



AYUNTAMIENTO DE ASTORGA



REVISIÓN DEL PLAN GENERAL DE ORDENACIÓN URBANA DE A S T O R G A DOCUMENTO PARA LA APROBACIÓN INICIAL

1. DOCUMENTOS DE INFORMACIÓN, ANÁLISIS Y DIAGNÓSTICO
 - 1.5. INFORME HIDROLÓGICO (IHd)

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EQUIPO
REDACTOR:



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Contenido del documento.

El presente Informe hidrológico forma parte del Documento de Información, Análisis y Diagnóstico (DIAD) de la Revisión del Plan General de Ordenación Urbana (PGOU) del término municipal de Astorga.

El Informe hidrológico está compuesto por un único documento que contiene la Memoria y los Anexos. Está redactado y suscrito por técnico competente, e incluye toda la documentación cuya aportación exige la Confederación Hidrográfica del Duero (CHD) al órgano promotor del planeamiento, para realizar el informe de la revisión del PGOU al que se refieren el art.25.4 del Texto Refundido de la Ley de Aguas, aprobado mediante real decreto legislativo 1/2001, de 20 de julio, y el art.15.3.a TRLS.

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada definitivamente en sesión plenaria del Ayuntamiento de Astorga, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018
EL SECRETARIO GENERAL
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MEMORIA

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Abreviaciones utilizadas en la memoria.

AEMET	Agencia Estatal de Meteorología.
apdo.	Apartado.
art.	Artículo.
av.	Avenida.
c.	Calle.
CHD	Confederación Hidrográfica del Duero.
ctra.	Carretera.
DPH	Dominio público hidráulico.
DIAD	Documentos de información, análisis y diagnóstico.
EDAR	Estación de depuración de aguas residuales.
ETAP	Estación de tratamiento de agua potable.
IGN	Instituto Geográfico Nacional.
IHd	Informe hidrológico.
INE	Instituto Nacional de Estadística.
LUCyL	Ley de urbanismo de Castilla y León (Ley 5/1999, de 8 de abril).
MI	Memoria informativa.
PGOU	Plan General de Ordenación Urbana.
Pk	Punto kilométrico.
RD	Real Decreto.
SIGA	Servicio de Información Geográfica Agrario.
TM	Término municipal.
TRLA	Texto Refundido de la Ley de Aguas (RDL 1/2002, de 20 de julio).
VID	Vía de intenso desagüe.
ZIP	Zona de inundación peligrosa.
ZFP	Zona de flujo preferente.



A) OBJETO Y LOCALIZACIÓN DEL ÁMBITO DE ESTUDIO.

En el presente IHd se aporta la documentación exigida por la CHD para realizar el informe de la revisión del PGOU al que se refiere el art. 25.4 del TRLA, modificado por la Disposición Final Primera de la Ley 11/2005, de 22 de junio, en el que se exige que los actos y planes que las Comunidades Autónomas hayan de aprobar en el ejercicio de sus competencias sobre ordenación del territorio y urbanismo, deben contar con el informe previo preceptivo de las Confederaciones Hidrográficas. Dicho informe debe versar sobre la posible afección de la actuación al dominio público hidráulico o a sus zonas de servidumbre y policía, sobre la incidencia de la actuación en el estado de las masas de agua superficiales o subterráneas que pudieran verse afectadas, sobre la existencia de recursos hídricos suficientes para satisfacer las nuevas demandas planteadas, así como sobre la posible incidencia de la actuación en el régimen de corrientes.

Para dar cumplimiento a las necesidades de información requeridas, el IHd se ha estructurado en los siguientes capítulos:

- 1) Afección al dominio público hidráulico y a las masas de aguas superficiales o subterráneas.
- 2) Recursos hídricos y masas de agua.
- 3) Régimen de corrientes.

Astorga se localiza en la provincia de León, al suroeste de la capital leonesa, siendo capital de la comarca maragata, formada por los municipios de Santa Colomba, Lucillo, Brazuelo, Santiagomillas, Val de San Lorenzo, Luyego y la propia Astorga. En el ámbito del término municipal existen tres entidades locales menores: Valdeviejas, Santa Catalina de Somoza, Castrillo de Polvazares y Murias de Rechivaldo. El término municipal total abarca una superficie de 46.800 ha, limitando al norte con Brazuelo y Villaobispo; al este con San Justo de la Vega y al sur con Santiago Millas, Val de San Lorenzo y Santa Colomba.

Tras consulta realizada a la CHD en marzo de 2012 por parte de los técnicos competentes en materia hidráulica del equipo redactor, se determinó que el único cauce que podría verse "afectado" por los posibles desarrollos urbanos que la revisión del PGOU contemplara era el cauce del río Jerga, tanto en el entorno de Murias de Rechivaldo (al norte del núcleo), como en el entorno del Astorga (al sur del núcleo, en la zona del parque de La Eragudina y el barrio de Santa Clara). El resto de cauces que atraviesan el término municipal de Astorga no se ven afectados por ningún posible desarrollo urbano, y en el caso del cercano río Tuerto, existen estudios de inundabilidad indicativos de su no afección al término municipal de Astorga. Dichos estudios se pueden consultar en el visor cartográfico de zonas inundables del Sistema Nacional de Cartografía de Zonas Inundables (SNCZI), elaborado por el Ministerio de Agricultura, Alimentación y Medio Ambiente (MAGRAMA); el estudio de los periodos de retorno (T-10, T-50 y T-500) correspondientes al cauce del río Tuerto no afectan al término municipal de Astorga, ni siquiera en el supuesto de peligrosidad más intensa (T-500).

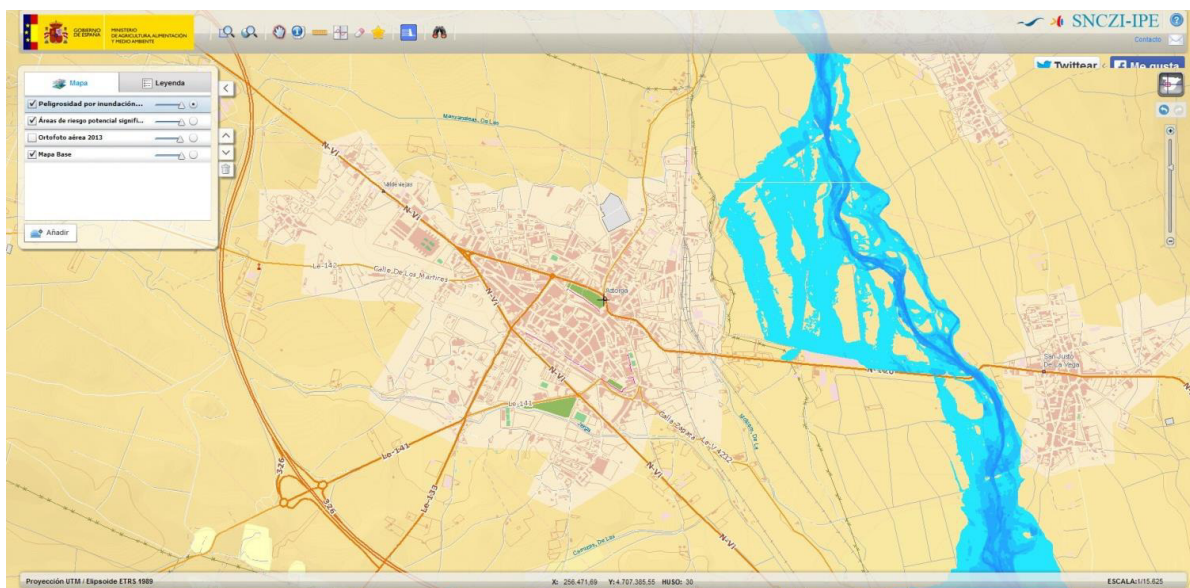


Ilustración 1. Simulación hidráulica de la avenida T500 del río Tuerto, a una escala aproximada de 1/15.000. Fuente: Visor del SNCZI 2013 del MAGRAMA.



B) MEMORIA.

1. AFECCIÓN AL DOMINIO PÚBLICO HIDRÁULICO O A SUS ZONAS DE SERVIDUMBRE Y POLICÍA, Y A LAS MASAS DE AGUA SUPERFICIALES O SUBTERRÁNEAS.

1.1 DOMINIO PÚBLICO HIDRÁULICO.

La protección del dominio público hidráulico tiene como objetivos fundamentales los enumerados en el art. 92 del TRLA. Sin perjuicio de las técnicas específicas dedicadas al cumplimiento de dichos objetivos, las márgenes de los terrenos que lindan con dichos cauces están sujetas en toda su extensión longitudinal:

- 1) A una zona de servidumbre de cinco metros de anchura para uso público.
- 2) A una zona de policía de cien metros de anchura, en la que se condicionará el uso del suelo y las actividades que en él se desarrollen.

Esta zona de policía se podrá ampliar para incluir la zona donde se concentra preferentemente el flujo, donde sólo podrán ser autorizadas actividades no vulnerables frente a avenidas y que no supongan una disminución significativa de la capacidad de desagüe.

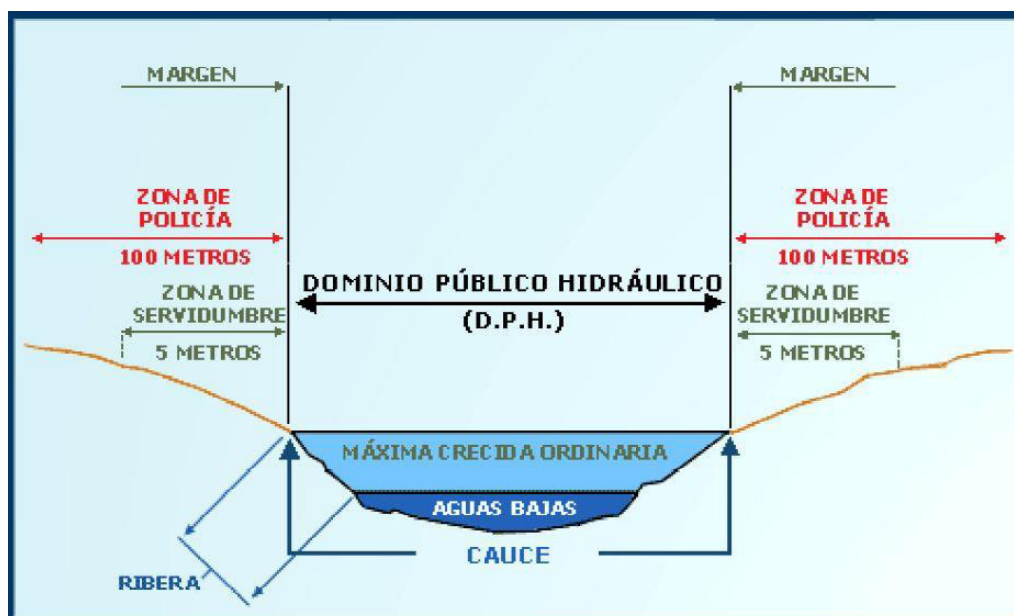


Ilustración 2. Esquema gráfico explicativo de los conceptos legales de DPH, zona de servidumbre y zona de policía. (Fuente: Oficina técnica municipal).

1.2 RED HIDROGRÁFICA.

La documentación requerida por la CHD hace referencia a que se atienda a todas las actuaciones previstas que pudieran tener afección sobre el dominio público hidráulico o sus zonas de protección.

El término municipal de Astorga se ubica dentro de la subcuenca del río Órbigo que a su vez pertenece a la cuenca del río Duero. Los Montes de León hacen de divisoria entre el límite noroeste de la cuenca del Duero en la provincia de León y el límite sureste de la cuenca Miño-Sil dentro de la propia provincia.

Acercándonos al ámbito de estudio, el río Tuerto hace la función de río focalizador donde desembocan los demás ríos menores como son el río Turienzo por el extremo sur, fuera del municipio de Astorga, y el río Jerga como el principal cauce del municipio. El río Tuerto discurre cerca del extremo este del término municipal de Astorga (a 1 km aproximadamente en el punto más cercano) pero sin penetrar en él. Su longitud, entre la presa de Villameca y su desembocadura en el río Órbigo, es de 52 km. La red hidrográfica del municipio de Astorga está formada por un río principal (río Jerga, afluente del río Tuerto) y otros arroyos secundarios y tributarios del Jerga. Por



tanto, la estructura de la red de arroyos del término municipal de Astorga se encuadra entorno al río Jerga, el cual atraviesa el término de este a oeste y al que desembocan una red de arroyos, principalmente por la margen izquierda que recogen la escorrentía de parte de los Montes de León.

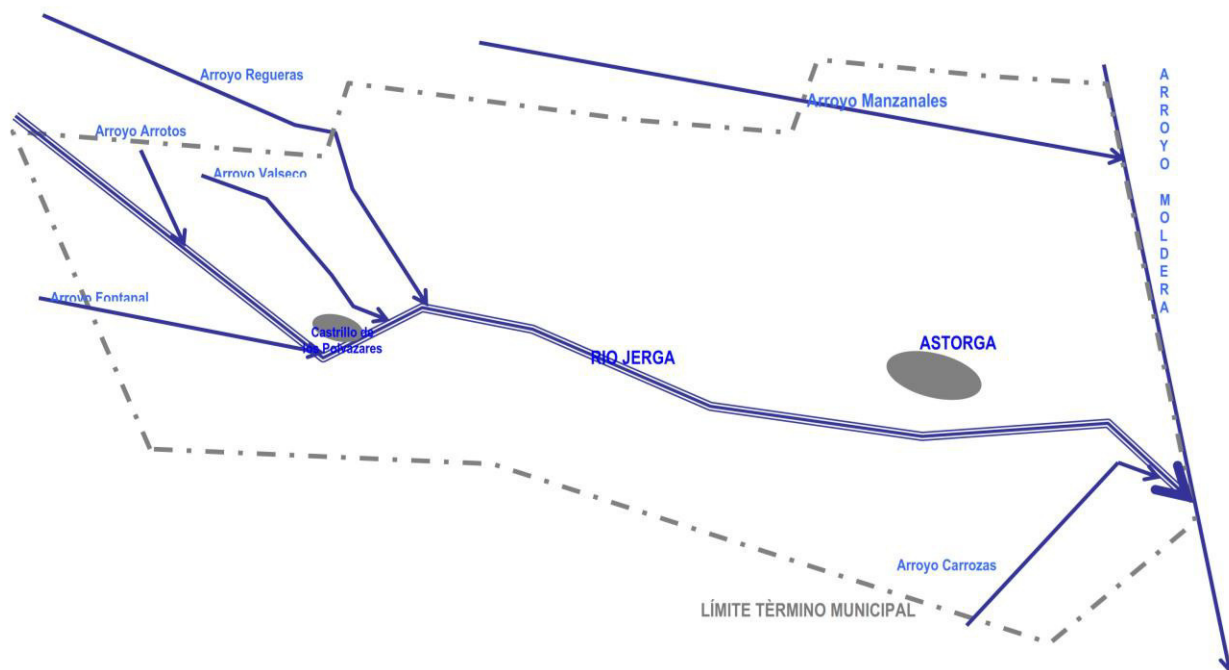


Ilustración 3. Hidrograma de los ríos y arroyos del término municipal de Astorga. (Fuente: elaboración propia).

Los arroyos tributarios del río Jerga son los siguientes:

- 1) El arroyo de las Regueras: nace en las inmediaciones de la ermita de San Esteban, en el municipio vecino de Brazuelo, y desemboca en el río Jerga por el norte, cerca del núcleo urbano de Castrillo de los Polvazares.
- 2) El arroyo de Valseco: nace dentro del término municipal de Astorga en el paraje conocido como Pico del Cuerno a una altura aproximada de 1.000 m, y desemboca en el arroyo de las Regueras, al norte del núcleo de Castrillo de los Polvazares, a unos 850m aguas arriba de la desembocadura de éste sobre el Jerga.
- 3) Arroyo de los Arrotos: del mismo modo que el arroyo de Valseco, el arroyo de los Arrotos nace dentro del municipio de Astorga en las inmediaciones del paraje del Pico del Cuerno y desemboca sobre el Jerga en el paraje conocido como El Tomillar, al noroeste del núcleo de Santa Catalina de Somoza.
- 4) Arroyo del Fontanal: nace en el paraje que le da nombre al arroyo en las cercanías del núcleo urbano de El Ganso, del vecino municipio de Brazuelo, fruto de la confluencia de los arroyos de la Veiga y de Valdeabrigo, y desemboca en el río Jerga, ya dentro del municipio de Astorga, en el paraje de Cuquillera.
- 5) Arroyo de las Carrozas.

Todos estos cursos fluviales están muy condicionados por las labores agrícolas que han ido reduciendo su capacidad de albergar vegetación de ribera de interés. En la época estival reducen considerablemente su lámina de agua llegando a desaparecer en algunos casos y convirtiéndose en cursos de agua de carácter estacional.

Además del río Jerga, dentro del término municipal de Astorga discurren otros dos arroyos que no son tributarios del mismo:

- 1) Arroyo de la Moldera o Moldera Real: nace a raíz de una presa o azud sobre el río Tuelto que se localiza en el vecino núcleo de Sopena de Carneros y que, aguas abajo, en el extremo sureste, vuelve a desembocar sobre el mismo río. En su recorrido hacia el Tuelto por el municipio de Astorga, el arroyo Moldera recibe parte de las aguas del río Argañoso en el municipio de Villaobispo, y del río Jerga en el extremo sureste del municipio de Astorga. El arroyo Moldera funciona a modo de acequia, abasteciendo mediante arquetas a multitud de campos de cultivo a su paso por Astorga, e incluso en otros tiempos se utilizaban sus aguas para mover molinos de los que hoy queda una variada arquitectura vinculada a este arroyo.
- 2) Arroyo de Manzanales: este arroyo, tributario a su vez del Moldera, nace en el paraje conocido como La Chana en el municipio de Brazuelo, y desemboca sobre el Moldera a la altura de la carretera que discurre de Astorga a San Román de la Vega.



Es importante destacar, a los efectos de la red hidrográfica, que el RD 478/2013, de 21 de junio, por el que se aprueba el Plan Hidrológico de la parte española de la Demarcación Hidrográfica del Duero, asigna tanto al río Jerga como a los restantes cauces del término municipal, la clase 3, lo que implica que la banda de protección asignada a los mismos es de 5 m en cada margen, coincidente por tanto con la zona de servidumbre. Y también que en el término municipal de Astorga tienen la categoría de "río natural" el río Jerga (código DU-103) y el arroyo de la Moldera, desde la confluencia con el río Tuerto (código DU-103). El tramo de la Moldera comprendido entre el azud de Sopena y la confluencia con el río Jerga (situada justo en el límite del término municipal de Astorga), no tienen la consideración de masa de agua superficial a los efectos del Plan Hidrológico.

Según las propuestas del PGOU y tras la reunión mantenida con la CDH, los únicos cauces que se podrían ver "afectados" y que, por lo tanto, es necesario evaluar y asegurar el Dominio Público Hidráulico, son el cauce del río Jerga en el entorno de Murias de Rechivaldo y de Astorga. Tampoco las masas de agua, descritas en el apdo. 2.2, se verían afectadas por las propuestas del PGOU.

1.3 RÍO JERGA.

A escala municipal, el cauce de mayor influencia es el río Jerga que enmarca el crecimiento por el sur del casco urbano en el núcleo de Astorga así como en la zona norte del núcleo de Murias de Rechivaldo.

El río Jerga es un cauce leonés, y en particular maragato. Nace en los Montes de León, en concreto en la Peña del Gato a 1.399 m de altitud. Comienza su recorrido con la denominación arroyo de la Reguera, recogiendo pequeños regatos de las laderas de los Montes de la Marquesa, para denominarse posteriormente arroyo Jerga a su paso por el término municipal de Brazuelo y, río Jerga una vez entra en el término municipal de Astorga. Dentro del municipio de Astorga cursa sus aguas por los núcleos urbanos de Castrillo de los Polvazares, Murias de Rechivaldo, y Astorga, desembocando actualmente en el arroyo Moldera (a raíz de la construcción de la variante de la ctra. N-120 primero y de la autopista AP-71 después, es el río Jerga el que desemboca actualmente en el arroyo Moldera; anteriormente lo hacía directamente en el río Tuerto, fuera del TM de Astorga).

Aguas arriba de Santa Catalina de Somoza recoge las aguas del arroyo del Fontanal y aguas abajo de Castrillo de Polvazares, del arroyo de Valseco. Cruza la autovía A-6 y pasa por el sur del casco urbano de Astorga, atravesando la N-VI, donde aguas abajo recoge el cauce Vertiente de las Carrozas, para conectarse con el arroyo de la Moldera y atravesar ambos la ctra. N-120 entorno al pk. 348+400 y desembocar aguas abajo en el río Tuerto, en las inmediaciones del núcleo de Nistal.

Tras analizar la posible afección de la clasificación propuesta en el Dominio Público Hidráulico del río Jerga en los puntos citados (zona sur del núcleo de Astorga y zona norte del núcleo de Murias de Rechivaldo) de acuerdo con los resultados del estudio hidráulico realizado y recogido en el capítulo 3.5 del presente documento, se puede asegurar la nula afección sobre el Dominio Público Hidráulico del río Jerga en el entorno estudiado, y por lo tanto, en el término municipal de Astorga.

ILUSTRACIÓN para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada definitivamente en sesión plenaria del Ayuntamiento de Astorga, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018

EL SECRETARIO GENERAL

FELIX ALFONSO RAMÍREZ



2. RECURSOS HÍDRICOS Y MASAS DE AGUA.

2.1 SISTEMA HÍDRICO.

El término municipal de Astorga se localiza dentro de la Confederación Hidrográfica del Duero, que actuará como Organismo de Cuenca, y pertenece al sistema de explotación Órbigo. Este sistema está incluido en la Zona A de la parte española de la Cuenca del Duero, cubriendo el sector noroccidental de la Cuenca. Comprende las cuencas de los ríos Tera, Órbigo, Esla y Valderaduey, en las provincias de León y Zamora.

Los principales cauces presentes en el sistema de explotación son los ríos Luna (denominado también Órbigo) y sus afluentes, Rodil por la margen derecha y Omañas, Tuerto, Jamuz y Eria por la derecha, y el río Esla, cuyo afluente principal por la derecha es el propio río Luna.

También comprende las masas de agua subterránea de La Pola de Gordón (400002), La Maragatería (400012), las Rañas de la Bañeza (400019) y del Órbigo (400015), así como parte de la masa denominada Terciario y Cuaternario del Tuerto-Esla (400005).

La aportación media actual, según la Propuesta del Plan Hidrológico de la Cuenca del Duero es de 1.436 hm³ y para su regulación cuenta con los embalses de Barrios de Luna (308hm³), Villameca (20 hm³), Valtabuyo (3,3 hm³), Selga de Ordás (2,4 hm³), Valdesamario (0,2 hm³) y Antoñán del Valle (0,8 hm³), que recientemente se han visto acompañados de Villagatón (4 hm³). En el horizonte 2021 entrarán en servicio los nuevos embalses de los Morales (11,3 hm³) y de la Rial (23 hm³).

El Sistema Órbigo es un sistema aislado, por lo que no se incluyen aportaciones desde otros sistemas, y únicamente el balance hídrico se ciñe a los recursos generados en las subcuencas pertenecientes al mismo sistema.

El sistema cuenta con una compleja red de canales vertebrada a partir de grandes ejes, como el Canal General del Páramo, el de Villilla y el Principal del Órbigo. Otro elemento de transporte relevante, por el papel que desempeña en el esquema de regulación, es el Canal Valdesamario-Villameca. Actualmente este sistema atiende el abastecimiento de unas 147.000 personas y el regadío de 70.000ha.

2.2 HIDROLOGÍA SUBTERRÁNEA.

2.2.1 La Maragatería.

Parte de la comarca de Astorga se enmarca dentro de la Masa de agua subterránea 400012 La Maragatería, que ocupa la zona centro-occidental de la provincia de León adentrándose en parte en la de Zamora. El límite oeste y noroeste es el propio de la cuenca hidrográfica del Duero, el norte lo define el río Omañas y el este el Terciario de la cuenca del Duero; al sur limita con los gneises de la Formación "Ollo de Sapo" para continuar por el arroyo de La Almucera.

Está formada principalmente por rocas paleozoicas: cuarcitas, areniscas y pizarras y conglomerados del Cámbrico, "cuarcita armoricana", pizarras y areniscas del Ordovícico y Silúrico. En la parte sur de la masa aparece una importante estructura, el Sinclinal de Truchas. También incluye afloramientos de escasa extensión de abanicos aluviales del Mioceno y depósitos cuaternarios constituidos por glaciares y coluviones, y algún aluvial.

Según los registros inscritos el índice de explotación es de 0,021 siendo los aprovechamientos y sus volúmenes los recogidos en la siguiente tabla:



Tipos	nº Puntos extracción	Volumen anual autorizado (hm3)
Abast. Población	66	0.53
Agricultura y Ganadería	325	2.17
Recreativos	0	0
Otros	109	0.02
Industria	9	0.12
TOTAL	509	2.84

Tabla 1. Aprovechamientos y volúmenes de la Masa 400012 La Maragatería. (Fuente: Registros inscritos en el índice de explotación).

2.2.2 Terciario y Cuaternario del Tuerto-Esla.

Ocupa el sector centro-oriental de la provincia de León, y su parte sur penetra en la provincia de Zamora, entre la confluencia de los aluviales del Órbigo y el Esla. El límite norte lo forman las sierras de la Cordillera Cantábrica hasta el curso del río Esla y la zona occidental limita con los materiales paleozoicos de La Maragatería y aluviales de los ríos Tuerto y el Órbigo.

Se trata de una acumulación de materiales terciarios cabalgados por materiales mesozoicos en el borde norte, dando lugar a facies proximales de abanicos aluviales (conglomeráticas), que se hacen más finas (arenas y lutitas) hacia el sur. El Mioceno cubre casi totalmente el complejo del Paleógeno y concluye con unos depósitos tipo raña pliocuaternarios. El Cuaternario se encuentra formando terrazas y depósitos aluviales de fondos de valle.

Los límites de esta masas se caracterizan por tener un contacto mecánico al norte con las masas de Guardo y Pola de Gordón. En la zona este y sur se encuentra el límite con los materiales semipermeables del Aluvial del Esla y en el oeste existe un contacto con los materiales paleozoicos de La Maragatería. En la zona oeste encontramos una conexión con los materiales de la Raña del Órbigo de tipo convencional.

2.3 DESCRIPCIÓN DE LAS INFRAESTRUCTURAS DE ABASTECIMIENTO EXISTENTES.

En la actualidad el municipio de Astorga capta el agua de abastecimiento del cauce del río Tuerto dentro del término municipal de Villaobispo de Otero, cauce embalsado mediante el embalse de Villameca. Desde la captación el agua discurre por gravedad hasta la estación elevadora en Villaseca, punto donde se impulsa hasta la ETAP de "El Sierro".

Respecto a los restantes núcleos, Valdeviejas conecta con la red de Astorga y, por lo tanto se abastece desde la ETAP del Sierro, mientras que Castrillo de Polvazares, Murias de Rechivaldo y Santa Catalina de Somoza tienen captaciones y redes autónomas.

2.3.1 Abastecimiento del agua en alta.

1) Astorga-Valdeviejas.

La gestión y explotación de la red de abastecimiento del municipio de Astorga la lleva a cabo la empresa concesionaria AQUONA (antigua AQUAGEST). La captación de abastecimiento de Astorga se localiza en el término municipal de Villaobispo de Otero sobre el río Tuerto. En éste se localiza un azud de 20 m de longitud y 1,20 m de alto que garantiza la cota necesaria en la toma incluso en época de estiaje. Desde este punto parte una tubería de fibrocemento de 400 mm de diámetro en gravedad, de 4,5 km de longitud, hasta la estación de bombeo, localizada en las instalaciones de la antigua ETAP de Villaseca, donde las aguas se impulsan hasta la ETAP del Sierro a través de una tubería de impulsión de 2,1 km de fibrocemento de 250 mm de diámetro.

2.3.2 Potabilización del agua.

1) Astorga-Valdeviejas.

La actual ETAP se localiza en la zona denominada Alto de El Sierro, al norte del núcleo urbano de Astorga. Posee una capacidad de tratamiento de 225m³/h al día. El agua que llega desde el depósito de regulación a la ETAP es sometida primeramente a un proceso de



preoxidación para pasar posteriormente a unos filtros Culligan, que recientemente han sido rellenados con carbón activo. Tras pasar por los filtros, el agua es vuelta a tratar con hipoclorito sódico para asegurar una correcta desinfección.

2.3.3 Depósitos de almacenamiento.

1) Astorga-Valdeviejas.

La ETAP de Astorga cuenta con dos depósitos de almacenamiento de agua tratada gestionados desde una única cámara de llaves, que garantizan una autonomía de suministro en caso de avería o parada de la planta:

- Depósito de 2.160 m³.
- Depósito de 5.000 m³ en dos cuencos independientes de 2500 m³ cada uno.

2) Santa Catalina de Somoza.

El núcleo de Santa Catalina de Somoza cuenta con un depósito de volumen 50 m³.

3) Castrillo de los Polvazares.

El núcleo de Santa Catalina de Somoza cuenta con un depósito de volumen 50 m³.

4) Murias de Rechivaldo.

El núcleo de Santa Catalina de Somoza cuenta con un depósito de volumen 50 m³.

2.3.4 Redes de distribución.

1) Astorga-Valdeviejas.

En Astorga la red actual parte de la ETAP situada en el Alto del Sierro con una conducción principal de fibrocemento de 300 mm de diámetro de una longitud total de aproximadamente 2 km, que llega al casco urbano por la calle del Mayuelo. Antes de llegar al casco urbano, a 850 m de la ETAP, se localiza la tubería de abastecimiento hacia el polígono industrial, una tubería de PVC de 250 mm de diámetro y 1,5 km de longitud.

En la década de 1990 se redactó un proyecto general de abastecimiento para el núcleo de Astorga introduciéndose la utilización de tubería de polietileno. En la red de distribución se diferencia claramente la red de transporte, en la que se utiliza tubería PE de 200 mm de diámetro, y la red de distribución, en la que se utiliza tubería de PE de 90 mm de diámetro. A medida que progresa la ciudad, la renovación se va ajustando a este criterio quedando cada vez menos tramos no jerarquizados.

El núcleo de Valdeviejas se abastece en conjunto con el núcleo de Astorga desde la ETAP del Sierro.

2.4 DIAGNÓSTICO DE LAS INFRAESTRUCTURAS DE ABASTECIMIENTO.

Según los datos del Instituto Nacional de Estadística, la población de Astorga y pedanías en los últimos años es la siguiente:

Núcleo	2000	2005	2009	2011
Astorga	11.978	11.876	11.672	11.503
Valdeviejas	167	171	167	156
Murias de Rechivaldo	108	110	109	108
Castrillo de Polvazares	76	71	70	73
Santa Catalina de Somoza	48	47	60	57
Total	12.350	12.275	12.078	11.897

Tabla 2. Población de los núcleos urbanos del término municipal de Astorga. (Fuente: INE).

2.4.1 Captación y demanda.

1) Astorga-Valdeviejas.

En el Plan Hidrológico de la Confederación Hidrográfica del Duero se recoge la demanda de agua de Astorga en el año 2009 con un total de 2,03 hm³. Considerando que el polígono industrial se abastece con la red de abastecimiento de Astorga, con unas dotaciones



de agua para este tipo de instalaciones de $50\text{m}^3/\text{ha}/\text{día}$ y una superficie de polígono de 59,55 ha, se obtiene una demanda del polígono industrial de $1,09\text{ hm}^3/\text{año}$. La revisión del PGOU clasifica como SUC-industrial 33,58 ha (17,69 ha procedentes del antiguo sector I1 y 15,89 ha del antiguo sector I2), además de prever dos sectores de SUR-industrial, uno de 20,26 ha y otro de 5,71 ha.

Evaluando las instalaciones de Astorga para una población de 12.000 habitantes y considerando una dotación unitaria máxima bruta de agua para abastecimiento de $250\text{l}/\text{hab}/\text{día}$ ($0,25\text{ m}^3/\text{hab}/\text{día} = 91,25\text{ m}^3/\text{año}$) (esta dotación incluye a los servicios prestados de ganadería e industria por la red municipal) para poblaciones entre 10.000 y 20.000 habitantes, tal y como recoge el art. 49 del Real Decreto 478/2013, de 21 de junio, por el que se aprueba el Plan Hidrológico de la parte española de la Demarcación Hidrográfica del Duero, y una dotación unitaria máxima bruta de $4.000\text{m}^3/\text{ha}$ para atender los polígonos industriales, según el art. 50 del citado Real Decreto, se tiene la siguiente demanda poblacional:

- a) Demanda anual: $12.000 \times 91,25\text{ m}^3/\text{año} = 1,095\text{ hm}^3/\text{año}$.
- b) Demanda industrial: $59,55\text{ Ha} \times 4.000\text{m}^3/\text{Ha}/\text{año} = 0,23\text{ hm}^3/\text{año}$.

Según la clasificación del PGOU vigente, el suelo Astorga tiene una capacidad de suelo para albergar entre 7.593 y 7.956 viviendas (302,32 ha residencial y 79 ha industrial), lo que reflejan una población entre 17.608 y 18.515 habitantes (frente a la población actual de 12.000).

La revisión del PGOU plantea, aproximadamente, una reclasificación de 20,18 ha, pasando de 302,32 ha de suelo residencial a 322,96 ha, y reduciendo la superficie industrial en 59,55 ha, lo que implica una horquilla a ampliar de viviendas entre 7.998 y 8.985 y, por lo tanto una población total estimada máxima de entre 18.847 y 21.086 habitantes.

Teniendo en cuenta el trabajo y concienciación de la población en los temas de ahorro en consumo de agua potable, es de esperar que las demandas unitarias de agua potable no crezcan sino disminuyan con el tiempo; por ello y considerando la dotación de $250\text{l}/\text{hab}/\text{día}$, los máximos habitantes a los que se podría servir con la demanda suministrada en el 2009 ascienden a 22.246 habitantes, cifra suficientemente alta como para que no sea necesario tener en cuenta mejoras. Lo que indica que, a priori, los derechos de agua que posee el Ayuntamiento de Astorga en concesión son más que suficiente para el desarrollo urbano previsto en la revisión del PGOU.

2.4.2 Sistemas de tratamiento.

1) Astorga-Valdeviejas.

Los depósitos deben tener una capacidad (de regulación y almacenaje) que garanticen al menos el consumo máximo diario, siendo en el caso calculado de $7.875\text{m}^3/\text{día}$. Con los datos de consumos obtenidos anteriormente podemos afirmar que la capacidad de almacenamiento de agua tratada de Astorga (7.160m^3) no garantizaría el consumo máximo diario en situación de población máxima prevista.

Población máxima considerada = 21.000 habitantes.
Consumo medio diario: $21.000 \times 0,25 = 5.250\text{ m}^3/\text{día}$.
Consumo máximo diario ($C_p = 1,5$) = $7.875\text{ m}^3/\text{día}$.
Caudal medio: $60,76\text{ l/s}$.
Caudal punta ($C_p = 2,4$): $145,83\text{ l/s}$.

Hay que hacer constar que la población considerada resulta del lado de la seguridad; evaluando la población actual (12.000 habitantes), el crecimiento de población máximo con la nueva clasificación (2.571 habitantes) y la demanda del polígono industrial (considerando una dotación de $50\text{m}^3/\text{ha}$, que es muy superior a la dotación del Plan Hidrológico), los depósitos tienen capacidad suficiente:

Población = $12.000 + 2.571 = 14.571$ habitantes.
Demanda población = $14.571 \times 0,25 = 3.642,75\text{m}^3/\text{día}$.
Demanda industrial = $0,42\text{ hm}^3/\text{año} = 1.150\text{m}^3/\text{día}$.
Consumo medio diario = $4.792,75\text{m}^3/\text{día}$.
Consumo máximo diario = $7.174\text{ m}^3/\text{día}$.



2.4.3 Redes de distribución.

1) Astorga-Valdeviejas.

Respecto a las redes de abastecimiento cabe decir los problemas que se plantean en las conducciones más antiguas, lo cual hace necesario intervenciones periódicas para garantizar el funcionamiento adecuado. Hay que hacer constar la existencia de tuberías obsoletas de fibrocemento, representando un 35% de la red de abastecimiento, así como de diámetros muy bajos, Ø50mm, siendo no obstante la mayor parte de la red de polietileno, lo que indica la reciente construcción.

2.4.4 Conclusión.

1) Astorga-Valdeviejas.

En resumen, cabe apuntar que para lo que comúnmente se denomina abastecimiento en alta, Astorga está particularmente bien dotada, pudiendo considerarse que sus límites de crecimiento no representan problemas en el sistema hidráulico. Por el contrario, el estado de las infraestructuras de abastecimiento en baja es en parte deficitario, en particular en lo que se refiere a materiales y diámetros, debiendo considerarse la renovación de las zonas de red de abastecimiento más antiguas según vayan cumpliendo su vida útil, además de, en las posibles zonas a desarrollar, analizarse los puntos de conexión en relación con el abastecimiento actual.

2.5 DESCRIPCIÓN DE LAS INSTALACIONES DE SANEAMIENTO.

La red de saneamiento de Astorga conduce las aguas hasta la estación de depuración de aguas residuales cuyo vertido, una vez pasado el tratamiento de depuración, se hace al cauce del río Tuerto. La red de saneamiento del núcleo de Valdeviejas se conecta con la red de Astorga y se conducen en conjunto hasta la EDAR de Astorga.

En el caso de los núcleos rurales, vierten sus aguas residuales al río Jerga previo paso por las instalaciones de depuración de cada localidad.

Tanto Astorga como los núcleos rurales cuentan con las pertinentes autorizaciones de vertido de la CHD.

2.5.1 Estación de Depuración de Aguas Residuales (EDAR).

1) Astorga-Valdeviejas.

La actual EDAR de Astorga se localiza en la margen derecha del río Tuerto, en la ctra. LE-CV-193-26, en el límite con el término municipal de San Justo de la Vega. Su capacidad de tratamiento es de 4.200 m³/día (385 m³/h) para una población equivalente de 20.000 hab-eq.

El proceso de depuración es el siguiente:

- Tanque de llegada de 900 m³.
- Desbaste de gruesos.
- Tamizado.
- Desarenador-desengrasador.
- Tratamiento biológico.
- Decantación secundaria.
- Tratamiento de fangos.

2) Santa Catalina de Somoza.

Cuenta con una instalación de depuración consistente en una fosa séptica. Según el informe de la CHD al Documento de Inicio del trámite ambiental de la Revisión del PGOU, esta instalación no tiene un diseño y dimensionamiento adecuados, no consiguiendo unas características del efluente compatibles con la definición de tratamiento adecuado. Según dicho informe, en la última revisión de la autorización de vertido de esta localidad se impuso un programa de reducción de la contaminación consistente en la limpieza y adaptación de las actuales instalaciones de depuración, o bien, en la construcción de unas nuevas instalaciones antes del 31 de diciembre de 2010.



3) Castrillo de los Polvazares.

Cuenta con una instalación de depuración consistente en una fosa séptica, cuyo diseño y dimensionamiento, según el informe de la CHD al Documento de Inicio del trámite ambiental, se considera adecuado para la población actual, siempre y cuando se realice un mantenimiento adecuado de la misma.

4) Murias de Rechivaldo.

5) Cuenta con una instalación de depuración consistente en una fosa séptica, cuyo diseño y dimensionamiento, según el informe de la CHD al Documento de Inicio del trámite ambiental, se considera adecuado para la población actual.

2.5.2 Red de saneamiento.

1) Astorga-Valdeviejas.

La gestión y explotación de la red de saneamiento del municipio de Astorga la lleva a cabo la empresa concesionaria AQUONA (antigua AQUAGEST). La red de saneamiento conduce las aguas hasta la EDAR cuyo vertido, una vez pasado el tratamiento de depuración, se hace al cauce del río Tuerto.

La red de saneamiento interna del núcleo de Astorga la componen tuberías de hormigón de diámetros desde 30 mm hasta 600 mm y determinados tramos en PVC que indican las tuberías de reciente ejecución.

Los emisarios hacia la EDAR se pueden englobar en los siguientes tramos:

- Colector del ferrocarril: de hormigón de 800 mm de diámetro. Comienza en la c. Santa Colomba, sigue por c. de la Piedad y c. del Cabildo, para continuar por un camino paralelo al antiguo ferrocarril hasta cruzar con la ctra. N-120, e ir por detrás de la subestación eléctrica y cruzar el ferrocarril en el entorno de la c. San Marcos, siguiendo paralelo por el camino existente hasta el cruce con la c. de la Zapata, cerca de la antigua estación de ferrocarril, donde se conecta con el colector del río Jerga y conecta el denominado emisario a la EDAR.
- Colector Camino de Valdeviejas: de PVC de 500 mm de diámetro, que conecta con el emisario de Valdeviejas.
- Colector Valdeviejas: de PVC de 600 mm de diámetro. Comienza en las cercanías de la c. del Río o Ecce Homo, en Valdeviejas con el río Jerga, en las inmediaciones del cruce con la autovía, para discurrir por el camino paralelo al río hasta conectar con el colector Camino de Valdeviejas, reseñado anteriormente. A partir de este punto el colector pasa a PVC de 500 mm hasta la plaza de Toros y calle Sanabria, punto en el cual se considera comienza un tramo en hormigón Ø1.000mm que discurre por la c. Lago del Marqués hasta el cruce con el paseo General Martínez Cabrero, en cuyas inmediaciones se localiza un aliviadero y se considera comienza el colector del río Jerga.
- Colector del río Jerga: comienza en el aliviadero del paseo General Martínez Cabrero, tratándose de un colector de hormigón de 600mm de diámetro que discurre paralelo al río por su margen izquierda, para cruzarlo en las inmediaciones de la c. Santa Clara, siendo a partir de este punto de 800 mm de diámetro, para volver a cruzarlo en el entorno de la avenida Madrid-Coruña y discurrir paralelo al río hasta conectar con el colector del Ferrocarril en la c. de la Zapata.
- Emisario a la EDAR: de hormigón de 1.000mm de diámetro, que conduce todas las aguas residuales hacia la depuradora en paralelo a la ctra. CV-193-26.

2.6 DIAGNÓSTICO DE LAS INSTALACIONES DE SANEAMIENTO.

2.6.1 Red de saneamiento.

1) Astorga.

En cuanto a la red de saneamiento cabe destacar la carencia de red separativa. Igualmente hay que destacar el empleo de pequeños colectores de hormigón, sobre todo en la zona del casco antiguo.

En general se debería verificar el funcionamiento de los aliviaderos existentes y analizar la necesidad de nuevos aliviaderos en las conexiones de los emisarios principales, teniendo en cuenta que el infradimensionamiento de los mismos (pocos o que no entran en funcionamiento cuando deben) comportaría exceso de caudal a la EDAR, mientras que en el caso contrario de sobredimensionamiento (muchos aliviaderos o que entran en funcionamiento con pequeños incrementos de caudal) incrementaría los vertidos directos a cauce público.



En relación a la red de colectores y emisarios hacia la EDAR se califican en principio de adecuados, haciendo notar que en el colector de Valdeviejas se produce una disminución de diámetro sin que aparentemente exista aliviadero de pluviales.

2.6.2 EDAR.

La capacidad de la EDAR actualmente es adecuada, puesto que su capacidad de 4.200 m³/día puede satisfacer a una población equivalente de 20.000 habitantes, previendo la revisión del PGOU una horquilla de población entre 18.847 y 21.000 habitantes. En el caso de llegarse a alcanzar la previsión máxima de habitantes, la EDAR necesitaría de una pequeña ampliación que pudiera dar servicio a 1.000 habitantes.

En cualquier caso hay que hacer constar nuevamente que la población considerada resulta del lado de la seguridad; evaluando la población actual (12.000 habitantes) y el crecimiento de población máximo con la nueva clasificación (2.571 habitantes) tenemos una población de 14.571 habitantes.

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada definitivamente en sesión plenaria del Ayuntamiento de Astorga, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez



3. RÉGIMEN DE CORRIENTES.

3.1 MARCO NORMATIVO.

A continuación se expone la normativa vigente en referencia a zonas susceptibles de ser afectadas por las crecidas de los cauces naturales. Se considera necesario el reproducir, literalmente, los artículos más importantes de las citadas normativas en los que se apoya el presente IHd.

3.1.1 Reglamento del Dominio Público Hidráulico (RD 849/1986, de 11 de abril) y su modificación mediante el RD 9/2008, de 11 de enero.

Art.14:

"1. Se consideran **zonas inundables** las delimitadas por los niveles teóricos que alcanzarían las aguas en las avenidas cuyo período estadístico de retorno sea de quinientos años, atendiendo a estudios geomorfológicos, hidrológicos e hidráulicos, así como de series de avenidas históricas y documentos o evidencias históricas de las mismas, a menos que el Ministerio de Medio Ambiente, a propuesta del organismo de cuenca fije, en expediente concreto, la delimitación que en cada caso resulte más adecuada al comportamiento de la corriente. La calificación como zonas inundables no alterará la calificación jurídica y la titularidad dominical que dichos terrenos tuviesen.

2. Los organismos de cuenca darán traslado a las Administraciones competentes en materia de ordenación del territorio y urbanismo de los datos y estudios disponibles sobre avenidas, al objeto de que se tengan en cuenta en la planificación del suelo, y en particular, en las autorizaciones de usos que se acuerden en las zonas inundables. De igual manera los organismos de cuenca trasladarán al Catastro inmobiliario así como a las Administraciones competentes en materia de ordenación del territorio y urbanismo los deslindes aprobados definitivamente, o las delimitaciones de los mismos basadas en los estudios realizados, así como de las zonas de servidumbre y policía, al objeto de que sean incorporados en el catastro y tenidos en cuenta en el ejercicio de sus potestades sobre ordenación del territorio y planificación urbanística, o en la ejecución del planeamiento ya aprobado.

3. El conjunto de estudios de inundabilidad realizados por el Ministerio de Medio Ambiente y sus organismos de cuenca configurarán el Sistema Nacional de Cartografía de Zonas Inundables, que deberá desarrollarse en colaboración con las correspondientes comunidades autónomas, y, en su caso, con las administraciones locales afectadas. En esta cartografía, además de la zona inundable, se incluirá de forma preceptiva la delimitación de los cauces públicos y de las zonas de servidumbre y policía, incluyendo las vías de flujo preferente. La información contenida en el Sistema Nacional de Cartografía de las Zonas Inundables estará a disposición de los órganos de la Administración estatal, autonómica y local."

3.1.2 Plan Hidrológico Nacional (Ley 10/2001 de 5 de julio).

Art. 28. Protección del dominio público hidráulico y actuaciones en zonas inundables:

"1. En el **dominio público hidráulico** se adoptarán las medidas necesarias para corregir las situaciones que afecten a su protección, incluyendo la eliminación de construcciones y demás instalaciones situadas en el mismo. El Ministerio de Medio Ambiente impulsará la tramitación de los expedientes de deslinde del dominio público hidráulico en aquellos tramos de ríos, arroyos y ramblas que se considere necesario para prevenir, controlar y proteger dicho dominio.

2. Las Administraciones competentes delimitarán las **zonas inundables** teniendo en cuenta los estudios y datos disponibles que los Organismos de cuenca deben trasladar a las mismas, de acuerdo con lo previsto en el artículo 11.2 de la Ley de Aguas. Para ello contarán con el apoyo técnico de estos Organismos y en particular, con la información relativa a caudales máximos en la red fluvial, que la Administración hidráulica deberá facilitar.

3. El Ministerio de Medio Ambiente promoverá convenios de colaboración con las Administraciones Autonómicas y Locales que tengan por finalidad eliminar las construcciones y demás instalaciones situadas en dominio público hidráulico y en zonas inundables que pudieran implicar un grave riesgo para las personas y los bienes y la protección del mencionado dominio."

3.1.3 Reglamento de Planificación Hidrológica (RD 907/2007, de 6 de julio).

Art. 59. Situaciones hidrológicas extremas:

"1. El plan hidrológico, con los datos históricos disponibles sobre precipitaciones y caudales máximos y mínimos, establecerá los criterios para la realización de estudios y la determinación de actuaciones y obras relacionadas con situaciones hidrológicas extremas. Como consecuencia de estos estudios se determinarán las condiciones en que puede admitirse en situaciones hidrológicas extremas el deterioro temporal, así como las masas de agua a las que se refiere el artículo 38.



2. Establecerá las medidas que deben adoptarse en circunstancias excepcionales correspondientes a situaciones hidrológicas extremas, incluyendo la realización de planes o programas específicos como los indicados en el artículo 62.
3. Las administraciones competentes delimitarán las zonas inundables teniendo en cuenta los estudios y datos disponibles que los organismos de cuenca deben trasladar a las mismas, de acuerdo con lo previsto en el artículo 11.2 del texto refundido de la Ley de Aguas. Para ello contarán con el apoyo técnico de estos organismos y, en particular, con la información relativa a caudales máximos en la red fluvial, que la administración hidráulica deberá facilitar.”

3.1.4 Real Decreto 478/2013, de 21 de junio, por el que se aprueba el Plan Hidrológico de la parte española de la Demarcación Hidrográfica del Duero.

Art. 72. Protección contra inundaciones:

“1. De conformidad con lo previsto en el artículo 11.3 del TRLA y en el RDL 2/2008, de 20 de junio, por el que se aprueba el texto refundido de la Ley del Suelo, y sin perjuicio de lo que en el momento de su aprobación establezcan los planes de gestión del riesgo de inundación redactados de acuerdo con los artículos 11, 12 y 13 del RD 903/2010, de 9 de julio, de evaluación y gestión del riesgo de inundación (en adelante REGRI) o sus ulteriores revisiones, conforme a lo previsto en el artículo 106 de este Plan, la ordenación de usos del suelo en las zonas inundables que lleven a cabo las Comunidades Autónomas en el ejercicio de sus competencias, tendrá en cuenta los siguientes criterios de coordinación:

a) Los **usos del suelo que puedan permitirse en la zona de flujo preferente** serán tales que los daños potenciales por causa de las avenidas sean moderados, no se obstruya el flujo de las aguas y no se requieran estructuras, terraplenes o almacenamientos permanentes de bienes o equipos.

b) **Para el resto de la zona inundable:**

b.1) Las edificaciones de carácter residencial deberán tener su planta baja, o los sótanos si los hubiera, a una cota tal que las citadas construcciones no se vean afectadas por la avenida con periodo de retorno de 100 años.

b.2) Las construcciones no residenciales (industriales, ganaderas, comerciales, etc.) deben estar situadas a cota suficiente para evitar que durante la avenida de periodo de retorno de 100 años se produzcan alturas de inundación sobre el suelo superiores a 50 cm, salvo que se hubieran adoptado en todo el conjunto medidas impermeabilizadoras hasta el nivel de dicha avenida.”

3.1.5 Ley 7/2014, de 19 de septiembre, de medidas sobre rehabilitación, regeneración, y renovación urbanística y sostenibilidad, coordinación y simplificación en materia de urbanismo en Castilla y León.

Art. 36 quáter. Consideración de los riesgos:

“Para establecer sus determinaciones, el planeamiento tendrá en cuenta los riesgos naturales y tecnológicos detectados en su ámbito de aplicación, de conformidad con las áreas delimitadas a tal efecto por la administración competente para la protección de cada riesgo. En particular, en los terrenos afectados por riesgos de inundación, se aplicarán las siguientes normas:

- Los terrenos afectados por avenidas con periodos de retorno de 100 años solo podrán ser clasificadas como suelo urbano o urbanizable cuando tuvieran anteriormente dicha clasificación, y quedando sometidos a las restricciones especiales que se determinen reglamentariamente.
- Los terrenos afectados por avenidas con periodos de retorno de 500 años podrán ser clasificadas como suelo urbano o urbanizable cuando tuvieran anteriormente dicha clasificación, o si no la tuvieran, cuando se adopten restricciones especiales conforme a las reglas que se determinen reglamentariamente.
- En otro caso los terrenos se clasificarán como suelo rústico, sistema general de espacios libres o sistema general de espacios protegidos, y las construcciones e instalaciones con ocupación humana permanente se declararán expresamente fuera de ordenación, excepto las dedicadas a la piscicultura y su industria de transformación.

3.2 OBJETO.

En este apartado se analizará el régimen de avenidas del río Jerga a su paso por los núcleos de Astorga y Murias de Rechivaldo, con el objeto de delimitar los límites del Dominio Público Hidráulico y láminas de inundación para su análisis en el desarrollo previsto por la Revisión del PGOU de Astorga, tanto protegiendo dicho dominio, como evitando o disminuyendo riesgos potenciales de inundación en áreas contiguas de propiedad privada.

El momento en el que se desarrolla el estudio le proporciona un carácter de diagnóstico previo, muy útil desde el punto de vista de ordenación y clasificación de nuevos suelos de desarrollo. Dado que la revisión del PGOU no prevé actuaciones que precisen la elaboración de planeamiento de desarrollo para establecer la ordenación detallada en el entorno del tramo del río Jerga que atraviesa



el núcleo de Astorga ni tampoco en el núcleo de Murias de Rechivaldo, no serán necesarios nuevos Estudios Hidrológicos-Hidráulicos específicos que deban ser nuevamente validados por el Organismo de Cuenca.

La finalidad del presente IHd es que la variable hidrológica se incluya en la ordenación desde el primer momento, ya que se puede tratar de una de los condicionantes territoriales esenciales.

El IHd se estructura en los siguientes apartados:

- 1) Datos previos: recopilación de información relativa a problemas de inundación, datos de aforos, cartografía, geología, vegetación, usos del suelo..., etc.
- 2) Hidrología: análisis de precipitaciones, umbral de escorrentía, y cálculo de caudales para diversos periodos de retorno.
- 3) Estudio hidráulico de los tramos del río Jerga en análisis: determinación de la zona de dominio público hidráulico y de las zonas con riesgo de inundación.

3.3 DATOS PREVIOS.

3.3.1 Cartografía.

Para la correcta definición física de la zona estudiada se cuenta con la restitución cartográfica a escala 1:1000 en formato digital aportada por el Ayuntamiento de Astorga.

Además se cuenta con la cartografía en formato digital a escala 1:5.000 y 1:10.000 de la Junta de Castilla y León, y los mapas topográficos nacionales.

3.3.2 Precipitaciones.

El estudio hidrológico se ha realizado en base a los datos de la AEMET de las estaciones meteorológicas de la zona, realizando un contraste basado en los datos de las publicaciones "Máximas Lluvias Diarias en la España Peninsular" editado por el Ministerio de Fomento y "Estudio sobre las precipitaciones máximas diarias y periodos de retorno para un conjunto de estaciones pluviométricas seleccionadas de España", editado en el año 2007 por el Ministerio de Medio Ambiente.

3.3.3 Datos de la cuenca del río Jerga.

La cuenca del río Jerga en estudio se ha definido sobre los mapas topográficos nacionales a escala 1:25.000 editados por el IGN y la cartografía de apoyo para el desarrollo del PGOU.

Los parámetros principales de dicha cuenca son los siguientes:

- 1) Superficie: 61,398 km².
- 2) Longitud: 25,694 km.
- 3) Cota máxima: 1.364 m.
- 4) Cota mínima: 843 m.
- 5) Pendiente media: 2,03%.

En el Anexo 1, se incluye el plano de delimitación de la cuenca del río Jerga en estudio.

3.4 HIDROLOGÍA.

El entorno estudiado pertenece a la Cuenca Hidrográfica del río Duero (Cuenca nº 2), en concreto a la subcuenca del río Jerga.

Para la realización de este estudio hidrológico se ha empleado el método racional modificado, método hidrometeorológico que recoge las modificaciones realizadas por Témez en una comunicación al XXIV Congreso de la Asociación Internacional de Investigaciones Hidráulicas (Madrid 1991) y reproducida en el nº 82 de la revista de "Ingeniería Civil", y empleado para cuencas cuyo tiempo de concentración excede de las 6 horas.



3.4.1 Método racional modificado por Témez.

El método parte básicamente de las mismas hipótesis que el clásico método racional, pero incluye un factor de corrección de uniformidad que tiene en cuenta el reparto del aguacero, cuya duración total se considera equivalente al tiempo de concentración.

$$Q = \frac{C \cdot I \cdot S}{3,6} \cdot K$$

Donde:

Q: caudal punta (m³/s) en el punto de desagüe correspondiente a un período de retorno dado.

C: coeficiente medio de escorrentía de la cuenca o superficie drenada.

I: intensidad media (mm/h) de lluvia correspondiente al período de retorno considerado y a un intervalo igual al tiempo de concentración.

S: superficie de aportación (km²).

K: coeficiente que tiene en cuenta la falta de uniformidad en la distribución temporal del aguacero.

El valor de k depende del tiempo de concentración, aunque puede variar de unos episodios a otros. A efectos prácticos para su evaluación, este método propone desechar la influencia del resto de variables (torrencialidad, características de la cuenca,...) y definirlo sólo en función del tiempo de concentración:

$$K = 1 + \frac{T_c^{1,25}}{T_c^{1,25} + 14}$$

Precipitación areal.

La hipótesis de lluvia neta constante que éste establece no es real y, en la práctica, existen variaciones de reparto temporal, las cuales favorecen el desarrollo de los caudales punta.

Este método, teniendo en cuenta una duración igual al tiempo de concentración, la variación de lluvia neta la refleja globalmente, refiriendo los caudales punta considerando esta variación a los caudales homólogos calculados con una lluvia neta constante.

La segunda consideración en el método modificado por Témez introduce un factor corrector de la precipitación máxima obtenida anteriormente, considerando la no simultaneidad de las precipitaciones de un mismo período de retorno en todos los puntos de la cuenca, obteniéndose así la precipitación real. Este factor corrector se propone determinarlo con la siguiente expresión:

$$\text{ARF} = 1 \quad \text{si } A < 1 \text{ km}^2.$$

$$\text{ARF} = 1 - \frac{\log A}{15} \quad \text{si } 1 \text{ km}^2 < A < 3.000 \text{ km}^2.$$

Donde A es el área de la cuenca en km².

Máxima intensidad de precipitación media en un tiempo de concentración para un período de retorno dado.

Para el cálculo del caudal se ha considerado, de acuerdo con el método hidrometeorológico, que el caso más desfavorable es aquel en que el aguacero tiene una duración igual a la del tiempo de concentración.

Al contar sólo con datos de precipitaciones máximas diarias, no se pueden extrapolar los valores de las intensidades de aguaceros de distinta duración, por lo que para determinarlos se ha de recurrir a las curvas intensidad-duración elaboradas para un conjunto de estaciones españolas. Consultando el mapa de isóneas de los valores I1/Id para España que figura en la Norma 5.2-IC., siendo I1 la

intensidad horaria e Id la intensidad media diaria, se obtiene que en la zona de estudio. $\frac{I_1}{I_d} = 9$.



La publicación “*Máximas precipitaciones diarias en la España peninsular*”, de la Dirección General de Carreteras (Ministerio de Fomento) se realizó en 1999 mediante un convenio de la Dirección General de Carreteras (Ministerio de Fomento) con el CEDEX, que realizó una modelización estadística de las series anuales de máximas lluvias diarias, cuyo resultado ha sido la aplicación informática MAXPLU, que permite la consulta de los cuantiles de máximas lluvias diarias en cualquier punto de la península.

Como ley de distribución para el análisis de máximas lluvias se ha adoptado la ley denominada SQR-ET max, que ha sido desarrollada específicamente para el análisis de máximas lluvias diarias. El cálculo se facilita mediante una aplicación informática denominada MAXPLU, que obtiene las precipitaciones máximas previsible en un día en cualquier punto definido por sus coordenadas geográficas. En esta publicación se incluyen los mapas de isolinéas representando tanto la precipitación media como el coeficiente de variación C_v .

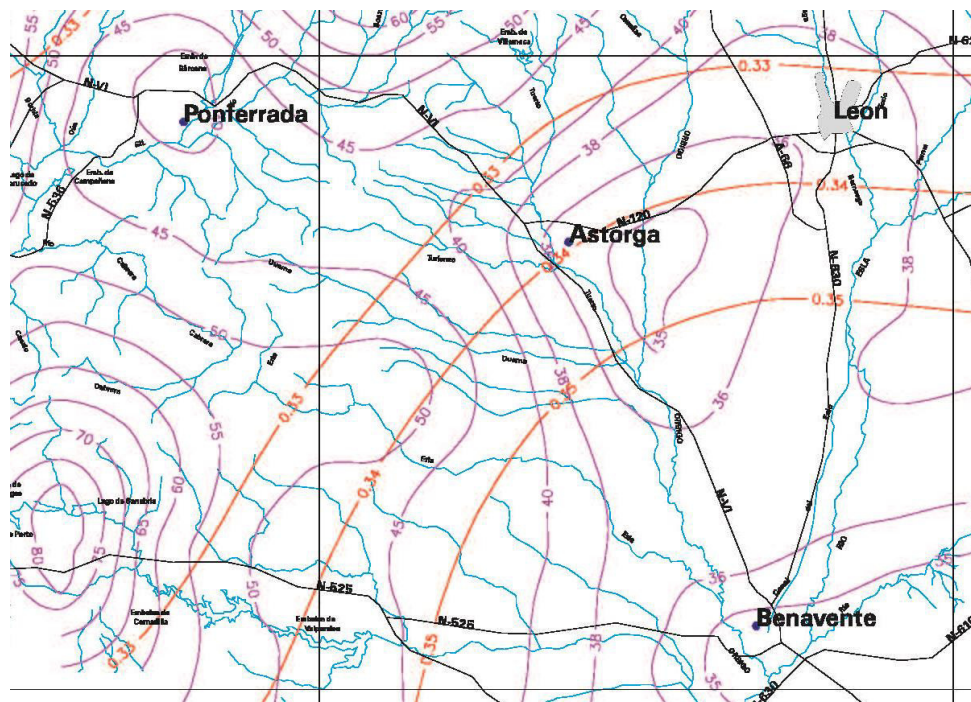


Ilustración 5. Mapa de isolinéas. (Fuente: *Máximas precipitaciones diarias en la España peninsular*, de la Dirección General de Carreteras, Ministerio de Fomento).

Según esta publicación, entrando en la aplicación con las coordenadas de la estación meteorológica citada se tiene:

- 1) $P_d = 37\text{mm/día}$.
- 2) $C_v = 0,3360$

Siendo finalmente las precipitaciones máximas en 24 horas para los distintos períodos de retorno las siguientes:

	2 años	5 años	10 años	25 años	50 años	100 años	500 años
Kt	0,925	1,211	1,420	1,705	1,924	2,162	2,761
Pd (mm)	34,23	44,82	52,53	63,07	71,19	79,99	102,10

Tabla 3. Precipitaciones máximas en 24 horas para el término municipal de Astorga. (Fuente: *Máximas precipitaciones diarias en la España peninsular*, de la Dirección General de Carreteras, Ministerio de Fomento).

En base a la cada vez más presente demanda de datos meteorológicos, en especial a cantidades máximas de precipitación registradas en distintos intervalos de tiempo así como la frecuencia con la que cabe esperar se alcancen o superen dichas cantidades el Ministerio de Medio Ambiente, en el año 2007, publica el “*Estudio sobre las precipitaciones máximas diarias y períodos de retorno para un conjunto de estaciones pluviométricas seleccionadas de España*”, donde se recoge un análisis de un total de 2.390 estaciones pluviométricas. En este estudio se recogen los datos de la estación 2734A Astorga Regimiento de Artillería del período 1954-1997. A continuación se trasladan los datos recogidos:



Año	Pmax (mm)
1954	29.0
1955	42.0
1956	24.0
1957	26.0
1958	31.0
1959	34.0
1960	44.0
1961	41.0
1962	34.0
1963	35.5
1964	35.0
1965	24.0
1966	62.0
1967	26.0
1968	25.0
1969	25.0
1970	24.0
1971	35.0
1972	35.0
1973	25.0
1974	23.0
1975	47.0
1976	21.5
1977	25.0
1978	30.0
1979	24.0
1980	17.0
1981	17.0
1982	37.0
1983	26.5
1984	24.0
1985	30.0
1987	98.0
1988	21.0
1989	24.5
1991	10.0
1993	27.0
1995	25.0
1997	103.0

Tabla 4. Datos de la estación 2734A Astorga Regimiento de Artillería del período 1954-1997. (Fuente: Fuente: "Estudio sobre las precipitaciones máximas diarias y períodos de retorno para un conjunto de estaciones pluviométricas seleccionadas de España" 2007, del Ministerio de Medio Ambiente).

Resultando, del ajuste estadístico que se realiza en el Estudio, las siguientes precipitaciones máximas en 24 horas:

	2 años	5 años	10 años	25 años	50 años	100 años	500 años
Pd (mm)	29	42	51	64	74	86	115

Tabla 5. Precipitaciones máximas en 24 horas para el término municipal de Astorga. (Fuente: elaboración propia).

Como se puede observar, ambas publicaciones ofrecen resultados similares, no obstante en los cálculos sucesivos se han seleccionado los datos que ofrecen los resultados más conservadores.



Precipitaciones máximas en las cuencas identificadas.

De esta forma y dada la entidad de la cuenca se ha considerado aplicar para la toda la cuenca la precipitación que se recoge en la estación meteorológica de referencia.

	2 años	5 años	10 años	25 años	50 años	100 años	500 años
Pd (mm)	34	45	53	64	74	86	115

Tabla 6. Precipitaciones de cálculo. (Fuente: elaboración propia).

3.4.3 Coeficiente de escorrentía.

El coeficiente de escorrentía se define esencialmente como la relación entre el volumen de lluvia neta (o de escorrentía) y la lluvia total, por lo que, teóricamente, varía en el rango de valores entre 0 y 1.

La Dirección General de Carreteras propone, para obras de drenaje, estimar dicho coeficiente mediante la siguiente expresión:

$$C = \frac{((P_d / P_0) - 1)((P_d / P_0) + 23)}{((P_d / P_0) + 11)^2}$$

Según la Instrucción 5.2-IC, si la razón P_d/P_0 fuera inferior a la unidad, el coeficiente C de escorrentía podrá considerarse nulo; en caso contrario se calcula mediante la expresión anterior, siendo:

- 1) P_d : Precipitación total diaria en mm correspondiente al período de retorno de cálculo.
- 2) P_0 : Umbral de escorrentía. Define el valor de la altura de lluvia a partir del cual se inicia la escorrentía.

El parámetro P_0 , cuyo valor depende de la naturaleza del terreno, el tipo de vegetación y cultivos existentes y otros factores que puedan facilitar la retención superficial del agua, como el grado de pendiente del terreno, puede estimarse mediante la Tabla 2.1. de la ya citada Instrucción 5.2.-I.C.

Grupos de suelos.

En primer lugar, para evaluar la capacidad de infiltración se ha procedido a distribuir la superficie de la cuenca vertiente entre los Grupos de Suelos establecidos por el Servicio de Conservación de Suelos de los Estados Unidos de América, cuya identificación es la siguiente:

- 1) GRUPO A: suelos con gran capacidad de infiltración, aún cuando están empapados; constituidos, fundamentalmente, por arenas y gravas intensa y profundamente drenadas.
- 2) GRUPO B: suelos con grados de infiltración moderados cuando están empapados y que cuentan con un drenaje relativamente bueno y profundo con texturas intermedias entre fina y gruesa.
- 3) GRUPO C: suelos con bajos niveles de infiltración cuando están completamente mojados; lo forman, básicamente, suelos con texturas entre fina y medianamente fina y aquellos donde exista un nivel impermeable que impida el movimiento del agua hacia capas inferiores.
- 4) GRUPO D: corresponde a suelos con un potencial de infiltración muy bajo cuando están mojados. Este grupo lo forman suelos con un alto contenido en arcillas, con niveles freáticos altos, con estratos impermeables cerca de la superficie o aquellos formados por una capa de suelo superficial sobre materiales impermeables.

Esta identificación se lleva a cabo con los mapas geológicos de la zona. Del análisis geológico de los suelos, a efectos de infiltración, los terrenos pertenecientes a la cuenca del Río Jerga se clasifican como de infiltración baja, grupo C.

Usos del suelo.

Para la caracterización de la cuenca vertiente en función de la vegetación y los cultivos existentes, se han establecido diferentes grupos de usos del suelo a partir de la clasificación de usos agrícolas recogida en el Mapa de Cultivos y Aprovechamientos del Ministerio de Agricultura Pesca y Alimentación de la zona en estudio.

Se ha empleado la información que recoge la aplicación informática MCA, del SIGA (Servicio de Información Geográfica Agrario) del Ministerio de Agricultura, Pesca y Alimentación, disponible en la página web www.mapa.es. Esta aplicación ofrece la información



cartográfica y alfanumérica relacionada con el Mapa de Cultivos y Aprovechamientos de España. Posee una precisión a escala 1:50.000, la misma que la cartografía en formato analógico.

Del análisis de los Mapas de Cultivos se deduce:

- 1) Coníferas: 25%.
- 2) Otras frondosas: 15%.
- 3) Matorral: 22%.
- 4) Improductivo: 5%.
- 5) Regadío: 3%.
- 6) Labor de Secano: 10%.
- 7) Pastizal: 11%.
- 8) Pastizal-matorral: 9%.

Coeficiente corrector del umbral de escorrentía.

Según la Instrucción 5.2-IC estos valores de P_o deben multiplicarse por un factor regional que tiene en cuenta la variación de la humedad habitual en el suelo al comienzo de aguaceros significativos en el área de estudio. En el caso de la zona de estudio se ha considerado un factor regional corrector de 2,00.

Umbral de escorrentía.

Dadas las características geológicas y usos del suelo citados el umbral de escorrentía medio para la cuenca del río Jerga es 17,90 mm.

Considerando el coeficiente corrector del umbral de escorrentía, según la Instrucción 5.-IC, =2, el umbral de escorrentía corregido es $P_o^* = 35,80$ mm.

3.4.4 Tiempo de concentración.

El tiempo de concentración es el tiempo que necesita el agua que cae en la zona más alejada de la cuenca para llegar al punto de salida de la misma.

Existe una gran cantidad de fórmulas para estimar el valor de t_c . En este caso se empleará la fórmula de Témez, especificada en la normativa de drenaje de carreteras 5.2-IC de la que obtenemos el tiempo de concentración en horas:

$$t_c = 0.3 \left(\frac{L}{\sqrt[4]{J}} \right)^{0.76}$$

Donde:

- 1) L: longitud del cauce principal en km.
- 2) J: pendiente del cauce principal (tanto por uno).

Con la cuenca en estudio el tiempo de concentración resulta de 7,42 horas.

3.4.5 Intensidad de precipitación.

El valor de la intensidad media (I_t) de precipitación a emplear en la estimación de caudales de referencia por métodos hidrometeorológicos se ha obtenido por medio de la siguiente fórmula, recogida en apartados anteriores:

$$I_t / I_d = (I_1 / I_d)^{\frac{28^{0.1} - I^{0.1}}{28^{0.1} - 1}}$$



3.4.6 Caudales de cálculo.

Método Racional modificado			J. R. Témez							
Demoninación de la cuenca		RÍO JERGA								
Pk obra										
Datos de la cuenca										
Longitud	L	26	25.694	25.694	25.694	25.694	25.694	25.694	25.694	Km
Área	A	61.40	61.397602	61.3976	61.3976	61.398	61.398	61.398	61.3976	Km²
Factor corrector de la precipitación	Ka	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	
Cota máxima	Zmax	1364	1364	1364	1364	1364	1364	1364	1364	m
Cota mínima	Zmin	843	843	843	843	843	843	843	843	m
Desnivel	ΔH	521	521	521	521	521	521	521	521	m
Pendiente media	p	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	m/m
Tiempo de concentración	Tc	7.42	7.42	7.42	7.42	7.42	7.42	7.42	7.42	h
Precipitación										
Período de retorno	T	2	5	10	25	50	100	500		años
Precipitación de cálculo	Pd	34	45	53	64	74	86	115		mm
Precipitación de cálculo corregida	Pd*Ka	29.95	39.6	46.7	56.4	65.2	75.7	101.3		mm
Intensidad media diaria	Id	1.25	1.65	1.95	2.35	2.72	3.16	4.22		mm/h
Coef. Isolíneas(Fig. 2.2)	I1/Id	9	9	9	9	9	9	9		
It/Id		2.62	2.62	2.62	2.62	2.62	2.62	2.62		mm/h
Intensidad	I	3.27	4.33	5.10	6.16	7.12	8.28	11.07		mm/h
Escorrentía										
Umbral de escorrentía	Po	17.90	17.9	17.9	17.9	17.9	17.9	17.9		mm
Coeficiente corrector de Po (Fig.2.5)		2	2	2	2	2	2	2		
Umbral de escorrentía corregido	Po*	35.8	35.8	35.8	35.8	35.8	35.8	35.8		mm
Coeficiente de escorrentía	C	0.000	0.018	0.049	0.089	0.124	0.163	0.247		
Cálculo del caudal										
Coeficiente de uniformidad	K	1.47	1.47	1.47	1.47	1.47	1.47	1.47		
Caudal	Q	0.000	1.91	6.23	13.76	22.1	33.7	68.4		m³/seg

Tabla 7. Caudales de cálculo. (Fuente: Método Racional modificado. J.R.Témez).

3.5 ESTUDIO HIDRÁULICO.

3.5.1 Metodología.

La metodología seguida para la realización del estudio hidrológico ha sido la siguiente: se ha realizado la caracterización del cauce en la situación actual, evaluándose el funcionamiento hidráulico del río y la cota de la lámina de agua y línea de inundación para varios caudales de avenida.

Los cálculos se han realizado mediante el programa de análisis fluvial HEC-RAS, en su versión 4.1.0 de enero de 2010, desarrollado por el Centro de Ingeniería Hidrológica del Cuerpo de Ingenieros del Ejército de Estados Unidos de Norteamérica (Hydrologic Engineering Center U.S. Army Corps of Engineers).

Se han estudiado dos tramos del río Jerga:

- 1) Río Jerga en Murias de Rechivaldo.
- 2) Río Jerga en Astorga, en particular el tramo comprendido entre la plaza de toros y aguas abajo del cruce bajo la N-VI.





3.6 CÁLCULOS REALIZADOS.

3.6.1 Modelización geométrica.

El modelo geométrico del cauce en cada escenario temporal se consigue mediante la determinación de secciones transversales dispuestas de manera tal que representen lo más fielmente posible el desplazamiento de los caudales que se quieren simular.

A partir de la cartografía se han realizado una serie de perfiles longitudinales del área de estudio utilizando el módulo ISPOL de trazado de obras lineales. Estos perfiles longitudinales son los utilizados como secciones transversales del cauce a la hora de modelizar el funcionamiento hidráulico del río en estudio, obteniéndose con ellos la geometría del cauce y llanuras de inundación. La identificación de estos perfiles en el programa se realiza por la "River Station" siendo el valor mayor el situado más aguas arriba del cauce y el menor el último aguas abajo.

Una vez introducidos los datos referentes a la sección geométrica del cauce y llanuras de inundación mediante estos perfiles, se procede a la introducción de los datos referentes a las estructuras existentes.

3.6.2 Modelización hidráulica.

Para la modelización hidráulica, tal y como se cita anteriormente, se ha empleado el programa de análisis fluvial HEC-RAS en su versión 4.1.0 de enero de 2010, perteneciente al Hydrologic Engineering Center del U.S. Army Corps of Engineers.

Se trata de un programa de análisis de lámina de avenida para régimen uniforme, a partir de una geometría completamente variable y unos datos de caudales definidos por el usuario. A continuación se recoge una descripción más detallada del sistema de cálculo empleado por el programa.

Descripción del programa HEC-RAS.

El modelo HEC-RAS fue desarrollado por Hydrologic Engineering Center (HEC) del U.S. Army Corps of Engineers (autor anónimo, 1979 y Feldman, 1981).

El modelo HEC-RAS se desarrolló para calcular perfiles para flujos permanentes, gradualmente variados en canales prismáticos y no prismáticos. Se pueden estimar perfiles subcríticos y supercríticos, y se consideran los efectos de varias obstrucciones como son puentes, alcantarillas, vertederos, y estructuras en llanuras de inundación. El modelo está sujeto a cuatro posiciones críticas:

- 1) Dado que las ecuaciones no contienen términos dependientes del tiempo, el flujo debe ser permanente.
- 2) El flujo debe ser gradualmente variado dado que las ecuaciones del modelo suponen una distribución hidrostática de presiones.
- 3) El flujo es unidimensional.
- 4) La pendiente del canal es pequeña.

El propósito original del modelo HEC-RAS fue el de determinar las elevaciones de la superficie del agua para gastos especificados en canales naturales para ayudar en el programa de manejo de llanuras de inundación del U.S. Army Corps of Engineers. En este contexto el modelo se ha empleado para:

- 1) Determinar áreas inundadas para varios gastos de inundación para la evaluación de daños.
- 2) Estudiar efectos sobre las llanuras de inundación del uso de tierras desde el punto de vista daños por inundación.
- 3) Estudiar como se pueden mitigar los daños de las inundaciones con diversas mejoras en el canal.

El modelo HEC-RAS puede también emplearse para estudiar los perfiles de flujo gradualmente variado permanente. El modelo HEC-RAS está escrito en FORTRAN IV.

Al ampliar la ecuación de la energía entre dos secciones del canal se tiene:

$$z_2 + \alpha \frac{u_2^2}{2g} = z_1 + \alpha_1 \frac{u_1^2}{2g} + h \quad (A)$$

donde

$$h = L\bar{S}_f + c \left| \alpha_2 \frac{u_2^2}{2g} - \alpha_1 \frac{u_1^2}{2g} \right| \quad (B)$$



donde

- 1) h = pérdida total de energía entre las dos estaciones.
- 2) S_f = pendiente de fricción representativa en el tramo.
- 3) L = longitud pesada en el gasto.
- 4) c = coeficiente de pérdida de expansión o contracción.

Por ende, el modelo HEC-RAS es esencialmente un esquema de cálculo automático, iterativo del método de paso directo. El procedimiento de cálculo es como sigue:

- 1) Si los cálculos se dirigen hacia aguas arriba, se supone que se dispone de todos los datos para el cálculo de las variables en las ecuaciones (A) y (B) con subíndice 1.
- 2) Se supone la elevación de la superficie del agua en la estación 2.
- 3) Basándose en la suposición de la elevación de la superficie del agua, se determinan el factor de forma y carga de velocidad correspondientes.
- 4) Con los valores obtenidos en el paso 3, se determina S_f y se resuelve la ecuación (B) para h .
- 5) Se calcula z_2 a partir de los valores encontrados en los pasos 3 y 4 con la ecuación (A).
- 6) El valor de z_2 calculado en el paso 5 se compara con el supuesto en el paso 2. Se repiten los pasos 2 al 5 hasta que los valores supuestos y calculados de z_2 concuerdan en una variación de 0,01 m.

El método por el cual se suponen las elevaciones de la superficie del agua en el procedimiento iterativo descrito arriba varía en función del número de tanteos anteriores.

El primer valor de tanteo se estima proyectando la elevación de la sección transversal anterior sobre la pendiente de fricción media de las dos secciones transversales anteriores. El segundo valor de tanteo se estima como la media aritmética de los valores calculados y supuestos de la elevación de la superficie del agua del primer tanteo. Los terceros y subsecuentes valores de tanteo se estiman por el método de la secante de proyectar el ritmo de cambio de la diferencia entre los valores calculados y supuestos de las elevaciones de los dos tanteos previos a cero. En los terceros y subsecuentes tanteos, el cambio de valor de un tanteo a otro se restringe a un máximo de ∇ 50% de la elevación supuesta del tanteo anterior. Una vez obtenida la elevación correcta de la superficie del agua, se verifica que la elevación calculada se encuentre en el lado correcto de la elevación del tirante crítico para esa sección; eje, para un perfil subcrítico, las elevaciones de la superficie del agua deben ser mayores que las del tirante crítico. Si la elevación se encuentra en el lado equivocado de la elevación del tirante crítico, se ha cometido un error y se le notifica al usuario. Este tipo de error por lo común se produce cuando las longitudes de los tramos son muy grandes o de una mala representación del área de flujo de la sección transversal. Adicionalmente deberá notarse que la técnica empleada por el modelo HEC-RAS para la estimación del tirante crítico de flujo puede producir errores significativos cuando se amplía a una canal con sección compuesta.

El tirante crítico se encuentra al suponer las elevaciones de la superficie del agua y calcular el valor correspondiente de la energía especificada. Por esto, la metodología HEC-RAS no garantiza que se encuentre el valor correcto del tirante crítico para un canal específico de sección compuesta.

El modelo HEC-RAS tiene un número de opciones y restricciones que también deben notarse, como sigue:

- 1) Dentro del modelo se tienen cuatro métodos para la determinación de la pendiente media de fricción para el tramo.
 - a) Factor de forma media:

$$\bar{S}_f = \left[\frac{Q_1 + Q_2}{K_1 + K_2} \right]^2 \quad (C)$$

donde K_1 y K_2 son los factores de forma totales en las estaciones 1 y 2 respectivamente.

- b) Pendiente de fricción media:

$$\bar{S}_f = \frac{S_{f1} + S_{f2}}{2} \quad (D)$$

- c) Media geométrica:

$$\bar{S}_f = \sqrt{S_{f1} S_{f2}} \quad (E)$$

- d) Media armónica:

$$\bar{S}_f = \frac{2S_{f1} S_{f2}}{S_{f1} + S_{f2}} \quad (F)$$





Además de las ecuaciones anteriores, Reed y Wolfkill (1976), en su estudio de los modelos de pendientes de fricción, notaron que se han empleado también las siguientes formulaciones para estimar la pendiente de fricción en el tramo.

a)

$$\bar{S}_f = \frac{Q^2 n^2}{\phi^2 [2 A_1 A_2 / (A_1 + A_2)]^2 [(R_1 + R_2) / 2]^{\frac{4}{3}}} \quad (G)$$

b)

$$\bar{S}_f = \frac{Q^2 n^2}{\phi^2 [(A_1 + A_2) / 2] [(A_1 + A_2) / (P_1 + P_2) / 2]^{\frac{4}{3}}} \quad (H)$$

c)

$$\bar{S}_f = \frac{Q^2 n^2}{\phi^2 [(A_1 + A_2) / 2]^2 [(R_1 + R_2) / 2]^{\frac{4}{3}}} \quad (I)$$

d)

$$\bar{S}_f = \frac{Q^2 n^2}{\phi^2 \left[\left(A_1 R_1^{2/3} + A_2 R_2^{2/3} \right) / 2 \right]} \quad (J)$$

Donde R_1 y R_2 = radios hidráulicos al principio y final del tramo, respectivamente; A_1 y A_2 = áreas de flujo al principio y final del tramo respectivamente; n = coeficiente de rugosidad de Manning para el tramo, y Q = gasto en el tramo. Aunque muchas de las ecuaciones anteriores darán una estimación satisfactoria de la pendiente de fricción siempre que el tramo no sea demasiado largo, el concepto de proporcionar dentro de un modelo metodologías alternas para maximizar la longitud del tramo es atractiva. La ecuación (C) es la formulación estándar de HEC-RAS, y la ecuación (E) es la formulación empleada por el U.S. Geological Survey en su modelo de flujo gradualmente variado (Shearman, 1976, 1977).

- 2) Los datos adecuados sobre la sección transversal del canal son esenciales para la operación apropiada y precisa del modelo. Se necesita de secciones transversales donde se presentan cambios significativos en la geometría del canal o en sus características hidráulicas. Los cambios cruciales de geometría por lo común implica contracciones o expansiones naturales o artificiales, mientras que los cambios de pendiente, rugosidad, o gasto del canal se pueden considerar como cambios significativos de las características hidráulicas del canal. En general, las secciones transversales estipuladas deben ser perpendiculares a la dirección del flujo y extenderse completamente a través del canal hasta el terreno superior que se encuentra a ambos lados del canal. En algunos casos donde se tienen cambios muy significativos en la geometría o las características hidráulicas del canal, se requerirán varias secciones transversales. Debe tenerse la seguridad que sólo se incluya el área efectiva del flujo del canal.
- 3) La distancia entre las secciones transversales, también conocida como longitud de tramo, está en función del grado de detalle hidráulico requerido y los recursos humanos, temporales y financieros disponibles. Canales pequeños, no uniformes o de pendientes pronunciadas pueden requerir longitudes de tramo muy pequeñas, p. ej. (600 m), mientras que en canales, largos, uniformes con pendientes leves, longitudes de tramo de hasta (3 km) pueden ser apropiadas. Adicionalmente, el tipo de estudio que se esté efectuando puede dictar el grado de detalle y por ende la longitud de tramo. Por ejemplo, un estudio de navegación del río Missouri requirió de longitudes de tramo de (150 m) (Feldman, 1981). Las longitudes de tramo se pueden optimizar adaptando una ecuación apropiada para la pendiente de fricción. El modelo HEC-RAS requiere de longitudes de tramo para ambas bermas del canal, si es que existen éstas, y del canal principal. En el canal principal, la distancia se mide ya sea sobre la línea central en un canal artificial o sobre la línea de corriente en un canal natural, mientras que en las bermas la longitud del tramo representaría la longitud de paso del flujo del centro de masa del agua que se mueve en esa área.

Caudales considerados en la modelización.

Según el Reglamento del Dominio Público Hidráulico (R.D. 849/86, de 11 de abril) es necesario respetar las dimensiones del cauce natural y la servidumbre de uso público. Así, en la Ley de Aguas (R.D. 1/2001, de 20 de julio) en el art. 4 se define el cauce natural de una corriente al terreno cubierto por las aguas en las máximas crecidas ordinarias.





En el art. 4 del Reglamento del Dominio Público Hidráulico se define el caudal de máxima crecida ordinaria como la media de los máximos caudales anuales, en su régimen natural, producidos durante diez años consecutivos, que sean representativos del comportamiento hidráulico de la corriente.

Para poder realizar el estudio hidrológico, lo ideal es tener datos foronómicos, donde a partir de datos reales y mediante ajustes estadísticos se obtienen caudales de avenida asociados a periodos de ocurrencia. Dado que el Río Jerga no está aforado y, por lo tanto, no se dispone de una serie de caudales máximos, es necesario adoptar otros métodos de cálculo del caudal correspondiente a la máxima crecida ordinaria.

En el Informe Guías Metodológicas para la estimación del Caudal de Máxima Crecida Ordinaria redactado por el CEDEX en el año 1996 se establece que en la mayoría de los cursos españoles el caudal de máxima crecida ordinaria conduce a periodos de retorno entre 1,5 y 7 años. Los valores bajos corresponden a regímenes de hidrología moderada y los altos a las corrientes de hidrología extrema, por lo tanto se ha considerado como caudal de máxima crecida ordinaria al correspondiente al periodo de retorno de 5 años.

Según la Directriz Básica de Planificación de Protección Civil ante los riesgos de Inundaciones, se establecen las zonas inundables en función de los periodos de ocurrencia:

- 1) Zona de inundación frecuente: zonas inundables para avenidas de periodos de retorno de 50 años.
- 2) Zona de inundación ocasional: zonas inundables para avenidas de periodo de retorno en 50 y 100 años.
- 3) Zona de inundación excepcional: zonas inundables para avenidas de periodo de retorno entre 100 y 500 años.

Así, finalmente en el modelo se han modelizado los siguientes caudales, por ser los más representativos del comportamiento del río:

- 1) Q5 años (MCO): 1,91 m³/s.
- 2) Q50 años: 22,10 m³/s.
- 3) Q100 años: 33,70 m³/s.
- 4) Q500 años: 68,40 m³/s.

Además se ha modelizado el caudal correspondiente a 100 años de periodo de retorno para identificar la lámina de agua que define la vía de intenso desagüe, denominada según el Real Decreto 9/2008, de 11 de enero, por el que se modifica el Reglamento del Dominio Público Hidráulico, como la franja donde se concentra un caudal correspondiente a la avenida de periodo de retorno de 100 años sin producir una sobreelevación superior a 30 cm respecto a la situación natural, denominada en el estudio realizado como "profile" VID. Para ello se ha reducido la anchura de las secciones transversales mediante un encauzamiento (encroachment) de tal manera que la sobreelevación que se produzca con la avenida de 100 años no sobrepase los 30cm.

Datos del modelo.

Los datos básicos de partida que necesita el programa se refieren al modelo geométrico del cauce y los específicamente hidráulicos.

Los datos geométricos de entrada son los perfiles longitudinales realizados y los caudales para los que se realiza el cálculo, especificados anteriormente.

Un dato que es preciso introducir al programa es el coeficiente de Manning. Este coeficiente refleja la resistencia al escurrimiento que ofrece el canal, el cual dependerá de la rugosidad de la superficie, existencia o no de vegetación, irregularidad del canal, etc... Estos valores se han fijado siguiendo las recomendaciones de prestigiosas publicaciones ("Hidráulica de Canales Abiertos" Ven Te Chow 1959, "Revisión de Hidráulica Aplicada" Ed. Metcalf Eddy).

En cualquier caso, se opta por tomar valores conservadores que permitan un cierto margen de seguridad que cubran el inevitable margen de imprecisión de este tipo de modelos hidráulicos.

A lo largo de las márgenes del cauce del río se localiza vegetación de ribera, mientras que en las llanuras de inundación existen cultivos de pequeñas huertas y choperas para el aprovechamiento maderero, siendo por lo tanto los valores considerados:

- 1) Cauce principal: 0,035.
- 2) Llanuras de inundación: 0,050.

Los cálculos se han realizado para un régimen mixto (opción de mayor seguridad) comenzando por la sección más aguas abajo y calculando en sentido aguas arriba, ya que aunque la pendiente del cauce es escasa y tendida, existen varias estructuras que modifican el comportamiento hidráulico.



Las pérdidas de carga entre perfiles se calculan mediante la ecuación de la energía.

La condición de contorno es que la lámina de agua en los perfiles más aguas abajo y aguas arriba coincida con el calado normal en ese punto, calculado con una pendiente hacia aguas arriba igual a la pendiente media del fondo del cauce.

Las curvas del perfil longitudinal mantienen, para estas condiciones de contorno, pendientes uniformes y consistentes, lo que avala la bondad de las mismas.

3.6.3 Resultados.

Con los datos expuestos en epígrafes anteriores se realizan los cálculos hidráulicos.

Como resultado se obtienen las cotas de lámina de agua, velocidades y cotas de la línea de energía en cada una de las secciones transversales propuestas. En los anexos del presente estudio se incluyen los listados numéricos y gráficos de los cálculos realizados para ambas modelizaciones del río Jerga, en Murias de Rechivaldo y en Astorga.

En el cálculo de las vías de intenso desagüe se han presentado los siguientes casos:

- 1) Perfiles en los que se obtienen sobreelevaciones de 30 cm o muy próximas (25cm-35cm) en los que se adopta como válido el encauzamiento previsto.
- 2) Perfiles con sobreelevaciones superiores a los 30 cm incluso aunque el "encauzamiento" se defina por el exterior de la ocupación correspondiente a los 100 años de período de retorno. Esto viene provocado por la sobreelevación de los perfiles situados aguas abajo; no resulta posible obtener una sobreelevación de 30 cm sin reducir la sobreelevación aguas abajo. Por lo tanto, en estos perfiles se ha considerado que la vía de intenso desagüe (VID) y, por lo tanto, la ZFP
- 3) queda definida por el límite de la avenida de los 100 años.
- 4) Perfiles con sobreelevaciones muy bajas, o incluso negativas, motivadas por el encauzamiento previsto, que generan un resalto hidráulico con calado crítico en la sección considerada y una sobreelevación aguas arriba; esto ocurre, generalmente, en los perfiles cercanos a las estructuras existentes.

En los resultados gráficos se incluye lo siguiente:

- 1) Perfiles transversales con lámina de agua y línea de energía.
- 2) Perfil longitudinal con lámina de agua y línea de energía.
- 3) Geometría 3D y gráficas 3D de la cuenca de inundación.

También se incluye en los resultados gráficos una simulación del comportamiento hidráulico del cauce en Murias y en Astorga, que se refleja en los planos 6.1 (E: 1/2.000) y 6.2 (E: 1/5.000) respectivamente.

Para realizar la simulación del comportamiento hidráulico se tomó como base el MDT LIDAR, con una precisión geométrica de 5x5 m (elaborada por el IGN a partir de una nube de puntos LIDAR con una resolución de 0,5 punto/m²). Además del MDT se generaron curvas de nivel con un intervalo de 10 – 30 cm, que se emplearon, junto con el MDT para interpretar la geometría del terreno en aquellas zonas donde la simulación de HEC-RAS no ofrecía dato sobre la lámina de inundación y realizar una interpretación del comportamiento hidráulico en dichos puntos.

Como resumen se recogen al final de este apartado las tablas que ofrece el programa con los resultados obtenidos.

Cabe señalar que en lo que se refiere a la **zona de policía** y en base a los resultados del IHd, no será necesario su ampliación como permite la Ley (se permite la ampliación de la zona de policía para incluir la zona o zonas donde se concentra preferentemente el flujo o Zona de Flujo Preferente (ZPF), al objeto de proteger el régimen de corrientes en avenidas y reducir el riesgo de producción de daños en personas y bienes). Por otro lado, en la **ZPF** sólo podrán ser autorizadas por el Organismo de cuenca aquellas actividades no vulnerables frente a las avenidas y que no supongan una reducción significativa de la capacidad de desagüe de dicha vía (la ZFP es aquella constituida por la unión de la zona o zona donde se concentra preferentemente el flujo o Vía de Intenso Desagüe, y de la zona donde, para la avenida de 100 años de período de retorno, se pueden producir graves daños sobre las personas y los bienes o Zona de Inundación Peligrosa (ZIP), quedando delimitado su límite exterior mediante la envolvente de ambas).

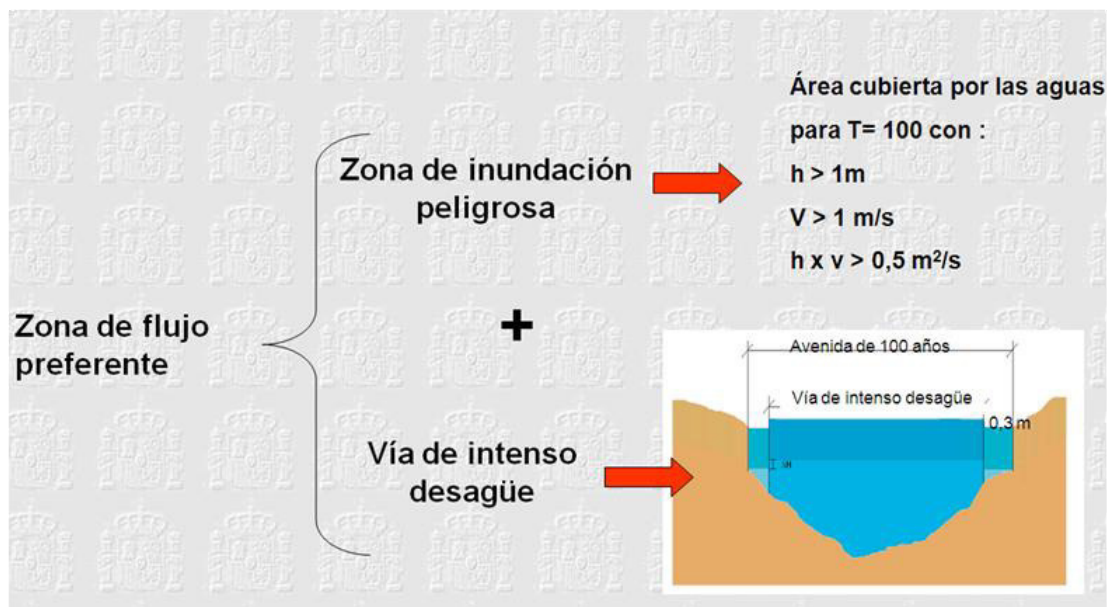


Ilustración 6. Esquema gráfico que define la zona de flujo preferente (ZFP) a partir de la vía de intenso desagüe (VID) y la zona de inundación peligrosa (ZIP). (Fuente: publicaciones del Ministerio de Fomento).

Para determinar la ZIP se han analizado los resultados de lámina de agua para los 100 años de período de retorno en cada una de las secciones propuestas, determinando para ello la opción Flow distribution location del programa HEC-RAS, a partir de la cual se obtienen las velocidades distribuidas a lo largo del perfil.

En los planos incorporados en el Anexo se recogen los gráficos que definen las láminas de inundación para los diferentes períodos de retorno de cálculo, así como la definición de la VID y ZIP y, por lo tanto, la ZFP.



Modelización en Murias de Rechivaldo.

HEC-RAS Plan: Plan 02 River: Jerga Reach: Murias

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Murias	390	MCO(5añ)	1.91	879.61	880.18		880.19	0.000761	0.44	4.37	10.44	0.22
Murias	390	50 años	22.10	879.61	880.95		881.08	0.003375	1.61	13.72	13.86	0.52
Murias	390	100 años	33.70	879.61	881.17	880.79	881.33	0.003456	1.84	24.48	61.11	0.54
Murias	390	500 años	68.40	879.61	881.78		881.88	0.001649	1.68	66.55	75.38	0.40
Murias	356	MCO(5añ)	1.91	879.50	880.16		880.17	0.000649	0.47	4.25	10.19	0.21
Murias	356	50 años	22.10	879.50	880.69	880.60	880.92	0.006120	2.29	12.63	26.59	0.71
Murias	356	100 años	33.70	879.50	880.95	880.86	881.18	0.005141	2.43	21.53	41.85	0.68
Murias	356	500 años	68.40	879.50	881.72		881.82	0.001728	1.92	66.32	66.07	0.42
Murias	326	MCO(5añ)	1.91	879.47	879.92	879.92	880.10	0.019308	1.83	1.04	2.95	0.99
Murias	326	50 años	22.10	879.47	880.70	880.42	880.75	0.002854	1.27	25.52	44.94	0.44
Murias	326	100 años	33.70	879.47	880.99	880.54	881.04	0.002019	1.24	37.07	53.61	0.39
Murias	326	500 años	68.40	879.47	881.73	880.79	881.77	0.000969	1.22	91.00	79.66	0.29
Murias	307	MCO(5añ)	1.91	879.19	879.87	879.45	879.88	0.000453	0.35	5.47	12.27	0.17
Murias	307	50 años	22.10	879.19	880.60	880.13	880.69	0.002166	1.37	16.74	33.91	0.42
Murias	307	100 años	33.70	879.19	880.84	880.34	880.98	0.002560	1.70	20.62	38.29	0.47
Murias	307	500 años	68.40	879.19	881.70	880.81	881.75	0.000648	1.17	94.27	82.95	0.25
Murias	305	Bridge										
Murias	300	MCO(5añ)	1.91	879.13	879.85	879.55	879.87	0.002717	0.68	2.82	8.69	0.38
Murias	300	50 años	22.10	879.13	880.45	880.32	880.66	0.007438	2.06	11.16	32.36	0.74
Murias	300	100 años	33.70	879.13	880.54	880.54	880.93	0.011928	2.80	12.60	33.74	0.95
Murias	300	500 años	68.40	879.13	881.02	881.02	881.64	0.010769	3.55	20.38	63.00	0.97
Murias	287	MCO(5añ)	1.91	879.04	879.83		879.84	0.001007	0.46	4.12	10.72	0.24
Murias	287	50 años	22.10	879.04	880.48		880.56	0.002762	1.36	22.58	54.23	0.46
Murias	287	100 años	33.70	879.04	880.60		880.71	0.003554	1.67	29.04	56.04	0.53
Murias	287	500 años	68.40	879.04	880.85		881.05	0.005096	2.32	43.70	59.96	0.66
Murias	262	MCO(5añ)	1.91	879.10	879.79		879.81	0.001492	0.64	2.97	6.22	0.30
Murias	262	50 años	22.10	879.10	880.46		880.50	0.001927	1.21	32.92	67.05	0.38
Murias	262	100 años	33.70	879.10	880.57		880.63	0.002472	1.48	40.63	68.94	0.44
Murias	262	500 años	68.40	879.10	880.82		880.92	0.003556	2.02	58.44	73.10	0.55
Murias	238	MCO(5añ)	1.91	879.14	879.69		879.75	0.005440	1.09	1.75	4.26	0.55
Murias	238	50 años	22.10	879.14	880.29	880.29	880.42	0.008500	1.98	20.05	70.36	0.76
Murias	238	100 años	33.70	879.14	880.38	880.38	880.54	0.010160	2.33	25.74	70.97	0.85
Murias	238	500 años	68.40	879.14	880.56	880.56	880.80	0.012689	3.01	38.97	72.37	0.99
Murias	219	MCO(5añ)	1.91	879.01	879.62		879.65	0.003747	0.77	2.47	7.80	0.44
Murias	219	50 años	22.10	879.01	880.16	880.08	880.24	0.005057	1.52	23.47	69.35	0.59
Murias	219	100 años	33.70	879.01	880.33		880.40	0.003701	1.51	35.39	70.12	0.52
Murias	219	500 años	68.40	879.01	880.50		880.65	0.006270	2.23	47.82	71.80	0.70
Murias	206	MCO(5añ)	1.91	879.00	879.38	879.38	879.55	0.019997	1.81	1.05	3.15	1.00
Murias	206	50 años	22.10	879.00	880.01	880.01	880.14	0.011422	1.88	17.16	61.45	0.85
Murias	206	100 años	33.70	879.00	880.29		880.36	0.003442	1.39	36.83	75.15	0.50
Murias	206	500 años	68.40	879.00	880.36		880.56	0.009710	2.47	41.89	75.87	0.86
Murias	180	MCO(5añ)	1.91	878.29	878.84		878.90	0.005057	1.07	1.78	4.22	0.53
Murias	180	50 años	22.10	878.29	879.91		879.95	0.001391	1.24	36.13	68.35	0.34
Murias	180	100 años	33.70	878.29	880.29		880.31	0.000701	1.04	67.29	90.84	0.25
Murias	180	500 años	68.40	878.29	880.33		880.41	0.002472	1.98	71.10	91.75	0.47
Murias	163	MCO(5añ)	1.91	878.09	878.84	878.41	878.86	0.001047	0.59	3.25	5.85	0.25
Murias	163	50 años	22.10	878.09	879.89	879.47	879.93	0.000998	1.13	32.24	74.38	0.29
Murias	163	100 años	33.70	878.09	880.28	879.62	880.30	0.000505	0.93	72.58	89.69	0.22
Murias	163	500 años	68.40	878.09	880.29	879.92	880.37	0.001988	1.86	73.79	90.08	0.43
Murias	75	MCO(5añ)	1.91	878.40	878.72	878.67	878.78	0.009742	1.11	1.72	6.86	0.71
Murias	75	50 años	22.10	878.40	879.58	879.46	879.84	0.006546	2.34	10.61	55.46	0.73
Murias	75	100 años	33.70	878.40	880.27	879.70	880.28	0.000435	0.84	86.33	130.96	0.21
Murias	75	500 años	68.40	878.40	880.24	880.12	880.31	0.002010	1.79	82.45	128.54	0.44
Murias	70	Bridge										
Murias	67	MCO(5añ)	1.91	878.19	878.46	878.45	878.56	0.016221	1.34	1.43	6.18	0.89
Murias	67	50 años	22.10	878.19	879.32	879.29	879.73	0.011183	2.86	7.96	34.29	0.92
Murias	67	100 años	33.70	878.19	879.58	879.58	880.16	0.011927	3.43	10.17	55.06	0.98
Murias	67	500 años	68.40	878.19	880.16	880.12	880.26	0.002467	2.02	70.98	120.84	0.48
Murias	45	MCO(5añ)	1.91	877.89	878.28	878.17	878.34	0.006000	1.07	1.79	5.01	0.57
Murias	45	50 años	22.10	877.89	879.28	879.13	879.50	0.006002	2.11	12.69	29.65	0.68
Murias	45	100 años	33.70	877.89	879.49	879.44	879.74	0.006011	2.39	20.20	43.75	0.70
Murias	45	500 años	68.40	877.89	879.86	879.84	880.16	0.006003	2.88	41.62	69.77	0.73

DOCUMENTO PARA LA APROBACIÓN INICIAL (DAI)
1. DOCUMENTOS DE INFORMACIÓN, ANÁLISIS Y DIAGNÓSTICO. 1.5. INFORME HIDROLÓGICO (IHd)

HEC-RAS Plan: Plan 04 River: Jerga Reach: Murias

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Murias	390	100 años	33.70	879.61	881.17	880.79	881.33	0.003456	1.84	24.48	61.11	0.54
Murias	390	VID	33.70	879.61	881.40	880.78	881.54	0.002445	1.88	20.02	14.07	0.45
Murias	356	100 años	33.70	879.50	880.95	880.86	881.18	0.005141	2.43	21.53	41.85	0.68
Murias	356	VID	33.70	879.50	881.11		881.41	0.005662	2.53	15.03	11.38	0.66
Murias	326	100 años	33.70	879.47	880.99	880.54	881.04	0.002019	1.24	37.07	53.61	0.39
Murias	326	VID	33.70	879.47	881.11	880.67	881.22	0.003764	1.81	23.57	21.06	0.54
Murias	307	100 años	33.70	879.19	880.84	880.34	880.98	0.002560	1.70	20.62	38.29	0.47
Murias	307	VID	33.70	879.19	881.07	880.33	881.17	0.001592	1.46	24.29	16.22	0.37
Murias	305	Bridge										
Murias	300	100 años	33.70	879.13	880.54	880.54	880.93	0.011928	2.80	12.60	33.74	0.95
Murias	300	VID	33.70	879.13	880.96	880.53	881.15	0.004090	1.95	17.32	13.38	0.55
Murias	287	100 años	33.70	879.04	880.60	880.40	880.71	0.003554	1.67	29.04	58.04	0.53
Murias	287	VID	33.70	879.04	880.96		881.09	0.002511	1.60	21.09	15.43	0.44
Murias	262	100 años	33.70	879.10	880.57		880.63	0.002472	1.48	40.63	68.94	0.44
Murias	262	VID	33.70	879.10	880.95		881.02	0.001612	1.45	33.56	30.54	0.38
Murias	238	100 años	33.70	879.14	880.98	880.38	880.54	0.010160	2.33	25.74	70.97	0.85
Murias	238	VID	33.70	879.14	880.70		880.95	0.007325	2.40	17.05	18.90	0.73
Murias	219	100 años	33.70	879.01	880.33	880.18	880.40	0.003701	1.51	35.39	70.12	0.52
Murias	219	VID	33.70	879.01	880.85		880.83	0.004219	1.94	18.74	16.87	0.57
Murias	206	100 años	33.70	879.00	880.29		880.36	0.003442	1.39	36.83	75.15	0.50
Murias	206	VID	33.70	879.00	880.81		880.78	0.003921	1.81	18.61	16.96	0.55
Murias	180	100 años	33.70	878.29	880.29		880.31	0.000701	1.04	67.29	90.84	0.25
Murias	180	VID	33.70	878.29	880.68		880.71	0.000506	1.01	51.01	32.00	0.22
Murias	163	100 años	33.70	878.09	880.28	879.62	880.30	0.000505	0.93	72.58	89.69	0.22
Murias	163	VID	33.70	878.09	880.67	879.62	880.70	0.000380	0.92	56.09	34.00	0.19
Murias	75	100 años	33.70	878.40	880.27	879.70	880.28	0.000435	0.84	86.33	130.96	0.21
Murias	75	VID	33.70	878.40	880.42	879.73	880.65	0.003686	2.15	15.69	8.37	0.50
Murias	70	Bridge										
Murias	67	100 años	33.70	878.19	879.58	879.58	880.16	0.011927	3.43	10.17	55.06	0.98
Murias	67	VID	33.70	878.19	879.71	879.71	880.45	0.017565	3.81	8.84	5.95	1.00
Murias	45	100 años	33.70	877.89	879.22	879.44	879.83	0.018530	3.53	10.87	25.05	1.18
Murias	45	VID	33.70	877.89	879.61	879.34	879.94	0.006007	2.55	13.22	10.16	0.71

Tabla 8. Tablas de resultados en la zona de Murias de Rechivaldo. (Fuente: elaboración propia en el programa HEC-RAS).

DOCUMENTO PARA LA APROBACIÓN INICIAL (DAI)
1. DOCUMENTOS DE INFORMACIÓN, ANÁLISIS Y DIAGNÓSTICO. 1.5. INFORME HIDROLÓGICO (IHd)

Modelización en Astorga.

HEC-RAS Plan: Plan 01 River: Jerga Reach: Astorga

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Cnt W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Astorga	1595	5 años	1.81	850.62	851.17	850.95	851.20	0.002361	0.76	2.53	6.01	0.37
Astorga	1595	50 años	22.10	850.62	852.53	851.86	852.67	0.002671	1.64	13.44	10.33	0.46
Astorga	1595	100 años	33.70	850.62	852.81	852.19	853.02	0.003561	2.04	16.52	11.38	0.54
Astorga	1595	500 años	68.40	850.62	853.17	852.93	853.72	0.007363	3.28	21.32	18.53	0.80
Astorga	1512	5 años	1.81	850.38	851.00		851.03	0.002051	0.74	2.57	5.52	0.35
Astorga	1512	50 años	22.10	850.38	852.27		852.43	0.003204	1.80	14.04	24.36	0.50
Astorga	1512	100 años	33.70	850.38	852.57		852.75	0.003258	1.98	23.78	41.53	0.52
Astorga	1512	500 años	68.40	850.38	853.05		853.23	0.003326	2.27	50.39	70.91	0.54
Astorga	1440	5 años	1.81	850.34	850.87	850.60	850.89	0.001714	0.67	2.87	6.34	0.32
Astorga	1440	50 años	22.10	850.34	852.12	851.50	852.22	0.002312	1.40	16.29	23.17	0.43
Astorga	1440	100 años	33.70	850.34	852.42	851.79	852.54	0.002314	1.55	26.73	46.30	0.44
Astorga	1440	500 años	68.40	850.34	852.98	852.51	853.07	0.001488	1.56	81.38	147.17	0.37
Astorga	1395	5 años	1.81	850.12	850.77	850.44	850.79	0.001113	0.58	3.30	6.55	0.26
Astorga	1395	50 años	22.10	850.12	852.04	851.38	852.08	0.001274	0.88	25.24	33.96	0.31
Astorga	1395	100 años	33.70	850.12	852.38	851.60	852.42	0.000886	0.92	40.92	59.72	0.27
Astorga	1395	500 años	68.40	850.12	852.95	852.02	852.99	0.000572	0.97	109.33	143.25	0.24
Astorga	1339	5 años	1.81	850.20	850.66	850.51	850.70	0.003777	0.86	2.22	6.25	0.46
Astorga	1339	50 años	22.10	850.20	851.91	851.41	851.99	0.002644	1.27	17.43	21.16	0.45
Astorga	1339	100 años	33.70	850.20	852.28	851.66	852.36	0.001673	1.25	31.92	67.43	0.37
Astorga	1339	500 años	68.40	850.20	852.93	852.21	852.96	0.000515	0.94	133.63	174.46	0.22
Astorga	1276	5 años	1.81	850.00	850.39	850.26	850.43	0.004814	0.93	2.06	6.06	0.51
Astorga	1276	50 años	22.10	850.00	851.46	851.18	851.72	0.006688	2.26	9.79	9.92	0.69
Astorga	1276	100 años	33.70	850.00	851.80	851.51	852.14	0.006789	2.61	12.90	12.17	0.72
Astorga	1276	500 años	68.40	850.00	852.86	852.20	852.92	0.000955	1.33	104.80	172.17	0.30
Astorga	1270		Bridge									
Astorga	1254	5 años	1.81	849.03	849.36	849.33	849.43	0.012715	1.16	1.65	7.44	0.79
Astorga	1254	50 años	22.10	849.03	850.61	850.10	850.77	0.003388	1.80	12.31	9.54	0.50
Astorga	1254	100 años	33.70	849.03	851.00	850.39	851.22	0.003549	2.08	16.11	10.11	0.53
Astorga	1254	500 años	68.40	849.03	850.69	851.08	852.08	0.027253	5.23	13.07	9.65	1.44
Astorga	1215	5 años	1.81	848.71	849.21	848.99	849.24	0.002293	0.74	2.58	6.19	0.36
Astorga	1215	50 años	22.10	848.71	850.49	849.89	850.64	0.003347	1.71	12.95	11.23	0.51
Astorga	1215	100 años	33.70	848.71	850.89	850.25	851.07	0.003398	1.87	17.98	13.90	0.52
Astorga	1215	500 años	68.40	848.71	851.42	850.96	851.77	0.004495	2.64	27.26	22.37	0.63
Astorga	1108	5 años	1.81	848.62	849.12	848.86	849.14	0.001747	0.67	2.86	6.53	0.32
Astorga	1108	50 años	22.10	848.62	850.34	849.74	850.48	0.003236	1.63	13.52	12.50	0.50
Astorga	1108	100 años	33.70	848.62	850.75	850.07	850.91	0.003140	1.73	19.51	16.40	0.51
Astorga	1108	500 años	68.40	848.62	851.47	850.79	851.57	0.001634	1.60	74.40	147.48	0.39
Astorga	1088	5 años	1.81	848.40	848.73	848.70	848.83	0.014826	1.37	1.39	5.50	0.87
Astorga	1088	50 años	22.10	848.40	849.78	849.59	850.08	0.007778	2.42	9.14	8.93	0.76
Astorga	1088	100 años	33.70	848.40	850.19	849.91	850.52	0.007126	2.58	13.08	10.87	0.75
Astorga	1088	500 años	68.40	848.40	850.68	850.75	851.29	0.008203	2.86	27.99	94.59	0.82
Astorga	1023	5 años	1.81	847.91	848.34	848.18	848.37	0.003764	0.86	2.22	6.27	0.46
Astorga	1023	50 años	22.10	847.91	849.53	849.05	849.70	0.003709	1.80	12.25	10.55	0.53
Astorga	1023	100 años	33.70	847.91	849.97	849.35	850.16	0.003606	1.92	17.52	13.56	0.54
Astorga	1023	500 años	68.40	847.91	850.68	850.07	850.94	0.003144	2.30	40.28	105.13	0.53
Astorga	943	5 años	1.81	847.51	847.98		848.02	0.005143	0.92	2.07	6.68	0.53
Astorga	943	50 años	22.10	847.51	849.22		849.39	0.003834	1.83	12.06	10.31	0.54
Astorga	943	100 años	33.70	847.51	849.67		849.86	0.003704	1.93	17.47	13.68	0.54
Astorga	943	500 años	68.40	847.51	850.45	849.78	850.68	0.002977	2.21	38.80	70.00	0.52
Astorga	898	5 años	1.81	847.29	847.83	847.59	847.86	0.002444	0.80	2.39	5.25	0.38
Astorga	898	50 años	22.10	847.29	848.75	848.59	849.12	0.009178	2.68	8.26	7.45	0.81
Astorga	898	100 años	33.70	847.29	849.15	848.95	849.59	0.009239	2.95	11.44	10.41	0.83
Astorga	898	500 años	68.40	847.29	850.41	849.80	850.54	0.002121	1.66	55.80	88.40	0.43
Astorga	890		Bridge									
Astorga	888	5 años	1.81	847.22	847.69	847.69	847.80	0.020122	1.51	1.26	5.44	0.99
Astorga	888	50 años	22.10	847.22	848.35	848.47	848.92	0.021621	3.35	6.59	9.75	1.25
Astorga	888	100 años	33.70	847.22	848.57	848.74	849.35	0.020751	3.92	8.59	10.09	1.28
Astorga	888	500 años	68.40	847.22	849.36	849.42	850.33	0.011526	4.36	15.68	15.01	1.05
Astorga	848	5 años	1.81	846.85	847.35	847.09	847.36	0.001008	0.49	3.93	9.78	0.24
Astorga	848	50 años	22.10	846.85	848.66	847.77	848.73	0.001128	1.17	18.94	12.88	0.31
Astorga	848	100 años	33.70	846.85	848.00	848.02	849.11	0.001408	1.44	23.43	13.58	0.35
Astorga	848	500 años	68.40	846.85	849.51	848.62	849.75	0.002308	2.19	35.59	34.09	0.47
Astorga	786	5 años	1.81	846.85	847.26	847.06	847.28	0.001844	0.81	3.14	8.79	0.32
Astorga	786	50 años	22.10	846.85	848.56	847.77	848.65	0.001567	1.31	16.93	12.47	0.36
Astorga	786	100 años	33.70	846.85	848.87	848.05	849.00	0.002002	1.61	20.89	13.35	0.41
Astorga	786	500 años	68.40	846.85	849.17	848.67	849.54	0.004670	2.68	28.49	47.61	0.64

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada definitivamente en sesión plenaria del Ayuntamiento de Astorga, en su sesión ordinaria, de fecha 17.05.2018.



Fdo. D. Manuel Alja Rodríguez



HEC-RAS Plan: Plan 01 River: Jerga Reach: Astorga (Continued)

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Astorga	713	5 años	1.91	846.50	847.22	846.76	847.23	0.000340	0.36	5.30	8.81	0.15
Astorga	713	50 años	22.10	846.50	848.45	847.49	848.51	0.002033	1.10	20.07	23.92	0.38
Astorga	713	100 años	33.70	846.50	848.76	847.77	848.83	0.002122	1.16	29.13	33.85	0.40
Astorga	713	500 años	68.40	846.50	849.00	848.59	849.16	0.003936	1.82	40.20	73.22	0.56
Astorga	638	5 años	1.91	846.46	847.17		847.19	0.000932	0.51	3.74	7.97	0.24
Astorga	638	50 años	22.10	846.46	848.15		848.31	0.003157	1.78	13.49	25.80	0.50
Astorga	638	100 años	33.70	846.46	848.11	847.92	848.51	0.008344	2.84	12.44	20.87	0.80
Astorga	638	500 años	68.40	846.46	848.68	848.68	848.87	0.003762	2.44	62.15	151.69	0.57
Astorga	563	5 años	1.91	846.58	847.12	846.77	847.13	0.000685	0.38	5.09	14.14	0.20
Astorga	563	50 años	22.10	846.58	848.20	847.41	848.21	0.000329	0.49	63.96	181.44	0.16
Astorga	563	100 años	33.70	846.58	848.28	847.58	848.30	0.000502	0.64	77.58	166.92	0.20
Astorga	563	500 años	68.40	846.58	848.48	847.99	848.52	0.000845	0.93	112.71	180.28	0.27
Astorga	526	5 años	1.91	846.50	847.02	846.91	847.06	0.006021	0.90	2.11	7.84	0.56
Astorga	526	50 años	22.10	846.50	848.17	847.67	848.19	0.000685	0.83	54.91	152.62	0.24
Astorga	526	100 años	33.70	846.50	848.24	847.96	848.27	0.001094	1.09	65.53	160.42	0.30
Astorga	526	500 años	68.40	846.50	848.41	848.18	848.47	0.001868	1.55	94.29	167.64	0.40
Astorga	520	Bridge										
Astorga	512	5 años	1.91	846.49	846.71	846.64	846.75	0.006536	0.80	2.38	11.50	0.56
Astorga	512	50 años	22.10	846.49	847.57	847.22	847.72	0.003699	1.70	13.04	67.52	0.54
Astorga	512	100 años	33.70	846.49	847.69	847.45	847.96	0.005929	2.30	14.65	72.14	0.69
Astorga	512	500 años	68.40	846.49	848.39	847.93	848.41	0.000502	0.80	143.10	189.76	0.21
Astorga	463	5 años	1.91	846.00	846.54		846.57	0.002266	0.69	2.75	7.21	0.36
Astorga	463	50 años	22.10	846.00	847.54		847.57	0.001494	0.95	44.99	152.67	0.33
Astorga	463	100 años	33.70	846.00	847.90		847.92	0.000630	0.74	87.19	171.40	0.23
Astorga	463	500 años	68.40	846.00	848.38		848.39	0.000258	0.63	195.02	197.38	0.15
Astorga	389	5 años	1.91	845.90	846.29		846.33	0.004597	0.87	2.18	7.04	0.50
Astorga	389	50 años	22.10	845.90	847.47		847.49	0.000760	0.85	56.65	180.77	0.25
Astorga	389	100 años	33.70	845.90	847.77		847.78	0.000311	0.63	115.18	198.31	0.17
Astorga	389	500 años	68.40	845.90	848.37		848.37	0.000150	0.55	241.72	217.10	0.12
Astorga	314	5 años	1.91	845.48	846.21	845.83	846.22	0.000687	0.43	4.48	10.15	0.20
Astorga	314	50 años	22.10	845.48	847.40	846.57	847.43	0.000728	0.85	35.15	93.34	0.25
Astorga	314	100 años	33.70	845.48	847.73	846.80	847.75	0.000420	0.76	79.79	151.64	0.20
Astorga	314	500 años	68.40	845.48	848.34	847.43	848.36	0.000230	0.70	173.51	153.50	0.15
Astorga	300	5 años	1.91	845.30	845.91	845.82	845.98	0.007599	1.11	1.71	5.58	0.64
Astorga	300	50 años	22.10	845.30	846.86	846.89	847.16	0.007725	2.42	9.12	12.35	0.78
Astorga	300	100 años	33.70	845.30	847.17	847.00	847.56	0.007428	2.76	12.23	35.26	0.80
Astorga	300	500 años	68.40	845.30	848.23	847.64	848.29	0.000960	1.29	76.43	67.24	0.31
Astorga	275	Bridge										
Astorga	250	5 años	1.91	845.28	845.82	845.61	845.84	0.002322	0.69	2.76	7.58	0.37
Astorga	250	50 años	22.10	845.28	846.75	846.39	846.96	0.004235	1.99	11.10	9.75	0.59
Astorga	250	100 años	33.70	845.28	847.08	846.68	847.36	0.004525	2.37	14.23	138.48	0.63
Astorga	250	500 años	68.40	845.28	848.24	847.34	848.25	0.000141	0.59	236.18	207.02	0.12
Astorga	200	5 años	1.91	845.15	845.67	845.49	845.70	0.002983	0.79	2.41	6.34	0.41
Astorga	200	50 años	22.10	845.15	846.69	846.36	846.77	0.002141	1.52	20.80	127.06	0.42
Astorga	200	100 años	33.70	845.15	847.10	846.54	847.18	0.001498	1.52	31.11	164.56	0.37
Astorga	200	500 años	68.40	845.15	848.14	846.92	848.23	0.000904	1.61	57.15	178.20	0.31
Astorga	169	5 años	1.91	845.15	845.46	845.37	845.50	0.005228	0.85	2.25	11.55	0.53
Astorga	169	50 años	22.10	845.15	846.28	846.08	846.57	0.006444	2.41	9.17	23.60	0.74
Astorga	169	100 años	33.70	845.15	846.59	846.37	847.00	0.006323	2.84	11.88	28.32	0.77
Astorga	169	500 años	68.40	845.15	847.37	847.08	848.07	0.005993	3.71	18.46	156.05	0.80
Astorga	150	Bridge										
Astorga	144	5 años	1.91	844.85	845.10	845.10	845.20	0.020320	1.38	1.39	8.84	0.99
Astorga	144	50 años	22.10	844.85	845.89	845.89	846.33	0.012739	2.94	7.51	21.04	0.99
Astorga	144	100 años	33.70	844.85	846.18	846.18	846.76	0.011729	3.38	9.98	166.28	0.99
Astorga	144	500 años	68.40	844.85	846.88	846.88	847.82	0.010128	4.29	15.95	222.69	1.00
Astorga	86	5 años	1.91	844.00	844.34	844.25	844.40	0.007307	1.08	1.76	5.57	0.62
Astorga	86	50 años	22.10	844.00	845.63	845.32	845.72	0.004432	1.27	17.36	30.50	0.54
Astorga	86	100 años	33.70	844.00	845.87	845.53	845.94	0.002884	1.22	35.62	109.57	0.45
Astorga	86	500 años	68.40	844.00	845.55	845.93	846.62	0.006078	4.58	14.95	27.32	1.97
Astorga	18	5 años	1.91	843.53	843.90	843.79	843.95	0.006003	1.03	1.85	5.54	0.57
Astorga	18	50 años	22.10	843.53	845.20	844.71	845.36	0.006008	1.78	12.43	18.07	0.65
Astorga	18	100 años	33.70	843.53	845.51	845.19	845.67	0.006002	1.75	20.98	61.40	0.65
Astorga	18	500 años	68.40	843.53	845.79	845.76	845.95	0.006004	2.01	52.03	207.50	0.68

ILICENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada inicialmente en sesión plenaria del Ayuntamiento de Astorga, de fecha 17.05.2018.



Fdo. D. Manuel Alja Rodríguez

DOCUMENTO PARA LA APROBACIÓN INICIAL (DAI)
1. DOCUMENTOS DE INFORMACIÓN, ANÁLISIS Y DIAGNÓSTICO. 1.5. INFORME HIDROLÓGICO (IHd)

HEC-RAS Plan: Plan 04 VID River: Jerga Reach: Astorga

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Astorga	1595	100 años	33.70	850.62	852.81	852.19	853.02	0.003561	2.04	16.52	11.38	0.54
Astorga	1595	VID	33.70	850.62	853.10	852.19	853.24	0.002095	1.69	19.91	12.08	0.42
Astorga	1512	100 años	33.70	850.38	852.57		852.75	0.003258	1.98	23.78	41.53	0.52
Astorga	1512	VID	33.70	850.38	852.88		853.06	0.002474	1.87	18.02	10.74	0.46
Astorga	1440	100 años	33.70	850.34	852.42	851.79	852.54	0.002314	1.55	26.73	46.30	0.44
Astorga	1440	VID	33.70	850.34	852.77	851.76	852.90	0.001689	1.58	21.34	10.50	0.35
Astorga	1395	100 años	33.70	850.12	852.38	851.60	852.42	0.000886	0.92	40.92	59.72	0.27
Astorga	1395	VID	33.70	850.12	852.72	851.56	852.79	0.000899	1.17	28.77	14.50	0.27
Astorga	1339	100 años	33.70	850.20	852.28	851.66	852.36	0.001673	1.25	31.92	67.43	0.37
Astorga	1339	VID	33.70	850.20	852.48	851.66	852.71	0.003319	2.10	16.06	7.80	0.47
Astorga	1276	100 años	33.70	850.00	851.80	851.51	852.14	0.006789	2.61	12.90	12.17	0.72
Astorga	1276	VID	33.70	850.00	851.86	851.53	852.35	0.009617	3.09	10.89	6.00	0.73
Astorga	1270	Bridge										
Astorga	1254	100 años	33.70	849.03	851.00	850.39	851.22	0.003549	2.09	16.11	10.11	0.53
Astorga	1254	VID	33.70	849.03	851.29	850.38	851.47	0.002604	1.90	17.73	8.50	0.42
Astorga	1215	100 años	33.70	848.71	850.88	850.25	851.07	0.003398	1.87	17.99	13.80	0.52
Astorga	1215	VID	33.70	848.71	851.16	850.19	851.37	0.002785	2.00	16.85	7.50	0.43
Astorga	1108	100 años	33.70	848.62	850.75	850.07	850.91	0.003140	1.73	19.51	16.40	0.51
Astorga	1108	VID	33.70	848.62	851.06	850.03	851.24	0.002358	1.87	18.02	8.00	0.40
Astorga	1088	100 años	33.70	848.40	850.19	849.91	850.52	0.007126	2.58	13.08	10.87	0.75
Astorga	1088	VID	33.70	848.40	850.51	849.98	850.91	0.006996	2.79	12.07	6.00	0.63
Astorga	1023	100 años	33.70	847.91	849.97	849.35	850.16	0.003606	1.92	17.52	13.56	0.54
Astorga	1023	VID	33.70	847.91	850.27	849.39	850.53	0.004034	2.28	14.76	6.50	0.48
Astorga	943	100 años	33.70	847.51	849.67		849.86	0.003704	1.93	17.47	13.68	0.54
Astorga	943	VID	33.70	847.51	849.98		850.22	0.003545	2.16	15.60	6.75	0.45
Astorga	898	100 años	33.70	847.29	849.15	848.95	849.59	0.009239	2.95	11.44	10.41	0.83
Astorga	898	VID	33.70	847.29	849.29	849.03	849.91	0.012434	3.49	9.67	5.00	0.80
Astorga	890	Bridge										
Astorga	888	100 años	33.70	847.22	848.57	848.74	849.35	0.020751	3.92	8.59	10.09	1.28
Astorga	888	VID	33.70	847.22	849.00	848.96	849.70	0.016201	3.70	9.12	6.00	0.96
Astorga	848	100 años	33.70	846.85	849.00	848.02	849.11	0.001408	1.44	23.43	13.58	0.35
Astorga	848	VID	33.70	846.85	849.33	848.02	849.42	0.000917	1.27	26.63	11.85	0.27
Astorga	786	100 años	33.70	846.85	848.87	848.05	849.00	0.002002	1.61	20.89	13.35	0.41
Astorga	786	VID	33.70	846.85	849.14	848.11	849.32	0.002569	1.87	18.05	8.00	0.40
Astorga	713	100 años	33.70	846.50	848.76	847.77	848.83	0.002122	1.16	29.13	33.95	0.40
Astorga	713	VID	33.70	846.50	848.98	847.81	849.14	0.002153	1.76	19.16	8.00	0.36
Astorga	638	100 años	33.70	846.46	848.11	847.92	848.51	0.006344	2.84	12.44	20.87	0.80
Astorga	638	VID	33.70	846.46	848.43		848.84	0.007632	2.81	11.99	6.75	0.67
Astorga	583	100 años	33.70	846.58	848.28	847.58	848.30	0.000502	0.64	77.58	166.92	0.20
Astorga	583	VID	33.70	846.58	848.66	847.58	848.67	0.000219	0.52	72.60	61.00	0.14
Astorga	526	100 años	33.70	846.50	848.24	847.96	848.27	0.001094	1.09	65.53	160.42	0.30
Astorga	526	VID	33.70	846.50	848.48	847.96	848.64	0.002458	1.83	22.13	22.10	0.47
Astorga	520	Bridge										
Astorga	512	100 años	33.70	846.49	847.69	847.45	847.96	0.005929	2.30	14.65	72.14	0.69
Astorga	512	VID	33.70	846.49	848.16	847.64	848.40	0.004090	2.17	15.56	10.00	0.55
Astorga	463	100 años	33.70	846.00	847.80		847.82	0.000630	0.74	87.19	171.40	0.23
Astorga	463	VID	33.70	846.00	848.19		848.25	0.001145	1.22	32.58	27.00	0.32
Astorga	389	100 años	33.70	845.90	847.77		847.78	0.000311	0.63	115.18	198.31	0.17
Astorga	389	VID	33.70	845.90	848.11		848.18	0.000897	1.23	35.05	25.00	0.29
Astorga	314	100 años	33.70	845.48	847.73	848.80	847.75	0.000420	0.76	79.79	151.64	0.20
Astorga	314	VID	33.70	845.48	848.01	848.78	848.10	0.001086	1.32	25.54	11.75	0.29
Astorga	300	100 años	33.70	845.30	847.17	847.00	847.56	0.007428	2.76	12.23	35.26	0.80
Astorga	300	VID	33.70	845.30	847.27	847.03	847.71	0.009151	2.97	11.35	7.50	0.77
Astorga	275	Bridge										

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Astorga, 19 de mayo de 2018
EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez



HEC-RAS Plan: Plan 04 VID River: Jerga Reach: Astorga (Continued)

Reach	River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Froude # Chl
Astorga	250	100 años	33.70	845.28	847.08	846.68	847.36	0.004525	2.37	14.23	138.48	0.63
Astorga	250	VID	33.70	845.28	847.36	846.67	847.56	0.002625	1.99	16.97	10.10	0.48
Astorga	200	100 años	33.70	845.15	847.10	846.54	847.18	0.001498	1.52	31.11	164.56	0.37
Astorga	200	VID	33.70	845.15	847.40	846.54	847.45	0.000763	1.20	38.65	39.61	0.27
Astorga	169	100 años	33.70	845.15	846.59	846.37	847.00	0.006323	2.84	11.88	28.32	0.77
Astorga	169	VID	33.70	845.16	846.83	846.57	847.31	0.010153	3.07	10.97	6.70	0.77
Astorga	150	Bridge										
Astorga	144	100 años	33.70	844.85	846.18	846.18	846.76	0.011729	3.38	9.98	166.28	0.99
Astorga	144	VID	33.70	844.85	846.50	846.18	846.86	0.005301	2.66	12.67	22.73	0.70
Astorga	86	100 años	33.70	844.00	845.87	845.53	845.94	0.002885	1.22	35.61	109.56	0.45
Astorga	86	VID	33.70	844.00	846.22		846.54	0.005248	2.52	13.35	6.30	0.55
Astorga	18	100 años	33.70	843.53	845.51	845.19	845.67	0.006002	1.75	20.98	61.40	0.65
Astorga	18	VID	33.70	843.53	845.81	845.14	846.16	0.006000	2.62	12.88	6.00	0.57

Tabla 9. Tablas de resultados en la zona de Astorga. (Fuente: elaboración propia en el programa HEC-RAS).

3.7 CONCLUSIONES.

Las consecuencias del IHd desde el punto de vista urbanístico en la zona sur del núcleo de Astorga, son bastante relevantes como vamos a describir a continuación, no tanto en lo que se refiere al ZFP propiamente dicho, sino a la zona inundable determinada por la avenida T-100. Por el contrario, en el núcleo de Murias, las implicaciones a nivel urbanístico son muy escasas (al menos del lado del núcleo). Por lo tanto la ordenación propuesta al sur del núcleo de Astorga, en la zona ineditada comprendida entre el río Jerga y el barrio de Santa Clara, se ha visto condicionada por los resultados del IHd especialmente tras la última modificación de la LUCyL operada a través de la Ley 7/2014), habiéndose tenido que desestimar la propuesta esbozada en el Documento de Inicio del trámite ambiental que preveía la creación de un sector de SU-NC en esa zona.

Ciertamente tras el resultado del IHd surgió la posibilidad de plantear una bolsa de suelo al sur del núcleo de Astorga, ya que si bien, las avenidas con periodo de retorno de 100 años (T-100) y de 500 años (T-500) afectaban a una gran parte de dichos terrenos, la ZFP los afectaba de forma mucho más limitada y perfectamente asumible en la ordenación de un sector de SU-NC, y bien entendido que los criterios sobre protección contra inundaciones establecidos en la normativa sectorial hidráulica únicamente prohibía la edificación en la ZFP pero no así en las zonas afectadas por las avenidas T-100 ni T-500. Por ello, el primer planteamiento fue la delimitación de un sector de SU-NC en esa zona. Esta situación se ha visto sustancialmente modificada por la nueva normativa urbanística, que ignorando (en apariencia) los criterios de la normativa hidráulica, restringe la clasificación de suelo en las zonas afectadas por la T-100 y T-500:

- 1) Para los terrenos afectados por la avenida T-100: no pueden clasificarse como SU o SUR, salvo que ya tuviesen esa clasificación antes del 19-10-2014.
- 2) Para los terrenos afectados por la avenida T-500: pueden clasificarse como SU o SUR aunque estuviesen clasificados como SR antes del 19-10-2014.
- 3) Para los terrenos afectados por las avenidas T-100 o T-500 que no se clasifiquen como SU o SUR:
 - a) Debe optarse por una de las siguientes alternativas:
 - i) Clasificarlos como SR.
 - ii) Adscribirlos a un sistema general (el de "espacios libres" o el de "espacios protegidos"), cuando se considere necesario que sean de titularidad pública.
 - b) Todas las construcciones o instalaciones "con ocupación humana permanente" que existan en ellos, deben declararse en situación de fuera de ordenación.

En el núcleo de Astorga, una buena parte de los terrenos situados al sur del cauce del río Jerga, actualmente clasificados como SR, están afectados por la avenida T-100, por lo que en aplicación de los nuevos criterios de la LUCyL sobre prevención de riesgos naturales no pueden de ningún modo reclasificarse como SU-NC en la revisión del PGOU. En cambio, sí que sería posible reclasificar como SU-C algunas franjas de terreno que no están afectadas por la avenida T-100, y en muchos tramos tampoco por la T-500. Ésta es por tanto la opción de ordenación para la zona sur del núcleo de Astorga que propone la revisión del PGOU.

Como hemos indicado, las consecuencias del IHd en el núcleo de Murias de Rechivaldo no son importantes desde el punto de vista urbanístico, puesto que no se prevé ningún crecimiento en la zona norte del núcleo lindando con el cauce del río Jerga.



Respecto a los posibles usos del suelo en las zonas definidas en el artículo 72. Protección contra inundaciones, del Real Decreto 478/2013, de 21 de junio, por el que se aprueba el Plan Hidrológico de la parte española de la Demarcación Hidrográfica del Duero se indica que se deberán tener en cuenta las siguientes consideraciones:

- 1) Los usos permitidos en la zona de flujo preferente serán tales que los daños potenciales por avenida sean moderados y no se obstruya el flujo de las aguas.
- 2) En el resto de la *zona inundable fuera de la zona de flujo preferente*, las limitaciones al uso del suelo no van encaminadas a preservar el régimen de corrientes sino a evitar daños importantes:
 - a) Las futuras edificaciones de carácter residencial deben tener la planta baja a una cota tal que no sean afectadas por la avenida de 100 años.
 - b) Las construcciones no residenciales (industriales, comerciales, etc.) deben situarse a cotas suficientes para evitar que durante la avenida de 100 años se produzcan alturas de inundación sobre el suelo superiores a 0,50 m., salvo que se hubieran adoptado en todo el contorno medidas impermeabilizadoras hasta el nivel de dicha avenida.

Es poco probable que se produzcan las situaciones mencionadas en el apdo.2, puesto que la revisión del PGOU no clasifica SU ni SUR en el interior de la avenida T-100, salvo alguna pequeña zona que corresponde a terrenos que ya estaban clasificados como SU-C en el PGOU-1985.

Abril de 2015

Por TECOPY, S.A.
EL INGENIERO AUTOR DEL INFORME

Fdo: Félix Zambrano Martín
Ingeniero de Caminos, Canales y Puertos

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada definitivamente en sesión plenaria del Ayuntamiento de Astorga, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018
EL SECRETARIO GENERAL



Fdo. D. Manuel Alja Rodríguez



C) ANEXOS.

1. ANEXO 1. PLANOS.

- 1.- Cuenca del río Jerga. Escala: 1/25.000.
- 2.- Tramos del Estudio. Escala: 1/20.000.
- 3.1.- Perfiles transversales estudio en Murias de Rechivaldo. Escala 1/2.000.
- 3.2.- Perfiles transversales estudio en Astorga. Escala: 1/5.000.
- 4.1.- Lámina de inundación en Murias de Rechivaldo. Escala: 1/2.000.
- 4.2.- Lámina de inundación en Astorga. Escala: 1/5.000.
- 5.1.- Flujo preferente Murias de Rechivaldo. Escala: 1/2.000.
- 5.2.- Flujo preferente Astorga. Escala: 1/5.000.
- 6.1.- Interpretación de los datos obtenidos: simulación del comportamiento hidráulico del cacuce en Murias de Rechivaldo. E: 1/2.000.
- 6.2.- Interpretación de los datos obtenidos: simulación del comportamiento hidráulico del cauce en Astorga. E: 1/5.000.

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada definitivamente en sesión plenaria del Ayuntamiento de Astorga, de fecha 17.05.2018.

Astorga, 18 de mayo de 2018
EL SECRETARIO GENERAL
Fdo. D. Manuel Alja Rodríguez

CUENCA HIDROGRÁFICA DEL RÍO JERGA

CUENCA HIDROGRÁFICA DEL RÍO JERGA

- CUENCA HIDROGRÁFICA DEL RÍO JERGA
- HIDROGRAFÍA
- Ríos
- Arroyos

TOPOGRÁFICOS

TOPOGRÁFICOS



MTN25 RÁSTER

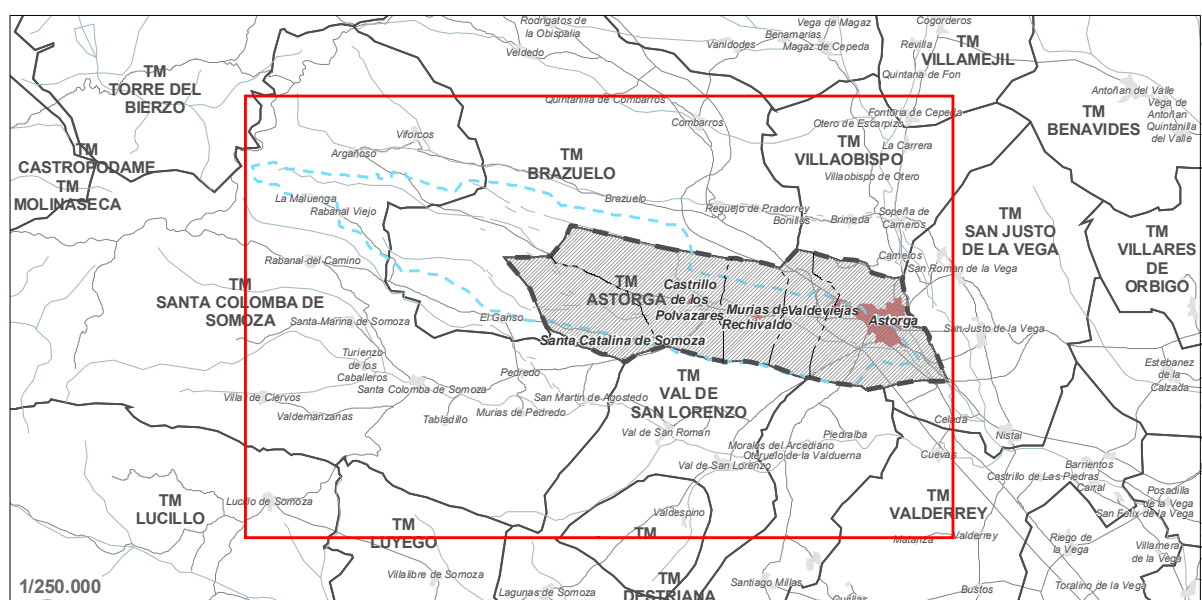
Archivos ráster del Mapa Topográfico Nacional 1:25.000 que incluyen sombreado de relieve.

Veladura exterior a la Cuenca del Río Jerga

DIAGRAMA para tener control que la presente documentación, relativa a la
Revisión del PGOU de Astorga, ha aprobado igualmente en sesión plenaria
del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.
Astorga, 10 de mayo de 2018
EL SECRETARIO GENERAL
Fdo. D. Manuel Alja Rodríguez

CARTOGRAFÍA ELABORADA A PARTIR DE:

CARTOGRAFÍA DERIVADA APORTADA POR EL CENTRO DE INFORMACIÓN TERRITORIAL (CIT)
TOPOGRÁFICO NACIONAL A ESCALA 1:25.000 (MTN25)
SISTEMA DE PROYECCIÓN: EUROPEAN DATUM 50 HUSO 28 N ZONA UM (ED0028N)
SISTEMA DE REPRESENTACIÓN: UTM
LONGITUDES REFERIDAS AL MERIDIANO DE GREENWICH
ALTITUDES REFERIDAS AL NIVEL DEL MAR EN ALICANTE
ACTUALIZADA PUNTUALMENTE POR LOS TÉCNICOS DEL AYUNTAMIENTO DE ASTORGA



REVISIÓN DEL PLAN GENERAL DE ORDENACIÓN URBANA DE

ASTORGA

DOCUMENTOS DE INFORMACIÓN ANÁLISIS Y DIAGNÓSTICO
INFORME HIDROLÓGICO

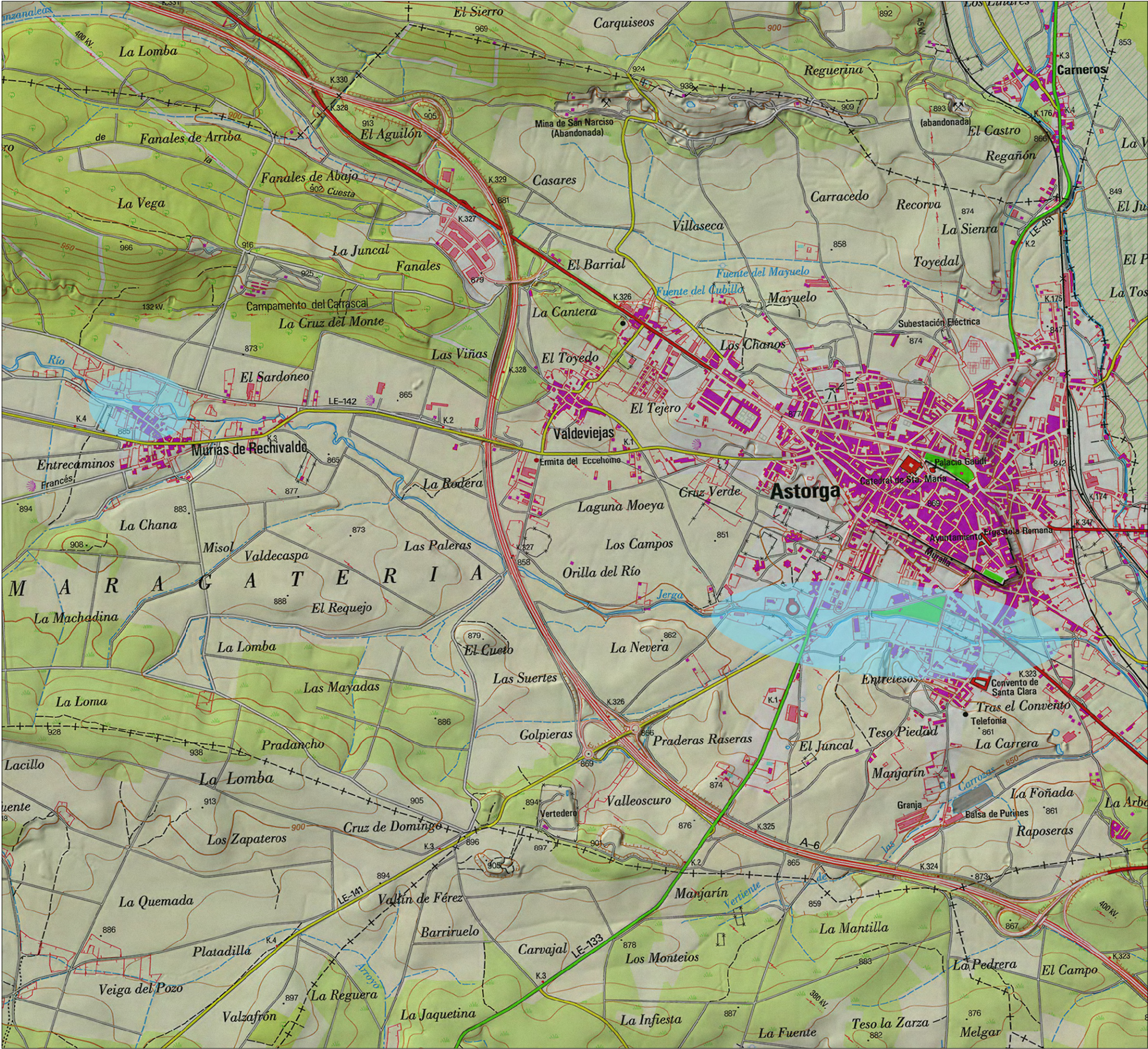
DICIEMBRE 2017

PLANO: CUENCA DEL RÍO JERGA

ESCALA: 1:25.000

EQUIPO REDACTOR: cotesa





TRAMOS DEL ESTUDIO

TRAMOS DEL ESTUDIO

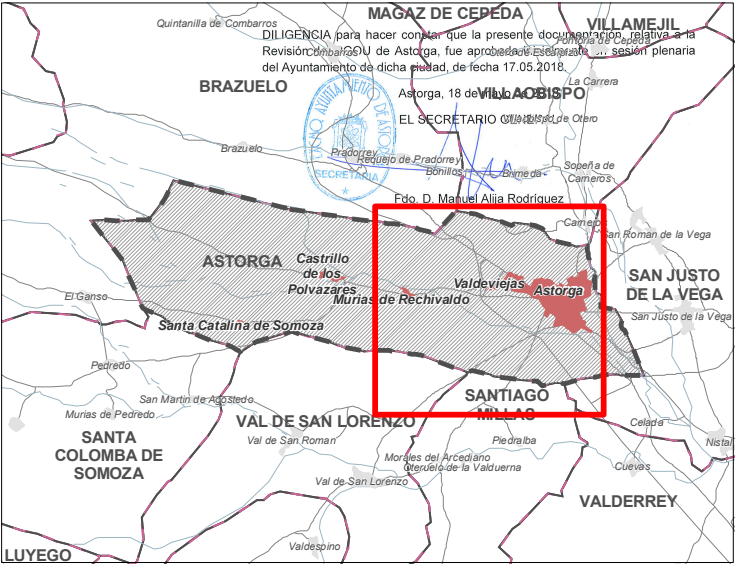
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TOPOGRÁFICOS



MTN25 RÁSTER

Archivos ráster del Mapa Topográfico Nacional 1:25.000 que incluyen sombreado de relieve.



REVISIÓN DEL PLAN GENERAL DE ORDENACIÓN URBANA DE A S T O R G A

DOCUMENTOS DE INFORMACIÓN ANÁLISIS Y DIAGNÓSTICO
INFORME HIDROLÓGICO

DICIEMBRE 2017

PLANO:

TRAMOS DEL ESTUDIO

ESCALA: 1:20.000

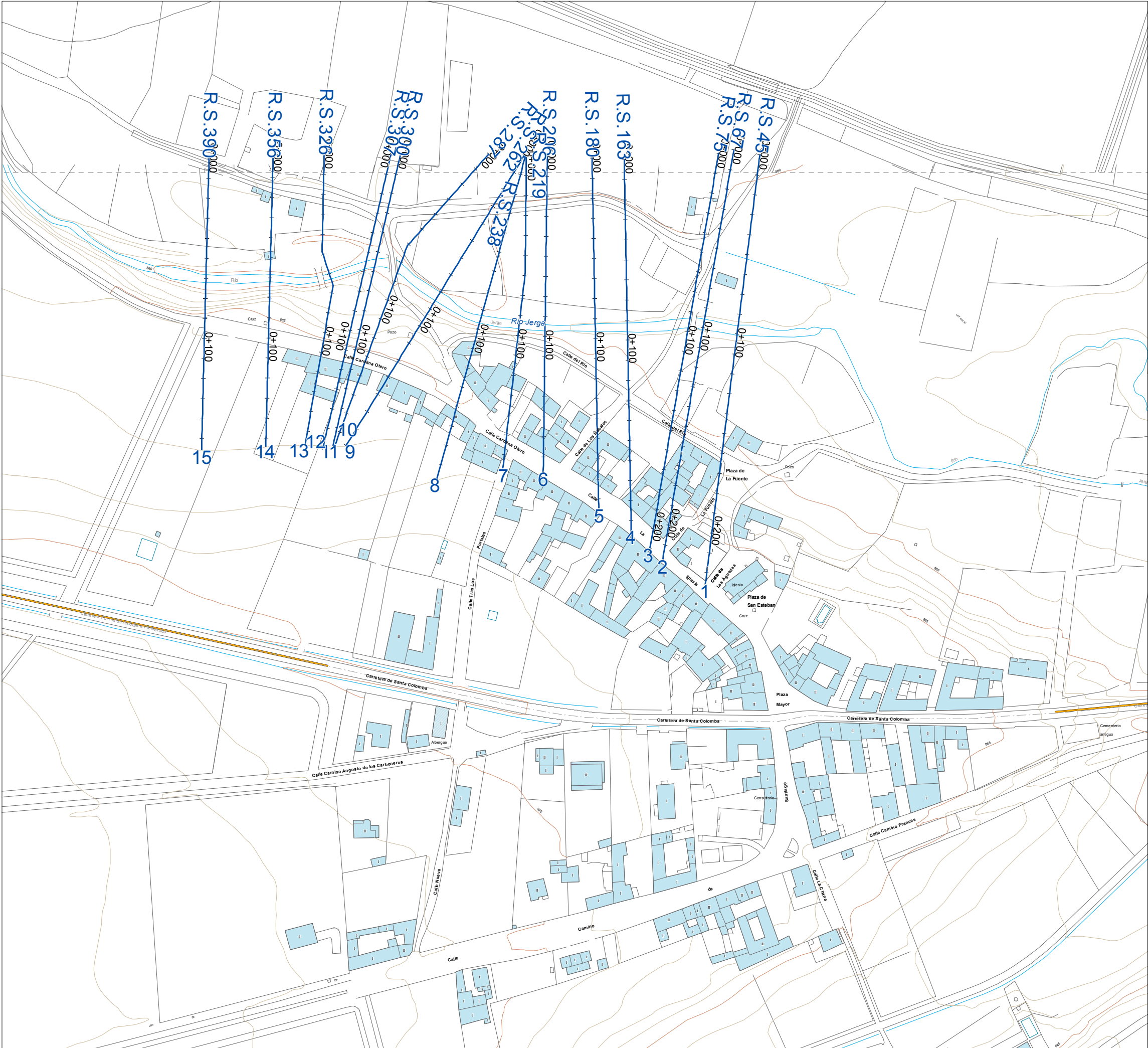
EQUIPO
REDACTOR: **cotesa**



AYUNTAMIENTO
DE ASTORGA



DIAD/IHd
PIHd-2



PERFILES TRANSVERSALES

PERFILES TRANSVERSALES



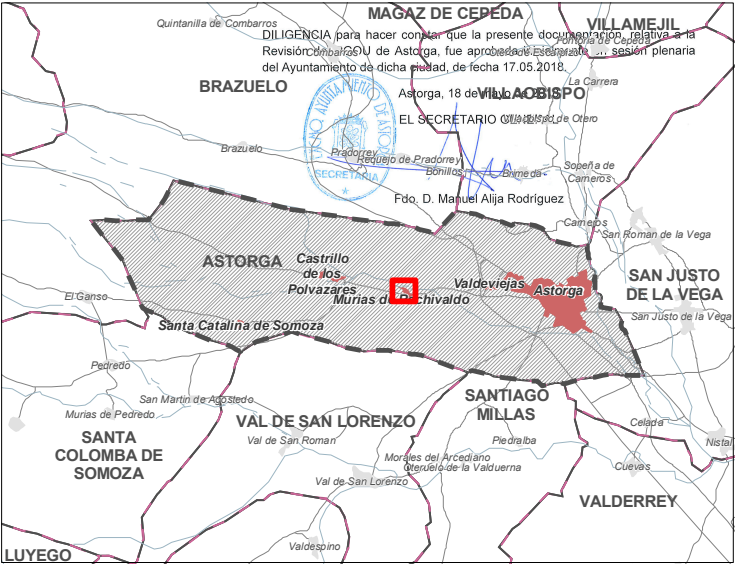
PERFILES TRANSVERSALES

CARTOGRAFÍA BASE

- + - + - + - Término municipal
- Edificaciones
- Vías de comunicación
- Ferrocarril
- Cursos fluviales
- Curvas de nivel

CARTOGRAFÍA ELABORADA A PARTIR DE:

CARTOGRAFÍA DERIVADA APORTADA POR EL CENTRO DE INFORMACIÓN TERRITORIAL (JCyL).
CARTOGRAFÍA BÁSICA TERRITORIAL: SERIES 1:5.000 EN EL ÁMBITO DE LA HOJA Nº 193-I DEL MAPA TOPOGRÁFICO NACIONAL A ESCALA 1:25.000 (MTN-25) Y 1:10.000 EN EL ÁMBITO DE LA HOJA Nº 192-II DEL MTN-25 (AL OESTE DEL PLANO) DE LA JUNTA DE CASTILLA Y LEÓN.
SISTEMA DE PROYECCIÓN: EUROPEAN DATUM 50 HUSO 29 N ZONA UM (ED5029N).
SISTEMA DE REPRESENTACIÓN: U.T.M.
LONGITUDES REFERIDAS AL MERIDIANO DE GREENWICH.
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A S T O R G A

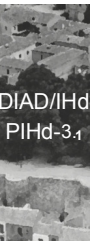
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INFORME HIDROLÓGICO

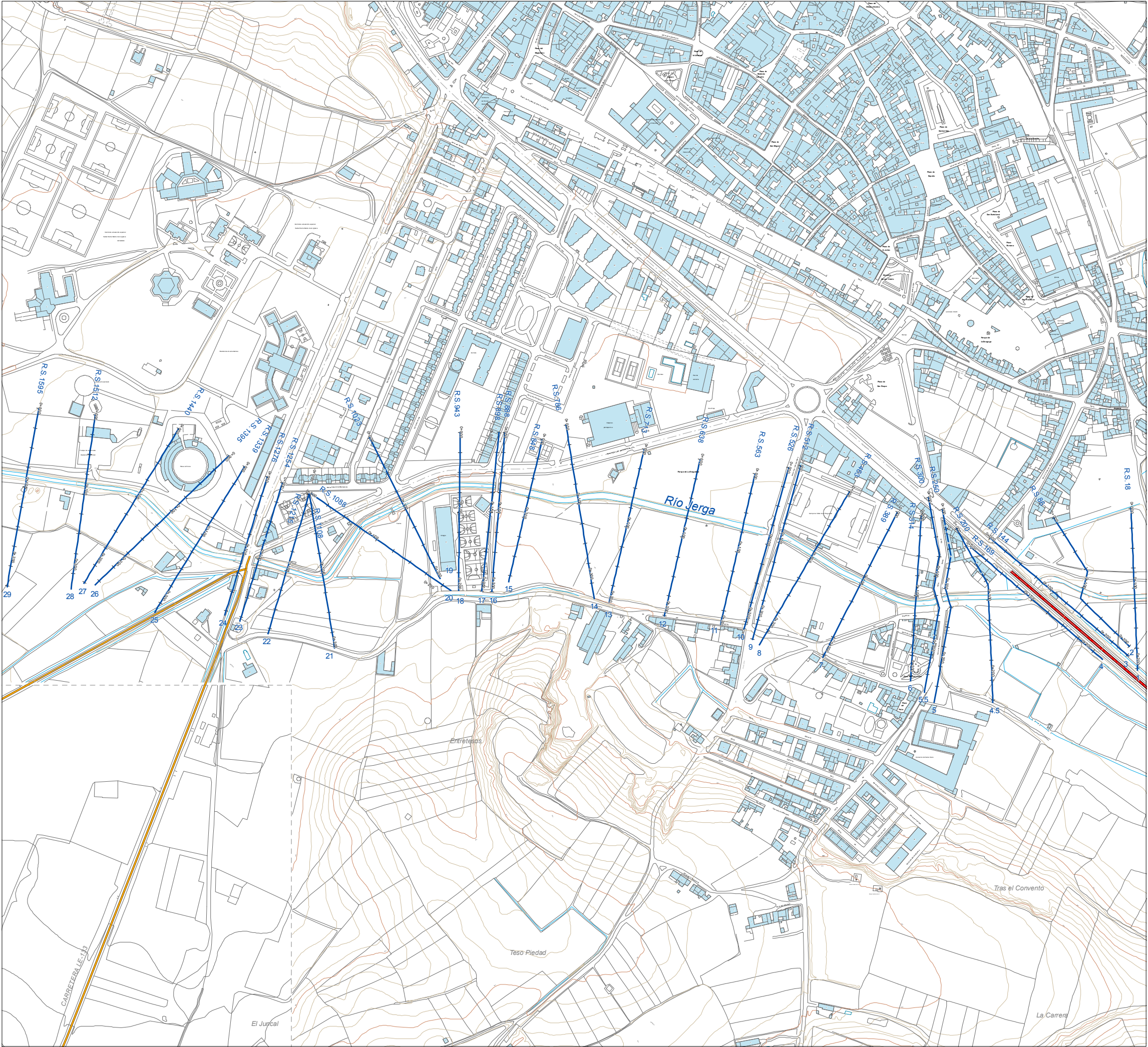
DICIEMBRE 2017

PLANO: PERFILES TRANSVERSALES
ESTUDIO EN MURIAS DE RECHIVALDO

ESCALA: 1:2.000

EQUIPO REDACTOR: cotesa





PERFILES TRANSVERSALES

PERFILES TRANSVERSALES



PERFILES TRANSVERSALES

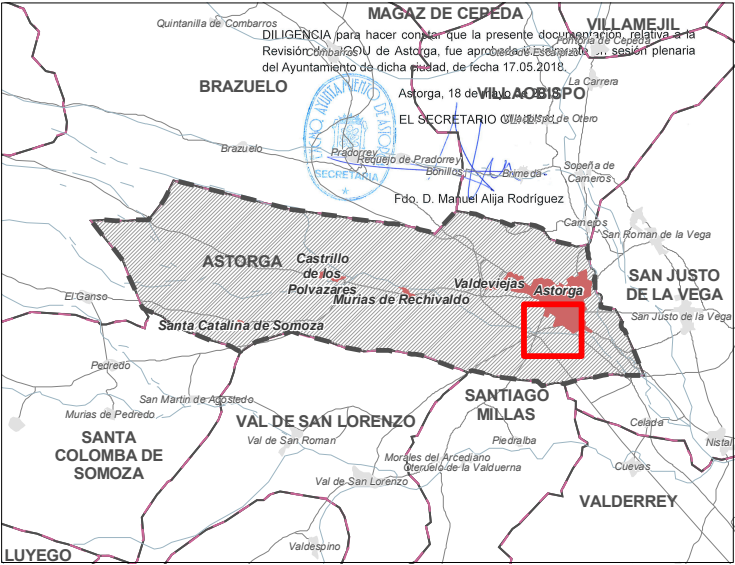
CARTOGRAFÍA BASE

- + - + - + - Término municipal
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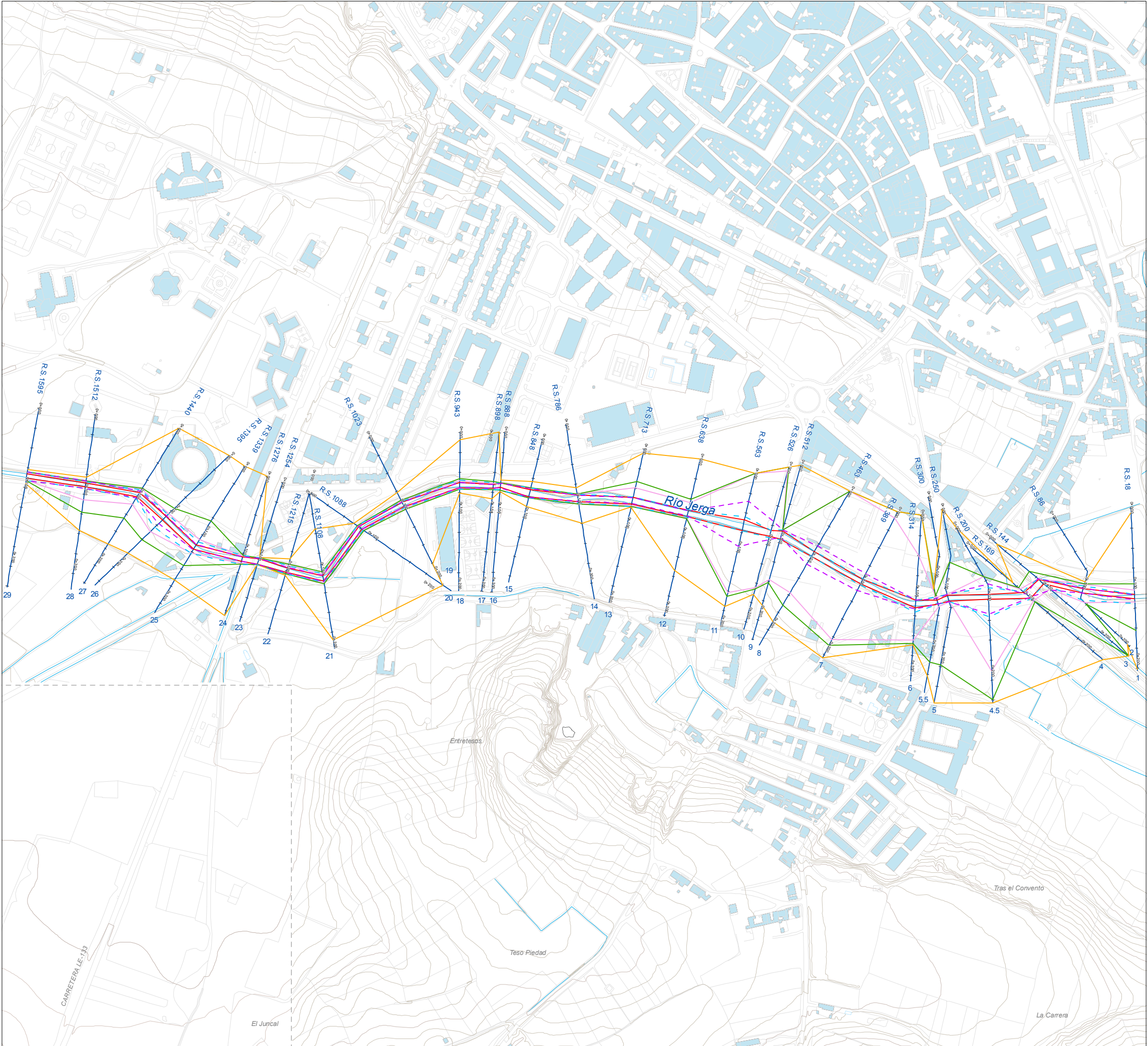
DICIEMBRE 2017

PLANO: PERFILES TRANSVERSALES
ESTUDIO EN ASTORGA

ESCALA: 1:5.000

EQUIPO REDACTOR: cotesa





LÁMINAS DE INUNDACIÓN

LÁMINAS DE INUNDACIÓN

- 500 AÑOS
- 100 AÑOS
- 50 AÑOS
- 5 AÑOS
- VID
- ZIP

PERFILES TRANSVERSALES



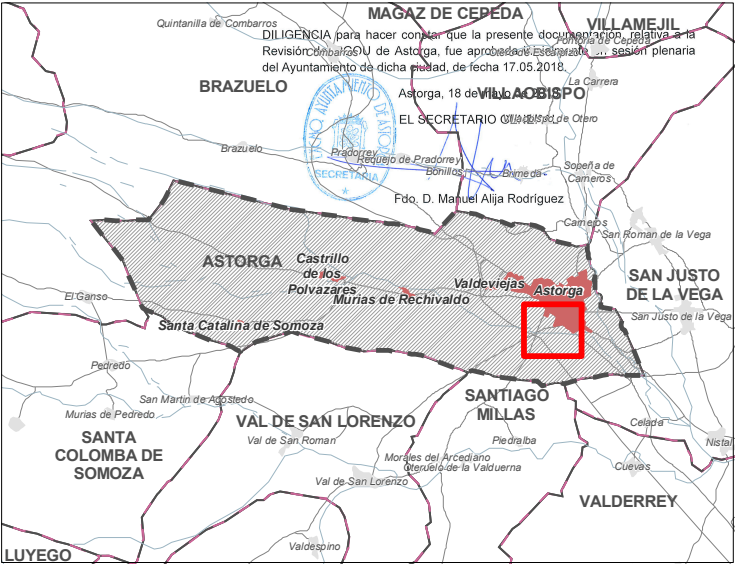
PERFILES TRANSVERSALES

CARTOGRAFÍA BASE

- Cartografía
- Edificaciones
- Cursos fluviales
- Curvas de nivel

CARTOGRAFÍA ELABORADA A PARTIR DE:

CARTOGRAFIA DERIVADA APORTADA POR EL CENTRO DE INFORMACIÓN TERRITORIAL (JCYL).
CARTOGRAFIA BÁSICA TERRITORIAL: SERIES 1:5.000 EN EL ÁMBITO DE LA HOJA Nº 193-I DEL MAPA TOPOGRÁFICO NACIONAL A ESCALA 1:25.000 (MTN-25) Y 1:10.000 EN EL ÁMBITO DE LA HOJA Nº 192-II DEL MTN-25 (AL OESTE DEL PLANO) DE LA JUNTA DE CASTILLA Y LEÓN.
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DOCUMENTOS DE INFORMACIÓN ANÁLISIS Y DIAGNÓSTICO
INFORME HIDROLÓGICO

DICIEMBRE 2017

PLANO:

LÁMINAS DE INUNDACIÓN EN ASTORGA

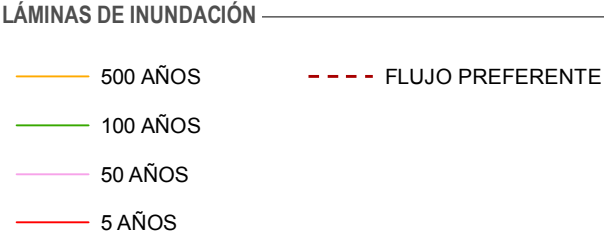
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EQUIPO REDACTOR: cotesa





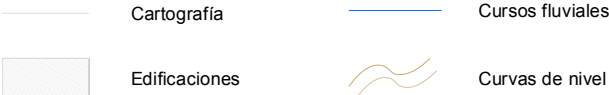
LÁMINAS DE INUNDACIÓN



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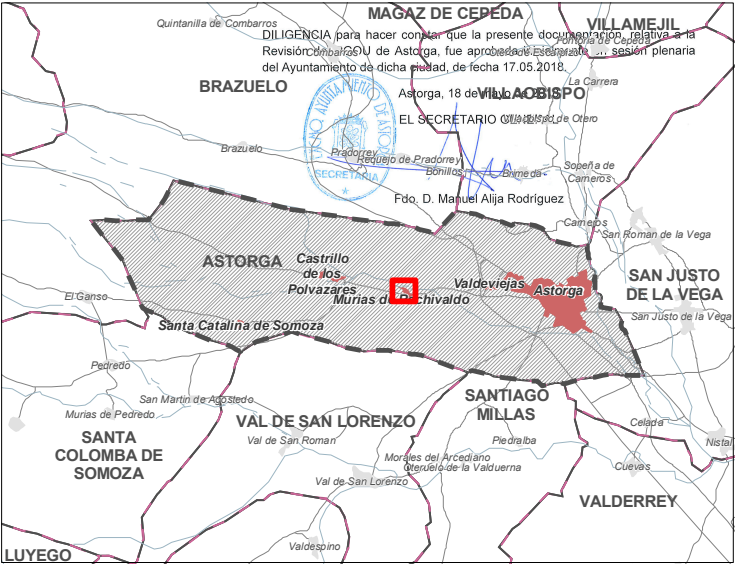


CARTOGRAFÍA BASE



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A S T O R G A

DOCUMENTOS DE INFORMACIÓN ANÁLISIS Y DIAGNÓSTICO
INFORME HIDROLÓGICO

DICIEMBRE 2017

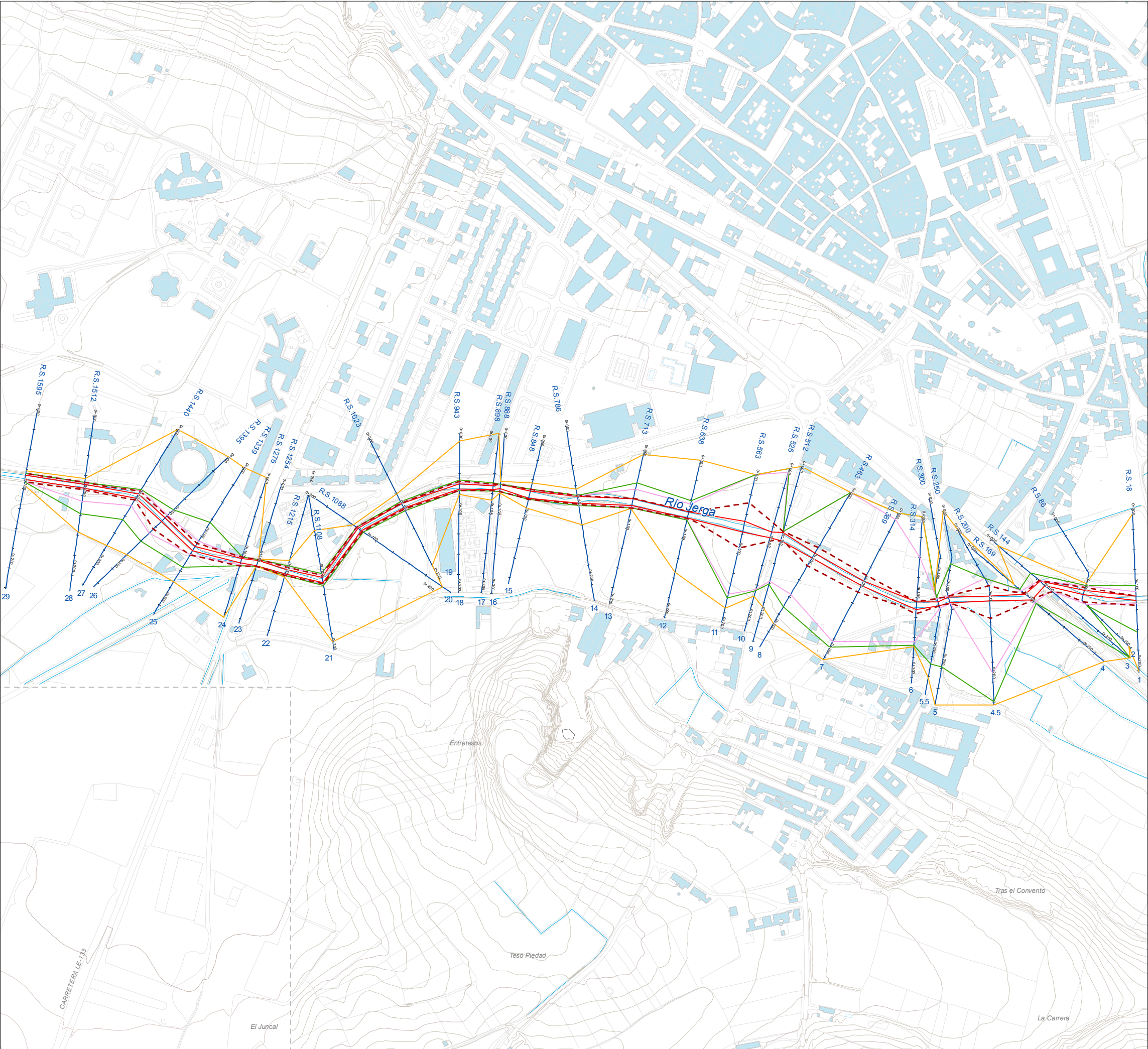
PLANO: LÁMINAS DE INUNDACIÓN EN MURIAS DE RECHIVALDO
FLUJO PREFERENTE

ESCALA: 1:2.000

EQUIPO
REDACTOR: cotesa



DIAD/IHd
PIHd-5.1



LÁMINAS DE INUNDACIÓN

LÁMINAS DE INUNDACIÓN

- 500 AÑOS
- 100 AÑOS
- 50 AÑOS
- 5 AÑOS
- FLUJO PREFERENTE

PERFILES TRANSVERSALES



PERFILES TRANSVERSALES

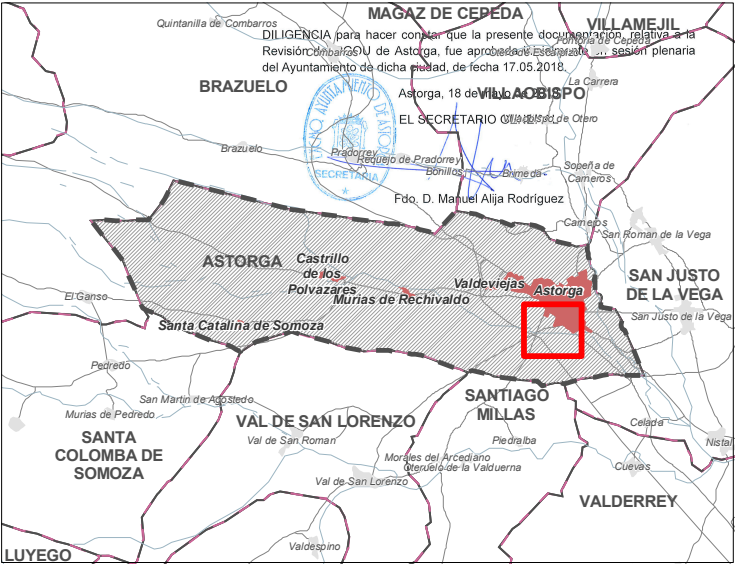
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- Curvas de nivel

CARTOGRAFÍA ELABORADA A PARTIR DE:

CARTOGRAFIA DERIVADA APORTADA POR EL CENTRO DE INFORMACIÓN TERRITORIAL (JCyL).
CARTOGRAFIA BÁSICA TERRITORIAL: SERIES 1:5.000 EN EL ÁMBITO DE LA HOJA Nº 193-I DEL MAPA TOPOGRÁFICO NACIONAL A ESCALA 1:25.000 (MTN-25) Y 1:10.000 EN EL ÁMBITO DE LA HOJA Nº 192-II DEL MTN-25 (AL OESTE DEL PLANO) DE LA JUNTA DE CASTILLA Y LEÓN.
SISTEMA DE PROYECCIÓN: EUROPEAN DATUM 50 HUSO 29 N ZONA UM (ED5029N).
LONGITUDES REFERIDAS AL MERIDIANO DE GREENWICH.
ALTITUDES REFERIDAS AL NIVEL DEL MAR EN ALICANTE.

ACTUALIZADA PUNTUALMENTE POR LOS TÉCNICOS DEL AYUNTAMIENTO DE ASTORGA



REVISIÓN DEL PLAN GENERAL DE ORDENACIÓN URBANA DE
A S T O R G A

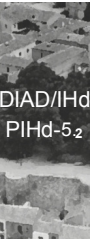
DOCUMENTOS DE INFORMACIÓN ANÁLISIS Y DIAGNÓSTICO
INFORME HIDROLÓGICO

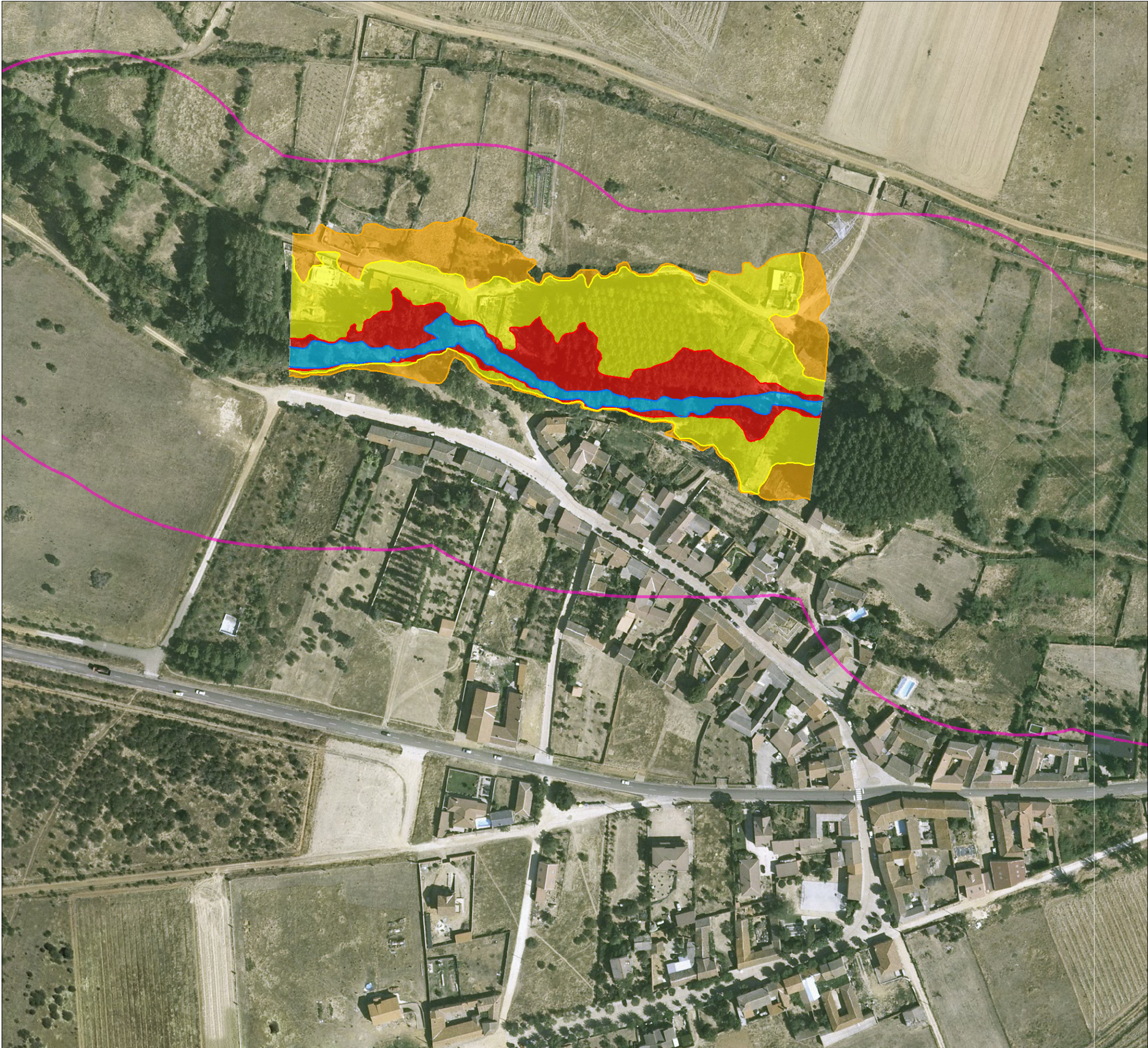
DICIEMBRE 2017

PLANO: LÁMINAS DE INUNDACIÓN EN ASTORGA
FLUJO PREFERENTE

ESCALA: 1:5.000

EQUIPO REDACTOR: cotesa



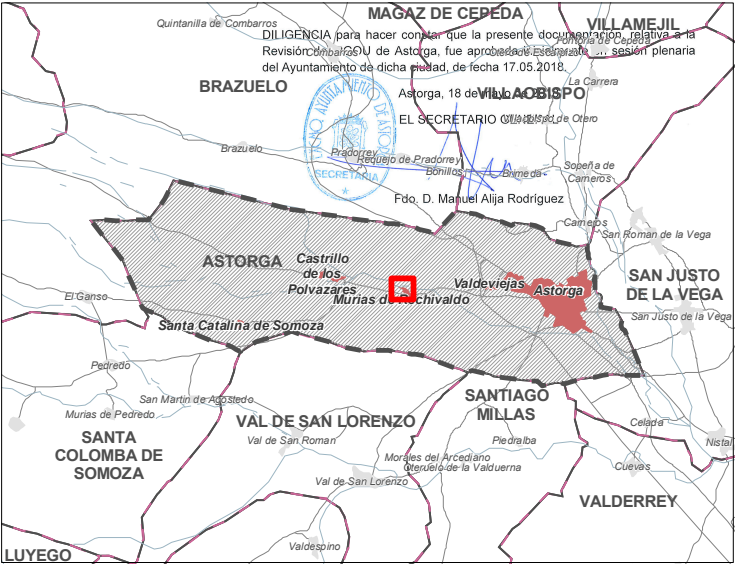


INTERPRETACIÓN

INTERPRETACIÓN

- ZONA POLICIA (100m)
- MÁXIMA CRECIDA ORDINARIA -T5 (DPH)
- ZONA DE FLUJO PREFERENTE (ZFP)
- ZONA AFECTADA POR LA AVENIDA DE PERIODO DE RETORNO DE 100 AÑOS - T100
- ZONA INUNDABLE (ZI) - T500

CARTOGRAFÍA ELABORADA A PARTIR DE:
CARTOGRAFÍA DERIVADA APORTADA POR EL CENTRO DE INFORMACIÓN TERRITORIAL (JCyL).
CARTOGRAFÍA BÁSICA TERRITORIAL: ORTOFOTO PNOA 2008. RESOLUCIÓN: 25 cm.
SISTEMA DE PROYECCIÓN: EUROPEAN DATUM 50 HUSO 29 N ZONA UM (ED5029N).
SISTEMA DE REPRESENTACIÓN: U.T.M.
LONGITUDES REFERIDAS AL MERIDIANO DE GREENWICH.
ALTITUDES REFERIDAS AL NIVEL DEL MAR EN ALICANTE.
ACTUALIZADA PUNTUALMENTE POR LOS TÉCNICOS DEL AYUNTAMIENTO DE ASTORGA



REVISIÓN DEL PLAN GENERAL DE ORDENACIÓN URBANA DE
A S T O R G A

DOCUMENTOS DE INFORMACIÓN ANÁLISIS Y DIAGNÓSTICO
INFORME HIDROLÓGICO

DICIEMBRE 2017

PLANO: INTERPRETACIÓN DE LOS DATOS OBTENIDOS:
SIMULACIÓN DEL COMPORTAMIENTO HIDRÁULICO DEL CAUCE
MURIAS DE RECHIVALDO

ESCALA: 1:2.000 0 12.5 25 50 m

EQUIPO
REDACTOR: cotesa



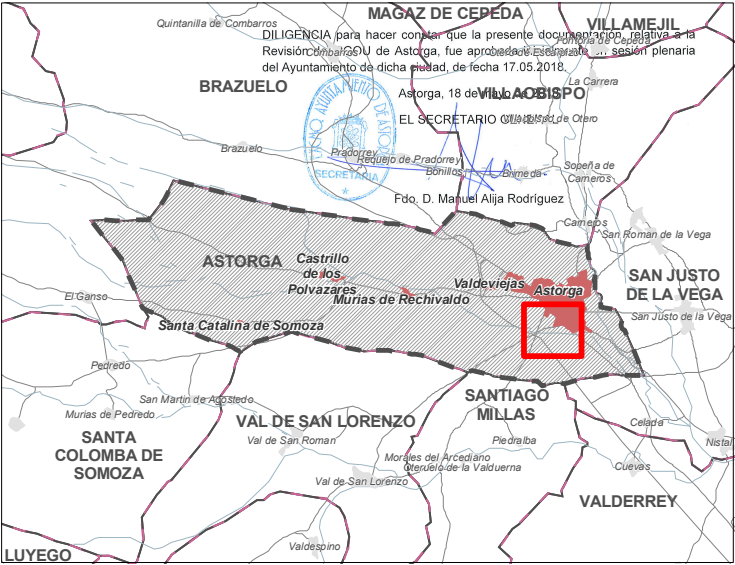


INTERPRETACIÓN

INTERPRETACIÓN

- ZONA POLICIA (100m)
- MÁXIMA CRECIDA ORDINARIA -T5 (DPH)
- ZONA DE FLUJO PREFERENTE (ZFP)
- ZONA AFECTADA POR LA AVENIDA DE PERIODO DE RETORNO DE 100 AÑOS - T100
- ZONA INUNDABLE (ZI) - T500

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CARTOGRAFÍA DERIVADA APORTADA POR EL CENTRO DE INFORMACIÓN TERRITORIAL (JCyL).
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SISTEMA DE PROYECCIÓN: EUROPEAN DATUM 50 HUSO 29 N ZONA UM (ED5029N).
SISTEMA DE REPRESENTACIÓN: U.T.M.
LONGITUDES REFERIDAS AL MERIDIANO DE GREENWICH.
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ACTUALIZADA PUNTUALMENTE POR LOS TÉCNICOS DEL AYUNTAMIENTO DE ASTORGA



REVISIÓN DEL PLAN GENERAL DE ORDENACIÓN URBANA DE
A S T O R G A

DOCUMENTOS DE INFORMACIÓN ANÁLISIS Y DIAGNÓSTICO
INFORME HIDROLÓGICO

DICIEMBRE 2017

PLANO: INTERPRETACIÓN DE LOS DATOS OBTENIDOS:
SIMULACIÓN DEL COMPORTAMIENTO HIDRÁULICO DEL CAUCE
ASTORGA

ESCALA: 1:5.000

EQUIPO
REDACTOR: **cotesa**





2. ANEXO 2. MODELIZACIÓN HEC-RAS DEL RÍO JERGA EN MURIAS DE RECHIVALDO.

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada por el Ayuntamiento de Astorga en sesión plenaria de 17 de mayo de 2018, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018
EL SECRETARIO GENERAL
Fdo. D. Manuel Alja Rodríguez

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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PROJECT DATA

Project Title: Jerga en Murias

Project File : Murias122013.prj

Run Date and Time: 29/05/2012 09:48:57 a.m.

Project in SI units

Project Description:

Estudio Hidraulico Rio Jerga en Murias de Rechivaldo.

Plan General de

Ordenación Urbana de Astorga

PLAN DATA

Plan Title: Plan 02

Plan File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.p02

Geometry Title: Murias en Rechivaldo-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.g03

Flow Title : caudales1

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.f01

Plan Summary Information:

Number of: Cross Sections = 15 Multiple Openings = 0

Culverts = 0 Inline Structures = 0

Bridges = 2 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.003

Critical depth calculation tolerance = 0.003

Maximum number of iterations = 20

Maximum difference tolerance = 0.1

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: caudales1

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.f01

Flow Data (m3/s)

River	Reach	RS	MCO(5añ)	50 años	100 años	500 años
Jerga	Murias	390	1.91	22.1	33.7	68.4

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Jerga	Murias	MCO(5añ)	Normal S = 0.006	Normal S = 0.006
Jerga	Murias	50 años	Normal S = 0.006	Normal S = 0.006
Jerga	Murias	100 años	Normal S = 0.006	Normal S = 0.006
Jerga	Murias	500 años	Normal S = 0.006	Normal S = 0.006

GEOMETRY DATA

Geometry Title: Murias en Rechivaldo-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.g03

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 390

INPUT

Description: p15

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.67	2.453	881.61	4.907	881.507	14.655	881 37.829 881
57.607	881	60.399	880	61.865	879.61	66.119	879.65 70.033 880
71.681	881	76.403	882	78.956	883	80.392	884 82.238 885
84.521	885.565	90.019	885.871	154.495	887		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	57.607	.035	71.681	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	57.607	71.681	34	34	34	.1	.3	

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	880.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	880.18	Reach Len. (m)	34.00	34.00	34.00
Crit W.S. (m)		Flow Area (m2)	4.37		
E.G. Slope (m/m)	0.000761	Area (m2)	4.37		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	10.44	Top Width (m)	10.44		
Vel Total (m/s)	0.44	Avg. Vel. (m/s)	0.44		



Max Chl Dpth (m)	0.57	Hydr. Depth (m)	0.42		
Conv. Total (m3/s)	69.3	Conv. (m3/s)	69.3		
Length Wtd. (m)	34.00	Wetted Per. (m)	10.59		
Min Ch El (m)	879.61	Shear (N/m2)	3.08		
Alpha	1.00	Stream Power (N/m s)	7396.89	0.00	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.00	0.75	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.06	1.85	0.01

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	881.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.035		
W.S. Elev (m)	880.95	Reach Len. (m)	34.00	34.00	34.00
Crit W.S. (m)		Flow Area (m2)	13.72		
E.G. Slope (m/m)	0.003375	Area (m2)	13.72		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	13.86	Top Width (m)	13.86		
Vel Total (m/s)	1.61	Avg. Vel. (m/s)	1.61		
Max Chl Dpth (m)	1.34	Hydr. Depth (m)	0.99		
Conv. Total (m3/s)	380.4	Conv. (m3/s)	380.4		
Length Wtd. (m)	34.00	Wetted Per. (m)	14.36		
Min Ch El (m)	879.61	Shear (N/m2)	31.63		
Alpha	1.00	Stream Power (N/m s)	7396.89	0.00	0.00
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	3.23	2.60	0.38
C & E Loss (m)	0.01	Cum SA (1000 m2)	9.11	2.82	1.31

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	881.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	881.17	Reach Len. (m)	34.00	34.00	34.00
Crit W.S. (m)	880.79	Flow Area (m2)	7.61	16.80	0.07
E.G. Slope (m/m)	0.003456	Area (m2)	7.61	16.80	0.07
Q Total (m3/s)	33.70	Flow (m3/s)	2.69	31.00	0.02
Top Width (m)	61.11	Top Width (m)	46.23	14.07	0.81
Vel Total (m/s)	1.38	Avg. Vel. (m/s)	0.35	1.84	0.22
Max Chl Dpth (m)	1.56	Hydr. Depth (m)	0.16	1.19	0.09
Conv. Total (m3/s)	573.3	Conv. (m3/s)	45.7	527.3	0.3
Length Wtd. (m)	34.00	Wetted Per. (m)	46.24	14.59	0.82
Min Ch El (m)	879.61	Shear (N/m2)	5.58	39.01	2.83
Alpha	1.66	Stream Power (N/m s)	7396.89	0.00	0.00
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	6.42	3.27	1.04
C & E Loss (m)	0.01	Cum SA (1000 m2)	12.57	2.83	2.21

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	881.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	881.78	Reach Len. (m)	34.00	34.00	34.00
Crit W.S. (m)		Flow Area (m2)	39.69	25.42	1.45
E.G. Slope (m/m)	0.001649	Area (m2)	39.69	25.42	1.45
Q Total (m3/s)	68.40	Flow (m3/s)	25.10	42.68	0.62
Top Width (m)	75.38	Top Width (m)	57.61	14.07	3.70
Vel Total (m/s)	1.03	Avg. Vel. (m/s)	0.63	1.68	0.43
Max Chl Dpth (m)	2.17	Hydr. Depth (m)	0.69	1.81	0.39
Conv. Total (m3/s)	1684.6	Conv. (m3/s)	618.2	1051.1	15.3
Length Wtd. (m)	34.00	Wetted Per. (m)	57.74	14.59	3.78
Min Ch El (m)	879.61	Shear (N/m2)	11.11	28.16	6.19
Alpha	1.81	Stream Power (N/m s)	7396.89	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	11.07	4.26	2.12

C & E Loss (m) 0.00 Cum SA (1000 m2) 15.68 2.79 3.78

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 356

INPUT

Description: p14

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.825	13.217	881	13.731	881.151	16.528	881.032	21.697	881
50.005	880.5	54.089	880.5	60.539	880	62.126	879.5	65.89	879.52
68.382	880	70.461	881	72.228	882	73.794	883	76.245	884
84.982	885	90.517	885.747	96.426	885.859	153.182	887		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	60.539	.035	68.382	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	60.539	68.382	27	30	27	.1	.3	

Blocked Obstructions num= 1

Sta L	Sta R	Elev
50	54	883.978

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	880.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.16	Reach Len. (m)	27.00	30.00	27.00
Crit W.S. (m)		Flow Area (m2)	0.16	4.07	0.03
E.G. Slope (m/m)	0.000649	Area (m2)	0.16	4.07	0.03
Q Total (m3/s)	1.91	Flow (m3/s)	0.01	1.89	0.00
Top Width (m)	10.19	Top Width (m)	2.02	7.84	0.33
Vel Total (m/s)	0.45	Avg. Vel. (m/s)	0.09	0.47	0.09
Max Chl Dpth (m)	0.66	Hydr. Depth (m)	0.08	0.52	0.08
Conv. Total (m3/s)	75.0	Conv. (m3/s)	0.6	74.3	0.1
Length Wtd. (m)	29.99	Wetted Per. (m)	2.03	7.97	0.36
Min Ch El (m)	879.50	Shear (N/m2)	0.50	3.25	0.45
Alpha	1.06	Stream Power (N/m s)	7334.03	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	0.00	0.61	0.00
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.03	1.54	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.69	Reach Len. (m)	27.00	30.00	27.00
Crit W.S. (m)	880.60	Flow Area (m2)	3.88	8.25	0.50
E.G. Slope (m/m)	0.006120	Area (m2)	3.88	8.25	0.50
Q Total (m3/s)	22.10	Flow (m3/s)	2.85	18.89	0.36

Top Width (m)	26.59	Top Width (m)	17.31	7.84	1.44
Vel Total (m/s)	1.75	Avg. Vel. (m/s)	0.73	2.29	0.72
Max Chl Dpth (m)	1.19	Hydr. Depth (m)	0.22	1.05	0.35
Conv. Total (m3/s)	282.5	Conv. (m3/s)	36.4	241.5	4.6
Length Wtd. (m)	28.72	Wetted Per. (m)	17.71	7.97	1.59
Min Ch El (m)	879.50	Shear (N/m2)	13.15	62.19	18.67
Alpha	1.49	Stream Power (N/m s)	7334.03	0.00	0.00
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	3.16	2.22	0.37
C & E Loss (m)	0.06	Cum SA (1000 m2)	8.81	2.45	1.28

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	881.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.95	Reach Len. (m)	27.00	30.00	27.00
Crit W.S. (m)	880.86	Flow Area (m2)	10.30	10.29	0.94
E.G. Slope (m/m)	0.005141	Area (m2)	10.30	10.29	0.94
Q Total (m3/s)	33.70	Flow (m3/s)	7.92	25.02	0.77
Top Width (m)	41.85	Top Width (m)	32.04	7.84	1.98
Vel Total (m/s)	1.57	Avg. Vel. (m/s)	0.77	2.43	0.81
Max Chl Dpth (m)	1.45	Hydr. Depth (m)	0.32	1.31	0.48
Conv. Total (m3/s)	470.0	Conv. (m3/s)	110.4	348.9	10.7
Length Wtd. (m)	28.50	Wetted Per. (m)	32.96	7.97	2.19
Min Ch El (m)	879.50	Shear (N/m2)	15.75	65.15	21.59
Alpha	1.85	Stream Power (N/m s)	7334.03	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	6.11	2.81	1.02
C & E Loss (m)	0.06	Cum SA (1000 m2)	11.24	2.46	2.17

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	881.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	881.72	Reach Len. (m)	27.00	30.00	27.00
Crit W.S. (m)		Flow Area (m2)	46.99	16.34	3.00
E.G. Slope (m/m)	0.001728	Area (m2)	46.99	16.34	3.00
Q Total (m3/s)	68.40	Flow (m3/s)	34.93	31.33	2.14
Top Width (m)	66.07	Top Width (m)	54.88	7.84	3.35
Vel Total (m/s)	1.03	Avg. Vel. (m/s)	0.74	1.92	0.71
Max Chl Dpth (m)	2.22	Hydr. Depth (m)	0.86	2.08	0.89
Conv. Total (m3/s)	1645.2	Conv. (m3/s)	840.1	753.6	51.5
Length Wtd. (m)	28.01	Wetted Per. (m)	57.39	7.97	3.77
Min Ch El (m)	879.50	Shear (N/m2)	13.88	34.77	13.48
Alpha	1.86	Stream Power (N/m s)	7334.03	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	9.60	3.55	2.04
C & E Loss (m)	0.02	Cum SA (1000 m2)	13.77	2.42	3.66



Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 326

INPUT

Description: p13

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.604	16.681	881	19.085	880.752	23.657	880.752	42.995	880
45.849	880	62.088	880	63.683	880.078	64	879.578	66.2	879.47
66.786	879.97	68.443	880	70.376	881	83.071	882	91.517	883
93.998	884	98.846	885	99.78	885.354	104.347	885.452	156.018	887

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	63.683	.035	70.376	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	63.683	70.376	25	19	27	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	30	881.36	F
80	156.018	881.36	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
108	129	892.19

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	880.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.035		
W.S. Elev (m)	879.92	Reach Len. (m)	25.00	19.00	27.00
Crit W.S. (m)	879.92	Flow Area (m2)		1.04	
E.G. Slope (m/m)	0.019308	Area (m2)		1.04	
Q Total (m3/s)	1.91	Flow (m3/s)		1.91	
Top Width (m)	2.95	Top Width (m)		2.95	
Vel Total (m/s)	1.83	Avg. Vel. (m/s)		1.83	
Max Chl Dpth (m)	0.45	Hydr. Depth (m)		0.35	
Conv. Total (m3/s)	13.7	Conv. (m3/s)		13.7	
Length Wtd. (m)	19.00	Wetted Per. (m)		3.31	
Min Ch El (m)	879.47	Shear (N/m2)		59.48	
Alpha	1.00	Stream Power (N/m s)	7469.81	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)		0.53	
C & E Loss (m)	0.05	Cum SA (1000 m2)		1.38	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.70	Reach Len. (m)	25.00	19.00	27.00
Crit W.S. (m)	880.42	Flow Area (m2)	20.40	5.13	
E.G. Slope (m/m)	0.002854	Area (m2)	20.91	5.13	
Q Total (m3/s)	22.10	Flow (m3/s)	15.59	6.51	
Top Width (m)	44.94	Top Width (m)	38.81	6.12	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)	0.76	1.27	
Max Chl Dpth (m)	1.23	Hydr. Depth (m)	0.61	0.84	
Conv. Total (m3/s)	413.7	Conv. (m3/s)	291.9	121.8	
Length Wtd. (m)	21.22	Wetted Per. (m)	33.69	6.76	
Min Ch El (m)	879.47	Shear (N/m2)	16.94	21.23	
Alpha	1.18	Stream Power (N/m s)	7469.81	0.00	0.00
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	2.83	2.02	0.36
C & E Loss (m)	0.00	Cum SA (1000 m2)	8.05	2.24	1.26

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	881.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.99	Reach Len. (m)	25.00	19.00	27.00
Crit W.S. (m)	880.54	Flow Area (m2)	30.10	6.97	
E.G. Slope (m/m)	0.002019	Area (m2)	33.80	6.97	
Q Total (m3/s)	33.70	Flow (m3/s)	25.09	8.61	
Top Width (m)	53.61	Top Width (m)	46.93	6.68	
Vel Total (m/s)	0.91	Avg. Vel. (m/s)	0.83	1.24	
Max Chl Dpth (m)	1.52	Hydr. Depth (m)	0.89	1.04	
Conv. Total (m3/s)	750.0	Conv. (m3/s)	558.4	191.6	
Length Wtd. (m)	21.36	Wetted Per. (m)	33.69	7.38	
Min Ch El (m)	879.47	Shear (N/m2)	17.69	18.69	
Alpha	1.10	Stream Power (N/m s)	7469.81	0.00	0.00
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	5.52	2.55	1.01
C & E Loss (m)	0.01	Cum SA (1000 m2)	10.17	2.24	2.14

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	881.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	881.73	Reach Len. (m)	25.00	19.00	27.00
Crit W.S. (m)	880.79	Flow Area (m2)	75.69	11.91	3.40
E.G. Slope (m/m)	0.000969	Area (m2)	75.69	11.91	3.40
Q Total (m3/s)	68.40	Flow (m3/s)	52.77	14.55	1.08
Top Width (m)	79.66	Top Width (m)	63.68	6.69	9.29
Vel Total (m/s)	0.75	Avg. Vel. (m/s)	0.70	1.22	0.32
Max Chl Dpth (m)	2.26	Hydr. Depth (m)	1.19	1.78	0.37
Conv. Total (m3/s)	2197.8	Conv. (m3/s)	1695.4	467.7	34.7
Length Wtd. (m)	22.79	Wetted Per. (m)	63.85	7.40	9.32
Min Ch El (m)	879.47	Shear (N/m2)	11.26	15.30	3.46
Alpha	1.23	Stream Power (N/m s)	7469.81	0.00	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	7.94	3.12	1.95
C & E Loss (m)	0.00	Cum SA (1000 m2)	12.17	2.20	3.49

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 307

INPUT

Description: p12 aguas arriba

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.733	6.616	881	28.302	880.82	34.714	880.066	49.778	880
58.068	879.24	62.75	879.19	63.609	880	64.405	881	70.464	881
73.589	881	87.264	882	96.594	883	99.181	884	103.267	885
104.098	885.39	108.784	885.272	158.093	887				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	49.778	.035	64.405	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	49.778	64.405	4.9	4.9	4.9	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	47.89	881.36	F
64.11	158.093	881.36	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
112.5	134.5	892.5

CROSS SECTION OUTPUT Profile #MCO(5año)

E.G. Elev (m)	879.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	879.87	Reach Len. (m)	1.65	1.65	1.65
Crit W.S. (m)	879.45	Flow Area (m2)	5.47		
E.G. Slope (m/m)	0.000453	Area (m2)	5.47		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	12.27	Top Width (m)	12.27		
Vel Total (m/s)	0.35	Avg. Vel. (m/s)	0.35		
Max Chl Dpth (m)	0.68	Hydr. Depth (m)	0.45		
Conv. Total (m3/s)	89.8	Conv. (m3/s)	89.8		
Length Wtd. (m)	1.65	Wetted Per. (m)	12.57		
Min Ch El (m)	879.19	Shear (N/m2)	1.93		
Alpha	1.00	Stream Power (N/m s)	7569.16	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.47		
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.24		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.60	Reach Len. (m)	1.65	1.65	1.65
Crit W.S. (m)	880.13	Flow Area (m2)	1.12	15.61	
E.G. Slope (m/m)	0.002166	Area (m2)	9.75	15.61	
Q Total (m3/s)	22.10	Flow (m3/s)	0.74	21.36	
Top Width (m)	33.91	Top Width (m)	19.60	14.31	

Vel Total (m/s)	1.32	Avg. Vel. (m/s)	0.66	1.37
Max Chl Dpth (m)	1.41	Hydr. Depth (m)	0.60	1.09
Conv. Total (m3/s)	474.9	Conv. (m3/s)	15.9	459.0
Length Wtd. (m)	1.65	Wetted Per. (m)	1.89	14.95
Min Ch El (m)	879.19	Shear (N/m2)	12.65	22.17
Alpha	1.05	Stream Power (N/m s)	7569.16	0.00 0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	2.44	1.82 0.36
C & E Loss (m)	0.00	Cum SA (1000 m2)	7.32	2.05 1.26

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.98	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.84	Reach Len. (m)	1.65	1.65	1.65
Crit W.S. (m)	880.34	Flow Area (m2)	1.58	19.04	
E.G. Slope (m/m)	0.002560	Area (m2)	14.71	19.06	
Q Total (m3/s)	33.70	Flow (m3/s)	1.41	32.29	
Top Width (m)	38.29	Top Width (m)	23.79	14.50	
Vel Total (m/s)	1.63	Avg. Vel. (m/s)	0.90	1.70	
Max Chl Dpth (m)	1.65	Hydr. Depth (m)	0.84	1.33	
Conv. Total (m3/s)	666.0	Conv. (m3/s)	28.0	638.0	
Length Wtd. (m)	1.65	Wetted Per. (m)	1.89	14.99	
Min Ch El (m)	879.19	Shear (N/m2)	20.97	31.89	
Alpha	1.04	Stream Power (N/m s)	7569.16	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	4.91	2.30	1.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	9.29	2.04	2.14

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	881.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	881.70	Reach Len. (m)	1.65	1.65	1.65
Crit W.S. (m)	880.81	Flow Area (m2)	52.71	31.70	9.85
E.G. Slope (m/m)	0.000648	Area (m2)	52.71	31.70	9.85
Q Total (m3/s)	68.40	Flow (m3/s)	27.95	37.20	3.26
Top Width (m)	82.95	Top Width (m)	49.52	14.63	18.81
Vel Total (m/s)	0.73	Avg. Vel. (m/s)	0.53	1.17	0.33
Max Chl Dpth (m)	2.51	Hydr. Depth (m)	1.06	2.17	0.52
Conv. Total (m3/s)	2687.2	Conv. (m3/s)	1098.0	1461.3	127.9
Length Wtd. (m)	1.65	Wetted Per. (m)	49.60	15.47	18.84
Min Ch El (m)	879.19	Shear (N/m2)	6.75	13.02	3.32
Alpha	1.65	Stream Power (N/m s)	7569.16	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	6.34	2.71	1.78
C & E Loss (m)	0.04	Cum SA (1000 m2)	10.75	2.00	3.11

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE



RIVER: Jerga
REACH: Murias RS: 305

INPUT

Description: Paraje Molino
Distance from Upstream XS = 1.65
Deck/Roadway Width = 2.27
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 4
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
27.85 880.82 47.89 881.36 881.11 64.11 881.36 881.11
73.59 881

Upstream Bridge Cross Section Data

Station Elevation Data num= 18
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 881.733 6.616 881 28.302 880.82 34.714 880.066 49.778 880
58.068 879.24 62.75 879.19 63.609 880 64.405 881 70.464 881
73.589 881 87.264 882 96.594 883 99.181 884 103.267 885
104.098 885.39 108.784 885.272 158.093 887

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 49.778 .035 64.405 .05

Bank Sta: Left Right Coeff Contr. Expan.
49.778 64.405 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 47.89 881.36 F
64.11 158.093 881.36 F

Blocked Obstructions num= 1
Sta L Sta R Elev
112.5 134.5 892.5

Downstream Deck/Roadway Coordinates

num= 4
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
29.2 880.88 49.77 881.36 881.11 65.99 881.36 881.11
68.91 881

Downstream Bridge Cross Section Data

Station Elevation Data num= 20
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 881.776 6.459 881 29.201 880.883 37.814 880 41.551 880
41.726 879.889 49.798 880 57.291 879.63 57.7 879.13 61 879.33
61.464 879.83 63.182 880 68.914 881 87.502 882 97.375 883
100.532 884 104.757 885 106.09 885.373 110.493 885.305 158.446 887

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 49.798 .035 63.182 .05

Bank Sta: Left Right Coeff Contr. Expan.
49.798 63.182 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 49.77 881.36 F
65.99 158.446 881.36 F

Blocked Obstructions num= 1

Sta L Sta R Elev
113 122 892.04

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 300

INPUT

Description: p11 aguas abajo

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.776	6	459	881	29.201	880	883	37	814
880	41.551	880							
41	726	879	889	49	798	880	57.291	879	63
57	7	879	13	61	879	33			
61	464	879	83	63	182	880	68	914	881
87	502	882	97	375	883				
100	532	884	104	757	885	106	09	885	373
110	493	885	305	158	446	887			

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	49	798	.035	63
182		.05			

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Sta	Left	Right	Lengths	Left	Channel	Right	Coeff	Contr.	Expan.
49	798	63	182	27	13	9	.1	.3	

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0	49	77	881	36	F
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65	99	158	446	881	36	F
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Blocked Obstructions num= 1

Sta L Sta R Elev

113	122	892	04
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CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	879.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	879.85	Reach Len. (m)	27.00	13.00	9.00
Crit W.S. (m)	879.55	Flow Area (m2)	2.82		
E.G. Slope (m/m)	0.002717	Area (m2)	2.82		

Q Total (m3/s)	1.91	Flow (m3/s)	1.91
Top Width (m)	8.69	Top Width (m)	8.69
Vel Total (m/s)	0.68	Avg. Vel. (m/s)	0.68
Max Chl Dpth (m)	0.72	Hydr. Depth (m)	0.32
Conv. Total (m3/s)	36.6	Conv. (m3/s)	36.6
Length Wtd. (m)	13.00	Wetted Per. (m)	9.16
Min Ch El (m)	879.13	Shear (N/m2)	8.19
Alpha	1.00	Stream Power (N/m s)	7586.06 0.00 0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.45
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.18

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.66	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.	0.000	0.035	0.050
W.S. Elev (m)	880.45	Reach Len. (m)	27.00	13.00	9.00
Crit W.S. (m)	880.32	Flow Area (m2)	0.01	10.56	0.58
E.G. Slope (m/m)	0.007438	Area (m2)	6.86	10.56	0.58
Q Total (m3/s)	22.10	Flow (m3/s)	0.01	21.72	0.37
Top Width (m)	32.36	Top Width (m)	16.39	13.38	2.59
Vel Total (m/s)	1.98	Avg. Vel. (m/s)	1.02	2.06	0.63
Max Chl Dpth (m)	1.32	Hydr. Depth (m)	0.45	0.79	0.23
Conv. Total (m3/s)	256.2	Conv. (m3/s)	0.1	251.8	4.3
Length Wtd. (m)	13.96	Wetted Per. (m)	0.03	13.86	2.63
Min Ch El (m)	879.13	Shear (N/m2)	32.94	55.58	16.22
Alpha	1.06	Stream Power (N/m s)	7586.06	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	2.43	1.76	0.36
C & E Loss (m)	0.04	Cum SA (1000 m2)	7.29	1.98	1.26

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.39	Wt. n-Val.	0.000	0.035	0.050
W.S. Elev (m)	880.54	Reach Len. (m)	27.00	13.00	9.00
Crit W.S. (m)	880.54	Flow Area (m2)	0.02	11.76	0.83
E.G. Slope (m/m)	0.011928	Area (m2)	8.36	11.76	0.84
Q Total (m3/s)	33.70	Flow (m3/s)	0.02	32.88	0.80
Top Width (m)	33.74	Top Width (m)	17.26	13.38	3.10
Vel Total (m/s)	2.67	Avg. Vel. (m/s)	1.45	2.80	0.96
Max Chl Dpth (m)	1.41	Hydr. Depth (m)	0.54	0.88	0.30
Conv. Total (m3/s)	308.6	Conv. (m3/s)	0.2	301.1	7.3
Length Wtd. (m)	14.41	Wetted Per. (m)	0.03	13.86	2.85
Min Ch El (m)	879.13	Shear (N/m2)	63.27	99.22	34.08
Alpha	1.07	Stream Power (N/m s)	7586.06	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	4.89	2.22	1.01
C & E Loss (m)	0.08	Cum SA (1000 m2)	9.26	1.97	2.13



Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	881.64	Element	Left OB	Channel	Right OB
Vel Head (m)	0.62	Wt. n-Val.	0.000	0.035	0.050
W.S. Elev (m)	881.02	Reach Len. (m)	27.00	13.00	9.00
Crit W.S. (m)	881.02	Flow Area (m2)	0.03	18.18	2.18
E.G. Slope (m/m)	0.010769	Area (m2)	19.46	18.18	2.99
Q Total (m3/s)	68.40	Flow (m3/s)	0.06	64.56	3.78
Top Width (m)	63.00	Top Width (m)	43.51	13.38	6.11
Vel Total (m/s)	3.36	Avg. Vel. (m/s)	2.10	3.55	1.73
Max Chl Dpth (m)	1.89	Hydr. Depth (m)	1.02	1.36	0.78
Conv. Total (m3/s)	659.1	Conv. (m3/s)	0.6	622.2	36.4
Length Wtd. (m)	15.02	Wetted Per. (m)	0.03	13.86	2.85
Min Ch El (m)	879.13	Shear (N/m2)	107.76	138.47	80.66
Alpha	1.07	Stream Power (N/m s)	7586.06	0.00	0.00
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	6.28	2.60	1.76
C & E Loss (m)	0.13	Cum SA (1000 m2)	10.69	1.98	3.10

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga
REACH: Murias RS: 287

INPUT
Description: p10
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.95	9.901	881.202	30.12	881.345	36.511	880.468	42.832	880.424
71.797	880	74.943	879.752	75.4	879.25	80	879.04	80.209	879.541
87.129	880	87.234	880.071	94.851	881	103.861	882	114.305	883
119.028	884	123.853	885	125.79	885.363	130.027	885.341	177.538	887

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	71.797	.035	87.234	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

71.797	87.234	23	25	14	.1	.3
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
132	142	892.784

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	879.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	879.83	Reach Len. (m)	23.00	25.00	14.00
Crit W.S. (m)		Flow Area (m2)	4.12		
E.G. Slope (m/m)	0.001007	Area (m2)	4.12		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	10.72	Top Width (m)	10.72		
Vel Total (m/s)	0.46	Avg. Vel. (m/s)	0.46		
Max Chl Dpth (m)	0.79	Hydr. Depth (m)	0.38		
Conv. Total (m3/s)	60.2	Conv. (m3/s)	60.2		
Length Wtd. (m)	25.00	Wetted Per. (m)	11.30		
Min Ch El (m)	879.04	Shear (N/m2)	3.60		
Alpha	1.00	Stream Power (N/m s)	8500.15	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.41		
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.06		

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.48	Reach Len. (m)	23.00	25.00	14.00
Crit W.S. (m)		Flow Area (m2)	8.12	13.76	0.70
E.G. Slope (m/m)	0.002762	Area (m2)	8.12	13.76	0.70
Q Total (m3/s)	22.10	Flow (m3/s)	3.20	18.64	0.26
Top Width (m)	54.23	Top Width (m)	35.40	15.44	3.39
Vel Total (m/s)	0.98	Avg. Vel. (m/s)	0.39	1.36	0.37
Max Chl Dpth (m)	1.44	Hydr. Depth (m)	0.23	0.89	0.21
Conv. Total (m3/s)	420.5	Conv. (m3/s)	60.9	354.8	4.9
Length Wtd. (m)	24.19	Wetted Per. (m)	35.41	16.04	3.41
Min Ch El (m)	879.04	Shear (N/m2)	6.21	23.22	5.55
Alpha	1.64	Stream Power (N/m s)	8500.15	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	2.23	1.60	0.35
C & E Loss (m)	0.01	Cum SA (1000 m2)	6.60	1.80	1.23

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.60	Reach Len. (m)	23.00	25.00	14.00
Crit W.S. (m)		Flow Area (m2)	12.32	15.57	1.15
E.G. Slope (m/m)	0.003554	Area (m2)	12.32	15.57	1.15
Q Total (m3/s)	33.70	Flow (m3/s)	7.15	25.98	0.56
Top Width (m)	56.04	Top Width (m)	36.26	15.44	4.35

Vel Total (m/s)	1.16	Avg. Vel. (m/s)	0.58	1.67	0.49
Max Chl Dpth (m)	1.56	Hydr. Depth (m)	0.34	1.01	0.27
Conv. Total (m3/s)	565.3	Conv. (m3/s)	120.0	435.8	9.5
Length Wtd. (m)	24.03	Wetted Per. (m)	36.27	16.04	4.38
Min Ch El (m)	879.04	Shear (N/m2)	11.84	33.82	9.17
Alpha	1.65	Stream Power (N/m s)	8500.15	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	4.61	2.05	1.00
C & E Loss (m)	0.02	Cum SA (1000 m2)	8.53	1.78	2.10

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	881.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.85	Reach Len. (m)	23.00	25.00	14.00
Crit W.S. (m)		Flow Area (m2)	21.72	19.47	2.51
E.G. Slope (m/m)	0.005096	Area (m2)	21.72	19.47	2.51
Q Total (m3/s)	68.40	Flow (m3/s)	21.31	45.18	1.91
Top Width (m)	59.96	Top Width (m)	38.10	15.44	6.42
Vel Total (m/s)	1.57	Avg. Vel. (m/s)	0.98	2.32	0.76
Max Chl Dpth (m)	1.81	Hydr. Depth (m)	0.57	1.26	0.39
Conv. Total (m3/s)	958.1	Conv. (m3/s)	298.5	632.8	26.8
Length Wtd. (m)	23.77	Wetted Per. (m)	38.13	16.04	6.47
Min Ch El (m)	879.04	Shear (N/m2)	28.47	60.64	19.42
Alpha	1.58	Stream Power (N/m s)	8500.15	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	5.72	2.35	1.74
C & E Loss (m)	0.03	Cum SA (1000 m2)	9.59	1.80	3.04

CROSS SECTION

RIVER: Jerga
REACH: Murias RS: 262

INPUT

Description: p9

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.888	23.896	880.881	30.216	880.274	30.859	880	33.751	880.286
35.795	880	84.601	880	85.201	879.796	85.7	879.29	90	879.1
90.415	879.603	92.535	880	98.741	881	100.542	881.917	103.904	881.786
104.425	882	109.699	883	113.925	884	126.965	885	129.768	885.374
134.052	885.508	180.524	887						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	84.601	.035	92.535	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	84.601	92.535		13	24	36	.1	.3	

Blocked Obstructions num= 1

Sta L	Sta R	Elev
136	146	891.84

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	879.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	879.79	Reach Len. (m)	13.00	24.00	36.00
Crit W.S. (m)		Flow Area (m2)	2.97		
E.G. Slope (m/m)	0.001492	Area (m2)	2.97		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		

Top Width (m)	6.22	Top Width (m)	6.22
Vel Total (m/s)	0.64	Avg. Vel. (m/s)	0.64
Max Chl Dpth (m)	0.69	Hydr. Depth (m)	0.48
Conv. Total (m3/s)	49.4	Conv. (m3/s)	49.4
Length Wtd. (m)	24.00	Wetted Per. (m)	6.69
Min Ch El (m)	879.10	Shear (N/m2)	6.50
Alpha	1.00	Stream Power (N/m s)	8643.10 0.00 0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	0.32
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.46	Reach Len. (m)	13.00	24.00	36.00
Crit W.S. (m)		Flow Area (m2)	24.21	8.06	0.65
E.G. Slope (m/m)	0.001927	Area (m2)	24.21	8.06	0.65
Q Total (m3/s)	22.10	Flow (m3/s)	12.10	9.79	0.21
Top Width (m)	67.05	Top Width (m)	56.28	7.93	2.83
Vel Total (m/s)	0.67	Avg. Vel. (m/s)	0.50	1.21	0.33
Max Chl Dpth (m)	1.36	Hydr. Depth (m)	0.43	1.02	0.23
Conv. Total (m3/s)	503.5	Conv. (m3/s)	275.5	223.1	4.8
Length Wtd. (m)	18.81	Wetted Per. (m)	56.38	8.46	2.87
Min Ch El (m)	879.10	Shear (N/m2)	8.11	18.01	4.26
Alpha	1.76	Stream Power (N/m s)	8643.10	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	1.85	1.33	0.34
C & E Loss (m)	0.01	Cum SA (1000 m2)	5.54	1.50	1.19

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.57	Reach Len. (m)	13.00	24.00	36.00
Crit W.S. (m)		Flow Area (m2)	30.66	8.96	1.01
E.G. Slope (m/m)	0.002472	Area (m2)	30.66	8.96	1.01
Q Total (m3/s)	33.70	Flow (m3/s)	20.03	13.23	0.43
Top Width (m)	68.94	Top Width (m)	57.47	7.93	3.54
Vel Total (m/s)	0.83	Avg. Vel. (m/s)	0.65	1.48	0.43
Max Chl Dpth (m)	1.47	Hydr. Depth (m)	0.53	1.13	0.29
Conv. Total (m3/s)	677.8	Conv. (m3/s)	402.9	266.2	8.7
Length Wtd. (m)	18.13	Wetted Per. (m)	57.57	8.46	3.58
Min Ch El (m)	879.10	Shear (N/m2)	12.91	25.69	6.82
Alpha	1.62	Stream Power (N/m s)	8643.10	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	4.12	1.74	0.98
C & E Loss (m)	0.01	Cum SA (1000 m2)	7.46	1.49	2.05

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.82	Reach Len. (m)	13.00	24.00	36.00
Crit W.S. (m)		Flow Area (m2)	45.40	10.95	2.09
E.G. Slope (m/m)	0.003556	Area (m2)	45.40	10.95	2.09
Q Total (m3/s)	68.40	Flow (m3/s)	44.87	22.17	1.36
Top Width (m)	73.10	Top Width (m)	60.08	7.93	5.09
Vel Total (m/s)	1.17	Avg. Vel. (m/s)	0.99	2.02	0.65
Max Chl Dpth (m)	1.72	Hydr. Depth (m)	0.76	1.38	0.41
Conv. Total (m3/s)	1147.0	Conv. (m3/s)	752.4	371.8	22.9
Length Wtd. (m)	17.26	Wetted Per. (m)	60.19	8.46	5.16
Min Ch El (m)	879.10	Shear (N/m2)	26.30	45.16	14.13
Alpha	1.44	Stream Power (N/m s)	8643.10	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	4.95	1.97	1.70
C & E Loss (m)	0.01	Cum SA (1000 m2)	8.46	1.50	2.96

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 238

INPUT

Description: p8

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.886	20.986	880.836	25.766	880	25.926	880.225	29.278	880.262
54.222	880	84.249	880	88.101	879.787	88.6	879.28	91.8	879.14
92.247	879.641	93.9	880	95.74	881	97.744	882.007	99.382	882
99.407	882.055	122.742	884.335	125.469	884.888	135.975	885	136.305	885.247
178.239	888								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	84.249	.035	93.9	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	84.249	93.9	9	19	25	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
108	122	887.77	139	145	891.161

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	879.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035		
W.S. Elev (m)	879.69	Reach Len. (m)	9.00	19.00	25.00
Crit W.S. (m)		Flow Area (m2)	1.75		
E.G. Slope (m/m)	0.005440	Area (m2)		1.75	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	4.26	Top Width (m)	4.26		
Vel Total (m/s)	1.09	Avg. Vel. (m/s)	1.09		
Max Chl Dpth (m)	0.55	Hydr. Depth (m)	0.41		
Conv. Total (m3/s)	25.9	Conv. (m3/s)	25.9		
Length Wtd. (m)	19.00	Wetted Per. (m)	4.66		
Min Ch El (m)	879.14	Shear (N/m2)	19.97		
Alpha	1.00	Stream Power (N/m s)	8533.71	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.26	

C & E Loss (m) 0.01 Cum SA (1000 m2) 0.72

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.29	Reach Len. (m)	9.00	19.00	25.00
Crit W.S. (m)	880.29	Flow Area (m2)	13.39	6.59	0.08
E.G. Slope (m/m)	0.008500	Area (m2)	13.39	6.59	0.08
Q Total (m3/s)	22.10	Flow (m3/s)	9.05	13.01	0.04
Top Width (m)	70.36	Top Width (m)	60.17	9.65	0.54
Vel Total (m/s)	1.10	Avg. Vel. (m/s)	0.68	1.98	0.47
Max Chl Dpth (m)	1.15	Hydr. Depth (m)	0.22	0.68	0.15
Conv. Total (m3/s)	239.7	Conv. (m3/s)	98.2	141.1	0.4
Length Wtd. (m)	15.10	Wetted Per. (m)	60.31	10.14	0.62
Min Ch El (m)	879.14	Shear (N/m2)	18.50	54.16	10.80
Alpha	2.05	Stream Power (N/m s)	8533.71	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	1.61	1.15	0.33
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.78	1.29	1.13

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.38	Reach Len. (m)	9.00	19.00	25.00
Crit W.S. (m)	880.38	Flow Area (m2)	18.25	7.36	0.13
E.G. Slope (m/m)	0.010160	Area (m2)	18.25	7.36	0.13
Q Total (m3/s)	33.70	Flow (m3/s)	16.49	17.13	0.08
Top Width (m)	70.97	Top Width (m)	60.63	9.65	0.69
Vel Total (m/s)	1.31	Avg. Vel. (m/s)	0.90	2.33	0.61
Max Chl Dpth (m)	1.24	Hydr. Depth (m)	0.30	0.76	0.19
Conv. Total (m3/s)	334.3	Conv. (m3/s)	163.6	170.0	0.8
Length Wtd. (m)	14.14	Wetted Per. (m)	60.78	10.14	0.79
Min Ch El (m)	879.14	Shear (N/m2)	29.91	72.37	16.43
Alpha	1.84	Stream Power (N/m s)	8533.71	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	3.80	1.54	0.96
C & E Loss (m)	0.03	Cum SA (1000 m2)	6.69	1.28	1.97

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.56	Reach Len. (m)	9.00	19.00	25.00
Crit W.S. (m)	880.56	Flow Area (m2)	29.54	9.14	0.29
E.G. Slope (m/m)	0.012689	Area (m2)	29.54	9.14	0.29
Q Total (m3/s)	68.40	Flow (m3/s)	40.67	27.48	0.26
Top Width (m)	72.37	Top Width (m)	61.68	9.65	1.03
Vel Total (m/s)	1.76	Avg. Vel. (m/s)	1.38	3.01	0.88
Max Chl Dpth (m)	1.42	Hydr. Depth (m)	0.48	0.95	0.28
Conv. Total (m3/s)	607.2	Conv. (m3/s)	361.0	243.9	2.3
Length Wtd. (m)	13.31	Wetted Per. (m)	61.85	10.14	1.17
Min Ch El (m)	879.14	Shear (N/m2)	59.43	112.27	30.61
Alpha	1.54	Stream Power (N/m s)	8533.71	0.00	0.00
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	4.46	1.73	1.66
C & E Loss (m)	0.03	Cum SA (1000 m2)	7.67	1.29	2.85

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 219

INPUT

Description: p7

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.884	20.229	880.824	24.514	880.273	24.569	880	27.818	880.142
42	879.85	61	879.89	80	879.77	87.83	879.511	88	879.01
91.5	879.07	92.052	879.572	93.595	880	95.91	881.272	98.979	881.292
99.189	881	148.973	886.47	153.903	886.723	166.895	887.704		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	80	.035	93.595	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

80	93.595	11	13	17	.1	.3
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Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
110	149	890	154	166.895	890

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	879.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035		
W.S. Elev (m)	879.62	Reach Len. (m)	11.00	13.00	17.00
Crit W.S. (m)		Flow Area (m2)	2.47		
E.G. Slope (m/m)	0.003747	Area (m2)	2.47		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	7.80	Top Width (m)	7.80		
Vel Total (m/s)	0.77	Avg. Vel. (m/s)	0.77		
Max Chl Dpth (m)	0.61	Hydr. Depth (m)	0.32		

Conv. Total (m3/s)	31.2	Conv. (m3/s)	31.2		
Length Wtd. (m)	13.00	Wetted Per. (m)	8.36		
Min Ch El (m)	879.01	Shear (N/m2)	10.83		
Alpha	1.00	Stream Power (N/m s)	7990.58	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	0.22		
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.61		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.16	Reach Len. (m)	11.00	13.00	17.00
Crit W.S. (m)	880.08	Flow Area (m2)	14.29	9.15	0.02
E.G. Slope (m/m)	0.005057	Area (m2)	14.29	9.15	0.02
Q Total (m3/s)	22.10	Flow (m3/s)	8.22	13.87	0.01
Top Width (m)	69.35	Top Width (m)	55.46	13.59	0.29
Vel Total (m/s)	0.94	Avg. Vel. (m/s)	0.58	1.52	0.24
Max Chl Dpth (m)	1.15	Hydr. Depth (m)	0.26	0.67	0.08
Conv. Total (m3/s)	310.8	Conv. (m3/s)	115.6	195.1	0.1
Length Wtd. (m)	12.34	Wetted Per. (m)	55.60	14.21	0.33
Min Ch El (m)	879.01	Shear (N/m2)	12.75	31.95	3.44
Alpha	1.77	Stream Power (N/m s)	7990.58	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	1.49	1.00	0.33
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.26	1.07	1.12

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.33	Reach Len. (m)	11.00	13.00	17.00
Crit W.S. (m)		Flow Area (m2)	23.81	11.48	0.10
E.G. Slope (m/m)	0.003701	Area (m2)	23.81	11.48	0.10
Q Total (m3/s)	33.70	Flow (m3/s)	16.35	17.32	0.03
Top Width (m)	70.12	Top Width (m)	55.92	13.59	0.60
Vel Total (m/s)	0.95	Avg. Vel. (m/s)	0.69	1.51	0.33
Max Chl Dpth (m)	1.32	Hydr. Depth (m)	0.43	0.84	0.16
Conv. Total (m3/s)	554.0	Conv. (m3/s)	268.8	284.7	0.5
Length Wtd. (m)	12.07	Wetted Per. (m)	56.16	14.21	0.68
Min Ch El (m)	879.01	Shear (N/m2)	15.39	29.33	5.24
Alpha	1.54	Stream Power (N/m s)	7990.58	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	3.61	1.36	0.96
C & E Loss (m)	0.00	Cum SA (1000 m2)	6.16	1.06	1.95

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.50	Reach Len. (m)	11.00	13.00	17.00
Crit W.S. (m)		Flow Area (m2)	33.73	13.87	0.23
E.G. Slope (m/m)	0.006270	Area (m2)	33.73	13.87	0.23
Q Total (m3/s)	68.40	Flow (m3/s)	37.41	30.86	0.13
Top Width (m)	71.80	Top Width (m)	57.29	13.59	0.92

Vel Total (m/s)	1.43	Avg. Vel. (m/s)	1.11	2.23	0.58
Max Chl Dpth (m)	1.49	Hydr. Depth (m)	0.59	1.02	0.25
Conv. Total (m3/s)	863.8	Conv. (m3/s)	472.5	389.7	1.7
Length Wtd. (m)	11.98	Wetted Per. (m)	57.53	14.21	1.05
Min Ch El (m)	879.01	Shear (N/m2)	36.04	59.99	13.60
Alpha	1.42	Stream Power (N/m s)	7990.58	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	4.18	1.51	1.66
C & E Loss (m)	0.00	Cum SA (1000 m2)	7.13	1.07	2.82

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 206

INPUT

Description: p6

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.828	18.602	880.751	22.94	880	23.294	880.186	26.245	880.198
40	879.84	62	879.77	78	879.77	89.313	879.417	89.6	879
92.1	879.01	92.637	879.51	94.957	880	104.729	881.965	121.561	881.99
158.956	887.087	168.113	887.176						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	78	.035	94.957	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
78	94.957	25	26	27	.1	.3	

Blocked Obstructions num= 1

Sta L	Sta R	Elev
125	157	890

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	879.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.035		
W.S. Elev (m)	879.38	Reach Len. (m)	25.00	26.00	27.00
Crit W.S. (m)	879.38	Flow Area (m2)	1.05		
E.G. Slope (m/m)	0.019997	Area (m2)	1.05		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	3.15	Top Width (m)	3.15		
Vel Total (m/s)	1.81	Avg. Vel. (m/s)	1.81		
Max Chl Dpth (m)	0.38	Hydr. Depth (m)	0.33		
Conv. Total (m3/s)	13.5	Conv. (m3/s)	13.5		
Length Wtd. (m)	26.00	Wetted Per. (m)	3.50		
Min Ch El (m)	879.00	Shear (N/m2)	59.02		
Alpha	1.00	Stream Power (N/m s)	8048.90	0.00	0.00
Frctn Loss (m)	0.23	Cum Volume (1000 m3)	0.20		
C & E Loss (m)	0.03	Cum SA (1000 m2)	0.53		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.





Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	880.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.050	0.035	0.000
W.S. Elev (m)	880.01	Reach Len. (m)	25.00	26.00	27.00
Crit W.S. (m)	880.01	Flow Area (m2)	8.76	8.40	0.00
E.G. Slope (m/m)	0.011422	Area (m2)	8.76	8.40	0.00
Q Total (m3/s)	22.10	Flow (m3/s)	6.35	15.75	0.00
Top Width (m)	61.45	Top Width (m)	44.46	16.96	0.03
Vel Total (m/s)	1.29	Avg. Vel. (m/s)	0.72	1.88	0.05
Max Chl Dpth (m)	1.01	Hydr. Depth (m)	0.20	0.50	0.00
Conv. Total (m3/s)	206.8	Conv. (m3/s)	59.4	147.4	0.0
Length Wtd. (m)	25.66	Wetted Per. (m)	44.47	17.43	0.04
Min Ch El (m)	879.00	Shear (N/m2)	22.07	53.95	
Alpha	1.60	Stream Power (N/m s)	8048.90	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	1.36	0.89	0.33
C & E Loss (m)	0.03	Cum SA (1000 m2)	3.71	0.87	1.11

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.29	Reach Len. (m)	25.00	26.00	27.00
Crit W.S. (m)		Flow Area (m2)	23.40	13.22	0.21
E.G. Slope (m/m)	0.003442	Area (m2)	23.40	13.22	0.21
Q Total (m3/s)	33.70	Flow (m3/s)	15.20	18.43	0.07
Top Width (m)	75.15	Top Width (m)	56.74	16.96	1.45
Vel Total (m/s)	0.91	Avg. Vel. (m/s)	0.65	1.39	0.32
Max Chl Dpth (m)	1.29	Hydr. Depth (m)	0.41	0.78	0.15
Conv. Total (m3/s)	574.4	Conv. (m3/s)	259.1	314.2	1.2
Length Wtd. (m)	25.53	Wetted Per. (m)	56.82	17.43	1.48
Min Ch El (m)	879.00	Shear (N/m2)	13.90	25.60	4.82
Alpha	1.50	Stream Power (N/m s)	8048.90	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	3.35	1.20	0.96
C & E Loss (m)	0.01	Cum SA (1000 m2)	5.54	0.86	1.94

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.36	Reach Len. (m)	25.00	26.00	27.00
Crit W.S. (m)		Flow Area (m2)	27.21	14.36	0.32
E.G. Slope (m/m)	0.009710	Area (m2)	27.21	14.36	0.32
Q Total (m3/s)	68.40	Flow (m3/s)	32.68	35.52	0.20
Top Width (m)	75.87	Top Width (m)	57.13	16.96	1.78
Vel Total (m/s)	1.63	Avg. Vel. (m/s)	1.20	2.47	0.62
Max Chl Dpth (m)	1.36	Hydr. Depth (m)	0.48	0.85	0.18
Conv. Total (m3/s)	694.1	Conv. (m3/s)	331.7	360.5	2.0
Length Wtd. (m)	25.51	Wetted Per. (m)	57.21	17.43	1.82
Min Ch El (m)	879.00	Shear (N/m2)	45.29	78.44	16.73
Alpha	1.45	Stream Power (N/m s)	8048.90	0.00	0.00
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	3.84	1.33	1.65
C & E Loss (m)	0.03	Cum SA (1000 m2)	6.51	0.87	2.80

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 180

INPUT

Description: p5

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.698	15.796	880.6	18.963	880	19.767	880.128	22.421	880.107
87.377	879	87.879	878.86	88.3	878.36	91.2	878.29	91.767	878.79
93.15	879	103.568	880	139.153	882.156	143.431	882.977	175.169	887.897
185.983	894.119								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	87.377	.035	93.15	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	87.377	93.15	17	17	17	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
147	173	890

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	878.90	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	878.84	Reach Len. (m)	17.00	17.00	17.00
Crit W.S. (m)		Flow Area (m2)	1.78		
E.G. Slope (m/m)	0.005057	Area (m2)		1.78	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	4.22	Top Width (m)	4.22		
Vel Total (m/s)	1.07	Avg. Vel. (m/s)	1.07		
Max Chl Dpth (m)	0.55	Hydr. Depth (m)	0.42		
Conv. Total (m3/s)	26.9	Conv. (m3/s)	26.9		
Length Wtd. (m)	17.00	Wetted Per. (m)	4.64		
Min Ch El (m)	878.29	Shear (N/m2)	19.03		
Alpha	1.00	Stream Power (N/m s)	8904.46	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.44	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	879.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.91	Reach Len. (m)	17.00	17.00	17.00
Crit W.S. (m)		Flow Area (m2)	24.07	7.79	4.27
E.G. Slope (m/m)	0.001391	Area (m2)	24.07	7.79	4.27
Q Total (m3/s)	22.10	Flow (m3/s)	10.59	9.64	1.87
Top Width (m)	68.35	Top Width (m)	53.15	5.77	9.44
Vel Total (m/s)	0.61	Avg. Vel. (m/s)	0.44	1.24	0.44
Max Chl Dpth (m)	1.62	Hydr. Depth (m)	0.45	1.35	0.45
Conv. Total (m3/s)	592.5	Conv. (m3/s)	283.9	258.4	50.2
Length Wtd. (m)	17.00	Wetted Per. (m)	53.15	6.23	9.48
Min Ch El (m)	878.29	Shear (N/m2)	6.18	17.06	6.15
Alpha	2.08	Stream Power (N/m s)	8904.46	0.00	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.95	0.68	0.27
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.49	0.58	0.99

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.29	Reach Len. (m)	17.00	17.00	17.00
Crit W.S. (m)		Flow Area (m2)	48.44	9.99	8.87
E.G. Slope (m/m)	0.000701	Area (m2)	48.44	9.99	8.87
Q Total (m3/s)	33.70	Flow (m3/s)	20.07	10.35	3.28
Top Width (m)	90.84	Top Width (m)	69.92	5.77	15.14
Vel Total (m/s)	0.50	Avg. Vel. (m/s)	0.41	1.04	0.37
Max Chl Dpth (m)	2.00	Hydr. Depth (m)	0.69	1.73	0.59
Conv. Total (m3/s)	1272.8	Conv. (m3/s)	758.1	390.9	123.8
Length Wtd. (m)	17.00	Wetted Per. (m)	69.97	6.23	15.20
Min Ch El (m)	878.29	Shear (N/m2)	4.76	11.02	4.01
Alpha	1.78	Stream Power (N/m s)	8904.46	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	2.46	0.90	0.83
C & E Loss (m)	0.00	Cum SA (1000 m2)	3.96	0.56	1.71

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.33	Reach Len. (m)	17.00	17.00	17.00
Crit W.S. (m)		Flow Area (m2)	51.36	10.23	9.51
E.G. Slope (m/m)	0.002472	Area (m2)	51.36	10.23	9.51
Q Total (m3/s)	68.40	Flow (m3/s)	41.46	20.22	6.72
Top Width (m)	91.75	Top Width (m)	70.15	5.77	15.83
Vel Total (m/s)	0.96	Avg. Vel. (m/s)	0.81	1.98	0.71
Max Chl Dpth (m)	2.04	Hydr. Depth (m)	0.73	1.77	0.60
Conv. Total (m3/s)	1375.8	Conv. (m3/s)	833.9	406.7	135.1
Length Wtd. (m)	17.00	Wetted Per. (m)	70.20	6.23	15.89
Min Ch El (m)	878.29	Shear (N/m2)	17.73	39.80	14.51
Alpha	1.73	Stream Power (N/m s)	8904.46	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	2.86	1.01	1.52
C & E Loss (m)	0.00	Cum SA (1000 m2)	4.91	0.58	2.56

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 163

INPUT

Description: p4

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.704	19.183	880.551	22.919	880	23.726	880.184	26.798	879.919
85.854	879	86.639	878.65	87	878.15	90.8	878.09	91.246	878.59
92.601	879	104.689	880	122.004	880.797	128.757	880.741	186.867	888.091
196.974	893.734								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	85.854	.035	92.601	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
85.854	92.601		35	28	20	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	60	880.12	F
100	196.974	880.12	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
153	184	890

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	878.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	878.84	Reach Len. (m)	35.00	28.00	20.00
Crit W.S. (m)	878.41	Flow Area (m2)		3.25	
E.G. Slope (m/m)	0.001047	Area (m2)		3.25	
Q Total (m3/s)	1.91	Flow (m3/s)		1.91	
Top Width (m)	5.85	Top Width (m)		5.85	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.75	Hydr. Depth (m)		0.56	
Conv. Total (m3/s)	59.0	Conv. (m3/s)		59.0	
Length Wtd. (m)	28.00	Wetted Per. (m)		6.40	
Min Ch El (m)	878.09	Shear (N/m2)		5.21	
Alpha	1.00	Stream Power (N/m s)	9430.69	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.35	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	879.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.89	Reach Len. (m)	35.00	28.00	20.00
Crit W.S. (m)	879.47	Flow Area (m2)	17.70	10.25	4.29
E.G. Slope (m/m)	0.000998	Area (m2)	25.21	10.25	4.74
Q Total (m3/s)	22.10	Flow (m3/s)	8.69	11.53	1.88
Top Width (m)	74.38	Top Width (m)	56.92	6.75	10.71
Vel Total (m/s)	0.69	Avg. Vel. (m/s)	0.49	1.13	0.44

Max Chl Dpth (m)	1.80	Hydr. Depth (m)	0.68	1.52	0.58
Conv. Total (m3/s)	699.4	Conv. (m3/s)	275.0	364.9	59.5
Length Wtd. (m)	29.29	Wetted Per. (m)	25.86	7.36	7.42
Min Ch El (m)	878.09	Shear (N/m2)	6.70	13.63	5.66
Alpha	1.64	Stream Power (N/m s)	9430.69	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	0.53	0.52	0.19
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.56	0.47	0.81

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.28	Reach Len. (m)	35.00	28.00	20.00
Crit W.S. (m)	879.62	Flow Area (m2)	49.44	12.89	10.24
E.G. Slope (m/m)	0.000505	Area (m2)	49.44	12.89	10.24
Q Total (m3/s)	33.70	Flow (m3/s)	18.54	12.02	3.14
Top Width (m)	89.69	Top Width (m)	64.82	6.75	18.13
Vel Total (m/s)	0.46	Avg. Vel. (m/s)	0.37	0.93	0.31
Max Chl Dpth (m)	2.19	Hydr. Depth (m)	0.76	1.91	0.57
Conv. Total (m3/s)	1499.9	Conv. (m3/s)	825.0	535.1	139.8
Length Wtd. (m)	29.13	Wetted Per. (m)	64.88	7.36	18.17
Min Ch El (m)	878.09	Shear (N/m2)	3.77	8.67	2.79
Alpha	1.84	Stream Power (N/m s)	9430.69	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	1.62	0.71	0.67
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.82	0.46	1.43

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.37	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.29	Reach Len. (m)	35.00	28.00	20.00
Crit W.S. (m)	879.92	Flow Area (m2)	50.32	12.98	10.49
E.G. Slope (m/m)	0.001988	Area (m2)	50.32	12.98	10.49
Q Total (m3/s)	68.40	Flow (m3/s)	37.84	24.14	6.42
Top Width (m)	90.08	Top Width (m)	64.91	6.75	18.42
Vel Total (m/s)	0.93	Avg. Vel. (m/s)	0.75	1.86	0.61
Max Chl Dpth (m)	2.20	Hydr. Depth (m)	0.78	1.92	0.57
Conv. Total (m3/s)	1534.0	Conv. (m3/s)	848.7	541.4	143.9
Length Wtd. (m)	29.13	Wetted Per. (m)	64.97	7.36	18.47
Min Ch El (m)	878.09	Shear (N/m2)	15.10	34.38	11.08
Alpha	1.83	Stream Power (N/m s)	9430.69	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	2.00	0.81	1.35
C & E Loss (m)	0.00	Cum SA (1000 m2)	3.77	0.47	2.27

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Murias

RS: 75

INPUT

Description: p3 aguas arriba

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.447	4.242	880.358	45.425	879.799	53.361	879.629	67.023	879.441
74.93	879.862	86.48	879	88.46	878.4	93.738	878.48	94.852	879
140.023	880	143.861	880.549	147.722	880.705	169.8	881	203.521	888.056
211.966	887.531	212.309	887.738						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	86.48	.035	94.852	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	86.48	94.852		8	8	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	82.09	880.12	F
94.95	212.309	880.12	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
169.5	201.5	891

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	878.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035		
W.S. Elev (m)	878.72	Reach Len. (m)	0.91	0.91	0.91
Crit W.S. (m)	878.67	Flow Area (m2)	1.72		
E.G. Slope (m/m)	0.009742	Area (m2)	1.72		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.86	Top Width (m)	6.86		
Vel Total (m/s)	1.11	Avg. Vel. (m/s)	1.11		
Max Chl Dpth (m)	0.32	Hydr. Depth (m)	0.25		
Conv. Total (m3/s)	19.4	Conv. (m3/s)	19.4		
Length Wtd. (m)	0.91	Wetted Per. (m)	6.96		
Min Ch El (m)	878.40	Shear (N/m2)	23.61		
Alpha	1.00	Stream Power (N/m s)	10164.91	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	0.05		
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.17		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	879.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.26	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.58	Reach Len. (m)	0.91	0.91	0.91
Crit W.S. (m)	879.46	Flow Area (m2)	1.84	8.72	0.06
E.G. Slope (m/m)	0.006546	Area (m2)	3.19	8.72	7.67
Q Total (m3/s)	22.10	Flow (m3/s)	1.66	20.37	0.06
Top Width (m)	55.46	Top Width (m)	20.77	8.37	26.32
Vel Total (m/s)	2.08	Avg. Vel. (m/s)	0.90	2.34	1.13
Max Chl Dpth (m)	1.18	Hydr. Depth (m)	0.42	1.04	0.58
Conv. Total (m3/s)	273.2	Conv. (m3/s)	20.6	251.8	0.8
Length Wtd. (m)	0.91	Wetted Per. (m)	4.40	8.58	0.10
Min Ch El (m)	878.40	Shear (N/m2)	26.82	65.25	37.33

Alpha	1.18	Stream Power (N/m s)	10164.91	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	0.03	0.26	0.07
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.20	0.26	0.44

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.27	Reach Len. (m)	0.91	0.91	0.91
Crit W.S. (m)	879.70	Flow Area (m2)	36.98	14.45	34.90
E.G. Slope (m/m)	0.000435	Area (m2)	36.98	14.45	34.90
Q Total (m3/s)	33.70	Flow (m3/s)	9.58	12.19	11.93
Top Width (m)	130.96	Top Width (m)	75.55	8.37	47.04
Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.26	0.84	0.34
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	0.49	1.73	0.74
Conv. Total (m3/s)	1615.4	Conv. (m3/s)	459.2	584.3	571.8
Length Wtd. (m)	0.91	Wetted Per. (m)	75.60	8.58	47.07
Min Ch El (m)	878.40	Shear (N/m2)	2.09	7.19	3.16
Alpha	2.09	Stream Power (N/m s)	10164.91	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.11	0.33	0.22
C & E Loss (m)	0.03	Cum SA (1000 m2)	0.36	0.24	0.78

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water

whose main channel velocity head was the closest to the previously computed cross section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.24	Reach Len. (m)	0.91	0.91	0.91
Crit W.S. (m)	880.12	Flow Area (m2)	34.76	14.20	33.50
E.G. Slope (m/m)	0.002010	Area (m2)	34.76	14.20	33.50
Q Total (m3/s)	68.40	Flow (m3/s)	18.94	25.45	24.02
Top Width (m)	128.54	Top Width (m)	73.34	8.37	46.83
Vel Total (m/s)	0.83	Avg. Vel. (m/s)	0.54	1.79	0.72
Max Chl Dpth (m)	1.84	Hydr. Depth (m)	0.47	1.70	0.72
Conv. Total (m3/s)	1525.5	Conv. (m3/s)	422.3	567.6	535.6
Length Wtd. (m)	0.91	Wetted Per. (m)	73.39	8.58	46.86
Min Ch El (m)	878.40	Shear (N/m2)	9.34	32.63	14.09
Alpha	2.12	Stream Power (N/m s)	10164.91	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.51	0.43	0.91
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.35	0.26	1.62

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Jerga
REACH: Murias RS: 70

INPUT

Description:

Distance from Upstream XS = .91

Deck/Roadway Width = 2.5

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 5

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-----	----	------	----	------	-----	----	------	----	------	-----	----	------	----	------

69.75	879.26			83.45	880.12	879.87			89.9	880.12	879.87		
-------	--------	--	--	-------	--------	--------	--	--	------	--------	--------	--	--

94.95	880.12	879.87		102.9	879.26								
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Upstream Bridge Cross Section Data

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	880.447	4.242	880.358	45.425	879.799	53.361	879.629	67.023	879.441
---	---------	-------	---------	--------	---------	--------	---------	--------	---------

74.93	879.862	86.48	879	88.46	878.4	93.738	878.48	94.852	879
-------	---------	-------	-----	-------	-------	--------	--------	--------	-----

140.023	880	143.861	880.549	147.722	880.705	169.8	881	203.521	888.056
---------	-----	---------	---------	---------	---------	-------	-----	---------	---------

211.966	887.531	212.309	887.738						
---------	---------	---------	---------	--	--	--	--	--	--

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
-----	---	-----	-----	---	-----	-----	---	-----

0	.05	86.48	.035	94.852	.05			
---	-----	-------	------	--------	-----	--	--	--

Bank Sta: Left Right Coeff Contr. Expan.

86.48	94.852		.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-------	-------	------	-----------

0	82.09	880.12	F
---	-------	--------	---

94.95	212.309	880.12	F
-------	---------	--------	---

Blocked Obstructions num= 1

Sta L	Sta R	Elev
-------	-------	------

169.5	201.5	891
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Downstream Deck/Roadway Coordinates

num= 5

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-----	----	------	----	------	-----	----	------	----	------	-----	----	------	----	------

74.12	879.4			89.24	880.12	879.87			91.53	880.12	879.87		
-------	-------	--	--	-------	--------	--------	--	--	-------	--------	--------	--	--

97.99	880.12	879.87		110	879.2								
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Downstream Bridge Cross Section Data

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	880.44	6.374	880.307	27.424	880	38.61	880.146	48.189	880.228
---	--------	-------	---------	--------	-----	-------	---------	--------	---------

89.439	879	91.066	878.25	96.614	878.19	97.119	879	145.878	880
--------	-----	--------	--------	--------	--------	--------	-----	---------	-----

150.483	880.565	153.922	880.774	208.129	887.836	220.069	887.517		
---------	---------	---------	---------	---------	---------	---------	---------	--	--

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
-----	---	-----	-----	---	-----	-----	---	-----

0	.05	89.439	.035	97.119	.05			
---	-----	--------	------	--------	-----	--	--	--

Bank Sta: Left Right Coeff Contr. Expan.

89.439	97.119		.1	.3
--------	--------	--	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-------	-------	------	-----------

0	89.24	880.12	F
---	-------	--------	---

97.99	220.069	880.12	F
-------	---------	--------	---

Blocked Obstructions num= 1

Sta L	Sta R	Elev
-------	-------	------

155.5 206 890.7

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 67

INPUT

Description: p2-aguas abajo

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.44	6.374	880.307	27.424	880	38.61	880.146	48.189	880.228
89.439	879	91.066	878.25	96.614	878.19	97.119	879	145.878	880
150.483	880.565	153.922	880.774	208.129	887.836	220.069	887.517		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	89.439	.035	97.119	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	89.439	97.119		20 22 26	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	89.24	880.12	F
97.99	220.069	880.12	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
155.5	206	890.7

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	878.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.	0.035		
W.S. Elev (m)	878.46	Reach Len. (m)	20.00	22.00	26.00
Crit W.S. (m)	878.45	Flow Area (m2)	1.43		
E.G. Slope (m/m)	0.016221	Area (m2)	1.43		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.18	Top Width (m)	6.18		

Vel Total (m/s)	1.34	Avg. Vel. (m/s)	1.34		
Max Chl Dpth (m)	0.27	Hydr. Depth (m)	0.23		
Conv. Total (m3/s)	15.0	Conv. (m3/s)	15.0		
Length Wtd. (m)	22.00	Wetted Per. (m)	6.38		
Min Ch El (m)	878.19	Shear (N/m2)	35.53		
Alpha	1.00	Stream Power (N/m s)	10536.43	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.12	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	879.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.41	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.32	Reach Len. (m)	20.00	22.00	26.00
Crit W.S. (m)	879.29	Flow Area (m2)	0.06	7.62	0.27
E.G. Slope (m/m)	0.011183	Area (m2)	1.75	7.62	2.55
Q Total (m3/s)	22.10	Flow (m3/s)	0.06	21.77	0.27
Top Width (m)	34.29	Top Width (m)	10.85	7.68	15.75
Vel Total (m/s)	2.78	Avg. Vel. (m/s)	0.99	2.86	0.98
Max Chl Dpth (m)	1.13	Hydr. Depth (m)	0.32	0.99	0.31
Conv. Total (m3/s)	209.0	Conv. (m3/s)	0.6	205.9	2.5
Length Wtd. (m)	22.09	Wetted Per. (m)	0.20	8.29	0.87
Min Ch El (m)	878.19	Shear (N/m2)	35.09	100.78	34.45
Alpha	1.04	Stream Power (N/m s)	10536.43	0.00	0.00
Frctn Loss (m)	0.18	Cum Volume (1000 m3)	0.02	0.19	0.06
C & E Loss (m)	0.06	Cum SA (1000 m2)	0.16	0.20	0.39

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.59	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.58	Reach Len. (m)	20.00	22.00	26.00
Crit W.S. (m)	879.58	Flow Area (m2)	0.11	9.56	0.49
E.G. Slope (m/m)	0.011927	Area (m2)	5.56	9.56	8.07
Q Total (m3/s)	33.70	Flow (m3/s)	0.17	32.79	0.74
Top Width (m)	55.06	Top Width (m)	19.33	7.68	28.05
Vel Total (m/s)	3.31	Avg. Vel. (m/s)	1.51	3.43	1.50
Max Chl Dpth (m)	1.39	Hydr. Depth (m)	0.57	1.24	0.57
Conv. Total (m3/s)	308.6	Conv. (m3/s)	1.6	300.3	6.8
Length Wtd. (m)	22.22	Wetted Per. (m)	0.20	8.29	0.87
Min Ch El (m)	878.19	Shear (N/m2)	66.92	134.80	66.24
Alpha	1.05	Stream Power (N/m s)	10536.43	0.00	0.00
Frctn Loss (m)	0.18	Cum Volume (1000 m3)	0.08	0.24	0.18
C & E Loss (m)	0.10	Cum SA (1000 m2)	0.28	0.20	0.69

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

INFORMACIÓN para hacer constar que la presente documentación, relativa a la
Revisión del P.O.O. de Asesoría, fue aprobada oficialmente en sesión plenaria
del Ayuntamiento de esta ciudad, de fecha 17.05.2018.

Asílega, 19 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez

SECRETARIA

SECRETARIA

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.16	Reach Len. (m)	20.00	22.00	26.00
Crit W.S. (m)	880.12	Flow Area (m2)	24.56	14.06	32.36
E.G. Slope (m/m)	0.002467	Area (m2)	24.56	14.06	32.36
Q Total (m3/s)	68.40	Flow (m3/s)	16.01	28.37	24.02
Top Width (m)	120.84	Top Width (m)	63.08	7.68	50.07
Vel Total (m/s)	0.96	Avg. Vel. (m/s)	0.65	2.02	0.74
Max Chl Dpth (m)	1.97	Hydr. Depth (m)	0.39	1.83	0.65
Conv. Total (m3/s)	1377.2	Conv. (m3/s)	322.3	571.2	483.6
Length Wtd. (m)	22.88	Wetted Per. (m)	63.10	8.29	50.09
Min Ch El (m)	878.19	Shear (N/m2)	9.41	41.01	15.63
Alpha	2.13	Stream Power (N/m s)	10536.43	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	0.31	0.33	0.67
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.78	0.20	1.23

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 45

INPUT

Description: p1

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.242	9.729	880.075	13.543	880.558	13.562	880	55.652	880.87
88.993	879	90.912	878.383	91.4	877.9	95.6	877.89	96.111	878.361
99.149	879	150.273	880	157.859	880.794	161.984	880.964	169.263	881
176.893	882.157	180.461	882	187.414	883	194.849	884.328	195.934	884
228.769	886.821								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	88.993	.035	99.149	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

88.993	99.149	100	100	100	.1	.3
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Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
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164 168 885.58 206 227 890

CROSS SECTION OUTPUT Profile #MCO(5añ)

E.G. Elev (m)	878.34	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035		
W.S. Elev (m)	878.28	Reach Len. (m)			
Crit W.S. (m)	878.17	Flow Area (m2)	1.79		
E.G. Slope (m/m)	0.006000	Area (m2)	1.79		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	5.01	Top Width (m)	5.01		
Vel Total (m/s)	1.07	Avg. Vel. (m/s)	1.07		
Max Chl Dpth (m)	0.39	Hydr. Depth (m)	0.36		
Conv. Total (m3/s)	24.7	Conv. (m3/s)	24.7		
Length Wtd. (m)		Wetted Per. (m)	5.32		
Min Ch El (m)	877.89	Shear (N/m2)	19.75		
Alpha	1.00	Stream Power (N/m s)	10952.97	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	879.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.28	Reach Len. (m)			
Crit W.S. (m)	879.13	Flow Area (m2)	0.71	9.94	2.04
E.G. Slope (m/m)	0.006002	Area (m2)	0.71	9.94	2.04
Q Total (m3/s)	22.10	Flow (m3/s)	0.30	20.94	0.86
Top Width (m)	29.65	Top Width (m)	5.04	10.16	14.45
Vel Total (m/s)	1.74	Avg. Vel. (m/s)	0.42	2.11	0.42
Max Chl Dpth (m)	1.39	Hydr. Depth (m)	0.14	0.98	0.14
Conv. Total (m3/s)	285.3	Conv. (m3/s)	3.9	270.3	11.1
Length Wtd. (m)		Wetted Per. (m)	5.05	10.70	14.45
Min Ch El (m)	877.89	Shear (N/m2)	8.31	54.67	8.32
Alpha	1.39	Stream Power (N/m s)	10952.97	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	879.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.49	Reach Len. (m)			
Crit W.S. (m)	879.44	Flow Area (m2)	2.12	12.02	6.07
E.G. Slope (m/m)	0.006011	Area (m2)	2.12	12.02	6.07
Q Total (m3/s)	33.70	Flow (m3/s)	1.28	28.75	3.67
Top Width (m)	43.75	Top Width (m)	8.69	10.16	24.91
Vel Total (m/s)	1.67	Avg. Vel. (m/s)	0.60	2.39	0.60
Max Chl Dpth (m)	1.60	Hydr. Depth (m)	0.24	1.18	0.24
Conv. Total (m3/s)	434.7	Conv. (m3/s)	16.5	370.9	47.3
Length Wtd. (m)		Wetted Per. (m)	8.70	10.70	24.91
Min Ch El (m)	877.89	Shear (N/m2)	14.34	66.18	14.36
Alpha	1.77	Stream Power (N/m s)	10952.97	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	880.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.29	Wt. n-Val.	0.050	0.035	0.050

W.S. Elev (m)	879.86	Reach Len. (m)			
Crit W.S. (m)	879.84	Flow Area (m2)	6.66	15.85	19.10
E.G. Slope (m/m)	0.006003	Area (m2)	6.66	15.85	19.10
Q Total (m3/s)	68.40	Flow (m3/s)	5.90	45.58	16.92
Top Width (m)	69.77	Top Width (m)	15.41	10.16	44.20
Vel Total (m/s)	1.64	Avg. Vel. (m/s)	0.88	2.88	0.89
Max Chl Dpth (m)	1.97	Hydr. Depth (m)	0.43	1.56	0.43
Conv. Total (m3/s)	882.8	Conv. (m3/s)	76.1	588.3	218.4
Length Wtd. (m)		Wetted Per. (m)	15.44	10.70	44.21
Min Ch El (m)	877.89	Shear (N/m2)	25.41	87.18	25.44
Alpha	2.14	Stream Power (N/m s)	10952.97	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River: Jerga

Reach	River Sta.	n1	n2	n3
Murias	390	.05	.035	.05
Murias	356	.05	.035	.05
Murias	326	.05	.035	.05
Murias	307	.05	.035	.05
Murias	305	Bridge		
Murias	300	.05	.035	.05
Murias	287	.05	.035	.05
Murias	262	.05	.035	.05
Murias	238	.05	.035	.05
Murias	219	.05	.035	.05
Murias	206	.05	.035	.05
Murias	180	.05	.035	.05
Murias	163	.05	.035	.05
Murias	75	.05	.035	.05
Murias	70	Bridge		
Murias	67	.05	.035	.05
Murias	45	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: Jerga

Reach	River Sta.	Left	Channel	Right
Murias	390	34	34	34
Murias	356	27	30	27
Murias	326	25	19	27
Murias	307	4.9	4.9	4.9
Murias	305	Bridge		
Murias	300	27	13	9
Murias	287	23	25	14
Murias	262	13	24	36
Murias	238	9	19	25
Murias	219	11	13	17
Murias	206	25	26	27
Murias	180	17	17	17
Murias	163	35	28	20

Murias	75	8	8	8
Murias	70	Bridge		
Murias	67	20	22	26
Murias	45	100	100	100

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Jerga

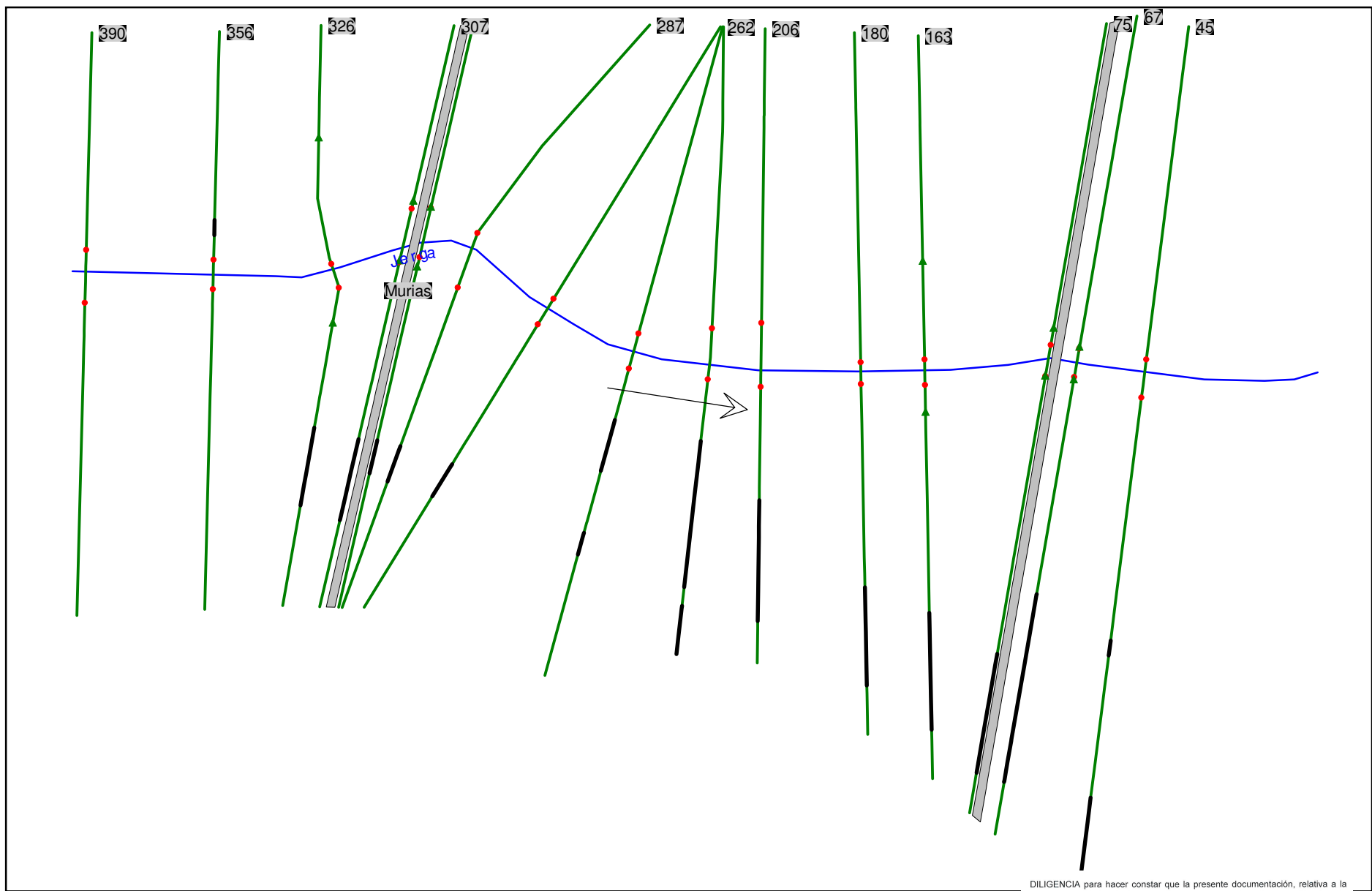
Reach	River Sta.	Contr.	Expan.
Murias	390	.1	.3
Murias	356	.1	.3
Murias	326	.1	.3
Murias	307	.1	.3
Murias	305	Bridge	
Murias	300	.1	.3
Murias	287	.1	.3
Murias	262	.1	.3
Murias	238	.1	.3
Murias	219	.1	.3
Murias	206	.1	.3
Murias	180	.1	.3
Murias	163	.1	.3
Murias	75	.1	.3
Murias	70	Bridge	
Murias	67	.1	.3
Murias	45	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m/m)	E.G. Elev (m/s)	E.G. Slope (m2)	Vel Chnl (m)	Flow Area	Top Width	Froude # Chl
Murias	390	MCO(5añ)	1.91	879.61	880.18		880.19	0.000761	0.44	4.37	10.44	0.22
Murias	390	50 años	22.10	879.61	880.95		881.08	0.003375	1.61	13.72	13.86	0.52
Murias	390	100 años	33.70	879.61	881.17	880.79	881.33	0.003456	1.84	24.48	61.11	0.54
Murias	390	500 años	68.40	879.61	881.78		881.88	0.001649	1.68	66.55	75.38	0.40
Murias	356	MCO(5añ)	1.91	879.50	880.16		880.17	0.000649	0.47	4.25	10.19	0.21
Murias	356	50 años	22.10	879.50	880.69	880.60	880.92	0.006120	2.29	12.63	26.59	0.71
Murias	356	100 años	33.70	879.50	880.95	880.86	881.18	0.005141	2.43	21.53	41.85	0.68
Murias	356	500 años	68.40	879.50	881.72		881.82	0.001728	1.92	66.32	66.07	0.42
Murias	326	MCO(5añ)	1.91	879.47	879.92	879.92	880.10	0.019308	1.83	1.04	2.95	0.99
Murias	326	50 años	22.10	879.47	880.70	880.42	880.75	0.002854	1.27	25.52	44.94	0.44
Murias	326	100 años	33.70	879.47	880.99	880.54	881.04	0.002019	1.24	37.07	53.61	0.39
Murias	326	500 años	68.40	879.47	881.73	880.79	881.77	0.000969	1.22	91.00	79.66	0.29
Murias	307	MCO(5añ)	1.91	879.19	879.87	879.45	879.88	0.000453	0.35	5.47	12.27	0.17
Murias	307	50 años	22.10	879.19	880.60	880.13	880.69	0.002166	1.37	16.74	33.91	0.42
Murias	307	100 años	33.70	879.19	880.84	880.34	880.98	0.002560	1.70	20.62	38.29	0.47
Murias	307	500 años	68.40	879.19	881.70	880.81	881.75	0.000648	1.17	94.27	82.95	0.25
Murias	305	Bridge										
Murias	300	MCO(5añ)	1.91	879.13	879.85	879.55	879.87	0.002717	0.68	2.82	8.69	0.38
Murias	300	50 años	22.10	879.13	880.45	880.32	880.66	0.007438	2.06	11.16	32.36	0.74
Murias	300	100 años	33.70	879.13	880.54	880.54	880.93	0.011928	2.80	12.60	33.74	0.95
Murias	300	500 años	68.40	879.13	881.02	881.02	881.64	0.010769	3.55	20.38	63.00	0.97
Murias	287	MCO(5añ)	1.91	879.04	879.83		879.84	0.001007	0.46	4.12	10.72	0.24
Murias	287	50 años	22.10	879.04	880.48		880.56	0.002762	1.36	22.58	54.23	0.46
Murias	287	100 años	33.70	879.04	880.60		880.71	0.003554	1.67	29.04	56.04	0.53
Murias	287	500 años	68.40	879.04	880.85		881.05	0.005096	2.32	43.70	59.96	0.66
Murias	262	MCO(5añ)	1.91	879.10	879.79		879.81	0.001492	0.64	2.97	6.22	0.30
Murias	262	50 años	22.10	879.10	880.46		880.50	0.001927	1.21	32.92	67.05	0.38
Murias	262	100 años	33.70	879.10	880.57		880.63	0.002472	1.48	40.63	68.94	0.44
Murias	262	500 años	68.40	879.10	880.82		880.92	0.003556	2.02	58.44	73.10	0.55
Murias	238	MCO(5añ)	1.91	879.14	879.69		879.75	0.005440	1.09	1.75	4.26	0.55

Astorga, 18 de mayo de 2018
 EL Jefe de Rango General
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Murias	238	50 años	22.10	879.14	880.29	880.29	880.42	0.008500	1.98	20.05	70.36	0.76
Murias	238	100 años	33.70	879.14	880.38	880.38	880.54	0.010160	2.33	25.74	70.97	0.85
Murias	238	500 años	68.40	879.14	880.56	880.56	880.80	0.012689	3.01	38.97	72.37	0.99
Murias	219	MCO(5añ)	1.91	879.01	879.62		879.65	0.003747	0.77	2.47	7.80	0.44
Murias	219	50 años	22.10	879.01	880.16	880.08	880.24	0.005057	1.52	23.47	69.35	0.59
Murias	219	100 años	33.70	879.01	880.33		880.40	0.003701	1.51	35.39	70.12	0.52
Murias	219	500 años	68.40	879.01	880.50		880.65	0.006270	2.23	47.82	71.80	0.70
Murias	206	MCO(5añ)	1.91	879.00	879.38	879.38	879.55	0.019997	1.81	1.05	3.15	1.00
Murias	206	50 años	22.10	879.00	880.01	880.01	880.14	0.011422	1.88	17.16	61.45	0.85
Murias	206	100 años	33.70	879.00	880.29		880.36	0.003442	1.39	36.83	75.15	0.50
Murias	206	500 años	68.40	879.00	880.36		880.56	0.009710	2.47	41.89	75.87	0.86
Murias	180	MCO(5añ)	1.91	878.29	878.84		878.90	0.005057	1.07	1.78	4.22	0.53
Murias	180	50 años	22.10	878.29	879.91		879.95	0.001391	1.24	36.13	68.35	0.34
Murias	180	100 años	33.70	878.29	880.29		880.31	0.000701	1.04	67.29	90.84	0.25
Murias	180	500 años	68.40	878.29	880.33		880.41	0.002472	1.98	71.10	91.75	0.47
Murias	163	MCO(5añ)	1.91	878.09	878.84	878.41	878.86	0.001047	0.59	3.25	5.85	0.25
Murias	163	50 años	22.10	878.09	879.89	879.47	879.93	0.000998	1.13	32.24	74.38	0.29
Murias	163	100 años	33.70	878.09	880.28	879.62	880.30	0.000505	0.93	72.58	89.69	0.22
Murias	163	500 años	68.40	878.09	880.29	879.92	880.37	0.001988	1.86	73.79	90.08	0.43
Murias	75	MCO(5añ)	1.91	878.40	878.72	878.67	878.78	0.009742	1.11	1.72	6.86	0.71
Murias	75	50 años	22.10	878.40	879.58	879.46	879.84	0.006546	2.34	10.61	55.46	0.73
Murias	75	100 años	33.70	878.40	880.27	879.70	880.28	0.000435	0.84	86.33	130.96	0.21
Murias	75	500 años	68.40	878.40	880.24	880.12	880.31	0.002010	1.79	82.45	128.54	0.44
Murias	70	Bridge										
Murias	67	MCO(5añ)	1.91	878.19	878.46	878.45	878.56	0.016221	1.34	1.43	6.18	0.89
Murias	67	50 años	22.10	878.19	879.32	879.29	879.73	0.011183	2.86	7.96	34.29	0.92
Murias	67	100 años	33.70	878.19	879.58	879.58	880.16	0.011927	3.43	10.17	55.06	0.98
Murias	67	500 años	68.40	878.19	880.16	880.12	880.26	0.002467	2.02	70.98	120.84	0.48
Murias	45	MCO(5añ)	1.91	877.89	878.28	878.17	878.34	0.006000	1.07	1.79	5.01	0.57
Murias	45	50 años	22.10	877.89	879.28	879.13	879.50	0.006002	2.11	12.69	29.65	0.68
Murias	45	100 años	33.70	877.89	879.49	879.44	879.74	0.006011	2.39	20.20	43.75	0.70
Murias	45	500 años	68.40	877.89	879.86	879.84	880.16	0.006003	2.88	41.62	69.77	0.73



DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada inicialmente en sesión plenaria del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

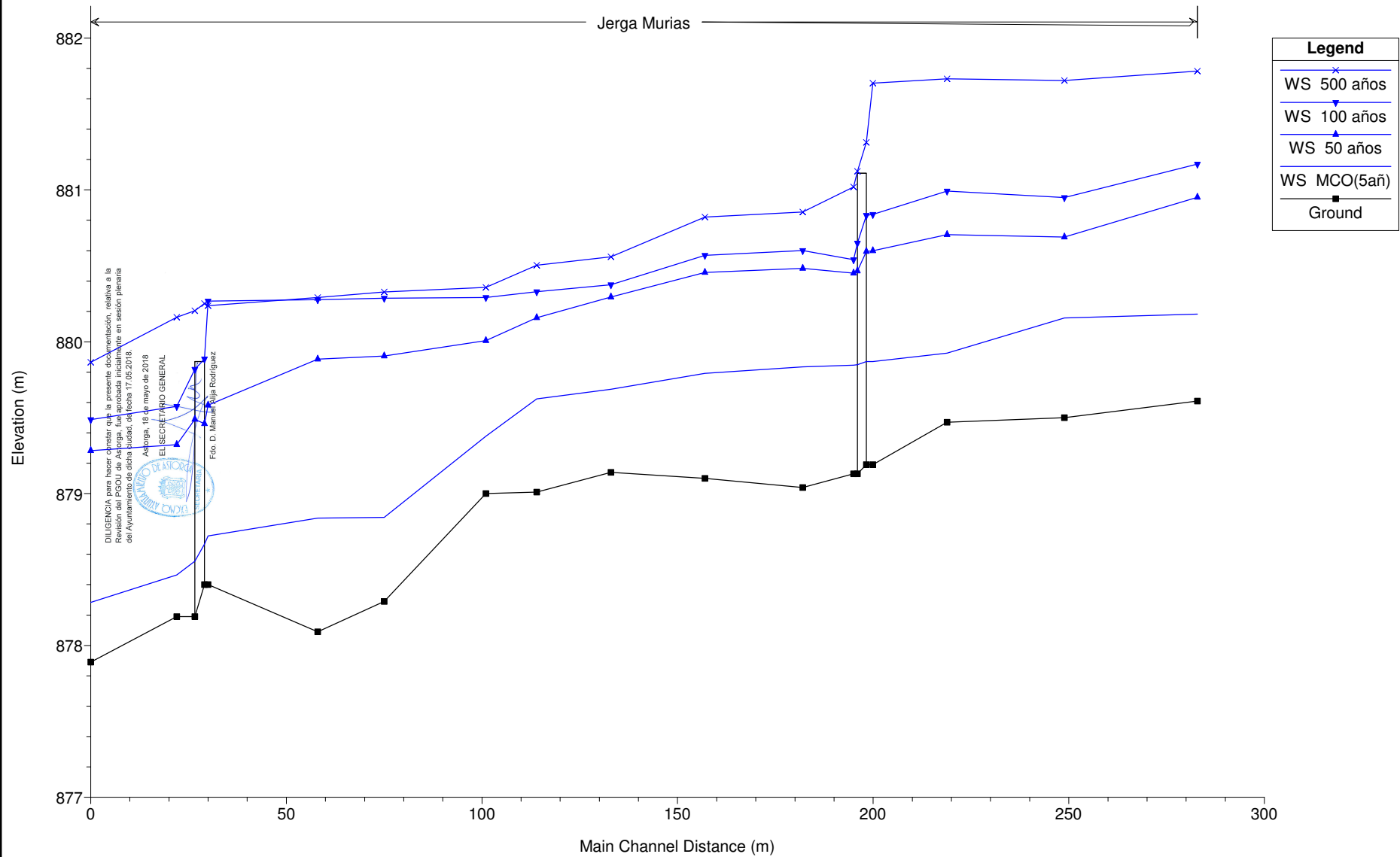


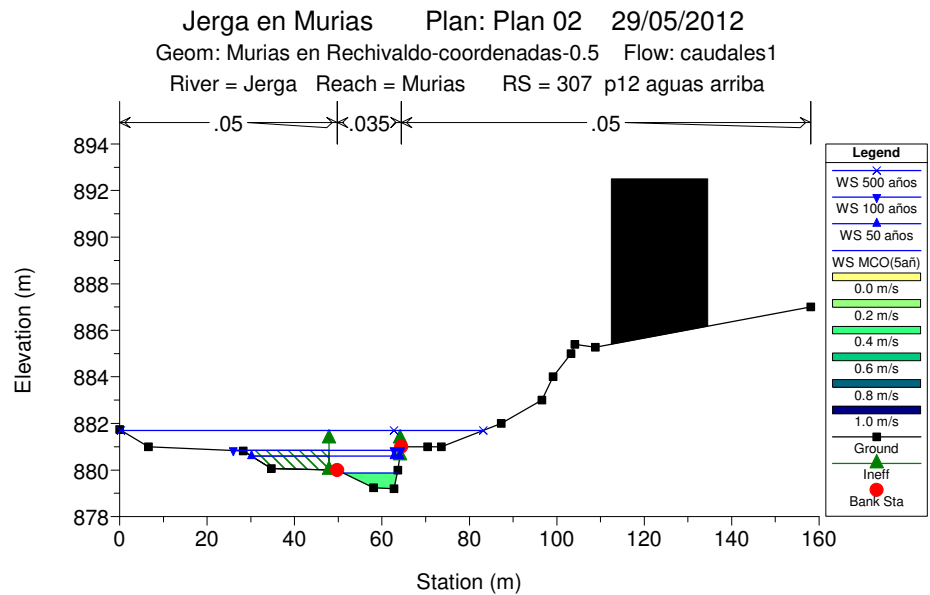
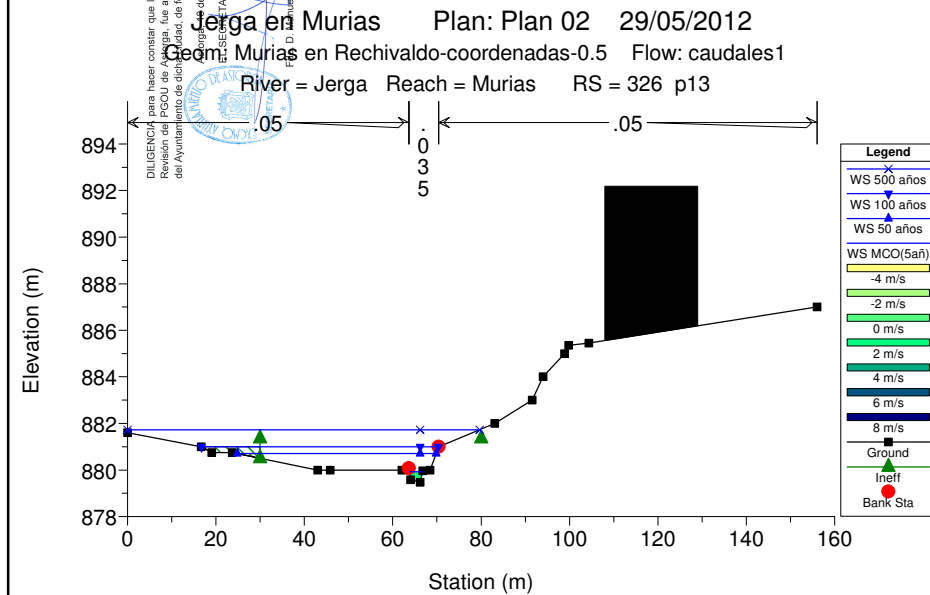
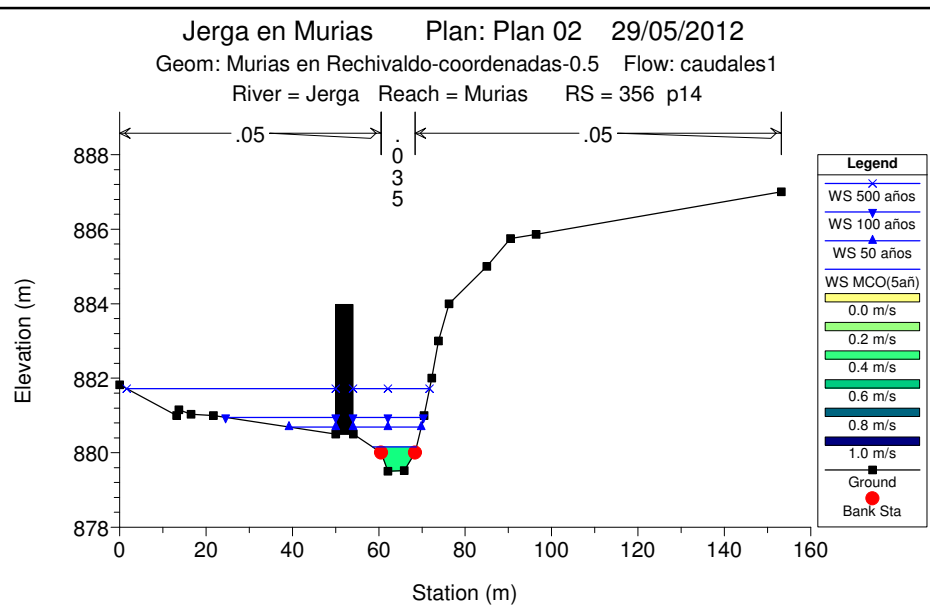
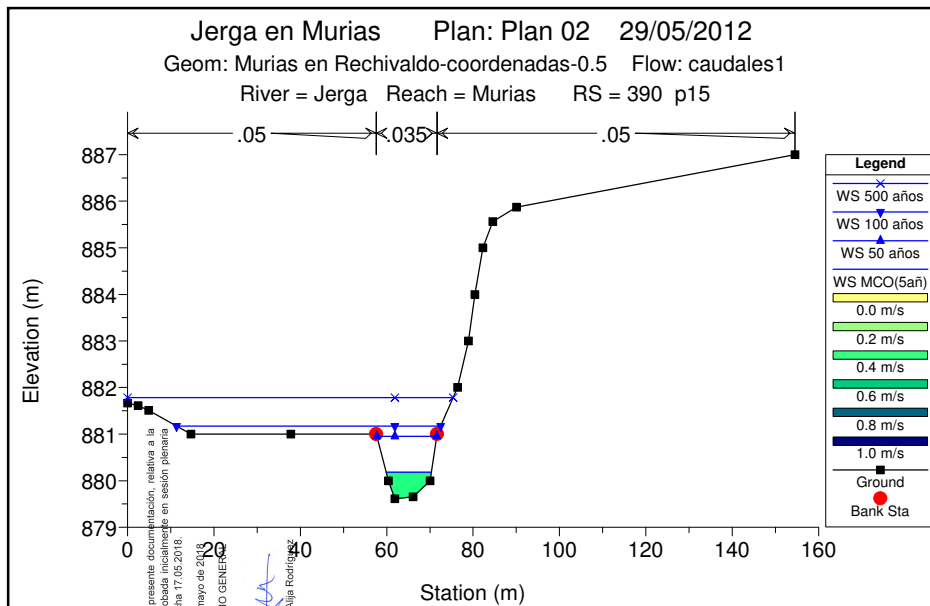
Astorga, 18 de mayo de 2018

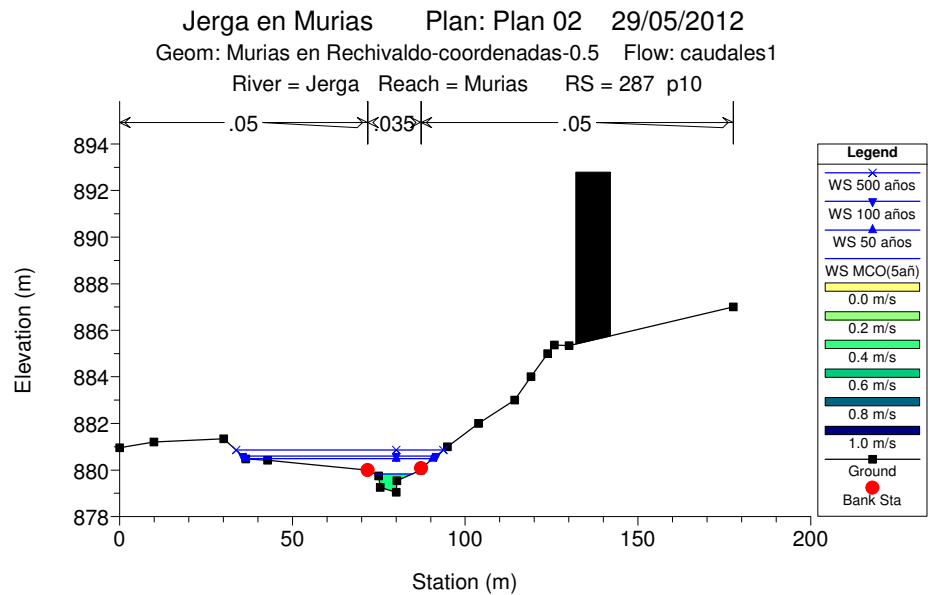
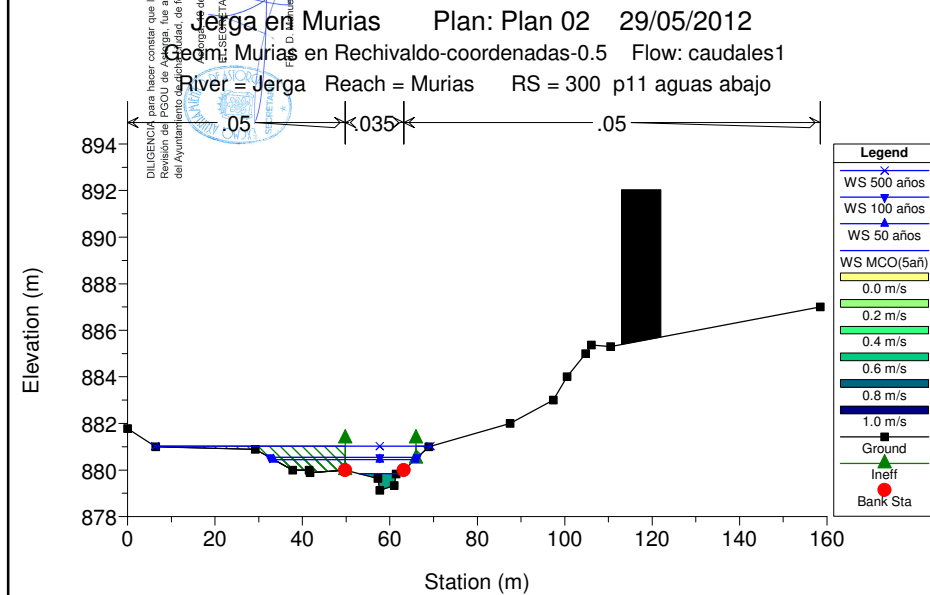
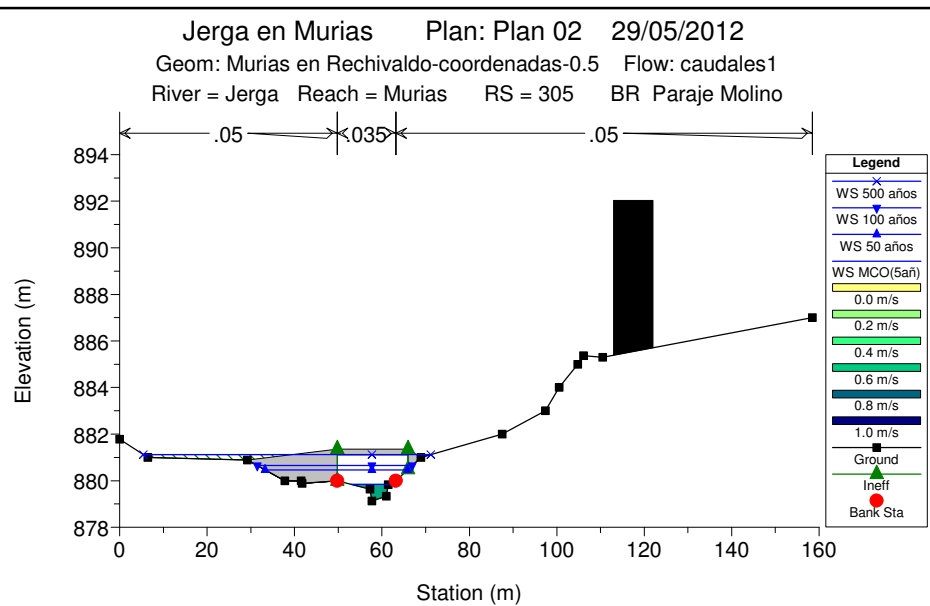
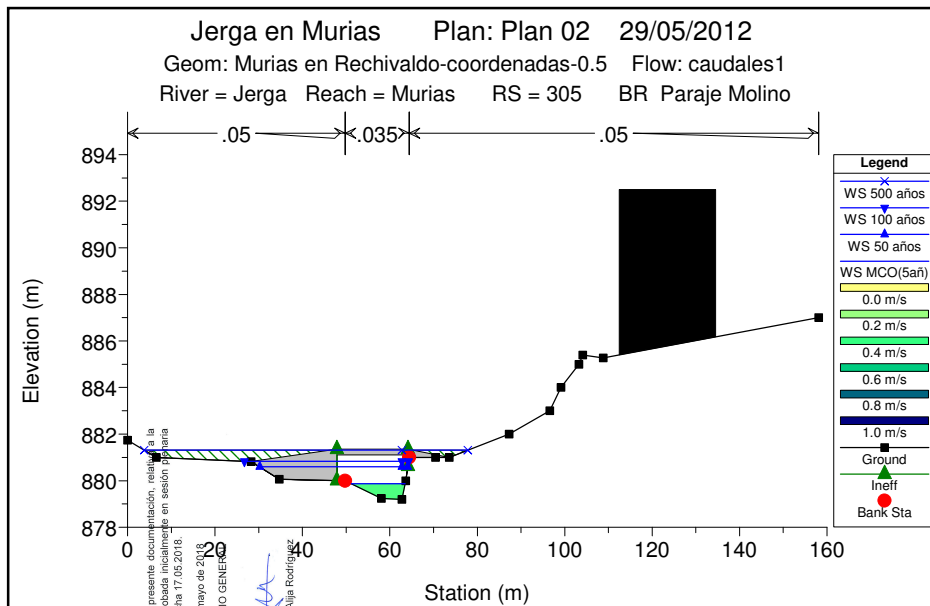
EL SECRETARIO GENERAL

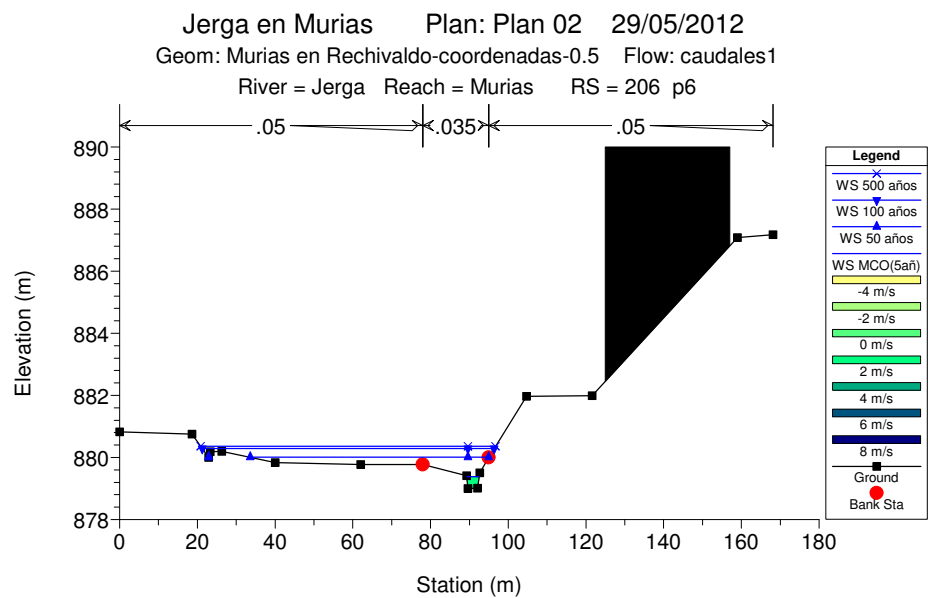
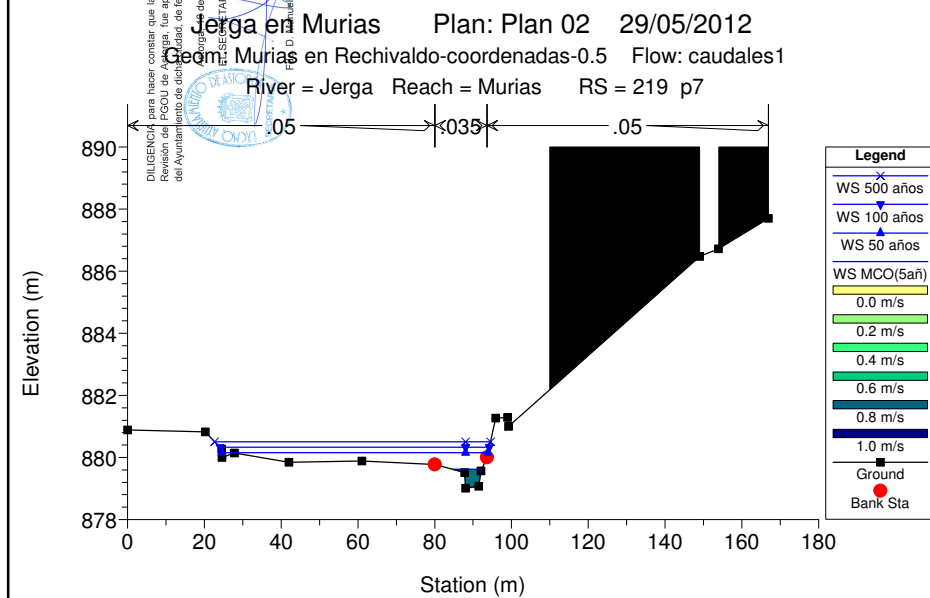
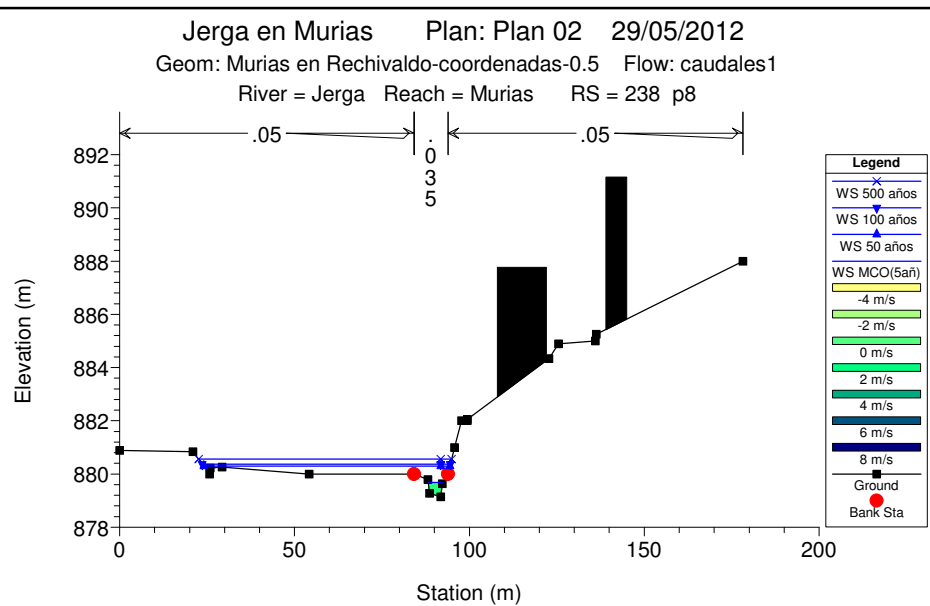
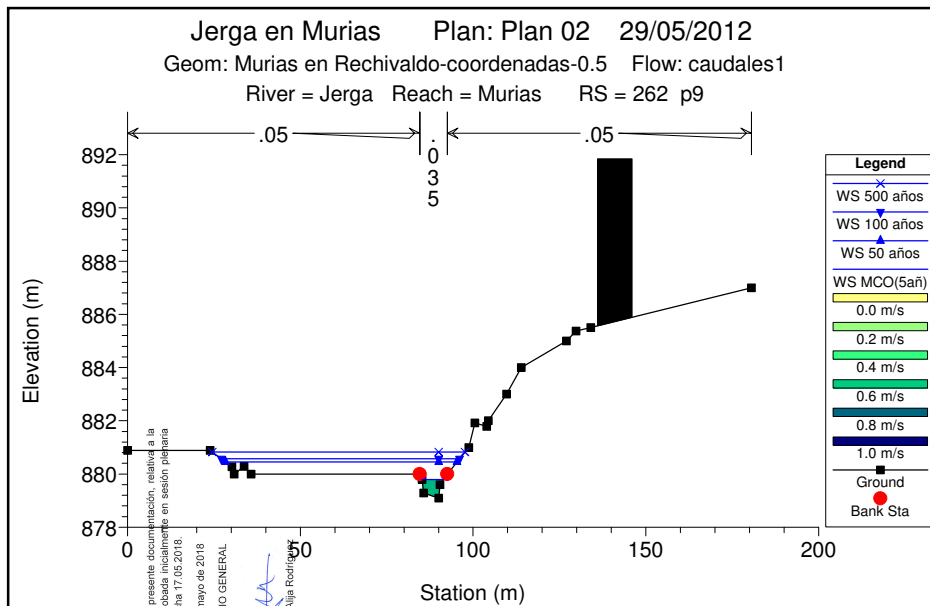
Fdo. D. Manuel Alija Rodríguez

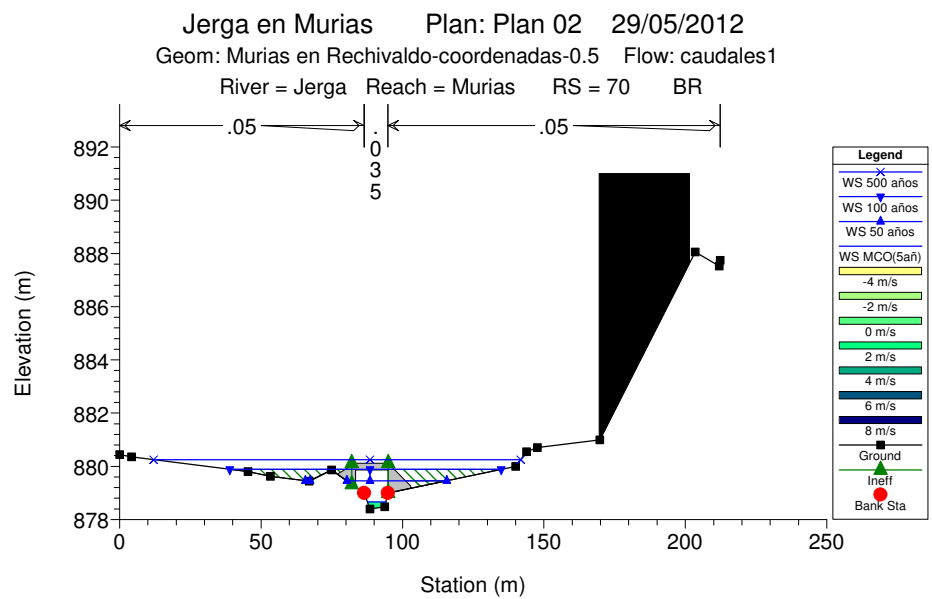
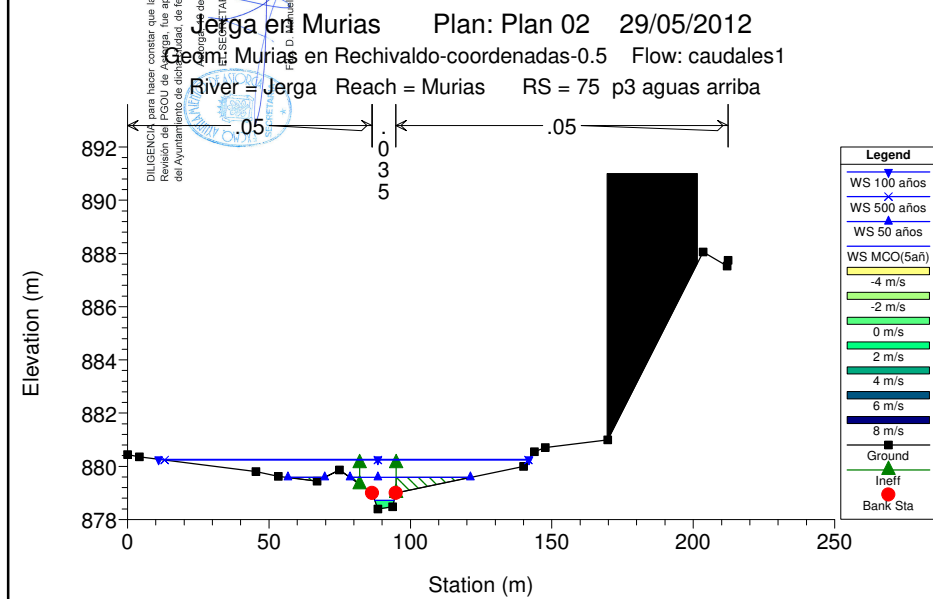
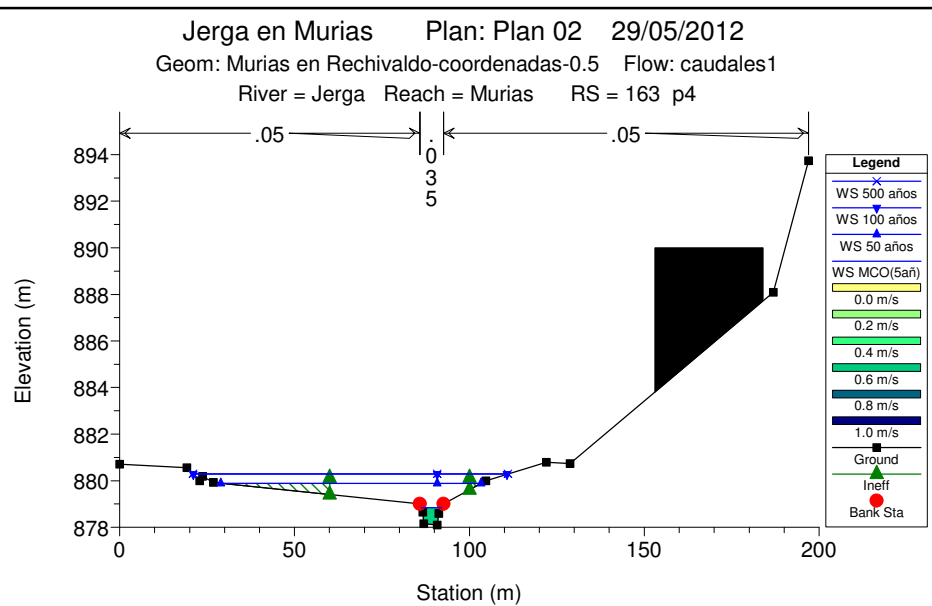
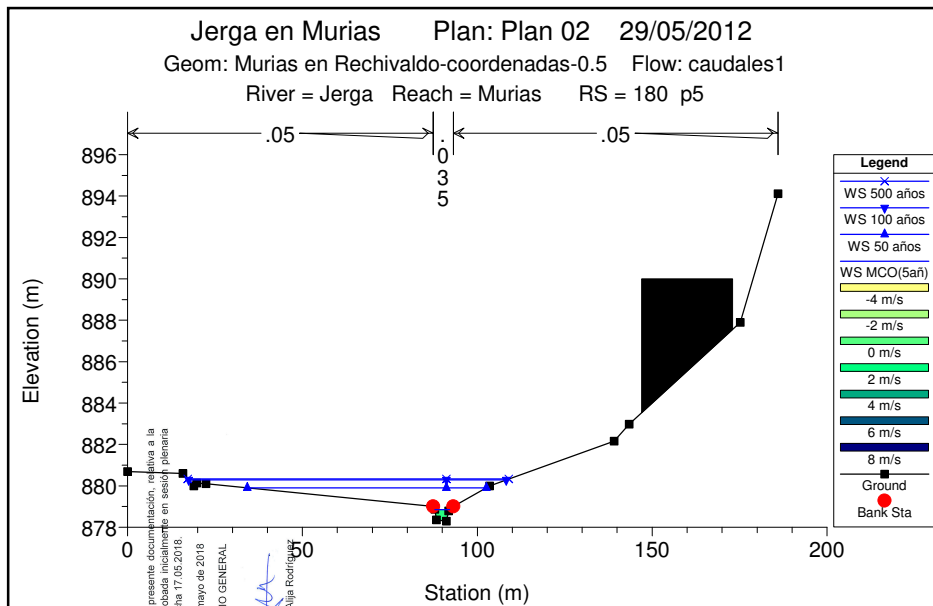
Jerga en Murias Plan: Plan 02 29/05/2012
Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: caudales1

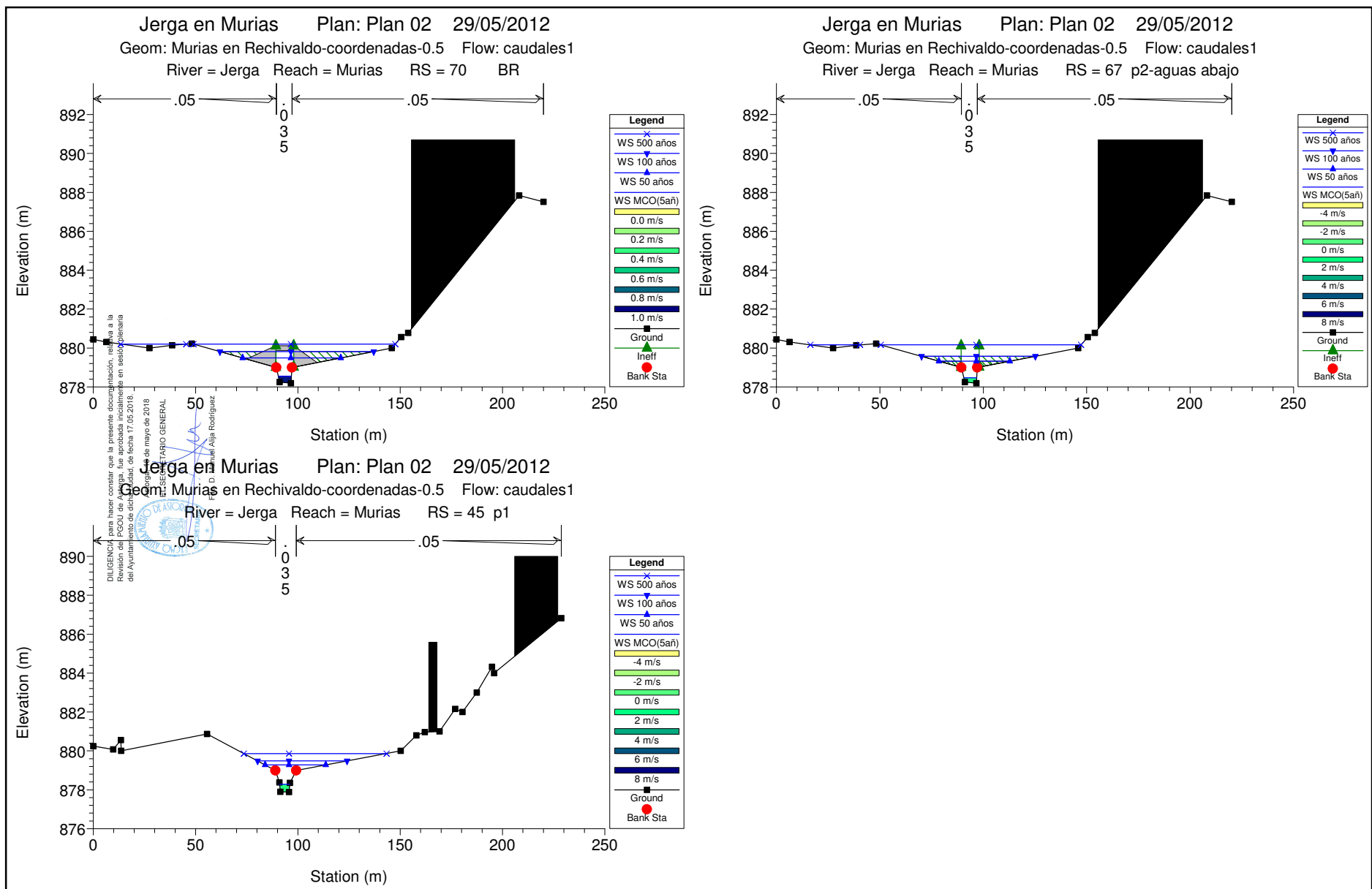






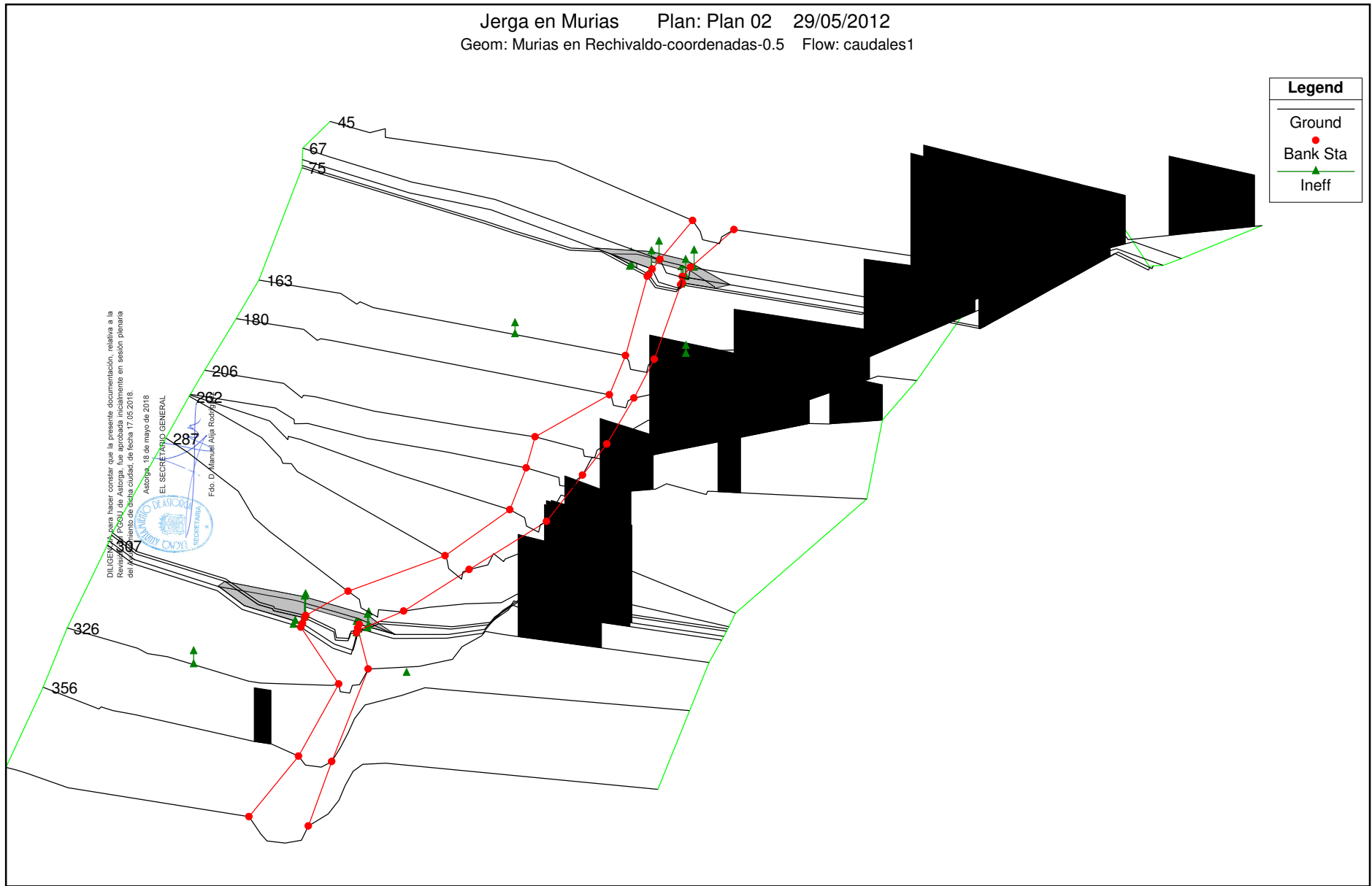




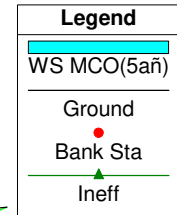


Jerga en Murias Plan: Plan 02 29/05/2012
Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: caudales1

Legend
Ground
Bank Sta
Ineff

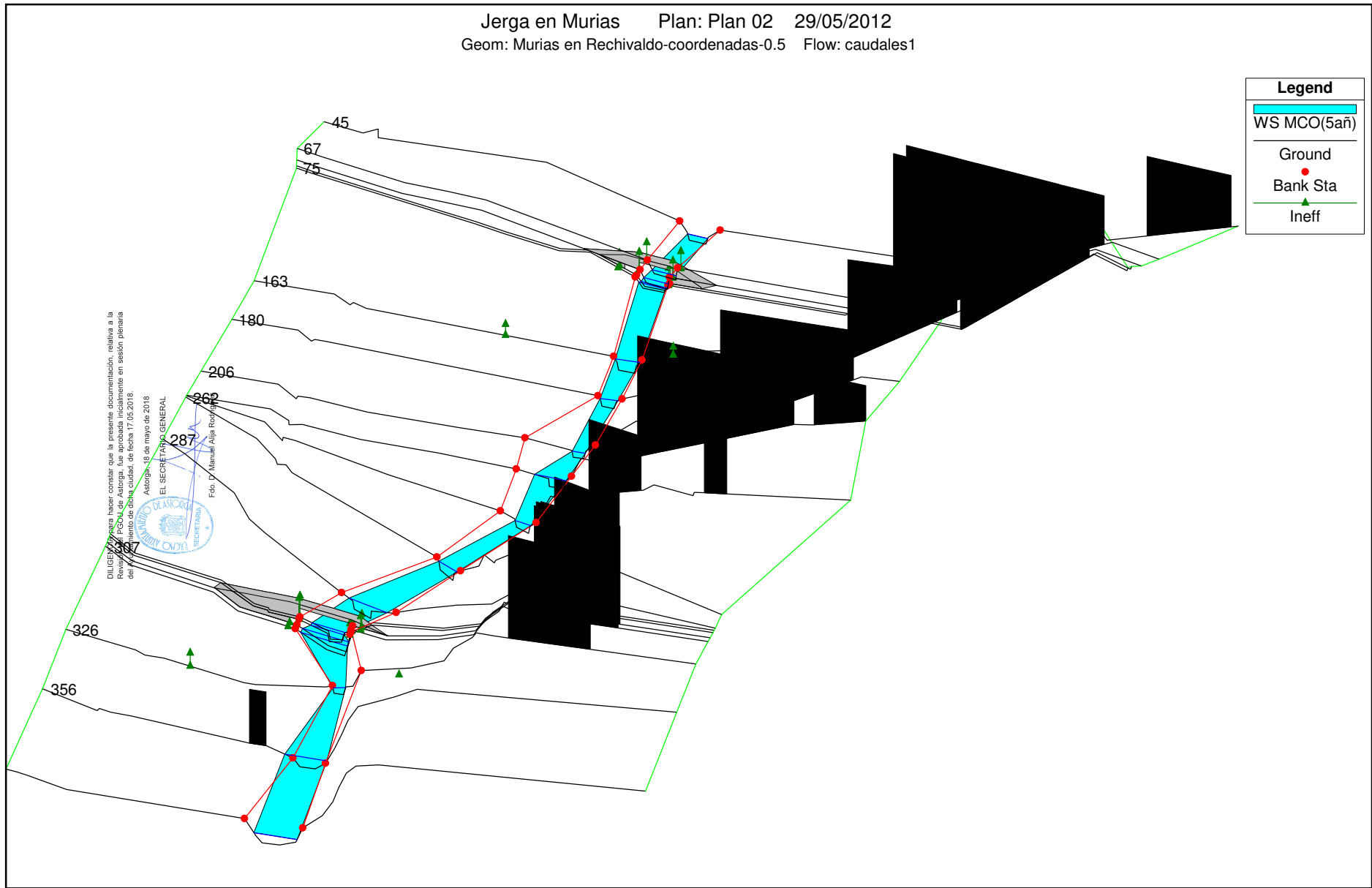


Jerga en Murias Plan: Plan 02 29/05/2012
Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: caudales1



DILIGENCIAR para hacer constar que la presente documentación, relativa a la
Revisión del PISOI de Astorga, fue aprobada inicialmente en sesión plenaria
del # 1297
Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL
Fdo. D. Manuel Allja Rodríguez



Jerga en Murias Plan: Plan 02 29/05/2012
 Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: caudales1

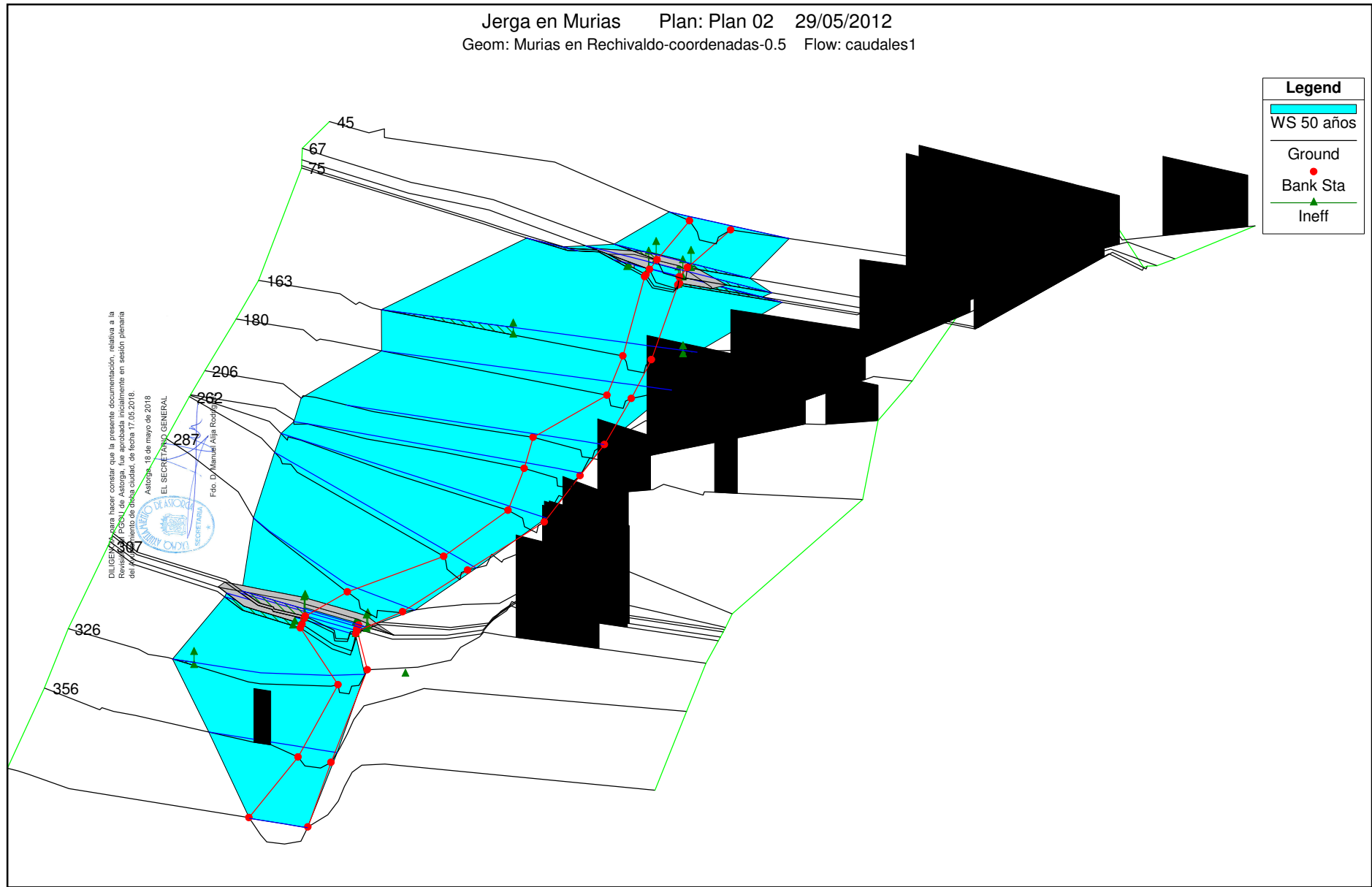
Legend

WS 50 años




Ground

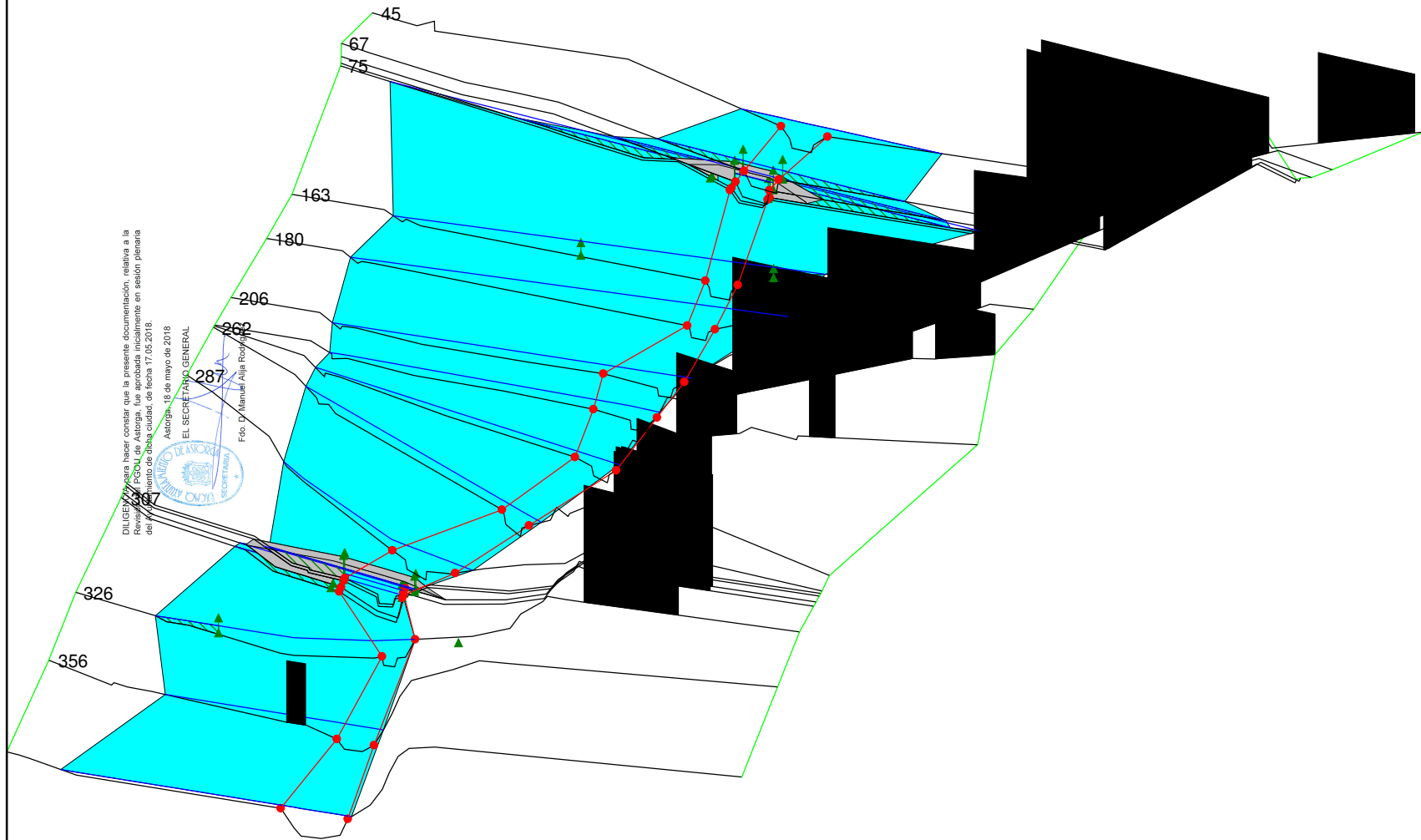
Bank Sta

Ineff



Jerga en Murias Plan: Plan 02 29/05/2012
 Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: caudales1

Legend	
	WS 100 años
	Ground
	Bank Sta
	Ineff



DILIGENTE para hacer constar que la presente documentación, relativa a la
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 del 17 de mayo de 2018.

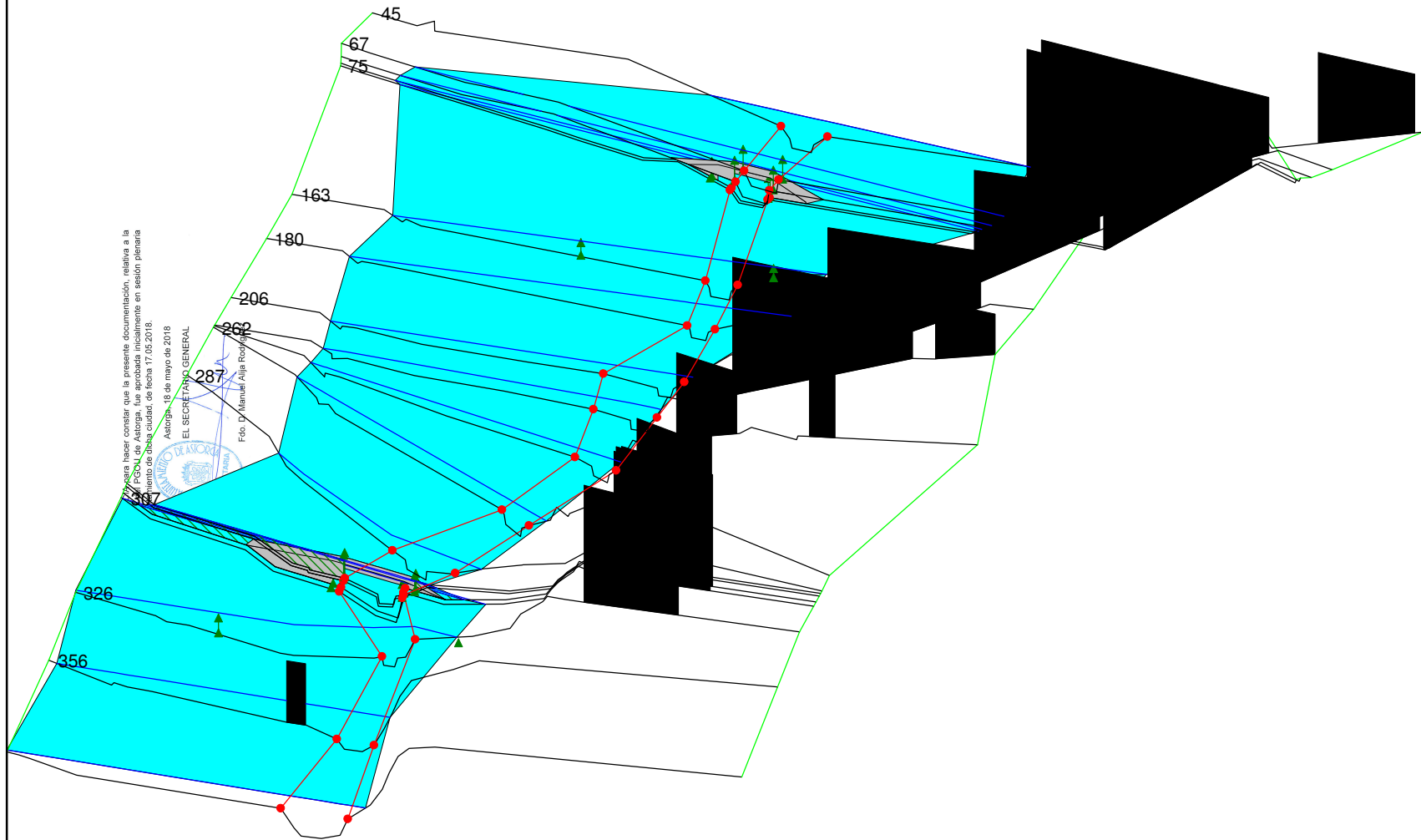
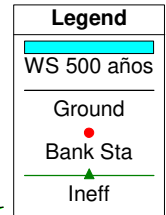
Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Allja Rodríguez



Jerga en Murias Plan: Plan 02 29/05/2012
Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: caudales1



HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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PROJECT DATA

Project Title: Jerga en Murias

Project File : Murias122013.prj

Run Date and Time: 12/12/2013 09:44:35 a.m.

Project in SI units

Project Description:

Estudio Hidraulico Rio Jerga en Murias de Rechivaldo.

Plan General de

Ordenación Urbana de Astorga

PLAN DATA

Plan Title: Plan 04.Nueva VID

Plan File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.p01

Geometry Title: Murias en Rechivaldo-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.g03

Flow Title : VID

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.f03

Plan Summary Information:

Number of: Cross Sections = 15 Multiple Openings = 0

Culverts = 0 Inline Structures = 0

Bridges = 2 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.003

Critical depth calculation tolerance = 0.003

Maximum number of iterations = 20

Maximum difference tolerance = 0.1

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Mixed Flow

Encroachment Data

Equal Conveyance = True

Left Offset = 0

Right Offset = 0

River = Jerga		Reach = Murias		
RS	Profile	Method	Value1	Value2
390	VID	1	57.61	71.68
356	VID	1	60.54	68.38
326	VID	1	49.32	70.38
307	VID	1	49.78	64.4
300	VID	1	49.8	63.18
287	VID	1	71.8	87.23
262	VID	1	84.5	91.5
238	VID	1	82.57	93.9
219	VID	1	76.72	93.59
206	VID	1	78	94.96
180	VID	1	66.86	93.15
163	VID	1	63.89	92.6
75	VID	1	86.48	94.85
67	VID	1	90.5	96.7
45	VID	1	88.99	99.15

FLOW DATA

Flow Title: VID

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.f03

Flow Data (m3/s)

River	Reach	RS	100 años	VID
Jerga	Murias	390	33.7	33.7

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Jerga	Murias	100 años	Normal S = 0.006	Normal S = 0.006
Jerga	Murias	VID	Normal S = 0.006	Normal S = 0.006

GEOMETRY DATA

Geometry Title: Murias en Rechivaldo-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Murias\Murias122013.g03

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 390

INPUT

Description: p15

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.67	2.453	881.61	4.907	881.507	14.655	881	37.829	881

57.607 881 60.399 880 61.865 879.61 66.119 879.65 70.033 880
 71.681 881 76.403 882 78.956 883 80.392 884 82.238 885
 84.521 885.565 90.019 885.871 154.495 887

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val
 0 .05 57.607 .035 71.681 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 57.607 71.681 34 34 34 .1 .3

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	881.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	881.17	Reach Len. (m)	34.00	34.00	34.00
Crit W.S. (m)	880.79	Flow Area (m2)	7.61	16.80	0.07
E.G. Slope (m/m)	0.003456	Area (m2)	7.61	16.80	0.07
Q Total (m3/s)	33.70	Flow (m3/s)	2.69	31.00	0.02
Top Width (m)	61.11	Top Width (m)	46.23	14.07	0.81
Vel Total (m/s)	1.38	Avg. Vel. (m/s)	0.35	1.84	0.22
Max Chl Dpth (m)	1.56	Hydr. Depth (m)	0.16	1.19	0.09
Conv. Total (m3/s)	573.3	Conv. (m3/s)	45.7	527.3	0.3
Length Wtd. (m)	34.00	Wetted Per. (m)	46.24	14.59	0.82
Min Ch El (m)	879.61	Shear (N/m2)	5.58	39.01	2.83
Alpha	1.66	Stream Power (N/m s)	7396.89	0.00	0.00
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	6.40	3.24	0.98
C & E Loss (m)	0.01	Cum SA (1000 m2)	12.52	2.83	2.03

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	881.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035		
W.S. Elev (m)	881.40	Reach Len. (m)	34.00	34.00	34.00
Crit W.S. (m)	880.78	Flow Area (m2)	20.02		
E.G. Slope (m/m)	0.002445	Area (m2)	20.02		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	14.07	Top Width (m)	14.07		
Vel Total (m/s)	1.68	Avg. Vel. (m/s)	1.68		
Max Chl Dpth (m)	1.79	Hydr. Depth (m)	1.42		
Conv. Total (m3/s)	681.6	Conv. (m3/s)	681.6		
Length Wtd. (m)	34.00	Wetted Per. (m)	15.39		
Min Ch El (m)	879.61	Shear (N/m2)	31.18		
Alpha	1.00	Stream Power (N/m s)	7396.89	0.00	0.00
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	2.74	4.02	0.13
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.21	2.79	0.09

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	11.52	0.00	0.00	0.15	0.00	0.00	0.03	0.13	0.00
2	LOB	11.52	23.04	0.56	1.71	11.53	1.67	0.15	0.33	5.03	1.65
3	LOB	23.04	34.56	0.71	1.97	11.52	2.10	0.17	0.36	5.78	2.08
4	LOB	34.56	46.09	0.71	1.97	11.52	2.10	0.17	0.36	5.78	2.08
5	LOB	46.09	57.61	0.71	1.97	11.52	2.10	0.17	0.36	5.78	2.08
6	Chan	57.61	60.42	2.23	1.90	2.99	6.62	0.67	1.17	21.53	25.29

7	Chan	60.42	63.24	8.30	4.11	2.87	24.62	1.46	2.02	48.58	98.13
8	Chan	63.24	66.05	9.13	4.32	2.81	27.09	1.53	2.11	52.00	109.91
9	Chan	66.05	68.87	7.82	3.94	2.83	23.21	1.40	1.98	47.29	93.82
10	Chan	68.87	71.68	3.52	2.53	3.10	10.43	0.90	1.39	27.69	38.45
11	ROB	71.68	88.24	0.02	0.07	0.82	0.05	0.09	0.22	2.83	0.64

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	57.61	60.42	2.80	2.54	3.39	8.30	0.90	1.10	18.00	19.79
2	Chan	60.42	63.24	8.86	4.75	2.87	26.29	1.69	1.87	39.75	74.14
3	Chan	63.24	66.05	9.64	4.96	2.81	28.62	1.76	1.94	42.27	82.13
4	Chan	66.05	68.87	8.43	4.59	2.83	25.03	1.63	1.84	38.91	71.56
5	Chan	68.87	71.68	3.96	3.18	3.50	11.76	1.13	1.25	21.76	27.17

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 356

INPUT

Description: p14

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.825	13.217	881	13.731	881.151	16.528	881.032	21.697	881
50.005	880.5	54.089	880.5	60.539	880	62.126	879.5	65.89	879.52
68.382	880	70.461	881	72.228	882	73.794	883	76.245	884
84.982	885	90.517	885.747	96.426	885.859	153.182	887		

Manning's n Values num= 3

Sta	n	Sta	n	Sta	n	Sta	n	Sta	n
0	.05	60.539	.035	68.382	.05				

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
60.539 68.382 27 30 27 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
50	54	883.978

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	881.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.95	Reach Len. (m)	27.00	30.00	27.00
Crit W.S. (m)	880.86	Flow Area (m2)	10.30	10.29	0.94
E.G. Slope (m/m)	0.005141	Area (m2)	10.30	10.29	0.94
Q Total (m3/s)	33.70	Flow (m3/s)	7.92	25.02	0.77
Top Width (m)	41.85	Top Width (m)	32.04	7.84	1.98
Vel Total (m/s)	1.57	Avg. Vel. (m/s)	0.77	2.43	0.81
Max Chl Dpth (m)	1.45	Hydr. Depth (m)	0.32	1.31	0.48
Conv. Total (m3/s)	470.0	Conv. (m3/s)	110.4	348.9	10.7
Length Wtd. (m)	28.50	Wetted Per. (m)	32.96	7.97	2.19
Min Ch El (m)	879.50	Shear (N/m2)	15.75	65.15	21.59
Alpha	1.85	Stream Power (N/m s)	7334.03	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	6.10	2.78	0.96

C & E Loss (m) 0.06 Cum SA (1000 m2) 11.19 2.46 1.99

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	881.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.29	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	881.11	Reach Len. (m)	27.00	30.00	27.00
Crit W.S. (m)		Flow Area (m2)	3.46	11.58	
E.G. Slope (m/m)	0.005662	Area (m2)	3.46	11.58	
Q Total (m3/s)	33.70	Flow (m3/s)	4.44	29.26	
Top Width (m)	11.38	Top Width (m)	3.54	7.84	
Vel Total (m/s)	2.24	Avg. Vel. (m/s)	1.28	2.53	
Max Chl Dpth (m)	1.61	Hydr. Depth (m)	0.98	1.48	
Conv. Total (m3/s)	447.9	Conv. (m3/s)	59.0	388.9	
Length Wtd. (m)	28.92	Wetted Per. (m)	4.39	9.08	
Min Ch El (m)	879.50	Shear (N/m2)	43.74	70.80	
Alpha	1.15	Stream Power (N/m s)	7334.03	0.00	0.00
Frctn Loss (m)	0.13	Cum Volume (1000 m3)	2.69	3.48	0.13
C & E Loss (m)	0.05	Cum SA (1000 m2)	2.15	2.42	0.09

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	24.22	36.32	0.38	1.23	11.82	1.13	0.10	0.31	5.26	1.62
2	LOB	36.32	48.43	2.46	3.82	12.11	7.31	0.32	0.64	15.91	10.25
3	LOB	48.43	60.54	5.07	5.24	9.03	15.05	0.65	0.97	29.28	28.33
4	Chan	60.54	62.11	4.17	1.88	1.64	12.38	1.20	2.22	57.59	127.92
5	Chan	62.11	63.68	5.90	2.27	1.57	17.49	1.45	2.60	72.88	189.39
6	Chan	63.68	65.24	5.84	2.26	1.57	17.33	1.44	2.59	72.51	187.78
7	Chan	65.24	66.81	5.41	2.16	1.59	16.05	1.38	2.50	68.78	171.97
8	Chan	66.81	68.38	3.70	1.73	1.60	10.98	1.10	2.14	54.54	116.83
9	ROB	68.38	85.34	0.77	0.94	2.19	2.27	0.48	0.81	21.59	17.59

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	48.43	60.54	4.44	3.46	4.39	13.17	0.98	1.28	43.74	56.14
2	Chan	60.54	62.11	5.21	2.14	1.64	15.47	1.36	2.44	72.09	175.99
3	Chan	62.11	63.68	7.11	2.53	1.57	21.11	1.61	2.82	89.34	251.63
4	Chan	63.68	65.24	7.06	2.51	1.57	20.94	1.60	2.81	88.93	249.74
5	Chan	65.24	66.81	6.58	2.42	1.59	19.52	1.54	2.72	84.73	230.39

6	Chan	66.81	68.38	3.30	1.98	2.71	9.80	1.27	1.67	40.62	67.65
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Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 326

INPUT

Description: p13

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.604	16.681	881	19.085	880.752	23.657	880.752	42.995	880
45.849	880	62.088	880	63.683	880.078	64	879.578	66.2	879.47
66.786	879.97	68.443	880	70.376	881	83.071	882	91.517	883
93.998	884	98.846	885	99.78	885.354	104.347	885.452	156.018	887

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	63.683	.035	70.376	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	63.683	70.376		25	19	27	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	30	881.36	F
80	156.018	881.36	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
108	129	892.19

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	881.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.99	Reach Len. (m)	25.00	19.00	27.00
Crit W.S. (m)	880.54	Flow Area (m2)	30.10	6.97	
E.G. Slope (m/m)	0.002019	Area (m2)	33.80	6.97	
Q Total (m3/s)	33.70	Flow (m3/s)	25.09	8.61	
Top Width (m)	53.61	Top Width (m)	46.93	6.68	
Vel Total (m/s)	0.91	Avg. Vel. (m/s)	0.83	1.24	
Max Chl Dpth (m)	1.52	Hydr. Depth (m)	0.89	1.04	
Conv. Total (m3/s)	750.0	Conv. (m3/s)	558.4	191.6	
Length Wtd. (m)	21.36	Wetted Per. (m)	33.69	7.38	
Min Ch El (m)	879.47	Shear (N/m2)	17.69	18.69	
Alpha	1.10	Stream Power (N/m s)	7469.81	0.00	0.00
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	5.50	2.52	0.95
C & E Loss (m)	0.01	Cum SA (1000 m2)	10.12	2.24	1.96

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	881.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.	0.050	0.035	0.000
W.S. Elev (m)	881.11	Reach Len. (m)	25.00	19.00	27.00
Crit W.S. (m)	880.67	Flow Area (m2)	15.84	7.73	0.00
E.G. Slope (m/m)	0.003764	Area (m2)	15.84	7.73	0.00

Q Total (m3/s)	33.70	Flow (m3/s)	19.74	13.96	0.00
Top Width (m)	21.06	Top Width (m)	14.36	6.69	0.00
Vel Total (m/s)	1.43	Avg. Vel. (m/s)	1.25	1.81	0.03
Max Chl Dpth (m)	1.64	Hydr. Depth (m)	1.10	1.16	0.11
Conv. Total (m3/s)	549.3	Conv. (m3/s)	321.8	227.6	0.0
Length Wtd. (m)	20.87	Wetted Per. (m)	15.47	7.40	0.11
Min Ch El (m)	879.47	Shear (N/m2)	37.78	38.58	
Alpha	1.11	Stream Power (N/m s)	7469.81	0.00	0.00
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	2.42	3.19	0.13
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.91	2.20	0.09

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	15.00	30.00	0.00	3.69	13.27	0.00	0.28	0.00	5.51	0.00
2	LOB	30.00	41.23	5.57	7.93	11.24	16.54	0.71	0.70	13.96	9.82
3	LOB	41.23	52.46	9.76	11.09	11.23	28.96	0.99	0.88	19.55	17.21
4	LOB	52.46	63.68	9.76	11.09	11.23	28.95	0.99	0.88	19.54	17.20
5	Chan	63.68	65.02	2.37	1.84	1.61	7.02	1.37	1.29	22.56	29.01
6	Chan	65.02	66.36	2.99	1.99	1.39	8.86	1.49	1.50	28.39	42.54
7	Chan	66.36	67.70	1.67	1.44	1.47	4.96	1.08	1.16	19.34	22.45
8	Chan	67.70	69.04	1.34	1.24	1.41	3.99	0.93	1.08	17.41	18.83
9	Chan	69.04	70.38	0.24	0.45	1.49	0.72	0.34	0.53	6.03	3.21

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	41.23	52.46	3.69	3.47	4.24	10.96	1.11	1.06	30.20	32.14
2	LOB	52.46	63.68	16.05	12.37	11.23	47.61	1.10	1.30	40.65	52.74
3	Chan	63.68	65.02	3.74	1.99	1.61	11.11	1.49	1.88	45.55	85.58
4	Chan	65.02	66.36	4.68	2.15	1.39	13.89	1.60	2.18	56.97	124.25
5	Chan	66.36	67.70	2.74	1.59	1.47	8.12	1.19	1.72	39.89	68.59
6	Chan	67.70	69.04	2.26	1.40	1.41	6.70	1.04	1.62	36.44	58.99
7	Chan	69.04	70.38	0.54	0.61	1.51	1.60	0.45	0.89	14.86	13.23
8	ROB	70.38	80.00	0.00	0.00	0.11	0.00	0.11	0.03	0.15	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 307

INPUT

Description: p12 aguas arriba

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0 881.733 6.616 881 28.302 880.82 34.714 880.066 49.778 880
 58.068 879.24 62.75 879.19 63.609 880 64.405 881 70.464 881
 73.589 881 87.264 882 96.594 883 99.181 884 103.267 885
 104.098 885.39 108.784 885.272 158.093 887

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .05 49.778 .035 64.405 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 49.778 64.405 4.9 4.9 4.9 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 0 47.89 881.36 F
 64.11 158.093 881.36 F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 112.5 134.5 892.5

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.98	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.84	Reach Len. (m)	1.65	1.65	1.65
Crit W.S. (m)	880.34	Flow Area (m2)	1.58	19.04	
E.G. Slope (m/m)	0.002560	Area (m2)	14.71	19.06	
Q Total (m3/s)	33.70	Flow (m3/s)	1.41	32.29	
Top Width (m)	38.29	Top Width (m)	23.79	14.50	
Vel Total (m/s)	1.63	Avg. Vel. (m/s)	0.90	1.70	
Max Chl Dpth (m)	1.65	Hydr. Depth (m)	0.84	1.33	
Conv. Total (m3/s)	666.0	Conv. (m3/s)	28.0	638.0	
Length Wtd. (m)	1.65	Wetted Per. (m)	1.89	14.99	
Min Ch El (m)	879.19	Shear (N/m2)	20.97	31.89	
Alpha	1.04	Stream Power (N/m s)	7569.16	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	4.90	2.27	0.95
C & E Loss (m)	0.00	Cum SA (1000 m2)	9.24	2.04	1.96

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	881.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	881.07	Reach Len. (m)	1.65	1.65	1.65
Crit W.S. (m)	880.33	Flow Area (m2)	2.00	22.29	
E.G. Slope (m/m)	0.001592	Area (m2)	2.00	22.29	
Q Total (m3/s)	33.70	Flow (m3/s)	1.24	32.46	
Top Width (m)	16.22	Top Width (m)	1.89	14.33	
Vel Total (m/s)	1.39	Avg. Vel. (m/s)	0.62	1.46	
Max Chl Dpth (m)	1.88	Hydr. Depth (m)	1.06	1.55	
Conv. Total (m3/s)	844.6	Conv. (m3/s)	31.0	813.6	
Length Wtd. (m)	1.65	Wetted Per. (m)	2.95	15.43	
Min Ch El (m)	879.19	Shear (N/m2)	10.62	22.55	
Alpha	1.07	Stream Power (N/m s)	7569.16	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	2.20	2.91	0.13
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.70	2.00	0.09

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	19.16	28.73	0.00	0.04	2.75	0.00	0.02	0.00	0.38	0.00
2	LOB	28.73	38.31	0.00	5.33	9.62	0.00	0.56	0.00	13.92	0.00
3	LOB	38.31	47.89	0.00	7.76	9.58	0.00	0.81	0.00	20.34	0.00
4	LOB	47.89	49.78	1.41	1.58	1.89	4.20	0.84	0.90	20.97	18.82
5	Chan	49.78	52.64	3.85	2.78	2.88	11.44	0.97	1.39	24.27	33.63
6	Chan	52.64	55.51	5.75	3.54	2.88	17.05	1.23	1.63	30.84	50.13
7	Chan	55.51	58.38	7.92	4.28	2.88	23.50	1.49	1.85	37.39	69.11
8	Chan	58.38	61.24	9.06	4.64	2.87	26.87	1.62	1.95	40.61	79.33
9	Chan	61.24	64.11	5.71	3.80	3.49	16.94	1.33	1.50	27.35	41.04
10	Chan	64.11	64.40	0.00	0.02	0.27	0.00	0.10	0.00	1.64	0.00

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	47.89	49.78	1.24	2.00	2.95	3.67	1.06	0.62	10.62	6.56
2	Chan	49.78	52.64	4.31	3.43	2.88	12.78	1.20	1.25	18.61	23.35
3	Chan	52.64	55.51	5.99	4.18	2.88	17.78	1.46	1.43	22.69	32.50
4	Chan	55.51	58.38	7.89	4.93	2.88	23.41	1.72	1.60	26.77	42.80
5	Chan	58.38	61.24	8.87	5.29	2.87	26.33	1.84	1.68	28.78	48.32
6	Chan	61.24	64.11	5.40	4.45	3.93	16.03	1.55	1.21	17.70	21.48

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Jerga

REACH: Murias RS: 305

INPUT

Description: Paraje Molino

Distance from Upstream XS = 1.65

Deck/Roadway Width = 2.27

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 4

Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

27.85 880.82 47.89 881.36 881.11 64.11 881.36 881.11

73.59 881

Upstream Bridge Cross Section Data

Station Elevation Data num= 18

Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

0 881.733 6.616 881 28.302 880.82 34.714 880.066 49.778 880

58.068 879.24 62.75 879.19 63.609 880 64.405 881 70.464 881

73.589 881 87.264 882 96.594 883 99.181 884 103.267 885

104.098 885.39 108.784 885.272 158.093 887

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val

0 .05 49.778 .035 64.405 .05

Bank Sta: Left Right Coeff Contr. Expan.

49.778 64.405 .1 .3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 47.89 881.36 F

64.11 158.093 881.36 F

Blocked Obstructions num= 1

Sta L Sta R Elev

112.5 134.5 892.5

Downstream Deck/Roadway Coordinates

num= 4

Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

29.2 880.88 49.77 881.36 881.11 65.99 881.36 881.11

68.91 881

Downstream Bridge Cross Section Data

Station Elevation Data num= 20

Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

0 881.776 6.459 881 29.201 880.883 37.814 880 41.551 880

41.726 879.889 49.798 880 57.291 879.63 57.7 879.13 61 879.33

61.464 879.83 63.182 880 68.914 881 87.502 882 97.375 883

100.532 884 104.757 885 106.09 885.373 110.493 885.305 158.446 887

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val

0 .05 49.798 .035 63.182 .05

Bank Sta: Left Right Coeff Contr. Expan.

49.798 63.182 .1 .3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 49.77 881.36 F

65.99 158.446 881.36 F

Blocked Obstructions num= 1

Sta L Sta R Elev

113 122 892.04

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga
REACH: Murias RS: 300

INPUT

Description: p11 aguas abajo

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	881.776	6.459	881	29.201	880.883	37.814	880	41.551	880
41.726	879.889	49.798	880	57.291	879.63	57.7	879.13	61	879.33
61.464	879.83	63.182	880	68.914	881	87.502	882	97.375	883
100.532	884	104.757	885	106.09	885.373	110.493	885.305	158.446	887

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	49.798	.035	63.182	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	49.798	63.182	27	13	9	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	49.77	881.36	F
65.99	158.446	881.36	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
113	122	892.04

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.39	Wt. n-Val.	0.000	0.035	0.050
W.S. Elev (m)	880.54	Reach Len. (m)	27.00	13.00	9.00
Crit W.S. (m)	880.54	Flow Area (m2)	0.02	11.76	0.83
E.G. Slope (m/m)	0.011928	Area (m2)	8.36	11.76	0.84
Q Total (m3/s)	33.70	Flow (m3/s)	0.02	32.88	0.80
Top Width (m)	33.74	Top Width (m)	17.26	13.38	3.10
Vel Total (m/s)	2.67	Avg. Vel. (m/s)	1.45	2.80	0.96
Max Chl Dpth (m)	1.41	Hydr. Depth (m)	0.54	0.88	0.30
Conv. Total (m3/s)	308.6	Conv. (m3/s)	0.2	301.1	7.3
Length Wtd. (m)	14.41	Wetted Per. (m)	0.03	13.86	2.85
Min Ch El (m)	879.13	Shear (N/m2)	63.27	99.22	34.08
Alpha	1.07	Stream Power (N/m s)	7586.06	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	4.88	2.19	0.94
C & E Loss (m)	0.08	Cum SA (1000 m2)	9.21	1.97	1.95

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	881.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.035		
W.S. Elev (m)	880.96	Reach Len. (m)	27.00	13.00	9.00
Crit W.S. (m)	880.53	Flow Area (m2)	17.32		
E.G. Slope (m/m)	0.004090	Area (m2)	17.32		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.38	Top Width (m)	13.38		
Vel Total (m/s)	1.95	Avg. Vel. (m/s)	1.95		
Max Chl Dpth (m)	1.83	Hydr. Depth (m)	1.29		
Conv. Total (m3/s)	526.9	Conv. (m3/s)	526.9		
Length Wtd. (m)	13.00	Wetted Per. (m)	15.77		
Min Ch El (m)	879.13	Shear (N/m2)	44.06		
Alpha	1.00	Stream Power (N/m s)	7586.06	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	2.20	2.81	0.13
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.70	1.93	0.09

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	29.86	39.82	0.00	2.51	7.30	0.00	0.34	0.00	40.18	0.00
2	LOB	39.82	49.77	0.00	5.84	9.99	0.00	0.59	0.00	68.40	0.00
3	LOB	49.77	49.80	0.02	0.02	0.03	0.07	0.54	1.45	63.27	91.75
4	Chan	49.80	52.47	3.48	1.62	2.68	10.31	0.61	2.14	70.90	151.69
5	Chan	52.47	55.15	4.83	1.98	2.68	14.32	0.74	2.44	86.34	210.66
6	Chan	55.15	57.83	6.70	2.49	2.92	19.88	0.93	2.69	99.89	268.62
7	Chan	57.83	60.51	12.72	3.54	2.68	37.73	1.32	3.59	154.33	554.62
8	Chan	60.51	63.18	5.16	2.13	2.90	15.33	0.79	2.43	85.69	208.03
9	ROB	63.18	65.99	0.80	0.83	2.85	2.37	0.30	0.96	34.08	32.72
10	ROB	65.99	84.48	0.00	0.01	0.30	0.00	0.03	0.00	2.93	0.00

DILIGENCIA para hacer constar que la presente documentación, relativa a la
Revisión del P.O.O.U. de Asesoría, fue elaborada y firmada en sesión plenaria
del Ayuntamiento de esta ciudad, de fecha 17.05.2018.

Asílega, 19 de mayo de 2018
EL SECRETARIO GENERAL



Fdo. D. Manuel Alja Rodríguez

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	49.80	52.47	3.93	2.74	3.63	11.66	1.02	1.44	30.19	43.37
2	Chan	52.47	55.15	5.90	3.09	2.68	17.52	1.16	1.91	46.28	88.36
3	Chan	55.15	57.83	7.21	3.60	2.92	21.38	1.35	2.00	49.57	99.09
4	Chan	57.83	60.51	11.66	4.65	2.68	34.59	1.74	2.51	69.58	174.36
5	Chan	60.51	63.18	5.00	3.24	3.86	14.85	1.21	1.54	33.67	52.00

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 287

INPUT

Description: p10

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.95	9.901	881.202	30.12	881.345	36.511	880.468	42.832	880.424
71.797	880	74.943	879.752	75.4	879.25	80	879.04	80.209	879.541
87.129	880	87.234	880.071	94.851	881	103.861	882	114.305	883
119.028	884	123.853	885	125.79	885.363	130.027	885.341	177.538	887

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	71.797	.035	87.234	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

71.797	87.234	23	25	14	.1	.3
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
132	142	892.784

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.60	Reach Len. (m)	23.00	25.00	14.00
Crit W.S. (m)	880.40	Flow Area (m2)	12.32	15.57	1.15
E.G. Slope (m/m)	0.003554	Area (m2)	12.32	15.57	1.15
Q Total (m3/s)	33.70	Flow (m3/s)	7.15	25.98	0.56
Top Width (m)	56.04	Top Width (m)	36.26	15.44	4.35
Vel Total (m/s)	1.16	Avg. Vel. (m/s)	0.58	1.67	0.49
Max Chl Dpth (m)	1.56	Hydr. Depth (m)	0.34	1.01	0.27
Conv. Total (m3/s)	565.3	Conv. (m3/s)	120.0	435.8	9.5
Length Wtd. (m)	24.03	Wetted Per. (m)	36.27	16.04	4.38
Min Ch El (m)	879.04	Shear (N/m2)	11.84	33.82	9.17
Alpha	1.65	Stream Power (N/m s)	8500.15	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	4.60	2.02	0.94
C & E Loss (m)	0.02	Cum SA (1000 m2)	8.49	1.78	1.92

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	881.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.035		
W.S. Elev (m)	880.96	Reach Len. (m)	23.00	25.00	14.00
Crit W.S. (m)		Flow Area (m2)	21.09		
E.G. Slope (m/m)	0.002511	Area (m2)	21.09		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	15.43	Top Width (m)	15.43		
Vel Total (m/s)	1.60	Avg. Vel. (m/s)	1.60		
Max Chl Dpth (m)	1.92	Hydr. Depth (m)	1.37		
Conv. Total (m3/s)	672.6	Conv. (m3/s)	672.6		

Length Wtd. (m) 24.52 Wetted Per. (m) 17.89
 Min Ch El (m) 879.04 Shear (N/m2) 29.03
 Alpha 1.00 Stream Power (N/m s) 8500.15 0.00 0.00
 Frctn Loss (m) 0.05 Cum Volume (1000 m3) 2.20 2.56 0.13
 C & E Loss (m) 0.02 Cum SA (1000 m2) 1.70 1.74 0.09

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	28.72	43.08	0.33	1.09	7.55	0.97	0.14	0.30	5.03	1.51
2	LOB	43.08	57.44	1.95	4.11	14.36	5.78	0.29	0.47	9.97	4.72
3	LOB	57.44	71.80	4.88	7.12	14.36	14.47	0.50	0.68	17.29	11.84
4	Chan	71.80	74.88	2.95	2.23	3.10	8.76	0.72	1.32	25.12	33.21
5	Chan	74.88	77.97	8.02	4.18	3.31	23.81	1.35	1.92	43.97	84.44
6	Chan	77.97	81.06	7.99	4.22	3.43	23.70	1.37	1.89	42.98	81.29
7	Chan	81.06	84.15	4.26	2.78	3.09	12.66	0.90	1.53	31.35	48.04
8	Chan	84.15	87.23	2.76	2.15	3.12	8.18	0.70	1.28	24.02	30.83
9	ROB	87.23	105.29	0.56	1.15	4.38	1.67	0.27	0.49	9.17	4.49

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	71.80	74.88	4.00	3.34	4.05	11.88	1.08	1.20	20.26	24.31
2	Chan	74.88	77.97	9.86	5.29	3.31	29.26	1.71	1.87	39.29	73.30
3	Chan	77.97	81.06	9.78	5.33	3.43	29.02	1.73	1.83	38.32	70.31
4	Chan	81.06	84.15	6.19	3.89	3.09	18.37	1.26	1.59	30.95	49.25
5	Chan	84.15	87.23	3.87	3.25	4.00	11.47	1.05	1.19	20.00	23.78

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 262

INPUT

Description: p9

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.888	23.896	880.881	30.216	880.274	30.859	880	33.751	880.286
35.795	880	84.601	880	85.201	879.796	85.7	879.29	90	879.1
90.415	879.603	92.535	880	98.741	881	100.542	881.917	103.904	881.786
104.425	882	109.699	883	113.925	884	126.965	885	129.768	885.374
134.052	885.508	180.524	887						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	84.601	.035	92.535	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	84.601	92.535	13	24	36	.1	.3		

Blocked Obstructions num= 1

Sta L	Sta R	Elev
136	146	891.84

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.57	Reach Len. (m)	13.00	24.00	36.00
Crit W.S. (m)		Flow Area (m2)	30.66	8.96	1.01
E.G. Slope (m/m)	0.002472	Area (m2)	30.66	8.96	1.01
Q Total (m3/s)	33.70	Flow (m3/s)	20.03	13.23	0.43
Top Width (m)	68.94	Top Width (m)	57.47	7.93	3.54
Vel Total (m/s)	0.83	Avg. Vel. (m/s)	0.65	1.48	0.43
Max Chl Dpth (m)	1.47	Hydr. Depth (m)	0.53	1.13	0.29
Conv. Total (m3/s)	677.8	Conv. (m3/s)	402.9	266.2	8.7
Length Wtd. (m)	18.13	Wetted Per. (m)	57.57	8.46	3.58
Min Ch El (m)	879.10	Shear (N/m2)	12.91	25.69	6.82
Alpha	1.62	Stream Power (N/m s)	8643.10	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	4.10	1.71	0.92
C & E Loss (m)	0.01	Cum SA (1000 m2)	7.41	1.49	1.87

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	881.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.95	Reach Len. (m)	13.00	24.00	36.00
Crit W.S. (m)		Flow Area (m2)	21.55	12.01	0.00
E.G. Slope (m/m)	0.001612	Area (m2)	21.55	12.01	0.00
Q Total (m3/s)	33.70	Flow (m3/s)	16.31	17.39	0.00
Top Width (m)	30.54	Top Width (m)	22.60	7.93	0.00
Vel Total (m/s)	1.00	Avg. Vel. (m/s)	0.76	1.45	0.02
Max Chl Dpth (m)	1.85	Hydr. Depth (m)	0.95	1.51	0.95
Conv. Total (m3/s)	839.4	Conv. (m3/s)	406.2	433.2	0.0
Length Wtd. (m)	19.97	Wetted Per. (m)	23.55	8.46	0.96
Min Ch El (m)	879.10	Shear (N/m2)	14.46	22.44	0.08
Alpha	1.35	Stream Power (N/m s)	8643.10	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	1.95	2.15	0.13
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.44	1.45	0.09

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	LOB	16.92	33.84	0.86	2.00	6.79	2.56	0.30	0.43	7.12	3.08
2	LOB	33.84	50.76	6.19	9.38	16.94	18.37	0.55	0.66	13.42	8.86
3	LOB	50.76	67.68	6.49	9.64	16.92	19.26	0.57	0.67	13.82	9.30
4	LOB	67.68	84.60	6.49	9.64	16.92	19.26	0.57	0.67	13.82	9.30
5	Chan	84.60	86.19	1.89	1.55	1.83	5.62	0.97	1.22	20.44	25.04
6	Chan	86.19	87.77	3.53	2.12	1.59	10.47	1.34	1.66	32.37	53.87
7	Chan	87.77	89.36	3.84	2.23	1.59	11.41	1.41	1.72	34.07	58.67
8	Chan	89.36	90.95	2.73	1.92	1.83	8.09	1.21	1.42	25.44	36.05
9	Chan	90.95	92.54	1.24	1.14	1.61	3.68	0.72	1.09	17.12	18.64
10	ROB	92.54	110.13	0.43	1.01	3.58	1.28	0.29	0.43	6.82	2.91

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	50.76	67.68	3.79	5.42	6.63	11.25	0.95	0.70	12.91	9.03
2	LOB	67.68	84.60	12.52	16.13	16.92	37.14	0.95	0.78	15.07	11.69
3	Chan	84.60	86.19	2.69	2.15	1.83	7.99	1.36	1.25	18.58	23.24
4	Chan	86.19	87.77	4.40	2.73	1.59	13.05	1.72	1.61	27.16	43.77
5	Chan	87.77	89.36	4.70	2.84	1.59	13.95	1.79	1.65	28.27	46.78
6	Chan	89.36	90.95	3.53	2.53	1.83	10.47	1.60	1.39	21.83	30.41
7	Chan	90.95	92.54	2.07	1.75	1.61	6.15	1.10	1.18	17.12	20.28
8	ROB	92.54	110.13	0.00	0.00	0.96	0.00	0.95	0.02	0.08	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 238

INPUT

Description: p8

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.886	20.986	880.836	25.766	880	25.926	880.225	29.278	880.262
54.222	880	84.249	880	88.101	879.787	88.6	879.28	91.8	879.14
92.247	879.641	93.9	880	95.74	881	97.744	882.007	99.382	882
99.407	882.055	122.742	884.335	125.469	884.888	135.975	885	136.305	885.247
178.239	888								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	84.249	.035	93.9	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
84.249 93.9 9 19 25 .1 .3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
108	122	887.77	139	145	891.161

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.38	Reach Len. (m)	9.00	19.00	25.00
Crit W.S. (m)	880.38	Flow Area (m2)	18.25	7.36	0.13
E.G. Slope (m/m)	0.010160	Area (m2)	18.25	7.36	0.13
Q Total (m3/s)	33.70	Flow (m3/s)	16.49	17.13	0.08
Top Width (m)	70.97	Top Width (m)	60.63	9.65	0.69
Vel Total (m/s)	1.31	Avg. Vel. (m/s)	0.90	2.33	0.61
Max Chl Dpth (m)	1.24	Hydr. Depth (m)	0.30	0.76	0.19
Conv. Total (m3/s)	334.3	Conv. (m3/s)	163.6	170.0	0.8
Length Wtd. (m)	14.14	Wetted Per. (m)	60.78	10.14	0.79

Min Ch El (m)	879.14	Shear (N/m2)	29.91	72.37	16.43
Alpha	1.84	Stream Power (N/m s)	8533.71	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	3.79	1.51	0.90
C & E Loss (m)	0.03	Cum SA (1000 m2)	6.64	1.28	1.79

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	880.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.70	Reach Len. (m)	9.00	19.00	25.00
Crit W.S. (m)		Flow Area (m2)	6.52	10.54	
E.G. Slope (m/m)	0.007325	Area (m2)	6.52	10.54	
Q Total (m3/s)	33.70	Flow (m3/s)	8.41	25.29	
Top Width (m)	18.90	Top Width (m)	9.25	9.65	
Vel Total (m/s)	1.98	Avg. Vel. (m/s)	1.29	2.40	
Max Chl Dpth (m)	1.56	Hydr. Depth (m)	0.70	1.09	
Conv. Total (m3/s)	393.8	Conv. (m3/s)	98.2	295.5	
Length Wtd. (m)	17.32	Wetted Per. (m)	9.95	10.84	
Min Ch El (m)	879.14	Shear (N/m2)	47.02	69.84	
Alpha	1.21	Stream Power (N/m s)	8533.71	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	1.77	1.88	0.13
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.23	1.24	0.09

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	LOB	16.85	33.70	0.79	1.49	10.23	2.35	0.15	0.53	14.50	7.71
2	LOB	33.70	50.55	3.17	4.18	16.85	9.41	0.25	0.76	24.72	18.75
3	LOB	50.55	67.40	6.20	6.25	16.85	18.41	0.37	0.99	36.97	36.69
4	LOB	67.40	84.25	6.32	6.32	16.85	18.76	0.38	1.00	37.39	37.38
5	Chan	84.25	86.18	1.26	0.83	1.93	3.72	0.43	1.52	42.64	64.68
6	Chan	86.18	88.11	1.82	1.03	1.94	5.39	0.54	1.76	53.17	93.42
7	Chan	88.11	90.04	5.26	2.04	2.14	15.62	1.06	2.58	94.83	245.05
8	Chan	90.04	91.97	6.70	2.30	2.02	19.90	1.19	2.92	113.61	331.19
9	Chan	91.97	93.90	2.09	1.16	2.11	6.21	0.60	1.80	55.01	98.87
10	ROB	93.90	110.77	0.08	0.13	0.79	0.23	0.19	0.61	16.43	9.96

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program



defaulted to critical depth.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	67.40	84.25	8.41	6.52	9.95	24.95	0.70	1.29	47.02	60.68
2	Chan	84.25	86.18	2.81	1.46	1.93	8.34	0.76	1.92	54.35	104.44
3	Chan	86.18	88.11	3.50	1.67	1.94	10.38	0.86	2.10	61.90	129.70
4	Chan	88.11	90.04	7.17	2.67	2.14	21.28	1.38	2.68	89.69	240.64
5	Chan	90.04	91.97	8.72	2.94	2.02	25.88	1.52	2.97	104.54	310.63
6	Chan	91.97	93.90	3.09	1.80	2.81	9.17	0.93	1.72	45.95	78.95

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 219

INPUT

Description: p7

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.884	20.229	880.824	24.514	880.273	24.569	880	27.818	880.142
42	879.85	61	879.89	80	879.77	87.83	879.511	88	879.01
91.5	879.07	92.052	879.572	93.595	880	95.91	881.272	98.979	881.292
99.189	881	148.973	886.47	153.903	886.723	166.895	887.704		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	80	.035	93.595	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

80	93.595	11	13	17	.1	.3
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Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
110	149	890	154	166.895	890

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.33	Reach Len. (m)	11.00	13.00	17.00
Crit W.S. (m)	880.18	Flow Area (m2)	23.81	11.48	0.10
E.G. Slope (m/m)	0.003701	Area (m2)	23.81	11.48	0.10
Q Total (m3/s)	33.70	Flow (m3/s)	16.35	17.32	0.03
Top Width (m)	70.12	Top Width (m)	55.92	13.59	0.60
Vel Total (m/s)	0.95	Avg. Vel. (m/s)	0.69	1.51	0.33
Max Chl Dpth (m)	1.32	Hydr. Depth (m)	0.43	0.84	0.16
Conv. Total (m3/s)	554.0	Conv. (m3/s)	268.8	284.7	0.5
Length Wtd. (m)	12.07	Wetted Per. (m)	56.16	14.21	0.68
Min Ch El (m)	879.01	Shear (N/m2)	15.39	29.33	5.24
Alpha	1.54	Stream Power (N/m s)	7990.58	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	3.60	1.33	0.90
C & E Loss (m)	0.00	Cum SA (1000 m2)	6.12	1.06	1.77

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	880.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	880.65	Reach Len. (m)	11.00	13.00	17.00

Crit W.S. (m)	Flow Area (m2)	2.86	15.88	
E.G. Slope (m/m)	0.004219	Area (m2)	2.86	15.88
Q Total (m3/s)	33.70	Flow (m3/s)	2.90	30.80
Top Width (m)	16.87	Top Width (m)	3.28	13.59
Vel Total (m/s)	1.80	Avg. Vel. (m/s)	1.02	1.94
Max Chl Dpth (m)	1.64	Hydr. Depth (m)	0.87	1.17
Conv. Total (m3/s)	518.8	Conv. (m3/s)	44.7	474.1
Length Wtd. (m)	12.91	Wetted Per. (m)	4.14	14.86
Min Ch El (m)	879.01	Shear (N/m2)	28.58	44.21
Alpha	1.09	Stream Power (N/m s)	7990.58	0.00 0.00
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	1.72	1.62 0.13
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.18	1.02 0.09

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	16.00	32.00	0.80	1.83	8.16	2.37	0.23	0.44	8.13	3.55
2	LOB	32.00	48.00	4.34	6.60	16.00	12.88	0.41	0.66	14.98	9.84
3	LOB	48.00	64.00	5.06	7.24	16.00	15.01	0.45	0.70	16.42	11.47
4	LOB	64.00	80.00	6.15	8.14	16.00	18.26	0.51	0.76	18.47	13.96
5	Chan	80.00	82.72	1.95	1.64	2.72	5.78	0.60	1.19	21.92	25.99
6	Chan	82.72	85.44	2.46	1.89	2.72	7.29	0.69	1.30	25.18	32.76
7	Chan	85.44	88.16	3.03	2.25	3.08	9.00	0.83	1.35	26.54	35.74
8	Chan	88.16	90.88	6.93	3.52	2.72	20.56	1.29	1.97	46.94	92.46
9	Chan	90.88	93.59	2.95	2.18	2.97	8.76	0.80	1.35	26.68	36.07
10	ROB	93.59	108.26	0.03	0.10	0.68	0.10	0.16	0.33	5.24	1.75

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	64.00	80.00	2.90	2.86	4.14	8.62	0.87	1.02	28.58	29.02
2	Chan	80.00	82.72	4.31	2.52	2.72	12.78	0.93	1.71	38.36	65.48
3	Chan	82.72	85.44	5.02	2.77	2.72	14.91	1.02	1.82	42.08	76.41
4	Chan	85.44	88.16	5.68	3.13	3.08	16.86	1.15	1.82	42.07	76.36
5	Chan	88.16	90.88	10.87	4.40	2.72	32.26	1.62	2.47	66.89	165.40
6	Chan	90.88	93.59	4.91	3.06	3.62	14.58	1.13	1.60	34.98	56.13

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 206

INPUT

Description: p6

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.828	18.602	880.751	22.94	880	23.294	880.186
26.245	880.198	40	879.84	62	879.77	78	879.77
89.313	879.417	89.6	879	92.1	879.01	92.637	879.51
94.957	880	104.729	881.965	121.561	881.99	158.956	887.087
168.113	887.176						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	78	.035	94.957	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	78	94.957		25	26	27	.1	.3	

Blocked Obstructions num= 1

Sta L Sta R Elev
125 157 890

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.29	Reach Len. (m)	25.00	26.00	27.00
Crit W.S. (m)		Flow Area (m2)	23.40	13.22	0.21
E.G. Slope (m/m)	0.003442	Area (m2)	23.40	13.22	0.21
Q Total (m3/s)	33.70	Flow (m3/s)	15.20	18.43	0.07
Top Width (m)	75.15	Top Width (m)	56.74	16.96	1.45
Vel Total (m/s)	0.91	Avg. Vel. (m/s)	0.65	1.39	0.32
Max Chl Dpth (m)	1.29	Hydr. Depth (m)	0.41	0.78	0.15
Conv. Total (m3/s)	574.4	Conv. (m3/s)	259.1	314.2	1.2
Length Wtd. (m)	25.53	Wetted Per. (m)	56.82	17.43	1.48
Min Ch El (m)	879.00	Shear (N/m2)	13.90	25.60	4.82
Alpha	1.50	Stream Power (N/m s)	8048.90	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	3.34	1.17	0.89
C & E Loss (m)	0.01	Cum SA (1000 m2)	5.50	0.86	1.76

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	880.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	880.61	Reach Len. (m)	25.00	26.00	27.00
Crit W.S. (m)		Flow Area (m2)	18.61	0.00	
E.G. Slope (m/m)	0.003921	Area (m2)	18.61	0.00	
Q Total (m3/s)	33.70	Flow (m3/s)	33.70	0.00	
Top Width (m)	16.96	Top Width (m)	16.96	0.00	
Vel Total (m/s)	1.81	Avg. Vel. (m/s)	1.81	0.03	
Max Chl Dpth (m)	1.61	Hydr. Depth (m)	1.10	0.61	
Conv. Total (m3/s)	538.2	Conv. (m3/s)	538.2	0.0	
Length Wtd. (m)	25.72	Wetted Per. (m)	18.27	0.61	
Min Ch El (m)	879.00	Shear (N/m2)	39.16	0.12	
Alpha	1.00	Stream Power (N/m s)	8048.90	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	1.71	1.40	0.13
C & E Loss (m)	0.04	Cum SA (1000 m2)	1.16	0.82	0.09

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	15.60	31.20	0.41	1.39	10.02	1.22	0.14	0.30	4.69	1.39
2	LOB	31.20	46.80	3.60	6.11	15.60	10.69	0.39	0.59	13.21	7.80
3	LOB	46.80	62.40	5.38	7.77	15.60	15.95	0.50	0.69	16.80	11.63
4	LOB	62.40	78.00	5.81	8.13	15.60	17.23	0.52	0.71	17.60	12.56
5	Chan	78.00	81.39	2.20	1.95	3.39	6.52	0.57	1.13	19.37	21.86
6	Chan	81.39	84.78	2.91	2.31	3.39	8.64	0.68	1.26	22.95	28.98
7	Chan	84.78	88.17	3.71	2.67	3.39	11.00	0.79	1.39	26.52	36.88
8	Chan	88.17	91.57	6.47	3.82	3.61	19.20	1.13	1.69	35.68	60.47
9	Chan	91.57	94.96	3.15	2.48	3.64	9.33	0.73	1.27	23.04	29.17

10	ROB	94.96	109.59	0.07	0.21	1.48	0.20	0.15	0.32	4.82	1.55
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Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	78.00	81.39	4.22	3.02	4.23	12.53	0.89	1.40	27.48	38.37	
2	Chan	81.39	84.78	5.90	3.38	3.39	17.50	1.00	1.74	38.34	66.84	
3	Chan	84.78	88.17	6.98	3.74	3.39	20.71	1.10	1.86	42.41	79.08	
4	Chan	88.17	91.57	10.47	4.89	3.61	31.07	1.44	2.14	52.11	111.46	
5	Chan	91.57	94.96	6.13	3.56	3.64	18.19	1.05	1.72	37.62	64.77	
6	ROB	94.96	109.59	0.00	0.00	0.61	0.00	0.61	0.03	0.12	0.00	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 180

INPUT

Description: p5

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.698	15.796	880.6	18.963	880	19.767	880.128	22.421	880.107
87.377	879	87.879	878.86	88.3	878.36	91.2	878.29	91.767	878.79
93.15	879	103.568	880	139.153	882.156	143.431	882.977	175.169	887.897
185.983	894.119								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	87.377	.035	93.15	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
87.377 93.15 17 17 17 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
147	173	890

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.29	Reach Len. (m)	17.00	17.00	17.00
Crit W.S. (m)		Flow Area (m2)	48.44	9.99	8.87
E.G. Slope (m/m)	0.000701	Area (m2)	48.44	9.99	8.87
Q Total (m3/s)	33.70	Flow (m3/s)	20.07	10.35	3.28
Top Width (m)	90.84	Top Width (m)	69.92	5.77	15.14
Vel Total (m/s)	0.50	Avg. Vel. (m/s)	0.41	1.04	0.37
Max Chl Dpth (m)	2.00	Hydr. Depth (m)	0.69	1.73	0.59
Conv. Total (m3/s)	1272.8	Conv. (m3/s)	758.1	390.9	123.8
Length Wtd. (m)	17.00	Wetted Per. (m)	69.97	6.23	15.20
Min Ch El (m)	878.29	Shear (N/m2)	4.76	11.02	4.01
Alpha	1.78	Stream Power (N/m s)	8904.46	0.00	0.00

Frctn Loss (m)	0.01	Cum Volume (1000 m3)	2.44	0.87	0.77
C & E Loss (m)	0.00	Cum SA (1000 m2)	3.91	0.56	1.53

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	880.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.68	Reach Len. (m)	17.00	17.00	17.00
Crit W.S. (m)		Flow Area (m2)	35.82	12.24	2.94
E.G. Slope (m/m)	0.000506	Area (m2)	35.82	12.24	2.94
Q Total (m3/s)	33.70	Flow (m3/s)	20.14	12.35	1.21
Top Width (m)	32.00	Top Width (m)	24.38	5.77	1.85
Vel Total (m/s)	0.66	Avg. Vel. (m/s)	0.56	1.01	0.41
Max Chl Dpth (m)	2.39	Hydr. Depth (m)	1.47	2.12	1.59
Conv. Total (m3/s)	1498.1	Conv. (m3/s)	895.4	548.9	53.8
Length Wtd. (m)	17.00	Wetted Per. (m)	25.64	6.23	3.36
Min Ch El (m)	878.29	Shear (N/m2)	6.93	9.75	4.34
Alpha	1.30	Stream Power (N/m s)	8904.46	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	1.26	1.00	0.09
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.85	0.53	0.06

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	17.48	34.95	0.83	4.43	17.51	2.46	0.25	0.19	1.74	0.33
2	LOB	34.95	52.43	2.95	9.47	17.48	8.76	0.54	0.31	3.72	1.16
3	LOB	52.43	69.90	6.13	14.67	17.48	18.18	0.84	0.42	5.77	2.41
4	LOB	69.90	87.38	10.16	19.88	17.48	30.16	1.14	0.51	7.82	4.00
5	Chan	87.38	88.53	1.63	1.83	1.41	4.83	1.59	0.89	8.96	7.95
6	Chan	88.53	89.69	2.60	2.25	1.15	7.72	1.95	1.16	13.37	15.50
7	Chan	89.69	90.84	2.67	2.28	1.15	7.91	1.97	1.17	13.56	15.87
8	Chan	90.84	92.00	2.01	2.04	1.35	5.96	1.77	0.98	10.44	10.25
9	Chan	92.00	93.15	1.45	1.59	1.17	4.29	1.37	0.91	9.34	8.52
10	ROB	93.15	111.72	3.28	8.87	15.20	9.73	0.59	0.37	4.01	1.48

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	52.43	69.90	4.37	9.11	8.16	12.96	1.32	0.48	5.54	2.65
2	LOB	69.90	87.38	15.78	26.71	17.48	46.81	1.53	0.59	7.58	4.48
3	Chan	87.38	88.53	2.00	2.28	1.41	5.94	1.98	0.88	8.06	7.07
4	Chan	88.53	89.69	3.01	2.70	1.15	8.94	2.34	1.12	11.59	12.94
5	Chan	89.69	90.84	3.07	2.73	1.15	9.12	2.36	1.13	11.73	13.20
6	Chan	90.84	92.00	2.39	2.49	1.35	7.08	2.16	0.96	9.20	8.80
7	Chan	92.00	93.15	1.87	2.04	1.17	5.56	1.76	0.92	8.66	7.96
8	ROB	93.15	111.72	1.21	2.94	3.36	3.59	1.59	0.41	4.34	1.79

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 163

INPUT

Description: p4

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0 880.704 19.183 880.551 22.919 880 23.726 880.184 26.798 879.919
85.854 879 86.639 878.65 87 878.15 90.8 878.09 91.246 878.59
92.601 879 104.689 880 122.004 880.797 128.757 880.741 186.867 888.091
196.974 893.734

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 85.854 .035 92.601 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.854 92.601 35 28 20 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 60 880.12 F
100 196.974 880.12 F

Blocked Obstructions num= 1
Sta L Sta R Elev
153 184 890

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.28	Reach Len. (m)	35.00	28.00	20.00
Crit W.S. (m)	879.62	Flow Area (m2)	49.44	12.89	10.24
E.G. Slope (m/m)	0.000505	Area (m2)	49.44	12.89	10.24
Q Total (m3/s)	33.70	Flow (m3/s)	18.54	12.02	3.14
Top Width (m)	89.69	Top Width (m)	64.82	6.75	18.13
Vel Total (m/s)	0.46	Avg. Vel. (m/s)	0.37	0.93	0.31
Max Chl Dpth (m)	2.19	Hydr. Depth (m)	0.76	1.91	0.57
Conv. Total (m3/s)	1499.9	Conv. (m3/s)	825.0	535.1	139.8
Length Wtd. (m)	29.13	Wetted Per. (m)	64.88	7.36	18.17
Min Ch El (m)	878.09	Shear (N/m2)	3.77	8.67	2.79
Alpha	1.84	Stream Power (N/m s)	9430.69	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	1.61	0.68	0.61
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.77	0.46	1.25

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	880.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.67	Reach Len. (m)	35.00	28.00	20.00
Crit W.S. (m)	879.62	Flow Area (m2)	36.76	15.55	3.77
E.G. Slope (m/m)	0.000380	Area (m2)	36.76	15.55	3.77
Q Total (m3/s)	33.70	Flow (m3/s)	17.99	14.26	1.44
Top Width (m)	34.00	Top Width (m)	24.85	6.75	2.40
Vel Total (m/s)	0.60	Avg. Vel. (m/s)	0.49	0.92	0.38
Max Chl Dpth (m)	2.58	Hydr. Depth (m)	1.48	2.31	1.57
Conv. Total (m3/s)	1728.8	Conv. (m3/s)	922.9	731.7	74.1
Length Wtd. (m)	29.70	Wetted Per. (m)	26.14	7.36	3.88
Min Ch El (m)	878.09	Shear (N/m2)	5.24	7.87	3.62
Alpha	1.36	Stream Power (N/m s)	9430.69	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.64	0.76	0.04
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.43	0.42	0.02

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	20.00	40.00	1.56	7.20	19.02	4.64	0.38	0.22	1.87	0.41
2	LOB	40.00	60.00	4.79	14.40	20.00	14.23	0.72	0.33	3.56	1.19
3	LOB	60.00	72.93	5.15	12.62	12.93	15.27	0.98	0.41	4.83	1.97
4	LOB	72.93	85.85	7.03	15.22	12.93	20.87	1.18	0.46	5.83	2.69
5	Chan	85.85	87.20	1.72	2.25	1.68	5.10	1.67	0.76	6.64	5.07
6	Chan	87.20	88.55	3.02	2.89	1.35	8.95	2.14	1.04	10.60	11.07
7	Chan	88.55	89.90	3.07	2.92	1.35	9.10	2.16	1.05	10.71	11.25
8	Chan	89.90	91.25	2.63	2.83	1.57	7.81	2.10	0.93	8.91	8.28
9	Chan	91.25	92.60	1.59	2.00	1.41	4.71	1.48	0.79	7.02	5.57
10	ROB	92.60	100.00	2.65	7.19	7.42	7.85	0.97	0.37	4.79	1.76
11	ROB	100.00	119.39	0.50	3.05	10.75	1.47	0.28	0.16	1.41	0.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	60.00	72.93	7.36	16.44	13.21	21.84	1.38	0.45	4.64	2.08
2	LOB	72.93	85.85	10.63	20.32	12.93	31.55	1.57	0.52	5.86	3.06
3	Chan	85.85	87.20	2.14	2.78	1.68	6.34	2.06	0.77	6.18	4.74
4	Chan	87.20	88.55	3.49	3.42	1.35	10.34	2.54	1.02	9.45	9.63
5	Chan	88.55	89.90	3.53	3.45	1.35	10.49	2.56	1.02	9.53	9.76
6	Chan	89.90	91.25	3.06	3.36	1.57	9.07	2.49	0.91	7.97	7.24
7	Chan	91.25	92.60	2.05	2.53	1.41	6.08	1.88	0.81	6.69	5.42
8	ROB	92.60	100.00	1.44	3.77	3.88	4.29	1.57	0.38	3.62	1.39

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 75

INPUT

Description: p3 aguas arriba

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0 880.447	4.242	880.358	45.425	879.799	53.361	879.629	67.023
879.441	74.93	879.862	86.48	879	88.46	878.4	93.738
878.48	94.852	879	140.023	880	143.861	880.549	147.722
880.705	169.8	881	203.521	888.056	211.966	887.531	212.309
887.738							

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	86.48	.035	94.852	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

86.48 94.852 8 8 8 .1 .3
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 0 82.09 880.12 F
 94.95 212.309 880.12 F
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 169.5 201.5 891

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	880.27	Reach Len. (m)	0.91	0.91	0.91
Crit W.S. (m)	879.70	Flow Area (m2)	36.98	14.45	34.90
E.G. Slope (m/m)	0.000435	Area (m2)	36.98	14.45	34.90
Q Total (m3/s)	33.70	Flow (m3/s)	9.58	12.19	11.93
Top Width (m)	130.96	Top Width (m)	75.55	8.37	47.04
Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.26	0.84	0.34
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	0.49	1.73	0.74
Conv. Total (m3/s)	1615.4	Conv. (m3/s)	459.2	584.3	571.8
Length Wtd. (m)	0.91	Wetted Per. (m)	75.60	8.58	47.07
Min Ch El (m)	878.40	Shear (N/m2)	2.09	7.19	3.16
Alpha	2.09	Stream Power (N/m s)	10164.91	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.09	0.30	0.16
C & E Loss (m)	0.03	Cum SA (1000 m2)	0.31	0.24	0.60

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water

surface whose main channel velocity head was the closest to the previously computed cross section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross

sections. Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater

than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	880.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.	0.035		
W.S. Elev (m)	880.42	Reach Len. (m)	0.91	0.91	0.91
Crit W.S. (m)	879.73	Flow Area (m2)		15.69	
E.G. Slope (m/m)	0.003696	Area (m2)		15.69	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	8.37	Top Width (m)		8.37	
Vel Total (m/s)	2.15	Avg. Vel. (m/s)		2.15	
Max Chl Dpth (m)	2.02	Hydr. Depth (m)		1.87	
Conv. Total (m3/s)	554.3	Conv. (m3/s)		554.3	
Length Wtd. (m)	0.91	Wetted Per. (m)		11.41	
Min Ch El (m)	878.40	Shear (N/m2)		49.85	
Alpha	1.00	Stream Power (N/m s)	10164.91	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	0.00	0.33	0.00
C & E Loss (m)	0.02	Cum SA (1000 m2)		0.21	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	16.42	0.01	0.20	5.48	0.02	0.04	0.04	0.16	0.01
2	LOB	16.42	32.84	0.35	3.05	16.42	1.05	0.19	0.12	0.79	0.09
3	LOB	32.84	49.25	1.33	6.76	16.42	3.96	0.41	0.20	1.76	0.35
4	LOB	49.25	65.67	3.15	11.34	16.42	9.35	0.69	0.28	2.95	0.82
5	LOB	65.67	82.09	2.90	10.78	16.45	8.60	0.66	0.27	2.80	0.75
6	LOB	82.09	86.48	1.84	4.84	4.40	5.45	1.10	0.38	4.70	1.78
7	Chan	86.48	88.15	1.94	2.55	1.75	5.75	1.52	0.76	6.21	4.73
8	Chan	88.15	89.83	2.75	3.10	1.69	8.17	1.85	0.89	7.83	6.96
9	Chan	89.83	91.50	2.73	3.07	1.67	8.09	1.83	0.89	7.82	6.95
10	Chan	91.50	93.18	2.66	3.03	1.67	7.90	1.81	0.88	7.72	6.79
11	Chan	93.18	94.85	2.11	2.70	1.79	6.27	1.62	0.78	6.45	5.03
12	ROB	94.85	94.95	0.06	0.12	0.10	0.17	1.27	0.46	5.40	2.46
13	ROB	94.95	118.42	9.22	23.59	23.48	27.35	1.01	0.39	4.29	1.68
14	ROB	118.42	141.89	2.66	11.18	23.49	7.88	0.48	0.24	2.03	0.48

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface whose main channel velocity head was the closest to the previously computed cross section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	86.48	88.15	4.13	2.80	3.17	12.25	1.67	1.48	32.01	47.26
2	Chan	88.15	89.83	8.47	3.35	1.69	25.14	2.00	2.53	71.85	181.86
3	Chan	89.83	91.50	8.40	3.32	1.67	24.93	1.98	2.53	71.84	181.82
4	Chan	91.50	93.18	8.22	3.28	1.67	24.40	1.96	2.51	70.92	177.96
5	Chan	93.18	94.85	4.48	2.95	3.20	13.30	1.76	1.52	33.38	50.69

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Jerga

REACH: Murias RS: 70

INPUT

Description:

Distance from Upstream XS = .91

Deck/Roadway Width = 2.5

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 5

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
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69.75	879.26		83.45	880.12	879.87	89.9	880.12	879.87
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94.95	880.12	879.87	102.9	879.26				
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Upstream Bridge Cross Section Data

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0	880.447	4.242	880.358	45.425	879.799	53.361	879.629	67.023	879.441
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74.93	879.862	86.48	879	88.46	878.4	93.738	878.48	94.852	879
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140.023	880	143.861	880.549	147.722	880.705	169.8	881	203.521	888.056
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211.966	887.531	212.309	887.738						
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Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
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0	.05	86.48	.035	94.852	.05
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Bank Sta: Left Right Coeff Contr. Expan.

86.48	94.852		.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
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0	82.09	880.12	F
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94.95	212.309	880.12	F
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
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169.5	201.5	891
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Downstream Deck/Roadway Coordinates

num= 5

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
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74.12	879.4		89.24	880.12	879.87	91.53	880.12	879.87
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97.99	880.12	879.87	110	879.2				
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Downstream Bridge Cross Section Data

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0	880.44	6.374	880.307	27.424	880	38.61	880.146	48.189	880.228
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89.439	879	91.066	878.25	96.614	878.19	97.119	879	145.878	880
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150.483	880.565	153.922	880.774	208.129	887.836	220.069	887.517		
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Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
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0	.05	89.439	.035	97.119	.05
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Bank Sta: Left Right Coeff Contr. Expan.

89.439	97.119		.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
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0	89.24	880.12	F
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97.99	220.069	880.12	F
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
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155.5	206	890.7
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Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters

Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga
REACH: Murias RS: 67

INPUT

Description: p2-aguas abajo

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.44	6.374	880.307	27.424	880	38.61	880.146
48.189	880.228	89.439	879	91.066	878.25	96.614	878.19
97.119	879	145.878	880	150.483	880.565	153.922	880.774
208.129	887.836	220.069	887.517				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	89.439	.035	97.119	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
89.439	97.119	20	22	26	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	89.24	880.12	F
97.99	220.069	880.12	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
155.5	206	890.7

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	880.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.59	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.58	Reach Len. (m)	20.00	22.00	26.00
Crit W.S. (m)	879.58	Flow Area (m2)	0.11	9.56	0.49
E.G. Slope (m/m)	0.011927	Area (m2)	5.56	9.56	8.07
Q Total (m3/s)	33.70	Flow (m3/s)	0.17	32.79	0.74
Top Width (m)	55.06	Top Width (m)	19.33	7.68	28.05
Vel Total (m/s)	3.31	Avg. Vel. (m/s)	1.51	3.43	1.50
Max Chl Dpth (m)	1.39	Hydr. Depth (m)	0.57	1.24	0.57
Conv. Total (m3/s)	308.6	Conv. (m3/s)	1.6	300.3	6.8
Length Wtd. (m)	22.07	Wetted Per. (m)	0.20	8.29	0.87
Min Ch El (m)	878.19	Shear (N/m2)	66.92	134.80	66.24
Alpha	1.05	Stream Power (N/m s)	10536.43	0.00	0.00
Frctn Loss (m)	0.18	Cum Volume (1000 m3)	0.06	0.21	0.12

C & E Loss (m) 0.10 Cum SA (1000 m2) 0.23 0.20 0.51

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	880.45	Element	Left OB	Channel	Right OB
Vel Head (m)	0.74	Wt. n-Val.	0.035		
W.S. Elev (m)	879.71	Reach Len. (m)	20.00	22.00	26.00
Crit W.S. (m)	879.71	Flow Area (m2)	8.84		
E.G. Slope (m/m)	0.017565	Area (m2)	8.84		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	5.95	Top Width (m)	5.95		
Vel Total (m/s)	3.81	Avg. Vel. (m/s)	3.81		
Max Chl Dpth (m)	1.52	Hydr. Depth (m)	1.49		
Conv. Total (m3/s)	254.3	Conv. (m3/s)	254.3		
Length Wtd. (m)	22.00	Wetted Per. (m)	8.76		
Min Ch El (m)	878.19	Shear (N/m2)	173.89		
Alpha	1.00	Stream Power (N/m s)	10536.43	0.00	0.00
Frctn Loss (m)	0.21	Cum Volume (1000 m3)	0.00	0.24	0.00
C & E Loss (m)	0.12	Cum SA (1000 m2)	0.18		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power	
	(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)	
1	LOB	53.54	71.39	0.00	0.02	1.28	0.00	0.02	0.00	2.23	0.00

2	LOB	71.39	89.24	0.00	5.42	17.86	0.00	0.30	0.00	35.51	0.00
3	LOB	89.24	89.44	0.17	0.11	0.20	0.51	0.57	1.51	66.92	100.73
4	Chan	89.44	90.98	3.90	1.43	1.69	11.57	0.93	2.73	98.71	269.52
5	Chan	90.98	92.51	7.54	2.04	1.55	22.36	1.33	3.69	154.77	570.32
6	Chan	92.51	94.05	7.74	2.07	1.54	22.95	1.35	3.73	157.78	588.96
7	Chan	94.05	95.58	7.89	2.10	1.54	23.43	1.37	3.76	159.73	601.11
8	Chan	95.58	97.12	5.73	1.92	1.99	17.00	1.25	2.99	112.95	337.40
9	ROB	97.12	97.99	0.74	0.49	0.87	2.19	0.57	1.50	66.24	99.03
10	ROB	97.99	122.41	0.00	7.50	24.42	0.00	0.31	0.00	35.91	0.00
11	ROB	122.41	146.82	0.00	0.08	2.77	0.00	0.03	0.00	3.32	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	89.44	90.98	0.34	0.31	1.56	1.01	1.37	1.11	33.91	37.61
2	Chan	90.98	92.51	9.51	2.26	1.55	28.23	1.47	4.22	251.41	1060.29
3	Chan	92.51	94.05	9.74	2.28	1.54	28.92	1.49	4.27	255.99	1092.69
4	Chan	94.05	95.58	9.93	2.31	1.54	29.46	1.50	4.30	258.86	1113.15
5	Chan	95.58	97.12	4.17	1.69	2.58	12.39	1.51	2.47	112.83	278.92

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Murias RS: 45

INPUT

Description: p1

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880.242	9.729	880.075	13.543	880.558	13.562	880
55.652	880.87	88.993	879	90.912	878.383	91.4	877.9
95.6	877.89	96.111	878.361	99.149	879	150.273	880
157.859	880.794	161.984	880.964	169.263	881	176.893	882
182.157	180.461	182	187.414	183	194.849	184	328
195.934	884	228.769	886.821				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	88.993	.035	99.149	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
88.993	99.149	100	100	100	.1	.3	

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
164	168	885.58	206	227	890

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	879.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.62	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	879.22	Reach Len. (m)			
Crit W.S. (m)	879.44	Flow Area (m2)	0.42	9.26	1.19
E.G. Slope (m/m)	0.018530	Area (m2)	0.42	9.26	1.19
Q Total (m3/s)	33.70	Flow (m3/s)	0.26	32.71	0.74
Top Width (m)	25.05	Top Width (m)	3.85	10.16	11.04
Vel Total (m/s)	3.10	Avg. Vel. (m/s)	0.62	3.53	0.62
Max Chl Dpth (m)	1.33	Hydr. Depth (m)	0.11	0.91	0.11
Conv. Total (m3/s)	247.6	Conv. (m3/s)	1.9	240.3	5.4
Length Wtd. (m)		Wetted Per. (m)	3.86	10.70	11.04
Min Ch El (m)	877.89	Shear (N/m2)	19.59	157.25	19.62
Alpha	1.26	Stream Power (N/m s)	10952.97	0.00	0.00
Frctn Loss (m)	0.32	Cum Volume (1000 m3)			
C & E Loss (m)	0.00	Cum SA (1000 m2)			

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	879.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.33	Wt. n-Val.	0.050	0.035	0.000
W.S. Elev (m)	879.61	Reach Len. (m)			
Crit W.S. (m)	879.34	Flow Area (m2)	0.00	13.22	0.00
E.G. Slope (m/m)	0.006007	Area (m2)	0.00	13.22	0.00
Q Total (m3/s)	33.70	Flow (m3/s)	0.00	33.70	0.00
Top Width (m)	10.16	Top Width (m)		10.16	
Vel Total (m/s)	2.55	Avg. Vel. (m/s)	0.03	2.55	0.01
Max Chl Dpth (m)	1.72	Hydr. Depth (m)	0.61	1.30	0.61
Conv. Total (m3/s)	434.8	Conv. (m3/s)	0.0	434.8	0.0
Length Wtd. (m)		Wetted Per. (m)	0.61	10.70	0.61
Min Ch El (m)	877.89	Shear (N/m2)	0.18	72.77	
Alpha	1.00	Stream Power (N/m s)	10952.97	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			

C & E Loss (m) Cum SA (1000 m2)

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	71.19	88.99	0.26	0.42	3.86	0.76	0.11	0.62	19.59	12.08
2	Chan	88.99	91.02	2.51	1.11	2.17	7.43	0.54	2.27	92.46	209.44
3	Chan	91.02	93.06	10.42	2.61	2.18	30.91	1.28	4.00	216.79	866.69
4	Chan	93.06	95.09	11.50	2.69	2.03	34.11	1.32	4.28	240.23	1028.42
5	Chan	95.09	97.12	6.55	1.99	2.24	19.43	0.98	3.29	161.76	532.00
6	Chan	97.12	99.15	1.74	0.87	2.08	5.16	0.43	1.99	76.38	152.31
7	ROB	99.15	125.07	0.74	1.19	11.04	2.18	0.11	0.62	19.62	12.11

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	71.19	88.99	0.00	0.00	0.61	0.00	0.61	0.03	0.18	0.01
2	Chan	88.99	91.02	3.67	1.90	2.17	10.88	0.93	1.93	51.43	99.42
3	Chan	91.02	93.06	9.65	3.40	2.18	28.64	1.67	2.84	91.64	260.34
4	Chan	93.06	95.09	10.53	3.48	2.03	31.24	1.71	3.03	100.84	305.37
5	Chan	95.09	97.12	6.81	2.78	2.24	20.21	1.37	2.45	73.29	179.40
6	Chan	97.12	99.15	3.04	1.66	2.08	9.02	0.82	1.83	47.23	86.25
7	ROB	99.15	125.07	0.00	0.00	0.61	0.00	0.61	0.01	0.05	0.00

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

SUMMARY OF MANNING'S N VALUES

River:Jerga

Reach	River Sta.	n1	n2	n3
Murias	390	.05	.035	.05
Murias	356	.05	.035	.05
Murias	326	.05	.035	.05
Murias	307	.05	.035	.05
Murias	305	Bridge		
Murias	300	.05	.035	.05
Murias	287	.05	.035	.05
Murias	262	.05	.035	.05
Murias	238	.05	.035	.05
Murias	219	.05	.035	.05
Murias	206	.05	.035	.05
Murias	180	.05	.035	.05
Murias	163	.05	.035	.05
Murias	75	.05	.035	.05
Murias	70	Bridge		
Murias	67	.05	.035	.05

Murias	45	.05	.035	.05
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SUMMARY OF REACH LENGTHS

River: Jerga

Reach	River Sta.	Left	Channel	Right
Murias	390	34	34	34
Murias	356	27	30	27
Murias	326	25	19	27
Murias	307	4.9	4.9	4.9
Murias	305	Bridge		
Murias	300	27	13	9
Murias	287	23	25	14
Murias	262	13	24	36
Murias	238	9	19	25
Murias	219	11	13	17
Murias	206	25	26	27
Murias	180	17	17	17
Murias	163	35	28	20
Murias	75	8	8	8
Murias	70	Bridge		
Murias	67	20	22	26
Murias	45	100	100	100

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Jerga

Reach	River Sta.	Contr.	Expan.
Murias	390	.1	.3
Murias	356	.1	.3
Murias	326	.1	.3
Murias	307	.1	.3
Murias	305	Bridge	
Murias	300	.1	.3
Murias	287	.1	.3
Murias	262	.1	.3
Murias	238	.1	.3
Murias	219	.1	.3
Murias	206	.1	.3
Murias	180	.1	.3
Murias	163	.1	.3
Murias	75	.1	.3
Murias	70	Bridge	
Murias	67	.1	.3
Murias	45	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m/s)	E.G. Slope (m2)	Vel Chnl (m)	Flow Area	Top Width	Froude #	Chl
Murias	390	100 años	33.70	879.61	881.17	880.79	881.33	0.003456	1.84	24.48	61.11	0.54	
Murias	390	VID	33.70	879.61	881.40	880.78	881.54	0.002445	1.68	20.02	14.07	0.45	
Murias	356	100 años	33.70	879.50	880.95	880.86	881.18	0.005141	2.43	21.53	41.85	0.68	
Murias	356	VID	33.70	879.50	881.11	881.41	0.005662	2.53	15.03	11.38	0.66		
Murias	326	100 años	33.70	879.47	880.99	880.54	881.04	0.002019	1.24	37.07	53.61	0.39	
Murias	326	VID	33.70	879.47	881.11	880.67	881.22	0.003764	1.81	23.57	21.06	0.54	
Murias	307	100 años	33.70	879.19	880.84	880.34	880.98	0.002560	1.70	20.62	38.29	0.47	
Murias	307	VID	33.70	879.19	881.07	880.33	881.17	0.001592	1.46	24.29	16.22	0.37	
Murias	305	Bridge											
Murias	300	100 años	33.70	879.13	880.54	880.54	880.93	0.011928	2.80	12.60	33.74	0.95	
Murias	300	VID	33.70	879.13	880.96	880.53	881.15	0.004090	1.95	17.32	13.38	0.55	
Murias	287	100 años	33.70	879.04	880.60	880.40	880.71	0.003554	1.67	29.04	56.04	0.53	
Murias	287	VID	33.70	879.04	880.96	881.09	0.002511	1.60	21.09	15.43	0.44		
Murias	262	100 años	33.70	879.10	880.57	880.63	0.002472	1.48	40.63	68.94	0.44		
Murias	262	VID	33.70	879.10	880.95	881.02	0.001612	1.45	33.56	30.54	0.38		
Murias	238	100 años	33.70	879.14	880.38	880.38	880.54	0.010160	2.33	25.74	70.97	0.85	
Murias	238	VID	33.70	879.14	880.70	880.95	0.007325	2.40	17.05	18.90	0.73		
Murias	219	100 años	33.70	879.01	880.33	880.18	880.40	0.003701	1.51	35.39	70.12	0.52	
Murias	219	VID	33.70	879.01	880.65	880.83	0.004219	1.94	18.74	16.87	0.57		
Murias	206	100 años	33.70	879.00	880.29	880.36	0.003442	1.39	36.83	75.15	0.50		
Murias	206	VID	33.70	879.00	880.61	880.78	0.003921	1.81	18.61	16.96	0.55		
Murias	180	100 años	33.70	878.29	880.29	880.31	0.000701	1.04	67.29	90.84	0.25		
Murias	180	VID	33.70	878.29	880.68	880.71	0.000506	1.01	51.01	32.00	0.22		
Murias	163	100 años	33.70	878.09	880.28	879.62	880.30	0.000505	0.93	72.58	89.69	0.22	
Murias	163	VID	33.70	878.09	880.67	879.62	880.70	0.000380	0.92	56.09	34.00	0.19	

DILIGENCIA para hacer constar que la presente documentación es fiel y verdadera copia de la original, la cual se encuentra en poder de la Presidencia Municipal de Astorga, Coahuila de Zaragoza, y que la misma fue revisada y aprobada por el Presidente Municipal de Astorga, Coahuila de Zaragoza, el día 17 de mayo de 2018, en un plenario de dicho Ayuntamiento.

Astorga, 18 de mayo de 2018.

EL PRESIDENTE MUNICIPAL
 Fdo. D. Manuel Aljila Rodríguez

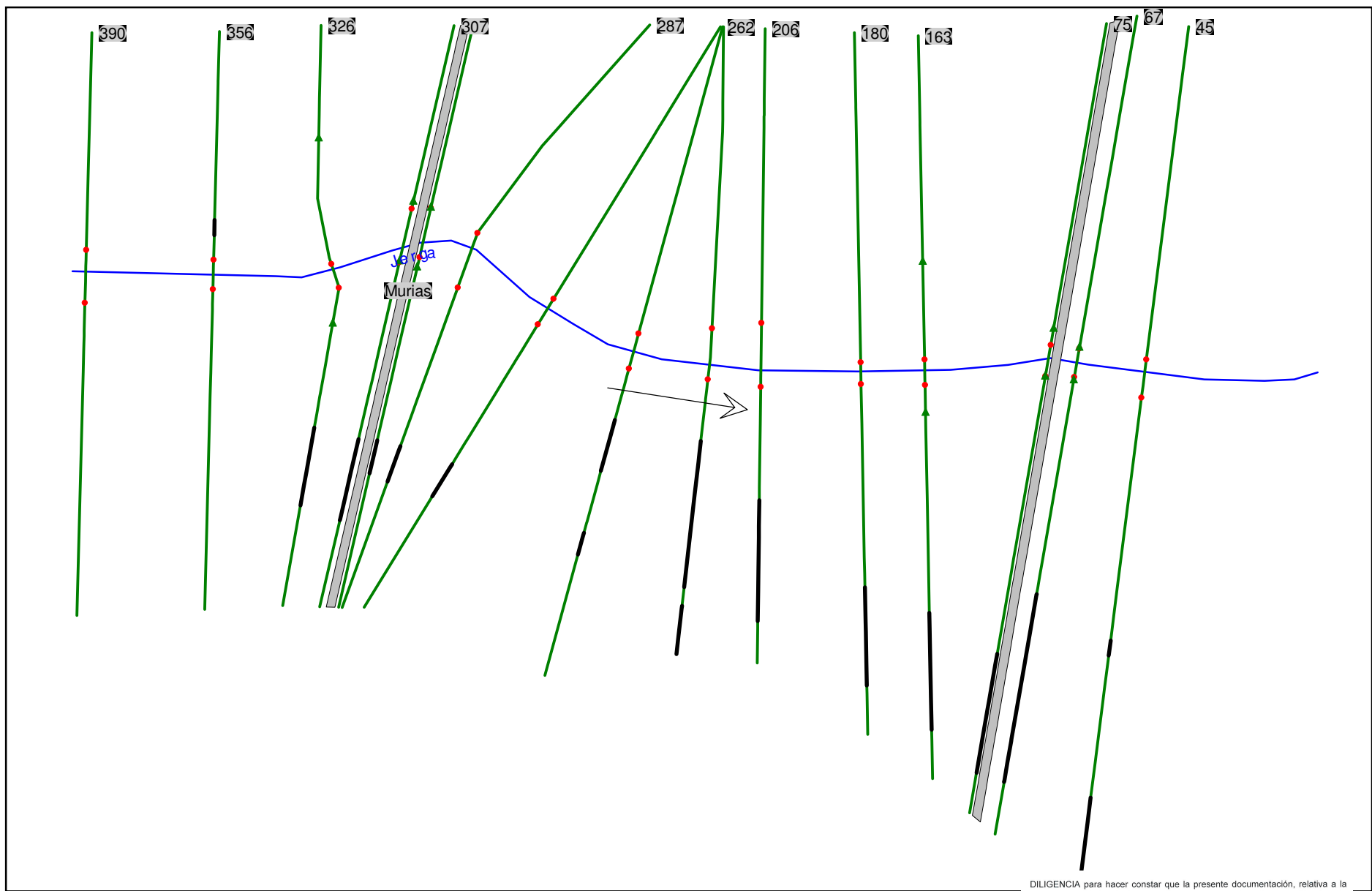
Murias	75	100 años	33.70	878.40	880.27	879.70	880.28	0.000435	0.84	86.33	130.96	0.21
Murias	75	VID	33.70	878.40	880.42	879.73	880.65	0.003696	2.15	15.69	8.37	0.50
Murias	70	Bridge										
Murias	67	100 años	33.70	878.19	879.58	879.58	880.16	0.011927	3.43	10.17	55.06	0.98
Murias	67	VID	33.70	878.19	879.71	879.71	880.45	0.017565	3.81	8.84	5.95	1.00
Murias	45	100 años	33.70	877.89	879.22	879.44	879.83	0.018530	3.53	10.87	25.05	1.18
Murias	45	VID	33.70	877.89	879.61	879.34	879.94	0.006007	2.55	13.22	10.16	0.71

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PISOU de Astorga, fue aprobada inicialmente en sesión plenaria del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL


Fdo. D. Manuel Aljiza Rodríguez



DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada inicialmente en sesión plenaria del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.



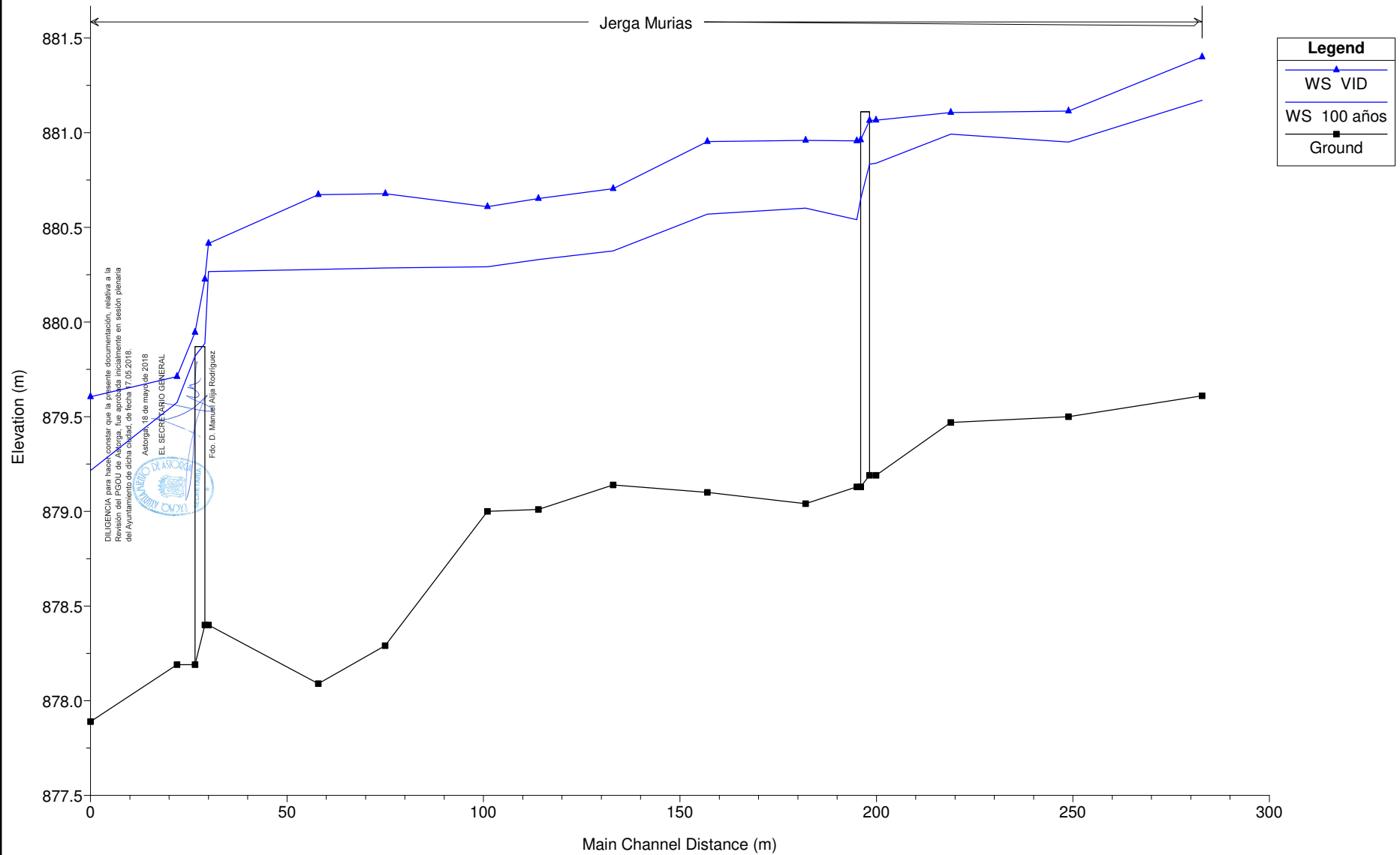
Astorga, 18 de mayo de 2018

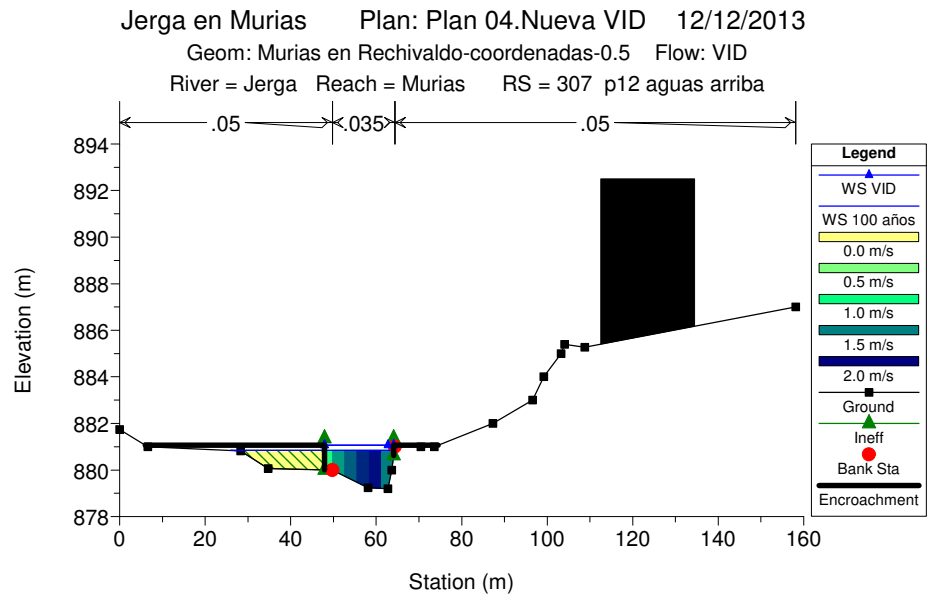
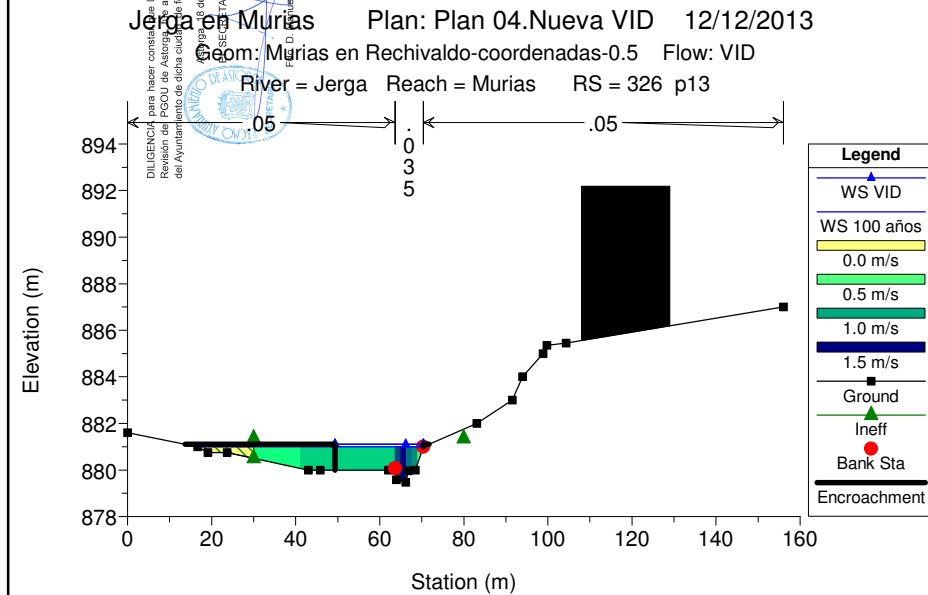
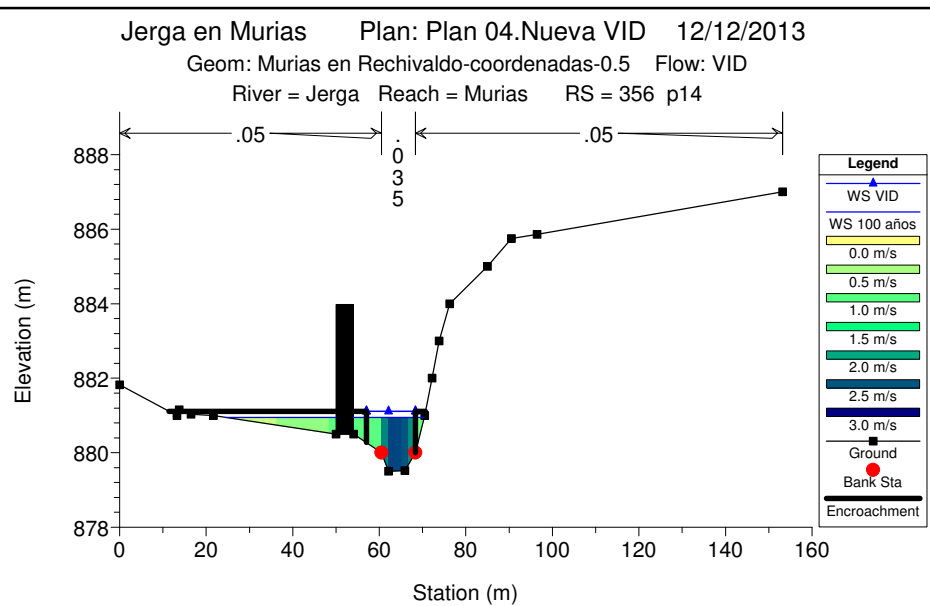
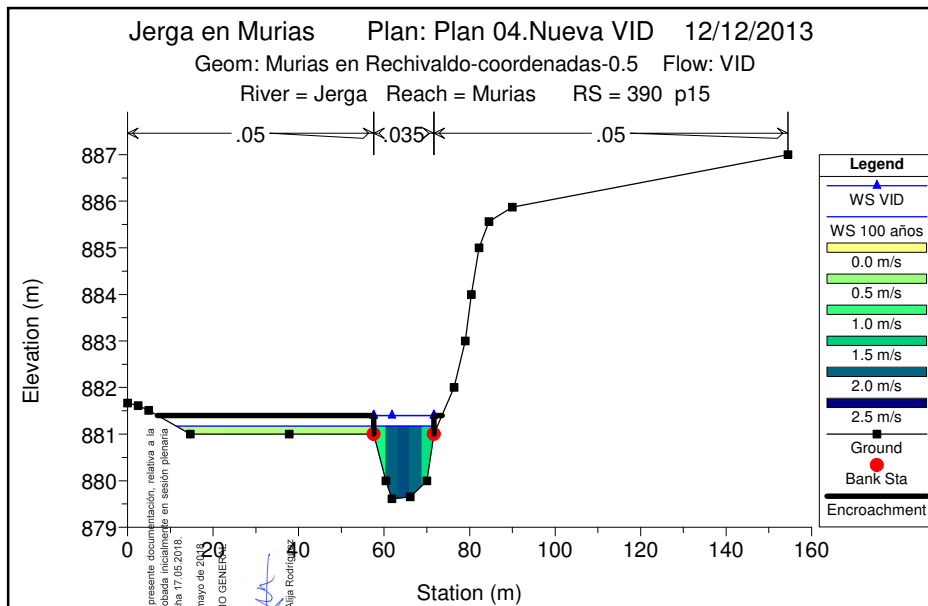
EL SECRETARIO GENERAL

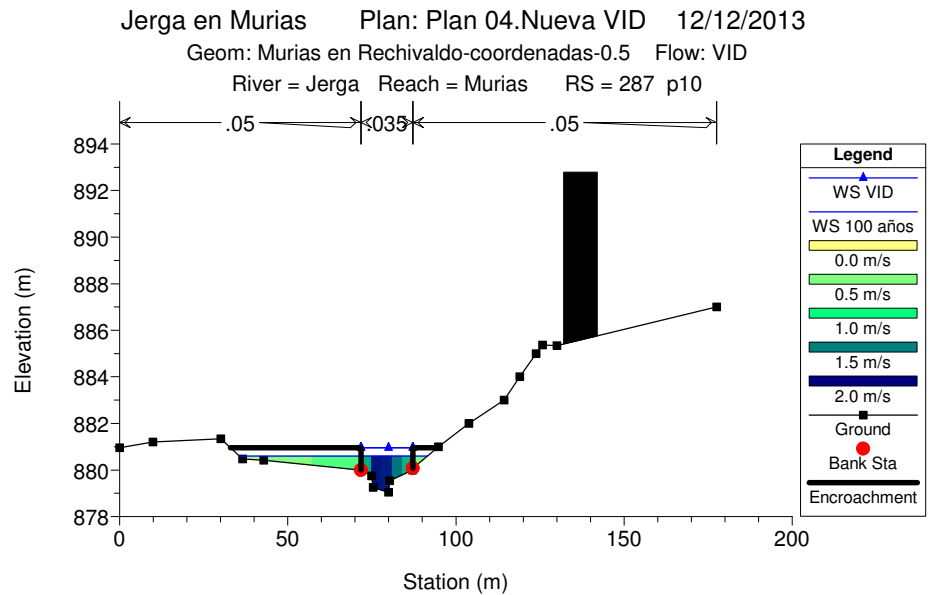
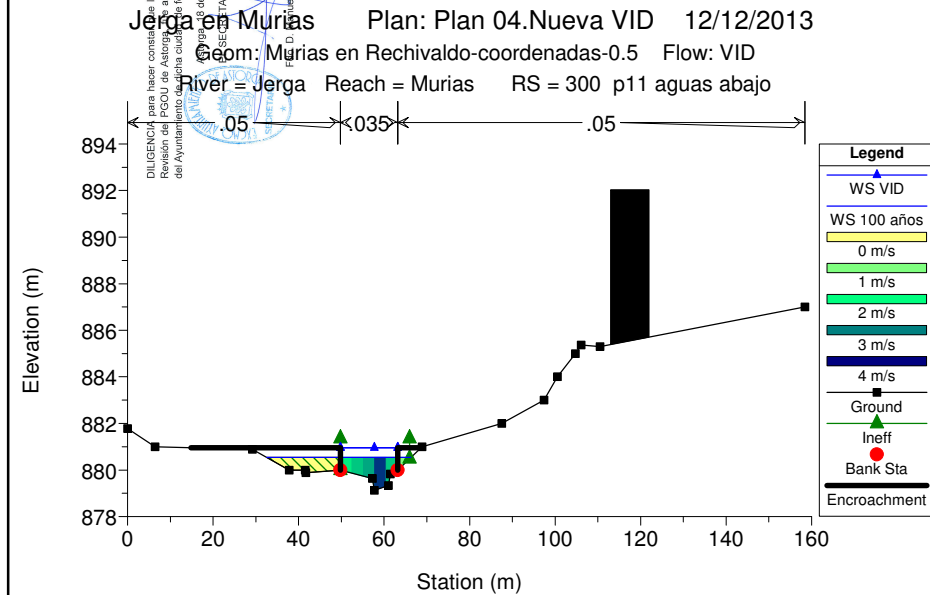
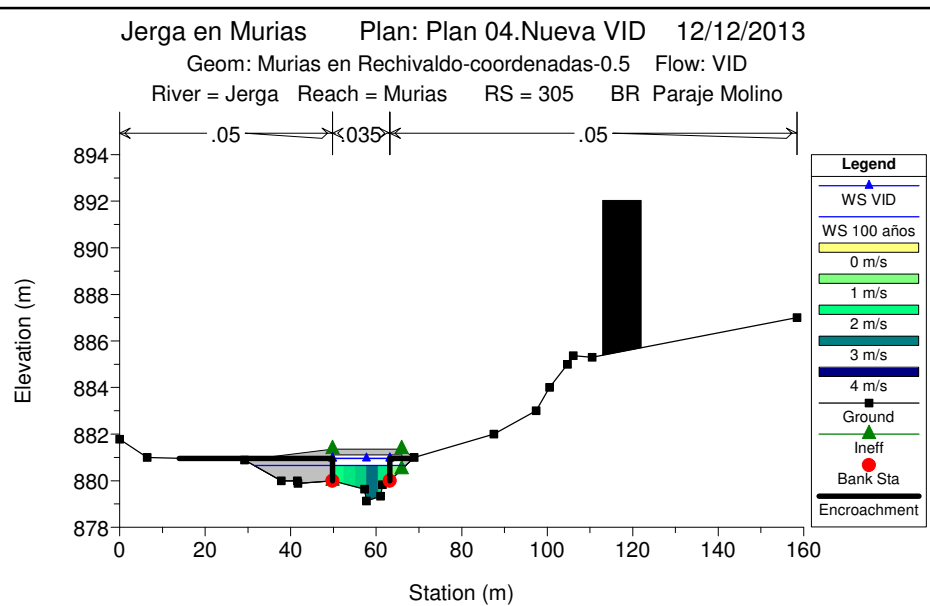
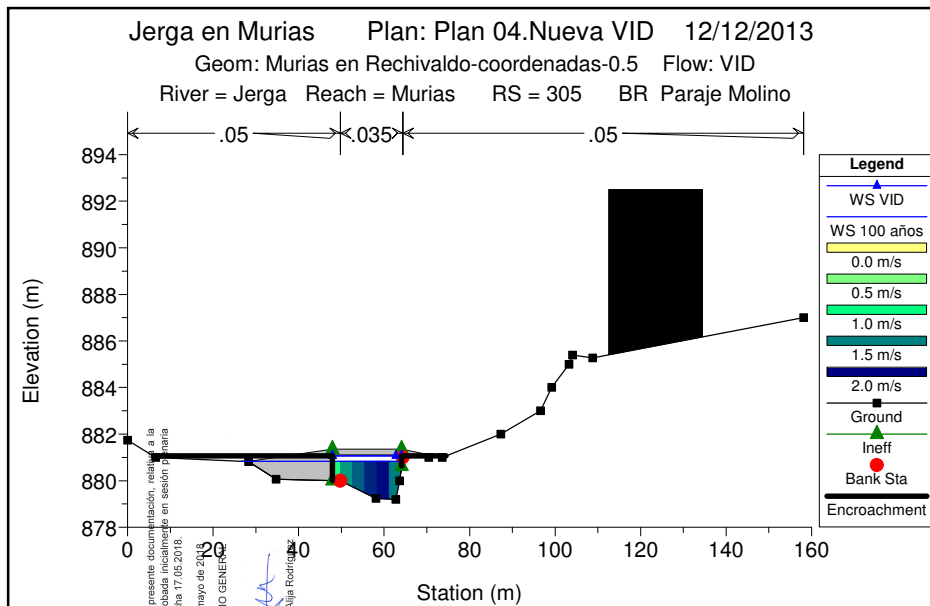
Fdo. D. Manuel Alija Rodríguez

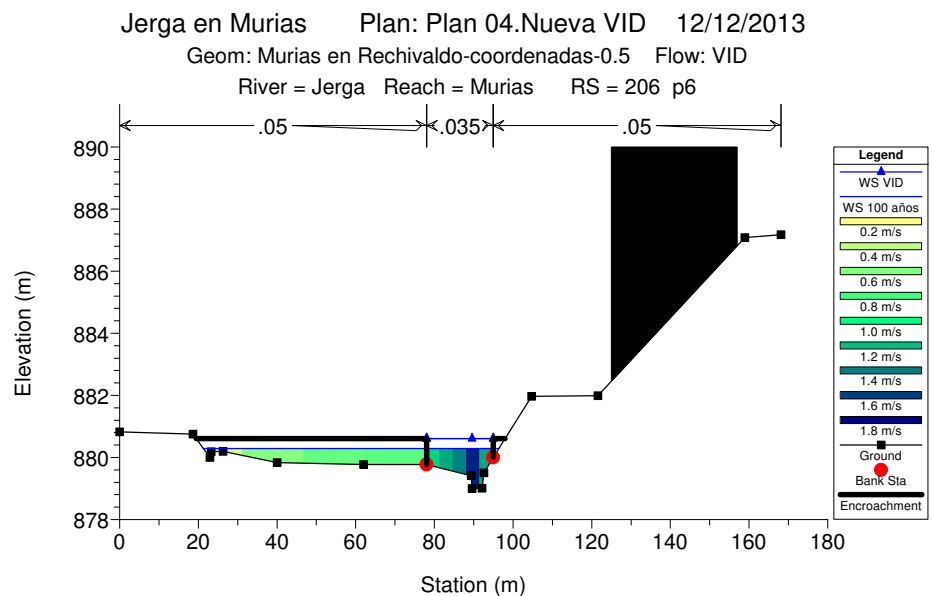
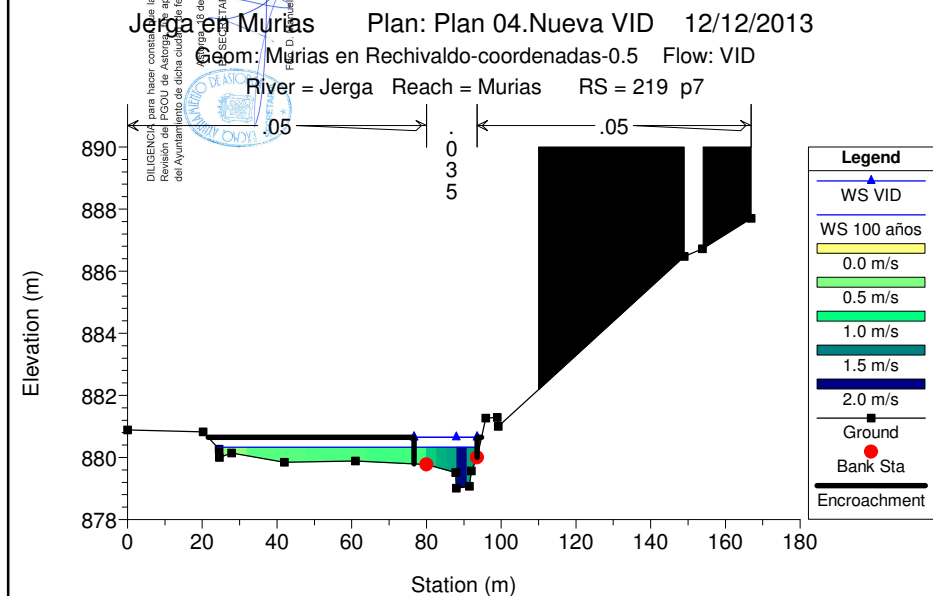
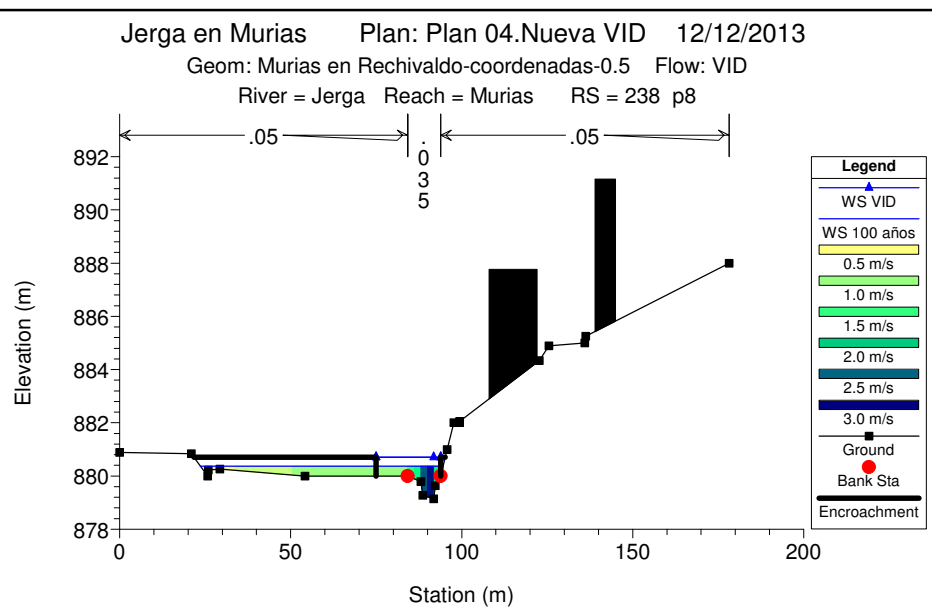
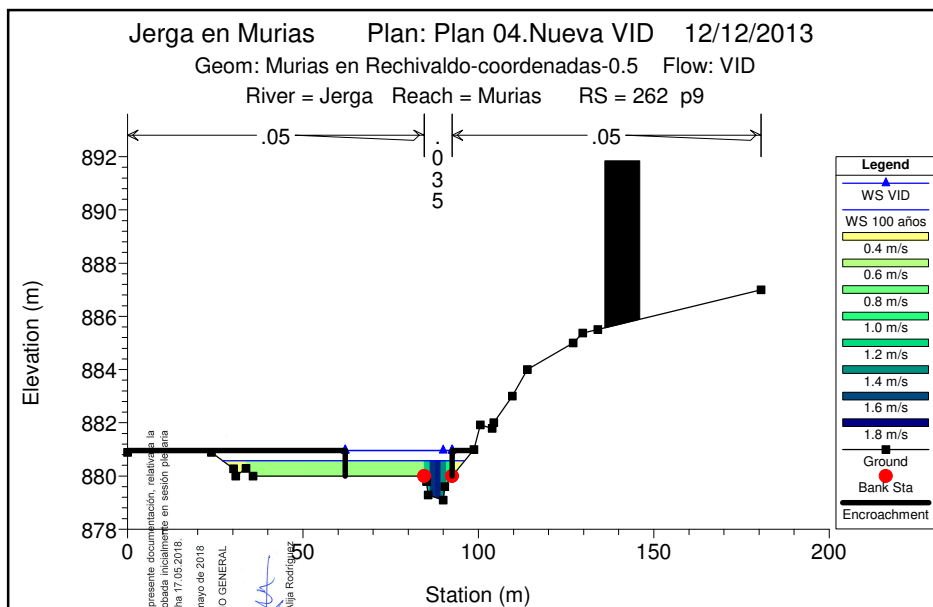
Jerga en Murias Plan: Plan 04.Nueva VID 12/12/2013

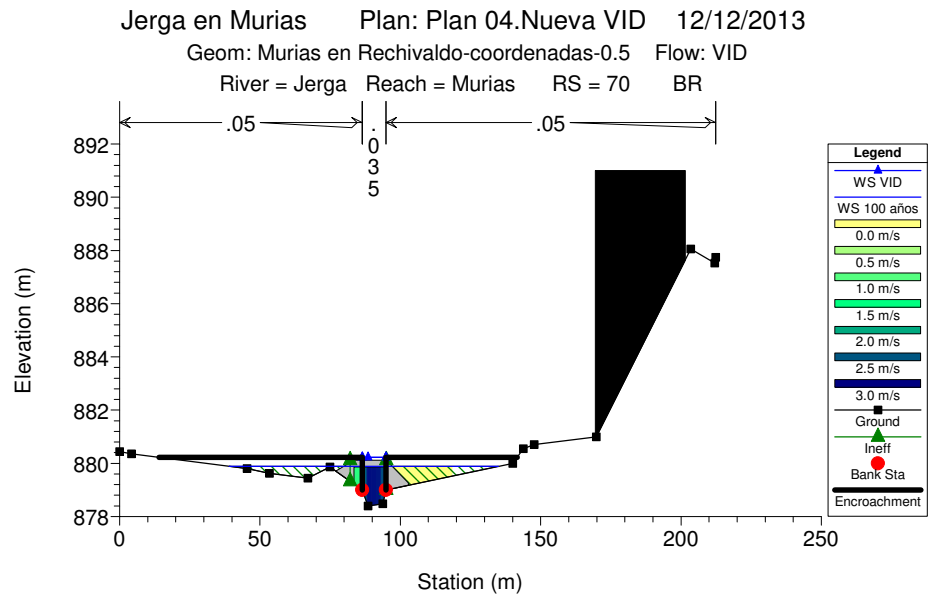
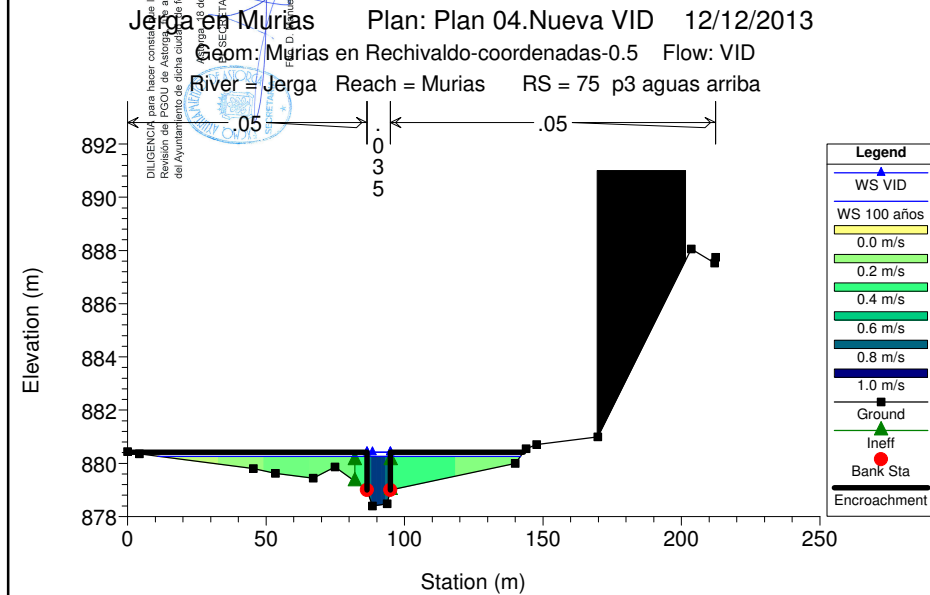
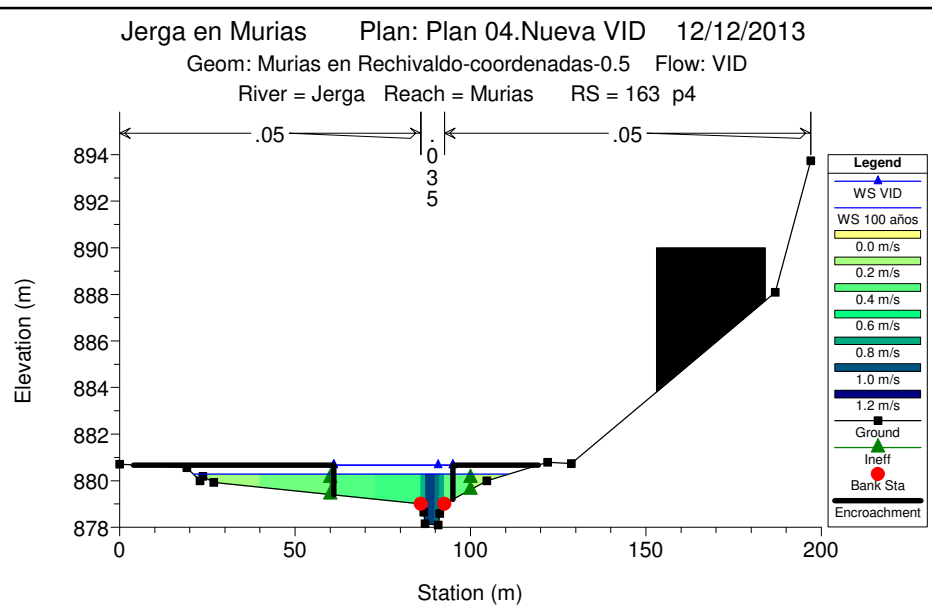
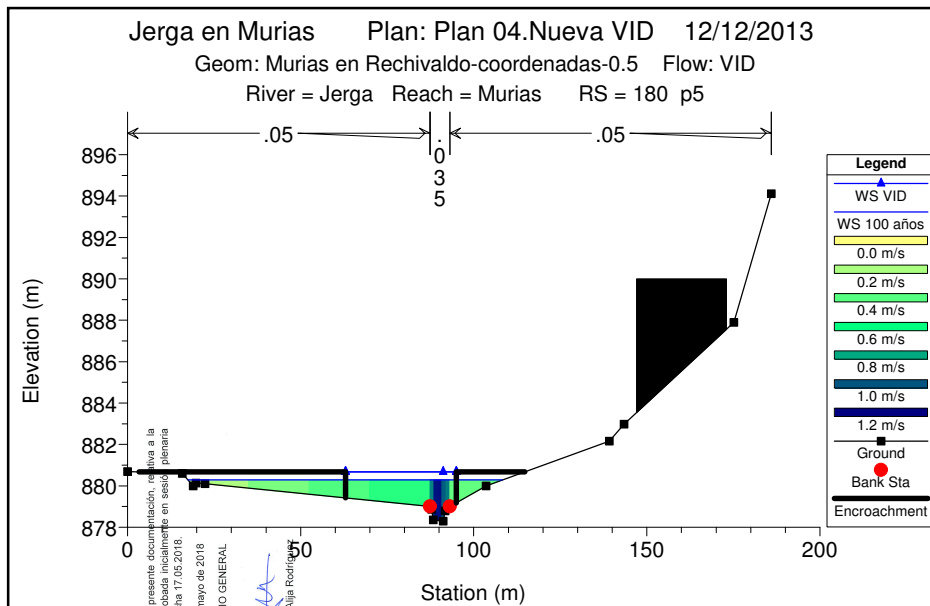
Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: VID

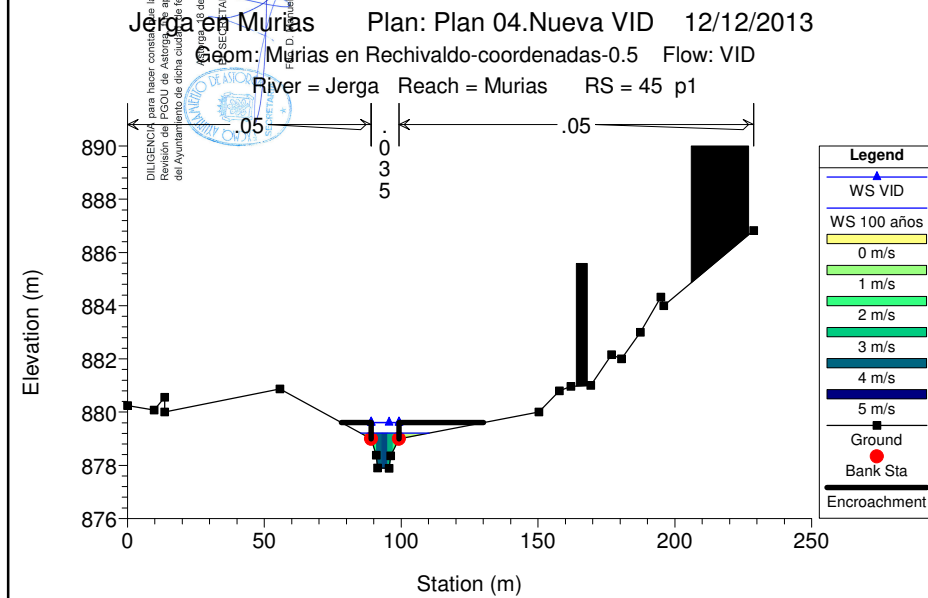
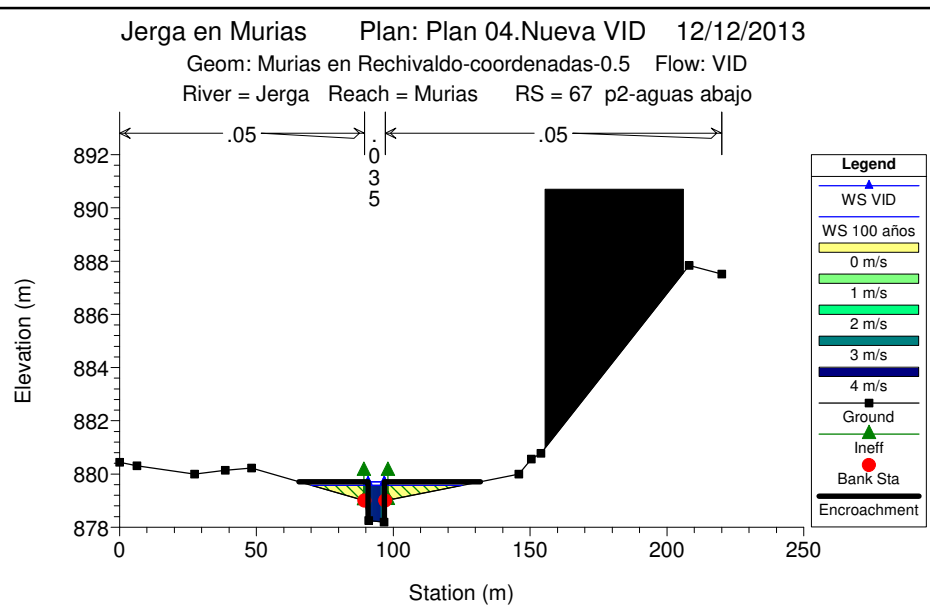
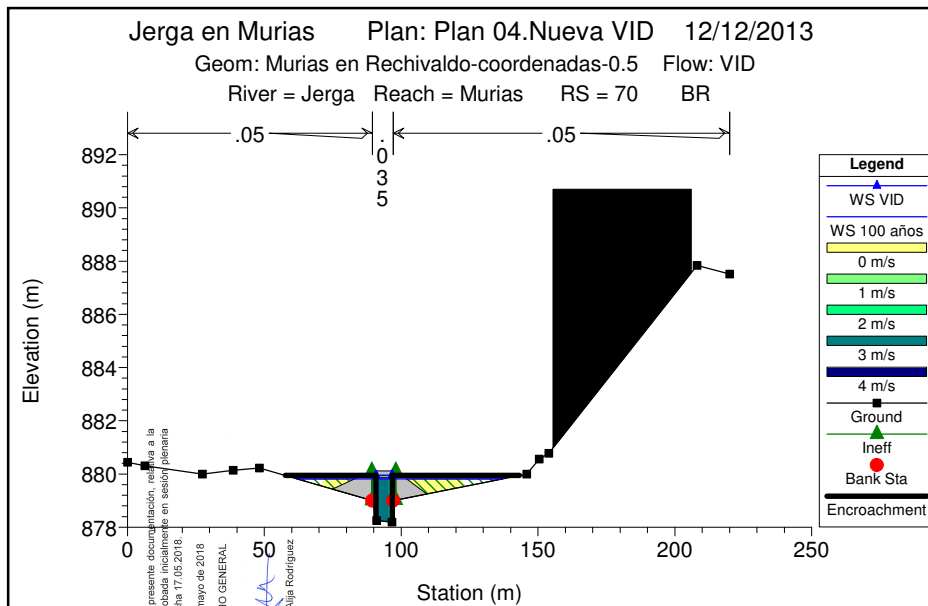






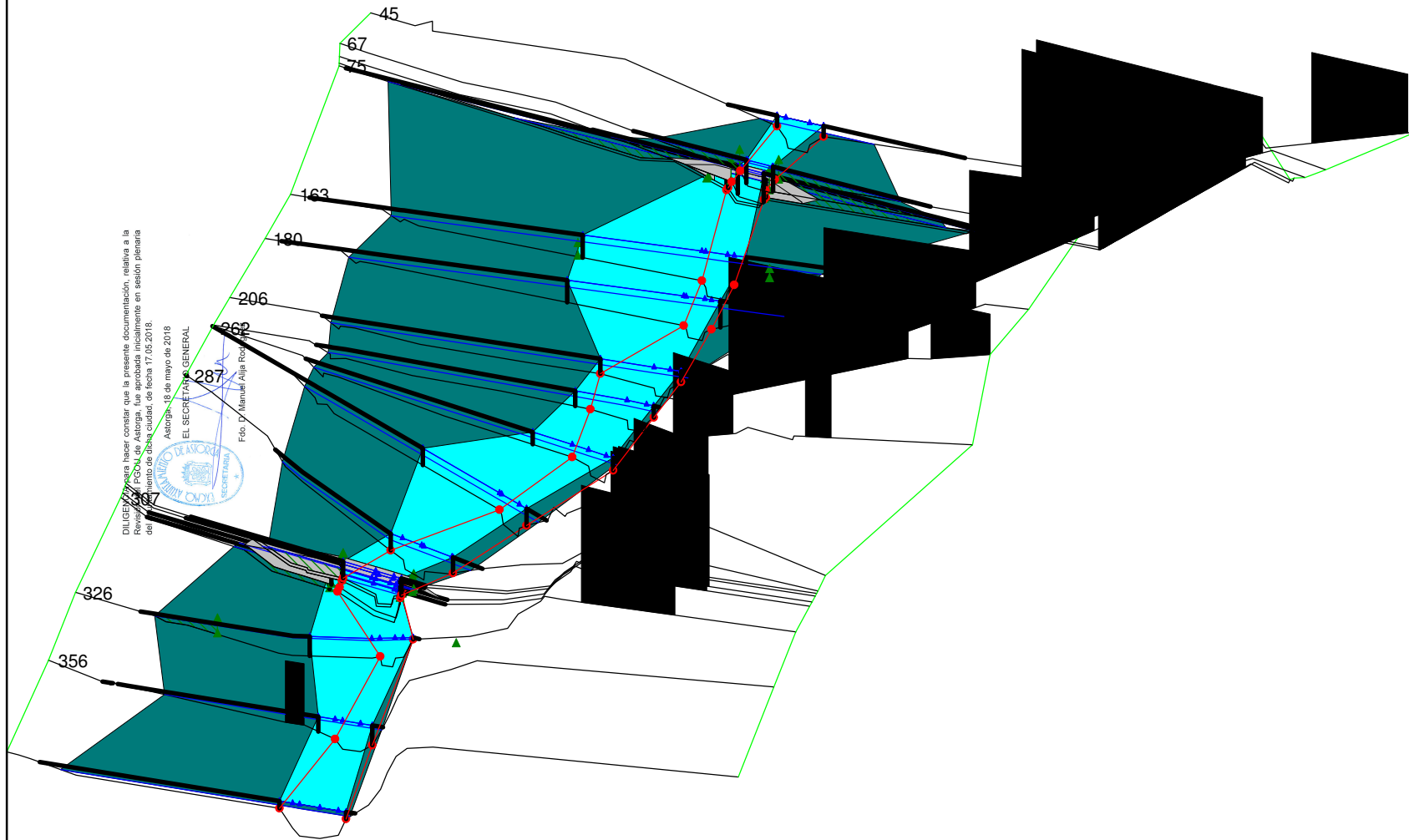






Jerga en Murias Plan: Plan 04.Nueva VID 12/12/2013
 Geom: Murias en Rechivaldo-coordenadas-0.5 Flow: VID

Legend	
	WS 100 años
	WS VID
	Ground
	Bank Sta
	Encroachment
	Ineff



DILIGE para hacer constar que la presente documentación, relativa a la
 Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria
 del 17 de mayo de 2018.

Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Allja Rodríguez





3. ANEXO 3. MODELIZACIÓN DEL RÍO JERGA EN ASTORGA.

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada fehaciente en sesión plenaria del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018
EL SECRETARIO GENERAL
Fdo. D. Manuel Alja Rodríguez

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X  X XXXXXX  XXXX   XXXX   XX   XXXX
X  X X   X  X   X  X   X  X   X
X  X X   X       X  X   X  X   X
XXXXXXXX XXXX   X   XXX XXXX  XXXXXX  XXXX
X  X X   X       X  X   X  X   X
X  X X   X  X   X  X   X  X   X
X  X XXXXXX  XXXX   X  X   X  X  XXXXX
```

PROJECT DATA

Project Title: JergaenAstorga

Project File : Astorga122013.prj

Run Date and Time: 28/11/2013 12:10:53 p.m.

Project in SI units

Project Description:

Estudio Hidráulico Río Jerga en Astorga

Plan General de Ordenación Urbana de

Astorga

PLAN DATA

Plan Title: Plan 01

Plan File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.p01

Geometry Title: Jerga-Astorga-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.g02

Flow Title : caudales

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.f01

Plan Summary Information:

Number of: Cross Sections = 31 Multiple Openings = 0

Culverts = 0 Inline Structures = 0

Bridges = 5 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.003

Critical depth calculation tolerance = 0.003

Maximum number of iterations = 20

Maximum difference tolerance = 0.1

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: caudales

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.f01

Flow Data (m3/s)

River	Reach	RS	5 años	50 años	100 años	500 años
Jerga	Astorga	1595	1.91	22.1	33.7	68.4

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Jerga	Astorga	5 años	Normal S = 0.006	Normal S = 0.006

GEOMETRY DATA

Geometry Title: Jerga-Astorga-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.g02

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1595

INPUT

Description: p29

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	10.203	853.929	71.681	853.592	78.408	853.362	84.301	853.105
85.902	853	87.346	852	88.889	850.778	93.518	850.617	95.732	852
97.98	853	117.641	854	121.829	854	127.818	853	151.57	853
164.449	853.45	235.358	853.796	240.524	853.825				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	85.902	.035	97.98	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.902 97.98 77.27 78.3 81.9 .1 .3

Right Levee Station= 117.64 Elevation= 854

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	851.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035		
W.S. Elev (m)	851.17	Reach Len. (m)	77.27	78.30	81.90
Crit W.S. (m)	850.95	Flow Area (m2)	2.53		
E.G. Slope (m/m)	0.002361	Area (m2)	2.53		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.01	Top Width (m)	6.01		
Vel Total (m/s)	0.76	Avg. Vel. (m/s)	0.76		
Max Chl Dpth (m)	0.55	Hydr. Depth (m)	0.42		
Conv. Total (m3/s)	39.3	Conv. (m3/s)	39.3		
Length Wtd. (m)	78.30	Wetted Per. (m)	6.31		



Min Ch El (m)	850.62	Shear (N/m2)	9.29		
Alpha	1.00	Stream Power (N/m s)	11515.78	0.00	5632.35
Frctn Loss (m)	0.17	Cum Volume (1000 m3)	4.77		
C & E Loss (m)	0.00	Cum SA (1000 m2)	12.73		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	852.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035		
W.S. Elev (m)	852.53	Reach Len. (m)	77.27	78.30	81.90
Crit W.S. (m)	851.86	Flow Area (m2)	13.44		
E.G. Slope (m/m)	0.002671	Area (m2)	13.44		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	10.33	Top Width (m)	10.33		
Vel Total (m/s)	1.64	Avg. Vel. (m/s)	1.64		
Max Chl Dpth (m)	1.91	Hydr. Depth (m)	1.30		
Conv. Total (m3/s)	427.6	Conv. (m3/s)	427.6		
Length Wtd. (m)	78.35	Wetted Per. (m)	11.43		
Min Ch El (m)	850.62	Shear (N/m2)	30.78		
Alpha	1.00	Stream Power (N/m s)	11515.78	0.00	5632.35
Frctn Loss (m)	0.23	Cum Volume (1000 m3)	4.26	26.24	6.55
C & E Loss (m)	0.00	Cum SA (1000 m2)	23.06	26.93	21.60

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	853.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.	0.035		
W.S. Elev (m)	852.81	Reach Len. (m)	77.27	78.30	81.90
Crit W.S. (m)	852.19	Flow Area (m2)	16.52		
E.G. Slope (m/m)	0.003561	Area (m2)	16.52		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	11.38	Top Width (m)	11.38		
Vel Total (m/s)	2.04	Avg. Vel. (m/s)	2.04		
Max Chl Dpth (m)	2.19	Hydr. Depth (m)	1.45		
Conv. Total (m3/s)	564.7	Conv. (m3/s)	564.7		
Length Wtd. (m)	78.54	Wetted Per. (m)	12.63		
Min Ch El (m)	850.62	Shear (N/m2)	45.68		
Alpha	1.00	Stream Power (N/m s)	11515.78	0.00	5632.35
Frctn Loss (m)	0.27	Cum Volume (1000 m3)	11.68	34.58	14.10
C & E Loss (m)	0.01	Cum SA (1000 m2)	31.96	30.11	36.03

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	853.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.55	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	853.17	Reach Len. (m)	77.27	78.30	81.90
Crit W.S. (m)	852.93	Flow Area (m2)	0.24	20.79	0.29
E.G. Slope (m/m)	0.007363	Area (m2)	0.24	20.79	0.29
Q Total (m3/s)	68.40	Flow (m3/s)	0.07	68.23	0.09
Top Width (m)	18.53	Top Width (m)	3.10	12.08	3.35
Vel Total (m/s)	3.21	Avg. Vel. (m/s)	0.31	3.28	0.33
Max Chl Dpth (m)	2.55	Hydr. Depth (m)	0.08	1.72	0.09
Conv. Total (m3/s)	797.1	Conv. (m3/s)	0.9	795.2	1.1
Length Wtd. (m)	78.92	Wetted Per. (m)	3.10	13.43	3.36

Min Ch El (m)	850.62	Shear (N/m ²)	5.53	111.81	6.15
Alpha	1.04	Stream Power (N/m s)	11515.78	0.00	5632.35
Frctn Loss (m)	0.38	Cum Volume (1000 m ³)	46.67	51.15	45.95
C & E Loss (m)	0.11	Cum SA (1000 m ²)	78.84	32.38	76.41

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m ³ /s)	Area (m ²)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m ²)	Power (N/m s)
1	Chan	88.32	90.73	0.60	0.88	2.48	31.40	0.38	0.68	8.22	5.61
2	Chan	90.73	93.15	1.03	1.20	2.42	53.84	0.50	0.85	11.53	9.85
3	Chan	93.15	95.56	0.28	0.45	1.41	14.76	0.36	0.63	7.32	4.62

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m ³ /s)	Area (m ²)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m ²)	Power (N/m s)
1	Chan	85.90	88.32	0.89	1.09	2.17	4.03	0.63	0.82	13.15	10.76
2	Chan	88.32	90.73	7.41	4.16	2.57	33.54	1.72	1.78	42.28	75.42
3	Chan	90.73	93.15	8.77	4.48	2.42	39.68	1.86	1.96	48.57	95.03
4	Chan	93.15	95.56	4.80	3.30	2.78	21.73	1.37	1.45	31.10	45.21
5	Chan	95.56	97.98	0.22	0.41	1.50	1.01	0.30	0.55	7.18	3.92

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m ³ /s)	Area (m ²)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m ²)	Power (N/m s)
1	Chan	85.90	88.32	1.76	1.64	2.67	5.22	0.76	1.07	21.47	23.04
2	Chan	88.32	90.73	10.95	4.84	2.57	32.50	2.00	2.26	65.70	148.61
3	Chan	90.73	93.15	12.74	5.17	2.42	37.79	2.14	2.46	74.68	184.03
4	Chan	93.15	95.56	7.53	3.99	2.78	22.36	1.65	1.89	50.09	94.57
5	Chan	95.56	97.98	0.72	0.89	2.19	2.13	0.44	0.81	14.08	11.41

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m ³ /s)	Area (m ²)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m ²)	Power (N/m s)
1	LOB	77.31	85.90	0.07	0.24	3.10	0.11	0.08	0.31	5.53	1.71
2	Chan	85.90	88.32	4.76	2.48	3.00	6.96	1.03	1.92	59.75	114.73
3	Chan	88.32	90.73	21.15	5.71	2.57	30.92	2.36	3.70	160.14	593.26
4	Chan	90.73	93.15	24.20	6.04	2.42	35.38	2.50	4.01	180.30	722.93
5	Chan	93.15	95.56	15.34	4.86	2.78	22.43	2.01	3.16	126.05	398.12
6	Chan	95.56	97.98	2.78	1.71	2.66	4.07	0.71	1.62	46.50	75.55

7 ROB 97.98 117.64 0.09 0.29 3.36 0.14 0.09 0.33 6.15 2.04

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1512

INPUT

Description: p28

Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853.493	67.436	853.207	76.941	853.145	86.336	853.024	87.964	853
90.541	852	91.569	851	92.248	850.376	96.367	850.556	97.089	851
98.968	852	154.466	853	157.615	853.19	203.868	853.287	234.17	853.361

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	87.964	.035	98.968	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	87.964	98.968	92.66	72.85	42.04	.1	.3	

Blocked Obstructions num= 1

Sta L	Sta R	Elev
17.5	30.5	858.73

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	851.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035		
W.S. Elev (m)	851.00	Reach Len. (m)	92.66	72.85	42.04
Crit W.S. (m)		Flow Area (m2)	2.57		
E.G. Slope (m/m)	0.002051	Area (m2)	2.57		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	5.52	Top Width (m)	5.52		
Vel Total (m/s)	0.74	Avg. Vel. (m/s)	0.74		
Max Chl Dpth (m)	0.62	Hydr. Depth (m)	0.47		
Conv. Total (m3/s)	42.2	Conv. (m3/s)	42.2		
Length Wtd. (m)	72.85	Wetted Per. (m)	5.89		
Min Ch El (m)	850.38	Shear (N/m2)	8.77		
Alpha	1.00	Stream Power (N/m s)	11211.56	0.00	0.00
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	4.57		
C & E Loss (m)	0.00	Cum SA (1000 m2)	12.27		

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	852.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	852.27	Reach Len. (m)	92.66	72.85	42.04
Crit W.S. (m)		Flow Area (m2)	11.95	2.09	
E.G. Slope (m/m)	0.003204	Area (m2)	11.95	2.09	

Q Total (m3/s)	22.10	Flow (m3/s)	21.47	0.63
Top Width (m)	24.36	Top Width (m)	9.13	15.23
Vel Total (m/s)	1.57	Avg. Vel. (m/s)	1.80	0.30
Max Chl Dpth (m)	1.90	Hydr. Depth (m)	1.31	0.14
Conv. Total (m3/s)	390.4	Conv. (m3/s)	379.3	11.1
Length Wtd. (m)	72.36	Wetted Per. (m)	10.21	15.23
Min Ch El (m)	850.38	Shear (N/m2)	36.77	4.31
Alpha	1.27	Stream Power (N/m s)	11211.56	0.00 0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	4.26	25.25 6.46
C & E Loss (m)	0.02	Cum SA (1000 m2)	23.06	26.16 20.97

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	852.57	Reach Len. (m)	92.66	72.85	42.04
Crit W.S. (m)		Flow Area (m2)	14.76	9.01	
E.G. Slope (m/m)	0.003258	Area (m2)	14.76	9.01	
Q Total (m3/s)	33.70	Flow (m3/s)	29.25	4.45	
Top Width (m)	41.53	Top Width (m)	9.90	31.63	
Vel Total (m/s)	1.42	Avg. Vel. (m/s)	1.98	0.49	
Max Chl Dpth (m)	2.19	Hydr. Depth (m)	1.49	0.28	
Conv. Total (m3/s)	590.4	Conv. (m3/s)	512.4	78.0	
Length Wtd. (m)	69.82	Wetted Per. (m)	11.03	31.64	
Min Ch El (m)	850.38	Shear (N/m2)	42.77	9.10	
Alpha	1.71	Stream Power (N/m s)	11211.56	0.00	0.00
Frctn Loss (m)	0.19	Cum Volume (1000 m3)	11.68	33.35	13.73
C & E Loss (m)	0.02	Cum SA (1000 m2)	31.96	29.28	34.73

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	853.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	853.05	Reach Len. (m)	92.66	72.85	42.04
Crit W.S. (m)		Flow Area (m2)	0.09	19.80	30.50
E.G. Slope (m/m)	0.003326	Area (m2)	0.09	19.80	30.50
Q Total (m3/s)	68.40	Flow (m3/s)	0.01	45.02	23.38
Top Width (m)	70.91	Top Width (m)	3.59	11.00	56.32
Vel Total (m/s)	1.36	Avg. Vel. (m/s)	0.10	2.27	0.77
Max Chl Dpth (m)	2.67	Hydr. Depth (m)	0.02	1.80	0.54
Conv. Total (m3/s)	1186.0	Conv. (m3/s)	0.1	780.6	405.3
Length Wtd. (m)	64.72	Wetted Per. (m)	3.59	12.22	56.33
Min Ch El (m)	850.38	Shear (N/m2)	0.78	52.85	17.66
Alpha	1.95	Stream Power (N/m s)	11211.56	0.00	0.00
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	46.66	49.56	44.69
C & E Loss (m)	0.03	Cum SA (1000 m2)	78.58	31.48	73.97

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	90.16	92.37	0.15	0.28	1.04	7.66	0.36	0.51	5.50	2.83
2	Chan	92.37	94.57	1.05	1.25	2.20	55.12	0.57	0.84	11.45	9.61
3	Chan	94.57	96.77	0.70	1.00	2.27	36.83	0.45	0.71	8.83	6.23
4	Chan	96.77	98.97	0.01	0.03	0.38	0.39	0.10	0.23	1.69	0.40

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	87.96	90.16	0.00	0.02	0.35	0.02	0.06	0.22	1.88	0.42
2	Chan	90.16	92.37	2.60	2.17	2.88	11.78	0.99	1.20	23.71	28.43
3	Chan	92.37	94.57	8.83	4.06	2.20	39.95	1.85	2.17	57.92	125.93
4	Chan	94.57	96.77	7.76	3.80	2.27	35.09	1.73	2.04	52.60	107.24
5	Chan	96.77	98.97	2.28	1.90	2.51	10.31	0.86	1.20	23.78	28.56
6	ROB	98.97	112.49	0.63	2.06	13.52	2.84	0.15	0.30	4.79	1.46
7	ROB	112.49	126.01	0.00	0.03	1.71	0.01	0.02	0.07	0.48	0.03

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	87.96	90.16	0.11	0.23	1.17	0.34	0.21	0.49	6.31	3.09
2	Chan	90.16	92.37	4.03	2.82	2.88	11.95	1.28	1.43	31.33	44.71
3	Chan	92.37	94.57	11.30	4.71	2.20	33.54	2.14	2.40	68.33	163.94
4	Chan	94.57	96.77	10.08	4.45	2.27	29.92	2.02	2.26	62.63	141.78
5	Chan	96.77	98.97	3.72	2.55	2.51	11.04	1.16	1.46	32.47	47.44
6	ROB	98.97	112.49	3.49	6.06	13.52	10.35	0.45	0.58	14.31	8.24
7	ROB	112.49	126.01	0.94	2.76	13.52	2.80	0.20	0.34	6.53	2.23
8	ROB	126.01	139.53	0.02	0.19	4.59	0.07	0.04	0.12	1.32	0.16

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	79.17	87.96	0.01	0.09	3.59	0.01	0.02	0.10	0.78	0.07
2	Chan	87.96	90.16	0.89	1.05	2.36	1.30	0.48	0.85	14.48	12.31
3	Chan	90.16	92.37	6.91	3.88	2.88	10.10	1.76	1.78	43.94	78.30
4	Chan	92.37	94.57	16.00	5.77	2.20	23.38	2.62	2.77	85.37	236.82
5	Chan	94.57	96.77	14.52	5.51	2.27	21.23	2.50	2.64	79.07	208.44
6	Chan	96.77	98.97	6.70	3.60	2.51	9.80	1.64	1.86	46.87	87.19
7	ROB	98.97	112.49	11.88	12.54	13.52	17.37	0.93	0.95	30.24	28.66
8	ROB	112.49	126.01	7.15	9.25	13.52	10.45	0.68	0.77	22.30	17.25
9	ROB	126.01	139.53	3.43	5.95	13.52	5.02	0.44	0.58	14.36	8.28
10	ROB	139.53	153.05	0.90	2.66	13.52	1.31	0.20	0.34	6.41	2.16
11	ROB	153.05	166.57	0.01	0.11	2.24	0.02	0.05	0.13	1.58	0.21

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1440

INPUT

Description: p27

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.668	60.315	852.68	86.983	852.752	92.124	852.543	95.064	852
99.617	851	99.857	850.338	104.568	850.354	106.384	851	108.898	852
180.44	853	184.151	853.252	241.243	853.266				

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 92.124 .035 108.898 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
92.124 108.898 95.14 72.85 40.8 .1 .3
Left Levee Station= 86.98 Elevation= 852.75
Blocked Obstructions num= 1
Sta L Sta R Elev
8.5 40.3 858.2

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	850.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	850.87	Reach Len. (m)	95.14	72.85	40.80
Crit W.S. (m)	850.60	Flow Area (m2)	2.87		
E.G. Slope (m/m)	0.001714	Area (m2)	2.87		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.34	Top Width (m)	6.34		
Vel Total (m/s)	0.67	Avg. Vel. (m/s)	0.67		
Max Chl Dpth (m)	0.53	Hydr. Depth (m)	0.45		
Conv. Total (m3/s)	46.1	Conv. (m3/s)	46.1		
Length Wtd. (m)	72.85	Wetted Per. (m)	6.80		
Min Ch El (m)	850.34	Shear (N/m2)	7.09		
Alpha	1.00	Stream Power (N/m s)	11550.21	4164.41	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	4.37		
C & E Loss (m)	0.00	Cum SA (1000 m2)	11.84		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	852.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	852.12	Reach Len. (m)	95.14	72.85	40.80
Crit W.S. (m)	851.50	Flow Area (m2)	15.77	0.53	
E.G. Slope (m/m)	0.002312	Area (m2)	15.77	0.53	
Q Total (m3/s)	22.10	Flow (m3/s)	22.02	0.08	
Top Width (m)	23.17	Top Width (m)	14.49	8.68	
Vel Total (m/s)	1.36	Avg. Vel. (m/s)	1.40	0.15	
Max Chl Dpth (m)	1.78	Hydr. Depth (m)	1.09	0.06	
Conv. Total (m3/s)	459.6	Conv. (m3/s)	458.0	1.6	
Length Wtd. (m)	72.79	Wetted Per. (m)	15.38	8.68	
Min Ch El (m)	850.34	Shear (N/m2)	23.24	1.37	
Alpha	1.06	Stream Power (N/m s)	11550.21	4164.41	0.00
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	4.26	24.24	6.41
C & E Loss (m)	0.02	Cum SA (1000 m2)	23.06	25.30	20.47

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	852.42	Reach Len. (m)	95.14	72.85	40.80
Crit W.S. (m)	851.79	Flow Area (m2)	20.36	6.37	
E.G. Slope (m/m)	0.002314	Area (m2)	20.36	6.37	
Q Total (m3/s)	33.70	Flow (m3/s)	31.53	2.17	
Top Width (m)	46.30	Top Width (m)	16.12	30.18	
Vel Total (m/s)	1.26	Avg. Vel. (m/s)	1.55	0.34	

Max Chl Dpth (m)	2.08	Hydr. Depth (m)	1.26	0.21	
Conv. Total (m3/s)	700.6	Conv. (m3/s)	655.5	45.1	
Length Wtd. (m)	71.67	Wetted Per. (m)	17.03	30.19	
Min Ch El (m)	850.34	Shear (N/m2)	27.13	4.79	
Alpha	1.42	Stream Power (N/m s)	11550.21	4164.41	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	11.68	32.07	13.41
C & E Loss (m)	0.02	Cum SA (1000 m2)	31.96	28.33	33.44

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	853.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.98	Reach Len. (m)	95.14	72.85	40.80
Crit W.S. (m)	852.51	Flow Area (m2)	17.39	29.68	34.31
E.G. Slope (m/m)	0.001488	Area (m2)	17.39	29.68	34.31
Q Total (m3/s)	68.40	Flow (m3/s)	5.80	46.16	16.44
Top Width (m)	147.17	Top Width (m)	60.32	16.77	70.07
Vel Total (m/s)	0.84	Avg. Vel. (m/s)	0.33	1.56	0.48
Max Chl Dpth (m)	2.64	Hydr. Depth (m)	0.29	1.77	0.49
Conv. Total (m3/s)	1773.1	Conv. (m3/s)	150.3	1196.6	426.2
Length Wtd. (m)	70.31	Wetted Per. (m)	61.25	17.70	70.08
Min Ch El (m)	850.34	Shear (N/m2)	4.14	24.47	7.14
Alpha	2.40	Stream Power (N/m s)	11550.21	4164.41	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	45.85	47.76	43.32
C & E Loss (m)	0.01	Cum SA (1000 m2)	75.62	30.47	71.31

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	98.83	102.19	0.84	1.27	2.89	44.15	0.50	0.66	7.39	4.90
2	Chan	102.19	105.54	1.06	1.56	3.41	55.43	0.46	0.68	7.67	5.21
3	Chan	105.54	108.90	0.01	0.04	0.49	0.42	0.08	0.21	1.31	0.27

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.12	95.48	0.03	0.11	1.09	0.13	0.10	0.26	2.26	0.59
2	Chan	95.48	98.83	1.61	1.95	3.43	7.28	0.58	0.83	12.86	10.62
3	Chan	98.83	102.19	7.94	5.31	3.84	35.94	1.58	1.50	31.36	46.93
4	Chan	102.19	105.54	9.87	5.77	3.41	44.65	1.72	1.71	38.31	65.51
5	Chan	105.54	108.90	2.57	2.63	3.60	11.64	0.78	0.98	16.57	16.21
6	ROB	108.90	122.13	0.08	0.53	8.68	0.35	0.06	0.15	1.37	0.20

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.12	95.48	0.32	0.68	2.75	0.95	0.25	0.47	5.58	2.64
2	Chan	95.48	98.83	3.23	2.96	3.43	9.58	0.88	1.09	19.53	21.34
3	Chan	98.83	102.19	10.63	6.32	3.84	31.54	1.88	1.68	37.35	62.86
4	Chan	102.19	105.54	12.92	6.78	3.41	38.35	2.02	1.91	45.04	85.89
5	Chan	105.54	108.90	4.43	3.64	3.60	13.13	1.08	1.22	22.95	27.91
6	ROB	108.90	122.13	1.73	4.36	13.24	5.12	0.33	0.40	7.47	2.96
7	ROB	122.13	135.37	0.44	1.91	13.24	1.30	0.14	0.23	3.28	0.75
8	ROB	135.37	148.60	0.01	0.10	3.71	0.02	0.03	0.07	0.59	0.04

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	9.66	0.89	2.64	9.12	1.30	0.31	0.34	4.22	1.42
2	LOB	9.66	19.33					0.00	0.00		
3	LOB	19.33	28.99					0.00	0.00		
4	LOB	28.99	38.66					0.00	0.00		
5	LOB	38.66	48.32	0.82	2.43	8.33	1.20	0.30	0.34	4.25	1.44
6	LOB	48.32	57.99	1.00	2.90	9.66	1.46	0.30	0.34	4.39	1.51
7	LOB	57.99	67.65	0.95	2.82	9.66	1.39	0.29	0.34	4.26	1.44
8	LOB	67.65	77.32	0.82	2.57	9.66	1.20	0.27	0.32	3.89	1.24
9	LOB	77.32	86.98	0.69	2.32	9.66	1.01	0.24	0.30	3.51	1.04
10	LOB	86.98	92.12	0.63	1.71	5.15	0.92	0.33	0.37	4.84	1.78
11	Chan	92.12	95.48	2.09	2.51	3.41	3.05	0.75	0.83	10.71	8.93
12	Chan	95.48	98.83	6.21	4.83	3.43	9.07	1.44	1.29	20.51	26.37
13	Chan	98.83	102.19	13.90	8.19	3.84	20.32	2.44	1.70	31.13	52.86
14	Chan	102.19	105.54	16.47	8.65	3.41	24.07	2.58	1.90	36.96	70.37
15	Chan	105.54	108.90	7.50	5.51	3.60	10.96	1.64	1.36	22.34	30.41
16	ROB	108.90	122.13	7.06	11.74	13.24	10.32	0.89	0.60	12.94	7.78
17	ROB	122.13	135.37	4.78	9.29	13.24	6.99	0.70	0.51	10.24	5.27
18	ROB	135.37	148.60	2.87	6.84	13.24	4.20	0.52	0.42	7.54	3.17
19	ROB	148.60	161.84	1.37	4.39	13.24	2.01	0.33	0.31	4.84	1.51
20	ROB	161.84	175.07	0.35	1.95	13.24	0.52	0.15	0.18	2.14	0.39
21	ROB	175.07	188.31	0.01	0.11	3.90	0.01	0.03	0.06	0.40	0.02

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1395

INPUT

Description: p26

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.192	1.926	852.418	13.893	852.307	90.414	852.693	112.547	852
115.822	851	116.324	850.262	120.947	850.115	123.086	851	143.348	852
188.382	853	191.649	853.171	247.061	853.116				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	112.547	.035	143.348	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

112.547	143.348	61.03	47.34	28.37	.1	.3
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Left Levee Station= 90.41 Elevation= 852.69

Blocked Obstructions num= 1

Sta L	Sta R	Elev
25	68	858.6

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	850.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	850.77	Reach Len. (m)	61.03	47.34	28.37
Crit W.S. (m)	850.44	Flow Area (m2)	3.30		
E.G. Slope (m/m)	0.001113	Area (m2)	3.30		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.55	Top Width (m)	6.55		
Vel Total (m/s)	0.58	Avg. Vel. (m/s)	0.58		
Max Chl Dpth (m)	0.66	Hydr. Depth (m)	0.50		
Conv. Total (m3/s)	57.3	Conv. (m3/s)	57.3		
Length Wtd. (m)	47.34	Wetted Per. (m)	6.95		
Min Ch El (m)	850.12	Shear (N/m2)	5.17		
Alpha	1.00	Stream Power (N/m s)	11828.76	4328.64	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	4.14		
C & E Loss (m)	0.00	Cum SA (1000 m2)	11.37		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	852.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.04	Reach Len. (m)	61.03	47.34	28.37
Crit W.S. (m)	851.38	Flow Area (m2)	0.03	25.18	0.04
E.G. Slope (m/m)	0.001274	Area (m2)	0.03	25.18	0.04
Q Total (m3/s)	22.10	Flow (m3/s)	0.00	22.10	0.00
Top Width (m)	33.96	Top Width (m)	1.31	30.80	1.85
Vel Total (m/s)	0.88	Avg. Vel. (m/s)	0.05	0.88	0.05
Max Chl Dpth (m)	1.93	Hydr. Depth (m)	0.02	0.82	0.02
Conv. Total (m3/s)	619.2	Conv. (m3/s)	0.0	619.1	0.1
Length Wtd. (m)	47.34	Wetted Per. (m)	1.31	31.54	1.85
Min Ch El (m)	850.12	Shear (N/m2)	0.26	9.97	0.26
Alpha	1.00	Stream Power (N/m s)	11828.76	4328.64	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	4.26	22.75	6.39
C & E Loss (m)	0.00	Cum SA (1000 m2)	23.00	23.65	20.26

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.38	Reach Len. (m)	61.03	47.34	28.37
Crit W.S. (m)	851.60	Flow Area (m2)	2.25	35.49	3.18
E.G. Slope (m/m)	0.000886	Area (m2)	2.25	35.49	3.18
Q Total (m3/s)	33.70	Flow (m3/s)	0.44	32.64	0.62
Top Width (m)	59.72	Top Width (m)	12.00	30.80	16.92
Vel Total (m/s)	0.82	Avg. Vel. (m/s)	0.20	0.92	0.20
Max Chl Dpth (m)	2.26	Hydr. Depth (m)	0.19	1.15	0.19
Conv. Total (m3/s)	1132.3	Conv. (m3/s)	14.8	1096.7	20.8
Length Wtd. (m)	47.26	Wetted Per. (m)	12.01	31.54	16.92
Min Ch El (m)	850.12	Shear (N/m2)	1.63	9.77	1.63
Alpha	1.21	Stream Power (N/m s)	11828.76	4328.64	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	11.57	30.04	13.21
C & E Loss (m)	0.00	Cum SA (1000 m2)	31.39	26.62	32.47

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	852.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.95	Reach Len. (m)	61.03	47.34	28.37
Crit W.S. (m)	852.02	Flow Area (m2)	35.66	53.25	20.43
E.G. Slope (m/m)	0.000572	Area (m2)	35.66	53.25	20.43
Q Total (m3/s)	68.40	Flow (m3/s)	10.83	51.61	5.96
Top Width (m)	143.25	Top Width (m)	69.55	30.80	42.90
Vel Total (m/s)	0.63	Avg. Vel. (m/s)	0.30	0.97	0.29
Max Chl Dpth (m)	2.84	Hydr. Depth (m)	0.51	1.73	0.48
Conv. Total (m3/s)	2858.7	Conv. (m3/s)	452.6	2157.0	249.1
Length Wtd. (m)	48.83	Wetted Per. (m)	71.29	31.54	42.91
Min Ch El (m)	850.12	Shear (N/m2)	2.81	9.48	2.67
Alpha	1.87	Stream Power (N/m s)	11828.76	4328.64	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	43.33	44.74	42.21
C & E Loss (m)	0.00	Cum SA (1000 m2)	69.44	28.73	69.01

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	112.55	118.71	0.79	1.39	3.00	41.51	0.51	0.57	5.06	2.89
2	Chan	118.71	124.87	1.12	1.91	3.95	58.49	0.50	0.59	5.26	3.08

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
	(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)

1	LOB	101.48	112.55	0.00	0.03	1.31	0.01	0.02	0.05	0.26	0.01
2	Chan	112.55	118.71	6.03	6.81	6.70	27.30	1.11	0.89	12.70	11.25
3	Chan	118.71	124.87	10.31	9.18	6.34	46.63	1.49	1.12	18.10	20.31
4	Chan	124.87	131.03	3.73	4.93	6.17	16.87	0.80	0.76	10.00	7.55
5	Chan	131.03	137.19	1.68	3.06	6.17	7.61	0.50	0.55	6.20	3.41
6	Chan	137.19	143.35	0.35	1.19	6.17	1.57	0.19	0.29	2.41	0.70
7	ROB	143.35	153.72	0.00	0.04	1.85	0.01	0.02	0.05	0.26	0.01

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	90.41	101.48	0.00	0.01	0.93	0.00	0.01	0.03	0.13	0.00
2	LOB	101.48	112.55	0.44	2.24	11.07	1.30	0.20	0.20	1.76	0.34
3	Chan	112.55	118.71	8.43	8.87	6.70	25.01	1.44	0.95	11.50	10.92
4	Chan	118.71	124.87	12.98	11.25	6.34	38.52	1.83	1.15	15.41	17.79
5	Chan	124.87	131.03	5.99	7.00	6.17	17.79	1.14	0.86	9.85	8.44
6	Chan	131.03	137.19	3.57	5.12	6.17	10.58	0.83	0.70	7.21	5.02
7	Chan	137.19	143.35	1.67	3.25	6.17	4.96	0.53	0.51	4.58	2.35
8	ROB	143.35	153.72	0.58	2.70	10.37	1.71	0.26	0.21	2.26	0.48
9	ROB	153.72	164.09	0.04	0.48	6.55	0.13	0.07	0.09	0.63	0.06

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	11.30	2.04	6.66	12.08	2.98	0.59	0.31	3.10	0.95
2	LOB	11.30	22.60	2.35	7.07	11.30	3.44	0.63	0.33	3.51	1.17
3	LOB	22.60	33.90	0.40	1.43	2.99	0.58	0.60	0.28	2.68	0.75
4	LOB	33.90	45.21					0.00	0.00		
5	LOB	45.21	56.51					0.00	0.00		
6	LOB	56.51	67.81					0.00	0.00		
7	LOB	67.81	79.11	0.84	3.83	11.48	1.22	0.34	0.22	1.87	0.41
8	LOB	79.11	90.41	0.65	3.25	11.30	0.94	0.29	0.20	1.62	0.32
9	LOB	90.41	101.48	1.24	4.79	11.07	1.82	0.43	0.26	2.43	0.63
10	LOB	101.48	112.55	3.32	8.62	11.07	4.85	0.78	0.38	4.37	1.68
11	Chan	112.55	118.71	12.40	12.42	6.70	18.13	2.02	1.00	10.41	10.39
12	Chan	118.71	124.87	17.22	14.80	6.34	25.18	2.40	1.16	13.10	15.25
13	Chan	124.87	131.03	9.98	10.55	6.17	14.59	1.71	0.95	9.60	9.08
14	Chan	131.03	137.19	7.20	8.68	6.17	10.53	1.41	0.83	7.90	6.56
15	Chan	137.19	143.35	4.80	6.80	6.17	7.02	1.10	0.71	6.19	4.37
16	ROB	143.35	153.72	3.13	8.68	10.37	4.58	0.84	0.36	4.70	1.69
17	ROB	153.72	164.09	1.83	6.30	10.37	2.68	0.61	0.29	3.41	0.99
18	ROB	164.09	174.46	0.83	3.91	10.37	1.21	0.38	0.21	2.11	0.45
19	ROB	174.46	184.83	0.17	1.52	10.37	0.25	0.15	0.11	0.82	0.09
20	ROB	184.83	195.20	0.00	0.02	1.41	0.00	0.02	0.03	0.09	0.00

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga
REACH: Astorga RS: 1339

INPUT

Description: p25

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.076	16.676	852.307	32.3	852.551	80.767	852.296	86.099	852.275
112.958	852	121.996	851	123	850.2	128.164	850.339	129.215	851
135.492	852	165.529	852.456	168.982	852.543	173.962	852.549	176.847	852.993
218.411	853.116	223.078	852.504	227.222	853				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	112.958	.035	135.492	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
112.958 135.492 47.94 63.01 73.27 .1 .3

Left Levee Station= 32.3 Elevation= 852.551

Right Levee Station= 176.847 Elevation= 852.993

Blocked Obstructions num= 1

Sta L	Sta R	Elev
144	146	853.8

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	850.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035		
W.S. Elev (m)	850.66	Reach Len. (m)	47.94	63.01	73.27
Crit W.S. (m)	850.51	Flow Area (m2)	2.22		
E.G. Slope (m/m)	0.003777	Area (m2)	2.22		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.25	Top Width (m)	6.25		
Vel Total (m/s)	0.86	Avg. Vel. (m/s)	0.86		
Max Chl Dpth (m)	0.46	Hydr. Depth (m)	0.36		
Conv. Total (m3/s)	31.1	Conv. (m3/s)	31.1		
Length Wtd. (m)	63.01	Wetted Per. (m)	6.50		
Min Ch El (m)	850.20	Shear (N/m2)	12.67		
Alpha	1.00	Stream Power (N/m s)	10878.91	1546.45	8467.06
Frctn Loss (m)	0.27	Cum Volume (1000 m3)	4.01		
C & E Loss (m)	0.00	Cum SA (1000 m2)	11.07		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	851.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.035		
W.S. Elev (m)	851.91	Reach Len. (m)	47.94	63.01	73.27
Crit W.S. (m)	851.41	Flow Area (m2)	17.43		
E.G. Slope (m/m)	0.002644	Area (m2)	17.43		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	21.16	Top Width (m)	21.16		
Vel Total (m/s)	1.27	Avg. Vel. (m/s)	1.27		
Max Chl Dpth (m)	1.71	Hydr. Depth (m)	0.82		
Conv. Total (m3/s)	429.8	Conv. (m3/s)	429.8		
Length Wtd. (m)	63.01	Wetted Per. (m)	21.75		
Min Ch El (m)	850.20	Shear (N/m2)	20.78		
Alpha	1.00	Stream Power (N/m s)	10878.91	1546.45	8467.06
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	4.26	21.74	6.39
C & E Loss (m)	0.02	Cum SA (1000 m2)	22.96	22.42	20.23



sections.
than 1.4.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.28	Reach Len. (m)	47.94	63.01	73.27
Crit W.S. (m)	851.66	Flow Area (m2)	3.86	25.73	2.33
E.G. Slope (m/m)	0.001673	Area (m2)	3.86	25.73	2.33
Q Total (m3/s)	33.70	Flow (m3/s)	0.83	32.27	0.60
Top Width (m)	67.43	Top Width (m)	28.39	22.53	16.51
Vel Total (m/s)	1.06	Avg. Vel. (m/s)	0.22	1.25	0.26
Max Chl Dpth (m)	2.08	Hydr. Depth (m)	0.14	1.14	0.14
Conv. Total (m3/s)	824.0	Conv. (m3/s)	20.4	789.0	14.6
Length Wtd. (m)	62.91	Wetted Per. (m)	28.39	23.14	16.78
Min Ch El (m)	850.20	Shear (N/m2)	2.23	18.24	2.27
Alpha	1.35	Stream Power (N/m s)	10878.91	1546.45	8467.06
Frctn Loss (m)	0.19	Cum Volume (1000 m3)	11.39	28.59	13.13
C & E Loss (m)	0.03	Cum SA (1000 m2)	30.16	25.36	32.00

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	852.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.93	Reach Len. (m)	47.94	63.01	73.27
Crit W.S. (m)	852.21	Flow Area (m2)	69.73	40.42	23.49
E.G. Slope (m/m)	0.000515	Area (m2)	69.73	40.42	23.49
Q Total (m3/s)	68.40	Flow (m3/s)	22.83	38.00	7.57
Top Width (m)	174.46	Top Width (m)	112.96	22.53	38.96
Vel Total (m/s)	0.51	Avg. Vel. (m/s)	0.33	0.94	0.32
Max Chl Dpth (m)	2.73	Hydr. Depth (m)	0.62	1.79	0.60
Conv. Total (m3/s)	3014.2	Conv. (m3/s)	1005.9	1674.7	333.6
Length Wtd. (m)	58.13	Wetted Per. (m)	113.82	23.14	40.57
Min Ch El (m)	850.20	Shear (N/m2)	3.09	8.82	2.92
Alpha	2.06	Stream Power (N/m s)	10878.91	1546.45	8467.06
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	40.11	42.52	41.58
C & E Loss (m)	0.00	Cum SA (1000 m2)	63.88	27.47	67.85

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)	

1	Chan	121.97	126.48	1.41	1.57	4.22	73.78	0.39	0.90	13.75	12.38
2	Chan	126.48	130.99	0.50	0.66	2.29	26.22	0.30	0.76	10.67	8.11

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	112.96	117.46	0.32	0.75	3.72	1.44	0.20	0.42	5.27	2.21
2	Chan	117.46	121.97	2.72	2.97	4.53	12.30	0.66	0.92	16.96	15.55
3	Chan	121.97	126.48	11.29	7.12	4.79	51.11	1.58	1.59	38.58	61.17
4	Chan	126.48	130.99	7.08	5.35	4.72	32.03	1.19	1.32	29.40	38.89
5	Chan	130.99	135.49	0.69	1.24	3.99	3.12	0.31	0.56	8.04	4.48

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	78.39	89.91	0.01	0.10	5.34	0.01	0.02	0.05	0.31	0.02
2	LOB	89.91	101.44	0.18	1.20	11.52	0.54	0.10	0.15	1.71	0.26
3	LOB	101.44	112.96	0.65	2.56	11.52	1.92	0.22	0.25	3.64	0.92
4	Chan	112.96	117.46	1.64	2.39	4.53	4.86	0.53	0.69	8.65	5.92
5	Chan	117.46	121.97	4.94	4.64	4.53	14.66	1.03	1.07	16.77	17.88
6	Chan	121.97	126.48	13.85	8.80	4.79	41.09	1.95	1.57	30.13	47.44
7	Chan	126.48	130.99	9.61	7.02	4.72	28.52	1.56	1.37	24.40	33.39
8	Chan	130.99	135.49	2.23	2.88	4.56	6.62	0.64	0.77	10.37	8.01
9	ROB	135.49	143.76	0.53	1.80	8.27	1.56	0.22	0.29	3.58	1.04
10	ROB	143.76	152.03	0.07	0.49	6.54	0.21	0.08	0.14	1.23	0.18
11	ROB	152.03	160.31	0.00	0.03	1.97	0.00	0.01	0.05	0.24	0.01

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	10.77	3.00	8.42	11.62	4.38	0.78	0.36	3.66	1.30
2	LOB	10.77	21.53	2.21	6.79	10.77	3.23	0.63	0.32	3.19	1.03
3	LOB	21.53	32.30	1.33	5.02	10.77	1.95	0.47	0.27	2.35	0.62
4	LOB	32.30	43.82	1.16	4.75	11.52	1.70	0.41	0.24	2.08	0.51
5	LOB	43.82	55.35	1.46	5.45	11.52	2.13	0.47	0.27	2.39	0.64
6	LOB	55.35	66.87	1.78	6.15	11.52	2.61	0.53	0.29	2.69	0.78
7	LOB	66.87	78.39	2.13	6.84	11.52	3.12	0.59	0.31	3.00	0.94
8	LOB	78.39	89.91	2.50	7.53	11.52	3.66	0.65	0.33	3.30	1.10
9	LOB	89.91	101.44	3.19	8.71	11.52	4.66	0.76	0.37	3.82	1.40
10	LOB	101.44	112.96	4.06	10.07	11.52	5.94	0.87	0.40	4.41	1.78

11	Chan	112.96	117.46	3.69	5.33	4.53	5.39	1.18	0.69	5.93	4.11
12	Chan	117.46	121.97	6.63	7.57	4.53	9.69	1.68	0.87	8.44	7.38
13	Chan	121.97	126.48	13.25	11.73	4.79	19.37	2.60	1.13	12.37	13.98
14	Chan	126.48	130.99	10.18	9.96	4.72	14.89	2.21	1.02	10.66	10.89
15	Chan	130.99	135.49	4.26	5.82	4.56	6.22	1.29	0.73	6.44	4.71
16	ROB	135.49	143.76	2.89	7.19	8.27	4.22	0.87	0.40	4.39	1.76
17	ROB	143.76	152.03	1.41	4.58	7.85	2.06	0.73	0.31	2.95	0.91
18	ROB	152.03	160.31	1.64	5.12	8.27	2.39	0.62	0.32	3.12	1.00
19	ROB	160.31	168.58	1.10	4.03	8.27	1.61	0.49	0.27	2.46	0.67
20	ROB	168.58	176.85	0.53	2.57	7.91	0.78	0.33	0.21	1.64	0.34

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1276

INPUT

Description: p 24 aguas arriba

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.05	87.145	852.423	93.692	852.65	109.302	852.111	111.312	851
111.739	850.07	117.379	850.118	118.094	851.122	122.856	852.125	125.986	852.758
134.66	852.59	192.666	852.664						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	109.302	.035	122.856	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

109.302	122.856	21.5	21.5	21.5	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
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0	109.29	852.66	F
119.43	192.666	852.66	F

Right Levee Station= 125.99 Elevation= 852.76

Blocked Obstructions num= 1

Sta L	Sta R	Elev
137	157.5	856.1

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	850.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035		
W.S. Elev (m)	850.39	Reach Len. (m)	6.20	6.20	6.20
Crit W.S. (m)	850.26	Flow Area (m2)	2.06		
E.G. Slope (m/m)	0.004814	Area (m2)	2.06		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.06	Top Width (m)	6.06		
Vel Total (m/s)	0.93	Avg. Vel. (m/s)	0.93		
Max Chl Dpth (m)	0.39	Hydr. Depth (m)	0.34		
Conv. Total (m3/s)	27.5	Conv. (m3/s)	27.5		
Length Wtd. (m)	6.20	Wetted Per. (m)	6.47		
Min Ch El (m)	850.00	Shear (N/m2)	15.07		
Alpha	1.00	Stream Power (N/m s)	9224.44	0.00	6032.13
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	3.88		
C & E Loss (m)	0.01	Cum SA (1000 m2)	10.68		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	851.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.26	Wt. n-Val.	0.035		
W.S. Elev (m)	851.46	Reach Len. (m)	6.20	6.20	6.20
Crit W.S. (m)	851.18	Flow Area (m2)		9.79	
E.G. Slope (m/m)	0.006688	Area (m2)		9.86	
Q Total (m3/s)	22.10	Flow (m3/s)		22.10	
Top Width (m)	9.92	Top Width (m)		9.92	
Vel Total (m/s)	2.26	Avg. Vel. (m/s)		2.26	
Max Chl Dpth (m)	1.46	Hydr. Depth (m)		1.08	
Conv. Total (m3/s)	270.2	Conv. (m3/s)		270.2	
Length Wtd. (m)	6.20	Wetted Per. (m)		10.30	
Min Ch El (m)	850.00	Shear (N/m2)		62.32	
Alpha	1.00	Stream Power (N/m s)	9224.44	0.00	6032.13
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	4.26	20.88	6.39
C & E Loss (m)	0.02	Cum SA (1000 m2)	22.96	21.44	20.23

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.35	Wt. n-Val.	0.035		
W.S. Elev (m)	851.80	Reach Len. (m)	6.20	6.20	6.20
Crit W.S. (m)	851.51	Flow Area (m2)		12.90	
E.G. Slope (m/m)	0.006789	Area (m2)		13.53	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	12.17	Top Width (m)		12.17	
Vel Total (m/s)	2.61	Avg. Vel. (m/s)		2.61	
Max Chl Dpth (m)	1.80	Hydr. Depth (m)		1.33	
Conv. Total (m3/s)	409.0	Conv. (m3/s)		409.0	
Length Wtd. (m)	6.20	Wetted Per. (m)		11.04	
Min Ch El (m)	850.00	Shear (N/m2)		77.79	
Alpha	1.00	Stream Power (N/m s)	9224.44	0.00	6032.13
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	11.29	27.35	13.05
C & E Loss (m)	0.02	Cum SA (1000 m2)	29.48	24.26	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	852.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.86	Reach Len. (m)	6.20	6.20	6.20
Crit W.S. (m)	852.20	Flow Area (m2)	65.28	27.88	11.65
E.G. Slope (m/m)	0.000955	Area (m2)	65.28	27.88	11.65
Q Total (m3/s)	68.40	Flow (m3/s)	28.47	37.20	2.73
Top Width (m)	172.17	Top Width (m)	109.30	13.55	49.31
Vel Total (m/s)	0.65	Avg. Vel. (m/s)	0.44	1.33	0.23
Max Chl Dpth (m)	2.86	Hydr. Depth (m)	0.60	2.06	0.24
Conv. Total (m3/s)	2213.6	Conv. (m3/s)	921.2	1204.0	88.4
Length Wtd. (m)	6.20	Wetted Per. (m)	110.13	15.00	50.12
Min Ch El (m)	850.00	Shear (N/m2)	5.55	17.40	2.18
Alpha	2.46	Stream Power (N/m s)	9224.44	0.00	6032.13
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	36.88	40.37	40.30
C & E Loss (m)	0.01	Cum SA (1000 m2)	58.55	26.33	64.61

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface

whose main channel velocity head was the closest to the previously computed cross section.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	109.30	111.83	0.03	0.05	0.44	1.31	0.22	0.47	5.66	2.66
2	Chan	111.83	114.37	0.79	0.85	2.53	41.23	0.33	0.93	15.77	14.68
3	Chan	114.37	116.90	0.91	0.93	2.53	47.90	0.37	0.99	17.26	17.06
4	Chan	116.90	119.43	0.18	0.24	0.96	9.56	0.31	0.77	11.76	9.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	109.30	111.83	0.75	0.74	2.16	3.39	0.51	1.01	22.61	22.76
2	Chan	111.83	114.37	9.19	3.57	2.53	41.57	1.41	2.57	92.46	237.96
3	Chan	114.37	116.90	9.53	3.65	2.53	43.13	1.44	2.61	94.52	246.88
4	Chan	116.90	119.43	2.63	1.82	3.08	11.91	0.72	1.44	38.86	56.11
5	Chan	119.43	122.86	0.00	0.08	0.89	0.00	0.09	0.00	5.86	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	109.30	111.83	1.66	1.34	2.90	4.93	0.63	1.24	30.67	38.09
2	Chan	111.83	114.37	13.30	4.41	2.53	39.46	1.74	3.01	115.99	349.65
3	Chan	114.37	116.90	13.70	4.49	2.53	40.66	1.77	3.05	118.08	360.25
4	Chan	116.90	119.43	5.04	2.66	3.08	14.95	1.05	1.89	57.66	109.09
5	Chan	119.43	122.86	0.00	0.63	2.50	0.00	0.26	0.00	16.77	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	10.93	4.24	8.64	11.74	6.21	0.79	0.49	6.89	3.38
2	LOB	10.93	21.86	4.02	8.13	10.93	5.88	0.74	0.49	6.97	3.45
3	LOB	21.86	32.79	3.61	7.62	10.93	5.28	0.70	0.47	6.53	3.09
4	LOB	32.79	43.72	3.22	7.11	10.93	4.70	0.65	0.45	6.09	2.76
5	LOB	43.72	54.65	2.84	6.60	10.93	4.15	0.60	0.43	5.65	2.43
6	LOB	54.65	65.57	2.48	6.09	10.93	3.63	0.56	0.41	5.22	2.13
7	LOB	65.57	76.50	2.15	5.58	10.93	3.14	0.51	0.38	4.78	1.84
8	LOB	76.50	87.43	1.83	5.07	10.93	2.67	0.46	0.36	4.34	1.57
9	LOB	87.43	98.36	0.98	3.48	10.94	1.43	0.32	0.28	2.98	0.83
10	LOB	98.36	109.29	3.10	6.95	10.94	4.53	0.64	0.45	5.95	2.65
11	LOB	109.29	109.30	0.01	0.01	0.01	0.01	0.86	0.55	8.08	4.41
12	Chan	109.30	111.83	3.66	4.00	3.36	5.36	1.58	0.92	11.14	10.20
13	Chan	111.83	114.37	11.56	7.12	2.53	16.90	2.81	1.62	26.32	42.74
14	Chan	114.37	116.90	11.78	7.20	2.53	17.22	2.84	1.64	26.61	43.54
15	Chan	116.90	119.43	6.35	5.37	3.08	9.28	2.12	1.18	16.35	19.33
16	Chan	119.43	122.86	3.86	4.19	3.50	5.64	1.22	0.92	11.22	10.31
17	ROB	122.86	125.99	0.55	1.52	3.23	0.80	0.48	0.36	4.41	1.59
18	ROB	125.99	132.66	0.21	1.14	6.67	0.31	0.17	0.18	1.60	0.29
19	ROB	132.66	139.33	0.27	1.15	4.61	0.40	0.26	0.24	2.33	0.55
20	ROB	139.33	145.99					0.00	0.00		
21	ROB	145.99	152.66					0.00	0.00		
22	ROB	152.66	159.33	0.10	0.45	2.07	0.14	0.24	0.21	2.02	0.43
23	ROB	159.33	166.00	0.36	1.59	6.67	0.53	0.24	0.23	2.23	0.51
24	ROB	166.00	172.66	0.34	1.53	6.67	0.50	0.23	0.22	2.16	0.48
25	ROB	172.66	179.33	0.32	1.48	6.67	0.47	0.22	0.22	2.08	0.45
26	ROB	179.33	186.00	0.30	1.42	6.67	0.44	0.21	0.21	2.00	0.42
27	ROB	186.00	192.67	0.28	1.36	6.87	0.40	0.20	0.20	1.86	0.38

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface

whose main channel velocity head was the closest to the previously computed cross section.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 1270

INPUT

Description: Puente Ctra Val de Santa Maria

Distance from Upstream XS = 6.2

Deck/Roadway Width = 9

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 5

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
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0	852.33	93.69	852.6	109.29	852.66	852.16								
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119.43	852.66	852.16	125.99	852.6										
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Upstream Bridge Cross Section Data

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0	852.05	87.145	852.423	93.692	852.65	109.302	852	111.312	851
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111.739	850.07	117.379	850	118.094	851	122.856	852	125.986	852.758
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134.66	852.59	192.666	852.664						
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Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
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0	.05	109.302	.035	122.856	.05			
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Bank Sta: Left Right Coeff Contr. Expan.

109.302	122.856	.1	.3		
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Ineffective Flow num= 2

Sta	L	Sta	R	Elev	Permanent
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0	109.29	852.66	F		
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119.43	192.666	852.66	F		
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Right Levee Station= 125.99 Elevation= 852.76

Blocked Obstructions num= 1

Sta	L	Sta	R	Elev
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137	157.5	856.1		
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Downstream Deck/Roadway Coordinates

num= 5

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
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0	852.33	94.74	852.57	103.93	852.66	852.16								
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114.07	852.66	852.16	118	852.6										
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Downstream Bridge Cross Section Data

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0	851.588	6.053	850.277	10.079	850.217	85.255	852.551	86.702	852.488
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94.744	852.574	98.273	852	103.793	851	105.015	850	105.921	849.03
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112.934	849.24	113.644	850	113.91	851	117.789	852	140.137	852.626
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145.213	852.188	155.383	852.242	156.763	853.552	159.823	853.433	192.508	852.242
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Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
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0	.05	98.273	.035	117.789	.05			
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Bank Sta: Left Right Coeff Contr. Expan.

98.273	117.789	.1	.3		
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Ineffective Flow num= 2

Sta	L	Sta	R	Elev	Permanent
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0	103.93	852.66	F		
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114.07	192.508	852.66	F		
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Left Levee Station= 94.74 Elevation= 852.57
 Right Levee Station= 140.14 Elevation= 852.63
 Blocked Obstructions num= 2
 Sta L Sta R Elev Sta L Sta R Elev
 57.5 71 856 118 134 856.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1254

INPUT

Description: p23 aguas abajo

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851.588	6.053	850.277	10.079	850.217	85.255	852.551
86.702	852.488	94.744	852.574	98.273	852.103.793	851	105.015
850	105.921	849.03	112.934	849.24	113.644	850	113.91
851	117.789	852	140.137	852.626	145.213	852.188	155.383
852.242	156.763	853.552	159.823	853.433	192.508	852.242	

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	98.273	.035	117.789	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
98.273	117.789	38.98	39.35	40.21	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	103.93	852.66	F
114.07	192.508	852.66	F

Left Levee Station= 94.74 Elevation= 852.57
 Right Levee Station= 140.14 Elevation= 852.63
 Blocked Obstructions num= 2
 Sta L Sta R Elev Sta L Sta R Elev
 57.5 71 856 118 134 856.5

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	849.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.035		
W.S. Elev (m)	849.36	Reach Len. (m)	38.98	39.35	40.21
Crit W.S. (m)	849.33	Flow Area (m2)		1.65	
E.G. Slope (m/m)	0.012715	Area (m2)		1.65	
Q Total (m3/s)	1.91	Flow (m3/s)		1.91	
Top Width (m)	7.44	Top Width (m)		7.44	
Vel Total (m/s)	1.16	Avg. Vel. (m/s)		1.16	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	16.9	Conv. (m3/s)		16.9	
Length Wtd. (m)	39.35	Wetted Per. (m)		7.64	
Min Ch El (m)	849.03	Shear (N/m2)		26.91	
Alpha	1.00	Stream Power (N/m s)	9216.88	4535.95	6709.61
Frctn Loss (m)	0.18	Cum Volume (1000 m3)		3.85	
C & E Loss (m)	0.01	Cum SA (1000 m2)		10.55	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	850.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035		
W.S. Elev (m)	850.61	Reach Len. (m)	38.98	39.35	40.21
Crit W.S. (m)	850.10	Flow Area (m2)		12.31	
E.G. Slope (m/m)	0.003388	Area (m2)		12.31	
Q Total (m3/s)	22.10	Flow (m3/s)		22.10	
Top Width (m)	9.54	Top Width (m)		9.54	
Vel Total (m/s)	1.80	Avg. Vel. (m/s)		1.80	
Max Chl Dpth (m)	1.58	Hydr. Depth (m)		1.29	
Conv. Total (m3/s)	379.7	Conv. (m3/s)		379.7	
Length Wtd. (m)	39.35	Wetted Per. (m)		10.98	
Min Ch El (m)	849.03	Shear (N/m2)		37.26	
Alpha	1.00	Stream Power (N/m s)	9216.88	4535.95	6709.61
Frctn Loss (m)	0.13	Cum Volume (1000 m3)	4.26	20.72	6.39
C & E Loss (m)	0.00	Cum SA (1000 m2)	22.96	21.26	20.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	851.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.	0.035		
W.S. Elev (m)	851.00	Reach Len. (m)	38.98	39.35	40.21
Crit W.S. (m)	850.39	Flow Area (m2)		16.11	
E.G. Slope (m/m)	0.003549	Area (m2)		16.11	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	10.11	Top Width (m)		10.11	
Vel Total (m/s)	2.09	Avg. Vel. (m/s)		2.09	
Max Chl Dpth (m)	1.97	Hydr. Depth (m)		1.61	
Conv. Total (m3/s)	565.7	Conv. (m3/s)		565.7	
Length Wtd. (m)	39.35	Wetted Per. (m)		11.82	
Min Ch El (m)	849.03	Shear (N/m2)		47.43	
Alpha	1.00	Stream Power (N/m s)	9216.88	4535.95	6709.61
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	11.29	27.14	13.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	29.48	24.06	31.40

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	852.08	Element	Left OB	Channel	Right OB
Vel Head (m)	1.40	Wt. n-Val.	0.035		
W.S. Elev (m)	850.69	Reach Len. (m)	38.98	39.35	40.21
Crit W.S. (m)	851.08	Flow Area (m2)	13.07		
E.G. Slope (m/m)	0.027253	Area (m2)	13.07		
Q Total (m3/s)	68.40	Flow (m3/s)	68.40		
Top Width (m)	9.65	Top Width (m)	9.65		
Vel Total (m/s)	5.23	Avg. Vel. (m/s)	5.23		
Max Chl Dpth (m)	1.66	Hydr. Depth (m)	1.35		
Conv. Total (m3/s)	414.3	Conv. (m3/s)	414.3		
Length Wtd. (m)	39.35	Wetted Per. (m)	11.18		
Min Ch El (m)	849.03	Shear (N/m2)	312.35		
Alpha	1.00	Stream Power (N/m s)	9216.88	4535.95	6709.61
Frctn Loss (m)	0.22	Cum Volume (1000 m3)	36.44	40.02	40.21
C & E Loss (m)	0.20	Cum SA (1000 m2)	57.38	26.09	64.08

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: The energy method has computed a class B profile.

Profile #5 años

Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	103.93	107.31	0.62	0.48	1.84	32.49	0.28	1.28	32.68	41.98
2	Chan	107.31	110.69	0.98	0.81	3.38	51.23	0.24	1.21	29.85	36.08
3	Chan	110.69	114.07	0.31	0.36	2.41	16.28	0.15	0.87	18.37	16.07

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	103.93	107.31	5.19	3.38	3.68	23.46	1.11	1.53	30.55	46.82
2	Chan	107.31	110.69	10.61	5.03	3.38	48.01	1.49	2.11	49.39	104.24
3	Chan	110.69	114.07	6.30	3.90	3.92	28.53	1.25	1.62	33.09	53.48

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
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1	Chan	98.27	103.93	0.00	0.01	0.17	0.00	0.05	0.00	1.46	0.00
2	Chan	103.93	107.31	8.31	4.64	4.12	24.65	1.37	1.79	39.24	70.19
3	Chan	107.31	110.69	15.90	6.34	3.38	47.18	1.87	2.51	65.20	163.61
4	Chan	110.69	114.07	9.49	5.13	4.32	28.17	1.59	1.85	41.33	76.54

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	103.93	107.31	16.13	3.63	3.80	23.58	1.16	4.45	254.87	1133.22
2	Chan	107.31	110.69	32.76	5.29	3.38	47.90	1.57	6.19	418.45	2589.29
3	Chan	110.69	114.07	19.51	4.15	4.00	28.52	1.32	4.70	277.30	1304.26

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: The energy method has computed a class B profile.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1215

INPUT

Description: p22

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851	51.207	851.807	58.503	851.77	64.039	851.59	88.711	851.51
96.727	851	101.798	850	103.245	848.795	108.299	848.71	109.922	850
111.226	851	114.26	851.99	119.147	852.094	121.718	851.979	125.551	851.996
144.577	851.481	160.932	851.73	171.347	851.557	189.007	851.943	194.357	851.87

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	96.727	.035	111.226	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

96.727 111.226 17.71 47.72 69.38 .1 .3

Left Levee Station= 58.5 Elevation= 851.77

Right Levee Station= 119.15 Elevation= 852.09

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	849.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035		
W.S. Elev (m)	849.21	Reach Len. (m)	17.71	47.72	69.38
Crit W.S. (m)	848.99	Flow Area (m2)	2.59		
E.G. Slope (m/m)	0.002293	Area (m2)	2.59		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.19	Top Width (m)	6.19		
Vel Total (m/s)	0.74	Avg. Vel. (m/s)	0.74		
Max Chl Dpth (m)	0.50	Hydr. Depth (m)	0.42		
Conv. Total (m3/s)	39.9	Conv. (m3/s)	39.9		

Length Wtd. (m)	47.72	Wetted Per. (m)	6.51		
Min Ch El (m)	848.71	Shear (N/m2)	8.92		
Alpha	1.00	Stream Power (N/m s)	9305.40	2800.85	5704.65
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	3.77		
C & E Loss (m)	0.00	Cum SA (1000 m2)	10.28		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	850.64	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.035		
W.S. Elev (m)	850.49	Reach Len. (m)	17.71	47.72	69.38
Crit W.S. (m)	849.89	Flow Area (m2)	12.95		
E.G. Slope (m/m)	0.003347	Area (m2)	12.95		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	11.23	Top Width (m)	11.23		
Vel Total (m/s)	1.71	Avg. Vel. (m/s)	1.71		
Max Chl Dpth (m)	1.78	Hydr. Depth (m)	1.15		
Conv. Total (m3/s)	382.0	Conv. (m3/s)	382.0		
Length Wtd. (m)	47.72	Wetted Per. (m)	12.33		
Min Ch El (m)	848.71	Shear (N/m2)	34.45		
Alpha	1.00	Stream Power (N/m s)	9305.40	2800.85	5704.65
Frctn Loss (m)	0.16	Cum Volume (1000 m3)	4.26	20.23	6.39
C & E Loss (m)	0.00	Cum SA (1000 m2)	22.96	20.85	20.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	851.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035		
W.S. Elev (m)	850.89	Reach Len. (m)	17.71	47.72	69.38
Crit W.S. (m)	850.25	Flow Area (m2)	17.99		
E.G. Slope (m/m)	0.003398	Area (m2)	17.99		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.80	Top Width (m)	13.80		
Vel Total (m/s)	1.87	Avg. Vel. (m/s)	1.87		
Max Chl Dpth (m)	2.18	Hydr. Depth (m)	1.30		
Conv. Total (m3/s)	578.1	Conv. (m3/s)	578.1		
Length Wtd. (m)	47.72	Wetted Per. (m)	15.08		
Min Ch El (m)	848.71	Shear (N/m2)	39.75		
Alpha	1.00	Stream Power (N/m s)	9305.40	2800.85	5704.65
Frctn Loss (m)	0.16	Cum Volume (1000 m3)	11.29	26.47	13.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	29.48	23.59	31.40

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	851.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.35	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	851.42	Reach Len. (m)	17.71	47.72	69.38
Crit W.S. (m)	850.96	Flow Area (m2)	1.38	25.61	0.27
E.G. Slope (m/m)	0.004495	Area (m2)	1.38	25.61	0.27
Q Total (m3/s)	68.40	Flow (m3/s)	0.65	67.63	0.12
Top Width (m)	22.37	Top Width (m)	6.59	14.50	1.28
Vel Total (m/s)	2.51	Avg. Vel. (m/s)	0.47	2.64	0.46
Max Chl Dpth (m)	2.71	Hydr. Depth (m)	0.21	1.77	0.21
Conv. Total (m3/s)	1020.3	Conv. (m3/s)	9.7	1008.7	1.8

Length Wtd. (m)	47.48	Wetted Per. (m)	6.60	15.82	1.35
Min Ch El (m)	848.71	Shear (N/m2)	9.21	71.34	8.78
Alpha	1.10	Stream Power (N/m s)	9305.40	2800.85	5704.65
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	36.41	39.26	40.21
C & E Loss (m)	0.07	Cum SA (1000 m2)	57.25	25.61	64.06

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	102.53	105.43	0.72	1.05	2.83	37.91	0.39	0.69	8.37	5.75
2	Chan	105.43	108.33	1.12	1.39	2.91	58.78	0.48	0.81	10.72	8.68
3	Chan	108.33	111.23	0.06	0.15	0.77	3.31	0.24	0.44	4.23	1.84

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	96.73	99.63	0.00	0.01	0.31	0.01	0.03	0.13	0.96	0.13	
2	Chan	99.63	102.53	0.85	1.17	3.16	3.83	0.40	0.72	12.16	8.79	
3	Chan	102.53	105.43	8.78	4.73	3.12	39.71	1.63	1.85	49.86	92.43	
4	Chan	105.43	108.33	10.36	5.09	2.91	46.86	1.75	2.04	57.41	116.90	
5	Chan	108.33	111.23	2.12	1.95	2.84	9.59	0.87	1.09	22.48	24.51	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	96.73	99.63	0.28	0.54	2.39	0.83	0.23	0.52	7.56	3.92
2	Chan	99.63	102.53	2.66	2.34	3.16	7.91	0.81	1.14	24.66	28.08
3	Chan	102.53	105.43	12.58	5.90	3.12	37.33	2.04	2.13	63.11	134.52
4	Chan	105.43	108.33	14.51	6.25	2.91	43.05	2.16	2.32	71.67	166.28
5	Chan	108.33	111.23	3.66	2.95	3.50	10.87	1.07	1.24	28.07	34.87

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	87.17	96.73	0.65	1.38	6.60	0.95	0.21	0.47	9.21	4.35	
2	Chan	96.73	99.63	2.74	2.04	2.96	4.01	0.70	1.34	30.48	40.90	
3	Chan	99.63	102.53	7.60	3.87	3.16	11.11	1.33	1.96	53.97	106.00	
4	Chan	102.53	105.43	22.78	7.43	3.12	33.30	2.56	3.06	105.14	322.09	
5	Chan	105.43	108.33	25.76	7.79	2.91	37.66	2.69	3.31	118.02	390.49	
6	Chan	108.33	111.23	8.74	4.47	3.68	12.78	1.54	1.95	53.57	104.67	
7	ROB	111.23	119.15	0.12	0.27	1.35	0.18	0.21	0.46	8.78	4.01	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1108

INPUT

Description: p21

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851	40.402	851.498	46.157	851.516	53.099	851.302	92.683	851.03
98.737	851	101.541	850.87	103.56	850.967	109.601	850	110.67	849
111.21	848.621	116.017	848.615	118.906	850	122.642	851.179	124.113	851
168.492	851.22	180.963	851.086	203.494	851.646	208.349	851.772		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	103.56	.035	122.642	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	103.56	122.642	31.62	80.21	117.75	.1	.3

Left Levee Station= 46.16 Elevation= 851.52

Blocked Obstructions num= 1

Sta L	Sta R	Elev
49.5	51	854

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	849.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	849.12	Reach Len. (m)	31.62	80.21	117.75
Crit W.S. (m)	848.86	Flow Area (m2)	2.86		
E.G. Slope (m/m)	0.001747	Area (m2)	2.86		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.53	Top Width (m)	6.53		
Vel Total (m/s)	0.67	Avg. Vel. (m/s)	0.67		
Max Chl Dpth (m)	0.51	Hydr. Depth (m)	0.44		
Conv. Total (m3/s)	45.7	Conv. (m3/s)	45.7		
Length Wtd. (m)	80.21	Wetted Per. (m)	6.81		
Min Ch El (m)	848.62	Shear (N/m2)	7.18		
Alpha	1.00	Stream Power (N/m s)	9975.31	2210.05	0.00
Frctn Loss (m)	0.31	Cum Volume (1000 m3)	3.64		
C & E Loss (m)	0.01	Cum SA (1000 m2)	9.98		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	850.48	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035		
W.S. Elev (m)	850.34	Reach Len. (m)	31.62	80.21	117.75
Crit W.S. (m)	849.74	Flow Area (m2)		13.52	
E.G. Slope (m/m)	0.003236	Area (m2)		13.52	
Q Total (m3/s)	22.10	Flow (m3/s)		22.10	
Top Width (m)	12.50	Top Width (m)		12.50	
Vel Total (m/s)	1.63	Avg. Vel. (m/s)		1.63	
Max Chl Dpth (m)	1.72	Hydr. Depth (m)		1.08	
Conv. Total (m3/s)	388.5	Conv. (m3/s)		388.5	
Length Wtd. (m)	80.21	Wetted Per. (m)		13.41	
Min Ch El (m)	848.62	Shear (N/m2)		32.00	
Alpha	1.00	Stream Power (N/m s)	9975.31	2210.05	0.00
Frctn Loss (m)	0.38	Cum Volume (1000 m3)	4.26	19.60	6.39
C & E Loss (m)	0.02	Cum SA (1000 m2)	22.96	20.29	20.23

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	850.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.035		
W.S. Elev (m)	850.75	Reach Len. (m)	31.62	80.21	117.75
Crit W.S. (m)	850.07	Flow Area (m2)		19.51	
E.G. Slope (m/m)	0.003140	Area (m2)		19.51	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	16.40	Top Width (m)		16.40	
Vel Total (m/s)	1.73	Avg. Vel. (m/s)		1.73	
Max Chl Dpth (m)	2.14	Hydr. Depth (m)		1.19	
Conv. Total (m3/s)	601.4	Conv. (m3/s)		601.4	
Length Wtd. (m)	80.21	Wetted Per. (m)		17.41	
Min Ch El (m)	848.62	Shear (N/m2)		34.51	
Alpha	1.00	Stream Power (N/m s)	9975.31	2210.05	0.00
Frctn Loss (m)	0.36	Cum Volume (1000 m3)	11.29	25.57	13.05
C & E Loss (m)	0.02	Cum SA (1000 m2)	29.48	22.87	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	851.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	851.47	Reach Len. (m)	31.62	80.21	117.75

Crit W.S. (m)	850.79	Flow Area (m2)	17.91	32.81	23.68
E.G. Slope (m/m)	0.001634	Area (m2)	17.91	32.81	23.68
Q Total (m3/s)	68.40	Flow (m3/s)	7.02	52.42	8.97
Top Width (m)	147.49	Top Width (m)	54.51	19.08	73.90
Vel Total (m/s)	0.92	Avg. Vel. (m/s)	0.39	1.60	0.38
Max Chl Dpth (m)	2.86	Hydr. Depth (m)	0.33	1.72	0.32
Conv. Total (m3/s)	1691.9	Conv. (m3/s)	173.6	1296.5	221.8
Length Wtd. (m)	80.52	Wetted Per. (m)	54.69	20.17	73.92
Min Ch El (m)	848.62	Shear (N/m2)	5.25	26.07	5.13
Alpha	2.35	Stream Power (N/m s)	9975.31	2210.05	0.00
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	36.24	37.86	39.38
C & E Loss (m)	0.03	Cum SA (1000 m2)	56.71	24.81	61.45

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	107.38	111.19	0.07	0.17	0.81	3.49	0.26	0.40	3.50	1.40
2	Chan	111.19	115.01	1.39	1.91	3.82	73.00	0.50	0.73	8.59	6.25
3	Chan	115.01	118.83	0.45	0.77	2.18	23.51	0.38	0.58	6.10	3.54

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	107.38	111.19	1.76	2.05	4.25	7.97	0.55	0.86	15.33	13.15
2	Chan	111.19	115.01	13.13	6.57	3.82	59.41	1.72	2.00	54.56	109.05
3	Chan	115.01	118.83	7.12	4.69	4.12	32.21	1.23	1.52	36.10	54.79
4	Chan	118.83	122.64	0.09	0.21	1.22	0.41	0.18	0.43	5.51	2.39

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
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1	Chan	103.56	107.38	0.22	0.49	2.52	0.65	0.20	0.44	6.05	2.68
2	Chan	107.38	111.19	4.23	3.63	4.36	12.54	0.95	1.16	25.69	29.88
3	Chan	111.19	115.01	17.72	8.15	3.82	52.58	2.14	2.17	65.69	142.85
4	Chan	115.01	118.83	10.88	6.27	4.12	32.30	1.64	1.74	46.84	81.31
5	Chan	118.83	122.64	0.65	0.96	2.59	1.93	0.39	0.68	11.42	7.74

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	46.16	55.73	0.15	0.82	6.85	0.22	0.12	0.19	1.93	0.36
2	LOB	55.73	65.29	0.60	2.12	9.57	0.87	0.22	0.28	3.56	1.00
3	LOB	65.29	74.86	0.92	2.75	9.57	1.34	0.29	0.33	4.61	1.54
4	LOB	74.86	84.43	1.30	3.38	9.57	1.89	0.35	0.38	5.67	2.17
5	LOB	84.43	93.99	1.72	4.01	9.57	2.52	0.42	0.43	6.72	2.88
6	LOB	93.99	103.56	2.33	4.82	9.57	3.41	0.50	0.48	8.07	3.91
7	Chan	103.56	107.38	2.74	3.10	3.86	4.01	0.81	0.89	12.85	11.37
8	Chan	107.38	111.19	8.44	6.38	4.36	12.34	1.67	1.32	23.47	31.07
9	Chan	111.19	115.01	22.48	10.89	3.82	32.87	2.85	2.06	45.71	94.32
10	Chan	115.01	118.83	15.59	9.02	4.12	22.79	2.36	1.73	35.05	60.60
11	Chan	118.83	122.64	3.16	3.42	4.01	4.62	0.90	0.92	13.69	12.64
12	ROB	122.64	131.21	1.70	3.80	8.58	2.48	0.44	0.45	7.09	3.17
13	ROB	131.21	139.78	1.53	3.57	8.57	2.24	0.42	0.43	6.68	2.86
14	ROB	139.78	148.35	1.28	3.21	8.57	1.87	0.37	0.40	6.00	2.39
15	ROB	148.35	156.92	1.05	2.84	8.57	1.53	0.33	0.37	5.31	1.96
16	ROB	156.92	165.50	0.83	2.48	8.57	1.22	0.29	0.34	4.63	1.56
17	ROB	165.50	174.07	0.77	2.36	8.57	1.12	0.28	0.33	4.41	1.43
18	ROB	174.07	182.64	1.16	3.03	8.57	1.70	0.35	0.38	5.66	2.17
19	ROB	182.64	191.21	0.61	2.05	8.57	0.89	0.24	0.30	3.83	1.13
20	ROB	191.21	199.78	0.04	0.35	5.33	0.07	0.07	0.13	1.06	0.13

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1088

INPUT

Description: p20

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851.31466	851	39.649	851	45.76	851.331	51.926	851.279	
68.762	851.72.219	850.482	74.12	850.53	75.563	850	76.718	849	

77.536 848.396 81.819 848.491 83.451 849 85.119 850 88.617 850.8
148.866 851.161 151.571 850.841 189.811 850.862 201.745 850.663 214.467 850.92
226.087 851

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val
0 .05 68.762 .035 88.617 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
68.762 88.617 86.72 65.2 28.83 .1 .3
Left Levee Station= 68.76 Elevation= 851

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	848.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.035		
W.S. Elev (m)	848.73	Reach Len. (m)	86.72	65.20	28.83
Crit W.S. (m)	848.70	Flow Area (m2)		1.39	
E.G. Slope (m/m)	0.014826	Area (m2)		1.39	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	5.50	Top Width (m)	5.50		
Vel Total (m/s)	1.37	Avg. Vel. (m/s)	1.37		
Max Chl Dpth (m)	0.33	Hydr. Depth (m)	0.25		
Conv. Total (m3/s)	15.7	Conv. (m3/s)	15.7		
Length Wtd. (m)	65.20	Wetted Per. (m)	5.65		
Min Ch El (m)	848.40	Shear (N/m2)	35.90		
Alpha	1.00	Stream Power (N/m s)	10824.56	3292.09	0.00
Frctn Loss (m)	0.43	Cum Volume (1000 m3)		3.47	
C & E Loss (m)	0.02	Cum SA (1000 m2)		9.49	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	850.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.30	Wt. n-Val.	0.035		
W.S. Elev (m)	849.78	Reach Len. (m)	86.72	65.20	28.83
Crit W.S. (m)	849.59	Flow Area (m2)		9.14	
E.G. Slope (m/m)	0.007778	Area (m2)		9.14	
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	8.93	Top Width (m)	8.93		
Vel Total (m/s)	2.42	Avg. Vel. (m/s)	2.42		
Max Chl Dpth (m)	1.38	Hydr. Depth (m)	1.02		
Conv. Total (m3/s)	250.6	Conv. (m3/s)	250.6		
Length Wtd. (m)	65.20	Wetted Per. (m)	9.71		
Min Ch El (m)	848.40	Shear (N/m2)	71.75		
Alpha	1.00	Stream Power (N/m s)	10824.56	3292.09	0.00
Frctn Loss (m)	0.34	Cum Volume (1000 m3)	4.26	18.69	6.39
C & E Loss (m)	0.04	Cum SA (1000 m2)	22.96	19.43	20.23

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	850.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.34	Wt. n-Val.	0.035		
W.S. Elev (m)	850.19	Reach Len. (m)	86.72	65.20	28.83
Crit W.S. (m)	849.91	Flow Area (m2)	13.08		
E.G. Slope (m/m)	0.007126	Area (m2)	13.08		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	10.87	Top Width (m)	10.87		
Vel Total (m/s)	2.58	Avg. Vel. (m/s)	2.58		
Max Chl Dpth (m)	1.79	Hydr. Depth (m)	1.20		
Conv. Total (m3/s)	399.2	Conv. (m3/s)	399.2		
Length Wtd. (m)	65.20	Wetted Per. (m)	11.85		
Min Ch El (m)	848.40	Shear (N/m2)	77.14		
Alpha	1.00	Stream Power (N/m s)	10824.56	3292.09	0.00
Frctn Loss (m)	0.32	Cum Volume (1000 m3)	11.29	24.27	13.05
C & E Loss (m)	0.04	Cum SA (1000 m2)	29.48	21.78	31.40

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	851.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.41	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	850.88	Reach Len. (m)	86.72	65.20	28.83
Crit W.S. (m)	850.75	Flow Area (m2)	23.48	4.51	
E.G. Slope (m/m)	0.008203	Area (m2)	23.48	4.51	
Q Total (m3/s)	68.40	Flow (m3/s)	67.14	1.26	
Top Width (m)	94.59	Top Width (m)	19.08	75.50	
Vel Total (m/s)	2.44	Avg. Vel. (m/s)	2.86	0.28	
Max Chl Dpth (m)	2.49	Hydr. Depth (m)	1.23	0.06	
Conv. Total (m3/s)	755.2	Conv. (m3/s)	741.3	13.9	
Length Wtd. (m)	64.69	Wetted Per. (m)	20.22	75.51	
Min Ch El (m)	848.40	Shear (N/m2)	93.41	4.80	
Alpha	1.34	Stream Power (N/m s)	10824.56	3292.09	0.00
Frctn Loss (m)	0.31	Cum Volume (1000 m3)	35.96	35.61	37.72
C & E Loss (m)	0.05	Cum SA (1000 m2)	55.85	23.28	52.65

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	76.70	80.67	1.47	1.02	3.70	77.05	0.28	1.45	39.87	57.79
2	Chan	80.67	84.65	0.44	0.38	1.95	22.95	0.20	1.15	28.35	32.74

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	72.73	76.70	0.35	0.34	1.17	1.58	0.38	1.03	22.07	22.82
2	Chan	76.70	80.67	13.87	5.12	4.18	62.77	1.29	2.71	93.57	253.44
3	Chan	80.67	84.65	7.88	3.67	4.25	35.64	0.92	2.15	65.94	141.45
4	Chan	84.65	88.62	0.00	0.00	0.12	0.00	0.03	0.21	2.00	0.42

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	72.73	76.70	0.95	0.82	2.05	2.81	0.50	1.15	28.05	32.33
2	Chan	76.70	80.67	19.64	6.74	4.18	58.28	1.70	2.91	112.81	328.69
3	Chan	80.67	84.65	12.97	5.29	4.25	38.48	1.33	2.45	87.04	213.35
4	Chan	84.65	88.62	0.15	0.23	1.38	0.44	0.18	0.64	11.61	7.43

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	68.76	72.73	0.57	0.74	3.23	0.83	0.23	0.77	18.52	14.22
2	Chan	72.73	76.70	4.68	2.98	4.43	6.84	0.75	1.57	54.08	84.87
3	Chan	76.70	80.67	33.70	9.52	4.18	49.26	2.40	3.54	183.34	649.24
4	Chan	80.67	84.65	25.29	8.07	4.25	36.98	2.03	3.14	152.77	479.05
5	Chan	84.65	88.62	2.90	2.18	4.14	4.24	0.55	1.33	42.33	56.41
6	ROB	88.62	102.36	0.11	0.59	13.75	0.16	0.04	0.19	3.44	0.64
7	ROB	102.36	116.11	0.00	0.00	0.27	0.00	0.00	0.01	0.07	0.00
8	ROB	116.11	129.86					0.00	0.00		
9	ROB	129.86	143.60					0.00	0.00		
10	ROB	143.60	157.35	0.04	0.25	6.15	0.07	0.04	0.18	3.25	0.58
11	ROB	157.35	171.10	0.08	0.50	13.75	0.12	0.04	0.17	2.91	0.48
12	ROB	171.10	184.85	0.06	0.39	13.75	0.08	0.03	0.14	2.30	0.33
13	ROB	184.85	198.59	0.25	0.95	13.75	0.36	0.07	0.26	5.58	1.43
14	ROB	198.59	212.34	0.72	1.82	13.75	1.06	0.13	0.40	10.67	4.23
15	ROB	212.34	226.09	0.00	0.00	0.36	0.00	0.00	0.04	0.29	0.01

ILICENCIA para hacer constar que la presente documentación, relativa a la
Revisión del P.O.O. de Astorga, fue aprobada oficialmente en sesión plenaria
del Ayuntamiento de dicho ciudad, de fecha 17.05.2018.



Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1023

INPUT

Description: p19

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851	18.271	850.883	20.756	851	25.169	851.471	29.267	851.576
30.778	851	41.762	850.887	45.67	850.67	76.564	850.865	81.495	850.72
89.105	850	90.688	850.279	92.706	850.273	95.455	849	97.172	848
97.527	847.95	101.969	847.91	102.154	848	104.258	849	104.271	849.408
107.072	850	107.243	850.463	114.784	850.675	118.883	850.55	168.955	850.568
209.672	850.827								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.706	.035	107.243	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

92.706	107.243	97.42	80.8	48.03	.1	.3
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Left Levee Station= 76.56 Elevation= 850.86

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	848.37	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035		
W.S. Elev (m)	848.34	Reach Len. (m)	97.42	80.80	48.03
Crit W.S. (m)	848.18	Flow Area (m2)	2.22		
E.G. Slope (m/m)	0.003764	Area (m2)	2.22		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.27	Top Width (m)	6.27		
Vel Total (m/s)	0.86	Avg. Vel. (m/s)	0.86		
Max Chl Dpth (m)	0.43	Hydr. Depth (m)	0.35		
Conv. Total (m3/s)	31.1	Conv. (m3/s)	31.1		
Length Wtd. (m)	80.80	Wetted Per. (m)	6.46		
Min Ch El (m)	847.91	Shear (N/m2)	12.69		
Alpha	1.00	Stream Power (N/m s)	10038.65	3665.53	0.00
Frctn Loss (m)	0.35	Cum Volume (1000 m3)	3.35		
C & E Loss (m)	0.00	Cum SA (1000 m2)	9.11		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	849.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.035		
W.S. Elev (m)	849.53	Reach Len. (m)	97.42	80.80	48.03
Crit W.S. (m)	849.05	Flow Area (m2)	12.25		
E.G. Slope (m/m)	0.003709	Area (m2)	12.25		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	10.55	Top Width (m)	10.55		
Vel Total (m/s)	1.80	Avg. Vel. (m/s)	1.80		
Max Chl Dpth (m)	1.62	Hydr. Depth (m)	1.16		
Conv. Total (m3/s)	362.9	Conv. (m3/s)	362.9		
Length Wtd. (m)	80.80	Wetted Per. (m)	11.59		
Min Ch El (m)	847.91	Shear (N/m2)	38.42		
Alpha	1.00	Stream Power (N/m s)	10038.65	3665.53	0.00
Frctn Loss (m)	0.30	Cum Volume (1000 m3)	4.26	17.99	6.39
C & E Loss (m)	0.00	Cum SA (1000 m2)	22.96	18.79	20.23

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	850.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.035		
W.S. Elev (m)	849.97	Reach Len. (m)	97.42	80.80	48.03
Crit W.S. (m)	849.35	Flow Area (m2)	17.52		
E.G. Slope (m/m)	0.003606	Area (m2)	17.52		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.56	Top Width (m)	13.56		
Vel Total (m/s)	1.92	Avg. Vel. (m/s)	1.92		
Max Chl Dpth (m)	2.06	Hydr. Depth (m)	1.29		
Conv. Total (m3/s)	561.2	Conv. (m3/s)	561.2		
Length Wtd. (m)	80.80	Wetted Per. (m)	14.75		
Min Ch El (m)	847.91	Shear (N/m2)	41.99		
Alpha	1.00	Stream Power (N/m s)	10038.65	3665.53	0.00
Frctn Loss (m)	0.30	Cum Volume (1000 m3)	11.29	23.27	13.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	29.48	20.98	31.40

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	850.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	850.68	Reach Len. (m)	97.42	80.80	48.03
Crit W.S. (m)	850.07	Flow Area (m2)	4.14	27.75	8.39
E.G. Slope (m/m)	0.003144	Area (m2)	4.14	27.75	8.39
Q Total (m3/s)	68.40	Flow (m3/s)	2.44	63.86	2.10
Top Width (m)	105.13	Top Width (m)	10.82	14.54	79.78
Vel Total (m/s)	1.70	Avg. Vel. (m/s)	0.59	2.30	0.25
Max Chl Dpth (m)	2.77	Hydr. Depth (m)	0.38	1.91	0.11
Conv. Total (m3/s)	1219.8	Conv. (m3/s)	43.6	1138.8	37.4
Length Wtd. (m)	80.84	Wetted Per. (m)	10.88	16.12	79.78
Min Ch El (m)	847.91	Shear (N/m2)	11.75	53.09	3.24
Alpha	1.72	Stream Power (N/m s)	10038.65	3665.53	0.00
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	35.78	33.94	37.53
C & E Loss (m)	0.00	Cum SA (1000 m2)	55.38	22.18	50.42

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	95.61	98.52	0.48	0.61	2.02	25.05	0.32	0.78	11.21	8.74
2	Chan	98.52	101.43	1.13	1.19	2.91	59.01	0.41	0.95	15.08	14.31
3	Chan	101.43	104.34	0.30	0.42	1.53	15.94	0.29	0.73	10.10	7.34

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.71	95.61	0.26	0.40	1.45	1.19	0.30	0.66	9.96	6.58
2	Chan	95.61	98.52	6.77	3.81	3.16	30.62	1.31	1.78	43.90	78.00
3	Chan	98.52	101.43	10.01	4.66	2.91	45.31	1.60	2.15	58.33	125.28
4	Chan	101.43	104.34	5.05	3.35	3.55	22.85	1.15	1.51	34.31	51.74
5	Chan	104.34	107.24	0.01	0.03	0.53	0.03	0.05	0.22	1.95	0.44

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.71	95.61	1.04	1.17	2.49	3.09	0.52	0.89	16.68	14.79
2	Chan	95.61	98.52	10.21	5.08	3.16	30.29	1.75	2.01	56.91	114.35
3	Chan	98.52	101.43	13.97	5.93	2.91	41.44	2.04	2.35	72.16	169.85
4	Chan	101.43	104.34	8.06	4.62	3.55	23.91	1.59	1.74	46.02	80.24
5	Chan	104.34	107.24	0.43	0.71	2.65	1.28	0.27	0.61	9.46	5.75

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	76.56	84.63	0.09	0.36	2.76	0.14	0.13	0.26	3.99	1.05
2	LOB	84.63	92.71	2.35	3.79	8.12	3.44	0.47	0.62	14.39	8.93
3	Chan	92.71	95.61	4.53	3.15	3.21	6.62	1.08	1.44	30.23	43.46
4	Chan	95.61	98.52	17.99	7.16	3.16	26.30	2.46	2.51	69.91	175.75
5	Chan	98.52	101.43	22.93	8.01	2.91	33.52	2.75	2.86	84.94	243.14
6	Chan	101.43	104.34	14.89	6.70	3.55	21.77	2.30	2.22	58.16	129.31
7	Chan	104.34	107.24	3.53	2.74	3.29	5.15	0.94	1.29	25.65	33.04
8	ROB	107.24	117.49	0.22	0.99	10.25	0.33	0.10	0.22	2.98	0.67
9	ROB	117.49	127.73	0.36	1.32	10.24	0.52	0.13	0.27	3.97	1.08
10	ROB	127.73	137.97	0.35	1.31	10.24	0.52	0.13	0.27	3.94	1.07
11	ROB	137.97	148.21	0.34	1.27	10.24	0.49	0.12	0.27	3.83	1.02
12	ROB	148.21	158.46	0.32	1.24	10.24	0.47	0.12	0.26	3.72	0.97
13	ROB	158.46	168.70	0.31	1.20	10.24	0.45	0.12	0.26	3.60	0.92
14	ROB	168.70	178.94	0.18	0.86	10.24	0.26	0.08	0.20	2.59	0.53
15	ROB	178.94	189.19	0.02	0.21	8.08	0.03	0.03	0.09	0.79	0.07

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 943

INPUT

Description: p18

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.48	28.71	850.389	36.778	850.276	44.65	850	45.374	850.031
46.443	850	47.215	850.407	53.756	850.156	60.285	850	65.82	849
66.952	848	67.799	847.514	72.942	847.739	73.751	848	74.484	849
76.403	850	83.472	850.74	86.125	850.796	100.187	850.82	105.279	850.775
110.001	850.816	114.817	850.809	119.358	850.798	122.333	850.791	126.855	850.812
128.991	850.809	165.156	850.815	203.055	850.873	210.396	851		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	60.285	.035	76.403	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	60.285	76.403		47.56	44.81	37.87	.1	.3

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	848.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035		
W.S. Elev (m)	847.98	Reach Len. (m)	47.56	44.81	37.87
Crit W.S. (m)		Flow Area (m2)	2.07		
E.G. Slope (m/m)	0.005143	Area (m2)	2.07		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.68	Top Width (m)	6.68		
Vel Total (m/s)	0.92	Avg. Vel. (m/s)	0.92		
Max Chl Dpth (m)	0.46	Hydr. Depth (m)	0.31		
Conv. Total (m3/s)	26.6	Conv. (m3/s)	26.6		
Length Wtd. (m)	44.81	Wetted Per. (m)	6.85		
Min Ch El (m)	847.51	Shear (N/m2)	15.24		
Alpha	1.00	Stream Power (N/m s)	10073.32	0.00	0.00
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	3.18		
C & E Loss (m)	0.00	Cum SA (1000 m2)	8.59		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	849.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.035		
W.S. Elev (m)	849.22	Reach Len. (m)	47.56	44.81	37.87
Crit W.S. (m)		Flow Area (m2)	12.06		
E.G. Slope (m/m)	0.003834	Area (m2)	12.06		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	10.31	Top Width (m)	10.31		
Vel Total (m/s)	1.83	Avg. Vel. (m/s)	1.83		
Max Chl Dpth (m)	1.71	Hydr. Depth (m)	1.17		
Conv. Total (m3/s)	356.9	Conv. (m3/s)	356.9		



Length Wtd. (m)	44.81	Wetted Per. (m)	11.45		
Min Ch El (m)	847.51	Shear (N/m2)	39.61		
Alpha	1.00	Stream Power (N/m s)	10073.32	0.00	0.00
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	4.26	17.01	6.39
C & E Loss (m)	0.02	Cum SA (1000 m2)	22.96	17.95	20.23

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.035		
W.S. Elev (m)	849.67	Reach Len. (m)	47.56	44.81	37.87
Crit W.S. (m)		Flow Area (m2)	17.47		
E.G. Slope (m/m)	0.003704	Area (m2)	17.47		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.68	Top Width (m)	13.68		
Vel Total (m/s)	1.93	Avg. Vel. (m/s)	1.93		
Max Chl Dpth (m)	2.16	Hydr. Depth (m)	1.28		
Conv. Total (m3/s)	553.7	Conv. (m3/s)	553.7		
Length Wtd. (m)	44.81	Wetted Per. (m)	14.96		
Min Ch El (m)	847.51	Shear (N/m2)	42.43		
Alpha	1.00	Stream Power (N/m s)	10073.32	0.00	0.00
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	11.29	21.86	13.05
C & E Loss (m)	0.03	Cum SA (1000 m2)	29.48	19.88	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	850.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	850.45	Reach Len. (m)	47.56	44.81	37.87
Crit W.S. (m)	849.78	Flow Area (m2)	8.30	29.55	0.95
E.G. Slope (m/m)	0.002977	Area (m2)	8.30	29.55	0.95
Q Total (m3/s)	68.40	Flow (m3/s)	2.75	65.27	0.38
Top Width (m)	70.00	Top Width (m)	49.62	16.12	4.26
Vel Total (m/s)	1.76	Avg. Vel. (m/s)	0.33	2.21	0.40
Max Chl Dpth (m)	2.93	Hydr. Depth (m)	0.17	1.83	0.22
Conv. Total (m3/s)	1253.7	Conv. (m3/s)	50.3	1196.4	7.0
Length Wtd. (m)	44.97	Wetted Per. (m)	49.74	17.51	4.29
Min Ch El (m)	847.51	Shear (N/m2)	4.87	49.25	6.48
Alpha	1.50	Stream Power (N/m s)	10073.32	0.00	0.00
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	35.17	31.62	37.31
C & E Loss (m)	0.03	Cum SA (1000 m2)	52.43	20.95	48.40

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	66.73	69.96	1.06	1.08	3.09	55.72	0.36	0.99	17.65	17.39
2	Chan	69.96	73.18	0.83	0.95	3.24	43.54	0.29	0.88	14.79	12.95

3	Chan	73.18	76.40	0.01	0.04	0.52	0.74	0.08	0.36	3.85	1.37
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Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	63.51	66.73	0.47	0.71	2.46	2.13	0.33	0.67	10.76	7.18
2	Chan	66.73	69.96	10.09	5.07	3.43	45.68	1.57	1.99	55.57	110.69
3	Chan	69.96	73.18	10.13	4.96	3.24	45.85	1.54	2.04	57.63	117.62
4	Chan	73.18	76.40	1.40	1.33	2.32	6.35	0.77	1.06	21.50	22.74

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	60.28	63.51	0.06	0.18	1.43	0.19	0.13	0.36	4.55	1.64
2	Chan	63.51	66.73	2.04	2.05	3.57	6.06	0.64	1.00	20.91	20.82
3	Chan	66.73	69.96	14.41	6.52	3.43	42.76	2.02	2.21	69.10	152.66
4	Chan	69.96	73.18	14.57	6.42	3.24	43.25	1.99	2.27	72.00	163.48
5	Chan	73.18	76.40	2.61	2.30	3.30	7.74	0.89	1.13	25.37	28.75

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	6.03	12.06	0.00	0.00	1.39	0.00	0.00	0.01	0.06	0.00
2	LOB	12.06	18.09	0.00	0.08	6.03	0.01	0.01	0.05	0.41	0.02
3	LOB	18.09	24.11	0.02	0.20	6.03	0.02	0.03	0.08	0.97	0.08
4	LOB	24.11	30.14	0.04	0.33	6.03	0.06	0.05	0.12	1.58	0.18
5	LOB	30.14	36.17	0.14	0.72	6.03	0.21	0.12	0.20	3.49	0.69
6	LOB	36.17	42.20	0.50	1.54	6.03	0.74	0.26	0.33	7.45	2.44
7	LOB	42.20	48.23	0.77	2.01	6.13	1.13	0.33	0.39	9.55	3.69
8	LOB	48.23	54.26	0.32	1.17	6.03	0.46	0.19	0.27	5.64	1.53
9	LOB	54.26	60.28	0.95	2.26	6.03	1.39	0.37	0.42	10.92	4.61
10	Chan	60.28	63.51	2.66	2.38	3.28	3.88	0.74	1.12	21.18	23.67
11	Chan	63.51	66.73	7.40	4.55	3.57	10.82	1.41	1.63	37.22	60.57
12	Chan	66.73	69.96	23.77	9.02	3.43	34.76	2.80	2.64	76.76	202.39
13	Chan	69.96	73.18	24.22	8.91	3.24	35.42	2.76	2.72	80.34	218.34
14	Chan	73.18	76.40	7.22	4.69	4.00	10.56	1.46	1.54	34.21	52.63
15	ROB	76.40	89.80	0.38	0.95	4.29	0.56	0.22	0.40	6.48	2.59

CROSS SECTION

RIVER: Jerga
REACH: Astorga RS: 898

INPUT

Description: p17 aguas arriba

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.117	24.526	850.105	41.977	850.154	42.705	850	44.513	849.678
45.749	850	46.102	850.121	52.877	850.061	53.112	850.054	54.952	850
67.986	849	69.56	848	70.257	847.341	74.309	847.291	75.201	848
76.029	849	79.335	850	98.684	850.882	110.934	850.848	113.726	850.82
145.285	850.805	174.359	850.781	175.596	850.812	179.339	850.777	184.451	850.77
188.074	850.72	189.584	850.732	193.152	850.791	194.509	850.79	196.045	850.826
211.855	851								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	54.952	.035	79.335	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	54.952	79.335		9.5	9.5	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	67.34	849.61	F
76.34	211.855	849.61	F

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035		
W.S. Elev (m)	847.83	Reach Len. (m)	2.80	2.80	2.80
Crit W.S. (m)	847.59	Flow Area (m2)		2.39	
E.G. Slope (m/m)	0.002444	Area (m2)		2.39	
Q Total (m3/s)	1.91	Flow (m3/s)		1.91	
Top Width (m)	5.25	Top Width (m)		5.25	
Vel Total (m/s)	0.80	Avg. Vel. (m/s)		0.80	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	38.6	Conv. (m3/s)		38.6	
Length Wtd. (m)	2.80	Wetted Per. (m)		5.63	
Min Ch El (m)	847.29	Shear (N/m2)		10.18	
Alpha	1.00	Stream Power (N/m s)	10143.16	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		3.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		8.32	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	849.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.37	Wt. n-Val.	0.035		
W.S. Elev (m)	848.75	Reach Len. (m)	2.80	2.80	2.80
Crit W.S. (m)	848.59	Flow Area (m2)		8.26	
E.G. Slope (m/m)	0.009178	Area (m2)		8.26	
Q Total (m3/s)	22.10	Flow (m3/s)		22.10	
Top Width (m)	7.45	Top Width (m)		7.45	
Vel Total (m/s)	2.68	Avg. Vel. (m/s)		2.68	
Max Chl Dpth (m)	1.46	Hydr. Depth (m)		1.11	
Conv. Total (m3/s)	230.7	Conv. (m3/s)		230.7	
Length Wtd. (m)	2.80	Wetted Per. (m)		8.54	
Min Ch El (m)	847.29	Shear (N/m2)		87.04	

Alpha	1.00	Stream Power (N/m s)	10143.16	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)	4.26	16.55	6.39
C & E Loss (m)		Cum SA (1000 m2)	22.96	17.55	20.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.44	Wt. n-Val.	0.035		
W.S. Elev (m)	849.15	Reach Len. (m)	2.80	2.80	2.80
Crit W.S. (m)	848.95	Flow Area (m2)	11.44		
E.G. Slope (m/m)	0.009239	Area (m2)	11.50		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	10.41	Top Width (m)	10.41		
Vel Total (m/s)	2.95	Avg. Vel. (m/s)	2.95		
Max Chl Dpth (m)	1.85	Hydr. Depth (m)	1.27		
Conv. Total (m3/s)	350.6	Conv. (m3/s)	350.6		
Length Wtd. (m)	2.80	Wetted Per. (m)	10.29		
Min Ch El (m)	847.29	Shear (N/m2)	100.72		
Alpha	1.00	Stream Power (N/m s)	10143.16	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)	11.29	21.21	13.05
C & E Loss (m)		Cum SA (1000 m2)	29.48	19.34	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	850.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	850.41	Reach Len. (m)	2.80	2.80	2.80
Crit W.S. (m)	849.80	Flow Area (m2)	17.47	36.45	1.87
E.G. Slope (m/m)	0.002121	Area (m2)	17.47	36.45	1.87
Q Total (m3/s)	68.40	Flow (m3/s)	7.46	60.34	0.60
Top Width (m)	88.40	Top Width (m)	54.95	24.38	9.07
Vel Total (m/s)	1.23	Avg. Vel. (m/s)	0.43	1.66	0.32
Max Chl Dpth (m)	3.12	Hydr. Depth (m)	0.32	1.50	0.21
Conv. Total (m3/s)	1485.1	Conv. (m3/s)	162.0	1310.0	13.1
Length Wtd. (m)	2.80	Wetted Per. (m)	55.36	25.84	9.08
Min Ch El (m)	847.29	Shear (N/m2)	6.57	29.34	4.29
Alpha	1.62	Stream Power (N/m s)	10143.16	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	34.56	30.14	37.25
C & E Loss (m)	0.01	Cum SA (1000 m2)	49.95	20.04	48.15

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	67.34	71.84	0.70	0.92	2.30	36.69	0.44	0.76	9.57	7.32
2	Chan	71.84	76.34	1.21	1.48	3.34	63.31	0.47	0.82	10.61	8.69

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	67.34	71.84	8.62	3.46	3.95	39.00	1.00	2.49	78.77	196.42
2	Chan	71.84	76.34	13.48	4.80	4.59	61.00	1.20	2.81	94.16	264.47

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	63.21	67.34	0.00	0.06	1.25	0.00	0.05	0.00	4.32	0.00
2	Chan	67.34	71.84	13.51	4.99	5.05	40.08	1.11	2.71	89.48	242.10
3	Chan	71.84	76.34	20.19	6.44	5.23	59.92	1.43	3.13	111.57	349.68
4	Chan	76.34	79.33	0.00	0.00	0.18	0.00	0.03	0.00	2.21	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	5.50	0.64	1.64	5.79	0.94	0.30	0.39	5.88	2.31
2	LOB	5.50	10.99	0.68	1.65	5.50	0.99	0.30	0.41	6.25	2.56
3	LOB	10.99	16.49	0.69	1.67	5.50	1.01	0.30	0.41	6.31	2.60
4	LOB	16.49	21.98	0.70	1.68	5.50	1.02	0.31	0.42	6.36	2.64
5	LOB	21.98	27.48	0.70	1.68	5.50	1.02	0.31	0.42	6.37	2.64
6	LOB	27.48	32.97	0.65	1.61	5.50	0.95	0.29	0.40	6.08	2.45
7	LOB	32.97	38.47	0.59	1.52	5.50	0.87	0.28	0.39	5.76	2.24
8	LOB	38.47	43.96	0.80	1.83	5.53	1.17	0.33	0.44	6.90	3.02
9	LOB	43.96	49.46	1.12	2.24	5.57	1.64	0.41	0.50	8.39	4.19
10	LOB	49.46	54.95	0.89	1.95	5.50	1.30	0.35	0.46	7.37	3.38
11	Chan	54.95	59.08	1.89	2.36	4.14	2.76	0.57	0.80	11.86	9.48
12	Chan	59.08	63.21	3.94	3.67	4.14	5.76	0.89	1.07	18.43	19.78
13	Chan	63.21	67.34	6.55	4.98	4.14	9.57	1.21	1.31	25.00	32.87
14	Chan	67.34	71.84	20.52	10.70	5.05	30.00	2.38	1.92	44.03	84.43
15	Chan	71.84	76.34	24.78	12.15	5.23	36.23	2.70	2.04	48.31	98.54
16	Chan	76.34	79.33	2.66	2.59	3.13	3.89	0.87	1.03	17.25	17.71
17	ROB	79.33	92.59	0.60	1.87	9.08	0.88	0.21	0.32	4.29	1.38

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 890



INPUT

Description:

Distance from Upstream XS = 2.8

Deck/Roadway Width = 4.5

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 4

Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

52.88 850.06 67.34 849.61 849.36 76.34 849.61 849.36

79.33 850

Upstream Bridge Cross Section Data

Station Elevation Data num= 31

Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

0 850.117 24.526 850.105 41.977 850.154 42.705 850 44.513 849.678

45.749 850 46.102 850.121 52.877 850.061 53.112 850.054 54.952 850

67.986 849 69.56 848 70.257 847.341 74.309 847.291 75.201 848

76.029 849 79.335 850 98.684 850.882 110.934 850.848 113.726 850.82

145.285 850.805 174.359 850.781 175.596 850.812 179.339 850.777 184.451 850.77

188.074 850.72 189.584 850.732 193.152 850.791 194.509 850.79 196.045 850.826

211.855 851

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val

0 .05 54.952 .035 79.335 .05

Bank Sta: Left Right Coeff Contr. Expan.

54.952 79.335 .1 .3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 67.34 849.61 F

76.34 211.855 849.61 F

Downstream Deck/Roadway Coordinates

num= 4

Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

58.5 850 67.92 849.61 849.36 76.91 849.61 849.36

81.18 850

Downstream Bridge Cross Section Data

Station Elevation Data num= 24

Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

0 850.063 17.198 850 34.128 850 41.87 850.164 42.072 850

44.185 849.669 45.346 850 45.932 850.042 52.973 850.133 58.051 850.04

58.504 850 67.087 849 67.554 848 68.255 847.22 76.784 848.01

77.838 849 81.181 850 83.362 850.378 100.715 850.59 103.151 850.499

117.74 850 142.278 850 209.846 850.65 212.481 851

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val

0 .05 58.504 .035 81.181 .05

Bank Sta: Left Right Coeff Contr. Expan.

58.504 81.181 .1 .3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 67.92 849.61 F

76.91 212.481 849.61 F

Left Levee Station= 58.05 Elevation= 850.04

Right Levee Station= 83.36 Elevation= 850.38

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 888

INPUT

Description: p16 aguas abajo

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.063	17.198	850	34.128	850	41.87	850.164	42.072	850
44.185	849.669	45.346	850	45.932	850.042	52.973	850.133	58.051	850.04
58.504	850	67.087	849	67.554	848	68.255	847.22	76.784	848.01
77.838	849	81.181	850	83.362	850.378	100.715	850.59	103.151	850.499
117.74	850	142.278	850	209.846	850.65	212.481	851		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	58.504	.035	81.181	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
58.504	81.181	44.44	40.08	29.42	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-------	-------	------	-----------

0	67.92	849.61	F
76.91	212.481	849.61	F

Left Levee Station= 58.05 Elevation= 850.04

Right Levee Station= 83.36 Elevation= 850.38

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.	0.035		
W.S. Elev (m)	847.69	Reach Len. (m)	44.44	40.08	29.42
Crit W.S. (m)	847.69	Flow Area (m2)	1.26		
E.G. Slope (m/m)	0.020122	Area (m2)	1.27		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	5.44	Top Width (m)	5.44		
Vel Total (m/s)	1.51	Avg. Vel. (m/s)	1.51		
Max Chl Dpth (m)	0.47	Hydr. Depth (m)	0.24		

Conv. Total (m3/s)	13.5	Conv. (m3/s)	13.5
Length Wtd. (m)	40.08	Wetted Per. (m)	5.55
Min Ch El (m)	847.22	Shear (N/m2)	44.94
Alpha	1.00	Stream Power (N/m s)	10173.14 2779.31 3991.10
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	3.06
C & E Loss (m)	0.03	Cum SA (1000 m2)	8.27

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	848.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.57	Wt. n-Val.	0.035		
W.S. Elev (m)	848.35	Reach Len. (m)	44.44	40.08	29.42
Crit W.S. (m)	848.47	Flow Area (m2)	6.59		
E.G. Slope (m/m)	0.021621	Area (m2)	6.84		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	9.75	Top Width (m)	9.75		
Vel Total (m/s)	3.35	Avg. Vel. (m/s)	3.35		
Max Chl Dpth (m)	1.13	Hydr. Depth (m)	0.73		
Conv. Total (m3/s)	150.3	Conv. (m3/s)	150.3		
Length Wtd. (m)	40.08	Wetted Per. (m)	9.24		
Min Ch El (m)	847.22	Shear (N/m2)	151.22		
Alpha	1.00	Stream Power (N/m s)	10173.14 2779.31 3991.10		
Frctn Loss (m)		Cum Volume (1000 m3)	4.26 16.49 6.39		
C & E Loss (m)		Cum SA (1000 m2)	22.96 17.47 20.23		

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.78	Wt. n-Val.	0.035		
W.S. Elev (m)	848.57	Reach Len. (m)	44.44	40.08	29.42
Crit W.S. (m)	848.74	Flow Area (m2)	8.59		
E.G. Slope (m/m)	0.020751	Area (m2)	9.06		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	10.09	Top Width (m)	10.09		
Vel Total (m/s)	3.92	Avg. Vel. (m/s)	3.92		
Max Chl Dpth (m)	1.35	Hydr. Depth (m)	0.96		

Conv. Total (m3/s)	233.9	Conv. (m3/s)	233.9
Length Wtd. (m)	40.08	Wetted Per. (m)	9.24
Min Ch El (m)	847.22	Shear (N/m2)	189.27
Alpha	1.00	Stream Power (N/m s)	10173.14 2779.31 3991.10
Frctn Loss (m)		Cum Volume (1000 m3)	11.29 21.12 13.05
C & E Loss (m)		Cum SA (1000 m2)	29.48 19.25 31.40

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	850.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.97	Wt. n-Val.	0.035		
W.S. Elev (m)	849.36	Reach Len. (m)	44.44	40.08	29.42
Crit W.S. (m)	849.42	Flow Area (m2)	15.68		
E.G. Slope (m/m)	0.011526	Area (m2)	18.14		
Q Total (m3/s)	68.40	Flow (m3/s)	68.40		
Top Width (m)	15.01	Top Width (m)	15.01		
Vel Total (m/s)	4.36	Avg. Vel. (m/s)	4.36		
Max Chl Dpth (m)	2.14	Hydr. Depth (m)	1.74		
Conv. Total (m3/s)	637.1	Conv. (m3/s)	637.1		
Length Wtd. (m)	40.02	Wetted Per. (m)	9.24		
Min Ch El (m)	847.22	Shear (N/m2)	191.77		
Alpha	1.00	Stream Power (N/m s)	10173.14 2779.31 3991.10		
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	34.46 29.88 37.25		
C & E Loss (m)	0.02	Cum SA (1000 m2)	49.47 19.82 48.11		

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: The energy method has computed a class B profile.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	63.21	67.92	0.00	0.00	0.12	0.00	0.05	0.00	6.13	0.00
2	Chan	67.92	72.41	1.89	1.23	4.68	99.20	0.27	1.54	51.83	79.91
3	Chan	72.41	76.91	0.02	0.03	0.87	0.80	0.04	0.44	7.89	3.47

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	63.21	67.92	0.00	0.23	0.93	0.00	0.43	0.00	52.31	0.00	
2	Chan	67.92	72.41	15.82	4.20	4.68	71.56	0.93	3.77	190.33	716.69	
3	Chan	72.41	76.91	6.28	2.39	4.56	28.44	0.53	2.63	111.10	292.17	
4	Chan	76.91	81.18	0.00	0.03	0.32	0.00	0.11	0.00	16.87	0.00	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	63.21	67.92	0.00	0.36	1.18	0.00	0.57	0.00	62.07	0.00	
2	Chan	67.92	72.41	22.49	5.20	4.68	66.73	1.16	4.32	226.25	978.04	
3	Chan	72.41	76.91	11.21	3.39	4.56	33.27	0.75	3.31	151.33	500.33	
4	Chan	76.91	81.18	0.00	0.10	0.64	0.00	0.22	0.00	32.72	0.00	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	63.21	67.92	0.00	1.52	4.74	0.00	0.39	0.00	36.25	0.00	
2	Chan	67.92	72.41	40.45	8.74	4.68	59.14	1.95	4.63	211.21	977.17	
3	Chan	72.41	76.91	27.95	6.93	4.56	40.86	1.54	4.03	171.82	692.74	
4	Chan	76.91	81.18	0.00	0.95	2.52	0.00	0.45	0.00	42.59	0.00	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: The energy method has computed a class B profile.



CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 848

INPUT

Description: p15

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	849.809	33.318	849.691	34.98	849.618	37.121	849.864	43.594	849.919
46.356	850.057	49.083	850.023	66.605	849	67.622	848	69.433	847
77.474	846.85	78.226	847	79.208	848	80.147	849	100.673	849.89
144.594	850	194.831	850.308						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	66.605	.035	80.147	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Lengths	Left	Channel	Right	Coeff	Contr.	Expan.
66.605	80.147	48.68	62.54	86.13	.1	.3		

Left Levee Station= 49.08 Elevation= 850.02

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	847.35	Reach Len. (m)	48.68	62.54	86.13
Crit W.S. (m)	847.09	Flow Area (m2)	3.93		
E.G. Slope (m/m)	0.001008	Area (m2)	3.93		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	9.78	Top Width (m)	9.78		
Vel Total (m/s)	0.49	Avg. Vel. (m/s)	0.49		
Max Chl Dpth (m)	0.50	Hydr. Depth (m)	0.40		
Conv. Total (m3/s)	60.1	Conv. (m3/s)	60.1		
Length Wtd. (m)	62.54	Wetted Per. (m)	10.03		
Min Ch El (m)	846.85	Shear (N/m2)	3.88		
Alpha	1.00	Stream Power (N/m s)	9328.09	2349.85	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	2.96		
C & E Loss (m)	0.00	Cum SA (1000 m2)	7.96		

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	848.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.035		
W.S. Elev (m)	848.66	Reach Len. (m)	48.68	62.54	86.13
Crit W.S. (m)	847.77	Flow Area (m2)	18.94		
E.G. Slope (m/m)	0.001128	Area (m2)	18.94		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	12.88	Top Width (m)	12.88		
Vel Total (m/s)	1.17	Avg. Vel. (m/s)	1.17		
Max Chl Dpth (m)	1.81	Hydr. Depth (m)	1.47		
Conv. Total (m3/s)	658.0	Conv. (m3/s)	658.0		
Length Wtd. (m)	62.54	Wetted Per. (m)	14.13		
Min Ch El (m)	846.85	Shear (N/m2)	14.83		
Alpha	1.00	Stream Power (N/m s)	9328.09	2349.85	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	4.26	15.97	6.39
C & E Loss (m)	0.00	Cum SA (1000 m2)	22.96	17.02	20.23

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.035		
W.S. Elev (m)	849.00	Reach Len. (m)	48.68	62.54	86.13
Crit W.S. (m)	848.02	Flow Area (m2)	23.43		
E.G. Slope (m/m)	0.001408	Area (m2)	0.00	23.43	0.00
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.58	Top Width (m)	0.02	13.54	0.02
Vel Total (m/s)	1.44	Avg. Vel. (m/s)	1.44		
Max Chl Dpth (m)	2.15	Hydr. Depth (m)	1.73		
Conv. Total (m3/s)	898.0	Conv. (m3/s)	898.0		
Length Wtd. (m)	62.54	Wetted Per. (m)	15.08		
Min Ch El (m)	846.85	Shear (N/m2)	21.46		
Alpha	1.00	Stream Power (N/m s)	9328.09	2349.85	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	11.29	20.47	13.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	29.47	18.78	31.39

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	849.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	849.51	Reach Len. (m)	48.68	62.54	86.13
Crit W.S. (m)	848.62	Flow Area (m2)	2.24	30.34	3.01
E.G. Slope (m/m)	0.002308	Area (m2)	2.24	30.34	3.01
Q Total (m3/s)	68.40	Flow (m3/s)	0.87	66.37	1.17
Top Width (m)	34.09	Top Width (m)	8.76	13.54	11.79
Vel Total (m/s)	1.92	Avg. Vel. (m/s)	0.39	2.19	0.39
Max Chl Dpth (m)	2.66	Hydr. Depth (m)	0.26	2.24	0.26
Conv. Total (m3/s)	1423.8	Conv. (m3/s)	18.0	1381.5	24.3
Length Wtd. (m)	62.77	Wetted Per. (m)	8.77	15.08	11.80
Min Ch El (m)	846.85	Shear (N/m2)	5.78	45.54	5.78
Alpha	1.26	Stream Power (N/m s)	9328.09	2349.85	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	34.41	28.91	37.20
C & E Loss (m)	0.01	Cum SA (1000 m2)	49.28	19.25	47.93

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	66.60	69.31	0.02	0.07	0.59	0.86	0.14	0.22	1.24	0.27
2	Chan	69.31	72.02	0.46	1.01	2.73	24.18	0.37	0.46	3.67	1.68
3	Chan	72.02	74.73	0.58	1.15	2.71	30.16	0.43	0.50	4.21	2.10
4	Chan	74.73	77.44	0.69	1.29	2.71	36.36	0.48	0.54	4.71	2.54
5	Chan	77.44	80.15	0.16	0.40	1.30	8.44	0.35	0.40	3.05	1.23

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	66.60	69.31	1.57	2.13	2.88	7.11	0.90	0.74	8.20	6.04
2	Chan	69.31	72.02	5.78	4.56	2.73	26.16	1.68	1.27	18.50	23.46
3	Chan	72.02	74.73	6.11	4.70	2.71	27.63	1.74	1.30	19.19	24.94
4	Chan	74.73	77.44	6.41	4.84	2.71	28.99	1.79	1.32	19.75	26.16
5	Chan	77.44	80.15	2.23	2.72	3.11	10.11	1.14	0.82	9.66	7.94

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	66.60	69.31	2.77	2.99	3.36	8.21	1.10	0.93	12.31	11.38
2	Chan	69.31	72.02	8.72	5.48	2.73	25.86	2.02	1.59	27.76	44.16
3	Chan	72.02	74.73	9.13	5.62	2.71	27.09	2.07	1.62	28.65	46.55
4	Chan	74.73	77.44	9.50	5.76	2.71	28.20	2.13	1.65	29.35	48.45
5	Chan	77.44	80.15	3.58	3.58	3.58	10.63	1.32	1.00	13.84	13.84

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	54.92	60.76	0.04	0.25	2.92	0.06	0.09	0.16	1.92	0.32
2	LOB	60.76	66.60	0.82	1.99	5.85	1.21	0.34	0.41	7.70	3.19
3	Chan	66.60	69.31	6.80	4.37	3.36	9.95	1.62	1.56	29.48	45.85
4	Chan	69.31	72.02	16.55	6.86	2.73	24.20	2.53	2.41	56.96	137.44
5	Chan	72.02	74.73	17.19	7.00	2.71	25.14	2.58	2.46	58.49	143.66
6	Chan	74.73	77.44	17.76	7.14	2.71	25.96	2.64	2.49	59.64	148.37
7	Chan	77.44	80.15	8.06	4.96	3.58	11.78	1.83	1.62	31.42	51.00
8	ROB	80.15	91.62	1.17	3.01	11.48	1.70	0.26	0.39	5.94	2.30
9	ROB	91.62	103.08	0.00	0.00	0.32	0.00	0.01	0.03	0.16	0.01

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 786

INPUT

Description: p14

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	849.686	46.694	849.706	49.383	849.613	55.1	849.679	57.992	849.748

60.688 849.697 93.414 849 94.218 848 94.945 847 95.614 846.9
102.69 846.85 107.48 849.16 130.279 848.977 134.369 849.29 173.708 849.375
183.055 849.036 226.114 849.29 232.857 851.142 234.337 851

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 93.414 .035 107.48 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
93.414 107.48 84.07 73.66 45.06 .1 .3
Right Levee Station= 134.37 Elevation= 849.29

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	847.26	Reach Len. (m)	84.07	73.66	45.06
Crit W.S. (m)	847.06	Flow Area (m2)		3.14	
E.G. Slope (m/m)	0.001844	Area (m2)		3.14	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	8.79	Top Width (m)	8.79		
Vel Total (m/s)	0.61	Avg. Vel. (m/s)	0.61		
Max Chl Dpth (m)	0.41	Hydr. Depth (m)	0.36		
Conv. Total (m3/s)	44.5	Conv. (m3/s)	44.5		
Length Wtd. (m)	73.66	Wetted Per. (m)	9.02		
Min Ch El (m)	846.85	Shear (N/m2)	6.30		
Alpha	1.00	Stream Power (N/m s)	11219.55	0.00	6433.34
Frctn Loss (m)	0.05	Cum Volume (1000 m3)		2.73	
C & E Loss (m)	0.00	Cum SA (1000 m2)		7.38	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	848.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.	0.035		
W.S. Elev (m)	848.56	Reach Len. (m)	84.07	73.66	45.06
Crit W.S. (m)	847.77	Flow Area (m2)		16.93	
E.G. Slope (m/m)	0.001567	Area (m2)		16.93	
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	12.47	Top Width (m)	12.47		
Vel Total (m/s)	1.31	Avg. Vel. (m/s)	1.31		
Max Chl Dpth (m)	1.71	Hydr. Depth (m)	1.36		
Conv. Total (m3/s)	558.4	Conv. (m3/s)	558.4		
Length Wtd. (m)	73.66	Wetted Per. (m)	13.64		
Min Ch El (m)	846.85	Shear (N/m2)	19.06		
Alpha	1.00	Stream Power (N/m s)	11219.55	0.00	6433.34
Frctn Loss (m)	0.13	Cum Volume (1000 m3)	4.26	14.85	6.39
C & E Loss (m)	0.01	Cum SA (1000 m2)	22.96	16.23	20.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.00	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.035		
W.S. Elev (m)	848.87	Reach Len. (m)	84.07	73.66	45.06
Crit W.S. (m)	848.05	Flow Area (m2)		20.89	

E.G. Slope (m/m)	0.002002	Area (m2)	20.89		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.35	Top Width (m)	13.35		
Vel Total (m/s)	1.61	Avg. Vel. (m/s)	1.61		
Max Chl Dpth (m)	2.02	Hydr. Depth (m)	1.56		
Conv. Total (m3/s)	753.1	Conv. (m3/s)	753.1		
Length Wtd. (m)	73.66	Wetted Per. (m)	14.75		
Min Ch El (m)	846.85	Shear (N/m2)	27.82		
Alpha	1.00	Stream Power (N/m s)	11219.55	0.00	6433.34
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	11.29	19.08	13.05
C & E Loss (m)	0.02	Cum SA (1000 m2)	29.47	17.94	31.39

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	849.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.36	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	849.17	Reach Len. (m)	84.07	73.66	45.06
Crit W.S. (m)	848.67	Flow Area (m2)	0.71	25.12	2.66
E.G. Slope (m/m)	0.004670	Area (m2)	0.71	25.12	2.66
Q Total (m3/s)	68.40	Flow (m3/s)	0.19	67.40	0.81
Top Width (m)	47.61	Top Width (m)	8.18	14.07	25.37
Vel Total (m/s)	2.40	Avg. Vel. (m/s)	0.27	2.68	0.30
Max Chl Dpth (m)	2.32	Hydr. Depth (m)	0.09	1.79	0.10
Conv. Total (m3/s)	1000.9	Conv. (m3/s)	2.8	986.2	11.8
Length Wtd. (m)	73.56	Wetted Per. (m)	8.18	15.59	25.38
Min Ch El (m)	846.85	Shear (N/m2)	3.99	73.79	4.80
Alpha	1.23	Stream Power (N/m s)	11219.55	0.00	6433.34
Frctn Loss (m)	0.31	Cum Volume (1000 m3)	34.34	27.18	36.96
C & E Loss (m)	0.06	Cum SA (1000 m2)	48.87	18.39	46.33

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv Depth(m)		(m/s)	(N/m2)	(N/m s)
1	Chan	93.41	96.23	0.24	0.46	1.61	12.49	0.31	0.52	5.12	2.68
2	Chan	96.23	99.04	0.67	1.06	2.81	34.98	0.38	0.63	6.80	4.30
3	Chan	99.04	101.85	0.73	1.11	2.81	38.12	0.40	0.65	7.16	4.68
4	Chan	101.85	104.67	0.28	0.52	1.78	14.40	0.31	0.53	5.25	2.79

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv Depth(m)		(m/s)	(N/m2)	(N/m s)
1	Chan	93.41	96.23	2.97	2.99	3.24	13.45	1.22	0.99	14.17	14.08
2	Chan	96.23	99.04	6.96	4.71	2.81	31.50	1.67	1.48	25.72	38.01
3	Chan	99.04	101.85	7.10	4.77	2.81	32.12	1.69	1.49	26.02	38.77

4	Chan	101.85	104.67	4.76	3.87	3.03	21.56	1.37	1.23	19.59	24.15
5	Chan	104.67	107.48	0.30	0.59	1.74	1.37	0.38	0.51	5.23	2.68

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	93.41	96.23	4.56	3.79	3.64	13.55	1.40	1.21	20.43	24.64
2	Chan	96.23	99.04	10.32	5.57	2.81	30.63	1.98	1.85	38.91	72.06
3	Chan	99.04	101.85	10.50	5.63	2.81	31.15	2.00	1.86	39.30	73.27
4	Chan	101.85	104.67	7.47	4.73	3.03	22.17	1.68	1.58	30.64	48.40
5	Chan	104.67	107.48	0.84	1.17	2.45	2.50	0.53	0.72	9.41	6.76

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	84.07	93.41	0.19	0.71	8.18	0.28	0.09	0.27	3.99	1.07
2	Chan	93.41	96.23	9.48	4.64	3.81	13.86	1.65	2.04	55.83	114.01
3	Chan	96.23	99.04	20.01	6.44	2.81	29.25	2.29	3.11	104.81	325.76
4	Chan	99.04	101.85	20.30	6.49	2.81	29.68	2.31	3.13	105.72	330.49
5	Chan	101.85	104.67	15.06	5.59	3.03	22.02	1.99	2.69	84.52	227.59
6	Chan	104.67	107.48	2.55	1.95	3.12	3.72	0.69	1.31	28.57	37.33
7	ROB	107.48	120.93	0.19	0.92	13.45	0.28	0.07	0.21	3.12	0.66
8	ROB	120.93	134.37	0.62	1.75	11.94	0.90	0.15	0.35	6.70	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 713

INPUT

Description: p13

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	849.253	4.987	849	41.784	848.857	44.536	848.763	65.7	848
66.19	847	66.701	846.5	74.106	846.65	74.716	847	75.496	848
79.841	849.114	120.383	849.049	137.209	848.875	201.212	849	202.962	849.12
208.888	850								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	44.536	.035	79.841	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

44.536 79.841 75 75 75 .1 .3

Right Levee Station= 79.84 Elevation= 849.11

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	847.22	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	846.76	Flow Area (m2)		5.30	
E.G. Slope (m/m)	0.000340	Area (m2)		5.30	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	8.81	Top Width (m)	8.81		
Vel Total (m/s)	0.36	Avg. Vel. (m/s)	0.36		
Max Chl Dpth (m)	0.72	Hydr. Depth (m)	0.60		
Conv. Total (m3/s)	103.6	Conv. (m3/s)	103.6		
Length Wtd. (m)	75.00	Wetted Per. (m)	9.35		
Min Ch El (m)	846.50	Shear (N/m2)	1.89		
Alpha	1.00	Stream Power (N/m s)	10001.11	0.00	3822.57
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	2.42		
C & E Loss (m)	0.00	Cum SA (1000 m2)	6.73		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	848.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035		
W.S. Elev (m)	848.45	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	847.49	Flow Area (m2)		20.07	
E.G. Slope (m/m)	0.002033	Area (m2)		20.07	
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	23.92	Top Width (m)	23.92		
Vel Total (m/s)	1.10	Avg. Vel. (m/s)	1.10		
Max Chl Dpth (m)	1.95	Hydr. Depth (m)	0.84		
Conv. Total (m3/s)	490.1	Conv. (m3/s)	490.1		
Length Wtd. (m)	75.00	Wetted Per. (m)	25.39		
Min Ch El (m)	846.50	Shear (N/m2)	15.76		
Alpha	1.00	Stream Power (N/m s)	10001.11	0.00	3822.57
Frctn Loss (m)	0.19	Cum Volume (1000 m3)	4.26	13.49	6.39
C & E Loss (m)	0.01	Cum SA (1000 m2)	22.96	14.89	20.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.035		
W.S. Elev (m)	848.76	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	847.77	Flow Area (m2)		29.13	
E.G. Slope (m/m)	0.002122	Area (m2)		29.13	
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	33.85	Top Width (m)	33.85		
Vel Total (m/s)	1.16	Avg. Vel. (m/s)	1.16		
Max Chl Dpth (m)	2.26	Hydr. Depth (m)	0.86		
Conv. Total (m3/s)	731.5	Conv. (m3/s)	731.5		
Length Wtd. (m)	75.00	Wetted Per. (m)	35.37		
Min Ch El (m)	846.50	Shear (N/m2)	17.15		
Alpha	1.00	Stream Power (N/m s)	10001.11	0.00	3822.57
Frctn Loss (m)	0.28	Cum Volume (1000 m3)	11.29	17.24	13.05
C & E Loss (m)	0.03	Cum SA (1000 m2)	29.47	16.20	31.39

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	849.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	849.00	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	848.59	Flow Area (m2)	2.98	37.22	
E.G. Slope (m/m)	0.003936	Area (m2)	2.98	37.22	
Q Total (m3/s)	68.40	Flow (m3/s)	0.68	67.72	
Top Width (m)	73.22	Top Width (m)	38.38	34.84	
Vel Total (m/s)	1.70	Avg. Vel. (m/s)	0.23	1.82	
Max Chl Dpth (m)	2.50	Hydr. Depth (m)	0.08	1.07	
Conv. Total (m3/s)	1090.3	Conv. (m3/s)	10.8	1079.5	
Length Wtd. (m)	75.00	Wetted Per. (m)	38.38	36.39	
Min Ch El (m)	846.50	Shear (N/m2)	2.99	39.47	
Alpha	1.13	Stream Power (N/m s)	10001.11	0.00	3822.57
Frctn Loss (m)	0.29	Cum Volume (1000 m3)	34.18	24.88	36.90
C & E Loss (m)	0.00	Cum SA (1000 m2)	46.91	16.59	45.76

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	65.72	72.78	1.59	4.26	7.04	83.39	0.64	0.37	2.02	0.75
2	Chan	72.78	79.84	0.32	1.04	2.31	16.61	0.49	0.31	1.49	0.46

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	51.60	58.66	0.10	0.51	5.34	0.47	0.10	0.20	1.92	0.39
2	Chan	58.66	65.72	1.01	2.26	7.09	4.58	0.32	0.45	6.35	2.85
3	Chan	65.72	72.78	16.98	12.78	7.87	76.82	1.81	1.33	32.39	43.03
4	Chan	72.78	79.84	4.01	4.52	5.10	18.13	1.01	0.89	17.67	15.68

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	44.54	51.60	0.22	0.88	6.99	0.65	0.13	0.25	2.62	0.65
2	Chan	51.60	58.66	1.39	2.68	7.07	4.13	0.38	0.52	7.89	4.10



3	Chan	58.66	65.72	3.27	4.47	7.09	9.71	0.63	0.73	13.14	9.61
4	Chan	65.72	72.78	22.91	15.00	7.87	67.97	2.12	1.53	39.68	60.61
5	Chan	72.78	79.84	5.91	6.11	6.36	17.54	1.08	0.97	19.99	19.34

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	4.45	8.91	0.00	0.01	2.75	0.00	0.01	0.03	0.21	0.01
2	LOB	8.91	13.36	0.01	0.09	4.45	0.01	0.02	0.07	0.75	0.06
3	LOB	13.36	17.81	0.02	0.16	4.45	0.03	0.04	0.11	1.41	0.16
4	LOB	17.81	22.27	0.04	0.24	4.45	0.05	0.05	0.15	2.08	0.31
5	LOB	22.27	26.72	0.06	0.32	4.45	0.08	0.07	0.18	2.75	0.49
6	LOB	26.72	31.18	0.08	0.39	4.45	0.12	0.09	0.21	3.42	0.70
7	LOB	31.18	35.63	0.11	0.47	4.45	0.16	0.11	0.23	4.09	0.95
8	LOB	35.63	40.08	0.14	0.55	4.45	0.21	0.12	0.26	4.75	1.22
9	LOB	40.08	44.54	0.23	0.74	4.46	0.34	0.17	0.31	6.41	2.00
10	Chan	44.54	51.60	1.92	2.54	7.07	2.81	0.36	0.76	13.87	10.51
11	Chan	51.60	58.66	4.70	4.34	7.07	6.87	0.61	1.08	23.69	25.65
12	Chan	58.66	65.72	8.35	6.14	7.09	12.21	0.87	1.36	33.40	45.48
13	Chan	65.72	72.78	41.17	16.66	7.87	60.19	2.36	2.47	81.72	202.00
14	Chan	72.78	79.84	11.58	7.55	7.31	16.92	1.14	1.53	39.89	61.14

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 638

INPUT

Description: p12

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0 848.394	40.939	848.33	43.501	848.274	69.633	848	70.366	847	
71.043	846.463	77.263	846.85	78.061	847	78.893	848	82.575	848.249
203.281	849	206.301	849	210.54	849.92	213.776	849	871	

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	69.633	.035	78.893	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	69.633	78.893		75	75	.1	.3	

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	847.17	Reach Len. (m)	75.00	75.00	75.00

Crit W.S. (m)	Flow Area (m2)	3.74		
E.G. Slope (m/m)	0.000932	Area (m2)	3.74	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91	
Top Width (m)	7.97	Top Width (m)	7.97	
Vel Total (m/s)	0.51	Avg. Vel. (m/s)	0.51	
Max Chl Dpth (m)	0.71	Hydr. Depth (m)	0.47	
Conv. Total (m3/s)	62.6	Conv. (m3/s)	62.6	
Length Wtd. (m)	75.00	Wetted Per. (m)	8.35	
Min Ch El (m)	846.46	Shear (N/m2)	4.10	
Alpha	1.00	Stream Power (N/m s)	10235.14	0.00 0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	2.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)	6.10	

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	848.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.15	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	Flow Area (m2)	1.08	12.25	0.17	
E.G. Slope (m/m)	0.003157	Area (m2)	1.08	12.25	0.17
Q Total (m3/s)	22.10	Flow (m3/s)	0.22	21.85	0.03
Top Width (m)	25.80	Top Width (m)	14.32	9.26	2.22
Vel Total (m/s)	1.64	Avg. Vel. (m/s)	0.20	1.78	0.20
Max Chl Dpth (m)	1.69	Hydr. Depth (m)	0.08	1.32	0.08
Conv. Total (m3/s)	393.3	Conv. (m3/s)	3.8	388.9	0.6
Length Wtd. (m)	75.00	Wetted Per. (m)	14.32	10.45	2.23
Min Ch El (m)	846.46	Shear (N/m2)	2.32	36.28	2.32
Alpha	1.17	Stream Power (N/m s)	10235.14	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	4.22	12.27	6.39
C & E Loss (m)	0.05	Cum SA (1000 m2)	22.42	13.64	20.15

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.41	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.11	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	847.92	Flow Area (m2)	0.53	11.83	0.08
E.G. Slope (m/m)	0.008344	Area (m2)	0.53	11.83	0.08
Q Total (m3/s)	33.70	Flow (m3/s)	0.14	33.54	0.02
Top Width (m)	20.87	Top Width (m)	10.05	9.26	1.56
Vel Total (m/s)	2.71	Avg. Vel. (m/s)	0.26	2.84	0.26
Max Chl Dpth (m)	1.64	Hydr. Depth (m)	0.05	1.28	0.05
Conv. Total (m3/s)	368.9	Conv. (m3/s)	1.5	367.2	0.2
Length Wtd. (m)	75.00	Wetted Per. (m)	10.05	10.45	1.56
Min Ch El (m)	846.46	Shear (N/m2)	4.31	92.65	4.30
Alpha	1.09	Stream Power (N/m s)	10235.14	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	11.27	15.70	13.05
C & E Loss (m)	0.12	Cum SA (1000 m2)	29.10	14.58	31.34

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.68	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	848.68	Flow Area (m2)	28.11	17.14	16.90
E.G. Slope (m/m)	0.003762	Area (m2)	28.11	17.14	16.90
Q Total (m3/s)	68.40	Flow (m3/s)	18.78	41.79	7.83
Top Width (m)	151.69	Top Width (m)	69.63	9.26	72.80
Vel Total (m/s)	1.10	Avg. Vel. (m/s)	0.67	2.44	0.46
Max Chl Dpth (m)	2.22	Hydr. Depth (m)	0.40	1.85	0.23
Conv. Total (m3/s)	1115.2	Conv. (m3/s)	306.2	681.3	127.7
Length Wtd. (m)	75.00	Wetted Per. (m)	69.92	10.45	72.80
Min Ch El (m)	846.46	Shear (N/m2)	14.83	60.53	8.56
Alpha	3.12	Stream Power (N/m s)	10235.14	0.00	0.00
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	33.02	22.84	36.26
C & E Loss (m)	0.05	Cum SA (1000 m2)	42.86	14.93	43.03

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	69.63	71.49	0.28	0.62	1.52	14.83	0.50	0.46	3.72	1.70
2	Chan	71.49	73.34	0.71	1.16	1.86	36.99	0.63	0.61	5.71	3.48
3	Chan	73.34	75.19	0.50	0.95	1.86	26.35	0.51	0.53	4.66	2.48
4	Chan	75.19	77.04	0.33	0.73	1.86	17.21	0.40	0.45	3.61	1.62
5	Chan	77.04	78.89	0.09	0.28	1.26	4.62	0.24	0.31	2.07	0.64

Profile #50 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	LOB	48.74	55.71	0.00	0.00	0.40	0.00	0.00	0.02	0.06	0.00
2	LOB	55.71	62.67	0.03	0.28	6.96	0.15	0.04	0.12	1.26	0.15
3	LOB	62.67	69.63	0.18	0.79	6.96	0.82	0.11	0.23	3.52	0.81
4	Chan	69.63	71.49	3.00	2.18	2.55	13.59	1.18	1.38	26.46	36.52
5	Chan	71.49	73.34	6.22	2.97	1.86	28.13	1.60	2.10	49.49	103.73
6	Chan	73.34	75.19	5.49	2.75	1.86	24.84	1.49	1.99	45.94	91.60
7	Chan	75.19	77.04	4.80	2.54	1.86	21.72	1.37	1.89	42.38	80.09
8	Chan	77.04	78.89	2.34	1.81	2.34	10.58	0.98	1.29	23.98	31.00
9	ROB	78.89	92.38	0.03	0.17	2.23	0.15	0.08	0.20	2.32	0.46

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	55.71	62.67	0.01	0.05	3.09	0.02	0.02	0.10	1.32	0.14
2	LOB	62.67	69.63	0.13	0.48	6.96	0.39	0.07	0.27	5.63	1.54
3	Chan	69.63	71.49	4.57	2.09	2.55	13.56	1.13	2.18	67.26	146.82
4	Chan	71.49	73.34	9.62	2.88	1.86	28.56	1.56	3.34	127.16	424.40
5	Chan	73.34	75.19	8.47	2.67	1.86	25.13	1.44	3.17	117.76	373.39
6	Chan	75.19	77.04	7.37	2.46	1.86	21.87	1.33	3.00	108.36	325.04
7	Chan	77.04	78.89	3.51	1.73	2.34	10.41	0.93	2.03	60.47	122.97
8	ROB	78.89	92.38	0.02	0.08	1.56	0.06	0.05	0.26	4.30	1.10

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	6.96	1.01	2.02	7.25	1.48	0.29	0.50	10.29	5.14
2	LOB	6.96	13.93	1.10	2.10	6.96	1.61	0.30	0.53	11.11	5.85
3	LOB	13.93	20.89	1.17	2.17	6.96	1.71	0.31	0.54	11.52	6.20
4	LOB	20.89	27.85	1.24	2.25	6.96	1.81	0.32	0.55	11.92	6.57
5	LOB	27.85	34.82	1.31	2.33	6.96	1.92	0.33	0.56	12.32	6.94
6	LOB	34.82	41.78	1.39	2.41	6.96	2.03	0.35	0.58	12.76	7.36
7	LOB	41.78	48.74	1.93	2.93	6.96	2.82	0.42	0.66	15.53	10.21
8	LOB	48.74	55.71	2.54	3.46	6.96	3.71	0.50	0.73	18.32	13.44
9	LOB	55.71	62.67	3.19	3.97	6.96	4.66	0.57	0.80	21.01	16.90
10	LOB	62.67	69.63	3.90	4.47	6.96	5.70	0.64	0.87	23.70	20.66
11	Chan	69.63	71.49	6.17	3.16	2.55	9.03	1.70	1.96	45.72	89.43
12	Chan	71.49	73.34	11.06	3.95	1.86	16.18	2.13	2.80	78.46	219.99
13	Chan	73.34	75.19	10.09	3.73	1.86	14.75	2.02	2.70	74.22	200.53
14	Chan	75.19	77.04	9.14	3.52	1.86	13.37	1.90	2.60	69.98	181.81
15	Chan	77.04	78.89	5.32	2.79	2.34	7.78	1.51	1.91	44.05	84.06
16	ROB	78.89	92.38	3.54	5.96	13.50	5.18	0.44	0.59	16.29	9.68
17	ROB	92.38	105.87	2.15	4.41	13.49	3.14	0.33	0.49	12.07	5.87
18	ROB	105.87	119.36	1.31	3.28	13.49	1.91	0.24	0.40	8.97	3.58
19	ROB	119.36	132.85	0.65	2.15	13.49	0.94	0.16	0.30	5.87	1.77
20	ROB	132.85	146.33	0.19	1.02	13.49	0.27	0.08	0.18	2.78	0.51
21	ROB	146.33	159.82	0.01	0.09	5.35	0.01	0.02	0.07	0.61	0.04

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.



Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Jerga
REACH: Astorga RS: 563

INPUT

Description: p11

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.064	12.21	848	35.117	848.098	38.286	848	66.511	847
68.388	846.6	75.911	846.58	76.766	847	80.649	847.863	148.32	848
195.845	848.72	199.293	849	202.878	849.265	205.339	849.414		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	38.286	.035	80.649	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	38.286	80.649		39.35	37.53	34.15	.1	.3
Left Levee	Station=		35.12	Elevation=		848.1		

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	847.12	Reach Len. (m)	39.35	37.53	34.15
Crit W.S. (m)	846.77	Flow Area (m2)	5.09		
E.G. Slope (m/m)	0.000685	Area (m2)	5.09		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	14.14	Top Width (m)	14.14		
Vel Total (m/s)	0.38	Avg. Vel. (m/s)	0.38		
Max Chl Dpth (m)	0.54	Hydr. Depth (m)	0.36		
Conv. Total (m3/s)	73.0	Conv. (m3/s)	73.0		
Length Wtd. (m)	37.53	Wetted Per. (m)	14.29		
Min Ch El (m)	846.58	Shear (N/m2)	2.39		
Alpha	1.00	Stream Power (N/m s)	9831.19	1681.47	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	1.75		
C & E Loss (m)	0.00	Cum SA (1000 m2)	5.27		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	848.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.20	Reach Len. (m)	39.35	37.53	34.15
Crit W.S. (m)	847.41	Flow Area (m2)	5.94	38.64	19.39
E.G. Slope (m/m)	0.000329	Area (m2)	5.94	38.64	19.39
Q Total (m3/s)	22.10	Flow (m3/s)	0.62	18.76	2.72
Top Width (m)	161.44	Top Width (m)	38.29	42.36	80.79
Vel Total (m/s)	0.35	Avg. Vel. (m/s)	0.10	0.49	0.14
Max Chl Dpth (m)	1.62	Hydr. Depth (m)	0.16	0.91	0.24

Conv. Total (m3/s)	1218.0	Conv. (m3/s)	34.2	1034.0	149.7
Length Wtd. (m)	36.74	Wetted Per. (m)	38.43	42.62	80.79
Min Ch El (m)	846.58	Shear (N/m2)	0.50	2.93	0.77
Alpha	1.70	Stream Power (N/m s)	9831.19	1681.47	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	3.96	10.37	5.65
C & E Loss (m)	0.00	Cum SA (1000 m2)	20.45	11.71	17.03

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.28	Reach Len. (m)	39.35	37.53	34.15
Crit W.S. (m)	847.58	Flow Area (m2)	9.12	42.15	26.32
E.G. Slope (m/m)	0.000502	Area (m2)	9.12	42.15	26.32
Q Total (m3/s)	33.70	Flow (m3/s)	1.56	26.79	5.35
Top Width (m)	166.92	Top Width (m)	38.29	42.36	86.27
Vel Total (m/s)	0.43	Avg. Vel. (m/s)	0.17	0.64	0.20
Max Chl Dpth (m)	1.70	Hydr. Depth (m)	0.24	0.99	0.31
Conv. Total (m3/s)	1503.8	Conv. (m3/s)	69.8	1195.5	238.5
Length Wtd. (m)	36.73	Wetted Per. (m)	38.51	42.62	86.27
Min Ch El (m)	846.58	Shear (N/m2)	1.17	4.87	1.50
Alpha	1.74	Stream Power (N/m s)	9831.19	1681.47	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	10.91	13.68	12.06
C & E Loss (m)	0.00	Cum SA (1000 m2)	27.29	12.65	28.04

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.48	Reach Len. (m)	39.35	37.53	34.15
Crit W.S. (m)	847.99	Flow Area (m2)	16.86	50.72	45.12
E.G. Slope (m/m)	0.000845	Area (m2)	16.86	50.72	45.12
Q Total (m3/s)	68.40	Flow (m3/s)	5.63	47.30	15.47
Top Width (m)	180.28	Top Width (m)	38.29	42.36	99.63
Vel Total (m/s)	0.61	Avg. Vel. (m/s)	0.33	0.93	0.34
Max Chl Dpth (m)	1.90	Hydr. Depth (m)	0.44	1.20	0.45
Conv. Total (m3/s)	2353.6	Conv. (m3/s)	193.8	1627.6	532.3
Length Wtd. (m)	36.74	Wetted Per. (m)	38.71	42.62	99.63
Min Ch El (m)	846.58	Shear (N/m2)	3.61	9.86	3.75
Alpha	1.73	Stream Power (N/m s)	9831.19	1681.47	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	31.33	20.30	33.94
C & E Loss (m)	0.00	Cum SA (1000 m2)	38.81	13.00	36.57

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	55.23	63.70	0.00	0.01	0.54	0.01	0.01	0.03	0.06	0.00
2	Chan	63.70	72.18	0.95	2.77	8.52	49.60	0.33	0.34	2.19	0.75
3	Chan	72.18	80.65	0.96	2.31	5.23	50.39	0.45	0.42	2.96	1.24

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	3.90	0.05	0.57	4.04	0.25	0.14	0.10	0.45	0.04
2	LOB	3.90	7.80	0.07	0.65	3.90	0.31	0.17	0.11	0.53	0.06
3	LOB	7.80	11.71	0.08	0.73	3.90	0.38	0.19	0.12	0.60	0.07
4	LOB	11.71	15.61	0.09	0.75	3.90	0.40	0.19	0.12	0.62	0.07
5	LOB	15.61	19.51	0.08	0.69	3.90	0.35	0.18	0.11	0.57	0.06
6	LOB	19.51	23.41	0.07	0.62	3.90	0.30	0.16	0.10	0.51	0.05
7	LOB	23.41	27.32	0.05	0.56	3.90	0.25	0.14	0.10	0.46	0.04
8	LOB	27.32	31.22	0.04	0.49	3.90	0.20	0.13	0.09	0.41	0.04
9	LOB	31.22	35.12	0.03	0.43	3.90	0.16	0.11	0.08	0.35	0.03
10	LOB	35.12	38.29	0.05	0.47	3.17	0.22	0.15	0.10	0.48	0.05
11	Chan	38.29	46.76	0.69	2.96	8.48	3.13	0.35	0.23	1.13	0.26
12	Chan	46.76	55.23	1.95	5.50	8.48	8.82	0.65	0.35	2.09	0.74
13	Chan	55.23	63.70	3.67	8.04	8.48	16.62	0.95	0.46	3.06	1.40
14	Chan	63.70	72.18	7.06	11.93	8.52	31.95	1.41	0.59	4.52	2.68
15	Chan	72.18	80.65	5.39	10.21	8.67	24.38	1.21	0.53	3.80	2.01
16	ROB	80.65	93.12	0.65	4.03	12.47	2.95	0.32	0.16	1.04	0.17
17	ROB	93.12	105.59	0.57	3.71	12.47	2.58	0.30	0.15	0.96	0.15
18	ROB	105.59	118.06	0.49	3.40	12.47	2.22	0.27	0.14	0.88	0.13
19	ROB	118.06	130.52	0.42	3.08	12.47	1.89	0.25	0.14	0.80	0.11
20	ROB	130.52	142.99	0.35	2.77	12.47	1.58	0.22	0.13	0.72	0.09
21	ROB	142.99	155.46	0.22	2.12	12.47	1.01	0.17	0.11	0.55	0.06
22	ROB	155.46	167.93	0.01	0.27	5.98	0.05	0.05	0.04	0.15	0.01

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	3.90	0.14	0.89	4.12	0.42	0.23	0.16	1.06	0.17
2	LOB	3.90	7.80	0.17	0.97	3.90	0.51	0.25	0.18	1.22	0.22
3	LOB	7.80	11.71	0.19	1.05	3.90	0.58	0.27	0.19	1.32	0.25
4	LOB	11.71	15.61	0.20	1.07	3.90	0.60	0.28	0.19	1.36	0.26
5	LOB	15.61	19.51	0.18	1.01	3.90	0.54	0.26	0.18	1.27	0.23
6	LOB	19.51	23.41	0.16	0.94	3.90	0.48	0.24	0.17	1.19	0.21
7	LOB	23.41	27.32	0.15	0.88	3.90	0.43	0.23	0.16	1.11	0.18
8	LOB	27.32	31.22	0.13	0.81	3.90	0.38	0.21	0.16	1.03	0.16
9	LOB	31.22	35.12	0.11	0.75	3.90	0.33	0.19	0.15	0.94	0.14

10	LOB	35.12	38.29	0.12	0.74	3.17	0.37	0.23	0.17	1.14	0.19
11	Chan	38.29	46.76	1.24	3.66	8.48	3.67	0.43	0.34	2.13	0.72
12	Chan	46.76	55.23	2.98	6.20	8.48	8.86	0.73	0.48	3.60	1.73
13	Chan	55.23	63.70	5.29	8.75	8.48	15.70	1.03	0.61	5.08	3.07
14	Chan	63.70	72.18	9.73	12.63	8.52	28.88	1.49	0.77	7.30	5.63
15	Chan	72.18	80.65	7.54	10.91	8.67	22.38	1.29	0.69	6.20	4.29
16	ROB	80.65	93.12	1.17	5.06	12.47	3.48	0.41	0.23	2.00	0.46
17	ROB	93.12	105.59	1.05	4.75	12.47	3.13	0.38	0.22	1.88	0.42
18	ROB	105.59	118.06	0.94	4.43	12.47	2.79	0.36	0.21	1.75	0.37
19	ROB	118.06	130.52	0.83	4.12	12.47	2.47	0.33	0.20	1.63	0.33
20	ROB	130.52	142.99	0.73	3.80	12.47	2.16	0.31	0.19	1.50	0.29
21	ROB	142.99	155.46	0.53	3.16	12.47	1.58	0.25	0.17	1.25	0.21
22	ROB	155.46	167.93	0.08	0.99	11.46	0.24	0.09	0.08	0.43	0.04

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	3.90	0.52	1.68	4.32	0.76	0.43	0.31	3.22	0.99
2	LOB	3.90	7.80	0.60	1.76	3.90	0.88	0.45	0.34	3.73	1.27
3	LOB	7.80	11.71	0.65	1.84	3.90	0.94	0.47	0.35	3.90	1.37
4	LOB	11.71	15.61	0.66	1.86	3.90	0.96	0.48	0.35	3.96	1.40
5	LOB	15.61	19.51	0.62	1.80	3.90	0.91	0.46	0.35	3.82	1.32
6	LOB	19.51	23.41	0.59	1.73	3.90	0.86	0.44	0.34	3.68	1.24
7	LOB	23.41	27.32	0.55	1.67	3.90	0.80	0.43	0.33	3.54	1.17
8	LOB	27.32	31.22	0.51	1.60	3.90	0.75	0.41	0.32	3.40	1.09
9	LOB	31.22	35.12	0.48	1.54	3.90	0.70	0.39	0.31	3.26	1.02
10	LOB	35.12	38.29	0.46	1.38	3.17	0.67	0.44	0.33	3.60	1.20
11	Chan	38.29	46.76	3.12	5.37	8.48	4.56	0.63	0.58	5.25	3.05
12	Chan	46.76	55.23	5.95	7.92	8.48	8.70	0.93	0.75	7.73	5.81
13	Chan	55.23	63.70	9.47	10.46	8.48	13.84	1.23	0.91	10.22	9.25
14	Chan	63.70	72.18	15.98	14.34	8.52	23.36	1.69	1.11	13.95	15.54
15	Chan	72.18	80.65	12.78	12.63	8.67	18.68	1.49	1.01	12.07	12.21
16	ROB	80.65	93.12	2.93	7.59	12.47	4.29	0.61	0.39	5.04	1.95
17	ROB	93.12	105.59	2.73	7.27	12.47	3.99	0.58	0.38	4.83	1.81
18	ROB	105.59	118.06	2.54	6.96	12.47	3.71	0.56	0.36	4.62	1.69
19	ROB	118.06	130.52	2.35	6.64	12.47	3.44	0.53	0.35	4.41	1.56
20	ROB	130.52	142.99	2.17	6.33	12.47	3.17	0.51	0.34	4.20	1.44
21	ROB	142.99	155.46	1.81	5.68	12.47	2.65	0.46	0.32	3.77	1.20
22	ROB	155.46	167.93	0.81	3.51	12.47	1.19	0.28	0.23	2.33	0.54
23	ROB	167.93	180.40	0.13	1.15	12.35	0.19	0.09	0.11	0.77	0.09

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 526

INPUT

Description: p10 aguas arriba Camino Piedralba

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.232	21.62	848	69.865	847.98	86.298	848.03	87.472	847
94.801	846.5	95.199	847	97	847.5	107.221	847.6	134.922	847.553
159.947	848	170.464	848.332	196.008	848.828	217.017	849	221.231	849.061
223.091	849								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	86.298	.035	97	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

86.298	97	14.68	14.68	14.68	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev Permanent
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0	86.41	847.96	F
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95.59	223.091	847.96	F
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
97.1	104.2	851.5

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	847.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035		
W.S. Elev (m)	847.02	Reach Len. (m)	3.70	3.70	3.70
Crit W.S. (m)	846.91	Flow Area (m2)	2.11		
E.G. Slope (m/m)	0.006021	Area (m2)	2.11		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	7.84	Top Width (m)	7.84		
Vel Total (m/s)	0.90	Avg. Vel. (m/s)	0.90		
Max Chl Dpth (m)	0.52	Hydr. Depth (m)	0.27		
Conv. Total (m3/s)	24.6	Conv. (m3/s)	24.6		
Length Wtd. (m)	3.70	Wetted Per. (m)	8.11		
Min Ch El (m)	846.50	Shear (N/m2)	15.38		
Alpha	1.00	Stream Power (N/m s)	10681.13	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	1.62		
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.86		

DILIGENCIA para hacer constar que la presente documentación, relativa a la
 Revisión del P.O.O. de Asesoría, fue elaborada y firmada por el personal
 del Ayuntamiento de esta ciudad, de fecha 17.05.2018.



Asesora: 19 de mayo de 2018
 EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	848.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.17	Reach Len. (m)	3.70	3.70	3.70
Crit W.S. (m)	847.67	Flow Area (m2)	12.84	13.41	28.65
E.G. Slope (m/m)	0.000685	Area (m2)	12.84	13.41	28.65
Q Total (m3/s)	22.10	Flow (m3/s)	1.97	11.17	8.96
Top Width (m)	152.62	Top Width (m)	80.65	10.70	61.28
Vel Total (m/s)	0.40	Avg. Vel. (m/s)	0.15	0.83	0.31
Max Chl Dpth (m)	1.67	Hydr. Depth (m)	0.16	1.25	0.47
Conv. Total (m3/s)	844.4	Conv. (m3/s)	75.5	426.7	342.3
Length Wtd. (m)	3.70	Wetted Per. (m)	80.65	11.42	62.55
Min Ch El (m)	846.50	Shear (N/m2)	1.07	7.89	3.08
Alpha	2.42	Stream Power (N/m s)	10681.13	0.00	0.00

Frctn Loss (m)	0.01	Cum Volume (1000 m3)	3.59	9.39	4.83
C & E Loss (m)	0.01	Cum SA (1000 m2)	18.11	10.71	14.61

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.24	Reach Len. (m)	3.70	3.70	3.70
Crit W.S. (m)	847.96	Flow Area (m2)	18.51	14.14	32.88
E.G. Slope (m/m)	0.001094	Area (m2)	18.51	14.14	32.88
Q Total (m3/s)	33.70	Flow (m3/s)	4.39	15.41	13.91
Top Width (m)	160.42	Top Width (m)	86.30	10.70	63.42
Vel Total (m/s)	0.51	Avg. Vel. (m/s)	0.24	1.09	0.42
Max Chl Dpth (m)	1.74	Hydr. Depth (m)	0.21	1.32	0.52
Conv. Total (m3/s)	1018.9	Conv. (m3/s)	132.7	465.8	420.5
Length Wtd. (m)	3.70	Wetted Per. (m)	86.31	11.42	64.84
Min Ch El (m)	846.50	Shear (N/m2)	2.30	13.28	5.44
Alpha	2.36	Stream Power (N/m s)	10681.13	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	10.37	12.62	11.04
C & E Loss (m)	0.01	Cum SA (1000 m2)	24.83	11.65	25.49

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.41	Reach Len. (m)	3.70	3.70	3.70
Crit W.S. (m)	848.18	Flow Area (m2)	33.69	16.02	44.59
E.G. Slope (m/m)	0.001868	Area (m2)	33.69	16.02	44.59
Q Total (m3/s)	68.40	Flow (m3/s)	15.53	24.79	28.08
Top Width (m)	167.64	Top Width (m)	86.30	10.70	70.64
Vel Total (m/s)	0.73	Avg. Vel. (m/s)	0.46	1.55	0.63
Max Chl Dpth (m)	1.91	Hydr. Depth (m)	0.39	1.50	0.63
Conv. Total (m3/s)	1582.7	Conv. (m3/s)	359.4	573.6	649.7
Length Wtd. (m)	3.70	Wetted Per. (m)	86.48	11.42	72.40
Min Ch El (m)	846.50	Shear (N/m2)	7.14	25.70	11.28
Alpha	2.05	Stream Power (N/m s)	10681.13	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	30.34	19.05	32.41
C & E Loss (m)	0.00	Cum SA (1000 m2)	36.36	12.00	33.66

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	86.41	88.70	0.03	0.08	1.27	1.35	0.06	0.32	3.75	1.19	
2	Chan	88.70	91.00	0.28	0.43	2.30	14.49	0.19	0.65	10.93	7.10	
3	Chan	91.00	93.29	0.77	0.79	2.30	40.15	0.34	0.98	20.15	19.68	
4	Chan	93.29	95.59	0.84	0.82	2.24	44.02	0.41	1.02	21.66	22.20	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.63	0.00	0.05	2.98	0.01	0.02	0.03	0.11	0.00	
2	LOB	8.63	17.26	0.06	0.67	8.63	0.28	0.08	0.09	0.53	0.05	
3	LOB	17.26	25.89	0.20	1.38	8.63	0.92	0.16	0.15	1.07	0.16	
4	LOB	25.89	34.52	0.24	1.51	8.63	1.07	0.17	0.16	1.17	0.18	
5	LOB	34.52	43.15	0.24	1.54	8.63	1.11	0.18	0.16	1.20	0.19	
6	LOB	43.15	51.78	0.25	1.57	8.63	1.14	0.18	0.16	1.22	0.20	
7	LOB	51.78	60.41	0.26	1.60	8.63	1.18	0.19	0.16	1.25	0.20	
8	LOB	60.41	69.04	0.27	1.63	8.63	1.22	0.19	0.17	1.27	0.21	
9	LOB	69.04	77.67	0.25	1.56	8.63	1.13	0.18	0.16	1.21	0.19	
10	LOB	77.67	86.30	0.19	1.33	8.63	0.87	0.15	0.14	1.04	0.15	
11	Chan	86.30	86.41	0.00	0.02	0.15	0.02	0.19	0.20	0.96	0.19	
12	Chan	86.41	88.70	1.45	2.25	2.65	6.57	0.98	0.65	5.69	3.68	
13	Chan	88.70	91.00	2.67	3.06	2.30	12.10	1.33	0.87	8.94	7.81	
14	Chan	91.00	93.29	3.22	3.42	2.30	14.56	1.49	0.94	9.99	9.40	
15	Chan	93.29	95.59	3.03	3.44	2.55	13.73	1.50	0.88	9.05	7.98	
16	Chan	95.59	97.00	0.78	1.22	1.46	3.54	0.87	0.64	5.61	3.60	
17	ROB	97.00	109.61	0.95	3.21	6.78	4.31	0.58	0.30	3.18	0.94	
18	ROB	109.61	122.22	2.53	7.39	12.61	11.46	0.59	0.34	3.94	1.35	
19	ROB	122.22	134.83	2.69	7.66	12.61	12.17	0.61	0.35	4.08	1.43	
20	ROB	134.83	147.44	1.99	6.40	12.61	9.01	0.51	0.31	3.41	1.06	
21	ROB	147.44	160.05	0.75	3.56	12.61	3.39	0.28	0.21	1.89	0.40	
22	ROB	160.05	172.65	0.04	0.45	5.33	0.19	0.08	0.09	0.56	0.05	

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.63	0.04	0.46	8.64	0.12	0.05	0.09	0.57	0.05	
2	LOB	8.63	17.26	0.22	1.26	8.63	0.65	0.15	0.17	1.57	0.27	
3	LOB	17.26	25.89	0.46	1.96	8.63	1.37	0.23	0.23	2.44	0.57	
4	LOB	25.89	34.52	0.51	2.09	8.63	1.52	0.24	0.24	2.60	0.64	
5	LOB	34.52	43.15	0.53	2.12	8.63	1.56	0.25	0.25	2.64	0.65	
6	LOB	43.15	51.78	0.54	2.15	8.63	1.60	0.25	0.25	2.68	0.67	
7	LOB	51.78	60.41	0.55	2.19	8.63	1.64	0.25	0.25	2.72	0.68	
8	LOB	60.41	69.04	0.56	2.22	8.63	1.67	0.26	0.25	2.75	0.70	
9	LOB	69.04	77.67	0.53	2.14	8.63	1.58	0.25	0.25	2.66	0.66	
10	LOB	77.67	86.30	0.44	1.92	8.63	1.31	0.22	0.23	2.38	0.55	

11	Chan	86.30	86.41	0.01	0.03	0.15	0.03	0.26	0.31	2.08	0.64
12	Chan	86.41	88.70	2.06	2.40	2.65	6.11	1.05	0.86	9.72	8.34
13	Chan	88.70	91.00	3.68	3.22	2.30	10.93	1.40	1.14	15.00	17.17
14	Chan	91.00	93.29	4.39	3.58	2.30	13.03	1.56	1.23	16.67	20.48
15	Chan	93.29	95.59	4.14	3.60	2.55	12.28	1.57	1.15	15.11	17.38
16	Chan	95.59	97.00	1.13	1.32	1.46	3.34	0.93	0.85	9.66	8.25
17	ROB	97.00	109.61	1.43	3.58	6.92	4.24	0.65	0.40	5.55	2.21
18	ROB	109.61	122.22	3.84	8.24	12.61	11.40	0.65	0.47	7.01	3.27
19	ROB	122.22	134.83	4.05	8.51	12.61	12.02	0.68	0.48	7.24	3.45
20	ROB	134.83	147.44	3.10	7.25	12.61	9.20	0.57	0.43	6.17	2.64
21	ROB	147.44	160.05	1.35	4.41	12.61	4.02	0.35	0.31	3.75	1.15
22	ROB	160.05	172.65	0.13	0.88	7.48	0.39	0.12	0.15	1.26	0.19

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.63	0.62	1.98	8.81	0.91	0.23	0.31	4.11	1.29
2	LOB	8.63	17.26	1.11	2.78	8.63	1.62	0.32	0.40	5.89	2.36
3	LOB	17.26	25.89	1.62	3.48	8.63	2.37	0.40	0.46	7.39	3.43
4	LOB	25.89	34.52	1.72	3.61	8.63	2.51	0.42	0.48	7.66	3.65
5	LOB	34.52	43.15	1.74	3.64	8.63	2.55	0.42	0.48	7.73	3.70
6	LOB	43.15	51.78	1.77	3.67	8.63	2.59	0.43	0.48	7.79	3.75
7	LOB	51.78	60.41	1.79	3.70	8.63	2.62	0.43	0.48	7.86	3.81
8	LOB	60.41	69.04	1.82	3.73	8.63	2.66	0.43	0.49	7.92	3.86
9	LOB	69.04	77.67	1.76	3.66	8.63	2.57	0.42	0.48	7.77	3.73
10	LOB	77.67	86.30	1.58	3.43	8.63	2.31	0.40	0.46	7.29	3.36
11	Chan	86.30	86.41	0.03	0.05	0.15	0.04	0.43	0.57	5.97	3.40
12	Chan	86.41	88.70	3.50	2.80	2.65	5.12	1.22	1.25	19.39	24.24
13	Chan	88.70	91.00	5.89	3.62	2.30	8.62	1.58	1.63	28.82	46.92
14	Chan	91.00	93.29	6.90	3.98	2.30	10.09	1.73	1.73	31.68	54.94
15	Chan	93.29	95.59	6.49	4.00	2.55	9.49	1.74	1.62	28.69	46.57
16	Chan	95.59	97.00	1.97	1.57	1.46	2.88	1.11	1.26	19.60	24.68
17	ROB	97.00	109.61	2.65	4.55	7.27	3.87	0.83	0.58	11.46	6.67
18	ROB	109.61	122.22	7.34	10.46	12.61	10.73	0.83	0.70	15.19	10.67
19	ROB	122.22	134.83	7.66	10.73	12.61	11.20	0.85	0.71	15.59	11.13
20	ROB	134.83	147.44	6.22	9.47	12.61	9.09	0.75	0.66	13.75	9.03
21	ROB	147.44	160.05	3.43	6.63	12.61	5.02	0.53	0.52	9.63	4.99
22	ROB	160.05	172.65	0.77	2.71	12.61	1.13	0.22	0.29	3.94	1.12
23	ROB	172.65	185.26	0.00	0.04	2.08	0.00	0.02	0.06	0.37	0.02

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 520

INPUT

Description: Camino Piedralba

Distance from Upstream XS = 3.7

Deck/Roadway Width = 5.3

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 7

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-----	---------	---------	-----	---------	---------	-----	---------	---------

0	847.96		60	847.94		81.49	847.93	847.68
---	--------	--	----	--------	--	-------	--------	--------

95.59	847.93	847.68	97	847.93		115	847.82	
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200	848.66							
-----	--------	--	--	--	--	--	--	--

Upstream Bridge Cross Section Data

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	848.232	21.62	848	69.865	847.98	86.298	848.03	87.472	847
---	---------	-------	-----	--------	--------	--------	--------	--------	-----

94.801	846.5	95.199	847	97	847.5	107.221	847.6	134.922	847.553
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159.947	848	170.464	848.332	196.008	848.828	217.017	849	221.231	849.061
---------	-----	---------	---------	---------	---------	---------	-----	---------	---------

223.091	849								
---------	-----	--	--	--	--	--	--	--	--

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-----	-------	-----	-------	-----	-------

0	.05	86.298	.035	97	.05
---	-----	--------	------	----	-----

Bank Sta: Left Right Coeff Contr. Expan.

86.298	97	.1	.3		
--------	----	----	----	--	--

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-------	-------	------	-----------

0	86.41	847.96	F
---	-------	--------	---

95.59	223.091	847.96	F
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
-------	-------	------

97.1	104.2	851.5
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Downstream Deck/Roadway Coordinates

num= 7

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-----	---------	---------	-----	---------	---------	-----	---------	---------

0	847.96		40	847.96		70	847.94	
---	--------	--	----	--------	--	----	--------	--

88.2	847.93	847.68	102.27	847.93	847.68	120	847.82	
------	--------	--------	--------	--------	--------	-----	--------	--

200	848.66							
-----	--------	--	--	--	--	--	--	--

Downstream Bridge Cross Section Data

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	847.87	89.092	847.764	89.88	847	90.865	846.49	101.724	846.51
---	--------	--------	---------	-------	-----	--------	--------	---------	--------

102.232	847	121.696	847.45	149.391	847.366	172.421	848	224.779	849.028
---------	-----	---------	--------	---------	---------	---------	-----	---------	---------

231.255	849	231.418	849.15	240.145	849.228				
---------	-----	---------	--------	---------	---------	--	--	--	--

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-----	-------	-----	-------	-----	-------

0	.05	89.092	.035	121.696	.05
---	-----	--------	------	---------	-----

Bank Sta: Left Right Coeff Contr. Expan.

89.092	121.696	.1	.3		
--------	---------	----	----	--	--

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-------	-------	------	-----------

0	88.2	847.93	F
---	------	--------	---

102.27	240.145	847.93	F
--------	---------	--------	---

Blocked Obstructions num= 1

Sta L	Sta R	Elev
-------	-------	------

.6	3	850.8
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Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 512

INPUT

Description: p9 aguas abajo Camino Piedralba

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.87	89.092	847.764	89.88	847	90.865	846.49	101.724	846.51
102.232	847	121.696	847.45	149.391	847.366	172.421	848	224.779	849.028
231.255	849	231.418	849.15	240.145	849.228				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	89.092	.035	121.696	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	89.092	121.696	60.22	49.19	25.67	.1	.3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 88.2 847.93 F

102.27 240.145 847.93 F

Blocked Obstructions num= 1

Sta L Sta R Elev

.6 3 850.8

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	846.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035		
W.S. Elev (m)	846.71	Reach Len. (m)	60.22	49.19	25.67
Crit W.S. (m)	846.64	Flow Area (m2)	2.38		
E.G. Slope (m/m)	0.006536	Area (m2)	2.38		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	11.50	Top Width (m)	11.50		
Vel Total (m/s)	0.80	Avg. Vel. (m/s)	0.80		
Max Chl Dpth (m)	0.22	Hydr. Depth (m)	0.21		
Conv. Total (m3/s)	23.6	Conv. (m3/s)	23.6		
Length Wtd. (m)	49.19	Wetted Per. (m)	11.64		
Min Ch El (m)	846.49	Shear (N/m2)	13.12		

Alpha	1.00	Stream Power (N/m s)	11497.63	0.00	0.00
Frctn Loss (m)	0.18	Cum Volume (1000 m3)		1.59	
C & E Loss (m)	0.00	Cum SA (1000 m2)		4.72	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	847.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.035		
W.S. Elev (m)	847.57	Reach Len. (m)	60.22	49.19	25.67
Crit W.S. (m)	847.22	Flow Area (m2)		13.04	
E.G. Slope (m/m)	0.003699	Area (m2)		19.73	5.25
Q Total (m3/s)	22.10	Flow (m3/s)		22.10	
Top Width (m)	67.52	Top Width (m)		32.40	35.11
Vel Total (m/s)	1.70	Avg. Vel. (m/s)		1.70	
Max Chl Dpth (m)	1.08	Hydr. Depth (m)		1.00	
Conv. Total (m3/s)	363.4	Conv. (m3/s)		363.4	
Length Wtd. (m)	49.44	Wetted Per. (m)		13.53	
Min Ch El (m)	846.49	Shear (N/m2)		34.95	
Alpha	1.00	Stream Power (N/m s)	11497.63	0.00	0.00
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	3.53	9.24	4.74
C & E Loss (m)	0.04	Cum SA (1000 m2)	17.63	10.49	14.22

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.	0.035		
W.S. Elev (m)	847.69	Reach Len. (m)	60.22	49.19	25.67
Crit W.S. (m)	847.45	Flow Area (m2)		14.65	
E.G. Slope (m/m)	0.005929	Area (m2)		23.76	9.88
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	72.14	Top Width (m)		32.53	39.61
Vel Total (m/s)	2.30	Avg. Vel. (m/s)		2.30	
Max Chl Dpth (m)	1.20	Hydr. Depth (m)		1.12	
Conv. Total (m3/s)	437.7	Conv. (m3/s)		437.7	
Length Wtd. (m)	49.19	Wetted Per. (m)		13.71	
Min Ch El (m)	846.49	Shear (N/m2)		62.15	
Alpha	1.00	Stream Power (N/m s)	11497.63	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	10.28	12.40	10.91
C & E Loss (m)	0.08	Cum SA (1000 m2)	24.32	11.49	25.05

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.39	Reach Len. (m)	60.22	49.19	25.67
Crit W.S. (m)	847.93	Flow Area (m2)	49.57	46.36	47.17
E.G. Slope (m/m)	0.000502	Area (m2)	49.57	46.36	47.17
Q Total (m3/s)	68.40	Flow (m3/s)	15.19	37.04	16.17
Top Width (m)	189.76	Top Width (m)	86.69	32.60	70.46
Vel Total (m/s)	0.48	Avg. Vel. (m/s)	0.31	0.80	0.34
Max Chl Dpth (m)	1.90	Hydr. Depth (m)	0.57	1.42	0.67
Conv. Total (m3/s)	3053.8	Conv. (m3/s)	678.3	1653.5	722.0
Length Wtd. (m)	46.68	Wetted Per. (m)	88.25	33.24	70.47
Min Ch El (m)	846.49	Shear (N/m2)	2.76	6.86	3.29
Alpha	1.73	Stream Power (N/m s)	11497.63	0.00	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	29.79	18.66	32.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	35.09	11.66	32.73

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	89.09	95.68	0.89	1.10	5.30	46.64	0.21	0.81	13.30	10.77
2	Chan	95.68	102.27	1.02	1.28	6.34	53.36	0.20	0.80	12.96	10.31

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater

than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	89.09	95.68	10.07	6.16	6.74	45.54	0.96	1.63	33.14	54.14
2	Chan	95.68	102.27	12.03	6.88	6.79	54.46	1.04	1.75	36.75	64.33
3	Chan	102.27	108.75	0.00	3.20	6.48	0.00	0.49	0.00	17.93	0.00
4	Chan	108.75	115.22	0.00	2.23	6.48	0.00	0.34	0.00	12.50	0.00
5	Chan	115.22	121.70	0.00	1.26	6.48	0.00	0.19	0.00	7.07	0.00
6	ROB	121.70	133.54	0.00	1.64	11.84	0.00	0.14	0.00	5.01	0.00
7	ROB	133.54	145.39	0.00	2.06	11.84	0.00	0.17	0.00	6.31	0.00
8	ROB	145.39	157.23	0.00	1.55	11.43	0.00	0.14	0.00	4.92	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	89.09	95.68	15.34	6.96	6.92	45.52	1.07	2.20	58.47	128.85
2	Chan	95.68	102.27	18.36	7.69	6.79	54.48	1.17	2.39	65.90	157.30
3	Chan	102.27	108.75	0.00	4.00	6.48	0.00	0.62	0.00	35.95	0.00

4	Chan	108.75	115.22	0.00	3.03	6.48	0.00	0.47	0.00	27.24	0.00
5	Chan	115.22	121.70	0.00	2.06	6.48	0.00	0.32	0.00	18.54	0.00
6	ROB	121.70	133.54	0.00	3.10	11.84	0.00	0.26	0.00	15.23	0.00
7	ROB	133.54	145.39	0.00	3.53	11.84	0.00	0.30	0.00	17.32	0.00
8	ROB	145.39	157.23	0.00	3.02	11.85	0.00	0.25	0.00	14.80	0.00
9	ROB	157.23	169.08	0.00	0.23	4.08	0.00	0.06	0.00	3.26	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.82	0.85	3.36	7.98	1.24	0.52	0.25	2.07	0.52
2	LOB	8.82	17.64	1.39	4.70	8.82	2.03	0.53	0.29	2.62	0.77
3	LOB	17.64	26.46	1.43	4.79	8.82	2.09	0.54	0.30	2.67	0.80
4	LOB	26.46	35.28	1.48	4.89	8.82	2.16	0.55	0.30	2.73	0.82
5	LOB	35.28	44.10	1.52	4.98	8.82	2.23	0.56	0.31	2.78	0.85
6	LOB	44.10	52.92	1.57	5.07	8.82	2.30	0.58	0.31	2.83	0.88
7	LOB	52.92	61.74	1.62	5.17	8.82	2.37	0.59	0.31	2.88	0.90
8	LOB	61.74	70.56	1.67	5.26	8.82	2.44	0.60	0.32	2.93	0.93
9	LOB	70.56	79.38	1.72	5.35	8.82	2.51	0.61	0.32	2.98	0.96
10	LOB	79.38	88.20	1.77	5.44	8.82	2.58	0.62	0.32	3.04	0.99
11	LOB	88.20	89.09	0.18	0.56	0.89	0.27	0.62	0.33	3.06	1.00
12	Chan	89.09	95.68	10.01	11.53	7.02	14.64	1.75	0.87	8.08	7.01
13	Chan	95.68	102.27	11.35	12.26	6.79	16.60	1.86	0.93	8.89	8.23
14	Chan	102.27	108.75	6.35	8.49	6.48	9.29	1.31	0.75	6.45	4.83
15	Chan	108.75	115.22	5.19	7.52	6.48	7.59	1.16	0.69	5.72	3.94
16	Chan	115.22	121.70	4.12	6.55	6.48	6.03	1.01	0.63	4.98	3.13
17	ROB	121.70	133.54	4.29	11.32	11.84	6.27	0.96	0.38	4.70	1.78
18	ROB	133.54	145.39	4.56	11.74	11.84	6.67	0.99	0.39	4.88	1.89
19	ROB	145.39	157.23	4.23	11.23	11.85	6.19	0.95	0.38	4.66	1.76
20	ROB	157.23	169.08	2.21	7.61	11.85	3.24	0.64	0.29	3.16	0.92
21	ROB	169.08	180.92	0.77	4.03	11.85	1.12	0.34	0.19	1.68	0.32
22	ROB	180.92	192.77	0.11	1.24	11.24	0.16	0.11	0.09	0.54	0.05

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 463

INPUT

Description: p8

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.472	3.127	847.249	32.48	847.22	42.839	847.22	69.599	847.383
87.621	847.44	89.528	847.51	91.952	847	92.854	846.272	99.224	846.003
100.157	847	105.634	847.341	135.591	847.263	188.593	848	217.267	848.922
224.636	849.15	225.322	849	236.383	849.111				

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val
0 .05 89.528 .035 105.634 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
89.528 105.634 71.66 73.89 78.45 .1 .3
Blocked Obstructions num= 1
Sta L Sta R Elev
82 85 851

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	846.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	846.54	Reach Len. (m)	71.66	73.89	78.45
Crit W.S. (m)		Flow Area (m2)	2.75		
E.G. Slope (m/m)	0.002266	Area (m2)	2.75		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	7.21	Top Width (m)	7.21		
Vel Total (m/s)	0.69	Avg. Vel. (m/s)	0.69		
Max Chl Dpth (m)	0.54	Hydr. Depth (m)	0.38		
Conv. Total (m3/s)	40.1	Conv. (m3/s)	40.1		
Length Wtd. (m)	73.89	Wetted Per. (m)	7.54		
Min Ch El (m)	846.00	Shear (N/m2)	8.10		
Alpha	1.00	Stream Power (N/m s)	11317.52	0.00	0.00
Frctn Loss (m)	0.23	Cum Volume (1000 m3)	1.46		
C & E Loss (m)	0.00	Cum SA (1000 m2)	4.26		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	847.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.54	Reach Len. (m)	71.66	73.89	78.45
Crit W.S. (m)		Flow Area (m2)	21.52	13.47	10.00
E.G. Slope (m/m)	0.001494	Area (m2)	21.52	13.47	10.00
Q Total (m3/s)	22.10	Flow (m3/s)	6.66	12.80	2.64
Top Width (m)	152.67	Top Width (m)	86.53	16.11	50.04
Vel Total (m/s)	0.49	Avg. Vel. (m/s)	0.31	0.95	0.26
Max Chl Dpth (m)	1.54	Hydr. Depth (m)	0.25	0.84	0.20
Conv. Total (m3/s)	571.8	Conv. (m3/s)	172.2	331.2	68.4
Length Wtd. (m)	74.65	Wetted Per. (m)	86.84	16.86	50.04
Min Ch El (m)	846.00	Shear (N/m2)	3.63	11.70	2.93
Alpha	2.32	Stream Power (N/m s)	11317.52	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	2.88	8.42	4.54
C & E Loss (m)	0.00	Cum SA (1000 m2)	15.02	9.29	13.13

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.80	Reach Len. (m)	71.66	73.89	78.45
Crit W.S. (m)		Flow Area (m2)	44.05	17.66	25.47
E.G. Slope (m/m)	0.000630	Area (m2)	44.05	17.66	25.47
Q Total (m3/s)	33.70	Flow (m3/s)	14.04	13.06	6.59
Top Width (m)	171.40	Top Width (m)	86.53	16.11	68.77

Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.32	0.74	0.26
Max Chl Dpth (m)	1.80	Hydr. Depth (m)	0.51	1.10	0.37
Conv. Total (m3/s)	1342.7	Conv. (m3/s)	559.5	520.5	262.8
Length Wtd. (m)	74.58	Wetted Per. (m)	87.62	16.86	68.77
Min Ch El (m)	846.00	Shear (N/m2)	3.11	6.47	2.29
Alpha	1.79	Stream Power (N/m s)	11317.52	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	8.96	11.38	10.46
C & E Loss (m)	0.00	Cum SA (1000 m2)	21.71	10.30	23.66

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.38	Reach Len. (m)	71.66	73.89	78.45
Crit W.S. (m)		Flow Area (m2)	93.94	26.95	74.13
E.G. Slope (m/m)	0.000258	Area (m2)	93.94	26.95	74.13
Q Total (m3/s)	68.40	Flow (m3/s)	31.28	16.90	20.22
Top Width (m)	197.38	Top Width (m)	86.53	16.11	94.75
Vel Total (m/s)	0.35	Avg. Vel. (m/s)	0.33	0.63	0.27
Max Chl Dpth (m)	2.38	Hydr. Depth (m)	1.09	1.67	0.78
Conv. Total (m3/s)	4259.0	Conv. (m3/s)	1947.8	1052.3	1258.8
Length Wtd. (m)	74.67	Wetted Per. (m)	89.35	16.86	94.76
Min Ch El (m)	846.00	Shear (N/m2)	2.66	4.04	1.98
Alpha	1.38	Stream Power (N/m s)	11317.52	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	25.47	16.86	30.46
C & E Loss (m)	0.00	Cum SA (1000 m2)	29.88	10.46	30.61

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	89.53	92.75	0.00	0.02	0.29	0.25	0.09	0.22	1.59	0.36
2	Chan	92.75	95.97	0.66	1.07	3.25	34.44	0.33	0.62	7.29	4.49
3	Chan	95.97	99.19	1.18	1.51	3.22	61.78	0.47	0.78	10.40	8.13
4	Chan	99.19	102.41	0.07	0.15	0.77	3.53	0.29	0.44	4.42	1.95

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.95	0.69	2.29	9.03	3.10	0.26	0.30	3.72	1.11
2	LOB	8.95	17.91	0.91	2.72	8.95	4.14	0.30	0.34	4.44	1.50
3	LOB	17.91	26.86	0.96	2.80	8.95	4.34	0.31	0.34	4.57	1.57
4	LOB	26.86	35.81	1.00	2.87	8.95	4.53	0.32	0.35	4.69	1.64
5	LOB	35.81	44.76	1.00	2.87	8.95	4.55	0.32	0.35	4.70	1.64
6	LOB	44.76	53.72	0.82	2.54	8.95	3.69	0.28	0.32	4.15	1.33
7	LOB	53.72	62.67	0.57	2.05	8.95	2.58	0.23	0.28	3.35	0.93
8	LOB	62.67	71.62	0.36	1.56	8.95	1.65	0.17	0.23	2.56	0.60
9	LOB	71.62	80.58	0.25	1.24	8.95	1.12	0.14	0.20	2.03	0.41
10	LOB	80.58	89.53	0.09	0.58	6.18	0.40	0.10	0.15	1.38	0.21

11	Chan	89.53	92.75	0.69	1.38	3.50	3.11	0.43	0.50	5.79	2.88
12	Chan	92.75	95.97	4.76	4.29	3.25	21.52	1.33	1.11	19.32	21.41
13	Chan	95.97	99.19	5.64	4.73	3.22	25.50	1.47	1.19	21.51	25.61
14	Chan	99.19	102.41	1.32	2.09	3.66	5.98	0.65	0.63	8.35	5.29
15	Chan	102.41	105.63	0.40	0.97	3.23	1.82	0.30	0.41	4.41	1.82
16	ROB	105.63	118.71	0.75	2.85	13.07	3.40	0.22	0.26	3.20	0.84
17	ROB	118.71	131.78	0.96	3.30	13.07	4.32	0.25	0.29	3.70	1.07
18	ROB	131.78	144.86	0.83	3.04	13.08	3.76	0.23	0.27	3.40	0.93
19	ROB	144.86	157.93	0.11	0.81	10.82	0.48	0.08	0.13	1.10	0.14

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.95	1.44	4.63	9.29	4.28	0.52	0.31	3.07	0.96	
2	LOB	8.95	17.91	1.71	5.05	8.95	5.08	0.56	0.34	3.48	1.18	
3	LOB	17.91	26.86	1.76	5.13	8.95	5.21	0.57	0.34	3.54	1.21	
4	LOB	26.86	35.81	1.80	5.20	8.95	5.34	0.58	0.35	3.59	1.24	
5	LOB	35.81	44.76	1.80	5.21	8.95	5.35	0.58	0.35	3.59	1.24	
6	LOB	44.76	53.72	1.61	4.87	8.95	4.78	0.54	0.33	3.36	1.11	
7	LOB	53.72	62.67	1.35	4.38	8.95	4.01	0.49	0.31	3.02	0.93	
8	LOB	62.67	71.62	1.11	3.90	8.95	3.30	0.44	0.29	2.69	0.77	
9	LOB	71.62	80.58	0.96	3.57	8.95	2.86	0.40	0.27	2.47	0.66	
10	LOB	80.58	89.53	0.49	2.13	6.71	1.46	0.36	0.23	1.96	0.45	
11	Chan	89.53	92.75	1.05	2.22	3.50	3.13	0.69	0.47	3.92	1.86	
12	Chan	92.75	95.97	4.46	5.13	3.25	13.23	1.59	0.87	9.74	8.46	
13	Chan	95.97	99.19	5.15	5.57	3.22	15.27	1.73	0.92	10.68	9.86	
14	Chan	99.19	102.41	1.62	2.92	3.66	4.79	0.91	0.55	4.94	2.73	
15	Chan	102.41	105.63	0.79	1.81	3.23	2.34	0.56	0.44	3.46	1.51	
16	ROB	105.63	118.71	1.73	6.26	13.07	5.14	0.48	0.28	2.96	0.82	
17	ROB	118.71	131.78	1.94	6.70	13.07	5.76	0.51	0.29	3.17	0.92	
18	ROB	131.78	144.86	1.82	6.44	13.08	5.39	0.49	0.28	3.04	0.86	
19	ROB	144.86	157.93	0.88	4.18	13.08	2.62	0.32	0.21	1.98	0.42	
20	ROB	157.93	171.01	0.22	1.81	13.08	0.65	0.14	0.12	0.85	0.10	
21	ROB	171.01	184.08	0.00	0.08	3.39	0.01	0.02	0.04	0.15	0.01	

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.95	3.11	9.79	9.87	4.55	1.09	0.32	2.51	0.80	
2	LOB	8.95	17.91	3.56	10.21	8.95	5.20	1.14	0.35	2.88	1.01	
3	LOB	17.91	26.86	3.61	10.29	8.95	5.27	1.15	0.35	2.91	1.02	
4	LOB	26.86	35.81	3.65	10.36	8.95	5.33	1.16	0.35	2.93	1.03	
5	LOB	35.81	44.76	3.65	10.37	8.95	5.34	1.16	0.35	2.93	1.03	
6	LOB	44.76	53.72	3.46	10.03	8.95	5.05	1.12	0.34	2.83	0.98	
7	LOB	53.72	62.67	3.18	9.54	8.95	4.65	1.07	0.33	2.70	0.90	
8	LOB	62.67	71.62	2.92	9.06	8.95	4.26	1.01	0.32	2.56	0.82	
9	LOB	71.62	80.58	2.74	8.73	8.95	4.01	0.98	0.31	2.47	0.78	
10	LOB	80.58	89.53	1.41	5.56	7.86	2.06	0.93	0.25	1.79	0.45	
11	Chan	89.53	92.75	1.97	4.08	3.50	2.88	1.27	0.48	2.95	1.42	
12	Chan	92.75	95.97	5.06	6.99	3.25	7.40	2.17	0.72	5.43	3.94	
13	Chan	95.97	99.19	5.64	7.43	3.22	8.25	2.31	0.76	5.83	4.43	
14	Chan	99.19	102.41	2.49	4.78	3.66	3.64	1.48	0.52	3.31	1.72	
15	Chan	102.41	105.63	1.74	3.67	3.23	2.54	1.14	0.47	2.87	1.36	

16	ROB	105.63	118.71	4.21	13.80	13.07	6.15	1.06	0.30	2.67	0.81
17	ROB	118.71	131.78	4.44	14.24	13.07	6.49	1.09	0.31	2.76	0.86
18	ROB	131.78	144.86	4.30	13.98	13.08	6.29	1.07	0.31	2.70	0.83
19	ROB	144.86	157.93	3.21	11.72	13.08	4.69	0.90	0.27	2.27	0.62
20	ROB	157.93	171.01	2.20	9.34	13.08	3.21	0.71	0.24	1.81	0.43
21	ROB	171.01	184.08	1.35	6.97	13.08	1.97	0.53	0.19	1.35	0.26
22	ROB	184.08	197.16	0.52	3.92	13.08	0.75	0.30	0.13	0.76	0.10
23	ROB	197.16	210.23	0.01	0.17	3.23	0.01	0.05	0.04	0.13	0.01

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 389

INPUT

Description: p7

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.5	96.357	847.19	97.832	847.277	99.3	847	100.896	846
106.49	845.9	109.209	847	113.571	846.915	173.057	847.156	190.173	847.474
195.217	847.737	211.262	847.93	213.795	847.96	217.101	848		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	97.832	.035	109.209	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	97.832	109.209	53.87	74.85	96.61	.1	.3	

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	846.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035		
W.S. Elev (m)	846.29	Reach Len. (m)	53.87	74.85	96.61
Crit W.S. (m)		Flow Area (m2)	2.18		
E.G. Slope (m/m)	0.004597	Area (m2)		2.18	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	7.04	Top Width (m)	7.04		
Vel Total (m/s)	0.87	Avg. Vel. (m/s)	0.87		
Max Chl Dpth (m)	0.39	Hydr. Depth (m)	0.31		
Conv. Total (m3/s)	28.2	Conv. (m3/s)	28.2		
Length Wtd. (m)	74.85	Wetted Per. (m)	7.20		
Min Ch El (m)	845.90	Shear (N/m2)	13.68		
Alpha	1.00	Stream Power (N/m s)	10394.34	0.00	0.00
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	1.28		
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.74		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	847.49	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.47	Reach Len. (m)	53.87	74.85	96.61
Crit W.S. (m)		Flow Area (m2)	12.56	13.32	30.77

E.G. Slope (m/m)	0.000760	Area (m2)	12.56	13.32	30.77
Q Total (m3/s)	22.10	Flow (m3/s)	1.88	11.30	8.91
Top Width (m)	180.77	Top Width (m)	88.62	11.38	80.76
Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.15	0.85	0.29
Max Chl Dpth (m)	1.57	Hydr. Depth (m)	0.14	1.17	0.38
Conv. Total (m3/s)	801.6	Conv. (m3/s)	68.3	410.0	323.3
Length Wtd. (m)	78.66	Wetted Per. (m)	88.63	11.91	80.77
Min Ch El (m)	845.90	Shear (N/m2)	1.06	8.34	2.84
Alpha	2.66	Stream Power (N/m s)	10394.34	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	1.66	7.43	2.94
C & E Loss (m)	0.00	Cum SA (1000 m2)	8.75	8.28	8.00

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.77	Reach Len. (m)	53.87	74.85	96.61
Crit W.S. (m)		Flow Area (m2)	42.15	16.77	56.27
E.G. Slope (m/m)	0.000311	Area (m2)	42.15	16.77	56.27
Q Total (m3/s)	33.70	Flow (m3/s)	8.47	10.62	14.61
Top Width (m)	198.31	Top Width (m)	97.83	11.38	89.10
Vel Total (m/s)	0.29	Avg. Vel. (m/s)	0.20	0.63	0.26
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	0.43	1.47	0.63
Conv. Total (m3/s)	1910.4	Conv. (m3/s)	479.9	602.2	828.2
Length Wtd. (m)	75.57	Wetted Per. (m)	98.11	11.91	89.11
Min Ch El (m)	845.90	Shear (N/m2)	1.31	4.30	1.93
Alpha	1.94	Stream Power (N/m s)	10394.34	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	5.87	10.11	7.25
C & E Loss (m)	0.00	Cum SA (1000 m2)	15.11	9.28	17.47

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.37	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.37	Reach Len. (m)	53.87	74.85	96.61
Crit W.S. (m)		Flow Area (m2)	100.12	23.51	118.09
E.G. Slope (m/m)	0.000150	Area (m2)	100.12	23.51	118.09
Q Total (m3/s)	68.40	Flow (m3/s)	24.77	12.96	30.66
Top Width (m)	217.10	Top Width (m)	97.83	11.38	107.89
Vel Total (m/s)	0.28	Avg. Vel. (m/s)	0.25	0.55	0.26
Max Chl Dpth (m)	2.47	Hydr. Depth (m)	1.02	2.07	1.09
Conv. Total (m3/s)	5581.6	Conv. (m3/s)	2021.7	1057.6	2502.3
Length Wtd. (m)	72.40	Wetted Per. (m)	98.70	11.91	108.27
Min Ch El (m)	845.90	Shear (N/m2)	1.49	2.91	1.61
Alpha	1.37	Stream Power (N/m s)	10394.34	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	18.52	15.00	22.92
C & E Loss (m)	0.00	Cum SA (1000 m2)	23.27	9.45	22.67

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv Depth(m)		(m/s)	(N/m2)	(N/m s)
1	Chan	100.11	102.38	0.40	0.53	2.04	20.85	0.27	0.76	11.61	8.80
2	Chan	102.38	104.66	0.71	0.78	2.28	37.09	0.34	0.91	15.36	14.03
3	Chan	104.66	106.93	0.78	0.83	2.31	40.86	0.36	0.94	16.13	15.23
4	Chan	106.93	109.21	0.02	0.06	0.57	1.20	0.11	0.40	4.48	1.80



Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	9.78	0.00	0.00	0.58	0.00	0.00	0.00	0.01	0.00	
2	LOB	9.78	19.57	0.01	0.17	9.78	0.02	0.02	0.03	0.13	0.00	
3	LOB	19.57	29.35	0.03	0.48	9.78	0.14	0.05	0.06	0.37	0.02	
4	LOB	29.35	39.13	0.07	0.79	9.78	0.31	0.08	0.09	0.60	0.05	
5	LOB	39.13	48.92	0.12	1.10	9.78	0.54	0.11	0.11	0.83	0.09	
6	LOB	48.92	58.70	0.18	1.40	9.78	0.81	0.14	0.13	1.07	0.14	
7	LOB	58.70	68.48	0.25	1.71	9.78	1.13	0.17	0.15	1.30	0.19	
8	LOB	68.48	78.27	0.33	2.02	9.78	1.48	0.21	0.16	1.54	0.25	
9	LOB	78.27	88.05	0.42	2.33	9.78	1.88	0.24	0.18	1.77	0.32	
10	LOB	88.05	97.83	0.49	2.57	9.79	2.22	0.26	0.19	1.96	0.37	
11	Chan	97.83	100.11	0.45	1.07	2.45	2.04	0.47	0.42	3.26	1.37	
12	Chan	100.11	102.38	2.77	3.17	2.42	12.52	1.39	0.87	9.77	8.53	
13	Chan	102.38	104.66	3.32	3.45	2.28	15.02	1.52	0.96	11.31	10.87	
14	Chan	104.66	106.93	3.37	3.50	2.31	15.24	1.54	0.96	11.30	10.86	
15	Chan	106.93	109.21	1.40	2.12	2.45	6.33	0.93	0.66	6.43	4.25	
16	ROB	109.21	120.00	1.92	5.72	10.79	8.71	0.53	0.34	3.95	1.33	
17	ROB	120.00	130.79	1.79	5.47	10.79	8.09	0.51	0.33	3.78	1.23	
18	ROB	130.79	141.58	1.54	5.00	10.79	6.96	0.46	0.31	3.46	1.06	
19	ROB	141.58	152.37	1.31	4.53	10.79	5.91	0.42	0.29	3.13	0.90	
20	ROB	152.37	163.16	1.09	4.06	10.79	4.92	0.38	0.27	2.81	0.75	
21	ROB	163.16	173.94	0.88	3.58	10.79	3.99	0.33	0.25	2.48	0.61	
22	ROB	173.94	184.73	0.37	2.13	10.79	1.68	0.20	0.17	1.47	0.26	
23	ROB	184.73	195.52	0.02	0.26	5.24	0.08	0.05	0.07	0.36	0.02	

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	9.78	0.42	2.84	10.06	1.25	0.29	0.15	0.86	0.13	
2	LOB	9.78	19.57	0.51	3.14	9.78	1.51	0.32	0.16	0.98	0.16	
3	LOB	19.57	29.35	0.59	3.45	9.78	1.76	0.35	0.17	1.08	0.19	
4	LOB	29.35	39.13	0.68	3.76	9.78	2.03	0.38	0.18	1.17	0.21	
5	LOB	39.13	48.92	0.78	4.07	9.78	2.31	0.42	0.19	1.27	0.24	
6	LOB	48.92	58.70	0.88	4.37	9.78	2.61	0.45	0.20	1.36	0.27	
7	LOB	58.70	68.48	0.99	4.68	9.78	2.93	0.48	0.21	1.46	0.31	
8	LOB	68.48	78.27	1.10	4.99	9.78	3.25	0.51	0.22	1.56	0.34	
9	LOB	78.27	88.05	1.21	5.30	9.78	3.60	0.54	0.23	1.65	0.38	
10	LOB	88.05	97.83	1.30	5.54	9.79	3.87	0.57	0.24	1.73	0.41	
11	Chan	97.83	100.11	0.68	1.76	2.45	2.01	0.77	0.38	2.20	0.85	
12	Chan	100.11	102.38	2.53	3.86	2.42	7.50	1.70	0.65	4.87	3.19	
13	Chan	102.38	104.66	2.96	4.14	2.28	8.78	1.82	0.71	5.56	3.97	
14	Chan	104.66	106.93	2.99	4.20	2.31	8.87	1.84	0.71	5.54	3.95	
15	Chan	106.93	109.21	1.47	2.81	2.45	4.37	1.23	0.52	3.49	1.83	
16	ROB	109.21	120.00	2.64	9.00	10.79	7.84	0.83	0.29	2.55	0.75	
17	ROB	120.00	130.79	2.52	8.75	10.79	7.48	0.81	0.29	2.48	0.71	
18	ROB	130.79	141.58	2.30	8.28	10.79	6.82	0.77	0.28	2.34	0.65	
19	ROB	141.58	152.37	2.09	7.81	10.79	6.19	0.72	0.27	2.21	0.59	
20	ROB	152.37	163.16	1.88	7.34	10.79	5.58	0.68	0.26	2.08	0.53	
21	ROB	163.16	173.94	1.68	6.86	10.79	4.99	0.64	0.24	1.94	0.48	
22	ROB	173.94	184.73	1.13	5.41	10.79	3.36	0.50	0.21	1.53	0.32	
23	ROB	184.73	195.52	0.37	2.77	10.80	1.10	0.26	0.13	0.78	0.10	
24	ROB	195.52	206.31	0.00	0.05	2.79	0.00	0.02	0.02	0.05	0.00	

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	9.78	1.83	8.63	10.65	2.67	0.88	0.21	1.19	0.25
2	LOB	9.78	19.57	2.05	8.94	9.78	3.00	0.91	0.23	1.35	0.31
3	LOB	19.57	29.35	2.17	9.25	9.78	3.17	0.95	0.23	1.39	0.33
4	LOB	29.35	39.13	2.29	9.56	9.78	3.35	0.98	0.24	1.44	0.35
5	LOB	39.13	48.92	2.42	9.87	9.78	3.53	1.01	0.25	1.49	0.36
6	LOB	48.92	58.70	2.54	10.17	9.78	3.72	1.04	0.25	1.53	0.38
7	LOB	58.70	68.48	2.67	10.48	9.78	3.91	1.07	0.26	1.58	0.40
8	LOB	68.48	78.27	2.81	10.79	9.78	4.10	1.10	0.26	1.62	0.42
9	LOB	78.27	88.05	2.94	11.10	9.78	4.30	1.13	0.27	1.67	0.44
10	LOB	88.05	97.83	3.05	11.34	9.79	4.45	1.16	0.27	1.71	0.46
11	Chan	97.83	100.11	1.24	3.11	2.45	1.82	1.37	0.40	1.87	0.75
12	Chan	100.11	102.38	2.96	5.21	2.42	4.33	2.29	0.57	3.17	1.80
13	Chan	102.38	104.66	3.36	5.49	2.28	4.92	2.41	0.61	3.55	2.18
14	Chan	104.66	106.93	3.38	5.54	2.31	4.94	2.44	0.61	3.53	2.16
15	Chan	106.93	109.21	2.01	4.16	2.45	2.94	1.83	0.48	2.49	1.21
16	ROB	109.21	120.00	4.52	15.39	10.79	6.61	1.43	0.29	2.10	0.62
17	ROB	120.00	130.79	4.40	15.15	10.79	6.43	1.40	0.29	2.07	0.60
18	ROB	130.79	141.58	4.17	14.67	10.79	6.10	1.36	0.28	2.00	0.57
19	ROB	141.58	152.37	3.95	14.20	10.79	5.78	1.32	0.28	1.94	0.54
20	ROB	152.37	163.16	3.74	13.73	10.79	5.46	1.27	0.27	1.87	0.51
21	ROB	163.16	173.94	3.52	13.26	10.79	5.15	1.23	0.27	1.81	0.48
22	ROB	173.94	184.73	2.90	11.80	10.79	4.24	1.09	0.25	1.61	0.40
23	ROB	184.73	195.52	1.90	9.16	10.80	2.78	0.85	0.21	1.25	0.26
24	ROB	195.52	206.31	0.95	6.06	10.79	1.40	0.56	0.16	0.83	0.13
25	ROB	206.31	217.10	0.60	4.66	11.16	0.88	0.43	0.13	0.61	0.08

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 314

INPUT

Description: p6

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.6	105.253	847.202	107.324	847.126	108.944	847.24	110.722	847.27
112.198	847	113.094	846	113.988	845.482	120.068	845.77	120.971	846
129.403	846.839	130.578	847	134.508	847	134.925	846.968	159.489	847.006
185.094	848.755	220.091	847.322						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	110.722	.035	130.578	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

110.722	130.578	99.53	145.33	198.5	.1	.3
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Right Levee Station= 185.09 Elevation= 848.76

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
137.5	156	852.6	172	182	849.5

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	846.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035		
W.S. Elev (m)	846.21	Reach Len. (m)	99.53	145.33	198.50
Crit W.S. (m)	845.83	Flow Area (m2)		4.48	
E.G. Slope (m/m)	0.000687	Area (m2)		4.48	
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	10.15	Top Width (m)	10.15		
Vel Total (m/s)	0.43	Avg. Vel. (m/s)	0.43		
Max Chl Dpth (m)	0.73	Hydr. Depth (m)	0.44		
Conv. Total (m3/s)	72.9	Conv. (m3/s)	72.9		
Length Wtd. (m)	145.33	Wetted Per. (m)	10.43		
Min Ch El (m)	845.48	Shear (N/m2)	2.89		
Alpha	1.00	Stream Power (N/m s)	10537.48	0.00	8861.72
Frctn Loss (m)	0.24	Cum Volume (1000 m3)	1.03		
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.09		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	847.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.40	Reach Len. (m)	99.53	145.33	198.50
Crit W.S. (m)	846.57	Flow Area (m2)	6.17	23.63	5.34
E.G. Slope (m/m)	0.000728	Area (m2)	6.17	23.63	5.34
Q Total (m3/s)	22.10	Flow (m3/s)	0.75	19.98	1.36
Top Width (m)	93.34	Top Width (m)	57.33	19.86	16.15
Vel Total (m/s)	0.63	Avg. Vel. (m/s)	0.12	0.85	0.25
Max Chl Dpth (m)	1.92	Hydr. Depth (m)	0.11	1.19	0.33
Conv. Total (m3/s)	819.3	Conv. (m3/s)	27.9	740.8	50.5
Length Wtd. (m)	146.19	Wetted Per. (m)	57.33	20.55	16.99
Min Ch El (m)	845.48	Shear (N/m2)	0.77	8.20	2.24
Alpha	1.65	Stream Power (N/m s)	10537.48	0.00	8861.72
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	1.16	6.05	1.20
C & E Loss (m)	0.03	Cum SA (1000 m2)	4.81	7.11	3.32

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.73	Reach Len. (m)	99.53	145.33	198.50
Crit W.S. (m)	846.80	Flow Area (m2)	37.92	30.29	11.58
E.G. Slope (m/m)	0.000420	Area (m2)	37.92	30.29	11.58
Q Total (m3/s)	33.70	Flow (m3/s)	7.60	22.97	3.13
Top Width (m)	151.64	Top Width (m)	110.72	19.86	21.06
Vel Total (m/s)	0.42	Avg. Vel. (m/s)	0.20	0.76	0.27
Max Chl Dpth (m)	2.25	Hydr. Depth (m)	0.34	1.53	0.55
Conv. Total (m3/s)	1643.9	Conv. (m3/s)	370.9	1120.6	152.5

Length Wtd. (m)	142.63	Wetted Per. (m)	110.86	20.55	22.58
Min Ch El (m)	845.48	Shear (N/m2)	1.41	6.07	2.11
Alpha	2.29	Stream Power (N/m s)	10537.48	0.00	8861.72
Frctn Loss (m)	0.16	Cum Volume (1000 m3)	3.71	8.35	3.98
C & E Loss (m)	0.04	Cum SA (1000 m2)	9.49	8.11	12.15

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.34	Reach Len. (m)	99.53	145.33	198.50
Crit W.S. (m)	847.43	Flow Area (m2)	105.60	42.43	25.48
E.G. Slope (m/m)	0.000230	Area (m2)	105.60	42.43	25.48
Q Total (m3/s)	68.40	Flow (m3/s)	30.92	29.83	7.65
Top Width (m)	153.50	Top Width (m)	110.72	19.86	22.92
Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.29	0.70	0.30
Max Chl Dpth (m)	2.86	Hydr. Depth (m)	0.95	2.14	1.11
Conv. Total (m3/s)	4506.4	Conv. (m3/s)	2037.2	1965.1	504.1
Length Wtd. (m)	145.77	Wetted Per. (m)	111.47	20.55	26.15
Min Ch El (m)	845.48	Shear (N/m2)	2.14	4.66	2.20
Alpha	1.70	Stream Power (N/m s)	10537.48	0.00	8861.72
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	12.97	12.53	15.98
C & E Loss (m)	0.00	Cum SA (1000 m2)	17.65	8.28	16.35

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	110.72	114.69	0.39	0.94	2.02	20.38	0.52	0.42	3.12	1.30
2	Chan	114.69	118.66	1.17	2.38	3.98	61.18	0.60	0.49	4.02	1.98
3	Chan	118.66	122.64	0.35	1.16	4.01	18.41	0.29	0.30	1.95	0.59
4	Chan	122.64	126.61	0.00	0.01	0.42	0.02	0.02	0.05	0.14	0.01

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	44.29	55.36	0.00	0.01	1.97	0.00	0.00	0.01	0.03	0.00
2	LOB	55.36	66.43	0.01	0.31	11.07	0.06	0.03	0.04	0.20	0.01



3	LOB	66.43	77.51	0.06	0.78	11.07	0.27	0.07	0.08	0.50	0.04
4	LOB	77.51	88.58	0.13	1.24	11.07	0.60	0.11	0.11	0.80	0.09
5	LOB	88.58	99.65	0.22	1.71	11.07	1.01	0.15	0.13	1.10	0.14
6	LOB	99.65	110.72	0.32	2.13	11.08	1.47	0.19	0.15	1.37	0.21
7	Chan	110.72	114.69	2.64	4.01	4.58	11.96	1.01	0.66	6.25	4.12
8	Chan	114.69	118.66	7.52	7.10	3.98	34.05	1.79	1.06	12.75	13.50
9	Chan	118.66	122.64	5.47	5.89	4.01	24.76	1.48	0.93	10.48	9.74
10	Chan	122.64	126.61	3.02	4.11	3.99	13.64	1.03	0.73	7.35	5.39
11	Chan	126.61	130.58	1.33	2.51	4.00	6.01	0.63	0.53	4.49	2.37
12	ROB	130.58	139.66	0.81	2.84	7.35	3.66	0.41	0.29	2.76	0.79
13	ROB	139.66	148.75					0.00	0.00		
14	ROB	148.75	157.83	0.18	0.73	2.23	0.84	0.40	0.25	2.32	0.59
15	ROB	157.83	166.92	0.37	1.78	7.41	1.67	0.24	0.21	1.71	0.35

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	11.07	0.19	1.71	11.21	0.56	0.15	0.11	0.63	0.07
2	LOB	11.07	22.14	0.28	2.17	11.07	0.84	0.20	0.13	0.81	0.10
3	LOB	22.14	33.22	0.39	2.64	11.07	1.15	0.24	0.15	0.98	0.14
4	LOB	33.22	44.29	0.51	3.10	11.07	1.51	0.28	0.16	1.15	0.19
5	LOB	44.29	55.36	0.64	3.56	11.07	1.90	0.32	0.18	1.33	0.24
6	LOB	55.36	66.43	0.79	4.03	11.07	2.34	0.36	0.20	1.50	0.29
7	LOB	66.43	77.51	0.94	4.49	11.07	2.80	0.41	0.21	1.67	0.35
8	LOB	77.51	88.58	1.11	4.96	11.07	3.30	0.45	0.22	1.84	0.41
9	LOB	88.58	99.65	1.29	5.42	11.07	3.83	0.49	0.24	2.02	0.48
10	LOB	99.65	110.72	1.46	5.84	11.08	4.34	0.53	0.25	2.17	0.54
11	Chan	110.72	114.69	3.32	5.35	4.58	9.86	1.35	0.62	4.81	2.99
12	Chan	114.69	118.66	7.81	8.43	3.98	23.17	2.12	0.93	8.74	8.09
13	Chan	118.66	122.64	5.99	7.22	4.01	17.77	1.82	0.83	7.42	6.16
14	Chan	122.64	126.61	3.75	5.44	3.99	11.13	1.37	0.69	5.62	3.87
15	Chan	126.61	130.58	2.10	3.85	4.00	6.24	0.97	0.55	3.97	2.17
16	ROB	130.58	139.66	1.55	5.16	7.68	4.61	0.75	0.30	2.77	0.83
17	ROB	139.66	148.75					0.00	0.00		
18	ROB	148.75	157.83	0.34	1.34	2.57	1.01	0.73	0.25	2.15	0.55
19	ROB	157.83	166.92	1.20	4.73	9.10	3.56	0.52	0.25	2.14	0.54
20	ROB	166.92	176.00	0.03	0.35	3.23	0.09	0.11	0.09	0.45	0.04

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	11.07	2.04	8.48	11.82	2.98	0.77	0.24	1.62	0.39

2	LOB	11.07	22.14	2.33	8.94	11.07	3.41	0.81	0.26	1.82	0.48
3	LOB	22.14	33.22	2.53	9.41	11.07	3.71	0.85	0.27	1.92	0.52
4	LOB	33.22	44.29	2.75	9.87	11.07	4.01	0.89	0.28	2.01	0.56
5	LOB	44.29	55.36	2.96	10.33	11.07	4.33	0.93	0.29	2.11	0.60
6	LOB	55.36	66.43	3.19	10.80	11.07	4.66	0.98	0.30	2.20	0.65
7	LOB	66.43	77.51	3.42	11.26	11.07	5.00	1.02	0.30	2.30	0.70
8	LOB	77.51	88.58	3.66	11.72	11.07	5.35	1.06	0.31	2.39	0.75
9	LOB	88.58	99.65	3.90	12.19	11.07	5.71	1.10	0.32	2.49	0.80
10	LOB	99.65	110.72	4.13	12.61	11.08	6.04	1.14	0.33	2.57	0.84
11	Chan	110.72	114.69	4.68	7.77	4.58	6.84	1.96	0.60	3.83	2.31
12	Chan	114.69	118.66	8.99	10.86	3.98	13.14	2.74	0.83	6.17	5.11
13	Chan	118.66	122.64	7.33	9.65	4.01	10.72	2.43	0.76	5.44	4.13
14	Chan	122.64	126.61	5.24	7.87	3.99	7.66	1.98	0.67	4.45	2.97
15	Chan	126.61	130.58	3.59	6.27	4.00	5.25	1.58	0.57	3.55	2.03
16	ROB	130.58	139.66	3.03	9.39	8.30	4.42	1.36	0.32	2.56	0.82
17	ROB	139.66	148.75					0.00	0.00		
18	ROB	148.75	157.83	0.62	2.46	3.18	0.90	1.34	0.25	1.75	0.44
19	ROB	157.83	166.92	3.31	10.28	9.10	4.83	1.13	0.32	2.55	0.82
20	ROB	166.92	176.00	0.70	3.34	5.58	1.03	0.66	0.21	1.35	0.29

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 300

INPUT

Description: p5.5 aguas arriba Sta. Clara

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.054	11.31	847.908	123.104	848.413	126.155	847.395	130.174	847.444
134.799	847.136	771	846.268	142.315	845.3	149.097	847.322	158.848	846.93
194.773	846.797	219.399	847.001	263.491	849.526				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	130.174	.035	149.097	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

130.174	149.097	15	15	15	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
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0	134.51	847.88	F
144.52	263.491	847.88	F

Left Levee Station= 123.1 Elevation= 848.41

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
18	37	850	167	217	854

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	845.98	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035		
W.S. Elev (m)	845.91	Reach Len. (m)	2.35	2.35	2.35
Crit W.S. (m)	845.82	Flow Area (m2)	1.71		

E.G. Slope (m/m)	0.007589	Area (m2)	1.71
Q Total (m3/s)	1.91	Flow (m3/s)	1.91
Top Width (m)	5.58	Top Width (m)	5.58
Vel Total (m/s)	1.11	Avg. Vel. (m/s)	1.11
Max Chl Dpth (m)	0.61	Hydr. Depth (m)	0.31
Conv. Total (m3/s)	21.9	Conv. (m3/s)	21.9
Length Wtd. (m)	2.35	Wetted Per. (m)	5.72
Min Ch El (m)	845.30	Shear (N/m2)	22.29
Alpha	1.00	Stream Power (N/m s)	12615.39 5893.76 0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.58
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.95

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	847.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.30	Wt. n-Val.	0.035		
W.S. Elev (m)	846.86	Reach Len. (m)	2.35	2.35	2.35
Crit W.S. (m)	846.69	Flow Area (m2)	9.12		
E.G. Slope (m/m)	0.007725	Area (m2)	10.48		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	12.35	Top Width (m)	12.35		
Vel Total (m/s)	2.42	Avg. Vel. (m/s)	2.42		
Max Chl Dpth (m)	1.56	Hydr. Depth (m)	0.98		
Conv. Total (m3/s)	251.4	Conv. (m3/s)	251.4		
Length Wtd. (m)	2.35	Wetted Per. (m)	9.62		
Min Ch El (m)	845.30	Shear (N/m2)	71.82		
Alpha	1.00	Stream Power (N/m s)	12615.39 5893.76 0.00		
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.85 3.57 0.67		
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.96 4.77 1.71		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.39	Wt. n-Val.	0.035		
W.S. Elev (m)	847.17	Reach Len. (m)	2.35	2.35	2.35
Crit W.S. (m)	847.00	Flow Area (m2)	12.23		
E.G. Slope (m/m)	0.007428	Area (m2)	14.82	3.55	
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	35.26	Top Width (m)	15.62	19.64	
Vel Total (m/s)	2.76	Avg. Vel. (m/s)	2.76		
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	1.22		
Conv. Total (m3/s)	391.0	Conv. (m3/s)	391.0		
Length Wtd. (m)	2.35	Wetted Per. (m)	10.32		
Min Ch El (m)	845.30	Shear (N/m2)	86.27		
Alpha	1.00	Stream Power (N/m s)	12615.39 5893.76 0.00		
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	1.82 5.07 2.47		
C & E Loss (m)	0.02	Cum SA (1000 m2)	3.98 5.53 8.11		

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.23	Reach Len. (m)	2.35	2.35	2.35
Crit W.S. (m)	847.64	Flow Area (m2)	4.31	34.41	37.70
E.G. Slope (m/m)	0.000960	Area (m2)	4.31	34.41	37.70
Q Total (m3/s)	68.40	Flow (m3/s)	2.00	44.56	21.84
Top Width (m)	67.24	Top Width (m)	6.53	18.92	41.79
Vel Total (m/s)	0.89	Avg. Vel. (m/s)	0.46	1.29	0.58
Max Chl Dpth (m)	2.93	Hydr. Depth (m)	0.66	1.82	0.90
Conv. Total (m3/s)	2207.3	Conv. (m3/s)	64.5	1438.0	704.7
Length Wtd. (m)	2.35	Wetted Per. (m)	6.66	19.45	44.41
Min Ch El (m)	845.30	Shear (N/m2)	6.10	16.66	7.99
Alpha	1.51	Stream Power (N/m s)	12615.39	5893.76	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	7.50	6.94	9.71
C & E Loss (m)	0.00	Cum SA (1000 m2)	11.82	5.46	9.92

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface

whose main channel velocity head was the closest to the previously computed cross section.

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	137.85	141.18	0.41	0.50	2.42	21.67	0.21	0.83	15.28	12.71
2	Chan	141.18	144.52	1.50	1.22	3.30	78.33	0.38	1.23	27.44	33.75

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	134.51	137.85	1.60	1.20	2.78	7.25	0.45	1.33	32.68	43.58
2	Chan	137.85	141.18	8.61	3.56	3.39	38.94	1.07	2.42	79.67	192.48
3	Chan	141.18	144.52	11.89	4.36	3.45	53.81	1.31	2.73	95.68	261.17
4	Chan	144.52	149.10	0.00	1.36	3.15	0.00	0.45	0.00	32.64	0.00

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	130.17	134.51	0.00	0.11	1.53	0.00	0.07	0.00	5.31	0.00
2	Chan	134.51	137.85	3.70	2.19	3.49	10.97	0.66	1.69	45.71	77.29

3	Chan	137.85	141.18	13.12	4.62	3.39	38.93	1.39	2.84	99.40	282.13
4	Chan	141.18	144.52	16.88	5.42	3.45	50.10	1.62	3.12	114.38	356.49
5	Chan	144.52	149.10	0.00	2.48	4.26	0.00	0.61	0.00	42.47	0.00
6	ROB	149.10	160.54	0.00	1.16	7.76	0.00	0.15	0.00	10.86	0.00
7	ROB	160.54	171.98	0.00	1.69	6.74	0.00	0.26	0.00	18.32	0.00
8	ROB	171.98	183.42					0.00	0.00		
9	ROB	183.42	194.85					0.00	0.00		
10	ROB	194.85	206.29					0.00	0.00		
11	ROB	206.29	217.73	0.00	0.14	0.93	0.00	0.19	0.00	10.95	0.00
12	ROB	217.73	229.17	0.00	0.56	4.69	0.00	0.12	0.00	8.71	0.00

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	123.10	130.17	2.00	4.31	6.66	2.92	0.66	0.46	6.10	2.83
2	Chan	130.17	134.51	3.58	4.32	4.36	5.24	1.00	0.83	9.33	7.74
3	Chan	134.51	137.85	6.63	5.72	3.49	9.69	1.71	1.16	15.44	17.91
4	Chan	137.85	141.18	12.21	8.15	3.39	17.85	2.44	1.50	22.66	33.95
5	Chan	141.18	144.52	14.09	8.94	3.45	20.59	2.68	1.57	24.42	38.45
6	Chan	144.52	149.10	8.05	7.29	4.78	11.78	1.59	1.11	14.36	15.88
7	ROB	149.10	160.54	8.35	12.98	11.45	12.21	1.13	0.64	10.68	6.87
8	ROB	160.54	171.98	5.36	8.53	7.80	7.83	1.32	0.63	10.30	6.47
9	ROB	171.98	183.42					0.00	0.00		
10	ROB	183.42	194.85					0.00	0.00		
11	ROB	194.85	206.29					0.00	0.00		
12	ROB	206.29	217.73	0.32	0.91	1.98	0.47	1.25	0.35	4.34	1.53
13	ROB	217.73	229.17	6.67	11.35	11.46	9.76	0.99	0.59	9.33	5.49
14	ROB	229.17	240.61	1.14	3.93	11.46	1.66	0.34	0.29	3.23	0.93
15	ROB	240.61	252.05	0.00	0.00	0.27	0.00	0.01	0.02	0.07	0.00

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface

whose main channel velocity head was the closest to the previously computed cross section.

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 275

INPUT

Description: Calle Santa Clara

Distance from Upstream XS = 2.35

Deck/Roadway Width = 4.5

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 7

Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

0 847.81 20 847.39 124 847.6

134.51 847.88 847.53 144.52 847.88 847.53 160 847.53

200 847.27

Upstream Bridge Cross Section Data

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.054	11.31	847.908	123.104	848.413	126.155	847.395	130.174	847.444
134.799	847.136	771	846.268	142.315	845.3	149.097	847.322	158.848	846.93
194.773	846.797	219.399	847.001	263.491	849.526				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	130.174	.035	149.097	.05

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff	Contr.	Expan.
130.174	149.097	.1	.3	

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0	134.51	847.88	F
144.52	263.491	847.88	F

Left Levee Station= 123.1 Elevation= 848.41

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
18	37	850	167	217	854

Downstream Deck/Roadway Coordinates

num= 8

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	847.81		20	847.39		100	847.6							
114.982	847.88	847.53	124.99	847.88	847.53	140	847.53							
200	847.27		220	847.11										

Downstream Bridge Cross Section Data

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.957	11.494	847.852	73.01	847.105	45	847.107	891	847
110.06	847.115	228	847.116	327	846.117	913	845.275	123.108	845.494
124.99	846.125	334	847.134	809	847.167	04	847.170	392	847
203.741	847.261	522	847.662						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	115.228	.035	125.334	.05

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff	Contr.	Expan.
115.228	125.334	.1	.3	

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0	114.98	847.88	F
124.99	261.522	847.88	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
17.5	72	852

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1



Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 250

INPUT

Description: p5 aguas abajo Snta Clara

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.957	11.494	847.852	73.01	847	105.45	847	107.891	847
110.06	847	115.228	847	116.327	846	117.913	845.275	123.108	845.494
124.99	846	125.334	847	134.809	847	167.04	847	170.392	847
203.741	847	261.522	847.662						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	115.228	.035	125.334	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

115.228	125.334	59	54	24	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
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0	114.98	847.88	F
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124.99	261.522	847.88	F
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
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17.5	72	852
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CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	845.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035		
W.S. Elev (m)	845.82	Reach Len. (m)	59.00	54.00	24.00
Crit W.S. (m)	845.61	Flow Area (m2)	2.76		
E.G. Slope (m/m)	0.002322	Area (m2)	2.76		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	7.58	Top Width (m)	7.58		
Vel Total (m/s)	0.69	Avg. Vel. (m/s)	0.69		
Max Chl Dpth (m)	0.54	Hydr. Depth (m)	0.36		
Conv. Total (m3/s)	39.6	Conv. (m3/s)	39.6		
Length Wtd. (m)	54.00	Wetted Per. (m)	7.74		
Min Ch El (m)	845.28	Shear (N/m2)	8.11		
Alpha	1.00	Stream Power (N/m s)	12521.12	0.00	0.00
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	0.54		
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.85		



used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	846.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.035		
W.S. Elev (m)	846.75	Reach Len. (m)	59.00	54.00	24.00
Crit W.S. (m)	846.39	Flow Area (m2)	11.10		
E.G. Slope (m/m)	0.004235	Area (m2)	11.20		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	9.75	Top Width (m)	9.75		
Vel Total (m/s)	1.99	Avg. Vel. (m/s)	1.99		
Max Chl Dpth (m)	1.48	Hydr. Depth (m)	1.17		
Conv. Total (m3/s)	339.6	Conv. (m3/s)	339.6		
Length Wtd. (m)	51.48	Wetted Per. (m)	10.01		
Min Ch El (m)	845.28	Shear (N/m2)	46.03		
Alpha	1.00	Stream Power (N/m s)	12521.12	0.00	0.00
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	0.85	3.42	0.67
C & E Loss (m)	0.04	Cum SA (1000 m2)	1.96	4.62	1.71

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.29	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	847.08	Reach Len. (m)	59.00	54.00	24.00
Crit W.S. (m)	846.68	Flow Area (m2)	0.02	14.21	
E.G. Slope (m/m)	0.004525	Area (m2)	3.33	14.41	6.32
Q Total (m3/s)	33.70	Flow (m3/s)	0.00	33.70	
Top Width (m)	138.48	Top Width (m)	43.23	10.11	85.15
Vel Total (m/s)	2.37	Avg. Vel. (m/s)	0.24	2.37	
Max Chl Dpth (m)	1.80	Hydr. Depth (m)	0.08	1.46	
Conv. Total (m3/s)	501.0	Conv. (m3/s)	0.1	500.9	
Length Wtd. (m)	50.95	Wetted Per. (m)	0.25	10.38	
Min Ch El (m)	845.28	Shear (N/m2)	3.43	60.78	
Alpha	1.00	Stream Power (N/m s)	12521.12	0.00	0.00
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	1.81	4.87	2.44
C & E Loss (m)	0.06	Cum SA (1000 m2)	3.80	5.38	7.74

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.24	Reach Len. (m)	59.00	54.00	24.00
Crit W.S. (m)	847.34	Flow Area (m2)	60.10	26.18	149.90
E.G. Slope (m/m)	0.000141	Area (m2)	60.10	26.18	149.90
Q Total (m3/s)	68.40	Flow (m3/s)	15.19	15.41	37.80
Top Width (m)	207.02	Top Width (m)	60.73	10.11	136.19
Vel Total (m/s)	0.29	Avg. Vel. (m/s)	0.25	0.59	0.25
Max Chl Dpth (m)	2.97	Hydr. Depth (m)	0.99	2.59	1.10

Conv. Total (m3/s)	5766.7	Conv. (m3/s)	1280.6	1298.9	3187.1
Length Wtd. (m)	42.69	Wetted Per. (m)	62.71	11.44	136.77
Min Ch El (m)	845.28	Shear (N/m2)	1.32	3.16	1.51
Alpha	1.52	Stream Power (N/m s)	12521.12	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	7.03	6.58	8.25
C & E Loss (m)	0.01	Cum SA (1000 m2)	11.16	5.27	8.32

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	115.23	117.18	0.01	0.05	0.50	0.65	0.10	0.27	2.14	0.57
2	Chan	117.18	119.13	0.68	0.90	2.03	35.56	0.46	0.75	10.15	7.63
3	Chan	119.13	121.09	0.66	0.88	1.95	34.66	0.45	0.75	10.22	7.71
4	Chan	121.09	123.04	0.47	0.72	1.95	24.74	0.37	0.66	8.35	5.51
5	Chan	123.04	124.99	0.08	0.22	1.31	4.39	0.17	0.39	3.75	1.45

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	115.23	117.18	1.33	1.12	2.06	6.02	0.67	1.18	22.65	26.82
2	Chan	117.18	119.13	5.92	2.73	2.03	26.81	1.40	2.17	56.04	121.40
3	Chan	119.13	121.09	5.97	2.71	1.95	27.02	1.39	2.21	57.55	126.90
4	Chan	121.09	123.04	5.39	2.55	1.95	24.40	1.30	2.12	54.14	114.61
5	Chan	123.04	124.99	3.48	1.99	2.02	15.75	1.02	1.75	40.82	71.60
6	Chan	124.99	125.33	0.00	0.10	0.80	0.00	0.38	0.00	5.10	0.00

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	68.99	80.49	0.00	0.65	8.55	0.00	0.08	0.00	3.37	0.00
2	LOB	80.49	91.98	0.00	0.89	11.50	0.00	0.08	0.00	3.43	0.00
3	LOB	91.98	103.48	0.00	0.89	11.50	0.00	0.08	0.00	3.43	0.00
4	LOB	103.48	114.98	0.00	0.89	11.50	0.00	0.08	0.00	3.43	0.00
5	LOB	114.98	115.23	0.00	0.02	0.25	0.01	0.08	0.24	3.43	0.84
6	Chan	115.23	117.18	2.51	1.72	2.42	7.45	0.88	1.46	31.49	45.98
7	Chan	117.18	119.13	8.66	3.36	2.03	25.70	1.72	2.57	73.68	189.66
8	Chan	119.13	121.09	8.76	3.34	1.95	25.98	1.71	2.62	75.80	198.84
9	Chan	121.09	123.04	8.07	3.18	1.95	23.93	1.63	2.54	72.16	183.16
10	Chan	123.04	124.99	5.70	2.61	2.02	16.92	1.34	2.18	57.47	125.33
11	Chan	124.99	125.33	0.00	0.20	1.06	0.00	0.58	0.00	8.34	0.00
12	ROB	125.33	138.95	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
13	ROB	138.95	152.57	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
14	ROB	152.57	166.19	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00

15	ROB	166.19	179.81	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
16	ROB	179.81	193.43	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
17	ROB	193.43	207.05	0.00	0.99	13.62	0.00	0.07	0.00	3.22	0.00
18	ROB	207.05	220.67	0.00	0.07	3.44	0.00	0.02	0.00	0.87	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	11.50	0.44	3.87	11.78	0.64	0.34	0.11	0.45	0.05
2	LOB	11.50	23.00	0.33	2.58	6.47	0.49	0.43	0.13	0.55	0.07
3	LOB	23.00	34.49					0.00	0.00		
4	LOB	34.49	45.99					0.00	0.00		
5	LOB	45.99	57.49					0.00	0.00		
6	LOB	57.49	68.99					0.00	0.00		
7	LOB	68.99	80.49	2.63	10.53	9.71	3.84	1.24	0.25	1.50	0.37
8	LOB	80.49	91.98	3.90	14.27	11.50	5.71	1.24	0.27	1.71	0.47
9	LOB	91.98	103.48	3.90	14.27	11.50	5.71	1.24	0.27	1.71	0.47
10	LOB	103.48	114.98	3.90	14.27	11.50	5.71	1.24	0.27	1.71	0.47
11	LOB	114.98	115.23	0.08	0.31	0.25	0.12	1.24	0.27	1.71	0.47
12	Chan	115.23	117.18	1.78	3.99	2.42	2.61	2.04	0.45	2.27	1.02
13	Chan	117.18	119.13	3.57	5.64	2.03	5.22	2.89	0.63	3.84	2.43
14	Chan	119.13	121.09	3.63	5.61	1.95	5.31	2.87	0.65	3.96	2.56
15	Chan	121.09	123.04	3.46	5.45	1.95	5.06	2.79	0.64	3.85	2.44
16	Chan	123.04	124.99	2.82	4.89	2.02	4.13	2.50	0.58	3.34	1.93
17	Chan	124.99	125.33	0.13	0.60	1.06	0.19	1.74	0.22	0.78	0.17
18	ROB	125.33	138.95	4.53	16.90	13.62	6.63	1.24	0.27	1.71	0.46
19	ROB	138.95	152.57	4.53	16.90	13.62	6.63	1.24	0.27	1.71	0.46
20	ROB	152.57	166.19	4.53	16.90	13.62	6.63	1.24	0.27	1.71	0.46
21	ROB	166.19	179.81	4.53	16.90	13.62	6.63	1.24	0.27	1.71	0.46
22	ROB	179.81	193.43	4.53	16.90	13.62	6.63	1.24	0.27	1.71	0.46
23	ROB	193.43	207.05	4.51	16.84	13.62	6.59	1.24	0.27	1.71	0.46
24	ROB	207.05	220.67	3.85	15.32	13.62	5.63	1.13	0.25	1.55	0.39
25	ROB	220.67	234.28	3.00	13.20	13.62	4.39	0.97	0.23	1.34	0.30
26	ROB	234.28	247.90	2.24	11.08	13.62	3.28	0.81	0.20	1.12	0.23
27	ROB	247.90	261.52	1.53	8.95	14.20	2.23	0.66	0.17	0.87	0.15

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 200

INPUT

Description: p4.5

Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.004	98.831	846	100.182	845.154	105.56	845.369	105.852	846
141.108	846.16	236.843	847	242.698	847.336				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	98.831	.035	105.852	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	98.831	105.852	99	52	12	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	90	849	F
115	242.698	849	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
9.5	74	850

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	845.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035		
W.S. Elev (m)	845.67	Reach Len. (m)	99.00	52.00	12.00
Crit W.S. (m)	845.49	Flow Area (m2)	2.41		
E.G. Slope (m/m)	0.002983	Area (m2)	2.41		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	6.34	Top Width (m)	6.34		
Vel Total (m/s)	0.79	Avg. Vel. (m/s)	0.79		
Max Chl Dpth (m)	0.51	Hydr. Depth (m)	0.38		
Conv. Total (m3/s)	35.0	Conv. (m3/s)	35.0		
Length Wtd. (m)	52.00	Wetted Per. (m)	6.68		
Min Ch El (m)	845.15	Shear (N/m2)	10.57		
Alpha	1.00	Stream Power (N/m s)	11619.86	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	0.40		
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.47		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	846.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	846.69	Reach Len. (m)	99.00	52.00	12.00
Crit W.S. (m)	846.36	Flow Area (m2)	5.27	9.45	6.08
E.G. Slope (m/m)	0.002141	Area (m2)	10.78	9.45	37.14
Q Total (m3/s)	22.10	Flow (m3/s)	3.45	14.36	4.29
Top Width (m)	127.06	Top Width (m)	24.83	7.02	95.21
Vel Total (m/s)	1.06	Avg. Vel. (m/s)	0.66	1.52	0.71
Max Chl Dpth (m)	1.53	Hydr. Depth (m)	0.60	1.35	0.67
Conv. Total (m3/s)	477.6	Conv. (m3/s)	74.6	310.3	92.7
Length Wtd. (m)	51.79	Wetted Per. (m)	8.83	7.67	9.15
Min Ch El (m)	845.15	Shear (N/m2)	12.52	25.87	13.96
Alpha	1.47	Stream Power (N/m s)	11619.86	0.00	0.00
Frctn Loss (m)	0.18	Cum Volume (1000 m3)	0.53	2.86	0.22
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.23	4.17	0.57

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.10	Reach Len. (m)	99.00	52.00	12.00
Crit W.S. (m)	846.54	Flow Area (m2)	8.91	12.35	9.86
E.G. Slope (m/m)	0.001498	Area (m2)	21.02	12.35	85.63
Q Total (m3/s)	33.70	Flow (m3/s)	6.93	18.75	8.02
Top Width (m)	164.56	Top Width (m)	24.83	7.02	132.71
Vel Total (m/s)	1.08	Avg. Vel. (m/s)	0.78	1.52	0.81
Max Chl Dpth (m)	1.94	Hydr. Depth (m)	1.01	1.76	1.08
Conv. Total (m3/s)	870.8	Conv. (m3/s)	179.2	484.4	207.2
Length Wtd. (m)	52.08	Wetted Per. (m)	8.83	7.67	9.15
Min Ch El (m)	845.15	Shear (N/m2)	14.81	23.63	15.82
Alpha	1.33	Stream Power (N/m s)	11619.86	0.00	0.00
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	1.09	4.15	1.34
C & E Loss (m)	0.03	Cum SA (1000 m2)	1.79	4.92	5.12

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.14	Reach Len. (m)	99.00	52.00	12.00
Crit W.S. (m)	846.92	Flow Area (m2)	18.10	19.66	19.38
E.G. Slope (m/m)	0.000904	Area (m2)	49.08	19.66	227.65
Q Total (m3/s)	68.40	Flow (m3/s)	17.56	31.61	19.22
Top Width (m)	178.20	Top Width (m)	34.33	7.02	136.85
Vel Total (m/s)	1.20	Avg. Vel. (m/s)	0.97	1.61	0.99
Max Chl Dpth (m)	2.99	Hydr. Depth (m)	2.05	2.80	2.12
Conv. Total (m3/s)	2275.5	Conv. (m3/s)	584.3	1051.7	639.6
Length Wtd. (m)	52.41	Wetted Per. (m)	8.83	7.67	9.15
Min Ch El (m)	845.15	Shear (N/m2)	18.16	22.70	18.77
Alpha	1.20	Stream Power (N/m s)	11619.86	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	3.81	5.34	3.72
C & E Loss (m)	0.06	Cum SA (1000 m2)	8.35	4.81	5.04

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #5 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	98.83	100.24	0.14	0.24	1.02	7.09	0.27	0.57	6.81	3.88
2	Chan	100.24	101.64	0.63	0.68	1.41	32.88	0.48	0.93	14.12	13.07

3	Chan	101.64	103.04	0.51	0.60	1.41	26.75	0.43	0.85	12.48	10.64
4	Chan	103.04	104.45	0.40	0.52	1.41	21.15	0.37	0.78	10.84	8.41
5	Chan	104.45	105.85	0.23	0.38	1.44	12.14	0.30	0.62	7.65	4.70

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	70.00	80.00	0.00	1.46	6.18	0.00	0.24	0.00	4.95	0.00
2	LOB	80.00	90.00	0.00	4.05	10.00	0.00	0.41	0.00	8.51	0.00
3	LOB	90.00	98.83	3.45	5.27	8.83	15.62	0.60	0.66	12.52	8.21
4	Chan	98.83	100.24	1.99	1.58	1.65	9.00	1.12	1.26	20.13	25.36
5	Chan	100.24	101.64	3.58	2.11	1.41	16.20	1.50	1.70	31.51	53.49
6	Chan	101.64	103.04	3.36	2.03	1.41	15.20	1.45	1.66	30.33	50.20
7	Chan	103.04	104.45	3.14	1.95	1.41	14.23	1.39	1.61	29.15	46.99
8	Chan	104.45	105.85	2.28	1.78	1.81	10.34	1.27	1.28	20.69	26.53
9	ROB	105.85	115.00	4.29	6.08	9.15	19.41	0.67	0.71	13.96	9.85
10	ROB	115.00	129.19	0.00	8.69	14.19	0.00	0.61	0.00	12.86	0.00
11	ROB	129.19	143.38	0.00	7.76	14.19	0.00	0.55	0.00	11.49	0.00
12	ROB	143.38	157.57	0.00	6.30	14.19	0.00	0.44	0.00	9.32	0.00
13	ROB	157.57	171.75	0.00	4.53	14.19	0.00	0.32	0.00	6.71	0.00
14	ROB	171.75	185.94	0.00	2.77	14.19	0.00	0.19	0.00	4.09	0.00
15	ROB	185.94	200.13	0.00	1.00	14.19	0.00	0.07	0.00	1.48	0.00
16	ROB	200.13	214.32	0.00	0.00	0.93	0.00	0.00	0.00	0.09	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	70.00	80.00	0.00	3.93	6.60	0.00	0.66	0.00	8.76	0.00
2	LOB	80.00	90.00	0.00	8.18	10.00	0.00	0.82	0.00	12.01	0.00
3	LOB	90.00	98.83	6.93	8.91	8.83	20.58	1.01	0.78	14.81	11.53
4	Chan	98.83	100.24	2.81	2.16	1.65	8.35	1.54	1.30	19.24	25.07
5	Chan	100.24	101.64	4.51	2.69	1.41	13.37	1.91	1.68	28.09	47.09
6	Chan	101.64	103.04	4.29	2.61	1.41	12.72	1.86	1.64	27.26	44.81
7	Chan	103.04	104.45	4.07	2.53	1.41	12.09	1.80	1.61	26.44	42.57
8	Chan	104.45	105.85	3.07	2.36	1.81	9.10	1.68	1.30	19.17	24.92
9	ROB	105.85	115.00	8.02	9.86	9.15	23.80	1.08	0.81	15.82	12.87
10	ROB	115.00	129.19	0.00	14.54	14.19	0.00	1.02	0.00	15.05	0.00
11	ROB	129.19	143.38	0.00	13.62	14.19	0.00	0.96	0.00	14.09	0.00
12	ROB	143.38	157.57	0.00	12.15	14.19	0.00	0.86	0.00	12.58	0.00
13	ROB	157.57	171.75	0.00	10.38	14.19	0.00	0.73	0.00	10.75	0.00
14	ROB	171.75	185.94	0.00	8.62	14.19	0.00	0.61	0.00	8.92	0.00
15	ROB	185.94	200.13	0.00	6.85	14.19	0.00	0.48	0.00	7.09	0.00
16	ROB	200.13	214.32	0.00	5.09	14.19	0.00	0.36	0.00	5.26	0.00
17	ROB	214.32	228.51	0.00	3.32	14.19	0.00	0.23	0.00	3.44	0.00
18	ROB	228.51	242.70	0.00	1.21	10.05	0.00	0.12	0.00	1.77	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	10.00	0.00	2.20	9.97	0.00	0.23	0.00	1.96	0.00
2	LOB	10.00	20.00					0.00	0.00		
3	LOB	20.00	30.00					0.00	0.00		
4	LOB	30.00	40.00					0.00	0.00		
5	LOB	40.00	50.00					0.00	0.00		
6	LOB	50.00	60.00					0.00	0.00		
7	LOB	60.00	70.00					0.00	0.00		
8	LOB	70.00	80.00	0.00	10.18	7.64	0.00	1.70	0.00	11.81	0.00
9	LOB	80.00	90.00	0.00	18.59	10.00	0.00	1.86	0.00	16.47	0.00
10	LOB	90.00	98.83	17.56	18.10	8.83	25.68	2.05	0.97	18.16	17.62
11	Chan	98.83	100.24	5.20	3.62	1.65	7.60	2.58	1.44	19.48	27.95
12	Chan	100.24	101.64	7.25	4.15	1.41	10.60	2.96	1.75	26.17	45.72
13	Chan	101.64	103.04	7.02	4.07	1.41	10.27	2.90	1.73	25.67	44.28
14	Chan	103.04	104.45	6.80	3.99	1.41	9.94	2.84	1.70	25.17	42.86
15	Chan	104.45	105.85	5.35	3.82	1.81	7.81	2.72	1.40	18.73	26.19
16	ROB	105.85	115.00	19.22	19.38	9.15	28.11	2.12	0.99	18.77	18.62
17	ROB	115.00	129.19	0.00	29.31	14.19	0.00	2.07	0.00	18.31	0.00
18	ROB	129.19	143.38	0.00	28.39	14.19	0.00	2.00	0.00	17.73	0.00
19	ROB	143.38	157.57	0.00	26.93	14.19	0.00	1.90	0.00	16.81	0.00
20	ROB	157.57	171.75	0.00	25.16	14.19	0.00	1.77	0.00	15.71	0.00
21	ROB	171.75	185.94	0.00	23.39	14.19	0.00	1.65	0.00	14.61	0.00
22	ROB	185.94	200.13	0.00	21.63	14.19	0.00	1.52	0.00	13.51	0.00
23	ROB	200.13	214.32	0.00	19.86	14.19	0.00	1.40	0.00	12.40	0.00
24	ROB	214.32	228.51	0.00	18.09	14.19	0.00	1.28	0.00	11.30	0.00
25	ROB	228.51	242.70	0.00	15.49	15.00	0.00	1.09	0.00	9.15	0.00

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 169

INPUT

Description: p4 aguas arriba N-VI

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.514	44.711	847.668	61.61	848.027	80	847	94.957	845.15
102.378	845.22	115	847.1	208.681	847	229.464	846.678		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	80	.035	115	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

80 115 25.6 25.6 25.6 .1 .3
Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 94.83 849.63 F
103.33 229.464 849.63 F
Left Levee Station= 61.61 Elevation= 848.03
Right Levee Station= 115 Elevation= 847.1

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	845.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035		
W.S. Elev (m)	845.46	Reach Len. (m)	4.00	4.00	4.00
Crit W.S. (m)	845.37	Flow Area (m2)	2.25		
E.G. Slope (m/m)	0.005228	Area (m2)	2.63		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	11.55	Top Width (m)	11.55		
Vel Total (m/s)	0.85	Avg. Vel. (m/s)	0.85		
Max Chl Dpth (m)	0.31	Hydr. Depth (m)	0.26		
Conv. Total (m3/s)	26.4	Conv. (m3/s)	26.4		
Length Wtd. (m)	4.00	Wetted Per. (m)	8.51		
Min Ch El (m)	845.15	Shear (N/m2)	13.53		
Alpha	1.00	Stream Power (N/m s)	10986.25	2949.76	5505.96
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	0.27		
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.01		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	846.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.30	Wt. n-Val.	0.035		
W.S. Elev (m)	846.28	Reach Len. (m)	4.00	4.00	4.00
Crit W.S. (m)	846.08	Flow Area (m2)	9.17		
E.G. Slope (m/m)	0.006444	Area (m2)	16.95		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	23.60	Top Width (m)	23.60		
Vel Total (m/s)	2.41	Avg. Vel. (m/s)	2.41		
Max Chl Dpth (m)	1.13	Hydr. Depth (m)	1.08		
Conv. Total (m3/s)	275.3	Conv. (m3/s)	275.3		
Length Wtd. (m)	4.00	Wetted Per. (m)	8.51		
Min Ch El (m)	845.15	Shear (N/m2)	68.08		
Alpha	1.00	Stream Power (N/m s)	10986.25	2949.76	5505.96
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.00	2.17	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.00	3.37	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.00	Element	Left OB	Channel	Right OB
Vel Head (m)	0.41	Wt. n-Val.	0.035		
W.S. Elev (m)	846.59	Reach Len. (m)	4.00	4.00	4.00
Crit W.S. (m)	846.37	Flow Area (m2)	11.88		
E.G. Slope (m/m)	0.006323	Area (m2)	25.22		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		

Top Width (m)	28.32	Top Width (m)	28.32
Vel Total (m/s)	2.84	Avg. Vel. (m/s)	2.84
Max Chl Dpth (m)	1.44	Hydr. Depth (m)	1.40
Conv. Total (m3/s)	423.8	Conv. (m3/s)	423.8
Length Wtd. (m)	4.00	Wetted Per. (m)	8.51
Min Ch El (m)	845.15	Shear (N/m2)	86.53
Alpha	1.00	Stream Power (N/m s)	10986.25 2949.76 5505.96
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.05 3.17 0.83
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.56 4.00 4.33

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	848.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.70	Wt. n-Val.	0.035		
W.S. Elev (m)	847.37	Reach Len. (m)	4.00	4.00	4.00
Crit W.S. (m)	847.08	Flow Area (m2)	18.46		
E.G. Slope (m/m)	0.005993	Area (m2)	1.21	50.79	40.79
Q Total (m3/s)	68.40	Flow (m3/s)	68.40		
Top Width (m)	156.05	Top Width (m)	6.59	35.00	114.46
Vel Total (m/s)	3.71	Avg. Vel. (m/s)	3.71		
Max Chl Dpth (m)	2.22	Hydr. Depth (m)	2.17		
Conv. Total (m3/s)	883.6	Conv. (m3/s)	883.6		
Length Wtd. (m)	4.00	Wetted Per. (m)	8.51		
Min Ch El (m)	845.15	Shear (N/m2)	127.45		
Alpha	1.00	Stream Power (N/m s)	10986.25	2949.76	5505.96
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	1.32	3.51	2.11
C & E Loss (m)	0.01	Cum SA (1000 m2)	6.33	3.71	3.53

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #5 años

Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	87.41	94.83	0.00	0.35	2.40	0.00	0.15	0.00	0.00
2	Chan	94.83	103.33	1.91	2.25	8.51	100.00	0.26	0.85	13.53
3	Chan	103.33	109.17	0.00	0.03	0.67	0.00	0.05	0.00	2.51

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	80.00	87.41	0.00	0.15	1.57	0.00	0.10	0.00	6.03
2	Chan	87.41	94.83	0.00	4.83	7.47	0.00	0.65	0.00	40.82
3	Chan	94.83	103.33	22.10	9.17	8.51	100.00	1.08	2.41	68.08
4	Chan	103.33	109.17	0.00	2.79	5.90	0.00	0.48	0.00	29.94
5	Chan	109.17	115.00	0.00	0.01	0.30	0.00	0.02	0.00	1.39

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	80.00	87.41	0.00	1.06	4.16	0.00	0.26	0.00	15.72	0.00
2	Chan	87.41	94.83	0.00	7.19	7.47	0.00	0.97	0.00	59.66	0.00
3	Chan	94.83	103.33	33.70	11.88	8.51	100.00	1.40	2.84	86.53	245.50
4	Chan	103.33	109.17	0.00	4.65	5.90	0.00	0.80	0.00	48.92	0.00
5	Chan	109.17	115.00	0.00	0.44	2.46	0.00	0.18	0.00	11.13	0.00

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	70.81	80.00	0.00	1.21	6.60	0.00	0.18	0.00	10.80	0.00
2	Chan	80.00	87.41	0.00	6.13	7.47	0.00	0.83	0.00	48.21	0.00
3	Chan	87.41	94.83	0.00	12.93	7.47	0.00	1.74	0.00	101.70	0.00
4	Chan	94.83	103.33	68.40	18.46	8.51	100.00	2.17	3.71	127.45	472.27
5	Chan	103.33	109.17	0.00	9.17	5.90	0.00	1.57	0.00	91.36	0.00
6	Chan	109.17	115.00	0.00	4.10	5.90	0.00	0.70	0.00	40.84	0.00
7	ROB	115.00	126.45	0.00	3.14	11.45	0.00	0.27	0.00	16.12	0.00
8	ROB	126.45	137.89	0.00	3.28	11.45	0.00	0.29	0.00	16.83	0.00
9	ROB	137.89	149.34	0.00	3.42	11.45	0.00	0.30	0.00	17.55	0.00
10	ROB	149.34	160.79	0.00	3.56	11.45	0.00	0.31	0.00	18.27	0.00
11	ROB	160.79	172.23	0.00	3.70	11.45	0.00	0.32	0.00	18.98	0.00
12	ROB	172.23	183.68	0.00	3.84	11.45	0.00	0.34	0.00	19.70	0.00
13	ROB	183.68	195.12	0.00	3.98	11.45	0.00	0.35	0.00	20.42	0.00
14	ROB	195.12	206.57	0.00	4.12	11.45	0.00	0.36	0.00	21.14	0.00
15	ROB	206.57	218.02	0.00	4.89	11.45	0.00	0.43	0.00	25.08	0.00
16	ROB	218.02	229.46	0.00	6.88	12.14	0.00	0.60	0.00	33.33	0.00

Warning: The cross-section end points had to be extended vertically for the computed water surface.

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 150

INPUT

Description: Ctra Madrid-coruña

Distance from Upstream XS = 4

Deck/Roadway Width = 12

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 7

Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

0 848.51 60 849.52 94.83 849.63 848.63

103.33 849.63 848.63 135 849.45 180 848.82

200 848.34

Upstream Bridge Cross Section Data

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.514	44.711	847.668	61.61	848.027	80	847	94.957	845.15
102.378	845.22	115	847.1	208.681	847	229.464	846.678		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	80	.035	115	.05

Bank Sta: Left Right Coeff Contr. Expan.
 80 115 .1 .3
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 0 94.83 849.63 F
 103.33 229.464 849.63 F
 Left Levee Station= 61.61 Elevation= 848.03
 Right Levee Station= 115 Elevation= 847.1

Downstream Deck/Roadway Coordinates
 num= 7

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
10	848.87		50	849.52	83.8	849.63	848.63							
92.3	849.63	848.63	120	849.45	160	848.82								
200	848.34													

Downstream Bridge Cross Section Data
 Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847	1.195	847.022	7.336	847.037	13.26	846.86	83.747	846
85.17	845.107	88.237	844.85	92.753	844.85	93.671	845.069	106.481	846
125.152	846	155.662	845.828	220.76	845.798	232.805	845.745	241.16	845.959

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	83.747	.035	106.481	.05

Bank Sta: Left Right Coeff Contr. Expan.
 83.747 106.481 .1 .3
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 0 83.8 849.63 F
 92.3 241.16 849.63 F
 Right Levee Station= 106.48 Elevation= 846
 Blocked Obstructions num= 1

Sta	L	Sta	R	Elev
112	118	848		

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only



Additional Bridge Parameters

Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 144

INPUT

Description: p3 aguas abajo N-VI

Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847	1.195	847.022	7.336	847.037	13.26	846.86	83.747	846
85.17	845.107	88.237	844.85	92.753	844.85	93.671	845.069	106.481	846
125.152	846	155.662	845.828	220.76	845.798	232.805	845.745	241.16	845.959

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	83.747	.035	106.481	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	83.747	106.481		66.28	58.3	14.04	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-------	-------	------	-----------

0	83.8	849.63	F
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92.3	241.16	849.63	F
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Right Levee Station= 106.48 Elevation= 846

Blocked Obstructions num= 1

Sta L	Sta R	Elev
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112	118	848
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CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	845.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.035		
W.S. Elev (m)	845.10	Reach Len. (m)	66.28	58.30	14.04
Crit W.S. (m)	845.10	Flow Area (m2)	1.39		
E.G. Slope (m/m)	0.020320	Area (m2)	1.64		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	8.84	Top Width (m)	8.84		
Vel Total (m/s)	1.38	Avg. Vel. (m/s)	1.38		
Max Chl Dpth (m)	0.25	Hydr. Depth (m)	0.20		
Conv. Total (m3/s)	13.4	Conv. (m3/s)	13.4		
Length Wtd. (m)	58.30	Wetted Per. (m)	7.06		
Min Ch El (m)	844.85	Shear (N/m2)	39.18		
Alpha	1.00	Stream Power (N/m s)	11546.22	0.00	5098.04
Frctn Loss (m)	0.67	Cum Volume (1000 m3)	0.22		
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.79		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	846.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.44	Wt. n-Val.	0.035		
W.S. Elev (m)	845.89	Reach Len. (m)	66.28	58.30	14.04
Crit W.S. (m)	845.89	Flow Area (m2)	7.51		
E.G. Slope (m/m)	0.012739	Area (m2)	13.47		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	21.04	Top Width (m)	21.04		
Vel Total (m/s)	2.94	Avg. Vel. (m/s)	2.94		
Max Chl Dpth (m)	1.04	Hydr. Depth (m)	0.90		
Conv. Total (m3/s)	195.8	Conv. (m3/s)	195.8		
Length Wtd. (m)	58.30	Wetted Per. (m)	8.61		
Min Ch El (m)	844.85	Shear (N/m2)	108.91		
Alpha	1.00	Stream Power (N/m s)	11546.22	0.00	5098.04
Frctn Loss (m)	0.41	Cum Volume (1000 m3)	1.90		
C & E Loss (m)	0.11	Cum SA (1000 m2)	3.06		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	846.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.58	Wt. n-Val.	0.035		
W.S. Elev (m)	846.18	Reach Len. (m)	66.28	58.30	14.04
Crit W.S. (m)	846.18	Flow Area (m2)	9.98		
E.G. Slope (m/m)	0.011729	Area (m2)	1.35	20.00	42.14
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	166.28	Top Width (m)	14.87	22.73	128.68
Vel Total (m/s)	3.38	Avg. Vel. (m/s)	3.38		
Max Chl Dpth (m)	1.33	Hydr. Depth (m)	1.17		
Conv. Total (m3/s)	311.2	Conv. (m3/s)	311.2		
Length Wtd. (m)	56.31	Wetted Per. (m)	8.76		
Min Ch El (m)	844.85	Shear (N/m2)	131.09		
Alpha	1.00	Stream Power (N/m s)	11546.22	0.00	5098.04
Frctn Loss (m)	0.29	Cum Volume (1000 m3)	0.04	2.79	0.63

C & E Loss (m) 0.15 Cum SA (1000 m2) 0.49 3.67 3.71

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	847.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.94	Wt. n-Val.	0.035		
W.S. Elev (m)	846.88	Reach Len. (m)	66.28	58.30	14.04
Crit W.S. (m)	846.88	Flow Area (m2)	15.95		
E.G. Slope (m/m)	0.010128	Area (m2)	31.99	35.97	132.51
Q Total (m3/s)	68.40	Flow (m3/s)	68.40		
Top Width (m)	222.69	Top Width (m)	71.28	22.73	128.68
Vel Total (m/s)	4.29	Avg. Vel. (m/s)	4.29		
Max Chl Dpth (m)	2.03	Hydr. Depth (m)	1.88		
Conv. Total (m3/s)	679.7	Conv. (m3/s)	679.7		
Length Wtd. (m)	58.30	Wetted Per. (m)	8.76		
Min Ch El (m)	844.85	Shear (N/m2)	180.88		
Alpha	1.00	Stream Power (N/m s)	11546.22	0.00	5098.04
Frctn Loss (m)	0.26	Cum Volume (1000 m3)	1.17	2.88	1.39
C & E Loss (m)	0.26	Cum SA (1000 m2)	5.97	3.37	2.69

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	83.80	88.05	0.30	0.33	2.80	15.68	0.12	0.92	23.24	21.28
2	Chan	88.05	92.30	1.61	1.06	4.25	84.32	0.25	1.52	49.69	75.50
3	Chan	92.30	97.03	0.00	0.25	1.82	0.00	0.14	0.00	27.16	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	83.80	88.05	7.77	3.09	4.36	35.14	0.75	2.51	88.51	222.37
2	Chan	88.05	92.30	14.33	4.42	4.25	64.86	1.04	3.24	129.85	421.25
3	Chan	92.30	97.03	0.00	3.67	4.76	0.00	0.78	0.00	96.34	0.00
4	Chan	97.03	101.75	0.00	1.92	4.74	0.00	0.41	0.00	50.51	0.00
5	Chan	101.75	106.48	0.00	0.38	3.22	0.00	0.12	0.00	14.55	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	67.00	75.37	0.00	0.26	6.49	0.00	0.04	0.00	4.55	0.00
2	LOB	75.37	83.75	0.00	1.09	8.38	0.00	0.13	0.00	14.98	0.00

3	Chan	83.75	83.80	0.00	0.01	0.06	0.00	0.20	0.00	19.29	0.00
4	Chan	83.80	88.05	12.83	4.32	4.51	38.07	1.02	2.97	110.36	327.37
5	Chan	88.05	92.30	20.87	5.66	4.25	61.93	1.33	3.69	153.07	564.72
6	Chan	92.30	97.03	0.00	5.05	4.76	0.00	1.07	0.00	121.97	0.00
7	Chan	97.03	101.75	0.00	3.29	4.74	0.00	0.70	0.00	79.94	0.00
8	Chan	101.75	106.48	0.00	1.67	4.74	0.00	0.35	0.00	40.52	0.00
9	Chan	106.48	106.48	0.00	0.00	0.00	0.00	0.18	0.00	19.23	0.00
10	ROB	106.48	119.95	0.00	1.35	7.83	0.00	0.18	0.00	19.89	0.00
11	ROB	119.95	133.42	0.00	2.64	13.47	0.00	0.20	0.00	22.50	0.00
12	ROB	133.42	146.88	0.00	3.58	13.47	0.00	0.27	0.00	30.60	0.00
13	ROB	146.88	160.35	0.00	4.55	13.47	0.00	0.34	0.00	38.86	0.00
14	ROB	160.35	173.82	0.00	4.83	13.47	0.00	0.36	0.00	41.28	0.00
15	ROB	173.82	187.29	0.00	4.92	13.47	0.00	0.37	0.00	41.99	0.00
16	ROB	187.29	200.76	0.00	5.00	13.47	0.00	0.37	0.00	42.70	0.00
17	ROB	200.76	214.22	0.00	5.08	13.47	0.00	0.38	0.00	43.41	0.00
18	ROB	214.22	227.69	0.00	5.26	13.47	0.00	0.39	0.00	44.92	0.00
19	ROB	227.69	241.16	0.00	4.93	13.69	0.00	0.37	0.00	41.39	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	8.37	16.75	0.00	0.17	4.28	0.00	0.04	0.00	3.86	0.00
2	LOB	16.75	25.12	0.00	0.98	8.38	0.00	0.12	0.00	11.66	0.00
3	LOB	25.12	33.50	0.00	1.84	8.38	0.00	0.22	0.00	21.80	0.00
4	LOB	33.50	41.87	0.00	2.69	8.38	0.00	0.32	0.00	31.95	0.00
5	LOB	41.87	50.25	0.00	3.55	8.38	0.00	0.42	0.00	42.10	0.00
6	LOB	50.25	58.62	0.00	4.41	8.38	0.00	0.53	0.00	52.24	0.00
7	LOB	58.62	67.00	0.00	5.26	8.38	0.00	0.63	0.00	62.38	0.00
8	LOB	67.00	75.37	0.00	6.12	8.38	0.00	0.73	0.00	72.53	0.00
9	LOB	75.37	83.75	0.00	6.97	8.38	0.00	0.83	0.00	82.68	0.00
10	Chan	83.75	83.80	0.00	0.05	0.06	0.00	0.90	0.00	75.74	0.00
11	Chan	83.80	88.05	28.81	7.31	4.51	42.11	1.72	3.94	161.05	634.68
12	Chan	88.05	92.30	39.59	8.64	4.25	57.89	2.03	4.58	201.91	925.10
13	Chan	92.30	97.03	0.00	8.37	4.76	0.00	1.77	0.00	174.56	0.00
14	Chan	97.03	101.75	0.00	6.61	4.74	0.00	1.40	0.00	138.59	0.00
15	Chan	101.75	106.48	0.00	4.99	4.74	0.00	1.06	0.00	104.55	0.00
16	Chan	106.48	106.48	0.00	0.00	0.00	0.00	0.88	0.00	80.89	0.00
17	ROB	106.48	119.95	0.00	6.60	9.24	0.00	0.88	0.00	70.96	0.00
18	ROB	119.95	133.42	0.00	12.09	13.47	0.00	0.90	0.00	89.18	0.00
19	ROB	133.42	146.88	0.00	13.04	13.47	0.00	0.97	0.00	96.17	0.00

20	ROB	146.88	160.35	0.00	14.01	13.47	0.00	1.04	0.00	103.30	0.00
21	ROB	160.35	173.82	0.00	14.29	13.47	0.00	1.06	0.00	105.39	0.00
22	ROB	173.82	187.29	0.00	14.37	13.47	0.00	1.07	0.00	106.00	0.00
23	ROB	187.29	200.76	0.00	14.46	13.47	0.00	1.07	0.00	106.61	0.00
24	ROB	200.76	214.22	0.00	14.54	13.47	0.00	1.08	0.00	107.23	0.00
25	ROB	214.22	227.69	0.00	14.72	13.47	0.00	1.09	0.00	108.54	0.00
26	ROB	227.69	241.16	0.00	14.38	14.40	0.00	1.07	0.00	99.25	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 86

INPUT

Description: p2

Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	846.757	20.075	846.518	23.286	846.163	81.693	845.956	90.217	846
92.619	846.137	95.446	846.225	107.914	845	108.531	844	113.736	844.022
114.227	845	133.289	845.681	190.19	845.733	192.611	845.759	212.64	845.898

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
0	.05	92.619	.035	133.289	.05			

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

92.619	133.289	79.5	67	41.05	.1	.3
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
.05	10	857

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	844.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035		
W.S. Elev (m)	844.34	Reach Len. (m)	79.50	67.00	41.05
Crit W.S. (m)	844.25	Flow Area (m2)	1.76		
E.G. Slope (m/m)	0.007307	Area (m2)	1.76		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	5.57	Top Width (m)	5.57		

Vel Total (m/s)	1.08	Avg. Vel. (m/s)	1.08		
Max Chl Dpth (m)	0.34	Hydr. Depth (m)	0.32		
Conv. Total (m3/s)	22.3	Conv. (m3/s)	22.3		
Length Wtd. (m)	67.00	Wetted Per. (m)	5.96		
Min Ch El (m)	844.00	Shear (N/m2)	21.20		
Alpha	1.00	Stream Power (N/m s)	10180.75	0.00	0.00
Frctn Loss (m)	0.44	Cum Volume (1000 m3)	0.12		
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.37		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	845.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.035		
W.S. Elev (m)	845.63	Reach Len. (m)	79.50	67.00	41.05
Crit W.S. (m)	845.32	Flow Area (m2)	17.36		
E.G. Slope (m/m)	0.004432	Area (m2)	17.36		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	30.50	Top Width (m)	30.50		
Vel Total (m/s)	1.27	Avg. Vel. (m/s)	1.27		
Max Chl Dpth (m)	1.63	Hydr. Depth (m)	0.57		
Conv. Total (m3/s)	332.0	Conv. (m3/s)	332.0		
Length Wtd. (m)	67.00	Wetted Per. (m)	31.71		
Min Ch El (m)	844.00	Shear (N/m2)	23.80		
Alpha	1.00	Stream Power (N/m s)	10180.75	0.00	0.00
Frctn Loss (m)	0.34	Cum Volume (1000 m3)	1.00		
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.56		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	845.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	845.87	Reach Len. (m)	79.50	67.00	41.05
Crit W.S. (m)	845.53	Flow Area (m2)	25.14	10.48	
E.G. Slope (m/m)	0.002884	Area (m2)	25.14	10.48	
Q Total (m3/s)	33.70	Flow (m3/s)	30.68	3.02	
Top Width (m)	109.57	Top Width (m)	34.23	75.34	
Vel Total (m/s)	0.95	Avg. Vel. (m/s)	1.22	0.29	
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	0.73	0.14	
Conv. Total (m3/s)	627.5	Conv. (m3/s)	571.2	56.3	
Length Wtd. (m)	65.66	Wetted Per. (m)	35.45	75.34	
Min Ch El (m)	844.00	Shear (N/m2)	20.06	3.94	
Alpha	1.52	Stream Power (N/m s)	10180.75	0.00	0.00
Frctn Loss (m)	0.26	Cum Volume (1000 m3)	1.48	0.26	
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.01	2.28	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	846.62	Element	Left OB	Channel	Right OB
Vel Head (m)	1.07	Wt. n-Val.	0.035		
W.S. Elev (m)	845.55	Reach Len. (m)	79.50	67.00	41.05
Crit W.S. (m)	845.93	Flow Area (m2)	14.95		
E.G. Slope (m/m)	0.060678	Area (m2)	14.95		
Q Total (m3/s)	68.40	Flow (m3/s)	68.40		
Top Width (m)	27.32	Top Width (m)	27.32		
Vel Total (m/s)	4.58	Avg. Vel. (m/s)	4.58		
Max Chl Dpth (m)	1.55	Hydr. Depth (m)	0.55		
Conv. Total (m3/s)	277.7	Conv. (m3/s)	277.7		
Length Wtd. (m)	61.10	Wetted Per. (m)	28.52		
Min Ch El (m)	844.00	Shear (N/m2)	311.93		
Alpha	1.00	Stream Power (N/m s)	10180.75	0.00	0.00
Frctn Loss (m)	1.19	Cum Volume (1000 m3)	0.11	1.40	0.46
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.61	1.91	1.78

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	100.75	108.89	0.13	0.16	0.75	6.87	0.27	0.85	14.77	12.49
2	Chan	108.89	117.02	1.78	1.61	5.20	93.13	0.32	1.11	22.13	24.50

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	100.75	108.89	2.77	3.32	8.01	12.53	0.45	0.83	18.03	15.02
2	Chan	108.89	117.02	16.51	10.05	8.74	74.70	1.24	1.64	49.97	82.10
3	Chan	117.02	125.16	2.52	3.16	8.14	11.40	0.39	0.80	16.88	13.45
4	Chan	125.16	133.29	0.30	0.83	6.82	1.38	0.12	0.37	5.28	1.94

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.62	100.75	0.03	0.14	1.70	0.10	0.08	0.25	2.34	0.58
2	Chan	100.75	108.89	4.84	5.22	8.73	14.35	0.64	0.93	16.93	15.67
3	Chan	108.89	117.02	19.25	11.97	8.74	57.13	1.47	1.61	38.74	62.31

4	Chan	117.02	125.16	4.84	5.08	8.14	14.37	0.63	0.95	17.67	16.83
5	Chan	125.16	133.29	1.71	2.72	8.14	5.07	0.33	0.63	9.45	5.94
6	ROB	133.29	141.22	0.48	1.47	7.94	1.43	0.19	0.33	5.25	1.72
7	ROB	141.22	149.16	0.45	1.42	7.94	1.34	0.18	0.32	5.05	1.61
8	ROB	149.16	157.09	0.42	1.36	7.94	1.25	0.17	0.31	4.84	1.50
9	ROB	157.09	165.03	0.39	1.30	7.94	1.16	0.16	0.30	4.64	1.39
10	ROB	165.03	172.96	0.36	1.24	7.94	1.08	0.16	0.29	4.43	1.29
11	ROB	172.96	180.90	0.34	1.19	7.94	1.00	0.15	0.28	4.23	1.20
12	ROB	180.90	188.83	0.31	1.13	7.94	0.92	0.14	0.27	4.02	1.10
13	ROB	188.83	196.77	0.21	0.89	7.94	0.62	0.11	0.23	3.17	0.74
14	ROB	196.77	204.71	0.06	0.43	7.94	0.19	0.05	0.14	1.55	0.22
15	ROB	204.71	212.64	0.00	0.05	3.93	0.01	0.01	0.06	0.39	0.02

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	100.75	108.89	7.94	2.74	7.16	11.60	0.42	2.90	227.78	659.84
2	Chan	108.89	117.02	53.92	9.37	8.74	78.83	1.15	5.76	637.88	3671.21
3	Chan	117.02	125.16	6.18	2.48	8.14	9.03	0.31	2.49	181.45	451.70
4	Chan	125.16	133.29	0.36	0.36	4.48	0.53	0.08	1.02	47.53	48.43

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 18

INPUT

Description: p1

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	846	2.582	845.788	84.91	845.729	95.108	845.77	97.312	845.666
114.738	845	115.172	844	115.852	843.527	120.583	843.551	120.942	844
123.858	845	127.072	845.401	183.254	845.577	208.718	845.601	211.499	845.548
216.303	846								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	97.312	.035	127.072	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	97.312	127.072		100	100	100	.1	.3

CROSS SECTION OUTPUT Profile #5 años

E.G. Elev (m)	843.95	Element	Left OB	Channel	Right OB
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Vel Head (m)	0.05	Wt. n-Val.	0.035		
W.S. Elev (m)	843.90	Reach Len. (m)			
Crit W.S. (m)	843.79	Flow Area (m2)	1.85		
E.G. Slope (m/m)	0.006003	Area (m2)	1.85		
Q Total (m3/s)	1.91	Flow (m3/s)	1.91		
Top Width (m)	5.54	Top Width (m)	5.54		
Vel Total (m/s)	1.03	Avg. Vel. (m/s)	1.03		
Max Chl Dpth (m)	0.37	Hydr. Depth (m)	0.33		
Conv. Total (m3/s)	24.7	Conv. (m3/s)	24.7		
Length Wtd. (m)		Wetted Per. (m)	5.83		
Min Ch El (m)	843.53	Shear (N/m2)	18.71		
Alpha	1.00	Stream Power (N/m s)	10356.13	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50 años

E.G. Elev (m)	845.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035		
W.S. Elev (m)	845.20	Reach Len. (m)			
Crit W.S. (m)	844.71	Flow Area (m2)	12.43		
E.G. Slope (m/m)	0.006008	Area (m2)	12.43		
Q Total (m3/s)	22.10	Flow (m3/s)	22.10		
Top Width (m)	16.07	Top Width (m)	16.07		
Vel Total (m/s)	1.78	Avg. Vel. (m/s)	1.78		
Max Chl Dpth (m)	1.68	Hydr. Depth (m)	0.77		
Conv. Total (m3/s)	285.1	Conv. (m3/s)	285.1		
Length Wtd. (m)		Wetted Per. (m)	17.27		
Min Ch El (m)	843.53	Shear (N/m2)	42.39		
Alpha	1.00	Stream Power (N/m s)	10356.13	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	845.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	845.51	Reach Len. (m)			
Crit W.S. (m)	845.19	Flow Area (m2)	18.98	1.99	
E.G. Slope (m/m)	0.006002	Area (m2)	18.98	1.99	
Q Total (m3/s)	33.70	Flow (m3/s)	33.25	0.45	
Top Width (m)	61.40	Top Width (m)	25.75	35.65	
Vel Total (m/s)	1.61	Avg. Vel. (m/s)	1.75	0.23	
Max Chl Dpth (m)	1.99	Hydr. Depth (m)	0.74	0.06	
Conv. Total (m3/s)	435.0	Conv. (m3/s)	429.2	5.8	
Length Wtd. (m)		Wetted Per. (m)	26.97	35.65	
Min Ch El (m)	843.53	Shear (N/m2)	41.43	3.29	
Alpha	1.17	Stream Power (N/m s)	10356.13	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #500 años

E.G. Elev (m)	845.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	845.79	Reach Len. (m)			
Crit W.S. (m)	845.76	Flow Area (m2)	2.72	26.78	22.52
E.G. Slope (m/m)	0.006004	Area (m2)	2.72	26.78	22.52
Q Total (m3/s)	68.40	Flow (m3/s)	0.41	53.81	14.18
Top Width (m)	207.50	Top Width (m)	90.79	29.76	86.95

Vel Total (m/s)	1.31	Avg. Vel. (m/s)	0.15	2.01	0.63
Max Chl Dpth (m)	2.26	Hydr. Depth (m)	0.03	0.90	0.26
Conv. Total (m3/s)	882.7	Conv. (m3/s)	5.2	694.4	183.0
Length Wtd. (m)		Wetted Per. (m)	90.80	30.98	86.96
Min Ch El (m)	843.53	Shear (N/m2)	1.76	50.90	15.25
Alpha	1.88	Stream Power (N/m s)	10356.13	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Profile #5 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	115.17	121.12	1.91	1.85	5.83	100.00	0.33	1.03	18.71	19.29

Profile #50 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	109.22	115.17	0.34	0.84	6.40	1.55	0.15	0.41	7.74	3.16
2	Chan	115.17	121.12	19.92	9.58	6.33	90.12	1.61	2.08	89.12	185.30
3	Chan	121.12	127.07	1.84	2.01	4.54	8.32	0.46	0.92	26.07	23.88

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	97.31	103.26	0.01	0.07	1.94	0.04	0.04	0.17	2.18	0.38
2	Chan	103.26	109.22	0.57	1.12	5.96	1.69	0.19	0.51	11.04	5.63
3	Chan	109.22	115.17	2.28	2.68	6.61	6.78	0.45	0.85	23.89	20.35
4	Chan	115.17	121.12	26.29	11.42	6.33	78.02	1.92	2.30	106.14	244.36
5	Chan	121.12	127.07	4.09	3.69	6.13	12.14	0.62	1.11	35.43	39.25
6	ROB	127.07	136.00	0.24	0.87	8.92	0.72	0.10	0.28	5.75	1.61
7	ROB	136.00	144.92	0.14	0.62	8.92	0.41	0.07	0.22	4.11	0.92
8	ROB	144.92	153.84	0.06	0.37	8.92	0.18	0.04	0.16	2.46	0.39
9	ROB	153.84	162.76	0.01	0.12	8.88	0.03	0.01	0.08	0.82	0.06

Profile #500 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	9.73	0.00	0.00	3.21	0.00	0.00	0.01	0.07	0.00
2	LOB	9.73	19.46	0.00	0.06	9.73	0.00	0.01	0.04	0.34	0.01
3	LOB	19.46	29.19	0.01	0.12	9.73	0.01	0.01	0.07	0.75	0.06
4	LOB	29.19	38.92	0.02	0.19	9.73	0.03	0.02	0.10	1.17	0.11
5	LOB	38.92	48.66	0.03	0.26	9.73	0.05	0.03	0.12	1.58	0.19
6	LOB	48.66	58.39	0.05	0.33	9.73	0.07	0.03	0.14	1.99	0.28
7	LOB	58.39	68.12	0.06	0.40	9.73	0.09	0.04	0.16	2.40	0.38
8	LOB	68.12	77.85	0.08	0.46	9.73	0.12	0.05	0.18	2.81	0.49
9	LOB	77.85	87.58	0.10	0.52	9.73	0.14	0.05	0.19	3.12	0.59
10	LOB	87.58	97.31	0.06	0.38	9.73	0.08	0.04	0.15	2.28	0.35
11	Chan	97.31	103.26	0.90	1.39	5.96	1.32	0.23	0.65	13.70	8.90
12	Chan	103.26	109.22	2.80	2.74	5.96	4.10	0.46	1.02	27.08	27.71
13	Chan	109.22	115.17	5.55	4.30	6.61	8.12	0.72	1.29	38.35	49.50
14	Chan	115.17	121.12	36.26	13.04	6.33	53.01	2.19	2.78	121.26	337.13
15	Chan	121.12	127.07	8.29	5.31	6.13	12.13	0.89	1.56	51.01	79.62
16	ROB	127.07	136.00	2.55	3.30	8.92	3.73	0.37	0.77	21.80	16.84

17	ROB	136.00	144.92	2.24	3.05	8.92	3.27	0.34	0.73	20.15	14.77
18	ROB	144.92	153.84	1.94	2.80	8.92	2.84	0.31	0.69	18.51	12.82
19	ROB	153.84	162.76	1.66	2.56	8.92	2.43	0.29	0.65	16.86	10.97
20	ROB	162.76	171.69	1.40	2.31	8.92	2.05	0.26	0.61	15.21	9.24
21	ROB	171.69	180.61	1.16	2.06	8.92	1.69	0.23	0.56	13.56	7.64
22	ROB	180.61	189.53	0.97	1.85	8.92	1.42	0.21	0.52	12.21	6.40
23	ROB	189.53	198.46	0.90	1.77	8.92	1.32	0.20	0.51	11.66	5.94
24	ROB	198.46	207.38	0.84	1.69	8.92	1.22	0.19	0.49	11.17	5.53
25	ROB	207.38	216.30	0.52	1.13	6.65	0.76	0.17	0.46	10.03	4.62

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

SUMMARY OF MANNING'S N VALUES

River:Jerga

Reach	River Sta.	n1	n2	n3
Astorga	1595	.05	.035	.05
Astorga	1512	.05	.035	.05
Astorga	1440	.05	.035	.05
Astorga	1395	.05	.035	.05
Astorga	1339	.05	.035	.05
Astorga	1276	.05	.035	.05
Astorga	1270	Bridge		
Astorga	1254	.05	.035	.05
Astorga	1215	.05	.035	.05
Astorga	1108	.05	.035	.05
Astorga	1088	.05	.035	.05
Astorga	1023	.05	.035	.05
Astorga	943	.05	.035	.05
Astorga	898	.05	.035	.05
Astorga	890	Bridge		
Astorga	888	.05	.035	.05
Astorga	848	.05	.035	.05
Astorga	786	.05	.035	.05
Astorga	713	.05	.035	.05
Astorga	638	.05	.035	.05
Astorga	563	.05	.035	.05
Astorga	526	.05	.035	.05
Astorga	520	Bridge		
Astorga	512	.05	.035	.05
Astorga	463	.05	.035	.05
Astorga	389	.05	.035	.05
Astorga	314	.05	.035	.05
Astorga	300	.05	.035	.05
Astorga	275	Bridge		
Astorga	250	.05	.035	.05
Astorga	200	.05	.035	.05
Astorga	169	.05	.035	.05
Astorga	150	Bridge		
Astorga	144	.05	.035	.05
Astorga	86	.05	.035	.05
Astorga	18	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: Jerga

Reach	River Sta.	Left	Channel	Right
Astorga	1595	77.27	78.3	81.9
Astorga	1512	92.66	72.85	42.04
Astorga	1440	95.14	72.85	40.8
Astorga	1395	61.03	47.34	28.37
Astorga	1339	47.94	63.01	73.27
Astorga	1276	21.5	21.5	21.5
Astorga	1270	Bridge		
Astorga	1254	38.98	39.35	40.21
Astorga	1215	17.71	47.72	69.38
Astorga	1108	31.62	80.21	117.75
Astorga	1088	86.72	65.2	28.83
Astorga	1023	97.42	80.8	48.03
Astorga	943	47.56	44.81	37.87
Astorga	898	9.5	9.5	9.5
Astorga	890	Bridge		
Astorga	888	44.44	40.08	29.42
Astorga	848	48.68	62.54	86.13
Astorga	786	84.07	73.66	45.06
Astorga	713	75	75	75
Astorga	638	75	75	75
Astorga	563	39.35	37.53	34.15
Astorga	526	14.68	14.68	14.68
Astorga	520	Bridge		
Astorga	512	60.22	49.19	25.67
Astorga	463	71.66	73.89	78.45
Astorga	389	53.87	74.85	96.61
Astorga	314	99.53	145.33	198.5
Astorga	300	15	15	15
Astorga	275	Bridge		
Astorga	250	59	54	24
Astorga	200	99	52	12
Astorga	169	25.6	25.6	25.6
Astorga	150	Bridge		
Astorga	144	66.28	58.3	14.04
Astorga	86	79.5	67	41.05
Astorga	18	100	100	100

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Jerga

Reach	River Sta.	Contr.	Expan.
Astorga	1595	.1	.3
Astorga	1512	.1	.3
Astorga	1440	.1	.3
Astorga	1395	.1	.3
Astorga	1339	.1	.3
Astorga	1276	.1	.3
Astorga	1270	Bridge	
Astorga	1254	.1	.3
Astorga	1215	.1	.3
Astorga	1108	.1	.3
Astorga	1088	.1	.3
Astorga	1023	.1	.3
Astorga	943	.1	.3

Astorga	898	.1	.3
Astorga	890	Bridge	
Astorga	888	.1	.3
Astorga	848	.1	.3
Astorga	786	.1	.3
Astorga	713	.1	.3
Astorga	638	.1	.3
Astorga	563	.1	.3
Astorga	526	.1	.3
Astorga	520	Bridge	
Astorga	512	.1	.3
Astorga	463	.1	.3
Astorga	389	.1	.3
Astorga	314	.1	.3
Astorga	300	.1	.3
Astorga	275	Bridge	
Astorga	250	.1	.3
Astorga	200	.1	.3
Astorga	169	.1	.3
Astorga	150	Bridge	
Astorga	144	.1	.3
Astorga	86	.1	.3
Astorga	18	.1	.3

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del P.O.O. de Astorga, fue aprobada fehaciente en sesión plenaria del Ayuntamiento de esta ciudad, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018
EL SECRETARIO GENERAL

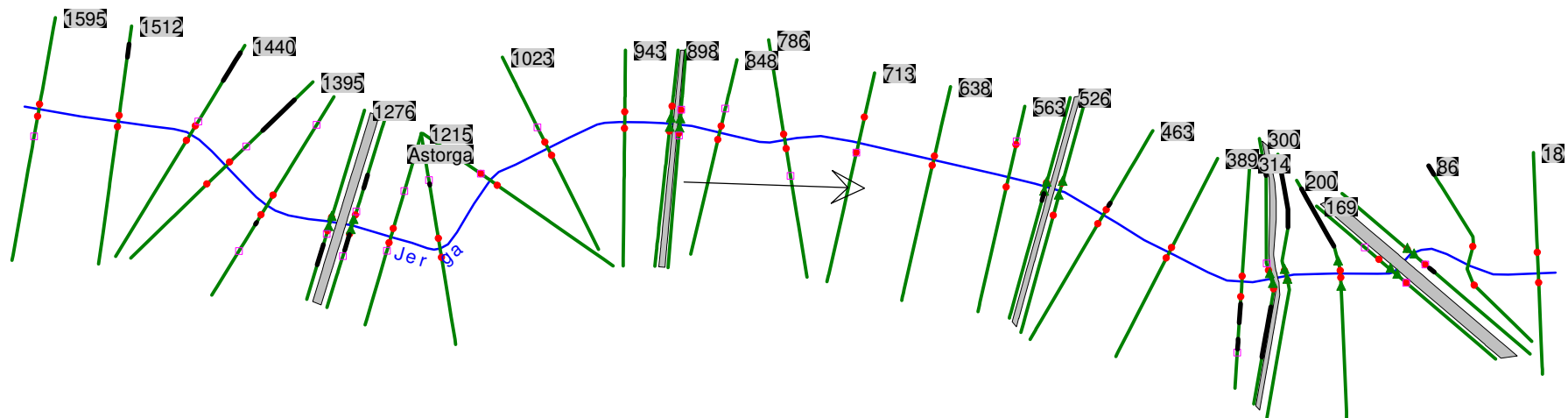


Fdo. D. Manuel Alja Rodríguez

Reach	River Sta	Profile (m3/s)	Q Total (m)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m/m)	E.G. Elev (m/s)	E.G. Slope (m2)	Vel Chnl (m)	Flow Area	Top Width	Froude # Chl
Astorga	1595	5 años	1.91	850.62	851.17	850.95	851.20	0.002361	0.76	2.53	6.01	0.37
Astorga	1595	50 años	22.10	850.62	852.53	851.86	852.67	0.002671	1.64	13.44	10.33	0.46
Astorga	1595	100 años	33.70	850.62	852.81	852.19	853.02	0.003561	2.04	16.52	11.38	0.54
Astorga	1595	500 años	68.40	850.62	853.17	852.93	853.72	0.007363	3.28	21.32	18.53	0.80
Astorga	1512	5 años	1.91	850.38	851.00		851.03	0.002051	0.74	2.57	5.52	0.35
Astorga	1512	50 años	22.10	850.38	852.27		852.43	0.003204	1.80	14.04	24.36	0.50
Astorga	1512	100 años	33.70	850.38	852.57		852.75	0.003258	1.98	23.78	41.53	0.52
Astorga	1512	500 años	68.40	850.38	853.05		853.23	0.003326	2.27	50.39	70.91	0.54
Astorga	1440	5 años	1.91	850.34	850.87	850.60	850.89	0.001714	0.67	2.87	6.34	0.32
Astorga	1440	50 años	22.10	850.34	852.12	851.50	852.22	0.002312	1.40	16.29	23.17	0.43
Astorga	1440	100 años	33.70	850.34	852.42	851.79	852.54	0.002314	1.55	26.73	46.30	0.44
Astorga	1440	500 años	68.40	850.34	852.98	852.51	853.07	0.001488	1.56	81.38	147.17	0.37
Astorga	1395	5 años	1.91	850.12	850.77	850.44	850.79	0.001113	0.58	3.30	6.55	0.26
Astorga	1395	50 años	22.10	850.12	852.04	851.38	852.08	0.001274	0.88	25.24	33.96	0.31
Astorga	1395	100 años	33.70	850.12	852.38	851.60	852.42	0.000886	0.92	40.92	59.72	0.27
Astorga	1395	500 años	68.40	850.12	852.95	852.02	852.99	0.000572	0.97	109.33	143.25	0.24
Astorga	1339	5 años	1.91	850.20	850.66	850.51	850.70	0.003777	0.86	2.22	6.25	0.46
Astorga	1339	50 años	22.10	850.20	851.91	851.41	851.99	0.002644	1.27	17.43	21.16	0.45
Astorga	1339	100 años	33.70	850.20	852.28	851.66	852.36	0.001673	1.25	31.92	67.43	0.37
Astorga	1339	500 años	68.40	850.20	852.93	852.21	852.96	0.000515	0.94	133.63	174.46	0.22
Astorga	1276	5 años	1.91	850.00	850.39	850.26	850.43	0.004814	0.93	2.06	6.06	0.51
Astorga	1276	50 años	22.10	850.00	851.46	851.18	851.72	0.006688	2.26	9.79	9.92	0.69
Astorga	1276	100 años	33.70	850.00	851.80	851.51	852.14	0.006789	2.61	12.90	12.17	0.72
Astorga	1276	500 años	68.40	850.00	852.86	852.20	852.92	0.000955	1.33	104.80	172.17	0.30
Astorga	1270	Bridge										
Astorga	1254	5 años	1.91	849.03	849.36	849.33	849.43	0.012715	1.16	1.65	7.44	0.79
Astorga	1254	50 años	22.10	849.03	850.61	850.10	850.77	0.003388	1.80	12.31	9.54	0.50
Astorga	1254	100 años	33.70	849.03	851.00	850.39	851.22	0.003549	2.09	16.11	10.11	0.53
Astorga	1254	500 años	68.40	849.03	850.69	851.08	852.08	0.027253	5.23	13.07	9.65	1.44
Astorga	1215	5 años	1.91	848.71	849.21	848.99	849.24	0.002293				

Astorga	1215	50 años	22.10	848.71	850.49	849.89	850.64	0.003347	1.71	12.95	11.23	0.51
Astorga	1215	100 años	33.70	848.71	850.89	850.25	851.07	0.003398	1.87	17.99	13.80	0.52
Astorga	1215	500 años	68.40	848.71	851.42	850.96	851.77	0.004495	2.64	27.26	22.37	0.63
Astorga	1108	5 años	1.91	848.62	849.12	848.86	849.14	0.001747	0.67	2.86	6.53	0.32
Astorga	1108	50 años	22.10	848.62	850.34	849.74	850.48	0.003236	1.63	13.52	12.50	0.50
Astorga	1108	100 años	33.70	848.62	850.75	850.07	850.91	0.003140	1.73	19.51	16.40	0.51
Astorga	1108	500 años	68.40	848.62	851.47	850.79	851.57	0.001634	1.60	74.40	147.49	0.39
Astorga	1088	5 años	1.91	848.40	848.73	848.70	848.83	0.014826	1.37	1.39	5.50	0.87
Astorga	1088	50 años	22.10	848.40	849.78	849.59	850.08	0.007778	2.42	9.14	8.93	0.76
Astorga	1088	100 años	33.70	848.40	850.19	849.91	850.52	0.007126	2.58	13.08	10.87	0.75
Astorga	1088	500 años	68.40	848.40	850.88	850.75	851.29	0.008203	2.86	27.99	94.59	0.82
Astorga	1023	5 años	1.91	847.91	848.34	848.18	848.37	0.003764	0.86	2.22	6.27	0.46
Astorga	1023	50 años	22.10	847.91	849.53	849.05	849.70	0.003709	1.80	12.25	10.55	0.53
Astorga	1023	100 años	33.70	847.91	849.97	849.35	850.16	0.003606	1.92	17.52	13.56	0.54
Astorga	1023	500 años	68.40	847.91	850.68	850.07	850.94	0.003144	2.30	40.28	105.13	0.53
Astorga	943	5 años	1.91	847.51	847.98		848.02	0.005143	0.92	2.07	6.68	0.53
Astorga	943	50 años	22.10	847.51	849.22		849.39	0.003834	1.83	12.06	10.31	0.54
Astorga	943	100 años	33.70	847.51	849.67		849.86	0.003704	1.93	17.47	13.68	0.54
Astorga	943	500 años	68.40	847.51	850.45	849.78	850.68	0.002977	2.21	38.80	70.00	0.52
Astorga	898	5 años	1.91	847.29	847.83	847.59	847.86	0.002444	0.80	2.39	5.25	0.38
Astorga	898	50 años	22.10	847.29	848.75	848.59	849.12	0.009178	2.68	8.26	7.45	0.81
Astorga	898	100 años	33.70	847.29	849.15	848.95	849.59	0.009239	2.95	11.44	10.41	0.83
Astorga	898	500 años	68.40	847.29	850.41	849.80	850.54	0.002121	1.66	55.80	88.40	0.43
Astorga	890	Bridge										
Astorga	888	5 años	1.91	847.22	847.69	847.69	847.80	0.020122	1.51	1.26	5.44	0.99
Astorga	888	50 años	22.10	847.22	848.35	848.47	848.92	0.021621	3.35	6.59	9.75	1.25
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Astorga	888	500 años	68.40	847.22	849.36	849.42	850.33	0.011526	4.36	15.68	15.01	1.05
Astorga	848	5 años	1.91	846.85	847.35	847.09	847.36	0.001008	0.49	3.93	9.78	0.24
Astorga	848	50 años	22.10	846.85	848.66	847.77	848.73	0.001128	1.17	18.94	12.88	0.31
Astorga	848	100 años	33.70	846.85	849.00	848.02	849.11	0.001408	1.44	23.43	13.58	0.35
Astorga	848	500 años	68.40	846.85	849.51	848.62	849.75	0.002308	2.19	35.59	34.09	0.47
Astorga	786	5 años	1.91	846.85	847.26	847.06	847.28	0.001844	0.61	3.14	8.79	0.32
Astorga	786	50 años	22.10	846.85	848.56	847.77	848.65	0.001567	1.31	16.93	12.47	0.36

Astorga	314	500 años	68.40	845.48	848.34	847.43	848.36	0.000230	0.70	173.51	153.50	0.15
Astorga	300	5 años	1.91	845.30	845.91	845.82	845.98	0.007589	1.11	1.71	5.58	0.64
Astorga	300	50 años	22.10	845.30	846.86	846.69	847.16	0.007725	2.42	9.12	12.35	0.78
Astorga	300	100 años	33.70	845.30	847.17	847.00	847.56	0.007428	2.76	12.23	35.26	0.80
Astorga	300	500 años	68.40	845.30	848.23	847.64	848.29	0.000960	1.29	76.43	67.24	0.31
Astorga	275	Bridge										
Astorga	250	5 años	1.91	845.28	845.82	845.61	845.84	0.002322	0.69	2.76	7.58	0.37
Astorga	250	50 años	22.10	845.28	846.75	846.39	846.96	0.004235	1.99	11.10	9.75	0.59
Astorga	250	100 años	33.70	845.28	847.08	846.68	847.36	0.004525	2.37	14.23	138.48	0.63
Astorga	250	500 años	68.40	845.28	848.24	847.34	848.25	0.000141	0.59	236.18	207.02	0.12
Astorga	200	5 años	1.91	845.15	845.67	845.49	845.70	0.002983	0.79	2.41	6.34	0.41
Astorga	200	50 años	22.10	845.15	846.69	846.36	846.77	0.002141	1.52	20.80	127.06	0.42
Astorga	200	100 años	33.70	845.15	847.10	846.54	847.18	0.001498	1.52	31.11	164.56	0.37
Astorga	200	500 años	68.40	845.15	848.14	846.92	848.23	0.000904	1.61	57.15	178.20	0.31
Astorga	169	5 años	1.91	845.15	845.46	845.37	845.50	0.005228	0.85	2.25	11.55	0.53
Astorga	169	50 años	22.10	845.15	846.28	846.08	846.57	0.006444	2.41	9.17	23.60	0.74
Astorga	169	100 años	33.70	845.15	846.59	846.37	847.00	0.006323	2.84	11.88	28.32	0.77
Astorga	169	500 años	68.40	845.15	847.37	847.08	848.07	0.005993	3.71	18.46	156.05	0.80
Astorga	150	Bridge										
Astorga	144	5 años	1.91	844.85	845.10	845.10	845.20	0.020320	1.38	1.39	8.84	0.99
Astorga	144	50 años	22.10	844.85	845.89	845.89	846.33	0.012739	2.94	7.51	21.04	0.99
Astorga	144	100 años	33.70	844.85	846.18	846.18	846.76	0.011729	3.38	9.98	166.28	0.99
Astorga	144	500 años	68.40	844.85	846.88	846.88	847.82	0.010128	4.29	15.95	222.69	1.00
Astorga	86	5 años	1.91	844.00	844.34	844.25	844.40	0.007307	1.08	1.76	5.57	0.62
Astorga	86	50 años	22.10	844.00	845.63	845.32	845.72	0.004432	1.27	17.36	30.50	0.54
Astorga	86	100 años	33.70	844.00	845.87	845.53	845.94	0.002884	1.22	35.62	109.57	0.45
Astorga	86	500 años	68.40	844.00	845.55	845.93	846.62	0.060678	4.58	14.95	27.32	1.97
Astorga	18	5 años	1.91	843.53	843.90	843.79	843.95	0.006003	1.03	1.85	5.54	0.57
Astorga	18	50 años	22.10	843.53	845.20	844.71	845.36	0.006008	1.78	12.43	16.07	0.65
Astorga	18	100 años	33.70	843.53	845.51	845.19	845.67	0.006002	1.75	20.98	61.40	0.65
Astorga	18	500 años	68.40	843.53	845.79	845.76	845.95	0.006004	2.01	52.03	207.50	0.68



DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada inicialmente en sesión plenaria del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

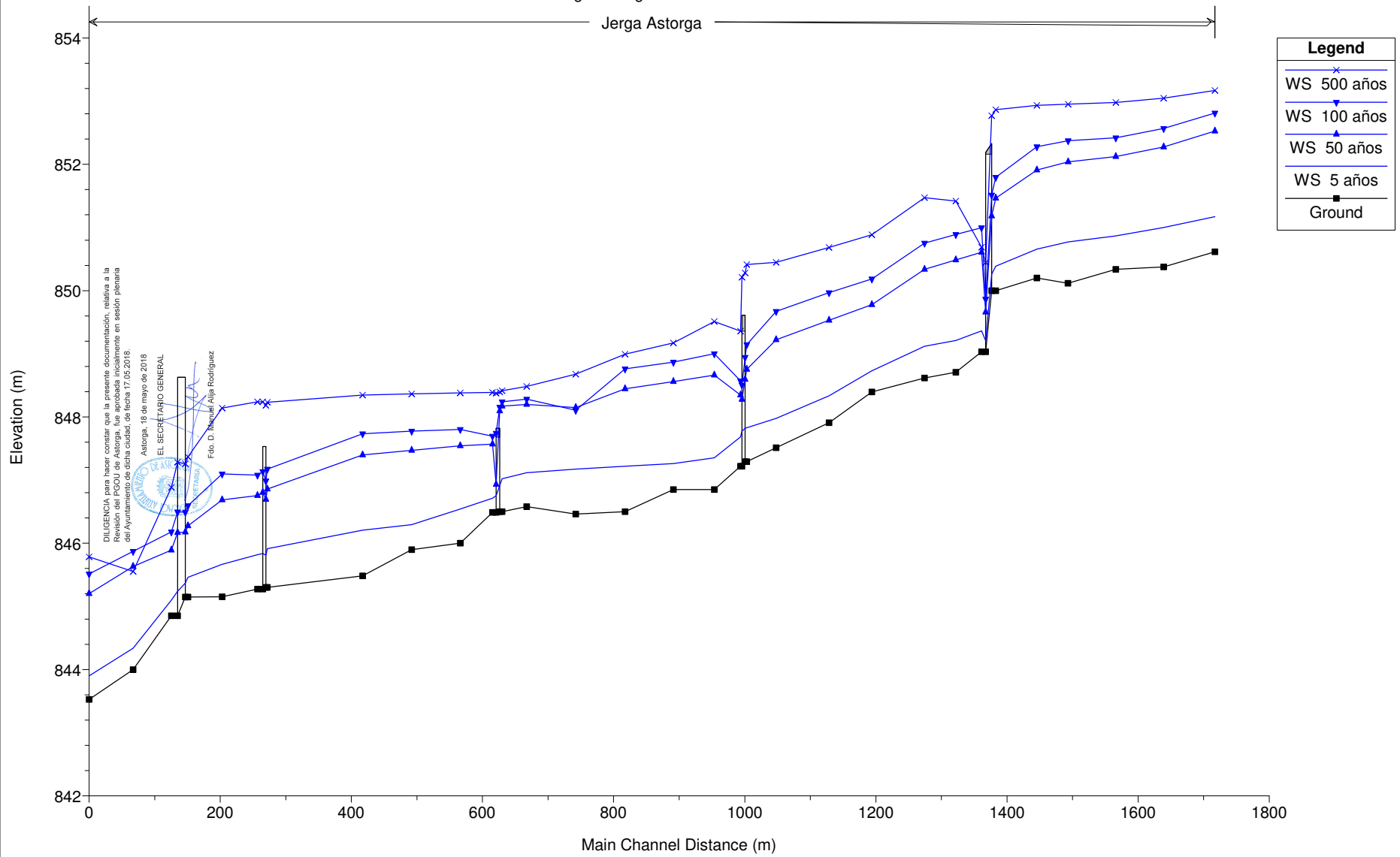


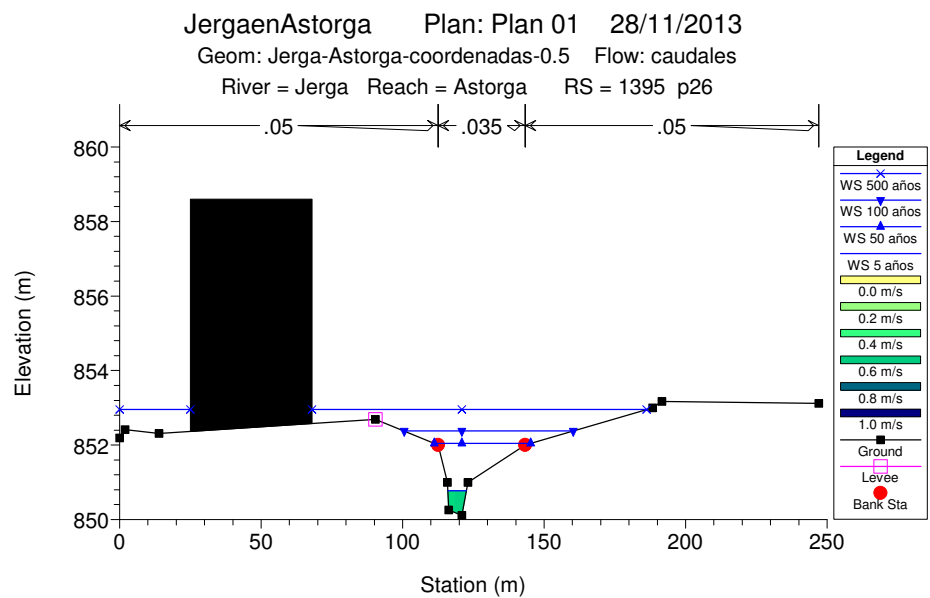
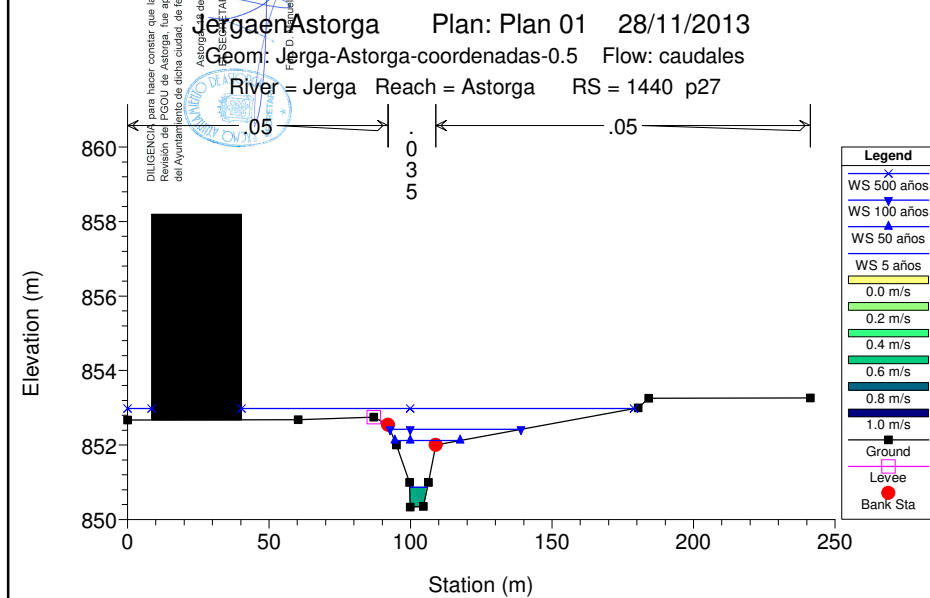
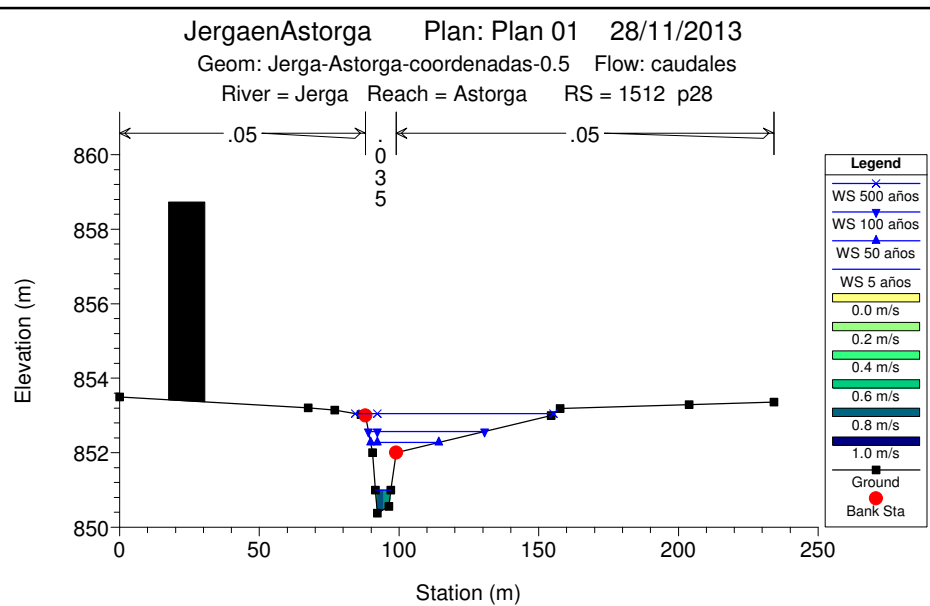
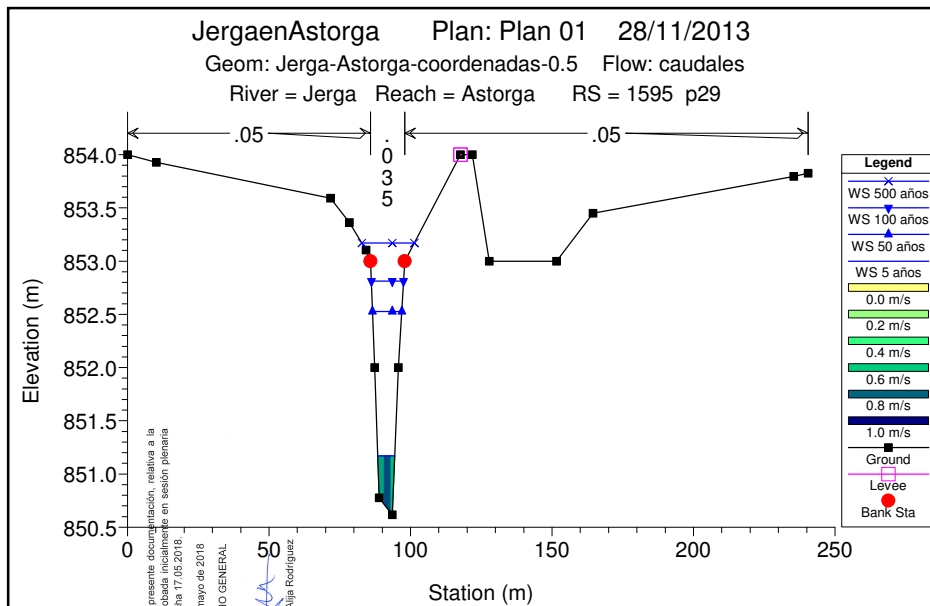
Astorga, 18 de mayo de 2018

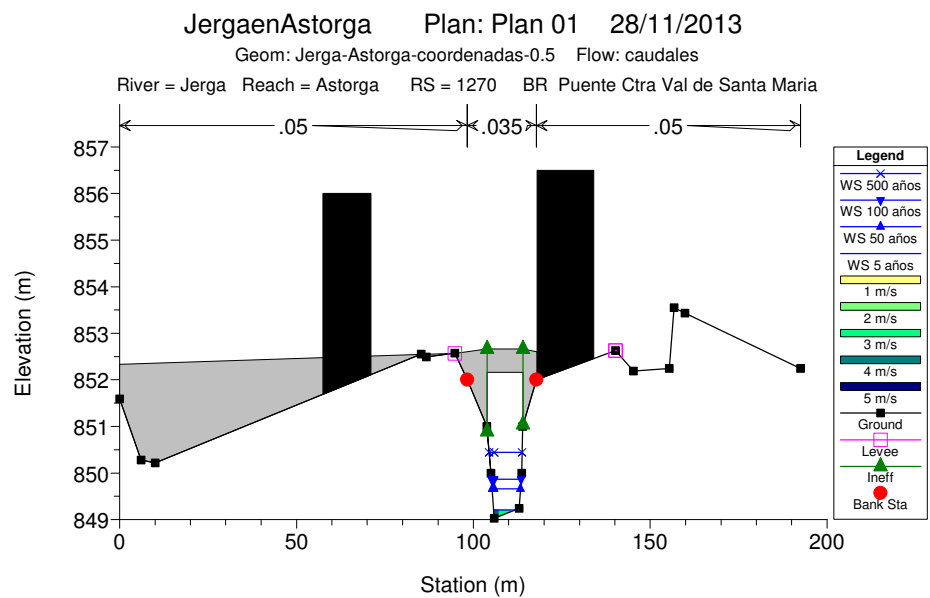
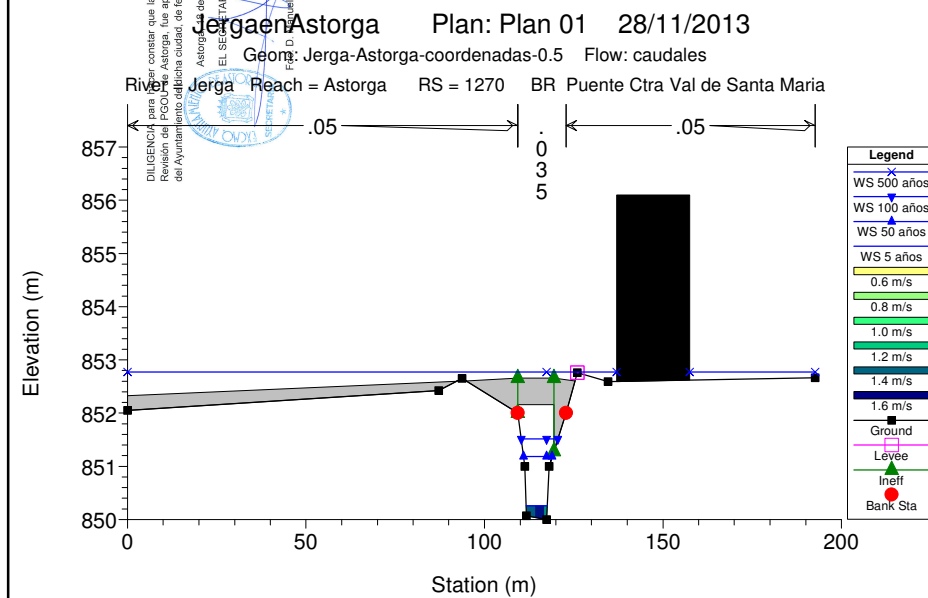
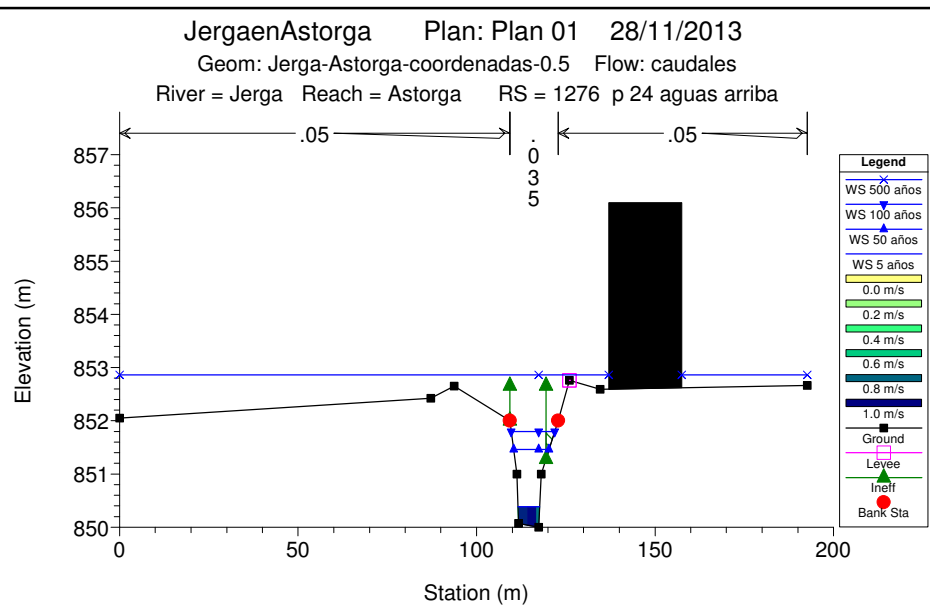
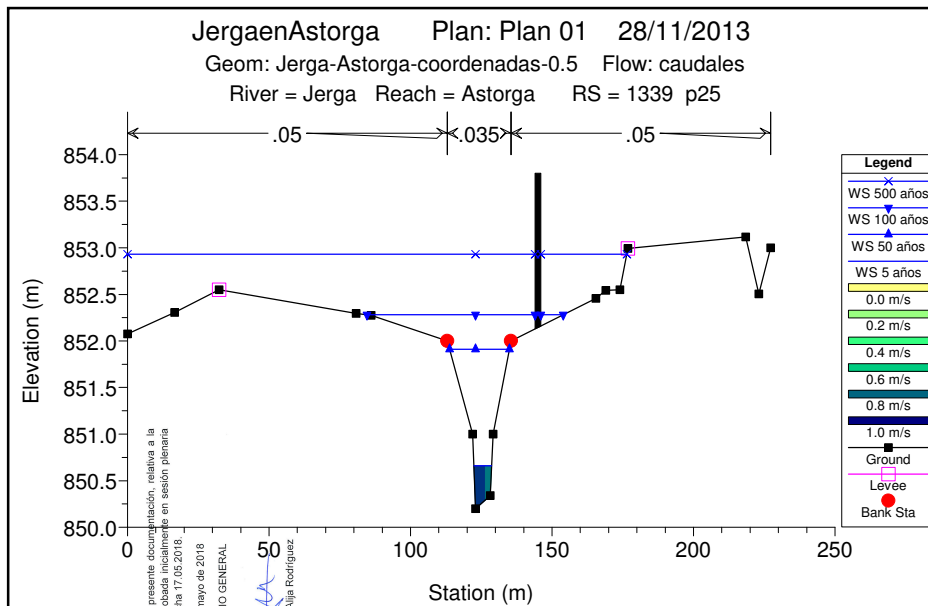
EL SECRETARIO GENERAL

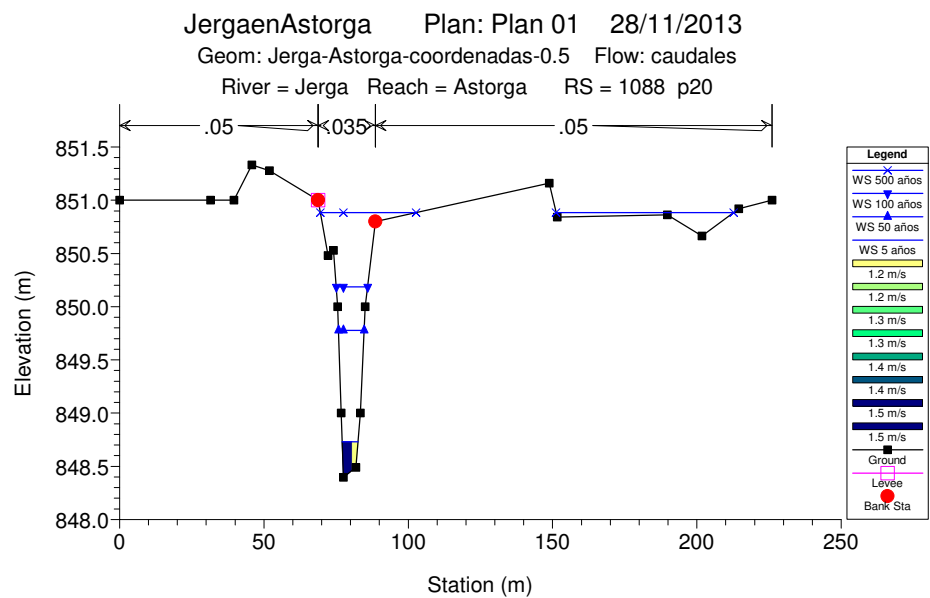
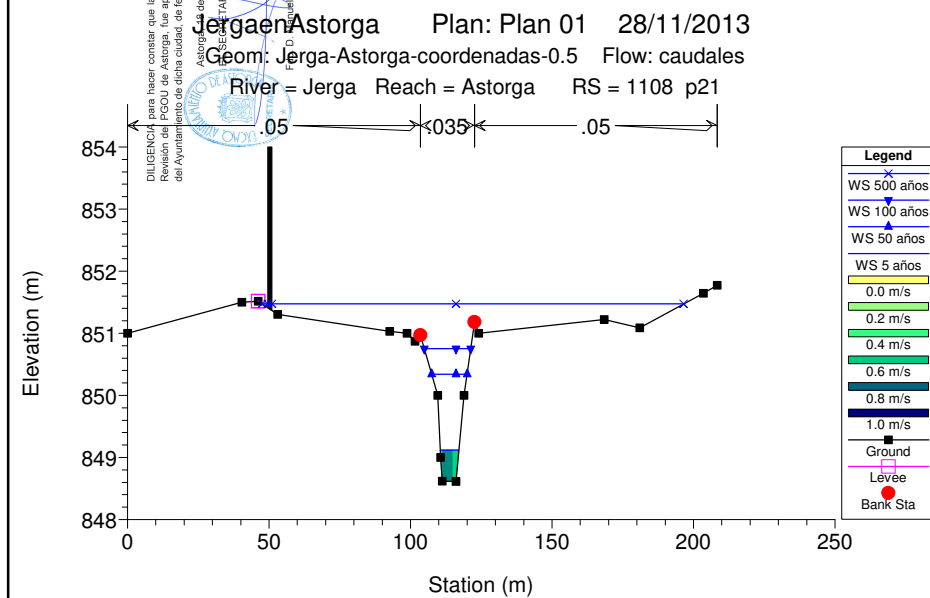
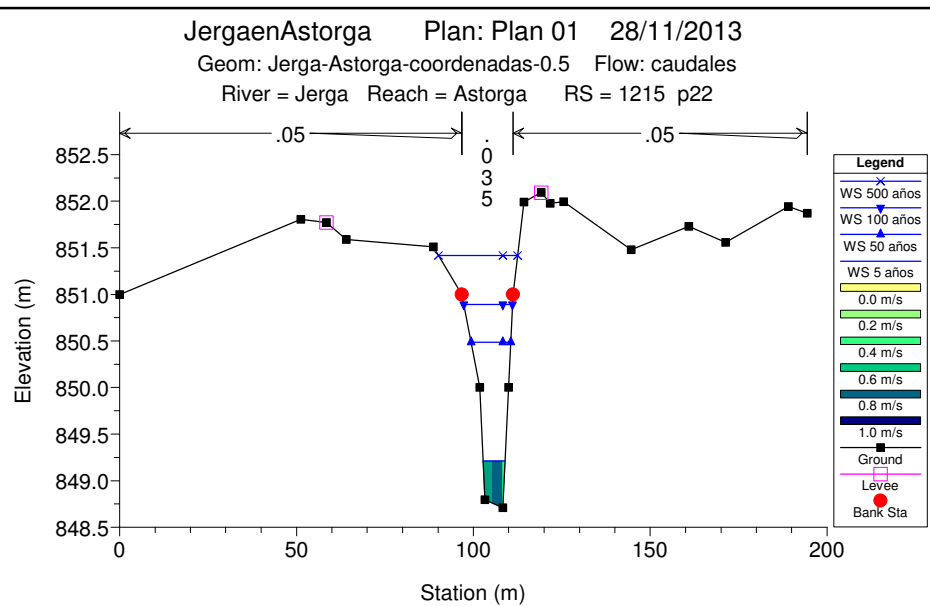
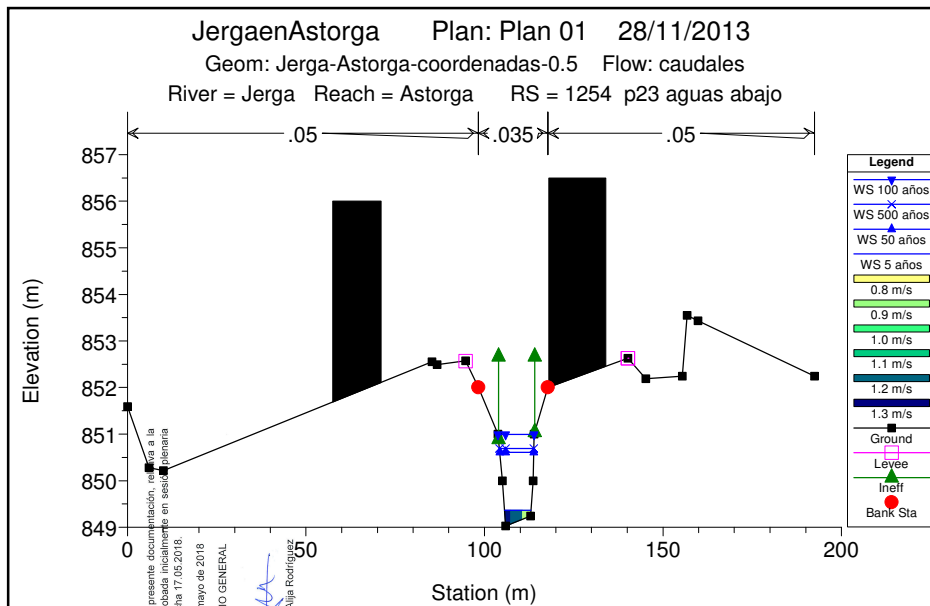
Fdo. D. Manuel Alija Rodríguez

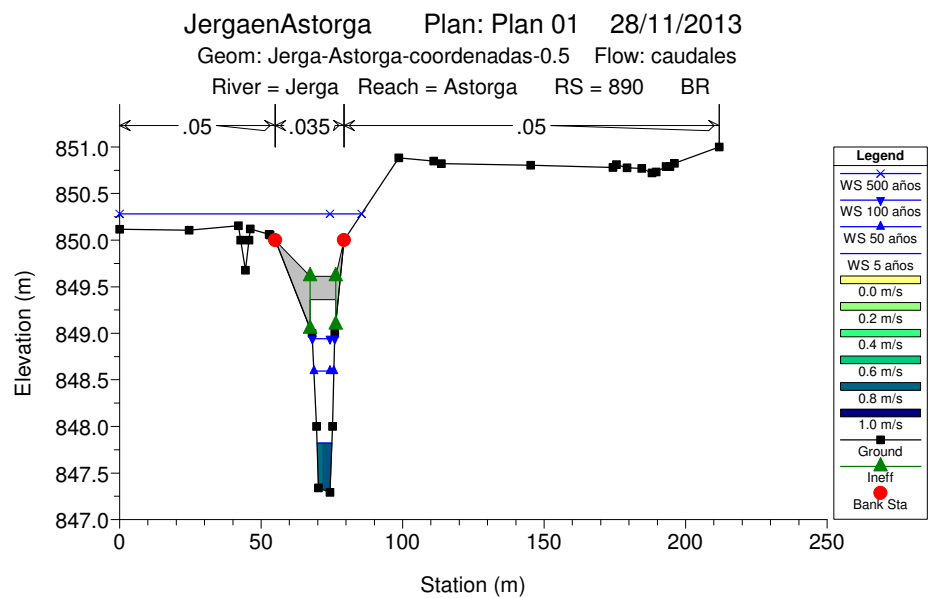
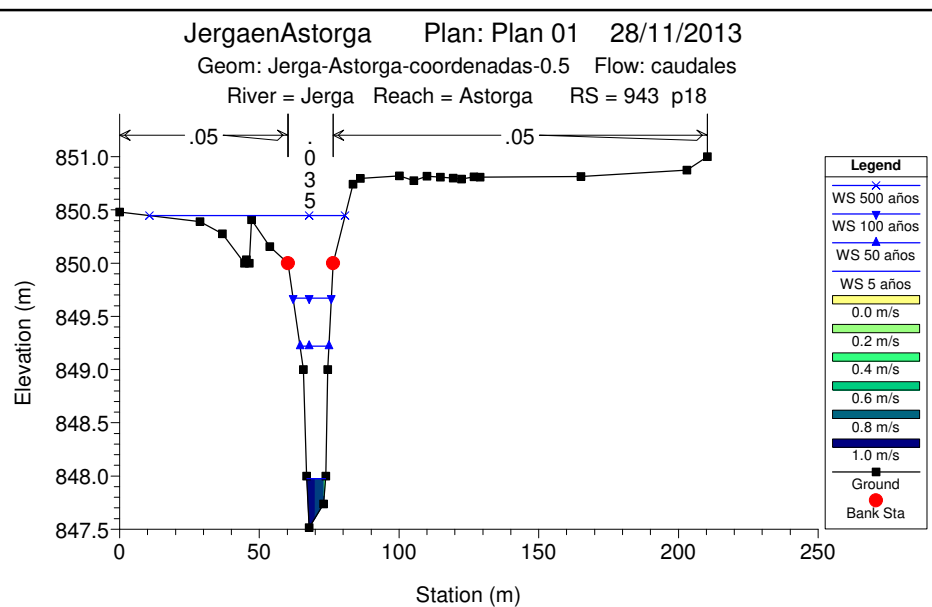
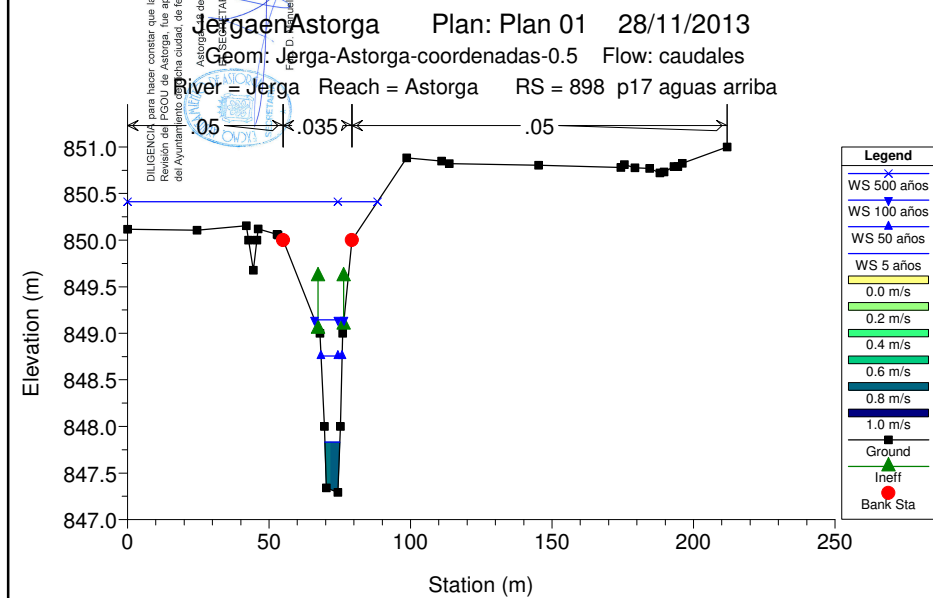
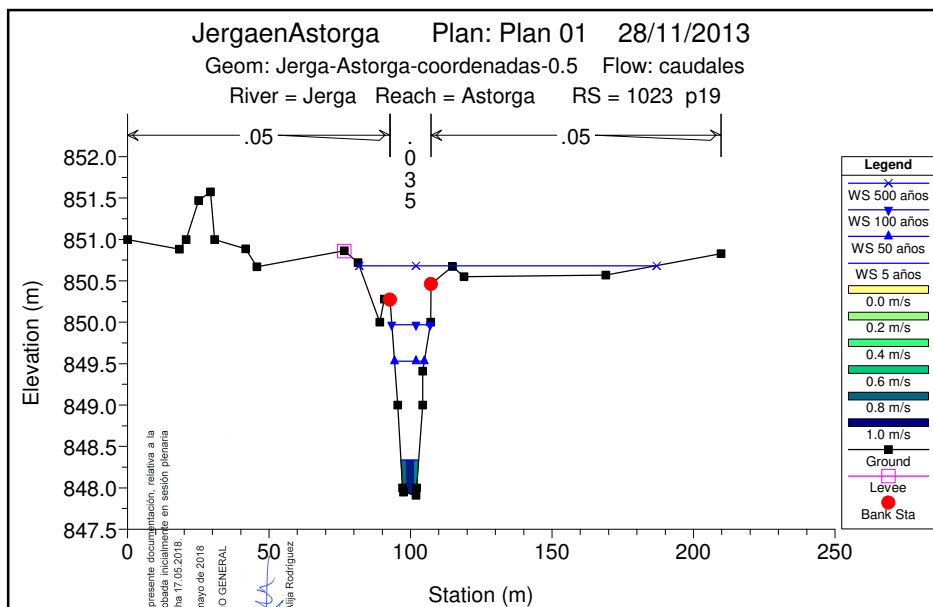
JergaenAstorga Plan: Plan 01 28/11/2013
Geom: Jerga-Astorga-coordenadas-0.5 Flow: caudales

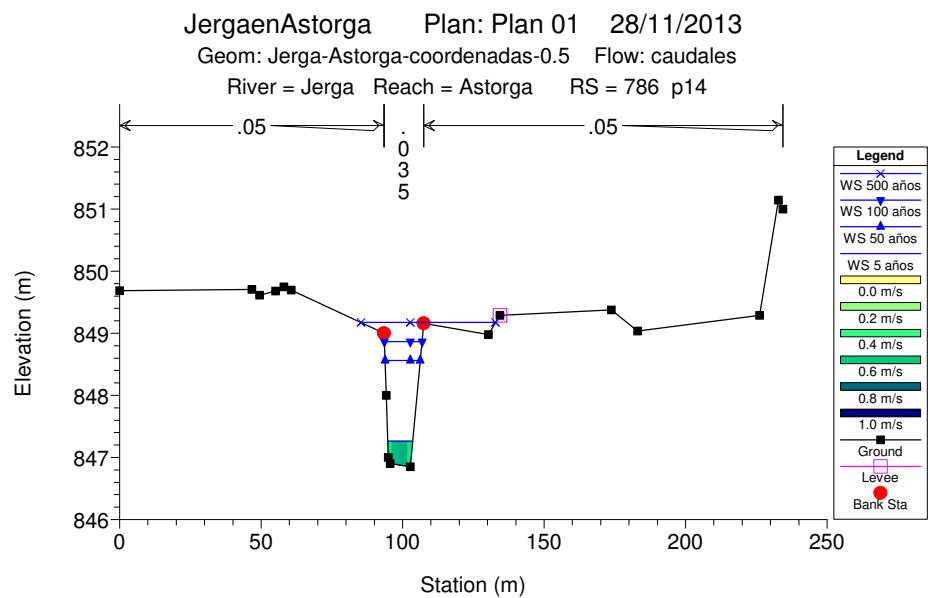
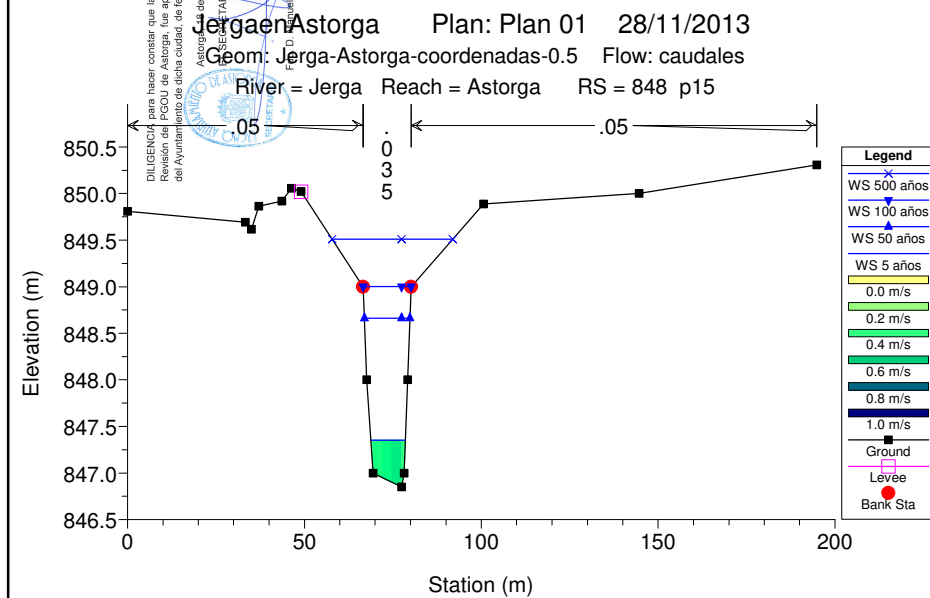
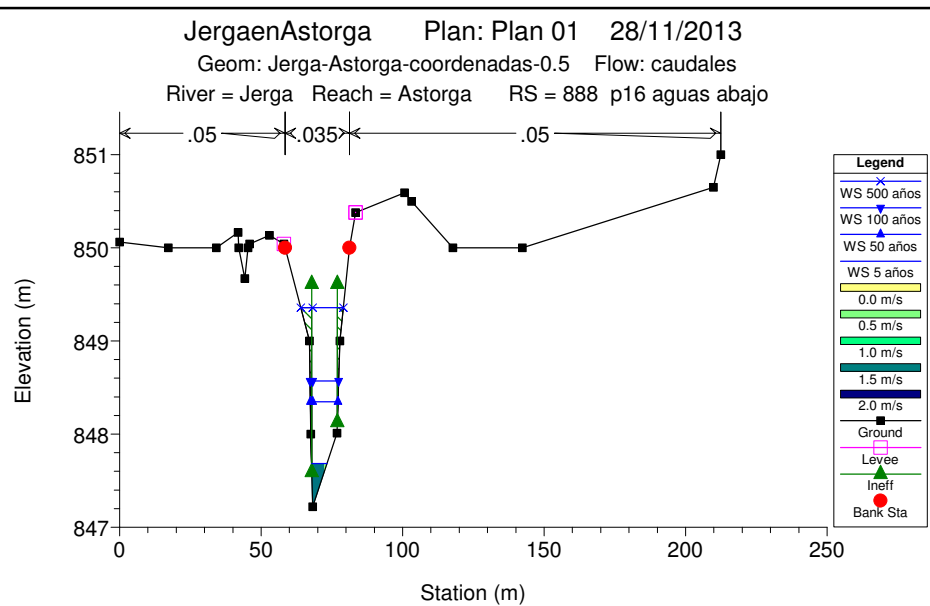
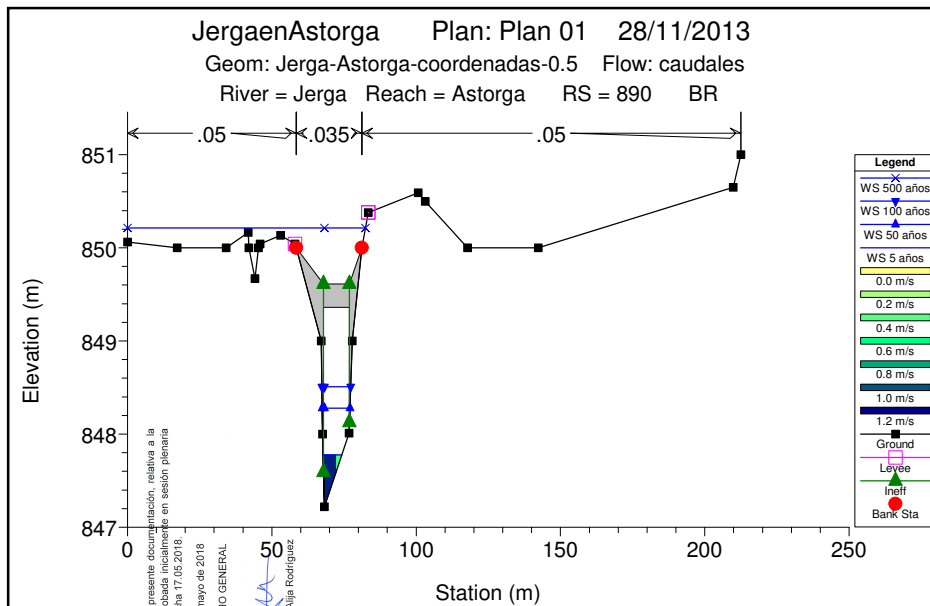


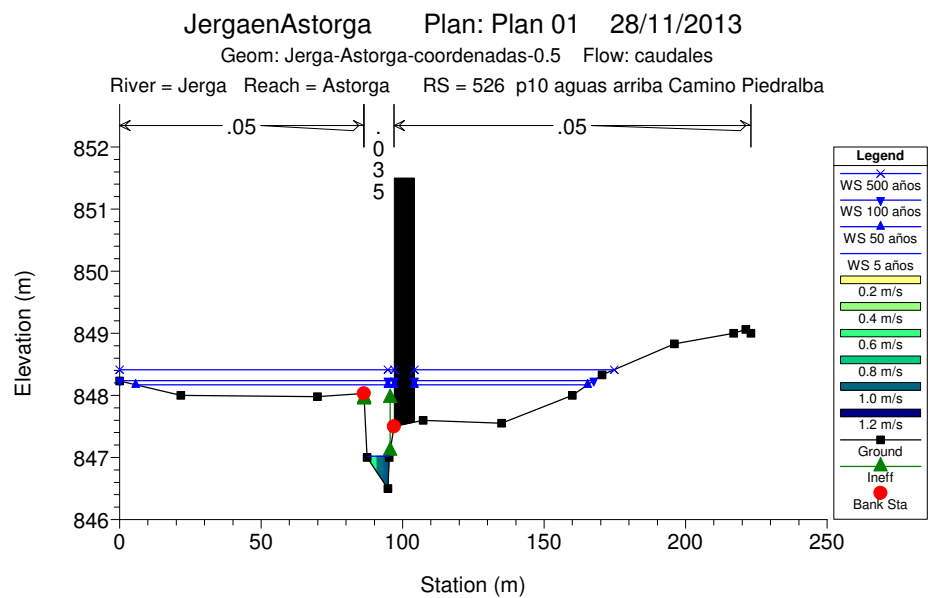
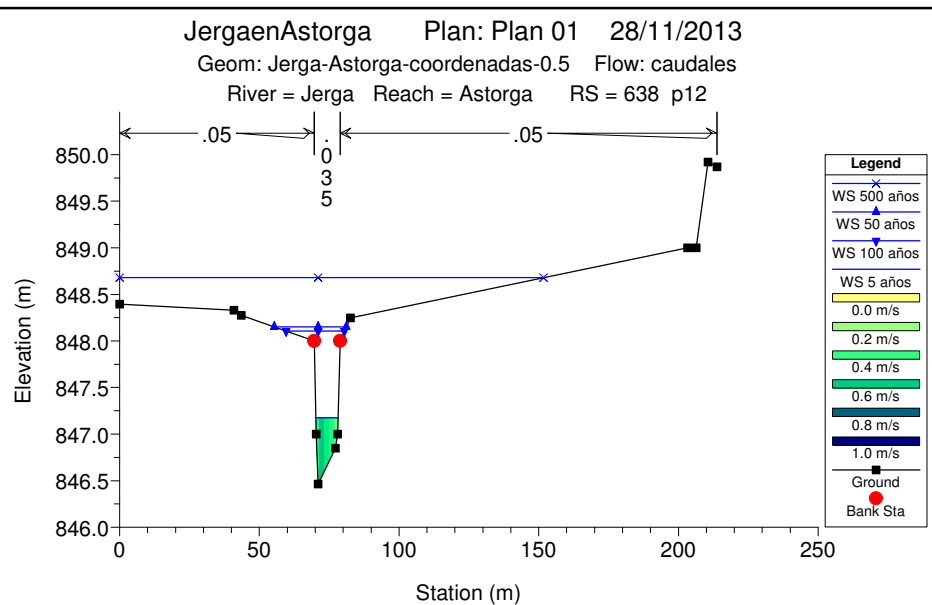
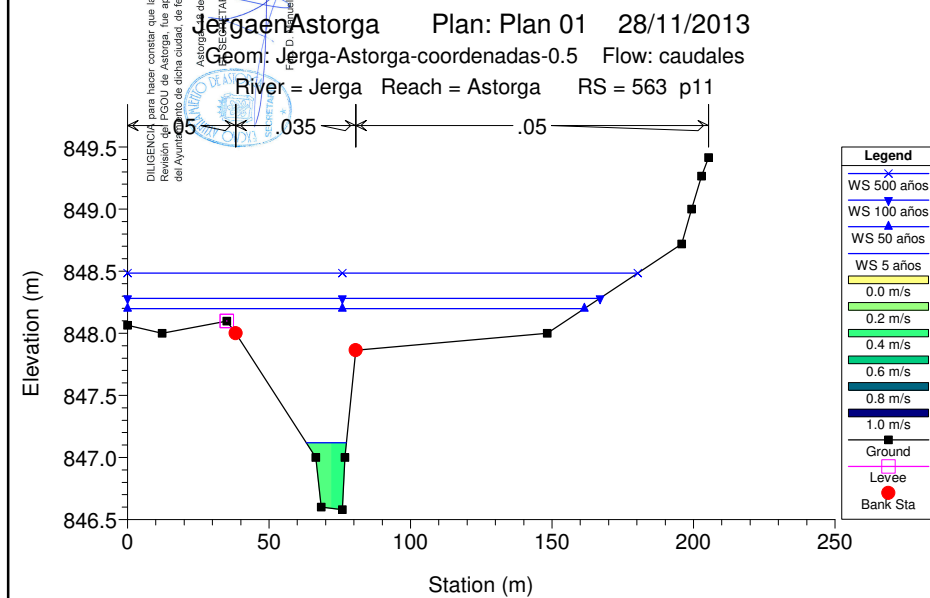
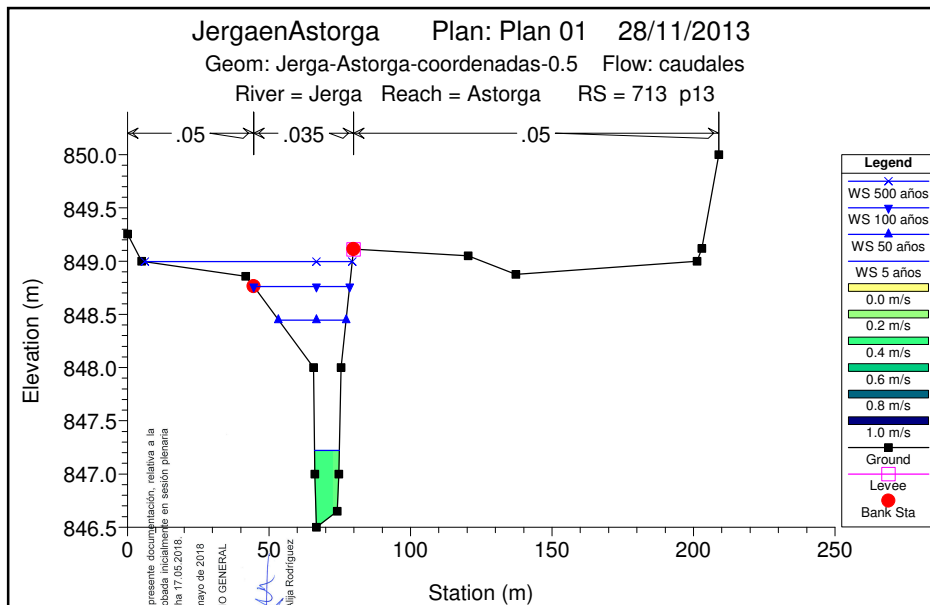


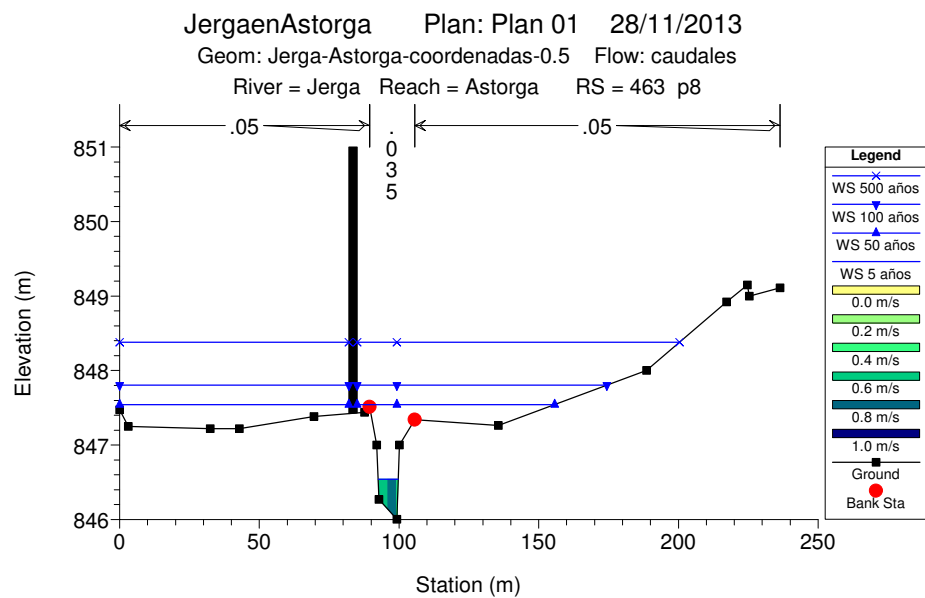
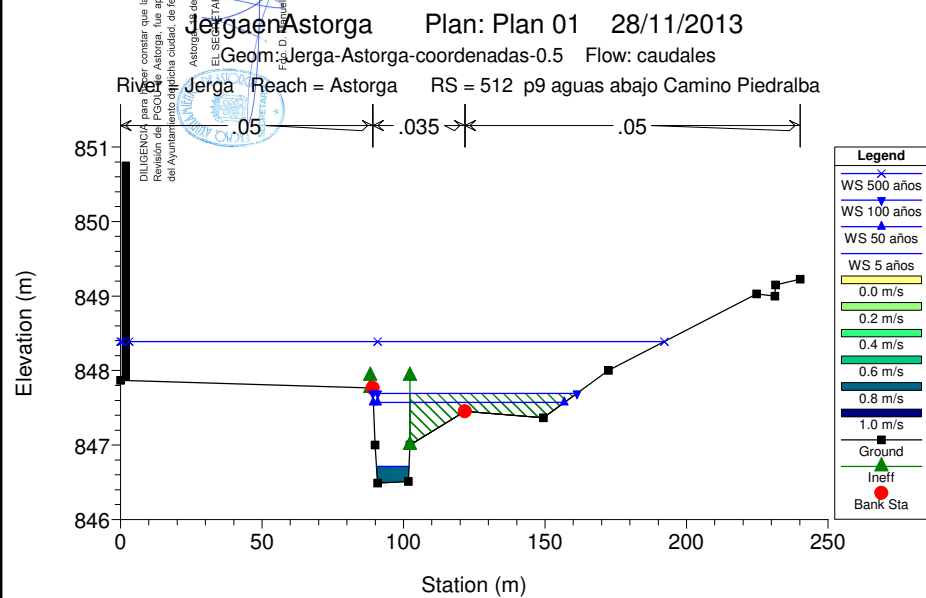
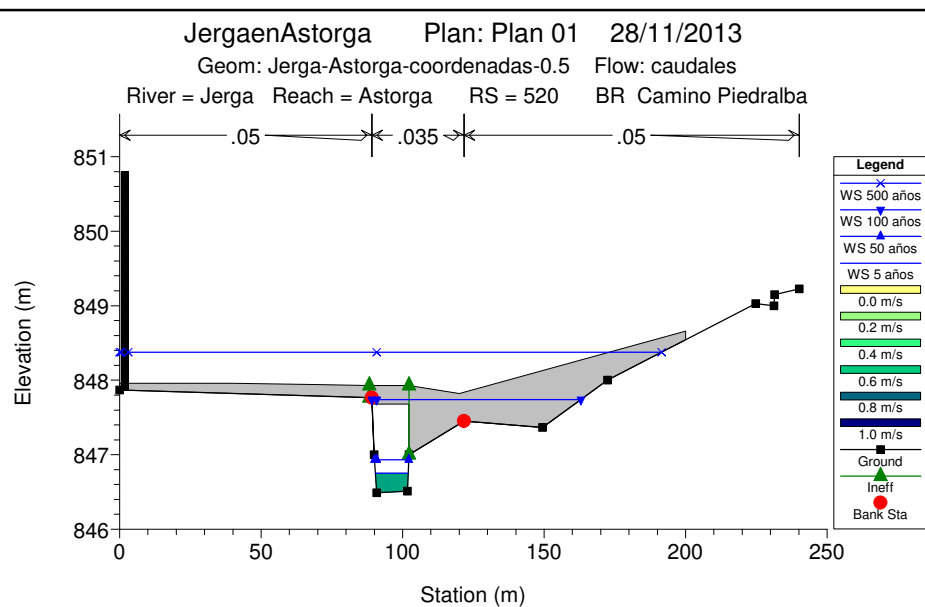
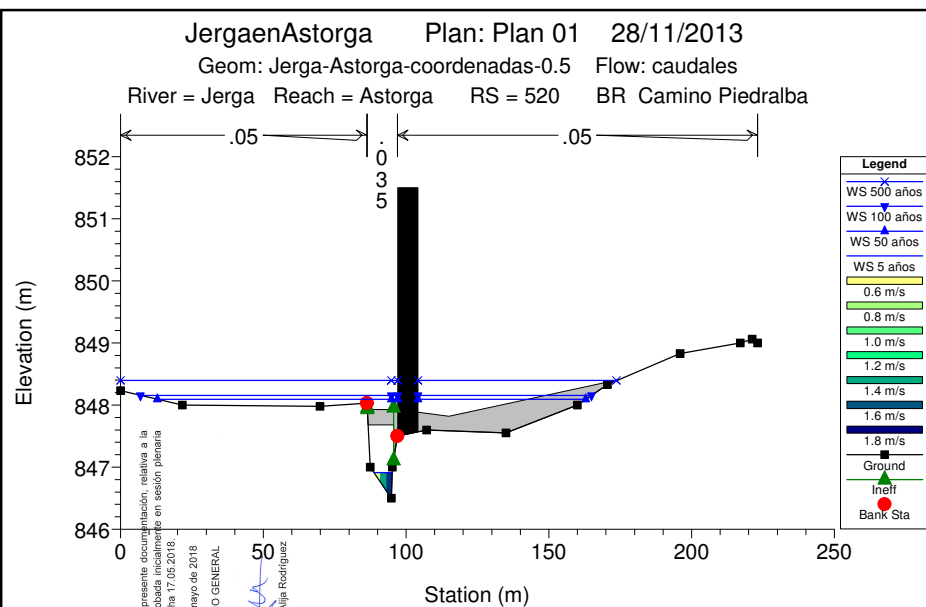


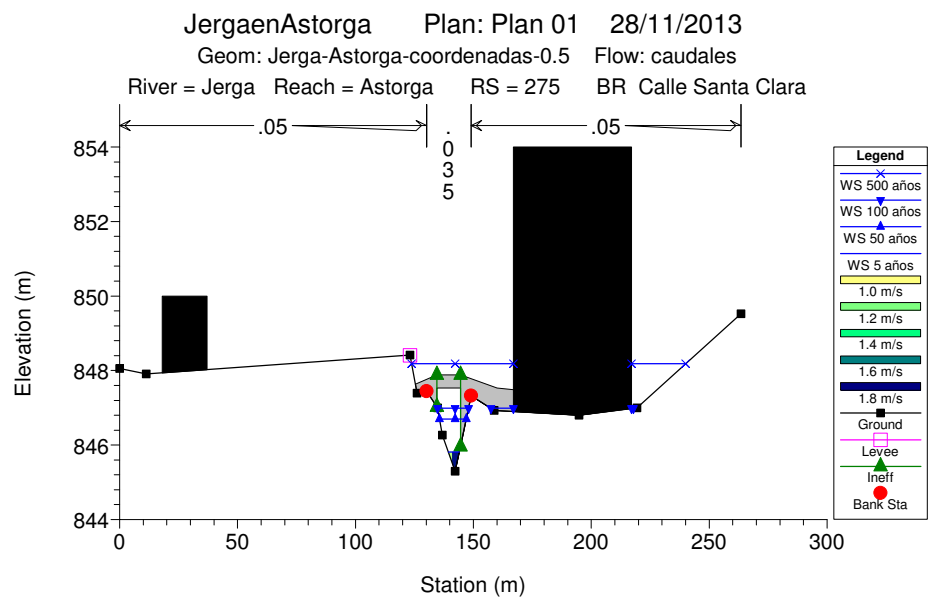
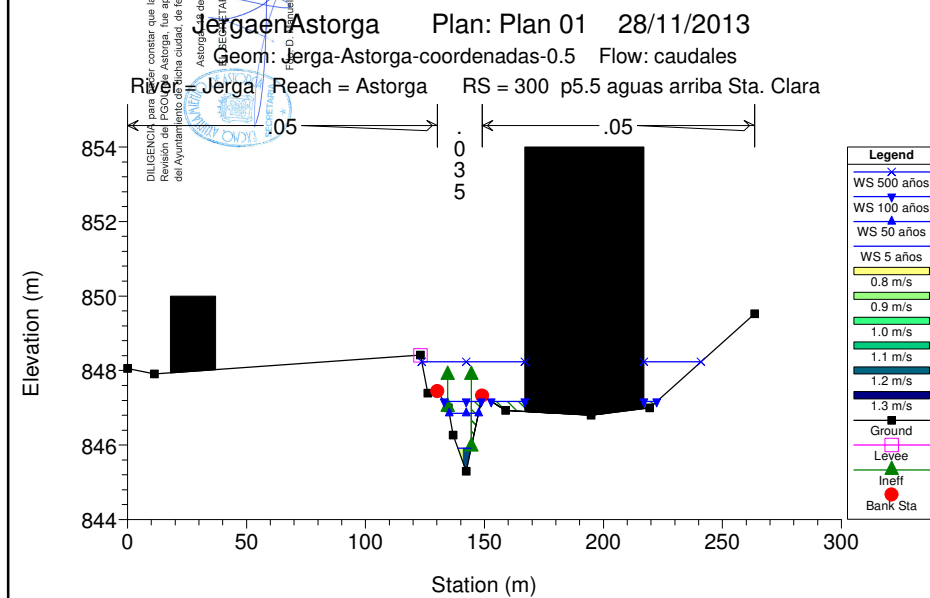
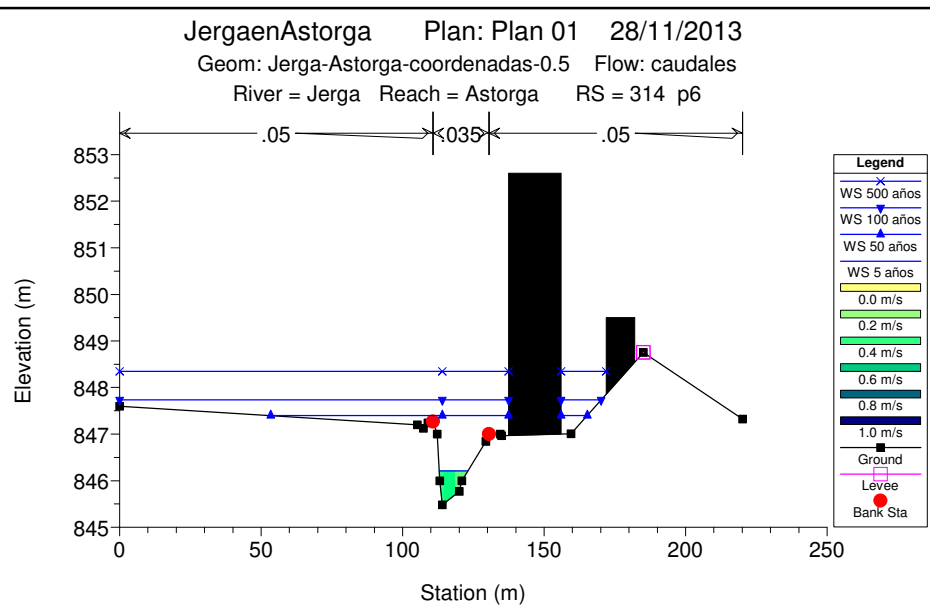
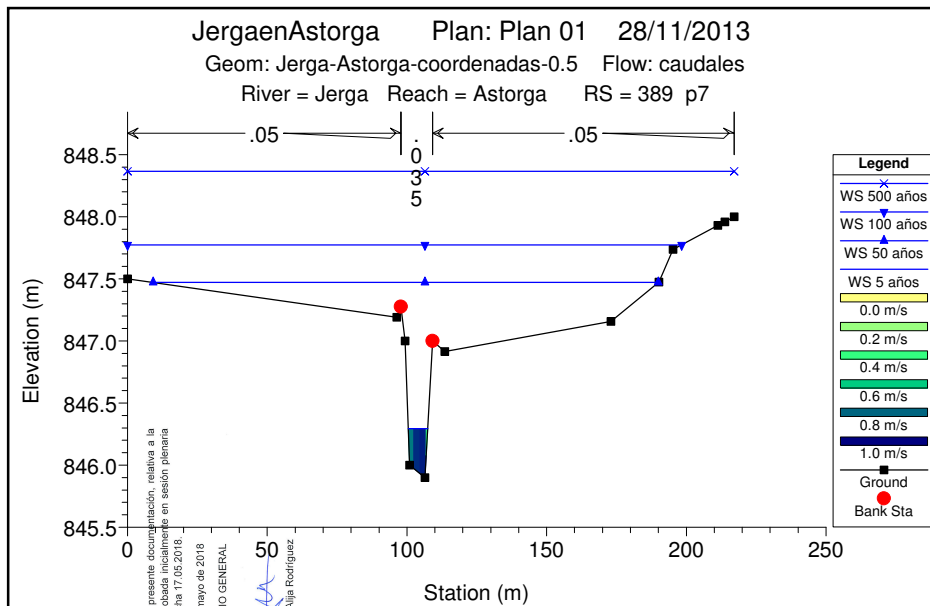


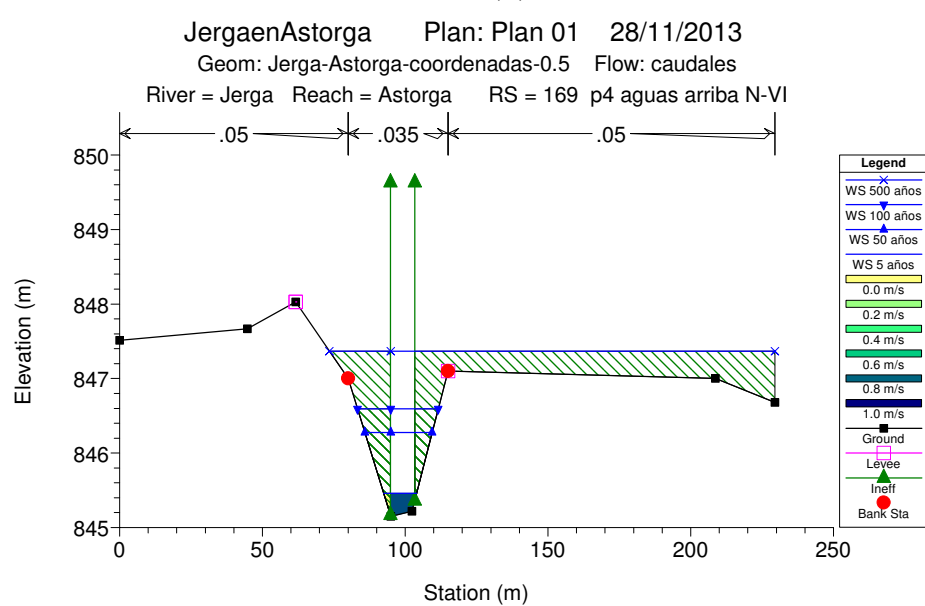
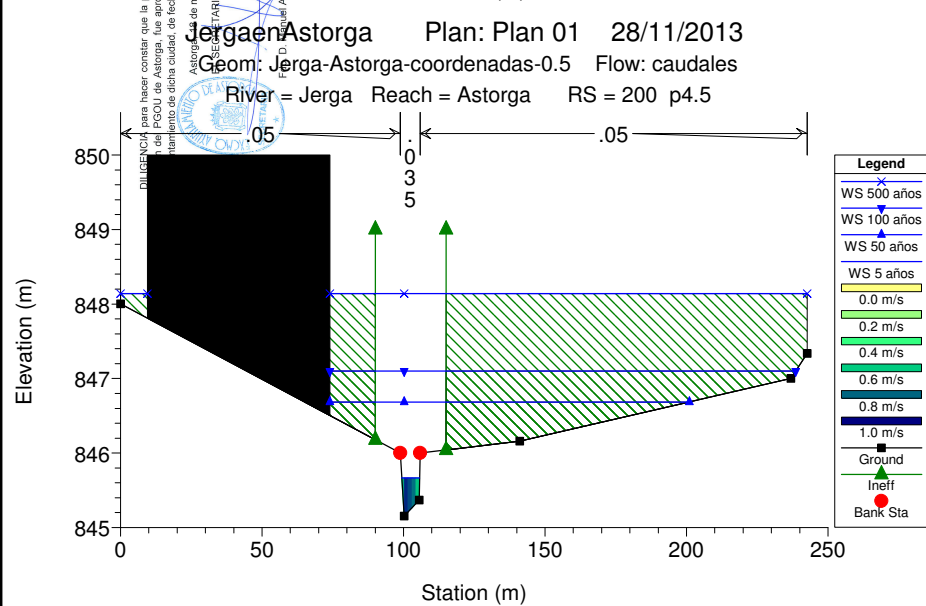
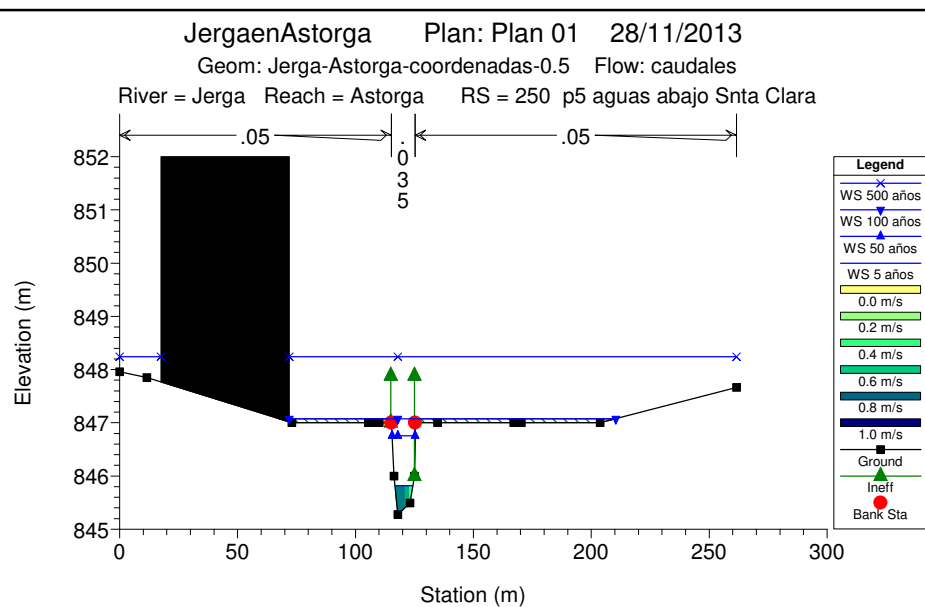
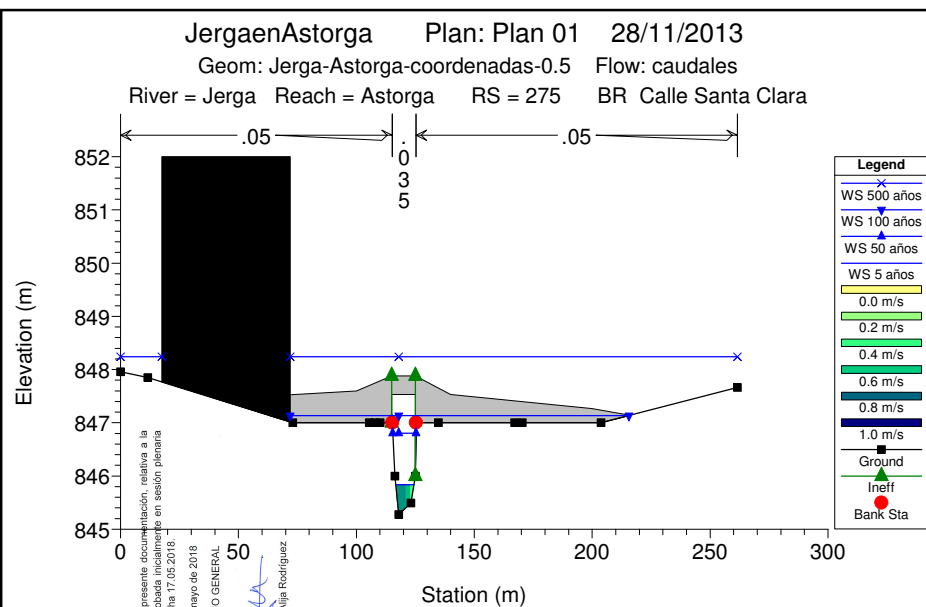


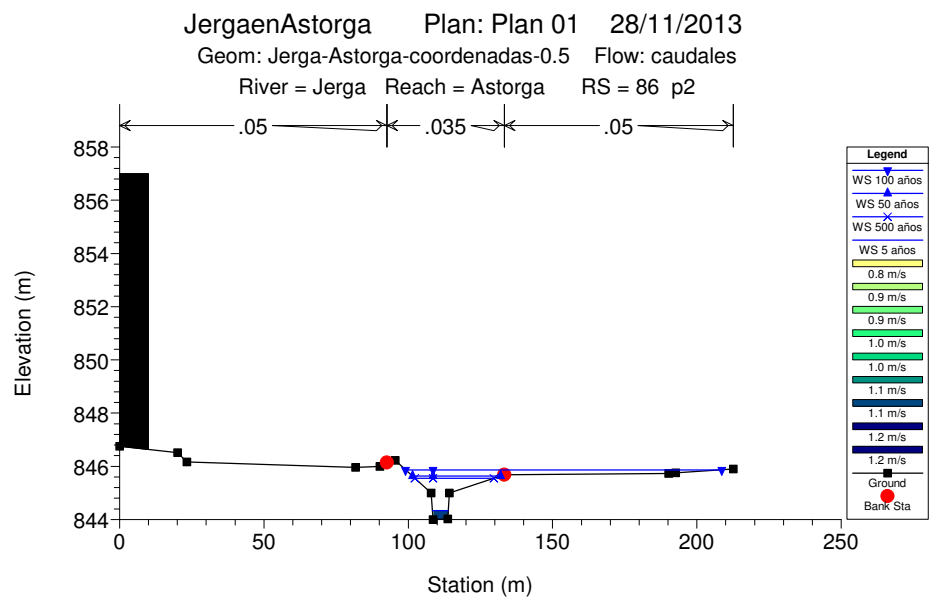
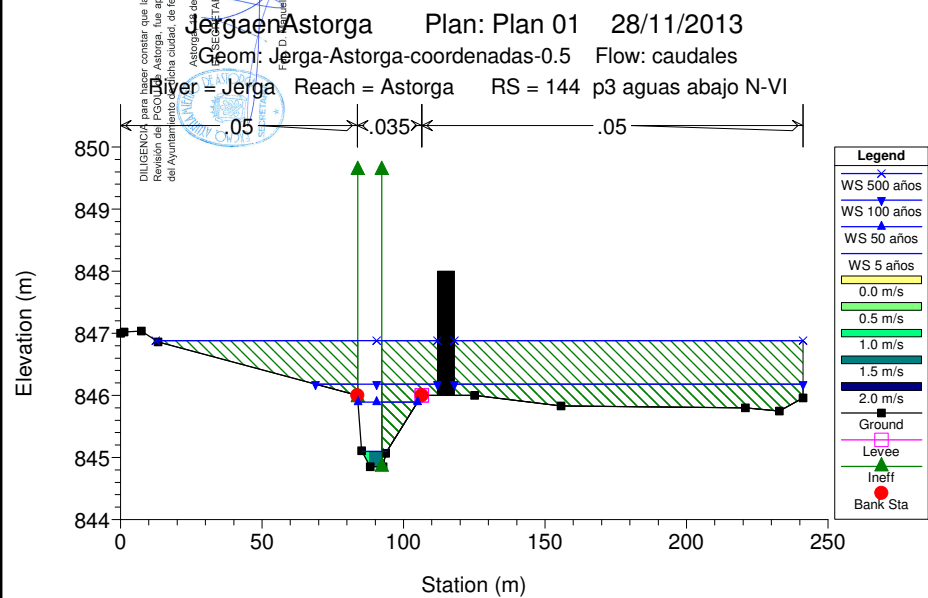
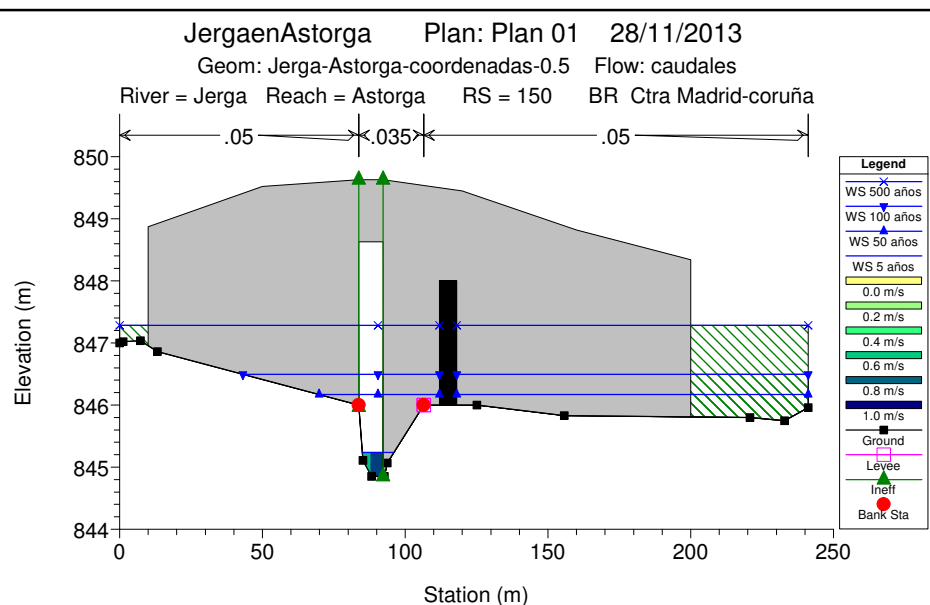
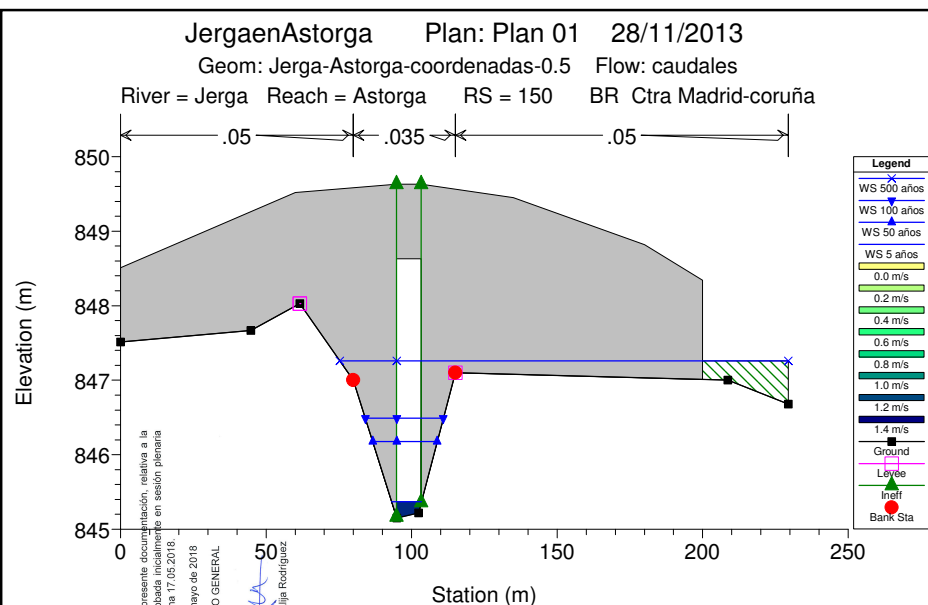








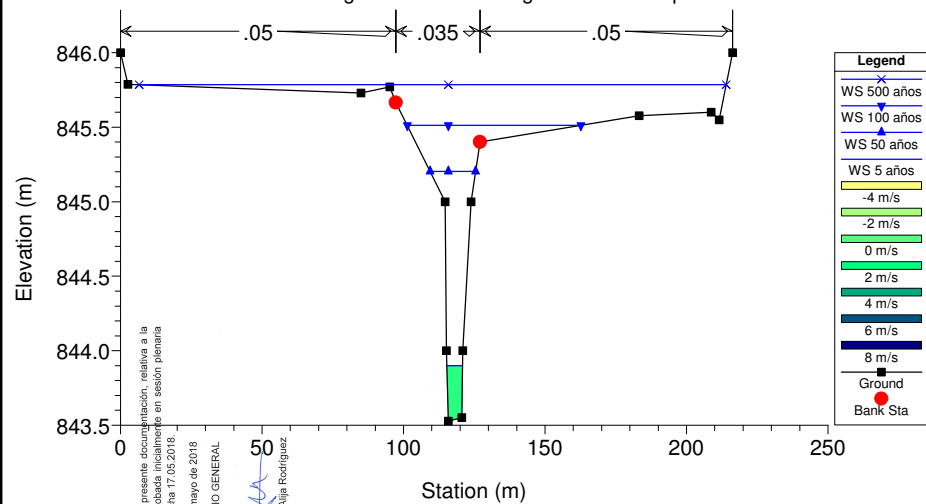




JergaenAstorga Plan: Plan 01 28/11/2013

Geom: Jerga-Astorga-coordenadas-0.5 Flow: caudales

River = Jerga Reach = Astorga RS = 18 p1



DILIGENCIA para hacer constar que la presente documentación, relativa a la
Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria
del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

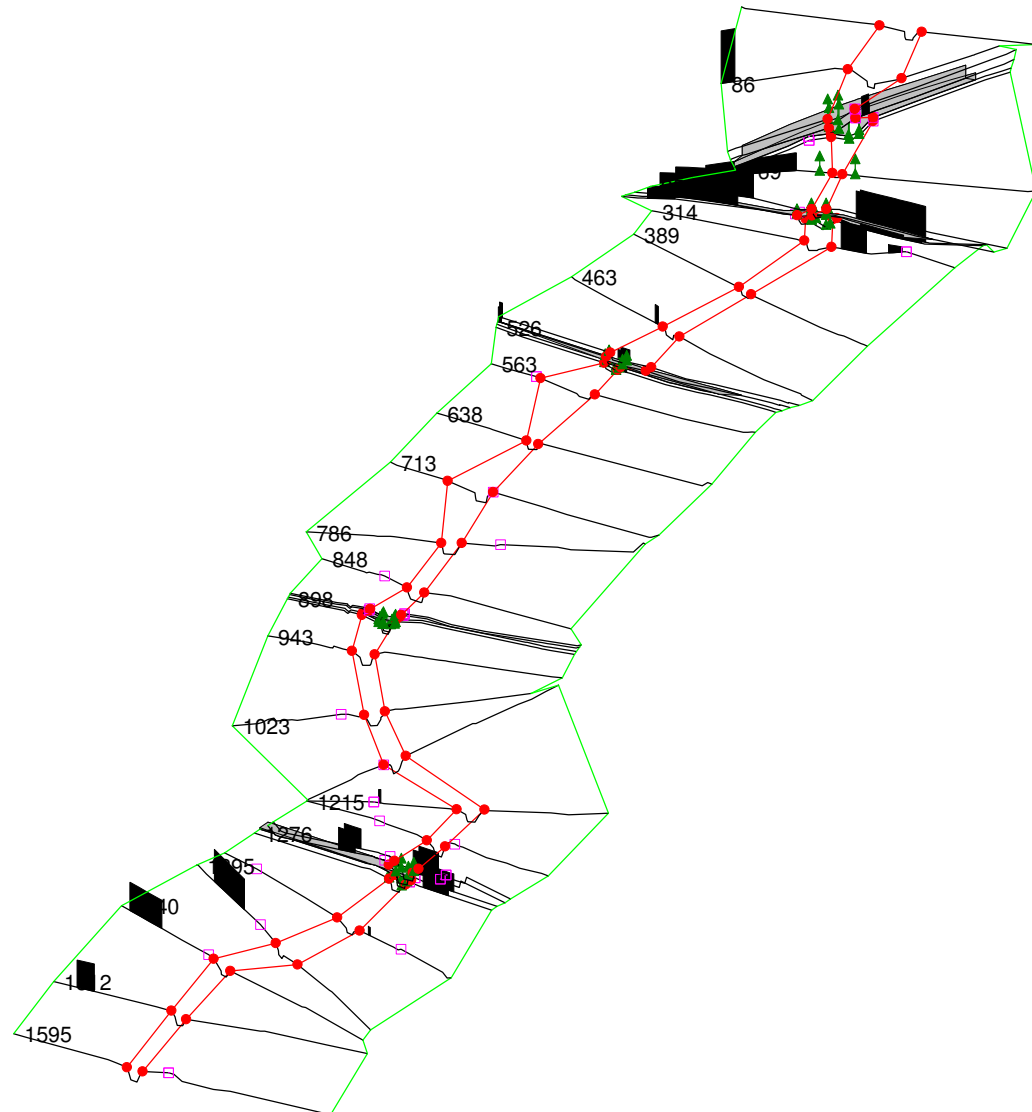
Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez

JergaenAstorga Plan: Plan 01 28/11/2013
 Geom: Jerga-Astorga-coordenadas-0.5 Flow: caudales

Legend	
Ground	
Levee	
Bank Sta	
Ineff	



DILIGENCIA para hacer constar que la presente documentación, relativa a la
 Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria
 del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

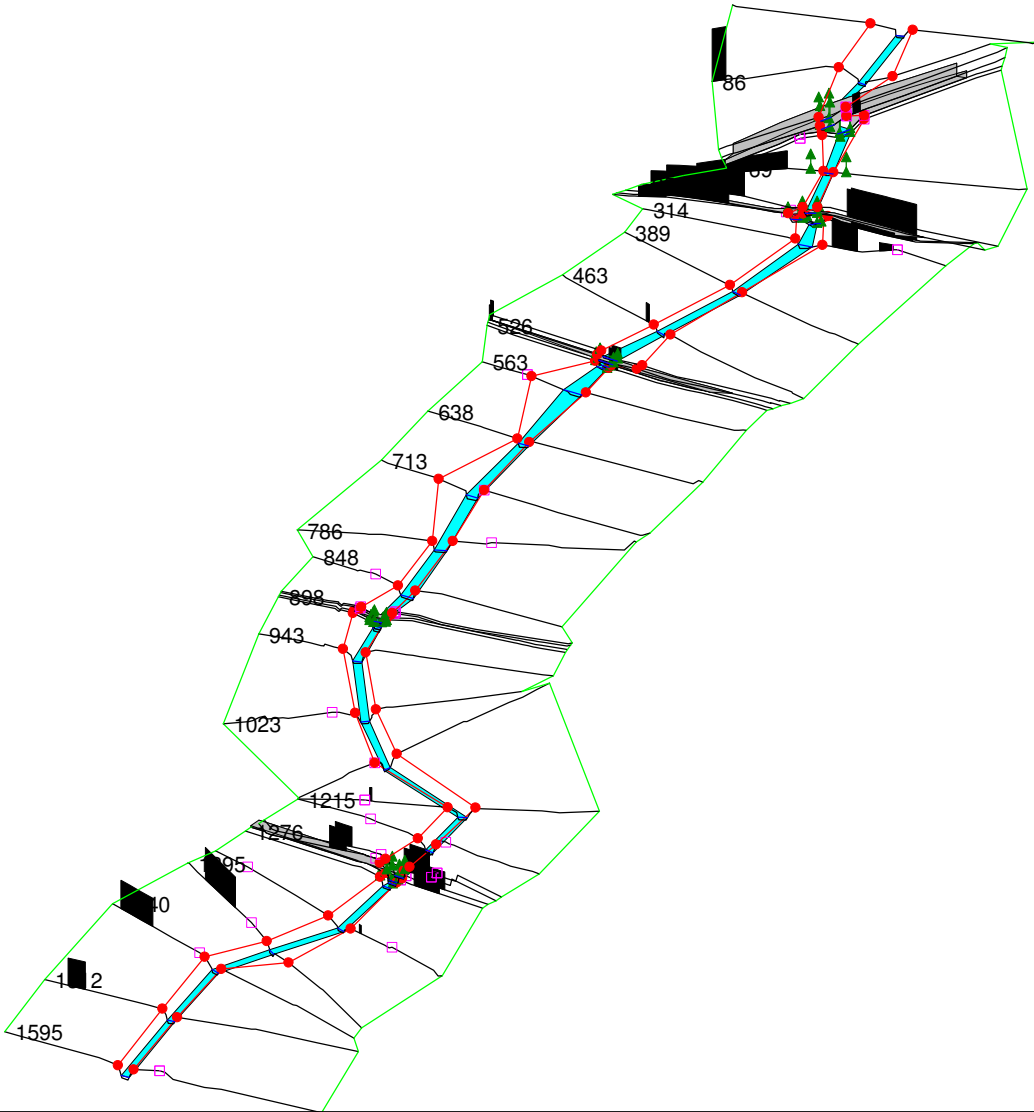
Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL



Fdo. D. Manuel Alja Rodríguez

JergaenAstorga Plan: Plan 01 28/11/2013
Geom: Jerga-Astorga-coordenadas-0.5 Flow: caudales



Legend	
	WS 5 años
	Ground
	Levee
	Bank Sta
	Ineff

DILIGENCIA para hacer constar que la presente documentación, relativa a la
Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria
del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.


Astorga, 18 de mayo de 2018

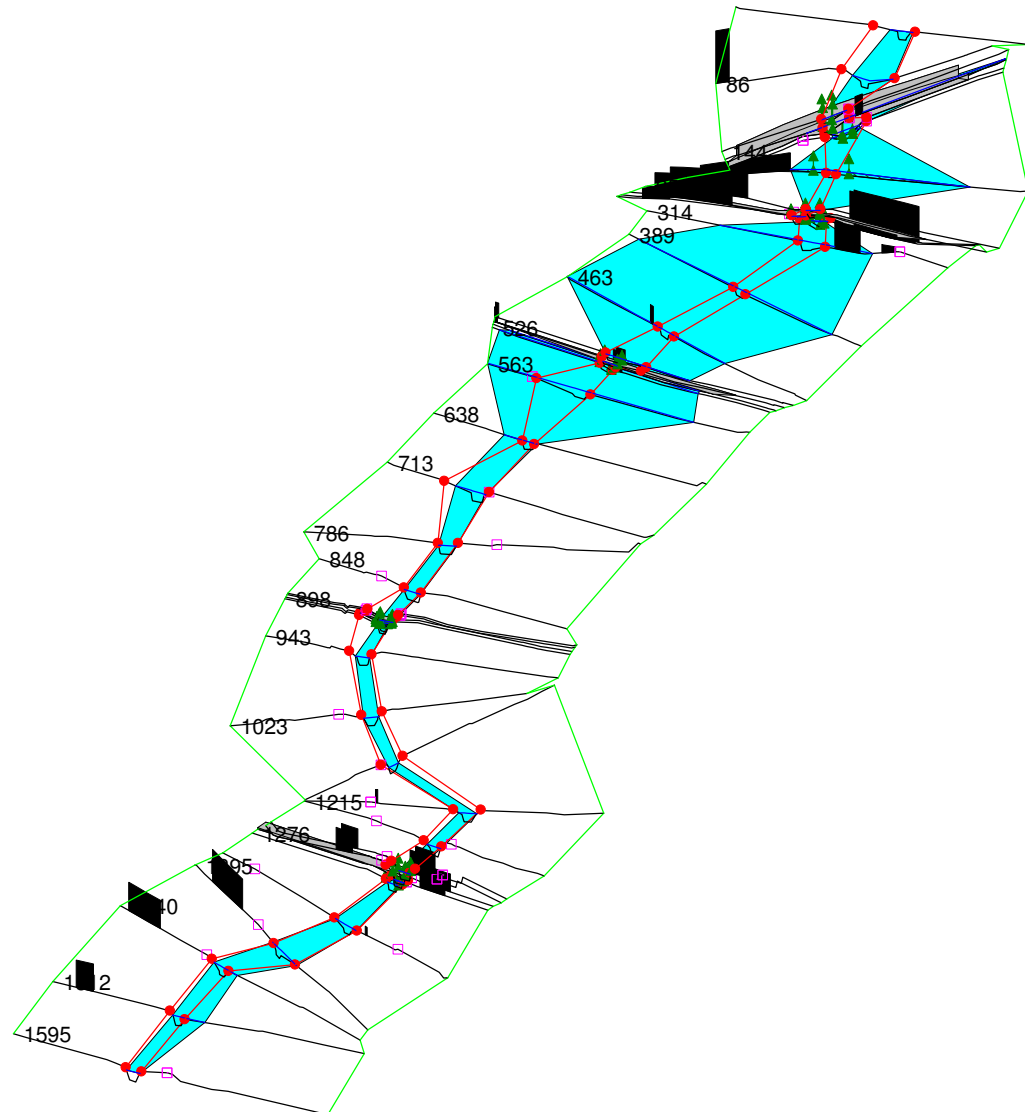
EL SECRETARIO GENERAL



Fdo. D. Manuel Allja Rodríguez

JergaenAstorga Plan: Plan 01 28/11/2013
 Geom: Jerga-Astorga-coordenadas-0.5 Flow: caudales

Legend	
	WS 50 años
	Ground
	Levee
	Bank Sta
	Ineff



DILIGENCIA para hacer constar que la presente documentación, relativa a la
 Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria
 del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.






Astorga, 18 de mayo de 2018

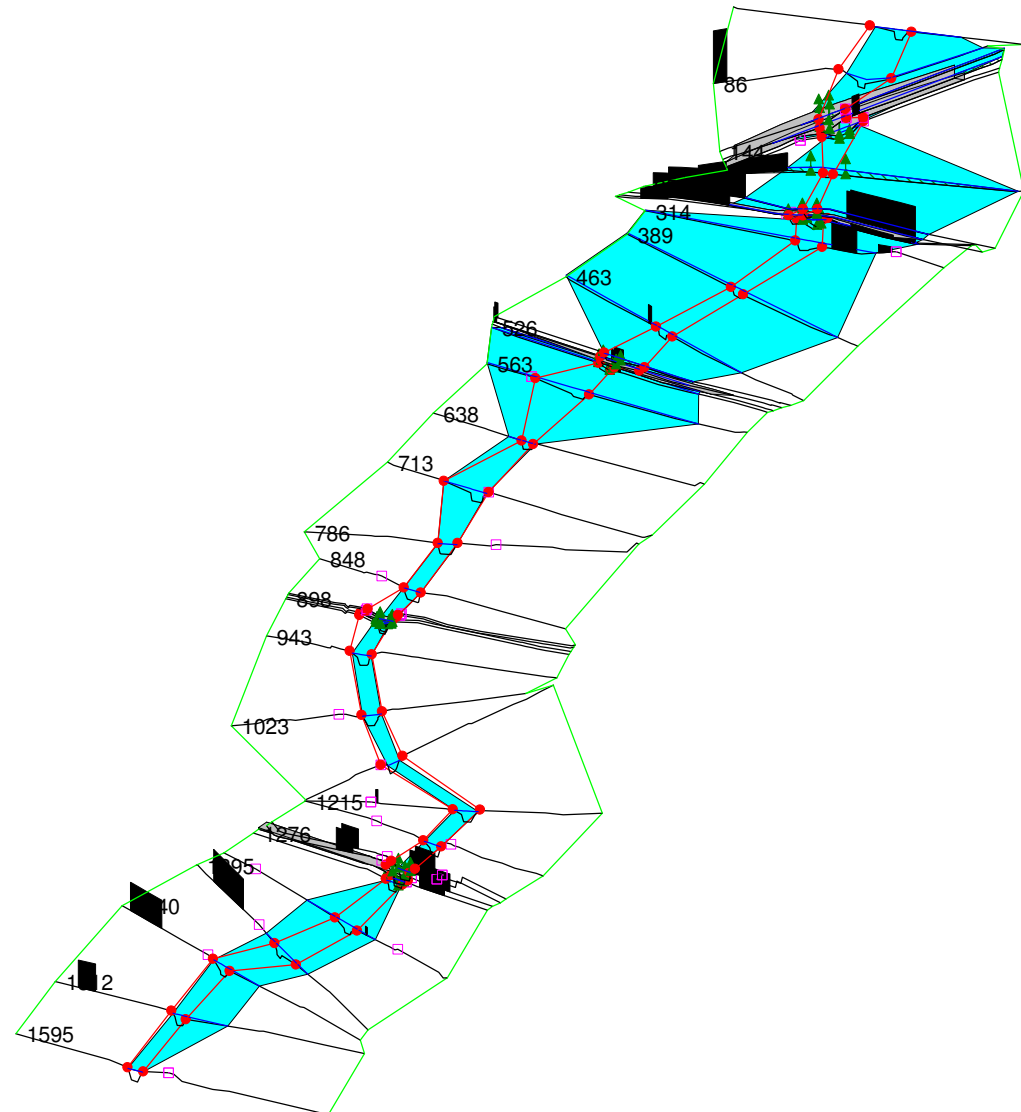
EL SECRETARIO GENERAL

Fdo. D. Manuel Aljiza Rodríguez



JergaenAstorga Plan: Plan 01 28/11/2013
 Geom: Jerga-Astorga-coordenadas-0.5 Flow: caudales

Legend	
	WS 100 años
	Ground
	Levee
	Bank Sta
	Ineff



DILIGENCIA para hacer constar que la presente documentación, relativa a la
 Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria
 del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.






Astorga, 18 de mayo de 2018

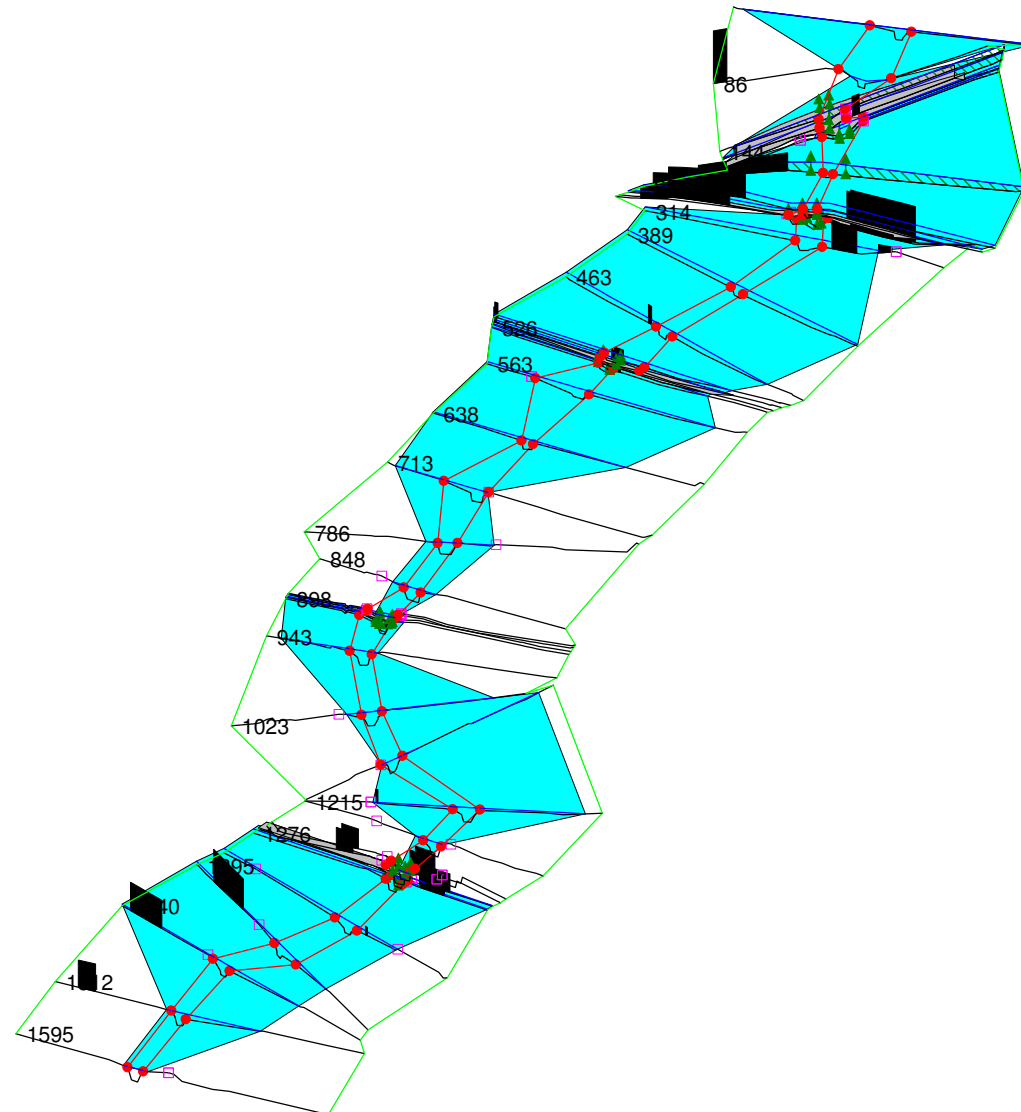
EL SECRETARIO GENERAL



Fdo. D. Manuel Aljiza Rodríguez

JergaenAstorga Plan: Plan 01 28/11/2013
 Geom: Jerga-Astorga-coordenadas-0.5 Flow: caudales

Legend	
	WS 500 años
	Ground
	Levee
	Bank Sta
	Ineff



DILIGENCIA para hacer constar que la presente documentación, relativa a la
 Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria
 del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Aljila Rodríguez



HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X X XXXXXX XXXX XXXX XX XXXX
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PROJECT DATA

Project Title: JergaenAstorga

Project File : Astorga122013.prj

Run Date and Time: 29/11/2013 11:38:49 a.m.

Project in SI units

Project Description:

Estudio Hidráulico Río Jerga en Astorga

Plan General de Ordenación Urbana de

Astorga

PLAN DATA

Plan Title: Plan 04. VID

Plan File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.p02

Geometry Title: Jerga-Astorga-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.g02

Flow Title : VID

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.f02

Plan Summary Information:

Number of: Cross Sections = 31 Multiple Openings = 0

Culverts = 0 Inline Structures = 0

Bridges = 5 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.003

Critical depth calculation tolerance = 0.003

Maximum number of iterations = 20

Maximum difference tolerance = 0.1

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Mixed Flow

Encroachment Data

Equal Conveyance = True

Left Offset = 0

Right Offset = 0

River = Jerga		Reach = Astorga		
RS	Profile	Method	Value1	Value2
1595	VID	1	85.9	97.98
1512	VID	1	87.96	99
1440	VID	1	97.5	108
1395	VID	1	115	129.5
1339	VID	1	121.8	129.6
1276	VID	1	111.6	117.6
1254	VID	1	105	113.5
1215	VID	1	102	109.5
1108	VID	1	110	118
1088	VID	1	77	83
1023	VID	1	96.5	103
943	VID	1	67	73.75
898	VID	1	70	75
888	VID	1	68	74
848	VID	1	67.4	79.25
786	VID	1	95	103
713	VID	1	66.5	74.5
638	VID	1	70.5	77.25
563	VID	1	38	99
526	VID	1	75	100
512	VID	1	89	99
463	VID	1	84	112
389	VID	1	92	117
314	VID	1	112.75	124.5
300	VID	1	136.5	144
250	VID	1	115.23	125.33
200	VID	1	85.35	124.96
169	VID	1	95.8	102.5
144	VID	1	83.75	106.48
86	VID	1	107.9	114.2
18	VID	1	116	122

DILIGENCIA para hacer constar que la presente documentación, relativa a la
 Revisión del P.O.O. de Astorga, fue aprobada por el Comité de Asesoría Técnica
 del Ayuntamiento de Astorga, en sesión plenaria celebrada el día 17 de mayo de 2018.



Astorga, 19 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez

FLOW DATA

Flow Title: VID

Flow File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.f02

Flow Data (m3/s)

River	Reach	RS	100 años	VID
Jerga	Astorga	1595	33.7	33.7

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Jerga	Astorga	100 años	Normal S = 0.006	Normal S = 0.006

GEOMETRY DATA

Geometry Title: Jerga-Astorga-coordenadas-0.5

Geometry File : p:\150 Plan General Astorga\Hec-Rio Jerga\Diciembre2013\Tramo Astorga\Astorga122013.g02

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1595

INPUT

Description: p29

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	10.203	853.929	71.681	853.592	78.408	853.362	84.301	853.105
85.902	853	87.346	852	88.889	850.778	93.518	850.617	95.732	852
97.98	853	117.641	854	121.829	854	127.818	853	151.57	853
164.449	853.45	235.358	853.796	240.524	853.825				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	85.902	.035	97.98	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.902	97.98	77.27	78.3	81.9	.1	.3
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Right Levee Station= 117.64 Elevation= 854

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	853.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.	0.035		
W.S. Elev (m)	852.81	Reach Len. (m)	77.27	78.30	81.90
Crit W.S. (m)	852.19	Flow Area (m2)	16.52		
E.G. Slope (m/m)	0.003561	Area (m2)	16.52		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	11.38	Top Width (m)	11.38		
Vel Total (m/s)	2.04	Avg. Vel. (m/s)	2.04		
Max Chl Dpth (m)	2.19	Hydr. Depth (m)	1.45		
Conv. Total (m3/s)	564.7	Conv. (m3/s)	564.7		
Length Wtd. (m)	78.54	Wetted Per. (m)	12.63		
Min Ch El (m)	850.62	Shear (N/m2)	45.68		
Alpha	1.00	Stream Power (N/m s)	11515.78	0.00	5632.35
Frctn Loss (m)	0.27	Cum Volume (1000 m3)	11.68	34.58	14.10
C & E Loss (m)	0.01	Cum SA (1000 m2)	31.96	30.11	36.03

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	853.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.000	0.035	
W.S. Elev (m)	853.10	Reach Len. (m)	77.27	78.30	81.90
Crit W.S. (m)	852.19	Flow Area (m2)	0.00	19.91	
E.G. Slope (m/m)	0.002095	Area (m2)	0.00	19.91	
Q Total (m3/s)	33.70	Flow (m3/s)	0.00	33.70	
Top Width (m)	12.08	Top Width (m)		12.08	
Vel Total (m/s)	1.69	Avg. Vel. (m/s)	0.01	1.69	
Max Chl Dpth (m)	2.48	Hydr. Depth (m)	0.10	1.65	
Conv. Total (m3/s)	736.3	Conv. (m3/s)	0.0	736.3	
Length Wtd. (m)	78.30	Wetted Per. (m)	0.10	13.52	
Min Ch El (m)	850.62	Shear (N/m2)		30.25	
Alpha	1.00	Stream Power (N/m s)	11515.78	0.00	5632.35

Frctn Loss (m)	0.18	Cum Volume (1000 m3)	2.04	32.43	2.33
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.04	17.71	2.36

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	85.90	88.32	1.76	1.64	2.67	5.22	0.76	1.07	21.47	23.04	
2	Chan	88.32	90.73	10.95	4.84	2.57	32.50	2.00	2.26	65.70	148.61	
3	Chan	90.73	93.15	12.74	5.17	2.42	37.79	2.14	2.46	74.68	184.03	
4	Chan	93.15	95.56	7.53	3.99	2.78	22.36	1.65	1.89	50.09	94.57	
5	Chan	95.56	97.98	0.72	0.89	2.19	2.13	0.44	0.81	14.08	11.41	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	77.31	85.90	0.00	0.00	0.10	0.00	0.10	0.01	0.04	0.00	
2	Chan	85.90	88.32	2.22	2.30	3.00	6.58	0.95	0.96	15.79	15.20	
3	Chan	88.32	90.73	10.57	5.53	2.57	31.36	2.29	1.91	44.15	84.34	
4	Chan	90.73	93.15	12.13	5.86	2.42	35.99	2.43	2.07	49.80	103.07	
5	Chan	93.15	95.56	7.59	4.68	2.78	22.54	1.94	1.62	34.56	56.07	
6	Chan	95.56	97.98	1.19	1.54	2.76	3.54	0.64	0.78	11.45	8.89	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1512

INPUT

Description: p28

Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853.493	67.436	853.207	76.941	853.145	86.336	853.024	87.964	853
90.541	852	91.569	851	92.248	850.376	96.367	850.556	97.089	851
98.968	852	154.466	853	157.615	853.19	203.868	853.287	234.17	853.361

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	87.964	.035	98.968	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	87.964	98.968		92.66	72.85	42.04	.1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
17.5	30.5	858.73

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	852.57	Reach Len. (m)	92.66	72.85	42.04
Crit W.S. (m)		Flow Area (m2)	14.76	9.01	

E.G. Slope (m/m)	0.003258	Area (m2)	14.76	9.01
Q Total (m3/s)	33.70	Flow (m3/s)	29.25	4.45
Top Width (m)	41.53	Top Width (m)	9.90	31.63
Vel Total (m/s)	1.42	Avg. Vel. (m/s)	1.98	0.49
Max Chl Dpth (m)	2.19	Hydr. Depth (m)	1.49	0.28
Conv. Total (m3/s)	590.4	Conv. (m3/s)	512.4	78.0
Length Wtd. (m)	69.82	Wetted Per. (m)	11.03	31.64
Min Ch El (m)	850.38	Shear (N/m2)	42.77	9.10
Alpha	1.71	Stream Power (N/m s)	11211.56	0.00 0.00
Frctn Loss (m)	0.19	Cum Volume (1000 m3)	11.68	33.35 13.73
C & E Loss (m)	0.02	Cum SA (1000 m2)	31.96	29.28 34.73

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	853.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	852.88	Reach Len. (m)	92.66	72.85	42.04
Crit W.S. (m)		Flow Area (m2)	18.00	0.03	
E.G. Slope (m/m)	0.002474	Area (m2)	18.00	0.03	
Q Total (m3/s)	33.70	Flow (m3/s)	33.70	0.00	
Top Width (m)	10.74	Top Width (m)	10.70	0.03	
Vel Total (m/s)	1.87	Avg. Vel. (m/s)	1.87	0.10	
Max Chl Dpth (m)	2.51	Hydr. Depth (m)	1.68	0.88	
Conv. Total (m3/s)	677.6	Conv. (m3/s)	677.5	0.1	
Length Wtd. (m)	72.85	Wetted Per. (m)	11.90	0.91	
Min Ch El (m)	850.38	Shear (N/m2)	36.69	0.75	
Alpha	1.00	Stream Power (N/m s)	11211.56	0.00 0.00	
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	2.04	30.95 2.33	
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.04	16.82 2.36	

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	87.96	90.16	0.11	0.23	1.17	0.34	0.21	0.49	6.31	3.09
2	Chan	90.16	92.37	4.03	2.82	2.88	11.95	1.28	1.43	31.33	44.71
3	Chan	92.37	94.57	11.30	4.71	2.20	33.54	2.14	2.40	68.33	163.94
4	Chan	94.57	96.77	10.08	4.45	2.27	29.92	2.02	2.26	62.63	141.78
5	Chan	96.77	98.97	3.72	2.55	2.51	11.04	1.16	1.46	32.47	47.44
6	ROB	98.97	112.49	3.49	6.06	13.52	10.35	0.45	0.58	14.31	8.24
7	ROB	112.49	126.01	0.94	2.76	13.52	2.80	0.20	0.34	6.53	2.23
8	ROB	126.01	139.53	0.02	0.19	4.59	0.07	0.04	0.12	1.32	0.16

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	87.96	90.16	0.43	0.70	2.04	1.28	0.37	0.62	8.34	5.13
2	Chan	90.16	92.37	5.03	3.51	2.88	14.92	1.60	1.43	29.61	42.39
3	Chan	92.37	94.57	12.31	5.40	2.20	36.53	2.45	2.28	59.48	135.55
4	Chan	94.57	96.77	11.12	5.14	2.27	32.99	2.34	2.16	54.92	118.68
5	Chan	96.77	98.97	4.81	3.24	2.51	14.28	1.47	1.49	31.33	46.58
6	ROB	98.97	112.49	0.00	0.03	0.91	0.01	0.88	0.10	0.75	0.07

CROSS SECTION

RIVER: Jerga
REACH: Astorga RS: 1440

INPUT

Description: p27

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.668	60.315	852.68	86.983	852.752	92.124	852.543	95.064	852
99.617	851	99.857	850.338	104.568	850.354	106.384	851	108.898	852
180.44	853	184.151	853.252	241.243	853.266				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.124	.035	108.898	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

92.124	108.898	95.14	72.85	40.8	.1	.3
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Left Levee Station= 86.98 Elevation= 852.75

Blocked Obstructions num= 1

Sta L	Sta R	Elev
-------	-------	------

8.5	40.3	858.2
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CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	852.42	Reach Len. (m)	95.14	72.85	40.80
Crit W.S. (m)	851.79	Flow Area (m2)	20.36	6.37	
E.G. Slope (m/m)	0.002314	Area (m2)	20.36	6.37	
Q Total (m3/s)	33.70	Flow (m3/s)	31.53	2.17	
Top Width (m)	46.30	Top Width (m)	16.12	30.18	
Vel Total (m/s)	1.26	Avg. Vel. (m/s)	1.55	0.34	
Max Chl Dpth (m)	2.08	Hydr. Depth (m)	1.26	0.21	
Conv. Total (m3/s)	700.6	Conv. (m3/s)	655.5	45.1	
Length Wtd. (m)	71.67	Wetted Per. (m)	17.03	30.19	
Min Ch El (m)	850.34	Shear (N/m2)	27.13	4.79	
Alpha	1.42	Stream Power (N/m s)	11550.21	4164.41	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	11.68	32.07	13.41
C & E Loss (m)	0.02	Cum SA (1000 m2)	31.96	28.33	33.43

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del P.O.C. de Asesoría, fue elaborada y firmada por el personal de la Oficina de Asesoría Técnica, de fecha 17.05.2018.

Asesora: 19 de mayo de 2018

EL SECRETARIO GENERAL



Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	852.90	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.035		
W.S. Elev (m)	852.77	Reach Len. (m)	95.14	72.85	40.80
Crit W.S. (m)	851.76	Flow Area (m2)	21.34		
E.G. Slope (m/m)	0.001689	Area (m2)	21.34		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	10.50	Top Width (m)	10.50		
Vel Total (m/s)	1.58	Avg. Vel. (m/s)	1.58		
Max Chl Dpth (m)	2.43	Hydr. Depth (m)	2.03		
Conv. Total (m3/s)	820.0	Conv. (m3/s)	820.0		
Length Wtd. (m)	72.85	Wetted Per. (m)	13.69		
Min Ch El (m)	850.34	Shear (N/m2)	25.83		
Alpha	1.00	Stream Power (N/m s)	11550.21	4164.41	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	2.04	29.52	2.33
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.04	16.04	2.36

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.12	95.48	0.32	0.68	2.75	0.95	0.25	0.47	5.58	2.64
2	Chan	95.48	98.83	3.23	2.96	3.43	9.58	0.88	1.09	19.53	21.34
3	Chan	98.83	102.19	10.63	6.32	3.84	31.54	1.88	1.68	37.35	62.86
4	Chan	102.19	105.54	12.92	6.78	3.41	38.35	2.02	1.91	45.04	85.89
5	Chan	105.54	108.90	4.43	3.64	3.60	13.13	1.08	1.22	22.95	27.91
6	ROB	108.90	122.13	1.73	4.36	13.24	5.12	0.33	0.40	7.47	2.96
7	ROB	122.13	135.37	0.44	1.91	13.24	1.30	0.14	0.23	3.28	0.75
8	ROB	135.37	148.60	0.01	0.10	3.71	0.02	0.03	0.07	0.59	0.04

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	95.48	98.83	1.68	1.94	2.67	4.99	1.45	0.87	12.01	10.43
2	Chan	98.83	102.19	12.58	7.49	3.84	37.34	2.23	1.68	32.33	54.30
3	Chan	102.19	105.54	15.03	7.95	3.41	44.59	2.37	1.89	38.57	72.88
4	Chan	105.54	108.90	4.41	3.96	3.76	13.08	1.61	1.11	17.44	19.41

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1395

INPUT

Description: p26

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.192	1.926	852.418	13.893	852.307	90.414	852.693	112.547	852
115.822	851	116.324	850.262	120.947	850.115	123.086	851	143.348	852
188.382	853	191.649	853.171	247.061	853.116				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	112.547	.035	143.348	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
112.547	143.348	61.03	47.34	28.37	.1	.3

Left Levee Station= 90.41 Elevation= 852.69

Blocked Obstructions num= 1

Sta L	Sta R	Elev
25	68	858.6

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	852.38	Reach Len. (m)	61.03	47.34	28.37

Crit W.S. (m)	851.60	Flow Area (m2)	2.25	35.49	3.18
E.G. Slope (m/m)	0.000886	Area (m2)	2.25	35.49	3.18
Q Total (m3/s)	33.70	Flow (m3/s)	0.44	32.64	0.62
Top Width (m)	59.72	Top Width (m)	12.00	30.80	16.92
Vel Total (m/s)	0.82	Avg. Vel. (m/s)	0.20	0.92	0.20
Max Chl Dpth (m)	2.26	Hydr. Depth (m)	0.19	1.15	0.19
Conv. Total (m3/s)	1132.3	Conv. (m3/s)	14.8	1096.7	20.8
Length Wtd. (m)	47.26	Wetted Per. (m)	12.01	31.54	16.92
Min Ch El (m)	850.12	Shear (N/m2)	1.63	9.77	1.63
Alpha	1.21	Stream Power (N/m s)	11828.76	4328.64	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	11.57	30.04	13.21
C & E Loss (m)	0.00	Cum SA (1000 m2)	31.39	26.62	32.47

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	852.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.035		
W.S. Elev (m)	852.72	Reach Len. (m)	61.03	47.34	28.37
Crit W.S. (m)	851.56	Flow Area (m2)	28.77		
E.G. Slope (m/m)	0.000899	Area (m2)	28.77		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	14.50	Top Width (m)	14.50		
Vel Total (m/s)	1.17	Avg. Vel. (m/s)	1.17		
Max Chl Dpth (m)	2.61	Hydr. Depth (m)	1.98		
Conv. Total (m3/s)	1123.9	Conv. (m3/s)	1123.9		
Length Wtd. (m)	47.34	Wetted Per. (m)	18.00		
Min Ch El (m)	850.12	Shear (N/m2)	14.10		
Alpha	1.00	Stream Power (N/m s)	11828.76	4328.64	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	2.04	27.69	2.33
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.04	15.13	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	90.41	101.48	0.00	0.01	0.93	0.00	0.01	0.03	0.13	0.00
2	LOB	101.48	112.55	0.44	2.24	11.07	1.30	0.20	0.20	1.76	0.34
3	Chan	112.55	118.71	8.43	8.87	6.70	25.01	1.44	0.95	11.50	10.92
4	Chan	118.71	124.87	12.98	11.25	6.34	38.52	1.83	1.15	15.41	17.79
5	Chan	124.87	131.03	5.99	7.00	6.17	17.79	1.14	0.86	9.85	8.44
6	Chan	131.03	137.19	3.57	5.12	6.17	10.58	0.83	0.70	7.21	5.02
7	Chan	137.19	143.35	1.67	3.25	6.17	4.96	0.53	0.51	4.58	2.35
8	ROB	143.35	153.72	0.58	2.70	10.37	1.71	0.26	0.21	2.26	0.48
9	ROB	153.72	164.09	0.04	0.48	6.55	0.13	0.07	0.09	0.63	0.06

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
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This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	852.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.	0.035		
W.S. Elev (m)	852.48	Reach Len. (m)	47.94	63.01	73.27
Crit W.S. (m)	851.66	Flow Area (m2)	16.06		
E.G. Slope (m/m)	0.003319	Area (m2)	16.06		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	7.80	Top Width (m)	7.80		
Vel Total (m/s)	2.10	Avg. Vel. (m/s)	2.10		
Max Chl Dpth (m)	2.28	Hydr. Depth (m)	2.06		
Conv. Total (m3/s)	584.9	Conv. (m3/s)	584.9		
Length Wtd. (m)	63.01	Wetted Per. (m)	11.16		
Min Ch El (m)	850.20	Shear (N/m2)	46.85		
Alpha	1.00	Stream Power (N/m s)	10878.91	1546.45	8467.06
Frctn Loss (m)	0.33	Cum Volume (1000 m3)	2.04	26.63	2.33
C & E Loss (m)	0.03	Cum SA (1000 m2)	2.04	14.60	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	78.39	89.91	0.01	0.10	5.34	0.01	0.02	0.05	0.31	0.02
2	LOB	89.91	101.44	0.18	1.20	11.52	0.54	0.10	0.15	1.71	0.26
3	LOB	101.44	112.96	0.65	2.56	11.52	1.92	0.22	0.25	3.64	0.92
4	Chan	112.96	117.46	1.64	2.39	4.53	4.86	0.53	0.69	8.65	5.92
5	Chan	117.46	121.97	4.94	4.64	4.53	14.66	1.03	1.07	16.77	17.88
6	Chan	121.97	126.48	13.85	8.80	4.79	41.09	1.95	1.57	30.13	47.44
7	Chan	126.48	130.99	9.61	7.02	4.72	28.52	1.56	1.37	24.40	33.39
8	Chan	130.99	135.49	2.23	2.88	4.56	6.62	0.64	0.77	10.37	8.01
9	ROB	135.49	143.76	0.53	1.80	8.27	1.56	0.22	0.29	3.58	1.04
10	ROB	143.76	152.03	0.07	0.49	6.54	0.21	0.08	0.14	1.23	0.18
11	ROB	152.03	160.31	0.00	0.03	1.97	0.00	0.01	0.05	0.24	0.01

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	117.46	121.97	0.11	0.25	1.63	0.32	1.47	0.43	5.03	2.14
2	Chan	121.97	126.48	22.91	9.70	4.79	67.97	2.15	2.36	65.92	155.72

3	Chan	126.48	130.99	10.69	6.11	4.74	31.71	1.96	1.75	41.99	73.44
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Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1276

INPUT

Description: p 24 aguas arriba

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.05	87.145	852.423	93.692	852.65	109.302	852	111.312	851
111.739	850.07	117.379	850	118.094	851	122.856	852	125.986	852.758
134.66	852.59	192.666	852.664						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	109.302	.035	122.856	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

109.302	122.856	21.5	21.5	21.5	.1	.3
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Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0	109.29	852.66	F
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119.43	192.666	852.66	F
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Right Levee Station= 125.99 Elevation= 852.76

Blocked Obstructions num= 1

Sta L	Sta R	Elev
137	157.5	856.1

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	852.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.35	Wt. n-Val.	0.035		
W.S. Elev (m)	851.80	Reach Len. (m)	6.20	6.20	6.20
Crit W.S. (m)	851.51	Flow Area (m2)	12.90		
E.G. Slope (m/m)	0.006789	Area (m2)	13.53		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	12.17	Top Width (m)	12.17		
Vel Total (m/s)	2.61	Avg. Vel. (m/s)	2.61		
Max Chl Dpth (m)	1.80	Hydr. Depth (m)	1.33		
Conv. Total (m3/s)	409.0	Conv. (m3/s)	409.0		
Length Wtd. (m)	6.20	Wetted Per. (m)	11.04		
Min Ch El (m)	850.00	Shear (N/m2)	77.79		
Alpha	1.00	Stream Power (N/m s)	9224.44	0.00	6032.13
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	11.29	27.35	13.05
C & E Loss (m)	0.02	Cum SA (1000 m2)	29.48	24.26	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	852.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.49	Wt. n-Val.	0.035		
W.S. Elev (m)	851.86	Reach Len. (m)	6.20	6.20	6.20
Crit W.S. (m)	851.53	Flow Area (m2)	10.89		
E.G. Slope (m/m)	0.009617	Area (m2)	10.89		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	6.00	Top Width (m)	6.00		
Vel Total (m/s)	3.09	Avg. Vel. (m/s)	3.09		
Max Chl Dpth (m)	1.86	Hydr. Depth (m)	1.82		
Conv. Total (m3/s)	343.6	Conv. (m3/s)	343.6		
Length Wtd. (m)	6.20	Wetted Per. (m)	9.39		
Min Ch El (m)	850.00	Shear (N/m2)	109.41		
Alpha	1.00	Stream Power (N/m s)	9224.44	0.00	6032.13
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	2.04	25.78	2.33
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.04	14.17	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant

method to find critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	109.30	111.83	1.66	1.34	2.90	4.93	0.63	1.24	30.67	38.09
2	Chan	111.83	114.37	13.30	4.41	2.53	39.46	1.74	3.01	115.99	349.65
3	Chan	114.37	116.90	13.70	4.49	2.53	40.66	1.77	3.05	118.08	360.25
4	Chan	116.90	119.43	5.04	2.66	3.08	14.95	1.05	1.89	57.66	109.09
5	Chan	119.43	122.86	0.00	0.63	2.50	0.00	0.26	0.00	16.77	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	109.30	111.83	0.32	0.40	1.91	0.95	1.70	0.80	19.58	15.70
2	Chan	111.83	114.37	15.52	4.57	2.53	46.04	1.81	3.39	170.33	577.90
3	Chan	114.37	116.90	15.97	4.65	2.53	47.39	1.84	3.43	173.30	594.79
4	Chan	116.90	119.43	1.89	1.27	2.41	5.62	1.81	1.49	49.66	74.09

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant

method to find critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 1270

INPUT

Description: Puente Ctra Val de Santa Maria

Distance from Upstream XS = 6.2

Deck/Roadway Width = 9

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 5

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
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0	852.33	93.69	852.6	109.29	852.66	852.16								
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119.43	852.66	852.16	125.99	852.6										
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Upstream Bridge Cross Section Data

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0	852.05	87.145	852.423	93.692	852.65	109.302	852.111.312	851	
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111.739	850.07	117.379	850	118.094	851	122.856	852	125.986	852.758
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134.66	852.59	192.666	852.664						
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Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
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0	.05	109.302	.035	122.856	.05			
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Bank Sta: Left Right Coeff Contr. Expan.

109.302	122.856	.1	.3		
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Ineffective Flow num= 2

Sta	L	Sta	R	Elev	Permanent
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0	109.29	852.66	F		
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119.43	192.666	852.66	F		
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Right Levee Station= 125.99 Elevation= 852.76

Blocked Obstructions num= 1

Sta	L	Sta	R	Elev
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137	157.5	856.1		
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Downstream Deck/Roadway Coordinates

num= 5

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
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0	852.33	94.74	852.57	103.93	852.66	852.16								
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114.07	852.66	852.16	118	852.6										
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Downstream Bridge Cross Section Data

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0	851.588	6.053	850.277	10.079	850.217	85.255	852.551	86.702	852.488
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94.744	852.574	98.273	852	103.793	851	105.015	850	105.921	849.03
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112.934	849.24	113.644	850	113.91	851	117.789	852	140.137	852.626
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145.213	852.188	155.383	852.242	156.763	853.552	159.823	853.433	192.508	852.242
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Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val
0 .05 98.273 .035 117.789 .05

Bank Sta: Left Right Coeff Contr. Expan.
98.273 117.789 .1 .3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 103.93 852.66 F

114.07 192.508 852.66 F

Left Levee Station= 94.74 Elevation= 852.57

Right Levee Station= 140.14 Elevation= 852.63

Blocked Obstructions num= 2

Sta L Sta R Elev Sta L Sta R Elev

57.5 71 856 118 134 856.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1254

INPUT

Description: p23 aguas abajo

Station Elevation Data num= 20

Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

0 851.588 6.053 850.277 10.079 850.217 85.255 852.551 86.702 852.488

94.744 852.574 98.273 852 103.793 851 105.015 850 105.921 849.03

112.934 849.24 113.644 850 113.91 851 117.789 852 140.137 852.626

145.213 852.188 155.383 852.242 156.763 853.552 159.823 853.433 192.508 852.242

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val

0 .05 98.273 .035 117.789 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

98.273 117.789 38.98 39.35 40.21 .1 .3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 103.93 852.66 F

114.07 192.508 852.66 F
 Left Levee Station= 94.74 Elevation= 852.57
 Right Levee Station= 140.14 Elevation= 852.63
 Blocked Obstructions num= 2
 Sta L Sta R Elev Sta L Sta R Elev
 57.5 71 856 118 134 856.5

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	851.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.	0.035		
W.S. Elev (m)	851.00	Reach Len. (m)	38.98	39.35	40.21
Crit W.S. (m)	850.39	Flow Area (m2)	16.11		
E.G. Slope (m/m)	0.003549	Area (m2)	16.11		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	10.11	Top Width (m)	10.11		
Vel Total (m/s)	2.09	Avg. Vel. (m/s)	2.09		
Max Chl Dpth (m)	1.97	Hydr. Depth (m)	1.61		
Conv. Total (m3/s)	565.7	Conv. (m3/s)	565.7		
Length Wtd. (m)	39.35	Wetted Per. (m)	11.82		
Min Ch El (m)	849.03	Shear (N/m2)	47.43		
Alpha	1.00	Stream Power (N/m s)	9216.88	4535.95	6709.61
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	11.29	27.14	13.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	29.48	24.06	31.40

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	851.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035		
W.S. Elev (m)	851.29	Reach Len. (m)	38.98	39.35	40.21
Crit W.S. (m)	850.38	Flow Area (m2)	17.73		
E.G. Slope (m/m)	0.002604	Area (m2)	17.73		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	8.50	Top Width (m)	8.50		
Vel Total (m/s)	1.90	Avg. Vel. (m/s)	1.90		
Max Chl Dpth (m)	2.26	Hydr. Depth (m)	2.09		
Conv. Total (m3/s)	660.4	Conv. (m3/s)	660.4		
Length Wtd. (m)	39.35	Wetted Per. (m)	11.91		
Min Ch El (m)	849.03	Shear (N/m2)	38.00		
Alpha	1.00	Stream Power (N/m s)	9216.88	4535.95	6709.61
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	2.04	25.49	2.33
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.04	14.01	2.36

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	98.27	103.93	0.00	0.01	0.17	0.00	0.05	0.00	1.46	0.00
2	Chan	103.93	107.31	8.31	4.64	4.12	24.65	1.37	1.79	39.24	70.19
3	Chan	107.31	110.69	15.90	6.34	3.38	47.18	1.87	2.51	65.20	163.61
4	Chan	110.69	114.07	9.49	5.13	4.32	28.17	1.59	1.85	41.33	76.54

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	103.93	107.31	7.38	4.74	4.01	21.91	2.05	1.56	30.14	46.98
2	Chan	107.31	110.69	17.12	7.33	3.38	50.81	2.17	2.34	55.34	129.32
3	Chan	110.69	114.07	9.19	5.67	4.52	27.27	2.02	1.62	32.02	51.94

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1215

INPUT

Description: p22

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851.51	51.207	851.807	58.503	851.77	64.039	851.59	88.711	851.51
96.727	851.51	101.798	850.103	103.245	848.795	108.299	848.71	109.922	850.103
111.226	851.51	114.26	851.99	119.147	852.094	121.718	851.979	125.551	851.996
144.577	851.481	160.932	851.73	171.347	851.557	189.007	851.943	194.357	851.87

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	96.727	.035	111.226	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

96.727 111.226 17.71 47.72 69.38 .1 .3

Left Levee Station= 58.5 Elevation= 851.77

Right Levee Station= 119.15 Elevation= 852.09

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	851.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035		
W.S. Elev (m)	850.89	Reach Len. (m)	17.71	47.72	69.38
Crit W.S. (m)	850.25	Flow Area (m2)	17.99		
E.G. Slope (m/m)	0.003398	Area (m2)	17.99		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.80	Top Width (m)	13.80		
Vel Total (m/s)	1.87	Avg. Vel. (m/s)	1.87		
Max Chl Dpth (m)	2.18	Hydr. Depth (m)	1.30		
Conv. Total (m3/s)	578.1	Conv. (m3/s)	578.1		
Length Wtd. (m)	47.72	Wetted Per. (m)	15.08		
Min Ch El (m)	848.71	Shear (N/m2)	39.75		
Alpha	1.00	Stream Power (N/m s)	9305.40	2800.85	5704.65
Frctn Loss (m)	0.16	Cum Volume (1000 m3)	11.29	26.47	13.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	29.48	23.59	31.40

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	851.37	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.035		
W.S. Elev (m)	851.16	Reach Len. (m)	17.71	47.72	69.38

Crit W.S. (m)	850.19	Flow Area (m2)	16.85
E.G. Slope (m/m)	0.002785	Area (m2)	16.85
Q Total (m3/s)	33.70	Flow (m3/s)	33.70
Top Width (m)	7.50	Top Width (m)	7.50
Vel Total (m/s)	2.00	Avg. Vel. (m/s)	2.00
Max Chl Dpth (m)	2.45	Hydr. Depth (m)	2.25
Conv. Total (m3/s)	638.6	Conv. (m3/s)	638.6
Length Wtd. (m)	47.72	Wetted Per. (m)	11.04
Min Ch El (m)	848.71	Shear (N/m2)	41.71
Alpha	1.00	Stream Power (N/m s)	9305.40 2800.85 5704.65
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	2.04 24.81 2.33
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.04 13.70 2.36

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	96.73	99.63	0.28	0.54	2.39	0.83	0.23	0.52	7.56	3.92
2	Chan	99.63	102.53	2.66	2.34	3.16	7.91	0.81	1.14	24.66	28.08
3	Chan	102.53	105.43	12.58	5.90	3.12	37.33	2.04	2.13	63.11	134.52
4	Chan	105.43	108.33	14.51	6.25	2.91	43.05	2.16	2.32	71.67	166.28
5	Chan	108.33	111.23	3.66	2.95	3.50	10.87	1.07	1.24	28.07	34.87

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	99.63	102.53	0.57	0.82	2.02	1.70	1.55	0.70	11.06	7.78
2	Chan	102.53	105.43	14.31	6.69	3.12	42.47	2.31	2.14	58.63	125.43
3	Chan	105.43	108.33	16.32	7.04	2.91	48.44	2.43	2.32	66.15	153.34
4	Chan	108.33	111.23	2.49	2.31	3.00	7.38	1.96	1.08	21.01	22.67

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1108

INPUT

Description: p21

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851	40.402	851.498	46.157	851.516	53.099	851.302	92.683	851.03
98.737	851	101.541	850.87	103.56	850.967	109.601	850	110.67	849
111.21	848.621	116.017	848.615	118.906	850	122.642	851.179	124.113	851
168.492	851.22	180.963	851.086	203.494	851.646	208.349	851.772		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	103.56	.035	122.642	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

103.56 122.642 31.62 80.21 117.75 .1 .3

Left Levee Station= 46.16 Elevation= 851.52

Blocked Obstructions num= 1

Sta L Sta R Elev
49.5 51 854

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	850.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.035		
W.S. Elev (m)	850.75	Reach Len. (m)	31.62	80.21	117.75
Crit W.S. (m)	850.07	Flow Area (m2)	19.51		
E.G. Slope (m/m)	0.003140	Area (m2)	19.51		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	16.40	Top Width (m)	16.40		
Vel Total (m/s)	1.73	Avg. Vel. (m/s)	1.73		
Max Chl Dpth (m)	2.14	Hydr. Depth (m)	1.19		
Conv. Total (m3/s)	601.4	Conv. (m3/s)	601.4		
Length Wtd. (m)	80.21	Wetted Per. (m)	17.41		
Min Ch El (m)	848.62	Shear (N/m2)	34.51		
Alpha	1.00	Stream Power (N/m s)	9975.31	2210.05	0.00
Frctn Loss (m)	0.36	Cum Volume (1000 m3)	11.29	25.57	13.05
C & E Loss (m)	0.02	Cum SA (1000 m2)	29.48	22.87	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	851.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035		
W.S. Elev (m)	851.06	Reach Len. (m)	31.62	80.21	117.75
Crit W.S. (m)	850.03	Flow Area (m2)	18.02		
E.G. Slope (m/m)	0.002358	Area (m2)	18.02		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	8.00	Top Width (m)	8.00		
Vel Total (m/s)	1.87	Avg. Vel. (m/s)	1.87		
Max Chl Dpth (m)	2.44	Hydr. Depth (m)	2.25		
Conv. Total (m3/s)	694.0	Conv. (m3/s)	694.0		
Length Wtd. (m)	80.21	Wetted Per. (m)	11.51		
Min Ch El (m)	848.62	Shear (N/m2)	36.20		
Alpha	1.00	Stream Power (N/m s)	9975.31	2210.05	0.00
Frctn Loss (m)	0.30	Cum Volume (1000 m3)	2.04	23.97	2.33
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.04	13.33	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años



	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	103.56	107.38	0.22	0.49	2.52	0.65	0.20	0.44	6.05	2.68	
2	Chan	107.38	111.19	4.23	3.63	4.36	12.54	0.95	1.16	25.69	29.88	
3	Chan	111.19	115.01	17.72	8.15	3.82	52.58	2.14	2.17	65.69	142.85	
4	Chan	115.01	118.83	10.88	6.27	4.12	32.30	1.64	1.74	46.84	81.31	
5	Chan	118.83	122.64	0.65	0.96	2.59	1.93	0.39	0.68	11.42	7.74	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	107.38	111.19	2.52	2.34	2.99	7.47	1.96	1.08	18.12	19.48	
2	Chan	111.19	115.01	21.33	9.31	3.82	63.29	2.44	2.29	56.36	129.11	
3	Chan	115.01	118.83	9.85	6.36	4.70	29.24	2.13	1.55	31.31	48.48	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1088

INPUT

Description: p20

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851 31.466	851 39.649	851 45.76	851.331	51.926	851.279	68.762	851 72.219	850.482
74.12	850.53	75.563	850 76.718	849	77.536	848.396	81.819	848.491	83.451
849	85.119	850 88.617	850.8	148.866	851.161	151.571	850.841	189.811	850.862
201.745	850.663	214.467	850.92	226.087	851				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	68.762	.035	88.617	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

68.762	88.617	86.72	65.2	28.83	.1	.3
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Left Levee Station= 68.76 Elevation= 851

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	850.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.34	Wt. n-Val.	0.035		
W.S. Elev (m)	850.19	Reach Len. (m)	86.72	65.20	28.83
Crit W.S. (m)	849.91	Flow Area (m2)		13.08	
E.G. Slope (m/m)	0.007126	Area (m2)		13.08	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	10.87	Top Width (m)		10.87	
Vel Total (m/s)	2.58	Avg. Vel. (m/s)		2.58	
Max Chl Dpth (m)	1.79	Hydr. Depth (m)		1.20	
Conv. Total (m3/s)	399.2	Conv. (m3/s)		399.2	
Length Wtd. (m)	65.20	Wetted Per. (m)		11.85	
Min Ch El (m)	848.40	Shear (N/m2)		77.14	
Alpha	1.00	Stream Power (N/m s)	10824.56	3292.09	0.00
Frctn Loss (m)	0.32	Cum Volume (1000 m3)	11.29	24.27	13.05
C & E Loss (m)	0.04	Cum SA (1000 m2)	29.48	21.78	31.40

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	850.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.40	Wt. n-Val.	0.035		
W.S. Elev (m)	850.51	Reach Len. (m)	86.72	65.20	28.83
Crit W.S. (m)	849.98	Flow Area (m2)		12.07	
E.G. Slope (m/m)	0.006996	Area (m2)		12.07	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	6.00	Top Width (m)		6.00	
Vel Total (m/s)	2.79	Avg. Vel. (m/s)		2.79	
Max Chl Dpth (m)	2.12	Hydr. Depth (m)		2.01	
Conv. Total (m3/s)	402.9	Conv. (m3/s)		402.9	
Length Wtd. (m)	65.20	Wetted Per. (m)		9.57	
Min Ch El (m)	848.40	Shear (N/m2)		86.59	
Alpha	1.00	Stream Power (N/m s)	10824.56	3292.09	0.00
Frctn Loss (m)	0.34	Cum Volume (1000 m3)	2.04	22.77	2.33
C & E Loss (m)	0.04	Cum SA (1000 m2)	2.04	12.77	2.36

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	72.73	76.70	0.95	0.82	2.05	2.81	0.50	1.15	28.05	32.33
2	Chan	76.70	80.67	19.64	6.74	4.18	58.28	1.70	2.91	112.81	328.69
3	Chan	80.67	84.65	12.97	5.29	4.25	38.48	1.33	2.45	87.04	213.35
4	Chan	84.65	88.62	0.15	0.23	1.38	0.44	0.18	0.64	11.61	7.43

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	76.70	80.67	22.19	7.57	5.53	65.85	2.06	2.93	93.94	275.32
2	Chan	80.67	84.65	11.51	4.50	4.04	34.15	1.94	2.56	76.52	195.58

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 1023

INPUT

Description: p19

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851	18.271	850.883	20.756	851	25.169	851.471	29.267	851.576
30.778	851	41.762	850.887	45.67	850.67	76.564	850.865	81.495	850.72
89.105	850	90.688	850.279	92.706	850.273	95.455	849	97.172	848
97.527	847.95	101.969	847.91	102.154	848	104.258	849	104.271	849.408
107.072	850	107.243	850.463	114.784	850.675	118.883	850.55	168.955	850.568
209.672	850.827								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.706	.035	107.243	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
92.706 107.243 97.42 80.8 48.03 .1 .3

Left Levee Station= 76.56 Elevation= 850.86

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	850.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.035		
W.S. Elev (m)	849.97	Reach Len. (m)	97.42	80.80	48.03
Crit W.S. (m)	849.35	Flow Area (m2)	17.52		
E.G. Slope (m/m)	0.003606	Area (m2)	17.52		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.56	Top Width (m)	13.56		
Vel Total (m/s)	1.92	Avg. Vel. (m/s)	1.92		
Max Chl Dpth (m)	2.06	Hydr. Depth (m)	1.29		
Conv. Total (m3/s)	561.2	Conv. (m3/s)	561.2		
Length Wtd. (m)	80.80	Wetted Per. (m)	14.75		
Min Ch El (m)	847.91	Shear (N/m2)	41.99		
Alpha	1.00	Stream Power (N/m s)	10038.65	3665.53	0.00
Frctn Loss (m)	0.30	Cum Volume (1000 m3)	11.29	23.27	13.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	29.48	20.98	31.40

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	850.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.	0.035		

W.S. Elev (m)	850.27	Reach Len. (m)	97.42	80.80	48.03
Crit W.S. (m)	849.39	Flow Area (m2)	14.76		
E.G. Slope (m/m)	0.004034	Area (m2)	14.76		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	6.50	Top Width (m)	6.50		
Vel Total (m/s)	2.28	Avg. Vel. (m/s)	2.28		
Max Chl Dpth (m)	2.36	Hydr. Depth (m)	2.27		
Conv. Total (m3/s)	530.6	Conv. (m3/s)	530.6		
Length Wtd. (m)	80.80	Wetted Per. (m)	10.46		
Min Ch El (m)	847.91	Shear (N/m2)	55.83		
Alpha	1.00	Stream Power (N/m s)	10038.65	3665.53	0.00
Frctn Loss (m)	0.31	Cum Volume (1000 m3)	2.04	21.89	2.33
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.04	12.36	2.36

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.71	95.61	1.04	1.17	2.49	3.09	0.52	0.89	16.68	14.79
2	Chan	95.61	98.52	10.21	5.08	3.16	30.29	1.75	2.01	56.91	114.35
3	Chan	98.52	101.43	13.97	5.93	2.91	41.44	2.04	2.35	72.16	169.85
4	Chan	101.43	104.34	8.06	4.62	3.55	23.91	1.59	1.74	46.02	80.24
5	Chan	104.34	107.24	0.43	0.71	2.65	1.28	0.27	0.61	9.46	5.75

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	95.61	98.52	8.13	4.51	4.01	24.13	2.23	1.80	44.57	80.30
2	Chan	98.52	101.43	19.94	6.80	2.91	59.16	2.34	2.93	92.53	271.30
3	Chan	101.43	104.34	5.63	3.45	3.55	16.71	2.19	1.63	38.46	62.80

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 943

INPUT

Description: p18

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.48	28.71	850.389	36.778	850.276	44.65	850	45.374	850.031
46.443	850	47.215	850.407	53.756	850.156	60.285	850	65.82	849
66.952	848	67.799	847.514	72.942	847.739	73.751	848	74.484	849
76.403	850	83.472	850.74	86.125	850.796	100.187	850.82	105.279	850.775
110.001	850.816	114.817	850.809	119.358	850.798	122.333	850.791	126.855	850.812
128.991	850.809	165.156	850.815	203.055	850.873	210.396	851		

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 60.285 .035 76.403 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
60.285 76.403 47.56 44.81 37.87 .1 .3

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.035		
W.S. Elev (m)	849.67	Reach Len. (m)	47.56	44.81	37.87
Crit W.S. (m)		Flow Area (m2)	17.47		
E.G. Slope (m/m)	0.003704	Area (m2)	17.47		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.68	Top Width (m)	13.68		
Vel Total (m/s)	1.93	Avg. Vel. (m/s)	1.93		
Max Chl Dpth (m)	2.16	Hydr. Depth (m)	1.28		
Conv. Total (m3/s)	553.7	Conv. (m3/s)	553.7		
Length Wtd. (m)	44.81	Wetted Per. (m)	14.96		
Min Ch El (m)	847.51	Shear (N/m2)	42.43		
Alpha	1.00	Stream Power (N/m s)	10073.32	0.00	0.00
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	11.29	21.86	13.05
C & E Loss (m)	0.03	Cum SA (1000 m2)	29.48	19.88	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	850.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.	0.035		
W.S. Elev (m)	849.98	Reach Len. (m)	47.56	44.81	37.87
Crit W.S. (m)		Flow Area (m2)	15.60		
E.G. Slope (m/m)	0.003545	Area (m2)	15.60		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	6.75	Top Width (m)	6.75		
Vel Total (m/s)	2.16	Avg. Vel. (m/s)	2.16		
Max Chl Dpth (m)	2.47	Hydr. Depth (m)	2.31		
Conv. Total (m3/s)	566.0	Conv. (m3/s)	566.0		
Length Wtd. (m)	44.81	Wetted Per. (m)	10.91		
Min Ch El (m)	847.51	Shear (N/m2)	49.73		
Alpha	1.00	Stream Power (N/m s)	10073.32	0.00	0.00
Frctn Loss (m)	0.27	Cum Volume (1000 m3)	2.04	20.67	2.33
C & E Loss (m)	0.04	Cum SA (1000 m2)	2.04	11.83	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Profile #100 años



	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	60.28	63.51	0.06	0.18	1.43	0.19	0.13	0.36	4.55	1.64
2	Chan	63.51	66.73	2.04	2.05	3.57	6.06	0.64	1.00	20.91	20.82
3	Chan	66.73	69.96	14.41	6.52	3.43	42.76	2.02	2.21	69.10	152.66
4	Chan	69.96	73.18	14.57	6.42	3.24	43.25	1.99	2.27	72.00	163.48
5	Chan	73.18	76.40	2.61	2.30	3.30	7.74	0.89	1.13	25.37	28.75

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	66.73	69.96	13.13	7.01	5.09	38.97	2.37	1.87	47.87	89.73
2	Chan	69.96	73.18	19.50	7.41	3.24	57.87	2.30	2.63	79.58	209.33
3	Chan	73.18	76.40	1.07	1.18	2.58	3.16	2.07	0.90	15.94	14.35

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 898

INPUT

Description: p17 aguas arriba

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.117	24.526	850.105	41.977	850.154	42.705	850	44.513	849.678
45.749	850	46.102	850.121	52.877	850.061	53.112	850.054	54.952	850
67.986	849	69.56	848	70.257	847.341	74.309	847.291	75.201	848
76.029	849	79.335	850	98.684	850.882	110.934	850.848	113.726	850.82
145.285	850.805	174.359	850.781	175.596	850.812	179.339	850.777	184.451	850.77
188.074	850.72	189.584	850.732	193.152	850.791	194.509	850.79	196.045	850.826
211.855	851								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	54.952	.035	79.335	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

54.952	79.335	9.5	9.5	9.5	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
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0	67.34	849.61	F
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76.34	211.855	849.61	F
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CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.44	Wt. n-Val.	0.035		
W.S. Elev (m)	849.15	Reach Len. (m)	2.80	2.80	2.80
Crit W.S. (m)	848.95	Flow Area (m2)		11.44	
E.G. Slope (m/m)	0.009239	Area (m2)		11.50	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	10.41	Top Width (m)		10.41	
Vel Total (m/s)	2.95	Avg. Vel. (m/s)		2.95	
Max Chl Dpth (m)	1.85	Hydr. Depth (m)		1.27	
Conv. Total (m3/s)	350.6	Conv. (m3/s)		350.6	
Length Wtd. (m)	2.80	Wetted Per. (m)		10.29	
Min Ch El (m)	847.29	Shear (N/m2)		100.72	
Alpha	1.00	Stream Power (N/m s)	10143.16	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)	11.29	21.21	13.05
C & E Loss (m)		Cum SA (1000 m2)	29.48	19.34	31.40

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	849.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.62	Wt. n-Val.	0.035		
W.S. Elev (m)	849.29	Reach Len. (m)	2.80	2.80	2.80
Crit W.S. (m)	849.03	Flow Area (m2)		9.67	
E.G. Slope (m/m)	0.012434	Area (m2)		9.67	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	5.00	Top Width (m)		5.00	
Vel Total (m/s)	3.49	Avg. Vel. (m/s)		3.49	
Max Chl Dpth (m)	2.00	Hydr. Depth (m)		1.93	
Conv. Total (m3/s)	302.2	Conv. (m3/s)		302.2	
Length Wtd. (m)	2.80	Wetted Per. (m)		8.45	
Min Ch El (m)	847.29	Shear (N/m2)		139.54	
Alpha	1.00	Stream Power (N/m s)	10143.16	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	2.04	20.10	2.33
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.04	11.56	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant

method to find critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv Depth(m)	(m/s)	(N/m2)	(N/m s)	
1	Chan	63.21	67.34	0.00	0.06	1.25	0.00	0.05	0.00	4.32	0.00
2	Chan	67.34	71.84	13.51	4.99	5.05	40.08	1.11	2.71	89.48	242.10
3	Chan	71.84	76.34	20.19	6.44	5.23	59.92	1.43	3.13	111.57	349.68
4	Chan	76.34	79.33	0.00	0.00	0.18	0.00	0.03	0.00	2.21	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	67.34	71.84	11.14	3.57	3.64	33.05	1.94	3.12	119.55	372.67
2	Chan	71.84	76.34	22.56	6.09	4.80	66.95	1.93	3.70	154.71	572.72

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant

method to find critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 890

INPUT

Description:

Distance from Upstream XS = 2.8

Deck/Roadway Width = 4.5

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 4

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
52.88	850.06	67.34	849.61	849.36	76.34	849.61	849.36							
79.33	850													

Upstream Bridge Cross Section Data

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.117	24.526	850.105	41.977	850.154	42.705	850	44.513	849.678
45.749	850	46.102	850.121	52.877	850.061	53.112	850.054	54.952	850
67.986	849	69.56	848	70.257	847.341	74.309	847.291	75.201	848
76.029	849	79.335	850	98.684	850.882	110.934	850.848	113.726	850.82
145.285	850.805	174.359	850.781	175.596	850.812	179.339	850.777	184.451	850.77
188.074	850.72	189.584	850.732	193.152	850.791	194.509	850.79	196.045	850.826
211.855	851								

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
0	.05	54.952	.035	79.335	.05			

Bank Sta: Left Right Coeff Contr. Expan.

54.952	79.335	.1	.3
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Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0	67.34	849.61	F
76.34	211.855	849.61	F

Downstream Deck/Roadway Coordinates

num= 4

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
58.5	850	67.92	849.61	849.36	76.91	849.61	849.36							

81.18 850

Downstream Bridge Cross Section Data

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.063	17.198	850	34.128	850	41.87	850.164	42.072	850
44.185	849.669	45.346	850	45.932	850.042	52.973	850.133	58.051	850.04
58.504	850	67.087	849	67.554	848	68.255	847.22	76.784	848.01
77.838	849	81.181	850	83.362	850.378	100.715	850.59	103.151	850.499
117.74	850	142.278	850	209.846	850.65	212.481	851		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	58.504	.035	81.181	.05

Bank Sta: Left Right Coeff Contr. Expan.

58.504 81.181 .1 .3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

0 67.92 849.61 F

76.91 212.481 849.61 F

Left Levee Station= 58.05 Elevation= 850.04

Right Levee Station= 83.36 Elevation= 850.38

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 888

INPUT

Description: p16 aguas abajo

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.063	17.198	850	34.128	850	41.87	850.164	42.072	850
44.185	849.669	45.346	850	45.932	850.042	52.973	850.133	58.051	850.04
58.504	850	67.087	849	67.554	848	68.255	847.22	76.784	848.01
77.838	849	81.181	850	83.362	850.378	100.715	850.59	103.151	850.499
117.74	850	142.278	850	209.846	850.65	212.481	851		

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 58.504 .035 81.181 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
58.504 81.181 44.44 40.08 29.42 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 67.92 849.61 F
76.91 212.481 849.61 F

Left Levee Station= 58.05 Elevation= 850.04
Right Levee Station= 83.36 Elevation= 850.38

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.78	Wt. n-Val.	0.035		
W.S. Elev (m)	848.57	Reach Len. (m)	44.44	40.08	29.42
Crit W.S. (m)	848.74	Flow Area (m2)	8.59		
E.G. Slope (m/m)	0.020751	Area (m2)	9.06		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	10.09	Top Width (m)	10.09		
Vel Total (m/s)	3.92	Avg. Vel. (m/s)	3.92		
Max Chl Dpth (m)	1.35	Hydr. Depth (m)	0.96		
Conv. Total (m3/s)	233.9	Conv. (m3/s)	233.9		
Length Wtd. (m)	40.08	Wetted Per. (m)	9.24		
Min Ch El (m)	847.22	Shear (N/m2)	189.27		
Alpha	1.00	Stream Power (N/m s)	10173.14	2779.31	3991.10
Frctn Loss (m)		Cum Volume (1000 m3)	11.29	21.12	13.05
C & E Loss (m)		Cum SA (1000 m2)	29.48	19.25	31.40

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the

surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross

sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	849.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.70	Wt. n-Val.	0.035		
W.S. Elev (m)	849.00	Reach Len. (m)	44.44	40.08	29.42
Crit W.S. (m)	848.96	Flow Area (m2)	9.12		
E.G. Slope (m/m)	0.016201	Area (m2)	9.12		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	6.00	Top Width (m)	6.00		
Vel Total (m/s)	3.70	Avg. Vel. (m/s)	3.70		
Max Chl Dpth (m)	1.78	Hydr. Depth (m)	1.52		
Conv. Total (m3/s)	264.8	Conv. (m3/s)	264.8		
Length Wtd. (m)	40.08	Wetted Per. (m)	8.90		
Min Ch El (m)	847.22	Shear (N/m2)	162.82		
Alpha	1.00	Stream Power (N/m s)	10173.14	2779.31	3991.10
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	2.04	20.02	2.33
C & E Loss (m)	0.18	Cum SA (1000 m2)	2.04	11.51	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross

sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	63.21	67.92	0.00	0.36	1.18	0.00	0.57	0.00	62.07	0.00
2	Chan	67.92	72.41	22.49	5.20	4.68	66.73	1.16	4.32	226.25	978.04
3	Chan	72.41	76.91	11.21	3.39	4.56	33.27	0.75	3.31	151.33	500.33
4	Chan	76.91	81.18	0.00	0.10	0.64	0.00	0.22	0.00	32.72	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	67.92	72.41	27.61	7.02	6.06	81.93	1.59	3.93	184.22	724.33
2	Chan	72.41	76.91	6.09	2.09	2.84	18.07	1.32	2.91	117.17	340.74

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 848

INPUT

Description: p15

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	849.809	33.318	849.691	34.98	849.618	37.121	849.864	43.594	849.919
46.356	850.057	49.083	850.023	66.605	849	67.622	848	69.433	847
77.474	846.85	78.226	847	79.208	848	80.147	849	100.673	849.89
144.594	850	194.831	850.308						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	66.605	.035	80.147	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

66.605	80.147	48.68	62.54	86.13	.1	.3
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Left Levee Station= 49.08 Elevation= 850.02



CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.035		
W.S. Elev (m)	849.00	Reach Len. (m)	48.68	62.54	86.13
Crit W.S. (m)	848.02	Flow Area (m2)	23.43		
E.G. Slope (m/m)	0.001408	Area (m2)	0.00	23.43	0.00
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.58	Top Width (m)	0.02	13.54	0.02
Vel Total (m/s)	1.44	Avg. Vel. (m/s)	1.44		
Max Chl Dpth (m)	2.15	Hydr. Depth (m)	1.73		
Conv. Total (m3/s)	898.0	Conv. (m3/s)	898.0		
Length Wtd. (m)	62.54	Wetted Per. (m)	15.08		
Min Ch El (m)	846.85	Shear (N/m2)	21.46		
Alpha	1.00	Stream Power (N/m s)	9328.09	2349.85	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	11.29	20.47	13.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	29.47	18.78	31.39

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	849.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.035		
W.S. Elev (m)	849.33	Reach Len. (m)	48.68	62.54	86.13
Crit W.S. (m)	848.02	Flow Area (m2)	26.63		
E.G. Slope (m/m)	0.000917	Area (m2)	26.63		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	11.85	Top Width (m)	11.85		
Vel Total (m/s)	1.27	Avg. Vel. (m/s)	1.27		
Max Chl Dpth (m)	2.48	Hydr. Depth (m)	2.25		
Conv. Total (m3/s)	1112.7	Conv. (m3/s)	1112.7		
Length Wtd. (m)	62.54	Wetted Per. (m)	15.06		
Min Ch El (m)	846.85	Shear (N/m2)	15.91		
Alpha	1.00	Stream Power (N/m s)	9328.09	2349.85	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	2.04	19.30	2.33
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.04	11.15	2.36

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	66.60	69.31	2.77	2.99	3.36	8.21	1.10	0.93	12.31	11.38
2	Chan	69.31	72.02	8.72	5.48	2.73	25.86	2.02	1.59	27.76	44.16
3	Chan	72.02	74.73	9.13	5.62	2.71	27.09	2.07	1.62	28.65	46.55
4	Chan	74.73	77.44	9.50	5.76	2.71	28.20	2.13	1.65	29.35	48.45
5	Chan	77.44	80.15	3.58	3.58	3.58	10.63	1.32	1.00	13.84	13.84

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
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		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	66.60	69.31	2.62	3.32	3.36	7.78	1.73	0.79	8.88	7.03
2	Chan	69.31	72.02	8.97	6.38	2.73	26.61	2.36	1.41	21.05	29.59
3	Chan	72.02	74.73	9.34	6.52	2.71	27.71	2.41	1.43	21.65	31.01
4	Chan	74.73	77.44	9.67	6.66	2.71	28.68	2.46	1.45	22.11	32.10
5	Chan	77.44	80.15	3.11	3.76	3.55	9.22	2.07	0.83	9.51	7.86

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 786

INPUT

Description: p14

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	849.686	46.694	849.706	49.383	849.613	55.1	849.679	57.992	849.748
60.688	849.697	93.414	849.94.218	848	94.945	847	95.614	846.9	
102.69	846.85	107.48	849.16	130.279	848.977	134.369	849.29	173.708	849.375
183.055	849.036	226.114	849.29	232.857	851.142	234.337	851		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	93.414	.035	107.48	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

93.414	107.48	84.07	73.66	45.06	.1	.3
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Right Levee Station= 134.37 Elevation= 849.29

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	849.00	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.035		
W.S. Elev (m)	848.87	Reach Len. (m)	84.07	73.66	45.06
Crit W.S. (m)	848.05	Flow Area (m2)	20.89		
E.G. Slope (m/m)	0.002002	Area (m2)	20.89		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	13.35	Top Width (m)	13.35		
Vel Total (m/s)	1.61	Avg. Vel. (m/s)	1.61		
Max Chl Dpth (m)	2.02	Hydr. Depth (m)	1.56		
Conv. Total (m3/s)	753.1	Conv. (m3/s)	753.1		
Length Wtd. (m)	73.66	Wetted Per. (m)	14.75		
Min Ch El (m)	846.85	Shear (N/m2)	27.82		
Alpha	1.00	Stream Power (N/m s)	11219.55	0.00	6433.34
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	11.29	19.08	13.05
C & E Loss (m)	0.02	Cum SA (1000 m2)	29.47	17.94	31.39

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	849.32	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035		
W.S. Elev (m)	849.14	Reach Len. (m)	84.07	73.66	45.06
Crit W.S. (m)	848.11	Flow Area (m2)	18.05		

E.G. Slope (m/m)	0.002569	Area (m2)	18.05
Q Total (m3/s)	33.70	Flow (m3/s)	33.70
Top Width (m)	8.00	Top Width (m)	8.00
Vel Total (m/s)	1.87	Avg. Vel. (m/s)	1.87
Max Chl Dpth (m)	2.29	Hydr. Depth (m)	2.26
Conv. Total (m3/s)	664.8	Conv. (m3/s)	664.8
Length Wtd. (m)	73.66	Wetted Per. (m)	12.33
Min Ch El (m)	846.85	Shear (N/m2)	36.89
Alpha	1.00	Stream Power (N/m s)	11219.55 0.00 6433.34
Frctn Loss (m)	0.17	Cum Volume (1000 m3)	2.04 17.91 2.33
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.04 10.53 2.36

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	93.41	96.23	4.56	3.79	3.64	13.55	1.40	1.21	20.43	24.64
2	Chan	96.23	99.04	10.32	5.57	2.81	30.63	1.98	1.85	38.91	72.06
3	Chan	99.04	101.85	10.50	5.63	2.81	31.15	2.00	1.86	39.30	73.27
4	Chan	101.85	104.67	7.47	4.73	3.03	22.17	1.68	1.58	30.64	48.40
5	Chan	104.67	107.48	0.84	1.17	2.45	2.50	0.53	0.72	9.41	6.76

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	93.41	96.23	2.99	2.72	3.38	8.88	2.22	1.10	20.27	22.30
2	Chan	96.23	99.04	13.85	6.34	2.81	41.09	2.25	2.19	56.75	124.03
3	Chan	99.04	101.85	14.05	6.39	2.81	41.70	2.27	2.20	57.25	125.86
4	Chan	101.85	104.67	2.81	2.60	3.32	8.33	2.27	1.08	19.72	21.30

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 713

INPUT

Description: p13

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	849.253	4.987	849	41.784	848.857	44.536	848.763	65.7	848
66.19	847	66.701	846.5	74.106	846.65	74.716	847	75.496	848
79.841	849.114	120.383	849.049	137.209	848.875	201.212	849	202.962	849.12
208.888	850								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	44.536	.035	79.841	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

44.536	79.841	75	75	75	.1	.3
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Right Levee Station= 79.84 Elevation= 849.11

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.035		
W.S. Elev (m)	848.76	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	847.77	Flow Area (m2)	29.13		
E.G. Slope (m/m)	0.002122	Area (m2)	29.13		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	33.85	Top Width (m)	33.85		
Vel Total (m/s)	1.16	Avg. Vel. (m/s)	1.16		
Max Chl Dpth (m)	2.26	Hydr. Depth (m)	0.86		
Conv. Total (m3/s)	731.5	Conv. (m3/s)	731.5		
Length Wtd. (m)	75.00	Wetted Per. (m)	35.37		
Min Ch El (m)	846.50	Shear (N/m2)	17.15		
Alpha	1.00	Stream Power (N/m s)	10001.11	0.00	3822.57
Frctn Loss (m)	0.28	Cum Volume (1000 m3)	11.29	17.24	13.05
C & E Loss (m)	0.03	Cum SA (1000 m2)	29.47	16.20	31.39

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	849.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035		
W.S. Elev (m)	848.98	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	847.81	Flow Area (m2)	19.16		
E.G. Slope (m/m)	0.002153	Area (m2)	19.16		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	8.00	Top Width (m)	8.00		
Vel Total (m/s)	1.76	Avg. Vel. (m/s)	1.76		
Max Chl Dpth (m)	2.48	Hydr. Depth (m)	2.39		
Conv. Total (m3/s)	726.4	Conv. (m3/s)	726.4		
Length Wtd. (m)	75.00	Wetted Per. (m)	12.53		
Min Ch El (m)	846.50	Shear (N/m2)	32.28		
Alpha	1.00	Stream Power (N/m s)	10001.11	0.00	3822.57
Frctn Loss (m)	0.28	Cum Volume (1000 m3)	2.04	16.54	2.33
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.04	9.94	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	44.54	51.60	0.22	0.88	6.99	0.65	0.13	0.25	2.62	0.65
2	Chan	51.60	58.66	1.39	2.68	7.07	4.13	0.38	0.52	7.89	4.10
3	Chan	58.66	65.72	3.27	4.47	7.09	9.71	0.63	0.73	13.14	9.61
4	Chan	65.72	72.78	22.91	15.00	7.87	67.97	2.12	1.53	39.68	60.61

5 Chan 72.78 79.84 5.91 6.11 6.36 17.54 1.08 0.97 19.99 19.34

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	65.72	72.78	28.48	15.17	8.64	84.51	2.42	1.88	37.06	69.55
2	Chan	72.78	79.84	5.22	3.98	3.88	15.49	2.31	1.31	21.64	28.37

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 638

INPUT

Description: p12

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.394	40.939	848.33	43.501	848.274	69.633	848	70.366	847
71.043	846.463	77.263	846.85	78.061	847	78.893	848	82.575	848.249
203.281	849	206.301	849	210.54	849.92	213.776	849.871		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	69.633	.035	78.893	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	69.633	78.893		75	75	.1	.3	

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.41	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.11	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)	847.92	Flow Area (m2)	0.53	11.83	0.08
E.G. Slope (m/m)	0.008344	Area (m2)	0.53	11.83	0.08
Q Total (m3/s)	33.70	Flow (m3/s)	0.14	33.54	0.02
Top Width (m)	20.87	Top Width (m)	10.05	9.26	1.56
Vel Total (m/s)	2.71	Avg. Vel. (m/s)	0.26	2.84	0.26
Max Chl Dpth (m)	1.64	Hydr. Depth (m)	0.05	1.28	0.05
Conv. Total (m3/s)	368.9	Conv. (m3/s)	1.5	367.2	0.2
Length Wtd. (m)	75.00	Wetted Per. (m)	10.05	10.45	1.56
Min Ch El (m)	846.46	Shear (N/m2)	4.31	92.65	4.30

Alpha	1.09	Stream Power (N/m s)	10235.14	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	11.27	15.70	13.04
C & E Loss (m)	0.12	Cum SA (1000 m2)	29.10	14.58	31.34

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	848.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.40	Wt. n-Val.	0.035		
W.S. Elev (m)	848.43	Reach Len. (m)	75.00	75.00	75.00
Crit W.S. (m)		Flow Area (m2)	11.99		
E.G. Slope (m/m)	0.007632	Area (m2)	11.99		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	6.75	Top Width (m)	6.75		
Vel Total (m/s)	2.81	Avg. Vel. (m/s)	2.81		
Max Chl Dpth (m)	1.97	Hydr. Depth (m)	1.78		
Conv. Total (m3/s)	385.8	Conv. (m3/s)	385.8		
Length Wtd. (m)	75.00	Wetted Per. (m)	10.04		
Min Ch El (m)	846.46	Shear (N/m2)	89.41		
Alpha	1.00	Stream Power (N/m s)	10235.14	0.00	0.00
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	2.04	15.37	2.33
C & E Loss (m)	0.12	Cum SA (1000 m2)	2.04	9.39	2.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	LOB	55.71	62.67	0.01	0.05	3.09	0.02	0.02	0.10	1.32	0.14
2	LOB	62.67	69.63	0.13	0.48	6.96	0.39	0.07	0.27	5.63	1.54
3	Chan	69.63	71.49	4.57	2.09	2.55	13.56	1.13	2.18	67.26	146.82
4	Chan	71.49	73.34	9.62	2.88	1.86	28.56	1.56	3.34	127.16	424.40
5	Chan	73.34	75.19	8.47	2.67	1.86	25.13	1.44	3.17	117.76	373.39
6	Chan	75.19	77.04	7.37	2.46	1.86	21.87	1.33	3.00	108.36	325.04
7	Chan	77.04	78.89	3.51	1.73	2.34	10.41	0.93	2.03	60.47	122.97
8	ROB	78.89	92.38	0.02	0.08	1.56	0.06	0.05	0.26	4.30	1.10

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #VID

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	69.63	71.49	2.98	1.82	2.68	8.83	1.85	1.64	50.86	83.21
2	Chan	71.49	73.34	11.27	3.49	1.86	33.45	1.89	3.23	140.90	454.68
3	Chan	73.34	75.19	10.15	3.28	1.86	30.12	1.77	3.09	132.30	409.37

4	Chan	75.19	77.04	9.07	3.07	1.86	26.92	1.66	2.96	123.70	365.99
5	Chan	77.04	78.89	0.23	0.33	1.79	0.68	1.59	0.69	13.88	9.55

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 563

INPUT

Description: p11

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.064	12.21	848	35.117	848.098	38.286	848	66.511	847
68.388	846.6	75.911	846.58	76.766	847	80.649	847.863	148.32	848
195.845	848.72	199.293	849	202.878	849.265	205.339	849.414		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	38.286	.035	80.649	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	38.286	80.649		39.35	37.53	34.15	.1 .3

Left Levee Station= 35.12 Elevation= 848.1

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.28	Reach Len. (m)	39.35	37.53	34.15
Crit W.S. (m)	847.58	Flow Area (m2)	9.12	42.15	26.32
E.G. Slope (m/m)	0.000502	Area (m2)	9.12	42.15	26.32
Q Total (m3/s)	33.70	Flow (m3/s)	1.56	26.79	5.35
Top Width (m)	166.92	Top Width (m)	38.29	42.36	86.27
Vel Total (m/s)	0.43	Avg. Vel. (m/s)	0.17	0.64	0.20
Max Chl Dpth (m)	1.70	Hydr. Depth (m)	0.24	0.99	0.31
Conv. Total (m3/s)	1503.8	Conv. (m3/s)	69.8	1195.5	238.5
Length Wtd. (m)	36.73	Wetted Per. (m)	38.51	42.62	86.27
Min Ch El (m)	846.58	Shear (N/m2)	1.17	4.87	1.50
Alpha	1.74	Stream Power (N/m s)	9831.19	1681.47	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	10.91	13.68	12.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	27.29	12.65	28.04

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	848.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.66	Reach Len. (m)	39.35	37.53	34.15
Crit W.S. (m)	847.58	Flow Area (m2)	0.19	58.14	14.27

E.G. Slope (m/m)	0.000219	Area (m2)	0.19	58.14	14.27
Q Total (m3/s)	33.70	Flow (m3/s)	0.02	30.21	3.47
Top Width (m)	61.00	Top Width (m)	0.29	42.36	18.35
Vel Total (m/s)	0.46	Avg. Vel. (m/s)	0.10	0.52	0.24
Max Chl Dpth (m)	2.08	Hydr. Depth (m)	0.65	1.37	0.78
Conv. Total (m3/s)	2279.7	Conv. (m3/s)	1.3	2043.5	234.9
Length Wtd. (m)	37.44	Wetted Per. (m)	0.94	42.62	19.11
Min Ch El (m)	846.58	Shear (N/m2)	0.43	2.92	1.60
Alpha	1.15	Stream Power (N/m s)	9831.19	1681.47	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	2.03	12.74	1.79
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.03	7.55	1.67

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	3.90	0.14	0.89	4.12	0.42	0.23	0.16	1.06	0.17
2	LOB	3.90	7.80	0.17	0.97	3.90	0.51	0.25	0.18	1.22	0.22
3	LOB	7.80	11.71	0.19	1.05	3.90	0.58	0.27	0.19	1.32	0.25
4	LOB	11.71	15.61	0.20	1.07	3.90	0.60	0.28	0.19	1.36	0.26
5	LOB	15.61	19.51	0.18	1.01	3.90	0.54	0.26	0.18	1.27	0.23
6	LOB	19.51	23.41	0.16	0.94	3.90	0.48	0.24	0.17	1.19	0.21
7	LOB	23.41	27.32	0.15	0.88	3.90	0.43	0.23	0.16	1.11	0.18
8	LOB	27.32	31.22	0.13	0.81	3.90	0.38	0.21	0.16	1.03	0.16
9	LOB	31.22	35.12	0.11	0.75	3.90	0.33	0.19	0.15	0.94	0.14
10	LOB	35.12	38.29	0.12	0.74	3.17	0.37	0.23	0.17	1.14	0.19
11	Chan	38.29	46.76	1.24	3.66	8.48	3.67	0.43	0.34	2.13	0.72
12	Chan	46.76	55.23	2.98	6.20	8.48	8.86	0.73	0.48	3.60	1.73
13	Chan	55.23	63.70	5.29	8.75	8.48	15.70	1.03	0.61	5.08	3.07
14	Chan	63.70	72.18	9.73	12.63	8.52	28.88	1.49	0.77	7.30	5.63
15	Chan	72.18	80.65	7.54	10.91	8.67	22.38	1.29	0.69	6.20	4.29
16	ROB	80.65	93.12	1.17	5.06	12.47	3.48	0.41	0.23	2.00	0.46
17	ROB	93.12	105.59	1.05	4.75	12.47	3.13	0.38	0.22	1.88	0.42
18	ROB	105.59	118.06	0.94	4.43	12.47	2.79	0.36	0.21	1.75	0.37
19	ROB	118.06	130.52	0.83	4.12	12.47	2.47	0.33	0.20	1.63	0.33
20	ROB	130.52	142.99	0.73	3.80	12.47	2.16	0.31	0.19	1.50	0.29
21	ROB	142.99	155.46	0.53	3.16	12.47	1.58	0.25	0.17	1.25	0.21
22	ROB	155.46	167.93	0.08	0.99	11.46	0.24	0.09	0.08	0.43	0.04

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	35.12	38.29	0.02	0.19	0.94	0.06	0.65	0.10	0.43	0.04
2	Chan	38.29	46.76	2.41	6.86	8.48	7.16	0.81	0.35	1.73	0.61
3	Chan	46.76	55.23	4.08	9.40	8.48	12.12	1.11	0.43	2.38	1.03
4	Chan	55.23	63.70	6.09	11.94	8.48	18.06	1.41	0.51	3.02	1.54
5	Chan	63.70	72.18	9.70	15.83	8.52	28.79	1.87	0.61	3.98	2.44
6	Chan	72.18	80.65	7.92	14.11	8.67	23.51	1.67	0.56	3.49	1.96
7	ROB	80.65	93.12	2.45	9.77	12.47	7.27	0.78	0.25	1.68	0.42

8	ROB	93.12	105.59	1.02	4.50	6.64	3.04	0.76	0.23	1.45	0.33
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Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 526

INPUT

Description: p10 aguas arriba Camino Piedralba

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.232	21.62	848.69	86.5	847.98	86.298	848.03
87.472	847	94.801	846.5	95.199	847	97	847.5
107.221	847.6	134.922	847.553	159.947	848	170.464	848.332
196.008	848.828	217.017	849	221.231	849.061	223.091	849

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
0	.05	86.298	.035	97	.05			

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
86.298	97	14.68	14.68	14.68	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	86.41	847.96	F
95.59	223.091	847.96	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
97.1	104.2	851.5

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	848.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.24	Reach Len. (m)	3.70	3.70	3.70
Crit W.S. (m)	847.96	Flow Area (m2)	18.51	14.14	32.88
E.G. Slope (m/m)	0.001094	Area (m2)	18.51	14.14	32.88
Q Total (m3/s)	33.70	Flow (m3/s)	4.39	15.41	13.91
Top Width (m)	160.42	Top Width (m)	86.30	10.70	63.42
Vel Total (m/s)	0.51	Avg. Vel. (m/s)	0.24	1.09	0.42
Max Chl Dpth (m)	1.74	Hydr. Depth (m)	0.21	1.32	0.52
Conv. Total (m3/s)	1018.9	Conv. (m3/s)	132.7	465.8	420.5
Length Wtd. (m)	3.70	Wetted Per. (m)	86.31	11.42	64.84
Min Ch El (m)	846.50	Shear (N/m2)	2.30	13.28	5.44
Alpha	2.36	Stream Power (N/m s)	10681.13	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	10.37	12.62	11.04
C & E Loss (m)	0.01	Cum SA (1000 m2)	24.83	11.65	25.49

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	848.64	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.48	Reach Len. (m)	3.70	3.70	3.70
Crit W.S. (m)	847.96	Flow Area (m2)	5.30	16.74	0.10
E.G. Slope (m/m)	0.002458	Area (m2)	5.30	16.74	0.10
Q Total (m3/s)	33.70	Flow (m3/s)	3.08	30.60	0.02
Top Width (m)	22.10	Top Width (m)	11.30	10.70	0.10
Vel Total (m/s)	1.52	Avg. Vel. (m/s)	0.58	1.83	0.20
Max Chl Dpth (m)	1.98	Hydr. Depth (m)	0.47	1.56	0.98
Conv. Total (m3/s)	679.7	Conv. (m3/s)	62.2	617.1	0.4
Length Wtd. (m)	3.70	Wetted Per. (m)	11.78	11.42	1.08
Min Ch El (m)	846.50	Shear (N/m2)	10.84	35.34	2.19
Alpha	1.32	Stream Power (N/m s)	10681.13	0.00	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	1.93	11.33	1.55
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.80	6.55	1.36

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	8.63	0.04	0.46	8.64	0.12	0.05	0.09	0.57	0.05
2	LOB	8.63	17.26	0.22	1.26	8.63	0.65	0.15	0.17	1.57	0.27
3	LOB	17.26	25.89	0.46	1.96	8.63	1.37	0.23	0.23	2.44	0.57
4	LOB	25.89	34.52	0.51	2.09	8.63	1.52	0.24	0.24	2.60	0.64
5	LOB	34.52	43.15	0.53	2.12	8.63	1.56	0.25	0.25	2.64	0.65
6	LOB	43.15	51.78	0.54	2.15	8.63	1.60	0.25	0.25	2.68	0.67
7	LOB	51.78	60.41	0.55	2.19	8.63	1.64	0.25	0.25	2.72	0.68
8	LOB	60.41	69.04	0.56	2.22	8.63	1.67	0.26	0.25	2.75	0.70
9	LOB	69.04	77.67	0.53	2.14	8.63	1.58	0.25	0.25	2.66	0.66
10	LOB	77.67	86.30	0.44	1.92	8.63	1.31	0.22	0.23	2.38	0.55
11	Chan	86.30	86.41	0.01	0.03	0.15	0.03	0.26	0.31	2.08	0.64
12	Chan	86.41	88.70	2.06	2.40	2.65	6.11	1.05	0.86	9.72	8.34
13	Chan	88.70	91.00	3.68	3.22	2.30	10.93	1.40	1.14	15.00	17.17
14	Chan	91.00	93.29	4.39	3.58	2.30	13.03	1.56	1.23	16.67	20.48
15	Chan	93.29	95.59	4.14	3.60	2.55	12.28	1.57	1.15	15.11	17.38
16	Chan	95.59	97.00	1.13	1.32	1.46	3.34	0.93	0.85	9.66	8.25
17	ROB	97.00	109.61	1.43	3.58	6.92	4.24	0.65	0.40	5.55	2.21
18	ROB	109.61	122.22	3.84	8.24	12.61	11.40	0.65	0.47	7.01	3.27
19	ROB	122.22	134.83	4.05	8.51	12.61	12.02	0.68	0.48	7.24	3.45
20	ROB	134.83	147.44	3.10	7.25	12.61	9.20	0.57	0.43	6.17	2.64
21	ROB	147.44	160.05	1.35	4.41	12.61	4.02	0.35	0.31	3.75	1.15
22	ROB	160.05	172.65	0.13	0.88	7.48	0.39	0.12	0.15	1.26	0.19

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	69.04	77.67	0.70	1.29	3.15	2.08	0.48	0.54	9.83	5.35
2	LOB	77.67	86.30	2.38	4.01	8.63	7.07	0.46	0.59	11.21	6.66
3	Chan	86.30	86.41	0.04	0.06	0.15	0.12	0.50	0.72	9.08	6.54

4	Chan	86.41	88.70	4.40	2.96	2.65	13.07	1.29	1.49	26.92	40.07
5	Chan	88.70	91.00	7.26	3.77	2.30	21.54	1.64	1.92	39.54	76.07
6	Chan	91.00	93.29	8.45	4.13	2.30	25.07	1.80	2.04	43.31	88.51
7	Chan	93.29	95.59	7.95	4.16	2.55	23.58	1.81	1.91	39.21	75.00
8	Chan	95.59	97.00	2.50	1.66	1.46	7.41	1.18	1.50	27.35	41.15
9	ROB	97.00	109.61	0.02	0.10	1.08	0.06	0.98	0.20	2.19	0.44

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 520

INPUT

Description: Camino Piedralba

Distance from Upstream XS = 3.7

Deck/Roadway Width = 5.3

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 7

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-----	----	------	----	------	-----	----	------	----	------	-----	----	------	----	------

0	847.96	60	847.94	81.49	847.93	847.68			
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95.59	847.93	847.68	97	847.93	115	847.82			
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200	848.66								
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Upstream Bridge Cross Section Data

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	848.232	21.62	848	69.865	847.98	86.298	848.03	87.472	847
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94.801	846.5	95.199	847	97	847.5	107.221	847.6	134.922	847.553
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159.947	848	170.464	848.332	196.008	848.828	217.017	849	221.231	849.061
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223.091	849								
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Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
-----	---	-----	-----	---	-----	-----	---	-----

0	.05	86.298	.035	97	.05			
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Bank Sta: Left Right Coeff Contr. Expan.

86.298	97	.1	.3				
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Ineffective Flow num= 2

Sta	L	Sta	R	Elev	Permanent
-----	---	-----	---	------	-----------

0	86.41	847.96	F		
---	-------	--------	---	--	--

95.59	223.091	847.96	F		
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Blocked Obstructions num= 1

Sta	L	Sta	R	Elev
-----	---	-----	---	------

97.1	104.2	851.5		
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Downstream Deck/Roadway Coordinates

num= 7

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-----	----	------	----	------	-----	----	------	----	------	-----	----	------	----	------

0	847.96	40	847.96	70	847.94				
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88.2	847.93	847.68	102.27	847.93	847.68	120	847.82		
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200	848.66								
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Downstream Bridge Cross Section Data

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	847.87	89.092	847.764	89.88	847	90.865	846.49	101.724	846.51
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102.232 847 121.696 847.45 149.391 847.366 172.421 848 224.779 849.028
231.255 849 231.418 849.15 240.145 849.228

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 89.092 .035 121.696 .05

Bank Sta: Left Right Coeff Contr. Expan.
89.092 121.696 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 88.2 847.93 F
102.27 240.145 847.93 F

Blocked Obstructions num= 1
Sta L Sta R Elev
.6 3 850.8

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga
REACH: Astorga RS: 512

INPUT

Description: p9 aguas abajo Camino Piedralba

Station Elevation Data num= 13
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 847.87 89.092 847.764 89.88 847 90.865 846.49 101.724 846.51
102.232 847 121.696 847.45 149.391 847.366 172.421 848 224.779 849.028
231.255 849 231.418 849.15 240.145 849.228

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .05 89.092 .035 121.696 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
89.092 121.696 60.22 49.19 25.67 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent

0 88.2 847.93 F
102.27 240.145 847.93 F
Blocked Obstructions num= 1
Sta L Sta R Elev
.6 3 850.8

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.	0.035		
W.S. Elev (m)	847.69	Reach Len. (m)	60.22	49.19	25.67
Crit W.S. (m)	847.45	Flow Area (m2)	14.65		
E.G. Slope (m/m)	0.005929	Area (m2)	23.76	9.88	
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	72.14	Top Width (m)	32.53	39.61	
Vel Total (m/s)	2.30	Avg. Vel. (m/s)	2.30		
Max Chl Dpth (m)	1.20	Hydr. Depth (m)	1.12		
Conv. Total (m3/s)	437.7	Conv. (m3/s)	437.7		
Length Wtd. (m)	49.19	Wetted Per. (m)	13.71		
Min Ch El (m)	846.49	Shear (N/m2)	62.15		
Alpha	1.00	Stream Power (N/m s)	11497.63	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	10.28	12.40	10.91
C & E Loss (m)	0.08	Cum SA (1000 m2)	24.32	11.49	25.05

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	848.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	848.16	Reach Len. (m)	60.22	49.19	25.67
Crit W.S. (m)	847.64	Flow Area (m2)	0.04	15.53	
E.G. Slope (m/m)	0.004090	Area (m2)	0.04	15.53	
Q Total (m3/s)	33.70	Flow (m3/s)	0.01	33.69	
Top Width (m)	10.00	Top Width (m)	0.09	9.91	
Vel Total (m/s)	2.17	Avg. Vel. (m/s)	0.23	2.17	
Max Chl Dpth (m)	1.67	Hydr. Depth (m)	0.40	1.57	
Conv. Total (m3/s)	527.0	Conv. (m3/s)	0.1	526.8	
Length Wtd. (m)	48.40	Wetted Per. (m)	0.49	12.00	
Min Ch El (m)	846.49	Shear (N/m2)	2.99	51.91	
Alpha	1.00	Stream Power (N/m s)	11497.63	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	1.90	11.13	1.55
C & E Loss (m)	0.05	Cum SA (1000 m2)	1.73	6.40	1.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	89.09	95.68	15.34	6.96	6.92	45.52	1.07	2.20	58.47	128.85
2	Chan	95.68	102.27	18.36	7.69	6.79	54.48	1.17	2.39	65.90	157.30
3	Chan	102.27	108.75	0.00	4.00	6.48	0.00	0.62	0.00	35.95	0.00
4	Chan	108.75	115.22	0.00	3.03	6.48	0.00	0.47	0.00	27.24	0.00
5	Chan	115.22	121.70	0.00	2.06	6.48	0.00	0.32	0.00	18.54	0.00
6	ROB	121.70	133.54	0.00	3.10	11.84	0.00	0.26	0.00	15.23	0.00
7	ROB	133.54	145.39	0.00	3.53	11.84	0.00	0.30	0.00	17.32	0.00
8	ROB	145.39	157.23	0.00	3.02	11.85	0.00	0.25	0.00	14.80	0.00
9	ROB	157.23	169.08	0.00	0.23	4.08	0.00	0.06	0.00	3.26	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	88.20	89.09	0.01	0.04	0.49	0.02	0.40	0.23	2.99	0.68
2	Chan	89.09	95.68	23.03	10.02	7.02	68.34	1.52	2.30	57.25	131.53
3	Chan	95.68	102.27	10.66	5.50	4.97	31.64	1.66	1.94	44.36	85.98

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 463

INPUT

Description: p8

Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.472	3	127 847.249	32	48 847.22	42	839 847.22	69	599 847.383
87	621 847.44	89	528 847.51	91	952 847	92	854 846.272	99	224 846.003
100	157 847	105	634 847.341	135	591 847.263	188	593 848	217	267 848.922
224	636 849.15	225	322 849	236	383 849.111				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05 89.528	.035	105.634	.05	

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	89.528	105.634		71.66 73.89	78.45	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
82	85	851

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.80	Reach Len. (m)	71.66	73.89	78.45
Crit W.S. (m)		Flow Area (m2)	44.05	17.66	25.47
E.G. Slope (m/m)	0.000630	Area (m2)	44.05	17.66	25.47
Q Total (m3/s)	33.70	Flow (m3/s)	14.04	13.06	6.59
Top Width (m)	171.40	Top Width (m)	86.53	16.11	68.77
Vel Total (m/s)	0.39	Avg. Vel. (m/s)	0.32	0.74	0.26
Max Chl Dpth (m)	1.80	Hydr. Depth (m)	0.51	1.10	0.37
Conv. Total (m3/s)	1342.7	Conv. (m3/s)	559.5	520.5	262.8
Length Wtd. (m)	74.58	Wetted Per. (m)	87.62	16.86	68.77
Min Ch El (m)	846.00	Shear (N/m2)	3.11	6.47	2.29
Alpha	1.79	Stream Power (N/m s)	11317.52	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	8.96	11.38	10.46
C & E Loss (m)	0.00	Cum SA (1000 m2)	21.71	10.30	23.66

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	848.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.19	Reach Len. (m)	71.66	73.89	78.45
Crit W.S. (m)		Flow Area (m2)	3.32	23.83	5.43
E.G. Slope (m/m)	0.001145	Area (m2)	3.32	23.83	5.43
Q Total (m3/s)	33.70	Flow (m3/s)	1.65	29.01	3.04
Top Width (m)	27.00	Top Width (m)	4.53	16.11	6.37
Vel Total (m/s)	1.03	Avg. Vel. (m/s)	0.50	1.22	0.56
Max Chl Dpth (m)	2.18	Hydr. Depth (m)	0.73	1.48	0.85
Conv. Total (m3/s)	995.8	Conv. (m3/s)	48.7	857.4	89.7
Length Wtd. (m)	74.33	Wetted Per. (m)	5.28	16.86	7.23
Min Ch El (m)	846.00	Shear (N/m2)	7.06	15.87	8.44
Alpha	1.23	Stream Power (N/m s)	11317.52	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	1.80	10.16	1.48
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.59	5.76	1.28

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv Depth(m)		(m/s)	(N/m2)	(N/m s)
1	LOB	0.00	8.95	1.44	4.63	9.29	4.28	0.52	0.31	3.07	0.96
2	LOB	8.95	17.91	1.71	5.05	8.95	5.08	0.56	0.34	3.48	1.18
3	LOB	17.91	26.86	1.76	5.13	8.95	5.21	0.57	0.34	3.54	1.21
4	LOB	26.86	35.81	1.80	5.20	8.95	5.34	0.58	0.35	3.59	1.24
5	LOB	35.81	44.76	1.80	5.21	8.95	5.35	0.58	0.35	3.59	1.24
6	LOB	44.76	53.72	1.61	4.87	8.95	4.78	0.54	0.33	3.36	1.11
7	LOB	53.72	62.67	1.35	4.38	8.95	4.01	0.49	0.31	3.02	0.93
8	LOB	62.67	71.62	1.11	3.90	8.95	3.30	0.44	0.29	2.69	0.77
9	LOB	71.62	80.58	0.96	3.57	8.95	2.86	0.40	0.27	2.47	0.66
10	LOB	80.58	89.53	0.49	2.13	6.71	1.46	0.36	0.23	1.96	0.45
11	Chan	89.53	92.75	1.05	2.22	3.50	3.13	0.69	0.47	3.92	1.86
12	Chan	92.75	95.97	4.46	5.13	3.25	13.23	1.59	0.87	9.74	8.46
13	Chan	95.97	99.19	5.15	5.57	3.22	15.27	1.73	0.92	10.68	9.86
14	Chan	99.19	102.41	1.62	2.92	3.66	4.79	0.91	0.55	4.94	2.73
15	Chan	102.41	105.63	0.79	1.81	3.23	2.34	0.56	0.44	3.46	1.51
16	ROB	105.63	118.71	1.73	6.26	13.07	5.14	0.48	0.28	2.96	0.82
17	ROB	118.71	131.78	1.94	6.70	13.07	5.76	0.51	0.29	3.17	0.92

18	ROB	131.78	144.86	1.82	6.44	13.08	5.39	0.49	0.28	3.04	0.86
19	ROB	144.86	157.93	0.88	4.18	13.08	2.62	0.32	0.21	1.98	0.42
20	ROB	157.93	171.01	0.22	1.81	13.08	0.65	0.14	0.12	0.85	0.10
21	ROB	171.01	184.08	0.00	0.08	3.39	0.01	0.02	0.04	0.15	0.01

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	80.58	89.53	1.65	3.32	5.28	4.89	0.73	0.50	7.06	3.50
2	Chan	89.53	92.75	3.10	3.46	3.50	9.21	1.07	0.90	11.09	9.96
3	Chan	92.75	95.97	9.01	6.36	3.25	26.75	1.98	1.42	21.97	31.11
4	Chan	95.97	99.19	10.14	6.81	3.22	30.10	2.11	1.49	23.71	35.34
5	Chan	99.19	102.41	4.10	4.16	3.66	12.17	1.29	0.99	12.77	12.59
6	Chan	102.41	105.63	2.65	3.04	3.23	7.86	0.94	0.87	10.59	9.22
7	ROB	105.63	118.71	3.04	5.43	7.23	9.01	0.85	0.56	8.44	4.72

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 389

INPUT

Description: p7

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.5	96.357	847.19	97.832	847.277	99.3	847	100.896	846
106.49	845.9	109.209	847	113.571	846.915	173.057	847.156	190.173	847.474
195.217	847.737	211.262	847.93	213.795	847.96	217.101	848		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	97.832	.035	109.209	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	97.832	109.209		53.87	74.85	96.61	.1 .3

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.77	Reach Len. (m)	53.87	74.85	96.61
Crit W.S. (m)		Flow Area (m2)	42.15	16.77	56.27
E.G. Slope (m/m)	0.000311	Area (m2)	42.15	16.77	56.27
Q Total (m3/s)	33.70	Flow (m3/s)	8.47	10.62	14.61
Top Width (m)	198.31	Top Width (m)	97.83	11.38	89.10
Vel Total (m/s)	0.29	Avg. Vel. (m/s)	0.20	0.63	0.26
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	0.43	1.47	0.63
Conv. Total (m3/s)	1910.4	Conv. (m3/s)	479.9	602.2	828.2
Length Wtd. (m)	75.57	Wetted Per. (m)	98.11	11.91	89.11
Min Ch El (m)	845.90	Shear (N/m2)	1.31	4.30	1.93
Alpha	1.94	Stream Power (N/m s)	10394.34	0.00	0.00
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	5.87	10.11	7.25
C & E Loss (m)	0.00	Cum SA (1000 m2)	15.11	9.28	17.47

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	848.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	848.11	Reach Len. (m)	53.87	74.85	96.61
Crit W.S. (m)		Flow Area (m2)	5.29	20.63	9.13
E.G. Slope (m/m)	0.000897	Area (m2)	5.29	20.63	9.13
Q Total (m3/s)	33.70	Flow (m3/s)	2.70	25.48	5.53
Top Width (m)	25.00	Top Width (m)	5.83	11.38	7.79
Vel Total (m/s)	0.96	Avg. Vel. (m/s)	0.51	1.23	0.61
Max Chl Dpth (m)	2.21	Hydr. Depth (m)	0.91	1.81	1.17
Conv. Total (m3/s)	1125.1	Conv. (m3/s)	90.0	850.5	184.6
Length Wtd. (m)	75.80	Wetted Per. (m)	6.74	11.91	8.98
Min Ch El (m)	845.90	Shear (N/m2)	6.90	15.25	8.95
Alpha	1.33	Stream Power (N/m s)	10394.34	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	1.49	8.52	0.91
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.22	4.75	0.72

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	9.78	0.42	2.84	10.06	1.25	0.29	0.15	0.86	0.13	
2	LOB	9.78	19.57	0.51	3.14	9.78	1.51	0.32	0.16	0.98	0.16	
3	LOB	19.57	29.35	0.59	3.45	9.78	1.76	0.35	0.17	1.08	0.19	
4	LOB	29.35	39.13	0.68	3.76	9.78	2.03	0.38	0.18	1.17	0.21	
5	LOB	39.13	48.92	0.78	4.07	9.78	2.31	0.42	0.19	1.27	0.24	
6	LOB	48.92	58.70	0.88	4.37	9.78	2.61	0.45	0.20	1.36	0.27	
7	LOB	58.70	68.48	0.99	4.68	9.78	2.93	0.48	0.21	1.46	0.31	
8	LOB	68.48	78.27	1.10	4.99	9.78	3.25	0.51	0.22	1.56	0.34	
9	LOB	78.27	88.05	1.21	5.30	9.78	3.60	0.54	0.23	1.65	0.38	
10	LOB	88.05	97.83	1.30	5.54	9.79	3.87	0.57	0.24	1.73	0.41	
11	Chan	97.83	100.11	0.68	1.76	2.45	2.01	0.77	0.38	2.20	0.85	
12	Chan	100.11	102.38	2.53	3.86	2.42	7.50	1.70	0.65	4.87	3.19	
13	Chan	102.38	104.66	2.96	4.14	2.28	8.78	1.82	0.71	5.56	3.97	
14	Chan	104.66	106.93	2.99	4.20	2.31	8.87	1.84	0.71	5.54	3.95	
15	Chan	106.93	109.21	1.47	2.81	2.45	4.37	1.23	0.52	3.49	1.83	
16	ROB	109.21	120.00	2.64	9.00	10.79	7.84	0.83	0.29	2.55	0.75	
17	ROB	120.00	130.79	2.52	8.75	10.79	7.48	0.81	0.29	2.48	0.71	
18	ROB	130.79	141.58	2.30	8.28	10.79	6.82	0.77	0.28	2.34	0.65	
19	ROB	141.58	152.37	2.09	7.81	10.79	6.19	0.72	0.27	2.21	0.59	
20	ROB	152.37	163.16	1.88	7.34	10.79	5.58	0.68	0.26	2.08	0.53	
21	ROB	163.16	173.94	1.68	6.86	10.79	4.99	0.64	0.24	1.94	0.48	
22	ROB	173.94	184.73	1.13	5.41	10.79	3.36	0.50	0.21	1.53	0.32	
23	ROB	184.73	195.52	0.37	2.77	10.80	1.10	0.26	0.13	0.78	0.10	
24	ROB	195.52	206.31	0.00	0.05	2.79	0.00	0.02	0.02	0.05	0.00	

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr (m/s)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	88.05	97.83	2.70	5.29	6.74	8.00	0.91	0.51	6.90	3.52	
2	Chan	97.83	100.11	2.14	2.53	2.45	6.36	1.11	0.85	9.11	7.71	
3	Chan	100.11	102.38	5.91	4.63	2.42	17.53	2.04	1.27	16.86	21.49	
4	Chan	102.38	104.66	6.79	4.92	2.28	20.14	2.16	1.38	19.00	26.23	
5	Chan	104.66	106.93	6.83	4.97	2.31	20.28	2.18	1.38	18.91	26.02	
6	Chan	106.93	109.21	3.81	3.58	2.45	11.29	1.57	1.06	12.84	13.64	
7	ROB	109.21	120.00	5.53	9.13	8.98	16.41	1.17	0.61	8.95	5.42	

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 314

INPUT

Description: p6

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.6	105.253	847.202	107.324	847.126	108.944	847.24	110.722	847.27
112.198	847.113	094	846.113	988	845.482	120.068	845.77	120.971	846
129.403	846.839	130.578	847.134	508	847.134	925	846.968	159.489	847.006
185.094	848.755	220.091	847.322						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	110.722	.035	130.578	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 110.722 130.578 99.53 145.33 198.5 .1 .3

Right Levee Station= 185.09 Elevation= 848.76

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
137.5	156	852.6	172	182	849.5

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.73	Reach Len. (m)	99.53	145.33	198.50
Crit W.S. (m)	846.80	Flow Area (m2)	37.92	30.29	11.58
E.G. Slope (m/m)	0.000420	Area (m2)	37.92	30.29	11.58
Q Total (m3/s)	33.70	Flow (m3/s)	7.60	22.97	3.13
Top Width (m)	151.64	Top Width (m)	110.72	19.86	21.06
Vel Total (m/s)	0.42	Avg. Vel. (m/s)	0.20	0.76	0.27
Max Chl Dpth (m)	2.25	Hydr. Depth (m)	0.34	1.53	0.55
Conv. Total (m3/s)	1643.9	Conv. (m3/s)	370.9	1120.6	152.5
Length Wtd. (m)	142.63	Wetted Per. (m)	110.86	20.55	22.58
Min Ch El (m)	845.48	Shear (N/m2)	1.41	6.07	2.11
Alpha	2.29	Stream Power (N/m s)	10537.48	0.00	8861.72
Frctn Loss (m)	0.16	Cum Volume (1000 m3)	3.71	8.35	3.98
C & E Loss (m)	0.04	Cum SA (1000 m2)	9.49	8.11	12.15

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	848.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.	0.035		
W.S. Elev (m)	848.01	Reach Len. (m)	99.53	145.33	198.50
Crit W.S. (m)	846.78	Flow Area (m2)		25.54	
E.G. Slope (m/m)	0.001086	Area (m2)		25.54	

Q Total (m3/s)	33.70	Flow (m3/s)	33.70
Top Width (m)	11.75	Top Width (m)	11.75
Vel Total (m/s)	1.32	Avg. Vel. (m/s)	1.32
Max Chl Dpth (m)	2.53	Hydr. Depth (m)	2.17
Conv. Total (m3/s)	1022.7	Conv. (m3/s)	1022.7
Length Wtd. (m)	145.33	Wetted Per. (m)	15.40
Min Ch El (m)	845.48	Shear (N/m2)	17.66
Alpha	1.00	Stream Power (N/m s)	10537.48 0.00 8861.72
Frctn Loss (m)	0.35	Cum Volume (1000 m3)	1.35 6.79 0.47
C & E Loss (m)	0.04	Cum SA (1000 m2)	1.07 3.88 0.34

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	0.00	11.07	0.19	1.71	11.21	0.56	0.15	0.11	0.63	0.07
2	LOB	11.07	22.14	0.28	2.17	11.07	0.84	0.20	0.13	0.81	0.10
3	LOB	22.14	33.22	0.39	2.64	11.07	1.15	0.24	0.15	0.98	0.14
4	LOB	33.22	44.29	0.51	3.10	11.07	1.51	0.28	0.16	1.15	0.19
5	LOB	44.29	55.36	0.64	3.56	11.07	1.90	0.32	0.18	1.33	0.24
6	LOB	55.36	66.43	0.79	4.03	11.07	2.34	0.36	0.20	1.50	0.29
7	LOB	66.43	77.51	0.94	4.49	11.07	2.80	0.41	0.21	1.67	0.35
8	LOB	77.51	88.58	1.11	4.96	11.07	3.30	0.45	0.22	1.84	0.41
9	LOB	88.58	99.65	1.29	5.42	11.07	3.83	0.49	0.24	2.02	0.48
10	LOB	99.65	110.72	1.46	5.84	11.08	4.34	0.53	0.25	2.17	0.54
11	Chan	110.72	114.69	3.32	5.35	4.58	9.86	1.35	0.62	4.81	2.99
12	Chan	114.69	118.66	7.81	8.43	3.98	23.17	2.12	0.93	8.74	8.09
13	Chan	118.66	122.64	5.99	7.22	4.01	17.77	1.82	0.83	7.42	6.16
14	Chan	122.64	126.61	3.75	5.44	3.99	11.13	1.37	0.69	5.62	3.87
15	Chan	126.61	130.58	2.10	3.85	4.00	6.24	0.97	0.55	3.97	2.17
16	ROB	130.58	139.66	1.55	5.16	7.68	4.61	0.75	0.30	2.77	0.83
17	ROB	139.66	148.75					0.00	0.00		
18	ROB	148.75	157.83	0.34	1.34	2.57	1.01	0.73	0.25	2.15	0.55
19	ROB	157.83	166.92	1.20	4.73	9.10	3.56	0.52	0.25	2.14	0.54
20	ROB	166.92	176.00	0.03	0.35	3.23	0.09	0.11	0.09	0.45	0.04

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	110.72	114.69	4.22	4.43	3.88	12.53	2.28	0.95	12.14	11.59
2	Chan	114.69	118.66	14.94	9.53	3.98	44.32	2.40	1.57	25.54	40.00

3	Chan	118.66	122.64	11.83	8.32	4.01	35.11	2.09	1.42	22.09	31.42
4	Chan	122.64	126.61	2.71	3.27	3.53	8.04	1.75	0.83	9.84	8.17

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 300

INPUT

Description: p5.5 aguas arriba Sta. Clara

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0 848.054	11.31	847.908	123.104	848.413	126.155	847.395	130.174	847.444	
134.799	847.136	771 846.268	142.315	845.3	149.097	847.322	158.848	846.93	
194.773	846.797	219.399	847.001	263.491	849.526				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	130.174	.035	149.097	.05

Bank Sta	Left	Right	Lengths	Left Channel	Right	Coeff Contr.	Expan.
130.174	149.097	15	15	15	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	134.51	847.88	F
144.52	263.491	847.88	F

Left Levee Station= 123.1 Elevation= 848.41

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
18	37	850	167	217	854

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.39	Wt. n-Val.	0.035		
W.S. Elev (m)	847.17	Reach Len. (m)	2.35	2.35	2.35
Crit W.S. (m)	847.00	Flow Area (m2)	12.23		
E.G. Slope (m/m)	0.007428	Area (m2)	14.82	3.55	
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	35.26	Top Width (m)	15.62	19.64	
Vel Total (m/s)	2.76	Avg. Vel. (m/s)	2.76		
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	1.22		
Conv. Total (m3/s)	391.0	Conv. (m3/s)	391.0		
Length Wtd. (m)	2.35	Wetted Per. (m)	10.32		
Min Ch El (m)	845.30	Shear (N/m2)	86.27		
Alpha	1.00	Stream Power (N/m s)	12615.39	5893.76	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	1.82	5.07	2.47
C & E Loss (m)	0.02	Cum SA (1000 m2)	3.98	5.53	8.11

Warning: Divided flow computed for this cross-section.

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	847.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.45	Wt. n-Val.	0.035		
W.S. Elev (m)	847.27	Reach Len. (m)	2.35	2.35	2.35
Crit W.S. (m)	847.03	Flow Area (m2)	11.35		
E.G. Slope (m/m)	0.009151	Area (m2)	11.35		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	7.50	Top Width (m)	7.50		
Vel Total (m/s)	2.97	Avg. Vel. (m/s)	2.97		
Max Chl Dpth (m)	1.96	Hydr. Depth (m)	1.51		
Conv. Total (m3/s)	352.3	Conv. (m3/s)	352.3		
Length Wtd. (m)	2.35	Wetted Per. (m)	10.03		
Min Ch El (m)	845.30	Shear (N/m2)	101.55		
Alpha	1.00	Stream Power (N/m s)	12615.39	5893.76	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	1.35	4.11	0.47
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.07	2.48	0.34

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	130.17	134.51	0.00	0.11	1.53	0.00	0.07	0.00	5.31	0.00
2	Chan	134.51	137.85	3.70	2.19	3.49	10.97	0.66	1.69	45.71	77.29
3	Chan	137.85	141.18	13.12	4.62	3.39	38.93	1.39	2.84	99.40	282.13
4	Chan	141.18	144.52	16.88	5.42	3.45	50.10	1.62	3.12	114.38	356.49
5	Chan	144.52	149.10	0.00	2.48	4.26	0.00	0.61	0.00	42.47	0.00
6	ROB	149.10	160.54	0.00	1.16	7.76	0.00	0.15	0.00	10.86	0.00
7	ROB	160.54	171.98	0.00	1.69	6.74	0.00	0.26	0.00	18.32	0.00
8	ROB	171.98	183.42					0.00	0.00		
9	ROB	183.42	194.85					0.00	0.00		
10	ROB	194.85	206.29					0.00	0.00		
11	ROB	206.29	217.73	0.00	0.14	0.93	0.00	0.19	0.00	10.95	0.00
12	ROB	217.73	229.17	0.00	0.56	4.69	0.00	0.12	0.00	8.71	0.00

Warning: Divided flow computed for this cross-section.

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	134.51	137.85	2.75	1.43	2.28	8.17	1.06	1.92	56.35	108.45
2	Chan	137.85	141.18	16.59	4.93	3.39	49.23	1.48	3.37	130.49	439.60
3	Chan	141.18	144.52	14.36	5.00	4.37	42.60	1.78	2.87	102.68	294.83

used. Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 275

INPUT

Description: Calle Santa Clara

Distance from Upstream XS = 2.35

Deck/Roadway Width = 4.5

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 7

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
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0	847.81	20	847.39	124	847.6
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134.51	847.88	847.53	144.52	847.88	847.53	160	847.53
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200	847.27
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Upstream Bridge Cross Section Data

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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0	848.054	11.31	847.908	123.104	848.413	126.155	847.395	130.174	847.444
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134.799	847	136.771	846.268	142.315	845.3	149.097	847.322	158.848	846.93
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194.773	846.797	219.399	847.001	263.491	849.526
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Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
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0	.05	130.174	.035	149.097	.05
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Bank Sta: Left Right Coeff Contr. Expan.

130.174	149.097	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev Permanent
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0	134.51	847.88
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F

144.52	263.491	847.88
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F

Left Levee Station= 123.1 Elevation= 848.41

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
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18	37	850	167	217	854
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Downstream Deck/Roadway Coordinates

num= 8

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
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0	847.81	20	847.39	100	847.6
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114.982	847.88	847.53	124.99	847.88	847.53	140	847.53
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200	847.27	220	847.11
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Downstream Bridge Cross Section Data

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	847.957	11.494	847.852	73.01	847	105.45	847	107.891	847
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110.06	847	115.228	847	116.327	846	117.913	845.275	123.108	845.494
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124.99	846	125.334	847	134.809	847	167.04	847	170.392	847
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203.741	847	261.522	847.662
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Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
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0	.05	115.228	.035	125.334	.05
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Bank Sta: Left Right Coeff Contr. Expan.

115.228	125.334	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev Permanent
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0	114.98	847.88
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F

124.99	261.522	847.88
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F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
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17.5 72 852

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 250

INPUT

Description: p5 aguas abajo Snta Clara

Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.957	11.494	847.852	73.01	847	105.45	847	107.891	847
110.06	847	115.228	847	116.327	846	117.913	845.275	123.108	845.494
124.99	846	125.334	847	134.809	847	167.04	847	170.392	847
203.741	847	261.522	847.662						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	115.228	.035	125.334	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Bank Sta	Left	Right	Lengths	Left	Channel	Right	Coeff	Contr.	Expan.
115.228	125.334		59	54	24	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	114.98	847.88	F
124.99	261.522	847.88	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
17.5	72	852

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.29	Wt. n-Val.	0.050	0.035	
W.S. Elev (m)	847.08	Reach Len. (m)	59.00	54.00	24.00
Crit W.S. (m)	846.68	Flow Area (m2)	0.02	14.21	
E.G. Slope (m/m)	0.004525	Area (m2)	3.33	14.41	6.32
Q Total (m3/s)	33.70	Flow (m3/s)	0.00	33.70	

Top Width (m)	138.48	Top Width (m)	43.23	10.11	85.15
Vel Total (m/s)	2.37	Avg. Vel. (m/s)	0.24	2.37	
Max Chl Dpth (m)	1.80	Hydr. Depth (m)	0.08	1.46	
Conv. Total (m3/s)	501.0	Conv. (m3/s)	0.1	500.9	
Length Wtd. (m)	50.95	Wetted Per. (m)	0.25	10.38	
Min Ch El (m)	845.28	Shear (N/m2)	3.43	60.78	
Alpha	1.00	Stream Power (N/m s)	12521.12	0.00	0.00
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	1.81	4.87	2.44
C & E Loss (m)	0.06	Cum SA (1000 m2)	3.80	5.38	7.74

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	847.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.035		
W.S. Elev (m)	847.36	Reach Len. (m)	59.00	54.00	24.00
Crit W.S. (m)	846.67	Flow Area (m2)	16.97		
E.G. Slope (m/m)	0.002625	Area (m2)	17.26		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	10.10	Top Width (m)	10.10		
Vel Total (m/s)	1.99	Avg. Vel. (m/s)	1.99		
Max Chl Dpth (m)	2.08	Hydr. Depth (m)	1.74		
Conv. Total (m3/s)	657.7	Conv. (m3/s)	657.7		
Length Wtd. (m)	50.72	Wetted Per. (m)	10.74		
Min Ch El (m)	845.28	Shear (N/m2)	40.68		
Alpha	1.00	Stream Power (N/m s)	12521.12	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	1.35	3.88	0.47
C & E Loss (m)	0.05	Cum SA (1000 m2)	1.07	2.34	0.34

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	68.99	80.49	0.00	0.65	8.55	0.00	0.08	0.00	3.37	0.00
2	LOB	80.49	91.98	0.00	0.89	11.50	0.00	0.08	0.00	3.43	0.00
3	LOB	91.98	103.48	0.00	0.89	11.50	0.00	0.08	0.00	3.43	0.00
4	LOB	103.48	114.98	0.00	0.89	11.50	0.00	0.08	0.00	3.43	0.00
5	LOB	114.98	115.23	0.00	0.02	0.25	0.01	0.08	0.24	3.43	0.84
6	Chan	115.23	117.18	2.51	1.72	2.42	7.45	0.88	1.46	31.49	45.98
7	Chan	117.18	119.13	8.66	3.36	2.03	25.70	1.72	2.57	73.68	189.66
8	Chan	119.13	121.09	8.76	3.34	1.95	25.98	1.71	2.62	75.80	198.84
9	Chan	121.09	123.04	8.07	3.18	1.95	23.93	1.63	2.54	72.16	183.16
10	Chan	123.04	124.99	5.70	2.61	2.02	16.92	1.34	2.18	57.47	125.33
11	Chan	124.99	125.33	0.00	0.20	1.06	0.00	0.58	0.00	8.34	0.00
12	ROB	125.33	138.95	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
13	ROB	138.95	152.57	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
14	ROB	152.57	166.19	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
15	ROB	166.19	179.81	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00

16	ROB	179.81	193.43	0.00	1.05	13.62	0.00	0.08	0.00	3.43	0.00
17	ROB	193.43	207.05	0.00	0.99	13.62	0.00	0.07	0.00	3.22	0.00
18	ROB	207.05	220.67	0.00	0.07	3.44	0.00	0.02	0.00	0.87	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	115.23	117.18	2.76	2.27	2.78	8.19	1.16	1.22	21.00	25.52
2	Chan	117.18	119.13	8.45	3.92	2.03	25.08	2.01	2.16	49.74	107.38
3	Chan	119.13	121.09	8.56	3.89	1.95	25.41	1.99	2.20	51.23	112.80
4	Chan	121.09	123.04	7.98	3.73	1.95	23.68	1.91	2.14	49.11	105.14
5	Chan	123.04	124.99	5.95	3.17	2.02	17.64	1.62	1.88	40.36	75.79
6	Chan	124.99	125.33	0.00	0.29	1.42	0.00	0.86	0.00	5.35	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 200

INPUT

Description: p4.5

Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.004	98.831	846	100.182	845.154	105.56	845.369	105.852	846
141.108	846.16	236.843	847	242.698	847.336				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	98.831	.035	105.852	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	98.831	105.852		99 52 12	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	90	849	F
115	242.698	849	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
9.5	74	850

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.10	Reach Len. (m)	99.00	52.00	12.00

Crit W.S. (m)	846.54	Flow Area (m2)	8.91	12.35	9.86
E.G. Slope (m/m)	0.001498	Area (m2)	21.02	12.35	85.63
Q Total (m3/s)	33.70	Flow (m3/s)	6.93	18.75	8.02
Top Width (m)	164.56	Top Width (m)	24.83	7.02	132.71
Vel Total (m/s)	1.08	Avg. Vel. (m/s)	0.78	1.52	0.81
Max Chl Dpth (m)	1.94	Hydr. Depth (m)	1.01	1.76	1.08
Conv. Total (m3/s)	870.8	Conv. (m3/s)	179.2	484.4	207.2
Length Wtd. (m)	52.08	Wetted Per. (m)	8.83	7.67	9.15
Min Ch El (m)	845.15	Shear (N/m2)	14.81	23.63	15.82
Alpha	1.33	Stream Power (N/m s)	11619.86	0.00	0.00
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	1.09	4.15	1.34
C & E Loss (m)	0.03	Cum SA (1000 m2)	1.79	4.92	5.12

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	847.45	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (m)	847.40	Reach Len. (m)	99.00	52.00	12.00
Crit W.S. (m)	846.54	Flow Area (m2)	11.57	14.46	12.62
E.G. Slope (m/m)	0.000763	Area (m2)	17.03	14.46	25.92
Q Total (m3/s)	33.70	Flow (m3/s)	7.65	17.42	8.63
Top Width (m)	39.61	Top Width (m)	13.48	7.02	19.11
Vel Total (m/s)	0.87	Avg. Vel. (m/s)	0.66	1.20	0.68
Max Chl Dpth (m)	2.25	Hydr. Depth (m)	1.31	2.06	1.38
Conv. Total (m3/s)	1220.2	Conv. (m3/s)	277.0	630.6	312.6
Length Wtd. (m)	52.21	Wetted Per. (m)	8.83	7.67	9.15
Min Ch El (m)	845.15	Shear (N/m2)	9.80	14.10	10.31
Alpha	1.27	Stream Power (N/m s)	11619.86	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	0.84	3.03	0.16
C & E Loss (m)	0.04	Cum SA (1000 m2)	0.67	1.88	0.11

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	LOB	70.00	80.00	0.00	3.93	6.60	0.00	0.66	0.00	8.76	0.00
2	LOB	80.00	90.00	0.00	8.18	10.00	0.00	0.82	0.00	12.01	0.00
3	LOB	90.00	98.83	6.93	8.91	8.83	20.58	1.01	0.78	14.81	11.53
4	Chan	98.83	100.24	2.81	2.16	1.65	8.35	1.54	1.30	19.24	25.07
5	Chan	100.24	101.64	4.51	2.69	1.41	13.37	1.91	1.68	28.09	47.09
6	Chan	101.64	103.04	4.29	2.61	1.41	12.72	1.86	1.64	27.26	44.81
7	Chan	103.04	104.45	4.07	2.53	1.41	12.09	1.80	1.61	26.44	42.57
8	Chan	104.45	105.85	3.07	2.36	1.81	9.10	1.68	1.30	19.17	24.92
9	ROB	105.85	115.00	8.02	9.86	9.15	23.80	1.08	0.81	15.82	12.87
10	ROB	115.00	129.19	0.00	14.54	14.19	0.00	1.02	0.00	15.05	0.00
11	ROB	129.19	143.38	0.00	13.62	14.19	0.00	0.96	0.00	14.09	0.00
12	ROB	143.38	157.57	0.00	12.15	14.19	0.00	0.86	0.00	12.58	0.00

13	ROB	157.57	171.75	0.00	10.38	14.19	0.00	0.73	0.00	10.75	0.00
14	ROB	171.75	185.94	0.00	8.62	14.19	0.00	0.61	0.00	8.92	0.00
15	ROB	185.94	200.13	0.00	6.85	14.19	0.00	0.48	0.00	7.09	0.00
16	ROB	200.13	214.32	0.00	5.09	14.19	0.00	0.36	0.00	5.26	0.00
17	ROB	214.32	228.51	0.00	3.32	14.19	0.00	0.23	0.00	3.44	0.00
18	ROB	228.51	242.70	0.00	1.21	10.05	0.00	0.12	0.00	1.77	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	LOB	80.00	90.00	0.00	5.46	5.78	0.00	1.17	0.00	7.06	0.00
2	LOB	90.00	98.83	7.65	11.57	8.83	22.70	1.31	0.66	9.80	6.48
3	Chan	98.83	100.24	2.71	2.58	1.65	8.04	1.84	1.05	11.72	12.30
4	Chan	100.24	101.64	4.11	3.11	1.41	12.20	2.22	1.32	16.56	21.88
5	Chan	101.64	103.04	3.94	3.03	1.41	11.69	2.16	1.30	16.14	20.96
6	Chan	103.04	104.45	3.77	2.95	1.41	11.18	2.10	1.28	15.72	20.06
7	Chan	104.45	105.85	2.89	2.78	1.81	8.57	1.98	1.04	11.52	11.94
8	ROB	105.85	115.00	8.63	12.62	9.15	25.62	1.38	0.68	10.31	7.06
9	ROB	115.00	129.19	0.00	13.30	11.27	0.00	1.34	0.00	8.83	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 169

INPUT

Description: p4 aguas arriba N-VI

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.514	44.711	847.668	61.61	848.027	80	847	94.957	845.15
102.378	845.22	115	847.1	208.681	847	229.464	846.678		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	80	.035	115	.05

Bank Sta	Left	Right	Lengths	Left Channel	Right	Coeff	Contr.	Expan.
80	115	25.6	25.6	25.6	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	94.83	849.63	F
103.33	229.464	849.63	F

Left Levee Station= 61.61 Elevation= 848.03

Right Levee Station= 115 Elevation= 847.1

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	847.00	Element	Left OB	Channel	Right OB
Vel Head (m)	0.41	Wt. n-Val.	0.035		
W.S. Elev (m)	846.59	Reach Len. (m)	4.00	4.00	4.00
Crit W.S. (m)	846.37	Flow Area (m2)		11.88	
E.G. Slope (m/m)	0.006323	Area (m2)		25.22	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	28.32	Top Width (m)		28.32	
Vel Total (m/s)	2.84	Avg. Vel. (m/s)		2.84	
Max Chl Dpth (m)	1.44	Hydr. Depth (m)		1.40	
Conv. Total (m3/s)	423.8	Conv. (m3/s)		423.8	
Length Wtd. (m)	4.00	Wetted Per. (m)		8.51	
Min Ch El (m)	845.15	Shear (N/m2)		86.53	
Alpha	1.00	Stream Power (N/m s)	10986.25	2949.76	5505.96
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.05	3.17	0.83
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.56	4.00	4.33

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	847.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.48	Wt. n-Val.	0.035		
W.S. Elev (m)	846.83	Reach Len. (m)	4.00	4.00	4.00
Crit W.S. (m)	846.57	Flow Area (m2)		10.97	
E.G. Slope (m/m)	0.010153	Area (m2)		10.97	
Q Total (m3/s)	33.70	Flow (m3/s)		33.70	
Top Width (m)	6.70	Top Width (m)		6.70	
Vel Total (m/s)	3.07	Avg. Vel. (m/s)		3.07	
Max Chl Dpth (m)	1.67	Hydr. Depth (m)		1.64	
Conv. Total (m3/s)	334.4	Conv. (m3/s)		334.4	
Length Wtd. (m)	4.00	Wetted Per. (m)		9.96	
Min Ch El (m)	845.16	Shear (N/m2)		109.69	
Alpha	1.00	Stream Power (N/m s)	10986.25	2949.76	5505.96
Frctn Loss (m)	0.04	Cum Volume (1000 m3)		2.36	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.53	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant

method to find critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv	Depth(m)	(m/s)	(N/m2)	(N/m s)
1	Chan	80.00	87.41	0.00	1.06	4.16	0.00	0.26	0.00	15.72	0.00
2	Chan	87.41	94.83	0.00	7.19	7.47	0.00	0.97	0.00	59.66	0.00
3	Chan	94.83	103.33	33.70	11.88	8.51	100.00	1.40	2.84	86.53	245.50
4	Chan	103.33	109.17	0.00	4.65	5.90	0.00	0.80	0.00	48.92	0.00
5	Chan	109.17	115.00	0.00	0.44	2.46	0.00	0.18	0.00	11.13	0.00

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	94.83	103.33	33.70	10.97	9.96	100.00	1.64	3.07	109.69	336.87

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant

method to find critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Jerga

REACH: Astorga RS: 150

INPUT

Description: Ctra Madrid-coruña

Distance from Upstream XS = 4

Deck/Roadway Width = 12

Weir Coefficient = 1.4

Upstream Deck/Roadway Coordinates

num= 7

Sta	Hi	Cord	Lo	Sta	Hi	Cord	Lo	Sta	Hi	Cord	Lo
0	848.51			60	849.52			94.83	849.63	848.63	
103.33	849.63	848.63		135	849.45			180	848.82		
200	848.34										

Upstream Bridge Cross Section Data

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847.514	44.711	847.668	61.61	848.027	80	847.94.957	845.15	
102.378	845.22	115	847.1	208.681	847.229.464	846.678			

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	80	.035	115	.05

Bank Sta: Left Right Coeff Contr. Expan.

Sta	Left	Right	Coeff	Contr.	Expan.
80	115		.1	.3	

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

Sta	L	Sta	R	Elev	Permanent
0	94.83	849.63		F	
103.33	229.464	849.63		F	

Left Levee Station= 61.61 Elevation= 848.03

Right Levee Station= 115 Elevation= 847.1

Downstream Deck/Roadway Coordinates

num= 7

Sta	Hi	Cord	Lo	Sta	Hi	Cord	Lo	Sta	Hi	Cord	Lo
10	848.87			50	849.52			83.8	849.63	848.63	
92.3	849.63	848.63		120	849.45			160	848.82		
200	848.34										

Downstream Bridge Cross Section Data

Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847	1.195	847.022	7.336	847.037	13.26	846.86	83.747	846
85.17	845.107	88.237	844.85	92.753	844.85	93.671	845.069	106.481	846
125.152	846	155.662	845.828	220.76	845.798	232.805	845.745	241.16	845.959

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	83.747	.035	106.481	.05

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff	Contr.	Expan.
83.747	106.481	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	83.8	849.63	F
92.3	241.16	849.63	F

Right Levee Station= 106.48 Elevation= 846

Blocked Obstructions num= 1

Sta L	Sta R	Elev
112	118	848

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 144

INPUT

Description: p3 aguas abajo N-VI

Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	847	1.195	847.022	7.336	847.037	13.26	846.86	83.747	846
85.17	845.107	88.237	844.85	92.753	844.85	93.671	845.069	106.481	846
125.152	846	155.662	845.828	220.76	845.798	232.805	845.745	241.16	845.959

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	83.747	.035	106.481	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

83.747 106.481 66.28 58.3 14.04 .1 .3
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 0 83.8 849.63 F
 92.3 241.16 849.63 F
 Right Levee Station= 106.48 Elevation= 846
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 112 118 848

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	846.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.58	Wt. n-Val.	0.035		
W.S. Elev (m)	846.18	Reach Len. (m)	66.28	58.30	14.04
Crit W.S. (m)	846.18	Flow Area (m2)	9.98		
E.G. Slope (m/m)	0.011729	Area (m2)	1.35	20.00	42.14
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	166.28	Top Width (m)	14.87	22.73	128.68
Vel Total (m/s)	3.38	Avg. Vel. (m/s)	3.38		
Max Chl Dpth (m)	1.33	Hydr. Depth (m)	1.17		
Conv. Total (m3/s)	311.2	Conv. (m3/s)	311.2		
Length Wtd. (m)	56.32	Wetted Per. (m)	8.76		
Min Ch El (m)	844.85	Shear (N/m2)	131.09		
Alpha	1.00	Stream Power (N/m s)	11546.22	0.00	5098.04
Frctn Loss (m)	0.29	Cum Volume (1000 m3)	0.04	2.79	0.63
C & E Loss (m)	0.15	Cum SA (1000 m2)	0.49	3.67	3.71

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross

depth

sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	846.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.36	Wt. n-Val.	0.035		
W.S. Elev (m)	846.50	Reach Len. (m)	66.28	58.30	14.04
Crit W.S. (m)	846.18	Flow Area (m2)	12.67		
E.G. Slope (m/m)	0.005301	Area (m2)	27.18		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	22.73	Top Width (m)	22.73		
Vel Total (m/s)	2.66	Avg. Vel. (m/s)	2.66		
Max Chl Dpth (m)	1.65	Hydr. Depth (m)	1.49		
Conv. Total (m3/s)	462.8	Conv. (m3/s)	462.8		
Length Wtd. (m)	58.30	Wetted Per. (m)	8.76		

Min Ch El (m)	844.85	Shear (N/m ²)	75.19
Alpha	1.00	Stream Power (N/m s)	11546.22 0.00 5098.04
Frctn Loss (m)	0.31	Cum Volume (1000 m ³)	2.06
C & E Loss (m)	0.01	Cum SA (1000 m ²)	1.26

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m ³ /s)	Area (m ²)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m ²)	Power (N/m s)
1	LOB	67.00	75.37	0.00	0.26	6.49	0.00	0.04	0.00	4.55	0.00
2	LOB	75.37	83.75	0.00	1.09	8.38	0.00	0.13	0.00	14.98	0.00
3	Chan	83.75	83.80	0.00	0.01	0.06	0.00	0.20	0.00	19.29	0.00
4	Chan	83.80	88.05	12.83	4.32	4.51	38.07	1.02	2.97	110.36	327.37
5	Chan	88.05	92.30	20.87	5.66	4.25	61.93	1.33	3.69	153.07	564.72
6	Chan	92.30	97.03	0.00	5.05	4.76	0.00	1.07	0.00	121.97	0.00
7	Chan	97.03	101.75	0.00	3.29	4.74	0.00	0.70	0.00	79.94	0.00
8	Chan	101.75	106.48	0.00	1.67	4.74	0.00	0.35	0.00	40.52	0.00
9	Chan	106.48	106.48	0.00	0.00	0.00	0.00	0.18	0.00	19.23	0.00
10	ROB	106.48	119.95	0.00	1.35	7.83	0.00	0.18	0.00	19.89	0.00
11	ROB	119.95	133.42	0.00	2.64	13.47	0.00	0.20	0.00	22.50	0.00
12	ROB	133.42	146.88	0.00	3.58	13.47	0.00	0.27	0.00	30.60	0.00
13	ROB	146.88	160.35	0.00	4.55	13.47	0.00	0.34	0.00	38.86	0.00
14	ROB	160.35	173.82	0.00	4.83	13.47	0.00	0.36	0.00	41.28	0.00
15	ROB	173.82	187.29	0.00	4.92	13.47	0.00	0.37	0.00	41.99	0.00
16	ROB	187.29	200.76	0.00	5.00	13.47	0.00	0.37	0.00	42.70	0.00
17	ROB	200.76	214.22	0.00	5.08	13.47	0.00	0.38	0.00	43.41	0.00
18	ROB	214.22	227.69	0.00	5.26	13.47	0.00	0.39	0.00	44.92	0.00
19	ROB	227.69	241.16	0.00	4.93	13.69	0.00	0.37	0.00	41.39	0.00

DILIGENCIA para hacer constar que la presente documentación, relativa a la revisión del P.O.O. de Asesoría, fue elaborada y firmada en sesión plenaria del Ayuntamiento de esta ciudad, de fecha 17.05.2018.

Asílega, 19 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez



Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m ³ /s)	Area (m ²)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m ²)	Power (N/m s)
1	Chan	83.75	83.80	0.00	0.03	0.56	0.00	0.51	0.00	2.40	0.00

2	Chan	83.80	88.05	13.60	5.67	4.51	40.35	1.33	2.40	65.36	156.83
3	Chan	88.05	92.30	20.10	7.00	4.25	59.65	1.65	2.87	85.60	245.85
4	Chan	92.30	97.03	0.00	6.54	4.76	0.00	1.38	0.00	71.43	0.00
5	Chan	97.03	101.75	0.00	4.79	4.74	0.00	1.01	0.00	52.51	0.00
6	Chan	101.75	106.48	0.00	3.16	5.24	0.00	0.67	0.00	31.40	0.00

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 86

INPUT

Description: p2

Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	846.757	20.075	846.518	23.286	846.163	81.693	845.956	90.217	846
92.619	846.137	95.446	846.225	107.914	845	108.531	844	113.736	844.022
114.227	845	133.289	845.681	190.19	845.733	192.611	845.759	212.64	845.898

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.619	.035	133.289	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	92.619	133.289	79.5	67	41.05	.1	.3	

Blocked Obstructions num= 1

Sta L	Sta R	Elev
.05	10	857

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	845.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	845.87	Reach Len. (m)	79.50	67.00	41.05
Crit W.S. (m)	845.53	Flow Area (m2)	25.14	10.48	
E.G. Slope (m/m)	0.002885	Area (m2)	25.14	10.48	
Q Total (m3/s)	33.70	Flow (m3/s)	30.68	3.02	
Top Width (m)	109.56	Top Width (m)	34.23	75.33	
Vel Total (m/s)	0.95	Avg. Vel. (m/s)	1.22	0.29	
Max Chl Dpth (m)	1.87	Hydr. Depth (m)	0.73	0.14	
Conv. Total (m3/s)	627.4	Conv. (m3/s)	571.1	56.3	
Length Wtd. (m)	65.66	Wetted Per. (m)	35.45	75.33	
Min Ch El (m)	844.00	Shear (N/m2)	20.07	3.94	
Alpha	1.52	Stream Power (N/m s)	10180.75	0.00	0.00
Frctn Loss (m)	0.26	Cum Volume (1000 m3)	1.48	0.26	
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.01	2.28	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	846.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.32	Wt. n-Val.	0.035		
W.S. Elev (m)	846.22	Reach Len. (m)	79.50	67.00	41.05
Crit W.S. (m)		Flow Area (m2)	13.35		
E.G. Slope (m/m)	0.005248	Area (m2)	13.35		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	6.30	Top Width (m)	6.30		
Vel Total (m/s)	2.52	Avg. Vel. (m/s)	2.52		
Max Chl Dpth (m)	2.21	Hydr. Depth (m)	2.12		
Conv. Total (m3/s)	465.2	Conv. (m3/s)	465.2		
Length Wtd. (m)	67.00	Wetted Per. (m)	9.91		
Min Ch El (m)	844.00	Shear (N/m2)	69.32		
Alpha	1.00	Stream Power (N/m s)	10180.75	0.00	0.00
Frctn Loss (m)	0.38	Cum Volume (1000 m3)	0.88		
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.41		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Profile #100 años

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	92.62	100.75	0.03	0.14	1.70	0.10	0.08	0.25	2.34	0.58
2	Chan	100.75	108.89	4.84	5.22	8.73	14.35	0.64	0.93	16.93	15.68
3	Chan	108.89	117.02	19.25	11.97	8.74	57.13	1.47	1.61	38.76	62.34
4	Chan	117.02	125.16	4.84	5.08	8.14	14.37	0.62	0.95	17.67	16.84
5	Chan	125.16	133.29	1.71	2.72	8.14	5.07	0.33	0.63	9.46	5.94
6	ROB	133.29	141.22	0.48	1.47	7.94	1.43	0.19	0.33	5.25	1.72
7	ROB	141.22	149.16	0.45	1.42	7.94	1.34	0.18	0.32	5.05	1.61
8	ROB	149.16	157.09	0.42	1.36	7.94	1.25	0.17	0.31	4.84	1.50
9	ROB	157.09	165.03	0.39	1.30	7.94	1.16	0.16	0.30	4.64	1.39
10	ROB	165.03	172.96	0.36	1.24	7.94	1.08	0.16	0.29	4.43	1.29
11	ROB	172.96	180.90	0.34	1.19	7.94	0.99	0.15	0.28	4.23	1.19
12	ROB	180.90	188.83	0.31	1.13	7.94	0.92	0.14	0.27	4.02	1.10
13	ROB	188.83	196.77	0.21	0.89	7.94	0.62	0.11	0.23	3.17	0.74
14	ROB	196.77	204.71	0.06	0.43	7.94	0.19	0.05	0.14	1.55	0.22
15	ROB	204.71	212.64	0.00	0.05	3.91	0.01	0.01	0.06	0.38	0.02

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Depth(m)	Hydr Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	100.75	108.89	2.81	1.86	2.76	8.34	1.89	1.51	34.76	52.46
2	Chan	108.89	117.02	30.89	11.49	7.15	91.66	2.16	2.69	82.65	222.25

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Jerga

REACH: Astorga RS: 18

INPUT

Description: p1

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	846	2.582	845.788	84.91	845.729	95.108	845.77
97.312	845.666	114.738	845.115	115.172	844	115.852	843.527
120.583	843.551	120.942	844	123.858	845.127	127.072	845.401
183.254	845.577	208.718	845.601	211.499	845.548	216.303	846

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	97.312	.035	127.072	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	97.312	127.072	100	100	100	.1	.3

CROSS SECTION OUTPUT Profile #100 años

E.G. Elev (m)	845.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.035	0.050	
W.S. Elev (m)	845.51	Reach Len. (m)			
Crit W.S. (m)	845.19	Flow Area (m2)	18.98	1.99	
E.G. Slope (m/m)	0.006002	Area (m2)	18.98	1.99	
Q Total (m3/s)	33.70	Flow (m3/s)	33.25	0.45	
Top Width (m)	61.40	Top Width (m)	25.75	35.65	
Vel Total (m/s)	1.61	Avg. Vel. (m/s)	1.75	0.23	
Max Chl Dpth (m)	1.99	Hydr. Depth (m)	0.74	0.06	
Conv. Total (m3/s)	435.0	Conv. (m3/s)	429.2	5.8	
Length Wtd. (m)		Wetted Per. (m)	26.97	35.65	
Min Ch El (m)	843.53	Shear (N/m2)	41.43	3.29	
Alpha	1.17	Stream Power (N/m s)	10356.13	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #VID

E.G. Elev (m)	846.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.35	Wt. n-Val.	0.035		
W.S. Elev (m)	845.81	Reach Len. (m)			
Crit W.S. (m)	845.14	Flow Area (m2)	12.88		
E.G. Slope (m/m)	0.006000	Area (m2)	12.88		
Q Total (m3/s)	33.70	Flow (m3/s)	33.70		
Top Width (m)	6.00	Top Width (m)	6.00		
Vel Total (m/s)	2.62	Avg. Vel. (m/s)	2.62		
Max Chl Dpth (m)	2.28	Hydr. Depth (m)	2.15		
Conv. Total (m3/s)	435.1	Conv. (m3/s)	435.1		
Length Wtd. (m)		Wetted Per. (m)	10.01		
Min Ch El (m)	843.53	Shear (N/m2)	75.68		
Alpha	1.00	Stream Power (N/m s)	10356.13	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Profile #100 años

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(m)	(m)	(m3/s)	(m2)	(m)	Conv Depth(m)		(m/s)	(N/m2)	(N/m s)
1	Chan	97.31	103.26	0.01	0.07	1.94	0.04	0.04	0.17	2.18	0.38
2	Chan	103.26	109.22	0.57	1.12	5.96	1.69	0.19	0.51	11.04	5.63
3	Chan	109.22	115.17	2.28	2.68	6.61	6.78	0.45	0.85	23.89	20.35

4	Chan	115.17	121.12	26.29	11.42	6.33	78.02	1.92	2.30	106.14	244.36
5	Chan	121.12	127.07	4.09	3.69	6.13	12.14	0.62	1.11	35.43	39.25
6	ROB	127.07	136.00	0.24	0.87	8.92	0.72	0.10	0.28	5.75	1.61
7	ROB	136.00	144.92	0.14	0.62	8.92	0.41	0.07	0.22	4.11	0.92
8	ROB	144.92	153.84	0.06	0.37	8.92	0.18	0.04	0.16	2.46	0.39
9	ROB	153.84	162.76	0.01	0.12	8.88	0.03	0.01	0.08	0.82	0.06

Profile #VID

	Pos	Left Sta (m)	Right Sta (m)	Flow (m3/s)	Area (m2)	W.P. (m)	Percent Conv	Hydr Depth(m)	Velocity (m/s)	Shear (N/m2)	Power (N/m s)
1	Chan	115.17	121.12	31.61	11.47	7.63	93.81	2.24	2.76	88.42	243.76
2	Chan	121.12	127.07	2.09	1.41	2.38	6.19	1.60	1.48	34.82	51.57

SUMMARY OF MANNING'S N VALUES

River:Jerga

Reach	River Sta.	n1	n2	n3
Astorga	1595	.05	.035	.05
Astorga	1512	.05	.035	.05
Astorga	1440	.05	.035	.05
Astorga	1395	.05	.035	.05
Astorga	1339	.05	.035	.05
Astorga	1276	.05	.035	.05
Astorga	1270	Bridge		
Astorga	1254	.05	.035	.05
Astorga	1215	.05	.035	.05
Astorga	1108	.05	.035	.05
Astorga	1088	.05	.035	.05
Astorga	1023	.05	.035	.05
Astorga	943	.05	.035	.05
Astorga	898	.05	.035	.05
Astorga	890	Bridge		
Astorga	888	.05	.035	.05
Astorga	848	.05	.035	.05
Astorga	786	.05	.035	.05
Astorga	713	.05	.035	.05
Astorga	638	.05	.035	.05
Astorga	563	.05	.035	.05
Astorga	526	.05	.035	.05
Astorga	520	Bridge		
Astorga	512	.05	.035	.05
Astorga	463	.05	.035	.05
Astorga	389	.05	.035	.05
Astorga	314	.05	.035	.05
Astorga	300	.05	.035	.05
Astorga	275	Bridge		
Astorga	250	.05	.035	.05
Astorga	200	.05	.035	.05
Astorga	169	.05	.035	.05
Astorga	150	Bridge		
Astorga	144	.05	.035	.05
Astorga	86	.05	.035	.05
Astorga	18	.05	.035	.05

SUMMARY OF REACH LENGTHS

River: Jerga

Reach	River Sta.	Left	Channel	Right
Astorga	1595	77.27	78.3	81.9
Astorga	1512	92.66	72.85	42.04
Astorga	1440	95.14	72.85	40.8
Astorga	1395	61.03	47.34	28.37
Astorga	1339	47.94	63.01	73.27
Astorga	1276	21.5	21.5	21.5
Astorga	1270	Bridge		
Astorga	1254	38.98	39.35	40.21
Astorga	1215	17.71	47.72	69.38
Astorga	1108	31.62	80.21	117.75
Astorga	1088	86.72	65.2	28.83
Astorga	1023	97.42	80.8	48.03
Astorga	943	47.56	44.81	37.87
Astorga	898	9.5	9.5	9.5
Astorga	890	Bridge		
Astorga	888	44.44	40.08	29.42
Astorga	848	48.68	62.54	86.13
Astorga	786	84.07	73.66	45.06
Astorga	713	75	75	75
Astorga	638	75	75	75
Astorga	563	39.35	37.53	34.15
Astorga	526	14.68	14.68	14.68
Astorga	520	Bridge		
Astorga	512	60.22	49.19	25.67
Astorga	463	71.66	73.89	78.45
Astorga	389	53.87	74.85	96.61
Astorga	314	99.53	145.33	198.5
Astorga	300	15	15	15
Astorga	275	Bridge		
Astorga	250	59	54	24
Astorga	200	99	52	12
Astorga	169	25.6	25.6	25.6
Astorga	150	Bridge		
Astorga	144	66.28	58.3	14.04
Astorga	86	79.5	67	41.05
Astorga	18	100	100	100

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Jerga

Reach	River Sta.	Contr.	Expan.
Astorga	1595	.1	.3
Astorga	1512	.1	.3
Astorga	1440	.1	.3
Astorga	1395	.1	.3
Astorga	1339	.1	.3
Astorga	1276	.1	.3
Astorga	1270	Bridge	
Astorga	1254	.1	.3
Astorga	1215	.1	.3
Astorga	1108	.1	.3

Astorga	1088	.1	.3
Astorga	1023	.1	.3
Astorga	943	.1	.3
Astorga	898	.1	.3
Astorga	890	Bridge	
Astorga	888	.1	.3
Astorga	848	.1	.3
Astorga	786	.1	.3
Astorga	713	.1	.3
Astorga	638	.1	.3
Astorga	563	.1	.3
Astorga	526	.1	.3
Astorga	520	Bridge	
Astorga	512	.1	.3
Astorga	463	.1	.3
Astorga	389	.1	.3
Astorga	314	.1	.3
Astorga	300	.1	.3
Astorga	275	Bridge	
Astorga	250	.1	.3
Astorga	200	.1	.3
Astorga	169	.1	.3
Astorga	150	Bridge	
Astorga	144	.1	.3
Astorga	86	.1	.3
Astorga	18	.1	.3

DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del P.O.O. de Astorga, fue aprobada fehaciente en sesión plenaria del Ayuntamiento de esta ciudad, de fecha 17.05.2018.

Astorga, 19 de mayo de 2018

EL SECRETARIO GENERAL



Fdo. D. Manuel Alja Rodríguez

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m/s)	E.G. Slope (m2)	Vel Chnl (m)	Flow Area	Top Width	Froude #	Chl
Astorga	1595	100 años	33.70	850.62	852.81	852.19	853.02	0.003561	2.04	16.52	11.38	0.54	
Astorga	1595	VID	33.70	850.62	853.10	852.19	853.24	0.002095	1.69	19.91	12.08	0.42	
Astorga	1512	100 años	33.70	850.38	852.57		852.75	0.003258	1.98	23.78	41.53	0.52	
Astorga	1512	VID	33.70	850.38	852.88		853.06	0.002474	1.87	18.02	10.74	0.46	
Astorga	1440	100 años	33.70	850.34	852.42	851.79	852.54	0.002314	1.55	26.73	46.30	0.44	
Astorga	1440	VID	33.70	850.34	852.77	851.76	852.90	0.001689	1.58	21.34	10.50	0.35	
Astorga	1395	100 años	33.70	850.12	852.38	851.60	852.42	0.000886	0.92	40.92	59.72	0.27	
Astorga	1395	VID	33.70	850.12	852.72	851.56	852.79	0.000899	1.17	28.77	14.50	0.27	
Astorga	1339	100 años	33.70	850.20	852.28	851.66	852.36	0.001673	1.25	31.92	67.43	0.37	
Astorga	1339	VID	33.70	850.20	852.48	851.66	852.71	0.003319	2.10	16.06	7.80	0.47	
Astorga	1276	100 años	33.70	850.00	851.80	851.51	852.14	0.006789	2.61	12.90	12.17	0.72	
Astorga	1276	VID	33.70	850.00	851.86	851.53	852.35	0.009617	3.09	10.89	6.00	0.73	
Astorga	1270	Bridge											
Astorga	1254	100 años	33.70	849.03	851.00	850.39	851.22	0.003549	2.09	16.11	10.11	0.53	
Astorga	1254	VID	33.70	849.03	851.29	850.38	851.47	0.002604	1.90	17.73	8.50	0.42	
Astorga	1215	100 años	33.70	848.71	850.89	850.25	851.07	0.003398	1.87	17.99	13.80	0.52	
Astorga	1215	VID	33.70	848.71	851.16	850.19	851.37	0.002785	2.00	16.85	7.50	0.43	
Astorga	1108	100 años	33.70	848.62	850.75	850.07	850.91	0.003140	1.73	19.51	16.40	0.51	
Astorga	1108	VID	33.70	848.62	851.06	850.03	851.24	0.002358	1.87	18.02	8.00	0.40	
Astorga	1088	100 años	33.70	848.40	850.19	849.91	850.52	0.007126	2.58	13.08	10.87	0.75	
Astorga	1088	VID	33.70	848.40	850.51	849.98	850.91	0.006996	2.79	12.07	6.00	0.63	
Astorga	1023	100 años	33.70	847.91	849.97	849.35	850.16	0.003606	1.92	17.52	13.56	0.54	
Astorga	1023	VID	33.70	847.91	850.27	849.39	850.53	0.004034	2.28	14.76	6.50	0.48	
Astorga	943	100 años	33.70	847.51	849.67		849.86	0.003704	1.93	17.47	13.68	0.54	
Astorga	943	VID	33.70	847.51	849.98		850.22	0.003545	2.16	15.60	6.75	0.45	

DILIGENTE en hacer constar que la presente documentacion fue revisada por el Ing. D. Manuel Ajila Rodriguez, Secretario General del Ayuntamiento de Astorga, el 18 de mayo de 2018.

Astorga	898	100 años	33.70	847.29	849.15	848.95	849.59	0.009239	2.95	11.44	10.41	0.83
Astorga	898	VID	33.70	847.29	849.29	849.03	849.91	0.012434	3.49	9.67	5.00	0.80
Astorga	890	Bridge										
Astorga	888	100 años	33.70	847.22	848.57	848.74	849.35	0.020751	3.92	8.59	10.09	1.28
Astorga	888	VID	33.70	847.22	849.00	848.96	849.70	0.016201	3.70	9.12	6.00	0.96
Astorga	848	100 años	33.70	846.85	849.00	848.02	849.11	0.001408	1.44	23.43	13.58	0.35
Astorga	848	VID	33.70	846.85	849.33	848.02	849.42	0.000917	1.27	26.63	11.85	0.27
Astorga	786	100 años	33.70	846.85	848.87	848.05	849.00	0.002002	1.61	20.89	13.35	0.41
Astorga	786	VID	33.70	846.85	849.14	848.11	849.32	0.002569	1.87	18.05	8.00	0.40
Astorga	713	100 años	33.70	846.50	848.76	847.77	848.83	0.002122	1.16	29.13	33.85	0.40
Astorga	713	VID	33.70	846.50	848.98	847.81	849.14	0.002153	1.76	19.16	8.00	0.36
Astorga	638	100 años	33.70	846.46	848.11	847.92	848.51	0.008344	2.84	12.44	20.87	0.80
Astorga	638	VID	33.70	846.46	848.43	848.84	0.007632	2.81	11.99	6.75	0.67	
Astorga	563	100 años	33.70	846.58	848.28	847.58	848.30	0.000502	0.64	77.58	166.92	0.20
Astorga	563	VID	33.70	846.58	848.66	847.58	848.67	0.000219	0.52	72.60	61.00	0.14
Astorga	526	100 años	33.70	846.50	848.24	847.96	848.27	0.001094	1.09	65.53	160.42	0.30
Astorga	526	VID	33.70	846.50	848.48	847.96	848.64	0.002458	1.83	22.13	22.10	0.47
Astorga	520	Bridge										
Astorga	512	100 años	33.70	846.49	847.69	847.45	847.96	0.005929	2.30	14.65	72.14	0.69
Astorga	512	VID	33.70	846.49	848.16	847.64	848.40	0.004090	2.17	15.56	10.00	0.55
Astorga	463	100 años	33.70	846.00	847.80	847.82	0.000630	0.74	87.19	171.40	0.23	
Astorga	463	VID	33.70	846.00	848.19	848.25	0.001145	1.22	32.58	27.00	0.32	
Astorga	389	100 años	33.70	845.90	847.77	847.78	0.000311	0.63	115.18	198.31	0.17	
Astorga	389	VID	33.70	845.90	848.11	848.18	0.000897	1.23	35.05	25.00	0.29	
Astorga	314	100 años	33.70	845.48	847.73	846.80	847.75	0.000420	0.76	79.79	151.64	0.20
Astorga	314	VID	33.70	845.48	848.01	846.78	848.10	0.001086	1.32	25.54	11.75	0.29
Astorga	300	100 años	33.70	845.30	847.17	847.00	847.56	0.007428	2.76	12.23	35.26	0.80
Astorga	300	VID	33.70	845.30	847.27	847.03	847.71	0.009151	2.97	11.35	7.50	0.77

DILIGENCIA para habilitar que la presente documenta
 para la revisión y aprobación de la presente
 Revisión al PSOU de Astorga, fue aprobada por la
 Comisión de Planeación y Desarrollo Urbano
 del Ayuntamiento de Astorga, el día 17 de mayo de 2018.

Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Ajlla Rodríguez



Astorga	275	Bridge										
Astorga	250	100 años	33.70	845.28	847.08	846.68	847.36	0.004525	2.37	14.23	138.48	0.63
Astorga	250	VID	33.70	845.28	847.36	846.67	847.56	0.002625	1.99	16.97	10.10	0.48
Astorga	200	100 años	33.70	845.15	847.10	846.54	847.18	0.001498	1.52	31.11	164.56	0.37
Astorga	200	VID	33.70	845.15	847.40	846.54	847.45	0.000763	1.20	38.65	39.61	0.27
Astorga	169	100 años	33.70	845.15	846.59	846.37	847.00	0.006323	2.84	11.88	28.32	0.77
Astorga	169	VID	33.70	845.16	846.83	846.57	847.31	0.010153	3.07	10.97	6.70	0.77
Astorga	150	Bridge										
Astorga	144	100 años	33.70	844.85	846.18	846.18	846.76	0.011729	3.38	9.98	166.28	0.99
Astorga	144	VID	33.70	844.85	846.50	846.18	846.86	0.005301	2.66	12.67	22.73	0.70
Astorga	86	100 años	33.70	844.00	845.87	845.53	845.94	0.002885	1.22	35.61	109.56	0.45
Astorga	86	VID	33.70	844.00	846.22	846.54	0.005248	2.52	13.35	6.30	0.55	
Astorga	18	100 años	33.70	843.53	845.51	845.19	845.67	0.006002	1.75	20.98	61.40	0.65
Astorga	18	VID	33.70	843.53	845.81	845.14	846.16	0.006000	2.62	12.88	6.00	0.57

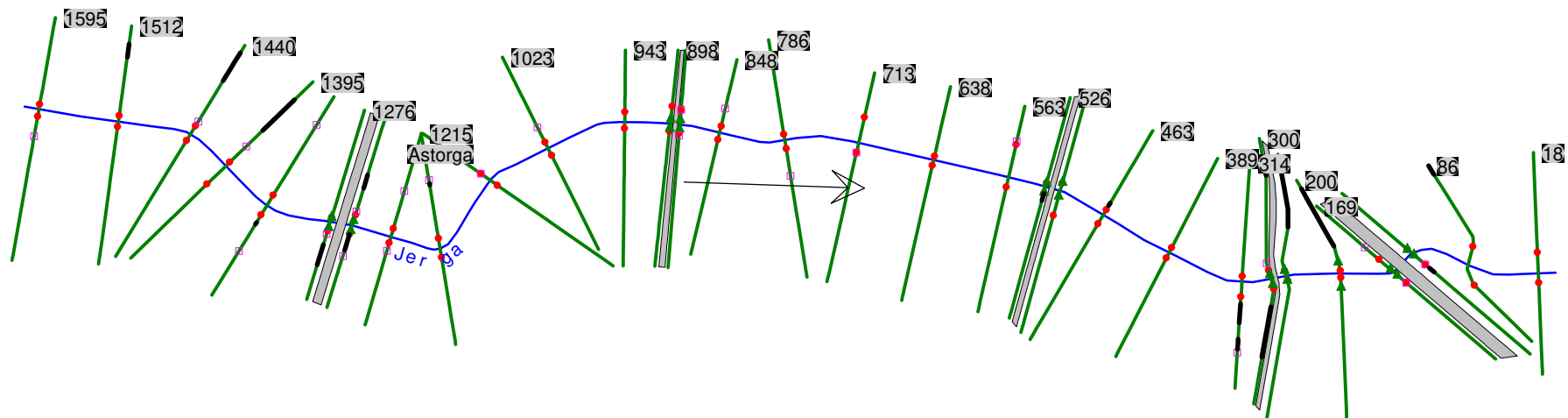
DILIGENCIA para hacer constar que la presente documentación se remite a la Revisión del PISO de Astorga, fue aprobada por el Ayuntamiento de Astorga el 18 de mayo de 2018.

Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez





DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PGOU de Astorga, fue aprobada inicialmente en sesión plenaria del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.



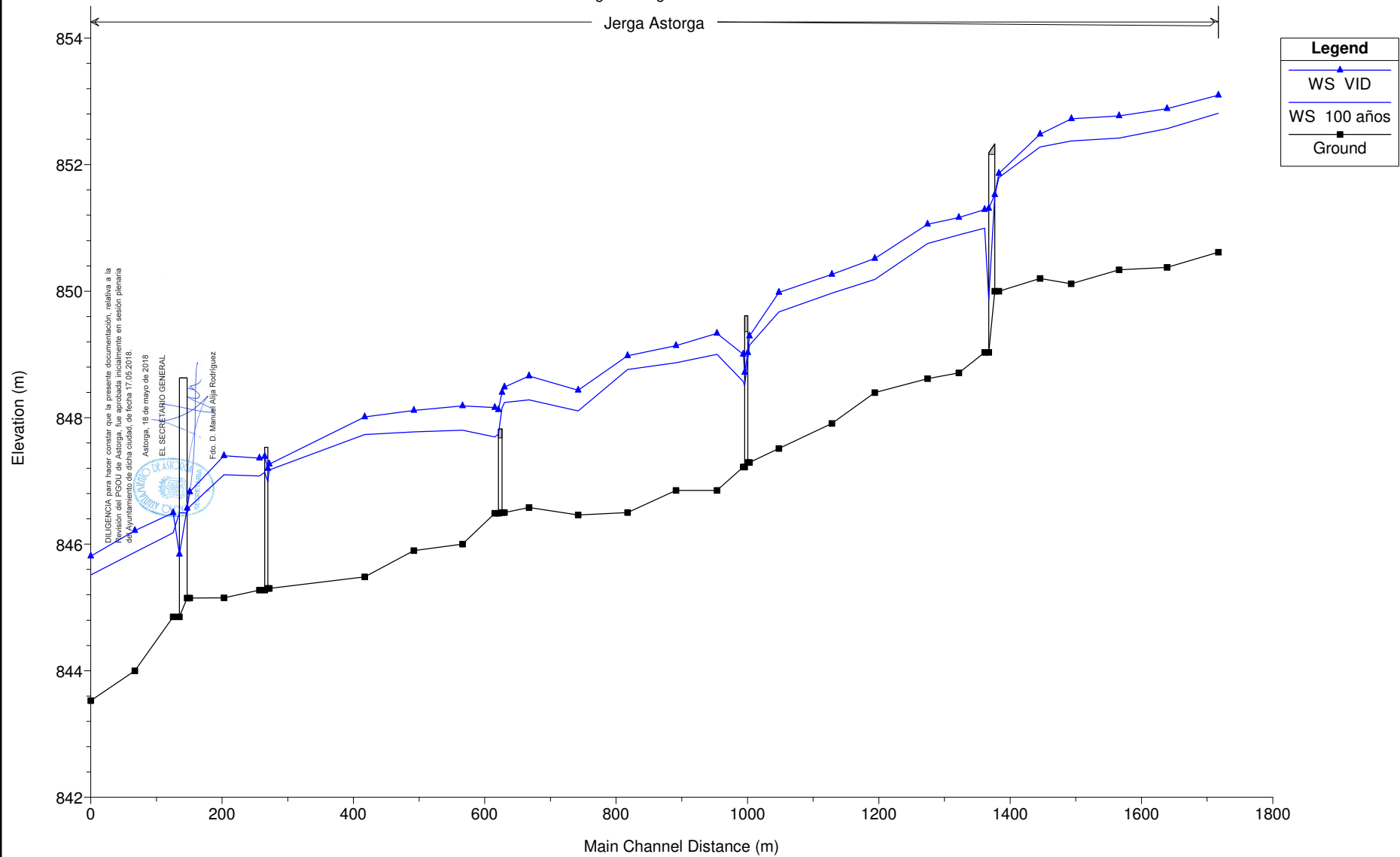
Astorga, 18 de mayo de 2018

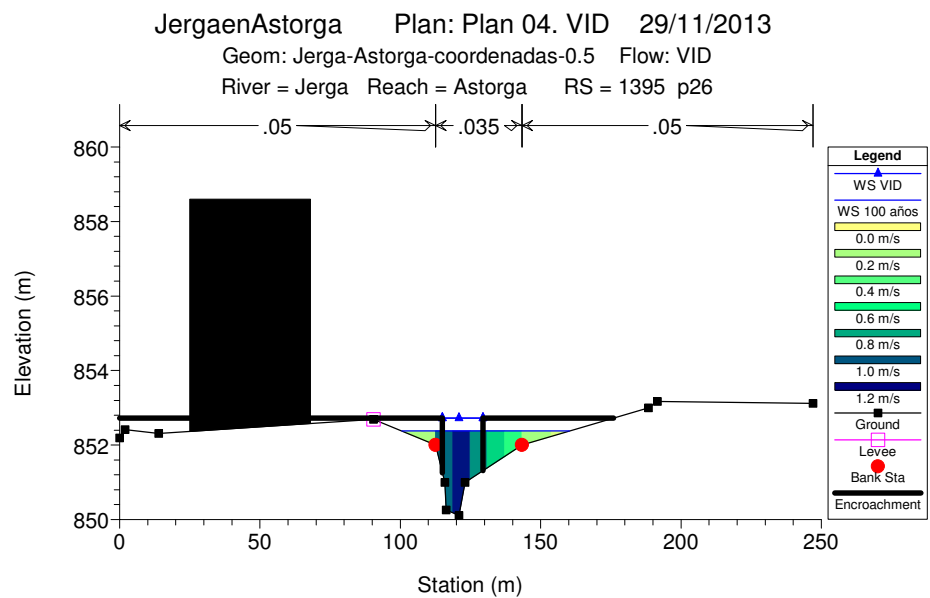
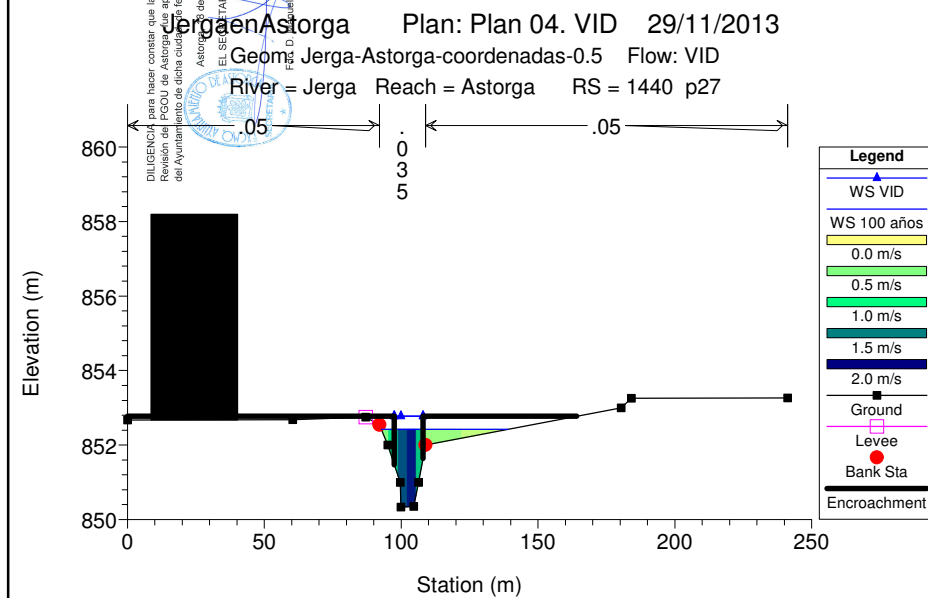
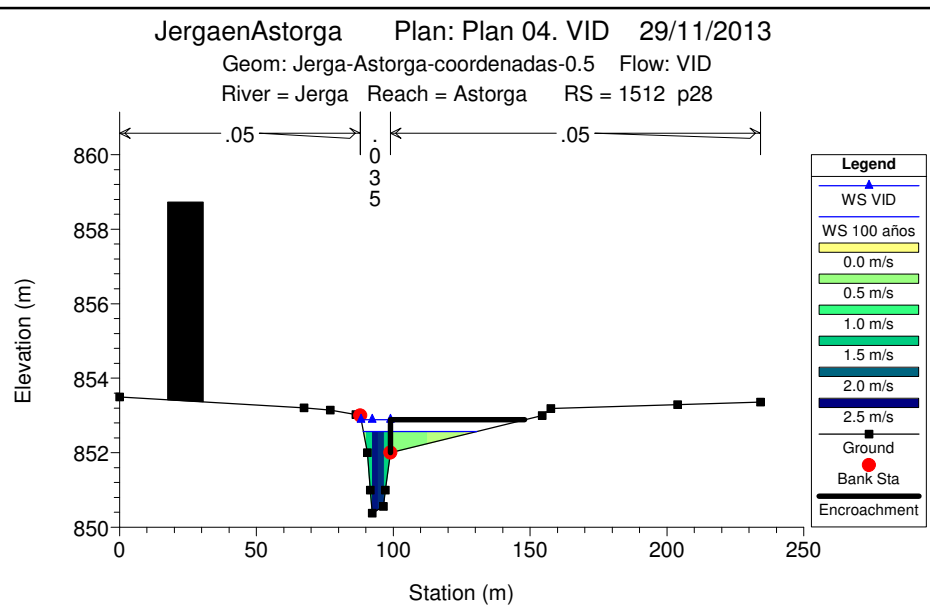
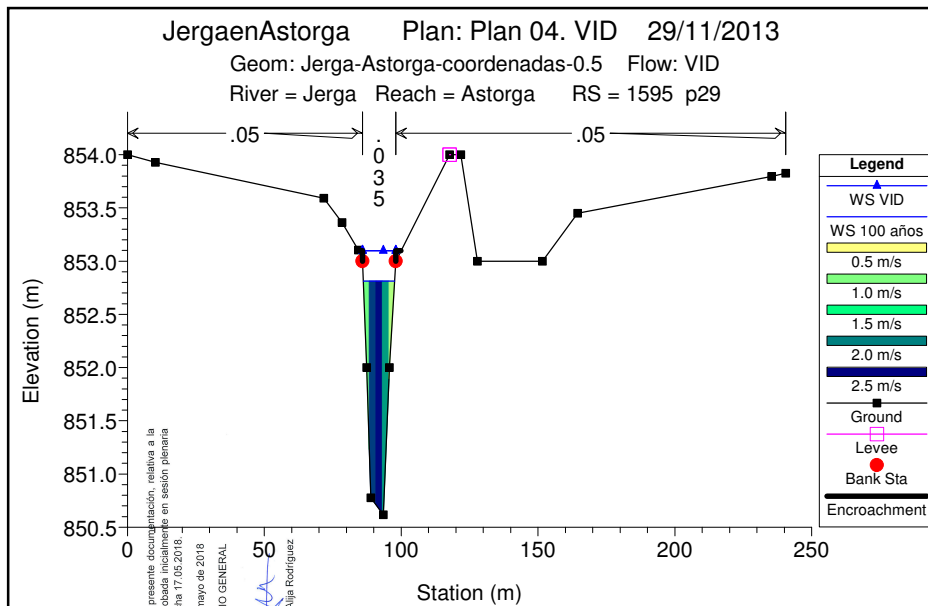
EL SECRETARIO GENERAL

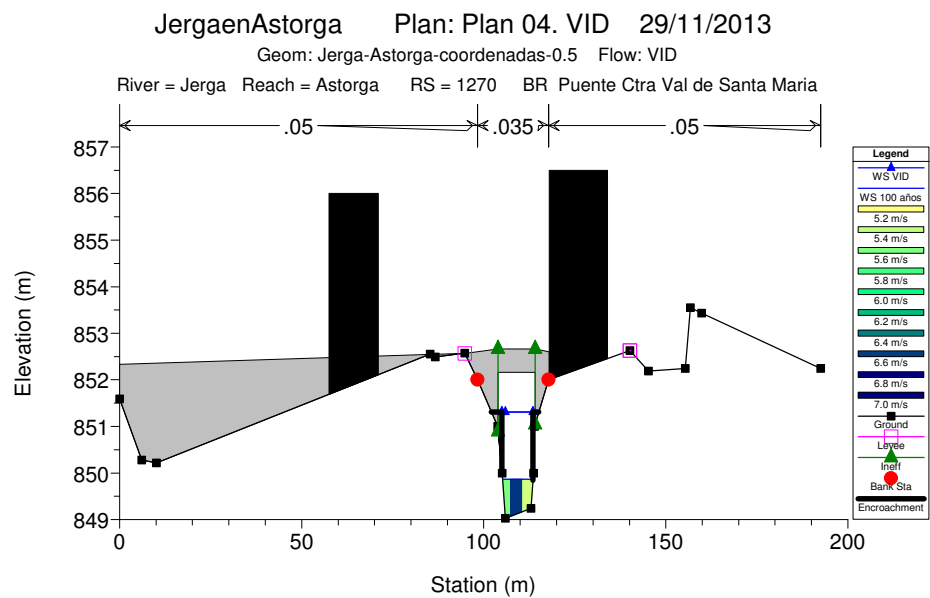
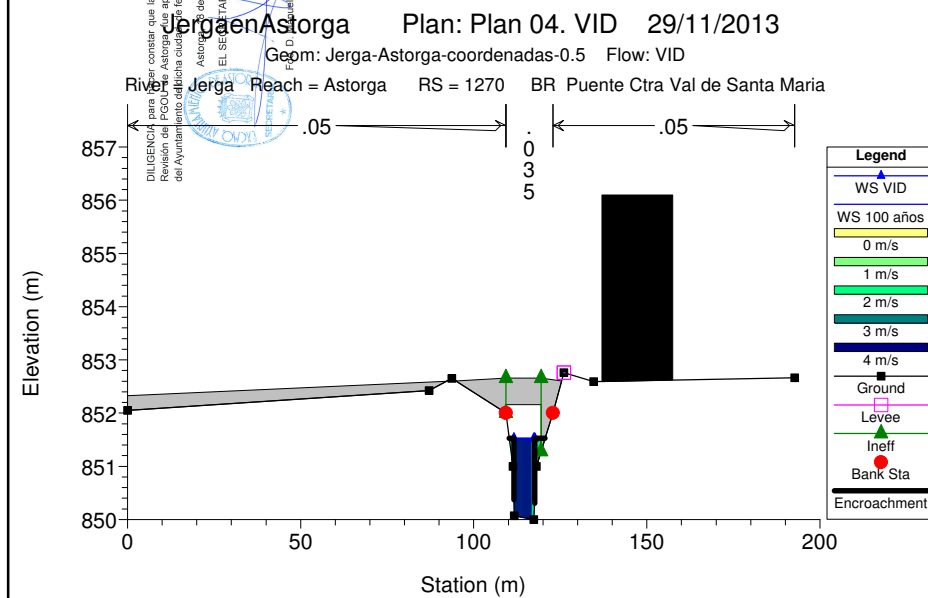
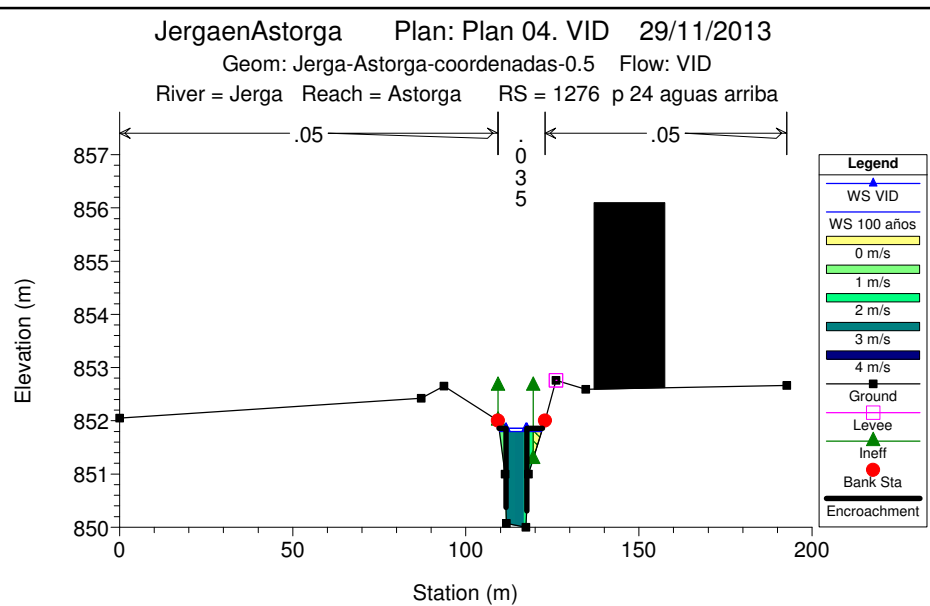
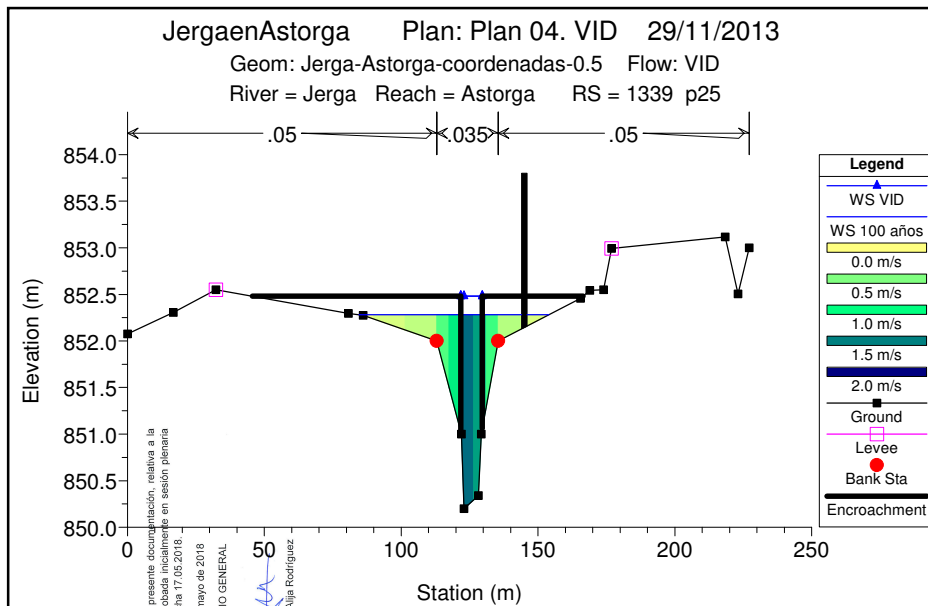
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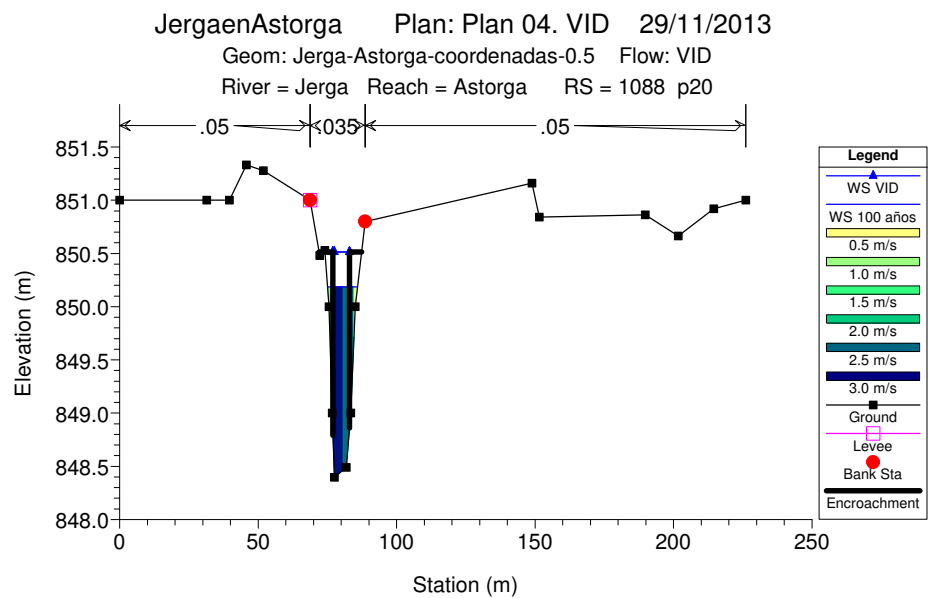
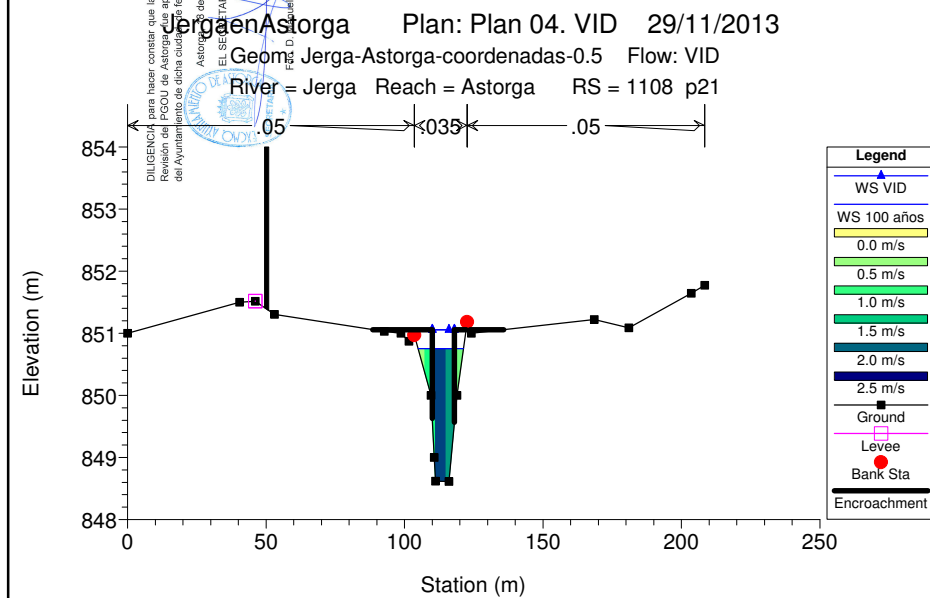
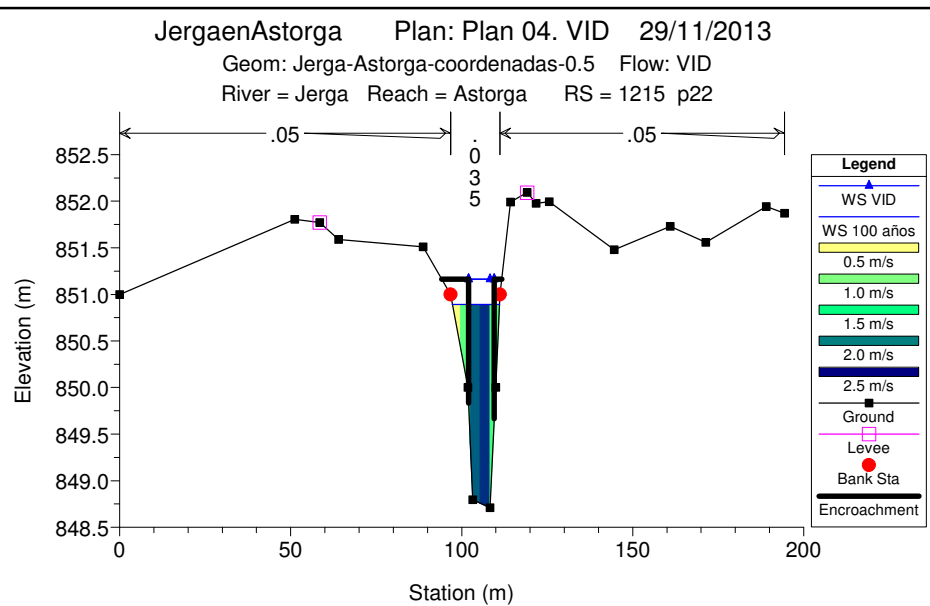
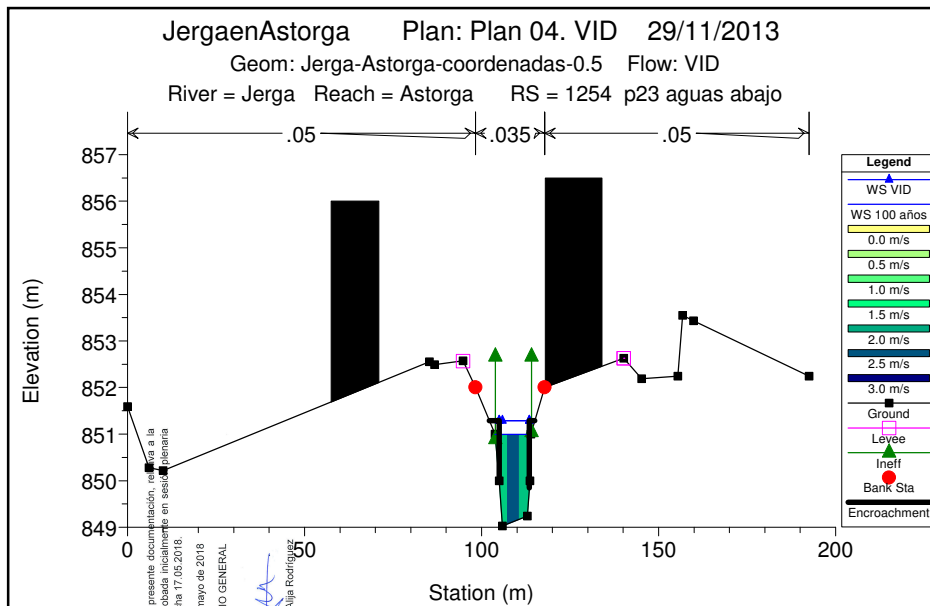
JergaenAstorga Plan: Plan 04. VID 29/11/2013

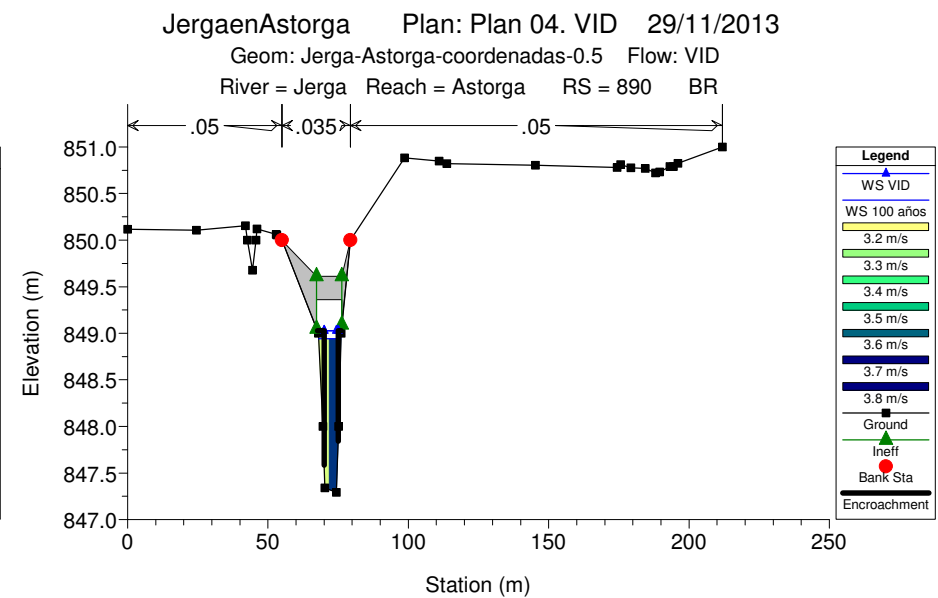
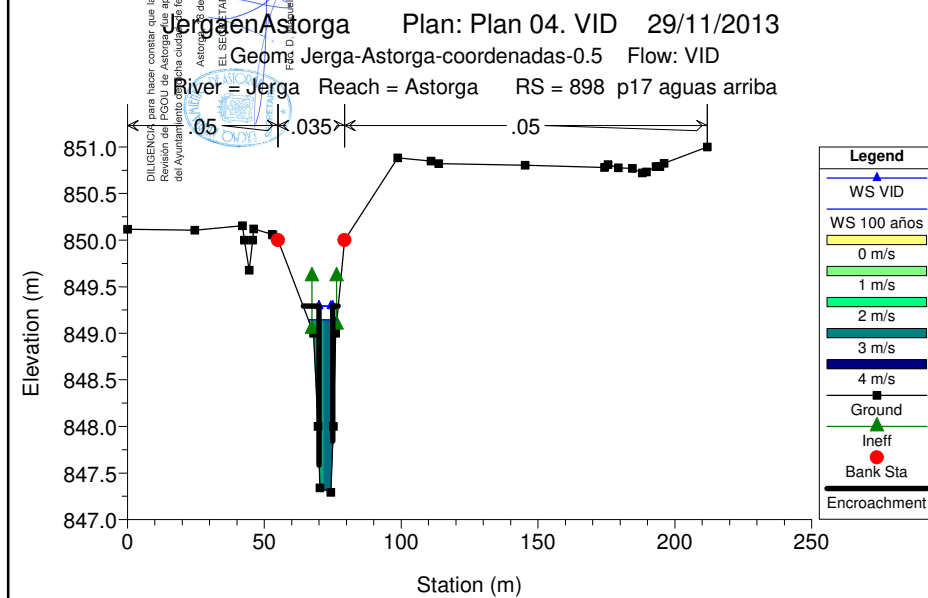
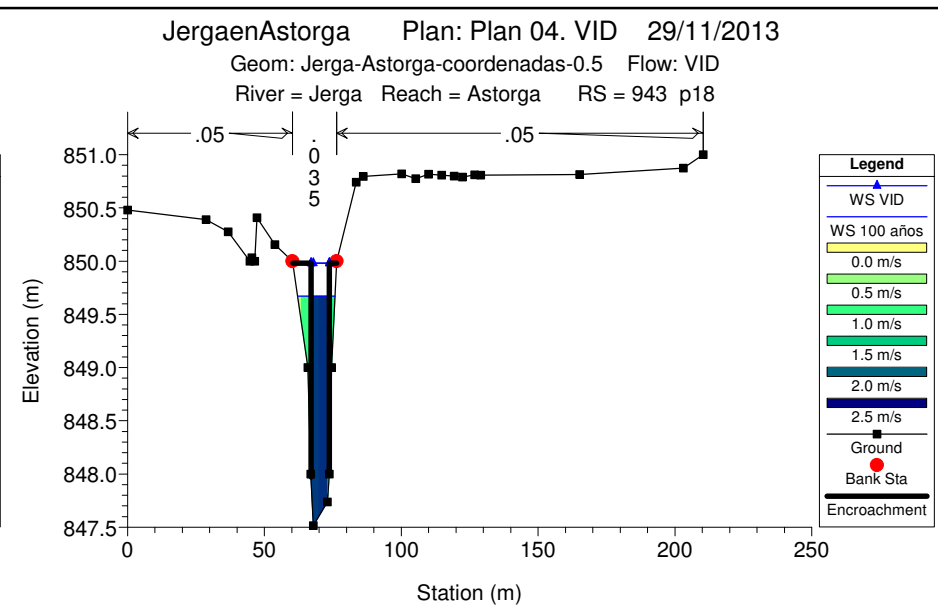
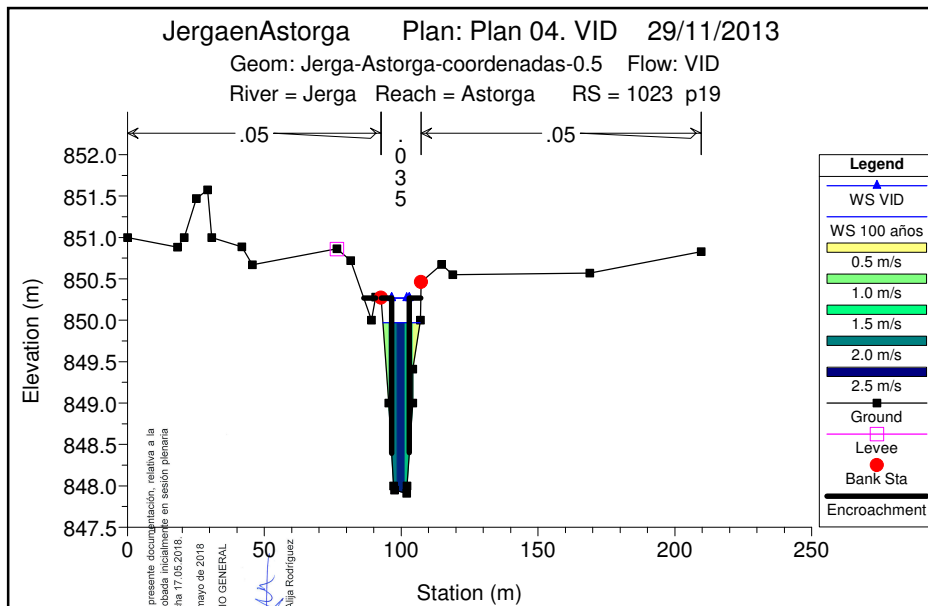
Geom: Jerga-Astorga-coordenadas-0.5 Flow: VID

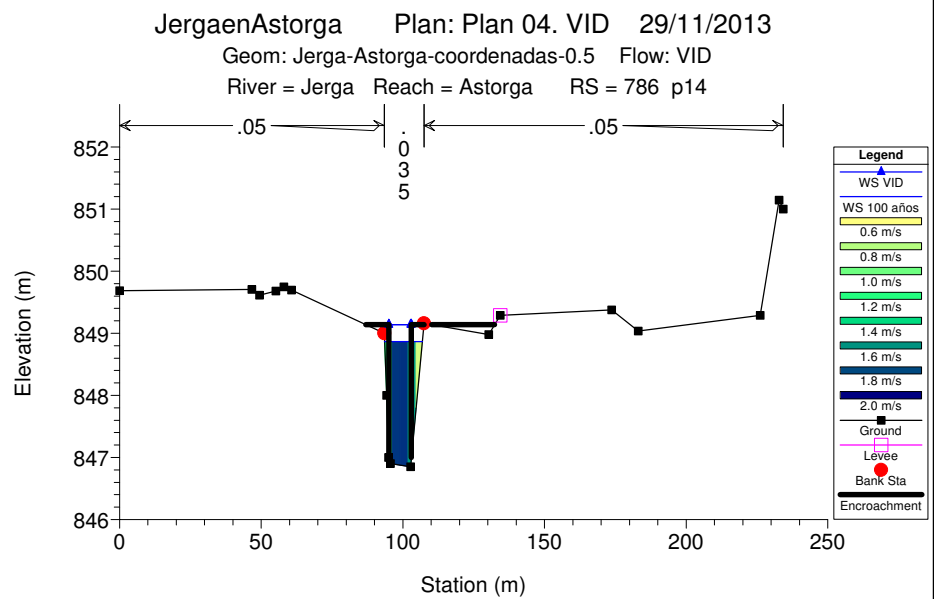
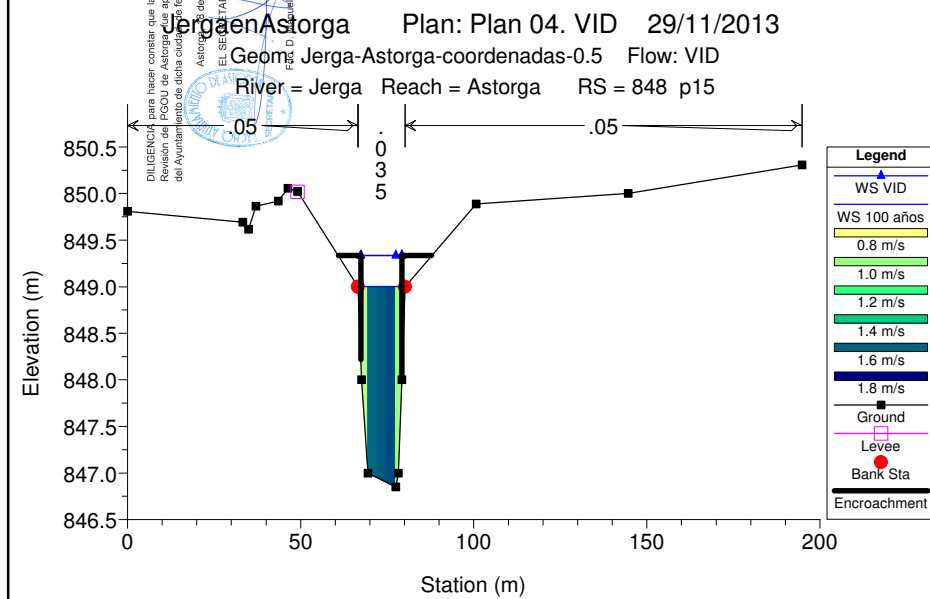
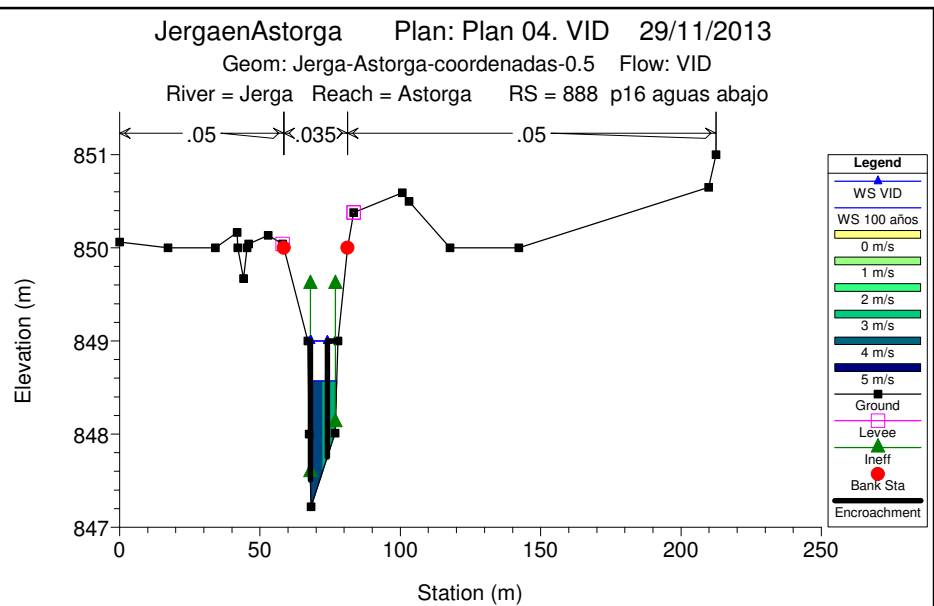
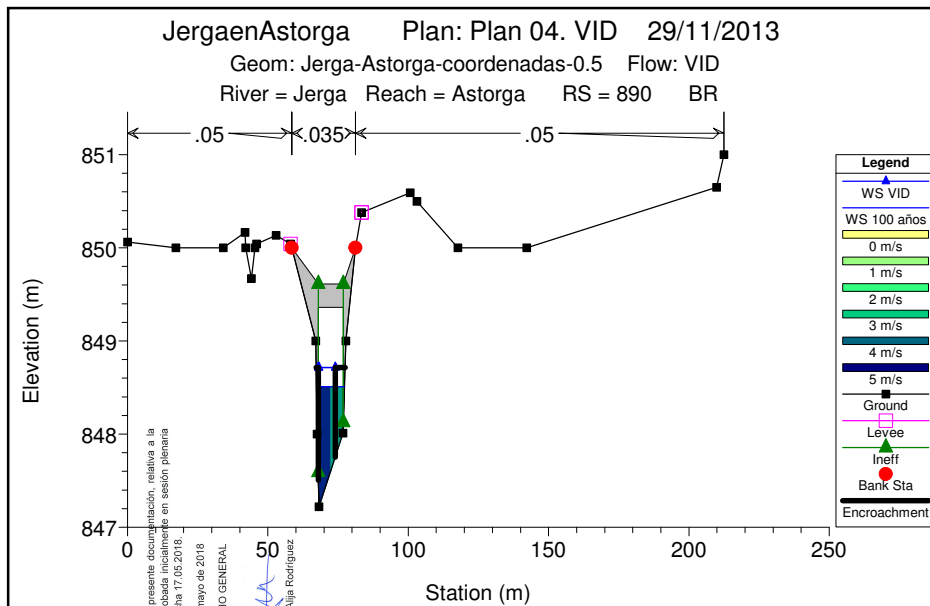


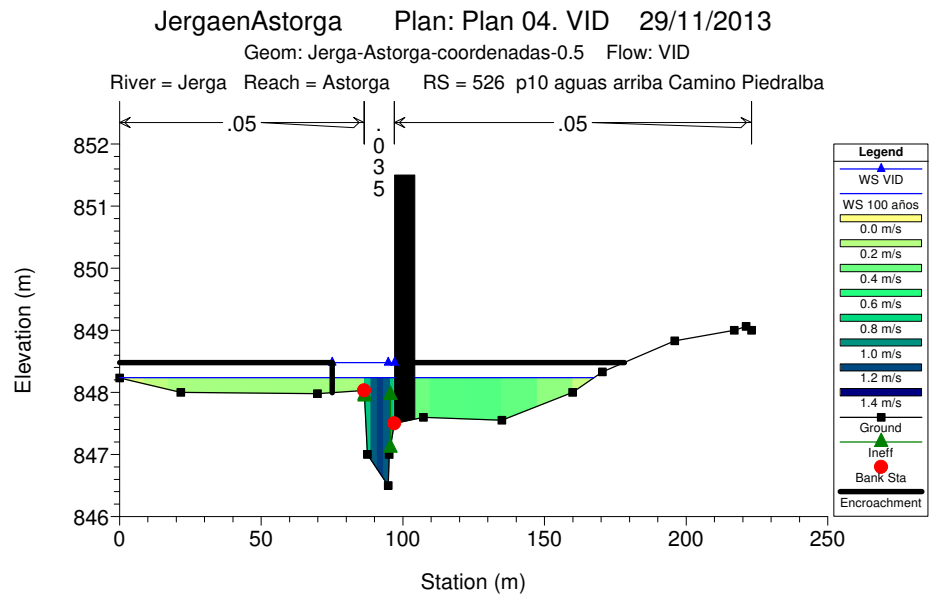
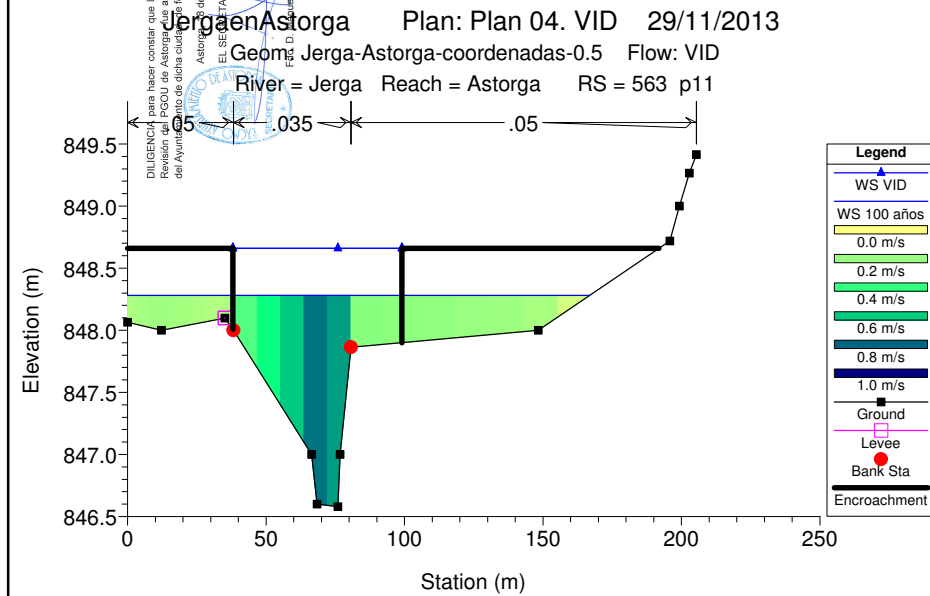
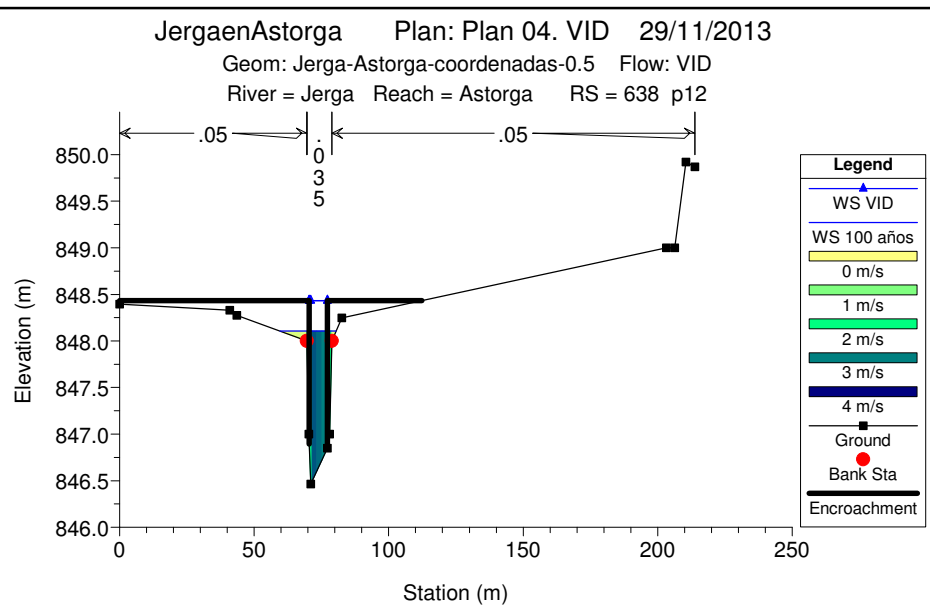
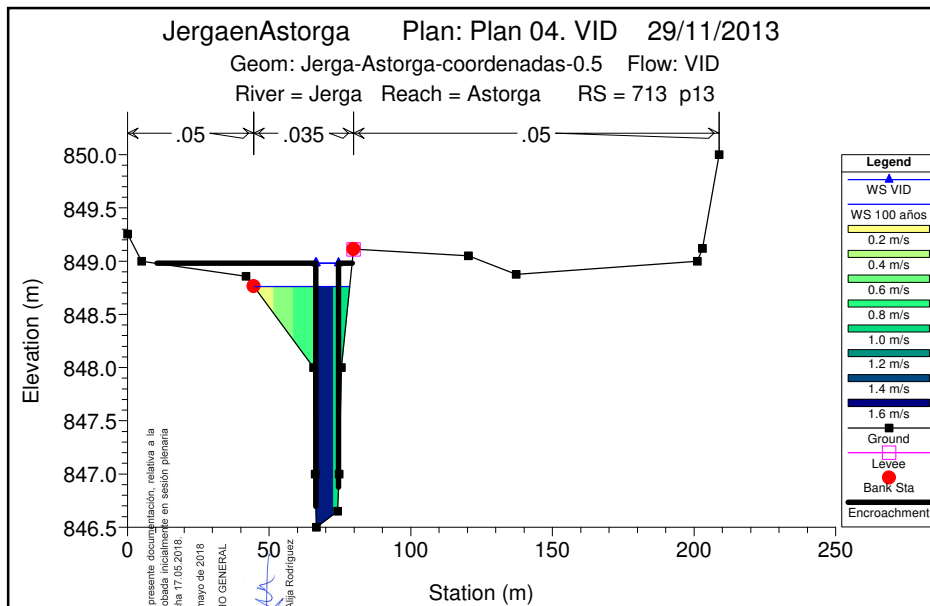


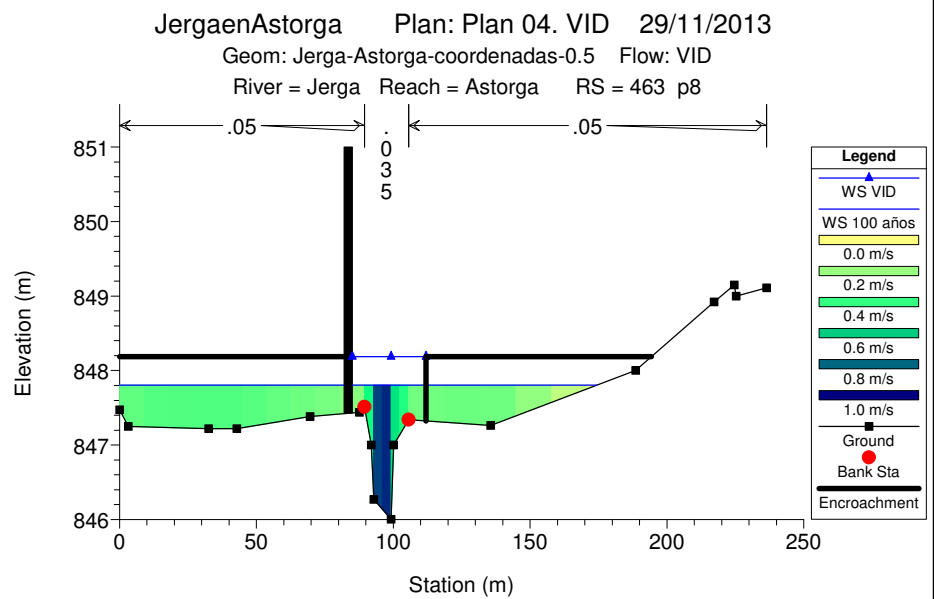
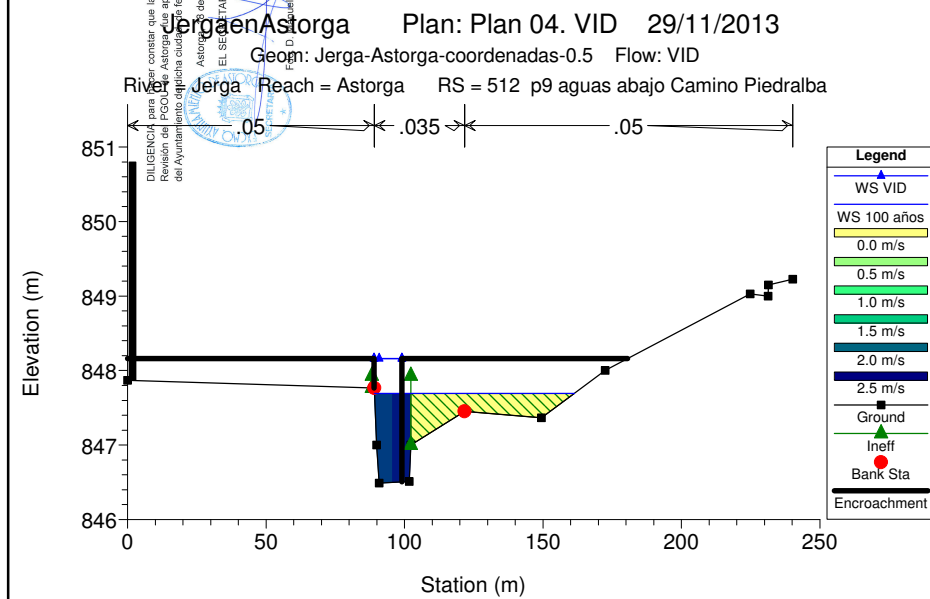
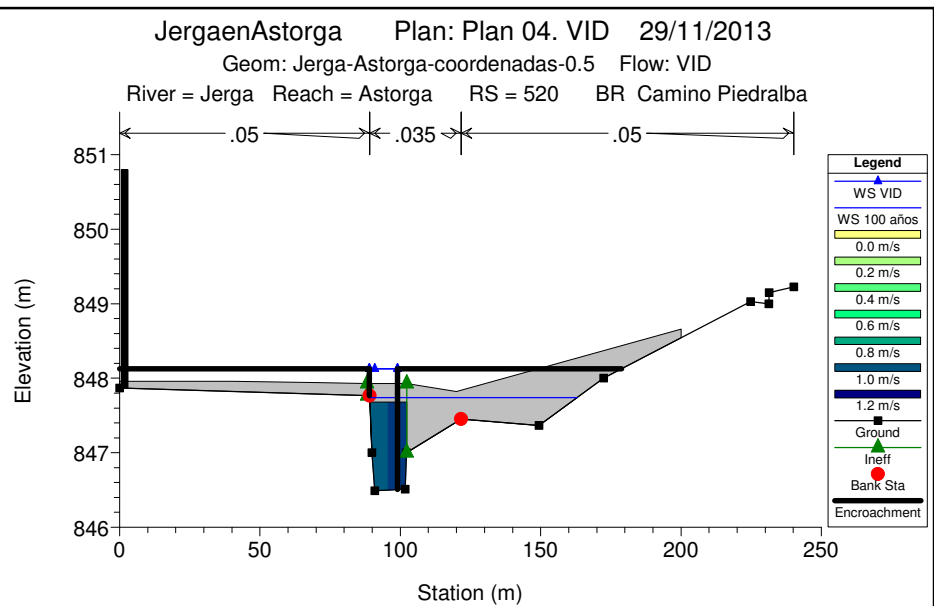
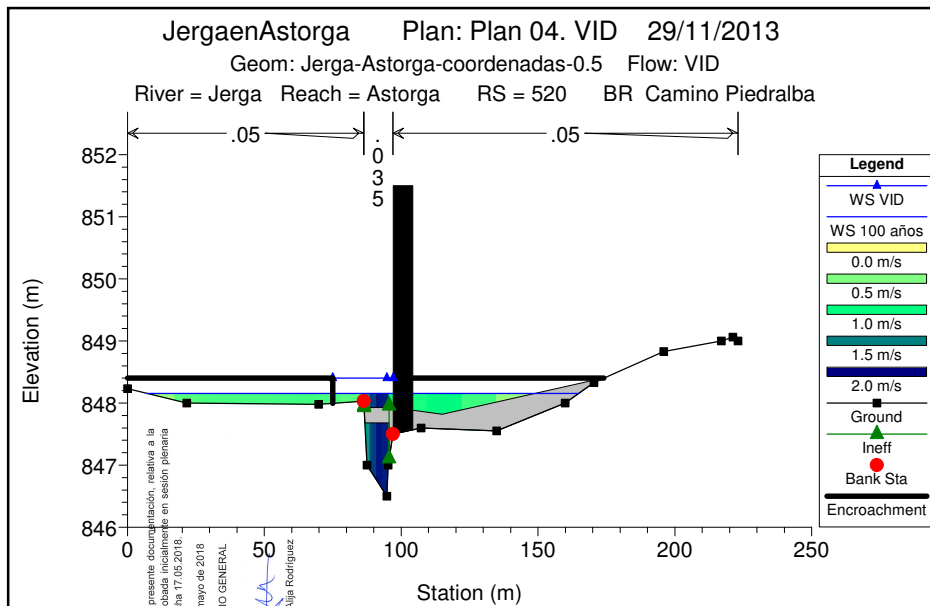


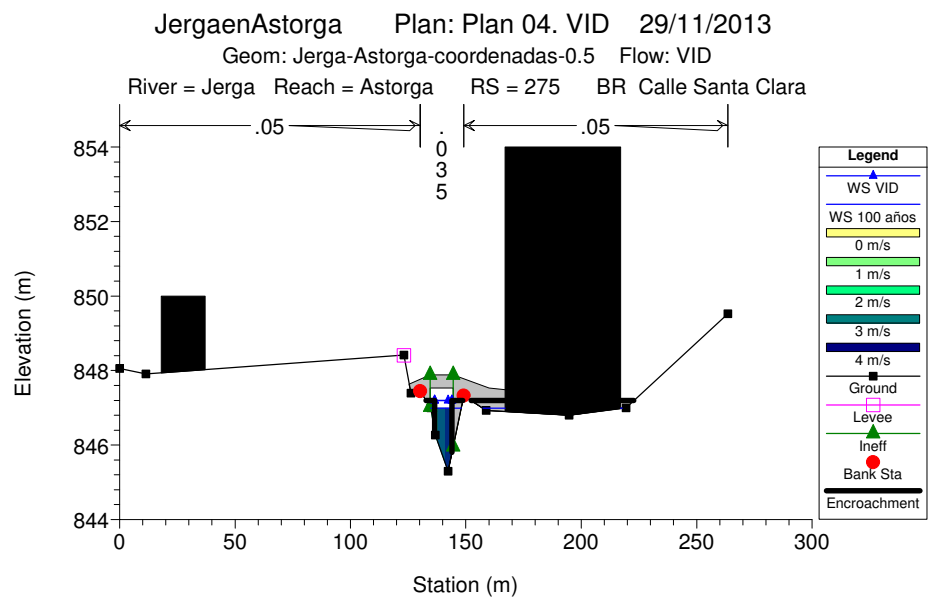
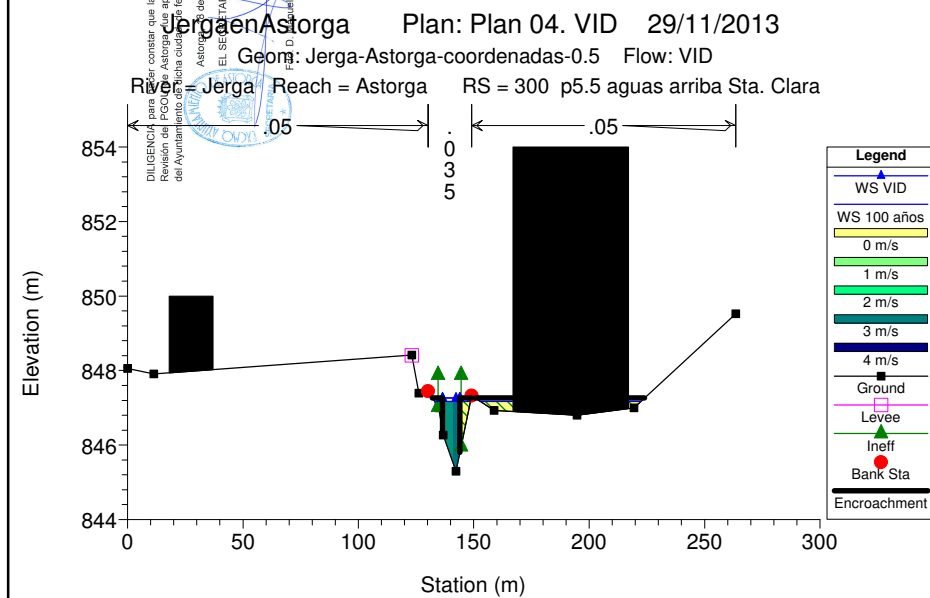
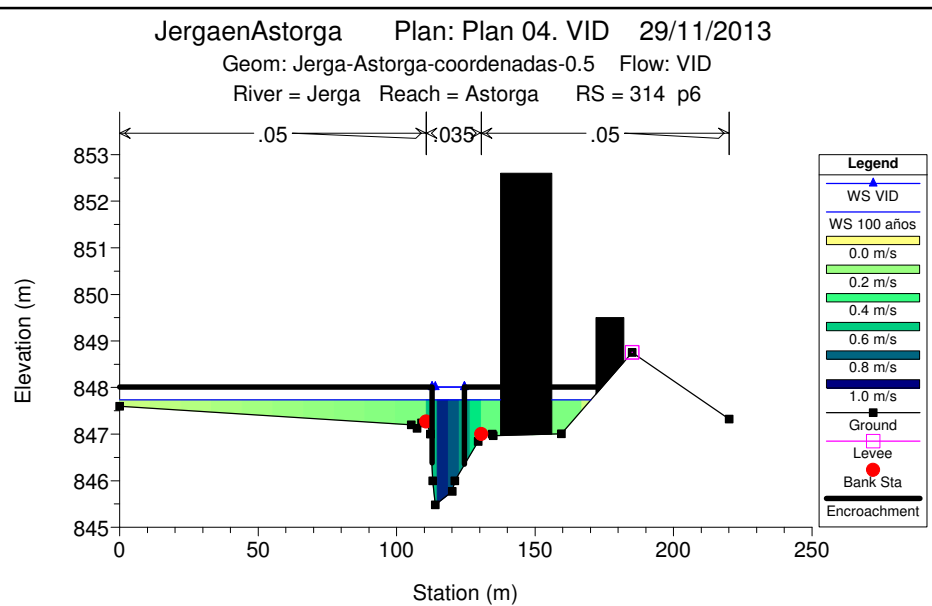
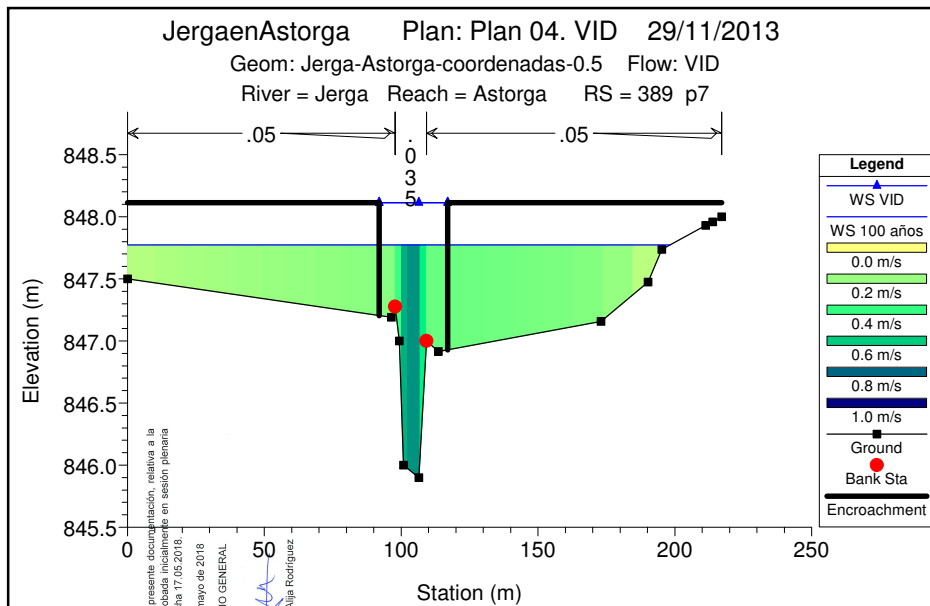


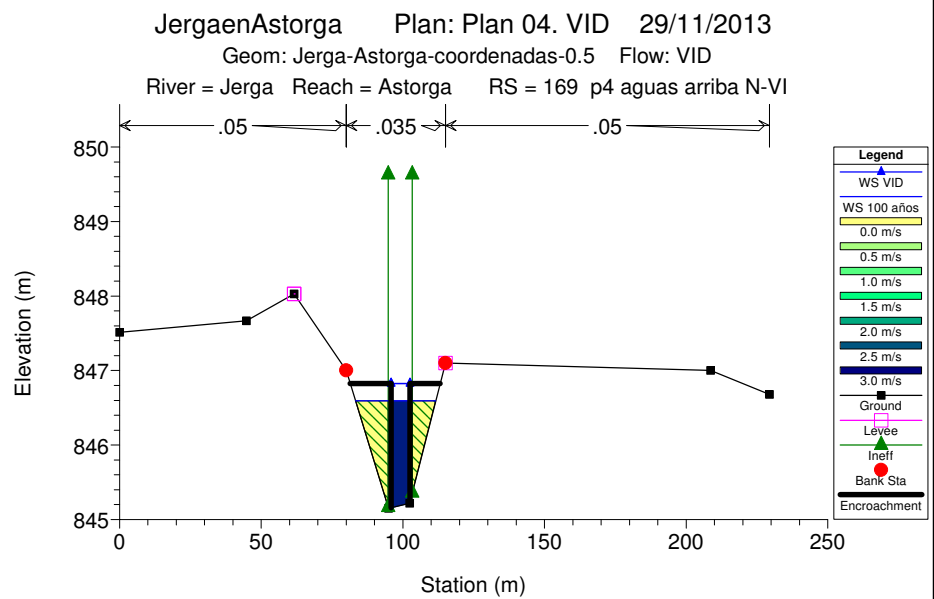
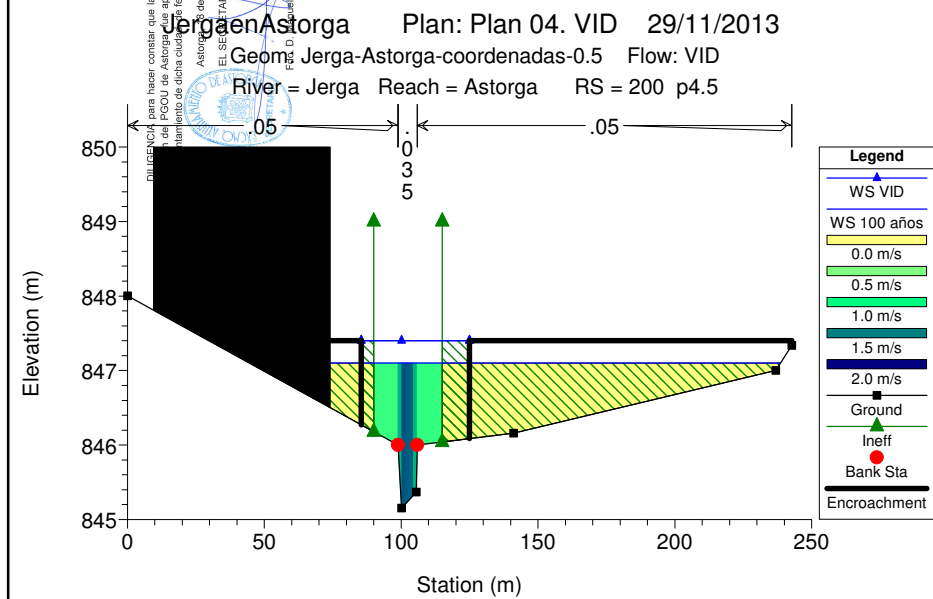
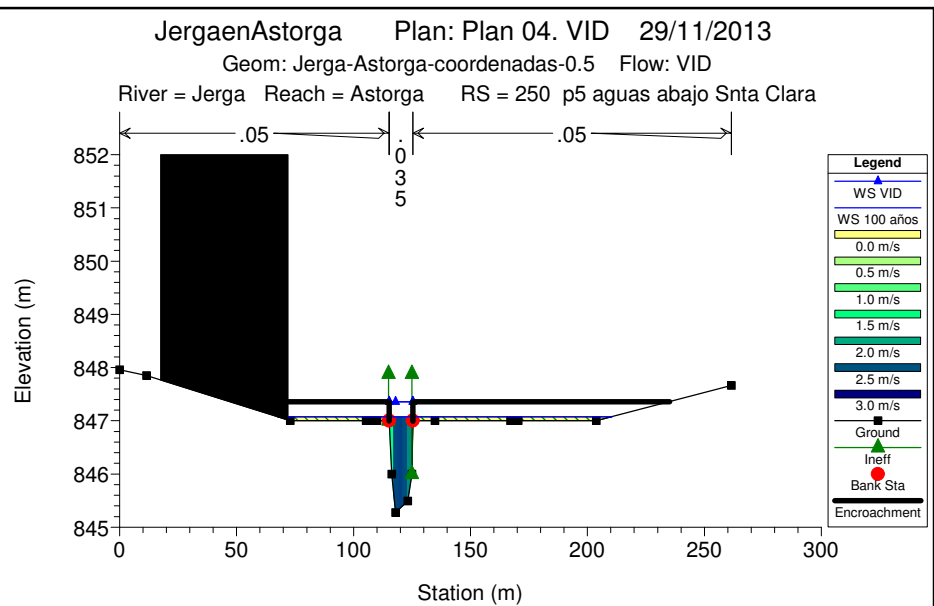
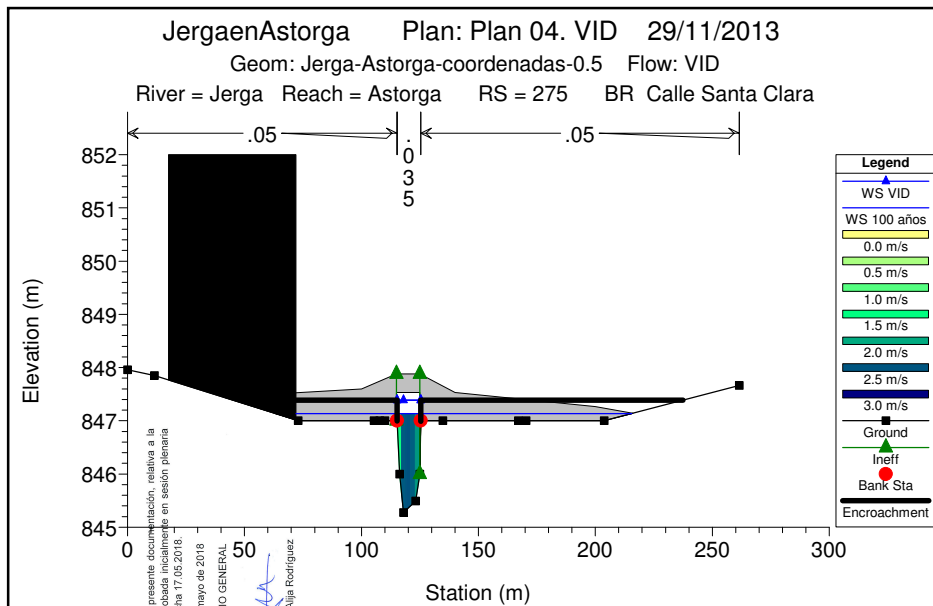


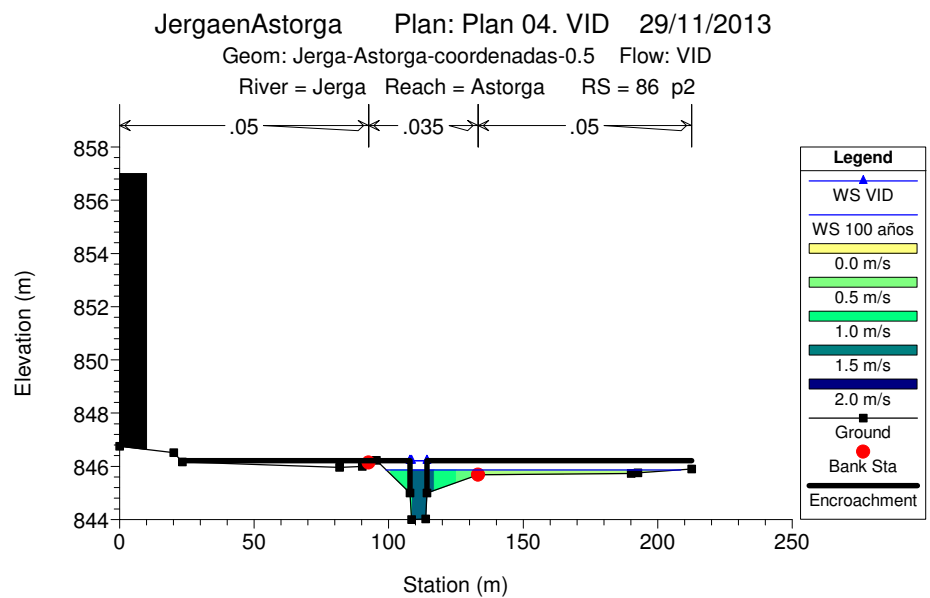
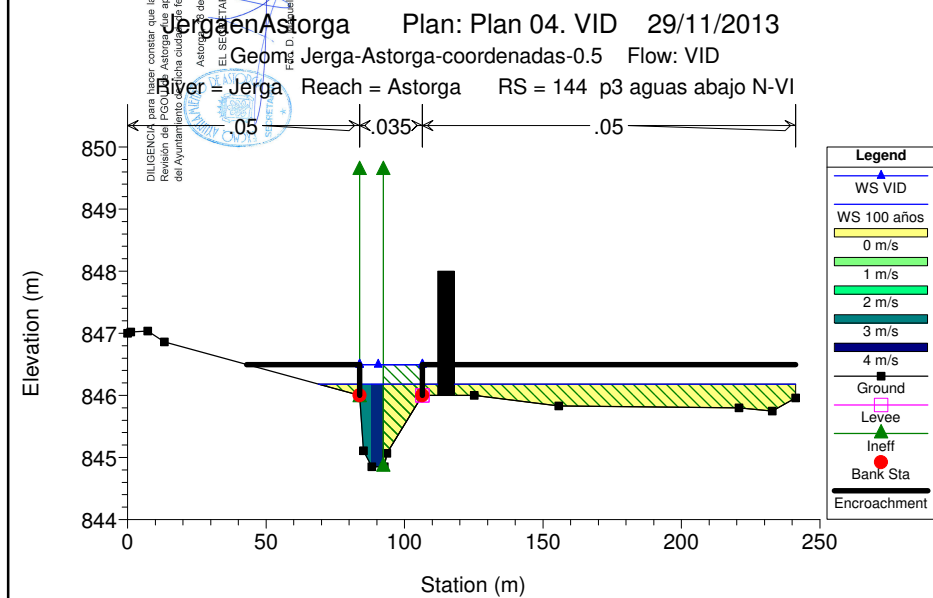
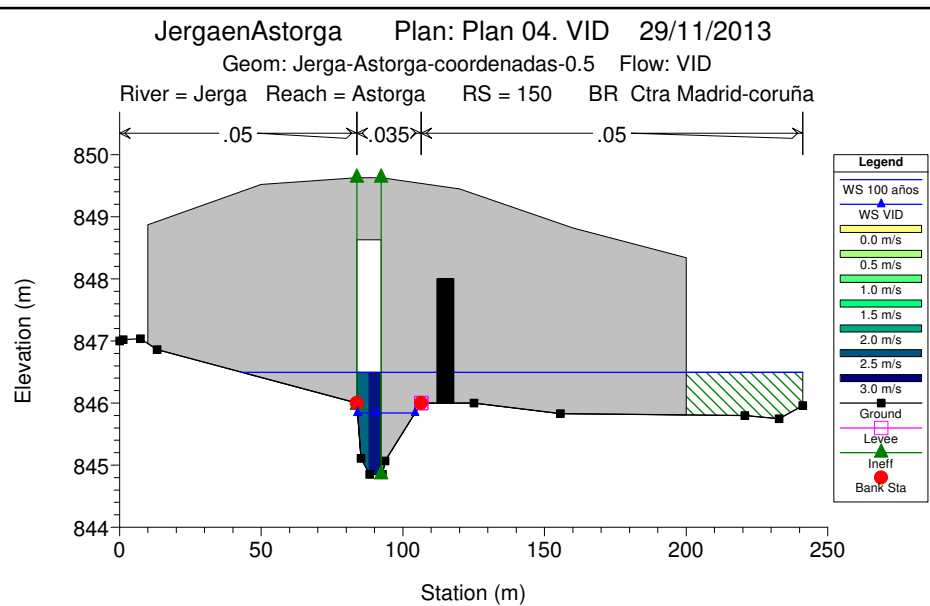
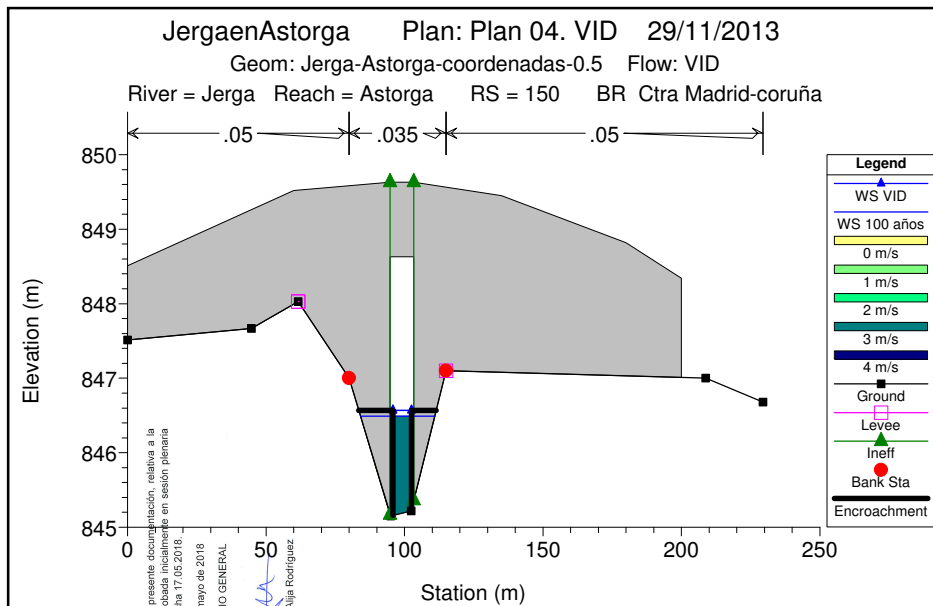








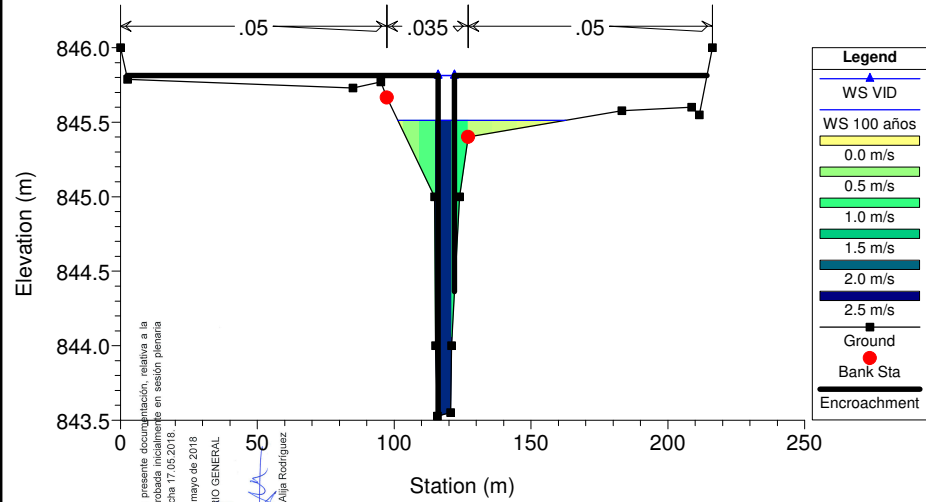




JergaenAstorga Plan: Plan 04. VID 29/11/2013

Geom: Jerga-Astorga-coordenadas-0.5 Flow: VID

River = Jerga Reach = Astorga RS = 18 p1



DILIGENCIA para hacer constar que la presente documentación, relativa a la Revisión del PISO de Astorga, fue aprobada inicialmente en sesión plenaria del Ayuntamiento de dicha ciudad, de fecha 17.05.2018.

Astorga, 18 de mayo de 2018

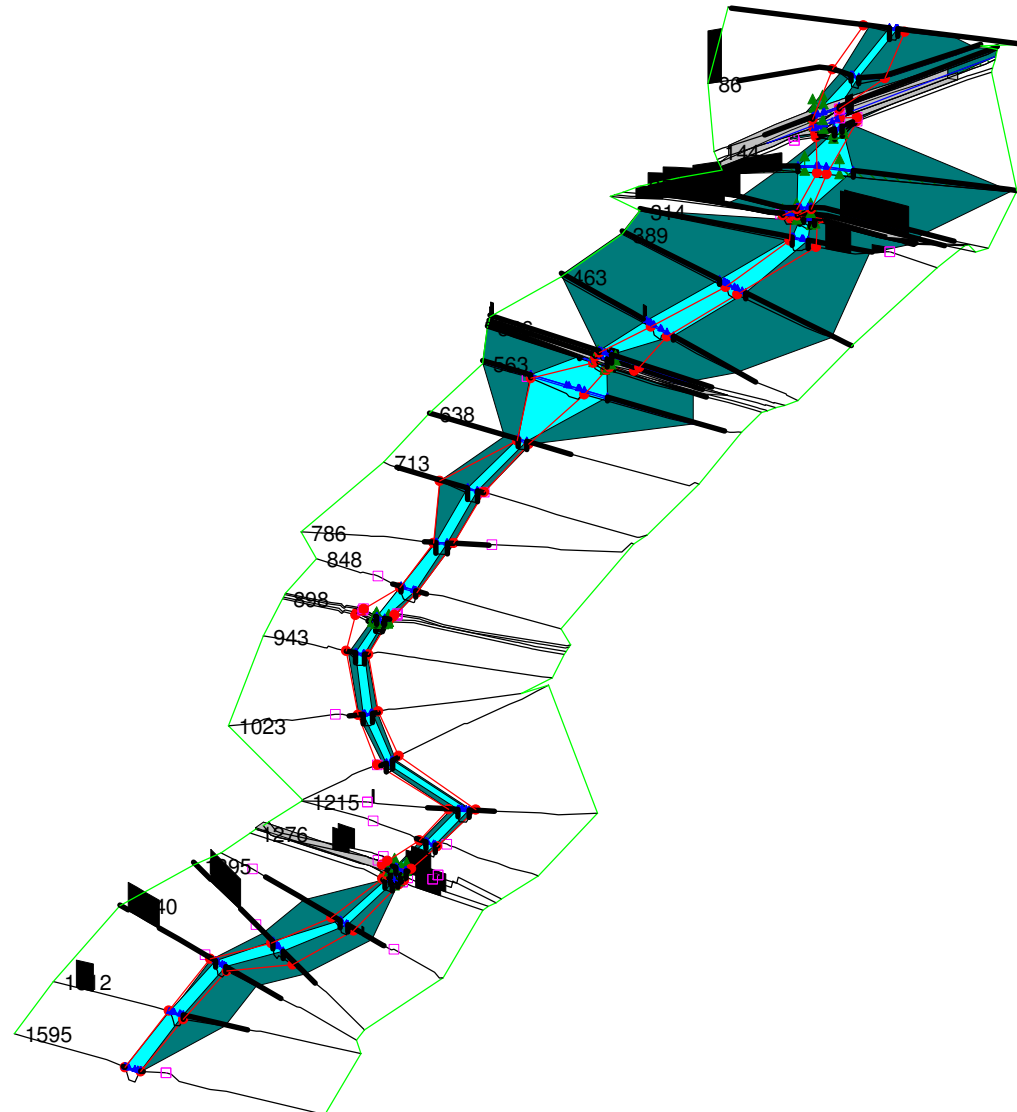
EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez



JergaenAstorga Plan: Plan 04. VID 29/11/2013

Geom: Jerga-Astorga-coordenadas-0.5 Flow: VID



Legend	
	WS 100 años
	WS VID
	Ground
	Levee
	Bank Sta
	Encroachment
	Ineff

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del Ayuntamiento de dicha ciudad, de fecha 17.05.2013.

Astorga, 18 de mayo de 2018

EL SECRETARIO GENERAL

Fdo. D. Manuel Alja Rodríguez