APPENDIX P FLOODPLAIN ANALYSIS TECHNIQUES

ATTACHMENTS:

1. EXECUTIVE ORDER 13690 FLOOD ASSESSMENT OF PERMANENT ABOVEGROUND FACILITIES ALONG THE MAINLINE ROUTE

2. ALASKA LNG PIPELINE – FLOODPLAIN ANALYSIS TECHNIQUES (Draft 2 RR July 2016)

ALASKA LNG

EXECUTIVE ORDER 13690

FLOOD ASSESSMENT OF PERMANENT ABOVEGROUND FACILITIES ALONG THE MAINLINE ROUTE

USAP-P2-SRZZZ-00-000001-000

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1.0 INTRODUCTION

The purpose of this assessment is to fulfill the requirements of Executive Orders (EO) 11988and 13690, which established a Federal Flood Risk Management Standard. Under the Executive Orders, projects with a federal action or federal grant are required to evaluate impacts from the project on floodplains for the purpose of avoiding an increase to flood risks. To support an impact evaluation projects are also required to establish flood elevations in areas where facilities are proposed near floodplains. For the Alaska LNG Project (Project), flood elevations were based on a 500-year flood event, a requirement established in EO 13690. This document identifies Alaska LNG Project facilities located near floodplains, provides the calculated 500-year flood elevations where possible, discusses potential flood impacts where flood calculations were not possible, and assesses the overall potential of the Project to influence flooding. In summary, few of the Project's facilities are located near floodplains and those facilities would include small gravel pads in largely undeveloped floodplains and they would impact only a very small portion of the floodplain. Floodplain impacts from proposed Project facilities would be localized near the facility and are not expected to increase the risk of downstream flood damage to other developments or the environment.

Alaska LNG Project Facilities reviewed in this document include proposed permanent facilities located along the Mainline and aerial pipeline crossings. Facilities associated with the Gas Treatment Plant, Point Thomson Transmission Line, and Liquefaction Plant were reviewed but are not included because they are not located within active floodplains.

This report is an updated assessment to the initial geomorphic assessment and proposed floodplain analysis technique outlined in Draft 2 Resource Report No. 2, Appendix Q, for the Project.

EO 11988, Floodplain Management, was issued on May 24, 1977, and requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The EO established a process for flood hazard evaluation based upon a 100-year base flood (i.e., a flood that has a 1 percent chance of occurring in any given year).

EO 11988 was amended by EO 13690 in 2015 for consistency with the federal Climate Action Plan. . The new executive order changes the definition of a floodplain from the 100-year base flood (1 percent annual chance flood) to: (1) the elevation and flood hazard area that result from using a climate-informed science approach that uses the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science. This approach will also include an emphasis on whether the action is a critical action as one of the factors to be considered when conducting the analysis; (2) the elevation and flood hazard area that result from using the freeboard value, reached by adding an additional 2 feet to the base flood elevation for non-critical actions and by adding an additional 3 feet to the base flood elevation for critical actions; or (3) the area subject to flooding by the 0.2-percent annual chance flood.

A review of climate science for Alaska by the United States Army Corps of Engineers (USACE) published in 2015 (USACE 2015) suggests that snowmelt-driven peak flows are likely to occur earlier in the year due to warmer predicted temperatures. Changes in peak flows are much less certain. One study in southern Alaska predicted considerable increases in the 100-year peak flow, and another predicted that the 20-year precipitation event is expected to occur two to seven times more frequently when compared to historical conditions (USACE 2015). Both increases in the frequency of flood or precipitation events of similar magnitudes and increases in the magnitude of flows for a given probability event indicate that floods are becoming more frequent.

In addition to flooding hazards, increases in peak flow events are likely to increase the rate of channel migration, stream bank erosion, and scour. Many Alaskan streams have high sediment loads and are prone to active channel migration already. Increased peak flows or frequency of extreme events may change or increase the size of existing floodplains. Streams in confined valleys tend to move back and forth across their entire valley bottom, and will continue to do so in the absence of development that tends to confine river movement.

Because the best-available, actionable hydrologic and hydraulic data has not yet estimated the magnitude of change for peak flows due to climate change, the 0.2-percent annual chance flood was used to define floodplains for this report consistent with EO 13690. The 0.2-percent annual peak flow was estimated based on historical data from United States Geological Survey (USGS) gages on streams near the Project area or from regional regression techniques developed for ungaged streams in Alaska (Curran et al. 2016). An initial geomorphic review of floodplains crossed by the Mainline right-of-way (ROW) was conducted to assess flooding potential.

In Alaska, the Federal Emergency Management Agency (FEMA) has delineated only a small portion of the state's abundant floodplains. The National Flood Insurance Program (NFIP) requirements apply to areas mapped as Special Flood Hazard Areas (SFHAs). The SFHA is the area that would be flooded by a 100-year base flood (also referred to a 1 percent annual probability flood). Because the NFIP is primarily a federally managed flood insurance program, the focus of FEMA mapping and local requirements for construction in a floodplain are habitable structures (homes). Habitable structures are typically required to have the first habitable floor above the flood elevation. Non-habitable structures are allowed to use flood-proofing measures (such as building on fill or piles, use of water-tight seals, berms, etc.) to protect against flooding. An important feature of the development and analysis of facility siting is to conduct engineering-level analyses of the flood levels and structures in floodplains.

This report assesses proposed permanent aboveground facilities located along the Mainline route from the gas treatment plant (GTP) facility in the north to the Liquefaction Facility near Nikiski. Descriptions of flood hazards for the GTP facility and the Liquefaction Facility are included in Resource Report No. 2.

This report includes analyses of the following proposed permanent facilities:

- Compressor stations.
- Heater station.
- Mainline block valves (MLBVs).
- Aerial crossings of water bodies (where the pipeline is located above ground).

The report did not analyze meter stations and launching and receiving facilities because they are located at the major facilities such as the GTP facility and the Liquefaction Facility. The locations of off-take interconnection sites have not been determined at this time. Cathodic protection test stations are proposed to be located every 2 miles along the Mainline, but the protection equipment would be located at existing compressor stations, meter stations, and MLBVs.

2.0 FLOOD HAZARD SUMMARY

Mainline permanent facilities and aerial crossings were screened to determine which sites were located near floodplains and would therefore require additional analysis. The screening process included a desktop review of geomorphic features indicative of floodplains. Available data included high-resolution aerial imagery, a light detection and ranging (LiDAR) shaded-relief digital elevation model (DEM), and contour elevation mapping.

Desktop indicators used to screen sites are listed below.

- Evidence of a site's location within a current or historical floodplain (such as steep valley edges, relict channels, and vegetation patterns).
- The location and elevation relative to nearby waterbodies.
- The size and type of nearby waterbodies.
- The topography around the site.
- Indicators of geomorphic activity (such as erosion, deposition, and channel migration).
- Geomorphic features such as alluvial fans.

Table 1 summarizes the permanent facilities and aerial crossings that were screened in the desktop review. Of 30 total sites, 4 were flagged as potentially located near a floodplain. The seven sites, listed below, were then assessed in more detail based on available data in Section 3.0 and 4.0.

- MLBV 2 near MP 37.
- Sagwon Compressor Station including MLBV 3 near MP 76.
- Galbraith Lake Compressor Station including MLBV 5 near MP 149.
- MLBV 13 near MP 467.

Galbraith Lake Compressor Station including MLBV 5, are located on alluvial fans and both are potentially at risk from debris flows or channel avulsions. Flood elevations could not be calculated based on available data. Flood impacts were evaluated through additional desktop geomorphic review. The remaining three sites (MLBV 2, , Sagwon Compressor Station, and MLBV 13) are located in or near existing or historical floodplains. . MLBV 2, and the Sagwon Compressor Station including MLBV 3, and MLBV 13 were analyzed for the 0.2-percent probability flood to estimate flood elevations relative to each of the proposed facilities. The following assessments are based on the 42-inch diameter case Revision C data available in the Project geographic information system (GIS) web mapping application.

Table 1. Flood Assessment Summary

Nearest MP	Facility	Nearest Significant Waterbody	Location Relative to Floodplains or other Waterbodies	500-year Flood Potential
37	MLBV 2	1,075 feet to the Sag River	Located adjacent to a floodplain, but on the other side of Dalton Highway and the Trans-Alaska Pipeline System (TAPS) maintenance road from the Sag River floodplain	Yes
76	MLBV 3, Sagwon Compressor Station	3,083 feet to the edge of the active Sag River channel	In the Sag River floodplain on other side of the Dalton Highway	Yes

Nearest MP	Facility	Nearest Significant Waterbody	Location Relative to Floodplains or other Waterbodies	500-year Flood Potential
112	MLBV 4	1,200 feet to a small (1.5 acre) pond to the east, 3,091 feet to a small stream to the west, 3,347 feet to a larger river to the southeast	On a tundra flat outside of the stream floodplain on the west; a larger river to the east is located below a bluff, which constrains the floodplain.	No
149	MLBV 5, Galbraith Lake Compressor Station	510 feet to a small drainage to the south, 4,083 feet to a larger river to the west	The proposed compressor station would be located on an alluvial fan adjacent to a small stream that bends to the south around the proposed site. This stream could unpredictably avulse to a different location anywhere on the fan in the future. Aerial photos show debris flows from this and similar drainages with alluvial fans nearby (immediately south). Note: the location of the proposed facility has been shifted north and the pipeline has been moved west of the haul road compared to the Rev B location analyzed in Appendix Q of Resource Report No. 2.	Yes
194	MLBV 6	1,870 feet to a floodplain to the west	Not located in or near a floodplain.	No
240	MLBV 7, Coldfoot Compressor Station	2,795 feet to the edge of a river and floodplain	Located on a hillside away from the floodplain to the west. There is a small channel on the north side of the site that is unlikely to cause flooding or major erosion.	No
286	MLBV 8	804 feet to a small drainage to the north	Located on a rise between two small drainages to the north and south. Not in a floodplain.	No
333	MLBV 9, Ray River Compressor Station	2,368 feet to a small drainage to the west	Located on gently sloping terrain away from major drainages and floodplains.	No
378	MLBV 10	312 feet to a small drainage to the east, 1,787 feet to a larger drainage to the northwest	Located on gentle slope away from drainages and floodplains.	No
422	MLBV 11, Minto Compressor Station	8,420 feet to a drainage to the west	Located in a level area on high slope above a floodplain to the west.	No
445	MLBV 12	Approximately 9,800 feet to the Chatanika River to the south	Located on gentle slope away from drainages and floodplains	No
467	MLBV 13	Approximately 7,500 feet to Tanana River main channel	920 feet to a pond to the west, 3,743 feet to a floodplain edge to the west	Yes
493	MLBV 14	4,880 feet to Nenana river and floodplain to the east	Located on gentle slope away from drainages and floodplains	No
518	MLBV 15, Healy Compressor Station	3,003 feet to a floodplain and river to the east	Located in a level area above a floodplain to the east.	No

Nearest MP	Facility	Nearest Significant Waterbody	Location Relative to Floodplains or other Waterbodies	500-year Flood Potential
532	Aerial Crossing WPC296-B	Spans Nenana River	Aerial crossing of Nenana River #3. The crossing is located far above the river and is anchored high on the bluffs on either side of the canyon.	No
534	Aerial crossing WPC300	Spans Fox Creek	Aerial crossing of Fox Creek. If the crossing spans the ravine from the tops of the ridges, it would be far above the creek and out of the floodplain.	No
535	MLBV 16	274 to stream to the south, and 605 feet to a river to the southwest	Located on a level area upslope from the stream to the south and a river to the west. A highway is located between the site and the river to the west.	No
538	Aerial crossing WPC306	Spans Lynx Creek	Aerial crossing of Lynx Creek. The crossing spans the ravine from near the tops of the ridges and would be far above the creek and out of the floodplain.	No
539	MLBV 17	849 feet to the stream valley to the north	Located on a terrace above adjacent river valleys. Not located in or near a floodplain.	No
547	MLBV 18	1,230 feet to a pond to the northeast	Located in a hummocky area away from nearby floodplains or streams.	No
573	MLBV 19	2,150 feet to a pond to the southeast, 5,300 feet to a river to the west	Located in a hummocky area over a mile from the nearest stream. Not located in or near a floodplain.	No
598	MLBV 20, Honolulu Creek Compressor Station	2,534 feet to a small stream to the north, 2,856 feet to the larger drainage to the southeast	Site is located on a mostly level post-glacial plain at the edge of a valley. Not located in or near a floodplain.	No
626	MLBV 21	7,880 feet to main channel of Chulitna River to the west	The site is located on a ridge between two river valleys, an active floodplain to the west and a less active floodplain to the east. The site itself is not located in or near a floodplain.	No
648	MLBV 22	1,329 feet to the river to the east, 1,585 feet to a pond to the southwest	The site is located on post-glacial terrain near an entrenched river channel. The site itself is not located in or near a floodplain.	No
675	MLBV 23, Rabideux Creek Compressor Station	1,403 feet to a small pond to the east and 3,004 feet to a stream to the east	Site is located on small bluff on a terrace above the river to the east. It is not located in or near the floodplain.	No
704	MLBV 24,	2,406 feet to a river to the west, 7,439 feet to the larger floodplain and river to the east	Located on a terrace above the narrow river floodplain to the west and the larger floodplain of the glacial-fed river to the east. Not located in or near a floodplain.	No
726	MLBV 25	1,100 feet to Anderson creek to the northeast	Located outside on an Susitna River alluvial fan that does not have any active channels near the proposed site. Not located in or near an active floodplain.	No
750	MLBV 26, Theodore River Heater Station	Small pond near the western corner of the facility footprint that is the source for a small creek	Site is located on a bluff on the western edge of the floodplain. Site is located outside floodplain, and the nearest active channel is almost 2,000 feet to the east.	No

Nearest MP	Facility	Nearest Significant Waterbody	Location Relative to Floodplains or other Waterbodies	500-year Flood Potential
		that drains southwest. Site is 175 feet from the edge of a bluff that defines the edge of the floodplain to the east. Nearest side channel is 1,931 feet to the east with the main channel 2,252 feet to the northeast		
766	MLBV 27	1,208 feet to the shoreline to the east, 2,736 feet to the nearest pond to the west	Located on the bluff above the shoreline. No streams or channels nearby. Not located in a riverine floodplain.	No
794	MLBV 28	697 feet to a drainage to the west, 751 feet to a pond area to the south, 1,187 feet to the shoreline	Located on a bluff above the shoreline north of a pond/bog area to the south. Not located in a riverine floodplain.	No
800	MLBV 29	277 feet to a pond to the southwest, 838 feet to the shoreline	Located on bluff above the shoreline to the north. Not located in or near a riverine floodplain.	No

3.0 GEOMORPHIC RISK ASSESSMENTS

The Galbraith Lake Compressor Station including MLBV 5, are located on active alluvial fans and could be impacted by a 500-year flood event or a debris flow. The flood elevations cannot be estimated at this site due to its location on an alluvial fan, which is convex in shape with multiple channels. Instead, geomorphic indicators were used to estimate flood hazards.

3.1 GALBRAITH LAKE COMPRESSOR STATION AND MLBV 5

The Galbraith Lake Compressor Station and MLBV 5 are located on an alluvial fan where a steep confined mountain stream emerges onto the Atigun River floodplain (Figures 1 and 2). As shown in the figures, the stream currently bends to the south and around the proposed Galbraith Lake Compressor Station footprint. Alluvial fans, however, are dynamic geomorphic features formed where high-energy flows from the confined canyon upstream emerge onto a lower gradient valley floor and deposit their sediment loads in a fan shape at the mouth of the canyon (Figure 1). Channels construct their fans by moving back and forth across the fan over time in response to plugging of existing channels by sediment during high-flow events, a process that will continue at this site. Multiple recent channels can be seen immediately to the south of the proposed facility (Figures 1 and 2). Older channels are readily visible throughout the footprint of the proposed facility (Figures 1 and 2).

Channels on alluvial fans avulse, or change location suddenly, during a flood event. Although the current channels only impinge on the southern edge of the site footprint, it is possible that during a significant flood event the current channel could avulse to flow straight out of the canyon and into the proposed facility. In that case, the road may help block or divert flood and debris flows to some extent, depending on the magnitude and duration of the flood event and the composition of the roadbed (which is likely composed of smaller-sized material than the surrounding material deposited by the creek in the alluvial fan). However, it is unlikely to provide substantial protection, assuming the requirements of EO 11988, including a 500-year flood event.

Based strictly on the visible airphoto expressions of past channel morphology and plausible rates of bioturbation and soil creep, these features are estimated to be younger than a century old and within the range of design consideration.

Flood flows at the site were estimated using the current USGS regression procedure for Alaska (USGS 2015); the drainage area for the stream was estimated at 9.9 square miles and the mean annual precipitation was estimated at 20.35 inches (see Attachment A for more details on the methods used to determine flood flows). The results indicate that the 50 percent chance exceedance flow, which is likely to fill the existing channel, would be approximately 140 cubic feet per second (cfs). The 1 percent chance exceedance flow (100-year flood) would be 610 cfs, and the 0.2-percent chance exceedance flow would be approximately 840 cfs (with a 95 percent confidence range of 258 to 2,730 cfs[1]).

Approximate estimates of plausible flow conditions through an approximately 100-foot-wide active channel corridor under a 1,000-cfs discharge suggest water depths of 1 to 2 feet with velocities in excess of 5 feet per second (fps). If shear stresses under these conditions are sufficient to mobilize sediment (or if an actual 500-year discharge lies at the upper end of the discharge confidence interval), then one or more deeper channels could be eroded, and flood

[1] Several factors contribute to the wide confidence interval for flows resulting from the USGS regression equation: short periods of record, low density of stream gages, natural variability in rainfall-runoff relationships and watersheds, and broad area of applicability across Alaska. Multiple years of site-specific data would need to be collected to refine flood frequency estimates at ungaged locations.

depths and velocities could locally approach twice these values. In addition, the site could be inundated by rocks and sediment from a debris flow, which is the main mechanism that forms alluvial fans. Figure 4 shows poorly sorted rocks and sediment from past debris flows in a road cut above the proposed site

The footprint for the compressor station and MLBV comprise a small portion of a remote and largely undeveloped floodplain. Potential impacts to the floodplain would likely be localized and small scale. The only existing developments are the Dalton Highway, which is located uphill from the Project facilities, and a small gravel mine used for highway maintenance. The gravel mine is located downgradient from the compressor station and MLBV footprint. In order for the Project facilities to potentially influence flood flows, first the Dalton Highway would have to be overtopped. If that occurred, the compressor station and MLBV pad could potentially impact the floodplain by blocking relic channels, reducing flood storage capacity, and redirecting flows around the facility. These changes could cause localized erosion near the alluvial fan, and potentially increase the chance of flooding the gravel mine. Potential mitigation could include relocating the compressor station and MLBV outside of the alluvial fan, or adding erosion control measures. .

Figure 1. Oblique aerial image from Google Earth showing the approximate location of the proposed Galbraith Lake Compressor station on the alluvial fan below the canyon mouth.

Figure 2. Aerial image of the Galbraith Lake Compressor Station footprint.

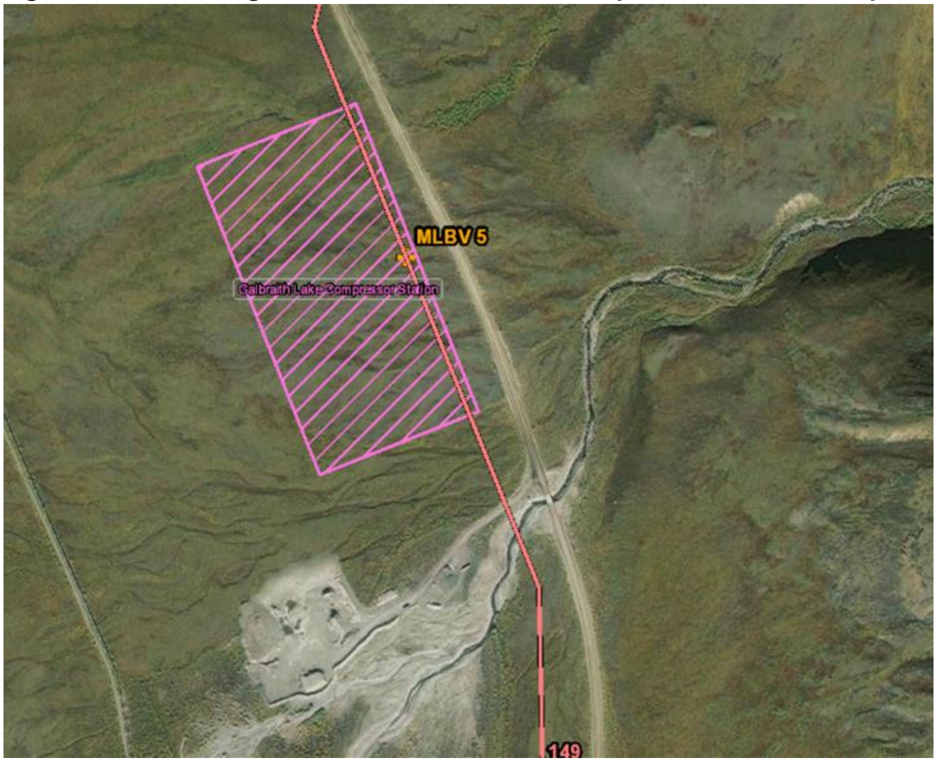


Figure 3. Field photo from road looking west toward the proposed facility. Note undulating surface and protruding rocks.

Figure 4. Field photo from road showing poorly sorted sediment along the road cut in the alluvial fan near the proposed site.

4.0 FLOOD DEPTH ANALYSIS

Three sites (MLBV 2, Sagwon Compressor Station, and MLBV 13) are located in or near a floodplain and may be at risk to flooding during a 500-year event. A site-specific flood analysis was conducted for each location, based on available data.

4.1 SAGWON COMPRESSOR STATION AND MLBV 3

The proposed Sagwon Pump Station near MP 76 is located at the edge of the Sag River floodplain and adjacent to a smaller stream that drains north along the west edge of the valley and runs parallel to the main channel (Figure 5). Figure 6 shows a ground-level view of the site from the southwest corner showing the mostly-level surface extending to the valley edge in the distance. Impacts from a 0.2-percent annual chance event range from up to 8.5 feet of flooding at the unimproved site if the adjacent roadbed remains intact to significant erosion from high-velocity flows if the river avulses or overflows due to aufeis and washes out the roadbed.

A floodplain elevation relative to water surface elevation map was also produced at this location as part of the previous effort (Appendix Q) that shows that a portion of the unimproved site is at or below the typical water surface elevation (Figure 7). Figure 7 shows the section of the Sag River with surface elevations colored according to their elevation relative to the water surface elevation when the LiDAR data was collected. The colored and grey shaded area represent the extent of the higher-resolution (1m) LiDAR data, which was generally collected along a narrow strip following the Mainline ROW. The different colors on the map represent the surface elevation relative to the water surface. The map illustrates areas that are above the water surface such as gravel bars as well as lower areas that would carry water at higher flows. The compressor station is located very close to the LiDAR water surface elevation, which is a low-flow elevation. Although the active part of the Sag River channel currently abuts the east side of the valley, it is an active high-sediment river that is prone to move back and forth across the valley bottom, particularly during flood events. A major flood event could cause it to avulse or spread out and re-occupy relict channels along the west side of the valley.

Figure 5. Aerial overview of the proposed Sagwon Compressor Station outlined in orange. The red line is the cross section used to estimate the flood elevation

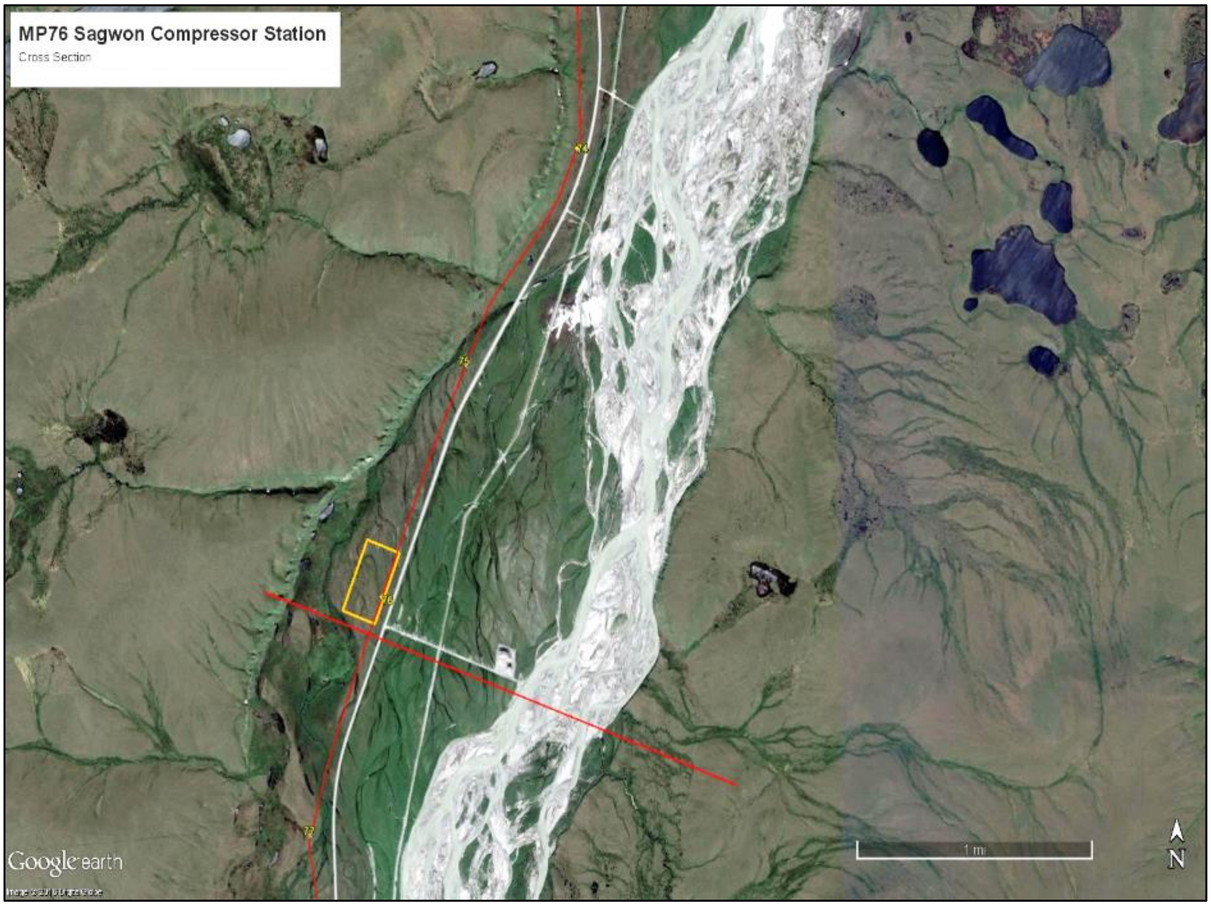
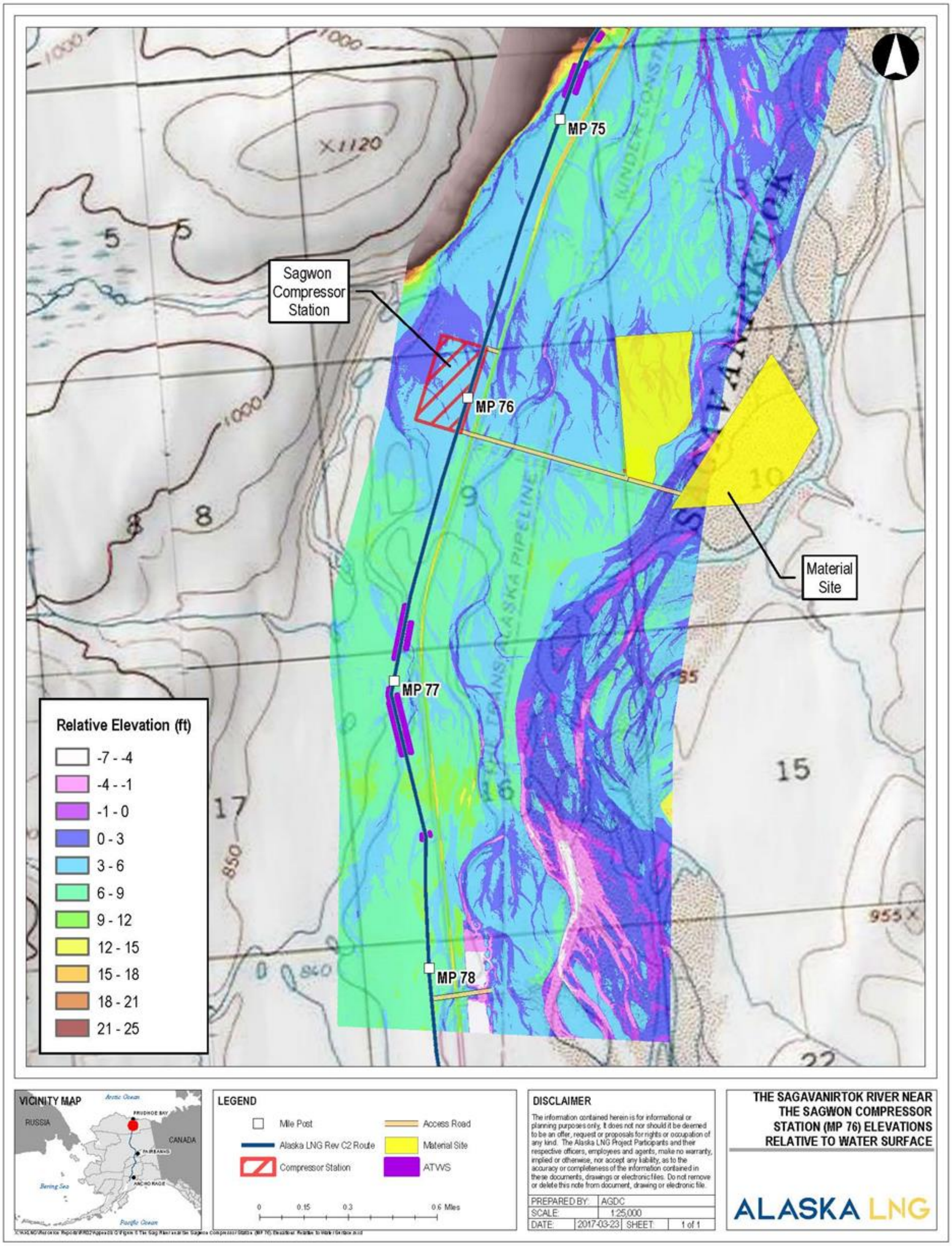


Figure 6. Field photo of site looking northwest from the road at the southwest corner of the site showing mostly level site to the edge of the valley with a channel visible in the middle of the photo.

Figure 7. Floodplain elevation relative to water surface elevation near the proposed Sagwon Compressor Station and MLBV 3.



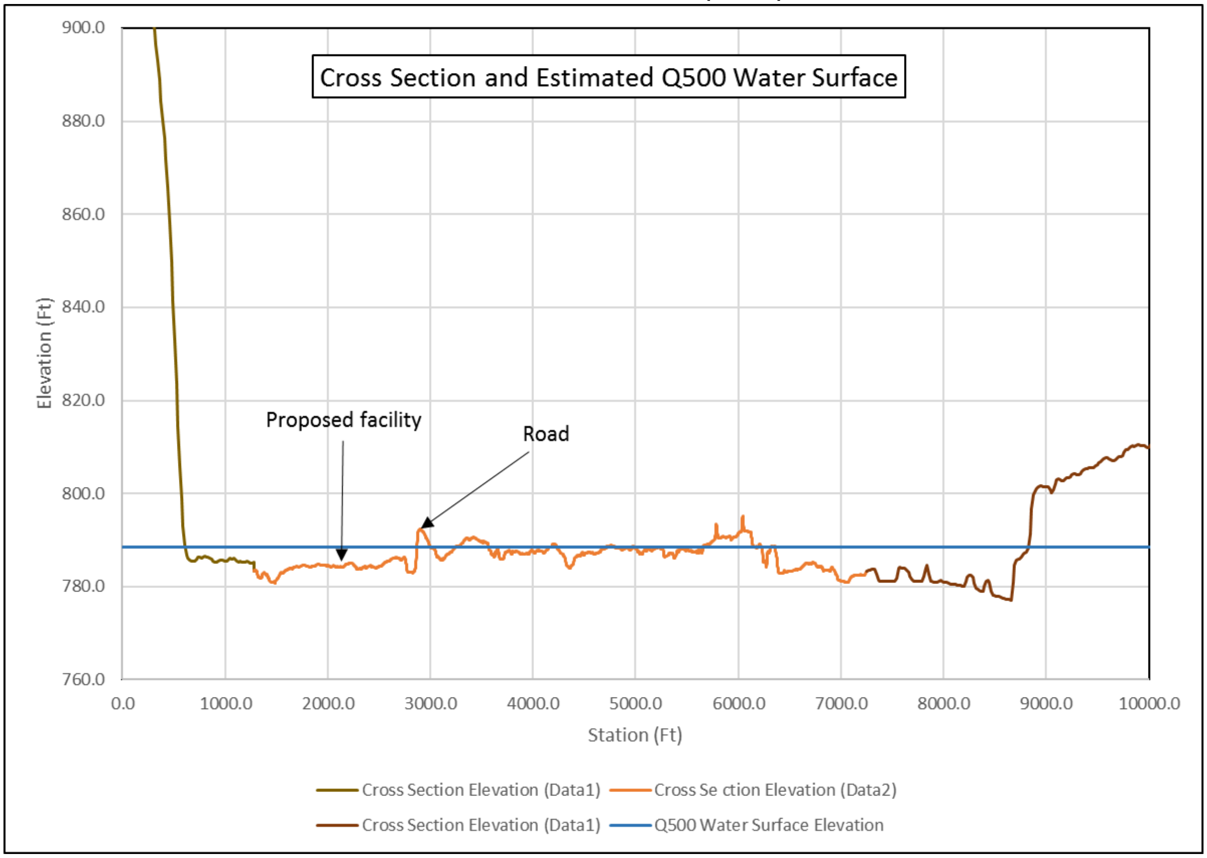
The 0.2-percent chance flood elevation was estimated using the techniques described in Attachment A. Figure 5 shows the location of the cross section used in the Manning's equation and Figure A1 shows the delineated watershed. Table 2 shows the input variables and results of the equations for estimating the 0.2-percent chance flow and elevation. USGS gage 15908000, Sag River near Pump Station 3, is located upstream of the facility at MP 76 near MP 96 and has a 30-year record of peak flows that was used to calculate flood frequency statistics (Curran et al. 2016). The 0.2-percent chance flow at the station yielded a weighted estimate of 60,300 cfs for that gage.

Table 2. Sagwon Compressor Station – Input Variables and Results of the Flood Frequency Analysis and Manning's Equation

Input Variable	Input Value	Result
Flood frequency spreadsheet (Curran et al. 2016)		
Watershed area	587.8 square miles	0.2-percent chance exceedance flow: 11,200 cfs calculated output + 60,300 cfs for the upstream gage near MP 96 = 71,500 cfs estimate for MP 76
Mean annual precipitation	13.059 inches	
Manning's Equation		
Q	71,500 cfs	Flood elevation: 3.2-foot average depth 788.5-foot flood elevation
S (slope)	0.002689	
Channel width	7,013 feet	
Manning's n		
– In channel (32%) gravel/cobble	0.04	
– Bank (5%) shrubs	0.15	
– Overbank (63%) tundra	0.05	
– Weighted average of n	0.052	

The elevation at the unimproved Sagwon facility ranges from approximately 780 to 790 feet in elevation and portions would be subject to the 0.2 percent chance flood with an elevation of approximately 788.5 feet (Figure 8). Note that while the elevation figure appears to be relatively precise, the 95 percent confidence interval of values for the exceedance flow calculation result of 11,200 cfs for the contributing watershed below the gage ranges from 3,440 to 36,300 cfs. The Manning's equation is an estimate that is also very sensitive to variables such as slope and Manning's n, and channel configuration. The estimated elevation therefore represents a best estimate for a flood elevation that could vary by several feet. Also worth noting is that the road may provide some flood protection at the facility depending on how permeable it is to flood waters from the adjacent Sag River, whether the drainage to the west of the road also floods, and whether the road survives an avulsion event of the main channel. Impacts range from up to 8.5 feet of flooding at the unimproved site if the adjacent roadbed remains intact to significant erosion from high-velocity flows if the river avulses or overflows due to aufeis and washes out the roadbed.

Figure 8. Cross section near the Sagwon Compressor Station showing the approximate location of the proposed facility, the adjacent road, and the estimated 0.2-percent chance annual flood elevation (Q500).

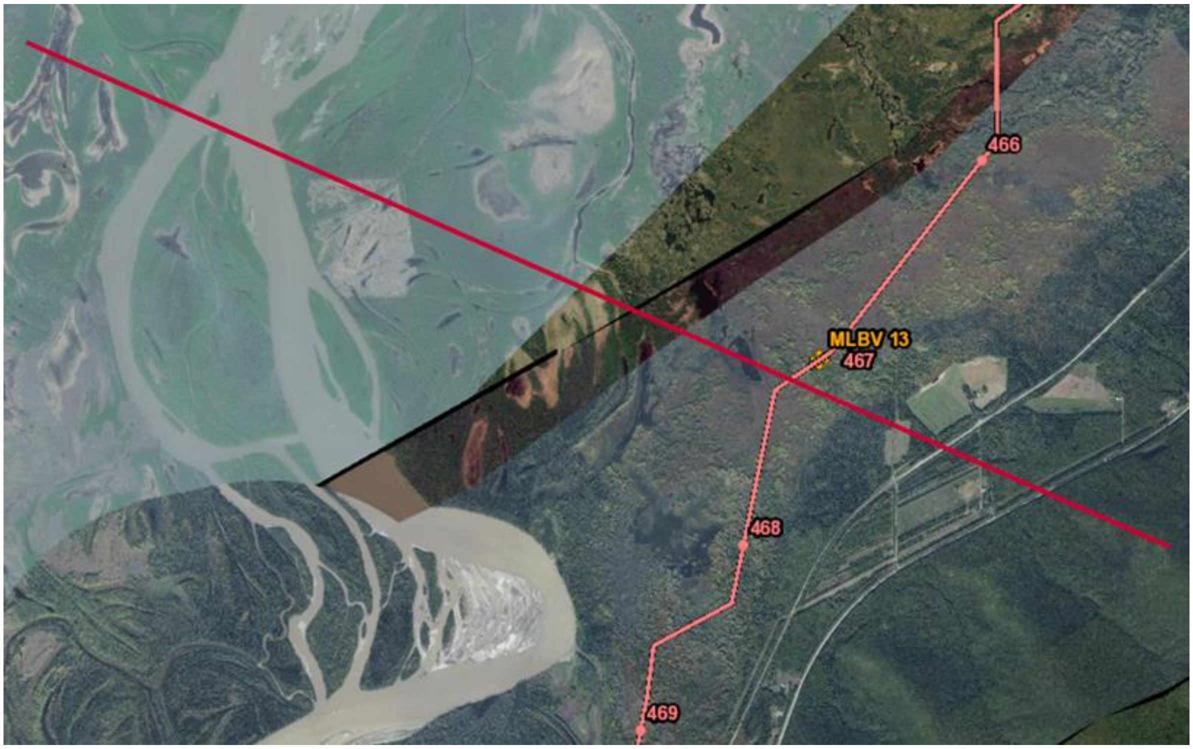


4.2 MLBV 13

MLBV 13 is located approximately 7,500 feet northwest of the mainstem Tanana River, but is still located in the extensive floodplain of this large river (Figure 9). It is situated along the east side of the valley downstream of the confluence of the Tanana and Nenana rivers and the City of Nenana. Although it does not appear to be located near active or relict channels from the main river, the valley is broad and relatively flat. Impacts from a 0.2-percent annual chance event would be approximately 4 feet of flooding at the unimproved site. The facility is located in a largely undeveloped floodplain. Potential impacts to the floodplain are therefore expected to be very limited but could include a small scale reduction in flood storage capacity and erosion near the facility. Mitigation, if found to be appropriate based on additional data, would likely be focused on protecting the gravel pad for the facility.

A flood insurance study was completed for the City of Nenana (FEMA 1999) and a bridge scour study (Langley 2006) provided Manning's n estimates based on the Tanana River near the bridge crossing (Table 3).

Figure 9. Aerial overview of the proposed MLBV 13. The red line is the approximate cross section used to estimate the flood elevation.



The flood of record in the vicinity occurred in 1967 resulting in a peak flow of 186,000 cfs in the City of Nenana, which is very close to the estimated 0.2-percent chance flood of 184,000 cfs (USGS) and 192,000 cfs (FEMA). As described in the Flood Insurance Study for the City of Nenana:

> "Storm runoff caused numerous slides on headwater hillsides, washed out roads and tree-covered river terraces, and covered the floodplain in the City of Nenana for 10 days to an average depth of 6 feet. The entire City of Nenana was evacuated. Flood damages were estimated to be $1 million… The crest stage in the City of Nenana at the USGS gaging station on the Tanana River at the Alaska Railroad bridge was 357.4 feet National Geodetic Vertical Datum of 1929 (NGVD)…" (FEMA 1999)

MLBV 13 is located below the confluence of the Tanana and Nenana rivers. USGS stream gage 15515500 is located on the Tanana River in the city of Nenana just upstream from the confluence, and has a period of record of 75 years and calculated flood frequency estimates. The Nenana River, which joins from the south, is not gaged so the 0.2-percent chance flood was estimated at 61,300 cfs using the USGS flood frequency analysis spreadsheet as described in Attachment A.

Figure 10 shows the location of the cross section used in the Manning's equation. Table 3 shows the input variables and results of the equations for estimating the 0.2-percent chance flow and elevation. The slope was estimated from Google Earth elevations along a segment of the river that includes the cross section and was estimated at 0.000273 ft/ft, which is close to the water surface slope at Nenana described in Langely (2006) for the bridge scour study

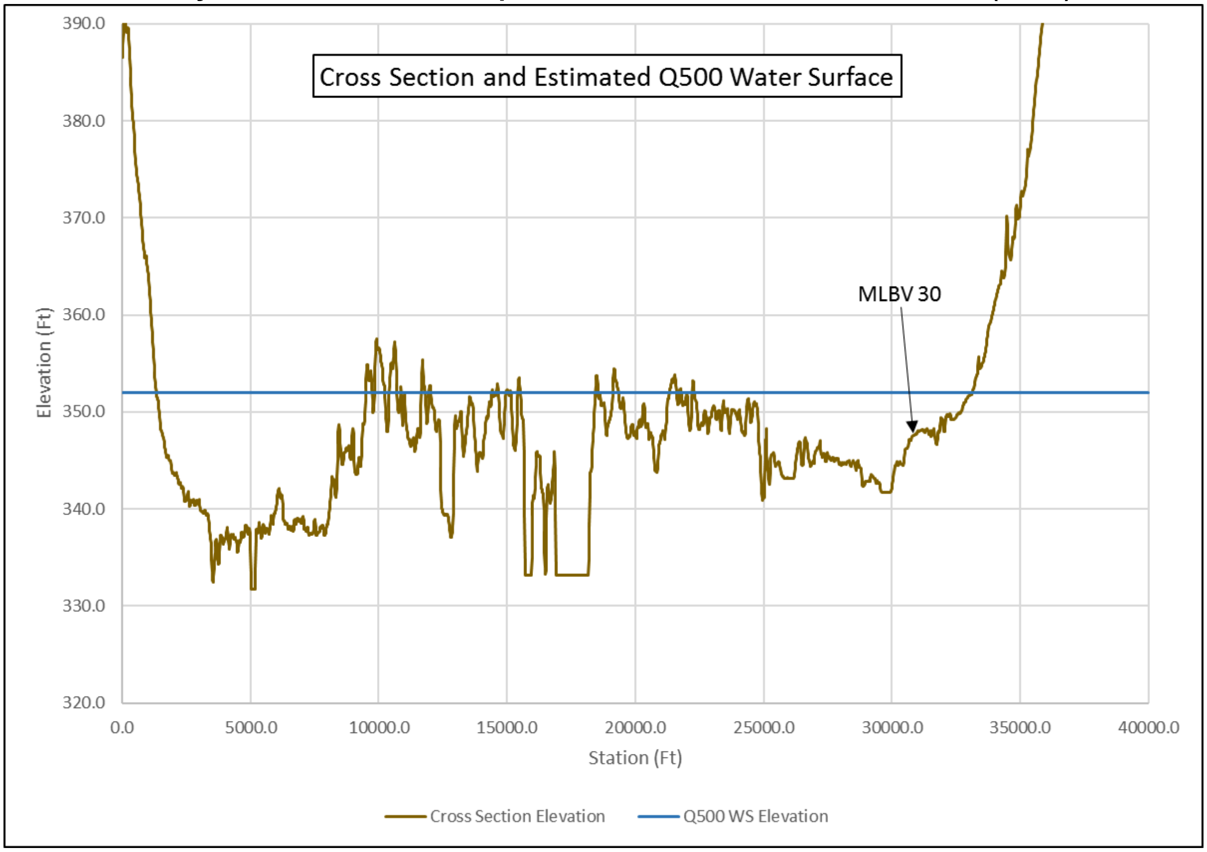
(0.0003 ft/ft). Manning's n values for the in-channel and bank portion of the cross section were also from Langley (2006), and the forested overland value was from Chow (1959) as referenced online.

Table 3. MLBV 13 – Input Variables and Results of the Flood Frequency Analysis and Manning's Equation

Input Variable	Input Value	Result
Flood frequency spreadsheet (Curran et al. 2016)		
Watershed area	3904.7 square miles	0.2-percent chance exceedance flow: 61,300 cfs for the Nenana River + 184,000 cfs from the Tanana River = 245,300 cfs
Mean annual precipitation	21.329 inches	
Manning's Equation		
Q	245,300 cfs	Flood elevation: 7.7-foot average depth 352-foot flood elevation
S (slope)	0.000273	
Channel width	29,440 feet	
Manning's n		
– In channel (9%) gravel/cobble	0.025	
– Bank (10%) shrubs	0.045	
– Overbank (81%) forest/shrub	0.1	
– Weighted average of n	0.088	

The elevation at the proposed MLBV 13 facility is approximately 348 feet based on contour intervals from the Project GIS database. This is lower than the estimated 0.2-percent chance water surface elevation of 352 feet (Figure 10). Note that while the elevation figure appears to be relatively precise, the 95 percent confidence interval of values for the exceedance flow calculation result of 61,300 cfs for the Nenana River ranges from 18,800 cfs to 199,000 cfs. The Manning's equation is an estimate that is also very sensitive to variables such as slope, Manning's n, and channel configuration. The flood elevation therefore represents a best estimate for a flood elevation that could vary by several feet. The site is located outside of the area likely to be impacted from channel erosion and therefore would only be subject to lower velocity flooding. The average velocity calculated from the Manning's equation across the entire cross-section is approximately 1 foot per second, which would be less in the vicinity of the proposed site due to vegetation.

Figure 10. Cross section near the MLBV 13 showing the approximate location of the proposed facility and the estimated 0.2-percent chance annual flood elevation (Q500).



5.0 CONCLUSION

Four Alaska LNG Project facilities are located near a floodplain and were evaluated based on the requirements of EO 11988 and 13690. These sites are located near largely undeveloped floodplains. Their footprints would comprise a very small portion of the floodplain. Potential impacts may include small and localized reductions in flood storage capacity and erosion near the facilities. Existing developments downstream of the proposed facilities are not expected to be impacted as a result of the Project facilities. Mitigation would likely be focused on protecting the Project facilities and may include relocating them outside the floodplain or adding erosion control features.

(Galbraith Lake Compressor Station including MLBV 5 are located on alluvial fans, which are dynamic geomorphic systems where channels frequently deposit new material and change location over time. These two proposed sites could be impacted by a 0.2-percent annual chance flood event or debris flow.

Three sites (MLBV 2, Sagwon Compressor Station, and MLBV 13) were evaluated for flood risk by estimating the 0.2-percent chance flow and calculating the flood elevation at a cross section near the site using the Manning's equation. The results indicate that MLBV 2, Sagwon Compressor Station, and MLBV 13 would be partially or completely inundated by the 0.2-percent annual chance flood. With the exception of MLBV 13, each site could also be impacted by erosion or scour if a channel avulsion were to occur during the flood event and erode the roadbed between the sites and the main river. The roadbed is likely to provide some protection from less-extreme flooding events, but its ability to maintain integrity during a design flood is unknown and probably low. A summary of potential flood elevations is provided in Table 4.

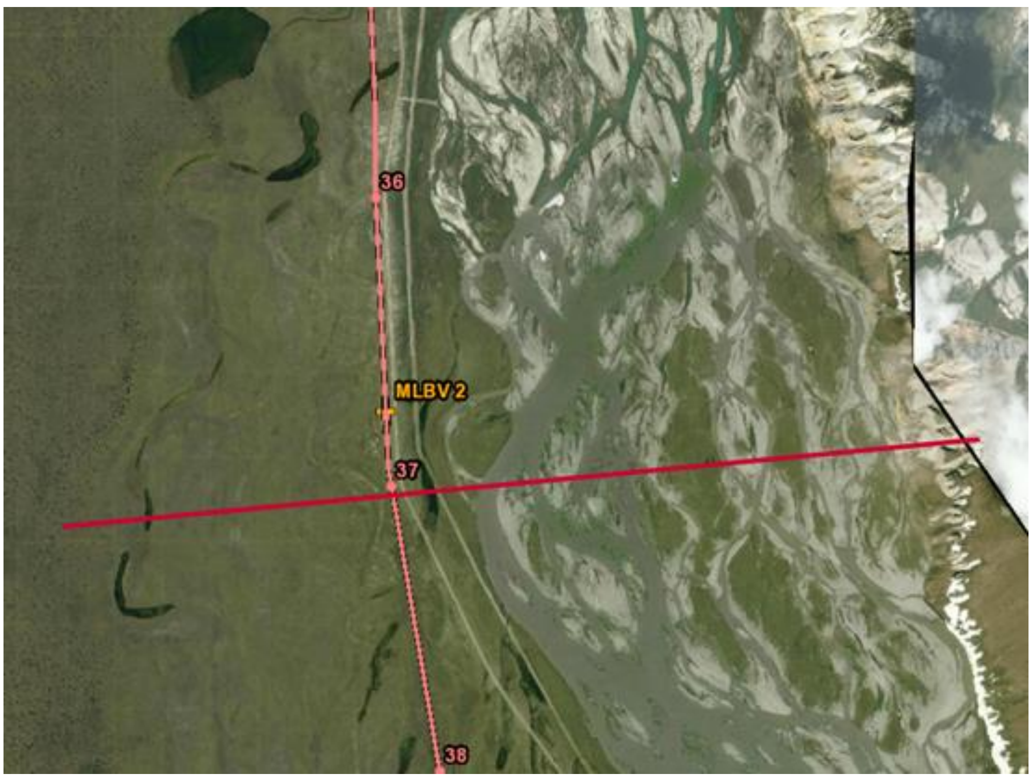
Table 4. Approximate Facility Elevations and Estimated 500-year (0.2-Percent Annual) Chance Flood Elevations

Location	Facility	Elevation (feet)	Flood Elevation (feet)
MP 37	MLBV 2	282	283
MP 76	Sagwon Compressor Station and MLBV 3	780-790	789
MP 149	Galbraith Lake Compressor Station and MLBV 5	844	Not known (flood potential exists from channel avulsion)
MP 467	MLBV 13	348	352

5.1 MLBV 2

The proposed MLBV 2 near MP 37 is located on the west side of the Sag River floodplain. Relict channels and small drainages are clearly visible to the west of the ROW and proposed location of the MLBV (Figure 11). The highly dynamic nature of the Sag River is clearly visible in this image where multiple active channels are visible along with vegetated side-channels and bars. Impacts from a 0.2-percent annual chance event range from minor flooding if the adjacent roadbed remains intact to significant erosion from high-velocity flows if the river avulses or overflows due to aufeis and washes out the roadbed. The facility is located in a largely undeveloped floodplain. Existing developments include the Dalton Highway, the Trans-Alaska Pipeline, and supporting infrastructure such as gravel mines. The facility would occupy a very small portion of the overall floodplain. Potential impacts to the floodplain are therefore expected to be very limited but could include a small scale reduction in flood storage capacity and erosion near the facility. Mitigation, if found to be appropriate based on additional data, would likely be focused on protecting the gravel pad for the facility.

Figure 11. Aerial overview of the proposed MLBV 2. The red line is the cross section used to estimate the flood elevation.



The 0.2-percent chance flood elevation was estimated using the techniques described in Attachment A. Figure 12 shows the location of the cross section used in the Manning's equation. Table 5 shows the input variables and results of the equations for estimating the 0.2-percent chance flow and elevation. USGS gage 15908000, Sag River near Pump Station 3, is located upstream of the facility at MP 76 near MP 96 and has a 30-year record of peak flows that was used to calculate flood frequency statistics for the upstream portion of the watershed (Curran et al. 2016). The 0.2-percent chance flow at the station yielded a weighted estimate of 60,300 cfs.

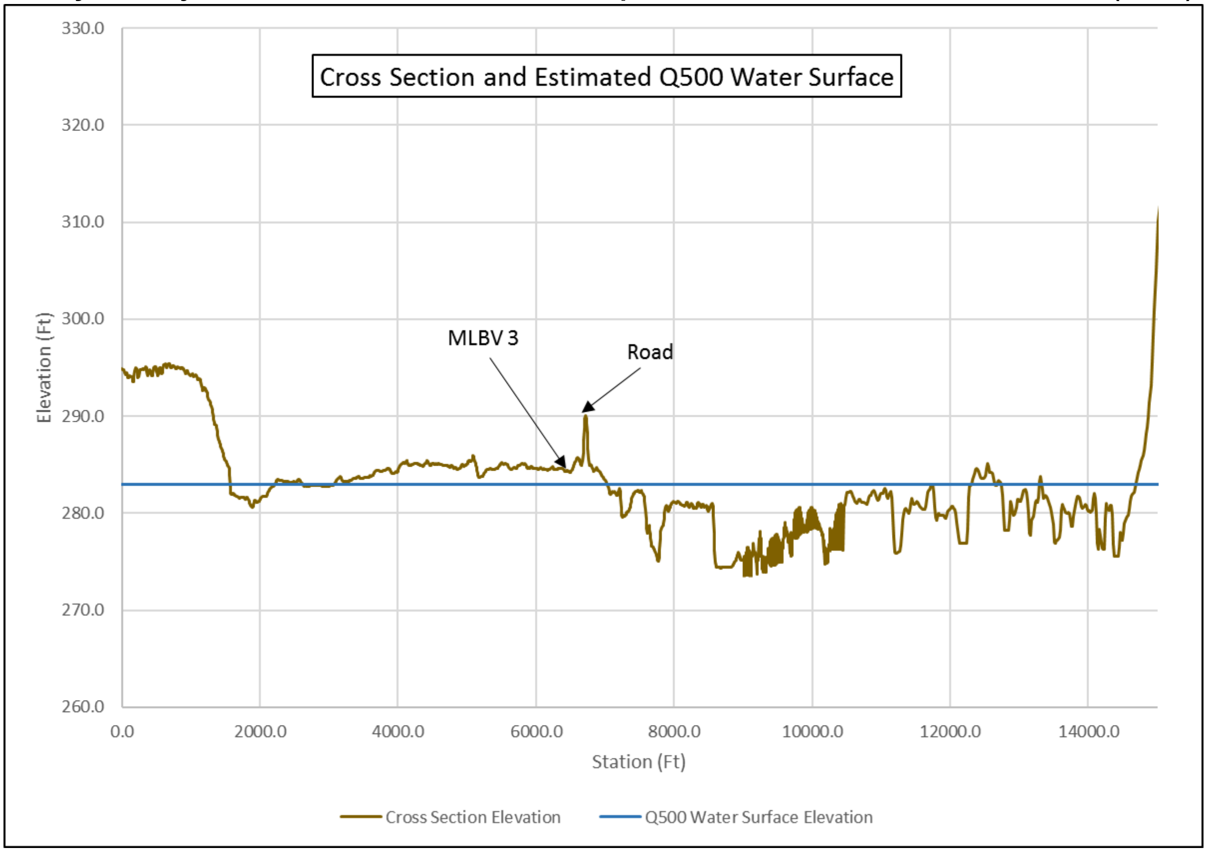
Table 5. Input Variables and Results of the Flood Frequency Analysis and Manning's Equation

Input Variable	Input Value	Result
Flood frequency spreadsheet (Curran et al. 2016)		
Watershed area	2195 square miles	0.2-percent chance exceedance flow: 31,300 cfs calculated output + 60,300 cfs for the upstream gage near MP 96 = 96,700 cfs estimate for MP 37
Mean annual precipitation	14.87 inches	
Manning's Equation		
Q	96,700 cfs	Flood elevation: 3.7-foot average depth 283-foot flood elevation
S (slope)	0.00215	
Channel width	8,345 feet	
Manning's n		
– In channel (75%) gravel/cobble	0.04	
– Bank (10%) shrubs	0.15	
– Overbank (15%) tundra	0.05	
– Weighted average of n	0.053	

The elevation at the proposed MLBV 3 facility is approximately 282 feet on the lower north side based on the Project LiDAR contour elevations. This is slightly lower than the elevation shown on the cross section in Figure 4 (which is about 1,000 feet to the south) and the estimated 0.2-percent chance water surface elevation of 282.9 feet. Note that while the elevation figure appears to be relatively precise, the 95 percent confidence interval of values for the exceedance flow calculation result of 31,300 cfs for the contributing watershed below the gage ranges from 9,640 to 102,000 cfs.

The Manning's equation is an estimate that is also very sensitive to variables such as slope, Manning's n, and channel configuration. The flood elevation therefore represents a best estimate for a flood elevation that could vary by several feet. Also worth noting is that the road may provide some flood protection at the facility depending on how permeable it is to flood waters from the adjacent Sag River, whether the drainage to the west of the road also floods, and whether the road survives an avulsion event of the main channel. Several culverts under the Dalton Highway were noted in the aerial images within a couple miles upstream of MP 37, so floodwaters from the mainstem of the Sag River could flood the side channels on the east side of the road. As described previously, the aufeis ice event that caused extensive North Slope flooding in the spring of 2015 flooded and destroyed several sections of the Dalton Highway between miles 375 and 412 (ACCAP 2015) and could occur at other locations along the Sag River. Impacts range from minor flooding if the adjacent roadbed remains intact to significant erosion from high-velocity flows if the river avulses or overflows due to aufeis and washes out the roadbed.

Figure 12. Cross section near MLBV 2 showing the approximate location of the proposed facility, the adjacent road, and the estimated 0.2-percent chance annual flood elevation (Q500).



6.0 ACRONYMS AND TERMS

Term	Definition
Abbreviations for Units of Measurement	
cfs	cubic feet per second
fps	feet per second
ft	feet
Other Abbreviations	
ACCAP	Alaska Center for Climate Assessment and Policy
DEM	digital elevation model
EO	executive order
FEMA	Federal Emergency Management Agency
GIS	geographic information system
GTP	Gas Treatment Plant
HUC	hydrologic unit code
LiDAR	light detection and ranging
MLBV	Mainline block valve
MP	milepost
NFIP	National Flood Insurance Program
NHD	National Hydrology Dataset
ROW	right-of-way
Sag River	Sagavanirktok River
SFHA	Special Flood Hazard Area
TAPS	Trans-Alaska Pipeline System
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

7.0 REFERENCES

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ATTACHMENT A: METHODS

ESTIMATE FLOOD FLOWS

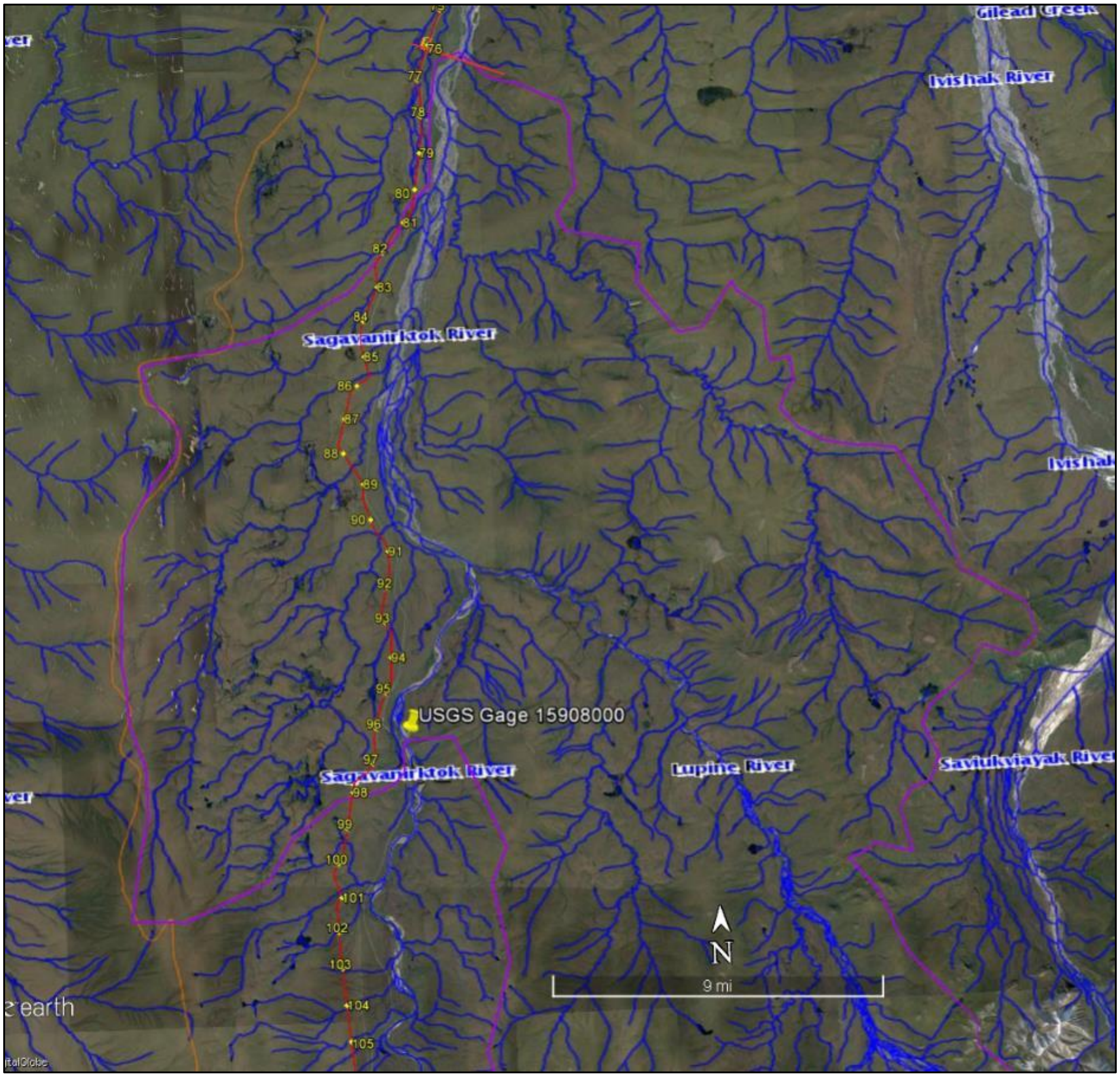
The 0.2-percent chance flood flow and elevation was estimated by first conducting a flood frequency analysis at each site and then using Manning's equation to estimate the flood height. The flood frequency analysis was based on methods described in a recent publication by the USGS in 2016 for Alaska (Curran et al. 2016). The methods for determining flood magnitudes were updated for this publication based on additional regional gage data and analysis of the watershed characteristics that contribute to flood flows. In contrast to earlier publications, the updated method uses only two watershed characteristics to estimate exceedance flows for the entire state of Alaska: watershed area and mean annual precipitation. The paper also describes how to combine the results of the updated regression equation with data from gages up or downstream of the target location. Using available gage data in combination with the regression equation yields more accurate results by incorporating measured flood frequency data from the same watershed. Gage data was used in combination with the regression equation at the MP 37, MP 76, and MP 467 sites.

Watersheds were delineated by hand in Google Earth using aerial imagery with GIS overlays of 1:63,360 USGS topographic maps, a National Hydrography Dataset (NHD) stream layer, and hydrologic unit code (HUC) sub-basin delineations. These data were obtained from the Alaska Bureau of Land Management (BLM) Spatial Data Management System website as a Google Earth KMZ file (BLM 2016). An example delineation for the site at MP 76 is illustrated in Figure A-1. The watershed was delineated between MP 9 where USGS gage 15908000 is located, and MP 76 where the Sagwon Compressor Station is proposed to be located.

Hand delineation was used after attempting to use a GIS-based watershed delineation tool based on DEMs. Appropriate-scale DEMs were either not available for the extent of the larger watersheds or were too large to obtain in a reasonable time frame.

The dataset for precipitation specified in the USGS report is the 1971-2000 PRISM mean annual precipitation data layer, which was obtained from the National Park Service Data Store (Gibson 2009). The mean annual precipitation for each delineated watershed was estimated using GIS.

Figure A-1. Delineation of watershed boundaries that contributes flows between MP 75 and MP 88. The purple line represents the watershed boundary as drawn based on the NHD hydrology layer (blue stream lines), the orange HUC watershed boundaries, and underlying aerial imagery. A USGS topo map overlay was also used, but is not shown in the image.



The watershed area and mean annual precipitation values were entered into the USGS flood-frequency spreadsheet to estimate the exceedance flows. Figures A-2 and A-3 show the spreadsheet output for the watershed delineated between MP 96 and MP 76 using 587.8 square miles for the watershed area and 13.059 inches for the mean annual precipitation.

Figure A-2. USGS Flood-frequency spreadsheet tool (Curran et al 2016). This estimate is for MP 76 with a watershed area of 587.8 square miles and a mean annual precipitation of 13.059 inches entered into the yellow boxes. The results are presented in the orange boxes.

Enter the explanatory variables:

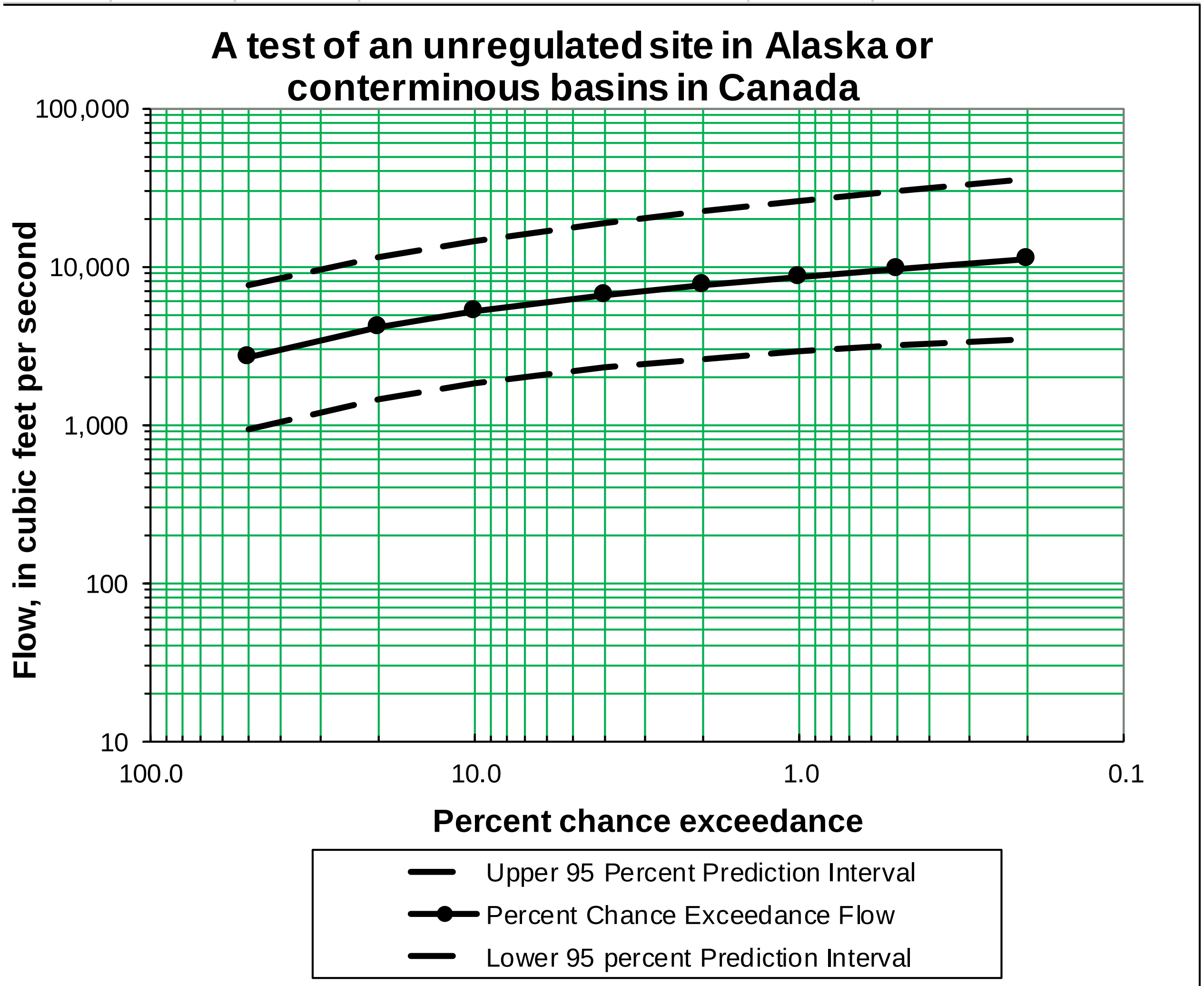
Drainage area, in square miles	DRNAREA	587.8	Equations are valid for DRNAREA between 0.4 and 1,000 mi^2 with PRECPRIS00 between 8 and 280 inches, and for DRNAREA greater than 1,000 and less than 31,100 mi^2 with PRECPRIS00 between 10 and 111 inches.
Mean annual precipitation from 1971-2000 PRISM data, in inches	PRECPRIS00	13.059	

Warnings regarding range of variables: None.

Results:

Percent chance exceedance	Percent chance exceedance flow, in ft^3/s	Lower 95 percent prediction interval flow, in ft^3/s	Upper 95 percent prediction interval flow, in ft^3/s	$-SEP_{P,i}$ (percent)	$+SEP_{P,i}$ (percent)	Average $SEP_{P,i}$ (percent)
50	2,700	943	7,740	-47.2	89.3	70.9
20	4,130	1,470	11,600	-46.5	86.9	69.2
10	5,180	1,850	14,500	-46.5	86.9	69.2
4	6,550	2,280	18,800	-47.2	89.4	70.9
2	7,580	2,590	22,200	-47.9	91.8	72.7
1	8,640	2,890	25,800	-48.5	94.2	74.4
0.5	9,720	3,150	30,000	-49.5	98.1	77.2
0.2	11,200	3,440	36,300	-51.0	104.3	81.6

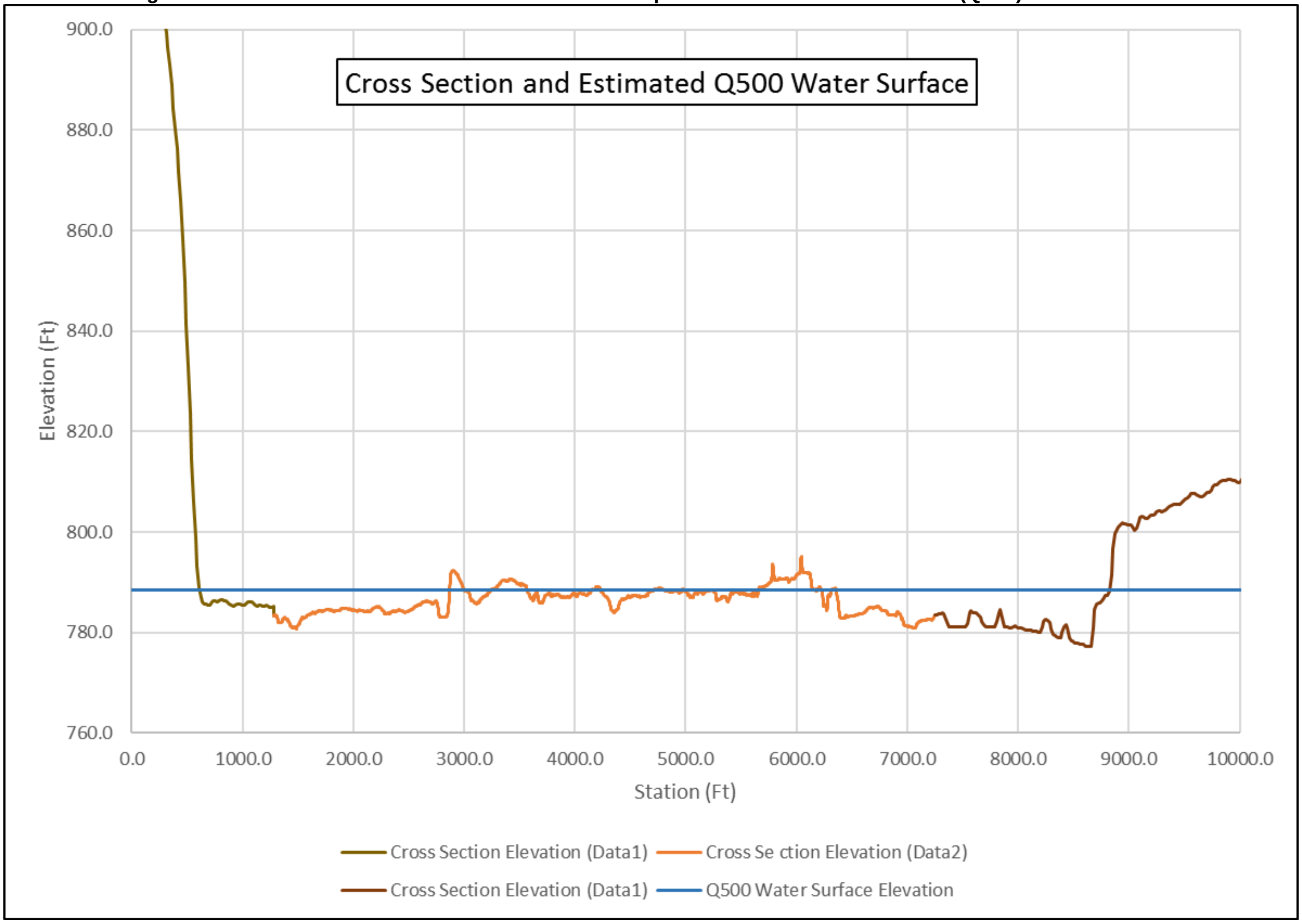
Figure A-3. Spreadsheet output for percent chance exceedance and corresponding flow based on the values for MP 76 used in Figure A-2.



ESTIMATE FLOOD HEIGHT

The height of the 0.2-percent chance exceedance flow was estimated using Manning's equation. The first step was to evaluate each location to determine an appropriate location for a cross section. The cross section was delineated based on aerial imagery in Google Earth and exported to GIS. Elevation data for the cross section was obtained from a combination of sources. Because the cross sections usually extended beyond the "strip" of data available from Project GIS along the ROW, additional elevation data were obtained from the USGS from the IfSAR (USGS 2016a) or the 3DEP 1/3 arc-second DEM (USGS 2016b) datasets. Therefore, each cross section contained data from two different datasets at different resolutions. Although not optimal, it was preferable to use the higher resolution data from Project GIS where it was available. Figure A-4 shows the cross section at MP 76, the two data sets used, and the estimated 0.2-percent chance flood elevation also referred to the 500-year flood or Q500.

Figure A-4. Cross section at MP 76 with estimated 0.2-percent chance flood elevation (Q500).



Manning's equation was used to estimate the depth (d) of the flow at the cross section:

$$V = \frac{1.49}{n} R^{\frac{2}{3}} s^{\frac{1}{2}}$$

Manning's equation, where V= Velocity, n=Manning's roughness coefficient, R=hydraulic radius and s=channel slope

Q=VA

Q (discharge) = Volume * Area

$$Q = \frac{1.49}{n} AR^{\frac{2}{3}} s^{\frac{1}{2}}$$

Substitute Q for V in the equation

$$Q = \frac{1.49}{n} Ad^{\frac{2}{3}} s^{\frac{1}{2}}$$

In wide channels, R may be approximated as d (depth)

$$Q = \frac{1.49}{n} wd^{\frac{5}{3}} s^{\frac{1}{2}}$$

Substitute width * depth for A (area)

$$d = \left(\frac{Qn}{1.49ws^{\frac{1}{2}}}\right)^{\frac{3}{5}}$$

Solve for d (average depth)

Using the site at MP 76 as an example, the cross section elevations were imported into a spreadsheet calculation of Manning's equation, and the cross section plotted (Figure A-4). Manning's roughness values (n) were estimated for in-channel (0.04- gravel/cobbles), bank (0.15- shrubs), and overbank (0.05- tundra) based on Manning's values determined in a published study on the Upper Kuparuk River in the north foothills of the Brooks Range (Kane et al. 2003). The width of the active channel (gravel/cobbles) was measured along the cross section from the aerial image and assigned a percentage of the cross section width along with the estimated length of the cross section consisting of shrubs. The remaining portion was assigned to the overbank tundra category and a weighted average Manning's N was calculated based on the percentage of each roughness value in the cross section. For this example, at MP 76 the ratios were 32 percent, 5 percent, and 63 percent for in-channel, bank, and overbank areas, respectively, yielding a weighted average n of 0.052.

The estimated 0.2-percent chance discharge at MP 76 was estimated by adding the flow from the regression equation in the section above (11,000 cfs) with the weighted discharge from the gage near MP 96 (60,300 cfs, from Curran et al 2016) to yield 71,500 cfs. The slope (s) of 0.0027 ft/ft was obtained from the Project GIS contours or Google Earth for the channel gradient, and a cross-section width of 7013-feet was determined from the spreadsheet. The average 0.2-percent annual flood depth was calculated to be 3.2-feet. To determine floodwater elevations from the average flood depth, the non-uniform cross section depths must be taken into account. Floodwater surface elevations were iterated in the cross-section spreadsheet until the average flood depth shown for the cross section matched the average depth calculation from Manning's equation. The resulting flood elevation is illustrated in Figure A-4.

ATTACHMENT B: USGS FLOOD FREQUENCY SPREADSHEET (CURRAN ET AL. 2016)

Flood-frequency applications tool for use on unregulated streams in Alaska and conterminous basins in (Version 1.0)

About
The file is designed as a tool for computing regional-regression-based flood-frequency estimates and the associated prediction intervals for Alaska and conterminous basins in Canada based on the methods determined in U.S. Geological Survey Scientific Investigations Report 2016-5024, available for download at http://dx.doi.org/10.3133/sir20165024. The equations are based on peak-flow data through water year 2012; that is, ending on September 30, 2012.

Instructions
To make use of the spreadsheet, enter indicated information only within the light yellow shaded cells on the Input_and_results tab. Final results are shaded with light orange background. The worksheet is protected to avoid inadvertent user modification of formulas. If needed, the worksheet may be unprotected without a password from the Review tab.

Notes
The Supplementary_data tab contains the covariance matrix and other pertinent data needed in the flood-frequency estimate and associated prediction interval computations.

Questions about the methods or this spreadsheet should be directed to Janet Curran at jcurran@usgs.gov.

Version History

Version 1.0 spreadsheet completed, reviewed, and released in March 2016.
Version 1.1 released in March 2016. This version includes a minor revision to Warnings regarding range of variables

Flood-frequency applications tool for use on unregulated streams in Alaska and conterminous basins in Canada

This spreadsheet computes the regression estimate of the 50-, 20-, 10-, 4-, 2-, 1-, 0.5-, and 0.2-percent chance exceedance flows for an unregulated stream in Alaska or conterminous basins in Canada. The spreasheet also includes the 95-percent prediction intervals, the minus and plus standard error of prediction intervals, and the average standard error of prediction. To use the spreadsheet, enter requested information in the yellow cells below.

Enter a site-description name:

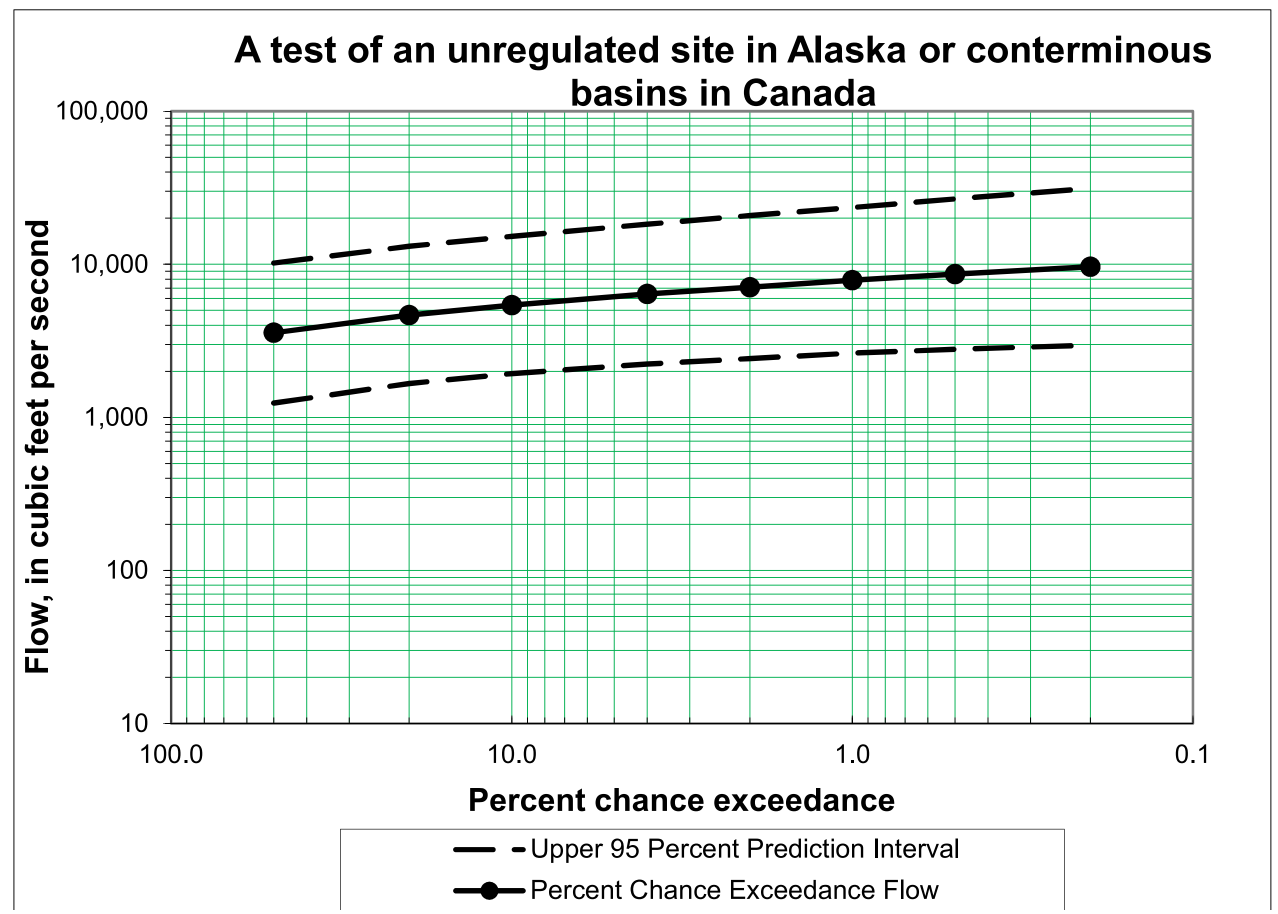
A test of an unregulated site in Alaska or conterminous basins in Canada

Enter the explanatory variables:

Drainage area, in square miles	DRNAREA	35.5	Equations are valid for DRNAREA between 0.4 and 1,000 mi^2 with PRECPRIS00 between 8 and 280 inches, and for DRNAREA greater than 1,000 and less than 31,100 mi^2 with PRECPRIS00 between 10 and 111 inches.
Mean annual precipitation from 1971-2000 PRISM data, in inches	PRECPRIS00	170	
Warnings regarding range of variables:			

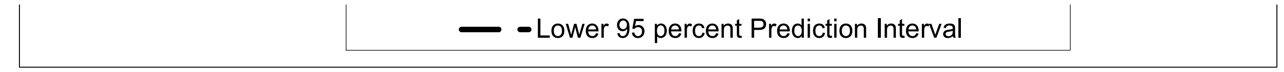
Results:

Percent chance exceedance	Percent chance exceedance flow, in ft^3/s	Lower 95 percent prediction interval flow, in ft^3/s	Upper 95 percent prediction interval flow, in ft^3/s	$-SEP_{P,i}$ (percent)	$+SEP_{P,i}$ (percent)	Average $SEP_{P,i}$ (percent)
50	3,570	1,240	10,200	-47.2	89.4	71.0
20	4,660	1,660	13,100	-46.5	87.0	69.3
10	5,420	1,930	15,200	-46.5	87.0	69.3
4	6,390	2,230	18,300	-47.2	89.5	71.0
2	7,100	2,420	20,800	-47.9	91.9	72.7
1	7,870	2,630	23,500	-48.5	94.3	74.5
0.5	8,620	2,790	26,700	-49.6	98.2	77.3
0.2	9,630	2,960	31,300	-51.1	104.4	81.7



Notes

Differences in rounding of equation parameters can produce minor differences between the results obtained using the regression equations in table 7 and using WREG software. The estimates in this spreadsheet use the regression equations as published in table 7. The regression estimates for streamgages shown in table 4 were computed using WREG during the regression analysis.


Lower 95 percent Prediction Interval

Computations

from table 8 and equation 8

Percent chance exceedance	t (α/2)	Model error (σ^2_δ) (From WREG)	U (Covariance Matrix from WREG)		
50	1.65	0.076	7.26E-03	-7.56E-04	-3.42E-03
			-7.56E-04	2.22E-04	2.12E-04
			-3.42E-03	2.12E-04	1.86E-03
20	1.65	0.073	7.42E-03	-7.70E-04	-3.47E-03
			-7.70E-04	2.20E-04	2.18E-04
			-3.47E-03	2.18E-04	1.88E-03
10	1.65	0.073	7.82E-03	-8.09E-04	-3.64E-03
			-8.09E-04	2.27E-04	2.30E-04
			-3.64E-03	2.30E-04	1.96E-03
4	1.65	0.076	8.64E-03	-8.91E-04	-4.01E-03
			-8.91E-04	2.45E-04	2.55E-04
			-4.01E-03	2.55E-04	2.15E-03
2	1.65	0.079	9.29E-03	-9.56E-04	-4.30E-03
			-9.56E-04	2.60E-04	2.74E-04
			-4.30E-03	2.74E-04	2.30E-03
1	1.65	0.082	9.95E-03	-1.02E-03	-4.60E-03
			-1.02E-03	2.76E-04	2.94E-04
			-4.60E-03	2.94E-04	2.46E-03
0.5	1.65	0.087	1.08E-02	-1.11E-03	-4.98E-03
			-1.11E-03	2.97E-04	3.19E-04
			-4.98E-03	3.19E-04	2.66E-03
0.2	1.65	0.095	1.20E-02	-1.23E-03	-5.54E-03
			-1.23E-03	3.29E-04	3.55E-04
			-5.54E-03	3.55E-04	2.96E-03

User-input data

DRNAREA	35.5
PRECPRIS00	170

Results

Percent chance exceedance	Percent chance exceedance flow, in ft^3/s	Lower 95 percent prediction interval flow, in ft^3/s	Upper 95 percent prediction interval flow, in ft^3/s	-SP,i (percent)	+SP,i (percent)	Average Sp,i (percent)

Matrix computations

xi'	
	1
Log (DRNAREA)	1.550228
Log(PRECPRIS00)	2.230449

Percent chance exceedance	
50	
20	
10	
4	
2	
1	
0.5	
0.2	

Note: when putting in the Excel formula for doing the maxt
Enter. Doing so will fill all 1x8 cells with the results. Otherw

Note: The covariance matrix 〚(X^T Λ^(-1) X)〛^(-1) is abbre

Regression Coefficients from WREG

Q50%

50	3570.361116	1244.743477	10241.04864	-47.2	89.4	71.0
20	4658.216892	1657.852376	13088.61086	-46.5	87.0	69.3
10	5418.881616	1928.322198	15227.88982	-46.5	87.0	69.3
4	6388.25006	2225.429638	18337.91467	-47.2	89.5	71.0
2	7098.585907	2421.989109	20805.18104	-47.9	91.9	72.7
1	7865.656595	2629.034373	23532.80516	-48.5	94.3	74.5
0.5	8621.942739	2788.129145	26662.28597	-49.6	98.2	77.3
0.2	9632.918063	2960.343685	31345.38428	-51.1	104.4	81.7

constant in equation	0.944
DRNAREA exponent in equation	0.836
PRECIP exponent in equation	1.023

Regression Coefficient Attribute	
DRNAREA	Total drain
PRECPRIS00	Mean annu

xi (row vector for the ungaged site, i, containing a one and the basin characteristics enter by the user.)		
	Log (DRNAREA)	Log(PRECPRIS00)
1	1.550228353	2.230448921

(xi' is the matrix transpose of xi.)

xiU (the row vector xi multiplied times the covariance matrix from WREG for the specified recurrence interval)			(xiU)x'i	SEP,i
-0.001547174	6.07161E-05	0.00106601	0.000925	0.277353
-0.001513334	5.72881E-05	0.001061194	0.000942	0.271924
-0.001552969	5.59051E-05	0.001088232	0.000961	0.271958
-0.001685354	5.75704E-05	0.001180773	0.001038	0.277556
-0.001782949	5.82024E-05	0.001254795	0.001106	0.28303
-0.001891298	6.3615E-05	0.001342671	0.001202	0.288448
-0.002028389	6.1931E-05	0.001447517	0.001296	0.297147
-0.002263468	7.18345E-05	0.00161246	0.001444	0.310555

rix algebra mulitplication of XiU, you first highlight all the cells equal to the 1xn matrix, in this case 1x8, type in the formula, hit F2, and then press Ctrl-Shift-
vise, only the cell in which you entered the formula will have a result.

eviated as U in this spreadsheet.

Q20%	Q10%	Q4%	Q2%	Q1%	Q0.5%	Q0.2%

2.47	4.01	6.53	8.79	11.4	14.3	18.7
0.795	0.775	0.755	0.743	0.732	0.723	0.712
0.916	0.865	0.816	0.787	0.764	0.744	0.721

Description
age area, in square miles
ual basin precipitation, in inches

Documentation

A 100 (1-α) prediction interval for the true value of a streamflow statistic for an ungaged location from the regression equations can be computed by (Tasker and Driver, 1988): Q/C < Q < CQ ,

where, Q is the percent chance exceedance flow for the ungaged site.

C is computed as: $C = 10^{t(\alpha/2)SEPp,i}$,

where, $t_{(\alpha/2,\ n\text{-}p)}$ is the critical value from the Student's t-distribution at a particular alpha-level (α) and degrees of freedom (n-p) and is equal to 1.65 for the 341 streamgages and 3 regression parameter in the equations for Alaska and conterminous basins in Canada for a prediction interval of 95 percent (α=0.05) .

$SEP_{p,i}$ is the standard error of prediction and is computed from $SEP_{p,i} = [\sigma^2_\delta + x_i U x_i']^{0.5}$,

where σ^2_δ is the model error variance; x_i is a row vector of the logarithms of the explanatory variables for site i, augmented by a 1 as the first element; U is the covariance matrix for the regression coefficients; and x_i' is the transpose of x_i (Ludwig and Tasker, 1993).

To convert the $SEP_{p,i}$ to minus and plus percent, use the following equations:

$-SEP_{p,i}$ (percent) = $100*((10^{-Sp,i})-1)$

$+SEP_{p,i}$ (percent) = $100*((10^{Sp,i})-1)$

The average $SEP_{p,i}$ (percent) is computed using the following equaiton:
$SEP_{p,i}$ $(\text{percent})_{ave}$ = $100*(10^{ln(10)*SEPp,i\text{^}2}-1)^{0.5}$

References

Ludwig, A.H., and Tasker, G.D., 1993, Regionalization of low-flow characteristics of Arkansas streams: U.S. Geological Survey Water-Resources Investigations Report 93-4013, 19 p.

Ott, Lyman, 1988, An introduction to statistical methods and data analysis, third edition: Boston, MA, PWS-Kent Publishing Company, 945 p.

Ott, R.L., and Longnecker, M.T., 2004, A first course in statistical methods: Belmont, CA, Brooks/Cole - Thomas Learning, 741 p.

Tasker, G.D., and Driver, N.E., 1988, Nationwide regression models for predicting urban runoff water quality at unmonitored sites: Water Resources Bulletin, v. 24, no. 5, p. 1091-1101.

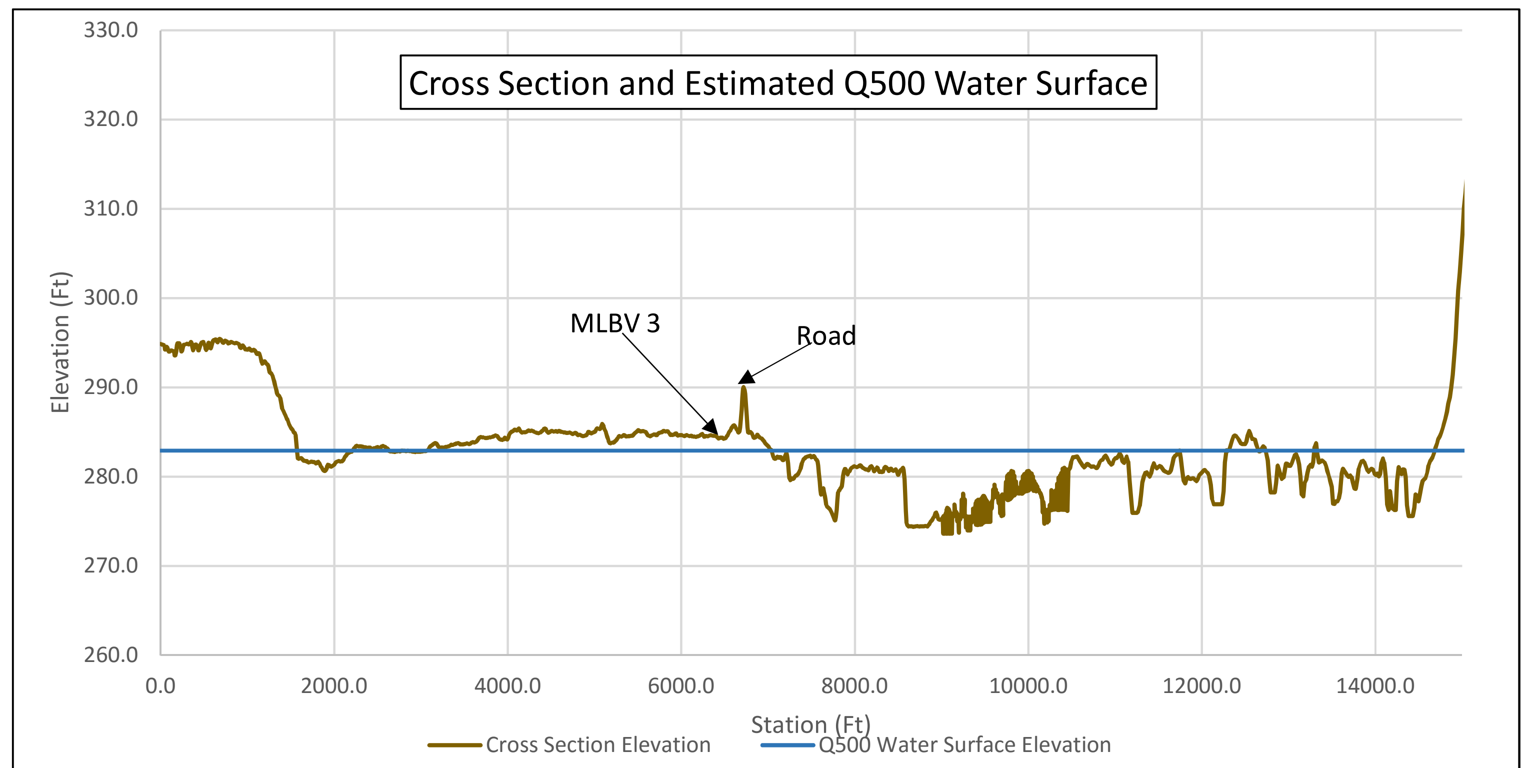
ATTACHMENT C: MANNING'S EQUATION SPREADSHEET EXAMPLE

Site Name MP 37

Station (m)	Station (ft)	Width (ft)	Z (m)	Z (ft)	D	VOL	Wet width	Bathy ADJ	Z ADJ	D ADJ	VOL ADJ
0.000	0.0	#VALUE!	89.872	294.9					294.9		
2.589	8.5	8.5	89.858	294.8					294.8		
5.178	17.0	8.5	89.851	294.8					294.8		
7.767	25.5	8.5	89.852	294.8					294.8		
10.357	34.0	8.5	89.841	294.8					294.8		
12.946	42.5	8.5	89.774	294.5					294.5		
15.535	51.0	8.5	89.681	294.2					294.2		
18.124	59.5	8.5	89.698	294.3					294.3		
20.713	68.0	8.5	89.774	294.5					294.5		
23.302	76.5	8.5	89.754	294.5					294.5		
25.891	84.9	8.5	89.669	294.2					294.2		
28.480	93.4	8.5	89.610	294.0					294.0		
31.070	101.9	8.5	89.610	294.0					294.0		
33.659	110.4	8.5	89.641	294.1					294.1		
36.248	118.9	8.5	89.652	294.1					294.1		
38.837	127.4	8.5	89.648	294.1					294.1		
41.426	135.9	8.5	89.647	294.1					294.1		
44.015	144.4	8.5	89.636	294.1					294.1		
46.604	152.9	8.5	89.572	293.9					293.9		
49.193	161.4	8.5	89.486	293.6					293.6		
51.783	169.9	8.5	89.481	293.6					293.6		
54.372	178.4	8.5	89.623	294.0					294.0		
56.961	186.9	8.5	89.818	294.7					294.7		
59.550	195.4	8.5	89.902	295.0					295.0		
62.139	203.9	8.5	89.902	295.0					295.0		
64.728	212.4	8.5	89.898	294.9					294.9		
67.317	220.9	8.5	89.866	294.8					294.8		
69.907	229.4	8.5	89.752	294.5					294.5		
72.496	237.8	8.5	89.615	294.0					294.0		
75.085	246.3	8.5	89.638	294.1					294.1		
77.674	254.8	8.5	89.775	294.5					294.5		
80.263	263.3	8.5	89.840	294.7					294.7		
82.852	271.8	8.5	89.847	294.8					294.8		
85.441	280.3	8.5	89.850	294.8					294.8		
88.030	288.8	8.5	89.859	294.8					294.8		
90.620	297.3	8.5	89.878	294.9					294.9		
93.209	305.8	8.5	89.890	294.9					294.9		
95.798	314.3	8.5	89.875	294.9					294.9		
98.387	322.8	8.5	89.859	294.8					294.8		
100.976	331.3	8.5	89.875	294.9					294.9		
103.565	339.8	8.5	89.913	295.0					295.0		
106.154	348.3	8.5	89.942	295.1					295.1		
108.743	356.8	8.5	89.912	295.0					295.0		

IGNORE THIS COLUMN	WS Elev
Total Vol (ft3)	Total Vol (ft3)
0	26884
Channel Width from this Tab	
8262	
Calculated Avg D from Mannings	
3.6	
Avg D (ft)	Avg D (ft)
	3.6
Flood Elev	**Flood Elev**
	282.9

Instructions:
- Copy and Paste from GIS: "ET_Station" and "Z"
- Edit Column H to account for estimated bathymetry (optional)
- Complete the "Mannings Eqn" Tab
- Adjust the Flood Elev cells until the Avg D matches the Calculated Avg D from Mannings (from the Mannings Eqn tab)
- Confirm the sum of the "In-chan" and "Overbank" measurements used for the Mannings n calculation on the Mannings Eqn sheet match the total channel width -- It may take several iterations of adjusting the "Flood Elev" on this sheet and the "In-chan" and "Overbank" values on the Mannings Eqn sheet.



111.333	365.3	8.5	89.781	294.6		294.6
113.922	373.8	8.5	89.662	294.2		294.2
116.511	382.3	8.5	89.709	294.3		294.3
119.100	390.7	8.5	89.818	294.7		294.7
121.689	399.2	8.5	89.859	294.8		294.8
124.278	407.7	8.5	89.858	294.8		294.8
126.867	416.2	8.5	89.815	294.7		294.7
129.456	424.7	8.5	89.732	294.4		294.4
132.046	433.2	8.5	89.653	294.1		294.1
134.635	441.7	8.5	89.656	294.1		294.1
137.224	450.2	8.5	89.759	294.5		294.5
139.813	458.7	8.5	89.865	294.8		294.8
142.402	467.2	8.5	89.912	295.0		295.0
144.991	475.7	8.5	89.932	295.1		295.1
147.580	484.2	8.5	89.946	295.1		295.1
150.169	492.7	8.5	89.938	295.1		295.1
152.759	501.2	8.5	89.873	294.9		294.9
155.348	509.7	8.5	89.775	294.5		294.5
157.937	518.2	8.5	89.698	294.3		294.3
160.526	526.7	8.5	89.668	294.2		294.2
163.115	535.2	8.5	89.713	294.3		294.3
165.704	543.6	8.5	89.821	294.7		294.7
168.293	552.1	8.5	89.914	295.0		295.0
170.882	560.6	8.5	89.910	295.0		295.0
173.472	569.1	8.5	89.809	294.6		294.6
176.061	577.6	8.5	89.727	294.4		294.4
178.650	586.1	8.5	89.762	294.5		294.5
181.239	594.6	8.5	89.882	294.9		294.9
183.828	603.1	8.5	89.983	295.2		295.2
186.417	611.6	8.5	90.002	295.3		295.3
189.006	620.1	8.5	90.007	295.3		295.3
191.595	628.6	8.5	90.027	295.4		295.4
194.185	637.1	8.5	90.029	295.4		295.4
196.774	645.6	8.5	89.979	295.2		295.2
199.363	654.1	8.5	89.930	295.0		295.0
201.952	662.6	8.5	89.964	295.2		295.2
204.541	671.1	8.5	90.025	295.4		295.4
207.130	679.6	8.5	90.049	295.4		295.4
209.719	688.1	8.5	90.044	295.4		295.4
212.308	696.6	8.5	90.014	295.3		295.3
214.898	705.0	8.5	89.965	295.2		295.2
217.487	713.5	8.5	89.916	295.0		295.0
220.076	722.0	8.5	89.905	295.0		295.0
222.665	730.5	8.5	89.943	295.1		295.1
225.254	739.0	8.5	89.981	295.2		295.2
227.843	747.5	8.5	89.988	295.2		295.2
230.432	756.0	8.5	89.977	295.2		295.2

	Chart WS Elev	
	Sta	Elev
Adjusted	0	0
	20000	0
Not Adj	0	282.9
	20000	282.9

233.021	764.5	8.5	89.947	295.1		295.1
235.611	773.0	8.5	89.908	295.0		295.0
238.200	781.5	8.5	89.885	294.9		294.9
240.789	790.0	8.5	89.895	294.9		294.9
243.378	798.5	8.5	89.926	295.0		295.0
245.967	807.0	8.5	89.941	295.1		295.1
248.556	815.5	8.5	89.936	295.1		295.1
251.145	824.0	8.5	89.929	295.0		295.0
253.734	832.5	8.5	89.917	295.0		295.0
256.324	841.0	8.5	89.906	295.0		295.0
258.913	849.5	8.5	89.899	294.9		294.9
261.502	857.9	8.5	89.901	295.0		295.0
264.091	866.4	8.5	89.907	295.0		295.0
266.680	874.9	8.5	89.907	295.0		295.0
269.269	883.4	8.5	89.897	294.9		294.9
271.858	891.9	8.5	89.885	294.9		294.9
274.447	900.4	8.5	89.868	294.8		294.8
277.037	908.9	8.5	89.816	294.7		294.7
279.626	917.4	8.5	89.742	294.4		294.4
282.215	925.9	8.5	89.735	294.4		294.4
284.804	934.4	8.5	89.793	294.6		294.6
287.393	942.9	8.5	89.826	294.7		294.7
289.982	951.4	8.5	89.820	294.7		294.7
292.571	959.9	8.5	89.782	294.6		294.6
295.160	968.4	8.5	89.722	294.4		294.4
297.750	976.9	8.5	89.685	294.2		294.2
300.339	985.4	8.5	89.685	294.2		294.2
302.928	993.9	8.5	89.676	294.2		294.2
305.517	1002.4	8.5	89.675	294.2		294.2
308.106	1010.8	8.5	89.706	294.3		294.3
310.695	1019.3	8.5	89.722	294.4		294.4
313.284	1027.8	8.5	89.700	294.3		294.3
315.873	1036.3	8.5	89.663	294.2		294.2
318.462	1044.8	8.5	89.641	294.1		294.1
321.052	1053.3	8.5	89.650	294.1		294.1
323.641	1061.8	8.5	89.670	294.2		294.2
326.230	1070.3	8.5	89.681	294.2		294.2
328.819	1078.8	8.5	89.670	294.2		294.2
331.408	1087.3	8.5	89.642	294.1		294.1
333.997	1095.8	8.5	89.591	293.9		293.9
336.586	1104.3	8.5	89.534	293.7		293.7
339.175	1112.8	8.5	89.530	293.7		293.7
341.765	1121.3	8.5	89.563	293.8		293.8
344.354	1129.8	8.5	89.561	293.8		293.8
346.943	1138.3	8.5	89.532	293.7		293.7
349.532	1146.8	8.5	89.472	293.5		293.5
352.121	1155.3	8.5	89.363	293.2		293.2

354.710	1163.7	8.5	89.252	292.8		292.8
357.299	1172.2	8.5	89.202	292.7		292.7
359.888	1180.7	8.5	89.227	292.7		292.7
362.478	1189.2	8.5	89.279	292.9		292.9
365.067	1197.7	8.5	89.285	292.9		292.9
367.656	1206.2	8.5	89.251	292.8		292.8
370.245	1214.7	8.5	89.210	292.7		292.7
372.834	1223.2	8.5	89.190	292.6		292.6
375.423	1231.7	8.5	89.175	292.6		292.6
378.012	1240.2	8.5	89.118	292.4		292.4
380.601	1248.7	8.5	88.999	292.0		292.0
383.190	1257.2	8.5	88.903	291.7		291.7
385.780	1265.7	8.5	88.883	291.6		291.6
388.369	1274.2	8.5	88.866	291.6		291.6
390.958	1282.7	8.5	88.823	291.4		291.4
393.547	1291.2	8.5	88.761	291.2		291.2
396.136	1299.7	8.5	88.689	291.0		291.0
398.725	1308.2	8.5	88.602	290.7		290.7
401.314	1316.6	8.5	88.497	290.3		290.3
403.903	1325.1	8.5	88.394	290.0		290.0
406.493	1333.6	8.5	88.293	289.7		289.7
409.082	1342.1	8.5	88.187	289.3		289.3
411.671	1350.6	8.5	88.124	289.1		289.1
414.260	1359.1	8.5	88.116	289.1		289.1
416.849	1367.6	8.5	88.097	289.0		289.0
419.438	1376.1	8.5	88.030	288.8		288.8
422.027	1384.6	8.5	87.918	288.4		288.4
424.616	1393.1	8.5	87.785	288.0		288.0
427.205	1401.6	8.5	87.673	287.6		287.6
429.795	1410.1	8.5	87.605	287.4		287.4
432.384	1418.6	8.5	87.556	287.3		287.3
434.973	1427.1	8.5	87.500	287.1		287.1
437.562	1435.6	8.5	87.440	286.9		286.9
440.151	1444.1	8.5	87.381	286.7		286.7
442.740	1452.6	8.5	87.325	286.5		286.5
445.329	1461.1	8.5	87.272	286.3		286.3
447.918	1469.5	8.5	87.212	286.1		286.1
450.507	1478.0	8.5	87.140	285.9		285.9
453.097	1486.5	8.5	87.075	285.7		285.7
455.686	1495.0	8.5	87.029	285.5		285.5
458.275	1503.5	8.5	86.999	285.4		285.4
460.864	1512.0	8.5	86.973	285.3		285.3
463.453	1520.5	8.5	86.935	285.2		285.2
466.042	1529.0	8.5	86.886	285.1		285.1
468.631	1537.5	8.5	86.849	284.9		284.9
471.220	1546.0	8.5	86.829	284.9		284.9
473.810	1554.5	8.5	86.758	284.6		284.6

476.399	1563.0	8.5	86.521	283.9					283.9
478.988	1571.5	8.5	86.165	282.7	0.2	1.7	8.5		282.7
481.577	1580.0	8.5	85.966	282.0	0.9	7.3	8.5		282.0
484.166	1588.5	8.5	85.951	282.0	0.9	7.7	8.5		282.0
486.755	1597.0	8.5	85.948	282.0	0.9	7.8	8.5		282.0
489.344	1605.5	8.5	85.961	282.0	0.9	7.4	8.5		282.0
491.933	1614.0	8.5	85.976	282.1	0.8	7.0	8.5		282.1
494.522	1622.4	8.5	85.973	282.1	0.8	7.1	8.5		282.1
497.112	1630.9	8.5	85.944	282.0	0.9	7.9	8.5		282.0
499.701	1639.4	8.5	85.907	281.8	1.1	8.9	8.5		281.8
502.290	1647.9	8.5	85.890	281.8	1.1	9.4	8.5		281.8
504.879	1656.4	8.5	85.884	281.8	1.1	9.6	8.5		281.8
507.468	1664.9	8.5	85.877	281.7	1.2	9.8	8.5		281.7
510.057	1673.4	8.5	85.878	281.8	1.1	9.8	8.5		281.8
512.646	1681.9	8.5	85.872	281.7	1.2	9.9	8.5		281.7
515.235	1690.4	8.5	85.848	281.7	1.2	10.6	8.5		281.7
517.824	1698.9	8.5	85.828	281.6	1.3	11.1	8.5		281.6
520.414	1707.4	8.5	85.825	281.6	1.3	11.2	8.5		281.6
523.003	1715.9	8.5	85.830	281.6	1.3	11.1	8.5		281.6
525.592	1724.4	8.5	85.843	281.6	1.3	10.7	8.5		281.6
528.181	1732.9	8.5	85.855	281.7	1.2	10.4	8.5		281.7
530.770	1741.4	8.5	85.850	281.7	1.2	10.5	8.5		281.7
533.359	1749.9	8.5	85.840	281.6	1.3	10.8	8.5		281.6
535.948	1758.4	8.5	85.840	281.6	1.3	10.8	8.5		281.6
538.537	1766.9	8.5	85.839	281.6	1.3	10.8	8.5		281.6
541.126	1775.3	8.5	85.828	281.6	1.3	11.2	8.5		281.6
543.716	1783.8	8.5	85.806	281.5	1.4	11.8	8.5		281.5
546.305	1792.3	8.5	85.790	281.5	1.4	12.2	8.5		281.5
548.894	1800.8	8.5	85.803	281.5	1.4	11.9	8.5		281.5
551.483	1809.3	8.5	85.839	281.6	1.3	10.8	8.5		281.6
554.072	1817.8	8.5	85.850	281.7	1.2	10.5	8.5		281.7
556.661	1826.3	8.5	85.815	281.5	1.4	11.5	8.5		281.5
559.250	1834.8	8.5	85.768	281.4	1.5	12.8	8.5		281.4
561.839	1843.3	8.5	85.715	281.2	1.7	14.3	8.5		281.2
564.428	1851.8	8.5	85.664	281.0	1.9	15.7	8.5		281.0
567.018	1860.3	8.5	85.624	280.9	2.0	16.8	8.5		280.9
569.607	1868.8	8.5	85.590	280.8	2.1	17.8	8.5		280.8
572.196	1877.3	8.5	85.557	280.7	2.2	18.7	8.5		280.7
574.785	1885.8	8.5	85.540	280.6	2.3	19.2	8.5		280.6
577.374	1894.3	8.5	85.540	280.6	2.3	19.2	8.5		280.6
579.963	1902.8	8.5	85.554	280.7	2.2	18.8	8.5		280.7
582.552	1911.3	8.5	85.616	280.9	2.0	17.1	8.5		280.9
585.141	1919.8	8.5	85.707	281.2	1.7	14.5	8.5		281.2
587.730	1928.2	8.5	85.751	281.3	1.6	13.3	8.5		281.3
590.320	1936.7	8.5	85.741	281.3	1.6	13.6	8.5		281.3
592.909	1945.2	8.5	85.709	281.2	1.7	14.5	8.5		281.2
595.498	1953.7	8.5	85.687	281.1	1.8	15.1	8.5		281.1

598.087	1962.2	8.5	85.684	281.1	1.8	15.2	8.5	281.1
600.676	1970.7	8.5	85.689	281.1	1.8	15.0	8.5	281.1
603.265	1979.2	8.5	85.707	281.2	1.7	14.5	8.5	281.2
605.854	1987.7	8.5	85.726	281.3	1.6	14.0	8.5	281.3
608.443	1996.2	8.5	85.740	281.3	1.6	13.6	8.5	281.3
611.032	2004.7	8.5	85.767	281.4	1.5	12.8	8.5	281.4
613.622	2013.2	8.5	85.809	281.5	1.4	11.7	8.5	281.5
616.211	2021.7	8.5	85.842	281.6	1.3	10.7	8.5	281.6
618.800	2030.2	8.5	85.858	281.7	1.2	10.3	8.5	281.7
621.389	2038.7	8.5	85.863	281.7	1.2	10.2	8.5	281.7
623.978	2047.2	8.5	85.870	281.7	1.2	10.0	8.5	281.7
626.567	2055.7	8.5	85.873	281.7	1.2	9.9	8.5	281.7
629.156	2064.2	8.5	85.863	281.7	1.2	10.2	8.5	281.7
631.745	2072.7	8.5	85.857	281.7	1.2	10.3	8.5	281.7
634.334	2081.1	8.5	85.862	281.7	1.2	10.2	8.5	281.7
636.924	2089.6	8.5	85.869	281.7	1.2	10.0	8.5	281.7
639.513	2098.1	8.5	85.888	281.8	1.1	9.5	8.5	281.8
642.102	2106.6	8.5	85.923	281.9	1.0	8.5	8.5	281.9
644.691	2115.1	8.5	85.971	282.1	0.8	7.2	8.5	282.1
647.280	2123.6	8.5	86.015	282.2	0.7	5.9	8.5	282.2
649.869	2132.1	8.5	86.050	282.3	0.6	5.0	8.5	282.3
652.458	2140.6	8.5	86.087	282.4	0.5	3.9	8.5	282.4
655.047	2149.1	8.5	86.118	282.5	0.4	3.1	8.5	282.5
657.636	2157.6	8.5	86.134	282.6	0.3	2.6	8.5	282.6
660.226	2166.1	8.5	86.151	282.6	0.3	2.1	8.5	282.6
662.815	2174.6	8.5	86.171	282.7	0.2	1.6	8.5	282.7
665.404	2183.1	8.5	86.187	282.8	0.1	1.1	8.5	282.8
667.993	2191.6	8.5	86.192	282.8	0.1	1.0	8.5	282.8
670.582	2200.1	8.5	86.198	282.8	0.1	0.8	8.5	282.8
673.171	2208.6	8.5	86.225	282.9	0.0	0.1	8.5	282.9
675.760	2217.1	8.5	86.260	283.0				283.0
678.349	2225.6	8.5	86.292	283.1				283.1
680.938	2234.0	8.5	86.326	283.2				283.2
683.527	2242.5	8.5	86.361	283.3				283.3
686.117	2251.0	8.5	86.388	283.4				283.4
688.706	2259.5	8.5	86.399	283.5				283.5
691.295	2268.0	8.5	86.393	283.4				283.4
693.884	2276.5	8.5	86.383	283.4				283.4
696.473	2285.0	8.5	86.377	283.4				283.4
699.062	2293.5	8.5	86.378	283.4				283.4
701.651	2302.0	8.5	86.378	283.4				283.4
704.240	2310.5	8.5	86.375	283.4				283.4
706.829	2319.0	8.5	86.368	283.4				283.4
709.419	2327.5	8.5	86.363	283.3				283.3
712.008	2336.0	8.5	86.357	283.3				283.3
714.597	2344.5	8.5	86.347	283.3				283.3
717.186	2353.0	8.5	86.343	283.3				283.3

719.775	2361.5	8.5	86.342	283.3					283.3
722.364	2370.0	8.5	86.337	283.3					283.3
724.953	2378.5	8.5	86.330	283.2					283.2
727.542	2386.9	8.5	86.328	283.2					283.2
730.131	2395.4	8.5	86.332	283.2					283.2
732.720	2403.9	8.5	86.338	283.3					283.3
735.310	2412.4	8.5	86.334	283.2					283.2
737.899	2420.9	8.5	86.310	283.2					283.2
740.488	2429.4	8.5	86.283	283.1					283.1
743.077	2437.9	8.5	86.279	283.1					283.1
745.666	2446.4	8.5	86.297	283.1					283.1
748.255	2454.9	8.5	86.317	283.2					283.2
750.844	2463.4	8.5	86.316	283.2					283.2
753.433	2471.9	8.5	86.313	283.2					283.2
756.022	2480.4	8.5	86.326	283.2					283.2
758.612	2488.9	8.5	86.348	283.3					283.3
761.201	2497.4	8.5	86.353	283.3					283.3
763.790	2505.9	8.5	86.330	283.2					283.2
766.379	2514.4	8.5	86.309	283.2					283.2
768.968	2522.9	8.5	86.304	283.2					283.2
771.557	2531.4	8.5	86.320	283.2					283.2
774.146	2539.8	8.5	86.351	283.3					283.3
776.735	2548.3	8.5	86.382	283.4					283.4
779.324	2556.8	8.5	86.394	283.4					283.4
781.913	2565.3	8.5	86.393	283.4					283.4
784.503	2573.8	8.5	86.383	283.4					283.4
787.092	2582.3	8.5	86.368	283.4					283.4
789.681	2590.8	8.5	86.346	283.3					283.3
792.270	2599.3	8.5	86.326	283.2					283.2
794.859	2607.8	8.5	86.314	283.2					283.2
797.448	2616.3	8.5	86.293	283.1					283.1
800.037	2624.8	8.5	86.254	283.0					283.0
802.626	2633.3	8.5	86.218	282.9	0.0	0.3	8.5		282.9
805.215	2641.8	8.5	86.200	282.8	0.1	0.8	8.5		282.8
807.804	2650.3	8.5	86.204	282.8	0.1	0.7	8.5		282.8
810.394	2658.8	8.5	86.208	282.8	0.1	0.5	8.5		282.8
812.983	2667.3	8.5	86.205	282.8	0.1	0.7	8.5		282.8
815.572	2675.8	8.5	86.197	282.8	0.1	0.9	8.5		282.8
818.161	2684.3	8.5	86.190	282.8	0.1	1.1	8.5		282.8
820.750	2692.7	8.5	86.187	282.8	0.1	1.1	8.5		282.8
823.339	2701.2	8.5	86.189	282.8	0.1	1.1	8.5		282.8
825.928	2709.7	8.5	86.193	282.8	0.1	1.0	8.5		282.8
828.517	2718.2	8.5	86.198	282.8	0.1	0.8	8.5		282.8
831.106	2726.7	8.5	86.207	282.8	0.1	0.6	8.5		282.8
833.695	2735.2	8.5	86.214	282.9	0.0	0.4	8.5		282.9
836.285	2743.7	8.5	86.212	282.8	0.1	0.4	8.5		282.8
838.874	2752.2	8.5	86.207	282.8	0.1	0.6	8.5		282.8

841.463	2760.7	8.5	86.209	282.8	0.1	0.5	8.5	282.8
844.052	2769.2	8.5	86.223	282.9	0.0	0.1	8.5	282.9
846.641	2777.7	8.5	86.232	282.9				282.9
849.230	2786.2	8.5	86.226	282.9	0.0	0.1	8.5	282.9
851.819	2794.7	8.5	86.221	282.9	0.0	0.2	8.5	282.9
854.408	2803.2	8.5	86.220	282.9	0.0	0.2	8.5	282.9
856.997	2811.7	8.5	86.222	282.9	0.0	0.2	8.5	282.9
859.586	2820.2	8.5	86.218	282.9	0.0	0.3	8.5	282.9
862.176	2828.7	8.5	86.215	282.9	0.0	0.4	8.5	282.9
864.765	2837.2	8.5	86.219	282.9	0.0	0.2	8.5	282.9
867.354	2845.6	8.5	86.224	282.9	0.0	0.1	8.5	282.9
869.943	2854.1	8.5	86.223	282.9	0.0	0.2	8.5	282.9
872.532	2862.6	8.5	86.217	282.9	0.0	0.3	8.5	282.9
875.121	2871.1	8.5	86.212	282.8	0.1	0.4	8.5	282.8
877.710	2879.6	8.5	86.211	282.8	0.1	0.5	8.5	282.8
880.299	2888.1	8.5	86.209	282.8	0.1	0.5	8.5	282.8
882.888	2896.6	8.5	86.204	282.8	0.1	0.7	8.5	282.8
885.477	2905.1	8.5	86.196	282.8	0.1	0.9	8.5	282.8
888.067	2913.6	8.5	86.192	282.8	0.1	1.0	8.5	282.8
890.656	2922.1	8.5	86.189	282.8	0.1	1.1	8.5	282.8
893.245	2930.6	8.5	86.186	282.8	0.1	1.2	8.5	282.8
895.834	2939.1	8.5	86.185	282.8	0.1	1.2	8.5	282.8
898.423	2947.6	8.5	86.189	282.8	0.1	1.1	8.5	282.8
901.012	2956.1	8.5	86.194	282.8	0.1	1.0	8.5	282.8
903.601	2964.6	8.5	86.194	282.8	0.1	0.9	8.5	282.8
906.190	2973.1	8.5	86.191	282.8	0.1	1.0	8.5	282.8
908.779	2981.6	8.5	86.189	282.8	0.1	1.1	8.5	282.8
911.368	2990.1	8.5	86.192	282.8	0.1	1.0	8.5	282.8
913.958	2998.5	8.5	86.198	282.8	0.1	0.8	8.5	282.8
916.547	3007.0	8.5	86.200	282.8	0.1	0.8	8.5	282.8
919.136	3015.5	8.5	86.203	282.8	0.1	0.7	8.5	282.8
921.725	3024.0	8.5	86.209	282.8	0.1	0.5	8.5	282.8
924.314	3032.5	8.5	86.214	282.9	0.0	0.4	8.5	282.9
926.903	3041.0	8.5	86.217	282.9	0.0	0.3	8.5	282.9
929.492	3049.5	8.5	86.217	282.9	0.0	0.3	8.5	282.9
932.081	3058.0	8.5	86.219	282.9	0.0	0.2	8.5	282.9
934.670	3066.5	8.5	86.224	282.9	0.0	0.1	8.5	282.9
937.259	3075.0	8.5	86.235	282.9				282.9
939.849	3083.5	8.5	86.264	283.0				283.0
942.438	3092.0	8.5	86.311	283.2				283.2
945.027	3100.5	8.5	86.352	283.3				283.3
947.616	3109.0	8.5	86.379	283.4				283.4
950.205	3117.5	8.5	86.395	283.4				283.4
952.794	3126.0	8.5	86.416	283.5				283.5
955.383	3134.5	8.5	86.438	283.6				283.6
957.972	3143.0	8.5	86.457	283.7				283.7
960.561	3151.4	8.5	86.477	283.7				283.7

963.150	3159.9	8.5	86.483	283.7		283.7
965.740	3168.4	8.5	86.484	283.7		283.7
968.329	3176.9	8.5	86.481	283.7		283.7
970.918	3185.4	8.5	86.443	283.6		283.6
973.507	3193.9	8.5	86.385	283.4		283.4
976.096	3202.4	8.5	86.357	283.3		283.3
978.685	3210.9	8.5	86.342	283.3		283.3
981.274	3219.4	8.5	86.332	283.2		283.2
983.863	3227.9	8.5	86.331	283.2		283.2
986.452	3236.4	8.5	86.337	283.3		283.3
989.041	3244.9	8.5	86.341	283.3		283.3
991.630	3253.4	8.5	86.338	283.3		283.3
994.220	3261.9	8.5	86.336	283.3		283.3
996.809	3270.4	8.5	86.345	283.3		283.3
999.398	3278.9	8.5	86.354	283.3		283.3
1001.987	3287.4	8.5	86.358	283.3		283.3
1004.576	3295.9	8.5	86.360	283.3		283.3
1007.165	3304.3	8.5	86.371	283.4		283.4
1009.754	3312.8	8.5	86.383	283.4		283.4
1012.343	3321.3	8.5	86.381	283.4		283.4
1014.932	3329.8	8.5	86.384	283.4		283.4
1017.521	3338.3	8.5	86.408	283.5		283.5
1020.110	3346.8	8.5	86.430	283.6		283.6
1022.700	3355.3	8.5	86.435	283.6		283.6
1025.289	3363.8	8.5	86.426	283.5		283.5
1027.878	3372.3	8.5	86.429	283.6		283.6
1030.467	3380.8	8.5	86.445	283.6		283.6
1033.056	3389.3	8.5	86.451	283.6		283.6
1035.645	3397.8	8.5	86.460	283.7		283.7
1038.234	3406.3	8.5	86.473	283.7		283.7
1040.823	3414.8	8.5	86.480	283.7		283.7
1043.412	3423.3	8.5	86.487	283.7		283.7
1046.001	3431.8	8.5	86.492	283.8		283.8
1048.591	3440.3	8.5	86.472	283.7		283.7
1051.180	3448.8	8.5	86.447	283.6		283.6
1053.769	3457.2	8.5	86.441	283.6		283.6
1056.358	3465.7	8.5	86.443	283.6		283.6
1058.947	3474.2	8.5	86.445	283.6		283.6
1061.536	3482.7	8.5	86.443	283.6		283.6
1064.125	3491.2	8.5	86.444	283.6		283.6
1066.714	3499.7	8.5	86.451	283.6		283.6
1069.303	3508.2	8.5	86.459	283.7		283.7
1071.892	3516.7	8.5	86.471	283.7		283.7
1074.481	3525.2	8.5	86.481	283.7		283.7
1077.071	3533.7	8.5	86.477	283.7		283.7
1079.660	3542.2	8.5	86.463	283.7		283.7
1082.249	3550.7	8.5	86.455	283.6		283.6

1084.838	3559.2	8.5	86.457	283.7	283.7
1087.427	3567.7	8.5	86.468	283.7	283.7
1090.016	3576.2	8.5	86.484	283.7	283.7
1092.605	3584.7	8.5	86.505	283.8	283.8
1095.194	3593.2	8.5	86.520	283.9	283.9
1097.783	3601.7	8.5	86.517	283.8	283.8
1100.372	3610.1	8.5	86.509	283.8	283.8
1102.961	3618.6	8.5	86.509	283.8	283.8
1105.551	3627.1	8.5	86.518	283.9	283.9
1108.140	3635.6	8.5	86.537	283.9	283.9
1110.729	3644.1	8.5	86.562	284.0	284.0
1113.318	3652.6	8.5	86.593	284.1	284.1
1115.907	3661.1	8.5	86.628	284.2	284.2
1118.496	3669.6	8.5	86.662	284.3	284.3
1121.085	3678.1	8.5	86.689	284.4	284.4
1123.674	3686.6	8.5	86.699	284.4	284.4
1126.263	3695.1	8.5	86.691	284.4	284.4
1128.852	3703.6	8.5	86.684	284.4	284.4
1131.441	3712.1	8.5	86.686	284.4	284.4
1134.031	3720.6	8.5	86.682	284.4	284.4
1136.620	3729.1	8.5	86.673	284.4	284.4
1139.209	3737.6	8.5	86.664	284.3	284.3
1141.798	3746.1	8.5	86.662	284.3	284.3
1144.387	3754.6	8.5	86.664	284.3	284.3
1146.976	3763.0	8.5	86.664	284.3	284.3
1149.565	3771.5	8.5	86.669	284.3	284.3
1152.154	3780.0	8.5	86.678	284.4	284.4
1154.743	3788.5	8.5	86.682	284.4	284.4
1157.332	3797.0	8.5	86.681	284.4	284.4
1159.921	3805.5	8.5	86.683	284.4	284.4
1162.511	3814.0	8.5	86.695	284.4	284.4
1165.100	3822.5	8.5	86.706	284.5	284.5
1167.689	3831.0	8.5	86.709	284.5	284.5
1170.278	3839.5	8.5	86.724	284.5	284.5
1172.867	3848.0	8.5	86.742	284.6	284.6
1175.456	3856.5	8.5	86.746	284.6	284.6
1178.045	3865.0	8.5	86.745	284.6	284.6
1180.634	3873.5	8.5	86.740	284.6	284.6
1183.223	3882.0	8.5	86.721	284.5	284.5
1185.812	3890.5	8.5	86.686	284.4	284.4
1188.401	3899.0	8.5	86.643	284.3	284.3
1190.990	3907.4	8.5	86.614	284.2	284.2
1193.580	3915.9	8.5	86.604	284.1	284.1
1196.169	3924.4	8.5	86.606	284.1	284.1
1198.758	3932.9	8.5	86.602	284.1	284.1
1201.347	3941.4	8.5	86.597	284.1	284.1
1203.936	3949.9	8.5	86.606	284.1	284.1

1206.525	3958.4	8.5	86.639	284.2		284.2
1209.114	3966.9	8.5	86.670	284.3		284.3
1211.703	3975.4	8.5	86.656	284.3		284.3
1214.292	3983.9	8.5	86.622	284.2		284.2
1216.881	3992.4	8.5	86.610	284.2		284.2
1219.470	4000.9	8.5	86.644	284.3		284.3
1222.060	4009.4	8.5	86.712	284.5		284.5
1224.649	4017.9	8.5	86.781	284.7		284.7
1227.238	4026.4	8.5	86.830	284.9		284.9
1229.827	4034.9	8.5	86.860	285.0		285.0
1232.416	4043.4	8.5	86.879	285.0		285.0
1235.005	4051.9	8.5	86.886	285.1		285.1
1237.594	4060.3	8.5	86.894	285.1		285.1
1240.183	4068.8	8.5	86.921	285.2		285.2
1242.772	4077.3	8.5	86.944	285.2		285.2
1245.361	4085.8	8.5	86.943	285.2		285.2
1247.950	4094.3	8.5	86.923	285.2		285.2
1250.539	4102.8	8.5	86.912	285.1		285.1
1253.129	4111.3	8.5	86.935	285.2		285.2
1255.718	4119.8	8.5	86.973	285.3		285.3
1258.307	4128.3	8.5	86.988	285.4		285.4
1260.896	4136.8	8.5	86.947	285.3		285.3
1263.485	4145.3	8.5	86.900	285.1		285.1
1266.074	4153.8	8.5	86.867	285.0		285.0
1268.663	4162.3	8.5	86.848	284.9		284.9
1271.252	4170.8	8.5	86.847	284.9		284.9
1273.841	4179.3	8.5	86.859	285.0		285.0
1276.430	4187.8	8.5	86.860	285.0		285.0
1279.019	4196.3	8.5	86.857	285.0		285.0
1281.609	4204.8	8.5	86.861	285.0		285.0
1284.198	4213.2	8.5	86.869	285.0		285.0
1286.787	4221.7	8.5	86.886	285.1		285.1
1289.376	4230.2	8.5	86.911	285.1		285.1
1291.965	4238.7	8.5	86.923	285.2		285.2
1294.554	4247.2	8.5	86.914	285.2		285.2
1297.143	4255.7	8.5	86.899	285.1		285.1
1299.732	4264.2	8.5	86.899	285.1		285.1
1302.321	4272.7	8.5	86.917	285.2		285.2
1304.910	4281.2	8.5	86.917	285.2		285.2
1307.499	4289.7	8.5	86.903	285.1		285.1
1310.088	4298.2	8.5	86.884	285.1		285.1
1312.678	4306.7	8.5	86.872	285.0		285.0
1315.267	4315.2	8.5	86.863	285.0		285.0
1317.856	4323.7	8.5	86.850	284.9		284.9
1320.445	4332.2	8.5	86.842	284.9		284.9
1323.034	4340.7	8.5	86.837	284.9		284.9
1325.623	4349.2	8.5	86.829	284.9		284.9

1328.212	4357.7	8.5	86.827	284.9		284.9
1330.801	4366.1	8.5	86.835	284.9		284.9
1333.390	4374.6	8.5	86.851	284.9		284.9
1335.979	4383.1	8.5	86.873	285.0		285.0
1338.568	4391.6	8.5	86.896	285.1		285.1
1341.157	4400.1	8.5	86.915	285.2		285.2
1343.747	4408.6	8.5	86.940	285.2		285.2
1346.336	4417.1	8.5	86.975	285.3		285.3
1348.925	4425.6	8.5	86.994	285.4		285.4
1351.514	4434.1	8.5	86.983	285.4		285.4
1354.103	4442.6	8.5	86.943	285.2		285.2
1356.692	4451.1	8.5	86.895	285.1		285.1
1359.281	4459.6	8.5	86.858	285.0		285.0
1361.870	4468.1	8.5	86.842	284.9		284.9
1364.459	4476.6	8.5	86.849	284.9		284.9
1367.048	4485.1	8.5	86.874	285.0		285.0
1369.637	4493.6	8.5	86.893	285.1		285.1
1372.226	4502.1	8.5	86.906	285.1		285.1
1374.815	4510.5	8.5	86.908	285.1		285.1
1377.405	4519.0	8.5	86.897	285.1		285.1
1379.994	4527.5	8.5	86.882	285.0		285.0
1382.583	4536.0	8.5	86.878	285.0		285.0
1385.172	4544.5	8.5	86.888	285.1		285.1
1387.761	4553.0	8.5	86.898	285.1		285.1
1390.350	4561.5	8.5	86.879	285.0		285.0
1392.939	4570.0	8.5	86.865	285.0		285.0
1395.528	4578.5	8.5	86.885	285.1		285.1
1398.117	4587.0	8.5	86.903	285.1		285.1
1400.706	4595.5	8.5	86.904	285.1		285.1
1403.295	4604.0	8.5	86.881	285.0		285.0
1405.884	4612.5	8.5	86.874	285.0		285.0
1408.474	4621.0	8.5	86.880	285.0		285.0
1411.063	4629.5	8.5	86.872	285.0		285.0
1413.652	4638.0	8.5	86.860	285.0		285.0
1416.241	4646.5	8.5	86.853	285.0		285.0
1418.830	4655.0	8.5	86.855	285.0		285.0
1421.419	4663.4	8.5	86.853	285.0		285.0
1424.008	4671.9	8.5	86.841	284.9		284.9
1426.597	4680.4	8.5	86.836	284.9		284.9
1429.186	4688.9	8.5	86.836	284.9		284.9
1431.775	4697.4	8.5	86.840	284.9		284.9
1434.364	4705.9	8.5	86.844	284.9		284.9
1436.953	4714.4	8.5	86.845	284.9		284.9
1439.542	4722.9	8.5	86.838	284.9		284.9
1442.132	4731.4	8.5	86.825	284.9		284.9
1444.721	4739.9	8.5	86.810	284.8		284.8
1447.310	4748.4	8.5	86.795	284.8		284.8

1449.899	4756.9	8.5	86.801	284.8		284.8
1452.488	4765.4	8.5	86.832	284.9		284.9
1455.077	4773.9	8.5	86.843	284.9		284.9
1457.666	4782.4	8.5	86.833	284.9		284.9
1460.255	4790.9	8.5	86.811	284.8		284.8
1462.844	4799.4	8.5	86.783	284.7		284.7
1465.433	4807.9	8.5	86.760	284.6		284.6
1468.022	4816.3	8.5	86.756	284.6		284.6
1470.611	4824.8	8.5	86.767	284.7		284.7
1473.200	4833.3	8.5	86.777	284.7		284.7
1475.790	4841.8	8.5	86.761	284.6		284.6
1478.379	4850.3	8.5	86.740	284.6		284.6
1480.968	4858.8	8.5	86.731	284.6		284.6
1483.557	4867.3	8.5	86.730	284.5		284.5
1486.146	4875.8	8.5	86.733	284.6		284.6
1488.735	4884.3	8.5	86.736	284.6		284.6
1491.324	4892.8	8.5	86.745	284.6		284.6
1493.913	4901.3	8.5	86.755	284.6		284.6
1496.502	4909.8	8.5	86.767	284.7		284.7
1499.091	4918.3	8.5	86.815	284.8		284.8
1501.680	4926.8	8.5	86.873	285.0		285.0
1504.269	4935.3	8.5	86.871	285.0		285.0
1506.858	4943.8	8.5	86.845	284.9		284.9
1509.448	4952.3	8.5	86.827	284.9		284.9
1512.037	4960.8	8.5	86.819	284.8		284.8
1514.626	4969.2	8.5	86.829	284.9		284.9
1517.215	4977.7	8.5	86.852	284.9		284.9
1519.804	4986.2	8.5	86.863	285.0		285.0
1522.393	4994.7	8.5	86.862	285.0		285.0
1524.982	5003.2	8.5	86.866	285.0		285.0
1527.571	5011.7	8.5	86.905	285.1		285.1
1530.160	5020.2	8.5	86.966	285.3		285.3
1532.749	5028.7	8.5	86.993	285.4		285.4
1535.338	5037.2	8.5	86.993	285.4		285.4
1537.927	5045.7	8.5	86.979	285.4		285.4
1540.516	5054.2	8.5	86.971	285.3		285.3
1543.106	5062.7	8.5	86.972	285.3		285.3
1545.695	5071.2	8.5	86.997	285.4		285.4
1548.284	5079.7	8.5	87.074	285.7		285.7
1550.873	5088.2	8.5	87.143	285.9		285.9
1553.462	5096.7	8.5	87.115	285.8		285.8
1556.051	5105.2	8.5	87.052	285.6		285.6
1558.640	5113.6	8.5	86.981	285.4		285.4
1561.229	5122.1	8.5	86.922	285.2		285.2
1563.818	5130.6	8.5	86.858	285.0		285.0
1566.407	5139.1	8.5	86.780	284.7		284.7
1568.996	5147.6	8.5	86.695	284.4		284.4

1571.585	5156.1	8.5	86.605	284.1		284.1
1574.174	5164.6	8.5	86.526	283.9		283.9
1576.763	5173.1	8.5	86.483	283.7		283.7
1579.353	5181.6	8.5	86.476	283.7		283.7
1581.942	5190.1	8.5	86.483	283.7		283.7
1584.531	5198.6	8.5	86.496	283.8		283.8
1587.120	5207.1	8.5	86.505	283.8		283.8
1589.709	5215.6	8.5	86.503	283.8		283.8
1592.298	5224.1	8.5	86.512	283.8		283.8
1594.887	5232.6	8.5	86.540	283.9		283.9
1597.476	5241.1	8.5	86.560	284.0		284.0
1600.065	5249.6	8.5	86.582	284.1		284.1
1602.654	5258.1	8.5	86.617	284.2		284.2
1605.243	5266.5	8.5	86.660	284.3		284.3
1607.832	5275.0	8.5	86.701	284.5		284.5
1610.421	5283.5	8.5	86.724	284.5		284.5
1613.011	5292.0	8.5	86.726	284.5		284.5
1615.600	5300.5	8.5	86.714	284.5		284.5
1618.189	5309.0	8.5	86.710	284.5		284.5
1620.778	5317.5	8.5	86.718	284.5		284.5
1623.367	5326.0	8.5	86.740	284.6		284.6
1625.956	5334.5	8.5	86.758	284.6		284.6
1628.545	5343.0	8.5	86.757	284.6		284.6
1631.134	5351.5	8.5	86.735	284.6		284.6
1633.723	5360.0	8.5	86.717	284.5		284.5
1636.312	5368.5	8.5	86.713	284.5		284.5
1638.901	5377.0	8.5	86.723	284.5		284.5
1641.490	5385.5	8.5	86.725	284.5		284.5
1644.079	5394.0	8.5	86.721	284.5		284.5
1646.668	5402.5	8.5	86.723	284.5		284.5
1649.258	5411.0	8.5	86.731	284.6		284.6
1651.847	5419.4	8.5	86.741	284.6		284.6
1654.436	5427.9	8.5	86.736	284.6		284.6
1657.025	5436.4	8.5	86.737	284.6		284.6
1659.614	5444.9	8.5	86.760	284.6		284.6
1662.203	5453.4	8.5	86.793	284.8		284.8
1664.792	5461.9	8.5	86.826	284.9		284.9
1667.381	5470.4	8.5	86.850	284.9		284.9
1669.970	5478.9	8.5	86.863	285.0		285.0
1672.559	5487.4	8.5	86.880	285.0		285.0
1675.148	5495.9	8.5	86.918	285.2		285.2
1677.737	5504.4	8.5	86.936	285.2		285.2
1680.326	5512.9	8.5	86.917	285.2		285.2
1682.915	5521.4	8.5	86.894	285.1		285.1
1685.504	5529.9	8.5	86.880	285.0		285.0
1688.094	5538.4	8.5	86.887	285.1		285.1
1690.683	5546.9	8.5	86.896	285.1		285.1

1693.272	5555.4	8.5	86.899	285.1		285.1
1695.861	5563.8	8.5	86.892	285.1		285.1
1698.450	5572.3	8.5	86.889	285.1		285.1
1701.039	5580.8	8.5	86.886	285.1		285.1
1703.628	5589.3	8.5	86.872	285.0		285.0
1706.217	5597.8	8.5	86.834	284.9		284.9
1708.806	5606.3	8.5	86.781	284.7		284.7
1711.395	5614.8	8.5	86.752	284.6		284.6
1713.984	5623.3	8.5	86.736	284.6		284.6
1716.573	5631.8	8.5	86.723	284.5		284.5
1719.162	5640.3	8.5	86.719	284.5		284.5
1721.751	5648.8	8.5	86.730	284.5		284.5
1724.341	5657.3	8.5	86.752	284.6		284.6
1726.930	5665.8	8.5	86.765	284.7		284.7
1729.519	5674.3	8.5	86.772	284.7		284.7
1732.108	5682.8	8.5	86.779	284.7		284.7
1734.697	5691.3	8.5	86.784	284.7		284.7
1737.286	5699.8	8.5	86.780	284.7		284.7
1739.875	5708.3	8.5	86.765	284.7		284.7
1742.464	5716.7	8.5	86.766	284.7		284.7
1745.053	5725.2	8.5	86.796	284.8		284.8
1747.642	5733.7	8.5	86.818	284.8		284.8
1750.231	5742.2	8.5	86.832	284.9		284.9
1752.820	5750.7	8.5	86.842	284.9		284.9
1755.409	5759.2	8.5	86.849	284.9		284.9
1757.998	5767.7	8.5	86.854	285.0		285.0
1760.587	5776.2	8.5	86.860	285.0		285.0
1763.177	5784.7	8.5	86.879	285.0		285.0
1765.766	5793.2	8.5	86.902	285.1		285.1
1768.355	5801.7	8.5	86.905	285.1		285.1
1770.944	5810.2	8.5	86.896	285.1		285.1
1773.533	5818.7	8.5	86.886	285.1		285.1
1776.122	5827.2	8.5	86.889	285.1		285.1
1778.711	5835.7	8.5	86.895	285.1		285.1
1781.300	5844.2	8.5	86.889	285.1		285.1
1783.889	5852.7	8.5	86.867	285.0		285.0
1786.478	5861.1	8.5	86.824	284.9		284.9
1789.067	5869.6	8.5	86.777	284.7		284.7
1791.656	5878.1	8.5	86.765	284.7		284.7
1794.245	5886.6	8.5	86.783	284.7		284.7
1796.834	5895.1	8.5	86.777	284.7		284.7
1799.423	5903.6	8.5	86.765	284.7		284.7
1802.013	5912.1	8.5	86.768	284.7		284.7
1804.602	5920.6	8.5	86.790	284.7		284.7
1807.191	5929.1	8.5	86.817	284.8		284.8
1809.780	5937.6	8.5	86.822	284.8		284.8
1812.369	5946.1	8.5	86.790	284.7		284.7

1814.958	5954.6	8.5	86.747	284.6		284.6
1817.547	5963.1	8.5	86.740	284.6		284.6
1820.136	5971.6	8.5	86.749	284.6		284.6
1822.725	5980.1	8.5	86.759	284.6		284.6
1825.314	5988.6	8.5	86.758	284.6		284.6
1827.903	5997.1	8.5	86.756	284.6		284.6
1830.492	6005.6	8.5	86.759	284.6		284.6
1833.081	6014.0	8.5	86.751	284.6		284.6
1835.670	6022.5	8.5	86.737	284.6		284.6
1838.259	6031.0	8.5	86.728	284.5		284.5
1840.848	6039.5	8.5	86.733	284.6		284.6
1843.438	6048.0	8.5	86.749	284.6		284.6
1846.027	6056.5	8.5	86.764	284.7		284.7
1848.616	6065.0	8.5	86.766	284.7		284.7
1851.205	6073.5	8.5	86.755	284.6		284.6
1853.794	6082.0	8.5	86.742	284.6		284.6
1856.383	6090.5	8.5	86.732	284.6		284.6
1858.972	6099.0	8.5	86.730	284.5		284.5
1861.561	6107.5	8.5	86.735	284.6		284.6
1864.150	6116.0	8.5	86.734	284.6		284.6
1866.739	6124.5	8.5	86.721	284.5		284.5
1869.328	6133.0	8.5	86.712	284.5		284.5
1871.917	6141.5	8.5	86.711	284.5		284.5
1874.506	6150.0	8.5	86.713	284.5		284.5
1877.095	6158.4	8.5	86.706	284.5		284.5
1879.684	6166.9	8.5	86.697	284.4		284.4
1882.273	6175.4	8.5	86.706	284.5		284.5
1884.863	6183.9	8.5	86.717	284.5		284.5
1887.452	6192.4	8.5	86.722	284.5		284.5
1890.041	6200.9	8.5	86.726	284.5		284.5
1892.630	6209.4	8.5	86.737	284.6		284.6
1895.219	6217.9	8.5	86.761	284.6		284.6
1897.808	6226.4	8.5	86.780	284.7		284.7
1900.397	6234.9	8.5	86.794	284.8		284.8
1902.986	6243.4	8.5	86.800	284.8		284.8
1905.575	6251.9	8.5	86.760	284.6		284.6
1908.164	6260.4	8.5	86.704	284.5		284.5
1910.753	6268.9	8.5	86.708	284.5		284.5
1913.342	6277.4	8.5	86.725	284.5		284.5
1915.931	6285.9	8.5	86.726	284.5		284.5
1918.520	6294.4	8.5	86.724	284.5		284.5
1921.109	6302.9	8.5	86.722	284.5		284.5
1923.698	6311.3	8.5	86.723	284.5		284.5
1926.288	6319.8	8.5	86.736	284.6		284.6
1928.877	6328.3	8.5	86.751	284.6		284.6
1931.466	6336.8	8.5	86.757	284.6		284.6
1934.055	6345.3	8.5	86.755	284.6		284.6

1936.644	6353.8	8.5	86.747	284.6	284.6
1939.233	6362.3	8.5	86.738	284.6	284.6
1941.822	6370.8	8.5	86.736	284.6	284.6
1944.411	6379.3	8.5	86.740	284.6	284.6
1947.000	6387.8	8.5	86.737	284.6	284.6
1949.589	6396.3	8.5	86.730	284.5	284.5
1952.178	6404.8	8.5	86.720	284.5	284.5
1954.767	6413.3	8.5	86.698	284.4	284.4
1957.356	6421.8	8.5	86.667	284.3	284.3
1959.945	6430.3	8.5	86.644	284.3	284.3
1962.534	6438.8	8.5	86.653	284.3	284.3
1965.123	6447.3	8.5	86.678	284.4	284.4
1967.712	6455.7	8.5	86.676	284.4	284.4
1970.302	6464.2	8.5	86.672	284.4	284.4
1972.891	6472.7	8.5	86.668	284.3	284.3
1975.480	6481.2	8.5	86.647	284.3	284.3
1978.069	6489.7	8.5	86.630	284.2	284.2
1980.658	6498.2	8.5	86.640	284.3	284.3
1983.247	6506.7	8.5	86.655	284.3	284.3
1985.836	6515.2	8.5	86.678	284.4	284.4
1988.425	6523.7	8.5	86.714	284.5	284.5
1991.014	6532.2	8.5	86.754	284.6	284.6
1993.603	6540.7	8.5	86.800	284.8	284.8
1996.192	6549.2	8.5	86.852	284.9	284.9
1998.781	6557.7	8.5	86.892	285.1	285.1
2001.370	6566.2	8.5	86.925	285.2	285.2
2003.959	6574.7	8.5	86.979	285.4	285.4
2006.548	6583.2	8.5	87.031	285.5	285.5
2009.137	6591.7	8.5	87.060	285.6	285.6
2011.726	6600.2	8.5	87.092	285.7	285.7
2014.316	6608.6	8.5	87.104	285.8	285.8
2016.905	6617.1	8.5	87.069	285.7	285.7
2019.494	6625.6	8.5	87.022	285.5	285.5
2022.083	6634.1	8.5	86.977	285.4	285.4
2024.672	6642.6	8.5	86.936	285.2	285.2
2027.261	6651.1	8.5	86.883	285.0	285.0
2029.850	6659.6	8.5	86.847	284.9	284.9
2032.439	6668.1	8.5	86.886	285.1	285.1
2035.028	6676.6	8.5	87.009	285.5	285.5
2037.617	6685.1	8.5	87.255	286.3	286.3
2040.206	6693.6	8.5	87.635	287.5	287.5
2042.795	6702.1	8.5	88.048	288.9	288.9
2045.384	6710.6	8.5	88.321	289.8	289.8
2047.973	6719.1	8.5	88.398	290.0	290.0
2050.562	6727.6	8.5	88.311	289.7	289.7
2053.151	6736.1	8.5	88.171	289.3	289.3
2055.740	6744.6	8.5	87.856	288.2	288.2

2058.329	6753.0	8.5	87.391	286.7					286.7
2060.919	6761.5	8.5	87.037	285.6					285.6
2063.508	6770.0	8.5	86.856	285.0					285.0
2066.097	6778.5	8.5	86.841	284.9					284.9
2068.686	6787.0	8.5	86.859	285.0					285.0
2071.275	6795.5	8.5	86.866	285.0					285.0
2073.864	6804.0	8.5	86.844	284.9					284.9
2076.453	6812.5	8.5	86.813	284.8					284.8
2079.042	6821.0	8.5	86.764	284.7					284.7
2081.631	6829.5	8.5	86.697	284.4					284.4
2084.220	6838.0	8.5	86.665	284.3					284.3
2086.809	6846.5	8.5	86.680	284.4					284.4
2089.398	6855.0	8.5	86.690	284.4					284.4
2091.987	6863.5	8.5	86.719	284.5					284.5
2094.576	6872.0	8.5	86.767	284.7					284.7
2097.165	6880.5	8.5	86.767	284.7					284.7
2099.754	6889.0	8.5	86.733	284.6					284.6
2102.343	6897.5	8.5	86.701	284.5					284.5
2104.932	6905.9	8.5	86.676	284.4					284.4
2107.522	6914.4	8.5	86.662	284.3					284.3
2110.111	6922.9	8.5	86.655	284.3					284.3
2112.700	6931.4	8.5	86.634	284.2					284.2
2115.289	6939.9	8.5	86.597	284.1					284.1
2117.878	6948.4	8.5	86.568	284.0					284.0
2120.467	6956.9	8.5	86.533	283.9					283.9
2123.056	6965.4	8.5	86.487	283.8					283.8
2125.645	6973.9	8.5	86.454	283.6					283.6
2128.234	6982.4	8.5	86.430	283.6					283.6
2130.823	6990.9	8.5	86.408	283.5					283.5
2133.412	6999.4	8.5	86.392	283.4					283.4
2136.001	7007.9	8.5	86.362	283.3					283.3
2138.590	7016.4	8.5	86.298	283.1					283.1
2141.179	7024.9	8.5	86.259	283.0					283.0
2143.768	7033.4	8.5	86.253	283.0					283.0
2146.357	7041.9	8.5	86.227	282.9	0.0	0.0	8.5		282.9
2148.946	7050.3	8.5	86.145	282.6	0.3	2.3	8.5		282.6
2151.535	7058.8	8.5	86.026	282.2	0.7	5.6	8.5		282.2
2154.124	7067.3	8.5	85.966	282.0	0.9	7.3	8.5		282.0
2156.714	7075.8	8.5	85.951	282.0	0.9	7.7	8.5		282.0
2159.303	7084.3	8.5	85.950	282.0	0.9	7.7	8.5		282.0
2161.892	7092.8	8.5	85.971	282.1	0.8	7.2	8.5		282.1
2164.481	7101.3	8.5	86.006	282.2	0.7	6.2	8.5		282.2
2167.070	7109.8	8.5	86.028	282.2	0.7	5.6	8.5		282.2
2169.659	7118.3	8.5	86.013	282.2	0.7	6.0	8.5		282.2
2172.248	7126.8	8.5	85.989	282.1	0.8	6.7	8.5		282.1
2174.837	7135.3	8.5	86.012	282.2	0.7	6.0	8.5		282.2
2177.426	7143.8	8.5	86.019	282.2	0.7	5.8	8.5		282.2

2180.015	7152.3	8.5	85.973	282.1	0.8	7.1	8.5		282.1
2182.604	7160.8	8.5	85.928	281.9	1.0	8.4	8.5		281.9
2185.193	7169.3	8.5	85.903	281.8	1.1	9.1	8.5		281.8
2187.782	7177.8	8.5	85.912	281.9	1.0	8.8	8.5		281.9
2190.371	7186.3	8.5	85.954	282.0	0.9	7.6	8.5		282.0
2192.960	7194.8	8.5	86.030	282.3	0.6	5.5	8.5		282.3
2195.549	7203.2	8.5	86.111	282.5	0.4	3.2	8.5		282.5
2198.138	7211.7	8.5	86.136	282.6	0.3	2.6	8.5		282.6
2200.727	7220.2	8.5	86.035	282.3	0.6	5.4	8.5		282.3
2203.316	7228.7	8.5	85.799	281.5	1.4	11.9	8.5		281.5
2205.905	7237.2	8.5	85.511	280.5	2.4	20.0	8.5		280.5
2208.495	7245.7	8.5	85.284	279.8	3.1	26.3	8.5		279.8
2211.084	7254.2	8.5	85.215	279.6	3.3	28.2	8.5		279.6
2213.673	7262.7	8.5	85.246	279.7	3.2	27.4	8.5		279.7
2216.262	7271.2	8.5	85.282	279.8	3.1	26.4	8.5		279.8
2218.851	7279.7	8.5	85.278	279.8	3.1	26.5	8.5		279.8
2221.440	7288.2	8.5	85.259	279.7	3.2	27.0	8.5		279.7
2224.029	7296.7	8.5	85.277	279.8	3.1	26.5	8.5		279.8
2226.618	7305.2	8.5	85.322	279.9	3.0	25.3	8.5		279.9
2229.207	7313.7	8.5	85.366	280.1	2.8	24.0	8.5		280.1
2231.796	7322.2	8.5	85.379	280.1	2.8	23.7	8.5		280.1
2234.385	7330.7	8.5	85.388	280.1	2.8	23.4	8.5		280.1
2236.974	7339.2	8.5	85.415	280.2	2.7	22.7	8.5		280.2
2239.563	7347.6	8.5	85.454	280.4	2.5	21.6	8.5		280.4
2242.152	7356.1	8.5	85.494	280.5	2.4	20.5	8.5		280.5
2244.741	7364.6	8.5	85.537	280.6	2.3	19.2	8.5		280.6
2247.330	7373.1	8.5	85.617	280.9	2.0	17.0	8.5		280.9
2249.919	7381.6	8.5	85.717	281.2	1.7	14.2	8.5		281.2
2252.508	7390.1	8.5	85.799	281.5	1.4	11.9	8.5		281.5
2255.097	7398.6	8.5	85.871	281.7	1.2	10.0	8.5		281.7
2257.686	7407.1	8.5	85.926	281.9	1.0	8.4	8.5		281.9
2260.276	7415.6	8.5	85.955	282.0	0.9	7.6	8.5		282.0
2262.865	7424.1	8.5	85.979	282.1	0.8	6.9	8.5		282.1
2265.454	7432.6	8.5	86.003	282.2	0.7	6.3	8.5		282.2
2268.043	7441.1	8.5	86.017	282.2	0.7	5.9	8.5		282.2
2270.632	7449.6	8.5	86.025	282.2	0.7	5.6	8.5		282.2
2273.221	7458.1	8.5	86.032	282.3	0.6	5.5	8.5		282.3
2275.810	7466.6	8.5	86.036	282.3	0.6	5.4	8.5		282.3
2278.399	7475.1	8.5	86.047	282.3	0.6	5.0	8.5		282.3
2280.988	7483.6	8.5	86.061	282.4	0.5	4.6	8.5		282.4
2283.577	7492.1	8.5	86.037	282.3	0.6	5.3	8.5		282.3
2286.166	7500.5	8.5	85.998	282.1	0.8	6.4	8.5		282.1
2288.755	7509.0	8.5	86.009	282.2	0.7	6.1	8.5		282.2
2291.344	7517.5	8.5	86.040	282.3	0.6	5.3	8.5		282.3
2293.933	7526.0	8.5	86.049	282.3	0.6	5.0	8.5		282.3
2296.522	7534.5	8.5	86.023	282.2	0.7	5.7	8.5		282.2
2299.111	7543.0	8.5	85.976	282.1	0.8	7.0	8.5		282.1

2301.700	7551.5	8.5	85.933	281.9	1.0	8.2	8.5		281.9
2304.289	7560.0	8.5	85.915	281.9	1.0	8.7	8.5		281.9
2306.878	7568.5	8.5	85.870	281.7	1.2	10.0	8.5		281.7
2309.467	7577.0	8.5	85.719	281.2	1.7	14.2	8.5		281.2
2312.056	7585.5	8.5	85.475	280.4	2.5	21.0	8.5		280.4
2314.646	7594.0	8.5	85.165	279.4	3.5	29.6	8.5		279.4
2317.235	7602.5	8.5	84.876	278.5	4.4	37.7	8.5		278.5
2319.824	7611.0	8.5	84.728	278.0	4.9	41.8	8.5		278.0
2322.413	7619.5	8.5	84.778	278.1	4.8	40.4	8.5		278.1
2325.002	7628.0	8.5	84.913	278.6	4.3	36.7	8.5		278.6
2327.591	7636.5	8.5	84.952	278.7	4.2	35.6	8.5		278.7
2330.180	7644.9	8.5	84.812	278.3	4.6	39.5	8.5		278.3
2332.769	7653.4	8.5	84.674	277.8	5.1	43.3	8.5		277.8
2335.358	7661.9	8.5	84.545	277.4	5.5	46.9	8.5		277.4
2337.947	7670.4	8.5	84.393	276.9	6.0	51.1	8.5		276.9
2340.536	7678.9	8.5	84.314	276.6	6.3	53.3	8.5		276.6
2343.125	7687.4	8.5	84.303	276.6	6.3	53.6	8.5		276.6
2345.714	7695.9	8.5	84.277	276.5	6.4	54.4	8.5		276.5
2348.303	7704.4	8.5	84.248	276.4	6.5	55.2	8.5		276.4
2350.892	7712.9	8.5	84.223	276.3	6.6	55.9	8.5		276.3
2353.481	7721.4	8.5	84.177	276.2	6.7	57.2	8.5		276.2
2356.070	7729.9	8.5	84.121	276.0	6.9	58.7	8.5		276.0
2358.659	7738.4	8.5	84.066	275.8	7.1	60.2	8.5		275.8
2361.248	7746.9	8.5	84.008	275.6	7.3	61.9	8.5		275.6
2363.837	7755.4	8.5	83.939	275.4	7.5	63.8	8.5		275.4
2366.426	7763.9	8.5	83.868	275.2	7.7	65.8	8.5		275.2
2369.015	7772.4	8.5	83.845	275.1	7.8	66.4	8.5		275.1
2371.605	7780.9	8.5	83.947	275.4	7.5	63.6	8.5		275.4
2374.194	7789.3	8.5	84.217	276.3	6.6	56.0	8.5		276.3
2376.783	7797.8	8.5	84.543	277.4	5.5	46.9	8.5		277.4
2379.372	7806.3	8.5	84.790	278.2	4.7	40.1	8.5		278.2
2381.961	7814.8	8.5	84.865	278.4	4.5	38.0	8.5		278.4
2384.550	7823.3	8.5	84.884	278.5	4.4	37.4	8.5		278.5
2387.139	7831.8	8.5	84.933	278.7	4.2	36.1	8.5		278.7
2389.728	7840.3	8.5	84.958	278.7	4.2	35.4	8.5		278.7
2392.317	7848.8	8.5	85.015	278.9	4.0	33.8	8.5		278.9
2394.906	7857.3	8.5	85.183	279.5	3.4	29.1	8.5		279.5
2397.495	7865.8	8.5	85.385	280.1	2.8	23.5	8.5		280.1
2400.084	7874.3	8.5	85.542	280.6	2.3	19.1	8.5		280.6
2402.673	7882.8	8.5	85.602	280.8	2.1	17.5	8.5		280.8
2405.262	7891.3	8.5	85.603	280.8	2.1	17.4	8.5		280.8
2407.851	7899.8	8.5	85.552	280.7	2.2	18.8	8.5		280.7
2410.440	7908.3	8.5	85.458	280.4	2.5	21.5	8.5		280.4
2413.029	7916.8	8.5	85.417	280.2	2.7	22.6	8.5		280.2
2415.618	7925.3	8.5	85.471	280.4	2.5	21.1	8.5		280.4
2418.207	7933.8	8.5	85.511	280.5	2.4	20.0	8.5		280.5
2420.796	7942.2	8.5	85.539	280.6	2.3	19.2	8.5		280.6

2423.385	7950.7	8.5		85.594	280.8	2.1	17.7	8.5		280.8
2425.974	7959.2	8.5		85.636	281.0	1.9	16.5	8.5		281.0
2428.563	7967.7	8.5		85.657	281.0	1.9	15.9	8.5		281.0
2431.152	7976.2	8.5		85.671	281.1	1.8	15.5	8.5		281.1
2433.742	7984.7	8.5		85.688	281.1	1.8	15.0	8.5		281.1
2436.331	7993.2	8.5		85.701	281.2	1.7	14.7	8.5		281.2
2438.920	8001.7	8.5		85.693	281.1	1.8	14.9	8.5		281.1
2441.509	8010.2	8.5		85.679	281.1	1.8	15.3	8.5		281.1
2444.098	8018.7	8.5		85.672	281.1	1.8	15.5	8.5		281.1
2446.687	8027.2	8.5		85.668	281.1	1.8	15.6	8.5		281.1
2449.276	8035.7	8.5		85.674	281.1	1.8	15.5	8.5		281.1
2451.865	8044.2	8.5		85.693	281.1	1.8	14.9	8.5		281.1
2454.454	8052.7	8.5		85.719	281.2	1.7	14.2	8.5		281.2
2457.043	8061.2	8.5		85.730	281.3	1.6	13.9	8.5		281.3
2459.632	8069.7	8.5		85.711	281.2	1.7	14.4	8.5		281.2
2462.221	8078.2	8.5		85.682	281.1	1.8	15.2	8.5		281.1
2464.810	8086.6	8.5		85.656	281.0	1.9	15.9	8.5		281.0
2467.399	8095.1	8.5		85.637	281.0	1.9	16.5	8.5		281.0
2469.988	8103.6	8.5		85.625	280.9	2.0	16.8	8.5		280.9
2472.577	8112.1	8.5		85.613	280.9	2.0	17.1	8.5		280.9
2475.166	8120.6	8.5		85.590	280.8	2.1	17.8	8.5		280.8
2477.755	8129.1	8.5		85.578	280.8	2.1	18.1	8.5		280.8
2480.344	8137.6	8.5		85.590	280.8	2.1	17.8	8.5		280.8
2482.933	8146.1	8.5		85.576	280.8	2.1	18.2	8.5		280.8
2485.522	8154.6	8.5		85.555	280.7	2.2	18.8	8.5		280.7
2488.111	8163.1	8.5		85.588	280.8	2.1	17.8	8.5		280.8
2490.700	8171.6	8.5		85.649	281.0	1.9	16.1	8.5		281.0
2493.289	8180.1	8.5		85.694	281.1	1.8	14.9	8.5		281.1
2495.878	8188.6	8.5		85.699	281.2	1.7	14.7	8.5		281.2
2498.468	8197.1	8.5		85.673	281.1	1.8	15.5	8.5		281.1
2501.057	8205.6	8.5		85.626	280.9	2.0	16.8	8.5		280.9
2503.646	8214.1	8.5		85.564	280.7	2.2	18.5	8.5		280.7
2506.235	8222.6	8.5		85.530	280.6	2.3	19.4	8.5		280.6
2508.824	8231.0	8.5		85.557	280.7	2.2	18.7	8.5		280.7
2511.413	8239.5	8.5		85.586	280.8	2.1	17.9	8.5		280.8
2514.002	8248.0	8.5		85.614	280.9	2.0	17.1	8.5		280.9
2516.591	8256.5	8.5		85.652	281.0	1.9	16.0	8.5		281.0
2519.180	8265.0	8.5		85.626	280.9	2.0	16.8	8.5		280.9
2521.769	8273.5	8.5		85.545	280.7	2.2	19.0	8.5		280.7
2524.358	8282.0	8.5		85.504	280.5	2.4	20.2	8.5		280.5
2526.947	8290.5	8.5		85.508	280.5	2.4	20.1	8.5		280.5
2529.536	8299.0	8.5		85.522	280.6	2.3	19.7	8.5		280.6
2532.125	8307.5	8.5		85.515	280.6	2.3	19.9	8.5		280.6
2534.714	8316.0	8.5		85.498	280.5	2.4	20.3	8.5		280.5
2537.303	8324.5	8.5		85.508	280.5	2.4	20.1	8.5		280.5
2539.892	8333.0	8.5		85.571	280.7	2.2	18.3	8.5		280.7
2542.481	8341.5	8.5		85.648	281.0	1.9	16.2	8.5		281.0

2545.070	8350.0	8.5	85.674	281.1	1.8	15.5	8.5		281.1
2547.659	8358.5	8.5	85.664	281.1	1.8	15.7	8.5		281.1
2550.248	8367.0	8.5	85.640	281.0	1.9	16.4	8.5		281.0
2552.837	8375.5	8.5	85.610	280.9	2.0	17.2	8.5		280.9
2555.426	8383.9	8.5	85.569	280.7	2.2	18.4	8.5		280.7
2558.015	8392.4	8.5	85.542	280.6	2.3	19.1	8.5		280.6
2560.604	8400.9	8.5	85.574	280.8	2.1	18.2	8.5		280.8
2563.193	8409.4	8.5	85.617	280.9	2.0	17.0	8.5		280.9
2565.783	8417.9	8.5	85.611	280.9	2.0	17.2	8.5		280.9
2568.372	8426.4	8.5	85.576	280.8	2.1	18.2	8.5		280.8
2570.961	8434.9	8.5	85.544	280.7	2.2	19.1	8.5		280.7
2573.550	8443.4	8.5	85.536	280.6	2.3	19.3	8.5		280.6
2576.139	8451.9	8.5	85.549	280.7	2.2	18.9	8.5		280.7
2578.728	8460.4	8.5	85.575	280.8	2.1	18.2	8.5		280.8
2581.317	8468.9	8.5	85.592	280.8	2.1	17.7	8.5		280.8
2583.906	8477.4	8.5	85.554	280.7	2.2	18.8	8.5		280.7
2586.495	8485.9	8.5	85.463	280.4	2.5	21.3	8.5		280.4
2589.084	8494.4	8.5	85.401	280.2	2.7	23.1	8.5		280.2
2591.673	8502.9	8.5	85.402	280.2	2.7	23.0	8.5		280.2
2594.262	8511.4	8.5	85.462	280.4	2.5	21.3	8.5		280.4
2596.851	8519.9	8.5	85.532	280.6	2.3	19.4	8.5		280.6
2599.440	8528.3	8.5	85.574	280.8	2.1	18.2	8.5		280.8
2602.029	8536.8	8.5	85.582	280.8	2.1	18.0	8.5		280.8
2604.618	8545.3	8.5	85.617	280.9	2.0	17.0	8.5		280.9
2607.207	8553.8	8.5	85.647	281.0	1.9	16.2	8.5		281.0
2609.796	8562.3	8.5	85.554	280.7	2.2	18.8	8.5		280.7
2612.385	8570.8	8.5	85.247	279.7	3.2	27.3	8.5		279.7
2614.974	8579.3	8.5	84.726	278.0	4.9	41.9	8.5		278.0
2617.563	8587.8	8.5	84.171	276.2	6.7	57.3	8.5		276.2
2620.152	8596.3	8.5	83.790	274.9	8.0	67.9	8.5		274.9
2622.741	8604.8	8.5	83.678	274.5	8.4	71.1	8.5		274.5
2625.330	8613.3	8.5	83.656	274.5	8.4	71.7	8.5		274.5
2627.919	8621.8	8.5	83.641	274.4	8.5	72.1	8.5		274.4
2630.508	8630.3	8.5	83.642	274.4	8.5	72.1	8.5		274.4
2633.097	8638.8	8.5	83.646	274.4	8.5	72.0	8.5		274.4
2635.686	8647.3	8.5	83.648	274.4	8.5	71.9	8.5		274.4
2638.276	8655.8	8.5	83.648	274.4	8.5	71.9	8.5		274.4
2640.865	8664.3	8.5	83.638	274.4	8.5	72.2	8.5		274.4
2643.454	8672.7	8.5	83.626	274.4	8.5	72.5	8.5		274.4
2646.043	8681.2	8.5	83.630	274.4	8.5	72.4	8.5		274.4
2648.632	8689.7	8.5	83.640	274.4	8.5	72.1	8.5		274.4
2651.221	8698.2	8.5	83.643	274.4	8.5	72.0	8.5		274.4
2653.810	8706.7	8.5	83.649	274.4	8.5	71.9	8.5		274.4
2656.399	8715.2	8.5	83.655	274.5	8.4	71.7	8.5		274.5
2658.988	8723.7	8.5	83.651	274.4	8.5	71.8	8.5		274.4
2661.577	8732.2	8.5	83.643	274.4	8.5	72.0	8.5		274.4
2664.166	8740.7	8.5	83.641	274.4	8.5	72.1	8.5		274.4

2666.755	8749.2	8.5	83.646	274.4	8.5	72.0	8.5		274.4
2669.344	8757.7	8.5	83.647	274.4	8.5	71.9	8.5		274.4
2671.933	8766.2	8.5	83.643	274.4	8.5	72.0	8.5		274.4
2674.522	8774.7	8.5	83.643	274.4	8.5	72.0	8.5		274.4
2677.111	8783.2	8.5	83.645	274.4	8.5	72.0	8.5		274.4
2679.700	8791.7	8.5	83.646	274.4	8.5	72.0	8.5		274.4
2682.289	8800.2	8.5	83.649	274.4	8.5	71.9	8.5		274.4
2684.878	8808.7	8.5	83.656	274.5	8.4	71.7	8.5		274.5
2687.467	8817.1	8.5	83.657	274.5	8.4	71.6	8.5		274.5
2690.056	8825.6	8.5	83.646	274.4	8.5	72.0	8.5		274.4
2692.645	8834.1	8.5	83.640	274.4	8.5	72.1	8.5		274.4
2695.234	8842.6	8.5	83.664	274.5	8.4	71.5	8.5		274.5
2697.823	8851.1	8.5	83.701	274.6	8.3	70.4	8.5		274.6
2700.412	8859.6	8.5	83.739	274.7	8.2	69.4	8.5		274.7
2703.001	8868.1	8.5	83.777	274.9	8.0	68.3	8.5		274.9
2705.590	8876.6	8.5	83.810	275.0	7.9	67.4	8.5		275.0
2708.179	8885.1	8.5	83.840	275.1	7.8	66.6	8.5		275.1
2710.768	8893.6	8.5	83.879	275.2	7.7	65.5	8.5		275.2
2713.357	8902.1	8.5	83.922	275.3	7.6	64.3	8.5		275.3
2715.946	8910.6	8.5	83.965	275.5	7.4	63.1	8.5		275.5
2718.536	8919.1	8.5	84.031	275.7	7.2	61.2	8.5		275.7
2721.125	8927.6	8.5	84.100	275.9	7.0	59.3	8.5		275.9
2723.714	8936.1	8.5	84.115	276.0	6.9	58.9	8.5		276.0
2726.303	8944.6	8.5	84.058	275.8	7.1	60.5	8.5		275.8
2728.892	8953.1	8.5	83.962	275.5	7.4	63.1	8.5		275.5
2731.481	8961.6	8.5	83.902	275.3	7.6	64.8	8.5		275.3
2734.070	8970.0	8.5	83.877	275.2	7.7	65.5	8.5		275.2
2736.659	8978.5	8.5	83.867	275.2	7.7	65.8	8.5		275.2
2739.248	8987.0	8.5	83.874	275.2	7.7	65.6	8.5		275.2
2741.837	8995.5	8.5	83.888	275.2	7.7	65.2	8.5		275.2
2744.426	9004.0	8.5	83.904	275.3	7.6	64.8	8.5		275.3
2747.015	9012.5	8.5	83.949	275.4	7.5	63.5	8.5		275.4
2748.811	9018.4	5.9	83.400	273.6	9.3	54.7	5.9		273.6
2749.604	9021.0	2.6	83.994	275.6	7.3	19.1	2.6		275.6
2752.193	9029.5	8.5	83.990	275.6	7.3	62.4	8.5		275.6
2753.809	9034.8	5.3	83.400	273.6	9.3	49.2	5.3		273.6
2754.782	9038.0	3.2	84.014	275.6	7.3	23.2	3.2		275.6
2757.371	9046.5	8.5	84.110	276.0	6.9	59.0	8.5		276.0
2758.807	9051.2	4.7	83.400	273.6	9.3	43.7	4.7		273.6
2759.960	9055.0	3.8	84.218	276.3	6.6	24.9	3.8		276.3
2762.549	9063.5	8.5	84.279	276.5	6.4	54.3	8.5		276.5
2763.804	9067.6	4.1	83.400	273.6	9.3	38.2	4.1		273.6
2765.138	9072.0	4.4	84.273	276.5	6.4	28.1	4.4		276.5
2767.727	9080.5	8.5	84.237	276.4	6.5	55.5	8.5		276.4
2768.802	9084.0	3.5	83.400	273.6	9.3	32.7	3.5		273.6
2770.316	9089.0	5.0	84.189	276.2	6.7	33.2	5.0		276.2
2772.905	9097.5	8.5	84.129	276.0	6.9	58.5	8.5		276.0

2773.800	9100.4	2.9		83.400	273.6	9.3	27.2	2.9		273.6
2775.494	9106.0	5.6		84.084	275.9	7.0	39.1	5.6		275.9
2778.083	9114.4	8.5		84.068	275.8	7.1	60.2	8.5		275.8
2778.798	9116.8	2.3		83.400	273.6	9.3	21.8	2.3		273.6
2780.672	9122.9	6.1		84.070	275.8	7.1	43.5	6.1		275.8
2783.261	9131.4	8.5		84.081	275.9	7.0	59.8	8.5		275.9
2783.796	9133.2	1.8		83.977	275.5	7.4	13.0	1.8		275.5
2785.850	9139.9	6.7		84.097	275.9	7.0	47.1	6.7		275.9
2788.439	9148.4	8.5		84.110	275.9	7.0	59.0	8.5		275.9
2788.794	9149.6	1.2		84.391	276.9	6.0	7.0	1.2		276.9
2791.028	9156.9	7.3		84.112	276.0	6.9	50.9	7.3		276.0
2793.617	9165.4	8.5		84.107	275.9	7.0	59.1	8.5		275.9
2793.791	9166.0	0.6		84.152	276.1	6.8	3.9	0.6		276.1
2796.206	9173.9	7.9		84.103	275.9	7.0	55.2	7.9		275.9
2798.789	9182.4	8.5		83.813	275.0	7.9	67.2	8.5		275.0
2798.795	9182.4	0.0		84.069	275.8	7.1	0.1	0.0		275.8
2801.384	9190.9	8.5		83.991	275.6	7.3	62.3	8.5		275.6
2803.787	9198.8	7.9		83.423	273.7	9.2	72.5	7.9		273.7
2803.973	9199.4	0.6		83.947	275.4	7.5	4.6	0.6		275.4
2806.563	9207.9	8.5		83.956	275.4	7.5	63.3	8.5		275.4
2808.785	9215.2	7.3		83.880	275.2	7.7	56.2	7.3		275.2
2809.152	9216.4	1.2		83.970	275.5	7.4	8.9	1.2		275.5
2811.741	9224.9	8.5		83.978	275.5	7.4	62.7	8.5		275.5
2813.783	9231.6	6.7		84.566	277.4	5.5	36.5	6.7		277.4
2814.330	9233.4	1.8		83.981	275.5	7.4	13.2	1.8		275.5
2816.919	9241.9	8.5		83.982	275.5	7.4	62.6	8.5		275.5
2818.781	9248.0	6.1		84.762	278.1	4.8	29.4	6.1		278.1
2819.508	9250.4	2.4		83.985	275.5	7.4	17.6	2.4		275.5
2822.097	9258.8	8.5		83.990	275.6	7.3	62.4	8.5		275.6
2823.779	9264.4	5.5		84.563	277.4	5.5	30.1	5.5		277.4
2824.686	9267.3	3.0		83.994	275.6	7.3	21.8	3.0		275.6
2827.275	9275.8	8.5		83.996	275.6	7.3	62.2	8.5		275.6
2828.776	9280.8	4.9		83.600	274.3	8.6	42.5	4.9		274.3
2829.864	9284.3	3.6		83.994	275.6	7.3	26.1	3.6		275.6
2832.453	9292.8	8.5		83.984	275.5	7.4	62.5	8.5		275.5
2833.774	9297.2	4.3		83.500	274.0	8.9	38.8	4.3		274.0
2835.042	9301.3	4.2		83.970	275.5	7.4	30.8	4.2		275.5
2837.631	9309.8	8.5		83.966	275.5	7.4	63.0	8.5		275.5
2838.772	9313.6	3.7		83.500	274.0	8.9	33.5	3.7		274.0
2840.220	9318.3	4.8		83.969	275.5	7.4	35.2	4.8		275.5
2842.809	9326.8	8.5		83.973	275.5	7.4	62.8	8.5		275.5
2843.770	9330.0	3.2		83.500	274.0	8.9	28.2	3.2		274.0
2845.398	9335.3	5.3		83.969	275.5	7.4	39.6	5.3		275.5
2847.987	9343.8	8.5		83.963	275.5	7.4	63.1	8.5		275.5
2848.768	9346.4	2.6		83.773	274.8	8.1	20.6	2.6		274.8
2850.576	9352.3	5.9		83.961	275.5	7.4	44.1	5.9		275.5
2853.165	9360.8	8.5		83.967	275.5	7.4	63.0	8.5		275.5

2853.766	9362.7	2.0	84.243	276.4	6.5	12.8	2.0		276.4
2855.754	9369.3	6.5	84.020	275.7	7.2	47.3	6.5		275.7
2858.343	9377.8	8.5	84.156	276.1	6.8	57.7	8.5		276.1
2858.763	9379.1	1.4	84.138	276.0	6.9	9.5	1.4		276.0
2860.932	9386.3	7.1	84.327	276.7	6.2	44.4	7.1		276.7
2863.521	9394.8	8.5	84.460	277.1	5.8	49.3	8.5		277.1
2863.761	9395.5	0.8	83.706	274.6	8.3	6.5	0.8		274.6
2866.110	9403.2	7.7	84.515	277.3	5.6	43.3	7.7		277.3
2868.699	9411.7	8.5	84.534	277.3	5.6	47.2	8.5		277.3
2868.759	9411.9	0.2	83.685	274.6	8.3	1.6	0.2		274.6
2871.288	9420.2	8.3	84.548	277.4	5.5	45.7	8.3		277.4
2873.757	9428.3	8.1	83.700	274.6	8.3	67.2	8.1		274.6
2873.877	9428.7	0.4	84.547	277.4	5.5	2.2	0.4		277.4
2876.466	9437.2	8.5	84.550	277.4	5.5	46.8	8.5		277.4
2878.755	9444.7	7.5	83.700	274.6	8.3	62.3	7.5		274.6
2879.055	9445.7	1.0	84.565	277.4	5.5	5.4	1.0		277.4
2881.644	9454.2	8.5	84.576	277.5	5.4	46.0	8.5		277.5
2883.753	9461.1	6.9	83.707	274.6	8.3	57.2	6.9		274.6
2884.233	9462.7	1.6	84.598	277.6	5.3	8.4	1.6		277.6
2886.822	9471.2	8.5	84.647	277.7	5.2	44.1	8.5		277.7
2888.750	9477.5	6.3	83.752	274.8	8.1	51.4	6.3		274.8
2889.411	9479.7	2.2	84.685	277.8	5.1	11.0	2.2		277.8
2892.000	9488.2	8.5	84.684	277.8	5.1	43.0	8.5		277.8
2893.748	9493.9	5.7	83.791	274.9	8.0	45.9	5.7		274.9
2894.589	9496.7	2.8	84.642	277.7	5.2	14.4	2.8		277.7
2897.178	9505.2	8.5	84.591	277.5	5.4	45.6	8.5		277.5
2898.746	9510.3	5.1	83.800	274.9	8.0	41.0	5.1		274.9
2899.767	9513.7	3.4	84.549	277.4	5.5	18.5	3.4		277.4
2902.356	9522.2	8.5	84.506	277.2	5.7	48.0	8.5		277.2
2903.744	9526.7	4.6	83.800	274.9	8.0	36.3	4.6		274.9
2904.946	9530.7	3.9	84.436	277.0	5.9	23.2	3.9		277.0
2907.535	9539.2	8.5	84.347	276.7	6.2	52.4	8.5		276.7
2908.742	9543.1	4.0	83.800	274.9	8.0	31.5	4.0		274.9
2910.124	9547.6	4.5	84.289	276.5	6.4	28.8	4.5		276.5
2912.713	9556.1	8.5	84.301	276.6	6.3	53.7	8.5		276.6
2913.740	9559.5	3.4	83.800	274.9	8.0	26.8	3.4		274.9
2915.302	9564.6	5.1	84.378	276.8	6.1	31.1	5.1		276.8
2917.891	9573.1	8.5	84.464	277.1	5.8	49.2	8.5		277.1
2918.737	9575.9	2.8	84.243	276.4	6.5	18.1	2.8		276.4
2920.480	9581.6	5.7	84.528	277.3	5.6	31.9	5.7		277.3
2923.069	9590.1	8.5	84.578	277.5	5.4	46.0	8.5		277.5
2923.735	9592.3	2.2	84.900	278.5	4.4	9.5	2.2		278.5
2925.658	9598.6	6.3	84.622	277.6	5.3	33.2	6.3		277.6
2928.247	9607.1	8.5	84.655	277.7	5.2	43.8	8.5		277.7
2928.733	9608.7	1.6	85.068	279.1	3.8	6.1	1.6		279.1
2930.836	9615.6	6.9	84.665	277.8	5.1	35.4	6.9		277.8
2933.425	9624.1	8.5	84.663	277.8	5.1	43.6	8.5		277.8

2933.731	9625.1	1.0	84.910	278.6	4.3	4.3	1.0		278.6
2936.014	9632.6	7.5	84.656	277.7	5.2	38.6	7.5		277.7
2938.603	9641.1	8.5	84.633	277.7	5.2	44.5	8.5		277.7
2938.729	9641.5	0.4	84.778	278.1	4.8	2.0	0.4		278.1
2941.192	9649.6	8.1	84.599	277.6	5.3	43.2	8.1		277.6
2943.727	9657.9	8.3	84.431	277.0	5.9	49.0	8.3		277.0
2943.781	9658.1	0.2	84.576	277.5	5.4	1.0	0.2		277.5
2946.370	9666.6	8.5	84.586	277.5	5.4	45.8	8.5		277.5
2948.724	9674.3	7.7	84.081	275.9	7.0	54.4	7.7		275.9
2948.959	9675.1	0.8	84.626	277.6	5.3	4.0	0.8		277.6
2951.548	9683.6	8.5	84.675	277.8	5.1	43.3	8.5		277.8
2953.722	9690.7	7.1	84.001	275.6	7.3	52.1	7.1		275.6
2954.137	9692.1	1.4	84.721	278.0	4.9	6.7	1.4		278.0
2956.726	9700.5	8.5	84.742	278.0	4.9	41.4	8.5		278.0
2958.720	9707.1	6.5	84.016	275.6	7.3	47.5	6.5		275.6
2959.315	9709.0	2.0	84.724	278.0	4.9	9.6	2.0		278.0
2961.904	9717.5	8.5	84.703	277.9	5.0	42.5	8.5		277.9
2963.718	9723.5	6.0	84.595	277.5	5.4	31.9	6.0		277.5
2964.493	9726.0	2.5	84.694	277.9	5.0	12.8	2.5		277.9
2967.082	9734.5	8.5	84.660	277.8	5.1	43.7	8.5		277.8
2968.716	9739.9	5.4	85.166	279.4	3.5	18.7	5.4		279.4
2969.671	9743.0	3.1	84.603	277.6	5.3	16.7	3.1		277.6
2972.260	9751.5	8.5	84.559	277.4	5.5	46.5	8.5		277.4
2973.714	9756.3	4.8	85.377	280.1	2.8	13.3	4.8		280.1
2974.849	9760.0	3.7	84.543	277.4	5.5	20.6	3.7		277.4
2977.438	9768.5	8.5	84.546	277.4	5.5	46.9	8.5		277.4
2978.711	9772.7	4.2	85.423	280.3	2.6	11.0	4.2		280.3
2980.027	9777.0	4.3	84.556	277.4	5.5	23.7	4.3		277.4
2982.616	9785.5	8.5	84.566	277.4	5.5	46.3	8.5		277.4
2983.709	9789.1	3.6	85.462	280.4	2.5	9.0	3.6		280.4
2985.205	9794.0	4.9	84.585	277.5	5.4	26.4	4.9		277.5
2987.794	9802.5	8.5	84.620	277.6	5.3	44.8	8.5		277.6
2988.707	9805.5	3.0	85.535	280.6	2.3	6.8	3.0		280.6
2990.383	9811.0	5.5	84.655	277.7	5.2	28.4	5.5		277.7
2992.972	9819.5	8.5	84.677	277.8	5.1	43.2	8.5		277.8
2993.705	9821.9	2.4	85.514	280.6	2.3	5.6	2.4		280.6
2995.561	9828.0	6.1	84.688	277.8	5.1	30.8	6.1		277.8
2998.150	9836.5	8.5	84.700	277.9	5.0	42.6	8.5		277.9
2998.703	9838.3	1.8	85.374	280.1	2.8	5.1	1.8		280.1
3000.739	9844.9	6.7	84.724	278.0	4.9	33.0	6.7		278.0
3003.328	9853.4	8.5	84.759	278.1	4.8	40.9	8.5		278.1
3003.701	9854.7	1.2	85.181	279.5	3.4	4.2	1.2		279.5
3005.917	9861.9	7.3	84.786	278.2	4.7	34.4	7.3		278.2
3008.506	9870.4	8.5	84.787	278.2	4.7	40.2	8.5		278.2
3008.699	9871.1	0.6	84.993	278.8	4.1	2.6	0.6		278.8
3011.095	9878.9	7.9	84.769	278.1	4.8	37.6	7.9		278.1
3013.684	9887.4	8.5	84.760	278.1	4.8	40.9	8.5		278.1

3013.696	9887.5	0.0	84.883	278.5	4.4	0.2	0.0	278.5
3016.273	9895.9	8.5	84.776	278.1	4.8	40.3	8.5	278.1
3018.694	9903.9	7.9	84.951	278.7	4.2	33.3	7.9	278.7
3018.862	9904.4	0.6	84.788	278.2	4.7	2.6	0.6	278.2
3021.451	9912.9	8.5	84.772	278.1	4.8	40.6	8.5	278.1
3023.692	9920.2	7.4	85.160	279.4	3.5	25.7	7.4	279.4
3024.041	9921.4	1.1	84.756	278.1	4.8	5.5	1.1	278.1
3026.630	9929.9	8.5	84.761	278.1	4.8	40.9	8.5	278.1
3028.690	9936.6	6.8	85.360	280.1	2.8	19.3	6.8	280.1
3029.219	9938.4	1.7	84.788	278.2	4.7	8.2	1.7	278.2
3031.808	9946.9	8.5	84.814	278.3	4.6	39.4	8.5	278.3
3033.688	9953.0	6.2	85.431	280.3	2.6	16.1	6.2	280.3
3034.397	9955.4	2.3	84.831	278.3	4.6	10.7	2.3	278.3
3036.986	9963.9	8.5	84.843	278.4	4.5	38.6	8.5	278.4
3038.686	9969.4	5.6	85.460	280.4	2.5	14.1	5.6	280.4
3039.575	9972.4	2.9	84.848	278.4	4.5	13.2	2.9	278.4
3042.164	9980.9	8.5	84.847	278.4	4.5	38.5	8.5	278.4
3043.683	9985.8	5.0	85.523	280.6	2.3	11.5	5.0	280.6
3044.753	9989.3	3.5	84.848	278.4	4.5	15.9	3.5	278.4
3047.342	9997.8	8.5	84.859	278.4	4.5	38.1	8.5	278.4
3048.681	10002.2	4.4	85.532	280.6	2.3	10.0	4.4	280.6
3049.931	10006.3	4.1	84.882	278.5	4.4	18.1	4.1	278.5
3052.520	10014.8	8.5	84.910	278.6	4.3	36.7	8.5	278.6
3053.679	10018.6	3.8	85.478	280.4	2.5	9.4	3.8	280.4
3055.109	10023.3	4.7	84.927	278.6	4.3	20.0	4.7	278.6
3057.698	10031.8	8.5	84.929	278.6	4.3	36.2	8.5	278.6
3058.677	10035.0	3.2	85.447	280.3	2.6	8.2	3.2	280.3
3060.287	10040.3	5.3	84.932	278.6	4.3	22.5	5.3	278.6
3062.876	10048.8	8.5	84.912	278.6	4.3	36.7	8.5	278.6
3063.675	10051.4	2.6	85.347	280.0	2.9	7.6	2.6	280.0
3065.465	10057.3	5.9	84.857	278.4	4.5	26.4	5.9	278.4
3068.054	10065.8	8.5	84.864	278.4	4.5	38.0	8.5	278.4
3068.673	10067.8	2.0	85.201	279.5	3.4	6.8	2.0	279.5
3070.643	10074.3	6.5	84.914	278.6	4.3	27.9	6.5	278.6
3073.232	10082.8	8.5	84.875	278.5	4.4	37.7	8.5	278.5
3073.670	10084.2	1.4	85.100	279.2	3.7	5.3	1.4	279.2
3075.821	10091.3	7.1	84.834	278.3	4.6	32.3	7.1	278.3
3078.410	10099.8	8.5	84.869	278.4	4.5	37.9	8.5	278.4
3078.668	10100.6	0.8	85.021	278.9	4.0	3.4	0.8	278.9
3080.999	10108.3	7.6	84.879	278.5	4.4	33.9	7.6	278.5
3083.588	10116.8	8.5	84.854	278.4	4.5	38.3	8.5	278.4
3083.666	10117.0	0.3	84.907	278.6	4.3	1.1	0.3	278.6
3086.177	10125.3	8.2	84.838	278.3	4.6	37.6	8.2	278.3
3088.664	10133.4	8.2	84.771	278.1	4.8	39.0	8.2	278.1
3088.766	10133.7	0.3	84.807	278.2	4.7	1.6	0.3	278.2
3091.355	10142.2	8.5	84.746	278.0	4.9	41.3	8.5	278.0
3093.662	10149.8	7.6	84.636	277.7	5.2	39.5	7.6	277.7

3093.944	10150.7	0.9	84.667	277.8	5.1	4.7	0.9		277.8
3096.533	10159.2	8.5	84.580	277.5	5.4	45.9	8.5		277.5
3098.660	10166.2	7.0	84.119	276.0	6.9	48.3	7.0		276.0
3099.122	10167.7	1.5	84.483	277.2	5.7	8.7	1.5		277.2
3101.711	10176.2	8.5	84.371	276.8	6.1	51.8	8.5		276.8
3103.657	10182.6	6.4	83.729	274.7	8.2	52.3	6.4		274.7
3104.300	10184.7	2.1	84.262	276.4	6.5	13.6	2.1		276.4
3106.889	10193.2	8.5	84.192	276.2	6.7	56.7	8.5		276.2
3108.655	10199.0	5.8	83.809	275.0	7.9	46.0	5.8		275.0
3109.478	10201.7	2.7	84.182	276.2	6.7	18.1	2.7		276.2
3112.067	10210.2	8.5	84.199	276.2	6.7	56.5	8.5		276.2
3113.653	10215.4	5.2	83.779	274.9	8.0	41.8	5.2		274.9
3114.656	10218.7	3.3	84.207	276.3	6.6	21.8	3.3		276.3
3117.245	10227.2	8.5	84.219	276.3	6.6	56.0	8.5		276.3
3118.651	10231.8	4.6	83.821	275.0	7.9	36.4	4.6		275.0
3119.834	10235.7	3.9	84.233	276.4	6.5	25.4	3.9		276.4
3122.423	10244.2	8.5	84.228	276.3	6.6	55.7	8.5		276.3
3123.649	10248.2	4.0	84.381	276.8	6.1	24.4	4.0		276.8
3125.012	10252.7	4.5	84.208	276.3	6.6	29.6	4.5		276.3
3127.601	10261.2	8.5	84.195	276.2	6.7	56.7	8.5		276.2
3128.647	10264.6	3.4	84.880	278.5	4.4	15.2	3.4		278.5
3130.190	10269.7	5.1	84.203	276.3	6.6	33.6	5.1		276.3
3132.779	10278.1	8.5	84.214	276.3	6.6	56.1	8.5		276.3
3133.644	10281.0	2.8	84.811	278.3	4.6	13.2	2.8		278.3
3135.368	10286.6	5.7	84.214	276.3	6.6	37.4	5.7		276.3
3137.957	10295.1	8.5	84.215	276.3	6.6	56.1	8.5		276.3
3138.642	10297.4	2.2	84.775	278.1	4.8	10.7	2.2		278.1
3140.546	10303.6	6.2	84.221	276.3	6.6	41.1	6.2		276.3
3143.135	10312.1	8.5	84.226	276.3	6.6	55.8	8.5		276.3
3143.640	10313.8	1.7	84.873	278.5	4.4	7.4	1.7		278.5
3145.724	10320.6	6.8	84.224	276.3	6.6	45.0	6.8		276.3
3148.313	10329.1	8.5	84.215	276.3	6.6	56.1	8.5		276.3
3148.638	10330.2	1.1	85.103	279.2	3.7	3.9	1.1		279.2
3150.902	10337.6	7.4	84.205	276.3	6.6	49.3	7.4		276.3
3153.491	10346.1	8.5	84.200	276.2	6.7	56.5	8.5		276.2
3153.636	10346.6	0.5	85.310	279.9	3.0	1.4	0.5		279.9
3156.080	10354.6	8.0	84.205	276.3	6.6	53.2	8.0		276.3
3158.634	10363.0	8.4	85.383	280.1	2.8	23.2	8.4		280.1
3158.669	10363.1	0.1	84.216	276.3	6.6	0.8	0.1		276.3
3161.258	10371.6	8.5	84.221	276.3	6.6	55.9	8.5		276.3
3163.632	10379.4	7.8	85.475	280.4	2.5	19.2	7.8		280.4
3163.847	10380.1	0.7	84.217	276.3	6.6	4.7	0.7		276.3
3166.436	10388.6	8.5	84.217	276.3	6.6	56.0	8.5		276.3
3168.629	10395.8	7.2	85.612	280.9	2.0	14.5	7.2		280.9
3169.025	10397.1	1.3	84.218	276.3	6.6	8.6	1.3		276.3
3171.614	10405.6	8.5	84.214	276.3	6.6	56.1	8.5		276.3
3173.627	10412.2	6.6	85.647	281.0	1.9	12.6	6.6		281.0

3174.203	10414.1	1.9	84.215	276.3	6.6	12.5	1.9		276.3
3176.793	10422.5	8.5	84.217	276.3	6.6	56.0	8.5		276.3
3178.625	10428.6	6.0	85.601	280.8	2.1	12.4	6.0		280.8
3179.382	10431.0	2.5	84.206	276.3	6.6	16.5	2.5		276.3
3181.971	10439.5	8.5	84.187	276.2	6.7	56.9	8.5		276.2
3183.623	10445.0	5.4	85.575	280.8	2.1	11.6	5.4		280.8
3184.560	10448.0	3.1	84.175	276.2	6.7	20.7	3.1		276.2
3188.621	10461.4	13.3	85.557	280.7	2.2	29.3	13.3		280.7
3193.619	10477.8	16.4	85.633	280.9	2.0	32.0	16.4		280.9
3198.616	10494.1	16.4	85.849	281.7	1.2	20.4	16.4		281.7
3203.614	10510.5	16.4	86.008	282.2	0.7	11.8	16.4		282.2
3208.612	10526.9	16.4	86.009	282.2	0.7	11.8	16.4		282.2
3213.610	10543.3	16.4	86.015	282.2	0.7	11.4	16.4		282.2
3218.608	10559.7	16.4	86.043	282.3	0.6	9.9	16.4		282.3
3223.606	10576.1	16.4	85.965	282.0	0.9	14.2	16.4		282.0
3228.603	10592.5	16.4	85.859	281.7	1.2	19.8	16.4		281.7
3233.601	10608.9	16.4	85.801	281.5	1.4	23.0	16.4		281.5
3238.599	10625.3	16.4	85.714	281.2	1.7	27.6	16.4		281.2
3243.597	10641.7	16.4	85.658	281.0	1.9	30.7	16.4		281.0
3248.595	10658.1	16.4	85.716	281.2	1.7	27.5	16.4		281.2
3253.593	10674.5	16.4	85.782	281.4	1.5	24.0	16.4		281.4
3258.590	10690.9	16.4	85.767	281.4	1.5	24.8	16.4		281.4
3263.588	10707.3	16.4	85.709	281.2	1.7	27.9	16.4		281.2
3268.586	10723.7	16.4	85.674	281.1	1.8	29.8	16.4		281.1
3273.584	10740.1	16.4	85.685	281.1	1.8	29.2	16.4		281.1
3278.582	10756.5	16.4	85.692	281.1	1.8	28.9	16.4		281.1
3283.580	10772.9	16.4	85.651	281.0	1.9	31.0	16.4		281.0
3288.577	10789.3	16.4	85.632	280.9	2.0	32.1	16.4		280.9
3293.575	10805.7	16.4	85.717	281.2	1.7	27.5	16.4		281.2
3298.573	10822.1	16.4	85.843	281.6	1.3	20.7	16.4		281.6
3303.571	10838.5	16.4	85.898	281.8	1.1	17.8	16.4		281.8
3308.569	10854.9	16.4	85.919	281.9	1.0	16.6	16.4		281.9
3313.567	10871.3	16.4	86.011	282.2	0.7	11.7	16.4		282.2
3318.564	10887.7	16.4	86.064	282.4	0.5	8.8	16.4		282.4
3323.562	10904.1	16.4	85.991	282.1	0.8	12.8	16.4		282.1
3328.560	10920.5	16.4	85.891	281.8	1.1	18.1	16.4		281.8
3333.558	10936.9	16.4	85.813	281.5	1.4	22.3	16.4		281.5
3338.556	10953.3	16.4	85.750	281.3	1.6	25.7	16.4		281.3
3343.554	10969.7	16.4	85.781	281.4	1.5	24.1	16.4		281.4
3348.552	10986.1	16.4	85.913	281.9	1.0	17.0	16.4		281.9
3353.549	11002.5	16.4	85.973	282.1	0.8	13.7	16.4		282.1
3358.547	11018.9	16.4	85.975	282.1	0.8	13.6	16.4		282.1
3363.545	11035.3	16.4	86.054	282.3	0.6	9.4	16.4		282.3
3368.543	11051.7	16.4	86.138	282.6	0.3	4.9	16.4		282.6
3373.541	11068.0	16.4	86.053	282.3	0.6	9.4	16.4		282.3
3378.539	11084.4	16.4	85.870	281.7	1.2	19.3	16.4		281.7
3383.536	11100.8	16.4	85.812	281.5	1.4	22.4	16.4		281.5

3388.534	11117.2	16.4	85.909	281.9	1.0	17.1	16.4		281.9
3393.532	11133.6	16.4	86.031	282.3	0.6	10.6	16.4		282.3
3398.530	11150.0	16.4	85.849	281.7	1.2	20.4	16.4		281.7
3403.528	11166.4	16.4	85.234	279.6	3.3	53.5	16.4		279.6
3408.526	11182.8	16.4	84.598	277.6	5.3	87.7	16.4		277.6
3413.523	11199.2	16.4	84.105	275.9	7.0	114.2	16.4		275.9
3418.521	11215.6	16.4	84.100	275.9	7.0	114.5	16.4		275.9
3423.519	11232.0	16.4	84.101	275.9	7.0	114.4	16.4		275.9
3428.517	11248.4	16.4	84.107	275.9	7.0	114.1	16.4		275.9
3433.515	11264.8	16.4	84.149	276.1	6.8	111.8	16.4		276.1
3438.513	11281.2	16.4	84.350	276.7	6.2	101.0	16.4		276.7
3443.510	11297.6	16.4	84.717	277.9	5.0	81.3	16.4		277.9
3448.508	11314.0	16.4	85.143	279.3	3.6	58.3	16.4		279.3
3453.506	11330.4	16.4	85.354	280.0	2.9	47.0	16.4		280.0
3458.504	11346.8	16.4	85.470	280.4	2.5	40.8	16.4		280.4
3463.502	11363.2	16.4	85.498	280.5	2.4	39.3	16.4		280.5
3468.500	11379.6	16.4	85.401	280.2	2.7	44.5	16.4		280.2
3473.497	11396.0	16.4	85.335	280.0	2.9	48.0	16.4		280.0
3478.495	11412.4	16.4	85.437	280.3	2.6	42.5	16.4		280.3
3483.493	11428.8	16.4	85.667	281.1	1.8	30.2	16.4		281.1
3488.491	11445.2	16.4	85.801	281.5	1.4	23.0	16.4		281.5
3493.489	11461.6	16.4	85.695	281.2	1.7	28.7	16.4		281.2
3498.487	11478.0	16.4	85.619	280.9	2.0	32.8	16.4		280.9
3503.484	11494.4	16.4	85.664	281.0	1.9	30.3	16.4		281.0
3508.482	11510.8	16.4	85.708	281.2	1.7	28.0	16.4		281.2
3513.480	11527.2	16.4	85.695	281.2	1.7	28.7	16.4		281.2
3518.478	11543.6	16.4	85.610	280.9	2.0	33.3	16.4		280.9
3523.476	11560.0	16.4	85.551	280.7	2.2	36.4	16.4		280.7
3528.474	11576.4	16.4	85.518	280.6	2.3	38.2	16.4		280.6
3533.472	11592.8	16.4	85.490	280.5	2.4	39.7	16.4		280.5
3538.469	11609.2	16.4	85.472	280.4	2.5	40.6	16.4		280.4
3543.467	11625.5	16.4	85.478	280.4	2.5	40.4	16.4		280.4
3548.465	11641.9	16.4	85.546	280.7	2.2	36.7	16.4		280.7
3553.463	11658.3	16.4	85.779	281.4	1.5	24.2	16.4		281.4
3558.461	11674.7	16.4	85.989	282.1	0.8	12.9	16.4		282.1
3563.459	11691.1	16.4	86.063	282.4	0.5	8.9	16.4		282.4
3568.456	11707.5	16.4	86.087	282.4	0.5	7.6	16.4		282.4
3573.454	11723.9	16.4	86.182	282.7	0.2	2.5	16.4		282.7
3578.452	11740.3	16.4	86.239	282.9					282.9
3583.450	11756.7	16.4	85.985	282.1	0.8	13.1	16.4		282.1
3588.448	11773.1	16.4	85.530	280.6	2.3	37.6	16.4		280.6
3593.446	11789.5	16.4	85.208	279.6	3.3	54.9	16.4		279.6
3598.443	11805.9	16.4	85.110	279.2	3.7	60.2	16.4		279.2
3603.441	11822.3	16.4	85.270	279.8	3.1	51.5	16.4		279.8
3608.439	11838.7	16.4	85.334	280.0	2.9	48.1	16.4		280.0
3613.437	11855.1	16.4	85.279	279.8	3.1	51.0	16.4		279.8
3618.435	11871.5	16.4	85.263	279.7	3.2	51.9	16.4		279.7

3623.433	11887.9	16.4	85.286	279.8	3.1	50.7	16.4	279.8
3628.430	11904.3	16.4	85.290	279.8	3.1	50.4	16.4	279.8
3633.428	11920.7	16.4	85.224	279.6	3.3	54.0	16.4	279.6
3638.426	11937.1	16.4	85.186	279.5	3.4	56.1	16.4	279.5
3643.424	11953.5	16.4	85.278	279.8	3.1	51.1	16.4	279.8
3648.422	11969.9	16.4	85.399	280.2	2.7	44.6	16.4	280.2
3653.420	11986.3	16.4	85.453	280.4	2.5	41.7	16.4	280.4
3658.417	12002.7	16.4	85.498	280.5	2.4	39.3	16.4	280.5
3663.415	12019.1	16.4	85.560	280.7	2.2	35.9	16.4	280.7
3668.413	12035.5	16.4	85.575	280.8	2.1	35.1	16.4	280.8
3673.411	12051.9	16.4	85.512	280.6	2.3	38.5	16.4	280.6
3678.409	12068.3	16.4	85.456	280.4	2.5	41.5	16.4	280.4
3683.407	12084.7	16.4	85.348	280.0	2.9	47.4	16.4	280.0
3688.405	12101.1	16.4	85.061	279.1	3.8	62.8	16.4	279.1
3693.402	12117.5	16.4	84.577	277.5	5.4	88.8	16.4	277.5
3698.400	12133.9	16.4	84.400	276.9	6.0	98.3	16.4	276.9
3703.398	12150.3	16.4	84.400	276.9	6.0	98.3	16.4	276.9
3708.396	12166.7	16.4	84.400	276.9	6.0	98.3	16.4	276.9
3713.394	12183.1	16.4	84.400	276.9	6.0	98.3	16.4	276.9
3718.392	12199.4	16.4	84.400	276.9	6.0	98.3	16.4	276.9
3723.389	12215.8	16.4	84.400	276.9	6.0	98.3	16.4	276.9
3728.387	12232.2	16.4	84.400	276.9	6.0	98.3	16.4	276.9
3733.385	12248.6	16.4	84.850	278.4	4.5	74.1	16.4	278.4
3738.383	12265.0	16.4	85.827	281.6	1.3	21.6	16.4	281.6
3743.381	12281.4	16.4	86.244	283.0				283.0
3748.379	12297.8	16.4	86.216	282.9	0.0	0.7	16.4	282.9
3753.376	12314.2	16.4	86.257	283.0				283.0
3758.374	12330.6	16.4	86.396	283.5				283.5
3763.372	12347.0	16.4	86.585	284.1				284.1
3768.370	12363.4	16.4	86.716	284.5				284.5
3773.368	12379.8	16.4	86.752	284.6				284.6
3778.366	12396.2	16.4	86.721	284.5				284.5
3783.363	12412.6	16.4	86.659	284.3				284.3
3788.361	12429.0	16.4	86.570	284.0				284.0
3793.359	12445.4	16.4	86.483	283.7				283.7
3798.357	12461.8	16.4	86.450	283.6				283.6
3803.355	12478.2	16.4	86.451	283.6				283.6
3808.353	12494.6	16.4	86.458	283.7				283.7
3813.350	12511.0	16.4	86.529	283.9				283.9
3818.348	12527.4	16.4	86.736	284.6				284.6
3823.346	12543.8	16.4	86.907	285.1				285.1
3828.344	12560.2	16.4	86.801	284.8				284.8
3833.342	12576.6	16.4	86.633	284.2				284.2
3838.340	12593.0	16.4	86.629	284.2				284.2
3843.337	12609.4	16.4	86.604	284.1				284.1
3848.335	12625.8	16.4	86.441	283.6				283.6
3853.333	12642.2	16.4	86.283	283.1				283.1

3858.331	12658.6	16.4	86.205	282.8	0.1	1.2	16.4		282.8
3863.329	12675.0	16.4	86.211	282.8	0.1	0.9	16.4		282.8
3868.327	12691.4	16.4	86.315	283.2					283.2
3873.325	12707.8	16.4	86.379	283.4					283.4
3878.322	12724.2	16.4	86.326	283.2					283.2
3883.320	12740.6	16.4	86.174	282.7	0.2	2.9	16.4		282.7
3888.318	12756.9	16.4	85.896	281.8	1.1	17.9	16.4		281.8
3893.316	12773.3	16.4	85.343	280.0	2.9	47.6	16.4		280.0
3898.314	12789.7	16.4	84.800	278.2	4.7	76.8	16.4		278.2
3903.312	12806.1	16.4	84.800	278.2	4.7	76.8	16.4		278.2
3908.309	12822.5	16.4	84.800	278.2	4.7	76.8	16.4		278.2
3913.307	12838.9	16.4	84.800	278.2	4.7	76.8	16.4		278.2
3918.305	12855.3	16.4	85.127	279.3	3.6	59.3	16.4		279.3
3923.303	12871.7	16.4	85.719	281.2	1.7	27.4	16.4		281.2
3928.301	12888.1	16.4	85.606	280.9	2.0	33.4	16.4		280.9
3933.299	12904.5	16.4	85.369	280.1	2.8	46.2	16.4		280.1
3938.296	12920.9	16.4	85.262	279.7	3.2	52.0	16.4		279.7
3943.294	12937.3	16.4	85.304	279.9	3.0	49.7	16.4		279.9
3948.292	12953.7	16.4	85.543	280.7	2.2	36.9	16.4		280.7
3953.290	12970.1	16.4	85.784	281.4	1.5	23.9	16.4		281.4
3958.288	12986.5	16.4	85.778	281.4	1.5	24.2	16.4		281.4
3963.286	13002.9	16.4	85.710	281.2	1.7	27.9	16.4		281.2
3968.283	13019.3	16.4	85.716	281.2	1.7	27.6	16.4		281.2
3973.281	13035.7	16.4	85.803	281.5	1.4	22.9	16.4		281.5
3978.279	13052.1	16.4	85.948	282.0	0.9	15.0	16.4		282.0
3983.277	13068.5	16.4	86.075	282.4	0.5	8.2	16.4		282.4
3988.275	13084.9	16.4	86.105	282.5	0.4	6.6	16.4		282.5
3993.273	13101.3	16.4	85.995	282.1	0.8	12.5	16.4		282.1
3998.270	13117.7	16.4	85.750	281.3	1.6	25.7	16.4		281.3
4003.268	13134.1	16.4	85.353	280.0	2.9	47.0	16.4		280.0
4008.266	13150.5	16.4	84.724	278.0	4.9	80.9	16.4		278.0
4013.264	13166.9	16.4	84.666	277.8	5.1	84.0	16.4		277.8
4018.262	13183.3	16.4	85.117	279.3	3.6	59.7	16.4		279.3
4023.260	13199.7	16.4	85.235	279.6	3.3	53.4	16.4		279.6
4028.257	13216.1	16.4	85.471	280.4	2.5	40.7	16.4		280.4
4033.255	13232.5	16.4	85.692	281.1	1.8	28.9	16.4		281.1
4038.253	13248.9	16.4	85.740	281.3	1.6	26.3	16.4		281.3
4043.251	13265.3	16.4	85.680	281.1	1.8	29.5	16.4		281.1
4048.249	13281.7	16.4	85.838	281.6	1.3	21.0	16.4		281.6
4053.247	13298.1	16.4	86.341	283.3					283.3
4058.245	13314.5	16.4	86.486	283.7					283.7
4063.242	13330.8	16.4	86.102	282.5	0.4	6.8	16.4		282.5
4068.240	13347.2	16.4	85.824	281.6	1.3	21.7	16.4		281.6
4073.238	13363.6	16.4	85.846	281.6	1.3	20.5	16.4		281.6
4078.236	13380.0	16.4	85.893	281.8	1.1	18.0	16.4		281.8
4083.234	13396.4	16.4	85.865	281.7	1.2	19.5	16.4		281.7
4088.232	13412.8	16.4	85.820	281.6	1.3	21.9	16.4		281.6

4093.229	13429.2	16.4	85.713	281.2	1.7	27.7	16.4		281.2
4098.227	13445.6	16.4	85.537	280.6	2.3	37.1	16.4		280.6
4103.225	13462.0	16.4	85.363	280.1	2.8	46.5	16.4		280.1
4108.223	13478.4	16.4	85.194	279.5	3.4	55.6	16.4		279.5
4113.221	13494.8	16.4	84.989	278.8	4.1	66.6	16.4		278.8
4118.219	13511.2	16.4	84.421	277.0	5.9	97.2	16.4		277.0
4123.216	13527.6	16.4	84.406	276.9	6.0	98.0	16.4		276.9
4128.214	13544.0	16.4	84.500	277.2	5.7	93.0	16.4		277.2
4133.212	13560.4	16.4	84.503	277.2	5.7	92.8	16.4		277.2
4138.210	13576.8	16.4	84.600	277.6	5.3	87.6	16.4		277.6
4143.208	13593.2	16.4	84.818	278.3	4.6	75.9	16.4		278.3
4148.206	13609.6	16.4	85.440	280.3	2.6	42.4	16.4		280.3
4153.203	13626.0	16.4	85.615	280.9	2.0	33.0	16.4		280.9
4158.201	13642.4	16.4	85.521	280.6	2.3	38.0	16.4		280.6
4163.199	13658.8	16.4	85.461	280.4	2.5	41.3	16.4		280.4
4168.197	13675.2	16.4	85.376	280.1	2.8	45.8	16.4		280.1
4173.195	13691.6	16.4	85.325	279.9	3.0	48.6	16.4		279.9
4178.193	13708.0	16.4	85.382	280.1	2.8	45.5	16.4		280.1
4183.190	13724.4	16.4	85.326	279.9	3.0	48.5	16.4		279.9
4188.188	13740.8	16.4	85.141	279.3	3.6	58.5	16.4		279.3
4193.186	13757.2	16.4	84.934	278.7	4.2	69.6	16.4		278.7
4198.184	13773.6	16.4	84.923	278.6	4.3	70.2	16.4		278.6
4203.182	13790.0	16.4	85.257	279.7	3.2	52.2	16.4		279.7
4208.180	13806.4	16.4	85.605	280.9	2.0	33.5	16.4		280.9
4213.178	13822.8	16.4	85.763	281.4	1.5	25.0	16.4		281.4
4218.175	13839.2	16.4	85.868	281.7	1.2	19.4	16.4		281.7
4223.173	13855.6	16.4	85.885	281.8	1.1	18.5	16.4		281.8
4228.171	13872.0	16.4	85.829	281.6	1.3	21.5	16.4		281.6
4233.169	13888.3	16.4	85.714	281.2	1.7	27.6	16.4		281.2
4238.167	13904.7	16.4	85.558	280.7	2.2	36.0	16.4		280.7
4243.165	13921.1	16.4	85.504	280.5	2.4	38.9	16.4		280.5
4248.162	13937.5	16.4	85.570	280.7	2.2	35.4	16.4		280.7
4253.160	13953.9	16.4	85.615	280.9	2.0	33.0	16.4		280.9
4258.158	13970.3	16.4	85.583	280.8	2.1	34.7	16.4		280.8
4263.156	13986.7	16.4	85.450	280.3	2.6	41.8	16.4		280.3
4268.154	14003.1	16.4	85.398	280.2	2.7	44.6	16.4		280.2
4273.152	14019.5	16.4	85.446	280.3	2.6	42.1	16.4		280.3
4278.149	14035.9	16.4	85.356	280.0	2.9	46.9	16.4		280.0
4283.147	14052.3	16.4	85.430	280.3	2.6	42.9	16.4		280.3
4288.145	14068.7	16.4	85.810	281.5	1.4	22.5	16.4		281.5
4293.143	14085.1	16.4	85.968	282.0	0.9	14.0	16.4		282.0
4298.141	14101.5	16.4	85.820	281.6	1.3	21.9	16.4		281.6
4303.139	14117.9	16.4	85.295	279.8	3.1	50.2	16.4		279.8
4308.136	14134.3	16.4	84.397	276.9	6.0	98.5	16.4		276.9
4313.134	14150.7	16.4	84.200	276.2	6.7	109.1	16.4		276.2
4318.132	14167.1	16.4	84.846	278.4	4.5	74.3	16.4		278.4
4323.130	14183.5	16.4	84.423	277.0	5.9	97.1	16.4		277.0

4328.128	14199.9	16.4	84.233	276.4	6.5	107.3	16.4		276.4
4333.126	14216.3	16.4	84.207	276.3	6.6	108.7	16.4		276.3
4338.123	14232.7	16.4	84.200	276.2	6.7	109.1	16.4		276.2
4343.121	14249.1	16.4	85.185	279.5	3.4	56.1	16.4		279.5
4348.119	14265.5	16.4	85.664	281.1	1.8	30.3	16.4		281.1
4353.117	14281.9	16.4	85.479	280.4	2.5	40.3	16.4		280.4
4358.115	14298.3	16.4	85.429	280.3	2.6	43.0	16.4		280.3
4363.113	14314.7	16.4	85.593	280.8	2.1	34.2	16.4		280.8
4368.110	14331.1	16.4	85.575	280.8	2.1	35.1	16.4		280.8
4373.108	14347.5	16.4	85.322	279.9	3.0	48.8	16.4		279.9
4378.106	14363.9	16.4	84.363	276.8	6.1	100.3	16.4		276.8
4383.104	14380.3	16.4	84.000	275.6	7.3	119.9	16.4		275.6
4388.102	14396.7	16.4	84.000	275.6	7.3	119.9	16.4		275.6
4393.100	14413.1	16.4	84.000	275.6	7.3	119.9	16.4		275.6
4398.098	14429.5	16.4	84.000	275.6	7.3	119.9	16.4		275.6
4403.095	14445.9	16.4	84.277	276.5	6.4	104.9	16.4		276.5
4408.093	14462.2	16.4	84.738	278.0	4.9	80.1	16.4		278.0
4413.091	14478.6	16.4	84.697	277.9	5.0	82.4	16.4		277.9
4418.089	14495.0	16.4	84.498	277.2	5.7	93.1	16.4		277.2
4423.087	14511.4	16.4	84.716	277.9	5.0	81.3	16.4		277.9
4428.085	14527.8	16.4	85.012	278.9	4.0	65.4	16.4		278.9
4433.082	14544.2	16.4	85.195	279.5	3.4	55.5	16.4		279.5
4438.080	14560.6	16.4	85.258	279.7	3.2	52.2	16.4		279.7
4443.078	14577.0	16.4	85.292	279.8	3.1	50.3	16.4		279.8
4448.076	14593.4	16.4	85.467	280.4	2.5	40.9	16.4		280.4
4453.074	14609.8	16.4	85.711	281.2	1.7	27.8	16.4		281.2
4458.072	14626.2	16.4	85.861	281.7	1.2	19.7	16.4		281.7
4463.069	14642.6	16.4	85.931	281.9	1.0	16.0	16.4		281.9
4468.067	14659.0	16.4	86.010	282.2	0.7	11.7	16.4		282.2
4473.065	14675.4	16.4	86.160	282.7	0.2	3.7	16.4		282.7
4478.063	14691.8	16.4	86.320	283.2					283.2
4483.061	14708.2	16.4	86.479	283.7					283.7
4488.059	14724.6	16.4	86.630	284.2					284.2
4493.056	14741.0	16.4	86.731	284.6					284.6
4498.054	14757.4	16.4	86.837	284.9					284.9
4503.052	14773.8	16.4	86.996	285.4					285.4
4508.050	14790.2	16.4	87.154	285.9					285.9
4513.048	14806.6	16.4	87.304	286.4					286.4
4518.046	14823.0	16.4	87.554	287.2					287.2
4523.043	14839.4	16.4	87.833	288.2					288.2
4528.041	14855.8	16.4	88.046	288.9					288.9
4533.039	14872.2	16.4	88.352	289.9					289.9
4538.037	14888.6	16.4	88.813	291.4					291.4
4543.035	14905.0	16.4	89.363	293.2					293.2
4548.033	14921.4	16.4	90.076	295.5					295.5
4553.030	14937.8	16.4	90.919	298.3					298.3
4558.028	14954.2	16.4	91.698	300.8					300.8

4563.026	14970.6	16.4	92.314	302.9		302.9
4568.024	14987.0	16.4	92.921	304.9		304.9
4573.022	15003.4	16.4	93.737	307.5		307.5
4578.020	15019.8	16.4	94.529	310.1		310.1
4583.018	15036.1	16.4	95.039	311.8		311.8
4588.015	15052.5	16.4	95.618	313.7		313.7
4593.013	15068.9	16.4	96.313	316.0		316.0
4598.011	15085.3	16.4	96.870	317.8		317.8
4603.009	15101.7	16.4	97.483	319.8		319.8
4608.007	15118.1	16.4	98.377	322.8		322.8
4613.005	15134.5	16.4	99.370	326.0		326.0
4618.002	15150.9	16.4	100.215	328.8		328.8
4623.000	15167.3	16.4	101.008	331.4		331.4
4627.998	15183.7	16.4	101.909	334.3		334.3
4632.996	15200.1	16.4	102.691	336.9		336.9
4637.994	15216.5	16.4	103.421	339.3		339.3
4642.992	15232.9	16.4	104.374	342.4		342.4
4647.989	15249.3	16.4	105.347	345.6		345.6
4652.987	15265.7	16.4	106.208	348.5		348.5
4657.985	15282.1	16.4	107.134	351.5		351.5
4662.983	15298.5	16.4	108.326	355.4		355.4
4667.981	15314.9	16.4	110.050	361.1		361.1
4672.979	15331.3	16.4	111.394	365.5		365.5
4677.976	15347.7	16.4	112.205	368.1		368.1
4682.974	15364.1	16.4	113.038	370.9		370.9
4687.972	15380.5	16.4	114.069	374.2		374.2
4692.970	15396.9	16.4	115.471	378.8		378.8
4697.968	15413.3	16.4	118.277	388.0		388.0
4702.966	15429.7	16.4	120.819	396.4		396.4
4707.963	15446.1	16.4	122.127	400.7		400.7
4712.961	15462.5	16.4	126.188	414.0		414.0
4717.959	15478.9	16.4	128.299	420.9		420.9
4722.957	15495.3	16.4	129.307	424.2		424.2
4727.955	15511.7	16.4	130.847	429.3		429.3
4732.953	15528.1	16.4	133.505	438.0		438.0
4737.951	15544.5	16.4	134.355	440.8		440.8
4742.948	15560.9	16.4	132.864	435.9		435.9
4747.946	15577.3	16.4	132.434	434.5		434.5
4752.944	15593.6	16.4	133.005	436.4		436.4
4757.942	15610.0	16.4	133.103	436.7		436.7
4762.940	15626.4	16.4	132.190	433.7		433.7
4767.938	15642.8	16.4	131.877	432.7		432.7
4772.935	15659.2	16.4	132.138	433.5		433.5
4777.933	15675.6	16.4	132.423	434.5		434.5
4782.931	15692.0	16.4	133.003	436.4		436.4
4787.929	15708.4	16.4	133.893	439.3		439.3
4792.927	15724.8	16.4	134.965	442.8		442.8

4797.925	15741.2	16.4	135.793	445.5	445.5
4802.922	15757.6	16.4	136.569	448.1	448.1
4807.920	15774.0	16.4	138.251	453.6	453.6
4812.918	15790.4	16.4	140.726	461.7	461.7
4817.916	15806.8	16.4	146.660	481.2	481.2
4822.914	15823.2	16.4	150.053	492.3	492.3
4827.912	15839.6	16.4	150.205	492.8	492.8
4832.909	15856.0	16.4	151.025	495.5	495.5
4837.907	15872.4	16.4	151.215	496.1	496.1
4842.905	15888.8	16.4	151.970	498.6	498.6
4847.903	15905.2	16.4	152.835	501.4	501.4
4852.901	15921.6	16.4	153.849	504.8	504.8
4857.899	15938.0	16.4	154.962	508.4	508.4
4862.896	15954.4	16.4	156.544	513.6	513.6
4867.894	15970.8	16.4	159.017	521.7	521.7
4872.892	15987.2	16.4	160.875	527.8	527.8
4877.890	16003.6	16.4	162.119	531.9	531.9
4882.888	16020.0	16.4	163.524	536.5	536.5
4887.886	16036.4	16.4	165.080	541.6	541.6
4892.883	16052.8	16.4	167.047	548.1	548.1
4897.881	16069.2	16.4	169.438	555.9	555.9
4902.879	16085.6	16.4	172.424	565.7	565.7
4907.877	16102.0	16.4	174.653	573.0	573.0
4912.875	16118.4	16.4	178.957	587.1	587.1
4917.873	16134.8	16.4	181.194	594.5	594.5
4922.871	16151.2	16.4	183.118	600.8	600.8
4927.868	16167.5	16.4	185.822	609.7	609.7
4932.866	16183.9	16.4	189.519	621.8	621.8
4937.864	16200.3	16.4	192.277	630.8	630.8
4942.862	16216.7	16.4	193.783	635.8	635.8
4947.860	16233.1	16.4	194.752	638.9	638.9
4952.858	16249.5	16.4	196.113	643.4	643.4
4957.855	16265.9	16.4	197.432	647.7	647.7
4962.853	16282.3	16.4	199.301	653.9	653.9
4967.851	16298.7	16.4	201.455	660.9	660.9
4972.849	16315.1	16.4	202.892	665.7	665.7
4977.847	16331.5	16.4	203.847	668.8	668.8
4982.845	16347.9	16.4	204.579	671.2	671.2
4987.842	16364.3	16.4	205.273	673.5	673.5
4992.840	16380.7	16.4	205.914	675.6	675.6
4997.838	16397.1	16.4	206.551	677.7	677.7
5002.836	16413.5	16.4	207.265	680.0	680.0
5007.834	16429.9	16.4	207.898	682.1	682.1
5012.832	16446.3	16.4	208.317	683.5	683.5
5017.829	16462.7	16.4	208.605	684.4	684.4
5022.827	16479.1	16.4	208.882	685.3	685.3
5027.825	16495.5	16.4	209.198	686.3	686.3

5032.823	16511.9	16.4	209.484	687.3		687.3
5037.821	16528.3	16.4	209.687	687.9		687.9
5042.819	16544.7	16.4	209.796	688.3		688.3
5047.816	16561.1	16.4	209.903	688.7		688.7
5052.814	16577.5	16.4	209.989	688.9		688.9
5057.812	16593.9	16.4	210.061	689.2		689.2
5062.810	16610.3	16.4	210.277	689.9		689.9
5067.808	16626.7	16.4	210.570	690.8		690.8
5072.806	16643.1	16.4	210.735	691.4		691.4
5077.803	16659.5	16.4	210.756	691.5		691.5
5082.801	16675.9	16.4	210.723	691.3		691.3
5087.799	16692.3	16.4	210.709	691.3		691.3
5092.797	16708.7	16.4	210.751	691.4		691.4
5097.795	16725.0	16.4	210.821	691.7		691.7
5102.793	16741.4	16.4	210.884	691.9		691.9
5107.791	16757.8	16.4	210.903	691.9		691.9
5112.788	16774.2	16.4	210.895	691.9		691.9
5117.786	16790.6	16.4	210.884	691.9		691.9
5122.784	16807.0	16.4	210.838	691.7		691.7
5127.782	16823.4	16.4	210.829	691.7		691.7
5132.780	16839.8	16.4	210.867	691.8		691.8
5137.778	16856.2	16.4	210.868	691.8		691.8
5142.775	16872.6	16.4	210.814	691.6		691.6
5147.773	16889.0	16.4	210.775	691.5		691.5
5152.771	16905.4	16.4	210.803	691.6		691.6
5157.769	16921.8	16.4	210.870	691.8		691.8
5162.767	16938.2	16.4	210.883	691.9		691.9
5167.765	16954.6	16.4	210.804	691.6		691.6
5172.762	16971.0	16.4	210.706	691.3		691.3
5177.760	16987.4	16.4	210.659	691.1		691.1
5182.758	17003.8	16.4	210.605	691.0		691.0
5187.756	17020.2	16.4	210.498	690.6		690.6
5192.754	17036.6	16.4	210.370	690.2		690.2
5197.752	17053.0	16.4	210.257	689.8		689.8
5202.749	17069.4	16.4	210.149	689.5		689.5
5207.747	17085.8	16.4	210.005	689.0		689.0
5212.745	17102.2	16.4	209.808	688.3		688.3
5217.743	17118.6	16.4	209.514	687.4		687.4
5222.741	17135.0	16.4	209.132	686.1		686.1
5227.739	17151.4	16.4	208.789	685.0		685.0
5232.736	17167.8	16.4	208.556	684.2		684.2
5237.734	17184.2	16.4	208.377	683.7		683.7
5242.732	17200.6	16.4	208.207	683.1		683.1
5247.730	17217.0	16.4	208.005	682.4		682.4
5252.728	17233.4	16.4	207.718	681.5		681.5
5257.726	17249.8	16.4	207.480	680.7		680.7
5262.724	17266.2	16.4	207.391	680.4		680.4

5267.721	17282.6	16.4	207.312	680.2	680.2
	0.0	0.0		0.0	

Mannings equation spreadsheet:

Entar data into the appropriate blue cells only

$$V = \frac{1.49}{n} R^{\frac{2}{3}} s^{\frac{1}{2}}$$

Q=VA

$$Q = \frac{1.49}{n} A R^{\frac{2}{3}} s^{\frac{1}{2}}$$

For a rectangular channel:

w (ft)	8261.725
Averagae d (ft)	3.6
A = wd (ft^2)	29909.47
P = 2d+w (ft)	8268.966
R = A/P	3.617075
Manning's n	0.053
s (slope ws)	0.002151

V (ft/s)	**3.060787**	
Q (cfs)	**91546.52**	Compare with Q entered below for accuracy

Q is known and d is unknown:

In wide channels, R may be approximated as d.

$$Q = \frac{1.49}{n} A d^{\frac{2}{3}} s^{\frac{1}{2}} \quad \text{or } Q = \frac{1.49}{n} w d^{\frac{5}{3}} s^{\frac{1}{2}}$$

$$d = \left(\frac{Qn}{1.49 w s^{\frac{1}{2}}}\right)^{\frac{3}{5}}$$

Q (cfs)	91,600
Manning's n	0.053
w (ft)	8262
s	0.002151

Average d (ft)	**3.6**

Manning's n estimate

	Weighted Avg n	In-chan	Overbank	Bank	
	0.053	0.04	0.05	0.15	n
		grav/cob	tundra	Shrub	type
Total W:	8262	5618	1818	826	width (ft)
Total %	100%	68.0%	22%	10%	%

Manning's n estimates from Kane et al (2003)

Active channel	5623.73
Total flooded channel	8262
Percent channel	68.1%

Estimate 0.02 percent annual flood

31,300	from regression equations between gage and MP 37
60300	weighted average for .02 percent flood at the Sagwon pumping station gage. Note the gage estimate is much higher. Should adjust regression estimate with gage data.
91,600	Total

Estimate slope from google earth

Upstream elevation	299	feet
Downstream elevation	250	feet
Distance	22781	feet
Slope	0.002151	