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DILLON CREEK STABILIZATION PROJECT
DESIGN REPORT

NOBLE AND KOSCIUSKO COUNTIES, INDIANA

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Executive Summary

Dillon Creek is a major source of sedimentation into Lake Wawasee at its outlet in Enchanted Hills on the east side of the lake. Dillon Creek flows westerly for approximately 3.0 miles (4.8 km) from the town of Cromwell, Indiana draining an area of approximately 1,427 acres (577.5 ha). The lower and upper ends of Dillon Creek are fairly stable. The channel within Enchanted Hills was dredged to remove accumulated sediment and increase the capacity of this reach to trap additional sediments in 2007. The upper end of the creek was stabilized with rock check dams by the County Drainage Board within the past 10 years. The middle reach of Dillon Creek appears highly unstable and is generating the majority of the sediment witnessed as plumes of brown water in Lake Wawasee.

Preliminary surveys of Dillon Creek within the 1.25 mile (2 km) project reach extending east of Kosciusko County Road 1100 North noted eroding embankments as high as 15 feet (4.5 m) above the water line, numerous debris dams, and multiple channels in the floodplain. The design focused on stabilizing the bed of Dillon Creek at an elevation that allows annual floods access to the existing wide forested floodplain using grade control structures. Where necessary, a floodplain shelf was designed to increase channel capacity while not flooding adjacent agricultural land. Log jams were identified for removal to promote a free flowing channel. Direct bank stabilization measures were designed along 915 feet (279 m) of embankment.

Permits were obtained for all of the proposed work and are valid through at least March 12, 2012. The Wawasee Area Conservacy Foundation (WACF) owns the entire corridor where work is proposed; however, permission from the adjacent landowner is required and has been granted for access to all of the work areas in Noble County east of County Line Road. The projected cost to implement the proposed restoration measures has been estimated at $198,278.00 including the cost of project management and construction oversight. The project is proposed for construction beginning in 2011 and potentially continuing into 2012 pending available funding. Follow up annual monitoring and potential maintenance is recommended.

Acknowledgements

The Dillon Creek Stabilization Design was completed with funding from the Indiana Department of Natural Resources (IDNR) Division of Fish and Wildlife and the Wawasee Area Conservancy Foundation (WACF). Individuals from JFNew that participated in the project survey and design included John Richardson, Aaron Steber, Christine Dittmar, Tom Estrem, Betsy Ewoldt and Joe Cumbo. Joseph Miller, P.E. of Banning Engineering completed the floodway modeling and floodway permit application. Professional Survey assistance was provided by Michael Rozycki, PLS.

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DILLON CREEK STABILIZATION PROJECT
DESIGN REPORT - DRAFT

NOBLE AND KOSCIUSKO COUNTIES, INDIANA

1.0 Project Description and Purpose

Dillon Creek flows for approximately 3.0 miles (4.8 km) in a generally westward direction from land adjacent to State Road 5 south of Cromwell, Indiana to the Enchanted Hill Subdivision on the west side of Lake Wawasee in Kosciusko County, Indiana (Figure 1). The total watershed area encompassing Dillon Creek is approximately 1,427 acres (577.5 ha). The project site begins approximately 0.5 miles (0.8 km) upstream of the lake with drainage area of 1,184 acres (479.1 ha) and continues for 1.25 miles (2.0 km) of stream length. At the upper end of the project the drainage area of 1024 acres (414.3 ha) is approximately 95 percent well drained agricultural ground. In contrast, Dillon Creek within the project reach is well buffered with most of the stream having a forested riparian corridor exceeding 300 feet (91.4 m) in width. The corridor is mixture of hardwood species within wetlands and uplands including Ohio buckeye, maple, oak, elm, sycamore, cherry, and hickory. The soils adjacent to the creek are dominated by loam, muck, and silty clay loam.

Dillon Creek has long been identified as a major contributor of sediment to Lake Wawasee. At the downstream end, WACF and Enchanted Hills constructed a sediment trap by dredging out a portion of the channel to capture as much of the sediment as possible before it entered Lake Wawasee during 2007. Previous stabilization work on the ditch banks and stream bed in the upstream end by the Noble County Surveyor and others has decreased erosion and the sediment supply. A preliminary survey of the middle reach of Dillon Creek identified in-channel erosion as a major contributor of sediment, with only minor erosion rills and gullies from overland flow. The middle and upper reaches of Dillon Creek have a gradient 28.5 feet per mile (Indiana Stream Stats), which is a steeper slope than most northern Indiana streams. Approximately 1/3 of the 1.25 mile (2.0 km) project reach has severe bank erosion, while another third has braided channels. These braided reaches were formed when the water was forced from the main channel by debris dams during storm events. The severe bank erosion drops the trees into the channel which form the debris jams. Eventually one of the new channels in the braided reach erodes enough to carry all of the flow and the channel reroutes itself completely. There are four identified reaches over several hundred feet in length where three or more channels currently exist to carry the flow. Each of these additional channels is contributing hundreds of tons of sediment annually to Lake Wawasee.

With the above knowledge and concerns about future access to control the erosion, the Lake Wawasee Area Conservancy Foundation (WACF) acquired the entire 74 acre (29.9 ha) wooded corridor for a distance of 1.25 miles (2.0 km) upstream of 1100 North Road. This project, funded by the Indiana Department of Natural Resources Lake and River Enhancement Program (LARE) and WACF, involved designing and permitting a solution for controlling the erosion from this reach of Dillon Creek.

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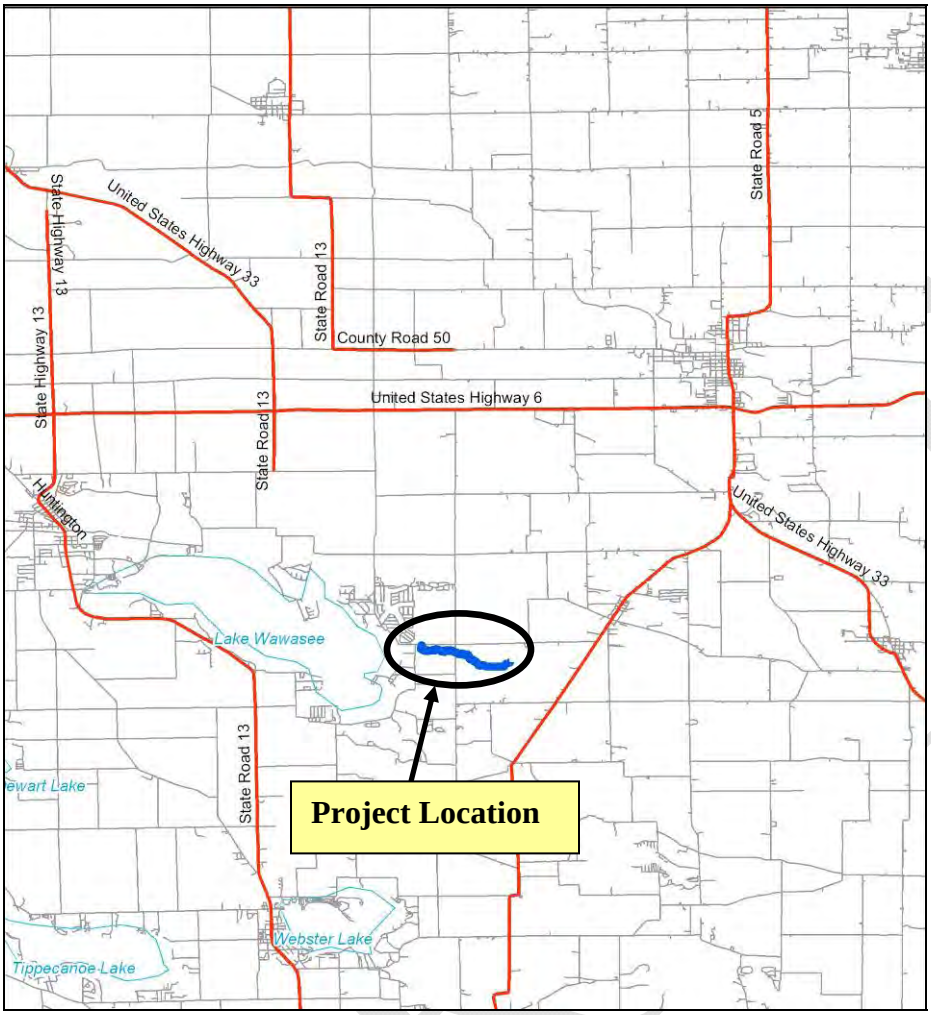

Figure 1. Approximate Dillon Creek project location.

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Figure 2. Aerial view of Dillon Creek project reach near Cromwell, Indiana.

Figure 3. Example of erosion along Dillon Creek within the project reach.

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Figure 4. Example of Woody Debris dams located within the project reach.

Figure 5. Facing East and West in area of proposed two-stage ditch construction.

2.0 Design Rationale

The goal of this project was to design measures to reduce sedimentation into Lake Wawasee from Dillon Creek. To meet the goal we set primary objectives of stabilizing the grade, stabilizing the embankments, and defining a single thread channel that has access to an adequate floodplain at its bankfull elevation or 1.5 year return flow for the entire reach. A 1.5 year return flow is also known as the bankfull elevation. Secondary objectives included improving fish and wildlife habitat throughout the stream corridor, and not negatively affecting any adjacent or upstream landowners.

The design was based on data collected from a detailed topographical survey of the entire 8,900 foot (2,712.7 m) wooded corridor, a separate in-channel survey, and hydrological modeling. The guiding principal of the design was to restore the stream to an elevation where it could access the floodplain during a 1.5 to 2 year return flood event. When the channel is allowed to access its floodplain during these relatively frequent events, the erosional stress is significantly reduced on the stream embankments. Where raising the channel bottom was not possible because of adjacent agricultural land use in the historic floodplain or because of the existing road culvert at County Line Road, construction of an adequate floodplain was considered.

To begin the design process, the topographic survey of the 1.25 mile (2 km) corridor was conducted between January and March 2010. An approximate 50 foot by 50 foot (15 m by 15 m) grid pattern of survey points was taken throughout the corridor extending to the highest elevations within 400 feet (122 m) of the creek. This survey focused on mapping the elevations adjacent to the creek and mapping the precise position of the channel in the floodplain as it could not be seen from aerials due to the dense overstory vegetation. Following that survey, in late March 2010, a longitudinal survey of the creek channel was conducted which picked up details of the channel dimensions (width and depth) and flow line (thalweg) as well as mapped erode areas of embankments. Construction staking on 300 foot (91.4 m) intervals and mapped using GPS was conducted to facilitate location of work areas in the future. These three surveys were combined with multiple field visits to map all the problem areas within the project reach before the design was started. An additional GPS survey was conducted in June 2010 to locate the wetland boundaries delineated in May 2010.

The survey work identified stream incision as the primary driver of the erosion from Lake Wawasee 1.5 miles (2.41 km) upstream. Stream incision has led to bank failure, which led to trees falling into the creek, which led to debris jams. The debris jams caused the stream to abandon the main channel in several locations leading to a braided system. Sediment that has eroded from the stream banks and the alternate braided channels ends up in the lower part of the project reach and eventually into the lake. The two culverts under 1100 North are undersized causing water to back up at existing bankfull and flood conditions. When the water backs up it slows and drops a load of sediment because it no longer has the energy to move that sediment. The end result is an avulsed channel for approximately 1,500 feet (457.2 m) upstream of Kosciusko CR 1100 North. Loose, unconsolidated sediment is abundant in the floodplain and in the multiple channels in this reach. This avulsed condition will not change until the culverts are increased in size under CR 1100 North. The effect of the undersized culverts and blocked floodplain downstream of CR 1100 are apparent. The channel downstream is again incised and the stream has no access to its floodplain resulting in severe bank erosion between CR 1100 North and the Enchanted Hills Subdivision. At some point in the future multiple floodplain level culverts should be installed under CR 1100 North, and the channel bottom downstream raised to an elevation that is within two feet of its floodplain. Until that occurs, the current project will not succeed in eliminating the plumes of sediment that enter Lake Wawasee.

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The methods chosen to address the incision, debris and bank erosion issues within the project reach included: 1) creating a wider floodplain at the existing bankfull elevation in stream reaches where lifting the channel bottom would cause flooding in adjacent agricultural fields; 2) using rock grade controls to lift the bottom elevation of the existing stream channel to within its bankfull elevation of the floodplain so that annual floods can spill onto the existing wide forested floodplain; 3) adding armored bank protection in the form of tree rootwads at the base of steep eroding embankments; and 4) removal of the debris jams where in our opinion the existing main channel was still functional without difficult and expensive stabilization issues.

A hydraulic study of Dillon creek using HEC RAS was conducted by Banning Engineering on the proposed in-stream work during May 2010 (Appendix A). The study resulted in a conclusion of no upstream flooding effects by the proposed work.

3.0 Design and Construction Specifics

3.1 Access

The project requires access at numerous locations along the 1.25 mile (2 km) of corridor. The primary access sites will be directly from County Roads at three locations. One is an existing farm lane off Noble County Road 300 North that required landowner authorization (Appendix D). The other two are off County Line Road immediately north of Dillon Creek. The west side of County Line road is owned by WACF and therefore does not require a property owner agreement. The east side of the road is privately owned and required authorization (Appendix D). All three of these primary access areas will require the construction of a temporary construction entrance as detailed on Sheet 8 of the plans (Appendix B). The respective owners may wish to leave these structures in place after construction and should be consulted before construction as well as near the end of the construction period to seek their opinion on removal.

Secondary access sites are labeled on the plan sheets 2 and 3 as “A” through K”. To get to these woodland access sites the contractor(s) will have to utilize one of the primary access sites and then travel along the edge of the existing wood line following the edge as closely as possible including trimming overhead branches as necessary in order to limit their impacts. Access sites E through H can only be utilized after crops have been removed in the fall, and before spring planting occurs. Secondary access sites allow the contractor(s) access to the stream in predominantly upland areas; however, there are several areas where wetland or floodplain secondary channels have to be crossed to get to the stream work site. The contractor(s) shall place logs from existing dead or downed trees in a corduroy fashion (perpendicular to the path) within these wet areas before crossing them to limit ruts or other damage. This is not detailed on the plan set. No additional fill is allowed in these areas. Logs shall be removed from the crossings upon completion of construction. Other trees and downed logs may have to be cut for access with required machinery. Any cut trees shall be cabled to the existing floodplain or hauled to areas above the floodplain prior to the completion of work as a condition of the IDNR permit. Cabling the trees across the access paths will aid in disguising the access lanes upon project completion. All bare soil on access

areas shall be stabilized with a combination of seed oats and riparian rye and then covered with straw. Where slopes are steeper then 3:1 straw erosion control blankets with biodegradable netting shall be placed on the slopes to prevent erosion.

3.2 Grade Controls

A total of 18 riffle grade control structures have been specified on plan sheets 2 and 3 (Appendix B) to lift the channel bottom up within incised stream reaches. These structures will allow the stream to access its floodplain and disperse energy during even minor floods thereby reducing bank shear stress and decreasing erosion. The grade controls are constructed of rock and generally have a long downstream slope to prevent turbulence (Plan Sheet 6, Appendix B). The majority of the grade controls are just six inches (15.2 cm) to a foot (30.4 cm) in height, but two are over two feet (0.6 m) in height. When constructing a riffle grade control it is important that a key trench be excavated across the entire cross section of the channel extending to a depth of equal to the deepest pool scour depths in the channel, which in this case is approximately two feet (0.6 m). The key trench should be tightly filled with rock of a size that can not be moved by the stream, about 14 inches (35 cm) in diameter for Dillon Creek. The larger rock shall be used for the crest stones as well as lining the center top of the grade control in a concave shape from bank to bank. The downstream side of the structure shall have progressively smaller stone to blend into the exiting grade at a 30:1 slope if possible. On a six inch (15.2 cm) high grade control the riffle would stretch 15 feet (4.6 m) downstream.

3.3 Debris Removal

There are 18 sites with the project reach where we identified woody debris that needs removal from the channel to protect the stream from further erosion (Plan Sheets 2 and 3, Appendix B). The location or number of logs needing removal may change between the time of the survey and the time of construction. At least four of these sites are major woody debris dams. Removal of the scattered logs is a matter of simple hand work with a chain saw. Removal includes disposal of wood in upland areas or cabling to surface of floodplain as per IDNR permit conditions. The four debris jams, identified in the table on Plan Sheet 6, should not be removed until the proposed grade control is installed immediately downstream of the debris jam. Otherwise a lot of sediment that is backed up behind these debris dams will be free to erode downstream. The removal of these debris jams may require heavy machinery. One site, identified on the plans as a debris removal site, is a neatly stacked pile of old concrete sacks adjacent to the stream at station 15+20 [1,520 feet (463.3 m) upstream of CR 1100 North]. The contractor may use these solidified concrete sacks within one of the adjacent proposed grade control structures. The sacks may be placed into the key trench and should work as well or better than rocks while being hidden from view.

3.4 Bank Stabilization

There are ten identified locations where the stream channel flow line or thalweg is eroding the outside bend of the Dillon Creek at a rapid pace (Plan Sheets 2 and 3, Appendix B). In three areas this eroding bank height exceeds eight feet, (2.4 m) in which stabilization is only possible by armoring the embankment or moving the thalweg.

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In combination with moving the thalweg and armoring the eroding slope the design incorporates a shelf at the bank full or floodplain elevation. By creating the bankfull shelf instead of armoring the entire eroding bank not only is the effort and thus the cost of restoration reduced, but the shelf functions as a floodplain providing storage and riparian habitat. The thalweg will be moved and the bank armored to the bankfull elevation on nine of the embankments using available woody debris (rootwads).

The rootwads and a portion of the trunk of downed trees or trees that are already falling into the channel will be utilized in the following manner as shown on Sheet 4 (Appendix B). The trunk will be placed at a perpendicular angle to and forced into the embankment using an excavator with the root mass facing slightly upstream. A footer log will be placed nearly parallel to the existing embankment at the location of the desired thalweg. This footer log will be excavated into the substrate and weighted if necessary using stone. A series of rootwads will be placed side by side around the entire bend of the stream with the upstream rootwad overlapping the downstream rootwad on top of the footer log. The top of the rootwads will be trimmed to the bankfull elevation of approximately 2 feet (0.6 m) above the desired thalweg. Stone will be placed behind the root mass over the exposed portion of the tree trunks to a depth of at least twice the diameter of the tree trunk. Soil from the opposite bank will then be placed on top of the stone to bring the shelf to the proposed bankfull shelf grade. A mix of riparian rye and seed oats will then be seeded onto the shelf and any disturbed areas. An erosion control blanket will then secured over all disturbed surfaces adjacent to the stream.

One area of proposed bank stabilization (station 38+60 to 39+60) will be constructed with a 2 foot wide by 2 foot high (0.6 m by 0.6 m) rock toe and two 1 foot (0.3 m) high soil encapsulated lifts (Sheet 4, Appendix B). The purpose of this structure is to minimize the encroachment into the channel while establishing vegetation on this vertical embankment. Each soil encapsulated lift is constructed by wrapping layers of compacted and seeded soil with a woven coconut (coir) fabric built to withstand velocities in excess of 10 ft/sec (3.0 m/sec). Each lift is installed over a layer of cuttings or bare root shrubs on approximately 3.3 foot (1 m) centers which eventually grow to protect the entire embankment.

3.5 Two-Stage Ditch

Four areas along the stream have been identified for excavation to increase floodplain capacity and storage within the existing channel (Sheet 2 and 3, Appendix B). Two areas near station 19+20 and 23+30 are being excavated on inside point bars as backfill for rootwad installations on the opposite banks. These areas will be excavated only for the required fill behind the rootwads (Sheet 5-Alternate 1, Appendix B). After completion of excavation these areas will be leveled, seeded with oats and riparian rye, and protected from erosion with erosion control blankets. The other two sites are channel enlargements to increase the floodplain while keeping the bottom elevation of the ditch at the existing grade (Sheet 5-Typical Excavation, Appendix B). This technique is also called a two-stage ditch method. Along with the additional flood capacity this method reduces shear stress on the channel banks and thus reduces erosion potential.

The proposed two-stage site just upstream from County Line Road (station 34+20 to 35+00) will also incorporate an existing gully formed by a failing 4-inch (10.2 cm) diameter field tile that drains into Dillon Creek. Trees will be removed from the north bank of this reach and utilized for the rootwads detailed in the proposed bank stabilization reaches. The excavated shelf is proposed to be at the same elevation as the tile allowing the tile to drain out onto the shelf. The drainage path to Dillon Creek from the tile will be shaped and lined with riprap underlain by filter cloth. The excavated shelf and the slopes will be seeded with a mixture of seed oats and riparian rye and then protected with a coconut erosion control blanket. All fill material removed from the excavation will be placed immediately upslope of the excavation area and level graded to match the existing slope (Sheet 7, Appendix B). This spoils distribution area shall be seeded with a mixture of fine fescue and smooth brome and then protected with straw erosion control mats. This spoils distribution area is on adjacent private property and authorization has been obtained for temporary use of this area (Appendix D).

The proposed two-stage ditch from station 74+00 to 85+00 near the upper reaches of the project will also reduce in-channel erosion while protecting the adjacent crop land from flooding. Trees will be removed from the north bank of this reach and utilized for the rootwads detailed in the proposed bank stabilization reaches. The proposed excavation will create a five foot wide shelf at the bankfull elevation of the stream (approximately 1.5 feet [0.5 m] above the existing stream bottom). An estimated 800 to 1,000 cubic yards (611.6 to 764.4 cubic meters) of material will be excavated from the north embankment of Dillon Creek in this reach. This material will be blended into the adjacent crop field after removing and conserving the existing top soil (Sheet 7, Appendix B). The top soil will then be replaced, conserving the natural overland flow drainage back to the stream. This spoils distribution area is on adjacent private property and authorization has been obtained for temporary use of this area (Appendix D). The excavated shelf and the slopes will be seeded with a mixture of seed oats and riparian rye and then protected with a coconut erosion control blanket. The existing access for this work area is a farm lane that runs along the edge of the crop field. The maintenance and restoration of this access on private property is part of the property owner agreement (Appendix D).

3.6 Site Clean-Up

Access to the various areas of the stream work involves several areas of impact for each project reach. It is important for the contractor(s) to understand that these access areas must be restored to pre-existing conditions or better when exiting the site or these areas will be a blemish on the preserved natural corridor and may promote trespass and possible vandalism of the private property. Any disturbed areas, including but not limited to where vehicles leave the county road, existing farm access lanes, equipment or material storage areas, temporary or permanent excavation areas, access lanes through the woods or along the crop field will be seeded and mulched upon completion of the work. No trash or debris will be left on-site. As equipment is being removed, the temporary access roads will be graded to match the existing adjacent grades, seeded, and mulched. Trees branches that are trimmed or removed during the construction

process will be scattered in the woods or be pulled perpendicular across the secondary access lanes in the woods to prevent ATV or vehicle access.

4.0 Permitting and Landowner Agreement

Copies of all of the permits can be found in Appendix C. An Indiana Department of Natural Resources (IDNR) Division of Water Floodway Construction permit (FW-25,804) was approved on August 30, 2010 and is valid to begin work on the project until August 30, 2012. Once work has begun under a floodway permit there is no expiration date. The Indiana Department of Environmental Management (IDEM) granted a 401 Water Quality Certification permit on December 29, 2010, which is valid for two years. A one year extension of the IDEM 401 Certification can be requested if the project has not been completed by the expiration date. The U.S. Army Corps of Engineers (ACOE) issued authorization for the project under a Nationwide Permit within Section 404 of the Clean Water Act on December 29, 2010. The ACOE authorization ends with the expiration of the current Nationwide Permits on or before March 12, 2012; however, if the project has begun before that time you have an additional 12 months to finish the project. The ACOE permit requires a "Project Completion Report" that must be signed and sent to the agency upon completion of the project (Appendix C). The Kosciusko County Drainage Board does not regulate the portion of Dillon Creek in Kosciusko County. The Noble County Drainage Board approved of the Dillon Creek Project at their regular Drainage Board meeting on January 10, 2011. There is no expiration date for the Drainage Board approval.

WACF owns the entire stream corridor where the work will occur. The only private landowner affected will be Russell Anderson who owns the farm land adjacent to the stream corridor. Mr. Anderson has provided his signature to a letter allowing two access lanes to be utilized during construction (Appendix D). Mr. Anderson does have several conditions included in this access permission. These conditions include: 1) The right to attend a required pre-construction meeting and place limitations upon the timing of a contractors entrance to and use of the lanes on his property; 2) the right to have soil that would otherwise be placed on his property moved and placed into an area of greater need on his property; 3) the right to demand deep plowing or ripping of construction impacted areas of his crop field and; 4) the right to keep or have removed the gravel construction entrances on his property.

5.0 Opinion of Probable Cost

The opinion of the probable cost for the restoration of 1,800 feet (548.6 m) of Dillon Creek channel is $198,278.00 (Table 1). The cost estimates are based on 2010-2011 material and labor costs. The estimate includes project management and construction oversight to account for the possibility of either 1) a design-build project where a single prime contractor is entirely responsible for all aspects of the project from communication with WACF, the adjacent landowners, grant agencies and the permit agencies to all phases of construction implementation and success or 2) where WACF employs a construction administrator and oversight engineer to bid the construction out in whole or in phases to various contractors. The project engineer is then responsible for all the communication listed above as well as bid administration, contracts, and construction

oversight. Appendix A includes the calculations and notes on individual line items within Table 1. The project plans in Appendix B are more suited to a design-build contract as many of the construction details are included in this report and are not shown on the plans. This report, or at a minimum Sections 1 through 4 and Appendix B through D shall be incorporated within any bid documents (Appendix E).

Table 1. Probable estimates of cost for the construction of Dillon Creek Stabilization Project based on JFNew plans dated January 2011.

Task	Unit	Unit Quantity	Unit Cost	Total
Tree Trimming to secondary access lanes along crop field	**Lineal feet**	**5,100**	**$1.50**	**$7,650.00**
Construction Access off Paved roads	**Each**	**3**	**$2,275.00**	**$6,825.00**
Two-Stage Channel	**Lineal feet**	**1,180**	**$30.00**	**$35,400.00**
Woody Debris Removal	**Each**	**18**	**$420.00**	**$7,560.00**
Bank Stabilization Rootwads	**Lineal feet**	**815**	**$43.00**	**$35,045.00**
Bank Stabilization Soil Lift	**Lineal feet**	**100**	**$80.00**	**$8,000.00**
Riffle Grade Controls	**Each**	**18**	**$2,200.00**	**$39,600.00**
Site Clean-up of Access Lanes	**Each**	**9**	**$400.00**	**$3,600.00**
Subtotal 1				**$143,680.00**
Contingency	**Each**	**1**	**20% of subtotal 1**	**$28,736.00**
Subtotal 2				**$172,416.00**
Project Management	**Each**	**1**	**15% of subtotal 2**	**$25,862.00**
Project Total				**$198,278.00**

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6.0 Bidding Requirements

Example bid documents are included in Appendix E.

7.0 Construction Schedule

The WACF plans to pursue construction grants in 2011 or until project funding is received. The permits have been obtained and therefore work could begin immediately

upon receipt of construction funding. Construction should take place when the site is dry to prevent unnecessary disturbance to the access lanes and riparian zone and to make construction as efficient as possible. July through October is the best time for the work to be performed due to a lower potential for wet conditions and the opportunity for the plantings and cover crop to become established before winter. The two-stage ditch portion of the project will require that the adjacent crop field has been harvested before the spoils can be spread within the crop field and that the work is completed prior to spring planting.

8.0 Monitoring and Maintenance Schedule

Annual and seasonal maintenance and monitoring of the site is highly recommended. A designated member of the WACF should periodically monitor the site after significant rain events and at the start of each season to make sure that no significant erosion is occurring or that additional trees have not fallen in and blocked the waterway. An example of maintenance and monitoring form is included in Appendix F.

9.0 Project Summary

One of the major sources of sedimentation into Lake Wawasee is Dillon Creek. Dillon Creek flows westerly from the town of Cromwell, Indiana toward the Enchanted Hills subdivision on the west side of Lake Wawasee. The entire creek is approximately 3.0 miles (4.8 km) in length with a drainage area of approximately 1,427 acres (577.5 ha). The lower end of Dillon Creek within the Enchanted Hills Subdivision is entirely channelized and surrounded by a developed residential area with fairly stable embankments maintained by individual lot owners. The channels within this lower reach have been dredged within the past three years to remove accumulated sediment and increase the capacity of this reach to trap additional sediments. The upper end of the creek has been modified by ditching but appears stable with rock check dams and grassy embankments. The middle reach of the Dillon Creek (approximately 1.5 miles) is contained within a broad wooded corridor. The stream channel in this middle reach appears highly unstable and is generating the majority of the sediment witnessed as plumes of brown water in Lake Wawasee.

This project was undertaken to design stabilization measures for a 0.5 mile (0.8 km) reach owned by WACF that extends from Kosciusko County Road 1100 North east to the north-South County Line Road and then another 0.75 mile (1.2 km) reach from County Line Road east until Dillon Creek reaches a point where it flows directly from north to south along a property boundary. The project area includes approximately 800 feet (243.8 m) of a tributary stream at the eastern edge of the project. Excluded from this project is a 0.25 mile (0.4 km) reach of Dillon Creek between Enchanted Hills and CR 1100 North.

Preliminary surveys of Dillon Creek within the project reach noted that most of stream length had one or both banks eroding at heights ranging from just over a foot to as high as 15 feet (4.5 m) of the water line. There were numerous stream blockages east of County Line Road that forced the stream to leave the main channel and erode multiple paths through the forested floodplain, which in some cases resulted in new main

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channels being created, generating hundreds of tons of sediment. The design concept included stabilizing the channel in a single thread that has access to an adequate floodplain and stabilizing the embankments. Secondary design objectives included improving fish and wildlife habitat throughout the stream corridor, and not negatively affecting any adjacent or upstream landowners.

The design focused on stabilizing the bed of Dillon Creek at an elevation that allows annual floods access the existing wide forested floodplain which would result in reduced erosion of embankments and settling of sediments in the floodplain. There were 18 locations identified for these riffle grade controls. A floodplain shelf was designed in two reaches of Dillon Creek along 1,180 feet (360 m) of embankment within the project area where the stream bed could not be raised to access the existing floodplain because of the potential flooding of a road or adjacent agricultural land. Four major and 16 minor log jams were identified for removal to promote a free flowing channel. Direct bank stabilization measures were designed along 915 feet (279 m) of embankment in 10 locations where natural restoration is not likely to occur over the next 10 years due to the height of the embankments or severity of the erosion. Permits were obtained for all of the proposed work between August and December 2010. Permits begin to expire for the proposed work on March 12, 2012. WACF owns the entire corridor where work is proposed; however, permission from the adjacent landowner is required and has been granted for access to all of the work areas in Noble County east of County Line Road.

The projected cost to implement the proposed restoration measures has been estimated at $198,278.00 including the cost of Project Management and Construction Oversight. In addition to the proposed work elements, construction of access lanes through and along the wooded corridor, Rule 5 compliant public road access sites, erosion control, and clean up has been included in the estimates. The project is proposed for construction beginning in 2011 and potentially continuing into 2012 pending funding. WACF is seeking grant money to complete the construction in 2011. Follow up annual monitoring and potential maintenance are important and it is recommended that WACF consider implementing the proposed inspection schedule and protocol.

DRAFT

Appendix A:

Survey Data, Engineering and Cost Estimate Calculations, and Computer Model Information

DRAFT

DRAFT

PERMIT APPLICATION FOR CONSTRUCTION

State Form 42946 (R6 / 2-05)
Approved by the State Board of Accounts, 2005

Mail To: **Department of Natural Resources Division of Water**
402 West Washington Street, Room W264
Indianapolis, Indiana 46204-2641
Telephone Number: (317) 232-4160
Toll Free: 1-877-928-3755
Fax Number: (317) 233-4579
www.IN.gov/dnr/water

Based on the "Permit Application Assistance Manual", I am submitting this application to perform work under:

Permit Type	Application Fee	Permit Type	Application Fee
☐ IC 14-26-2 Lake Preservation Act	$ 100.00	☐ IC 14-29-3 Sand and Gravel Permits Act	$ 50.00
☐ IC 14-26-5 Lowering of the Ten Acre Lake Act	$ 25.00	☐ IC 14-29-4 Construction of Channels Act	$ 100.00
☐ IC 14-29-1 Navigable Waterways Act	No Fee		
☑ IC 14-28-1 Flood Control Act, *(select one of the following:)*			
☑ Excavation, fill, or non-residential construction in a floodway			$ 200.00
☐ Residential reconstruction in a floodway, other than the Ohio River floodway			$ 50.00
☐ Residential construction, or reconstruction, in the Ohio River floodway			$ 10.00

PLEASE TYPE OR PRINT

1. APPLICANT INFORMATION

Name of Applicant: Wawasee Area Conservancy Foundation Name of Contact Person: Heather Harwood

Applicant Mailing Address: P.O. Box 548 (Street, P.O. Box or Rural Route) Syracuse (City) IN (State) 46567 (ZIP Code)

Contact Information: Daytime Tele. # (574) 475-4549 Fax # ( ) E-mail Address:

2. AGENT INFORMATION

Name of Agent: Banning Engineering Name of Contact Person: Joe Miller

Agent Mailing Address: 853 Columbia Road, Suite 101 (Street, P.O. Box or Rural Route) Plainfield (City) IN (State) 46168 (ZIP Code)

Contact Information: Daytime Tele. # (317) 707-3736 Fax # (317) 707-3636 E-mail Address: jmiller@banning-eng.com

3. PROPERTY OWNER INFORMATION

Name of Property Owner: Same as Applicant Name of Contact Person:

Property Owner Mailing Address: (Street, P.O. Box or Rural Route) (City) (State) (ZIP Code)

Contact Information: Daytime Tele. # ( ) Fax # ( ) E-mail Address:

Relationship of applicant to property: ☑ Owner ☐ Purchaser ☐ Lessee Other

4. PUBLIC NOTICE ***(See Permit Application Assistance Manual)***

Complete and submit SF # 52086 titled "Adjacent Property Owners Listing - Form N-4: Affirmation of personal service, 1st class mail service, or certified mail service

5. PROJECT DESCRIPTION **5.1 Description Narrative:** ***(See Permit Application Assistance Manual)***

Stream restoration along approximately 6,870 linear feet of Dillon Creek within Noble and Kosciusko Counties. Proposed work includes: (4) areas of 2-stage channel excavation totalling approximately 790 cubic yards (1,240') of excavation. Excavated materials will be placed landward of the floodway offsite. (15) riffle structures within the channel are also proposed as part of the restoration project. Fill placement for the riffle structures totals approximately 156 cubic yards (220'). (9) root wad bank stabilzation areas along 740' of streambank. A total of 177 cubic yards of fill is proposed for the root wad placement. (1) rock vane structure is being proposed with a total impact of 10 cubic yards (10'). (1) soil life tstructure along 100' of streambank totalling 22 cubic yards of fill placement. The project begins approxiamtely 1,600 feet (River Mile 0.745) upstream of CR 1100 North in Kosciusko County and continues upstream through County Line Road into Noble County. The project ends at the IDNR jurisdictional boundary, project station 85+00 (River Mile 2.045).

6. PROJECT LOCATION

6-1 Location Narrative: ***(See Permit Application Assistance Manual)*** **Stream/Lake Name:**

The project is located along both banks of Dillon Creek starting 1,600 feet upstream of CR 1100 North in Kosciusko County and continues upstream 6,870 feet through County Line Road into Noble County.

6-2 Driving Directions: ***(See Permit Application Assistance Manual)***

From the intersection of SR 6 and SR 5 on the south side of Ligonier travel west approximately 3.5 miles to CR 1200 W (County Line Road). Turn left (south on CR 1200 W), and travel south 4 miles.

6-3 Special Information: ***(See Permit Application Assistance Manual)***

6-4 Project Location Map: ***(See Permit Application Assistance Manual)***

6-5 Project Site Map: ***(See Permit Application Assistance Manual)***

7. DISTURBED AREA DRAWING

7-1 Drawing Requirements: ***(See Permit Application Assistance Manual)***

8. PROJECT PHOTOGRAPHS

8-1 Images: ***(See Permit Application Assistance Manual)***

8-2 Photo Orientation Map: ***(See Permit Application Assistance Manual)***

8-3 Photo Documentation: ***(See Permit Application Assistance Manual)***

9. RELATED PROJECT INFORMATION

Department of Natural Resources

Administrative Cause #	Related Application(s) #	Early Coordination #
Floodplain Analysis/Regulatory Assessment #	Violation #	Exemption #

Department of Environmental Management

Section 401 #

Corps of Engineers

Public Notice #	Section 404 Application #	Section 10 Application #

10. STATEMENT OF AFFIRMATION

I hereby swear or affirm, under the penalties for perjury, that the information submitted herewith is to the best of my knowledge and belief, true, accurate and complete. I further certify that I possess the authority to undertake the project. I hereby grant to the Department of Natural Resources, the right to enter the above-described location to inspect the work.

Signature of Applicant or Authorized Agent ***(REQUIRED)*** — **Date** ***(month, day, year)*** 5-26-10

11. REGULATORY FEES

11-1 Regulatory Fees Submitted: ***(See Permit Application Assistance Manual)***

11-3 Payment Method: ***(See Permit Application Assistance Manual)***

REQUIREMENT FOR ADDITIONAL INFORMATION AND PERMITS

Application made to and approval granted by the Department of Natural Resources does not in any way relieve the applicant of the necessity of securing easements or other property rights, permits and approvals from affected property owners and other local, state, and federal agencies.

"Your Project is Our Priority"

Construction in Floodway Permit Hydraulic Study

for

Dillon Creek
Kosciusko & Noble Counties, Indiana

Prepared for:

Wawasee Area Conservancy Foundation
P.O. Box 548
Syracuse, IN 46567

May 2010

Banning Engineering, P.C. • 853 Columbia Road, Suite 101 • Plainfield, IN 46168
Phone: (317) 707-3700 • Fax: (317) 707-3800 • E-mail: banning@BanningEngineering.com

Job #05160

Hydraulic Study for Dillon Creek

Study Area

The project site is along Dillon Creek. The project extends approximately 6,370' from beginning to end. The project beginning is located in Section 24, Township 34 North, Range 7 East in Kosciusko County, Indiana. The project end is located in Section 19, Township 34 North, Range 8 East in Noble County.

Scope of Study

The scope is to provide a hydraulic study for a construction in floodway application. The study will evaluate the effects of stream restoration practices throughout the 6,370' project reach. The project begins approximately 1,600' upstream of the CR 1100 N road crossing in Kosciusko County. The project extends upstream to the IDNR jurisdictional boundary (River Mile 2.045).

The Wawasee Area Conservancy Foundation has secured property rights throughout the project area and riparian corridor. An approximate property boundary is shown on both the project plan sheets, and the hec-ras cross-section map. At no point along the project corridor does the surcharge exceed 0.14' outside the acquired property. A Model Summary Table is included in the attached appendicies.

Existing Model

The existing hydraulic model (base model) has been compiled utilizing topographic information provided by JF New. The topographic information was collected in the winter of 2009 / 2010 and is on the NAVD 88 vertical datum. A site visit was conducted in April of 2010 to evaluate the hydraulic efficiency of the reach. Supporting photographs and aerial mapping accompanies the report in the Photo Log appendix.

Pre-project coordination with IDNR personnel led to the use of the Noble County FIS Curve 'C' coordinated discharge graph. The design discharge at the lower reach is 190 CFS for 1,198 acres. A drainage basin map is included in the appendix.

Proposed Model

The proposed model includes the installation of (15) riffle structures and (4) areas of two-stage channel. Also being permitted are (9) root wad streambank stabilization measures and (1) rock vane. These structures are being permitted, but are not included in the modeling since they are intended to match pre-existing conditions for the reaches where they are being utilized. Further information can be found in the project plan and hec-ras cross-section appendices.

Summary

The results of the proposed grade changes along the site comply with IDNR-DOW 0.14 maximum surcharge limitations. Detailed information on the results can be found in the attached appendices.

IDNR Model Guidelines were followed in development of all of the above models. Maps and calculation to support the observations above are contained in attached appendices.

References

- USGS 7 ½ Minute Quadrangle Mapping
- HEC-RAS, River Analysis System, v3.1.3, USACE
- CHECK-RAS v1.4, FEMA, March 2005
- IDNR-DOW Coordinated Discharge Graph
- JF New Topographic Survey Winter 2009 / 2010

Appendices

1. Hydraulic Modeling Checklist
2. Model Summary
3. Project Location Map
4. Coordinated Discharge Graph
5. Check-RAS Output, Proposed Model
6. Standard Table 1, Existing Model
7. Standard Table 1, Proposed Model
8. Cross Sections, Proposed Model
9. Photo Log
10. Hec-RAS Cross Section Map
11. Project Plan

HYDRAULIC MODELING CHECKLIST

Division of Water
Indiana Department of Natural Resources
Hydraulic Modeling Checklist

This checklist will assist the staff at the Division of Water in the review of modeling for the definition of the floodway, for evaluation of a Construction in a Floodway permit application, for state concurrence of a Letter of Map Revision or a Flood Insurance Study or any other modeling that is submitted for review. The checklist items are based on the document "General Guidelines for the Hydrologic-Hydraulic Assessment of Floodplains in Indiana." The modeler should be familiar with this document and any discrepancies between the general guidelines and the submitted modeling should be discussed with the Division of Water Engineering Services staff prior to submittal.

This completed checklist must be submitted to the Division of Water along with your models. The Division of Water <u>will not</u> review any modeling submittal that is not accompanied by a completed checklist.

Please keep in mind that these questions were written primarily for the application of HEC-RAS computer models. HEC-RAS is preferred by the Division of Water, however, other modeling programs may be used provided their use has been discussed previously with Division of Water Staff. Should you have any questions, please contact Division of Water staff at (317) 232–4160 or toll free at (877) 928-3755.

1. General Information

a. Preparer Name: Joe Miller
(Name of individual who prepared the submitted modeling)

b. Preparer Firm: Banning Engineering

c. Date: 5-25-10

2. Project Location and Background Information

a. Waterbody Name: Dillon Creek
(Use name as shown on USGS 7 ½ minute quadrangle)

b. Location Description: Along both banks of Dillon Creek 1,600' upstream of CR 1100N upstream ~6,370'.
(Example: Along the west bank of Blank Creek beginning at Culvert Avenue and extending upstream (north) approximately 2,000 feet to C.R. 700 North)

c. Nearest Town/City: Cromwell

d. County: Noble & Kosciusko

e. Downstream End of Project Location:

Section: 24 Township: 34N Range: 7E Quadrangle: Lake Wawasee
(if the project is in a grant, reserve or donation, check here and give information below) ☐

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

Upstream End of Project Location:

Section: 19 Township: 34N Range: 8E Quadrangle: Lake Wawasee
(if the project is in a grant, reserve or donation, check here and give information below) ☐

f. Study Reach Location: Downstream Limit 0.568 miles *(unit of distance)*
Upstream Limit 2.094 miles *(unit of distance)*

(Limits should be measured in miles from the mouth of the stream or use units of distance consistent with published flood study. The Division of Water has mileage on many streams.)

g. Type of Model

☑ HEC-RAS ☐ HEC-2 ☐ WSPRO ☐ WSP2 ☐ HY-8

Other _____

h. Published Flood Insurance model *(Name, Study Reach and Date)* N/A

i. IDNR model *(Name, Study Reach and Date)* N/A

j. Previous FARA / Floodway Permits within study reach *(Application Number and Approval Date)*

1. All previous FARA and Floodway permits are downstream of the project reach.
2. _____
3. _____
4. _____
5. _____

3. Request Information

Please indicate for what purpose the models are submitted for review and approval:

- ☐ Floodway / Base Flood Elevation Determination (FARA)
- ☑ Construction in a Floodway Application
- ☐ Letter of Map Revision (LOMR)
- ☐ Flood Insurance Study modeling
- ☐ Other (please describe) _____

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

4. Discharges

The source of the 100-year frequency flood discharges used in a hydraulic model need to be fully documented by completing the questions listed below.

It is strongly suggested that a preparer-determined 100-year discharge be submitted for approval prior to the submittal of hydraulic models. Discharge determinations and hydraulic models are considered to be separate items, each subject to review.

a. What is the source of the discharges used in the submitted model *(Please check one):*

- [x] Discharges based on a curve published in "Coordinated Discharges of Selected Streams in Indiana"
  (Please attach copy of applicable graph)
- [ ] Discharges based on a determination from the Department of Natural Resources
  (Please attach copy of letter from IDNR)
- [ ] Discharges based on hydrologic analyses submitted with this model
  (Please attach a copy of the IDNR approval letter)
- [ ] Discharges from a Flood Insurance Study
- [ ] Discharges from other modeling *(Indicate source)* _____

b. Table of Discharges used in the model *(Expand table as needed)*

Drainage Area (sq. mi.)	Discharge (cfs)	Cross-Section / Location Where Discharge is Specified
1.87	190	0.745
1.72	180	1.601
1.45	158	1.936
1.06	125	2.094

c. Comments regarding discharge determination:

Used Curve 'C' for Noble County FIS. Double checked results with USGS Streamstats online resource.

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

5. Starting Elevation / Boundary Conditions

Complete the following section fully to document the starting elevations and boundary conditions for starting the model:

a. Boundary condition used to derive starting elevations: *(Please check one)*

- ☐ Known water surface *(Indicate source):* _____
- ☐ Energy slope estimated from historic flood profile *(Indicate date):* _____
- ☑ Energy slope estimated from stream thalweg *(Indicate mapping used):* JF New Topo
- ☐ Other *(Please Describe):* _____

b. Description (show any calculations):
Channel Fall = (871.43-869.7) / 280 = 0.00618

6. Manning's Roughness Coefficients ("n" Values)

Complete the following section fully to document the Manning's roughness coefficients:

a. How were the roughness coefficients estimated? *(Check all that apply)*

- ☐ Flood Insurance Study
- ☐ Other modeling
- ☑ Field inspection
- ☑ Site photos
- ☑ Aerial photography or mapping
- ☐ Calibration
- ☐ Other *(Describe)* _____

b. What is the range of the roughness coefficients?

Left Overbank	Minimum 0.1	Maximum 0.1
Channel	Minimum 0.05	Maximum 0.05
Right Overbank	Minimum 0.06	Maximum 0.1

c. Are proposed roughness coefficients different from the base roughness coefficients?
☐ Yes ☑ No

Note: In most cases, the Department will not approve modeling based on an "improved" condition. If the "Yes" box is checked, you will need to justify the use of the modified roughness coefficients below. It is strongly suggested that these issues should be discussed with personnel at the Department prior to submittal.

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

d. Description of "n" values

Please further describe the methods checked above that were used to estimate the roughness coefficients. If they are estimated from photos, please attach copies of the photos, along with an orientation map. If the roughness coefficients are estimated by calibration, please submit supporting documentation.

Please see attached photos and photo log for field data used to verify n-values.

e. Check-RAS

For HEC-RAS models, please run the "NT" report from Check-RAS and attach it to this checklist. List any comments in the model and justification for not correcting these comments (use additional sheets, if necessary):

See Attached Check-RAS.

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

7. Cross Sections

The following questions have to do with the cross section information that is the basis of the submitted modeling:

a. What is the source of the cross section information *(check all that apply):*
- ☐ Flood Insurance Study
- ☐ Field survey *(Date)* _____
- ☑ Detailed topographic mapping *(Date)* JF New Winter 2009 / 2010
- ☐ Other modeling *(Indicate source)* _____
- ☐ Other *(please specify)* _____

b. Are cross sections stationed increasing from left to right looking downstream?
☑ Yes ☐ No

c. How are sections labeled *(check one)* (Note: The following list is in order of preference)
- ☐ Consistent with FIS / other studies
- ☑ Miles above mouth
- ☐ Feet above other landmark *(Please specify landmark)* _____
- ☐ Other *(Please specify)* _____

d. Are sections oriented perpendicular to flow at all portions of the cross section?
☑ Yes ☐ No

e. Are the full cross section extents shown on submitted mapping?
☑ Yes ☐ No

f. Do the cross sections extend fully across the floodplain *(above expected 100-year flood elevations)*?
☑ Yes ☐ No

g. Do the cross sections represent average conditions in the reach at which they are located?
☑ Yes ☐ No

h. Are areas of blocked or ineffective flow indicated on the submitted cross sections?
☑ Yes ☐ No

i. Are cross sections located at places where discharge values change along the stream reach?
☑ Yes ☐ No

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

j. For any "No" answers above, please provide an explanation:

N/A

k. Are interpolated sections used anywhere in the model (if yes, state reasons for using interpolated sections)

☑ Yes ☐ No

Reason: Detailed topographic information scarce downstream of project beginning. Interpolated sections were used to fill in longer distances cross-sections and to minimize modeling defaulting to critical depth.

l. Check-RAS

For HEC-RAS models, please run the "XS" report from Check-RAS and attach it to this checklist. List any comments in the model and justification for not correcting these comments (use additional sheets, if necessary):

See Attached Check-RAS.

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

8. Bridges

The following questions should be answered for each bridge in the model being submitted. Use a separate sheet for each bridge

a. Name of Bridge in model: N/A

b. Bridge cross-section locations *(See Section 8.9 of the Guidelines for location of bridge sections):*

Section 1 Cross-section number: N/A
Section 2 Cross-section number: N/A
Section 3 Cross-section number: N/A
Section 4 Cross-section number: N/A

c. Is this model submitted in support of a Construction in a Floodway application for the bridge in question?
☐ Yes ☐ No

d. If the answer to c is "yes," then are the same number of sections used in the existing (or pre-project) and proposed (or post-project) model?
☐ Yes ☐ No ☐ N/A

e. Do the cross sections extend across the entire valley to the 100-year frequency flood elevation?
☐ Yes ☐ No

f. Is cross section 1 located at a 2:1 flow expansion ratio downstream of the bridge face?
☐ Yes ☐ No

g. Is cross section 4 located at a 1:1 flow contraction ratio upstream of the bridge face?
☐ Yes ☐ No

h. Have the expansion / contraction coefficients been adjusted to reflect the effects of the bridge?
☐ Yes ☐ No

i. Were effective flow limits set at sections 2 and 3?
☐ Yes ☐ No

j. What is the selected modeling method *(for the 100-year frequency flood only)*
☐ Energy (Low flow)
☐ Momentum (Low flow)
☐ WSPRO (Low flow)
☐ Energy (High flow)
☐ Pressure / Weir flow (High flow)

k. Does approach roadway profile data extend across the full valley cross section?
☐ Yes ☐ No

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

l. Are bridge piers included in the model?

☐ Yes ☐ No

m. Were HEC-RAS default embankment side slopes applied at all bridge crossings in the model?

☐ Yes ☐ No

n. For all "No" answer above, please provide an explanation:

N/A

o. Check-RAS

For HEC-RAS models, please run the "Structure" report from Check-RAS and attach it to this checklist. List any comments in the model and justification for not correcting these comments (use additional sheets, if necessary):

N/A

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

9. Culverts

The following questions should be answered for each culvert in the model being submitted. Use a separate sheet for each culvert:

a. Name of Culvert in model: County Line Road

b. Cross section locations (See Section 8.9 and 8.10 of the Guidelines for the location of culvert sections):

Section 1 Cross section number: 1.051
Section 2 Cross section number: 1.075
Section 3 Cross section number: 1.091
Section 4 Cross section number: 1.098

c. Is this model submitted in support of a Construction in a Floodway application for the culvert in question?

☐ Yes ☑ No

d. If the answer to c is "yes," then is the same number of sections used in the existing (or pre-project) and proposed (or post-project) model?

☑ Yes ☐ No ☐ N/A

e. Do the cross sections extend across the entire valley to the 100-year frequency flood elevation?

☑ Yes ☐ No

f. Is cross-section 1 located at a 2:1 flow expansion ratio downstream of the culvert?

☑ Yes ☐ No

g. Is cross-section 4 located at a 1:1 flow contraction ratio upstream of the culvert?

☑ Yes ☐ No

h. Have the expansion / contraction coefficients been adjusted to reflect the effects of the culvert?

☑ Yes ☐ No

i. Were effective flow limits set at sections 2 and 3?

☑ Yes ☐ No

j. Does approach roadway profile data extend across the full valley cross section?

☑ Yes ☐ No

k. Were HEC-RAS default embankment side slopes applied at all culvert crossings in the model?

☑ Yes ☐ No

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

l. For all "No" answer above, please provide an explanation:

Submitted Model is not for culvert construction in floodway application.

m. Check-RAS

For HEC-RAS models, please run the "Structure" report from Check-RAS and attach it to this checklist. List any comments in the model and justification for not correcting these comments (use additional sheets, if necessary):

See Attached Check-RAS.

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

10. Floodways

Has floodway determination been done in accordance with Section 8.12 of the Guidelines?

☐ Yes ☐ No ☑ N/A

11. Model Output

For all model outputs review the "errors and warnings" and address those comments not already addressed.

12. Documentation

Submitted documentation *(Check all that apply)*:

- ☑ Narrative regarding modeling
- ☐ Application Forms and/or LOMR Application Forms
- ☑ Pictures of stream reach *(w/ orientation map)*
- ☐ FIS map / profile
- ☐ Previous FARA/Floodway permits in study reach *(Including maps)*
- ☑ Check-RAS output
- ☑ Cross Section plots
- ☑ HEC-RAS "Standard Table 1"
- ☐ HEC-RAS "Encroachment 1" table *(Show where the 0.14' surcharge occurs)*
- ☐ Profile plots
- ☑ Summary of Modeling and Project Evaluation Results *(Mandatory – See Figure 3.1)*
- ☐ Floodplain mapping including:
  - ☐ Stream in question *(Along with other hydrographic features)*
  - ☐ Roads *(With street names)*
  - ☐ Existing features *(Buildings, parking lots, woods, etc)*

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

- [x] The full extent of each cross section included in the model, with each cross section clearly labeled *(Include the location of initial and end points as used in the model)*
- [x] Contour topographic data *(If available)*
- [x] Property limits *(Approximate property limits are acceptable only if surcharges are 0.14' or less at all cross sections)*
- [x] North arrow
- [x] Scale *(Numerical and graphical)*
- [ ] Horizontal and vertical control benchmark used *(See Section 5.4 of the Guidelines for benchmark guidance.)*
- [x] Horizontal and vertical datums
- [ ] Delineated flood fringe and floodway limits

  (The flood fringe and floodway should be shaded so that it is obvious to the reviewer what areas are flood fringe and floodway, but not shaded so dark that other features are obscured. For multi-colored plans, the Division of Water convention is to shade the flood fringe blue and the floodway yellow. See Section 8.12 of the Guidelines for delineation guidance.)

- [x] Disk with input data and model output *(Check all that apply)*
  - [ ] Base Condition (FIS, IDNR Regulatory) File name: _____
  - [ ] Duplicate Effective File name: _____
  - [ ] Corrected Effective File name: _____
  - [x] Existing (Pre-project) File name: 10020_CON_FW.PRJ
  - [x] Proposed (Post-project) File name: 10020_CON_FW.PRJ

Waterbody Name: Dillon Creek
Preparer: JLM
Date: 5-25-10

13. Affirmation

By signing this document you are indicating that the submitted models have been developed and reviewed in accordance with accepted Division of Water procedures, that should the Division of Water find inconsistencies between your submitted models and the checklist, you will be notified in writing of the deficiencies and given 90 days to correct these problems; and that if after 90 days these inconsistencies still exist, you will be notified that your model is unacceptable and the Department will take no further action if the request is for a FARA, or issue a denial notice if the request is associated with a permit application.

5-26-10
Date:

Signature

Joseph L. Miller, P.E.
Name

Banning Engineering, P.C.
Firm

Division of Water Use Only

Date Received _____ File Number _____

Reviewer _____ Date reviewed _____

☐ Approved ☐ Rejected

Section Manager Review _____

MODEL SUMMARY

Dillon Creek
JLM
26-May-10

Cross Section	Existing (NAVD 88) HEC-RAS, v3.1.3	Proposed Project (NAVD 88) HEC-RAS, v3.1.3	Project Impacts (ft)	
0.568	870.96	870.96	0.00	
0.621	873.16	873.16	0.00	
0.668	875.48	875.48	0.00	
0.723	876.90	876.90	0.00	
0.745	877.32	877.36	0.04	
0.800	878.85	878.87	0.02	
0.857	880.16	880.24	0.08	
0.873	880.50	880.58	0.08	
0.902	881.19	881.28	0.09	
0.938	881.44	881.49	0.05	
0.966	881.73	881.77	0.04	
1.005	882.82	883.13	0.31	within property limits
1.030	883.37	883.54	0.17	within property limits
1.051	883.65	883.80	0.15	within property limits
1.075	883.78	883.91	0.13	
1.083	Culvert			
1.091	886.20	886.21	0.01	
1.098	886.22	886.22	0.00	
1.116	886.28	886.37	0.09	
1.138	886.38	886.51	0.13	
1.159	886.54	886.65	0.11	
1.172	886.64	887.43	0.79	within property limits
1.196	887.12	887.89	0.77	within property limits
1.216	887.95	888.45	0.50	within property limits
1.239	889.07	889.28	0.21	within property limits
1.263	889.69	890.00	0.31	within property limits
1.313	890.60	890.82	0.22	within property limits
1.360	891.60	891.43	-0.17	
1.384	892.37	892.43	0.06	
1.403	892.63	892.67	0.04	
1.434	893.12	893.15	0.03	
1.470	893.58	893.59	0.01	
1.511	894.19	894.19	0.00	
1.543	895.10	895.10	0.00	
1.573	895.87	895.87	0.00	
1.601	896.60	896.60	0.00	
1.634	896.94	896.94	0.00	
1.661	897.71	897.71	0.00	
1.686	898.61	898.61	0.00	
1.705	899.01	899.01	0.00	
1.725	899.12	899.12	0.00	
1.747	899.57	899.57	0.00	
1.773	899.73	899.73	0.00	
1.819	900.13	900.13	0.00	
1.837	900.57	900.54	-0.03	
1.874	901.24	901.12	-0.12	
1.910	901.87	901.72	-0.15	
1.936	902.30	902.21	-0.09	
1.967	902.63	902.63	0.00	
1.991	902.78	902.79	0.01	
2.019	902.99	903.10	0.11	
2.045	903.23	903.34	0.11	
2.078	903.57	903.62	0.05	
2.094	903.85	903.89	0.04	

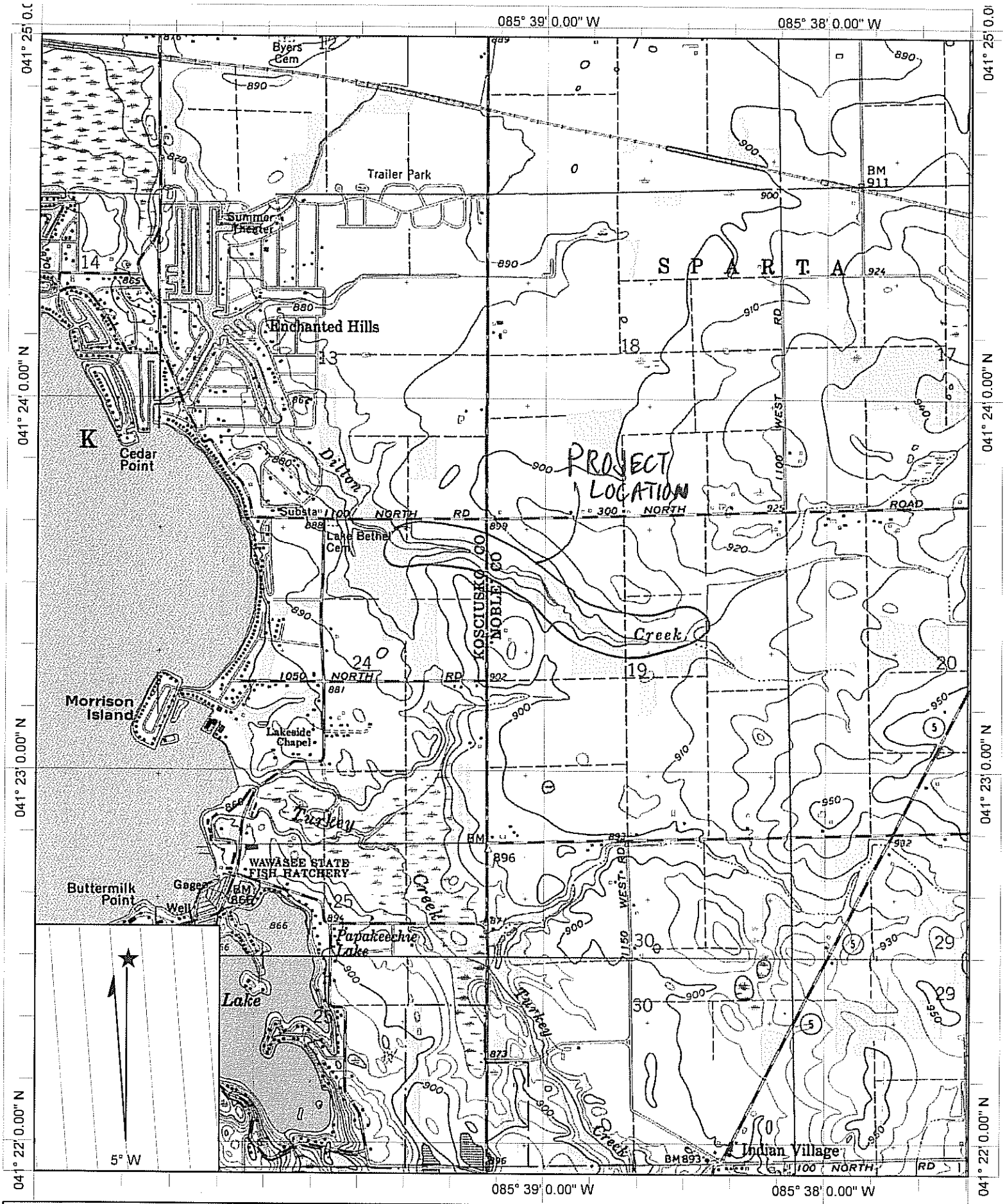
All Elevations on NAVD 88 Vertical Datum.

Study Reach Length

L=150HD^.8/S

HD Upstream=	2.11 ft
HD Downstream=	0.70 ft
Average Channel Slope=	0.62 ft/100ft
Upstream tie in Length=	440 ft
Downstream tie in Length=	180 ft

PROJECT LOCATION MAP

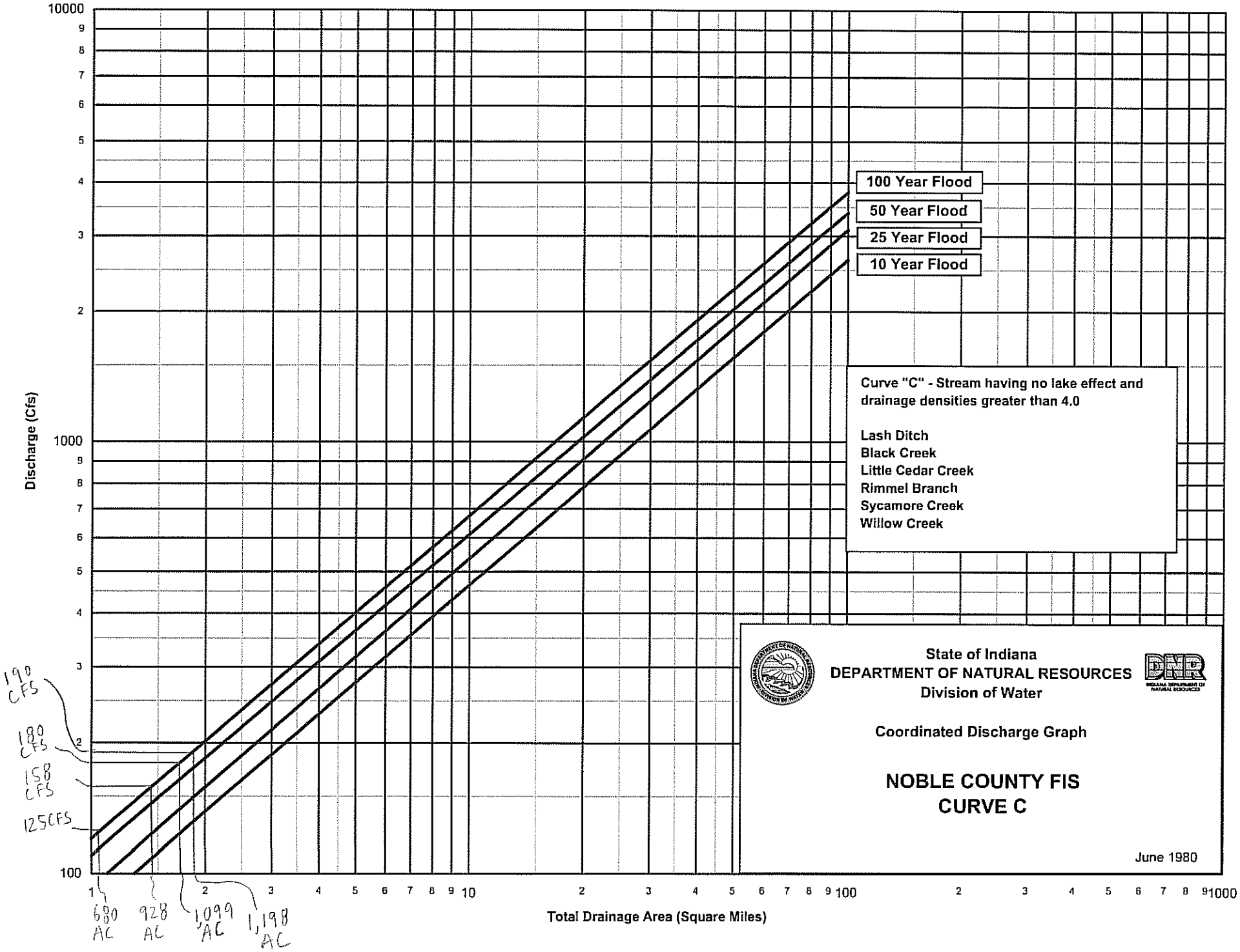


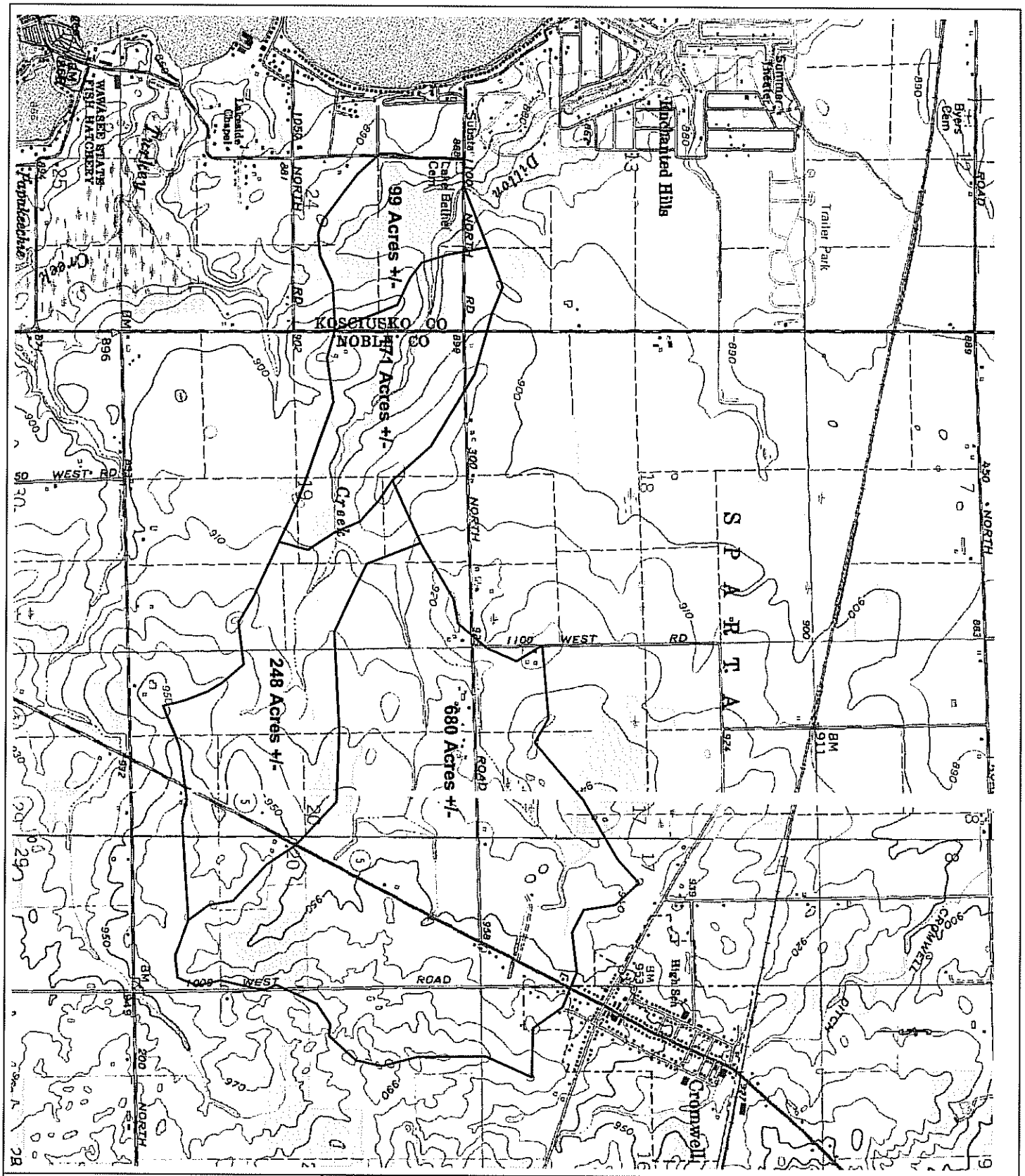
Name: LAKE WAWASEE
Date: 5/25/2010
Scale: 1 inch equals 2000 feet

Location: 041° 23' 26.7" N 085° 39' 09.1" W
Caption: Dillon Creek

Copyright (C) 1997, Maptech, Inc.

COORDINATED DISCHARGE GRAPH


100 Year Flood
50 Year Flood
25 Year Flood
10 Year Flood
Curve "C" - Stream having no lake effect and drainage densities greater than 4.0
Lash Ditch
Black Creek
Little Cedar Creek
Rimmel Branch
Sycamore Creek
Willow Creek
State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Coordinated Discharge Graph
NOBLE COUNTY FIS
CURVE C
June 1980
Discharge (Cfs)
Total Drainage Area (Square Miles)
190 CFS
180 CFS
158 CFS
125CFS
680 AC
928 AC
1,099 AC
1,198 AC



Drawn By: JLM Date: 5-21-10 Project Number: 10020 Scale: 1"=2000' (8 1/2 x 11)	Drainage Basins Dillon Creek Noble & Kosciusko Counties Indiana	BANNING ENGINEERING 853 COLUMBIA ROAD, SUITE #101 PLAINFIELD, IN 46168 BUS: (317) 707-3700, FAX: (317) 707-3800 E-MAIL: Banning@BanningEngineering.com WEB: www.BanningEngineering.com

USGS Indiana StreamStats

Streamstats Ungaged Site Report

Date: Mon May 24 2010 16:29:42 Mountain Daylight Time
Site Location: Indiana
NAD27 Latitude: 41.3945 (41 23 40)
NAD27 Longitude: -85.6614 (-85 39 41)
NAD83 Latitude: 41.3946 (41 23 40)
NAD83 Longitude: -85.6614 (-85 39 41)
Drainage Area: 1.852 mi2

Peak Flow Basin Characteristics			
Region number=1012			
100% Region 8 Peak Flow (1.85 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	1.85	0.45	3370
Percent Wetlands (percent)	2.1	0	12.1

Peak Flow Streamflow Statistics					
Statistic	Flow (ft^3/s)	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK10	77.4	41	1.2	35.5	169
PK25	87.9	40	1.7	40.7	190
PK50	95.5	40	2	44.5	205
PK100	103	40	2.4	48.1	220
PK200	110	39	2.8	51.7	233
PK500	119	39	3.4	56.2	250

CHECK-RAS OUTPUT
PROPOSED MODEL

CHECK-RAS Program: NT Check
Manning's n Value and Transition Loss Coefficient Review

Project File: S:\Projects\10020\hecras\10020_Con_FW.prj
Plan File: S:\Projects\10020\hecras\10020_Con_FW.p02
Geometry File: S:\Projects\10020\hecras\10020_Con_FW.g02
Flow File: S:\Projects\10020\hecras\10020_Con_FW.f01
Report File: S:\Projects\10020\hecras\10020_Con_FW.nt
Selected profiles: 100 Year
Date: 5/28/2010
Time: 9:57:18 AM

SECNO	STRUCTURE	NLOB	NCHL	NROB	CNTR	EXP
Dillon Creek,Dillon						
2.094		0.1	0.05	0.06	0.1	0.3
2.078		0.1	0.05	0.06	0.1	0.3
2.045		0.1	0.05	0.06	0.1	0.3
2.019		0.1	0.05	0.06	0.1	0.3
1.991		0.1	0.05	0.06	0.1	0.3
1.967		0.1	0.05	0.06	0.1	0.3
1.936		0.1	0.05	0.06	0.1	0.3
1.91		0.1	0.05	0.06	0.1	0.3
1.874		0.1	0.05	0.1	0.1	0.3
1.837		0.1	0.05	0.1	0.1	0.3
1.819		0.1	0.05	0.1	0.1	0.3
1.773		0.1	0.05	0.1	0.1	0.3
1.747		0.1	0.05	0.1	0.1	0.3
1.725		0.1	0.05	0.1	0.1	0.3
1.705		0.1	0.05	0.1	0.1	0.3
1.686		0.1	0.05	0.1	0.1	0.3
1.661		0.1	0.05	0.1	0.1	0.3
1.634		0.1	0.05	0.1	0.1	0.3
1.601		0.1	0.05	0.1	0.1	0.3
1.573		0.1	0.05	0.1	0.1	0.3
1.543		0.1	0.05	0.1	0.1	0.3
1.511		0.1	0.05	0.1	0.1	0.3
1.47		0.1	0.05	0.1	0.1	0.3
1.434		0.1	0.05	0.1	0.1	0.3
1.403		0.1	0.05	0.1	0.1	0.3
1.384		0.1	0.05	0.1	0.1	0.3
1.36		0.1	0.05	0.1	0.1	0.3
1.313		0.1	0.05	0.1	0.1	0.3
1.263		0.1	0.05	0.1	0.1	0.3
1.239		0.1	0.05	0.1	0.1	0.3
1.216		0.1	0.05	0.1	0.1	0.3
1.196		0.1	0.05	0.1	0.1	0.3
1.172		0.1	0.05	0.1	0.1	0.3
1.159		0.1	0.05	0.1	0.1	0.3
1.138		0.1	0.05	0.1	0.1	0.3
1.116		0.1	0.05	0.1	0.1	0.3
1.098		0.1	0.05	0.1	0.3	0.5
1.091		0.1	0.05	0.1	0.3	0.5
1.083	Culvert-Up	0.1	0.05	0.1	0.3	0.5
1.083	Culvert-Dn	0.1	0.05	0.1	0.3	0.5
1.075		0.1	0.05	0.1	0.3	0.5
1.051		0.1	0.05	0.1	0.1	0.3
1.03		0.1	0.05	0.1	0.1	0.3
1.005		0.1	0.05	0.1	0.1	0.3
.966		0.1	0.05	0.1	0.1	0.3
.938		0.1	0.05	0.1	0.1	0.3
.902		0.1	0.05	0.1	0.1	0.3
.873		0.1	0.05	0.1	0.1	0.3
.857		0.1	0.05	0.1	0.1	0.3
.8		0.1	0.05	0.1	0.1	0.3
.781666		0.1	0.05	0.1	0.1	0.3
.763333		0.1	0.05	0.1	0.1	0.3
.745		0.1	0.05	0.1	0.1	0.3
.723		0.1	0.05	0.1	0.1	0.3
.668		0.1	0.05	0.1	0.1	0.3
.621		0.1	0.05	0.1	0.1	0.3
.568		0.1	0.05	0.1	0.1	0.3

---Summary of Statistics---

	Minimum	Maximum
Left Overbank n Value:	0.1	0.1
Right Overbank n Value:	0.06	0.1
Channel n Value:	0.05	0.05
Contraction Coefficient:	0.1	0.3
Expansion Coefficient:	0.3	0.5

ROUGHNESS COEFFICIENT CHECK

TRANSITION LOSS COEFFICIENT CHECK

ROUGHNESS COEFFICIENT AT STRUCTURES

---END---

CHECK-RAS Program, XS Check
Cross Section Location and Alignment Review

Project File: S:\Projects\10020\hecras\10020_Con_FW.prj
Plan File: S:\Projects\10020\hecras\10020_Con_FW.p02
Geometry File: S:\Projects\10020\hecras\10020_Con_FW.g02
Flow File: S:\Projects\10020\hecras\10020_Con_FW.f01
Report File: S:\Projects\10020\hecras\10020_Con_FW.xs
Selected profiles: 100 Year
Date: 5/28/2010
Time: 9:57:41 AM

SECNO	Len Lob	Len Chl	Len Rob	TopWdthAct	Q Total	Flow Code
Dillon Creek,Dillon						
2.094	90	85	80	21.26	125	
2.078	200	170	140	21.74	125	
2.045	150	140	170	40.25	125	
2.019	145	145	145	39.82	125	
1.991	130	130	130	41.02	125	
1.967	170	165	110	49.19	125	
1.936	135	135	135	37.13	158	
1.91	190	190	190	36.91	158	
1.874	195	195	195	103.12	158	
1.837	100	95	95	102.73	158	
1.819	240	245	240	81.38	158	
1.773	140	135	140	90.38	158	
1.747	110	115	115	147.14	158	
1.725	115	105	90	21.05	158	D
1.705	93	105	105	231.4	158	
1.686	95	130	130	150.41	158	D
1.661	142	140	105	163.71	158	
1.634	185	175	125	82.12	158	
1.601	145	150	135	151.45	180	
1.573	125	160	175	105.27	180	
1.543	145	165	135	204.24	180	
1.511	170	220	190	207.78	180	
1.47	100	190	80	147.91	180	
1.434	165	160	53	156.45	180	
1.403	55	105	160	211.16	180	
1.384	120	125	40	223.21	180	
1.36	33	249.99	195	73.99	180	
1.313	67	260	210	165.79	180	
1.263	100	130	115	145.6	180	
1.239	125	120	100	64.34	180	
1.216	45	105	115	165.33	180	
1.196	27	105	115	101.56	180	
1.172	100	70	40	71.54	180	
1.159	102	110	80	31.9	180	D
1.138	130	120	93	158.98	180	
1.116	75	90	100	92.86	180	
1.098	30	40	50	62.7	180	
1.091	72	85	95	20.5	180	
1.083	Culvert #1-Up					
1.083	Culvert #1-Dn					
1.075	135	125	78	14.5	180	
1.051	110	110	115	35.27	180	D
1.03	83	135	175	31.41	180	
1.005	225	205	142	200.07	180	
.966	85	145	152	105.22	180	
.938	75	190	105	216.88	180	D
.902	160	155	40	282.71	180	
.873	69	85	75	148.28	180	
.857	262	300	185	246.15	180	
.8	46.67	96.67	93.33	188.6	180	
.781666*	46.67	96.67	93.33	225.41	180	
.763333*	46.67	96.67	93.33	207.93	180	
.745	112	115	60	77.71	190	
.723	265	295	255	155.24	190	
.668	225	245	225	313.76	190	
.621	295	280	150	431.82	190	D
.568	0	0	0	314.34	190	

B=blocked obstruction XS SC 05
C=critial depth XS SC 03
D=divided flow XS SC 01
E=cross section extended XS SC 02
K=known water-surface XS SC 04

DISTANCE CHECK

SPACING CHECK

XS SP 02 This is an interpolated cross section.
Interpolation of the cross sections should be performed only
when all of the following conditions are met.
Change in velocity head > 0.5
Conveyance Ratio < 0.7 or Conveyance Ratio > 1.4
Hydraulic Depth Ratio < 0.9 or Hydraulic Depth Ratio > 1.1
Top Wdth Act Ratio < 0.5 or Top Wdth Act Ratio > 2.0
Length Chnl Up / 500 > 1.1
Please review the file with no interpolation and select the
cross sections that meet the above criteria to consider
interpolation.
The following is the list of interpolated cross section:
Dillon Creek,Dillon
0.781666
0.763333

INTERPOLATED SECTIONS NEEDED DUE TO LIMITED TOPO AT THESE DOWNSTREAM SECTIONS.
WITHOUT INTERPOLATION MODEL DEFAULTS TO CRITICAL DEPTH

INEFFECTIVE FLOW CHECK

DISCHARGE CHECK

LOCATION CHECK

BOUNDARY CONDITION CHECK

XS BC 02 The name of the stream is Dillon Creek,Dillon
Normal S = 0.00618 is specified as the downstream boundary
for profile 100 Year

XS BC 03 Maximum number of iterations is 0
It should not be less than 20.

LATERAL WEIRS CHECK

---END---

CHECK-RAS Program: Structure Check

Project File: S:\Projects\10020\hecras\10020_Con_FW.prj
Plan File: S:\Projects\10020\hecras\10020_Con_FW.p02
Geometry File: S:\Projects\10020\hecras\10020_Con_FW.g02
Flow File: S:\Projects\10020\hecras\10020_Con_FW.f01
Report File: S:\Projects\10020\hecras\10020_Con_FW.br
Selected profiles: 100 Year
Date: 5/28/2010
Time: 9:58:04 AM

RS	MaxLoChord	MnTpRd	EGEL	WSEL	MinChEl	Structure
Dillon Creek,Dillon						
2.094			904.01	903.89	901	
2.078			903.73	903.62	900.6	
2.045			903.39	903.34	900	
2.019			903.17	903.1	900	
1.991			902.88	902.79	899.5	
1.967			902.68	902.63	899.5	
1.936			902.35	902.21	899.5	
1.91			901.85	901.72	898.6	
1.874			901.23	901.12	897.6	
1.837			900.64	900.54	897.5	
1.819			900.26	900.13	897.4	
1.773			899.78	899.73	894.3	
1.747			899.62	899.57	895.5	
1.725			899.3	899.12	895.8	
1.705			899.03	899.01	896	
1.686			898.71	898.61	897.2	
1.661			897.77	897.71	895.1	
1.634			897.08	896.94	894.4	
1.601			896.63	896.6	893.7	
1.573			896.12	895.87	893	
1.543			895.21	895.1	891.7	
1.511			894.4	894.19	890.9	
1.47			893.65	893.59	889.9	
1.434			893.26	893.15	889.8	
1.403			892.78	892.67	889	
1.384			892.48	892.43	888.7	
1.36			891.92	891.43	888.5	
1.313			890.86	890.82	888	
1.263			890.18	890	887.5	
1.239			889.49	889.28	886.5	
1.216			888.61	888.45	886.5	
1.196			888.03	887.89	885	
1.172			887.58	887.43	885	
1.159			886.97	886.65	885	
1.138			886.57	886.51	882.5	
1.116			886.42	886.37	882.5	
1.098			886.29	886.22	882.5	
1.091			886.25	886.21	879.9	
1.083	886.5	888.1	0	884.95	880	Culvert #1-Up
1.083	886.55	888.1	0	883.91	880.05	Culvert #1-Dn
1.075			884.08	883.91	880.1	
1.051			883.85	883.8	879.8	
1.03			883.67	883.54	879.75	
1.005			883.24	883.13	879.75	
0.966			882.07	881.77	879.25	
0.938			881.52	881.49	878.1	
0.902			881.3	881.28	878	
0.873			880.91	880.58	877.5	
0.857			880.32	880.24	877	
0.8			878.98	878.87	876.25	
0.781666			878.45	878.33	875.37	
0.763333			877.95	877.79	874.93	
0.745			877.49	877.36	875	
0.723			876.98	876.9	874.6	
0.668			875.53	875.48	873.4	
0.621			873.25	873.16	871.43	
0.568			871	870.96	869.7	

RIVER/REACH: Dillon Creek, Dillon
RIVER STATION: 1.083
TYPE OF STRUCTURE: Culvert

Description:	County Line Road
Distance from Upstream XS:	30
Deck/Roadway Width:	22
Weir Coefficient:	2.6

Elevation at which weir flow begins: 888.13
Weir crest shape: Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	1.098	40.00	886.22		886.29	62.7	
3	1.091	85.00	886.21		886.25	20.5	
	1.083	70.00	884.95		0	0	Culvert #1-Up
	1.083	8.00	883.91		0	0	Culvert #1-Dn
2	1.075	125.00	883.91		884.08	14.5	
1	1.051	110.00	883.8		883.85	35.27	

	Ineffective Flow, Section 3			Ineffective Flow, Section 2		
	Sta L	Sta R	Elev	Sta L	Sta R	Elev
1	0	25.75	888.13	0	70.75	888.13
2	46.25	178	888.13	85.25	291	888.13

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Culvert Group					25.75	46.25	U
					70.75	85.25	D

CULVERT:
Culvert Name: Culvert #1
Shape: Circular Rise: 6.5 Span: 0 Barrels: 1
FHWA Chart #: # 2 - Corrugated Metal Pipe C
FHWA Scale #: # 3 - Pipe projecting from fill
Solution Crit:Highest U.S. EG

UpstrmDist: 7 Length: 70 n-Value: 0.027
EntLossCoef: 0.9 ExtLossCoef: 1 CulvInvElU 880 CulvInvElD 880.05
LCntStaU: 36 RCntStaU: 36 LCntStaD 78 RCntStaD 78
Culvert Depth Blocked: 0

Culv Area: 33.18 CulvQ: 180 MinTopRd: 888.14

	LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd	
Culvert #1	32.75	39.25	888.71	888.1	888.1	886.5	U
	74.75	81.25	888.39	888.1	888.1	886.55	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Culvert #1		180	0	Highest U.S. EG	Low Flow

GEOMETRIC CHECK

TYPE OF FLOW CHECK

RS: 1.083 This is Culvert #1
CV LF 01 Type of flow is low flow because,
1. EGEL 3 of 886.25 is less than or equal to MinTopRd of 888.14.
2. EGEL 3 of 886.25 is less than MxLoCdU of 886.50.

DISTANCE CHECK

CULVERT COEFFICIENT CHECK

CULVERT CRITERIA CHECK

INEFFECTIVE FLOW CHECK

RS: 1.051 This is Section 1
ST IF 07 Ineffective flow option was considered at this section.

THIS INEFFECTIVE FLOW REPRESENTS A HIGH TOP OF BANK ELEVATION

Ineffective flow stations and elevations should be cleared from
this section, unless the ares beyond the ineffective flow stations
are not within the flow path of the stream.
This message should be ignored if this section is Section 3 of the downstream
structure.

---END

STANDARD TABLE 1
EXISTING MODEL

HEC-RAS Plan: Dillon Creek River: Dillon Creek Reach: Dillon Profile: 100 Year

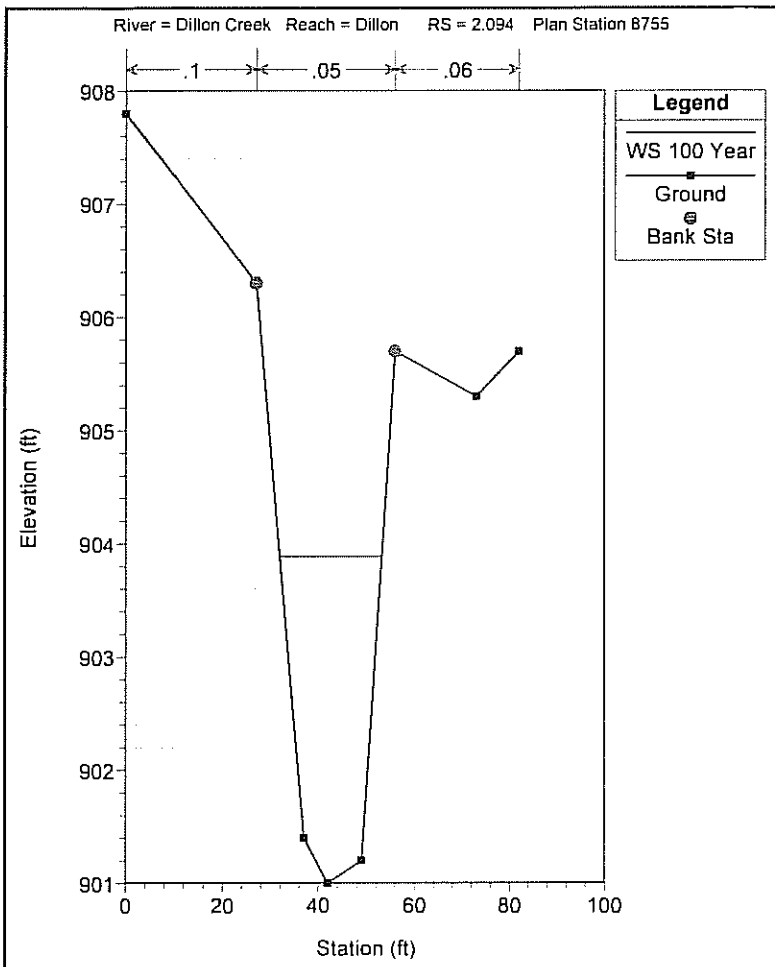
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Dillon	2.094	100 Year	125	901.00	903.85		904.0	0.003693	2.83	44	21	0.35
Dillon	2.078	100 Year	125	900.60	903.57		903.7	0.003151	2.68	47	22	0.32
Dillon	2.045	100 Year	125	899.70	903.23		903.3	0.001619	2.11	59	24	0.23
Dillon	2.019	100 Year	125	899.50	902.99		903.1	0.001695	2.16	58	23	0.24
Dillon	1.991	100 Year	125	898.40	902.78	900.38	902.8	0.001332	2.06	61	21	0.21
Dillon	1.967	100 Year	125	899.10	902.63	900.50	902.7	0.001092	1.83	68	24	0.19
Dillon	1.936	100 Year	158	898.80	902.30	900.53	902.4	0.002519	2.65	60	100	0.29
Dillon	1.910	100 Year	158	898.60	901.87	900.40	902.0	0.003488	2.99	53	159	0.34
Dillon	1.874	100 Year	158	897.60	901.24	899.78	901.4	0.003247	2.96	93	168	0.33
Dillon	1.837	100 Year	158	897.50	900.57	899.39	900.7	0.003692	2.91	84	104	0.35
Dillon	1.819	100 Year	158	897.40	900.13	899.35	900.3	0.005319	3.29	74	81	0.41
Dillon	1.773	100 Year	158	894.30	899.73		899.8	0.000939	1.96	103	90	0.19
Dillon	1.747	100 Year	158	895.50	899.57	898.00	899.6	0.001636	2.12	140	147	0.23
Dillon	1.725	100 Year	158	895.80	899.12	898.00	899.3	0.005041	3.40	46	106	0.40
Dillon	1.705	100 Year	158	896.00	899.01		899.0	0.001198	1.56	214	231	0.20
Dillon	1.686	100 Year	158	897.20	898.61		898.7	0.017648	3.58	86	150	0.67
Dillon	1.661	100 Year	158	895.10	897.71		897.8	0.004390	2.89	133	164	0.37
Dillon	1.634	100 Year	158	894.40	896.94		897.1	0.005777	3.15	69	82	0.43
Dillon	1.601	100 Year	180	893.70	896.60		896.6	0.001608	1.96	193	151	0.24
Dillon	1.573	100 Year	180	893.00	895.87	895.51	896.1	0.010579	4.35	64	180	0.58
Dillon	1.543	100 Year	180	891.70	895.10		895.2	0.003529	3.03	130	204	0.34
Dillon	1.511	100 Year	180	890.90	894.19	893.43	894.4	0.007453	4.17	94	208	0.48
Dillon	1.470	100 Year	180	889.90	893.58		893.6	0.001944	2.46	157	148	0.26
Dillon	1.434	100 Year	180	889.80	893.12		893.2	0.003805	3.31	125	153	0.36
Dillon	1.403	100 Year	180	888.50	892.63		892.7	0.003307	3.09	128	208	0.33
Dillon	1.384	100 Year	180	888.70	892.37		892.4	0.002327	2.59	175	222	0.28
Dillon	1.360	100 Year	180	888.00	891.60		891.9	0.010679	4.68	56	109	0.58
Dillon	1.313	100 Year	180	888.00	890.60	890.01	890.7	0.003963	2.77	146	162	0.35
Dillon	1.263	100 Year	180	886.50	889.69		889.8	0.003796	3.12	61	51	0.36
Dillon	1.239	100 Year	180	885.80	889.07		889.3	0.004926	3.76	59	53	0.42
Dillon	1.216	100 Year	180	885.00	887.95	887.26	888.4	0.012522	5.22	35	87	0.62
Dillon	1.196	100 Year	180	884.20	887.12	886.16	887.3	0.007031	3.81	47	26	0.47
Dillon	1.172	100 Year	180	883.30	886.64	885.28	886.8	0.003809	3.11	58	30	0.36
Dillon	1.159	100 Year	180	882.80	886.54	884.48	886.6	0.001550	2.13	84	69	0.23
Dillon	1.138	100 Year	180	882.00	886.38		886.4	0.001311	2.11	120	150	0.22
Dillon	1.116	100 Year	180	881.60	886.28	883.63	886.3	0.000827	1.66	130	92	0.17
Dillon	1.098	100 Year	180	880.00	886.22		886.3	0.000533	1.69	128	60	0.14
Dillon	1.091	100 Year	180	879.90	886.20	882.08	886.2	0.000345	1.62	111	75	0.12
Dillon	1.083		Culvert									
Dillon	1.075	100 Year	180	880.10	883.78	881.87	884.0	0.002441	3.45	52	27	0.32
Dillon	1.051	100 Year	180	879.80	883.65	881.40	883.7	0.001077	1.87	96	35	0.20
Dillon	1.030	100 Year	180	879.20	883.37	881.89	883.5	0.002982	3.05	63	72	0.32
Dillon	1.005	100 Year	180	879.25	882.82		883.0	0.004968	3.42	64	134	0.41
Dillon	0.966	100 Year	180	878.25	881.73		881.9	0.005538	3.54	58	94	0.43
Dillon	0.938	100 Year	180	878.10	881.44		881.5	0.001644	1.90	205	212	0.23
Dillon	0.902	100 Year	180	877.50	881.19		881.2	0.001659	1.95	230	280	0.24
Dillon	0.873	100 Year	180	877.00	880.50	879.90	880.8	0.009706	4.56	50	148	0.56
Dillon	0.857	100 Year	180	876.50	880.16	879.88	880.3	0.003951	3.02	147	244	0.36
Dillon	0.800	100 Year	180	875.80	878.85	878.63	879.0	0.005768	3.23	122	243	0.43
Dillon	.781666*	100 Year	180	875.37	878.30		878.4	0.006605	3.49	112	224	0.46
Dillon	.763333*	100 Year	180	874.93	877.72		877.9	0.006086	3.61	89	187	0.45
Dillon	0.745	100 Year	190	874.50	877.32	876.44	877.4	0.003900	3.25	97	153	0.38
Dillon	0.723	100 Year	190	874.60	876.90		877.0	0.004507	3.00	137	155	0.39
Dillon	0.668	100 Year	190	873.40	875.48	875.16	875.5	0.006006	2.57	170	314	0.41
Dillon	0.621	100 Year	190	871.43	873.16	873.12	873.2	0.018884	3.81	143	432	0.70
Dillon	0.568	100 Year	190	869.70	870.96	870.54	871.0	0.006185	2.51	192	314	0.42

STANDARD TABLE 1
PROPOSED MODEL

HEC-RAS Plan: Proposed River: Dillon Creek Reach: Dillon Profile: 100 Year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Dillon	2.094	100 Year	125	901.00	903.89		904.0	0.003529	2.79	45	21	0.34
Dillon	2.078	100 Year	125	900.60	903.62		903.7	0.002954	2.62	48	22	0.31
Dillon	2.045	100 Year	125	900.00	903.34		903.4	0.001317	1.96	72	40	0.21
Dillon	2.019	100 Year	125	900.00	903.10		903.2	0.001830	2.21	63	40	0.25
Dillon	1.991	100 Year	125	899.50	902.79		902.9	0.002203	2.43	57	41	0.27
Dillon	1.967	100 Year	125	899.50	902.63		902.7	0.001044	1.76	84	49	0.19
Dillon	1.936	100 Year	158	899.50	902.21	901.11	902.3	0.004147	3.13	58	105	0.37
Dillon	1.910	100 Year	158	898.60	901.72	900.40	901.8	0.003295	2.94	61	138	0.33
Dillon	1.874	100 Year	158	897.60	901.12	899.78	901.2	0.003130	2.98	90	115	0.33
Dillon	1.837	100 Year	158	897.50	900.54	899.44	900.6	0.002939	2.75	101	103	0.32
Dillon	1.819	100 Year	158	897.40	900.13	899.35	900.3	0.005319	3.29	74	81	0.41
Dillon	1.773	100 Year	158	894.30	899.73		899.8	0.000939	1.96	103	90	0.19
Dillon	1.747	100 Year	158	895.50	899.57	898.00	899.6	0.001636	2.12	140	147	0.23
Dillon	1.725	100 Year	158	895.80	899.12	898.00	899.3	0.005041	3.40	46	106	0.40
Dillon	1.705	100 Year	158	896.00	899.01		899.0	0.001198	1.56	214	231	0.20
Dillon	1.686	100 Year	158	897.20	898.61		898.7	0.017648	3.58	86	150	0.67
Dillon	1.661	100 Year	158	895.10	897.71		897.8	0.004390	2.89	133	164	0.37
Dillon	1.634	100 Year	158	894.40	896.94		897.1	0.005777	3.15	69	82	0.43
Dillon	1.601	100 Year	180	893.70	896.60		896.6	0.001608	1.96	193	151	0.24
Dillon	1.573	100 Year	180	893.00	895.87	895.51	896.1	0.010585	4.35	64	180	0.58
Dillon	1.543	100 Year	180	891.70	895.10		895.2	0.003525	3.02	130	204	0.34
Dillon	1.511	100 Year	180	890.90	894.19	893.43	894.4	0.007481	4.17	94	208	0.48
Dillon	1.470	100 Year	180	889.90	893.59		893.6	0.001917	2.44	158	148	0.26
Dillon	1.434	100 Year	180	889.80	893.15		893.3	0.003573	3.23	129	156	0.35
Dillon	1.403	100 Year	180	889.00	892.67		892.8	0.003457	3.08	133	211	0.34
Dillon	1.384	100 Year	180	888.70	892.43		892.5	0.001989	2.43	188	223	0.26
Dillon	1.360	100 Year	180	888.50	891.43	891.14	891.9	0.019271	5.72	38	74	0.77
Dillon	1.313	100 Year	180	888.00	890.82	890.01	890.9	0.002181	2.21	182	166	0.27
Dillon	1.263	100 Year	180	887.50	890.00		890.2	0.005491	3.43	70	146	0.43
Dillon	1.239	100 Year	180	886.50	889.28	888.32	889.5	0.005191	3.78	66	75	0.43
Dillon	1.216	100 Year	180	886.50	888.45	888.34	888.6	0.010613	4.11	101	165	0.57
Dillon	1.196	100 Year	180	885.00	887.89	886.58	888.0	0.003909	3.05	66	204	0.36
Dillon	1.172	100 Year	180	885.00	887.43	886.43	887.6	0.004878	3.24	68	104	0.40
Dillon	1.159	100 Year	180	885.00	886.65	886.36	887.0	0.017928	4.55	40	76	0.72
Dillon	1.138	100 Year	180	882.50	886.51		886.6	0.001162	2.01	137	159	0.21
Dillon	1.116	100 Year	180	882.50	886.37	884.35	886.4	0.001288	1.88	120	93	0.21
Dillon	1.098	100 Year	180	882.50	886.22		886.3	0.001575	2.35	107	63	0.24
Dillon	1.091	100 Year	180	879.90	886.21	882.08	886.2	0.000343	1.62	111	76	0.12
Dillon	1.083		Culvert									
Dillon	1.075	100 Year	180	880.10	883.91	881.87	884.1	0.002179	3.33	54	27	0.30
Dillon	1.051	100 Year	180	879.80	883.80	881.40	883.8	0.000930	1.78	101	49	0.19
Dillon	1.030	100 Year	180	879.75	883.54	882.05	883.7	0.002780	3.00	66	93	0.32
Dillon	1.005	100 Year	180	879.75	883.13		883.2	0.003407	2.89	114	200	0.34
Dillon	0.966	100 Year	180	879.25	881.77	881.31	882.1	0.011993	4.46	51	105	0.62
Dillon	0.938	100 Year	180	878.10	881.49		881.5	0.001487	1.82	214	217	0.22
Dillon	0.902	100 Year	180	878.00	881.28		881.3	0.001424	1.85	255	283	0.22
Dillon	0.873	100 Year	180	877.50	880.58	880.06	880.9	0.012479	4.88	64	272	0.63
Dillon	0.857	100 Year	180	877.00	880.24	879.96	880.3	0.003733	2.80	163	246	0.35
Dillon	0.800	100 Year	180	876.25	878.87	878.69	879.0	0.007066	3.31	122	245	0.47
Dillon	.781666*	100 Year	180	875.37	878.33		878.5	0.005931	3.35	118	225	0.44
Dillon	.763333*	100 Year	180	874.93	877.79		878.0	0.005521	3.53	103	208	0.43
Dillon	0.745	100 Year	190	875.00	877.36	876.59	877.5	0.004732	3.37	95	165	0.41
Dillon	0.723	100 Year	190	874.60	876.90		877.0	0.004507	3.00	137	155	0.39
Dillon	0.668	100 Year	190	873.40	875.48	875.16	875.5	0.006006	2.57	170	314	0.41
Dillon	0.621	100 Year	190	871.43	873.16	873.12	873.2	0.018884	3.81	143	432	0.70
Dillon	0.568	100 Year	190	869.70	870.96	870.54	871.0	0.006185	2.51	192	314	0.42

CROSS-SECTIONS
PROPOSED MODEL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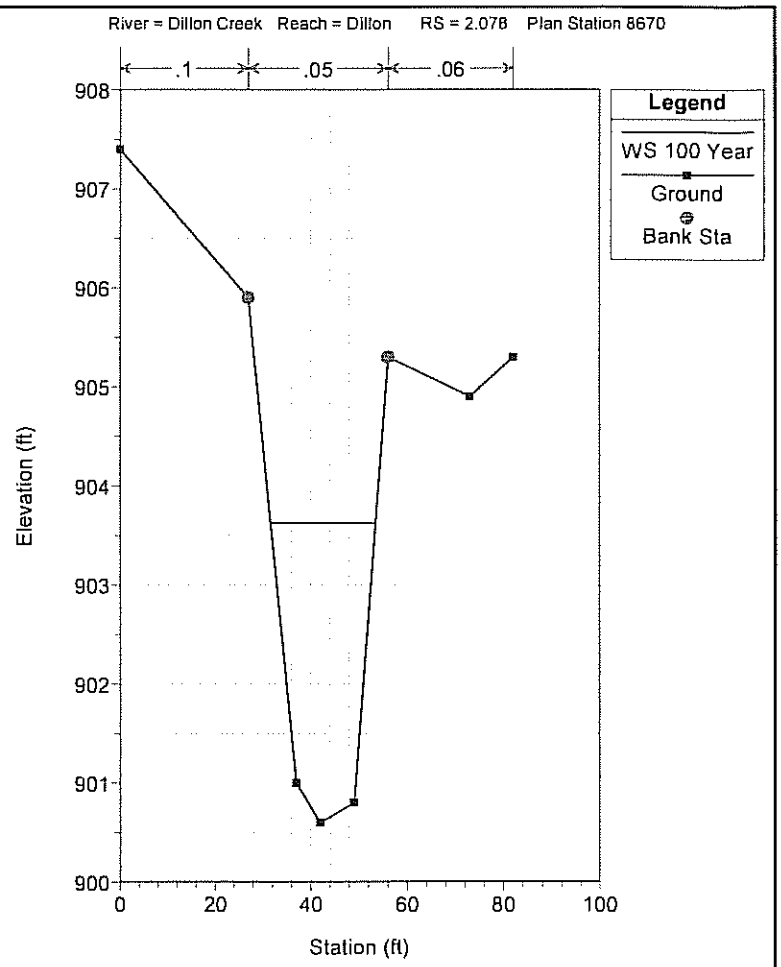
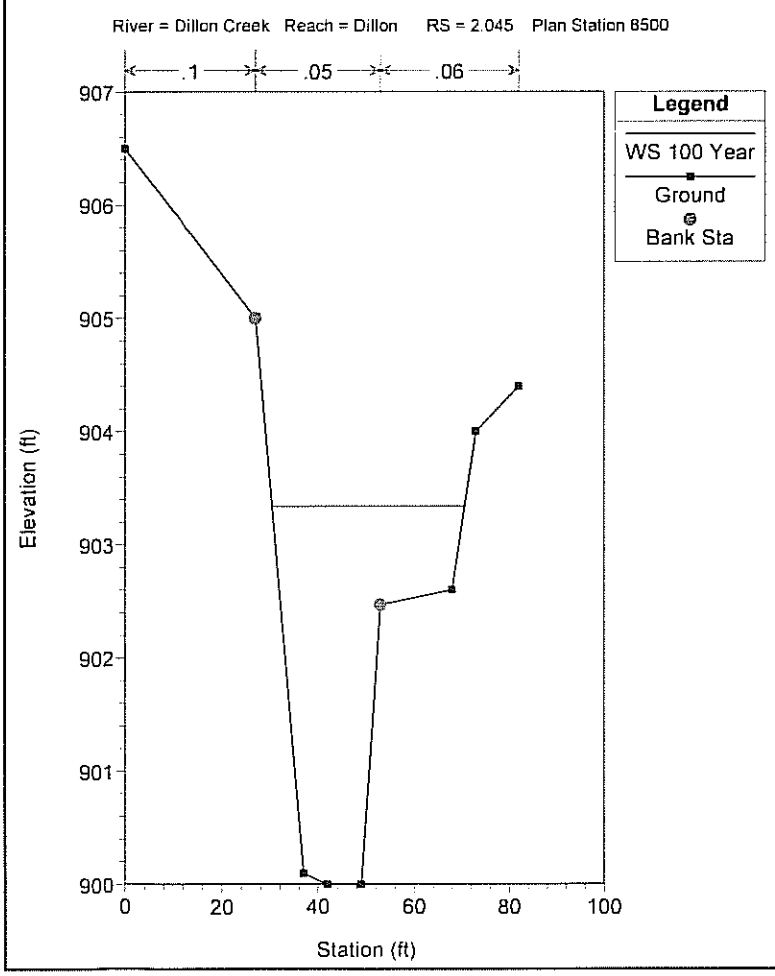
.1
.05
.06
Legend
WS 100 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


River = Dillon Creek Reach = Dillon RS = 2.078 Plan Station 8670
.1
.05
.06
Legend
WS 100 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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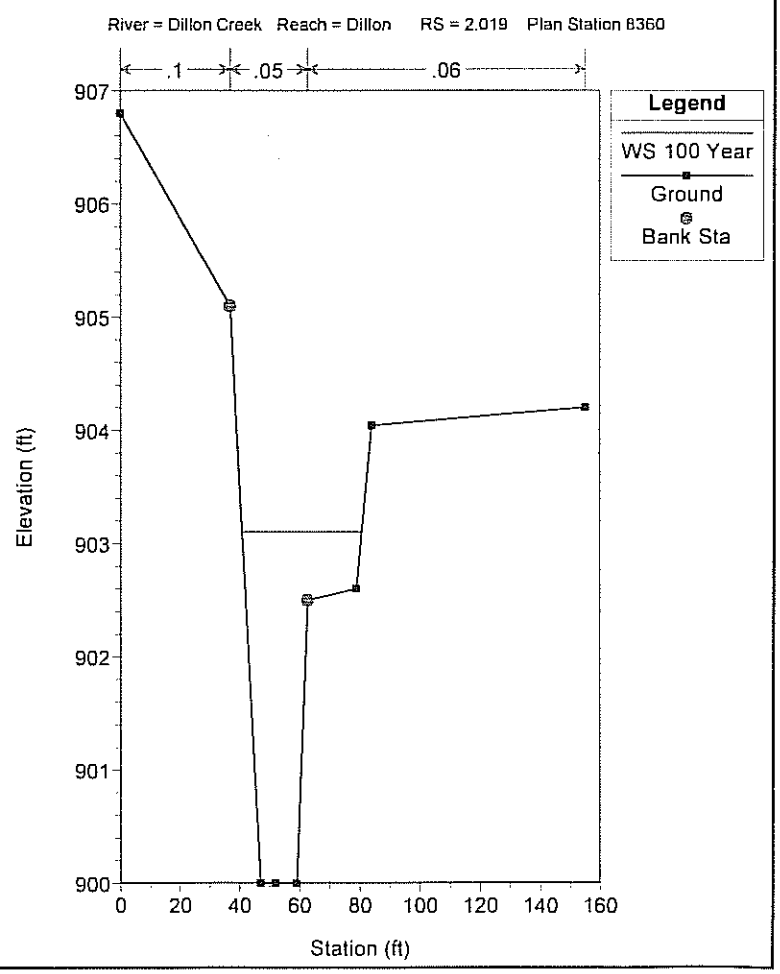
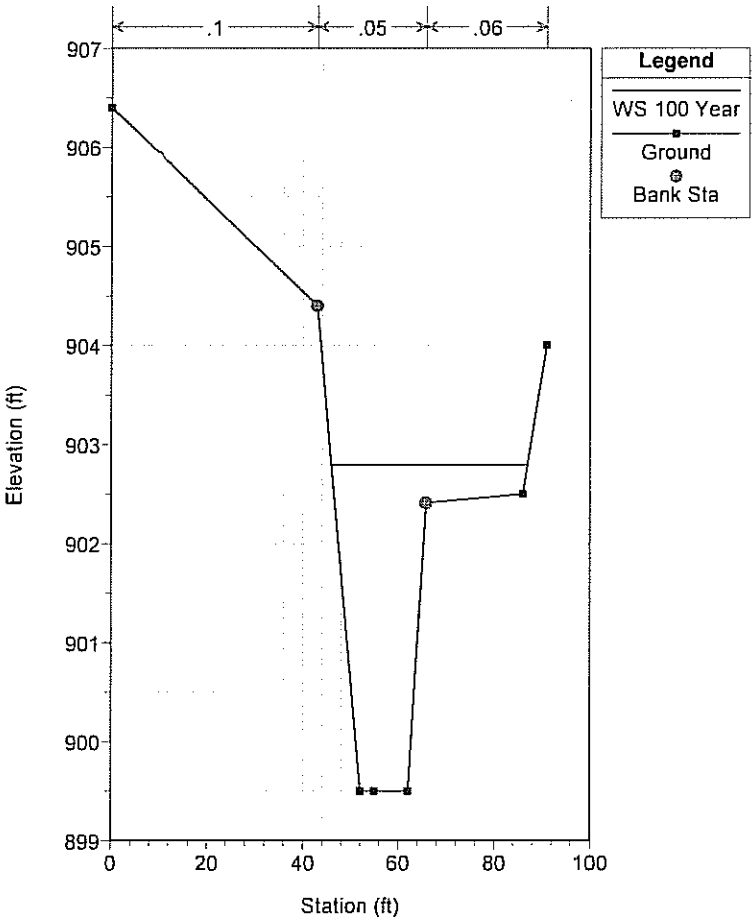
.1
.05
.06
Legend
WS 100 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


River = Dillon Creek Reach = Dillon RS = 2.019 Plan Station 8360
.1
.05
.06
Legend
WS 100 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

River = Dillon Creek Reach = Dillon RS = 1.991 Plan Station 8215



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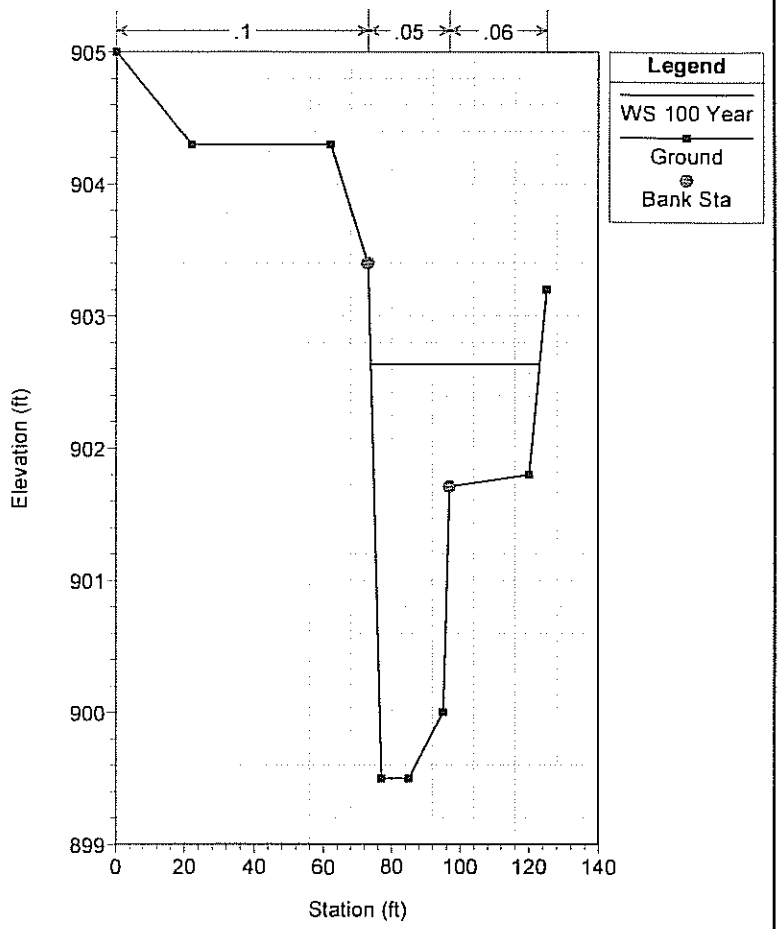

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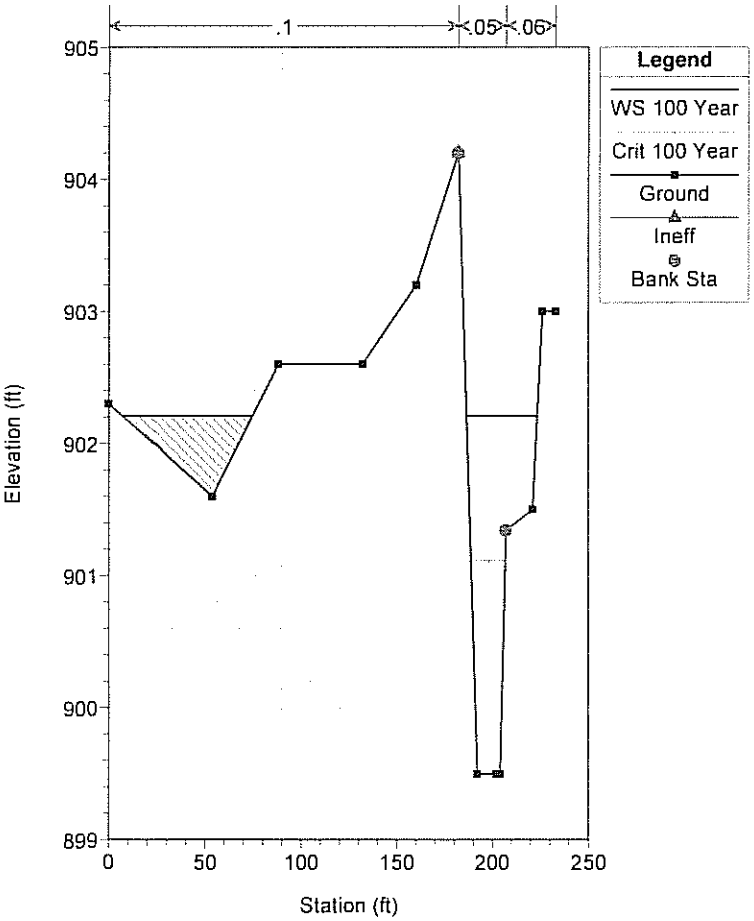
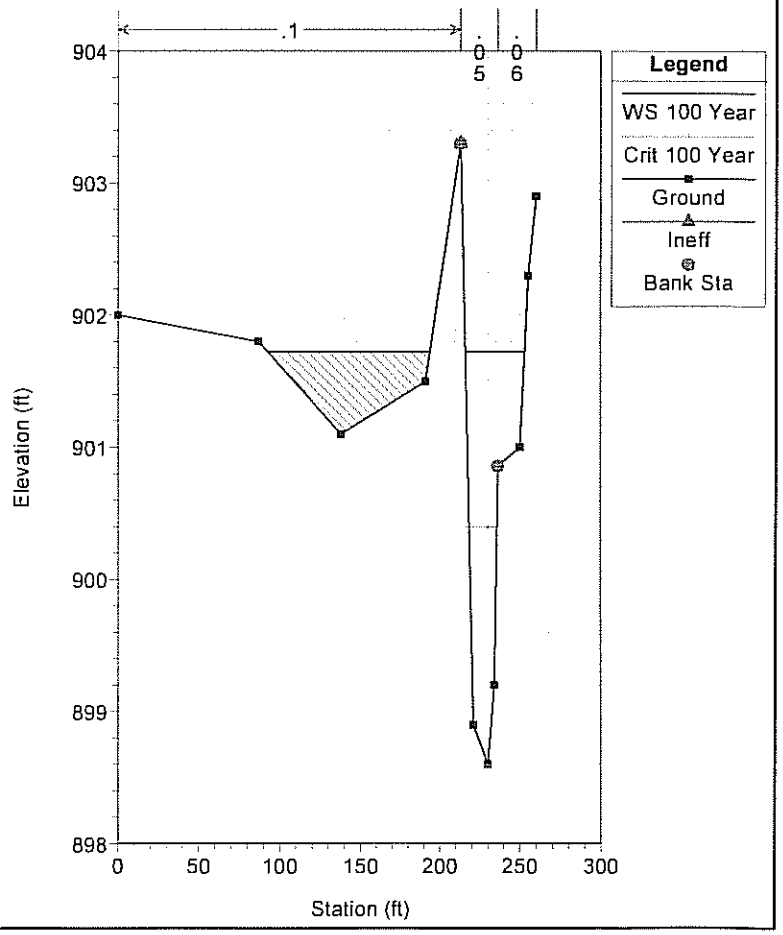


River = Dillon Creek Reach = Dillon RS = 1.910 Plan Station 7785



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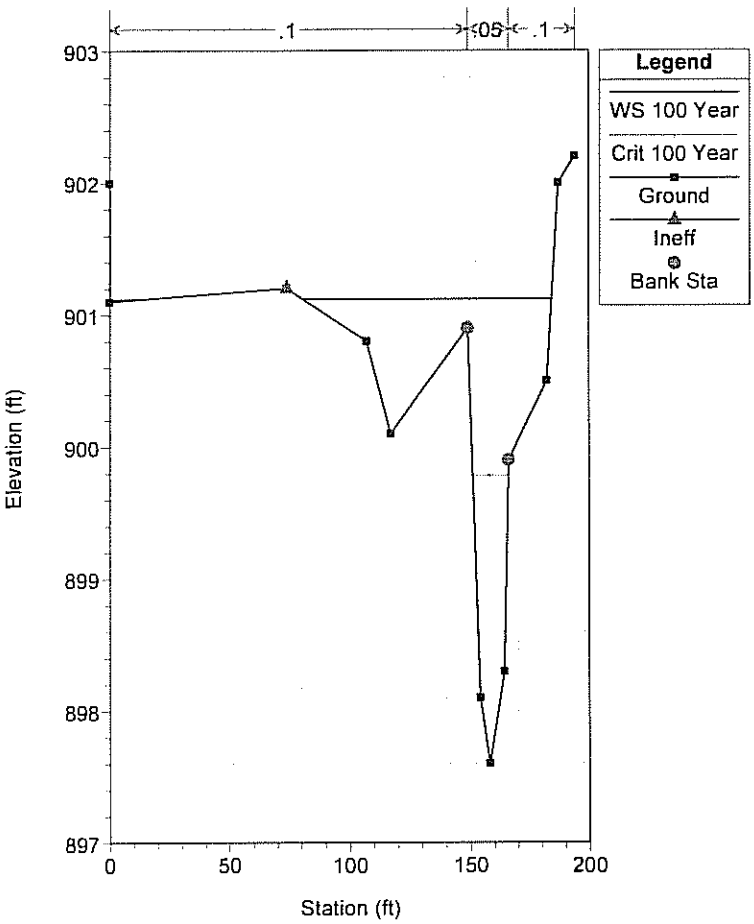

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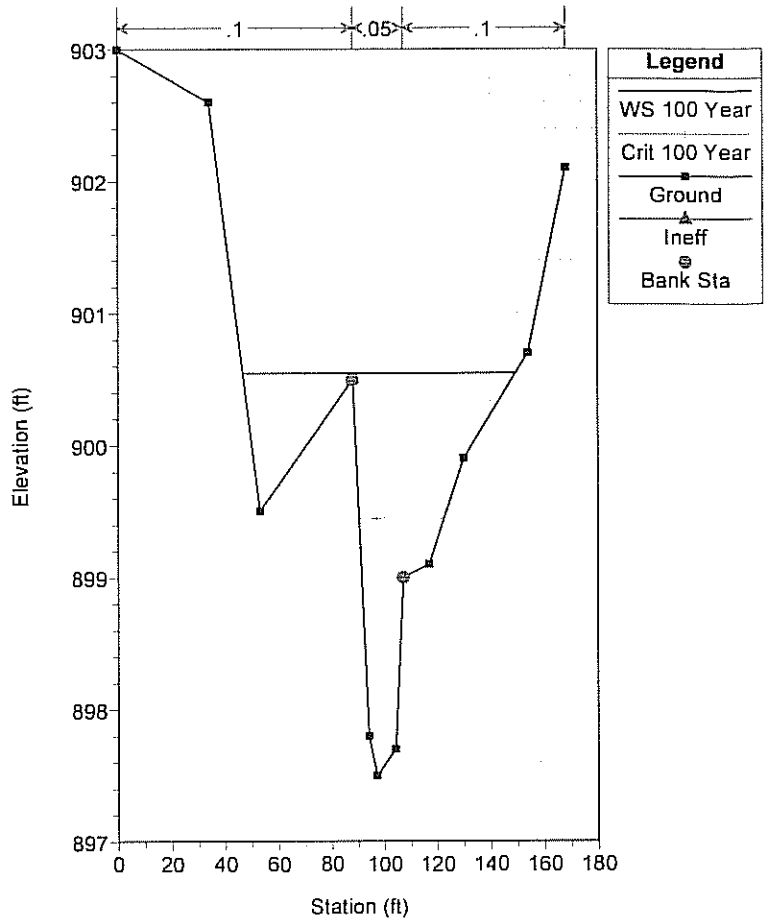

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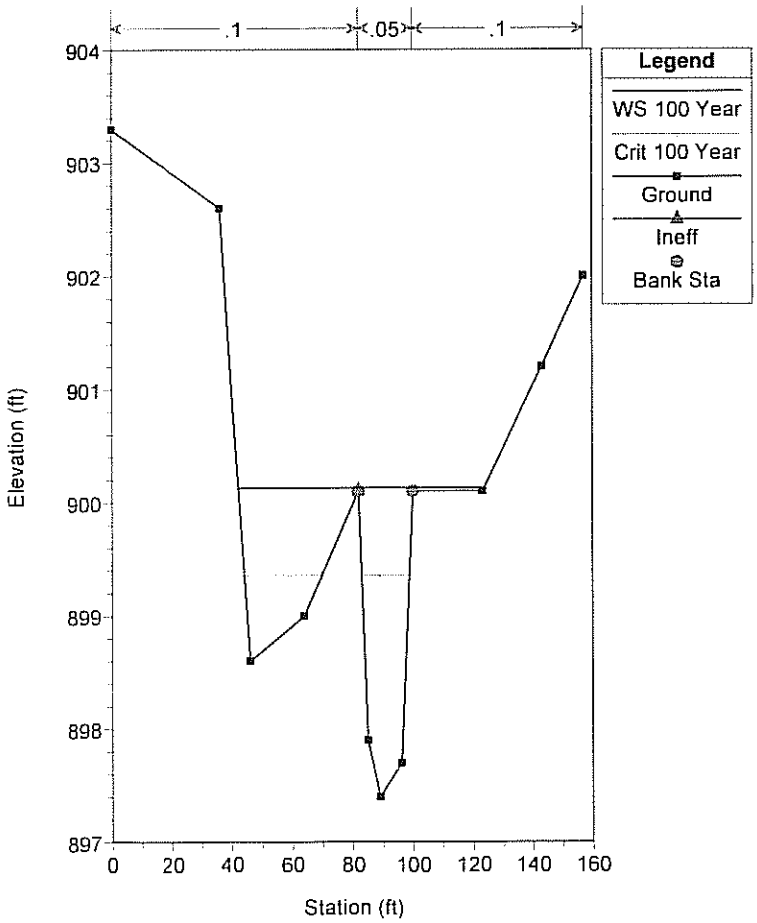

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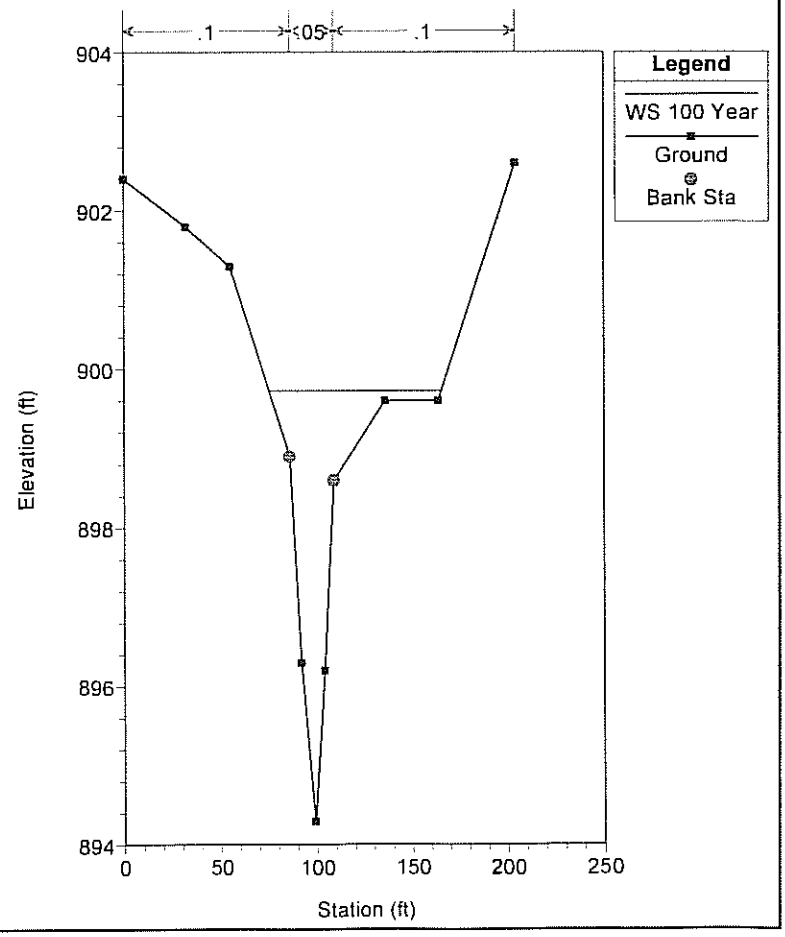

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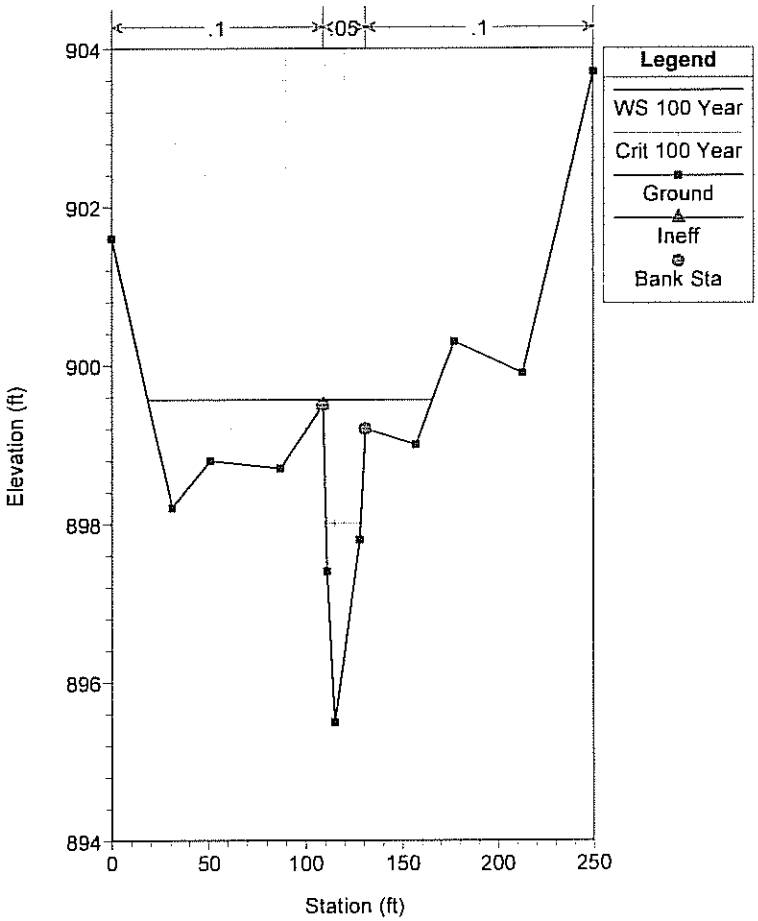

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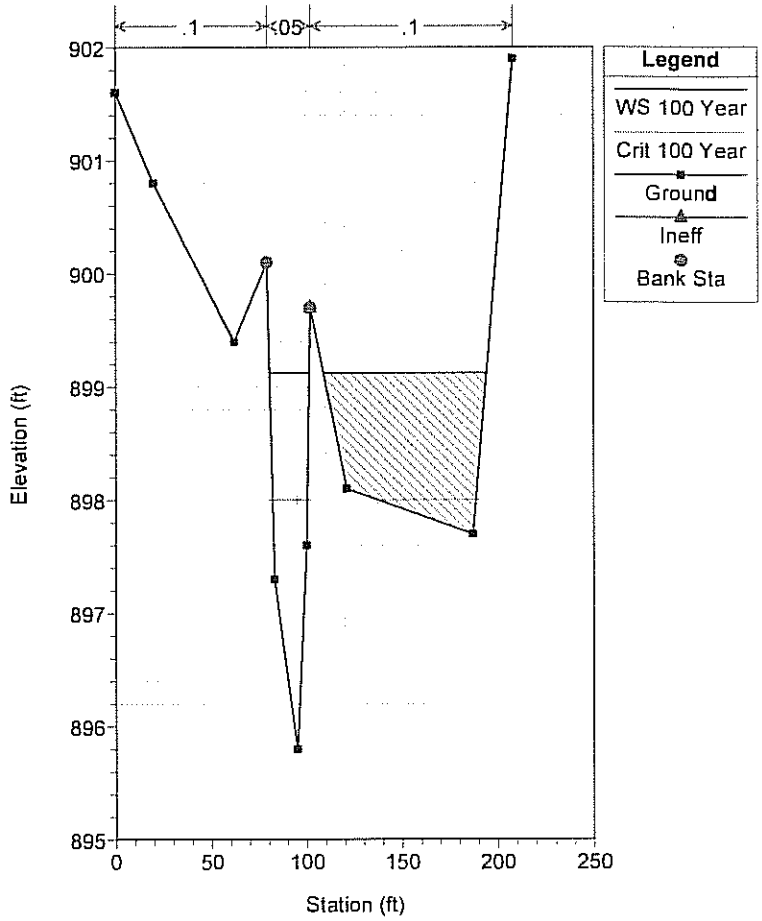

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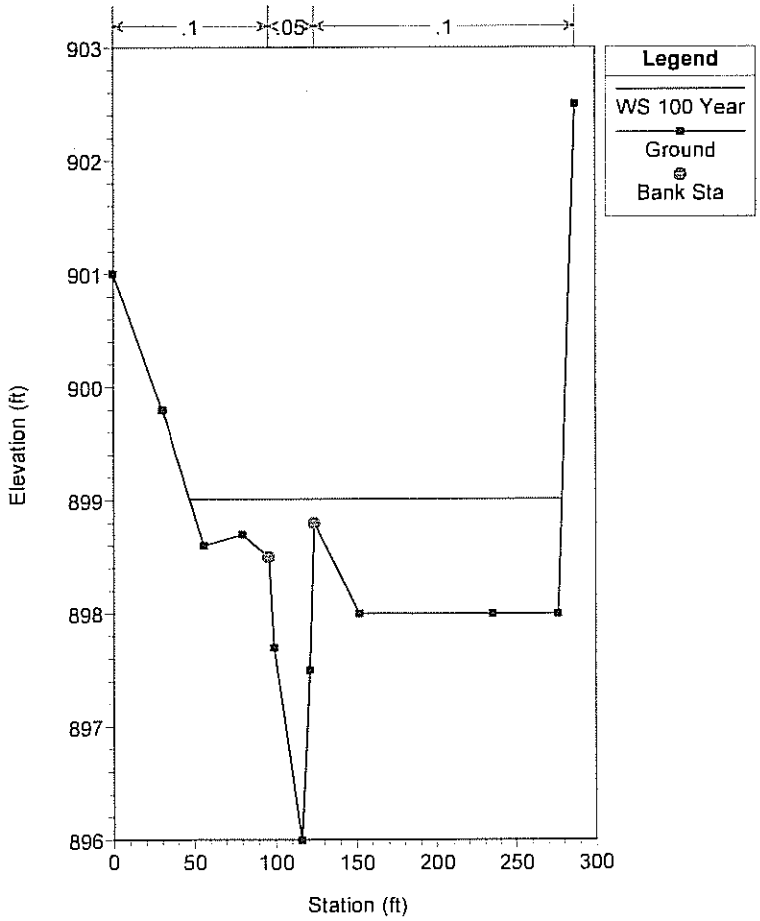
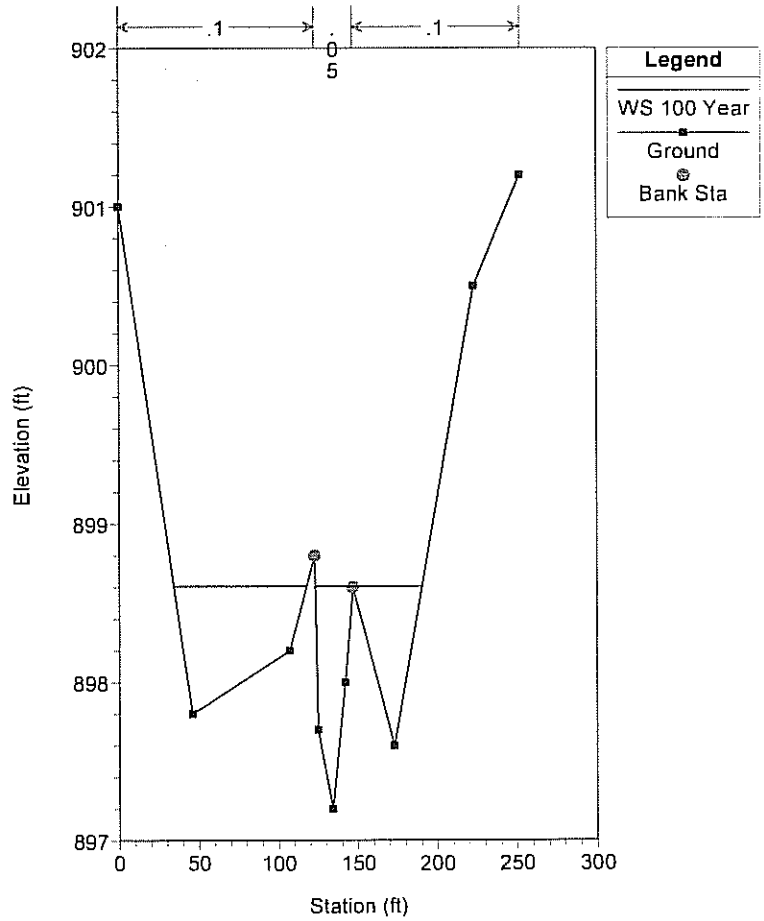


River = Dillon Creek Reach = Dillon RS = 1.686 Plan Station 6600



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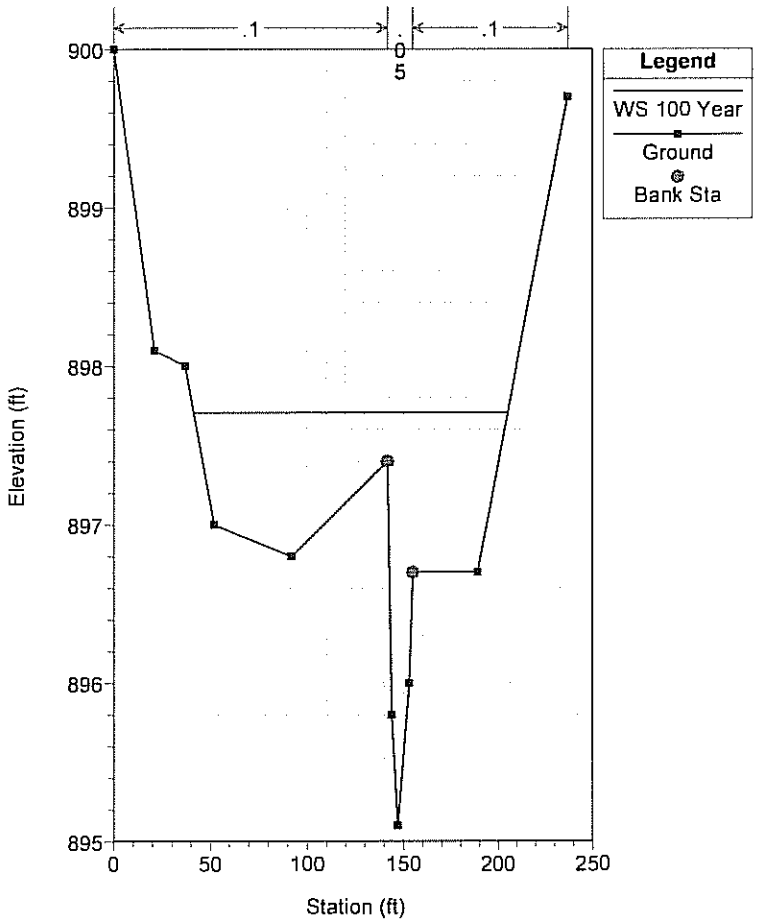
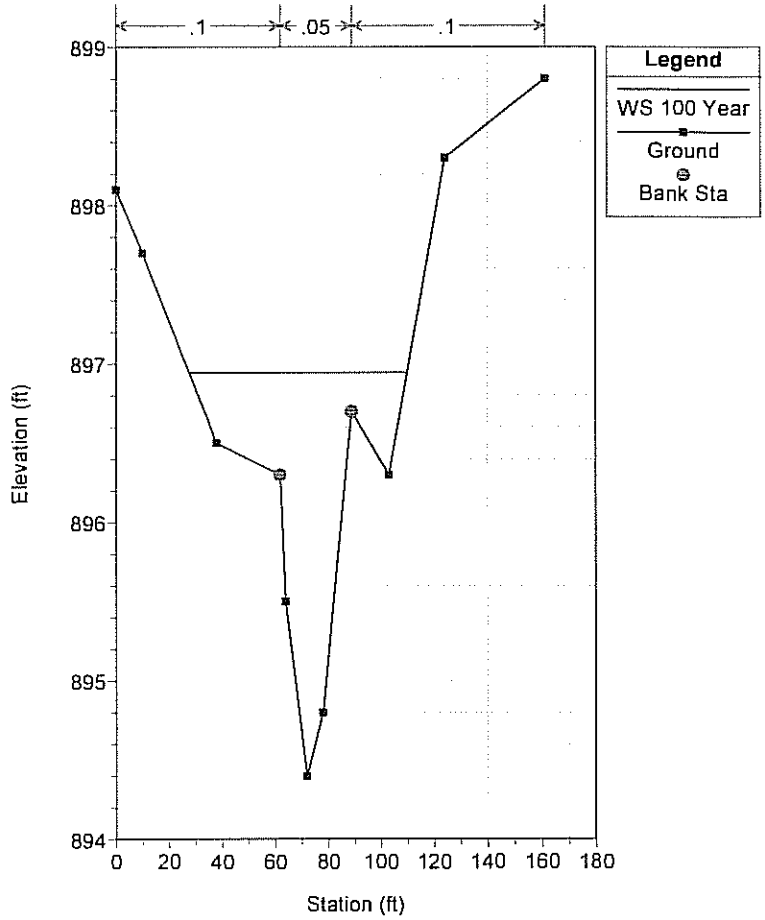


River = Dillon Creek Reach = Dillon RS = 1.634 Plan Station 6330



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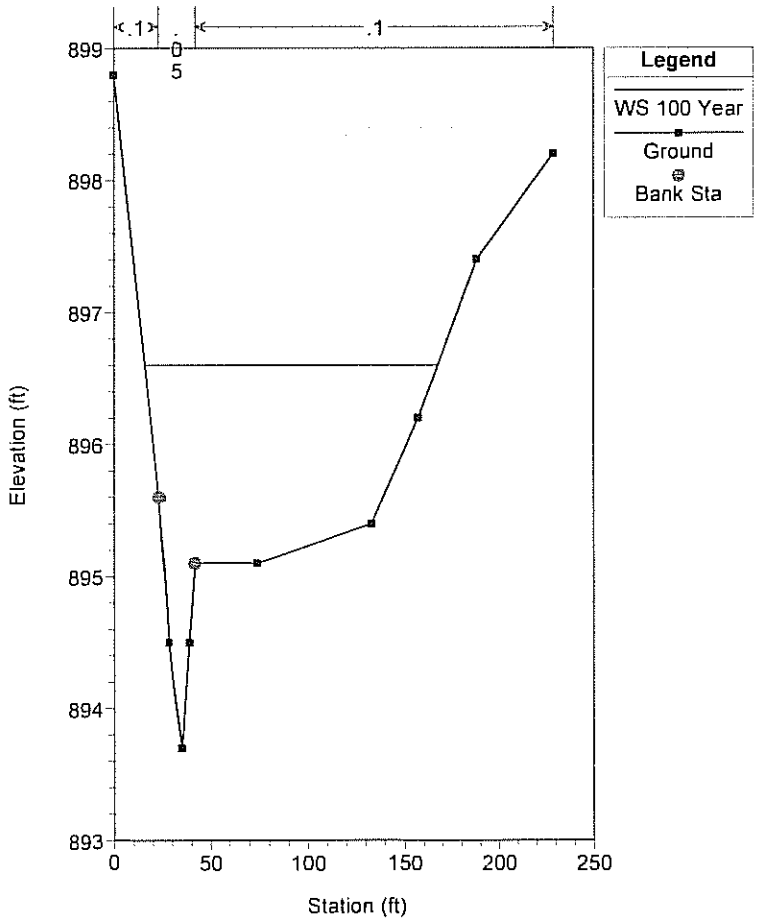

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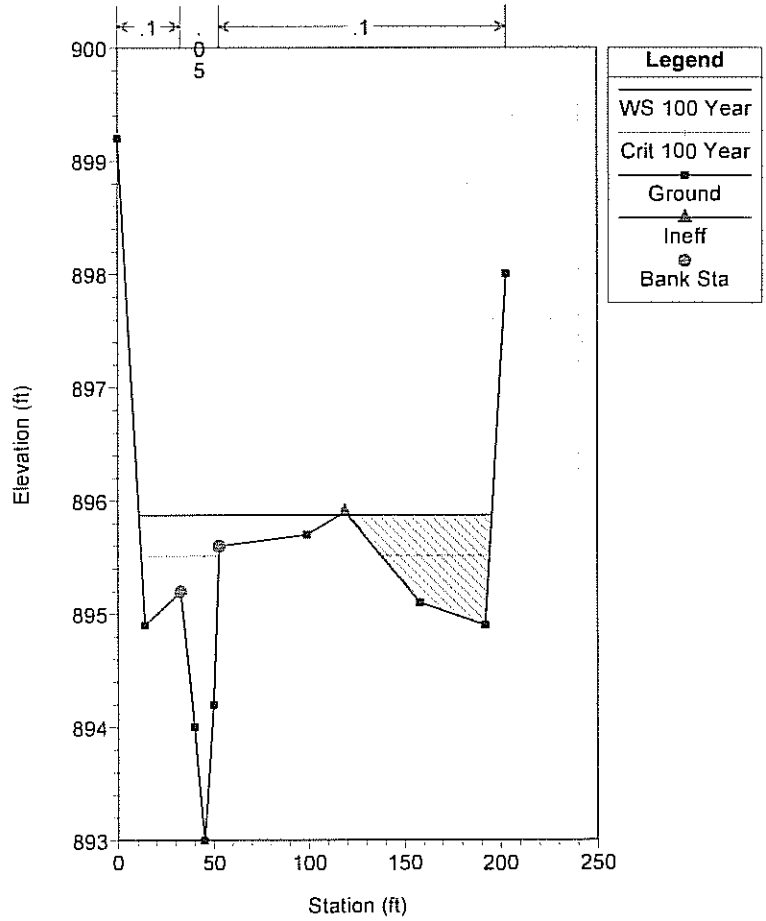
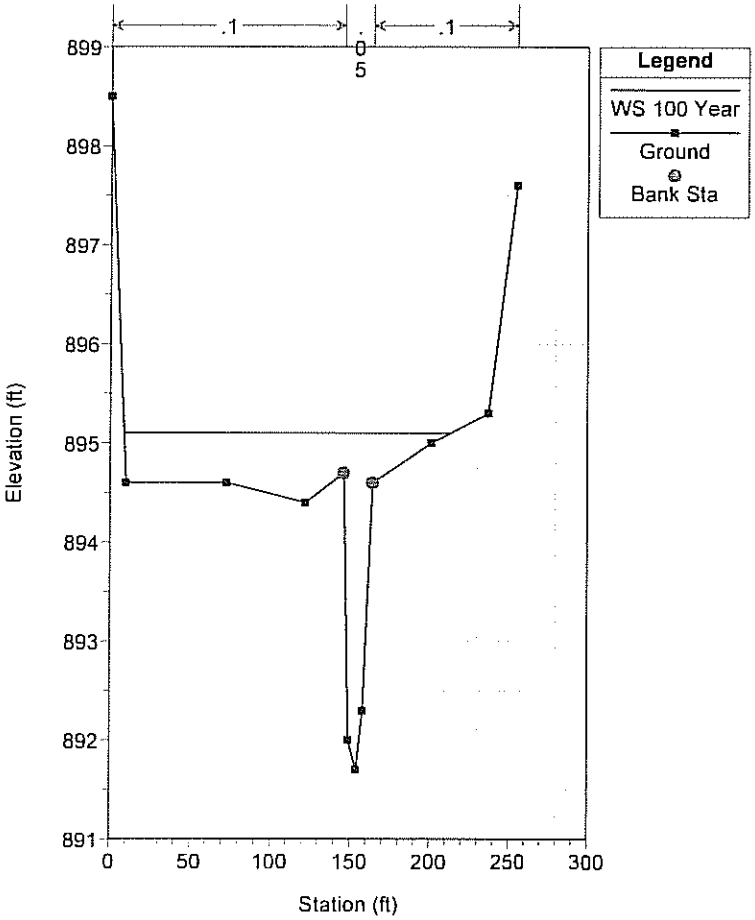
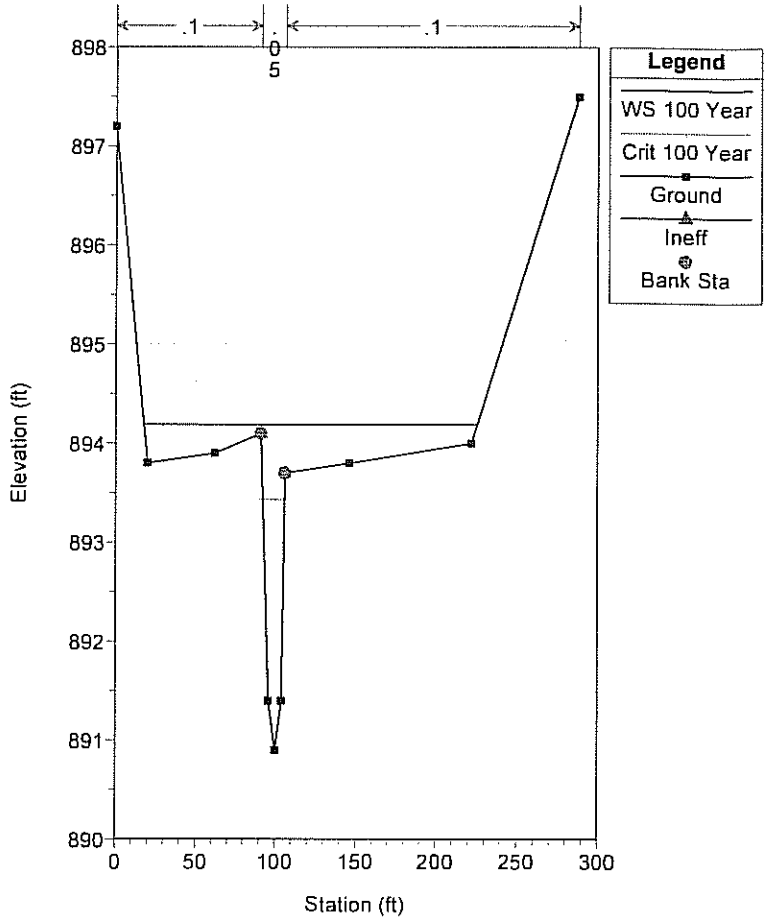


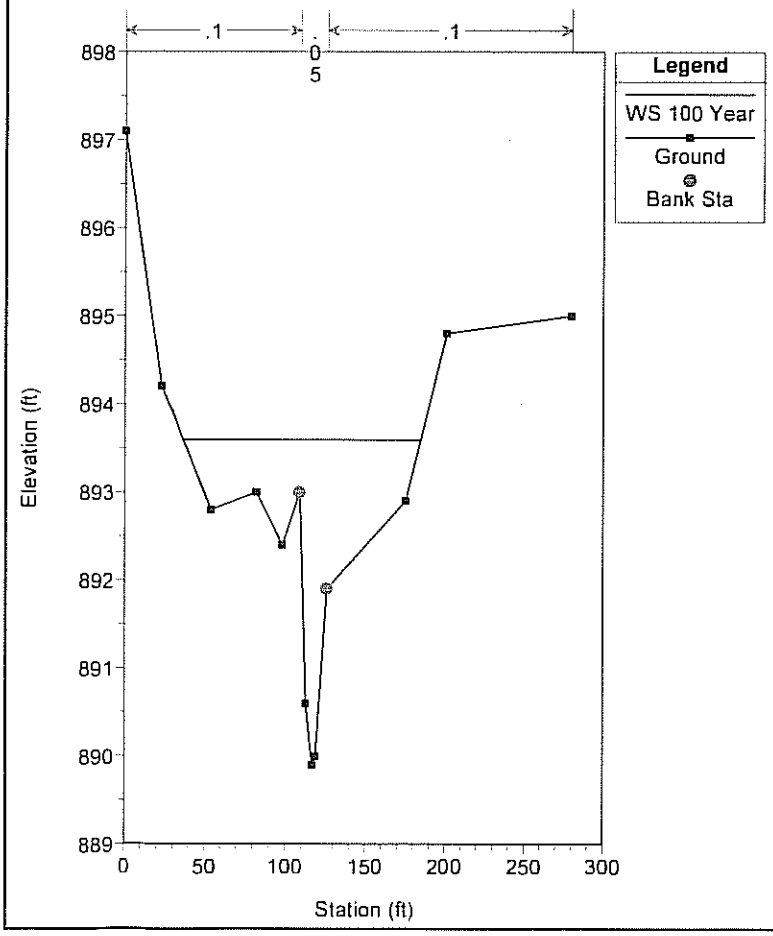
River = Dillon Creek Reach = Dillon RS = 1.543 Plan Station 5845



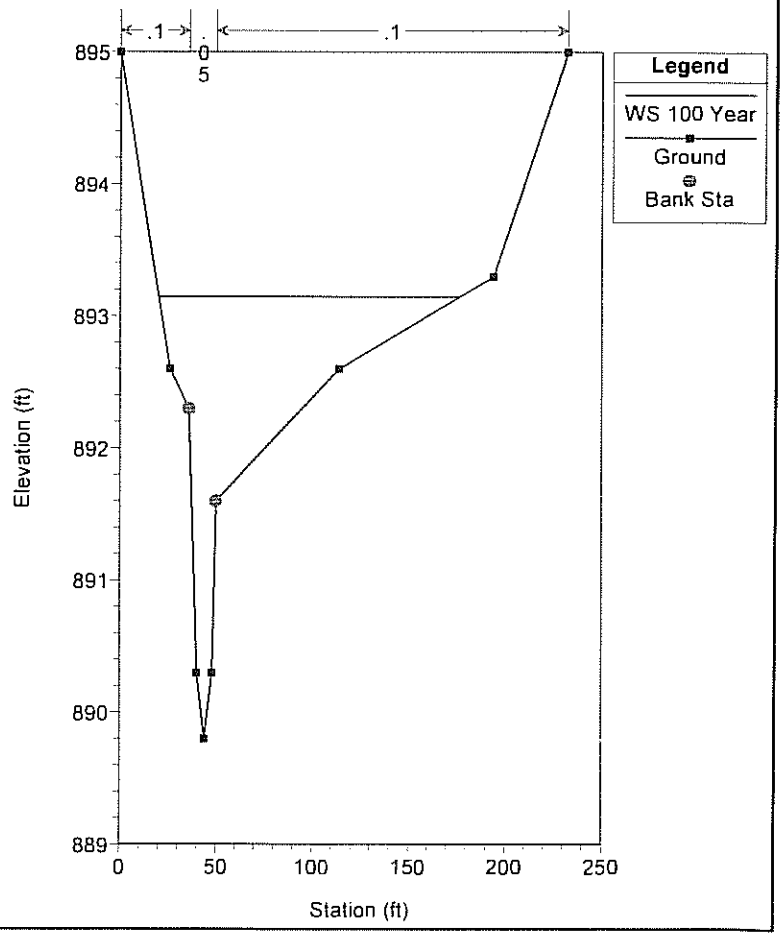
River = Dillon Creek Reach = Dillon RS = 1.511 Plan Station 5680



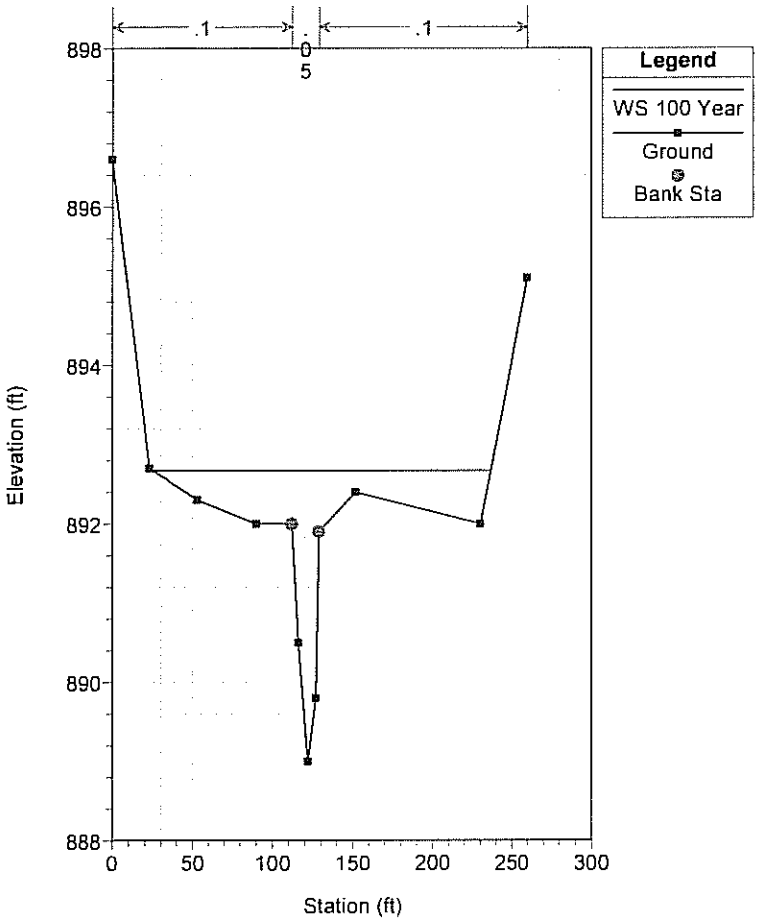
River = Dillon Creek Reach = Dillon RS = 1.470 Plan Station 5460



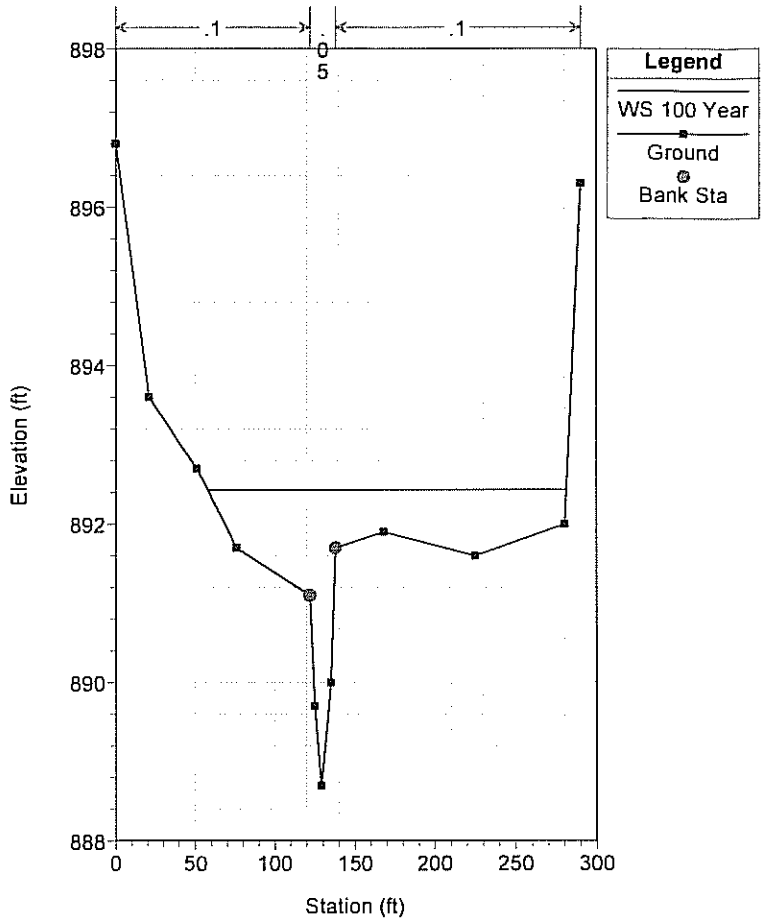
River = Dillon Creek Reach = Dillon RS = 1.434 Plan Station 5270



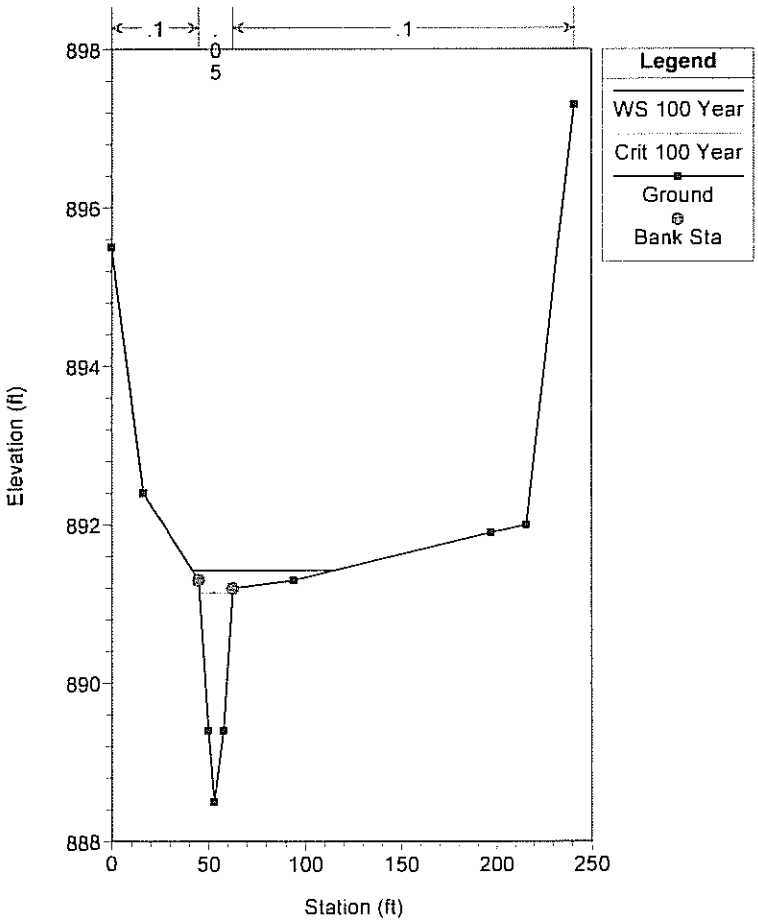
River = Dillon Creek Reach = Dillon RS = 1.403 Plan Station 5110



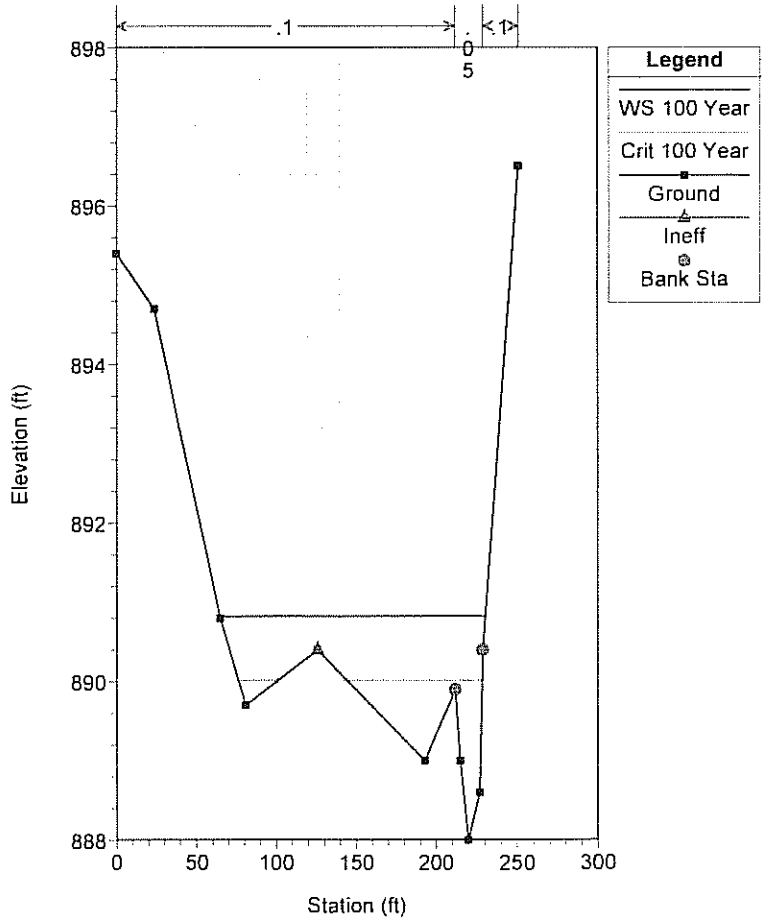
River = Dillon Creek Reach = Dillon RS = 1.384 Plan Station 5005



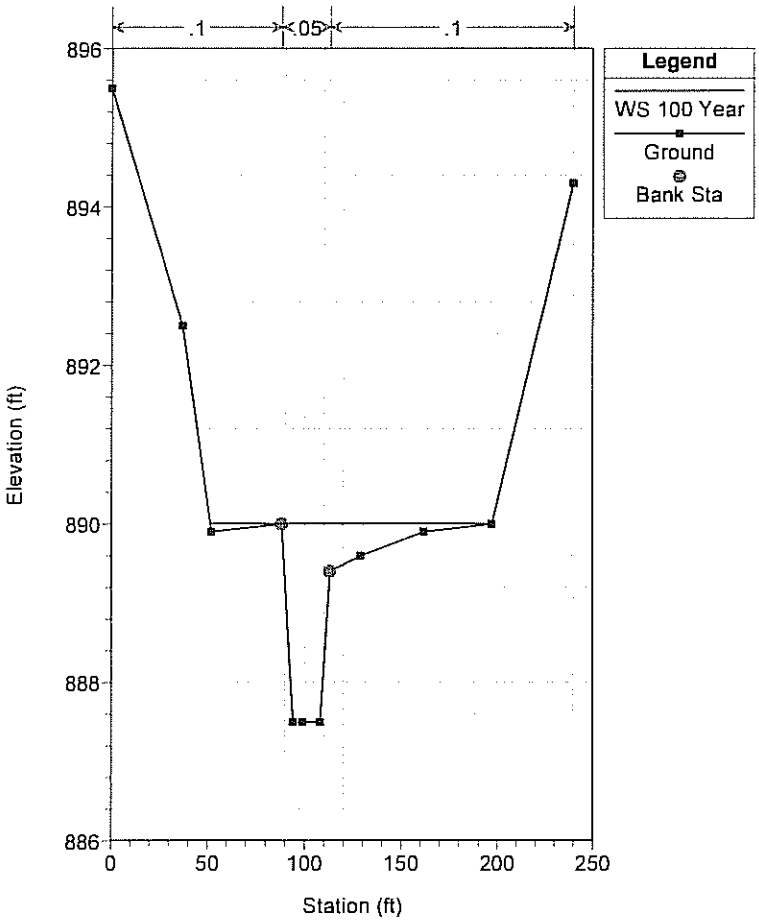
River = Dillon Creek Reach = Dillon RS = 1.360 Plan Station 4880



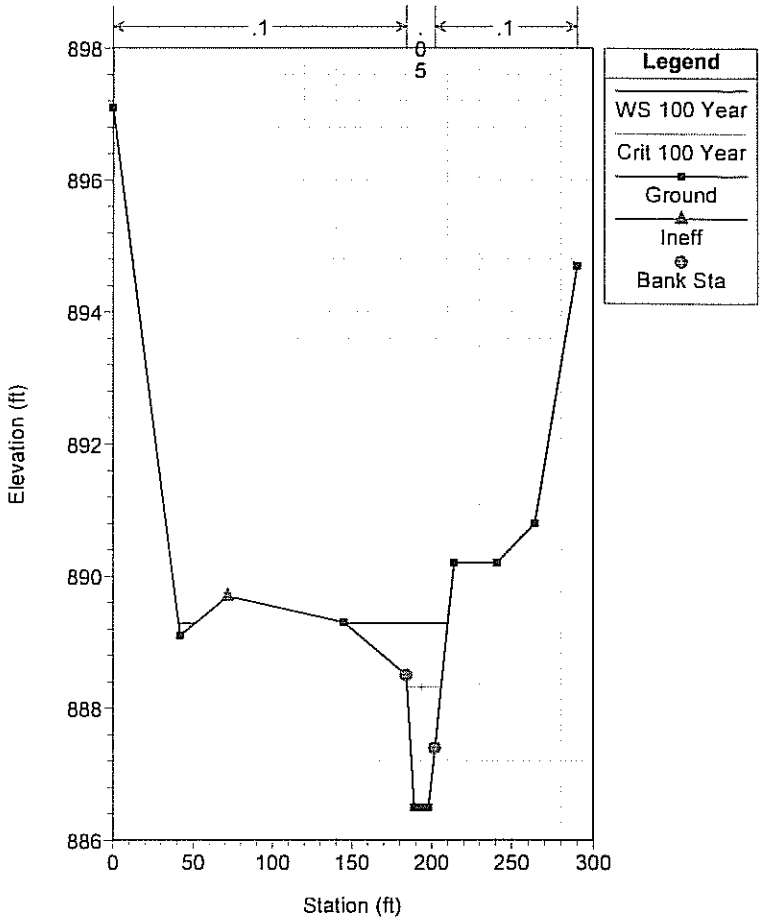
River = Dillon Creek Reach = Dillon RS = 1.313 Plan Station 4630



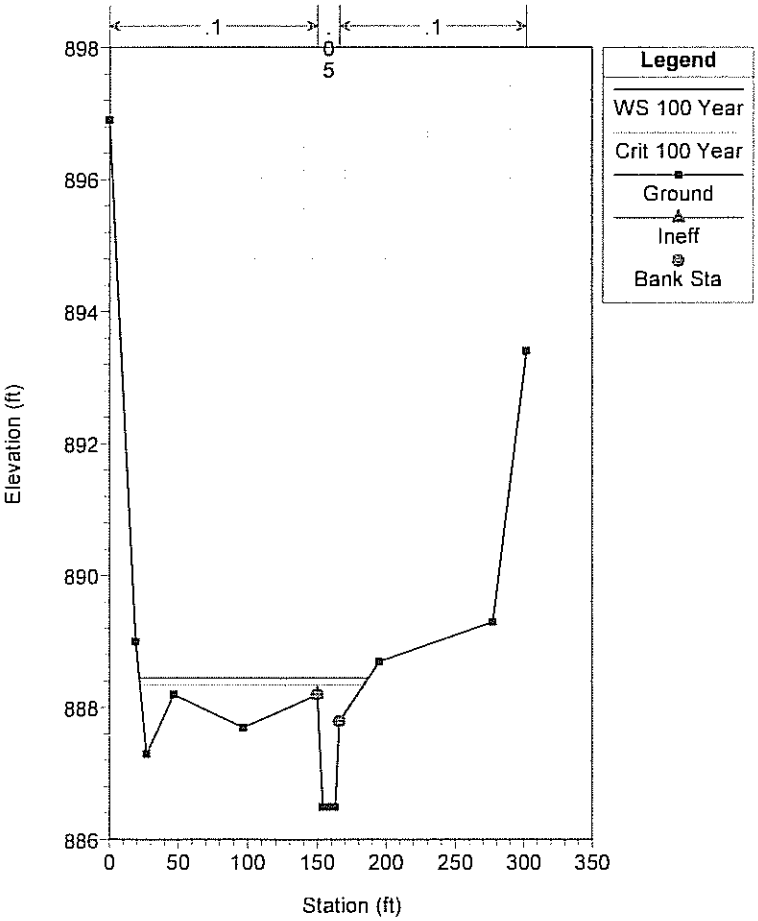
River = Dillon Creek Reach = Dillon RS = 1.263 Plan Station 4370



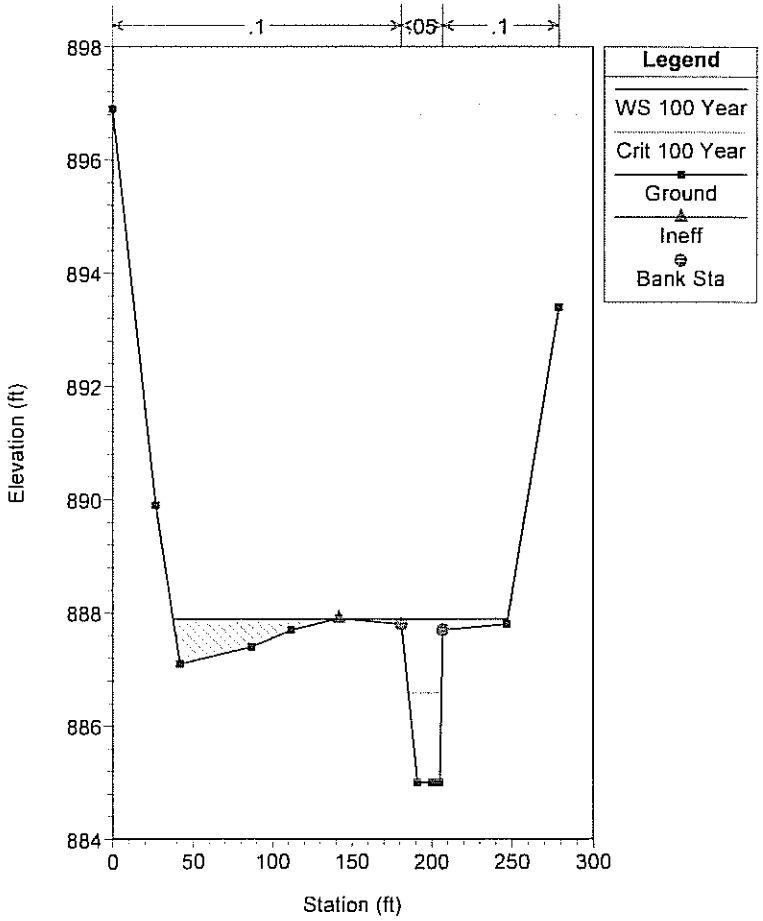
River = Dillon Creek Reach = Dillon RS = 1.239 Plan Station 4240



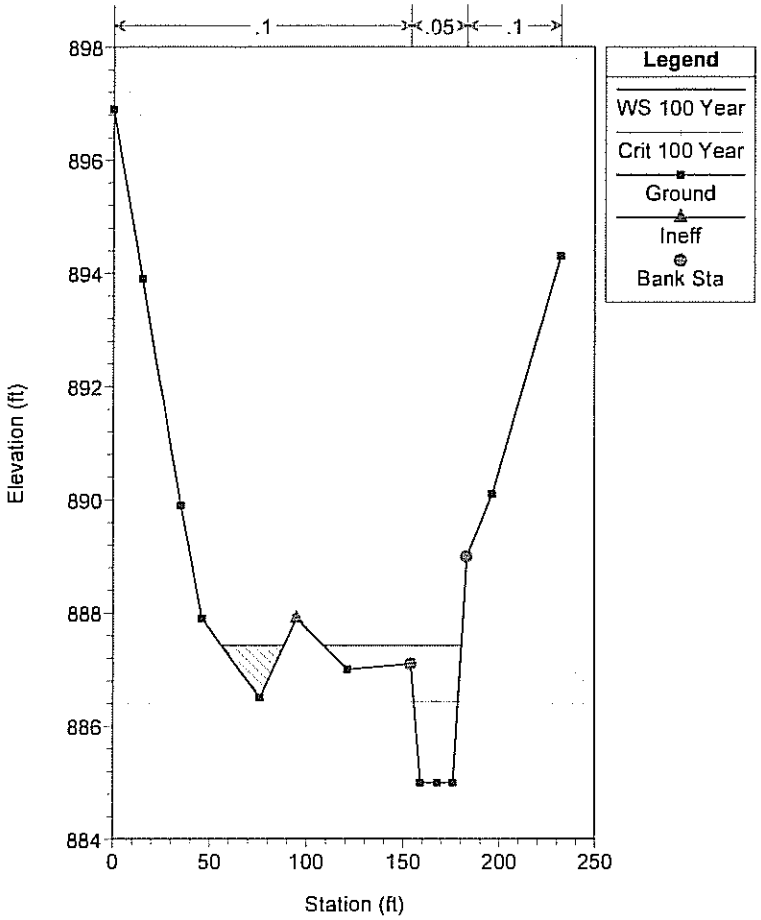
River = Dillon Creek Reach = Dillon RS = 1.216 Plan Station 4120



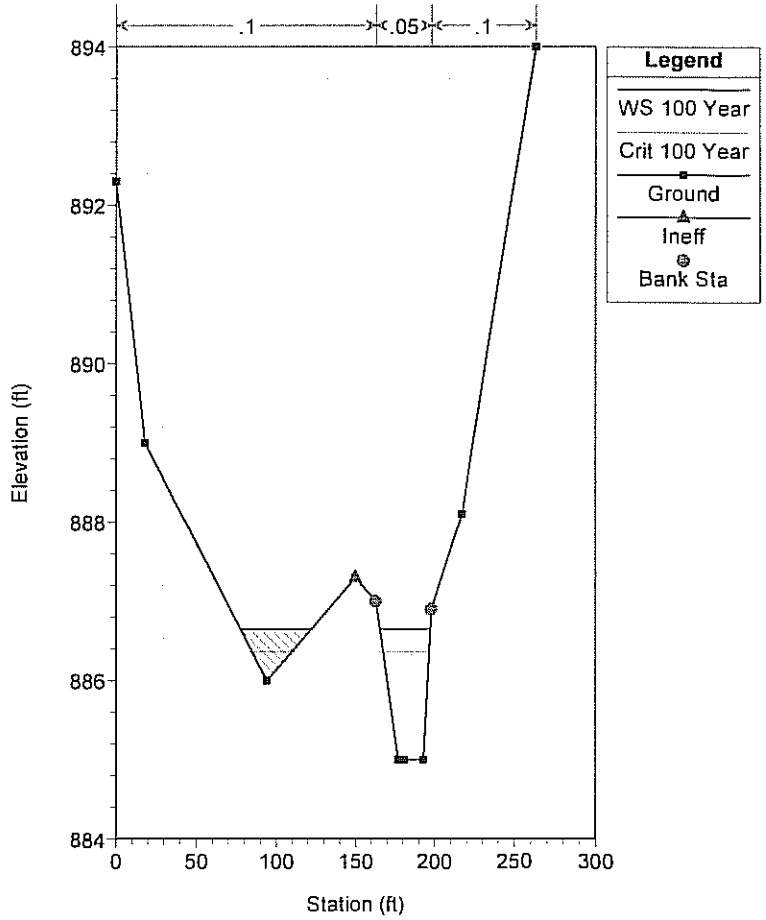
River = Dillon Creek Reach = Dillon RS = 1.196 Plan Station 4015



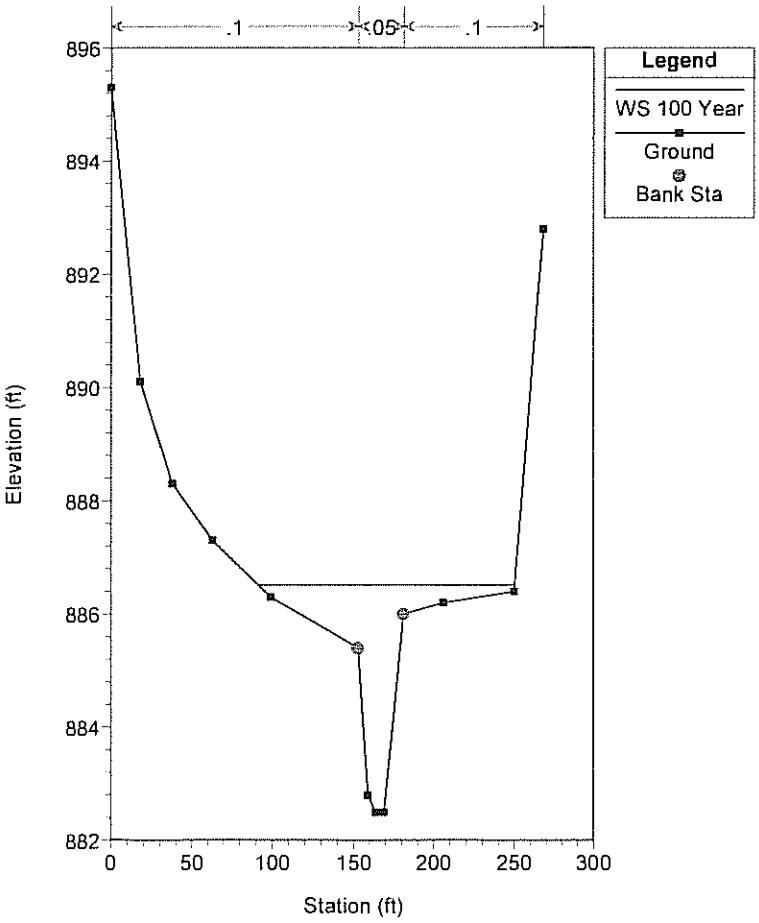
River = Dillon Creek Reach = Dillon RS = 1.172 Plan Station 3890



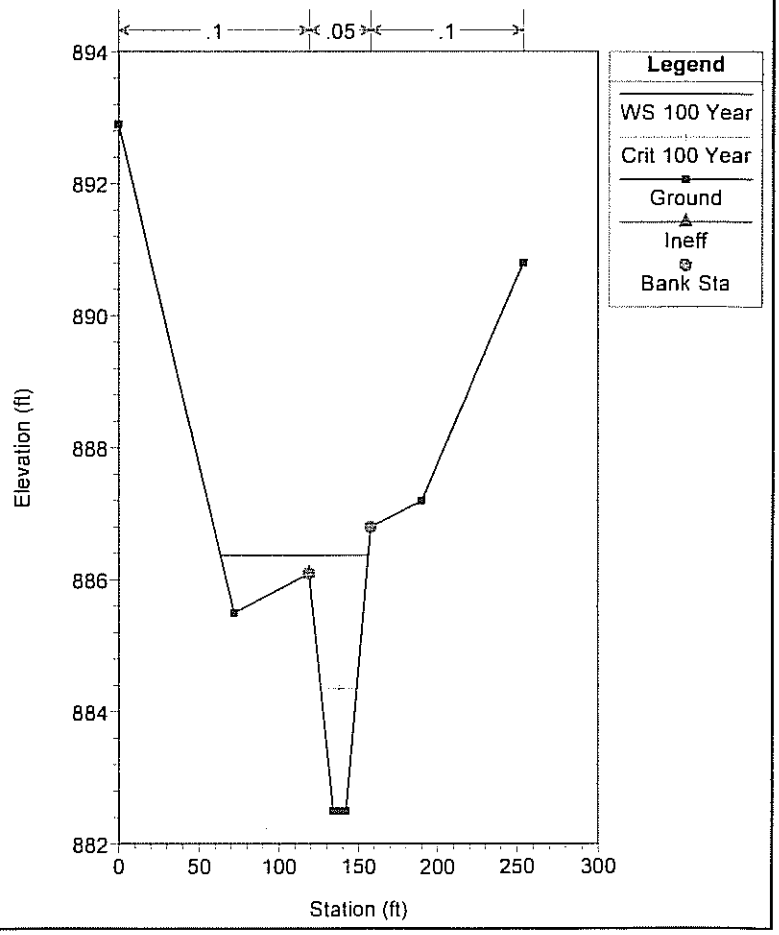
River = Dillon Creek Reach = Dillon RS = 1.159 Plan Station 3820



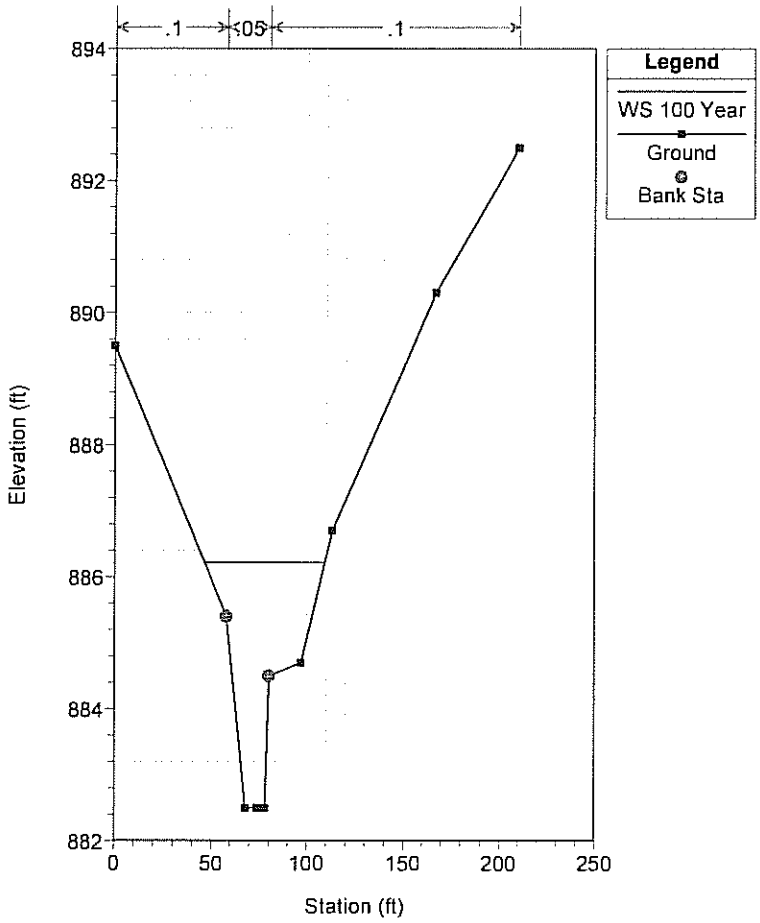
River = Dillon Creek Reach = Dillon RS = 1.138 Plan Station 3710



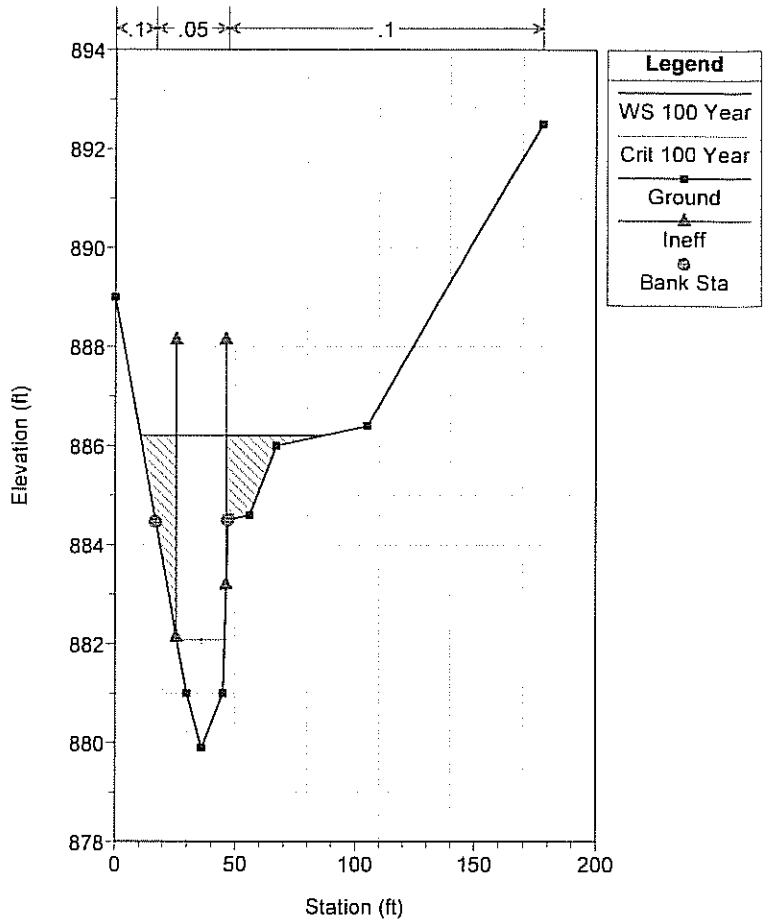
River = Dillon Creek Reach = Dillon RS = 1.116 Plan Station 3590



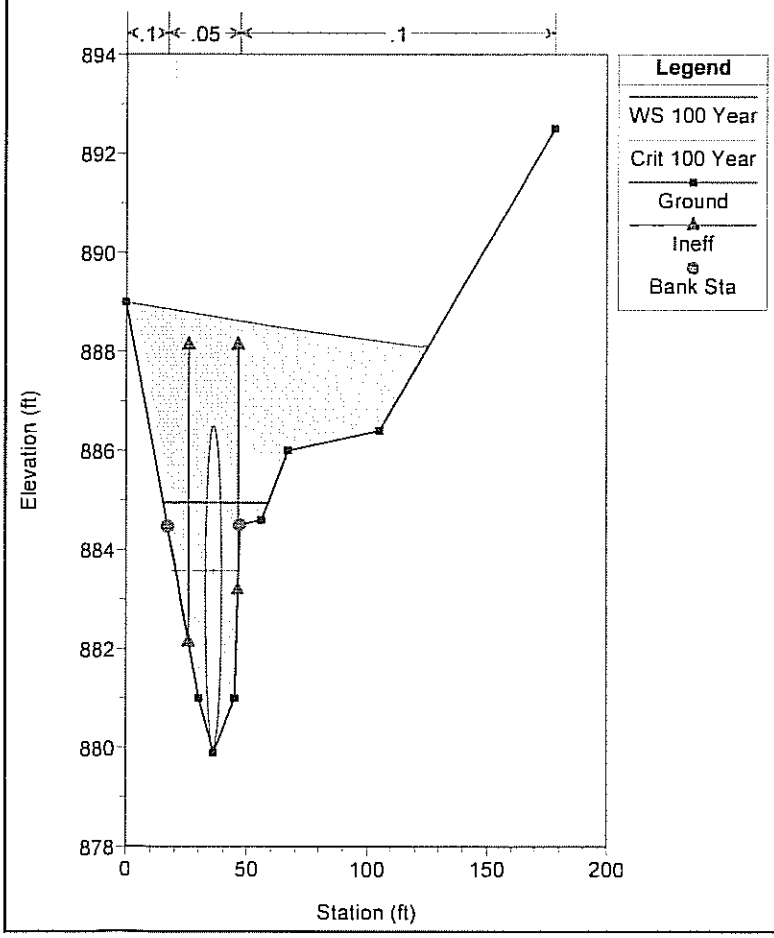
River = Dillon Creek Reach = Dillon RS = 1.098 Plan Station 3500



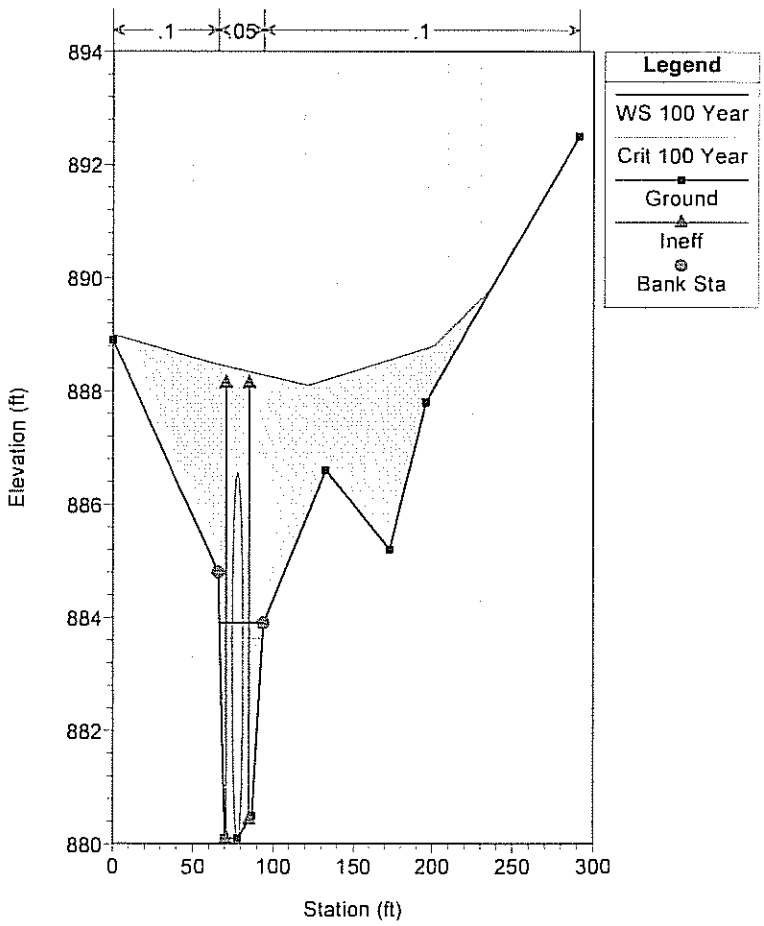
River = Dillon Creek Reach = Dillon RS = 1.091 Plan Station 3460



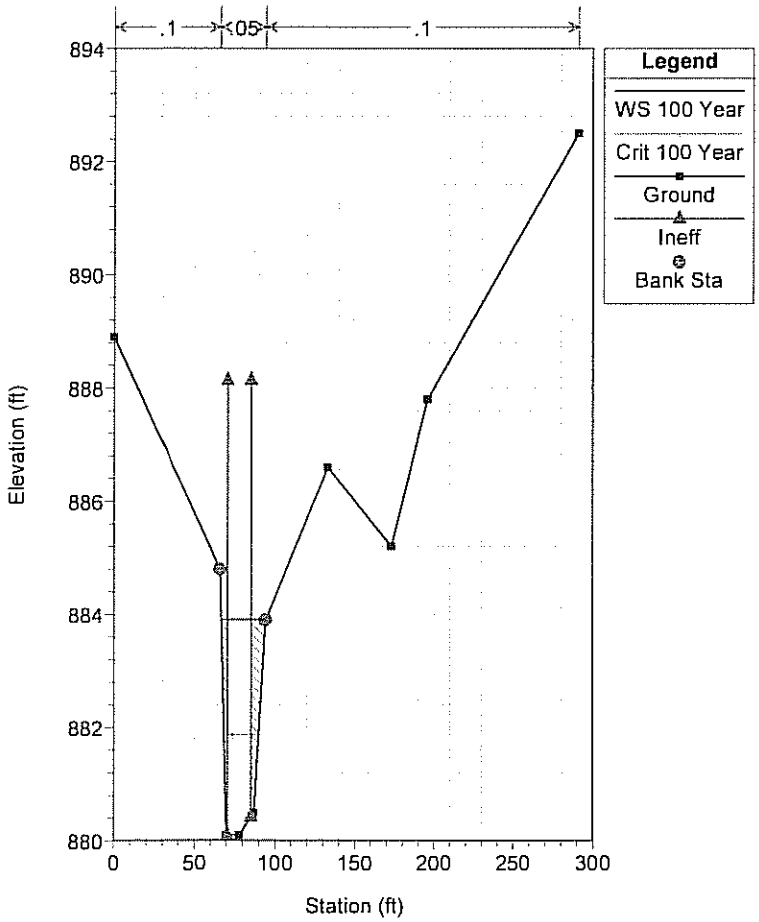
River = Dillon Creek Reach = Dillon RS = 1.083 Culv County Line Road



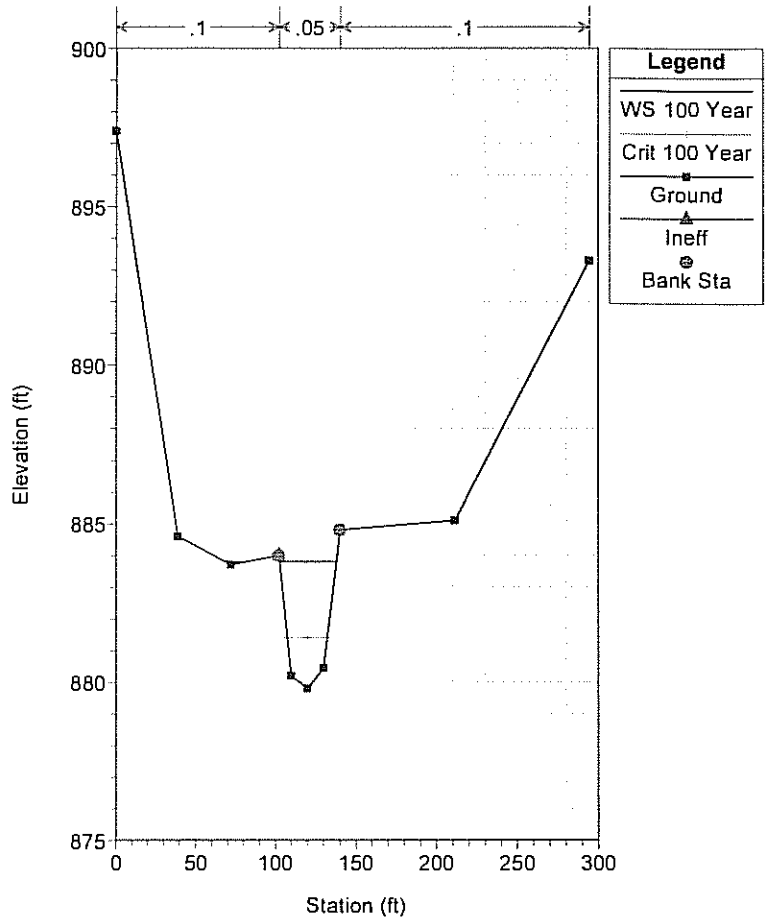
River = Dillon Creek Reach = Dillon RS = 1.083 Culv County Line Road



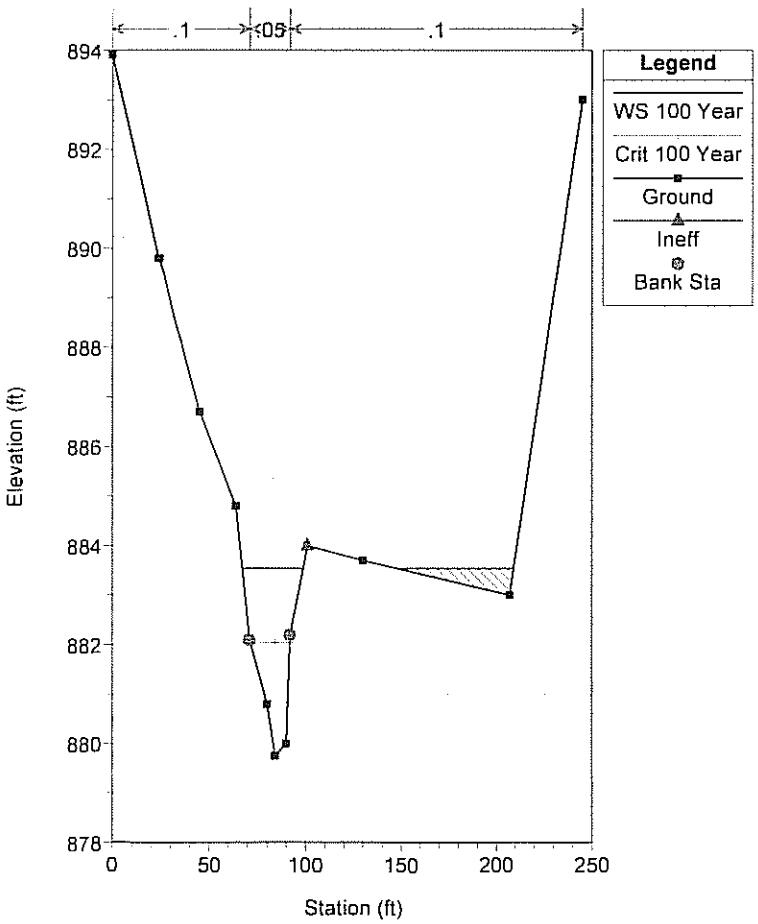
River = Dillon Creek Reach = Dillon RS = 1.075 Plan Station 3375



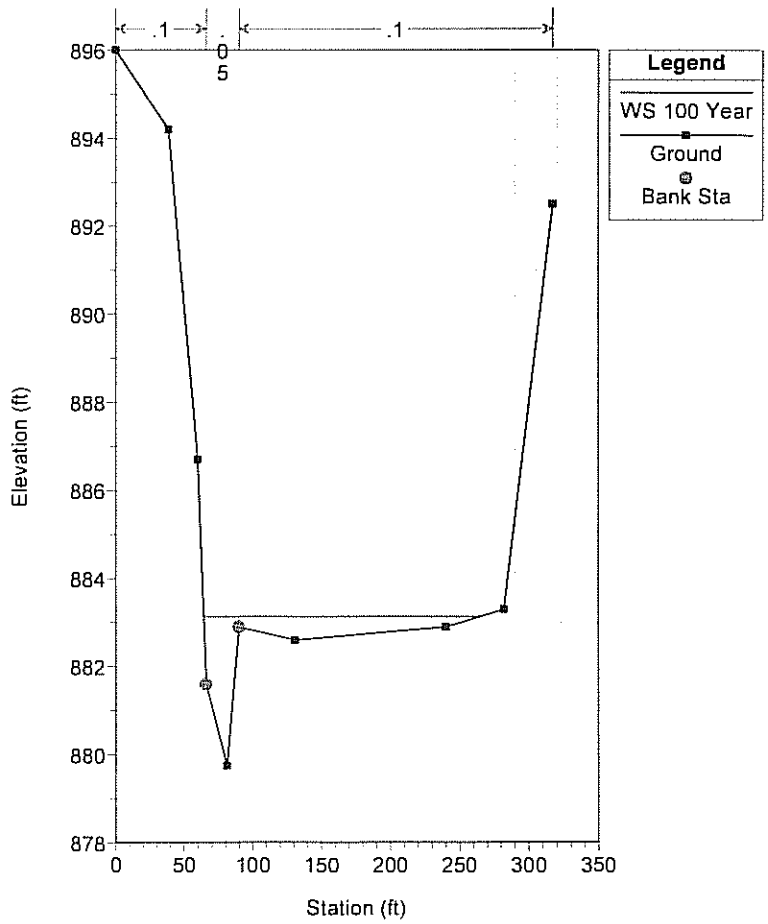
River = Dillon Creek Reach = Dillon RS = 1.051 Plan Station 3250



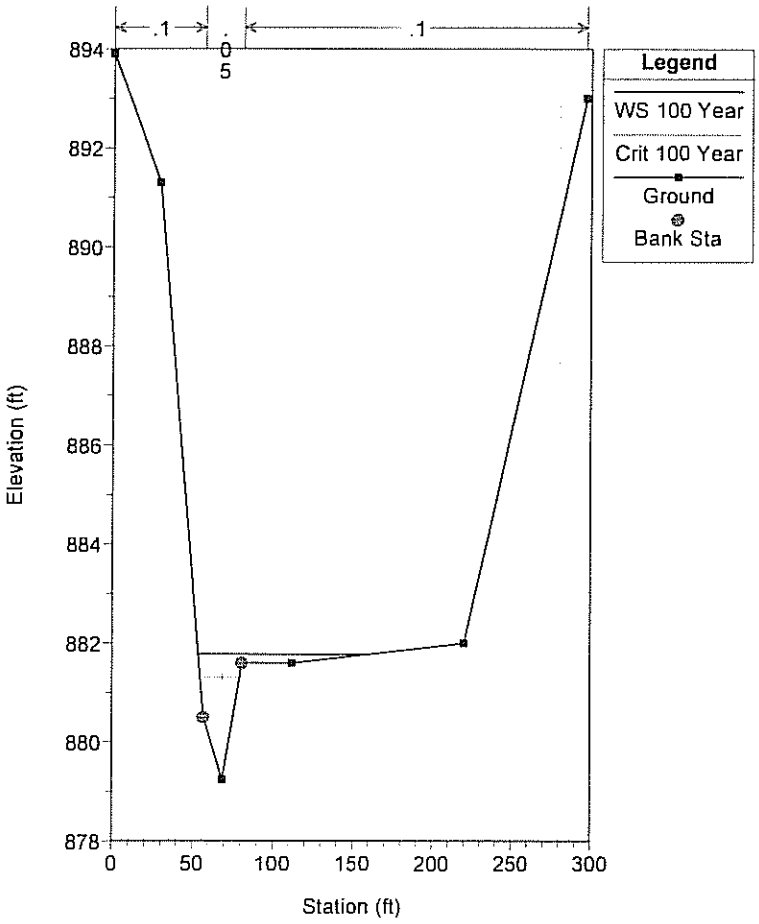
River = Dillon Creek Reach = Dillon RS = 1.030 Plan Station 3140



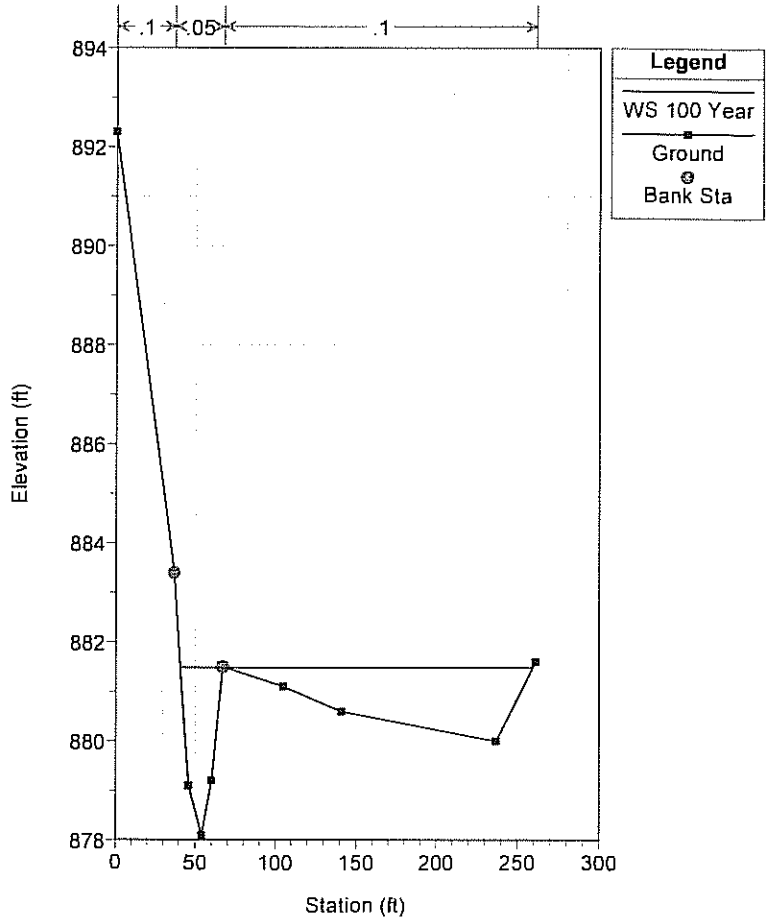
River = Dillon Creek Reach = Dillon RS = 1.005 Plan Station 3005



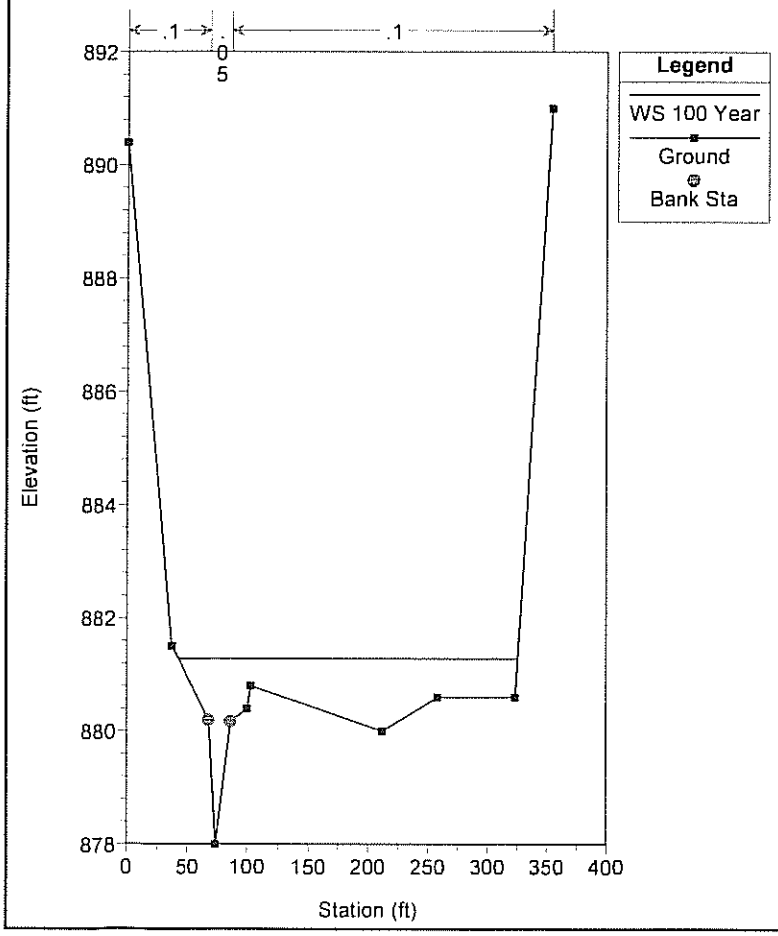
River = Dillon Creek Reach = Dillon RS = 0.966 Plan Station 2800



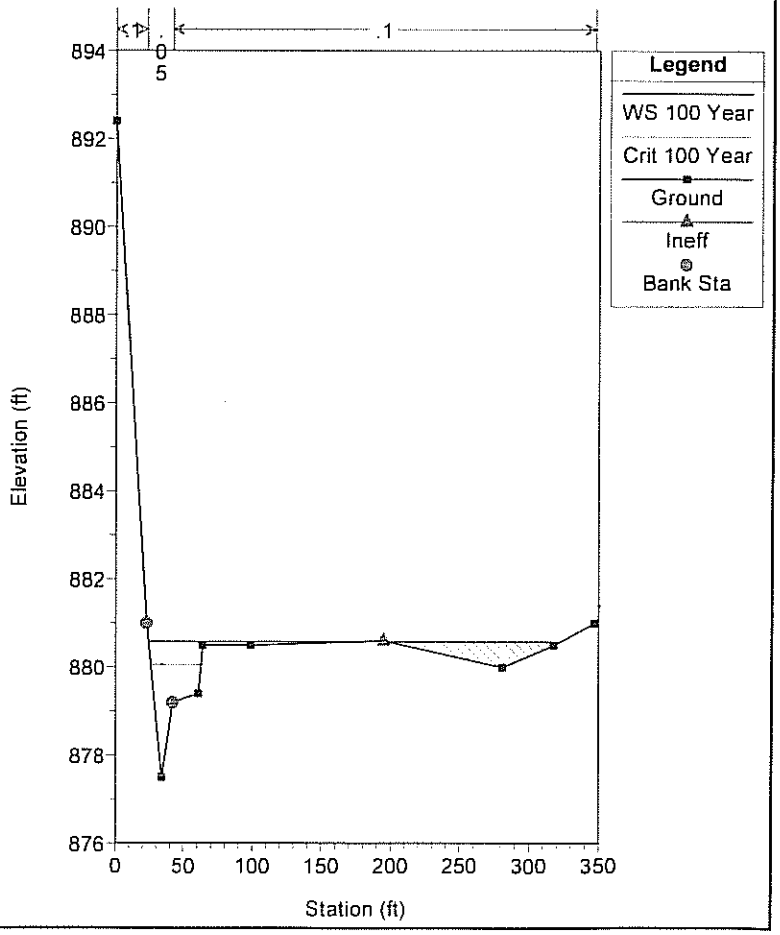
River = Dillon Creek Reach = Dillon RS = 0.938 Plan Station 2655

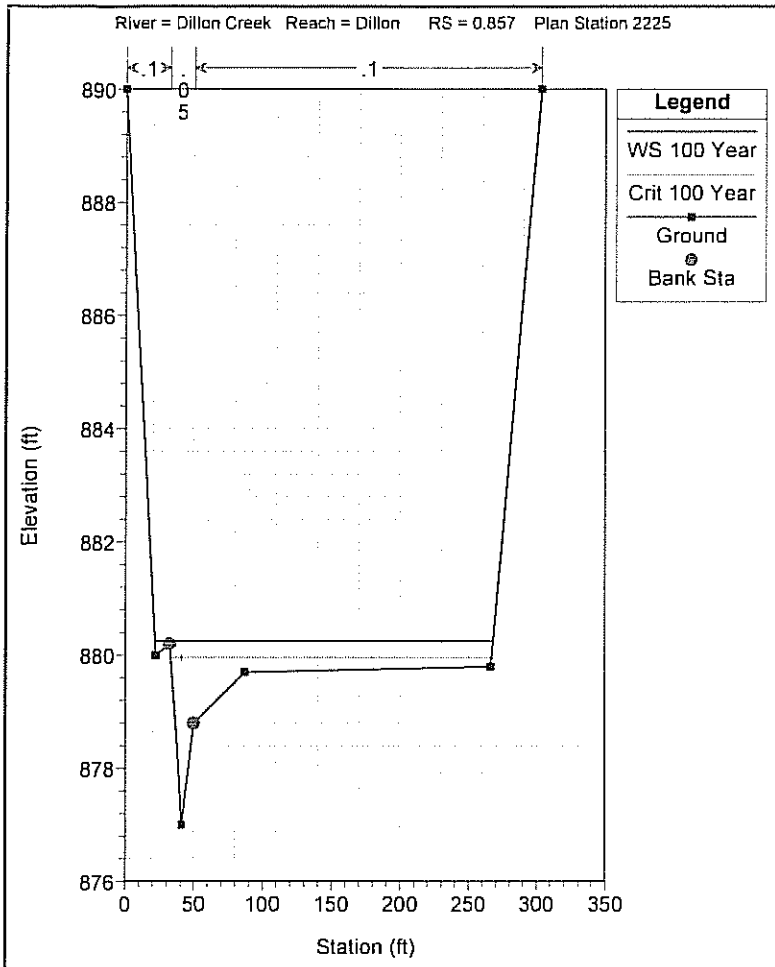


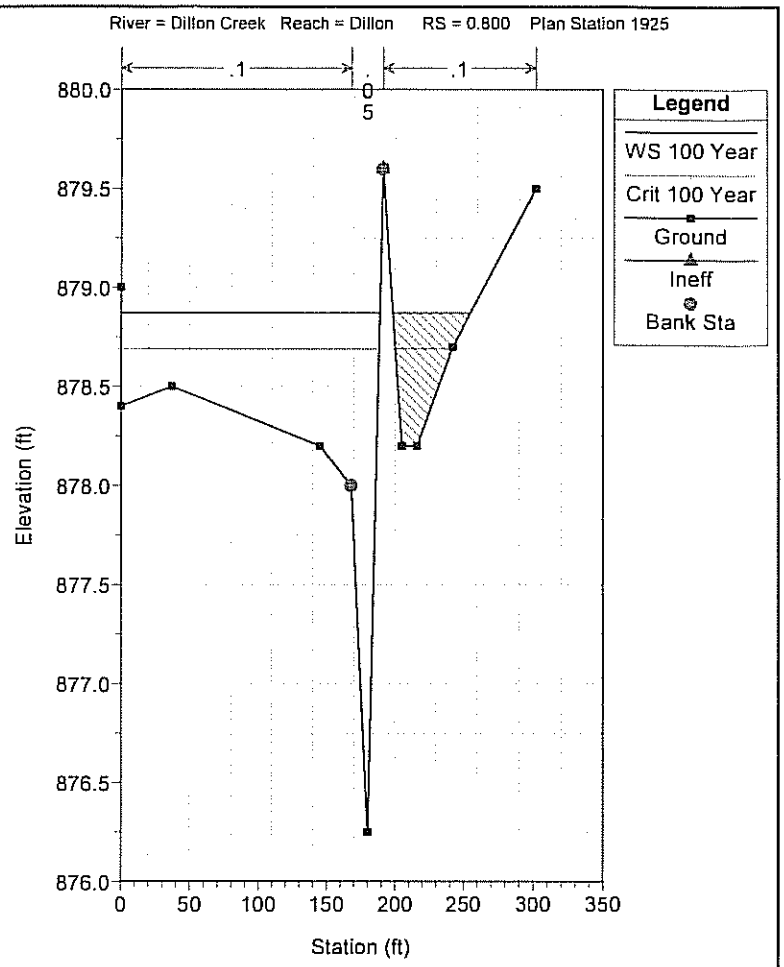
River = Dillon Creek Reach = Dillon RS = 0.902 Plan Station 2465

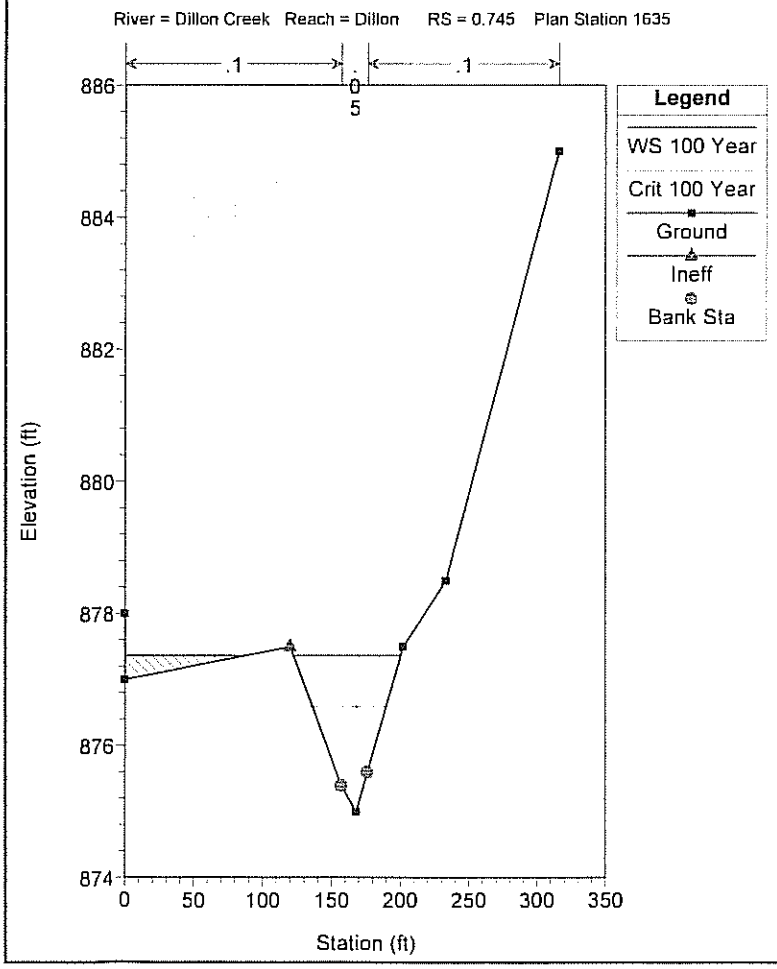


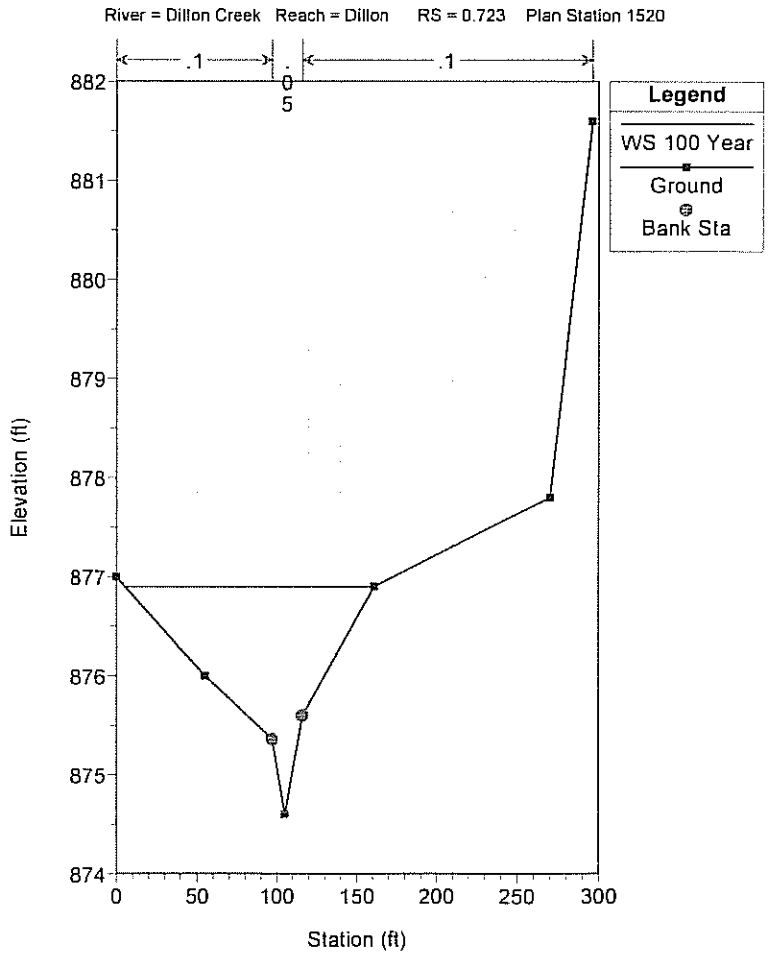
River = Dillon Creek Reach = Dillon RS = 0.873 Plan Station 2310

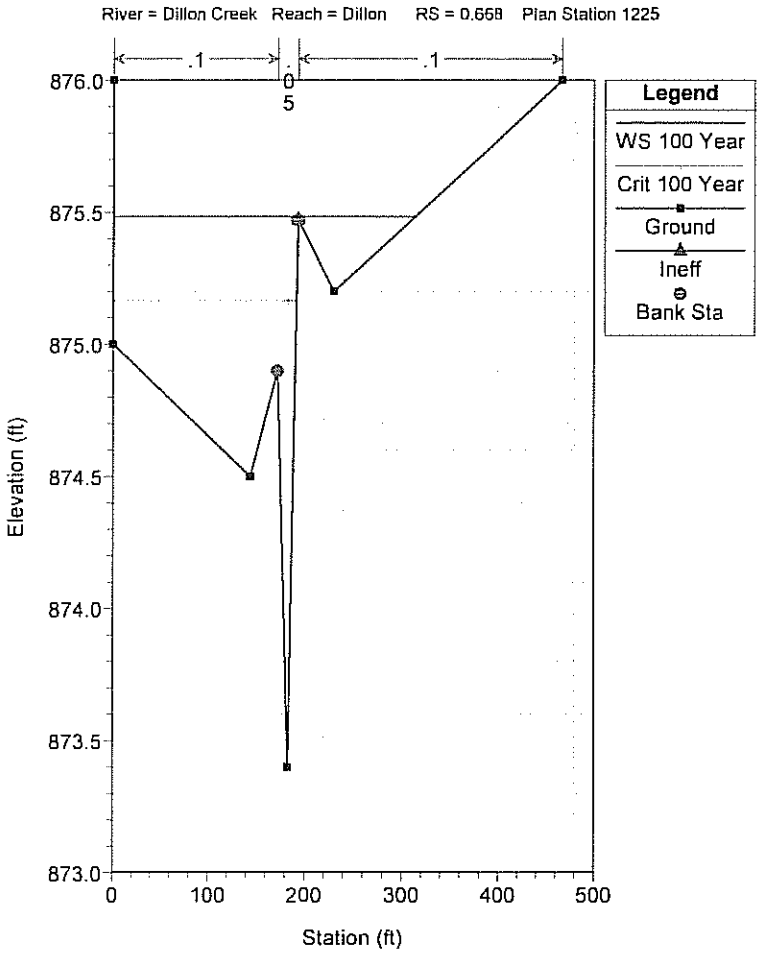


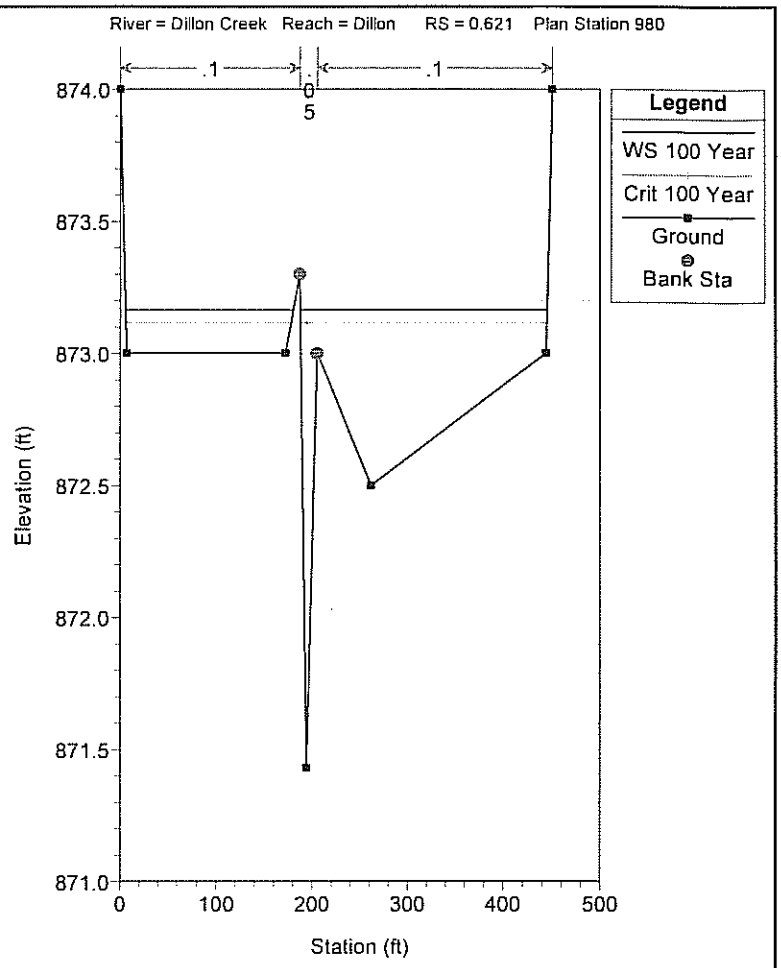

River = Dillon Creek Reach = Dillon RS = 0.857 Plan Station 2225
Legend
WS 100 Year
Crit 100 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


River = Dillon Creek Reach = Dillon RS = 0.800 Plan Station 1925
Legend
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


River = Dillon Creek Reach = Dillon RS = 0.745 Plan Station 1635
Legend
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


River = Dillon Creek Reach = Dillon RS = 0.723 Plan Station 1520
Legend
WS 100 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


River = Dillon Creek Reach = Dillon RS = 0.668 Plan Station 1225
.1
.1
0
5
Legend
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta
Elevation (ft)
876.0
875.5
875.0
874.5
874.0
873.5
873.0
0
100
200
300
400
500
Station (ft)


River = Dillon Creek Reach = Dillon RS = 0.621 Plan Station 980
.1
.1
0
5
Legend
WS 100 Year
Crit 100 Year
Ground
Bank Sta
Elevation (ft)
874.0
873.5
873.0
872.5
872.0
871.5
871.0
0
100
200
300
400
500
Station (ft)

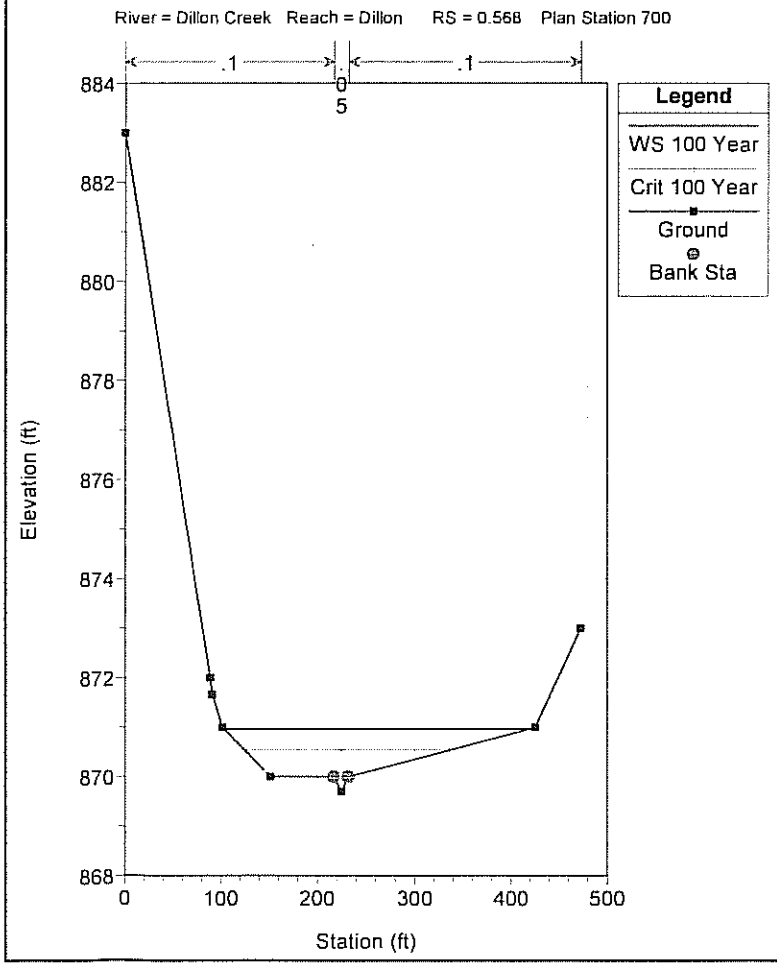

River = Dillon Creek Reach = Dillon RS = 0.568 Plan Station 700
.1
.1
0
5
Legend
WS 100 Year
Crit 100 Year
Ground
Bank Sta
Elevation (ft)
884
882
880
878
876
874
872
870
868
0
100
200
300
400
500
Station (ft)

PHOTO LOG

Photo #1 at County Line Road looking upstream

Photo #2 at station 38+00 looking upstream

Photo #3 at station 39+50 looking downstream

Area of soil lift (right bank)

Photo #4 at station 40+50 looking upstream

Photo #5 at station 42+50 looking downstream

Photo #6 at station 43+00

Photo #7 at station 49+00

Photo #8 at station 51+00

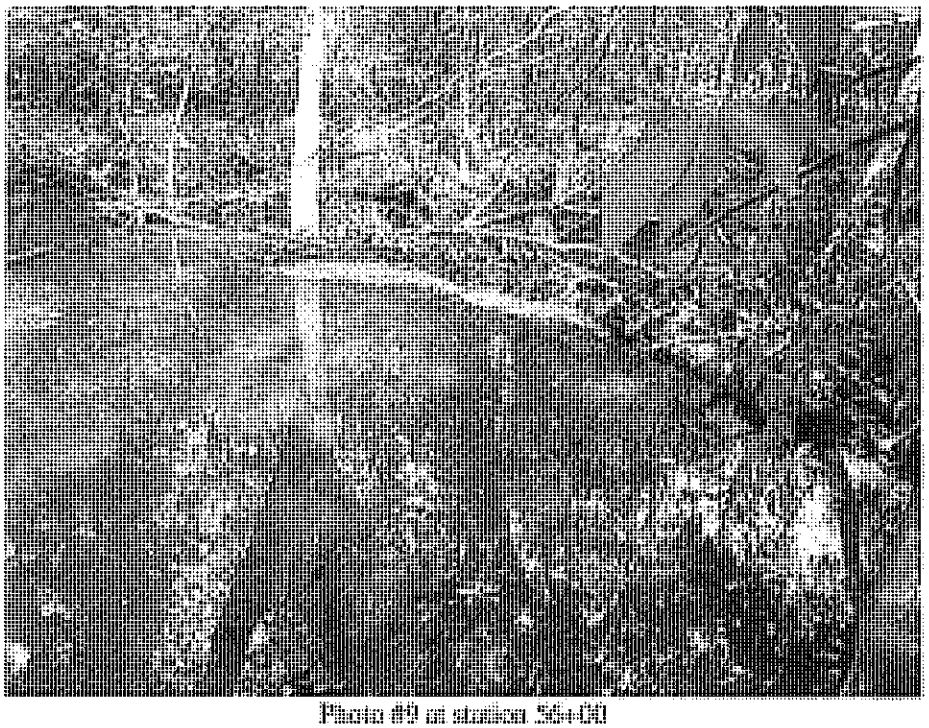


Photo #9 at station 56+00

Photo #10 at station 66+50

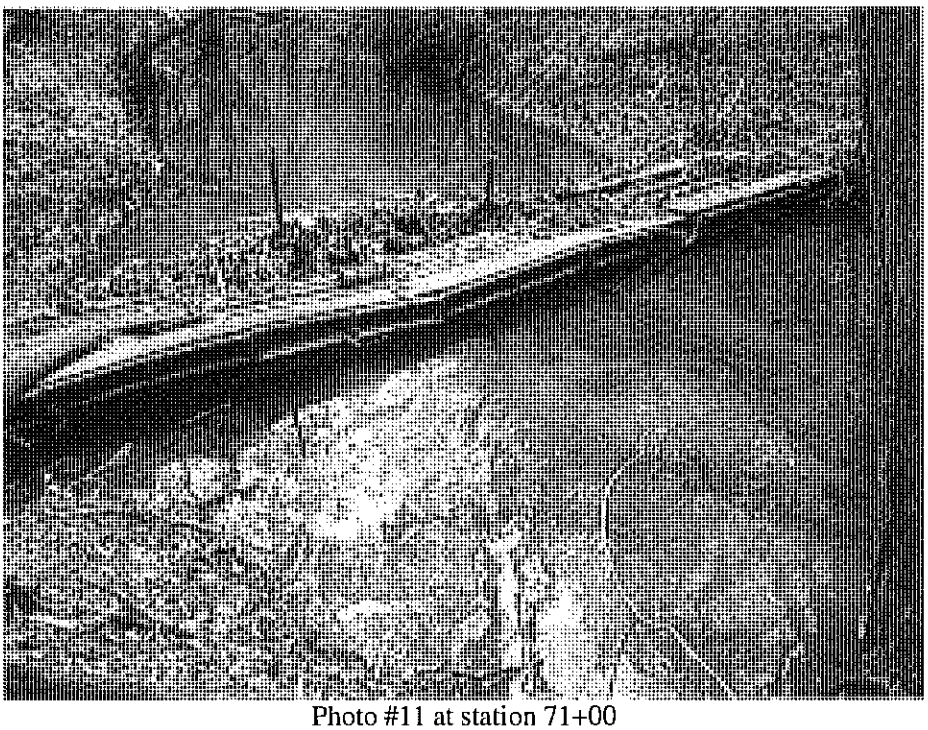


Photo #11 at station 71+00

Existing crossing to be replaced with rock vane structure

Photo #12 at station 74+00

Photo #13 at station 79+00

Photo #14 at station 83+00 looking downstream

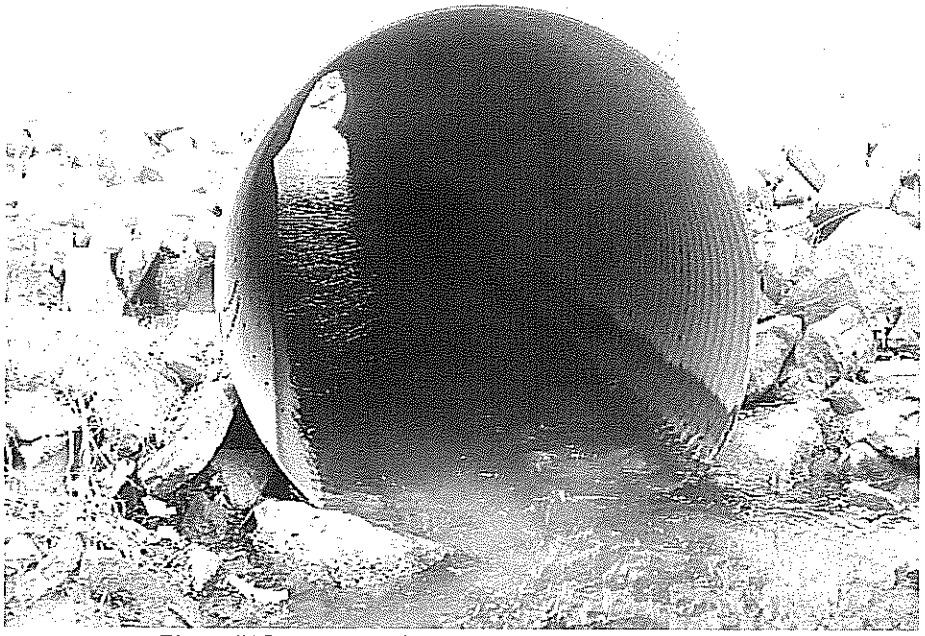


Photo #15 upstream side of County Line Road culvert

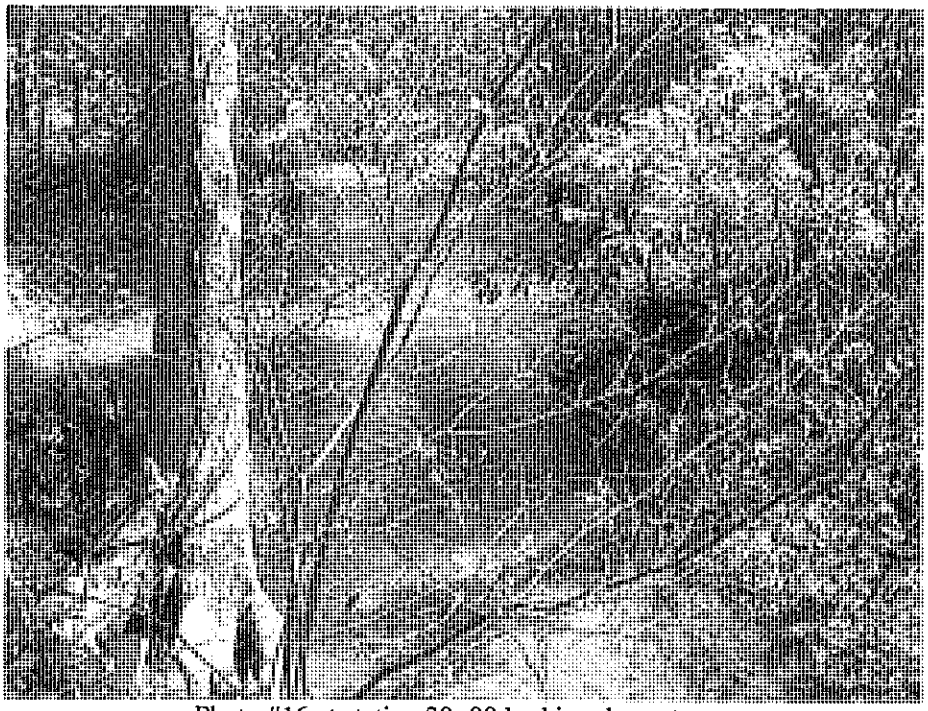


Photo #16 at station 30+00 looking downstream

Photo #17 at station 28+00 looking downstream

Photo #18 at station 25+00 looking downstream

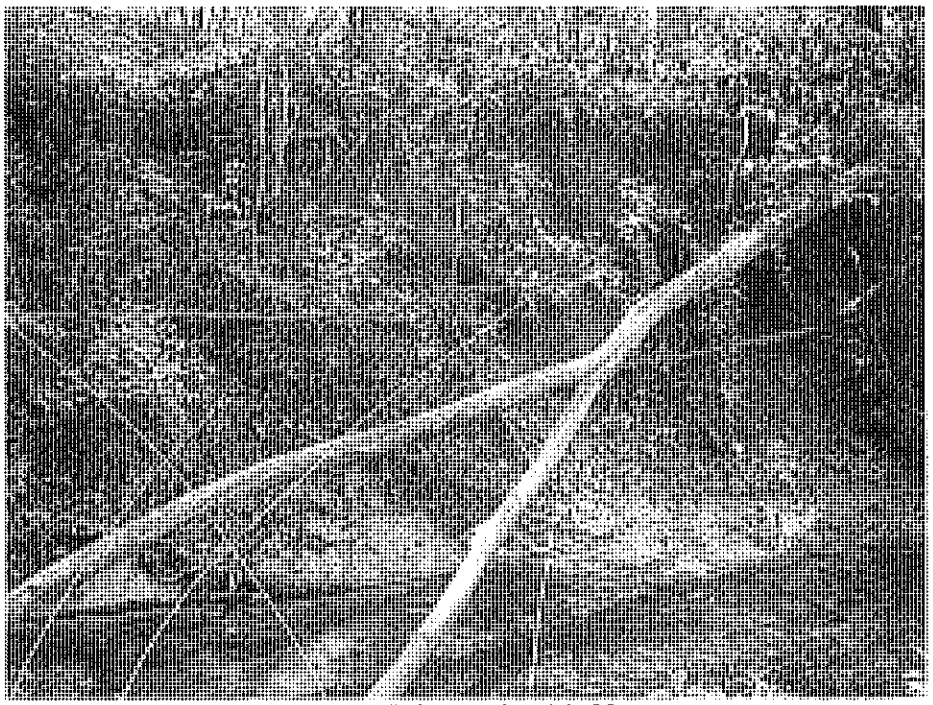


Photo #19 at station 24+00
Root wad embankment stabilization location

Photo #20 at station 23+00 looking downstream

Photo #21 at station 22+00

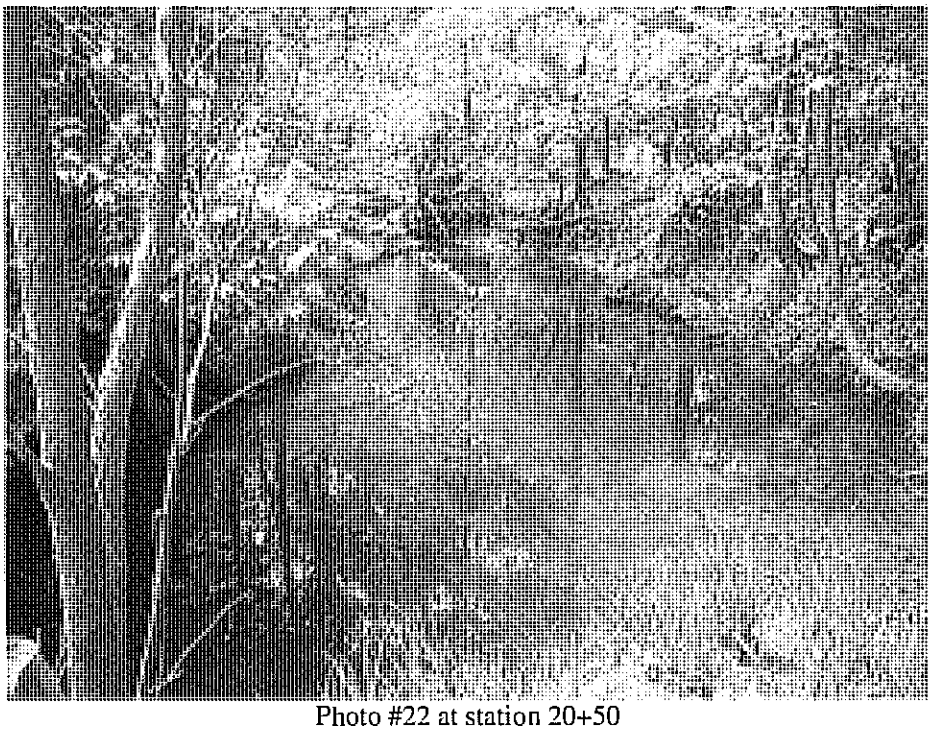


Photo #22 at station 20+50

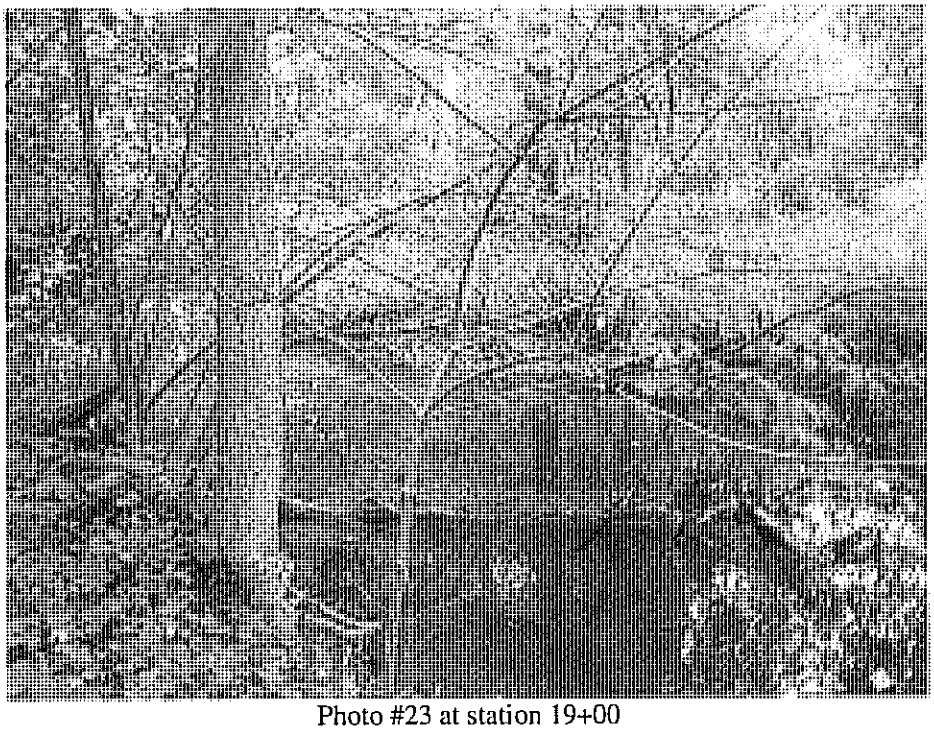


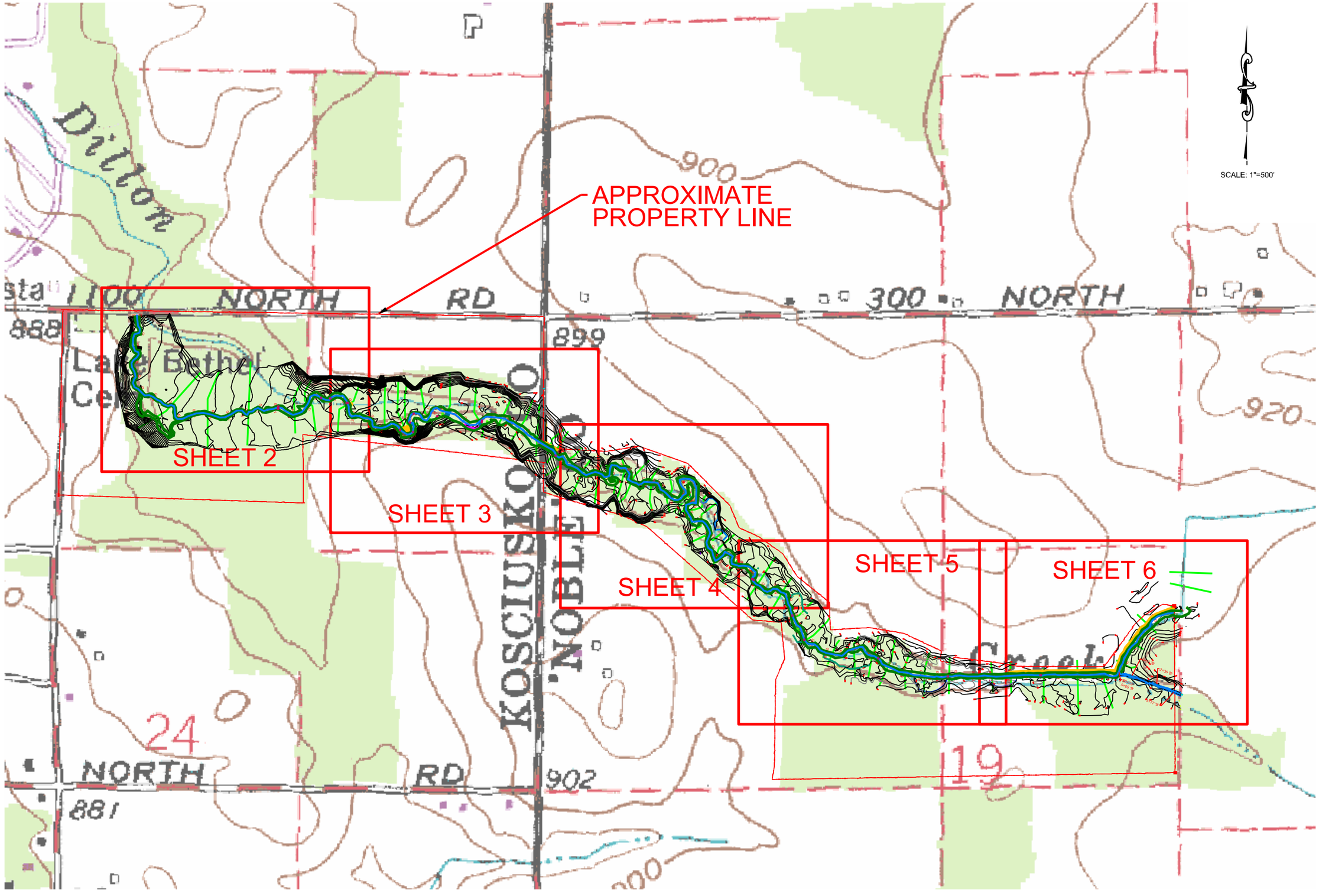
Photo #23 at station 19+00

Photo # 24 at station 16+00 looking downstream

Photo # 25 at station 14+00

HEC-RAS CROSS SECTION MAP

PROJECT PLAN



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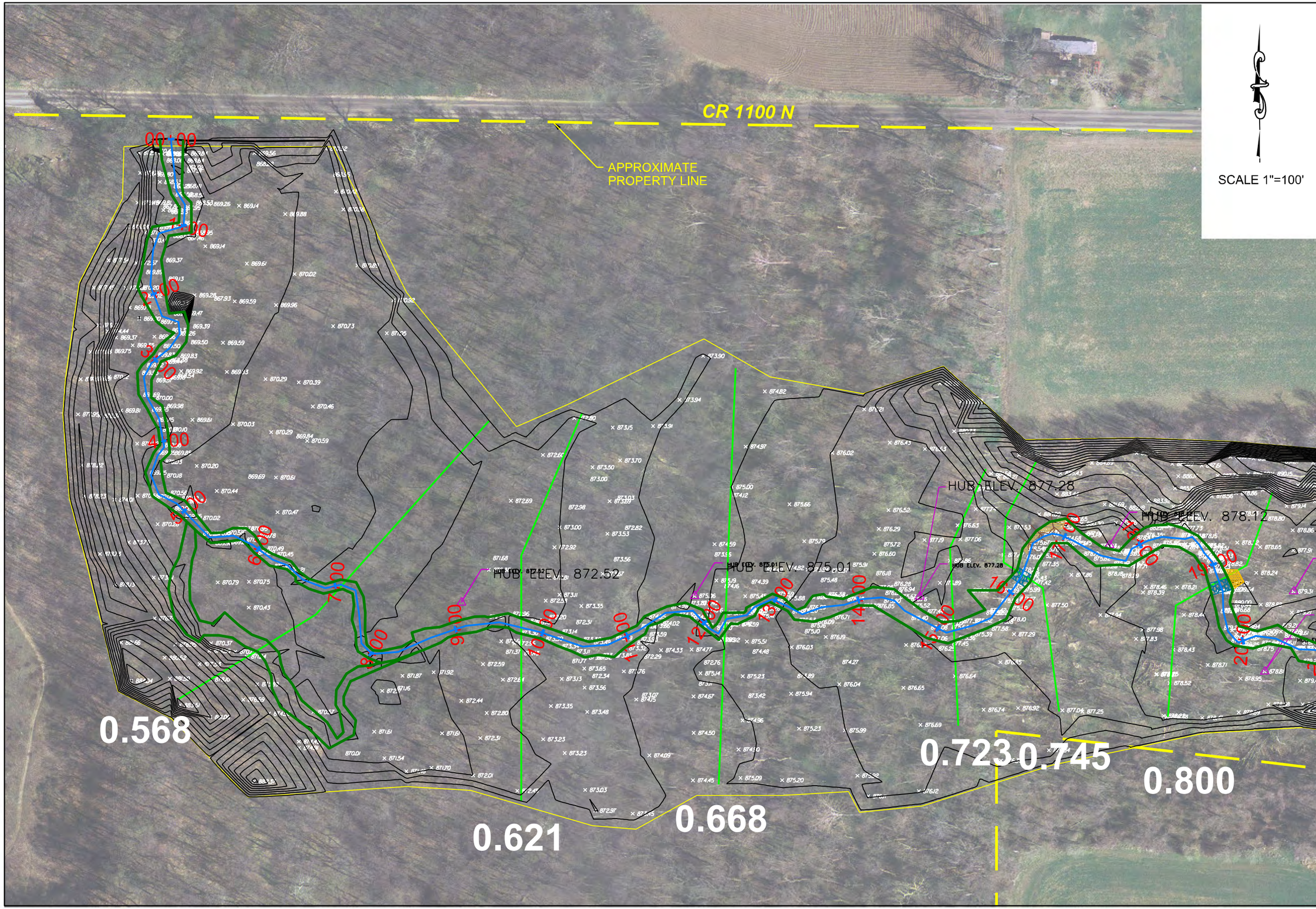
Overall Cross Section Sheet Map
Dillon Creek
Kosciusko & Noble Counties
State of Indiana

Drawn By: JLM
Date: 5-26-10
Project Number: 10020
Scale: As Shown
Page: 1 of 6



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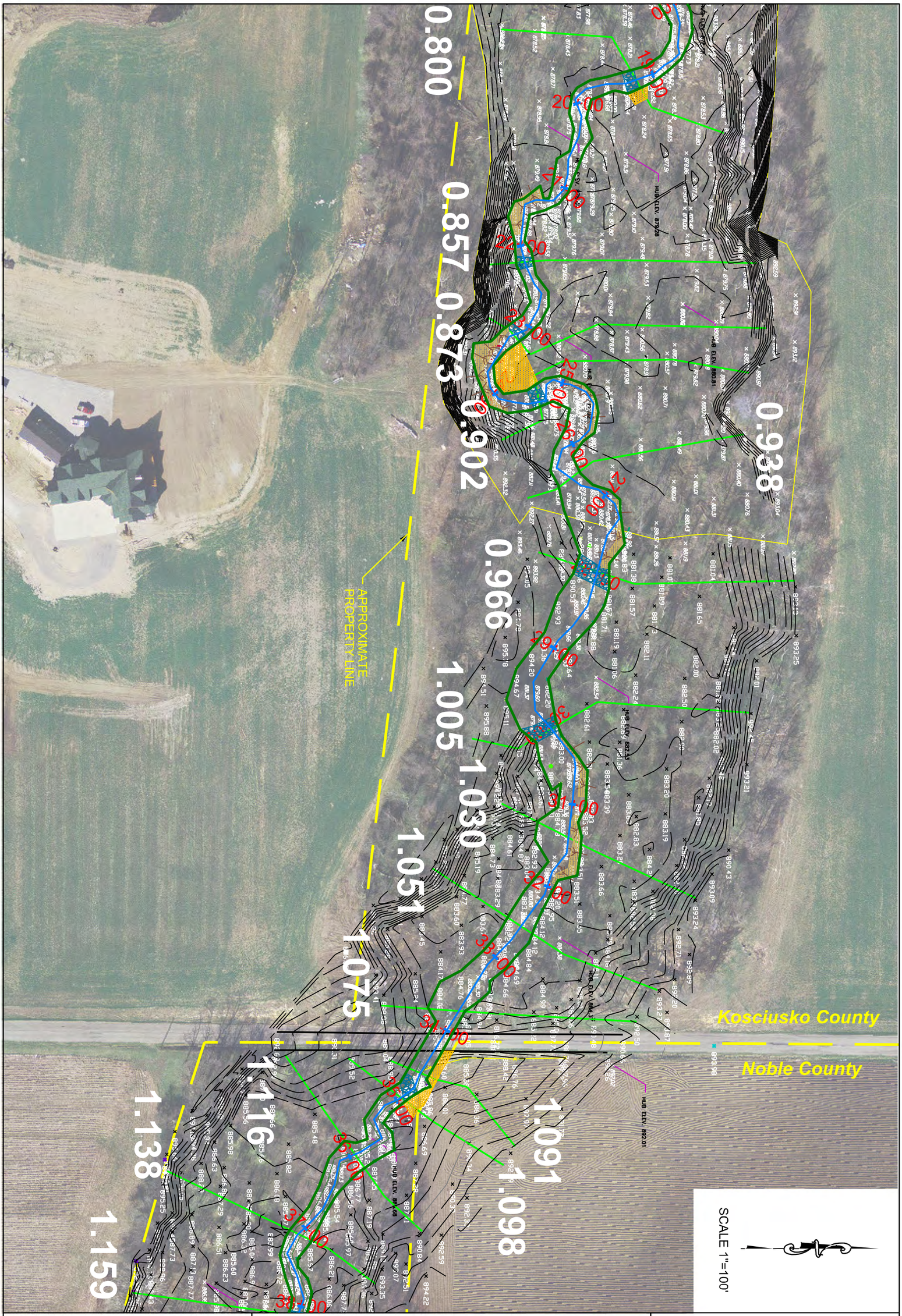
Cross Section Map 2
Dillon Creek
Kosciusko & Noble Counties
State of Indiana

Drawn By: JLM
Date: 5-26-10
Project Number: 10020
Scale: As Shown
Page: 2 of 6



Drawn By: JLM
Date: 5-26-10
Project Number: 10020
Scale: As Shown
Page: 3 of 6

Cross Section Map 3
Dillon Creek
Kosciusko & Noble Counties
State of Indiana

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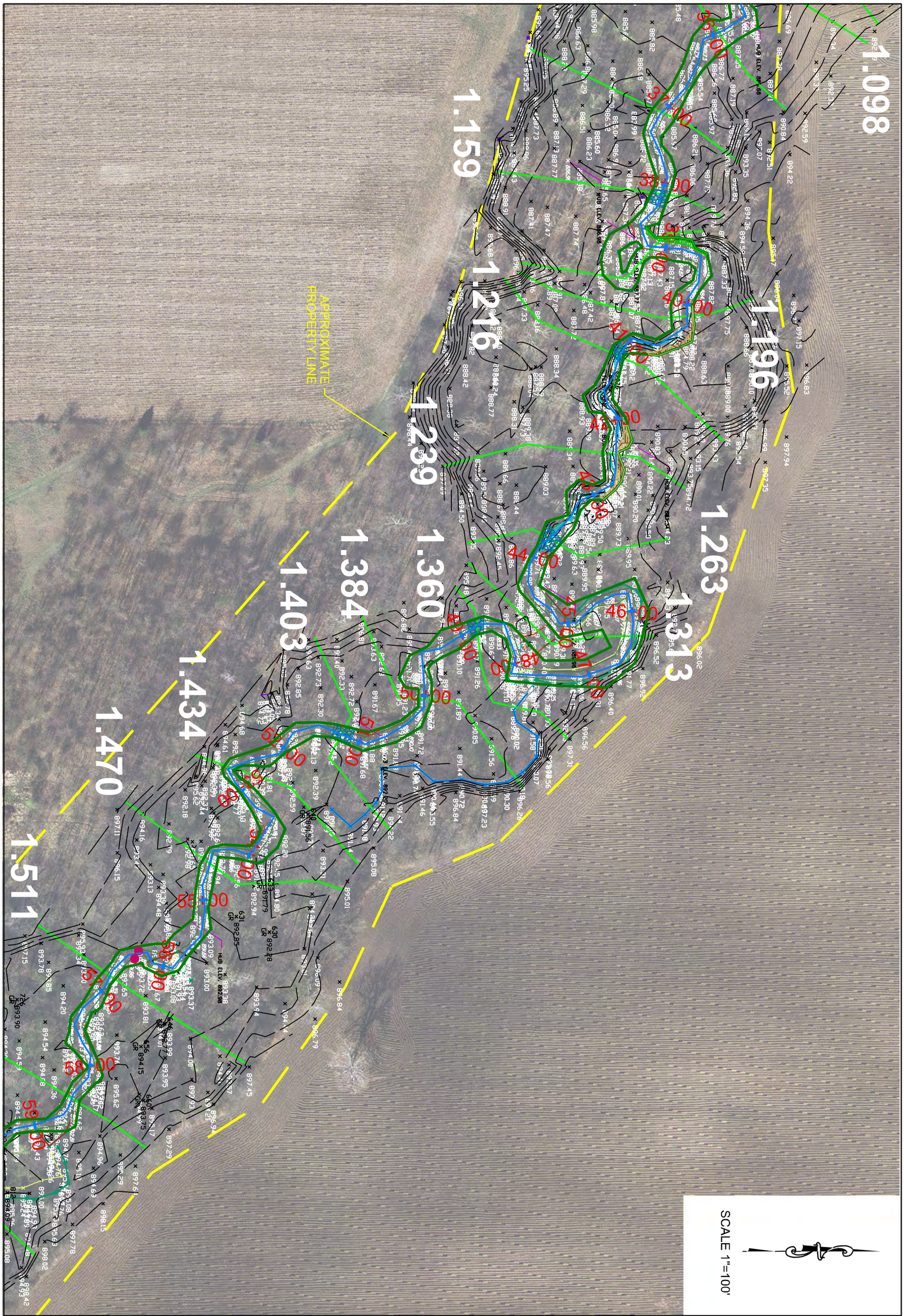

Drawn By: JLM
Date: 5-26-10
Project Number: 10020
Scale: As Shown
Page: 4 of 6

Cross Section Map 4
Dillon Creek
Kosciusko & Noble Counties
State of Indiana

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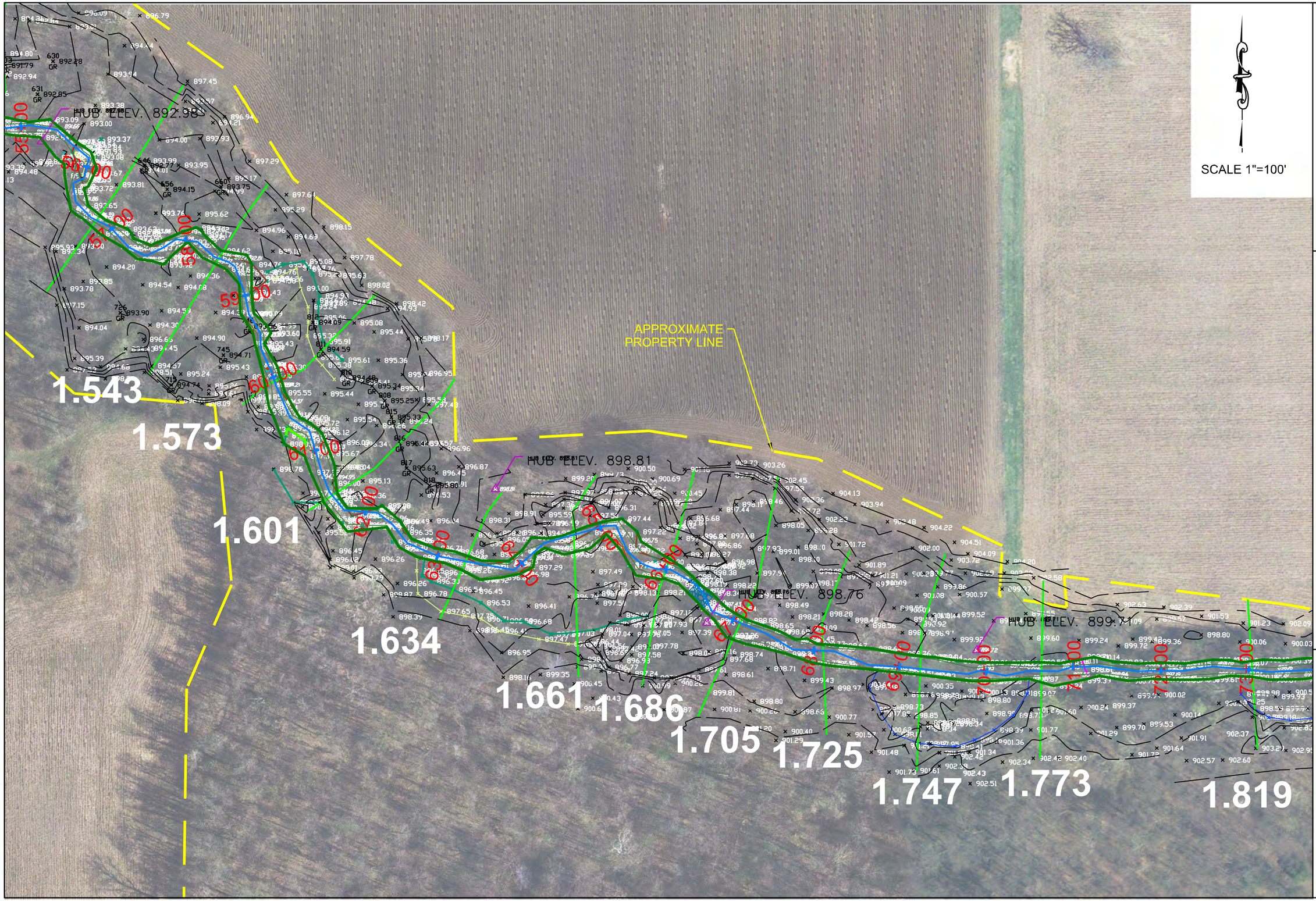

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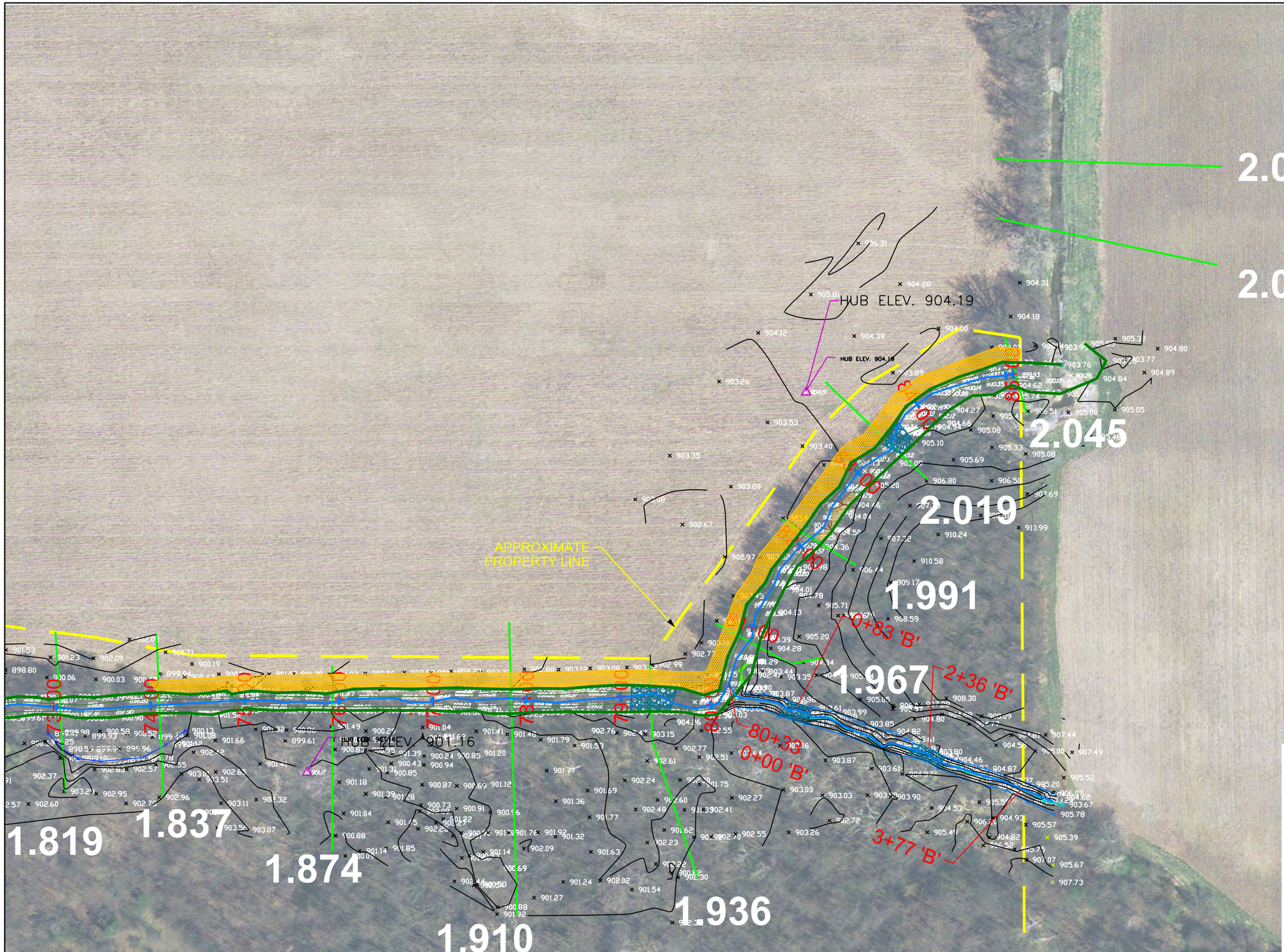
Cross Section Map 5
Dillon Creek
Kosciusko & Noble Counties
State of Indiana

Drawn By: JLM
Date: 5-26-10
Project Number: 10020
Scale: As Shown
Page: 5 of 6



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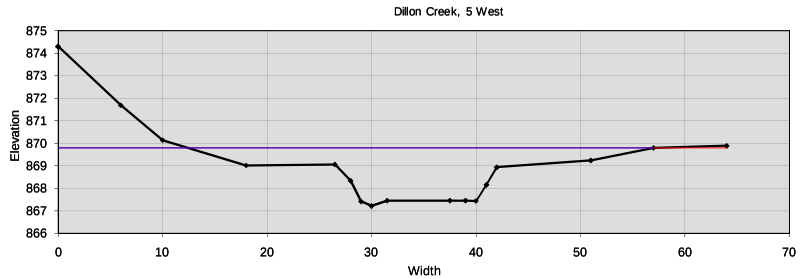
Cross Section Map 6
Dillon Creek
Kosciusko & Noble Counties
State of Indiana

Drawn By: JLM
Date: 5-26-10
Project Number: 10020
Scale: As Shown
Page: 6 of 6

Cross Section 1



Bankfull Dimensions	
49.6	x-section area (ft.sq.)
44.6	width (ft)
1.1	mean depth (ft)
2.6	max depth (ft)
45.7	wetted parimeter (ft)
1.1	hyd radi (ft)
40.1	width-depth ratio

Flood Dimensions	
44.6	W flood prone area (ft)
1.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
13	threshold grain size (mm):

Bankfull Flow	
2.5	velocity (ft/s)
123.3	discharge rate (cfs)
0.42	Froude number

Flow Resistance	
0.040	Manning's roughness
0.18	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.4	channel slope (%)
0.27	shear stress (lb/sq.ft.)
0.37	shear velocity (ft/s)
0.69	unit strm power (lb/ft/s)

Cross Section

reference ID	1	
instrument height	879.54	874.96
longitudinal station		25.0

Bankfull Stage

FS	9.74	= 869.8 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		44.6

Channel Slope

percent slope	0.4	---

Flow Resistance

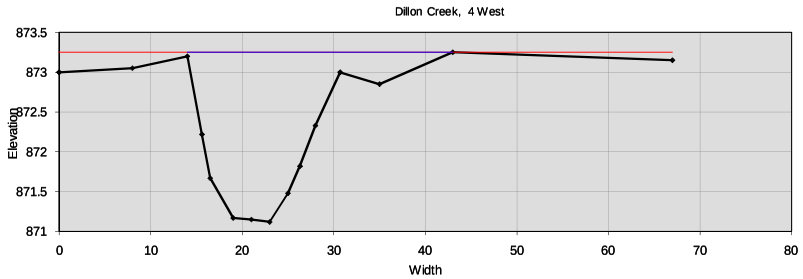
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		879.54	5.24	874.3	☐	
6		879.54	7.85	871.69	☐	
10		879.54	9.4	870.14	☐	
18		879.54	10.52	869.02	☐	
26.5		879.54	10.48	869.06	☐	
28		879.54	11.2	868.34	☐	
29		879.54	12.12	867.42	☐	
30		879.54	12.32	867.22	☐	
31.5		879.54	12.08	867.46	☐	
37.5		879.54	12.08	867.46	☐	
39		879.54	12.08	867.46	☐	
40		879.54	12.1	867.44	☐	
41		879.54	11.38	868.16	☐	
42		879.54	10.6	868.94	☐	
51		879.54	10.3	869.24	☐	
57		879.54	9.74	869.8	☐	
64		879.54	9.65	869.89	☑	

FPA	TRUE	BKHT	TRUE			D MAX	POWER
869.80		x lf bk	y lf bk	x rt bk	y rt bk	0	0.691
0	869.8	0	#N/A	57	#N/A		
64	869.8	10	#N/A	64	#N/A		

Cross Section 2



Bankfull Dimensions	
27.6	x-section area (ft.sq.)
29.0	width (ft)
1.0	mean depth (ft)
2.1	max depth (ft)
29.7	wetted parimeter (ft)
0.9	hyd radi (ft)
30.5	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
11	threshold grain size (mm):

Bankfull Flow	
2.2	velocity (ft/s)
61.8	discharge rate (cfs)
0.41	Froude number

Flow Resistance	
0.040	Manning's roughness
0.19	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.4	channel slope (%)
0.23	shear stress (lb/sq.ft.)
0.35	shear velocity (ft/s)
0.53	unit strm power (lb/ft/s)

Cross Section

reference ID	2	
instrument height	878.45	878.98
longitudinal station		1067.9

Bankfull Stage

FS	5.2	= 873.25 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		67.0

Channel Slope

percent slope	0.4	---

Flow Resistance

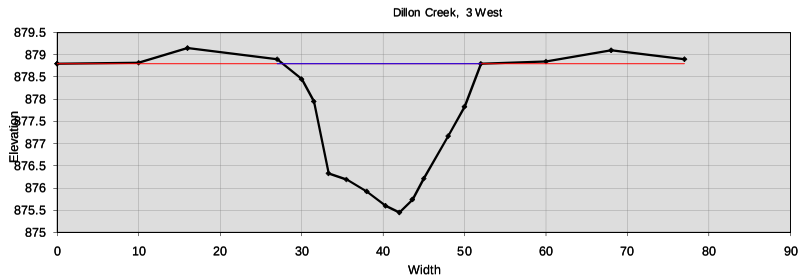
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		878.45	5.45	873	☑	
8		878.45	5.4	873.05	☑	
14		878.45	5.25	873.2	☐	
15.6		878.45	6.23	872.22	☐	
16.5		878.45	6.78	871.67	☐	
19		878.45	7.28	871.17	☐	
21		878.45	7.3	871.15	☐	
23		878.45	7.33	871.12	☐	
25		878.45	6.97	871.48	☐	
26.3		878.45	6.63	871.82	☐	
28		878.45	6.12	872.33	☐	
30.7		878.45	5.45	873	☐	
35		878.45	5.6	872.85	☐	
43		878.45	5.2	873.25	☐	
67		878.45	5.3	873.15	☑	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

FPA	TRUE	BKHT	TRUE				D MAX	POWER	
873.25		x lf bk	y lf bk	x rt bk	y rt bk		0	0.532	1
0	873.25	0	#N/A	43	#N/A				
67	873.3	14	#N/A	67	#N/A				

Cross Section 3



Bankfull Dimensions	
48.3	x-section area (ft.sq.)
24.3	width (ft)
2.0	mean depth (ft)
3.4	max depth (ft)
25.7	wetted parimeter (ft)
1.9	hyd radi (ft)
12.3	width-depth ratio

Flood Dimensions	
24.3	W flood prone area (ft)
1.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
12	threshold grain size (mm):

Bankfull Flow	
2.5	velocity (ft/s)
122.5	discharge rate (cfs)
0.33	Froude number

Flow Resistance	
0.040	Manning's roughness
0.15	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.2	channel slope (%)
0.23	shear stress (lb/sq.ft.)
0.35	shear velocity (ft/s)
0.63	unit strm power (lb/ft/s)

Cross Section

reference ID	3	
instrument height	883.6	883.69
longitudinal station		2128.4

Bankfull Stage

FS	4.8	= 878.8 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		24.3

Channel Slope

percent slope	0.2	---

Flow Resistance

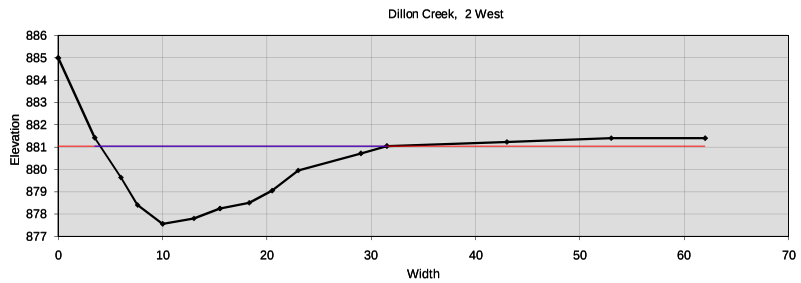
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		883.6	4.8	878.8	☑	
10		883.6	4.78	878.82	☑	
16		883.6	4.45	879.15	☑	
27		883.6	4.7	878.9	☐	
30		883.6	5.15	878.45	☐	
31.5		883.6	5.65	877.95	☐	
33.3		883.6	7.27	876.33	☐	
35.5		883.6	7.41	876.19	☐	
38		883.6	7.68	875.92	☐	
40.3		883.6	8	875.6	☐	
42		883.6	8.15	875.45	☐	
43.6		883.6	7.86	875.74	☐	
45		883.6	7.39	876.21	☐	
48		883.6	6.43	877.17	☐	
50		883.6	5.77	877.83	☐	
52		883.6	4.8	878.8	☐	
60		883.6	4.75	878.85	☑	
68		883.6	4.5	879.1	☑	
77		883.6	4.7	878.9	☑	
					☑	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

FPA	TRUE	BKHT	TRUE			D MAX	POWER	
878.80		x lf bk	y lf bk	x rt bk	y rt bk	0	0.628	1
0	878.8	0	#N/A	52	#N/A			
77	878.8	27	#N/A	77	#N/A			

Cross Section 4



Bankfull Dimensions	
50.8	x-section area (ft.sq.)
27.5	width (ft)
1.8	mean depth (ft)
3.5	max depth (ft)
28.9	wetted parimeter (ft)
1.8	hyd radi (ft)
14.9	width-depth ratio

Flood Dimensions	
27.5	W flood prone area (ft)
1.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
17	threshold grain size (mm):

Bankfull Flow	
3.1	velocity (ft/s)
155.8	discharge rate (cfs)
0.41	Froude number

Flow Resistance	
0.040	Manning's roughness
0.15	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.32	channel slope (%)
0.35	shear stress (lb/sq.ft.)
0.43	shear velocity (ft/s)
1.13	unit strm power (lb/ft/s)

Cross Section

reference ID	4	
instrument height	886.3	886.39
longitudinal station		3076.1

Bankfull Stage

FS	5.25	= 881.05 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		27.5

Channel Slope

percent slope	0.32	---

Flow Resistance

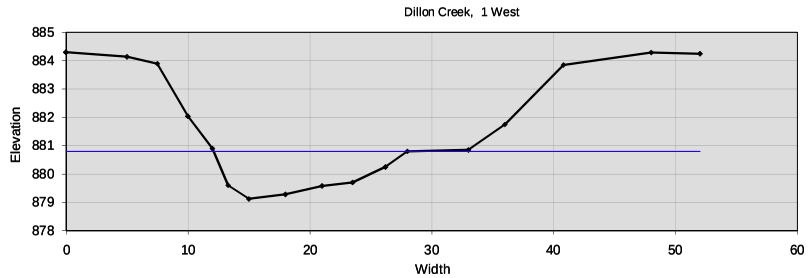
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		886.3	1.3	885	☑	
3.5		886.3	4.88	881.42	☐	
6		886.3	6.66	879.64	☐	
7.6		886.3	7.9	878.4	☐	
10		886.3	8.74	877.56	☐	
13		886.3	8.5	877.8	☐	
15.5		886.3	8.05	878.25	☐	
18.3		886.3	7.8	878.5	☐	
20.5		886.3	7.25	879.05	☐	
23		886.3	6.35	879.95	☐	
29		886.3	5.58	880.72	☐	
31.5		886.3	5.25	881.05	☐	
43		886.3	5.07	881.23	☑	
53		886.3	4.9	881.4	☑	
62		886.3	4.9	881.4	☑	

FPA	TRUE	BKHT	TRUE			D MAX	POWER	
881.05		x lf bk	y lf bk	x rt bk	y rt bk	0	1.132	1
0	881.05	0	#N/A	31.5	#N/A			
62	881.1	3.5	#N/A	62	#N/A			

Cross Section 5



Bankfull Dimensions	
17.7	x-section area (ft.sq.)
15.9	width (ft)
1.1	mean depth (ft)
1.7	max depth (ft)
16.6	wetted parimeter (ft)
1.1	hyd radi (ft)
14.3	width-depth ratio

Flood Dimensions	
15.9	W flood prone area (ft)
1.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
19	threshold grain size (mm):

Bankfull Flow	
2.9	velocity (ft/s)
51.9	discharge rate (cfs)
0.50	Froude number

Flow Resistance	
0.040	Manning's roughness
0.18	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.57	channel slope (%)
0.38	shear stress (lb/sq.ft.)
0.44	shear velocity (ft/s)
1.16	unit strm power (lb/ft/s)

Cross Section

reference ID	5	
instrument height	888.8	887.47
longitudinal station		3522.7

Bankfull Stage

FS	8	= 880.8 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		15.9

Channel Slope

percent slope	0.57	---

Flow Resistance

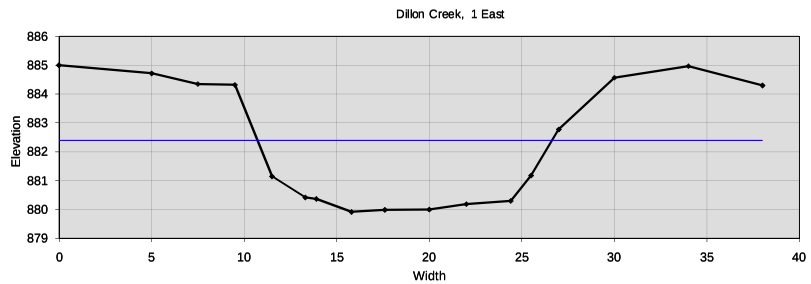
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		888.8	4.5	884.3	☐	
5		888.8	4.66	884.14	☐	
7.5		888.8	4.9	883.9	☐	
10		888.8	6.76	882.04	☐	
12		888.8	7.9	880.9	☐	
13.3		888.8	9.2	879.6	☐	
15		888.8	9.68	879.12	☐	
18		888.8	9.52	879.28	☐	
21		888.8	9.22	879.58	☐	
23.5		888.8	9.1	879.7	☐	
26.2		888.8	8.55	880.25	☐	
28		888.8	8	880.8	☐	
33		888.8	7.95	880.85	☐	
36		888.8	7.05	881.75	☐	
40.8		888.8	4.95	883.85	☐	
48		888.8	4.51	884.29	☐	
52		888.8	4.55	884.25	☐	

FPA	TRUE	BKHT	TRUE			D MAX	POWER	
880.80		x lf bk	y lf bk	x rt bk	y rt bk	0	1.161	1
0	880.8	0	#N/A	28	#N/A			
52	880.8	12	#N/A	52	#N/A			

Cross Section 6



Bankfull Dimensions

31.4	x-section area (ft.sq.)
15.9	width (ft)
2.0	mean depth (ft)
2.5	max depth (ft)
17.7	wetted parimeter (ft)
1.8	hyd radi (ft)
8.1	width-depth ratio

Flood Dimensions

200.0	W flood prone area (ft)
12.6	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
31	threshold grain size (mm):

Bankfull Flow

4.1	velocity (ft/s)
129.3	discharge rate (cfs)
0.55	Froude number

Flow Resistance

0.040	Manning's roughness
0.15	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.57	channel slope (%)
0.63	shear stress (lb/sq.ft.)
0.57	shear velocity (ft/s)
2.9	unit strm power (lb/ft/s)

Cross Section

reference ID	6	
instrument height	888.9	892
longitudinal station		3692.5

Bankfull Stage

FS	6.5	= 882.4 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa	200	15.9

Channel Slope

percent slope	0.57	---

Flow Resistance

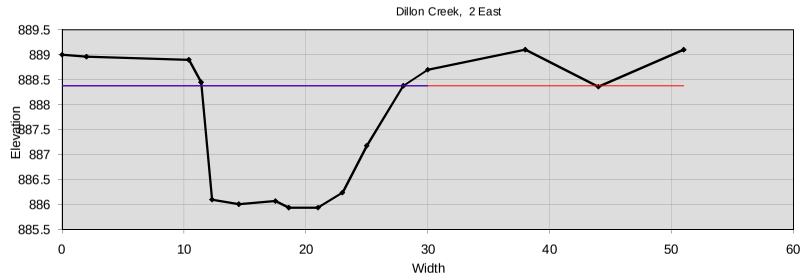
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		888.9	3.9	885	☐	
5		888.9	4.18	884.72	☐	
7.5		888.9	4.55	884.35	☐	
9.5		888.9	4.58	884.32	☐	
11.5		888.9	7.75	881.15	☐	
13.3		888.9	8.48	880.42	☐	
13.9		888.9	8.53	880.37	☐	
15.8		888.9	8.98	879.92	☐	
17.6		888.9	8.91	879.99	☐	
20		888.9	8.9	880	☐	
22		888.9	8.71	880.19	☐	
24.4		888.9	8.6	880.3	☐	
25.5		888.9	7.72	881.18	☐	
27		888.9	6.12	882.78	☐	
30		888.9	4.33	884.57	☐	
34		888.9	3.93	884.97	☐	
38		888.9	4.6	884.3	☐	

FPA	TRUE	BKHT	TRUE			D MAX	POWER	
882.40		x lf bk	y lf bk	x rt bk	y rt bk	0	2.886	1
0	882.4	0	#N/A	27	#N/A			
38	882.4	9.5	#N/A	38	#N/A			

Cross Section 7



Bankfull Dimensions	
31.3	x-section area (ft.sq.)
16.6	width (ft)
1.9	mean depth (ft)
2.4	max depth (ft)
18.6	wetted parimeter (ft)
1.7	hyd radi (ft)
8.8	width-depth ratio

Flood Dimensions	
200.0	W flood prone area (ft)
12.1	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
15	threshold grain size (mm):

Bankfull Flow	
2.9	velocity (ft/s)
90.4	discharge rate (cfs)
0.39	Froude number

Flow Resistance	
0.040	Manning's roughness
0.16	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.3	channel slope (%)
0.31	shear stress (lb/sq.ft.)
0.40	shear velocity (ft/s)
1.02	unit strm power (lb/ft/s)

Cross Section

reference ID	7	
instrument height	894.1	895.59
longitudinal station		4715.2

Bankfull Stage

FS	5.72	= 888.38 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa	200	16.9

Channel Slope

percent slope	0.3	---

Flow Resistance

Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		894.1	5.1	889	☐	
2		894.1	5.14	888.96	☐	
10.4		894.1	5.2	888.9	☐	
11.4		894.1	5.65	888.45	☐	
12.3		894.1	8	886.1	☐	
14.5		894.1	8.09	886.01	☐	
17.5		894.1	8.03	886.07	☐	
18.6		894.1	8.16	885.94	☐	
21		894.1	8.16	885.94	☐	
23		894.1	7.86	886.24	☐	
25		894.1	6.92	887.18	☐	
28		894.1	5.72	888.38	☐	
30		894.1	5.4	888.7	☐	
38		894.1	5	889.1	☑	
44		894.1	5.74	888.36	☑	
51		894.1	5	889.1	☑	
					☐	
					☐	
					☐	
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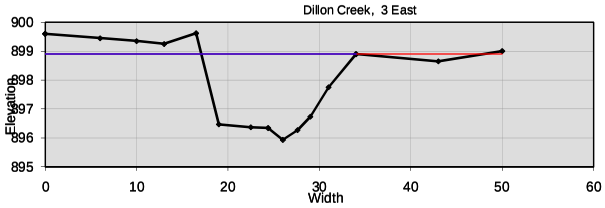
					☐	
					☐	
					☐	
					☐	

FPA	TRUE	BKHT	TRUE			D MAX	POWER	DIST
888.38		x lf bk	y lf bk	x rt bk	y rt bk	0	1.021	1
0	888.38	0	#N/A	28	#N/A			
51	888.4	11.4	#N/A	51	#N/A			

Cross Section 8



Bankfull Dimensions	
33.2	x-section area (ft.sq.)
16.9	width (ft)
2.0	mean depth (ft)
3.0	max depth (ft)
18.7	wetted parimeter (ft)
1.8	hyd radi (ft)
8.6	width-depth ratio

Flood Dimensions	
30.9	W flood prone area (ft)
1.8	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
9	threshold grain size (mm):

Bankfull Flow	
2.2	velocity (ft/s)
74.6	discharge rate (cfs)
0.30	Froude number

Flow Resistance	
0.040	Manning's roughness
0.15	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.17	channel slope (%)
0.19	shear stress (lb/sq.ft.)
0.31	shear velocity (ft/s)
0.47	unit strm power (lb/ft/s)

Cross Section

reference ID	8	
instrument height	903.05	906.25
longitudinal station		7922.9

Bankfull Stage

FS	4.15	= 898.9 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		30.9

Channel Slope

percent slope	0.17	---

Flow Resistance

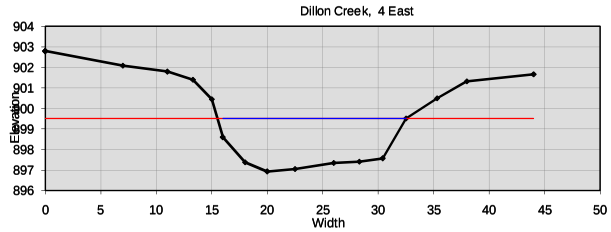
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		903.05	3.45	899.6	☐	
6		903.05	3.6	899.45	☐	
10		903.05	3.7	899.35	☐	
13		903.05	3.8	899.25	☐	
16.5		903.05	3.43	899.62	☐	
19		903.05	6.58	896.47	☐	
22.5		903.05	6.68	896.37	☐	
24.4		903.05	6.71	896.34	☐	
26		903.05	7.12	895.93	☐	
27.6		903.05	6.78	896.27	☐	
29		903.05	6.32	896.73	☐	
31		903.05	5.3	897.75	☐	
34		903.05	4.15	898.9	☐	
43		903.05	4.4	898.65	☑	
50		903.05	4.05	899	☑	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

FPA	TRUE	BKHT	TRUE				D MAX	POWER	LIST
898.90		x lf bk	y lf bk	x rt bk	y rt bk		0	0.467	1
0	898.9	0	#N/A	34	#N/A				
50	898.9	16.5	#N/A	50	#N/A				

Cross Section 9



Bankfull Dimensions	
33.5	x-section area (ft.sq.)
16.5	width (ft)
2.0	mean depth (ft)
2.6	max depth (ft)
17.7	wetted parimeter (ft)
1.9	hyd radi (ft)
8.1	width-depth ratio

Flood Dimensions	
17.0	W flood prone area (ft)
1.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
17	threshold grain size (mm):

Bankfull Flow	
3.1	velocity (ft/s)
104.7	discharge rate (cfs)
0.40	Froude number

Flow Resistance	
0.040	Manning's roughness
0.15	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.3	channel slope (%)
0.35	shear stress (lb/sq.ft.)
0.43	shear velocity (ft/s)
1.19	unit strm power (lb/ft/s)

Cross Section

reference ID	9	
instrument height	906.2	907.24
longitudinal station		8514.8

Bankfull Stage

FS	6.68	= 899.52 elev
elevation		---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		17.0

Channel Slope

percent slope	0.3	---

Flow Resistance

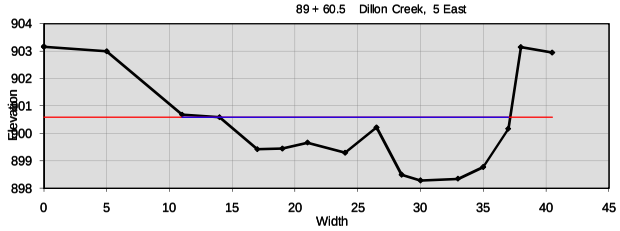
Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		906.2	3.4	902.8	☑	
7		906.2	4.11	902.09	☑	
11		906.2	4.4	901.8	☑	
13.3		906.2	4.8	901.4	☑	
15		906.2	5.75	900.45	☑	
16		906.2	7.6	898.6	☐	
18		906.2	8.83	897.37	☐	
20		906.2	9.27	896.93	☐	
22.5		906.2	9.15	897.05	☐	
26		906.2	8.86	897.34	☐	
28.3		906.2	8.79	897.41	☐	
30.4		906.2	8.63	897.57	☐	
32.5		906.2	6.68	899.52	☐	
35.3		906.2	5.7	900.5	☑	
38		906.2	4.88	901.32	☑	
44		906.2	4.53	901.67	☑	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

FPA	TRUE	BKHT	TRUE				D MAX	POWER	
899.52		x lf bk	y lf bk	x rt bk	y rt bk		0	1.188	1
0	899.52	0	#N/A	32.5	#N/A				
44	899.5	16	#N/A	44	#N/A				

Cross Section 10



Bankfull Dimensions	
30.5	x-section area (ft.sq.)
23.0	width (ft)
1.3	mean depth (ft)
2.3	max depth (ft)
24.6	wetted parimeter (ft)
1.2	hyd radi (ft)
17.3	width-depth ratio

Flood Dimensions	
23.1	W flood prone area (ft)
1.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
11	threshold grain size (mm):

Bankfull Flow	
2.4	velocity (ft/s)
72.0	discharge rate (cfs)
0.37	Froude number

Flow Resistance	
0.040	Manning's roughness
0.17	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.3	channel slope (%)
0.23	shear stress (lb/sq.ft.)
0.35	shear velocity (ft/s)
0.59	unit strm power (lb/ft/s)

Cross Section

reference ID: 10
instrument height: 907.24
longitudinal station: 8960.5

Bankfull Stage

FS: 6.65 = 900.59 elev
elevation: ---

Low Bank Height

FS: ---
elevation:

Flood Prone Area

width fpa: 23.1

Channel Slope

percent slope: 0.3 ---

Flow Resistance

Manning's "n": 0.04 ---
D'Arcy - Weisbach "f": ---

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		907.24	4.08	903.16	☑	
5		907.24	4.25	902.99	☑	
11		907.24	6.56	900.68	☐	
14		907.24	6.65	900.59	☐	
17		907.24	7.82	899.42	☐	
19		907.24	7.8	899.44	☐	
21		907.24	7.58	899.66	☐	
24		907.24	7.95	899.29	☐	
26.5		907.24	7.03	900.21	☐	
28.5		907.24	8.75	898.49	☐	
30		907.24	8.96	898.28	☐	
33		907.24	8.9	898.34	☐	
35		907.24	8.47	898.77	☐	
37		907.24	7.07	900.17	☐	
38		907.24	4.1	903.14	☑	
40.5		907.24	4.3	902.94	☑	
					☑	
					☐	
					☐	
					☐	
					☐	
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					☐	
					☐	
					☐	
					☐	
					☐	

FPA	TRUE	BKHT	TRUE				D MAX	POWER	
900.59		x lf bk	y lf bk	x rt bk	y rt bk		0	0.586	1
0	900.59	0	#N/A	37	#N/A				
40.5	900.6	14	#N/A	40.5	#N/A				

File> C:\Program Files\Carlson Software 2006\DATA\Dillon Creek.crd
Job Description>
Job Number> 0.000 Job Date> 2010.0209

PointNo.	Northing(Y)	Easting(X)	Elev(Z)	Description
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201	9239.156	10219.945	888.739	CP144
203	9239.422	10219.922	888.705	CHECK
204	9231.953	10187.054	884.954	CL
205	9207.125	10196.378	884.292	CL
206	9198.124	10196.462	884.923	CL
207	9180.477	10189.807	884.244	CL
208	9170.136	10196.461	884.683	CL
209	9163.691	10206.097	884.287	CL
210	9157.971	10226.028	884.234	CL
211	9153.487	10244.391	884.875	CL
212	9143.560	10251.043	884.474	CL
213	9143.326	10256.950	884.495	CL
214	9162.832	10274.440	885.260	CL
215	9165.649	10286.771	885.356	CL
216	9163.774	10299.034	884.929	CL
217	9157.977	10309.939	885.840	CL
218	9156.128	10320.894	885.870	CL
219	9157.060	10332.057	885.512	CL
220	9162.341	10342.500	885.561	CL
221	9155.914	10352.149	886.144	CL
222	9155.896	10352.114	886.145	CL
223	9148.905	10362.623	885.918	CL
224	9130.397	10365.536	885.898	CL
225	9123.035	10365.918	885.819	CL
226	9116.070	10386.016	885.983	CL
227	9110.922	10393.388	886.028	CL
228	9097.508	10399.594	886.479	CL
229	9078.667	10426.859	886.968	CL
230	9097.940	10412.515	887.317	EW
231	9091.269	10399.375	887.069	EW
232	9115.618	10394.430	886.662	EW
233	9109.223	10389.655	886.811	EW
234	9130.846	10368.986	886.872	EW
235	9125.466	10355.552	887.094	EW
236	9147.529	10355.669	886.743	EW
237	9153.550	10364.832	886.278	EW
238	9154.448	10342.047	886.600	EW
239	9167.228	10344.992	886.520	EW
240	9160.905	10318.799	886.194	EW
241	9151.708	10314.841	886.499	EW
242	9169.829	10300.241	886.371	EW
243	9157.912	10292.876	886.319	EW
244	9146.082	10268.763	886.027	EW
245	9155.392	10263.870	885.778	EW
246	9165.014	10223.573	885.756	EW

247	9156.012	10219.892	885.494	EW
248	9175.418	10186.471	885.398	EW
249	9181.793	10195.966	885.786	EW
250	9214.578	10204.052	885.669	EW
251	9211.781	10190.424	885.703	EW
252	9229.330	10179.392	885.240	EW
253	9241.232	10190.405	884.792	EW
254	9230.660	10199.575	888.376	RDB
255	9209.546	10207.630	888.219	RDB
256	9180.430	10204.865	888.122	RDB
257	9171.271	10206.974	887.749	RDB
258	9164.964	10232.227	888.585	RDB
259	9158.227	10247.083	887.956	RDB
260	9158.158	10257.644	888.393	RDB
261	9172.689	10278.045	890.314	RDB
262	9180.075	10303.766	891.552	RDB
263	9176.375	10311.625	890.205	RDB
264	9163.868	10317.464	887.395	RDB
265	9171.313	10336.828	890.444	RDB
266	9168.063	10350.179	890.209	RDB
267	9160.869	10359.555	889.074	RDB
268	9151.362	10368.074	889.215	RDB
269	9147.947	10370.769	887.541	RDB
270	9133.894	10371.240	888.279	RDB
271	9122.390	10382.391	889.381	RDB
272	9113.688	10403.876	888.725	RDB
273	9115.308	10422.648	889.630	GR
274	9126.887	10441.274	889.946	GR
275	9143.683	10432.898	889.865	GR
276	9123.019	10415.805	889.993	GR
277	9131.415	10401.799	889.557	GR
278	9127.678	10388.197	889.257	GR
279	9135.890	10390.592	887.893	GR
280	9144.654	10387.638	889.503	GR
281	9140.750	10375.973	888.644	GR
282	9165.211	10389.951	889.729	GR
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284	9198.664	10382.730	890.575	GR
285	9184.228	10364.804	890.201	GR
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288	9220.423	10388.344	894.225	GR
289	9244.457	10350.493	894.720	GR
290	9246.598	10324.191	893.752	GR
291	9240.377	10288.399	890.848	GR
292	9209.433	10287.883	890.829	GR
293	9202.614	10305.830	891.417	GR
294	9200.778	10332.250	890.218	GR
295	9221.621	10336.518	890.791	GR
296	9223.979	10316.067	892.210	GR
297	9260.354	10273.743	889.399	GR
298	9274.453	10294.940	893.433	GR

299	9308.271	10281.093	892.595	GR
300	9319.038	10258.832	890.834	GR
301	9288.619	10240.260	889.004	GR
302	9225.347	10178.600	887.811	LDB
303	9206.905	10189.139	888.272	LDB
304	9180.951	10182.274	887.713	LDB
305	9159.084	10195.508	888.228	LDB
306	9148.088	10221.319	888.464	LDB
307	9137.616	10241.658	888.302	LDB
308	9123.889	10252.986	888.933	LDB
309	9131.178	10271.636	889.094	LDB
310	9146.152	10272.746	888.289	LDB
311	9155.858	10290.594	888.735	LDB
312	9146.645	10315.718	888.489	LDB
313	9148.725	10348.027	888.797	LDB
314	9136.135	10353.984	889.684	LDB
315	9119.634	10348.563	889.617	LDB
316	9105.763	10361.323	890.087	LDB
317	9106.661	10380.054	889.556	LDB
318	9107.666	10388.362	888.407	LDB
319	9083.227	10395.504	890.018	LDB
320	9073.536	10423.730	889.714	LDB
321	9028.596	10390.488	890.371	GR
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327	8991.898	10210.592	888.415	GR
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329	9023.050	10148.149	887.118	GR
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336	8977.772	10135.312	896.789	GR
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344	8966.333	10333.001	897.089	GR
345	8987.292	10364.281	894.503	GR
346	9000.635	10394.557	893.049	GR
347	9049.488	10354.421	888.438	GR
348	9030.708	10352.761	888.670	GR
349	9012.556	10338.587	889.507	GR
350	9005.862	10317.757	889.061	GR

351	9037.014	10318.971	889.656	GR
352	9082.761	10333.569	889.033	GR
353	9113.607	10333.088	889.165	GR
354	9109.776	10293.418	889.341	GR
355	9062.649	10271.154	889.380	GR
356	9056.869	10266.015	887.730	GR
357	9047.176	10260.106	888.308	GR
358	9020.905	10243.956	888.771	GR
359	9025.448	10220.581	888.243	GR
360	9026.449	10209.838	887.614	GR
361	9030.371	10167.936	888.402	GR
362	9073.379	10150.385	888.165	GR
363	9114.538	10156.692	887.723	GR
364	9094.863	10200.204	888.345	GR
365	9077.651	10220.777	888.493	GR
366	9065.773	10222.990	888.039	GR
367	9071.286	10220.523	887.574	GR
368	9010.546	10460.171	894.705	CP H/T
369	9095.542	10232.225	888.935	CHECK
370	9064.586	10435.726	890.885	LDB
371	9050.669	10466.126	890.906	LDB
372	9052.636	10473.484	889.037	LDB
373	9055.122	10476.720	889.789	LDB
374	9064.735	10486.992	889.596	LDB
375	9068.560	10492.287	888.962	LDB
376	9072.835	10496.108	890.188	LDB
377	9084.870	10512.093	890.773	LDB
378	9068.891	10523.332	890.904	LDB
379	9057.878	10525.725	891.273	LDB
380	9053.033	10537.561	889.270	CL
381	9059.036	10537.767	890.690	JAM
382	9064.542	10534.947	888.316	CL
383	9043.479	10512.832	890.805	LBD
384	9012.550	10502.697	891.473	LBD
385	8990.924	10510.079	891.324	LBD
386	8963.487	10518.589	895.358	LBD
387	8948.827	10536.443	893.595	LBD
388	8928.249	10547.212	891.697	LBD
389	8916.679	10572.410	891.945	LBD
390	8923.555	10583.233	891.226	LBD
391	8938.571	10585.400	891.070	LBD
392	8937.905	10605.115	891.281	LBD
393	8919.274	10620.238	891.849	LBD
394	8901.239	10627.870	891.529	LBD
395	8886.360	10636.393	891.877	LBD
396	8860.410	10632.938	892.077	LBD
397	8843.345	10624.491	892.382	LBD
398	8824.487	10622.635	892.036	LBD
399	8799.156	10623.360	892.433	LBD
400	8782.852	10635.867	891.131	LBD
401	8781.096	10619.169	892.881	GR
402	8773.115	10589.522	894.052	GR

403	8779.748	10585.850	895.345	SP
404	8790.484	10580.212	892.783	GR
405	8802.640	10561.658	892.847	GR
406	8786.240	10539.733	895.027	GR
407	8814.636	10529.298	896.630	GR
408	8825.293	10549.053	892.727	GR
409	8828.189	10583.755	892.295	GR
410	8868.918	10599.345	892.049	GR
411	8889.481	10580.193	891.666	GR
412	8862.813	10571.112	892.720	GR
413	8852.254	10553.203	892.331	GR
414	8846.505	10529.055	895.399	GR
415	8874.224	10502.897	896.812	GR
416	8888.231	10520.304	893.626	GR
417	8896.976	10536.985	892.683	GR
418	8928.417	10517.389	895.424	GR
419	8922.082	10487.429	896.884	GR
420	8965.530	10482.248	895.936	GR
421	8981.543	10490.891	892.398	GR
422	9015.936	10483.169	891.268	GR
423	9037.894	10492.708	890.834	GR
424	9049.768	10502.165	889.709	GR
425	9058.189	10505.324	891.251	GR
426	9059.935	10426.235	890.150	CS2E
427	9043.797	10414.975	889.858	GR
428	9029.377	10417.134	892.449	GR
429	8992.836	10445.063	895.479	GR
430	9064.793	10551.238	890.356	LBD2
431	9048.361	10555.670	890.801	LBD2
432	9045.672	10565.401	890.226	LBD2
433	9054.851	10565.901	890.699	LBD2
434	9067.823	10562.980	890.358	LBD2
435	9086.164	10563.286	890.265	LBD2
436	9114.606	10562.591	890.608	LBD2
437	9136.788	10557.626	890.181	LBD2
438	9162.608	10544.553	890.125	LBD2
439	9170.854	10519.393	889.848	LBD2
440	9171.527	10502.401	890.292	LBD2
441	9170.097	10485.935	889.974	LBD2
442	9141.974	10492.640	889.254	LBD2
443	9123.766	10511.627	888.254	LBD2
444	9121.566	10513.457	889.168	LBD2
445	9101.968	10521.123	889.295	RDB LDB
446	9095.248	10527.056	890.488	RDB
447	9080.995	10536.893	890.405	RDB
448	9034.245	10553.335	890.857	RDB2
449	9038.188	10570.903	891.100	RDB2
450	9045.811	10578.542	890.399	RDB2
451	9059.022	10576.289	890.955	RDB2
452	9072.523	10574.531	890.350	RDB2
453	9084.458	10578.304	890.758	RDB2
454	9113.202	10578.833	891.149	RDB2

455	9141.978	10574.481	892.314	RDB2
456	9176.617	10552.849	891.774	RDB2
457	9184.454	10532.776	890.382	RDB2
458	9187.387	10512.178	890.168	RDB2
459	9188.440	10508.658	888.511	RDB2 TILE
460	9189.516	10504.008	890.670	RDB2
461	9191.148	10484.948	890.339	RDB2
462	9186.597	10474.380	890.888	RDB2
463	9170.171	10466.122	889.934	RDB2
464	9152.191	10472.918	890.254	RDB2
465	9131.592	10481.900	890.662	RDB2
466	9120.298	10495.057	890.262	RDB2
467	9105.289	10503.199	889.815	RDB2
468	9090.465	10485.777	890.003	RDB
469	9075.194	10468.316	889.627	RDB
470	9084.489	10438.354	889.426	RDB
471	9092.286	10460.088	889.366	GR
472	9112.336	10466.370	890.406	GR
473	9142.319	10449.702	890.100	GR
474	9183.343	10449.848	890.095	GR
475	9220.618	10464.426	891.230	GR
476	9228.394	10492.904	892.771	GR
477	9224.906	10515.627	895.612	GR
478	9207.821	10524.213	896.516	GR
479	9192.582	10561.927	896.917	GR
480	9156.479	10581.982	896.397	GR
481	9127.112	10620.752	896.563	GR
482	9086.748	10652.955	895.384	GR
483	9076.826	10634.088	891.710	GR
484	9105.227	10612.178	892.028	GR
485	9069.315	10583.101	889.700	CL OB
486	9059.231	10592.843	889.810	CL OB
487	9046.402	10609.370	889.756	CL OB
488	9049.851	10621.924	890.017	CL OB
489	9073.069	10638.243	890.129	CL OB
490	9071.823	10661.757	890.066	CL OB
491	9056.516	10679.115	890.184	CL OB
492	9038.944	10690.368	890.301	CL OB
493	9013.806	10693.373	890.431	CL OB
494	8987.659	10687.490	890.724	CL OB
495	8956.228	10689.840	890.457	CL OB
496	8935.062	10671.694	890.739	CL OB
497	8896.993	10674.843	890.988	CL OB
498	8897.621	10700.611	891.117	CL OB
499	8890.459	10713.573	890.930	CL OB
500	8878.239	10726.856	891.180	CL OB
501	8861.813	10740.251	891.141	CL OB
502	8840.890	10721.633	891.191	CL OB
503	8834.833	10715.841	891.988	GR
504	8822.507	10677.191	892.390	GR
505	8792.654	10667.330	892.371	3900
506	8787.233	10656.995	892.385	RDB

507	8820.204	10638.355	892.127	RDB
508	8840.226	10639.672	891.917	RDB
509	8875.694	10654.777	891.684	RDB
510	8912.935	10645.183	891.828	RDB
511	8941.531	10627.863	891.724	RDB
512	8953.764	10598.007	891.727	RDB
513	8953.384	10575.749	890.592	RDB
514	8939.919	10560.604	891.362	RDB
515	8952.520	10556.608	890.478	RDB
516	8963.362	10549.984	891.415	RDB
517	8985.161	10539.121	891.104	RDB
518	9003.715	10523.477	891.169	RDB
519	9021.338	10519.331	890.633	RDB
520	9037.380	10528.859	891.118	RDB
521	9044.582	10542.898	890.581	RDB
522	9005.543	10553.281	891.263	GR
523	8969.189	10567.138	891.607	GR
524	8984.263	10588.664	891.893	GR
525	9002.871	10614.998	890.850	GR
526	9021.410	10641.201	891.561	GR
527	9068.245	10622.836	891.577	GR
528	9085.276	10596.741	891.926	GR
529	9085.448	10664.441	896.558	GR
530	9110.083	10641.920	897.308	GR
531	9053.558	10700.709	896.262	GR
532	9013.129	10708.802	897.227	GR
533	8980.906	10702.130	896.837	GR
534	8954.392	10706.550	895.551	GR
535	8907.353	10722.375	894.218	GR
536	8888.202	10764.908	895.082	GR
537	8917.675	10705.759	891.436	GR
538	8943.428	10697.462	891.460	GR
539	8937.064	10660.346	891.295	GR
540	8985.466	10652.276	891.441	GR
541	9023.605	10681.006	891.594	GR
542	9270.770	10508.703	896.699	NAIL SPIKE
543	8771.527	10645.050	892.263	H/T
544	9010.605	10460.181	894.730	CHECK368
545	9256.591	10529.904	896.017	RC FP
546	9685.230	9719.296	893.981	CL ROAD
547	10086.502	9719.296	899.100	MON INTER
548	9570.513	9740.699	892.022	H/T CP
549	9324.670	10067.298	895.292	R/C
550	9337.392	10001.998	893.776	H/T
551	9239.223	10219.757	888.877	CHECK
552	8769.208	10590.977	894.171	RP
553	8765.319	10591.315	896.432	RP
554	8760.042	10592.060	894.717	RP
555	8739.204	10603.604	894.681	GR
556	8720.024	10625.508	894.608	GR
557	8696.398	10650.244	894.961	GR
558	8686.899	10683.554	895.622	GR

559	8674.847	10699.136	892.185	GR
560	8697.500	10689.487	892.370	GR
561	8707.970	10670.438	892.385	GR
562	8711.669	10647.772	892.305	GR
563	8731.544	10636.629	892.258	GR
564	8763.079	10652.912	892.102	LDB
565	8724.545	10663.949	892.259	LDB
566	8716.291	10675.886	892.264	LDB
567	8718.866	10683.797	892.318	LDB
568	8731.619	10695.822	891.770	LDB
569	8737.579	10700.343	890.669	LDB
570	8740.017	10704.042	892.126	LDB
571	8750.616	10724.401	892.205	LDB
572	8765.044	10742.070	892.950	LDB
573	8760.178	10755.145	892.783	LDB
574	8747.694	10762.902	892.819	LDB
575	8717.001	10760.832	892.784	LDB
576	8702.369	10764.537	892.832	LDB
577	8690.848	10784.582	892.995	LDB
578	8685.766	10814.638	892.393	LDB
579	8683.384	10845.309	892.837	LDB
580	8661.074	10862.953	893.128	LDB
581	8640.095	10873.405	893.440	LDB
582	8656.139	10837.229	892.815	GR
583	8653.654	10827.248	894.951	GR
584	8644.690	10809.533	894.484	GR
585	8649.730	10794.657	893.388	GR
586	8635.468	10783.925	893.129	GR
587	8619.931	10755.790	893.469	GR
588	8597.883	10770.404	896.145	GR
589	8597.730	10721.469	897.107	GR
590	8626.143	10726.013	894.160	GR
591	8656.423	10737.603	892.790	GR
592	8677.663	10754.910	892.976	GR
593	8682.946	10757.793	891.652	GR
594	8692.758	10757.459	892.399	GR
595	8711.417	10730.725	892.610	GR
596	8707.227	10725.459	891.324	GR
597	8704.371	10720.003	892.905	GR
598	8693.578	10694.479	892.445	GR
599	8706.137	10674.117	892.586	GR
600	8710.682	10649.105	892.481	GR
601	8786.395	10658.304	892.411	RDB
602	8770.394	10671.924	891.810	RDB
603	8762.176	10672.803	890.388	RDB CO
604	8754.801	10671.669	891.821	RDB
605	8738.473	10671.441	891.660	RDB
606	8729.387	10676.929	891.965	RDB
607	8737.341	10686.667	892.598	RDB
608	8745.255	10690.771	891.239	RDB CO
609	8756.621	10701.908	892.290	RDB
610	8775.000	10723.229	892.907	RDB

611	8787.658	10743.355	892.204	RDB
612	8778.937	10764.420	892.447	RDB
613	8770.188	10771.842	892.517	RDB
614	8762.075	10780.657	891.207	RDB CO
615	8755.863	10781.956	891.919	RDB
616	8733.503	10777.021	892.556	RDB
617	8711.604	10774.713	891.945	RDB
618	8700.705	10832.495	892.945	RDB
619	8703.734	10856.507	893.089	RDB
620	8678.459	10886.492	892.978	RDB
621	8666.822	10882.222	893.640	RDB
622	8699.150	10895.292	892.997	GR
623	8719.956	10907.855	893.377	GR
624	8755.429	10922.197	893.940	GR
625	8787.708	10940.979	894.440	GR
626	8821.773	10958.433	896.787	GR
627	8849.380	10916.320	896.836	GR
628	8824.756	10889.224	896.089	GR
629	8809.365	10878.866	893.007	GR
630	8769.955	10860.144	892.283	GR CO
631	8732.618	10842.369	892.846	GR CO
632	8752.491	10808.443	892.937	GR
633	8765.141	10806.243	891.792	GR CO
634	8778.514	10804.595	894.803	GR
635	8818.380	10817.112	894.312	GR
636	8815.760	10833.528	892.839	GR
637	8858.255	10802.775	895.008	GR
638	8830.779	10767.836	893.307	GR
639	8816.654	10731.500	892.373	GR
640	8813.789	10726.788	891.559	GR CO
641	8808.919	10718.743	892.866	GR
642	8796.513	10691.107	892.589	GR
643	8628.016	10913.265	893.896	H/T
644	8630.045	10931.975	893.811	GR
645	8646.735	10960.038	894.014	GR
646	8651.524	10963.730	892.774	GR CO
647	8657.019	10966.952	893.991	GR
648	8680.759	10980.787	893.998	GR
649	8714.172	11000.402	894.409	GR
650	8724.491	11010.197	893.573	GR
651	8747.324	11012.612	897.453	GR
652	8706.865	11054.585	896.939	GR
653	8700.384	11041.447	894.211	GR
654	8682.312	11026.656	893.933	GR
655	8652.133	11002.503	893.946	GR
656	8624.763	10989.575	894.150	GR
657	8597.525	10976.608	893.757	GR CO
658	8596.631	11025.733	895.620	GR
659	8622.746	11043.572	894.994	GR
660	8627.502	11050.564	893.746	GR CO
661	8637.167	11059.592	895.169	GR
662	8656.466	11083.082	897.291	GR

663	8618.517	11124.776	897.642	GR
664	8601.473	11112.256	895.288	GR
665	8578.342	11090.740	894.959	GR
666	8539.279	11086.834	894.761	RDB
667	8554.902	11050.705	894.617	RDB
668	8573.022	11031.346	894.168	RDB
669	8578.979	11027.721	893.020	RDB CO
670	8581.025	11022.135	894.321	RDB
671	8576.525	11007.493	894.179	RDB
672	8558.549	10973.766	893.708	RDB
673	8563.153	10980.690	893.354	RDB CO
674	8568.856	10950.905	893.899	RDB
675	8574.389	10949.129	892.880	RDB CO
676	8579.616	10944.566	893.621	RDB
677	8589.878	10919.591	893.855	RDB
678	8606.167	10899.809	893.654	RDB
679	8625.774	10895.365	893.722	RDB
680	8635.809	10892.695	892.351	RDB CO
681	8640.805	10890.490	893.572	RDB
682	8660.227	10875.992	892.408	CL
683	8662.223	10874.980	893.832	CL JAM
684	8664.496	10872.662	891.726	CL
685	8668.042	10881.954	893.210	RDB
686	8675.247	10897.923	893.542	RDB2
687	8681.493	10914.809	893.371	RDB2
688	8681.593	10914.812	893.371	GR
689	8672.509	10904.690	892.839	RDB2
690	8667.349	10906.447	891.931	RDB2 CO
691	8661.141	10907.918	893.082	RDB2
692	8643.021	10905.403	893.666	RDB2
693	8639.319	10893.216	893.297	LDB2
694	8654.310	10897.341	892.608	LDB2
695	8665.382	10885.933	893.045	LDB2
696	8652.757	10873.119	893.244	LDB
697	8623.306	10875.922	893.950	LDB
698	8600.861	10880.133	894.021	LDB
699	8591.543	10893.763	893.689	LDB
700	8594.603	10887.864	892.927	LDB CO
701	8574.158	10913.095	894.085	LDB
702	8558.784	10938.994	894.157	LDB
703	8545.345	10955.155	894.315	LDB
704	8542.971	10973.121	894.444	LDB
705	8539.027	10985.537	893.923	LDB
706	8549.245	10994.952	894.029	LDB
707	8564.894	11012.962	893.720	LDB
708	8547.271	11029.218	894.668	LDB
709	8534.037	11055.834	894.661	LDB
710	8517.304	11072.737	894.987	LDB
711	8504.499	11064.387	894.630	GR
712	8484.975	11044.495	894.394	GR
713	8456.039	11023.059	894.898	GR
714	8415.279	11004.955	895.237	GR

715	8402.817	10994.012	894.741	GR CO
716	8385.301	11001.317	898.608	GR
717	8417.170	10963.839	898.515	GR
718	8424.678	10972.097	894.573	GR
719	8444.502	10968.053	894.450	GR
720	8454.483	10962.841	896.657	GR
721	8470.771	10970.094	894.297	GR
722	8486.914	10983.234	894.593	GR
723	8513.511	11001.896	894.080	GR
724	8526.466	11015.922	894.363	GR
725	8516.401	10961.766	894.540	GR
726	8484.625	10936.491	893.902	GR CO
727	8443.759	10942.350	894.431	GR
728	8423.200	10913.928	894.679	GR
729	8409.813	10919.447	898.336	GR
730	8419.873	10875.926	897.530	GR
731	8432.802	10884.566	895.386	GR
732	8467.685	10889.524	894.036	GR
733	8493.353	10864.446	897.150	GR
734	8511.865	10872.793	893.783	GR
735	8520.301	10894.255	893.848	GR
736	8536.716	10920.657	894.199	GR
737	8560.155	10885.505	893.897	GR
738	8554.265	10863.450	893.342	GR
739	8558.936	10850.979	895.927	GR
740	8425.781	11140.954	895.498	H/T
741	8381.737	11029.075	898.088	GR
742	8392.794	11036.568	894.607	GR CO
743	8401.754	11037.139	895.259	GR
744	8422.842	11049.782	895.428	GR
745	8436.648	11053.210	894.710	GR CO
746	8469.611	11080.947	893.564	GR CO
747	8467.654	11086.748	894.979	LDB
748	8483.423	11072.631	894.413	LDB
749	8445.010	11090.261	895.207	LDB
750	8413.160	11098.449	895.397	LDB
751	8377.411	11104.949	895.945	LDB
752	8377.987	11092.698	895.181	GR
753	8372.334	11081.097	898.050	GR
754	8385.747	11074.266	899.177	GR
755	8389.206	11086.214	894.850	GR
756	8411.928	11079.455	895.611	GR
757	8422.421	11103.705	895.752	CL JAM
758	8420.169	11103.429	894.003	CL
759	8425.518	11102.345	894.171	CL
760	8423.020	11114.722	895.303	RDB
761	8449.458	11099.592	895.432	RDB
762	8461.439	11107.266	893.601	RDB CO
763	8470.011	11102.734	894.991	RDB
764	8483.695	11087.905	895.090	RDB
765	8507.529	11085.127	894.426	RDB
766	8520.958	11102.394	894.376	RDB

767	8523.654	11094.966	893.582	GR
768	8523.529	11089.219	894.601	GR
769	8530.051	11082.505	894.576	GR
770	8522.954	11110.780	894.260	LBD2
771	8535.475	11136.267	894.569	LBD2
772	8512.158	11140.938	895.002	LBD2
773	8491.463	11149.362	895.239	LBD2
774	8474.054	11149.587	895.386	LBD2
775	8458.501	11148.405	895.315	LBD2
776	8434.337	11156.995	895.659	LBD2
777	8425.408	11165.369	895.385	LBD2
778	8409.383	11178.859	895.476	LBD2
779	8430.978	11188.108	895.613	RDB2
780	8452.016	11166.416	895.913	RDB2
781	8478.844	11160.523	895.064	RDB2
782	8495.588	11161.179	893.890	RLB2 CO
783	8504.021	11162.286	894.925	RLB2
784	8528.641	11154.426	895.253	RLB2
785	8542.786	11144.499	895.085	RLB2
786	8539.334	11120.851	895.242	RLB2
787	8531.105	11103.111	894.764	RLB2
788	8554.403	11109.386	895.181	GR
789	8570.996	11127.076	894.690	GR
790	8582.000	11167.277	898.152	GR
791	8547.285	11190.726	897.776	GR
792	8526.953	11182.209	895.631	GR
793	8496.713	11193.293	894.482	GR
794	8515.954	11210.040	898.025	GR
795	8495.036	11249.753	898.424	GR
796	8489.652	11239.576	894.929	GR
797	8462.919	11224.293	895.443	GR
798	8473.150	11201.783	895.081	GR
799	8405.532	11211.047	895.411	GR
800	8430.739	11229.114	895.355	GR
801	8454.986	11262.844	895.783	GR
802	8456.033	11277.767	898.174	GR
803	8415.871	11279.835	896.950	GR
804	8380.425	11286.333	897.433	GR
805	8385.971	11272.356	895.578	GR
806	8414.592	11256.232	895.942	GR
807	8398.735	11247.453	895.341	GR
808	8385.031	11236.398	895.250	GR CO
809	8401.629	11221.866	895.335	GR CO
810	8411.026	11192.760	894.477	GR CO
811	8443.183	11164.051	894.591	GR CO
812	8473.846	11154.852	894.088	GR CO
813	8498.632	11155.620	893.674	GR CO
814	8534.394	11147.374	893.762	GR CO
815	8366.335	11243.949	895.326	GR CO
816	8336.363	11253.444	895.440	GR CO
817	8308.462	11261.009	895.628	GR CO
818	8288.650	11287.116	895.805	GR CO

819	8303.008	11294.991	896.447	GR
820	8330.511	11300.441	896.959	GR
821	8336.622	11280.409	895.565	GR
822	8336.151	11270.682	895.755	GR
823	8361.691	11257.424	896.239	GR
824	8356.777	11227.156	896.260	GR
825	8335.680	11206.088	896.342	GR
826	8309.591	11187.910	896.044	GR
827	8337.594	11186.469	896.027	GR
828	8363.474	11193.954	895.545	GR
829	8380.895	11206.377	895.761	GR
830	8392.740	11168.189	895.435	GR
831	8393.881	11119.975	895.551	RDB
832	8365.453	11139.897	895.079	RDB
833	8363.911	11143.447	894.144	RDB CO
834	8359.374	11151.631	895.720	RDB
835	8348.941	11164.745	896.125	RDB
836	8324.892	11174.563	895.672	RDB
837	8309.527	11180.073	896.046	RDB
838	8291.216	11176.964	896.002	RDB
839	8279.783	11182.663	895.087	RDB CO
840	8274.033	11184.382	895.923	RDB
841	8254.226	11199.154	896.506	RDB
842	8262.396	11227.171	896.593	RDB
843	8265.655	11233.286	895.084	RDB CO
844	8293.871	11211.435	895.132	CO
845	8248.106	11253.943	896.494	RDB
846	8277.246	11204.759	896.360	GR
847	8263.544	11172.096	896.426	LDB
848	8269.404	11166.930	895.594	LDB DR
849	8275.226	11165.329	896.844	LDB
850	8303.511	11152.253	897.225	LDB
851	8322.030	11145.422	897.352	LDB
852	8329.883	11144.923	895.854	RDB BF
853	8339.617	11146.468	895.650	RDB BF
854	8353.662	11125.772	895.819	RDB BF
855	8345.317	11124.249	895.528	RDB BF
856	8335.627	11122.169	898.053	RDB
857	8352.280	11090.861	898.735	GR
858	8371.062	11108.264	895.739	LDB
859	8307.245	11110.273	898.758	GR
860	8307.148	11110.251	898.752	DR
861	8269.421	11132.993	898.028	DR
862	8264.565	11143.149	898.790	GR
863	8280.117	11143.636	898.721	GR
864	8251.046	11171.928	895.143	CO
865	8235.421	11161.636	895.521	CO
866	8241.305	11176.231	896.362	CO
867	8246.414	11188.171	896.696	DLB
868	8241.579	11210.576	895.850	DLB
869	8251.718	11229.742	895.963	DLB
870	8224.579	11244.972	896.373	DLB

871	8205.240	11225.689	896.265	GR
872	8192.143	11200.957	896.031	GR
873	8183.989	11201.598	898.786	GR
874	8195.614	11174.626	899.008	GR
875	8204.730	11174.218	896.017	GR
876	8214.600	11177.613	896.446	GR
877	8284.775	11361.728	898.854	H/T
878	8309.934	11320.425	896.873	GR
879	8290.363	11298.401	895.914	GR
880	8277.983	11277.786	896.532	GR
881	8248.759	11288.621	896.040	GR
882	8232.592	11335.590	896.252	GR
883	8249.176	11347.739	898.311	GR
884	8234.473	11363.380	898.196	GR
885	8227.211	11368.758	896.045	GR
886	8222.461	11349.047	895.889	GR
887	8210.638	11360.675	896.943	GR
888	8235.392	11386.632	896.412	GR
889	8256.810	11377.073	898.907	GR
890	8278.398	11395.527	897.956	GR
891	8267.011	11418.818	897.358	GR
892	8245.783	11408.667	897.088	GR
893	8246.042	11423.469	896.985	GR
894	8263.164	11438.982	896.721	GR
895	8254.465	11469.056	897.500	GR
896	8268.441	11471.557	896.996	GR
897	8281.777	11473.267	898.892	GR
898	8301.191	11474.013	899.725	GR
899	8296.530	11441.526	899.197	GR
900	8280.589	11440.927	897.973	GR
901	8234.703	11413.764	894.919	GR
902	8255.537	11415.691	895.585	CO
903	8273.130	11439.523	895.968	CO
904	8270.615	11473.631	896.073	CO
905	8263.512	11490.568	896.309	CO
906	8281.546	11495.669	896.108	CO
907	8284.547	11522.474	896.337	CO
908	8270.467	11552.240	896.381	CO
909	8242.992	11556.874	896.324	CO
910	8230.813	11591.984	896.837	CO
911	8251.469	11582.988	896.684	GR
912	8246.147	11568.957	897.836	GR
913	8279.788	11565.096	900.451	GR
914	8306.912	11576.372	901.160	GR
915	8296.292	11540.130	900.687	GR
916	8307.917	11512.456	900.497	GR
917	8292.696	11512.477	898.296	GR
918	8280.081	11518.045	897.276	GR
919	8268.199	11542.680	897.372	GR
920	8241.145	11548.900	897.343	GR
921	8228.758	11571.449	897.613	GR
922	8222.562	11590.391	897.802	GR

923	8195.087	11573.411	898.809	DRB
924	8201.865	11543.093	898.296	DRB
925	8198.061	11528.240	898.388	CL JAM
926	8199.937	11526.005	895.967	CL
927	8196.955	11531.941	897.656	CL
928	8214.517	11521.009	897.222	RDB
929	8236.215	11522.460	897.221	RDB
930	8250.910	11505.399	897.440	RDB
931	8247.317	11484.148	897.189	RDB
932	8235.251	11467.714	897.409	RDB
933	8222.995	11444.878	896.737	RDB
934	8228.420	11421.919	895.990	RDB
935	8229.513	11403.020	896.502	RDB
936	8214.717	11391.977	896.483	RDB
937	8202.676	11377.013	896.350	RDB
938	8198.059	11345.579	896.814	RDB
939	8213.312	11315.814	896.680	RDB
940	8217.466	11293.212	896.708	RDB
941	8226.541	11271.069	896.718	RDB
942	8235.702	11258.007	896.348	RDB
943	8240.975	11238.454	896.161	LDB
944	8218.438	11252.452	896.696	LDB
945	8207.232	11272.879	896.490	LDB
946	8206.517	11277.624	894.490	CO
947	8205.063	11281.610	896.125	LDB
948	8200.137	11304.774	896.238	LDB
949	8192.244	11324.404	896.256	LDB
950	8181.290	11344.110	896.915	LDB
951	8184.220	11368.616	896.805	LDB
952	8188.011	11389.732	896.985	LDB
953	8195.680	11404.754	897.289	LDB
954	8210.500	11407.280	896.998	LDB
955	8217.452	11417.445	896.917	LDB
956	8209.999	11440.268	897.385	LDB
957	8217.136	11469.238	896.876	LDB
958	8232.979	11487.912	897.005	LDB
959	8219.559	11506.002	897.394	LDB
960	8198.643	11513.480	897.586	LDB
961	8186.596	11521.277	898.149	LDB
962	8182.207	11549.910	898.963	LDB
963	8167.309	11546.533	898.209	GR
964	8140.391	11534.286	898.011	RDB2
965	8136.685	11510.023	897.943	RDB2
966	8124.791	11473.770	898.013	RDB2
967	8121.105	11441.754	897.031	RDB2
968	8120.006	11424.745	897.251	RDB2
969	8134.365	11392.665	896.675	RDB2
970	8135.234	11371.440	896.588	RDB2
971	8155.716	11345.527	896.532	RDB2
972	8170.901	11313.900	896.537	RDB2
973	8179.960	11288.877	896.298	RDB2
974	8186.358	11278.940	896.316	RDB2

975	8191.899	11272.427	896.148	LDB2
976	8177.576	11250.814	896.256	GR
977	8164.824	11234.855	898.867	GR
978	8139.781	11245.741	898.389	GR
979	8165.990	11273.949	896.777	LDB2
980	8146.012	11300.005	897.653	LDB2
981	8140.755	11327.153	897.750	LDB2
982	8137.317	11345.960	896.713	LDB2
983	8123.547	11366.386	896.409	LDB2
984	8114.423	11411.132	897.468	LDB2
985	8108.999	11444.267	897.361	LDB2
986	8108.704	11454.923	897.747	LDB2
987	8082.882	11455.006	899.303	GR
988	8074.165	11412.655	899.354	GR
989	8071.107	11370.722	898.155	GR
990	8099.269	11368.928	896.953	GR
991	8125.225	11344.334	896.454	GR
992	8124.125	11332.901	898.124	GR
993	8168.618	11336.774	896.450	GR
994	8189.879	11297.607	896.550	GR
995	8152.018	11399.372	896.407	GR
996	8162.391	11445.589	896.794	GR
997	8191.041	11472.448	897.489	GR
998	8173.920	11517.824	897.875	GR
999	8167.671	11480.984	896.590	GR
1000	8132.979	11601.235	898.763	H/T
1001	8197.424	11513.407	897.870	DLB
1002	8185.002	11533.107	898.757	DLB
1003	8182.761	11553.342	898.826	DLB
1004	8176.522	11570.393	898.562	DLB
1005	8155.788	11591.154	898.500	DLB
1006	8151.560	11593.341	897.371	CO
1007	8148.099	11597.126	898.209	DLB
1008	8135.414	11610.376	898.697	DLB
1009	8116.409	11623.654	898.467	DLB
1010	8108.751	11645.384	898.910	DLB
1011	8104.179	11666.875	898.663	DLB
1012	8097.504	11691.922	899.315	DLB
1013	8087.360	11720.922	900.725	DLB
1014	8083.787	11743.019	900.101	DLB
1015	8080.250	11783.247	900.126	DLB
1016	8080.153	11795.414	897.481	OB
1017	8077.612	11802.747	898.585	LDB
1018	8075.256	11828.024	899.510	LDB
1019	8072.526	11852.274	900.327	LDB
1020	8067.925	11887.328	900.399	LDB
1021	8094.233	11851.858	899.237	DRB
1022	8097.904	11822.634	898.764	DRB
1023	8103.330	11789.657	898.642	DRB
1024	8106.975	11750.302	899.671	DRB
1025	8108.886	11726.993	900.774	DRB
1026	8114.723	11715.130	900.454	DRB

1027	8113.879	11702.163	898.367	DRB
1028	8122.723	11685.392	898.677	DRB
1029	8129.539	11667.065	898.650	DRB
1030	8135.525	11648.306	898.822	DRB
1031	8148.724	11624.917	898.536	DRB
1032	8166.578	11607.035	898.339	DRB
1033	8177.028	11592.983	898.186	DRB
1034	8180.960	11587.587	897.600	DRB CO
1035	8185.412	11585.098	898.730	RDB
1036	8197.092	11571.963	898.620	RDB
1037	8210.008	11576.852	898.035	GR
1038	8210.635	11595.639	898.267	GR
1039	8231.173	11591.873	896.804	CO
1040	8220.705	11608.153	896.861	CO
1041	8201.979	11622.951	896.976	CO
1042	8197.425	11612.670	896.916	CO
1043	8198.327	11602.145	896.981	CO
1044	8196.088	11599.129	897.400	CO
1045	8189.944	11602.444	898.378	GR
1046	8175.154	11624.727	898.219	GR
1047	8163.964	11655.852	897.950	GR
1048	8152.911	11684.194	898.488	GR
1049	8175.060	11696.013	899.072	GR
1050	8205.086	11699.047	898.100	GR
1051	8213.744	11676.853	899.006	GR
1052	8217.208	11652.331	897.927	GR
1053	8189.447	11658.741	897.935	GR
1054	8231.505	11622.493	897.681	GR
1055	8261.357	11616.914	897.443	GR
1056	8267.381	11635.080	898.114	GR
1057	8300.444	11627.121	897.437	GR
1058	8296.539	11653.589	897.501	GR
1059	8285.342	11678.680	897.582	GR
1060	8259.757	11697.453	897.725	GR
1061	8237.842	11716.813	898.279	GR
1062	8250.446	11729.337	902.230	GR
1063	8272.569	11702.620	902.355	GR
1064	8294.463	11682.775	902.449	GR
1065	8312.110	11658.583	903.259	GR
1066	8314.123	11627.072	902.730	GR
1067	8270.589	11654.666	898.462	GR
1068	8243.471	11680.147	898.046	GR
1069	8218.753	11705.326	898.097	GR
1070	8191.195	11722.503	898.076	GR
1071	8221.867	11751.324	901.722	GR
1072	8198.630	11774.360	901.892	GR
1073	8186.559	11789.650	901.211	GR
1074	8247.529	11806.579	903.476	GR
1075	8267.327	11769.627	903.936	GR
1076	8279.821	11744.842	904.131	GR
1077	8178.175	11797.597	900.092	GR
1078	8149.720	11814.117	899.553	GR

1079	8188.400	11827.688	900.226	GR
1080	8241.042	11848.018	904.221	GR
1081	8217.679	11834.854	901.999	GR
1082	8176.837	11786.636	897.931	GR
1083	8187.796	11767.319	897.740	GR
1084	8185.233	11753.682	897.379	GR
1085	8177.988	11719.477	898.172	GR
1086	8139.708	11698.781	898.208	GR
1087	8127.171	11717.027	898.093	GR
1088	8143.019	11734.135	898.283	GR
1089	8136.063	11762.965	898.421	GR
1090	8129.836	11783.188	898.557	GR
1091	8121.836	11823.376	898.667	GR
1092	8137.096	11829.638	898.934	GR
1093	8147.501	11824.419	900.092	GR
1094	8141.174	11850.916	900.314	GR
1095	8051.534	11826.951	898.661	GR
1096	8037.547	11814.387	898.728	GR
1097	8015.176	11843.892	898.780	GR
1098	8019.007	11860.401	899.259	GR
1099	8049.395	11862.994	899.032	GR
1100	7996.067	11842.563	898.167	CO
1101	8006.408	11815.177	898.011	CO
1102	8029.569	11799.596	897.853	CO
1103	8059.454	11785.805	897.479	CO
1104	8063.078	11779.061	900.642	GR
1105	8034.470	11790.262	900.249	GR
1106	8011.613	11802.508	900.619	GR
1107	7993.712	11825.407	901.205	GR
1108	7985.602	11865.213	901.165	GR
1109	7965.326	11836.619	901.615	GR
1110	7963.712	11808.505	901.725	GR
1111	7986.061	11788.228	901.476	GR
1112	8005.968	11762.762	901.567	GR
1113	8025.858	11740.540	900.768	GR
1114	8058.888	11743.566	898.968	GR
1115	8067.642	11712.441	899.425	GR
1116	8032.010	11701.820	898.657	GR
1117	8009.653	11690.620	900.404	GR
1118	7999.696	11680.086	901.290	GR
1119	8012.984	11645.324	901.199	GR
1120	8033.057	11650.736	900.256	GR
1121	8043.950	11655.379	898.803	GR
1122	8081.026	11671.120	898.707	GR
1123	8097.109	11632.678	898.740	GR
1124	8074.139	11623.523	898.613	GR
1125	8034.835	11610.502	900.811	GR
1126	8053.670	11602.101	899.814	STA 5100
1127	8034.447	11553.100	900.868	GR
1128	8064.198	11565.812	900.264	GR
1129	8061.562	11528.974	900.985	GR
1130	8026.700	11513.450	900.814	GR

1131	8047.401	11472.251	900.430	GR
1132	8078.155	11481.754	899.370	GR
1133	8091.547	11459.633	898.137	GR
1134	8063.814	11451.374	900.445	GR
1135	8035.490	11455.314	900.612	GR
1136	8111.521	11469.330	896.441	CO
1137	8099.321	11479.728	896.685	CO
1138	8082.666	11490.661	896.766	CO
1139	8075.332	11513.345	897.240	CO
1140	8070.605	11542.195	897.193	CO
1141	8070.557	11561.438	897.529	CO
1142	8079.769	11592.598	897.608	CO
1143	8091.771	11620.962	897.681	CO
1144	8118.757	11627.262	897.261	CO
1145	8149.840	11590.394	897.342	CO
1146	8136.157	11574.824	897.377	CO
1147	8144.289	11553.609	897.122	CO
1148	8136.174	11531.344	897.313	CO
1149	8130.749	11512.162	896.979	CO
1150	8133.121	11491.610	896.990	CO
1151	8120.328	11483.305	897.041	CO
1152	8106.609	11477.391	896.556	CO
1153	8090.040	11504.208	896.979	CO
1154	8105.710	11516.870	897.074	CO
1155	8121.389	11528.615	897.051	CO
1156	8130.175	11530.029	897.196	CO
1157	8141.553	11503.273	898.005	GR
1158	8167.107	11512.730	898.125	GR
1159	8168.891	11495.386	896.447	GR
1160	8165.837	11475.520	896.460	GR
1161	8176.210	11478.029	897.287	GR
1162	8155.318	11477.279	897.503	GR
1163	8119.635	11516.222	897.757	GR
1164	8103.372	11491.756	897.419	GR
1165	8096.648	11516.416	897.585	GR
1166	8106.644	11535.976	897.775	GR
1167	8131.163	11546.172	897.934	GR
1168	8122.092	11573.639	897.386	GR
1169	8098.588	11574.871	898.041	GR
1170	8100.183	11604.021	898.157	GR
1171	8101.925	11907.584	899.716	H/T
1172	8135.233	11927.005	899.643	GR
1173	8171.275	11936.340	899.374	GR
1174	8189.183	11939.074	903.280	GR
1175	8202.187	11942.604	904.198	GR
1176	8211.340	11897.834	904.092	GR
1177	8189.345	11894.853	902.692	GR
1178	8165.104	11888.363	900.572	GR
1179	8142.374	11884.092	899.516	GR
1180	8113.986	11882.360	899.916	GR
1181	8120.953	11848.840	898.969	GR
1182	8140.740	11858.038	900.440	GR

1183	8173.955	11863.327	899.864	GR
1184	8204.062	11878.860	903.723	GR
1185	8224.287	11882.518	904.506	GR
1186	8189.155	11847.926	899.772	GR
1187	8164.082	11840.164	900.084	GR
1188	8131.557	11839.961	898.923	GR
1189	8093.856	11858.833	899.338	RDB
1190	8089.648	11885.883	899.530	RDB
1191	8087.916	11911.557	899.057	RDB
1192	8087.288	11940.931	899.709	RDB
1193	8087.457	11956.110	899.569	RDB
1194	8088.137	11975.155	898.593	RDB
1195	8086.811	12001.964	898.318	RDB
1196	8089.353	12017.507	900.107	RDB
1197	8094.498	12026.303	898.710	BRIDGE
1198	8093.843	12040.599	900.136	RDB
1199	8106.816	12068.509	899.720	GR
1200	8134.765	12062.702	899.092	GR
1201	8153.716	12067.487	902.628	GR
1202	8161.057	12036.654	903.014	R/C
1203	8135.601	12030.701	899.816	R/C
1204	8113.071	12023.767	899.240	GR
1205	8115.606	11969.242	899.601	GR
1206	8143.465	11963.475	899.547	GR
1207	8183.999	11972.384	902.578	GR
1208	8207.359	11955.025	904.531	R/C
1209	8066.350	11902.346	899.753	LDB
1210	8066.593	11926.405	899.304	LDB
1211	8069.008	11967.279	898.875	LDB
1212	8061.194	11995.062	899.244	LDB
1213	8067.291	12026.876	899.391	LDB
1214	8071.872	12035.903	898.576	BRIDGE
1215	8080.107	12030.595	898.609	CL BRIDGE
1216	8072.532	12046.856	899.781	LDB
1217	8066.839	12079.662	900.781	LDB
1218	8050.317	12083.427	899.939	GR
1219	8018.087	12097.327	899.527	GR
1220	7990.742	12112.067	901.644	GR
1221	7983.340	12083.960	901.718	GR
1222	8014.155	12066.519	899.703	GR
1223	8038.799	12055.169	899.375	GR
1224	8036.849	12026.001	900.244	GR
1225	8007.485	12037.031	901.291	GR
1226	7979.255	12000.824	902.397	GR
1227	8032.057	11990.634	901.602	GR
1228	8034.046	11970.177	901.267	GR
1229	8011.464	11969.085	901.770	GR
1230	7979.227	11971.962	902.420	GR
1231	7975.027	11937.171	902.343	GR
1232	7997.506	11930.822	901.363	GR
1233	7986.200	11899.403	901.341	GR
1234	7950.622	11900.234	902.505	GR

1235	7962.445	11885.477	902.433	STA 5400
1236	7980.966	11882.964	902.421	GR
1237	7985.570	11865.724	901.235	GR
1238	7970.396	11865.223	902.377	GR
1239	7995.191	11854.873	897.950	OB
1240	7992.597	11883.139	898.412	OB
1241	8000.026	11905.443	898.159	OB
1242	8011.226	11927.425	898.395	OB
1243	8027.984	11949.364	898.734	OB
1244	8052.471	11965.230	899.067	OB
1245	8053.286	11940.245	898.911	GR
1246	8030.111	11919.216	898.902	GR
1247	8045.199	11913.793	898.800	GR
1248	8053.981	11912.921	900.134	GR
1249	8055.398	11890.877	900.784	GR
1250	8048.925	11884.796	899.130	GR
1251	8021.746	11878.380	898.907	GR
1252	8018.424	11881.899	898.336	GR
1253	8012.585	11851.914	898.345	GR
1254	8019.452	11852.212	899.370	GR
1255	8027.951	11830.783	898.851	GR
1256	8050.612	11854.617	898.717	GR
1257	8061.219	11850.121	900.349	GR
1258	8013.558	12180.506	902.400	H/T
1259	8101.892	11907.686	899.703	CHECK
1260	8073.435	12359.234	901.017	LDB
1261	8072.993	12313.906	900.474	LDB
1262	8068.662	12277.442	900.898	LDB
1263	8068.025	12240.340	900.665	LDB
1264	8071.378	12219.909	900.136	LDB
1265	8072.270	12195.639	899.502	LDB
1266	8068.730	12171.958	899.613	LDB
1267	8068.193	12153.023	900.512	LDB
1268	8068.043	12130.006	900.646	LDB
1269	8069.071	12106.676	900.490	LDB
1270	8051.219	12114.044	900.024	GR
1271	8028.560	12132.631	900.142	GR
1272	8002.221	12139.887	901.911	GR
1273	7976.518	12145.798	902.571	GR
1274	7977.298	12186.785	902.602	GR
1275	8007.029	12184.333	902.372	STA 5700
1276	8041.680	12182.450	900.518	GR
1277	8043.304	12204.199	901.253	GR
1278	8025.787	12220.434	902.563	GR
1279	7990.716	12224.282	903.285	GR
1280	7988.142	12258.530	902.949	GR
1281	8013.950	12256.605	902.829	GR
1282	8014.238	12290.703	902.573	GR
1283	7977.939	12290.082	902.776	GR
1284	7984.445	12325.043	902.965	GR
1285	8018.876	12321.465	902.547	GR
1286	8041.351	12342.003	901.117	GR

1287	8009.294	12348.711	903.010	GR
1288	8050.053	12355.165	901.081	GR
1289	8055.117	12353.010	900.127	OB
1290	8040.238	12332.513	899.804	OB
1291	8026.672	12307.093	899.778	OB
1292	8024.694	12288.229	899.765	OB
1293	8022.600	12263.377	899.205	OB
1294	8025.645	12238.899	899.180	OB
1295	8035.645	12222.485	898.593	OB
1296	8052.117	12207.552	899.408	OB
1297	8053.410	12218.277	899.982	GR
1298	8049.356	12246.872	899.933	GR
1299	8035.597	12251.803	899.936	GR
1300	8035.949	12283.215	899.961	GR
1301	8048.417	12317.811	899.493	GR
1302	8052.005	12291.303	900.521	GR
1303	8054.267	12262.421	900.583	GR
1304	8088.449	12063.111	899.822	RDB
1305	8086.578	12090.594	900.049	RDB
1306	8087.321	12116.512	899.775	RDB
1307	8086.308	12143.952	900.146	RDB
1308	8090.848	12175.933	900.475	RDB
1309	8090.253	12194.464	899.600	RDB
1310	8087.714	12208.243	900.067	RDB
1311	8090.862	12232.892	900.123	RDB
1312	8089.808	12256.245	900.393	RDB
1313	8092.058	12277.799	900.214	RDB
1314	8093.994	12303.442	899.940	RDB
1315	8095.294	12326.252	900.258	RDB
1316	8093.159	12358.219	900.481	RDB
1317	8112.127	12352.072	900.435	GR
1318	8115.272	12326.042	899.940	GR
1319	8109.172	12291.398	900.429	CROSS 8
1320	8109.330	12257.955	900.034	GR
1321	8131.816	12255.548	902.090	GR
1322	8132.621	12210.119	901.225	GR
1323	8111.328	12206.017	900.063	GR
1324	8119.310	12162.425	898.804	GR
1325	8140.474	12162.880	901.535	GR
1326	8150.758	12120.074	902.394	GR
1327	8137.260	12112.044	899.571	GR
1328	8111.642	12106.730	899.365	GR
1329	8114.393	12084.805	899.416	GR
1330	8010.819	12481.429	901.207	H/T
1331	8094.588	12377.508	901.014	RDB
1332	8096.769	12396.347	901.131	RDB
1333	8095.561	12398.975	899.009	RDB
1334	8093.348	12401.803	901.040	RDB
1335	8096.896	12423.634	901.176	RDB
1336	8094.936	12450.163	901.211	RDB
1337	8095.434	12476.874	902.037	RDB
1338	8093.887	12501.928	901.473	RDB

1339	8098.832	12531.522	902.756	RDB
1340	8099.488	12559.660	903.111	RDB
1341	8098.889	12593.092	902.574	RDB
1342	8099.996	12640.535	902.909	RDB
1343	8099.153	12668.718	902.813	RDB
1344	8116.850	12665.445	902.320	GR
1345	8117.723	12634.124	902.229	GR
1346	8116.087	12612.919	902.341	GR
1347	8116.256	12584.798	902.531	GR
1348	8115.541	12543.342	902.501	GR
1349	8114.764	12505.513	901.967	GR
1350	8115.118	12468.154	901.296	GR
1351	8114.866	12441.629	901.065	GR
1352	8102.409	12401.614	899.602	GR
1353	8105.601	12397.382	900.927	GR
1354	8114.894	12388.273	900.500	GR
1355	8125.669	12359.840	900.189	GR
1356	8138.146	12331.816	900.714	GR
1357	8151.709	12293.673	902.091	GR
1358	8072.852	12360.873	901.321	DLB
1359	8071.630	12381.497	901.524	DLB
1360	8076.226	12399.761	900.045	DLB
1361	8077.573	12423.436	899.860	DLB
1362	8076.014	12450.048	900.487	DLB
1363	8076.853	12477.717	900.863	DLB
1364	8076.583	12500.667	901.272	DLB
1365	8076.049	12517.198	900.397	DLB
1366	8076.020	12536.489	901.773	DLB
1367	8076.371	12559.445	901.258	DLB
1368	8076.219	12576.214	900.687	DLB
1369	8074.234	12591.301	901.658	JAM
1370	8076.184	12604.828	899.133	CO
1371	8076.029	12612.168	901.105	LDB
1372	8074.789	12636.168	901.507	LDB
1373	8076.227	12659.091	901.710	LDB
1374	8054.393	12660.998	901.411	GR
1375	8031.201	12662.445	901.198	GR
1376	7998.384	12669.238	901.124	GR
1377	7996.594	12640.312	900.692	GR
1378	8028.533	12633.862	900.847	GR
1379	8048.554	12619.215	901.617	GR
1380	8058.539	12604.179	901.044	GR
1381	8047.275	12604.169	900.960	GR
1382	8028.170	12605.598	900.235	GR
1383	8018.639	12605.502	900.938	GR
1384	7997.648	12603.681	900.874	GR
1385	7976.281	12602.414	900.729	GR
1386	7969.633	12601.225	902.094	GR
1387	7951.183	12599.321	902.254	GR
1388	7943.778	12636.233	902.314	GR
1389	7946.602	12645.252	900.900	GR
1390	7947.181	12673.627	901.018	GR

1391	7946.900	12695.489	901.758	GR
1392	7947.292	12726.323	901.921	GR
1393	7972.576	12640.208	900.905	GR
1394	7961.281	12625.976	901.220	GR
1395	7957.496	12618.457	902.269	GR
1396	8031.053	12571.976	901.388	GR
1397	8020.442	12571.109	900.430	GR
1398	8010.479	12566.607	900.853	GR
1399	7984.858	12565.198	901.282	GR
1400	7958.006	12567.708	901.445	GR
1401	7930.545	12565.470	901.850	GR
1402	7927.619	12537.553	901.140	GR
1403	7922.295	12522.272	900.092	GR
1404	7943.887	12512.086	900.877	GR
1405	7967.372	12520.483	901.040	GR
1406	8000.521	12516.050	901.180	GR
1407	8035.149	12511.520	900.830	GR
1408	8045.204	12509.266	900.059	GR
1409	8059.420	12507.432	901.492	GR
1410	8054.715	12544.097	900.287	GR
1411	8045.304	12544.575	900.096	GR
1412	8034.409	12543.518	900.954	GR
1413	8014.417	12547.531	901.307	GR
1414	7988.060	12544.126	901.389	GR
1415	8044.214	12458.760	899.606	GR
1416	8055.709	12460.012	900.865	GR
1417	8056.553	12427.383	901.319	GR
1418	8019.803	12432.080	901.412	GR
1419	7982.022	12427.799	902.320	GR
1420	7950.134	12416.952	903.072	GR
1421	7952.205	12386.651	903.561	GR
1422	7978.182	12390.696	903.112	GR
1423	8011.275	12385.099	902.653	GR
1424	8044.536	12384.761	901.660	GR
1425	8032.149	12361.760	902.424	GR
1426	8003.312	12367.597	903.511	GR
1427	7968.835	12366.516	903.421	GR
1428	8006.469	12692.624	901.710	H/T
1429	7968.539	12675.909	900.965	GR
1430	7909.301	12682.905	900.686	GR SP
1431	7868.247	12683.606	900.876	GR
1432	7860.673	12682.903	901.923	GR
1433	7891.392	12658.262	902.540	GR
1434	7892.193	12661.830	900.533	GR
1435	7895.462	12637.910	902.440	GR
1436	7920.383	12645.752	901.659	GR
1437	7922.681	12653.779	900.932	GR
1438	7926.606	12668.261	901.143	GR
1439	7877.929	12722.200	901.266	GR
1440	7930.349	12711.473	902.094	GR
1441	8051.210	12693.888	901.476	GR
1442	8045.357	12728.987	901.789	GR

1443	8012.872	12735.589	901.769	GR
1444	7980.262	12745.302	901.358	GR
1445	7942.912	12744.812	901.324	GR
1446	7894.793	12752.971	901.236	GR
1447	7896.204	12792.390	902.022	GR
1448	7926.665	12782.455	901.631	GR
1449	7963.413	12780.970	901.768	GR
1450	7886.747	12825.801	901.540	GR
1451	7851.791	12868.635	902.364	GR
1452	7900.095	12874.870	902.305	GR
1453	7904.384	12867.922	900.818	GR
1454	7913.606	12851.192	902.218	GR
1455	7936.553	12842.167	902.226	GR
1456	7971.653	12829.834	902.481	GR
1457	8002.304	12818.434	902.239	GR
1458	7991.686	12779.130	901.694	GR
1459	8039.131	12765.104	901.533	GR
1460	8054.852	12776.183	902.764	STA 6300
1461	8052.616	12810.018	902.473	GR
1462	8051.334	12840.064	903.152	GR
1463	8022.966	12842.095	902.614	GR
1464	7981.629	12853.172	902.603	GR
1465	7949.829	12860.169	901.621	GR
1466	7942.224	12891.589	901.921	GR
1467	7971.154	12881.571	901.334	GR
1468	8002.827	12877.087	902.299	GR
1469	8036.345	12872.802	902.769	GR
1470	8063.895	12866.553	904.259	CROSS 9
1471	8055.201	12899.521	902.550	GR
1472	8026.924	12897.324	902.513	GR
1473	7998.286	12897.561	901.746	GR
1474	7971.377	12901.476	902.409	GR
1475	7942.773	12909.815	902.699	GR
1476	8070.882	12899.633	902.564	LDB
1477	8074.099	12882.237	903.529	LDB
1478	8075.262	12856.247	903.010	LDB
1479	8074.747	12837.607	904.660	LDB
1480	8074.606	12811.916	904.238	LDB
1481	8074.586	12792.814	903.215	LDB
1482	8074.714	12755.145	902.958	LDB
1483	8074.209	12723.031	903.029	LDB
1484	8072.816	12699.727	903.247	LDB
1485	8072.838	12674.884	902.300	LDB
1486	8098.611	12699.436	903.042	RDB
1487	8099.653	12724.075	903.410	RDB
1488	8099.128	12755.632	903.201	RDB
1489	8101.332	12782.809	903.514	RDB
1490	8103.182	12816.314	903.537	RDB
1491	8102.114	12844.885	903.823	RDB
1492	8099.744	12877.571	903.140	RDB
1493	8092.467	12901.968	902.073	RDB
1494	8111.633	12896.174	903.820	GR

1495	8136.379	12882.347	902.768	GR
1496	8124.913	12846.947	902.988	GR
1497	8122.053	12820.477	903.224	GR
1498	8120.940	12781.716	903.083	GR
1499	8119.772	12748.142	903.118	GR
1500	8119.927	12711.855	902.883	GR
1501	8062.709	12933.516	904.083	H/T
1502	8071.831	12916.462	903.028	LDB
1503	8078.380	12934.572	903.621	LDBT
1504	8079.240	12961.938	903.111	LDBT
1505	8070.691	12980.419	903.746	LDBT
1506	8062.496	13009.456	904.197	LDBT
1507	8051.478	13046.878	904.722	LDBT
1508	8039.776	13078.706	904.190	LDBT
1509	8031.678	13099.719	905.380	LDBT
1510	8022.540	13139.245	904.069	LDBT
1511	8028.471	13141.536	901.625	CL
1512	8033.185	13124.183	901.666	CL
1513	8037.161	13091.846	901.484	CL
1514	8050.334	13074.550	901.321	CL
1515	8057.499	13052.528	901.386	CL
1516	8069.148	13035.888	901.184	CL
1517	8067.808	13014.114	901.123	CL
1518	8071.928	13008.191	899.383	CL
1519	8073.781	12991.220	899.874	CL
1520	8084.229	12978.919	899.823	CL
1521	8087.866	12959.297	899.615	CL
1522	8090.631	12936.977	899.242	CL
1523	8094.125	12947.648	902.776	RDBT
1524	8094.262	12966.018	903.873	RDBT
1525	8087.871	12988.542	902.957	RDBT
1526	8079.117	13017.445	903.614	RDBT
1527	8074.745	13042.212	903.992	RDBT
1528	8062.216	13071.314	903.855	RDBT
1529	8054.213	13099.598	904.819	RDBT
1530	8081.538	13102.843	906.059	GR
1531	8088.127	13067.728	905.048	GR
1532	8112.850	13050.150	905.337	GR
1533	8113.855	13021.717	904.962	GR
1534	8127.483	13007.589	904.339	GR
1535	8111.879	12983.695	903.348	GR
1536	8117.588	12964.405	903.443	GR
1537	8142.173	12973.017	904.284	GR
1538	8154.591	13002.998	905.198	GR
1539	8187.710	13023.898	905.706	GR
1540	8177.219	13050.668	906.789	GR
1541	8198.119	12996.162	904.776	STA 6600
1542	8204.392	12987.221	904.006	LDB
1543	8180.389	12974.764	904.127	LDB
1544	8151.198	12961.786	903.391	LDB
1545	8114.044	12952.659	902.408	LDB
1546	8118.499	12940.764	900.890	BF

1547	8127.916	12949.900	901.295	BF
1548	8100.838	12943.266	900.897	BF
1549	8097.430	12918.268	902.160	RDB
1550	8132.917	12927.370	903.605	RDB
1551	8159.913	12939.952	903.592	RDB
1552	8188.069	12947.333	903.777	RDB
1553	8211.474	12967.146	903.730	RDB
1554	8239.088	12961.327	903.518	GR
1555	8197.626	12933.197	903.452	GR
1556	8171.299	12915.624	903.174	GR
1557	8148.143	12899.459	903.103	GR
1558	8114.717	12885.007	903.965	R/C
1559	8114.691	12905.527	903.852	GR
1560	8031.288	12931.369	903.644	GR
1561	7983.914	12931.735	902.272	GR
1562	7945.518	12935.475	902.547	GR
1563	7947.288	12992.099	903.256	GR
1564	7992.640	12986.377	903.027	GR
1565	8039.233	12982.932	903.159	GR
1566	8023.668	13030.923	903.871	GR
1567	7986.498	13027.672	903.032	GR
1568	7959.870	13035.271	902.716	GR
1569	7986.770	13075.459	903.799	GR
1570	8014.886	13079.691	903.607	GR
1571	8009.165	13112.435	904.969	GR
1572	7984.985	13099.875	903.898	GR
1573	8003.511	13146.666	905.325	H/T
1574	8287.987	13068.606	905.492	H/T
1575	8413.689	13010.011	904.193	H/T
1576	8045.925	13116.228	903.609	RDBT
1577	8032.707	13144.308	903.804	RDBT
1578	8024.502	13165.198	904.462	RDBT
1579	8014.610	13201.266	904.865	RDBT
1580	7998.381	13247.475	905.199	RDBT
1581	7988.890	13272.377	906.074	RDBT
1582	7984.416	13279.255	904.621	COR POST
1583	8005.276	13283.375	905.518	GR
1584	8032.245	13292.162	907.494	GR
1585	8050.715	13264.185	907.441	GR
1586	8033.403	13253.086	905.004	GR
1587	8039.611	13211.668	904.548	GR
1588	8050.356	13227.674	904.805	GR
1589	8070.366	13196.391	908.095	GR
1590	8061.853	13182.896	904.774	GR
1591	8072.140	13154.345	904.879	GR
1592	8089.410	13158.818	908.299	GR
1593	8082.859	13130.391	907.284	GR
1594	8067.399	13125.459	904.799	GR
1595	8078.020	13102.337	905.968	GR
1596	8041.143	13099.713	901.586	CL
1597	8036.076	13116.964	901.685	CL
1598	8030.173	13137.194	901.611	CL

1599	8019.044	13156.861	901.619	CL
1600	8015.704	13172.935	901.929	CL
1601	8011.030	13181.757	902.181	CL
1602	8006.346	13200.673	901.905	CL
1603	8002.475	13218.551	902.368	CL
1604	7995.769	13231.428	902.727	CL
1605	7987.297	13253.589	902.044	CL
1606	7981.214	13261.398	903.242	CL
1607	7976.698	13282.105	903.667	CL
1608	7966.378	13273.189	905.779	DLBT
1609	7979.461	13245.131	905.502	DLBT
1610	7991.945	13222.870	904.777	DLBT
1611	7995.615	13206.727	904.931	DLBT
1612	8003.853	13177.682	905.124	DLBT
1613	8015.266	13149.768	904.473	DLBT
1614	7972.997	13143.432	904.529	GR
1615	7947.404	13138.623	905.489	GR
1616	7958.724	13181.135	906.197	GR
1617	7933.536	13197.947	906.517	GR
1618	7942.238	13204.706	904.817	GR
1619	7962.649	13208.670	904.933	GR
1620	7955.366	13243.140	905.570	GR
1621	7929.384	13231.185	905.748	GR
1622	7918.267	13243.529	907.074	GR
1623	7894.354	13271.444	907.725	FN
1624	7912.862	13271.877	905.667	FN
1625	7941.895	13265.885	905.387	FN
1626	7979.397	13194.020	905.594	GR
1627	8228.340	13000.439	902.982	LDB
1628	8249.845	13023.756	904.364	LDB
1629	8264.949	13036.720	904.503	LDB
1630	8281.965	13048.168	904.037	LDB
1631	8293.976	13056.985	904.461	LDB
1632	8314.876	13077.454	905.204	LDB
1633	8338.307	13102.291	905.087	LDB
1634	8359.761	13126.025	905.101	LDB
1635	8376.785	13142.754	904.938	LDB
1636	8380.720	13153.080	904.659	CS 10.00
1637	8394.489	13162.104	904.272	LDB
1638	8409.415	13186.219	904.320	LDB
1639	8410.872	13209.162	906.049	LDB
1640	8420.628	13228.200	904.622	LDB
1641	8413.306	13247.667	905.424	LDB
1642	8411.630	13279.358	905.713	LDB
1643	8427.680	13318.033	904.841	LDB
1644	8446.593	13328.294	903.248	LDB
1645	8464.902	13305.115	905.850	LDB
1646	8470.246	13337.887	905.319	GR
1647	8448.309	13347.862	903.772	GR
1648	8459.749	13382.856	904.804	GR
1649	8434.372	13368.634	904.894	GR
1650	8394.859	13337.349	905.055	GR

1651	8366.306	13311.852	905.478	GR
1652	8391.965	13288.162	905.081	GR
1653	8393.429	13245.569	906.506	GR
1654	8409.155	13225.377	905.738	GR
1655	8388.339	13208.494	905.408	GR
1656	8373.518	13184.914	905.076	GR
1657	8355.149	13207.368	905.326	GR
1658	8348.129	13243.001	905.085	GR
1659	8305.710	13244.917	907.691	GR
1660	8269.925	13235.466	910.991	GR
1661	8282.966	13195.319	908.508	GR
1662	8319.882	13206.848	906.498	GR
1663	8341.987	13166.477	905.687	GR
1664	8319.770	13137.858	906.801	GR
1665	8293.446	13120.443	907.731	GR
1666	8262.795	13150.439	910.236	GR
1667	8234.561	13124.890	910.579	GR
1668	8258.454	13089.646	907.316	GR
1669	8225.277	13060.136	906.442	GR
1670	8212.118	13099.841	909.171	GR
1671	8173.483	13097.139	908.591	GR
1672	8176.871	13044.322	906.158	GR
1673	8225.254	12973.608	903.675	RDB
1674	8245.705	12989.941	903.667	RDB
1675	8272.530	13010.512	904.097	RDB
1676	8293.865	13024.849	904.269	RDB
1677	8313.303	13045.632	904.561	RDB
1678	8338.657	13057.839	904.134	RDB
1679	8353.832	13082.723	903.961	RDB
1680	8370.577	13100.417	904.467	RDB
1681	8398.357	13116.331	904.320	RDB
1682	8416.512	13141.780	904.461	RDB
1683	8429.660	13172.547	904.786	RDB
1684	8437.089	13196.528	904.740	RDB
1685	8445.096	13218.377	904.716	RDB
1686	8443.885	13254.876	904.368	RDB
1687	8442.623	13280.287	903.757	RDB
1688	8460.921	13276.985	903.949	R-C 6994
1689	8462.328	13253.131	905.139	GR
1690	8461.102	13207.088	904.034	GR
1691	8470.077	13213.212	904.415	R/C
1692	8493.773	13227.111	904.183	GR
1693	8529.471	13236.694	904.309	GR
1694	8569.423	13292.114	905.929	GR
1695	8550.922	13289.785	904.894	TOP CMP
1696	8590.105	13292.039	904.851	TOP CMP
1697	8590.378	13292.094	900.778	INV CMP
1698	8578.292	13232.352	904.335	GR
1699	8599.907	13176.513	904.481	GR
1700	8625.926	13109.490	905.781	GR
1701	8571.215	13065.779	906.309	GR
1702	8528.010	13110.094	904.277	GR

1703	8481.001	13150.742	904.002	GR
1704	8434.170	13102.388	903.889	GR
1705	8472.987	13061.327	904.388	GR
1706	8517.034	13015.416	905.807	GR
1707	8476.372	12959.662	904.124	GR
1708	8424.838	12918.250	903.255	GR
1709	8381.528	12969.511	903.533	GR
1710	8356.359	13006.539	903.404	GR
1711	8336.570	13029.236	904.112	GR
1712	8279.904	12986.015	903.968	GR
1713	8313.520	12930.620	903.092	GR
1714	8346.416	12866.012	903.346	GR
1715	8299.869	12829.408	903.084	GR
1716	8273.312	12879.352	902.671	GR
1717	8239.168	12924.291	902.971	GR
1718	9098.493	10112.543	887.906	GR
1719	9126.625	10127.422	886.481	GR
1720	9133.344	10136.826	887.421	GR
1721	9157.091	10146.343	887.692	GR
1722	9163.458	10150.006	886.738	CO
1723	9186.630	10155.684	887.890	GR
1724	9220.201	10122.401	887.162	GR
1725	9223.752	10151.113	887.822	LDB
1726	9231.094	10134.652	887.617	LDB
1727	9248.916	10122.771	886.841	LDB
1728	9251.923	10110.425	886.641	LDB
1729	9244.723	10103.367	887.183	LDB
1730	9224.991	10100.230	887.147	LDB
1731	9212.055	10096.634	887.432	LDB
1732	9200.805	10096.766	887.129	LDB
1733	9185.884	10078.742	886.076	LDB
1734	9178.153	10057.572	885.705	LDB
1735	9169.933	10061.326	886.442	LDB OB
1736	9154.506	10070.626	886.348	LDB OB
1737	9148.430	10083.495	886.030	LDB OB
1738	9144.859	10099.542	885.867	LDB OB
1739	9147.217	10116.954	887.869	LDB OB
1740	9162.360	10131.871	887.447	LDB OB
1741	9179.687	10134.494	887.069	LDB OB
1742	9186.261	10125.356	887.525	LDB OB
1743	9193.471	10102.251	887.022	LDB OB
1744	9187.072	10087.046	886.301	RDB OB
1745	9179.072	10097.723	887.157	RDB OB
1746	9173.466	10112.225	887.054	RDB OB
1747	9168.613	10113.878	886.621	RDB OB
1748	9165.199	10089.922	886.520	RDB OB
1749	9178.860	10080.872	886.289	RDB OB
1750	9196.107	10062.654	885.857	RDB
1751	9207.071	10074.092	888.772	RDB
1752	9232.481	10074.323	891.403	RDB
1753	9247.762	10077.214	892.503	RDB
1754	9251.675	10085.957	887.176	RDB

1755	9264.980	10092.343	886.979	RDB
1756	9270.255	10116.815	887.817	RDB
1757	9254.747	10136.995	886.952	RDB
1758	9248.549	10150.854	887.311	RDB
1759	9250.534	10173.488	887.721	RDB
1760	9247.949	10191.874	888.221	RDB
1761	9231.447	10199.575	888.504	RDB
1762	9261.902	10206.702	888.626	GR
1763	9288.933	10219.582	889.047	GR
1764	9315.526	10221.553	890.099	GR
1765	9355.535	10219.576	895.523	GR
1766	9377.891	10218.577	896.834	GR
1767	9369.274	10168.538	897.147	GR
1768	9341.619	10179.222	896.573	GR
1769	9363.246	10139.839	896.767	GR
1770	9333.011	10158.960	896.507	GR
1771	9315.653	10135.660	895.392	GR
1772	9344.544	10115.353	896.037	GR
1773	9340.080	10075.022	895.166	GR
1774	9305.999	10090.395	894.671	GR
1775	9286.548	10074.103	894.553	GR
1776	9305.241	10059.934	894.581	GR
1777	9281.704	10059.871	894.117	GR
1778	9262.291	10061.400	894.252	GR
1779	9266.785	10070.681	894.236	GR
1780	9245.324	10063.199	892.780	GR
1781	9225.959	10061.246	890.780	GR
1782	9266.115	10084.913	887.685	GR
1783	9284.679	10098.952	887.330	GR
1784	9290.439	10123.588	887.577	GR
1785	9288.111	10150.807	887.748	GR
1786	9309.863	10176.248	888.663	GR
1787	9315.872	10199.712	889.084	GR
1788	9308.337	10265.327	889.263	GR
1789	9330.007	10282.754	896.990	GR
1790	9355.127	10299.962	897.941	GR
1791	9331.033	10328.632	897.348	GR
1792	9300.707	10298.180	895.539	GR
1793	9288.396	10277.537	889.755	GR
1794	9254.033	10276.373	889.276	GR
1795	9255.305	10307.557	893.154	GR
1796	9107.874	9987.386	887.061	H/T
1797	9080.897	10088.610	887.602	GR
1798	9068.194	10103.664	893.862	GR
1799	9049.181	10089.266	896.386	GR
1800	9020.224	10063.013	895.681	GR
1801	9003.161	10044.819	896.052	GR
1802	9023.412	10002.732	894.926	GR
1803	9027.215	9997.917	892.249	TILE
1804	9032.506	9981.104	893.525	GR
1805	9029.295	9962.764	894.536	GR
1806	9030.640	9963.327	892.371	GULLY

1807	9045.239	9950.568	894.759	GR
1808	9054.561	9920.411	895.746	GR
1809	9071.237	9908.621	894.483	GR
1810	9060.759	9875.597	895.253	GR
1811	9064.387	9854.189	895.809	GR
1812	9062.900	9848.358	893.268	GULLY
1813	9065.144	9842.272	895.864	GR
1814	9074.321	9816.530	895.661	GR
1815	9095.635	9816.327	894.379	GR
1816	9094.174	9792.657	897.160	GR
1817	9110.454	9798.135	895.840	GR
1818	9126.633	9770.026	896.051	GR
1819	9150.357	9745.474	894.771	GR
1820	9173.739	9749.289	887.598	GR
1821	9184.859	9779.059	885.659	GR
1822	9154.663	9775.105	885.564	GR
1823	9137.433	9809.305	885.977	GR
1824	9172.775	9818.576	885.664	GR
1825	9203.122	9830.709	885.820	GR
1826	9232.874	9796.854	885.483	GR
1827	9189.858	9864.195	886.077	GR
1828	9199.602	9889.817	885.973	GR
1829	9158.667	9874.706	886.472	GR
1830	9130.300	9857.244	886.805	GR
1831	9119.317	9828.738	886.629	GR
1832	9103.956	9852.450	888.292	GR
1833	9082.308	9862.985	890.054	GR
1834	9125.973	9878.541	887.287	GR
1835	9157.586	9895.106	886.299	GR
1836	9152.670	9921.179	886.320	GR
1837	9161.611	9929.890	885.044	GR
1838	9182.704	9924.607	883.992	GR SP
1839	9200.687	9931.417	882.786	GR SP
1840	9141.114	9946.899	885.596	GR SP
1841	9124.304	9924.953	886.513	GR
1842	9093.653	9910.693	886.893	GR
1843	9071.659	9930.383	887.733	GR
1844	9094.927	9946.718	887.129	GR
1845	9131.709	9953.885	886.235	GR
1846	9161.811	9961.562	886.913	GR
1847	9177.894	9989.642	887.661	GR
1848	9176.736	10000.269	886.159	GR
1849	9172.614	10027.913	887.338	GR
1850	9141.762	10025.228	887.358	GR
1851	9149.848	9999.980	885.651	GR
1852	9153.844	9986.427	887.061	GR
1853	9121.233	9988.280	885.981	GR
1854	9092.338	9973.434	887.774	GR
1855	9060.301	9953.611	888.964	GR
1856	9047.137	9978.610	889.429	GR
1857	9037.008	10017.689	888.906	GR
1858	9030.627	10043.915	888.766	GR

1859	9056.012	10066.835	887.549	GR
1860	9066.072	10033.361	887.405	GR
1861	9084.601	10040.028	887.475	GR
1862	9116.784	10050.171	887.742	GR
1863	9146.661	10056.158	887.722	GR
1864	9193.658	10041.396	885.493	LDB
1865	9199.010	10029.153	885.560	LDB
1866	9191.609	10028.230	883.168	GULLY
1867	9186.269	10025.388	886.995	GR
1868	9192.758	10023.810	885.429	GR
1869	9204.959	10022.649	885.484	LDB
1870	9206.820	10003.910	886.079	LDB
1871	9199.484	9982.915	886.367	LDB
1872	9192.729	9956.330	886.725	LDB
1873	9199.327	9935.941	885.408	LDB
1874	9204.465	9927.379	885.601	LDB
1875	9224.966	9902.476	886.120	LDB
1876	9237.492	9878.041	886.365	LDB
1877	9248.843	9846.085	885.541	LDB
1878	9265.903	9827.029	886.138	LDB
1879	9279.414	9829.058	886.060	LDB
1880	9292.122	9824.969	885.284	LDB
1881	9288.591	9802.920	885.627	LDB
1882	9307.154	9775.004	885.416	LDB
1883	9329.048	9760.943	885.119	LDB
1884	9273.757	9870.582	886.562	RDB
1885	9257.821	9887.060	885.540	RDB
1886	9245.044	9908.299	885.744	RDB
1887	9227.740	9941.984	885.965	RDB
1888	9213.007	9960.643	884.874	RDB
1889	9224.316	9983.149	886.513	RDB
1890	9213.507	9969.921	885.238	RDB
1891	9229.159	9998.790	886.877	RDB
1892	9224.702	10018.734	886.900	RDB
1893	9213.627	10048.229	888.716	RDB
1894	9210.828	10057.999	888.946	RDB
1895	9237.263	10050.006	890.045	GR
1896	9242.393	10026.731	888.104	GR
1897	9272.524	10030.719	889.698	GR
1898	9311.183	10032.740	894.358	GR
1899	9297.238	10000.058	892.828	GR
1900	9265.593	9990.883	887.794	GR
1901	9249.122	9983.654	886.063	GR
1902	9251.884	9950.583	886.207	GR
1903	9270.516	9924.661	885.970	GR
1904	9293.153	9940.591	885.821	GR
1905	9288.528	9972.341	886.364	GR
1906	9309.163	9973.077	893.351	GR
1907	9310.134	9933.062	889.125	GR
1908	9300.469	9939.745	886.853	3000
1909	9358.950	9980.348	894.216	GR
1910	9336.087	9966.604	892.511	GR

1911	9324.505	9954.451	893.072	GR
1912	9351.555	9932.397	890.837	GR
1913	9376.207	9933.771	892.590	GR
1914	9405.341	9891.621	892.326	GR
1915	9388.807	9876.011	890.390	GR
1916	9407.761	9829.687	890.339	GR
1917	9454.847	9841.032	892.486	GR
1918	9512.386	9790.983	891.722	GR
1919	9472.165	9779.209	887.971	GR
1920	9416.289	9774.272	886.362	GR
1921	9380.518	9766.230	886.007	GR
1922	9357.050	9810.466	886.691	GR
1923	9347.050	9852.238	887.285	GR
1924	9336.840	9888.678	887.708	GR
1925	9294.611	9894.233	887.185	GR
1926	9273.594	9910.856	885.604	GR
1927	9281.583	9863.272	886.774	RDB
1928	9300.591	9849.766	887.547	RDB
1929	9322.700	9837.120	886.993	RDB
1930	9320.185	9817.076	887.530	RDB
1931	9310.071	9806.517	885.990	RDB
1932	9318.644	9794.724	884.866	RDB
1933	9340.007	9778.012	885.491	RDB
1934	9356.249	9768.176	885.477	RDB
1935	9360.720	9764.506	882.448	GULLY
1936	9363.451	9765.372	885.858	RDB
1937	9359.190	9757.049	885.411	RDB
1938	9354.184	9748.130	881.011	RSD
1939	9362.781	9744.000	884.429	RSD
1940	9404.427	9732.828	885.584	RSD
1941	9459.679	9734.072	886.756	RSD
1942	9516.275	9732.842	887.961	RSD
1943	9564.519	9726.741	890.262	EOP
1944	9511.865	9726.062	889.123	EOP
1945	9448.969	9725.711	888.425	EOP
1946	9379.430	9724.991	888.602	EOP
1947	9351.069	9745.064	886.473	CPM TOP
1948	9383.345	9682.788	886.586	CPM TOP
1949	9318.621	9724.682	888.953	EOP
1950	9274.982	9724.244	889.516	EOP
1951	9186.650	9724.177	892.903	EOP
1952	9189.798	9703.383	892.677	EOP
1953	9255.088	9704.152	890.314	EOP
1954	9312.805	9705.050	889.040	EOP
1955	9373.988	9705.646	888.434	EOP
1956	9434.789	9705.702	888.113	EOP
1957	9517.493	9706.171	888.758	EOP
1958	9581.917	9706.498	890.660	EOP
1959	9510.312	9597.053	884.403	H/T
1960	9402.477	9680.054	883.921	RDB
1961	9419.150	9668.133	884.937	RDB
1962	9430.307	9658.171	883.906	RDB

1963	9431.221	9645.746	883.787	RDB
1964	9449.260	9631.336	884.659	RDB
1965	9461.472	9616.741	884.689	RDB
1966	9475.150	9602.467	884.841	RDB
1967	9482.196	9583.530	884.124	RDB
1968	9490.534	9565.383	884.119	RDB
1969	9501.112	9544.836	882.951	RDB
1970	9508.243	9531.581	882.205	RDB
1971	9529.713	9526.186	883.508	RDB
1972	9533.389	9499.776	883.512	RDB
1973	9534.867	9481.801	883.877	RDB
1974	9530.782	9465.699	883.889	RDB
1975	9539.328	9447.015	883.524	RDB
1976	9541.452	9407.397	883.085	RDB
1977	9545.801	9433.172	883.827	STA 2400
1978	9563.885	9422.784	883.388	GR
1979	9588.713	9434.648	883.626	GR
1980	9630.010	9456.157	883.187	GR
1981	9651.760	9485.670	882.320	GR
1982	9642.996	9514.824	882.300	GR
1983	9615.923	9544.053	882.378	GR
1984	9593.313	9554.920	882.524	GR
1985	9567.089	9571.560	883.788	GR
1986	9564.826	9598.742	884.161	GR
1987	9551.137	9613.925	885.114	GR
1988	9533.362	9645.373	885.001	GR
1989	9523.354	9666.821	885.064	GR
1990	9506.744	9675.949	885.057	GR
1991	9480.910	9681.030	885.219	GR
1992	9491.233	9643.330	884.986	GR
1993	9533.005	9558.364	883.552	GR
1994	9557.580	9516.059	883.661	GR
1995	9594.803	9532.587	883.372	GR
1996	9611.888	9496.597	884.211	GR
1997	9578.631	9480.830	883.202	GR
1998	9597.103	9459.420	882.832	GR
1999	9701.812	9497.362	890.426	GR
2000	9683.026	9524.650	893.093	GR
2001	9664.157	9554.234	893.244	GR
2002	9644.954	9587.485	892.707	GR
2003	9657.359	9615.620	892.889	GR
2004	9640.523	9643.887	892.201	GR
2005	9623.264	9657.415	893.273	GR
2006	9631.963	9681.369	893.875	GR
2007	9597.938	9686.358	892.504	GR
2008	9548.787	9689.303	890.478	GR
2009	9502.700	9693.854	887.755	GR
2010	9439.026	9690.075	886.721	GR
2011	9406.612	9688.797	885.055	GR
2012	9369.867	9691.585	885.472	LDB
2013	9360.506	9675.405	884.966	LDB
2014	9374.514	9646.556	884.017	LDB

2015	9398.305	9633.730	884.757	LDB
2016	9424.697	9610.068	884.746	LDB
2017	9441.710	9589.867	884.853	LDB
2018	9451.317	9572.801	882.242	LDB
2019	9454.087	9568.107	883.989	LDB
2020	9470.248	9543.156	883.700	LDB
2021	9485.466	9524.812	883.428	LDB
2022	9497.087	9510.334	882.535	LDB
2023	9481.815	9485.236	882.933	LDB
2024	9485.276	9464.418	886.784	LDB
2025	9507.998	9448.472	884.782	LDB
2026	9511.316	9421.984	882.696	LDB
2027	9489.388	9418.580	885.615	GR
2028	9462.902	9413.686	887.314	GR
2029	9438.814	9410.381	894.217	GR
2030	9441.183	9437.586	893.743	GR
2031	9467.019	9450.993	889.833	GR
2032	9454.087	9473.198	884.613	GR
2033	9434.161	9483.915	884.730	GR
2034	9417.423	9492.125	885.185	GR
2035	9402.374	9526.303	884.768	GR
2036	9393.706	9550.117	883.603	GR
2037	9354.383	9572.715	883.448	GR
2038	9315.332	9587.041	885.280	GR
2039	9346.847	9637.509	885.237	GR
2040	9375.443	9612.580	884.169	GR
2041	9398.981	9582.496	883.935	GR
2042	9423.414	9561.166	883.673	GR
2043	9440.023	9528.973	883.294	GR
2044	9441.143	9507.218	884.871	GR
2045	9473.171	9497.483	883.037	GR
2046	9466.399	9478.080	884.869	GR
2047	9436.109	9448.265	893.905	GR
2048	9416.366	9452.047	894.196	GR
2049	9394.052	9473.737	895.402	GR
2050	9379.522	9485.416	897.251	GR
2051	9369.984	9510.706	897.363	GR
2052	9353.580	9529.911	898.074	GR
2053	9329.625	9552.373	897.009	GR
2054	9299.121	9559.901	896.864	GR
2055	9268.057	9599.505	896.651	GR
2056	9301.943	9638.986	893.411	GR
2057	9310.881	9661.839	888.878	GR
2058	9551.640	9301.251	882.598	H/T
2059	9531.158	9391.496	882.921	RDB
2060	9512.331	9367.809	883.002	RDB
2061	9505.405	9349.879	882.863	RDB
2062	9497.008	9303.512	882.204	RDB
2063	9521.140	9268.573	882.639	RDB
2064	9548.571	9239.351	881.884	RDB
2065	9560.607	9220.533	881.708	RDB
2066	9566.119	9200.572	881.567	RDB

2067	9566.223	9172.438	881.582	RDB
2068	9583.783	9150.522	881.835	RDB
2069	9594.173	9161.882	881.377	GR
2070	9592.703	9200.568	881.571	GR
2071	9574.694	9238.827	881.191	GR
2072	9572.696	9272.338	881.056	GR
2073	9541.161	9331.254	882.607	GR
2074	9544.062	9374.862	882.311	GR
2075	9564.303	9399.695	883.543	GR
2076	9578.301	9374.905	881.357	GR
2077	9582.751	9338.144	882.692	GR
2078	9596.422	9299.006	882.239	GR
2079	9609.101	9252.495	882.112	GR
2080	9617.817	9220.484	881.733	GR
2081	9626.035	9188.075	881.892	GR
2082	9635.228	9165.840	881.074	GR
2083	9684.066	9161.327	881.042	GR
2084	9668.789	9209.736	881.648	GR
2085	9664.775	9269.529	882.000	GR
2086	9651.909	9302.706	882.495	GR
2087	9648.580	9351.738	882.904	GR
2088	9631.511	9405.412	883.205	GR
2089	9667.708	9438.017	881.848	GR
2090	9679.766	9415.761	882.187	GR
2091	9693.529	9384.879	882.418	GR
2092	9687.761	9355.407	882.021	GR
2093	9690.477	9329.780	883.248	GR
2094	9690.358	9298.905	881.825	GR
2095	9699.835	9268.376	881.717	GR
2096	9707.531	9245.218	881.438	GR
2097	9777.514	9198.859	893.131	GR
2098	9778.347	9253.961	893.248	GR
2099	9733.675	9282.562	892.010	GR
2100	9726.916	9342.490	892.454	GR
2101	9722.423	9400.459	893.213	GR
2102	9501.392	9429.007	884.815	LDB
2103	9487.571	9396.659	884.526	LDB
2104	9483.303	9375.615	886.740	LDB
2105	9464.961	9360.412	894.154	LDB
2106	9449.465	9326.704	895.111	LDB
2107	9461.166	9291.297	894.673	LDB
2108	9478.518	9268.156	894.202	LDB
2109	9492.723	9250.477	893.359	LDB
2110	9508.160	9208.453	892.927	LDB
2111	9525.222	9184.260	890.530	LDB
2112	9533.118	9161.050	887.359	LDB
2113	9534.807	9143.655	886.452	LDB
2114	9544.150	9152.303	881.555	BF
2115	9512.331	9149.022	889.160	GR
2116	9473.584	9167.553	894.053	GR
2117	9463.334	9216.300	894.776	GR
2118	9448.551	9256.185	895.775	GR

2119	9423.944	9291.268	894.513	GR
2120	9427.358	9334.038	895.883	GR
2121	9443.719	9390.045	894.713	GR
2122	9442.939	9419.523	893.690	GR
2123	9458.728	9430.093	889.957	GR
2124	9476.037	9435.451	887.202	GR
2125	9500.375	9402.133	882.529	BF
2126	9598.985	9085.875	881.755	H/T
2127	9509.092	8914.640	880.523	H/T
2128	9649.692	8878.095	880.816	H/T

Number of points listed> 1928

DILLON CREEK BENCHMARK ELEVATIONS

Point #	Northerly (N)	Easterly (E)	Elevation	Label
643	8628.016	10913.265	893.90	H/T
740	8425.781	11140.954	895.5	H/T
877	8284.775	11361.728	898.85	H/T
1000	8132.979	11601.235	898.76	H/T
1171	8101.925	11907.584	899.72	H/T
1258	8013.558	12180.506	902.40	H/T
1330	8010.819	12481.429	901.21	H/T
1428	8006.469	12692.624	901.71	H/T
1501	8062.709	12933.516	904.08	H/T
1558	8114.717	12885.007	903.96	R/C
1573	8003.511	13146.666	905.32	H/T
1574	8287.987	13068.606	905.49	H/T
1575	8413.689	13010.011	904.19	H/T
1691	8470.077	13213.212	904.42	R/C
1796	9107.874	9987.386	887.06	H/T
1947*			886.47 East	Top of culvert – County Line Road
1948*			886.59 West	Top of culvert – County Line Road
1959	9510.12	9597.053	884.40	
542	9270.770	10508.703	896.70	Nail spike
548	9570.513	9740.699	892.02	H/T cp
549	9324.670	10067.298	895.29	R/C
550	9337.392	10001.998	893.78	H/T
545	9256.591	10529.904	896.02	R/C
547	10086.502	9719.296	899.1	CR Intersection
2058	9551.640	9301.251	882.6	H/T
2126	9598.985	9085.875	881.75	H/T
2127	9509.092	8914.640	880.52	H/T
2128	9649.692	8878.095	880.82	H/T

Legend: H/T – Hub Tac
R/C – Rebar Cap
CR Intersection – County Road Intersection

*: Culvert is inverted

USGS Indiana Streamstats

Basin Characteristics Report

Date: Tue Jan 12 2010 09:06:07 Mountain Standard Time
NAD83 Latitude: 41.3927 (41 23 33)
NAD83 Longitude: -85.6533 (-85 39 11)
NAD27 Latitude: 41.3926 (41 23 33)
NAD27 Longitude: -85.6533 (-85 39 11)

Parameter	Value
Channel 10-85 slope in feet per mile	25.5
Contributing drainage area in square miles.	1.607
Region number	1012
Percent of area covered by water and wetland	1.47
Total drainage area in square miles	1.607
Percent of area covered by urban land cover	0.21

USGS Indiana Streamstats

Streamstats Ungaged Site Report

Date: Tue Jan 12 2010 09:03:29 Mountain Standard Time
Site Location: Indiana
NAD83 Latitude: 41.3927 (41 23 33)
NAD83 Longitude: -85.6533 (-85 39 11)
NAD27 Latitude: 41.3926 (41 23 33)
NAD27 Longitude: -85.6533 (-85 39 11)
Drainage Area: 1.607 mi2

Peak Flow Basin Characteristics			
Region number=1012			
100% Region 8 Peak Flow (1.61 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	1.61	0.45	3370
Percent Wetlands (percent)	1.47	0	12.1

Peak Flow Streamflow Statistics					
Statistic	Flow (ft^3/s)	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK10	81.2	41	1.2	37.2	177
PK25	91.9	40	1.7	42.4	199
PK50	99.5	40	2	46.2	214
PK100	107	40	2.4	49.9	229
PK200	114	39	2.8	53.4	242
PK500	122	39	3.4	57.8	259

USGS Indiana Streamstats

Streamstats Ungaged Site Report

Date: Tue Jan 12 2010 09:08:29 Mountain Standard Time
Site Location: Indiana
NAD83 Latitude: 41.3945 (41 23 40)
NAD83 Longitude: -85.6613 (-85 39 40)
NAD27 Latitude: 41.3944 (41 23 39)
NAD27 Longitude: -85.6613 (-85 39 40)
Drainage Area: 1.851 mi2

Peak Flow Basin Characteristics			
Region number=1012			
100% Region 8 Peak Flow (1.85 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	1.85	0.45	3370
Percent Wetlands (percent)	2.1	0	12.1

Peak Flow Streamflow Statistics					
Statistic	Flow (ft^3/s)	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK10	77.3	41	1.2	35.5	169
PK25	87.8	40	1.7	40.7	190
PK50	95.5	40	2	44.5	205
PK100	103	39	2.4	48.1	219
PK200	110	39	2.8	51.6	233
PK500	119	39	3.4	56.2	250

GRIDCODE		Area (ac)
11	Open Water	5162.44
21	Developed, Open Space	7143.99
22	Developed, Low	3354.72
23	Developed, Medium	638.63
24	Developed, High	485.94
31	Barren Land	3.24
41	Deciduous Forest	8493.26
42	Evergreen Forest	155.35
43	Mixed Forest	2.89
52	Shurb/Scrub	360.50
71	Grassland/Herbaceous	323.92
81	Pasture/Hay	8363.09
82	Row Crops	77920.80
90	Woody Wetlands	3309.25
95	Emergent Herb. Wetlands	1433.51
		117151.52789000000

DILLON CREEK COST ESTIMATES

1.	Tree Trimming – along ag field sta 34+00 to 85+00		
	5,100 ft at $1.50/ft		$7,650.00
2.	Construction access off paved roads (rules compliant)		
	Pipe – 12” diameter x 20’ length – dual well plastic	$300.00	
	Filter Fabric – 100 sq yds at $1.00/yd	100.00	
	Gravel & rock – 45 ton at $35/ton	1,575.00	
	Dozer/skidsteer- 4 hours at 75/hr	300.00	
	Per site cost	$2,275.00	
	Needed 3 sites at $2,275.00		$6,825.00
3.	Two-stage channel construction		
	A= sta 35+20 to 35+00=80’		
	B= sta 74+00 to 85+00=1,100’		
	i. clear trees (conserve stumps for rootwads)		
	A=~10 trees at 1 hr each at $175/hr		$1,750.00
	B=~60 trees at 1 hr each at $175/hr		$10,500.00
	ii. Excavate soil from shelf		
	A= ~90cys: 4 hrs at $125/hr		$500.00
	B= ~611cys: 26 hrs at $125/hr		$3,250.00
	iii. Fix drain tile outlet at “A” only		
	1 ton rock at $35/hr + 2 yds filter fabric + 1 hr excavating		$160.00
	iv. Clear top soil, spread excavated spoils, redistribute top soil		
	A= 6 hrs at $125/hr		$750.00
	B=36 hrs at $125/hr		$4,500.00
	v. Seed and blanket disturbed areas		
	A=6 hrs at $125/hr		$750.00
	B=36 hrs at $125/hr		$4,500.00
	vi. JFNew Supervision		
	A=2 hrs at $120/hr		$240.00
	B=10 hrs at $120/hr		$1,200.00
			$35,350.00

Round to $35,400 or $30.00/ft

4. Wood Debris Removal
Summary of Work (18 Sites)

A. 4 Sites involving excavator

4 hrs with excavator at $125.00/hr (per site)	$500.00	
8 hrs labor (2 person at 4hrs each) at $50/hr (per site)	$400.00	
Seed & straw for access (per site)	$120.00	
Per site cost	$1,020.00	
Needed 4 sites at $1,020.00		$4,080.00

B. 13 sites are hard work only (1-6 logs)

4 hrs labor per site (average) at $50.00/hr	$2,600.00

C. 1 site is a pallet of hardened concrete sacks
Pallet of concrete to be removed by hand to adjacent grade control

8 hrs labor at $50.00/hr	$400.00

D. Supervision – inspection of all sites

4 hrs at $120.00/hr	$480.00
	$7,560.00

$7,560.00 / 18 sites = $420.00/site

5. Bank stabilization – rootwads – 84 hrs labor
9 structures using 5 access points (access elsewhere)

Estimated number of stumps 144 + 48 foot logs
Time to move and place each stump – 0.5 hrs
Time to move and place each foot log – 0.25 hrs
Total time= 84 hrs

Excavator & truck/skidsteer (includes operators)	
84 hrs at $200.00/hr	$16,800.00
Rock for ballast on top of rootwads	
2 tons x 144 stumps x $35.00/ton	$10,080.00
Placement of rock	
2 hrs/structure at $200.00/hr (9x2x$200)	$3,600.00
Supervision 2 hrs at $120.00/hr	$240.00
Seeding	
1/10 acre seed/structure ~9/10 acre seed at $400.00/acre	$400.00
Erosion control blankets for shelf & borrow area	
1,300 sq yds at $3.00/sq yd	$3,900.00
	$35,020.00

Round to $35,045 / 815 lineal feet = $43.00/ft

6. Bank Stabilization – soil lift

Excavator & skidsteer (includes operators)	
12 hrs at $200.00/hr	$2,400.00
Labor – 3 people at 12 hrs/ea at $50.00/hr	$1,800.00
Supervision – 10 hrs at $120.00/hr	$1,200.00
Mileage	$100.00
Supplies	
Rock – 22 cy or 33 ton at $35.00/ton	$1,155.00
Filter fabric – 750 sq ft = 83 sq yd at $1.00/yd	$133.00
Shrub cuttings 160 ft / 3.3=50 at $2.00/ea	$100.00
Coir fabric 165' roll x 6.6' wide=1,205 sq yd at $2.50/yd	$300.00
Straw/coconut liner fabric 165 ft (2 rolls) at $50.00/roll	$100.00
Compactor (jumping jack) rental at $100.00/day	$100.00
Wood stakes 1 every 3' = 63 at $1.00/ea	$63.00
Seed ¼ acre at $200.00/acre	$50.00
Straw 10 bales at $5.00/bale	$50.00
Erosion blankets for access – 150 sq yd at $3.00/sq yd	$450.00
	$8,001.00

Round to $8,000 / 100 lineal feet = $80.00/ft

7. Riffle Grade Controls
17 regular + 1 cross vane
9 dump sites for rock

Materials – Rock at $35.00 ton

Rock 16 tons (average) at 17 structures = 272 tons		
28 tons for cross vane = 28 tons		
Total of 300 ton at $35.00/ton		$10,500.00

Equipment – includes operator

Excavator at 4 hrs/site at $1254.00/hr	$500.00	
Loader/skidsteer at 4 hrs/site at $75.00/hr	$300.00	
Per Site Cost	$800.00	
Needed 18 sites at $800.00		$14,400.00

Labor

Seed and straw access and dump sites	
8 hrs at $50.00/hr x 9 sites	$3,600.00
Supervision	
2 hrs/site at $120.00/hr x 18 sites	$4,320.00

Seed and straw disturbance areas
Average disturbance area = 200 sq yd or ¼ acre seed/site
1 straw bale = 200 sq ft ~20 sq yd = ~10 bales/site/$5.00/bale

3 hrs labor for spreading seed and straw at $50.00/hr

27 sites (18 grade controls + 9 dump sites)		
Seed $50.00/site	$50.00	
Straw $50.00/site	$50.00	
Labor $150.00/site	$150.00	
Per Site Cost	$250.00	
Needed 27 sites at $250.00		$6,750.00
		$39,570.00

Round to $39,600 / 18 sites = $2,200/site

DRAFT

Appendix B:

Design Plan Set and Specifications

DRAFT

JFNew
http://www.jfnew.com

Corporate/Northern Indiana
708 Roosevelt Road
Walkerton, Indiana 46574
574-586-3400 fax 574-586-3446

Central Indiana
3901 Industrial Boulevard
Indianapolis, Indiana 46254
317-388-1982 fax 317-388-1986

Ohio
11156 Luschek Drive
Cincinnati, Ohio 45241
513-489-2402 fax 513-489-2404

Eastern Michigan
605 S. Main Street, Suite 1
Ann Arbor, MI 48104
734-222-9690 fax 734-222-9655

Western Michigan
11181 Marwill Avenue
West Olive, Michigan 49460
608-240-1453 fax 616-847-9970

Illinois
6605 Steger Road, Unit A
Monee, Illinois 60449
708-534-3450 fax 708-534-3480

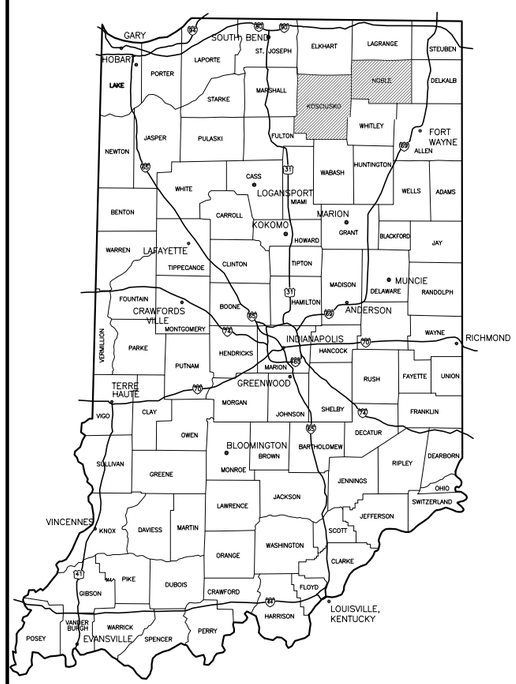
Wisconsin
403 Venture Ct Unit 7
Verona, Wisconsin 53593
608-848-1789 fax 608-848-3013

Dillon Creek Stream Stabilization
Lake and River Enhancement Program (LARE)
WAWASEE AREA CONSERVANCY FOUNDATION (WACF)
Section 24, Twp 34N, Range 8 East, Noble County and
Section 19, Twp 34N, Range 8 East, Kosciusko County, Indiana

JANUARY 2011

SHEET INDEX

SHEET	DESCRIPTION
1	TITLE SHEET AND SHEET INDEX
2	PROPOSED PLAN - WEST END
3	PROPOSED PLAN - EAST END
4	DETAILS 1 of 5
5	DETAILS 2 of 5
6	DETAILS 3 of 5
7	DETAILS 4 of 5
8	DETAILS 5 of 5

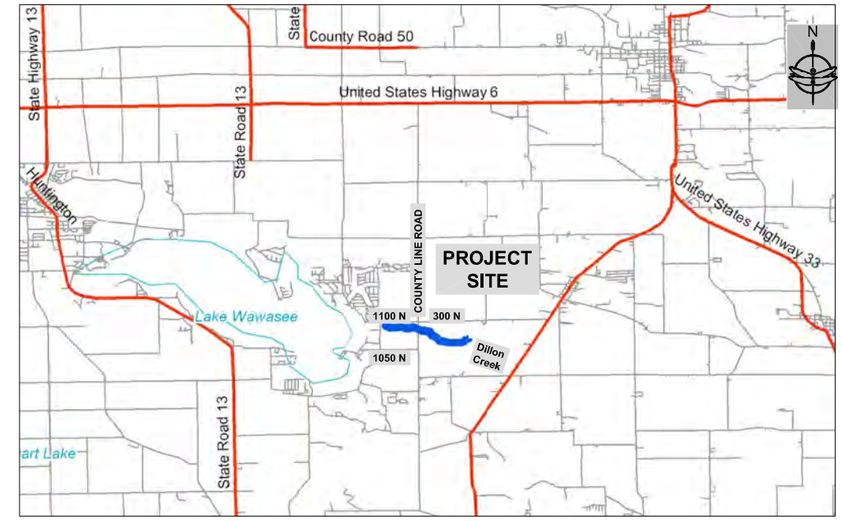


INDIANA STATE MAP
NOT TO SCALE

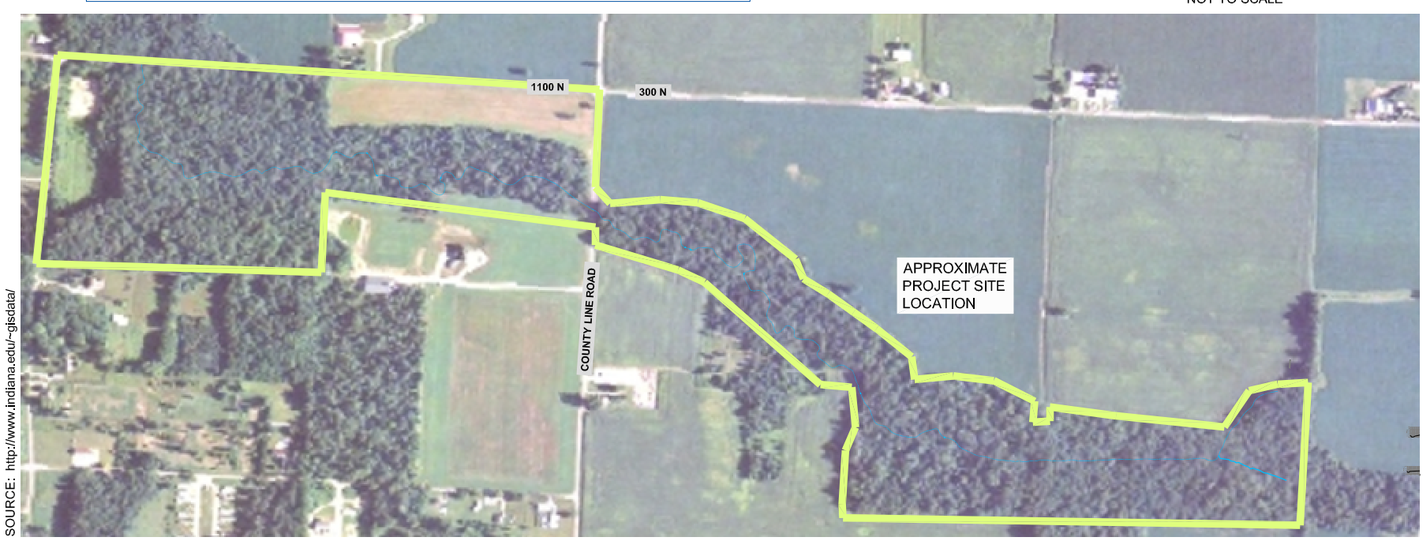
CONTACT INFORMATION

Wawasee Area Conservancy Foundation
PO Box 548
Syracuse, IN 46567

Indiana Department of Natural Resources
Lake and River Enhancement Section
Division of Fish and Wildlife
1353 S Governors Drive
Columbia City, IN 46725



VICINITY MAP
NOT TO SCALE



SOURCE: http://www.indiana.edu/~gisdata/

SITE LOCATION MAP
NOT TO SCALE

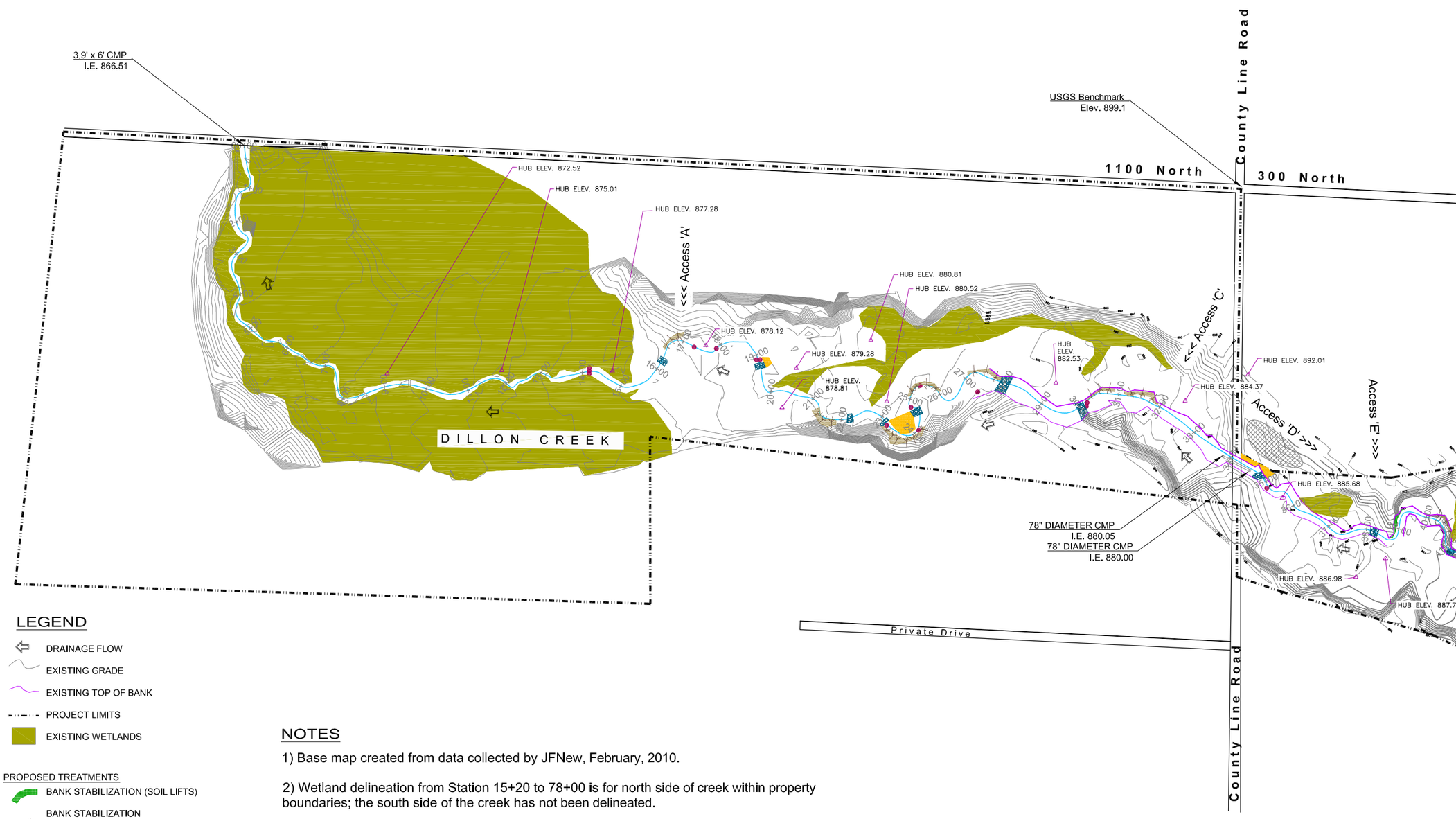
Our mission is to provide the highest quality environmental services to our clients while positively impacting the lives of our employees and the conservation of natural resources through prosperity and stewardship.

REVISION

TITLE SHEET AND SHEET INDEX
Dillon Creek Stream Stabilization
Noble County and Kosciusko County, Indiana

DRAWN BY:	COD
DESIGNED BY:	JBR
DATE:	JANUARY 2011
JOB NO:	0901008

DRAWING NO.
1



LEGEND

- DRAINAGE FLOW
- EXISTING GRADE
- EXISTING TOP OF BANK
- PROJECT LIMITS
- EXISTING WETLANDS

PROPOSED TREATMENTS

- BANK STABILIZATION (SOIL LIFTS)
- BANK STABILIZATION (ROOTWADS)
- GRADE CONTROL
- EXCAVATION
- DISPOSAL AREA FOR EXCAVATED MATERIAL (Refer to Sheet 7 for Details)
- DEBRIS REMOVAL

NOTES

1) Base map created from data collected by JFNew, February, 2010.

2) Wetland delineation from Station 15+20 to 78+00 is for north side of creek within property boundaries; the south side of the creek has not been delineated.

3) Access B has been eliminated from consideration.

4) Refer to Sheets 4 - 8 for Details.

N

0 120'

SCALE IN FEET

GRAPHIC SCALE VERIFICATION
This bar measures 1" on 22"x34" or 1/2" on 11"x17" original. Adjust scale accordingly.

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708 Roosevelt Road
Walkerton, Indiana 46574
574-586-3400

REVISION

PROPOSED PLAN - WEST END
Dillon Creek Stream Stabilization
Noble County and Kosciusko County, Indiana

DRAWN BY:	COD
DESIGNED BY:	JBR
DATE:	JANUARY 2011
JOB NO:	0901008

DRAWING NO.

2

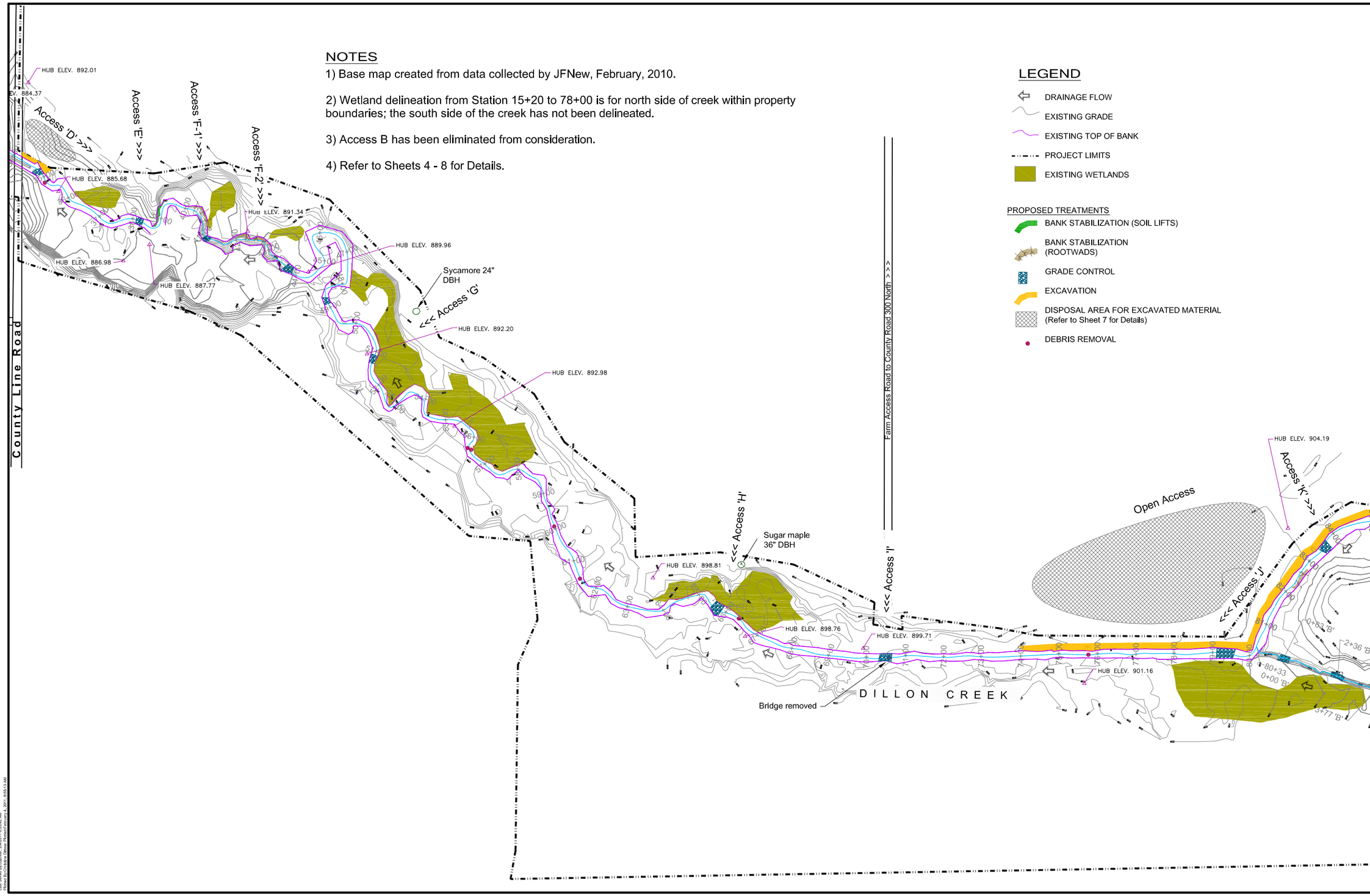
NOTES

1) Base map created from data collected by JFNew, February, 2010.

2) Wetland delineation from Station 15+20 to 78+00 is for north side of creek within property boundaries; the south side of the creek has not been delineated.

3) Access B has been eliminated from consideration.

4) Refer to Sheets 4 - 8 for Details.



LEGEND

- DRAINAGE FLOW
- EXISTING GRADE
- EXISTING TOP OF BANK
- PROJECT LIMITS
- EXISTING WETLANDS

PROPOSED TREATMENTS

- BANK STABILIZATION (SOIL LIFTS)
- BANK STABILIZATION (ROOTWADS)
- GRADE CONTROL
- EXCAVATION
- DISPOSAL AREA FOR EXCAVATED MATERIAL (Refer to Sheet 7 for Details)
- DEBRIS REMOVAL

N

0 120'

SCALE IN FEET

GRAPHIC SCALE VERIFICATION
This bar measures 1" on 22"x34" or 1/2" on 11"x17" original. Adjust scale accordingly.

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REVISION

PROPOSED PLAN - EAST END
Dillon Creek Stream Stabilization
Noble County and Kosciusko County, Indiana

DRAWN BY:	COD
DESIGNED BY:	JBR
DATE:	JANUARY 2011
JOB NO:	0901008

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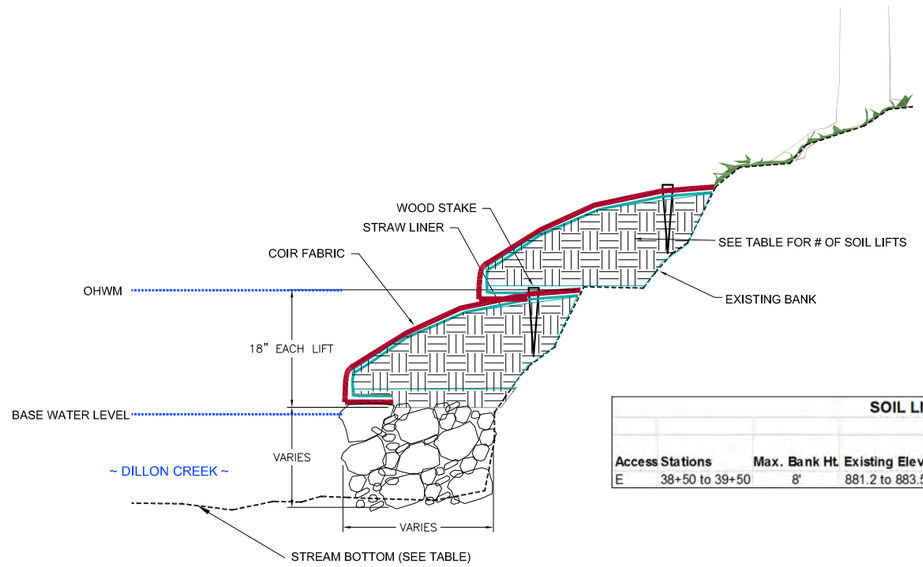
DEBRIS REMOVAL

Access	Station	Width	Obstruction Ht.	Removal Method	Estimated Logs/Volume	Disposal Method
A	14+20	20	2'	hand	6 logs	floodplain cableing
A	15+20	20	4'	hand	36 concrete sacks	off-site or buried
A	15+30	N/A	3'	hand	1 log	floodplain cableing
A	17+30	20	N/A	hand	3 logs	floodplain cableing
A	17+90	20	4'	excavator	6 logs	floodplain cableing
A	19+10	25	N/A	hand	3 logs	floodplain cableing
B	23+20	20	N/A	hand	3 logs	floodplain cableing
B	24+10	20	1.5'	excavator	10 logs/debris	floodplain cableing
B	24+80	20	2.5'	excavator	10 logs/debris	floodplain cableing
B	25+40	20	N/A	hand	4 logs	floodplain cableing
B	27+00	20	N/A	hand	6 logs	floodplain cableing
B	30+10	20	N/A	hand	5 logs	floodplain cableing
G or H	56+40	15	2.25'	hand	debris jam	floodplain cableing
G or H	60+00	15	2'	hand	debris jam	floodplain cableing
G or H	61+50	15	2.25'	hand	debris jam	floodplain cableing
G or H	66+40	18	2.5'	hand	5 logs	floodplain cableing
H	70+50	20	2'	excavator	bridge and posts	off-site or buried
OPEN	75+80	15	N/A	hand	3 logs	floodplain cableing

1) Debris removal shall include cutting and cabling of all logs within stream channel at identified locations. This includes trees leaning at angles of 30 degrees or greater over the channel.

2) All logs shall be anchored to flood plain using 3/8-inch braided steel cable and duckbill anchors or secured between leaning trees.

- DEBRIS REMOVAL



SOIL LIFT BANK STABILIZATION

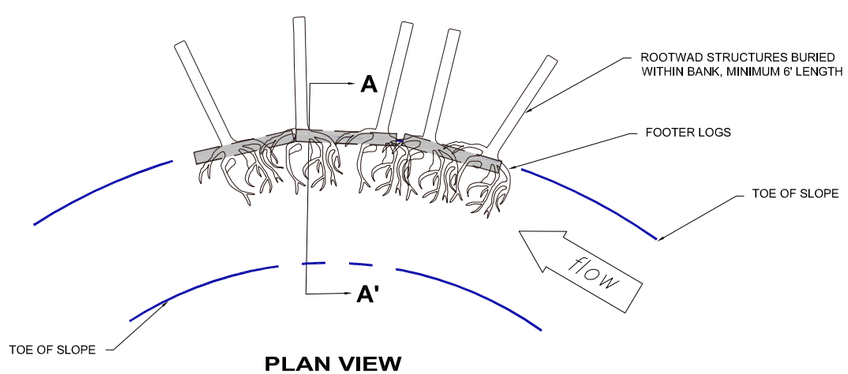
Access	Stations	Max. Bank Ht.	Existing Elev.	Rock Toe Elev.	Lift Length	Rock Estimate	Fabric Estimate
E	38+50 to 39+50	8'	881.2 to 883.5	884 to 886	100 ft lower 60 ft upper	22 cys	125 sys

BANK STABILIZATION - SOIL LIFT TREATMENT

NOT TO SCALE

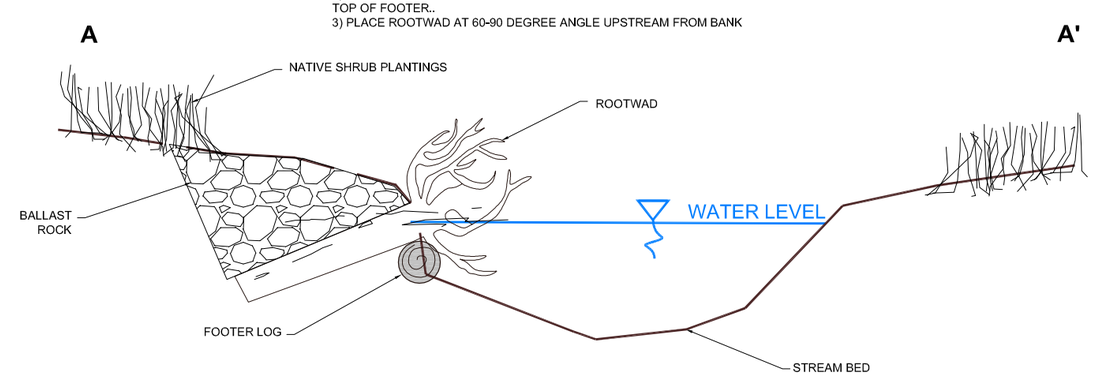
ROOTWAD BANK STABILIZATION

Access	Stations	Bank Ht.	Existing Thalweg Elev.	Shelf Elev.	Estimate # Stumps
A	16+40 to 17+00	3'	872.7	875	14
A or B	21+20 to 21+80	12'	875.6	878	12
B	23+00 to 24+30	12'	877.3	879.5	22
B	25+10 to 26+00	3.5'	877.5	879.5	15
B	27+10 to 28+00	4'	877.5	880	15
C	30+20 to 32+00	4.5'	879	881	30
F	40+20 to 41+00	3'	884	886	14
F	42+00 to 43+00	3'	885.5	887.5	17
OPEN	82+50 to 82+75	6'	897.4	902	5



PLAN VIEW

NOTE:
1) PLACE FOOTER LOG BELOW THE WATERLINE BURIED INTO BANK 1/2 DIAMETER OF TRUNK.
2) ROOTWAD SHALL BE KEYED A MINIMUM OF 6 FEET INTO BANK AND PLACED ON TOP OF FOOTER..
3) PLACE ROOTWAD AT 60-90 DEGREE ANGLE UPSTREAM FROM BANK



CROSS-SECTION A - A'

BANK STABILIZATION - ROOTWADS

NOT TO SCALE

Base map provided by LandTech Resources.

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REVISION

DETAILS 1 of 5

Dillon Creek Stream Stabilization

Noble County and Kosciusko County, Indiana

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DATE:	JANUARY 2011
JOB NO:	0901008

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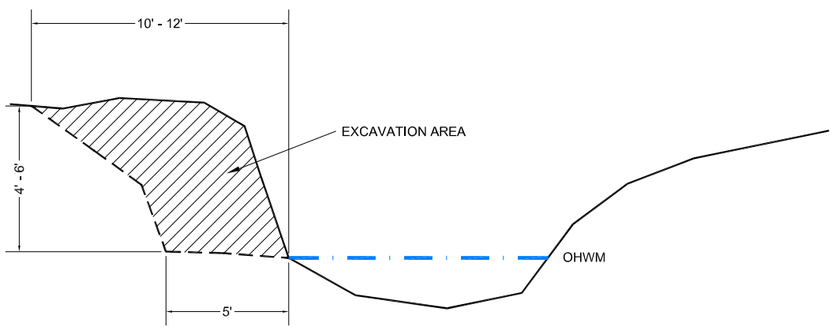
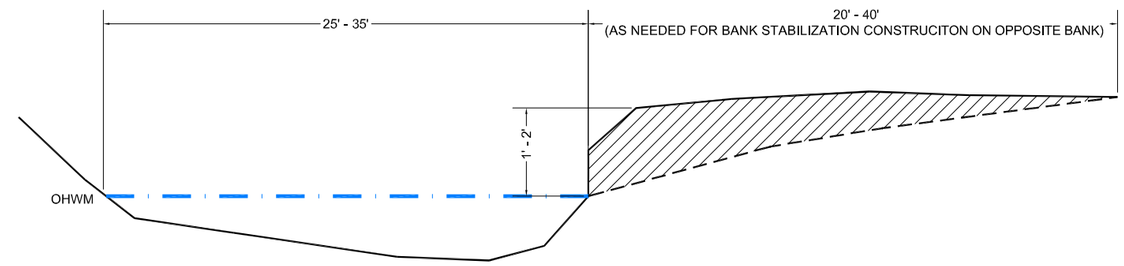
2-STAGE CHANNEL EXCAVATION					
Access	**Stations**	**Area of Cut (SqFt)**	**Ave. Depth of Cut**	**Estimated Volume (CYS)**	**Fill Use**
A	19+20 to 19+40	200	2'	15	root wad shelf at 21+40
B	23+30 to 24+70	2,000	1'	74	root wad shelf at 23+50
D	34+20 to 35+00	1,200	2'	90	spread in adjacent field
OPEN	74+00 to 85+00	13,200	1.5'	611	spread in adjacent field



TYPICAL EXCAVATION PLAN
(REPRESENTS STATIONS 34+20 THRU 35+00 AND 74+00 THRU 85+00)



TYPICAL EXCAVATION PLAN – ALTERNATE 1
REPRESENTS STATIONS 19+00 THRU 19+40 AND 23+30 THRU 24+70)

EXCAVATION - 2-STAGE CHANNEL
NOT TO SCALE

Base map provided by LandTech Resources.

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REVISION

DETAILS 2 of 5
Dillon Creek Stream Stabilization
Noble County and Kosciusko County, Indiana

DRAWN BY:	COD
DESIGNED BY:	JBR
DATE:	JANUARY 2011
JOB NO:	0901008

DRAWING NO.

5

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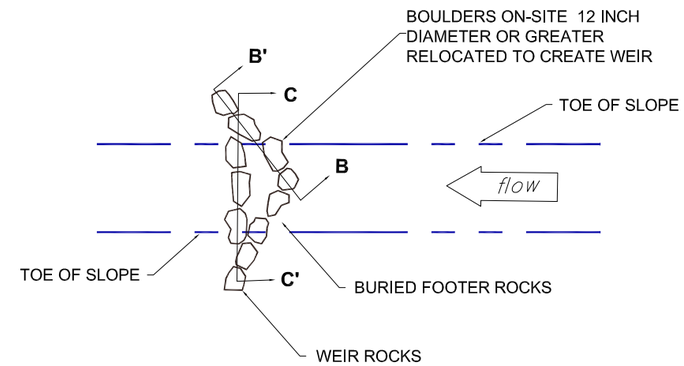
Plotted By:Christine Steele Plotted:February 4, 2011, 8:55:30 AM

RIFFLES - GRADE CONTROL

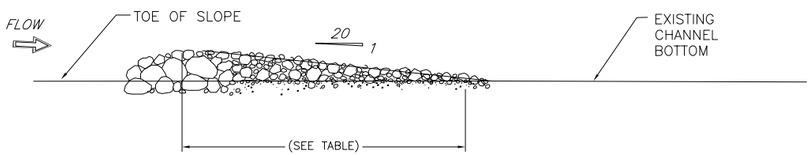
Access	Stations	Width	Existing Thalweg Elev.	Proposed Crest Elev.	Estimated Volume (CYS)
A	16+30 to 16+40	20	874.50	875.00	5
A	19+20 to 19+30	20	875.80	876.25	5
B	22+20 to 22+30	20	876.50	877.00	5
B	23+05 to 23+15	20	877.00	877.50	5
B	24+60 to 24+70	20	877.50	878.00	5
B	27+90 to 28+10	20	878.25	879.25	10
C	30+00 to 30+10	20	879.25	879.75	5
D	34+60 to 34+70	20	880.00	882.50	28
E	38+10 to 38+40	20	882.80	885.00	28
F	41+10 to 41+30	20	885.00	886.50	18
F	43+70 to 43+90	20	886.50	887.50	10
G	48+70 to 48+80	20	888.00	888.50	5
G	51+05 to 51+15	20	888.50	889.00	5
open	79+10 to 79+30	20	898.80	899.50	12
open	B' 0+75 to 0+85	12	900.50	901.50	18
open	B' 2+30 to 2+40	12	902.50	903.50	18
open	83+50 to 83+70	20	899.50	900.00	10

GRADE CONTROL

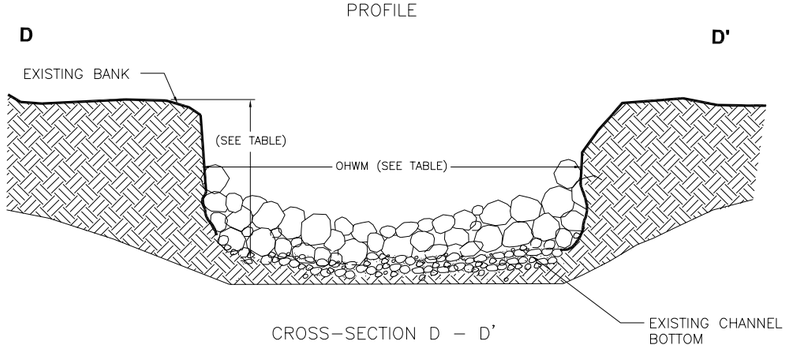
Access	Station	Width	Crest Elev.	Existing Elev.	Estimated Volume
H	70+50	20'	895.2	897.6	10 CYS



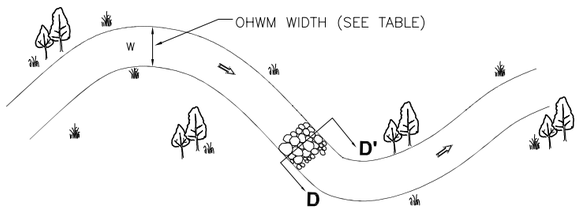
PLAN VIEW



PROFILE



CROSS–SECTION D – D'



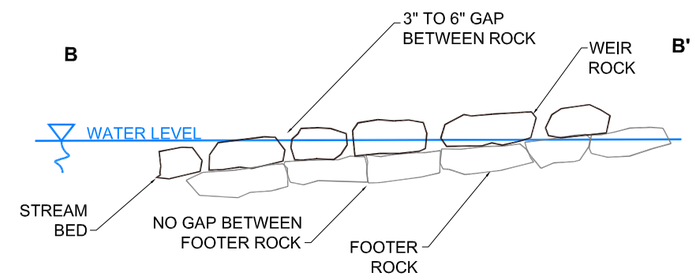
PLAN VIEW

GRADE CONTROL – RIFFLE

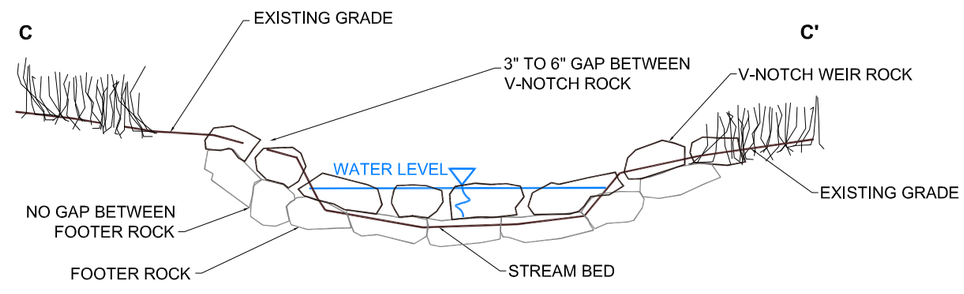
NOTE:
1) BURY FOOTER ROCKS WITH NO GAPS BETWEEN STONES THE EXTENT OF WEIR APPLICATION

2) PLACE V-NOTCH WEIR ROCKS ON TOP OF FOOTERS WITH 3" TO 6" GAP BETWEEN STONES

3) ASSEMBLE AS SHOWN



CROSS–SECTION B – B'



CROSS–SECTION C – C'

GRADE CONTROL – ALTERNATE 1 – V–NOTCH WEIR

GRADE CONTROL

NOT TO SCALE

Base map provided by LandTech Resources.

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REVISION

DETAILS 3 of 5
Dillon Creek Stream Stabilization
Noble County and Kosciusko County, Indiana

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DATE:	JANUARY 2011
JOB NO:	0901008

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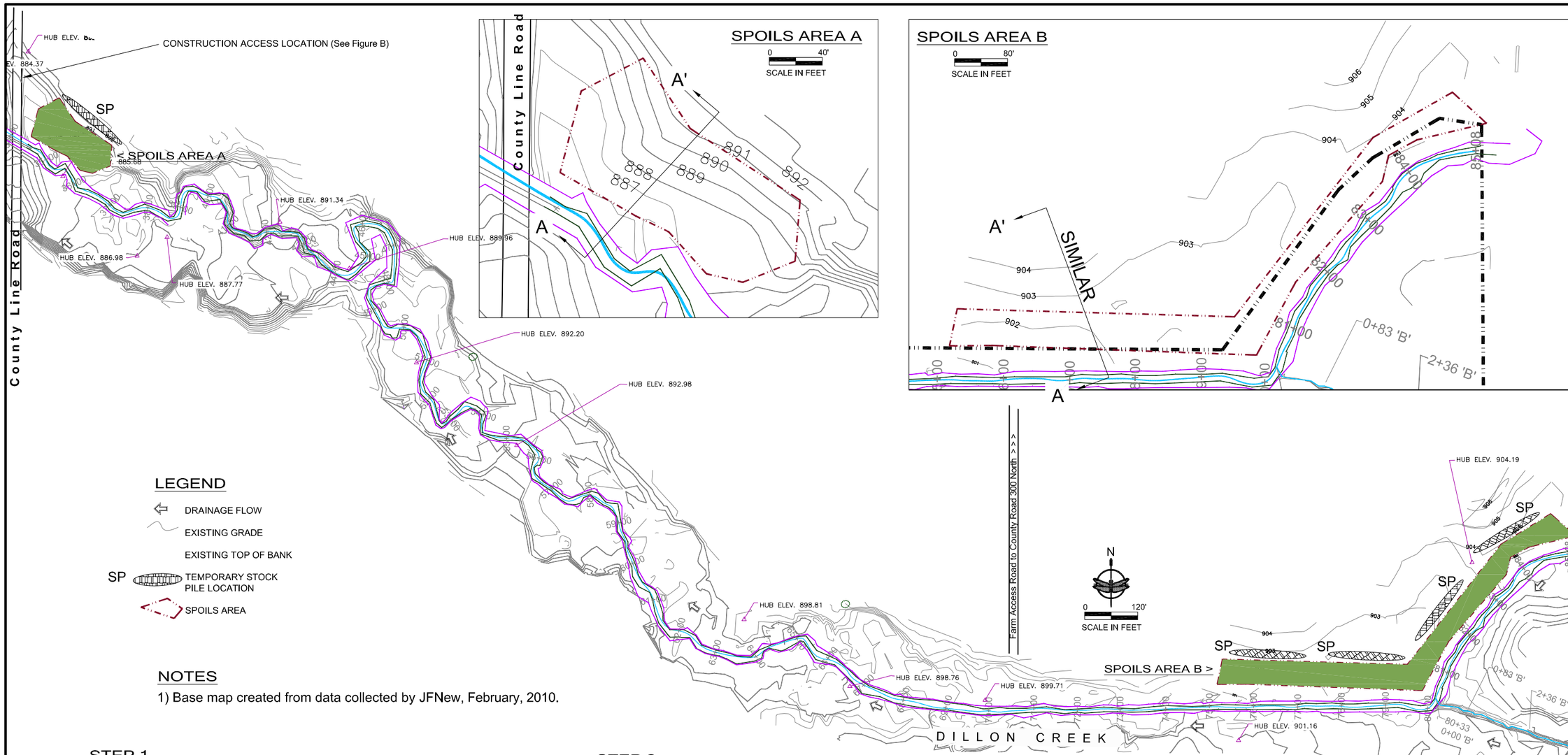


LEGEND

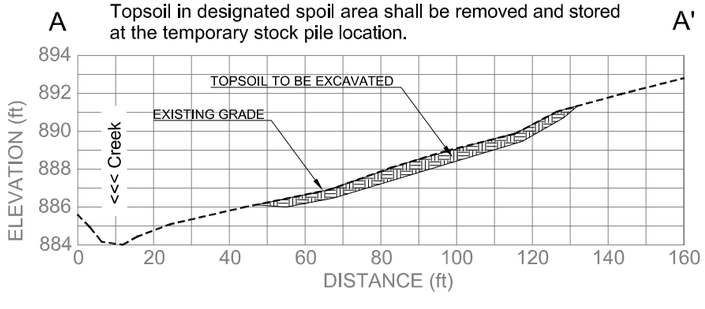
- DRAINAGE FLOW
- EXISTING GRADE
- EXISTING TOP OF BANK
- SP — TEMPORARY STOCK PILE LOCATION
- SPOILS AREA

NOTES

1) Base map created from data collected by JFNew, February, 2010.

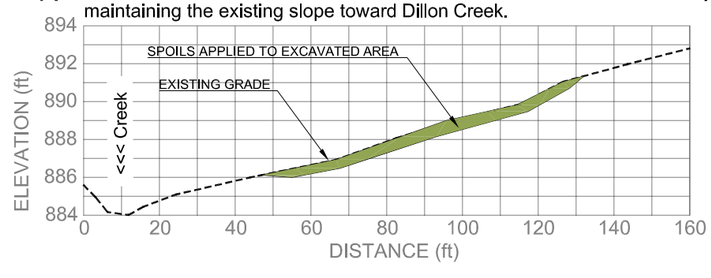
STEP 1

Topsoil in designated spoil area shall be removed and stored at the temporary stock pile location.



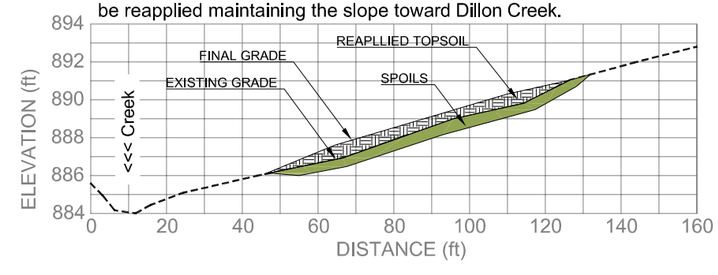
STEP 2

Spoils from the creek bank shall then be placed in the excavated area maintaining the existing slope toward Dillon Creek.



STEP 3

Once the spoils have been distributed, the salvaged topsoil shall be reapplied maintaining the slope toward Dillon Creek.



Base map created from data collected by JFNew, February, 2010.

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REVISION

DETAILS 4 of 5

Dillon Creek Stream Stabilization

Noble County and Kosciusko County, Indiana

DRAWN BY:	COD
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DATE:	JANUARY 2011
JOB NO:	0901008

DRAWING NO.

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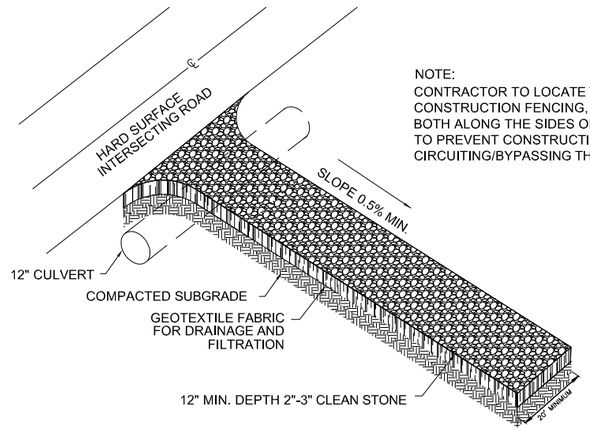
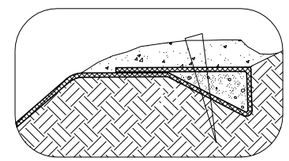


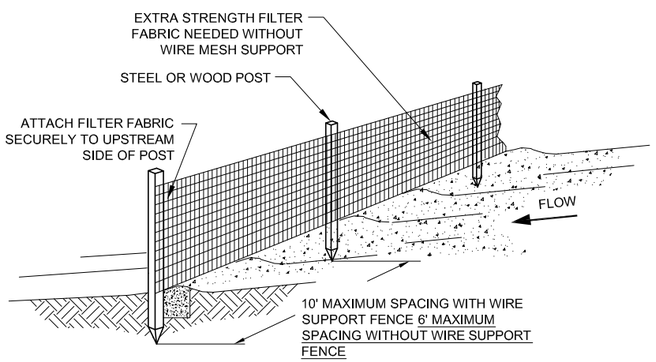
NOTE:
CONTRACTOR TO LOCATE TEMPORARY CONSTRUCTION FENCING, JERSEY BARRIERS, OR BOTH ALONG THE SIDES OF THE CONSTRUCTION EXIT TO PREVENT CONSTRUCTION TRAFFIC FROM SHORT CIRCUITING/BYPASSING THE EXIT.

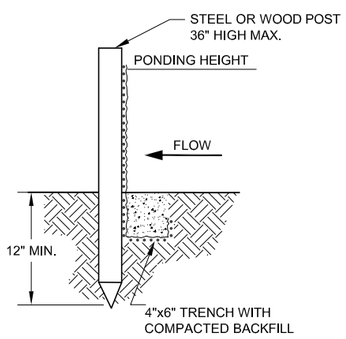
PLAN

CONSTRUCTION ENTRANCE

NOT TO SCALE







NOTES:

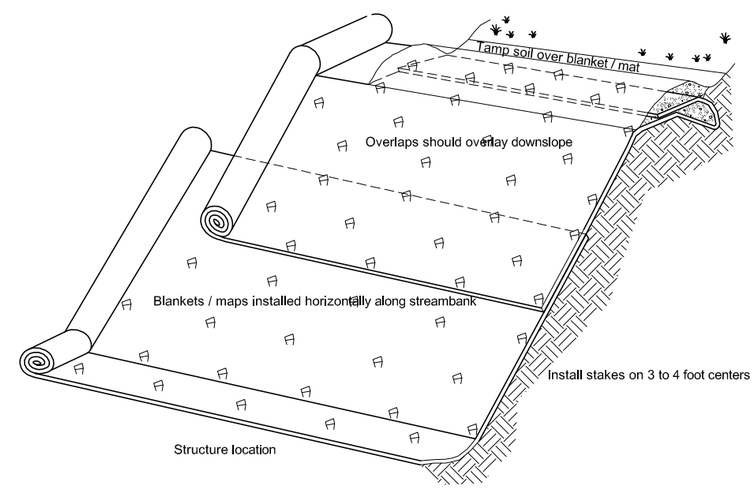
1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY. 9" MAXIMUM RECOMMENDED STORAGE HEIGHT.

3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

SILT FENCE DETAIL

NOT TO SCALE



EROSION CONTROL BLANKET DETAIL

NOT TO SCALE

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REVISION

DETAILS 5 of 5
Dillon Creek Stream Stabilization
Noble County and Kosciusko County, Indiana

DRAWN BY:	COD
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8

Appendix C:

Regulatory Permits

DRAFT

DRAFT

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
REGULATORY OFFICE
MICHIANA BRANCH
2422 VIRIDIAN DRIVE SUITE # 200
SOUTH BEND, INDIANA 46628

December 29, 2010

REPLY TO
ATTENTION OF:
Engineering & Technical Services
Regulatory Office
File No. LRE-2010-00404-143-N10

Heather Harwood
Wawasee Area Conservancy Foundation
P.O. Box 548
Syracuse, Indiana 46567

Dear Ms. Harwood:

Reference your application for a Department of the Army (DA) permit to discharge fill as part of a stream restoration project near Lake Wawasee, Indiana (Section 19 and 24, Township 34N, Range 8E, Noble and Kosciusko Counties) . We have verified that the project is authorized by nationwide permit as published in the Federal Register.

As indicated on the enclosed plans, the following work is authorized under NWP 27:

To discharge a total of 365 cubic yards (cy) of fill below the Ordinary High Water Mark (OWHM) of Dillon Creek in association with a stream restoration project. Of the 365 cy, 156 cy will be rock used for the construction of 17 rock riffles along with 10 cy of rock that will be used for the construction of one rock vane. In addition 177 cy of the 365 cy will be root wads that will be installed for bank stabilization and 22 cy of earthen fill will be discharged below the OHWM in order to construct a soil lift. An additional 50 cy of fill will be temporarily discharged for use as construction matting. All work is to be completed according to the plans submitted.

This authorization is contingent on compliance with the following terms and conditions:

a. The Nationwide Permit General Conditions.

b. The following special conditions:

1. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

2. All fill shall consist of clean, inert materials from an upland source.

3. Physical disturbance of banks, submerged vegetation and riparian vegetation, especially large trees which provide shade to the waterbody, should be limited to that which is absolutely necessary to the conduct of the project.

4. All temporary structures must be removed upon completion of the project.

5. The permittee shall adhere to the conditions specified by the Indiana Department of Environmental Management (as attached) for waiver of Section 401 Water Quality Certification.

Any construction activity other than that shown on the plans may not qualify for the authorization. If you contemplate any changes or additional activities from those depicted on the plans, please submit them to this office for authorization review prior to any construction. On completion of the work, you must fill in and return the enclosed COMPLETION REPORT.

This verification is valid until the NWP is modified, reissued, or revoked. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2012. It is incumbent upon you to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant nationwide permit is modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit.

If you have any questions, please contact me at the above address or telephone 574-232-1952 Ext. 21961 or E-Mail aaron.w.damrill@usace.army.mil. Please refer to File Number: LRE-2010-00404-143-N10 in all future communications with this office.

We are interested in your thoughts and opinions concerning your experience with the Detroit District, Corps of Engineers Regulatory Program. If you are interested in letting us know how we are doing, you can complete an electronic Customer Service Survey from our web site at: **http://per2.nwp.usace.army.mil/survey.html**. Alternatively, you may contact us and request a paper copy of the survey that you may complete and return to us by mail or fax. Thank you for taking the time to complete the survey, we appreciate your feedback.

Sincerely,

ORIGINAL SIGNED BY

Aaron W. Damrill
Regulatory Project Manager
Michiana Branch

Enclosures

Copy Furnished

IDEM/Baldwin, w/encl.
IDNR/Division of Water, w/encl.
JFNew/Richardson, w/encl.

A. Nationwide Permit General Conditions:

To qualify for NWP authorization, the permittee must comply with the following general conditions, as appropriate. These conditions are selected from those published in the Federal Register that are particularly relevant to the construction and/or operation of this particular authorized activity. The complete text is available at: http://www.usace.army.mil/CECW/Documents/cecwo/reg/nwp/nwp2007_gen_conditions_def.pdf or you may contact the Detroit District. We have done our best to verify that your project complies with the others, where applicable.

1. Navigation. (b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

9. Management of Water Flows. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

13. Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety.

18. Historic Properties. (e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h–2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, explaining the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

25. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

> "When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____

(Transferee) (Date)

26. Compliance Certification. Each permittee who receives an NWP verification from the Corps must submit a signed certification regarding the completed work and any required mitigation. The certification form, forwarded by the Corps with this NWP verification letter, includes:

(a) A statement that the authorized work was done in accordance with the NWP authorization, including any general or specific conditions;
(b) A statement that any required mitigation was completed in accordance with the permit conditions; and
(c) A place for the signature of the permittee certifying the completion of the work and mitigation.

B. Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project

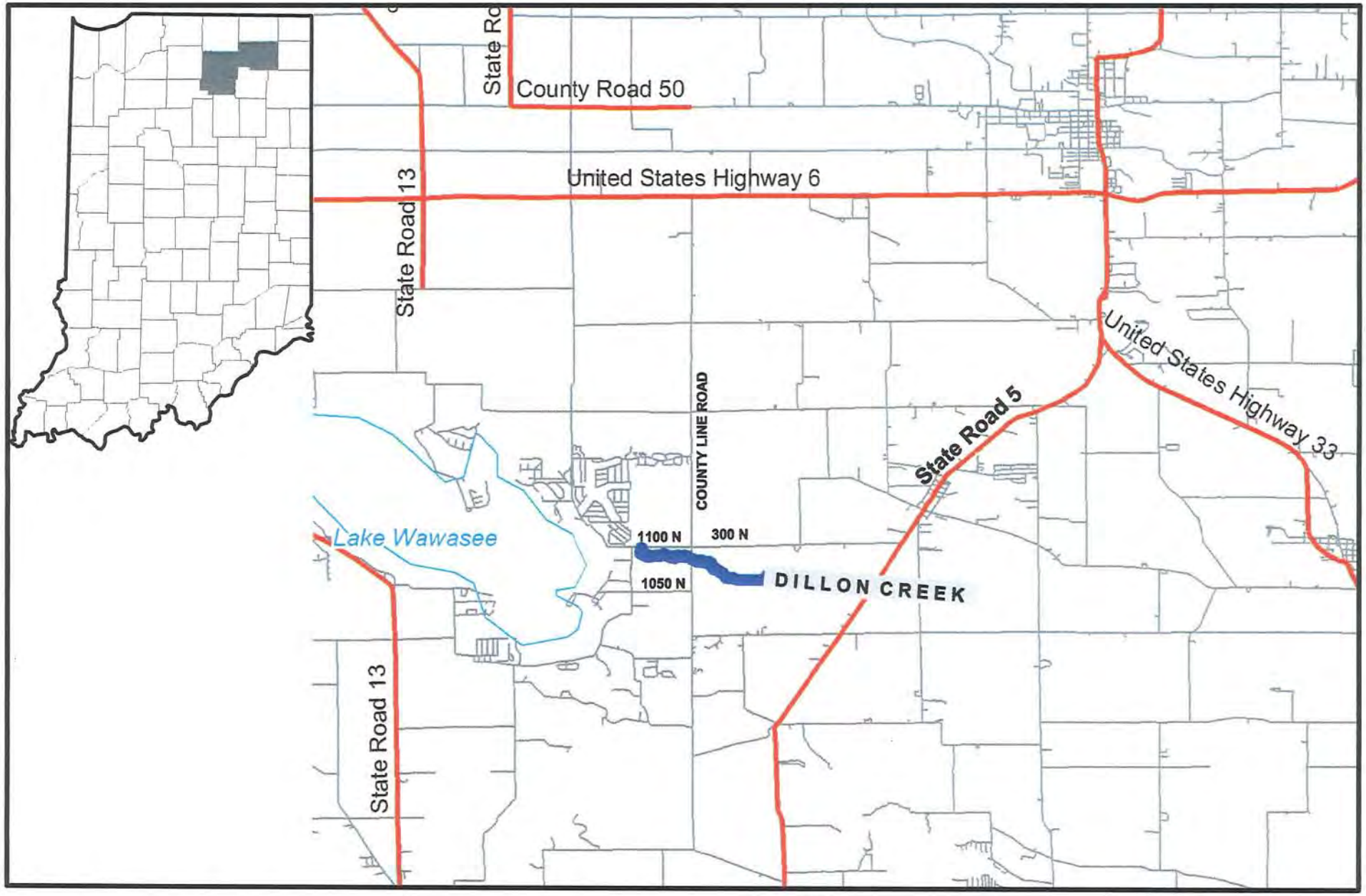

Figure 1 : LOCATION MAP
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

N

0 750' 1500' 3000'
Feet

JFNew
708 Roosevelt Road, Walkerton, IN 46574
Phone 574-586-3400 / Fax 574-586-3446
www.jfnew.com

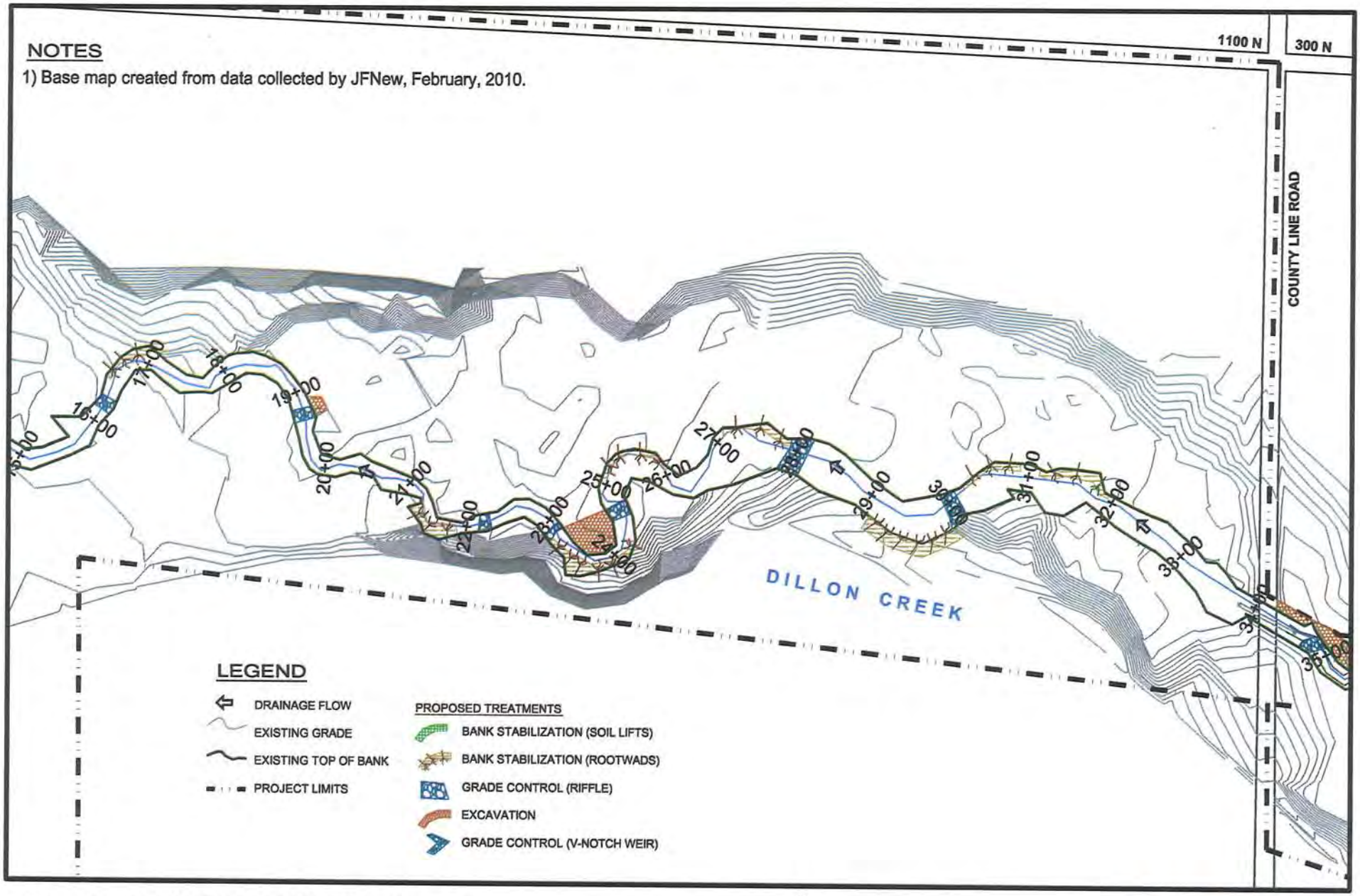

Figure 3 : PLAN VIEW PROPOSED WORK, PHASE I
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

N

0 75' 150' Feet

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Phone 574-586-3400 / Fax 574-586-3446
www.jfnew.com

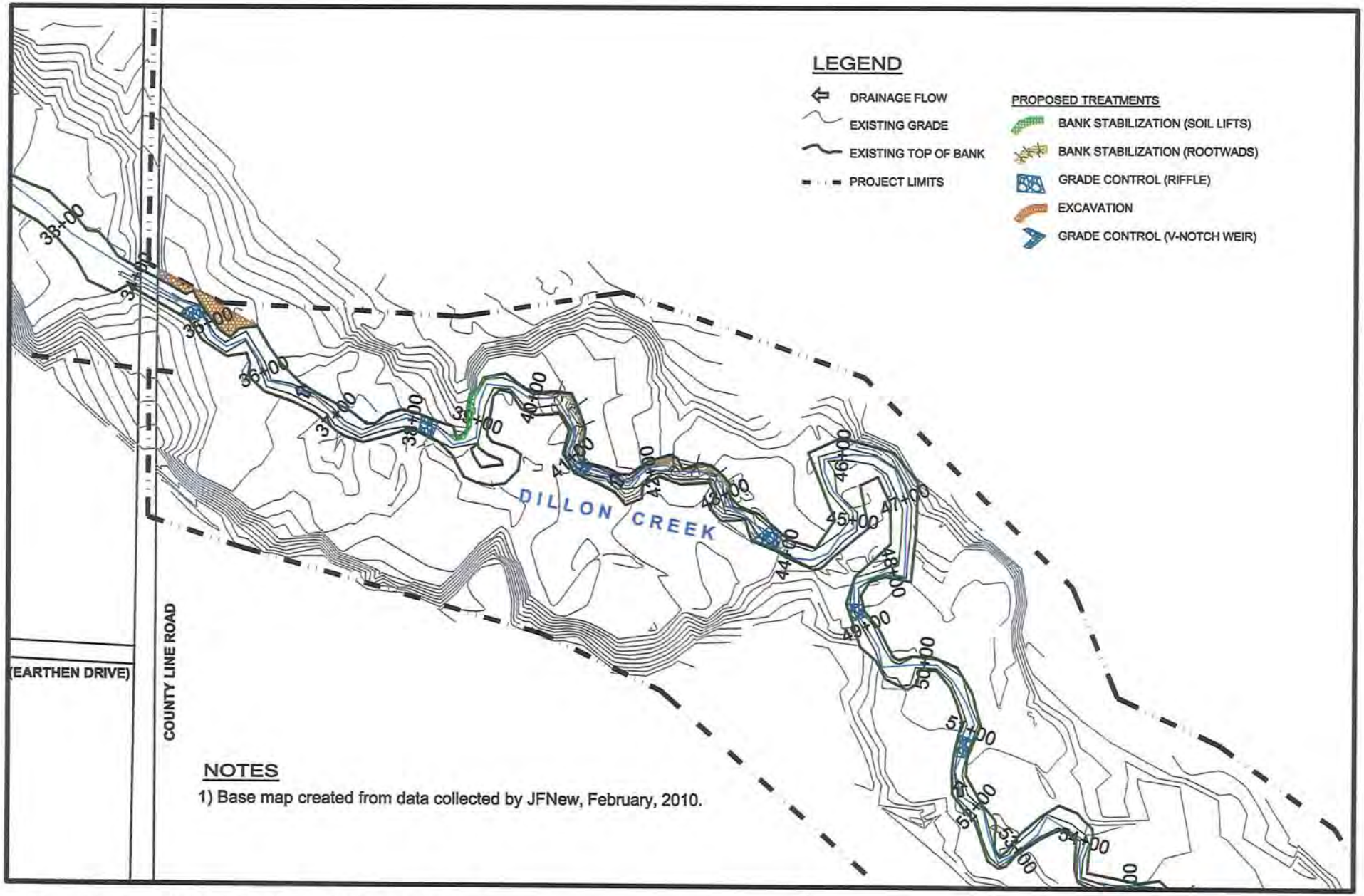

Figure 4 : PLAN VIEW PROPOSED WORK, PHASE II
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

N

0 75' 150' Feet

JFNew
708 Roosevelt Road, Walkerton, IN 46574
Phone 574-586-3400 / Fax 574-586-3446
www.jfnew.com

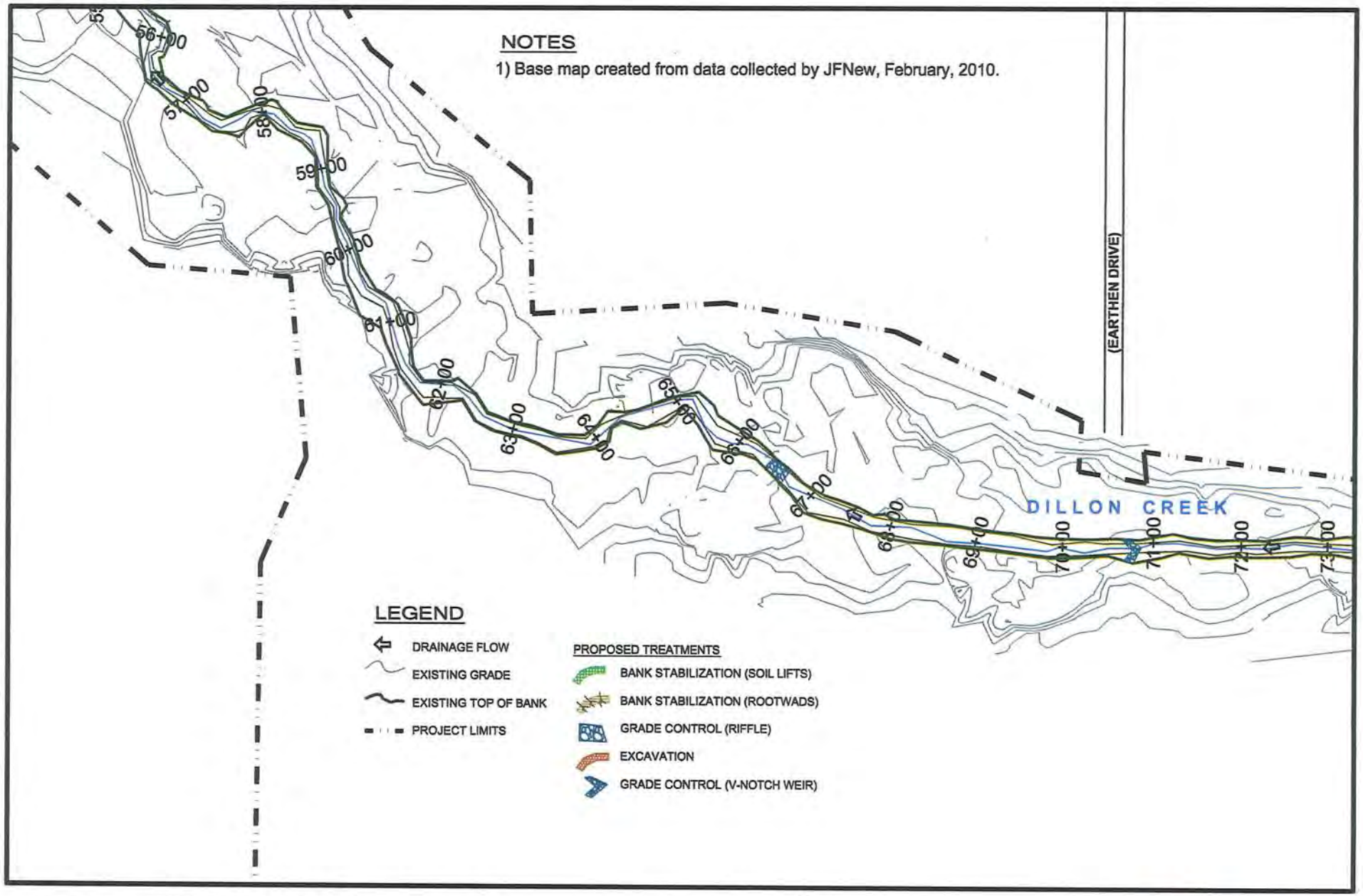

Figure 5 : PLAN VIEW PROPOSED WORK, PHASE III
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

N

0 75' 150' Feet

JFNew
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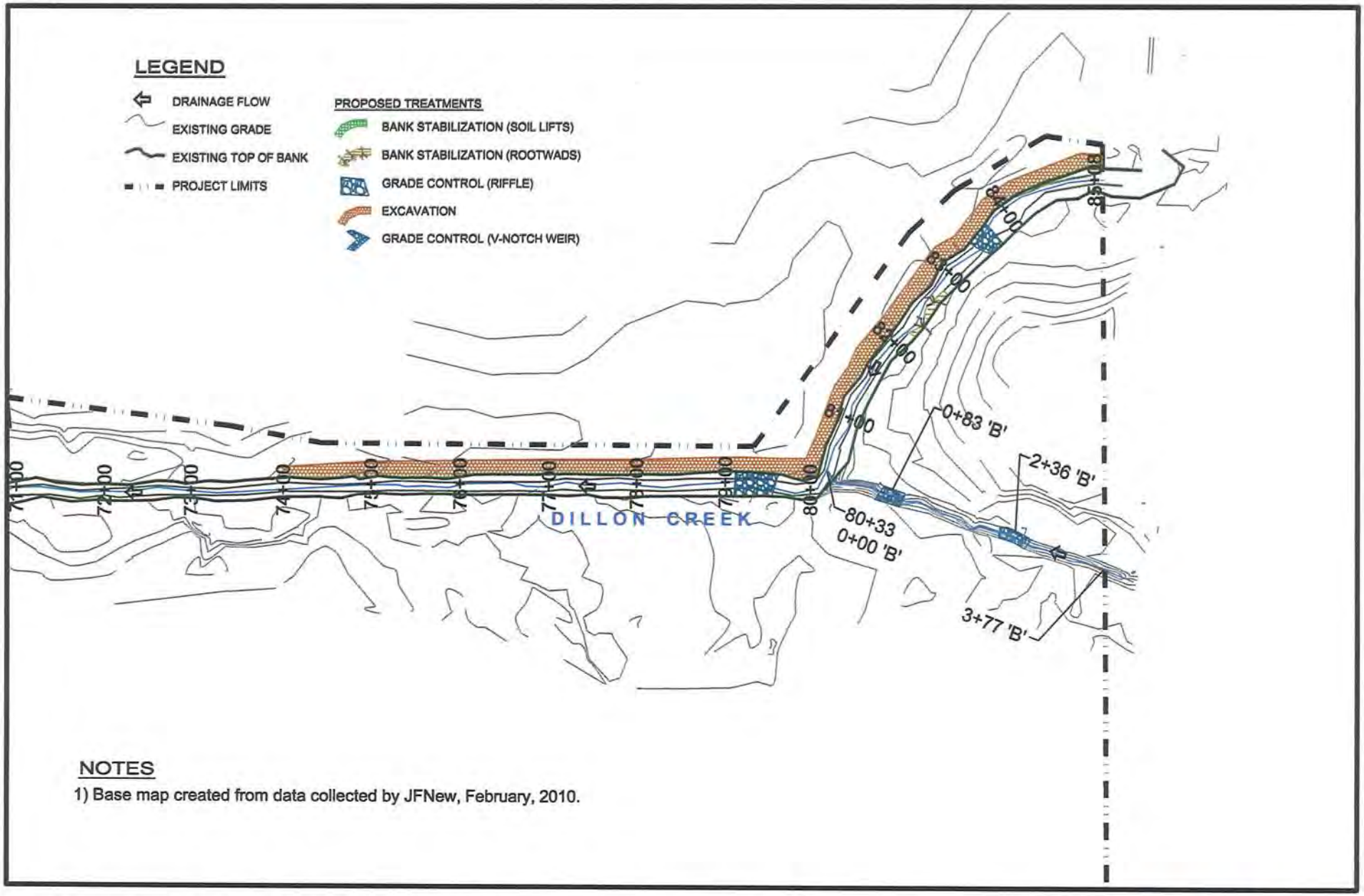
Phone 574-586-3400 / Fax 574-586-3446
www.jfnew.com



NOTES

1) Base map created from data collected by JFNew, February, 2010.

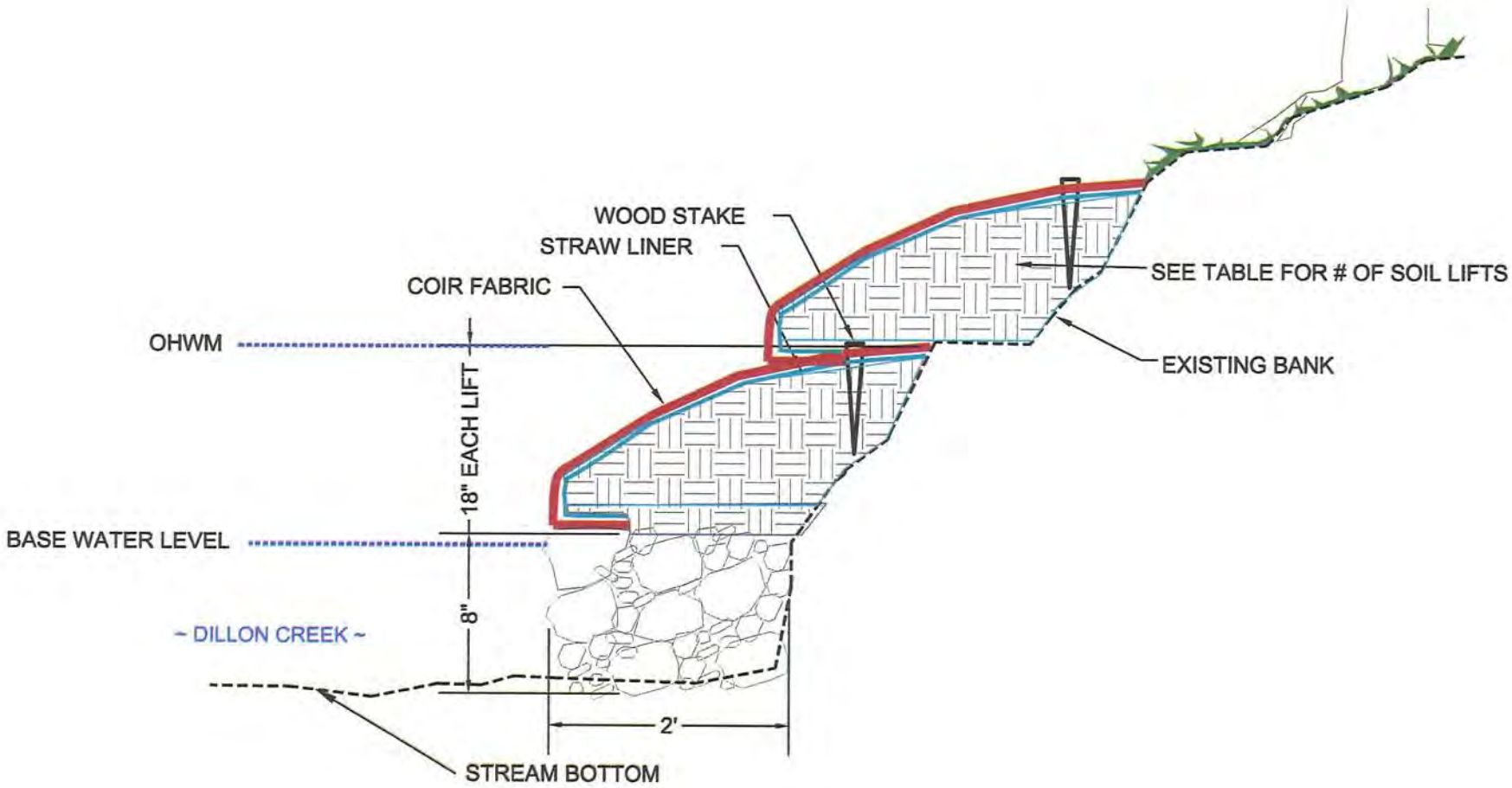
Figure 6 : PLAN VIEW PROPOSED WORK, PHASE IV
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

N

0 75' 150' Feet

JFNew
708 Roosevelt Road, Walkerton, IN 46574
Phone 574-586-3400 / Fax 574-586-3446
www.jfnew.com



SOIL LIFT BANK STABILIZATION

NOT TO SCALE

Figure 7 : Detail and Cross Section: Soil Lift Bank Stabilization
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

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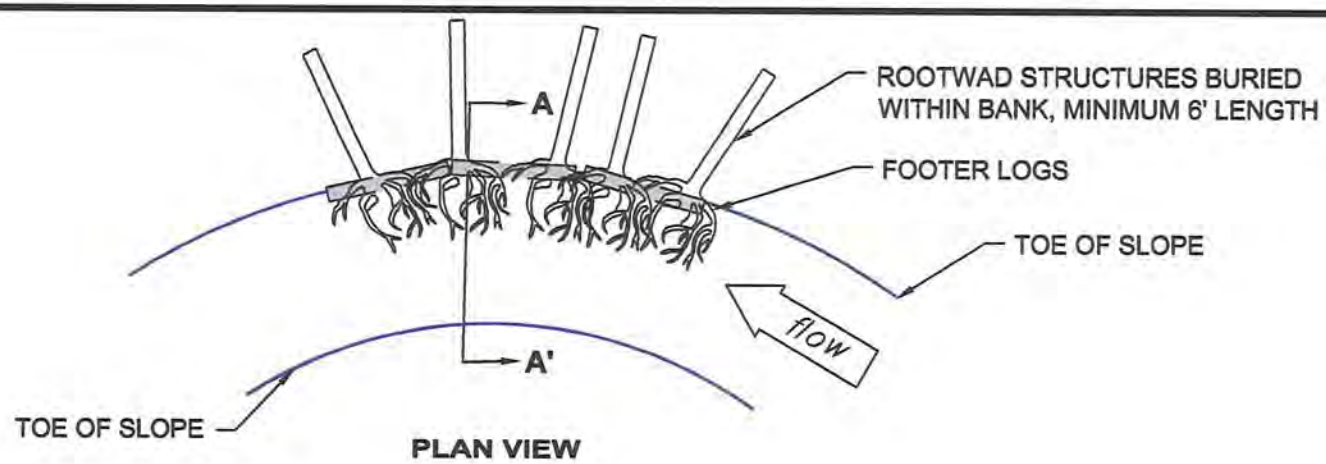
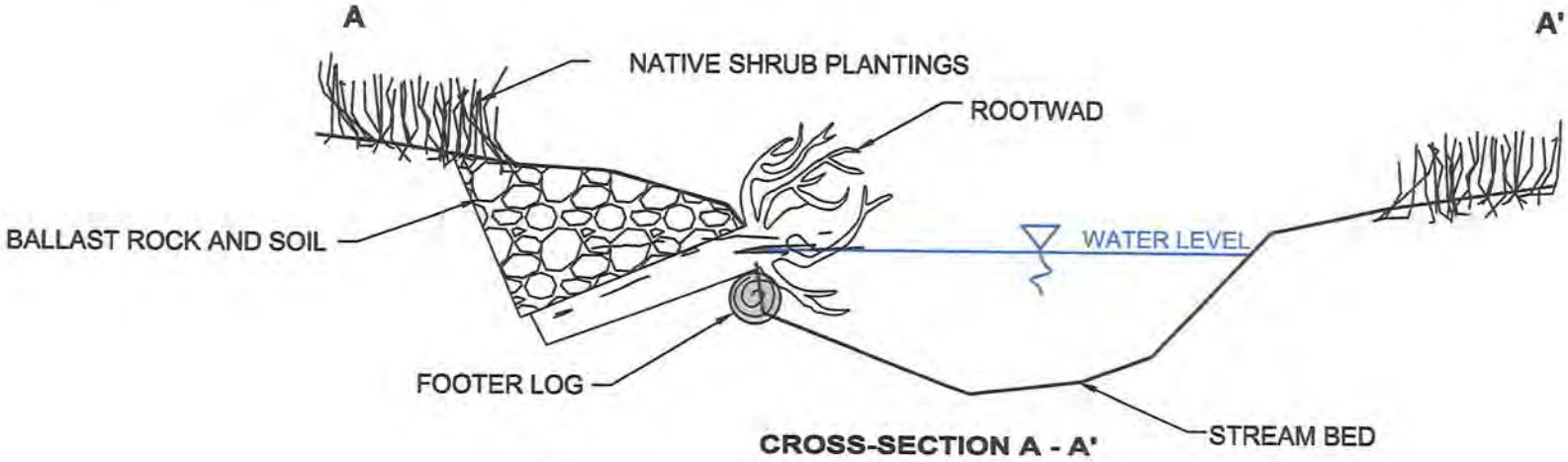


PLAN VIEW

NOTE:
1) PLACE FOOTER LOG BELOW THE WATERLINE BURIED INTO BANK 1/2 DIAMETER OF TRUNK.
2) ROOTWAD SHALL BE KEYED A MINIMUM OF 6 FEET INTO BANK AND PLACED ON TOP OF FOOTER.
3) PLACE ROOTWAD AT 60-90 DEGREE ANGLE UPSTREAM FROM BANK



CROSS-SECTION A - A'

ROOTWAD BANK STABILIZATION
NOT TO SCALE

Figure 8 : Detail and Cross Section: Rootwad Bank Stabilization
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

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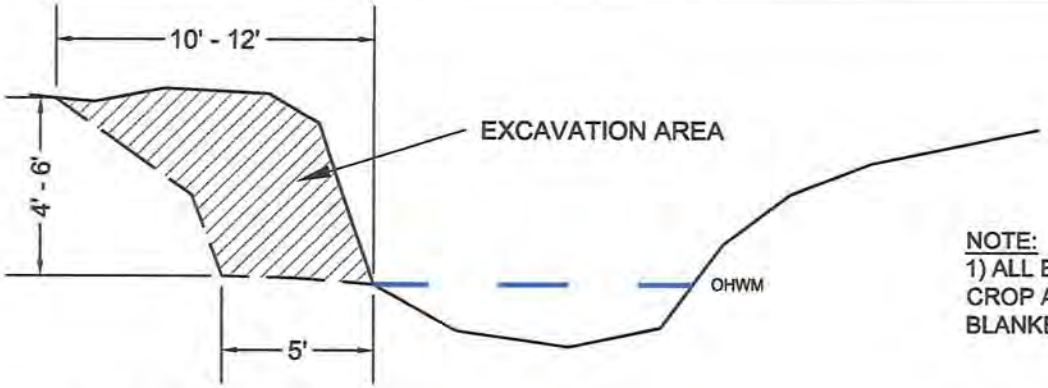
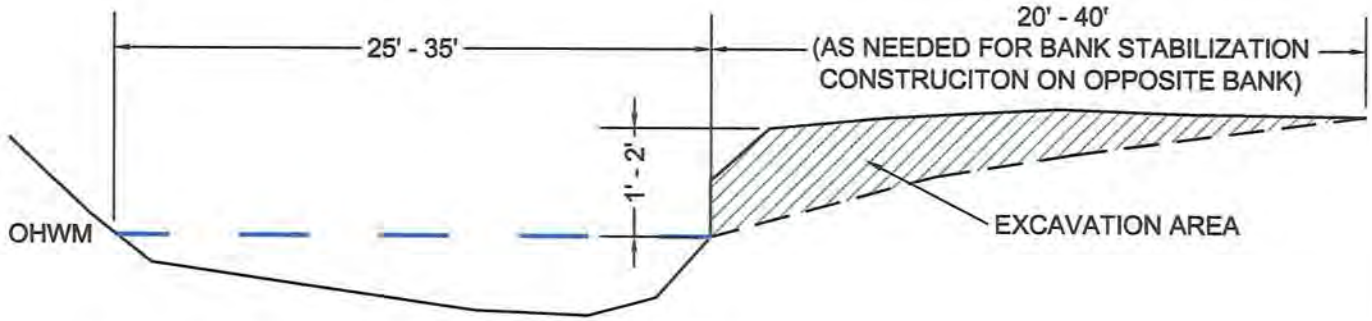
www.jfnew.com



NOTE:
1) ALL EXCAVATED AREAS TO BE SEEDED WITH TEMPORARY COVER CROP AND RIPARIAN RYE; PROTECTED WITH EROSION CONTROL BLANKETS WITHIN 24 HOURS OF EXCAVATION.

TYPICAL EXCAVATION PLAN
(REPRESENTS STATIONS 34+20 THRU 35+00 AND 74+00 THRU 85+00)



TYPICAL EXCAVATION PLAN - ALTERNATE 1
REPRESENTS STATIONS 19+00 THRU 19+40 AND 23+30 THRU 24+70)

EXCAVATION - 2-STAGE CHANNEL

NOT TO SCALE

Figure 9 : Detail and Cross Section: Excavation 2-Stage Channel
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

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www.jfnew.com

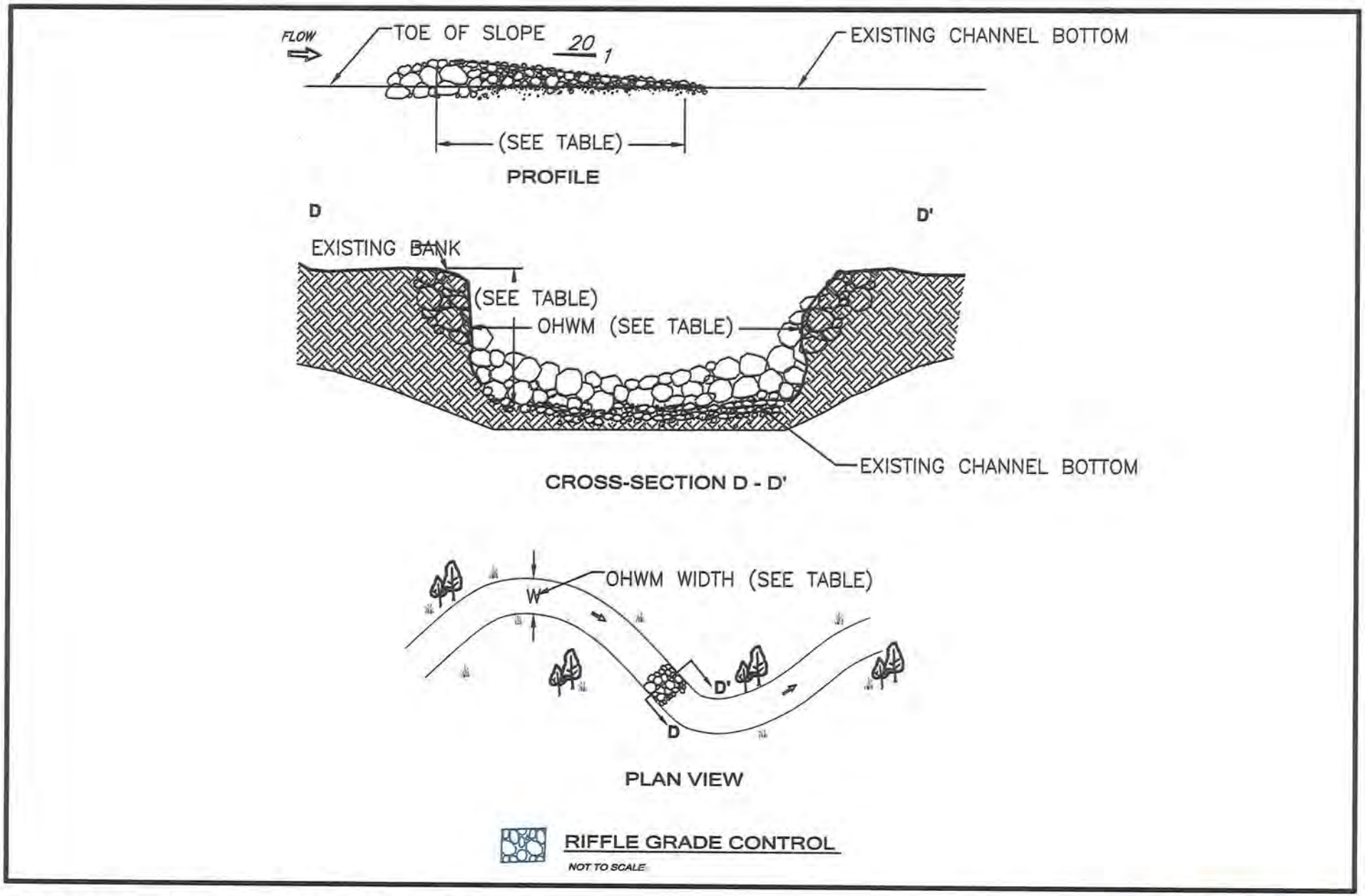

Figure 10 : Detail and Cross Section: Riffle Grade Control
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

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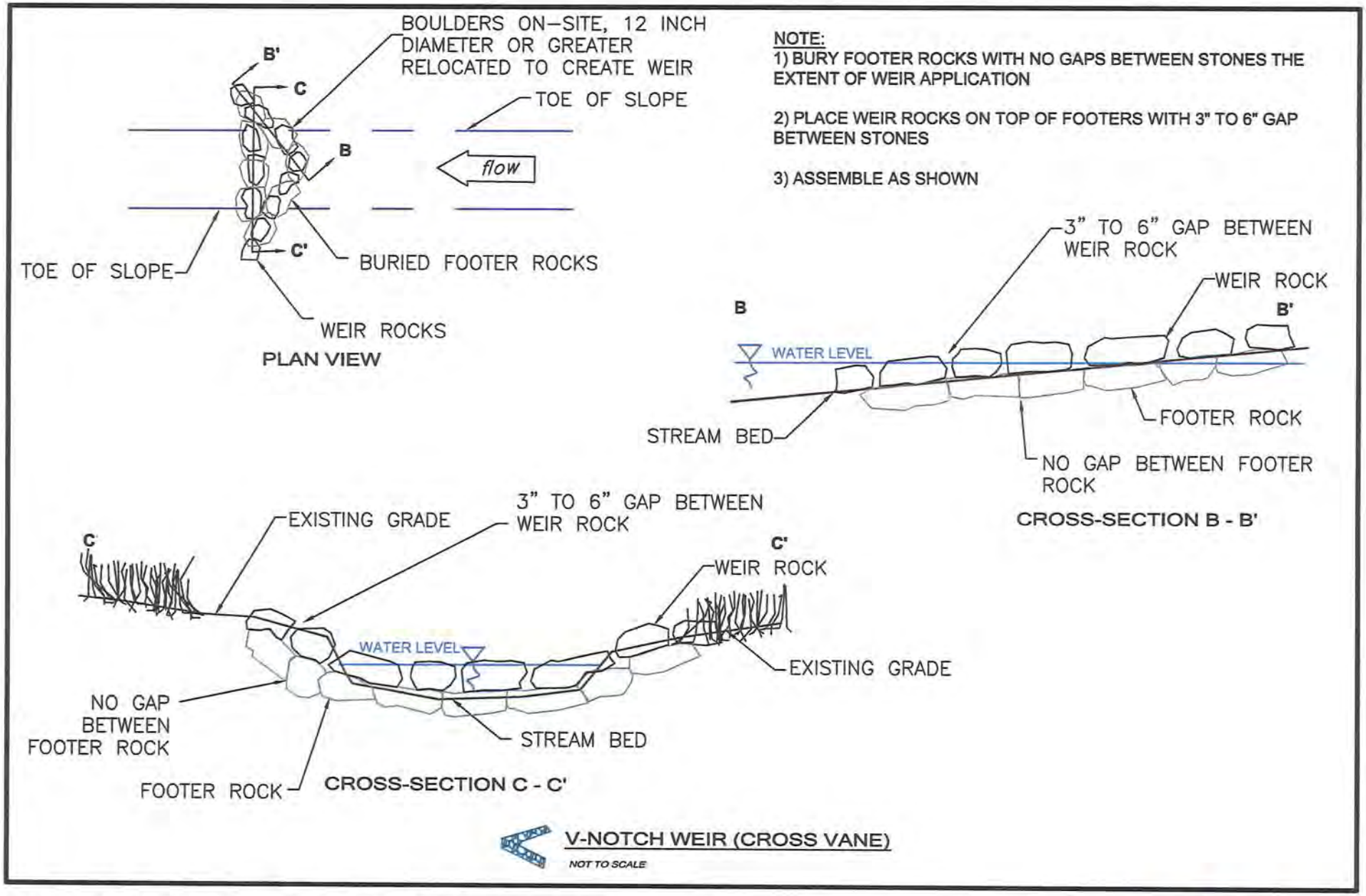

Figure 11 : Detail and Cross Section: V-Notch Weir (Cross Vane)
Dillon Creek Stabilization
Noble County and Kosciusko County, Indiana

JFNew # 0901008

JFNew
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NATIONWIDE PERMIT COMPLETION REPORT

CELRE-RG-M December 29, 2010

Chief, Compliance and Enforcement Branch
Regulatory Office
U.S. Army Corps of Engineers
477 Michigan Avenue
Room 603
Detroit, MI 48226-2550

Dear Sir:

You are hereby notified that work under Department of the Army Permit No. LRE-2010-00404-143-N10 to discharge fill near Lake Wawasee, Noble and Kosciusko Counties Indiana, issued to the Wawasee Are Conservancy Foundation (Heather Harwood) was completed in accordance with the permit on:

_____.
(Date work completed)

_____
(Permittee's Signature)

IMPORTANT

1. This COMPLETION REPORT MUST BE MAILED to the above addressee within 10 days after completion of work covered by the FEDERAL PERMIT to insure an accurate Government record of data affecting navigation.

2. Where dredging soundings are made of projects which include dredging, a copy of the soundings should accompany this report. If the soundings are measured from the water surface and have not been corrected to International Great Lakes Datum plane, the hour and date soundings was made should be noted on sounding reports.

NOTE: Although permits authorizing structures carry an expiration date, REPAIRS that conform to the permit plans are also within the scope of the authorization. Therefore, it is recommended that expired permits NOT be destroyed, but retained as proof that the work to be repaired has received the Corps of Engineers' approval.

NCE FL 191
R 17 October 2007 (Edition of 23 July 1981 is obsolete)

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

CERTIFICATE OF APPROVAL
CONSTRUCTION IN A FLOODWAY

MAILED AUG 3 1 2010

APPLICATION # : FW-25804

STREAM : Dillon Creek

APPLICANT : Wawasee Area Conservancy Foundation
Heather Harwood
PO Box 548
Syracuse, IN 46567-0548

AGENT : Banning Engineering PC
Joseph L Miller
853 Columbia Road, Suite 101
Plainfield, IN 46168-7560

AUTHORITY : IC 14-28-1 with 312 IAC 10

DESCRIPTION : A stream restoration project is proposed and will include approximately 6,870 linear feet of the stream. The proposed work includes excavation, riffle structure construction, root wad bank stabilization areas, rock vane structure construction and soil lift structure construction. Four areas will be excavated using 2-stage channel excavation and will produce approximately 790 cubic yards of material that will be placed offsite, landward of the floodway. Fifteen riffle structures will be constructed within the channel using approximately 156 cubic yards of fill. A maximum of 177 cubic yards of fill will be used to construct 9 root wad bank stabilization areas. Additionally, a rock vane structure will be constructed using stone and a soil lift structure will be constructed along 100' of the streambank and will use a maximum of 22 cubic yards of fill. Details of the project are contained in information and plans received at the Division of Water on June 2, 2010, June 28, 2010 and August 6, 2010.

LOCATION : DOWNSTREAM: Beginning approximately 1600' upstream of the County Road 1100 North crossing near Syracuse, Turkey Creek Township, Kosciusko County
Section 24, T 34N, R 7E, Lake Wawasee Quadrangle
UTM Coordinates: Downstream 4583434 North, 611890 East
UPSTREAM: near Cromwell, Sparta Township, Noble County
Section 19, T 34N, R 7E, Lake Wawasee Quadrangle
UTM Coordinates: Upstream 4582978 North, 613669 East

APPROVED BY : Shirley A. Fitzwater
Shirley A. Fitzwater, Environmental Manager
Division of Water

APPROVED ON : August 30, 2010

Attachments: Notice Of Right To Administrative Review
General Conditions
Special Conditions
Service List

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

NOTICE OF RIGHT TO ADMINISTRATIVE REVIEW

APPLICATION #: FW- 25804

This signed document constitutes the issuance of a permit by the Department of Natural Resources, subject to the conditions and limitations stated on the pages entitled "General Conditions" and "Special Conditions".

The permit or any of the conditions or limitations which it contains may be appealed by applying for administrative review. Such review is governed by the Administrative Orders and Procedures Act, IC 4-21.5, and the Department's rules pertaining to adjudicative proceedings, 312 IAC 3-1.

In order to obtain a review, a written petition must be filed with the Division of Hearings within 18 days of the mailing date of this notice. The petition should be addressed to:

Mr. Stephen L. Lucas, Director
Division of Hearings
Indiana Government Center North, Room N501A
100 North Senate Avenue
Indianapolis, Indiana 46204

The petition must contain specific reasons for the appeal and indicate the portion or portions of the permit to which the appeal pertains.

If an appeal is filed, the final agency determination will be made by the Natural Resources Commission following a legal proceeding conducted before an Administrative Law Judge. The Department of Natural Resources will be represented by legal counsel.

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

GENERAL CONDITIONS

APPLICATION #: FW- 25804

(1) If any archaeological artifacts or human remains are uncovered during construction, federal law and regulations (16 USC 470, et seq.; 36 CFR 800.11, et al) and State Law (IC 14-21-1) require that work must stop and that the discovery must be reported to the Division of Historic Preservation and Archaeology within 2 business days.

Division of Historic Preservation and Archaeology
Room W274
402 West Washington Street
Indianapolis, IN 46204

Telephone: (317) 232-1646, FAX: (317) 232-8036

(2) This permit must be posted and maintained at the project site until the project is completed.

(3) This permit does not relieve the permittee of the responsibility for obtaining additional permits, approvals, easements, etc. as required by other federal, state, or local regulatory agencies. These agencies include, but are not limited to:

Agency	Telephone Number
Kosciusko County Drainage Board	(574) 372-2367
St. Joseph River Basin Commission	(574) 287-1829
US Army Corps of Engineers Detroit District	(313) 226-6828
Indiana Department of Environmental Management	(317) 233-8488 or (800) 451-6027
Local city or county planning or zoning commission	

(4) This permit must not be construed as a waiver of any local ordinance or other state or federal law.

(5) This permit does not relieve the permittee of any liability for the effects which the project may have upon the safety of the life or property of others.

(6) This permit may be revoked by the Department of Natural Resources for violation of any condition, limitation or applicable statute or rule.

(7) This permit shall not be assignable or transferable without the prior written approval of the Department of Natural Resources. To initiate a transfer contact:

Mr. Michael W. Neyer, PE, Director
Division of Water
Room W264
402 West Washington Street
Indianapolis, IN 46204

Telephone: (317) 232-4160, Toll Free: (877) 928-3755
FAX: (317) 233-4579

(8) The Department of Natural Resources shall have the right to enter upon the site of the permitted activity for the purpose of inspecting the authorized work.

(9) The receipt and acceptance of this permit by the applicant or authorized agent shall be considered as acceptance of the conditions and limitations stated on the pages entitled "General Conditions" and "Special Conditions".

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

SPECIAL CONDITIONS

APPLICATION #: FW- 25804

PERMIT VALIDITY : This permit is valid for 24 months from the "Approved On" date shown on the first page. If work has not been initiated by August 30, 2012 the permit will become void and a new permit will be required in order to continue work on the project.

This permit becomes effective 18 days after the "MAILED" date shown on the first page. If both a petition for review and a petition for a stay of effectiveness are filed before this permit becomes effective, any part of the permit that is within the scope of the petition for stay is stayed for an additional 15 days.

CONFORMANCE : Other than those measures necessary to satisfy the "General Conditions" and "Special Conditions", the project must conform to the information received by the Department of Natural Resources on: June 2, 2010, June 28, 2010 and August 6, 2010. Any deviation from the information must receive the prior written approval of the Department.

Number	Special Condition
(1)	revegetate all bare and disturbed areas with a mixture of grasses (excluding all varieties of tall fescue), legumes, and native shrub and hardwood tree species as soon as possible upon completion
(2)	minimize and contain within the project limits inchannel disturbance and the clearing of trees and brush
(3)	do not work in the waterway from April 1 through June 30 without the prior written approval of the Division of Fish and Wildlife
(4)	do not cut any trees suitable for Indiana bat roosting (greater than 3 inches dbh, living or dead, with loose hanging bark) from April 1 through September 30
(5)	do not deposit or allow demolition materials or debris to fall or otherwise enter the waterway
(6)	appropriately designed measures for controlling erosion and sediment must be implemented to prevent sediment from entering the stream or leaving the construction site; maintain these measures until construction is complete and all disturbed areas are stabilized
(7)	seed and protect all disturbed streambanks and slopes that are 3:1 or steeper with erosion control blankets (follow manufacturer's recommendations for installation); seed and apply mulch on all other disturbed areas
(8)	implement the planting plan received at the Division of Water on August 6, 2010 within one complete growing season of project initiation
(9)	except for the material used as backfill as shown on the above referenced project plans on file at the Division of Water, place all excavated material landward of the floodway *
(10)	all work must conform with the existing bank at the upstream and downstream limits of the project site
(11)	do not leave felled trees, brush, or other debris in the floodway *

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

SPECIAL CONDITIONS

APPLICATION #: FW- 25804

(12) upon completion of the project, remove all construction debris from the floodway *

(13) keep the culvert waterway opening within the scope of this project free of debris and sediment at all times

(14) * NOTE: for regulatory purposes, the floodway is defined as the area below the 1% chance flood event elevations as determined in the modeling for FW-25804.

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

SERVICE LIST

APPLICATION #: FW- 25804

Wawasee Area Conservancy Foundation
Heather Harwood
PO Box 548
Syracuse, IN 46567-0548

Banning Engineering PC
Joseph L Miller
853 Columbia Road, Suite 101
Plainfield, IN 46168-7560

Russell Anderson
11672 West 300 North
Cromwell, IN 46732-9738

Kevin and Christina Davidson
11308 West 200 North
Cromwell, IN 46732-9757

Guy Moore Real Estate Holdings LLC
605 East Harcourt Road
Angola, IN 46703-8802

David Henn
6 Meadow Court
Huntington, IN 46750-4406

Kosciusko County Drainage Board
County Surveyor
Courthouse Room 103
100 West Center Street
Warsaw, IN 46580-2872

Lake Bethel Church Cemetery
310 North Huntington Street
Syracuse, IN 46567-1309

Lau Building Company
3326 Mallard Cove Lane
Fort Wayne, IN 46804-2884

Glade and Elaine Rogers
11236 West 75 North
Cromwell, IN 46732

Roy Parker and Sons Incorporated
11761 North Pine Drive
Syracuse, IN 46567-8681

Karl and Yvette Schumucker
9820 East 1100 North
Cromwell, IN 46732-9606

St. Joseph River Basin Commission
Karen M Mackowiak
227 West Jefferson Boulevard #1120
South Bend, IN 46601-1830

US Army Corps of Engineers Detroit District
John Konik
Regulatory Office
PO Box 1027
Detroit, MI 48231-1027

Mr. Richard Adair
2090 North State Road 9, Suite A
Albion, IN 46701

Cromwell Plan Commission
Town Hall
Box 574
Cromwell, IN 46732

Indiana Department of Natural Resources
Division of Law Enforcement
1124 North Mexico Road
Peru, IN 46970

Kosciusko County Area Plan Commission
Court House 1st Floor Room 26
100 West Center Street
Warsaw, IN 46580-2872

Kosciusko County Soil and Water Conservation District
217 Bell Drive
Warsaw, IN 46580-9362

Noble County Area Plan Commission
2090 North State Road 9 Suite A
Albion, IN 46701-9594

Noble County Soil and Water Conservation District
100 East Park Drive
Albion, IN 46701-1478

Mr. Matt Sandy
100 West Center Street
Warsaw, IN 46580

Staff Assignment:

Administrative	: Shirley A. Fitzwater
Technical	: Shirley A. Fitzwater
Environmental	: Christie L. Stanifer
Fish and Wildlife	: Lori White
Engineering	: Samantha Hess

Appendix D:

Landowner Agreement

The attached letter was delivered to the landowner and a follow up meeting held on February 10, 2011. The landowner verbally agreed to the use of his land pending certain conditions. We requested that the landowner state those conditions on the letter as discussed and return the signed letter to JFNew for incorporation into this report.

DRAFT

DRAFT

JFNew
Full-Service Ecological Solutions™

708 Roosevelt Road
Walkerton, Indiana 46574
Phone: 574-586-3400 ext. 307
Fax: 574-586-3446

John B. Richardson
Senior Project Manager
email: jrichardson@jfnew.com

Corporate Office:
Walkerton, Indiana

Chicago, Illinois

Indianapolis, Indiana

Ann Arbor, Michigan

Grand Haven, Michigan

Cincinnati, Ohio

Madison, Wisconsin

Native Plant Nursery:
Walkerton, Indiana

www.jfnew.com

January 28, 2011

Mr. Russell Anderson
11672 W. 300 N
Cromwell, IN 46732

RE: Proposed Dillon Creek work

Dear Mr. Anderson:

Please find enclosed a plan set for the WACF sponsored work on Dillon Creek. These plans are for your review and approval. WACF is now seeking funding to begin the project hopefully within the next 12 months, likely late summer or fall 2011 at the earliest. The project can be completed in smaller phases if funding is limited and therefore may be drawn out over several years. There are two components of this project that affect your property located east of County Line Road and south of CR 300N. We have attempted to describe the impacts in detail below and in the attached plans. Please review these impacts carefully for discussion and approval.

One of the work elements involves excavating the embankment of Dillon Creek to create more room for flood waters below the top of the bank. This is proposed along 1,300 feet of stream east of your access lane (Sheet 3). The details of how we deal with the excess dirt are shown in Sheet 7. We will conserve existing top soil and the existing grade during the process. We will prepare the disturbed crop land by ripping any compacted soil areas to a depth of 12 inches. All areas of disturbed crop land will also be tilled upon completion of the work. Access to this work location will be your existing farm access road. We will document the existing condition of the lane upon the start of construction with photographs and we will repair the lane to a level, compacted, and vegetated condition upon completion of construction. Upon completion of grading the access lane we will plant a seed mixture of fescue, brome and clover on the lane. Construction from this access shall only occur between October and December after crops have been removed.

The second area of impact involves access from County Line Road approximately 300 feet north of the culvert for Dillon Creek. This access would receive a 20 foot long by 12 inch culvert covered with 12 inches of stone for 20 feet to serve as a 16-foot wide construction entrance (Sheet 8). The access would then proceed onto the existing grassy area that you have recently stabilized. This construction access would serve the proposed work area from County Line road east to Access G at Station 51 (Sheet 3 of 8). Any vehicles would be required to travel along a 16 foot wide corridor immediately adjacent to the tree line. The tree line would be trimmed back

to accommodate taller vehicles. At this access area, the work that is proposed would pull back the existing stream bank to eliminate the gully. Redistribution of spoils would be similar to that described above. We will preserve existing grades and topsoil. Restoration will include seeding with fescue and brome and then blanketing the entire disturbed area with a coconut erosion control blanket (Sheet 8). Silt fence will be used during construction because of the steeper slopes at this location (Sheet 8). Upon completion of this work, all silt fences will be removed. The construction access will be removed at your discretion. If you would like the entrance to remain it will be left in a serviceable condition. If you prefer that it be removed, it will be removed at the contractor's expense and the area restored to pre-construction conditions.

None of the above proposed impacts to your property are intended to expose you to any liability or costs associated with the proposed work. The project owner is WACF and they are ultimately responsible to you for any property damage or inconvenience caused by the project. JFNew intends to provide construction services to WACF for this project by bidding out and supervising all of the proposed work and as such would assume the responsibility for any damages. However, JFNew's future involvement is contingent upon WACF receiving funding for the work and JFNew successfully negotiating a contract with WACF for this work. JFNew will not assume any responsibility for the work if we are not involved in the construction.

Prior to any work occurring, assuming you allow access for this work to occur, it is imperative that you sign an agreement with WACF for access through your property to protect yourself and WACF. The signed agreement can be as simple as authorizing the work by signing this letter agreement or by signing a more formalized legal agreement. We can discuss this in greater detail in a meeting. I will be calling you to arrange a meeting within the next few days.

MRA 2/12/2011

Sincerely

John B. Richardson
JFNew

ALL PARTIES INVOLVED MUST UNDERSTAND THAT ANY & ALL PROJECT WORK ACCESSED THROUGH OR PERFORMED ON PROPERTY OWNED BY RUSSELL & MARY ANDERSON MUST BE APPROVED BY RUSSELL ANDERSON ON A DAILY BASIS. RUSSELL'S WORD ON OUR SIDE OF THE PROPERTY LINE IS FINAL.

Encl: Project Plans

C: Heather Harwood, WACF
Doug Nusbaum, LARE
JFNew File 09-01-008

The signature below authorizes WACF to proceed with Dillon Creek Stream Stabilization project plans dated January 2011, including impacts to property as described above and as attached to this letter during 2011 and 2012.

M. Russell Anderson 2/12/2011

Russell Anderson Date

JFNew
Full-Service Ecological Solutions™

Appendix E:

Example Bid Documents

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INVITING BIDS

FOR DILLON CREEK STABILIZATION PROJECT
NOBLE AND KOSCIUSKO COUNTY, INDIANA

Pursuant to I.C. 5-3-1 the Wawasee Area Conservancy Foundation (WACF), Kosciusko County, Indiana, will receive bid proposals until {TIME} pm on {DATE} at the location stated below for the construction of the: **"DILLON CREEK STABILIZATION PROJECT"**.

Bids shall be submitted on the enclosed documents. After a satisfactory bid is received WACF shall award a contract to the lowest responsible and responsive bidders.

Pursuant to I.C. 36-1-12-4(10), in determining whether a bidder is responsive WACF may consider the following factors:

(1) Whether the bidder has submitted a bid or quote that conforms in all material respects to the specifications

(2) Whether the bidder has submitted a bid that complies specifically with the invitation to bid and the instructions to the bidder.

(3) Whether the bidder has complied with all applicable statutes, ordinances, resolutions, or rules pertaining to the award of a public contract.

Pursuant to I.C. 36-1-12-4(11), in determining whether a bidder is a responsible bidder, the WACF may consider the following factors:

(1) The ability and capacity of the bidder to perform the work.

(2) The integrity, character, and reputation of the bidder.

(3) The competency and experience of the bidder.

Bids shall be submitted to:

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Bid Documents and Specifications: Section 2

INSTRUCTIONS TO BIDDERS

TITLE AND LOCATION OF THE WORK: The work on this contract is identified as: **Dillon Creek Stabilization Project**. The project is located on the south side of Kosciusko County Road 1100 North and Noble County Road 300 North east and west of County Line Road.

SPECIFICATIONS: Specifications to be used in the construction of this project are contained herein.

PROPOSALS: Bid proposals shall be submitted on the forms provided herein.

INTERPRETATION OF THE PLANS AND SPECIFICATIONS: If any person contemplating submitting a bid for this work is in doubt as to the true meaning of any part of the Plans, Specifications or other proposed contract documents, he or she may submit a written request to the Owner for interpretation thereof. The Owner will not be responsible for any other explanations or interpretations of the contract documents.

ADDENDA: Any addenda issued during the time of bidding, or forming a part of the contract documents given to the bidder for preparation of his or her proposal, shall be covered in the proposal and shall be made a part of the proposal. Receipt of each addendum shall be acknowledged and attached to the proposal.

AWARD OF THE CONTRACT: After a satisfactory bid is received WACF shall award a contract to the lowest responsible and responsive bidders on or before {DATE}.

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Bid Documents and Specifications: Section 3

BIDDERS LUMP SUM PROPOSAL

Noble and Kosciusko County, Indiana

Instructions to Bidders:

All Bidders shall utilize this form. Except as otherwise specifically provided, all parts shall be fully and accurately filled in and completed.

Project: **DILLON CREEK STABILIZATION PROJECT**

Date: _____

To:

PART 1
BIDDER INFORMATION

(Print or Type)

1.1 Bidder Name:_____

1.2 Bidders Address:_____

City:_____ State: _____ Zip:_____

Phone: (___) _____ Fax:_____

1.3 Bidder is a/an *[mark one]*:

_____ Individual _____ Partnership _____ Indiana Corporation
_____ Foreign (Out of State) Corporation
_____ Joint Venture _____ Other: _____

1.4 Bidders Federal ID No._____

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PART 2
PROPOSAL (BID)

2.1 The undersigned Bidder proposes to furnish all necessary labor, equipment, tools, apparatus, materials, equipment, service and other necessary supplies, and to perform and fulfill all obligations incident thereto in strict accordance with and within the time(s) provided by the terms and conditions of the Contract Documents, including any and all addenda thereto, to construct {*Describe work to be conducted under this bid*}. Bidder agrees to furnish and install seed, trees, and erosion control material in areas indicated on construction plan set. Clean-up and mobilization/demobilization fees will be included. All work outlined in the plan set will be completed for the total sum of: _____ _____ Dollars ($ _____).

Signed the _____ day of _____, 20__

_____
Bidder/Contractor - Signature

_____
Name - Printed

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PART 3
BID SCOPE OF SERVICES

Bidder shall construct {*Describe work to be conducted under this bid*}. Bidder agrees to furnish and install seed, trees, and erosion control material in areas indicated on construction plan set. Clean-up and mobilization/demobilization fees will be included as part of bid. Bidder shall regularly provide written or verbal communication to the WACF and/or their agent, on the progress of the project.

PART 4
CONTRACT DOCUMENTS AND ADDENDA

4.1 The bidder agrees to be bound by the terms and provisions of all Contract Documents and incorporates such Contract Documents herein by reference.

4.2 The Bidder acknowledges receipt of the following addenda:

Addendum Number	Date
_____	_____
_____	_____

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Bid Documents and Specifications: Section 4

CONTRACT

THIS AGREEMENT, made and entered into by and between the WACF, as party of the first part, hereinafter called the "Owner and_____ _____, as party of the second party, hereinafter called the "Contractor"

WITNESSTH

That for and in consideration of the mutual covenants herewith enumerated, the Owner does hereby hire and employ the Contractor to furnish all materials, equipment and labor necessary to fully construct the work designated as follows:

DILLON CREEK STABILIZATION PROJECT
NOBLE AND KOSCIUSKO COUNTY, INDIANA

According to the plans, standard specifications, supplemental specifications, profiles and drawings therefrom, and any supplemental or special provisions set out or referred to in the Contractor's attached Proposal, and hereby agrees to pay the Contractor therefor, for the actual amount of work done and materials in place, as measured and approved by the Engineer or duly authorized representative, for the lump sum price as stated in the Contractor's attached Lump Sum Bid Proposal dated _____ _____, which sum the Contractor agrees to accept as full payment for such construction work; and

IT IS FUTHER MUTALLY AGREED:

That the accompanying Proposal together with the plans, standard and supplemental specifications and special provisions herein designated and referred to, are hereby made a part of the Contract the same as if herein fully set forth; and

That the Contract amount may be paid to the Contractor upon progress estimates of completed and approved work prepared by the Engineer, in an amount not exceed Eighty Five Percent (85%) of such estimates, Fifteen Percent (15%) shall be withheld by WACF for a period sixty (60) days after the completion of the work, for the purpose of securing payment of all properly prepared and certified statements of indebtedness which shall have been filed against the Contractor for labor performed and materials furnished or other services rendered in carrying forward, performing and the completing of this contract, and such estimates shall also be subject to the provisions of the Standard Specifications on file in the office of the Owner and made a part hereof; and that before any estimate is paid to the Contractor, he shall furnish receipts for all debts incurred in the prosecution of such work or satisfactory evidence and assurance that the same have been paid; or shall consent to the withholding by Owner from his final estimate of sums sufficient to cover such indebtedness, which sums may be held until such indebtedness is settled, or until conclusion of any litigation in the relation thereto

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filed within such period; and that no monies due on this final estimate shall be paid until the work is fully completed and accepted as provided in the Specifications.

IN TESTIMONY WHEREOF, the Bidder has hereunto set his hand this _____day of _____, 20__.

_____
Contractor

_____
By

IN TESTIMONY WHEREOF, the WACF does hereby accept the foregoing agreement and has herewith set their hands this day _____ of _____ _____, 20__.

WACF
Syracuse, Indiana

_____
, President

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Appendix F:

Example Maintenance and Monitoring Form

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Dillon Creek Stabilization Monitoring and Maintenance Form

Date:_____

Inspected by:_____

1. Is erosion occurring on any of the access sites?

2. Is any erosion occurring around the rootwads?

3. Is herbaceous vegetation becoming established on the shelf above the rootwad stabilization and on the opposite bank where soil was mined?

4. Are there any erosion indicators around the grade control structures?

5. Are there areas of the embankment that appear to be eroding where no treatment apparently took place?

6. Is any erosion occurring around the bank stabilization work upstream and within 500 feet of the culvert under County Line road?

7. Are the planted trees in generally good condition? If not, how many are dead or dying?

8. In the area of the two-stage ditch has vegetation established on the flat shelf adjacent to the stream? Are there shrubs or trees growing?

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Is there water in the channel? Is it flowing? Please note Depth?

Are there fish or other aquatic organisms present in the channel?

General Site Observations and Comments:

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Suggested Maintenance:

Problem	Course of Action	Requested (Date)	Action Taken (Date)
No vegetation	Re-seed with appropriate seed mix		
Significant tree die-off	Replant in spring of year		
Erosion occurring in channel	Consult natural resource professional		
Erosion occurring along two-stage ditch area	Consult natural resource professional		

If questions or concerns exist, please contact a natural resource professional from JFNew, county NRCS, or DNR to review the issue and suggest repairs.