

Prepared for:

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Submitted to:
Hamilton County Drainage Board
Attn: Kenton C. Ward
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Prepared by:


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February 26, 2014

Project Location

This project is located within the Cool Creek Overall Watershed. The William Knight Regulated Drain tile serves an area of 110.5 acres within western Hamilton County. The drain is located within the City of Westfield, and Washington Township. The regulated tile drain is more specifically located within Section 11, Range 3 East and Township 18 North. The proposed reconstruction begins at the outfall of the tile drain and proceeds upstream 3,357 linear feet to parcel number 08-09-11-00-00-013.002 currently deeded to Klingensmith, David W. & Judith O.

History

The existing William Knight Regulated Tile Drain is the primary discharge point for the 110.5 acre watershed it serves. The original drain was constructed in 1903 of clay tile and ranges in size from 10" to 15". The primary use of the drain at the time of construction was agricultural drainage. Over the years, several small developments and residential houses have replaced the agricultural land within the watershed. Several portions of the drain have been replaced as upgrades for this development, but the tile sizes have not been increased.

Current Conditions

The clay tile has reached its use life. Field reconnaissance in December 2014 found numerous large blow holes and countless other starts of blow holes. The areas of the drain that have been upgraded appear to be in reasonable condition, but flooding debris was noted in the area upstream of the grass air strip on Ferraro. This appears to be due to the undersized capacity of the drain to serve as the primary stormwater outlet of the watershed. One other item of significance was noted in correspondence with the Surveyor's Office, there is a 20 inch City of Westfield / Citizens waterline running under or just to the north of approximately 1,300 linear feet of the drain. It has been reported that when the waterline was installed it hit the drain in several locations requiring repair. The location of the waterline can be found on the reconstruction plans provided separate of this report.

It has been determined that the William Knight Regulated Tile Drain is neither in the condition nor has the hydraulic capacity to adequately serve the watershed it drains. Development pressure is occurring within the watershed, and this reconstruction proposal and report is being submitted to provide an adequate outlet for the watershed and furthermore a 7 acre development at the southeast corner of 161st Street and Springmill Road. The existing tile drain has a CFS / Acre capacity of between 0.03 and 0.06. with the vast majority of the drain being less than 0.05 CFS/Acre. The maximum existing gravity capacity of the drain is 4.7 CFS.

Reconstruction

The reconstruction proposed has flowrates based on the current 100-year allowable discharge (0.3 CFS/Acre) within the Hamilton County Stormwater Technical Design Manual (2009). The alignment of the proposed reconstruction will predominately follow the current alignment of the drain. The drain will be offset south 10 feet outside the waterline easement to lessen the frequency of conflicts along the 1,300 linear feet of parallel pipe. At the west end of the drain where the existing drain turns south an arm will be added to the northwest to access the proposed development. Additionally an arm will cross the waterline to tie in a private tile from 161st Street that passes through the Marcum, James C & Doris N, Rev, Liv, Tryst parcel.

The reconstruction proposed enlarges the tile drain outlet to a 30 inch pipe at a 0.56% slope (33.2 CFS). From the outlet, the pipe will become smaller as less area is draining to it. The most upstream pipe size is 18 inches. The drain will be lowered enough through the reach to adequately serve future development likely to occur within the watershed. Pipe material will be HDPE perforated smooth interior within agricultural areas and reinforced concrete pipe in other locations. Several manholes will be added to the drain to allow for visual evidence of the drain location, surface water inflow, and ease of maintenance. The manholes will be placed strategically to maximize their effectiveness and minimize agricultural disturbance.

The existing waterline will be crossed over the top of in (2) locations. It is important to have the contractor verify the depth of the waterline by potholing at these two locations prior to beginning construction. The waterline depth was not able to be surveyed with this report and plan. Conversations with Citizens staff estimate the waterline depth to be a standard 4.5' to 5' deep (cover). If the waterline was placed at an elevation shallower than local standard requirements it will be necessary to lower the waterline. The estimated construction cost for the proposed reconstruction as attached is \$349,076.

An alternative that lowered the tile elevation enough to go under the 20 inch waterline was explored. This alternative was deemed excessive in cost. Construction costs were estimated to increase 35,000 more to lower the pipes to the necessary elevations. There is additional uncertainty with lowering the pipe for the length required for clearance. The additional depth needed for clearance is enough to raise concerns of sand or gravel seams as noted in several other areas of the county at these depths. This could greatly increase costs of construction beyond the \$35,000 estimated. No soil borings were completed as part of this reconstruction report. The Soil Survey of Hamilton County, Indiana was referenced.

Calculations to support the design are contained in Appendix A.

A detailed construction cost opinion is included in Appendix B.

References

- "Hamilton County Stormwater Management Technical Standards Manual." Hamilton County Gov., Jan. 2009. Web. 22 December 2014. <http://www.hamiltoncounty.in.gov/egov/documents/1321628191_98613.pdf>.
- "Maps, Aerial Photos, & GIS." *Government of Hamilton County Indiana*. Hamilton County Gov., n.d. Web. 22 December 2014. <<http://www.hamiltoncounty.in.gov/category/subcategory.php?categoryid=65>>.
- "Web Soil Survey." *Natural Resources Conservation Service*. United States Department of Agriculture, February 2012. Web. 22 December 2014. <<http://websoilsurvey.nrcs.usda.gov/app/>>.

List of Appendices

- Appendix A - Calculations
- Appendix B – Construction Cost Opinion
- Appendix C - Photo Log
- Appendix D - Watershed Map

APPENDIX A - Calculations

Existing Conditions

WILLIAM KNIGHT RECONSTRUCTION DESIGN CALCULATIONS -EXISTING CONDITIONS ANALYSIS CFS/ACRE ESTIMATE-												
PROJECT: William Knight Tile Existing												
COMPUTED BY: JLM												
JOB #: 07053												
DATE: 12/31/14												
Pipe Type: Corrugated Metal Clay Tile												
n-value Used: 0.024 0.015												
ACRES DRAINING BASIN TOTAL	STRUCTURE		CFS per Acre	L (ft)	DIA. (in)	SLOPE %	CAP. Q (cfs)	VEL. (ft/s)	RIM ELEV.		INVERT ELEV.	
	FROM	TO							UP	hamilt	UP	DOWN
18.5	43.7	105	104	1500	10	0.63	1.51	2.77	898.50	892.00	899.09	889.64
0	68.8	104	103	315	15	0.30	3.08	2.51	892.00	892.00	889.64	888.69
0	68.8	103	102	63	15	0.65	2.83	2.31	892.00	891.00	888.69	888.28
9.9	78.7	102	101	106	15	0.40	3.56	2.90	891.00	891.00	888.28	887.86
5.2	83.9	101	100A	691	15	0.70	4.70	3.83	891.00	887.50	887.86	883.02
26.6	110.5	100A	100	360	15	0.70	4.70	3.83	887.50	880.50	883.02	880.50

Proposed Reconstruction

WILLIAM KNIGHT RECONSTRUCTION DESIGN CALCULATIONS -PIPE DESIGN 0.30 CFS/ACRE-													
PROJECT: William Knight Reconstruction		COMPUTED BY: JLM											
JOB #: 07053		Pipe Type: Concrete											
DATE: 12/31/14		n-value Used: 0.013											
CFS/ACRE= 0.3		HDPE / PVC											
		0.012											
ACRES DRAINING BASIN TOTAL	STRUCTURE		DESIGN Q (cfs)	L (ft)	DIA. (in)	SLOPE %	CAP. Q (cfs)	VEL. (ft/s)	RIM ELEV.		INVERT ELEV.		COVER (ft)
	FROM	TO							UP	DOWN	UP	DOWN	
21.1	112	105	6.33	43	18	0.37	6.94	3.93	893.00	893.00	888.98	888.82	2.33
17.8	111	110	5.34	509	18	0.26	5.37	3.04	904.00	900.00	897.48	896.16	4.83
7.4	110	109	7.56	44	18	0.52	8.23	4.66	900.00	899.70	896.16	895.93	2.15
6	109	108	9.36	289	18	0.73	9.75	5.52	899.70	898.00	893.93	891.82	4.08
12.5	108	107	13.11	403	24	0.29	13.26	4.22	898.00	895.50	891.32	890.15	4.45
0	107	106	13.11	291	24	0.29	13.26	4.22	895.50	894.50	890.15	889.31	3.12
0	106	105	13.11	282	24	0.35	14.55	4.63	894.50	893.00	889.31	888.32	2.96
0	105	104	19.44	115	24	0.80	20.29	6.46	893.00	891.50	888.32	887.40	2.45
4	104	103	20.64	170	24	0.90	21.52	6.85	891.50	891.50	887.40	885.87	1.87
0	103	102	20.64	63	24	0.90	21.52	6.85	891.50	891.00	885.87	885.30	3.40
9.9	102	101	23.61	106	24	1.10	23.81	7.58	891.00	891.00	885.30	884.13	3.47
5.2	101	100A	25.17	691	30	0.32	25.23	5.14	891.00	887.50	883.63	881.42	4.58
26.6	100A	100	33.15	346	30	0.56	33.23	6.77	887.50	879.50	881.42	879.50	3.29

APPENDIX B – Construction Cost Opinion

Construction Cost Opinion

Item	Description	Unit	Quantity	Unit Price	Amount
1	30" HDPE Perforated w/ Backfill	LFT	1037	\$79.00	\$81,923.00
2	24" RCP w/ Backfill (within 5')	LFT	39	\$74.00	\$2,886.00
3	24" RCP w/ Backfill (outside 5')	LFT	415	\$66.00	\$27,390.00
4	24" HDPE Perforated w/ Backfill	LFT	976	\$61.00	\$59,536.00
5	18" RCP w/ Backfill (outside 5')	LFT	509	\$60.00	\$30,540.00
6	18" PVC SDR 21 w/ Backfill	LFT	87	\$100.00	\$8,700.00
7	18" HDPE Perforated w/ Backfill	LFT	289	\$55.00	\$15,895.00
8	Manholes w/ Castings 4'	EA	10	\$4,000.00	\$40,000.00
9	Manholes w/ Castings 5'	EA	2	\$5,000.00	\$10,000.00
10	Existing Manhole Removal	EA	4	\$750.00	\$3,000.00
11	Flowable Fill at Waterline	EA	2	\$500.00	\$1,000.00
12	Destroying and Removing old Pipe	LFT	2804	\$1.50	\$4,206.00
13	Seeding & Mulching	LS	1	\$7,500.00	\$7,500.00
14	Tree removal	LS	1	\$3,500.00	\$3,500.00
15	Stone Driveway Repairs	EA	2	\$2,000.00	\$4,000.00
16	Fence Repairs	LS	1	\$3,500.00	\$3,500.00
				Subtotal	\$303,576.00
17			Contingency	15.00%	\$45,500.00
				Total	\$349,076.00

APPENDIX C - Photo Log

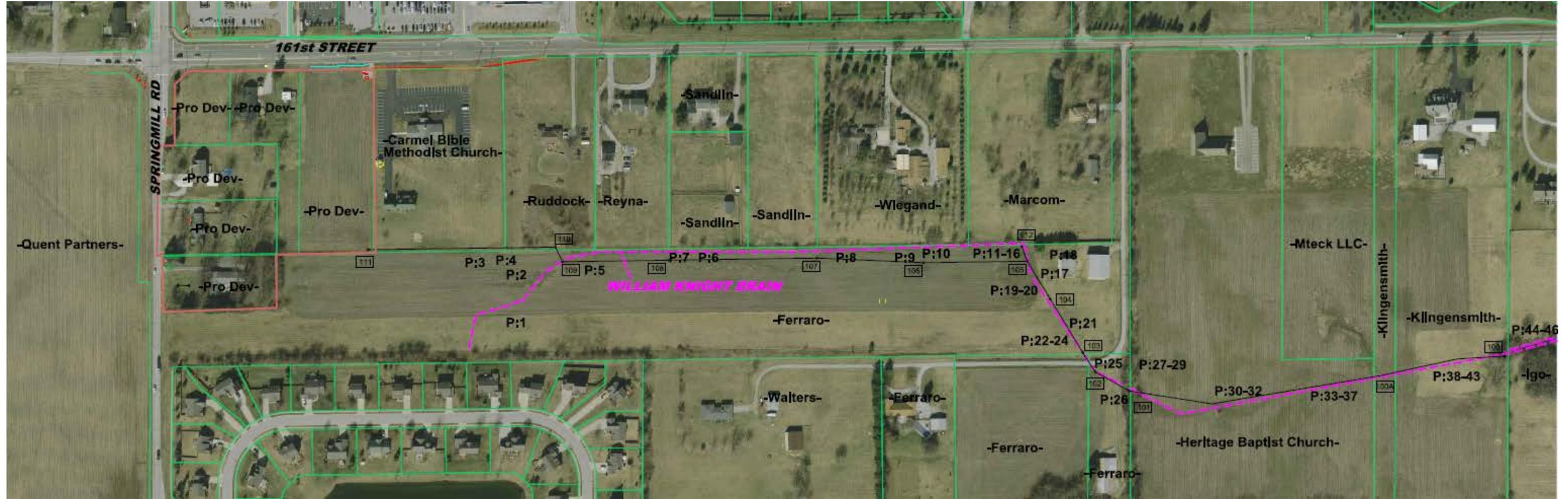


Photo Log Map

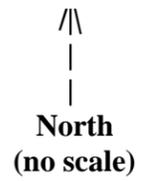




Photo #1 – Looking northeast from upper end of drain “along alignment”.



Photo #2 – Looking west from upper end of drain “unregulated”.



Photo #3 – Private tile hole 240' +/- from regulated drain.



Photo #4 – Looking east from eastern property line of proposed development.



Photo #5 – Looking east from future structure #109.



Photo #6 – From south of Sandlin property looking west.



Photo #7 – “Same as above” looking east.



Photo #8 – Surface water erosion due to broken down tile / lack of capacity.



Photo #9 – From south side of Wiegand property looking west more erosion.



Photo #10 – Tile blow hole.



Photo #11 – Start of tile blow hole and surface erosion.



Photo #12 – Root infiltration into tile and blow hole just south of Marcum property.



Photo #13 – Another start of a blow hole south of Marcum property.



Photo #14 – From south of Marcum property looking west.



Photo #15 – Looking north onto Marcum property at (3) large blow holes on mutual drain.



Photo #16 – Large blow hole on Marcum property mutual drain.



Photo #17 – Looking north to future structure 112.



Photo #18 – Looking at structure to be replaced with structure 112.



Photo #19 – Looking south to grass airstrip along drain line; notice flood debris line.



Photo #20 – Marked blow hole just north of grass airstrip.



Photo #21 – Looking north from airstrip; notice flood debris line.



Photo #22 – Looking south from airstrip. (2) more blow holes.



Photo #23 – Upclose shot of blow hole south of airstrip.



Photo #24 – Structure to be replaced with structure #103; notice infiltration on side.



Photo #25 – Wooden fence between structures 103 & 102, gravel drive.



Photo #26 – Drain marker and inlet along Ferraro/Heritage Baptist Church property line.



Photo #27 – Structure to be replaced with structure 101; notice side infiltration.



Photo #28 – Tile sedimentation just downstream of structure 101.



Photo #29 – Looking downstream from structure 101.



Photo #30 – Tile blow hole in middle of Heritage Baptist Church property.



Photo #31 – Looking east in middle of Heritage Baptist Church property.



Photo #32 – Looking west in middle of Heritage Baptist Church property



Photo #33 – One of the numerous tile holes on the eastern half of the Heritage Baptist Church property.



Photo #34 – One of the numerous tile holes on the eastern half of the Heritage Baptist Church property.



Photo #35 – One of the numerous tile holes on the eastern half of the Heritage Baptist Church property.



Photo #36 – One of the numerous tile holes on the eastern half of the Heritage Baptist Church property.



Photo #37 – One of the numerous tile holes on the eastern half of the Heritage Baptist Church property.



Photo #38 – One of the numerous tile holes on Klingensmith property.



Photo #39 – One of the numerous tile holes on Klingensmith property.



Photo #40 – Looking west from Klingensmith property.



Photo #41 – One of the numerous tile holes on Klingensmith property.



Photo #42 – One of the numerous tile holes on Klingensmith property.



Photo #43 – One of the numerous tile holes on Klingensmith property.



Photo #44 – Current tile outlet, notice submerged.

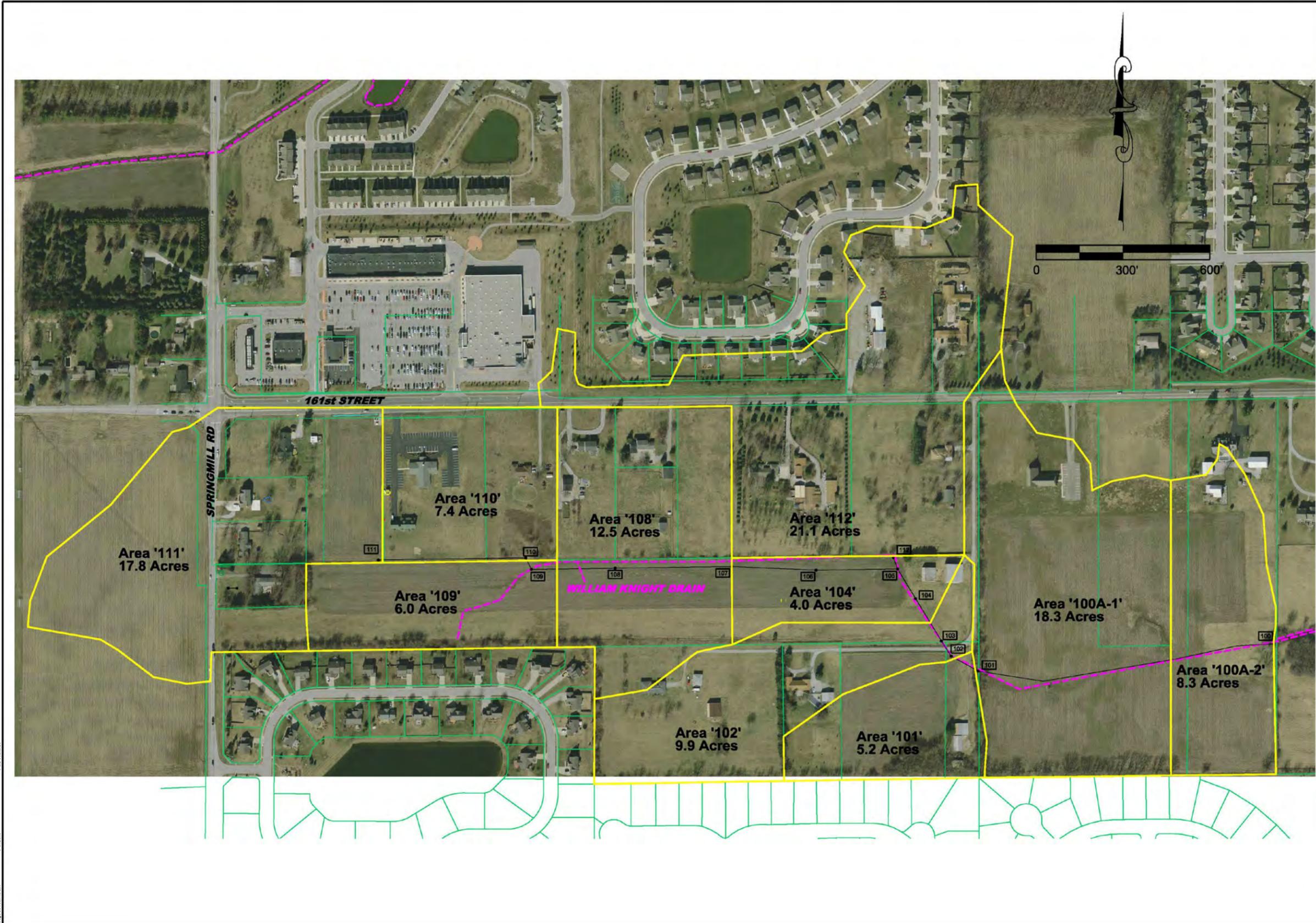


Photo #45 – Looking downstream of tile outlet.



Photo #46 – Concrete rubble tile on Klingensmith property.

APPENDIX D – Watershed Map



02/20/2015
SCALE: 300.0000 1/8"
PROJECT NUMBER:
FORMET
FILE NAME:

DATE	
REVISIONS	
DATE	
BY	
DESCRIPTION	
DESIGNED: JLM	
DRAWN: JLM	
CHECKED: JLM	
SCALE: AS SHOWN	
DATE: 12/15	

**INTERNAL DRAINAGE BASINS
WILLIAM KNIGHT RECONSTRUCTION
CITY OF WESTFIELD
HAMILTON COUNTY, INDIANA**

NOT FOR CONSTRUCTION

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Project No: 07053
Sheet No:
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