5th Year Monitoring of Mitigation Provided on the Birch River for the O'Brien #2 Surface Mine.

Conducted for:

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Executive Summary

1. REI Consultants, Inc. (REIC) was contracted by ICG Eastern, LLC to conduct monitoring of mitigation channels for a compensatory mitigation plan (CMP) entitled "Compensatory Mitigation Plan and Stream Restoration Plan for the Permanent and Temporary Impacts to Jurisdictional Waters of the United States at the O'Brien #2 Surface Mine". This report was written by REI Consultants and was submitted to ICG Eastern in March 2006.

2. Impacts at the O'Brien #2 Surface Mine included 3,131 linear feet of permanent impact, and 453 linear feet of temporary impact.

3. Mitigation activities consisting of stream creation, stream restoration, and stream enhancements were to take place on a total of 7,688 linear feet of stream. Creation activities will develop 4,235 linear feet of stream channel; restoration activities will re-establish 453 linear feet of temporarily impacted (ponded) areas; and enhancement will increase habitat on 3,000 linear feet of the Birch River.

4. This report details only the enhancements provided on the Birch River in August of 2007.

5. In May 2012, REIC performed the monitoring survey of this enhancement area.

6. At the time of the Year 5 Monitoring of the Birch River project, a total of 225.14 Stream Habitat Units (SHUs) were gained through the mitigation efforts on the Birch River. An estimate of 117.93 SHUs were expected to be gained through these enhancements. Thus, mitigation exceeded expectations on the Birch River.

Introduction & Background

ICG Eastern, LLC., received a Nationwide Permit to install a single fill and associated sediment control structures at their Birch River Operation near Cowen, in Webster County, West Virginia. Under existing law the U.S. Army Corps of Engineers requires compensatory mitigation to replace aquatic resource functions unavoidably lost or adversely affected by authorized activities. Permittees must provide appropriate and practicable mitigation for authorized impacts to aquatic resources in accordance with the laws and regulations of the Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Therefore, to comply with the U.S. Army Corps of Engineers permitting process, ICG Eastern submitted a compensatory mitigation and restoration plan (referred herein as the CMP) entitled, "Compensatory Mitigation Plan and Stream Restoration Plan for the Permanent and Temporary Impacts to Jurisdictional Waters of the United States at the O'Brien #2 Surface Mine". This report was written by REI Consultants, and was submitted to ICG Eastern., dated March 06, 2006.

As part of the approved CMP, ICG Eastern proposed to provide mitigation for those sections of streams permanently impacted by the O'Brien Surface Mine by providing stream improvements and enhancements on the Birch River. The construction on Birch River associated with this permit was completed in the Summer of 2007 (see FIGURE 6).

The mitigation plan was approved using a ratio of 1:1 linear feet replacement and functional replacement using the SHU (Stream Habitat Unit) method to determine the value of channels. This method used the EPA Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers (EPA 841-B-99-002), the acreage of the channel, and the classification of the stream-flow regime (ephemeral, intermittent, and perennial) in order to create a numerical value of the stream channels. For this report, and the monitoring of the Birch River mitigation efforts, a total of 3,000 linear feet were to have been enhanced, providing a net gain of 117.93 SHUs.

Goals of Enhancement

The goals stated in the CMP included conducting stream enhancements on the Birch River to:

1. Reposition and anchor mis-angled structures
2. Install in-stream structures
3. Install bank stabilization structures
4. Repair any riparian vegetation disturbed during construction and re-establish riparian vegetation in deficient areas, where practical

The success of these goals was based upon several criteria:

1. Photos of the area

   The CMP stated: Success of the reconstructed creation channel and enhancement channel where structures are installed will be examined and photographs will be taken to ensure overall stability. Photographs will be taken early to confirm the channels bank stability and proper structure construction by observing any possible deficiencies such as cracks in the substrate, inadequate flow, washed away vegetation in the channel (indicating that the water in the channel is exceeding bankfull measurements), or collapsed banks.

2. Measurements of the reach

   The CMP stated: Rosgen-type morphological parameters and profiles, such as cross-sections and longitudinal profiles will be measured to determine if the proposed mitigation efforts are successful. Cross sections and longitudinal profiles will clearly demonstrate the change in slope and in-stream characteristics. For instance, both diagrams showed a very shallow, run area with no pool habitats before the structures were installed. After the structures were installed, a pool area was clearly shown in the cross section, and a significant depression was noticed in the longitudinal profile where a pool was created.

3. Habitat scores

   The CMP stated: Annual habitat assessments will be conducted annually for a period of five years at the creation and enhancement reaches. For a period of five years, average habitat scores will be compared annually to pre-mining scores as a measurement of success. If at the end of the five year monitoring period, total SHU's or linear feet are different from those predicted in the CMP, ICG Eastern would consult the District Engineer of the U.S. Army Corps of Engineers to determine what, if any, additional or remedial measures should be undertaken. Specific parameters to be examined include:

   a) Epifaunal Substrate/Available Cover - by adding in-stream structures, including boulders, vanes, and large woody debris, substrate will be more favorable for colonization and cover

   b) Pool Substrate Characterization/Embeddedness - by adding in-stream structures, including boulders, vanes, and large woody debris, the mixture of substrate materials and vegetation will improve

c) Pool Variability/Velocity-Depth Combinations - by adding in-stream structures, including boulders, vanes, and large woody debris, there will be an even mix of pool sizes

d) Bank Stability - by planting live stakes and installing in-stream structures, bank stability scores will improve

e) Vegetation Protection - by planting saplings and/or installing live stakes, between 70% and 90% of the bank surfaces and immediate riparian zone will be covered by native vegetation

4. Riparian Zone Additions

The CMP stated: Riparian evaluations will be conducted annually. The 50-foot riparian zone (25-ft on each side or maximize zones in road paralleling areas) will be re-vegetated to ensure success of approximately 80% of the planted native species. The native tree plantings will consist of a minimum of 70% woody tree stems, planted irregularly along the corridor, and no more than 25% of the trees will be soft mast producers, which will be planted between the woody tree stems. The riparian zone is expected to consist of a density of at least 30 to100 trees and 20 to 50 shrubs per acre. The initial plant-to-plant densities for trees and shrubs will depend on their potential height at 20 years (NRCS Code 342). It is understood that it will take several years, outside of the 5-year monitoring period, for the riparian zone to reach full maturity. Nonetheless, the riparian vegetation is expected to ultimately reach or exceed existing conditions over time.

Goal 1: Reposition and Anchor Mis-Angled Structures

According to the GPS table provided in the 2006 CMP, there were two areas in the enhancement reach where structures need repositioned. At Improvement Point (IP) 4a, the water is angled toward the right bank during higher flows and it was recommended to "shave off top of bedrock layers". Several layers of bedrock in this area were removed on the left side of the channel bottom (see PHOTOS 1 and 2). The angle that had formed was removed and the right bank was armored, at the request of the landowner.

The habitat at IP 4, prior to the mitigation efforts, scored 130 out of 200, indicating "sub-optimal" aquatic habitat. The mitigation effort described above, along with the additional habitat improvements described as part of goals 2and 3, greatly improved the reach's "Velocity-Depth Combinations" and "Frequency of Riffles" scores, and served to improve the overall habitat quality. With the successful completion of the mitigation effort, the reach scored 150 out of 200, and now continues to provide somewhat improved "sub-optimal" aquatic habitat.

At the end of the reach at Station 30+20 (no IP # assigned), there was an area where a large boulder needed reposition to bank. This boulder was causing erosion on the right bank during higher flows. The boulder was moved to the right bank and the area adjacent to the boulder was armored, again at the request of the landowner.

Summary: The goal of repositioning and anchoring mis-angled structures in the stream bed was achieved by the mitigation effort, improving in-steam habitat and increasing habitat scores throughout the reach.

Goal 2: Install In-Stream Structures

According to the 2006 CMP, in-stream structures were to be installed at IPs 1, 2, 4b, 4c, 4d, 6, 7, 8, 9a, 10a. This section will consider each of the mentioned improvement points and if these installed structures helped to increase the in-stream habitat and "function" of the Birch River. Criteria used to measure success of Goal 2 include cross sections, habitat scores, and photographs.

Site IP 1

IP 1 was proposed for a rock cross-vane installation at Station 0+30 (see Photos 3, 4, and 5). This structure was installed and is functioning properly. This structure has been chosen to be monitored annually to ensure stability of the channel (see FIGURE 1). For the monitoring surveys, pins were placed on both banks to ensure consistency year after year.

The cross-vane at IP 1 was installed onto bedrock so the creation of a pool was not a optimally feasible goal. The pool that was created has some habitat inside the deepest section of the pool, however at the upper and lower ends of the pool the habitat increased greatly. At the downstream end of the created pool substrates including cobble have deposited, greatly increasing the amount of available cover. The structure is also helping to control the thalweg, keeping it in the middle of the channel and helping to stabilize the banks.

The habitat at this station, prior to the mitigation efforts, scored 90 out of 200, indicating "marginal" aquatic habitat. The post mitigation scores were higher and totaled 157 out of 200. The score increase was due to improved "Epifaunal Substrate", better "Velocity-Depth Combinations" and higher "Frequency of Riffles". Improved "Bank Stability" and decreased "Sediment Deposition" and "Embeddedness" also contributed to the improved habitat score. With the successful completion of the mitigation effort, the reach now provides "sub-optimal" aquatic habitat.

Site IP 2

IP 2 was slated for installation of a rock cross-vane at Station 2+35 (see PHOTOS 6 and 7). This structure was installed and is functioning properly. This structure has been chosen to be monitored annually to ensure stability of the channel (see FIGURE 2). For the monitoring surveys, pins were placed on both banks to ensure consistency year after year.

The cross-vane at IP 2 was also installed onto bedrock so the creation of a pool was not optimally feasible. Nevertheless, the pool that was created has some habitat inside the deepest section of the pool (see FIGURE 2). However, at the upper and lower ends of the pool, the habitat increased greatly. At the downstream end of the created pool substrates including cobble have deposited, greatly increasing the available cover. The structure is also helping to control the thalweg, keeping it in the middle of the channel and helping to stabilize the banks.

The habitat at this station, prior to the mitigation efforts, scored 90 out of 200, indicating "marginal" aquatic habitat. The post mitigation scores were higher and totaled 153 out of 200.

The score increase was due to improved "Epifaunal Substrate", better "Velocity-Depth Combinations" and higher "Frequency of Riffles". Improved "Bank Stability" and decreased "Sediment Deposition" and "Embeddedness" also contributed to the improved habitat score. With the successful completion of the mitigation effort, the reach now provides "sub-optimal" aquatic habitat.

Sites IP 4b, 4c, and 4d

IP 4b, from Station 6+22 to 6+30, was an area where a rootwad, boulders, and a tree were proposed to be installed into the left bank. IP 4c, at Station 6+61, was an area where bank boulders were to be installed on the left bank and in-stream random boulder clusters were to be installed. IP 4d, at Station 7+40, was an area where the left bank was to be protected with a rootwad, a brush mattress, boulder toe protection, and live stakes. Random boulder clusters were also to be installed in this section (see PHOTOS 8 - 12).

In this section of Birch River, the final mitigation efforts performed included the installation of boulder toe protection along the left bank. At the insistence of the landowner, no rootwads were installed. Further, no in-steam boulder clusters were installed; these structures were not permitted within the Stream Activity Application through the Department of Natural Resources for fear that they may increase bank erosion and decrease the effectiveness of the mitigation activities.

The habitat at IP 4, prior to the mitigation efforts, scored 130 out of 200, indicating "sub-optimal" aquatic habitat. The mitigation effort described above, along with the additional habitat improvements described as part of Goals 1 and 3, improved the reach's "Bank Stability" score, and served to improve the overall habitat quality. With the successful completion of the mitigation effort, the reach scored 150 out of 200, and now continues to provide somewhat improved "sub-optimal" aquatic habitat.

Site IP 6

IP 6, at Station 10+71, was proposed for installation of a rock J-hook Vane installed on the right bank (see PHOTOS 13 and 14). This structure was installed and is functioning properly. This structure is located slightly upstream from the area originally planned for the structure, as the originally planned area was directly under power-lines and the excavator could not operate safety in this section of the Birch River. This structure is helping to control the thalweg and to increase the stability of the right bank.

The habitat at this station, prior to the mitigation efforts, scored 106 out of 200, indicating "marginal" aquatic habitat. The post mitigation scores were substantially higher, and totaled 145 out of 200. The score increase was due to improved "Epifaunal Substrate" and increased "Frequency of Riffles". Improved "Bank Stability" and decreased "Embeddedness" also contributed to the improved habitat score. With the successful completion of the mitigation effort, the reach now provides "sub-optimal" aquatic habitat.

Site IP 7

IP 7, at Station 13+90, was slated for a rock J-hook Vane installed on the right bank (see PHOTOs 15 and 16). This structure was installed and is functioning properly. This structure has been chosen to be monitored annually to ensure stability of the channel (see FIGURE 3). For the annual monitoring surveys, pins were placed on both banks to ensure consistency year after year.

The habitat at this station, prior to the mitigation efforts, scored 105 out of 200, indicating "marginal" aquatic habitat. The post mitigation scores were substantially higher, and totaled 148 out of 200. The score increase was due to improved "Epifaunal Substrate", better "Velocity-Depth Combinations", and increased "Frequency of Riffles". Decreased "Sediment Deposition" and improved "Channel Flow Status" and "Bank Stability" also contributed to the improved habitat score. With the successful completion of the mitigation effort, the reach now provides "sub-optimal" aquatic habitat.

Site IP 8

IP 8, at Station 18+16, was proposed for a rootwad to be installed into the left bank. At Station 18+90, a rock J-hook Vane was to be installed on the left bank (see PHOTOS 17 and 18). Both structures were installed and are functioning properly. The J-hook Vane structure has been chosen to be monitored annually to ensure stability of the channel (see FIGURE 4). For the annual monitoring surveys, pins were placed on both banks to ensure consistency year after year.

The habitat at this station, prior to the mitigation efforts, scored 112 out of 200, indicating "marginal" aquatic habitat. The post mitigation scores were higher, and totaled 155 out of 200. The score increase was due to improved "Epifaunal Substrate" and better "Velocity-Depth Combinations". Improved "Bank Stability" and decreased "Sediment Deposition" and "Embeddedness" also contributed to the improved habitat score. With the successful completion of the mitigation effort, the reach now provides "sub-optimal" aquatic habitat.

Site IP 9a

IP 9a, at Station 20+27, was slated to be a rock J-hook Vane installed on the right bank (see PHOTOS 19 - 21). The structure was installed and is functioning properly. The J-hook Vane structure has been chosen to be monitored annually to ensure stability of the channel (see FIGURE 5). For the annual monitoring, pins were placed on both banks to ensure consistency year after year.

The habitat at this station, prior to the mitigation efforts, scored a 122 out of 200 indicating "sub-optimal" aquatic habitat. The post mitigation scores were higher, and totaled 155 out of 200. The score increase was due to improved "Epifaunal Substrate" and better "Velocity-Depth Combinations". Improved "Channel Flow Status" and "Bank Stability" and decreased "Sediment Deposition" also contributed to the improved habitat score. With the successful completion of the mitigation effort, the reach now continues to provide somewhat improved "sub-optimal" aquatic habitat.

Site IP 10a

At IP 10a, random boulder clusters were to be installed. However, no in-steam boulder clusters were installed as these structures were not permitted within the Stream Activity Application through the Department of Natural Resources for fear that they may increase bank erosion and decrease the effectiveness of mitigation activities.

Summary: The goal of installing in-stream structures was achieved by the mitigation effort. All structures were installed except for the random boulder clusters, as per the request of WV-DNR. All installed structures are functioning to control the thalweg, stabilize the stream banks, and improve physical habitat quality.

Goal 3: Install Bank Stabilization Structures

Bank stabilization structures were to be installed at Stations IP 3, 4, 6, 9, and 10.

At IP 3, vegetated rip-rap was to be installed on the right bank and unstable banks caused by leaning trees were to be stabilized by removing the problematic trees. Rip-rap was installed throughout this reach and the leaning trees were removed leaving rootwads in place (see PHOTOS 22 and 23). The trunks of the leaning trees were placed beneath undercut banks in an effort to further stabilize the area and to provide additional habitat. The banks have been stabilized at a near 2:1 slope ratio.

The habitat at this station, prior to the mitigation efforts, scored a 117 out of 200 indicating "sub-optimal" aquatic habitat. The post mitigation scores were higher, and totaled 153 out of 200. The score increase was due to improved "Bank Stability", which, in combination with up-stream enhancements, decreased "Sediment Deposition" and drastically improved "Embeddedness" in this reach. With the successful completion of the mitigation effort, the reach now continues to provide somewhat improved "sub-optimal" aquatic habitat.

At IP 4, rootwads, bank boulders, and brush mattresses were initially proposed to be installed to stabilize the stream banks. Only bank boulders were finally used to stabilize the banks in the area (see PHOTOS 8 - 12). The banks have been stabilized at a near 1:1 slope ratio. The improved "Bank Stability" score contributed to the improved overall habitat score discussed above, and, with the successful completion of the mitigation effort, the reach now continues to provide somewhat improved "sub-optimal" aquatic habitat.

At IP 6, vegetated rip-rap was proposed to be installed on the right bank. This reach runs parallel with Birch River Road, and has been stabilized with both bank and toe boulders as well as a series of rock J-hooks. The J-hooks are performing well, moving the thalweg to the bank opposite the road. Vegetated rip-rap was not used along the road side since the area is within the mowing boundaries of the WV Department of Highways, and also as an attempt to maintain good visibility along the road (see PHOTOS 24 and 25).

At IP 9, bank boulders were to be installed on the right bank. In this area, adjacent to where a J-hook vane was installed, bank boulders are providing added stability to the banks. The right bank in this area has been stabilized by the arm of the vane, which is at a near 5% slope, and the boulders above the arm, which are at a near 1:1 slope (see PHOTOS 19 - 21). The improved "Bank Stability" score contributed to the improved overall habitat score discussed above, and, with the successful completion of the mitigation effort, the reach now continues to provide somewhat improved "sub-optimal" aquatic habitat.

At IP 10, a brush mattress was originally proposed to be installed on the left stream bank. In this area, a bankfull bench was created with brush mattresses, live stakes, and trees were planted (see PHOTOS 26 and 27). The area was very wet at the time of construction, indicating a seep in the stream bank. The area has been stabilized; the bankfull bench is at a slope of near 2:1 ratio. The area above the bench was stabilized at a near 1:1 slope ratio.

The habitat at this station, prior to the mitigation efforts, scored a 121 out of 200 indicating "sub-optimal" aquatic habitat. The post mitigation scores were higher, and totaled 151 out of 200. The score increase was due to improved "Epifaunal Substrate", better "Velocity-Depth Combinations", and increased "Frequency of Riffles". Better "Bank Stability" and decreased "Sediment Deposition" also contributed to the improved habitat score. With the successful completion of the mitigation effort, the reach now continues to provide somewhat improved "sub-optimal" aquatic habitat.

Summary: The goal of installing bank stabilization structures was achieved. All unstable stream banks in the reach were stabilized, though not all were stabilized in the exact manner originally specified of the CMP. The more stable banks have decreased the amount of sediment reaching the stream, resulting in less deposition in the channel and improving overall habitat quality.

Goal 4: Repair any Riparian Vegetation Disturbed During Construction, and Re-Establish Riparian Vegetation in Deficient Areas, Where Practical

Riparian vegetation was to be added in three specific areas along the Birch River, at IPs 6, 9, and 10.

At IP 6, it was determined that the WV State Department of Highways crews mowed the area to keep vegetation down; therefore, planting was not practical.

At IP 9, the land owner did not provide approval of the plantings along the fence line. Therefore, no trees were planted.

At IP 10, brush mattresses, trees, and live stakes were installed along the left stream bank (see PHOTOS 26 and 27). Several of trees are doing well and vegetation has covered much of the bankfull bench; however, some of the live stakes and the brush mattresses did not take root. The vegetation that has become established improved the reach's "Vegetative Protection" score, contributing to the improved overall habitat score discussed above, and, with the successful completion of the mitigation effort, the reach now continues to provide somewhat improved "sub-optimal" aquatic habitat.

Summary: The goal of repairing and re-establishing riparian vegetation was achieved with the understanding that, as stated above, it will take several years for the riparian zone to reach full maturity and, at the discretion of the client (ICG-Eastern, LLC), additional plantings may be needed.

SHU calculations through Habitat Scoring Evaluations

In-stream habitat was measured at all IPs where enhancements were performed, using the EPA Rapid Bioassement Method. The overall habitat has increased for the full mitigation reach.

Habitat Parameter	IP 1		IP 2		IP 3	
	Pre	Post	Pre	Post	Pre	Post
1. Epifaunal Substrate	10	13	10	14	15	14
2. Embeddedness	5	17	5	17	5	17
3. Velocity-Depth Combinations	3	14	3	14	10	14
4. Sediment Deposition	1	17	1	14	12	14
5. Channel Flow Status	19	19	19	19	19	19
6. Channel Alteration	16	16	16	16	16	16
7. Frequency of Riffles	7	14	7	14	7	14
8. Bank Stability (L/R)	9/4	9/9	9/4	9/9	9/2	9/9
9. Vegetation Protection (L/R)	4/2	8/7	4/2	8/6	5/2	8/6
10. Riparian Zone (L/R)	10/0	9/5	10/0	10/3	9/1	10/3
Totals	90	157	90	153	117	153

Habitat Parameter	IP 4		IP 6		IP 7	
	Pre	Post	Pre	Post	Pre	Post
1. Epifaunal Substrate	16	16	13	15	11	16
2. Embeddedness	19	18	5	14	16	16
3. Velocity-Depth Combinations	10	18	16	16	10	17
4. Sediment Deposition	15	15	15	16	6	15
5. Channel Flow Status	15	15	19	19	9	16
6. Channel Alteration	16	17	6	14	16	16
7. Frequency of Riffles	10	16	10	16	11	14
8. Bank Stability (L/R)	3/6	8/6	8/0	8/7	6/3	7/8
9. Vegetation Protection (L/R)	5/8	5/8	6/0	8/2	4/4	6/6
10. Riparian Zone (L/R)	2/7	3/5	8/0	8/2	3/6	4/7
Totals	130	150	106	145	105	148

Habitat Parameter	IP 8		IP 9		IP 10	
	Pre	Post	Pre	Post	Pre	Post
1. Epifaunal Substrate	13	17	11	17	13	16
2. Embeddedness	12	17	16	16	16	16
3. Velocity-Depth Combinations	11	18	10	16	10	17
4. Sediment Deposition	7	15	11	15	15	16
5. Channel Flow Status	19	17	11	17	15	16
6. Channel Alteration	10	15	16	16	17	17
7. Frequency of Riffles	13	14	13	14	10	16
8. Bank Stability (L/R)	2/8	8/8	8/3	9/8	1/8	7/8
9. Vegetation Protection (L/R)	5/4	7/7	8/3	8/7	2/8	7/8
10. Riparian Zone (L/R)	6/2	7/5	9/3	9/3	3/3	4/3
Totals	112	155	122	155	121	151

Table showing average of habitat scores for Stream Habitat Unit (SHU) calculations.

Improvement Point	Pre-Restoration Habitat	Post-Restoration Habitat
1	90	157
2	90	153
3	117	153
4	130	150
6	106	145
7	105	148
8	112	155
9	122	155
10	121	151
Average	110	152

Stream Habitat Unit (SHU) calculations.

Location	Acres	Habitat Score	Segment Classification	Classification Value	SHUs
Birch River 0+00 to 30+00	2.978	Pre 110	Perennial	2.0	655.16
		Post 152			905.31
				Net Gain	**250.15**

250.15 x 0.9* = 225.14 total SHUs gained.

117.93 SHUs were expected to be gained through enhancements.

* NOTE = Total SHUs reduced to account for temporal losses during construction process.

LIST OF PHOTOS

LIST OF PHOTOS Continued

PHOTO 1. IP4a: Proposed location to clip off bedrock in channel on Birch River. ICG Eastern, February 2006.

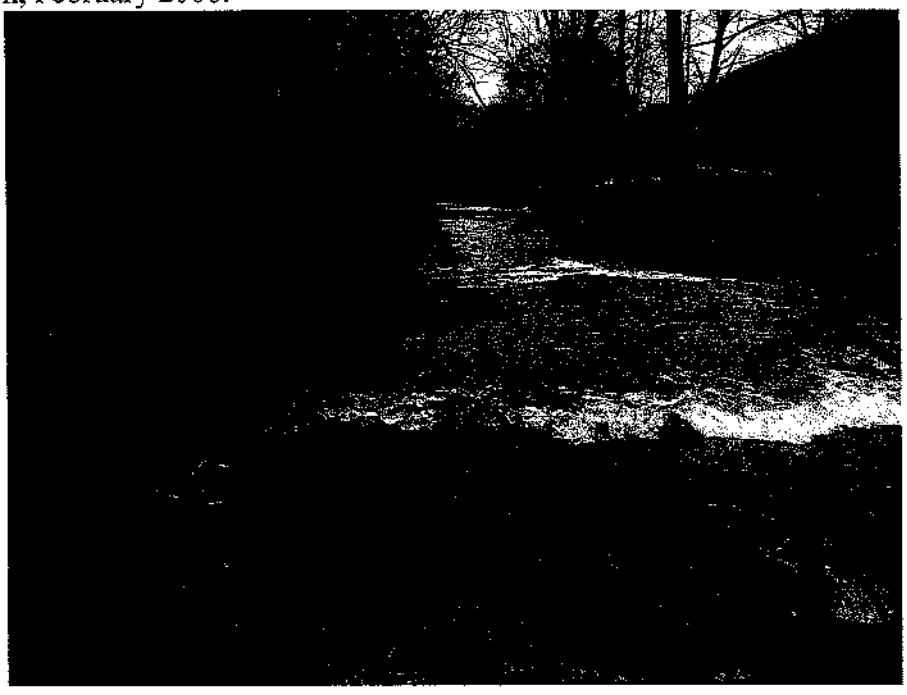

PHOTO 2. IP4a: Location of clipped off bedrock in channel on Birch River. ICG Eastern, May, 2012.

PHOTO 3. IP1: Proposed location for a cross vane on Birch River. ICG Eastern, February 2006.

PHOTO 4. IP1: Location of a cross vane on Birch River, looking downstream. ICG Eastern, May 2012.

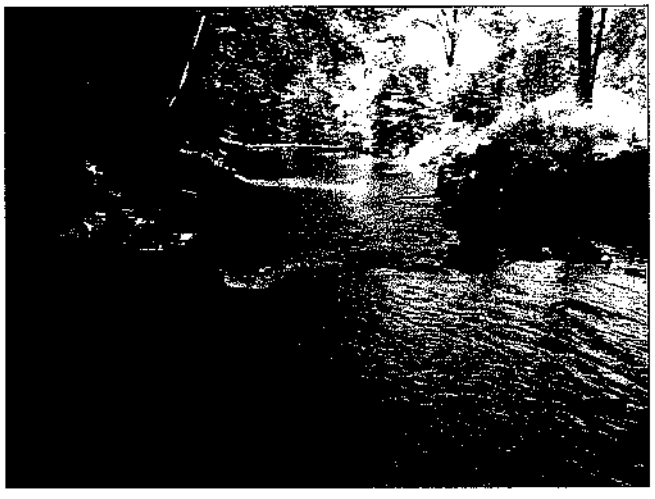

PHOTO 5. IP1: Location of a cross vane on Birch River, looking upstream. ICG Eastern, May 2012.

PHOTO 6. IP2: Proposed location for a cross vane on Birch River. ICG Eastern, February 2006.

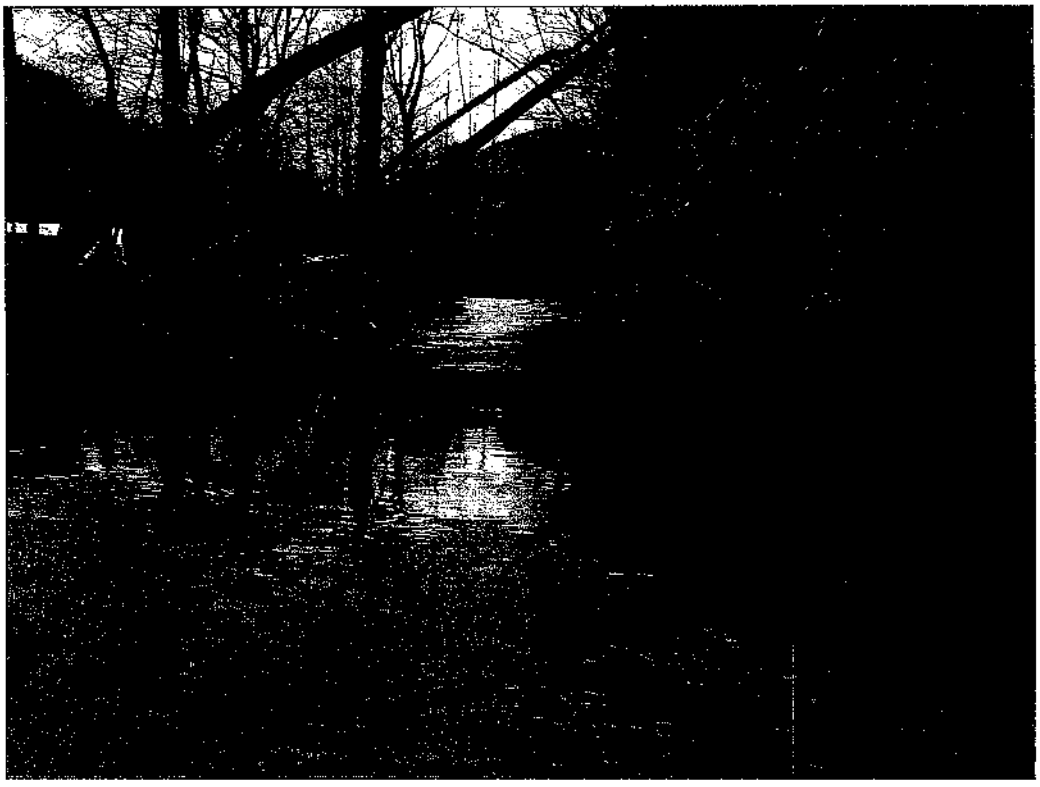

PHOTO 7. IP2: Location of a cross vane on Birch River. ICG Eastern, May 2012.

PHOTO 8. IP4: Proposed location to stabilize bank with rootwad and bank boulders on Birch River. ICG Eastern, February 2006.

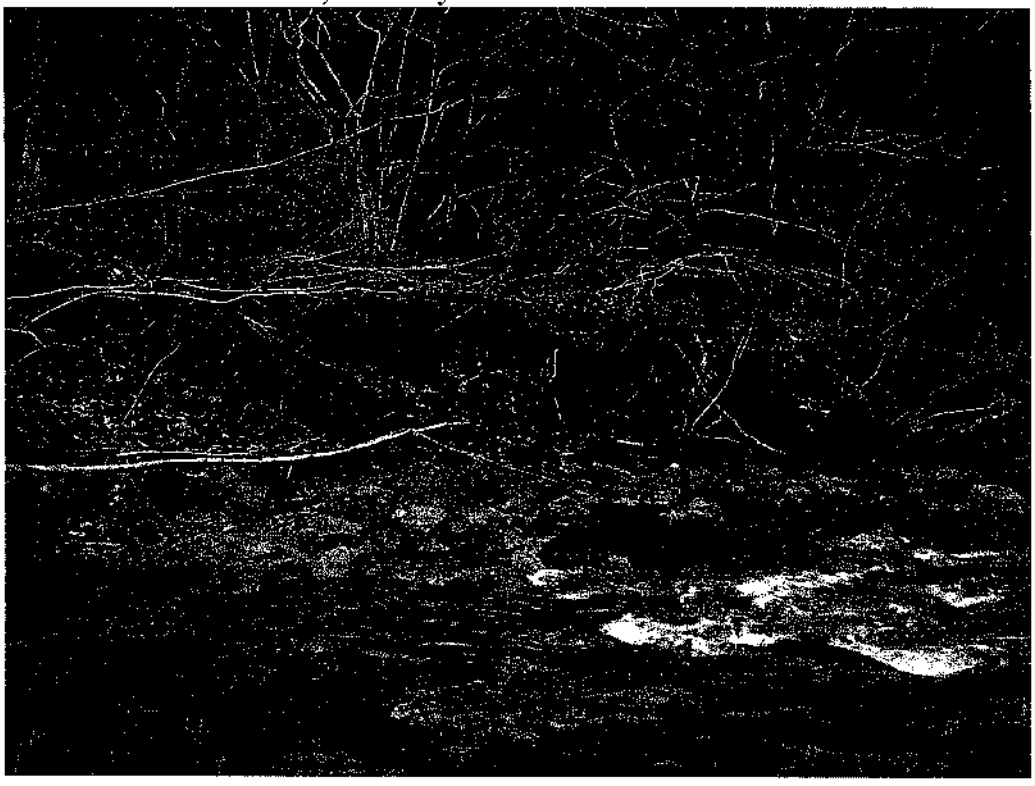

PHOTO 9. IP4: Proposed location to stabilize bank with rootwad and bank boulders on Birch River. ICG Eastern, February 2006.

PHOTO 10. IP4: Location of bank boulders on the left bank of Birch River. ICG Eastern, May 2012.

PHOTO 11. IP4: Location of bank boulders on the right bank of Birch River. ICG Eastern, May 2012.

PHOTO 12. IP4: Location of bank boulders, brush mattress, and live stakes on the left bank of Birch River. ICG Eastern, May 2012.

PHOTO 13. IP6: Proposed location to install a J-hook vane to reduce near bank stress on Birch River. ICG Eastern, February 2006.

PHOTO 14. IP6: Location of J-hook vane to reduce near bank stress on Birch River. ICG Eastern, May 2012.

PHOTO 15. IP7: Proposed location to install a J-hook vane to reduce near bank stress on Birch River. ICG Eastern, February 2006.

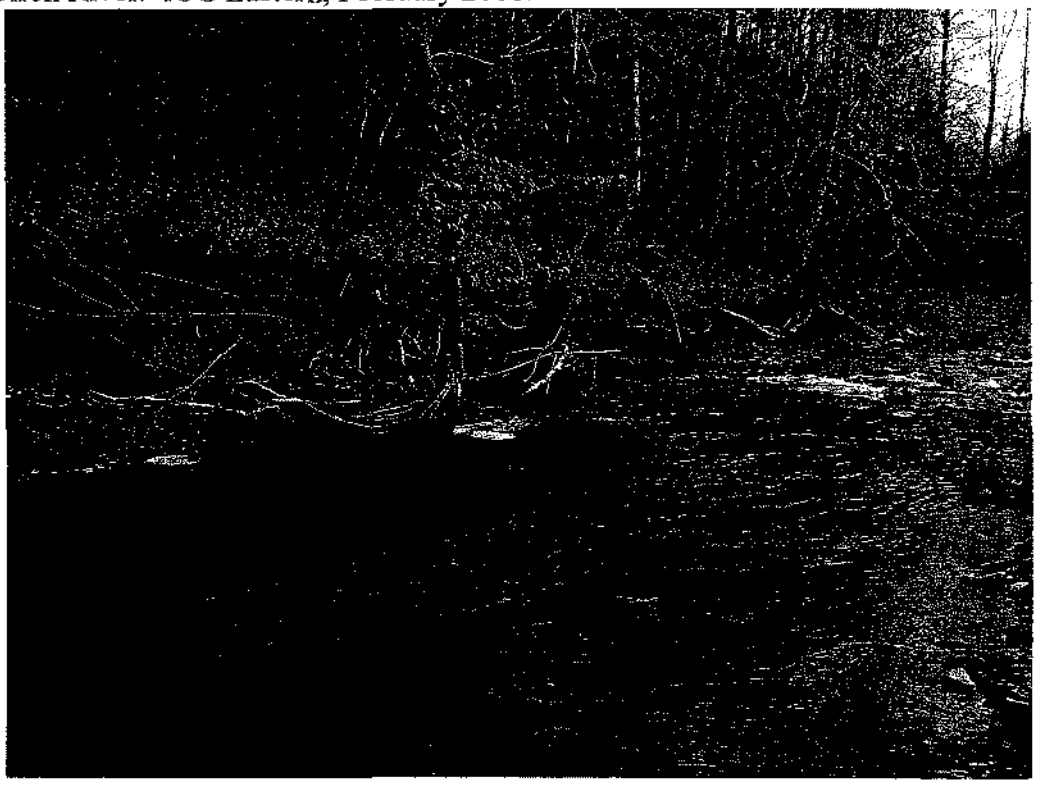

PHOTO 16. IP7: Location of J-hook vane to reduce near bank stress on Birch River. ICG Eastern, May 2012.

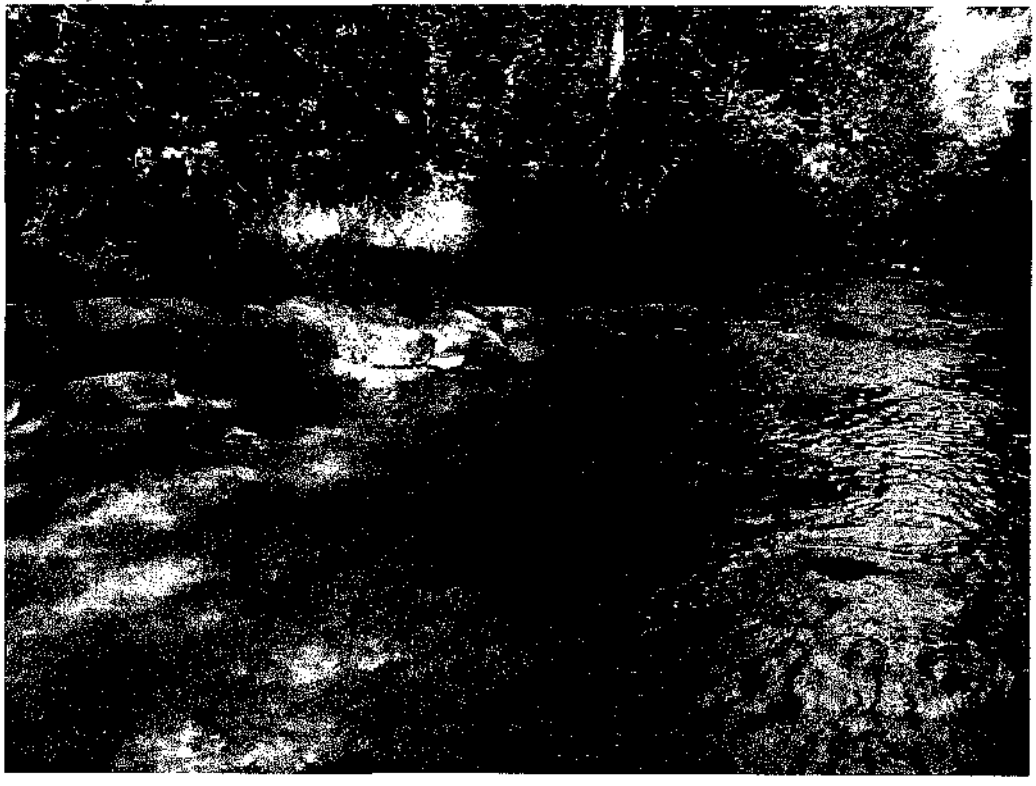

PHOTO 17. IP8: Proposed location to install a J-hook vane to reduce near bank stress on Birch River. ICG Eastern, February 2006.

PHOTO 18. IP8: Location of J-hook vane to reduce near bank stress on Birch River. ICG Eastern, May 2012.

PHOTO 19. IP9: Proposed location to install a J-hook vane and bank and toe boulders to reduce near bank stress on Birch River. ICG Eastern, February 2006.

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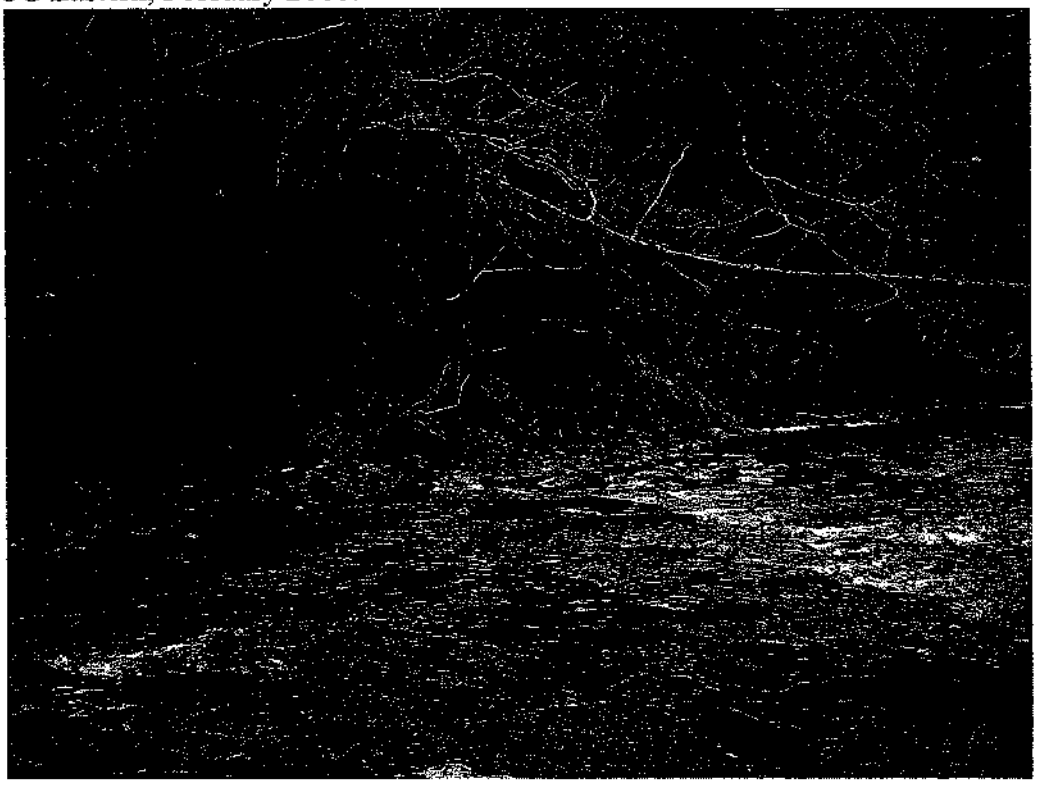

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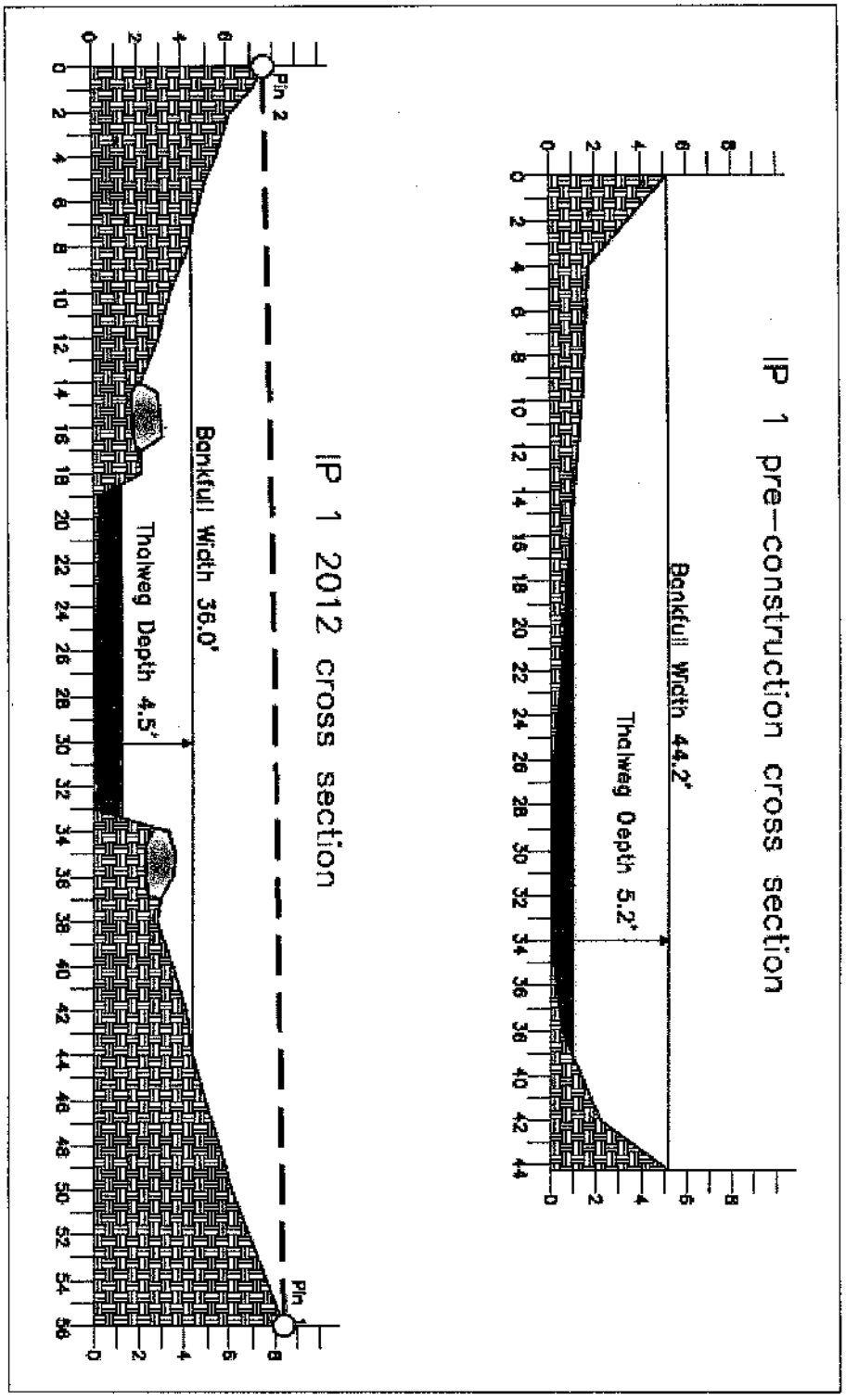


FIGURE 2. IP2: Pre-construction and 2012 cross sections.

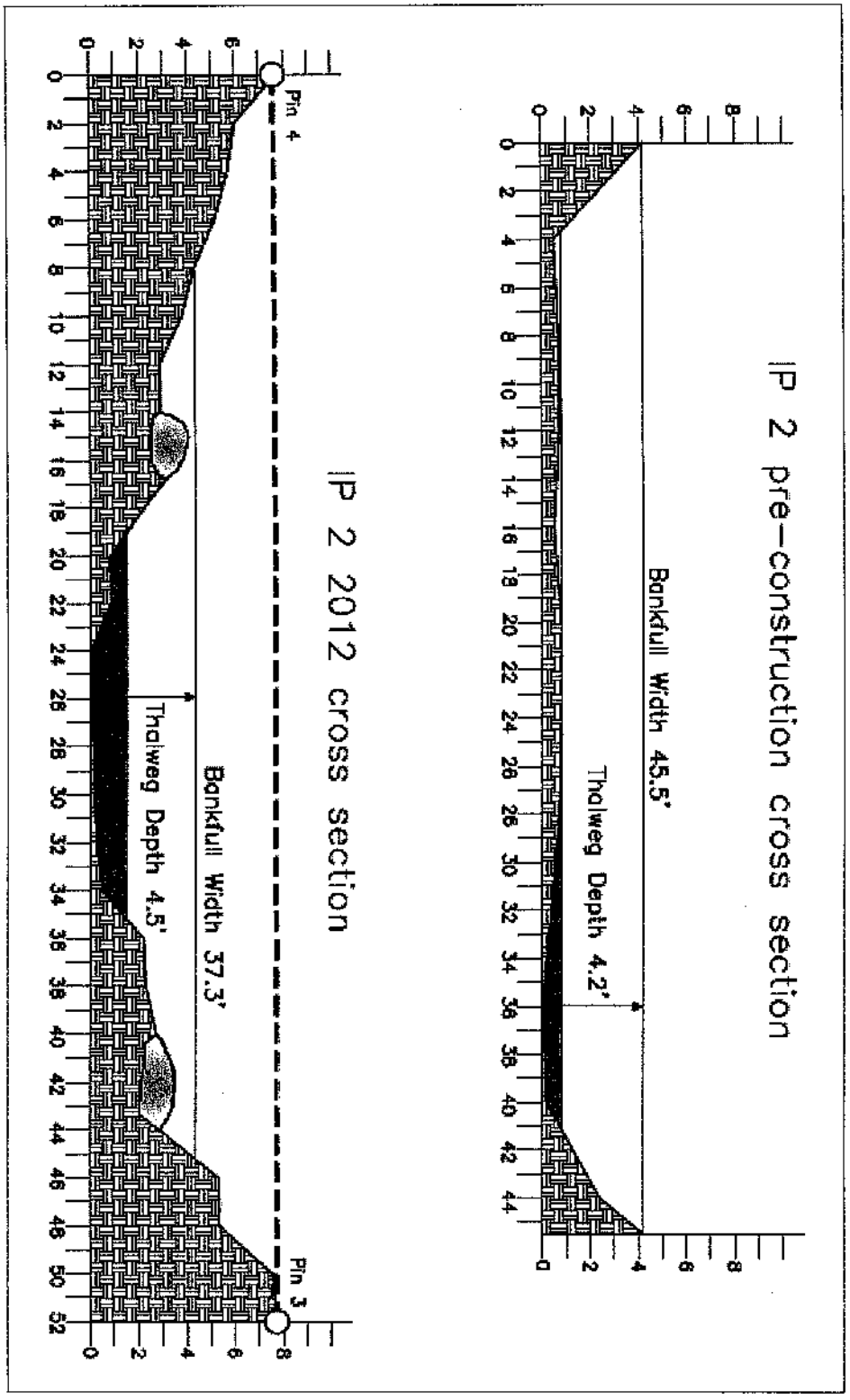
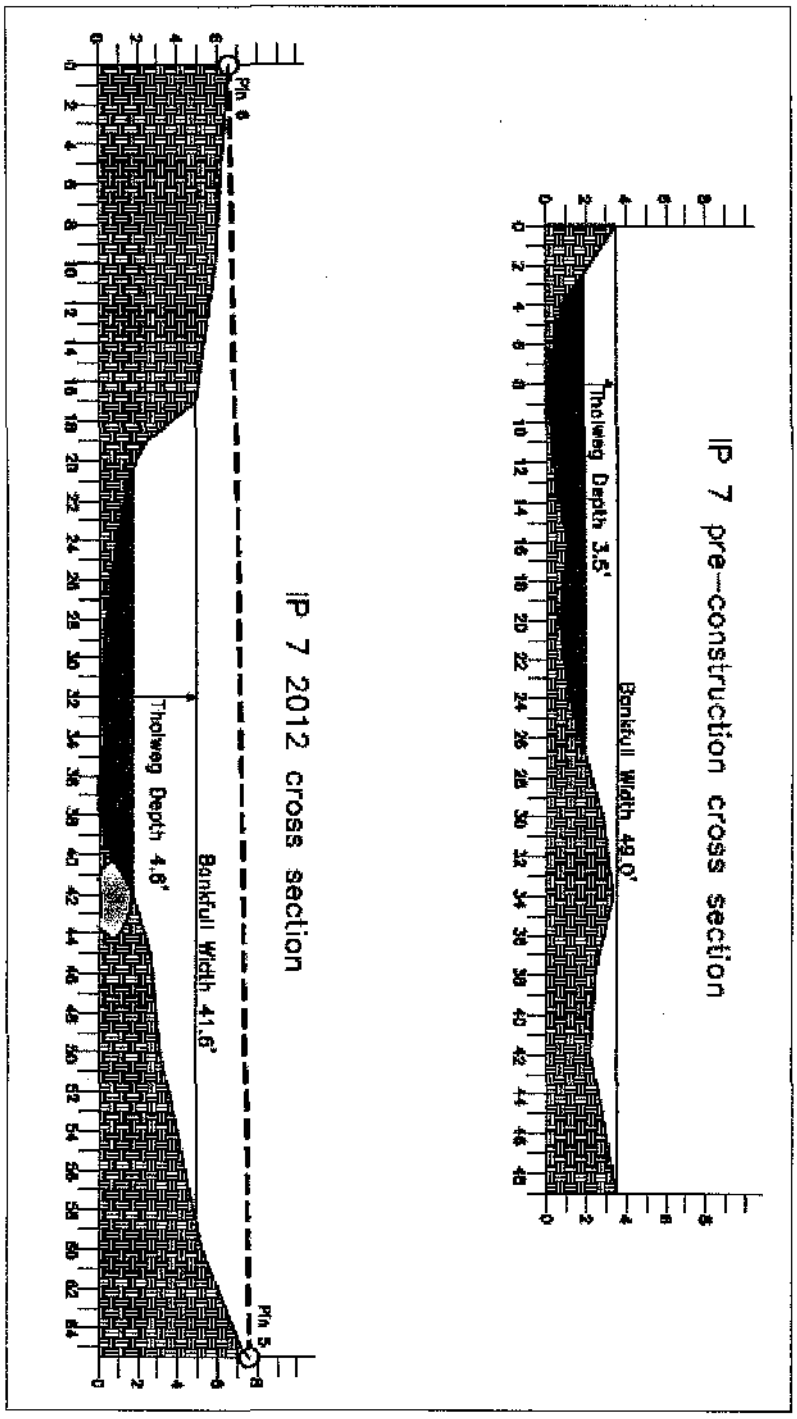


FIGURE 3 . IP7: Pre-construction and 2012 cross sections.



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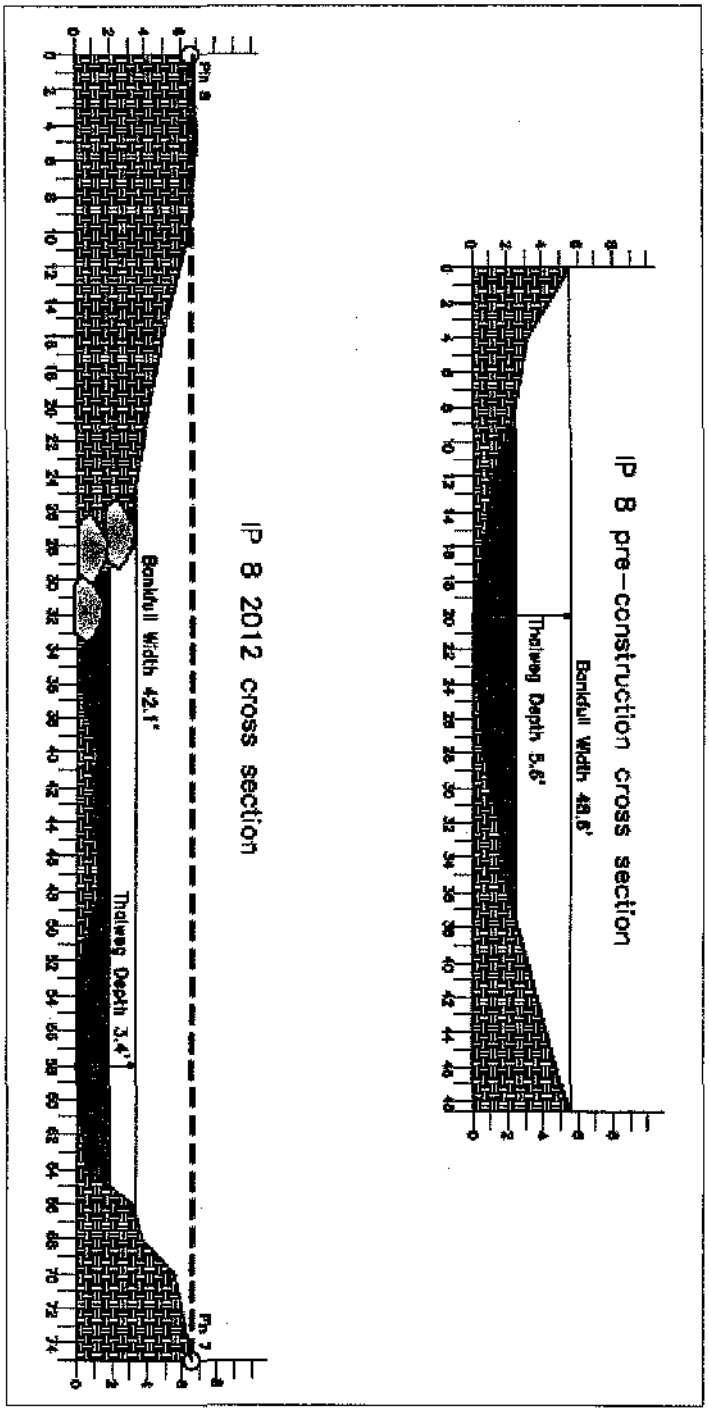

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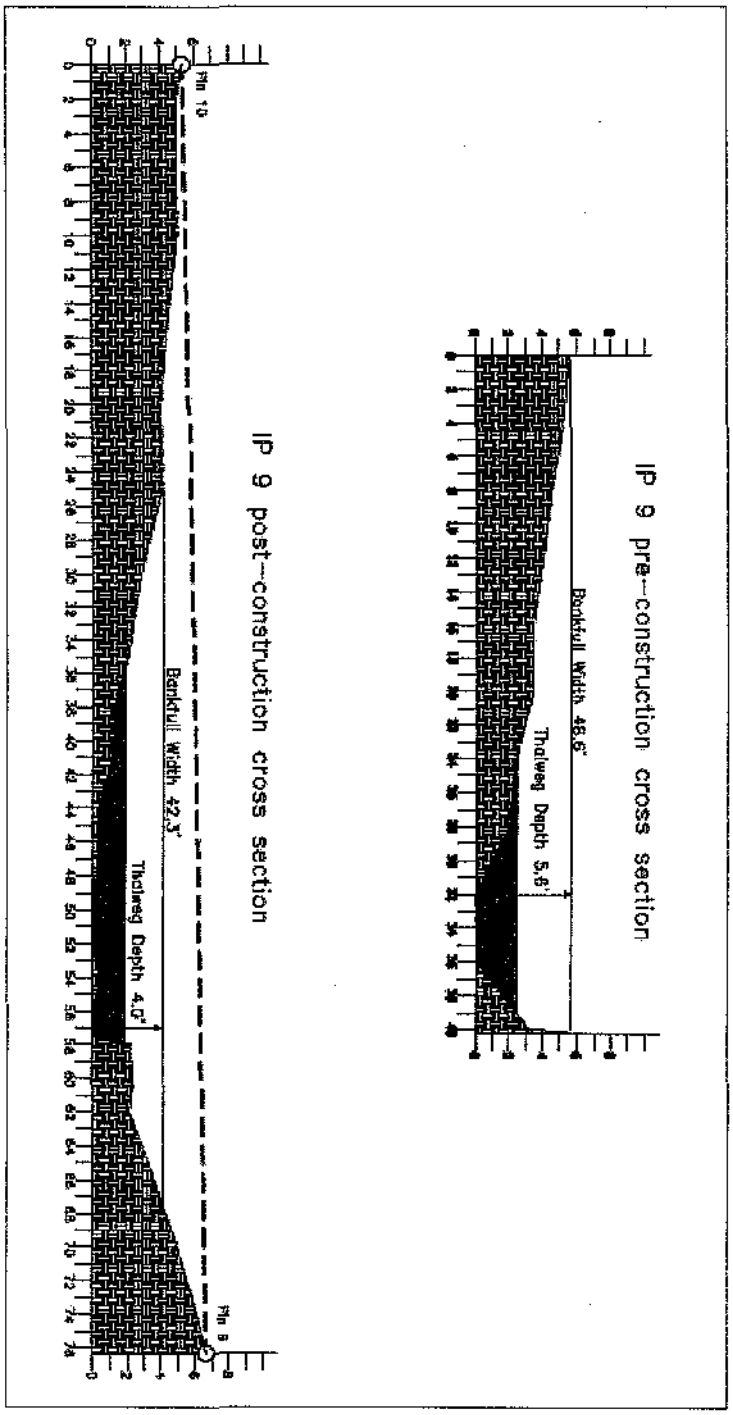

FIGURE 6. Birch River IP summary. May 2012. (See report hard copy for full-size version.)