreat

Rockwall retreat results from the erosion and removal of sediment and debris from valley walls (Figure 6a). Retreat typically occurs in a non-uniform spatial pattern because sections of rockwall may fail independently of one another (Figure 6b).

Studies of rock wall retreat (Rapp, 1960; Gray, 1973a; Hinchcliffe and Ballantyne, 1999; Rapp, 1960) provide important, but varied, information about rates of retreat of hillslopes and cirques. Differences in climate, lithology, structure, tectonic history, and sampling methods must be taken into account when comparing these various data (Hinchcliffe and Ballantyne, 1999). Cliff retreat rates generally reflect current processes and are largely confined to the Holocene or present day (Whalley, 1996). Present day alpine environments yield retreat rates that range from 0.05 to 4.00 mm yr^{-1} (Hinchcliffe and Ballantyne, 1999). It is thought that high retreat rates in alpine environments are due in large part to the joint density, slope steepness, and cliff height (Andre, 1997).

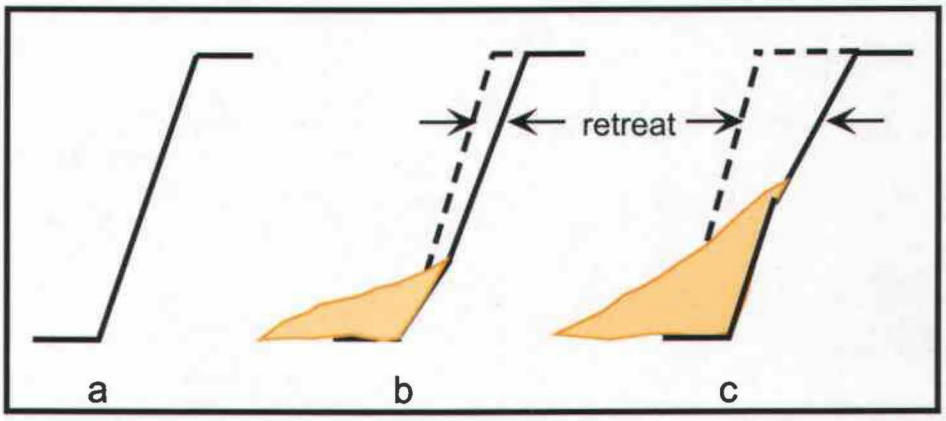


Figure 6a. Theoretical hillslope evolution and retreat. Landslides and rockfall cause the face of the hillslope to retreat back. Typically retreat does not occur uniformly across the entire cliff face. Talus that is not removed builds up at the base of the cliff and can retard retreat rate. (After Selby, 1993).

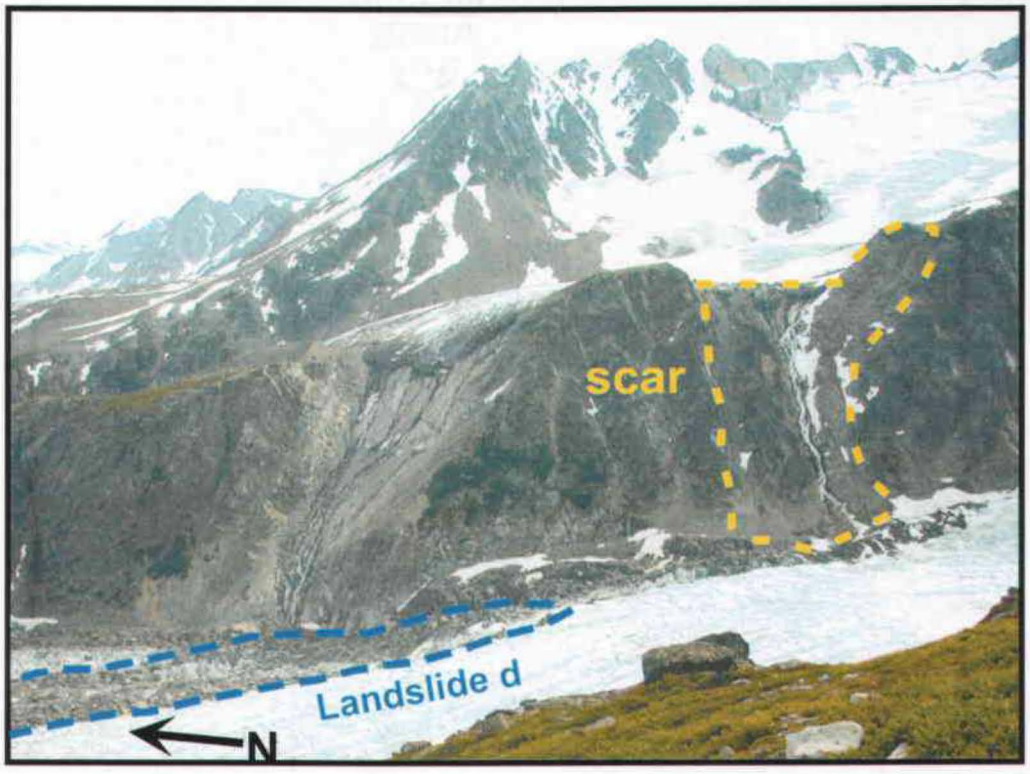


Figure 6b. Landslide scar visible on the eastern wall of Glacier # 6. Landslide "d" is visible at the bottom of the photo. Erosion occurs in discrete sections, therefore one section of the hillslope fails and retreats independently of adjoining sections.

Methods

In the summer of 2002 a field survey of three landslides ("b", "c" and "d") (Figure 4), on Glacier 6 was conducted using a global positioning system, a laser theodolite, aerial and satellite photographs, and topographic maps, in order to determine a total landslide volume. A fourth landslide (Landslide "a") present on the glacier surface is currently at the terminus and an unknown volume of the original material is missing. From these volumetric data, a sediment flux, short-term erosion rate, and rockwall retreat rate were calculated. Digital elevation models were used to determine basin morphology and relief for each of the eleven basins on Thompson Ridge in an effort to determine if such factors affect the basin denudation regime.

Field Methods

A laser range finder/theodolite (Laser Atlanta Advantage®) and a Garmin GPS II Global Positioning System (GPS) were used to survey the three landslides (Figure 4). The GPS was used to determine the UTM coordinates of survey stations from which sections of each landslide were measured (Appendix A). The stations (numbered 1-36) were located on the crest of the landslide deposits: A point from which there was an unobstructed line of sight to either the landslide perimeter or a potential transect line. The range finder operates by shooting a pulse of light that is reflected by a prism located at the point to be surveyed, and returns a distance, bearing (azimuthal) and inclination (Appendix A). The measurement errors associated with the theodolite are as follows:

Distance: ± 0.5 feet (15.3 cm)
Azimuth: ± 1.0° when level
± 1.0° when tilted
Inclination: ± 0.4°

The Garmin GPS II provides horizontal accuracy within 15 m and vertical accuracy of ± 75 m. The measurement error introduced by both of these instruments is systematic, and therefore not critical to this particular study.

For each landslide, points were surveyed around the perimeter and across the landslide on transects along its length (Figures 7a-c). The number of transects varied for each landslide and were spaced 50 to 75 m apart. Fifty-six transects were mapped on landslide "b" and four transects on landslide "d" (Appendix A). No transects were mapped on landslide "c" as the surface expressed little-to-no relief. The landslides are relatively thin blankets of debris sitting on the glacier surface. Points for each transect were collected along the ice surface and along the tops of boulders in an effort to measure the envelope of debris (Figure 8). This technique was employed at several locations along landslide "b" and allowed a more accurate calculation of the total volume of debris. Due to the nature of the debris in both landslides "c" and "d", the envelope technique was not used. Landslide "c" had little relief, < 4 cm, so this technique was not necessary, and Landslide "d" proved to be logistically difficult to survey in this manner.

As a second method by which to determine total sediment volume on Landslides "a" and "c", boulder counts were performed. Measurements of 100 of the largest boulders in a given area (bounded by two transects) were taken to determine if once broken down to finer particles, the volume of the boulders would more or less equal that of the finer

sediment blanketing the same area. The boulders were treated as ellipsoidal in shape and measurements of the long and short axes were used to calculate a volume (Figure 9; Equation1).

$$4/3\pi\, a^2 b \quad a = \text{short axis, } b = \text{long axis.} \tag{1}$$

Lab Methods

Each survey point measured with the laser range finder was converted into a point having an x, y, and z coordinate representing 3-dimensional UTM space (Appendix A). Distances were corrected for inclination and translated into actual ground distances. Bearings, measured from 0° - 360°, were combined with distance data in order to obtain the UTM coordinates for each surveyed point. The corrected data were then used to map a footprint for each of the three landslides (Figures 10a-c) from which the surface area for each was calculated (Table 1). The spatial data were used to create 3-D surface models of each landslide (Figures 11a-c), which allowed for the calculation of the total volume of sediment and debris contained in each landslide. The volume of sediment was calculated by multiplying the total surface area by thickness (Table 1).

	Landslide b	Landslide c	Landslide d	Total	Basin 6
width (m)	45-380	~50	~100	---------	---------
length (m)	1200	425	425	---------	---------
surface area (m^2)	331,500	20,258	42,460	394,218	1.9×10^7
thickness (cm)	7-100	4	100-200	---------	---------
avg. relief (m)	27	0.06	7	---------	---------
volume (m^3)	164,750	810	64,765	230,325	---------

Table 1. Statistics for Landslides b, c, and d, and Basin # 6. The length of each landslide is measured east to west across the basin. The width is the distance as measured north to south. Total volume of sediment in the three landslides is 2.3×10^5 m^3.

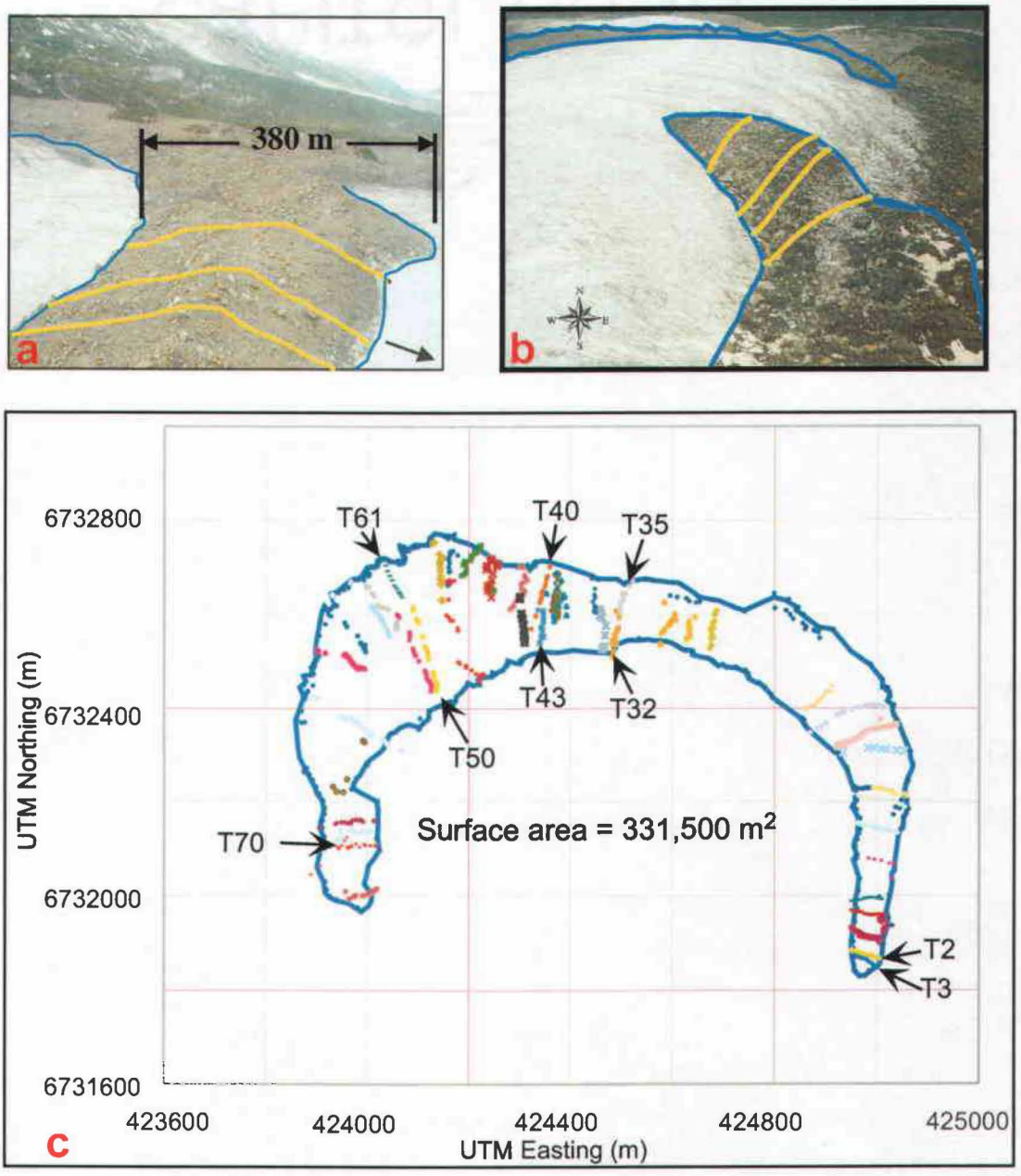


Figure 7a-c. Survey lines of perimeter and transects. 7a) Perimeter (outlined in blue) and example of 3 transects (yellow) on landslide "b". 7b) Perimeter and 4 transects on landslide "c". 7c) Footprint of landslide "b" constructed from the perimeter and transect survey data. Fifty-six transects measured on the surface of "b" (shown in various colors). Profiles of the landslide were constructed from transects T2, T3, T32, T35, T40, T43, T50, T61, and T70, and are displayed in Figures 14a-f. .

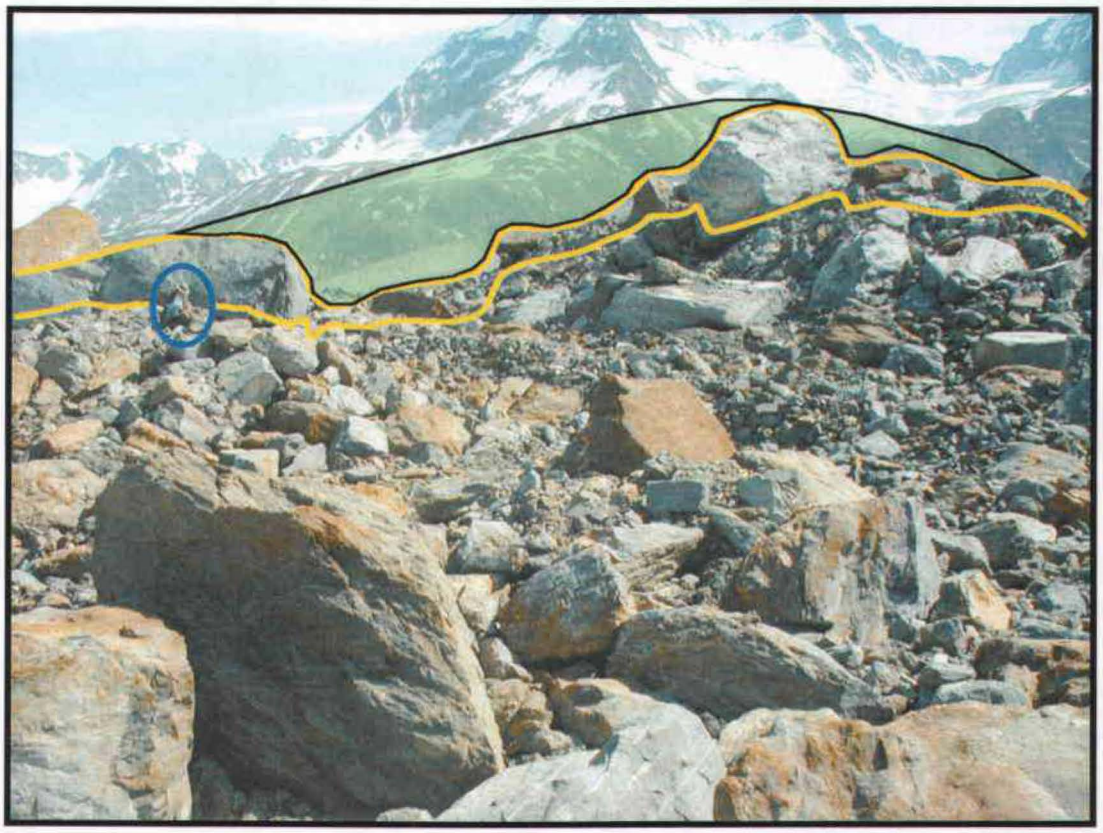


Figure 8. Envelope measurement technique. Note the person circled in blue on the left side of the photo. Landslide "b", in general, is composed of a thin veneer of sediment and debris, ranging in thickness from 7-100 cm. In order to calculate a precise volume an "enveloping" technique was employed. Transects were surveyed along the ice-debris contact and over large boulders (upper yellow line). Depth to the ice was measured and is taken to be the thickness of sediment (area between the two yellow lines). This method introduces an error in volume of +/- 7%. The area shown in green represents an error of ~ 30% which is the potential error associated with fitting a surface to the highest points on the landslide.

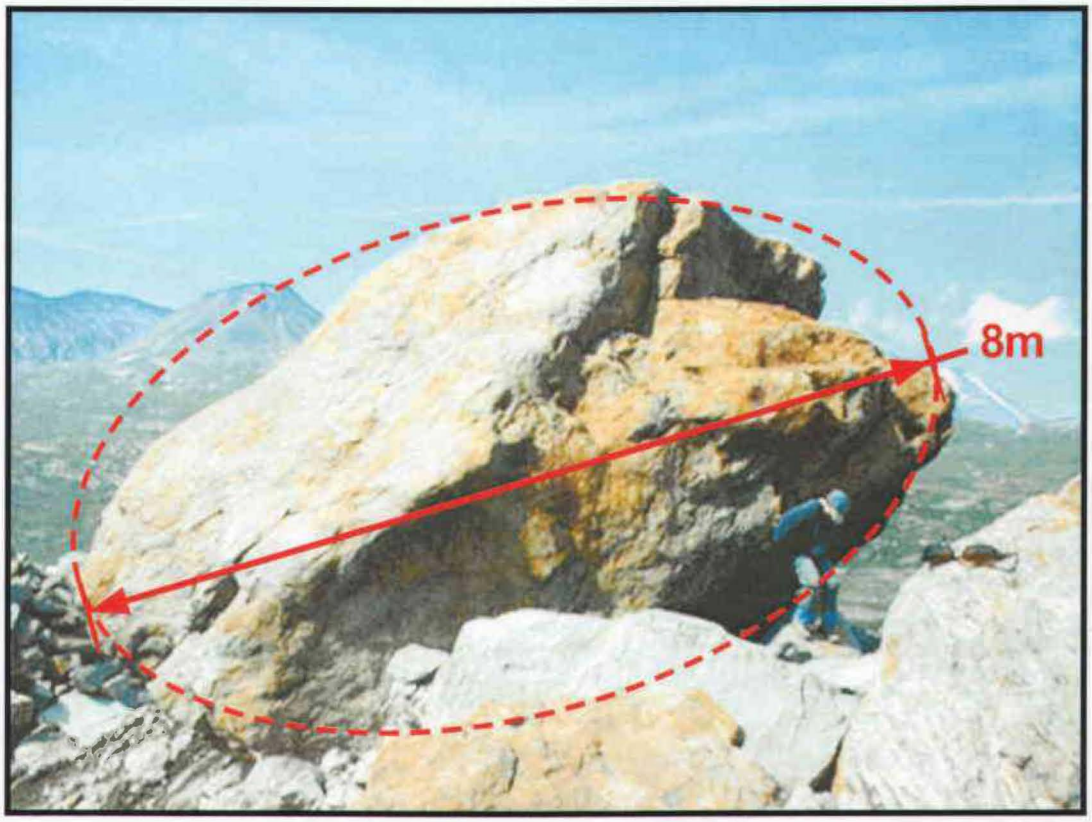
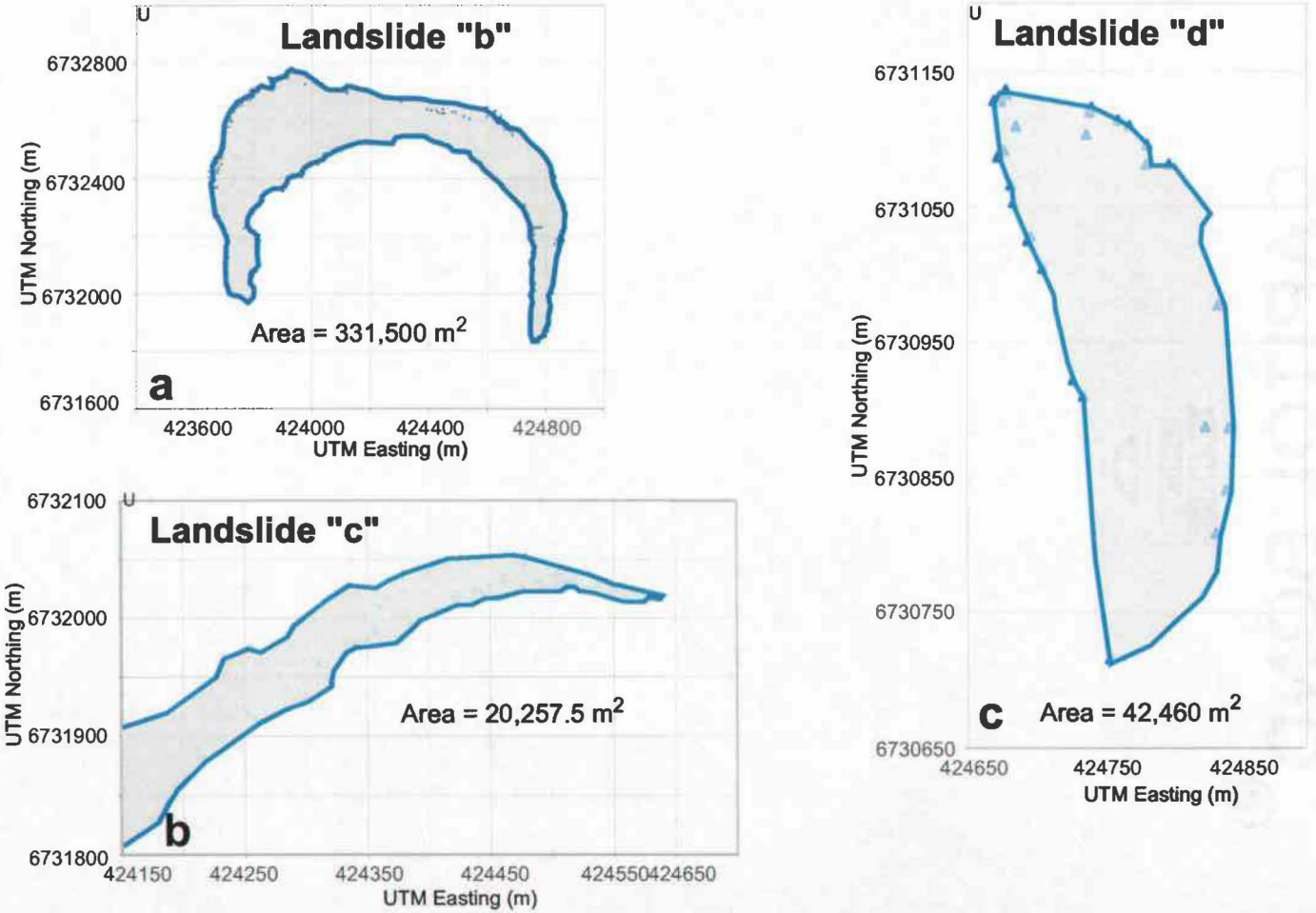
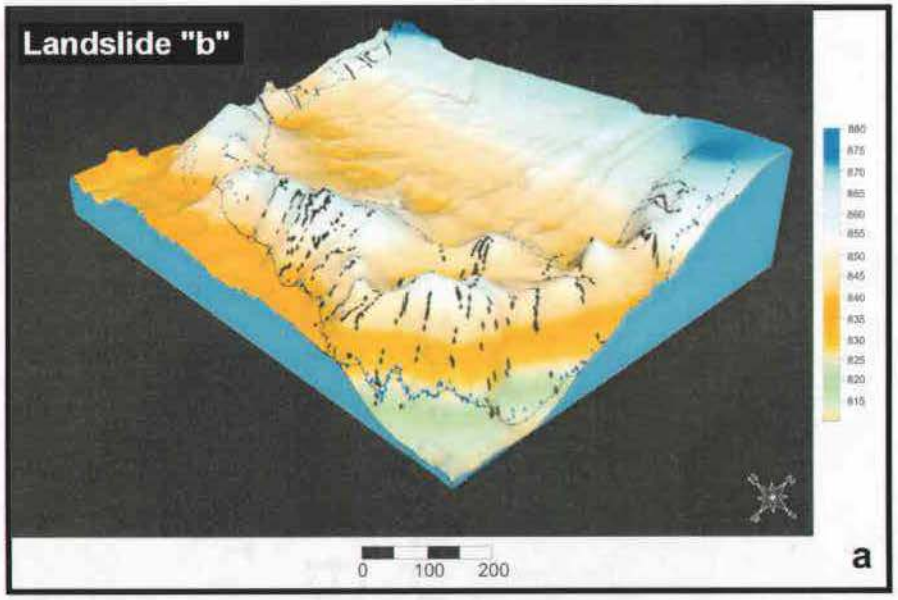
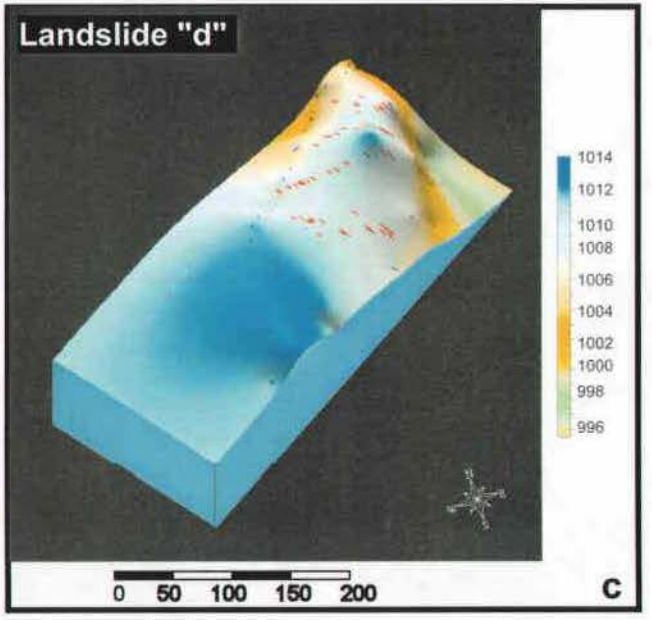


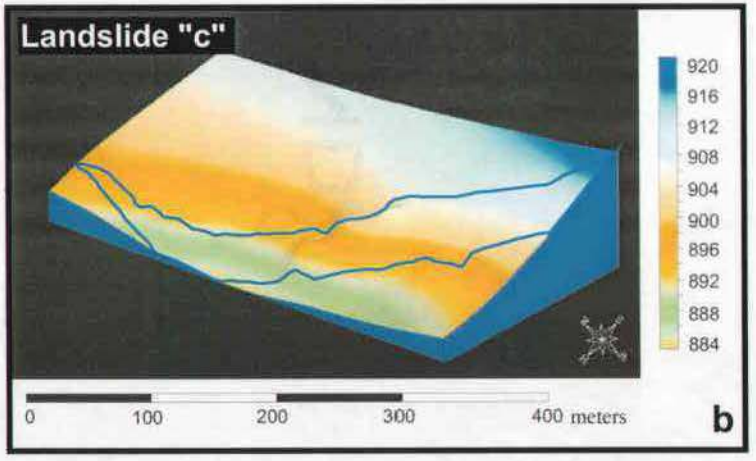
Figure 9. Boulder measurements. Numerous large boulders (1.0 - 25 m) are present on the surface of landslides "b" and "c". One hundred of the largest boulders were measured in each of four locations on Landslide "b" and two locations on Landslide "c" as a second method in which to determine sediment volume. The boulders were assumed to be roughly ellipsoidal in shape, therefore, the long and short axes were measured to determine the volume of each individual boulder. This method introduces an overestimate in volume of ~3-7%.



Figures 10a-c. Footprints of each of the landslides. Landslide "b" has a surface area of ~331,500 m^2, landslide "c" has a surface area of 20,258 m^2 and landslide "d" has a surface area of 42,460 m^2. The cumulative surface area is 394,218 m^2 which is approximately one-tenth of the total ice surface area in the ablation zone.







Figures 11a-c. 3-D models of landslides b, c, and d. Survey data was used to create a surface model, and together with elevation and thickness data, models of each landslide were created. This allowed the calculation of the volume of sediment and debris in each landslide.

The thickness of landslide "b" varied across its length therefore the volume calculation was performed twice with two different thickness values and the average of the two iterations was taken to be the total volume. The first iteration was calculated using the smaller thickness values and the second iteration with the higher values. For example, the eastern limb of landslide "b" was found to have a thickness range of 7-15 cm, and the western limb ranged from 50-100 cm. Therefore the first volume calculation was performed using a thickness of 7 cm for the eastern limb and 50 cm for the western limb. The second iteration was performed with values of 15 cm and 100 cm for the eastern and western limbs respectively. The resulting sediment volume, 164,750 m^3, is an average of the two iterations (Appendix B).

A point-kriging gridding method was used to estimate the volume of the landslides. The default parameters were accepted and are as follows: Kriging = Linear, Slope = 1, Aniso = 1,0; Kriging type = Point; and Drift type = non. Kriging is a geostatistical method that generates an interpolated grid by estimating the values of the points at the grid nodes (Surfer 8 User's Guide, p. 119). This method is considered to be an exact interpolator, which means the program honors data points exactly when the point coincides with the grid node. When a point does not coincide with a node, a weighted average interpolation algorithm is applied. That is, the closer a point is to a grid, the more weight it carries in determining the Z value at that grid node. The difference between gridding methods is determined by how the weighting factors are computed and applied to the data points. Kriging is well-suited for producing maps from irregularly spaced data points, and is also useful for both small (<10 observations) and large (>1000 observations) data sets. The data set for landslide "b" contains 1653 measured points,

landslide "c" contains 80 points, and landslide "d" contains 100. Several other gridding methods were considered, including minimum curvature, natural neighbor, nearest neighbor, and triangulation, with less than satisfying results.

Sediment flux (volume/time) and a basin-scale erosion rate (volume/area/time) were calculated using 1) total volume estimates, 2) area of the basin as calculated from a USGS 1:63 360 topographic map (NOS/NOAA, 1985) and aerial photographs, and 3) the period of record, 25 years. The sediment flux is a measure of the volume of debris falling onto the glacier surface over a given amount of time. The erosion rate is the sediment flux divided by the total basin area.

Rockwall retreat rate was calculated to determine how quickly landslides are eroding the basin walls. The following equation, adapted from Hinchcliffe, (1999) was used to determine the rate:

$$R = \frac{V}{A} = \frac{V}{A' \sec(\tan^{-1}(h/d))} \qquad (2)$$

R = rockwall retreat rate
V = volume of sediment
A = area of contributing rockwall
A′ = planimetric area of contributing rockwall
h = average rockwall height
d = average planimetric distance from base of rockwall to crest

Retreat rate (R) was calculated by dividing the total amount of sediment in the three landslides (V) by the area of exposed rockwall in the basin. (i.e. contributing rockwall area (A)). The planimetric area (A′) was measured on a 1:63 360 topographic map and aerial photographs (Figure 12). Average rockwall height (h) was measured in

the field and on topographic maps and the average planimetric distance (d) was measured on the topographic map and aerial photos (Figure 12).

Digital elevation models (USGS Bering Glacier E, W, and C) were analyzed with Erdas Imagine 8.5 to determine basin profiles, valley slope, and relief for each of the eleven basins on Thompson Ridge.

Flow velocity for Glacier 6 was calculated from aerial photographs (Figure 3) in an effort to determine a) how fast the landslides are being transported down-stream, and b) the total duration of time a landslide exists on the surface of the glacier.

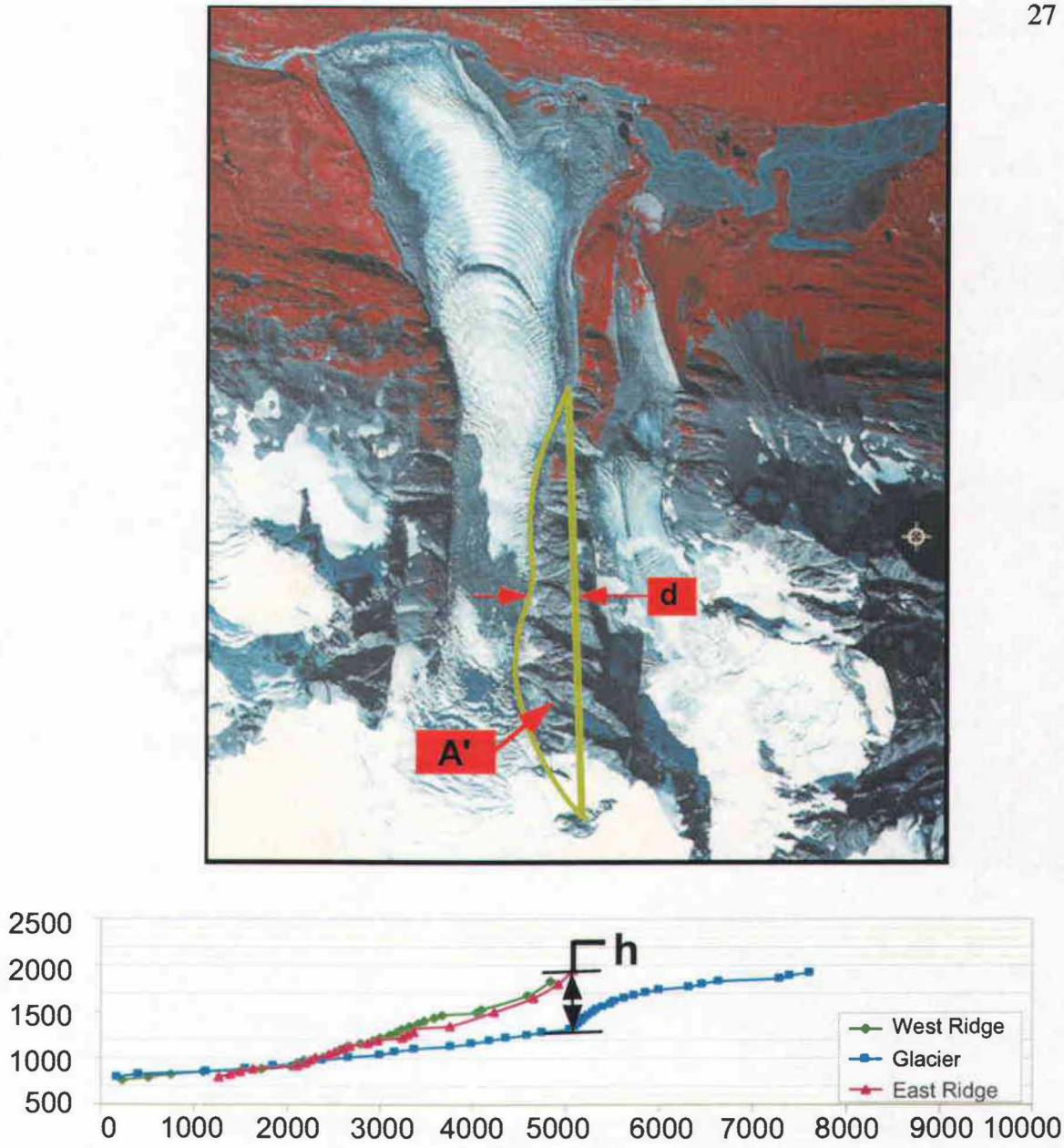


Figure 12. Rockwall retreat rate. The mean rate at which the valley walls are retreating (6.7 mm a^{-1}) was calculated using the planimetric area (A'), the average planimetric distance (d) on the aerial photo, and the average height (h) of the contributing rockwall from the valley profile. (1978 USGS Landsat 5 TM image).

Results

Landslide "b"

Landslide "b" is arcuate in shape, 1.2 km (1200 m) long, as measured from east to west, 45 to 380 m wide, has a surface area of 331,500 m^2 and ranges from 7 to 40 m in relief (Figures 4, 10a, 11a, 13). The landslide lies on the surface of the glacier between 813 and 880 m elevation and spans the entire width of the basin. Of the three landslides surveyed, it is the oldest, having occurred about 1974. In the 1978 aerial photo the landslide appears high on the glacier near the steep basin walls just below an icefall (Figure 3). Since it is not present in the 1972 photo, the slope failure occurred between 1972 and 1978. The slope of the glacier underneath the present day location of the landslide ranges from 0.05°-10° with an average slope of 3°. The relief of the landslide varies and is dependent on the location of measurement. Generally the up-stream relief is less than the down-stream relief. That is, the up-stream slope is less steep than the down-stream slope (Figure 14). Though the landslide appears as if it is a ridge of sediment and debris, it is actually composed of ice covered with a veneer of sediment (Figure 13). The thickness of the veneer varies from 7-100 cm and has served to insulate the glacier. As a result, the surrounding ice has ablated at a faster rate. The minimum ablation rate is ~1.0 m yr^{-1} and was calculated by estimating the amount of ice down-wastage as seen in surface profiles of the landslide. The amount of ablation represents a minimum because it is not possible to calculate how much ice below the surface of the landslide has melted.

The debris representing landslide "b" ranges from sand-sized grains to boulders up to 10 meters across (Figures 8, 9). There is no vegetation and in many places ice is visible (Figures 13). In general the eastern limb of the landslide has smaller, sub-angular

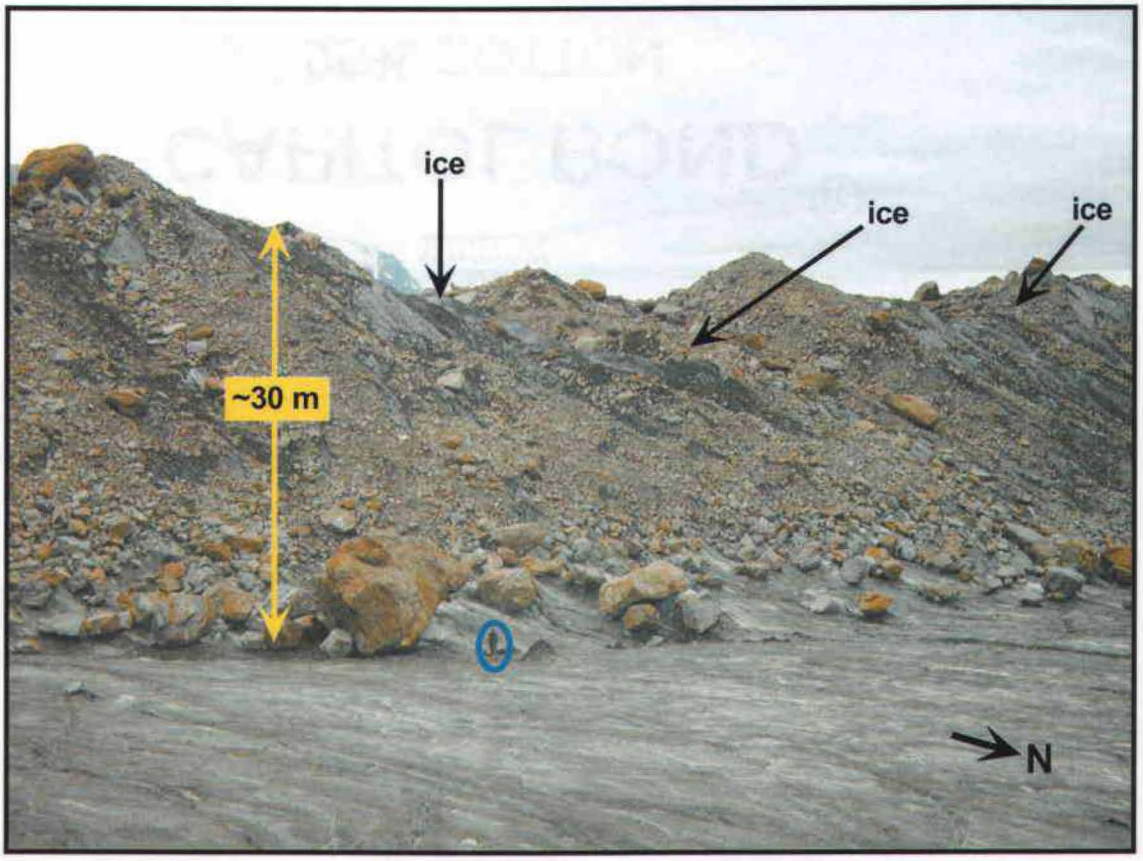
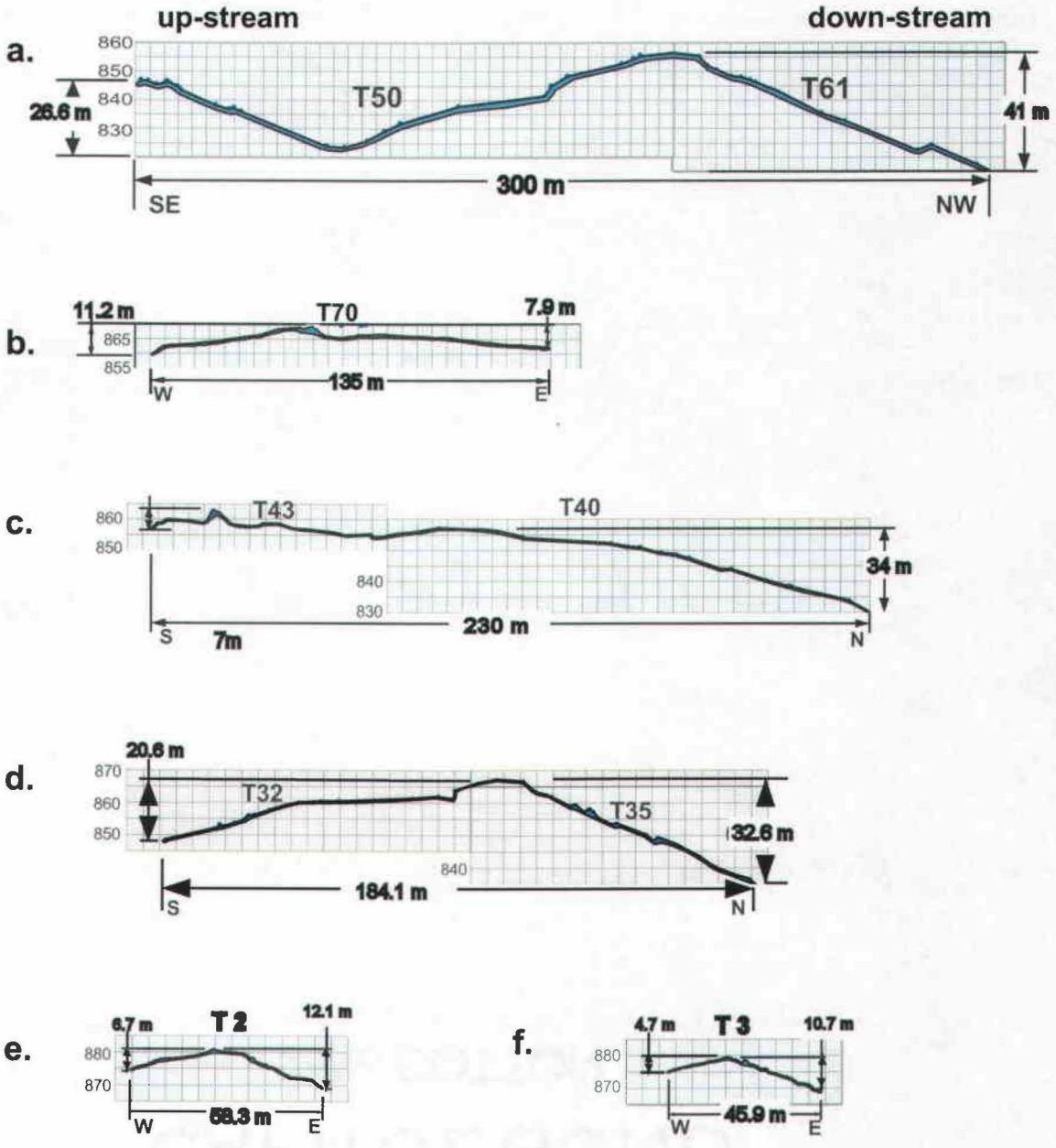


Figure 13. Relief of Landslide "b". Relief ranges from 7-40 m depending on the location of measurement. The relief is a result of ablation. The landslide has insulated the glacier such that the ice around the landslide has ablated at a faster rate; ~ 1.0 m yr^{-1}. This photo was taken on the down-stream side of the eastern limb (person circled in blue for scale). Patches of ice can be seen showing through the thin blanket of sediment on the steep slope faces.



Figures 14a-f. Selected transects from landslide "b" (see Figure 7c for transect locations). Up-stream is to the left and down-stream to the right in all profiles.
14a and 14b are profiles of the western limb of the landslide. The western limb is composed of two ridges therefore it was necessary to link two separate transects to create one profile. 14c and 14d are profiles located across the central portion of Landslide "b". The landslide is wide in this region therefore two transects were linked to compose one profile. 14e and 14f are profiles across the eastern limb of the landslide. In general the up-stream side of the landslide has less relief than the down-stream side.

boulders (0.5 to 3 m), and a thinner veneer of sediment (7 to 50 cm), than the western limb. Conversely, the western limb of landslide "b" has a thicker veneer of sediment (15 to 100 cm) and a greater number of boulders that are both larger (1.5 to 8 m) and more angular.

The total volume of sediment and debris contained within landslide "b" is estimated to be 164,750 m^3 ± 16,475 m^3 (Table 1). This value represents the average of the two volume calculations performed to account for variations in thickness along the landslide.

Landslide "c"

Landslide "c" (Figures 4, 10b, 11b) is very different from both Landslide "b" and "d". Volumetrically it is the smallest of the three landslides, only 810 m^3, and exhibits little to no relief (< 4 cm). It is arcuate in shape and is located at an elevation of 883 to 921 m. Its location indicates that it is younger than landslide "b", but older than landslide "d" and occurred sometime after 1978 and before 1986 (Figure 3). Unlike Landslide "b", Landslide "c" does not extend across the entire width of the basin. Instead, it appears to have originated from the western wall and extends toward the middle of the glacier in a slightly arcuate shape. It is approximately 425 m long, 50 m wide, ~4 cm thick and has a surface area of 20,258 m^2. The sediment and debris that make up Landslide "c" is much different than that of Landslides "b" or "d". The clasts are angular and small, ranging in size from sand and silt sized particles up to ~ 15 cm (Figure 15). Very few boulders were observed and those that were present were not larger than 1 m across.

Figure 15. Sediment and debris on Landslide "c". Landslide "c' is composed of small, sub-angular clasts ranging in size from sand and silt-sized particles to 15 cm across. Several larger boulders (~ 1 m) were observed but were not common. The landslide exhibits little to no relief (< 4 cm) and is volumetrically the smallest of the three landslides.

Landslide "d"

Landslide "d" (Figures 4, 10c, 11c) is the youngest of the three landslides, appearing in the aerial photos after 1986 and before 2000 (Figure 3). The landslide lies at an elevation of 999 to 1014 m and abuts the eastern side of the basin. It is 425 m long, approximately 100 m wide and is composed of very large angular blocks and flat slabs up to 15 m across (Figures 16a, b). The slabs appear to be relatively fresh, are unvegetated, and exhibit little to no weathering. The surface area of the landslide is 42,460 m^2 and the thickness was estimated to be 1.0 to 2.0 m resulting in an average sediment volume of 64,765 m^3. This volume is considered to be a conservative minimum given that Landslide "d" was located in a somewhat inaccessible region on Glacier # 6.

Boulder count

The boulder count volume calculation method was not useful as it resulted in large overestimates of sediment volume. For example, the surface area surveyed between Transects 1 and 2 is 882 m^2, and contains 251 m^3 of sediment, based on an average thickness of 0.28 m. The volume of sediment for the same area, as calculated from the boulder volumes, is 428 m^3, nearly twice that of the survey method. The ellipsoidal measurement technique resulted in only slight overestimates of boulder volumes, ~3-7%, and therefore accounts for a fraction of the total volume overestimate. It is possible that the volume of material obtained by the transect method is conservative and the boulder-count-method results are not a gross overestimate. However, the boulder method was applied over only four areas on Glacier "b" and does not supply us with a large enough data set to calculate an accurate volume.

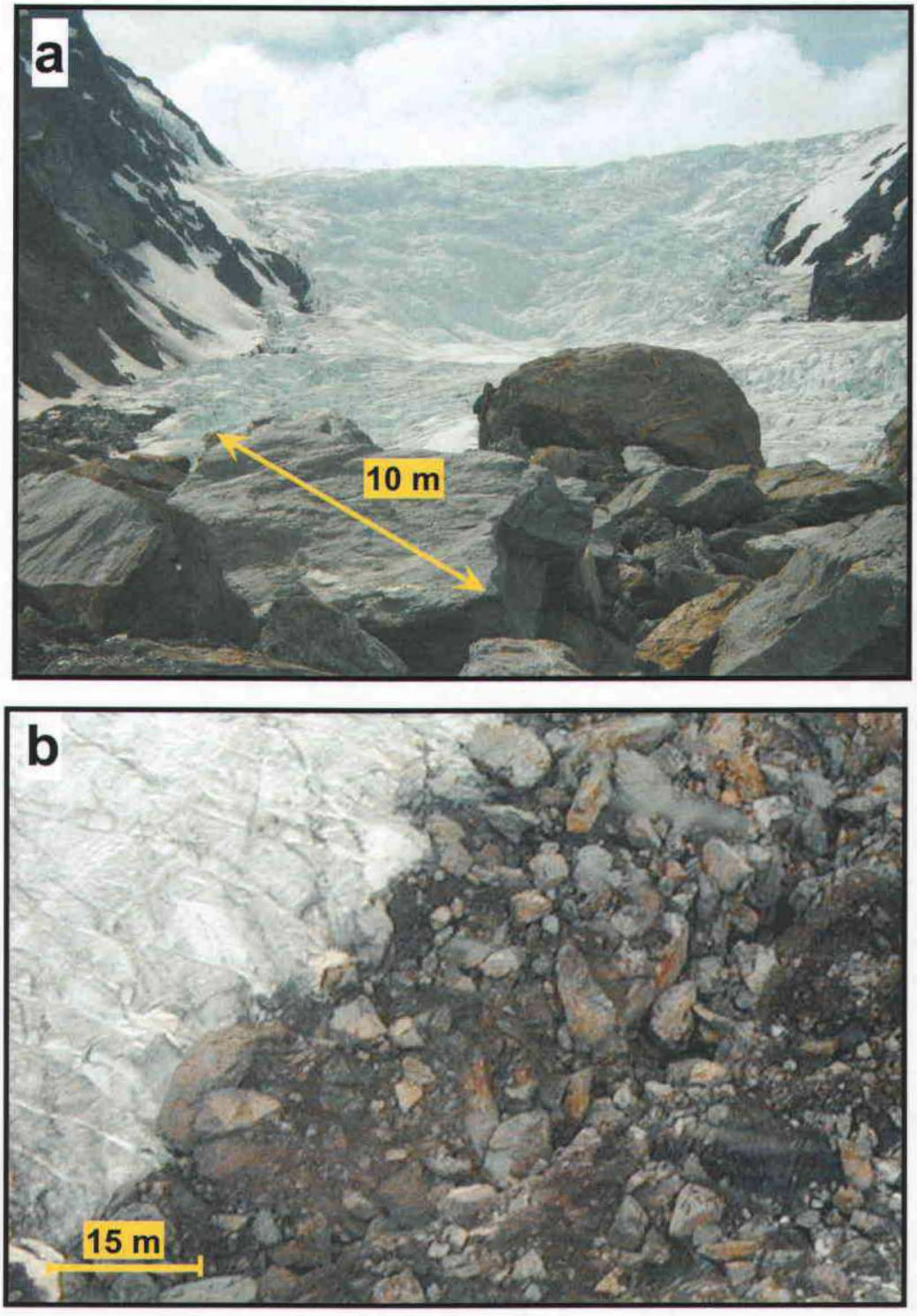


Figure 16a,b. Sediment and debris on Landslide "d". The debris and clasts that compose Landslide "d" are subangular and range from sand-sized grains to boulders up to 15 m across. Landslide "d" is the youngest of the three landslides and occurred between 1986 and 2000.

Sediment Flux/Erosion rate

The total volume of landslides b, c, and d, averaged over 25 years, can be used to calculate a basin-scale sediment flux (Equation 3) and a corresponding basin-scale erosion rate (Equation 4). The total volume of sediment for the three landslides is 230,325 m^3, the total basin area (accumulation area plus ablation area) is ~19 km^2 (Figure 17), and the interval of time over which this volume accumulated is 25 years.

Sediment flux = V/time (3)
= 230,325 m^3 / 25 yr^{-1}
= 9213 m^3 yr^{-1}

Corresponding erosion rate = sed flux /basin area (4)
= 9213 m^3 yr^{-1} / 19 km^2
= 0.4 mm yr^{-1}

Rockwall retreat rate

Rockwall retreat rate can also be estimated for the 25-year period. The maximum value of retreat rate (R= 7.3 mm yr^{-1}) was calculated by dividing the total amount of sediment (V) in the three landslides by the area of exposed rockwall in the basin (i.e. contributing rockwall area (A)) (Equation 2). The planimetric area (A′) as measured on the 1:63 360 topographic maps and aerial photograph (Figure 12) is approximately 700,000 m^2. Average rockwall height (h) as measured on the topographic maps and aerial photo is 365 m and the average planimetric distance (d) is 245 m (Figure 12). A second calculation to determine rockwall retreat was performed using the measurement of the contributing rockwall area directly from the Basin # 6 profile (Figure 18f). This method yielded a larger contributing rockwall area, which results in a slightly lower rockwall retreat rate of 6.1 mm yr^{-1}. Therefore the mean retreat rate is calculated to be 6.7 mm yr^{-1}.

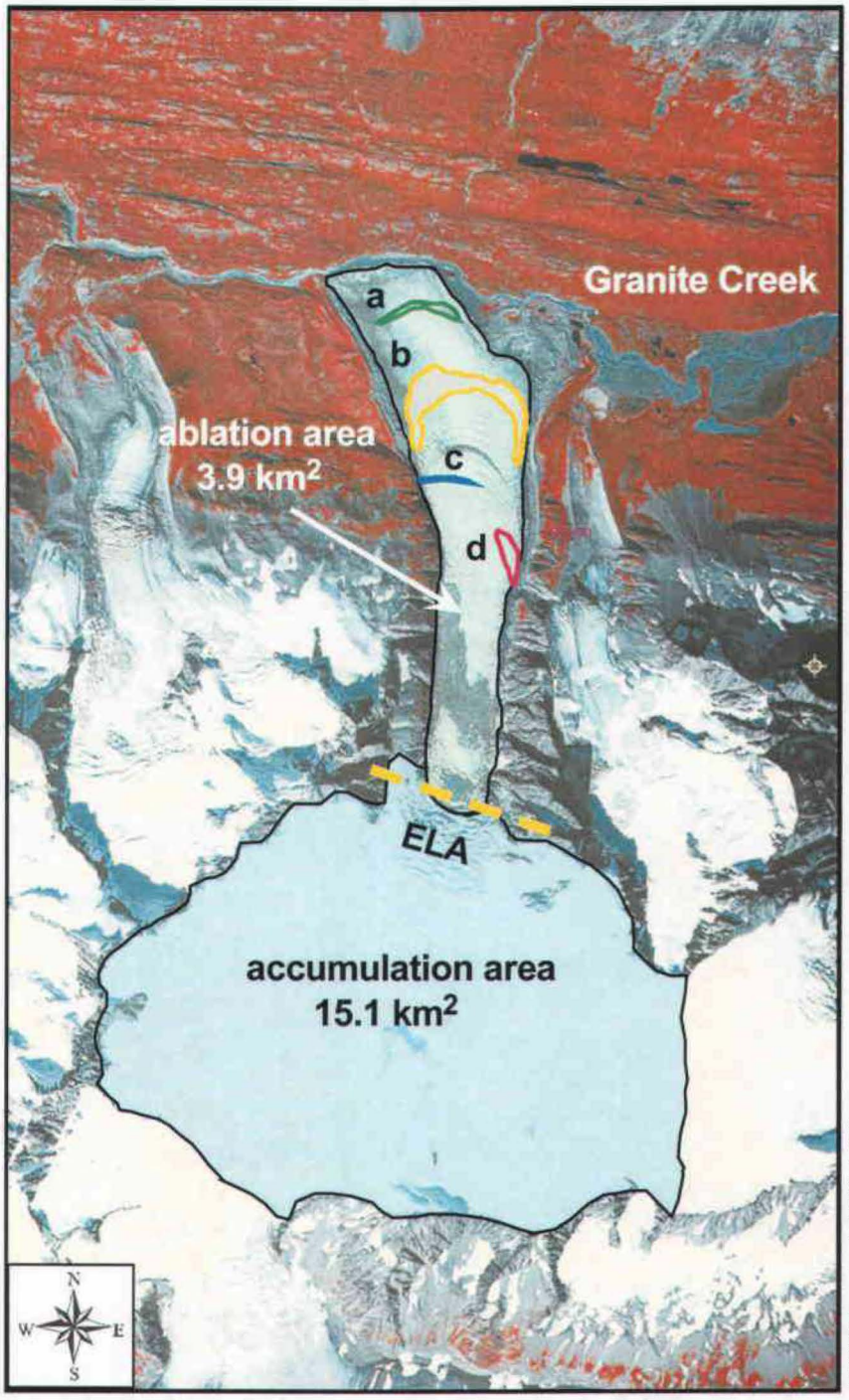
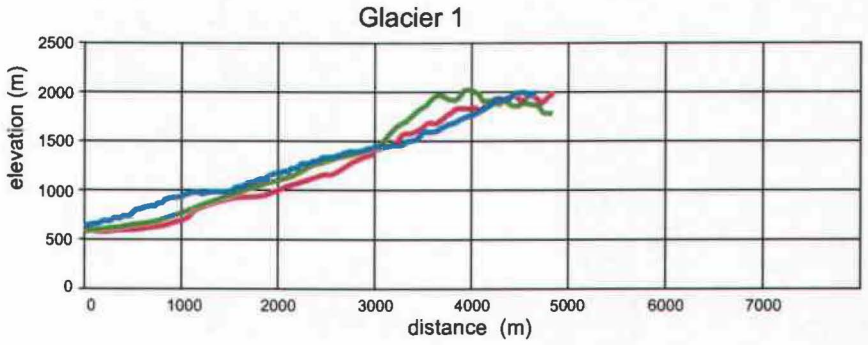
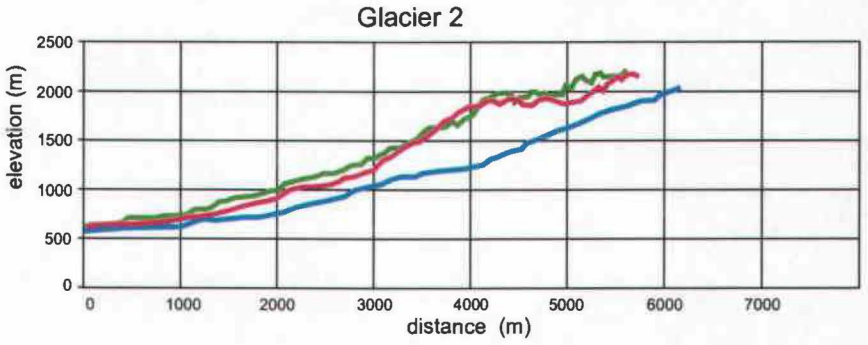


Figure 17. Accumulation and ablation zones on glacier # 6. The accumulation zone (above the ELA) and the ablation zone (below the ELA) were determined using the AAR method (e.g Meier and Post, 1962). The landslides that have fallen onto the surface of Glacier # 6 originated from the valley walls in the ablation area, therefore the sediment is being transported down-glacier supraglacially and has remained relatively intact. The four landslides (a, b, c and d) are indicated on the surface of the glacier in their present-day locations. The 1978 aerial photo was used as a base, and Landslides a and b are visible south of their present day positions (Figure 3).

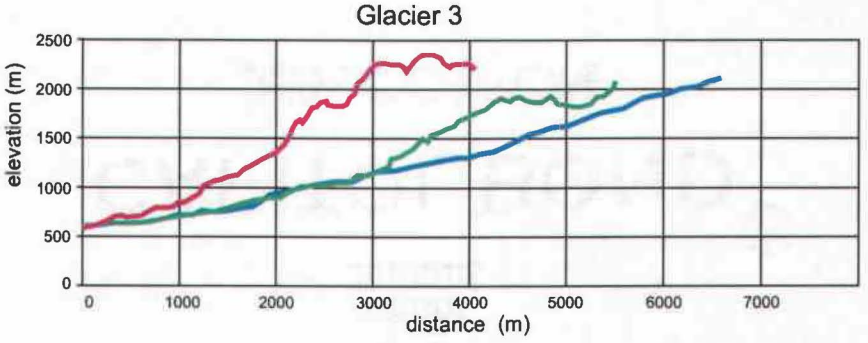
a.



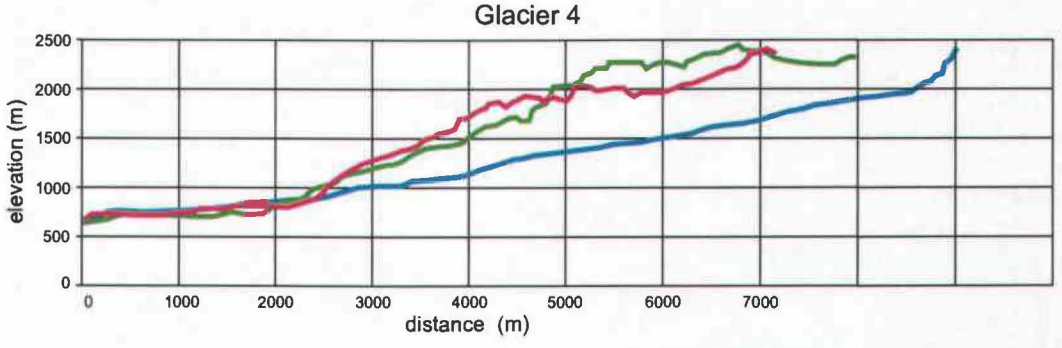
b.



c.



d.



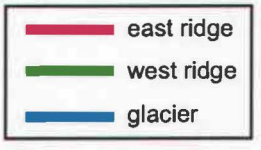
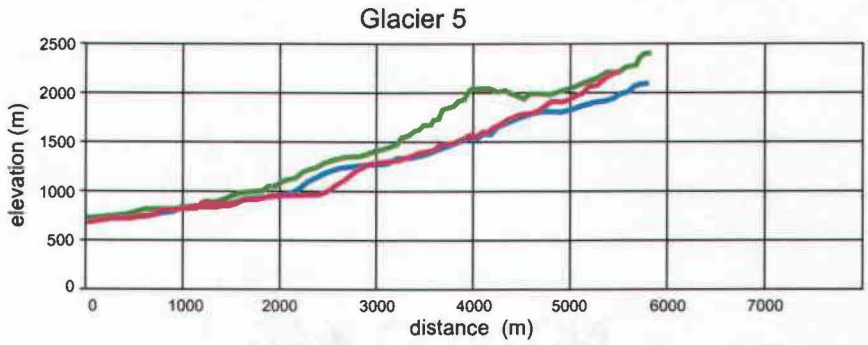
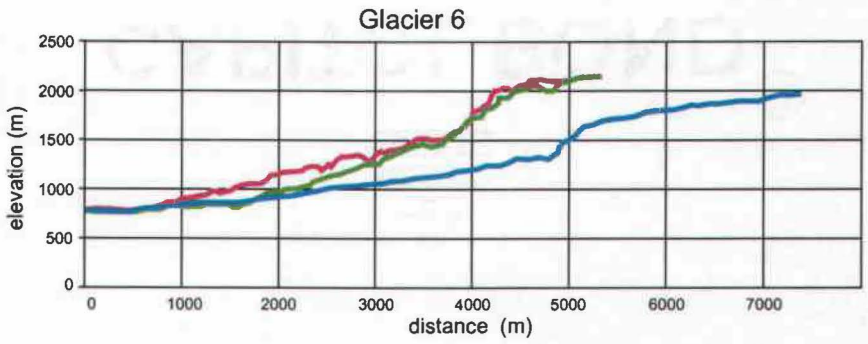


Figure 18 a-1. Profiles of basins 1-11.

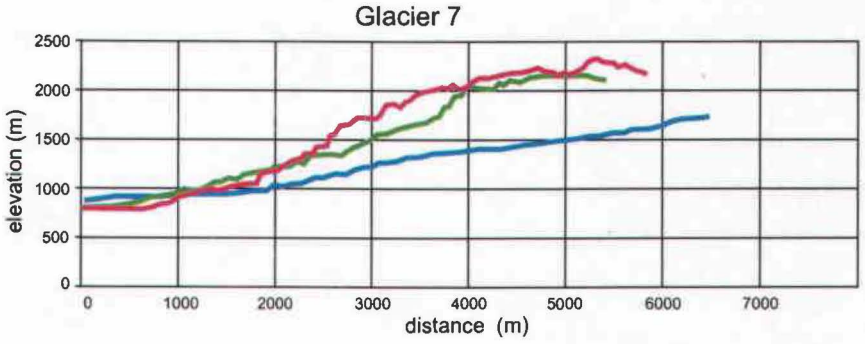
e.



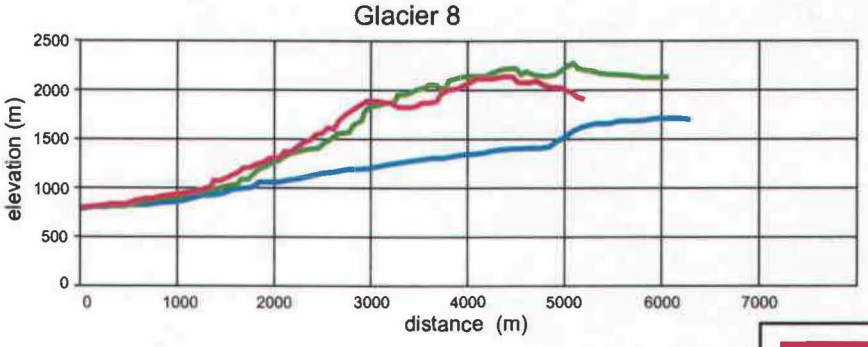
f.



g.



h.



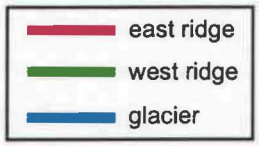
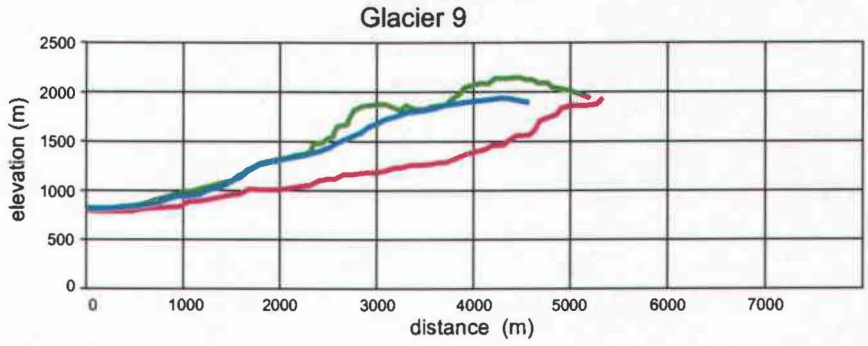
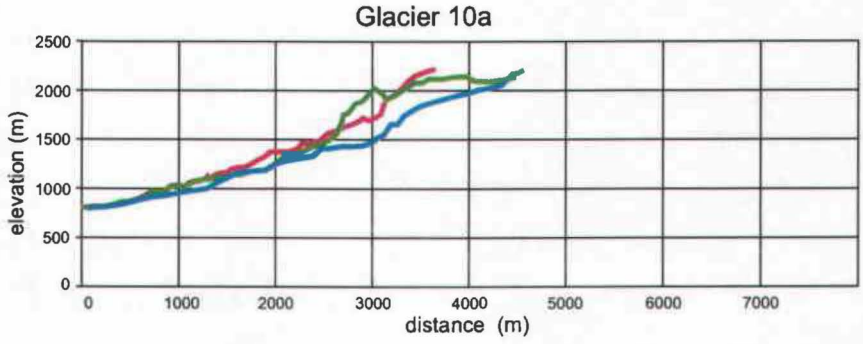


Figure 18 a-l (continued...) Profiles of basins 1-11.

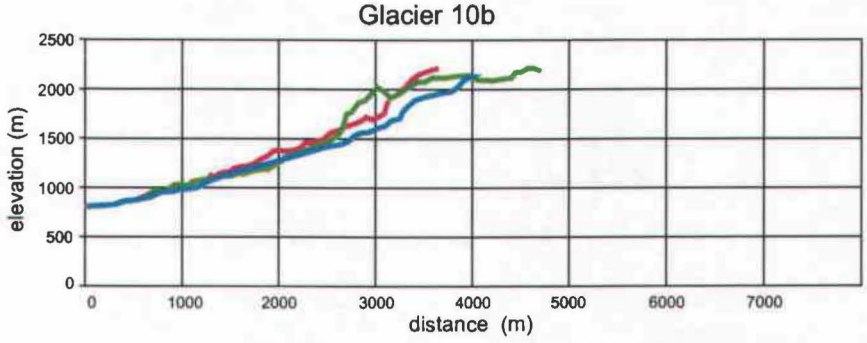
i.



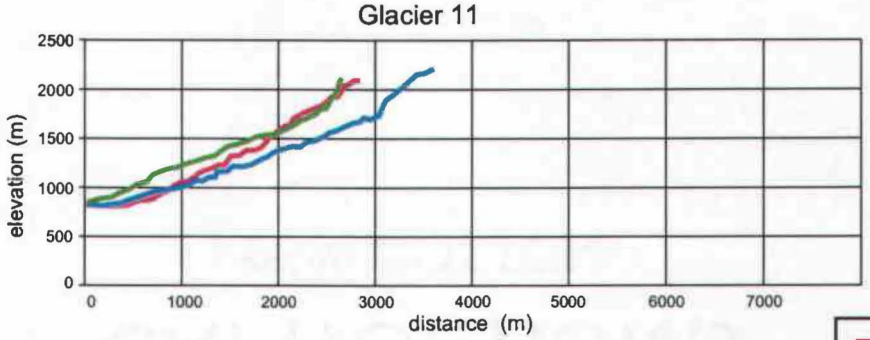
j.



k.



l.



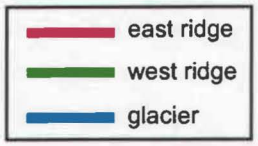


Figure 18 a-l (continued...) Profiles of basins 1-11. There are two profiles for basin 10 (Figures 18 j and k) because it appears as if there are two tributaries feeding into the basin.

Flow velocity

The flow velocity for both the upper and lower part of Glacier # 6 was calculated by estimating the distance that each landslide traveled down-glacier over a given amount of time. For example, Landslide "b" traveled a distance of 3006 m from ~1974 to 2000. Though the aerial photos indicate that Landslide "b" was present on the surface of the glacier in the 1978 photo, it is estimated from ogives that the landslide could have been deposited as early as ~1974. Ogives are arcuate alternating light and dark seasonal depositional bands (Figure 4). Lighter bands represent winter deposition and darker bands, which contain a higher concentration of wind-blown dust, represent summer deposition. A pair of ogives is referred to as a couplet and represents one year's deposition (Benn and Evans, 1998). The ogives are convex downstream due to variable flow velocity of the glacial ice. The velocity is less at the margins of the glacier due to friction with the valley walls, whereas the velocity in the center is greater.

Landslide "b" was transported a distance of 3006 m over a 26 year time interval resulting in a flow velocity of 116 m yr^{-1} for the upper part of the glacier. Landslide "a" traveled a distance of 650 m during a 28-year interval, 1972 to 2000, resulting in a flow velocity of 39 m yr^{-1} for the lower part of the glacier. The calculated flow velocities indicate a ~55-year life span for landslides on the surface of the glacier.

Discussion

Sediment Flux

A sediment flux of 9213 m^3 yr^{-1} (Equation 3) represents the annual amount of sediment coming from the hillslopes via landslides in Basin 6, over the last 30 years. The corresponding erosion rate is calculated to be 0.4 mm yr^{-1} (Equation 4). Though the landslides originated entirely from the exposed hillslopes in the ablation area, the area of the entire basin (ablation plus accumulation area) was used to calculate the erosion rate, in an effort to conform to published standards. If the erosion rate is calculated based solely on the area of ablation (3.9 km^2), instead of the entire 19 km^2 basin area, the resulting erosion rate is 2.5 mm yr^{-1}. It is more realistic to take into account only the area of the contributing rockwall to calculate the erosion rate, because the landslides originated from the exposed bedrock of the valley walls. However, in an effort to compare the sediment flux from this isolated source (the valley walls) to overall sediment flux, it is more useful to use the entire area.

Though a fourth landslide (Landslide "a") is present on the surface of the glacier, it is not intact; therefore its volume was not measured. An estimated volume of material in this landslide is ~79,000 m^3. Inclusion of this volume represents an ~8% increase in sediment flux, to 9978 m^3yr^{-1} considering a 6-year increase in temporal scale. The corresponding erosion rate is increased from 0.4 mm yr^{-1} to 0.5 mm yr^{-1} by the inclusion of this additional volume.

Volume contribution due to rockfall was not included in the sediment flux calculation. Rockfall is considered to be a high frequency, low magnitude process of erosion, and though rates are not well constrained, it is likely dependent on lithology,

climate, and geography (Whalley, 1983). Several studies of talus accumulation (Gardner, 1983; Luckman, 1988; Hinchcliffe and Ballantyne, 1999) found that rates of rockfall activity are generally higher immediately after deglaciation, and that Holocene rates are much lower, ranging from 0.08 to 0.13 mm yr^{-1}. In an effort to determine whether the inclusion of rockfall would significantly effect the erosion rate, rockfall volume was estimated from visual inspection of the surface debris at the lateral edges of the basin and as seen in the 1972 aerial photo. The 1972 photo was chosen because the rockfall was more easily defined and there is less contamination from landslides. Volume, based on a surface area of 191,500 m^2 and an estimated average depth of 0.20 m, is ~ 38,300 m^3. If the additional volume is added to the volume of the three landslides, and the temporal scale is extended to 31 years (to include 1972), then according to equation 3, the resulting sediment flux due to landslides and rockfall:

$$= 268{,}625\ m^3/31\ yr^{-1}$$
$$= 8665\ m^3\ yr^{-1}$$

and the equivalent erosion rate (equation 4)

$$= 8665\ m^3\ yr^{-1}/19\ km^2$$
$$\approx 0.5\ mm\ yr^{-1}$$

The additional volume as contributed by rockfall results in an ~8% increase in sediment flux rate and an increase in equivalent erosion rate from 0.4 mm yr^{-1} to 0.5 mm yr^{-1}. Note that the volume increase due to 31 years of rockfall is estimated to be equivalent to the volume as contributed by a single large-volume landslide.

Erosion rate

A wide range of erosion rates (~5–70 mm yr^{-1}), which are based on sediment flux, has been reported for Alaskan glaciers (Hallet et al., 1996) (Figure 19). The basins are plotted according to size and overall denudation. Note that a shorter length of record does not necessarily imply higher erosion rates. A majority of these denudation rates are for tidewater glaciers, which, due to such variables as bedrock topography, higher precipitation, and marine termini, typically exhibit increased sliding velocity, which is associated with higher erosion rates than valley or alpine glaciers (Benn and Evans, 1998). Erosion rates calculated for Alpine and Arctic basins are lower, 0.06-5.6 mm yr^{-1}. The calculated equivalent erosion rate of 0.4 mm yr^{-1} for Basin 6, which represents only that sediment contributed from the hillslope, is more closely aligned with erosion rates for the alpine basins than with the Alaskan data (Figure 19).

In studies of sediment yield from glaciated basins, the fraction of material contributed from the hillslope is not well constrained, though several studies have attempted to quantify the volume of sediment contributed from supraglacial sources. Koppes et al. (2002) assume the sediment contribution from hillslope failure to be minor, whereas Hicks (1990) determined that approximately 60% of the sediment was contributed from non-glacial erosion of the valley walls. A third study conducted by Hammer and Smith (1983) argued that 24% of the total sediment supply originated through supraglacial and/or high englacial sources, (i.e. cirque or valley walls). If a sediment flux of 9213 $m^3 yr^{-1}$ (which corresponds to an equivalent erosion rate of 0.4 mm yr^{-1}) represents 60% of the total erosion for Basin 6, the total sediment flux would be 1.5×10^5 $m^3 yr^{-1}$ (an erosion rate of 0.7 mm yr^{-1}). Conversely if 9213 $m^3 yr^{-1}$ represents

24% of the total sediment flux, then the flux would be 3.8 x 10^5 m^3 yr^{-1} (1.7 mm yr^{-1} of erosion). If the contribution from landslides is minor, then the volume and equivalent erosion rate would be indeterminate. For example, if the hillslopes contribute 5% of the total sediment yield, the sediment flux would be 1.8 x 10^5 mm yr^{-1} and the equivalent bedrock erosion rate would be 9.7 mm yr^{-1}. When the Glacier 6 landslide volume is considered in the context of other alpine basins, a contribution of sediment by landslides of 25 to 65% seems reasonable.

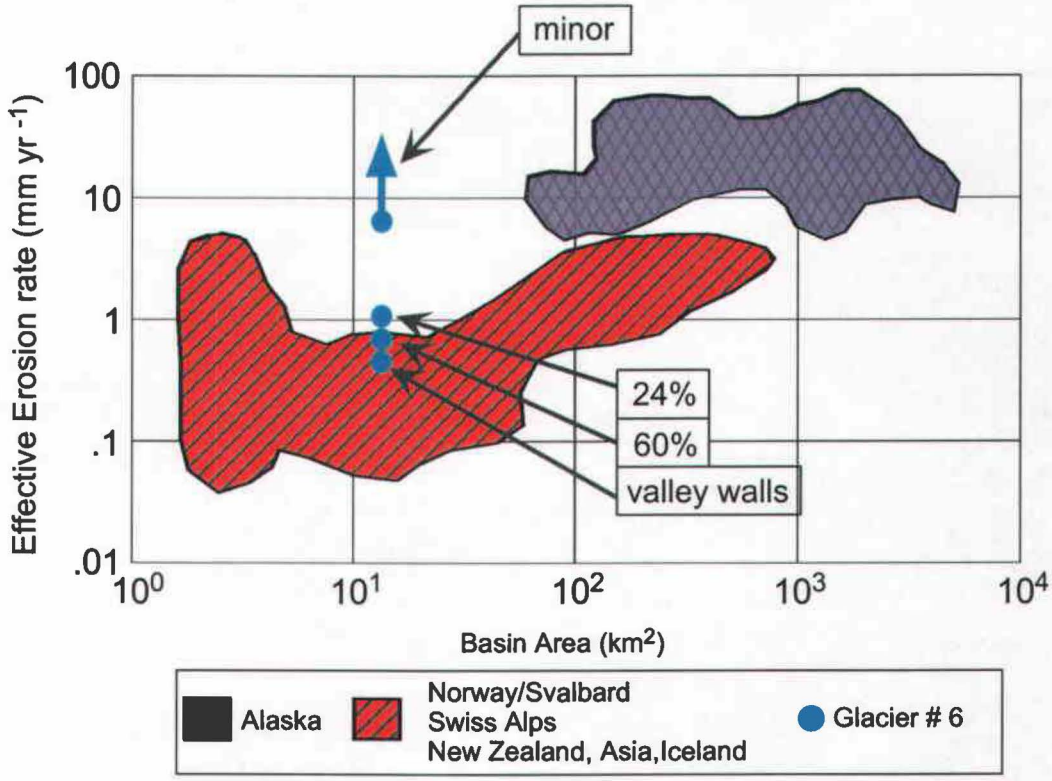


Figure 19. Effective bedrock erosion rates for glaciated basins. Blue hatched: Alaska. Red striped: New Zealand, Asia, Iceland, Norway/Svalbard, Swiss Alps. Erosion rates range from 5-70 mm yr^{-1} for Alaskan tidewater glaciers. Due to such variables as bedrock topography, and water-terminating toes, tidewater glaciers typically exhibit increased sliding velocity, and thus higher erosion rates than valley or alpine glaciers. Erosion rates for alpine and arctic basins range from 0.06 to 5.6 mm yr^{-1}. The blue dot plotted at 19 km^2 and 0.4 mm yr^{-1} is the calculated erosion rate for Glacier # 6, and represents the sediment contribution from landslides.. An erosion rate of 0.4 mm yr^{-1} is a minimum and may represent 24-60% of the total erosion. If the landslides are contributing a minor amount , the total erosion rate of the basin would be indeterminate, as represented by the uppermost blue dot (After Hallet et al., 1996).

Rockwall retreat

A mean rockwall retreat rate of 6.7 mm yr^{-1} is high when compared with published rates for other alpine environments with similar lithology, which range from 0.04-4.0 mm yr^{-1} (Hinchcliffe and Ballantyne, 1999). Rapid retreat rates (> 1 mm yr^{-1}) are typically associated with weakening of bedrock due to post-glacial stress relaxation, high-joint density and high, steep rockwalls (Andre, 1997). Possible reasons for such a high rate include an underestimate of the contributing rockwall area (Equation 2), due to surface irregularities in the cliff face and/or measurement error. This would cause an overestimate in values of cliff retreat, though we estimate these errors to be minimal. A second possible source of error is the exclusion of rockfall contributed by smaller, more frequent events and granular weathering. An underreporting of sediment volume due to the exclusion of rockfall volume results in only a slight underestimate of retreat rate. The main source of discrepancy between the published retreat rates and rates calculated here is due to the 25-year temporal scale. The data reported in Hinchcliffe et al. (1999) represent long-term rates of retreat, averaged over the past 17,500 years. If the calculated retreat rate for Basin 6 is averaged over longer time scales, for instance 100 years, since the end of the LIA, the calculated mean retreat rate for Basin 6 would be 1.6 mm yr^{-1} and would be in close agreement with the reported rates of 0.4 to 4.0 mm yr^{-1}. It is likely that if a mean retreat rate of 6.7 mm yr^{-1} were sustained over longer periods of time, erosion would have greatly outpaced uplift and the mountains would exhibit lower relief. The observed high relief in Basin 6 suggests that the high rate of rockwall retreat has not been sustained.

Flow velocity

Flow velocity for the upper half of the ablation zone is approximately 116 m yr^{-1}, whereas velocity for the lower half of the ablation zone is ~ 39 m yr^{-1}. The velocity varies with both distance down glacier and longitudinal differences in basin morphology. Velocity is highest at the ELA and where the valley has a smaller cross-sectional area. Conversely, the velocity decreases down ice, where the glacier has a wider cross-sectional area (Benn and Evans, 1998).

We have irregularly-spaced repeat photographic records for Basin 6, therefore we can only bracket a timeframe for landslide deposition. Flow velocities and the presence of ogives help to constrain these time intervals further. For example, Landslide "a" is present on the surface of the glacier in the 1972 aerial photo; however, since we do not have imagery prior to 1972 we cannot directly determine the time of landslide deposition. Assuming Landslide "a" was deposited near the base of the icefall (Figure 17) we can calculate the approximate time of deposition using the flow velocity and ogives. The distance from the icefall to its 1972 position is ~ 1748 m, and the upper flow velocity is 116 m yr^{-1} indicating that Landslide "a" was deposited near the base of the icefall ~ 47 years ago, in 1957. Additionally, there are ~ 45 ogive couplets present from the icefall to its 2000 position, which supports the time of deposition as ~1957. Landslide "a" is currently (as of 2000) ~500 meters from the terminus of the glacier. Assuming a flow velocity of 39 m yr^{-1}, Landslide "a" should reach the terminus in ~13 years (2013) and either will be deposited as a moraine, or carried away by Granite Creek. The calculated flow velocities indicate a ~ 55-year life span for landslides on the surface of the glacier. If

Landslide "a" occurred in ~1957, Landslide "b" in ~ 1974, and Landslide "c" in ~1980, the reoccurrence interval for landslides on Glacier 6 is 6-17 years.

Landslide mechanisms

Possible mechanisms of hillslope failure in the basin include topographic and rock-structural controls, debutressing, seismicity, and freeze/thaw processes. It is likely all of these mechanisms contribute to failure, though the primary cause in Basin 6 is thought to be rock strength and topography. Bedrock landslides typically occur when relief is high, slopes become oversteepened and shear stresses exceed hillslope strength (Terzhaghi, 1962). Additionally, a glacially steepened U-shaped valley with joints or bedding planes that dip valley-ward is one of the most likely combinations for the release of large rockslides (Rapp, 1960). The hillslopes of Basin 6 are composed of high strength metamorphic rock with large valley-wall-parallel joints (Figure 5). The valley walls have high relief, an average of ~400 m from the present day ice surface to the adjacent peaks, with a maximum relief of 700 m, and steep slopes ranging from 60-70° (Figure 20). The rocks exhibit a north-dipping foliation that lies at a high angle to the strike of the basin, therefore failure is associated with joint planes and not foliation planes.

Slope adjustments in the form of bedrock landslides are commonly linked to channel incision and base level lowering. The base level for the adjacent hillslopes in a glaciated valley is set by the surface of the glacial ice, rather than the valley bottom, although the valley bottom may also be lowering due to subglacial erosion (Benn and Evans, 1998). Advance and retreat of a glacier, which are accompanied by a thickening and thinning of the ice, respectively, cause a change in base level. As base level (the ice

surface) is lowered, the hillslope gradient becomes steeper and longer until a critical threshold slope angle is reached, after which landslides are likely to occur (Terzaghi, 1962). Average slope angle is a function of relief (r) and basin spacing (w), where the slope angle (θ) = r/0.5 w (Figure 21a). For slopes composed of high-grade metamorphic rock, that threshold is estimated to be ~30-40° (Schmidt and Montgomery, 1995). However, critical slope angles can be as high as ~70° for hard massive rock with random joint patterns (Terzaghi, 1962).

Additionally, base level lowering caused by glacial retreat serves to debuttress the hillslopes. Removal of ice at the toe of a hillslope results in destabilization and subsequent failure. In western North America, as well as Canada and Alaska, landslides are common on steep slopes that have experienced debuttressing (Evans and Clague, 1994). For example, the Melbern Glacier system in the southern St. Elias Mountains of western Canada has experienced a 400-600 m lowering of its ice surface in the last 200 years, resulting in large catastrophic slope failures (Clague and Evans, 1993). Though debutressing is a significant mechanism in hillslope failure, lithology plays an important role. Valleys composed of strong rock, such as granite or gneiss, as opposed to a weak lithology, such as sandstone, have a very low probability of increased landslide activity due to post-LIA glacial retreat (Holm et al., 2004). However, studies show that small reductions in ice height at the toe of a slope can translate to large increases in sheer stress, increasing the likelihood of failure (Terzaghi, 1962).

In glaciated regions, the lag time between debutressing and hillslope failure may be on the order of 10^4-10^5 years (Selby, 1985). On short time scales it may appear as if base level lowering and hillsope adjustments are occurring at the same rate. However,

these processes do not necessarily occur synchronously (Figure 21b) and may only appear synchronous due to the short (~55 year) window of observation.

Data show that fluctuations in the ELA on the northern (leeward) side of the St. Elias mountain range have small amplitudes indicating that the ice height does not change significantly from glacial to interglacial times (Péwé, 1975). Indeed, the trimline observed along the basin walls of Glacier # 6, indicates that base level has lowered by only ~50 meters since the end of the Little Ice Age (Figure 20). If only a minor amount of lowering is needed to increase the sheer stresses at the toe of the hillslope, then debutressing could be an important failure mechanism in Basin 6.

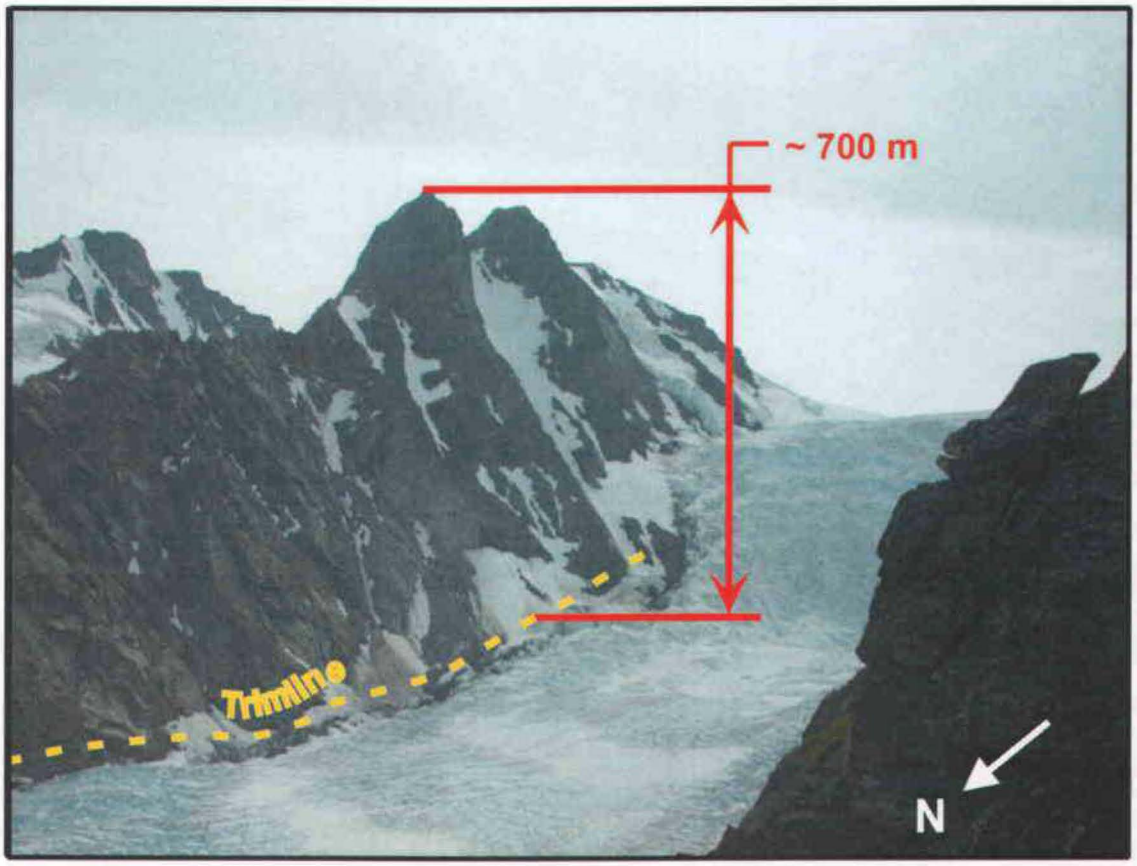


Figure 20. Basin # 6 relief and trimline. View looking southeast at eastern wall of Glacier # 6 basin. The maximum relief of Basin # 6 is 700 m and the eastern wall of the basin has a slope of ~70°. The trimline marks the Little Ice Age maximum ice height and is approximately 50-100 m above the present surface of the ice. Because the maximum ice level was not substantially higher than the present level, ice retreat and debutressing of the valley wall is likely not a slope failure mechanism.

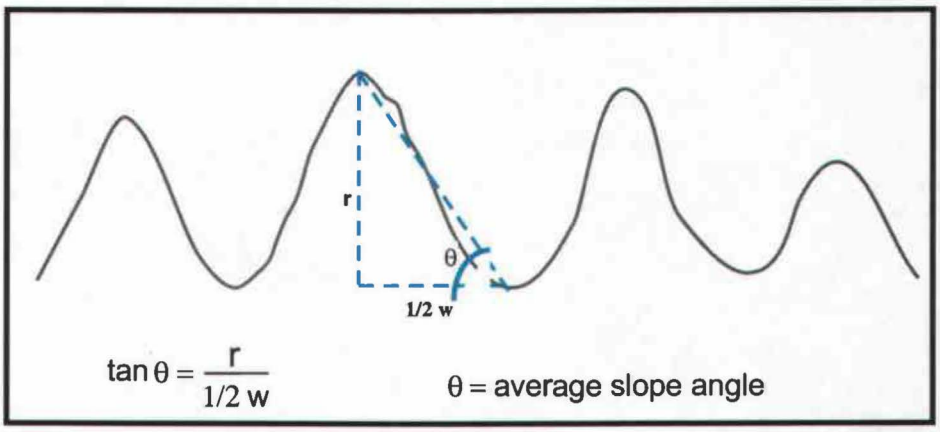


Figure 21a. Average basin slope angle. The average slope angle is represented by the equation tan o = r/0.5w, where r is relief and w is the wavelength of the basins, or distance from peak to peak or valley to valley. Relief is limited by the maximum slope angle which is ultimately controlled by rock strength. The rocks in Basin 6 are high-grade metamorphic and the valley walls have steep slopes (60-70^{o})

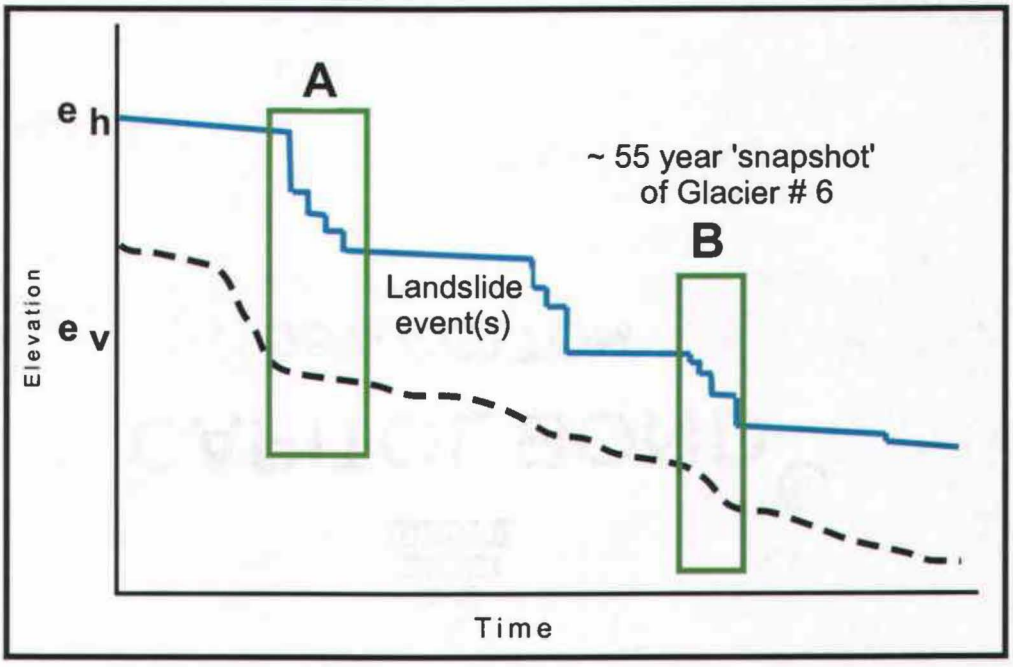


Figure 21b. Valley lowering vs. hillslope response via landslides. Base-level lowering, or erosion of the valley (e_v) (black dashed line), and erosion of the hillslope (e_h) by landslides (solid blue line) does not necessarily occur synchronously. The rate of valley erosion is related to sliding velocity which varies on glacial/interglacial timescales, whereas the rate of landsliding is not. For example, in box "A", e_v and e_h are out of phase whereas in box "B", the two processes are in phase. The two examples above highlight the controls on hillslope erosion, whereby A may represent failure due to debutressing of the hillslope and B may represent oscillations of ice height leading to destabilization of the toe, and subsequent failure.

Earthquake induced landslides can generate large volumes of sediment and are important to long-term slope erosion. However, seismic activity is not believed to be a direct cause of the hillslope failure in this basin, though it may serve as a contributing factor. A strong correlation ($r^2 = 0.876$) between earthquake magnitude and landslide volume (Keefer, 1994) indicates that an earthquake with a magnitude (M) of 5.3-5.4 would be needed to produce landslides with volumes comparable to those of Landslides "b" and "d". Thompson Ridge is located south of the Borders Fault on the hanging wall of the Chugach-St. Elias thrust. During a period of approximately 16 years, from 1963 to 1979, there was a fairly continuous background level of earthquake activity (Perez and Klaus, 1980). Fifteen seismic events of magnitude 4.2 or larger occurred during the period from 1963 to 1972, then after a six year period of relative quiescence, there was a sequence of five earthquakes in five months measuring between 4.1 and 5.0 in magnitude. In 1979 an earthquake of magnitude 7.9 occurred on the St. Elias fault and was reportedly felt over an area of about 500,000 km^2 (Stover et al., 1980). This earthquake postdates the largest of the landslides, Landslide "b", which is already present on the ice surface in the 1978 photograph, and predates Landslides "c" and "d". The magnitude and timing of earthquake events in this region do not support an earthquake-induced landslide mechanism.

Freeze/thaw processes act to weaken rock by contraction and expansion of water in fractures and joints. Fractures propagate when water freezes and expands, resulting in lengthening and/or widening of a crack. Bedrock landslides involve large masses of rock, most of which lie beyond the depth of frost penetration and/or large temperature variations (Terzaghi, 1962). Therefore it is thought that freeze-thaw is an unlikely

mechanism for large slides (Whalley, 1983) and is not a key process in rockwall retreat (Andre, 1997). Recent studies by Matsuoka (1999, 2001) indicate that freeze-thaw processes are important to small-scale erosion processes such as rockfall. A Seasonal frost penetration depth of 5 m was shown to cause a maximum of 10^2 to 10^3 m^3 of rockfall. Though large joints and fractures are present on the hillslopes of Basin 6, and rockfall activity was observed during the study period, freeze-thaw processes were not investigated, therefore their role in hillslope failure is not well known.

A visual comparison of the eleven glaciated basins as seen in an along-strike profile of Thompson Ridge indicates that Basin 6 is not anomalous with regard to high relief and steeply dipping valley walls (Figure 22); Basins 4 and 8 appear to have similar characteristics, yet there are no landslides observed on these glaciers. A possible reason for the absence of landslides in Basins 4 and 8 is the short temporal scale of this study. Due to the random nature of the landslides, the ~55 year window of observation may not be a long enough period of time to observe landslide activity. Another possibility may be that the walls of Basins 4 and 8 have not reached critical heights, either because they have not experienced the same amount of glacial retreat or a critical amount of debutressing. A cursory examination of the aerial photos (Figure 2) indicates that Glacier 6 has a very large accumulation area compared with Basins 4 and 8, therefore we would expect that Basins 4 and 8 would be experiencing more retreat and thinning than Basin 6. Increased thinning would indicate increased debutressing, therefore we would expect failure of the hillslopes in Basins 4 and 8. It therefore seems reasonable that the absence of landslides in Basins 4 and 8 is due, in part, to the short-temporal scale of the study.

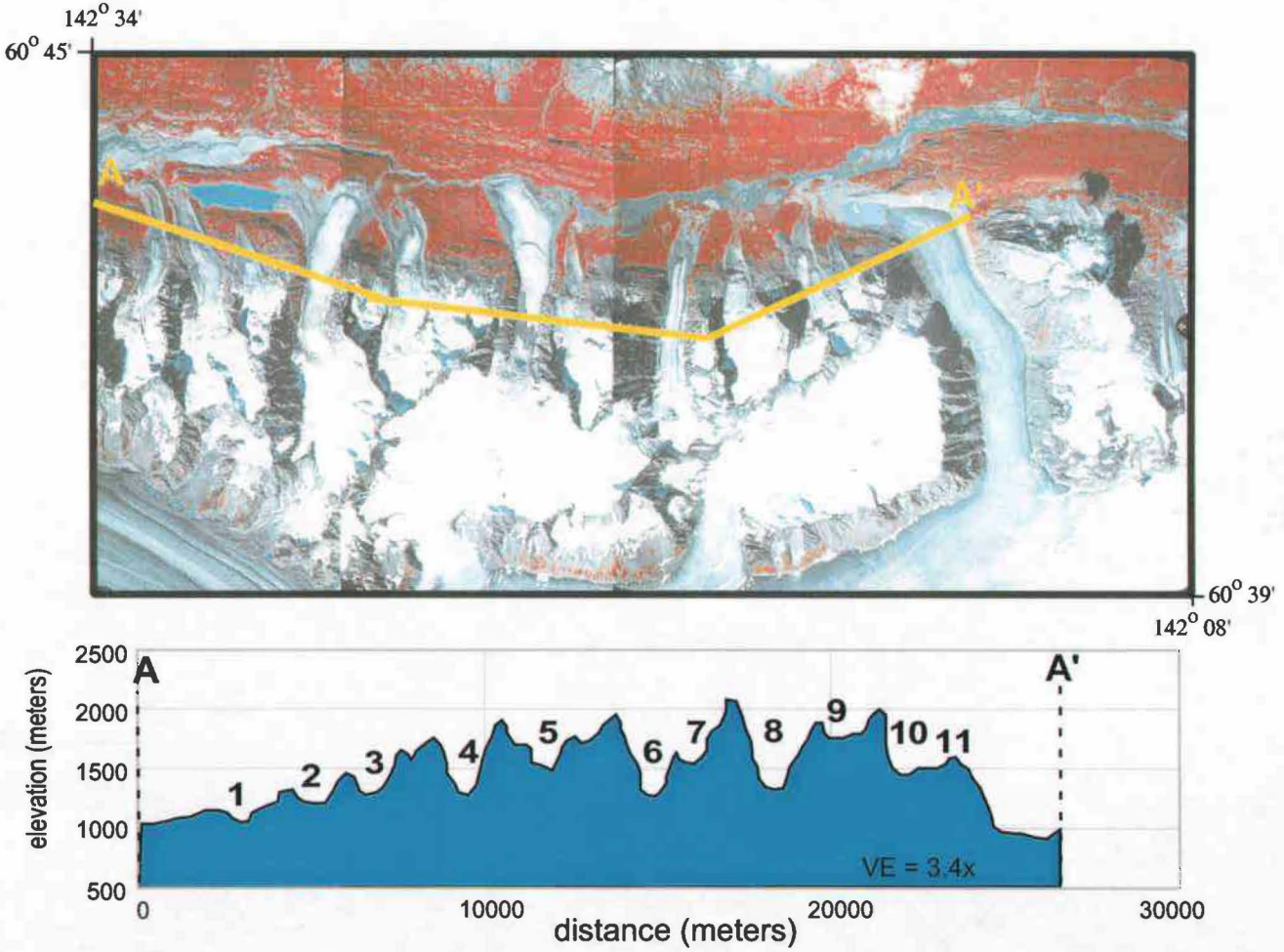


Figure 22. Along strike profile of Thompson Ridge. The location of transect A - A' was chosen because the valley walls in each basin are exposed and have high relief at that elevation. Basins 4 and 8 have high relief and steep slopes, similar to Basin 6, but are not experiencing landslides at this time. The basins may not have reached rock-failure threshold yet, which may be why landslides are not present.

Conclusions

Total sediment volume for three landslides deposited on the surface of a glacier located in the Chugach Mountains in southern Alaska was estimated in an effort to determine the sediment flux, a basin-scale equivalent erosion rate, and the rockwall retreat rate. The landslides, which are present on the surface of the glacier, are intact and can be traced to their source area. The estimated values represent rates derived from volumes of sediment contributed solely by landslides, and do not account for high frequency/low magnitude rockfall, or sediment derived englacially or subglacially.

- The sediment flux, or the annual amount of landslide-derived sediment being eroded from the basin walls, is 9213 m^3 yr^{-1}.
- The corresponding short-term basin scale erosion rate is 0.4 mm yr^{-1}. This represents a rate based on hillsope erosion alone. The basin may be experiencing overall erosion rates of 0.7 to 1.7 mm yr^{-1}.
- The rockwall retreat rate ranges from 6.1 to 7.3 mm yr^{-1}, with a mean of 6.7 mm yr^{-1}. In comparison to published rates, which range from 0.04 to 4.0 mm yr^{-1}, this value is high. The primary reason for the discrepancy is the short temporal scale (25 years) over which this rate was calculated.
- Flow velocity varies from 116 m yr^{-1} in the upper part of the basin to 39 m yr^{-1} in the lower part. Variation is due to distance downstream and valley cross-sectional area. Assuming the landslides originated from the valley walls adjacent to an icefall, the residence time of any given landslide on the surface of the glacier is ~ 55 years.

- The hillslopes of Basin 6 are composed of high strength metamorphic rock with an east west strike, and steep, valleyward dips of 60-70°. The valley walls exhibit high relief, an average of 400 m from the present day ice surface to the adjacent peaks, with a maximum relief of 700 m and are dissected by numerous valley-parallel joints and fractures. .
- Topography and rock strength are likely the primary controls on slope failure in the form of bedrock landslides. Given the relief (average 400 m) and the steepness of the slopes (60-70°) the hillslopes are at or near their failure threshold. Because rock strength is high, slopes are able to attain and maintain high angles.
- Basins 4 and 8 are similar in slope and relief to Basin 6, yet have no landslides. Perhaps these basins have not yet reached failure threshold conditions. More likely, the short-temporal scale of this study (~55 years) limits the window of observation and fails to capture the geomorphic processes that are likely operating at a different rate than those of Basin 6.

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Appendix A. Transect and perimeter data from the Advantage Laser range finder for landslides "b", "c", and "d". Stations are numbered 1-36 and are identified by a UTM coordinate (easting and northing), and an elevation. Transect lines (T), perimeter lines (P), and ridgelines (R) are numbered 1-91 and are associated with a particular station.

Perimeter	Ridge	Transect	Station	Easting	Northing	Alt. (m)	Datafile
P1a		1,2,3	1	424977	6731877	880	00,01
		4,5,6,7	2a	424995	6731997	860	02,03
P8		8	2b	424988	6732232	856	04
P10,P12		9,11,13	2c	424990	6732224	851	05
P14,P16		15,17	3	424983	6732279		07
P18a		17cont...	4a	424997	6732323	854	08,09
P18b	R18		4b	425111	6732498	841	
		19	5	424945	6732405	855	10
P20		19,21	6	424872	6732422	859	06
P22	R23	24,25	7	424646	6732576	866	12
P27		26	8	424646	6732601	862	13
		28,29	9	424570	6732592	861	14
P30		31,32,33	10	424450	6732563	864	15,16
P34		35	11	424474	6732617	862	17
		36,37	12	424465	6732619	860	17
		38	13	424371	6732627	865	18
		39	14	424389	6732614	865	18
		40,41	15	424346	6732644	852	19
P42		43,44	16	424307	6732555	861	20,21
P45	R52	46-51	17	424139	6732450	853	22,23,24
P53		54,55,56,57	18	424169	6732726	847	26
		58	19	424155	6732711	849	27
P59		60,61,62	20	424059	6732653	849	28
		63,64	21	424026	6732596	862	29
		65,66	22				30
P67			23	423918	6732442	838	31
P68		69,70,71,72	24	423977	6732196	869	32,33
P68cont		76	25				34
		73,74,75	26	423957	6732244	853	34
		77,78	27	423949	6732347	854	37
		79,80	28	423969	6732524	844	38
P81...			29	424115	6732261	863	39
P81...			30	424135	6732316	860	39
P81			31	424075	6732160	862	39
P82			32	424277	6731945	906	40
P83			33	424360	6732010	896	41
P84			34	424518	6732016	897	42
P85			35	424760	6731076	1015	43
P86		87,88,90,91	36	424729	6730993	1015	44,45

Landslide "b"

GPS Survey Station Info				Laser Atlanta Data				Calculations					Coordinates		
Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St1 T1	424977	6731877	880	202.33	2	83.1	89.7	202.33	0.0	-0.1	1.6	200.86	424984	6732078	855
	424977	6731877	880	200.35	5.2	82.8	89.9	200.35	0.1	-0.1	1.6	198.77	424995	6732075	854
	424977	6731877	880	199.68	9.4	83	90	199.68	0.2	-0.1	1.6	198.19	425009	6732073	855
	424977	6731877	880	197.62	14	83.1	89.8	197.62	0.2	-0.1	1.6	196.19	425024	6732067	856
	424977	6731877	880	199.71	16.8	82.4	89.4	199.71	0.3	-0.1	1.6	197.96	425034	6732067	853
	424977	6731877	880	166.64	17.9	82.4	89.6	166.64	0.3	-0.1	1.6	165.18	425028	6732034	857
T2	424977	6731877	880	26.32	110.5	72.5	89.2	26.32	1.9	-0.3	1.6	25.10	425001	6731868	871
	424977	6731877	880	24.99	111.1	71.9	89.6	24.99	1.9	-0.3	1.6	23.75	424999	6731868	872
	424977	6731877	880	23.5	110.2	71.4	89.3	23.50	1.9	-0.3	1.6	22.27	424998	6731869	872
	424977	6731877	880	30.22	109.3	69.9	89.1	30.22	1.9	-0.4	1.6	28.38	425004	6731868	869
	424977	6731877	880	20.14	108.9	68.7	89.5	20.14	1.9	-0.4	1.6	18.76	424995	6731871	872
	424977	6731877	880	18.76	109	69.4	89.4	18.76	1.9	-0.4	1.6	17.56	424994	6731871	873
	424977	6731877	880	17.51	109.5	70	89.2	17.51	1.9	-0.3	1.6	16.45	424993	6731872	873
	424977	6731877	880	15.61	109.4	70.8	88.9	15.61	1.9	-0.3	1.6	14.74	424991	6731872	874
	424977	6731877	880	14.72	110.2	72.1	89.5	14.72	1.9	-0.3	1.6	14.01	424990	6731872	875
	424977	6731877	880	13.57	109.1	71.9	89.6	13.57	1.9	-0.3	1.6	12.90	424989	6731873	875
	424977	6731877	880	12.79	108.2	70.8	89.9	12.79	1.9	-0.3	1.6	12.08	424988	6731873	875
	424977	6731877	880	11.81	108	72.9	89.3	11.81	1.9	-0.3	1.6	11.29	424988	6731874	876
	424977	6731877	880	11.32	108	72.3	89.4	11.32	1.9	-0.3	1.6	10.78	424987	6731874	876
	424977	6731877	880	10.05	108.8	72	89.8	10.05	1.9	-0.3	1.6	9.56	424986	6731874	876
	424977	6731877	880	9.05	108	72.6	89.1	9.05	1.9	-0.3	1.6	8.64	424985	6731874	877
	424977	6731877	880	7.84	107.1	74.7	89.8	7.84	1.9	-0.3	1.6	7.56	424984	6731875	877
	424977	6731877	880	7.72	106.8	80	89.8	7.72	1.9	-0.2	1.6	7.60	424984	6731875	878
	424977	6731877	880	6.97	104.2	73.7	89.5	6.97	1.8	-0.3	1.6	6.69	424983	6731875	877
	424977	6731877	880	6.32	104.2	80.9	89.4	6.32	1.8	-0.2	1.6	6.24	424983	6731875	878
	424977	6731877	880	4.44	107.7	91.8	89.5	4.44	1.9	0.0	1.6	4.44	424981	6731876	879
	424977	6731877	880	1.8	282.2	102.2	89	1.80	4.9	0.2	1.6	1.76	424975	6731877	880
	424977	6731877	880	3.6	281.7	105.1	88.9	3.60	4.9	0.3	1.6	3.48	424974	6731878	880
	424977	6731877	880	4.75	273.9	104.7	88.7	4.75	4.8	0.3	1.5	4.59	424972	6731877	881
	424977	6731877	880	6.46	276.7	92.1	89.5	6.46	4.8	0.0	1.6	6.46	424971	6731878	880
	424977	6731877	880	7.84	281.6	88.2	89.8	7.84	4.9	0.0	1.6	7.84	424969	6731879	879
	424977	6731877	880	9.69	283.7	86.2	89.3	9.69	5.0	-0.1	1.6	9.67	424968	6731879	879
	424977	6731877	880	11.55	284	85.5	89.6	11.55	5.0	-0.1	1.6	11.51	424966	6731880	878
	424977	6731877	880	13.73	283.6	84.7	89.5	13.73	4.9	-0.1	1.6	13.67	424964	6731880	878
	424977	6731877	880	16.36	283.5	84.4	89.5	16.36	4.9	-0.1	1.6	16.28	424961	6731881	878
	424977	6731877	880	18.94	284.8	85.1	89.9	18.94	5.0	-0.1	1.6	18.87	424959	6731882	878
	424977	6731877	880	21.36	284.7	84.5	89.4	21.36	5.0	-0.1	1.6	21.26	424956	6731882	877
	424977	6731877	880	22.87	284.9	83.2	89.3	22.87	5.0	-0.1	1.6	22.71	424955	6731883	877
	424977	6731877	880	24.75	284.4	82.2	89.7	24.75	5.0	-0.1	1.6	24.52	424953	6731883	876
	424977	6731877	880	26.08	284.3	81.8	89.7	26.08	5.0	-0.1	1.6	25.81	424952	6731883	876
	424977	6731877	880	28.07	285.2	81.3	89.4	28.07	5.0	-0.2	1.6	27.75	424950	6731884	875
	424977	6731877	880	29.68	287.5	80.6	89.4	29.68	5.0	-0.2	1.6	29.28	424949	6731886	875
St1 T3	424977	6731877	880	23.6	259.3	79.5	89.2	23.60	4.5	-0.2	1.6	23.20	424954	6731873	875
	424977	6731877	880	22.46	256	80.7	89.3	22.46	4.5	-0.2	1.6	22.16	424955	6731872	876
	424977	6731877	880	20.89	251.7	81.2	89.7	20.89	4.4	-0.2	1.6	20.64	424957	6731871	876
	424977	6731877	880	18.74	249.5	81.5	89.6	18.74	4.4	-0.1	1.6	18.53	424960	6731871	877
	424977	6731877	880	17.58	247	82.5	89.6	17.58	4.3	-0.1	1.6	17.43	424961	6731870	877
	424977	6731877	880	16.4	242.6	82.5	89.5	16.40	4.2	-0.1	1.6	16.26	424963	6731870	877
	424977	6731877	880	15.61	238.2	83.1	89.5	15.61	4.2	-0.1	1.6	15.50	424964	6731869	877
	424977	6731877	880	14.66	234.4	84.5	89.6	14.66	4.1	-0.1	1.6	14.59	424965	6731869	878
	424977	6731877	880	13.07	223.3	86.2	89.5	13.07	3.9	-0.1	1.6	13.04	424968	6731868	878
	424977	6731877	880	12.24	217.8	86.9	89.6	12.24	3.8	-0.1	1.6	12.22	424970	6731867	879
	424977	6731877	880	11.91	211.5	89.8	90.3	11.91	3.7	0.0	1.6	11.91	424971	6731867	879
	424977	6731877	880	11.71	202.4	86.6	89.6	11.71	3.5	-0.1	1.6	11.69	424973	6731866	879
	424977	6731877	880	11.73	195.9	84.5	89.6	11.73	3.4	-0.1	1.6	11.68	424974	6731866	878
	424977	6731877	880	11.86	189.5	80.7	89.4	11.86	3.3	-0.2	1.6	11.70	424975	6731865	877
	424977	6731877	880	11.54	186.2	85.2	89.2	11.54	3.2	-0.1	1.6	11.50	424976	6731866	878
	424977	6731877	880	12.08	180	80.1	89.7	12.08	3.1	-0.2	1.6	11.90	424977	6731865	877
	424977	6731877	880	13.21	175.7	79.5	89.4	13.21	3.1	-0.2	1.6	12.99	424978	6731864	877
	424977	6731877	880	14	171.7	78.5	89.3	14.00	3.0	-0.2	1.6	13.72	424979	6731863	877
	424977	6731877	880	15.25	167.5	76.4	89	15.25	2.9	-0.2	1.6	14.82	424980	6731863	876
	424977	6731877	880	16.8	165.6	77.9	89.8	16.80	2.9	-0.2	1.6	16.43	424981	6731861	876
	424977	6731877	880	18.25	163.7	75.4	90	18.25	2.9	-0.3	1.6	17.86	424982	6731860	875
	424977	6731877	880	19.94	159.6	75.8	89.4	19.94	2.8	-0.2	1.6	19.33	424984	6731859	874
	424977	6731877	880	21.61	155	74.4	89.5	21.81	2.7	-0.3	1.6	21.01	424986	6731858	873
	424977	6731877	880	23.12	154.1	74.6	89.9	23.12	2.7	-0.3	1.6	22.29	424987	6731857	873
	424977	6731877	880	25.14	152.6	74.2	89.2	25.14	2.7	-0.3	1.6	24.19	424988	6731856	873
	424977	6731877	880	26.86	150.6	72.9	89.3	26.86	2.6	-0.3	1.6	25.67	424990	6731855	871
	424977	6731877	880	28.87	148.8	73.5	89.5	28.87	2.6	-0.3	1.6	27.68	424991	6731853	871
	424977	6731877	880	29.65	147.2	73.4	89.6	29.65	2.6	-0.3	1.6	28.41	424992	6731853	871
	424977	6731877	880	30.94	146.7	72.6	89.7	30.94	2.6	-0.3	1.6	29.52	424993	6731852	870
	424977	6731877	880	32.35	147.4	71.9	89.6	32.35	2.6	-0.3	1.6	30.75	424994	6731851	869
	424977	6731877	880	33.11	146.1	72.8	89.8	33.11	2.5	-0.3	1.6	31.63	424995	6731851	870
	424977	6731877	880	34.17	146.3	72.2	89.8	34.17	2.6	-0.3	1.6	32.53	424995	6731850	869

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St2a T4	424995	6731997	860	85.61	221.6	91	89.3	85.61	3.9	0.0	1.6	85.60	424938	6731933	861
	424995	6731997	860	87.59	217.9	91.2	88.9	87.59	3.8	0.0	1.6	87.57	424941	6731928	861
	424995	6731997	860	86.41	216	91.7	88.8	86.41	3.8	0.0	1.5	86.37	424944	6731927	862
	424995	6731997	860	85.8	214.1	91.4	89.1	85.80	3.7	0.0	1.6	85.77	424947	6731926	861
	424995	6731997	860	85.66	212.3	90.9	89	85.66	3.7	0.0	1.6	85.65	424949	6731925	861
	424995	6731997	860	85.79	209.9	91.4	88.7	85.79	3.7	0.0	1.5	85.76	424952	6731923	861
	424995	6731997	860	85.55	208.3	91.6	88.8	85.55	3.6	0.0	1.5	85.52	424954	6731922	862
	424995	6731997	860	86.87	203.9	91.1	88.8	86.87	3.6	0.0	1.5	86.85	424960	6731918	861
	424995	6731997	860	86.91	201.5	91.3	88.9	86.91	3.5	0.0	1.6	86.89	424963	6731916	861
	424995	6731997	860	86.99	200.8	92.2	89.4	86.99	3.5	0.0	1.6	86.93	424964	6731916	863
	424995	6731997	860	87.32	199.4	92.8	89.2	87.32	3.5	0.0	1.6	87.22	424966	6731915	864
	424995	6731997	860	86.94	197	93.4	88.2	86.94	3.4	0.1	1.5	86.79	424970	6731914	865
	424995	6731997	860	87.01	195.7	93.8	89.1	87.01	3.4	0.1	1.6	86.82	424972	6731913	865
	424995	6731997	860	86.48	194.5	93.3	89	86.48	3.4	0.1	1.6	86.34	424973	6731913	864
	424995	6731997	860	86.87	192.7	93.3	89	86.87	3.4	0.1	1.6	86.73	424976	6731912	864
	424995	6731997	860	86.71	190.9	93.4	88.3	86.71	3.3	0.1	1.5	86.56	424979	6731912	864
	424995	6731997	860	86.96	188.6	93.6	88.8	86.96	3.3	0.1	1.5	86.79	424982	6731911	865
	424995	6731997	860	88.39	186.4	94.1	89	88.39	3.3	0.1	1.6	88.16	424985	6731909	866
	424995	6731997	860	86.09	183.9	93.4	88.7	86.09	3.2	0.1	1.5	85.94	424989	6731911	864
	424995	6731997	860	86.13	181.5	92.9	88.5	86.13	3.2	0.1	1.5	86.02	424993	6731911	864
	424995	6731997	860	86.79	179	92.1	88.8	86.79	3.1	0.0	1.5	86.73	424997	6731910	863
	424995	6731997	860	86.91	178	91.1	88.7	86.91	3.1	0.0	1.5	86.89	424998	6731910	861
	424995	6731997	860	97.89	180.9	91.8	89	97.89	3.2	0.0	1.6	97.84	424993	6731899	862
	424995	6731997	860	80.57	175.4	90.9	89.6	80.57	3.1	0.0	1.6	80.56	425001	6731917	861
	424995	6731997	860	78.21	174.9	90.7	89.7	78.21	3.1	0.0	1.6	78.20	425002	6731919	860
	424995	6731997	860	72.71	174.6	90.3	89	72.71	3.0	0.0	1.6	72.71	425002	6731925	860
	424995	6731997	860	69.44	174.8	90.7	89.6	69.44	3.1	0.0	1.6	69.43	425001	6731928	860
	424995	6731997	860	68	172.2	91.2	89.6	68.00	3.0	0.0	1.6	67.99	425004	6731930	861
	424995	6731997	860	64.58	171	90.7	89.9	64.58	3.0	0.0	1.6	64.58	425005	6731933	860
	424995	6731997	860	48.76	169.7	89.6	89.3	48.76	3.0	0.0	1.6	48.76	425004	6731949	859
	424995	6731997	860	54.03	165.9	90.5	89.5	54.03	2.9	0.0	1.6	54.03	425008	6731945	860
	424995	6731997	860	50.86	163.8	90.4	89.5	50.86	2.9	0.0	1.6	50.86	425009	6731948	860
	424995	6731997	860	47.78	163.9	91	89.7	47.78	2.9	0.0	1.6	47.77	425008	6731951	860
	424995	6731997	860	45.23	160.5	89.7	89.6	45.23	2.8	0.0	1.6	45.23	425010	6731954	859
	424995	6731997	860	41.02	160.3	87.2	89.2	41.02	2.8	0.0	1.6	40.97	425009	6731958	857
T5	424995	6731997	860	40.96	163.8	87.1	89.4	40.96	2.9	-0.1	1.6	40.91	425006	6731958	857
	424995	6731997	860	39.6	167	87.4	89.2	39.60	2.9	0.0	1.6	39.56	425004	6731958	858
	424995	6731997	860	39.08	170.4	87.8	89.3	39.08	3.0	0.0	1.6	39.05	425002	6731958	858
	424995	6731997	860	38.98	172.3	87.2	89.3	38.98	3.0	0.0	1.6	38.93	425000	6731958	857
	424995	6731997	860	39.1	175.1	86.2	89.6	39.10	3.1	-0.1	1.6	39.01	424998	6731958	857
	424995	6731997	860	39.59	178	86	89.8	39.59	3.1	-0.1	1.6	39.49	424996	6731958	857
	424995	6731997	860	39.35	181	86.8	89.5	39.35	3.2	-0.1	1.6	39.29	424994	6731958	857
	424995	6731997	860	39.79	184.2	85.2	89.4	39.79	3.2	-0.1	1.6	39.65	424992	6731957	856
	424995	6731997	860	39.84	186.7	85.2	89.8	39.84	3.3	-0.1	1.6	39.70	424990	6731958	856
	424995	6731997	860	39.85	188.2	83.1	89.4	39.85	3.3	-0.1	1.6	39.56	424989	6731958	855
	424995	6731997	860	39.99	192.3	84.4	89.9	39.99	3.4	-0.1	1.6	39.80	424987	6731958	855
	424995	6731997	860	40.44	195.5	84.1	89.3	40.44	3.4	-0.1	1.6	40.23	424984	6731958	855
	424995	6731997	860	40.51	198.7	82.9	89.7	40.51	3.5	-0.1	1.6	40.20	424982	6731959	854
	424995	6731997	860	41.96	201.9	83.9	89.5	41.96	3.5	-0.1	1.6	41.72	424979	6731958	855
	424995	6731997	860	42.43	204.9	83.3	90.3	42.43	3.6	-0.1	1.6	42.14	424977	6731959	854
	424995	6731997	860	41.95	208.2	83.9	90.2	41.95	3.6	-0.1	1.6	41.71	424975	6731960	855
	424995	6731997	860	41.69	211.9	84.4	89.9	41.69	3.7	-0.1	1.6	41.49	424973	6731962	855
	424995	6731997	860	42.54	216.8	84.9	89.4	42.54	3.8	-0.1	1.6	42.37	424970	6731963	856
	424995	6731997	860	43.82	220.9	86.1	89.4	43.82	3.9	-0.1	1.6	43.72	424966	6731964	856
	424995	6731997	860	45.67	223.5	86.3	89.8	45.67	3.9	-0.1	1.6	45.57	424964	6731964	856
	424995	6731997	860	46.05	226.1	87.7	89.4	46.05	3.9	0.0	1.6	46.01	424962	6731965	858
	424995	6731997	860	46.47	227.8	86.8	89.3	46.47	4.0	-0.1	1.6	46.40	424961	6731966	857
	424995	6731997	860	48.42	229.7	86.9	89.6	48.42	4.0	-0.1	1.6	48.35	424958	6731966	857
	424995	6731997	860	50.53	231.5	87.5	89.9	50.53	4.0	0.0	1.6	50.48	424955	6731966	857
	424995	6731997	860	50.69	233	88.1	89.4	50.69	4.1	0.0	1.6	50.66	424955	6731967	858
	424995	6731997	860	51	233.2	87.3	89.4	51.00	4.1	0.0	1.6	50.94	424954	6731966	857
	424995	6731997	860	52.83	235.1	87.1	89.5	52.83	4.1	-0.1	1.6	52.76	424952	6731967	857
	424995	6731997	860	53.59	235.6	88.8	89.4	53.59	4.1	0.0	1.6	53.58	424951	6731967	858
	424995	6731997	860	54.52	237	87.5	89.4	54.52	4.1	0.0	1.6	54.47	424949	6731967	857

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St2 T6	424995	6731997	860	48.88	259.7	85	89.5	48.88	4.5	-0.1	1.6	48.59	424947	6731988	855
	424995	6731997	860	36.05	259.5	84.6	89.2	36.05	4.5	-0.1	1.6	35.89	424960	6731990	856
	424995	6731997	860	44.07	259	85.2	89.2	44.07	4.5	-0.1	1.6	43.92	424952	6731989	856
	424995	6731997	860	43.07	259.8	84.8	89.5	43.07	4.5	-0.1	1.6	42.89	424953	6731989	855
	424995	6731997	860	40.86	259.5	85.1	89.6	40.86	4.5	-0.1	1.6	40.71	424955	6731990	856
	424995	6731997	860	39.36	258.9	86.2	89.6	39.36	4.5	-0.1	1.6	39.27	424956	6731989	857
	424995	6731997	860	37.64	259.1	86.9	89.7	37.64	4.5	-0.1	1.6	37.58	424958	6731990	857
	424995	6731997	860	35.8	259.8	87.4	89.3	35.80	4.5	0.0	1.6	35.76	424960	6731991	858
	424995	6731997	860	33.34	258.5	87.3	89.1	33.34	4.5	0.0	1.6	33.30	424962	6731990	858
	424995	6731997	860	30.42	259.2	86.6	88.6	30.42	4.5	-0.1	1.5	30.37	424965	6731991	858
	424995	6731997	860	26.09	260.5	87.2	89.4	26.09	4.5	0.0	1.6	26.06	424969	6731993	858
	424995	6731997	860	24.87	261.3	88.2	89.6	24.87	4.6	0.0	1.6	24.86	424970	6731993	859
	424995	6731997	860	22.13	262.4	87.7	89.3	22.13	4.6	0.0	1.6	22.11	424973	6731994	858
	424995	6731997	860	19.88	263.7	88.4	89.2	19.88	4.6	0.0	1.6	19.87	424975	6731995	859
	424995	6731997	860	18.34	263.5	90.4	89.1	18.34	4.6	0.0	1.6	18.34	424977	6731995	859
	424995	6731997	860	17.91	265.5	89.4	89.4	17.91	4.6	0.0	1.6	17.91	424977	6731996	859
	424995	6731997	860	16.8	265.7	92.4	89.5	16.80	4.6	0.0	1.6	16.79	424978	6731996	860
	424995	6731997	860	15.89	266.7	90.1	89.7	15.89	4.7	0.0	1.6	15.89	424979	6731996	859
	424995	6731997	860	12.64	267.7	89.9	89.6	12.64	4.7	0.0	1.6	12.64	424982	6731996	859
	424995	6731997	860	11.76	263.6	95.2	88.9	11.76	4.6	0.1	1.6	11.71	424983	6731996	860
	424995	6731997	860	10.34	265.3	91.5	89.3	10.34	4.6	0.0	1.6	10.34	424985	6731996	860
	424995	6731997	860	8.67	265.5	90.9	89.1	8.67	4.6	0.0	1.6	8.67	424986	6731996	859
	424995	6731997	860	5.59	260.8	93.5	89.3	5.59	4.6	0.1	1.6	5.58	424989	6731996	860
	424995	6731997	860	3.93	254.3	97.3	89.3	3.93	4.4	0.1	1.6	3.90	424991	6731996	860
	424995	6731997	860	1.91	126.1	94.9	89.3	1.91	2.2	0.1	1.6	1.90	424997	6731996	860
	424995	6731997	860	5.01	114.4	91.4	89.1	5.01	2.0	0.0	1.6	5.01	425000	6731995	859
	424995	6731997	860	7.2	112.1	91.3	89.4	7.20	2.0	0.0	1.6	7.20	425002	6731994	860
	424995	6731997	860	9.85	109.4	90.9	89	9.85	1.9	0.0	1.6	9.85	425004	6731994	860
	424995	6731997	860	12.31	112.8	91.9	89.3	12.31	2.0	0.0	1.6	12.30	425006	6731992	860
	424995	6731997	860	13.13	111.5	88.9	89.4	13.13	1.9	0.0	1.6	13.13	425007	6731992	859
	424995	6731997	860	14.98	108	86.4	89.7	14.98	1.9	-0.1	1.6	14.95	425009	6731992	858
T7	424995	6731997	860	32.22	26.8	81.4	90	32.22	0.5	-0.2	1.6	31.86	425009	6732025	855
	424995	6731997	860	32.08	24.5	80.6	89.9	32.08	0.4	-0.2	1.6	31.65	425008	6732026	854
	424995	6731997	860	31.29	20.5	80.9	89.8	31.29	0.4	-0.2	1.6	30.90	425006	6732026	854
	424995	6731997	860	30.76	16.3	82.2	89.6	30.76	0.3	-0.1	1.6	30.48	425004	6732026	855
	424995	6731997	860	31.05	12.3	80.5	89.7	31.05	0.2	-0.2	1.6	30.62	425002	6732027	854
	424995	6731997	860	32.14	5.1	80.6	89.9	32.14	0.1	-0.2	1.6	31.71	424998	6732029	854
	424995	6731997	860	32.64	359.7	80.1	89.4	32.64	6.3	-0.2	1.6	32.15	424995	6732029	854
	424995	6731997	860	33.08	356.5	80.1	89.8	33.08	6.2	-0.2	1.6	32.59	424993	6732030	854
	424995	6731997	860	34.25	351.3	81	90.1	34.25	6.1	-0.2	1.6	33.83	424990	6732030	854
	424995	6731997	860	35	347.6	80.3	90	35.00	6.1	-0.2	1.6	34.50	424988	6732031	853
	424995	6731997	860	36.53	344.6	80.7	89.9	36.53	6.0	-0.2	1.6	36.05	424985	6732032	853
	424995	6731997	860	37.33	340.9	80.6	90	37.33	5.9	-0.2	1.6	36.83	424983	6732032	853
	424995	6731997	860	38.38	337.7	81	89.6	38.38	5.9	-0.2	1.6	37.91	424981	6732032	853
	424995	6731997	860	39.26	334.8	81.5	89.7	39.26	5.8	-0.1	1.6	38.83	424978	6732032	854
	424995	6731997	860	40.97	333	80.9	89.6	40.97	5.8	-0.2	1.6	40.45	424977	6732033	853
	424995	6731997	860	43.07	330.2	80.5	89.5	43.07	5.8	-0.2	1.6	42.48	424974	6732034	852
	424995	6731997	860	44.33	329	80	89.7	44.33	5.7	-0.2	1.6	43.66	424973	6732034	852
	424995	6731997	860	45.7	327.1	79.3	89.7	45.70	5.7	-0.2	1.6	44.91	424971	6732035	851
	424995	6731997	860	47.38	324.2	79.6	89.3	47.38	5.7	-0.2	1.6	46.60	424968	6732035	851
	424995	6731997	860	49.41	323.1	79.2	89.9	49.41	5.6	-0.2	1.6	48.53	424966	6732036	850
	424995	6731997	860	51.82	319.8	79.6	89.8	51.82	5.6	-0.2	1.6	50.97	424962	6732036	850
	424995	6731997	860	52.76	318.9	80.5	90.3	52.76	5.6	-0.2	1.6	52.04	424961	6732036	851
	424995	6731997	860	55.96	315.9	79.8	89.8	55.96	5.5	-0.2	1.6	55.08	424957	6732037	849

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St2b T8	424988	6732232	856	94.66	326.8	81.3	91.7	94.66	5.7	-0.2	1.6	93.57	424937	6732310	841
	424988	6732232	856	92.21	328.7	82.1	91.8	92.21	5.7	-0.1	1.6	91.33	424941	6732310	843
	424988	6732232	856	83.55	331.9	81.5	91.6	83.55	5.8	-0.1	1.6	82.63	424949	6732305	843
	424988	6732232	856	80.26	337.4	81.2	91.8	80.26	5.9	-0.2	1.6	79.32	424958	6732305	843
	424988	6732232	856	79.6	338	81.6	91.2	79.60	5.9	-0.1	1.6	78.75	424959	6732305	844
	424988	6732232	856	80.32	340.1	82.9	91.3	80.32	5.9	-0.1	1.6	79.70	424961	6732307	845
	424988	6732232	856	80.56	342.4	82.9	90.6	80.56	6.0	-0.1	1.6	79.94	424964	6732308	845
	424988	6732232	856	80.26	346.6	84.2	91.2	80.26	6.0	-0.1	1.6	79.85	424969	6732310	847
	424988	6732232	856	80.28	348.7	84.8	90.8	80.28	6.1	-0.1	1.6	79.95	424972	6732310	848
	424988	6732232	856	79.27	352.2	87.1	91.1	79.27	6.1	-0.1	1.6	79.17	424977	6732310	851
	424988	6732232	856	79.68	352.6	87	91.5	79.68	6.2	-0.1	1.6	79.57	424978	6732311	851
	424988	6732232	856	82.02	358	90.8	91.2	82.02	6.2	0.0	1.6	82.01	424985	6732314	856
	424988	6732232	856	81.67	359.6	90.8	91.3	81.67	6.3	0.0	1.6	81.66	424987	6732314	856
	424988	6732232	856	81.17	95.8	90.9	90.4	81.17	1.7	0.0	1.6	81.16	425069	6732224	857
	424988	6732232	856	79.32	10.9	87	90.7	79.32	0.2	-0.1	1.6	79.21	425003	6732310	851
	424988	6732232	856	79.47	12.1	86.7	91.5	79.47	0.2	-0.1	1.6	79.34	425005	6732310	851
	424988	6732232	856	79.23	14.3	86.4	91.1	79.23	0.2	-0.1	1.6	79.07	425008	6732309	850
	424988	6732232	856	80.15	16.2	84.9	91.1	80.15	0.3	-0.1	1.6	79.83	425013	6732308	848
	424988	6732232	856	87.1	30.8	82.7	91.1	87.10	0.5	-0.1	1.6	86.39	425032	6732306	844
	424988	6732232	856	89.27	32.5	82.2	91.2	89.27	0.6	-0.1	1.6	88.44	425036	6732307	843
	424988	6732232	856	99.37	55.5	81.5	90.8	99.37	1.0	-0.1	1.6	98.28	425069	6732288	841
	424988	6732232	856	93.04	55.8	81.3	91	93.04	1.0	-0.2	1.6	91.97	425064	6732284	841
	424988	6732232	856	89.56	58.1	81.7	91.4	89.56	1.0	-0.1	1.6	88.62	425063	6732279	842
	424988	6732232	856	88.93	59.8	81.5	90.7	88.93	1.0	-0.1	1.6	87.95	425064	6732276	842
	424988	6732232	856	90.2	63.5	81.2	91.6	90.20	1.1	-0.2	1.6	89.14	425068	6732272	842
	424988	6732232	856	86.94	63.2	81.3	91.1	86.94	1.1	-0.2	1.6	85.94	425065	6732271	842
	424988	6732232	856	84.75	64	80.1	90.5	84.75	1.1	-0.2	1.6	83.49	425063	6732269	841
	424988	6732232	856	79.5	63.7	79.9	90.8	79.50	1.1	-0.2	1.6	78.27	425058	6732267	841
	424988	6732232	856	71.61	66.5	78.8	91.6	71.61	1.2	-0.2	1.6	70.25	425052	6732260	841
	424988	6732232	856	65.56	71.8	78.4	91.7	65.56	1.3	-0.2	1.6	64.22	425049	6732252	842
	424988	6732232	856	61.71	77.3	78.1	91.3	61.71	1.3	-0.2	1.6	60.38	425047	6732245	843
	424988	6732232	856	63.73	85	78.2	92.4	63.73	1.5	-0.2	1.6	62.38	425050	6732237	842
	424988	6732232	856	69.82	101.6	79.6	92.3	69.82	1.8	-0.2	1.6	68.67	425055	6732218	843
	424988	6732232	856	76.73	112.8	80.2	91.5	76.73	2.0	-0.2	1.6	75.61	425058	6732203	842
	424988	6732232	856	88.35	120.4	83.1	91.2	88.35	2.1	-0.1	1.6	87.71	425064	6732188	845
	424988	6732232	856	93.38	126.8	82.7	91.4	93.38	2.2	-0.1	1.6	92.62	425062	6732177	843
	424988	6732232	856	109.52	140.6	85.1	90.9	109.52	2.5	-0.1	1.6	109.12	425057	6732148	846
	424988	6732232	856	112.63	144.3	85	91.3	112.63	2.5	-0.1	1.6	112.20	425053	6732141	846
St2c T9	424990	6732224	851	76.33	204.3	86.6	88.4	76.33	3.6	-0.1	1.5	76.20	424959	6732155	846
	424990	6732224	851	75.56	202.2	87.2	89.8	75.56	3.5	0.0	1.6	75.47	424961	6732154	847
	424990	6732224	851	75.71	201	87.6	90.6	75.71	3.5	0.0	1.6	75.64	424963	6732153	847
	424990	6732224	851	75.43	197.1	88.6	90.4	75.43	3.4	0.0	1.6	75.41	424968	6732152	849
	424990	6732224	851	74.98	195.2	89.2	90.2	74.98	3.4	0.0	1.6	74.97	424970	6732152	849
	424990	6732224	851	74.97	194.1	90	90.8	74.97	3.4	0.0	1.6	74.97	424972	6732151	850
	424990	6732224	851	74.96	188.1	89.1	90.4	74.96	3.3	0.0	1.6	74.95	424979	6732150	849
	424990	6732224	851	77.26	181.6	87.9	90.4	77.26	3.2	0.0	1.6	77.21	424988	6732147	848
	424990	6732224	851	78.41	179.3	87.5	90.7	78.41	3.1	0.0	1.6	78.34	424991	6732146	847
	424990	6732224	851	79.74	176.4	86.5	90.6	79.74	3.1	-0.1	1.6	79.59	424995	6732145	845
	424990	6732224	851	80.98	173	86.4	90.6	80.98	3.0	-0.1	1.6	80.82	425000	6732144	845
	424990	6732224	851	84.17	170.7	85.8	90.2	84.17	3.0	-0.1	1.6	83.94	425004	6732141	844
	424990	6732224	851	86.16	167.1	85.9	90.5	86.16	2.9	-0.1	1.6	85.94	425009	6732140	844
	424990	6732224	851	87.45	163.5	85.7	90.3	87.45	2.9	-0.1	1.6	87.20	425015	6732140	844
	424990	6732224	851	88.31	160.5	85.2	90.6	88.31	2.8	-0.1	1.6	88.00	425019	6732141	843
	424990	6732224	851	91.22	158.5	85.5	90.6	91.22	2.8	-0.1	1.6	90.94	425023	6732139	843
	424990	6732224	851	94.13	156.8	85.5	90.8	94.13	2.7	-0.1	1.6	93.84	425027	6732138	843
	424990	6732224	851	97.5	154.4	85.2	90.7	97.50	2.7	-0.1	1.6	97.16	425032	6732136	842
	424990	6732224	851	102.01	151.3	85.3	91	102.01	2.6	-0.1	1.6	101.67	425039	6732135	842

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
T11	424990	6732224	851	76.14	118.7	82.9	90.8	76.14	2.1	-0.1	1.6	75.56	425056	6732188	841
	424990	6732224	851	70.69	118.9	82.9	90.9	70.69	2.1	-0.1	1.6	70.15	425051	6732190	842
	424990	6732224	851	68.04	119.1	82	91.1	68.04	2.1	-0.1	1.6	67.38	425049	6732191	841
	424990	6732224	851	65.04	119.9	80.8	90.8	65.04	2.1	-0.2	1.6	64.20	425046	6732192	840
	424990	6732224	851	61.2	119	80.8	91.5	61.20	2.1	-0.2	1.6	60.41	425043	6732195	841
	424990	6732224	851	56.3	117.7	79.5	91	56.30	2.1	-0.2	1.6	55.36	425039	6732198	840
	424990	6732224	851	51.71	118.5	79.7	91	51.71	2.1	-0.2	1.6	50.88	425035	6732200	841
	424990	6732224	851	47.46	119	78.4	91	47.46	2.1	-0.2	1.6	46.49	425031	6732201	841
	424990	6732224	851	42.94	122	77.8	91.1	42.94	2.1	-0.2	1.6	41.97	425026	6732202	841
	424990	6732224	851	34.85	129.4	77.9	91	34.85	2.3	-0.2	1.6	34.08	425016	6732202	843
	424990	6732224	851	30.39	134.8	78.1	90.5	30.39	2.4	-0.2	1.6	29.74	425011	6732203	844
	424990	6732224	851	26.22	141.4	80.7	90.7	26.22	2.5	-0.2	1.6	25.88	425006	6732204	846
	424990	6732224	851	22.42	152.2	82.1	90.8	22.42	2.7	-0.1	1.6	22.21	425000	6732204	847
	424990	6732224	851	19.43	165.9	82.1	90.4	19.43	2.9	-0.1	1.6	19.25	424995	6732205	848
	424990	6732224	851	18.22	184.1	81.1	90.2	18.22	3.2	-0.2	1.6	18.00	424989	6732206	848
	424990	6732224	851	18.07	200.1	80.4	91.6	18.07	3.5	-0.2	1.6	17.82	424984	6732207	847
	424990	6732224	851	19.6	214.9	80.9	91.4	19.60	3.8	-0.2	1.6	19.35	424979	6732208	847
	424990	6732224	851	22.13	226.8	80.4	91.4	22.13	4.0	-0.2	1.6	21.82	424974	6732209	847
	424990	6732224	851	24.11	235.9	79.5	91.2	24.11	4.1	-0.2	1.6	23.71	424970	6732211	846
	424990	6732224	851	26.54	239.4	78.1	91.3	26.54	4.2	-0.2	1.6	25.97	424968	6732211	845
	424990	6732224	851	26.75	239.2	78.3	90.8	26.75	4.2	-0.2	1.6	26.19	424968	6732211	845
	424990	6732224	851	28.73	243.3	77.4	91.2	28.73	4.2	-0.2	1.6	28.04	424965	6732211	844
	424990	6732224	851	29.98	245	76.5	91.1	29.98	4.3	-0.2	1.6	29.15	424964	6732212	843
	424990	6732224	851	31.42	249.1	75.9	91.2	31.42	4.3	-0.2	1.6	30.47	424962	6732213	843
	424990	6732224	851	38.57	256.2	77.7	91.3	38.57	4.5	-0.2	1.6	37.68	424953	6732215	842
T13	424990	6732224	851	7.08	5.4	104.6	90.8	7.08	0.1	0.3	1.6	6.85	424991	6732231	852
	424990	6732224	851	8.76	38.5	100.1	90.5	8.76	0.7	0.2	1.6	8.62	424995	6732231	852
	424990	6732224	851	11.6	56	97.2	90.2	11.60	1.0	0.1	1.6	11.51	425000	6732230	852
	424990	6732224	851	14.14	66.1	92.5	90.9	14.14	1.2	0.0	1.6	14.13	425003	6732230	851
	424990	6732224	851	17.64	72.6	90.2	91	17.64	1.3	0.0	1.6	17.64	425007	6732229	850
	424990	6732224	851	21.24	77.7	88.5	90.9	21.24	1.4	0.0	1.6	21.23	425011	6732229	850
	424990	6732224	851	24.34	82.9	86.3	91.1	24.34	1.4	-0.1	1.6	24.29	425014	6732227	849
	424990	6732224	851	30.48	88	84.9	91.2	30.48	1.5	-0.1	1.6	30.36	425020	6732225	848
	424990	6732224	851	36.5	88.4	83.5	90.9	36.50	1.5	-0.1	1.6	36.27	425026	6732225	846
	424990	6732224	851	41.13	89.9	83.4	91	41.13	1.6	-0.1	1.6	40.86	425031	6732224	846
	424990	6732224	851	40.08	95	79.4	91.6	40.08	1.7	-0.2	1.6	39.40	425029	6732221	843
	424990	6732224	851	43.66	96.9	78.5	91.4	43.66	1.7	-0.2	1.6	42.78	425032	6732219	842
	424990	6732224	851	47.5	98.3	78.4	90.9	47.50	1.7	-0.2	1.6	46.53	425036	6732217	841
	424990	6732224	851	60.62	96.4	79	90.7	60.62	1.7	-0.2	1.6	59.51	425049	6732217	839
	424990	6732224	851	65.14	96	79.4	91.3	65.14	1.7	-0.2	1.6	64.03	425054	6732217	838
	424990	6732224	851	69.23	98.6	80.8	91.3	69.23	1.7	-0.2	1.6	68.34	425058	6732214	839
St6 T21	424872	6732422	859	27.05	211	79.4	91.1	27.05	3.7	-0.2	1.6	26.59	424858	6732399	853
	424872	6732422	859	23.29	208.7	82.7	90.7	23.29	3.6	-0.1	1.6	23.10	424861	6732402	855
	424872	6732422	859	18.4	189.6	80.1	90.8	18.40	3.3	-0.2	1.6	18.13	424869	6732404	855
	424872	6732422	859	16.96	169.8	82.4	90.7	16.96	3.0	-0.1	1.6	16.81	424875	6732405	856
	424872	6732422	859	13.14	141.9	94.3	91.1	13.14	2.5	0.1	1.6	13.10	424880	6732412	859
	424872	6732422	859	14.6	115.2	92.5	90.5	14.60	2.0	0.0	1.6	14.59	424885	6732416	859
	424872	6732422	859	17.12	97	97.6	90.6	17.12	1.7	0.1	1.6	16.97	424889	6732420	861
	424872	6732422	859	20.59	80.9	95.1	91.1	20.59	1.4	0.1	1.6	20.51	424892	6732425	860
	424872	6732422	859	28.34	62.5	99.6	91.1	28.34	1.1	0.2	1.6	27.94	424897	6732435	863
	424872	6732422	859	28.55	66.3	96.2	90.8	28.55	1.2	0.1	1.6	28.38	424898	6732433	861
	424872	6732422	859	38.35	68.4	96.3	90.6	38.35	1.2	0.1	1.6	38.12	424907	6732436	863
	424872	6732422	859	44.69	54.2	96.3	90.4	44.69	0.9	0.1	1.6	44.42	424908	6732448	863
St3 T15	424983	6732279	852	76.91	66.6	76.9	91.1	76.91	1.2	-0.2	1.6	74.91	425052	6732309	834
	424983	6732279	852	63.77	60.9	76.9	91.2	63.77	1.1	-0.2	1.6	62.11	425037	6732309	837
	424983	6732279	852	49.14	45.4	76.3	91.1	49.14	0.8	-0.2	1.6	47.74	425017	6732313	840
	424983	6732279	852	49.53	45.1	75.8	91	49.53	0.8	-0.2	1.6	48.02	425017	6732313	839
	424983	6732279	852	37.82	15.5	83.4	91.1	37.82	0.3	-0.1	1.6	37.57	424993	6732315	847
	424983	6732279	852	36.16	356	90	89.9	36.16	6.2	0.0	1.6	36.16	424980	6732315	851
	424983	6732279	852	58.7	296.5	75.3	91.1	58.70	5.2	-0.3	1.6	56.78	424932	6732304	836
St3 T17	424983	6732279	852	74.67	299.9	81.1	91.2	74.67	5.2	-0.2	1.6	73.77	424919	6732316	840
	424983	6732279	852	73.16	302.8	79.9	90.8	73.16	5.3	-0.2	1.6	72.03	424922	6732318	839
	424983	6732279	852	78.01	305.7	79.4	90.6	78.01	5.3	-0.2	1.6	76.68	424921	6732324	837
	424983	6732279	852	68.74	306.3	79.1	91	68.74	5.4	-0.2	1.6	67.50	424930	6732321	838
	424983	6732279	852	66.77	308.5	78.5	90.8	66.77	5.4	-0.2	1.6	65.43	424932	6732320	838
	424983	6732279	852	65	311.5	78.4	91.1	65.00	5.4	-0.2	1.6	63.67	424935	6732321	838
	424983	6732279	852	65.36	312	77.3	91.3	65.36	5.4	-0.2	1.6	63.76	424936	6732322	837
	424983	6732279	852	72.14	310.1	79.8	91	72.14	5.4	-0.2	1.6	71.00	424929	6732325	839
	424983	6732279	852	70.04	313.7	80.3	91.3	70.04	5.5	-0.2	1.6	69.04	424933	6732327	840
	424983	6732279	852	68.05	315.2	81.4	90.8	68.05	5.5	-0.2	1.6	67.28	424936	6732327	841
	424983	6732279	852	65.91	317.9	82.3	91.1	65.91	5.5	-0.1	1.6	65.32	424939	6732327	843
	424983	6732279	852	64.38	321.5	82.3	91.1	64.38	5.6	-0.1	1.6	63.80	424943	6732329	843
	424983	6732279	852	62.69	324.7	83.6	90.8	62.69	5.7	-0.1	1.6	62.30	424947	6732330	844
	424983	6732279	852	60.97	330.4	85.6	90.5	60.97	5.8	-0.1	1.6	60.79	424953	6732332	847
	424983	6732279	852	60.18	331.9	87.8	90.7	60.18	5.8	0.0	1.6	60.14	424955	6732332	849
	424983	6732279	852	60.73	335.8	87.8	90.6	60.73	5.9	0.0	1.6	60.69	424958	6732334	849
	424983	6732279	852	61.18	340.8	88	90.8	61.18	5.9	0.0	1.6	61.14	424963	6732337	849
	424983	6732279	852	63.33	343	88.3	91.1	63.33	6.0	0.0	1.6	63.30	424964	6732340	849
	424983	6732279	852	63.66	345.3	88.5	90.5	63.66	6.0	0.0	1.6	63.64	424967	6732341	850
	424983	6732279	852	65.38	346.5	89.6	90.8	65.38	6.0	0.0	1.6	65.38	424968	6732343	851
	424983	6732279	852	66.21	349.2	89.5	90.8	66.21	6.1	0.0	1.6	66.21	424971	6732344	851
	424983	6732279	852	66.36	349.6	89.4	90.9	66.36	6.1	0.0	1.6	66.36	424971	6732344	851
	424983	6732279	852	68.72	350.3	89.6	91.3	68.72	6.1	0.0	1.6	68.72	424971	6732347	851
	424983	6732279	852	72.34	354.9	88.7	90.9	72.34	6.2	0.0	1.6	72.32	424977	6732351	850

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St4a	424997	6732323	854	54.37	9.7	82.5	91.4	54.37	0.2	-0.1	1.6	53.90	425006	6732376	846
	424997	6732323	854	33.15	342.7	83.6	90.9	33.15	6.0	-0.1	1.6	32.94	424987	6732354	850
	424997	6732323	854	31.75	349.6	81.3	90.7	31.75	6.1	-0.2	1.6	31.38	424991	6732354	849
	424997	6732323	854	33.67	358.5	78.6	90.7	33.87	6.3	-0.2	1.6	33.20	424996	6732356	847
	424997	6732323	854	34.71	9.2	74.6	90.5	34.71	0.2	-0.3	1.6	33.46	425002	6732356	844
	424997	6732323	854	37.34	16.6	73.3	90.5	37.34	0.3	-0.3	1.6	35.77	425007	6732357	843
	424997	6732323	854	41.22	21.4	71.5	91.1	41.22	0.4	-0.3	1.6	39.09	425011	6732359	840
	424997	6732323	854	44.8	26.9	70.2	91	44.80	0.5	-0.3	1.6	42.15	425016	6732361	838
	424997	6732323	854	45.63	33.4	70.6	91	45.63	0.6	-0.3	1.6	43.04	425021	6732359	838
	424997	6732323	854	49.48	35.9	70	91.3	49.48	0.6	-0.3	1.6	46.50	425024	6732361	836
	424997	6732323	854	53.77	38.5	70.5	91	53.77	0.7	-0.3	1.6	50.69	425029	6732363	835
	424997	6732323	854	59.7	41.3	69.5	91.6	59.70	0.7	-0.4	1.6	55.92	425034	6732365	832
	424997	6732323	854	62.03	43.4	68.8	92.6	62.03	0.8	-0.4	1.6	57.83	425037	6732365	831
St5 T19	424945	6732405	855	72.14	94.8	69.7	91.2	72.14	1.7	-0.4	1.6	67.66	425012	6732399	829
	424945	6732405	855	64.83	91.7	70.5	90.6	64.83	1.6	-0.3	1.6	61.11	425006	6732403	833
	424945	6732405	855	56.56	91.5	70.4	91.2	56.56	1.6	-0.3	1.6	53.28	424998	6732404	835
	424945	6732405	855	47.69	90.1	70.9	91.1	47.69	1.6	-0.3	1.6	45.06	424990	6732405	839
	424945	6732405	855	38.58	92.3	71.9	91	38.58	1.6	-0.3	1.6	36.67	424982	6732404	842
	424945	6732405	855	30.52	96.7	73.1	91.1	30.52	1.7	-0.3	1.6	29.20	424974	6732402	845
	424945	6732405	855	18.16	107.1	77.1	91	18.16	1.9	-0.2	1.6	17.70	424962	6732400	850
	424945	6732405	855	12.17	146.3	90.4	90.4	12.17	2.6	0.0	1.6	12.17	424952	6732395	854
	424945	6732405	855	18.24	208	100.8	90.9	18.24	3.6	0.2	1.6	17.92	424937	6732389	858
	424945	6732405	855	23.19	218.7	93.7	91.1	23.19	3.8	0.1	1.6	23.14	424931	6732387	856
	424945	6732405	855	27.27	222.6	95.3	90.5	27.27	3.9	0.1	1.6	27.15	424927	6732385	857
	424945	6732405	855	31.84	227.5	91.3	90.8	31.84	4.0	0.0	1.6	31.83	424922	6732383	855
	424945	6732405	855	13.85	228.4	89.4	90.9	13.85	4.0	0.0	1.6	13.85	424935	6732396	854
St6 T19	424872	6732422	859	62.55	152.2	93.2	90.5	62.55	2.7	0.1	1.6	62.45	424901	6732367	862
	424872	6732422	859	62.97	152.6	90.2	90.6	62.97	2.7	0.0	1.6	62.97	424901	6732366	859
	424872	6732422	859	64.19	152.2	87.4	90.9	64.19	2.7	0.0	1.6	64.12	424902	6732365	855
	424872	6732422	859	66.5	162.7	85.6	90.9	66.50	2.8	-0.1	1.6	66.32	424892	6732359	853
	424872	6732422	859	68.39	170.4	84	90.8	68.39	3.0	-0.1	1.6	68.02	424883	6732355	851
	424872	6732422	859	76.33	182	80.5	90.9	76.33	3.2	-0.2	1.6	75.28	424869	6732347	846
St7 T24	424646	6732576	866	103.91	119.4	80.2	91.3	103.91	2.1	-0.2	1.6	102.39	424735	6732526	848
	424646	6732576	866	105.51	110.3	80.9	91.8	105.51	1.9	-0.2	1.6	104.18	424744	6732540	849
	424646	6732576	866	106.4	105.7	82	91.2	106.40	1.8	-0.1	1.6	105.36	424747	6732547	851
	424646	6732576	866	107.4	103	83.1	91	107.40	1.8	-0.1	1.6	106.62	424750	6732552	852
	424646	6732576	866	110.28	101.1	83.1	91.3	110.28	1.8	-0.1	1.6	109.48	424753	6732555	852
	424646	6732576	866	114.21	99	83.7	91.6	114.21	1.7	-0.1	1.6	113.52	424758	6732558	853
	424646	6732576	866	115.31	93.9	82.3	91.7	115.31	1.6	-0.1	1.6	114.27	424760	6732558	850
	424646	6732576	866	117.83	90.1	80.9	91.5	117.83	1.6	-0.2	1.6	116.35	424762	6732576	847
	424646	6732576	866	113.44	83.7	78.1	91.9	113.44	1.5	-0.2	1.6	111.00	424756	6732588	842
	424646	6732576	866	116.54	80.9	77.1	91.7	116.54	1.4	-0.2	1.6	113.60	424758	6732594	839
	424646	6732576	866	118.78	75.8	74.9	91.3	118.78	1.3	-0.3	1.6	114.68	424757	6732604	834
	424646	6732576	866	121.92	74.5	74.2	91.3	121.92	1.3	-0.3	1.6	117.31	424759	6732607	832
	424646	6732576	866	139.67	132.7	82.1	91.3	139.87	2.3	-0.1	1.6	138.54	424748	6732482	846
	424646	6732576	866	133.97	130.4	83.1	91.3	133.97	2.3	-0.1	1.6	133.00	424747	6732490	849
	424646	6732576	866	151.07	119.2	86	90.7	151.07	2.1	-0.1	1.6	150.70	424778	6732502	855
St7 T25	424646	6732576	866	151.82	114.3	88.2	91.6	151.82	2.0	0.0	1.6	151.75	424784	6732514	861
	424646	6732576	866	153.86	110.8	86.7	91.5	153.86	1.9	-0.1	1.6	153.60	424790	6732521	856
	424646	6732576	866	144.2	106	85.5	90.8	144.20	1.9	-0.1	1.6	143.76	424784	6732536	854
	424646	6732576	866	148.63	103.1	84.5	91.7	148.63	1.8	-0.1	1.6	147.95	424790	6732542	851
St8 T26	424646	6732601	862	77.99	160.8	80.2	91.7	77.99	2.8	-0.2	1.6	76.85	424671	6732528	848
	424646	6732601	862	74.62	156.4	79.8	91.7	74.62	2.7	-0.2	1.6	73.44	424675	6732534	848
	424646	6732601	862	60.98	152.9	80.2	91.6	60.98	2.7	-0.2	1.6	60.09	424673	6732548	851
	424646	6732601	862	60.02	148.2	80.2	91.6	60.02	2.6	-0.2	1.6	59.14	424677	6732551	851
	424646	6732601	862	51.9	145.1	80.2	91.6	51.90	2.5	-0.2	1.6	51.14	424675	6732559	853
	424646	6732601	862	41.76	141.1	81.2	91.8	41.76	2.5	-0.2	1.6	41.27	424672	6732569	855
	424646	6732601	862	44.64	135.8	81.2	91.5	44.64	2.4	-0.2	1.6	44.11	424677	6732569	855
	424646	6732601	862	43.56	130.4	79.4	91.6	43.56	2.3	-0.2	1.6	42.82	424679	6732573	853
	424646	6732601	862	38.1	121.7	76	92	38.10	2.1	-0.2	1.6	36.97	424677	6732582	852
	424646	6732601	862	38.94	114.3	75.4	91.6	38.94	2.0	-0.3	1.6	37.68	424680	6732585	852
	424646	6732601	862	36.16	91.7	75.7	91.7	36.16	1.6	-0.2	1.6	35.04	424681	6732600	852
	424646	6732601	862	37.81	85.9	75.1	91.6	37.81	1.5	-0.3	1.6	36.54	424682	6732604	852
	424646	6732601	862	40.48	80	73.9	91.7	40.48	1.4	-0.3	1.6	38.89	424684	6732606	850
St9 T28	424570	6732592	861	75.32	129.6	83.8	91.9	75.32	2.3	-0.1	1.6	74.88	424628	6732544	852
	424570	6732592	861	72.67	126.9	83.9	91.9	72.67	2.2	-0.1	1.6	72.26	424628	6732549	853
	424570	6732592	861	78.15	122.2	86.3	91.7	78.15	2.1	-0.1	1.6	77.99	424636	6732550	855
	424570	6732592	861	71.92	116.2	86.7	91.6	71.92	2.0	-0.1	1.6	71.80	424634	6732560	856
	424570	6732592	861	70.75	114.6	86.8	91.5	70.75	2.0	-0.1	1.6	70.64	424634	6732563	856
	424570	6732592	861	67.48	112.6	87	91.5	67.48	2.0	-0.1	1.6	67.39	424632	6732566	857
	424570	6732592	861	69.26	110.1	88.2	91.4	69.26	1.9	0.0	1.6	69.23	424635	6732568	858
	424570	6732592	861	69.01	108.1	88.3	91.4	69.01	1.9	0.0	1.6	68.96	424636	6732571	858
	424570	6732592	861	63.48	104.7	88.4	91.2	63.48	1.8	0.0	1.6	63.46	424631	6732576	859
	424570	6732592	861	62.68	101.1	91.5	91.2	62.68	1.8	0.0	1.6	62.66	424631	6732580	862
	424570	6732592	861	63.48	96.4	88.2	91.5	63.48	1.7	0.0	1.6	63.45	424633	6732585	858
	424570	6732592	861	75.72	90.7	87.3	91.6	75.72	1.6	0.0	1.6	75.64	424646	6732591	857
	424570	6732592	861	73.95	88.7	86.9	91.5	73.95	1.5	-0.1	1.6	73.84	424644	6732594	856

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St9 T29	424570	6732592	861	56.92	175	76.6	91.7	56.92	3.1	-0.2	1.6	55.37	424575	6732537	847
	424570	6732592	861	32.07	167.3	75.7	91.4	32.07	2.9	-0.2	1.6	31.08	424577	6732562	852
	424570	6732592	861	26.72	152.7	81.2	91.7	26.72	2.7	-0.2	1.6	26.41	424582	6732569	856
	424570	6732592	861	25	127.4	77.5	90.9	25.00	2.2	-0.2	1.6	24.41	424589	6732577	855
	424570	6732592	861	25.62	120.9	77.8	91.6	25.62	2.1	-0.2	1.6	25.04	424591	6732579	855
	424570	6732592	861	25.34	119.4	79.4	91.7	25.34	2.1	-0.2	1.6	24.91	424592	6732580	856
	424570	6732592	861	25.4	108.5	79.8	91.9	25.40	1.9	-0.2	1.6	25.00	424594	6732584	856
	424570	6732592	861	26.39	106.4	80.7	91.6	26.39	1.9	-0.2	1.6	26.04	424595	6732585	856
	424570	6732592	861	26.57	104	80.7	91.4	26.57	1.8	-0.2	1.6	26.22	424595	6732586	856
	424570	6732592	861	28.92	96.7	81.7	91.5	28.92	1.7	-0.1	1.6	28.62	424598	6732589	856
	424570	6732592	861	34.85	93.2	85.1	91.9	34.85	1.6	-0.1	1.6	34.72	424605	6732590	857
	424570	6732592	861	33.37	88.1	86.3	91.6	33.37	1.5	-0.1	1.6	33.30	424603	6732593	858
	424570	6732592	861	34.7	75	90.2	91.7	34.70	1.3	0.0	1.6	34.70	424604	6732601	860
	424570	6732592	861	39.31	20.1	70.4	91.6	39.31	0.4	-0.3	1.6	37.03	424583	6732627	847
St10 R31	424450	6732563	864	121.19	79.8	89.6	91.2	121.19	1.4	0.0	1.6	121.19	424569	6732584	863
	424450	6732563	864	83.67	76.8	90.1	91.3	83.67	1.3	0.0	1.6	83.67	424531	6732582	863
	424450	6732563	864	84.81	75.4	90.3	91.5	84.81	1.3	0.0	1.6	84.81	424532	6732584	864
	424450	6732563	864	56.68	60.2	89.1	91.9	56.68	1.1	0.0	1.6	56.67	424499	6732591	862
	424450	6732563	864	55.23	54.3	87.6	91.4	55.23	0.9	0.0	1.6	55.19	424495	6732595	861
	424450	6732563	864	56.38	50.9	88	91.6	56.38	0.9	0.0	1.6	56.35	424494	6732599	861
	424450	6732563	864	60.22	49.3	88.5	91.6	60.22	0.9	0.0	1.6	60.20	424496	6732602	862
	424450	6732563	864	53.28	35.5	87.6	91.7	53.28	0.6	0.0	1.6	53.23	424481	6732606	861
	424450	6732563	864	55.23	33	88.1	91.8	55.23	0.6	0.0	1.6	55.20	424480	6732609	862
	424450	6732563	864	40.32	2.4	84.7	91.4	40.32	0.0	-0.1	1.6	40.15	424452	6732603	860
	424450	6732563	864	43.68	1.6	86.2	91	43.68	0.0	-0.1	1.6	43.58	424451	6732607	860
	424450	6732563	864	41.17	352.9	89.2	91.5	41.17	6.2	0.0	1.6	41.17	424445	6732604	863
	424450	6732563	864	42.96	344.2	86.6	91.4	42.96	6.0	-0.1	1.6	42.88	424436	6732604	861
	424450	6732563	864	48.71	341.8	87.4	91.1	48.71	6.0	0.0	1.6	48.66	424435	6732609	861
	424450	6732563	864	48.3	333.8	88.2	91.3	48.30	5.8	0.0	1.6	48.28	424429	6732606	862
	424450	6732563	864	53.15	329.8	89.5	91.3	53.15	5.8	0.0	1.6	53.15	424423	6732609	863
	424450	6732563	864	56.27	317.2	91	91.4	56.27	5.5	0.0	1.6	56.26	424412	6732604	864
	424450	6732563	864	63.42	314.8	91.8	91.6	63.42	5.5	0.0	1.6	63.39	424405	6732608	865
	424450	6732563	864	57.08	307.5	89.4	91.5	57.08	5.4	0.0	1.6	57.08	424405	6732598	863
	424450	6732563	864	61.53	303.4	89.3	91.1	61.53	5.3	0.0	1.6	61.53	424399	6732597	863
	424450	6732563	864	62.7	298.2	91.1	91.6	62.70	5.2	0.0	1.6	62.69	424395	6732593	865
	424450	6732563	864	64.41	295.2	92.3	91.1	64.41	5.2	0.0	1.6	64.36	424392	6732590	866
	424450	6732563	864	71.01	293	93.6	91.2	71.01	5.1	0.1	1.6	70.88	424385	6732591	868
	424450	6732563	864	76.39	289.9	91.4	91.1	76.39	5.1	0.0	1.6	76.37	424378	6732589	865
	424450	6732563	864	77.57	288	91.8	91	77.57	5.0	0.0	1.6	77.53	424376	6732587	866
	424450	6732563	864	62.91	281	90	91	62.91	4.9	0.0	1.6	62.91	424369	6732579	863
	424450	6732563	864	110.55	273.4	89.1	91.3	110.55	4.8	0.0	1.6	110.54	424340	6732570	862
	424450	6732563	864	110.64	269.7	90.2	91	110.64	4.7	0.0	1.6	110.64	424339	6732562	864
	424450	6732563	864	149.56	267.9	88.7	91.1	149.56	4.7	0.0	1.6	149.52	424301	6732558	860
	424450	6732563	864	151.26	264.6	89.7	90.9	151.26	4.6	0.0	1.6	151.26	424299	6732549	863
	424450	6732563	864	143.74	263.9	89.2	90.9	143.74	4.6	0.0	1.6	143.73	424307	6732548	861
St10 T32	424450	6732563	864	65.2	150.2	76.1	91.6	65.20	2.6	-0.2	1.6	63.29	424481	6732508	848
	424450	6732563	864	56.15	142.8	74.7	91.5	56.15	2.5	-0.3	1.6	54.16	424483	6732520	849
	424450	6732563	864	42.72	132.6	74.5	91.5	42.72	2.3	-0.3	1.6	41.17	424480	6732535	852
	424450	6732563	864	41.78	130.6	76	91.4	41.78	2.3	-0.2	1.6	40.54	424481	6732537	853
	424450	6732563	864	48.64	126.1	76.7	91.7	48.64	2.2	-0.2	1.6	47.34	424488	6732535	852
	424450	6732563	864	46.75	125.1	76.7	91.3	46.75	2.2	-0.2	1.6	45.50	424487	6732537	853
	424450	6732563	864	45.11	121.1	77.6	91.5	45.11	2.1	-0.2	1.6	44.06	424488	6732540	854
	424450	6732563	864	41.53	119.1	77.8	91.6	41.53	2.1	-0.2	1.6	40.59	424485	6732543	855
	424450	6732563	864	41.36	116.5	79.8	91.5	41.36	2.0	-0.2	1.6	40.71	424486	6732545	856
	424450	6732563	864	39.36	114.6	79.6	91.7	39.36	2.0	-0.2	1.6	38.71	424485	6732547	856
	424450	6732563	864	38.07	107.9	81.5	91.4	38.07	1.9	-0.1	1.6	37.65	424486	6732551	858
	424450	6732563	864	37.26	100.3	83.4	91.3	37.26	1.8	-0.1	1.6	37.01	424486	6732556	859
	424450	6732563	864	37.98	94.3	84.9	91.2	37.98	1.6	-0.1	1.6	37.83	424488	6732560	860
	424450	6732563	864	40.62	84.9	85.7	91.6	40.62	1.5	-0.1	1.6	40.71	424491	6732567	860
	424450	6732563	864	43.81	78.6	86.3	91.7	43.81	1.4	-0.1	1.6	43.72	424493	6732572	861
	424450	6732563	864	54.64	55	87.9	91.2	54.64	1.0	0.0	1.6	54.60	424495	6732594	861
	424450	6732563	864	59.99	49.4	88.7	91.3	59.99	0.9	0.0	1.6	59.97	424496	6732602	862
	424450	6732563	864	61.24	43.3	90.5	91.4	61.24	0.8	0.0	1.6	61.24	424492	6732606	864
	424450	6732563	864	59.19	40.9	87.9	91.5	59.19	0.7	0.0	1.6	59.16	424489	6732606	861
St10 T33	424450	6732563	864	41.21	164.3	73.4	91.6	41.21	2.9	-0.3	1.6	39.49	424461	6732525	852
	424450	6732563	864	40.14	161.5	72.8	91.4	40.14	2.8	-0.3	1.6	38.34	424462	6732527	851
	424450	6732563	864	35.94	154.9	71.9	91.7	35.94	2.7	-0.3	1.6	34.16	424464	6732532	852
	424450	6732563	864	18.81	113.2	72.4	91.5	18.81	2.0	-0.3	1.6	17.93	424466	6732556	858
	424450	6732563	864	22.79	54.5	78.4	91.5	22.79	1.0	-0.2	1.6	22.32	424468	6732576	859
	424450	6732563	864	31.69	20.5	81.7	91	31.69	0.4	-0.1	1.6	31.36	424481	6732592	859
	424450	6732563	864	34.41	19.4	82.9	91.2	34.41	0.3	-0.1	1.6	34.15	424481	6732595	859
	424450	6732563	864	34.87	11.5	83.3	91.4	34.87	0.2	-0.1	1.6	34.63	424457	6732597	859
	424450	6732563	864	41.63	12.6	84.8	91.2	41.63	0.2	-0.1	1.6	41.46	424459	6732603	860
	424450	6732563	864	48.05	7.6	85.6	91	48.05	0.1	-0.1	1.6	47.91	424456	6732610	860
St11 T35	424474	6732617	862	30.07	119.7	100.3	91.4	30.07	2.1	0.2	1.6	29.59	424500	6732602	867
	424474	6732617	862	26.58	113.5	94.6	91.5	26.58	2.0	0.1	1.6	26.49	424498	6732606	863
	424474	6732617	862	23.31	107.6	92.7	91.4	23.31	1.9	0.0	1.6	23.28	424496	6732610	862
	424474	6732617	862	23.9	103.3	91.6	91.5	23.90	1.8	0.0	1.6	23.89	424497	6732612	862
	424474	6732617	862	25.69	90.1	84.9	91.5	25.69	1.6	-0.1	1.6	25.59	424500	6732617	859
	424474	6732617	862	26.5	86.9	85.7	91.6	26.50	1.5	-0.1	1.6	26.43	424500	6732618	859
	424474	6732617	862	26.57	80.7	80.8	91.8	26.57	1.4	-0.2	1.6	26.23	424500	6732621	857
	424474	6732617	862	25.3	75.9	82.7	91.6	25.30	1.3	-0.1	1.6	25.09	424498	6732623	858
	424474	6732617	862	25.62	73.4	80.7	90.3	25.62	1.3	-0.2	1.6	25.28	424498	6732624	857
	424474	6732617	862	27.64	72.1	77.8	90.4	27.64	1.3	-0.2	1.6	27.02	424500	6732625	856
	424474	6732617	862	33.86	68.6	76.3	90.2	33.86	1.2	-0.2	1.6	32.90	424505	6732629	853
	424474	6732617	862	34.22	66.3	77.1	90.2	34.22	1.2	-0.2	1.6	33.36	424505	6732630	854
	424474	6732617	862	44.63	54.7	72.6	90.6	44.63	1.0	-0.3	1.6	42.59	424509	6732642	848
	424474	6732617	862	38.16	51.6	73	90	38.16	0.9	-0.3	1.6	36.49	424503	6732640	850
	424474	6732617	862	41.32	48.9	72.4	89.9	41.32	0.9	-0.3	1.6	39.39	424504	6732643	849
	424474	6732617	862	40.53	47.4	72.8	89.7	40.53	0.8	-0.3	1.6	38.72	424502	6732643	849
	424474	6732617	862	61.91	45.7	70.6	89.8	61.91	0.8	-0.3	1.6	58.39	424516	6732656	841
	424474	6732617	862	75.08	43.3	70.7	89.6	75.08	0.8	-0.3	1.6	70.86	424523	6732669	837

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St12 T36	424465	6732619	860	23.21	228.7	102	89.9	23.21	4.0	0.2	1.6	22.70	424448	6732604	864
	424465	6732619	860	24.77	238.1	95.9	90.2	24.77	4.2	0.1	1.6	24.64	424444	6732606	862
	424465	6732619	860	21.24	246.3	92.9	90.2	21.24	4.3	0.1	1.6	21.21	424446	6732610	860
	424465	6732619	860	17.23	258.8	89.3	90.3	17.23	4.5	0.0	1.6	17.23	424448	6732616	859
	424465	6732619	860	18.4	263.7	88.5	90.1	18.40	4.6	0.0	1.6	18.39	424447	6732617	859
	424465	6732619	860	18.98	268.3	87.2	90.3	18.98	4.7	0.0	1.6	18.96	424446	6732618	858
	424465	6732619	860	24.72	288.8	81.4	90	24.72	5.0	-0.2	1.6	24.44	424442	6732627	856
	424465	6732619	860	25.03	311.9	74	89.9	25.03	5.4	-0.3	1.6	24.06	424447	6732635	852
	424465	6732619	860	27.48	316.1	74.5	90.4	27.48	5.5	-0.3	1.6	26.48	424447	6732638	852
	424465	6732619	860	31.31	320.1	74.3	90.7	31.31	5.6	-0.3	1.6	30.14	424446	6732642	851
	424465	6732619	860	42.53	333.1	71.7	91.4	42.53	5.8	-0.3	1.6	40.38	424447	6732655	846
	424465	6732619	860	64.78	337.1	73.6	90.2	64.78	5.9	-0.3	1.6	62.14	424441	6732676	841
	424465	6732619	860	71.7	338.9	72.7	90.4	71.70	5.9	-0.3	1.6	68.46	424440	6732683	838
St12 T37	424465	6732619	860	54.78	259.8	97.6	90.1	54.78	4.5	0.1	1.6	54.30	424412	6732609	867
	424465	6732619	860	52.56	265.1	94.9	89.7	52.56	4.6	0.1	1.6	52.37	424413	6732615	864
	424465	6732619	860	53.93	267	93.3	89.7	53.93	4.7	0.1	1.6	53.84	424411	6732616	862
	424465	6732619	860	53.85	268.5	93.1	90.6	53.85	4.7	0.1	1.6	53.77	424411	6732618	862
	424465	6732619	860	54.23	269.8	93.9	89.8	54.23	4.7	0.1	1.6	54.10	424411	6732619	863
	424465	6732619	860	55.3	274.3	91.6	89.7	55.30	4.8	0.0	1.6	55.28	424410	6732623	861
	424465	6732619	860	54.64	276.3	92.2	89.4	54.64	4.8	0.0	1.6	54.60	424411	6732625	861
	424465	6732619	860	54.61	281.3	90.3	89.2	54.61	4.9	0.0	1.6	54.61	424411	6732630	860
	424465	6732619	860	58.86	282.6	88.1	89.1	58.86	4.9	0.0	1.6	58.83	424408	6732632	857
	424465	6732619	860	70.66	291.5	84.6	89.5	70.66	5.1	-0.1	1.6	70.35	424400	6732645	853
	424465	6732619	860	67.32	292.8	86.2	89.6	67.32	5.1	-0.1	1.6	67.17	424403	6732645	855
	424465	6732619	860	67.86	298.1	84.5	90.4	67.86	5.2	-0.1	1.6	67.55	424405	6732651	853
	424465	6732619	860	90.52	299.1	83	90.2	90.52	5.2	-0.1	1.6	89.85	424386	6732663	848
	424465	6732619	860	88.08	300.2	84.4	90	88.08	5.2	-0.1	1.6	87.66	424389	6732663	851
	424465	6732619	860	87.88	301.6	85.1	90	87.88	5.3	-0.1	1.6	87.56	424390	6732665	852
	424465	6732619	860	84.07	305.2	82.9	90.3	84.07	5.3	-0.1	1.6	83.43	424397	6732667	849
	424465	6732619	860	99.23	306.9	81.4	90.4	99.23	5.4	-0.2	1.6	98.11	424387	6732678	845
	424465	6732619	860	119.73	310	80.7	90.3	119.73	5.4	-0.2	1.6	118.16	424374	6732695	840
	424465	6732619	860	121.95	312.6	80.2	90.9	121.95	5.5	-0.2	1.6	120.17	424377	6732700	839
	424465	6732619	860	127.74	313.4	80.3	89.5	127.74	5.5	-0.2	1.6	125.91	424374	6732706	838
St13 T38	424371	6732627	865	39.53	160.5	101.3	90	39.53	2.8	0.2	1.6	38.76	424384	6732590	872
	424371	6732627	865	37.44	154.9	98.2	90.6	37.44	2.7	0.1	1.6	37.06	424387	6732593	870
	424371	6732627	865	32.6	148.5	92.3	90.2	32.60	2.6	0.0	1.6	32.57	424388	6732599	866
	424371	6732627	865	31.69	143.6	91.1	90.6	31.69	2.5	0.0	1.6	31.68	424390	6732601	865
	424371	6732627	865	31.76	143.4	91.1	90.4	31.76	2.5	0.0	1.6	31.75	424390	6732602	865
	424371	6732627	865	28.23	138.9	91.4	90.4	28.23	2.4	0.0	1.6	28.22	424390	6732606	865
	424371	6732627	865	29.82	131.9	91.7	90.1	29.82	2.3	0.0	1.6	29.81	424393	6732607	865
	424371	6732627	865	28.64	130	95.6	89.5	28.64	2.3	0.1	1.6	28.50	424393	6732609	867
	424371	6732627	865	30.3	119.6	93.7	89.8	30.30	2.1	0.1	1.6	30.24	424397	6732612	866
	424371	6732627	865	27.99	115.7	91.6	89.8	27.99	2.0	0.0	1.6	27.96	424396	6732615	865
	424371	6732627	865	26.55	111.1	92.1	90.1	26.55	1.9	0.0	1.6	26.53	424396	6732617	865
	424371	6732627	865	21.39	103.5	91.5	90.8	21.39	1.8	0.0	1.6	21.38	424392	6732622	865
	424371	6732627	865	22.16	91.4	87.9	89.8	22.16	1.6	0.0	1.6	22.15	424393	6732626	864
	424371	6732627	865	21.42	90.3	83	90.4	21.42	1.6	-0.1	1.6	21.26	424392	6732627	862
	424371	6732627	865	19.84	86.9	81.4	90.9	19.84	1.5	-0.2	1.6	19.62	424391	6732628	861
	424371	6732627	865	18.82	73.4	77.5	89.9	18.82	1.3	-0.2	1.6	18.37	424389	6732632	860
	424371	6732627	865	33.22	69	76.3	90.2	33.22	1.2	-0.2	1.6	32.27	424401	6732639	856
	424371	6732627	865	34.83	64.8	80.2	90.1	34.83	1.1	-0.2	1.6	34.32	424402	6732642	858
	424371	6732627	865	35.69	60.1	81.3	90.2	35.69	1.0	-0.2	1.6	35.28	424402	6732645	859
	424371	6732627	865	36.1	54.1	77.1	90.3	36.10	0.9	-0.2	1.6	35.19	424400	6732648	856
	424371	6732627	865	51.8	51.9	73.6	90.4	51.80	0.9	-0.3	1.6	49.69	424410	6732658	850
St14 T39	424389	6732614	865	27.55	223.4	96.1	90.4	27.55	3.9	0.1	1.6	27.39	424370	6732594	867
	424389	6732614	865	26.38	227.2	91.3	90	26.38	4.0	0.0	1.6	26.37	424370	6732596	865
	424389	6732614	865	24.73	231.1	89.5	90.1	24.73	4.0	0.0	1.6	24.73	424370	6732598	864
	424389	6732614	865	21.66	237.4	87.9	90	21.66	4.1	0.0	1.6	21.65	424371	6732602	864
	424389	6732614	865	22.48	242.3	85.7	89.5	22.48	4.2	-0.1	1.6	22.42	424369	6732604	863
	424389	6732614	865	22.43	252.1	83.4	90.1	22.43	4.4	-0.1	1.6	22.28	424368	6732607	862
	424389	6732614	865	25.68	257.9	82.3	90	25.68	4.5	-0.1	1.6	25.45	424364	6732609	861
	424389	6732614	865	18.48	264.8	78.3	90.6	18.48	4.6	-0.2	1.6	18.10	424371	6732612	861
	424389	6732614	865	18.04	273.9	78.4	90.4	18.04	4.8	-0.2	1.6	17.67	424371	6732615	861
	424389	6732614	865	21.71	283.6	82.6	90.1	21.71	5.0	-0.1	1.6	21.53	424368	6732619	862
	424389	6732614	865	23.19	287.8	82.7	90.1	23.19	5.0	-0.1	1.6	23.00	424367	6732621	861
	424389	6732614	865	21.71	295.1	80.9	90.2	21.71	5.2	-0.2	1.6	21.44	424370	6732623	861
	424389	6732614	865	24.1	298.2	81.4	89.9	24.10	5.2	-0.2	1.6	23.83	424368	6732625	861
	424389	6732614	865	24.84	304.4	82.4	89	24.84	5.3	-0.1	1.6	24.62	424369	6732628	861
	424389	6732614	865	20.7	307.7	80	89.1	20.70	5.4	-0.2	1.6	20.39	424373	6732626	861
	424389	6732614	865	19.6	311.8	80.8	89.5	19.60	5.4	-0.2	1.6	19.35	424375	6732627	861
	424389	6732614	865	24.91	315.7	77.5	89.4	24.91	5.5	-0.2	1.6	24.32	424372	6732631	859
	424389	6732614	865	31.44	318.9	76.8	89.9	31.44	5.6	-0.2	1.6	30.81	424369	6732637	857
	424389	6732614	865	37.96	332.5	73.7	89.1	37.96	5.8	-0.3	1.6	36.45	424372	6732646	854
	424389	6732614	865	57.19	343.5	72.1	90.8	57.19	6.0	-0.3	1.6	54.42	424374	6732666	847
	424389	6732614	865	77.16	346.4	72.2	90.3	77.16	6.0	-0.3	1.6	73.47	424372	6732685	841

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St15 T40	424346	6732644	852	80.11	196.7	93.9	90.4	80.11	3.4	0.1	1.6	79.92	424323	6732567	857
	424346	6732644	852	51.66	195.8	93.2	89.3	51.66	3.4	0.1	1.6	51.58	424332	6732594	854
	424346	6732644	852	51.33	196.2	92.6	90.1	51.33	3.4	0.0	1.6	51.28	424332	6732595	854
	424346	6732644	852	21.86	196	91.7	89.9	21.86	3.4	0.0	1.6	21.85	424340	6732623	852
	424346	6732644	852	16.21	196.6	88.8	89.5	16.21	3.4	0.0	1.6	16.21	424341	6732628	851
	424346	6732644	852	12.22	196.4	87.4	89.5	12.22	3.4	0.0	1.6	12.21	424343	6732632	851
	424346	6732644	852	5.56	198	67.7	90	5.56	3.5	-0.4	1.6	5.14	424344	6732639	849
	424346	6732644	852	3.84	273.3	40.1	89.9	3.84	4.8	-0.9	1.6	2.47	424344	6732644	848
	424346	6732644	852	4.23	293.6	40.4	90.3	4.23	5.1	-0.9	1.6	2.74	424343	6732645	848
	424346	6732644	852	5.92	358.4	46.9	90.2	5.92	6.3	-0.8	1.6	4.32	424346	6732648	847
	424346	6732644	852	16.94	14.4	63.2	89.9	16.94	0.3	-0.5	1.6	15.12	424350	6732659	844
	424346	6732644	852	19.73	13.6	67.6	89.8	19.73	0.2	-0.4	1.6	18.24	424350	6732662	844
	424346	6732644	852	31.74	13.4	69.4	89.8	31.74	0.2	-0.4	1.6	29.71	424353	6732673	840
	424346	6732644	852	39.28	13.7	70.8	90.2	39.28	0.2	-0.3	1.6	37.10	424355	6732680	838
	424346	6732644	852	59.92	13.2	72.9	90	59.92	0.2	-0.3	1.6	57.27	424359	6732700	834
St15 T41	424346	6732644	852	73.05	245	89.4	90.5	73.05	4.3	0.0	1.6	73.05	424280	6732613	851
	424346	6732644	852	65.81	247.2	88.8	91.1	65.81	4.3	0.0	1.6	65.80	424285	6732619	850
	424346	6732644	852	64.56	248.2	88.3	89.9	64.56	4.3	0.0	1.6	64.53	424286	6732620	849
	424346	6732644	852	55.59	256.4	87.3	90.2	55.59	4.5	0.0	1.6	55.53	424292	6732631	849
	424346	6732644	852	50.31	260.5	86.1	90.6	50.31	4.5	-0.1	1.6	50.19	424296	6732636	848
	424346	6732644	852	41.32	269.3	85.7	89.7	41.32	4.7	-0.1	1.6	41.20	424305	6732643	848
	424346	6732644	852	38.33	281.2	85.3	91.3	38.33	4.9	-0.1	1.6	38.20	424309	6732651	848
	424346	6732644	852	43.38	282.8	85.8	90.3	43.38	4.9	-0.1	1.6	43.26	424304	6732654	848
	424346	6732644	852	46.04	286.9	85	90.1	46.04	5.0	-0.1	1.6	45.86	424302	6732657	847
	424346	6732644	852	50.78	297.2	83.5	90	50.78	5.2	-0.1	1.6	50.45	424301	6732667	846
	424346	6732644	852	46.97	306.4	81.3	89.4	46.97	5.3	-0.2	1.6	46.43	424309	6732672	844
	424346	6732644	852	45.95	314.2	79.9	89.2	45.95	5.5	-0.2	1.6	45.24	424314	6732676	843
	424346	6732644	852	56.6	317.4	78.7	89.2	56.60	5.5	-0.2	1.6	55.50	424308	6732685	840
	424346	6732644	852	76.35	321.5	77.7	89.5	76.35	5.6	-0.2	1.6	74.60	424300	6732702	835
	424346	6732644	852	72.48	325.5	77.3	89.9	72.48	5.7	-0.2	1.6	70.71	424306	6732702	835
St16 T43	424307	6732555	861	34.06	119.7	87.2	90.5	34.06	2.1	0.0	1.6	34.02	424337	6732538	859
	424307	6732555	861	34.76	116.8	87.4	90	34.76	2.0	0.0	1.6	34.72	424338	6732539	859
	424307	6732555	861	35.1	113.4	88.8	89.9	35.10	2.0	0.0	1.6	35.09	424339	6732541	860
	424307	6732555	861	35.16	100.8	88.4	90.7	35.16	1.8	0.0	1.6	35.15	424342	6732548	859
	424307	6732555	861	39.61	94.2	87.8	89	39.61	1.6	0.0	1.6	39.58	424346	6732552	859
	424307	6732555	861	33.76	91.6	88	90.2	33.76	1.6	0.0	1.6	33.74	424341	6732554	859
	424307	6732555	861	35.23	88.8	94.3	90	35.23	1.5	0.1	1.6	35.13	424342	6732556	863
	424307	6732555	861	36.87	80.1	87.2	90.7	36.87	1.4	0.0	1.6	36.83	424343	6732561	859
	424307	6732555	861	36.56	77.7	86.1	90.2	36.56	1.4	-0.1	1.6	36.48	424343	6732563	858
	424307	6732555	861	38.74	70.5	85.8	90.2	38.74	1.2	-0.1	1.6	38.64	424343	6732568	858
	424307	6732555	861	38.21	64.9	86.1	89.8	38.21	1.1	-0.1	1.6	38.12	424342	6732571	858
	424307	6732555	861	37.4	62.5	87.2	89.3	37.40	1.1	0.0	1.6	37.36	424340	6732572	859
	424307	6732555	861	46.85	54.5	85.7	89.7	46.85	1.0	-0.1	1.6	46.72	424345	6732582	857
	424307	6732555	861	49.77	50.9	85.7	90.5	49.77	0.9	-0.1	1.6	49.63	424346	6732586	857
	424307	6732555	861	55.66	43.7	85.1	90	55.66	0.8	-0.1	1.6	55.46	424345	6732595	856
	424307	6732555	861	58.81	40.6	84.4	90.4	58.81	0.7	-0.1	1.6	58.53	424345	6732599	855
	424307	6732555	861	66.01	36.1	84.7	90.4	66.01	0.6	-0.1	1.6	65.73	424346	6732608	854
	424307	6732555	861	60.97	26.9	85.1	89.9	60.97	0.5	-0.1	1.6	60.75	424334	6732609	855
St16 T44	424307	6732555	861	16.24	174.8	89.6	89.1	16.24	3.1	0.0	1.6	16.24	424308	6732539	860
	424307	6732555	861	13	173.2	86.4	90.2	13.00	3.0	-0.1	1.6	12.97	424309	6732542	860
	424307	6732555	861	8.48	174.1	83	89.8	8.48	3.0	-0.1	1.6	8.42	424308	6732547	859
	424307	6732555	861	8.18	169.9	78.4	89.9	8.18	3.0	-0.2	1.6	8.01	424308	6732547	859
	424307	6732555	861	5.06	168.6	71.1	90.2	5.06	2.9	-0.3	1.6	4.79	424308	6732550	859
	424307	6732555	861	1.98	179.5	39.9	90.4	1.98	3.1	-0.9	1.6	1.27	424307	6732554	859
	424307	6732555	861	1.6	4.9	41.3	90	1.60	0.1	-0.8	1.6	1.06	424307	6732556	859
	424307	6732555	861	4.25	359.1	40.1	89.9	4.25	6.3	-0.9	1.6	2.74	424307	6732558	857
	424307	6732555	861	10.83	2.6	53	89.8	10.83	0.0	-0.6	1.6	8.65	424307	6732564	854
	424307	6732555	861	22.32	359.5	72.7	90	22.32	6.3	-0.3	1.6	21.31	424307	6732576	854
	424307	6732555	861	26.76	356	77	90.4	26.76	6.2	-0.2	1.6	26.07	424305	6732581	854
	424307	6732555	861	34.49	355.4	79.8	89.7	34.49	6.2	-0.2	1.6	33.94	424304	6732589	854
	424307	6732555	861	38.29	354.8	81.2	89.4	38.29	6.2	-0.2	1.6	37.84	424304	6732593	854
	424307	6732555	861	46.15	354.1	81.9	88.9	46.15	6.2	-0.1	1.6	45.69	424302	6732600	854
	424307	6732555	861	46.62	354.1	81.8	90	46.62	6.2	-0.1	1.6	46.14	424302	6732601	854
	424307	6732555	861	78.93	354.3	82.6	89.9	78.93	6.2	-0.1	1.6	78.27	424299	6732633	850
	424307	6732555	861	82.06	354.5	83.7	89.8	82.06	6.2	-0.1	1.6	81.56	424299	6732636	851
	424307	6732555	861	83.55	354.4	84.3	89.9	83.55	6.2	-0.1	1.6	83.14	424299	6732638	852
St17 T46	424139	6732450	853	296.98	218.9	90.8	90.5	296.98	3.8	0.0	1.6	296.95	423953	6732219	856
	424139	6732450	853	303.61	221	91.5	90.8	303.61	3.9	0.0	1.6	303.51	423940	6732221	860
	424139	6732450	853	301.32	223.2	92.5	90.1	301.32	3.9	0.0	1.6	301.03	423933	6732231	865
	424139	6732450	853	270.72	221.2	89.1	90.1	270.72	3.9	0.0	1.6	270.69	423961	6732246	848
	424139	6732450	853	190.46	230.5	91.8	89.9	190.48	4.0	0.0	1.6	190.39	423982	6732329	858
	424139	6732450	853	190.6	229.3	91.8	90.2	190.60	4.0	0.0	1.6	190.51	423995	6732326	858

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St17 T47	424139	6732450	853	82.81	85.3	90.7	89.9	82.81	1.5	-0.2	1.6	81.72	424220	6732457	839
	424139	6732450	853	83	90.3	83.2	90.2	83.00	1.4	-0.1	1.6	82.42	424220	6732464	843
	424139	6732450	853	92.91	78.5	84.9	91.2	92.91	1.3	-0.1	1.6	92.54	424229	6732472	844
	424139	6732450	853	87.58	74.8	85.8	89.9	87.58	1.3	-0.1	1.6	67.32	424223	6732473	846
	424139	6732450	853	77.94	72	86.5	90.2	77.94	1.3	-0.1	1.6	77.79	424213	6732474	848
	424139	6732450	853	72.51	64.2	85.9	89.8	72.51	1.1	-0.1	1.6	72.32	424204	6732481	847
	424139	6732450	853	66.25	55.4	85.2	89.8	66.25	1.0	-0.1	1.6	66.02	424193	6732487	847
	424139	6732450	853	68.58	52.8	85	90	68.58	0.9	-0.1	1.6	68.32	424193	6732491	846
	424139	6732450	853	62.7	42.2	83.7	90.6	62.70	0.7	-0.1	1.6	62.32	424181	6732496	845
	424139	6732450	853	62.66	38.7	83.8	90.7	62.66	0.7	-0.1	1.6	62.29	424178	6732499	846
	424139	6732450	853	122.72	18.4	81.5	90.2	122.72	0.3	-0.1	1.6	121.37	424177	6732565	834
	424139	6732450	853	128.09	17.3	82.2	90.1	128.09	0.3	-0.1	1.6	126.90	424177	6732571	835
	424139	6732450	853	140.45	11.5	83.8	90.2	140.45	0.2	-0.1	1.6	139.63	424167	6732587	837
	424139	6732450	853	140.03	9.1	84.3	89.9	140.03	0.2	-0.1	1.6	139.34	424181	6732588	838
	424139	6732450	853	146.17	7.8	85.4	89.8	146.17	0.1	-0.1	1.6	145.70	424159	6732594	841
	424139	6732450	853	149.59	5.8	86.6	89.7	149.59	0.1	-0.1	1.6	149.36	424154	6732599	844
	424139	6732450	853	184.28	5.9	87.1	89.9	184.28	0.1	-0.1	1.6	184.04	424158	6732633	843
	424139	6732450	853	216.8	5.8	87.8	89.9	216.80	0.1	0.0	1.6	216.64	424161	6732666	844
	424139	6732450	853	221.03	4.1	88.4	89.5	221.03	0.1	0.0	1.6	220.94	424155	6732670	846
	424139	6732450	853	221.62	6.3	88.9	89.9	221.62	0.1	0.0	1.6	221.58	424163	6732670	848
	424139	6732450	853	224.76	7.9	89.3	89.8	224.76	0.1	0.0	1.6	224.74	424170	6732673	850
	424139	6732450	853	225.66	5.2	89.5	89.4	225.66	0.1	0.0	1.6	225.65	424159	6732675	850
St17 T48	424139	6732450	853	17.92	159.8	91.3	89.1	17.92	2.8	0.0	1.6	17.92	424145	6732433	853
	424139	6732450	853	6.63	149.2	89.8	89.6	6.63	2.6	0.0	1.6	6.63	424142	6732444	852
	424139	6732450	853	5.12	94.4	81.5	89.7	5.12	1.6	-0.1	1.6	5.06	424144	6732450	852
	424139	6732450	853	7.6	41.8	75	90.2	7.60	0.7	-0.3	1.6	7.34	424144	6732455	850
	424139	6732450	853	11.68	28.2	73.8	90.6	11.68	0.5	-0.3	1.6	11.22	424144	6732460	849
	424139	6732450	853	15.91	15.4	72.6	89.3	15.91	0.3	-0.3	1.6	15.18	424143	6732465	848
	424139	6732450	853	37.37	8.7	70.6	90.2	37.37	0.2	-0.3	1.6	35.25	424144	6732485	840
	424139	6732450	853	42.06	7.3	72	90.1	42.06	0.1	-0.3	1.6	40.00	424144	6732490	839
	424139	6732450	853	51.96	7.2	72.7	90.4	51.96	0.1	-0.3	1.6	49.63	424145	6732499	837
	424139	6732450	853	62.33	7	73.4	90.4	62.33	0.1	-0.3	1.6	59.73	424146	6732509	835
	424139	6732450	853	63.24	6.5	73.7	90.2	63.24	0.1	-0.3	1.6	60.70	424146	6732510	835
	424139	6732450	853	86.67	8.5	78.8	91.1	86.67	0.1	-0.2	1.6	85.02	424152	6732534	836
	424139	6732450	853	97.73	7	80.3	90.9	97.73	0.1	-0.2	1.6	96.33	424151	6732546	836
	424139	6732450	853	102.45	6.5	81.4	90.8	102.45	0.1	-0.2	1.6	101.30	424150	6732551	837
	424139	6732450	853	106.9	7.2	82.9	90.1	106.90	0.1	-0.1	1.6	106.08	424152	6732555	839
	424139	6732450	853	130.13	7.1	84.4	90	130.13	0.1	-0.1	1.6	129.51	424155	6732579	840
	424139	6732450	853	133.76	5.2	85.1	90.1	133.76	0.1	-0.1	1.6	133.27	424151	6732583	841
	424139	6732450	853	150.47	2.5	87.2	89.9	150.47	0.0	0.0	1.6	150.29	424146	6732600	845
	424139	6732450	853	182.07	1.4	87.6	89.9	182.07	0.0	0.0	1.6	181.91	424143	6732632	845
	424139	6732450	853	190.08	0.2	88.3	89.7	190.08	0.0	0.0	1.6	190.00	424140	6732640	847
St17 T49	424139	6732450	853	18.58	200.2	103.5	89.9	18.58	3.5	0.2	1.6	18.07	424133	6732433	857
	424139	6732450	853	9.77	205.5	98.9	90.3	9.77	3.6	0.2	1.6	9.65	424135	6732441	854
	424139	6732450	853	5.68	220.7	91.7	90	5.68	3.9	0.0	1.6	5.68	424135	6732446	853
	424139	6732450	853	4.72	271.6	67	90	4.72	4.7	-0.4	1.6	4.34	424135	6732450	851
	424139	6732450	853	6.9	328.5	58.6	89.8	6.90	5.7	-0.5	1.6	5.89	424136	6732455	849
	424139	6732450	853	12.85	314.9	60.4	89.9	12.85	5.5	-0.5	1.6	11.17	424131	6732458	846
	424139	6732450	853	13.81	315.9	65	89.7	13.81	5.5	-0.4	1.6	12.52	424130	6732459	847
	424139	6732450	853	25.57	328.8	63.5	90	25.57	5.7	-0.5	1.6	22.88	424127	6732470	841
	424139	6732450	853	29.55	331.4	64.5	89.4	29.55	5.8	-0.4	1.6	26.67	424126	6732473	840
	424139	6732450	853	31.94	333.6	64.7	89.3	31.94	5.8	-0.4	1.6	28.88	424126	6732476	839
	424139	6732450	853	65.26	335.7	65.2	89	65.26	5.9	-0.4	1.6	59.24	424115	6732504	825
	424139	6732450	853	66.1	337.6	65.4	89.1	66.10	5.9	-0.4	1.6	60.10	424116	6732506	825
	424139	6732450	853	67.07	338.2	66.8	89.4	67.07	5.9	-0.4	1.6	61.65	424118	6732507	826
	424139	6732450	853	68.93	341.3	69.4	89	68.93	6.0	-0.4	1.6	64.52	424118	6732511	828
	424139	6732450	853	73.01	345.2	73.3	89.9	73.01	6.0	-0.3	1.6	69.93	424121	6732518	831
	424139	6732450	853	79.5	346.7	77.1	89.9	79.50	6.1	-0.2	1.6	77.49	424121	6732525	835
	424139	6732450	853	89.5	349.9	84.6	90.2	89.50	6.1	-0.1	1.6	89.10	424123	6732538	844
	424139	6732450	853	99.71	350.9	85.8	89.9	99.71	6.1	-0.1	1.6	99.44	424123	6732548	845
	424139	6732450	853	107.89	350.5	86.8	89.8	107.89	6.1	-0.1	1.6	107.72	424121	6732556	846
	424139	6732450	853	139.85	349.8	89.9	89.6	139.85	6.1	0.0	1.6	139.85	424114	6732588	852
	424139	6732450	853	142.32	349	91.3	89.5	142.32	6.1	0.0	1.6	142.28	424112	6732590	856

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St17 T50	424139	6732450	853	13.41	201	91.8	89.6	13.41	3.5	0.0	1.6	13.40	424134	6732437	853
	424139	6732450	853	11.16	204	87.5	90.1	11.16	3.6	0.0	1.6	11.15	424134	6732440	852
	424139	6732450	853	8.16	210.5	84.7	90.8	8.16	3.7	-0.1	1.6	8.13	424135	6732443	852
	424139	6732450	853	5.77	226.5	70.8	90	5.77	4.0	-0.3	1.6	5.45	424135	6732446	850
	424139	6732450	853	3.87	273.5	71	90	3.87	4.8	-0.3	1.6	3.66	424135	6732450	851
	424139	6732450	853	3.11	293.6	74.8	90.2	3.11	5.1	-0.3	1.6	3.00	424136	6732451	852
	424139	6732450	853	6.78	321.1	66.8	90.3	6.78	5.6	-0.4	1.6	6.23	424135	6732455	850
	424139	6732450	853	8.13	324.2	63.2	90	8.13	5.7	-0.5	1.6	7.26	424135	6732456	849
	424139	6732450	853	21.73	332.7	65.1	90.3	21.73	5.8	-0.4	1.6	19.71	424130	6732468	843
	424139	6732450	853	26.51	334	66.6	90.2	26.51	5.8	-0.4	1.6	24.33	424128	6732472	842
	424139	6732450	853	28.01	337.8	68.8	89.1	28.01	5.9	-0.4	1.6	26.11	424129	6732474	842
	424139	6732450	853	31.05	339.2	68.7	89.3	31.05	5.9	-0.4	1.6	28.93	424129	6732477	841
	424139	6732450	853	64.11	340.6	68.7	89.4	64.11	5.9	-0.4	1.6	59.73	424119	6732506	829
	424139	6732450	853	70.5	341.4	70.2	89.8	70.50	6.0	-0.3	1.6	66.33	424118	6732513	828
	424139	6732450	853	77.94	342.6	73.9	90.3	77.94	6.0	-0.3	1.6	74.88	424117	6732521	831
	424139	6732450	853	82.95	341.8	77.3	90.2	82.95	6.0	-0.2	1.6	80.92	424114	6732527	834
	424139	6732450	853	87.93	341.8	79.9	90.2	87.93	6.0	-0.2	1.6	86.57	424112	6732532	837
	424139	6732450	853	108.44	343.2	84.9	90.2	108.44	6.0	-0.1	1.6	108.01	424108	6732553	843
	424139	6732450	853	139.44	343.1	87.6	90.3	139.44	6.0	0.0	1.6	139.32	424099	6732583	847
	424139	6732450	853	141.47	343.3	89	90.3	141.47	6.0	0.0	1.6	141.45	424098	6732585	850
	424139	6732450	853	147.13	342.7	90.4	90.4	147.13	6.0	0.0	1.6	147.13	424095	6732590	853
	424139	6732450	853	166.62	342.6	91.8	90.5	166.62	6.0	0.0	1.6	166.54	424089	6732609	858
	424139	6732450	853	171.08	342.8	92.4	90.4	171.08	6.0	0.0	1.6	170.93	424088	6732613	860
	424139	6732450	853	173.55	343	92.7	90.4	173.55	6.0	0.0	1.6	173.36	424088	6732616	861
St17 T51	424139	6732450	853	21.13	221.8	91	90.1	21.13	3.9	0.0	1.6	21.13	424125	6732434	853
	424139	6732450	853	14.46	242.6	83.9	90	14.46	4.2	-0.1	1.6	14.38	424126	6732443	851
	424139	6732450	853	14.18	248.2	79.5	89.9	14.18	4.3	-0.2	1.6	13.94	424126	6732445	850
	424139	6732450	853	13.94	268.9	70.1	89.8	13.94	4.7	-0.3	1.6	13.11	424126	6732450	848
	424139	6732450	853	15.89	273.9	67.3	89.7	15.89	4.8	-0.4	1.6	14.66	424124	6732451	846
	424139	6732450	853	20.5	288.7	73.4	90	20.50	5.0	-0.3	1.6	19.65	424120	6732456	846
	424139	6732450	853	21.14	292.6	72.7	89.9	21.14	5.1	-0.3	1.6	20.18	424120	6732458	846
	424139	6732450	853	19.63	295.4	69.3	90	19.63	5.2	-0.4	1.6	18.36	424122	6732458	845
	424139	6732450	853	28.62	299.3	67.9	89.9	28.62	5.2	-0.4	1.6	26.52	424116	6732463	842
	424139	6732450	853	32.87	312.6	70.2	90.5	32.87	5.5	-0.3	1.6	30.93	424116	6732471	841
	424139	6732450	853	34.7	314	71.7	90.4	34.70	5.5	-0.3	1.6	32.95	424115	6732473	841
	424139	6732450	853	38.39	315.3	73.5	90.3	38.39	5.5	-0.3	1.6	36.81	424113	6732476	841
	424139	6732450	853	39.6	318.8	74.1	89.9	39.60	5.6	-0.3	1.6	38.08	424114	6732479	842
	424139	6732450	853	63.65	322.7	74.8	89.4	63.65	5.6	-0.3	1.6	61.42	424102	6732499	836
	424139	6732450	853	78.21	324.1	76.8	89.4	78.21	5.7	-0.2	1.6	76.14	424094	6732512	834
	424139	6732450	853	75.66	323.9	80.2	89.4	75.66	5.7	-0.2	1.6	74.56	424095	6732510	839
	424139	6732450	853	78.71	324.2	81.5	89.4	78.71	5.7	-0.1	1.6	77.85	424093	6732513	841
	424139	6732450	853	86.38	325.9	80.5	89.4	86.38	5.7	-0.2	1.6	85.20	424091	6732521	838
	424139	6732450	853	91.18	327.3	82.1	90.2	91.18	5.7	-0.1	1.6	90.31	424090	6732526	840
	424139	6732450	853	109.64	328.8	85.1	90.6	109.64	5.7	-0.1	1.6	109.24	424082	6732543	843
	424139	6732450	853	117.23	332	87.8	90	117.23	5.8	0.0	1.6	117.14	424084	6732553	848
	424139	6732450	853	123.57	333.4	89.2	89.9	123.57	5.8	0.0	1.6	123.56	424084	6732560	851
	424139	6732450	853	160.51	331.6	91	89.8	160.51	5.8	0.0	1.6	160.49	424063	6732591	855
	424139	6732450	853	163.3	331.8	92	89.7	163.30	5.8	0.0	1.6	163.20	424062	6732594	858
	424139	6732450	853	168.22	331.5	92.4	89.6	168.22	5.8	0.0	1.6	168.07	424059	6732598	859
St18 T54	424169	6732726	847	243.16	125.2	95	90.7	243.16	2.2	0.1	1.6	242.23	424367	6732586	868
	424169	6732726	847	235.46	123.2	93.8	89.8	235.46	2.2	0.1	1.6	234.94	424366	6732597	862
	424169	6732726	847	256.1	119.8	94.2	90.2	256.10	2.1	0.1	1.6	255.41	424391	6732599	865
	424169	6732726	847	230.82	117.1	93.1	90.3	230.82	2.0	0.1	1.6	230.48	424374	6732621	859
	424169	6732726	847	247.02	116	92.8	89.8	247.02	2.0	0.0	1.6	246.73	424391	6732618	858
	424169	6732726	847	199.85	113.9	91.9	90.2	199.85	2.0	0.0	1.6	199.74	424352	6732645	853
	424169	6732726	847	232.76	112.8	91.7	90.2	232.76	2.0	0.0	1.6	232.86	424383	6732636	853
	424169	6732726	847	234.72	111.7	92.1	90.4	234.72	1.9	0.0	1.6	234.56	424387	6732639	855
	424169	6732726	847	232.47	111.1	91.3	90.1	232.47	1.9	0.0	1.6	232.41	424386	6732642	852
	424169	6732726	847	214.1	108.9	91.1	89.9	214.10	1.9	0.0	1.6	214.06	424372	6732657	850
	424169	6732726	847	218.35	104.2	88.8	89.9	218.35	1.8	0.0	1.6	218.30	424381	6732672	842
	424169	6732726	847	205.7	100.6	88	90.7	205.70	1.8	0.0	1.6	205.57	424371	6732688	839
	424169	6732726	847	146.92	97.9	87.7	90.9	146.92	1.7	0.0	1.6	146.80	424314	6732706	840
	424169	6732726	847	160.32	97.2	87.6	90.9	160.32	1.7	0.0	1.6	160.18	424328	6732706	840
	424169	6732726	847	158.97	96.9	86.8	90.7	158.97	1.7	-0.1	1.6	158.72	424327	6732707	837
St18 T55	424169	6732726	847	116.18	140.7	93.3	89.4	116.18	2.5	0.1	1.6	115.99	424242	6732636	853
	424169	6732726	847	100.05	138.4	93.4	90	100.05	2.4	0.1	1.6	99.87	424235	6732651	852
	424169	6732726	847	100.21	138.2	94.2	89.9	100.21	2.4	0.1	1.6	99.94	424236	6732651	854
	424169	6732726	847	101.06	136.6	94.5	90	101.06	2.4	0.1	1.6	100.75	424238	6732653	854
	424169	6732726	847	96.24	135.1	94.1	90.1	96.24	2.4	0.1	1.6	95.99	424237	6732658	853
	424169	6732726	847	92.42	134.1	92.8	90.3	92.42	2.3	0.0	1.6	92.31	424235	6732662	851
	424169	6732726	847	95.48	130.3	92.3	90.4	95.48	2.3	0.0	1.6	95.40	424242	6732664	850
	424169	6732726	847	91.74	124.9	90.8	90.6	91.74	2.2	0.0	1.6	91.73	424244	6732674	848
	424169	6732726	847	85.91	116.6	87.8	90.1	85.91	2.0	0.0	1.6	85.85	424246	6732688	843
	424169	6732726	847	70.42	115.8	88.6	90	70.42	2.0	0.0	1.6	70.40	424232	6732695	845
	424169	6732726	847	70.23	113.9	89.6	89.6	70.23	2.0	0.0	1.6	70.23	424233	6732698	846
	424169	6732726	847	69.76	109.3	88	90.3	69.76	1.9	0.0	1.6	69.72	424235	6732703	844
	424169	6732726	847	68.64	108.3	86	90.7	68.64	1.9	-0.1	1.6	68.47	424234	6732705	842
	424169	6732726	847	88.81	105	84.9	90.7	88.81	1.8	-0.1	1.6	88.46	424254	6732703	836
	424169	6732726	847	87.53	101.9	85.8	90.8	87.53	1.8	-0.1	1.6	87.29	424254	6732706	840
	424169	6732726	847	88.73	101.1	85.8	90.3	88.73	1.8	-0.1	1.6	88.49	424256	6732709	840
	424169	6732726	847	73.03	98.4	85.4	90.3	73.03	1.7	-0.1	1.6	72.79	424241	6732715	840
	424169	6732726	847	74.2	95.9	84.4	90.3	74.20	1.7	-0.1	1.6	73.85	424242	6732718	839
	424169	6732726	847	74.79	94.6	83.2	90.3	74.79	1.7	-0.1	1.6	74.26	424243	6732720	837

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St18 T56	424169	6732726	847	46.21	160.8	101.1	90	46.21	2.8	0.2	1.6	45.35	424184	6732683	855
	424169	6732726	847	46.48	157.9	99.3	89.7	46.48	2.8	0.2	1.6	45.67	424186	6732684	854
	424169	6732726	847	46.02	154.9	97.5	89.9	46.02	2.7	0.1	1.6	45.63	424188	6732685	852
	424169	6732726	847	44.27	149.5	95.6	89.9	44.27	2.6	0.1	1.6	44.06	424191	6732688	851
	424169	6732726	847	41.58	142.7	91.5	90.3	41.58	2.5	0.0	1.6	41.57	424194	6732693	847
	424169	6732726	847	36.12	138.6	88.7	90.5	36.12	2.4	0.0	1.6	36.11	424193	6732699	846
	424169	6732726	847	26.64	138.4	91	90.3	26.64	2.4	0.0	1.6	26.64	424187	6732706	847
	424169	6732726	847	26.75	138.2	92.7	90.5	26.75	2.4	0.0	1.6	26.72	424187	6732706	848
	424169	6732726	847	109.3	133.5	93.3	90.3	109.30	2.3	0.1	1.6	109.12	424248	6732651	853
	424169	6732726	847	26.32	129.2	92.3	90	26.32	2.3	0.0	1.6	26.30	424189	6732709	847
	424169	6732726	847	26.36	123.8	86.1	90.1	26.36	2.2	-0.1	1.6	26.30	424191	6732711	845
	424169	6732726	847	24.04	122	84.2	90.3	24.04	2.1	-0.1	1.6	23.92	424189	6732713	844
	424169	6732726	847	27.81	116.3	83.4	90.8	27.81	2.0	-0.1	1.6	27.63	424194	6732714	843
	424169	6732726	847	35.54	108.7	82.8	90.5	35.54	1.9	-0.1	1.6	35.26	424202	6732715	842
	424169	6732726	847	34.87	102.5	81	90	34.87	1.8	-0.2	1.6	34.44	424203	6732719	841
	424169	6732726	847	34.89	98.8	80.9	90.4	34.89	1.7	-0.2	1.6	34.45	424203	6732721	841
	424169	6732726	847	37.19	94.8	80.4	90.5	37.19	1.7	-0.2	1.6	36.67	424206	6732723	840
	424169	6732726	847	34.28	91.4	78.6	90	34.28	1.6	-0.2	1.6	33.60	424203	6732725	840
	424169	6732726	847	42.91	84.3	77.1	90.7	42.91	1.5	-0.2	1.6	41.83	424211	6732730	837
	424169	6732726	847	41.74	80.9	76.7	90.7	41.74	1.4	-0.2	1.6	40.62	424209	6732732	837
	424169	6732726	847	53.76	78	77.2	91	53.76	1.4	-0.2	1.6	52.42	424220	6732737	834
	424169	6732726	847	58.45	68.9	79.8	90.3	58.45	1.2	-0.2	1.6	57.53	424223	6732747	836
	424169	6732726	847	56.87	66.9	78.1	90.3	56.87	1.2	-0.2	1.6	55.65	424220	6732748	835
St18 T57	424169	6732726	847	66.28	188.4	91	90.2	66.28	3.3	0.0	1.6	66.27	424159	6732660	848
	424169	6732726	847	36.37	189.6	89.9	89.6	36.37	3.3	0.0	1.6	36.37	424163	6732690	846
	424169	6732726	847	37.64	192.5	90	89.5	37.64	3.4	0.0	1.6	37.64	424161	6732689	846
	424169	6732726	847	28.53	197.7	88.3	90.5	28.53	3.5	0.0	1.6	28.52	424160	6732699	846
	424169	6732726	847	19.02	203.1	86.7	90	19.02	3.5	-0.1	1.6	18.99	424162	6732709	845
	424169	6732726	847	15.28	210.9	85.5	90.2	15.28	3.7	-0.1	1.6	15.23	424161	6732713	845
	424169	6732726	847	12.87	231.1	85.4	90.2	12.87	4.0	-0.1	1.6	12.83	424159	6732718	845
	424169	6732726	847	8.03	249.7	82.3	90.1	8.03	4.4	-0.1	1.6	7.96	424162	6732723	845
	424169	6732726	847	6.6	262.1	81.1	90.5	6.60	4.6	-0.2	1.6	6.52	424163	6732725	845
	424169	6732726	847	6.14	289.3	78.6	90.2	6.14	5.0	-0.2	1.6	6.02	424163	6732728	845
	424169	6732726	847	6.16	296.3	78.3	90	6.16	5.2	-0.2	1.6	6.03	424164	6732729	845
	424169	6732726	847	7.88	312.1	66.2	90.2	7.88	5.4	-0.4	1.6	7.21	424164	6732731	843
	424169	6732726	847	8.72	340.5	68	90.1	8.72	5.9	-0.4	1.6	8.09	424166	6732734	843
	424169	6732726	847	8.45	2.9	65.2	90	8.45	0.1	-0.4	1.6	7.67	424169	6732734	843
	424169	6732726	847	35.19	4.5	66.2	90	35.19	0.1	-0.4	1.6	32.20	424172	6732758	832
	424169	6732726	847	46.97	5.1	69.3	90	46.97	0.1	-0.4	1.6	43.94	424173	6732770	830
St19 T56	424155	6732711	849	81.25	185.4	93.1	90.5	81.25	3.2	0.1	1.6	81.13	424147	6732630	853
	424155	6732711	849	82.01	188.3	92.9	89.9	82.01	3.3	0.1	1.6	81.90	424143	6732630	852
	424155	6732711	849	49.86	192.8	92.9	89.9	49.86	3.4	0.1	1.6	49.80	424144	6732662	851
	424155	6732711	849	45.71	196	93	89.8	45.71	3.4	0.1	1.6	45.65	424142	6732667	851
	424155	6732711	849	37.16	197.7	93.3	90	37.16	3.5	0.1	1.6	37.10	424144	6732676	850
	424155	6732711	849	38.11	202.1	92.6	89.7	38.11	3.5	0.0	1.6	38.07	424141	6732676	850
	424155	6732711	849	29.76	203.6	90.7	89.7	29.76	3.6	0.0	1.6	29.76	424143	6732684	849
	424155	6732711	849	23.51	216.4	88.7	90	23.51	3.8	0.0	1.6	23.50	424141	6732692	848
	424155	6732711	849	17.37	226.4	87.1	89.7	17.37	4.0	-0.1	1.6	17.35	424142	6732699	847
	424155	6732711	849	14.11	248.5	87.9	90.5	14.11	4.3	0.0	1.6	14.10	424142	6732706	848
	424155	6732711	849	13.9	258.5	87.6	90.6	13.90	4.5	0.0	1.6	13.89	424141	6732708	848
	424155	6732711	849	15.33	264	87.6	90.7	15.33	4.6	0.0	1.6	15.32	424140	6732709	848
	424155	6732711	849	16.07	289.8	74.3	89.9	16.07	5.1	-0.3	1.6	15.47	424140	6732716	844
	424155	6732711	849	12.8	296.2	70.8	90	12.80	5.2	-0.3	1.6	12.09	424144	6732717	844
	424155	6732711	849	12.86	310.2	74	90	12.86	5.4	-0.3	1.6	12.36	424146	6732719	845
	424155	6732711	849	14.66	313.8	73.7	90.1	14.66	5.5	-0.3	1.6	14.07	424145	6732721	844
	424155	6732711	849	24.27	316.7	72.7	90	24.27	5.5	-0.3	1.6	23.17	424139	6732728	841
	424155	6732711	849	25.12	319.1	73.2	89.9	25.12	5.6	-0.3	1.6	24.05	424139	6732729	841
	424155	6732711	849	18.35	322.8	71.5	90.2	18.35	5.6	-0.3	1.6	17.40	424144	6732725	843
	424155	6732711	849	51.24	326.3	71.3	89.9	51.24	5.7	-0.3	1.6	48.54	424128	6732751	832
	424155	6732711	849	52.1	326.9	72.9	89.8	52.10	5.7	-0.3	1.6	49.80	424128	6732753	833
	424155	6732711	849	51.37	330.6	72.2	89.8	51.37	5.8	-0.3	1.6	48.91	424131	6732754	833
St20 T60	424059	6732653	849	45.69	110.9	102.2	89.6	45.69	1.9	0.2	1.6	44.66	424101	6732637	858
	424059	6732653	849	48.76	108.7	99.7	90.2	48.76	1.9	0.2	1.6	48.06	424105	6732636	857
	424059	6732653	849	47.87	107.8	101.7	89.9	47.87	1.9	0.2	1.6	46.88	424104	6732639	858
	424059	6732653	849	47.7	103.8	99.9	90.2	47.70	1.8	0.2	1.6	46.99	424105	6732642	857
	424059	6732653	849	46.7	102.6	99.4	90.1	46.70	1.8	0.2	1.6	46.07	424104	6732643	856
	424059	6732653	849	44.52	86	94.1	90	44.52	1.5	0.1	1.6	44.41	424103	6732656	852
	424059	6732653	849	42.41	79.7	93.1	90	42.41	1.4	0.1	1.6	42.35	424101	6732661	851
	424059	6732653	849	40.87	77.6	92	89.9	40.87	1.4	0.0	1.6	40.85	424099	6732662	850
	424059	6732653	849	40.89	75.5	92	89.8	40.89	1.3	0.0	1.6	40.87	424099	6732663	850
	424059	6732653	849	41.14	70.9	89.5	89.6	41.14	1.2	0.0	1.6	41.14	424096	6732666	848
	424059	6732653	849	40.76	66.9	88.4	89.7	40.76	1.2	0.0	1.6	40.74	424096	6732669	847
	424059	6732653	849	42.41	63.1	86.3	89.7	42.41	1.1	-0.1	1.6	42.32	424097	6732672	846
	424059	6732653	849	49.92	54	83	89.9	49.92	0.9	-0.1	1.6	49.55	424099	6732682	842
	424059	6732653	849	72.48	32.2	77.5	90	72.48	0.6	-0.2	1.6	70.76	424097	6732713	833
	424059	6732653	849	77	27.2	76.3	89.9	77.00	0.5	-0.2	1.6	74.81	424093	6732720	830
	424059	6732653	849	86.55	22.3	75.2	90.1	86.55	0.4	-0.3	1.6	83.68	424091	6732730	826
	424059	6732653	849	89.2	18.7	74.7	90.1	89.20	0.3	-0.3	1.6	86.04	424087	6732734	825
	424059	6732653	849	93.56	15.1	74.4	90.3	93.56	0.3	-0.3	1.6	90.11	424082	6732740	823
	424059	6732653	849	89.09	12.2	74.1	90.2	89.09	0.2	-0.3	1.6	85.68	424077	6732737	824
	424059	6732653	849	88.34	11.1	74.9	90.3	88.34	0.2	-0.3	1.6	85.29	424075	6732737	825
	424059	6732653	849	100.12	8	74.1	90.2	100.12	0.1	-0.3	1.6	96.29	424072	6732748	821
	424059	6732653	849	99.4	5.8	73.8	90.4	99.40	0.1	-0.3	1.6	95.45	424069	6732748	821
	424059	6732653	849	106.31	3.6	73.9	90.2	106.31	0.1	-0.3	1.6	102.14	424065	6732755	819

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St20 T61	424059	6732653	849	17.52	144.8	113.4	89.7	17.52	2.5	0.4	1.6	16.08	424068	6732640	855
	424059	6732653	849	13.68	141.8	105.7	90.1	13.68	2.5	0.3	1.6	13.17	424067	6732643	852
	424059	6732653	849	10.33	138.9	103	89.8	10.33	2.4	0.2	1.6	10.07	424066	6732645	851
	424059	6732653	849	5.31	122.1	91.1	90.2	5.31	2.1	0.0	1.6	5.31	424063	6732650	848
	424059	6732653	849	3.55	111.7	84.2	90	3.55	1.9	-0.1	1.6	3.53	424062	6732652	848
	424059	6732653	849	2.03	105.9	83.2	89.8	2.03	1.8	-0.1	1.6	2.02	424061	6732652	848
	424059	6732653	849	2.26	68.5	68.6	89.8	2.26	1.2	-0.4	1.6	2.10	424061	6732654	848
	424059	6732653	849	2.79	22.9	65.3	89.6	2.79	0.4	-0.4	1.6	2.53	424060	6732655	847
	424059	6732653	849	4.63	5.9	66.4	90	4.63	0.1	-0.4	1.6	4.24	424059	6732657	846
	424059	6732653	849	12.99	347.7	65.7	89.7	12.99	6.1	-0.4	1.6	11.84	424056	6732665	843
	424059	6732653	849	30.05	345.9	65	89.9	30.05	6.0	-0.4	1.6	27.23	424052	6732679	836
	424059	6732653	849	38.75	344.5	66.2	89.9	38.75	6.0	-0.4	1.6	35.45	424050	6732687	833
	424059	6732653	849	66.4	343.7	67	89.8	66.40	6.0	-0.4	1.6	61.12	424042	6732712	822
	424059	6732653	849	70.14	343.1	70	89.5	70.14	6.0	-0.3	1.6	65.91	424040	6732716	824
	424059	6732653	849	87.49	342.5	69.4	89.8	87.49	6.0	-0.4	1.6	81.90	424034	6732731	818
St20 T62	424059	6732653	849	94.82	217.4	93	90.3	94.82	3.8	0.1	1.6	94.69	424001	6732578	853
	424059	6732653	849	97.3	219.6	92.9	89.8	97.30	3.8	0.1	1.6	97.18	423997	6732578	853
	424059	6732653	849	94.69	223.7	90.4	89.9	94.69	3.9	0.0	1.6	94.69	423994	6732585	849
	424059	6732653	849	106.26	227.1	88.7	89.7	106.26	4.0	0.0	1.6	106.23	423981	6732581	846
	424059	6732653	849	86.54	231.9	86.7	90	86.54	4.0	-0.1	1.6	86.40	423991	6732600	843
	424059	6732653	849	87.78	241.9	82.8	89.9	87.78	4.2	-0.1	1.6	87.09	423982	6732612	837
	424059	6732653	849	114.83	246.2	80.8	89.6	114.83	4.3	-0.2	1.6	113.35	423955	6732607	830
	424059	6732653	849	110.43	252.9	78.5	89.4	110.43	4.4	-0.2	1.6	108.21	423956	6732621	826
	424059	6732653	849	116.4	259.8	76	90.3	116.40	4.5	-0.2	1.6	112.94	423948	6732633	820
	424059	6732653	849	126.17	259.7	77.6	90.4	126.17	4.5	-0.2	1.6	123.23	423938	6732631	821
	424059	6732653	849	123.67	261.7	77.7	90.3	123.67	4.6	-0.2	1.6	120.83	423939	6732636	822
	424059	6732653	849	133.03	263.8	77.3	90.3	133.03	4.6	-0.2	1.6	129.78	423930	6732639	819
	424059	6732653	849	134.02	265.1	76.7	90.2	134.02	4.6	-0.2	1.6	130.43	423929	6732642	818
	424059	6732653	849	133.76	265.3	76.5	89.9	133.76	4.6	-0.2	1.6	130.06	423929	6732642	817
St21 T63	424026	6732596	862	43.29	132.7	83.5	89.8	43.29	2.3	-0.1	1.6	43.01	424058	6732567	856
	424026	6732596	862	41.89	128.2	82.1	89.9	41.89	2.2	-0.1	1.6	41.49	424059	6732570	856
	424026	6732596	862	38.19	125.2	80.9	89.7	38.19	2.2	-0.2	1.6	37.71	424057	6732574	855
	424026	6732596	862	35.57	113.6	78.3	89.5	35.57	2.0	-0.2	1.6	34.83	424058	6732582	854
	424026	6732596	862	20.43	51.7	73.7	90.2	20.43	0.9	-0.3	1.6	19.61	424041	6732606	856
	424026	6732596	862	19.58	33.7	72.6	90.6	19.58	0.6	-0.3	1.6	18.68	424036	6732612	855
	424026	6732596	862	18.96	15.3	67.7	91.1	18.96	0.3	-0.4	1.6	17.56	424031	6732613	854
	424026	6732596	862	18	18.8	67.5	90.3	18.00	0.3	-0.4	1.6	16.63	424031	6732612	854
	424026	6732596	862	18.55	7.5	65.8	90.1	18.55	0.1	-0.4	1.6	16.92	424028	6732613	854
	424026	6732596	862	24.55	347.9	66.8	90.3	24.55	6.1	-0.4	1.6	22.56	424021	6732618	852
	424026	6732596	862	45.69	343.5	67.8	90.1	45.69	6.0	-0.4	1.6	42.30	424014	6732637	844
	424026	6732596	862	54.11	340.9	67.7	90.2	54.11	5.9	-0.4	1.6	50.06	424010	6732643	841
	424026	6732596	862	69.5	338.8	68	90.2	69.50	5.9	-0.4	1.6	64.44	424003	6732656	835
	424026	6732596	862	70.52	335.9	68.3	90.2	70.52	5.9	-0.4	1.6	65.52	423999	6732656	835
	424026	6732596	862	73.49	335.2	67.6	90.3	73.49	5.9	-0.4	1.6	67.94	423998	6732658	833
St21 T64	424026	6732596	862	44.05	158.7	85.5	90.1	44.05	2.8	-0.1	1.6	43.91	424042	6732555	858
	424026	6732596	862	41.75	158.1	82.1	90.1	41.75	2.8	-0.1	1.6	41.35	424041	6732558	856
	424026	6732596	862	34.03	157.4	80.4	90	34.03	2.7	-0.2	1.6	33.55	424039	6732565	856
	424026	6732596	862	23.75	157.1	77	90	23.75	2.7	-0.2	1.6	23.14	424035	6732575	856
	424026	6732596	862	20.91	158.7	72.1	89.9	20.91	2.8	-0.3	1.6	19.90	424033	6732577	855
	424026	6732596	862	12.08	158.7	68.1	89.8	12.08	2.8	-0.4	1.6	11.21	424030	6732586	857
	424026	6732596	862	8.58	168.5	59.2	89.7	8.58	2.9	-0.5	1.6	7.37	424027	6732589	857
	424026	6732596	862	1.42	181.4	48.5	90.5	1.42	3.2	-0.7	1.6	1.06	424026	6732595	860
	424026	6732596	862	2.39	202	52.8	90	2.39	3.5	-0.6	1.6	1.90	424025	6732594	860
	424026	6732596	862	1.7	255.2	75.5	89.9	1.70	4.5	-0.3	1.6	1.65	424024	6732596	861
	424026	6732596	862	2.58	294.5	75.8	90.1	2.58	5.1	-0.2	1.6	2.50	424024	6732597	861
	424026	6732596	862	14.96	314.2	65.7	89.2	14.96	5.5	-0.4	1.6	13.63	424016	6732606	855
	424026	6732596	862	23.61	317.8	66	90	23.61	5.5	-0.4	1.6	21.57	424012	6732612	852
	424026	6732596	862	30.59	319.5	68.1	89.7	30.59	5.6	-0.4	1.6	28.38	424008	6732618	850
	424026	6732596	862	101.94	320.9	68.4	89.2	101.94	5.6	-0.4	1.6	94.78	423966	6732670	824
St24 T69	423977	6732196	869	184.48	167.3	89.8	90.3	184.48	2.9	0.0	1.6	184.48	424018	6732016	868
	423977	6732196	869	187.41	168.7	90.3	90.3	187.41	2.9	0.0	1.6	187.41	424014	6732012	869
	423977	6732196	869	190.23	169.7	90.7	90.3	190.23	3.0	0.0	1.6	190.22	424011	6732009	871
	423977	6732196	869	192.01	172.2	91.2	90.4	192.01	3.0	0.0	1.6	191.97	424003	6732006	872
	423977	6732196	869	194.19	173.4	91.5	90.5	194.19	3.0	0.0	1.6	194.12	423999	6732003	873
	423977	6732196	869	195.04	175.1	91.9	90.5	195.04	3.1	0.0	1.6	194.93	423994	6732002	875
	423977	6732196	869	196.15	176.5	92	90.5	196.15	3.1	0.0	1.6	196.03	423989	6732000	875
	423977	6732196	869	194.54	180.2	91.9	90	194.54	3.1	0.0	1.6	194.43	423976	6732002	875
	423977	6732196	869	198.26	181.6	90.8	90.2	198.26	3.2	0.0	1.6	198.24	423971	6731998	871
	423977	6732196	869	202.22	183.9	91.9	90.2	202.22	3.2	0.0	1.6	202.11	423963	6731994	875
	423977	6732196	869	187.34	186.6	91.4	90	187.34	3.3	0.0	1.6	187.28	423955	6732010	873

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
S124 T70	423977	6732196	869	95.89	154.6	84.8	90	95.89	2.7	-0.1	1.6	95.50	424018	6732110	860
	423977	6732196	869	96.24	157.3	86.4	90	96.24	2.7	-0.1	1.6	96.06	424014	6732107	862
	423977	6732196	869	92.7	162.4	86.6	90	92.70	2.8	-0.1	1.6	92.64	424005	6732108	863
	423977	6732196	869	90.27	167.8	87.1	90.1	90.27	2.9	-0.1	1.6	90.15	423996	6732108	864
	423977	6732196	869	87.23	169.9	87.4	90.2	87.23	3.0	0.0	1.6	87.14	423992	6732110	864
	423977	6732196	869	91.33	176.2	88.3	90.2	91.33	3.1	0.0	1.6	91.29	423983	6732105	866
	423977	6732196	869	83.74	180.9	89.6	90.3	83.74	3.2	0.0	1.6	83.74	423976	6732112	868
	423977	6732196	869	89.67	185.1	90	90.3	89.67	3.2	0.0	1.6	89.67	423969	6732107	868
	423977	6732196	869	90.46	185.6	89.9	90.2	90.46	3.2	0.0	1.6	90.46	423968	6732106	868
	423977	6732196	869	91.39	187.7	90.2	90.2	91.39	3.3	0.0	1.6	91.39	423965	6732105	869
	423977	6732196	869	95.65	189.6	88.5	89.6	95.65	3.3	0.0	1.6	95.62	423961	6732102	866
	423977	6732196	869	92.45	190.8	88.2	89.6	92.45	3.3	0.0	1.6	92.40	423960	6732105	865
	423977	6732196	869	72.7	195.4	87.7	90.3	72.70	3.4	0.0	1.6	72.64	423958	6732126	865
	423977	6732196	869	80.4	196.3	87.6	90.2	80.40	3.4	0.0	1.6	80.33	423954	6732119	865
	423977	6732196	869	92.17	197.9	88.5	90.4	92.17	3.5	0.0	1.6	92.14	423949	6732108	866
	423977	6732196	869	101.01	200.1	88.6	90.5	101.01	3.5	0.0	1.6	100.98	423942	6732101	866
	423977	6732196	869	97.64	202	88.7	90.1	97.54	3.5	0.0	1.6	97.51	423940	6732106	866
	423977	6732196	869	150.39	208.7	88	90.6	150.39	3.6	0.0	1.6	150.30	423905	6732064	863
	423977	6732196	869	174.8	210.8	87.9	90.9	174.80	3.7	0.0	1.6	174.68	423888	6732046	862
S124 T71	423977	6732196	869	66.79	151.6	80.7	89.9	66.79	2.6	-0.2	1.6	65.91	424008	6732138	858
	423977	6732196	869	65.76	153.7	80.5	89.9	65.76	2.7	-0.2	1.6	64.86	424006	6732138	857
	423977	6732196	869	67.62	155.6	81.4	89.8	67.62	2.7	-0.2	1.6	66.86	424005	6732135	858
	423977	6732196	869	65.57	159.9	81.8	89.9	65.57	2.8	-0.1	1.6	64.90	423999	6732135	859
	423977	6732196	869	64.22	162.5	82.6	89.9	64.22	2.8	-0.1	1.6	63.69	423996	6732135	860
	423977	6732196	869	64.97	164.8	83	89.9	64.97	2.9	-0.1	1.6	64.49	423994	6732134	860
	423977	6732196	869	63.52	170.3	83.7	90	63.52	3.0	-0.1	1.6	63.14	423988	6732134	861
	423977	6732196	869	64.3	174.3	83.3	90.2	64.30	3.0	-0.1	1.6	63.86	423983	6732132	861
	423977	6732196	869	63.55	176.9	83.1	90.3	63.55	3.1	-0.1	1.6	63.09	423980	6732133	861
	423977	6732196	869	60.07	181.8	79.3	89.9	60.07	3.2	-0.2	1.6	59.03	423975	6732137	857
	423977	6732196	869	58.53	184.9	78.7	90.3	58.53	3.2	-0.2	1.6	57.40	423972	6732139	857
	423977	6732196	869	56.92	188.4	77.8	90.3	56.92	3.3	-0.2	1.6	55.63	423969	6732141	856
	423977	6732196	869	58.74	188.7	78	90.2	58.74	3.3	-0.2	1.6	57.46	423968	6732139	856
	423977	6732196	869	59.95	191.5	79.2	90	59.95	3.3	-0.2	1.6	58.89	423965	6732138	857
	423977	6732196	869	65.14	206.9	87.2	89.9	65.14	3.6	0.0	1.6	65.06	423948	6732138	865
	423977	6732196	869	74.8	198.5	86.6	90	74.80	3.5	-0.1	1.6	74.67	423953	6732126	864
	423977	6732196	869	79.14	200.2	88.5	90.1	79.14	3.5	0.0	1.6	79.11	423950	6732122	866
	423977	6732196	869	80.19	202	88.2	89.9	80.19	3.5	0.0	1.6	80.15	423947	6732122	866
	423977	6732196	869	82.62	204	88.6	89.9	82.62	3.6	0.0	1.6	82.60	423943	6732121	866
	423977	6732196	869	118.39	210.9	87.6	90	118.39	3.7	0.0	1.6	118.29	423916	6732095	863
	423977	6732196	869	119.91	213.5	87.7	90	119.91	3.7	0.0	1.6	119.81	423911	6732096	864
S124 T72	423977	6732196	869	52.33	134.9	75	90.1	52.33	2.4	-0.3	1.6	50.55	424013	6732160	855
	423977	6732196	869	50.58	136	75.1	90.1	50.58	2.4	-0.3	1.6	48.88	424011	6732161	855
	423977	6732196	869	41	160.4	77.8	90	41.00	2.8	-0.2	1.6	40.07	423990	6732158	860
	423977	6732196	869	36.15	163.4	78.5	89.9	36.15	2.9	-0.2	1.6	35.42	423987	6732162	861
	423977	6732196	869	35.19	168.1	80.6	89.9	35.19	2.9	-0.2	1.6	34.72	423984	6732162	863
	423977	6732196	869	34.93	173.1	79.7	90.1	34.93	3.0	-0.2	1.6	34.37	423981	6732162	862
	423977	6732196	869	33.56	181.9	78	90.5	33.56	3.2	-0.2	1.6	32.83	423976	6732163	861
	423977	6732196	869	36.51	191.7	76.4	90.1	36.51	3.3	-0.2	1.6	35.49	423970	6732161	860
	423977	6732196	869	43.79	194.4	75.9	90.2	43.79	3.4	-0.2	1.6	42.47	423966	6732155	858
	423977	6732196	869	43.74	200.1	76.5	90.2	43.74	3.5	-0.2	1.6	42.53	423962	6732156	858
	423977	6732196	869	45.88	203.9	76.7	90.3	45.88	3.6	-0.2	1.6	44.65	423959	6732155	858
	423977	6732196	869	47.05	211.2	74	90.6	47.05	3.7	-0.3	1.6	45.23	423954	6732157	855
	423977	6732196	869	49.37	218.2	78.4	90.1	49.37	3.8	-0.2	1.6	48.36	423947	6732158	858
	423977	6732196	869	56.71	223.4	81.3	90.1	56.71	3.9	-0.2	1.6	56.06	423938	6732155	860
	423977	6732196	869	59.51	224.5	82.7	90.1	59.51	3.9	-0.1	1.6	59.03	423936	6732154	861
	423977	6732196	869	89.83	235	81.5	90.9	89.83	4.1	-0.1	1.6	88.84	423904	6732145	855
S126 T73	423957	6732244	853	76.28	123.1	80.7	89.9	76.28	2.1	-0.2	1.6	75.28	424020	6732203	840
	423957	6732244	853	57.94	129.6	80.7	90	57.94	2.3	-0.2	1.6	57.18	424001	6732206	843
	423957	6732244	853	45.19	133.5	81.7	90	45.19	2.3	-0.1	1.6	44.72	423989	6732213	846
	423957	6732244	853	29.31	141.2	84.2	90	29.31	2.5	-0.1	1.6	29.16	423975	6732221	849
	423957	6732244	853	28.75	147	87.7	90.2	28.75	2.6	0.0	1.6	28.73	423973	6732220	851
	423957	6732244	853	24.12	150.7	89.4	89.8	24.12	2.6	0.0	1.6	24.12	423969	6732223	852
	423957	6732244	853	23.17	153.6	91.6	89.8	23.17	2.7	0.0	1.6	23.16	423967	6732223	853
	423957	6732244	853	23.76	155.8	93.5	90	23.76	2.7	0.1	1.6	23.72	423967	6732222	854
	423957	6732244	853	24.67	160	95.8	90.2	24.67	2.8	0.1	1.6	24.74	423965	6732221	855
	423957	6732244	853	23.71	164.4	94.2	89.8	23.71	2.9	0.1	1.6	23.65	423963	6732221	854
	423957	6732244	853	22.1	168.6	93.5	90	22.10	2.9	0.1	1.6	22.06	423961	6732222	854
	423957	6732244	853	21.63	170.2	93.1	90	21.63	3.0	0.1	1.6	21.60	423961	6732223	854
	423957	6732244	853	19.22	173.6	91	90.1	19.22	3.0	0.0	1.6	19.22	423959	6732225	853
	423957	6732244	853	18.12	194.6	84.5	89.7	18.12	3.4	-0.1	1.6	18.04	423952	6732227	851
	423957	6732244	853	18.41	200.1	83	90.5	18.41	3.5	-0.1	1.6	18.27	423951	6732227	850
	423957	6732244	853	21.74	213.7	80.4	90.9	21.74	3.7	-0.2	1.6	21.44	423945	6732226	849
	423957	6732244	853	22.82	216.2	77.7	89.6	22.82	3.8	-0.2	1.6	22.30	423943	6732226	847
	423957	6732244	853	22.95	221.8	77	89.9	22.95	3.9	-0.2	1.6	22.36	423942	6732227	847
	423957	6732244	853	22.92	222.3	77.5	90.1	22.92	3.9	-0.2	1.6	22.38	423942	6732227	847
	423957	6732244	853	26.62	231.8	75.8	89.8	26.62	4.0	-0.2	1.6	25.81	423937	6732228	846
	423957	6732244	853	28.82	237.3	74.9	89.8	28.82	4.1	-0.3	1.6	27.82	423934	6732229	845
	423957	6732244	853	32.6	243.7	74	90.1	32.60	4.3	-0.3	1.6	31.34	423929	6732230	843
	423957	6732244	853	39.18	246.3	73.9	90.2	39.18	4.3	-0.3	1.6	37.64	423923	6732229	841
	423957	6732244	853	31.34	249.9	71.6	90.4	31.34	4.4	-0.3	1.6	29.74	423929	6732234	842

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St27 T77	423949	6732347	854	115.87	99.9	84.1	90.3	115.87	1.7	-0.1	1.6	115.26	424063	6732327	841
	423949	6732347	854	115.32	98.8	84.8	90.1	115.32	1.7	-0.1	1.6	114.85	424062	6732329	843
	423949	6732347	854	116.03	97.3	84.1	90.1	116.03	1.7	-0.1	1.6	115.42	424063	6732332	841
	423949	6732347	854	114.85	95.6	84.3	90	114.85	1.7	-0.1	1.6	114.28	424063	6732336	842
	423949	6732347	854	110.6	93.3	85	89.7	110.60	1.6	-0.1	1.6	110.18	424059	6732341	844
	423949	6732347	854	108.85	92.5	84.9	90	108.85	1.6	-0.1	1.6	108.42	424057	6732342	844
	423949	6732347	854	112.04	90.6	84.9	89.9	112.04	1.6	-0.1	1.6	111.60	424061	6732346	843
	423949	6732347	854	109.63	85.9	84.4	89.8	109.63	1.5	-0.1	1.6	109.11	424058	6732355	843
	423949	6732347	854	106.46	81	83.9	90.1	106.46	1.4	-0.1	1.6	105.86	424054	6732364	842
	423949	6732347	854	104.38	76	83.7	90.2	104.38	1.3	-0.1	1.6	103.75	424050	6732372	842
	423949	6732347	854	98.75	74.2	83.9	90.2	98.75	1.3	-0.1	1.6	98.19	424043	6732374	843
	423949	6732347	854	97.42	68	85.1	90.3	97.42	1.2	-0.1	1.6	97.06	424039	6732383	845
	423949	6732347	854	98.43	64.4	84.9	90.4	98.43	1.1	-0.1	1.6	98.04	424037	6732389	845
	423949	6732347	854	99.63	63.8	85.9	89.7	99.63	1.1	-0.1	1.6	99.38	424038	6732391	846
	423949	6732347	854	92.55	61.3	86.4	89.6	92.55	1.1	-0.1	1.6	92.37	424030	6732391	848
	423949	6732347	854	94.73	59	86.3	89.7	94.73	1.0	-0.1	1.6	94.53	424030	6732396	847
	423949	6732347	854	94.32	54.9	85.7	90.1	94.32	1.0	-0.1	1.6	94.05	424026	6732401	846
	423949	6732347	854	100.25	51.2	85.4	90.2	100.25	0.9	-0.1	1.6	99.93	424027	6732410	845
	423949	6732347	854	92.44	47.9	83.8	90.3	92.44	0.8	-0.1	1.6	91.90	424017	6732409	843
	423949	6732347	854	98.38	45.5	83.6	90.3	98.38	0.8	-0.1	1.6	97.77	424019	6732416	842
	423949	6732347	854	81.41	42.6	84.6	90.2	81.41	0.7	-0.1	1.6	81.05	424004	6732407	846
	423949	6732347	854	79.75	36.4	84.8	91.3	79.75	0.6	-0.1	1.6	79.42	423996	6732411	846
	423949	6732347	854	78.28	29.1	87.6	90.3	78.28	0.5	0.0	1.6	78.21	423987	6732415	850
	423949	6732347	854	75.73	20	87.6	90.6	75.73	0.3	0.0	1.6	75.66	423975	6732418	850
	423949	6732347	854	62.42	16.8	86.7	90.8	62.42	0.3	-0.1	1.6	62.32	423967	6732407	850
	423949	6732347	854	64.67	10.2	88	90.4	64.67	0.2	0.0	1.6	64.63	423960	6732411	851
	423949	6732347	854	67.19	6.8	87.9	90.4	67.19	0.1	0.0	1.6	67.14	423957	6732414	851
	423949	6732347	854	70.86	1.6	88.6	90.4	70.86	0.0	0.0	1.6	70.84	423951	6732418	852
	423949	6732347	854	80.81	357.6	88.9	90.4	80.81	6.2	0.0	1.6	80.80	423946	6732428	852
	423949	6732347	854	75.86	353.9	87.7	90.4	75.86	6.2	0.0	1.6	75.80	423941	6732422	850
	423949	6732347	854	75.9	351.2	85.8	90.5	75.90	6.1	-0.1	1.6	75.70	423937	6732422	848
	423949	6732347	854	82.44	348.7	83.7	90.3	82.44	6.1	-0.1	1.6	81.94	423933	6732427	844
St27 T78	423949	6732347	854	122.7	107.1	84.1	89.9	122.70	1.9	-0.1	1.6	122.05	424066	6732311	841
	423949	6732347	854	92.4	103.6	82	90.2	92.40	1.8	-0.1	1.6	91.50	424038	6732325	840
	423949	6732347	854	83.14	100	80.7	90.1	83.14	1.7	-0.2	1.6	82.05	424030	6732333	840
	423949	6732347	854	59.46	93.4	80.3	90.4	59.46	1.6	-0.2	1.6	58.61	424008	6732344	843
	423949	6732347	854	50.64	88.5	80.4	90.1	50.64	1.5	-0.2	1.6	49.93	423999	6732348	845
	423949	6732347	854	48.23	83.6	82.1	89.8	48.23	1.5	-0.1	1.6	47.77	423996	6732352	847
	423949	6732347	854	47.95	80.7	82.2	88.7	47.95	1.4	-0.1	1.5	47.51	423996	6732355	847
	423949	6732347	854	42.84	73.2	81.4	89.1	42.84	1.3	-0.2	1.6	42.36	423990	6732359	847
	423949	6732347	854	42.75	72.2	80.8	89.7	42.75	1.3	-0.2	1.6	42.20	423989	6732360	847
	423949	6732347	854	38.15	58.3	74.1	90.4	38.15	1.0	-0.3	1.6	36.69	423980	6732366	843
	423949	6732347	854	39.59	51.5	73.3	90.6	39.59	0.9	-0.3	1.6	37.92	423979	6732371	842
	423949	6732347	854	34.56	45.2	76.7	90.1	34.56	0.8	-0.2	1.6	33.63	423973	6732371	845
	423949	6732347	854	34.61	43.3	77.5	90.1	34.61	0.8	-0.2	1.6	33.79	423972	6732372	846
	423949	6732347	854	37.36	36.8	77.5	90.6	37.36	0.6	-0.2	1.6	36.47	423971	6732376	845
	423949	6732347	854	39.58	26.3	80.5	90.1	39.58	0.5	-0.2	1.6	39.04	423968	6732382	847
	423949	6732347	854	35.51	21.5	81.4	90.6	35.51	0.4	-0.2	1.6	35.11	423962	6732380	848
	423949	6732347	854	32	13.5	78.6	90.3	32.00	0.2	-0.2	1.6	31.37	423956	6732378	847
	423949	6732347	854	32.9	9.1	78.8	90.1	32.90	0.2	-0.2	1.6	32.27	423954	6732379	847
	423949	6732347	854	34.87	1.2	78	90.1	34.87	0.0	-0.2	1.6	34.11	423950	6732381	846
	423949	6732347	854	34.3	355	77.3	90.1	34.30	6.2	-0.2	1.6	33.46	423946	6732380	846
	423949	6732347	854	91.46	326.4	75.3	90.1	91.46	5.7	-0.3	1.6	88.47	423900	6732421	830
	423949	6732347	854	98.24	323.1	75.1	90.2	98.24	5.6	-0.3	1.6	94.94	423892	6732423	828
	423949	6732347	854	98.78	321.3	76.4	90.1	98.78	5.6	-0.2	1.6	96.01	423889	6732422	830
	423949	6732347	854	98.55	319.2	76.5	90.1	98.55	5.6	-0.2	1.6	95.83	423886	6732420	830
St28 T79	423969	6732524	844	29.02	101.1	96.1	90.2	29.02	1.8	0.1	1.6	28.86	423997	6732518	846
	423969	6732524	844	26.64	93.6	101	90	26.64	1.6	0.2	1.6	26.15	423995	6732522	848
	423969	6732524	844	27.05	84.1	105.7	89.9	27.05	1.5	0.3	1.6	26.04	423995	6732527	851
	423969	6732524	844	25.12	80.4	104.9	90.1	25.12	1.4	0.3	1.6	24.28	423993	6732528	850
	423969	6732524	844	29.37	71.5	104.4	89.4	29.37	1.2	0.3	1.6	28.45	423996	6732533	851
	423969	6732524	844	23.13	60.2	103.5	90.3	23.13	1.1	0.2	1.6	22.49	423989	6732535	849
	423969	6732524	844	22.9	52.5	100.3	90.1	22.90	0.9	0.2	1.6	22.53	423987	6732538	847
	423969	6732524	844	31.37	23	87.2	90	31.37	0.4	0.0	1.6	31.33	423981	6732553	842
	423969	6732524	844	51.93	348.3	71.8	89.6	51.93	6.1	-0.3	1.6	49.33	423959	6732572	827
	423969	6732524	844	60.74	346.4	71.6	89.6	60.74	6.0	-0.3	1.6	57.63	423955	6732580	824
	423969	6732524	844	101.69	342.5	71.5	89.6	101.69	6.0	-0.3	1.6	96.44	423940	6732616	811

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St28 T80	423969	6732524	844	46.73	147.8	96.5	90.1	46.73	2.6	0.1	1.6	46.43	423994	6732485	849
	423969	6732524	844	43.71	152.1	99.6	90.1	43.71	2.7	0.2	1.6	43.10	423989	6732486	851
	423969	6732524	844	40.17	156.6	100.9	89.7	40.17	2.7	0.2	1.6	39.45	423985	6732488	851
	423969	6732524	844	41.36	164.2	100	89.8	41.36	2.9	0.2	1.6	40.73	423980	6732485	851
	423969	6732524	844	37.35	167	98.9	89.8	37.35	2.9	0.2	1.6	36.90	423977	6732488	849
	423969	6732524	844	30.67	173.6	101.4	89.4	30.67	3.0	0.2	1.6	30.06	423972	6732494	849
	423969	6732524	844	29.73	174.5	103.9	89.5	29.73	3.0	0.2	1.6	28.86	423972	6732495	850
	423969	6732524	844	30.64	176.6	99.7	90.1	30.64	3.1	0.2	1.6	30.20	423971	6732494	849
	423969	6732524	844	25.57	180.7	100.8	90.3	25.57	3.2	0.2	1.6	25.12	423969	6732499	848
	423969	6732524	844	22.76	189.2	101.3	90.3	22.76	3.3	0.2	1.6	22.32	423965	6732502	848
	423969	6732524	844	16.69	197.7	101.5	90.3	16.69	3.5	0.2	1.6	16.35	423964	6732508	847
	423969	6732524	844	16.39	207.6	103.5	90.5	16.39	3.6	0.2	1.6	15.94	423962	6732510	847
	423969	6732524	844	16.28	218.9	100.2	90.8	16.28	3.8	0.2	1.6	16.02	423959	6732512	846
	423969	6732524	844	16.22	235.2	90	90.3	16.22	4.1	0.0	1.6	16.22	423956	6732515	843
	423969	6732524	844	16.93	234	83.9	90.2	16.93	4.1	-0.1	1.6	16.83	423955	6732514	842
	423969	6732524	844	15.76	236.7	76	90.3	15.76	4.1	-0.2	1.6	15.29	423956	6732516	840
	423969	6732524	844	20.03	242.4	73.9	90.7	20.03	4.2	-0.3	1.6	19.24	423952	6732515	838
	423969	6732524	844	57.73	264.3	68.8	90	57.73	4.6	-0.4	1.6	53.82	423915	6732519	822
	423969	6732524	844	72.28	268	69.5	90.2	72.28	4.7	-0.4	1.6	67.70	423901	6732522	818
	423969	6732524	844	75.32	269.8	70.2	90	75.32	4.7	-0.3	1.6	70.87	423898	6732524	818
St1 P1a	424977	6731877	860	49.12	193.3	83	89.9	49.12	3.4	-0.1	1.6	48.75	424966	6731830	873
	424977	6731877	860	42.69	207.7	85.5	89.9	42.69	3.6	-0.1	1.6	42.56	424957	6731839	876
	424977	6731877	860	33.2	225.1	85.7	89.8	33.20	3.9	-0.1	1.6	33.11	424954	6731854	877
	424977	6731877	860	25.91	255.6	80.7	91.7	25.91	4.5	-0.2	1.6	25.57	424952	6731871	875
	424977	6731877	860	27.11	294.8	76.5	90.2	27.11	5.1	-0.2	1.6	26.57	424953	6731888	874
	424977	6731877	860	36.46	316.3	77.9	89.8	36.46	5.5	-0.2	1.6	35.65	424952	6731903	872
	424977	6731877	860	51.42	334.2	76.6	89.8	51.42	5.8	-0.2	1.6	50.02	424955	6731922	867
	424977	6731877	860	71.89	342.3	79.1	90.3	71.89	6.0	-0.2	1.6	70.59	424956	6731944	866
	424977	6731877	860	98.02	349.7	79.5	89.6	98.02	6.1	-0.2	1.6	96.38	424960	6731972	861
	424977	6731877	860	117.66	350.2	80.1	90.3	117.66	6.1	-0.2	1.6	115.91	424957	6731991	859
	424977	6731877	860	135.64	353.9	80.1	90.1	135.64	6.2	-0.2	1.6	133.62	424963	6732010	856
	424977	6731877	860	162.06	355.7	81.2	89.9	162.06	6.2	-0.2	1.6	160.17	424965	6732037	855
	424977	6731877	860	204.51	355	82.3	89.9	204.51	6.2	-0.1	1.6	202.67	424959	6732079	852
St1 P1b	424977	6731877	860	160.5	18.8	82.2	89.4	160.50	0.3	-0.1	1.6	159.02	425028	6732028	858
	424977	6731877	860	134.07	20.2	82.5	89.3	134.07	0.4	-0.1	1.6	132.92	425023	6732002	862
	424977	6731877	860	123.85	12.5	82.5	89.8	123.85	0.2	-0.1	1.6	122.79	425004	6731997	863
	424977	6731877	860	99.01	24.6	79.3	89.4	99.01	0.4	-0.2	1.6	97.29	425017	6731965	861
	424977	6731877	860	89.13	30.4	79.9	89.7	89.13	0.5	-0.2	1.6	87.75	425021	6731953	864
	424977	6731877	860	74.24	34.9	78.8	89.4	74.24	0.6	-0.2	1.6	72.83	425019	6731937	865
	424977	6731877	860	53.31	44.8	76.4	89.9	53.31	0.8	-0.2	1.6	51.82	425014	6731914	867
	424977	6731877	860	40.9	61.1	78.2	89	40.90	1.1	-0.2	1.6	40.04	425012	6731896	871
	424977	6731877	860	34.19	79.1	76.7	89.6	34.19	1.4	-0.2	1.6	33.27	425010	6731883	871
	424977	6731877	860	32.47	106.9	73.5	89.1	32.47	1.9	-0.3	1.6	31.13	425007	6731868	870
	424977	6731877	860	37.21	142.3	73.5	89.6	37.21	2.5	-0.3	1.6	35.68	424999	6731849	869
	424977	6731877	860	38.44	171.4	79.2	89.7	38.44	3.0	-0.2	1.6	37.76	424983	6731840	872
	424977	6731877	860	48.45	181.8	83	89.8	48.45	3.2	-0.1	1.6	48.09	424975	6731829	873
St2b P8	424988	6732232	856	158.55	191.6	89.2	90.9	158.55	3.3	0.0	1.6	158.53	424956	6732077	853
	424988	6732232	856	147.62	190.8	88.9	91.3	147.62	3.3	0.0	1.6	147.59	424960	6732087	853
	424988	6732232	856	131.03	194.1	88.5	91.4	131.03	3.4	0.0	1.6	130.99	424956	6732105	852
	424988	6732232	856	116.5	194	87.8	91.5	116.50	3.4	0.0	1.6	116.41	424960	6732119	851
	424988	6732232	856	102.64	193.8	86.8	91.3	102.64	3.4	-0.1	1.6	102.48	424964	6732132	850
	424988	6732232	856	93.33	194.1	86.1	90.7	93.33	3.4	-0.1	1.6	93.11	424965	6732142	849
	424988	6732232	856	81.39	197.5	84.9	91	81.39	3.4	-0.1	1.6	81.07	424964	6732155	848
	424988	6732232	856	71.67	198.6	83	91.3	71.67	3.5	-0.1	1.6	71.14	424965	6732165	847
	424988	6732232	856	57.72	211.4	80.6	91	57.72	3.7	-0.2	1.6	56.94	424958	6732183	846
	424988	6732232	856	54.26	221.3	80.1	90.6	54.26	3.9	-0.2	1.6	53.45	424953	6732192	846
	424988	6732232	856	42.38	225	75.8	91.6	42.38	3.9	-0.2	1.6	41.09	424959	6732203	845
	424988	6732232	856	38.27	241.5	75.7	90.8	38.27	4.2	-0.2	1.6	37.08	424956	6732214	846
	424988	6732232	856	33.99	253.8	72.1	91.1	33.99	4.4	-0.3	1.6	32.34	424957	6732223	845
	424988	6732232	856	33.87	268.7	71.9	91.6	33.87	4.7	-0.3	1.6	32.19	424956	6732231	845
	424988	6732232	856	59.49	306.8	78.3	91.3	59.49	5.4	-0.2	1.6	58.25	424941	6732267	843
	424988	6732232	856	65.84	310.8	79.1	90.8	65.84	5.4	-0.2	1.6	64.65	424939	6732274	843
	424988	6732232	856	87.58	315.7	82.3	90.8	87.58	5.5	-0.1	1.6	86.79	424927	6732294	844
	424988	6732232	856	99.42	320.1	82.9	91.2	99.42	5.6	-0.1	1.6	98.66	424925	6732308	843
St2c P10	424990	6732224	851	101.21	148.4	85.2	90.5	101.21	2.6	-0.1	1.6	100.86	425043	6732138	842
	424990	6732224	851	98.89	144.7	85.4	91	98.89	2.5	-0.1	1.6	98.57	425047	6732144	842
	424990	6732224	851	94.94	140.7	84.5	90.6	94.94	2.5	-0.1	1.6	94.50	425050	6732151	841
	424990	6732224	851	89.33	137	83.5	90.8	89.33	2.4	-0.1	1.6	88.76	425051	6732159	840
	424990	6732224	851	85.15	132.2	83	90.5	85.15	2.3	-0.1	1.6	84.52	425053	6732167	840
	424990	6732224	851	82.54	125.4	83	90.8	82.54	2.2	-0.1	1.6	81.92	425057	6732177	840
	424990	6732224	851	81.31	118.7	83.1	90.8	81.31	2.1	-0.1	1.6	80.72	425061	6732185	841

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St2c P12	424990	6732224	851	32.75	273.2	74.7	91.2	32.75	4.9	-0.3	1.6	31.59	424958	6732226	842
	424990	6732224	851	25.95	279.9	73.1	91.1	25.95	4.9	-0.3	1.6	24.83	424966	6732228	843
	424990	6732224	851	21.8	282.8	73.1	91	21.80	4.9	-0.3	1.6	20.86	424970	6732229	844
	424990	6732224	851	19.1	284.6	74.6	91.3	19.10	5.0	-0.3	1.6	18.41	424972	6732229	845
	424990	6732224	851	16.53	288.7	75.8	90.8	16.53	5.0	-0.2	1.6	16.02	424975	6732229	846
	424990	6732224	851	14.91	292.9	78.4	90.6	14.91	5.1	-0.2	1.6	14.61	424977	6732230	847
	424990	6732224	851	11.75	299.1	83.3	91	11.75	5.2	-0.1	1.6	11.67	424980	6732230	849
	424990	6732224	851	8.86	307.4	89.2	90.9	8.86	5.4	0.0	1.6	8.86	424983	6732229	850
	424990	6732224	851	6.95	332.9	96.2	91.2	6.95	5.8	0.1	1.6	6.88	424987	6732230	851
St6 P20	424872	6732422	859	61.92	191.5	79.3	90.9	61.92	3.3	-0.2	1.6	60.84	424860	6732362	847
	424872	6732422	859	50.97	198.8	76.9	90.8	50.97	3.5	-0.2	1.6	49.64	424856	6732375	847
	424872	6732422	859	48.7	204.8	78.2	91.2	48.70	3.6	-0.2	1.6	47.67	424852	6732379	848
St3 P14	424983	6732279	853	117.67	155.7	84.6	91.3	117.67	2.7	-0.1	1.6	117.15	425031	6732172	841
	424983	6732279	853	111.57	147.3	83.4	91	111.57	2.6	-0.1	1.6	110.83	425043	6732186	840
	424983	6732279	853	105.05	150	83.4	91.1	105.05	2.6	-0.1	1.6	104.35	425036	6732189	840
	424983	6732279	853	99.38	140.1	82.4	91	99.38	2.4	-0.1	1.6	98.51	425046	6732203	839
	424983	6732279	853	93.8	133.6	81.3	91.1	93.80	2.3	-0.2	1.6	92.72	425050	6732215	838
	424983	6732279	853	92.75	128.7	80.1	91.5	92.75	2.2	-0.2	1.6	91.37	425054	6732222	836
	424983	6732279	853	85.9	114.3	78.7	90.8	85.90	2.0	-0.2	1.6	84.23	425060	6732244	836
	424983	6732279	853	83.67	113.1	78.3	91.3	83.67	2.0	-0.2	1.6	81.93	425058	6732247	835
	424983	6732279	853	87.48	99.1	78	91.5	87.48	1.7	-0.2	1.6	86.57	425067	6732265	834
	424983	6732279	853	88.14	91.1	79.2	91.4	88.14	1.6	-0.2	1.6	86.58	425070	6732277	836
	424983	6732279	853	88.15	90	79.3	91.4	88.15	1.6	-0.2	1.6	86.62	425070	6732279	836
	424983	6732279	853	85.72	82.3	79.3	91.3	85.72	1.4	-0.2	1.6	84.23	425066	6732290	836
	424983	6732279	853	88.04	70.6	78.1	91.4	88.04	1.2	-0.2	1.6	86.15	425064	6732308	834
St3 P16	424983	6732279	853	63.15	295.7	76.5	90.7	63.15	5.2	-0.2	1.6	61.41	424928	6732306	838
	424983	6732279	853	70.21	291.5	79.4	90.8	70.21	5.1	-0.2	1.6	69.01	424919	6732304	839
	424983	6732279	853	74.66	293.7	80.8	91.2	74.66	5.1	-0.2	1.6	73.70	424916	6732309	840
	424983	6732279	853	76.66	293.7	81.2	90.8	76.66	5.1	-0.2	1.6	75.76	424914	6732309	841
St4a P18a	424997	6732323	854	62.74	43.3	70.7	91.4	62.74	0.8	-0.3	1.6	59.21	425038	6732366	833
	424997	6732323	854	68.47	37	71.2	91.3	68.47	0.6	-0.3	1.6	64.82	425036	6732375	831
	424997	6732323	854	71.78	32.1	71.8	90	71.78	0.6	-0.3	1.6	68.19	425033	6732381	831
	424997	6732323	854	78.61	26.2	73.3	91	78.61	0.5	-0.3	1.6	75.29	425030	6732391	831
	424997	6732323	854	81.82	24.3	73.8	90.3	81.82	0.4	-0.3	1.6	78.57	425029	6732395	831
	424997	6732323	854	86.53	23.5	74.8	90.8	86.53	0.4	-0.3	1.6	83.50	425030	6732400	831
	424997	6732323	854	93.66	22.3	75.9	90.6	93.66	0.4	-0.2	1.6	90.84	425031	6732407	831
	424997	6732323	854	107.41	15.2	76.8	91.3	107.41	0.3	-0.2	1.6	104.57	425024	6732424	829
	424997	6732323	854	113.43	13.9	76.8	91.3	113.43	0.2	-0.2	1.6	110.43	425024	6732430	827
	424997	6732323	854	119.04	11.3	77.4	91	119.04	0.2	-0.2	1.6	116.17	425020	6732437	827
	424997	6732323	854	124.93	10.8	78.1	91.3	124.93	0.2	-0.2	1.6	122.25	425020	6732443	828
St4b P18b	425111	6732498	841	125.23	227.2	87.9	90.9	125.23	4.0	0.0	1.6	125.15	425019	6732413	836
	425111	6732498	841	112.74	241	87.2	91	112.74	4.2	0.0	1.6	112.61	425013	6732443	835
	425111	6732498	841	112.57	241.2	86.8	91.2	112.57	4.2	-0.1	1.6	112.39	425013	6732444	834
	425111	6732498	841	108.48	250.2	86.1	90.9	108.48	4.4	-0.1	1.6	108.23	425009	6732461	833
	425111	6732498	841	125.89	268.1	85.1	91	125.89	4.7	-0.1	1.6	125.43	424986	6732494	830
	425111	6732498	841	166.77	278.2	86.4	90.9	166.77	4.9	-0.1	1.6	166.44	424946	6732522	830
	425111	6732498	841	211.5	289.5	85.5	91.1	211.50	5.1	-0.1	1.6	210.85	424912	6732568	824
	425111	6732498	841	233.78	288.1	86	90.7	233.78	5.0	-0.1	1.6	233.21	424889	6732570	824
	425111	6732498	841	246.83	285.9	86.6	91.4	246.83	5.0	-0.1	1.6	246.40	424874	6732566	826
	425111	6732498	841	263.34	285.5	87.1	90.4	263.34	5.0	-0.1	1.6	263.00	424858	6732568	827
	425111	6732498	841	276.87	291.6	86.2	91.3	276.87	5.1	-0.1	1.6	276.26	424854	6732600	822
	425111	6732498	841	289.75	292.3	85.8	91.1	289.75	5.1	-0.1	1.6	288.97	424844	6732608	819
	425111	6732498	841	292.29	293.8	85.6	90.8	292.29	5.1	-0.1	1.6	291.43	424844	6732616	818
	425111	6732498	841	316.21	295.2	85.5	91.2	316.21	5.2	-0.1	1.6	315.24	424826	6732632	816
	425111	6732498	841	347.17	295.1	86.4	90.7	347.17	5.2	-0.1	1.6	346.48	424797	6732645	819
St7 P22	424646	6732576	866	212.96	135.7	85.6	90.1	212.96	2.4	-0.1	1.6	212.33	424794	6732424	849
	424646	6732576	866	206.85	135.4	85.2	90.6	206.85	2.4	-0.1	1.6	206.12	424791	6732429	848
	424646	6732576	866	187.33	134.6	84.3	90.6	187.33	2.3	-0.1	1.6	186.40	424779	6732445	847
	424646	6732576	866	174.77	134.7	83.9	90.6	174.77	2.4	-0.1	1.6	173.78	424770	6732454	847
	424646	6732576	866	170.48	135.8	83.6	90.2	170.48	2.4	-0.1	1.6	169.42	424764	6732455	846
	424646	6732576	866	152.88	137	83.2	90.8	152.88	2.4	-0.1	1.6	151.80	424750	6732465	847
	424646	6732576	866	145.41	135.6	82.2	90.6	145.41	2.4	-0.1	1.6	144.06	424747	6732473	846
	424646	6732576	866	136.45	134.7	81.7	90.7	136.45	2.4	-0.1	1.6	135.02	424742	6732481	846
	424646	6732576	866	117.98	139.2	81	89.7	117.98	2.4	-0.2	1.6	116.53	424722	6732488	847
	424646	6732576	866	109.71	145.2	81.2	91.2	109.71	2.5	-0.2	1.6	108.42	424706	6732487	849
	424646	6732576	866	97.76	148.3	81.2	90.5	97.76	2.6	-0.2	1.6	96.61	424697	6732494	850
	424646	6732576	866	98.8	153.3	81.6	91	98.80	2.7	-0.1	1.6	97.74	424690	6732489	851
	424646	6732576	866	93.73	154.9	81.2	90.8	93.73	2.7	-0.2	1.6	92.63	424685	6732492	851
	424646	6732576	866	90.63	156.4	80.3	91	90.63	2.7	-0.2	1.6	89.33	424682	6732494	850
	424646	6732576	866	86.43	155.6	80	90.6	86.43	2.7	-0.2	1.6	85.12	424681	6732498	850
	424646	6732576	866	84.63	156.2	79.5	91.4	84.63	2.7	-0.2	1.6	83.21	424680	6732500	850
	424646	6732576	866	80.16	158	79.3	91.4	80.16	2.8	-0.2	1.6	78.77	424676	6732503	850
	424646	6732576	866	82.49	158	79.7	91.4	82.49	2.8	-0.2	1.6	81.16	424676	6732501	851
	424646	6732576	866	78.78	160.3	78.9	91.9	78.78	2.8	-0.2	1.6	77.31	424672	6732503	850
	424646	6732576	866	74.54	162.3	77.5	90.3	74.54	2.8	-0.2	1.6	72.77	424668	6732507	849
	424646	6732576	866	62.99	185.9	75.1	91.8	62.99	3.2	-0.3	1.6	60.87	424640	6732515	849
	424646	6732576	866	57.95	187.7	74.4	91.8	57.95	3.3	-0.3	1.6	55.82	424639	6732521	850
	424646	6732576	866	57.6	193	73.9	91.8	57.60	3.4	-0.3	1.6	55.34	424634	6732522	849
	424646	6732576	866	57.76	199.7	75	91.7	57.76	3.5	-0.3	1.6	55.79	424627	6732523	850

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
P22 cont...	424646	6732576	866	59.8	201.2	75.9	91.5	59.80	3.5	-0.2	1.6	58.00	424625	6732522	851
	424646	6732576	866	59.23	205	75.9	91.5	59.23	3.6	-0.2	1.6	57.45	424622	6732524	851
	424646	6732576	866	59.21	211.1	75.3	91.4	59.21	3.7	-0.3	1.6	57.27	424616	6732527	850
	424646	6732576	866	59.62	215.8	76.4	91.3	59.62	3.8	-0.2	1.6	57.95	424612	6732529	851
	424646	6732576	866	59.76	222.3	75.2	91.3	59.76	3.9	-0.3	1.6	57.78	424607	6732533	850
	424646	6732576	866	63.05	232.7	75.5	91.7	63.05	4.1	-0.3	1.6	61.04	424597	6732539	850
	424646	6732576	866	67.49	237.7	76.1	91.6	67.49	4.1	-0.2	1.6	65.51	424591	6732541	849
	424646	6732576	866	70.78	241.1	76.8	91.3	70.78	4.2	-0.2	1.6	68.91	424586	6732543	849
	424646	6732576	866	73.72	241.7	77.6	91.2	73.72	4.2	-0.2	1.6	72.00	424583	6732542	850
	424646	6732576	866	76.67	243.1	78.3	91.3	76.67	4.2	-0.2	1.6	75.08	424579	6732542	850
	424646	6732576	866	80.05	244.7	79.2	91.4	80.05	4.3	-0.2	1.6	78.63	424575	6732542	850
	424646	6732576	866	91.94	249.6	80.5	91.2	91.94	4.4	-0.2	1.6	90.68	424561	6732544	850
	424646	6732576	866	97.1	251.7	81.1	91.3	97.10	4.4	-0.2	1.6	95.93	424555	6732546	850
	424646	6732576	866	107.37	253.1	82.9	91.2	107.37	4.4	-0.1	1.6	106.55	424544	6732545	852
	424646	6732576	866	116.84	254.7	83.2	91.3	116.84	4.4	-0.1	1.6	116.02	424534	6732545	852
	424646	6732576	866	116.37	256.1	83.7	91.3	116.37	4.5	-0.1	1.6	115.67	424534	6732548	853
	424646	6732576	866	132.24	256.5	84	91.4	132.24	4.5	-0.1	1.6	131.52	424518	6732545	852
	424646	6732576	866	141.43	256.7	85.2	91.3	141.43	4.5	-0.1	1.6	140.93	424509	6732544	854
	424646	6732576	866	163.57	256.2	86.3	91.4	163.57	4.5	-0.1	1.6	163.23	424487	6732537	855
	424646	6732576	866	167.54	258.5	85.5	91.4	167.54	4.5	-0.1	1.6	167.02	424482	6732543	852
St8 P27	424646	6732576	866	244.75	96.4	79.7	91.3	244.75	1.7	-0.2	1.6	240.81	424885	6732549	822
	424646	6732576	866	242.26	93.5	78.9	91	242.26	1.6	-0.2	1.6	237.73	424883	6732561	819
	424646	6732576	866	234.71	92.9	78.6	91.1	234.71	1.6	-0.2	1.6	230.06	424876	6732564	819
	424646	6732576	866	218.6	90.7	77.4	91.8	218.60	1.6	-0.2	1.6	213.34	424859	6732573	818
	424646	6732576	866	212.92	88.6	76.3	91.6	212.92	1.5	-0.2	1.6	208.86	424853	6732581	815
	424646	6732576	866	195.47	85.7	74.9	92.3	195.47	1.5	-0.3	1.6	188.72	424834	6732590	814
	424646	6732576	866	191.18	82.5	74.3	92.4	191.18	1.4	-0.3	1.6	184.05	424828	6732600	814
	424646	6732576	866	184.83	79.6	73.7	92.3	184.83	1.4	-0.3	1.6	177.40	424820	6732608	813
	424646	6732576	866	164.7	76.4	72.6	92.3	164.70	1.3	-0.3	1.6	157.16	424799	6732613	816
	424646	6732576	866	104.21	72.2	70.6	92.4	104.21	1.3	-0.3	1.6	98.29	424740	6732606	831
	424646	6732576	866	89.33	63.1	68.3	90.3	89.33	1.1	-0.4	1.6	83.00	424720	6732614	832
	424646	6732576	866	74.09	41.2	68.2	91.9	74.09	0.7	-0.4	1.6	68.79	424691	6732628	838
	424646	6732576	866	69.73	32.2	66.4	92.1	69.73	0.6	-0.4	1.6	63.90	424680	6732630	837
	424646	6732576	866	54.99	7	67.5	91.5	54.99	0.1	-0.4	1.6	50.80	424652	6732626	844
	424646	6732576	866	68.78	2.1	67.6	91.4	68.78	0.0	-0.4	1.6	63.59	424648	6732640	839
	424646	6732576	866	53.05	358.1	67.7	91.3	53.05	6.3	-0.4	1.6	49.08	424644	6732625	845
	424646	6732576	866	57.82	344.8	68.8	91.7	57.82	6.0	-0.4	1.6	53.91	424632	6732628	844
	424646	6732576	866	65.36	341.1	70.8	91.8	65.36	6.0	-0.3	1.6	61.72	424626	6732634	844
	424646	6732576	866	75.29	327.4	72.7	91.2	75.29	5.7	-0.3	1.6	71.88	424607	6732637	843
	424646	6732576	866	85.29	320.8	75.4	91.2	85.29	5.6	-0.3	1.6	82.54	424594	6732640	844
St10 P30	424450	6732563	864	57.12	145.8	75.6	90.6	57.12	2.5	-0.3	1.6	55.33	424481	6732517	849
	424450	6732563	864	48.53	198.8	71.8	91.2	48.53	3.5	-0.3	1.6	46.10	424435	6732519	848
	424450	6732563	864	55.29	217.2	73.9	91.1	55.29	3.8	-0.3	1.6	53.12	424418	6732521	848
	424450	6732563	864	60.62	226.7	74.9	91.5	60.62	4.0	-0.3	1.6	58.53	424407	6732523	848
	424450	6732563	864	69.81	231.5	77.2	90.8	69.81	4.0	-0.2	1.6	68.08	424397	6732521	848
	424450	6732563	864	89.24	239.8	79.7	91.6	89.24	4.2	-0.2	1.6	87.80	424374	6732519	847
	424450	6732563	864	162.82	248.3	84.2	91	162.82	4.3	-0.1	1.6	161.99	424299	6732503	847
	424450	6732563	864	187.01	250	84.7	90.8	187.01	4.4	-0.1	1.6	186.21	424275	6732499	846
	424450	6732563	864	222.78	247.5	85.5	90.9	222.78	4.3	-0.1	1.6	222.09	424245	6732478	846
	424450	6732563	864	255.26	246.7	86	91.2	255.26	4.3	-0.1	1.6	254.64	424216	6732462	846
	424450	6732563	864	275.74	247.1	86.4	90.9	275.74	4.3	-0.1	1.6	275.20	424196	6732456	846
St11 P34	424474	6732617	862	150.81	71	80.8	91.2	150.81	1.2	-0.2	1.6	148.87	424615	6732665	837
	424474	6732617	862	135.83	67.5	79.7	91.1	135.83	1.2	-0.2	1.6	133.64	424597	6732668	837
	424474	6732617	862	105.17	57.8	75.8	91.9	105.17	1.0	-0.2	1.6	101.96	424560	6732671	836
	424474	6732617	862	95.53	52	74.6	91.6	95.53	0.9	-0.3	1.6	92.10	424547	6732674	836
	424474	6732617	862	59.39	33.5	68.9	91.8	59.39	0.6	-0.4	1.6	55.41	424505	6732663	840
	424474	6732617	862	64.86	17.8	67.8	91.5	64.86	0.3	-0.4	1.6	60.05	424492	6732674	837
	424474	6732617	862	64.34	340.7	71.2	91.6	64.34	5.9	-0.3	1.6	60.91	424454	6732674	841
	424474	6732617	862	112.81	317.9	78.8	91.8	112.81	5.5	-0.2	1.6	110.66	424400	6732699	839
	424474	6732617	862	135.01	312.1	80	91.9	135.01	5.4	-0.2	1.6	132.96	424375	6732706	838
	424474	6732617	862	150.85	309.4	81.6	91.6	150.85	5.4	-0.1	1.6	149.23	424359	6732712	839
	424474	6732617	862	161.76	306.9	82.7	91.4	161.76	5.4	-0.1	1.6	160.45	424346	6732713	841
	424474	6732617	862	174.4	303.6	83.6	91.3	174.40	5.3	-0.1	1.6	173.31	424330	6732713	842

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St16 P42	424307	6732555	861	61.03	187.2	75.2	90.4	61.03	3.3	-0.3	1.6	59.01	424300	6732496	845
	424307	6732555	861	73.3	207.2	77.7	90.6	73.30	3.6	-0.2	1.6	71.62	424274	6732491	845
	424307	6732555	861	86.6	209	80.1	90.2	86.60	3.6	-0.2	1.6	85.31	424266	6732480	845
	424307	6732555	861	97.48	213.5	81.2	91.3	97.48	3.7	-0.2	1.6	96.33	424254	6732475	845
	424307	6732555	861	109.62	215.3	81.9	90.6	109.62	3.8	-0.1	1.6	108.53	424244	6732466	845
	424307	6732555	861	137.43	219.4	82.7	90.3	137.43	3.8	-0.1	1.6	136.32	424220	6732450	843
	424307	6732555	861	146.31	223.5	84.1	90.1	146.31	3.9	-0.1	1.6	145.53	424207	6732449	845
	424307	6732555	861	172.69	226	84.7	91.2	172.69	3.9	-0.1	1.6	171.95	424183	6732436	844
	424307	6732555	861	186.95	225.8	85.2	90.4	186.95	3.9	-0.1	1.6	186.29	424173	6732425	845
	424307	6732555	861	193.53	224.2	85.3	90	193.53	3.9	-0.1	1.6	192.88	424173	6732417	844
	424307	6732555	861	202.17	226.2	85.4	89.9	202.17	3.9	-0.1	1.6	201.52	424162	6732416	844
	424307	6732555	861	205.97	223.1	85.8	90.2	205.97	3.9	-0.1	1.6	205.42	424167	6732405	845
	424307	6732555	861	212.67	226.8	85.9	91.8	212.67	4.0	-0.1	1.6	212.13	424152	6732410	845
	424307	6732555	861	229.66	228.5	86.2	90.3	229.66	4.0	-0.1	1.6	229.16	424135	6732403	845
	424307	6732555	861	244.75	229.4	86.5	91.8	244.75	4.0	-0.1	1.6	244.29	424122	6732396	845
	424307	6732555	861	254.95	227.4	86.5	90.5	254.95	4.0	-0.1	1.6	254.47	424120	6732383	845
	424307	6732555	861	271.39	226.5	86.8	90.4	271.39	4.0	-0.1	1.6	270.97	424110	6732368	845
	424307	6732555	861	286.61	226	87.2	89.8	286.61	3.9	0.0	1.6	286.27	424101	6732356	846
	424307	6732555	861	288.47	226.1	87.3	90.2	288.47	3.9	0.0	1.6	288.15	424099	6732355	847
St17 P45	424139	6732450	853	80.2	207.1	83.7	90.2	80.20	3.6	-0.1	1.6	79.72	424103	6732379	844
	424139	6732450	853	105.6	216.3	85.6	90.7	105.60	3.8	-0.1	1.6	105.29	424077	6732365	844
	424139	6732450	853	119.06	219.6	86.5	90	119.06	3.8	-0.1	1.6	118.84	424063	6732358	845
	424139	6732450	853	139.51	222.4	86.2	90.1	139.51	3.9	-0.1	1.6	139.20	424045	6732347	843
	424139	6732450	853	156.88	222.3	86.6	90.2	156.88	3.9	-0.1	1.6	156.60	424034	6732334	843
	424139	6732450	853	166.75	219.6	87.5	90.4	166.75	3.8	0.0	1.6	166.59	424033	6732322	845
	424139	6732450	853	184.98	218.7	88.7	90.5	184.98	3.8	0.0	1.6	184.93	424023	6732306	848
	424139	6732450	853	220.96	219.2	88.8	89.6	220.96	3.8	0.0	1.6	220.91	423999	6732279	848
	424139	6732450	853	256.46	219.2	88.8	89.7	256.46	3.8	0.0	1.6	256.40	423977	6732251	847
	424139	6732450	853	280.9	217.6	89	89.9	280.90	3.8	0.0	1.6	280.86	423968	6732227	847
St18 P53	424169	6732726	847	152.75	102	87.9	89.9	152.75	1.8	0.0	1.6	152.65	424318	6732694	841
	424169	6732726	847	157.25	99.4	87.6	90.6	157.25	1.7	0.0	1.6	157.11	424324	6732700	840
	424169	6732726	847	149.44	99.6	87.1	90.6	149.44	1.7	-0.1	1.6	149.25	424316	6732701	839
	424169	6732726	847	145.69	99.3	86.9	90.5	145.69	1.7	-0.1	1.6	145.48	424313	6732702	838
	424169	6732726	847	142.03	99.9	86.7	90.5	142.03	1.7	-0.1	1.6	141.79	424309	6732702	838
	424169	6732726	847	133.07	100.5	86.5	90.4	133.07	1.8	-0.1	1.6	132.82	424300	6732702	838
	424169	6732726	847	127.85	101.1	86.4	90.2	127.85	1.8	-0.1	1.6	127.60	424294	6732701	838
	424169	6732726	847	100.33	102.5	86.3	90.1	100.33	1.8	-0.1	1.6	100.12	424267	6732704	840
	424169	6732726	847	85.33	99.3	84.2	90.1	85.33	1.7	-0.1	1.6	84.89	424253	6732712	838
	424169	6732726	847	69.92	97	82.2	90.1	69.92	1.7	-0.1	1.6	69.27	424238	6732718	837
	424169	6732726	847	68.66	90.4	82.2	90.7	68.66	1.6	-0.1	1.6	68.02	424237	6732726	837
	424169	6732726	847	7.39	88.8	80	90.2	7.39	1.5	-0.2	1.6	7.28	424176	6732726	845
	424169	6732726	847	47.94	81.6	80.6	90.7	47.94	1.4	-0.2	1.6	47.30	424216	6732733	839
	424169	6732726	847	52.01	72.6	79	90.2	52.01	1.3	-0.2	1.6	51.05	424218	6732741	836
	424169	6732726	847	44.91	68.6	75.3	90	44.91	1.2	-0.3	1.6	43.44	424209	6732742	835
	424169	6732726	847	42.46	58.5	73.7	90.6	42.46	1.0	-0.3	1.6	40.75	424204	6732747	834
	424169	6732726	847	37.1	38.7	70.6	90.2	37.10	0.7	-0.3	1.6	34.99	424191	6732753	834
	424169	6732726	847	34.41	23.4	70.2	90.3	34.41	0.4	-0.3	1.6	32.38	424182	6732756	835
	424169	6732726	847	43.83	354.6	69.2	89.9	43.83	6.2	-0.4	1.6	40.97	424165	6732767	831
	424169	6732726	847	39.11	341.2	70.9	90.6	39.11	6.0	-0.3	1.6	36.96	424157	6732761	834
	424169	6732726	847	44.32	338.6	71.8	89.7	44.32	5.9	-0.3	1.6	42.10	424154	6732765	833
	424169	6732726	847	48.5	333.5	72.3	89.9	48.50	5.8	-0.3	1.6	46.20	424148	6732767	832
	424169	6732726	847	59.91	320.1	74.8	90.9	59.91	5.6	-0.3	1.6	57.81	424132	6732770	831
	424169	6732726	847	59.5	310.5	78	89.8	59.50	5.4	-0.2	1.6	58.20	424125	6732764	834
	424169	6732726	847	60.2	307.8	78.5	89.8	60.20	5.4	-0.2	1.6	58.99	424122	6732762	834

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
S120 P59	424059	6732653	849	114.76	32.2	80.9	90	114.76	0.6	-0.2	1.6	113.32	424119	6732749	830
	424059	6732653	849	110.02	30.1	80.2	90.3	110.02	0.5	-0.2	1.6	108.41	424113	6732747	830
	424059	6732653	849	101.17	23.9	77.7	90.1	101.17	0.4	-0.2	1.6	98.85	424099	6732743	827
	424059	6732653	849	104.01	21.2	78	90.3	104.01	0.4	-0.2	1.6	101.74	424096	6732748	827
	424059	6732653	849	95.97	19.5	76.6	90.1	95.97	0.3	-0.2	1.6	93.36	424090	6732741	826
	424059	6732653	849	99.44	18.3	76.1	90.1	99.44	0.3	-0.2	1.6	96.53	424089	6732745	824
	424059	6732653	849	88.04	14.7	74.7	90.5	88.04	0.3	-0.3	1.6	84.92	424081	6732735	825
	424059	6732653	849	94.61	7.8	73.7	90.1	94.61	0.1	-0.3	1.6	90.81	424071	6732743	822
	424059	6732653	849	93.93	6.3	74.3	90	93.93	0.1	-0.3	1.6	90.43	424069	6732743	823
	424059	6732653	849	92.4	3.8	73.9	89.9	92.40	0.1	-0.3	1.6	88.78	424065	6732742	823
	424059	6732653	849	99.73	1.3	73.6	89.8	99.73	0.0	-0.3	1.6	95.67	424061	6732749	820
	424059	6732653	849	96.61	2.7	73.4	90.1	96.61	0.0	-0.3	1.6	92.58	424063	6732745	821
	424059	6732653	849	86.67	3.8	72.5	90.2	86.67	0.1	-0.3	1.6	82.66	424064	6732735	822
	424059	6732653	849	85.43	6.8	72.3	90	85.43	0.1	-0.3	1.6	81.39	424069	6732734	822
	424059	6732653	849	79.9	8.5	71.6	90	79.90	0.1	-0.3	1.6	75.82	424070	6732728	823
	424059	6732653	849	75.6	9.3	70.9	90	75.60	0.2	-0.3	1.6	71.44	424071	6732723	824
	424059	6732653	849	75.32	10	70.7	89.8	75.32	0.2	-0.3	1.6	71.09	424071	6732723	823
	424059	6732653	849	74.99	11.7	70.6	89.6	74.99	0.2	-0.3	1.6	70.73	424073	6732722	823
	424059	6732653	849	70.55	12.7	69.9	89.5	70.55	0.2	-0.4	1.6	66.25	424074	6732718	824
	424059	6732653	849	68.77	12.4	69.9	90.4	68.77	0.2	-0.4	1.6	64.58	424073	6732716	825
	424059	6732653	849	63.34	12	67.9	90.3	63.34	0.2	-0.4	1.6	58.69	424071	6732710	825
	424059	6732653	849	60.53	9.3	66.6	90.2	60.53	0.2	-0.4	1.6	55.55	424068	6732708	824
	424059	6732653	849	57.93	3	68.3	90.6	57.93	0.1	-0.4	1.6	53.82	424062	6732707	827
	424059	6732653	849	68.04	359.5	66.5	90.2	68.04	6.3	-0.4	1.6	62.40	424058	6732715	821
	424059	6732653	849	64.5	357.2	66.7	90.4	64.50	6.2	-0.4	1.6	59.24	424056	6732712	823
	424059	6732653	849	65.95	346.5	67.5	90.1	65.95	6.0	-0.4	1.6	60.93	424045	6732712	823
	424059	6732653	849	71.05	344	67.8	90.1	71.05	6.0	-0.4	1.6	65.78	424041	6732716	822
	424059	6732653	849	76.75	337.1	68.1	90.3	76.75	5.9	-0.4	1.6	71.21	424031	6732719	820
	424059	6732653	849	76.53	331.7	67.7	90.5	76.53	5.8	-0.4	1.6	70.81	424025	6732716	819
	424059	6732653	849	75.28	326.2	67	90.2	75.28	5.7	-0.4	1.6	69.30	424020	6732711	819
	424059	6732653	849	68.94	321.2	67.4	90.6	68.94	5.6	-0.4	1.6	63.65	424019	6732703	822
	424059	6732653	849	71.58	315.7	66.3	90.5	71.58	5.5	-0.4	1.6	65.54	424013	6732700	820
	424059	6732653	849	75.39	313.8	67.5	90.2	75.39	5.5	-0.4	1.6	69.65	424009	6732701	819
	424059	6732653	849	73.45	312.8	67.8	90.2	73.45	5.5	-0.4	1.6	68.01	424009	6732699	821
	424059	6732653	849	79.73	307.9	68.1	91	79.73	5.4	-0.4	1.6	73.96	424001	6732698	819
P59 cont...	424059	6732653	849	79.96	303	68.7	90.2	79.96	5.3	-0.4	1.6	74.50	423997	6732694	819
	424059	6732653	849	78	300.9	67.8	90.3	78.00	5.3	-0.4	1.6	72.22	423997	6732690	819
	424059	6732653	849	71.17	301.4	66.8	90	71.17	5.3	-0.4	1.6	65.41	424003	6732687	820
	424059	6732653	849	70.38	299.1	65.6	89.7	70.38	5.2	-0.4	1.6	64.09	424003	6732684	819
	424059	6732653	849	73.51	297.5	67.3	90.2	73.51	5.2	-0.4	1.6	67.82	423999	6732684	820
	424059	6732653	849	71.1	295.7	66.9	90.1	71.10	5.2	-0.4	1.6	65.40	424000	6732681	820
	424059	6732653	849	78.89	291	67.8	89.9	78.89	5.1	-0.4	1.6	73.04	423991	6732679	819
	424059	6732653	849	76.85	286.5	67.2	90.4	76.85	5.0	-0.4	1.6	70.85	423991	6732673	819
	424059	6732653	849	86.21	284.6	69.4	89.9	86.21	5.0	-0.4	1.6	80.70	423981	6732673	818
	424059	6732653	849	91.71	283.9	70.8	89.8	91.71	5.0	-0.3	1.6	86.61	423975	6732674	818
	424059	6732653	849	100.42	278.8	72.4	89.5	100.42	4.9	-0.3	1.6	95.72	423964	6732668	818
	424059	6732653	849	104.89	276.9	73.1	89.4	104.89	4.8	-0.3	1.6	100.36	423959	6732665	818
	424059	6732653	849	102.92	276.2	73.4	89.2	102.92	4.8	-0.3	1.6	98.63	423961	6732664	819
	424059	6732653	849	102.4	275.9	73.8	90.4	102.40	4.8	-0.3	1.6	98.33	423961	6732663	820
	424059	6732653	849	101.46	272	74	90.3	101.46	4.7	-0.3	1.6	97.53	423962	6732656	820
	424059	6732653	849	115.44	271.3	74.7	90.5	115.44	4.7	-0.3	1.6	111.35	423948	6732656	818
	424059	6732653	849	110.23	269.3	75.3	90	110.23	4.7	-0.3	1.6	106.62	423952	6732652	820
	424059	6732653	849	121.17	266.2	75.6	90.1	121.17	4.6	-0.3	1.6	117.36	423942	6732645	818
	424059	6732653	849	129.05	261.6	77.2	89.9	129.05	4.6	-0.2	1.6	125.84	423935	6732635	820
	424059	6732653	849	130.91	259.5	78.4	90	130.91	4.5	-0.2	1.6	128.24	423933	6732630	822
	424059	6732653	849	151.56	255.8	78.8	89.9	151.56	4.5	-0.2	1.6	148.67	423915	6732617	819
	424059	6732653	849	155.8	253.3	79.6	90.1	155.80	4.4	-0.2	1.6	153.24	423912	6732609	820
	424059	6732653	849	145.66	251.5	79.5	90.1	145.66	4.4	-0.2	1.6	143.22	423923	6732608	822
	424059	6732653	849	149.81	248.7	80	90.3	149.81	4.3	-0.2	1.6	147.53	423922	6732599	822
	424059	6732653	849	169.03	246.9	81.2	89.9	169.03	4.3	-0.2	1.6	167.04	423905	6732587	822

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St23 P67	423918	6732442	838	155.58	3.3	81.6	90	155.58	0.1	-0.1	1.6	153.91	423927	6732596	815
	423918	6732442	838	139.03	359.1	80.1	89.9	139.03	6.3	-0.2	1.6	136.96	423916	6732579	813
	423918	6732442	838	114.85	353.1	78.5	90.4	114.85	6.2	-0.2	1.6	112.54	423904	6732554	814
	423918	6732442	838	84.46	348.6	78	89.6	84.46	6.1	-0.2	1.6	82.61	423902	6732523	820
	423918	6732442	838	71.26	347.6	77	90.2	71.26	6.1	-0.2	1.6	69.43	423903	6732510	821
	423918	6732442	838	63.56	341.8	76.1	90	63.56	6.0	-0.2	1.6	61.70	423899	6732501	822
	423918	6732442	838	56.57	335	75.9	90.2	56.57	5.8	-0.2	1.6	54.87	423895	6732492	824
	423918	6732442	838	52.47	331.4	75.2	90.3	52.47	5.8	-0.3	1.6	50.73	423894	6732487	824
	423918	6732442	838	51.34	327.9	74	90.2	51.34	5.7	-0.3	1.6	49.35	423892	6732484	823
	423918	6732442	838	55.06	325.4	72.6	90.1	55.06	5.7	-0.3	1.6	52.64	423888	6732485	821
	423918	6732442	838	42.91	320.7	70.2	90.3	42.91	5.6	-0.3	1.6	40.37	423892	6732473	823
	423918	6732442	838	43.93	318.8	69	90.3	43.93	5.6	-0.4	1.6	41.01	423891	6732473	822
	423918	6732442	838	43.09	313.5	68.4	90.1	43.09	5.5	-0.4	1.6	40.06	423889	6732470	821
	423918	6732442	838	53.86	303.3	69	90.4	53.86	5.3	-0.4	1.6	50.28	423876	6732470	818
	423918	6732442	838	55.19	298	68.5	90	55.19	5.2	-0.4	1.6	51.35	423873	6732466	817
	423918	6732442	838	45.73	290.5	68.3	89.9	45.73	5.1	-0.4	1.6	42.49	423878	6732457	820
	423918	6732442	838	29.87	283.7	69.4	89.9	29.87	5.0	-0.4	1.6	27.96	423891	6732449	827
	423918	6732442	838	48.66	278.8	69.2	90	48.66	4.9	-0.4	1.6	45.49	423873	6732449	820
	423918	6732442	838	55.74	272	69.7	90.1	55.74	4.7	-0.4	1.6	52.28	423866	6732444	818
	423918	6732442	838	39.91	262.2	70.9	89.1	39.91	4.6	-0.3	1.6	37.71	423881	6732437	824
	423918	6732442	838	39.57	258.7	72.1	90.2	39.57	4.5	-0.3	1.6	37.65	423881	6732435	825
	423918	6732442	838	43.13	253.6	73.4	90.1	43.13	4.4	-0.3	1.6	41.33	423878	6732430	825
	423918	6732442	838	47.22	246.6	75.5	90.1	47.22	4.3	-0.3	1.6	45.72	423876	6732424	826
	423918	6732442	838	48.14	241.7	76.5	90.4	48.14	4.2	-0.2	1.6	46.81	423877	6732420	826
	423918	6732442	838	70.61	225.4	79.2	89.9	70.61	3.9	-0.2	1.6	69.36	423869	6732393	824
	423918	6732442	838	90.28	221.1	80.3	90.4	90.28	3.9	-0.2	1.6	88.99	423860	6732375	822
	423918	6732442	838	88.75	214	81.9	90.1	88.75	3.7	-0.1	1.6	87.86	423869	6732369	825
	423918	6732442	838	84.35	210.8	82.7	90.2	84.35	3.7	-0.1	1.6	83.67	423875	6732370	827
St24 P68	423977	6732196	869	46.22	81	68.9	90.2	46.22	1.4	-0.4	1.6	43.12	424020	6732203	852
	423977	6732196	869	47.51	101.7	70.9	90.1	47.51	1.8	-0.3	1.6	44.89	424021	6732187	853
	423977	6732196	869	48.5	109.4	72.8	90	48.50	1.9	-0.3	1.6	46.33	424021	6732181	854
	423977	6732196	869	54.76	127.3	77.3	89.8	54.76	2.2	-0.2	1.6	53.42	424019	6732164	856
	423977	6732196	869	69.21	142.4	80.9	89.9	69.21	2.5	-0.2	1.6	68.34	424019	6732142	857
	423977	6732196	869	83.27	151.1	83	89.6	83.27	2.6	-0.1	1.6	82.65	424017	6732124	858
	423977	6732196	869	108.73	154.4	86.5	89.6	108.73	2.7	-0.1	1.6	108.53	424024	6732098	862
	423977	6732196	869	124.16	164.7	88.4	89.8	124.16	2.9	0.0	1.6	124.11	424010	6732076	865
	423977	6732196	869	134.44	170.2	88.7	90.2	134.44	3.0	0.0	1.6	134.41	424000	6732064	865
	423977	6732196	869	172.72	174.2	88.8	89.9	172.72	3.0	0.0	1.6	172.68	423994	6732024	865
	423977	6732196	869	185.47	172	89.4	89.8	185.47	3.0	0.0	1.6	185.46	424003	6732012	866
	423977	6732196	869	208.91	172	91.1	89.8	208.91	3.0	0.0	1.6	208.87	424006	6731989	872
	423977	6732196	869	228.7	176.9	91.6	89.8	228.70	3.1	0.0	1.6	228.61	423969	6731968	875
	423977	6732196	869	220.42	179.3	91.5	89.9	220.42	3.1	0.0	1.6	220.34	423980	6731976	874
	423977	6732196	869	210.02	184.6	91.4	90	210.02	3.2	0.0	1.6	209.96	423960	6731987	873
	423977	6732196	869	206.81	190.6	92.1	89.8	206.81	3.3	0.0	1.6	206.67	423939	6731993	876
	423977	6732196	869	202.89	194.7	90.5	90.3	202.89	3.4	0.0	1.6	202.88	423926	6732000	870
	423977	6732196	869	194.31	197.7	90.1	90.2	194.31	3.5	0.0	1.6	194.31	423918	6732011	869
	423977	6732196	869	190.65	197.7	89.4	90.1	190.65	3.5	0.0	1.6	190.64	423919	6732014	866
	423977	6732196	869	176	200.3	88.3	90	176.00	3.5	0.0	1.6	175.92	423916	6732031	863
	423977	6732196	869	111.4	215.9	86.8	89.9	111.40	3.8	-0.1	1.6	111.23	423912	6732106	862
	423977	6732196	869	94.35	222.1	84.4	90.4	94.35	3.9	-0.1	1.6	93.90	423914	6732126	859
	423977	6732196	869	84.45	233.1	80.9	90.4	84.45	4.1	-0.2	1.6	83.39	423910	6732146	855
	423977	6732196	869	76.67	241.8	79.7	90.3	76.67	4.2	-0.2	1.6	75.43	423911	6732160	855
	423977	6732196	869	66.61	251	78.4	90	66.61	4.4	-0.2	1.6	65.25	423915	6732175	855
	423977	6732196	869	64.14	262.5	77.6	90.3	64.14	4.6	-0.2	1.6	62.64	423915	6732188	855
	423977	6732196	869	64.03	262.6	77.5	90.3	64.03	4.6	-0.2	1.6	62.51	423915	6732188	854
	423977	6732196	869	67.33	276.7	75.5	89.6	67.33	4.8	-0.3	1.6	65.19	423912	6732204	851
	423977	6732196	869	79.11	286.9	74.9	90.1	79.11	5.0	-0.3	1.6	76.38	423904	6732218	848
	423977	6732196	869	90.53	295.7	77.1	89.9	90.53	5.2	-0.2	1.6	88.25	423897	6732234	848
	423977	6732196	869	102.74	301	76.9	89.7	102.74	5.3	-0.2	1.6	100.07	423891	6732248	845
	423977	6732196	869	115.66	304.5	78.1	89.8	115.66	5.3	-0.2	1.6	113.17	423884	6732260	845
	423977	6732196	869	124.04	304.4	78.5	90.6	124.04	5.3	-0.2	1.6	121.55	423877	6732265	844
	423977	6732196	869	126.79	308.1	78.2	89.8	126.79	5.4	-0.2	1.6	124.11	423879	6732273	842
St25 P68				93.09	303.6	74.6	89.9	93.09	5.3	-0.3	1.6	89.75	-75	50	-25
cont...				94.19	306.6	74.1	89.9	94.19	5.4	-0.3	1.6	90.59	-73	54	-26
no GPS				99.87	310	77.6	90	99.87	5.4	-0.2	1.6	97.54	-75	63	-22
				119.03	311.4	79.3	90.1	119.03	5.4	-0.2	1.6	116.96	-88	77	-23
				130.94	311.4	78.1	90	130.94	5.4	-0.2	1.6	128.13	-96	85	-28
				148.6	315	78.3	90.2	148.60	5.5	-0.2	1.6	145.51	-103	103	-31
				158.62	316.3	78.1	90	158.62	5.5	-0.2	1.6	155.21	-107	112	-33
				164.7	317.4	78.2	89.8	164.70	5.5	-0.2	1.6	161.22	-109	119	-34
				170.79	320	78.7	89.8	170.79	5.6	-0.2	1.6	167.48	-108	128	-34
				179.55	322.7	80.2	90.2	179.55	5.6	-0.2	1.6	176.93	-107	141	-31
St4b R18	425111	6732498	841	235.24	216.5	95.2	90.9	235.24	3.8	0.1	1.6	234.27	424972	6732310	862
	425111	6732498	841	203.47	224.5	94.4	90.5	203.47	3.9	0.1	1.6	202.87	424969	6732353	856
	425111	6732498	841	191.65	226.8	95.2	90.6	191.65	4.0	0.1	1.6	190.86	424972	6732367	858
	425111	6732498	841	190.23	235.1	95.7	90.5	190.23	4.1	0.1	1.6	189.29	424958	6732390	859
	425111	6732498	841	189.16	238.7	96.9	90.6	189.16	4.2	0.1	1.6	187.79	424951	6732400	863
	425111	6732498	841	187.96	251.8	96.3	91.5	187.96	4.4	0.1	1.6	186.82	424934	6732440	861
	425111	6732498	841	200.58	253.6	96	90.9	200.58	4.4	0.1	1.6	199.48	424920	6732442	861
	425111	6732498	841	212.64	256.3	96	90.3	212.64	4.5	0.1	1.6	211.48	424906	6732448	863
	425111	6732498	841	206.75	258.2	96.9	90.2	206.75	4.5	0.1	1.6	205.25	424910	6732456	865
	425111	6732498	841	210.17	260.6	95.7	90.6	210.17	4.5	0.1	1.6	209.13	424905	6732464	861
	425111	6732498	841	213.87	263.4	94.9	90.7	213.87	4.6	0.1	1.6	213.09	424899	6732474	859
	425111	6732498	841	285.35	268	93.4	90.6	285.35	4.7	0.1	1.6	284.85	424826	6732488	857
	425111	6732498	841	280.33	270.1	93.8	91.2	280.33	4.7	0.1	1.6	279.71	424831	6732498	859

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
S17 R23	424646	6732576	866	151.58	113.9	87.9	91.4	151.58	2.0	0.0	1.6	151.48	424784	6732515	860
	424646	6732576	866	115.95	105.7	82.7	91.5	115.95	1.8	-0.1	1.6	115.01	424757	6732545	851
	424646	6732576	866	113.75	99.4	83.5	91.1	113.75	1.7	-0.1	1.6	113.02	424758	6732556	852
	424646	6732576	866	83.5	91.6	74.1	90.9	83.50	1.6	-0.3	1.6	80.31	424726	6732574	842
	424646	6732576	866	36.86	86.1	73.9	90.8	36.86	1.5	-0.3	1.6	35.41	424681	6732577	855
	424646	6732576	866	28.84	83.7	69.7	91.1	28.84	1.5	-0.4	1.6	27.05	424673	6732579	855
	424646	6732576	866	15.23	46.7	86.3	91.1	15.23	0.8	-0.1	1.6	15.20	424657	6732586	864
	424646	6732576	866	6.71	19.3	79.3	92	6.71	0.3	-0.2	1.6	6.59	424648	6732582	864
	424646	6732576	866	11.55	333.6	104.8	90.8	11.55	5.8	0.3	1.6	11.17	424641	6732586	866
	424646	6732576	866	24.99	314.4	72.5	90.8	24.99	5.5	-0.3	1.6	23.83	424629	6732593	858
	424646	6732576	866	45.8	293.7	85.2	90.7	45.80	5.1	-0.1	1.6	45.64	424604	6732594	862
	424646	6732576	866	87.18	290.6	90.7	90.1	87.18	5.1	0.0	1.6	87.17	424564	6732607	866
	424646	6732576	866	99.3	278	87.1	90.6	99.30	4.9	-0.1	1.6	99.17	424548	6732590	860
	424646	6732576	866	109.75	279.6	90.7	91.4	109.75	4.9	0.0	1.6	109.74	424538	6732595	867
S110 R31	424450	6732563	864	121.19	79.8	89.6	91.2	121.19	1.4	0.0	1.6	121.19	424569	6732584	863
	424450	6732563	864	83.67	76.8	90.1	91.3	83.67	1.3	0.0	1.6	83.67	424531	6732582	863
	424450	6732563	864	84.81	75.4	90.3	91.5	84.81	1.3	0.0	1.6	84.81	424532	6732584	864
	424450	6732563	864	56.68	60.2	89.1	91.9	56.68	1.1	0.0	1.6	56.67	424499	6732591	862
	424450	6732563	864	55.23	54.3	87.9	91.4	55.23	0.9	0.0	1.6	55.19	424495	6732595	861
	424450	6732563	864	56.38	50.9	88	91.8	56.38	0.9	0.0	1.6	56.35	424494	6732599	861
	424450	6732563	864	60.22	49.3	88.5	91.6	60.22	0.9	0.0	1.6	60.20	424496	6732602	862
	424450	6732563	864	53.28	35.5	87.6	91.7	53.28	0.6	0.0	1.6	53.23	424481	6732606	861
	424450	6732563	864	55.23	33	88.1	91.8	55.23	0.6	0.0	1.6	55.20	424480	6732609	862
	424450	6732563	864	40.32	2.4	84.7	91.4	40.32	0.0	-0.1	1.6	40.15	424452	6732603	860
	424450	6732563	864	43.68	1.6	86.2	91	43.68	0.0	-0.1	1.6	43.56	424451	6732607	860
	424450	6732563	864	41.17	352.9	89.2	91.5	41.17	6.2	0.0	1.6	41.17	424445	6732604	863
	424450	6732563	864	42.96	344.2	86.6	91.4	42.96	6.0	-0.1	1.6	42.88	424438	6732604	861
	424450	6732563	864	48.71	341.8	87.4	91.1	48.71	6.0	0.0	1.6	48.66	424435	6732609	861
	424450	6732563	864	48.3	333.8	88.2	91.3	48.30	5.8	0.0	1.6	48.28	424429	6732606	862
	424450	6732563	864	53.15	329.8	89.5	91.3	53.15	5.8	0.0	1.6	53.15	424423	6732609	863
	424450	6732563	864	56.27	317.2	91	91.4	56.27	5.5	0.0	1.6	56.26	424412	6732604	864
	424450	6732563	864	63.42	314.8	91.8	91.6	63.42	5.5	0.0	1.6	63.39	424405	6732608	865
	424450	6732563	864	57.08	307.5	89.4	91.5	57.08	5.4	0.0	1.6	57.08	424405	6732598	863
	424450	6732563	864	61.53	303.4	89.3	91.1	61.53	5.3	0.0	1.6	61.53	424399	6732597	863
	424450	6732563	864	62.7	296.2	91.1	91.6	62.70	5.2	0.0	1.6	62.69	424395	6732593	865
	424450	6732563	864	64.41	295.2	92.3	91.1	64.41	5.2	0.0	1.6	64.36	424392	6732590	866
	424450	6732563	864	71.01	293	93.5	91.2	71.01	5.1	0.1	1.6	70.88	424385	6732591	868
	424450	6732563	864	76.39	289.9	91.4	91.1	76.39	5.1	0.0	1.6	76.37	424378	6732589	865
	424450	6732563	864	77.57	288	91.8	91	77.57	5.0	0.0	1.6	77.53	424376	6732587	866
	424450	6732563	864	82.91	281	90	91	82.91	4.9	0.0	1.6	82.91	424369	6732579	863
	424450	6732563	864	110.55	273.4	89.1	91.3	110.55	4.8	0.0	1.6	110.54	424340	6732570	862
	424450	6732563	864	110.64	269.7	90.2	91	110.64	4.7	0.0	1.6	110.64	424339	6732562	864
	424450	6732563	864	149.56	267.9	88.7	91.1	149.56	4.7	0.0	1.6	149.52	424301	6732558	860
	424450	6732563	864	151.26	264.6	89.7	90.9	151.26	4.6	0.0	1.6	151.26	424299	6732549	863
	424450	6732563	864	143.74	263.9	89.2	90.9	143.74	4.6	0.0	1.6	143.73	424307	6732548	861

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St17 R52	424139	6732450	853	193.92	64.1	93.3	90.3	193.92	1.1	0.1	1.6	193.60	424313	6732535	864
	424139	6732450	853	192.95	62.6	91.8	89.7	192.95	1.1	0.0	1.6	192.85	424310	6732539	858
	424139	6732450	853	190.25	80.6	91.5	90.1	190.25	1.1	0.0	1.6	190.18	424305	6732543	857
	424139	6732450	853	183.9	61	91.5	89.4	183.90	1.1	0.0	1.6	183.84	424300	6732539	857
	424139	6732450	853	208.01	53.9	90.7	90.3	208.01	0.9	0.0	1.6	207.99	424307	6732573	855
	424139	6732450	853	222.67	38.8	90.2	89.6	222.67	0.7	0.0	1.6	222.67	424279	6732624	853
	424139	6732450	853	213.97	35.3	89.3	90	213.97	0.6	0.0	1.6	213.95	424263	6732625	850
	424139	6732450	853	228.6	26.9	88.8	90.6	228.60	0.5	0.0	1.6	228.55	424242	6732654	848
	424139	6732450	853	220.89	18.8	90.7	90.2	220.69	0.3	0.0	1.6	220.67	424210	6732659	855
	424139	6732450	853	198.58	16.4	90.3	90.4	198.58	0.3	0.0	1.6	198.58	424195	6732640	853
	424139	6732450	853	195.12	14.6	88.9	89.6	195.12	0.3	0.0	1.6	195.08	424188	6732639	849
	424139	6732450	853	172.23	11.5	89.9	89.8	172.23	0.2	0.0	1.6	172.23	424173	6732619	852
	424139	6732450	853	149.08	7.7	90.6	89.7	149.08	0.1	0.0	1.6	149.07	424159	6732598	854
	424139	6732450	853	151.6	6.1	91.3	89.7	151.60	0.1	0.0	1.6	151.56	424155	6732601	856
	424139	6732450	853	166.27	4.2	90.8	89.8	166.27	0.1	0.0	1.6	166.25	424151	6732616	855
	424139	6732450	853	152.72	0.3	91.6	89.9	152.72	0.0	0.0	1.6	152.66	424140	6732603	857
	424139	6732450	853	175.17	356	92.7	89.8	175.17	6.2	0.0	1.6	174.98	424127	6732625	861
	424139	6732450	853	179.44	354	92.7	89.9	179.44	6.2	0.0	1.6	179.24	424120	6732628	861
	424139	6732450	853	173.92	350.6	92.1	90	173.92	6.1	0.0	1.6	173.80	424111	6732621	859
	424139	6732450	853	178.89	348.1	91.7	90.1	178.89	6.1	0.0	1.6	178.81	424102	6732625	858
	424139	6732450	853	165.03	345.1	91.6	90	165.03	6.0	0.0	1.6	164.97	424097	6732609	857
	424139	6732450	853	180.84	342.4	91.9	90	180.84	6.0	0.0	1.6	180.74	424084	6732622	858
	424139	6732450	853	173.53	339.2	92.3	89.9	173.53	5.9	0.0	1.6	173.39	424077	6732612	859
	424139	6732450	853	163.8	336.7	91	89.7	163.80	5.9	0.0	1.6	163.78	424074	6732600	855
	424139	6732450	853	170.92	336	90.4	89.8	170.92	5.9	0.0	1.6	170.92	424069	6732606	854
	424139	6732450	853	176.16	334.5	89.5	89.6	176.16	5.8	0.0	1.6	176.15	424063	6732609	851
	424139	6732450	853	125.78	332.7	89.2	90.1	125.78	5.8	0.0	1.6	125.77	424061	6732562	851
	424139	6732450	853	166.19	330.7	89.6	90	166.19	5.8	0.0	1.6	166.19	424058	6732595	851
	424139	6732450	853	169.32	324.6	90.8	89.8	169.32	5.7	0.0	1.6	169.30	424041	6732588	855
	424139	6732450	853	158.01	321.3	90.3	90.1	158.01	5.6	0.0	1.6	158.01	424040	6732573	853
	424139	6732450	853	158.96	317.4	91.4	90	158.96	5.5	0.0	1.6	158.91	424031	6732567	856
R52 cont...	424139	6732450	853	159.95	317.1	91	90	159.95	5.5	0.0	1.6	159.93	424030	6732567	855
	424139	6732450	853	143.91	315.5	91.4	90	143.91	5.5	0.0	1.6	143.87	424038	6732563	856
	424139	6732450	853	147.49	310.4	91.1	90.3	147.49	5.4	0.0	1.6	147.46	424027	6732546	855
	424139	6732450	853	165.95	307.2	91.6	90.4	165.95	5.4	0.0	1.6	165.89	424007	6732550	857
	424139	6732450	853	166.37	305.6	91.3	90.6	166.37	5.3	0.0	1.6	166.33	424004	6732547	856
	424139	6732450	853	156.72	310.6	91.1	89.9	156.72	5.4	0.0	1.6	156.69	424020	6732552	855
	424139	6732450	853	166.6	308.4	91.4	89.8	166.60	5.4	0.0	1.6	166.55	424006	6732553	856
	424139	6732450	853	166.17	305.8	91.3	89.7	166.17	5.3	0.0	1.6	166.13	424004	6732547	856
	424139	6732450	853	158.41	303.9	90.9	89.6	158.41	5.3	0.0	1.6	158.39	424008	6732538	855
	424139	6732450	853	153.35	301.6	91.2	89.8	153.35	5.3	0.0	1.6	153.32	424008	6732530	856
	424139	6732450	853	156.19	301.5	91.6	89.7	156.19	5.3	0.0	1.6	156.13	424006	6732532	857
	424139	6732450	853	153.54	300.5	91.9	89.7	153.54	5.2	0.0	1.6	153.46	424007	6732528	857
	424139	6732450	853	154.28	299.1	91.7	89.9	154.28	5.2	0.0	1.6	154.21	424004	6732525	857
	424139	6732450	853	153.3	298.1	91.2	90.1	153.30	5.2	0.0	1.6	153.27	424004	6732522	856
	424139	6732450	853	149.75	296.7	90.6	90.1	149.75	5.2	0.0	1.6	149.74	424005	6732517	854
	424139	6732450	853	134.62	295.7	89.7	90.1	134.62	5.2	0.0	1.6	134.62	424018	6732508	852
	424139	6732450	853	125.36	292.7	89.9	90.2	125.36	5.1	0.0	1.6	125.36	424023	6732498	852
	424139	6732450	853	127.82	290.4	90.1	90.3	127.82	5.1	0.0	1.6	127.82	424019	6732495	853
	424139	6732450	853	128.7	289.9	90.8	90.3	128.70	5.1	0.0	1.6	128.69	424018	6732494	854
	424139	6732450	853	161.24	286.3	90.7	90.5	161.24	5.0	0.0	1.6	161.23	423984	6732495	854
	424139	6732450	853	147.25	282.7	92	90.7	147.25	4.9	0.0	1.6	147.16	423995	6732482	857
	424139	6732450	853	163.79	281.6	91.3	90.9	163.79	4.9	0.0	1.6	163.75	423979	6732483	856
	424139	6732450	853	160.37	279	90.8	90.1	160.37	4.9	0.0	1.6	160.35	423981	6732475	855
	424139	6732450	853	175.11	278.2	91	89.9	175.11	4.9	0.0	1.6	175.08	423966	6732475	855
	424139	6732450	853	174.55	276.8	90.1	90.4	174.55	4.8	0.0	1.6	174.55	423968	6732471	853
	424139	6732450	853	171.73	275.3	90.2	90.6	171.73	4.8	0.0	1.6	171.73	423968	6732466	853
	424139	6732450	853	162.24	272.9	90.8	90.4	162.24	4.8	0.0	1.6	162.22	423977	6732458	855
	424139	6732450	853	163.72	271.6	91.6	90.3	163.72	4.7	0.0	1.6	163.66	423975	6732455	857
	424139	6732450	853	164.1	270.3	92.2	90.3	164.10	4.7	0.0	1.6	163.98	423975	6732451	859
	424139	6732450	853	164.06	269.3	91.7	90.1	164.06	4.7	0.0	1.6	163.99	423975	6732448	857
R52 cont...	424139	6732450	853	164.28	268.2	91.4	90.2	164.28	4.7	0.0	1.6	164.23	423975	6732445	856
	424139	6732450	853	184.35	267	91.3	90.3	184.35	4.7	0.0	1.6	184.30	423955	6732440	857
	424139	6732450	853	183.51	267.8	91.3	90.9	183.51	4.7	0.0	1.6	183.46	423956	6732443	857
	424139	6732450	853	186.97	262.2	91	90.7	186.97	4.6	0.0	1.6	186.94	423954	6732425	856
	424139	6732450	853	189.37	260	90.9	90.6	189.37	4.5	0.0	1.6	189.35	423953	6732417	855
	424139	6732450	853	168.52	256.3	90.8	90	168.52	4.5	0.0	1.6	168.50	423975	6732410	855
	424139	6732450	853	163.87	255.1	90.7	90	163.87	4.5	0.0	1.6	163.86	423981	6732408	854
	424139	6732450	853	165.74	252.3	89.8	89.9	165.74	4.4	0.0	1.6	165.74	423981	6732400	852
	424139	6732450	853	180.18	251.5	89.5	89.9	180.18	4.4	0.0	1.6	180.17	423968	6732393	851
	424139	6732450	853	180.08	251.1	89.5	90	180.08	4.4	0.0	1.6	180.07	423969	6732392	851
	424139	6732450	853	190.89	250.9	89.4	90.2	190.89	4.4	0.0	1.6	190.88	423959	6732388	850
	424139	6732450	853	209.51	247.7	89.6	90	209.51	4.3	0.0	1.6	209.50	423945	6732371	851
	424139	6732450	853	208.52	244.5	90	89.8	208.52	4.3	0.0	1.6	208.52	423951	6732360	852
	424139	6732450	853	218.42	246.7	89.8	90.5	218.42	4.3	0.0	1.6	218.42	423938	6732364	852
	424139	6732450	853	215.69	244.4	90.2	90.5	215.69	4.3	0.0	1.6	215.69	423944	6732357	853
	424139	6732450	853	215.34	243.4	91.4	90.4	215.34	4.2	0.0	1.6	215.28	423947	6732354	858
	424139	6732450	853	214.71	243.6	92	90	214.71	4.3	0.0	1.6	214.58	423947	6732355	860
	424139	6732450	853	216.1	241.4	92.1	89.9	216.10	4.2	0.0	1.6	215.95	423949	6732347	860
	424139	6732450	853	216.78	240.8	91.3	90.1	216.78	4.2	0.0	1.6	216.72	423950	6732344	857
	424139	6732450	853	227.16	235.6	91	90	227.16	4.1	0.0	1.6	227.13	423952	6732322	856
	424139	6732450	853	229.14	234.4	91.6	89.9	229.14	4.1	0.0	1.6	229.05	423953	6732317	859
	424139	6732450	853	226.89	226.8	92.6	89.6	226.69	4.0	0.0	1.6	226.46	423974	6732295	863
	424139	6732450	853	222.16	224.1	92.3	89.5	222.16	3.9	0.0	1.6	221.98	423985	6732291	861
	424139	6732450	853	215.33	221.1	91.9	90.4	215.33	3.9	0.0	1.6	215.21	423998	6732288	859
	424139	6732450	853	200.8	218.3	91.9	90.4	200.80	3.8	0.0	1.6	200.69	424015	6732293	859
	424139	6732450	853	197.58	216.8	92.4	90.2	197.58	3.8	0.0	1.6	197.41	424021	6732292	861
	424139	6732450	853	198.33	215.8	91.8	90	198.33	3.8	0.0	1.6	198.23	424023	6732289	859

Landslide "c"

GPS Survey Station Info				Laser Atlanta Data				Calculations					Coordinates		
Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St32 P82	424277	6731945	906	150.03	220.6	95.9	89.9	150.03	3.9	0.1	1.6	149.24	424180	6731832	921
	424277	6731945	906	134.15	222.2	95.6	89.5	134.15	3.9	0.1	1.6	133.51	424187	6731846	918
	424277	6731945	906	123.76	223.5	95.6	89.1	123.76	3.9	0.1	1.6	123.17	424192	6731856	917
	424277	6731945	906	35.89	222.8	94.4	89.4	35.89	3.9	0.1	1.6	35.58	424253	6731919	908
	424277	6731945	906	90.07	224.6	94.4	90.5	90.07	3.9	0.1	1.6	89.80	424214	6731881	912
	424277	6731945	906	86.96	223.5	94.3	89.7	86.96	3.9	0.1	1.6	86.72	424217	6731882	912
	424277	6731945	906	35.62	208.8	96.1	90	35.62	3.6	0.1	1.6	35.42	424260	6731914	909
	424277	6731945	906	20.99	186.7	94.1	89.7	20.99	2.9	0.1	1.6	20.94	424282	6731925	907
	424277	6731945	906	26.99	119.3	91.5	89.6	26.99	2.1	0.0	1.6	26.98	424301	6731932	906
	424277	6731945	906	43.28	90.9	88.6	89.7	43.28	1.6	0.0	1.6	43.27	424320	6731944	904
	424277	6731945	906	44.96	78.6	86.7	89.2	44.96	1.4	-0.1	1.6	44.89	424321	6731954	903
end so.side	424277	6731945	906	43.29	81	86.7	89.6	43.29	1.4	-0.1	1.6	43.22	424320	6731952	903
	424277	6731945	906	92.05	254.4	90.2	89.4	92.05	4.4	0.0	1.6	92.05	424188	6731920	906
	424277	6731945	906	50.49	276.2	84.4	89.6	50.49	4.8	-0.1	1.6	50.25	424227	6731950	900
	424277	6731945	906	45.49	282.1	82.6	89.1	45.49	4.9	-0.1	1.6	45.11	424233	6731954	899
	424277	6731945	906	49.73	296.9	78.9	89.5	49.73	5.2	-0.2	1.6	48.80	424233	6731967	896
	424277	6731945	906	39.28	321.1	77.1	89.9	39.28	5.6	-0.2	1.6	38.29	424253	6731975	897
	424277	6731945	906	38.68	324.3	77	89.8	38.68	5.7	-0.2	1.6	37.69	424255	6731976	897
	424277	6731945	906	29.77	332.8	73.4	89.8	29.77	5.8	-0.3	1.6	26.53	424264	6731970	897
	424277	6731945	906	35.05	358.6	71.4	89.4	35.05	6.3	-0.3	1.6	33.22	424276	6731978	894
	424277	6731945	906	41.28	11.8	74.6	89.8	41.28	0.2	-0.3	1.6	39.80	424285	6731984	894
	424277	6731945	906	51.65	16.2	75.7	89.2	51.65	0.3	-0.2	1.6	50.05	424291	6731993	893
St33 P83	424360	6732010	896	44.4	276.1	85.2	86.9	44.40	4.8	-0.1	1.6	44.24	424316	6732015	892
	424360	6732010	896	31.33	306.1	77.7	89.3	31.33	5.3	-0.2	1.6	30.61	424335	6732028	889
	424360	6732010	896	14.91	348.2	69.9	89.4	14.91	6.1	-0.4	1.6	14.00	424357	6732024	890
	424360	6732010	896	25.7	18.8	86.9	89.3	25.70	0.3	-0.4	1.6	23.98	424368	6732033	886
	424360	6732010	896	36.84	34.8	73.9	89.6	36.84	0.6	-0.3	1.6	35.40	424380	6732039	885
	424360	6732010	896	89.04	54.7	80	89.4	89.04	1.0	-0.2	1.6	87.99	424415	6732049	883
	424360	6732010	896	117.1	68.6	84.9	89.7	117.10	1.2	-0.1	1.6	116.84	424469	6732053	885
	424360	6732010	896	122.74	73	86.1	89.3	122.74	1.3	-0.1	1.6	122.46	424477	6732046	887
	424360	6732010	896	71.29	225.2	98.6	90	71.29	3.9	0.2	1.6	70.49	424310	6731960	906
	424360	6732010	896	41.95	220.3	97.3	89.7	41.95	3.8	0.1	1.6	41.61	424333	6731978	901
	424360	6732010	896	37.91	211.4	97.8	89.6	37.91	3.7	0.1	1.6	37.56	424340	6731978	900
	424360	6732010	896	33.32	199.7	96.4	89.6	33.32	3.5	0.1	1.6	33.11	424349	6731979	899
	424360	6732010	896	22.92	187.8	86.9	89.8	22.92	3.3	-0.1	1.6	22.89	424357	6731987	894
	424360	6732010	896	31.67	155.9	86.8	89.4	31.67	2.7	0.0	1.6	31.86	424373	6731981	895
	424360	6732010	896	29.46	123.4	86.4	89.4	29.46	2.2	-0.1	1.6	29.40	424385	6731994	894
	424360	6732010	896	33.08	106.8	86.4	90	33.08	1.9	-0.1	1.6	33.01	424392	6732000	893
	424360	6732010	896	46.5	94.7	86.5	89.6	46.50	1.7	-0.1	1.6	46.41	424406	6732006	893
	424360	6732010	896	61.39	85.9	85.7	89.6	61.39	1.5	-0.1	1.6	61.22	424421	6732014	891
	424360	6732010	896	63.61	83.6	85	89.5	63.61	1.5	-0.1	1.6	63.37	424423	6732017	890
	424360	6732010	896	74.08	87.6	88.2	89.6	74.08	1.5	-0.1	1.6	73.92	424434	6732013	890
	424360	6732010	896	77.8	78.9	85.2	89.6	77.80	1.4	-0.1	1.6	77.53	424436	6732025	889
	424360	6732010	896	85.28	82.6	86.2	89.6	85.26	1.4	-0.1	1.6	85.07	424444	6732021	890
	424360	6732010	896	90.46	78.6	86.2	89.1	90.46	1.4	-0.1	1.6	90.26	424448	6732028	889
	424360	6732010	896	97.4	84.6	88	89.6	97.40	1.5	0.0	1.6	97.34	424457	6732019	892
	424360	6732010	896	103.72	79.1	87.3	89.6	103.72	1.4	0.0	1.6	103.60	424462	6732030	890
	424360	6732010	896	104.69	75.3	86.5	89.5	104.69	1.3	-0.1	1.6	104.49	424461	6732037	889
	424360	6732010	896	115.84	82.3	88.5	89.4	115.84	1.4	0.0	1.6	115.60	424475	6732025	892
	424360	6732010	896	130.08	80.6	88.3	88.9	130.08	1.4	0.0	1.6	130.02	424488	6732031	891
	424360	6732010	896	129.04	83.1	86.9	89.4		1.5	0.0	1.6	0.00	424360	6732010	895
St34 P84	424518	6732016	897	55.64	313	78.3	89.7	55.64	5.5	-0.2	1.6	54.48	424478	6732053	885
	424518	6732016	897	26.9	325.3	76.8	90	26.90	5.7	-0.2	1.6	26.19	424503	6732038	890
	424518	6732016	897	25.98	348.6	75.9	89.7	25.98	6.1	-0.2	1.6	25.20	424513	6732041	890
	424518	6732016	897	23.29	24.4	79.2	89.8	23.29	0.4	-0.2	1.6	22.86	424527	6732037	892
	424518	6732016	897	28.51	52	84.4	89.7	28.51	0.9	-0.1	1.6	28.37	424540	6732033	894
	424518	6732016	897	39.3	73.7	88.1	89.8	39.30	1.3	0.0	1.6	39.28	424556	6732027	895
	424518	6732016	897	50.47	80.6	89.4	89.8	50.47	1.4	0.0	1.6	50.47	424568	6732024	896
	424518	6732016	897	59	86	89.9	90	59.00	1.5	0.0	1.6	59.00	424577	6732020	896
	424518	6732016	897	70.15	87.4	90.5	89.6	70.15	1.5	0.0	1.6	70.15	424588	6732019	897
	424518	6732016	897	26.36	290.9	81.1	89.9	28.36	5.1	-0.2	1.6	26.04	424494	6732025	892
	424518	6732016	897	19.58	301.5	77.5	90.2	19.58	5.3	-0.2	1.6	19.12	424502	6732026	892
	424518	6732016	897	15.88	307.1	75.9	89.8	15.86	5.4	-0.2	1.6	15.40	424506	6732025	892
	424518	6732016	897	16.58	330.4	73.9	90.2	16.58	5.8	-0.3	1.6	15.93	424510	6732030	892
	424518	6732016	897	16.29	341.2	73.9	90	16.29	6.0	-0.3	1.6	15.65	424513	6732031	892
	424518	6732016	897	16.67	2.9	75.6	89.7	16.67	0.1	-0.3	1.6	16.15	424519	6732032	892
	424518	6732016	897	10.4	25.7	73.9	89.6	10.40	0.4	-0.3	1.6	9.99	424522	6732025	893
	424518	6732016	897	15.39	49	81	89.7	15.39	0.9	-0.2	1.6	15.20	424529	6732026	894
	424518	6732016	897	16.42	82.8	84.1	89.7	16.42	1.1	-0.1	1.6	16.33	424533	6732023	895
	424518	6732016	897	23.16	57.7	85.4	89.6	23.16	1.0	-0.1	1.6	23.09	424536	6732028	894
	424518	6732016	897	32.8	70.5	87.7	89.5	32.80	1.2	0.0	1.6	32.77	424549	6732027	895
	424518	6732016	897	37.76	75	86.4	89.4	37.76	1.3	0.0	1.6	37.75	424554	6732026	895
	424518	6732016	897	42.43	77.7	89.1	89.9	42.43	1.4	0.0	1.6	42.42	424559	6732025	896
	424518	6732016	897	47.82	80.3	89.5	89.3	47.82	1.4	0.0	1.6	47.82	424565	6732024	896
	424518	6732016	897	50.87	84.5	90.3	89.6	50.87	1.5	0.0	1.6	50.87	424569	6732021	897
	424518	6732016	897	56.37	88.3	90.8	89.4	56.37	1.5	0.0	1.6	56.36	424574	6732018	897
	424518	6732016	897	41.42	88.7	90.9	89.6	41.42	1.5	0.0	1.6	41.41	424559	8732017	897

Landslide "d"

GPS Survey Station Info				Laser Atlanta Data				Calculations					Coordinates		
Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St35 P85	424760	6731076	1015	23.14	184	85.3	90.2	23.14	3.2	-0.1	1.6	23.06	424758	6731053	1012
	424760	6731076	1015	79.74	295	84.3	90	79.74	5.1	-0.1	1.6	79.35	424688	6731110	1006
	424760	6731076	1015	103.19	300.7	83.7	89.8	103.19	5.2	-0.1	1.6	102.57	424672	6731128	1003
	424760	6731076	1015	98.81	302.1	83.6	89.7	98.81	5.3	-0.1	1.6	98.19	424677	6731128	1003
	424760	6731076	1015	100.81	307.3	82.4	89.8	100.81	5.4	-0.1	1.6	99.92	424681	6731137	1001
	424760	6731076	1015	98.44	305.8	81.7	89.7	98.44	5.3	-0.1	1.6	97.41	424681	6731133	1000
	424760	6731076	1015	34.66	323.9	79.2	89.8	34.66	5.7	-0.2	1.6	34.05	424740	6731104	1006
	424760	6731076	1015	48.85	338.2	75.5	90	48.85	5.9	-0.3	1.6	47.29	424742	6731120	1002
	424760	6731076	1015	52.02	341.1	74.7	89.8	52.02	6.0	-0.3	1.6	50.18	424744	6731123	1001
	424760	6731076	1015	40.84	5.3	68.8	90.1	40.84	0.1	-0.4	1.6	38.08	424764	6731114	1000
	424760	6731076	1015	39.58	19.3	65.6	90.1	39.58	0.3	-0.4	1.6	36.04	424772	6731110	998
	424760	6731076	1015	35.31	51.5	64.6	89.7	35.31	0.9	-0.4	1.6	31.90	424785	6731096	999
	424760	6731076	1015	26.73	77	70.1	90	26.73	1.3	-0.3	1.6	25.13	424784	6731082	1005
	424760	6731076	1015	43.51	82.5	72.2	90.1	43.51	1.4	-0.3	1.6	41.43	424801	6731081	1001
	424760	6731076	1015	77.3	112.5	80.7	89.9	77.30	2.0	-0.2	1.6	76.28	424830	6731047	1002
	424760	6731076	1015	70.98	120.4	82.3	89.8	70.98	2.1	-0.1	1.6	70.34	424821	6731040	1005
	424760	6731076	1015	77.55	128.6	84.3	90	77.55	2.2	-0.1	1.6	77.17	424820	6731028	1007
	424760	6731076	1015	126.71	140.3	86.4	90.1	126.71	2.4	-0.1	1.6	126.46	424841	6730979	1006
	424760	6731076	1015	125.8	141.8	86.6	90	125.80	2.5	-0.1	1.6	125.58	424838	6730977	1007
	424760	6731076	1015	208.18	155.6	88.8	89.8	208.18	2.7	0.0	1.6	208.13	424846	6730886	1010
	424760	6731076	1015	250.02	160.5	90	90.2	250.02	2.8	0.0	1.6	250.02	424843	6730840	1014
	424760	6731076	1015	200.8	160.1	89.6	90.5	200.80	2.8	0.0	1.6	200.80	424828	6730887	1013
St36 P86	424729	6730993	1015	213.41	149.9	89.2	89.9	213.41	2.6	0.0	1.6	213.39	424836	6730808	1011
	424729	6730993	1015	213.3	149.8	89.3	90.1	213.30	2.6	0.0	1.6	213.28	424836	6730809	1012
	424729	6730993	1015	278.91	174.1	89.4	90	278.91	3.0	0.0	1.6	278.89	424758	6730716	1011
	424729	6730993	1015	83.52	173.9	88.4	90.2	83.52	3.0	0.0	1.6	83.49	424738	6730910	1012
	424729	6730993	1015	71.01	178.8	88	89.9	71.01	3.1	0.0	1.6	70.97	424730	6730922	1012
	424729	6730993	1015	56.67	183.1	86.2	90.4	56.67	3.2	-0.1	1.6	56.55	424726	6730937	1011
	424729	6730993	1015	36.37	190.3	79.2	89.9	36.37	3.3	-0.2	1.6	35.73	424723	6730958	1008
	424729	6730993	1015	17.32	247.1	70	90.1	17.32	4.3	-0.3	1.6	16.28	424714	6730987	1008
	424729	6730993	1015	25.59	298.4	71.3	89.5	25.59	5.2	-0.3	1.6	24.24	424708	6731005	1006
	424729	6730993	1015	46.64	315.2	78.4	89.9	46.64	5.5	-0.2	1.6	45.69	424697	6731025	1005
	424729	6730993	1015	47.38	319.4	79.9	90.1	47.38	5.6	-0.2	1.6	46.65	424699	6731028	1006
	424729	6730993	1015	74.79	324.7	81	90.1	74.79	5.7	-0.2	1.6	73.87	424686	6731053	1003
	424729	6730993	1015	86.36	328.6	82.5	89.7	86.36	5.7	-0.1	1.6	85.62	424684	6731066	1003
	424729	6730993	1015	109.07	329.8	84	89.7	109.07	5.8	-0.1	1.6	108.47	424674	6731087	1003
	424729	6730993	1015	110.94	333.3	85.3	89.7	110.94	5.8	-0.1	1.6	110.57	424679	6731092	1005
St36 T87	424729	6730993	1015	48.21	315.1	78.9	89.3	48.21	5.5	-0.2	1.6	47.31	424696	6731027	1005
	424729	6730993	1015	48.32	322.4	80.2	89.6	48.32	5.6	-0.2	1.6	47.61	424700	6731031	1006
	424729	6730993	1015	43.3	330.1	80.6	89.6	43.30	5.8	-0.2	1.6	42.72	424708	6731030	1007
	424729	6730993	1015	43.47	331.4	82.4	89.5	43.47	5.8	-0.1	1.6	43.09	424708	6731031	1009
	424729	6730993	1015	44.81	333.5	82.6	89.7	44.81	5.8	-0.1	1.6	44.44	424709	6731033	1009
	424729	6730993	1015	45.39	334.5	82.2	89.6	45.39	5.8	-0.1	1.6	44.97	424710	6731034	1008
	424729	6730993	1015	47.38	345.5	81.6	89.8	47.38	6.0	-0.1	1.6	46.87	424717	6731038	1007
	424729	6730993	1015	32.82	349.9	82.3	89.8	32.82	6.1	-0.1	1.6	32.52	424723	6731025	1010
	424729	6730993	1015	70.46	3.3	81.8	89.1	70.46	0.1	-0.1	1.6	69.74	424733	6731063	1004
	424729	6730993	1015	47.64	8.8	82.4	89.2	47.64	0.2	-0.1	1.6	47.22	424736	6731040	1008
	424729	6730993	1015	49.65	11.2	82.9	89.1	49.65	0.2	-0.1	1.6	49.27	424739	6731041	1008
	424729	6730993	1015	49.74	13.4	85	89.1	49.74	0.2	-0.1	1.6	49.55	424740	6731041	1010
	424729	6730993	1015	69.57	17.2	84.6	89.4	69.57	0.3	-0.1	1.6	69.26	424749	6731059	1008
	424729	6730993	1015	71.11	19.5	85.7	89.2	71.11	0.3	-0.1	1.6	70.91	424753	6731060	1009
	424729	6730993	1015	83.09	20.3	86.8	89.1	83.09	0.4	-0.1	1.6	82.96	424758	6731071	1010
	424729	6730993	1015	79.93	22.3	87.8	89.4	79.93	0.4	0.0	1.6	79.87	424759	6731067	1011
	424729	6730993	1015	86.73	23.9	88.5	89.2	86.73	0.4	0.0	1.6	86.70	424764	6731072	1012
	424729	6730993	1015	85.3	26.2	88.8	89.4	85.30	0.5	0.0	1.6	85.28	424767	6731070	1013
St 36 T88	424729	6730993	1015	79.44	36.7	88	88.6	79.44	0.6	0.0	1.5	79.39	424776	6731057	1012
	424729	6730993	1015	73.37	36.2	86.6	89.4	73.37	0.6	-0.1	1.6	73.24	424772	6731052	1010
	424729	6730993	1015	57.86	37.1	85.4	89.2	57.86	0.6	-0.1	1.6	57.67	424764	6731039	1010
	424729	6730993	1015	40.33	37	83.7	89.6	40.33	0.6	-0.1	1.6	40.09	424753	6731025	1010
	424729	6730993	1015	30.78	41.4	80.9	89.8	30.78	0.7	-0.2	1.6	30.39	424749	6731016	1009
	424729	6730993	1015	24.5	43.2	79.3	89.7	24.50	0.8	-0.2	1.6	24.07	424745	6731011	1010
	424729	6730993	1015	11.07	46.3	73.3	89.7	11.07	0.8	-0.3	1.6	10.60	424737	6731000	1011
	424729	6730993	1015	5.17	51.5	67.6	89.5	5.17	0.9	-0.4	1.6	4.78	424733	6730996	1012
	424729	6730993	1015	2.63	122.7	55.1	90.1	2.63	2.1	-0.6	1.6	2.16	424731	6730992	1013
	424729	6730993	1015	1.69	136.5	84.6	89.6	1.69	2.4	-0.1	1.6	1.68	424730	6730992	1014
	424729	6730993	1015	3.18	185.3	85.5	89.7	3.18	3.2	-0.1	1.6	3.17	424729	6730990	1014
	424729	6730993	1015	6.66	201.6	77	89.4	6.66	3.5	-0.2	1.6	6.49	424727	6730987	1013
	424729	6730993	1015	11.55	209.8	76	89.4	11.55	3.7	-0.2	1.6	11.30	424723	6730983	1012
	424729	6730993	1015	20.67	211.8	79.9	89.6	20.67	3.7	-0.2	1.6	20.35	424718	6730976	1011

Station ID	UTM (E)	UTM (N)	Elev(m)	Range	Bearing	Inclin	Roll	Range	Bearing	Inclin	Roll	Map Dist	x	y	z
St36 T89	424729	6730993	1015	95.42	285.6	83.7	90.1	95.42	5.0	-0.1	1.6	94.84	424638	6731019	1004
	424729	6730993	1015	65.21	287.6	83.3	89.9	65.21	5.0	-0.1	1.6	64.76	424667	6731013	1007
	424729	6730993	1015	74.82	290.7	83.2	89.5	74.82	5.1	-0.1	1.6	74.29	424660	6731019	1005
	424729	6730993	1015	76.44	292.3	83.4	89.2	76.44	5.1	-0.1	1.6	75.93	424659	6731022	1006
	424729	6730993	1015	81.04	297.7	82	89.4	81.04	5.2	-0.1	1.6	80.25	424658	6731030	1003
	424729	6730993	1015	62.1	301.3	81.4	89.6	62.10	5.3	-0.2	1.6	61.40	424677	6731025	1005
	424729	6730993	1015	62.89	306.8	83.4	89.5	62.89	5.3	-0.1	1.6	62.47	424678	6731030	1007
	424729	6730993	1015	60.35	306.4	81.9	89.8	60.35	5.3	-0.1	1.6	59.75	424681	6731028	1006
	424729	6730993	1015	64.64	309.5	81.6	89.3	64.64	5.4	-0.1	1.6	63.95	424680	6731034	1005
	424729	6730993	1015	67.85	312.9	80.8	89.1	67.85	5.5	-0.2	1.6	66.98	424680	6731039	1004
St36 T91	424729	6730993	1015	51.54	346.1	74.8	89.1	51.54	6.0	-0.3	1.6	49.74	424717	6731041	1001
	424729	6730993	1015	43.56	340.3	75.7	89.1	43.56	5.9	-0.2	1.6	42.21	424715	6731033	1004
	424729	6730993	1015	35.33	332.3	77.3	89.1	35.33	5.8	-0.2	1.6	34.47	424713	6731024	1007
	424729	6730993	1015	35.33	329.9	78.8	89	35.33	5.8	-0.2	1.6	34.66	424712	6731023	1007
	424729	6730993	1015	33.92	324.1	79.8	89.3	33.92	5.7	-0.2	1.6	33.38	424709	6731020	1008
	424729	6730993	1015	33.96	321.6	80.9	89.1	33.96	5.6	-0.2	1.6	33.53	424708	6731019	1009
	424729	6730993	1015	34.91	317.8	81.1	89.1	34.91	5.5	-0.2	1.6	34.49	424706	6731019	1009
	424729	6730993	1015	35.22	309.3	80.7	89.3	35.22	5.4	-0.2	1.6	34.76	424702	6731015	1009
	424729	6730993	1015	39.3	304	81.1	89.3	39.30	5.3	-0.2	1.6	38.83	424697	6731015	1006
	424729	6730993	1015	38.15	295.8	82.3	88.6	38.15	5.2	-0.1	1.5	37.81	424695	6731009	1009
	424729	6730993	1015	39.94	285.5	82.5	89.5	39.94	5.0	-0.1	1.6	39.60	424691	6731004	1009
	424729	6730993	1015	49.6	279.3	85.9	89	49.60	4.9	-0.1	1.6	49.47	424680	6731001	1011
	424729	6730993	1015	51.89	272	84.2	89	51.89	4.7	-0.1	1.6	51.62	424677	6730995	1009
	424729	6730993	1015	57.45	268.6	83.5	88.9	57.45	4.7	-0.1	1.6	57.08	424672	6730992	1008
	424729	6730993	1015	60.32	266.6	84.8	88.8	60.32	4.7	-0.1	1.5	60.07	424669	6730989	1009
	424729	6730993	1015	63.87	258.2	84.1	89	63.87	4.5	-0.1	1.6	63.53	424667	6730980	1008

Appendix B. Grid volume computations. Volume of sediment within the landslides was calculated with the Surfer 8 program. The thickness of Landslide "b" varied, therefore two iterations were performed to obtain an average volume for the entire landslide. Moreover, one limb of landslide "b was thicker than the other, so two different thicknesses were used for each iteration. The first iteration was performed with thicknesses of 7 cm and 15 cm and the second with 50 cm and 100 cm. Landslide "c" had little-to-no relief therefore a simple volume calculation was performed using the planar area and a thickness of 4 cm.

Landslide "b" (iteration 1)

Thickness used: 7 cm & 15 cm

Upper Surface

Grid Size: columns	78 rows x 100
X Minimum:	423886.3
X Maximum:	425068.9
X Spacing:	11.9
Y Minimum:	6731849.9
Y Maximum:	6732769.7
Y Spacing:	11.9
Z Minimum:	810.3
Z Maximum:	880.0

Lower Surface

Grid Size: columns	78 rows x 100
X Minimum:	423886.3
X Maximum:	425068.9
X Spacing:	11.9
Y Minimum:	6731849.9
Y Maximum:	6732769.7
Y Spacing:	11.9
Z Minimum:	810.1
Z Maximum:	880.0

Volumes

Z Scale Factor:	1

Total Volumes by:

Trapezoidal Rule:	36535.2
Simpson's Rule:	36254.7
Simpson's 3/8 Rule:	35975.6

Cut & Fill Volumes

Positive Volume [Cut]:	58387.9

Areas

Planar Areas

Positive Planar Area [Cut]:	283808.5
Negative Planar Area [Fill]:	32057.8
Blanked Planar Area:	771935.4
Total Planar Area:	1087801.8

Surface Areas

Positive Surface Area [Cut]:	315926.1
Negative Surface Area [Fill]:	0

Landslide "b" (iteration 2)

Thickness used: 50 cm & 100 cm

Upper Surface

Grid Size:	78 rows x 100 columns
X Minimum:	423886.3
X Maximum:	425068.9
X Spacing:	11.9
Y Minimum:	6731849.9
Y Maximum:	6732769.7
Y Spacing:	11.9
Z Minimum:	810.3
Z Maximum:	880.0

Lower Surface

Grid Size:	78 rows x 100 columns
X Minimum:	423886.3
X Maximum:	425068.9
X Spacing:	11.9
Y Minimum:	6731849.9
Y Maximum:	6732769.7
Y Spacing:	11.9
Negative Surface Area [Fill]:	0
Z Maximum: 879.5	
Z Minimum:	811.0
Z Maximum:	879.5

Volumes

Z Scale Factor:	1

Total Volumes by:

Trapezoidal Rule:	251051.0
Simpson's Rule:	249583.7
Simpson's 3/8 Rule:	248750.3

Cut & Fill Volumes

Positive Volume [Cut]:	258464.4
Negative Volume [Fill]:	0
Net Volume [Cut-Fill]:	258464.4

Areas

Planar Areas

Positive Planar Area [Cut]:	285179.4
Negative Planar Area [Fill]:	6713.3
Blanked Planar Area:	795909.0
Total Planar Area:	1087801.8

Surface Areas

Positive Surface Area [Cut]:	291953.1

Landslide "d"

Upper Surface

Grid Size:	100 rows x 42 columns
X Minimum:	424671.8
X Maximum:	424845.9
X Spacing:	4.2
Y Minimum:	6730715.5
Y Maximum:	6731136.5
Y Spacing:	4.2
Z Minimum:	998.5
Z Maximum:	1014.2

Lower Surface

Grid Size:	100 rows x 42 columns
X Minimum:	424671.8
X Maximum:	424845.9
X Spacing:	4.2
Y Minimum:	6730715.5
Y Maximum:	6731136.5
Y Spacing:	4.2
Z Minimum:	994.4
Z Maximum:	1013.2
Negative Surface Area [Fill]:	0

Volumes

Z Scale Factor:	1

Total Volumes by:

Trapezoidal Rule:	44622.8
Simpson's Rule:	44588.2
Simpson's 3/8 Rule:	44616.9

Cut & Fill Volumes

Positive Volume [Cut]:	44624.3
Negative Volume [Fill]:	0
Net Volume [Cut-Fill]:	44624.3

Areas

Planar Areas

Positive Planar Area [Cut]:	42459.7
Negative Planar Area [Fill]:	0
Blanked Planar Area:	30862.5
Total Planar Area:	73322.2

Surface Areas

Positive Surface Area [Cut]:	42459.7