



**CITY OF NOVI CITY COUNCIL
MAY 4, 2020**

SUBJECT: Consideration of approval of Change Order No. 5 to DVM Utilities, Inc. for the Nine Mile Road Sanitary Sewer project (Evergreen Court to Kensington) in the amount of \$536,429.91, and amend the budget.

SUBMITTING DEPARTMENT: Department of Public Works, Engineering Division

EXPENDITURE REQUIRED	\$ 536,429.91
AMOUNT BUDGETED	\$ 5,326,364
APPROPRIATION REQUIRED	\$ 590,309
LINE ITEM NUMBER	592-592.00-976.029

BACKGROUND INFORMATION: The Nine Mile Sanitary Sewer project has been in the works since 2015/16. The complicated endeavor involves the replacement of approximately 6,200 feet of force main sanitary sewer with gravity sewer from Evergreen Court to Kensington. The purpose of this project is to provide redundancy to the Park Place pump station, which is 1.6 miles from the closest gravity outlet (near Kensington). A failure of the existing force main could result in loss of service and potentially cause a significant sewage spill or sanitary sewage overflow. The construction of this project has taken substantially more effort than initially anticipated, primarily due to the intensive dewatering required to allow for safe construction.

Below is a summary of the current status of this project. Refer to the attached map, January 23, 2020, and April 3, 2020 memos for additional information:

- **100% of the 2,850 feet of the open-cut (Traditional Trench Excavation)** – this portion of the project is complete. This is the western half of the project, which is the shallower portion of the pipe installation.
- **40% of the 3,500 feet of the trenchless (Guided Pilot Tube)** – this is the deeper, eastern half of the project. This trenchless method allows for reduced impact to the road, natural features, and residential properties.

The following challenges have occurred in the field and delayed the project's timeline:

- **Excessive dewatering** – The dewatering system was modified twice and is now pumping up to 6 million gallons/day.
- **Challenging conditions near Vasilios Court** – created significant delays but has been resolved.

Staff expected this project to be complicated, as most sewer installations of this magnitude are far from routine (especially at depths to 30'). City staff, OHM, and the contractor have been working to keep the project on track and have administered change orders for validated items (materials and labor for increased dewatering). Without the benefit of knowing the total additional costs and acting within the parameters set forth by City Council, staff chose to keep the project going by administering CO #3 and CO #4, since any interruption would only have created significant setbacks and added costs.

However, it became clear in late 2019 the challenges were going to result in a significant cost increase due to circumstances out of the control of the contractor. A memo on January 23, 2020, informed City Council of the upcoming impacts to the project scope. After several reviews and revisions between staff and OHM, a claim was submitted by the contractor in February. Subsequent negotiations resulted in a final claim draft from the contractor (attached). On April 3, another update memo was provided with estimated costs, and after a final collaboration via virtual meetings, staff and OHM were able to approve a claim for CO #5 for \$536K (down from the ~\$800,000 originally submitted). This change order is for the additional effort for the time period from June 2019 through August 2019.

Below is a summary of the previous and proposed change orders for this project:

Change Order No.	Date Approved	Amount	Description of Change Order
1	4/15/2019	\$20.00	Balancing of Tree Clearing Items No. 7 & 8
2	7/8/2019	-\$11.32	Xypex Treatment additive and balancing of Erosion Control – Silt Fence item
3	1/10/2020	\$99,000.00	Upsize the dewatering header pipe from 12-inch to 18-inch, material only
4	2/24/2020	\$97,332.34	Additional increases for dewatering header pipe and increases for crew days on Basin "B" Improvements and CMP installation
5	Proposed	\$536,429.91	Increase Item No. 7 (Tree Removal, 6" - 18") and Item No. 82 (Emergency Excavation) and addition of dewatering claims from the contractor for additional effort, rental equipment, pumps, drop pipes, etc. along with the correlated inspection crew days and contract time.

Furthermore, an additional change order will be forthcoming near the completion of the project to cover the additional effort anticipated from September 2019 to completion. Staff anticipates this future claim will be in the range of \$600,000 to \$800,000 for a total project cost of \$7.35 million. Referring to the April 24, 2020 OHM memo for details describing the additional effort associated with the dewatering operations, which is the primary reason for all change orders discussed.

The construction engineering services and geotechnical engineering services related to this project will also be increased to reflect the additional effort anticipated to complete the remainder of the project and is summarized below:

OHM		
Contract Administration	Additional services anticipated for the remainder of the project.	\$88,772
Crew Days	Additional 90 days x \$700 daily inspection fee	\$63,000
Testing Engineers and Consultants (TEC)		
Material Testing	Additional piezometer installation and additional geotechnical services anticipated for the remainder of the project.	\$39,720

A timeline for this complex project has been difficult to predict, since ground conditions can change the contractor's method and approach and slow the progress of work. At this time, based on input from the contractor and OHM, we anticipate substantial completion of the sanitary installation to be October 2020 and final project completion at the end of 2020. Any resident concerns on this project thus far have been addressed promptly by staff and/or by the OHM field inspection team.

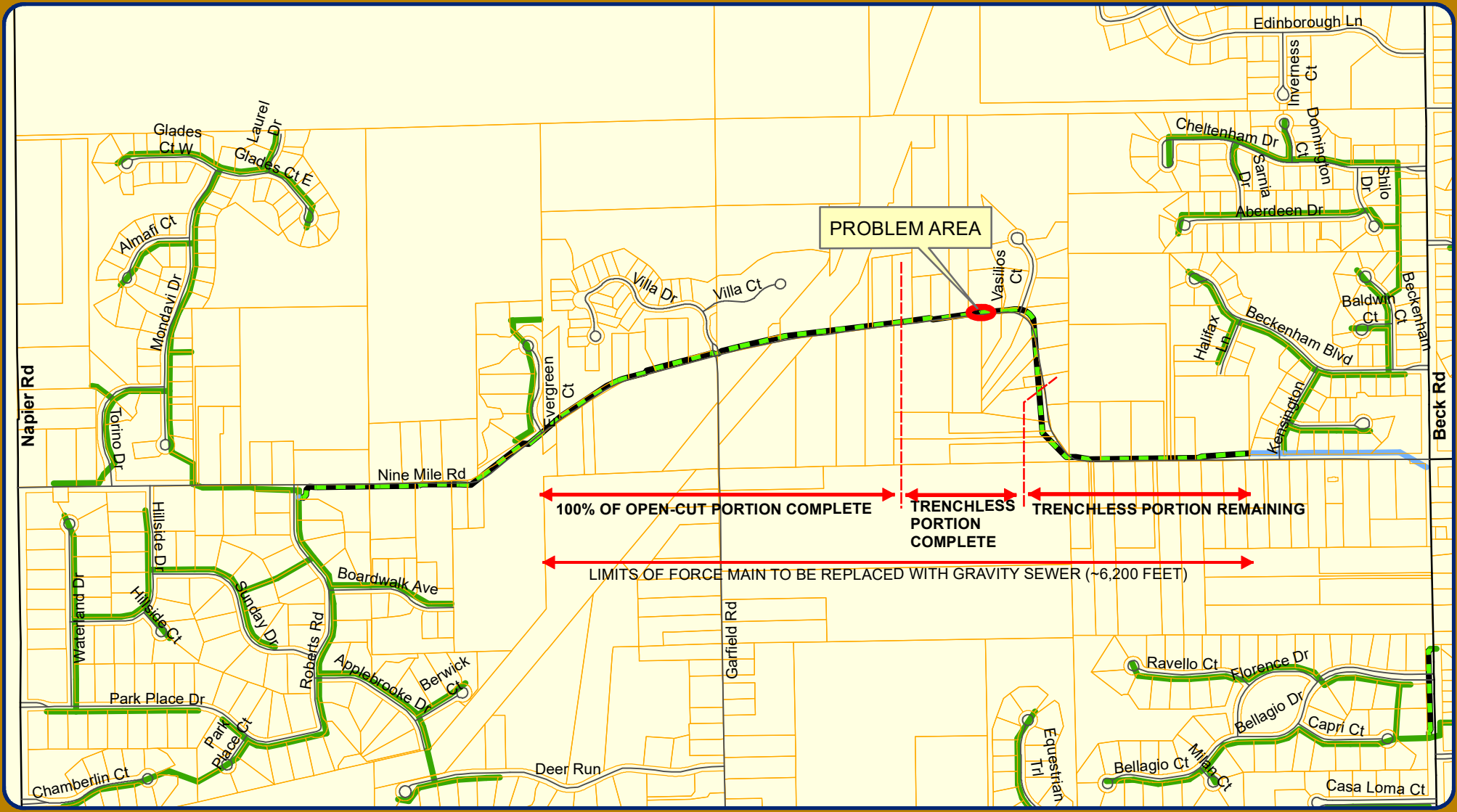
Although this project has been delayed by the challenges discussed above, the long-term benefits from replacement of the force main with new gravity sewer still outweigh the additional costs. The benefits of the gravity sewer installation are:

- Allows for reasonable mitigation of any major failure of the Park Place pump station.
- Eliminates need for parallel force main redundancy.
- Eliminates future sanitary pump stations to support future development in the area, as pump stations present the highest risk of failure.
- Eliminates long-term pump station maintenance (pumps and equipment replacements, technology upgrades for system reporting, utility costs).
- Allows Nine Mile residents connections to the sewer without the need to maintain a private grinder pump station at their residence.
- Mitigate failing septic systems in the area.

RECOMMENDED ACTION: Approval of Change Order No. 5 to DVM Utilities, Inc. for the Nine Mile Road Sanitary Sewer project (Evergreen Court to Kensington) in the amount of \$536,429.91, and amend the budget.

NINE MILE GRAVITY SEWER PROJECT

Location Map






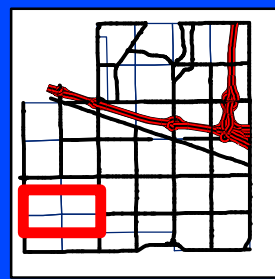
Map Author: Croy
 Date: 4/22/2020
 Project: Nine Mile Gravity Sewer
 Version #: v2.1

MAP INTERPRETATION NOTICE

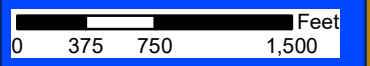
Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.

Map Legend

-  6" Sanitary Force Main
-  8.0" Gravity Sanitary Sewer
-  12.0" Gravity Sanitary Sewer



City of Novi
 Engineering Division
 Department of Public Works
 26300 Lee BeGole Drive
 Novi, MI 48375
 cityofnovi.org





memorandum

Date: April 24, 2020

To: Ben Croy, PE, City Engineer, City of Novi,

cc: Tim Juidici, PE, OHM Advisors

From: George Tsakoff, PE & Greg Marker, PE, OHM Advisors

Re: 9 Mile Rd Sanitary Sewer Construction – Overview of Dewatering Claim Impact

This memo serves as a summary overview of the additional dewatering effort and current claim under review from the Contractor (DVM) on this project through end of August 2019. This summary also provides a review of additional OHM Advisors (OHM) professional services for contract administration, construction engineering, and daily inspection services anticipated through the end of project construction.

The Nine Mile Road Sanitary Sewer project began construction in late March 2019 carefully negotiating the specific work areas for the project, mobilization, strategic clearing and tree removal, silt and construction fence installation, and setting up a dewatering system capable of handling 2 Million Gallons Per Day (MGD) in ground water discharge. As the project progressed, it was evident that a 2 MGD dewatering system was not capable of adequately dewatering the aquifer to provide adequate drawdown (cone of influence) to safely install vertical caissons/shafts or to begin the guided pilot tube operation for sanitary sewer installation. The reasoning for this is technical in nature regarding the specific hydrology and hydrogeologic characteristics of the site, aquifer, and ground conditions. This reality was acknowledged by the project engineering team (OHM and City) and supported by the geotechnical engineer (TEC) as being unforeseen without the benefit of extensive pre-construction hydrogeologic analysis and modeling.

It was then decided by the entire project team (OHM, TEC, City, and DVM) that continuing the sanitary sewer to the extent possible would be more cost effective and beneficial to the City and its residents, rather than stopping the project entirely to perform additional hydrogeologic analysis. In addition, extensive data had been obtained during the early stages of the project to provide a much better estimate for the necessary daily dewatering rate needed to allow for acceptable and safe construction progress. Therefore, prior to negotiating with DVM for a more robust dewatering system, the project continued to move forward at a slower pace during most of 2019 to ensure some level of continued progress. This insured the complete upgrade of the dewatering system could be implemented based on actual site/hydrogeological conditions. In September 2019, an application was prepared and secured by OHM for an EGLE Part 327 permit for up to 8 MGD in dewatering discharge and an upgraded dewatering system capable of pumping and conveying up to 8 MGD was installed by DVM. This more robust dewatering system was in operation in the late part of 2019.

The impacts to DVM's operation are best summarized in the attached 4-page narrative for their dewatering claim made from 6-13-2019 to 9-01-2019. This document was first discussed between DVM and OHM at the beginning of September with a first draft reviewed by OHM and comments provided to DVM. A second draft was verbally discussed between OHM, the City and TEC in October 2019, and a final round of comments were provided to DVM in January 2020 prior to the final version being received in late February 2020. This is the current version provided in this package to City Council.

The 9-page individual cost claim by DVM that is also attached to this letter has been reviewed per item by OHM during a series of back and forth communication with DVM that started in September 2019. This review



was performed to evaluate that each claim was consistent with unforeseen circumstances to this contract; was accurate compared to the project records; and that individual costs were in conformance with current unit costs for the value of work performed. The DVM dewatering claim as received at the end of February 2020 is for the time period from June 2019 through August 2019 and was originally in the amount of nearly \$800,000. After evaluation by OHM and several weeks of negotiation with DVM, the modified change order for the dewatering claim for delays and additional efforts for unforeseen hydrogeologic conditions and aquifer performance totaled \$537,929.91. Of that amount, \$17,500 of the items in the claim had been previously approved in Contract Change Order No's. 3 and 4. Therefore, the dewatering claim portion of Change Order No. 5 was again modified to the current amount of \$520,429.91. Also please note that Change Order No. 5 includes other costs in the amount of \$16,000 for tree removal and emergency excavation by DVM. Therefore, including all components, OHM Advisors recommends that the City approve Change Order No. 5 to DVM in the amount of \$536,429.91.

Additionally, it is important to note that this current claim for Change Order No. 5 will not be the final claim associated with the additional dewatering efforts. However, the background data for the time period from September 1st has not yet been fully submitted, reviewed, or processed. It is expected that the total amount of the claims from September 1st, 2019 through the end of the project in fall/early winter 2020 would likely be in the same order of magnitude as the current claim for proposed Change Order No. 5, or slightly higher. OHM's opinion is that this future claim will be in the range of \$600,000 to \$800,000, once all the data is received and can be vetted/validated.

Also, as part of this current claim and as proposed for Change Order No. 5, a calendar day extension is recommended. Based on the recent progress of work and anticipated production over the summer months, it is OHM's opinion that the City approve the calendar day extension for the project to a reasonable time period to complete the work. For the project as it currently stands, the following is recommended:

- Amend the current substantial completion date of February 13th, 2020 by 240 calendar days to October 10th, 2020
- Amend the current final completion date of March 29th, 2020 by 261 calendar days to December 15th, 2020

Please note that the above timelines could be affected by further unforeseen site conditions, abnormal weather-related impact, or impact to the schedule related to the on-going COVID-19 Pandemic such as State/Local restrictions or the health of staff involved in the project.

In terms of the current OHM Agreement for Professional Services with the City, attached is a request for an Authorization for Additional Services No. 2. This authorization contains two major components, an amendment to the contract administration task, and an amendment to the daily inspection (crew day) task. The contract administration task requests a total contract administration amendment of \$88,772 (which is comprised of past additional services related to unforeseen conditions due to dewatering analysis, dewatering planning and implementation assistance, as well as future contract administration/construction engineering services related to the extension of time into December 2020).

Under the Crew Day task, we are currently requesting 90 additional crew days at a cost of \$63,000 to the OHM Advisors Agreement. This is based on the additional number of crew days anticipated to be necessary in addition to the current amount of crew days issued on PO# 94706, to cover daily inspection services by OHM Advisors through the requested modified completion date of December 15, 2020. No crew day incentive would be available to DVM on this project by adding additional crew days to their contract.

We appreciate the opportunity to continue to assist the City with this challenging project. If you require any further information or clarification regarding the project status or cost, please do not hesitate to contact us.



CONTRACTOR: D.V.M. UTILITIES, INC.
 PROJECT NAME: Nine Mile Road Sanitary Sewer (Between Kensington & Evergreen CT)
 OWNER: CITY OF NOVI, MI
 ENGINEER: OHM Advisors, Livonia, MI

February 10, 2020

LOCATION: On 9 Mile Road at MH-12 Shaft, MH-11 Shaft, MH-10 Shaft and MH-9 Shaft
 Breakdown of costs for Additional DEWATERING - Claim #1

Date	Description	Unit Code	Quantity	Unit	Unit Price	Total Cost
6/13/2019	Inside Shaft #11: Tried excavating deeper and was unsuccessful due to ground water. Pumped shaft down & excavated (1) load of dirt out to set 3" 8.9 HP pump. Installed 3" 8.9 HP, HH pump from Xylem due to high head pressure since 5 HP pump was not sufficient enough to get the water table below the bottom of the shaft grade. Tried High head pump due to higher head pressure. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (2) Hours . Rental: Xylem Pump Rental from 06/10/19 to 09/15/19 - (3) Months at \$1,485.38/Month. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.	Xylem - Pump rental. Inv#400929093	3.00	MONTH	\$1,485.38	\$4,456.14
		DVM-Labor (Breakdown attached)	2.00	HRS	\$869.69	\$1,739.38
6/14/2019	Inside Shaft #11: Excavated inside shaft #11, reset & lowered pump. Installed 4" 8.9 HP, HV pump from Xylem due to high volumes since 5 HP pump was not sufficient enough to get the water pumped fast enough below the bottom of the shaft grade. High volume pump was tried to gain higher volumes with greater pumping capacity. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (2) Hours . Rental: Xylem Pump Rental from 06/14/19 to 09/15/19 - (3) Months at \$1,057.10/Month. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.	Xylem - Pump Rental. Inv#400930213	3.00	MONTH	\$1,057.10	\$3,171.30
		DVM-Labor (Breakdown attached)	2.00	HRS	\$869.69	\$1,739.38

6/26/2019	Inside Deep Well @ Shaft #11: Excavated at the center inside shaft #11 with 3 Ft of water at the center of the shaft. Installed 10 HP pump from Mersino due to high volumes since 5 HP pump was not sufficient enough to get the water pumped fast enough below the bottom of the shaft grade and below pipe invert. High volume pump was tried to gain higher volumes with greater pumping capacity. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (2) Hours. Rental: Mersino 10 HP Pump Rental at \$1,188.00 per Month from 06/26/19 to 09/15/19 (3) Months. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.	Mersino - Pump Rental. Inv#69458 (1) Pump for (3) Months	3.00	MONTH	\$1,188.00	\$3,564.00
		DVM-Labor (Breakdown attached)	2.00	HRS	\$869.69	\$1,739.38
6/28/2019	Inside Shaft #10: Excavated inside shaft #11 and Installed (3) 10 HP Pumps from Mersino due to high volumes since 5 HP pump was not sufficient enough to get the water pumped fast enough below the bottom of the shaft grade and below pipe invert. Additional pumps was used to be able to pour concrete on the shaft floor. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (2) Hours. Rental: Mersino (3) 10 HP Pump Rental at \$1,188.00 per Month from 06/26/19 to 09/15/19 (3) Months. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.	Mersino - Pump Rental. Inv#69458 (3) Pumps for (3) Months	3.00	MONTH	\$3,564.00	\$10,692.00
		Mersino - Labor to Install (3) Pumps at Shaft #10	1.00	LS	\$2,360.00	\$2,360.00
		DVM-Labor (Breakdown attached)	6.00	HR	\$869.69	\$5,218.14
7/2/2019	Additional Fueling Cost - Labor, Equipment & Fuel {From 06/29/19 to 08/31/19}. Breakdown of costs attached	DVM-Labor (Breakdown attached)	1.00	LS	\$40,970.52	\$40,970.52
7/18/2019 & 07/19/2019	Inside Shaft #11: Installation of a 10' diameter CMP pipe at the interior of shaft 11. The space between the existing sheeting at the 13' diameter shaft and the 10' diameter Corrugated Metal Caisson was grouted using a 150 to 250 psi flowable grout mix. Flow fill 33.5 yards {As per proposal & cost submitted 07/10/2019}	DVM-Labor (Breakdown attached)	1.00	LS	\$15,500.00	\$15,500.00
7/22/2019	Inside Shaft #11: Pumped down shaft #11. Extra work to shovel out flow fill residue & settlement from inside the CMP bottom from the uncontrollable ground water pushing the flow fill into the CMP. Pulled out pumps. Hauled pumps, hoses, materials & equipment with loader and dump truck. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (7) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.	DVM-Labor (Breakdown attached)	7.00	HRS	\$869.69	\$6,087.83

Paid
CO 3
or 4

7/29/2019	Inside Shaft #11: Install additional 3" 6 HP Xylem pump back in Shaft #11 after pilot tube was complete. Labor: DVM Crew includes (1) person crew for 2 Hrs. Equipment: Foreman Truck w/Fuel tank & tools. RENTAL: Xylem Pump rental from 07/03 to 07/30/19 Inv#400934843 - \$874.50 and Inv#400939991 - \$446.47	DVM-Labor (Breakdown attached)	2.00	HRS	\$123.05	\$246.10
		Xylem - Pump rental. Inv attached	1.00	MONTH	\$1,320.97	\$1,320.97
7/30/2019	Inside Shaft #10: Setup Grove Crane and Installed 4' Rib & Board set at the bottom of the shaft. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (4) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.	DVM-Labor (Breakdown attached)	4.00	HRS	\$869.69	\$3,478.76
7/31/2019	Inside Shaft #10: Set plywood/sand bags for forms between Rib & Board and PZC Sheeting at the bottom of the shaft. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (7) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.	DVM-Labor (Breakdown attached)	5.00	HRS	\$869.69	\$4,348.45
8/1/2019	Inside Shaft #11, Shaft #10 & Shaft #9: Pour 4.5 yds of flow fill between Rib & Board and PZC Sheeting. Install Rib & Board in Shaft #9. While casing entered CMP in Shaft #11, it flooded the shaft. Evacuated the shaft. Had to install 10 HP pump due to heavy water infiltration around casing. Labor: DVM Excavation crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (10) Hours. DVM Trenchless Crew includes (2) Operators, (1) Truck Driver, (2) Laborers & (1) Operator/Foreman for (5) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Foreman Truck. Loader was used to RENTAL: Vac Truck from Jack Doheny to remove rocks, water & sand in shaft #11.	DVM-Labor (Excavation Crew Breakdown attached)	10.00	HRS	\$622.44	\$6,224.40
		DVM-Labor (Trenchless Crew Breakdown attached)	5.00	HRS	\$1,427.44	\$7,137.20
		Superior Concrete	1.00	LS	\$580.88	\$580.88
		Jack Doheny-Vac Truck Rental	1.00	LS	\$1,500.00	\$1,500.00
	Between Shaft #12 to Shaft #11: While pushing clay pipe #13 water started flowing back to the shaft #12 and we noticed clay pipe was cracked. Clay pipe cracked due to unstable ground and uncontrollable ground water. Pushed (13) 12" Clay Pipe and removed (26)	DVM-Labor (Breakdown attached)	3.00	HRS	\$869.69	\$2,609.07

8/2/2019	casings. Broke (3) Clay pipe. Labor: DVM Excavation crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (3) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Tandem-Axle Dump Truck, Foreman Truck, Grove Crane. DVM Trenchless Crew from 1:30 pm to 5:30 pm with Equipment Akkerman, Grove Crane, Loader, Tandem Axle Dump Truck, F-450 Truck for (4) Hrs.	DVM-Labor (Trenchless Crew- Breakdown attached)	4.00	HRS	\$1,427.44	\$5,709.76
8/3/2019	Between Shaft #12 to Shaft #11: Dealing with cracked pipe. Setup Roddie 60 Ton GBM Machine in Shaft #11 and pushed out (3) broken clay pipe. Labor (OT): DVM Excavation crew from 1:30 pm to 4:30 pm includes (2) Operators, (1) Truck Driver & (1) Laborer for (3) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane. DVM Trenchless Crew from 7:30 to 2:00 pm includes (3) Operators, (1) Truck Driver & (1) Laborer. Equipment: Roddie GBM, Akkerman, Komatsu 200 Loader, F-450 Tool Truck, Tandem Grove Crane, Linkbelt	(Excavation Crew- Breakdown attached)	3.00	HRS	\$1,026.81	\$3,080.43
		DVM-Labor (Trenchless Crew- Breakdown attached)	6.75	HRS	\$1,621.93	\$10,948.03
8/5/2019	Between Shaft #12 to Shaft #11: Realigned GBM with pipe. Pushed (4) Clay pipe but 3rd pipe broke. Setup Montana GBM machine in Shaft #11 and pushed put broken pipe. Labor (OT): DVM Excavation crew from 1:30 pm to 4:30 pm includes (2) Operators, (1) Truck Driver & (1) Laborer for (3) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane. DVM Trenchless Crew includes (3) Operators, (1) Truck Driver & (1) Laborer. Equipment: Akkerman, Grove Crane, Komatsu 200 Loader, F-450 Tool Truck.	(Excavation Crew- Breakdown attached)	3.00	HRS	\$1,026.81	\$3,080.43
		DVM-Labor (Trenchless Crew- Breakdown attached)	10.50	HRS	\$1,621.93	\$17,030.27
8/6/2019	Between Shaft #12 to Shaft #11: Pumped AV101 & AV202 to stabilize the ground and stop material from running in around the casing. Pumped 60 Gal of Acrylamide & 7 Gal of Av202 & (3) tubes of AZO water stop through 1/2" pipe under casing approx. 8' outside of shaft#12. Pushed out (12) 12" Clay pipe. Labor: DVM Excavation crew from 1:30 pm to 4:30 pm includes (2) Operators, (1) Truck Driver & (1) Laborer for 10 Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane. DVM (7) Person Trenchless Crew from 7:00 am to 5:30 pm includes (1) Foreman/Operator, (3) Operators, (1) Truck Driver & (2) Laborer. Equipment: Akkerman, Grove Crane, Linkbelt	DVM-Labor (Trenchless Crew- Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30
		Material: Avanti Acrylamide Grout	60.00	Gal	\$6.05	\$363.00
		Material: Avanti AV202 Grout	7.00	Gal	\$103.88	\$727.16
		Material: AZO Water stop	3.00	Tubes	\$20.67	\$62.01
		(Trenchless Crew- Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30

8/7/2019	<p>Between Shaft #12 to Shaft #11: Pulled all of the augers out of the casing. Pumped (5) Gallons of AV202 around casing and (60) Gallons of Acrylamide grout around casing at Shaft #12 to stop material & water from coming in. Labor: DVM Trenchless crew from 7:00 am to 5:30 pm includes (1) Foreman/Operator, (2) Operators, (1) Truck Driver & (2) Laborer for (10) Hours. Equipment: Grout Truck w/Equipment, Portable Grout Pump, F-450 Tool Truck, Foreman Truck, Grove Crane. Material: Avanti Grout 60 Gallons per Bag.</p>	Material: Avanti Grout	60.00	Gal	\$6.05	\$363.00
		Material: Avanti AV202 Grout	5.00	Gal	\$103.88	\$519.40
		Material: AZO Water stop	2.00	Tubes	\$20.67	\$41.34
8/8/2019	<p>Between Shaft #12 to Shaft #11: Drilled (4) holes down to top of casing at 2', 5', 8' & 12' outside of shaft #12 and pumped 60 gallons of Acrylamide grout through 1/2" pipes down to casing to stabilize soil around casings and shaft. Pumped (40) gallons grout at shaft #11 under caing to stabilize soil. Backfilled (2) sink holes w/10 cyds of Class II sand. Labor: DVM Trenchless crew from 7:00 am to 5:30 pm includes (1) Foreman/Operator, (2) Operators, (1) Truck Driver & (2) Laborer for (10) Hours. Equipment: Grout Truck w/Equipment, Portable Grout Pump, F-450 Tool Truck, Foreman Truck, Grove Crane. DVM Trenchless Crew from 1:30 pm to 5:30 pm includes (3) Operators, (1) Truck Driver & (1) Laborer. Equipment: Akkerman, Grove Crane, Linkbelt 235, Bobcat w/drill. Material: Avanti Grout 60 Gallons per Bag.</p>	DVM-Labor (Trenchless Crew- Breakdown attached)	10.25	HRS	\$1,621.93	\$16,624.78
		Material: Avanti Grout	100.00	Gal	\$6.05	\$605.00
		Material: Class II Sand	13.50	Tons	\$10.33	\$139.46
8/12/2019	<p>Inside Shaft #11 & Shaft #10: Removed (1) 15 HP 4" pump and Installed HV Pencil Turbine pump in Shaft #11, Removed (1) 5 Hp pump from Shaft #10 and Installed (1) 15 HP pump in Shaft 10. Labor: DVM crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (5) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane. Dis-assembled and removed GBM from shaft #12, removed push plate and thrust block. Moved Akkerman equipment to shaft #10. Labor: DVM Trenchless crew from 7:00 am to 4:30 pm includes (1) Foreman/Operator, (2) Operators, (1) Truck Driver & (2) Laborer for (10) Hours. Equipment: Grout Truck w/Equipment, Portable Grout Pump, F-450 Tool Truck, Foreman Truck, Grove Crane. DVM Trenchless Crew from 1:30 pm to 5:30 pm includes (3) Operators, (1) Truck Driver & (1) Laborer. Equipment: Akkerman, Grove Crane, Linkbelt 235. Labor: Mersino - Inv#69458 08/31/19 \$2,360.00</p>	DVM-Labor (Excavation Crew- Breakdown attached)	5.00	HRS	\$869.69	\$4,348.45
		Mersino - Labor to Install Turbine Pump in Shaft #11	1.00	LS	\$2,360.00	\$2,360.00
		DVM-Labor (Trenchless Crew- Breakdown attached)	9.00	HRS	\$1,621.93	\$14,597.37

8/13/2019	<p>Between Shaft #10 to Shaft #11: Drilled down to pipe grade outside of shaft #10. Pumped (60) gallons of Acrylamide grout outside of shaft #10 to stabilize soil. Re-Welded push plate. Setup GBM to push pilot tubes. Set line and grade from Mh-10 to MH-11. Labor (OT): DVM (5) Person Trenchless crew from 7:00 am to 5:00 pm includes (1) Foreman/Operator, (2) Operators, & (2) Laborer for (5) Hours. Equipment: Grout Truck w/Equipment, Portable Grout Pump, F-450 Tool Truck, Foreman Truck, Grove Crane. Material: Avanti Grout 60 Gallons per Bag.</p>	DVM-Labor (Trenchless Crew-Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30
		Material: Avanti Grout	60.00	Gal	\$6.05	\$363.00
8/14/2019	<p>At Shaft #9 & Shaft #10: Pour 6 yds of flowable fill between boards & sheeting due to water level above pipe invert and soils not stable to pull sheeting at Entry in Shaft #9. Set up GBM in Shaft #10. Labor: DVM Excavation crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (8) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane. Labor: DVM (5) Person Trenchless crew from 7:00 am to 5:00 pm includes (1) Foreman/Operator, (2) Operators, & (2) Laborer for (5) Hours. Equipment: Grout Truck w/Equipment, Portable Grout Pump, F-450 Tool Truck, Foreman Truck, Grove Crane. Material: 6 yds of Flowable Fill from Superior Materials.</p>	DVM-Labor (Excavation Crew-Breakdown attached)	8.00	HRS	\$869.69	\$6,957.52
		DVM-Labor (Trenchless Crew-Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30
		Superior Materials - Invoice #	1.00	LS	\$719.74	\$719.74
8/15/2019	<p>Between Shaft #10 to Shaft #11: Pour additional 2 yds of flowable fill between boards & sheeting due to water level above pipe invert and soils not stable to pull sheeting at Entry in Shaft #9. Set up guidance system for GBM. Drilled out 150' from shaft #10 to shaft #11. Set up GBM to push casing. Labor: DVM Excavation crew includes (2) Operators, (1) Truck Driver & (1) Laborer for (1.5) Hours. Equipment: Linkbelt 235 Excavator, CAT 938 Loader, Dump Truck, Foreman Truck, Grove Crane.</p>	DVM-Labor (Excavation Crew-Breakdown attached)	1.50	HRS	\$869.69	\$1,304.54
		DVM-Labor (Trenchless Crew-Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30
		Superior Materials	1.00	LS	\$347.68	\$347.68

8/16/2019	Between Shaft #10 to Shaft #11: Pushed (18) Casings and removed pilot tubes from shaft #10 to shaft #11. Labor: DVM (5) Person Trenchless crew from 7:00 am to 5:00 pm includes (1) Foreman/Operator, (2) Operators, & (2) Laborer for (10) Hours. Equipment: Akkerman, Loader, F-450 Tool Truck, Foreman Truck, Grove Crane.	DVM-Labor (Trenchless Crew- Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30
8/19/2019	Between Shaft #10 to Shaft #11: Pushed (17) Casings and removed pilot tubes from shaft #10 to shaft #11. Large size rocks getting stuck in cutter head and augers. Labor: DVM (5) Person Trenchless crew from 7:00 am to 5:00 pm includes (1) Foreman/Operator, (2) Operators, & (2) Laborer for (10) Hours. Equipment: Akkerman, F-450 Tool Truck, Foreman Truck, Grove Crane.	DVM-Labor (Trenchless Crew- Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30
8/20/2019	Between Shaft #10 to Shaft #11: Pushed (6) more Casings and removed pilot tubes from shaft #10 to shaft #11. Setup GBM to push pipe. Pushed (8) 2m 12" Clay pipe from MH-10 to MH-11. Labor: DVM (5) Person Trenchless crew from 7:00 am to 5:00 pm includes (1) Foreman/Operator, (2) Operators, & (2) Laborer for (10) Hours. Equipment: Akkerman, F-450 Tool Truck, Foreman Truck, Grove Crane. (1) Additional Laborer assisted in removing casings on the exit side.	DVM-Labor (Trenchless Crew- Breakdown attached)	10.00	HRS	\$1,621.93	\$16,219.30
		DVM-Labor	4.50	HRS	\$57.00	\$256.50
8/21/2019	Between Shaft #10 to Shaft #11 and Outside Shaft #11: Pumped 60 Gallons of Acrylamide Grout at Shaft #11 to stabilize soil and slow down water infiltration at shaft wall. DVM crew includes (5) Person Trenchless Crew with Grout Truck & Pump, Foreman Truck with Tools, Operator truck and Generator. Pushed (14) 2m x 12" Clay pipe from MH-10 to MH-11 and removed casings. Labor: DVM crew includes (5) Person Trenchless Crew with Grout Truck & Pump, Foreman Truck with Tools, Operator truck and Generator. Materials: 80 Gallons of Avanti Acrylamide Grout from Sherwin Williams	DVM-Labor (Excavation Crew- Breakdown attached)	11.00	HRS	\$869.69	\$9,566.59
		DVM-Labor (Trenchless Crew- Breakdown attached)	11.00	HRS	\$1,621.93	\$17,841.23
		Material: Avanti Grout	60.00	Gal	\$6.05	\$363.00
8/22/2019	Between Shaft #10 to Shaft #11 and Outside Shaft #11: Set and tied in MH #11. Removed GBM out of Shaft #10. Used 2 yds of 6AA stone at Shaft #11. Labor: DVM crew includes (5) Person Trenchless Crew with Grout Truck & Pump, Foreman Truck with Tools, Operator truck and Generator. Materials: 2 yds of 6AA stone	DVM-Labor (Trenchless Crew- Breakdown attached)	9.25	HRS	\$1,621.93	\$15,002.85

8/23/2019	Outside Shaft #10 & Shaft #9: Pumped 60 Gallons of Acrylamide Grout outside Shaft #11 and Pumped 20 Gallons of Acrylamide Grout outside shaft #9 to stabilize soil and slow down water infiltration at shaft wall. Labor: DVM crew includes (5) Person Trenchless Crew with Grout Truck & Pump, Foreman Truck with Tools, Operator truck and Generator. Materials: 80 Gallons of Avanti Acrylamide Grout from Sherwin Williams	DVM-Labor (Trenchless Crew- Breakdown attached)	8.00	HRS	\$768.49	\$6,147.92
		Material: Avanti Grout	80.00	Gal	\$6.05	\$484.00
8/26/2019	Outside Shaft #10 & Shaft #9 and From Shaft #6 to Shaft #9: Pumped additional 45 Gallons of Acrylamide Grout outside Eastside of Shaft #9, Pumped 10 Gallons of Acrylamide Grout outside Westside of shaft #9, Pumped 10 Gallons of Acrylamide Grout outside Eastside of Shaft #10 to stabilize soil and slow down water infiltration at shaft wall. Labor: DVM crew includes (5) Person Trenchless Crew with Grout Truck & Pump, Foreman Truck with Tools, Operator truck, Bobcat w/Drill and Generator. Materials: 65 Gallons of Avanti Acrylamide Grout from Sherwin Williams. From Shaft #6 to Shaft #9: Mark K. worked with Mersino from 9:00 am to 3:00 pm with John Deere Mini Excavator. Disconnected and pulled all 8" from under driveways and loaded it on trailer from Shaft #6 to Shaft #9. Jose M. worked with Mersino from 1:00 pm to 3:00 pm with Loader. EXTRA Work is due to upsizing of dewatering discharge header pipe since 8" was found out to be too small to handle the volume of water.	DVM-Labor (Trenchless Crew- Breakdown attached)	8.00	HRS	\$768.49	\$6,147.92
		(Excavation Crew- Breakdown attached)	2.00	HRS	\$131.00	\$262.00
		(Excavation Crew- Breakdown attached)	6.00	HRS	\$97.00	\$582.00
		Material: Avanti Grout	65.00	Gal	\$6.05	\$393.25
8/27/2019	From Shaft #6 to Shaft #9: Brian D. fixed driveways where 8" discharge pipe was removed. DVM Labor: (1) Foreman/Operator with Loader & Operator truck for 2 Hrs.	DVM-Labor	2.00	HRS	\$219.00	\$438.00
06/13/19 to 08/27/19	PRO-TEC/L.B. FOSTER Equipment: ADDITIONAL RENTAL Cost for PZC-18 Sheeting and 24' Steel Overlap Sheeting {From 06/13/19 to 08/27/19}. Additional rental cost was incurred due to delays associated with the dewatering operations due to DEQ dewatering limitations and not being able to dig & install shafts for extended periods of time and not being able to install the pipe by trenchless pilot tube operations until the ground water was below the invert of the pipe at the shafts. Inv#PSI58099 \$3,219.75 (For 3 weeks), Inv#PSI58769 \$4,293.00, Inv#PSI59636 \$4,293.00, Inv#PSI59314 \$2,166.60, Inv#PSI58755 \$5,035.00, Inv#PSI59325 \$5,035.00.	RENTAL: PRO- TEC PZC-18 Steel Sheeting	1.00	LS	\$13,972.35	\$13,972.35
		RENTAL: PRO- TEC 24' Steel Overlap Sheeting	1.00	LS	\$10,070.00	\$10,070.00

06/21/19 to 08/27/19	MERSINO DEWATERING, INC.: ADDITIONAL RENTAL Cost for (1) Upsized 15 HP Pumps from 07/03/19, (2) 15 HP from 08/09/19. (1) Turbine Pump from 08/12/19. Deep Well Idle Charges for #8, #7 & #6 for (10 Weeks) {From 06/21/19 to 08/27/19}. Idle Dell Well Rental Charges \$200.00 per Well/Week, 15 HP Pump at \$1,320.00 per Month, Turnine Pump at \$1,104.00 per Month + Installation \$2,360.00. ADDITIONAL 15 HP & Turbine PUMPS WERE USED AS NEEDED TO GET THE WATER TABLE DOWN TO ALLOW SHAFT/PIPE INSTALLATION. THESE CHARGES WERE NOT ACCOUNTED ON COSTS SHOWN ABOVE AT EACH SHAFT LOCATION. Invoices from Mersino attached (Inv#68339 07/07/19, Inv#68835 07/31/19, Inv#69458 08/31/19.	RENTAL: Deep Well Idle Charges	1.00	LS	\$6,000.00	\$6,000.00
		RENTAL: 15 HP Pump	1.00	LS	\$6,600.00	\$6,600.00
		RENTAL: Turbine Pump	1.00	LS	\$1,104.00	\$1,104.00
07/15/19 to 09/06/19	MIDWEST VIBRO Equipment: ADDITIONAL RENTAL Cost for Steel Sheeting Hammer/Extractor H-1700 {From 07/15/19 to 09/06/19}. Additional rental cost was incurred due to delays associated with the dewatering operations due to DEQ dewatering limitations and not being able to dig & install shafts for extended periods of time and not being able to install the pipe by trenchless pilot tube operations until the ground water was below the invert of the pipe at the shafts. Inv#16011 08/19/19 \$8,851.00 (07/15-08/08/19 Rental), Inv#16081 09/06/19 \$8,851.00 (08/12-09/06 Rental)	RENTAL: MIDWEST VIBRO - Sheeting Hammer	1.00	LS	\$17,702.00	\$17,702.00
11/5/2019	Furnish & Install approx. 1,200 LFT of 4" Layflat Hose along the rear yard on Vasilius Ct to discharge water to the pond. Material: 4" Layflat Hose \$780.00 Labor: (2) Person Crew for 1/2 day to setup and 1/2 day to tear down.		1.00	LS	\$2,000.00	\$2,000.00
Total OHP as per the Contract, 15%						\$68,295.64
Total Amount of Additional work #1 -						\$527,959.91
ADDITIONAL INSPECTION DAYS REQUESTED BASED ON SCHEDULE IMPACT AND DELAYS ASSOCIATED WITH ADDITIONAL DEWATERING EFFORTS ON THE PROJECT						240 DAYS

Paid
CO4

ADDITIONAL CALENDAR DAYS FOR WORK NOT PERFORMED – 237 Days

ADDITIONAL CREW DAYS FOR WORK NOT PERFORMED – 240 Days

- Notice to Proceed: February 8th, 2019
- Substantial completion: Revised from February 13th, 2020 to September 22nd, 2020
- Final Completion: Revised from March 29th, 2020 to October 15th, 2020



6045 Sims Dr., Suite 2,
Sterling Heights, MI 48313
Ph: 586-979-0402
Fax: 586-979-8295
Email: info@dvmutilities.com

Project: Nine Mile Road Sanitary Sewer, OHM Job No. 0163-16-0050
Owner: City of Novi, MI
Sub: Additional DEWATERING costs - Claim #1

This project has an alternate method of construction for the use of Pilot Tube Guided Boring Method (PTM). This method is a Three-Step process. The first step is to establish “line and grade” with hollow pilot tubes that are controlled by operator using a Theodolite to guide the steering head. The second step is to jack a temporary casing with internal augers and reaming head that increases the diameter of “prepared hole”. The third step is to jack the final pipe product to complete the sanitary sewer per project specifications and push out the temporary casings and augers. For the 9 Mile project, we choose to use Vitrified Clay Jacking Pipe as the carrier pipe.

The engineering plans included a Dewatering Narrative and an MDEQ site specific Review letter:

We have designed and setup the dewatering and schedule based upon the soil borings, dewatering narrative & site specific review letter from the bid documents. The narrative discussed and the site specific review letter included a limitation of 2 MGD. We designed our system to utilize 5 HP pumps to be within this maximum limit. The design anticipated that our Deep Wells would dewater the existing water-table to allow the construction of a temporary shaft over a period of 2 to 3 weeks. This plan would lower the water below the invert of the pipe for shaft construction and maintain this elevation for the PTM operations for each shaft.

Our Means and Methods plan was to operate the PTM process and Open Cut operations to function simultaneously with dewatering ongoing with 5 HP pumps in Deep wells and additional shaft pumps up to 5 HP size. Our plan was designed to pump 1.0 MGD to 1.5 MGD in up to three deep wells from the East Section for the Trenchless sections and 0.5 MGD to 1 MGD was designed to be pumped from Open- Cut operations. Per our plan, the trenchless shafts need to be excavated and ready so that the PTM can advance section by section without delay. After the initial setup of the dewatering at four wells, the 2.0MGD was immediately reached with the water table essentially plateauing at six feet above invert for ten weeks. As the operation was unable to move forward due to the groundwater, the pumps (capacity east of operations) had to be moved and the HP (horsepower) increased and number of pumps used. Pumps (from 9 and 12) were then moved to shafts 10 & 11 to just maintain the plateaued water-table elevation. This now stopped the construction of shafts ahead of the crew (such as shafts 9 & 8) as there was not capacity in the system for them to pump. Additional Power (generators and fuel) has been required to maintain the water-table at its present elevation through larger pumps. Additional costs to maintain and refuel all equipment has been required (weekends and holidays (24/7 operation)) to maintain the current level of Dewatering that is more than would have been needed with 5HP pumps.

The first use of PTM (Pilot Tube Method) was from Manhole Number 17 to 18. During the shaft excavation, it was observed the soils present were not indicated in the Geotechnical Report. The soils encountered were a hard clay with mix-faced smaller cobbles/boulders. This drive consisted of PTM equipment that was intended for a Sand Type Strata. The first phase proceeded with higher jacking pressures

with one emergency shaft to remove a large boulder. The pilot tube was able to maintain “line and grade” with this drive. The second step was upsizing the pilot tube opening with auger casings that followed an open-faced reaming head (more appropriate for sand material). This step required repeated maximum jacking pressures and a “RAMMING” process instead of a typical “jacking” procedure. The second step was accomplished but the casings encountered “compression” which increased friction or drag. Installing casings with this added friction add additional time to the jacking process and greater time to dis-assemble each auger casing in reception shaft. The third step of jacking in the final carrier pipe went well with jacking pressure being reduced (compared to auger drive) after the first couple of sections of pipe. This 400 ft pipe section was successfully installed (but with additional construction time).

Our work plan was to start the second PTM operation at shaft #11. PTM procedures would allow us to “jack pipe” to the west (shaft #12) and then the east (shaft #10) from this central “jacking shaft”. The limitation of 2MGD for dewatering was a critical component to NEVER being able to successfully dewater outside shaft #11. Unforeseen and an unknown soil conditions are believed to allow the water-table to flow at unprecedented HIGH-WATER Flows.

The Site specific review letter pumping limitations and the guidance from the dewatering narrative lead DVM to set up a dewatering system that unable to reduce the water table for the shaft construction (shaft #11) and required the operations to be altered. Shaft #11 required additional time, effort and an altered means and method. Due to the high flow of groundwater, a poured concrete bottom could not be established. An alternate design had to be implemented that reduced this shaft down to 9.5 ft. diameter from the established 14 ft. diameter by cementing in an internal caisson to seal the bottom of the shaft. The groundwater flow could not be controlled with the current “DEWATERING PLAN”.

The second drive was then altered to perform PTM operations from shaft #12 and jacking into shaft #11. This required the jacking frame to be set into Shaft #12. This also required the jacking frame to be re-set into Shaft #10 to jack into Shaft #11. This alteration required additional days and time to set jacking frame and establish alignments and grades twice.

The drive from Shaft #12 to Shaft #11 required us to change strategies with regard to step 2 of the PTM operation. A new type of cutting head (power reaming head that proceeds the casings and “cuts” the soils) was ordered due to the change of soil condition we experienced in the first PTM operation. This Power Reaming Head allowed us to utilize hydraulic forces on the Jacking Frame to “power” a rotary apparatus to “cut” harder soils and especially small cobbles.

The PTM operations proceeded without any issues until the final step (3) of jacking the carrier pipe. Line and Grade were established with the pilot tubes in step 1 and step 2 jacking the temporary casings maintained both Line and Grade. As the pipe reached within 15 feet of shaft #11 when the operation encountered an issue. The pipe developed point-loading which increased jacking loads on the VCP and caused cracks to develop just outside of shaft 12 near the machine. The operation stopped to evaluate the broken pipe. It was DVM and Akerman’s conclusion that the high jacking and rotary forces (due to cobbles in the soils) during Step 2 - casing installation.

The remedy was to push the pipe back out of jacking shaft (#12) back toward MH 11 to install steel casing and evaluate the soils around Shaft #11 and #12. Reviewing the three steps for PTM, it was determined that the new power reaming head and higher than predicted water-table (we were at Maximum MGD per our permit). It was determined that during Step 2 (casings and augers) that coarse Sands had “run” into the casing and we assumed displaced soils above the casing and then the VCP. An “emergency shaft”

was used to evaluate the existing soil conditions. A large void was discovered twenty feet outside of shaft 12 (jacking pit). We backfilled this void and proceeded to Grout along the alignment of this pipe run. The purpose of the grout is to stabilize the soils and prevent movement when we continued to jack the VCP or carrier pipe. We completed this run by resetting the machine to push at the the same angle that the casing wanted to advance at rather than the design grade. The pipe entering at Shaft #12 is 0.30' higher than plan grade but the section is acceptable and the pipe entering Shaft #11 is at planned grade.

With the “lessons-learned” from this past run, we adjusted our operations once again by employing a swivel bearing cutting head and double flight lead auger (for Step 2). This head is designed to be more aggressive in breaking and ingesting small cobble while restricting sand migration during the process. We also pumped acrylamide grout outside the shafts prior to the PTM operation.

The jacking frame was inserted into shaft #10 to continue the PTM operations with jacking into shaft #11. Steps 1 and 2 went extremely well as line and grade were held on both operations. Step 3, jacking the pipe, went well until we entered shaft 11 (run was completed). After completing this run, we noticed the pipe had “floated” due to uplifting pressure of the HIGH water-table. The “floating” occurring from 55 feet downstream of shaft #11, peaking at 15 feet from 11, then back fall into MH 11. None of the pipe were cracked but the lifted pipe was 8 inches higher than plan grade 15 feet downstream of 11.

Attempts to sink the installed pipe by using steel weights to counter the buoyancy force were not successful. The lifted pipe was advanced out with the temporary casings. As expected, when the pipe were jacked while out of alignment, many of the pipes broke while being removed. With the casing (step 2 again) between shafts (#10 & #11), the trenchless operation was then stopped until a decision for additional pumping capacity could be reached. The pumps inside of shaft #11 were turned off to give pumping capacity to the open-cut wellpoint operation that was to run.

It is of significance that the first trenchless installation (shafts #17 to #18) was 400' long and installed successfully. The second and third installations were to be (#11 to #12) and (#11 to #10) but were changed to (#12 to #11) and (#10 to #11). The second (#12 to #11) was 240' long and entered Shaft #11 maintaining “line and grade”. The issues near the shaft #12 were from the high jacking forces that shifted the equipment. The power reaming head allowed more soil to enter the casings and augers (step 2) than the volume of the casing, these conditions allowed pipe displacement (0.3' deviation) near shaft #12 into voids created along the alignment. This was resolved and the pipe was successfully installed from shaft 12 to shaft 11.

The installation from (Shaft #10 to #11) was substantially different from the first two PTM installations. The distance was shorter (150') and additional equipment was procured (new swivel cutter head and double flight auger) based upon recommendations from Akkerman - PTM equipment manufacturer. With these equipment modifications the amount of material allowed into (step 2) operations was 2/3 less material per foot when compared to the #12 to #11) installation. The line and grade of the invert was per the plan for the pilot tube, the temporary casing and the pipe maintained grade at both shafts. The uplift of the carrier pipe between 10 and 11 prevents the line from being on grade.

With an increased allowable Daily Pumping Capacity DVM's intends to resume the PTM operation. The line from (shaft #10 to #11) will be reinstalled using welded steel casing left in place with a PVC pipe inside. The open cut has continued throughout the delay in the GPT operation. As discussed in the progress meetings, the timetable and schedule and production goals for the project have been and will continue to be adversely affected by these conditions.

Upon agreement from the City for the additional costs DVM is requesting under separate cover, DVM will revise the schedule and continue the operation.

Prepared by,
Vinay Shenoy
Estimator/Project Manager
Mobile: (586)202-2899
Email: vshenoy@dvmutilities.com

MEMORANDUM



TO: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS
FROM: BEN CROY, CITY ENGINEER
SUBJECT: NINE MILE SANITARY SEWER PROJECT UPDATE
DATE: APRIL 03, 2020

The Nine Mile Sanitary Sewer project involves the replacement of approximately 6,200 feet of force main sanitary sewer with gravity sewer from Evergreen Court to Kensington. The purpose of this project is to provide redundancy to the Park Place pump station, which is 1.6 miles from the closest gravity outlet (near Kensington). A failure of the existing force main could result in loss of service, and potentially cause a major sewage spill or sanitary sewage overflow (SSO). The construction of this project has taken longer than originally anticipated for two primary reasons: (1) excessive dewatering and (2) the challenging installation of one segment of trenchless pipe. The project has continued work through the Executive Order issued by the State, as this utility/public works construction is considered to be an essential sanitary sewer asset.

Below is a summary of the current status of this project (see attached map):

- **100% of the 2,850 feet of the open-cut (Traditional Trench Excavation)** – this portion of the project is complete. This is the western half of the project which is the shallower portion of the pipe installation.
- **31% of the 3,500 feet of the trenchless (Guided Pilot Tube)** - this is the deeper, eastern half of the project. This trenchless method allows for reduced impact to the road, natural features, and residential properties.

The following challenges have occurred in the field and delayed the project's timeline:

- **Excessive dewatering** - The dewatering system was modified twice and is now pumping up to 6 million gallons/day. At this rate, it takes 30 days to alter the groundwater table when necessary for work to progress.

Considerable dewatering was anticipated for this project, but the actual dewatering effort has proven to be significantly more than expected. The contractor, D.V.M. Utilities, installed and operated an elaborate dewatering system during the initial stages of the project, however, they were not able to lower the groundwater elevation to the depth needed for construction. There is an existing aquifer (an underground river) in this area and after modifying pumping operations once, it was determined still more dewatering capacity was required. The larger system has now been operational for several months and has effectively dewatered the construction zone allowing construction to progress. To put this in perspective, the generators required to run the dewatering pumps are using 2,500 gallons of

fuel per month, and are running 24 hours a day to maintain the lowered groundwater elevation.

- **Challenging conditions near Vasilios Court** - created significant delays and is close to being resolved. This segment of installation includes custom made devices from the supplier expected to be received in the next couple weeks.

The pipe installation west of Vasilios Court has been a significant challenge. The groundwater in this area has been described as “free-flowing water,” which introduced some unforeseen challenges. These groundwater conditions, coupled with the intense dewatering efforts, compromised the structural stability of the soil in this area. Therefore, an unplanned area had to be excavated to correct the problems encountered. This work has been particularly difficult due to the unusually narrow road, and the existence of a 47-inch Oak tree directly adjacent to the excavation. The preferred solution to this problem is currently being implemented (custom devices and parts), and work is expected to be completed by mid-April, which will open up this area of Nine Mile Road.

The original estimated contract amount for this project was ~\$5.6M. Through four (4) contract change orders, the current contract amount is ~\$5.8M, with ~\$2.5M paid to DVM to date. Staff and OHM Advisors, the engineering consultant who is performing the construction engineering and inspection on the project, are currently negotiating a dewatering claim for the time period from June to September 2019, and will be finalizing a recommendation in the near future. At this time, the estimated increasing change order amount is ~\$800K. Additionally, we anticipate another change order of approximately the same amount to account for the additional dewatering efforts from September 2019 until the end of the project. OHM’s estimate of final construction cost at this time is ~\$7.35M, or \$1.8M over the original contract amount. Also, an additional ~\$200K for OHM’s contract administration, construction engineering, and daily inspection services is expected as a result of the extended construction timeline associated with the unforeseen site conditions. The submittals for additional work and estimated total cost overages of ~\$2M will be critically reviewed by Staff and OHM for verification and will be detailed in a future technical report/memo to City Council.

Given the report above, staff is encouraged the project can now proceed at a pace closer to originally anticipated. Based on the current status and conditions of this project, we estimate the project could be substantially complete by the end of October, with final restoration being complete in the spring 2021, provided the COVID-19 crisis does not mandate a complete work suspension.

Cc: Megan Mikus, Deputy Director of Public Works
Aaron Staup, Construction Engineering Coordinator
Scott Roselle, Water and Sewer Manager

MEMORANDUM



TO: JEFF HERCZEG, DIRECTOR OF PUBLIC WORKS
FROM: BEN CROY, CITY ENGINEER
SUBJECT: NINE MILE SANITARY SEWER PROJECT UPDATE
DATE: JANUARY 23, 2020

The Nine Mile Sanitary Sewer project involves the replacement of approximately 6,200 feet of force main sanitary sewer with gravity sewer from Evergreen Ct. to Kensington. The purpose of this project is to provide redundancy to the Park Place pump station which is 1.6 miles from the closest gravity outlet (near Kensington Drive). A failure of the existing force main could result in loss of service to the entire area and would likely result in a major sewage spill. The construction of this project has taken longer than originally anticipated for two primary reasons – excessive dewatering required for the underground construction, and a challenging installation of one segment of the trenchless pipe installation.

Dewatering is required for any underground construction wherever groundwater is encountered. Although significant dewatering was anticipated for this project, the actual dewatering effort has proven to be significantly more than expected. The contractor, DVM, installed a relatively elaborate dewatering system and operated it during the initial stages of the project, however, they were not able to lower the groundwater elevation to the depth needed for construction. There is a prolific aquifer in this area and after modifying pumping operations, it was determined a larger capacity dewatering system would be required. The larger system has now been operational for several weeks and has effectively dewatered the construction zone allowing construction to progress.

The pipe installation west of Vasilios Court has been a significant challenge. The groundwater in this area has been described as “free-flowing water” which introduced some unforeseen challenges. These groundwater conditions, coupled with the intense dewatering efforts, compromised the structural stability of the soil in this area. Therefore, an unplanned area had to be excavated to correct the problems encountered. This work has been particularly difficult due to the unusually narrow road, and the existence of a 47-inch Oak tree directly adjacent to the excavation which requires extra care and protection.

Given the construction modifications and current progress, staff is encouraged the project can now proceed at a pace closer to originally anticipated. In the coming weeks, the project timeline will be updated and a technical memo will be issued on the project modifications by the engineering consultant OHM Advisors who is performing the construction engineering and inspection on the project.

Cc: Megan Mikus, Deputy Director of Public Works
Aaron Staup, Construction Engineering Coordinator
Scott Roselle, Water and Sewer Manager

RESOLUTION

NOW, THEREFORE BE IT RESOLVED that the following
Budget Amendment for change order No. 5 to
D.V.M. Utilities, Inc. construction associated with
the Nine Mile Road Sanitary Sewer project is authorized:

	INCREASE (DECREASE)
WATER & SEWER FUND	
APPROPRIATIONS	
Capital Outlay	590,309
TOTAL APPROPRIATIONS	<u>\$ 590,309</u>
Net Increase (Decrease) to Fund Balance	<u>\$ (590,309)</u>

I hereby certify that the foregoing is a true and complete copy of a
resolution adopted by the City Council of the City of Novi
at a regular meeting held on May 4, 2020.

Cortney Hanson
City Clerk