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To:	**Town of Okotoks**	Date:	**October 30, 2024**
Attention:	**Richard Boonstra**	Project No.:	**28650**
Cc:			
Reference:	**Final Zone 4N Watermain Project Design Basis**		
From:	**Kim Kimball, P.Eng., Shelby Juravle, EIT, Fadi Maalouf, P.Eng., CPESC**		

1.0 Introduction

This Design Basis Memorandum (DBM) presents the selected route for the Zone 4N Watermain and the additional watermain upgrades around the pump station, provides a confirmation of sizing and material of the watermains, construction methodology, and a description of operations for any changes recommended to the pump station (instrumentation, controls, communications), and justification that the watermain should be included in the Town's offsite levy bylaw. Several options were presented and analyzed in the Draft Design Basis Memorandum included in **Appendix A**, after which a draft Design Basis Review Meeting was held, and the preferred alignments were selected as outlined in this Final Design Basis Memorandum.

The following documents were received from the Town of Okotoks and reviewed for this concept design:

- Zone 3N/4N Reservoir Upgrade Control Narrative (2019) by CIMA+
- North Point ASP Water Servicing Study (2023) by CIMA+
- Operations and Maintenance Manual for the 3N & 4N Reservoir Upgrade (2019) by Chandos Construction
- Ridgemont Staged Water Servicing Report (2024) by CIMA+
- Town of Okotoks Record Drawings (2019) by CIMA+
- Geotechnical Investigation (2018) by ParklandGEO
- Geotechnical Investigation (2019) by ParklandGEO
- Town of Okotoks Water Master Plan (2020) by WSP
- Off-Site Levies Background Report (2020) by the Town of Okotoks
- Okotoks WMP Model created by CIMA+

2.0 Zone 4N Watermain Alignment

Four options for the Zone 4N Watermain alignment from Banister Gate to the Tower Hill Pump Station were presented to the Town, along with a cost benefit analysis for each option that outlined the advantages and disadvantages of each option. The alignments were reviewed at the draft Design Basis Memorandum Review Meeting held on September 24, 2024 and the Town decided to move forward with the Black Alignment for the new Zone 4N Watermain.

The watermain was initially proposed to be installed by directional drill within the green space adjacent to Northridge Drive and along Milligan Drive to the watermain corridor green space, but after discussion with the Town the decision has been made to not specify the construction method and instead leave room for flexibility for the contractor.

A cost estimate is included in **Appendix B** that breaks out the cost for the selected alignment of the Zone 4N Watermain, using the most expensive construction method to be conservative. The concept design drawings are included in **Appendix C**.

The selected alignment runs between the landscaped areas and overhead Fortis lines in the green space adjacent to Northridge Drive between Banister Gate and Milligan Drive, then runs along the southernmost westbound lane of Milligan Drive before turning north to run through the Town's watermain corridor green space and up along the west side of the reservoir. This option has an estimated cost of $4,951,000.00.

This option has the following advantages:

- It 'threads the needle' between the existing landscaped areas adjacent to Northridge Drive and the existing overhead Fortis lines. If the main is to be directional drilled in this space, the drill pit locations will be designed between Fortis poles to minimize the impacts to Fortis during construction. Minimizing impacts to Fortis infrastructure will mitigate any cost and schedule impacts related to the relocation of their infrastructure.
- Running the line through the southern westbound lane on Milligan Dr allows the contractor to avoid impacting the steep slope along the north side of Milligan Drive. This approach allows the two eastbound lanes on Milligan to be used for two-way traffic while the watermain is being installed in the westbound lanes.
- It minimizes the impact on the roadway and the intersection of Milligan and Northridge, which would reduce traffic disruption and maintenance costs.

This option has the following disadvantages:

- There is a conflict with the ATCO gas line in the green space south of the reservoir that will need to be addressed.
- The horizontal clearance required from the Fortis power lines is 3m and may impact the existing landscaped beds in the green space adjacent to Northridge Drive.

Based on the cost-benefit analysis, this alignment had the lowest cost and the most benefits among the four options. It avoids major conflicts with the shallow utilities, minimizes the impact on the roadway and the intersection at Milligan Dr and Northridge Dr, and provides a sufficient separation distance from the Fortis lines. Therefore, this alignment was selected as the most feasible and desirable option for the watermain alignment and was approved by the Town at the Design Basis Memorandum Review Meeting.

3.0 Additional Watermain Upgrades Alignments

Two options for the watermain upgrades around the reservoir were presented to the Town along with a cost benefit analysis for both, listing the advantages and disadvantages for consideration and discussion. These options can be found in **Appendix A** as part of the draft Design Basis Memorandum. The result of the draft Design Basis Review Meeting was to proceed with routing the 300 mm Zone 3 Distribution main around the east side of the reservoir, tying into Waldron Ave south of the Tower Hill Pump Station. The 450 mm Zone 2 – Zone 3 Transfer Main alignment will run along the west side of the Pump Station. The alignments can be found in **Appendix C.** The total cost for construction of the additional watermain upgrades is $1,321,000.00 as detailed in the cost estimate in **Appendix B**.

3.1 Zone 3 Distribution Main

The decision to route the Zone 3 Distribution Main around the east side of the reservoir was arrived at to reduce congestion on the west side of the reservoir.

This option has the following advantages:

- If the existing pipe is abandoned in place, this option would avoid excavation close to the reservoir walls therefore avoiding wall stability challenges. If the pipe is removed, this would reduce congestion of piping on the west side of the reservoir and provide spacing for additional piping in the future is needed. Abandonment or removal will be confirmed with the Town during preliminary design.
- The majority of the watermain replacement installation work can be completed without coordination of phasing.

This option originally had the following disadvantages:

- More materials are required to relocate the lines to the east side of the reservoir, resulting in a higher cost.
- This option will require excavation of the existing gravel driveway, which will increase costs and affect accessibility during construction.
- The watermains will run under the existing gravel access road to the pump station, which the Town had flagged as wanting to avoid during the project kick-off site meeting.

However, tying the watermain into Waldron Ave eliminates the need for more materials. The Town has approved running lines under the existing gravel access road, and the alignment of the sanitary connection outlined in **Section 8.0** is also on the east side of the reservoir, so the gravel road will already be excavated during construction.

3.2 Zone 2 – Zone 3 Transfer Main

The Zone 2 – Zone 3 Transfer Main will be routed along the west side of the reservoir.

This option has the following advantages:

- It utilizes the same excavation zone as the other water main upgrades, reducing the size of the construction area and rehabilitation costs.

This option has the following disadvantages:

- The two watermains closest to the reservoir present stability challenges when excavating near the reservoir walls. The reservoir walls extend about 5m below ground, however, due to the grading of the green space within the watermain corridor excavations of the two mains closest to the reservoir are expected to reach the bottom or undermine the edge of the reservoir.
- The construction would need to be carefully planning in line with the water level in the reservoir being lowered.

3.3 Zone 2 Distribution Main

In the RFP, the 200 mm CI main running on the west side of the reservoir was to be abandoned and removed. During the draft DBM Review Meeting, the topic of replacing the existing 200 mm CI from the reservoir to Milligan Drive was discussed since we are already excavating and replacing pipes within that entire area. The Town confirmed they would like to proceed with a cost estimate to include the main replacement. The cost to remove this line and replace with 350 mm PVC from the reservoir to Milligan Drive has been included in the cost estimate in **Appendix B**.

4.0 Watermain Material, Fittings, and Sizing

4.1 Material

ISL reviewed the options of the watermain installation via PVC and HDPE. Both are viable options for the material of the Zone 4N watermain. A cost benefit analysis has been performed and is summarized below.

Adjacent to Northridge Drive

- Trenchless installation is recommended to work around the existing Fortis power poles.
- Trenchless installation significantly limits the disturbance to the existing green space and landscaped areas.
- HDPE is the preferred material for trenchless installation, as discussed below.
- The awarded contractor would be able to suggest open cut installation in the green space adjacent to Northridge, if they feel it is more cost effective for them to complete.

Along Milligan Drive

- Trenchless installation and open cut installation are both viable options along Milligan. Directional drill is considered the preferred option as it is easier to install and roadway rehabilitation costs are lower.
- The awarded contractor would be able to suggest open cut installation along Milligan, if they feel it is more cost effective for them to complete.
- Both open cut PVC and trenchless HDPE installation can be completed without impacting the concrete curb and gutter of the road.
- Open cut is more disruptive and would require significant roadway replacement in the southern westbound lane of Milligan Drive.
- Trenchless installation would only cause limited roadway disturbance along Milligan at entrance pits and can be completed with detours that maintain two way traffic along Milligan Drive.
- Trenchless installation poses a slight risk of frac-out under the roadway, which may require additional road rehabilitation. This is considered a small and acceptable risk compared to the price of open cutting this length of pipe.

Within Watermain Corridor

- Open cut, PVC installation was assumed for the watermain corridor due to the existing watermains in close proximity. There are risks to directional drilling a new main, especially at the 450 mm size, so close to existing mains. The drill head for the trenchless installation has the possibility to veer off course, which is typically not a concern with more clearance but could push soil or rocks against the existing mains at such close proximity.
- Open cut would allow the main to be installed in a trench box with minimal risk to the adjacent watermains.

Based on the discussion with the Town at the September 24, 2024 meeting, there was no preference between open cut or trenchless installation. The project design and tender will leave it open to the contract to choose between open cut or trenchless to provide the most economical option.

It is expected that open cut will be used within the watermain corridor between Milligan Drive and the pump station as contractors will likely not want to take on the risk of trenchless installation in such close proximity to other watermains.

4.1.1 PVC Material

Cost: The cost of using PVC installed with an open-cut methodology for the Zone 4N Watermain would be approximately $3,863,000.00.

Constructing the Zone 4N watermain with PVC has the following benefits:

- PVC piping generally has a lower material cost than HDPE.
- Both PVC and HDPE have long lifespans.
- PVC piping has a larger internal diameter for the same nominal size which could reduce pumping costs over time.

Constructing the Zone 4N watermain with PVC has the following disadvantages:

- PVC installation may be more expensive due to the increased labor costs associated with the more rigid handling requirements and the higher number of joints.
- PVC is a more rigid material, making trenchless installation more difficult (it can be done with fusible PVC or restrained bell and spigot pipe like TerraBrute).
- Maintenance costs of PVC may be higher if TerraBrute is used due to the number of joints and rigid requirements.
- PVC production requires more energy than HDPE.

4.1.2 HDPE Material

Cost: The estimated cost of constructing the Zone 4N Watermain with HDPE installed with a trenchless method is $4,374,000.00.

HDPE presents the following advantages:

- HDPE presents an opportunity to use trenchless methods like horizontal directional drilling more easily than with PVC which reduces ground disturbance and environmental impact.
- HDPE requires less material because of its flexible nature and the ability to be installed in longer lengths.
- HDPE has lower maintenance costs because of fewer potential leak points at joints, and the flexible nature being more resistant to ground movement.
- HDPE maintains a smooth interior surface which results in consistent hydraulic performance over time.
- HDPE production requires less energy than PVC.

HDPE has the following disadvantages:

- The material cost of HDPE is more than PVC.
- HDPE has a smaller internal diameter for the same nominal size, requiring a larger nominal diameter size and thicker (and therefore more expensive pipe) to meet the same internal diameter as PVC.

4.1.3 Material Recommendation

ISL recommends HDPE pipe for all trenchless installations because of its flexibility and ease of installation compared to PVC. However, the decision was made during the draft Design Review Meeting to allow the successful contractor to propose alternate pipe materials and construction methodology, for approval by the Engineer and the Town. This decision was made to increase flexibility for the contractor with the intent to see cost savings. Due to the uncertainty with construction methodology at this time, the cost estimate in **Appendix B** reflects the highest cost option of 600 mm HDPE installed with an open cut methodology.

4.2 Fittings

The Zone 4N transmission main will have three gate valves on it, one outside the Tower Hill reservoir and two at the Banister Gate connection. There will be one valve on either side of hydrant just south of Banister Gate to allow for flushing and isolation options in the future. This will also provide ease of testing during construction. There is an option to add an additional valve, flushing point, or hydrant in the middle of the new Zone 4N main as discussed in the draft DBM Meeting. Once profiles are created as part of the preliminary design, the determination will be made whether an air release valve is required and a valve or flushing point can be added to the design at that time, as required. No other fittings, other than the required bends to match the alignment, are required on the transmission main.

Fittings for the other watermain upgrades around the Tower Hill reservoir will remain as is with any existing valves being replaced. New valves will be installed to isolate the new main connections into the pump station.

4.3 Sizing

ISL has reviewed the updated CIMA+ water model to confirm its operation and used it to confirm the sizing of the mains. Several pipe diameters were considered for velocity targets between 1.5 m/s to 2.0 m/s and it was determined that the ideal pipe would be a 600mm (24”) HDPE watermain with a pressure rating of 200 psi. A separate memo was provided to the Town titled *‘Zone 4N Supply Main Water Assessment Technical Memorandum’*. This memo is also included in **Appendix D**.

HDPE pipe is significantly thicker than PVC pipe so the nominal diameter of the proposed HDPE main will be 600 mm while the PVC main will be 500 mm to maintain a 492 mm internal diameter.

4.4 Recommendation

Based on the cost-benefit analysis, the HDPE benefits of lower maintenance costs, consistent hydraulic performance, less roadway rehabilitation, and lower environmental impact outweigh the increased material cost. The use of HDPE for the trenchless installation of the Zone 4N transmission main is recommended for the flexible nature, ease of installation, and limited impact to the roadway structure.

The recommended watermain sizing is a 600mm HDPE watermain with a pressure rating of 200 psi.

5.0 Construction Methodology

Due to the number of watermains within the project scope and the complexity of their connections, a phased construction approach is required. Based on our concept design, we are suggesting the following construction phasing approach:

- The Zone 4N transmission main will be installed and connected to the pump station.
- Both Zone 3N distribution mains can be replaced one at a time. Both of these mains can be installed without impacting the west side of the reservoir. This will reduce the service to Zone 3N from the pump station. It is understood that Zone 4 can backfeed to Zone 3 if needed to boost flows while this work is being completed.
- The abandoned 200 mm Zone 2 main will be replaced and connected to the pump station.
- The 450 mm Zone 2 – Zone 3 transfer main will be replaced. This transfer main will be out of service while it is being replaced. It is understood from the September 24, 2024 and October 10, 2024 meetings that this loss of service can be managed by the Town during construction.

- The existing Zone 3 distribution line beside the reservoir can be either removed or abandoned in place, depending on Town preference.

This option allows for all of the work to take place with limited water supply interruption periods and replaces the mains from the outside in against the reservoir, limiting the amount of time the west side of the reservoir is exposed.

6.0 Description of Operation

ISL reviewed the existing version of the pump station control narrative and based our description of operation on this draft version.

The pump station is currently set up to split normal supply operations between Zone 3N and Zone 4N. The pumps for both zones are already in place with a pressure reducing valve between the two zones. The operation of the pump station and associated water lines is based on pressure and the installation of the new transmission main does not change the operation philosophy. No additional instrumentation or valves are needed to maintain the intended operation of the system.

ISL will review the operating parameters in line with the new water model to confirm if adjustments to the operational set points within the pump station are needed.

7.0 Offsite Levy

ISL has reviewed the existing background information and water model in terms of including the new Zone 4N transmission main in the Town's Offsite Levy bylaw.

As stated in the *Off-Site Levies Background Report 2020* by the Town of Okotoks, the storage and distribution system provide the necessary water pressure and fire flow distribution to serve all customers. As this new improvement to the distribution network is necessary to add additional capacity for growth, it will directly benefit new development and should therefore be included in the Offsite Levy Bylaw. Schedule B of the *Off-Site Levies Background Report 2020* stated that the Town was currently reviewing long-term water distribution and storage needs and that additional water distribution and storage projects would be considered for subsequent updates.

As an update to that report, the *North Point ASP Water Servicing Study* by CIMA+ (2023) noted that:

- An additional dedicated main to Zone 4N is required to provide sufficient flow to accommodate growth in the Zone 4N area of Okotoks including North Point, Trilogy Plains, and Wedderburn.
- In order to achieve industrial fire flow in the northern extents of North Point, a second dedicated main from the 3N/4N pump station would be necessary.

Based on this information and our initial review of the water model, we agree with this assessment and confirm that there is justifiable reason to include the Zone 4N transmission main in the Offsite Levy bylaw.

8.0 Pump Station Sanitary Service

ISL designed the sanitary service connection to run from the edge of the pump station and down the access road connecting into the existing sanitary system on Waldron Avenue with a new manhole. This avoids conflict with the large electrical cabinet that was in the original design. The original alignment was

in the green space between the reservoir and the road, but during the Design Basis Review Meeting the Town approved construction under the gravel access road and the sanitary service was moved to this location.

Further conversation between the Town, ISL, and CIMA+ confirmed that the existing pump station floor drains currently drain to the weeping tile line and out to the storm sewer. The existing north reservoir overflow also runs to the storm sewer. The Town confirmed that both the floor drains and reservoir overflow should be rerouted to the sanitary sewer. ISL will update the preliminary design to include a new sanitary service for both the floor drains and the reservoir overflow.

9.0 Pump Station Reservoir Overflow

Due to the deterioration of the existing fill line connection, the decision was made to abandon the fill line and not convert this access to another reservoir overflow.

10.0 Conclusion and Recommendations

Based on ISL's understanding of the current status and operation of the existing water system and comments on the draft Design Basis Memorandum from the Town, we have provided the below recommendations for proceeding to preliminary design.

- The Zone 4N transmission watermain is proposed along the Option 1 black alignment.
- The 300 mm Zone 3 distribution main will be routed along the east side of the reservoir and will tie-in to Waldron Ave.
- The other watermain upgrades around the pump station are proposed along the west side of the reservoir.
- The watermain adjacent to Northridge Drive and along Milligan Drive will be open to contractor preference between open cut/trenchless and PVC/HDPE.
- The sizing of the watermains were confirmed with the updated CIMA+ model.
- The construction methodology proposed is a phased approach where the Zone 4N transmission main is installed first, then the Zone 3 distribution mains, then the Zone 2 distribution main, then the Zone 2 – Zone 3 transfer main, then the existing Zone 3 distribution main can be abandoned.
- Based on the control narrative, no upgrades are needed to the pump station instrumentation with the installation of the Zone 4N transmission mains. The operational set points within the station will be reviewed further in preliminary and detailed design.
- Due to the need to provide adequate fire flows and water pressure to the new developments within Zone 4N, the Town is justified in adding the transmission main to the Offsite Levy bylaw.
- The pump station sanitary service is proposed to run on the east side of reservoir under the existing gravel access road.
- The design of converting the existing fill line into a reservoir overflow line has been removed. This fill line will be capped. The Town may coordinate some reservoir wall repairs while the wall is exposed.

APPENDIX A

Draft Design Basis Memorandum

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To:	**Town of Okotoks**	Date:	**September 11, 2024**
Attention:	**Richard Boonstra**	Project No.:	**28650**
Cc:			
Reference:	**Watermain Alignment Options**		
From:	**Kim Kimball, P.Eng., Shelby Juravle, EIT, Fadi Maalouf, P.Eng.,CPESC**		

1.0 Introduction

This draft Design Basis Memorandum (DBM) presents the potential routes for the Zone 4N Watermain and the additional watermain upgrades around the pump station, provides a cost benefit analysis of the routing options, confirmation of sizing and material of the watermains, construction methodology, and a description of operations for any changes recommended to the pump station (instrumentation, controls, communications), and justification that the watermain should be included in the Town's offsite levy bylaw.

This DBM is intended to be presented in draft format for review and discussion with the Town. A finalized version will be submitted once all of the components noted above have been discussed with the Town and a recommended solution has been confirmed.

The following documents were received from the Town of Okotoks and reviewed for this concept design:

- Zone 3N/4N Reservoir Upgrade Control Narrative (2019) by CIMA+
- North Point ASP Water Servicing Study (2023) by CIMA+
- Operations and Maintenance Manual for the 3N & 4N Reservoir Upgrade (2019) by Chandos Construction
- Ridgemont Staged Water Servicing Report (2024) by CIMA+
- Town of Okotoks Record Drawings (2019) by CIMA+
- Geotechnical Investigation (2018) by ParklandGEO
- Geotechnical Investigation (2019) by ParklandGEO
- Town of Okotoks Water Master Plan (2020) by WSP
- Off-Site Levies Background Report (2020) by the Town of Okotoks
- Okotoks WMP Model created by CIMA+

*The sizing of the watermain is still pending confirmation of the Town's water model, which was just received from CIMA+ today.

2.0 Zone 4N Watermain Alignments

Four options for the Zone 4N Watermain alignment from Bannister Gate to the Tower Hill Pump Station have been reviewed, along with a cost benefit analysis for each option that outline the advantages and disadvantages for consideration and discussion with the Town.

The watermain is proposed to be installed by directional drill within the green space adjacent to Northridge Drive and along Milligan Drive to the watermain corridor green space, then by open cut to the pump station for Options 1 and 2.

The watermain is proposed to be installed by directional drill within the green space adjacent to Northridge Drive and by open cut along Milligan Drive to take advantage of the cost savings of PVC installation considering that the Town would like to replace the roadway on the south side of the street for Options 3 and 4.

A cost estimate is included in **Appendix A** that breaks out the costs for each of the following four options. A separate cost estimate is included in **Appendix A** that compares the difference in cost between HDPE directional drill installation and PVC open cut installation from Banister Gate to the entrance of the water corridor north of Milligan Drive for comparison. The concept design drawings are included in **Appendix B**.

A summary of the lengths for each options are included in the table below:

Options	**One: Black**	**Two: Orange**	**Three: Red**	**Four: Purple**
Total Length of Pipe (m)	1455	1505	1550	1585
Trenchless (m) / Open Cut (m)	1175 / 280	1175 / 330	655 / 895	680 / 905

2.1 Option 1: Black Alignment

Option 1 follows the alignment shown in black on the concept design drawings. This alignment runs between the landscaped areas and overhead Fortis lines in the green space adjacent to Northridge Drive between Bannister Gate and Milligan Drive, then runs along the middle of the two westbound lanes of Milligan Drive before turning north to run through the Town's watermain corridor green space and up along the west side of the reservoir.

Cost: This option has an estimated cost of $4,249,000.00.

This option has the following advantages:

- It 'threads the needle' between the existing landscaped areas adjacent to Northridge Drive and the existing overhead Fortis lines. Considering the main will be directional drilled in this space, the drill pit locations will be designed between Fortis poles to minimize the impacts to Fortis during construction. (*ISL is still coordinating a site visit with Fortis to confirm their thoughts and requirements with this alignment.)
- Running the line through the middle of the two north lanes allows the contractor to avoid impacting the existing concrete curb and gutter as well as the steep slope along the north side of Milligan Drive. This approach allows the two eastbound lanes on Milligan to be used for two-way traffic while the watermain is being installed in the westbound lanes.
- It minimizes the impact on the roadway and the intersection of Milligan and Northridge, which would reduce traffic disruption and maintenance costs.

This option has the following disadvantages:

- There is a conflict with the ATCO gas line in the green space south of the reservoir that will need to be addressed.
- The horizontal clearance from Fortis power poles is low and will need to be reviewed and approved by Fortis.

2.2 Option 2: Orange Alignment

Option 2 follows the orange line that runs between the existing fence and the overhead lines in the green space adjacent to Northridge Drive, then runs along the median westbound lane on Milligan then turning north to either the green space and following the same alignment as Option 1 or turning north up Robinson, east to Waldron, and north along the west side of the reservoir. The alignment option up Robinson and east on Waldron is an option for each of the four alignments but is highlighted as part of

Option 2 since its pros and cons will be the same in each option. Options 3 and 4 will use the green space alignment.

Cost: This option has an estimated cost of $4,490,000.00.

This option has the following advantages:

- It does not impact the existing landscaped areas in the green space adjacent to Northridge Drive.
- It minimizes the impact on the roadway and the intersection of Milligan and Northridge, which would reduce traffic disruption and maintenance costs.
- This approach allows the two eastbound lanes on Milligan to be used for two-way traffic while the watermain is being installed in the westbound lanes.

This option has the following disadvantages:

- It requires crossing the Fortis lines, which would require coordination with Fortis and the potential for future complications if the watermain needs to be exposed at the crossing location.
- The area for installation between the existing fence and power poles is narrow. There is the potential for future complications if the watermain needs to be exposed against the existing fence.
- There is additional cost when compared to Option 1 because of the concrete removal and replacement necessary if the line runs along the median lane of Milligan rather than in the middle of the two lanes.
- There is a conflict with the ATCO gas line in the green space south of the reservoir that will need to be addressed.
- Along the Robinson to Waldron alignment: the sanitary main runs down the middle of the street with the watermain on one side and the storm main on the other side. There is 3.5 m of space between the existing watermain and the sanitary main, leaving only 1m of space to install the new watermain while leaving the required 2.5m of clearance between the water and sanitary mains.
- Along the Robinson to Waldron alignment: The watermain would cross underground shallow utilities two more times than along the Town's watermain corridor alignment.

2.3 Option 3: Red Alignment

Option 3 follows the red line that runs between the pathway and the landscaped areas along Northridge Drive, crosses Milligan closer to the intersection of Milligan Drive and Northridge Drive then runs along the eastbound lanes of Milligan Drive then turning north to either the green space and following the same alignment as Option 1 or turning north up Robinson, east to Waldron, and north along the west side of the reservoir. The pros and cons for this option assume the watermain runs through the green space instead of along Robinson.

Cost: This option has an estimated cost of $5,197,000.00, which is higher than Options 1 and 2.

This option has the following advantages:

- It avoids crossing or being in close proximity to the Fortis lines, which limits the risks and costs of installation adjacent to Fortis.
- It maintains clearance from the existing landscaped areas.
- It could be used as a reason to replace the existing pavement on the eastbound lanes of Milligan Drive which are is poorer condition than the westbound lanes (based on Town information).

This option has the following disadvantages:

- It conflicts with the alignment of shallow utilities in the green space along Northridge Dr, which would require relocation so the watermain and shallow utility alignments are offset. This offset would push either the shallows or the watermain into the landscaping or the pathway.

- It crosses several storm culverts, impacting culvert outlet treatments if the main needs to be excavated.
- The intersection of Milligan and Northridge would be impacted for installation and maintenance, which would cause traffic disruption and increase maintenance costs.
- It impacts more roadway on Milligan, which would require more pavement restoration and curb modifications.
- There is greater risk to impacting all of Milligan Drive if the watermain has to be repaired.
- It comes in close proximity catch basins on Milligan Drive.
- There is a conflict with the ATCO gas line in the green space south of the reservoir that will need to be addressed.

2.4 Option 4: Purple Alignment

Option 4 follows the alignment denoted in purple that runs between the pathway and Northridge Drive. From there, it runs along the eastbound lanes of Milligan Drive and then turns north through the green space to run along the west side of the reservoir.

Cost: This option has an estimated cost of $4,869,000.00, which is higher than Options 1 and 2.

This option has the following advantages:

- It avoids crossing or being in proximity to the Fortis lines, which would reduce the risk and costs of installation adjacent to Fortis.
- It could be used as a reason to replace the existing pavement on the eastbound lanes of Milligan Drive which are is poorer condition than the westbound lanes (based on Town information).

This option has the following disadvantages:

- It crosses several shallow utilities and the pathway adjacent to Northridge Drive.
- Installation and maintenance would impact the intersection of Milligan and Northridge, which would cause traffic disruption and increase maintenance costs.
- It impacts more roadway on Milligan Dr by running along the eastbound lanes, which would require more pavement restoration and curb modifications than if it were to run along the westbound lanes.
- There is greater risk to impacting all of Milligan Drive if the watermain has to be repaired.
- There is a conflict with the ATCO gas line in the green space south of the reservoir that will need to be addressed.
- More pipe is required to move the alignment towards Northridge, which would increase construction costs.

2.5 Other Alignments

ISL also considered an alignment beside the roadway on both the north and south sides of Milligan Drive. Running the watermain in the green space north of Milligan Drive puts the watermain within a steep slope and impacts several trees growing beside the road. Running the watermain in the green space south of Milligan Drive puts the watermain partially in the laneway behind Lock Crescent and in a downward slope towards residential housing. If the watermain were ever to break in this location it could potentially flood multiple backyards.

Given that neither of these options are ideal, they were not considered further.

2.6 Recommendation

Based on the cost-benefit analysis, Option 1 is the recommended alignment for the Zone 4N watermain. This option has the lowest cost and the most benefits among the four options. It avoids major conflicts with the shallow utilities, minimizes the impact on the roadway and the intersection at Milligan Dr and Northridge Dr, and provides a sufficient separation distance from the Fortis lines. Option 1 is the most feasible and desirable option for the watermain alignment (*provided the alignment is discussed and approved by Fortis).

3.0 Additional Watermain Upgrades Alignments

Two options for the watermain upgrades around the reservoir have been reviewed along with a cost benefit analysis for both, listing the advantages and disadvantages for consideration and discussion with the Town.

3.1 Option 1: West of the Reservoir

Option 1 follows the alignment shown on the concept design drawings of all lines running on the west side of the reservoir.

Cost: This option has an estimated cost of $1,146,000.00.

This option has the following advantages:

- It utilizes the same excavation zone as the other water main upgrades, reducing the size of the construction area and rehabilitation costs.

This option has the following disadvantages:

- The two watermains closest to the reservoir present stability challenges when excavating near the reservoir walls. The reservoir walls extend about 5m below ground, however, due to the grading of the green space within the watermain corridor excavations of the two mains closest to the reservoir are expected to reach the bottom or undermine the edge of the reservoir.
- The construction would need to be carefully staged with each watermain is close proximity to the other.

3.2 Option 2: East of the Reservoir

Option 2 follows the alignments shown in blue on the last page of the concept drawings which includes the two water mains closest to the reservoir being relocated to run along the east side of the reservoir.

Cost: This option has an estimated cost of $1,804,000.00.

This option has the following advantages:

- If the existing pipes are abandoned in place, this option would avoid excavation close to the reservoir walls therefore avoiding wall stability challenges.
- The majority of the watermain replacement installation work can be completed without coordination of phasing.

This option has the following disadvantages:

- Removal of large trees to the south of the reservoir will have environmental and social impacts.
- More materials are required to relocate the lines to the east side of the reservoir, resulting in a higher cost.
- This option will require excavation of the existing gravel driveway, which will increase costs and affect accessibility during construction.
- The watermains will run under the existing gravel access road to the pump station, which the Town had flagged as wanting to avoid during the project kick-off site meeting.

3.3 Recommendation

Based on the cost-benefit analysis, Option 1 is the recommended option for the configuration of pipes around the reservoir. This option has a lower cost and minimizes the impact to the gravel driveway, the areas to the south and east of the reservoir, and the environment. Option 1 is the most economic option for the configuration of watermains around the reservoir. **Appendix A** includes a cost estimate comparison of these two options.

4.0 Watermain Material, Fittings, and Sizing

4.1 Material

ISL reviewed the options of the watermain installation via PVC and HDPE. Both are viable options for the material of the Zone 4N watermain. A cost benefit analysis has been performed and is summarized below.

The intention is that the watermain will be installed by trenchless installation within the green space adjacent to Northridge Drive and will be installed by open cut the remainder of the way. The basis for this assumption is outlined below:

Adjacent to Northridge Drive

- Trenchless installation is needed to work around the existing Fortis power poles.
- Trenchless installation significantly limits the disturbance to the existing green space and landscaped areas.
- HDPE is the preferred material for trenchless installation, as discussed below.

Along Milligan Drive

- Trenchless installation and open cut installation are both viable options along Milligan. Directional drill is considered the preferred option as it is easier to install and roadway rehabilitation costs are lower.
- The awarded contractor would be able to suggest open cut installation along Milligan, if they feel it is more cost effective for them to complete.
- Both open cut PVC and trenchless HDPE installation can be completed without impacting the concrete curb and gutter of the road.
- Open cut is more disruptive and would require significant roadway replacement in the two north lanes of Milligan Drive.
- Trenchless installation would only cause limited roadway disturbance along Milligan at entrance pits and can be completed with detours that maintain two way traffic along Milligan Drive.
- Trenchless installation poses a slight risk of frac-out under the roadway, which may require additional road rehabilitation. This is considered a small and acceptable risk compared to the price of open cutting this length of pipe.

Within Watermain Corridor

- Open cut, PVC installation was assumed for the watermain corridor due to the existing watermains in close proximity. There are risks to directional drilling a new main, especially at the 450 mm size, so close to existing mains. The drill head for the trenchless installation has the possibility to veer off course, which is typically not a concern with more clearance but could push soil or rocks against the existing mains at such close proximity.
- Open cut would allow the main to be installed in a trench box with minimal risk to the adjacent watermains.

4.1.1 PVC Material

Cost: The cost of using PVC for the Zone 4N Watermain would be approximately $4,667,000.00.

Constructing the Zone 4N watermain with PVC has the following benefits:

- PVC piping generally has a lower material cost than HDPE.
- Both PVC and HDPE have long lifespans.
- PVC piping has a larger internal diameter for the same nominal size which could reduce pumping costs over time.

Constructing the Zone 4N watermain with PVC has the following disadvantages:

- PVC installation may be more expensive due to the increased labor costs associated with the more rigid handling requirements and the higher number of joints.
- PVC is a more rigid material, making trenchless installation more difficult (it can be done with fusible PVC or restrained bell and spigot pipe like TerraBrute).
- Maintenance costs of PVC may be higher if TerraBrute is used due to the number of joints and rigid requirements.
- PVC production requires more energy than HDPE.

4.1.2 HDPE Material

Cost: The estimated cost of constructing the Zone 4N Watermain with HDPE is $4,249,000.00.

HDPE presents the following advantages:

- HDPE presents an opportunity to use trenchless methods like horizontal directional drilling more easily than with PVC which reduces ground disturbance and environmental impact.
- HDPE requires less material because of its flexible nature and the ability to be installed in longer lengths.
- HDPE has lower maintenance costs because of fewer potential leak points at joints, and the flexible nature being more resistant to ground movement.
- HDPE maintains a smooth interior surface which results in consistent hydraulic performance over time.
- HDPE production requires less energy than PVC.

HDPE has the following disadvantages:

- The material cost of HDPE is more than PVC.
- HDPE has a smaller internal diameter for the same nominal size, requiring a larger nominal diameter size and thicker (and therefore more expensive pipe) to meet the same internal diameter as PVC.

4.1.3 Material Recommendation

ISL recommends HDPE pipe for all trenchless installations because of its flexibility and ease of installation compared to PVC.

4.2 Fittings

The Zone 4N transmission main will have three gate valves on it, one outside the Tower Hill reservoir and two at the Banister Gate connection. There will be one valve on either side of hydrant just south of Banister Gate to allow for flushing and isolation options in the future. This will also provide ease of testing

during construction. No other fittings, other than the required bends to match the alignment, are required on the transmission main.

Fittings for the other watermain upgrades around the Tower Hill reservoir will remain as is with any existing valves being replaced. New valves will be installed to isolate the new main connections into the pump station.

4.3 Sizing

ISL will be reviewing the updated Cima+ water model to confirm its operation and then use it to confirm the sizing of the mains. Until the new Cima+ model is received and reviewed, we have assumed the transmission main will be 450 mm inside diameter and the mains around the pump station will be sized at 300 mm and 450 mm as noted in the RFP.

HDPE pipe is significantly thicker than PVC pipe so the nominal diameter of the proposed HDPE main will be 600 mm while the PVC main will be 450 mm to maintain a 450 mm internal diameter. For consistency through this memo, the transmission main will be referred to as 450 mm for the required internal diameter.

4.4 Recommendation

Based on the cost-benefit analysis, the HDPE benefits of lower maintenance costs, consistent hydraulic performance, less roadway rehabilitation, and lower environmental impact outweigh the increased material cost. The use of HDPE for the trenchless installation of the Zone 4N transmission main is recommended for the flexible nature, ease of installation, and limited impact to the roadway structure.

The watermain sizing will be confirmed once the updated, functional water model is received and verified from Cima+. Should these sizes change once the water model is verified, the change is not anticipated to impact the design or construction plans.

5.0 Construction Methodology

Due to the number of watermains within the project scope and the complexity of their connections, a phased construction approach is required. Based on our concept design, we are suggesting the following construction phasing approach:

- The two sections of distribution main to be replaced on Waldron Avenue and in the green space off Robinson Drive will be replaced in phases. These two sections of main are part of a looped system so one can be disconnected from service while the other is replaced. (ISL will confirm there is no significant reduction in service pressure by reducing the distribution service to one main with the new Cima+ model.)
- The Zone 4N transmission main will be installed and connected to the pump station.
- Two temporary connections will be made from the transmission main to the existing 200 and 450 mm mains by hot tap connection.
- Insertion valves will be installed on the existing mains north of the hot taps to isolate the sections of main to be replaced.
- A temporary connection will be installed from the new transmission main to the existing Zone 3N distribution mains inside the pump station. Based on the schematic record drawings, there are couplings that can be dismantled for these temporary connections
- The valve downstream of the transmission main connection to the pump station will be closed to isolate the transmission main from the Zone 4N side of the pump station. This allows water to

continue supplying Zone 3 and Zone 4 as usual while the other watermain upgrades around the pump station are completed.
- The 300 mm and 450 mm watermain upgrades will be completed and tied to the new insertion valves.
- The valves on the temporary connections to the transmission main will be closed.
- Remove temporary piping connection inside the pump station and reinstate piping as per the original installation.
- All watermains can be turned into their intended operation.

This option allows for all of the work to take place with limited water supply interruption periods and provides options for transferring water between mains in the future if other repair work is needed.

6.0 Description of Operation

ISL reviewed the existing draft version of the pump station control narrative and based our description of operation on this draft version. Once the finalized version is received we will update the proposed operation as needed.

The pump station is currently set up to split normal supply operations between Zone 3N and Zone 4N. The pumps for both zones are already in place with a pressure reducing valve between the two zones. The operation of the pump station and associated water lines is based on pressure and the installation of the new transmission main does not change the operation philosophy. No additional instrumentation or valves are needed to maintain the intended operation of the system.

ISL will review the operating parameters in line with the new water model to confirm if adjustments to the operational set points within the pump station are needed.

7.0 Offsite Levy

ISL has reviewed the existing background information and water model in terms of including the new Zone 4N transmission main in the Town's Offsite Levy bylaw.

As stated in the *Off-Site Levies Background Report 2020* by the Town of Okotoks, the storage and distribution system provide the necessary water pressure and fire flow distribution to serve all customers. As this new improvement to the distribution network is necessary to add additional capacity for growth, it will directly benefit new development and should therefore be included in the Offsite Levy Bylaw. Schedule B of the *Off-Site Levies Background Report 2020* stated that the Town was currently reviewing long-term water distribution and storage needs and that additional water distribution and storage projects would be considered for subsequent updates.

As an update to that report, the *North Point ASP Water Servicing Study* by CIMA+ (2023) noted that:
- An additional dedicated main to Zone 4N is required to provide sufficient flow to accommodate growth in the Zone 4N area of Okotoks including North Point, Trilogy Plains, and Wedderburn.
- In order to achieve industrial fire flow in the northern extents of North Point, a second dedicated main from the 3N/4N pump station would be necessary.

Based on this information and our initial review of the water model, we agree with this assessment and confirm that the there is justifiable reason to include the Zone 4N transmission main in the Offsite Levy bylaw.

8.0 Pump Station Sanitary Service

ISL designed the sanitary service connection to run from the edge of the pump station and down the green space between the tennis courts and the access road into the existing sanitary system on Waldron Avenue. This avoids conflict with the large electrical cabinet that was in the original design and follows the instructions received from the Town during the project kick off site walk to avoid running the sanitary service under the access road.

9.0 Pump Station Reservoir Overflow

We considered two options for the removal of the existing water fill line and installation of the reservoir overflow. Option 1 is to direct the overflow directly into a grated top manhole and out to the existing storm system on Waldron Avenue. Option 2 is to direct the overflow to an above ground swale within the watermain corridor and out to the curb and gutter on the street where it would flow to existing catch basins. Both options are viable and budgetary pricing for the alternatives is included in the table below. A cost estimate comparison of the two overflow options is included in **Appendix A**.

Options	Option 1: Grated Top Manhole	Option 2: Above Ground Swale
Estimated Cost	$119,000.00	$103,000.00

Option 1 has the following advantages:

- Provides an air gap so there is no risk of backflow of stormwater into the reservoir.
- Can provide for a security grate on the overflow pipe to prevent wildlife from climbing inside and to deter any kind of human disturbance to the overflow.
- Is a fully piped system directed straight to the existing storm system which limits the risk of the overflow flooding the existing above ground drainage network compared to Option 2. This risk will be reviewed further during preliminary design.

Option 2 has the following advantages:

- Provides an air gap so there is no risk of backflow of stormwater into the reservoir.
- Can provide for a security grate on the overflow pipe to prevent wildlife from climbing inside and to deter any kind of human disturbance to the overflow.
- Can piggyback on the watermain installations to grade the drainage swale as needed to reach the existing curb and gutter.

While dechlorination is not a requirement for an emergency overflow per Alberta regulations, the Town has also requested dechlorination options before it enters the storm system. This will be reviewed further during preliminary and detailed design.

10.0 Conclusion and Recommendations

Based on ISL's understanding of the current status and operation of the existing water system and initial comments on the concept drawings from the Town, we have provided the below recommendations for proceeding to preliminary design.

- The Zone 4N transmission watermain is proposed along the Option 1 black alignment.
- The other watermain upgrades around the pump station are proposed along the Option 1 alignment on the west side of the reservoir.
- The watermain adjacent to Northridge Drive is proposed to be HDPE installed by trenchless means.

- The watermain along Milligan Drive and up to the pump station is proposed to be PVC installed by open cut means.
- The sizing of the watermains will be confirmed with the updated Cima+ model.
- The construction methodology proposed is a phased approach where the Zone 4N transmission main is installed first and then used to maintain water service to Zone 3N while the watermain upgrades around the pump station are completed.
- Based on the draft control narrative, no major upgrades are needed to the pump station with the installation of the Zone 4N transmission mains. The operational set points within the station will be reviewed further in preliminary and detailed design.
- Due to the need to provide adequate fire flows and water pressure to the new developments within Zone 4N, the Town is justified in adding the transmission main to the Offsite Levy bylaw.
- The pump station sanitary service is proposed to run on the east side of reservoir between the tennis courts and the access road, avoiding conflict with the existing electrical cabinet and maintaining clearance from the access road as requested by the Town.
- The pump station overflow is proposed to run down an overland swale to the existing curb and gutter on Waldron Avenue as the more economical option. The amount of overflow compared to the capacity of the existing gutter system will be verified during the preliminary and design phases.

This design basis memorandum is in draft form and is intended to be reviewed and discussed with the Town. A final version will be provided based on Town comments and updated documentation that is currently in progress.

APPENDIX A

Cost Estimates

Project No.: 28650
Project Name: Okotoks Zone 4N Seconday Watermain
Project Estimate: Class 3 Cost Estimate - Zone 4N Alignment Options
Date: September 11, 2024

ISL Engineering and Land Services

Item No.	Description	Units	Unit Price	Quantity Black	Zone 4N Black	Quantity Orange	Zone 4N Orange	Quantity Red	Zone 4N Red	Quantity Purple	Zone 4N Purple	Other Upgrades	Other Upgrades
1.0	**General**												
1.1	Mobilization and Demobilization	L.S.	$250,000.00	1	$177,500.00	1	$177,500.00	1	$177,500.00	1	$177,500.00	1	$72,500.00
1.2	ESC Plan	L.S.	$6,000.00	1	$4,260.00	1	$4,260.00	1	$4,260.00	1	$4,260.00	1	$1,740.00
1.3	ECO Plan	L.S.	$5,000.00	1	$3,550.00	1	$3,550.00	1	$3,550.00	1	$3,550.00	1	$1,450.00
1.4	Traffic Accomodation	L.S.	$10,000.00	1	$7,100.00	1	$7,100.00	1	$7,100.00	1	$7,100.00	1	$2,900.00
1.5	Project Site Survey	L.S.	$20,000.00	1	$14,200.00	1	$14,200.00	1	$14,200.00	1	$14,200.00	1	$5,800.00
1.6	Geotechnical Testing	L.S.	$25,000.00	1	$17,750.00	1	$17,750.00	1	$17,750.00	1	$17,750.00	1	$7,250.00
1.7	Utility Coordination	L.S.	$15,000.00	1	$10,650.00	1	$15,000.00	1	$20,000.00	1	$13,000.00	1	$4,350.00
1.8	Provisional: Pole Relocation	ea.	$15,000.00	5	$75,000.00	5	$75,000.00						
1.9	Provisional: Hydrovac	Hours	$400.00	20	$5,680.00	20	$5,680.00	20	$5,680.00	20	$5,680.00	20	$2,320.00
2.0	**Removals**												
2.1	Topsoil Stripping (Typical 150 mm depth)	m²	$20.00	1900	$38,000.00	1380	$27,600.00	1900	$38,000.00	1900	$38,000.00	500	$10,000.00
2.2	Asphalt Milling (35mm)	m²	$10.00			280	$2,800.00	2600	$26,000.00	2600	$26,000.00		
2.3	Sawcutting, Removal, and Disposal of Curb and Gutter	l.m.	$30.00	10	$300.00	10	$300.00	10	$300.00	10	$300.00	5	$150.00
2.4	Sawcutting, Removal, and Disposal of Monolithic Walk, Rolled Curb & Gutter	l.m.	$100.00									60	$6,000.00
2.5	Sawcutting, Removal, and Disposal of Separate Walk	l.m.	$20.00	5	$100.00	5	$100.00	5	$100.00	5	$100.00	5	$100.00
2.6	Sawcutting, Removal, and Disposal of Driveway (Gravel)	m²	$25.00									55	$1,375.00
2.7	Sawcutting, Removal, and Disposal of Concrete Boulevard	l.m.	$75.00			60	$4,500.00	485	$36,375.00				
2.8	Remove and Dispose of Existing Road Structure	m²	$20.00	375	$7,500.00	860	$17,200.00	2200	$44,000.00	2200	$44,000.00	200	$4,000.00
3.0	**Roadworks**												
3.1	Subgrade Preparation, 150 mm Depth	m²	$10.00	375	$3,750.00	860	$8,600.00	2200	$22,000.00	2200	$22,000.00	200	$2,000.00
3.2	Granular Base Course 100 mm Depth	m²	$15.00	375	$5,625.00	860	$12,900.00	2200	$33,000.00	2200	$33,000.00	200	$3,000.00
3.3	Granular Sub-Base 300 mm Depth	m²	$30.00	375	$11,250.00	860	$25,800.00	2200	$66,000.00	2200	$66,000.00		
3.4	Granualr Sub-Base 200 mm Depth	m²	$25.00									200	$5,000.00
3.5	Prime Coat (SS-1)	m²	$2.00	375	$750.00	1140	$2,280.00	4800	$9,600.00	4800	$9,600.00	200	$400.00
3.6	Asphalt Mix A, 100 mm Depth	m²	$50.00	375	$18,750.00	1140	$57,000.00	4800	$240,000.00	4800	$240,000.00		
3.7	Tack Coat (SS-1 or MC-30)	m²	$2.00	375	$750.00	1140	$2,280.00	4800	$9,600.00	4800	$9,600.00	200	$400.00
3.8	Asphalt Mix B, 60 mm Depth	m²	$30.00	375	$11,250.00	1140	$34,200.00	4800	$144,000.00	4800	$144,000.00		
3.9	Asphalt Mix B, 80 mm Depth	m²	$31.00									200	$6,200.00
3.10	Re-establish Gravel Driveway	m²	$50.00									55	$2,750.00
3.11	Adjustment of Appurtenances - Valves	ea.	$1,000.00			3	$3,000.00	6	$6,000.00	6	$6,000.00	7	$7,000.00
4.0	**Concrete**												
4.1	Supply and Install Standard Concrete Curb and Gutter	l.m.	$250.00	10	$2,500.00	10	$2,500.00	10	$2,500.00	10	$2,500.00	5	$1,250.00
4.2	Supply and Install 1.3 m Separate Sidewalk	l.m.	$250.00	5	$1,250.00	5	$1,250.00	5	$1,250.00	5	$1,250.00	5	$1,250.00
4.3	Supply and Install 1.1 m Monolithic Walk, Rolled Curb & Gutter	l.m.	$650.00									60	$39,000.00
4.4	Supply and Install Concrete Boulevard	l.m.	$550.00			60	$33,000.00	485	$266,750.00				
5.0	**Water**												
	Water Mains												
5.1	Supply and Install 600 mm HDPE via Horizontal Directional Drilling	l.m.	$1,750.00	1175	$2,056,250.00	1175	$2,056,250.00	655	$1,146,250.00	680	$1,190,000.00		
5.2	Remove Existing 250 mm AC and Install 250 mm PVC (Open Cut w/ Trench Box)	l.m.	$600.00									60	$36,000.00
5.3	Remove Existing 200 mm DI and Valves	l.m.	$200.00									60	$12,000.00
5.4	Suppy and Install 300 mm PVC	l.m.	$600.00									50	$30,000.00
5.5	Remove Existing 200 mm CI	l.m.	$200.00									95	$19,000.00
5.6	Remove Existing 350 mm DI and Replace with 350 mm PVC	l.m.	$700.00									45	$31,500.00
5.7	Remove Existing 200 mm DI and Replace with 300 mm PVC	l.m.	$650.00									80	$52,000.00
5.8	Supply and Install 450 mm PVC	l.m.	$1,400.00	280	$392,000.00	330	$462,000.00	895	$1,253,000.00	905	$1,267,000.00	95	$133,000.00
5.9	Remove Existing 200 mm PVC	l.m.	$200.00									6	$1,200.00
	Valves												
5.10	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00									1	$20,000.00
5.11	Supply and Install 450 mm Gate Valve	ea.	$25,000.00	3	$50,000.00	3	$50,000.00	3	$50,000.00	3	$50,000.00	1	$25,000.00
5.12	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00									1	$8,000.00
5.13	Supply and Install 300 mm Gate Valve	ea.	$15,000.00									1	$15,000.00
5.14	Remove Existing and Replace with 300 mm Gate Valve	ea.	$15,000.00									2	$30,000.00
	Valves (Provisional)												
5.15	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00									1	$8,000.00
5.16	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00									2	$40,000.00
	Fittings												
	Tees												
5.17	Supply and Install 450 mm x 450mm x 450 mm Tee	ea.	$10,000.00									1	$10,000.00
	Reducers and Connections												
5.18	Supply and Install 300 mm x 450 mm Reducer	ea.	$3,500.00									2	$7,000.00
5.19	Supply and Install 400 mm x 450 mm Reducer	ea.	$4,000.00	1	$4,000.00	1	$4,000.00	1	$4,000.00	1	$4,000.00		
5.20	Supply and Install 600 mm HDPE to 450 mm PVC Connection	ea.	$3,000.00	1	$3,000.00	1	$3,000.00	1	$3,000.00	1	$3,000.00		
	Bends												
5.21	Supply and Install 450 mm 90° Elbow	ea.	$8,000.00	4	$32,000.00	6	$48,000.00	4	$32,000.00	4	$32,000.00	2	$16,000.00
5.22	Supply and install 450 mm 11.25° Elbow	ea.	$7,000.00	3	$21,000.00	3	$21,000.00	3	$21,000.00	3	$21,000.00		
5.23	Supply and install 450 mm 22.5° Elbow	ea.	$7,000.00	1	$7,000.00	1	$7,000.00	1	$7,000.00	1	$7,000.00		
5.24	Supply and install 250 mm 45° Elbow	ea.	$4,000.00									1	$4,000.00
	Hydrants												
5.25	Relocate existing Hydrant and Valve	ea.	$5,000.00	1	$5,000.00	1	$5,000.00	1	$5,000.00	1	$5,000.00		
5.26	Supply, Install, and Connection of 150 mm PVC Hydrant Lead	l.m.	$350.00	10	$3,500.00	10	$3,500.00	10	$3,500.00	10	$3,500.00		
5.27	Supply and Install 150 mm Gate Valve	ea.	$4,500.00	1	$4,500.00	1	$4,500.00	1	$4,500.00	1	$4,500.00		
	Connection to Existing												
5.28	Tie-in Pipework inside Pump Station	ea.	$10,000.00									1	$10,000.00
5.29	Tie-in to Existing 450 mm PVC	ea.	$7,500.00	1	$7,500.00	1	$7,500.00	1	$7,500.00	1	$7,500.00	3	$22,500.00
5.30	Tie-in to Existing 200 mm CI	ea.	$5,000.00									1	$5,000.00
5.31	Tie-in to Existing 400 mm PVC stub	ea.	$7,500.00	1	$7,500.00	1	$7,500.00	1	$7,500.00	1	$7,500.00		
5.32	Tie-in to Existing 250 mm HDPE	ea.	$6,000.00									1	$6,000.00
5.33	Tie-in to Existing 150 mm PVC	ea.	$5,000.00									1	$5,000.00
5.34	Tie-in to Existing 350 mm PVC	ea.	$7,500.00									2	$15,000.00
5.35	Tie-in to Existing 300mm DI	ea.	$7,500.00									1	$7,500.00
6.0	**Sanitary**												
	Sanitary Connections												
6.1	Supply and Install 100 mm PVC	lin.m.	$250.00									65	$16,250.00
6.2	Tie-in to existing Sanitary Service at Cleanout	ea.	$2,500.00									1	$2,500.00
6.3	Tie-in to Existing 200 mm PVC Sanitary Main c/w Tee Connection	ea.	$5,000.00									1	$5,000.00
7.0	**Storm**												
7.1	Supply and Install 300mm PVC overflow spill pipe	lin.m.	$450.00									50	$22,500.00
7.2	Tie-in to Existing Reservoir	ea.	$5,000.00									1	$5,000.00
7.3	Drainage Grading	m²	$45.00									150	$6,750.00
7.4	Supply and Install Grated Top Manhole	ea.	$5,000.00									1	$5,000.00
7.5	Tie-in to Existing Manhole	ea.	$5,000.00									1	$5,000.00
8.0	**Landscape Rehabilitation**												
8.1	Topsoil Placement, 150 mm Depth	m²	$50.00	1900	$95,000.00	1380	$69,000.00	1900	$95,000.00	1900	$95,000.00	500	$25,000.00
8.2	Supply and Install Grass Sod, incuding fertilizer	m²	$25.00	1900	$47,500.00	1380	$34,500.00	1900	$47,500.00	1900	$47,500.00	500	$12,500.00
					Sub-Total (Rounded)		**$3,338,100.00**		**$3,882,265.00**		**$3,629,890.00**		**$862,385.00**
					Contingency (30%)		**$1,001,430.00**		**$1,164,679.50**		**$1,088,967.00**		**$258,715.50**
					Engineering Fees for Tendering and Construction		**$150,000.00**		**$150,000.00**		**$150,000.00**		**$25,000.00**
					PROJECT TOTAL (ROUNDED)		**$4,489,530.00**		**$5,196,944.50**		**$4,868,857.00**		**$1,146,100.50**

Project No.: 28650
Project Name: Okotoks Zone 4N Seconday Watermain
Project Estimate: Class 3 Cost Estimate - Trenchless HDPE vs Open Cut PVC
Date: September 11, 2024

ISL Engineering and Land Services

Item No.	Description	Units	Unit Price	Quantity HDPE	Zone 4N HDPE	Quantity PVC	Zone 4N PVC
1.0	**General**						
1.1	Mobilization and Demobilization	L.S.	$250,000.00	1	$177,500.00	1	$177,500.00
1.2	ESC Plan	L.S.	$6,000.00	1	$4,260.00	1	$4,260.00
1.3	ECO Plan	L.S.	$5,000.00	1	$3,550.00	1	$3,550.00
1.4	Traffic Accomodation	L.S.	$10,000.00	1	$7,100.00	1	$7,100.00
1.5	Project Site Survey	L.S.	$20,000.00	1	$14,200.00	1	$14,200.00
1.6	Geotechnical Testing	L.S.	$25,000.00	1	$17,750.00	1	$17,750.00
1.7	Utility Coordination	L.S.	$15,000.00	1	$10,650.00	1	$15,000.00
1.8	Provisional: Pole Relocation	ea.	$15,000.00	5	$75,000.00	5	$53,250.00
1.9	Provisional: Hydrovac	Hours	$400.00	20	$5,680.00	20	$5,680.00
2.0	**Removals**						
2.1	Topsoil Stripping (Typical 150 mm depth)	m²	$20.00	1900	$38,000.00	5680	$113,600.00
2.2	Asphalt Milling (35mm)	m²	$10.00			1100	$11,000.00
2.3	Sawcutting, Removal, and Disposal of Curb and Gutter	l.m.	$30.00	10	$300.00	10	$300.00
2.4	Sawcutting, Removal, and Disposal of Monolithic Walk, Rolled Curb & Gutter	l.m.	$100.00				
2.5	Sawcutting, Removal, and Disposal of Separate Walk	l.m.	$20.00	5	$100.00	5	$100.00
2.6	Sawcutting, Removal, and Disposal of Driveway (Gravel)	m²	$25.00				
2.7	Remove and Dispose of Existing Road Structure	m²	$20.00	375	$7,500.00	2200	$44,000.00
3.0	**Roadworks**						
3.1	Subgrade Preparation, 150 mm Depth	m²	$10.00	375	$3,750.00	2200	$22,000.00
3.2	Granular Base Course 100 mm Depth	m²	$15.00	375	$5,625.00	2200	$33,000.00
3.3	Granular Sub-Base 300 mm Depth	m²	$30.00	375	$11,250.00	2200	$66,000.00
3.4	Granualr Sub-Base 200 mm Depth	m²	$25.00				
3.5	Prime Coat (SS-1)	m²	$2.00	375	$750.00	3300	$6,600.00
3.6	Asphalt Mix A, 100 mm Depth	m²	$50.00	375	$18,750.00	3300	$165,000.00
3.7	Tack Coat (SS-1 or MC-30)	m²	$2.00	375	$750.00	3300	$6,600.00
3.8	Asphalt Mix B, 60 mm Depth	m²	$30.00	375	$11,250.00	3300	$99,000.00
3.9	Asphalt Mix B, 80 mm Depth	m²	$31.00				
3.10	Re-establish Gravel Driveway	m²	$50.00				
3.11	Adjustment of Appurtenances - Valves	ea.	$1,000.00				
4.0	**Concrete**						
4.1	Supply and Install Standard Concrete Curb and Gutter	l.m.	$250.00	10	$2,500.00	10	$2,500.00
4.2	Supply and Install 1.3 m Separate Sidewalk	l.m.	$250.00	5	$1,250.00	5	$1,250.00
4.3	Supply and Install 1.1 m Monolithic Walk, Rolled Curb & Gutter	l.m.	$650.00				
5.0	**Water**						
	Water Mains						
5.1	Supply and Install 600 mm HDPE via Horizontal Directional Drilling	l.m.	$1,750.00	1175	$2,056,250.00		
5.2	Remove Existing 250 mm AC and Install 250 mm PVC (Open Cut w/ Trench Box)	l.m.	$600.00				
5.3	Remove Existing 200 mm DI and Valves	l.m.	$200.00				
5.4	Suppy and Install 300 mm PVC	l.m.	$600.00				
5.5	Remove Existing 200 mm CI	l.m.	$200.00				
5.6	Remove Existing 350 mm DI and Replace with 350 mm PVC	l.m.	$700.00				
5.7	Remove Existing 200 mm DI and Replace with 300 mm PVC	l.m.	$650.00				
5.8	Supply and Install 450 mm PVC	l.m.	$1,400.00	280	$392,000.00	1455	$2,037,000.00
5.9	Remove Existing 200 mm PVC	l.m.	$200.00				
	Valves						
5.10	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00				
5.11	Supply and Install 450 mm Gate Valve	ea.	$25,000.00	3	$50,000.00	3	$50,000.00
5.12	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00				
5.13	Supply and Install 300 mm Gate Valve	ea.	$15,000.00				
5.14	Remove Existing and Replace with 300 mm Gate Valve	ea.	$15,000.00				
	Valves (Provisional)						
5.15	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00				
5.16	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00				
	Fittings						
	Tees						
5.17	Supply and Install 450 mm x 450mm x 450 mm Tee	ea.	$10,000.00				
	Reducers and Connections						
5.18	Supply and Install 300 mm x 450 mm Reducer	ea.	$3,500.00				
5.19	Supply and Install 400 mm x 450 mm Reducer	ea.	$4,000.00	1	$4,000.00	1	$4,000.00
5.20	Supply and Install 600 mm HDPE to 450 mm PVC Connection	ea.	$3,000.00	1	$3,000.00		
	Bends						
5.21	Supply and Install 450 mm 90° Elbow	ea.	$8,000.00	4	$32,000.00	4	$32,000.00
5.22	Supply and install 450 mm 11.25° Elbow	ea.	$7,000.00	3	$21,000.00	3	$21,000.00
5.23	Supply and install 450 mm 22.5° Elbow	ea.	$7,000.00	1	$7,000.00	1	$7,000.00
5.24	Supply and install 250 mm 45° Elbow	ea.	$4,000.00				
	Hydrants						
5.25	Relocate existing Hydrant and Valve	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
5.26	Supply, Install, and Connection of 150 mm PVC Hydrant Lead	l.m.	$350.00	10	$3,500.00	10	$3,500.00
5.27	Supply and Install 150 mm Gate Valve	ea.	$4,500.00	1	$4,500.00	1	$4,500.00
	Connection to Existing						
5.28	Tie-in Pipework inside Pump Station	ea.	$10,000.00				
5.29	Tie-in to Existing 450 mm PVC	ea.	$7,500.00	1	$7,500.00	1	$7,500.00
5.30	Tie-in to Existing 200 mm CI	ea.	$5,000.00				
5.31	Tie-in to Existing 400 mm PVC stub	ea.	$7,500.00	1	$7,500.00	1	$7,500.00
5.32	Tie-in to Existing 250 mm HDPE	ea.	$6,000.00				
5.33	Tie-in to Existing 150 mm PVC	ea.	$5,000.00				
5.34	Tie-in to Existing 350 mm PVC	ea.	$7,500.00				
5.35	Tie-in to Existing 300mm DI	ea.	$7,500.00				
6.0	**Sanitary**						
	Sanitary Connections						
6.1	Supply and Install 100 mm PVC	lin.m.	$250.00				
6.2	Tie-in to existing Sanitary Service at Cleanout	ea.	$2,500.00				
6.3	Tie-in to Existing 200 mm PVC Sanitary Main c/w Tee Connection	ea.	$5,000.00				
7.0	**Storm**						
7.1	Supply and Install 300mm PVC overflow spill pipe	lin.m.	$450.00				

7.2	Tie-in to Existing Reservoir	ea.	$5,000.00				
7.3	Drainage Grading	m²	$45.00				
7.4	Supply and Install Grated Top Manhole	ea.	$5,000.00				
7.5	Tie-in to Existing Manhole	ea.	$5,000.00				
8.0	**Landscape Rehabilitation**						
8.1	Topsoil Placement, 150 mm Depth	m²	$50.00	1900	$95,000.00	5680	$284,000.00
8.2	Supply and Install Grass Sod, incuding fertilizer	m²	$25.00	1900	$47,500.00	5680	$142,000.00
Sub-Total (Rounded)					**$3,153,215.00**		**$3,474,240.00**
Contingency (30%)					**$945,964.50**		**$1,042,272.00**
Engineering Fees for Tendering and Construction					**$150,000.00**		**$150,000.00**
PROJECT TOTAL (ROUNDED)					**$4,249,179.50**		**$4,666,512.00**

Project No.: 28650
Project Name: Okotoks Zone 4N Seconday Watermain
Project Estimate: Class 3 Cost Estimate - Other Upgrades Options
Date: September 11, 2024

Item No.	Description	Units	Unit Price	Other Upgrades	Option 1	Other Upgrades	Option 2
1.0	**General**						
1.1	Mobilization and Demobilization	L.S.	$250,000.00	1	$72,500.00	1	$72,500.00
1.2	ESC Plan	L.S.	$6,000.00	1	$1,740.00	1	$1,740.00
1.3	ECO Plan	L.S.	$5,000.00	1	$1,450.00	1	$1,450.00
1.4	Traffic Accomodation	L.S.	$10,000.00	1	$2,900.00	1	$2,900.00
1.5	Project Site Survey	L.S.	$20,000.00	1	$5,800.00	1	$5,800.00
1.6	Geotechnical Testing	L.S.	$25,000.00	1	$7,250.00	1	$7,250.00
1.7	Utility Coordination	L.S.	$15,000.00	1	$4,350.00	1	$4,350.00
1.8	Provisional: Pole Relocation	ea.	$15,000.00				
1.9	Provisional: Hydrovac	Hours	$400.00	20	$2,320.00	20	$2,320.00
2.0	**Removals**						
2.1	Topsoil Stripping (Typical 150 mm depth)	m²	$20.00	500	$10,000.00	1530	$30,600.00
2.2	Asphalt Milling (35mm)	m²	$10.00				
2.3	Sawcutting, Removal, and Disposal of Curb and Gutter	l.m.	$30.00	5	$150.00	5	$150.00
2.4	Sawcutting, Removal, and Disposal of Monolithic Walk, Rolled Curb & Gutter	l.m.	$100.00	60	$6,000.00	60	$6,000.00
2.5	Sawcutting, Removal, and Disposal of Separate Walk	l.m.	$20.00	5	$100.00	5	$100.00
2.6	Sawcutting, Removal, and Disposal of Driveway (Gravel)	m²	$25.00	55	$1,375.00	655	$16,375.00
2.7	Remove and Dispose of Existing Road Structure	m²	$20.00	200	$4,000.00	200	$4,000.00
3.0	**Roadworks**						
3.1	Subgrade Preparation, 150 mm Depth	m²	$10.00	200	$2,000.00	200	$21,750.00
3.2	Granular Base Course 100 mm Depth	m²	$15.00	200	$3,000.00	200	$32,625.00
3.3	Granular Sub-Base 300 mm Depth	m²	$30.00				
3.4	Granualr Sub-Base 200 mm Depth	m²	$25.00	200	$5,000.00	200	$5,000.00
3.5	Prime Coat (SS-1)	m²	$2.00	200	$400.00	200	$4,350.00
3.6	Asphalt Mix A, 100 mm Depth	m²	$50.00				
3.7	Tack Coat (SS-1 or MC-30)	m²	$2.00	200	$400.00	200	$4,350.00
3.8	Asphalt Mix B, 60 mm Depth	m²	$30.00				
3.9	Asphalt Mix B, 80 mm Depth	m²	$31.00	200	$6,200.00	200	$6,200.00
3.10	Re-establish Gravel Driveway	m²	$50.00	55	$2,750.00	655	$32,750.00
3.11	Adjustment of Appurtenances - Valves	ea.	$1,000.00	7	$7,000.00	7	$7,000.00
4.0	**Concrete**						
4.1	Supply and Install Standard Concrete Curb and Gutter	l.m.	$250.00	5	$1,250.00	5	$1,250.00
4.2	Supply and Install 1.3 m Separate Sidewalk	l.m.	$250.00	5	$1,250.00	5	$1,250.00
4.3	Supply and Install 1.1 m Monolithic Walk, Rolled Curb & Gutter	l.m.	$650.00	60	$39,000.00	60	$39,000.00
5.0	**Water**						
	Water Mains						
5.1	Supply and Install 600 mm HDPE via Horizontal Directional Drilling	l.m.	$1,750.00				
5.2	Remove Existing 250 mm AC and Install 250 mm PVC (Open Cut w/ Trench Box)	l.m.	$600.00	60	$36,000.00	60	$36,000.00
5.3	Remove Existing 200 mm DI and Valves	l.m.	$200.00	60	$12,000.00	60	$12,000.00
5.4	Suppy and Install 300 mm PVC (Size to be Determined)	l.m.	$600.00	50	$30,000.00	245	$147,000.00
5.5	Remove Existing 200 mm CI	l.m.	$200.00	95	$19,000.00	95	$19,000.00
5.6	Remove Existing 350 mm DI and Replace with 350 mm PVC	l.m.	$700.00	45	$31,500.00	45	$31,500.00
5.7	Remove Existing 200 mm DI and Replace with 300 mm PVC	l.m.	$650.00	80	$52,000.00		
5.8	Abandon in Place Existing 200 mm DI and 450 mm PVC	L.S.	$5,000.00			1	$5,000.00
5.9	Supply and Install 450 mm PVC	l.m.	$1,400.00	95	$133,000.00	195	$273,000.00
5.10	Remove Existing 200 mm PVC	l.m.	$200.00	6	$1,200.00	6	$1,200.00
	Valves						
5.11	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00	1	$20,000.00	1	$20,000.00
5.12	Supply and Install 450 mm Gate Valve	ea.	$25,000.00	1	$25,000.00	1	$25,000.00
5.13	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00	1	$8,000.00	1	$8,000.00
5.14	Supply and Install 300 mm Gate Valve	ea.	$15,000.00	1	$15,000.00	1	$15,000.00
5.15	Remove Existing and Replace with 300 mm Gate Valve	ea.	$15,000.00	2	$30,000.00	2	$30,000.00
	Valves (Provisional)						
5.16	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00	1	$8,000.00	1	$8,000.00
5.17	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00	2	$40,000.00	2	$40,000.00
	Fittings						
	Tees						
5.18	Supply and Install 450 mm x 450mm x 450 mm Tee	ea.	$10,000.00	1	$10,000.00	1	$10,000.00
	Reducers						
5.19	Supply and Install 300 mm x 450 mm Reducer	ea.	$3,500.00	2	$7,000.00	2	$7,000.00
5.20	Supply and Install 400 mm x 450 mm Reducer	ea.	$4,000.00				
5.21	Supply and Install 600 mm HDPE to 450 mm PVC Connection	ea.	$3,000.00				
	Bends						
5.22	Supply and Install 450 mm 90° Elbow	ea.	$8,000.00	2	$16,000.00	4	$32,000.00
5.23	Supply and install 450 mm 11.25° Elbow	ea.	$7,000.00			4	$28,000.00
5.24	Supply and install 450 mm 22.5° Elbow	ea.	$7,000.00				
5.25	Supply and install 250 mm 45° Elbow	ea.	$4,000.00	1	$4,000.00	1	$4,000.00
5.26	Supply and Install 300 mm 90° Elbow	ea.	$7,000.00			4	$28,000.00
5.27	Supply and install 300 mm 11.25° Elbow	ea.	$6,000.00			4	$24,000.00
	Hydrants						
5.28	Relocate existing Hydrant and Valve	ea.	$5,000.00				
5.29	Supply, Install, and Connection of 150 mm PVC Hydrant Lead	l.m.	$350.00				
5.30	Supply and Install 150 mm Gate Valve	ea.	$4,500.00				
	Connection to Existing						
5.31	Tie-in Pipework inside Pump Station	ea.	$10,000.00	1	$10,000.00	1	$10,000.00
5.32	Tie-in to Existing 450 mm PVC	ea.	$7,500.00	3	$22,500.00	3	$22,500.00
5.33	Tie-in to Existing 200 mm CI	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
5.34	Tie-in to Existing 400 mm PVC stub	ea.	$7,500.00				
5.35	Tie-in to Existing 250 mm HDPE	ea.	$6,000.00	1	$6,000.00	1	$6,000.00
5.36	Tie-in to Existing 150 mm PVC	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
5.37	Tie-in to Existing 350 mm PVC	ea.	$7,500.00	2	$15,000.00	2	$15,000.00
5.38	Tie-in to Existing 300mm DI	ea.	$7,500.00	1	$7,500.00	1	$7,500.00
6.0	**Sanitary**						
	Sanitary Connections						
6.1	Supply and Install 100 mm PVC	lin.m.	$250.00	65	$16,250.00	65	$16,250.00
6.2	Tie-in to existing Sanitary Service at Cleanout	ea.	$2,500.00	1	$2,500.00	1	$2,500.00
6.3	Tie-in to Existing 200 mm PVC Sanitary Main c/w Tee Connection	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
7.0	**Storm**						
7.1	Supply and Install 300mm PVC overflow spill pipe	lin.m.	$450.00	50	$22,500.00	50	$22,500.00
7.2	Tie-in to Existing Reservoir	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
7.3	Drainage Grading	m²	$45.00	150	$6,750.00	150	$6,750.00

7.4	Supply and Install Grated Top Manhole	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
7.5	Tie-in to Existing Manhole	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
8.0	**Landscape Rehabilitation**						
8.1	Topsoil Placement, 150 mm Depth	m²	$50.00	500	$25,000.00	1530	$76,500.00
8.2	Supply and Install Grass Sod, incuding fertilizer	m²	$25.00	500	$12,500.00	1530	$38,250.00
Sub-Total (Rounded)					**$862,385.00**		**$1,368,510.00**
Contingency (30%)					**$258,715.50**		**$410,553.00**
					$25,000.00		**$25,000.00**
PROJECT TOTAL (ROUNDED)					**$1,146,100.50**		**$1,804,063.00**

Project No.: 28650
Project Name: Okotoks Zone 4N Seconday Watermain
Project Estimate: Class 3 Cost Estimate - Overflow Storm Options
Date: September 11, 2024

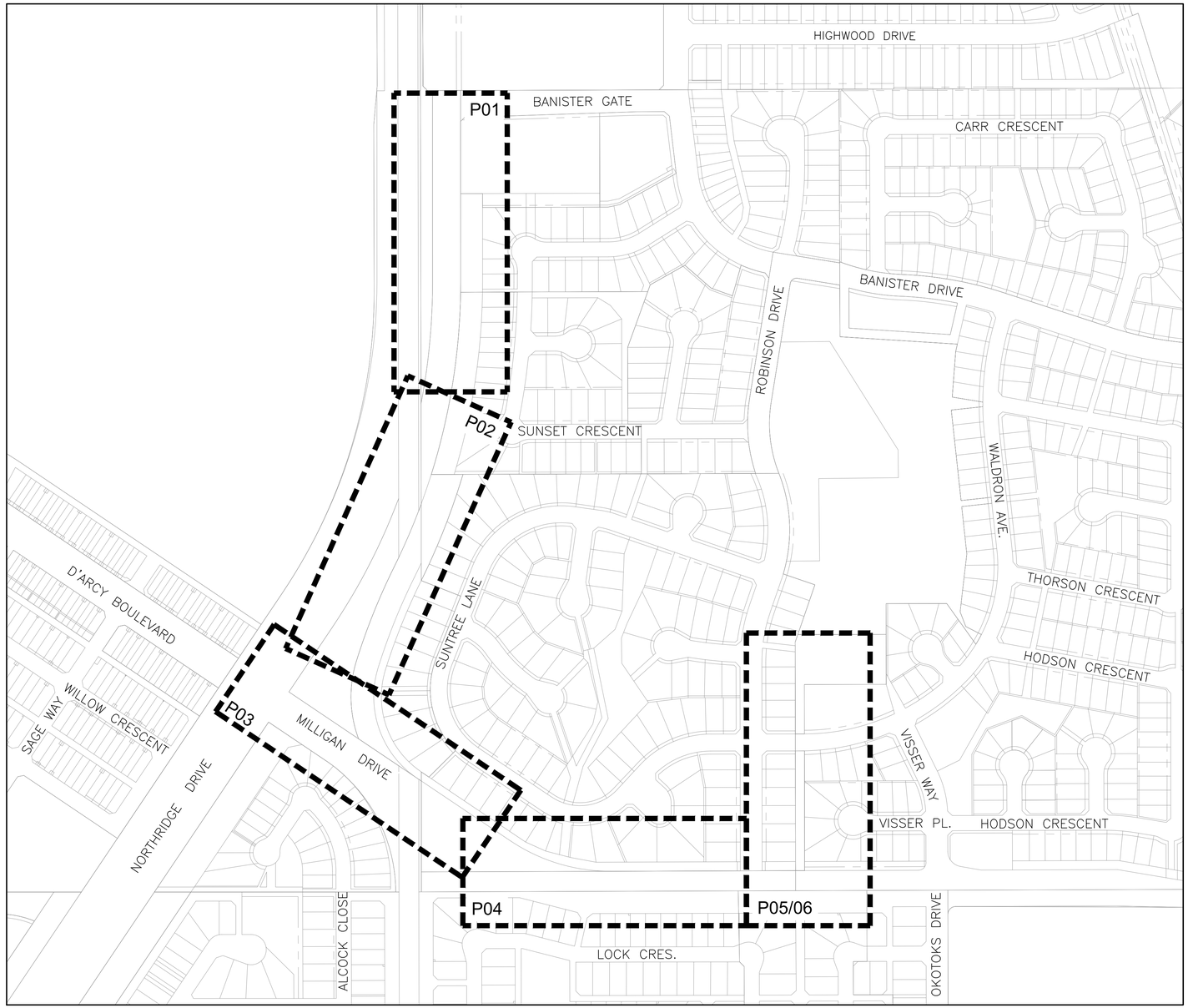
Item No.	Description	Units	Unit Price	Other Upgrades	Storm Option 1	Other Upgrades	Storm Option 2
2.0	**Removals**						
2.1	Topsoil Stripping (Typical 150 mm depth)	m²	$20.00	500	$10,000.00	550	$11,000.00
7.0	**Storm**						
7.1	Supply and Install 300mm PVC overflow spill pipe	lin.m.	$450.00	50	$22,500.00	2	$900.00
7.2	Tie-in to Existing Reservoir	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
7.3	Drainage Grading	m²	$45.00	150	$6,750.00	550	$24,750.00
7.4	Supply and Install Grated Top Manhole	ea.	$5,000.00	1	$5,000.00		
7.5	Tie-in to Existing Manhole	ea.	$5,000.00	1	$5,000.00		
8.0	**Landscape Rehabilitation**						
8.1	Topsoil Placement, 150 mm Depth	m²	$50.00	500	$25,000.00	550	$25,000.00
8.2	Supply and Install Grass Sod, incuding fertilizer	m²	$25.00	500	$12,500.00	550	$12,500.00
			Sub-Total (Rounded)		**$91,750.00**		**$79,150.00**
			Contingency (30%)		**$27,525.00**		**$23,745.00**
			PROJECT TOTAL (ROUNDED)		**$119,275.00**		**$102,895.00**

APPENDIX B

Concept Drawings

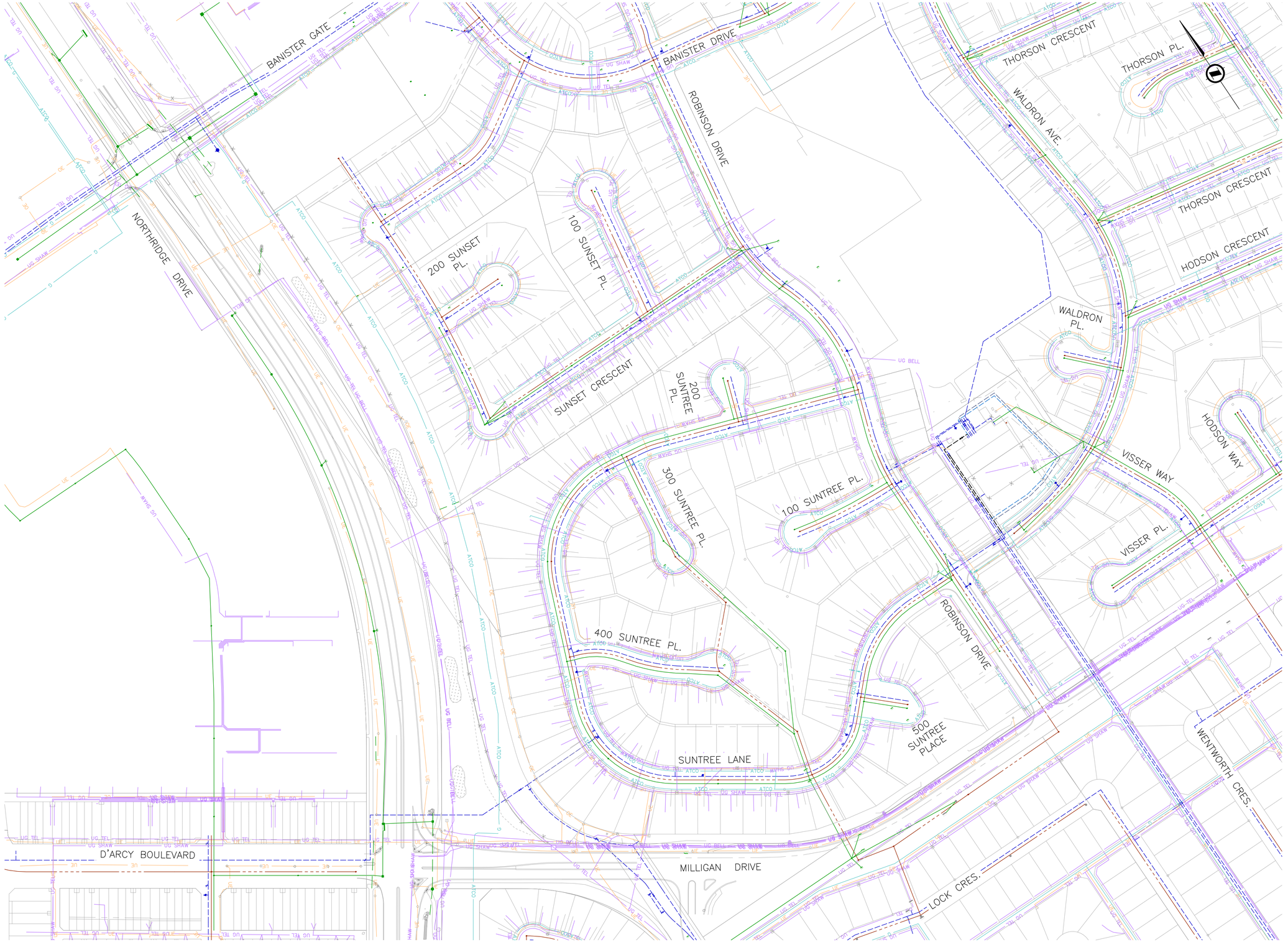
TOWN OF OKOTOKS
ZONE 4N
WATERMAIN

ISSUED FOR REVIEW
SEPTEMBER 2024



PROJECT EXTENTS

1:2500 0 50 100 m



NOTES

1. ALL PIPE SIZES ARE IN MILLIMETRES AND ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL COORDINATES AND DISTANCES ARE BASED ON 3TM COORDINATE SYSTEM (NAD 83).
3. UTILITY LOCATIONS ARE APPROXIMATE AND MUST BE CONFIRMED BY THE CONTRACTOR IN THE FIELD BEFORE CONSTRUCTIONS STARTS.

LEGEND

- ATCO — EXISTING ATCO LINE
- G — ABANDONED ATCO LINE
- UE — EXISTING UNDERGROUND FORTIS
- OE — EXISTING OVERHEAD FORTIS
- UG TEL — EXISTING UNDERGROUND TELUS
- EXISTING SANITARY LINE
- EXISTING STORM LINE
- EXISTING WATER LINE
- UG SHAW — EXISTING SHAW LINE
- UG BELL — EXISTING BELL/SUPERNET LINE

FOR DISCUSSION ONLY

Click Before You Dig

NAD 83 COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

PERMIT

SEAL

	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:1500 (0 — 30 — 60 m)

Okotoks — Where the Elbow Meets the Sky

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 32, 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
EXISTING UTILITY OVERVIEW

FILE NO.	ENG DWG NO.
28650_OverallPlan.dwg	
SHEET ID. **UT01**	SHEET NO. **1**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

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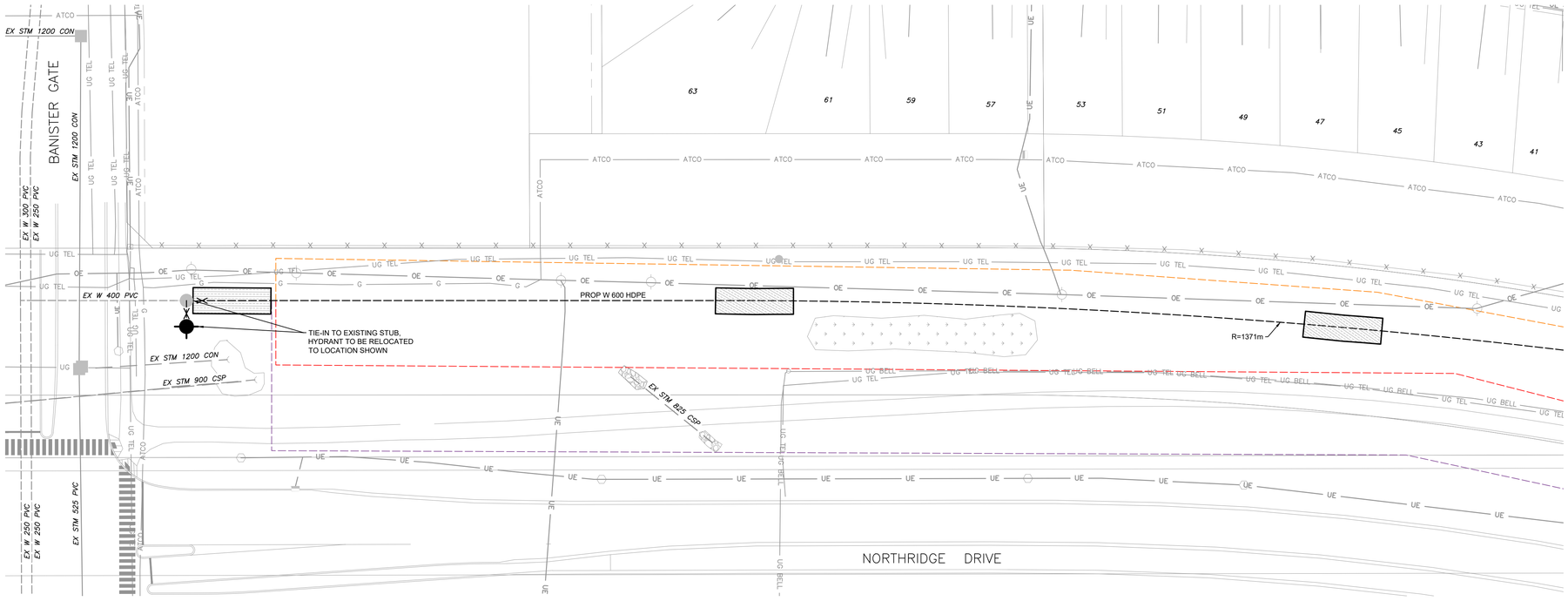

NOTES

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4. WATERMAIN LAYOUT TO BE REVIEWED WITH FORTIS IN THE FIELD DUE TO PROXIMITY TO OVERHEAD POWER AND POLES.
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LEGEND

- PROPOSED WATER LINE - OPTION 1
- PROPOSED WATER LINE - OPTION 2
- PROPOSED WATER LINE - OPTION 3
- PROPOSED WATER LINE - OPTION 4
- EXISTING WATER LINE
- EXISTING WATER LINE - TO BE REMOVED
- PROPOSED WATER VALVE
- EXISTING WATER VALVE
- EXISTING WATER HYDRANT
- EXISTING SANITARY LINE
- EXISTING SANITARY MANHOLE
- EXISTING STORM LINE
- EXISTING STORM MANHOLE
- EXISTING ATCO LINE
- ABANDONED ATCO LINE
- EXISTING UNDERGROUND FORTIS
- EXISTING OVERHEAD FORTIS
- EXISTING UNDERGROUND TELUS
- EXISTING SHAW LINE
- EXISTING BELL/SUPERNET LINE
- PROPOSED DRILL PIT

Click Before You Dig

NAD 83 COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

PERMIT

SEAL

	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 (0, 10, 20 m)

Okotoks — Where the Sustainable Future

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

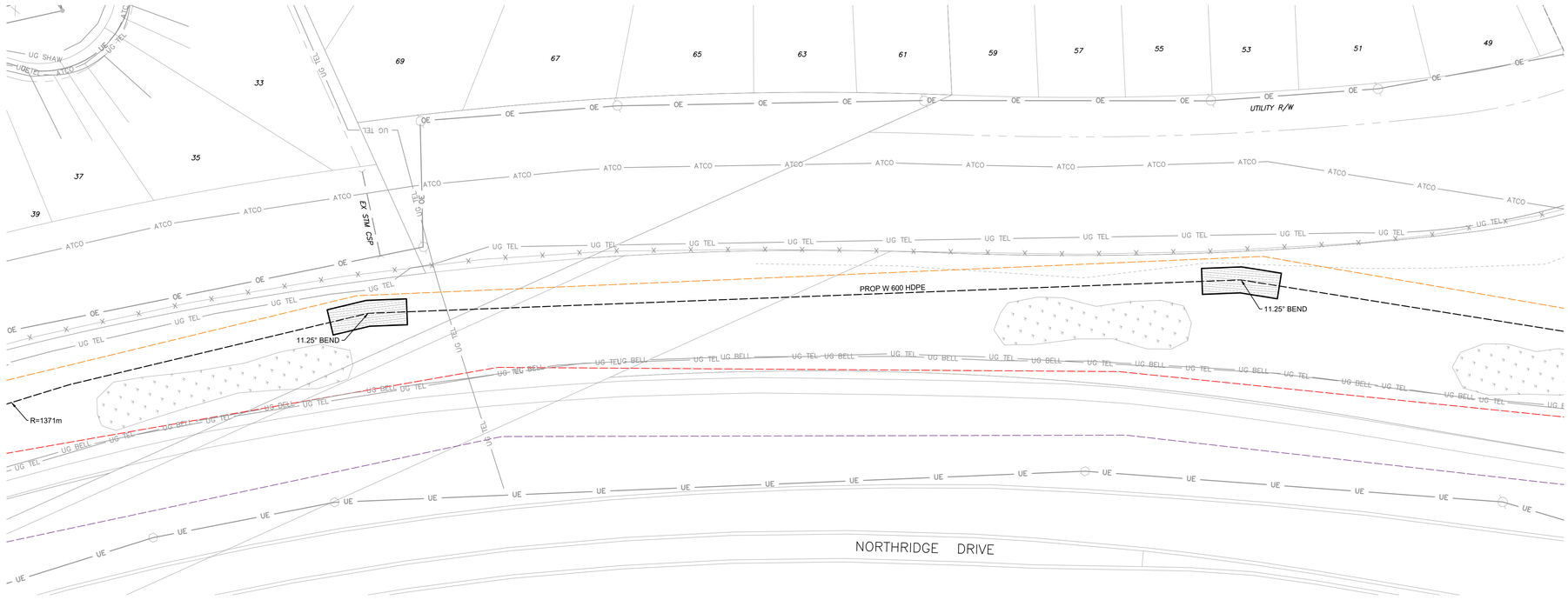
PLAN VIEW
PROPOSED WATERMAIN
NORTHRIDGE DRIVE TIE-IN

FILE NO.	ENG DWG NO.
28650_PlanView.dwg	
SHEET ID.	SHEET NO.
P01	2

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

FILE: C:\USERS\HEDE.ISLEDMONTON\DCA\CCDOCS\ISL\28650 - OKOTOKS ZONE 4N WATERMAIN\PROJECT FILES\02_CADD\23_SHEETS\28650_PLANVIEW.DWG | DATE: Wednesday, September 11, 2024 9:38:11 AM



NOTES

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LEGEND

- PROPOSED WATER LINE - OPTION 1
- PROPOSED WATER LINE - OPTION 2
- PROPOSED WATER LINE - OPTION 3
- PROPOSED WATER LINE - OPTION 4
- EXISTING WATER LINE
- EXISTING WATER LINE - TO BE REMOVED
- PROPOSED WATER VALVE
- EXISTING WATER VALVE
- EXISTING WATER HYDRANT
- EXISTING SANITARY LINE
- EXISTING SANITARY MANHOLE
- EXISTING STORM LINE
- EXISTING STORM MANHOLE
- EXISTING ATCO LINE
- ABANDONED ATCO LINE
- EXISTING UNDERGROUND FORTIS
- EXISTING OVERHEAD FORTIS
- EXISTING UNDERGROUND TELUS
- EXISTING SHAW LINE
- EXISTING BELL/SUPERNET LINE
- PROPOSED DRILL PIT

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NAD 83 COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

PERMIT

SEAL

	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 (0, 10, 20 m)

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 32, 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

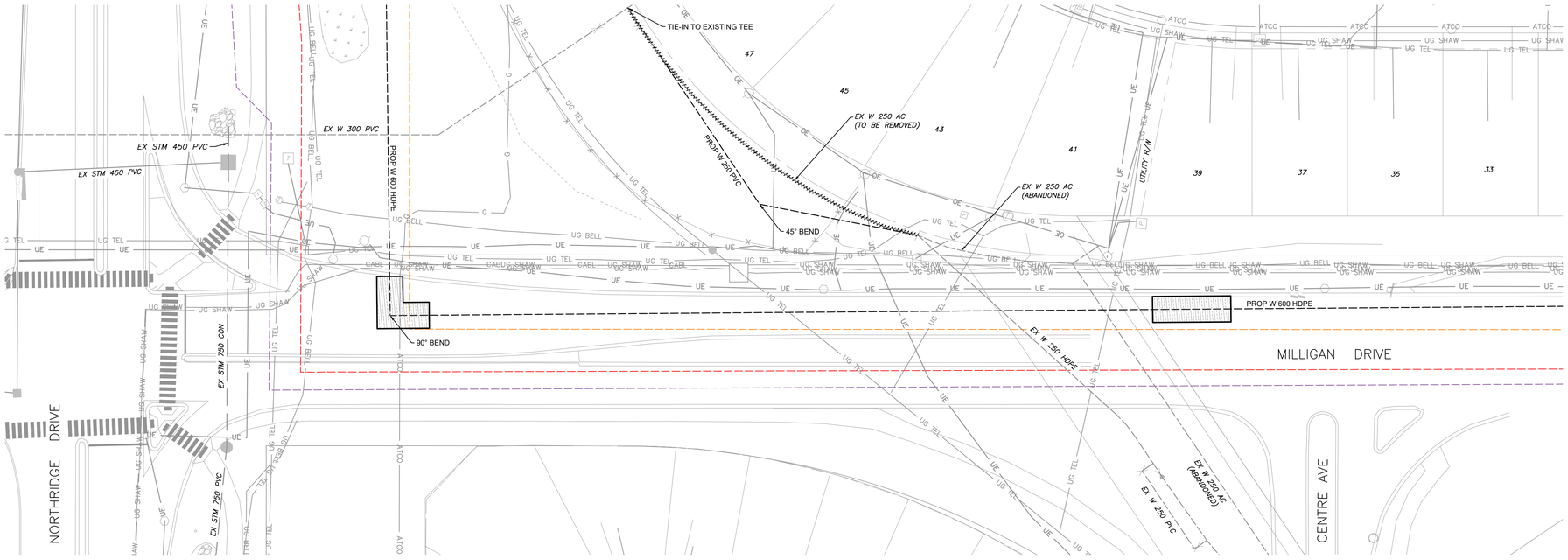
PLAN VIEW
PROPOSED WATERMAIN
NORTHRIDGE DRIVE

FILE NO.	ENG DWG NO.
28650_PlanView.dwg	
SHEET ID. **P02**	SHEET NO. **3**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

FILE: C:\USERS\HEHE.ISL\DESKTOP\OKOTOKS ZONE 4N WATERMAIN\PROJECT FILES\00_CADD\03_SHEETS\28650_PLANVIEW.DWG | DATE: Wednesday, September 11, 2024 9:39:07 AM



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LEGEND

- PROPOSED WATER LINE - OPTION 1
- PROPOSED WATER LINE - OPTION 2
- PROPOSED WATER LINE - OPTION 3
- PROPOSED WATER LINE - OPTION 4
- EXISTING WATER LINE
- EXISTING WATER LINE - TO BE REMOVED
- PROPOSED WATER VALVE
- EXISTING WATER VALVE
- EXISTING WATER HYDRANT
- EXISTING SANITARY LINE
- EXISTING SANITARY MANHOLE
- EXISTING STORM LINE
- EXISTING STORM MANHOLE
- EXISTING ATCO LINE
- ABANDONED ATCO LINE
- EXISTING UNDERGROUND FORTIS
- EXISTING OVERHEAD FORTIS
- EXISTING UNDERGROUND TELUS
- EXISTING SHAW LINE
- EXISTING BELL/SUPERNET LINE
- PROPOSED DRILL PIT

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NAD 83 COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

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SEAL

	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 — 0 10 20 m

Okotoks — Where the Foothills Roll

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 32, 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
MILLIGAN DRIVE

FILE NO.	ENG DWG NO.
28650_PlanView.dwg	
SHEET ID. **P03**	SHEET NO. **4**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

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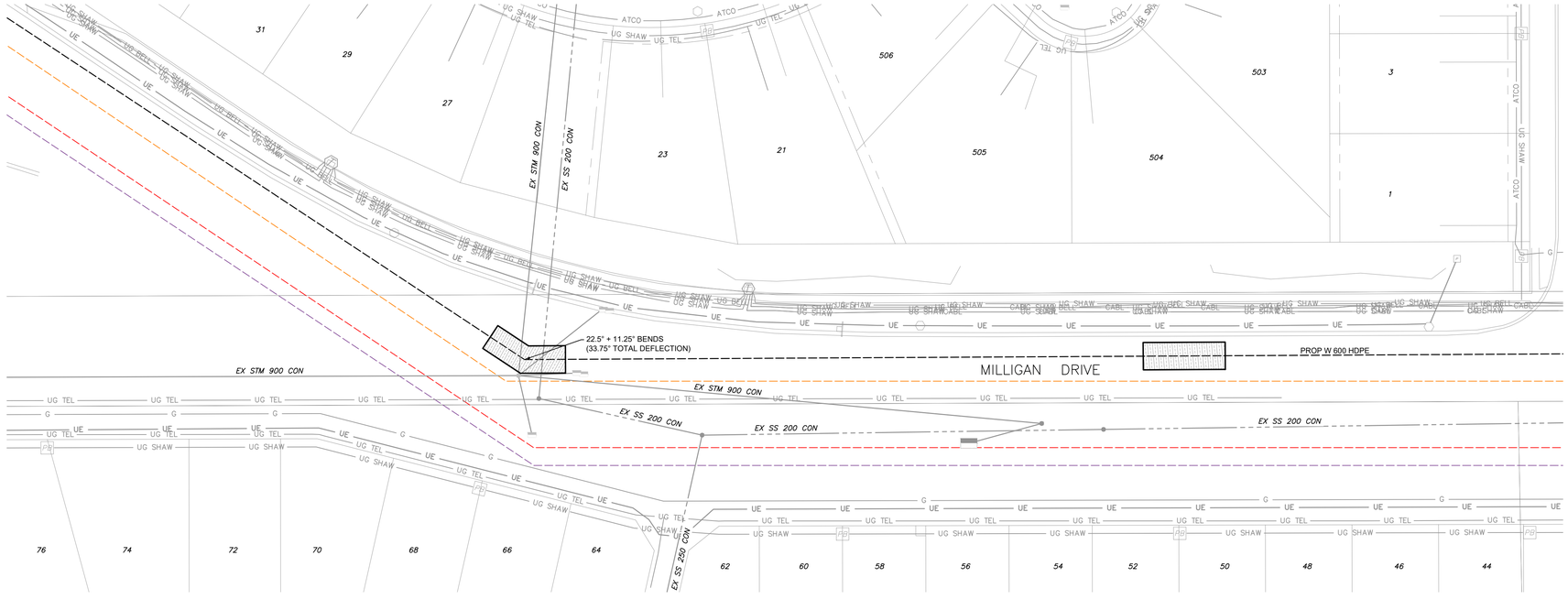

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- PROPOSED WATER LINE - OPTION 2
- PROPOSED WATER LINE - OPTION 3
- PROPOSED WATER LINE - OPTION 4
- EXISTING WATER LINE
- EXISTING WATER LINE - TO BE REMOVED
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- EXISTING WATER HYDRANT
- EXISTING SANITARY LINE
- EXISTING SANITARY MANHOLE
- EXISTING STORM LINE
- EXISTING STORM MANHOLE
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- EXISTING OVERHEAD FORTIS
- EXISTING UNDERGROUND TELUS
- EXISTING SHAW LINE
- EXISTING BELL/SUPERNET LINE
- PROPOSED DRILL PIT

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NAD 83
COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

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	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 — 0 10 20 m

Okotoks — Where the Rivers Flow

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
MILLIGAN DRIVE

FILE NO.	ENG DWG NO.
28650_PlanView.dwg	
SHEET ID. **P04**	SHEET NO. **5**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

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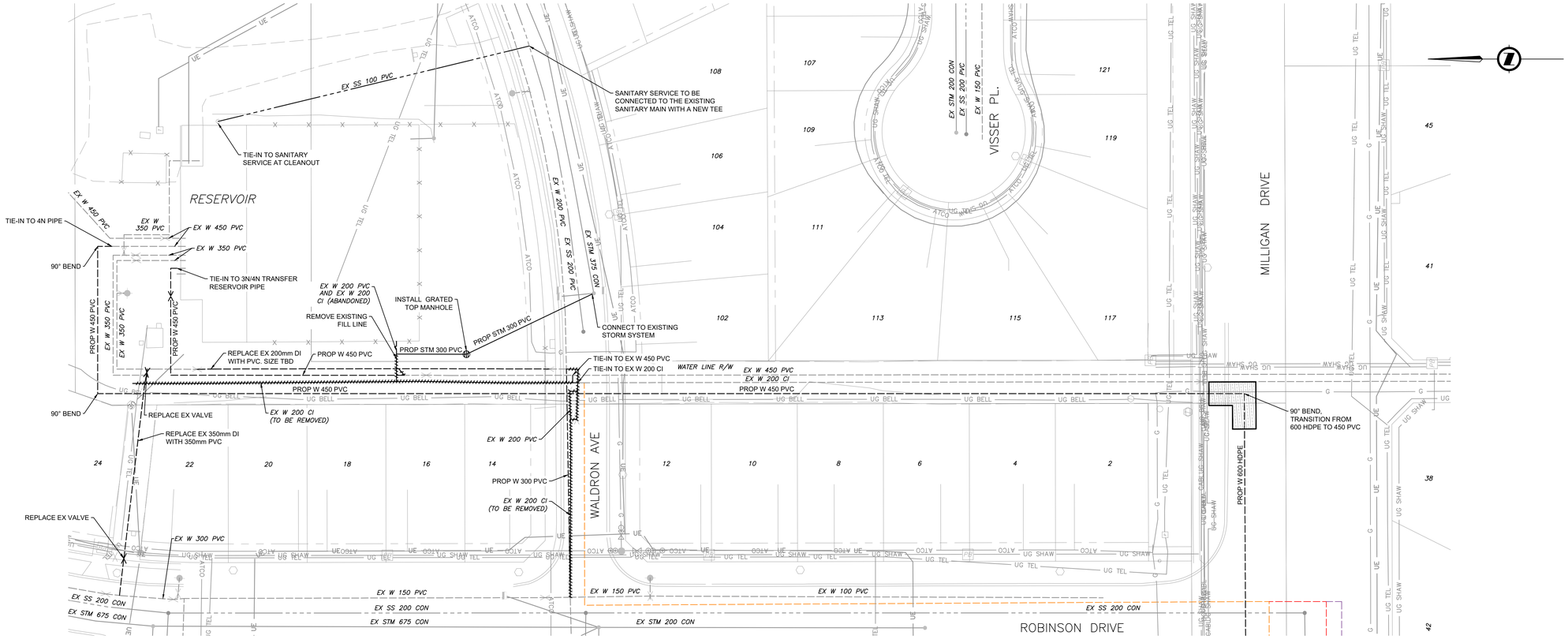

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   1) PIPED OVERFLOW TO GRATED TOP MANHOLE AND STORM SEWER CONNECTION DIRECTLY TO THE STORM MAIN ON WALDRON AVENUE.
   2) PIPED OVERFLOW TO A SWALE IN THE EXISTING GREEN SPACE AND OVERLAND FLOW TO THE EXISTING CATCHBASINS ON WALDRON AVENUE.

LEGEND

- PROPOSED WATER LINE - OPTION 1
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- EXISTING STORM LINE
- EXISTING STORM MANHOLE
- ATCO — EXISTING ATCO LINE
- G — ABANDONED ATCO LINE
- UE — EXISTING UNDERGROUND FORTIS
- OE — EXISTING OVERHEAD FORTIS
- UG TEL — EXISTING UNDERGROUND TELUS
- UG SHAW — EXISTING SHAW LINE
- UG BELL — EXISTING BELL/SUPERNET LINE
- PROPOSED DRILL PIT

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NAD 83 COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

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SEAL

	BY	DATE (YYYY-MM-DD)
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DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 — 0 10 20 m

Okotoks — Where the Rivers Run

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
RESERVOIR TIE-IN - OPTION 1

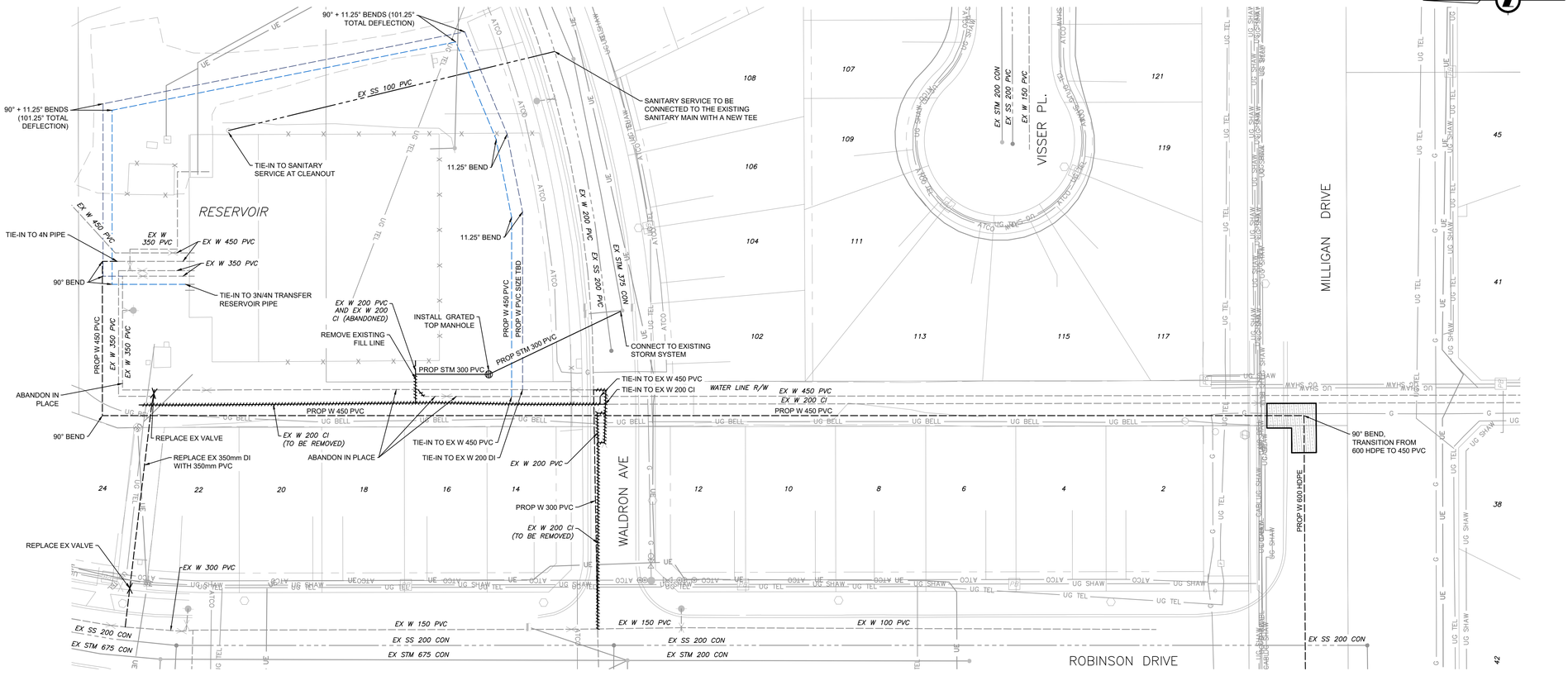
FILE NO.	ENG DWG NO.
28650_PlanView.dwg	
SHEET ID. **P05**	SHEET NO. **6**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC:

SHEET SIZE ANSI D 25 mm 0

FILE: C:\USERS\HERE.ISLEDMONTON\DCA\CDOCS\ISL\28650 - OKOTOKS ZONE 4N WATERMAIN\PROJECT FILES\03_CAD\D23_SHEETS\28650_PLANVIEW.DWG | DATE: Wednesday, September 11, 2024 8:51:55 AM



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LEGEND

- PROPOSED WATER LINE
- PROPOSED WATER LINE - REROUTING OPTION 1
- PROPOSED WATER LINE - REROUTING OPTION 2
- EXISTING WATER LINE
- EXISTING WATER LINE - TO BE REMOVED
- PROPOSED WATER VALVE
- EXISTING WATER VALVE
- EXISTING WATER HYDRANT
- EXISTING SANITARY LINE
- EXISTING SANITARY MANHOLE
- EXISTING STORM LINE
- EXISTING STORM MANHOLE
- ATCO — EXISTING ATCO LINE
- G — ABANDONED ATCO LINE
- UE — EXISTING UNDERGROUND FORTIS
- OE — EXISTING OVERHEAD FORTIS
- UG TEL — EXISTING UNDERGROUND TELUS
- UG SHAW — EXISTING SHAW LINE
- UG BELL — EXISTING BELL/SUPERNET LINE
- PROPOSED DRILL PIT

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NAD 83 COORDINATES

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1	ISSUED FOR REVIEW	2024-09-11	HE	KK

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	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 — 0 10 20 m

Okotoks — Where the Spirit Soars

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
RESERVOIR TIE-IN - OPTION 2

FILE NO.	ENG DWG NO.
28650_PlanView_P06_Option.dwg	
SHEET ID.	SHEET NO.
P06	7

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC:

SHEET SIZE ANSI D — 25 mm — 0

FILE: C:\USERS\HEHE.ISL\DMONTONDC\ACCDOCS\ISL\28650 - OKOTOKS ZONE 4N WATERMAIN\PROJECT FILES\02_CAD\02_SHEETS\28650_PLANVIEW_P06_OPTION.DWG | DATE: Wednesday, September 11, 2024 8:54:33 AM

APPENDIX B

Cost Estimates

Project No.: 28650
Project Name: Okotoks Zone 4N Seconday Watermain
Project Estimate: Class 3 Cost Estimate - Design Basis Memorandum
Date: October 30, 2024

ISL Engineering and Land Services

Item No.	Description	Units	Unit Price (Conservative)	Unit Price (Average)	Quantity 4N	Zone 4N Total (Conservative)	Quantity Other	Other Upgrades (Conservative)	Total Quantity	Total (Conservative)	Total (Average)
1.0	**General**										
1.1	Mobilization and Demobilization	L.S.	$250,000.00		1	$177,500.00	1	$72,500.00	1	$250,000.00	$250,000.00
1.2	ESC Plan	L.S.	$6,000.00		1	$4,260.00	1	$1,740.00	1	$6,000.00	$6,000.00
1.3	ECO Plan	L.S.	$5,000.00		1	$3,550.00	1	$1,450.00	1	$5,000.00	$5,000.00
1.4	Traffic Accomodation	L.S.	$10,000.00		1	$7,100.00	1	$2,900.00	1	$10,000.00	$10,000.00
1.5	Project Site Survey	L.S.	$20,000.00		1	$14,200.00	1	$5,800.00	1	$20,000.00	$20,000.00
1.6	Geotechnical Testing	L.S.	$25,000.00		1	$17,750.00	1	$7,250.00	1	$25,000.00	$25,000.00
1.7	Utility Coordination	L.S.	$19,350.00		1	$15,000.00	1	$4,350.00	1	$19,350.00	$19,350.00
1.8	Provisional: Pole Relocation	L.S.	$81,000.00		1	$81,000.00			1	$81,000.00	$81,000.00
1.9	Provisional: Hydrovac	Hours	$400.00		14	$5,600.00	6	$2,400.00	20	$8,000.00	$8,000.00
2.0	**Removals**										
2.1	Topsoil Stripping (Typical 150 mm depth)	m²	$20.00	$11.77	5680	$113,600.00	700	$14,000.00	6380	$127,600.00	$75,113.87
2.2	Asphalt Milling (35mm)	m²	$10.00	$10.00	2100	$21,000.00			2100	$21,000.00	$21,000.00
2.3	Sawcutting, Removal, and Disposal of Curb and Gutter	l.m.	$30.00	$23.88	10	$300.00	5	$150.00	15	$450.00	$358.20
2.4	Sawcutting, Removal, and Disposal of Monolithic Walk, Rolled Curb & Gutter	l.m.	$100.00				60	$6,000.00	60	$6,000.00	$6,000.00
2.5	Sawcutting, Removal, and Disposal of Separate Walk	l.m.	$20.00	$13.00	5	$100.00	5	$100.00	10	$200.00	$130.00
2.6	Sawcutting, Removal, and Disposal of Driveway (Gravel)	m²	$25.00	$11.91			850	$21,250.00	850	$21,250.00	$10,120.67
2.7	Remove and Dispose of Existing Road Structure	m²	$30.00	$12.69	1100	$33,000.00	250	$7,500.00	1350	$40,500.00	$17,131.50
3.0	**Roadworks**										
3.1	Subgrade Preparation, 150 mm Depth	m²	$10.00	$3.13	1100	$11,000.00	250	$2,500.00	1350	$13,500.00	$4,225.50
3.2	Granular Base Course 100 mm Depth	m²	$15.00	$9.58	1100	$16,500.00	250	$3,750.00	1350	$20,250.00	$12,933.00
3.3	Granular Sub-Base 300 mm Depth	m²	$30.00	$24.50	1100	$33,000.00			1100	$33,000.00	$26,950.00
3.4	Granualr Sub-Base 200 mm Depth	m²	$25.00				250	$6,250.00	250	$6,250.00	$6,250.00
3.5	Prime Coat (SS-1)	m²	$2.00	$1.09	1100	$2,200.00	250	$500.00	1350	$2,700.00	$1,464.75
3.6	Asphalt Mix A, 100 mm Depth	m²	$50.00		1100	$55,000.00			1100	$55,000.00	$55,000.00
3.7	Tack Coat (SS-1 or MC-30)	m²	$2.00	$1.09	2100	$4,200.00	250	$500.00	2350	$4,700.00	$2,561.50
3.8	Asphalt Mix B, 60 mm Depth	m²	$30.00	$24.64	2100	$63,000.00			2100	$63,000.00	$51,733.50
3.9	Asphalt Mix B, 80 mm Depth	m²	$31.00	$24.28			250	$7,750.00	250	$7,750.00	$6,070.00
3.10	Re-establish Gravel Driveway	m²	$50.00	$26.75			850	$42,500.00	850	$42,500.00	$22,737.50
3.11	Adjustment of Appurtenances - Valves	ea.	$1,000.00	$253.21			7	$7,000.00	7	$7,000.00	$1,772.47
4.0	**Concrete**										
4.1	Supply and Install Standard Concrete Curb and Gutter	l.m.	$250.00	$149.24	10	$2,500.00	5	$1,250.00	15	$3,750.00	$2,238.60
4.2	Supply and Install 1.3 m Separate Sidewalk	l.m.	$250.00	$206.62	5	$1,250.00	5	$1,250.00	10	$2,500.00	$2,066.17
4.3	Supply and Install 1.1 m Monolithic Walk, Rolled Curb & Gutter	l.m.	$650.00				60	$39,000.00	60	$39,000.00	$39,000.00
5.0	**Water**										
	Water Mains										
5.1	Remove Existing 250 mm AC and Install 250 mm PVC (Open Cut w/ Trench Box)	l.m.	$600.00				60	$36,000.00	60	$36,000.00	$36,000.00
5.2	Remove Existing 200 mm DI and Valves	l.m.	$200.00				60	$12,000.00	60	$12,000.00	$12,000.00
5.3	Suppy and Install 300 mm PVC (Size to be confirmed)	l.m.	$600.00	$609.00			185	$111,000.00	185	$111,000.00	$112,665.00
5.4	Remove Existing 200 mm CI	l.m.	$200.00				240	$48,000.00	240	$48,000.00	$48,000.00
5.5	Remove Existing 350 mm DI and Replace with 350 mm PVC	l.m.	$700.00				45	$31,500.00	45	$31,500.00	$31,500.00
5.6	Remove Existing 200 mm DI	l.m.	$650.00				80	$52,000.00	80	$52,000.00	$52,000.00
5.7	Supply and Install 600 mm HDPE	l.m.	$2,450.00		1455	$3,564,750.00			1455	$3,564,750.00	$3,564,750.00
5.8	Supply and Install 450 mm PVC	l.m.	$1,400.00				95	$133,000.00	95	$133,000.00	$133,000.00
5.9	Remove Existing 200 mm PVC	l.m.	$200.00				6	$1,200.00	6	$1,200.00	$1,200.00
5.10	Supply and Install 350mm PVC	l.m.	$700.00	$1,470.00			285	$199,500.00	285	$199,500.00	$418,950.00
	Valves										
5.11	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00	$17,826.00			3	$60,000.00	3	$60,000.00	$53,478.00
5.12	Supply and Install 450 mm Gate Valve	ea.	$25,000.00				1	$25,000.00	1	$25,000.00	$25,000.00
5.13	Supply and Install 600 mm Gate Valve	ea.	$35,000.00		3	$105,000.00				$105,000.00	$105,000.00
5.14	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00				1	$8,000.00	1	$8,000.00	$8,000.00
5.15	Supply and Install 300 mm Gate Valve	ea.	$15,000.00	$13,337.00			1	$15,000.00	1	$15,000.00	$13,337.00
5.16	Remove Existing and Replace with 300 mm Gate Valve	ea.	$15,000.00				2	$30,000.00	2	$30,000.00	$30,000.00
	Valves (Provisional)										
5.17	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00				1	$8,000.00	1	$8,000.00	$8,000.00
5.18	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00				2	$40,000.00	2	$40,000.00	$40,000.00
	Fittings										
	Tees										
5.19	Supply and Install 450 mm x 450mm x 450 mm Tee	ea.	$10,000.00				1	$10,000.00	1	$10,000.00	$10,000.00
5.20	Supply and Install 300mm x 300mm x 300mm Tee	ea.	$7,500.00				1	$7,500.00	1	$7,500.00	$7,500.00
	Reducers										
5.21	Supply and Install 300 mm x 450 mm Reducer	ea.	$3,500.00				2	$7,000.00	2	$7,000.00	$7,000.00
5.22	Supply and Install 400 mm x 600 mm HDPE to PVC Reducer	ea.	$15,000.00		1	$15,000.00			1	$15,000.00	$15,000.00
	Bends										
5.23	Supply and Install 450 mm 90° Elbow	ea.	$8,000.00				2	$16,000.00	2	$16,000.00	$16,000.00
5.24	Supply and install 600 mm 90° Elbow	ea.	$25,000.00		4	$100,000.00			4	$100,000.00	$100,000.00
5.25	Supply and install 600 mm 22.5° Elbow	ea.	$15,000.00		1	$15,000.00			1	$15,000.00	$15,000.00
5.26	Supply and install 250 mm 45° Elbow	ea.	$4,000.00				1	$4,000.00	1	$4,000.00	$4,000.00
5.27	Supply and Install 300 mm 90° Elbow	ea.	$7,000.00				2	$14,000.00	2	$14,000.00	$14,000.00
5.28	Supply and install 300 mm 11.25° Elbow	ea.	$6,000.00				1	$6,000.00	1	$6,000.00	$6,000.00
5.29	Supply and Install 350mm 90° Elbow	ea.	$7,500.00	$4,107.00			2	$12,000.00	2	$12,000.00	$8,214.00
	Hydrants										
5.30	Relocate existing Hydrant and Valve	ea.	$5,000.00		1	$5,000.00			1	$5,000.00	$5,000.00
5.31	Supply, Install, and Connection of 150 mm PVC Hydrant Lead	l.m.	$350.00		10	$3,500.00			10	$3,500.00	$3,500.00
5.32	Supply and Install 150 mm Gate Valve	ea.	$4,500.00		1	$4,500.00			1	$4,500.00	$4,500.00
	Connection to Existing										
5.33	Tie-in Pipework inside Pump Station	ea.	$10,000.00				1	$10,000.00	1	$10,000.00	$10,000.00
5.34	Tie-in to Existing 450 mm PVC	ea.	$7,500.00		1	$7,500.00	2	$15,000.00	3	$22,500.00	$22,500.00
5.35	Tie-in to Existing 200 mm CI	ea.	$5,000.00	$5,343.00			1	$5,000.00	1	$5,000.00	$5,343.00
5.36	Tie-in to Existing 400 mm PVC stub	ea.	$7,500.00		1	$7,500.00			1	$7,500.00	$7,500.00
5.37	Tie-in to Existing 250 mm HDPE	ea.	$6,000.00				1	$6,000.00	1	$6,000.00	$6,000.00
5.38	Tie-in to Existing 150 mm PVC	ea.	$5,000.00	$4,729.00			1	$5,000.00	1	$5,000.00	$4,729.00
5.39	Tie-in to Existing 350 mm PVC	ea.	$7,500.00				2	$15,000.00	2	$15,000.00	$15,000.00
5.40	Tie-in to Existing 300mm DI	ea.	$7,500.00	$4,614.00			1	$7,500.00	1	$7,500.00	$4,614.00
5.41	Tie-in to Existing 300mm PVC	ea.	$7,500.00				1	$7,500.00	1	$7,500.00	$7,500.00
5.42	Cap Existing Fill Line Tie-in to Reservoir and Patch Reservoir Wall	ea.	$6,000.00				1	$6,000.00	1	$6,000.00	$6,000.00
6.0	**Sanitary**										
	Sanitary Connections										
6.1	Supply and Install 200 mm PVC (Incl. Connection to Pump Station Sanitary Service Outlet)	l.m.	$350.00	$489.08			65	$22,750.00	65	$22,750.00	$31,790.20
6.2	Tie-in to Existing Sanitary Service at Cleanout	ea.	$2,500.00				1	$2,500.00	1	$2,500.00	$2,500.00
6.3	Tie-in to Existing 200 mm PVC Sanitary Main c/w Tee Connection	ea.	$5,000.00	$3,935.00			1	$5,000.00	1	$5,000.00	$3,935.00
6.4	Supply and Install Sanitary Manhole	L.S.	$15,000.00	$3,304.50			1	$15,000.00	1	$15,000.00	$3,304.50
7.0	**Landscape Rehabilitation**										
7.1	Topsoil Placement, 150 mm Depth	m²	$50.00	$31.36	5680	$284,000.00	700	$35,000.00	6380	$319,000.00	$200,098.07
7.2	Supply and Install Grass Sod, incuding fertilizer	m²	$25.00	$15.00	5680	$142,000.00	700	$17,500.00	6380	$159,500.00	$95,700.00
7.3	Remove stockpile and Replace Existing Trees (Inc. Mulch Bedding)	L.S.	$15,000.00		1	$15,000.00			1	$15,000.00	$15,000.00
				Sub-Total (Rounded)		**$4,951,360.00**		**$1,321,090.00**		**$6,272,450.00**	**$6,139,314.99**
				Contingency (30%)		**$1,485,408.00**		**$396,327.00**		**$1,881,735.00**	**$1,841,794.50**
				Engineering Fees for Tendering and Construction		**$150,000.00**		**$25,000.00**		**$174,999.00**	**$175,000.00**
				PROJECT TOTAL (ROUNDED)		**$6,586,768.00**		**$1,742,417.00**		**$8,329,184.00**	**$8,156,109.48**

Project No.: 28650
Project Name: Okotoks Zone 4N Seconday Watermain
Project Estimate: Class 3 Cost Estimate - Trenchless HDPE vs Open Cut PVC
Date: October 30, 2024

ISL Engineering and Land Services

Item No.	Description	Units	Unit Price	Quantity HDPE	Zone 4N HDPE	Quantity PVC	Zone 4N PVC
1.0	**General**						
1.1	Mobilization and Demobilization	L.S.	$250,000.00	1	$177,500.00	1	$177,500.00
1.2	ESC Plan	L.S.	$6,000.00	1	$4,260.00	1	$4,260.00
1.3	ECO Plan	L.S.	$5,000.00	1	$3,550.00	1	$3,550.00
1.4	Traffic Accomodation	L.S.	$10,000.00	1	$7,100.00	1	$7,100.00
1.5	Project Site Survey	L.S.	$20,000.00	1	$14,200.00	1	$14,200.00
1.6	Geotechnical Testing	L.S.	$25,000.00	1	$17,750.00	1	$17,750.00
1.7	Utility Coordination	L.S.	$15,000.00	1	$10,650.00	1	$15,000.00
1.8	Provisional: Pole Relocation	L.S.	$81,000.00	1	$81,000.00	1	$81,000.00
1.9	Provisional: Hydrovac	Hours	$400.00	14	$5,600.00	14	$5,600.00
2.0	**Removals**						
2.1	Topsoil Stripping (Typical 150 mm depth)	m²	$20.00	1900	$38,000.00	5680	$113,600.00
2.2	Asphalt Milling (35mm)	m²	$10.00			2100	$21,000.00
2.3	Sawcutting, Removal, and Disposal of Curb and Gutter	l.m.	$30.00	10	$300.00	10	$300.00
2.4	Sawcutting, Removal, and Disposal of Monolithic Walk, Rolled Curb & Gutter	l.m.	$100.00				
2.5	Sawcutting, Removal, and Disposal of Separate Walk	l.m.	$20.00	5	$100.00	5	$100.00
2.6	Sawcutting, Removal, and Disposal of Driveway (Gravel)	m²	$25.00				
2.7	Remove and Dispose of Existing Road Structure	m²	$20.00	375	$7,500.00	1100	$22,000.00
3.0	**Roadworks**						
3.1	Subgrade Preparation, 150 mm Depth	m²	$10.00	375	$3,750.00	1100	$11,000.00
3.2	Granular Base Course 100 mm Depth	m²	$15.00	375	$5,625.00	1100	$16,500.00
3.3	Granular Sub-Base 300 mm Depth	m²	$30.00	375	$11,250.00	1100	$33,000.00
3.4	Granualr Sub-Base 200 mm Depth	m²	$25.00				
3.5	Prime Coat (SS-1)	m²	$2.00	375	$750.00	1100	$2,200.00
3.6	Asphalt Mix A, 100 mm Depth	m²	$50.00	375	$18,750.00	1100	$55,000.00
3.7	Tack Coat (SS-1 or MC-30)	m²	$2.00	375	$750.00	2100	$4,200.00
3.8	Asphalt Mix B, 60 mm Depth	m²	$30.00	375	$11,250.00	2100	$63,000.00
3.9	Asphalt Mix B, 80 mm Depth	m²	$31.00				
3.10	Re-establish Gravel Driveway	m²	$50.00				
3.11	Adjustment of Appurtenances - Valves	ea.	$1,000.00				
4.0	**Concrete**						
4.1	Supply and Install Standard Concrete Curb and Gutter	l.m.	$250.00	10	$2,500.00	10	$2,500.00
4.2	Supply and Install 1.3 m Separate Sidewalk	l.m.	$250.00	5	$1,250.00	5	$1,250.00
4.3	Supply and Install 1.1 m Monolithic Walk, Rolled Curb & Gutter	l.m.	$650.00				
5.0	**Water**						
	Water Mains						
5.1	Supply and Install 600 mm HDPE	l.m.	$2,450.00	1455	$3,564,750.00		
5.2	Remove Existing 250 mm AC and Install 250 mm PVC (Open Cut w/ Trench Box)	l.m.	$600.00				
5.3	Remove Existing 200 mm DI and Valves	l.m.	$200.00				
5.4	Suppy and Install 300 mm PVC	l.m.	$600.00				
5.5	Remove Existing 200 mm CI	l.m.	$200.00				
5.6	Remove Existing 350 mm DI and Replace with 350 mm PVC	l.m.	$700.00				
5.7	Remove Existing 200 mm DI and Replace with 300 mm PVC	l.m.	$650.00				
5.8	Supply and Install 450 mm PVC	l.m.	$1,400.00				
5.9	Supply and Install 500 mm PVC		$1,750.00			1455	$2,546,250.00
5.1	Remove Existing 200 mm PVC	l.m.	$200.00				
	Valves						
5.11	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00				
5.12	Supply and Install 500 mm Gate Valve	ea.	$30,000.00			3	$90,000.00
5.13	Supply and Install 600 mm Gate Valve	ea.	$35,000.00	3	$105,000.00		
5.14	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00				
5.15	Supply and Install 300 mm Gate Valve	ea.	$15,000.00				
5.16	Remove Existing and Replace with 300 mm Gate Valve	ea.	$15,000.00				
	Valves (Provisional)						
5.16	Remove Existing and Replace with 250 mm Gate Valve	ea.	$8,000.00				
5.17	Remove Existing and Replace with 350 mm Gate Valve	ea.	$20,000.00				
	Fittings						
	Tees						
5.18	Supply and Install 450 mm x 450mm x 450 mm Tee	ea.	$10,000.00				
	Reducers						
5.19	Supply and Install 300 mm x 450 mm Reducer	ea.	$3,500.00				
5.20	Supply and Install 400 mm x 450 mm Reducer	ea.	$4,000.00				
5.21	Supply and Install 500 mm x 450 mm Reducer	ea.	$12,500.00			1	$12,500.00
5.22	Supply and Install 600 mm HDPE to 450 mm PVC Reducer	ea.	$15,000.00	1	$15,000.00		
	Bends						
5.23	Supply and Install 500 mm 90° Elbow	ea.	$12,000.00		$0.00	4	$48,000.00
5.24	Supply and install 500 mm 11.25° Elbow	ea.	$10,000.00		$0.00	3	$30,000.00
5.25	Supply and install 500 mm 22.5° Elbow	ea.	$11,000.00		$0.00	1	$11,000.00
5.26	Supply and install 250 mm 45° Elbow	ea.	$4,000.00				
5.27	Supply and install 600 mm 90° Elbow	ea.	$20,000.00	4	$80,000.00		

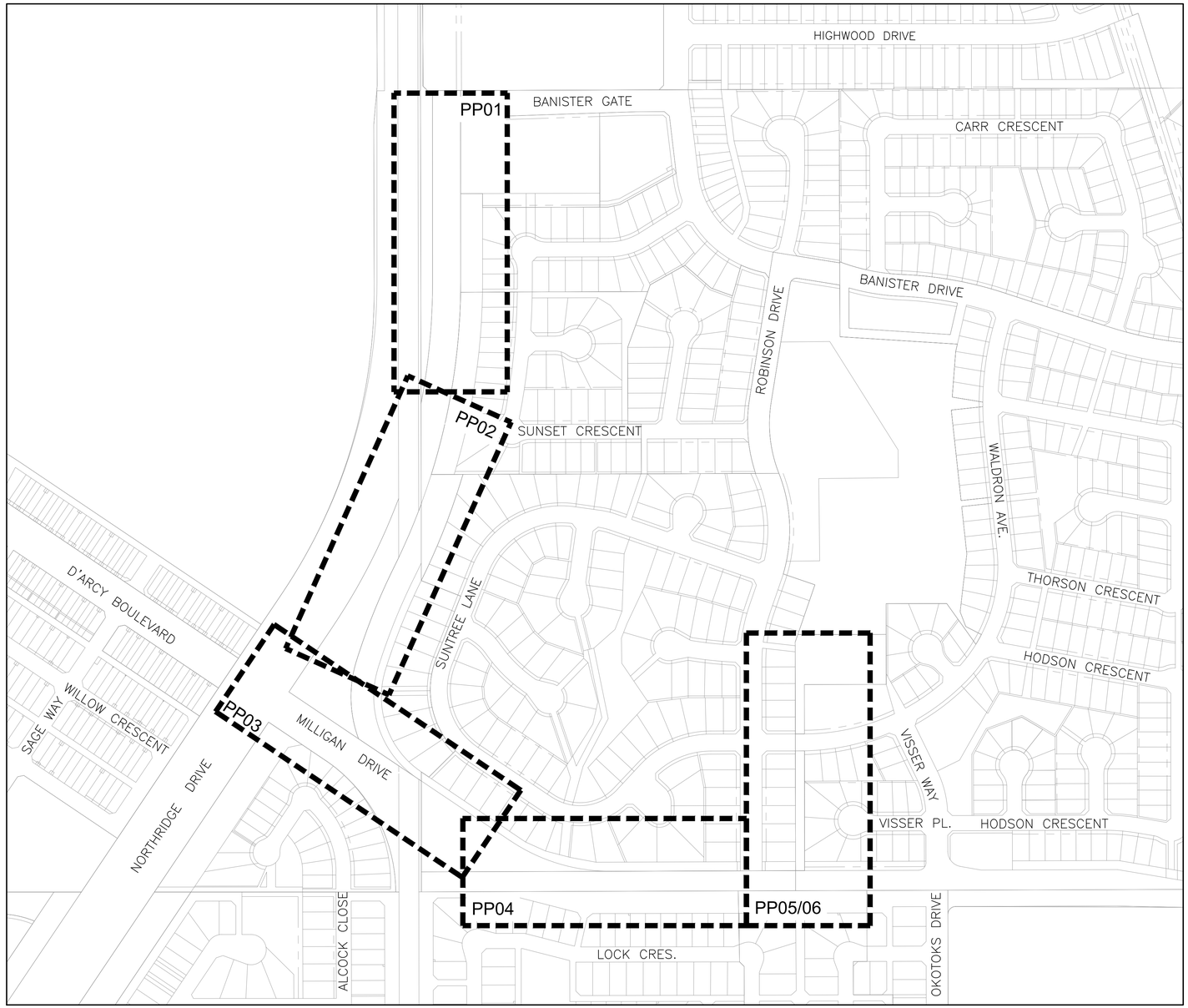
5.28	Supply and install 600 mm 22.5° Elbow	ea.	$15,000.00	1	$15,000.00		
	Hydrants						
5.29	Relocate existing Hydrant and Valve	ea.	$5,000.00	1	$5,000.00	1	$5,000.00
5.30	Supply, Install, and Connection of 150 mm PVC Hydrant Lead	l.m.	$350.00	10	$3,500.00	10	$3,500.00
5.31	Supply and Install 150 mm Gate Valve	ea.	$4,500.00	1	$4,500.00	1	$4,500.00
	Connection to Existing						
5.32	Tie-in Pipework inside Pump Station	ea.	$10,000.00				
5.33	Tie-in to Existing 450 mm PVC	ea.	$7,500.00	1	$7,500.00	1	$7,500.00
5.34	Tie-in to Existing 200 mm CI	ea.	$5,000.00				
5.35	Tie-in to Existing 400 mm PVC stub	ea.	$7,500.00	1	$7,500.00	1	$7,500.00
5.36	Tie-in to Existing 250 mm HDPE	ea.	$6,000.00				
5.37	Tie-in to Existing 150 mm PVC	ea.	$5,000.00				
5.38	Tie-in to Existing 350 mm PVC	ea.	$7,500.00				
5.39	Tie-in to Existing 300mm DI	ea.	$7,500.00				
6.0	**Sanitary**						
	Sanitary Connections						
6.1	Supply and Install 100 mm PVC	lin.m.	$250.00				
6.2	Tie-in to existing Sanitary Service at Cleanout	ea.	$2,500.00				
6.3	Tie-in to Existing 200 mm PVC Sanitary Main c/w Tee Connection	ea.	$5,000.00				
7.0	**Storm**						
7.1	Supply and Install 300mm PVC overflow spill pipe	lin.m.	$450.00				
7.2	Tie-in to Existing Reservoir	ea.	$5,000.00				
7.3	Drainage Grading	m²	$45.00				
7.4	Supply and Install Grated Top Manhole	ea.	$5,000.00				
7.5	Tie-in to Existing Manhole	ea.	$5,000.00				
8.0	**Landscape Rehabilitation**						
8.1	Topsoil Placement, 150 mm Depth	m²	$50.00	1900	$95,000.00	5680	$284,000.00
8.2	Supply and Install Grass Sod, incuding fertilizer	m²	$25.00	1900	$47,500.00	5680	$142,000.00
				Sub-Total (Rounded)	**$4,373,635.00**		**$3,863,360.00**
				Contingency (30%)	**$1,312,090.50**		**$1,159,008.00**
				Engineering Fees for Tendering and Construction	**$150,000.00**		**$150,000.00**
				PROJECT TOTAL (ROUNDED)	**$5,835,725.50**		**$5,172,368.00**

APPENDIX C

Concept Design Drawings

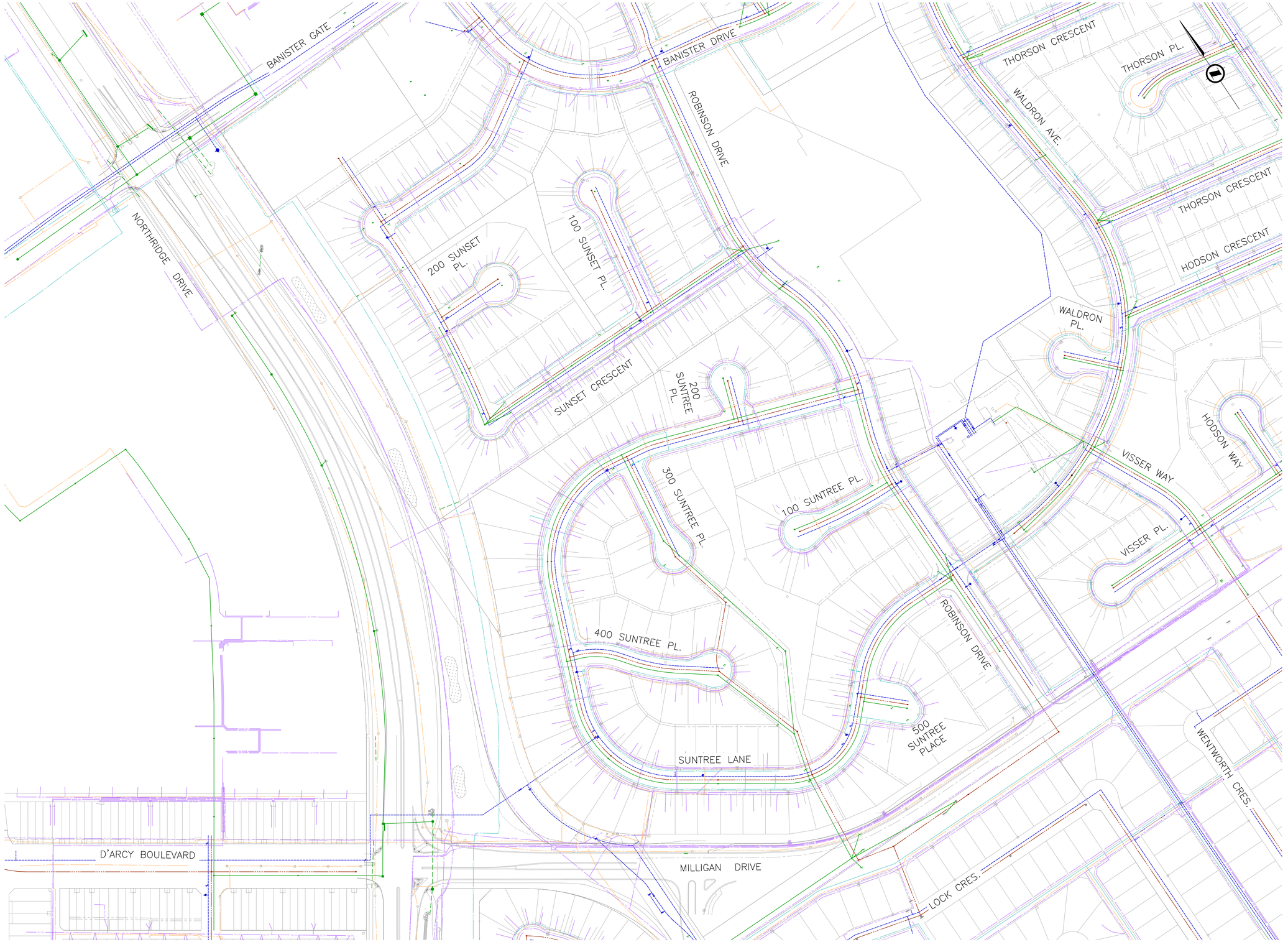
TOWN OF OKOTOKS
ZONE 4N
WATERMAIN

CONCEPT DESIGN
OCTOBER 2024



PROJECT EXTENTS

1:2500 0 50 100 m



NOTES

1. ALL PIPE SIZES ARE IN MILLIMETRES AND ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL COORDINATES AND DISTANCES ARE BASED ON 3TM COORDINATE SYSTEM (NAD 83).
3. UTILITY LOCATIONS ARE APPROXIMATE AND MUST BE CONFIRMED BY THE CONTRACTOR IN THE FIELD BEFORE CONSTRUCTIONS STARTS.

LEGEND

- EXISTING ATCO LINE
- ABANDONED ATCO LINE
- EXISTING UNDERGROUND FORTIS
- EXISTING OVERHEAD FORTIS
- EXISTING UNDERGROUND TELUS
- EXISTING SANITARY LINE
- EXISTING STORM LINE
- EXISTING WATER LINE
- EXISTING SHAW LINE
- EXISTING BELL/SUPERNET LINE

Click Before You Dig

NAD 83
COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

PERMIT

SEAL

	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:1500 (0 — 30 — 60 m)

Okotoks — Natural Joie, Everywhere Else

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 32, 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
EXISTING UTILITY OVERVIEW

FILE NO.	ENG DWG NO.
28650_OverallPlan.dwg	
SHEET ID.	SHEET NO.
UT01	1

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

FILE: C:\ADS\KACDOCS\ISL\28650 - OKOTOKS ZONE 4N WATERMAIN\PROJECT FILES\02_CADD\23_SHEETS\28650_OVERALLPLAN.DWG | DATE: Tuesday, October 22, 2024 3:59:59 PM

NOTES

1. ALL PIPE SIZES ARE IN MILLIMETERS AND ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED.
2. ALL COORDINATES AND DISTANCES ARE BASED ON 3TM COORDINATE SYSTEM (NAD 83).
3. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL CONFIRM UTILITY LOCATIONS IN THE FIELD BEFORE CONSTRUCTION BEGINS.
4. WATERMAIN MUST MAINTAIN 3m CLEARANCE FROM FORTIS OVERHEAD POWER.
5. CONTRACTOR MAY CHOOSE BETWEEN THE PVC OR HDPE PIPE AND OPEN CUT OR TRENCHLESS INSTALLATION OF THE WATERMAIN.
6. IF TRENCHLESS INSTALLATION IS CHOSEN, TRENCHLESS ACCESS PITS MUST BE SPACED AT LEAST 5m FROM EXISTING FORTIS POLES.
7. THE CONTRACTOR SHALL NOT IMPACT THE EXISTING PATHWAY.
8. THE CONTRACTOR SHALL REPLACE ALL GREEN SPACE DISTURBANCE TO EXISTING OR BETTER CONDITION.

LEGEND

- PROPOSED WATER LINE
- EXISTING WATER LINE
- EXISTING WATER LINE - TO BE REMOVED
- PROPOSED WATER VALVE
- EXISTING WATER VALVE
- EXISTING WATER HYDRANT
- EXISTING SANITARY LINE
- EXISTING SANITARY MANHOLE
- EXISTING STORM LINE
- EXISTING STORM MANHOLE
- ATCO — EXISTING ATCO LINE
- G — ABANDONED ATCO LINE
- UE — EXISTING UNDERGROUND FORTIS
- OE — EXISTING OVERHEAD FORTIS
- UG TEL — EXISTING UNDERGROUND TELUS
- UG SHAW — EXISTING SHAW LINE
- UG BELL — EXISTING BELL/SUPERNET LINE

Click Before You Dig

NAD 83
COORDINATES

NO.	DESCRIPTION	DATE (YYYY-MM-DD)	BY	APPD
1	ISSUED FOR REVIEW	2024-09-11	HE	KK

PERMIT

SEAL

	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 — 0 10 20 m

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

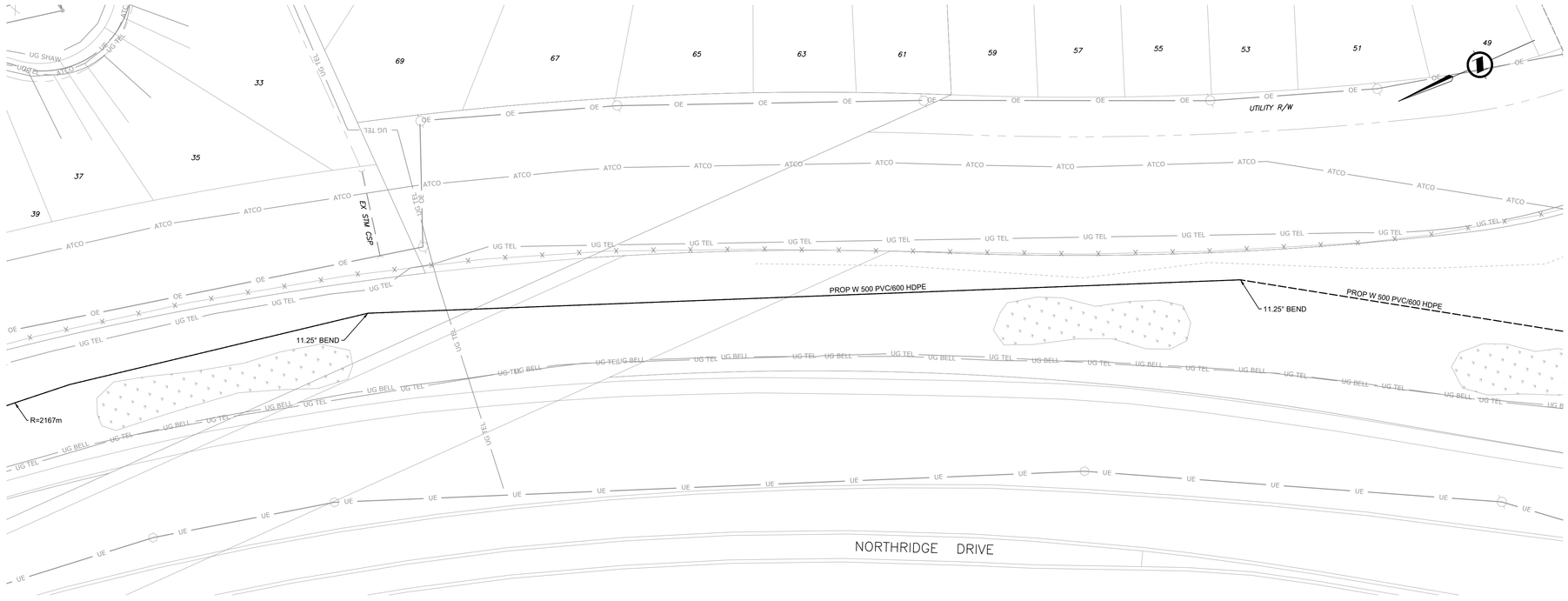
PLAN VIEW
PROPOSED WATERMAIN
NORTHRIDGE DRIVE TIE-IN

FILE NO.	ENG DWG NO.
28650_PlanView DBM.dwg	
SHEET ID. **P01**	SHEET NO. **2**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

FILE: C:\ADSK\ACCDOCS\ISL\28650 - OKOTOKS ZONE 4N WATERMAIN\PROJECT FILES\02_CAD\D23_SHEETS\DBM\28650_PLANVIEW DBM.DWG | DATE: Tuesday, October 22, 2024 3:51:41 PM



NOTES

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- EXISTING OVERHEAD FORTIS
- EXISTING UNDERGROUND TELUS
- EXISTING SHAW LINE
- EXISTING BELL/SUPERNET LINE

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	BY	DATE (YYYY-MM-DD)
DESIGNED	SJ	2024-09-11
DRAWN	HE	2024-09-11
CHECKED	KK	2024-09-11

SCALE 1:500 (0, 10, 20 m)

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 32, 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
NORTHRIDGE DRIVE

FILE NO.	ENG DWG NO.
28650_PlanView DBM.dwg	
SHEET ID. **P02**	SHEET NO. **3**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

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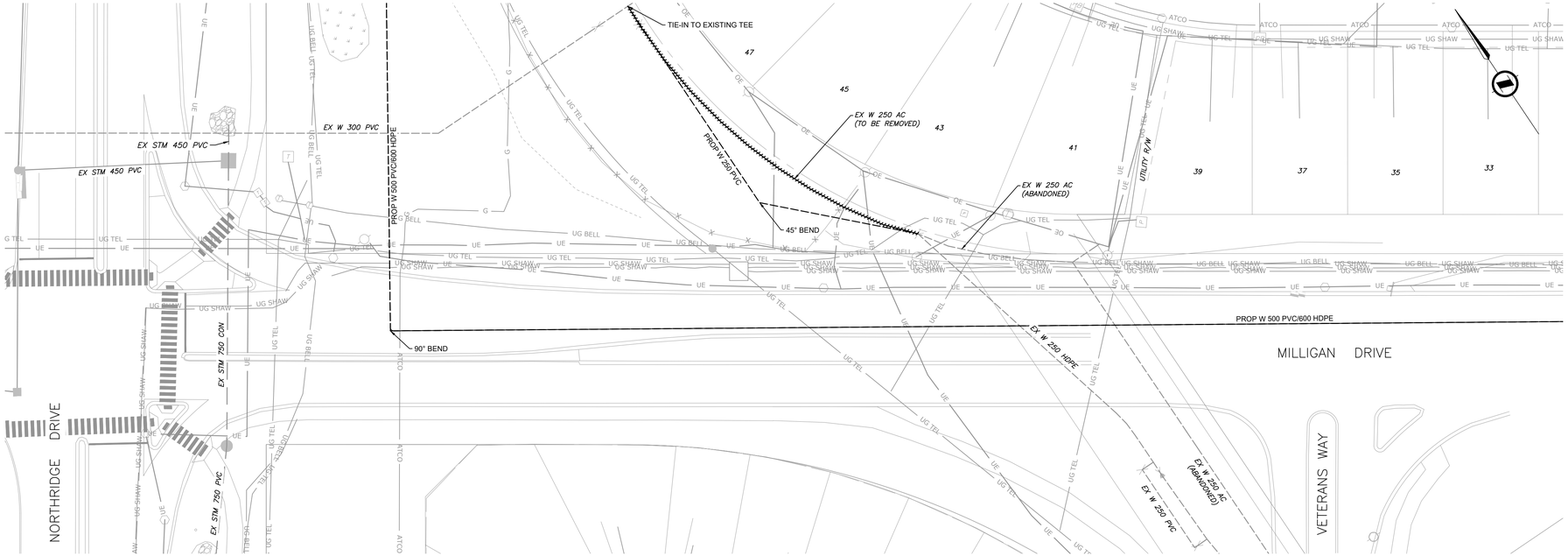

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SCALE 1:500 — 0 10 20 m

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 32, 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
MILLIGAN DRIVE

FILE NO.	ENG DWG NO.
28650_PlanView DBM.dwg	

SHEET ID.	SHEET NO.
P03	**4**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

ISC: SHEET SIZE ANSI D 25 mm 0

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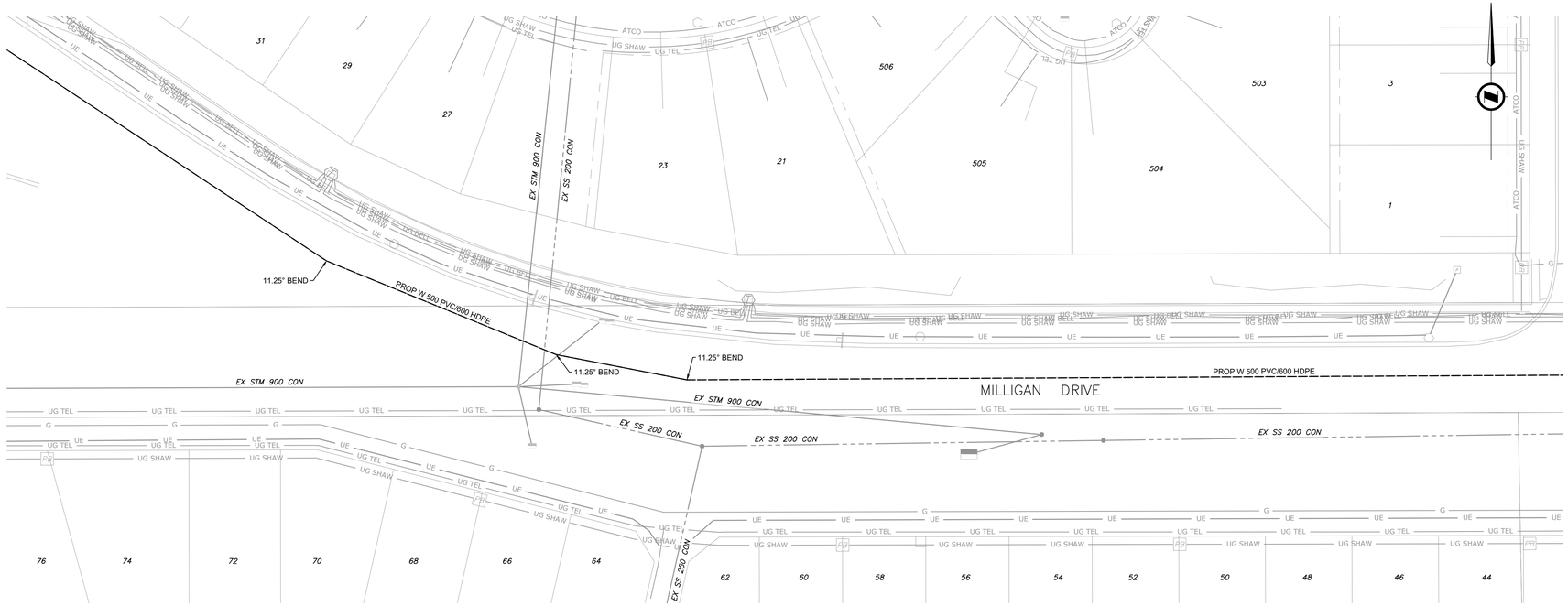

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PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
MILLIGAN DRIVE

FILE NO.	ENG DWG NO.
28650_PlanView DBM.dwg	
SHEET ID. **P04**	SHEET NO. **5**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
DRAWN	HE	2024-09-11	

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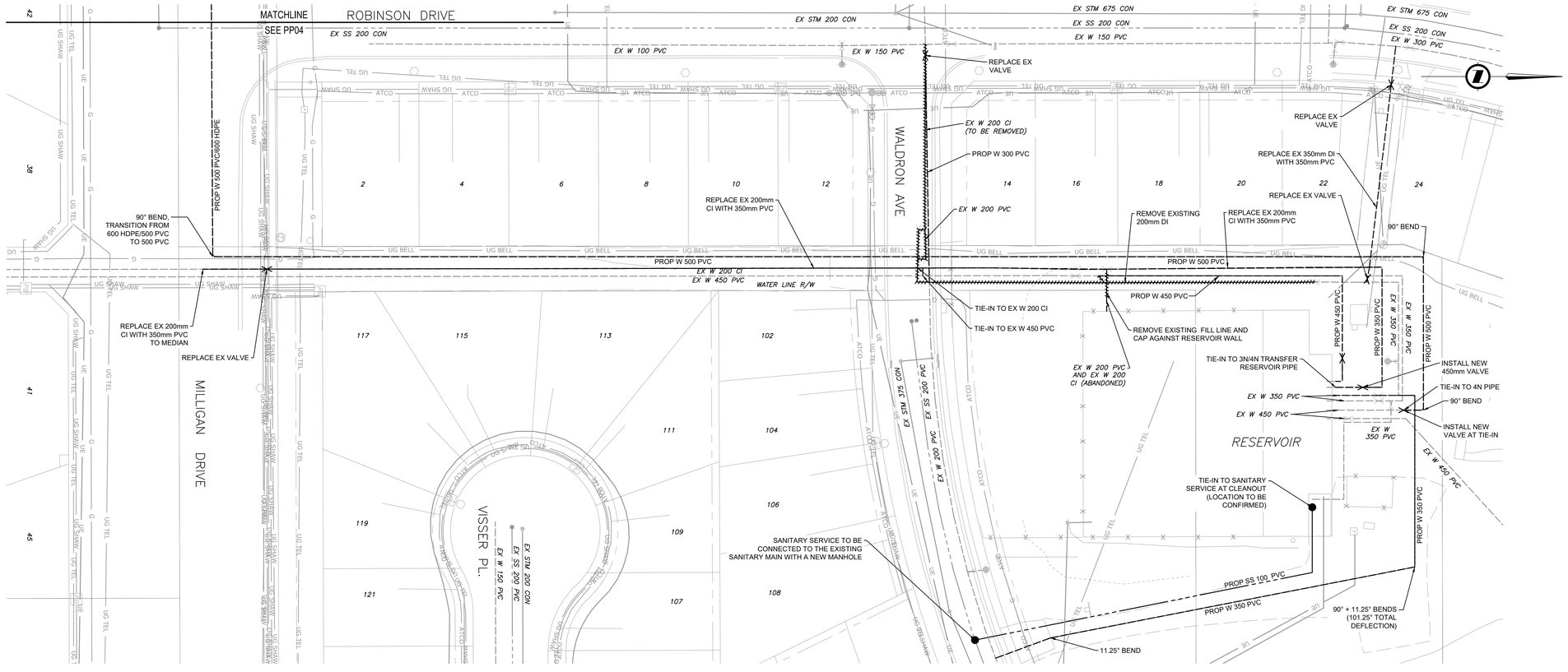

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- OE — EXISTING OVERHEAD FORTIS
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- UG SHAW — EXISTING SHAW LINE
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CHECKED	KK	2024-09-11

SCALE 1:500 (0 — 10 — 20 m)

Okotoks — Where the Elbow Runs Right

ISL

PROJECT

TOWN OF OKOTOKS
ZONE 4N WATERMAIN

SEC: 33 - TWP: 20 - RGE: 29 - W 4th M

SHEET TITLE

PLAN VIEW
PROPOSED WATERMAIN
RESERVOIR TIE-IN

FILE NO.	ENG DWG NO.
28650_PlanView DBM.dwg	
SHEET ID. **P05**	SHEET NO. **6**

	BY	DATE (YYYY-MM-DD)	PROFILE NO.
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APPENDIX D

Zone 4N Supply Main Water Assessment Technical Memorandum

4015 7 Street SE, Calgary AB T2G 2Y9

To:	**Town of Okotoks**	Date:	**October 16, 2024**
Attention:	**Richard Boonstra, P.Eng. – Development Engineer**	Project No.:	**28650**
Cc:			
Reference:	**Zone 4N Supply Main Water Assessment Technical Memorandum**		
From:	**Sarah Barbosa, P.Eng., ENV SP**		

1.0 Water Distribution System Modelling

To support the design and construction of a new supply main to the Zone 4N pressure zone, a water system assessment was undertaken.

2.0 Model Source and Assumptions

An existing WaterCAD model, last updated by CIMA+, was provided by the Town for this purpose. The model has the existing water distribution system infrastructure, plus new developments in the proposed Wedderburn, Trilogy Plains, and North Point communities to the north. Most of these communities are in Zone 4N, with a portion of the southeast of North Points proposed for Zone 3N. The model was provided with one scenario for peak hour demand (PHD) conditions, with additional demands distributed across the new communities. A technical memorandum was also provided with the model to support the updates to the model. The following assumptions were made and documented in the memorandum to determine the demands:

- Additional demands were added for 11.1 quarter sections in the new communities in the north.
- An average day demand (ADD) of 12 L/s was assumed per quarter section.
  - It is noted that this correlates to a population of 4,284 per quarter section assuming a rate of 242 L/c/d, based on the Town's Water Master Plan. This is generally conservative, but aligns with a density between 10-12 upa, so covers various density scenarios the Town is considering.
- Peaking factors consisted of the following:
  - Maximum Day Demand (MDD) = 1.65 x ADD
  - Peak Hour Demand = 2 x MDD
- A fire flow (FF) rate of 225 L/s, representing the maximum fire flow requirement for industrial land use types, was assumed.
- As the MDD+FF and PHD flows were similar, only a PHD scenario was simulated in the model. The demand was adjusted slightly to match the MDD+FF demands of 441 L/s.

Using the above assumptions, the demands in **Table 2.1** were calculated.

Table 2.1 Zone 4N Demand Conditions

Scenario	Peaking Factor	Consumption Flow[1]	Fire Flow	Total Demand
		L/s		
ADD	-	133.2	-	133.2
MDD+FF	1.65 x ADD	219.8	225.0	444.8
PHD	2.00 x MDD	439.6	-	439.6

[1] These flows vary slightly from CIMA+'s memo due to rounding variations.

These assumptions were deemed to be acceptable for the purpose of this assessment.

3.0 Design Conditions and Sizing

The model provided by the Town, last updated by CIMA+, was updated to include additional scenarios. Early in the project, it was identified that the new supply main must provide redundancy to the existing supply main in case of a failure. This ensures that the north communities can still be supplied adequate water and be protected from fires.

Full zonal redundancy at the governing demand scenario (i.e., MDD+FF at 444.8 L/s) was deemed to be over conservative. The assumption is that if there is a failure in the existing supply main, water restrictions would be in place in the Town, suggesting that MDD conditions would not be met. Alternatively, if the existing supply main requires maintenance, the assumption is that this would occur outside of peak conditions (i.e., at night, or not during the summer). That said, fire flows are critical to maintain if the existing supply main is offline for any reason. This led to the ultimate design scenario of supplying ADD+FF (358.2 L/s) for all of Zone 4N when sizing the new supply line.

A preliminary hand calculation sizing exercise was undertaken, which only considers demands from Zone 4N, assuming there is no back feeding through zones. This could either be from Zone 4N to Zone 3N, or under ultimate conditions, from a higher zone to Zone 4N. The decision to exclude the consideration of a higher zone at full build-out was made, given the timing of implementation for a higher zone is unknown. For example, if a higher zone is not developed for another twenty years, there would be added risk within those twenty years if this higher zone was intended to provide redundancy.

Back feeding from Zone 4N to Zone 3N was, however, considered in the modelling assessment for a degree of conservatism, discussed in Section 4.0 below (i.e., higher flow due to back feeding the lower zone results in larger velocities and greater headloss).

At a flow rate of 358.2 L/s, the following inner diameters in **Table 3.1** were calculated for velocities ranging from 1.5 m/s to 2.0 m/s.

Table 3.1 Inner Diameter Requirements at Design Flow Rate of 358.2 L/s

Velocity Target	Resultant Inner Diameter	Design Nominal Diameter[1]	Design Average Inner Diameter[1]	Design Velocity[1]
m/s	mm	mm	mm	m/s
1.5	551	700 (28”)	574	1.38
1.75	511	650 (26”)	533	1.61
2.0	478	600 (24”)	492	1.88

[1] Assumes installation of a high-density polyethylene (HDPE) watermain with a 200 psi pressure rating (PE4710 HDPE Pipe Sizes | ISCO (isco-pipe.com)).

Based on these results, a 600 mm (24”) HDPE watermain is considered ideal for installation, and was validated in the model as described below.

4.0 Pipe Sizing Validation

Model scenarios were undertaken to ensure the adequacy of the proposed pipe sizing:

- ADD + FF (358.2 L/s) to validate hand calculations of supply main sizing.
- PHD (439.6 L/s) with the existing supply main online to validate sizing under these conditions and determine pressures in Zone 4N.

The proposed supply main was modelled using a roughness coefficient of 140. This assumes that HDPE pipes do not degrade over time and maintain their condition well.

Table 4.1 summarizes the results from the analyzed scenario. As mentioned, the original model provided by the Town only included a scenario for PHD. The provided model did not have adequate information to properly perform fire flow assessments without making several updates and assumptions to the model. This would require significant additional effort and is not included in the scope of work for this assignment. To validate the supply main sizing for the ADD+FF scenario, a fire flow demand of 225 L/s was added to the end of the proposed supply main.

Table 4.1 Scenario Results

Scenario	Supply Conditions	New Supply Main Flow	New Supply Main Velocity	Pressure Range in Zone 4N
		L/s	m/s	kPa
ADD+FF	New Main Only	367.5[1]	1.93	217 - 560
PHD	New Main and Existing Main Active	174.5	0.92	226 - 614

[1] The total flow through the new supply main is larger than the hand calculation method due to some back feeding into the lower Zone 3N in the model scenario.

There are several nodes in the areas north of Wedderburn that are lacking sufficient pressure under both assessment scenarios. These are shown in **Figure 4.1** below, where any node with a pressure less than 275 kPa is colour coded red.

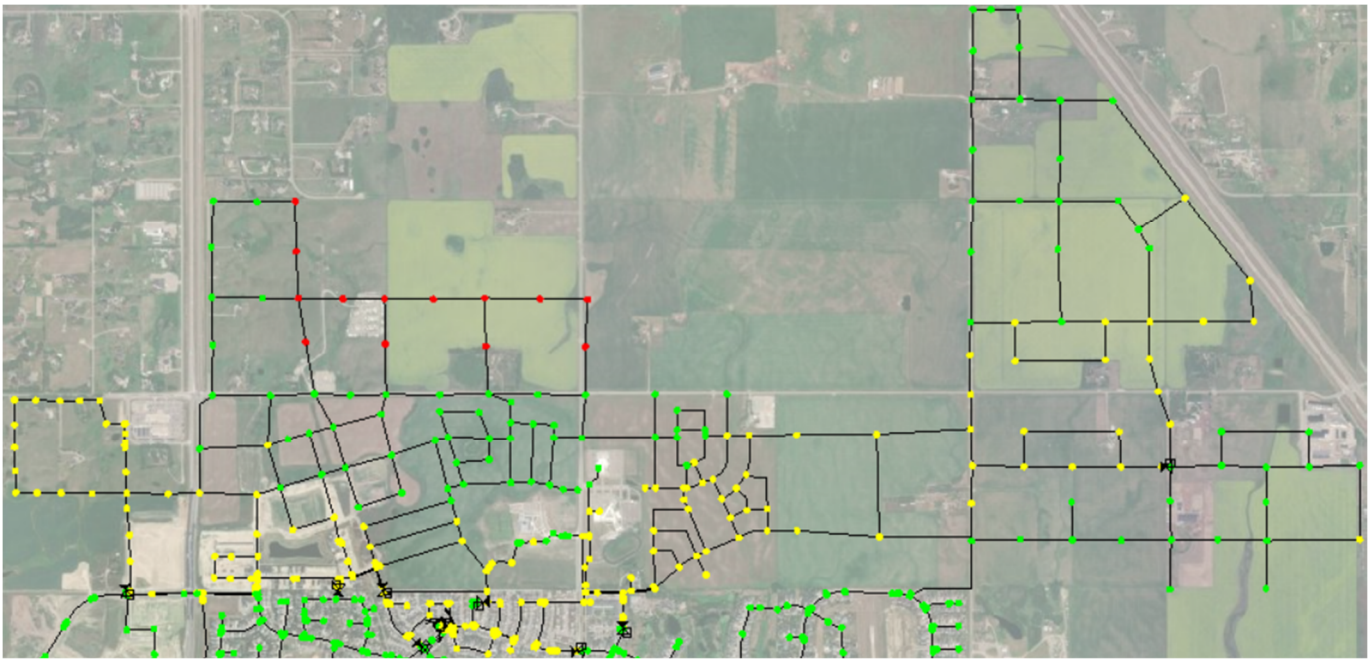

Figure 4.1 Pressure Deficient Nodes

The nodes lacking sufficient capacity are at the high end of the elevation range of this pressure zone, so have lower pressures under static conditions as well. Since the exact grading of these areas upon development are unknown and given that the deficiencies are topographically driven, this does not suggest that the new supply main is undersized. However, this should be considered further by the Town when developing these lands.

5.0 Conclusions and Recommendations

The intent of this analysis was to review and verify the pipe size required for the proposed supply main to Zone 4N. The supply main is required to provide system redundancy in case of a failure in the existing supply main, by adequately supplying ADD+FF demands to Zone 4N.

Several pipe diameters were considered for a range of velocity targets between 1.5 m/s to 2.0 m/s. From this analysis, the ideal pipe would be a 600 mm (24”) HDPE watermain with a pressure rating of 200 psi. This sizing was verified by running two scenarios in the model. Results from the modelling scenarios suggest that this watermain sizing is adequate, noting there are some topographically driven constraints in the lands north of Wedderburn. These deficiencies should be considered further by the Town prior to development of this area.

6.0 References

WSP. February 2020. Town of Okotoks Water Master Plan.

CIMA+. September 2024. 4N Proposed Water Main.

PE4710 HDPE IPS Pipe Sizes (ISCO). 2024. PE4710 HDPE Pipe Sizes | ISCO (isco-pipe.com)

7.0 Authorization

This document entitled “Water Assessment Memorandum” has been prepared by ISL Engineering and Land Services Ltd. (ISL) for the use of The Town of Okotoks. The information and data provided herein represent ISL’s professional judgment at the time of preparation. ISL denies any liability whatsoever to any other parties who may obtain this report and use it, or any of its contents, without prior written consent from ISL.

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Technical Author

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Director / General Manager Water and Environment