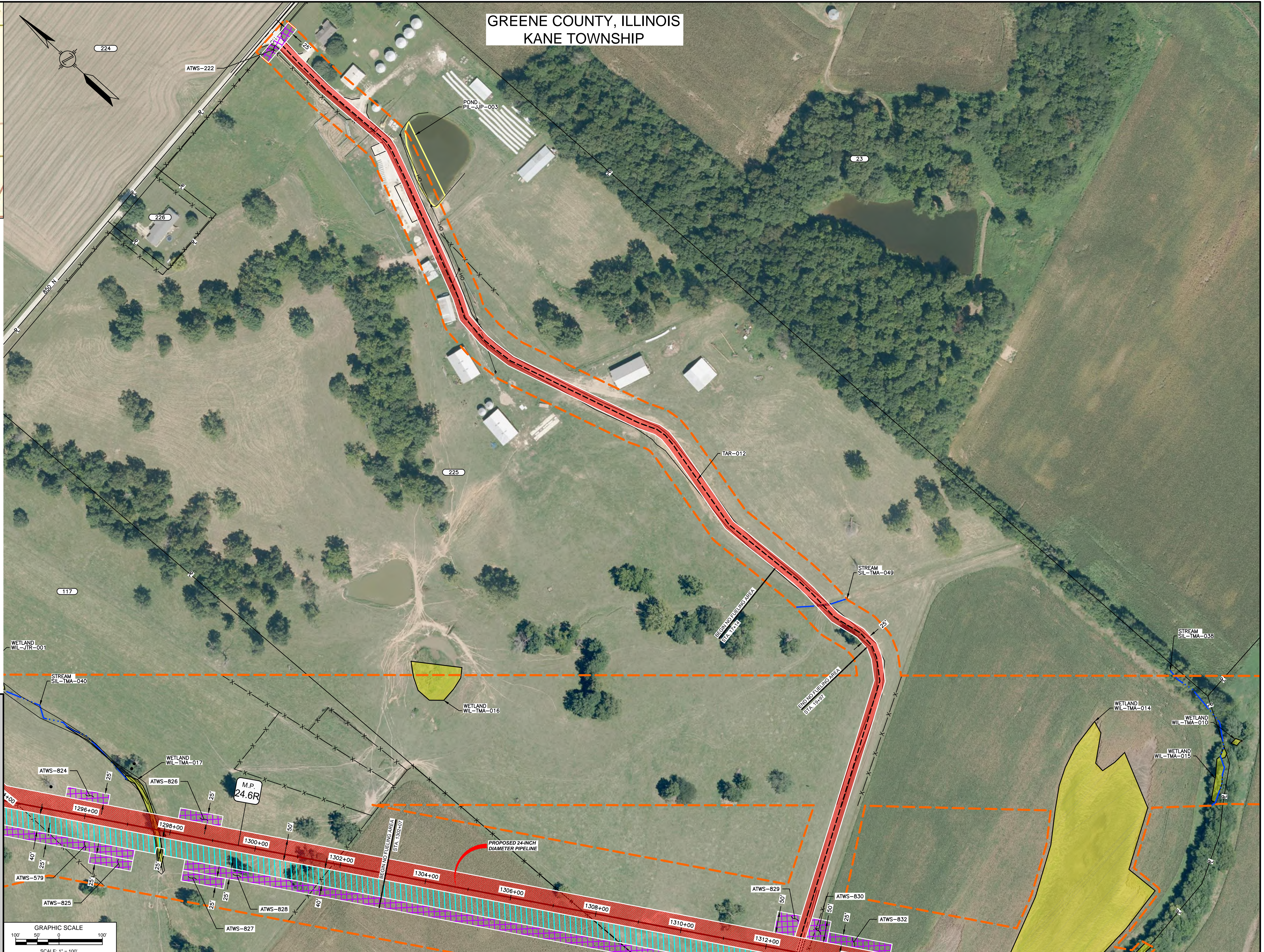


GREENE COUNTY, ILLINOIS  
KANE TOWNSHIP



LOCATION MAP  
N.T.S.



NOTES:  
1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-NWI AND USGS.  
2. EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE, AND SHALL BE VERIFIED BY CONTRACTOR.

**LEGEND**

- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- PROPOSED STAGING AREA
- ACCESS ROAD
- COMMON SURVEY CORRIDOR
- PROPOSED 24-INCH DIAMETER PIPELINE
- EXISTING CLIENT PIPELINE
- EXISTING FOREIGN PIPELINE
- OVERHEAD POWER LINE
- EXISTING FIBER OPTIC LINE
- M.M.I.D.
- PROPERTY LINE
- MUNICIPAL LINE
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- POND (DELINEATED)
- 1/2 OF STREAM (DESKTOP)
- 1/2 OF STREAM (DELINEATED)
- FENCE LINE

**GRAPHIC SCALE**  
100' 50' 0' 100'  
SCALE: 1" = 100'

REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS				REVISIONS				APPROVALS										
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTIONS	DATE	DRAWN	CK	APPR	NO.	DESCRIPTIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	
STLP-A-029	ALIGNMENT SHEET			0	ISSUE FOR CONSTRUCTION	01/2018	ACS	RJP	DGG	4	FERC SUPPLEMENTAL FILING	01/2018				ACS	04/2017	DGG	04/2017			
				2	ISSUE FOR FERC	01/2018				5	ISSUED FOR IMPLEMENTATION PLAN	05/2018				WAH	04/2017	JEW	04/2017			
				3	AMENDMENT TO FERC	01/2018																

PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**MOTT MACDONALD**

PROJECT: SPIRE STL PIPELINE PROJECT  
PROPOSED 24-INCH DIAMETER PIPELINE  
ACCESS ROAD SITE PLAN - TAR-012  
GREENE COUNTY, ILLINOIS

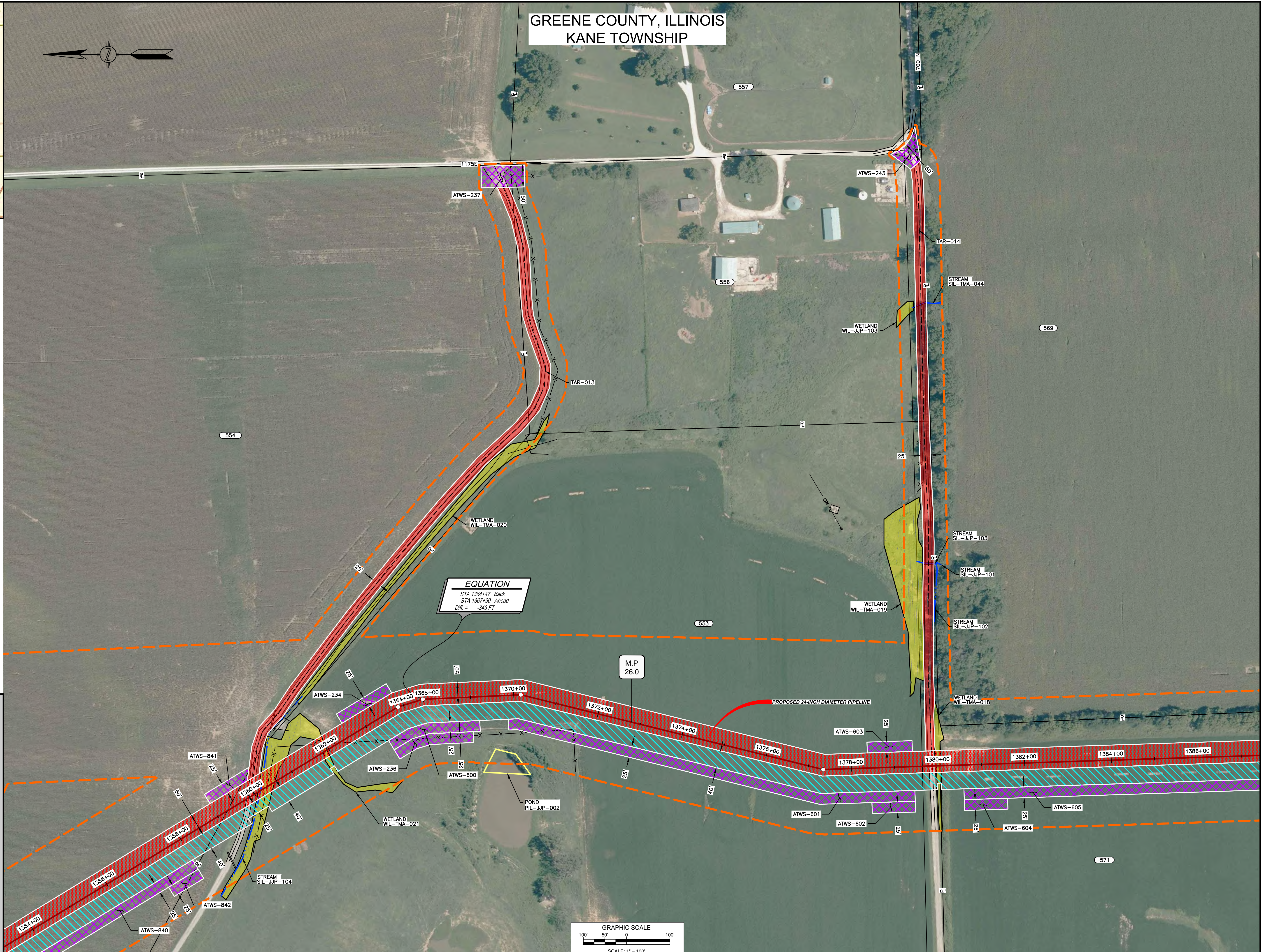
SCALE: 1" = 100'  
STLP-AR-001



GREENE COUNTY, ILLINOIS  
KANE TOWNSHIP



LOCATION MAP  
N.T.S.



**EQUATION**  
 STA 1364+47 Back  
 STA 1367+90 Ahead  
 Diff. = -343 FT

**NOTES:**  
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**LEGEND**

[Red Hatched Box]	PROPOSED PERMANENT EASEMENT
[Blue Hatched Box]	TEMPORARY WORKSPACE
[Purple Hatched Box]	ADDITIONAL TEMPORARY WORKSPACE (ATWS)
[Green Hatched Box]	PROPOSED STAGING AREA
[Red Dashed Line]	ACCESS ROAD
[Orange Dashed Line]	COMMON SURVEY CORRIDOR
[Red Line with Circle]	PROPOSED 24-INCH DIAMETER PIPELINE
[Red Line with Dash]	EXISTING CLIENT PIPELINE
[Red Line with Tick]	EXISTING FOREIGN PIPELINE
[Black Line with Tick]	OVERHEAD POWER LINE
[Black Line with Tick]	EXISTING FIBER OPTIC LINE
[Circle with 123]	M MID
[Line with Tick]	PROPERTY LINE
[Line with Tick]	MUNICIPAL LINE
[Green Wavy Line]	WETLAND (DESKTOP)
[Green Solid Line]	WETLAND (DELINEATED)
[Yellow Solid Line]	POND (DELINEATED)
[Blue Dotted Line]	5' OF STREAM (DESKTOP)
[Blue Dotted Line]	5' OF STREAM (DELINEATED)
[X]	FENCE LINE

REFERENCE DRAWINGS	DWG. NO.	TITLE
STLP-A-030		ALIGNMENT SHEET
STLP-A-031		ALIGNMENT SHEET

REFERENCE DRAWINGS	DWG. NO.	TITLE

REVISIONS			
NO.	DESCRIPTIONS	DATE	DRAWN
1	ISSUE FOR CONSTRUCTION	01/2018	ACS
2	ISSUE FOR FERC	01/2018	RJP
3	AMENDMENT TO FERC	01/2018	DGG

REVISIONS			
NO.	DESCRIPTIONS	DATE	DRAWN
4	FERC SUPPLEMENTAL FILING	01/2018	DGG
5	ISSUED FOR IMPLEMENTATION PLAN	05/2018	DGG

APPROVALS			
DRAWN BY	DATE	ENG. APPROVAL	DATE
ACS	04/2017	DGG	04/2017
CHECKED BY	DATE	P.M. APPROVAL	DATE
WAH	04/2017	JEV	04/2017

PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**MOTT MACDONALD**

SPIRE STL PIPELINE PROJECT  
 PROPOSED 24-INCH DIAMETER PIPELINE  
 ACCESS ROAD SITE PLAN - TAR-013 & TAR-014  
 GREENE COUNTY, ILLINOIS







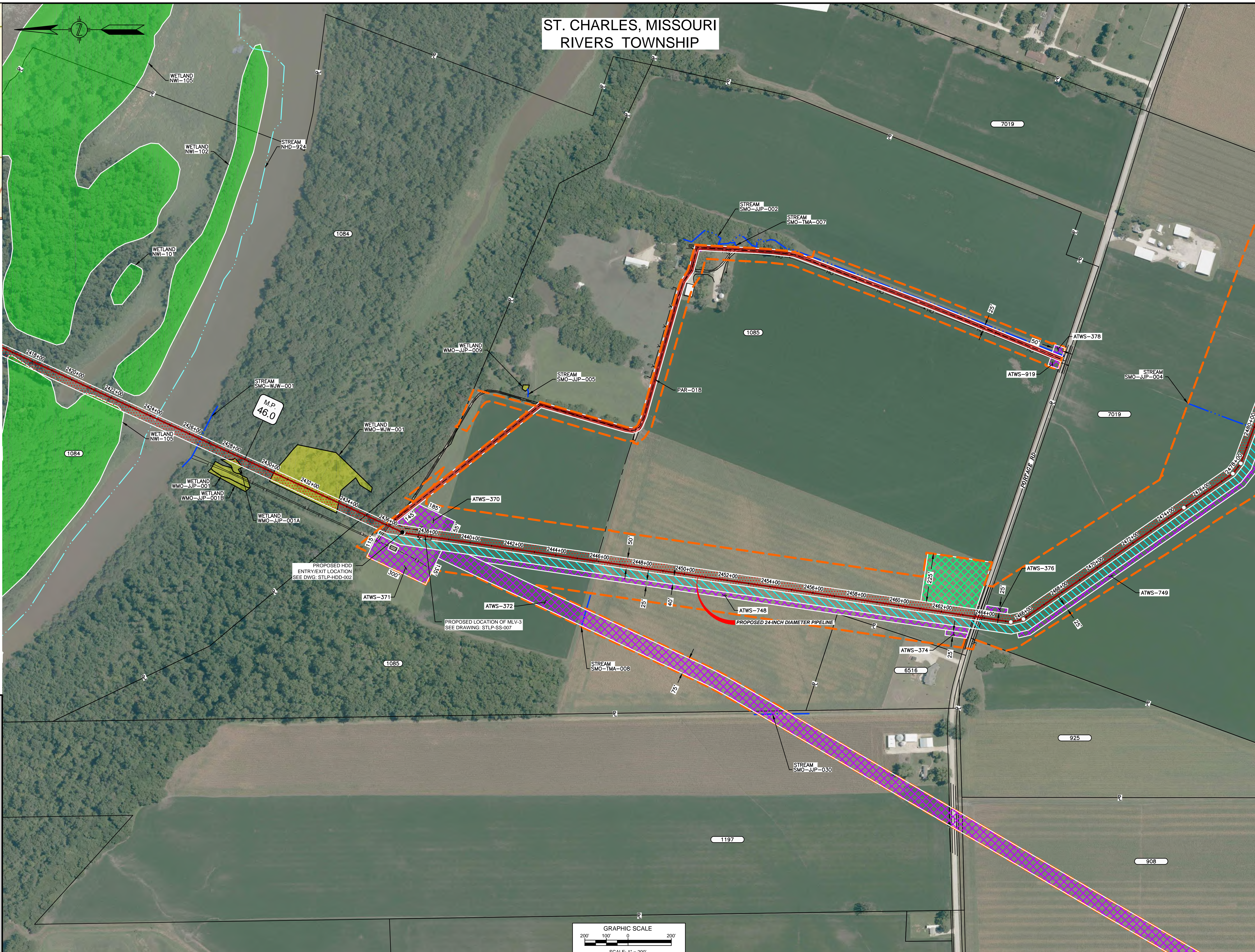




ST. CHARLES, MISSOURI  
RIVERS TOWNSHIP



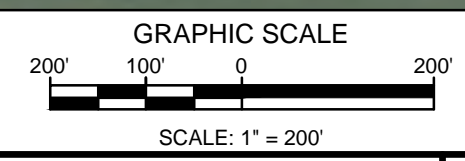
LOCATION MAP  
N.T.S.



NOTES:  
 1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-NWI AND USGS.  
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LEGEND

- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- PROPOSED STAGING AREA
- ACCESS ROAD
- COMMON SURVEY CORRIDOR
- PROPOSED 24-INCH DIAMETER PIPELINE
- EXISTING CLIENT PIPELINE
- EXISTING FOREIGN PIPELINE
- OVERHEAD POWER LINE
- EXISTING FIBER OPTIC LINE
- MMID
- PROPERTY LINE
- MUNICIPAL LINE
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- POND (DELINEATED)
- 5 OF STREAM (DESKTOP)
- 5 OF STREAM (DELINEATED)
- FENCE LINE



REFERENCE DRAWINGS				REVISIONS				APPROVALS									
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTIONS	DATE	DRAWN	CK	APPR	NO.	DESCRIPTIONS	DATE	DRAWN	CK	APPR	DATE	DATE
STLP-A-053	ALIGNMENT SHEET	STLP-SS-007	MLV SITE 3	0	ISSUE FOR CONSTRUCTION	01/2018	ACS	RJP	DGG	4	FERC SUPPLEMENTAL FILING	01/2018					
STLP-A-054	ALIGNMENT SHEET	STLP-RES-009	RESIDENTIAL SITE SPECIFIC	2	ISSUE FOR FERC	01/2018				5	ISSUED FOR IMPLEMENTATION PLAN	05/2018					
STLP-HDD-002	HDD PROFILE OVERVIEW			3	AMENDMENT TO FERC	01/2018											

PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**M MOTT MACDONALD**

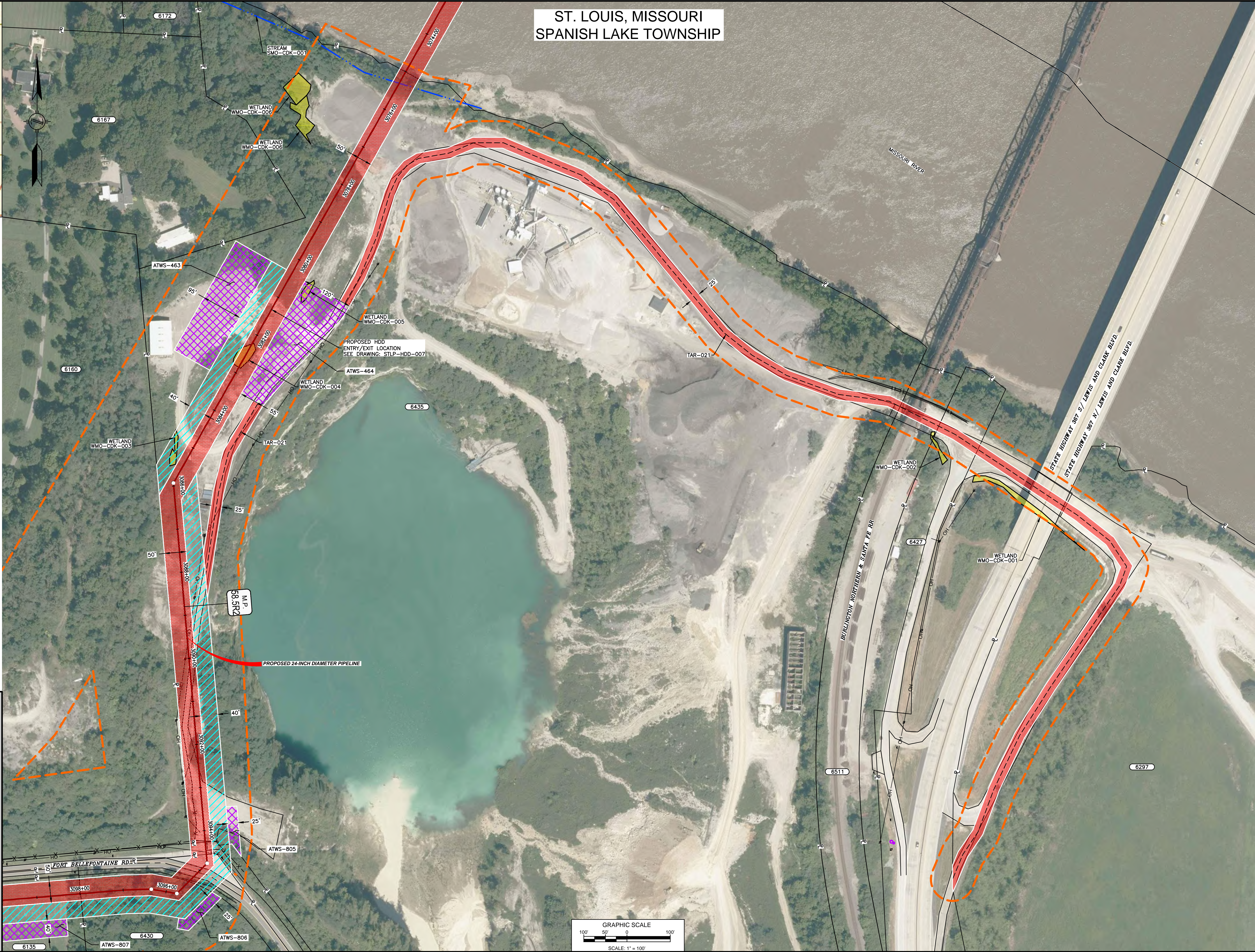
SPIRE STL PIPELINE PROJECT  
PROPOSED 24-INCH DIAMETER PIPELINE  
ACCESS ROAD SITE PLAN - PAR-018  
ST. CHARLES COUNTY, MISSOURI



ST. LOUIS, MISSOURI  
SPANISH LAKE TOWNSHIP

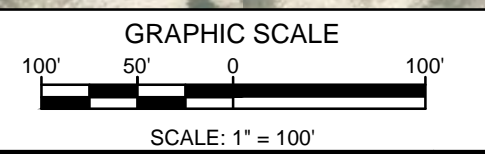


LOCATION MAP  
N.T.S.



NOTES:  
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LEGEND	
	PROPOSED PERMANENT EASEMENT
	TEMPORARY WORKSPACE
	ADDITIONAL TEMPORARY WORKSPACE (ATWS)
	PROPOSED STAGING AREA
	ACCESS ROAD
	COMMON SURVEY CORRIDOR
	PROPOSED 24-INCH DIAMETER PIPELINE
	EXISTING CLIENT PIPELINE
	EXISTING FOREIGN PIPELINE
	OVERHEAD POWER LINE
	EXISTING FIBER OPTIC LINE
	MMID
	PROPERTY LINE
	MUNICIPAL LINE
	WETLAND (DESKTOP)
	WETLAND (DELINEATED)
	POND (DELINEATED)
	∅ OF STREAM (DESKTOP)
	∅ OF STREAM (DELINEATED)
	FENCE LINE



REFERENCE DRAWINGS	
DWG. NO.	TITLE
STLP-A-069	ALIGNMENT SHEET
STLP-HDD-007	HDD PROFILE OVERVIEW - MISSOURI RIVER MAINLINE

REFERENCE DRAWINGS	
DWG. NO.	TITLE
6430	ATWS-807
6435	ATWS-806
6435	ATWS-805

REVISIONS			
NO.	DESCRIPTIONS	DATE	DRAWN
0	ISSUE FOR CONSTRUCTION	01/2018	ACS
2	ISSUE FOR FERC	01/2018	
3	AMENDMENT TO FERC	01/2018	

REVISIONS			
NO.	DESCRIPTIONS	DATE	DRAWN
4	FERC SUPPLEMENTAL FILING	01/2018	
5	ISSUED FOR IMPLEMENTATION PLAN	05/2018	

APPROVALS			
DRAWN BY	DATE	ENG. APPROVAL	DATE
RJP	01/2017	DGG	01/2017
CHECKED BY	DATE	P.M. APPROVAL	DATE
RJP	01/2017	JEV	01/2017



PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**MOTT MACDONALD**

SPIRE STL PIPELINE PROJECT  
PROPOSED 24-INCH DIAMETER PIPELINE  
ACCESS ROAD SITE PLAN - TAR-021  
ST. LOUIS, MISSOURI

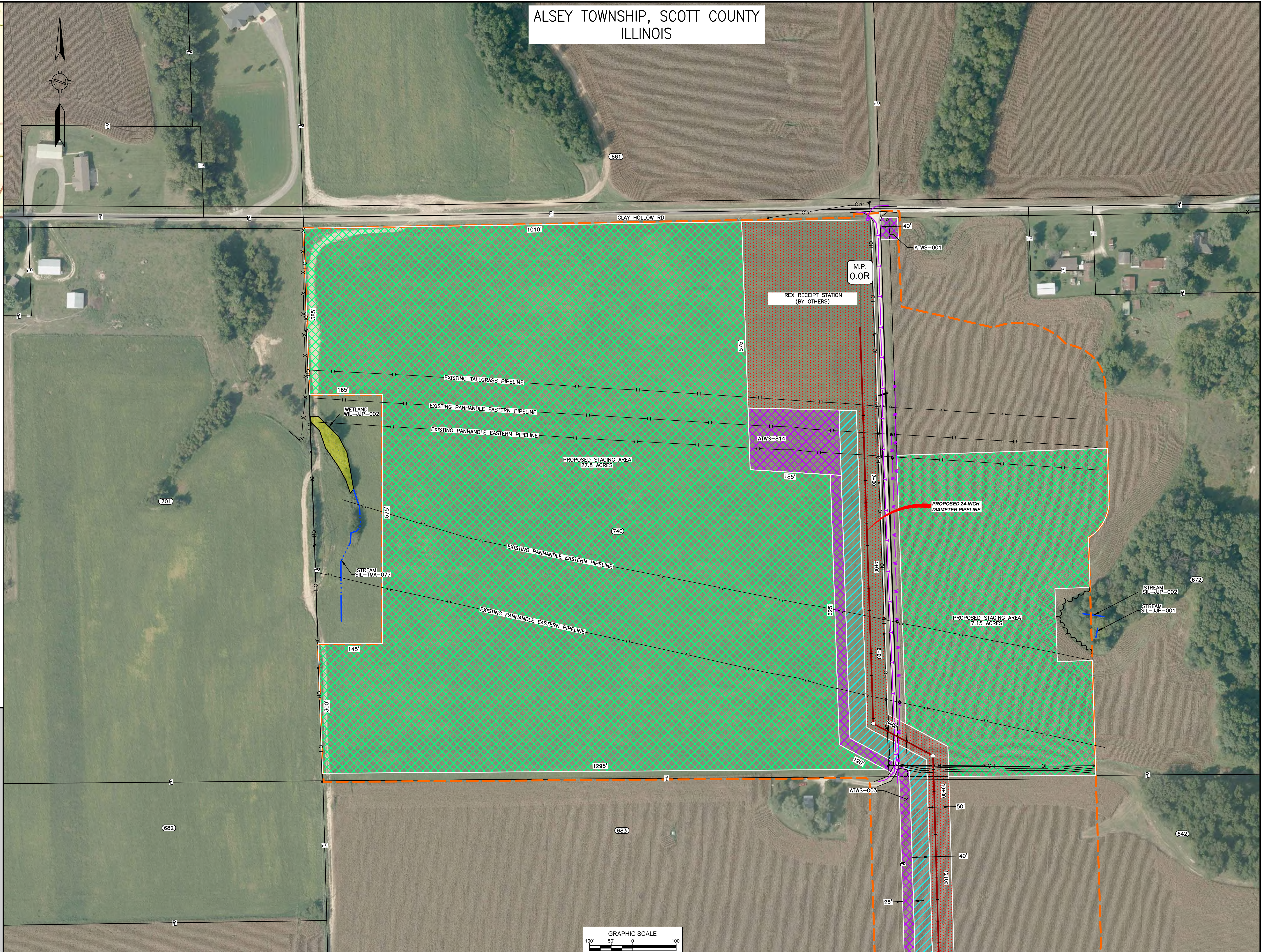
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ALSEY TOWNSHIP, SCOTT COUNTY ILLINOIS

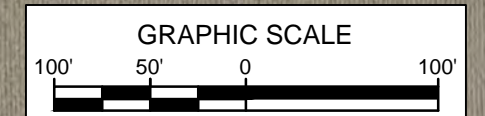


LOCATION MAP  
N.T.S.



**LEGEND**

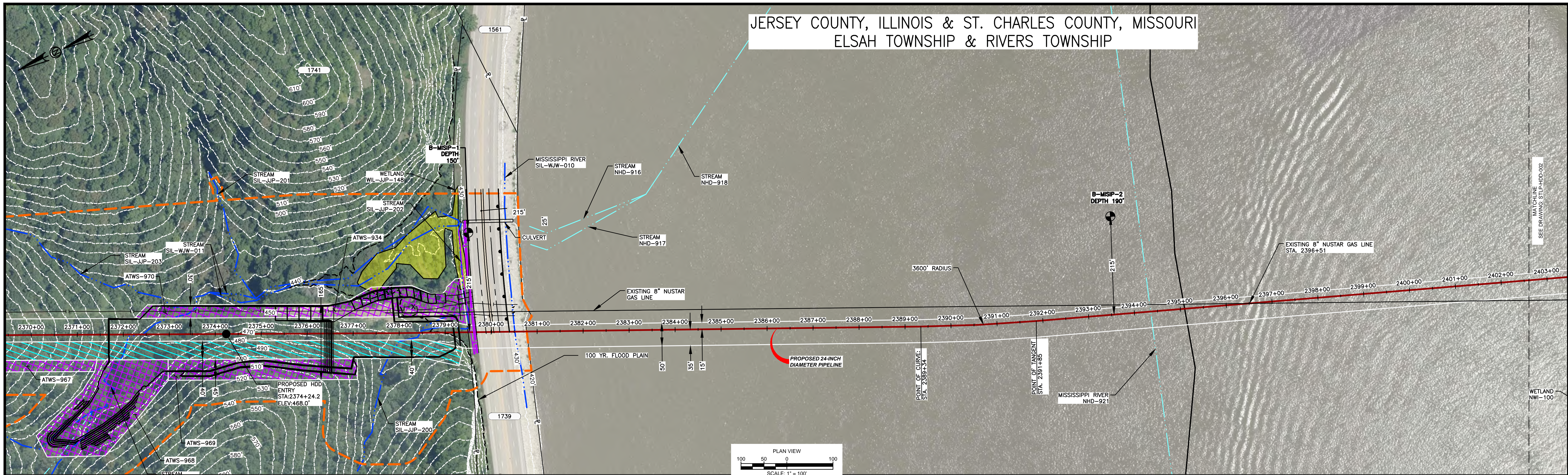
- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- PROPOSED STAGING AREA
- ACCESS ROAD
- COMMON SURVEY CORRIDOR
- PROPOSED PIPELINE
- EXISTING CLIENT PIPELINE
- EXISTING FOREIGN PIPELINE
- OVERHEAD POWER LINE
- EXISTING FIBER OPTIC LINE
- MMID
- PROPERTY LINE
- MUNICIPAL LINE
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- $\pm$  OF STREAM (DESKTOP)
- $\pm$  OF STREAM (DELINEATED)
- PROPOSED FENCE



REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS				REVISIONS				APPROVALS				PREPARED FOR <b>Spire STL Pipeline</b>	PREPARED BY <b>MOTT MACDONALD</b>	PROJECT <b>SPIRE STL PIPELINE PROJECT PROPOSED 24-INCH DIAMETER PIPELINE STAGING AREA SITE PLAN SCOTT COUNTY, ILLINOIS</b>				
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTIONS	DATE	DRAWN	CK	APPR	NO.	DESCRIPTIONS	DATE	DRAWN	CK	APPR				DRAWN BY	DATE	ENG. APPROVAL	DATE
STLP-A-001	ALIGNMENT SHEET			0	ISSUED FOR CONSTRUCTION	08/2018	ACS	RJP	DGG								CAD	03/2017	DGG	12/2017		
																	WAH	04/2017	JEV	12/2017		



JERSEY COUNTY, ILLINOIS & ST. CHARLES COUNTY, MISSOURI  
 ELSAH TOWNSHIP & RIVERS TOWNSHIP



- HDD NOTES:**
- ALL DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS OTHERWISE SPECIFIED.
  - ALL STATIONS ARE HORIZONTAL.
  - CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL PITS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
  - CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ADDITIONAL LENGTH OF TEMPORARY CONDUCTOR CASINGS THAN THOSE SHOWN ON THE DRAWINGS. ANY INSTALLED TEMPORARY CONDUCTOR CASING SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS.
  - THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 1,750 FEET BASED ON A 3-JOINT AVERAGE.
  - EXISTING UTILITY LOCATIONS AND DEPTHS, INCLUDING PRIVATE SERVICES, ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION OPERATIONS.
  - HDD OPERATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
  - DOWNHOLE ANNUAL DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING.

- PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
- UPON HDD COMPLETION AND EXTRACTION OF TEMPORARY CASING PIPE (IF APPLICABLE), CONTRACTOR SHALL PLACE A UNIFORM CEMENT BASED GROUT WITHIN THE NEAREST 200 FEET OF THE ANNULAR SPACE OF THE HDD BORE BETWEEN THE PRODUCT PIPE AND THE UNDISTURBED EARTH AT EACH HDD ENTRY AND EXIT LOCATIONS. GROUT DELIVERY METHOD SHALL BE FROM MULTIPLE POINTS WITHIN THE ANNULAR SPACE. CONTRACTOR SHALL MONITOR AND CONTROL GROUT PRESSURES TO WITHIN LIMITS FOR THE ENCOUNTERED GEOTECHNICAL MATERIALS.
- IF THE CONTRACTOR ENCOUNTERS AN OBSTRUCTION THAT PREVENTS THE INSTALLATION ACCORDING TO THE PROJECT SPECIFICATIONS, THE CONTRACTOR SHALL PLACE A CEMENT BASED GROUT WITHIN THE BORE. WORK SHALL NOT RESUME UNTIL REVISED PLANS AND PROCEDURES HAVE BEEN SUBMITTED TO AND ACCEPTED BY THE OWNER.

- CONTRACTOR SHALL USE THE DRILL AND INTERSECT INSTALLATION STRATEGY TO COMPLETE THIS INSTALLATION.
- THE PILOT BORE WILL BE EITHER 10.625" OR 12.25" IN DIAMETER. THE FINAL REAMED HOLE DIAMETER IS ANTICIPATED TO BE 36". THE NUMBER OF REAMING PASSES WILL BE DETERMINED BY THE CONTRACTOR SELECTED FOR THE WORK.
- CONTRACTOR SHALL USE A GYROSCOPIC GUIDANCE SYSTEM TO COMPLETE THE PILOT BORE INSTALLATION.
- CONTRACTOR SHALL MONITOR PRECIPITATION AND RIVER LEVEL ELEVATIONS AND BE PREPARED TO REMOVE EQUIPMENT PRIOR TO A FORECASTED FLOOD EVENT.
- IF AN INTERMEDIATE WELD IS REQUIRED DURING PULLBACK OPERATIONS, THE HDD CONTRACTOR SHALL INSTALL THE LONGEST PIPE SECTION LAST. THE FIRST PIPE STRING SHALL BE AS SHORT AS POSSIBLE TO ALLOW FOR THE INSTALLATION OF THE LONGEST SECOND SECTION OF PIPE STRING.
- LOCATION AND ELEVATION OF THE 8-INCH NUSTAR PIPELINE IS BASED ON INFORMATION PROVIDED BY NUSTAR. MOTT MACDONALD ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE DATA USED TO IDENTIFY THE NUSTAR PIPELINE LOCATION AND ELEVATION. HDD CONTRACTOR TO REVIEW AS-BUILT DATA AND CONFIRM APPROPRIATE SEPARATION FROM EXISTING UTILITY.

**MISSISSIPPI HDD PLAN VIEW**

PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:

ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1 (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
PILOT ALIGNMENT	UP TO TEN (10) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTER-LINE BUT NOT WITHIN FIVE (5) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY OR ANY BELOW GRADE UTILITY OR STRUCTURE.

**Soil Stratigraphic Legend:**

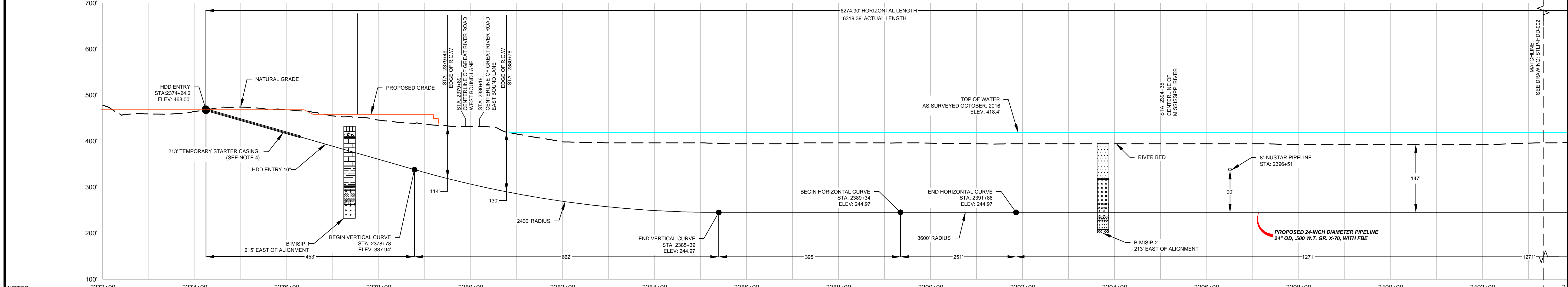
- ML: MUDSTONE
- CH: CLAY
- CL: CLAY
- SP: SANDSTONE
- SW: SAND
- GP: GRAVEL
- SM: SILTSTONE

**Rock Stratigraphic Legend:**

- LIMESTONE
- MUDSTONE
- SHALE
- SILTSTONE
- CONCRETE
- GP
- SANDSTONE
- QUARTZ

**LEGEND**

- PROPOSED PERMANENT EASEMENT
- EXISTING PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE
- PROPOSED STAGING AREA
- ACCESS ROAD
- USACE EASEMENT
- PROPOSED 24-INCH DIAMETER PIPELINE
- PROPERTY LINE
- MMID
- EXISTING GAS PIPELINE
- EXISTING FOREIGN PIPELINE
- EXISTING OVERHEAD LINE
- ROAD CENTERLINE
- COMMON SURVEY CORRIDOR
- STREAM (DELINEATED)
- STREAM (DESKTOP)
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- BORE LOCATION



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  - PROPERTY LINES DEPICTED ON THIS PLAN ARE APPROXIMATED BY DEED AND TITLE INFORMATION.
  - BASE FLOOD ELEVATION LINE SHOWN FOR 100 YEAR FLOOD PLAIN LIMIT WAS PULLED FROM FEMA FLOOD INSURANCE RATE MAPS (FIRM). THE ELEVATION OF 438 FEET WAS DETERMINED USING MAP NUMBERS 29189C0080K AND 17083C0278D.

REFERENCE DRAWINGS		REVISIONS		APPROVALS									
DWG. NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DATE	DRAWN	CK	APPR	DATE	DATE
STLP-A-052	ALIGNMENT SHEET	1	ISSUE FOR FERC	01/2017	RJR	EB	RJP	5	ISSUED FOR IMPLEMENTATION	05/2018			
STLP-HDD-002	HDD PROFILE OVERVIEW	2	AMENDMENT TO FERC	04/2017									
		3	FERC SUPPLEMENTAL FILING	07/2017									

DRAWN BY		DATE		ENG. APPROVAL		DATE		CLIENT APPROVAL		DATE	
D.R.G.	05/2017	D.G.G.	05/2017								
CHECKED BY	DATE	P.M. APPROVAL	DATE								
R.J.P.	05/2017	J.E.W.	05/2017								

PREPARED FOR: **Spire STL Pipeline**

PREPARED BY: **MOTT MACDONALD**

PROJECT: **SPIRE STL PIPELINE PROJECT**

TITLE: **HDD PROFILE OVERVIEW**

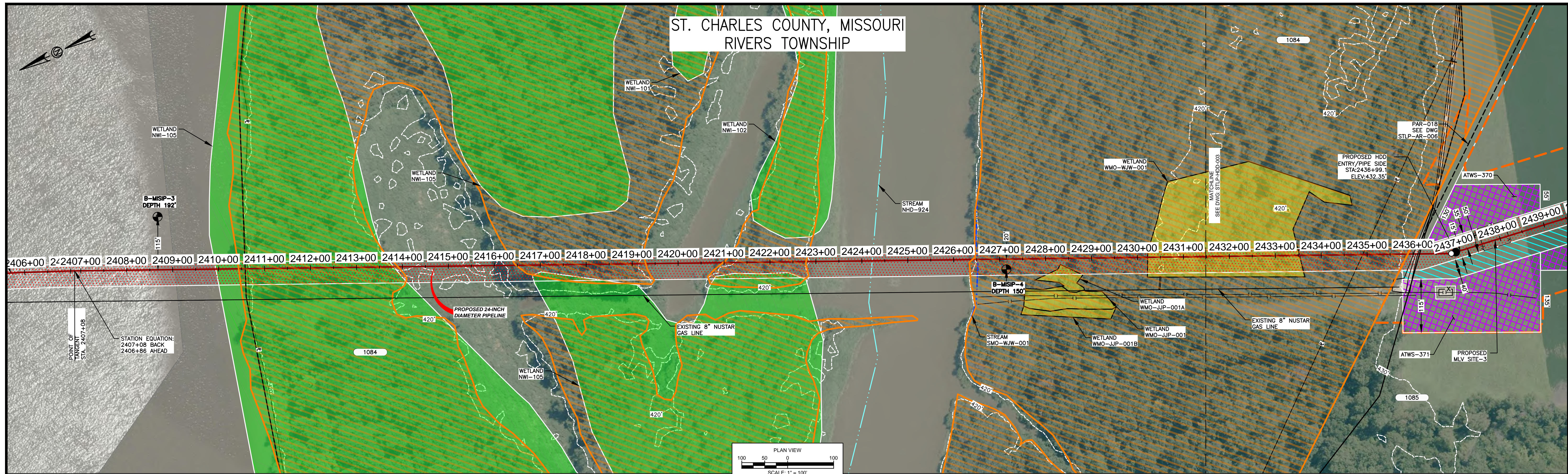
LOCATION: **MISSISSIPPI RIVER MAINLINE**

AREA: **JERSEY COUNTY, ILLINOIS & ST. CHARLES COUNTY, MISSOURI**

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ST. CHARLES COUNTY, MISSOURI  
RIVERS TOWNSHIP



MISSISSIPPI HDD PLAN VIEW

PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:

ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1° (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL.
PILOT EXIT ANGLE	DECREASE ANGLE UP TO 2° (FLATTER), BUT NO INCREASES IN EXIT ANGLE ALLOWED.
PILOT EXIT LOCATION	UP TO TEN (10) FEET SHORTER OR LONGER.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
PILOT ALIGNMENT	UP TO TEN (10) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTERLINE BUT NOT WITHIN FIVE (5) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY OR ANY BELOW GRADE UTILITY OR STRUCTURE.

Soil Stratigraphic Legend:

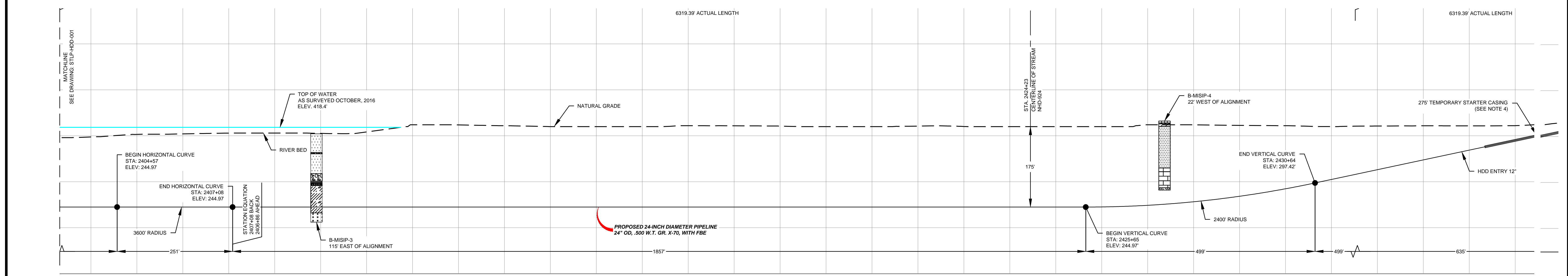
ML	CH	CL	SP
SW	GP	SM	

Rock Stratigraphic Legend:

LIMESTONE	MUDSTONE	SHALE	SILTSTONE
CONCRETE	GP	SANDSTONE	QUARTZ

LEGEND

[Red hatched box]	PROPOSED PERMANENT EASEMENT	[Red line with circle]	PROPOSED 24-INCH DIAMETER PIPELINE	[Blue dashed line]	STREAM (DELINEATED)
[Blue hatched box]	EXISTING PERMANENT EASEMENT	[Black line with circle]	PROPERTY LINE	[Cyan dashed line]	STREAM (DESKTOP)
[Green hatched box]	TEMPORARY WORKSPACE	[Circle with 123]	MMID	[Green arrow]	WETLAND (DESKTOP)
[Purple hatched box]	ADDITIONAL TEMPORARY WORKSPACE	[Red line with cross-ticks]	EXISTING GAS PIPELINE	[Yellow arrow]	WETLAND (DELINEATED)
[Green hatched box]	PROPOSED STAGING AREA	[Black line with cross-ticks]	EXISTING FOREIGN PIPELINE	[Black circle]	BORE LOCATION
[Dashed line]	ACCESS ROAD	[Green line with OH]	EXISTING OVERHEAD LINE		
[Dashed line]	USACE EASEMENT	[Black line]	ROAD CENTERLINE		
		[Dashed line]	COMMON SURVEY CORRIDOR		



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PROFILE  
SCALES HORIZ. 1" = 100' VERT. 1" = 100'

REFERENCE DRAWINGS				REVISIONS				REVISIONS				APPROVALS										
DWG NO.	TITLE	DWG NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	
STLP-A-052	ALIGNMENT SHEET	STLP-HDD-001	HDD PROFILE OVERVIEW	1	ISSUE FOR FERC	01/2017	RJR	EB	RJP	5	ISSUED FOR IMPLEMENTATION	12/2017				D.R.G.	05/2017	D.G.G.	05/2017			
STLP-A-053	ALIGNMENT SHEET	STLP-HDD-003	HDD PROFILE OVERVIEW	2	AMENDMENT TO FERC	04/2017										CHECKED BY	DATE	P.M. APPROVAL	DATE			
STLP-AR-006	ACCESS ROAD SITE PLAN - PAR-018			3	FERC SUPPLEMENTAL FILING	07/2017										E.B.	05/2017	J.E.W.	05/2017			STLP-HDD-002

PREPARED FOR  
**Spire STL Pipeline**

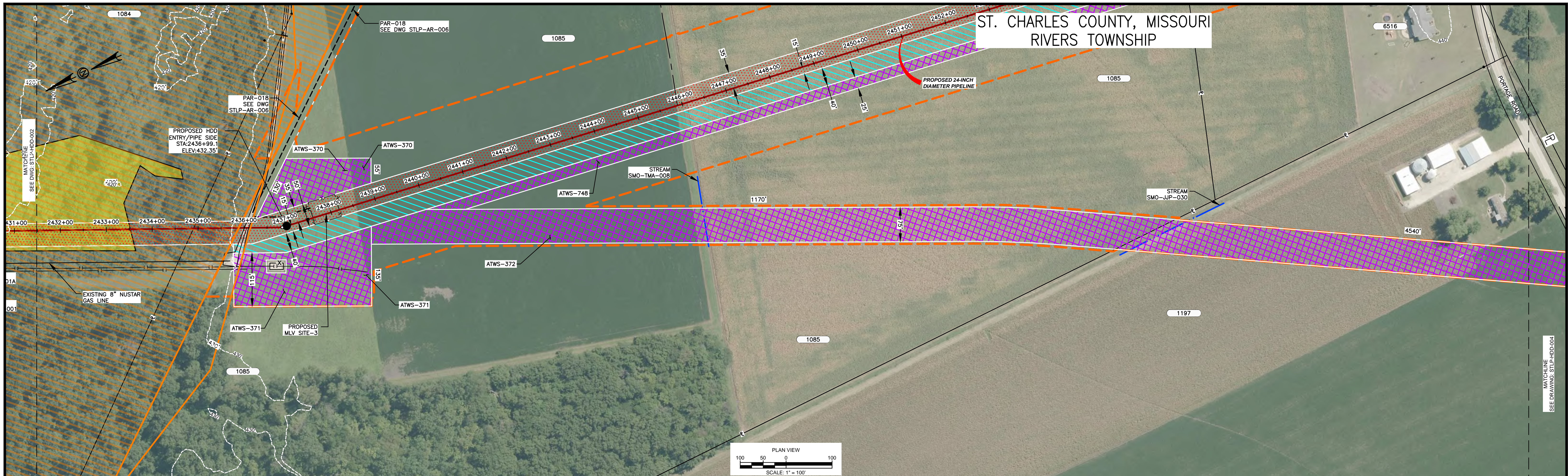
PREPARED BY  
**MOTT MACDONALD**

SPIRE STL PIPELINE PROJECT  
HDD PROFILE OVERVIEW  
MISSISSIPPI RIVER MAINLINE  
JERSEY COUNTY, ILLINOIS & ST. CHARLES COUNTY, MISSOURI

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May 17, 2018 - 1:09PM sig85256



ST. CHARLES COUNTY, MISSOURI  
RIVERS TOWNSHIP



- HDD NOTES:**
- ALL DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS OTHERWISE SPECIFIED.
  - ALL STATIONS ARE HORIZONTAL.
  - CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL PTS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
  - CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ADDITIONAL LENGTH OF TEMPORARY CONDUCTOR CASINGS THAN THOSE SHOWN ON THE DRAWINGS. ANY INSTALLED TEMPORARY CONDUCTOR CASING SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS.
  - THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 1,750 FEET BASED ON A 3-JOINT AVERAGE.
  - EXISTING UTILITY LOCATIONS AND DEPTHS, INCLUDING PRIVATE SERVICES, ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION OPERATIONS.
  - HDD OPERATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
  - DOWNHOLE ANNULAR DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING

- PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
- UPON HDD COMPLETION AND EXTRACTION OF TEMPORARY CASING PIPE (IF APPLICABLE), CONTRACTOR SHALL PLACE A UNIFORM CEMENT BASED GROUT WITHIN THE NEAREST 200 FEET OF THE ANNULAR SPACE OF THE HDD BORE BETWEEN THE PRODUCT PIPE AND THE UNDISTURBED EARTH AT EACH HDD ENTRY AND EXIT LOCATIONS. GROUT DELIVERY METHOD SHALL BE FROM MULTIPLE POINTS WITHIN THE ANNULAR SPACE. CONTRACTOR SHALL MONITOR AND CONTROL GROUT PRESSURES TO WITHIN LIMITS FOR THE ENCOUNTERED GEOTECHNICAL MATERIALS.
- IF THE CONTRACTOR ENCOUNTERS AN OBSTRUCTION THAT PREVENTS THE INSTALLATION ACCORDING TO THE PROJECT SPECIFICATIONS, THE CONTRACTOR SHALL PLACE A CEMENT BASED GROUT WITHIN THE BORE. WORK SHALL NOT RESUME UNTIL

- REVISED PLANS AND PROCEDURES HAVE BEEN SUBMITTED TO AND ACCEPTED BY THE OWNER.
- CONTRACTOR SHALL USE THE DRILL AND INTERSECT INSTALLATION STRATEGY TO COMPLETE THIS INSTALLATION.
  - THE PILOT BORE WILL BE EITHER 10.625" OR 12.25" IN DIAMETER. THE FINAL REAMED HOLE DIAMETER IS ANTICIPATED TO BE 36". THE NUMBER OF REAMING PASSES WILL BE DETERMINED BY THE CONTRACTOR SELECTED FOR THE WORK.
  - CONTRACTOR SHALL USE A GYROSCOPIC GUIDANCE SYSTEM TO COMPLETE THE PILOT BORE INSTALLATION.
  - CONTRACTOR SHALL MONITOR PRECIPITATION AND RIVER LEVEL ELEVATIONS AND BE PREPARED TO REMOVE EQUIPMENT PRIOR TO A FORECASTED FLOOD EVENT.
  - IF AN INTERMEDIATE WELD IS REQUIRED DURING PULLBACK OPERATIONS, THE HDD CONTRACTOR SHALL INSTALL THE LONGEST PIPE SECTION LAST. THE FIRST PIPE STRING SHALL BE AS SHORT AS POSSIBLE TO ALLOW FOR THE INSTALLATION OF THE LONGEST SECOND SECTION OF PIPE STRING.
  - LOCATION AND ELEVATION OF THE 8-INCH NUSTAR PIPELINE IS BASED ON INFORMATION PROVIDED BY NUSTAR. MOTT MACDONALD ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE DATA USED TO IDENTIFY THE NUSTAR PIPELINE LOCATION AND ELEVATION. HDD CONTRACTOR TO REVIEW AS-BUILT DATA AND CONFIRM APPROPRIATE SEPARATION FROM EXISTING UTILITY.

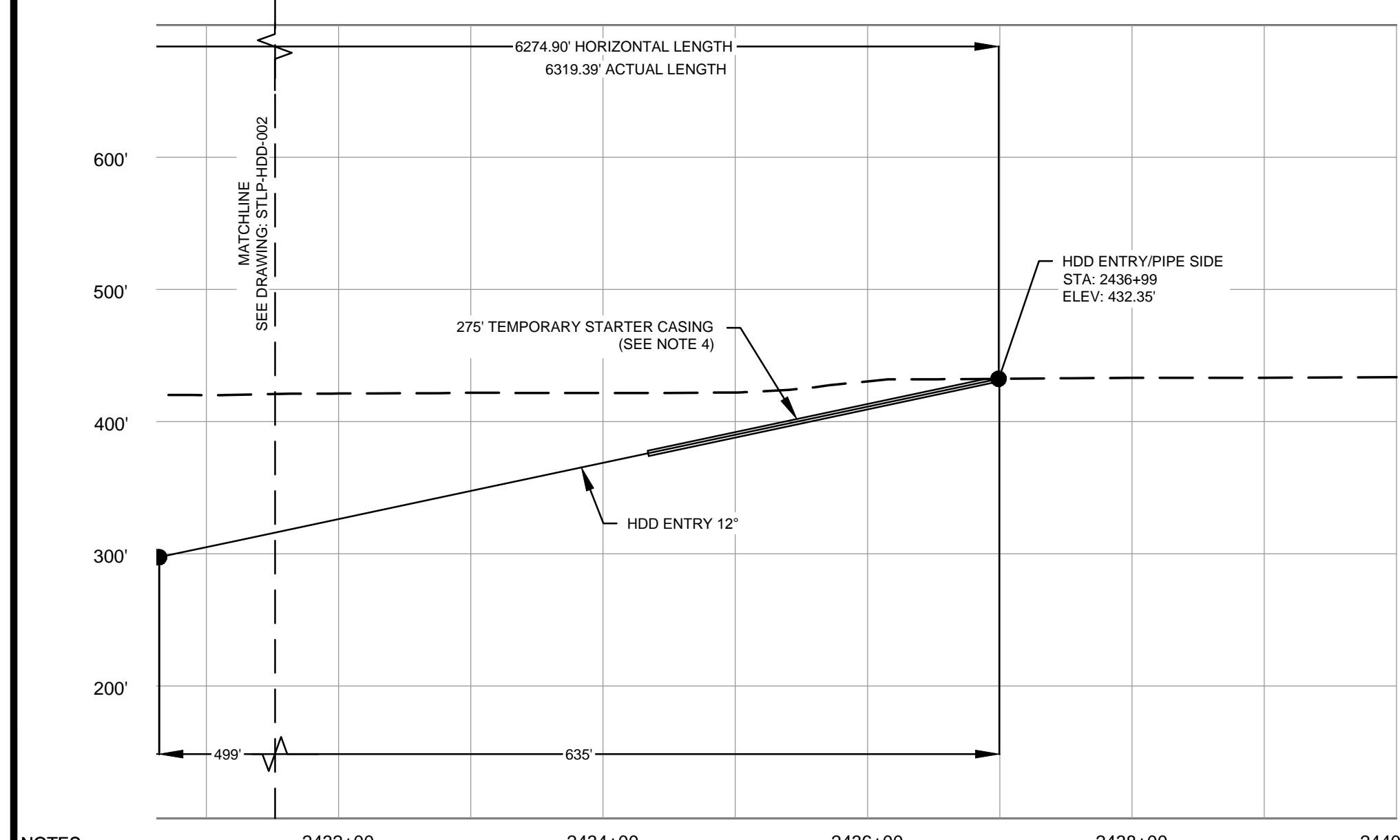
**MISSISSIPPI HDD PLAN VIEW**

PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:

ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1 (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
PILOT ALIGNMENT	UP TO TEN (10) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTERLINE BUT NOT WITHIN FIVE (5) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY OR ANY BELOW GRADE UTILITY OR STRUCTURE.

**LEGEND**

	PROPOSED PERMANENT EASEMENT		PROPOSED 24-INCH DIAMETER PIPELINE		STREAM (DELINEATED)
	EXISTING PERMANENT EASEMENT		PROPERTY LINE		STREAM (DESKTOP)
	TEMPORARY WORKSPACE		MMID		WETLAND (DESKTOP)
	ADDITIONAL TEMPORARY WORKSPACE		EXISTING GAS PIPELINE		WETLAND (DELINEATED)
	PROPOSED STAGING AREA		EXISTING FOREIGN PIPELINE		BORE LOCATION
	PROPOSED STAGING AREA		EXISTING OVERHEAD LINE		
	ACCESS ROAD		ROAD CENTERLINE		
	USACE EASEMENT		COMMON SURVEY CORRIDOR		



- NOTES:**
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  - EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR.
  - PROPERTY LINES DEPICTED ON THIS PLAN ARE APPROXIMATED BY DEED AND TITLE INFORMATION.
  - BASE FLOOD ELEVATION LINE SHOWN FOR 100 YEAR FLOOD PLAIN LIMIT WAS PULLED FROM FEMA FLOOD INSURANCE RATE MAPS (FIRM). THE ELEVATION OF 438 FEET WAS DETERMINED USING MAP NUMBERS 29189C0080K AND 17083C0278D.

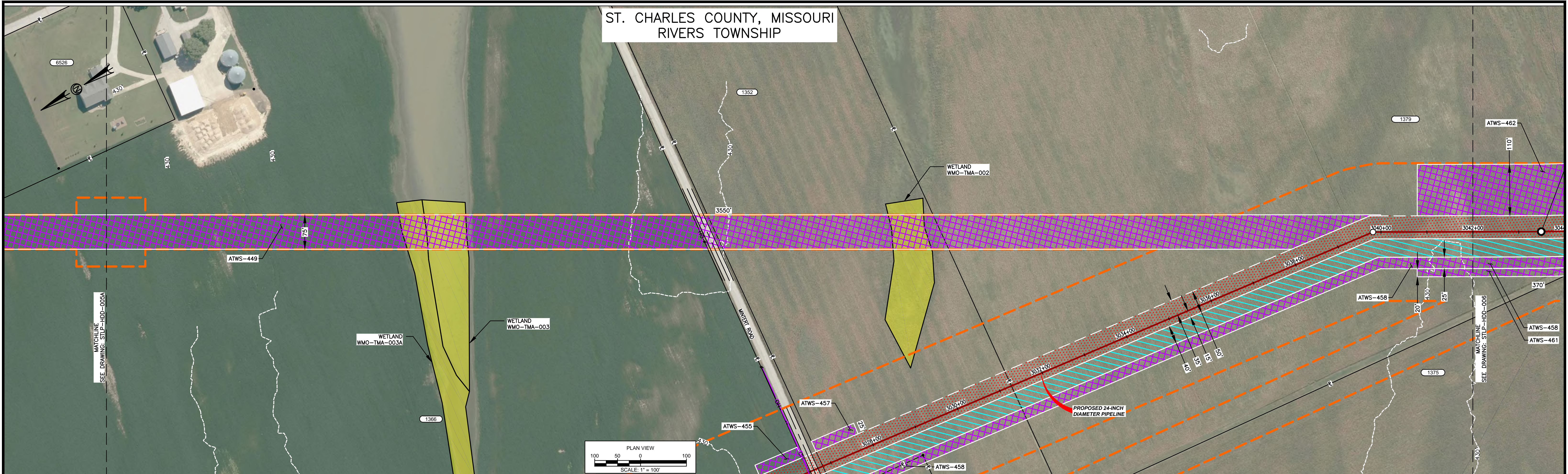
REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS				REVISIONS				APPROVALS				PREPARED FOR		PREPARED BY		SPIRE STL PIPELINE PROJECT								
DWG NO.	TITLE	DWG NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	Spire STL Pipeline		MOTT MACDONALD		HDD PROFILE OVERVIEW		
STLP-A-053	ALIGNMENT SHEET	STLP-HDD-004	HDD PROFILE OVERVIEW	1	ISSUE FOR FERC	01/2017	RJR	EB	RJP	4	FERC SUPPLEMENTAL FILING	10/2017				D.R.G.	05/2017	D.G.G.	05/2017				STLP-HDD-003		MOTT MACDONALD		MISSISSIPPI RIVER MAINLINE	
STLP-AR-006	ACCESS ROAD SITE PLAN - PAR-018			2	AMENDMENT TO FERC	04/2017				5	ISSUED FOR IMPLEMENTATION	05/2018				E.B.	05/2017	J.E.W.	05/2017								ST. CHARLES COUNTY, MISSOURI	
STLP-HDD-002	HDD PROFILE OVERVIEW			3	FERC SUPPLEMENTAL FILING	07/2017																						







ST. CHARLES COUNTY, MISSOURI  
RIVERS TOWNSHIP



MISSOURI RIVER HDD PLAN VIEW

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Soil Stratigraphic Legend:

ML	CH	CL	SP
SW	GP	SM	

Rock Stratigraphic Legend:

LIMESTONE	MUDSTONE	SHALE	SILTSTONE
CONCRETE	GP	SANDSTONE	QUARTZ

LEGEND

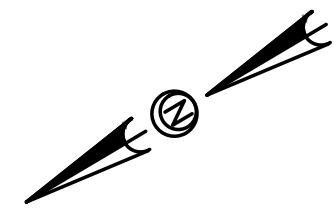
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[White box]	EXISTING PERMANENT EASEMENT	[Black line with square]	PROPERTY LINE	[Cyan dashed line]	STREAM (DESKTOP)
[Green hatched box]	TEMPORARY WORKSPACE	[Circle with 123]	MMID	[Green arrow]	WETLAND (DESKTOP)
[Purple hatched box]	ADDITIONAL TEMPORARY WORKSPACE	[Red line with cross-ticks]	EXISTING GAS PIPELINE	[Green arrow]	WETLAND (DELINEATED)
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[Green dashed line]	ACCESS ROAD	[Red line with cross-ticks]	EXISTING OVERHEAD LINE	[Black dashed line]	
[Black dashed line]	ROAD CENTERLINE	[Red dashed line]	COMMON SURVEY CORRIDOR		
[Orange dashed line]	USACE EASEMENT				

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REFERENCE DRAWINGS				REVISIONS				REVISIONS				APPROVALS				PREPARED FOR		PREPARED BY		SPIRE STL PIPELINE PROJECT											
DWG NO.	TITLE	DWG NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	
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STLP-A-067	ALIGNMENT SHEET			2	AMENDMENT TO FERC	04/2017				5	ISSUED FOR IMPLEMENTATION PLAN	01/2018				JAM	06/2017	J.E.W.	06/2017												
STLP-HDD-005A	HDD PROFILE OVERVIEW			3	FERC SUPPLEMENTAL FILING	07/2017																									

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MISSOURI RIVER HDD PLAN VIEW

PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:	
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ML	CH	CL	SP
SW	GP	SM	

Rock Stratigraphic Legend:

LIMESTONE	MUDSTONE	SHALE	SILTSTONE
CONCRETE	GP	SANDSTONE	QUARTZ

LEGEND

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PREPARED FOR  
**Spire**  
STL Pipeline

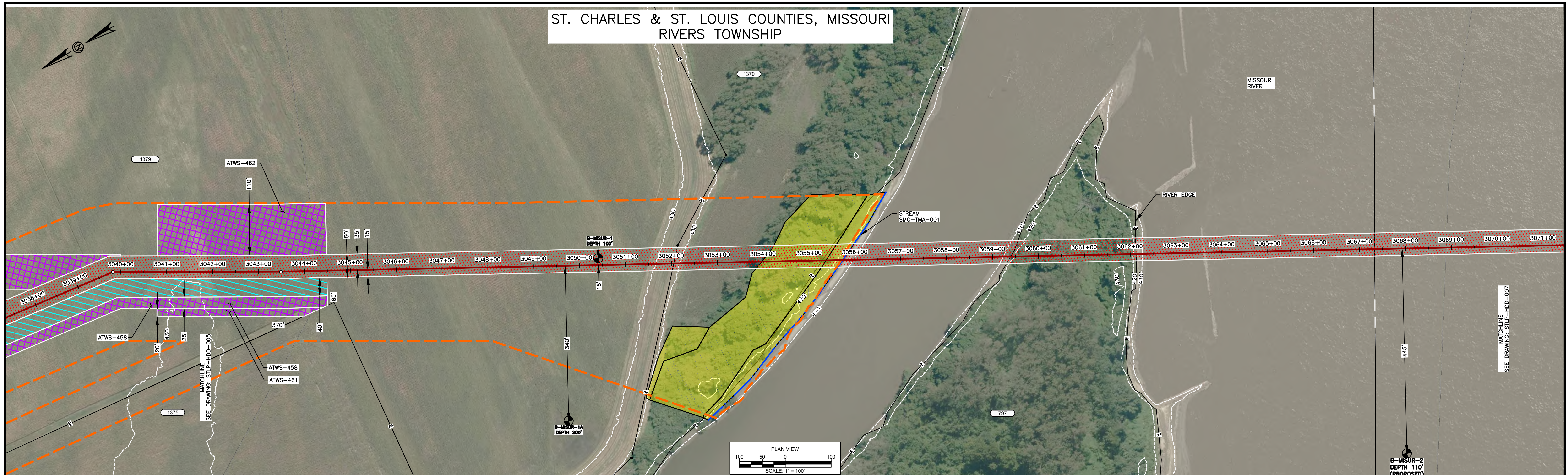
PREPARED BY  
**MOTT MACDONALD**

ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

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ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI  
RIVERS TOWNSHIP



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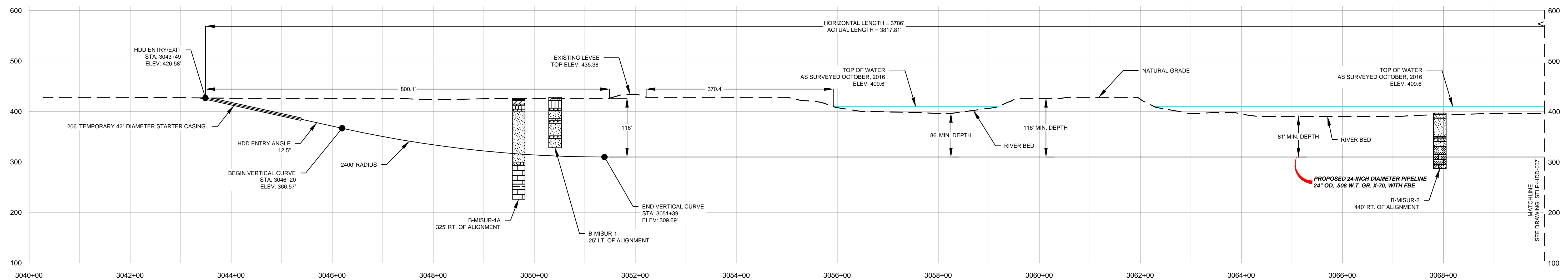
ML	CH	CL	SP
SW	GP	SM	

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LIMESTONE	MUDSTONE	SHALE	SILTSTONE
CONCRETE	GP	SANDSTONE	QUARTZ

LEGEND

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[White]	EXISTING PERMANENT EASEMENT	[Black Line]	PROPERTY LINE	[Cyan Dashed]	STREAM (DESKTOP)
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STLP-HDD-007	HDD PROFILE OVERVIEW			2	AMENDMENT TO FERC	04/2017										CHECKED BY	DATE	P.M. APPROVAL	DATE			
STLP-HDD-005	HDD PROFILE OVERVIEW			3	FERC SUPPLEMENTAL FILING	07/2017										JAM	06/2017	J.E.W.	09/2017			

PREPARED FOR  
**Spire STL Pipeline**

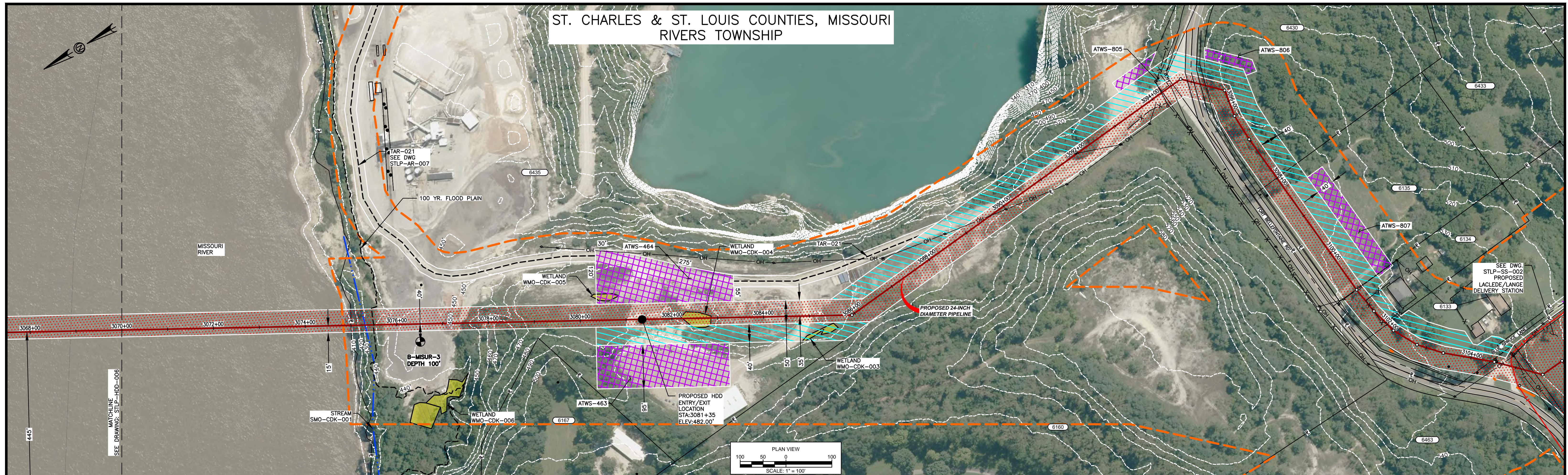
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SPIRE STL PIPELINE PROJECT  
HDD PROFILE OVERVIEW  
MISSOURI RIVER MAINLINE  
ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

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ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI  
RIVERS TOWNSHIP



MISSOURI RIVER HDD PLAN VIEW

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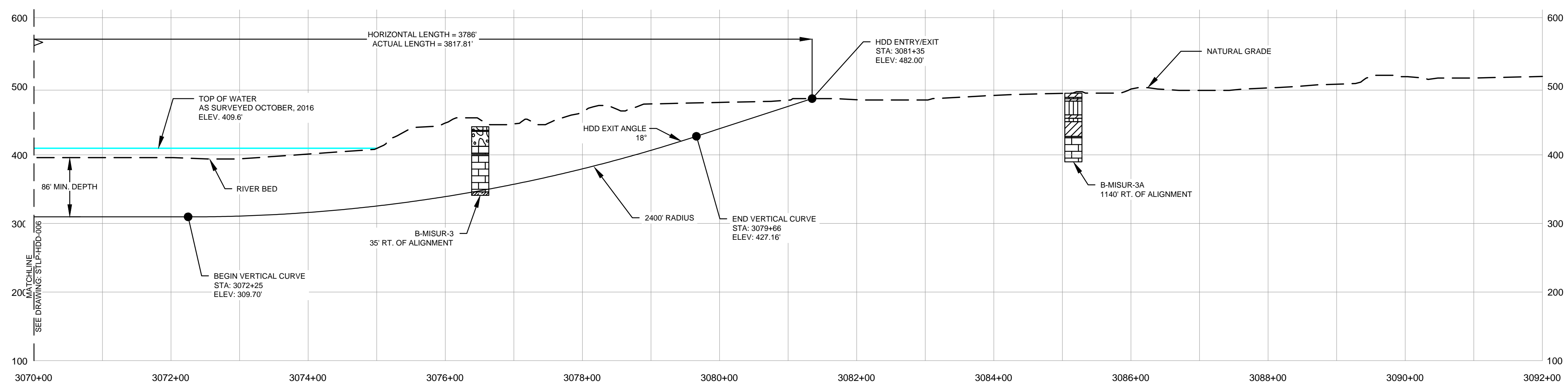
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CONCRETE	GP	SANDSTONE	QUARTZ

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[Green Dotted Box]	PROPOSED STAGING AREA	[Black Line with Tick]	EXISTING FOREIGN PIPELINE	[Black Circle]	BORE LOCATION
[Green Dashed Box]	PROPOSED STAGING AREA	[Green Line with OH]	EXISTING OVERHEAD LINE		
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PROFILE  
SCALES HORIZ. 1" = 100' VERT. 1" = 100'

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STLP-A-068	ALIGNMENT SHEET	STLP-HDD-006	HDD PROFILE OVERVIEW	1	ISSUE FOR FERC	01/2017	RJP	JAM	DGG	5	ISSUED FOR IMPLEMENTATION PLAN	01/2018				RJP	06/2017	D.G.G.	09/2017			
STLP-AR-007	ACCESS ROAD SITE PLAN - TAR-021			2	AMENDMENT TO FERC	04/2017												P.M. APPROVAL				
STLP-SS-002	LACLEDE/LANGE DELIVERY STATION SITE LAYOUT - STLP-SS-002			3	FERC SUPPLEMENTAL FILING	07/2017										JAM	06/2017	J.E.W.	09/2017			STLP-HDD-007

PREPARED FOR  
**Spire STL Pipeline**

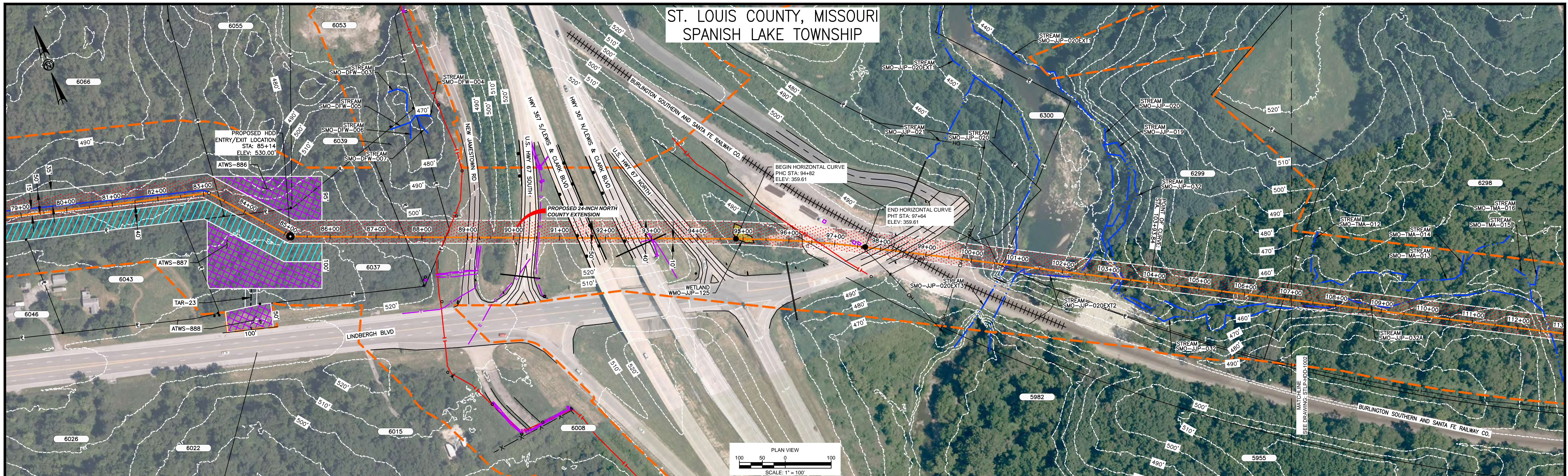
PREPARED BY  
**MOTT MACDONALD**

SPIRE STL PIPELINE PROJECT  
HDD PROFILE OVERVIEW  
MISSOURI RIVER MAINLINE  
ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

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# ST. LOUIS COUNTY, MISSOURI SPANISH LAKE TOWNSHIP



### HDD NOTES:

- ALL DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS OTHERWISE SPECIFIED.
- ALL STATIONS ARE HORIZONTAL.
- CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL PITS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
- CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ADDITIONAL LENGTH OF TEMPORARY CONDUCTOR CASINGS THAN THOSE SHOWN ON THE DRAWINGS. ANY INSTALLED TEMPORARY CONDUCTOR CASING SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS.
- THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 1,750 FEET BASED ON A 3-JOINT AVERAGE.
- EXISTING UTILITY LOCATIONS AND DEPTHS, INCLUDING PRIVATE SERVICES, ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION OPERATIONS.
- HDD OPERATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
- DOWNHOLE ANNULAR DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING.
- PROCESS. LOCATION OF MONITORING SHALL BE AS CLOSE TO THE DRILL BIT AS POSSIBLE.
- PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
- UPON HDD COMPLETION AND EXTRACTION OF TEMPORARY CASING PIPE (IF APPLICABLE), CONTRACTOR SHALL PLACE A UNIFORM CEMENT BASED GROUT WITHIN THE NEAREST 200 FEET OF THE ANNULAR SPACE OF THE HDD BORE BETWEEN THE PRODUCT PIPE AND THE UNDISTURBED EARTH AT EACH HDD ENTRY AND EXIT LOCATIONS. GROUT DELIVERY METHOD SHALL BE FROM MULTIPLE POINTS WITHIN THE ANNULAR SPACE. CONTRACTOR SHALL MONITOR AND CONTROL GROUT PRESSURES TO WITHIN LIMITS FOR THE ENCOUNTERED GEOTECHNICAL MATERIALS.
- IF THE CONTRACTOR ENCOUNTERS AN OBSTRUCTION THAT PREVENTS THE INSTALLATION ACCORDING TO THE PROJECT SPECIFICATIONS, THE CONTRACTOR SHALL PLACE A CEMENT BASED GROUT WITHIN THE BORE. WORK SHALL NOT RESUME UNTIL REVISED PLANS AND PROCEDURES HAVE BEEN SUBMITTED TO AND ACCEPTED BY THE OWNER.
- CONTRACTOR SHALL USE THE DRILL AND INTERSECT INSTALLATION STRATEGY TO COMPLETE THIS INSTALLATION.
- THE PILOT BORE WILL BE EITHER 10.625" OR 12.25" IN DIAMETER. THE FINAL REAMED HOLE DIAMETER IS ANTICIPATED TO BE 36". THE NUMBER OF REAMING PASSES WILL BE DETERMINED BY THE CONTRACTOR SELECTED FOR THE WORK.
- CONTRACTOR SHALL USE A GYROSCOPIC GUIDANCE SYSTEM TO COMPLETE THE PILOT BORE INSTALLATION.
- CONTRACTOR SHALL MONITOR PRECIPITATION AND RIVER LEVEL ELEVATIONS AND BE PREPARED TO REMOVE EQUIPMENT PRIOR TO A FORECASTED FLOOD EVENT.
- IF AN INTERMEDIATE WELD IS REQUIRED DURING PULLBACK OPERATIONS, THE HDD CONTRACTOR SHALL INSTALL THE LONGEST PIPE SECTION LAST. THE FIRST PIPE STRING SHALL BE AS SHORT AS POSSIBLE TO ALLOW FOR THE INSTALLATION OF THE LONGEST SECOND SECTION OF PIPE STRING.

### HIGHWAY 367 HDD PLAN VIEW

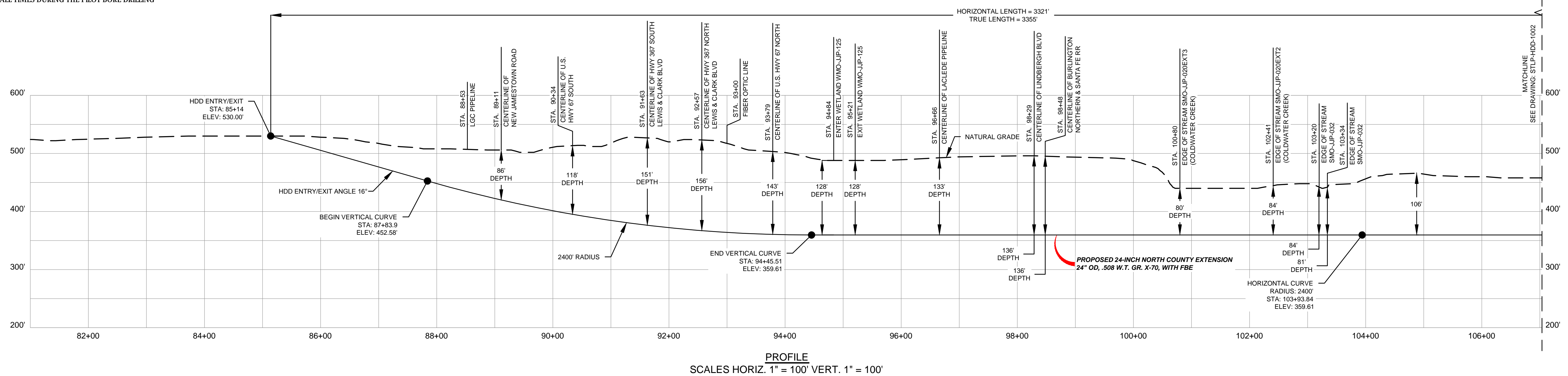
PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:	
ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1° (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STATED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL.
PILOT EXIT ANGLE	DECREASE ANGLE UP TO 2° (FLATTER), BUT NO INCREASES IN EXIT ANGLE ALLOWED.
PILOT EXIT LOCATION	UP TO TEN (10) FEET SHORTER OR LONGER.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
PILOT ALIGNMENT	UP TO TEN (10) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTERLINE BUT NOT WITHIN FIVE (5) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY OR ANY BELOW GRADE UTILITY OR STRUCTURE.

**Soil Stratigraphic Legend:**

- ML: MUDSTONE
- SW: SANDSTONE
- LIMESTONE
- CONCRETE
- CH: CLAY
- GP: GRAVEL
- SM: SILTSTONE
- SH: SHALE
- SP: SANDSTONE
- QUARTZ

**LEGEND**

- PROPOSED PERMANENT EASEMENT
- EXISTING PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE
- PROPOSED STAGING AREA
- ACCESS ROAD
- USACE EASEMENT
- PROPOSED 24-INCH NORTH COUNTY EXTENSION
- PROPERTY LINE
- MMID
- EXISTING GAS PIPELINE
- EXISTING FOREIGN PIPELINE
- EXISTING OVERHEAD LINE
- ROAD CENTERLINE
- COMMON SURVEY CORRIDOR
- STREAM (DELINEATED)
- STREAM (DESKTOP)
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
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REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS				REVISIONS				REVISIONS				APPROVALS						
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	
STLP-A-1002	ALIGNMENT SHEET			2	AMENDMENT TO FERC	04/2017	SG	KAM	RJP	5	ISSUED FOR IMPLEMENTATION	05/2018	RJP	MWF	DGG	S.G.	05/2017	D.G.G.	04/2017			
STLP-A-1002	ALIGNMENT SHEET			3	FERC SUPPLEMENTAL FILING	07/2017																
STLP-HDD-1002	HDD PLAN AND PROFILE			4	FERC SUPPLEMENTAL FILING	10/2017										R.J.P.	05/2017	J.E.W.	04/2017			

PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**MOTT MACDONALD**

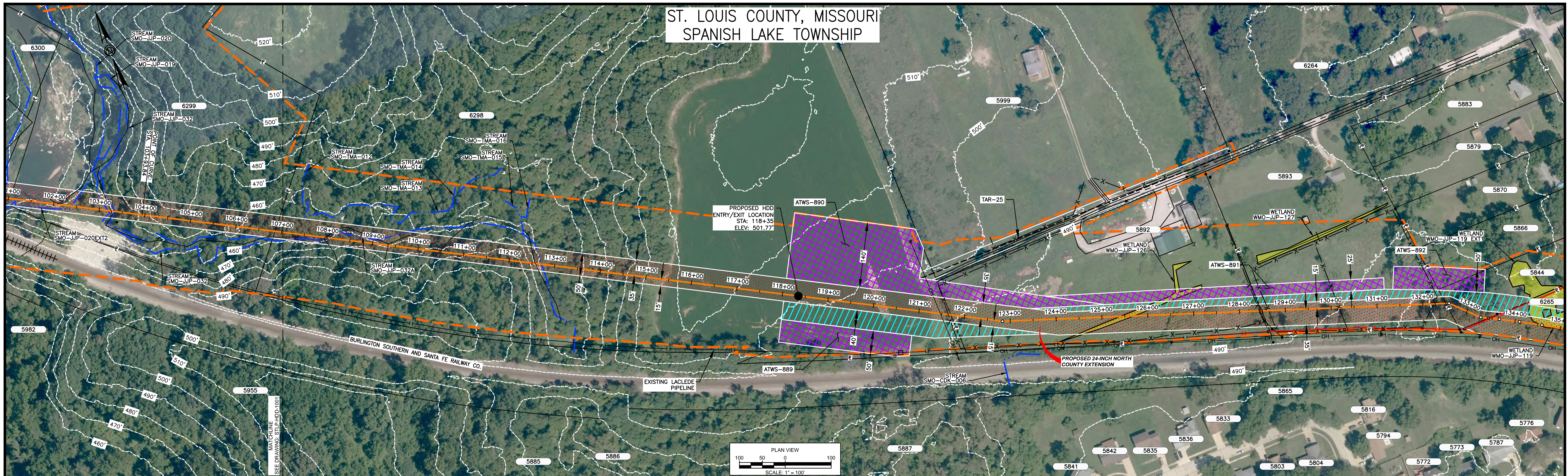
SPIRE STL PIPELINE PROJECT  
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HIGHWAY 367 & COLDWATER CREEK NORTH COUNTY EXTENSION  
SPANISH LAKE TOWNSHIP, ST. LOUIS, MISSOURI

STLP-HDD-1001

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ST. LOUIS COUNTY, MISSOURI  
SPANISH LAKE TOWNSHIP



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**HIGHWAY 367 HDD PLAN VIEW**

**Soil Stratigraphic Legend:**

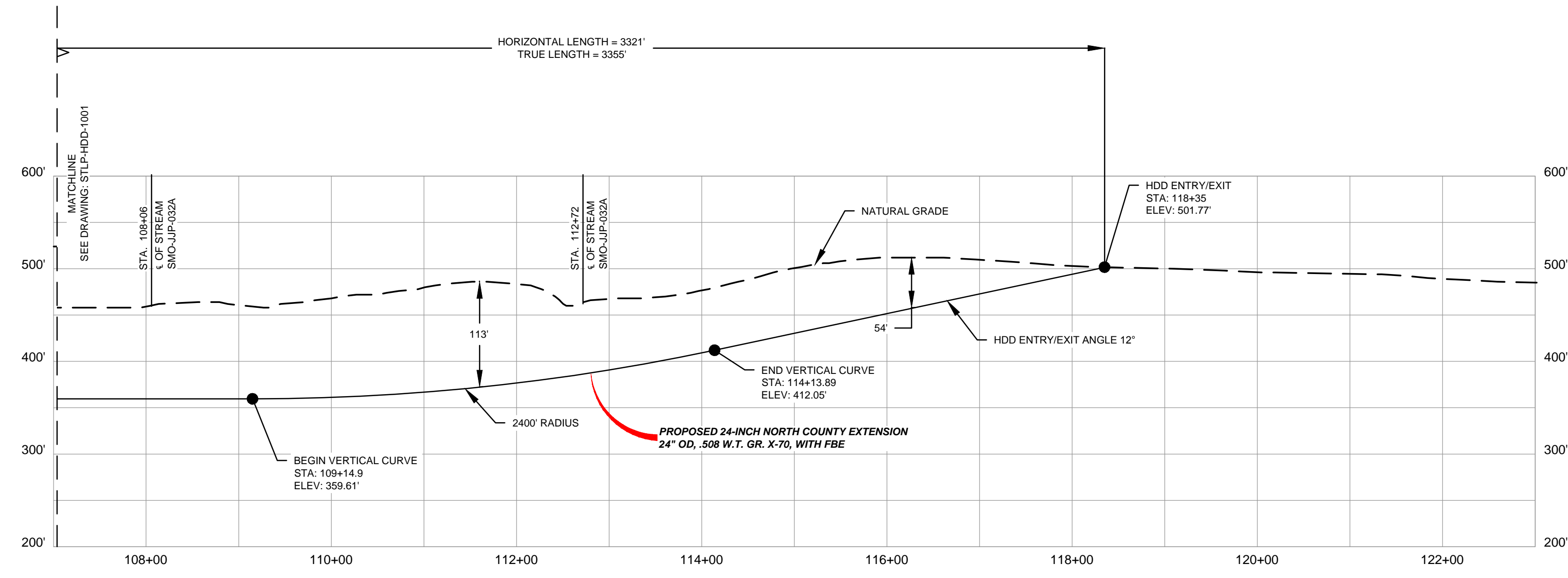
- ML (Mudstone)
- CH (Claystone)
- CL (Clay)
- SP (Sandstone)
- SW (Sandstone with well-sorted)
- GP (Gravelly sandstone)
- SM (Sandstone)

**Rock Stratigraphic Legend:**

- LIMESTONE
- MUDSTONE
- SHALE
- SILTSTONE
- CONCRETE
- GP (Gravelly sandstone)
- SANDSTONE
- QUARTZ

**LEGEND**

- PROPOSED PERMANENT EASEMENT
- EXISTING PERMANENT EASEMENT
- TEMPORARY WORKSPACE
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- USACE EASEMENT
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- MMID
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- EXISTING FOREIGN PIPELINE
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- COMMON SURVEY CORRIDOR
- STREAM (DELINEATED)
- STREAM (DESKTOP)
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- BORE LOCATION



**PROFILE**  
SCALES HORIZ. 1" = 100' VERT. 1" = 100'

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STLP-A-1003	ALIGNMENT SHEET			2	AMENDMENT TO FERC	04/2017	SG	KAM	RJP	5	ISSUED FOR IMPLEMENTATION	05/2018	RJP	MWF	DGG	S.G.	05/2017	D.G.G.	04/2017			
STLP-HDD-1001	HDD PLAN AND PROFILE			3	FERC SUPPLEMENTAL FILING	07/2017										CHECKED BY	DATE	P.M. APPROVAL	DATE			
				4	FERC SUPPLEMENTAL FILING	10/2017										R.J.P.	05/2017	J.E.W.	04/2017	STLP-HDD-1002		

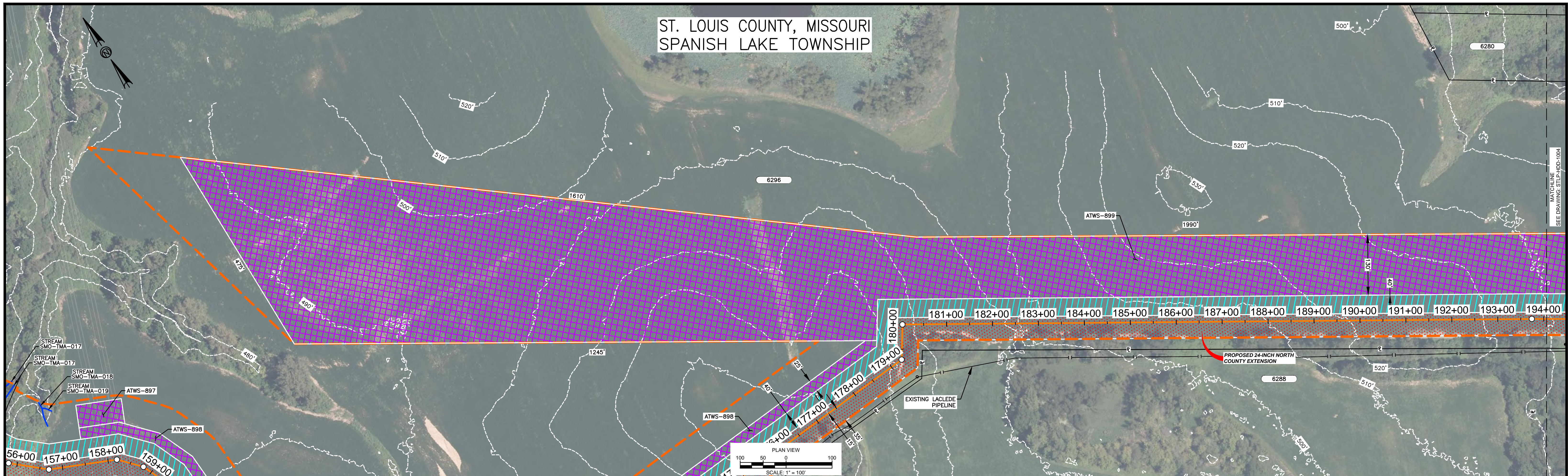
PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**MOTT MACDONALD**

SPIRE STL PIPELINE PROJECT  
HDD PROFILE OVERVIEW  
HIGHWAY 367 & COLDWATER CREEK NORTH COUNTY EXTENSION  
SPANISH LAKE TOWNSHIP, ST. LOUIS MISSOURI



ST. LOUIS COUNTY, MISSOURI  
SPANISH LAKE TOWNSHIP



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SPANISH LAKE PARK HDD PLAN VIEW

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ITEM	TOLERANCE
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- ML (Mudstone)
- CH (Claystone)
- CL (Clay)
- SP (Siltstone)
- SW (Sandstone)
- GP (Gypsum)
- SM (Shale)

**Rock Stratigraphic Legend:**

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- MUDSTONE
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**LEGEND**

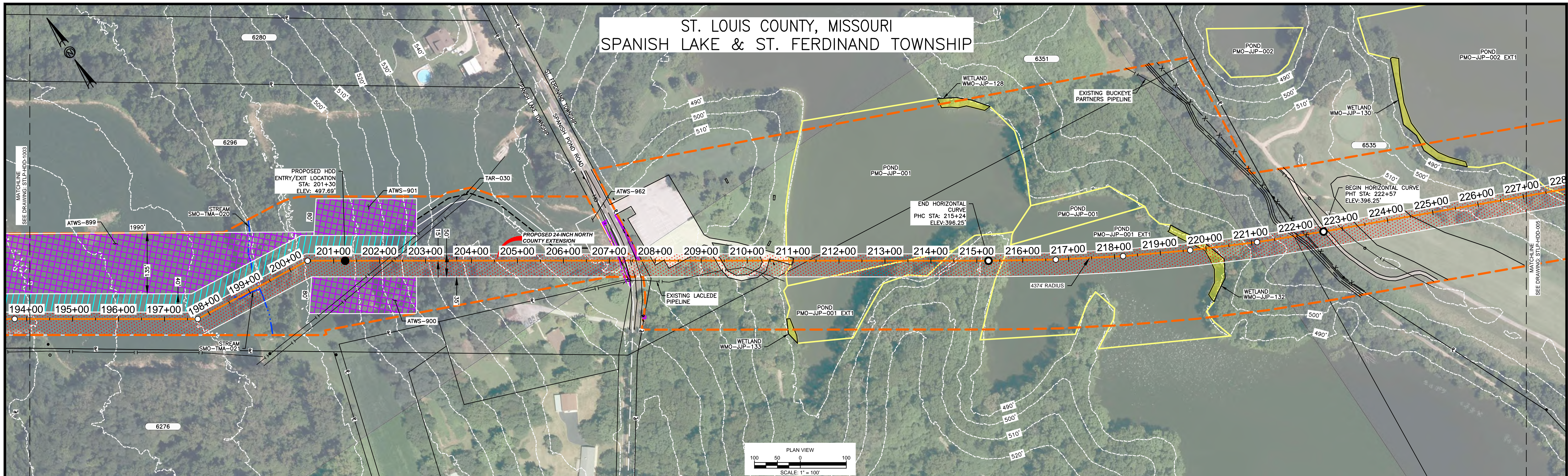
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DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	Spire STL Pipeline		MOTT MACDONALD		HDD PROFILE OVERVIEW		
STLP-A-1004	ALIGNMENT SHEET			2	AMENDMENT TO FERC	04/2017	AK	KAM	R.J.P.	5	ISSUED FOR IMPLEMENTATION PLAN	05/2018				A.K.Y.	05/2017	D.G.G.	05/2017									
STLP-HDD-1004	HDD PROFILE OVERVIEW			3	FERC SUPPLEMENTAL FILING	07/2017												P.M.										
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# ST. LOUIS COUNTY, MISSOURI SPANISH LAKE & ST. FERDINAND TOWNSHIP



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  - IF AN INTERMEDIATE WELD IS REQUIRED DURING PULLBACK OPERATIONS, THE HDD CONTRACTOR SHALL INSTALL THE LONGEST PIPE SECTION LAST. THE FIRST PIPE STRING SHALL BE AS SHORT AS POSSIBLE TO ALLOW FOR THE INSTALLATION OF THE LONGEST SECOND SECTION OF PIPE STRING.

**SPANISH LAKE PARK HDD PLAN VIEW**

ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1° (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STATED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL
PILOT EXIT ANGLE	DECREASE ANGLE UP TO 2° (FLATTER), BUT NO INCREASES IN EXIT ANGLE ALLOWED.
PILOT EXIT LOCATION	UP TO TEN (10) FEET SHORTER OR LONGER.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
PILOT ALIGNMENT	UP TO TEN (10) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTERLINE BUT NOT WITHIN FIVE (5) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY OR ANY BELOW GRADE UTILITY OR STRUCTURE.

**Soil Stratigraphic Legend:**

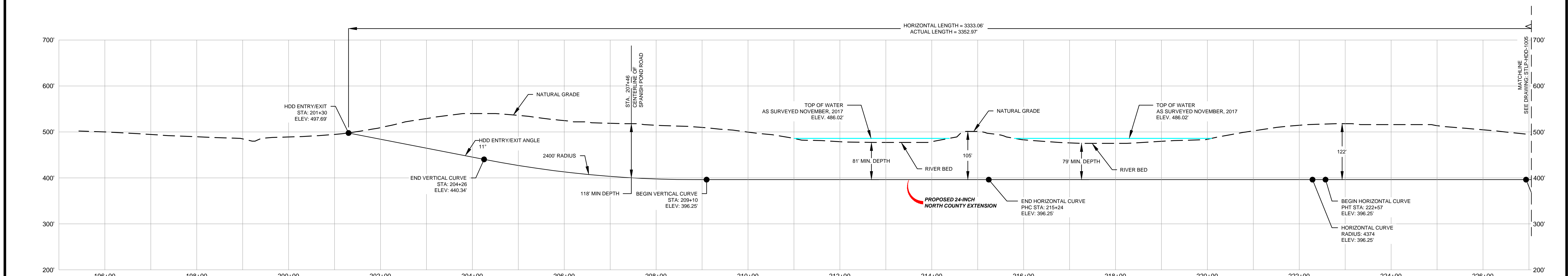
- ML (ML)
- CH (CH)
- CL (CL)
- SP (SP)
- SW (SW)
- GP (GP)
- SM (SM)

**Rock Stratigraphic Legend:**

- LIMESTONE
- MUDSTONE
- SHALE
- SILTSTONE
- CONCRETE
- GP
- SANDSTONE
- QUARTZ

**LEGEND**

- PROPOSED PERMANENT EASEMENT
- EXISTING PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE
- PROPOSED STAGING AREA
- ACCESS ROAD
- USACE EASEMENT
- PROPOSED 24-INCH NORTH COUNTY EXTENSION
- PROPERTY LINE
- MMID
- EXISTING GAS PIPELINE
- EXISTING FOREIGN PIPELINE
- EXISTING OVERHEAD LINE
- ROAD CENTERLINE
- COMMON SURVEY CORRIDOR
- STREAM (DELINEATED)
- STREAM (DESKTOP)
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- BORE LOCATION



- NOTES:**
- THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2017. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-NWI AND USGS.
  - EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR.
  - PROPERTY LINES DEPICTED ON THIS PLAN ARE APPROXIMATED BY DEED AND TITLE INFORMATION.
  - BASE FLOOD ELEVATION LINE SHOWN FOR 100 YEAR FLOOD PLAIN LIMIT WAS PULLED FROM FEMA FLOOD INSURANCE RATE MAPS (FIRM). THE ELEVATION OF 438 FEET WAS DETERMINED USING MAP NUMBERS 29189C0080K AND 17083C0278D.
  - SUNFISH LAKE BOTTOM ELEVATION WAS APPROXIMATED FROM SPOT DEPTH MEASUREMENTS TAKEN FROM THE SURFACE. ACTUAL SURFACE ELEVATION MAY VARY.

REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS				REVISIONS				APPROVALS										
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	
STLP-HDD-1003	HDD PLAN AND PROFILE			2	AMENDMENT TO PERC	04/2017	AK	KAM	RJP								R.J.P.	05/2017	D.G.G.	05/2017		
STLP-A-1005	ALIGNMENT SHEET			5	ISSUED FOR IMPLEMENTATION PLAN	05/2018													P.M. APPROVAL			
STLP-HDD-1005	HDD PLAN AND PROFILE																		J.E.W.	05/2017		

**SPIRE STL PIPELINE PROJECT**

**HDD PROFILE OVERVIEW**

SPANISH LAKE PARK NORTH COUNTY EXTENSION  
SPANISH LAKE & ST. FERDINAND TOWNSHIPS, ST. LOUIS, MISSOURI

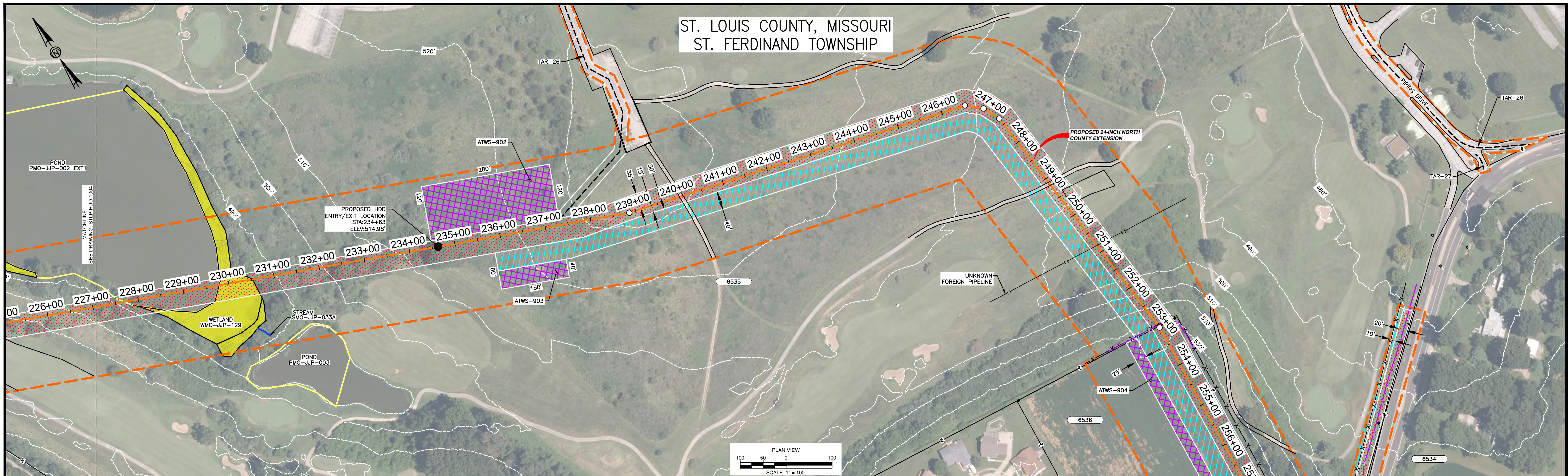
PREPARED FOR: **Spire STL Pipeline**

PREPARED BY: **MOTT MACDONALD**

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ST. LOUIS COUNTY, MISSOURI  
ST. FERDINAND TOWNSHIP



- HDD NOTES:**
1. ALL DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS OTHERWISE SPECIFIED.
  2. ALL STATIONS ARE HORIZONTAL.
  3. CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL PITS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
  4. CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ADDITIONAL LENGTH OF TEMPORARY CONDUCTOR CASINGS THAN THOSE SHOWN ON THE DRAWINGS. ANY INSTALLED TEMPORARY CONDUCTOR CASING SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS.
  5. THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 1,750 FEET BASED ON A 3-JOINT AVERAGE.
  6. EXISTING UTILITY LOCATIONS AND DEPTHS, INCLUDING PRIVATE SERVICES, ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION OPERATIONS.
  7. HDD OPERATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
  8. DOWNHOLE ANNULAR DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING

9. PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
10. UPON HDD COMPLETION AND EXTRACTION OF TEMPORARY CASING PIPE (IF APPLICABLE), CONTRACTOR SHALL PLACE A UNIFORM CEMENT BASED GROUT WITHIN THE NEAREST 200 FEET OF THE ANNULAR SPACE OF THE HDD BORE BETWEEN THE PRODUCT PIPE AND THE UNDISTURBED EARTH AT EACH HDD ENTRY AND EXIT LOCATIONS. GROUT DELIVERY METHOD SHALL BE FROM MULTIPLE POINTS WITHIN THE ANNULAR SPACE. CONTRACTOR SHALL MONITOR AND CONTROL GROUT PRESSURES TO WITHIN LIMITS FOR THE ENCOUNTERED GEOTECHNICAL MATERIALS.
11. IF THE CONTRACTOR ENCOUNTERS AN OBSTRUCTION THAT PREVENTS THE INSTALLATION ACCORDING TO THE PROJECT SPECIFICATIONS, THE CONTRACTOR SHALL PLACE A CEMENT BASED GROUT WITHIN THE BORE. WORK SHALL NOT RESUME UNTIL

12. CONTRACTOR SHALL USE THE DRILL AND INTERSECT INSTALLATION STRATEGY TO COMPLETE THIS INSTALLATION.
13. THE PILOT BORE WILL BE EITHER 10.625" OR 12.25" IN DIAMETER. THE FINAL REAMED HOLE DIAMETER IS ANTICIPATED TO BE 36". THE NUMBER OF REAMING PASSES WILL BE DETERMINED BY THE CONTRACTOR SELECTED FOR THE WORK.
14. CONTRACTOR SHALL USE A GYROSCOPIC GUIDANCE SYSTEM TO COMPLETE THE PILOT BORE INSTALLATION.
15. CONTRACTOR SHALL MONITOR PRECIPITATION AND RIVER LEVEL ELEVATIONS AND BE PREPARED TO REMOVE EQUIPMENT PRIOR TO A FORECASTED FLOOD EVENT.
16. IF AN INTERMEDIATE WELD IS REQUIRED DURING PULLBACK OPERATIONS, THE HDD CONTRACTOR SHALL INSTALL THE LONGEST PIPE SECTION LAST. THE FIRST PIPE STRING SHALL BE AS SHORT AS POSSIBLE TO ALLOW FOR THE INSTALLATION OF THE LONGEST SECOND SECTION OF PIPE STRING.

**SPANISH LAKE PARK HDD PLAN VIEW**

PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:	
ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1 (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STATED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL
PILOT EXIT ANGLE	DECREASE ANGLE UP TO 2° (FLATTER), BUT NO INCREASES IN EXIT ANGLE ALLOWED.
PILOT EXIT LOCATION	UP TO TEN (10) FEET SHORTER OR LONGER.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
PILOT ALIGNMENT	UP TO TEN (10) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTERLINE BUT NOT WITHIN FIVE (5) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY OR ANY BELOW GRADE UTILITY OR STRUCTURE.

**Soil Stratigraphic Legend:**

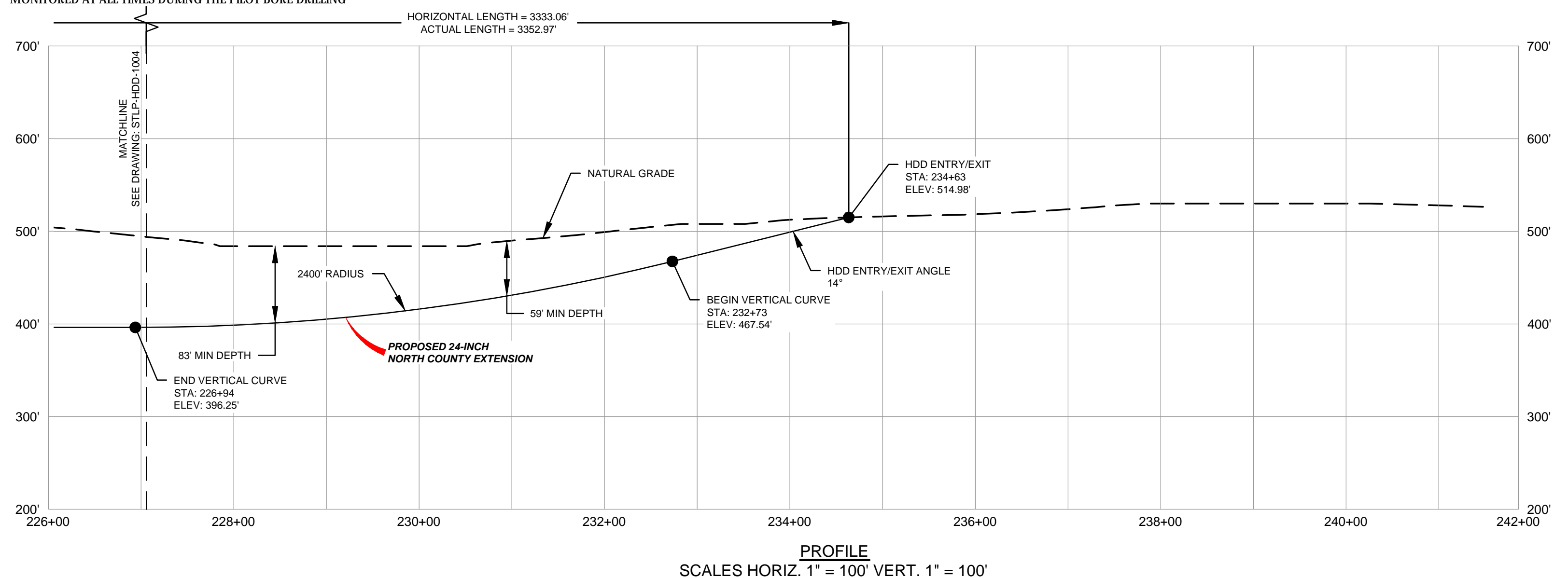
- ML: MUDSTONE
- CH: CLAY
- CL: CLAY
- SP: SILTSTONE
- SW: SANDSTONE
- GP: GRAVELLY SAND
- SM: SANDSTONE

**Rock Stratigraphic Legend:**

- L: LIMESTONE
- M: MUDDSTONE
- S: SHALE
- SL: SILTSTONE
- C: CONCRETE
- Q: QUARTZ

**LEGEND**

- PROPOSED PERMANENT EASEMENT
- EXISTING PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE
- PROPOSED STAGING AREA
- ACCESS ROAD
- USACE EASEMENT
- PROPOSED 24-INCH NORTH COUNTY EXTENSION
- PROPERTY LINE
- MMID
- EXISTING GAS PIPELINE
- EXISTING FOREIGN PIPELINE
- EXISTING OVERHEAD LINE
- ROAD CENTERLINE
- COMMON SURVEY CORRIDOR
- STREAM (DELINEATED)
- STREAM (DESKTOP)
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- BORE LOCATION



- NOTES:**
1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-AWI AND USGS.
  2. EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR.
  3. PROPERTY LINES DEPICTED ON THIS PLAN ARE APPROXIMATED BY DEED AND TITLE INFORMATION.
  4. BASE FLOOD ELEVATION LINE SHOWN FOR 100 YEAR FLOOD PLAIN LIMIT WAS PULLED FROM FEMA FLOOD INSURANCE RATE MAPS (FIRM). THE ELEVATION OF 438 FEET WAS DETERMINED USING MAP NUMBERS 29189C0080K AND 17083C0278D.

REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS				REVISIONS				REVISIONS				APPROVALS						
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	
STLP-A-1005	ALIGNMENT SHEET			2	AMENDMENT TO PERC	04/2017	AK	KAM	RJP													
STLP-A-1006	ALIGNMENT SHEET			5	ISSUED FOR IMPLEMENTATION PLAN	05/2018																
STLP-HDD-1004	HDD PLAN AND PROFILE																					

PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**MOTT MACDONALD**

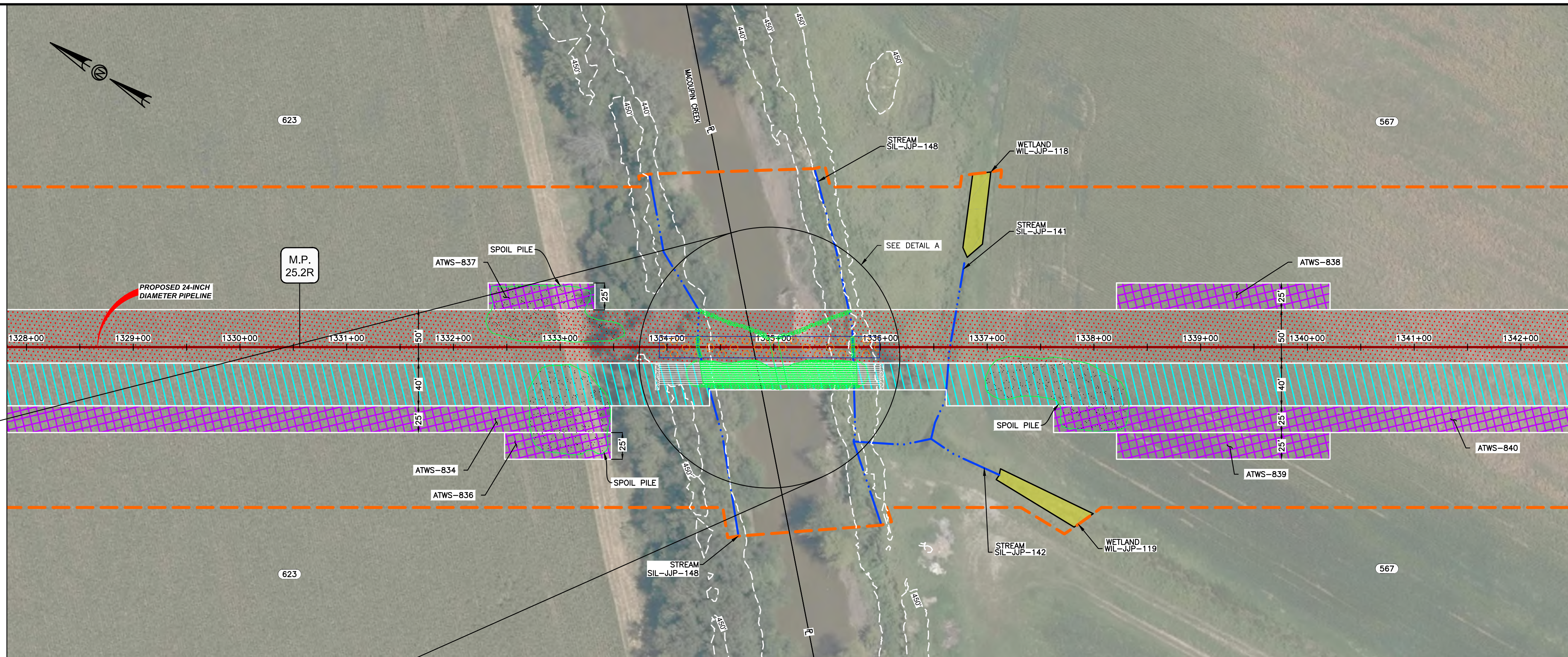
SPIRE STL PIPELINE PROJECT  
HDD PROFILE OVERVIEW  
SPANISH LAKE PARK NORTH COUNTY EXTENSION  
ST. FERDINAND TOWNSHIPS, ST. LOUIS MISSOURI

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- 12:58PM jmm71158

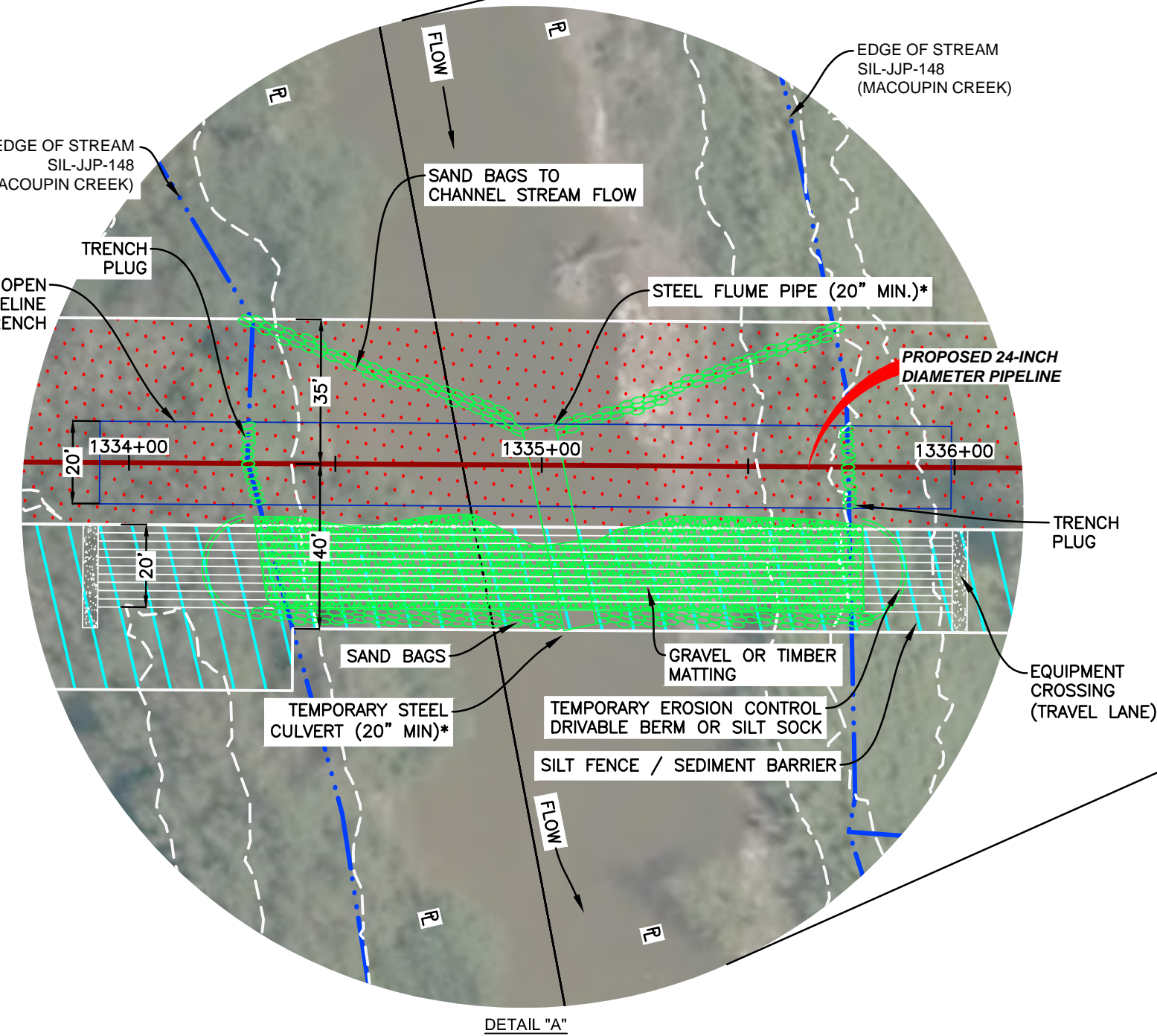
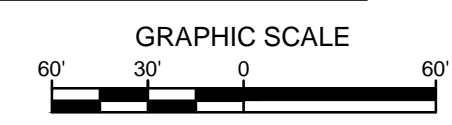




LOCATION MAP  
N.T.S.

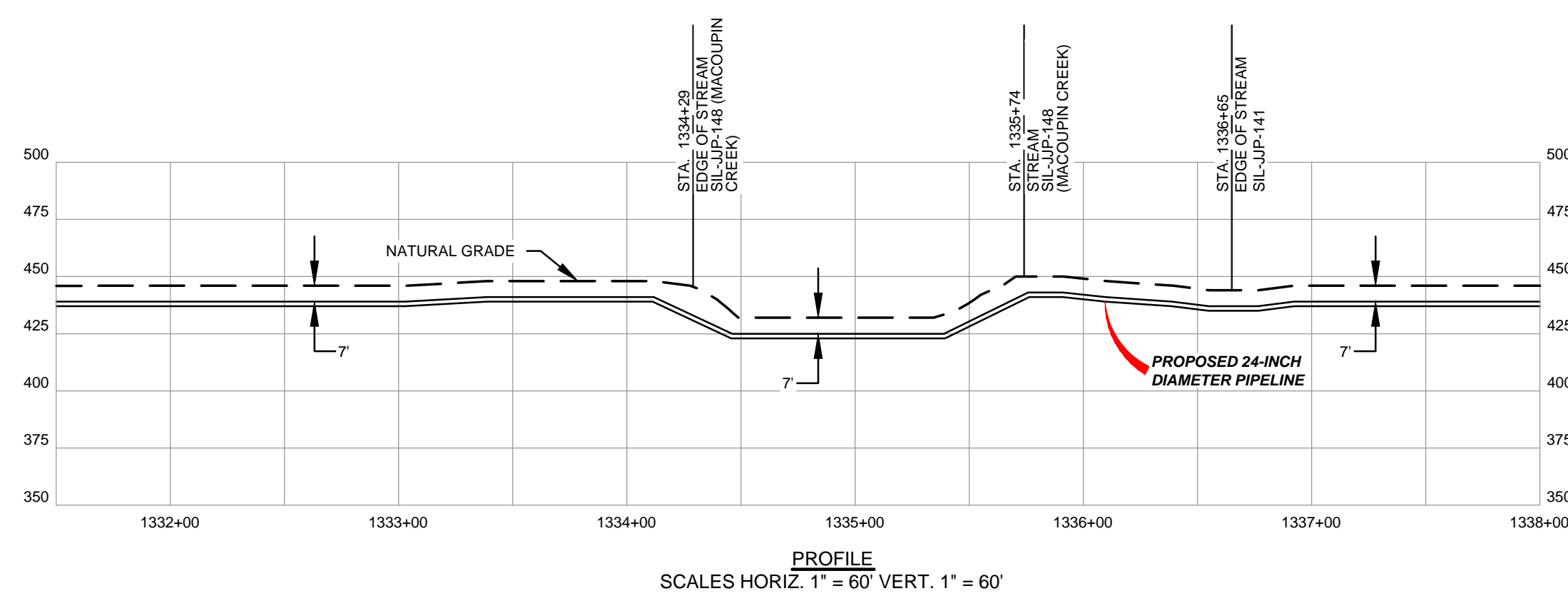


PLAN



DETAIL "A"

\*ACTUAL NUMBER OF FLUMES/PIPES/CULVERTS REQUIRED TO BE DETERMINED IN THE FIELD BASED ON STREAM FLOWS AT THE TIME OF CONSTRUCTION



PROFILE  
SCALES HORIZ. 1" = 60' VERT. 1" = 60'

LEGEND

- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- PROPOSED STAGING AREA
- ACCESS ROAD
- COMMON SURVEY CORRIDOR
- PROPOSED 24-INCH DIAMETER PIPELINE
- EXISTING GAS PIPELINE
- EXISTING FOREIGN PIPELINE
- OVERHEAD POWER LINE
- MMID
- PROPERTY LINE
- MUNICIPAL LINE
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- EDGE OF STREAM (DESKTOP)
- EDGE OF STREAM (DELINEATED)
- SILT FENCE / SEDIMENT BARRIER
- REINFORCED SILT FENCE
- FENCE LINE

NOTES

1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-NWI AND USGS.
2. EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE, AND SHALL BE VERIFIED BY CONTRACTOR.
3. THE MAXIMUM FLOW RECORDED DURING 2016 CALENDAR YEAR AT USGS 0658700 MACOUPIN CREEK NEAR KANE, IL WAS 7400 CUBIC FEET PER SECOND ON JULY 3, 2016.

REFERENCE DRAWINGS		REFERENCE DRAWINGS		REVISIONS					REVISIONS					APPROVALS								
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR	DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE	
STLP-A-030	ALIGNMENT SHEET			1	ISSUE FOR FER	01/2017	ACS	RJP	DGG							DS	03/2017	DGG	12/2017			
				2	AMENDMENT TO FER	04/2017	ACS	RJP	DGG							CHECKED BY	DATE	P.M. APPROVAL	DATE	SCALE: 1" = 60'		
				5	ISSUED FOR IMPLEMENTATION PLAN	05/2018	ACS	RJP	DGG							RJP	04/2017	JEV	12/2017		STLP-MC-001	

PREPARED FOR  
**Spire STL Pipeline**

PREPARED BY  
**MOTT MACDONALD**

PROJECT  
**SPIRE STL PIPELINE PROJECT**  
PROPOSED 24-INCH DIAMETER PIPELINE  
MACOUPIN CREEK CROSSING  
GREENE COUNTY, ILLINOIS