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MEMORANDUM

DATE: June 22, 2023
TO: City of Washington, IL
FROM: Howard Hamilton, PE, CFM, CPESC
SUBJECT: Alternative Analysis, Draft Concerns/Updates and
Smoke Test Discussion
HCE # 21911

ALTERNATIVE ANALYSIS

In response to the City's questions regarding Alternatives Analysis prepared by Hamilton Consulting Engineers, Inc. (HCE), we are pleased to provide additional context and answers to the Council. It is our understanding that the Council met to discuss the report on Monday, March 20, 2023, and expressed the following concerns:

1. Apparent errors and/or discrepancies with the Preliminary Engineer's Opinion of Probable Construction Costs (PEOPCC) for both the L-1 and E-3 alignments.
2. Revisions to Alignment E-3 from the original location proposed by Aptim/Goat Springs, LLC.

Background

HCE completed the first, *Draft* version, of the analysis, titled the "Farm Creek Trunk Sewer 3rd Party Alignment Analysis" on February 15, 2022, and presented our finding to the City Council on February 21, 2022. As outlined in our proposal and through discussions with City staff, HCE would present a draft version of the analysis to the city, finalize the report over the next one to two weeks, and then release a final version for public review and comment. While the substance of the final version would not change in a material way from the draft version, the estimates, exhibits, and text would continue to be refined, and input from the Council and City staff would be incorporated. At the direction of the city, HCE ceased all work after presenting to Draft version to the Council and HCE made no further edits.

Estimates

Specifically, the factor resulting in apparent errors is the draft nature of both the estimate and plans, specifically regarding the method of construction for each length of sewer.

Engineering is an iterative process involving trial runs, estimates and analyses, and then revisions. Through this process, HCE laid out the L-1 and E-3 alignments, provided manholes at key locations, and identified obvious locations where construction would use directional boring (at extreme sewer depths) or jack and bore methods (at sensitive crossings like creeks and railroads). This information was conveyed on the Plan and Profile drawings for each alignment.

The next step was to prepare a Preliminary Engineer's Opinion of Probable Construction Costs (PEOPCC). As part of the iterative design process, developing the PEOPCC would allow for a closer inspection of each manhole and pipe segment, including further refining of where trenchless construction methods are best suited.

To a certain depth, constructing sewers via open cutting is a more affordable process than using trenchless methods (directional bore and jack and bore). This is accurately reflected in our estimates and the first version of the plans prioritized using this method. However, at depths exceeding approximately 22-24 feet, open cutting becomes much more difficult and costly.

Excavators used for sewer construction can dig approximately 12 to 14 feet in depth. At this or shallower depths, construction activities have a small area of disturbance needing only space for the excavator and a six-foot wide trench. However, after this depth, the excavation must be benched, meaning that a plateau must first be dug to lower the excavator and extend the depth it can reach. The amount of earthwork, backfill and area of disturbance increases substantially. In addition, greater and more expensive trench protection and fall protection measures are needed to shore up the walls and make the excavation safe for human occupancy during construction. Between 12-14 feet and 22-24 feet, only one benching is necessary and open cutting is typically still cheaper than trenchless methods.

At approximately 22 feet, a second benching is needed. This roughly doubles the disturbed area, excavated material, and backfill, and further increases the safety precautions needed. It is also more time-consuming, further increasing costs. At this depth and beyond, trenchless methods become the cheaper, safer option.

However, for relatively large diameter sewer pipes (8-inches and larger) directional boring requires a gently sloping trench to daylight, or a long and wide enough trench to allow butt-fusing of at least two lengths of flexible pipe. The size of this trench can make bore and jacking which involves a rigid casing pipe a more attractive option.

Through development of the PEOPCC additional lengths of sewer were correctly identified as requiring directional boring. These were reflected in the PEOPCC; however, the draft plans did not receive an additional design iteration as our firm was then instructed to cease work on the contract. This caused the estimate to have discrepancies when compared to the plans.

At the City's request, HCE has since reviewed the estimates and plans, and further progressed both draft versions to bring them into agreement. We have also refined the Preliminary Engineer's Opinion of Probable Construction Costs. The results are a decrease of approximately 10% as follows:

Alignment	PEOPCC 02/15/2022 Draft	PEOPCC 06/12/2023 Draft	Variance
L-1	\$10.98m	\$9.57m	-13% (\$1.41m)
E-3	\$12.58m	\$11.85m	-5.8% (\$730k)

It should be noted that these remain preliminary opinions of cost for aid in selecting a chosen alternative and, while useful for budgeting, require complete engineering and design to be considered final.

Alignment E-3 Routing

As noted during the March 20, 2023 City Council Meeting, and discussed on page 27 of the “Farm Creek Trunk Sewer 3rd Party Alignment Analysis”, prepared by HCE, the alignment of the E-3 sewer routing presented in the report differs from that originally recommended by Aptim/Goat Springs, LLC. In our professional opinion, the shift was done to better the proposed alignment in cost, ease of construction, acquisition of easements, impact upon future use of the properties, and ability to extend service to the sewer in the future.

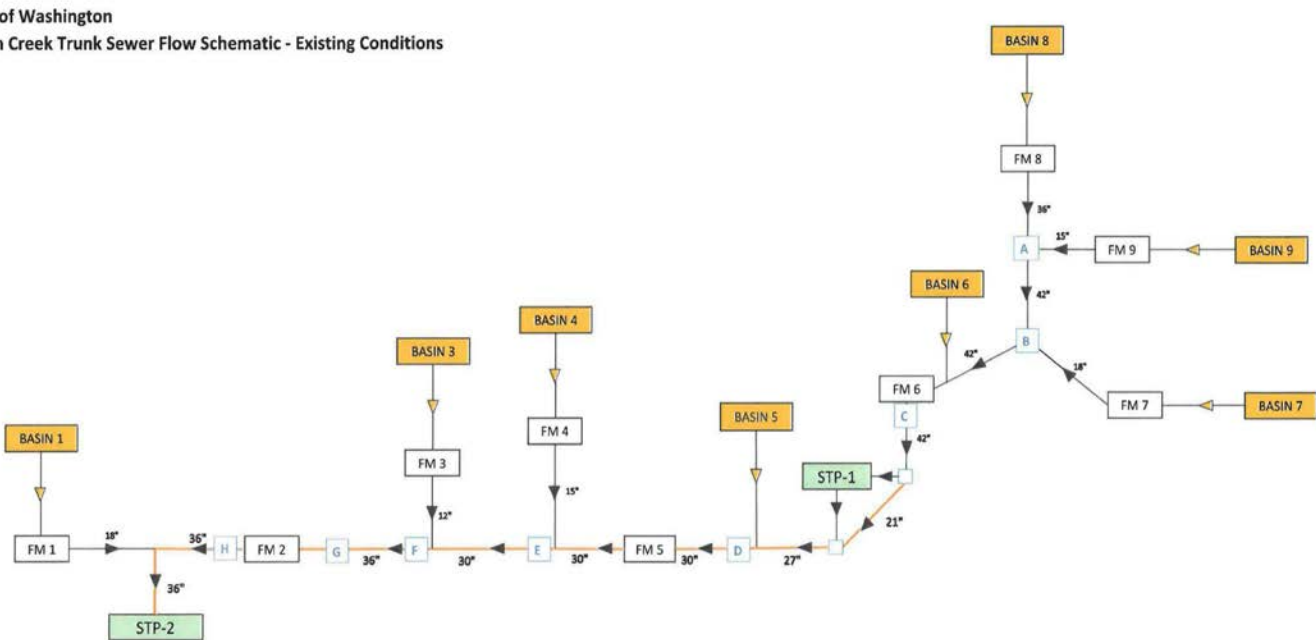
Easement Acquisition and Imposition to Property Owners

The shift in alignment was done to avoid routing the sewer through the middle properties, instead favoring a route that followed property lines. The Aptim alignment cuts across the middle of three properties and the corners of two additional properties. Easements will be needed both for construction and for long-term ownership and maintenance. The Aptim sewer is located further south than our suggested alignment, nearer the creek and is therefore shallower, which may result in less expensive construction. However, the long-term use and development potential of each of these properties will be severely impacted. During the appraisal and negotiation of easements, the sewer location and how it may restrict current and future uses of the property are considered. The Aptim alignment represents a significant imposition on the landowners and future growth of the city, which is likely to result in a longer and ultimately more costly land acquisition process. Sewer alignments that follow property lines naturally present less of an imposition on property owners and their future development potential, and the associated easements can therefore be easier to obtain.

As shown on the following page, by shifting the alignment north, HCE runs the sewer east along a common property line rather than through and across various parcels. This shifts the alignment for approximately 0.7 miles out of the total 2.25 mile long sewer construction and lessens the imposition on the property owners, which should aid the City in the negotiation and acquisition of easements should this alignment be selected.

SMOKE TEST DISCUSSION

In our review of alignments for the Farm Creek Trunk Sewer we found that Strand Associates had completed a flow study that included nine (9) system flow meters to determine the quantity of wet weather flows from 9 identified sewerage basins in the City. The schematic of this effort follows:



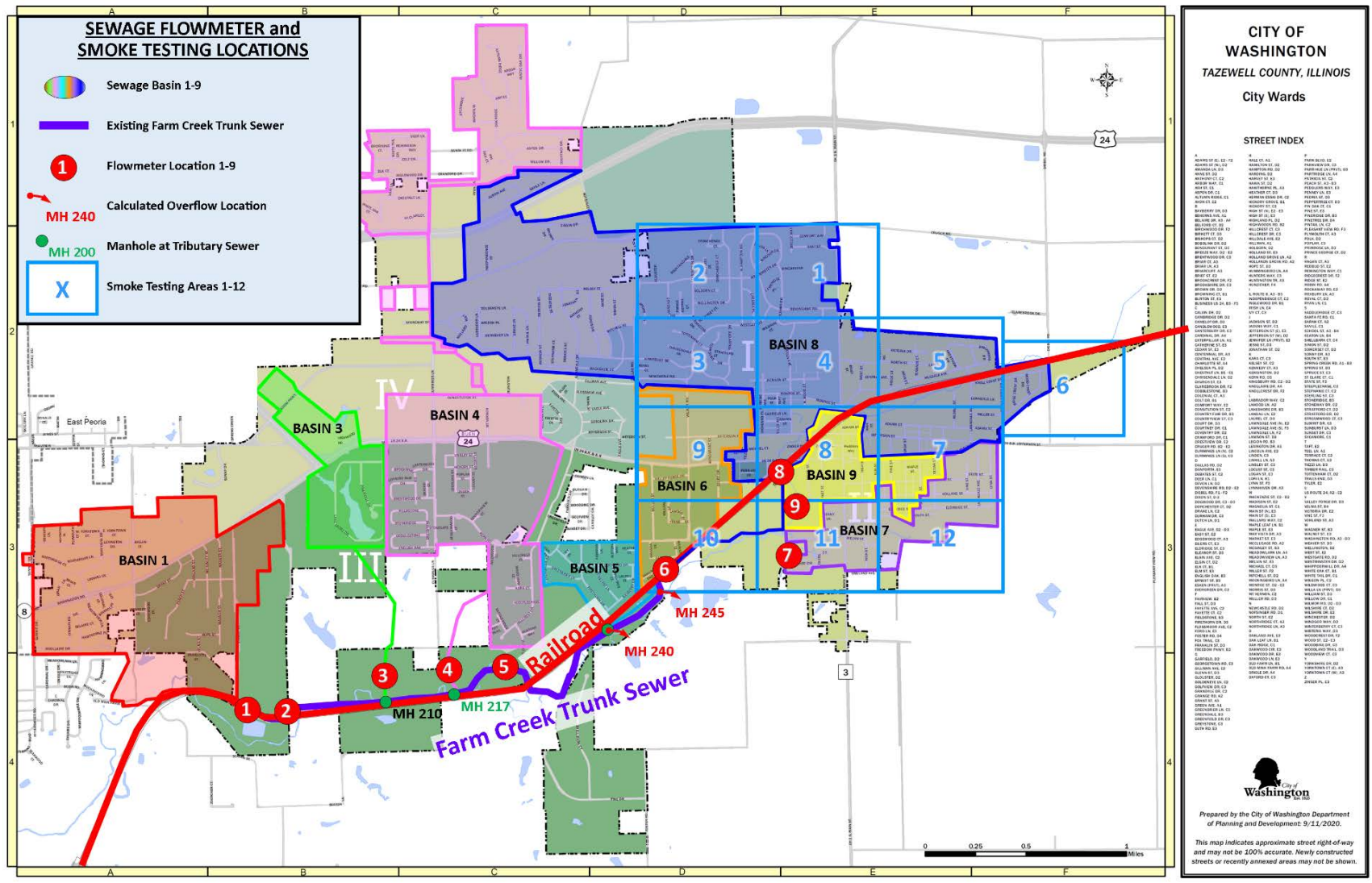
Preliminary Engineering Study for the Farm Creek Trunk Sewer
Strand Associates
October 2019

Figure 2.02-2 Existing System Flow Schematic

Evaluation of the information provided in Table 3.02-1 of the Strand Report revealed that the city is subject to flows of 16.92 times average flow with three most severe basins being Basin 7 with a peaking factor of 56.10, Basin 9 with a peaking factor of 43.47, and Basin 5 with a peaking factor of 56.10. HCE created a summary table of the information, a portion of which follows:

Basin	<u>EXISTING CONDITIONS</u>				
	Average Dry Weather Flow (gpm)	Population Equivalent PE (100 gpcd)	Excess Flow (gpm)	Total Peak Flow (MGD)	Observed Peaking Factor
9	78	1,123	3,313	4.883	43.47
8	636	9,158	8,948	13.801	15.07
7	56	806	3,086	4.524	56.10
	770	11,087	15,347	23.208	20.93
6	166	2,390	419	0.842	3.52
	936	13,477	15,766	24.050	17.84
5	345	4,968	10,489	15.601	31.40
4	349	5,026	560	1.309	2.60
	1,630	23,471	26,815	40.960	17.45
3	17	245	122	0.200	8.17
	1,647	23,716	26,937	41.160	17.35
2	0	-	-	-	-
1	179	2,578	2,111	3.298	12.79
10	0	0	-	-	-
TOTAL	1,826	26,294	29,048	44.459	16.91

In the summer of 2022 Robinson Engineering performed a smoke test study of Basin 6, Basin 7, the majority of Basin 8 and Basin 9. The basis of their study was twelve sections which we, with the assistance of Dennis Carr and Mike Genard, have been able to organize by Basin to agree with the Strand analysis. This combined exhibit is on the following page.





A total of 816 system defects were found by smoke testing. These defects were in each Basin and we have classified them by required repair type as follows:

Defect	Basin 6		Basin 7		Basin 8		Basin 9		Total		Repair Estimate
	No.	GPM	No.	GPM	No.	GPM	No.	GPM	No.	GPM	
1 Storm Sewer Connection	2	25.3	13	102.6	15	181.4	18	196.6	48	505.9	\$ 146,500
2 "Easy" System Repairs	16	31.7	25	51.5	81	152.8	24	44.6	146	280.6	\$ 127,950
3 "Easy" Private Repairs	40	73.0	68	111.9	165	446.8	46	82.5	319	714.2	\$ 37,050
4 Clean and Televisе Sewer between MHs	27		43		136		45		95,380	* LF	\$ 476,900 *
5 Point Repairs	13	19.5	13	19.5	35	52.5	8	12.0	69	103.5	unknown
6 Complicated Private Repairs	26	9.0	51	37.6	151	103.3	45	18.4	273	168.3	\$1,197,450
1 Public inflow sources should be а priority to remove 2 Manhole lid replacements and frame adjustments are effective and can tyoically be completed as force account work 3 Downspout connections, sump pump connections are large inflow contributors, ordinance violations, and easily/inexpensively completed 4 Cleaning and televising should be part of a continuing maintenance program, once conidition of the sewers has been assessed create a repair program * Based upon an average pipe diameter of 8 inches, average length of 380 feet beteen manholes, light cleaning for an average cost of \$5.00/LF 5 Point repairs can be by liner or excavation and pipe replacement, advance televising would be benneficial - cost is variable and not provided 6 Footing tile connections, window well drains, yard drains, leaking service pipes, etc. are expensive and difficult to correct on private property											

The 816 identified defects are estimated by Robinson to produce an estimated 258.2 gpm of excess flow in Basin 6, 288.6 gpm of excess flow in Basin 7, 930.2 gpm of excess flow in Basin 8, and 266.8 gpm of excess flow in Basin 9. This estimate totals 2.52 million gallons of extraneous flow at the WWTP which, though significant, is only 11.1% of the actual flow recorded from these basins by Strand. However, the apparent discrepancy between the two studies is not a concern, just the effect of comparing actual flows (Strand) to estimated flows (Robinson). There are several reasons for this:

1. Smoke Testing seldom finds all the system defects.
2. The severity of mainline leaks are difficult to estimate from smoke tests. The testing found 13 defects in Basin 6 with an estimated flow of 19.5 gpm, 13 defects in Basin 7 with an estimated flow of 19.5 gpm, 35 defects in Basin 8 with an estimated flow of 52.5 gpm, and 8 defects in Basin 9 with an estimated flow of 12.0 gpm. The number and severity of the defects needs to be confirmed with follow-up testing as recommended by Robinson.
3. Inflow sources amounts can vary widely dependent upon the areas draining to them and the precipitation event. Of the 816 identified defects, 161 can be identified as inflow sources and they are estimated to account for 63% of the total I/I as enumerated in the following table:

Identified Inflow Source	Basin 6		Basin 7		Basin 8		Basin 9		Total	
	No.	GPM	No.	GPM	No.	GPM	No.	GPM	No.	GPM
Area Drain	0	0	3	7.7	1	1.5	3	5.4	7	14.6
Creek / Stream	1	10.0	0	0	0	0	0	0	1	10.0
Drainage Ditch	0	0	1	5.0	0	0	0	0	1	5.0
Downspouts	14	64.2	20	73.4	47	369.4	16	67.3	97	574.3
Driveway Drain	0	0	3	9.5	0	0	0	0	3	9.5
Stairwell Drain	1	0.5	1	0.5	10	5.0	3	1.5	15	7.5
Storm Inlet, Catchbasin	1	15.3	6	80.4	14	179.9	15	191.2	36	466.8
Window Well Drain	1	0.5	1	0.5	7	3.5	0	0	9	4.5
Total	18	90.5	35	177.0	79	559.3	37	265.4	169	1,092.2

The flow produced from each of these identified sources will vary greatly during actual precipitation and snow melt events.

Recommendations

We recommend that the City follow the recommendations of the smoke testing report on pages 19-20 and Appendix 1 to control its infiltration/inflow issues. Those recommendations are reproduced herein:

City of Washington

2022 Smoke Testing Program

Robinson Engineering Project #22-R0435

RECOMMENDATIONS / NEXT STEPS

To effectively spend the money required to make the repairs of the defects found during the Smoke Testing it is recommended that the city also conduct comprehensive manhole inspections and then combine any public sector smoke testing manhole repairs with repairs recommended from manhole inspections. Then the plans and specifications can be created for bidding and released as a larger project.

By handling the repairs in this in this manner, it will allow for the prices to come in lower, by providing a proportionate saving in costs gained by an increase in quantities and level of production, also known as the economy of scale.

Primary Recommendations / Initial Steps:

1. Fix Public Sector Manhole Defects – To effectively start reducing I&I on the public sector side of the system, it is recommended that the identified manhole cover and frame seal defects be repaired as soon as possible. Replacing pick-hole lids & poor fitting or non-gasketed lids is considered a relatively simple repair for the city. Estimated costs for purchasing replacement covers are approximately \$25,000 for the replacement of one hundred and one (100) lids that were found to allow I&I into the system. This work can be conducted in-house by City staff or can be bid and included as part of a larger sewer manhole rehabilitation project. The total estimated costs of manhole frame seal defect repairs identified in this project are \$107,500. The overall project estimate for all manhole cover and frame seal repair work identified is approximately \$132,500.

2. Consider Comprehensive Manhole Inspections for a Larger Manhole Rehabilitation Program – Due to the large number of manhole defects observed during smoke testing, performing comprehensive manhole inspections for this portion of the system is a recommended next step. Some areas exhibited pick-holes and other cover inflow sources while frame seal defects were also common. Before moving forward with these repairs, consideration should be given to comprehensively identifying additional manhole defects through visual inspections and then this identified work can be coupled with other high priority manhole repairs identified during the manhole inspections.

Depending on how many additional manhole repairs are identified, the City could consider applying for a Water Pollution Control Loan Program (WPCLP) loan through the Illinois Environmental Protection Agency's State Revolving Fund (SRF) to fund the sanitary sewer system manhole rehabilitation program.

3. CCTV Smoking Sewer Mains & Cured-In-Place Pipelining (CIPP) Repairs – Numerous sewer mains were identified as smoking during this project. At a minimum, those identified with smoke defects are recommended to be cleaned and televised and then repaired with cured-in-place pipelining to provide structural repairs and to lessen the effects of I&I entering at those locations. Cured-in-place pipelining may need to be coupled with point repairs, service lateral grouting and or service lateral T-lining to effectively seal up mainlines from identified I&I sources. The extent of the additional repairs needed can be further evaluated after the CCTV inspection is

done. The cost of cured-in-place pipelining alone for mainline deficiencies found is estimated at \$335,526.

4. Perform follow-up Dyed Water Testing in Conjunction with CCTV – This project identified thirty-six storm inlets that are cross-connected and/or directly connected to the sanitary sewer. Prior to their disconnection or repair, the detail of each cross connection is recommended to be further evaluated with dyed water flooding performed in conjunction with CCTV. Additionally, the one Creek/Stream defect and Drainage Ditch defect are also recommended for dyed water flooding. This will enable the city to pinpoint and quantify the specific defect types contributing to these cross-connections, their location and what repairs are needed, i.e., mainline lining, lateral lining, chemical grouting, manhole repairs, etc. The estimated cost for conducting dyed water testing itself is approximately \$57,000. The additional cost for CCTV services is not factored into this cost estimate as sewer televising companies will usually provide an hourly rate to perform this slower production type of work. However, performing the CCTV portion of the work in-house with City staff can eliminate the need to solicit contracted services for CCTV.

5. Wet Weather Investigations for Defects Near Creeks – It is undetermined if the smoking pipes found near creeks are an inflow source where I&I is entering the sanitary sewer system during wet weather, or if these are bypasses that allow excess wet weather I&I to leave the sanitary sewer system at connection points to the creeks. To better understand these locations that smoked, follow up wet weather investigations are needed to determine the details of the piping configuration and flow conditions at these locations. CCTV is also recommended in these areas to determine entry and exit points for these smoking culvert pipes adjacent to creeks.

6. Private Sector Source Disconnections (Phase-1) – As one of the first steps in addressing private sector I&I in the collection system, the city is recommended to pursue corrections to the defects often considered relatively simple repairs and part of a Phase-1, Private Sector Source Disconnection program. These defects will typically include window wells and covers, cleanout caps and downspout disconnections. These repairs are generally \$150 or less to repair and from an I&I removal standpoint are a sound investment. From this study, one hundred and eighty (180) cleanouts, nine (9) window wells and ninety-seven (97) downspouts were found contributing I&I to the system and they can be corrected at a cost of approximately \$33,900.

Secondary Recommendations / Future Steps:

7. Consider a Lateral Televising, Lateral Repair and Foundation Drain Disconnection Program – This project identified one hundred forty-four (144) lateral defects that were located on one hundred and two (102) distinct properties and fourteen (14) properties that had foundation drains smoking. The City should consider televising the laterals at these properties as part of an overall Lateral Televising, Lateral Repair and Foundation Drain Disconnection Program to assess the internal condition of these pipes. This is also an effective way to identify additional footing tile / foundation drain connections to the private service lateral that can be large contributors of I&I. The estimated cost of televising and lining service laterals identified with defects on this project is \$867,000. The estimated cost for televising and disconnecting the (14) identified foundation drains is \$119,000. This work can be considered after other high priority work is completed.

8. Perform Internal Building Inspections – This project identified forty-eight (48) homes with building interior smoke identified as a possible I&I source. It is recommended the City follow up with internal building inspections at these properties to identify sump pumps, diverter valves, combination sumps and any other private sector I&I sources that may not have been found during the smoke testing phase, but could exist in addition to any dry floor drains, p-traps, etc. The

estimated cost of doing 48 Internal Building inspections is estimated at \$16,800. This work can be considered after the Primary Recommendations / Initial Steps and the associated repair work is completed.

9. Consider Private Sector Source Disconnections (Phases 2 & 3) – After any internal building inspections are conducted and a lateral televising, lateral lining and foundation drain repair program is completed, and all other cost-effective defects have been repaired, the City can consider disconnection of sump pumps, diverter valves, combo sumps, area drains, stairwell drains, driveway drains and any other connections which are not compliant with City Code (Chapter 52, § 52.081) and the Illinois Administrative Code (Ill. Admin. Code tit. 77, § 890.200). The estimated cost associated with disconnecting area drains identified in this study is \$59,500, driveways drains - \$30,000, external sumps - \$4,500, and stairwell drains - \$150,000.



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City of Washington

Smoke Test Summary Report

22-R0435


Defect	Number of Defects	Estimated I/I GPM	Repair Cost	\$/GPM
Area Drain	7	14.6	\$59,500	\$4,075 *
Building Interior	48	9.6	\$16,800	\$1,750 *
Cleanout	180	87.7	\$18,000	\$205 *
Creek / Stream	1	10.0	\$1,500	\$150 *
Downspouts	97	574.3	\$14,550	\$25 *
Drainage Ditch	1	5.0	\$1,500	\$300 *
Driveway Drain	3	9.5	\$30,000	\$3,158 *
External Sump	6	27.0	\$4,500	\$167 *
Foundation Drain	14	63.0	\$119,000	\$1,889 *
Frame Seal @ MH	48	57.6	\$103,200	\$1,792 *
Frame Seal @ Private MH	2	2.4	\$4,300	\$1,792 *
Gasket Seal Cover @ MH	50	85.0	\$12,500	\$147 *
Gasket Seal Cover @ Private MH	2	3.4	\$500	\$147 *
Lateral	144	43.2	\$867,000	\$20,069
Main Line	69	103.5	\$335,526	\$3,242 *
Other	36	25.2	\$0	\$0 *
Pick Hole @ MH	48	144.0	\$12,000	\$83 *
Stairwell Drain	15	7.5	\$150,000	\$20,000
Storm Inlet / CB	36	466.8	\$54,000	\$116 *
Window Well Drain	9	4.5	\$1,350	\$300 *
Totals	816	1,744	\$1,805,726	

* Indicates cost-effective repairs

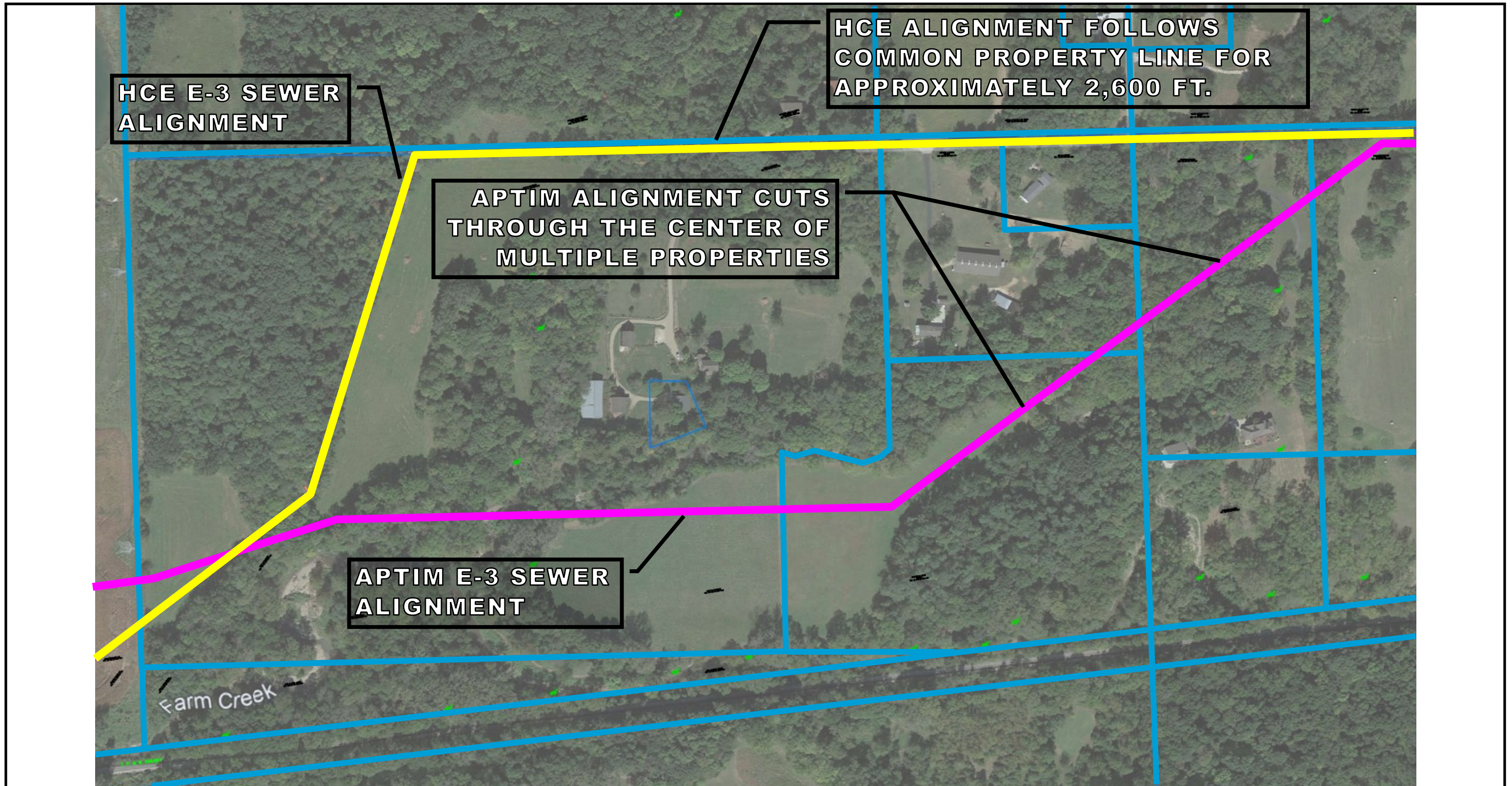


We thank the City of Washington for the opportunity to assist you in this important project. Should you have any further questions please feel free to contact project manager Howard Hamilton at hhamilton@envdesigni.com.

Respectfully,
Environmental Design International inc.



Howard J. Hamilton, PE, CFM, CPESC
Director of Civil Engineering



CITY OF WASHINGTON
FARM CREEK TRUNK SEWER 3RD PARTY ALIGNMENT ANALYSIS
ALIGNMENT E-3 COMPARISON

Scale: N.T.S.

Alternative B
Pudik L-1

FARM CREEK TRUNK SEWER REPLACEMENT
City of Washington, Illinois

June 22, 2023

Description	Units	Estimated Unit Price	ENGINEER'S OPCC Preliminary Engineering Report EOPCC	
RESTORATION-SEED, class 2, 4/5 or 4B/5B (topsoil,fertilizer,excelsior blanket, mulch	ACRE	\$10,000.00	3.4	\$33,600.00
PERIMETER EROSION BARRIER	FT	\$4.00	14,600	\$58,400.00
TREE REMOVAL (ACRE)	ACRE	\$5000.00	3.4	\$16,800.00
STABILIZED CONSTRUCTION ACCESS	EA	\$6,000.00	2	\$12,000.00
SANITARY SEWER, 42-IN HOBAS - OPEN CUT	LF	\$350.00	7003	\$2,451,050.00
SANITARY SEWER, 42-IN HOBAS - TRENCHLESS	LF	\$896.55	4067	\$3,646,268.85
SANITARY SEWER, 42-IN HOBAS - BORE AND JACK 60" STEEL CASING	LF	\$1,000.00	540	\$540,000.00
ABANDONMENT OF EXISTING SANITARY MANHOLES	EA	\$2,000.00	3	\$6,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, LESS THAN 20' DEEP	EA	\$9,000.00	27	\$243,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, 20' TO 25' DEEP	EA	\$12,000.00	5	\$60,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, 25' TO 30' DEEP	EA	\$15,000.00	5	\$75,000.00
CONSTRUCT MANHOLE OVER EX. SEWER	EA	\$2,000.00	5	\$10,000.00
SUBTOTAL CONSTRUCTION				\$7,152,118.85
MOBILIZATION (CONTRACTOR PROFIT, BONDS, INSURANCE)	LS	2%		\$143,042.00
ENGINEERING AND LEGAL	LS	5%		\$357,606.00
TOTAL BASE PROJECT				\$7,652,766.85
Contingencies - Base				25%
Total - Base Project w/ Contingencies				\$9,565,959.00

FARM CREEK TRUNK SEWER REPLACEMENT
City of Washington, Illinois

June 22, 2023

Description	Units	Estimated Unit Price	ENGINEER'S OPCC Third Party Analysis EOPCC	
RESTORATION-SEED, class 2, 4/5 or 4B/5B (topsoil,fertilizer,excelsior blanket, mulch	ACRE	\$10,000.00	2.1	\$21,400.00
PERIMETER EROSION BARRIER	FT	\$4.00	9,348	\$37,392.00
TREE REMOVAL (ACRE)	ACRE	\$5000.00	2.1	\$10,700.00
STABILIZED CONSTRUCTION ACCESS	EA	\$6,000.00	3	\$18,000.00
SANITARY SEWER, 42-IN HOBAS - OPEN CUT	LF	\$350.00	4294	\$1,502,900.00
SANITARY SEWER, 42-IN HOBAS - TRENCHLESS	LF	\$896.55	7191	\$6,447,091.05
SANITARY SEWER, 42-IN HOBAS - BORE AND JACK 60" STEEL CASING	LF	\$1,000.00	425	\$425,000.00
ABANDONMENT OF EXISTING SANITARY MANHOLES	EA	\$2,000.00	3	\$6,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, LESS THAN 20' DEEP	EA	\$9,000.00	15	\$135,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, 20' TO 25' DEEP	EA	\$12,000.00	6	\$72,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, 25' TO 30' DEEP	EA	\$15,000.00	4	\$60,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, 30' TO 35' DEEP	EA	\$18,000.00	3	\$54,000.00
SANITARY MANHOLE, TYPE A, 6-FT DIA, 35' TO 40' DEEP	EA	\$21,000.00	3	\$63,000.00
CONSTRUCT MANHOLE OVER EX. SEWER	EA	\$2,000.00	4	\$8,000.00
SUBTOTAL CONSTRUCTION				\$8,860,483.05
MOBILIZATION (CONTRACTOR PROFIT, BONDS, INSURANCE)	LS	2%		\$177,210.00
ENGINEERING AND LEGAL	LS	5%		\$443,024.00
TOTAL BASE PROJECT				\$9,480,717.05
Contingencies - Base				25%
Total - Base Project w/ Contingencies				\$11,850,896.00