



**NEXUS Gas Transmission
Proposed Pipeline Project**

DRAFT

Drain Tile Mitigation Plan



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LIST OF ACRONYMS

DSWR	Division of Soil and Water Resources
DTE	DTE Gas Company
DTMP	Drain Tile Mitigation Plan
HDPE	High-density polyethylene
NEXUS	NEXUS Gas Transmission, LLC
NRCS	Natural Resource Conservation Service
ODNR	Ohio Department of Natural Resources
PE	Polyethylene
PVC	Polyvinyl chloride
ROW	Right-of-Way
USDA	United States Department of Agriculture

1 INTRODUCTION

NEXUS Gas Transmission, LLC (NEXUS) is proposing construction of approximately 255 miles of new, 36-inch diameter natural gas transmission pipeline through Ohio and Michigan, known as the NEXUS Gas Transmission Project (Project or NEXUS Project). The mainline route originates in Columbiana County, Ohio and extends through Ohio and Michigan, connecting with facilities of DTE Gas Company (DTE) in Ypsilanti Township, Michigan. The proposed mainline route includes approximately 208 miles of new pipeline in Columbiana, Stark, Summit, Wayne, Medina, Lorain, Huron, Erie, Sandusky, Wood, Lucas, Henry, and Fulton Counties, Ohio; and approximately 47 miles of new pipeline in Lenawee, Monroe, Washtenaw and Wayne Counties, Michigan.

The proposed Project will cross agricultural fields that contain a widespread network of subsurface drainage systems, commonly known as drain tile systems. NEXUS is committed to working with Stakeholders and landowners to minimize the potential for impacts to drain tile systems and has developed this draft Drain Tile Mitigation Plan (DTMP) for use during planning, construction, and restoration of the proposed Project in order to manage, mitigate and repair drainage systems impacted by construction activities.

As outlined below, parcels crossed by the proposed Project will be individually reviewed and analyzed to determine the potential for drain tile impacts. Appropriate advance planning and mitigation work will be undertaken as practicable. This will be accomplished through communication with Stakeholders, landowners and subject matter experts. NEXUS will be responsible for the costs associated with mitigating and repairing drain tile impacts from construction-related activities so that drainage systems are at least equivalent to their pre-construction condition. This draft DTMP will be revised and expanded as appropriate as the proposed Project moves forward and additional site-specific information is obtained.

2 DEFINITIONS

A. Agricultural Land – Land which is presently under cultivation; land which has been previously cultivated and not subsequently developed for non-agriculture use; and cleared land which is capable of being cultivated. It includes land used for cropland, improved pasture, truck gardens, vineyards and orchards (ODNR).

B. Agricultural Inspector – A person qualified by education and experience for the purpose of evaluating pipeline construction in relation to soil removal and replacement, drainage repairs, and corridor restoration associated with agricultural land and cropland.

C. Cropland – A land use category that includes areas used for the production of crops for harvest, both cultivated and non-cultivated. Cultivated crops include row crops, close grown crops, vegetables and hay and pasture in rotation with the crops. Non-cultivated crops include lands used in conservation grassland programs, berries, horticultural plants and long stand vegetables.

D. Drain Tile – Any artificial sub-surface system designed to intercept, collect, and convey excess soil moisture to a suitable outlet. This may include systems constructed using clay, concrete, polyvinyl chloride (PVC), polyethylene (PE) materials, and high-density polyethylene (HDPE) plastic.

E. Drain Tile Inspector – A person qualified by experience for the purpose of evaluating pipeline construction in relation to drain tile removal and replacement, repairs and system restoration.

F. Drain Tile Contractor – A person qualified by experience for the purpose of drain tile installation, drainage repairs and drainage system restoration.

G. Landowner – Person(s) holding legal title to property on the pipeline route from whom NEXUS is seeking or has obtained a temporary or permanent easement, or any person(s) legally authorized by a landowner to make decisions regarding the mitigation or restoration of agricultural impacts to such landowner's property. This includes tenant farmers on the public or private properties

H. Stakeholders – Federal, state and local agencies, landowners and local citizens impacted by the proposed project activities.

I. Pipeline – The mainline pipeline and its related appurtenances (ODNR).

J. Right-of-Way (ROW) – The permanent and temporary easements that NEXUS acquires for the purpose of constructing and operating the pipeline.

K. Right-of-Way (ROW) Agent – A person to negotiate the buying and selling of private lands or land use rights (such as easements) between two or more parties.

L. Surface Drains – Any surface drainage system such as shallow surface field drains, grassed waterways, open ditches, or any other conveyance of surface water (ODNR).

M. Tenant – A person or persons lawfully residing on, or in operational control of the land.

N. Topsoil – The upper-most part of the soil commonly referred to as the plow layer, the A layer, or the A horizon, or its equivalent in uncultivated soils. It is the surface layer of the soil that has the darkest color or the highest content of organic matter (as Identified in the United States Department of Agriculture (USDA) County Soil Survey and verified with right-of-way samples) (ODNR).

3 GENERAL OVERVIEW OF DRAINAGE SYSTEMS

Drain tile is used in agricultural areas to improve drainage in soils with high groundwater or poor internal drainage. Drain tile typically removes excess water from the top 3 to 4 feet of soil and improves the potential for crop productivity. Pipeline construction activities, particularly trenching and heavy equipment traffic, can damage existing drain tile.

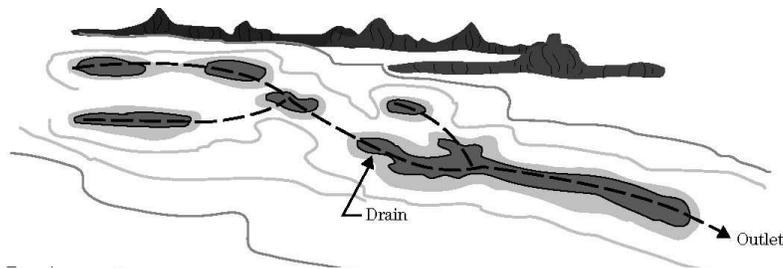
Conduits support the overall makeup of drain tile systems and are intended to facilitate water drainage. Laterals are smaller drain tile – typically 4" in diameter – aligned as much as possible with field contours in order to intercept or capture water as it flows down slope.

Mains and sub-mains are larger drain tile – typically 6" to 18" in diameter – positioned on steeper grades or in swales in order to facilitate the placement of laterals and to convey water to an outlet.

Historically, the most common materials used to manufacture drain tile have been clay, concrete, PVC, and PE. Practically all agricultural drain tile installed today is made from HDPE plastic. Drain tile made from HDPE plastic comes in various wall profiles (e.g. corrugated and smooth), diameters (e.g. 4" – 24" and larger), wall thicknesses (e.g. single and dual wall), and wall perforations (e.g. slotted and non-perforated).

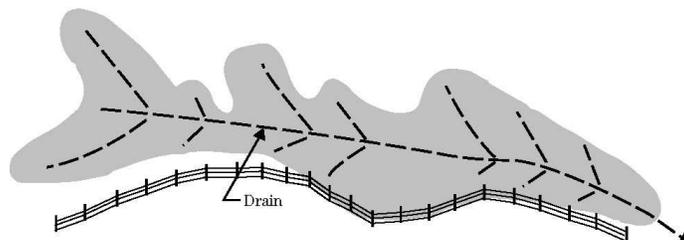
Because sub-surface drainage is used primarily to lower the water table or remove excess water percolating through the soil, drain tile is typically laid out in a pattern that best fits the soil and topography of the area. There are two basic ways to lay out drain tile: random and systematic. It is expected that the proposed NEXUS Project will encounter both layouts along the pipeline corridor.

The random system pattern is suitable for undulating or rolling land that contains isolated wet areas. The main drain is usually placed in the swales rather than in deep cuts through ridges. The laterals in this pattern are arranged according to the size of the isolated wet areas. Thus, the laterals may be arranged in a parallel or herringbone pattern or may be a single drain connected to a sub main or the main drain (NRCS).



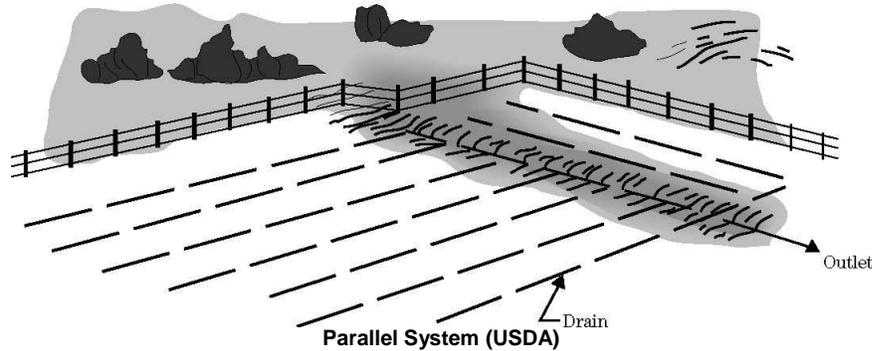
Random System (USDA)

The types of systematic systems expected to be encountered include the herringbone, parallel and double main system. The herringbone system consists of parallel laterals that enter the main at an angle, usually from both sides (USDA). The main is located on the major slope of the land, and the laterals are angled upstream on a grade. This pattern is often combined with other patterns to drain small or irregular areas. Its disadvantage is that it may cause double drainage (since two field laterals intercept the main at the same point). The herringbone pattern can provide the extra drainage needed for the less permeable soils that are found in narrow depressions.

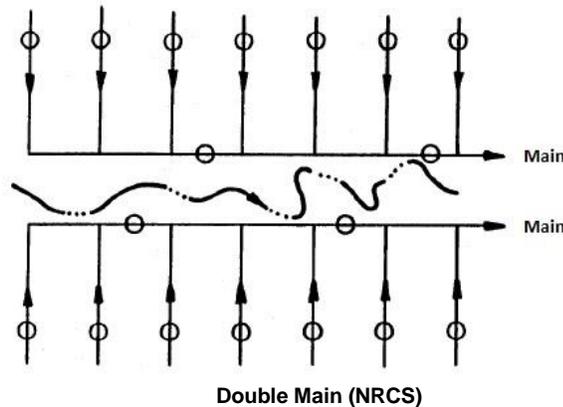


Herringbone System (USDA)

The parallel system consists of parallel lateral drains located perpendicular to the main drain. The laterals in the pattern may be spaced at any interval consistent with site conditions. This pattern is used on flat, regularly shaped fields and on uniform soil. Variations of this pattern are often combined with others (NRCS).



The double main system is a modification of the parallel and herringbone patterns. It is applicable where a depression, frequently a grass waterway, divides the field in which drains are to be installed. This pattern is used where a depression area is wet because of seepage from higher ground. Placing a main on each side of the depression serves two purposes, it intercepts the seepage water, and it provides an outlet for the laterals. If the depression is deep and unusually wide, and if there is only one main in the center, a change in the grade line of each lateral may be required before it reaches the main. Locating a main on each side of depressions keeps the grade line of the laterals more uniform.



Drain tile can be installed with a backhoe, tile plow, and chain machine or wheel trencher. Drain tile laterals are generally installed at a depth of three-to-five feet, and outlet tile is often installed five-to-six feet deep or deeper in some areas. Installation depths can vary dramatically based on the need to maintain grade through a hill slope and reach a desired outlet location and depth. The drain tile must be installed deep enough to effectively drain subsurface water from the property, minimizing the need to repair or install additional drain tile in the future.

4 PROPOSED NEXUS PROJECT AREA

The presence of drain tile along the proposed NEXUS pipeline route generally increases as the route traverses east to west. Beginning in Columbiana County and through Stark, Summit, Wayne, Medina and Lorain Counties in Ohio, the proposed pipeline route crosses agricultural land with minimal drain tile consisting mostly of random, with occasional systematic, layouts. Once into Erie County and continuing through Sandusky, Wood, Lucas, Henry and Fulton Counties in Ohio, drain tile becomes more prevalent and consists of mostly systematic layouts. As the proposed pipeline route crosses into Michigan, systematic drain tile layouts continue to be

prevalent in Lenawee County. The presence of drain tile is less in Monroe and Washtenaw Counties, Michigan. There are no known drain tile systems along the proposed NEXUS pipeline route in Wayne County, Michigan.

As the frequency of systematic layouts increases, the drain tile spacing typically becomes tighter or “closer”, increasing the intensity of drainage in that area. The counties in Ohio expected to have the greatest density of drain tile include Erie, Sandusky and Wood. In Michigan, Lenawee County is expected to have the greatest density of drain tile.

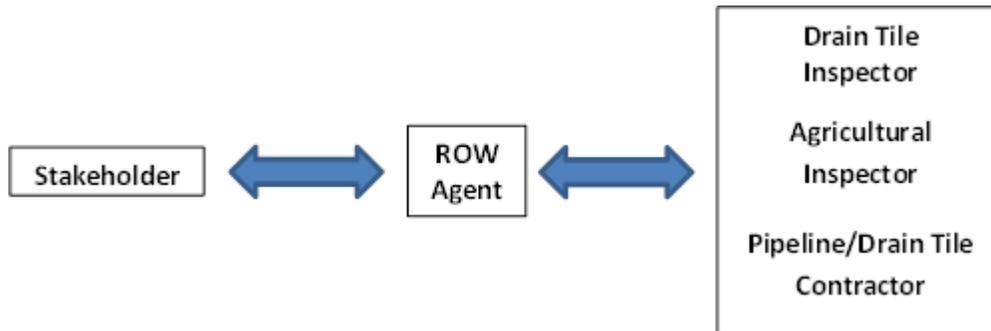
It is anticipated that many of the drainage systems in the proposed Project area are designed like a spider web: drain tile and surface drains funnel water to a main tile or area on or off the property, and the water is moved to a ditch, creek, or other waterbody.

5 PRE-CONSTRUCTION PHASE

5.1. Communication Protocol

NEXUS landowners will be enabled to easily communicate drain tile concerns before, during and following the construction process and for the life of the pipeline. The affected landowner’s primary point of contact will be a NEXUS ROW Agent, who in turn will coordinate with appropriate Drain Tile Inspectors and Contractors to develop responses and solutions to landowner concerns. Landowner communication can also be facilitated through the use of NEXUS’s toll-free telephone number (1-844-589-3655).

Flow Diagram for Communications



5.2. Preliminary Drain Tile Assessment

NEXUS ROW Agents will communicate with affected landowners in advance of construction activities to gain an understanding and knowledge of existing and planned drainage systems traversed by the proposed Project. NEXUS will use a structured landowner questionnaire (see Appendix 9.1) to collect information pertaining to drain tile layout, location, material, size, and depth of cover, etc. NEXUS will also gather information from the following additional sources, as needed and practicable:

- Interviews with various public agencies and entities (local Soil and Water Conservation Districts, County Engineers, Conservancy Districts and County Drain Commissioners, and Farm Bureaus)
- Interviews with local Drain Tile Contractors

- Review of existing drain tile plans, maps and as-built drawings
- Analysis of high resolution aerial imagery
- Field investigations

Where landowners have communicated plans to install future drain tile systems, NEXUS will endeavor to accommodate plans for future drain tile systems as provided by the landowner. NEXUS will construct the pipeline at a depth of approximately 6 to 12-inches below the planned drain tile to accommodate planned installation of drain tile systems. The location of planned drain tile systems will also be identified on the Project as-built alignment sheets.

5.3. Mitigation Planning and Process

If drain tile is determined to be present on a property, a meeting with a Drain Tile Contractor will be scheduled on-site to gather additional details to develop a drain tile mitigation plan in coordination with affected landowners. NEXUS will utilize the information gathered to identify mitigation options, taking into consideration drain tile size requirements and materials, if the drain tile is to be cut and capped, and/or if drain tile is to be removed and replaced.

NEXUS recognizes the amount of drain tile information from each landowner will vary. It is anticipated the information will range from detailed drain tile locations to unknown conditions. At the very least, drain tile information will be tabulated per property tract and utilized for construction planning. In the event detailed drain tile locations are known (i.e. existing maps, GPS data, imagery, etc.), the details will be illustrated on property drawings. The drawings will be utilized for pipeline construction planning and may be requested by the landowner before the construction process begins on their property. Appendix 9.2 provides a flow chart of this process.

The following mitigation measures will be implemented:

- NEXUS will be responsible for repairing drain tile damages that result from construction-related activities so that they are at least equivalent to their pre-construction condition. If the construction schedule impacts the landowner's ability to grow crops during that season, appropriate compensation will be provided.
 - If available during the time of construction, NEXUS will endeavor to use qualified local Drain Tile Contractors with experience in Ohio and Michigan to conduct drain tile repairs/replacements.
 - The Drain Tile Contractor will work under the direction of, and with the direct involvement of, the pipeline construction contractor and the NEXUS construction management team.
 - Repair materials will be equivalent to those currently in place for repairing the damaged drain tile and will be joined to existing drain tile by means of adapters or couplers manufactured for that purpose.
 - During construction, damaged drain tile will be staked with lath using colored flagging in such a manner that they will remain visible to the construction crews until permanent repairs are completed. Damaged, unused, or discarded pieces of drain tile will be removed and disposed of promptly and properly.
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- To the extent practicable, NEXUS will replace drain tile to the same location, depth, alignment, grade, and spacing as the pre-construction drain tile.
- GPS technology capable of 3-D survey grade accuracy, or other similarly accurate technology, will be used to document drain tile location, alignment and grade.
- The landowner will be given the opportunity to observe temporary and permanent repairs on their property. For safety concerns, the landowner shall request access with the ROW Agent to be properly escorted onto the construction ROW.
- The Agricultural Inspector and Drain Tile Inspector will inspect and approve the drain tile repairs prior to the commencement of final restoration.
- Permanent repairs to drain tile will be completed as soon as possible, based on, for example weather and soil conditions.
- NEXUS will collect as-built data of the restored and replaced drain tile. This will include the linear extent of the drain tile repairs and the location of adapter connections.

6 CONSTRUCTION PHASE

The following sets forth anticipated measures and techniques to be employed during mitigation activities (these may be subject to change depending on field conditions and other variables). NEXUS will have Agricultural Inspectors and Drain Tile Inspectors present during construction, to monitor the execution of the following measures and, as noted above, the landowner will be given the opportunity to observe temporary and permanent repairs on their property.

6.1 Drain Tile Identification

Using the information gathered during the drain tile assessment phase, known locations of existing drain tile will be staked with lath using colored flagging, after stripping the topsoil from the construction ROW. NEXUS will stake both sides of the trench, once the drain tile has been exposed. These locations will be surveyed to define the linear extent of each drain tile within the construction ROW.

In some cases, drain tile information may be limited or locations not known. Once the drain tile has been exposed during construction, NEXUS will communicate with the landowner based on field conditions as to how the drain tile will be repaired. If the drain tile location is not known, the drain tile will be staked with lath using colored flagging on both sides of the trench once it has been exposed during pipeline construction.

6.2 Drain Tile Repair

During construction, drain tile will be temporarily repaired in the trench until the pipe is lowered into the trench and permanent repairs are completed.

The following describes the typical pipeline construction process for drain tile repairs:

A. Pipeline Trench - Temporary Repair

As trenching equipment traverses across the landowner's property, temporary repairs will be completed at each drain tile location as it is being exposed. Drain tile that will be impacted by trenching will be:

- Cut and temporarily capped or screened, if water is not flowing in the drain tile.
- Cut and temporarily repaired, if water is flowing in the drain tile.

For temporary repairs, a rigid support or pipe will be laid across the full extent of the trench with a 1-foot minimum into undisturbed ground on both sides of the trench. Drain tile will be laid on the support and connected with adapters to the existing drain tile. This process will be utilized throughout the trenching phase to maintain drainage, where necessary.

The temporary drain tile will be disconnected as the pipe is lowered into the trench to approximately 6 to 12-inches below the drain tile. The drain tile connections will be re-established as quickly as possible to reduce the amount of water flowing into the trench.

B. Pipeline Trench - Permanent Repair

After the pipe is lowered into the trench but before the trench is backfilled, the drain tile will be permanently repaired:

- Where drain tile was temporarily capped or screened, the drain tile will be laid onto a rigid beam, high strength composite material, rigid outer casing pipe or other rigid support material that will keep the repaired drain tile supported the full length of the trench and approximately 3-feet into undisturbed ground on both sides of the trench. The rigid support will be stabilized and adapters or couplers will connect the repaired tile to existing drain tile on both sides of the trench.
- Where drain tile was temporarily repaired in the trench, the drain tile will be fortified based on the above mentioned requirements. The rigid support will be stabilized.

NEXUS will utilize sandbags in the trench to structurally support and prevent settling of the permanent repaired drain tile during or after the backfill process (see Appendix 9.3).

C. ROW - Permanent Repair

Before completing permanent drain tile repairs in the trench, the tile will be internally probed or examined by other suitable means on both sides of the trench for the entire width of the ROW. If damage has occurred, the drain tile will be repaired.

If Project construction activities damage drain tile outside the pipeline construction ROW, NEXUS will address the issue with the landowner on a case-by-case basis.

7 POST-CONSTRUCTION PHASE

After the replacement of topsoil in the ROW, drain tile repaired and replaced by NEXUS within the ROW will be monitored for three years, or until restoration is considered successful. Conditions

to be monitored during this period include drain tile settling, crop production, and drainage. The monitoring period is intended to allow for effects of weather changes such as frost action, precipitation, settling and changes in growing seasons, from which various monitoring determinations can be made.

During and after the post-construction monitoring phase, the NEXUS ROW Agent will remain the landowner's point of contact and will coordinate with appropriate Drain Tile Inspectors and Contractors to develop responses and solutions to landowner concerns. Landowner communication can also be facilitated through the use of NEXUS's toll-free telephone number (1-844-589-3655)

8 SUMMARY

NEXUS appreciates the importance of agricultural drainage systems in the proposed Project area and is committed to minimizing the potential for impacts to drainage systems as a result of construction-related activities. NEXUS will work with landowners to identify the locations of existing drain tile and plans for developing drainage systems, and devise mitigation and repair strategies as necessary. NEXUS will be responsible for the costs associated with mitigating and repairing impacts from construction-related activities. Unless otherwise negotiated with the landowner, drain tile systems directly damaged by NEXUS will be repaired to at least equivalent to their pre-construction condition or replaced by NEXUS. If available during the time of construction, NEXUS will endeavor to use qualified local Drain Tile Contractors with experience in Ohio and Michigan to conduct and/or consult during drain tile repairs/replacements. Repairs and restoration to drain tile systems conducted by NEXUS will be monitored for three years, or until restoration is considered successful, to ensure the system functions properly.

This draft DTMP will be revised and expanded as the Project develops and additional site-specific information is obtained.

9 REFERENCES AND APPENDICES

ODNR - DSWR Pipeline Standard, December 3, 2013.

USDA NRCS Water Management Guide - Chapter 3 Subsurface Drainage, July 2007.

NRCS National Engineering Handbook - H_210_NEH_16, May 2008.



9.1. Drain Tile Questionnaire

Landowner Drain Tile Questionnaire

Tract# _____

Landowner

Name:

Address:

Best Phone#:

Tenant (if applicable)

Name:

Address:

Best Phone#:

1. Are you aware of any existing drain tile or recent drain tile installation (within past 30 years) on this tract? **Y or N**

If yes, please describe the following:
 - Drain Tile General Description (e.g. location within this tract, random, patterned, deep main, drains to NE corner, outlets in ditch, etc.):
 - Drain Tile Operating Condition (e.g. unknown, poor – breaking down, fair, good, etc.)
 - Drain Tile Spacing (e.g. unknown, 40' centers, varies within field, etc.):
 - Drain Tile Size (e.g. unknown, 4", 6" and 8", etc.):
 - Drain Tile Depth (e.g. unknown, laterals ~ 3' deep, mains ~ 5' deep, etc.):
 - Drain Tile Material (e.g. unknown, corrugated plastic, clay, etc.):

 2. Do you have any drain tile maps, as-built drawings, or GPS coordinates for this tract? **Y or N**

If yes, please include/attach.

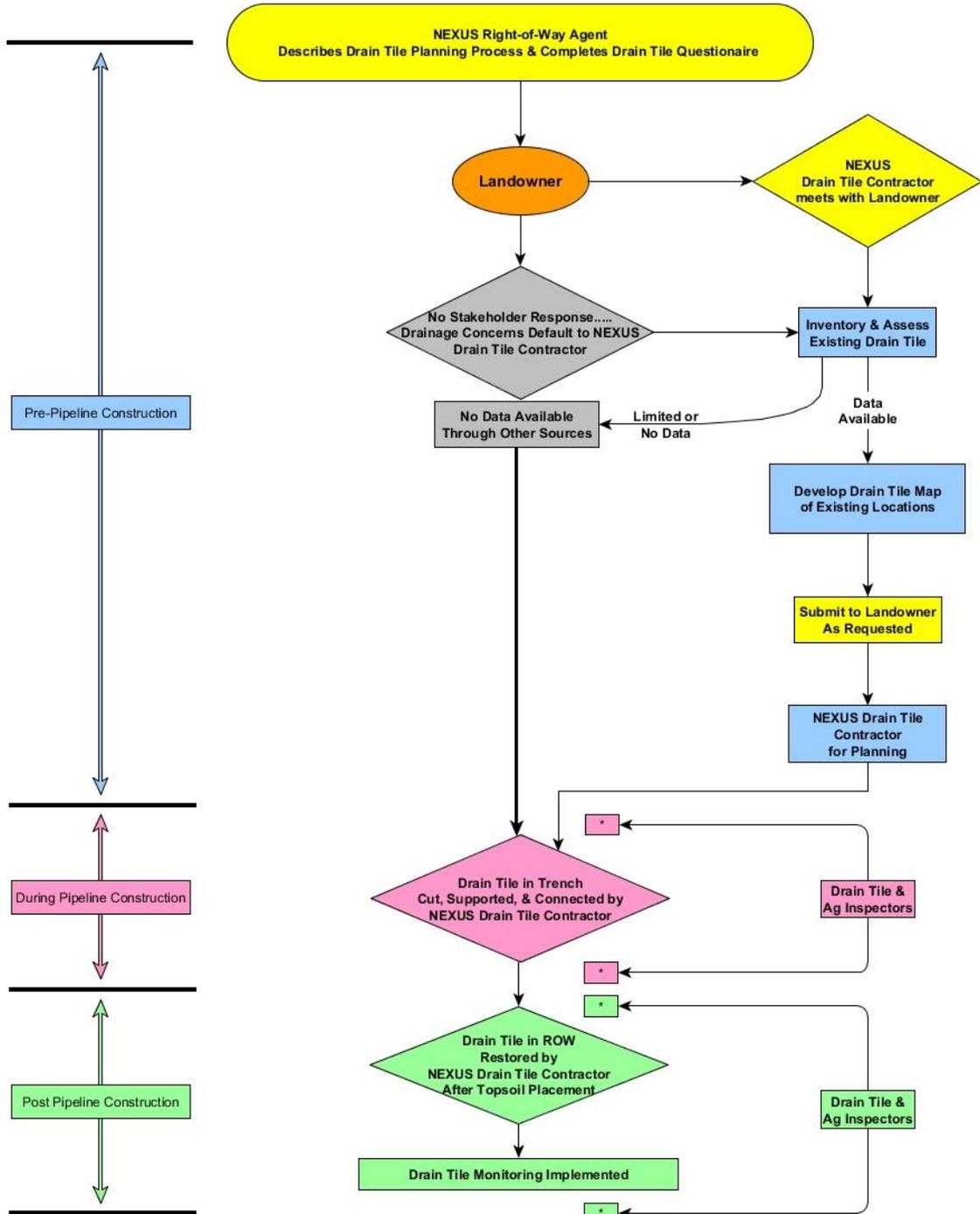
 3. Are you aware of any multiple landowner (public or private group) drainage projects associated with this tract? **Y or N**

If yes, please describe.

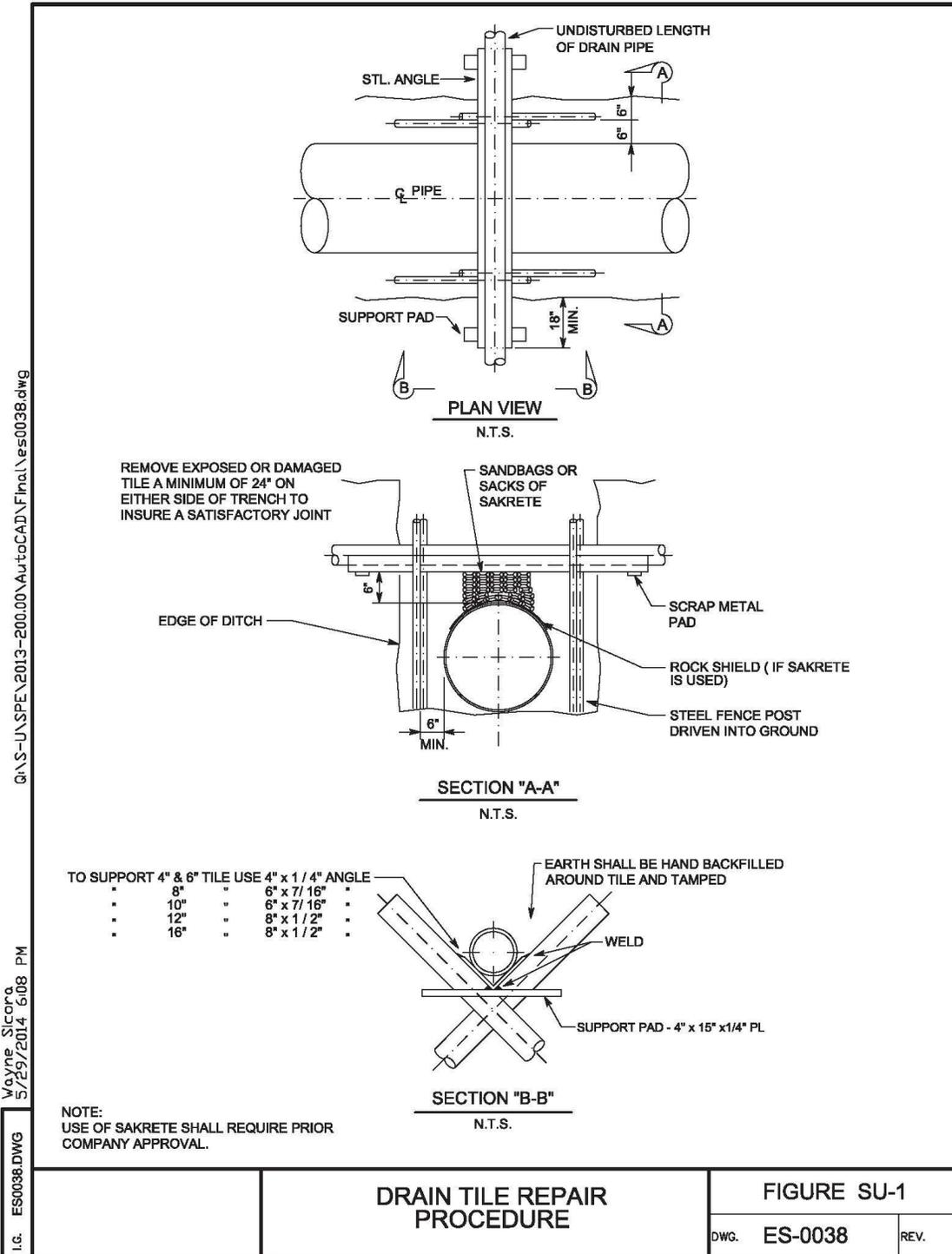
 4. Who has done or is doing drain tile installation or maintenance/repair work on this tract?

 5. Is there anything else you would like us to know about the drainage system on this tract? (e.g. surface inlets, pump/lift station, overloaded main, future drainage installation planned, etc.):
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9.2. Mitigation Planning and Process



9.3. Typical Permanent Drain Tile Repair Procedures



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