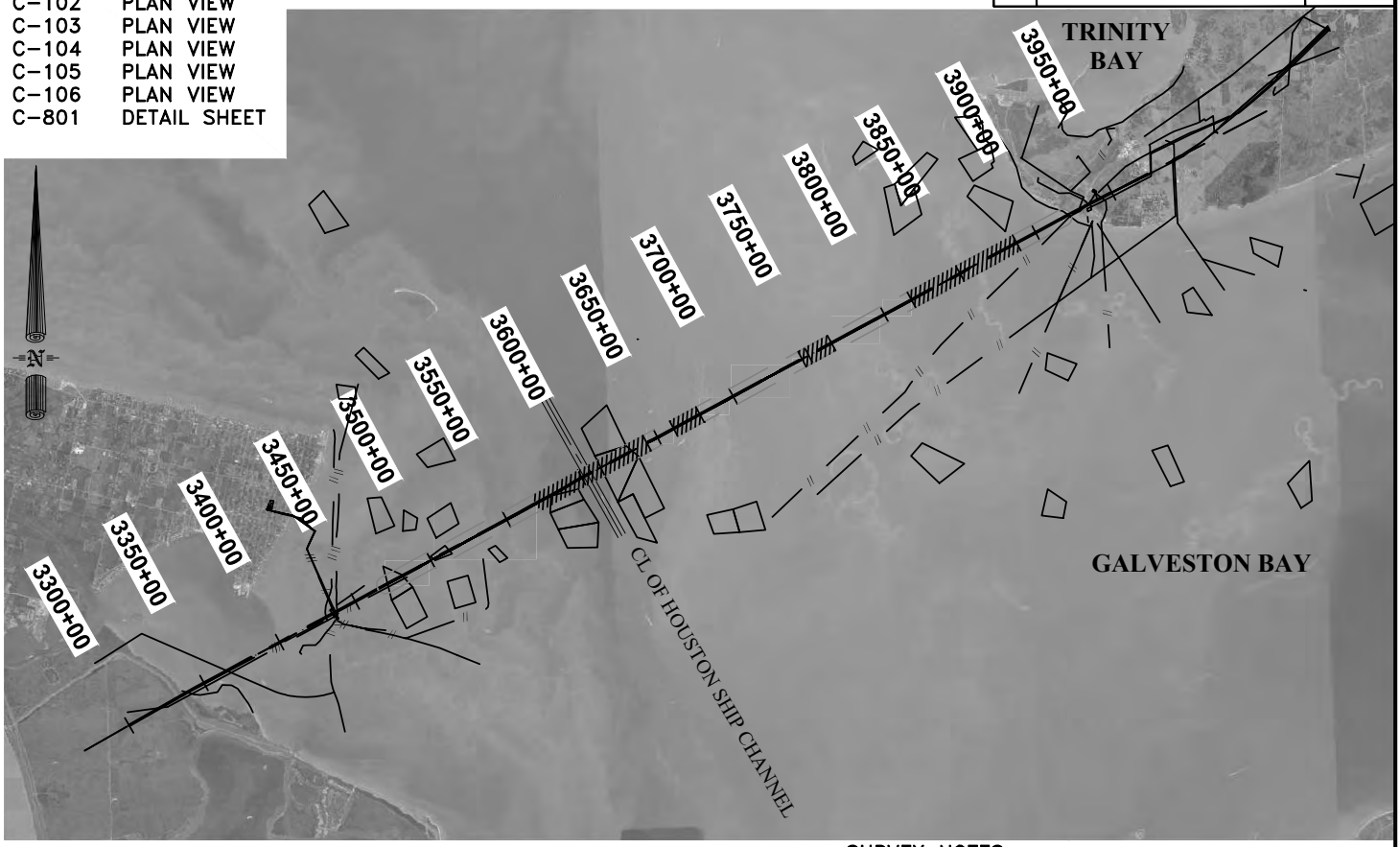
SHEET INDEX:

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



0' 10000' 20000' 30000'

SCALE: 1"=10000'

SURVEY NOTES:

1. SURVEY INFORMATION SHOWN PROVIDED BY T. BAKER SMITH DRAWING: "DEPTH OF COVER SURVEY" FOR FLORIDA GAS TRANSMISSION DATED 07/31/2018 & 02/26/2019. WATER DEPTHS DETERMINED FROM SURVEY DATED 07/31/2018.
2. ALL LOCATIONS OF UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE.

ARMORING LOCATIONS

STA. START (MAT BEGINNING)	STA. END (MAT ENDING)	LAT. (START)	LON. (START)	LAT. (END)	LON. (END)	COVER	WATER DEPTH	DISTANCE (LINEAR FT.)	MAT COUNT
3469+85	3498+37	29.47210	94.90004	29.47560	94.89201	2.0'-3.0'	8.0'-9.6'	2,852	150
3502+02	3569+30	29.47604	94.89098	29.48425	94.87203	1.0'-3.0'	8.5'-10.5'	6,728	354
3643+44	3660+18	29.49339	94.85121	29.49541	94.84648	1.0'-3.0'	11'-13.5'	1,674	88
3678+20	3696+84	29.49763	94.84141	29.49988	94.83615	1.0'-3.0'	9.5'-12.5'	2,064	98
3698+76	3737+16	29.50012	94.83561	29.50484	94.82481	1.0'-3.0'	9.5'-13.0'	3,840	202
3739+53	3744+87	29.50512	94.82414	29.50577	94.82263	0.0'-2.5'	9.5'-12.0'	534	28
3765+15	3796+33	29.50826	94.81693	29.51205	94.80814	0.0'-2.5'	10.0'-11.0'	3,118	164
3799+01	3817+27	29.51238	94.80738	29.51459	94.80223	0.0'-2.5'	9.0'-10.0'	1,826	96
3915+86	3918+16	29.52664	94.77445	29.52692	94.77381	2.5'-3.0'	2.0'-3.0'	230	12
							TOTAL	22,866	1,192

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FLORIDA GAS
24" PIPELINE
SHALLOW COVER
GALVESTON COUNTY
GALVESTON, TEXAS

Florida Gas Transmission Company
An Energy Transfer/Kinder Morgan Affiliate

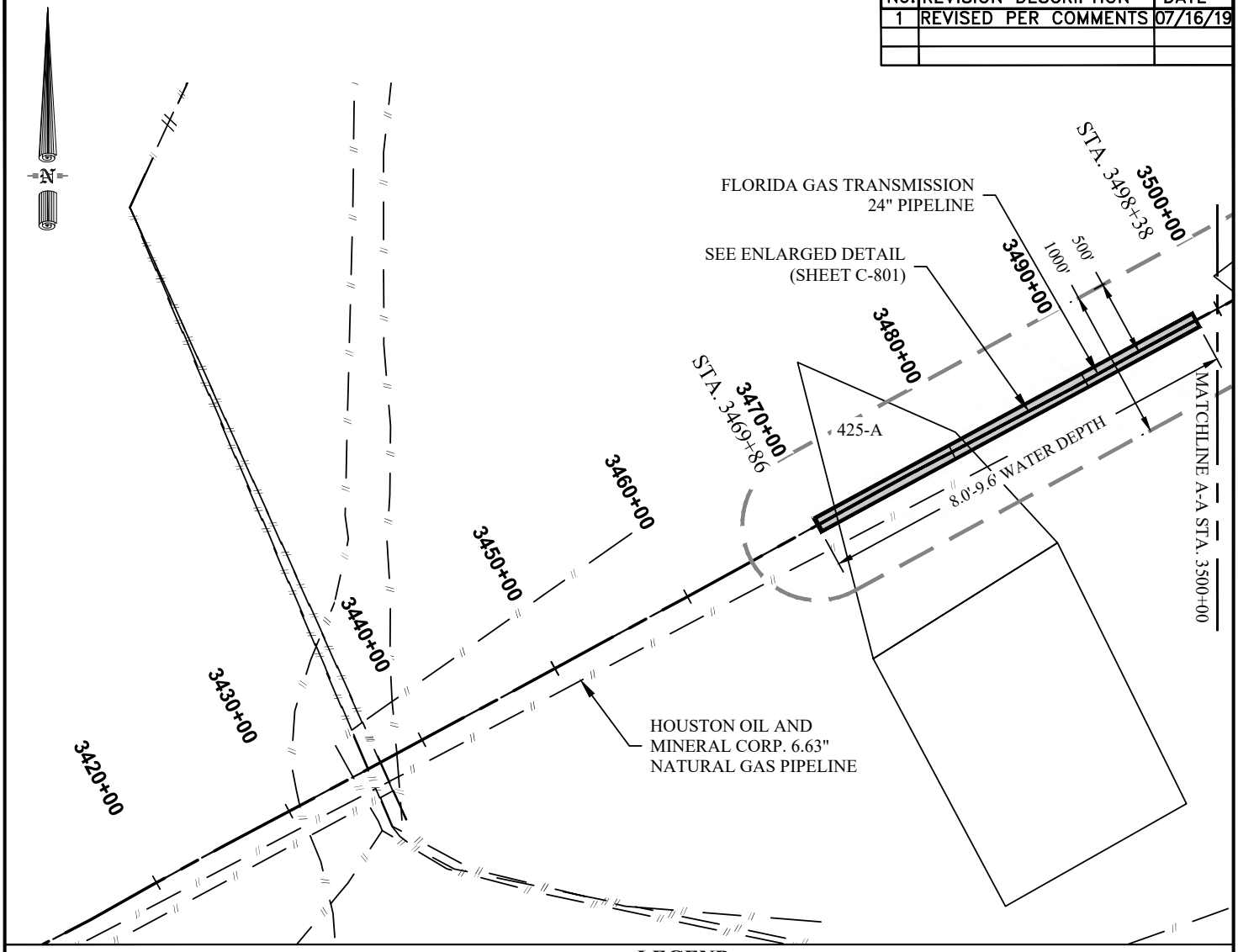
FOR PERMITTING ONLY

DATE: 06/13/2019 | DWN: KJD
PROJECT No: 15693 | CHK: JMF
CONTACT: | PHONE No:

SHEET TITLE: OVERALL VIEW

SHEET No: C-100

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



ARMORING LOCATIONS

STA. START (MAT BEGINNING)	STA. END (MAT ENDING)	LAT. (START)	LON. (START)	LAT. (END)	LON. (END)	COVER	WATER DEPTH	DISTANCE (LINEAR FT.)	MAT COUNT
3469+85	3498+37	29.47210	94.90004	29.47560	94.89201	2.0'-3.0'	8.0'-9.6'	2,852	150

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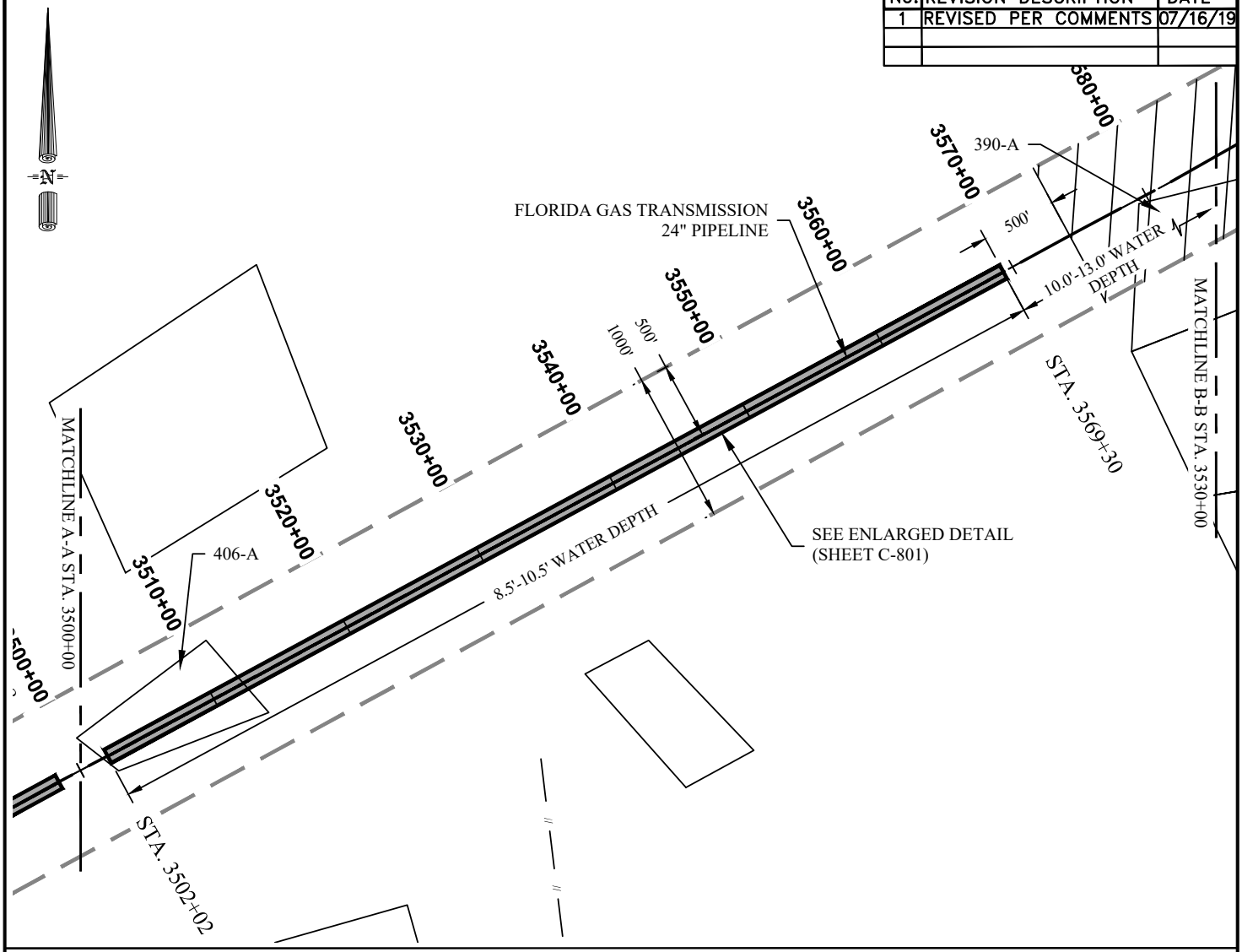
PROJECT No: 15693 | CHK: JMF
CONTACT: | PHONE No:

SHEET TITLE: PLAN VIEW

SHEET No: C-101

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



LEGEND:

- BURIED PIPELINE
- MAT LOCATIONS
- PROPOSED WORK AREA
- PROPOSED ACCESS ONLY
- 409-A — APPROXIMATE OYSTER LEASE BOUNDARY /DESIGNATION
- APPROXIMATE PIPELINE LOCATION

0' 1000' 2000' 3000'

SCALE: 1"=1000'

ARMORING LOCATIONS

STA. START (MAT BEGINNING)	STA. END (MAT ENDING)	LAT. (START)	LON. (START)	LAT. (END)	LON. (END)	COVER	WATER DEPTH	DISTANCE (LINEAR FT.)	MAT COUNT
3502+02	3569+30	29.47604	94.89098	29.48425	94.87203	1.0'-3.0'	8.5'-10.5'	6,728	354

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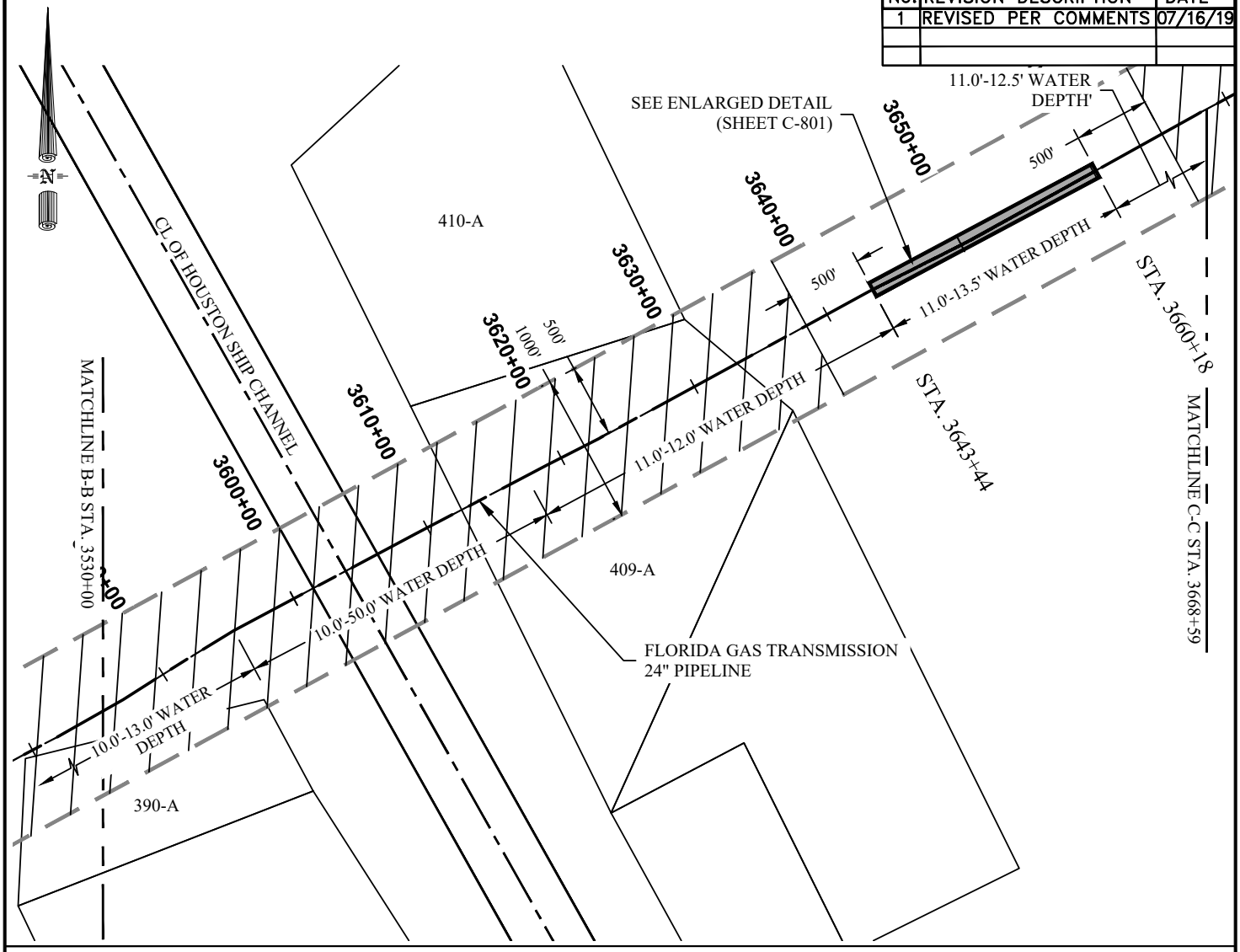
DATE: 06/13/2019 | DWN: KJD
PROJECT No: 15693 | CHK: JMF
CONTACT: | PHONE No:

SHEET TITLE: PLAN VIEW

SHEET No: C-102

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



LEGEND:

- BURIED PIPELINE
- MAT LOCATIONS
- PROPOSED WORK AREA
- PROPOSED ACCESS ONLY
- 409-A — APPROXIMATE OYSTER LEASE BOUNDARY /DESIGNATION
- APPROXIMATE PIPELINE LOCATION

0' 1000' 2000' 3000'

SCALE: 1"=1000'

ARMORING LOCATIONS

STA. START (MAT BEGINNING)	STA. END (MAT ENDING)	LAT. (START)	LON. (START)	LAT. (END)	LON. (END)	COVER	WATER DEPTH	DISTANCE (LINEAR FT.)	MAT COUNT
3643+44	3660+18	29.49339	94.85121	29.49541	94.84648	1.0'-3.0'	11.0'-13.5'	1,674	88

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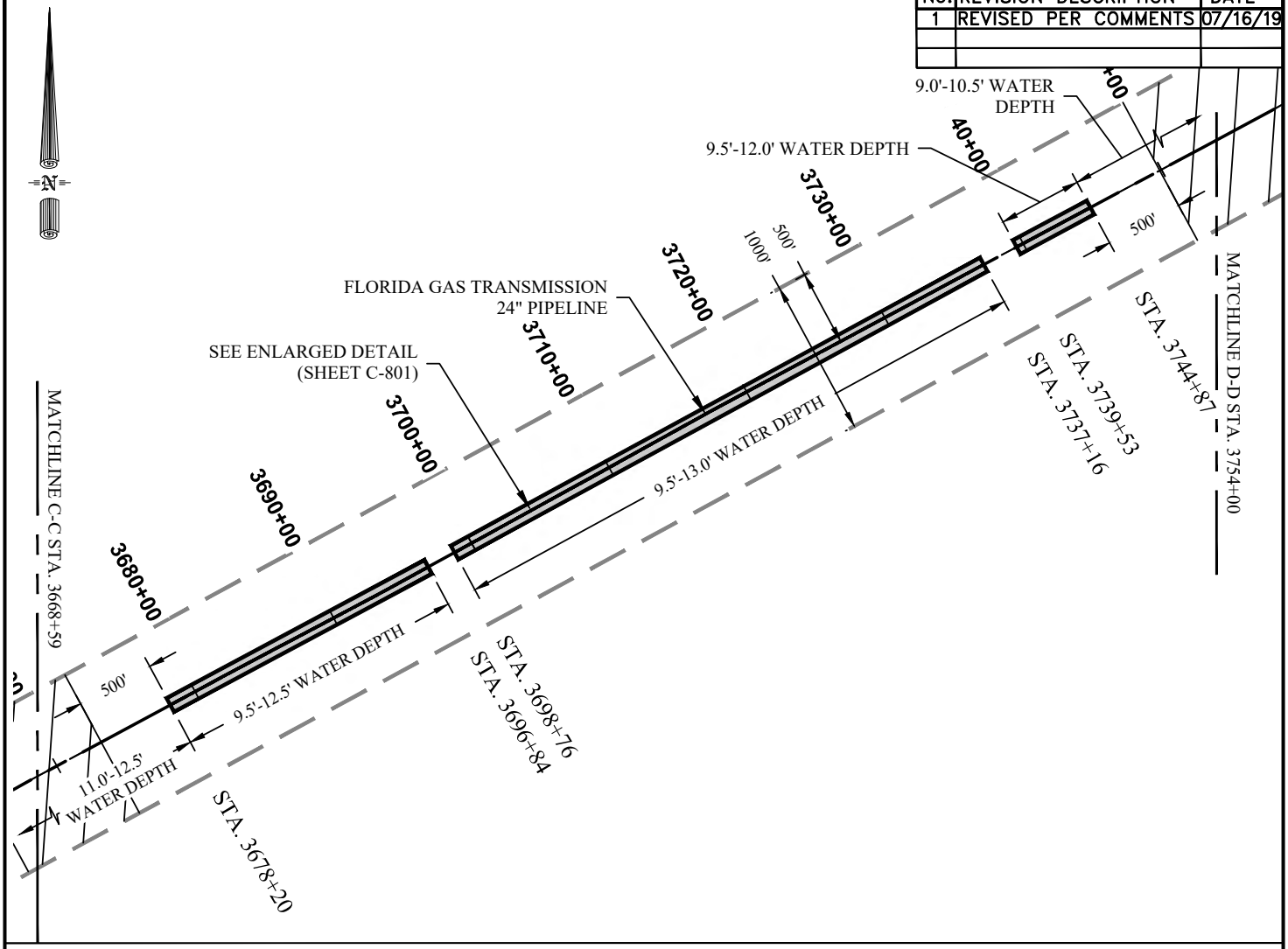
CONTACT: | PHONE No:

SHEET TITLE: PLAN VIEW

SHEET No: C-103

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



LEGEND:

- BURIED PIPELINE
- MAT LOCATIONS
- PROPOSED WORK AREA
- PROPOSED ACCESS ONLY
- 409-A — APPROXIMATE OYSTER LEASE BOUNDARY /DESIGNATION
- APPROXIMATE PIPELINE LOCATION

0' 1000' 2000' 3000'

SCALE: 1"=1000'

ARMORING LOCATIONS

STA. START (MAT BEGINNING)	STA. END (MAT ENDING)	LAT. (START)	LON. (START)	LAT. (END)	LON. (END)	COVER	WATER DEPTH	DISTANCE (LINEAR FT.)	MAT COUNT
3678+20	3696+84	29.49763	94.84141	29.49988	94.83615	1.0'-3.0'	9.5'-12.5'	2,064	98
3698+76	3737+16	29.50012	94.83561	29.50484	94.82481	1.0'-3.0'	9.5'-13.0'	3,840	202
3739+53	3744+87	29.50512	94.82414	29.50577	94.82263	0.0'-2.5'	9.5'-12.0'	534	28

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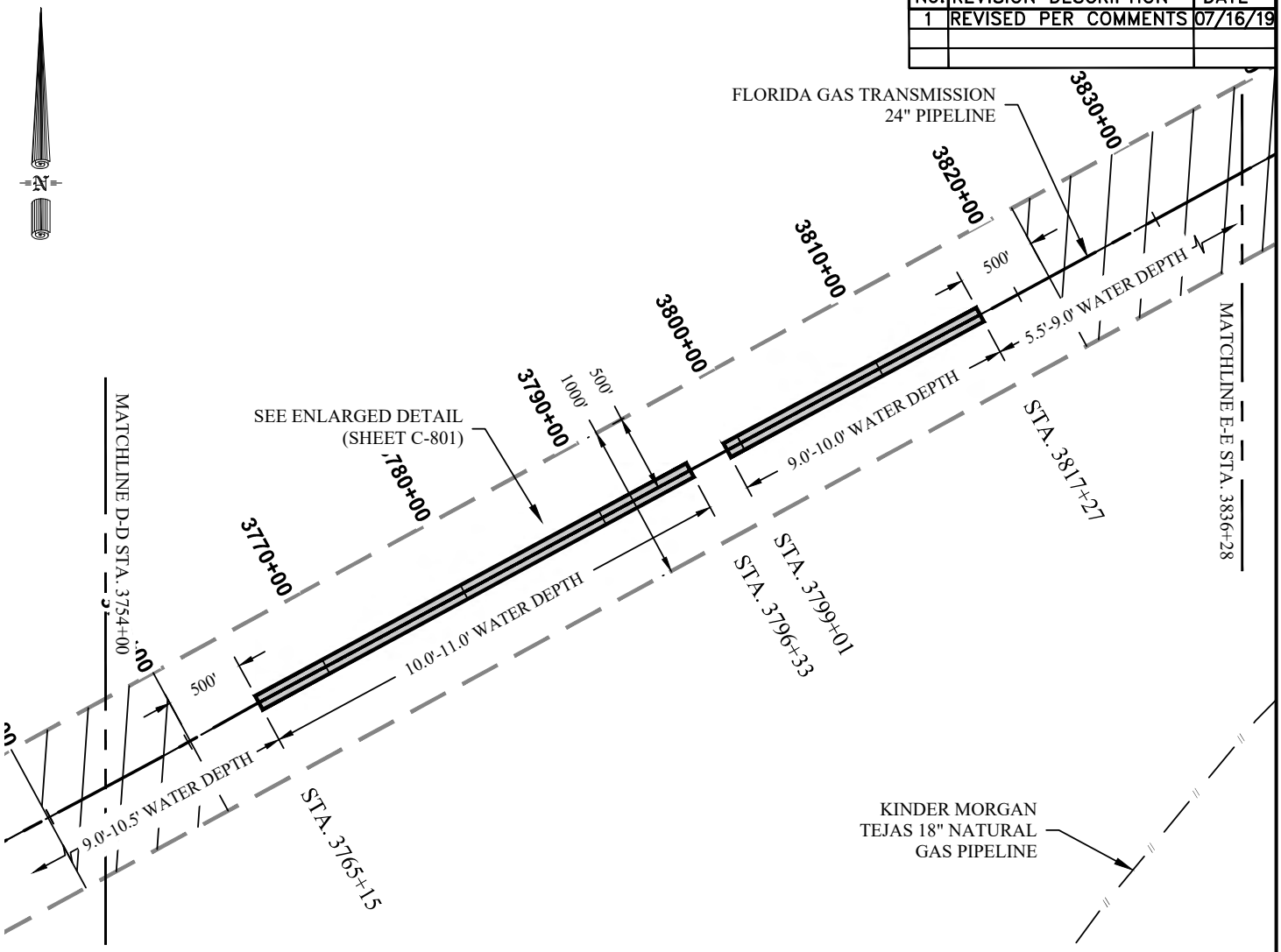
SHEET TITLE: PLAN VIEW

SHEET No: C-104

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



LEGEND:

- BURIED PIPELINE
- MAT LOCATIONS
- PROPOSED WORK AREA
- PROPOSED ACCESS ONLY
- 409-A — APPROXIMATE OYSTER LEASE BOUNDARY /DESIGNATION
- APPROXIMATE PIPELINE LOCATION

0' 1000' 2000' 3000'

SCALE: 1"=1000'

ARMORING LOCATIONS

STA. START (MAT BEGINNING)	STA. END (MAT ENDING)	LAT. (START)	LON. (START)	LAT. (END)	LON. (END)	COVER	WATER DEPTH	DISTANCE (LINEAR FT.)	MAT COUNT
3765+15	3796+33	29.50826	94.81693	29.51205	94.80814	0.0'-2.5'	10.0'-11.0'	3,118	164
3799+01	3817+27	29.51238	94.80738	29.51459	94.80223	0.0'-2.5'	9.0'-10.0'	1,826	96

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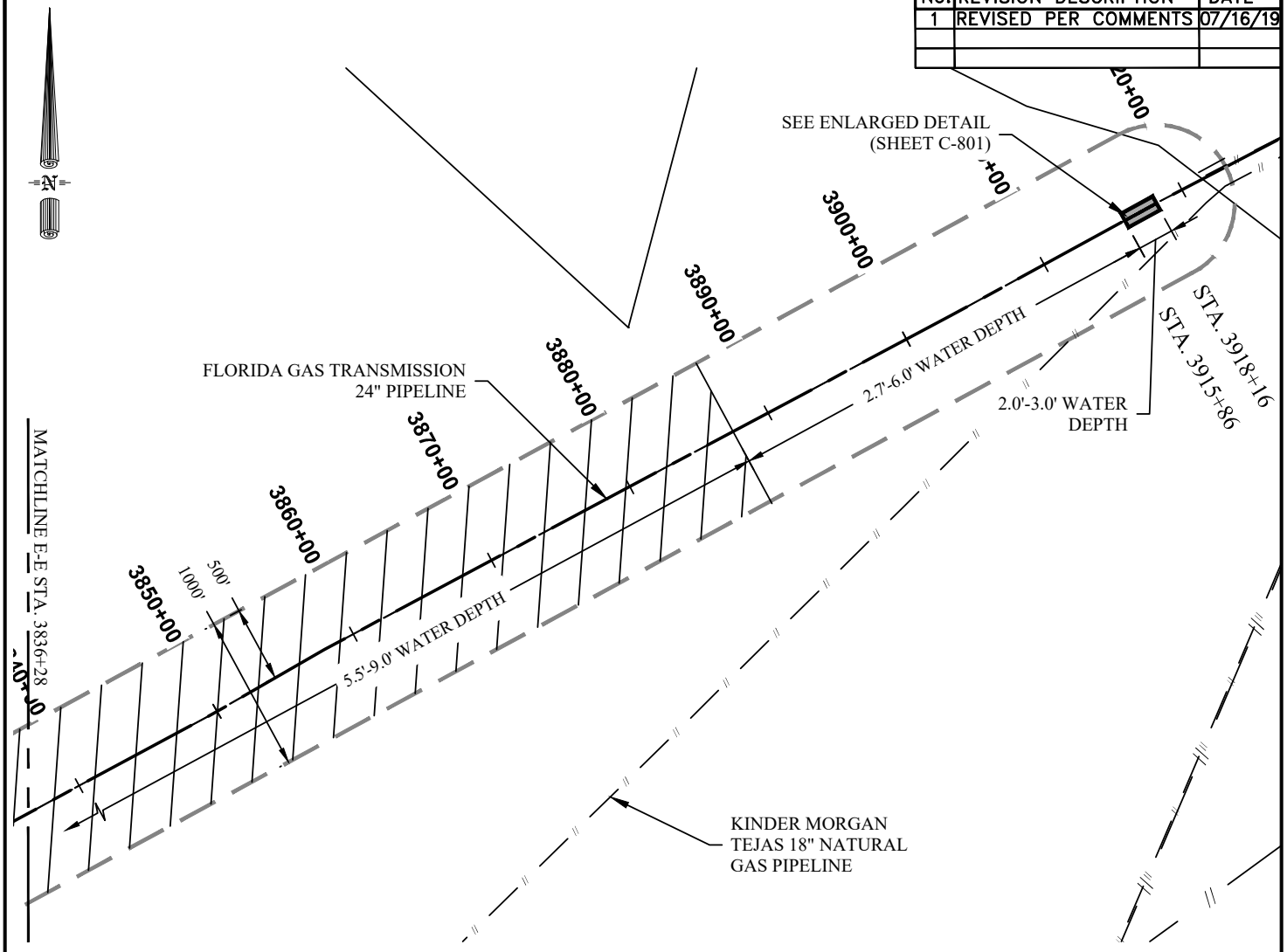
CONTACT: | PHONE No:

SHEET TITLE: PLAN VIEW

SHEET No: C-105

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



LEGEND:

- BURIED PIPELINE
- MAT LOCATIONS
- PROPOSED WORK AREA
- PROPOSED ACCESS ONLY
- 409-A — APPROXIMATE OYSTER LEASE BOUNDARY /DESIGNATION
- APPROXIMATE PIPELINE LOCATION

0' 1000' 2000' 3000'

SCALE: 1"=1000'

ARMORING LOCATIONS

STA. START (MAT BEGINNING)	STA. END (MAT ENDING)	LAT. (START)	LON. (START)	LAT. (END)	LON. (END)	COVER	WATER DEPTH	DISTANCE (LINEAR FT.)	MAT COUNT
3915+86	3918+16	29.52664	94.77445	29.52692	94.77381	2.5'-3.0'	2.0'-3.0'	230	12

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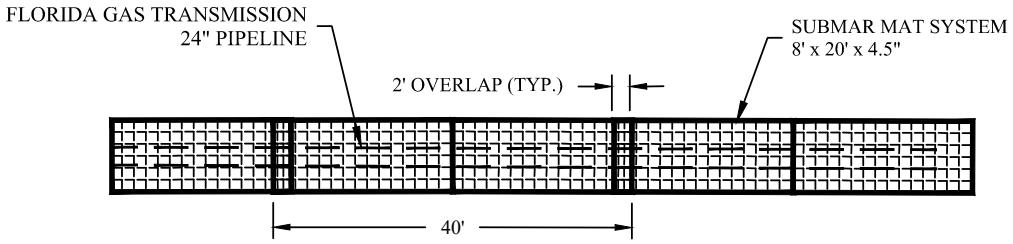
SHEET TITLE: PLAN VIEW

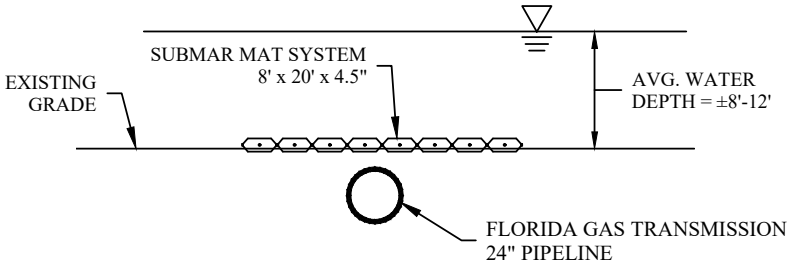
SHEET No: C-106

No.	REVISION DESCRIPTION	DATE
1	REVISED PER COMMENTS	07/16/19



TYP. MAT LAYOUT

SCALE: 1" = 20'



TYP. SECTION

SCALE: N.T.S.

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CONTACT: | PHONE No:

SHEET TITLE: DETAIL SHEET

SHEET No: C-801

Alternatives Analysis

1. **Alternative 1 – Do Nothing**

The "Do Nothing" alternative does not meet the Pipeline and Hazardous Material Safety Administration's (PHMSA) requirements to address shallow cover over the existing pipeline. Florida Gas is obligated to inspect the pipeline (DOT 195), repair any defects, and correct any safety-related conditions. The pipeline needs to be covered adequately to function as it was originally designed and shallow cover areas must be addressed due to the increased potential for corrosion or flowing debris or vessels striking the pipeline. This pipeline was designed so that the surrounding soil would provide restraining forces to counteract possible loads that could cause pipeline failure. Eroded areas along the pipeline, if left alone, will result in areas of unsupported pipe that would be subject to stress and subsequent failure. Areas of the pipeline with shallow cover are also vulnerable to pipeline strikes by vessels. The cost of a "Do Nothing" approach is immeasurable since the failure of this high-pressure pipeline can result in severe damage/harm to personnel and the surrounding environment. Therefore, the "Do Nothing" alternative is not a feasible option.

2. **Alternative 2 – Lowering the Pipelines (Open Cut Trenching)**

In order to lower the existing pipeline to an adequate depth below the existing streambed, significant jetting/excavation would be required. Jetting this reach of pipeline would create a great amount of suspended sediment in the water column, which could adversely impact adjacent oyster populations. This relatively large disturbance area could have lasting effects on the existing wildlife habitat and ecological system. Environmental impacts would be most unfavorable for this alternative.

In addition to having the most significant impact on the area, this alternative requires the shutdown of pipeline operations, purging the pipelines, cutting and welding the pipelines back together at a lower elevation while maintaining gradual slopes, and protecting the integrity of the pipelines from complications due to increased backfill loads. With pipeline separation, cutting, welding, and additional loads due to backfill, the risks of incident and repair complexity increase. This alternative is not as expensive as Alternative 3 but does require shutdown of the pipelines for completion of the work and has the most impact on the streambed and banks.

3. **Alternative 3 – Lowering the Pipeline (Horizontal Directional Drilling)**

Horizontal directional drilling (HDD) is a trenchless method of pipe installation where a pipeline is bored underground using a surface-launched drilling rig. This method has minimal impacts on the environment and surrounding area but is the most expensive option. Similar to the open cut trenching option, HDD would require the shutdown of pipeline operations for tying in to the existing pipeline. Due to the length of shallow-covered pipeline in this reach, the option for HDD would be excessive in terms of time required for repair and the total cost.

If HDD is used to install new deeper piping, the old pipe would need to be remediated so it would no longer be a hazard to navigation. Three potential methods of remediation include removal by excavation, lowering the pipe by open cut trenching, or covering the pipe with articulating concrete mattresses. Removal by excavation would disrupt oyster beds and distribute silt over other nearby areas. Lowering the pipe by excavation would cause similar environmental issues as in Alternative 2 above. Covering the disused pipe

with articulating concrete mattresses would result in environmental impacts as described in Alternative 4 (below).

4. Alternative 4 – Articulating Concrete Mattresses (ACMs)

The use of ACMs will restore cover to the pipeline and stabilize the streambed while protecting the existing pipeline. An ACM system is a proven pipeline protection and streambank stabilization technique when correctly installed. No adverse effects to water flows or impoundments are expected due to the low hydraulic profile of the ACMs (4.5" thick). Additionally, the voids in the ACMs will allow alluvial sediment to settle, re-establishing the native habitat function of the streambed. Case studies also have shown that the ACMs provide a valuable habitat for aquatic resources, including oysters. Some disruption to the local habitat can be expected during construction, but construction duration is estimated to be significantly shorter than Options 2 and 3. The ACM option, although expensive, can be completed quickly without disrupting pipeline operations. Because of these factors, installation of ACMs is the preferred option.