

Liberty and Commerce

Analysis of Independent Engineering Cost Estimates

In April of 2017, the Centreville Town Council authorized staff to begin assembling information to initiate the Liberty and Commerce (L&C) sewer and water utility replacement project. This action was precipitated by notice from the Maryland State Highway Administration (MSHA) District 2 Office that it was proceeding with the milling and complete resurfacing of both these streets in July of 2018 in accordance with its prior programmed budget. This MSHA project, if completed, would have deferred any substantive utility work by the Town for approximately 15 years or more as milling and overlay projects typically follow this cycle. After a new asphalt overlay, any water leaks would quickly damage the integrity of the new pavement and any major trench repair and patching would have required the Town to completely repave the streets to the condition found which would have been profoundly costly. MSHA was agreeable to defer the milling and overlay until the summer of 2019 that granted a narrow window of opportunity for the Town to pursue its much-needed utility work prior to the complete resurfacing MSHA had proposed. Once the utility project got underway, MSHA announced the complete reconstruction of the Gravel Run and Mill Stream bridges under the Governor's priority infrastructure funding.

The Town had previously competitively bid the Kidwell and adjoining streets project in 2016 and that work was moving along well. This existing Kidwell project was a unit price bid contract. Under a **Unit Price Bid Contract**, the contractor is paid for the actual quantity of each line item performed as measured in the field during construction. Each **unit price** includes all labor, material, equipment, overhead, and profit attributable to that scope of work. All the proposed work on L&C was covered by unit pricing in the Kidwell project bid. To ensure the Town was receiving all the value due under these terms, full time inspection was provided for every day worked. An example of this unit price method of contracting from the Kidwell bid is as follows:

- A. Bid Item 14 – 12” Gate Valve Installation (Contractor's Kidwell unit price = \$4,800 each)
 1. Measurement – Measurement will be based on the actual number of each 12” gate valve installed or replaced in accordance with the plans and specifications, complete, in place and accepted.
 2. Payment – Payment will be based on the number of each existing 12” gate valve installed or replaced at the contract unit price bid for installation. The price bid to replace the gate valves shall include but not be limited to furnishing of all labor, equipment and materials necessary to complete the work including survey and layout, notifications, coordination of water shut downs, excavation, removal of existing valve and piping, installation of new valve with pipe and couplings, disinfection, valve box, restoration, CR-6 backfill, AASHTO #57 backfill, compaction, dewatering, bypassing, testing, traffic control and all other items necessary to complete the work as specified and shown in the contract documents.

As has been explained with the narrow window of time before the milling and overlay would take place, the Town did not have time to bid and award engineering services for design and

then bid and award a new construction contract. Simply replacing existing infrastructure with new and upsized utilities to existing lines and grades made the existing Kidwell unit pricing optimal and timely. The Council decided to move forward with the L&C project based on the bid unit prices for the Kidwell project. Completing the entire utility replacement project prior to the resurfacing by MSHA, reduces the many potential open cuts and patches annually incurred to repair the 100-year-old infrastructure. MSHA project design life for the upcoming resurfacing is 15 years (2020 to 2035).

To compare other contracting methods the Town **did not** use, for instance:

Time and Materials (T&M) This is a standard phrase in a contract for construction, product development or any other piece of work in which the employer agrees to pay the contractor based upon the time spent by the contractor's employees and subcontractor's employees to perform the work, and for materials used in the construction (plus the contractor's mark up on the materials used), no matter how much time or work is required to complete construction. Time and Materials is generally used in projects in which it is not possible to accurately estimate the size of the project, or when it is expected that the project requirements would most likely change. The Town could not support a T&M type basis for this size of project as it would have much less control over the work performed and the total cost, and no control over the unit costs.

Another method is the **Fixed-Price Contract** in which the owner agrees to pay the contractor a **lump sum** for fulfillment of the contract no matter what the contractors pay their employees, sub-contractors and suppliers. In the absence of fully engineered plans with programmed unit quantities, this type of contract could not have been bid or executed within the time window allowed by MSHA for the deferred milling and resurfacing. When contractors bid on a lump sum fixed price basis, they have to factor in the uncertainty of unknown variables that may be encountered during construction and also whether the estimated quantities of materials are not as close to being accurate.

Concerned about project costs, the Centreville Town Council requested that an independent review be made of the total L&C project in a form that would reveal whether the total cost of the work performed was reasonable and represented a good value to the Town. This analysis was undertaken after the last piece of infrastructure was in place. To begin this review, the Town prepared a spreadsheet inputting as-constructed quantities from the completed L&C project based on unit items from the Kidwell project. These quantities were derived directly from the final project invoicing as verified by the Town inspectors.

Professional Engineering Estimates for Water and Sewer Construction were performed on this spreadsheet by independent registered professional engineers together with supporting documentation and estimating requested by the Town. All spreadsheets used for comparison were on the same actual item and unit basis. The consulting engineering firms were KCI Technologies (KCI) and Rummel, Klepper, and Kahl (RK&K). Both firms are national, highly qualified, and respected within the Civil Engineering community and both are well versed in working within MSHA right-of-ways.

Retallack & Sons, Inc.
 Invoice No: 746
 Date: 12/18/19
 Job Location: Commerce Street

Town of Centreville

Item No.	Description	Estimated Quantity	Unit Price	Quantities						Amount						
				Previous	Previous Total	This Period	Liberty Total	Commerce Total	To-Date	Previous	Previous Total	This Period	Liberty Total	Commerce Total	To-Date	
1	Install and Maintain Silt Fence	lf	\$12.00	0.00	2825.00	0.00	2825.00		2825.00	\$0.00	\$33,900.00	\$0.00	\$33,900.00		\$33,900.00	
2	Traffic Control									\$0.00	\$537,805.28	\$26,546.54	\$272,716.25	\$291,835.57	\$584,351.82	
3	Saw Cutting	lf	\$4.50	0.00	25791.00	0.00	15529.00	10846.00	25791.00	\$0.00	\$116,059.50	\$0.00	\$69,880.50	\$46,179.00	\$116,059.50	
4	Milling Profiling Existing Asphaltic Surface	sy	\$21.00	351.00	39969.51	0.00	20409.02	21480.49	39969.51	\$7,371.00	\$839,359.77	\$0.00	\$428,589.48	\$410,770.29	\$839,359.77	
5	Utility Locating Firm	hr	\$75.00	0.00	119.23	0.00	72.50	46.73	119.23	\$0.00	\$8,942.45	\$0.00	\$5,437.50	\$3,504.95	\$8,942.45	
6	Break Up and Remove Existing Concrete Road	ton	\$50.00	0.00	5392.43	0.00	1841.41	3551.02	5392.43	\$0.00	\$254,417.50	\$0.00	\$92,070.50	\$162,347.00	\$254,417.50	
7	General Site Clearing and Demolition	ls								\$0.00	\$186,990.00	\$0.00	\$57,020.00	\$129,970.00	\$186,990.00	
8	6" to 8" PVC Gravity Sewer Pipe From 0' to 8' Deep	lf	\$75.00	0.00	5520.00	0.00	2414.00	3106.00	5520.00	\$0.00	\$414,000.00	\$0.00	\$181,050.00	\$232,950.00	\$414,000.00	
9	6" to 8" PVC Gravity Sewer Pipe From 8' to 12' Deep	lf	\$150.00	78.00	3163.00	0.00	2276.00	887.00	3163.00	\$11,700.00	\$474,450.00	\$0.00	\$341,400.00	\$133,050.00	\$474,450.00	
10	4' Diameter Manhole From 0' to 8' Deep	ea	\$5,800.00	0.00	36.00	0.00	16.00	20.00	36.00	\$0.00	\$201,600.00	\$0.00	\$89,600.00	\$112,000.00	\$201,600.00	
11	4' Diameter Manhole Greater Than 8' Deep	ea	\$8,000.00	1.00	14.00	0.00	7.00	7.00	14.00	\$8,000.00	\$112,000.00	\$0.00	\$56,000.00	\$56,000.00	\$112,000.00	
12	New 4" and 6" PVC Gravity Sewer Lateral	ea	\$3,600.00	0.00	165.00	0.00	80.00	85.00	165.00	\$0.00	\$594,000.00	\$0.00	\$288,000.00	\$306,000.00	\$594,000.00	
13	6" C-900 PVC Water Pipe	lf	\$30.00	0.00	1484.00	0.00	1261.00	223.00	1484.00	\$0.00	\$44,520.00	\$0.00	\$37,830.00	\$6,690.00	\$44,520.00	
14	8" C-900 PVC Water Pipe	lf	\$30.00	0.00	94.00	0.00		94.00	94.00	\$0.00	\$2,820.00	\$0.00		\$2,820.00	\$2,820.00	
15	10" C-900 PVC Water Pipe	lf	\$40.00	0.00	4922.00	0.00	4687.00	235.00	4922.00	\$0.00	\$196,880.00	\$0.00	\$187,480.00	\$9,400.00	\$196,880.00	
16	12" C-900 PVC Water Pipe	lf	\$40.00	183.00	4650.00	0.00		4650.00	4650.00	\$7,320.00	\$186,000.00	\$0.00		\$186,000.00	\$186,000.00	
17	6" Gate Valve Installation	ea	\$1,850.00	0.00	6.00	0.00	3.00	3.00	6.00	\$0.00	\$11,100.00	\$0.00	\$5,550.00	\$5,550.00	\$11,100.00	
18	8" Gate Valve Installation	ea	\$2,600.00	0.00	6.00	0.00	2.00	4.00	6.00	\$0.00	\$15,600.00	\$0.00	\$5,200.00	\$10,400.00	\$15,600.00	
19	10" Gate Valve Installation	ea	\$4,800.00	0.00	14.00	0.00	13.00	1.00	14.00	\$0.00	\$67,200.00	\$0.00	\$62,400.00	\$4,800.00	\$67,200.00	
20	12" Gate Valve Installation	ea	\$4,800.00	1.00	14.00	0.00		14.00	14.00	\$4,800.00	\$67,200.00	\$0.00		\$67,200.00	\$67,200.00	
21	8" X 8" Water Main Tee	ea	\$5,000.00	0.00	0.00	0.00				\$0.00	\$0.00	\$0.00			\$0.00	
22	10" X 8" Water Main Tee	ea	\$5,500.00	0.00	10.00	0.00	6.00	4.00	10.00	\$0.00	\$55,000.00	\$0.00	\$33,000.00	\$22,000.00	\$55,000.00	
23	12" X 8" Water Main Tee	ea	\$5,500.00	1.00	16.00	0.00		16.00	16.00	\$5,500.00	\$88,000.00	\$0.00		\$88,000.00	\$88,000.00	
24	Water Service Replacement	ea	\$1,600.00	0.00	139.00	0.00	70.00	79.00	139.00	\$0.00	\$238,400.00	\$0.00	\$112,000.00	\$126,400.00	\$238,400.00	
25	Water Meter Relocation	ea	\$1,500.00	0.00	42.00	0.00	12.00	30.00	42.00	\$0.00	\$63,000.00	\$0.00	\$18,000.00	\$45,000.00	\$63,000.00	
26	Water Meter Installation	ea	\$3,600.00	0.00	31.00	0.00	17.00	14.00	31.00	\$0.00	\$111,600.00	\$0.00	\$61,200.00	\$50,400.00	\$111,600.00	
27	Fire Hydrant Replacement	ea	\$6,500.00	0.00	14.00	1.00	5.00	10.00	15.00	\$0.00	\$91,000.00	\$6,500.00	\$32,500.00	\$65,000.00	\$97,500.00	
27a	Fire Hydrant Relocation	ea	\$4,100.00	0.00	8.00	0.00	4.00	4.00	8.00	\$0.00	\$32,800.00	\$0.00	\$16,400.00	\$16,400.00	\$32,800.00	
28	4" CR6 Stone Base	sy	\$10.00	352.00	21616.91	0.00	9692.51	11924.40	21616.91	\$3,520.00	\$216,169.10	\$0.00	\$96,925.10	\$119,244.00	\$216,169.10	
29	8" CR6 Stone Base	sy	\$18.00	704.00	42004.19	0.00	18709.94	23294.25	42004.19	\$12,672.00	\$756,075.42	\$0.00	\$336,778.92	\$419,296.50	\$756,075.42	
30	3" Hot Mix Asphalt 19mm Super Pave Base Course	sy	\$26.00	543.00	43722.26	0.00	21761.33	21960.93	43722.26	\$14,118.00	\$1,136,778.84	\$0.00	\$565,794.66	\$570,984.18	\$1,136,778.84	
31	General Restoration	ls								\$0.00	\$498,645.00	\$17,120.00	\$239,675.00	\$276,090.00	\$515,765.00	
32	Undercut and Refill	cy	\$45.00	0.00	599.08	0.00	216.66	382.42	599.08	\$0.00	\$26,958.79	\$0.00	\$9,749.89	\$17,208.90	\$26,958.79	
33	Bypass Pumping Case 1	day	\$750.00	0.00	70.00	0.00	42.00	28.00	70.00	\$0.00	\$52,500.00	\$0.00	\$31,500.00	\$21,000.00	\$52,500.00	
34	Bypass Pumping Case 2	day	\$950.00	0.00	77.00	0.00	37.00	40.00	77.00	\$0.00	\$73,150.00	\$0.00	\$35,150.00	\$38,000.00	\$73,150.00	
35	Single WR Inlet	ea	\$3,600.00	0.00	0.00	0.00				\$0.00	\$0.00	\$0.00			\$0.00	
36	Storm Manhole	ea	\$3,600.00	0.00	3.00	0.00	2.00	1.00	3.00	\$0.00	\$10,800.00	\$0.00	\$7,200.00	\$3,600.00	\$10,800.00	
37	15" RCP CLV	lf	\$57.00	0.00	16.00	0.00	16.00		16.00	\$0.00	\$912.00	\$0.00	\$912.00		\$912.00	
38	18" RCP CL III	lf	\$67.00	0.00	100.00	0.00	84.00	16.00	100.00	\$0.00	\$6,700.00	\$0.00	\$5,628.00	\$1,072.00	\$6,700.00	
38a	24" RCP CL III	lf	\$78.00	0.00	628.50	0.00	126.00	502.50	628.50	\$0.00	\$49,023.00	\$0.00	\$9,828.00	\$39,195.00	\$49,023.00	
39	Curb and Gutter	lf	\$25.00	0.00	3378.00	271.00	1398.00	2,251	3649.00	\$0.00	\$84,450.00	\$6,775.00	\$34,950.00	\$56,275.00	\$91,225.00	
40	Sidewalk	lf	\$30.00	0.00	1787.00	101.00	787.00	1101.00	1888.00	\$0.00	\$53,610.00	\$3,030.00	\$23,610.00	\$33,030.00	\$56,640.00	
41	Driveway Aprons	sy	\$90.00	0.00	363.77	36.88	231.77	168.88	400.65	\$0.00	\$32,739.30	\$3,319.20	\$20,859.30	\$15,199.20	\$36,058.50	
42	Sidewalk Ramps	ea	\$1,650.00	0.00	7.00	0.00	5.00	2.00	7.00	\$0.00	\$11,550.00	\$0.00	\$8,250.00	\$3,300.00	\$11,550.00	
43	Mobilization	ls								\$0.00	\$29,282.50	\$0.00		\$29,282.50	\$29,282.50	
TOTALS										209,227.76	\$96,710.00	\$8,083,988.45	\$63,290.74	\$3,914,035.10	\$4,233,244.09	\$8,147,279.19

KCI

PROFESSIONAL ENGINEERING ESTIMATE FOR SEWER AND WATER UTILITY CONSTRUCTION				
Item No.	Description	Estimated Quantity	Unit Price	Total
1	Install and Maintain Silt Fence	2,825	lf \$3.75	\$10,593.75
2	Traffic Control	0		
3	Saw Cutting	26,175	lf \$1.00	\$26,175.00
4	Milling Profiling Existing Asphaltic Surface	41,890	sy \$4.00	\$167,560.00
5	Utility Locating Firm	119	hr \$160.00	\$19,040.00
6	Break Up and Remove Existing Concrete Road	5,392	ton \$30.00	\$161,760.00
7	General Site Clearing and Demolition	0	ls	
8	6" to 8" PVC Gravity Sewer Pipe From 0' to 8' Deep	5,520	lf \$67.00	\$369,840.00
9	6" to 8" PVC Gravity Sewer Pipe From 8' to 12' Deep	3,163	lf \$120.00	\$379,560.00
10	4' Diameter Manhole From 0' to 8' Deep	36	ea \$4,500.00	\$162,000.00
11	4' Diameter Manhole Greater Than 8' Deep	14	ea \$8,000.00	\$112,000.00
12	New 4" and 6" PVC Gravity Sewer Lateral	165	ea \$1,000.00	\$165,000.00
13	6" C-900 PVC Water Pipe	1,484	lf \$50.00	\$74,200.00
14	8" C-900 PVC Water Pipe	94	lf \$90.00	\$8,460.00
15	10" C-900 PVC Water Pipe	4,922	lf \$100.00	\$492,200.00
16	12" C-900 PVC Water Pipe	4,650	lf \$120.00	\$558,000.00
17	6" Gate Valve Installation	6	ea \$2,500.00	\$15,000.00
18	8" Gate Valve Installation	6	ea \$3,800.00	\$22,800.00
19	10" Gate Valve Installation	14	ea \$5,000.00	\$70,000.00
20	12" Gate Valve Installation	14	ea \$6,500.00	\$91,000.00
21	8" X 8" Water Main Tee	0	ea \$2,000.00	\$0.00
22	10" X 8" Water Main Tee	10	ea \$2,200.00	\$22,000.00
23	12" X 8" Water Main Tee	16	ea \$2,500.00	\$40,000.00
24	Water Service Replacement	149	ea \$500.00	\$74,500.00
25	Water Meter Relocation	42	ea \$300.00	\$12,600.00
26	Water Meter Installation	31	ea \$300.00	\$9,300.00
27	Fire Hydrant Replacement	15	ea \$2,500.00	\$37,500.00
27a	Fire Hydrant Relocation	8	ea \$4,000.00	\$32,000.00
28	4" CR6 Stone Base	21,617	sy \$20.00	\$432,340.00
29	8" CR6 Stone Base	42,004	sy \$45.00	\$1,890,180.00
30	3" Hot Mix Asphalt 19mm Super Pave Base Coarse	43,722	sy \$26.00	\$1,136,772.00
31	General Restoration	0	ls	
32	Undercut and Refill	599	cy \$55.00	\$32,945.00
33	Bypass Pumping Case 1	70	day \$1,000.00	\$70,000.00
34	Bypass Pumping Case 2	77	day \$2,200.00	\$169,400.00
35	Single WR Inlet	0	ea \$4,000.00	\$0.00
36	Storm Manhole	3	ea \$7,000.00	\$21,000.00
37	15" RCP CLV	16	lf \$85.00	\$1,360.00
38	18" RCP CL III	100	lf \$110.00	\$11,000.00
38a	24" RCP CL III	629	lf \$140.00	\$88,060.00
39	Curb and Gutter	3,649	lf \$18.00	\$65,682.00
40	Sidewalk	1,888	lf \$24.00	\$45,312.00
41	Driveway Aprons	401	sy \$50.00	\$20,050.00
42	Sidewalk Ramps	7	ea \$3,000.00	\$21,000.00
43	Mobilization	0	ls	
	Subtotal			\$7,138,189.75
	Lump Sum Contingency Items* (#2, 7, 31, & 43)		ls 17.94%	\$1,280,591.24
	TOTAL			\$8,418,780.99
44	Engineering Design Fee		ls	\$640,000.00
45	Full-time Inspection	2,865	hrs \$85.00	\$243,525.00
	Subtotal			\$883,525.00
	GRAND TOTAL			\$9,302,305.99

RK&K

Professional Engineering Estimates for Sewer and Water Utility Construction					
Item No.	Description	Estimated Quantity	Unit Price	Total	
1	Install and Maintain Silt Fence	2,825	lf	4	\$11,300.00
2	Traffic Control	0			
3	Saw Cutting	26,175	lf	3.35	\$87,686.25
4	Milling Profiling Existing Asphaltic Surface	41,890	sy	27	\$1,131,030.00
5	Utility Locating Firm	119	hr	268	\$31,892.00
6	Break Up and Remove Existing Concrete Road	5,392	ton	177	\$954,384.00
7	General Site Clearing and Demolition	0	ls		
8	6" to 8" PVC Gravity Sewer Pipe From 0' to 8' Deep	5,520	lf	210	\$1,159,200.00
9	6" to 8" PVC Gravity Sewer Pipe From 8' to 12' Deep	3,163	lf	225	\$711,675.00
10	4' Diameter Manhole From 0' to 8' Deep	36	ea	3450	\$124,200.00
11	4' Diameter Manhole Greater Than 8' Deep	14	ea	4500	\$63,000.00
12	New 4" and 6" PVC Gravity Sewer Lateral	165	ea	48	\$7,920.00
13	6" C-900 PVC Water Pipe	1,484	lf	260	\$385,840.00
14	8" C-900 PVC Water Pipe	94	lf	262	\$24,628.00
15	10" C-900 PVC Water Pipe	4,922	lf	270	\$1,328,940.00
16	12" C-900 PVC Water Pipe	4,650	lf	276	\$1,283,400.00
17	6" Gate Valve Installation	6	ea	3200	\$19,200.00
18	8" Gate Valve Installation	6	ea	3600	\$21,600.00
19	10" Gate Valve Installation	14	ea	4500	\$63,000.00
20	12" Gate Valve Installation	14	ea	5000	\$70,000.00
21	8" X 8" Water Main Tee	0	ea	410	\$0.00
22	10" X 8" Water Main Tee	10	ea	680	\$6,800.00
23	12" X 8" Water Main Tee	16	ea	894	\$14,304.00
24	Water Service Replacement	149	ea	120	\$17,880.00
25	Water Meter Relocation	42	ea	1000	\$42,000.00
26	Water Meter Installation	31	ea	1000	\$31,000.00
27	Fire Hydrant Replacement	15	ea	7103	\$106,545.00
27a	Fire Hydrant Relocation	8	ea	9000	\$72,000.00
28	4" CR6 Stone Base	21,617	sy	19	\$410,723.00
29	8" CR6 Stone Base	42,004	sy	38	\$1,596,152.00
30	3" Hot Mix Asphalt 19mm Super Pave Base Coarse (43,722 sy)	7,713	ton	120	\$925,507.20
31	General Restoration	0	ls		
32	Undercut and Refill	599	cy	14	\$8,386.00
33	Bypass Pumping Case 1	70	day	182	\$12,740.00
34	Bypass Pumping Case 2	77	day	832	\$64,064.00
35	Single WR Inlet	0	ea	2500	\$0.00
36	Storm Manhole	3	ea	2000	\$6,000.00
37	15" RCP CLV	16	lf	63	\$1,008.00
38	18" RCP CLIII	100	lf	132	\$13,200.00
38a	24" RCP CL III	629	lf	135	\$84,915.00
39	Curb and Gutter	3,649	lf	33.5	\$122,241.50
40	Sidewalk	1,888	lf	18	\$33,984.00
41	Driveway Aprons	401	sy	100	\$40,100.00
42	Sidewalk Ramps	7	ea	70	\$490.00
43	Mobilization	0	ls		
	Subtotal				\$11,088,934.95
	Lump Sum Contingency Items* (#2, 7, 31, & 43)		ls	17.94%	\$1,989,354.93
	TOTAL				\$13,078,289.88
44	Engineering Design Fee Per Plan Sheet (@ 40 Scale)	7	ps	\$50,000.00	\$350,000.00
45	Full-time Inspection	2,865	hrs	43.75	\$125,343.75
	Subtotal				\$475,343.75
	GRAND TOTAL				\$13,553,633.63

Comparison of Construction Cost Subtotals (without engineering fees and inspection):

Town \$8,147,279.19

KCI \$8,418,780.99

RK&K \$13,078,289.88

Because L&C utilities were constructed under an extension of a bid of previously approved unit pricing for the Kidwell Project, no Requests for Proposal (RFPs) were needed to be put forward for either civil engineering or construction services which would have required bidding processes to select the engineer and contractor. The Town incurred expenses for traffic design engineering and design-build construction management. Additional expenses in the amount of \$134,046 were incurred by the Town for miscellaneous vendors providing signage, arborist services, soil remediation, parking adjustments, etc. Not only was there less overall engineering expense but it allowed the project to proceed within the narrow window of time provided by MSHA.

To assist the Town in fully analyzing the full project costs, The Town requested each consultant to submit their estimates for full civil engineering design as would have been required to prepare the project for bid. The consulting engineers submitted their estimated design fees as follows:

Town – actual expense \$106,959.25

KCI – estimated expense \$640,000

RK&K – estimated expense \$350,000

Sound engineering judgment acknowledges that significant unknowns prevail in reconstruction of underground utilities. KCI recommended a bottom-line unqualified contingency for construction work of 10%. RK&K recommended a range of 20- 25% for rehabilitation projects in urban areas. No such additional contingency was applied to the Town's contractor's work so none was applied to the professional engineers' estimate to keep the results consistent. Full time inspection was required for the utility construction. The construction work was done for the Town on a unit (in place) cost basis and the Town inspectors verified daily progress and quantities. The Town used three independent contractors to cover the full-time inspection need. Time of service was 2,865 hours based on actual 1.5 years of construction time.

Comparison of Inspection Services:

Town – actual expense \$94,692.50 (\$33.05/hr.)

KCI – estimated expense \$243,525 (\$85/hr.)

RK&K – estimated expense \$125,343.75 (\$43.75/hr.)

Out of an abundance of caution, the Town contracted independent materials and compaction testing services (John D. Hynes and Associates) to ensure that all work met or exceeded minimum materials and compaction specification suitable for MSHA work.

Town – actual expense \$138,870 (Hynes and Associates)

KCI – estimated expense \$186,225 (KCI provides in house geotechnical services)

RK&K – estimated expense \$119,972 (RK&K provides in house geotechnical services)

The Town also requested each consulting engineer provide estimates for the amount of time required to produce the Design, for Permitting, and for Construction. The Town acquired the MSHA construction permit and the required sediment and erosion control permits for the materials stockpiles. Time of construction for the project was derived from the daily inspection reports: After 8 months of project preparation and 2 months of delay in construction due to a hard winter freeze, actual work began on North Liberty February 25, 2018 and ran through August 21, 2019 whereupon work stopped to allow MSHA completion of the Gravel Run Bridge in North Commerce or approximately 18 months (1.5 years). Final wrap up beyond the Town's control due to the bridges work was performed September 18, 2019 - October 7, 2019 (19 days).

KCI Estimated Project Timing:

- Design – 9 months
- Permitting – 12 months
- Construction – 18 months

RK&K Estimated Project Timing:

- Design – 11.3 months (49 weeks)
- Permitting – 7.8 months (34 weeks)
- Construction – 12 months (52 weeks)

To summarize the time line it is presumed the Council would have given the okay in April 2017 to proceed with a bid for engineering design services and the bid would have been prepared in June with a bid opening in August and a Notice to Proceed to the engineer in September 2017. The clock would have started at this time and according to the KCI timeline they would have taken 9 months to design or June 2018 and would at that time have a project cost estimate to share with the Council. If the Council reviewed the cost estimate in July, then time would be needed to ensure bond funding could be secured for the estimated construction costs. Allowing one month for a preliminary analysis of bond funding and assuming the Council approved to proceed with the project, KCI would have started their 12-month permitting process in August 2018 and would have completed this phase in August 2019. This would be followed by an advertisement period for bids and the engineer's review of bids received over the next two months with anticipation of sharing the results with the Council to determine if the bid amount meets approval to proceed with the project. Assuming the Council decided to award the bid, the engineer would issue a Notice to Proceed around November 2019 and the contractor would likely mobilize in December. Adding the 18 months construction time in the timeline for KCI would mean the project would be complete by June 2021.

Using the same starting time of September 2017, the RK&K timeline would have taken 11.3 months to design or September 2018 and would at that time have a project cost estimate to share with the Council. If the Council reviewed the cost estimate in October, then time would be needed to ensure bond funding could be secured for the estimated construction costs. Allowing one month for a preliminary analysis of bond funding and assuming the Council approved to proceed with the project, RK&K would have started the 7.8 month permitting process in November 2018 and would have completed this phase in July 2019. This would be followed by an advertisement period for bids and the engineer's review of bids received over the next two months with anticipation of sharing the results with the Council to determine if the bid amount meets approval to proceed with the project. Assuming the Council decided to award the bid, the engineer would issue a Notice to Proceed around October 2019 and the contractor would likely mobilize in November. Adding the 12 months construction time in the timeline for RK&K would mean the project would be complete by November 2020.

In comparison, the Town moved forward with the narrow window of time of SHA deferring the mill and overlay by one year (July 2018 to July 2019) by using the existing Kidwell project bid based on unit prices and started design, permitting and preparation in April 2017. Within 8 months the project was supposed to start January 4, 2018 and be completed in 18 months or June 2019. Due to a hard winter freeze, the project construction startup was delayed until February 25, 2018 and was finished in August 2019.

Based on the original construction schedule the Town would complete the project June 2019, RK&K would complete the project November 2020 and KCI would complete the project June 2021. The Town's schedule would complete the construction work in time to meet the July 2019 timeframe SHA agreed to defer the mill and overlay by one year and the hiring of an engineering firm to design and permit the project would put the construction completion date between November 2020 to June 2021.

KCI and RK&K relied on somewhat different methodologies to generate the unit costs for the items enumerated in the uniformly used spreadsheet. KCI relied primarily on internal pricing taken from their recent projects on the Eastern Shore that went to bid and award. RK&K relied primarily on the MDOT SHA price indexes with additions from bid tab results from their recent projects. Projects selected from the index were from MSHA projects bid on the Eastern Shore Counties.

Comparison of Total Project Costs:

Town – \$8,621,846.94

KCI – \$9,302,305.99 + \$186,225 (geotechnical services) = \$9,488,530.99

RK&K – \$13,553,633.63 + \$119,972 (geotechnical services) = \$13,673,605.63

The Liberty/Commerce project cost more than the original estimate; however, in comparing the independent engineering cost estimates, it is evident the Town received good value with the bid unit price based construction.