GILLETTE MADISON PIPELINE PROJECT (GMPP)
TECHNICAL MEMORANDUM #1
FINAL

TO:	Mike Cole, P.E., City of Gillette
FROM:	Casey Hanson, P.E., MMI
DATE:	February 4, 2010, Updated April 29, 2010, Finalized July 16, 2010
JOB NO.:	MMI #4776.001, BMcD # 54432
RE:	GMPP In –Town Piping Route
CC:	Darin Brickman, P.E., BMcD Dan Korinek, P.E., BMcD Carl Anderson, P.E., MMI Bryan Clerkin, P.E., WWDC
ATTACHMENTS:	City of Gillette Summary of Gillette Regional Master Plan Routes Alternative #1 Plan Sheet Alternative #1 Profile Sheet Alternative #2 Plan Sheet Alternative #2 Profile Sheet Alternative #3 Plan Sheet Alternative #3 Profile Sheet Alternative #4 Plan Sheet Alternative #4 Profile Sheet Alternative #5 Plan Sheet Alternative #5 Profile Sheet Alternative #6 Plan Sheet Alternative #6 Profile Sheet WWC Highway 50 Drawings

☐ **Urgent** ☒ **For Review** ☒ **Please Comment** ☐ **Please Reply** ☐ **For Your Use**

Background

During the November 19, 2009 project meeting, representatives from MMI (Carl Anderson, Casey Hanson) and the City of Gillette (Mike Cole, Steve Peterson, Kurt Siebenaler) met to discuss potential routes and configurations for the in-town piping portion of the Gillette Madison Pipeline Project (GMPP).

At this meeting, City of Gillette (COG) representatives discussed the WYDOT Highway 50 project that will be taking place in the corridor of the preferred in-town piping alignment identified in the Gillette Regional Master Plan, Level I study (GRMP). An overview map of this alignment and one other considered ("Option 1") was provided by COG and is attached to this memo.

WYDOT currently has plans to reconstruct Highway 50 from the intersection with US Highway 14/16 southerly to the intersection with Lakeway Road. This construction area encompasses approximately 8,000 lineal feet of the in-town piping route from the GRMP. COG representatives stated the Highway 50 work was scheduled for 2011. Kurt Siebenaler with the COG noted he had preliminary alignment and cross section drawings for the work. Kurt and Mike Cole subsequently made these available to Morrison Maierle Inc. (MMI).

Options for coordinating the in-town piping work with the Highway 50 work were discussed at the November 19, 2009 meeting. The highway 50 work includes a number of significant grade changes that include both cuts and fills. The challenges of working around these changes was briefly discussed. The meeting concluded with MMI committing to evaluating the in-town piping route further, including review of the Highway 50 drawings, and providing a written recommendation to COG covering coordination of the construction with the Highway 50 project and any other significant observations on the routing. This memo covers those topics.

Highway 50 Coordination

The Highway 50 project (Formally titled "Gillette Streets WYO 50 & US 14/16" on the preliminary Drawings) affects the GMPP from Westover Road to Lakeway Road. Beginning at Westover Road the Highway 50 project generally cuts down high point points at three (3) locations and fills low points at two (2) locations before returning to grade at the Lakeway Road intersection. The maximum cuts and fills are on the order of 15 vertical feet at the new road centerline. The maximum cuts and fills across the total section appear on the east side of the highway with a maximum cut of approximately 30 vertical feet and a maximum fill of approximately 25 vertical feet. These maximum cuts and fills for the Highway 50 project are substantial when considered in the context of piping design and impact the course of action for this section of the in-town piping.

A meeting was held between Wyoming Department of Transportation (WYDOT), Burns and McDonnell (BMcD), MMI and COG on December 18, 2009 at the WYDOT district office in Sheridan to discuss the GMPP in general as well as the Highway 50 coordination in particular. At this meeting, WYDOT indicated that they would not grant a license agreement for work that would be constructed after the WYDOT project was constructed. The possibility of executing a cooperative agreement to include the waterline design in the WYDOT Highway 50 project was also discussed. At that time there was a relatively low likelihood of this taking place due to

GMPP funding not being available until at least July 1, 2010, the inability to execute an agreement without funding, and WYDOT's current Highway 50 schedule.

Based on the findings above from the WYDOT meeting, it is clear that utilizing the WYDOT right-of-way between Lakeway and Westover Road on Highway 50 has a number of challenges that make this strategy unfeasible. Subsequent conversation between COG and WYDOT staff confirm this recommendation.

Subsequent to the original publishing of this memo, the City of Gillette and WYDOT have continued negotiations regarding inclusion of the Lakeway to Westover portion of the in-town piping in the pending WYDOT project. Changes to the WYDOT schedule due to other factors outside this project resulted in a schedule window in which the City of Gillette had the opportunity to insert the Lakeway to Westover piping into the WYDOT project that previously did not exist. After much discussion with stakeholder and the GMPP project team, the City of Gillette elected to exercise the option to include the Lakeway to Westover work in the WYDOT project. The City of Gillette contracted with Western Water Consultants (WWC) to complete this work. WWC is the design consultant for the WYDOT Highway 50 project.

On April 8, 2010, the City of Gillette provided the GMPP design team with a copy of plans, specifications, and a cost estimate that was submitted by WWC dated March 26, 2010. The plans from this submittal are attached herewith. These plans show a 36" pipeline along the general Highway 50 alignment (within the right-of-way). It is the GMPP design team's understanding that this diameter can be downsized within a reasonable time before the WYDOT project bids in the late fall of 2010. As the GMPP design progresses an in-town diameter will be selected and can be transmitted back to WWC through the City of Gillette.

Possible Alternatives to the GRMP Recommendation

MMI has evaluated five alternative alignments to achieve the following goals:

1. Hydraulically tie the Z1R4 and Z1R3 reservoirs together.
2. Provide service and new interconnect to the Z1R5 reservoir.
3. Avoid disturbing recently constructed, or soon-to-be constructed WYDOT facilities.

Each alternative evaluated below is shown graphically on Figures 1 PL – 6 PL (Plan view) and 1 PR – 6 PR (Profile view).

A hydraulic profile along the approximate route of each alternative was established using the contours from the COG GIS data. While this data does not exactly match the Highway 50 elevations, it is likely adequate for very preliminary planning purposes. MMI compared the elevations of the pipeline to the low water elevation of tank Z1R4 and the high water elevation of tank Z1R2. These elevations were chosen to represent the tank properties in Zone 1 that would be affected first by an intermediate high point in the line. A graphical representation of this analysis is included with this memo as the profile view for each alternative.

In the profile for each alternative, the ground elevation is represented by a dashed line. The red line represents the minimum tank level of 4713. Adding 6 feet to the minimum tank level of accounts for the minimum bury depth of the pipeline and yields a maximum allowable surface elevation (MASE) of 4719 which is shown as a solid blue line in the profile sheets. Anywhere the MASE exceeds the dashed existing ground line, the usable volume of storage is being diminished.

Solutions to encroachments that exceed the maximum allowable surface elevation may include achieving greater depths through trenchless construction, deeper open cut construction, or realignment to flatter terrain.

This data needs to be compared against actual survey data for the route once it is available. The COG GIS data (particularly contours) have been somewhat unreliable in the past and are presented herewith for very conceptual planning purposes only.

It should also be noted that the road section through a number of areas in this project is in an existing cut section. Such an arrangement creates a situation where a pipeline laid outside the road surface may be drastically higher in elevation than the section down the road centerline. This issue will be rechecked when a more firm alignment is selected. A drastic rise in elevation could possibly render some of the storage, or at least capacity between tanks to share storage less useful.

Alternative #1

Alternative #1 involves following the GRMP route west along Southern Drive from reservoir Z1R4 to Highway 50, north up Highway 50 to Lakeway, east on Lakeway to the new Lakeway/Burma road intersection, north up the new Burma Road to the Burma/Westover intersection and east into the existing Z1R3 reservoir.

Total Pipe Length = 40,075 Lineal Feet

Pros

- Relatively unobstructed route – this route does not have any major obstructions or grade conflicts.

- Good looping to Z1R5 – this alternative provides nearly full looping to Z1R5 with only a short spur. This alignment could be adjusted relatively easily to provide full looping to Z1R5 to help with existing water quality problems at that reservoir.

- Avoids Highway 50 Construction – this route avoids the upcoming WYDOT Highway 50 reconstruction and associated coordination and permitting issues.

Cons

- WYDOT may raise objections to encroachments along Burma similar to the objections they have raised along Highway 50. It may be possible to mitigate these objections by

routing the pipe outside the WYDOT right-of-way or easement similar to the proposal along Highway 50 in Alternative #3.

- The section of pipeline between 302+00 and 312+00 of Figure 1 PR shows the ground surface elevation above the minimum Zone 1 tank level. If a pipe were to be laid at this grade, it would be impeding the flow of water between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. The pipeline elevation must be kept below the 4713 elevation (red line on Figure 1 PR) in order to serve its intended purpose and prevent hydraulic interference between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. At the most extreme point of approximately 306+00, the difference between the ground surface elevation and MASE is approximately 30 feet and exceeds the MASE for about 800 feet. While open cut construction is possible at these depths, it can be costly and risky to accomplish. A better solution would likely be boring and jacking or horizontal directional drilling through this section of the project. These techniques cost more on a per lineal foot basis than normal depth open cut construction. However, the length of pipe requiring these construction methods is relatively short compared to the overall in-town piping length.

Discussion

Other than the potential of having WYDOT coordination issues along Burma, this alternative is viable and should be considered a potential route.

Alternative #2

Alternative 2 involves following the GRMP route west along Southern Drive from reservoir Z1R4 to Highway 50, north up Highway 50 to the future Box Elder extension, east on the future Box Elder extension to the new Box Elder/Burma Road intersection, north up the new Burma road to the Burma/Westover intersection and east into the existing Z1R3 reservoir.

Total Pipe Length = 39,365 Feet

Pros

- Good looping to Z1R5 – this alternative provides nearly full looping to Z1R5 with only a short spur. This alignment could be easily adjusted to provide full looping to Z1R5 to help with existing water quality problems at that reservoir.

Cons

- This route potentially has encroachment issues with both the Burma and Highway 50 construction areas. The greatest grade challenges when going outside the Highway 50 right-of-way are in the Lakeway to Box Elder section, which is included in this alternative.

- The section of pipeline between 296+00 and 311+00 of Figure 2 PR shows the ground surface elevation above the minimum Zone 1 tank level. If a pipe were to be laid at this

grade, it would be impeding the flow of water between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. The pipeline elevation must be kept below the 4713 elevation (red line on Figure 2 PR) in order to serve its intended purpose and prevent hydraulic interference between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. At the most extreme point of approximately 303+00, the difference between the ground surface elevation and MASE is approximately 21 feet and exceeds the MASE for about 1,400 feet. While open cut construction is possible at this depth, it can be costly and risky to accomplish. A better solution would likely be boring and jacking or horizontal directional drilling through this section of the project. These techniques cost more on a per lineal foot basis than normal depth open cut construction. However, the length of pipe requiring these construction methods is relatively short compared to the overall in-town piping length.

Discussion

This alternative involves coordination with WYDOT on both Burma and Highway 50, with no corresponding benefit over Alternative 1 and Alternative 3. Accordingly, MMI recommends this alternative be considered unfeasible and that it not be considered further.

Alternative #3

Alternative 3 involves following the GRMP preferred route, but routing the pipeline outside of the WYDOT Highway 50 project limits to the west from Lakeway to Westover.

Total Pipe Length = 40,870 Lineal Feet

Pros

- Relatively unobstructed route – this route does not have any major obstructions or grade conflicts.
- Good looping to Z1R5 – this alternative provides nearly full looping to Z1R5 with only a short spur. This alignment could be relatively easily adjusted to provide full looping to Z1R5 to help with existing water quality problems at that reservoir.
- Avoids Highway 50 Construction – this route avoids the upcoming WYDOT Highway 50 reconstruction and associated coordination and permitting issues by rerouting the pipe outside the WYDOT right-of-way.

Cons

- Requires additional easement – the portion of the proposed route that parallels the new Highway 50 construction (Lakeway to Westover) will require additional easement that will front a major arterial in Gillette. These easements may be difficult and/or expensive to procure given the proximity and potential future value of this frontage.

- The section of pipeline between 280+00 and 292+00 of Figure 3 PR shows the ground surface elevation above the minimum Zone 1 tank level. If a pipe were to be laid at this grade, it would be impeding the flow of water between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. The pipeline elevation must be kept below the 4713 elevation (red line on Figure 3 PR) in order to serve its intended purpose and prevent hydraulic interference between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. At the most extreme point of approximately 285+00, the difference between the ground surface elevation and MASE is approximately 19 feet and exceeds the MASE for about 1,100 feet.

  In the case of Alternative #3, the WYDOT Highway 50 data is available, which is survey based and considerably more accurate. The profile of the area immediately abutting the Highway 50 project to the west is shown in the cross section views of the Highway 50 plans. According to this information, the section requiring special construction is approximately 700 feet in length with a maximum depth in excess of 30 feet. Construction at this depth could be accomplished with deep open cut methods or a trenchless technology such as horizontal directional drilling. Both of these approaches are technically feasible, but both will cost more than standard-depth open cut installation.

Discussion

It is MMI's opinion that while this alternative has the challenges of additional easement and the short section of deep piping construction (short relative to overall pipe length, but relatively longer than Alternative #1), it is still a viable option that should be considered.

Alternative #4

Alternative 4 involves following the "Option 1" alignment from the GRMP and extending a spur line west along Southern Drive to Z1R5 from the intersection of the future Oakcrest extension and Southern Drive.

Total Pipe Length = 35,660 Lineal Feet

Pros

- Shorter overall pipeline length.

- Avoids Highway 50 Construction – this route avoids the upcoming WYDOT Highway 50 reconstruction and associated coordination and permitting issues.

Cons

- WYDOT may raise objections to encroachments along Burma similar to the objections they have raised along Highway 50. It may be possible to mitigate these objections by routing the pipe outside the WYDOT right-of-way or easement similar to the proposal along Highway 50 in Alternative #3.

- The southern part of the north-south portion of the route along the future Oakcrest extension appears to cut through some already developed lots.

- The looping potential of this alternative is less than all other alternatives. This alternative leaves a long spur line with no reasonable potential to loop it from the Oakcrest future extensions west along Southern Drive to reservoir Z1R5.

- The section of pipeline between 200+00 and 211+00 of Figure 4 PR shows the ground surface elevation above the minimum Zone 1 tank level. If a pipe were to be laid at this grade, it would be impeding the flow of water between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. The pipeline elevation must be kept below the 4713 elevation (red line on Figure 4 PR) in order to serve its intended purpose and prevent hydraulic interference between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. At the most extreme point of approximately 204+00+00, the difference between the ground surface elevation and MASE is approximately 30 feet and exceeds the MASE for about 800 feet. While open cut construction is possible at this depth, it can be costly and risky to accomplish. A better solution would likely be boring and jacking or horizontal directional drilling through this section of the project. These techniques cost more on a per lineal foot basis than normal depth open cut construction. However, the length of pipe requiring these construction methods is relatively short compared to the overall in-town piping length.

Discussion

Due to the long spur line, Burma road encroachments, and Oakcrest property complications, MMI believes this alternative is not feasible and recommends its removal from further consideration.

Alternative #5

Alternative 5 involves following Southern Drive west from the Z1R4 reservoir to Highway 50, north up Highway 50 to West 4-J Road, northeast along West 4-J road to the intersection of Oakcrest/West 4-J, north along the “Option 1” alignment from the GRMP to Westover, and then east along Westover into reservoir Z1R3.

Total Pipe Length = 38,980 Lineal Feet

Pros

- Shorter overall pipe length than Alternatives # 1, 2, and 3.
- Good looping to Z1R5 – this alternative provides nearly full looping to Z1R5 with only a short spur. This alignment could be adjusted relatively easily to provide full looping to Z1R5 to help with existing water quality problems at that reservoir.

Cons

- WYDOT may raise objections to encroachments along Burma similar to the objections they have raised along Highway 50. It may be possible to mitigate these objections by routing the pipe outside the WYDOT right-of-way or easement similar to the proposal along Highway 50 in Alternative #3.

- The section of pipeline between 291+00 and 302+00 of Figure 5 PR shows the ground surface elevation above the minimum Zone 1 tank level. If a pipe were to be laid at this grade, it would impede the flow of water between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. The pipeline elevation must be kept below the 4713 elevation (red line on Figure 5 PR) in order to serve its intended purpose and prevent hydraulic interference between reservoirs Z1R4 and Z1R5 and reservoir Z1R3. At the most extreme point of approximately 295+00, the difference between the ground surface elevation and MASE is approximately 29 feet and exceeds the MASE for about 900 feet. While open cut construction is possible at this depth, it can be costly and risky to accomplish. A better solution would likely be boring and jacking or horizontal directional drilling through this section of the project. These techniques cost more on a per lineal foot basis than normal depth open cut construction. However, the length of pipe requiring these construction methods is relatively short compared to the overall in-town piping length.

Discussion

The potential conflict with the Burma project is the only problem with this route. MMI considers this route feasible and a viable option for consideration.

Alternative #6

Alternative 6 involves following Southern Drive west from reservoir Z1R4 to the intersection with Enzi Drive (4-J Road), north along Enzi Drive (4-J Road) to the intersection of Enzi (4-J Road)/Westover, and Northwest along Westover to reservoir Z1R3.

Total Pipe Length = 31,600 Lineal Feet

Pros

- Shorter overall pipeline length.

- Avoids Highway 50 Construction – this route avoids the upcoming WYDOT Highway 50 reconstruction and associated coordination and permitting issues.

- Avoids encroachments on the Burma corridor and the associated coordination and permitting issues.

- There are no intermediate high points in the pipeline that would cause hydraulic interference between reservoirs Z1R4 and Z1R5 and reservoir Z1R3 (See Figure 6 PR).

Cons

- The Enzi Drive/4-J Road corridor is a well established corridor. Construction in this corridor, even outside of the actual driving surface, would likely have large traffic and travelling public impacts. The established nature of this corridor also greatly increases the likelihood of additional utility conflicts.

- The looping potential of this alternative is less than all other alternatives. This alternative leaves the longest spur line with no reasonable potential to loop it from the Oakcrest to reservoir Z1R5.

Discussion

The highly developed nature of the Enzi Drive/4-J corridor makes this alternative less desirable than other available alternatives. The level of disruption to traffic, adjoining businesses and facilities, and the travelling public is very high, and the congestion and existing development along this corridor will lengthen the construction time per unit of pipeline length considerably. These are both important considerations that do not favor this alternative. For these reasons, this alternative will not be considered further.

Routing Recommendations

Route Summary

Alternative #	Pipe Length (feet)	Non-Standard Construction Length	Viable	Special Considerations
1	40,075	800	YES	Burma Coord.
2	39,365	1,400	NO	
3	40,870	1,100	YES	Easements
4	35,660	800	NO	
5	38,980	900	YES	Burma Coord.
6	31,600	0	NO	

Discussion

From the discussion above, In-Town Pipeline Alternative Routes #1, #3, and #5 are considered viable. These routes all have very similar lengths with similar construction requirements and levels of complexity. For these reasons, at this stage of the planning, it is reasonable to assume that they are all similar in cost barring any large unforeseen expenses such as extraordinary easement acquisition costs. Alternatives #1 and #5 require coordination with the on-going Burma Road project, while Alternative #3 requires procurement of easement outside of the WYDOT Highway 50 right-of-way. The project team sees this trade-off as key in the final route selection.

Highway 50/WYDOT Update

Subsequent to the original publishing of this memo, the City of Gillette and WYDOT have continued negotiations regarding inclusion of the Lakeway to Westover portion of the in-town piping in the pending WYDOT project. Changes to the WYDOT schedule due to other factors outside this project resulted in a schedule window in which the City of Gillette had the opportunity to insert the Lakeway to Westover piping into the WYDOT project that previously did not exist. After much discussion with stakeholder and the GMPP project team, the City of Gillette elected to exercise the option to include the Lakeway to Westover work in the WYDOT project. The City of Gillette contracted with Western Water Consultants (WWC) to complete this work. WWC is the design consultant for the WYDOT Highway 50 project.

On April 8, 2010, the City of Gillette provided the GMPP design team with a copy of plans, specifications, and a cost estimate that was submitted by WWC dated March 26, 2010. The plans from this submittal are attached herewith. These plans show a 36" pipeline along the general Highway 50 alignment (within the right-of-way). It is the GMPP design team's understanding that this diameter can be downsized within a reasonable time before the WYDOT project bids in the late fall of 2010. As the GMPP design progresses an in-town diameter will be selected and can be transmitted back to WWC through the City of Gillette.

In-Town Easements

The following list reflects potential in-town easements. The locations of these easements and their relationship to the in-town pipeline are shown on the updated (July 2010) 10% in-town drawings.

10% In-Town Pipeline Easements

Drawing Number	Property Owner	Parcel Number	Type of Easement
WA-1	Cambell County	17507230001063	Permanent
WA-11	Newton Family Farms LP	17507230001061	Temporary
WA-14 to WA-16	Western Skyline Properties LLC	17507231101002	Temporary
WA-16	Gillette College Foundation	17507231101001	Temporary
WA-16 to WA-17	Western Skyline Properties LLC	17507231101003	Temporary
WA-18 to WA-19	Vessa, Gerald and Lorinda	17507230001065	Temporary
WA-19 to WA-20	Ogden, Michael Sr. and Dianna	17507230001066	Temporary
WA-20 to WA-22	Patel, Kanti and Sulabha	17497205205001	Permanent/Temporary
WA-26 to WA-27	JVK Holdings LLC	17497205301001	Temporary
WA-27	JVK Holdings LLC	17497205301002	Temporary
WA-27	Herman Family Irrevocable Trust	17497205302002	Temporary

WA-32	Hunt Club Investment Group LLC	17497205303009	Permanent/Temporary
WA-32 to WA-33	Hanson, Thomas and Carol	17497200001093	Permanent/Temporary
WA-35 to WA-36	Wilcox, Kenneth and Glenda	17497205303011	Permanent/Temporary
WA-36 to WA-37	Jones, John	17497205303012	Permanent/Temporary
WA-37 to WA-39	Legend Communications of Wyoming LLC	17497205303013	Permanent/Temporary
WA-39 to WA-40	Monsoor, Debra	17497205303014	Permanent/Temporary
WA-40	Monsoor, Debbie	17497208101001	Permanent/Temporary
WA-40 to WA-41	Monsoor, Debbie	17497208101002	Permanent/Temporary
WA-41	Walker, Ronald and Marjorie	17497208102002	Permanent/Temporary
WA-41 to WA-43	Ward, Bill and Daniel	17497208102001	Permanent/Temporary
WA-43 to WA-45	Ward, Bill et. al.	17497200001046	Temporary
WA-48 to WA-51	Appel Realty LLC	17497200001029	Temporary
WA-51	Remington Estates LLC	17497209102024	Temporary
WA-51 to WA-52	Remington Estates LLC	17497209114001	Temporary
WA-52 to WA-53	Kuehne, Marna M Foundation	17497209115002	Temporary
WA-53	Lang Holdings LLC	17497209115001	Temporary
WA-53 to WA-56	Meserve, James B Revocable Trust	17497200001026	Temporary
WA-56 to WA-61	Hitt, Harold and Mary Ruth Trusts	17497200001023	Temporary
WA-61 to WA-62	Hitt, Bruce and Joe, and Cranston, Janet	17497200001189	Temporary
WA-63 to WA-67	New Land Company LLC	17497205304001	Permanent

Legend

- Proposed Burma-Boxelder ROW
- Storage Tanks
- PS — Pump Stations

WATERLINES

Pipe_size

- 10.00
- 10.01 - 12.00
- 12.01 - 14.00
- 14.01 - 16.00
- 16.01 - 40.00
- Gillette City Limits
- PARCELS

1 in = 2,000 feet

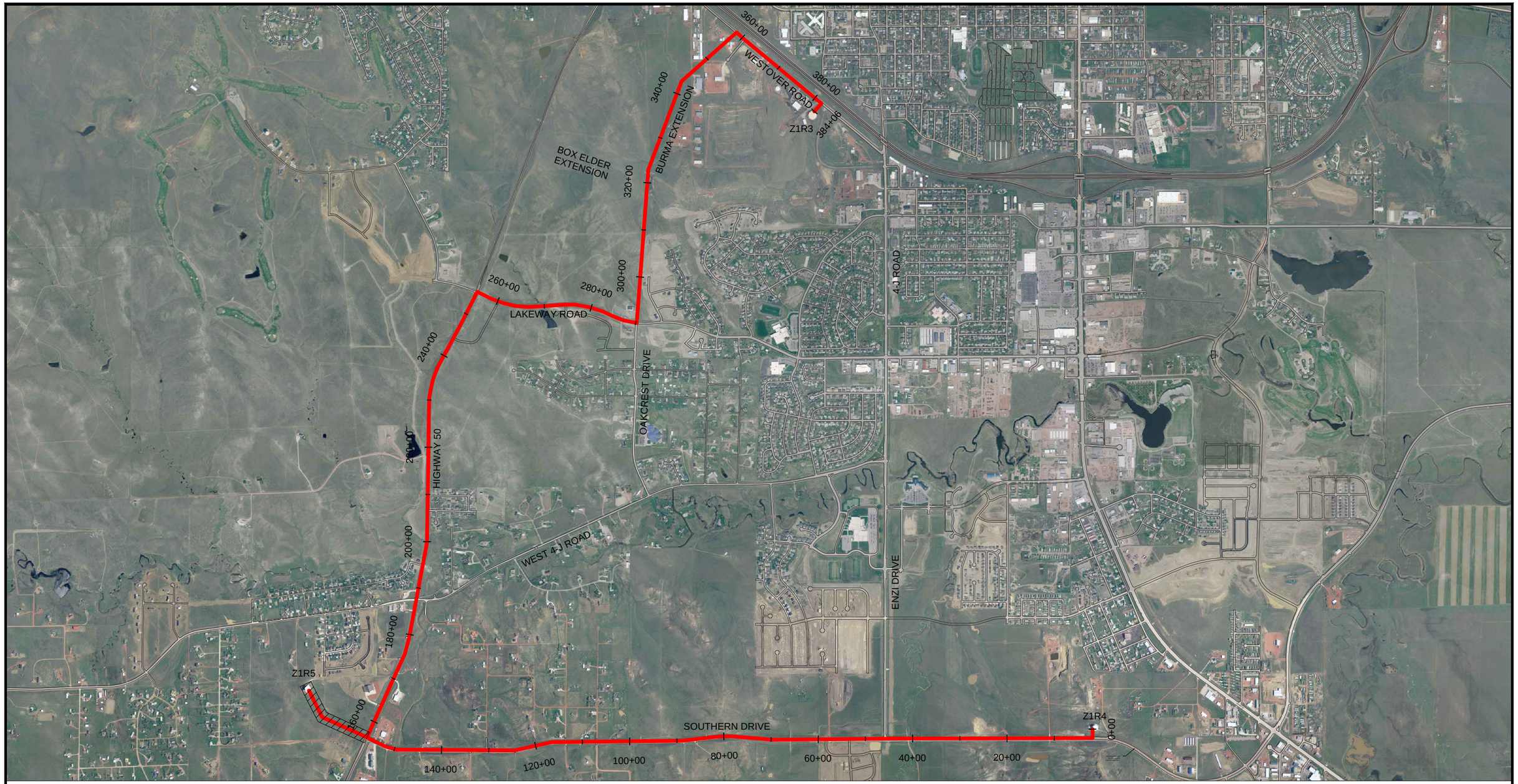
Feet
0 1,000 2,000 4,000

N W E S

Zone III - Reservoir I
Zone I - Reservoir II
Zone I - Reservoir III
Zone I - Reservoir I
Zone I - Reservoir V
Zone I - Reservoir IV
PS 3

HDR Level I
Preferred In-Town
Piping Alignment
Length = 7.2 miles (+/-)

Option 1 In-Town
Piping Alignment
Oakcrest - Burma
Length = 5.2 miles (+/-)



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MODIFY SCALE ACCORDINGLY!

REVISIONS

NO.	DESCRIPTION	DATE	BY

V:\4323\ln Town Piping Alternatives.dwg Plotted by Randy LaRance on 1/12/10

MORRISON MAIERLE, INC.
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

315 N. 25th Street, Suite 102
Billings, MT 59101

Phone: (406) 656-6000
Fax: (406) 237-1201

DRAWN BY:
DSGN. BY:
APPR. BY:
DATE:
Q.C. REVIEW BY:
DATE:

GILLETTE MADISON PIPELINE PROJECT

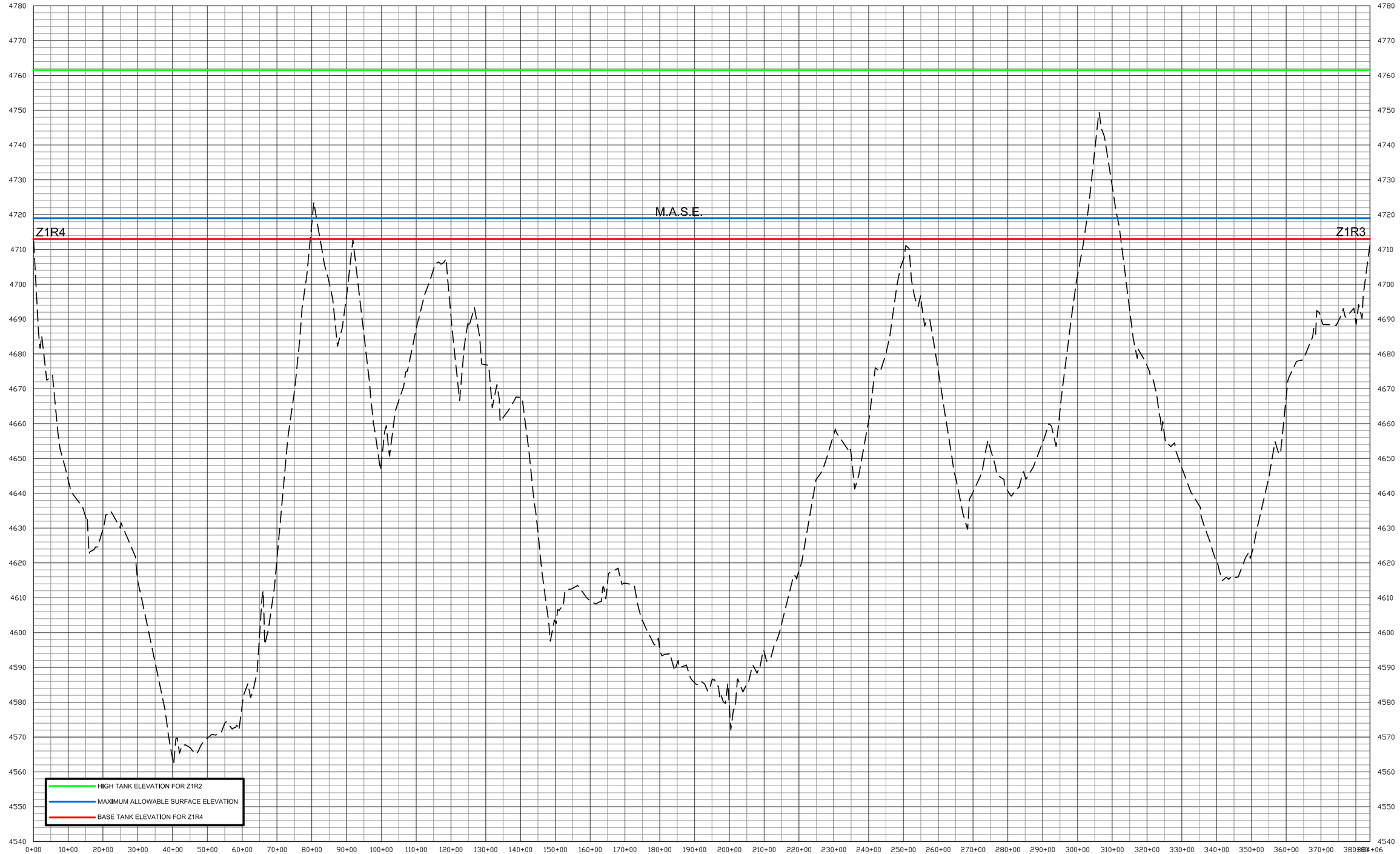
ALTERNATIVE 1

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 1 PL



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REVISIONS

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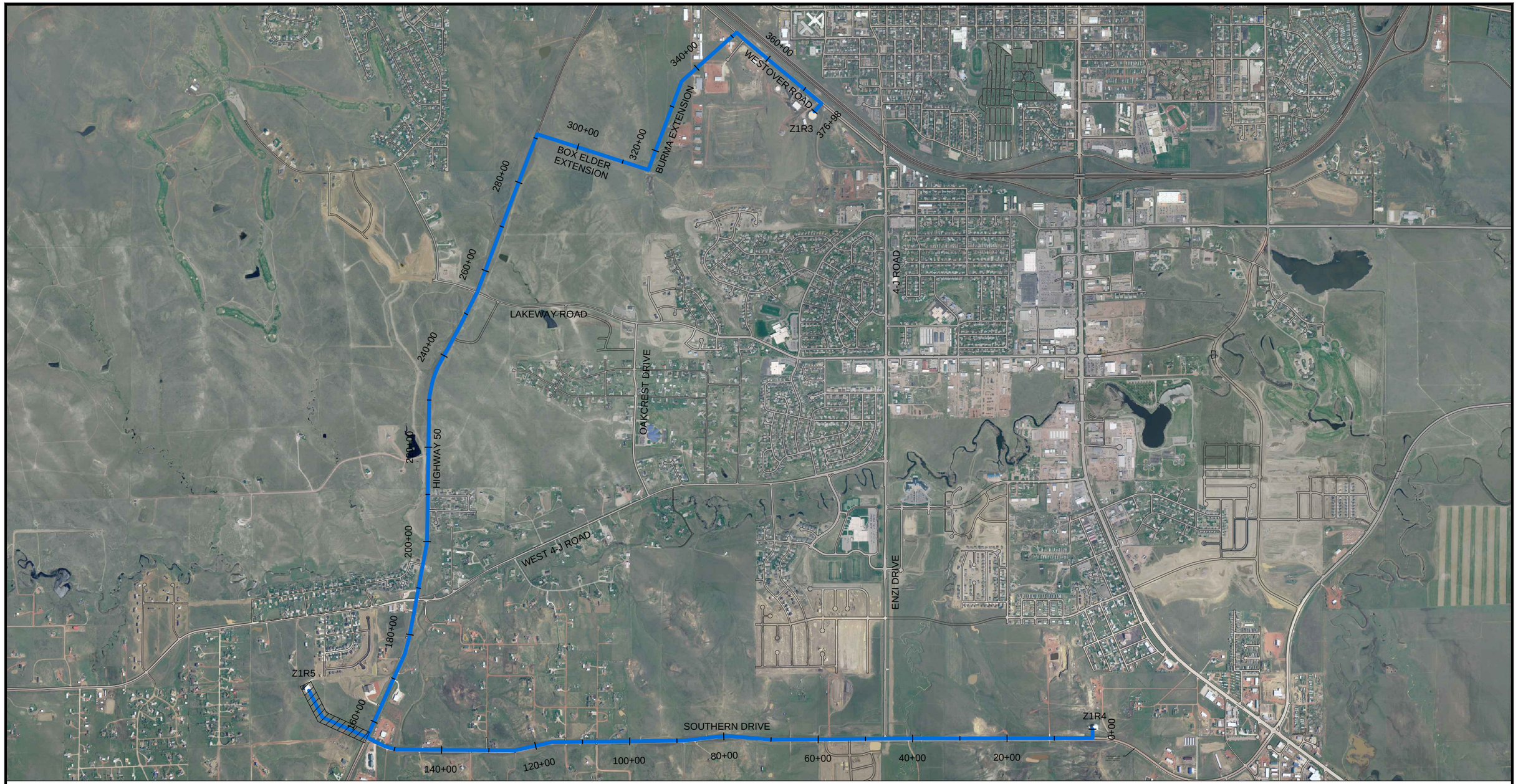

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GILLETTE MADISON PIPELINE PROJECT

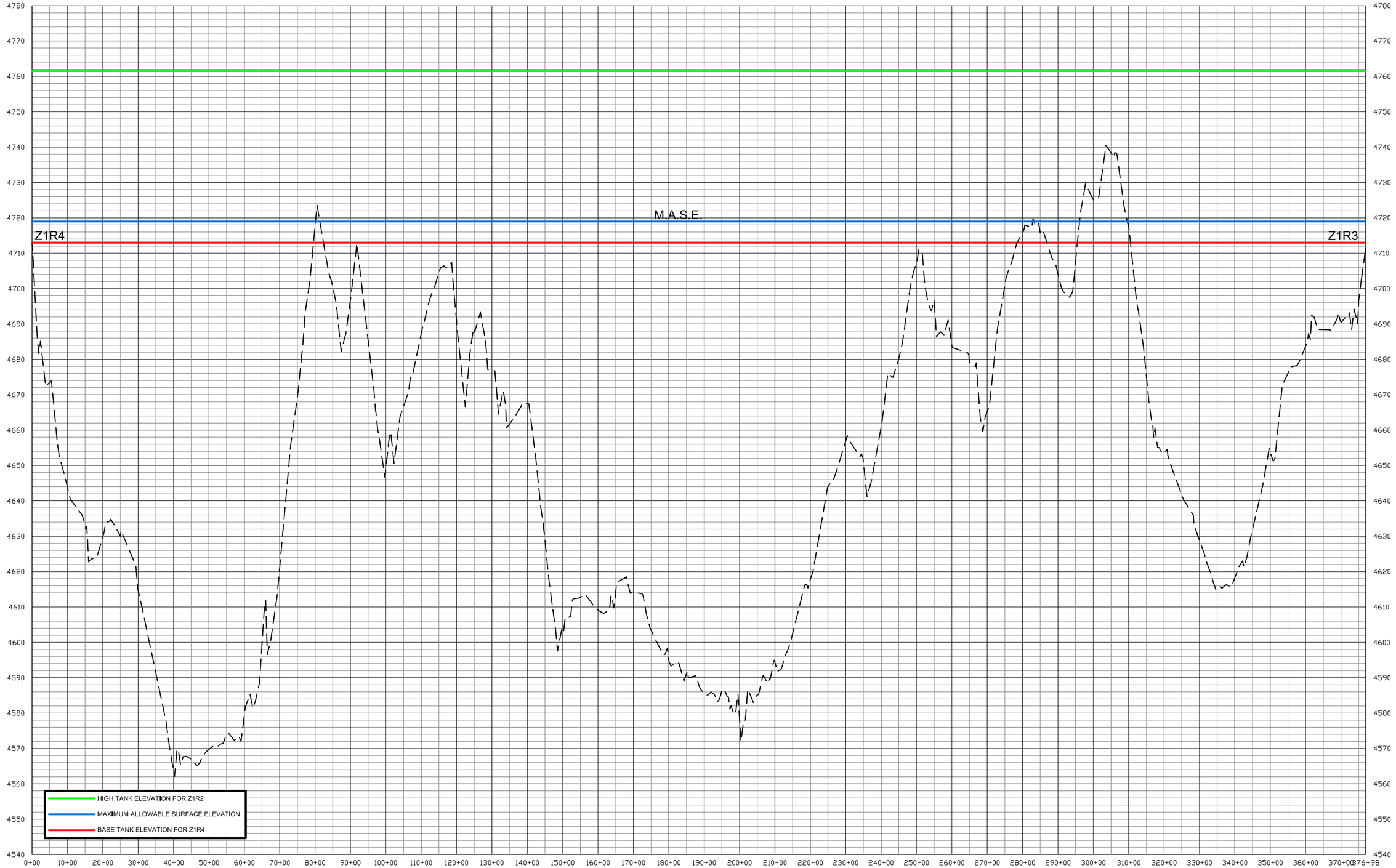
ALTERNATIVE 2

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 2 PL



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REVISIONS

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V:\4776\001\ACAD\concept\In town piping alternative profiles - '10.dwg Plotted by Kurtis Deshaw on 4/29/10

MORRISON MAIERLE, INC.
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

315 N. 25th Street, Suite 102
Billings, MT 59101

Phone: (406) 656-6000
Fax: (406) 237-1201

DRAWN BY:
DSGN. BY:
APPR. BY:
DATE:

Q.C. REVIEW BY:
DATE:

GILLETTE MADISON PIPELINE PROJECT

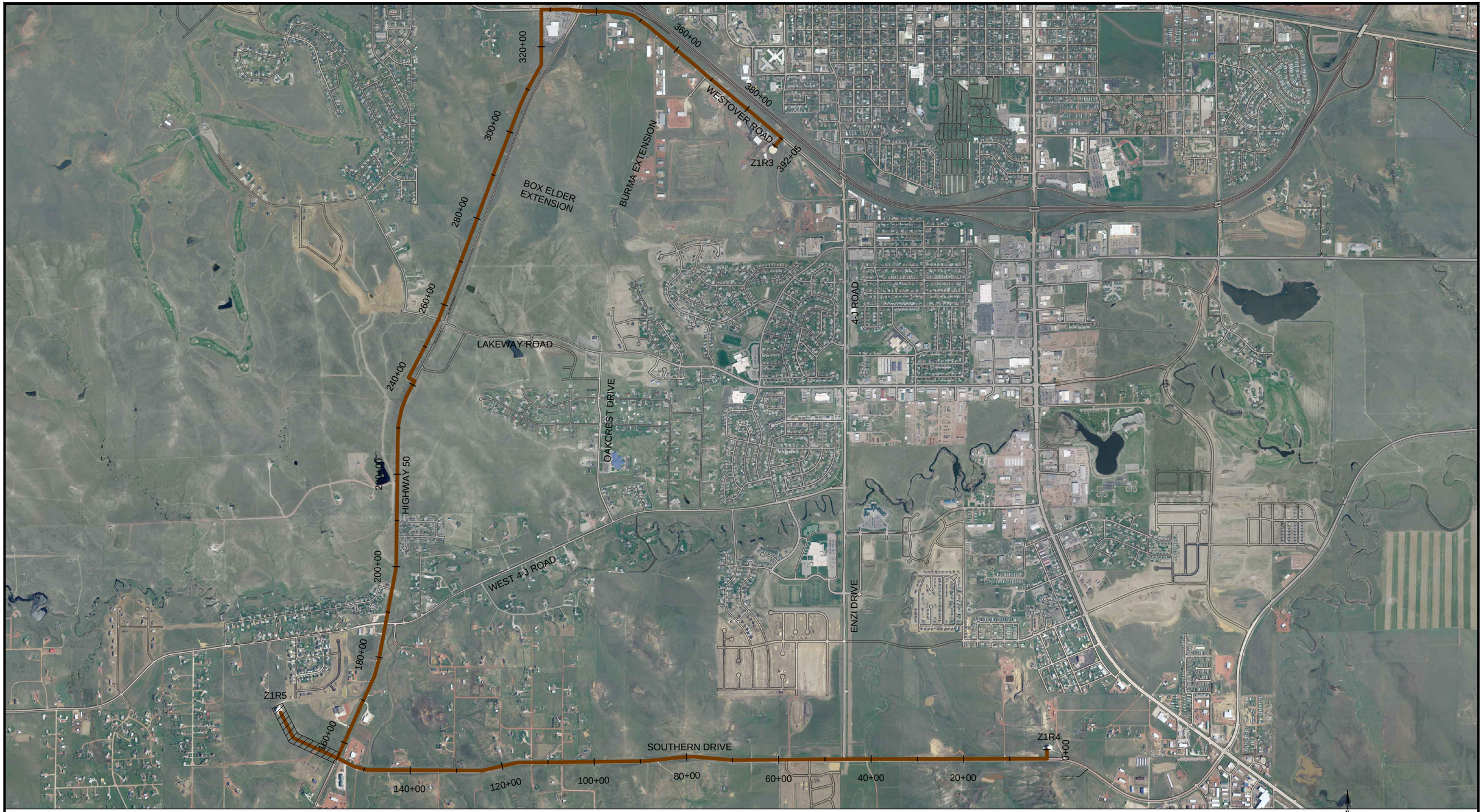
ALTERNATIVE 2

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 2 PR



VERIFY SCALE!

THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.

MODIFY SCALE ACCORDINGLY!

REVISIONS

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DATE:

GILLETTE MADISON PIPELINE PROJECT

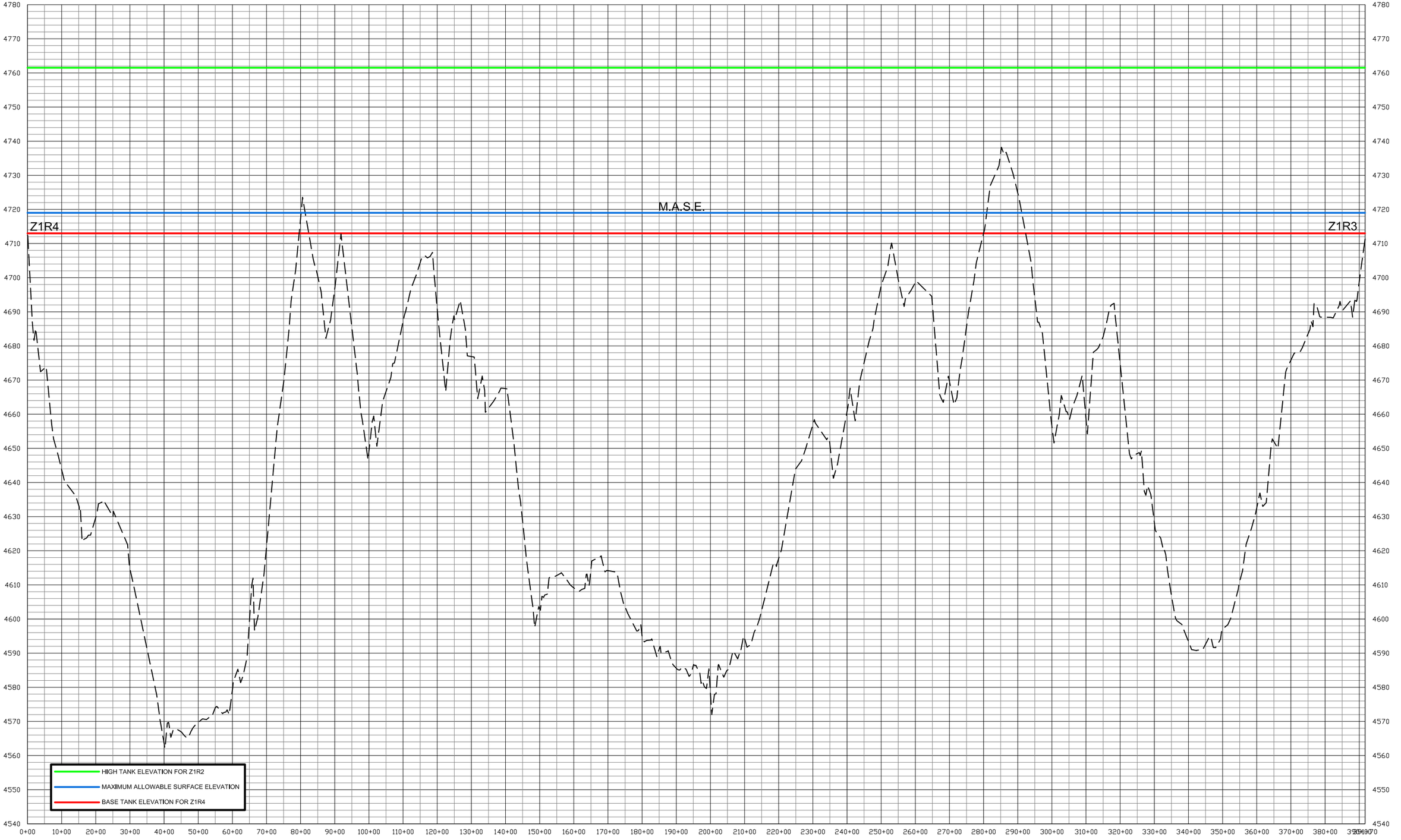
ALTERNATIVE 3

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 3 PL



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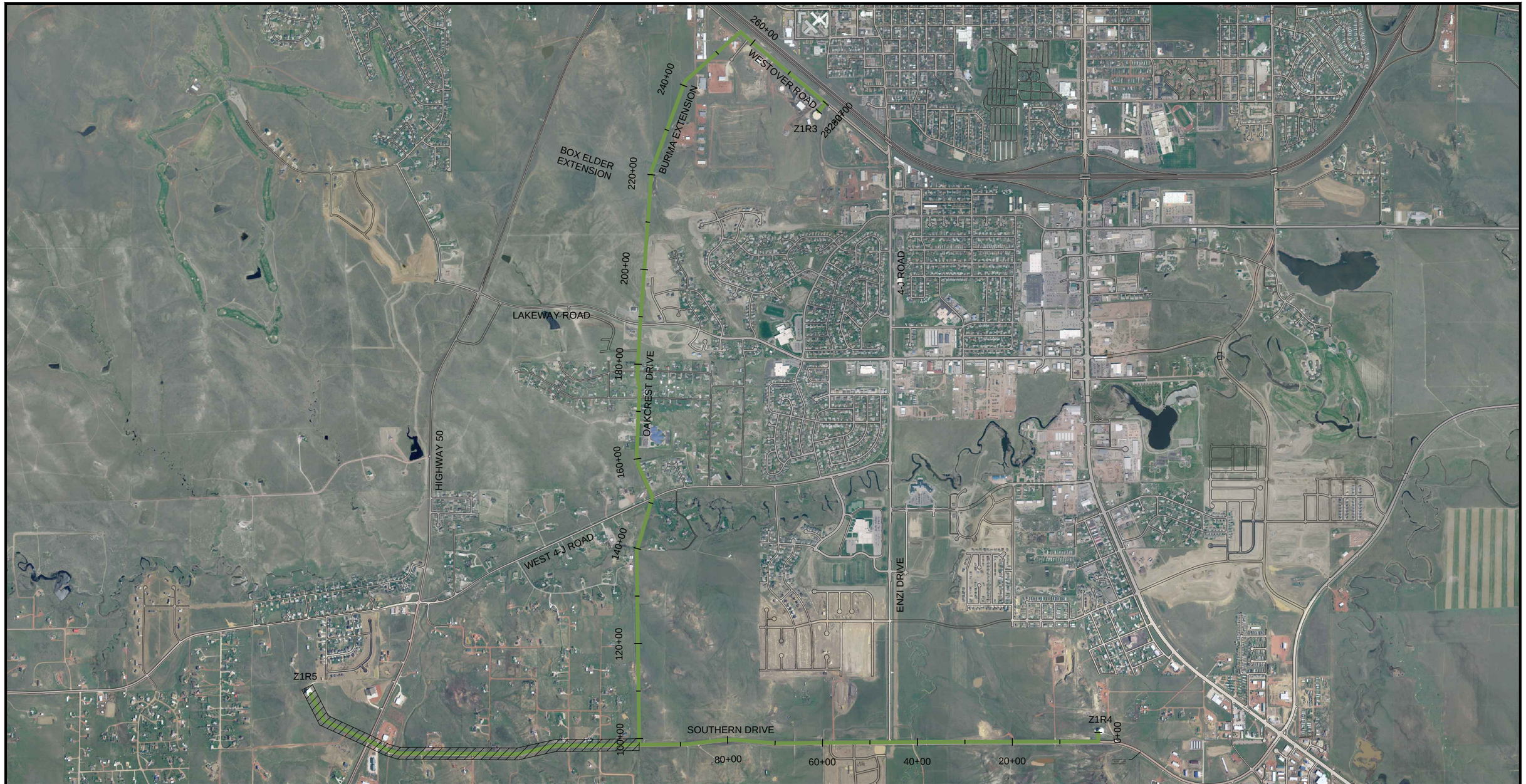
ALTERNATIVE 3

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 3 PR



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GILLETTE MADISON PIPELINE PROJECT

ALTERNATIVE 4

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 4 PL

VERIFY SCALE!

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DATE:

GILLETTE MADISON PIPELINE PROJECT

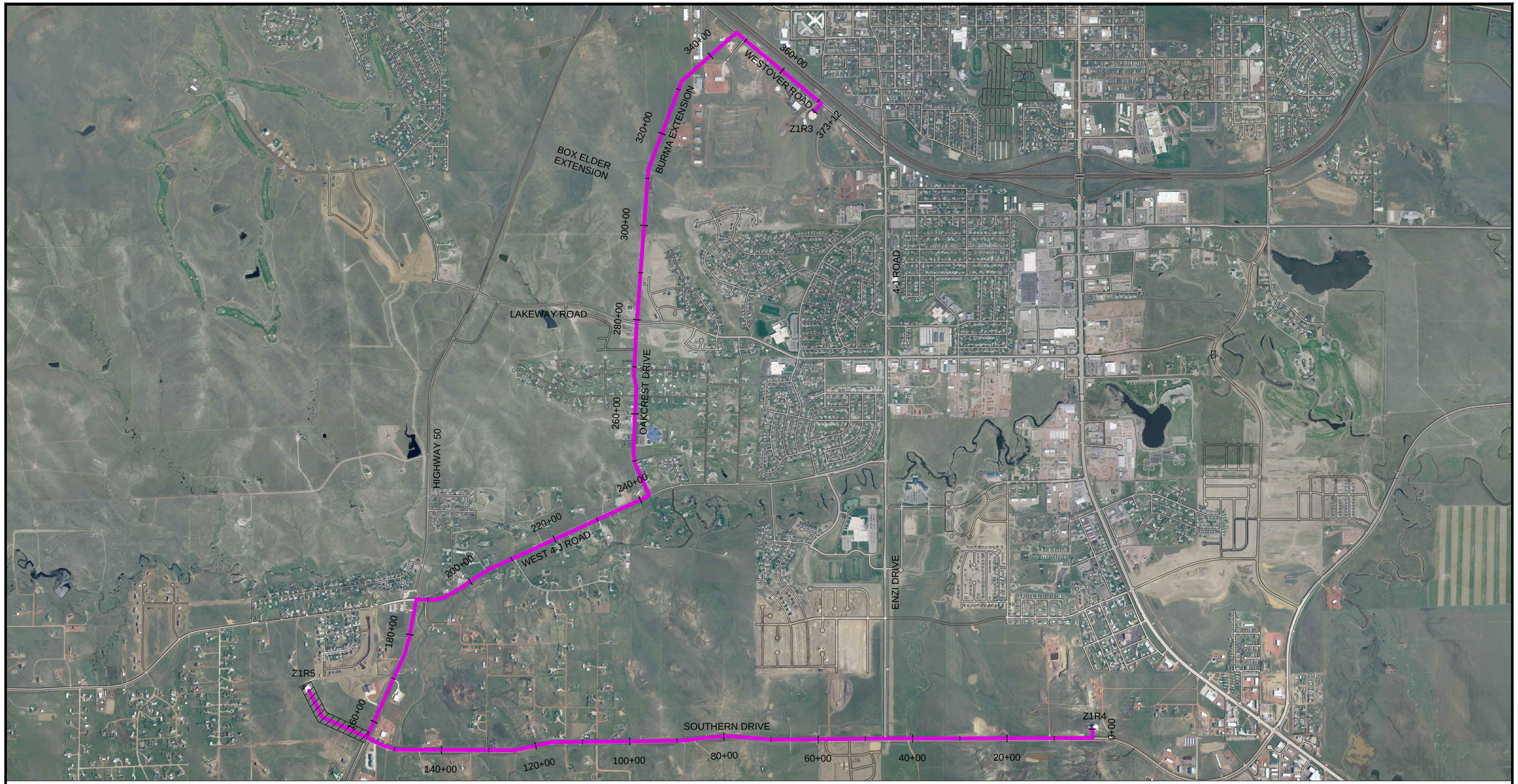
ALTERNATIVE 4

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 4 PR



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GILLETTE MADISON PIPELINE PROJECT

ALTERNATIVE 5

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 5 PL

VERIFY SCALE!

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GILLETTE MADISON PIPELINE PROJECT

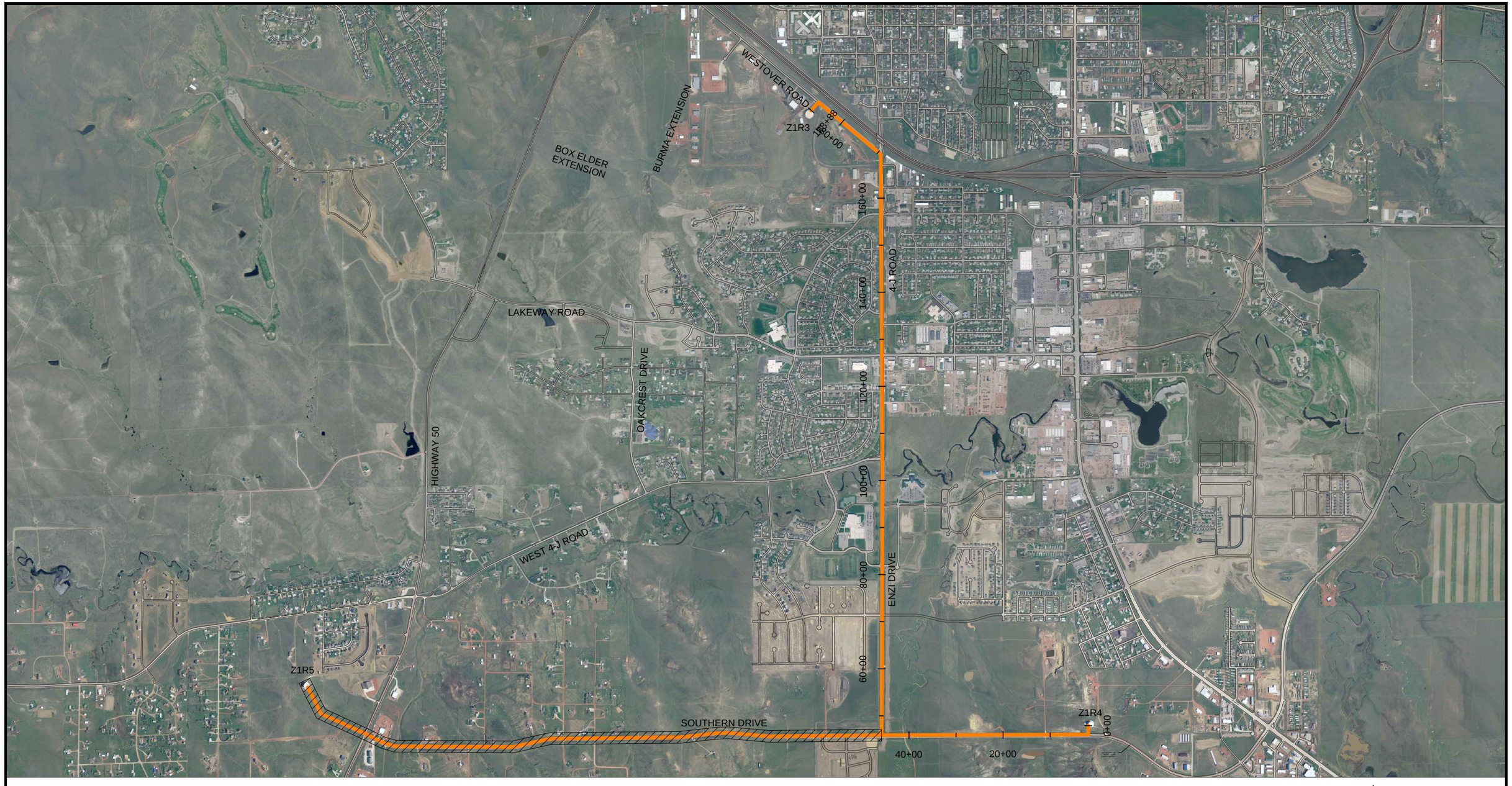
ALTERNATIVE 5

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 5 PR



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GILLETTE MADISON PIPELINE PROJECT

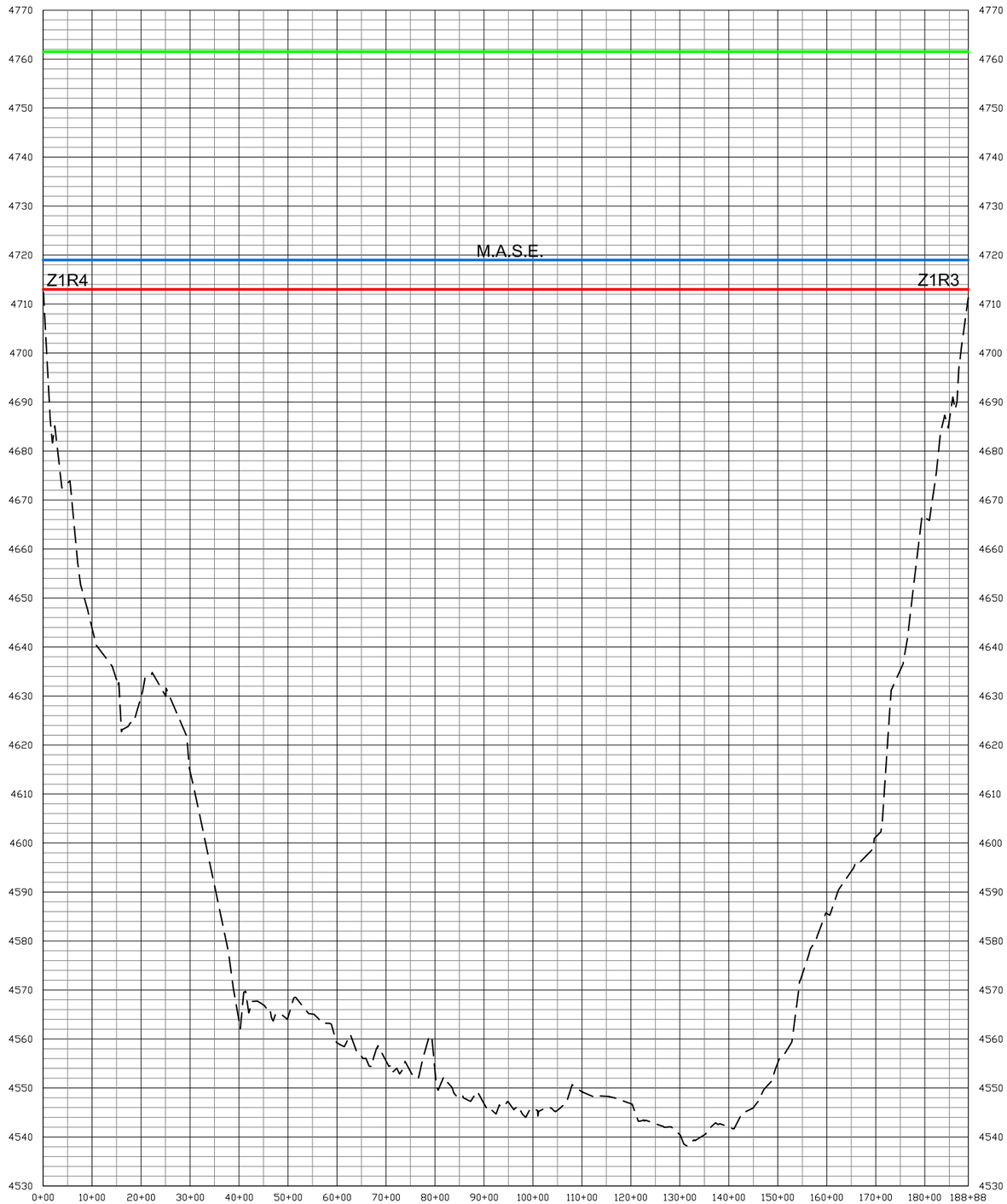
ALTERNATIVE 6

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 6 PL



HIGH TANK ELEVATION FOR Z1R2

MAXIMUM ALLOWABLE SURFACE ELEVATION

BASE TANK ELEVATION FOR Z1R4

VERIFY SCALE!

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MODIFY SCALE ACCORDINGLY!

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Q.C. REVIEW BY:
DATE:

GILLETTE MADISON PIPELINE PROJECT

ALTERNATIVE 6

PROJECT NUMBER 4776.001

SHEET NUMBER

DRAWING NUMBER

FIG. 6 PR

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	107	

Coordinates are based on the Wyoming Coordinate System NAD 83/93, Wyoming East Zone, and have been multiplied by a project factor of 1.00027099064. Labeled plan data (coordinates, curve data, bearings, distances, and stationing) exceed survey accuracy. Existing land lines, property lines and easement lines not surveyed or tied to the alignment should be considered approximate.

EXISTING 16" PVC WATER MAIN

EXISTING 12" PVC WATER MAIN

600+00

STA. 600+00.00
36" DIP CAP-RJ

STA. 600+20.00
36" BUTTERFLY VALVE-RJ

STA. 600+65.98
36" X 11.25° DIP ELBOW-RJ

STA. 601+88.43
36" X 36" X 12" DIP SWIVEL TEE-RJ
W/THRUST BLOCK

STA.601+98.43
36" BUTTERFLY VALVE-RJ

STA. 602+16.50
36" X 36" X 8" DIP SWIVEL TEE-RJ
W/THRUST BLOCK

STA. 602+26.50
36" X 11.25° DIP ELBOW-RJ

STA. 602+46.50
36" X 45° DIP ELBOW-RJ

12" GATE VALVE-RJ

12" X 12" X 12" DIP SWIVEL TEE-RJ

8" GATE VALVE-RJ

8" AWWA C900 DR18 PVC,
L = 105'

BLOW-OFF ASSEMBLY
(SEE DETAIL)

WESTOVER ROAD

25+00

30+00

605+00

610+00

35+00

36" AWWA C905 DR21 CIOD PVC

STA. 603+14.06
36" X 45° DIP ELBOW-RJ

WYO 50

*WYDOT TRAFFIC SIGNAL BOX

*WYDOT TRAFFIC SIGNAL BOX

*WYDOT TRAFFIC SIGNAL BOX

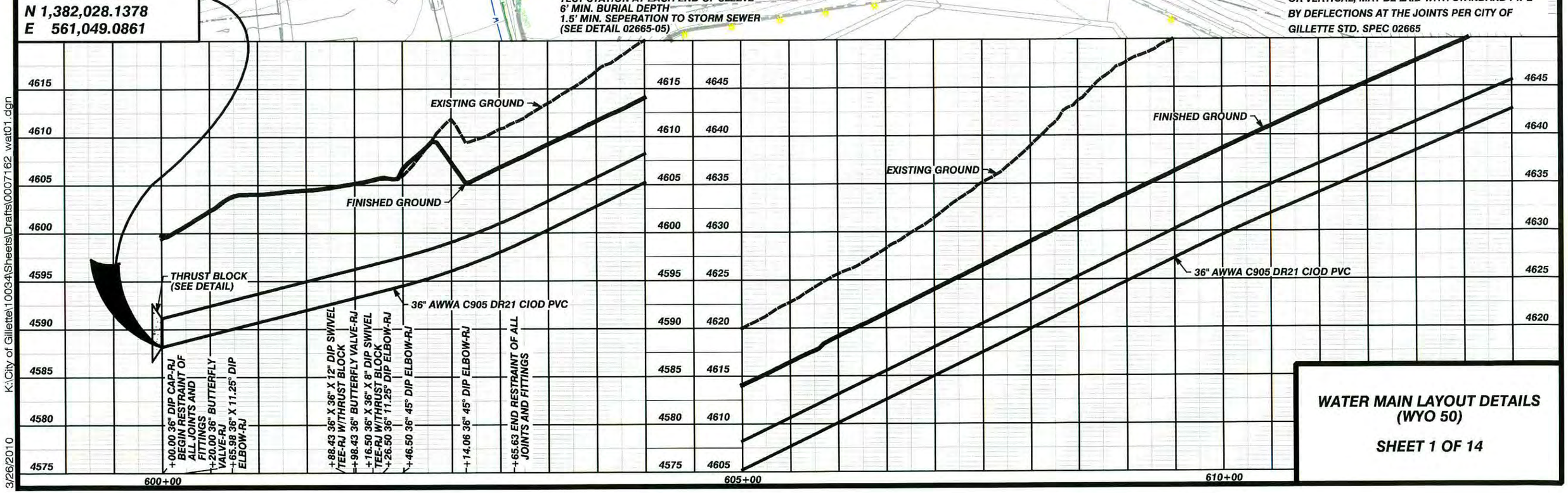
S 31° 32' 57.7" W

332.89

STA. 26+90.00
30" STEEL SLEEVE, L=120'
W/CATHODIC PROTECTION/TRACER WIRE
TEST STATION AT EACH END OF SLEEVE
6' MIN. BURIAL DEPTH
1.5' MIN. SEPERATION TO STORM SEWER
(SEE DETAIL 02665-05)

BEGIN WATER TRANSMISSION MAIN
STA. 600+00.00
N 1,382,028.1378
E 561,049.0861

NOTE: LONG RADIUS CURVES, EITHER HORIZONTAL OR VERTICAL, MAY BE LAID WITH STANDARD PIPE BY DEFLECTIONS AT THE JOINTS PER CITY OF GILLETTE STD. SPEC 02665



WATER MAIN LAYOUT DETAILS (WYO 50)

SHEET 1 OF 14

3/26/2010 K:\City of Gillette\10034\Sheets\Drafts\0007162_wat01.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	108	

Coordinates are based on the Wyoming Coordinate System NAD 83/93, Wyoming East Zone, and have been multiplied by a project factor of 1.00027099064. Labeled plan data (coordinates, curve data, bearings, distances, and stationing) exceed survey accuracy. Existing land lines, property lines and easement lines not surveyed or tied to the alignment should be considered approximate.

615+00 40+00 620+00 45+00 625+00 50+00

4" AIR VACUUM/AIR RELEASE VALVE ASSEMBLY (SEE DETAIL)

VERTICAL LOCATION OF WATER AND GAS UTILITIES ARE UNKNOWN

PC 40+19.27

36" AWWA C905 DR21 CIOD PVC

WYO 50

TRAFFIC SIGNAL BOX

WYDOT TRAFFIC SIGNAL BOX

TRAFFIC SIGNAL

TYPE 5 METAL POST

CITY OF GILLETTE UTILITY CORRIDOR

CLOS.BA

CLOS.B

PI STA 47+24.65
N = 1,380,387.7331
E = 559,714.9780
D = 0° 45' 50.2"
Δ = 10° 44' 44.6" (LT)
T = 705.38'
L = 1,406.61'
R = 7,500.00'
e = NC
DESIGN SPEED = 45 M.P.H.

NOTE: LONG RADIUS CURVES, EITHER HORIZONTAL OR VERTICAL, MAY BE LAID WITH STANDARD PIPE BY DEFLECTIONS AT THE JOINTS PER CITY OF GILLETTE STD. SPEC 02665

4675 4670 4665 4660 4655 4650 4645 4640 4635

EXISTING GROUND

FINISHED GROUND

36" AWWA C905 DR21 CIOD PVC

VPI 618+10.69
ELEV. 4,664.71'
V.C. 700.00'

INSULATION BOARD, L = 60' OVER CONCRETE ENCASEMENT (SEE DETAIL)

+14.58 BEGIN RESTRAINT OF ALL JOINTS AND FITTINGS

+54.58 4" AIR VACUUM/AIR RELEASE VALVE ASSEMBLY (SEE DETAIL)

+64.58 36" X 22.5° DIP ELBOW-RJ, BEGIN CEMENT TREATED BACKFILL

+75.75 36" X 22.5° DIP ELBOW-RJ

+85.75 36" CULVERT

+95.75 36" X 22.5° DIP ELBOW-RJ

+06.98 36" X 22.5° DIP ELBOW-RJ, END CEMENT TREATED BACKFILL

+56.98 END RESTRAINT OF ALL JOINTS AND FITTINGS

615+00 620+00 625+00

WATER MAIN LAYOUT DETAILS (WYO 50)

SHEET 2 OF 14

k:\city of gillette\10034\sheets\drafts\0007162_wat02.dgn

3/26/2010

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	109	

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630+00 | 55+00 | 635+00 | 60+00 | 640+00 | 65+00

BOXELDER ROAD

STA. 637+09.00
30" STEEL SLEEVE, L=145'
W/CATHODIC PROTECTION/TRACER WIRE
TEST STATION AT EACH END OF SLEEVE
6' MIN. BURIAL DEPTH
(SEE STD. DETAIL 02665-05)

STA. 637+20.53
36" BUTTERFLY VALVE-RJ

36"AWWA C905 DR21 CIOD PVC

WYO 50

CITY OF GILLETTE UTILITY CORRIDOR

TYPE F METAL POST

NEWTON FAMILY FARMS

NOTE: LONG RADIUS CURVES, EITHER HORIZONTAL OR VERTICAL, MAY BE LAID WITH STANDARD PIPE BY DEFLECTIONS AT THE JOINTS PER CITY OF GILLETTE STD. SPEC 02665

4705 | 4700 | 4695 | 4690 | 4685 | 4680 | 4675 | 4670 | 4665

VPI 627+94.45
ELEV. 4,669.28'
V.C. 370.00'

FINISHED GROUND

EXISTING GROUND

INSULTATION BOARD, L = 20'
(SEE DETAIL)

+48.82 24" CULVERT

+09.00 30" STEEL SLEEVE
+22.53 36" BUTTERFLY VALVE-RJ

36" AWWA C905 DR21 CIOD PVC

630+00 | 635+00 | 640+00

WATER MAIN LAYOUT DETAILS (WYO 50)

SHEET 3 OF 14

3/26/2010 k:\city of gillette\10034\sheets\drafts\0007162 wat03.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	110	

645+00 70+00 650+00 75+00 655+00

TRACT 1, BISON ESTATES
KANTI R. AND SULABHA K. PATEL

TRACT 1, BISON ESTATES

STA. 648+14.35
4" AIR VACUUM/AIR RELEASE VALVE ASSEMBLY
(SEE DETAIL)

36"AWWA C905 DR21 CIOD PVC

4,414.20'
S 20° 48' 13.1" W

NEWTON FAMILY FARMS

MOONSHINER DEVELOPMENT, LLC

TRACT B, MOONSHINER ESTATES II, PHASE I

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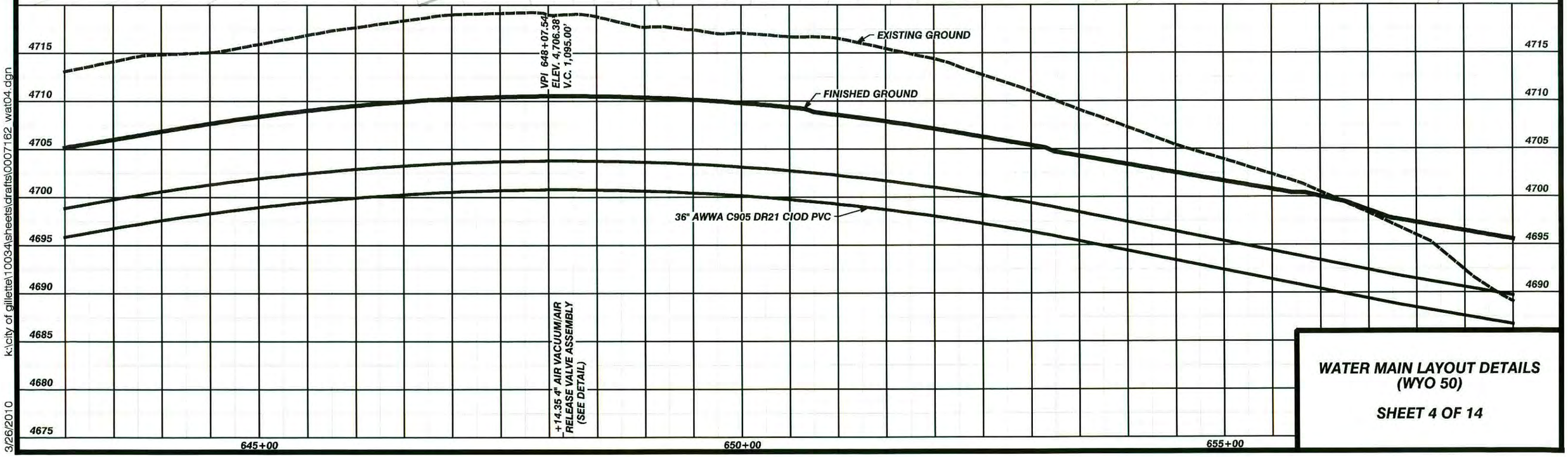

WATER MAIN LAYOUT DETAILS (WYO 50)

SHEET 4 OF 14

k:\city of gillette\10034\sheets\drafts\0007162_wat04.dgn
3/26/2010

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	111	

TRACT 1, BISON ESTATES
KANTI R. AND SULABHA K. PATEL

TRACT 1, BISON ESTATES
KANTI PATEL & SULABHA K. PATEL

660+00 | 665+00 | 670+00

STA. 666+25.00
BLOW-OFF ASSEMBLY
(SEE DETAIL)

8" AWWA C900 DR18 PVC,
L = 105'

8" GATE VALVE
STA 666+25.00
36" X 36" X 8" DIP SWIVEL TEE-RJ
W/THRUST BLOCK
36"AWWA C905 DR21 CIOD PVC

WYO 50

TRACT B, MOONSHINER ESTATES II, PHASE 1

MOONSHINER DEVELOPMENT, LLC

MOONSHINER DEVELO
TRACT B, MOONSH
ESTATES II, PHAS

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NOTE: LONG RADIUS CURVES, EITHER HORIZONTAL OR VERTICAL, MAY BE LAID WITH STANDARD PIPE BY DEFLECTIONS AT THE JOINTS PER CITY OF GILLETTE STD. SPEC 02665

4695 | 4690 | 4685 | 4680 | 4675 | 4670 | 4665 | 4660 | 4655

FINISHED GROUND

EXISTING GROUND

36" AWWA C905 DR21 CIOD PVC

VPI 665+81.22
ELEV. 4,674.61'
V.C. 685.00'

+25.00 36" X 36" X 8" DIP SWIVEL TEE-RJ W/THRUST BLOCK

60" CULVERT

660+00 | 665+00 | 670+00

WATER MAIN LAYOUT DETAILS (WYO 50)

SHEET 5 OF 14

k:\city of gillette\10034\sheets\drafts\0007162_wat05.dgn
3/26/2010

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	112	

STA.675+12.24
36" X 22.5° DIP ELBOW-RJ

STA. 675+97.24
36" X 45° DIP
ELBOW-RJ

PI STA. 102+04.58
N = 1,375,261.2062
E = 557,767.2199
D = 1° 02' 30.3"
Δ = 7° 34' 59.2" (RT)
T = 364.50'
L = 727.93'
R = 5,500.00'
e = NC
DESIGN SPEED = 45 M.P.H.

TRACT 1, BISON ESTATES

KANTI PATEL & SULABHA K. PATEL

BHL PROPERTIES, LLC

LOT 1, ANTELOPE RIDGE SUBDIVISION,
RESUBDIVISION OF TRACT E,
PRONGHORN RANCH, PHASE I,
RESUBDIVISION OF LOT 1,
TRACT 2, BISON ESTATES

STA. 673+74.48
4" AIR VACUUM/AIR RELEASE
VALVE ASSEMBLY
(SEE DETAIL)

STA. 673+64.48
36" X 22.5° DIP ELBOW-RJ

36" AWWA C905 DR21 CIOD PVC

STA. 678+53.45
36" BUTTERFLY VALVE-RJ

STA. 678+43.45
36" X 36"X 6" SWIVEL DIP TEE-RJ

STA. 678+63.45
36" DIP CAP-RJ

WYO 50

STA. 678+18.45
36" X 45° DIP ELBOW-RJ

FIRE
HYDRANT
(SEE DETAIL)

6" GATE
VALVE-RJ

STA. 676+04.63
30" STEEL SLEEVE, L=220'
W/CATHODIC PROTECTION/TRACER WIRE
TEST STATION AT EACH END OF SLEEVE
6' MIN. BURIAL DEPTH
1.5' MIN. SEPERATION TO STORM SEWER
(SEE STD. DETAIL 02665-05)

MOONSHINER DEVELOPMENT, LLC
TRACT B, MOONSHINER
ESTATES II, PHASE 1

LAKEWAY ROAD

605.20'
S 28° 23' 12.3" W

HIGH PLAINS COMMUNITY CHURCH
TRACT 1, EVANGELICAL
CHURCH SUBDIVISION

END WATER TRANSMISSION MAIN
STA. 678+63.46
N 1,375221.5669
E 557,696.1319

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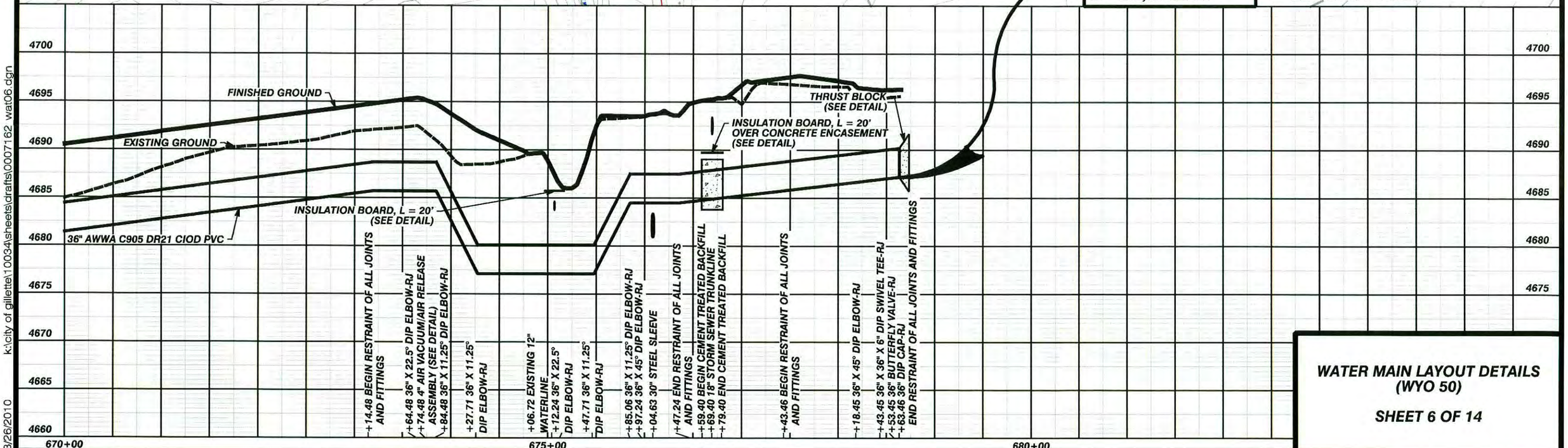


WATER MAIN LAYOUT DETAILS (WYO 50)

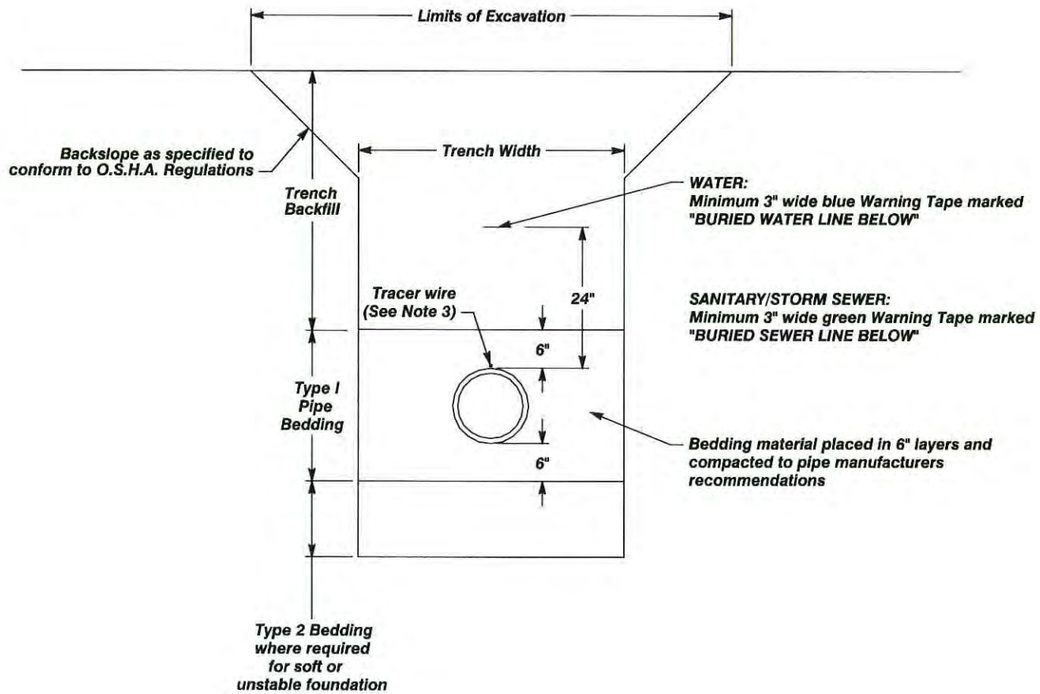
SHEET 6 OF 14

3/26/2010 k:\city of gillette\10034\sheets\drafts\0007162 wat06.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	113	

WATER/SEWER/STORM SEWER TRENCH & BEDDING

(DRAWING NO. 02220-01)
N.T.S.

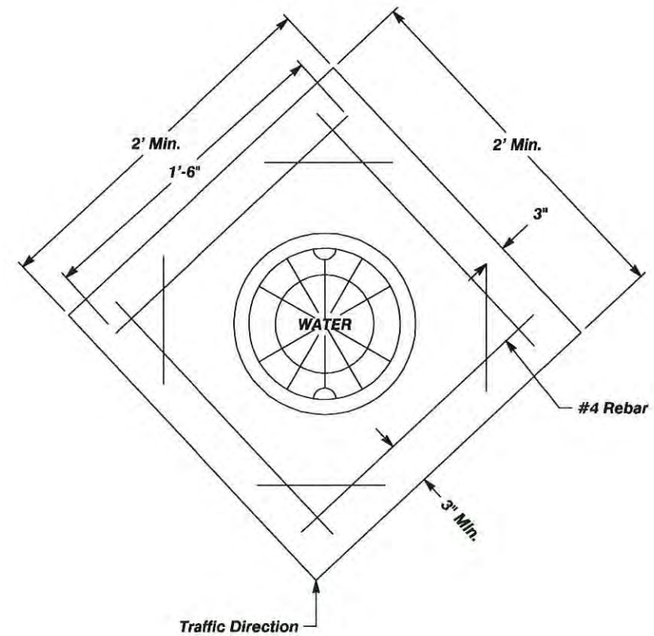


NOTES:

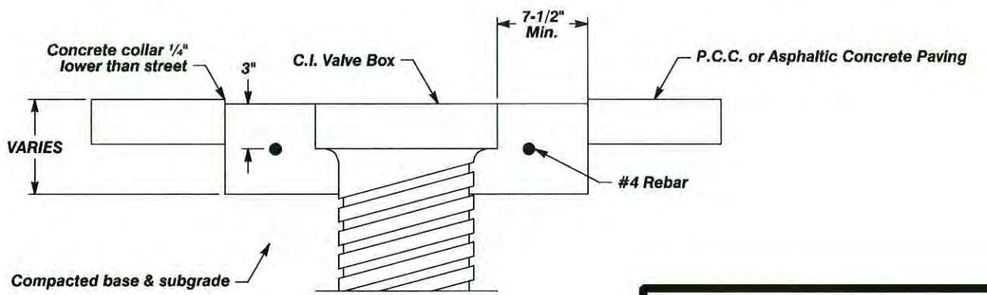
1. Comply with Specification Section 02220 for trench excavation & backfill.
2. Tracer wire and/or warning tape will be provided as shown on the plans and/or where applicable.
3. Tracer wire is required on all water lines and may be required on sanitary and storm sewer lines on a case by case basis or as specified on the plans.
4. Drawing No. 02220-01 referenced from City of Gillette Standard Details.

WATER VALVE ADJUSTMENT DETAIL

(DRAWING NO. 02570-02)
N.T.S.



CONCRETE VALVE BOX COLLAR



NOTE:

1. Valve box collar will extend to the full depth of adjacent surface.
2. Drawing No. 02570-02 referenced from City of Gillette Standard Details.

WATER MAIN DETAILS (WYO 50)

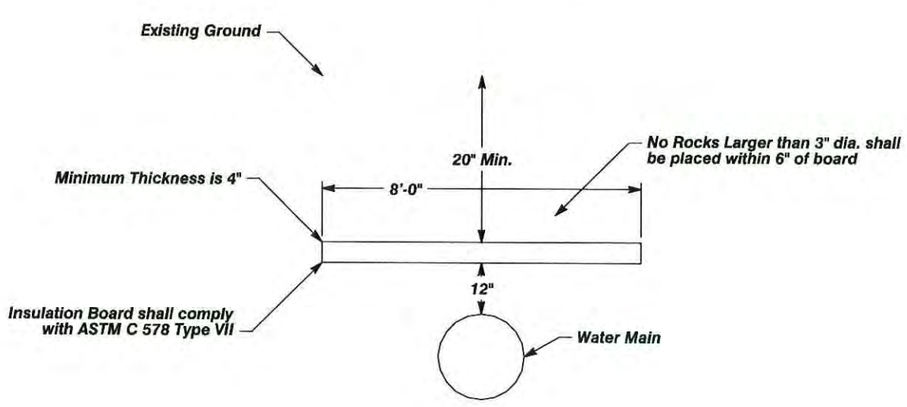
SHEET 7 OF 14

3/26/2010 K:\City of Gillette\10034\Sheets\10034_d01.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	114	

INSULATION BOARD INSTALLATION

(DRAWING NO. 02665-04)
N.T.S.

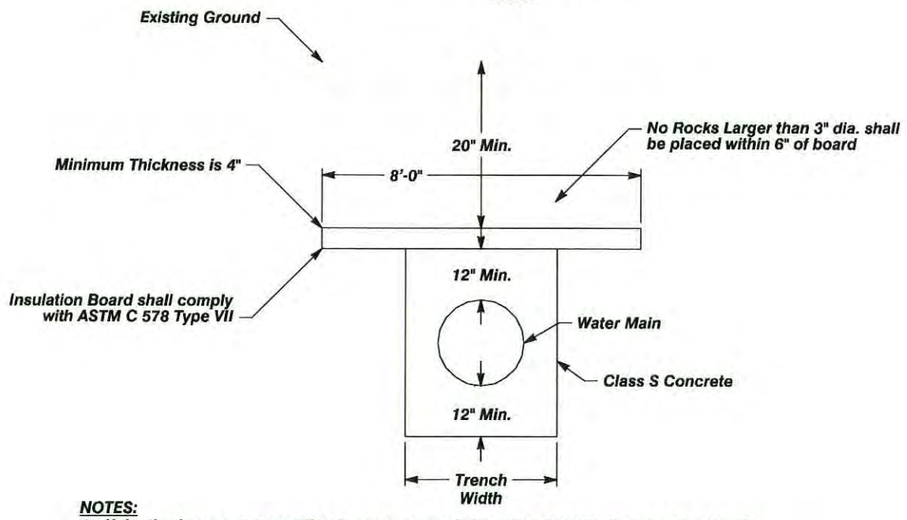


NOTES:

1. If depth of cover or separation to storm sewer is less than 5.0 feet, board shall extend a minimum of four feet either side of pipe until depth of cover or separation exceeds 5.0 feet.
2. Drawing No. 02665-04 referenced from City of Gillette Standard Details.

CEMENT TREATED FILL AND INSULATION BOARD INSTALLATION

(DRAWING NOS. 02225-01 & 02665-04)
N.T.S.



NOTES:

1. If depth of cover or separation to storm sewer is less than 5.0 feet, board shall extend a minimum of four feet either side of pipe until depth of cover or separation exceeds 5.0 feet.
2. Drawing Nos. 02225-01 & 02665-04 referenced from City of Gillette Standard Details.

WATER MAIN DETAILS (WYO 50)

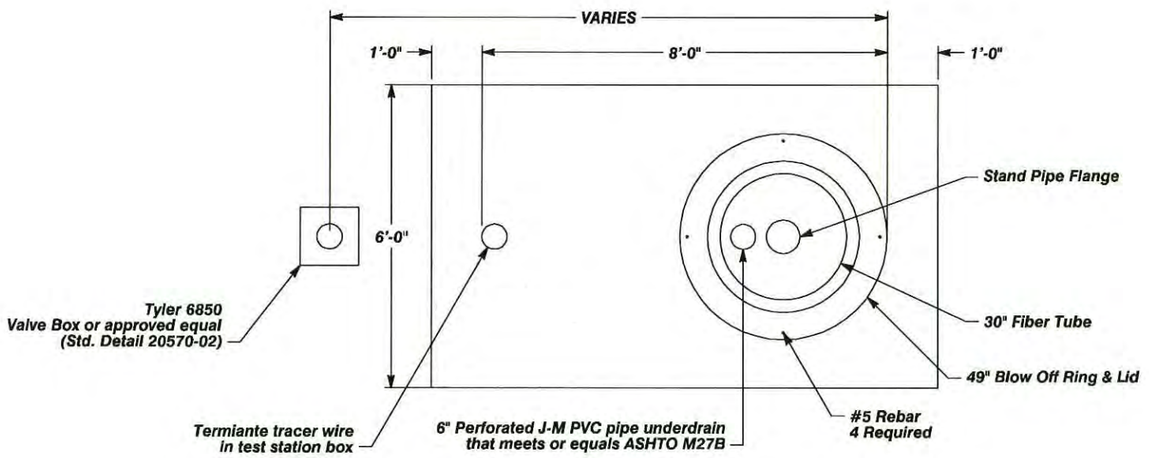
SHEET 8 OF 14

3/26/2010 K:\City of Gillette\10034\Sheets\10034_d01.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	115	

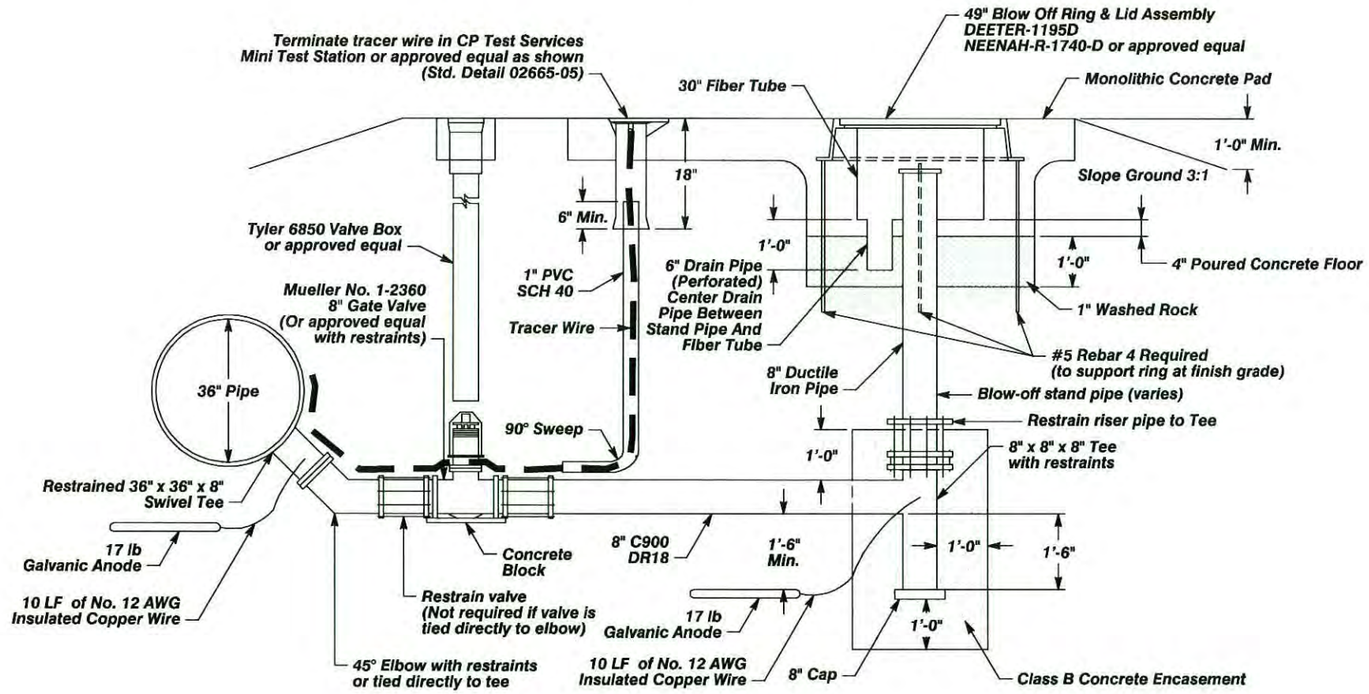
BLOW-OFF ASSEMBLY PLAN VIEW

N.T.S.



BLOW-OFF ASSEMBLY PROFILE VIEW

N.T.S.



NOTES:

1. Restraints will be:
   Push-on valve - Ford series 1300 or Ford series 1390 or approved equal (150 psi working pressure)
2. All valves and fittings shall be restrained mechanical joints conforming to City of Gillette standard specification.
3. Where 8" gate valve to be located outside of concrete pad (Std. detail 02665-02).

WATER MAIN DETAILS (WYO 50)

SHEET 9 OF 14

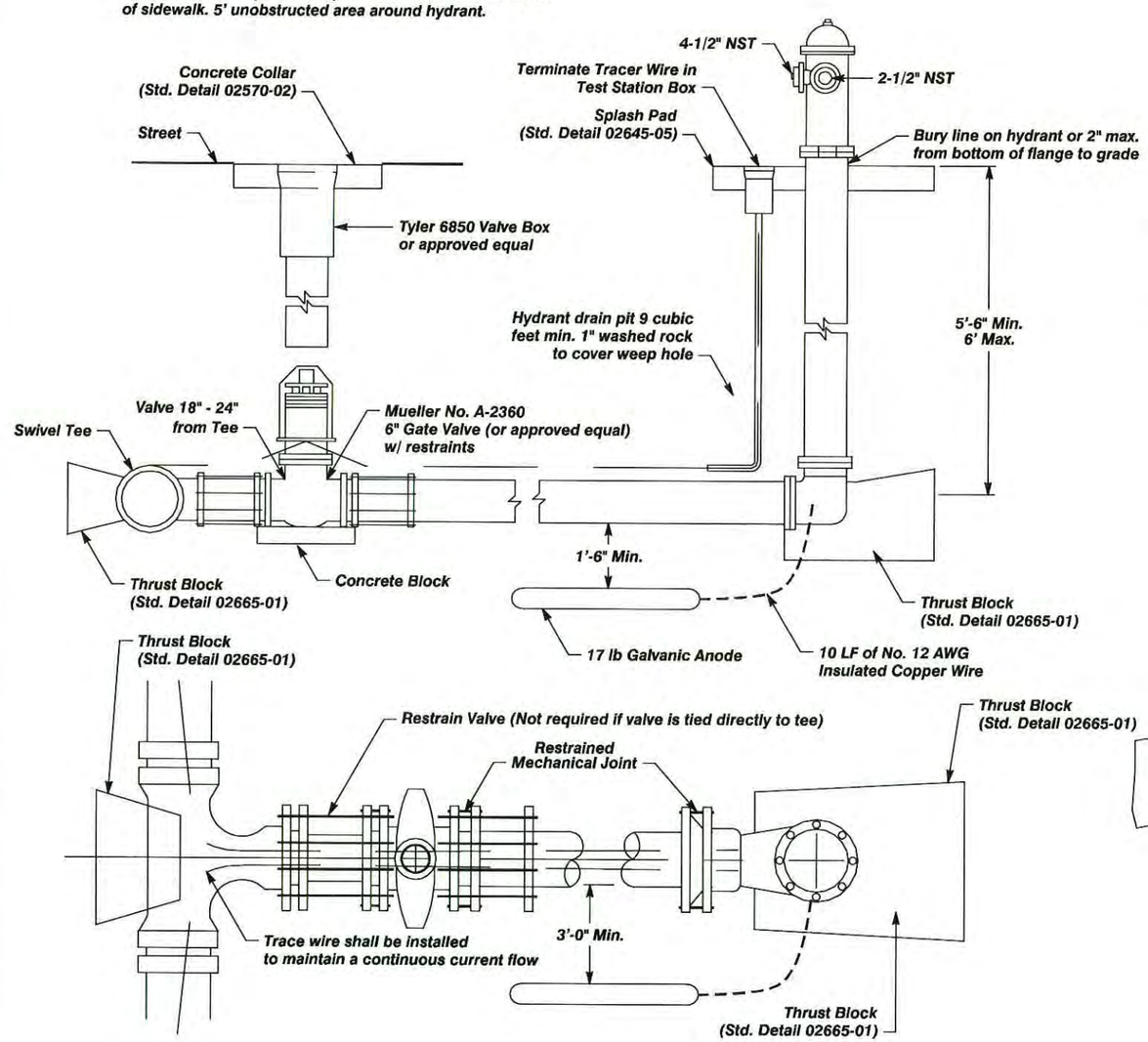
3/26/2010 K:\City of Gillette\10034\Sheets\10034_d01.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	116	

FIRE HYDRANT INSTALLATION

(DRAWING NO. 02645-01)
N.T.S.

FIRE HYDRANT:
Mueller Super Centurion 250 or American Flow Waterous Pacer WB-67-250 (5¼" barrel) 18" back of curb or 18" back of sidewalk. 5' unobstructed area around hydrant.

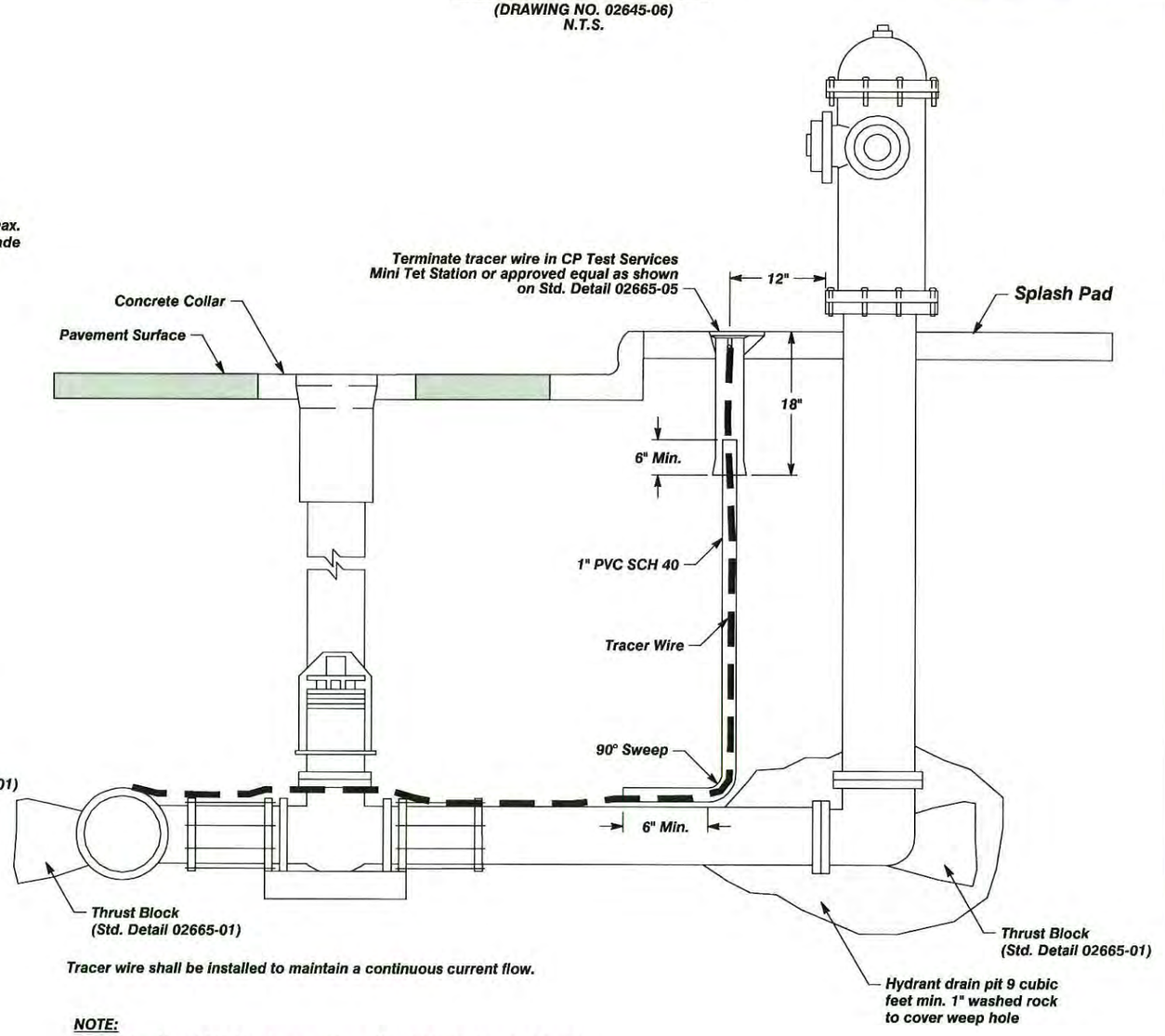


NOTES:

1. Wrap all D.I. fittings with 8 mil. polyethylene in accordance with ANSI/AWWA A21.5/C105.
2. The 6" pipe connection from the water main to the hydrant will be direct. Vertical or horizontal offset using elbows shall not be allowed.
3. Tracer wire shall be installed per Standard Detail 02645-06.
4. Mars Company, Zinc Anode Caps along with a Mechanical Joint Shoe may be used in place of the 17lb Galvanic Anode Bags.
5. Drawing No. 02645-01 referenced from City of Gillette Standard Details.

FIRE HYDRANT TRACER WIRE

(DRAWING NO. 02645-06)
N.T.S.



Tracer wire shall be installed to maintain a continuous current flow.

NOTE:

1. Drawing No. 02645-06 referenced from City of Gillette Standard Details.

WATER MAIN DETAILS
(WYO 50)

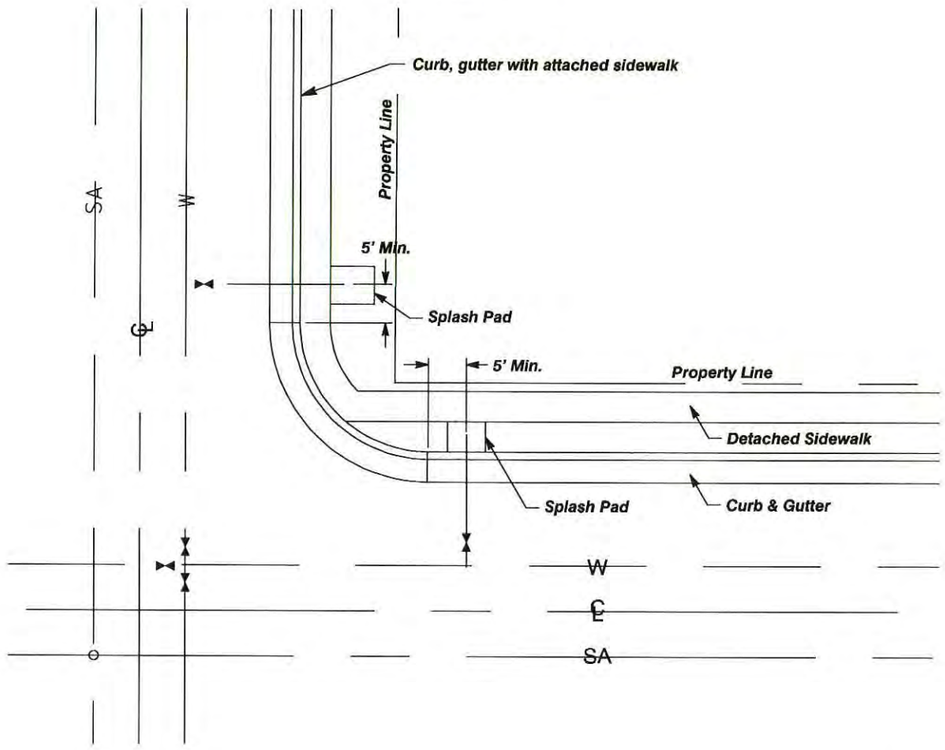
SHEET 10 OF 14

3/26/2010 k:\city of gillette\10034\sheets\10034 d02.dgn

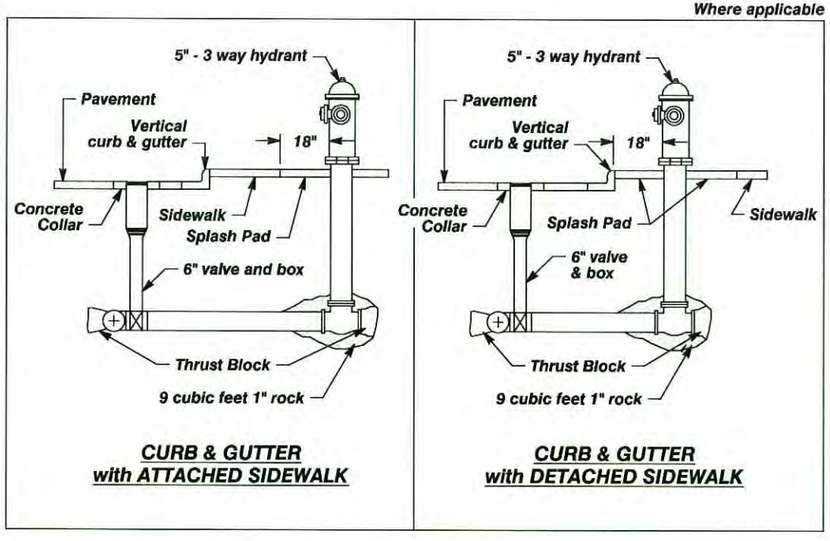
STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	117	

FIRE HYDRANT PLACEMENT

(DRAWING NO. 02645-02)
N.T.S.

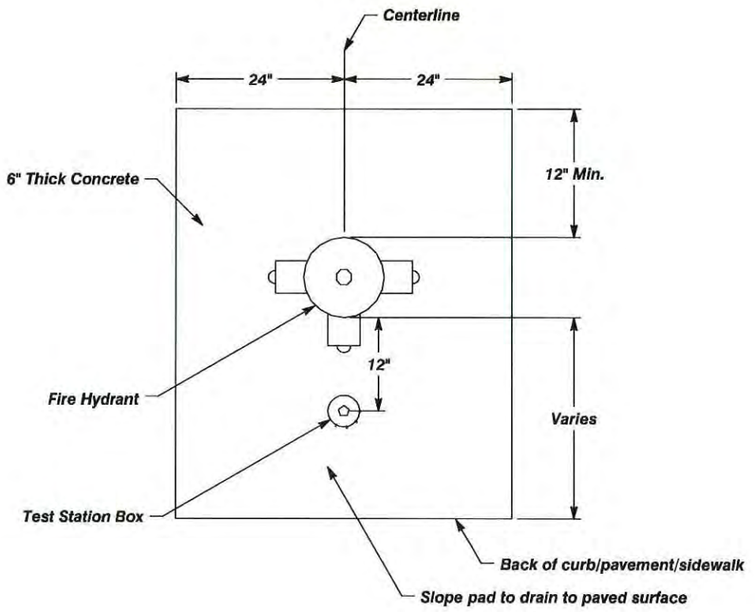


Where applicable



SPLASH PAD FOR FIRE HYDRANT DETAIL

(DRAWING NO. 02645-05)
N.T.S.



NOTE:
1. Drawing No. 02645-05 referenced from City of Gillette Standard Details.

WATER MAIN DETAILS (WYO 50)

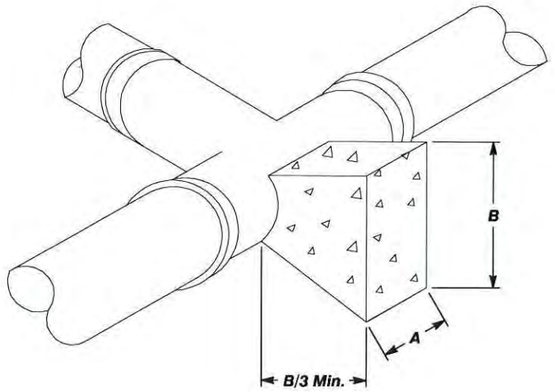
SHEET 11 OF 14

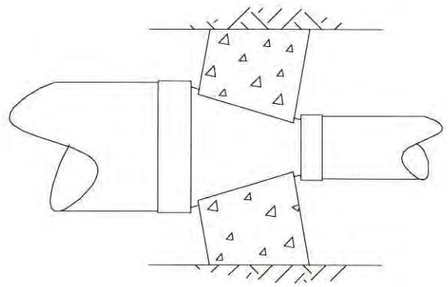
3/26/2010 k:\city of gillette\10034\sheets\10034_d02.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	118	

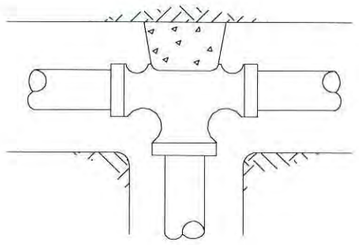
THRUST BLOCKING FOR WATER MAIN FITTINGS

(DRAWING NO. 02665-01)
N.T.S.

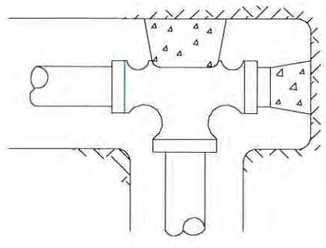




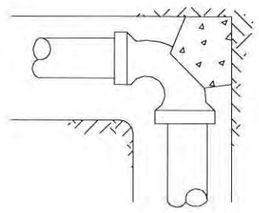
REDUCER



TEE



TEE (PLUGGED)



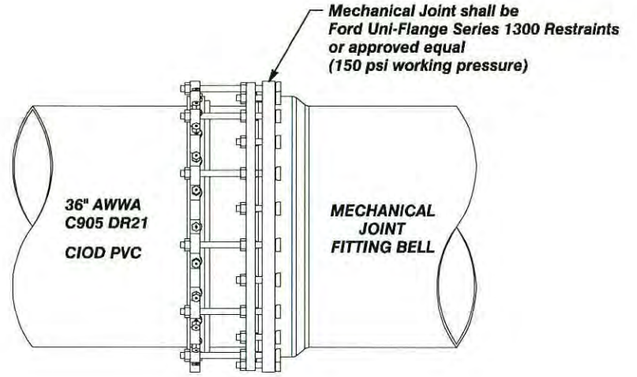
BEND

DIMENSION FOR THRUST BLOCKING								
FITTING SIZES	TEES & PLUGS		90° BEND		45° BEND & WYES		REDUCERS, 11-¼° 22-1/2° BENDS	
	A	B	A	B	A	B	A	B
4"	1'-7"	1'-2"	1'-9"	1'-6"	1'-8"	0'-10"	1'-7"	0'-6"
6"	2'-0"	1'-11"	2'-5"	2'-2"	1'-10"	1'-7"	1'-9"	0'-10"
8"	2'-8"	2'-6"	3'-2"	3'-0"	2'-5"	2'-1"	1'-9"	1'-6"
10"	3'-4"	3'-3"	4'-0"	3'-10"	3'-0"	2'-9"	2'-2"	1'-11"
12"	4'-0"	3'-10"	4'-8"	4'-8"	3'-8"	3'-3"	2'-7"	2'-3"
14"	5'-5"	3'-10"	6'-6"	4'-11"	4'-9"	3'-5"	3'-5"	2'-5"
36"	8'-0"	5'-0"	RESTRAINED FITTINGS & JOINTS		RESTRAINED FITTINGS & JOINTS		RESTRAINED FITTINGS & JOINTS	
	WITH RESTRAINTS							

NOTES:
1. Wrap all metallic fittings with 8 mil. polyethylene in accordance with ANSI/AWWA A21.5/C105.
2. Comply with Specification Section 02665 (Pipe Installation for water mains)
3. This table is based on 150 PSI Main Pressure 2000 PSF Soil Bearing Pressure.
4. For other conditions, size of thrust blocks must be computed and approved by Engineer.
5. All thrust blocks must be placed against undisturbed soil.
6. Joints and fittings shall be restrained as specified on the drawings.
7. Thrust blocks for tees shall have dimensions as above according to the pipe size of the branch/bullhead side of the tee.
8. Drawing No. 02665-01 referenced from City of Gillette Standard Details.

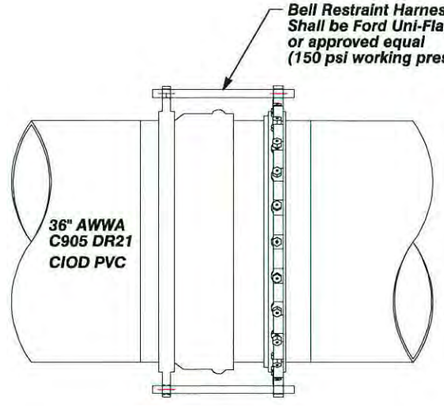
MECHANICAL JOINT RESTRAINTS

N.T.S.



BELL RESTRAINT HARNESS

N.T.S.



WATER MAIN DETAILS (WYO 50)

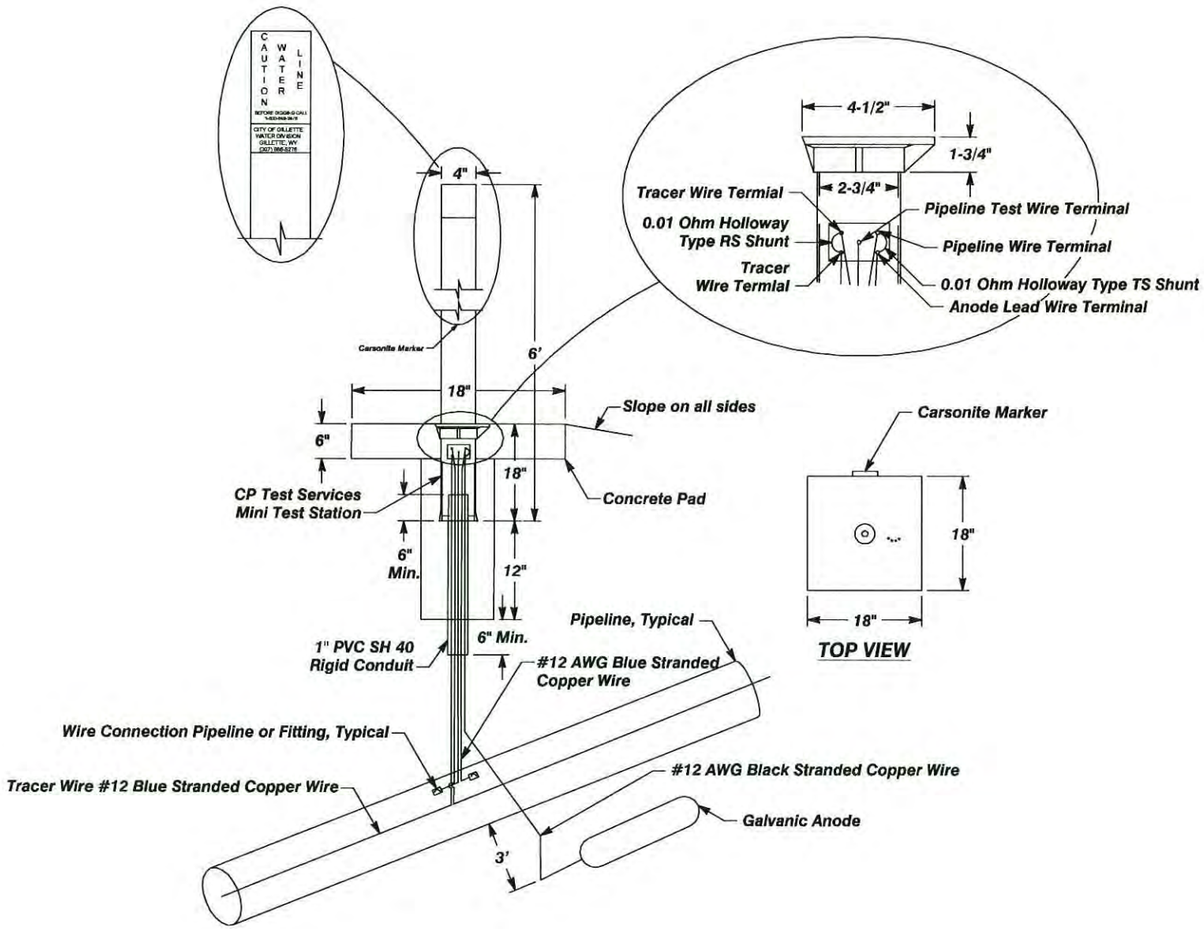
SHEET 12 OF 14

3/26/2010 k:\city of gillette\10034\sheets\10034 d03.dgn

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	119	

CATHODIC PROTECTION/TRACER WIRE TEST STATIONS

(DRAWING NO. 02665-05)
N.T.S.

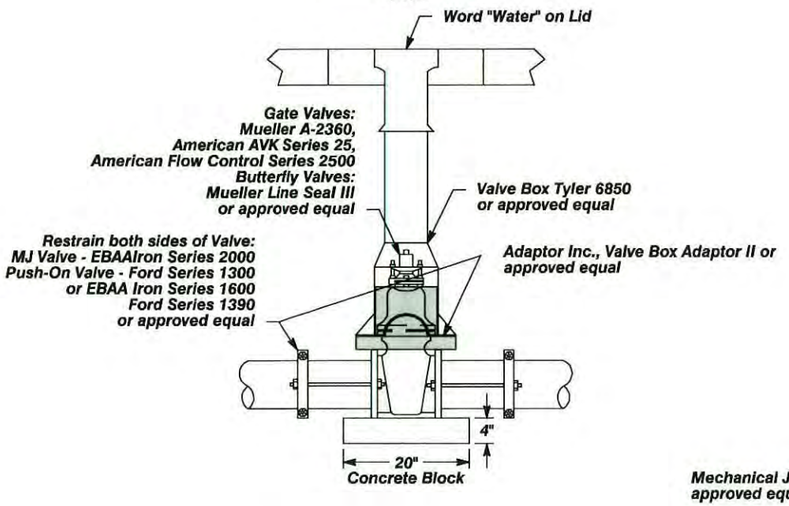


NOTES:

1. Install Galvanic Anode 1' below pipeline invert elevation.
2. Provide sufficient slack in test wires/tracer wires to allow terminal block to extend 18" out of test station.
3. Carsonite Markers shall be required only in non-urban areas.
4. If Cathodic protection is not required and a Test Station is provided exclusively for trace wire, a two (2) terminal Test Station is acceptable.
5. Drawing No. 02665-05 referenced from City of Gillette Standard Details.

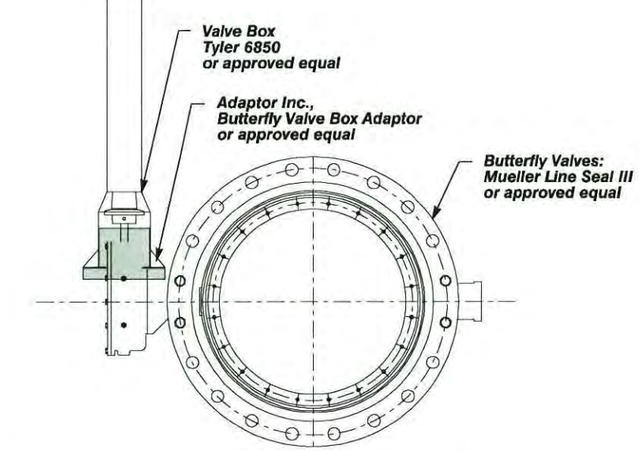
WATER MAIN VALVES

(DRAWING NO. 02665-02)
N.T.S.



Mechanical Joint Valve: Ford Series 1300 or approved equal.

Push-on Joint Valve: Ford Series 1300, Ford Series 1390, or approved equal (150 psi working pressure).



NOTES:

1. Fire Hydrant Isolation Valves may be restrained directly to the tee.
2. All Valves 14" and larger are required to be Butterfly Valves.
3. When a valve is located at a fitting, (tee, cross's, etc...), it must be installed 18" to 24" away from the fitting.
4. Drawing No. 02665-02 referenced from City of Gillette Standard Details.

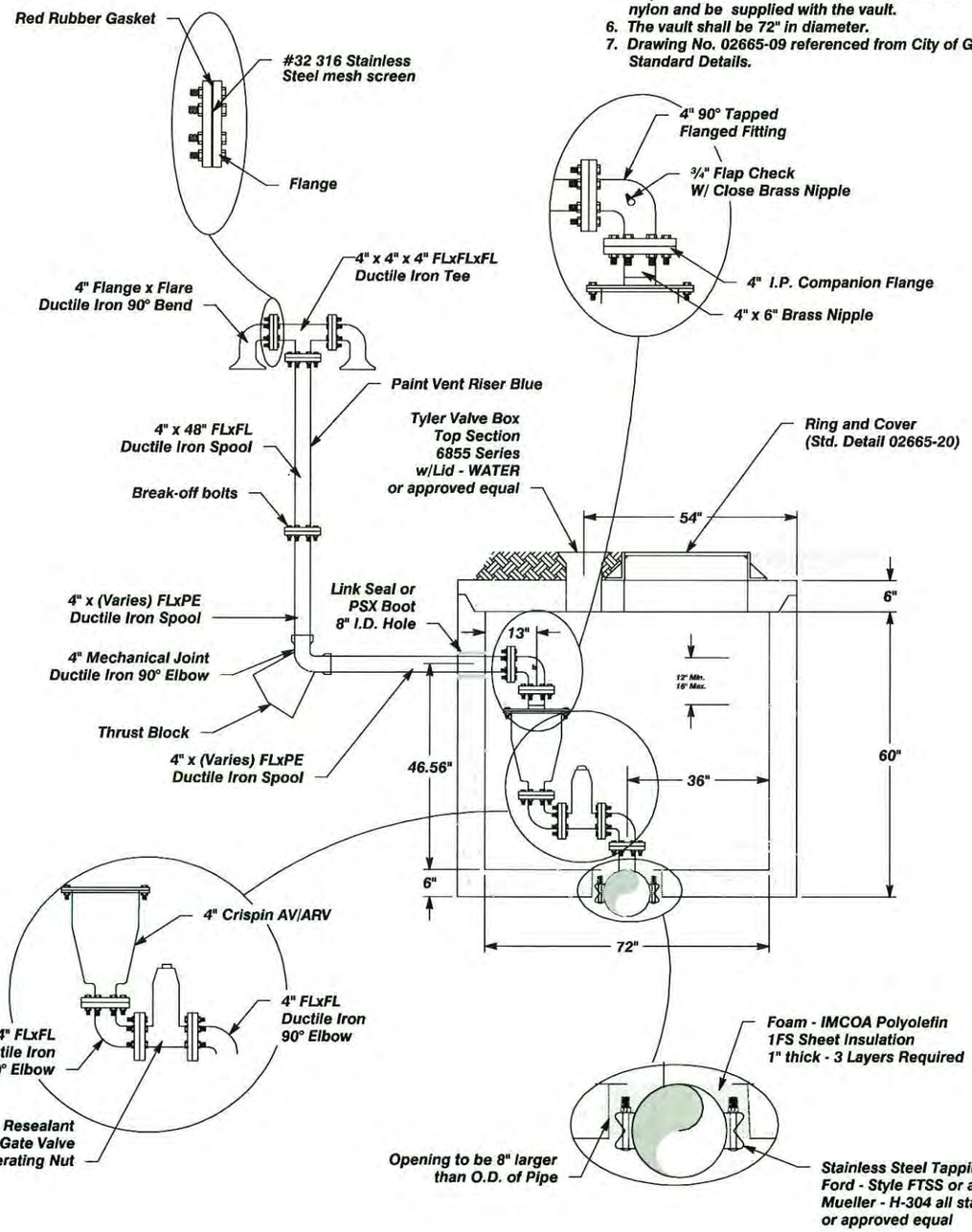
WATER MAIN DETAILS (WYO 50)

SHEET 13 OF 14

STATE OF WYOMING	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	0007162	120	

4" AIR VACUUM AIR RELEASE VALVE

(DRAWING NO. 02665-09)
N.T.S.



NOTES:

1. Concrete - Class B
2. Reinforcement - ASTM A-615 Grade 60 and A-185 WWF.
3. Cement - Type V or Type II with W/C ratio < 0.45.
4. ASTM C-478 governs.
5. Steps shall be non corrosive rubber coated aluminum or nylon and be supplied with the vault.
6. The vault shall be 72" in diameter.
7. Drawing No. 02665-09 referenced from City of Gillette Standard Details.

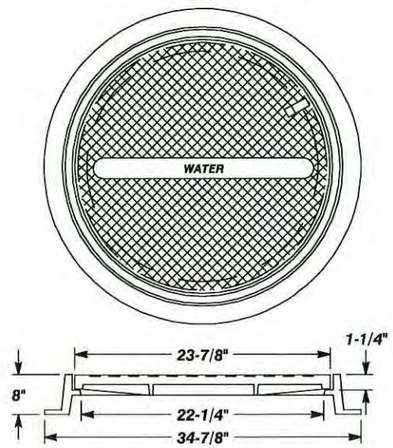
WATER ACCESS MANHOLE RING & COVER

(DRAWING NO. 02665-20)
N.T.S.

DEETER - #1258
NEENAH - #R-1649
or approved equal

MATERIAL: Cast gray iron
ASTM A-48 Class 35B

FINISH: No paint
LID: SELF SEALING

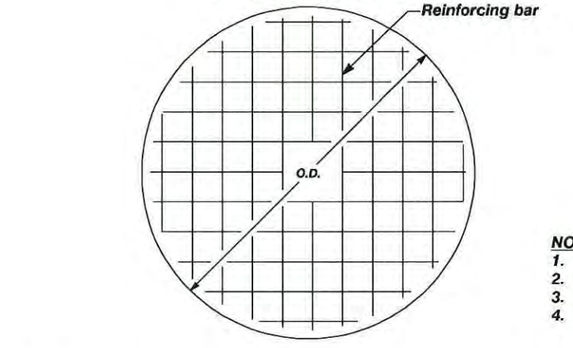


NOTES:

1. Furnished with machined horizontal bearing surface.
2. When ordering specify lettering on cover
3. Drawing No. 02665-20 referenced from City of Gillette Standard Details.

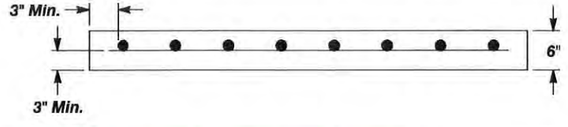
MANHOLE BASES

(DRAWING NO. 02200-04)



NOTES:

1. Bases may be cast in place or precast.
2. All concrete shall be City Class B.
3. Bases to be placed on undisturbed soil.
4. Drawing No. 02200-04 referenced from City of Gillette Standard Details.



MANHOLE SIZE	BASE O.D.	BASE REINFORCING	TOTAL WT.
48"	64"	#4@8" EACH WAY	1675+
60"	78"	#4@8" EACH WAY	2409+
72"	92"	#4@6" EACH WAY	3465+

WATER MAIN DETAILS (WYO 50)

SHEET 14 OF 14

3/26/2010 k:\city of gillette\10034\sheets\10034 d03.dgn