

SURVEYOR'S OFFICE

Hamilton County

Kenton C. Ward, CFM
Surveyor of Hamilton County
Phone (317) 776-8495
Fax (317) 776-9628

Suite 188
One Hamilton County Square
Noblesville, Indiana 46060-2230

November 12, 2015

To: Hamilton County Drainage Board

Re: William P. Bennett Drain Reconstruction

Attached is a petition, drainage map, drainage shed map and schedule of assessments for the reconstruction of the William P. Bennett Drain. The William P. Bennett Drain is listed as number three (3) on the 2015 Drain Classification List under reconstruction.

HISTORY

This drain was requested for classification by Steve Pitts on April 5, 1972 and by Alice Butler on June 14, 1974.

Petitions for reconstruction have been filed twice for this drain. These were filed with the Board on November 10, 2003 and the latest on March 10, 2004. The last petition having 18.8% of the landowners within the drainage shed signing.

The Drainage Area of William P. Bennett covers portions of Sections 13 and Section 24 of Adams Township, Range 3 East, Township 20 North and portions of Sections 8, 17, 18, 19, 20 of Jackson Township, Range 4 East, Township 20 North. The total watershed for the drain is 1,953.88 acres.

The William P. Bennett Drain consists of the William P. Bennett Drain, the Asa Wiles Drain and the S. Moriarty Drain.

The oldest portion of the system is the Asa Wiles Drain. This tile was viewed and ordered constructed on November 23, 1894. (Commissioners Record Book 9, Pgs. 303-306). This drain was installed as a replacement for the then existing Perry Bennett Drain. The Asa Wiles consists of a main tile that runs in a southwesterly direction from the south side of 266th Street to its outlet into the William P. Bennett Drain at Sta. 0 of the Bennett west of US 31. The Asa Wiles also has one arm running along the west side of Dunbar Rd. The Asa Wiles consists of 4,710 feet of 10" and 12" tile for the main drain and 825 feet of 10" tile for Arm 1. The Drain totals 5,535 feet of tile drain.

The next drain constructed was the S. Moriarty Drain. This drain was viewed and the report given by the viewers of the ditch to the Commissioners on March 3, 1910. (Commissioners Record Book 21, pgs. 104-106). This tile begins just south of the NW corner of the SE Quarter of Section 17 and runs in a northwesterly direction crossing Salem Road and outletting into the existing William P. Bennett open

ditch. The S. Moriarty consisted of one main tile consisting of 2,150 feet of 12" tile. The S. Moriarty Drain was reconstructed by Becks Hybrids in 2014. The tile now consists of main tile 2,135 feet of 18-inch tile.

The William P. Bennett Ditch was viewed on August 5, 1924 and then ordered constructed by the Commissioners on September 2, 1924 (Commissioners Record 28, Page 148-151). The William P. Bennett is an open ditch that runs in a northeasterly direction from the west side of US 31 to its confluence with Little Cicero Creek for a length of 14,437 feet. The Bennett drain also includes 542 feet of 20" tile west of US 31 (between the end of the Asa Wiles tile and the beginning of the open ditch portion of the W.P. Bennett Drain). The Bennett was cleaned out in 1947 and an arm, consisting of open ditch 1,070 feet in length, that runs along the southeast corner of the US 31 & 266th Street intersection was constructed in 1958. A segment of this arm was enclosed with 152-feet of 42" RCP in 1999. The Bennett drain consists of 694 feet of tile and 15,507 feet of open ditch.

The total drain length is 15,507 feet of open ditch and 8,364 feet of tile for a total of 23,871 feet.

The drain was placed on maintenance on May 27th, 2008. At that time it was recommended for the drain to be placed on maintenance but remain on the reconstruction list until plans could be finalized and a reconstruction hearing held. At that time, the drainage shed for the drain was reported to be 1,959.37 acres with a total annual maintenance assessment of \$7,514.66.

The following drain complaints and work orders are on file at the Hamilton County Surveyor's Office:

<u>Landowner (at time of complaint)</u>	<u>Date</u>	<u>Complaint</u>
Michael D and Lisa McCool	1/5/2005	Erosion
Michael D and Lisa McCool	4/20/2005	Erosion
Christine Durbin	2/26/2014	Flooding and Erosion
Dorothy M Grinstead	1/4/2011	Sink Hole
Dorothy M Grinstead	11/22/2011	Sink Hole
Markus E and Ruth A Patterson	11/14/2011	2 Sink Holes and Erosion
Dennis & Milton L Baltimore Jr. and Wayne F & Donna M Hunter	2/28/2012	Clear Open Drain
Dennis & Milton L Baltimore Jr. and Duvall, Bond & Harris LLC	7/25/2012	Clear easement for Highway project
Gene A and Beverly S Grinstead; trustees	6/10/2014	Sink Holes

All the work orders have been completed to date.

EXISTING CONDITIONS

The report to the drainage board in 2008 indicated that the open ditch was heavily overgrown and was in need of clearing. The condition of the drain was susceptible to jams caused by debris which could result in backwater and localized flooding. The condition of the drain has increased the potential for large woody debris to collect on road crossings, threatening the bridge structure and and/or redirecting flow and causing erosion.

The open ditch portion of the drain was inspected visually in December 2014. The inspection identified that the open ditch portion of the drain is heavily overgrown with vegetation and has a high amount of

accumulated sediment in the channel. This sediment compromises both the hydraulic capacity of the road crossings and the ability to effectively drain the root zone of the adjacent agricultural lands. An adequately drained root zone relieves stress on plants and also provides aeration to the root system, which potentially increases production/yield of the acreage.

In some areas the drain is close to existing roadway. The drain has been listed in the Surveyors Drain Classification List since 2007 as having portions of the drain within or immediately adjacent to the right of way. In the Drain Classification List these areas where the open ditch parallels the roadway are recommended to be moved away from the right-of-way so as to increase safety. This should be done during reconstruction of the drain. The following four (4) areas were recommended for reconstruction per the Drain Classification List:

1. Approximately 200 feet east of US 31 on south side of 266th Street
2. Approximately 2,700 feet east of US 31 on south side of 266th Street
3. Approximately 2,200 feet south of 276th Street along north side of Salem Road.
4. Approximately 730 feet west of Salem Road along south side of 276th Street

The crossing at Anthony Road and the westernmost crossing of 266th Street overtop during the NCRS Type A rain event as well as all rain events above this event. The existing channel is inadequate for the NCRS Type A rain event downstream of Anthony Road, at certain points along 266th Street and in the vicinity of US-31.

Although not specifically noted in the NPDES Phase II General Permit Application, Storm Water Quality Management Plan Part C: Program Implementation Report, the drain is within the drainage shed for the Little Cicero Creek which is identified on Page 4 of the report as an MS4 receiving stream. The drain is mentioned in the NPDES Phase II General Permit Application Storm Water Quality Management Plan Part B: Baseline Characterization Report. The Drain is listed on the following pages of this report:

1. Page 6 as #05120201080090 Watershed within the MS4 Area.
2. Page 14 as being in IDEM 305(b) Report as being fully supportive for aquatic life and full body contact.
3. Page 16 as not being substantially impacted by MS4 storm water discharges.
4. Page 18 as being a sub-watershed for Little Cicero Creek and is a priority watershed. Little Cicero Creek listed due to impaired biotic communities.

This drain is not listed on the 2004 303(d) List of Impaired Waters for Indiana. However, it is within the Little Cicero Creek Drainage Shed which is listed due to impaired biotic communities.

However, the drain is listed in the 2006 303(d) list for E. coli.

In 2006, the Board contracted with J.F. New to perform a Watershed Management Plan (WMP) for Little Cicero Creek. This plan was funded by a 319 Grant through IDEM and EPA. The Bennett Drain is mentioned in the report on pages 4, 47 and 93 as being impaired by E. coli. It is also listed on page 75 of the report as having elevated total suspended solids (TSS) concentrations. These were found during one or more of the base flow sampling events completed for the study.

The sampling done on the Bennett Drain for the study is discussed on pages 65 and 66 of the WMP. The sampling showed that the dissolved oxygen (DO), temperature and pH were at normal levels. However, the stream had a Qualitative Habitat Evaluation Index (QHEI) of 44 which suggests that the stream is non-supportive of aquatic life. Areas of concern other than TSS and E coli was the fecal coli form levels, nutrient concentrations, BOD and COD levels.

On Page 119 it is recommended that the drains not currently on maintenance be placed on a maintenance program. It was also recommended that filter strips be installed along the drain in order to reduce nutrient loading and sediment.

RECONSTRUCTION PROJECT

The project was designed by Banning Engineering. A final reconstruction report from Banning Engineering dated August 2015 is attached.

This project is located within the WP Bennett Watershed and comprises the reconstruction of the open portion of the drain. The enclosed portions of the drain are not included in this project. The project begins in the southwest quarter of Section 8, Township 20 North and Range 4 East, where the drain discharges to Little Cicero Creek. The project continues upstream generally west/southwest to the northeast quarter of Section 24, Township 20 North and Range 3 East, to the west side of U.S. 31 to the point where the enclosed portion of the drain discharges to the open channel portion of the drain. The majority of the project is within Jackson Township. A small portion (860 LFT) of the project is within Adams Township. The total length of the project is 14,125-feet.

A new channel was recommended for the entire length of the project. The recommended bottom width of the new channel varies between 4-feet and 6-feet. The first 4,000-LF of the ditch from Little Cicero Creek is recommended to have a 6-foot bottom width. The next 3,200-LF upstream of this segment is recommended to have a 5-foot bottom width. The final 6,925-LF of the channel within the project area is recommended to have a 4-foot bottom width. The side slopes of the new channel in all segments is 2-foot horizontal for each 1-foot vertical. The bottom widths were designed to keep the estimated 5-year flow rates within the ditch banks. The slope of the channel within the project limits varies. The slope is 0.16% from the Little Cicero Creek to Anthony Road (a distance of 6450-LF), 0.2% from Anthony Road to US-31 (a distance of 6,825-LF) and 0.10% from US-31 to the end of the project (a distance of 850-LF). The slopes were set to match the existing inverts of the crossing at U.S. 31 and to eliminate backwater during low flow conditions on tile outlets observed and surveyed along open ditch.

The channel is designed to carry/contain the NRCS Type A Drainage Curve flowrate for Indiana and the 5-year storm frequency within the banks at all locations. The following flow rate information was determined for the watershed.

Q [Type A] = 280 ft³ per second
Q5 = 390 ft³ per second
Q10 = 523 ft³ per Second
Q50 = 895 ft³ per Second

The project includes the widening and lowering of the open ditch, the installation of two sediment basin, the installation of two farm crossings, the extension of 19 farm outlets, the installation of one surface water pipe, and the installation of rip-rap armoring at several bends. Six of the existing eight pipe crossings are being reconstructed. The existing crossings of 276th Street and US-31 will remain in-place. All six of the reconstructed crossings are being lowered to match the proposed flow line. Five of the six reconstructed crossings are being increased in size.

The project will include tree removal and clearing of debris. Clearing of trees will take place to facilitate an operational side for equipment access for the project and for future maintenance. The operational side is generally on the west side of the drain from Little Cicero Creek to 276th Street. Looking upstream the operation side is proposed to be on the following side per the segments listed below:

Right side (West side) Little Cicero Creek to 276th Street
Left Side (East Side) 276th Street to Salem Road
Right Side (North Side) Salem Road Relocation
Left Side (East and South Side) Salem Road to Anthony Road

Right Side (West and North Side) Anthony Road to 266th Street
Left Side (South Side) Eastern 266th Street Crossing to Middle 266th Street Crossing
Right Side (North Side) Middle 266th Street Crossing to Western 266th Street Crossing
Left Side (South Side) Western 266th Street Crossing to US-31
Right Side (West Side) US-31 to End Project.

A 75-foot Conservation Clearing is proposed on the Operational Side from Station 0+00 to Station 31+00 and from Station 45+00 to Station 141+25. 50-foot Conservation Clearing is proposed on the Operational Side from Station 34+75 to Station 45+00. 75-foot Conservation Clearing is proposed on each side of the channel between Stations 31+00 and 34+75.

A proposed 20-foot filter strip is proposed along each of the above segments on the Operational Side.

With the exception of the approximately 325-LF relocation at Salem Road, the drain is being reconstructed in place. The approximately 325-LF segment of the ditch on the north side of Salem Road is being relocated such that the top of bank is at least 15-feet from the edge of the roadway shoulder. This is location 3 from page 3.

As currently designed, the reconstruction of this drain will not require acquisition of new easement. All work will occur within the existing 75 foot easement from the top of bank per IC 36-9-27-33.

The channel will be dredged an average of 2.32 feet in depth.

PERMITS

Per a letter dated July 2, 2015 from the IDNR, an IDNR Construction in the Floodway permit is not required as the William P. Bennett Regulated Open Channel is less than 10 miles in length.

Per a letter dated July 2, 2015 from the IDNR, an IDNR Ditch Reconstruction permit is not required as the work is not within one half (1/2) mile or a freshwater lake 10-acres or more in size.

Per a letter dated October 1, 2015 from the IDNR, there are no endangered, threatened or rare (ETR) species, high quality natural communities or natural areas within ½-mile of the project area.

A Rule 5 permit is not required as the project is exempt based on the work being maintenance activity.

Per a letter dated November 5, 2015 from the U.S. Army Corps of Engineers, the project is not subject to regulation under Section 404 of the Clean Water Act and is authorized under the Regional General Permit issued December 15, 2014.

An IDEM Individual Section 401 Water Quality Certification is required for this project due to the proposed relocation of the channel at Salem Road. This certification has not been received as of the date of this report.

A permit for work in the right of way of the INDOT has been submitted. This permit has not been received as of the date of this report.

QUANTITIES & COST ESTIMATE

Banning was hired by approval of a Professional Services Agreement in the amount of \$30,000 on November 14, 2014 per Hamilton County Drainage Board Book 16 Page 1. The final reconstruction report dated August 2015 is attached.

The construction cost estimate for the project is outlined in detail as follows:

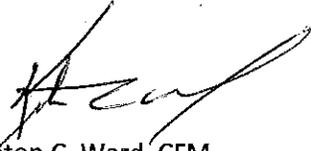
Regulated Drain Work				
Item Description	Quantity	Unit	Unit Cost	Total Cost
Clearing	1	LS	\$ 65,000.00	\$ 65,000.00
Excavate 4' channel bottom	6925	LFT	\$ 6.30	\$ 43,627.50
Excavate 5' channel bottom	3200	LFT	\$ 8.00	\$ 25,600.00
Excavate 6' channel bottom	3555	LFT	\$ 9.50	\$ 33,772.50
Riprap	172	Tons	\$ 75.00	\$ 12,900.00
Seeding Channel Banks	10.8	Acres	\$ 2,500.00	\$ 27,000.00
Seeding Filter Strip	7	Acres	\$ 1,750.00	\$ 12,250.00
Surface Water Pipe	8	EA	\$ 1,150.00	\$ 9,200.00
6"x20' CMP with Animal Guard	5	EA	\$ 500.00	\$ 2,500.00
8"x20' CMP with Animal Guard	3	EA	\$ 525.00	\$ 1,575.00
10"x20' CMP with Animal Guard	1	EA	\$ 575.00	\$ 575.00
12"x20' CMP with Animal Guard	6	EA	\$ 625.00	\$ 3,750.00
15"x20' CMP with Animal Guard	1	EA	\$ 700.00	\$ 700.00
18" RCP Extension	1	LS	\$ 1,500.00	\$ 1,500.00
Ford Crossing	2	EA	\$ 3,000.00	\$ 6,000.00
8.5' Diam. X 24' CMP w/backfill	1	EA	\$ 12,000.00	\$ 12,000.00
8.5' Diam. X 26' CMP w/backfill	1	EA	\$ 13,000.00	\$ 13,000.00
Remove (2) Driveway CMP's	2	EA	\$ 1,500.00	\$ 3,000.00
Driveway Crossing Stone	2	EA	\$ 1,000.00	\$ 2,000.00
Remove and Replace Fences as needed	1	LS	\$ 12,500.00	\$ 12,500.00
			Subtotal	\$ 288,450.00
			15% Contingency	\$ 43,267.50
			Subtotal	\$ 331,717.50
Banning Engineering			Engineering Services	\$ 30,000.00
Banning Engineering			Construction Staking	\$ 9,900.00
Total to be assessed to entire drainage shed.			Total	\$ 371,617.50

Highway Work				
Item Description	Quantity	Unit	Unit Cost	Total Cost
117"x79" CMP Arch Pipe x 40 LFT w/backfill	1	EA	\$ 20,000.00	\$ 20,000.00
117"x79" CMP Arch Pipe x 50 LFT w/backfill	3	EA	\$ 25,000.00	\$ 75,000.00
Sawcut and Remove Old Culverts	4	EA	\$ 4,000.00	\$ 16,000.00
6' Channel under 276th Street	135	LFT	\$ 35.00	\$ 4,725.00
Re-Aligned 6' Channel	310	LFT	\$ 35.00	\$ 10,850.00
3' Stone Shoulder (#53's 6" thick)	172	LFT	\$ 7.50	\$ 1,290.00
Pavement Repair	4	EA	\$ 7,500.00	\$ 30,000.00
			Subtotal	\$ 157,865.00
			15% Contingency	\$ 23,679.75
Total lump sum to County Highway			Total	\$ 181,544.75

The total cost of this project is estimated to be \$553,162.25.

The cost of the new pipe and culvert work at 276th Street will be paid by the County Highway Department per IC 36-9-27-71. The lump sum cost to be charged to the County Highway will be \$181,544.75. The remaining \$371,617.50 will be spread out to the entire drainage shed. The drainage shed for this reconstruction project is 1953.98 acres. I have reviewed the benefitted drainage shed and upon considering each parcel individually, I believe each parcel within the drainage shed will have equal benefits as provided by the drain. Therefore, I recommend each tract be assessed on the same basis equally. I also believe that no damages will result to landowners by reconstruction of this drain. I recommend a reconstruction assessment of \$189.74 per acre with the minimum assessment set at \$189.20.

At the meeting of the Board on October 26, 2015, the hearing for this proposed reconstruction project was set for December 14, 2015.



Kenton C. Ward, CFM
Hamilton County Surveyor

KCW/pll

W.P. Bennett #353

Reconstruction hearing: 12/14/15

\$189.74/Ac with a \$189.20 minimum for entire shed.

Co. Hwy - Lump Sum = \$181,544.75

Assessment roll grand total is \$553,162.43.

\$331,717.50 Construction Cost
 \$30,000.00 Engineering
 \$9,900.00 Construction Staking
\$371,617.50 Total asmt to shed

\$181,544.75 County Hwy Lump Sum

Beck, Hunt & Riggs * Petitioner

Parcel	Owner	Desc	Rate	Ben	Asmt	% of Total
03-02-20-00-00-002.000	Arcadia Christian Church w/LE to Joyce C Cline & LE to	S20 T20 R4 41.63Ac	Residential/Ag	32.63	\$6,191.22	1.12%
01-01-13-00-00-014.000	Armfield, Steve L	S13 T20 R3 20.00Ac	Residential/Ag	20.00	\$3,794.80	0.69%
03-02-18-00-00-012.000	Armfield, Steve L	S18 T20 R4 80.70Ac	Residential/Ag	44.70	\$8,481.38	1.53%
03-02-18-00-00-004.000	Baitz, Phyllis A & Phyllis Anne Baitz	S18 T20 R4 104.00Ac	Residential/Ag	43.37	\$8,229.02	1.49%
03-02-19-00-00-002.001	Baker, Nancy J	S19 T20 R4 2.00Ac	Residential/Ag	2.00	\$379.48	0.07%
03-02-19-00-00-002.002	Bales, Dale R & Jannis E	S19 T20 R4 3.00Ac	Residential/Ag	3.00	\$569.22	0.10%
03-02-08-00-00-024.000	Baltimore, Dennis M	S8 T20 R4 21.83Ac	Residential/Ag	16.33	\$3,098.46	0.56%
01-01-24-00-00-019.000	Barrus, Wilbur A & Cheryl A	S24 T20 R3 1.99Ac	Residential/Ag	1.99	\$377.58	0.07%
01-01-24-00-00-019.002	Barrus, Wilbur A & Cheryl A	S24 T20 R3 2.68Ac	Residential/Ag	2.68	\$508.50	0.09%
03-02-17-00-00-021.000	* Beck Family Limited Partnership	S17 T20 R4 20.00Ac	Residential/Ag	6.00	\$1,138.44	0.21%
03-02-17-00-00-023.000	* Beck Family Limited Partnership	S17 T20 R4 56.75Ac	Residential/Ag	56.75	\$10,767.76	1.95%
03-02-17-00-00-020.000	* Beck Family Limited Partnership	S17 T20 R4 1.03Ac	Residential/Ag	0.55	\$189.20	0.03%
03-02-17-00-00-022.000	* Beck Family Limited Partnership	S17 T20 R4 30.60Ac	Residential/Ag	22.88	\$4,341.26	0.78%
03-02-18-00-00-008.000	* Beck Family Limited Ptn	S18 T20 R4 60.22Ac	Residential/Ag	60.22	\$11,426.14	2.07%
03-02-18-00-00-009.003	* Beck Family Limited Ptn	S18 T20 R4 35.00Ac	Residential/Ag	35.00	\$6,640.90	1.20%
03-02-19-00-00-001.002	* Beck Foundation Inc	S19 T20 R4 77.41Ac	Residential/Ag	77.41	\$14,687.78	2.66%
03-02-18-00-00-006.000	* Becks Superior Hybrids Inc	S18 T20 R4 17.72Ac	Residential/Ag	11.00	\$2,087.14	0.38%
03-02-19-00-00-001.000	* Becks Superior Hybrids Inc	S19 T20 R4 1.67Ac	Residential/Ag	1.67	\$316.88	0.06%
03-02-19-00-00-006.000	* Becks Superior Hybrids Inc	S19 T20 R4 19.50Ac	Residential/Ag	0.30	\$189.20	0.03%
03-02-19-00-00-001.000	* Becks Superior Hybrids Inc	S19 T20 R4 60.24Ac	Residential/Ag	4.24	\$804.50	0.15%
03-02-19-00-00-006.002	* Becks Superior Hybrids Inc	S19 T20 R4 3.15Ac	Residential/Ag	0.50	\$189.20	0.03%
03-02-19-00-00-011.000	* Becks Superior Hybrids Inc	S19 T20 R4 65.63Ac	Residential/Ag	9.01	\$1,709.56	0.31%
03-02-20-00-00-006.000	* Becks Superior Hybrids Inc	S20 T20 R4 35.10Ac	Residential/Ag	1.00	\$189.74	0.03%
01-01-13-00-00-016.000	Bragg, Maria Stahl TR Betty Jo Stahl TR & Maria Stahl Bragg	S13 T20 R3 80.00Ac	Residential/Ag	46.00	\$8,728.04	1.58%
01-01-13-00-00-017.000	Bragg, Maria Stahl TR Betty Jo Stahl TR & Maria Stahl Bragg	S13 T20 R3 40.00Ac	Residential/Ag	21.00	\$3,984.54	0.72%
01-01-24-00-00-001.000	Bragg, Maria Stahl Trustee of Helen H Stahl Trust Agre	S24 T20 R3 40.00Ac	Residential/Ag	31.00	\$5,881.94	1.06%
01-01-24-00-00-002.000	Bragg, Maria Stahl Trustee of Helen H Stahl Trust Agre	S24 T20 R3 52.62Ac	Residential/Ag	52.62	\$9,984.12	1.80%
03-02-18-00-00-009.000	Brittain, Lee L & Allison M	S18 T20 R4 10.00Ac	Residential/Ag	10.00	\$1,897.40	0.34%
03-02-18-00-00-011.101	Brown, Jeffrey D & Cynthia K	S18 T20 R4 2.00Ac	Residential/Ag	2.00	\$379.48	0.07%
03-02-19-00-00-005.001	Chaszar, Frank & Mary Lou	S19 T20 R4 2.00Ac	Residential/Ag	2.00	\$379.48	0.07%
03-02-19-00-00-003.000	Clark, William Ray & Laura A Revocable Living Trust	S19 T20 R4 71.53Ac	Residential/Ag	56.53	\$10,726.00	1.94%
03-02-18-00-00-011.001	Crowley Norma S	S18 T20 R4 18.00Ac	Residential/Ag	18.00	\$3,415.32	0.62%
\$553,162.25 Grand total						

Parcel	Owner	Desc	Rate	Ben	Asmt	% of Total
03-02-08-00-00-023.000	Duvall Bond & Harris LLC	S8 T20 R4 38.99Ac	Residential/Ag	7.00	\$1,328.18	0.24%
03-02-17-00-00-003.000	Duvall Bond & Harris LLC	S17 T20 R4 85.06Ac	Residential/Ag	84.04	\$15,945.76	2.88%
03-02-18-00-00-005.000	Duvall Bond & Harris LLC	S18 T20 R4 60.83Ac	Residential/Ag	30.00	\$5,692.20	1.03%
03-02-17-00-00-002.101	Egler, Joshua	S17 T20 R4 3.00Ac	Residential/Ag	3.00	\$569.22	0.10%
01-01-24-00-00-016.001	Frey, Eric M & Julia E	S24 T20 R3 3.00Ac	Residential/Ag	2.00	\$379.48	0.07%
01-01-24-00-00-006.000	Grinstead, Beverly S Trustee of Beverly S Grinstead Rev Trust	S24 T20 R3 18.00Ac	Residential/Ag	18.00	\$3,415.32	0.62%
01-01-24-00-00-007.000	Grinstead, Beverly S Trustee of Beverly S Grinstead Rev Trust	S24 T20 R3 20.00Ac	Residential/Ag	20.00	\$3,794.80	0.69%
01-01-24-00-00-008.000	Grinstead, Beverly S Trustee of Beverly S Grinstead Rev Trust	S24 T20 R3 40.00Ac	Residential/Ag	40.00	\$7,589.60	1.37%
99-99-99-99-99-999.001	Hamilton County Highway Department	Anthony, Arthur Baker, Dunbar, Salem, 266, 276	Road	84.60	\$16,052.00	2.90%
99-99-99-99-99-999.001	Hamilton County Highway Department	276th Highway Work	Lump Sum	n/a	\$181,544.75	32.82%
03-02-19-00-00-012.000	Hammond Farm Inc	S19 T20 R4 85.00Ac	Residential/Ag	30.00	\$5,692.20	1.03%
03-02-19-00-00-002.000	Hampton, Glenn	S19 T20 R4 2.00Ac	Residential/Ag	2.00	\$379.48	0.07%
03-02-20-00-00-004.000	Hanni, Bradley & Lisa	S20 T20 R4 6.43Ac	Residential/Ag	6.43	\$1,220.04	0.22%
03-02-18-00-00-009.004	Havenwood Homeowners Association Inc	S18 T20 R4 3.44Ac	Residential/Ag	2.30	\$436.40	0.08%
03-02-18-00-00-008.001	Hinderliter, Richard & Diana	S18 T20 R4 14.78Ac	Residential/Ag	14.78	\$2,804.36	0.51%
03-02-20-00-00-003.000	Hoch, Jan L	S20 T20 R4 0.94Ac	Residential/Ag	0.94	\$189.20	0.03%
03-02-19-00-00-005.000	* Hunt Real Estate Limited Liability Company	S19 T20 R4 76.00Ac	Residential/Ag	76.00	\$14,420.24	2.61%
01-01-24-00-00-019.001	* Hunt Real Estate LLC	S24 T20 R3 94.61Ac	Residential/Ag	81.57	\$15,477.10	2.80%
03-02-08-00-00-025.000	Hunter, Wayne Francis & Donna Marie	S8 T20 R4 36.71Ac	Residential/Ag	0.10	\$189.20	0.03%
03-02-17-00-00-001.000	Hurley Cemetery	S17 T20 R4	Residential/Ag	0.21	\$189.20	0.03%
99-99-99-99-99-999.002	Indiana Department Of Transportation	US 31 S18&19 T20 R4 and S13&24 T20 R3	Road	88.11	\$16,718.00	3.02%
01-01-24-00-00-002.001	James, Christie Trustee of Helen H Stahl Trust	S24 T20 R3 8.96Ac	Residential/Ag	8.96	\$1,700.08	0.31%
01-01-24-00-00-002.002	James, Christie Trustee of Helen H Stahl Trust	S24 T20 R3 8.42Ac	Residential/Ag	8.42	\$1,597.62	0.29%
01-01-24-00-00-004.000	James, Christie Trustee of Helen H Stahl Trust	S24 T20 R3 75.00Ac	Residential/Ag	75.00	\$14,230.50	2.57%
03-02-18-00-00-007.000	Kinder, James Don & Mary E Trustee	S18 T20 R4 14.00Ac	Residential/Ag	14.00	\$2,656.36	0.48%
01-01-24-00-00-021.000	Kouns, Paul E	S24 T20 R3 88.56Ac	Residential/Ag	88.06	\$16,708.50	3.02%
03-02-17-00-00-015.000	Lawson, June L	S17 T20 R4 43.04Ac	Residential/Ag	0.75	\$189.20	0.03%
03-02-17-00-00-007.000	Leininger, William & Joyce A	S17 T20 R4 16.87Ac	Residential/Ag	1.50	\$284.62	0.05%
03-02-18-00-00-008.101	Lennis, Brett A & Dawn	S18 T20 R4 5.00Ac	Residential/Ag	5.00	\$948.70	0.17%
01-01-24-00-00-003.000	Matthews, Daniel H & Jan V	S24 T20 R3 1.44Ac	Residential/Ag	1.44	\$273.24	0.05%
03-02-20-00-00-024.000	Morgan, Jeffery R	S20 T20 R4 14.93Ac	Residential/Ag	0.94	\$189.20	0.03%
03-02-20-00-00-005.000	P & N Farms Inc	S20 T20 R4 36.00Ac	Residential/Ag	31.75	\$6,024.26	1.09%
03-02-20-00-00-008.000	P & N Farms Inc	S20 T20 R4 23.66Ac	Residential/Ag	2.00	\$379.48	0.07%
03-02-19-00-00-001.001	Patterson, Markus E & Ruth A	S19 T20 R4 1.14Ac	Commercial	1.14	\$216.30	0.04%
01-01-13-00-00-006.000	R & C Farm Inc	S13 T20 R3 34.30Ac	Residential/Ag	17.30	\$3,282.50	0.59%
01-01-13-00-00-007.000	R & C Farm Inc	S13 T20 R3 1.10Ac	Residential/Ag	0.90	\$189.20	0.03%
01-01-13-00-00-012.000	R & C Farm Inc	S13 T20 R3 40.00Ac	Residential/Ag	40.00	\$7,589.60	1.37%
01-01-13-00-00-013.000	R & C Farm Inc	S13 T20 R3 20.00Ac	Residential/Ag	20.00	\$3,794.80	0.69%
03-02-17-00-00-006.102	Reed, Robert L & Sherrie A	S17 T20 R4 2.09Ac	Residential/Ag	2.09	\$396.56	0.07%

Parcel	Owner	Desc	Rate	Ben	Asmt	% of Total
03-02-18-00-00-009.002	* Riggs, James	S18 T20 R4	Residential/Ag	44.00	\$8,348.56	1.51%
01-01-13-00-00-015.000	Rockwell, Raymond H & Linda Kay	S13 T20 R3	Residential/Ag	30.00	\$5,692.20	1.03%
03-02-20-00-00-001.000	Smith, David Ray & Kyle M	S20 T20 R4	Residential/Ag	1.00	\$189.74	0.03%
01-01-24-00-00-004.001	Stekete, Peter J & Terry Lynn Bowman J/RS	S24 T20 R3	Residential/Ag	5.00	\$948.70	0.17%
03-02-19-00-00-004.000	Stepp, Steven P & Julie A	S19 T20 R4	Residential/Ag	2.38	\$451.58	0.08%
03-02-18-00-00-011.003	Stern, Duane M & Nancy J Waltz Stern	S18 T20 R4	Residential/Ag	1.90	\$360.52	0.07%
03-02-18-00-00-009.001	Stringer, Matthew L & Ruth A	S18 T20 R4	Residential/Ag	2.00	\$379.48	0.07%
03-02-17-00-00-006.202	Thompson, Christopher A	S17 T20 R4	Residential/Ag	3.50	\$664.10	0.12%
03-02-18-00-00-011.000	VanMeter, Mark Todd	S18 T20 R4	Residential/Ag	16.02	\$3,039.64	0.55%
03-02-18-00-00-011.002	VanMeter, Mark Todd	S18 T20 R4	Residential/Ag	1.20	\$227.70	0.04%
03-02-17-00-00-002.000	W Lee Egler Farms Inc	S17 T20 R4	Residential/Ag	121.55	\$23,062.90	4.17%
03-02-17-00-00-006.101	Wallace, Stephen T	S17 T20 R4	Residential/Ag	6.96	\$1,320.60	0.24%
03-02-17-00-00-006.001	Wallace, Stephen Timothy	S17 T20 R4	Residential/Ag	13.93	\$2,643.08	0.48%
03-02-17-00-00-006.002	Wallace, Stephen Timothy	S17 T20 R4	Residential/Ag	52.00	\$9,866.48	1.78%
01-01-24-00-00-010.000	Whitmore, Dickie Lee	S24 T20 R3	Residential/Ag	1.20	\$227.70	0.04%
01-01-24-00-00-005.000	Wiggington, Daniel	S24 T20 R3	Residential/Ag	2.00	\$379.48	0.07%
01-01-24-00-00-016.000	Wilson, William D & Judith K	S24 T20 R3	Residential/Ag	9.00	\$1,707.66	0.31%
01-01-24-00-00-024.000	Wilson, Wm D & Judy K	S24 T20 R3	Residential/Ag	13.00	\$2,466.62	0.45%
01-01-24-00-00-020.001	Wright, Thomas E & Carolyn J Family Trust	S24 T20 R3	Residential/Ag	0.10	\$189.20	0.03%
01-01-24-00-00-020.000	Wright, Thomas E & Carolyn J Family Trust of 1993	S24 T20 R3	Residential/Ag	18.93	\$3,591.78	0.65%
01-01-24-00-00-017.000	Wyant, Greg A & Sheila C	S24 T20 R3	Residential/Ag	5.50	\$1,043.58	0.19%
Parcels: 91 + Lump Sum				1953.88	\$553,162.43	100.00%

Prepared for:



Hamilton County Drainage Board
1 Hamilton Square, Suite 188
Noblesville, IN 46060

President – Steven C. Dillinger
Vice President – Christine Altman
Member – Mark Heirbrandt
Surveyor – Kenton C. Ward

Prepared by:



853 Columbia Road, Suite 101
Plainfield, IN 46168
317-707-3700

August 2015

Project Location

This project is located within the WP Bennett Watershed which covers a 2.8 square mile area in Northern Hamilton County. The project begins in the southwest quarter of Section 8, Township 20N and Range 4E, where it enters Little Cicero Creek. The project continues generally west southwest to the northeast quarter of Section 24, Township 20N and Range 3E, where the tile enters into the open ditch along the west side of U.S. 31. The majority of the drain is located within Jackson Township, though a small portion (860 LFT) of the open drain is within Adams Township. The WP Bennett tile drain begins at the upper end of the open drain. The tile drain is not part of this study.

Existing Conditions

The WP Bennett drain has been petitioned for reconstruction. Field observations viewed in December of 2014 present a drain in need of dipping and tree clearing. In some areas the drain is also too close to public roadways and is recommended to be relocated so the top of bank is at least 15 LFT from edge of the road shoulder. Several areas were observed to have significant sediment compromising both the hydraulic capacity of road crossings and the ability to drain the root zone of the adjacent agricultural lands effectively. An adequately drained root zone relieves stress on plants and also provides aeration to the root system which also increases productivity potential.

An existing conditions hydraulic capacity analysis on the reach has been performed using Hydrologic Engineering Center River Analysis System software (HEC-RAS). Indiana Natural Resource Conservation Service (NRCS) open drain runoff curves were initially used to evaluate the project reach. The results shown in Figure 1.1 indicate that the majority of the ditch does not have adequate agricultural capacity as estimated using Indiana Drainage Runoff Curve 'A' (good protection from overflow, not maximum flood runoff) published by Indiana NRCS.

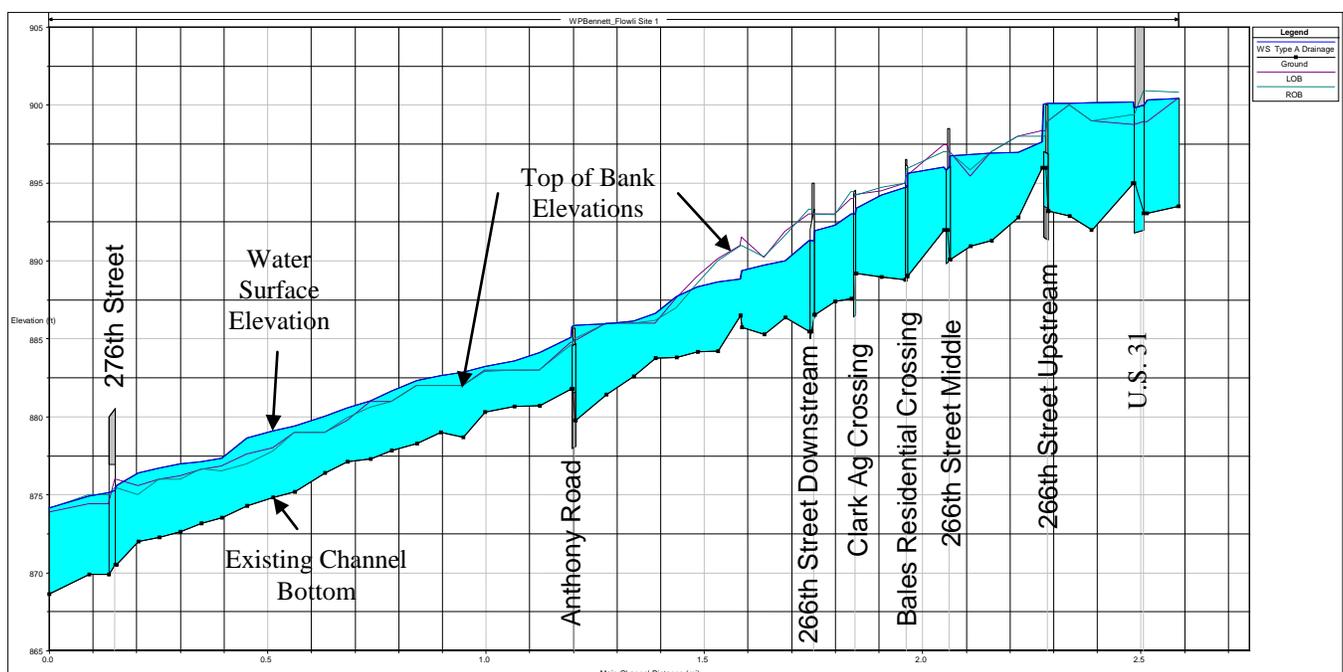


Figure 1.1 Agricultural Type 'A' Drainage Curve Analysis of Existing Conditions

Additionally, to evaluate flooding frequency potential of the channel and roadway overtopping potential crossing sizes, a NOAA Atlas 14 critical duration analysis was completed for the area. Four frequencies were evaluated; 5-Year, 10-Year, 25-Year and 50-Year. The 50% risk of exceedence “All” rainfall distribution was used for the hydrologic analysis. Flow rates at five locations were determined within the project area for the storm return frequencies noted above. The locations are shown in Figure 1.2. Tabulated results for the existing conditions analysis are shown below.

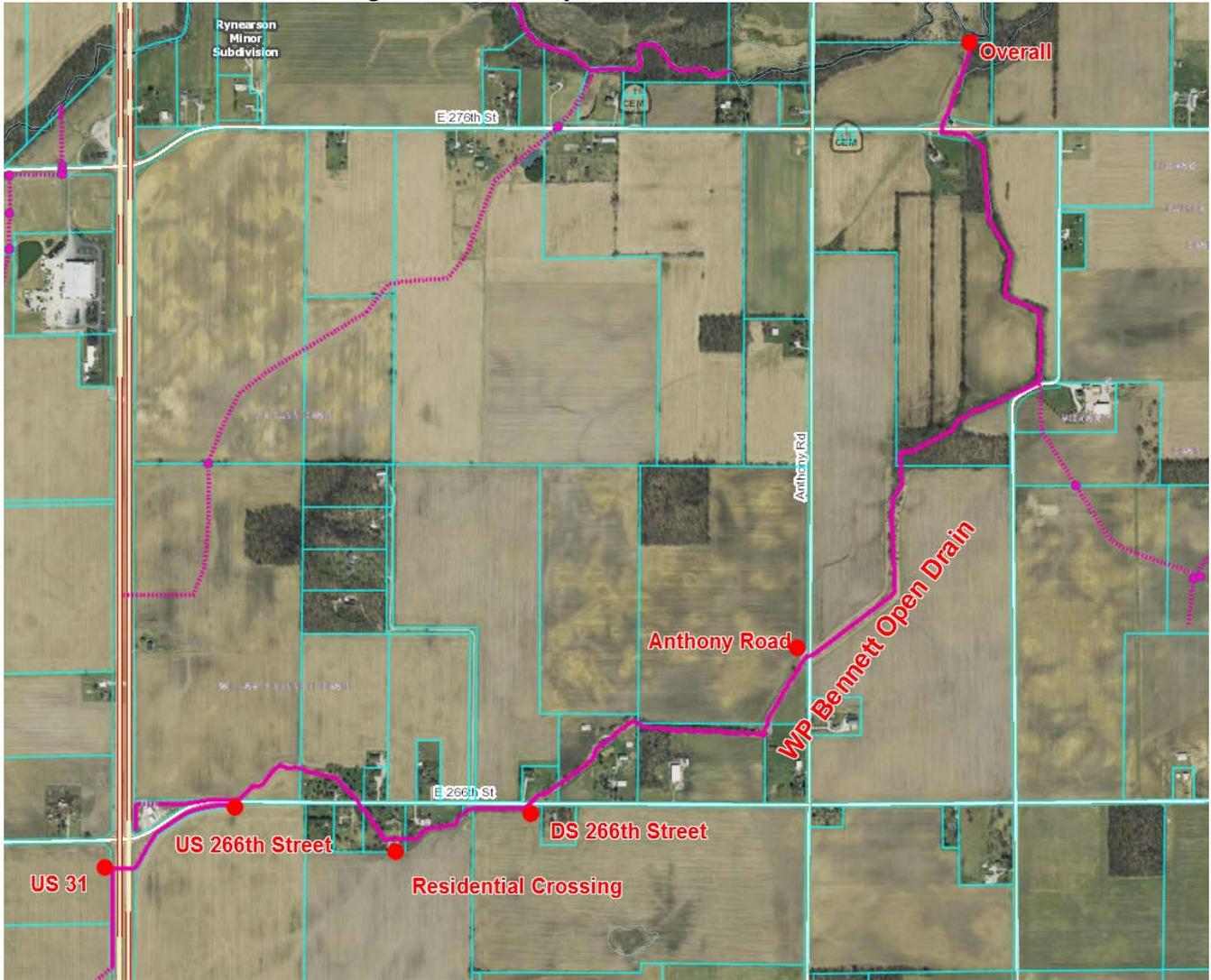


Figure 1.2 Flow rate Locations

Flowrates (cfs)

Location	Type A Drainage	5-Year	10-Year	25-Year	50-Year
Overall (1807 Ac.)	280	390	523	716	895
Anthony Road (1110 Ac.)	209	255	342	469	586
DS 266 th Street (939 Ac.)	189	223	300	410	514
Residential Crossing (872 Ac.)	181	211	283	388	486
US 266 th Street (785 Ac.)	170	195	262	359	450
U.S. 31 (680 Ac.)	156	172	231	317	397

Table 1.1 Flowrates for WP Bennett Drain

Recommended Reconstruction

A new channel is recommended throughout the project area. The recommended bottom width of the new channel varies between 4-feet and 6-feet. The first 4,000-LF of the ditch from the Little Cicero Creek is recommended to have a 6-foot bottom width. The next 3,200-LF upstream of this segment is recommended to have a 5-foot bottom width. The final 6,925-LF of the channel within the project area is recommended to have a 4-foot bottom width. The side slopes of the new channel in all segments is recommended to be 2-foot horizontal for each 1-foot vertical. The recommended slope of the channel within the project limits varies. The recommended slope is 0.16% from the Little Cicero Creek to Anthony Road (a distance of 6,415-LF), 0.2% from Anthony Road to US-31 (a distance of 6,775-LF) and 0.10% from US-31 to the end of the project (a distance of 925-LF). The bottom widths were designed to keep the estimated 5-year flow rates within the ditch banks. Slopes along the reach were set to both match existing inverts of the crossing at the U.S. 31 and eliminate backwater during low flow conditions on tile outlets observed and surveyed along the reach.

The designed channel will pass the NRCS Type 'A' Drainage Curve flowrate for Indiana and the 5- year storm. Storm events exceeding the 5-year event will overflow the channel starting downstream of Anthony Road. Road crossings for the reach vary in design frequency capacity prior to overtopping the roadway. Channel slope and roadway cover limits potential capacity at several of the roadway crossing locations.

The Anthony Road Crossing will pass the lowest frequency at the 10-year flowrate. Both residential crossings and the upstream two 266th Street crossings will pass the 25-year flowrate. The downstream 266th Street crossing, 276th Street crossing and the U.S. 31 crossing will pass the 50-year flowrates. The design proposes to use the existing 276th Street and U.S. 31 crossings. As development occurs within the watershed, the current Hamilton County Stormwater Management Technical Standards Manual release rate restrictions will continue to lessen the potential frequency of road overtopping. Below is a list of the proposed new drain crossings.

Anthony Road: 117" x 79" CMP Pipe Arch, 40 LFT
Downstream 266th Street: 117" x 79" CMP Pipe Arch, 50 LFT
Clark Agricultural: 8.5' Diameter CMP, 24 LFT
Bales Residential: 8.5' Diameter CMP, 26 LFT
Middle 266th Street: 117" x 79" CMP Pipe Arch, 50 LFT
Upstream 266th Street: 117" x 79" CMP Pipe Arch, 50 LFT

References

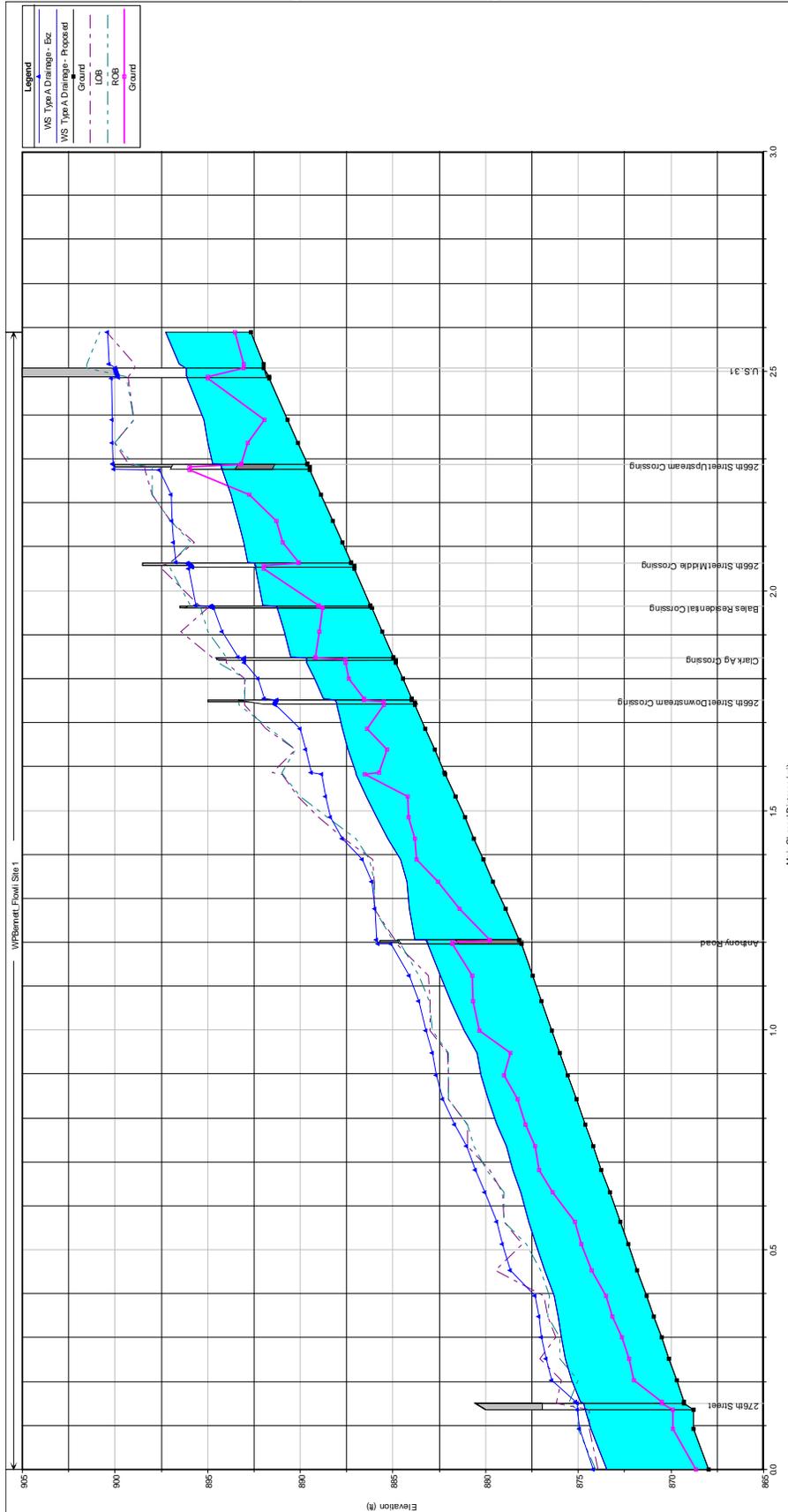
- "Maps, Aerial Photos, & GIS." *Government of Hamilton County Indiana*. Hamilton County Gov., n.d. Web. 20 May 2015.
<<http://www.hamiltoncounty.in.gov/category/subcategory.php?categoryid=65>>.
- "NOAA Atlas 14 Point Precipitation Frequency Estimates." *Hydrometeorological Design Studies Center*. NOAA, n.d. Web. 22 May 2015.
<http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=in>.
- "Web Soil Survey." *Natural Resources Conservation Service*. United States Department of Agriculture, February 2012. Web. 22 May 2015. <<http://websoilsurvey.nrcs.usda.gov/app/>>.

List of Appendices

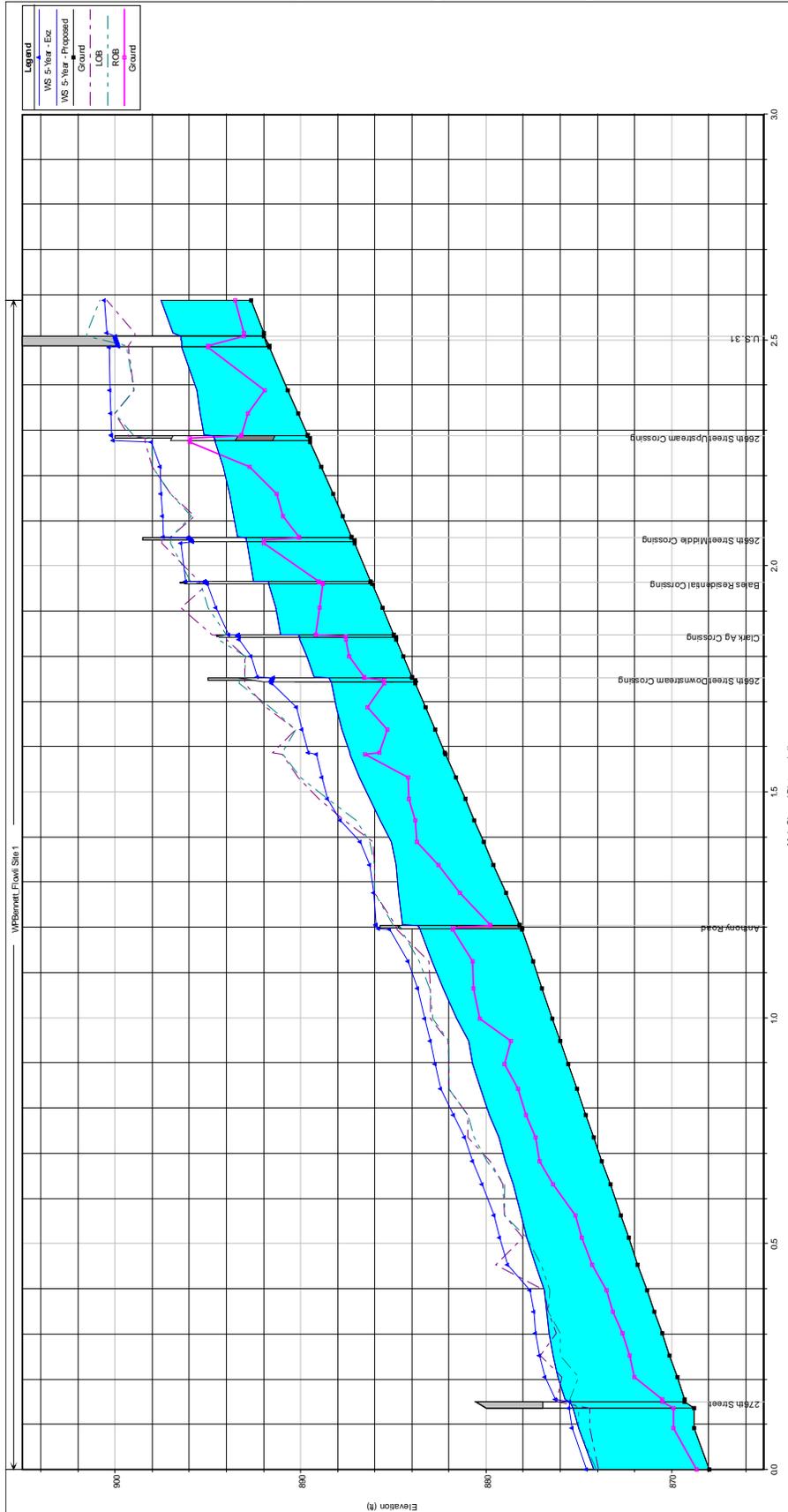
- Appendix A - Calculations
- Appendix B - Cost Opinion
- Appendix C - Photo Log

APPENDIX A - Calculations

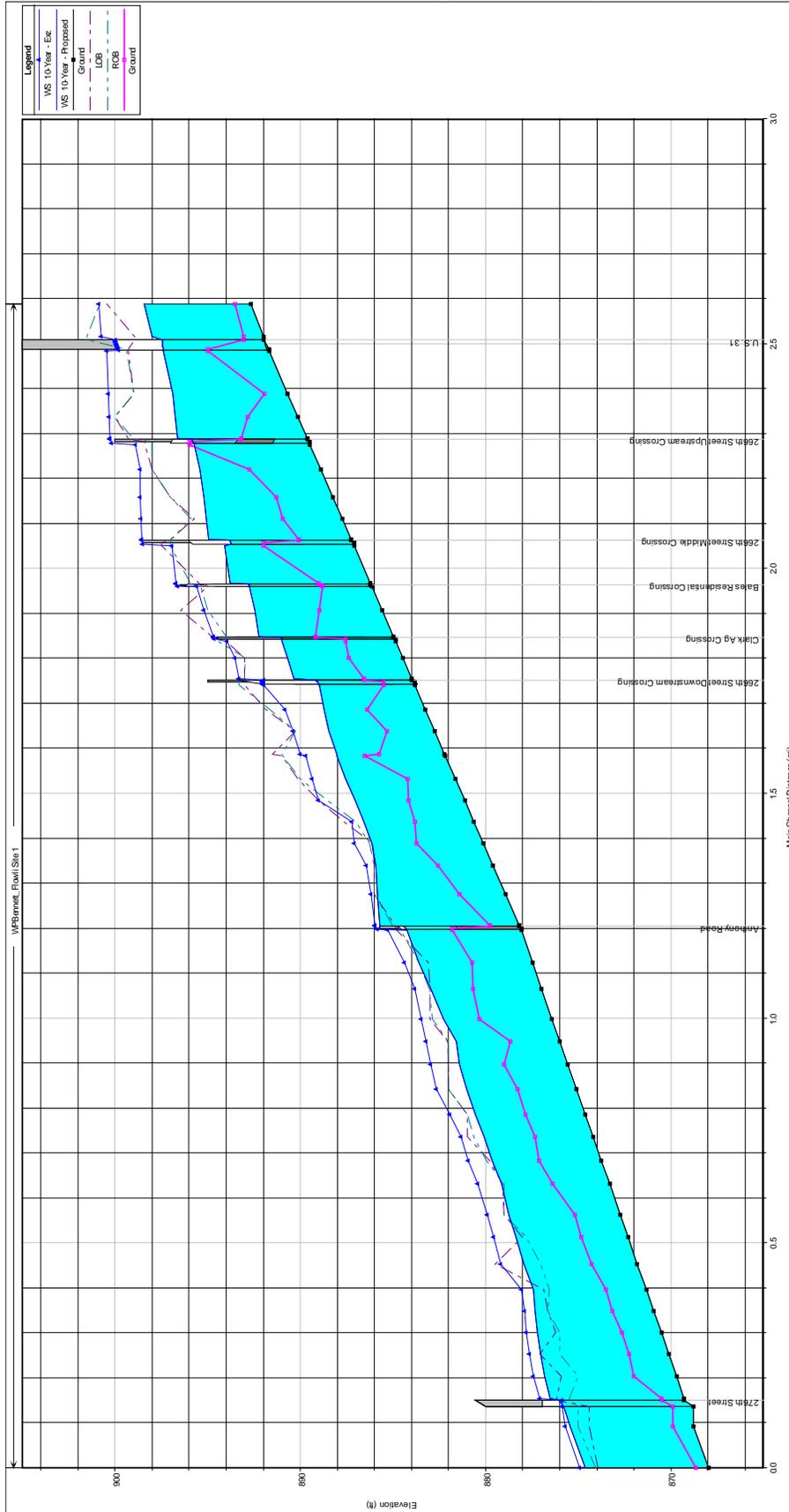
Type 'A' Drainage Curve Existing Versus Proposed



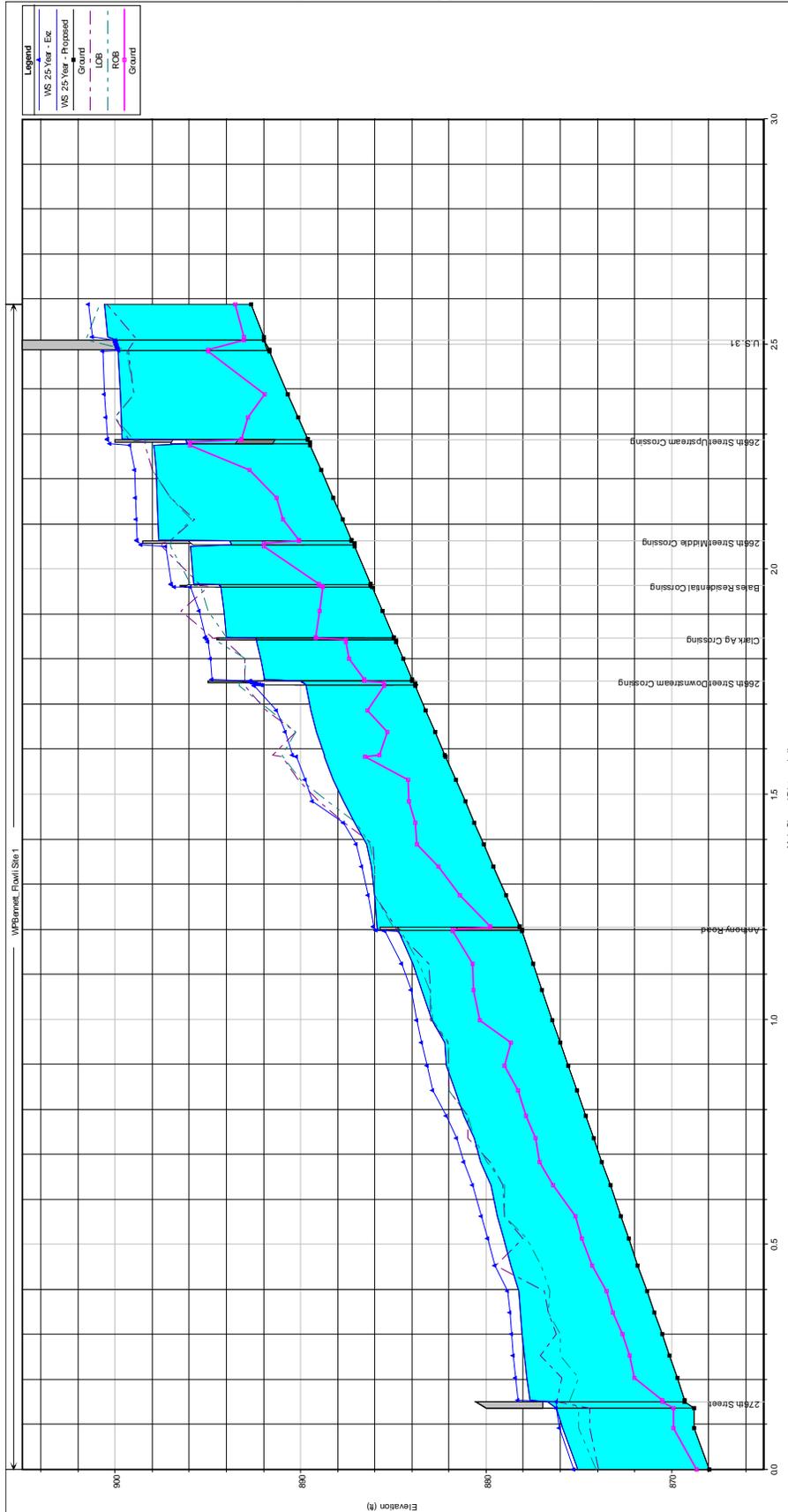
5-Year Analysis Existing Versus Proposed



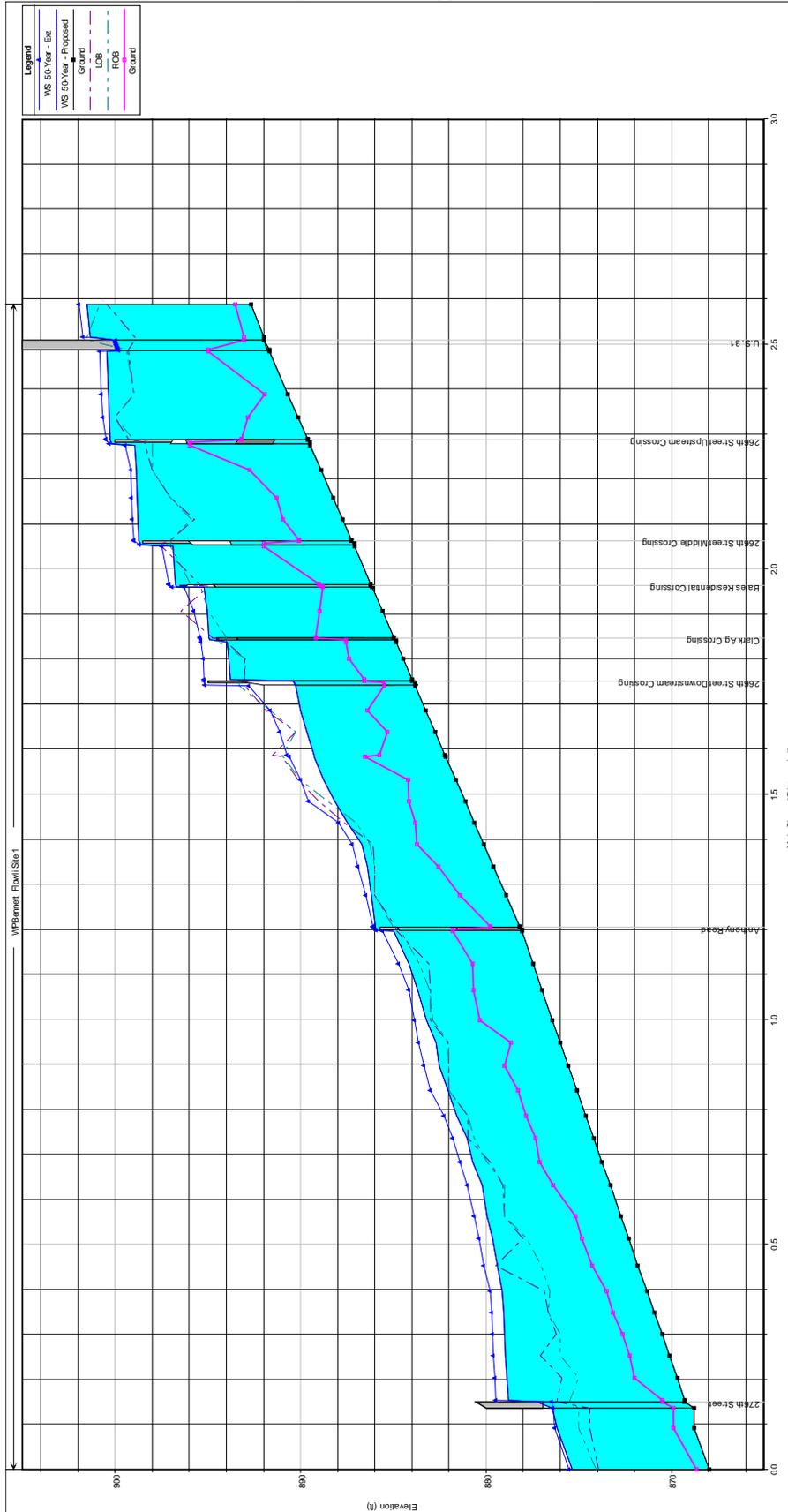
10-Year Analysis Existing Versus Proposed



25-Year Analysis Existing Versus Proposed



50-Year Analysis Existing Versus Proposed



APPENDIX B - Cost Opinion

CONSTRUCTION COST OPINION
for
WP Bennett Reconstruction

Date: 8/28/2015
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Clearing	1	LS	65,000.00	65,000.00
2	Excavate 4' Channel Bottom	6925	LFT	6.30	43,627.50
3	Excavate 5' Channel Bottom	3200	LFT	8.00	25,600.00
4	Excavate 6' Channel Bottom	3555	LFT	9.50	33,772.50
6	Riprap	172	Tons	75.00	12,900.00
7	Seeding Channel Banks	10.8	Acres	2,500.00	27,000.00
8	Seeding Filter Strip	7.0	Acres	1,750.00	12,250.00
9	Surface Water Pipe	8	EA	1,150.00	9,200.00
10	6" x 20' CMP with Animal Guard	5	EA	500.00	2,500.00
11	8" x 20' CMP with Animal Guard	3	EA	525.00	1,575.00
12	10" x 20' CMP with Animal Guard	1	EA	575.00	575.00
13	12" x 20' CMP with Animal Guard	6	EA	625.00	3,750.00
14	15" x 20' CMP with Animal Guard	1	EA	700.00	700.00
15	18" RCP Extension	1	LS	1,500.00	1,500.00
16	Ford Crossing	2	EA	3,000.00	6,000.00
17	8.5' Diam. X 24' CMP w/ backfill	1	EA	12,000.00	12,000.00
18	8.5' Diam. X 26' CMP w/ backfill	1	EA	13,000.00	13,000.00
19	Remove (2) Driveway CMPs	2	EA	1,500.00	3,000.00
20	Driveway Crossing Stone	2	EA	1,000.00	2,000.00
21	Remove and Replace Fences as needed	1	LS	12,500.00	12,500.00
Total					\$ 288,450.00
Contingencies					15% \$43,267.50
Net Total					\$ 331,720.00

Work for County Roads

Item No.	Description	Quantity	Unit	Unit Price	Amount
22	117" x 79" CMP Arch Pipe x 40 LFT w/ backfill	1	EA	\$20,000.00	\$20,000.00
23	117" x 79" CMP Arch Pipe x 50 LFT w/ backfill	3	EA	\$25,000.00	\$75,000.00
24	Sawcut & Remove old culverts	4	EA	\$4,000.00	\$16,000.00
25	6' Channel under 276th Street	135	LFT	\$35.00	\$4,725.00
36	Re-aligned 6' Channel	310	LFT	35.00	10,850.00
27	3' Stone Shoulder (#53s 6" Thick)	172	LFT	7.50	1,290.00
28	Pavement Repair	4	EA	\$7,500.00	\$30,000.00
Total					\$ 157,865.00
Contingencies					15% \$23,679.75
Net Total					\$ 181,540.00

APPENDIX C - Photo Log

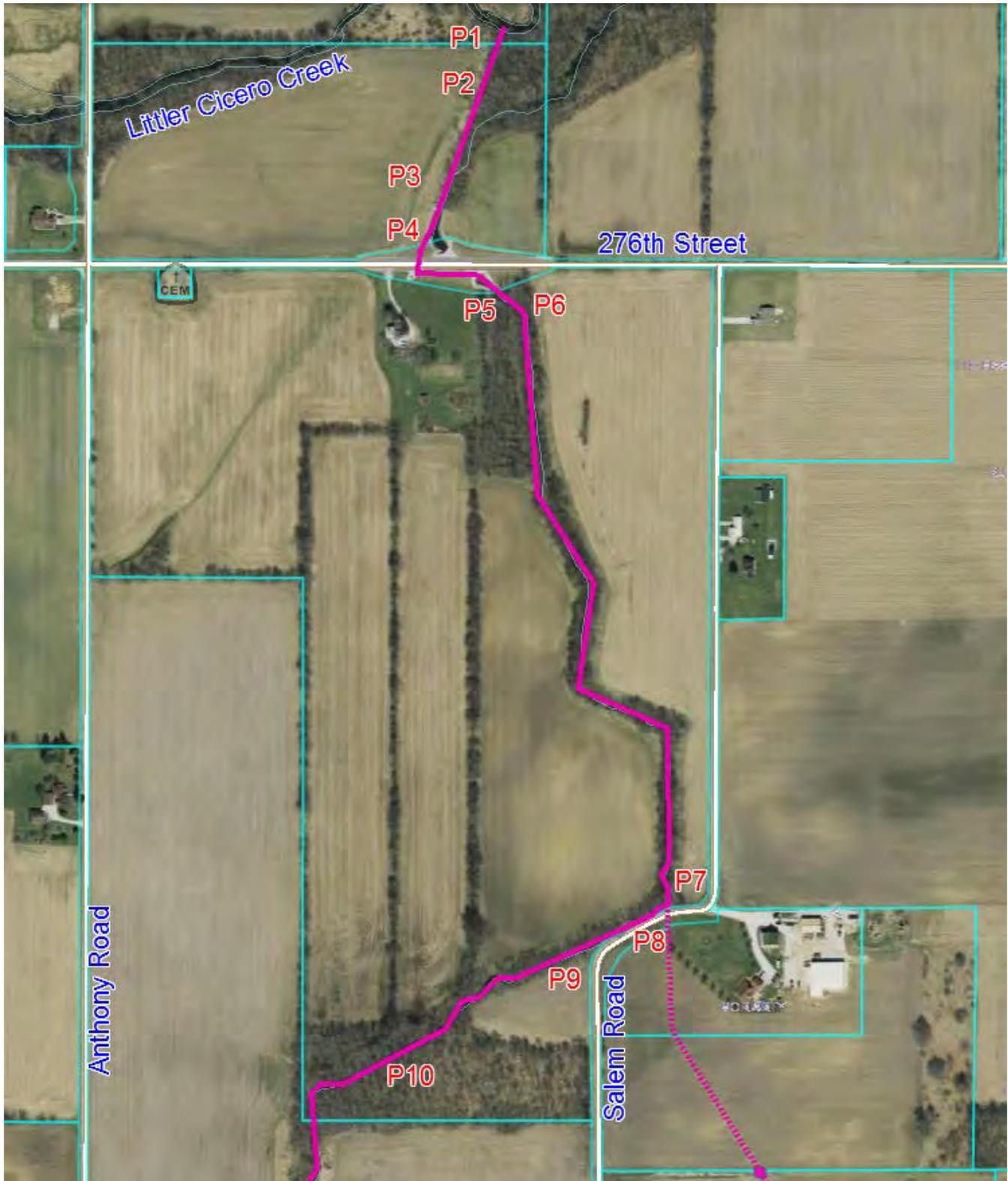


Photo Log Map: Photos P1 to P10



P1: Outlet to Little Cicero Creek



P2: Channel Downstream of 276th Street (Looking upstream)



P3: Overbank Erosion at Station 6+00 (Left Side)



P4: Bridge Under 276th Street



P5: Upstream Face of 276th Street Bridge



P6: Channel Upstream of 276th Street



P7: Outlet of Beck's Relocation Arm Regulated Drain



P8: Ditch Adjacent to Salem Road



P9: Channel Upstream of Salem Road



P10: Existing Ford Crossing on Duvall Bond & Harris LLC Property

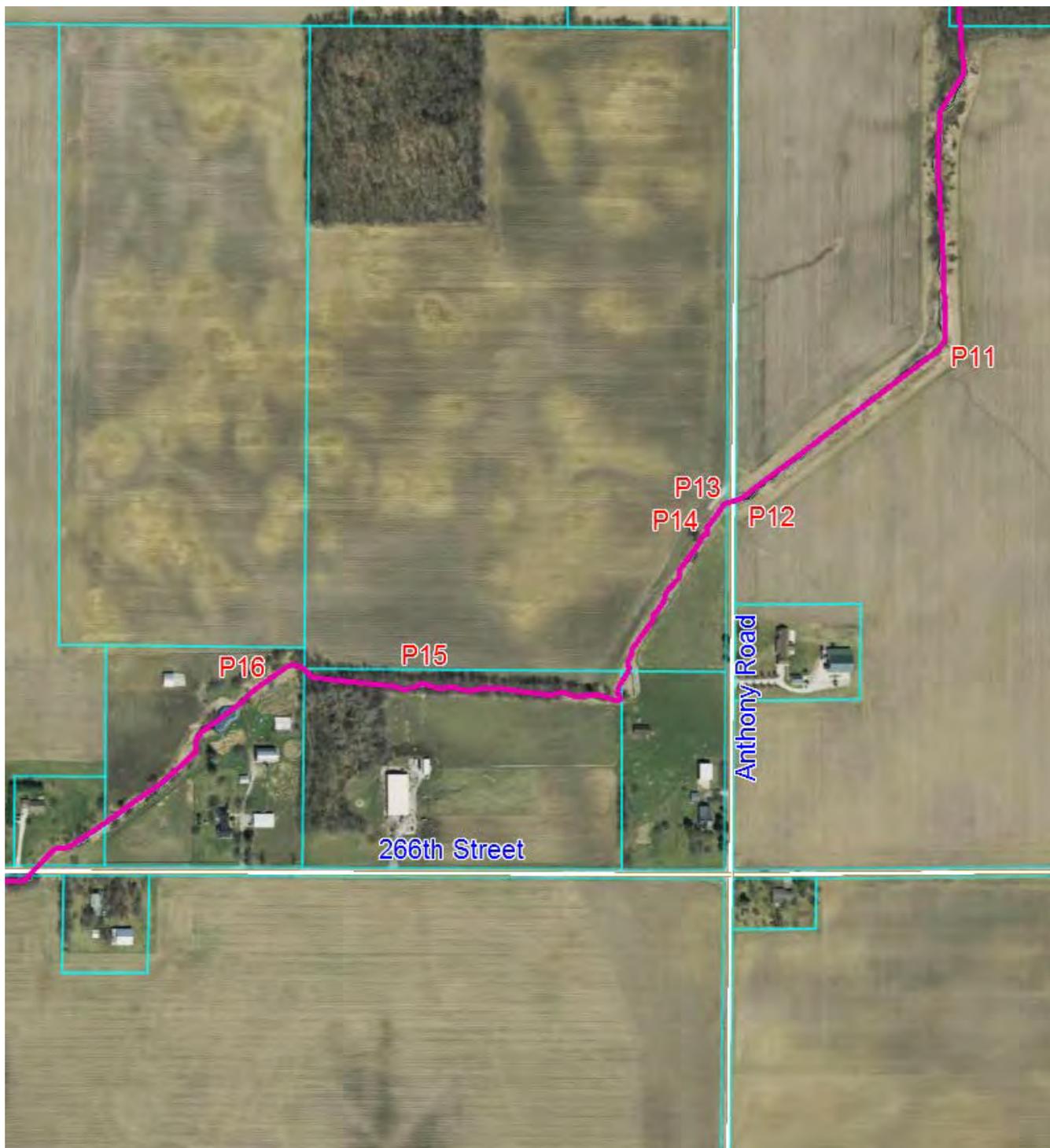


Photo Log Map: Photos P11 to P16



P11: Looking Upstream Towards Anthony Road



P12: Downstream Face of Anthony Road Culvert



P13: Upstream Face of Anthony Road Culvert



P14: Channel Upstream of Anthony Road



P15: Channel on Beck's / Hinderliter Property (Station 77+00)



P16: Channel on Durbin Property (Station 83+00)

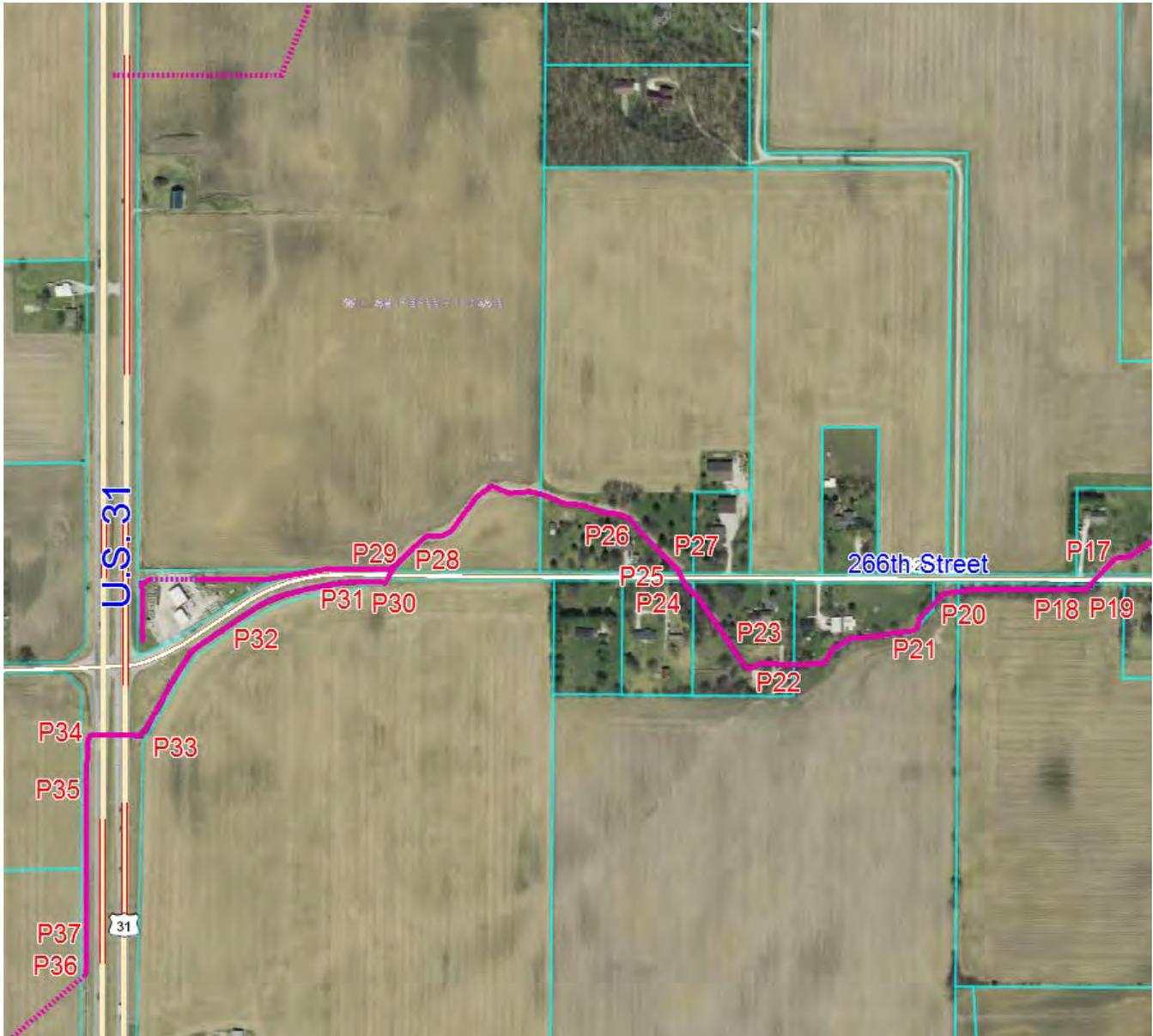


Photo Log Map: Photos P17 to P37



P17: Downstream Face of Downstream 266th Street Crossing



P18: Channel Upstream of 266th Street Crossing (Station 94+00)



P19: Submerged Outlet just Upstream of 266th Street (Station 93+31)



P20: Private Crossing on Clark Property (Station 98+00)



P21: Channel on Stepp Property (Station 100+00)



P22: Private Crossing on Bales Property (Station 104+50)



P23: Channel Upstream of Private Bales Crossing



P24: Downstream Face of Middle 266th Street Crossing



P25: Looking Downstream from 266th Street Middle Crossing



P26: Looking Upstream from Middle 266th Street Crossing



P27: Upstream Face of Middle 266th Steet Crossing



P28: Downstream Face of Upper 266th Street Crossing



P29: Looking Downstream from Upper 266th Street Crossing



P30: Looking Upstream from Upper 266th Street Crossing



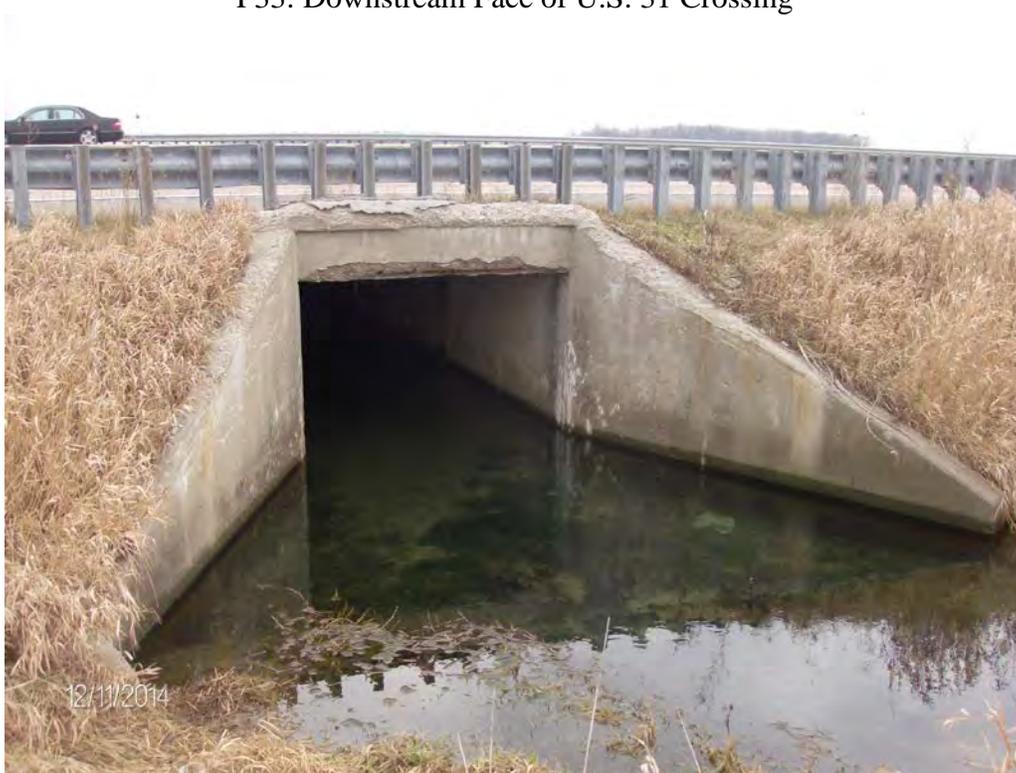
P31: Upstream Face of 266th Street Upper Crossing



P32: Channel Upstream of 266th Street



P33: Downstream Face of U.S. 31 Crossing



P34: Upstream Face of U.S. 31 Crossing



P35: Channel within U.S. 31 ROW



P36: WP Bennett Tile Outlet (Submerged)



P37: Looking Downstream from Tile Outlet (Beginning of Open Drain)