# DRAIN TILE SURVEY & MITIGATION PLAN

## INTRODUCTION

The White Tail Solar Facility (White Tail or the Project) is a proposed 150 MWac photovoltaic solar energy generation project in Washtenaw County, Michigan. Portions of the Project will be located in Augusta Township, approximately 1.0 mile northeast of Milan, Michigan. In Augusta Township, the Project is planned to be developed on primarily agricultural row crop land with Drain Tile having been installed on some, but not all, of the land. Review of the area indicates that only approximately 37% of the total acreage leased for the Project within Augusta Township is drained using Drain Tile (Drained Area). This Drain Tile Mitigation Plan identifies how the Drain Tile Networks were identified and how the Drain Tile Networks will be protected and/or decommissioned during construction and operation of the White Tail facility to ensure the integrity of the larger drainage network will be protected during construction and operations.

Planned decommissioning of Pattern Drain Tile during construction will avoid negatively impacting non-participating parcels. This will be accomplished by ensuring that all Mainlines that traverse the Project area and assist in draining surrounding properties will be protected throughout construction and operations from physical damage and sedimentation or repaired if any damage occurs.

This report consists of six sections including this introduction and finishing with conclusions. Section 2 (Soil Characterization and Soil Saturation) and Section 3 (White Tail Drained Area Vicinity Site Conditions) provide information regarding the soils, general site conditions and subsurface vadose zone hydrology. Section 4 identifies drain tile identification methods and soil saturation and water movement, both surface and subsurface, in the general area of the drained fields. Finally, a drain tile plan is provided in Section 5 that illustrates the plan based on various tile network infrastructure identified. At the end of the report is a list of applicable definitions to technical terms used throughout the report.

## SOIL CHARACTERISTICS AND SOIL SATURATION

Soil water content is classified into three general states: saturation, field capacity, and permanent wilting point. Saturation describes the point when the soil water fills all of the pore spaces (porosity) of the soil and freely drains due to gravitational potential. Soil water content at field capacity refers to a state in which the soil water no longer freely drains from the soil matrix and where gravitational potential is less than matrix potential. At field capacity there is generally enough air within the soils as not to limit crop production. Drainage tiles are generally used to remove water from the soil system between 100% saturation and field capacity.

Soil taxonomy classifies soils based on the percentage of time during the year that a soil condition is naturally above or below field capacity. In general the “aqu” modifier is used to indicate soils that have saturated conditions long enough to impact soil forming factors. The aqu modifier along with additional soil classification terms can indicate to soil scientists the potential for groundwater to be present within the soil profile.

Soils within the suborder "Aqu" can be defined as Endo or Epi saturated, which is a further diagnostic soil characteristic. Aquollic soil moisture conditions are a subgroup classification taxa and are generally saturated for a shorter duration than Endo and Epi saturated soil conditions. Endo and Epi saturated soils are defined by soil classification as[1]:

> *"Endosaturation - A diagnostic soil characteristic consisting of a particular pattern of soil wetness characterized by saturated layers throughout the profile from a depth of 200 cm or more and extending upward to the top of the water table. It is used to define some great groups. Saturation, reduction, and redoximorphic features are the three elements required for aquic conditions."*
>
> *"Episaturation - A diagnostic soil characteristic consisting of a particular pattern of soil wetness in which one or more saturated layers are underlain by one or more unsaturated layers, all within 200 cm from the mineral soil surface. Episaturation is commonly called a perched water table. It is used to define some great groups. Saturation, reduction, and redoximorphic features are the three elements required for aquic conditions."*
>
> *"Aquollic - These soils have, in one or more subhorizons within the upper 25 cm of the argillic horizon, redox depletions with chroma of 2 or less and also aquic conditions for some time in normal years (or artificial drainage). In addition, the Ap horizon or the surface soil to a depth of 18 cm after mixing has a color value of 3 or less, moist, and 5 or less, dry. These soils are intergrades between Argiaquolls and Hapludalfs."*

In general terms soils that are endosatruated are controlled by the water table, are saturated from below, and typically have less water at the soil surface. Episatruated soils have saturation caused by perching of water and typically have a higher likelihood of water at the soil surface during portions of the year than episaturated soils. As stated above all of these soils have redoximorphic features indicating that they are naturally saturated for portions of the year.

## WHITE TAIL DRAINED AREA VICINITY SITE CONDITIONS

The soils in the White Tail Drained Area naturally experience periods of saturation and reduction processes consistent with the suborder classification "aqu". The classification of the soils within the Drained Area within the Project area indicates these soils experience periods of saturation and reduction (Figure 1 and Table 1). Approximately 55% of the soils in the Drained Area have Endo or Epi diagnostic soil characterizations within the Great Group classification. Another 41% of the artificially drained soils are not "aqu" classed in the Suborder but do have some periods of reduced conditions described in the Subgroup with the taxa "Aquollic" (Table 2). Approximately 4% of the artificially drained soils in the Project area are not identified as having extended periods of saturated soil conditions that create redoximorphic features. Soil classification terms and definitions are based on the Keys to Soil Taxonomy, 13th edition[2].

[1] Ditzler, Craig. 2017. A Glossary of Terms Used in Soil Survey and Soil Classification Including Definitions and Brief Commentary (verified 4/3/2024 https://www.nrcs.usda.gov/sites/default/files/2022-08/A_Glossary_of_Terms_Used_in_Soil_Survey_and_Classification.pdf

[2] *Soil Survey Staff. 2022. Keys to Soil Taxonomy, 13th ed. USDA-Natural Resources Conservation Service.*

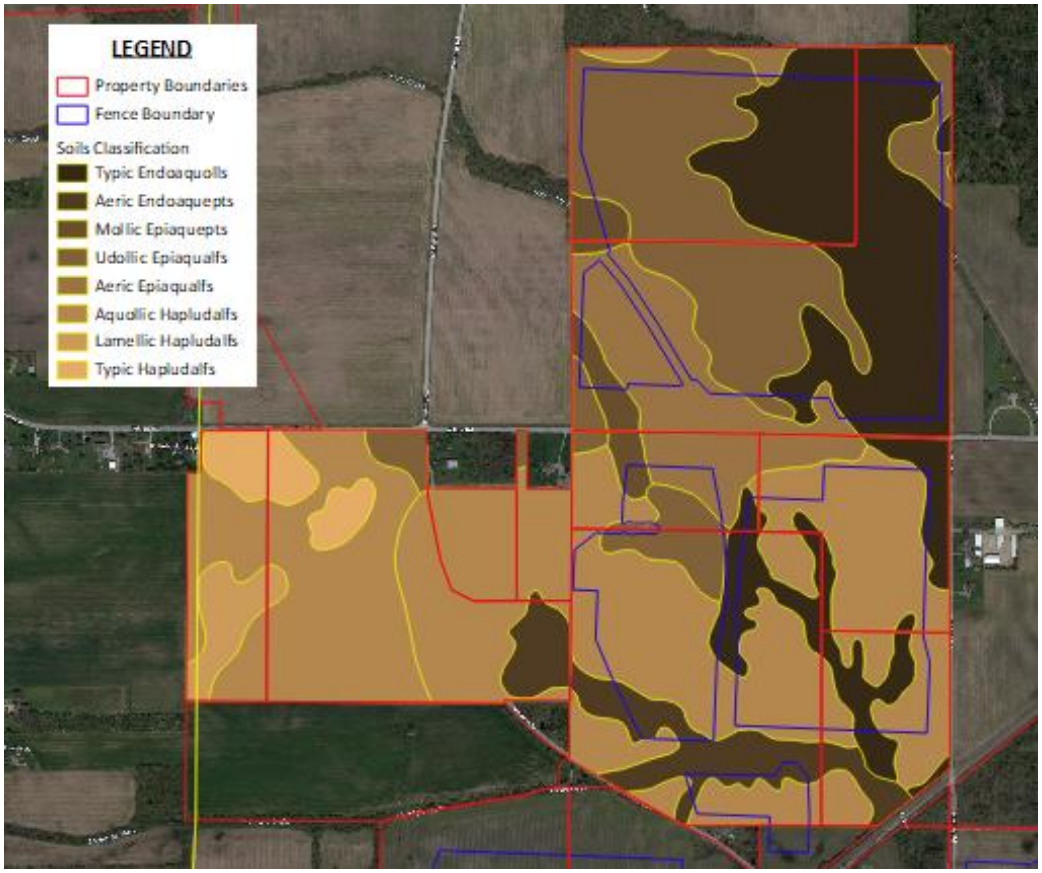


**Figure 1. Soil Classifications for the Drained Area within the White Tail Solar Facility in Augusta Township, Michigan**

**Table 1. Soil map units and classification of soil within the drainage properties within the Drained Area of the White Tail Solar Facility.**

| Map Unit Symbol | Map Unit name | Order | Suborder | Great Group | Subgroup | Acres |
|---|---|---|---|---|---|---|
| DoA | Dixboro-Kibbie fine sandy loams, 0 to 4 percent slopes | Alfisols | Udalfs | Hapludalfs | Aquollic Hapludalfs | 85.9 |
| KnA | Kibbie fine sandy loam, 0 to 4 percent slopes | Alfisols | Udalfs | Hapludalfs | Aquollic Hapludalfs | 35.9 |
| Ln | Lamson-Colwood complex | Inceptisol | Aquepts | Endoaquepts | Aeric Endoaquepts | 23.3 |
| NaA | Nappanee silty clay loam, 0 to 2 percent slopes | Alfisols | Aqualfs | Epiaqualfs | Aeric Epiaqualfs | 35.3 |
| OsB | Oshtemo loamy sand, 0 to 6 percent slopes | Alfisols | Udalfs | Hapludalfs | Typic Hapludalfs | 9.9 |
| Pc | Pella silt loam | Mollisols | Aquolls | Endoaquolls | Typic Endoaquolls | 87.7 |
| SpB | Spinks loamy sand, 0 to 6 percent slopes | Alfisols | Udalfs | Hapludalfs | Lamellic Hapludalfs | 7.1 |
| WaA | Wasepi sandy loam, 0 to 4 percent slopes | Alfisols | Udalfs | Hapludalfs | Aquollic Hapludalfs | 46.4 |
| YpA | Ypsi sandy loam, 0 to 4 percent slopes | Alfisols | Aqualfs | Epiaqualfs | Udollic Epiaqualfs | 71.8 |
| ZfsacA | Ziegenfuss clay loam, 0 to 1 percent slopes | Inceptisols | Aquepts | Epiaquepts | Mollic Epiaquepts | 8.8 |

**Table 2. Drained area soil saturation estimates based on classification taxa within the Drained Area of the White Tail Solar Facility in Augusta Township, Michigan.**

| Saturation | Classification Class | Acres | Percentage |
|---|---|---|---|
| Endo | Great Group | 116.6 | 28% |
| Epi | Great Group | 110.3 | 27% |
| Aquollic | Subgroup | 168.2 | 41% |
| No Saturation Classifier | -- | 17.00 | 4% |
| Total | -- | 412.1 | 100% |

## DRAIN TILE IDENTIFICATION & SOIL AND SURFACE WATER

Preliminary maps of the Drain Tile Network were prepared on the desktop using aerial imagery and landowner-provided data. This was supplemented by a site visit conducted on February 13, 2024 to ground-truth the preliminary maps. Data collected during the site visit was used to refine the preliminary maps and produce the Drain Tile Network map depicted in Figure 2. During the site inspection multiple locations were identified where the Drain Tile was broken and exposed. The exposed tile was clay type tile.

The Project has approximately 308,460 linear feet of Pattern Drain Tiles and 17,064 linear feet of Mainlines in Augusta Township that could be impacted by Project construction and operation (see Figure 2). The site also has approximately 933 linear feet of Drain Tiles in and around proposed solar array construction areas that appear to drain pothole areas that are not drained by Pattern Drain Tiles. This Drain Tile Mitigation Plan was developed to identify potential impacts from decommissioning Drain Tiles during construction on the subject properties and surrounding parcels that are not part of White Tail.

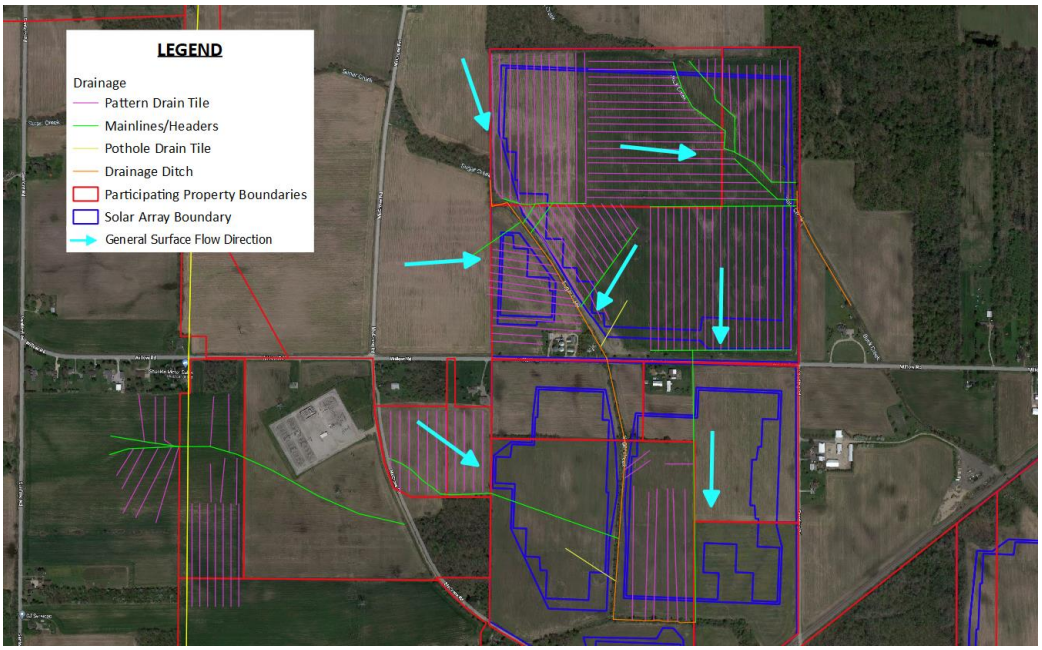


**Figure 2. Identified Mainlines and Drain Tiles within the Drain Area on the White Tail Solar Facility in Augusta Township Michigan.**

A majority of the Drain Tiles identified in the Project area in Augusta Township are located just north and south of Willow Road west of McCrone Road. Two creeks (Sugar Creek and Buck Creek) and a Drainage Way (McIntyre Drain) provide outlets for the Drain Tile in the area. These drainages also allow for the removal of surface water and natural groundwater. Sugar Creek runs generally northwest to southeast through the center of the Project where tiles are identified. Buck Creek also runs northwest to southeast but is located along the eastern edge. McIntyre Drain runs east to west and is located on the southern edge of the Drain Tiled fields. In general, surface water in this area flows from the Northwest to Southeast.

The soils north of Willow Road are mostly classified as endo and epi saturated soil conditions, as described above. The artificially drained soils within the Project in Augusta Township are naturally poorly drained prior to tiling. The Drain Tiles in this area are isolated from non-participating fields by Sugar Creek to the west and Buck Creek to the east and north. Willow Road isolates these fields in the south. The non-participating properties to the west of Sugar Creek and the solar arrays and east of McCrone Road drain to Sugar Creek. There is one identified Mainline that runs from the non-participating field immediately east of McCrone road.

The soils south of Willow Road are generally more well-drained than the soils north of Willow Road. This portion of the Project is isolated from non-participating properties by McCrone Road to the west, McIntyre Drain to the south, and Gooding Road to the east. Most of the surface and subsurface water drains to Sugar Creek which runs through the middle of the site or McIntyre Drain to the south. A single non-participating property to the east of the proposed Project and east of McCrone road is tiled and has a Mainline that flows through the facility to Sugar Creek.

# DRAIN TILE PLAN

The Project's overall goal is to ensure proper drainage in the Project area and avoid negative impacts on non-participating neighboring properties. Although Pattern Drain Tile and Pothole Drain Tile may be decommissioned, all Mainlines that assist in draining surrounding, non-participating properties, but traverse the Project will be protected throughout construction and operations from physical damage and sedimentation.

## Pattern Drain Tiles

Drain Tiles within the project area will be decommissioned in a manner that protects the integrity of the Mainlines and surface drainage features. Any Drain Tile within the Project that might be damaged during construction will be abandoned in place and the soils will be allowed to return to their natural soil water and drainage conditions. The Drain Tiles will be capped prior to entering the Mainline or drainageway to prevent sediment from entering those systems. If the Mainline only provides drainage for the area under construction (i.e., only Project property), the entire Mainline will be capped prior to flow into the surrounding ditches. If the Mainline drains non-participating properties, the Drain Tiles will be cut near the Mainline and capped so that sediment cannot enter the Mainline.

As noted above, approximately 55% of the soils in the Project area that are artificially drained have Endo or Epi diagnostic soil characterizations within the Great Group classification and another 41% of the artificially drained area soils are not "aqu" classed in the Suborder but have some periods of reduced conditions described in the Subgroup with the taxa "Aquollic". Removal of Drain Tiles in these soils will return the soil moisture conditions to native conditions and should not negatively affect surrounding upgradient properties.

Conversely, approximately 4% of the soils that contain Drain Tile in the Project area are not identified as having extended periods of saturated soil conditions that create redoximorphic features and removal of Drain Tiles from these soils should not cause drainage issues with surrounding non-participating properties.

The artificially drained soils within the Project will likely revert to being poorly drained if Drain Tiles are decommissioned. However, Drain Tile decommissioning will not negatively impact drainage on non-participating properties because of the location of Pattern Drain Tile and Mainlines relative to the creeks and drains that serve as the outlets for the Drain Tile Network.

The Drain Tiles north of Willow Road are isolated from non-participating fields by Sugar Creek to the west and Buck Creek to the east and north. Willow Road isolates these fields in the south. The non-participating properties west of Sugar Creek and the solar arrays and east of McCrone Road drain to Sugar Creek, and therefore drainage will not be negatively impacted if Drain Tiles are decommissioned within the Project. There is one identified Mainline that runs from the non-participating field immediately east of McCrone road. This Mainline will be maintained and protected throughout construction and operation.

The portion of the Project south of Willow Road is isolated from non-participating properties by McCrone Road to the west, McIntyre Drain to the south, and Gooding Road to the east. Most of the surface and subsurface water will drain to Sugar Creek which runs through the middle of the site or McIntyre Drain to the south. A single non-participating property to the east of the proposed Project and east of McCrone

road is tiled and has a Mainline that flows through the Project area to Sugar Creek. This Mainline will be maintained and protected throughout construction and operation.

In addition to subsurface drainage, White Tail is committed to protecting natural surface drainage. Two non-participating properties have surface flow that naturally drains across the Project. The natural drainage paths will be maintained so that surface water will not negatively impact non-participating properties. In some areas there may be issues with surface water flow if Drain Tiles are decommissioned. In those areas new diversion ditches or catchment basins will be installed.

### Mainlines – Drain Tiles

Mainlines will either be decommissioned or isolated from the decommissioned Drain Tile on a case-by-case basis. Mainlines that do not connect to Drain Tile outside of the Project on non-participating properties will be abandoned in place and capped prior to entering the open drainageways. Mainlines that are connected to non-participating properties will be allowed to continue to function. These Mainlines will be isolated from the Drain Tiles within Project Property to prevent potential sediment build-up and associated clogging. Mainlines that drain non-participating properties will be protected and maintained throughout construction and operations.

### Mainline – Potholes

Mainlines exist within a few areas of the Project to drain potholes and low-lying areas that are not associated with Pattern Drain Tiles. These Mainlines do not drain any non-participating properties. During construction and operations these Pothole Mainlines will be maintained or rerouted to continue to provide drainage from these pothole regions.

### Replacement

In areas where standing water becomes problematic for construction and/or operations White Tail Solar may add Drain Tile and additional Mainlines as appropriate. Drainage will be conducted in accordance with all applicable rules and regulations and necessary permits will be obtained prior to starting any work. The installation of new drainage devices will be conducted in a manner that will not interfere with other drainage networks in the area.

### Unforeseen Drainage Issues

If any unforeseen drainage issues, surface or subsurface, are identified by surrounding property owners or tenants those issues should be identified to White Tail as soon as possible. Upon notification of potential drainage issues, White Tail will review the situation and work with the landowner/tenant, appropriate jurisdictional groups, consultants, and contractors to identify the cause of the issue and potential solutions. If through the investigation it is determined that the Project is responsible for the identified drainage issues, a remedy will be identified and presented to all interested parties. Once an approved solution is identified and permitted White Tail will work with the affected landowner/tenant to implement the agreed upon and permitted solution.

## CONCLUSION

The Drain Tile Mitigation Plan identifies the process by which Drain Tile will be protected or and/or decommissioned during construction to ensure proper drainage in the Project area and avoid negative impacts on non-participating neighboring properties. Drain Tiles will be decommissioned or protected during construction. Those Drain Tiles that are not decommissioned will be protected throughout

operations. Mainlines will be decommissioned or protected during construction. Mainlines that serve non-participating parcels will be maintained and protected during construction and operations. If unforeseen drainage issues develop on non-participating parcels and are determined to be caused by the construction or operation of the Project, a remedy will be identified and implemented.

## DEFINITIONS

Drain Tile – Form of agricultural drainage that allows for removal of excess soil pore water from the soil environment that allows for cultivation and associated crop growth to occur.

Drain Tile Network – Consists of Drain Tile and Mainlines that are used to provide drainage to a single or multiple fields within a drainage area and ultimately terminate at surface waters.

Mainlines – Part of a Drain Tile network where the field Drain Tile terminates and allows for transport of collected water to the nearest surface water resource.

Pothole Drain Tile – Typically a single run of Drain Tile that is designed to drain water (surface and/or subsurface) from low lying areas. Typically used where the low-lying areas are isolated and the use of Pattern Drain Tile is not economically feasible.

Pattern Drain Tile – A system of Drain Tile installation where the Drain Tile is placed at defined distances to uniformly remove excess soil pore water from the soil environment.

Soil Saturation – Soil water condition where all pore spaces are filled with water.