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Floodplain Mapping in Response to Surface Mine Reclamation

Erin E. O’Leary

**Thesis submitted to the
Benjamin M. Statler College of Engineering and Mineral Resources
At West Virginia University
In partial fulfillment of the requirements for the degree of**

**Master of Science
In
Civil Engineering**

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Dr. John D. Quaranta, Ph.D.
Dr. Antar Jutla, Ph.D.**

Department of Civil and Environmental Engineering

**Morgantown, West Virginia
2014**

**Keywords: valley fill, modeling, geomorphic design,
surface mine reclamation
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Abstract

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Surface mining and the associated reclamation cause changes in land use and land cover. This change can affect the hydrologic balance. In some cases, an increase in number and magnitude of flood events is observed both on site and in surrounding areas. This research analyzed the hydrologic effects downstream of a reclaimed surface mine, considering the impact of an alternative reclamation technique. Geomorphic landform design (GLD) is a reclamation method that considers the development mature landform shapes to help create a long-term hydrologic balance. Flood maps were created for the pre-mined condition and compared to maps created for three reclamation conditions: conventional reclamation, GLD (During mining) reclamation, and GLD (Post-mining) reclamation. The valleyfill and study site is located in southern West Virginia. Approximately 2.1 km of the adjacent downstream channel were evaluated. The study area receives 101.6-127 cm precipitation annually and has a basin slope range of 0.44-0.56 m/m. GIS data were used to develop a schematic of the downstream channel. Cross-sections were extracted from a triangulated irregular network (TIN) developed from 1/9-arc-second elevation data. These geometric data and projected stormflow hydrographs for seven storm events were used to develop both steady and unsteady flow 1-D hydraulic models (HEC-RAS). The resulting water surface elevations were used to display flooding extents over time resulting from each reclamation condition. For smaller storm events (e.g. 2-yr), conventional reclamation resulted in decreased flooding, and increased flooding was observed for large storm events (e.g. 100-yr, 500-yr). The GLD (During mining) reclamation condition resulted in increased flooding; this increase was mitigated with time. The GLD (Post-mining) results were comparable to those of the pre-mining condition. GLD has the potential to mitigate flooding impacts from surface mining in the long-term in southern West Virginia, but is dependent on properly sized channels and stability of landforms.

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1 Introduction

1.1 Background

From 1973 to 2000, the leading cause of land use/land cover (LULC) change in Central Appalachia has been associated with mining, specifically surface mining and its subsequent reclamation (Climate Change Science Program 2003, Ferrari et al. 2009). This method of coal mining dramatically alters topography, vegetation, surface and subsurface properties, and potentially hydrologic response (Phillips 2004). Studies have shown that surface mines and valley fills tend to increase the runoff and decrease the surface detention time of the area (Phillips 2004). Flood magnitudes have been found to increase linearly as the percentage of land affected in the watershed increases. Earthmovers used during reclamation compact the soil and decrease infiltration rates up to 2 orders of magnitude, compared to undisturbed forest. The trends of LULC from surface mining and reclamation are similar to those of urbanization (Ferrari et al. 2009). Changes in hydrologic response associated with urbanization are typically mitigated with stormwater management practices; whereas LULC associated with both active and reclaimed surface mines tend to lack sufficient stormwater management (Phillips 2004).

Studies have also found long-term trends of increased precipitation (Leonard and Law 2004) and precipitation intensity (Pitchford et al. 2012) for the majority of West Virginia. These climate changes also demonstrate an increased number of extreme events that are expected to increase in the future (Kharin and Zwiers 2005). The increase of extreme events in combination with landuse change has potential to greatly increase flooding impacts.

These changes caused by surface mining and associated reclamation can increase the flow output into the headwaters of the adjoining channel and cause flooding. The downstream effects of surface mining and associated reclamation strongly depend on local conditions. Because of this, prediction of outcomes should be done on a case-by-case basis (Phillips 2004, Graf 2001). Floodplain maps are tools used to display flood extents of a channel into the surrounding areas based on water surface elevations of a given storm. Flood extent data can be combined with other data such as maps displaying critical infrastructure (bridges, roads, etc.), buildings (hospitals, etc.), and homes, to analyze the effects of the land use change when various storm events occur (Wurbs and James 2002). This work examines potential flooding impacts resulting from an alternate reclamation technique, geomorphic landform design (Phillips 2004).

1.2 Goals and Objectives

The objective of this research was to explore the potential application of geomorphic landform design (GLD) techniques for surface mine reclamation in southern West Virginia. Specific goals were to model the downstream flooding effects of four different conditions: Pre-mining, conventional reclamation, GLD (During mining) reclamation, and GLD (Post-mining) reclamation. Both cross-sectional properties (area, velocity, maximum depth, etc.) and flood extents were analyzed for various storm events. The conventional reclamation and both GLD reclamation conditions were compared to the pre-mining condition. The steps to achieve these objectives included obtaining geometric data for the study site, developing a hydraulic model, creating flood maps for each condition studied, and analyzing the results to find which reclamation technique to be most comparable to the pre-mining condition.

2 Literature Review

2.1 Techniques and Development

The basic process of floodplain delineation involves comparing water surface elevations with ground surface elevations. Observed water level points are marked on a topographic map, and then extended until intersection with a higher elevation contour. The points where water and land intersect are connected together by contour lines to form the extent of inundation (Noman et al. 2001). Development of floodplain delineation typically consists of six steps. First, determine a design flow. This flow can be estimated from a hydrologic model or statistical analysis. Then acquire channel geometry data of the study area. A hydraulic model is then developed using the previously established design flow and channel geometry data to compute water surface elevations and associated hydraulic parameters. The resulting water surface elevations are mapped to create a water level surface. Water depth is then determined by subtracting the ground surface elevations from the water surface elevations. The areas with positive values result in the flood inundation map (Merwade et al. 2008, Noman et al. 2001).

Manually delineating inundated areas on topographic maps can be a tedious and time-consuming process (Noman et al. 2001, Yang et al. 2006). Developments in linking hydraulic modeling and GIS have led to more sophisticated methods in floodplain mapping. Hydraulic modeling parameters can be extracted from a digital terrain model (DTM) and then imported into the hydraulic model. Output from the hydraulic model is then processed for display and analysis in GIS (Noman et al. 2001, Tate et al. 2002, Merwade et al. 2008).

Multiple features influence the accuracy of floodplain delineation due to uncertainties from the design flow, terrain data, hydraulic model, and mapping techniques (Yang et al. 2006, Merwade et al. 2008). The most important attribute of the modern floodplain delineation process is the accuracy and resolution of the DTM (Casas et al. 2006). Light detection and ranging (LiDAR) is commonly used as a source of topographic data for developing DTMs, although it cannot penetrate the water surface (Merwade et al. 2005) and generally overestimates inundation extent predictions compared to predictions based on surveyed data (Shatnawi and Goodall 2010). Casas (2006) assessed various DTMs developed from three different altimetric sources (GPS survey and bathymetry, LiDAR, and vectorial cartography (1:5000 scale)) for accuracy and cost-

effectiveness in hydraulic modeling of floods. The study found LiDAR (as the only elevation data source) as a suitable source for obtaining channel parameters and floodplain topography, especially in hydraulic modeling. The addition of surveyed points can improve DTMs developed by LiDAR.

2.2 Review of HEC-RAS

In the U.S., HEC-RAS is commonly used for floodplain mapping (Noman et al. 2001, Tate et al. 2002, Knebl et al. 2005, Merwade et al. 2008, Shatnawi and Goodall 2010). HEC-RAS is a one-dimensional hydraulic modeling software developed by the U.S. Army Corps of Engineers, and is the successor of HEC-2 (Yang et al. 2006). The primary function of HEC-RAS is to calculate water surface elevations for observed flow or routed hydrograph data (USACE, 2010A). Using geometric data input by the user, HEC-RAS has the capabilities to run river analysis for steady flow, unsteady flow, sediment transport, and water quality. (USACE 2010B, Shatnawi and Goodall 2010)

Boundary conditions are necessary for establishing starting water surface at the ends of the river system (upstream and downstream). The boundary conditions required depend on type of flow being analyzed. For steady flow data, the downstream boundary condition is required for subcritical flow analysis, upstream boundary condition for supercritical flow analysis, and both upstream and downstream boundary conditions are required for mixed flow regime calculations. For unsteady flow, both upstream and downstream boundary conditions are required. Internal boundary conditions can also be input as needed (USACE, 2010B).

The steady flow analysis component of HEC-RAS is intended to compute water surface profiles for steady gradually varied flow. Other outputs generated by HEC-RAS steady flow simulations include velocity, flow area, and top width (Shatnawi and Goodall 2010). It is capable of modeling subcritical, supercritical, and mixed flow water surface profiles. Manning's equation is used for these calculations, except around bridge piers, at river confluences, and hydraulic jumps where the momentum equation is used. Hydraulic structures such as bridges, culverts, and weirs, can be incorporated into the computational data (USACE 2010B).

The unsteady flow analysis component is similar to the steady flow analysis in that it computes flow data for a full network of open channels, can model various flow conditions, and

can incorporate hydraulic structures into the simulation. However, the unsteady flow analysis is designed to complete analysis for systems where flow characteristics change over time. Capabilities unique to the unsteady flow analysis component include dam break analysis, levee breaching and overtopping, pumping stations, navigation dam operations, and pressurized pipe systems (USACE 2010B).

The sediment transport component of HEC-RAS is designed to simulate scour and deposition in channels over moderate time periods. The model simulates long-term trends of scour and deposition in a channel resulting from modifying channel geometry or flow characteristics. The sediment transport component can be used to evaluate deposition in reservoirs, evaluate sedimentation in fixed channels, predict the influence of dredging on the rate of deposition, and estimate the maximum possible scour during large flood events (USACE 2010B).

The water quality analysis component is designed to perform environmental analysis of rivers and streams. The analyses included in this component are dissolved nitrogen, dissolved phosphorus, dissolved oxygen, and carbonaceous biological oxygen demand (USACE 2010B).

A major deficiency of HEC-RAS is that the simulated water surface elevation data cannot be transferred directly to topographic maps. However, the HEC-RAS channel network model supports the importation and exportation of GIS data. Other benefits include quick and simple cross-section interpolation and 3D view of river reach and cross-section data (Yang et al. 2006).

2.3 HEC-RAS Case Studies

The following section examines case studies that incorporated HEC-RAS for analysis. Descriptions of major objectives, data needs, and data sources are summarized in Table 1. HEC-RAS was used to model reservoir storage, assess different types of river morphological data, assess a potential dam breach, develop a new method for real-time flood management in river-reservoir systems, demonstrate a 1-D jokulhlaup simulation, determine flood frequency, quantify hydrogeomorphic processes that influence alluvial gully erosion along a fluvial megafan, and compute water levels in a channel network (Owusu et al. 2013, Saleh et al. 2013, Yochum et al. 2008, Malekmohammadi et al. 2010, Alho and Aaltonen 2008, Maingi and Marsh 2002, Shellberg et al. 2013, Knebl et al. 2005). From the case studies, it is shown that when channel

cross-sectional data is unavailable, cross-sections can be created from high resolution DEMs (Knebl et al. 2005, Yochum et al. 2008, Owusu et al. 2013, Shellberg et al. 2013).

Owusu et al. (2013) completed a case study in the Dzorwulu basin in Accra, Ghana simulating the incorporation of reservoir storage to analyze the effects on the reduction of flood peaks and volume in urban areas. Longitudinal and cross-sectional channel characteristics were determined from a field survey, and combined with a TIN model to establish surface elevations. A DEM from the Global Land Cover Facility website was also incorporated to georeference the data to the basin. A derived inflow flood hydrograph was used as the hydrology input. The study found that a reservoir-storage approach could be a good alternative for flood hazard reduction. The simulated reservoir resulted in a 45.45% reduction in flood peak and 38.50% reduction in inundation depths. It was also noted the use of HEC-RAS and HEC-GeoRAS were useful in flood studies and simplified producing useful results.

A study conducted by Saleh et al. (2013) assessed how various types of river morphological data affect a 1D Saint-Venant hydraulic model (HEC-RAS): mainly when surveyed cross-sections are not available. An Eau-Dyssee hydrologic model was used to simulate lateral inflows, which was then used as an internal boundary condition for the HEC-RAS model. An observed mean daily discharge hydrograph was used as the upstream boundary condition, and a rating curve based on discharge measurements and observed water levels was used as the downstream boundary condition. Morphological data of the study reach was readily available and consisted of 20 surveyed cross-sections with distances varying from 1 km to 10 km. Six geometry scenarios were tested, varying the number of surveyed cross-sections used, linearly interpolating bed levels, and using different cross-sectional shapes. The simulated water levels and discharges for the six geometry scenarios were compared to the observed water levels and discharge of the original geometry. The study found that simulated water levels are impacted more by the longitudinal description of bed level profiles than shape of cross-sections. River bed geomorphological irregularities influence the simulated water levels, particularly during low flows. It was also found that model error is likely to decrease as frequency of cross-sections along the reach is increased.

Yochum et al. (2008) conducted a case study testing the accuracy of dam breach predictions. The HEC-RAS unsteady option was used to construct and verify a model of the

dam failure. Geometric data for the model consisted of 105 cross-sections developed from a 10 m DEM with additional cross-sections interpolated at 61 m spacing and eight bridge sections. The downstream boundary condition was normal depth, assuming energy slope equaled valley slope. A breach hydrograph was used as the hydrology input. TR-66 and WinTR-20 hydraulic models were also assessed for this flood event. The study concluded that HEC-RAS produced predicted water levels that were relatively accurate compared to the measured high water marks. However, there were measurable errors due to the geometry extracted from a 10 m DEM, and higher resolution data was recommended for future studies. WinTR-20 resulted in a reasonably accurate breach attenuation prediction compared to measured high water marks. TR-66, however, did not compare well.

Malekmohammadi et al. (2010) presented a study for a river-reservoir flood management methodology using a combined optimization-simulation approach. The unsteady option in HEC-RAS was used for the flood inundation modeling and damage estimation portion of the study. The geometric data consisted of 129 cross-sections from a DEM representing the flood plain topography. Arcview GIS was used to combine various layers of geographic information as well as data from the hydraulic model to visualize and estimate flood damages. A genetic algorithm optimization model was used to construct release hydrographs which were used as the hydrology input in the hydraulic model. Specific boundary conditions, DEM resolution, and other flood plain modeling information were not provided within the text of this case study. The results of the hydraulic model and flood damage estimates were used to develop optimal operating rules for the methodology.

The capability of a 1-D hydraulic model (HEC-RAS) to simulate jokulhlaup inundation is compared to the results of a 2-D finite element model to determine possible limitations from the 1D model in a study by Alho and Aaltonen (2008). The finite element mesh from the 2-D model was converted into a TIN of the floodplain topography. From this, 28 cross-sections with 800 m spacing were extracted and input into the 1-D hydraulic model. An unsteady flow simulation was completed using an inflow hydrograph as the upstream boundary condition and normal depth (0.004 m/m slope) as the downstream boundary condition. The results of the 1-D and 2-D hydraulic models were compared. The 1D HEC-RAS model was found to generally compare favorably to the 2-D infinite mesh model (Alho and Aaltonen 2008).

A study by Maingi and Marsh (2002) assessed alterations to the hydraulic regime of the Tana River due to the construction of the Masinga Dam. A portion of the study focused on impacts to riverine forests. The steady module of HEC-RAS was used to compute water surface profiles at peak discharges to determine flood frequency at river sections near 71 vegetation sample plots. Geometric data was obtained from existing surveyed cross-sectional data. Only the downstream boundary condition was needed for analysis due to subcritical flow. Normal depth was used with an energy slope of 0.00033. Initial hydrology input consisted of reference discharges to calibrate the HEC-RAS model. Various discharges were then entered into the calibrated hydraulic model to determine the minimum discharge that would cause inundation of the study area. Results found plots located 1.8 m or less above dry season water level saw an increased number of days flooded, while plots above 1.8 m experienced decreased number of days flooded. Mean flood pulse duration from the pre- to post- dam period also declined from 8.2 days to 5.2 days. This study concludes that there were significant changes to the hydrologic regime and these changes will negatively impact the riverine forest in the Tana River basin (Maingi and Marsh 2002).

Shellberg et al. (2013) conducted a study with the goal of quantifying hydrogeomorphic processes affecting alluvial gully erosion along the fluvial megafan of the Mitchell River in Australia. The hydraulic modeling portion of the study was accomplished using the HEC-RAS unsteady module. LiDAR data was used to create DEMs (1 m² pixel) for each reach. Cross-sections and other parameters were extracted using HEC-GeoRAS. The model was calibrated using measured stage-discharge curves. The calibrated model was then used to model local rating curves to model inundation. The flood stage data and hydraulic modeling results showed increased flood duration and floodplain/gully connectivity. This study recommends a strong understanding the physical processes affecting large floodplain river systems for land, river, and restoration management (Shellberg et al. 2013).

A case study by Knebl et al. (2005) presents a methodology to streamline the process of modeling rainfall-runoff relations. HEC-HMS was used as the rainfall-runoff model and provided hydrograph data for use in the hydraulic model (HEC-RAS). The HEC-RAS unsteady module was executed using geometric data extracted for a high resolution DEM to compute water levels in the channel network. The results were combined with GIS to produce flood

inundation areas and depths. The study demonstrated regional hydrologic modeling incorporating real-time rainfall data and resulted in a complete hydrological and hydraulic model and comprehensive GIS database for the San Antonio River Basin. The methodology presented has strong potential to be successful in regional flood models for other regions of Texas and possibly throughout the nation (Knebl et al. 2005).

Table 1: HEC-RAS Case Studies

Objectives	Flow Classification	Geometric Data	Hydrology Input	Boundary Conditions	Reference
Model potential effects of incorporating reservoir storage for reducing flood peaks and volume	Unsteady	DEM (size not specified)	Inflow flood hydrographs	US**: Flow hydrograph DS**: *	(Owusu et al. 2013)
Evaluate 1-D hydraulic model sensitivity to various types of river morphological data	Unsteady	Surveyed cross-sections	Hydrogeological modeling platform Eau-Dyssée used to simulate lateral inflows	US: Observed mean daily discharge hydrograph DS: Rating curve	(Saleh et al. 2013)
Assess the potential accuracy of dam breach inundation predictions compared to an actual event	Unsteady	10-m DEM (7.5-min USGS quadrangle maps) and bridge cross-sections	Breach hydrograph created using the dam breach option within HEC-RAS	DS: Normal depth	(Yochum et al. 2008)
Develop a methodology for real-time flood management in river-reservoir systems	Unsteady	129 cross-sections (method not specified)	Inflow flood hydrographs	*	(Malekmohammadi et al. 2010)

Objectives	Flow Classification	Geometric Data	Hydrology Input	Boundary Conditions	Reference
Demonstrate the capability of 1-D jokulhlaup simulation and compare results with a 2-D finite element model	Unsteady	Nodes of a finite element mesh converted into TIN form to extract cross-sectional data	Flow hydrograph	US: Discharge hydrograph DS: Normal depth	(Alho and Aaltonen 2008)
Determine the frequency of flooding of vegetation sample plots.	Steady	Surveyed cross-section data	Initial analysis: Gauge data and known water surface elevations (for calibration). After calibration: Theoretical discharges used	DS: Normal depth	(Maingi and Marsh 2002)
Specify hydrogeomorphic processes affecting alluvial gully erosion along the Mitchell River fluvial megafan in Australia	Unsteady	Extracted cross-sections and estimated other geomorphic parameters from 1m ² pixel DEMs developed from LiDAR	Discharge and flood frequency data from river gauge stations	DS: Normal depth	(Shellberg et al. 2013)
Develop a framework for regional scale flood modeling that integrates NEXRAD Level III rainfall, GIS, and a hydrological model (HEC-HMS/RAS)	Unsteady	DEM enhanced by available cross-sections from the USGS	Hydrographs developed in HEC-HMS	*	(Knebl et al. 2005)

*Not specified.

**US = upstream, DS = downstream

3 Methods

First a conceptual model was developed using GIS data to develop a base map, extract geometric data, and display simulation results for the hydraulic modeling process. Then geometric data of the study reach was extracted from the model and exported into a hydraulic model (HEC-RAS 4.1.0). HEC-RAS was used to run both a steady and unsteady analysis of the inflow data from various reclamation conditions.

3.1 Study Site

The study site was an approximately 2.1 kilometer section of a 3rd order stream, located in southern West Virginia named Study Creek for the purposes of this report. The study reach began at the outlet of the unnamed mountain stream carrying the runoff from the mine site to Study Creek, and ended at the junction of Study Creek and the downstream tributary.

Figure 1: Study Site Map

3.2 Extraction of Geometric Data

Geometric data were not available for the study area. Previous studies (Alho and Aaltonen 2008; Owusu et al. 2013; Shellberg et al. 2013; Yochum et al. 2008) have shown that

extracting information from high quality elevation data is an acceptable alternative when survey data is not available. This method was applied to the study area to obtain geometric data for the hydraulic model. First GIS data were used to create a digital representation of the study area. A Digital Elevation Model (DEM) was produced using 1/9 arcsecond (approximately 3 meters) elevation data from USGS National Elevation georeferenced orthophotos and topographic maps were incorporated into the GIS to assist estimation of stream centerline and left and right bank locations (Figure 2).

Figure 2: Estimated stream centerline and bank locations

Samuel's equation was used to assist in determining cross-section spacing (Samuels 1989).

$$\Delta x \leq \frac{0.15D}{S_0} \quad (1)$$

where, Δx = cross-section spacing (ft); D = bankful depth (ft); and S_0 = stream slope (ft/ft).

Flood depths for the largest storm (500-yr) and smallest storm (2-yr) were input into the equation as "D" instead of bankful depth, due to the modeling of larger storm events. This resulted in a cross-sectional spacing range of 32 to 83 m. This range was used as a starting point, and cross-sections were added and altered as needed. The final model resulted in 52 cross-sections.

Cut lines for the cross-sections were drawn perpendicular to the contours and estimated centerline and bank locations (Figure 3). Spacing varied depending on the characteristics of certain locations in the reach. Cross-sections typically need to have smaller spacing where

channels bend or the channel geometry varies significantly, whereas straighter and more uniform sections of a channel can have a greater cross-sectional spacing.

Figure 3: Cut lines for extracted cross-sections

Cross-sectional data were extracted from the locations of the cut lines and exported into a hydraulic model (HEC-RAS 4.1.0).

3.3 Hydraulic Modeling

Four reclamation conditions were used for analysis: Pre-mining, Conventional, Geomorphic Landform Design (During mining), and Geomorphic Landform Design (Post-mining). The pre-mining condition analyzed the effects of runoff from the undisturbed topography at the mine site location.

The conventional reclamation condition is an Approximate Original Contour (AOC) variation. The design consists of a flat mountain top with a valley fill at the headwaters of the watershed, sedimentation ditches to redirect flow to NPDES permit points, 20 ft. horizontal benches every 50 vertical feet, and groin ditches on either side of the valley fill to redirect flow away from the valley fill face (Sears 2012, Snyder 2013).

The GLD (During mining) and GLD (Post-mining) reclamation conditions consisted of the same topography but represents two points in time after reclamation. The GLD reclamation design incorporated geomorphic landform design techniques. Man-made sub-basins were used to direct flow to pre-established stream beds. The stream beds were designed to carry runoff to the original stream (Snyder 2013). The GLD (During mining) reclamation condition analyzed the runoff effects during mining and had a CN of 84. The GLD (Post-mining) condition modeled the

short term (< 5 years) post-mining runoff effects of the GLD design and had a CN of 67. Hydrographs for each condition were developed by Snyder (2013).

3.3.1 Steady Analysis

Three storms were used for the steady analysis of each reclamation condition: 2-year, 100-year, and 500-year. Necessary data for a steady hydraulic model are geometric data, steady flow data, and boundary conditions (USACE, 2010b). Geometric data were extracted from GIS data, as described in the previous section. Peak discharges from the hydrologic model created in a previous study (Snyder, 2013) were used for the steady flow data (Table 2).

Table 2: Peak Discharges (Snyder 2013)

	Peak Discharge, cms (cfs)		
	2-year	100-year	500-year
Pre-mining	2.94 (104)	24.0 (849)	35.6 (1256)
Conventional	0.818 (28.9)	33.1 (1168)	46.1 (1628)
GLD (During mining)	19.4 (686)	62.4 (2205)	91.3 (3225)
GLD (Post-mining)	2.97 (105)	22.5 (795)	36.2 (1383)

Steady analysis in HEC-RAS only requires one boundary condition. Normal depth was used as the downstream boundary condition, which required entering the downstream slope for normal depth computation. A slope of 0.0144 that was measured from GIS was used for this input.

A steady flow analysis with a subcritical flow regime was performed. The resulting water surface elevations were imported into the conceptual model. The water surface elevation data were delineated to display the resulting flood extents for each storm event. This process was repeated for each of the four reclamation conditions.

3.3.2 Unsteady Analysis

Seven storm events were modeled for the unsteady flow analysis: 2-, 5-, 10-, 25-, 50-, 100-, and 500-year. The extracted geometric data used in the steady analysis was also used for the unsteady. The required unsteady flow data were initial conditions, upstream, and downstream boundary conditions (USACE 2010b).

Hydrographs (Figures 4-7) developed from a previous study (Snyder 2013) were input as the upstream boundary condition with a 6-minute time step. Normal depth was used as the downstream boundary condition using a slope of 0.0144.

Figure 4: Pre-mining hydrograph (data from Snyder, 2013)

Figure 5: Conventional hydrograph (data from Snyder, 2013)

Figure 6: GLD (During mining) hydrograph (data from Snyder, 2013)

Figure 7: GLD (Post-mining) hydrograph (data from Snyder, 2013)

The study reach was at an ungauged location; therefore the initial condition flow data was unknown. The baseline water depth was estimated using streamflow statistics with the assistance of the USGS National Streamflow Statistics Program 6.0 (USGS 2011). The estimated depth was modeled onto a sample cross-section to determine the cross-sectional area and wetted

perimeter. This information was then input into Manning's equation to determine the estimated baseline flow. The calculated flow ($0.844 \text{ m}^3/\text{s}$) was used as the initial condition for the unsteady analysis and also added to the inflow hydrograph data.

Once the necessary inputs were acquired, it was found that additional cross-sections were needed to stabilize the unsteady model. Additional cross-sections were interpolated in HEC-RAS to determine the optimum spacing. Once the spacing and location of the new cross-sections were determined for stabilization, the interpolated cross-sections were replaced with GIS extracted cross-sectional data to provide more accurate information for modeling. The unsteady analysis resulted in water surface levels at 1 hour intervals for a 24-hour period for each storm event as well as the maximum water elevations for each cross-section. The maximum water surface data were then imported back into GIS and used to delineate the flood areas for each modeled storm event. This process was repeated for each of the reclamation conditions.

4 Results and Discussion

4.1 Steady Analysis

The water surface elevations and associated cross-sectional results from the hydraulic model are displayed in the following sections. The cross-sectional results are the calculated outputs for each cross-section in the study reach. Tables 3-6 summarize the cross-sectional outputs for each reclamation condition. The flood extents and depths are presented in flood maps for the 2-yr, 100-yr, and 500-yr storm events for the pre-mining and three reclamation conditions (Figures 8-19). The range of flood extents and maximum flood depths are provided in tables for each condition. The results for each reclamation condition are compared to the pre-mining condition. The steady results are then compared to the unsteady results.

4.1.1 Pre-mining

The steady flow analysis results for the pre-mining condition are displayed in Table 3 and Figures 8-10. Table 3 presents the total surface area inundated, maximum depth, ranges of flood extents, cross-sectional flow areas, and velocities of the channel.

Table 3: Pre-mining condition steady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross-Sectional Flow Area* (m²)	Average Velocity (m/s)	Flood Surface Area (km²)
2	11.7 (6.0-29.7)	0.9	4.1 (2.1-17.1)	1.1	23.0
100	21.3 (10.1-45.1)	1.9	15.7 (8.6-53.4)	1.9	41.4
500	25.8 (11.2-55.5)	2.3	21.0 (11.4-71.2)	2.1	48.9

*mean and range in parentheses

The resulting flood extents and depths of the peak flows for the 2-yr, 100-yr, and 500-yr storm events are displayed in Figures 8, 9, and 10. These results will be used to compare the three reclamation conditions: conventional, GLD (Pre-mining), and GLD (Post-mining).

Figure 8: Pre-mining 2-yr flood extents and depth

Figure 9: Pre-mining 100-yr flood extents and depth

Figure 10: Pre-mining 500-yr flood extents and depth

4.1.2 Conventional

Results of the conventional reclamation steady flow analysis are displayed in Table 4 and Figures 11-13.

Table 4: Conventional reclamation condition steady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross-Sectional Flow Area* (m ²)	Average Velocity (m/s)	Flood Surface Area (km ²)
2	9.5 (5.1-26.0)	0.7	2.3 (1.1-10.7)	0.9	18.4
100	24.7 (11.0-53.1)	2.2	19.9 (10.9-67.3)	2.1	47.2
500	29.9 (11.9-70.2)	2.6	25.9 (13.8-88.0)	3.4	56.4

*mean and range in parentheses

The conventional reclamation resulted in smaller maximum channel depth for the 2-yr in comparison to the pre-mining conditions. The 100-yr and 500-yr had greater maximum channel depths compared to pre-mining conditions. The 2-yr depth was reduced by 25% and the 100-yr and 500-yr depths increased 15% and 13%, respectively, compared to the pre-mining conditions.

The inundation area covered by the flood events are 18.3 km², 47.1 km², and 56.4 km² for the 2-yr, 100-yr, and 500-year events. The inundation area from the 2-yr is 20% less than the resulting inundation area from the pre-mining conditions 2-yr storm event. The inundation areas for the 100-yr and 500-yr increased by 14% and 15% compared to pre-mining conditions.

Figure 11: Conventional 2-yr flood extents and depth

Figure 12: Conventional 100-yr flood extents and depth

Figure 13: Conventional 500-yr flood extents and depth

4.1.3 GLD (During mining)

The GLD (During mining) steady flow analysis results are displayed in Table 5 and Figures 14-16. The maximum channel depth increased for every modeled storm event from the GLD (During mining) reclamation condition when compared to pre-mining depths. The 2-yr, 100-yr, and 500-yr channel depths increased 96%, 54%, and 55%, respectively.

Table 5: GLD (During mining) reclamation condition steady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross-Sectional Flow Area* (m²)	Average Velocity (m/s)	Flood Surface Area (km²)
2	19.6 (9.7-42.6)	1.7	13.5 (7.4-46.8)	1.8	38.6
100	35.6 (12.9-85.1)	3.0	33.7 (17.6-114.1)	2.4	66.5
500	44.8 (15.1-99.3)	3.5	47.7 (23.3-156.6)	2.6	85.6

*mean and range in parentheses

The GLD (During mining) reclamation condition resulted in an increased inundated area for all calculated storm event peak flows. In comparison to the pre-mining conditions, the 2-yr storm event increased 68%, 100-yr increased 61%, and 500-yr increased 75%.

Figure 14: GLD (During mining) 2-yr flood extents and depth

Figure 15: GLD (During mining) 100-yr flood extents and depth

Figure 16: GLD (During mining) 500-yr flood extents and depth

4.1.4 GLD (Post-mining)

Steady flow analysis results of the GLD (Post-mining) reclamation condition are displayed in Table 6 and Figures 17-19. The 2-yr and 100-yr channel depths decreased in comparison to pre-mining channel depths. The 2-yr and 100-yr both decreased by 3%. The 500-yr GLD (Post-mining) maximum channel depth increased by 1% compared to pre-mining.

Table 6: GLD (Post-mining) reclamation condition steady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross-Sectional Flow Area* (m²)	Average Velocity (m/s)	Flood Surface Area (km²)
2	11.6 (6.0-28.7)	0.9	4.1 (2.1-17.2)	1.1	23.0
100	20.7 (10.0-44.1)	1.9	15.0 (8.2-51.2)	1.9	40.5
500	26.0 (11.2-56.1)	2.3	21.3 (11.6-72.2)	2.1	49.2

*mean and range in parentheses

The inundated areas from the GLD (Post-mining) reclamation condition resulted in small changes in comparison to the pre-mining condition. There was no change in from the 2-yr storm event. The 100-yr storm event resulted in a 2% decrease in flooded area. The 500-yr storm event inundated area increased by 1% compared to pre-mining conditions.

Figure 17: GLD (Post-mining) 2-yr flood extents and depth

Figure 18: GLD (Post-mining) 100-yr flood extents and depth

Figure 19: GLD (Post-mining) 500-yr flood extents and depth

4.1.5 Comparison of Reclamation Designs to Pre-mined Condition

The greatest flooding extents and depths for each storm event resulted from the GLD (During mining) reclamation condition. Conventional reclamation resulted in the least flooding impacts for the 2-year storm event. GLD (Post-mining) caused the least flooding impacts for the 100-year and 500-year storm events. The results from the GLD (Post-mining) reclamation condition were comparable to pre-mining results, often showing either no change or a decrease in outputs. In instances where the GLD (Post-mining) results were greater than those from the pre-mining condition, the maximum increase was 1%. Table 7 presents the difference in flood area as a percentage for each reclamation condition compared to the pre-mined condition.

The physical environment and ecological community characteristic of a stream are defined by the variations in frequency, magnitude, duration, and regularity of flow (Bednarek 2001, Shafroth et al. 2010). Changes in flooding can cause both socioeconomic and environmental impacts. These include damages to floodplain landscapes, deterioration of water

quality, disturbances to flora and fauna, and alteration to stream connectivity (Istomina et al. 2005). Organisms found in flood pulsing environments are typically adapted to the fluctuating environmental condition, however in low-order streams where pulses are brief and unpredictable, such as the study reach, the level of adaptation is low (Junk et al. 1989, Birkland et al. 2003).

The decrease in inundation area for the 2-yr conventional reclamation could decrease the impacts on communities and infrastructure, but could potentially result in altered channels and decreased biological activity and diversity. The increases seen from the GLD (During mining) condition would result in increased socioeconomic impacts during flood events such as damage to homes, bridges, roads, and agricultural land. The GLD (During mining) condition may also cause bank erosion, altered biological communities, and affect surrounding vegetation and animals. These effects could potentially be mitigated with the incorporation of detention or channel improvements. The outcomes of the GLD (Post-mining) condition demonstrate that when GLD reclamation reaches a mature state, the flood response could potentially be similar to that of the original topography. This is important because flood frequency is imperative for ecological services.

Table 7: Percent change in inundation area between reclamation conditions and pre-mining

Rainfall Return Period (yr)	Conventional	GLD (During Mining)	GLD (Post-Mining)
2-yr	-20%	68%	0%
100-yr	14%	61%	-2%
500-yr	15%	75%	1%

Percent difference between reclamation conditions and pre-mining conditions were calculated for each section. Tables 8-10 display the average percent difference of cross-sectional outputs for each reclamation technique for the 2-yr, 100-yr, and 500-yr storm events.

The averaged percent change of cross-sectional outputs (i.e. maximum channel depth, cross-sectional flow area, average velocity, and top width) of each reclamation compared to the pre-mining as a result of a 2-yr storm event are shown in Table 8. The conventional reclamation resulted in reduced cross-sectional outputs compared to the pre-mining condition for a 2-yr storm

event. The average cross-sectional outputs increased significantly for the GLD (During mining) condition from a 2-yr storm event. The 2-yr GLD (Post-mining) reclamation had very little change in channel velocity, flow area, top width, and maximum channel depth compared to the pre-mining condition.

Table 8: Average percent difference between original topography and reclamation designs over all cross-sectional outputs for 2-yr

	Conventional	GLD (During Mining)	GLD (Post-Mining)
Average Channel Velocity Difference	-21%	63%	0%
Average Flow Area Difference	-44%	238%	1%
Average Top Width Difference	-19%	66%	0%
Average Max. Channel Depth Difference	-30%	112%	0%

The three reclamation conditions are compared to the pre-mining condition for the 100-yr storm event by average percent change of cross-sectional outputs (Table 9). Both the conventional and GLD (During mining) reclamation conditions saw an increase in the average cross-sectional outputs, with GLD (During mining) resulting in the greatest increases. When compared to the pre-mining condition, the modeled GLD (Post-mining) results decreased overall with a reduced average channel velocity, flow area, top width, and channel depth.

Table 9: Average percent difference between original topography and reclamation designs over all cross-sectional outputs for 100-yr

	Conventional	GLD (During Mining)	GLD (Post-Mining)
Average Channel Velocity Difference	9%	29%	-2%
Average Flow Area Difference	27%	118%	-5%
Average Top Width Difference	16%	76%	-3%
Average Max. Channel Depth Difference	14%	51%	-3%

The 500-yr comparison of average cross-sectional outputs of reclamation conditions to the pre-mining condition are displayed in Table 10. The 500-yr storm event resulted in an increase in average cross-sectional properties for the conventional and GLD (During mining) conditions when compared to pre-mining. The GLD (Post-mining) conditions saw no change in average channel velocity and only a 1% increase in average flow area, top width, and maximum channel depth compared to pre-mining conditions.

Table 10: Average percent difference between original topography and reclamation designs over all cross-sectional outputs for 500-yr

	Conventional	GLD (During Mining)	GLD (Post-Mining)
Average Channel Velocity Difference	7%	25%	0%
Average Flow Area Difference	23%	129%	1%
Average Top Width Difference	17%	85%	1%
Average Max. Channel Depth Difference	12%	51%	1%

The greatest increases from the pre-mining conditions occurred from the GLD (During mining) reclamation condition for all modeled storm events. Conventional reclamation resulted in decreased outputs for the smaller storm event, but increased during the two larger storm events. The GLD (Post-mining) reclamation conditions remained comparable to the pre-mining conditions. The greatest increases from the GLD (Post-mining) were only 1%, occurring during the 2-yr and 500-yr storm events, whereas the 100-yr saw decreases in average cross-sectional outputs.

4.2 Unsteady Analysis

The unsteady analysis results of the study reach for a 24-hour period are presented in the following sections. The maximum water surface for each cross-section over the 24-hr period was used for analysis. The times the maximum water surfaces occurred for each cross-section are given in Appendix B (Tables 24-27). The cross-sectional outputs associated with the maximum water surface levels were used to analyze the unsteady model results. Tables (11-14) present these cross-sectional outputs for each reclamation condition. The maximum water surface levels for each cross-section over a 24-hour period were used to display inundation areas and flood depths to represent the maximum affected areas. Maps illustrating this information for

pre-mining and three reclamation conditions are shown in Figures 20-35. The findings for each reclamation condition are then compared to the pre-mining condition.

4.2.1 Pre-mining

The pre-mining cross-sectional outputs are presented in Table 11 and modeled inundation areas and flood depths are shown in Figures 20-23.

Table 11: Maximum water surface pre-mining condition unsteady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross- Sectional Flow Area* (m ²)	Average Velocity (m/s)	Flood Surface Area (km ²)
2	11.6 (5.7-27.1)	1.0	4.1 (1.4-16.5)	1.0	22.9
50	18.9 (8.2-41.0)	1.9	12.4 (4.8-42.7)	1.6	37.1
100	20.4 (8.7-44.6)	2.1	14.5 (5.7-48.4)	1.8	39.7
500	24.1 (9.7-54.9)	2.5	19.2 (7.4-61.5)	2.0	45.9

*mean and range in parentheses

The flood depths and inundated areas for the maximum water surface level per cross-section for the 2-yr, 50-yr, 100-yr, and 500-yr storm events are presented in Figures 20, 21, 22, and 23. Pre-mining results are used in the following sections to compare the conventional, GLD (Pre-mining) and GLD (Post-mining) reclamation conditions.

Figure 20: Pre-Mining 2-yr unsteady max water level flood extents and depth

Figure 21: Pre-Mining 50-yr unsteady maximum water level flood extents and depth

Figure 22: Pre-Mining 100-yr unsteady maximum water level flood extents and depth

Figure 23: Pre-Mining 500-yr unsteady maximum water level flood extents and depth

4.2.2 Conventional

Unsteady analysis results for the conventional reclamation condition are displayed in Table 12 and Figures 24-27. Modeled channel depths corresponding to the maximum water levels from conventional reclamation varied in comparison to pre-mining conditions depending on the return period. The 2-yr storm event produced lower channel depths (-22%), whereas the

50-, 100-, and 500-yr maximum channel depths increased by 15%, 12%, and 8 % respectively, compared to those of the pre-mining condition.

Table 12: Maximum water surface conventional condition unsteady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross- Sectional Flow Area* (m ²)	Average Velocity (m/s)	Flood Surface Area (km ²)
2	9.4 (4.7-24.6)	0.78	2.5 (0.7-11.2)	0.9	18.4
50	18.5 (8.0-42.1)	2.2	12.0 (4.5-41.7)	1.6	36.5
100	20.9 (8.7-48.4)	2.3	15.0 (5.6-50.9)	1.8	41.0
500	25.0 (9.7-61.9)	2.7	20.1 (7.5-65.5)	2.0	49.4

*mean and range in parentheses

The conventional reclamation condition inundated areas for the 2-yr, 50-yr, 100-yr, and 500-year were 18.4, 36.5, 410, and 49.4 km², respectively. In comparison to the pre-mining condition, the 2-yr and 50-yr storm events both resulted in decreased areas of 20% and 2%. The larger storms resulted in increased flood surface areas with the 100-yr storm increasing by 3% and the 500-yr storm resulting in an 8% increase (Figures 24-27).

Figure 24: Conventional 2-yr maximum unsteady flood extents and depth

Figure 25: Conventional 50-yr maximum unsteady flood extents and depth

Figure 26: Conventional 100-yr maximum unsteady flood extents and depth

Figure 27: Conventional 500-yr maximum unsteady flood extents and depth

4.2.3 GLD (During mining)

Unsteady flow analysis results of the GLD (During mining) condition are shown in Table 13 and Figures 28-31. All modeled storm events resulted in increased maximum channel depths in comparison to the pre-mining condition results. The 2-, 50-, 100-, and 500-yr channel depths increased 102%, 72%, 66%, and 61%, respectively.

Table 13: Maximum water surface GLD (During mining) condition unsteady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross-Sectional Flow Area* (m ²)	Average Velocity (m/s)	Flood Surface Area (km ²)
2	18.9 (8.2-42.3)	2.0	12.5 (4.8-42.3)	1.6	37.1
50	30.3 (10.6-80.3)	3.2	26.7 (9.3-85.7)	2.2	55.7
100	33.2 (10.9-86.4)	3.5	30.1 (10.0-96.3)	2.3	60.1
500	37.9 (11.4-97.6)	4.0	38.5 (11.3-119.0)	2.5	70.8

*mean and range in parentheses

The inundation areas from the unsteady analysis of the GLD (During mining) condition increased for every modeled storm event. The 2-yr storm event increased 62%, 50-yr increased 50%, 100-yr increased 51%, and 500-yr increased 54%.

Figure 28: GLD (During mining) 2-yr maximum unsteady flood extents and depth

Figure 29: GLD (During mining) 50-yr maximum unsteady flood extents and depth

Figure 30: GLD (During mining) 100-yr maximum unsteady flood extents and depth

Figure 31: GLD (During mining) 500-yr maximum unsteady flood extents and depth

4.2.4 GLD (Post-mining)

The GLD (Post-mining) unsteady analysis results are displayed in Table 14 and Figures 32-35. The maximum channel depths increased for each modeled storm event compared to pre-mining condition channel depths. The channel depths increased for the 2-yr and 500-yr storm events by 2%, 50-yr by 4%, and 100-yr by 3%.

Table 14: Maximum water surface GLD (Post-mining) condition unsteady flow analysis results

Rainfall Return Period (yr)	Flood Extents* (m)	Max. Depth (m)	Cross-Sectional Flow Area* (m ²)	Average Velocity (m/s)	Flood Surface Area (km ²)
2	11.9 (5.8-27.5)	1.0	4.4 (1.5-17.1)	1.0	23.4
50	19.1 (8.3-42.0)	1.9	12.7 (4.9-43.7)	1.7	37.5
100	20.6 (8.8-45.5)	2.2	14.8 (5.7-49.4)	1.8	40.1
500	24.6 (9.7-56.6)	2.6	19.5 (7.5-62.9)	2.0	46.4

*mean and range in parentheses

The inundation areas of the GLD (Post-mining) reclamation condition also saw slight increases for all each modeled storm event. The 2-yr inundated area increased by 2% and the 50-yr, 100-yr, and 500-yr inundated areas each increased by 1% compared to pre-mining inundation.

Figure 32: GLD (Post-mining) 2-yr maximum unsteady flood extents and depth

Figure 33: GLD (Post-mining) 50-yr maximum unsteady flood extents and depth

Figure 34: GLD (Post-mining) 100-yr maximum unsteady flood extents and depth

Figure 35: GLD (Post-mining) 500-yr maximum unsteady flood extents and depth

4.2.5 Comparison of Reclamation Designs to Pre-mined Condition

The results of each reclamation condition were analyzed based on how they compared to the pre-mined condition for the modeled storm events. The percent change from the pre-mined inundation area to each reclamation condition inundation areas are presented in Table 15.

Table 15: Percent change in inundation area from maximum water elevations between reclamation conditions and pre-mining

Rainfall Return Period (yr)	Conventional	GLD (During mining)	GLD (Post-mining)
2-yr	-20%	62%	2%
50-yr	-2	50%	1%
100-yr	3%	51%	1%
500-yr	8%	54%	1%

The three reclamation conditions were compared by calculating the percent change in the modeled outputs from the pre-mining condition to each reclamation condition. The average percent difference of cross-sectional outputs for each reclamation condition during 2-yr, 50-yr, 100-yr, and 500-yr storm events are displayed in Tables 16-19. Water surface longitudinal profiles of the maximum water surface elevations of each condition for each storm event are also provided in Figures 36-39.

Table 16 presents the 2-yr comparison of each reclamation condition to the pre-mining condition. Figure 36 illustrates the water surface longitudinal profile of the 2-yr storm event for each condition. The conventional reclamation resulted in overall decreases in cross-sectional outputs compared to the pre-mined condition. Both GLD conditions resulted in increases compared to the pre-mined condition, although GLD (During mining) had more significant increases than GLD (Post-mining).

The 2-yr and 50-yr inundation area of the conventional reclamation decreased compared to the pre-mined condition, which could cause potential decreases in flood damage to infrastructure and communities. It may also cause channel alteration and lead to biological activity and diversity decreases (Junk et al. 1989, Birkland et al. 2003). The increased inundation area from GLD (During mining) would increase flood damage to the surrounding area, and may alter biological activity, cause bank erosion, and impact flora and fauna (Bednarek 2001, Istomina et al. 2005). Stormwater BMPs (e.g. flow control structures, retention systems) could potentially be incorporated to mitigate these effects. GLD (Post-mining) results demonstrate how the mature state of GLD reclamation could potentially produce a similar flood response as that of the pre-mined condition.

Figure 36: 2-yr water surface longitudinal profile comparison

Table 16: Average percent difference between original topography and reclamation designs over all cross-sectional outputs for 2-yr

	Conventional	GLD (During Mining)	GLD (Post-Mining)
Average Channel Velocity Difference	-15%	68%	1%
Average Flow Area Difference	-43%	223%	6%
Average Top Width Difference	-19%	62%	2%
Average Max. Channel Depth Difference	-30%	105%	3%

The 50-yr water surface longitudinal profiles of the four conditions are represented in Figure 37. Comparison of the average percent difference between the reclamation conditions and pre-mining conditions of the 50-yr cross-sectional outputs are shown in Table 17. The trends found for the 50-yr comparison are similar to those of the 2-yr comparison. The average

percent changes of the conventional reclamation condition decreased, and both GLD conditions increased. The overall percent changes were smaller compared to the 2-yr outputs.

Figure 37: 50-yr water surface longitudinal profile comparison

Table 17: Average percent difference between original topography and reclamation designs over all cross-sectional outputs for 50-yr

	Conventional	GLD (During Mining)	GLD (Post-Mining)
Average Channel Velocity Difference	-1%	36%	1%
Average Flow Area Difference	-4%	114%	2%
Average Top Width Difference	-2%	65%	1%
Average Max. Channel Depth Difference	-3%	53%	1%

The water surface longitudinal profile of each condition during a 100-yr storm event is shown in Figure 38. The comparisons of each reclamation condition to the pre-mining condition

are shown in Table 18. For the 100-yr storm event, all three reclamation conditions resulted in increases compared to the pre-mining condition. GLD (Post-mining) had the smallest increases, but the conventional reclamation was only 1% higher than the GLD (Post-mining) in every output category. GLD (During mining) saw the greatest increases compared to pre-mining.

Figure 38: 100-yr water surface longitudinal profile comparison

Table 18: Average percent difference between original topography and reclamation designs over all cross-sectional outputs for 100-yr

	Conventional	GLD (During Mining)	GLD (Post-Mining)
Average Channel Velocity Difference	2%	31%	1%
Average Flow Area Difference	3%	105%	2%
Average Top Width Difference	2%	69%	1%
Average Max. Channel Depth Difference	2%	47%	1%

The 500-yr storm event water surface longitudinal profiles for each reclamation condition and the pre-mining condition are displayed in Figure 39. Table 19 presents the output of each reclamation condition shown as a percent change from the pre-mined condition for a 500-yr storm event. The trends observed from the 500-yr event are similar to those of the 100-yr. An increase occurred for all three reclamation conditions. The GLD (Post-mining) condition had the smallest increases, with the conventional reclamation condition only slightly higher, and the GLD (During mining) condition with the greatest increases.

Figure 39: 500-yr water surface longitudinal profile comparison

Table 19: Average percent difference between original topography and reclamation designs over all cross-sectional outputs for 500-yr

	Conventional	GLD (During Mining)	GLD (Post-Mining)
Average Channel Velocity Difference	2%	23%	1%
Average Flow Area Difference	4%	96%	2%
Average Top Width Difference	3%	63%	1%
Average Max. Channel Depth Difference	2%	40%	1%

4.3 Comparison of Steady and Unsteady Analysis

Both steady and unsteady hydraulic analyses were conducted for this research. Both analyses resulted in similar overall trends, and the differences that occurred were minor. The greatest difference between the steady and unsteady analyses were in the GLD (Post-mining) results. The steady GLD (Post-mining) results saw a decrease in outputs in comparison to the pre-mined condition, whereas the unsteady model resulted in no decreases. The unsteady GLD (post-mining) results remained within 1% change of the pre-mined condition, and could still be considered comparable.

Each analysis had advantages and disadvantages. The only flow data necessary for the steady hydraulic analysis was the peak discharge. Less information was required and therefore was less time consuming and simpler to model. The flood wave is not considered in the steady analysis, and may lead to less accurate results. The unsteady analysis was more complex. A flow hydrograph was required for the flow data input. Due to the increased complexity of the unsteady model, information input was more time consuming and the program required more time to complete. The unsteady analysis modeled the flood wave in time steps and provided a more accurate representation of flooding and associated cross-section outputs over time.

5 Conclusions

The goal of this research was to explore the potential future incorporation of geomorphic landform design techniques into surface mine reclamation in West Virginia. This particular study focused on studying the downstream effects and comparing it to the pre-mining condition and conventional reclamation. Runoff data from a previous study was used to develop a hydraulic model of the 2.1 km study reach. The water surface elevations from the model were then used to create inundation maps for various storm events for each condition. The results from the reclamation techniques were compared to the pre-mining results. Major research findings include the following:

- For smaller storm events (e.g. 2-yr) conventional reclamation resulted in decreased flooding, but increased flooding was observed for large storm events (100-yr, 500-yr). The decrease in flooding from the smaller storm events could result in negative ecological effects over time. Since the study area is a low-order stream, the flood pulses are brief and unpredictable. Organisms most likely have a low level of adaption (Junk et al. 1989, Birkland et al. 2003). There could potentially be a decrease of biological activity and diversity. The increased flooding resulting from larger storm events may be a concern as the frequency of extreme events increase, as seen in the study from (Kharin and Zwiers 2005).
- The GLD (During mining) reclamation condition had large increases in flooding that are mitigated post-mining. The GLD (Post-mining) results were comparable to those of the pre-mining condition. This is important for both socioeconomic purposes and ecological services.
- The greatest area of concern is the increased flooding during mining. This study did not model the downstream effects of the conventional reclamation during mining, so it cannot be stated how the GLD (During mining) condition compares. The increased flows could be mitigated by incorporating stormwater BMPs. It may also be advantageous to incorporate sediment control structures temporarily during the mining period, which would be removed post-mining.
- GLD has potential to mitigate flooding impacts from surface mining in the long-term. It is dependent on properly sized channels and stability of landforms.

Application of geomorphic landform design techniques to surface mine reclamation in southern West Virginia could be more beneficial for flood regulation in downstream areas than conventional reclamation. Conventional reclamation decreased flooding during the smaller storm events (e.g. 2-yr, 50-yr) which may be ideal for decreasing flood damages; however, GLD (Post-mining) outperformed conventional reclamation overall by being the most comparable to the pre-mining condition for every modeled storm event, whereas conventional reclamation lacked consistency in its flood response.

6 References

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Appendix A – Maps from Unsteady Storms 5-, 10-, and 25-yr Storm Events

Modeling was also completed for the 5-, 10-, and 25-year storm events. These storms were not discussed in the main text of this thesis, but the results are reported in the following figures.

Figure 40: Pre-Mining 5-year unsteady maximum water level flood extents and depth

Figure 41: Pre-Mining 10-year unsteady maximum water level flood extents and depth

Figure 42: Pre-Mining 25-year unsteady maximum water level flood extents and depth

Figure 43: Conventional 5-year maximum unsteady flood extents and depth

Figure 44: Conventional 10-year maximum unsteady flood extents and depth

Figure 45: Conventional 25-year maximum unsteady flood extents and depth

Figure 46: GLD (During mining) 5-year maximum unsteady flood extents and depth

Figure 47: GLD (During mining) 10-year maximum unsteady flood extents and depth

Figure 48: GLD (During mining) 25-year maximum unsteady flood extents and depth

Figure 49: GLD (Post mining) 5-year maximum unsteady flood extents and depth

Figure 50: GLD (Post mining) 10-year maximum unsteady flood extents and depth

Figure 51: GLD (Post mining) 25-year maximum unsteady flood extents and depth

Appendix B - Cross-Sectional Outputs

Table 20: Steady Pre-mining cross-sectional properties

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	2-yr	3.78	264.87	265.55	1	3.79	8.3	0.68
2097.011	100-yr	24.88	264.87	266.45	1.82	13.67	13.82	1.58
2097.011	500-yr	36.41	264.87	266.74	2.02	18.04	15.69	1.87
2052.742	2-yr	3.78	264.51	265.04	1.77	2.13	6.77	0.53
2052.742	100-yr	24.88	264.51	265.78	2.83	8.8	10.96	1.27
2052.742	500-yr	36.41	264.51	266.03	3.09	11.8	12.34	1.52
2009.086	2-yr	3.78	263.84	264.3	1.11	3.39	10.74	0.46
2009.086	100-yr	24.88	263.84	264.94	2.02	12.33	17.11	1.1
2009.086	500-yr	36.41	263.84	265.12	2.37	15.41	18.68	1.28
1964.49	2-yr	3.78	263.35	263.74	1.29	2.92	11.31	0.39
1964.49	100-yr	24.88	263.35	264.25	2.34	10.62	19.23	0.9
1964.49	500-yr	36.41	263.35	264.43	2.54	14.31	22.12	1.08
1925.761	2-yr	3.78	263.04	263.42	0.75	5.02	20.49	0.38
1925.761	100-yr	24.88	263.04	263.99	1.18	23.54	45.07	0.95
1925.761	500-yr	36.41	263.04	264.17	1.3	32.65	55.54	1.13
1874.546	2-yr	3.78	262.4	262.97	0.74	5.12	15.18	0.57
1874.546	100-yr	24.88	262.4	263.56	1.42	17.91	28.91	1.16
1874.546	500-yr	36.41	262.4	263.72	1.67	22.95	34.19	1.32
1828.159	2-yr	3.78	262.13	262.51	1.47	2.57	11.85	0.38
1828.159	100-yr	24.88	262.13	262.99	2.17	11.47	25.23	0.86
1828.159	500-yr	36.41	262.13	263.14	2.39	15.55	29.06	1.01
1788.723	2-yr	3.78	261.54	262.21	0.54	6.97	19.69	0.67
1788.723	100-yr	24.88	261.54	262.91	0.97	26.98	36.35	1.37
1788.723	500-yr	36.41	261.54	263.16	1.08	36.61	40.96	1.62
1742.556	2-yr	3.78	261.5	262.1	0.63	6.02	16.9	0.6
1742.556	100-yr	24.88	261.5	262.8	1.12	22.73	30.99	1.3
1742.556	500-yr	36.41	261.5	263.05	1.22	31.41	36.24	1.55

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1695.655	2-yr	3.78	261.28	261.71	1.61	2.35	9.16	0.43
1695.655	100-yr	24.88	261.28	262.46	1.92	13.29	21.7	1.18
1695.655	500-yr	36.41	261.28	262.82	1.8	23.49	48.08	1.54
1651.05	2-yr	3.78	260.78	261.37	0.68	5.57	14.43	0.59
1651.05	100-yr	24.88	260.78	262.44	0.95	26.23	24.13	1.66
1651.05	500-yr	36.41	260.78	262.79	1.03	35.47	27.46	2.01
1617.21	2-yr	3.78	260.56	261.28	0.72	5.27	11.57	0.72
1617.21	100-yr	24.88	260.56	262.37	1.08	23.11	20.87	1.81
1617.21	500-yr	36.41	260.56	262.73	1.17	30.99	23.19	2.17
1577.381	2-yr	3.78	260.48	261.29	0.22	17.14	27.32	0.81
1577.381	100-yr	24.88	260.48	262.39	0.47	53.41	40.53	1.91
1577.381	500-yr	36.41	260.48	262.75	0.54	71.22	55.22	2.27
1542.946	2-yr	3.78	260.49	261.2	1.16	3.26	6.47	0.71
1542.946	100-yr	24.88	260.49	262.08	2.32	10.74	10.43	1.59
1542.946	500-yr	36.41	260.49	262.35	2.66	13.69	11.3	1.86
1504.079	2-yr	3.78	260.31	260.94	1.18	3.2	8.06	0.63
1504.079	100-yr	24.88	260.31	261.73	2.26	11	11.66	1.42
1504.079	500-yr	36.41	260.31	261.96	2.64	13.8	12.72	1.65
1467.659	2-yr	3.78	260.12	260.68	1.08	3.51	9.07	0.56
1467.659	100-yr	24.88	260.12	261.5	1.85	13.42	15.65	1.38
1467.659	500-yr	36.41	260.12	261.74	2.09	17.44	18.19	1.62
1425.307	2-yr	3.78	259.66	260.24	1.43	2.64	7.56	0.58
1425.307	100-yr	24.88	259.66	260.96	2.4	10.37	14.84	1.3
1425.307	500-yr	36.41	259.66	261.15	2.76	13.7	20.65	1.49
1392.843	2-yr	3.78	259.14	259.68	1.61	2.35	7.45	0.54
1392.843	100-yr	24.88	259.14	260.4	2.63	9.47	12.05	1.26
1392.843	500-yr	36.41	259.14	260.71	2.67	13.65	15.18	1.57
1358.799	2-yr	3.78	258.63	259.23	1.31	2.88	7.98	0.6
1358.799	100-yr	24.88	258.63	259.93	2.49	10.01	12.26	1.3
1358.799	500-yr	36.41	258.63	260.11	2.95	12.32	13.54	1.48

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
1329.439	2-yr	3.78	258.21	258.7	1.72	2.19	7.4	0.48
1329.439	100-yr	24.88	258.21	259.4	2.75	9.03	11.9	1.19
1329.439	500-yr	36.41	258.21	259.72	2.75	13.26	13.85	1.51
1302.462	2-yr	3.78	257.76	258.51	0.6	6.25	12.02	0.75
1302.462	100-yr	24.88	257.76	259.49	1.18	21	18.35	1.73
1302.462	500-yr	36.41	257.76	259.82	1.33	27.41	20.63	2.06
1264.23	2-yr	3.78	257.59	258.1	1.73	2.19	6.9	0.51
1264.23	100-yr	24.88	257.59	258.92	2.51	9.93	11.54	1.33
1264.23	500-yr	36.41	257.59	259.16	2.86	12.73	12.68	1.57
1230.005	2-yr	3.78	257.24	257.91	0.93	4.08	9.07	0.67
1230.005	100-yr	24.88	257.24	258.79	1.71	14.57	14.49	1.55
1230.005	500-yr	36.41	257.24	259	2.05	17.79	15.62	1.76
1191.977	2-yr	3.78	256.91	257.8	0.52	7.22	11.98	0.89
1191.977	100-yr	24.88	256.91	258.56	1.36	19.07	28.5	1.65
1191.977	500-yr	36.41	256.91	258.72	1.66	24.43	39.11	1.81
1155.309	2-yr	3.78	257.11	257.65	1.31	2.88	7.71	0.54
1155.309	100-yr	24.88	257.11	258.34	1.87	16.45	37.29	1.23
1155.309	500-yr	36.41	257.11	258.57	1.74	26.23	45.69	1.46
1124.025	2-yr	3.78	255.94	256.48	1.76	2.15	7.02	0.54
1124.025	100-yr	24.88	255.94	257.23	2.88	8.63	10.2	1.29
1124.025	500-yr	36.41	255.94	257.5	3.16	11.5	11.31	1.56
1083.982	2-yr	3.78	255	255.79	0.85	4.46	8.3	0.79
1083.982	100-yr	24.88	255	256.78	1.69	14.72	12.44	1.78
1083.982	500-yr	36.41	255	257.09	1.93	18.83	13.76	2.09
1018.257	2-yr	3.78	254.8	255.42	1.31	2.88	7.68	0.62
1018.257	100-yr	24.88	254.8	256.26	2.32	10.74	11.02	1.46
1018.257	500-yr	36.41	254.8	256.5	2.66	14.47	21.63	1.7
959.582	2-yr	3.78	254.42	255.05	0.96	3.92	9.2	0.63
959.582	100-yr	24.88	254.42	255.97	1.7	14.84	19.58	1.55
959.582	500-yr	36.41	254.42	256.3	1.76	23.6	34	1.88

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
917.744	2-yr	3.78	253.94	254.63	1.11	3.4	8.22	0.69
917.744	100-yr	24.88	253.94	255.56	1.89	13.17	12.61	1.62
917.744	500-yr	36.41	253.94	255.87	2.1	17.63	19.23	1.93
885.843	2-yr	3.78	253.61	254.22	1.67	2.26	6.01	0.61
885.843	100-yr	24.88	253.61	254.99	2.9	8.58	10.17	1.38
885.843	500-yr	36.41	253.61	255.26	3.18	11.44	11.16	1.65
831.018	2-yr	3.78	252.63	253.1	1.81	2.08	6.26	0.47
831.018	100-yr	24.88	252.63	253.89	2.89	8.6	10.25	1.26
831.018	500-yr	36.41	252.63	254.16	3.15	11.55	11.51	1.53
794.448	2-yr	3.78	251.86	252.49	1.07	3.54	8	0.63
794.448	100-yr	24.88	251.86	253.39	1.86	13.35	13.5	1.53
794.448	500-yr	36.41	251.86	253.69	2.07	17.64	14.96	1.83
753.27	2-yr	3.78	251.5	252.15	1.31	2.88	7.46	0.65
753.27	100-yr	24.88	251.5	252.87	2.56	9.74	11.25	1.37
753.27	500-yr	36.41	251.5	253.09	2.96	12.3	12.22	1.59
720.714	2-yr	3.78	251.09	251.59	1.74	2.18	7.23	0.5
720.714	100-yr	24.88	251.09	252.3	2.77	8.99	11.68	1.21
720.714	500-yr	36.41	251.09	252.55	3.03	12.01	13.01	1.46
673.556	2-yr	3.78	250.52	251.22	0.49	7.76	16.92	0.7
673.556	100-yr	24.88	250.52	252.05	0.91	27.38	30.44	1.53
673.556	500-yr	36.41	250.52	252.31	1.02	35.61	34.8	1.79
625.562	2-yr	3.78	250.47	251.07	1	3.76	10.2	0.6
625.562	100-yr	24.88	250.47	251.72	2	12.42	16.9	1.25
625.562	500-yr	36.41	250.47	251.86	2.45	14.85	18.7	1.39
582.64	2-yr	3.78	250.01	250.5	1.61	2.34	9.12	0.49
582.64	100-yr	24.88	250.01	251.11	2.37	11.05	22.28	1.1
582.64	500-yr	36.41	250.01	251.31	2.53	16.08	28.88	1.3
543.04	2-yr	3.78	249.4	249.87	1.01	3.75	13.53	0.47
543.04	100-yr	24.88	249.4	250.41	1.89	13.49	22.16	1.01
543.04	500-yr	36.41	249.4	250.55	2.27	16.78	24.18	1.15

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
496.118	2-yr	3.78	249.1	249.66	0.63	5.99	19.56	0.56
496.118	100-yr	24.88	249.1	250.18	1.24	20.1	34.2	1.08
496.118	500-yr	36.41	249.1	250.32	1.48	25.12	37.83	1.22
428.594	2-yr	3.78	248.79	249.11	1.32	2.87	16.66	0.32
428.594	100-yr	24.88	248.79	249.5	2.05	13.14	34.28	0.71
428.594	500-yr	36.41	248.79	249.63	2.22	18.07	39.51	0.84
389.142	2-yr	3.78	248.21	248.59	0.75	6	29.68	0.38
389.142	100-yr	24.88	248.21	249.15	1.07	27.23	44.66	0.94
389.142	500-yr	36.41	248.21	249.34	1.19	36.36	48.86	1.13
343.978	2-yr	3.78	247.75	248.24	0.67	5.61	17.07	0.49
343.978	100-yr	24.88	247.75	248.86	1.28	20.89	31.98	1.11
343.978	500-yr	36.41	247.75	249.06	1.47	27.47	36.12	1.31
318.111	2-yr	3.78	247.65	248.13	0.79	4.77	15.54	0.48
318.111	100-yr	24.88	247.65	248.74	1.42	18.6	29.43	1.09
318.111	500-yr	36.41	247.65	248.93	1.62	24.43	33.02	1.28
284.899	2-yr	3.78	247.49	248.01	0.66	5.75	17.32	0.52
284.899	100-yr	24.88	247.49	248.64	1.19	21.5	32.14	1.15
284.899	500-yr	36.41	247.49	248.83	1.36	28.05	36.29	1.34
244.681	2-yr	3.78	247.05	247.43	1.53	2.48	10.7	0.38
244.681	100-yr	24.88	247.05	247.98	2.27	10.98	20.98	0.93
244.681	500-yr	36.41	247.05	248.15	2.44	14.9	24.93	1.1
214.499	2-yr	3.78	246.61	247.28	0.51	7.46	18.44	0.67
214.499	100-yr	24.88	246.61	247.95	1.05	24.82	33.2	1.34
214.499	500-yr	36.41	246.61	248.16	1.23	32.13	38.11	1.55
214.498	2-yr	3.78	246.61	247.02	1.12	3.38	12.95	0.41
214.498	100-yr	24.88	246.61	247.53	1.95	12.78	23.94	0.92
214.498	500-yr	36.41	246.61	247.67	2.27	16.2	26.97	1.06
147.881	2-yr	3.78	245.82	246.26	1.09	3.47	13.05	0.44
147.881	100-yr	24.88	245.82	246.88	1.61	15.46	25.68	1.06
147.881	500-yr	36.41	245.82	247.06	1.79	20.56	29.73	1.24

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
79.942	2-yr	3.78	245.12	245.64	1.04	3.63	10.86	0.52
79.942	100-yr	24.88	245.12	246.41	1.58	15.72	21.24	1.29
79.942	500-yr	36.41	245.12	246.66	1.7	21.46	24.88	1.54
53.415	2-yr	3.78	244.76	245.21	1.72	2.2	7.47	0.45
53.415	100-yr	24.88	244.76	245.9	2.63	9.47	13.47	1.14
53.415	500-yr	36.41	244.76	246.13	2.85	12.79	15.57	1.37
13.63	2-yr	3.78	243.93	244.4	1.41	2.69	8.31	0.47
13.63	100-yr	24.88	243.93	245.09	2.4	10.37	14.26	1.16
13.63	500-yr	36.41	243.93	245.31	2.62	14.31	23.68	1.38

Table 21: Steady Conventional cross-sectional properties

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	2-yr	1.66	264.87	265.34	0.75	2.21	6.87	0.47
2097.011	100-yr	33.91	264.87	266.68	1.98	17.13	15.34	1.81
2097.011	500-yr	46.94	264.87	266.98	2.15	21.86	17.71	2.11
2052.742	2-yr	1.66	264.51	264.88	1.44	1.16	5.52	0.37
2052.742	100-yr	33.91	264.51	265.98	3.04	11.16	12.06	1.47
2052.742	500-yr	46.94	264.51	266.23	3.27	14.37	13.41	1.72
2009.086	2-yr	1.66	263.84	264.14	0.91	1.83	8.79	0.3
2009.086	100-yr	33.91	263.84	265.08	2.29	14.82	18.39	1.24
2009.086	500-yr	46.94	263.84	265.23	2.68	17.59	19.68	1.39
1964.49	2-yr	1.66	263.35	263.64	0.89	1.86	9.86	0.29
1964.49	100-yr	33.91	263.35	264.39	2.51	13.53	21.53	1.04
1964.49	500-yr	46.94	263.35	264.57	2.66	17.63	24.47	1.22
1925.761	2-yr	1.66	263.04	263.28	0.65	2.55	15.68	0.24
1925.761	100-yr	33.91	263.04	264.13	1.28	30.67	52.8	1.09
1925.761	500-yr	46.94	263.04	264.31	1.39	41.53	70.22	1.27
1874.546	2-yr	1.66	262.4	262.81	0.56	2.96	12.25	0.41
1874.546	100-yr	33.91	262.4	263.69	1.62	21.88	33.08	1.29
1874.546	500-yr	46.94	262.4	263.8	1.94	25.98	37.78	1.4

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1828.159	2-yr	1.66	262.13	262.39	1.24	1.34	8.78	0.26
1828.159	100-yr	33.91	262.13	263.11	2.35	14.65	28.24	0.98
1828.159	500-yr	46.94	262.13	263.33	2.3	21.53	34.49	1.2
1788.723	2-yr	1.66	261.54	262.02	0.43	3.82	13.96	0.48
1788.723	100-yr	33.91	261.54	263.1	1.06	34.34	39.99	1.56
1788.723	500-yr	46.94	261.54	263.34	1.16	44.41	44.16	1.8
1742.556	2-yr	1.66	261.5	261.93	0.49	3.38	13.03	0.43
1742.556	100-yr	33.91	261.5	262.99	1.21	29.25	34.94	1.49
1742.556	500-yr	46.94	261.5	263.24	1.31	38.46	39.94	1.74
1695.655	2-yr	1.66	261.28	261.57	1.33	1.24	7.01	0.29
1695.655	100-yr	33.91	261.28	262.75	1.79	20.91	31.96	1.47
1695.655	500-yr	46.94	261.28	263.12	1.52	39.39	56.96	1.84
1651.05	2-yr	1.66	260.78	261.16	0.6	2.76	11.29	0.38
1651.05	100-yr	33.91	260.78	262.72	1.01	33.52	26.81	1.94
1651.05	500-yr	46.94	260.78	263.07	1.08	43.55	30.24	2.29
1617.21	2-yr	1.66	260.56	261.04	0.62	2.68	9.17	0.48
1617.21	100-yr	33.91	260.56	262.66	1.16	29.34	22.73	2.1
1617.21	500-yr	46.94	260.56	263.01	1.24	37.79	24.97	2.45
1577.381	2-yr	1.66	260.48	261.04	0.16	10.68	24.33	0.56
1577.381	100-yr	33.91	260.48	262.68	0.53	67.29	53.08	2.2
1577.381	500-yr	46.94	260.48	263.04	0.58	88.03	63.61	2.56
1542.946	2-yr	1.66	260.49	260.99	0.83	1.99	5.5	0.5
1542.946	100-yr	33.91	260.49	262.29	2.59	13.09	11.13	1.8
1542.946	500-yr	46.94	260.49	262.56	2.9	16.18	11.95	2.07
1504.079	2-yr	1.66	260.31	260.76	0.89	1.86	6.87	0.45
1504.079	100-yr	33.91	260.31	261.92	2.55	13.3	12.53	1.61
1504.079	500-yr	46.94	260.31	262.1	3	15.63	13.32	1.79
1467.659	2-yr	1.66	260.12	260.5	0.84	1.98	7.76	0.38
1467.659	100-yr	33.91	260.12	261.7	2.03	16.71	17.58	1.58
1467.659	500-yr	46.94	260.12	261.85	2.41	19.63	19.93	1.73

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1425.307	2-yr	1.66	259.66	260.08	1.09	1.52	6.18	0.42
1425.307	100-yr	33.91	259.66	261.1	2.71	12.87	19.27	1.44
1425.307	500-yr	46.94	259.66	261.34	2.83	18.46	28.67	1.68
1392.843	2-yr	1.66	259.14	259.52	1.31	1.26	5.91	0.38
1392.843	100-yr	33.91	259.14	260.65	2.67	12.72	14.49	1.51
1392.843	500-yr	46.94	259.14	260.9	2.8	17.4	26.96	1.76
1358.799	2-yr	1.66	258.63	259.06	0.99	1.67	6.63	0.43
1358.799	100-yr	33.91	258.63	260.07	2.88	11.78	13.19	1.44
1358.799	500-yr	46.94	258.63	260.3	3.14	14.97	15.1	1.67
1329.439	2-yr	1.66	258.21	258.55	1.4	1.19	6.12	0.34
1329.439	100-yr	33.91	258.21	259.66	2.74	12.37	13.49	1.45
1329.439	500-yr	46.94	258.21	259.96	2.83	16.71	15.53	1.75
1302.462	2-yr	1.66	257.76	258.29	0.45	3.71	10.48	0.53
1302.462	100-yr	33.91	257.76	259.75	1.3	26.07	20.15	1.99
1302.462	500-yr	46.94	257.76	260.07	1.44	32.84	22.97	2.31
1264.23	2-yr	1.66	257.59	257.95	1.35	1.23	5.79	0.36
1264.23	100-yr	33.91	257.59	259.11	2.79	12.16	12.46	1.52
1264.23	500-yr	46.94	257.59	259.31	3.18	14.78	13.45	1.72
1230.005	2-yr	1.66	257.24	257.66	0.8	2.08	7.14	0.42
1230.005	100-yr	33.91	257.24	258.96	1.98	17.15	15.4	1.72
1230.005	500-yr	46.94	257.24	259.14	2.35	20.02	16.69	1.9
1191.977	2-yr	1.66	256.91	257.58	0.35	4.7	10.39	0.67
1191.977	100-yr	33.91	256.91	258.69	1.61	23.13	36.74	1.77
1191.977	500-yr	46.94	256.91	258.86	1.81	31.38	53.55	1.95
1155.309	2-yr	1.66	257.11	257.48	0.99	1.68	6.46	0.37
1155.309	100-yr	33.91	257.11	258.53	1.77	24.17	44.67	1.42
1155.309	500-yr	46.94	257.11	258.76	1.62	34.94	48.66	1.65
1124.025	2-yr	1.66	255.94	256.33	1.42	1.17	5.94	0.39
1124.025	100-yr	33.91	255.94	257.44	3.11	10.89	11.08	1.5
1124.025	500-yr	46.94	255.94	257.71	3.36	13.97	13.21	1.77

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1083.982	2-yr	1.66	255	255.56	0.62	2.68	7.07	0.56
1083.982	100-yr	33.91	255	257.03	1.88	18.05	13.52	2.03
1083.982	500-yr	46.94	255	257.28	2.15	23.1	30.66	2.28
1018.257	2-yr	1.66	254.8	255.23	1.07	1.55	6.14	0.43
1018.257	100-yr	33.91	254.8	256.45	2.59	13.54	19.72	1.65
1018.257	500-yr	46.94	254.8	256.67	2.83	18.69	27.62	1.87
959.582	2-yr	1.66	254.42	254.86	0.73	2.28	7.7	0.44
959.582	100-yr	33.91	254.42	256.23	1.76	21.52	31.23	1.81
959.582	500-yr	46.94	254.42	256.53	1.75	32.66	44.16	2.11
917.744	2-yr	1.66	253.94	254.43	0.89	1.86	7.03	0.49
917.744	100-yr	33.91	253.94	255.81	2.07	16.47	17.57	1.87
917.744	500-yr	46.94	253.94	256.13	2.15	23.57	26.63	2.19
885.843	2-yr	1.66	253.61	254.06	1.23	1.35	5.1	0.45
885.843	100-yr	33.91	253.61	255.21	3.13	10.85	10.98	1.6
885.843	500-yr	46.94	253.61	255.47	3.39	13.84	11.85	1.86
831.018	2-yr	1.66	252.63	252.94	1.46	1.14	5.32	0.31
831.018	100-yr	33.91	252.63	254.11	3.11	10.91	11.25	1.48
831.018	500-yr	46.94	252.63	254.37	3.35	14.03	12.47	1.74
794.448	2-yr	1.66	251.86	252.27	0.84	1.99	6.63	0.41
794.448	100-yr	33.91	251.86	253.64	2.02	16.77	14.66	1.78
794.448	500-yr	46.94	251.86	253.93	2.22	21.28	16.17	2.07
753.27	2-yr	1.66	251.5	251.97	1	1.66	5.87	0.47
753.27	100-yr	33.91	251.5	253.05	2.88	11.79	12.03	1.55
753.27	500-yr	46.94	251.5	253.24	3.29	14.25	12.9	1.74
720.714	2-yr	1.66	251.09	251.44	1.4	1.19	6.03	0.35
720.714	100-yr	33.91	251.09	252.5	2.98	11.38	12.77	1.41
720.714	500-yr	46.94	251.09	252.74	3.23	14.6	14.29	1.65
673.556	2-yr	1.66	250.52	251.02	0.36	4.67	14.02	0.5
673.556	100-yr	33.91	250.52	252.26	1	33.92	33.96	1.74
673.556	500-yr	46.94	250.52	252.5	1.11	42.79	38.29	1.98

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
625.562	2-yr	1.66	250.47	250.91	0.75	2.2	8.69	0.44
625.562	100-yr	33.91	250.47	251.84	2.35	14.43	18.37	1.37
625.562	500-yr	46.94	250.47	251.96	2.82	16.74	20.45	1.49
582.64	2-yr	1.66	250.01	250.37	1.35	1.23	6.82	0.36
582.64	100-yr	33.91	250.01	251.27	2.49	15.03	27.65	1.26
582.64	500-yr	46.94	250.01	251.45	2.65	20.35	32.2	1.44
543.04	2-yr	1.66	249.4	249.72	0.85	1.95	10.45	0.32
543.04	100-yr	33.91	249.4	250.52	2.19	16.11	23.78	1.12
543.04	500-yr	46.94	249.4	250.66	2.56	19.36	25.65	1.26
496.118	2-yr	1.66	249.1	249.51	0.49	3.41	15	0.41
496.118	100-yr	33.91	249.1	250.29	1.43	24.14	37.2	1.19
496.118	500-yr	46.94	249.1	250.43	1.65	29.48	40.88	1.33
428.594	2-yr	1.66	248.79	249.01	1.1	1.51	12.29	0.22
428.594	100-yr	33.91	248.79	249.61	2.2	16.95	38.5	0.82
428.594	500-yr	46.94	248.79	249.73	2.39	21.86	42.82	0.94
389.142	2-yr	1.66	248.21	248.48	0.7	2.98	25.95	0.27
389.142	100-yr	33.91	248.21	249.3	1.16	34.46	48.02	1.09
389.142	500-yr	46.94	248.21	249.49	1.27	43.98	51.97	1.28
343.978	2-yr	1.66	247.75	248.08	0.52	3.17	14.02	0.33
343.978	100-yr	33.91	247.75	249.02	1.43	26.11	35.29	1.27
343.978	500-yr	46.94	247.75	249.2	1.61	32.92	39.28	1.45
318.111	2-yr	1.66	247.65	247.97	0.64	2.57	12.17	0.32
318.111	100-yr	33.91	247.65	248.89	1.58	23.23	32.28	1.24
318.111	500-yr	46.94	247.65	249.07	1.78	29.15	35.88	1.42
284.899	2-yr	1.66	247.49	247.85	0.51	3.27	13.91	0.36
284.899	100-yr	33.91	247.49	248.79	1.33	26.72	35.57	1.3
284.899	500-yr	46.94	247.49	248.97	1.51	33.17	39.06	1.48
244.681	2-yr	1.66	247.05	247.31	1.23	1.35	8.79	0.26
244.681	100-yr	33.91	247.05	248.11	2.41	14.05	24.09	1.06
244.681	500-yr	46.94	247.05	248.29	2.5	18.75	28.27	1.24

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
214.499	2-yr	1.66	246.61	247.1	0.37	4.46	14.49	0.49
214.499	100-yr	33.91	246.61	248.12	1.2	30.58	37.19	1.51
214.499	500-yr	46.94	246.61	248.32	1.35	38.45	41.67	1.71
214.498	2-yr	1.66	246.61	246.9	0.86	1.94	10.63	0.29
214.498	100-yr	33.91	246.61	247.64	2.2	15.5	26.37	1.03
214.498	500-yr	46.94	246.61	247.77	2.52	18.96	29.11	1.16
147.881	2-yr	1.66	245.82	246.12	0.88	1.88	10.22	0.3
147.881	100-yr	33.91	245.82	247.03	1.75	19.5	28.82	1.21
147.881	500-yr	46.94	245.82	247.21	1.92	25.17	33.21	1.39
79.942	2-yr	1.66	245.12	245.48	0.82	2.03	8.8	0.36
79.942	100-yr	33.91	245.12	246.61	1.68	20.25	24.15	1.49
79.942	500-yr	46.94	245.12	246.84	1.81	26.42	27.75	1.72
53.415	2-yr	1.66	244.76	245.06	1.4	1.18	6.01	0.3
53.415	100-yr	33.91	244.76	246.08	2.81	12.08	15.01	1.33
53.415	500-yr	46.94	244.76	246.3	3.04	15.54	17.53	1.54
13.63	2-yr	1.66	243.93	244.25	1.09	1.52	6.89	0.32
13.63	100-yr	33.91	243.93	245.27	2.59	13.34	21.18	1.34
13.63	500-yr	46.94	243.93	245.49	2.64	19.49	33.92	1.56

Table 22: Steady GLD (During mining) cross-sectional properties

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	2-yr	20.27	264.87	266.31	1.72	11.8	12.87	1.44
2097.011	100-yr	63.28	264.87	267.26	2.3	29.07	30.6	2.39
2097.011	500-yr	92.16	264.87	267.72	2.32	47.28	46.27	2.85
2052.742	2-yr	20.27	264.51	265.66	2.69	7.54	10.36	1.15
2052.742	100-yr	63.28	264.51	266.49	3.51	18.05	14.79	1.98
2052.742	500-yr	92.16	264.51	266.87	3.88	24.23	18.13	2.36
2009.086	2-yr	20.27	263.84	264.85	1.88	10.81	16.27	1.01

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2009.086	100-yr	63.28	263.84	265.39	3.08	20.78	21.06	1.55
2009.086	500-yr	92.16	263.84	265.67	3.5	27.1	23.67	1.83
1964.49	2-yr	20.27	263.35	264.17	2.23	9.09	17.85	0.82
1964.49	100-yr	63.28	263.35	264.74	2.87	22.1	27.24	1.39
1964.49	500-yr	92.16	263.35	265	3.16	29.69	31.62	1.65
1925.761	2-yr	20.27	263.04	263.9	1.12	19.84	41.9	0.86
1925.761	100-yr	63.28	263.04	264.5	1.46	55.91	85.14	1.46
1925.761	500-yr	92.16	263.04	264.74	1.56	78.31	98.37	1.7
1874.546	2-yr	20.27	262.4	263.48	1.31	15.7	26.69	1.08
1874.546	100-yr	63.28	262.4	263.93	2.26	31.08	44.79	1.53
1874.546	500-yr	92.16	262.4	264.29	2.22	49.33	55.79	1.89
1828.159	2-yr	20.27	262.13	262.93	2.05	9.9	23.62	0.8
1828.159	100-yr	63.28	262.13	263.65	2.07	33.85	43.52	1.52
1828.159	500-yr	92.16	262.13	264.17	1.82	63.97	83.24	2.04
1788.723	2-yr	20.27	261.54	262.81	0.9	23.34	34.08	1.27
1788.723	100-yr	63.28	261.54	263.65	1.21	58.75	49.2	2.11
1788.723	500-yr	92.16	261.54	264.16	1.25	86.33	58.94	2.62
1742.556	2-yr	20.27	261.5	262.69	1.04	19.66	29.11	1.19
1742.556	100-yr	63.28	261.5	263.57	1.34	52.69	47.31	2.07
1742.556	500-yr	92.16	261.5	264.1	1.36	87.25	99.3	2.6
1695.655	2-yr	20.27	261.28	262.29	2.02	10.04	17.55	1.01
1695.655	100-yr	63.28	261.28	263.51	1.29	63.66	66.38	2.23
1695.655	500-yr	92.16	261.28	264.08	1.12	104.02	75.83	2.8
1651.05	2-yr	20.27	260.78	262.27	0.91	22.33	22.68	1.49
1651.05	100-yr	63.28	260.78	263.46	1.16	55.87	34.13	2.68
1651.05	500-yr	92.16	260.78	264.01	1.28	76.4	40.61	3.23
1617.21	2-yr	20.27	260.56	262.21	1.03	19.73	19.66	1.64
1617.21	100-yr	63.28	260.56	263.4	1.32	47.84	27.26	2.84
1617.21	500-yr	92.16	260.56	263.95	1.45	63.71	30.77	3.39
1577.381	2-yr	20.27	260.48	262.22	0.43	46.79	36.8	1.74

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
1577.381	100-yr	63.28	260.48	263.43	0.63	114.06	72.2	2.95
1577.381	500-yr	92.16	260.48	263.99	0.68	156.59	79.93	3.51
1542.946	2-yr	20.27	260.49	261.95	2.16	9.4	9.97	1.46
1542.946	100-yr	63.28	260.49	262.86	3.17	19.94	12.88	2.37
1542.946	500-yr	92.16	260.49	263.19	3.79	24.5	18.37	2.7
1504.079	2-yr	20.27	260.31	261.61	2.1	9.67	11.13	1.3
1504.079	100-yr	63.28	260.31	262.29	3.49	18.21	14.1	1.98
1504.079	500-yr	92.16	260.31	262.72	3.77	25.23	22.18	2.41
1467.659	2-yr	20.27	260.12	261.38	1.74	11.67	14.59	1.26
1467.659	100-yr	63.28	260.12	261.96	2.96	21.91	24.62	1.84
1467.659	500-yr	92.16	260.12	262.28	3.2	32.58	36.37	2.16
1425.307	2-yr	20.27	259.66	260.84	2.31	8.79	13.27	1.18
1425.307	100-yr	63.28	259.66	261.56	2.92	25.61	33.46	1.9
1425.307	500-yr	92.16	259.66	261.81	3.28	33.96	35.63	2.15
1392.843	2-yr	20.27	259.14	260.29	2.49	8.13	11.28	1.15
1392.843	100-yr	63.28	259.14	261.18	2.7	27	36.63	2.04
1392.843	500-yr	92.16	259.14	261.56	2.65	41.39	39.48	2.42
1358.799	2-yr	20.27	258.63	259.82	2.33	8.69	11.58	1.19
1358.799	100-yr	63.28	258.63	260.53	3.42	18.74	17.45	1.9
1358.799	500-yr	92.16	258.63	261	3.44	30.07	37.78	2.37
1329.439	2-yr	20.27	258.21	259.28	2.62	7.74	11.23	1.07
1329.439	100-yr	63.28	258.21	260.25	3.01	21.69	18.26	2.04
1329.439	500-yr	92.16	258.21	260.48	3.74	26.11	24.02	2.27
1302.462	2-yr	20.27	257.76	259.34	1.11	18.25	17.3	1.58
1302.462	100-yr	63.28	257.76	260.39	1.56	43.91	51.25	2.63
1302.462	500-yr	92.16	257.76	260.74	1.75	62.58	57.57	2.98
1264.23	2-yr	20.27	257.59	258.81	2.36	8.6	10.96	1.22
1264.23	100-yr	63.28	257.59	259.55	3.49	18.13	14.73	1.96
1264.23	500-yr	92.16	257.59	260.09	3.21	32.75	39.39	2.5
1230.005	2-yr	20.27	257.24	258.68	1.57	12.93	13.87	1.44

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1230.005	100-yr	63.28	257.24	259.29	2.82	23.01	26.42	2.05
1230.005	500-yr	92.16	257.24	259.65	2.98	37.93	52.5	2.41
1191.977	2-yr	20.27	256.91	258.47	1.21	16.81	22.17	1.56
1191.977	100-yr	63.28	256.91	258.99	2.08	38.67	61.16	2.08
1191.977	500-yr	92.16	256.91	259.24	2.22	54.87	67.66	2.33
1155.309	2-yr	20.27	257.11	258.24	1.88	13.04	29.88	1.13
1155.309	100-yr	63.28	257.11	258.85	1.89	39.69	50.42	1.74
1155.309	500-yr	92.16	257.11	259.1	1.98	52.95	54.96	1.99
1124.025	2-yr	20.27	255.94	257.11	2.74	7.4	9.69	1.17
1124.025	100-yr	63.28	255.94	258.17	2.74	28.4	41.98	2.23
1124.025	500-yr	92.16	255.94	258.39	3.03	37.98	44.23	2.45
1083.982	2-yr	20.27	255	256.62	1.58	12.85	11.8	1.62
1083.982	100-yr	63.28	255	257.49	2.42	29.72	34.73	2.49
1083.982	500-yr	92.16	255	257.7	2.9	37.57	38.28	2.7
1018.257	2-yr	20.27	254.8	256.12	2.18	9.29	10.52	1.32
1018.257	100-yr	63.28	254.8	256.89	2.97	25.44	33.71	2.09
1018.257	500-yr	92.16	254.8	257.21	3.06	37.33	40.5	2.41
959.582	2-yr	20.27	254.42	255.83	1.61	12.63	13.06	1.41
959.582	100-yr	63.28	254.42	256.81	1.71	46.38	51.1	2.39
959.582	500-yr	92.16	254.42	257.17	1.77	65.68	55.9	2.75
917.744	2-yr	20.27	253.94	255.42	1.78	11.41	11.98	1.48
917.744	100-yr	63.28	253.94	256.48	2.11	34.16	33.74	2.54
917.744	500-yr	92.16	253.94	256.87	2.21	48.49	39.66	2.93
885.843	2-yr	20.27	253.61	254.87	2.75	7.36	9.69	1.26
885.843	100-yr	63.28	253.61	255.81	3.49	18.48	18.38	2.2
885.843	500-yr	92.16	253.61	256.29	3.47	29.7	27.89	2.68
831.018	2-yr	20.27	252.63	253.77	2.75	7.36	9.67	1.14
831.018	100-yr	63.28	252.63	254.64	3.59	17.64	13.58	2.01
831.018	500-yr	92.16	252.63	255.04	4	23.29	15.06	2.41
794.448	2-yr	20.27	251.86	253.25	1.77	11.48	12.75	1.39

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
794.448	100-yr	63.28	251.86	254.22	2.46	26.28	17.68	2.36
794.448	500-yr	92.16	251.86	254.65	2.8	34.27	19.86	2.79
753.27	2-yr	20.27	251.5	252.76	2.37	8.57	10.79	1.26
753.27	100-yr	63.28	251.5	253.51	3.54	17.88	14.08	2.01
753.27	500-yr	92.16	251.5	253.91	3.9	23.85	16.39	2.41
720.714	2-yr	20.27	251.09	252.19	2.64	7.69	11.02	1.1
720.714	100-yr	63.28	251.09	252.99	3.49	18.49	16.05	1.9
720.714	500-yr	92.16	251.09	253.37	3.86	25.02	18.61	2.28
673.556	2-yr	20.27	250.52	251.93	0.85	23.78	28.23	1.41
673.556	100-yr	63.28	250.52	252.76	1.22	53.19	43.29	2.24
673.556	500-yr	92.16	250.52	253.11	1.4	69.84	50.96	2.59
625.562	2-yr	20.27	250.47	251.64	1.83	11.09	15.88	1.17
625.562	100-yr	63.28	250.47	252.15	3.1	21.04	24.02	1.68
625.562	500-yr	92.16	250.47	252.47	3.33	29.79	29.93	2
582.64	2-yr	20.27	250.01	251.01	2.3	9.03	19.02	1
582.64	100-yr	63.28	250.01	251.61	2.87	25.78	35.28	1.6
582.64	500-yr	92.16	250.01	251.84	3.17	34.49	39.44	1.83
543.04	2-yr	20.27	249.4	250.34	1.72	12	21.15	0.94
543.04	100-yr	63.28	249.4	250.78	2.97	22.82	27.56	1.39
543.04	500-yr	92.16	249.4	251.05	3.3	30.76	31.6	1.65
496.118	2-yr	20.27	249.1	250.11	1.14	17.81	32.23	1.01
496.118	100-yr	63.28	249.1	250.57	1.88	35.44	44.61	1.47
496.118	500-yr	92.16	249.1	250.77	2.23	44.73	49.94	1.67
428.594	2-yr	20.27	248.79	249.44	1.95	11.09	31.79	0.65
428.594	100-yr	63.28	248.79	249.85	2.58	27.59	47.18	1.06
428.594	500-yr	92.16	248.79	250.04	2.86	36.91	53.35	1.25
389.142	2-yr	20.27	248.21	249.05	1.02	23.2	42.55	0.84
389.142	100-yr	63.28	248.21	249.69	1.39	54.8	55.95	1.48
389.142	500-yr	92.16	248.21	249.99	1.57	72.14	61.64	1.78
343.978	2-yr	20.27	247.75	248.77	1.19	18.04	29.77	1.02

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
343.978	100-yr	63.28	247.75	249.39	1.79	40.62	43.16	1.64
343.978	500-yr	92.16	247.75	249.66	2.05	53.26	49.13	1.91
318.111	2-yr	20.27	247.65	248.66	1.32	16.08	27.45	1.01
318.111	100-yr	63.28	247.65	249.24	1.99	35.69	39.25	1.59
318.111	500-yr	92.16	247.65	249.5	2.28	46.5	44.6	1.85
284.899	2-yr	20.27	247.49	248.55	1.1	18.71	29.99	1.06
284.899	100-yr	63.28	247.49	249.14	1.72	40.03	42.56	1.65
284.899	500-yr	92.16	247.49	249.39	2	51.45	47.76	1.9
244.681	2-yr	20.27	247.05	247.89	2.2	9.21	19.09	0.84
244.681	100-yr	63.28	247.05	248.5	2.55	25.02	33.14	1.45
244.681	500-yr	92.16	247.05	248.78	2.71	35.26	40.28	1.73
214.499	2-yr	20.27	246.61	247.86	0.97	21.75	31.05	1.25
214.499	100-yr	63.28	246.61	248.52	1.52	47.47	46.26	1.91
214.499	500-yr	92.16	246.61	248.81	1.75	61.65	52.44	2.2
214.498	2-yr	20.27	246.61	247.46	1.83	11.1	22.3	0.85
214.498	100-yr	63.28	246.61	247.92	2.76	23.64	32.36	1.31
214.498	500-yr	92.16	246.61	248.16	3.03	32.26	38.19	1.55
147.881	2-yr	20.27	245.82	246.78	1.56	13	23.58	0.96
147.881	100-yr	63.28	245.82	247.42	2.06	32.61	38.61	1.6
147.881	500-yr	92.16	245.82	247.73	2.23	45.97	47.95	1.91
79.942	2-yr	20.27	245.12	246.28	1.53	13.23	19.34	1.16
79.942	100-yr	63.28	245.12	247.1	1.93	34.28	34.19	1.98
79.942	500-yr	92.16	245.12	247.49	2.04	53.79	67.61	2.37
53.415	2-yr	20.27	244.76	245.79	2.51	8.07	12.56	1.03
53.415	100-yr	63.28	244.76	246.52	3.29	19.77	20.18	1.76
53.415	500-yr	92.16	244.76	246.9	3.5	29.03	29.46	2.14
13.63	2-yr	20.27	243.93	244.98	2.28	8.9	13.23	1.05
13.63	100-yr	63.28	243.93	245.7	2.71	27.66	43.62	1.77
13.63	500-yr	92.16	243.93	245.91	3.02	37.67	49.7	1.98

Table 23: Steady GLD (Post Mining) cross-sectional properties

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
2097.011	2-yr	3.81	264.87	265.55	1	3.81	8.31	0.68
2097.011	100-yr	23.35	264.87	266.4	1.79	13.06	13.51	1.53
2097.011	500-yr	37	264.87	266.76	2.03	18.25	15.77	1.89
2052.742	2-yr	3.81	264.51	265.04	1.78	2.14	6.78	0.53
2052.742	100-yr	23.35	264.51	265.74	2.79	8.38	10.77	1.23
2052.742	500-yr	37	264.51	266.05	3.1	11.94	12.4	1.54
2009.086	2-yr	3.81	263.84	264.31	1.12	3.41	10.76	0.47
2009.086	100-yr	23.35	263.84	264.92	1.97	11.86	16.86	1.08
2009.086	500-yr	37	263.84	265.12	2.38	15.55	18.74	1.28
1964.49	2-yr	3.81	263.35	263.74	1.3	2.94	11.33	0.39
1964.49	100-yr	23.35	263.35	264.22	2.31	10.09	18.77	0.87
1964.49	500-yr	37	263.35	264.44	2.55	14.5	22.26	1.09
1925.761	2-yr	3.81	263.04	263.42	0.75	5.06	20.57	0.38
1925.761	100-yr	23.35	263.04	263.96	1.16	22.32	44.05	0.92
1925.761	500-yr	37	263.04	264.18	1.31	33.11	56.11	1.14
1874.546	2-yr	3.81	262.4	262.97	0.74	5.15	15.22	0.57
1874.546	100-yr	23.35	262.4	263.53	1.38	17.2	28.2	1.13
1874.546	500-yr	37	262.4	263.72	1.69	23.13	34.36	1.32
1828.159	2-yr	3.81	262.13	262.52	1.47	2.59	11.89	0.39
1828.159	100-yr	23.35	262.13	262.97	2.13	10.95	24.69	0.84
1828.159	500-yr	37	262.13	263.15	2.38	15.86	29.34	1.02
1788.723	2-yr	3.81	261.54	262.21	0.54	7.01	19.75	0.67
1788.723	100-yr	23.35	261.54	262.88	0.95	25.76	35.6	1.34
1788.723	500-yr	37	261.54	263.17	1.08	37.03	41.14	1.63
1742.556	2-yr	3.81	261.5	262.11	0.63	6.05	16.94	0.61
1742.556	100-yr	23.35	261.5	262.76	1.1	21.68	30.35	1.26
1742.556	500-yr	37	261.5	263.06	1.23	31.77	36.44	1.56
1695.655	2-yr	3.81	261.28	261.71	1.61	2.37	9.18	0.43
1695.655	100-yr	23.35	261.28	262.41	1.95	12.18	20.18	1.13
1695.655	500-yr	37	261.28	262.84	1.78	24.36	48.78	1.56

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
1651.05	2-yr	3.81	260.78	261.38	0.68	5.61	14.46	0.6
1651.05	100-yr	23.35	260.78	262.38	0.94	24.95	23.67	1.6
1651.05	500-yr	37	260.78	262.81	1.03	35.93	27.62	2.03
1617.21	2-yr	3.81	260.56	261.29	0.72	5.3	11.6	0.73
1617.21	100-yr	23.35	260.56	262.32	1.06	22.01	20.48	1.76
1617.21	500-yr	37	260.56	262.75	1.18	31.38	23.3	2.19
1577.381	2-yr	3.81	260.48	261.29	0.22	17.22	27.35	0.81
1577.381	100-yr	23.35	260.48	262.33	0.46	51.23	39.76	1.85
1577.381	500-yr	37	260.48	262.77	0.54	72.16	55.82	2.29
1542.946	2-yr	3.81	260.49	261.2	1.16	3.28	6.48	0.71
1542.946	100-yr	23.35	260.49	262.03	2.27	10.31	10.29	1.54
1542.946	500-yr	37	260.49	262.36	2.68	13.83	11.34	1.87
1504.079	2-yr	3.81	260.31	260.94	1.18	3.22	8.07	0.63
1504.079	100-yr	23.35	260.31	261.69	2.21	10.57	11.49	1.38
1504.079	500-yr	37	260.31	261.97	2.66	13.92	12.76	1.66
1467.659	2-yr	3.81	260.12	260.69	1.08	3.53	9.08	0.57
1467.659	100-yr	23.35	260.12	261.46	1.82	12.86	15.32	1.34
1467.659	500-yr	37	260.12	261.75	2.1	17.61	18.34	1.63
1425.307	2-yr	3.81	259.66	260.24	1.44	2.65	7.58	0.58
1425.307	100-yr	23.35	259.66	260.92	2.36	9.89	14.05	1.26
1425.307	500-yr	37	259.66	261.16	2.77	13.9	21.16	1.5
1392.843	2-yr	3.81	259.14	259.69	1.61	2.36	7.47	0.54
1392.843	100-yr	23.35	259.14	260.37	2.59	9.02	11.75	1.23
1392.843	500-yr	37	259.14	260.73	2.67	13.86	15.33	1.59
1358.799	2-yr	3.81	258.63	259.23	1.31	2.9	7.99	0.6
1358.799	100-yr	23.35	258.63	259.9	2.44	9.58	12.04	1.27
1358.799	500-yr	37	258.63	260.12	2.97	12.46	13.63	1.49
1329.439	2-yr	3.81	258.21	258.7	1.73	2.21	7.42	0.49
1329.439	100-yr	23.35	258.21	259.36	2.71	8.61	11.68	1.15
1329.439	500-yr	37	258.21	259.74	2.75	13.46	13.93	1.53

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
1302.462	2-yr	3.81	257.76	258.52	0.61	6.28	12.04	0.76
1302.462	100-yr	23.35	257.76	259.44	1.16	20.1	17.99	1.68
1302.462	500-yr	37	257.76	259.83	1.34	27.71	20.76	2.07
1264.23	2-yr	3.81	257.59	258.11	1.73	2.2	6.91	0.52
1264.23	100-yr	23.35	257.59	258.89	2.46	9.49	11.35	1.3
1264.23	500-yr	37	257.59	259.17	2.88	12.86	12.73	1.58
1230.005	2-yr	3.81	257.24	257.91	0.93	4.1	9.08	0.67
1230.005	100-yr	23.35	257.24	258.75	1.66	14.03	14.28	1.51
1230.005	500-yr	37	257.24	259.01	2.06	17.94	15.67	1.77
1191.977	2-yr	3.81	256.91	257.81	0.53	7.25	12	0.9
1191.977	100-yr	23.35	256.91	258.53	1.32	18.18	26.43	1.62
1191.977	500-yr	37	256.91	258.73	1.68	24.74	39.66	1.82
1155.309	2-yr	3.81	257.11	257.65	1.32	2.9	7.73	0.54
1155.309	100-yr	23.35	257.11	258.31	1.86	15.21	31.83	1.2
1155.309	500-yr	37	257.11	258.58	1.73	26.72	45.86	1.47
1124.025	2-yr	3.81	255.94	256.48	1.76	2.16	7.03	0.54
1124.025	100-yr	23.35	255.94	257.19	2.84	8.23	10.04	1.25
1124.025	500-yr	37	255.94	257.51	3.18	11.64	11.36	1.57
1083.982	2-yr	3.81	255	255.79	0.85	4.48	8.32	0.79
1083.982	100-yr	23.35	255	256.73	1.65	14.11	12.24	1.73
1083.982	500-yr	37	255	257.1	1.95	19.01	13.81	2.1
1018.257	2-yr	3.81	254.8	255.42	1.32	2.89	7.7	0.62
1018.257	100-yr	23.35	254.8	256.21	2.27	10.27	10.87	1.41
1018.257	500-yr	37	254.8	256.51	2.67	14.69	22.02	1.71
959.582	2-yr	3.81	254.42	255.06	0.97	3.94	9.21	0.64
959.582	100-yr	23.35	254.42	255.93	1.67	14	16.05	1.51
959.582	500-yr	37	254.42	256.31	1.76	24.1	34.64	1.89
917.744	2-yr	3.81	253.94	254.63	1.12	3.42	8.23	0.69
917.744	100-yr	23.35	253.94	255.52	1.85	12.6	12.41	1.58
917.744	500-yr	37	253.94	255.89	2.11	17.92	19.64	1.95

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
885.843	2-yr	3.81	253.61	254.22	1.67	2.27	6.02	0.61
885.843	100-yr	23.35	253.61	254.95	2.85	8.18	10.02	1.34
885.843	500-yr	37	253.61	255.27	3.2	11.58	11.2	1.66
831.018	2-yr	3.81	252.63	253.11	1.82	2.1	6.27	0.48
831.018	100-yr	23.35	252.63	253.85	2.85	8.2	10.07	1.22
831.018	500-yr	37	252.63	254.17	3.17	11.69	11.56	1.54
794.448	2-yr	3.81	251.86	252.49	1.07	3.56	8.01	0.63
794.448	100-yr	23.35	251.86	253.35	1.83	12.74	13.28	1.49
794.448	500-yr	37	251.86	253.71	2.08	17.84	15.03	1.85
753.27	2-yr	3.81	251.5	252.15	1.32	2.9	7.48	0.65
753.27	100-yr	23.35	251.5	252.84	2.5	9.36	11.11	1.34
753.27	500-yr	37	251.5	253.1	2.98	12.43	12.26	1.6
720.714	2-yr	3.81	251.09	251.6	1.74	2.19	7.25	0.51
720.714	100-yr	23.35	251.09	252.27	2.73	8.57	11.47	1.18
720.714	500-yr	37	251.09	252.56	3.05	12.15	13.06	1.47
673.556	2-yr	3.81	250.52	251.22	0.49	7.8	16.96	0.7
673.556	100-yr	23.35	250.52	252.01	0.89	26.22	29.79	1.49
673.556	500-yr	37	250.52	252.32	1.03	36.01	34.99	1.8
625.562	2-yr	3.81	250.47	251.07	1.01	3.78	10.21	0.6
625.562	100-yr	23.35	250.47	251.7	1.94	12.02	16.6	1.23
625.562	500-yr	37	250.47	251.87	2.47	14.97	18.79	1.4
582.64	2-yr	3.81	250.01	250.51	1.62	2.36	9.13	0.5
582.64	100-yr	23.35	250.01	251.08	2.35	10.33	21.21	1.07
582.64	500-yr	37	250.01	251.32	2.54	16.33	29.16	1.31
543.04	2-yr	3.81	249.4	249.87	1.01	3.77	13.56	0.47
543.04	100-yr	23.35	249.4	250.39	1.84	13.01	21.85	0.99
543.04	500-yr	37	249.4	250.56	2.29	16.93	24.27	1.16
496.118	2-yr	3.81	249.1	249.66	0.63	6.03	19.61	0.56
496.118	100-yr	23.35	249.1	250.16	1.21	19.35	33.56	1.06
496.118	500-yr	37	249.1	250.33	1.49	25.37	38.01	1.23

River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
428.594	2-yr	3.81	248.79	249.11	1.32	2.88	16.71	0.32
428.594	100-yr	23.35	248.79	249.48	2.01	12.49	33.51	0.69
428.594	500-yr	37	248.79	249.64	2.23	18.3	39.71	0.85
389.142	2-yr	3.81	248.21	248.59	0.75	6.04	29.73	0.38
389.142	100-yr	23.35	248.21	249.12	1.05	25.93	44	0.91
389.142	500-yr	37	248.21	249.35	1.19	36.8	49.04	1.14
343.978	2-yr	3.81	247.75	248.24	0.68	5.64	17.11	0.49
343.978	100-yr	23.35	247.75	248.83	1.25	19.95	31.29	1.08
343.978	500-yr	37	247.75	249.07	1.47	27.79	36.31	1.32
318.111	2-yr	3.81	247.65	248.13	0.79	4.8	15.58	0.48
318.111	100-yr	23.35	247.65	248.72	1.39	17.77	28.76	1.07
318.111	500-yr	37	247.65	248.94	1.63	24.71	33.19	1.29
284.899	2-yr	3.81	247.49	248.01	0.66	5.78	17.36	0.52
284.899	100-yr	23.35	247.49	248.61	1.16	20.57	31.42	1.12
284.899	500-yr	37	247.49	248.84	1.37	28.36	36.45	1.35
244.681	2-yr	3.81	247.05	247.43	1.53	2.49	10.72	0.38
244.681	100-yr	23.35	247.05	247.95	2.24	10.42	20.39	0.9
244.681	500-yr	37	247.05	248.16	2.45	15.1	25.12	1.11
214.499	2-yr	3.81	246.61	247.28	0.51	7.5	18.48	0.67
214.499	100-yr	23.35	246.61	247.92	1.03	23.84	32.5	1.31
214.499	500-yr	37	246.61	248.17	1.24	32.52	38.34	1.56
214.498	2-yr	3.81	246.61	247.02	1.12	3.4	12.97	0.41
214.498	100-yr	23.35	246.61	247.51	1.9	12.31	23.45	0.9
214.498	500-yr	37	246.61	247.67	2.28	16.36	27.1	1.06
147.881	2-yr	3.81	245.82	246.26	1.09	3.49	13.08	0.44
147.881	100-yr	23.35	245.82	246.85	1.6	14.62	24.98	1.03
147.881	500-yr	37	245.82	247.07	1.79	20.81	29.94	1.25
79.942	2-yr	3.81	245.12	245.65	1.04	3.65	10.89	0.53
79.942	100-yr	23.35	245.12	246.37	1.57	14.9	20.63	1.25
79.942	500-yr	37	245.12	246.67	1.71	21.76	25.06	1.55

River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
53.415	2-yr	3.81	244.76	245.21	1.72	2.22	7.48	0.45
53.415	100-yr	23.35	244.76	245.87	2.59	9.01	13.18	1.11
53.415	500-yr	37	244.76	246.14	2.86	12.92	15.68	1.38
13.63	2-yr	3.81	243.93	244.41	1.41	2.7	8.33	0.48
13.63	100-yr	23.35	243.93	245.05	2.36	9.88	13.92	1.12
13.63	500-yr	37	243.93	245.32	2.63	14.54	24.2	1.39

Table 24: Unsteady Pre-mining cross-sectional properties

River Sta	Profile	Plan	Time at Max	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	Max WS	2-yr	05May2014 1218	3.8	264.87	265.77	0.66	5.79	9.76	0.9
2097.011	Max WS	5-yr	05May2014 1218	7.8	264.87	266.1	0.84	9.3	11.52	1.23
2097.011	Max WS	10-yr	05May2014 1218	12.12	264.87	266.36	0.97	12.48	13.22	1.49
2097.011	Max WS	25-yr	05May2014 1218	17.27	264.87	266.62	1.06	16.22	14.98	1.75
2097.011	Max WS	50-yr	05May2014 1218	20.03	264.87	266.74	1.11	18.06	15.69	1.87
2097.011	Max WS	100-yr	05May2014 1218	24.89	264.87	266.95	1.16	21.47	17.19	2.08
2097.011	Max WS	500-yr	05May2014 1218	36.42	264.87	267.36	1.23	32.1	33.7	2.49
2052.742	Max WS	2-yr	05May2014 1218	3.76	264.51	265.01	1.95	1.93	6.57	0.5
2052.742	Max WS	5-yr	05May2014 1218	7.74	264.51	265.16	2.54	3.04	7.61	0.65
2052.742	Max WS	10-yr	05May2014 1218	12.05	264.51	265.31	2.87	4.2	8.55	0.8
2052.742	Max WS	25-yr	05May2014 1218	17.19	264.51	265.41	3.34	5.15	9.11	0.9
2052.742	Max WS	50-yr	05May2014 1218	19.96	264.51	265.47	3.51	5.69	9.41	0.96
2052.742	Max WS	100-yr	05May2014 1218	24.78	264.51	265.56	3.77	6.57	9.88	1.05
2052.742	Max WS	500-yr	05May2014 1218	36.25	264.51	265.71	4.49	8.07	10.62	1.2
2009.086	Max WS	2-yr	05May2014 1218	3.72	263.84	264.28	1.17	3.17	10.53	0.44
2009.086	Max WS	5-yr	05May2014 1218	7.69	263.84	264.47	1.45	5.32	12.45	0.63
2009.086	Max WS	10-yr	05May2014 1218	12	263.84	264.64	1.6	7.52	14.13	0.8
2009.086	Max WS	25-yr	05May2014 1218	17.13	263.84	264.79	1.74	9.86	15.68	0.95
2009.086	Max WS	50-yr	05May2014 1218	19.9	263.84	264.86	1.82	10.95	16.35	1.02
2009.086	Max WS	100-yr	05May2014 1218	24.73	263.84	264.96	1.97	12.58	17.25	1.12
2009.086	Max WS	500-yr	05May2014 1218	36.18	263.84	265.17	2.2	16.47	19.17	1.33
1964.49	Max WS	2-yr	05May2014 1218	3.65	263.35	263.72	1.36	2.68	10.99	0.37

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1964.49	Max WS	5-yr	05May2014	1218	7.63	263.35	263.88	1.66	4.59	13.31	0.53
1964.49	Max WS	10-yr	05May2014	1218	11.93	263.35	263.99	1.94	6.14	14.93	0.64
1964.49	Max WS	25-yr	05May2014	1218	17.05	263.35	264.11	2.09	8.14	16.93	0.76
1964.49	Max WS	50-yr	05May2014	1218	19.83	263.35	264.15	2.23	8.88	17.65	0.8
1964.49	Max WS	100-yr	05May2014	1218	24.64	263.35	264.23	2.41	10.23	18.89	0.88
1964.49	Max WS	500-yr	05May2014	1218	36.07	263.35	264.39	2.67	13.52	21.52	1.04
1925.761	Max WS	2-yr	05May2014	1224	3.58	263.04	263.38	0.86	4.18	18.58	0.34
1925.761	Max WS	5-yr	05May2014	1218	7.53	263.04	263.56	0.92	8.22	25.68	0.52
1925.761	Max WS	10-yr	05May2014	1218	11.81	263.04	263.68	1.03	11.73	31.81	0.64
1925.761	Max WS	25-yr	05May2014	1218	16.86	263.04	263.82	1.1	16.4	37.78	0.78
1925.761	Max WS	50-yr	05May2014	1218	19.62	263.04	263.88	1.13	18.86	41.02	0.84
1925.761	Max WS	100-yr	05May2014	1218	24.44	263.04	263.98	1.18	22.97	44.6	0.94
1925.761	Max WS	500-yr	05May2014	1218	35.78	263.04	264.16	1.3	32.08	54.85	1.12
1874.546	Max WS	2-yr	05May2014	1224	3.55	262.4	262.99	0.66	5.41	15.61	0.59
1874.546	Max WS	5-yr	05May2014	1218	7.13	262.4	263.16	0.85	8.38	19.51	0.76
1874.546	Max WS	10-yr	05May2014	1218	11.42	262.4	263.27	1.07	10.66	21.83	0.87
1874.546	Max WS	25-yr	05May2014	1218	16.3	262.4	263.4	1.2	13.65	24.83	1
1874.546	Max WS	50-yr	05May2014	1218	19.04	262.4	263.44	1.3	14.79	25.84	1.04
1874.546	Max WS	100-yr	05May2014	1218	23.82	262.4	263.51	1.46	16.53	27.53	1.11
1874.546	Max WS	500-yr	05May2014	1218	34.93	262.4	263.66	1.72	21.13	32.28	1.26
1828.159	Max WS	2-yr	05May2014	1224	3.52	262.13	262.53	1.3	2.71	12.19	0.4
1828.159	Max WS	5-yr	05May2014	1224	7.19	262.13	262.67	1.5	4.78	16.47	0.54
1828.159	Max WS	10-yr	05May2014	1218	11.24	262.13	262.8	1.59	7.09	19.96	0.67
1828.159	Max WS	25-yr	05May2014	1218	16.09	262.13	262.91	1.68	9.6	23.23	0.78
1828.159	Max WS	50-yr	05May2014	1218	18.86	262.13	262.96	1.77	10.64	24.36	0.83
1828.159	Max WS	100-yr	05May2014	1218	23.6	262.13	263.04	1.88	12.63	26.32	0.91
1828.159	Max WS	500-yr	05May2014	1218	34.62	262.13	263.21	2.04	17.49	30.79	1.08
1788.723	Max WS	2-yr	05May2014	1230	3.39	261.54	262.25	0.43	7.82	21.06	0.71
1788.723	Max WS	5-yr	05May2014	1224	7.15	261.54	262.43	0.6	11.92	25.61	0.89
1788.723	Max WS	10-yr	05May2014	1218	11	261.54	262.58	0.69	16.17	29.25	1.04
1788.723	Max WS	25-yr	05May2014	1218	15.84	261.54	262.71	0.81	20.1	32.09	1.17
1788.723	Max WS	50-yr	05May2014	1218	18.57	261.54	262.77	0.87	22.19	33.34	1.23
1788.723	Max WS	100-yr	05May2014	1218	23.3	261.54	262.88	0.95	25.81	35.64	1.34
1788.723	Max WS	500-yr	05May2014	1218	34.21	261.54	263.08	1.1	33.52	39.62	1.54
1742.556	Max WS	2-yr	05May2014	1230	3.39	261.5	262.21	0.43	7.87	19	0.71

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1742.556	Max WS	5-yr	05May2014	1224	7.1	261.5	262.36	0.65	10.95	22.17	0.86
1742.556	Max WS	10-yr	05May2014	1218	10.66	261.5	262.5	0.74	14.49	25.29	1
1742.556	Max WS	25-yr	05May2014	1218	15.54	261.5	262.61	0.9	17.39	27.51	1.11
1742.556	Max WS	50-yr	05May2014	1218	18.15	261.5	262.68	0.96	19.14	28.78	1.18
1742.556	Max WS	100-yr	05May2014	1218	22.9	261.5	262.77	1.06	22.01	30.56	1.27
1742.556	Max WS	500-yr	05May2014	1218	33.68	261.5	262.97	1.24	28.37	34.4	1.47
1695.655	Max WS	2-yr	05May2014	1230	3.38	261.28	261.72	1.4	2.41	9.25	0.44
1695.655	Max WS	5-yr	05May2014	1224	7.05	261.28	261.89	1.67	4.22	11.75	0.61
1695.655	Max WS	10-yr	05May2014	1224	10.98	261.28	262.07	1.69	6.48	13.94	0.79
1695.655	Max WS	25-yr	05May2014	1224	15.42	261.28	262.22	1.77	8.74	16.1	0.94
1695.655	Max WS	50-yr	05May2014	1224	17.84	261.28	262.3	1.76	10.16	17.7	1.02
1695.655	Max WS	100-yr	05May2014	1224	22.02	261.28	262.42	1.8	12.5	20.6	1.14
1695.655	Max WS	500-yr	05May2014	1224	31.75	261.28	262.68	1.82	18.91	29.01	1.4
1651.05	Max WS	2-yr	05May2014	1230	3.35	260.78	261.35	0.64	5.22	14.18	0.57
1651.05	Max WS	5-yr	05May2014	1230	6.71	260.78	261.63	0.7	9.54	16.9	0.85
1651.05	Max WS	10-yr	05May2014	1224	10.84	260.78	261.85	0.8	13.62	18.98	1.07
1651.05	Max WS	25-yr	05May2014	1224	15.31	260.78	262.07	0.86	17.88	20.94	1.29
1651.05	Max WS	50-yr	05May2014	1224	17.72	260.78	262.17	0.88	20.06	21.81	1.39
1651.05	Max WS	100-yr	05May2014	1224	21.93	260.78	262.32	0.93	23.58	23.16	1.54
1651.05	Max WS	500-yr	05May2014	1224	31.65	260.78	262.62	1.02	30.95	25.92	1.84
1617.21	Max WS	2-yr	05May2014	1236	3.25	260.56	261.29	0.62	5.28	11.58	0.73
1617.21	Max WS	5-yr	05May2014	1230	6.7	260.56	261.57	0.75	8.89	14.09	1.01
1617.21	Max WS	10-yr	05May2014	1224	10.7	260.56	261.79	0.87	12.3	16.2	1.23
1617.21	Max WS	25-yr	05May2014	1224	15.2	260.56	262	0.95	15.93	18.04	1.44
1617.21	Max WS	50-yr	05May2014	1224	17.6	260.56	262.11	0.99	17.83	18.93	1.55
1617.21	Max WS	100-yr	05May2014	1224	21.84	260.56	262.26	1.05	20.84	20.06	1.7
1617.21	Max WS	500-yr	05May2014	1224	31.58	260.56	262.56	1.16	27.11	22.08	2
1577.381	Max WS	2-yr	05May2014	1236	3.25	260.48	261.26	0.2	16.5	27.07	0.78
1577.381	Max WS	5-yr	05May2014	1230	6.66	260.48	261.55	0.27	24.73	29.97	1.07
1577.381	Max WS	10-yr	05May2014	1224	10.46	260.48	261.78	0.33	31.87	32.05	1.3
1577.381	Max WS	25-yr	05May2014	1224	15	260.48	262	0.38	39.08	34.31	1.52
1577.381	Max WS	50-yr	05May2014	1224	17.41	260.48	262.1	0.41	42.73	35.02	1.62
1577.381	Max WS	100-yr	05May2014	1224	21.69	260.48	262.26	0.45	48.44	38.29	1.78
1577.381	Max WS	500-yr	05May2014	1224	31.45	260.48	262.57	0.53	61.53	50.88	2.09
1542.946	Max WS	2-yr	05May2014	1236	3.24	260.49	261.14	1.13	2.88	6.19	0.65

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1542.946	Max WS	5-yr	05May2014	1230	6.62	260.49	261.38	1.46	4.52	7.32	0.89
1542.946	Max WS	10-yr	05May2014	1224	10.29	260.49	261.57	1.73	5.95	8.19	1.08
1542.946	Max WS	25-yr	05May2014	1224	14.86	260.49	261.75	1.97	7.55	9.07	1.26
1542.946	Max WS	50-yr	05May2014	1224	17.28	260.49	261.84	2.07	8.34	9.47	1.35
1542.946	Max WS	100-yr	05May2014	1224	21.58	260.49	261.97	2.23	9.67	10.08	1.48
1542.946	Max WS	500-yr	05May2014	1224	31.35	260.49	262.23	2.54	12.35	10.93	1.74
1504.079	Max WS	2-yr	05May2014	1236	3.24	260.31	260.88	1.19	2.73	7.78	0.57
1504.079	Max WS	5-yr	05May2014	1230	6.61	260.31	261.11	1.43	4.61	8.82	0.8
1504.079	Max WS	10-yr	05May2014	1224	10.22	260.31	261.27	1.66	6.16	9.59	0.96
1504.079	Max WS	25-yr	05May2014	1224	14.8	260.31	261.44	1.88	7.85	10.36	1.13
1504.079	Max WS	50-yr	05May2014	1224	17.21	260.31	261.52	1.98	8.69	10.72	1.21
1504.079	Max WS	100-yr	05May2014	1224	21.52	260.31	261.65	2.15	10.03	11.28	1.34
1504.079	Max WS	500-yr	05May2014	1224	31.31	260.31	261.84	2.53	12.35	12.18	1.53
1467.659	Max WS	2-yr	05May2014	1236	3.23	260.12	260.71	0.87	3.71	9.22	0.59
1467.659	Max WS	5-yr	05May2014	1230	6.59	260.12	260.92	1.13	5.85	10.75	0.8
1467.659	Max WS	10-yr	05May2014	1230	10.08	260.12	261.11	1.26	8.02	12.17	0.99
1467.659	Max WS	25-yr	05May2014	1224	14.72	260.12	261.27	1.45	10.14	13.62	1.15
1467.659	Max WS	50-yr	05May2014	1224	17.13	260.12	261.36	1.5	11.39	14.41	1.24
1467.659	Max WS	100-yr	05May2014	1224	21.47	260.12	261.48	1.64	13.12	15.47	1.36
1467.659	Max WS	500-yr	05May2014	1224	31.25	260.12	261.69	1.89	16.57	17.45	1.57
1425.307	Max WS	2-yr	05May2014	1236	3.23	259.66	260.16	1.59	2.03	6.86	0.5
1425.307	Max WS	5-yr	05May2014	1230	6.56	259.66	260.34	1.91	3.44	8.41	0.68
1425.307	Max WS	10-yr	05May2014	1224	10.05	259.66	260.48	2.14	4.69	9.58	0.82
1425.307	Max WS	25-yr	05May2014	1224	14.62	259.66	260.64	2.32	6.31	11.07	0.98
1425.307	Max WS	50-yr	05May2014	1224	17.03	259.66	260.72	2.37	7.18	11.89	1.06
1425.307	Max WS	100-yr	05May2014	1224	21.39	259.66	260.81	2.55	8.39	12.95	1.15
1425.307	Max WS	500-yr	05May2014	1224	31.17	259.66	261.03	2.73	11.55	16.88	1.37
1392.843	Max WS	2-yr	05May2014	1236	3.23	259.14	259.67	1.44	2.23	7.3	0.53
1392.843	Max WS	5-yr	05May2014	1230	6.54	259.14	259.86	1.72	3.8	8.91	0.72
1392.843	Max WS	10-yr	05May2014	1230	10.07	259.14	260.01	1.92	5.24	9.76	0.87
1392.843	Max WS	25-yr	05May2014	1224	14.55	259.14	260.16	2.15	6.76	10.59	1.02
1392.843	Max WS	50-yr	05May2014	1224	16.96	259.14	260.25	2.21	7.67	11.05	1.11
1392.843	Max WS	100-yr	05May2014	1224	21.34	259.14	260.37	2.35	9.1	11.8	1.23
1392.843	Max WS	500-yr	05May2014	1224	31.1	259.14	260.62	2.54	12.22	14.11	1.47
1358.799	Max WS	2-yr	05May2014	1236	3.22	258.63	259.12	1.54	2.09	7.18	0.49

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1358.799	Max WS	5-yr	05May2014	1230	6.52	258.63	259.29	1.92	3.39	8.35	0.66
1358.799	Max WS	10-yr	05May2014	1230	10.07	258.63	259.43	2.16	4.67	9.23	0.8
1358.799	Max WS	25-yr	05May2014	1224	14.49	258.63	259.58	2.4	6.03	10.08	0.95
1358.799	Max WS	50-yr	05May2014	1224	16.89	258.63	259.64	2.52	6.71	10.48	1.01
1358.799	Max WS	100-yr	05May2014	1224	21.28	258.63	259.75	2.69	7.91	11.16	1.12
1358.799	Max WS	500-yr	05May2014	1224	31.04	258.63	259.97	2.97	10.46	12.49	1.34
1329.439	Max WS	2-yr	05May2014	1230	3.09	258.21	258.72	1.28	2.4	7.63	0.51
1329.439	Max WS	5-yr	05May2014	1230	6.49	258.21	258.93	1.55	4.18	9.12	0.72
1329.439	Max WS	10-yr	05May2014	1230	10.06	258.21	259.08	1.79	5.61	10.02	0.87
1329.439	Max WS	25-yr	05May2014	1224	14.42	258.21	259.27	1.9	7.6	11.15	1.06
1329.439	Max WS	50-yr	05May2014	1224	16.83	258.21	259.35	1.98	8.49	11.62	1.14
1329.439	Max WS	100-yr	05May2014	1224	21.21	258.21	259.49	2.08	10.19	12.47	1.28
1329.439	Max WS	500-yr	05May2014	1224	30.97	258.21	259.78	2.21	14.03	14.15	1.57
1302.462	Max WS	2-yr	05May2014	1230	3.07	257.76	258.62	0.4	7.62	12.69	0.86
1302.462	Max WS	5-yr	05May2014	1230	6.45	257.76	258.86	0.6	10.82	14.19	1.1
1302.462	Max WS	10-yr	05May2014	1230	10.05	257.76	259.03	0.75	13.35	15.31	1.27
1302.462	Max WS	25-yr	05May2014	1224	14.3	257.76	259.25	0.85	16.77	16.72	1.49
1302.462	Max WS	50-yr	05May2014	1224	16.73	257.76	259.34	0.91	18.3	17.32	1.58
1302.462	Max WS	100-yr	05May2014	1224	21.11	257.76	259.5	1	21.11	18.39	1.74
1302.462	Max WS	500-yr	05May2014	1224	30.88	257.76	259.82	1.13	27.39	20.62	2.06
1264.23	Max WS	2-yr	05May2014	1242	3.19	257.59	258.13	1.34	2.38	7.1	0.54
1264.23	Max WS	5-yr	05May2014	1236	6.33	257.59	258.34	1.59	3.99	8.61	0.75
1264.23	Max WS	10-yr	05May2014	1230	10.01	257.59	258.51	1.81	5.52	9.47	0.92
1264.23	Max WS	25-yr	05May2014	1230	14.12	257.59	258.65	2.02	6.99	10.2	1.06
1264.23	Max WS	50-yr	05May2014	1230	16.29	257.59	258.72	2.12	7.7	10.54	1.13
1264.23	Max WS	100-yr	05May2014	1224	20.83	257.59	258.84	2.32	8.97	11.12	1.25
1264.23	Max WS	500-yr	05May2014	1224	30.63	257.59	259.05	2.69	11.4	12.16	1.46
1230.005	Max WS	2-yr	05May2014	1242	3.18	257.24	257.98	0.67	4.74	9.53	0.74
1230.005	Max WS	5-yr	05May2014	1236	6.33	257.24	258.18	0.93	6.8	10.81	0.94
1230.005	Max WS	10-yr	05May2014	1230	9.97	257.24	258.38	1.1	9.04	12.05	1.14
1230.005	Max WS	25-yr	05May2014	1230	14.11	257.24	258.52	1.3	10.85	12.97	1.28
1230.005	Max WS	50-yr	05May2014	1230	16.28	257.24	258.6	1.37	11.85	13.45	1.36
1230.005	Max WS	100-yr	05May2014	1224	20.72	257.24	258.72	1.53	13.54	14.1	1.48
1230.005	Max WS	500-yr	05May2014	1224	30.52	257.24	258.93	1.83	16.64	15.22	1.69
1191.977	Max WS	2-yr	05May2014	1242	3.16	256.91	257.91	0.37	8.52	12.68	1

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1191.977	Max WS	5-yr	05May2014	1236	6.31	256.91	258.08	0.58	10.83	13.81	1.17
1191.977	Max WS	10-yr	05May2014	1230	9.85	256.91	258.26	0.74	13.4	14.96	1.35
1191.977	Max WS	25-yr	05May2014	1230	14.05	256.91	258.38	0.92	15.2	15.77	1.47
1191.977	Max WS	50-yr	05May2014	1230	16.23	256.91	258.45	1	16.27	18.62	1.54
1191.977	Max WS	100-yr	05May2014	1230	20.07	256.91	258.55	1.1	18.89	28.11	1.64
1191.977	Max WS	500-yr	05May2014	1224	29.92	256.91	258.76	1.32	26.05	46.62	1.85
1155.309	Max WS	2-yr	05May2014	1242	3.15	257.11	257.85	0.68	4.68	11.13	0.74
1155.309	Max WS	5-yr	05May2014	1236	6.29	257.11	258	1	6.83	20.23	0.89
1155.309	Max WS	10-yr	05May2014	1230	9.77	257.11	258.17	1.04	11.2	28.15	1.06
1155.309	Max WS	25-yr	05May2014	1230	13.98	257.11	258.3	1.13	14.94	31.63	1.19
1155.309	Max WS	50-yr	05May2014	1230	16.18	257.11	258.37	1.18	17.55	40.78	1.26
1155.309	Max WS	100-yr	05May2014	1230	20.06	257.11	258.49	1.13	22.45	43.8	1.38
1155.309	Max WS	500-yr	05May2014	1224	29.43	257.11	258.72	1.08	33.02	47.97	1.61
1124.025	Max WS	2-yr	05May2014	1242	3.14	255.94	256.41	1.91	1.64	6.53	0.47
1124.025	Max WS	5-yr	05May2014	1236	6.27	255.94	256.54	2.46	2.55	7.3	0.6
1124.025	Max WS	10-yr	05May2014	1230	9.64	255.94	256.67	2.69	3.58	7.88	0.73
1124.025	Max WS	25-yr	05May2014	1230	13.86	255.94	256.8	3.01	4.6	8.41	0.86
1124.025	Max WS	50-yr	05May2014	1230	16.1	255.94	256.86	3.16	5.1	8.66	0.92
1124.025	Max WS	100-yr	05May2014	1230	20.02	255.94	256.96	3.32	6.04	9.11	1.02
1124.025	Max WS	500-yr	05May2014	1230	28.88	255.94	257.14	3.72	7.76	9.84	1.2
1083.982	Max WS	2-yr	05May2014	1242	3.13	255	255.79	0.71	4.42	8.28	0.79
1083.982	Max WS	5-yr	05May2014	1236	6.25	255	256.03	0.95	6.58	9.37	1.03
1083.982	Max WS	10-yr	05May2014	1236	9.56	255	256.21	1.15	8.32	10.1	1.21
1083.982	Max WS	25-yr	05May2014	1230	13.82	255	256.41	1.32	10.46	10.93	1.41
1083.982	Max WS	50-yr	05May2014	1230	16.06	255	256.5	1.41	11.43	11.28	1.5
1083.982	Max WS	100-yr	05May2014	1230	19.99	255	256.65	1.52	13.15	11.9	1.65
1083.982	Max WS	500-yr	05May2014	1230	28.87	255	256.92	1.75	16.49	13.02	1.92
1018.257	Max WS	2-yr	05May2014	1242	3.11	254.8	255.36	1.3	2.39	7.19	0.56
1018.257	Max WS	5-yr	05May2014	1236	6.21	254.8	255.58	1.5	4.14	8.45	0.78
1018.257	Max WS	10-yr	05May2014	1236	9.55	254.8	255.73	1.74	5.48	9.04	0.93
1018.257	Max WS	25-yr	05May2014	1230	13.73	254.8	255.9	1.94	7.07	9.68	1.1
1018.257	Max WS	50-yr	05May2014	1230	15.98	254.8	255.98	2.04	7.82	9.97	1.18
1018.257	Max WS	100-yr	05May2014	1230	19.93	254.8	256.11	2.17	9.17	10.48	1.31
1018.257	Max WS	500-yr	05May2014	1230	28.83	254.8	256.35	2.44	11.85	13.35	1.55
959.582	Max WS	2-yr	05May2014	1242	3.09	254.42	255.01	0.88	3.5	8.88	0.59

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
959.582	Max WS	5-yr	05May2014	1236	6.16	254.42	255.22	1.11	5.53	10.17	0.8
959.582	Max WS	10-yr	05May2014	1236	9.53	254.42	255.39	1.29	7.38	11.18	0.97
959.582	Max WS	25-yr	05May2014	1230	13.62	254.42	255.57	1.44	9.43	11.96	1.15
959.582	Max WS	50-yr	05May2014	1230	15.88	254.42	255.66	1.51	10.5	12.34	1.24
959.582	Max WS	100-yr	05May2014	1230	19.84	254.42	255.81	1.61	12.35	12.97	1.39
959.582	Max WS	500-yr	05May2014	1230	28.76	254.42	256.08	1.76	17.28	25.03	1.66
917.744	Max WS	2-yr	05May2014	1248	3.08	253.94	254.52	1.22	2.51	7.67	0.58
917.744	Max WS	5-yr	05May2014	1242	6.07	253.94	254.75	1.37	4.43	8.82	0.81
917.744	Max WS	10-yr	05May2014	1236	9.5	253.94	254.95	1.51	6.3	9.81	1.01
917.744	Max WS	25-yr	05May2014	1230	13.46	253.94	255.12	1.68	8.03	10.62	1.18
917.744	Max WS	50-yr	05May2014	1230	15.72	253.94	255.22	1.73	9.06	11.07	1.28
917.744	Max WS	100-yr	05May2014	1230	19.7	253.94	255.36	1.84	10.69	11.72	1.42
917.744	Max WS	500-yr	05May2014	1230	28.63	253.94	255.65	2.01	14.23	12.97	1.71
885.843	Max WS	2-yr	05May2014	1248	3.08	253.61	254.27	1.22	2.53	6.26	0.66
885.843	Max WS	5-yr	05May2014	1236	6.05	253.61	254.47	1.54	3.93	7.44	0.86
885.843	Max WS	10-yr	05May2014	1236	9.48	253.61	254.67	1.71	5.55	8.6	1.06
885.843	Max WS	25-yr	05May2014	1230	13.4	253.61	254.84	1.89	7.1	9.58	1.23
885.843	Max WS	50-yr	05May2014	1230	15.66	253.61	254.94	1.95	8.03	9.96	1.33
885.843	Max WS	100-yr	05May2014	1230	19.65	253.61	255.09	2.05	9.6	10.56	1.48
885.843	Max WS	500-yr	05May2014	1230	28.58	253.61	255.39	2.21	12.94	11.59	1.78
831.018	Max WS	2-yr	05May2014	1248	3.07	252.63	253	2.13	1.44	5.69	0.37
831.018	Max WS	5-yr	05May2014	1242	6.07	252.63	253.16	2.46	2.47	6.58	0.53
831.018	Max WS	10-yr	05May2014	1236	9.46	252.63	253.3	2.8	3.38	7.26	0.67
831.018	Max WS	25-yr	05May2014	1236	13.31	252.63	253.43	3.04	4.38	7.94	0.8
831.018	Max WS	50-yr	05May2014	1230	15.58	252.63	253.48	3.22	4.83	8.23	0.85
831.018	Max WS	100-yr	05May2014	1230	19.58	252.63	253.58	3.46	5.67	8.74	0.95
831.018	Max WS	500-yr	05May2014	1230	28.52	252.63	253.77	3.86	7.39	9.69	1.14
794.448	Max WS	2-yr	05May2014	1248	3.07	251.86	252.43	0.99	3.09	7.64	0.57
794.448	Max WS	5-yr	05May2014	1242	6.06	251.86	252.69	1.15	5.29	9.27	0.83
794.448	Max WS	10-yr	05May2014	1236	9.44	251.86	252.86	1.36	6.96	10.34	1
794.448	Max WS	25-yr	05May2014	1236	13.3	251.86	253.05	1.47	9.03	11.52	1.19
794.448	Max WS	50-yr	05May2014	1236	15.32	251.86	253.13	1.53	10.03	12.05	1.27
794.448	Max WS	100-yr	05May2014	1230	19.51	251.86	253.27	1.67	11.67	12.83	1.41
794.448	Max WS	500-yr	05May2014	1230	28.47	251.86	253.54	1.85	15.42	14.21	1.68
753.27	Max WS	2-yr	05May2014	1248	3.06	251.5	252.05	1.4	2.19	6.61	0.55

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
753.27	Max WS	5-yr	05May2014	1242	6.06	251.5	252.24	1.7	3.56	8.17	0.74
753.27	Max WS	10-yr	05May2014	1236	9.41	251.5	252.38	1.96	4.79	8.96	0.88
753.27	Max WS	25-yr	05May2014	1236	13.29	251.5	252.51	2.23	5.97	9.58	1.01
753.27	Max WS	50-yr	05May2014	1230	15.41	251.5	252.58	2.3	6.7	9.94	1.08
753.27	Max WS	100-yr	05May2014	1230	19.43	251.5	252.69	2.5	7.77	10.44	1.19
753.27	Max WS	500-yr	05May2014	1230	28.4	251.5	252.9	2.81	10.11	11.4	1.4
720.714	Max WS	2-yr	05May2014	1248	3.06	251.09	251.58	1.48	2.06	7.11	0.49
720.714	Max WS	5-yr	05May2014	1242	6.05	251.09	251.74	1.81	3.35	8.35	0.65
720.714	Max WS	10-yr	05May2014	1236	9.39	251.09	251.9	2	4.69	9.33	0.8
720.714	Max WS	25-yr	05May2014	1236	13.29	251.09	252.04	2.19	6.07	10.15	0.95
720.714	Max WS	50-yr	05May2014	1236	15.32	251.09	252.11	2.26	6.79	10.55	1.02
720.714	Max WS	100-yr	05May2014	1230	19.38	251.09	252.21	2.44	7.93	11.15	1.12
720.714	Max WS	500-yr	05May2014	1230	28.35	251.09	252.42	2.74	10.36	12.33	1.33
673.556	Max WS	2-yr	05May2014	1254	2.99	250.52	251.24	0.37	8.13	17.23	0.72
673.556	Max WS	5-yr	05May2014	1242	6.01	250.52	251.46	0.49	12.27	20.64	0.94
673.556	Max WS	10-yr	05May2014	1236	9.3	250.52	251.63	0.58	16.16	23.36	1.11
673.556	Max WS	25-yr	05May2014	1236	13.23	250.52	251.82	0.63	20.87	26.38	1.3
673.556	Max WS	50-yr	05May2014	1236	15.28	250.52	251.91	0.66	23.09	27.78	1.39
673.556	Max WS	100-yr	05May2014	1230	19.16	250.52	252.03	0.72	26.57	29.99	1.51
673.556	Max WS	500-yr	05May2014	1230	28.12	250.52	252.28	0.81	34.57	34.28	1.76
625.562	Max WS	2-yr	05May2014	1254	2.99	250.47	251.17	0.62	4.84	11.12	0.7
625.562	Max WS	5-yr	05May2014	1242	5.96	250.47	251.36	0.84	7.12	12.82	0.89
625.562	Max WS	10-yr	05May2014	1236	9.18	250.47	251.51	1.01	9.12	14.25	1.04
625.562	Max WS	25-yr	05May2014	1236	13.16	250.47	251.7	1.1	12.01	16.59	1.23
625.562	Max WS	50-yr	05May2014	1236	15.22	250.47	251.77	1.15	13.29	17.53	1.3
625.562	Max WS	100-yr	05May2014	1236	18.78	250.47	251.88	1.23	15.28	19.03	1.41
625.562	Max WS	500-yr	05May2014	1230	27.83	250.47	252.12	1.4	20.33	23.49	1.65
582.64	Max WS	2-yr	05May2014	1254	2.98	250.01	250.45	1.61	1.86	8.47	0.44
582.64	Max WS	5-yr	05May2014	1242	5.94	250.01	250.56	2.06	2.89	9.78	0.55
582.64	Max WS	10-yr	05May2014	1242	9.13	250.01	250.68	2.24	4.07	11.2	0.67
582.64	Max WS	25-yr	05May2014	1236	13.12	250.01	250.78	2.43	5.4	13.2	0.77
582.64	Max WS	50-yr	05May2014	1236	15.19	250.01	250.81	2.62	5.8	13.76	0.8
582.64	Max WS	100-yr	05May2014	1236	18.78	250.01	250.87	2.86	6.57	14.75	0.86
582.64	Max WS	500-yr	05May2014	1230	27.69	250.01	250.99	3.25	8.68	18.42	0.98
543.04	Max WS	2-yr	05May2014	1254	2.98	249.4	249.93	0.64	4.65	14.71	0.53

River Sta	Profile	Plan	Time at Max	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
543.04	Max WS	5-yr	05May2014 1242	5.92	249.4	250.06	0.9	6.6	16.73	0.66
543.04	Max WS	10-yr	05May2014 1242	9.11	249.4	250.22	0.96	9.52	19.24	0.82
543.04	Max WS	25-yr	05May2014 1236	13.09	249.4	250.29	1.2	11.02	20.44	0.89
543.04	Max WS	50-yr	05May2014 1236	15.18	249.4	250.33	1.32	11.68	20.92	0.93
543.04	Max WS	100-yr	05May2014 1230	18.63	249.4	250.38	1.48	12.9	21.77	0.98
543.04	Max WS	500-yr	05May2014 1230	27.6	249.4	250.51	1.81	15.88	23.64	1.11
496.118	Max WS	2-yr	05May2014 1254	2.97	249.1	249.88	0.27	11.01	25.72	0.78
496.118	Max WS	5-yr	05May2014 1242	5.88	249.1	249.98	0.43	13.68	28.32	0.88
496.118	Max WS	10-yr	05May2014 1242	9.06	249.1	250.16	0.47	19.2	33.43	1.06
496.118	Max WS	25-yr	05May2014 1236	13.05	249.1	250.21	0.62	21.23	35.14	1.11
496.118	Max WS	50-yr	05May2014 1230	14.4	249.1	250.24	0.66	22.15	35.89	1.14
496.118	Max WS	100-yr	05May2014 1230	18.51	249.1	250.28	0.79	23.73	36.96	1.18
496.118	Max WS	500-yr	05May2014 1230	27.46	249.1	250.4	1	28.35	40.12	1.3
428.594	Max WS	2-yr	05May2014 1254	2.95	248.79	249.03	1.72	1.72	13.07	0.24
428.594	Max WS	5-yr	05May2014 1248	5.85	248.79	249.14	1.68	3.48	18.63	0.35
428.594	Max WS	10-yr	05May2014 1242	8.99	248.79	249.24	1.61	5.66	23.85	0.45
428.594	Max WS	25-yr	05May2014 1236	12.96	248.79	249.3	1.91	6.98	26.05	0.51
428.594	Max WS	50-yr	05May2014 1236	15.16	248.79	249.33	2.02	7.79	27.3	0.54
428.594	Max WS	100-yr	05May2014 1236	18.79	248.79	249.38	2.15	9.2	29.2	0.59
428.594	Max WS	500-yr	05May2014 1236	27.15	248.79	249.49	2.28	12.84	33.94	0.7
389.142	Max WS	2-yr	05May2014 1300	2.92	248.21	248.5	0.98	3.69	27.03	0.29
389.142	Max WS	5-yr	05May2014 1248	5.83	248.21	248.66	0.82	8.31	32.3	0.45
389.142	Max WS	10-yr	05May2014 1242	8.94	248.21	248.75	0.89	11.44	35.12	0.54
389.142	Max WS	25-yr	05May2014 1242	12.61	248.21	248.86	0.94	15.4	37.95	0.65
389.142	Max WS	50-yr	05May2014 1236	15.04	248.21	248.92	0.98	17.63	39.32	0.71
389.142	Max WS	100-yr	05May2014 1236	18.71	248.21	249.01	1.03	21.16	41.48	0.8
389.142	Max WS	500-yr	05May2014 1236	27.11	248.21	249.17	1.12	28.45	45.24	0.96
343.978	Max WS	2-yr	05May2014 1300	2.9	247.75	248.17	0.65	4.45	15.64	0.42
343.978	Max WS	5-yr	05May2014 1248	5.77	247.75	248.32	0.83	6.98	18.89	0.57
343.978	Max WS	10-yr	05May2014 1248	8.72	247.75	248.45	0.92	9.58	22.01	0.7
343.978	Max WS	25-yr	05May2014 1242	12.59	247.75	248.57	1.03	12.53	25.11	0.82
343.978	Max WS	50-yr	05May2014 1236	14.7	247.75	248.62	1.11	13.74	26.18	0.87
343.978	Max WS	100-yr	05May2014 1236	18.46	247.75	248.71	1.2	16.16	28.26	0.96
343.978	Max WS	500-yr	05May2014 1236	26.96	247.75	248.88	1.35	21.51	32.41	1.13
318.111	Max WS	2-yr	05May2014 1300	2.9	247.65	248.06	0.79	3.66	13.95	0.41

River Sta	Profile	Plan	Time at Max	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
318.111	Max WS	5-yr	05May2014 1248	5.75	247.65	248.2	0.98	5.87	16.99	0.55
318.111	Max WS	10-yr	05May2014 1248	8.72	247.65	248.33	1.05	8.3	20.19	0.68
318.111	Max WS	25-yr	05May2014 1242	12.58	247.65	248.45	1.17	10.86	22.84	0.8
318.111	Max WS	50-yr	05May2014 1236	14.61	247.65	248.49	1.25	11.89	23.81	0.84
318.111	Max WS	100-yr	05May2014 1236	18.39	247.65	248.58	1.35	14.1	25.79	0.93
318.111	Max WS	500-yr	05May2014 1236	26.92	247.65	248.75	1.52	18.81	29.6	1.1
284.899	Max WS	2-yr	05May2014 1300	2.89	247.49	247.92	0.68	4.23	15.27	0.43
284.899	Max WS	5-yr	05May2014 1248	5.73	247.49	248.06	0.87	6.57	18.58	0.57
284.899	Max WS	10-yr	05May2014 1248	8.71	247.49	248.2	0.92	9.46	22.22	0.71
284.899	Max WS	25-yr	05May2014 1242	12.56	247.49	248.32	1.01	12.4	25.04	0.83
284.899	Max WS	50-yr	05May2014 1236	14.49	247.49	248.37	1.07	13.55	26.01	0.88
284.899	Max WS	100-yr	05May2014 1236	18.29	247.49	248.46	1.14	16.15	28.08	0.97
284.899	Max WS	500-yr	05May2014 1236	26.86	247.49	248.64	1.28	21.57	32.2	1.15
244.681	Max WS	2-yr	05May2014 1300	2.87	247.05	247.46	1.01	2.85	11.22	0.41
244.681	Max WS	5-yr	05May2014 1254	5.64	247.05	247.63	1.14	4.95	13.98	0.58
244.681	Max WS	10-yr	05May2014 1248	8.69	247.05	247.76	1.25	6.93	16.55	0.71
244.681	Max WS	25-yr	05May2014 1242	12.49	247.05	247.88	1.38	9.04	18.89	0.83
244.681	Max WS	50-yr	05May2014 1242	14.49	247.05	247.95	1.39	10.41	20.38	0.9
244.681	Max WS	100-yr	05May2014 1242	17.8	247.05	248.04	1.43	12.43	22.47	0.99
244.681	Max WS	500-yr	05May2014 1236	26.69	247.05	248.2	1.64	16.24	26.17	1.15
214.499	Max WS	2-yr	05May2014 1306	2.85	246.61	247.36	0.32	8.99	20.13	0.75
214.499	Max WS	5-yr	05May2014 1254	5.63	246.61	247.56	0.42	13.37	24.49	0.95
214.499	Max WS	10-yr	05May2014 1248	8.67	246.61	247.69	0.52	16.79	27.46	1.08
214.499	Max WS	25-yr	05May2014 1242	12.43	246.61	247.82	0.63	20.45	30.16	1.21
214.499	Max WS	50-yr	05May2014 1242	14.44	246.61	247.9	0.66	22.9	31.84	1.29
214.499	Max WS	100-yr	05May2014 1242	17.79	246.61	247.99	0.72	26.14	34.14	1.38
214.499	Max WS	500-yr	05May2014 1236	26.58	246.61	248.16	0.9	32.01	38.04	1.55
214.498	Max WS	2-yr	05May2014 1306	2.85	246.61	246.94	1.18	2.43	11.51	0.33
214.498	Max WS	5-yr	05May2014 1254	5.6	246.61	247.09	1.28	4.37	14.36	0.48
214.498	Max WS	10-yr	05May2014 1248	8.62	246.61	247.18	1.52	5.68	16.18	0.57
214.498	Max WS	25-yr	05May2014 1242	12.29	246.61	247.29	1.63	7.56	18.55	0.68
214.498	Max WS	50-yr	05May2014 1242	14.33	246.61	247.34	1.68	8.53	19.61	0.73
214.498	Max WS	100-yr	05May2014 1242	17.77	246.61	247.4	1.81	9.83	21.05	0.79
214.498	Max WS	500-yr	05May2014 1236	26.37	246.61	247.53	2.06	12.81	23.96	0.92
147.881	Max WS	2-yr	05May2014 1306	2.85	245.82	246.16	1.26	2.26	11.14	0.34

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
147.881	Max WS	5-yr	05May2014	1254	5.59	245.82	246.32	1.29	4.34	14.17	0.5
147.881	Max WS	10-yr	05May2014	1248	8.57	245.82	246.43	1.42	6.02	16.37	0.61
147.881	Max WS	25-yr	05May2014	1242	12.17	245.82	246.57	1.44	8.45	19.14	0.75
147.881	Max WS	50-yr	05May2014	1242	14.25	245.82	246.63	1.49	9.59	20.41	0.81
147.881	Max WS	100-yr	05May2014	1242	17.73	245.82	246.72	1.54	11.53	22.28	0.9
147.881	Max WS	500-yr	05May2014	1236	26.16	245.82	246.91	1.6	16.34	26.4	1.09
79.942	Max WS	2-yr	05May2014	1306	2.84	245.12	245.64	0.78	3.62	10.85	0.52
79.942	Max WS	5-yr	05May2014	1254	5.55	245.12	245.85	0.91	6.08	13.42	0.73
79.942	Max WS	10-yr	05May2014	1248	8.5	245.12	246	1.03	8.26	15.42	0.88
79.942	Max WS	25-yr	05May2014	1248	11.99	245.12	246.16	1.09	10.96	17.57	1.04
79.942	Max WS	50-yr	05May2014	1242	14.1	245.12	246.24	1.14	12.38	18.64	1.12
79.942	Max WS	100-yr	05May2014	1242	17.66	245.12	246.36	1.2	14.76	20.52	1.24
79.942	Max WS	500-yr	05May2014	1236	25.81	245.12	246.6	1.29	20.11	24.06	1.48
53.415	Max WS	2-yr	05May2014	1306	2.83	244.76	245.11	1.89	1.5	6.5	0.35
53.415	Max WS	5-yr	05May2014	1254	5.53	244.76	245.26	2.13	2.6	7.96	0.5
53.415	Max WS	10-yr	05May2014	1248	8.48	244.76	245.37	2.45	3.47	8.91	0.61
53.415	Max WS	25-yr	05May2014	1248	11.99	244.76	245.48	2.62	4.58	9.92	0.72
53.415	Max WS	50-yr	05May2014	1242	14.05	244.76	245.54	2.72	5.17	10.41	0.78
53.415	Max WS	100-yr	05May2014	1242	17.63	244.76	245.62	2.96	5.96	11.04	0.86
53.415	Max WS	500-yr	05May2014	1236	25.71	244.76	245.78	3.28	7.84	12.4	1.02
13.63	Max WS	2-yr	05May2014	1306	2.83	243.93	244.34	1.32	2.14	7.68	0.41
13.63	Max WS	5-yr	05May2014	1254	5.52	243.93	244.49	1.6	3.45	9.06	0.56
13.63	Max WS	10-yr	05May2014	1248	8.46	243.93	244.62	1.8	4.69	10.15	0.69
13.63	Max WS	25-yr	05May2014	1248	11.99	243.93	244.75	1.98	6.05	11.24	0.82
13.63	Max WS	50-yr	05May2014	1242	14	243.93	244.81	2.07	6.76	11.77	0.88
13.63	Max WS	100-yr	05May2014	1242	17.61	243.93	244.91	2.2	7.99	12.63	0.98
13.63	Max WS	500-yr	05May2014	1242	25.65	243.93	245.1	2.43	10.56	14.39	1.17

Table 25: Unsteady Conventional cross-sectional properties

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	Max WS	2-yr	05May2014	1236	1.66	264.87	265.52	0.48	3.5	8.05	0.65
2097.011	Max WS	5-yr	05May2014	1236	1.43	264.87	269.11	0.01	131	74.38	4.24
2097.011	Max WS	10-yr	05May2014	1212	12.96	264.87	266.39	1	12.93	13.45	1.52
2097.011	Max WS	25-yr	05May2014	1206	23.13	264.87	266.85	1.17	19.73	16.31	1.98
2097.011	Max WS	50-yr	05May2014	1206	27.41	264.87	267.02	1.21	22.62	19.22	2.15

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	Max WS	100-yr	05May2014	1206	32	264.87	267.2	1.23	27.18	28.96	2.33
2097.011	Max WS	500-yr	05May2014	1200	45.47	264.87	267.55	1.31	39.78	42.5	2.68
2052.742	Max WS	2-yr	05May2014	1236	1.65	264.51	264.83	1.79	0.92	5.02	0.32
2052.742	Max WS	5-yr	05May2014	1236	0.66	264.51	266.86	0.03	24.03	18.03	2.35
2052.742	Max WS	10-yr	05May2014	1212	12.22	264.51	265.3	2.92	4.19	8.54	0.79
2052.742	Max WS	25-yr	05May2014	1206	21.73	264.51	265.5	3.66	5.93	9.54	0.99
2052.742	Max WS	50-yr	05May2014	1206	25.53	264.51	265.56	3.88	6.58	9.88	1.05
2052.742	Max WS	100-yr	05May2014	1206	31.37	264.51	265.65	4.21	7.45	10.32	1.14
2052.742	Max WS	500-yr	05May2014	1200	42.86	264.51	265.78	4.84	8.86	10.99	1.27
2009.086	Max WS	2-yr	05May2014	1236	1.64	263.84	264.1	1.12	1.46	8.21	0.26
2009.086	Max WS	5-yr	05May2014	1236	0.73	263.84	265.83	0.02	30.94	25.22	1.99
2009.086	Max WS	10-yr	05May2014	1212	11.65	263.84	264.62	1.59	7.31	13.98	0.78
2009.086	Max WS	25-yr	05May2014	1206	20.78	263.84	264.89	1.81	11.5	16.66	1.05
2009.086	Max WS	50-yr	05May2014	1206	24.4	263.84	264.98	1.89	12.94	17.43	1.14
2009.086	Max WS	100-yr	05May2014	1206	31.11	263.84	265.09	2.07	15.03	18.49	1.25
2009.086	Max WS	500-yr	05May2014	1200	41.91	263.84	265.32	2.19	19.33	20.45	1.48
1964.49	Max WS	2-yr	05May2014	1236	1.63	263.35	263.59	1.18	1.38	8.87	0.24
1964.49	Max WS	5-yr	05May2014	1236	1.09	263.35	266.39	0.01	107.9	81.25	3.04
1964.49	Max WS	10-yr	05May2014	1212	10.99	263.35	263.95	1.94	5.66	14.44	0.6
1964.49	Max WS	25-yr	05May2014	1212	19.03	263.35	264.14	2.2	8.65	17.43	0.79
1964.49	Max WS	50-yr	05May2014	1206	22.98	263.35	264.17	2.49	9.24	18	0.82
1964.49	Max WS	100-yr	05May2014	1206	30.73	263.35	264.3	2.62	11.73	20.1	0.95
1964.49	Max WS	500-yr	05May2014	1206	41.3	263.35	264.45	2.79	14.81	22.49	1.1
1925.761	Max WS	2-yr	05May2014	1242	1.61	263.04	263.25	0.77	2.09	14.76	0.21
1925.761	Max WS	5-yr	05May2014	1242	1.45	263.04	265.04	0.02	109.16	108.44	2
1925.761	Max WS	10-yr	05May2014	1218	10.42	263.04	263.65	1	10.54	29.98	0.61
1925.761	Max WS	25-yr	05May2014	1212	18.86	263.04	263.86	1.13	18.06	40.06	0.82
1925.761	Max WS	50-yr	05May2014	1212	20.83	263.04	263.91	1.14	20.09	42.12	0.87
1925.761	Max WS	100-yr	05May2014	1206	29.97	263.04	264.05	1.29	26.37	48.44	1.01
1925.761	Max WS	500-yr	05May2014	1206	40.92	263.04	264.24	1.34	36.59	61.85	1.2
1874.546	Max WS	2-yr	05May2014	1242	1.61	262.4	262.86	0.46	3.53	13.02	0.46
1874.546	Max WS	5-yr	05May2014	1242	0.39	262.4	263.48	0.03	15.65	26.65	1.08
1874.546	Max WS	10-yr	05May2014	1218	10.16	262.4	263.24	1.02	10	21.18	0.84
1874.546	Max WS	25-yr	05May2014	1212	18.18	262.4	263.43	1.26	14.48	25.57	1.03
1874.546	Max WS	50-yr	05May2014	1212	20.34	262.4	263.46	1.34	15.3	26.3	1.06

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1874.546	Max WS	100-yr	05May2014	1206	27.6	262.4	263.56	1.57	18	28.99	1.16
1874.546	Max WS	500-yr	05May2014	1206	39.77	262.4	263.71	1.84	22.81	34.04	1.31
1828.159	Max WS	2-yr	05May2014	1242	1.6	262.13	262.38	1.35	1.18	8.38	0.25
1828.159	Max WS	5-yr	05May2014	1242	0.05	262.13	263.34	0	21.73	34.65	1.21
1828.159	Max WS	10-yr	05May2014	1218	9.99	262.13	262.76	1.59	6.28	18.75	0.63
1828.159	Max WS	25-yr	05May2014	1212	17.85	262.13	262.94	1.75	10.19	23.99	0.81
1828.159	Max WS	50-yr	05May2014	1212	20.12	262.13	262.98	1.81	11.14	24.88	0.85
1828.159	Max WS	100-yr	05May2014	1206	26.76	262.13	263.08	1.97	13.72	27.37	0.95
1828.159	Max WS	500-yr	05May2014	1206	39.36	262.13	263.26	2.15	19.07	32.2	1.13
1788.723	Max WS	2-yr	05May2014	1242	1.59	261.54	262.06	0.36	4.46	15.3	0.52
1788.723	Max WS	5-yr	05May2014	1242	0.48	261.54	262.86	0.02	25.18	35.25	1.32
1788.723	Max WS	10-yr	05May2014	1218	9.72	261.54	262.53	0.67	14.69	28.09	0.99
1788.723	Max WS	25-yr	05May2014	1212	17.36	261.54	262.74	0.84	21.24	32.73	1.2
1788.723	Max WS	50-yr	05May2014	1212	19.68	261.54	262.8	0.89	23.15	33.96	1.26
1788.723	Max WS	100-yr	05May2014	1212	25.62	261.54	262.93	0.98	27.78	36.8	1.39
1788.723	Max WS	500-yr	05May2014	1206	38.77	261.54	263.14	1.16	36	40.7	1.6
1742.556	Max WS	2-yr	05May2014	1242	1.58	261.5	262.03	0.33	4.84	15.29	0.53
1742.556	Max WS	5-yr	05May2014	1242	1.23	261.5	262.6	0.07	16.94	27.18	1.1
1742.556	Max WS	10-yr	05May2014	1218	9.31	261.5	262.46	0.7	13.31	24.32	0.96
1742.556	Max WS	25-yr	05May2014	1212	16.71	261.5	262.65	0.91	18.47	28.3	1.15
1742.556	Max WS	50-yr	05May2014	1212	19.06	261.5	262.71	0.96	20.06	29.36	1.21
1742.556	Max WS	100-yr	05May2014	1206	24.16	261.5	262.83	1.05	23.64	31.59	1.33
1742.556	Max WS	500-yr	05May2014	1206	38.03	261.5	263.02	1.32	30.2	35.52	1.52
1695.655	Max WS	2-yr	05May2014	1248	1.57	261.28	261.55	1.45	1.08	6.61	0.27
1695.655	Max WS	5-yr	05May2014	1248	0.55	261.28	262.01	0.1	5.71	13.11	0.73
1695.655	Max WS	10-yr	05May2014	1224	9.08	261.28	261.99	1.67	5.42	12.83	0.71
1695.655	Max WS	25-yr	05May2014	1218	15.34	261.28	262.21	1.77	8.66	16.04	0.93
1695.655	Max WS	50-yr	05May2014	1218	17.15	261.28	262.28	1.76	9.74	17.17	1
1695.655	Max WS	100-yr	05May2014	1212	25.43	261.28	262.48	1.91	13.75	22.3	1.2
1695.655	Max WS	500-yr	05May2014	1212	34.94	261.28	262.76	1.83	21.11	32.27	1.48
1651.05	Max WS	2-yr	05May2014	1248	1.57	260.78	261.15	0.58	2.69	11.2	0.37
1651.05	Max WS	5-yr	05May2014	1248	0.88	260.78	261.88	0.06	14.07	19.23	1.1
1651.05	Max WS	10-yr	05May2014	1224	8.99	260.78	261.75	0.77	11.68	18.03	0.97
1651.05	Max WS	25-yr	05May2014	1218	15.24	260.78	262.06	0.86	17.74	20.88	1.28
1651.05	Max WS	50-yr	05May2014	1218	17.07	260.78	262.14	0.88	19.44	21.56	1.36

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1651.05	Max WS	100-yr	05May2014	1212	24.98	260.78	262.39	1	25.08	23.71	1.61
1651.05	Max WS	500-yr	05May2014	1212	34.74	260.78	262.7	1.06	32.91	26.6	1.92
1617.21	Max WS	2-yr	05May2014	1248	1.56	260.56	261.08	0.5	3.11	9.65	0.52
1617.21	Max WS	5-yr	05May2014	1248	0.24	260.56	261.56	0.03	8.74	14.01	1
1617.21	Max WS	10-yr	05May2014	1224	8.87	260.56	261.69	0.83	10.63	15.26	1.13
1617.21	Max WS	25-yr	05May2014	1218	15.11	260.56	262	0.96	15.81	17.98	1.44
1617.21	Max WS	50-yr	05May2014	1218	16.96	260.56	262.08	0.98	17.3	18.68	1.52
1617.21	Max WS	100-yr	05May2014	1212	24.56	260.56	262.32	1.11	22.04	20.5	1.76
1617.21	Max WS	500-yr	05May2014	1212	34.6	260.56	262.63	1.2	28.75	22.56	2.07
1577.381	Max WS	2-yr	05May2014	1248	1.54	260.48	261.06	0.14	11.18	24.58	0.58
1577.381	Max WS	5-yr	05May2014	1248	0	260.48	261.13	0	12.99	25.46	0.65
1577.381	Max WS	10-yr	05May2014	1224	8.65	260.48	261.67	0.3	28.41	31.15	1.19
1577.381	Max WS	25-yr	05May2014	1218	14.87	260.48	261.99	0.38	38.85	34.27	1.51
1577.381	Max WS	50-yr	05May2014	1218	16.75	260.48	262.07	0.4	41.73	34.83	1.59
1577.381	Max WS	100-yr	05May2014	1212	23.87	260.48	262.32	0.47	50.85	39.62	1.84
1577.381	Max WS	500-yr	05May2014	1212	34.33	260.48	262.64	0.55	65.47	52.55	2.16
1542.946	Max WS	2-yr	05May2014	1254	1.52	260.49	260.97	0.8	1.89	5.42	0.48
1542.946	Max WS	5-yr	05May2014	1248	0.47	260.49	261.01	0.22	2.13	5.61	0.52
1542.946	Max WS	10-yr	05May2014	1224	8.49	260.49	261.48	1.62	5.24	7.77	0.99
1542.946	Max WS	25-yr	05May2014	1218	14.71	260.49	261.75	1.96	7.5	9.05	1.26
1542.946	Max WS	50-yr	05May2014	1218	16.61	260.49	261.81	2.05	8.11	9.36	1.32
1542.946	Max WS	100-yr	05May2014	1212	23.37	260.49	262.02	2.29	10.2	10.26	1.53
1542.946	Max WS	500-yr	05May2014	1212	34.14	260.49	262.3	2.61	13.1	11.14	1.81
1504.079	Max WS	2-yr	05May2014	1254	1.52	260.31	260.72	0.97	1.56	6.48	0.41
1504.079	Max WS	5-yr	05May2014	1248	0.56	260.31	261.4	0.07	7.42	10.17	1.09
1504.079	Max WS	10-yr	05May2014	1224	8.42	260.31	261.19	1.56	5.4	9.22	0.88
1504.079	Max WS	25-yr	05May2014	1218	14.63	260.31	261.44	1.88	7.79	10.33	1.13
1504.079	Max WS	50-yr	05May2014	1218	16.54	260.31	261.5	1.96	8.43	10.61	1.19
1504.079	Max WS	100-yr	05May2014	1212	23.16	260.31	261.68	2.23	10.38	11.42	1.37
1504.079	Max WS	500-yr	05May2014	1212	34.07	260.31	261.88	2.65	12.84	12.36	1.57
1467.659	Max WS	2-yr	05May2014	1254	1.52	260.12	260.51	0.74	2.06	7.84	0.39
1467.659	Max WS	5-yr	05May2014	1248	0.44	260.12	260.85	0.09	5.12	10.26	0.73
1467.659	Max WS	10-yr	05May2014	1224	8.32	260.12	261.03	1.18	7.05	11.56	0.91
1467.659	Max WS	25-yr	05May2014	1218	14.53	260.12	261.27	1.45	10.03	13.54	1.15
1467.659	Max WS	50-yr	05May2014	1218	16.44	260.12	261.33	1.5	10.98	14.15	1.21

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1467.659	Max WS	100-yr	05May2014	1212	22.94	260.12	261.49	1.72	13.34	15.6	1.37
1467.659	Max WS	500-yr	05May2014	1212	33.99	260.12	261.71	2	17.03	17.85	1.59
1425.307	Max WS	2-yr	05May2014	1254	1.52	259.66	260	1.44	1.05	5.48	0.34
1425.307	Max WS	5-yr	05May2014	1254	0.32	259.66	260.3	0.1	3.09	8.05	0.64
1425.307	Max WS	10-yr	05May2014	1224	8.21	259.66	260.42	2	4.11	9.05	0.76
1425.307	Max WS	25-yr	05May2014	1218	14.4	259.66	260.63	2.31	6.22	10.99	0.97
1425.307	Max WS	50-yr	05May2014	1218	16.31	259.66	260.69	2.35	6.94	11.67	1.03
1425.307	Max WS	100-yr	05May2014	1212	22.65	259.66	260.85	2.55	8.87	13.34	1.19
1425.307	Max WS	500-yr	05May2014	1212	33.86	259.66	261.08	2.8	12.34	18.33	1.42
1392.843	Max WS	2-yr	05May2014	1254	1.51	259.14	259.51	1.28	1.18	5.78	0.37
1392.843	Max WS	5-yr	05May2014	1248	-0.02	259.14	259.79	-0.01	3.19	8.46	0.65
1392.843	Max WS	10-yr	05May2014	1224	8.13	259.14	259.94	1.8	4.53	9.35	0.8
1392.843	Max WS	25-yr	05May2014	1218	14.31	259.14	260.16	2.14	6.68	10.55	1.02
1392.843	Max WS	50-yr	05May2014	1218	16.22	259.14	260.22	2.19	7.39	10.91	1.08
1392.843	Max WS	100-yr	05May2014	1212	22.43	259.14	260.39	2.41	9.31	11.94	1.25
1392.843	Max WS	500-yr	05May2014	1212	33.74	259.14	260.67	2.58	13.07	14.75	1.53
1358.799	Max WS	2-yr	05May2014	1254	1.51	258.63	258.96	1.48	1.02	5.56	0.33
1358.799	Max WS	5-yr	05May2014	1254	0.13	258.63	259.5	0.03	5.28	9.62	0.87
1358.799	Max WS	10-yr	05May2014	1230	8.06	258.63	259.36	2	4.03	8.81	0.73
1358.799	Max WS	25-yr	05May2014	1218	14.22	258.63	259.57	2.4	5.93	10.02	0.94
1358.799	Max WS	50-yr	05May2014	1218	16.12	258.63	259.62	2.49	6.48	10.34	0.99
1358.799	Max WS	100-yr	05May2014	1212	22.22	258.63	259.77	2.73	8.14	11.28	1.14
1358.799	Max WS	500-yr	05May2014	1212	33.6	258.63	260.02	3.02	11.12	12.82	1.39
1329.439	Max WS	2-yr	05May2014	1254	1.51	258.21	258.57	1.14	1.32	6.31	0.36
1329.439	Max WS	5-yr	05May2014	1248	0.09	258.21	259.51	0.01	10.45	12.6	1.3
1329.439	Max WS	10-yr	05May2014	1230	8.06	258.21	259.01	1.66	4.86	9.55	0.8
1329.439	Max WS	25-yr	05May2014	1218	14.13	258.21	259.26	1.9	7.44	11.07	1.05
1329.439	Max WS	50-yr	05May2014	1218	16.02	258.21	259.32	1.96	8.19	11.47	1.11
1329.439	Max WS	100-yr	05May2014	1218	21.6	258.21	259.51	2.07	10.45	12.6	1.3
1329.439	Max WS	500-yr	05May2014	1212	33.47	258.21	259.84	2.25	14.94	14.51	1.63
1302.462	Max WS	2-yr	05May2014	1254	1.5	257.76	258.45	0.27	5.54	11.66	0.69
1302.462	Max WS	5-yr	05May2014	1242	0.02	257.76	259.51	0	21.4	18.5	1.75
1302.462	Max WS	10-yr	05May2014	1230	8.06	257.76	258.94	0.67	11.98	14.72	1.18
1302.462	Max WS	25-yr	05May2014	1218	13.98	257.76	259.23	0.85	16.5	16.61	1.47
1302.462	Max WS	50-yr	05May2014	1218	15.86	257.76	259.31	0.89	17.79	17.12	1.55

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1302.462	Max WS	100-yr	05May2014	1218	21.6	257.76	259.52	1	21.54	18.55	1.76
1302.462	Max WS	500-yr	05May2014	1212	33.29	257.76	259.89	1.15	28.88	21.29	2.13
1264.23	Max WS	2-yr	05May2014	1300	1.49	257.59	257.95	1.23	1.21	5.77	0.36
1264.23	Max WS	5-yr	05May2014	1254	1.91	257.59	258.2	0.66	2.89	7.65	0.61
1264.23	Max WS	10-yr	05May2014	1230	8.03	257.59	258.42	1.71	4.7	9.03	0.83
1264.23	Max WS	25-yr	05May2014	1224	13.43	257.59	258.63	1.99	6.74	10.08	1.04
1264.23	Max WS	50-yr	05May2014	1218	15.43	257.59	258.68	2.12	7.28	10.34	1.09
1264.23	Max WS	100-yr	05May2014	1218	21.55	257.59	258.86	2.34	9.2	11.22	1.27
1264.23	Max WS	500-yr	05May2014	1212	32.82	257.59	259.08	2.79	11.76	12.3	1.49
1230.005	Max WS	2-yr	05May2014	1300	1.49	257.24	257.75	0.53	2.79	7.9	0.51
1230.005	Max WS	5-yr	05May2014	1254	0.09	257.24	258.14	0.01	6.39	10.57	0.9
1230.005	Max WS	10-yr	05May2014	1230	7.99	257.24	258.27	1.02	7.81	11.39	1.03
1230.005	Max WS	25-yr	05May2014	1224	13.41	257.24	258.5	1.27	10.54	12.81	1.26
1230.005	Max WS	50-yr	05May2014	1224	14.99	257.24	258.55	1.33	11.26	13.16	1.31
1230.005	Max WS	100-yr	05May2014	1218	21.49	257.24	258.74	1.55	13.89	14.23	1.5
1230.005	Max WS	500-yr	05May2014	1212	32.62	257.24	258.96	1.91	17.05	15.37	1.72
1191.977	Max WS	2-yr	05May2014	1300	1.48	256.91	257.69	0.25	5.95	11.26	0.78
1191.977	Max WS	5-yr	05May2014	1254	1.05	256.91	257.98	0.11	9.38	13.12	1.07
1191.977	Max WS	10-yr	05May2014	1230	7.88	256.91	258.16	0.66	11.94	14.29	1.25
1191.977	Max WS	25-yr	05May2014	1224	13.34	256.91	258.36	0.9	14.89	15.63	1.45
1191.977	Max WS	50-yr	05May2014	1224	14.94	256.91	258.41	0.96	15.63	15.95	1.5
1191.977	Max WS	100-yr	05May2014	1218	21.3	256.91	258.57	1.15	19.43	29.32	1.66
1191.977	Max WS	500-yr	05May2014	1218	30.37	256.91	258.79	1.29	27.37	48.83	1.88
1155.309	Max WS	2-yr	05May2014	1300	1.48	257.11	257.66	0.5	2.98	7.81	0.55
1155.309	Max WS	5-yr	05May2014	1254	0.17	257.11	257.66	0.06	2.95	7.78	0.55
1155.309	Max WS	10-yr	05May2014	1230	7.8	257.11	258.07	1.05	8.6	25.03	0.96
1155.309	Max WS	25-yr	05May2014	1224	13.27	257.11	258.28	1.13	14.28	30.99	1.17
1155.309	Max WS	50-yr	05May2014	1224	14.89	257.11	258.33	1.15	15.95	35.27	1.22
1155.309	Max WS	100-yr	05May2014	1218	21.09	257.11	258.51	1.14	23.49	44.33	1.4
1155.309	Max WS	500-yr	05May2014	1218	30.36	257.11	258.74	1.07	34.4	48.46	1.63
1124.025	Max WS	2-yr	05May2014	1300	1.48	255.94	256.24	2.17	0.68	4.65	0.3
1124.025	Max WS	5-yr	05May2014	1300	0.17	255.94	256.28	0.19	0.88	5.28	0.34
1124.025	Max WS	10-yr	05May2014	1230	7.68	255.94	256.59	2.59	2.97	7.54	0.65
1124.025	Max WS	25-yr	05May2014	1224	13.15	255.94	256.78	2.96	4.44	8.33	0.84
1124.025	Max WS	50-yr	05May2014	1224	14.79	255.94	256.82	3.08	4.81	8.51	0.88

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1124.025	Max WS	100-yr	05May2014	1218	20.72	255.94	256.98	3.35	6.19	9.18	1.04
1124.025	Max WS	500-yr	05May2014	1218	30.33	255.94	257.17	3.77	8.04	9.96	1.23
1083.982	Max WS	2-yr	05May2014	1306	1.47	255	255.6	0.5	2.92	7.29	0.6
1083.982	Max WS	5-yr	05May2014	1300	1.1	255	255.52	0.46	2.36	6.76	0.52
1083.982	Max WS	10-yr	05May2014	1230	7.62	255	256.11	1.04	7.3	9.68	1.11
1083.982	Max WS	25-yr	05May2014	1224	13.08	255	256.38	1.29	10.13	10.81	1.38
1083.982	Max WS	50-yr	05May2014	1224	14.74	255	256.45	1.36	10.86	11.08	1.45
1083.982	Max WS	100-yr	05May2014	1218	20.6	255	256.67	1.54	13.39	11.99	1.67
1083.982	Max WS	500-yr	05May2014	1218	30.3	255	256.96	1.78	17.04	13.2	1.96
1018.257	Max WS	2-yr	05May2014	1306	1.47	254.8	255.21	1.03	1.42	5.92	0.41
1018.257	Max WS	5-yr	05May2014	1300	1.1	254.8	255.13	1.1	1	5.09	0.33
1018.257	Max WS	10-yr	05May2014	1236	7.49	254.8	255.64	1.61	4.64	8.67	0.84
1018.257	Max WS	25-yr	05May2014	1224	12.92	254.8	255.87	1.9	6.79	9.57	1.07
1018.257	Max WS	50-yr	05May2014	1224	14.63	254.8	255.93	1.99	7.36	9.8	1.13
1018.257	Max WS	100-yr	05May2014	1218	20.34	254.8	256.11	2.21	9.2	10.49	1.31
1018.257	Max WS	500-yr	05May2014	1218	30.19	254.8	256.38	2.49	12.19	15.3	1.58
959.582	Max WS	2-yr	05May2014	1306	1.47	254.42	254.88	0.6	2.46	7.87	0.46
959.582	Max WS	5-yr	05May2014	1300	0.05	254.42	254.81	0.03	1.87	7.25	0.39
959.582	Max WS	10-yr	05May2014	1236	7.48	254.42	255.29	1.2	6.22	10.56	0.87
959.582	Max WS	25-yr	05May2014	1224	12.76	254.42	255.54	1.41	9.02	11.81	1.12
959.582	Max WS	50-yr	05May2014	1224	14.5	254.42	255.6	1.48	9.82	12.1	1.18
959.582	Max WS	100-yr	05May2014	1218	19.99	254.42	255.8	1.63	12.28	12.95	1.38
959.582	Max WS	500-yr	05May2014	1218	29.95	254.42	256.11	1.78	17.92	26.14	1.69
917.744	Max WS	2-yr	05May2014	1306	1.46	253.94	254.36	1.03	1.41	6.38	0.42
917.744	Max WS	5-yr	05May2014	1300	0	253.94	254.33	0	1.21	6.03	0.39
917.744	Max WS	10-yr	05May2014	1236	7.45	253.94	254.83	1.45	5.15	9.21	0.89
917.744	Max WS	25-yr	05May2014	1224	12.53	253.94	255.08	1.65	7.61	10.44	1.14
917.744	Max WS	50-yr	05May2014	1224	14.28	253.94	255.16	1.7	8.4	10.79	1.22
917.744	Max WS	100-yr	05May2014	1218	19.48	253.94	255.35	1.84	10.59	11.68	1.41
917.744	Max WS	500-yr	05May2014	1218	29.58	253.94	255.68	2.02	14.65	13.1	1.74
885.843	Max WS	2-yr	05May2014	1306	1.46	253.61	254.11	0.91	1.6	5.36	0.5
885.843	Max WS	5-yr	05May2014	1300	0.98	253.61	254.06	0.73	1.35	5.1	0.45
885.843	Max WS	10-yr	05May2014	1236	7.44	253.61	254.55	1.63	4.58	7.92	0.94
885.843	Max WS	25-yr	05May2014	1224	12.44	253.61	254.81	1.82	6.82	9.42	1.2
885.843	Max WS	50-yr	05May2014	1224	14.19	253.61	254.88	1.91	7.43	9.72	1.27

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
885.843	Max WS	100-yr	05May2014	1218	19.31	253.61	255.09	2.01	9.61	10.56	1.48
885.843	Max WS	500-yr	05May2014	1218	29.48	253.61	255.44	2.19	13.45	11.74	1.83
831.018	Max WS	2-yr	05May2014	1306	1.46	252.63	252.87	1.9	0.77	4.85	0.24
831.018	Max WS	5-yr	05May2014	1300	1.11	252.63	252.83	1.9	0.58	4.59	0.2
831.018	Max WS	10-yr	05May2014	1236	7.42	252.63	253.22	2.64	2.81	6.85	0.59
831.018	Max WS	25-yr	05May2014	1230	12.28	252.63	253.4	2.95	4.17	7.8	0.77
831.018	Max WS	50-yr	05May2014	1224	14.07	252.63	253.44	3.12	4.52	8.03	0.81
831.018	Max WS	100-yr	05May2014	1224	19.3	252.63	253.58	3.44	5.62	8.71	0.95
831.018	Max WS	500-yr	05May2014	1218	29.36	252.63	253.78	3.92	7.48	9.73	1.15
794.448	Max WS	2-yr	05May2014	1306	1.45	251.86	252.25	0.79	1.83	6.44	0.39
794.448	Max WS	5-yr	05May2014	1306	1.11	251.86	252.17	0.83	1.34	5.8	0.31
794.448	Max WS	10-yr	05May2014	1236	7.4	251.86	252.76	1.25	5.94	9.7	0.9
794.448	Max WS	25-yr	05May2014	1230	12.27	251.86	253	1.45	8.47	11.21	1.14
794.448	Max WS	50-yr	05May2014	1224	13.95	251.86	253.07	1.51	9.24	11.63	1.21
794.448	Max WS	100-yr	05May2014	1224	19.27	251.86	253.26	1.66	11.62	12.81	1.4
794.448	Max WS	500-yr	05May2014	1218	29.25	251.86	253.55	1.88	15.55	14.26	1.69
753.27	Max WS	2-yr	05May2014	1306	1.45	251.5	251.9	1.14	1.27	5.27	0.4
753.27	Max WS	5-yr	05May2014	1300	-0.1	251.5	251.88	-0.08	1.18	5.11	0.38
753.27	Max WS	10-yr	05May2014	1236	7.37	251.5	252.3	1.79	4.11	8.57	0.8
753.27	Max WS	25-yr	05May2014	1230	12.26	251.5	252.48	2.17	5.66	9.42	0.98
753.27	Max WS	50-yr	05May2014	1224	13.82	251.5	252.53	2.22	6.21	9.7	1.03
753.27	Max WS	100-yr	05May2014	1218	18.7	251.5	252.68	2.42	7.73	10.42	1.18
753.27	Max WS	500-yr	05May2014	1218	29.12	251.5	252.92	2.81	10.36	11.5	1.42
720.714	Max WS	2-yr	05May2014	1312	1.45	251.09	251.41	1.47	0.99	5.76	0.32
720.714	Max WS	5-yr	05May2014	1306	0.04	251.09	251.47	0.03	1.37	6.27	0.38
720.714	Max WS	10-yr	05May2014	1236	7.34	251.09	251.81	1.88	3.91	8.77	0.72
720.714	Max WS	25-yr	05May2014	1230	12.25	251.09	252	2.15	5.69	9.93	0.91
720.714	Max WS	50-yr	05May2014	1230	13.73	251.09	252.05	2.2	6.23	10.24	0.96
720.714	Max WS	100-yr	05May2014	1224	19.23	251.09	252.21	2.43	7.92	11.14	1.12
720.714	Max WS	500-yr	05May2014	1218	29.02	251.09	252.43	2.78	10.45	12.37	1.34
673.556	Max WS	2-yr	05May2014	1312	1.45	250.52	251.04	0.29	4.96	14.33	0.52
673.556	Max WS	5-yr	05May2014	1306	1.15	250.52	250.98	0.28	4.18	13.48	0.46
673.556	Max WS	10-yr	05May2014	1236	7.25	250.52	251.52	0.53	13.7	21.67	1
673.556	Max WS	25-yr	05May2014	1230	12.17	250.52	251.78	0.62	19.64	25.61	1.26
673.556	Max WS	50-yr	05May2014	1230	13.68	250.52	251.84	0.64	21.37	26.7	1.32

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
673.556	Max WS	100-yr	05May2014	1224	19.1	250.52	252.03	0.72	26.61	30.02	1.51
673.556	Max WS	500-yr	05May2014	1218	28.61	250.52	252.28	0.82	34.76	34.38	1.76
625.562	Max WS	2-yr	05May2014	1312	1.44	250.47	250.97	0.51	2.81	9.31	0.5
625.562	Max WS	5-yr	05May2014	1306	0.98	250.47	250.93	0.4	2.43	8.93	0.46
625.562	Max WS	10-yr	05May2014	1236	7.13	250.47	251.42	0.91	7.85	13.33	0.95
625.562	Max WS	25-yr	05May2014	1230	12.05	250.47	251.65	1.07	11.3	16.05	1.18
625.562	Max WS	50-yr	05May2014	1230	13.61	250.47	251.72	1.11	12.31	16.81	1.25
625.562	Max WS	100-yr	05May2014	1224	18.91	250.47	251.88	1.24	15.28	19.03	1.41
625.562	Max WS	500-yr	05May2014	1218	28.07	250.47	252.12	1.41	20.43	23.56	1.65
582.64	Max WS	2-yr	05May2014	1312	1.44	250.01	250.3	1.82	0.8	5.6	0.29
582.64	Max WS	5-yr	05May2014	1306	0.05	250.01	250.37	0.04	1.23	6.81	0.36
582.64	Max WS	10-yr	05May2014	1242	7.03	250.01	250.6	2.14	3.28	10.23	0.59
582.64	Max WS	25-yr	05May2014	1230	11.98	250.01	250.76	2.35	5.1	12.79	0.75
582.64	Max WS	50-yr	05May2014	1230	13.57	250.01	250.79	2.47	5.48	13.32	0.78
582.64	Max WS	100-yr	05May2014	1224	18.82	250.01	250.87	2.86	6.58	14.77	0.86
582.64	Max WS	500-yr	05May2014	1218	27.82	250.01	251	3.25	8.7	18.46	0.99
543.04	Max WS	2-yr	05May2014	1318	1.43	249.4	249.8	0.49	2.91	12.21	0.4
543.04	Max WS	5-yr	05May2014	1306	0.98	249.4	249.73	0.48	2.04	10.63	0.33
543.04	Max WS	10-yr	05May2014	1242	7.02	249.4	250.11	0.92	7.61	17.58	0.71
543.04	Max WS	25-yr	05May2014	1230	11.94	249.4	250.28	1.13	10.69	20.19	0.88
543.04	Max WS	50-yr	05May2014	1230	13.53	249.4	250.3	1.22	11.22	20.59	0.9
543.04	Max WS	100-yr	05May2014	1224	18.76	249.4	250.39	1.48	12.96	21.82	0.99
543.04	Max WS	500-yr	05May2014	1218	27.65	249.4	250.52	1.79	16.05	23.75	1.12
496.118	Max WS	2-yr	05May2014	1318	1.43	249.1	249.76	0.18	8.11	22.35	0.66
496.118	Max WS	5-yr	05May2014	1312	0.93	249.1	249.69	0.14	6.61	20.47	0.59
496.118	Max WS	10-yr	05May2014	1242	6.99	249.1	250.04	0.45	15.43	30.06	0.94
496.118	Max WS	25-yr	05May2014	1230	11.85	249.1	250.2	0.57	20.89	34.86	1.1
496.118	Max WS	50-yr	05May2014	1230	13.47	249.1	250.22	0.63	21.58	35.42	1.12
496.118	Max WS	100-yr	05May2014	1224	18.68	249.1	250.29	0.79	23.87	37.04	1.19
496.118	Max WS	500-yr	05May2014	1218	27.38	249.1	250.42	0.98	28.83	40.44	1.32
428.594	Max WS	2-yr	05May2014	1318	1.42	248.79	248.98	1.31	1.09	10.58	0.19
428.594	Max WS	5-yr	05May2014	1312	-0.01	248.79	249.02	0	1.6	12.63	0.23
428.594	Max WS	10-yr	05May2014	1242	6.93	248.79	249.18	1.66	4.18	20.43	0.39
428.594	Max WS	25-yr	05May2014	1230	11.68	248.79	249.28	1.83	6.54	25.34	0.49
428.594	Max WS	50-yr	05May2014	1230	13.33	248.79	249.3	1.93	7.1	26.24	0.51

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
428.594	Max WS	100-yr	05May2014	1224	18.49	248.79	249.37	2.15	9.01	28.93	0.58
428.594	Max WS	500-yr	05May2014	1224	27.7	248.79	249.5	2.29	13.04	34.17	0.71
389.142	Max WS	2-yr	05May2014	1318	1.42	248.21	248.41	1.09	1.51	17.97	0.2
389.142	Max WS	5-yr	05May2014	1312	0	248.21	248.41	0	1.39	17.05	0.2
389.142	Max WS	10-yr	05May2014	1242	6.88	248.21	248.69	0.86	9.33	33.26	0.48
389.142	Max WS	25-yr	05May2014	1236	11.42	248.21	248.83	0.92	14.2	37.11	0.62
389.142	Max WS	50-yr	05May2014	1230	13.13	248.21	248.87	0.97	15.56	38.05	0.66
389.142	Max WS	100-yr	05May2014	1230	17.82	248.21	248.99	1.01	20.5	41.12	0.78
389.142	Max WS	500-yr	05May2014	1224	27.57	248.21	249.18	1.13	28.67	45.35	0.97
343.978	Max WS	2-yr	05May2014	1318	1.41	247.75	248.02	0.6	2.36	12.95	0.27
343.978	Max WS	5-yr	05May2014	1312	1.49	247.75	248.02	0.64	2.34	12.92	0.27
343.978	Max WS	10-yr	05May2014	1242	6.72	247.75	248.36	0.87	7.73	19.9	0.61
343.978	Max WS	25-yr	05May2014	1236	11.32	247.75	248.54	0.98	11.77	24.36	0.79
343.978	Max WS	50-yr	05May2014	1236	12.7	247.75	248.57	1.04	12.59	25.16	0.82
343.978	Max WS	100-yr	05May2014	1230	17.74	247.75	248.69	1.18	15.71	27.88	0.94
343.978	Max WS	500-yr	05May2014	1224	27.18	247.75	248.88	1.36	21.56	32.46	1.13
318.111	Max WS	2-yr	05May2014	1318	1.41	247.65	247.91	0.78	1.81	10.95	0.26
318.111	Max WS	5-yr	05May2014	1318	-0.02	247.65	247.92	-0.01	2	11.25	0.27
318.111	Max WS	10-yr	05May2014	1248	6.65	247.65	248.24	1.02	6.54	17.96	0.59
318.111	Max WS	25-yr	05May2014	1236	11.27	247.65	248.42	1.12	10.19	22.13	0.77
318.111	Max WS	50-yr	05May2014	1236	12.68	247.65	248.45	1.18	10.91	22.89	0.8
318.111	Max WS	100-yr	05May2014	1230	17.7	247.65	248.57	1.33	13.71	25.42	0.92
318.111	Max WS	500-yr	05May2014	1224	27.06	247.65	248.75	1.53	18.85	29.63	1.1
284.899	Max WS	2-yr	05May2014	1318	1.41	247.49	247.77	0.64	2.2	12.12	0.28
284.899	Max WS	5-yr	05May2014	1318	1.46	247.49	247.76	0.68	2.13	11.99	0.27
284.899	Max WS	10-yr	05May2014	1242	6.61	247.49	248.1	0.9	7.35	19.76	0.61
284.899	Max WS	25-yr	05May2014	1236	11.21	247.49	248.29	0.96	11.63	24.35	0.8
284.899	Max WS	50-yr	05May2014	1236	12.65	247.49	248.32	1.02	12.46	25.09	0.83
284.899	Max WS	100-yr	05May2014	1230	17.65	247.49	248.45	1.13	15.69	27.74	0.96
284.899	Max WS	500-yr	05May2014	1224	26.92	247.49	248.64	1.28	21.61	32.23	1.15
244.681	Max WS	2-yr	05May2014	1324	1.41	247.05	247.32	1.03	1.37	8.83	0.27
244.681	Max WS	5-yr	05May2014	1318	-0.09	247.05	247.31	-0.07	1.33	8.76	0.26
244.681	Max WS	10-yr	05May2014	1248	6.63	247.05	247.68	1.18	5.6	14.8	0.63
244.681	Max WS	25-yr	05May2014	1236	11.05	247.05	247.84	1.34	8.22	18.02	0.79
244.681	Max WS	50-yr	05May2014	1236	12.55	247.05	247.88	1.39	9.06	18.91	0.83

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
244.681	Max WS	100-yr	05May2014	1230	17.48	247.05	248.03	1.44	12.12	22.15	0.98
244.681	Max WS	500-yr	05May2014	1224	26.55	247.05	248.19	1.66	16.02	25.97	1.14
214.499	Max WS	2-yr	05May2014	1324	1.41	246.61	247.2	0.23	6.09	16.73	0.59
214.499	Max WS	5-yr	05May2014	1318	1.44	246.61	247.18	0.25	5.74	16.26	0.57
214.499	Max WS	10-yr	05May2014	1248	6.59	246.61	247.61	0.45	14.56	25.55	1
214.499	Max WS	25-yr	05May2014	1236	10.94	246.61	247.76	0.59	18.91	29.07	1.15
214.499	Max WS	50-yr	05May2014	1236	12.46	246.61	247.82	0.63	20.46	30.16	1.21
214.499	Max WS	100-yr	05May2014	1230	17.36	246.61	247.98	0.72	25.62	33.76	1.37
214.499	Max WS	500-yr	05May2014	1224	26.32	246.61	248.15	0.9	31.61	37.8	1.54
214.498	Max WS	2-yr	05May2014	1324	1.4	246.61	246.84	1.01	1.38	9.53	0.23
214.498	Max WS	5-yr	05May2014	1318	1.41	246.61	246.84	1.08	1.31	9.38	0.23
214.498	Max WS	10-yr	05May2014	1248	6.53	246.61	247.12	1.38	4.74	14.89	0.51
214.498	Max WS	25-yr	05May2014	1236	10.72	246.61	247.24	1.6	6.72	17.55	0.63
214.498	Max WS	50-yr	05May2014	1236	12.27	246.61	247.29	1.63	7.54	18.53	0.68
214.498	Max WS	100-yr	05May2014	1230	17.11	246.61	247.39	1.78	9.63	20.84	0.78
214.498	Max WS	500-yr	05May2014	1224	25.84	246.61	247.53	2.04	12.65	23.79	0.92
147.881	Max WS	2-yr	05May2014	1324	1.4	245.82	246.04	1.2	1.16	8.26	0.22
147.881	Max WS	5-yr	05May2014	1318	1.41	245.82	246.04	1.25	1.12	8.14	0.22
147.881	Max WS	10-yr	05May2014	1248	6.48	245.82	246.35	1.34	4.83	14.77	0.53
147.881	Max WS	25-yr	05May2014	1242	10.62	245.82	246.51	1.44	7.37	17.98	0.69
147.881	Max WS	50-yr	05May2014	1236	12.1	245.82	246.56	1.44	8.38	19.07	0.74
147.881	Max WS	100-yr	05May2014	1230	16.88	245.82	246.69	1.54	10.93	21.72	0.87
147.881	Max WS	500-yr	05May2014	1230	25.57	245.82	246.91	1.58	16.15	26.25	1.09
79.942	Max WS	2-yr	05May2014	1330	1.4	245.12	245.49	0.66	2.12	8.94	0.37
79.942	Max WS	5-yr	05May2014	1324	0.02	245.12	245.5	0.01	2.24	9.1	0.38
79.942	Max WS	10-yr	05May2014	1254	6.34	245.12	245.89	0.95	6.69	14.01	0.77
79.942	Max WS	25-yr	05May2014	1242	10.59	245.12	246.09	1.08	9.83	16.7	0.97
79.942	Max WS	50-yr	05May2014	1242	11.86	245.12	246.15	1.09	10.86	17.49	1.03
79.942	Max WS	100-yr	05May2014	1236	16.48	245.12	246.32	1.18	13.97	19.92	1.2
79.942	Max WS	500-yr	05May2014	1230	25.46	245.12	246.59	1.28	19.96	23.97	1.47
53.415	Max WS	2-yr	05May2014	1330	1.4	244.76	245	1.69	0.82	5.41	0.24
53.415	Max WS	5-yr	05May2014	1324	0.08	244.76	245.01	0.1	0.87	5.5	0.25
53.415	Max WS	10-yr	05May2014	1248	6.35	244.76	245.29	2.24	2.84	8.24	0.53
53.415	Max WS	25-yr	05May2014	1242	10.58	244.76	245.44	2.56	4.13	9.52	0.68
53.415	Max WS	50-yr	05May2014	1242	11.86	244.76	245.48	2.61	4.54	9.88	0.72

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
53.415	Max WS	100-yr	05May2014	1236	16.47	244.76	245.59	2.89	5.7	10.84	0.83
53.415	Max WS	500-yr	05May2014	1230	25.43	244.76	245.77	3.27	7.77	12.36	1.01
13.63	Max WS	2-yr	05May2014	1330	1.39	243.93	244.22	1.06	1.32	6.59	0.29
13.63	Max WS	5-yr	05May2014	1324	0.02	243.93	244.5	0.01	3.57	9.17	0.57
13.63	Max WS	10-yr	05May2014	1254	6.34	243.93	244.53	1.65	3.85	9.42	0.6
13.63	Max WS	25-yr	05May2014	1242	10.56	243.93	244.7	1.9	5.55	10.86	0.77
13.63	Max WS	50-yr	05May2014	1242	11.86	243.93	244.74	1.98	6	11.2	0.81
13.63	Max WS	100-yr	05May2014	1236	16.47	243.93	244.88	2.16	7.63	12.38	0.95
13.63	Max WS	500-yr	05May2014	1230	25.39	243.93	245.09	2.42	10.48	14.33	1.16

Table 26: Unsteady GLD (During mining) cross-sectional properties

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	Max WS	2-yr	05May2014	1206	23.93	264.87	266.89	1.17	20.47	16.58	2.02
2097.011	Max WS	5-yr	05May2014	1206	35.52	264.87	267.3	1.25	30.32	31.64	2.43
2097.011	Max WS	10-yr	05May2014	1206	46.44	264.87	267.63	1.26	42.9	44.21	2.76
2097.011	Max WS	25-yr	05May2014	1206	58.13	264.87	267.94	1.23	57.93	50.78	3.07
2097.011	Max WS	50-yr	05May2014	1206	64	264.87	268.08	1.23	64.9	53.82	3.21
2097.011	Max WS	100-yr	05May2014	1206	73.86	264.87	268.33	1.19	79.53	58.85	3.46
2097.011	Max WS	500-yr	05May2014	1206	95.71	264.87	268.88	1.1	114.5	69.87	4.01
2052.742	Max WS	2-yr	05May2014	1206	23.35	264.51	265.54	3.7	6.31	9.74	1.03
2052.742	Max WS	5-yr	05May2014	1206	34.45	264.51	265.69	4.4	7.83	10.5	1.18
2052.742	Max WS	10-yr	05May2014	1206	44.94	264.51	265.8	4.95	9.08	11.09	1.29
2052.742	Max WS	25-yr	05May2014	1206	56.15	264.51	265.9	5.48	10.24	11.64	1.39
2052.742	Max WS	50-yr	05May2014	1206	61.8	264.51	265.95	5.74	10.77	11.88	1.44
2052.742	Max WS	100-yr	05May2014	1206	71.31	264.51	266.01	6.22	11.46	12.19	1.5
2052.742	Max WS	500-yr	05May2014	1206	91.99	264.51	266.11	7.19	12.8	12.77	1.6
2009.086	Max WS	2-yr	05May2014	1206	22.99	263.84	264.93	1.9	12.11	17	1.09
2009.086	Max WS	5-yr	05May2014	1206	34.07	263.84	265.14	2.15	15.89	18.9	1.3
2009.086	Max WS	10-yr	05May2014	1206	44.46	263.84	265.31	2.35	19.12	20.36	1.47
2009.086	Max WS	25-yr	05May2014	1206	55.65	263.84	265.43	2.6	21.68	21.44	1.59
2009.086	Max WS	50-yr	05May2014	1206	61.28	263.84	265.52	2.64	23.67	22.25	1.68
2009.086	Max WS	100-yr	05May2014	1206	70.67	263.84	265.65	2.73	26.61	23.46	1.81
2009.086	Max WS	500-yr	05May2014	1206	91.25	263.84	265.82	3.08	30.91	25.21	1.98

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1964.49	Max WS	2-yr	05May2014	1206	22.54	263.35	264.19	2.37	9.49	18.23	0.84
1964.49	Max WS	5-yr	05May2014	1206	33.57	263.35	264.35	2.66	12.61	20.81	1
1964.49	Max WS	10-yr	05May2014	1206	43.78	263.35	264.46	2.91	15.06	22.67	1.11
1964.49	Max WS	25-yr	05May2014	1206	54.97	263.35	264.57	3.12	17.63	24.47	1.22
1964.49	Max WS	50-yr	05May2014	1206	60.58	263.35	264.61	3.26	18.58	25.06	1.26
1964.49	Max WS	100-yr	05May2014	1206	69.84	263.35	264.68	3.43	20.39	26.15	1.33
1964.49	Max WS	500-yr	05May2014	1206	90.22	263.35	264.81	3.76	24.1	28.46	1.46
1925.761	Max WS	2-yr	05May2014	1206	21.89	263.04	263.91	1.19	20.23	42.25	0.87
1925.761	Max WS	5-yr	05May2014	1206	32.82	263.04	264.1	1.3	28.85	50.82	1.06
1925.761	Max WS	10-yr	05May2014	1206	42.64	263.04	264.24	1.39	36.69	62	1.2
1925.761	Max WS	25-yr	05May2014	1206	53.7	263.04	264.38	1.44	46.82	77.25	1.34
1925.761	Max WS	50-yr	05May2014	1206	58.92	263.04	264.42	1.49	50.04	80.3	1.38
1925.761	Max WS	100-yr	05May2014	1206	68.15	263.04	264.51	1.53	57.35	86.38	1.47
1925.761	Max WS	500-yr	05May2014	1206	88.05	263.04	264.72	1.53	76.26	97.6	1.68
1874.546	Max WS	2-yr	05May2014	1206	20.13	262.4	263.46	1.33	15.3	26.3	1.06
1874.546	Max WS	5-yr	05May2014	1206	30.65	262.4	263.61	1.62	19.48	30.48	1.21
1874.546	Max WS	10-yr	05May2014	1206	39.55	262.4	263.71	1.83	22.81	34.04	1.31
1874.546	Max WS	25-yr	05May2014	1206	49.95	262.4	263.81	2.04	26.31	38.18	1.41
1874.546	Max WS	50-yr	05May2014	1206	54.12	262.4	263.85	2.11	27.93	40.06	1.45
1874.546	Max WS	100-yr	05May2014	1206	63.11	262.4	263.95	2.21	31.86	46.11	1.55
1874.546	Max WS	500-yr	05May2014	1206	81.91	262.4	264.07	2.49	37.73	50.01	1.67
1828.159	Max WS	2-yr	05May2014	1212	19.49	262.13	262.97	1.77	11.03	24.77	0.84
1828.159	Max WS	5-yr	05May2014	1212	29.03	262.13	263.13	1.94	15.23	28.77	1
1828.159	Max WS	10-yr	05May2014	1212	37.91	262.13	263.25	2.08	18.97	32.12	1.12
1828.159	Max WS	25-yr	05May2014	1212	47.54	262.13	263.38	2.17	23.22	35.81	1.25
1828.159	Max WS	50-yr	05May2014	1212	52.17	262.13	263.43	2.21	25.24	37.34	1.3
1828.159	Max WS	100-yr	05May2014	1212	60.42	262.13	263.54	2.24	29.41	40.36	1.41
1828.159	Max WS	500-yr	05May2014	1212	78.28	262.13	263.78	2.22	39.92	48.39	1.65
1788.723	Max WS	2-yr	05May2014	1212	19.43	261.54	262.8	0.87	23.16	33.97	1.26
1788.723	Max WS	5-yr	05May2014	1212	28.97	261.54	263	1.02	30.25	38.03	1.46
1788.723	Max WS	10-yr	05May2014	1212	37.84	261.54	263.15	1.13	36.08	40.74	1.61
1788.723	Max WS	25-yr	05May2014	1212	47.4	261.54	263.3	1.22	42.55	43.42	1.76
1788.723	Max WS	50-yr	05May2014	1212	52	261.54	263.36	1.26	45.29	44.5	1.82
1788.723	Max WS	100-yr	05May2014	1212	60.14	261.54	263.49	1.31	50.91	46.52	1.95
1788.723	Max WS	500-yr	05May2014	1212	77.78	261.54	263.75	1.38	63.78	51	2.21

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1742.556	Max WS	2-yr	05May2014	1212	19.33	261.5	262.71	0.98	20	29.32	1.21
1742.556	Max WS	5-yr	05May2014	1212	28.87	261.5	262.89	1.17	25.62	32.9	1.39
1742.556	Max WS	10-yr	05May2014	1212	37.72	261.5	263.03	1.3	30.46	35.67	1.53
1742.556	Max WS	25-yr	05May2014	1212	47.16	261.5	263.18	1.4	36.02	38.67	1.68
1742.556	Max WS	50-yr	05May2014	1212	51.71	261.5	263.24	1.45	38.49	39.95	1.74
1742.556	Max WS	100-yr	05May2014	1212	59.69	261.5	263.37	1.48	43.89	42.76	1.87
1742.556	Max WS	500-yr	05May2014	1212	77.01	261.5	263.65	1.52	56.84	49.5	2.15
1695.655	Max WS	2-yr	05May2014	1212	19.19	261.28	262.33	1.8	10.73	18.4	1.05
1695.655	Max WS	5-yr	05May2014	1212	28.67	261.28	262.58	1.87	16.19	25.31	1.3
1695.655	Max WS	10-yr	05May2014	1212	37.35	261.28	262.79	1.88	22.4	36.63	1.51
1695.655	Max WS	25-yr	05May2014	1212	46.58	261.28	263.01	1.74	33.49	54.39	1.73
1695.655	Max WS	50-yr	05May2014	1212	51	261.28	263.11	1.67	38.79	56.69	1.83
1695.655	Max WS	100-yr	05May2014	1212	58.84	261.28	263.28	1.56	48.6	60.72	2
1695.655	Max WS	500-yr	05May2014	1212	75.86	261.28	263.61	1.4	70	68.04	2.33
1651.05	Max WS	2-yr	05May2014	1212	18.93	260.78	262.2	0.91	20.75	22.08	1.42
1651.05	Max WS	5-yr	05May2014	1212	28.34	260.78	262.51	1.01	28.07	24.88	1.73
1651.05	Max WS	10-yr	05May2014	1212	36.83	260.78	262.74	1.09	33.94	26.95	1.96
1651.05	Max WS	25-yr	05May2014	1212	45.91	260.78	262.96	1.15	40.13	29.06	2.18
1651.05	Max WS	50-yr	05May2014	1212	50.23	260.78	263.05	1.18	42.82	30	2.27
1651.05	Max WS	100-yr	05May2014	1212	57.99	260.78	263.21	1.23	47.83	31.58	2.43
1651.05	Max WS	500-yr	05May2014	1212	74.84	260.78	263.53	1.31	58.52	34.99	2.75
1617.21	Max WS	2-yr	05May2014	1212	18.67	260.56	262.14	1.02	18.39	19.16	1.58
1617.21	Max WS	5-yr	05May2014	1212	28.06	260.56	262.45	1.14	24.65	21.35	1.88
1617.21	Max WS	10-yr	05May2014	1212	36.52	260.56	262.67	1.24	29.56	22.79	2.11
1617.21	Max WS	25-yr	05May2014	1212	45.57	260.56	262.89	1.31	34.72	24.21	2.33
1617.21	Max WS	50-yr	05May2014	1212	49.84	260.56	262.98	1.35	36.93	24.78	2.42
1617.21	Max WS	100-yr	05May2014	1212	57.59	260.56	263.14	1.4	41.01	25.67	2.58
1617.21	Max WS	500-yr	05May2014	1212	74.34	260.56	263.46	1.5	49.54	27.64	2.9
1577.381	Max WS	2-yr	05May2014	1212	18.27	260.48	262.13	0.42	43.79	35.23	1.65
1577.381	Max WS	5-yr	05May2014	1212	27.61	260.48	262.45	0.5	56.03	41.67	1.97
1577.381	Max WS	10-yr	05May2014	1212	35.94	260.48	262.68	0.56	67.44	53.1	2.2
1577.381	Max WS	25-yr	05May2014	1212	44.94	260.48	262.91	0.6	80.12	59.04	2.43
1577.381	Max WS	50-yr	05May2014	1212	49.14	260.48	263	0.62	85.68	60.55	2.52
1577.381	Max WS	100-yr	05May2014	1212	56.85	260.48	263.17	0.65	96.33	64.97	2.69
1577.381	Max WS	500-yr	05May2014	1212	73.43	260.48	263.5	0.7	118.96	73.34	3.02

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1542.946	Max WS	2-yr	05May2014	1212	17.99	260.49	261.86	2.1	8.56	9.57	1.37
1542.946	Max WS	5-yr	05May2014	1212	27.3	260.49	262.13	2.42	11.28	10.61	1.64
1542.946	Max WS	10-yr	05May2014	1212	35.52	260.49	262.33	2.64	13.45	11.23	1.84
1542.946	Max WS	25-yr	05May2014	1212	44.47	260.49	262.53	2.82	15.79	11.85	2.04
1542.946	Max WS	50-yr	05May2014	1212	48.62	260.49	262.61	2.9	16.75	12.1	2.12
1542.946	Max WS	100-yr	05May2014	1212	56.29	260.49	262.76	3.03	18.56	12.55	2.27
1542.946	Max WS	500-yr	05May2014	1212	72.75	260.49	263.06	3.22	22.58	13.54	2.57
1504.079	Max WS	2-yr	05May2014	1212	17.87	260.31	261.54	2.01	8.89	10.81	1.23
1504.079	Max WS	5-yr	05May2014	1212	27.18	260.31	261.76	2.4	11.32	11.78	1.45
1504.079	Max WS	10-yr	05May2014	1212	35.38	260.31	261.9	2.71	13.04	12.43	1.59
1504.079	Max WS	25-yr	05May2014	1212	44.33	260.31	262.02	3.04	14.59	12.98	1.71
1504.079	Max WS	50-yr	05May2014	1212	48.46	260.31	262.07	3.17	15.27	13.2	1.76
1504.079	Max WS	100-yr	05May2014	1212	56.12	260.31	262.17	3.39	16.56	13.61	1.86
1504.079	Max WS	500-yr	05May2014	1212	72.55	260.31	262.35	3.83	19.03	14.34	2.04
1467.659	Max WS	2-yr	05May2014	1212	17.7	260.12	261.38	1.52	11.67	14.6	1.26
1467.659	Max WS	5-yr	05May2014	1212	27.04	260.12	261.58	1.83	14.82	16.45	1.46
1467.659	Max WS	10-yr	05May2014	1212	35.24	260.12	261.72	2.06	17.12	17.93	1.6
1467.659	Max WS	25-yr	05May2014	1212	44.15	260.12	261.85	2.27	19.63	19.94	1.73
1467.659	Max WS	50-yr	05May2014	1212	48.18	260.12	261.95	2.26	21.8	24.19	1.83
1467.659	Max WS	100-yr	05May2014	1212	55.86	260.12	262.1	2.3	26.1	33.29	1.98
1467.659	Max WS	500-yr	05May2014	1212	72.1	260.12	262.44	2.17	38.5	37.48	2.32
1425.307	Max WS	2-yr	05May2014	1212	17.49	259.66	260.73	2.39	7.31	12.01	1.07
1425.307	Max WS	5-yr	05May2014	1212	26.84	259.66	260.95	2.62	10.24	14.61	1.29
1425.307	Max WS	10-yr	05May2014	1212	35.01	259.66	261.1	2.81	12.77	19.11	1.44
1425.307	Max WS	25-yr	05May2014	1212	43.89	259.66	261.22	3.05	15.3	23.42	1.56
1425.307	Max WS	50-yr	05May2014	1212	47.87	259.66	261.23	3.29	15.5	23.7	1.57
1425.307	Max WS	100-yr	05May2014	1212	55.55	259.66	261.29	3.55	17.04	26.34	1.63
1425.307	Max WS	500-yr	05May2014	1212	71.56	259.66	261.36	4.21	19.06	29.5	1.7
1392.843	Max WS	2-yr	05May2014	1212	17.35	259.14	260.26	2.22	7.8	11.12	1.12
1392.843	Max WS	5-yr	05May2014	1212	26.7	259.14	260.5	2.5	10.69	12.87	1.36
1392.843	Max WS	10-yr	05May2014	1212	34.81	259.14	260.69	2.61	13.31	14.94	1.55
1392.843	Max WS	25-yr	05May2014	1212	43.63	259.14	260.86	2.73	16.31	23.6	1.72
1392.843	Max WS	50-yr	05May2014	1212	47.63	259.14	260.94	2.73	18.4	30.12	1.8
1392.843	Max WS	100-yr	05May2014	1212	55.28	259.14	261.06	2.74	22.49	35.06	1.92
1392.843	Max WS	500-yr	05May2014	1212	71.18	259.14	261.33	2.58	32.58	38.25	2.19

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1358.799	Max WS	2-yr	05May2014	1212	17.23	258.63	259.65	2.54	6.79	10.53	1.02
1358.799	Max WS	5-yr	05May2014	1212	26.56	258.63	259.87	2.86	9.28	11.89	1.24
1358.799	Max WS	10-yr	05May2014	1212	34.61	258.63	260.04	3.04	11.37	12.94	1.41
1358.799	Max WS	25-yr	05May2014	1212	43.36	258.63	260.2	3.2	13.54	14.29	1.57
1358.799	Max WS	50-yr	05May2014	1212	47.32	258.63	260.27	3.25	14.57	14.87	1.64
1358.799	Max WS	100-yr	05May2014	1212	54.95	258.63	260.38	3.4	16.18	15.84	1.74
1358.799	Max WS	500-yr	05May2014	1212	70.74	258.63	260.56	3.73	19.23	17.89	1.93
1329.439	Max WS	2-yr	05May2014	1212	17.11	258.21	259.36	2	8.56	11.66	1.15
1329.439	Max WS	5-yr	05May2014	1212	26.39	258.21	259.65	2.15	12.28	13.45	1.44
1329.439	Max WS	10-yr	05May2014	1212	34.43	258.21	259.86	2.27	15.21	14.61	1.65
1329.439	Max WS	25-yr	05May2014	1212	43.16	258.21	260.07	2.38	18.42	16.61	1.86
1329.439	Max WS	50-yr	05May2014	1212	47.1	258.21	260.15	2.43	19.75	17.31	1.94
1329.439	Max WS	100-yr	05May2014	1212	54.69	258.21	260.29	2.54	22.28	18.54	2.08
1329.439	Max WS	500-yr	05May2014	1212	70.27	258.21	260.56	2.7	28.3	31.02	2.35
1302.462	Max WS	2-yr	05May2014	1212	16.94	257.76	259.35	0.92	18.42	17.36	1.59
1302.462	Max WS	5-yr	05May2014	1212	26.14	257.76	259.68	1.06	24.57	19.64	1.92
1302.462	Max WS	10-yr	05May2014	1212	34.19	257.76	259.91	1.17	29.33	21.48	2.15
1302.462	Max WS	25-yr	05May2014	1212	42.81	257.76	260.14	1.25	34.55	23.68	2.38
1302.462	Max WS	50-yr	05May2014	1212	46.73	257.76	260.23	1.29	36.81	32.41	2.47
1302.462	Max WS	100-yr	05May2014	1212	54.11	257.76	260.39	1.34	43.52	51.12	2.63
1302.462	Max WS	500-yr	05May2014	1212	69.41	257.76	260.68	1.38	59.28	56.54	2.92
1264.23	Max WS	2-yr	05May2014	1218	16.22	257.59	258.72	2.12	7.67	10.53	1.13
1264.23	Max WS	5-yr	05May2014	1212	25.58	257.59	258.94	2.53	10.11	11.62	1.35
1264.23	Max WS	10-yr	05May2014	1212	33.58	257.59	259.09	2.81	11.94	12.37	1.5
1264.23	Max WS	25-yr	05May2014	1212	42.01	257.59	259.22	3.09	13.6	13	1.63
1264.23	Max WS	50-yr	05May2014	1212	45.86	257.59	259.29	3.18	14.44	13.31	1.7
1264.23	Max WS	100-yr	05May2014	1218	49.04	257.59	259.37	3.15	15.57	13.76	1.78
1264.23	Max WS	500-yr	05May2014	1218	64	257.59	259.64	3.3	19.4	15.19	2.05
1230.005	Max WS	2-yr	05May2014	1218	16.2	257.24	258.59	1.37	11.8	13.42	1.35
1230.005	Max WS	5-yr	05May2014	1212	25.4	257.24	258.81	1.71	14.86	14.59	1.57
1230.005	Max WS	10-yr	05May2014	1212	33.37	257.24	258.97	1.93	17.25	15.44	1.73
1230.005	Max WS	25-yr	05May2014	1218	38.79	257.24	259.11	1.99	19.49	16.34	1.87
1230.005	Max WS	50-yr	05May2014	1218	42.54	257.24	259.2	2.04	20.97	17.31	1.96
1230.005	Max WS	100-yr	05May2014	1218	48.99	257.24	259.32	2.13	23.87	28.67	2.08
1230.005	Max WS	500-yr	05May2014	1218	63.65	257.24	259.69	1.97	40.04	53.14	2.45

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1191.977	Max WS	2-yr	05May2014	1218	16.14	256.91	258.44	1	16.2	18.14	1.53
1191.977	Max WS	5-yr	05May2014	1218	23.95	256.91	258.63	1.2	21.37	33.48	1.72
1191.977	Max WS	10-yr	05May2014	1218	30.85	256.91	258.79	1.3	27.83	49.44	1.88
1191.977	Max WS	25-yr	05May2014	1218	38.65	256.91	258.99	1.27	38.56	60.11	2.08
1191.977	Max WS	50-yr	05May2014	1218	42.32	256.91	259.1	1.21	45.59	63.86	2.19
1191.977	Max WS	100-yr	05May2014	1218	48.53	256.91	259.25	1.15	55.43	67.76	2.34
1191.977	Max WS	500-yr	05May2014	1218	62.2	256.91	259.67	0.95	84.74	72.08	2.76
1155.309	Max WS	2-yr	05May2014	1218	16.07	257.11	258.37	1.15	17.37	40.27	1.26
1155.309	Max WS	5-yr	05May2014	1218	23.91	257.11	258.58	1.12	26.72	45.86	1.47
1155.309	Max WS	10-yr	05May2014	1212	31.4	257.11	258.75	1.09	34.88	48.64	1.64
1155.309	Max WS	25-yr	05May2014	1218	38.52	257.11	258.96	0.99	45.3	52.4	1.85
1155.309	Max WS	50-yr	05May2014	1218	42.13	257.11	259.08	0.93	51.48	54.51	1.97
1155.309	Max WS	100-yr	05May2014	1218	48.21	257.11	259.23	0.9	59.97	57.07	2.12
1155.309	Max WS	500-yr	05May2014	1218	61.37	257.11	259.65	0.8	86.53	66.28	2.54
1124.025	Max WS	2-yr	05May2014	1218	15.95	255.94	256.85	3.15	5.06	8.64	0.91
1124.025	Max WS	5-yr	05May2014	1218	23.85	255.94	257.05	3.48	6.85	9.46	1.11
1124.025	Max WS	10-yr	05May2014	1218	30.84	255.94	257.18	3.79	8.14	10	1.24
1124.025	Max WS	25-yr	05May2014	1212	38.02	255.94	257.31	4.02	9.45	10.53	1.37
1124.025	Max WS	50-yr	05May2014	1218	41.95	255.94	257.34	4.27	9.82	10.67	1.4
1124.025	Max WS	100-yr	05May2014	1218	47.92	255.94	257.41	4.53	10.58	10.96	1.47
1124.025	Max WS	500-yr	05May2014	1218	60.6	255.94	257.51	5.22	11.61	11.35	1.57
1083.982	Max WS	2-yr	05May2014	1218	15.89	255	256.49	1.4	11.35	11.26	1.49
1083.982	Max WS	5-yr	05May2014	1218	23.81	255	256.78	1.62	14.71	12.44	1.78
1083.982	Max WS	10-yr	05May2014	1218	30.81	255	256.98	1.79	17.25	13.27	1.98
1083.982	Max WS	25-yr	05May2014	1212	37.67	255	257.14	1.93	19.55	17.38	2.14
1083.982	Max WS	50-yr	05May2014	1218	41.94	255	257.17	2.1	20.09	19.5	2.17
1083.982	Max WS	100-yr	05May2014	1218	47.88	255	257.27	2.23	22.61	30.27	2.27
1083.982	Max WS	500-yr	05May2014	1218	60.59	255	257.4	2.51	26.72	32.94	2.4
1018.257	Max WS	2-yr	05May2014	1218	15.78	254.8	255.97	2.04	7.74	9.94	1.17
1018.257	Max WS	5-yr	05May2014	1218	23.71	254.8	256.21	2.31	10.27	10.86	1.41
1018.257	Max WS	10-yr	05May2014	1218	30.73	254.8	256.39	2.51	12.36	16.19	1.59
1018.257	Max WS	25-yr	05May2014	1218	38.3	254.8	256.54	2.66	15.49	23.27	1.74
1018.257	Max WS	50-yr	05May2014	1218	41.79	254.8	256.61	2.68	17.21	25.65	1.81
1018.257	Max WS	100-yr	05May2014	1218	47.68	254.8	256.7	2.77	19.59	28.69	1.9
1018.257	Max WS	500-yr	05May2014	1218	60.3	254.8	256.89	2.81	25.63	33.85	2.09

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
959.582	Max WS	2-yr	05May2014	1218	15.65	254.42	255.65	1.51	10.37	12.29	1.23
959.582	Max WS	5-yr	05May2014	1218	23.55	254.42	255.92	1.7	13.88	15.48	1.5
959.582	Max WS	10-yr	05May2014	1218	30.53	254.42	256.12	1.78	18.36	26.83	1.7
959.582	Max WS	25-yr	05May2014	1218	37.95	254.42	256.33	1.78	24.63	35.26	1.91
959.582	Max WS	50-yr	05May2014	1218	41.46	254.42	256.4	1.79	27.24	38.04	1.98
959.582	Max WS	100-yr	05May2014	1218	47.15	254.42	256.51	1.79	31.91	43.3	2.09
959.582	Max WS	500-yr	05May2014	1218	59.55	254.42	256.75	1.73	43.03	50.32	2.33
917.744	Max WS	2-yr	05May2014	1218	15.44	253.94	255.2	1.73	8.92	11.01	1.26
917.744	Max WS	5-yr	05May2014	1218	23.32	253.94	255.48	1.92	12.17	12.26	1.54
917.744	Max WS	10-yr	05May2014	1218	30.2	253.94	255.69	2.03	14.87	13.18	1.75
917.744	Max WS	25-yr	05May2014	1218	37.55	253.94	255.91	2.1	18.32	20.21	1.97
917.744	Max WS	50-yr	05May2014	1218	40.96	253.94	256	2.11	20.41	23.05	2.06
917.744	Max WS	100-yr	05May2014	1218	46.32	253.94	256.15	2.08	24.14	27.06	2.21
917.744	Max WS	500-yr	05May2014	1218	58.41	253.94	256.45	2	33.21	33.16	2.51
885.843	Max WS	2-yr	05May2014	1218	15.36	253.61	254.93	1.94	7.92	9.91	1.32
885.843	Max WS	5-yr	05May2014	1218	23.24	253.61	255.23	2.09	11.09	11.05	1.62
885.843	Max WS	10-yr	05May2014	1218	30.1	253.61	255.45	2.21	13.62	11.78	1.84
885.843	Max WS	25-yr	05May2014	1218	37.43	253.61	255.68	2.28	16.45	12.56	2.07
885.843	Max WS	50-yr	05May2014	1218	40.78	253.61	255.78	2.31	17.88	17.59	2.17
885.843	Max WS	100-yr	05May2014	1218	46.03	253.61	255.94	2.3	20.98	21.33	2.33
885.843	Max WS	500-yr	05May2014	1218	57.97	253.61	256.3	2.16	29.95	28.02	2.69
831.018	Max WS	2-yr	05May2014	1218	15.25	252.63	253.48	3.2	4.76	8.19	0.85
831.018	Max WS	5-yr	05May2014	1218	23.12	252.63	253.66	3.61	6.4	9.16	1.03
831.018	Max WS	10-yr	05May2014	1218	29.99	252.63	253.79	3.95	7.6	9.79	1.16
831.018	Max WS	25-yr	05May2014	1218	37.28	252.63	253.91	4.25	8.77	10.33	1.28
831.018	Max WS	50-yr	05May2014	1218	40.61	252.63	253.96	4.36	9.32	10.57	1.33
831.018	Max WS	100-yr	05May2014	1218	45.72	252.63	254.02	4.56	10.02	10.87	1.39
831.018	Max WS	500-yr	05May2014	1218	57.53	252.63	254.14	5.08	11.32	11.42	1.51
794.448	Max WS	2-yr	05May2014	1218	15.15	251.86	253.12	1.54	9.85	11.95	1.26
794.448	Max WS	5-yr	05May2014	1218	23.03	251.86	253.38	1.75	13.14	13.42	1.52
794.448	Max WS	10-yr	05May2014	1218	29.9	251.86	253.57	1.88	15.88	14.36	1.71
794.448	Max WS	25-yr	05May2014	1218	37.17	251.86	253.75	2.01	18.55	15.27	1.89
794.448	Max WS	50-yr	05May2014	1218	40.5	251.86	253.83	2.06	19.74	15.67	1.97
794.448	Max WS	100-yr	05May2014	1218	45.58	251.86	253.93	2.15	21.32	16.18	2.07
794.448	Max WS	500-yr	05May2014	1218	57.38	251.86	254.13	2.37	24.62	17.19	2.27

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
753.27	Max WS	2-yr	05May2014	1218	15.02	251.5	252.57	2.28	6.59	9.89	1.07
753.27	Max WS	5-yr	05May2014	1218	22.91	251.5	252.78	2.63	8.72	10.85	1.28
753.27	Max WS	10-yr	05May2014	1218	29.78	251.5	252.93	2.85	10.46	11.53	1.43
753.27	Max WS	25-yr	05May2014	1218	37.04	251.5	253.07	3.07	12.06	12.13	1.57
753.27	Max WS	50-yr	05May2014	1218	40.35	251.5	253.14	3.13	12.88	12.42	1.64
753.27	Max WS	100-yr	05May2014	1218	45.4	251.5	253.23	3.22	14.11	12.85	1.73
753.27	Max WS	500-yr	05May2014	1218	57.14	251.5	253.48	3.27	17.46	13.95	1.98
720.714	Max WS	2-yr	05May2014	1224	14.62	251.09	252.08	2.23	6.56	10.42	0.99
720.714	Max WS	5-yr	05May2014	1218	22.84	251.09	252.29	2.6	8.8	11.58	1.2
720.714	Max WS	10-yr	05May2014	1218	29.7	251.09	252.44	2.78	10.68	12.47	1.35
720.714	Max WS	25-yr	05May2014	1218	36.96	251.09	252.57	3.02	12.24	13.1	1.48
720.714	Max WS	50-yr	05May2014	1218	40.27	251.09	252.61	3.14	12.84	13.41	1.52
720.714	Max WS	100-yr	05May2014	1218	45.3	251.09	252.68	3.3	13.73	13.86	1.59
720.714	Max WS	500-yr	05May2014	1218	57	251.09	252.8	3.71	15.46	14.7	1.71
673.556	Max WS	2-yr	05May2014	1224	14.6	250.52	251.88	0.65	22.39	27.34	1.36
673.556	Max WS	5-yr	05May2014	1218	22.55	250.52	252.12	0.77	29.39	31.52	1.6
673.556	Max WS	10-yr	05May2014	1218	29.36	250.52	252.3	0.83	35.54	34.76	1.78
673.556	Max WS	25-yr	05May2014	1218	36.63	250.52	252.46	0.89	41.35	37.57	1.94
673.556	Max WS	50-yr	05May2014	1218	39.94	250.52	252.52	0.93	43.51	38.64	2
673.556	Max WS	100-yr	05May2014	1218	44.93	250.52	252.6	0.98	46.69	40.23	2.08
673.556	Max WS	500-yr	05May2014	1218	56.66	250.52	252.75	1.09	53.1	43.25	2.23
625.562	Max WS	2-yr	05May2014	1224	14.56	250.47	251.75	1.13	12.9	17.24	1.28
625.562	Max WS	5-yr	05May2014	1218	22.18	250.47	251.96	1.32	16.92	20.64	1.49
625.562	Max WS	10-yr	05May2014	1218	28.88	250.47	252.15	1.42	20.96	23.96	1.68
625.562	Max WS	25-yr	05May2014	1218	36.18	250.47	252.3	1.52	25	26.79	1.83
625.562	Max WS	50-yr	05May2014	1218	39.53	250.47	252.35	1.59	26.25	27.82	1.88
625.562	Max WS	100-yr	05May2014	1218	44.48	250.47	252.42	1.69	28.16	29.06	1.95
625.562	Max WS	500-yr	05May2014	1218	56.22	250.47	252.53	1.93	31.63	30.87	2.06
582.64	Max WS	2-yr	05May2014	1224	14.54	250.01	250.8	2.56	5.67	13.58	0.79
582.64	Max WS	5-yr	05May2014	1218	21.98	250.01	250.92	3.02	7.3	16.08	0.91
582.64	Max WS	10-yr	05May2014	1218	28.65	250.01	251.01	3.28	8.91	18.8	1
582.64	Max WS	25-yr	05May2014	1218	35.91	250.01	251.09	3.53	10.66	21.72	1.08
582.64	Max WS	50-yr	05May2014	1218	39.32	250.01	251.12	3.67	11.33	22.73	1.11
582.64	Max WS	100-yr	05May2014	1218	44.24	250.01	251.17	3.84	12.34	24.32	1.16
582.64	Max WS	500-yr	05May2014	1224	55.92	250.01	251.28	4.05	15.3	27.98	1.27

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
543.04	Max WS	2-yr	05May2014	1224	14.52	249.4	250.32	1.28	11.49	20.78	0.92
543.04	Max WS	5-yr	05May2014	1218	21.86	249.4	250.44	1.6	14.09	22.54	1.04
543.04	Max WS	10-yr	05May2014	1218	28.52	249.4	250.53	1.83	16.23	23.85	1.13
543.04	Max WS	25-yr	05May2014	1218	35.75	249.4	250.61	2.08	18.11	24.95	1.21
543.04	Max WS	50-yr	05May2014	1218	39.18	249.4	250.63	2.2	18.81	25.35	1.23
543.04	Max WS	100-yr	05May2014	1218	44.08	249.4	250.67	2.36	19.75	25.87	1.27
543.04	Max WS	500-yr	05May2014	1218	55.76	249.4	250.76	2.7	22.04	27.14	1.36
496.118	Max WS	2-yr	05May2014	1218	13.66	249.1	250.23	0.63	21.9	35.68	1.13
496.118	Max WS	5-yr	05May2014	1218	21.66	249.1	250.33	0.87	25.55	38.14	1.23
496.118	Max WS	10-yr	05May2014	1218	28.3	249.1	250.42	1.01	29.03	40.58	1.32
496.118	Max WS	25-yr	05May2014	1218	35.56	249.1	250.49	1.16	31.85	42.45	1.39
496.118	Max WS	50-yr	05May2014	1218	39.04	249.1	250.51	1.25	32.7	42.96	1.41
496.118	Max WS	100-yr	05May2014	1218	43.93	249.1	250.53	1.37	33.77	43.6	1.43
496.118	Max WS	500-yr	05May2014	1218	55.56	249.1	250.6	1.6	36.79	45.44	1.5
428.594	Max WS	2-yr	05May2014	1224	14.48	248.79	249.32	1.99	7.53	26.9	0.53
428.594	Max WS	5-yr	05May2014	1224	21.49	248.79	249.41	2.21	10.3	30.73	0.62
428.594	Max WS	10-yr	05May2014	1224	27.89	248.79	249.5	2.29	13.18	34.33	0.71
428.594	Max WS	25-yr	05May2014	1224	34.86	248.79	249.58	2.38	16.07	37.57	0.79
428.594	Max WS	50-yr	05May2014	1224	38.33	248.79	249.61	2.44	17.29	38.81	0.82
428.594	Max WS	100-yr	05May2014	1224	43.53	248.79	249.66	2.5	19.25	40.55	0.87
428.594	Max WS	500-yr	05May2014	1224	55.94	248.79	249.78	2.58	24.26	44.77	0.99
389.142	Max WS	2-yr	05May2014	1224	14.35	248.21	248.9	0.98	16.91	38.89	0.69
389.142	Max WS	5-yr	05May2014	1224	21.42	248.21	249.06	1.05	23.63	42.78	0.85
389.142	Max WS	10-yr	05May2014	1224	27.83	248.21	249.19	1.13	28.99	45.5	0.98
389.142	Max WS	25-yr	05May2014	1224	34.8	248.21	249.3	1.19	34.44	48.02	1.09
389.142	Max WS	50-yr	05May2014	1224	38.28	248.21	249.36	1.22	37.1	49.17	1.15
389.142	Max WS	100-yr	05May2014	1224	43.44	248.21	249.43	1.26	40.96	50.76	1.22
389.142	Max WS	500-yr	05May2014	1224	55.81	248.21	249.59	1.36	49.09	53.91	1.38
343.978	Max WS	2-yr	05May2014	1224	13.96	247.75	248.6	1.09	13.28	25.78	0.85
343.978	Max WS	5-yr	05May2014	1224	21.16	247.75	248.77	1.24	18.05	29.78	1.02
343.978	Max WS	10-yr	05May2014	1224	27.62	247.75	248.89	1.37	21.82	32.64	1.14
343.978	Max WS	25-yr	05May2014	1224	34.6	247.75	249	1.49	25.53	34.93	1.25
343.978	Max WS	50-yr	05May2014	1224	38.07	247.75	249.06	1.53	27.49	36.13	1.31
343.978	Max WS	100-yr	05May2014	1224	43.16	247.75	249.13	1.59	30.24	37.68	1.38
343.978	Max WS	500-yr	05May2014	1224	55.46	247.75	249.28	1.75	35.91	40.79	1.53

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
318.111	Max WS	2-yr	05May2014	1224	13.86	247.65	248.48	1.23	11.48	23.43	0.83
318.111	Max WS	5-yr	05May2014	1224	21.08	247.65	248.65	1.39	15.89	27.3	1
318.111	Max WS	10-yr	05May2014	1224	27.56	247.65	248.76	1.54	19.08	29.79	1.11
318.111	Max WS	25-yr	05May2014	1224	34.54	247.65	248.87	1.67	22.37	31.73	1.22
318.111	Max WS	50-yr	05May2014	1224	38	247.65	248.92	1.71	24.16	32.86	1.27
318.111	Max WS	100-yr	05May2014	1224	43.09	247.65	248.99	1.78	26.48	34.32	1.34
318.111	Max WS	500-yr	05May2014	1224	55.36	247.65	249.13	1.96	31.35	37.06	1.48
284.899	Max WS	2-yr	05May2014	1224	13.73	247.49	248.35	1.04	13.16	25.67	0.86
284.899	Max WS	5-yr	05May2014	1224	20.97	247.49	248.54	1.16	18.29	29.66	1.05
284.899	Max WS	10-yr	05May2014	1224	27.47	247.49	248.65	1.29	21.82	32.4	1.16
284.899	Max WS	25-yr	05May2014	1224	34.46	247.49	248.76	1.41	25.49	34.9	1.27
284.899	Max WS	50-yr	05May2014	1224	37.91	247.49	248.82	1.44	27.51	36	1.33
284.899	Max WS	100-yr	05May2014	1224	43	247.49	248.89	1.51	30.05	37.34	1.4
284.899	Max WS	500-yr	05May2014	1224	55.23	247.49	249.02	1.68	35.33	40.15	1.53
244.681	Max WS	2-yr	05May2014	1230	13.46	247.05	247.91	1.39	9.71	19.64	0.87
244.681	Max WS	5-yr	05May2014	1224	20.72	247.05	248.1	1.52	13.66	23.7	1.05
244.681	Max WS	10-yr	05May2014	1224	27.23	247.05	248.21	1.65	16.5	26.4	1.16
244.681	Max WS	25-yr	05May2014	1224	34.22	247.05	248.34	1.69	20.2	29.45	1.29
244.681	Max WS	50-yr	05May2014	1224	37.67	247.05	248.4	1.72	21.94	30.8	1.35
244.681	Max WS	100-yr	05May2014	1224	42.75	247.05	248.46	1.81	23.72	32.11	1.41
244.681	Max WS	500-yr	05May2014	1224	54.95	247.05	248.59	1.98	28.26	35.59	1.54
214.499	Max WS	2-yr	05May2014	1230	13.41	246.61	247.86	0.64	21.68	31	1.25
214.499	Max WS	5-yr	05May2014	1224	20.58	246.61	248.04	0.79	27.89	35.41	1.43
214.499	Max WS	10-yr	05May2014	1224	27.09	246.61	248.17	0.91	32.42	38.28	1.56
214.499	Max WS	25-yr	05May2014	1224	34.06	246.61	248.31	0.99	38.11	41.48	1.7
214.499	Max WS	50-yr	05May2014	1224	37.51	246.61	248.37	1.03	40.68	42.89	1.76
214.499	Max WS	100-yr	05May2014	1224	42.62	246.61	248.43	1.11	43.34	44.24	1.82
214.499	Max WS	500-yr	05May2014	1224	54.82	246.61	248.58	1.25	50.06	47.47	1.97
214.498	Max WS	2-yr	05May2014	1230	13.33	246.61	247.31	1.66	8.05	19.07	0.7
214.498	Max WS	5-yr	05May2014	1224	20.27	246.61	247.44	1.9	10.64	21.86	0.83
214.498	Max WS	10-yr	05May2014	1224	26.79	246.61	247.54	2.07	12.93	24.09	0.93
214.498	Max WS	25-yr	05May2014	1224	33.75	246.61	247.63	2.23	15.22	26.12	1.02
214.498	Max WS	50-yr	05May2014	1224	37.16	246.61	247.68	2.28	16.47	27.2	1.07
214.498	Max WS	100-yr	05May2014	1224	42.33	246.61	247.73	2.39	17.93	28.36	1.12
214.498	Max WS	500-yr	05May2014	1224	54.51	246.61	247.85	2.6	21.5	30.88	1.24

River Sta	Profile	Plan	Time at Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
147.881	Max WS	2-yr	05May2014	1230	13.25	245.82	246.6	1.45	9.11	19.86	0.78
147.881	Max WS	5-yr	05May2014	1230	19.72	245.82	246.77	1.54	12.78	23.38	0.95
147.881	Max WS	10-yr	05May2014	1224	26.5	245.82	246.92	1.61	16.46	26.5	1.1
147.881	Max WS	25-yr	05May2014	1224	33.47	245.82	247.05	1.68	20.05	29.3	1.23
147.881	Max WS	50-yr	05May2014	1224	36.85	245.82	247.11	1.71	21.81	30.67	1.29
147.881	Max WS	100-yr	05May2014	1224	41.9	245.82	247.2	1.74	24.73	32.86	1.38
147.881	Max WS	500-yr	05May2014	1224	54.01	245.82	247.41	1.77	32.21	38.33	1.59
79.942	Max WS	2-yr	05May2014	1230	13.09	245.12	246.21	1.11	11.81	18.19	1.09
79.942	Max WS	5-yr	05May2014	1230	19.71	245.12	246.43	1.22	16.13	21.54	1.31
79.942	Max WS	10-yr	05May2014	1224	26.04	245.12	246.61	1.29	20.3	24.18	1.49
79.942	Max WS	25-yr	05May2014	1224	33.04	245.12	246.79	1.35	24.89	26.85	1.67
79.942	Max WS	50-yr	05May2014	1224	36.39	245.12	246.86	1.38	26.94	28.11	1.74
79.942	Max WS	100-yr	05May2014	1224	41.23	245.12	246.98	1.4	30.43	30.52	1.86
79.942	Max WS	500-yr	05May2014	1224	53.06	245.12	247.25	1.44	40.19	46.83	2.13
53.415	Max WS	2-yr	05May2014	1230	13.05	244.76	245.52	2.65	4.92	10.21	0.76
53.415	Max WS	5-yr	05May2014	1230	19.7	244.76	245.66	3.06	6.43	11.4	0.9
53.415	Max WS	10-yr	05May2014	1224	25.91	244.76	245.78	3.29	7.87	12.43	1.02
53.415	Max WS	25-yr	05May2014	1224	32.93	244.76	245.89	3.56	9.26	13.34	1.13
53.415	Max WS	50-yr	05May2014	1224	36.26	244.76	245.93	3.68	9.85	13.71	1.17
53.415	Max WS	100-yr	05May2014	1224	41.07	244.76	245.98	3.89	10.57	14.16	1.22
53.415	Max WS	500-yr	05May2014	1224	52.8	244.76	246.09	4.34	12.18	15.07	1.33
13.63	Max WS	2-yr	05May2014	1230	13	243.93	244.78	2.03	6.4	11.5	0.85
13.63	Max WS	5-yr	05May2014	1230	19.69	243.93	244.96	2.27	8.67	13.09	1.03
13.63	Max WS	10-yr	05May2014	1224	25.79	243.93	245.1	2.43	10.6	14.42	1.17
13.63	Max WS	25-yr	05May2014	1224	32.8	243.93	245.24	2.58	12.85	19.78	1.31
13.63	Max WS	50-yr	05May2014	1224	36.13	243.93	245.3	2.63	14.15	23.26	1.37
13.63	Max WS	100-yr	05May2014	1224	40.91	243.93	245.37	2.72	15.82	26.92	1.44
13.63	Max WS	500-yr	05May2014	1224	52.62	243.93	245.5	2.91	19.97	34.92	1.57

Table 27: Unsteady GLD (Post mining) cross-sectional properties

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	Max WS	2-yr	05May2014	1212	4.28	264.87	265.82	0.69	6.22	10	0.95
2097.011	Max WS	5-yr	05May2014	1212	8.62	264.87	266.16	0.87	9.92	11.84	1.29
2097.011	Max WS	10-yr	05May2014	1212	13.19	264.87	266.42	0.99	13.26	13.62	1.55

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
2097.011	Max WS	25-yr	05May2014	1212	18.63	264.87	266.68	1.09	17.12	15.33	1.81
2097.011	Max WS	50-yr	05May2014	1212	21.54	264.87	266.81	1.13	19.04	16.06	1.94
2097.011	Max WS	100-yr	05May2014	1212	26.63	264.87	267.02	1.18	22.67	19.28	2.15
2097.011	Max WS	500-yr	05May2014	1212	38.64	264.87	267.42	1.24	34.42	38.6	2.55
2052.742	Max WS	2-yr	05May2014	1212	4.23	264.51	265.03	2.05	2.06	6.7	0.52
2052.742	Max WS	5-yr	05May2014	1212	8.54	264.51	265.19	2.6	3.28	7.82	0.68
2052.742	Max WS	10-yr	05May2014	1212	13.09	264.51	265.33	2.99	4.38	8.68	0.82
2052.742	Max WS	25-yr	05May2014	1212	18.51	264.51	265.44	3.43	5.4	9.25	0.93
2052.742	Max WS	50-yr	05May2014	1212	21.41	264.51	265.5	3.59	5.97	9.56	0.99
2052.742	Max WS	100-yr	05May2014	1212	26.43	264.51	265.59	3.87	6.82	10	1.08
2052.742	Max WS	500-yr	05May2014	1212	38.33	264.51	265.73	4.6	8.34	10.74	1.22
2009.086	Max WS	2-yr	05May2014	1212	4.16	263.84	264.31	1.2	3.47	10.81	0.47
2009.086	Max WS	5-yr	05May2014	1212	8.47	263.84	264.5	1.48	5.74	12.79	0.66
2009.086	Max WS	10-yr	05May2014	1212	13.01	263.84	264.67	1.64	7.95	14.43	0.83
2009.086	Max WS	25-yr	05May2014	1212	18.41	263.84	264.83	1.77	10.4	16.02	0.99
2009.086	Max WS	50-yr	05May2014	1212	21.31	263.84	264.89	1.85	11.51	16.67	1.05
2009.086	Max WS	100-yr	05May2014	1212	26.33	263.84	264.99	2	13.15	17.54	1.15
2009.086	Max WS	500-yr	05May2014	1212	38.19	263.84	265.21	2.22	17.28	19.54	1.37
1964.49	Max WS	2-yr	05May2014	1212	4.07	263.35	263.74	1.37	2.97	11.37	0.39
1964.49	Max WS	5-yr	05May2014	1212	8.38	263.35	263.89	1.73	4.84	13.58	0.54
1964.49	Max WS	10-yr	05May2014	1212	12.89	263.35	264.01	1.98	6.5	15.31	0.66
1964.49	Max WS	25-yr	05May2014	1212	18.26	263.35	264.13	2.16	8.43	17.22	0.78
1964.49	Max WS	50-yr	05May2014	1212	21.19	263.35	264.17	2.3	9.23	17.98	0.82
1964.49	Max WS	100-yr	05May2014	1212	26.18	263.35	264.25	2.46	10.62	19.24	0.9
1964.49	Max WS	500-yr	05May2014	1212	37.99	263.35	264.41	2.71	14	21.88	1.06
1925.761	Max WS	2-yr	05May2014	1212	3.98	263.04	263.4	0.87	4.56	19.46	0.36
1925.761	Max WS	5-yr	05May2014	1212	8.24	263.04	263.58	0.95	8.7	26.59	0.54
1925.761	Max WS	10-yr	05May2014	1212	12.71	263.04	263.71	1.05	12.47	32.76	0.67
1925.761	Max WS	25-yr	05May2014	1212	17.99	263.04	263.84	1.12	17.23	38.96	0.8
1925.761	Max WS	50-yr	05May2014	1212	20.89	263.04	263.91	1.15	19.91	41.96	0.87
1925.761	Max WS	100-yr	05May2014	1212	25.87	263.04	264	1.21	23.88	45.48	0.96
1925.761	Max WS	500-yr	05May2014	1212	37.53	263.04	264.18	1.32	33.28	56.64	1.14
1874.546	Max WS	2-yr	05May2014	1218	3.85	262.4	263.01	0.67	5.72	16.04	0.61
1874.546	Max WS	5-yr	05May2014	1212	7.72	262.4	263.18	0.89	8.71	19.86	0.78
1874.546	Max WS	10-yr	05May2014	1212	12.14	262.4	263.29	1.09	11.1	22.26	0.89

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1874.546	Max WS	25-yr	05May2014	1212	17.21	262.4	263.42	1.23	14.05	25.19	1.02
1874.546	Max WS	50-yr	05May2014	1212	20.05	262.4	263.46	1.33	15.18	26.18	1.06
1874.546	Max WS	100-yr	05May2014	1212	24.96	262.4	263.53	1.49	17.03	28.04	1.13
1874.546	Max WS	500-yr	05May2014	1212	36.22	262.4	263.68	1.75	21.6	32.78	1.28
1828.159	Max WS	2-yr	05May2014	1218	3.82	262.13	262.55	1.27	3.02	12.92	0.42
1828.159	Max WS	5-yr	05May2014	1218	7.55	262.13	262.68	1.52	4.98	16.82	0.55
1828.159	Max WS	10-yr	05May2014	1212	11.9	262.13	262.82	1.59	7.48	20.52	0.69
1828.159	Max WS	25-yr	05May2014	1212	16.93	262.13	262.93	1.71	9.89	23.6	0.8
1828.159	Max WS	50-yr	05May2014	1212	19.79	262.13	262.97	1.8	10.99	24.73	0.84
1828.159	Max WS	100-yr	05May2014	1212	24.64	262.13	263.05	1.91	13.01	26.68	0.92
1828.159	Max WS	500-yr	05May2014	1212	35.78	262.13	263.22	2.07	17.82	31.09	1.09
1788.723	Max WS	2-yr	05May2014	1218	3.76	261.54	262.28	0.45	8.42	21.95	0.74
1788.723	Max WS	5-yr	05May2014	1218	7.53	261.54	262.44	0.61	12.36	26.01	0.9
1788.723	Max WS	10-yr	05May2014	1212	11.58	261.54	262.6	0.7	16.78	29.72	1.06
1788.723	Max WS	25-yr	05May2014	1212	16.6	261.54	262.73	0.83	20.66	32.38	1.19
1788.723	Max WS	50-yr	05May2014	1212	19.41	261.54	262.79	0.88	22.83	33.76	1.25
1788.723	Max WS	100-yr	05May2014	1212	24.22	261.54	262.89	0.97	26.4	36	1.35
1788.723	Max WS	500-yr	05May2014	1212	35.23	261.54	263.09	1.11	34.01	39.84	1.55
1742.556	Max WS	2-yr	05May2014	1218	3.64	261.5	262.23	0.43	8.38	19.6	0.73
1742.556	Max WS	5-yr	05May2014	1218	7.49	261.5	262.37	0.66	11.32	22.52	0.87
1742.556	Max WS	10-yr	05May2014	1212	11.13	261.5	262.52	0.74	15.01	25.75	1.02
1742.556	Max WS	25-yr	05May2014	1212	16.19	261.5	262.63	0.91	17.88	27.87	1.13
1742.556	Max WS	50-yr	05May2014	1212	18.88	261.5	262.7	0.97	19.7	29.14	1.2
1742.556	Max WS	100-yr	05May2014	1212	23.65	261.5	262.79	1.08	22.48	30.84	1.29
1742.556	Max WS	500-yr	05May2014	1212	34.53	261.5	262.98	1.26	28.73	34.62	1.48
1695.655	Max WS	2-yr	05May2014	1224	3.6	261.28	261.74	1.38	2.6	9.54	0.46
1695.655	Max WS	5-yr	05May2014	1218	7.44	261.28	261.9	1.68	4.42	11.97	0.62
1695.655	Max WS	10-yr	05May2014	1218	11.51	261.28	262.08	1.72	6.7	14.16	0.8
1695.655	Max WS	25-yr	05May2014	1218	16.11	261.28	262.24	1.77	9.08	16.41	0.96
1695.655	Max WS	50-yr	05May2014	1218	18.6	261.28	262.32	1.77	10.58	18.21	1.04
1695.655	Max WS	100-yr	05May2014	1218	22.9	261.28	262.44	1.81	12.91	21.17	1.16
1695.655	Max WS	500-yr	05May2014	1218	33.09	261.28	262.71	1.84	19.67	30.15	1.43
1651.05	Max WS	2-yr	05May2014	1224	3.58	260.78	261.37	0.64	5.55	14.42	0.59
1651.05	Max WS	5-yr	05May2014	1224	6.9	260.78	261.64	0.71	9.79	17.03	0.86
1651.05	Max WS	10-yr	05May2014	1218	11.36	260.78	261.88	0.81	14.06	19.23	1.1

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1651.05	Max WS	25-yr	05May2014	1218	15.98	260.78	262.09	0.87	18.4	21.15	1.31
1651.05	Max WS	50-yr	05May2014	1218	18.45	260.78	262.19	0.89	20.63	22.03	1.41
1651.05	Max WS	100-yr	05May2014	1218	22.76	260.78	262.35	0.94	24.11	23.36	1.57
1651.05	Max WS	500-yr	05May2014	1218	32.89	260.78	262.65	1.04	31.65	26.17	1.87
1617.21	Max WS	2-yr	05May2014	1230	3.44	260.56	261.31	0.62	5.52	11.77	0.75
1617.21	Max WS	5-yr	05May2014	1224	6.89	260.56	261.58	0.76	9.1	14.23	1.02
1617.21	Max WS	10-yr	05May2014	1218	11.2	260.56	261.81	0.88	12.67	16.39	1.25
1617.21	Max WS	25-yr	05May2014	1218	15.84	260.56	262.03	0.97	16.38	18.25	1.47
1617.21	Max WS	50-yr	05May2014	1218	18.3	260.56	262.13	1	18.32	19.13	1.57
1617.21	Max WS	100-yr	05May2014	1218	22.63	260.56	262.28	1.06	21.3	20.23	1.72
1617.21	Max WS	500-yr	05May2014	1218	32.76	260.56	262.58	1.18	27.69	22.25	2.02
1577.381	Max WS	2-yr	05May2014	1230	3.44	260.48	261.28	0.2	17.08	27.29	0.8
1577.381	Max WS	5-yr	05May2014	1224	6.87	260.48	261.57	0.27	25.18	30.12	1.09
1577.381	Max WS	10-yr	05May2014	1218	10.94	260.48	261.8	0.34	32.59	32.22	1.32
1577.381	Max WS	25-yr	05May2014	1218	15.6	260.48	262.02	0.39	39.95	34.48	1.54
1577.381	Max WS	50-yr	05May2014	1218	18.06	260.48	262.13	0.41	43.66	35.2	1.65
1577.381	Max WS	100-yr	05May2014	1218	22.41	260.48	262.28	0.46	49.35	38.81	1.8
1577.381	Max WS	500-yr	05May2014	1218	32.51	260.48	262.59	0.53	62.91	51.47	2.11
1542.946	Max WS	2-yr	05May2014	1230	3.43	260.49	261.15	1.15	2.98	6.27	0.66
1542.946	Max WS	5-yr	05May2014	1224	6.85	260.49	261.39	1.48	4.61	7.38	0.9
1542.946	Max WS	10-yr	05May2014	1218	10.75	260.49	261.59	1.76	6.11	8.29	1.1
1542.946	Max WS	25-yr	05May2014	1218	15.43	260.49	261.77	2	7.73	9.17	1.28
1542.946	Max WS	50-yr	05May2014	1218	17.9	260.49	261.86	2.1	8.54	9.56	1.37
1542.946	Max WS	100-yr	05May2014	1218	22.25	260.49	261.99	2.25	9.88	10.15	1.5
1542.946	Max WS	500-yr	05May2014	1218	32.33	260.49	262.25	2.56	12.61	11	1.76
1504.079	Max WS	2-yr	05May2014	1230	3.43	260.31	260.89	1.21	2.84	7.85	0.58
1504.079	Max WS	5-yr	05May2014	1224	6.84	260.31	261.12	1.45	4.7	8.87	0.81
1504.079	Max WS	10-yr	05May2014	1218	10.67	260.31	261.3	1.68	6.36	9.68	0.99
1504.079	Max WS	25-yr	05May2014	1218	15.36	260.31	261.46	1.91	8.03	10.44	1.15
1504.079	Max WS	50-yr	05May2014	1218	17.82	260.31	261.54	2	8.9	10.81	1.23
1504.079	Max WS	100-yr	05May2014	1218	22.18	260.31	261.66	2.17	10.21	11.35	1.35
1504.079	Max WS	500-yr	05May2014	1218	32.26	260.31	261.86	2.58	12.52	12.24	1.55
1467.659	Max WS	2-yr	05May2014	1224	3.38	260.12	260.72	0.88	3.82	9.31	0.6
1467.659	Max WS	5-yr	05May2014	1224	6.82	260.12	260.93	1.14	5.99	10.85	0.81
1467.659	Max WS	10-yr	05May2014	1218	10.57	260.12	261.13	1.28	8.23	12.32	1.01

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1467.659	Max WS	25-yr	05May2014	1218	15.26	260.12	261.29	1.47	10.38	13.77	1.17
1467.659	Max WS	50-yr	05May2014	1218	17.72	260.12	261.39	1.51	11.72	14.62	1.27
1467.659	Max WS	100-yr	05May2014	1218	22.1	260.12	261.49	1.66	13.32	15.59	1.37
1467.659	Max WS	500-yr	05May2014	1218	32.19	260.12	261.7	1.93	16.72	17.59	1.58
1425.307	Max WS	2-yr	05May2014	1230	3.43	259.66	260.17	1.62	2.11	6.96	0.51
1425.307	Max WS	5-yr	05May2014	1224	6.79	259.66	260.36	1.91	3.55	8.52	0.7
1425.307	Max WS	10-yr	05May2014	1218	10.47	259.66	260.49	2.18	4.81	9.7	0.83
1425.307	Max WS	25-yr	05May2014	1218	15.14	259.66	260.66	2.32	6.52	11.27	1
1425.307	Max WS	50-yr	05May2014	1218	17.59	259.66	260.73	2.4	7.33	12.03	1.07
1425.307	Max WS	100-yr	05May2014	1218	21.99	259.66	260.83	2.56	8.59	13.11	1.17
1425.307	Max WS	500-yr	05May2014	1218	32.07	259.66	261.05	2.75	11.8	17.28	1.39
1392.843	Max WS	2-yr	05May2014	1230	3.43	259.14	259.68	1.49	2.31	7.4	0.54
1392.843	Max WS	5-yr	05May2014	1224	6.77	259.14	259.87	1.73	3.92	8.98	0.73
1392.843	Max WS	10-yr	05May2014	1224	10.42	259.14	260.03	1.94	5.36	9.83	0.89
1392.843	Max WS	25-yr	05May2014	1218	15.06	259.14	260.18	2.17	6.95	10.69	1.04
1392.843	Max WS	50-yr	05May2014	1218	17.5	259.14	260.27	2.22	7.87	11.15	1.13
1392.843	Max WS	100-yr	05May2014	1218	21.91	259.14	260.38	2.38	9.21	11.88	1.24
1392.843	Max WS	500-yr	05May2014	1218	31.96	259.14	260.64	2.55	12.53	14.35	1.5
1358.799	Max WS	2-yr	05May2014	1230	3.42	258.63	259.14	1.57	2.18	7.28	0.51
1358.799	Max WS	5-yr	05May2014	1224	6.75	258.63	259.3	1.93	3.49	8.43	0.67
1358.799	Max WS	10-yr	05May2014	1224	10.42	258.63	259.45	2.19	4.77	9.29	0.82
1358.799	Max WS	25-yr	05May2014	1218	14.99	258.63	259.59	2.43	6.17	10.16	0.96
1358.799	Max WS	50-yr	05May2014	1218	17.41	258.63	259.66	2.54	6.85	10.56	1.03
1358.799	Max WS	100-yr	05May2014	1218	21.83	258.63	259.77	2.7	8.07	11.25	1.14
1358.799	Max WS	500-yr	05May2014	1218	31.86	258.63	259.98	2.99	10.66	12.59	1.35
1329.439	Max WS	2-yr	05May2014	1224	3.3	258.21	258.73	1.34	2.47	7.69	0.52
1329.439	Max WS	5-yr	05May2014	1224	6.73	258.21	258.95	1.55	4.34	9.22	0.74
1329.439	Max WS	10-yr	05May2014	1224	10.41	258.21	259.1	1.8	5.77	10.11	0.89
1329.439	Max WS	25-yr	05May2014	1218	14.89	258.21	259.29	1.91	7.8	11.26	1.08
1329.439	Max WS	50-yr	05May2014	1218	17.34	258.21	259.37	2	8.67	11.72	1.15
1329.439	Max WS	100-yr	05May2014	1218	21.75	258.21	259.51	2.09	10.38	12.57	1.3
1329.439	Max WS	500-yr	05May2014	1218	31.77	258.21	259.8	2.23	14.29	14.26	1.59
1302.462	Max WS	2-yr	05May2014	1224	3.29	257.76	258.63	0.43	7.67	12.71	0.87
1302.462	Max WS	5-yr	05May2014	1224	6.69	257.76	258.88	0.6	11.1	14.31	1.12
1302.462	Max WS	10-yr	05May2014	1224	10.4	257.76	259.05	0.76	13.63	15.44	1.29

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1302.462	Max WS	25-yr	05May2014	1218	14.75	257.76	259.27	0.86	17.1	16.85	1.51
1302.462	Max WS	50-yr	05May2014	1218	17.22	257.76	259.36	0.93	18.6	17.43	1.6
1302.462	Max WS	100-yr	05May2014	1218	21.61	257.76	259.51	1.01	21.44	18.51	1.75
1302.462	Max WS	500-yr	05May2014	1218	31.64	257.76	259.84	1.14	27.82	20.82	2.08
1264.23	Max WS	2-yr	05May2014	1236	3.38	257.59	258.15	1.35	2.5	7.22	0.56
1264.23	Max WS	5-yr	05May2014	1230	6.53	257.59	258.35	1.59	4.1	8.68	0.76
1264.23	Max WS	10-yr	05May2014	1224	10.36	257.59	258.52	1.83	5.65	9.53	0.93
1264.23	Max WS	25-yr	05May2014	1224	14.59	257.59	258.67	2.04	7.14	10.28	1.08
1264.23	Max WS	50-yr	05May2014	1224	16.82	257.59	258.74	2.14	7.87	10.62	1.15
1264.23	Max WS	100-yr	05May2014	1218	21.26	257.59	258.85	2.35	9.06	11.16	1.26
1264.23	Max WS	500-yr	05May2014	1218	31.29	257.59	259.06	2.72	11.52	12.2	1.47
1230.005	Max WS	2-yr	05May2014	1236	3.38	257.24	258	0.68	4.93	9.66	0.76
1230.005	Max WS	5-yr	05May2014	1230	6.53	257.24	258.19	0.94	6.93	10.89	0.95
1230.005	Max WS	10-yr	05May2014	1224	10.32	257.24	258.39	1.12	9.2	12.13	1.15
1230.005	Max WS	25-yr	05May2014	1224	14.57	257.24	258.54	1.32	11.06	13.07	1.3
1230.005	Max WS	50-yr	05May2014	1224	16.81	257.24	258.61	1.39	12.08	13.54	1.37
1230.005	Max WS	100-yr	05May2014	1224	20.69	257.24	258.73	1.51	13.68	14.16	1.49
1230.005	Max WS	500-yr	05May2014	1218	31.15	257.24	258.94	1.86	16.76	15.27	1.7
1191.977	Max WS	2-yr	05May2014	1236	3.36	256.91	257.93	0.38	8.76	12.8	1.02
1191.977	Max WS	5-yr	05May2014	1230	6.51	256.91	258.09	0.59	10.97	13.87	1.18
1191.977	Max WS	10-yr	05May2014	1224	10.21	256.91	258.27	0.75	13.56	15.03	1.36
1191.977	Max WS	25-yr	05May2014	1224	14.49	256.91	258.39	0.94	15.41	15.86	1.48
1191.977	Max WS	50-yr	05May2014	1224	16.74	256.91	258.46	1.02	16.55	20.32	1.55
1191.977	Max WS	100-yr	05May2014	1224	20.67	256.91	258.56	1.12	19.19	28.79	1.65
1191.977	Max WS	500-yr	05May2014	1224	29.76	256.91	258.77	1.29	26.69	47.93	1.86
1155.309	Max WS	2-yr	05May2014	1236	3.35	257.11	257.87	0.7	4.85	12.19	0.76
1155.309	Max WS	5-yr	05May2014	1230	6.5	257.11	258.01	1.02	7.02	21.97	0.9
1155.309	Max WS	10-yr	05May2014	1224	10.1	257.11	258.18	1.05	11.53	28.46	1.07
1155.309	Max WS	25-yr	05May2014	1224	14.42	257.11	258.31	1.13	15.42	31.97	1.2
1155.309	Max WS	50-yr	05May2014	1224	16.68	257.11	258.39	1.17	18.18	41.21	1.28
1155.309	Max WS	100-yr	05May2014	1224	20.63	257.11	258.5	1.13	23.03	44.1	1.39
1155.309	Max WS	500-yr	05May2014	1224	29.72	257.11	258.73	1.07	33.7	48.19	1.62
1124.025	Max WS	2-yr	05May2014	1236	3.34	255.94	256.41	1.97	1.7	6.59	0.47
1124.025	Max WS	5-yr	05May2014	1230	6.47	255.94	256.55	2.48	2.61	7.33	0.61
1124.025	Max WS	10-yr	05May2014	1224	9.91	255.94	256.68	2.7	3.67	7.92	0.74

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
1124.025	Max WS	25-yr	05May2014	1224	14.29	255.94	256.81	3.05	4.69	8.46	0.87
1124.025	Max WS	50-yr	05May2014	1224	16.57	255.94	256.87	3.18	5.21	8.71	0.93
1124.025	Max WS	100-yr	05May2014	1224	20.54	255.94	256.98	3.33	6.17	9.17	1.04
1124.025	Max WS	500-yr	05May2014	1224	29.68	255.94	257.16	3.75	7.91	9.9	1.22
1083.982	Max WS	2-yr	05May2014	1236	3.33	255	255.8	0.73	4.56	8.36	0.8
1083.982	Max WS	5-yr	05May2014	1230	6.46	255	256.04	0.96	6.7	9.43	1.04
1083.982	Max WS	10-yr	05May2014	1230	9.83	255	256.22	1.16	8.46	10.16	1.22
1083.982	Max WS	25-yr	05May2014	1224	14.24	255	256.43	1.34	10.64	11	1.43
1083.982	Max WS	50-yr	05May2014	1224	16.53	255	256.52	1.42	11.63	11.35	1.52
1083.982	Max WS	100-yr	05May2014	1224	20.5	255	256.67	1.53	13.37	11.98	1.67
1083.982	Max WS	500-yr	05May2014	1224	29.65	255	256.94	1.77	16.78	13.12	1.94
1018.257	Max WS	2-yr	05May2014	1236	3.31	254.8	255.37	1.32	2.51	7.31	0.57
1018.257	Max WS	5-yr	05May2014	1230	6.42	254.8	255.59	1.52	4.22	8.49	0.79
1018.257	Max WS	10-yr	05May2014	1230	9.83	254.8	255.74	1.75	5.6	9.09	0.94
1018.257	Max WS	25-yr	05May2014	1224	14.13	254.8	255.92	1.96	7.2	9.74	1.11
1018.257	Max WS	50-yr	05May2014	1224	16.42	254.8	255.99	2.06	7.96	10.03	1.19
1018.257	Max WS	100-yr	05May2014	1224	20.41	254.8	256.12	2.19	9.3	10.53	1.32
1018.257	Max WS	500-yr	05May2014	1224	29.57	254.8	256.37	2.46	12.06	14.59	1.57
959.582	Max WS	2-yr	05May2014	1236	3.29	254.42	255.02	0.91	3.62	8.99	0.6
959.582	Max WS	5-yr	05May2014	1230	6.37	254.42	255.23	1.13	5.64	10.23	0.81
959.582	Max WS	10-yr	05May2014	1230	9.81	254.42	255.41	1.3	7.55	11.26	0.99
959.582	Max WS	25-yr	05May2014	1224	14.01	254.42	255.59	1.46	9.61	12.02	1.17
959.582	Max WS	50-yr	05May2014	1224	16.3	254.42	255.67	1.52	10.69	12.41	1.25
959.582	Max WS	100-yr	05May2014	1224	20.29	254.42	255.82	1.62	12.52	13.03	1.4
959.582	Max WS	500-yr	05May2014	1224	29.4	254.42	256.1	1.77	17.64	25.67	1.68
917.744	Max WS	2-yr	05May2014	1242	3.29	253.94	254.54	1.23	2.66	7.77	0.6
917.744	Max WS	5-yr	05May2014	1236	6.3	253.94	254.76	1.39	4.55	8.88	0.82
917.744	Max WS	10-yr	05May2014	1230	9.77	253.94	254.97	1.52	6.44	9.88	1.03
917.744	Max WS	25-yr	05May2014	1224	13.83	253.94	255.14	1.69	8.19	10.69	1.2
917.744	Max WS	50-yr	05May2014	1224	16.12	253.94	255.23	1.74	9.25	11.15	1.29
917.744	Max WS	100-yr	05May2014	1224	20.11	253.94	255.37	1.85	10.85	11.78	1.43
917.744	Max WS	500-yr	05May2014	1224	29.15	253.94	255.66	2.02	14.44	13.04	1.72
885.843	Max WS	2-yr	05May2014	1242	3.29	253.61	254.29	1.24	2.65	6.37	0.68
885.843	Max WS	5-yr	05May2014	1236	6.3	253.61	254.48	1.57	4.01	7.5	0.87
885.843	Max WS	10-yr	05May2014	1230	9.76	253.61	254.68	1.72	5.66	8.67	1.07

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
885.843	Max WS	25-yr	05May2014	1224	13.75	253.61	254.86	1.9	7.24	9.64	1.25
885.843	Max WS	50-yr	05May2014	1224	16.05	253.61	254.96	1.95	8.21	10.03	1.35
885.843	Max WS	100-yr	05May2014	1224	20.05	253.61	255.11	2.05	9.77	10.63	1.5
885.843	Max WS	500-yr	05May2014	1224	29.08	253.61	255.41	2.21	13.15	11.65	1.8
831.018	Max WS	2-yr	05May2014	1242	3.28	252.63	253.01	2.13	1.54	5.78	0.38
831.018	Max WS	5-yr	05May2014	1236	6.3	252.63	253.17	2.49	2.53	6.63	0.54
831.018	Max WS	10-yr	05May2014	1230	9.73	252.63	253.31	2.82	3.45	7.31	0.68
831.018	Max WS	25-yr	05May2014	1230	13.75	252.63	253.44	3.08	4.47	8	0.81
831.018	Max WS	50-yr	05May2014	1224	15.95	252.63	253.49	3.25	4.9	8.27	0.86
831.018	Max WS	100-yr	05May2014	1224	19.96	252.63	253.59	3.48	5.74	8.78	0.96
831.018	Max WS	500-yr	05May2014	1224	28.99	252.63	253.78	3.89	7.46	9.72	1.15
794.448	Max WS	2-yr	05May2014	1242	3.28	251.86	252.45	1	3.28	7.79	0.59
794.448	Max WS	5-yr	05May2014	1236	6.29	251.86	252.71	1.15	5.45	9.38	0.85
794.448	Max WS	10-yr	05May2014	1230	9.71	251.86	252.87	1.36	7.12	10.43	1.01
794.448	Max WS	25-yr	05May2014	1230	13.74	251.86	253.07	1.49	9.24	11.63	1.21
794.448	Max WS	50-yr	05May2014	1230	15.82	251.86	253.15	1.55	10.19	12.13	1.29
794.448	Max WS	100-yr	05May2014	1224	19.88	251.86	253.28	1.68	11.82	12.89	1.42
794.448	Max WS	500-yr	05May2014	1224	28.91	251.86	253.55	1.86	15.55	14.25	1.69
753.27	Max WS	2-yr	05May2014	1242	3.27	251.5	252.06	1.45	2.25	6.69	0.56
753.27	Max WS	5-yr	05May2014	1236	6.28	251.5	252.25	1.71	3.67	8.26	0.75
753.27	Max WS	10-yr	05May2014	1230	9.68	251.5	252.39	1.99	4.87	9	0.89
753.27	Max WS	25-yr	05May2014	1230	13.72	251.5	252.52	2.24	6.12	9.66	1.02
753.27	Max WS	50-yr	05May2014	1224	15.76	251.5	252.59	2.31	6.81	9.99	1.09
753.27	Max WS	100-yr	05May2014	1224	19.78	251.5	252.7	2.51	7.87	10.49	1.2
753.27	Max WS	500-yr	05May2014	1224	28.82	251.5	252.91	2.82	10.22	11.44	1.41
720.714	Max WS	2-yr	05May2014	1242	3.27	251.09	251.59	1.51	2.16	7.22	0.5
720.714	Max WS	5-yr	05May2014	1236	6.27	251.09	251.76	1.82	3.45	8.43	0.67
720.714	Max WS	10-yr	05May2014	1230	9.66	251.09	251.9	2.02	4.78	9.39	0.81
720.714	Max WS	25-yr	05May2014	1230	13.71	251.09	252.05	2.2	6.22	10.23	0.96
720.714	Max WS	50-yr	05May2014	1230	15.81	251.09	252.12	2.27	6.95	10.63	1.03
720.714	Max WS	100-yr	05May2014	1230	19.37	251.09	252.22	2.42	8.01	11.19	1.13
720.714	Max WS	500-yr	05May2014	1224	28.75	251.09	252.43	2.75	10.45	12.37	1.34
673.556	Max WS	2-yr	05May2014	1248	3.21	250.52	251.27	0.37	8.63	17.66	0.75
673.556	Max WS	5-yr	05May2014	1236	6.23	250.52	251.47	0.5	12.55	20.84	0.95
673.556	Max WS	10-yr	05May2014	1230	9.56	250.52	251.65	0.58	16.48	23.57	1.13

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
673.556	Max WS	25-yr	05May2014	1230	13.64	250.52	251.84	0.64	21.33	26.68	1.32
673.556	Max WS	50-yr	05May2014	1230	15.75	250.52	251.92	0.67	23.55	28.08	1.4
673.556	Max WS	100-yr	05May2014	1230	19.36	250.52	252.04	0.72	27.01	30.24	1.52
673.556	Max WS	500-yr	05May2014	1224	28.48	250.52	252.28	0.82	34.85	34.42	1.76
625.562	Max WS	2-yr	05May2014	1248	3.21	250.47	251.2	0.62	5.17	11.39	0.73
625.562	Max WS	5-yr	05May2014	1236	6.18	250.47	251.37	0.85	7.26	12.92	0.9
625.562	Max WS	10-yr	05May2014	1230	9.43	250.47	251.52	1.02	9.29	14.4	1.05
625.562	Max WS	25-yr	05May2014	1230	13.56	250.47	251.71	1.1	12.29	16.8	1.24
625.562	Max WS	50-yr	05May2014	1230	15.67	250.47	251.79	1.16	13.54	17.7	1.32
625.562	Max WS	100-yr	05May2014	1230	19.33	250.47	251.9	1.25	15.56	19.24	1.43
625.562	Max WS	500-yr	05May2014	1224	28.12	250.47	252.13	1.41	20.5	23.62	1.66
582.64	Max WS	2-yr	05May2014	1248	3.2	250.01	250.47	1.59	2.02	8.7	0.46
582.64	Max WS	5-yr	05May2014	1236	6.15	250.01	250.57	2.08	2.96	9.86	0.56
582.64	Max WS	10-yr	05May2014	1236	9.42	250.01	250.68	2.25	4.18	11.37	0.67
582.64	Max WS	25-yr	05May2014	1230	13.51	250.01	250.79	2.47	5.47	13.3	0.78
582.64	Max WS	50-yr	05May2014	1230	15.63	250.01	250.82	2.65	5.9	13.89	0.81
582.64	Max WS	100-yr	05May2014	1230	19.31	250.01	250.88	2.89	6.68	14.86	0.87
582.64	Max WS	500-yr	05May2014	1224	27.95	250.01	251	3.26	8.74	18.5	0.99
543.04	Max WS	2-yr	05May2014	1248	3.2	249.4	249.94	0.66	4.82	14.89	0.54
543.04	Max WS	5-yr	05May2014	1236	6.13	249.4	250.06	0.91	6.74	16.86	0.66
543.04	Max WS	10-yr	05May2014	1236	9.41	249.4	250.23	0.98	9.7	19.38	0.83
543.04	Max WS	25-yr	05May2014	1230	13.47	249.4	250.3	1.22	11.15	20.54	0.9
543.04	Max WS	50-yr	05May2014	1230	15.61	249.4	250.33	1.34	11.83	21.02	0.93
543.04	Max WS	100-yr	05May2014	1230	19.31	249.4	250.39	1.52	13.04	21.87	0.99
543.04	Max WS	500-yr	05May2014	1224	27.85	249.4	250.52	1.81	15.99	23.71	1.12
496.118	Max WS	2-yr	05May2014	1248	3.19	249.1	249.89	0.28	11.26	25.97	0.79
496.118	Max WS	5-yr	05May2014	1236	6.09	249.1	249.98	0.44	13.86	28.49	0.88
496.118	Max WS	10-yr	05May2014	1236	9.37	249.1	250.16	0.48	19.49	33.68	1.06
496.118	Max WS	25-yr	05May2014	1230	13.42	249.1	250.22	0.63	21.42	35.29	1.12
496.118	Max WS	50-yr	05May2014	1224	14.58	249.1	250.24	0.66	22.28	35.99	1.14
496.118	Max WS	100-yr	05May2014	1224	18.72	249.1	250.29	0.8	23.89	37.05	1.19
496.118	Max WS	500-yr	05May2014	1224	27.67	249.1	250.41	1	28.56	40.26	1.31
428.594	Max WS	2-yr	05May2014	1248	3.17	248.79	249.04	1.74	1.82	13.45	0.25
428.594	Max WS	5-yr	05May2014	1242	6.09	248.79	249.15	1.67	3.64	19.22	0.36
428.594	Max WS	10-yr	05May2014	1236	9.29	248.79	249.25	1.62	5.81	24.12	0.46

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
428.594	Max WS	25-yr	05May2014	1230	13.31	248.79	249.3	1.93	7.1	26.24	0.51
428.594	Max WS	50-yr	05May2014	1230	15.56	248.79	249.33	2.04	7.94	27.56	0.54
428.594	Max WS	100-yr	05May2014	1230	19.27	248.79	249.38	2.16	9.38	29.46	0.59
428.594	Max WS	500-yr	05May2014	1230	27.9	248.79	249.5	2.29	13.18	34.33	0.71
389.142	Max WS	2-yr	05May2014	1254	3.14	248.21	248.52	0.94	4.11	27.57	0.31
389.142	Max WS	5-yr	05May2014	1242	6.07	248.21	248.67	0.82	8.63	32.61	0.46
389.142	Max WS	10-yr	05May2014	1236	9.23	248.21	248.76	0.9	11.76	35.37	0.55
389.142	Max WS	25-yr	05May2014	1236	13.1	248.21	248.87	0.95	15.87	38.24	0.66
389.142	Max WS	50-yr	05May2014	1230	15.42	248.21	248.93	0.99	17.98	39.53	0.72
389.142	Max WS	100-yr	05May2014	1230	19.17	248.21	249.01	1.03	21.53	41.67	0.8
389.142	Max WS	500-yr	05May2014	1230	27.82	248.21	249.19	1.13	28.94	45.48	0.98
343.978	Max WS	2-yr	05May2014	1254	3.12	247.75	248.19	0.65	4.79	16.04	0.44
343.978	Max WS	5-yr	05May2014	1242	5.99	247.75	248.33	0.84	7.16	19.14	0.58
343.978	Max WS	10-yr	05May2014	1242	9.03	247.75	248.46	0.92	9.88	22.31	0.71
343.978	Max WS	25-yr	05May2014	1236	13.05	247.75	248.58	1.05	12.8	25.35	0.83
343.978	Max WS	50-yr	05May2014	1236	15.06	247.75	248.63	1.11	14.02	26.43	0.88
343.978	Max WS	100-yr	05May2014	1230	18.86	247.75	248.72	1.21	16.42	28.47	0.97
343.978	Max WS	500-yr	05May2014	1230	27.57	247.75	248.89	1.37	21.79	32.62	1.14
318.111	Max WS	2-yr	05May2014	1254	3.11	247.65	248.08	0.78	3.98	14.42	0.43
318.111	Max WS	5-yr	05May2014	1242	5.97	247.65	248.21	0.99	6.03	17.23	0.56
318.111	Max WS	10-yr	05May2014	1242	9.03	247.65	248.34	1.05	8.59	20.48	0.69
318.111	Max WS	25-yr	05May2014	1236	13.03	247.65	248.46	1.19	11.1	23.07	0.81
318.111	Max WS	50-yr	05May2014	1236	15.05	247.65	248.5	1.26	12.16	24.06	0.85
318.111	Max WS	100-yr	05May2014	1230	18.77	247.65	248.59	1.36	14.33	26.01	0.94
318.111	Max WS	500-yr	05May2014	1230	27.5	247.65	248.76	1.54	19.05	29.78	1.11
284.899	Max WS	2-yr	05May2014	1254	3.1	247.49	247.94	0.67	4.6	15.78	0.45
284.899	Max WS	5-yr	05May2014	1242	5.95	247.49	248.07	0.88	6.75	18.86	0.58
284.899	Max WS	10-yr	05May2014	1242	9.02	247.49	248.21	0.92	9.8	22.55	0.72
284.899	Max WS	25-yr	05May2014	1236	13	247.49	248.33	1.03	12.68	25.28	0.84
284.899	Max WS	50-yr	05May2014	1236	15.04	247.49	248.38	1.09	13.85	26.29	0.89
284.899	Max WS	100-yr	05May2014	1230	18.65	247.49	248.47	1.14	16.43	28.28	0.98
284.899	Max WS	500-yr	05May2014	1230	27.41	247.49	248.65	1.29	21.81	32.39	1.16
244.681	Max WS	2-yr	05May2014	1300	3.07	247.05	247.48	1.01	3.06	11.5	0.43
244.681	Max WS	5-yr	05May2014	1248	5.91	247.05	247.64	1.15	5.13	14.22	0.59
244.681	Max WS	10-yr	05May2014	1242	8.99	247.05	247.77	1.26	7.11	16.76	0.72

River Sta	Profile	Plan	Time of Max		Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Max Chl Dpth (m)
244.681	Max WS	25-yr	05May2014	1236	12.91	247.05	247.89	1.39	9.26	19.14	0.84
244.681	Max WS	50-yr	05May2014	1236	14.97	247.05	247.96	1.4	10.71	20.7	0.91
244.681	Max WS	100-yr	05May2014	1236	18.41	247.05	248.06	1.45	12.69	22.73	1.01
244.681	Max WS	500-yr	05May2014	1230	27.17	247.05	248.21	1.65	16.46	26.37	1.16
214.499	Max WS	2-yr	05May2014	1300	3.07	246.61	247.38	0.33	9.32	20.5	0.77
214.499	Max WS	5-yr	05May2014	1248	5.89	246.61	247.57	0.43	13.72	24.79	0.96
214.499	Max WS	10-yr	05May2014	1242	8.96	246.61	247.7	0.53	17.07	27.7	1.09
214.499	Max WS	25-yr	05May2014	1236	12.84	246.61	247.83	0.64	20.83	30.42	1.22
214.499	Max WS	50-yr	05May2014	1236	14.9	246.61	247.91	0.67	23.4	32.19	1.3
214.499	Max WS	100-yr	05May2014	1236	18.38	246.61	248	0.73	26.52	34.44	1.39
214.499	Max WS	500-yr	05May2014	1230	27.03	246.61	248.17	0.91	32.36	38.25	1.56
214.498	Max WS	2-yr	05May2014	1300	3.06	246.61	246.96	1.17	2.61	11.81	0.35
214.498	Max WS	5-yr	05May2014	1248	5.86	246.61	247.1	1.31	4.46	14.5	0.49
214.498	Max WS	10-yr	05May2014	1242	8.9	246.61	247.19	1.53	5.81	16.35	0.58
214.498	Max WS	25-yr	05May2014	1236	12.67	246.61	247.3	1.63	7.77	18.78	0.69
214.498	Max WS	50-yr	05May2014	1236	14.76	246.61	247.35	1.69	8.74	19.85	0.74
214.498	Max WS	100-yr	05May2014	1236	18.33	246.61	247.41	1.83	10.01	21.24	0.8
214.498	Max WS	500-yr	05May2014	1230	26.75	246.61	247.54	2.07	12.92	24.08	0.93
147.881	Max WS	2-yr	05May2014	1300	3.06	245.82	246.17	1.25	2.44	11.51	0.35
147.881	Max WS	5-yr	05May2014	1248	5.83	245.82	246.33	1.3	4.48	14.34	0.51
147.881	Max WS	10-yr	05May2014	1242	8.85	245.82	246.44	1.43	6.18	16.6	0.62
147.881	Max WS	25-yr	05May2014	1242	12.49	245.82	246.58	1.43	8.75	19.46	0.76
147.881	Max WS	50-yr	05May2014	1236	14.65	245.82	246.63	1.5	9.78	20.62	0.81
147.881	Max WS	100-yr	05May2014	1236	18.27	245.82	246.73	1.54	11.83	22.55	0.91
147.881	Max WS	500-yr	05May2014	1236	26.52	245.82	246.92	1.6	16.61	26.61	1.1
79.942	Max WS	2-yr	05May2014	1300	3.04	245.12	245.66	0.8	3.81	11.07	0.54
79.942	Max WS	5-yr	05May2014	1248	5.8	245.12	245.86	0.92	6.28	13.61	0.74
79.942	Max WS	10-yr	05May2014	1242	8.77	245.12	246.01	1.04	8.46	15.59	0.89
79.942	Max WS	25-yr	05May2014	1242	12.47	245.12	246.18	1.1	11.35	17.85	1.06
79.942	Max WS	50-yr	05May2014	1242	14.34	245.12	246.25	1.14	12.61	18.83	1.13
79.942	Max WS	100-yr	05May2014	1236	18.16	245.12	246.38	1.2	15.08	20.76	1.26
79.942	Max WS	500-yr	05May2014	1236	26.47	245.12	246.62	1.29	20.63	24.37	1.5
53.415	Max WS	2-yr	05May2014	1300	3.04	244.76	245.13	1.9	1.6	6.65	0.37
53.415	Max WS	5-yr	05May2014	1248	5.78	244.76	245.27	2.17	2.67	8.05	0.51
53.415	Max WS	10-yr	05May2014	1248	8.74	244.76	245.37	2.46	3.55	8.98	0.61

River Sta	Profile	Plan	Time of Max	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Max Chl Dpth (m)
53.415	Max WS	25-yr	05May2014 1242	12.46	244.76	245.5	2.63	4.74	10.05	0.74
53.415	Max WS	50-yr	05May2014 1236	14.43	244.76	245.55	2.74	5.26	10.48	0.79
53.415	Max WS	100-yr	05May2014 1236	18.12	244.76	245.62	2.99	6.07	11.12	0.87
53.415	Max WS	500-yr	05May2014 1236	26.45	244.76	245.79	3.3	8.02	12.52	1.03
13.63	Max WS	2-yr	05May2014 1300	3.03	243.93	244.35	1.34	2.26	7.82	0.42
13.63	Max WS	5-yr	05May2014 1248	5.77	243.93	244.5	1.62	3.57	9.17	0.57
13.63	Max WS	10-yr	05May2014 1248	8.74	243.93	244.63	1.82	4.8	10.25	0.7
13.63	Max WS	25-yr	05May2014 1242	12.45	243.93	244.76	2.01	6.21	11.36	0.83
13.63	Max WS	50-yr	05May2014 1236	14.37	243.93	244.82	2.08	6.9	11.87	0.89
13.63	Max WS	100-yr	05May2014 1236	18.09	243.93	244.92	2.22	8.15	12.74	0.99
13.63	Max WS	500-yr	05May2014 1236	26.43	243.93	245.12	2.45	10.8	14.55	1.19

Appendix C - Steady Longitudinal Profiles, 2-, 100-, and 500-yr

Figure 52: Steady 2-yr water surface longitudinal profile

Figure 53: Steady 100-yr water surface longitudinal profile

Figure 54: Steady 500-yr water surface longitudinal profile

Unsteady Max WS Longitudinal Profiles, 5-, 10-, and 25-yr

Figure 55: Unsteady 5-yr water surface longitudinal profile

Figure 56: Unsteady 10-yr water surface longitudinal profile

Figure 57: Unsteady 25-yr water surface longitudinal profile