ROUTE EVALUATION STUDY

FOR THE:
ALAMO SOLAR PROJECT
PREBLE COUNTY, OHIO

PREPARED FOR:
OPEN ROAD RENEWABLES, LLC
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Environment / Energy / Infrastructure

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1.0 INTRODUCTION

1.1 Project Description and Purpose

Open Road Renewables, LLC is planning development of the Alamo Solar Project, an approximately 90-megawatt (MW) solar electric generation facility. The Alamo Solar Project is planned to include approximately 720 acres of solar panels, along with associated infrastructure such as access roads, electrical collection lines and a switchyard. The project is located in Washington and Gasper Townships in Preble County, Ohio. A Project Map is included in Appendix A.

The objective of this study is to support an application to the Ohio Power Siting Board (OPSB) for a Certification of Compatibility and Public Need (Certificate Application), as codified at Ohio Administrative Code (OAC) 4906, as follows:

1. OAC 4906-4-06(F)(3): The applicant shall evaluate and describe the anticipated impact to roads and bridges associated with construction vehicles and equipment delivery. Describe measures that will be taken to improve inadequate roads and repair roads and bridges to at least the condition present prior to the project.

2. OAC 4906-4-06(F)(4): The applicant shall list all transportation permits required for construction and operation of the project and describe any necessary coordination with appropriate authorities for temporary or permanent road closures, lane closures, road access restrictions, and traffic control necessary for construction and operation of the proposed facility.

For the purpose of this report, the following definitions have been used when describing the project (based on OAC 4906-1-01:

- **Project Area** means all land within a contiguous geographic boundary that contains the facility, associated setbacks, and properties under lease or agreement that contain any components of the facility.

- **Facility** means the proposed major utility facility and all associated facilities.

- **Associated Facility** means, for an electric power generation plant or wind farm: rights-of-way, land, permanent access roads, structures, tanks, distribution lines and substations necessary to interconnect the facility to the electric grid, water lines, pollution control equipment, and other equipment used for the generation of electricity.

1.2 Methodology

The solar panels will be located in groups at various locations in the Project Area and access to the proposed solar panels for construction and operation will be from State, county and township roads and, where

necessary, new private gravel access roads. Construction of the facility will cause temporary increases in truck traffic on area roadways due to the delivery of materials and equipment.

This evaluation identifies the probable public routes that can be used to construct and operate the facility. It is assumed that vehicle traffic will originate from an Interstate or 4-lane divided State highway. From these routes, 2-lane State highways will be used to travel to the Project Area. State, county and township roads will be used to access private leased parcels that make up the Project Area.

For purposes of this evaluation, Interstate, 4-lane and 2-lane State highways were not evaluated because it is assumed that these roadways are sufficient to accommodate the construction and operational traffic with respect to load capacity, geometry and condition.

For the County and Township roads, this evaluation includes a desktop study and on-site visual assessment of the probable routes, bridges and culverts in the Project Area. This evaluation includes the general condition based on visual assessment of culverts and bridges, general pavement conditions, vertical changes in grade, and overhead height obstructions. The evaluation identifies locations where improvements to the road are likely needed to accommodate the size of the delivery and construction vehicles. Research for state permits that are necessary for hauling the materials and equipment is also included in the evaluation.

1.3 Vehicle Types

The size and types of vehicles needed to deliver construction equipment, construction materials and facility components include flatbed or tractor-trailer equipment delivery vehicles and multi-axle dump trucks. In addition, typical automobiles and pickup trucks will be used to transport construction staff and other incidental truck trips.

1.4 Design Vehicle Characteristics

Transportation of construction equipment and materials and facility components will be completed using conventional transportation vehicles such as fixed-bed trucks or tractor-semi-trailers (AASHTO WB-50). Construction equipment such as excavators, bull dozers, and wheel tractor-scrapers will be transported to the site on fixed-bed or tractor-semi-trailer low-boy vehicles. Multi-axle dump trucks may also be used. For the vast majority of the vehicles, they will be of legal weight and dimensions. Some limited components such as switchgear or transformers for switchyards and substations may require the use of overweight/oversize vehicles.

2.0 PROBABLE ROUTE EVALUATION

2.1 Roadway Characteristics

An evaluation and visual assessment of the probable routes were conducted by traveling the roadways listed below (see Appendix A for location of probable routes). Table 1 summarizes the existing conditions of the roadways.

TABLE 1
ROADWAY CHARACTERISTICS

Road	From	To	Pavement Width (ft)	No. of Lanes	Pavement Condition	Surface Type	Speed Limit
Camden Road	North of Consolidated Road	Mann Road	17	2	Fair	Asphalt	NP
Kincaid Road	Antioch Road	Project Boundary	14	1	Fair	Asphalt	NP
Consolidated Road	US Route 127	Paint Creek Road	16	2	Good	Asphalt	NP
Antioch Road	US Route 127	Paint Creek Road	14	1	Fair	Asphalt	NP
Call Road	Antioch Road	Gasper Road	11	1	Poor	Asphalt	NP
Gasper Road	Call Road	Mann Road	13	1	Fair	Asphalt	NP
Mann Road	US Route 127	Paint Creek Road	18	2	Good	Asphalt	NP
Paint Creek Road	State Route 732	Mann Road	18	2	Good	Asphalt	NP

Notes:

NP – Not Posted

Lanes are assumed to be a minimum of 8 feet wide

Pavement Condition:

Excellent – recently paved

Good – pavement appears stable with minor cracking

Fair – pavement appears stable but may have a higher amount of cracking, especially at the pavement edge, potholes may be present

Poor – pavement is severely distressed with excessive cracks, potholes, rutting, and deterioration

Camden Road

This road is in fair condition and exhibits normal aging with routine maintenance with some visible pavement repairs. There is a box culvert on this road between Consolidated Road and Antioch Road that the County Engineer lists in poor condition. There is traverse cracking over a CMP culvert on this road. The Project Areas on this road should be accessed from Consolidated Road or Antioch Road; thereby avoiding the box culvert. Camden Road between Antioch Road and Mann Road has several steep grades and grade transitions. In addition, there is a bridge in this portion of the road that the County Engineer lists as in poor condition. This portion of the road should be avoided if possible.

Kincaid Road

This road is in fair condition and exhibits normal aging with routine maintenance with some visible pavement repairs and recent pavement overlay. There is a bridge north of Consolidated Road that the County Engineer lists in poor condition.

Consolidated Road

This road is in good condition exhibits normal aging with routine maintenance with some visible pavement repairs. There is one area of embankment erosion over an RCP culvert.

Antioch Road

This road is in fair condition and exhibits normal aging with routine maintenance with some visible pavement repairs and recent pavement overlay. There is significant erosion and pavement edge deterioration on the road just west of US Route 127. In addition, there are two bridges between US Route 127 and Camden Road that are in poor condition. This road also has relatively steep grades between US Route 127 and just west of Camden Road.

Call Road

This road is in poor condition and exhibits several areas of pavement distress including edge damage, poor drainage likely contributing to poor subgrade conditions, and rutting. There is one area where the pavement is depressed over a culvert.

Gasper Road

This road is in fair condition and exhibits normal aging with routine maintenance with some visible pavement repairs and recent pavement overlay.

Mann Road

This road is in good condition exhibits normal aging with routine maintenance with some visible pavement repairs. There is one area with pavement edge deterioration likely due to poor drainage and another are with depressed pavement over an RCP culvert.

Paint Creek Road

This road is in good condition exhibits normal aging with routine maintenance with some visible pavement repairs. There are two areas with traverse cracks over culverts.

Example areas of concern were photographed and are included in Appendix B.

2.2 Bridge and Road Load Restrictions

The Preble County Engineer was contacted to determine if there are any restrictions on bridges and roadways on the routes that were evaluated. The County Engineer provided the following information:

Cassel Road:	1 Bridge (structure #6839681) – Good Condition
Paint Creek Road:	No Bridges
Consolidated Road:	2 bridges (structure #6832105 and #6832113) – Good Condition
Antioch Road:	3 Bridges (structure #6831753) – Planned for Replacement in Fall 2018
	2 Bridges west of US Route 127 – one with retaining wall issues for westbound traffic
Mann Road:	1 Bridge (structure #6832156) – Good Condition
Camden Road:	1 Box Culvert – Poor Condition; 1 Bridge (structure #6832040) – Poor Condition
Kincaid Road:	1 Bridge (structure #6839312) – Poor Condition
Call Road:	No Bridges
Gasper Road:	No Bridges

The County Engineer indicated that there are no load restrictions on any of the bridges in the Project Area.

There were no signs posting load restrictions for bridges or roadways in the Project Area.

2.3 Culvert Characteristics

Culverts (where visible) were visually examined to determine its condition and if adequate cover is present. For purposes of this evaluation, adequate cover means there is more than one foot of cover over the culvert (inclusive of the pavement). The condition of the culvert was limited to a visual review to determine if there

is distortion in the shape (e.g., out of round) or evidence of corrosion (for steel culverts). The condition of concrete culverts is limited to evidence of cracking or surface spalling.

Camden Road

There are two CMP culverts with minimal cover and minor traverse cracking in the pavement. There is a box culvert that the County Engineer lists as in poor condition.

Kincaid Road

There no culverts noted with issues on this road.

Consolidated Road

There is an RCP culvert with embankment erosion on the downstream end.

Antioch Road

There is a triple CMP culvert with embankment erosion on the downstream end.

Call Road

There is one CMP culvert with pavement distress above the culvert.

Gasper Road

There no culverts noted with issues on this road.

Mann Road

There no culverts noted with issues on this road.

Paint Creek Road

There is one CMP culvert and one RCP culvert with minor traverse cracking in the pavement above the culvert.

2.4 Overhead and Width Restrictions

The roads were also investigated for height limitations. Permanent structures that cross over the road and restrict the clearance for oversized loads (such as bridges and overpasses) were not found along the evaluated routes. For overhead cables, the national standard for minimum clearance over roads is 15.5 feet, and cables cross over the studied routes in numerous locations. The height of the cables was not measured; however, there were no overhead cables that appeared to be obstructive. In the event a cable presents an obstruction, utility providers can temporarily or permanently raise the cables and/or move the poles. Therefore, cables should not be a limiting feature for use of the roads.

2.5 Posted Caution Signs

There were no posted caution signs on the roadways that were reviewed.

3.0 POTENTIAL IMPACTS TO ROADWAYS

The development of a solar electric generating facility has the potential to create transportation impacts because of short-term construction activities. The following sections estimate the traffic for construction vehicles during the project, summarize permitting and road use agreements, and outline steps for mitigating potential impacts to roadways.

3.1 Estimated Future Traffic

To deliver the construction equipment, materials and construction workers during the construction of the facility, the probable routes will experience increased truck traffic. Historic data for construction of solar electric generating facilities indicate that there are 17 to 18 vehicles per MW of power. This project is projected to be 90 MW; therefore, an estimated 1,530 to 1,620 vehicles for the project.

For the vast majority of the vehicles, they will be of legal weight and dimensions. Some limited components such as switchgear or transformers for switchyards and substations may require the use of overweight/oversize vehicles.

A final delivery route has not yet been finalized, but it is likely that delivery of facility components to the Project Area will be from the north by way of Interstate 70 and US Route 127. US Route 127 runs near the eastern side of the Project Area south of Eaton, Ohio. Some portions of the Project Area will be accessed via State Route 732 (intersects with US Route 127 in Eaton, Ohio) and Paint Creek Road which runs along the west side of the Project Area. Within the Project Area, county and township roads and new private gravel access roads will likely be used to deliver equipment and materials.

For the majority of the delivery vehicles that are of legal dimensions, no delays to local traffic should be experienced except where the delivery vehicles may need to travel on narrow roadways (less than 2 lanes in width). However, the delays to local traffic should be minimal due to the low traffic volume in the Project Area. When delivery vehicles are travelling on narrow roadways or when there is an occasional oversized vehicle, traffic control will be utilized to manage local traffic.

Potential access locations to the private leased parcels along the probable routes where identified during the evaluation (see Appendix A). These locations are based on the location of existing driveways on the parcels. In the event existing driveways were not present, the potential access locations were noted where a driveway could be located based on lack of obstructions and relatively flat topography. Due to the relatively flat topography in the Project Area, many other locations are possible along the probable routes.

Final driveway locations should take into consideration the final facility layout, location with respect to other driveways and roadways, topography and vertical and horizontal sight distance.

During operation and maintenance of the facility, there will be very little increase in traffic as solar electric generating facilities are normally unmanned. There will be occasional maintenance vehicles and additional traffic will be negligible.

3.2 Permits and Agreements

Prior to construction, the contractor will obtain all necessary permits from ODOT and the County Engineer. The County Engineer may require a Road Use and Maintenance Agreement (RUMA) for construction activities. This agreement will include procedures for temporary road closures, lane closures, road access restrictions and traffic control. For driveway access on County and Township roads, a permit will be required from the County Engineer.

Road crossing permits (e.g., collection lines) will require a permit from ODOT or the County Engineer.

Special Hauling Permits are required when loads exceed legal dimensions or weights. Table 2 summarizes the characteristics of vehicle characteristics without Special Hauling Permits for State of Ohio highways.

For construction of the Facility, the vast majority of the vehicles will meet current legal dimensions and weights. Therefore, Special Hauling Permits are only anticipated for a few vehicles that may exceed these criteria such as switchgear or transformers.

TABLE 2
DIMENSIONAL CRITERIA FOR VEHICLES WITHOUT SPECIAL HAULING PERMITS

Vehicle Characteristic	State Highway Limit
Width of vehicle, inclusive of load	8.5 Feet
Height of vehicle, inclusive of load	13.5 Feet
Length of vehicle, inclusive of load and bumpers	85 Feet
Total Weight of vehicle with 3 or more axles	80,000 Pounds

3.3 Proposed Mitigation

This study has determined that very little impact to roads associated with construction vehicles and material delivery is anticipated during the project. Final civil engineering design will be necessary prior to construction to ensure all transportation related activities are accounted for and approved by the County Engineer.

All roads should be monitored during construction for deterioration to ensure they are safe for local traffic. The volume and/or weight of construction traffic may cause accelerated pavement deterioration or stress on drainage structures that could necessitate temporary repairs. After completion of construction activities, there may be improvements required to return the roadways and drainage structures to pre-construction conditions. These requirements will be outlined in the RUMA with the County Engineer.

In the event impacts do occur, the following mitigation techniques will be utilized to avoid or minimize transportation-related impacts and/or to provide long-term improvement to the local road system:

3.3.1 Insufficient Roadway Width

- Rerouting over-width vehicles to wider roadways.

3.3.2 Insufficient Vertical Clearance

- Temporarily raising overhead utility lines.
- Rerouting over-height vehicles to roadways with sufficient vertical clearance.

3.3.3 Poor Pavement Condition or Insufficient Pavement Durability

- Roadside drainage improvements
- Pavement Patching
- Replacing pavement prior to construction (may include subgrade improvements).
- Replacing pavement during or after construction if damaged by construction traffic (may include subgrade improvements).
- Rerouting heavy-loaded vehicles to avoid insufficient pavement.

3.3.4 Insufficient Cover over Drainage Structures

- Adding temporary gravel and/or asphalt cover over structures.
- Using bridge jumpers to clear structures.
- Replacing structures during or after construction if damaged by construction traffic.
- Rerouting heavy-loaded vehicles to avoid structures.

3.3.5 Poor Structure Condition

- Replacing structure during or after construction if damaged by construction traffic.
- Using bridge jumpers to clear structures.
- Rerouting heavy-loaded vehicles to avoid structures.

3.3.6 Inadequate Bridge Capacity

- Using bridge jumpers to clear bridges.
- Rerouting heavy-loaded vehicles to avoid bridges.

3.3.7 Insufficient Roadway Geometry

- Rerouting over-sized vehicles to avoid insufficient roadway geometry.
- Profile adjustments to roadways with insufficient vertical geometry.
- Permanent or temporary plan adjustments to roadways with insufficient horizontal geometry.

4.0 CONCLUSIONS

Based on information collected during the field investigation, vehicle assumptions, and information available from ODOT and the County Engineer, sufficient infrastructure exists via Interstate, State and local roads to construct the facility. The vast majority of the vehicles transporting construction equipment, materials and workers are expected to meet legal load and dimensional limits. Some limited components such as switchgear or transformers for switchyards and substations may require overweight and/or oversize vehicles.

In the event overweight and/or oversized loads are necessary for construction, Special Hauling Permits will be obtained from the Ohio Department of Transportation (ODOT). All work will be coordinated and approved by the appropriate regulatory agencies prior to construction.

Once the final facility design is complete and the final vehicle characteristics can be determined, this information will be finalized with the County Engineer as part of a RUMA.

US Route 127 will be the primary route used to approach the project. Portions of the Project Area can be accessed from US 127 on the east side of the Project Area via Consolidated Road or Mann Road. Antioch Road should be avoided between US Route 127 and just west of Camden Road due to steep road grades and bridges in poor condition. Alternatively, the Project Areas can be accessed from the west side vis State Route 732 and Paint Creek Road. Paint Creek Road is in better condition and the topography is flatter west of the Project Area.

To the extent possible, the Project Areas should be accessed from Consolidated, Antioch and Mann Roads. The use of Camden, Call and Gasper Roads should be limited to the extent possible due to their narrow width, deteriorated pavement condition and potential damage to drainage structures.

All roads should be monitored during construction for deterioration to ensure they are safe for local traffic. The volume and/or weight of construction traffic may cause accelerated pavement deterioration or stress on drainage structures that could necessitate temporary repairs. After completion of construction activities, there may be improvements required to return the roadways and drainage structures to pre-construction conditions.

APPENDIX A

Project Map


0 500 1,000 2,000
Feet
1:12,000
Alamo - Project Area
Alamo - Buried Collection Easements
County Boundary
Civil Township
ODOT Bridges
US Routes
State Routes
County Road
Township Road
Probable Route
Potential Access Locations
Photo Locations
WASHINGTON TOWNSHIP
DIXON TOWNSHIP
GASPER TOWNSHIP
LANIER TOWNSHIP
CONCORD RD
W CONSOLIDATED RD
E CONSOLIDATED RD
KINCAID RD
CAMDEN RD
PAINT CREEK RD
ANTIOCH RD
CAIL RD
CASPER RD
MANN RD
POOS RD
WINTERS RD
FISHER TWIN RD
HALDERMAN RD
YOST RD
BROWER RD
WAYNE TRACE RD
SEVEN MILE RD
LONGMAN RD
SILVER HART RD
CASPER RD
BRANDE DR
W LAKENGREN DR
E LAKENGREN DR
STATE ROUTE 725
US ROUTE 127
OLD CAMDEN PIKE
6802044
6802591
6839312
6832032
6831966
6832105
6832113
6832016
6831990
6832059
6802567
6804926
6802060
6802532
6831931
6831737
6802508
6832067
6831729
6831796
6831753
6832040
6802443
6832156
6832024
6831826
6832075
6832148
6832083
6831886

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Project Map

Preble County, Ohio

Figure 1

Notes:
The aerial photo was acquired through the ESRI Imagery web service. Aerial photography dated 2016.

Produced using ArcGIS 10.5

File Name: ORR008_02_Fig01_Transportation.mxd

Edited: 10/4/2018 By: rkaip

APPENDIX B

Photo Pages

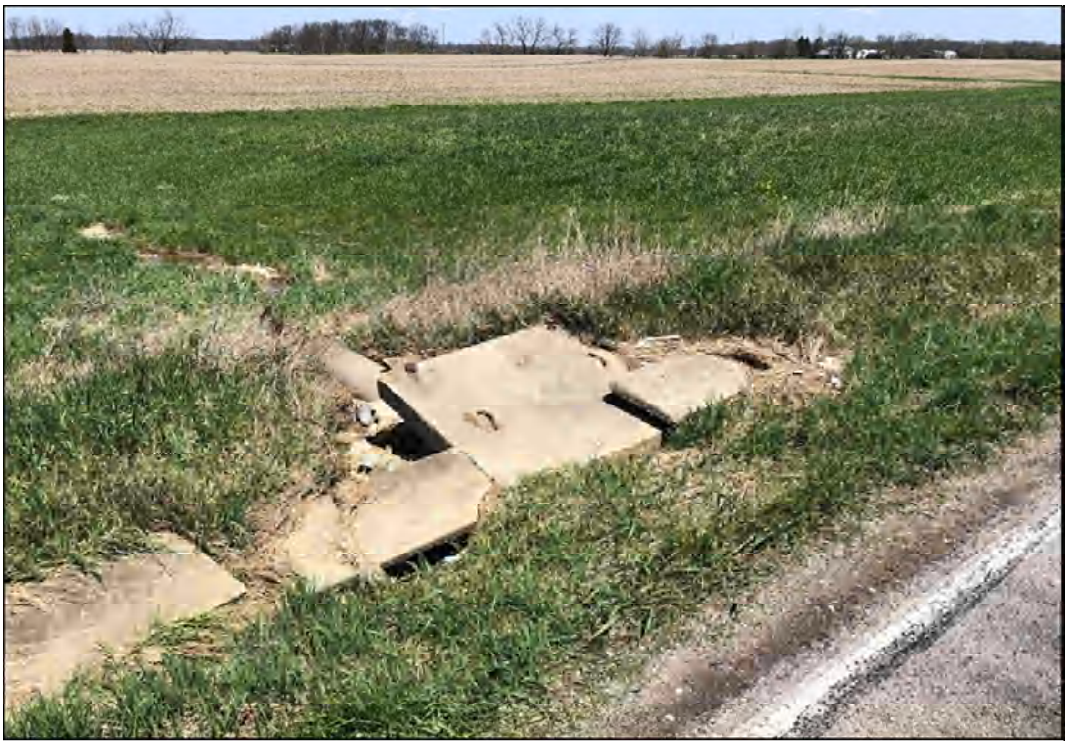

PHOTO 1: View of embankment erosion on downstream end of RCP culvert on Consolidated Road.

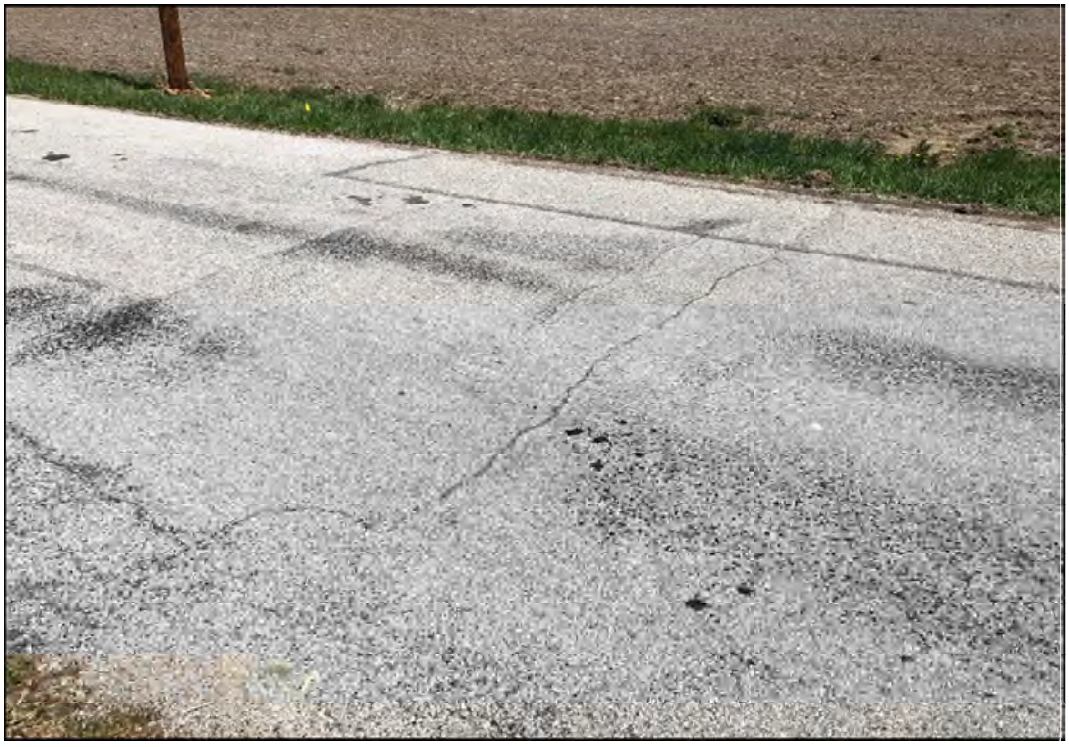

PHOTO 2: View of traverse cracking over CMP culvert on Camden Road.

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Preble County

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PHOTO 3: View of narrow bridge on Camden Road.

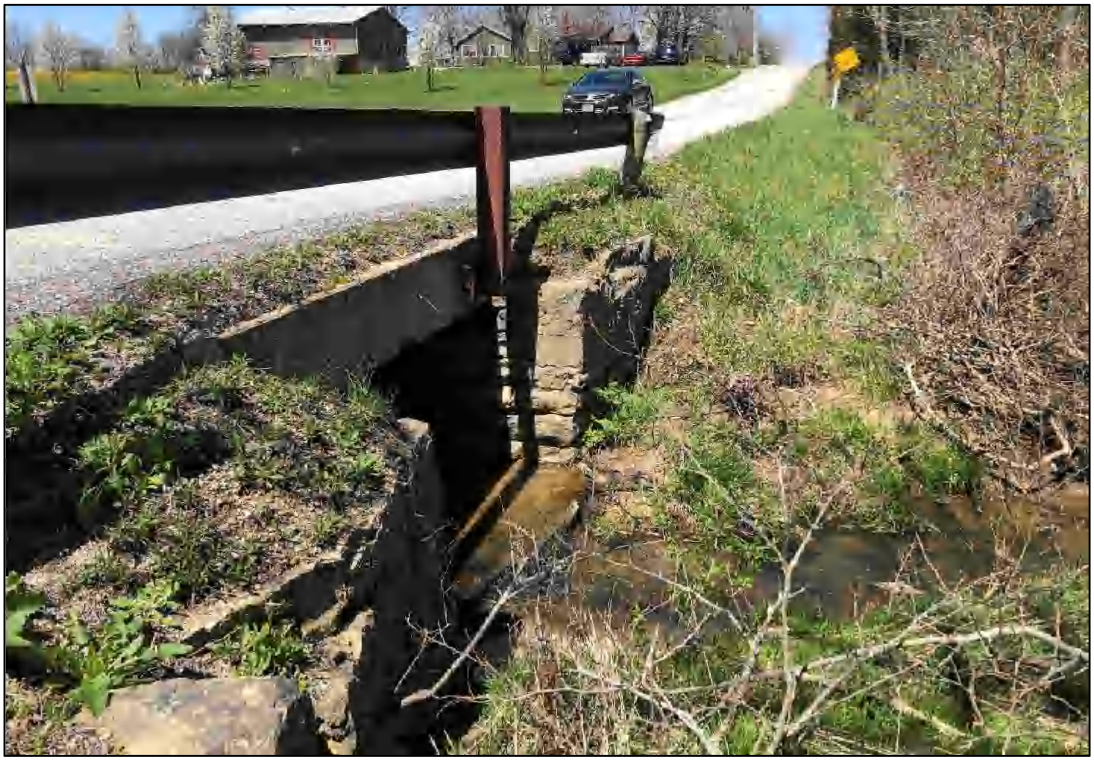

PHOTO 4: View of stone bridge abutment on Camden Road.

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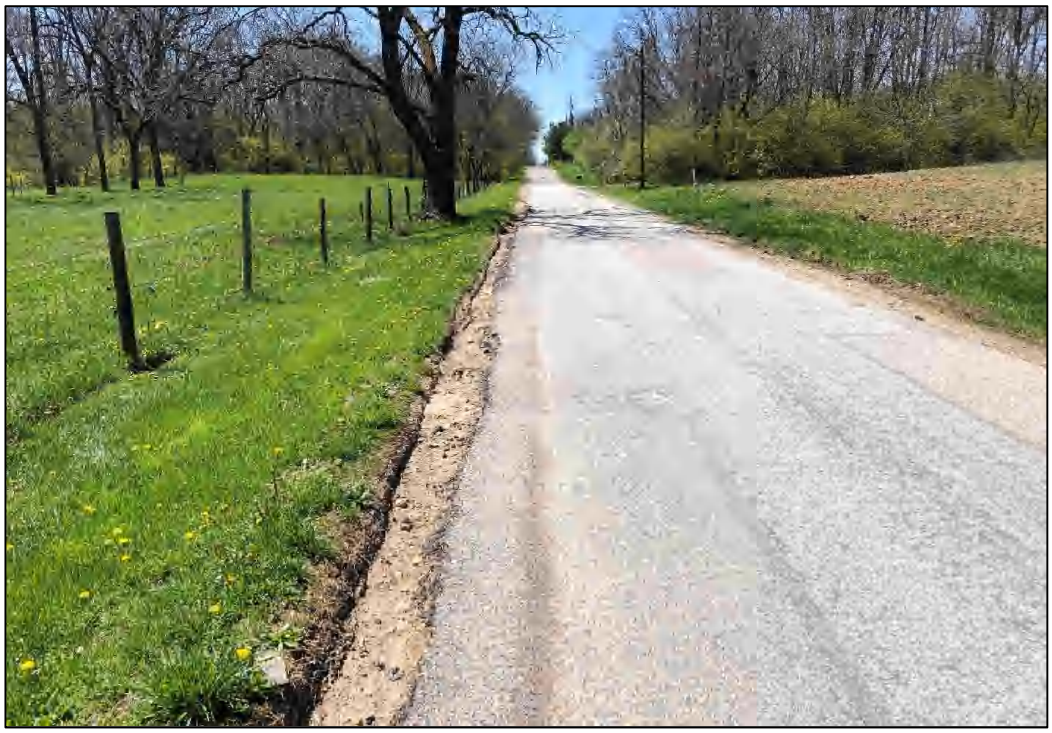

PHOTO 5: View of significant erosion and pavement edge deterioration on Antioch Road.

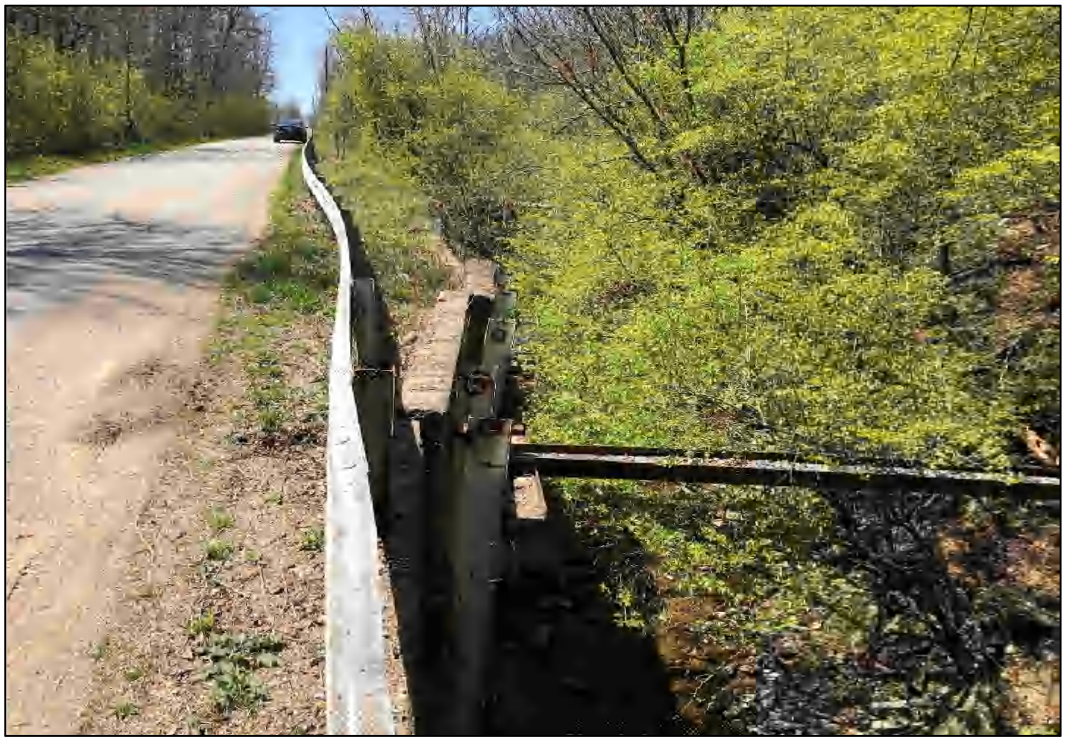

PHOTO 6: View of upstream retaining wall at bridge on Antioch Road. Note bracing and lateral panel movement.

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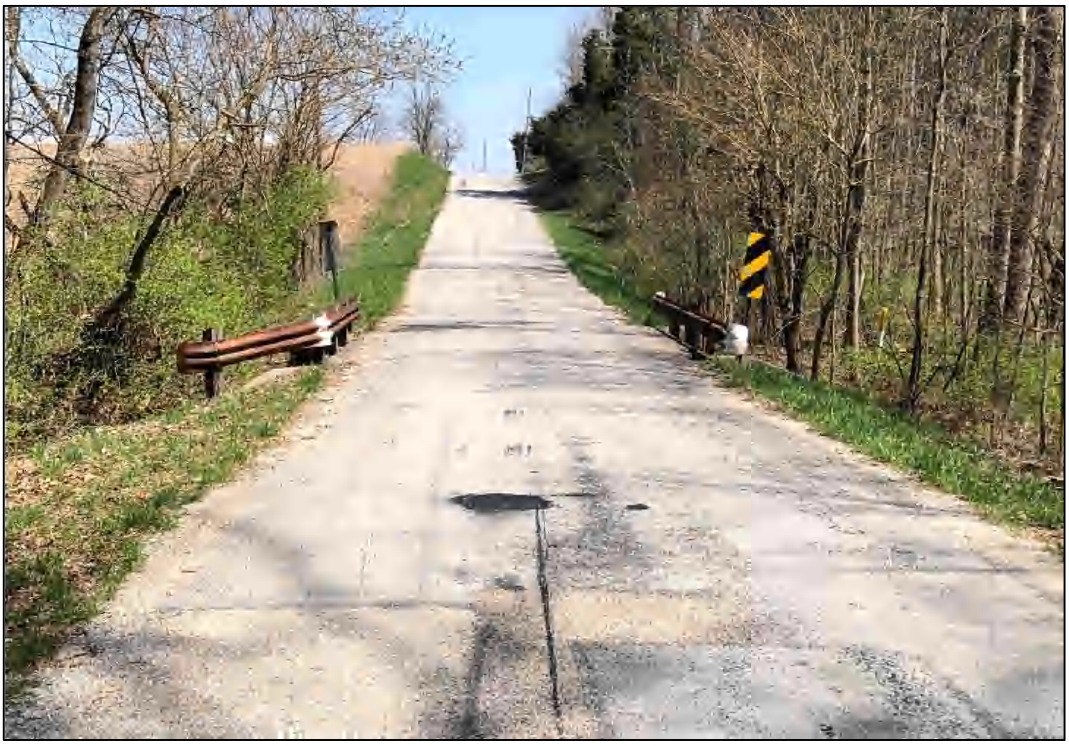

PHOTO 7: View of narrow bridge on Antioch Road.

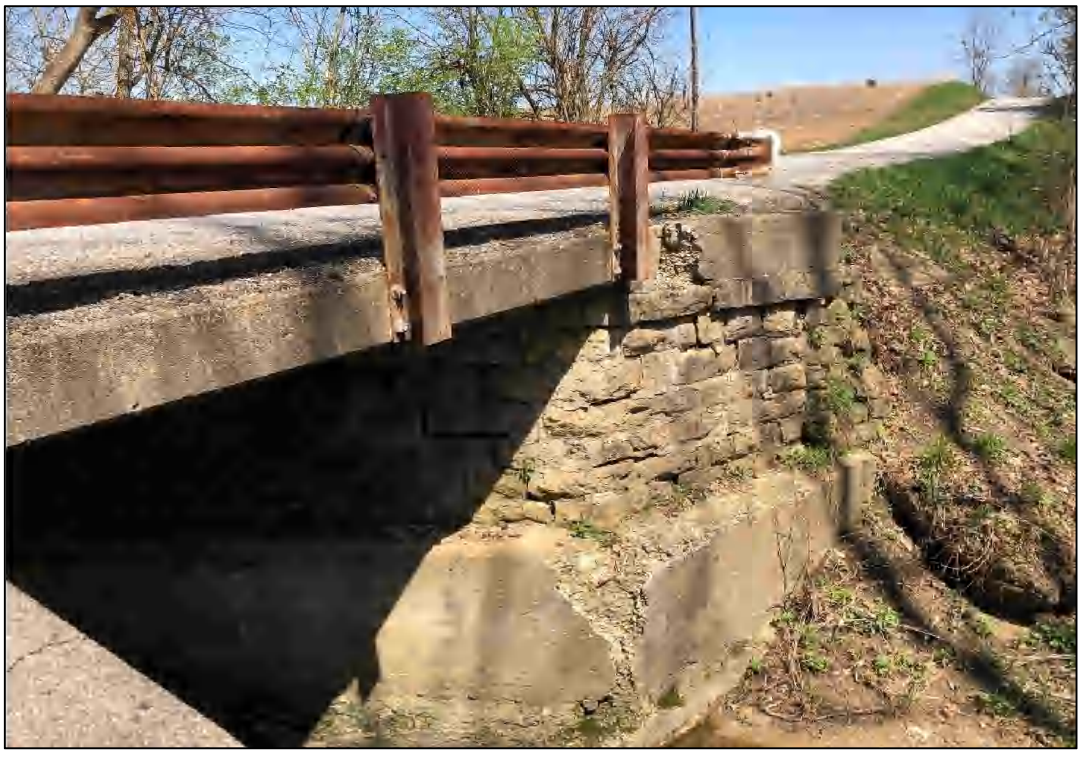

PHOTO 8: View of stone abutment on bridge on Antioch Road. Note cracks in abutment.

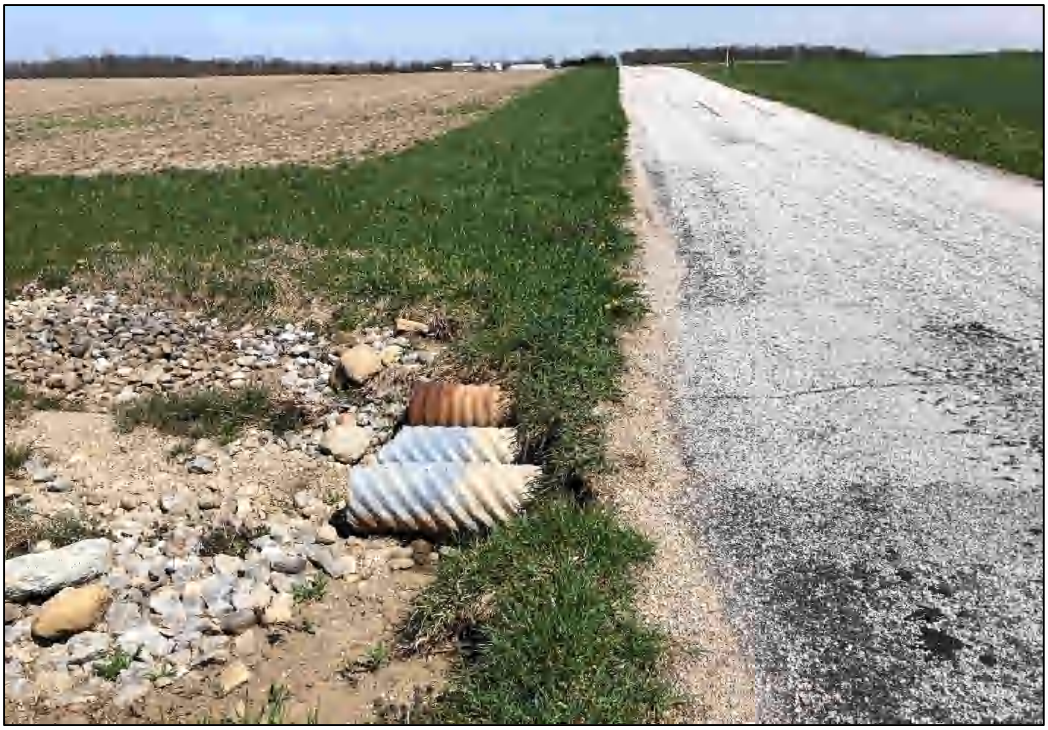

PHOTO 9: View of embankment erosion on downstream end of CMP culverts on Antioch Road.

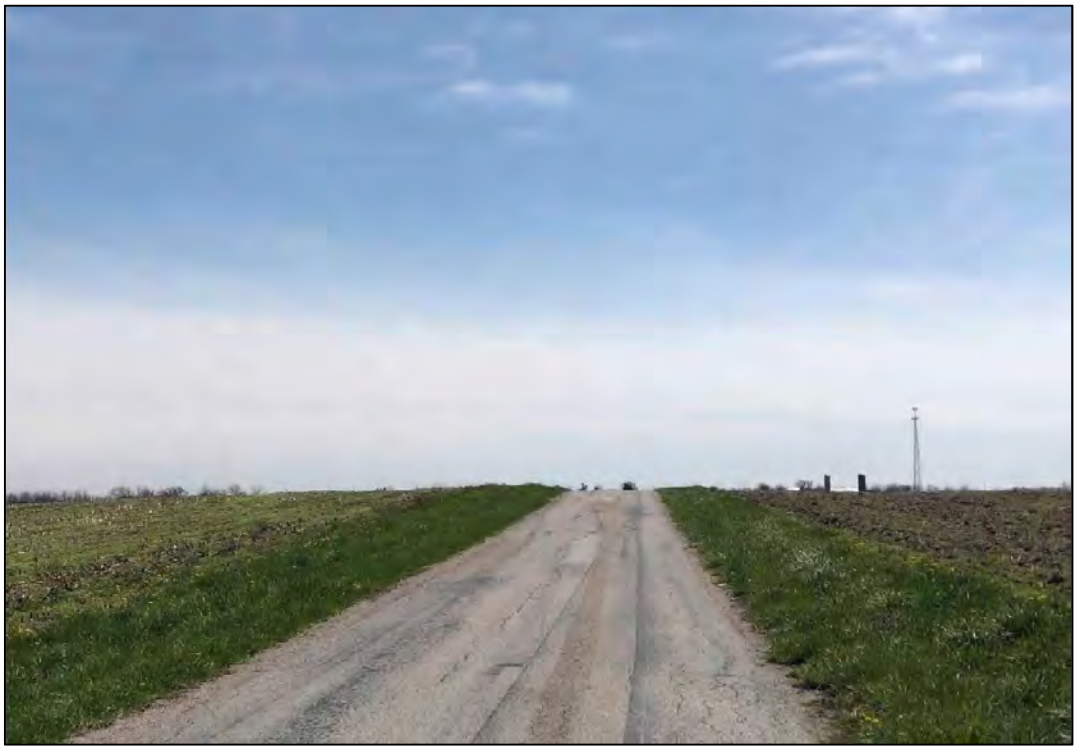

PHOTO 10: View of Call Road and lack of roadside drainage ditch.

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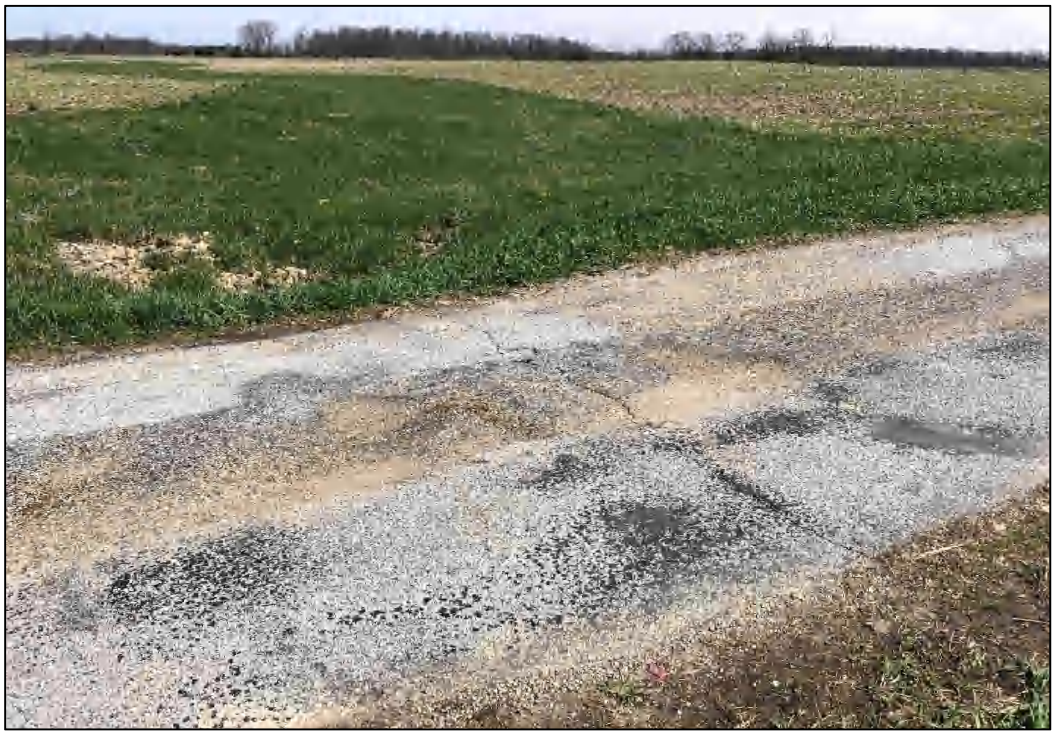

PHOTO 11: View of traverse crack over CMP culvert on Call Road.

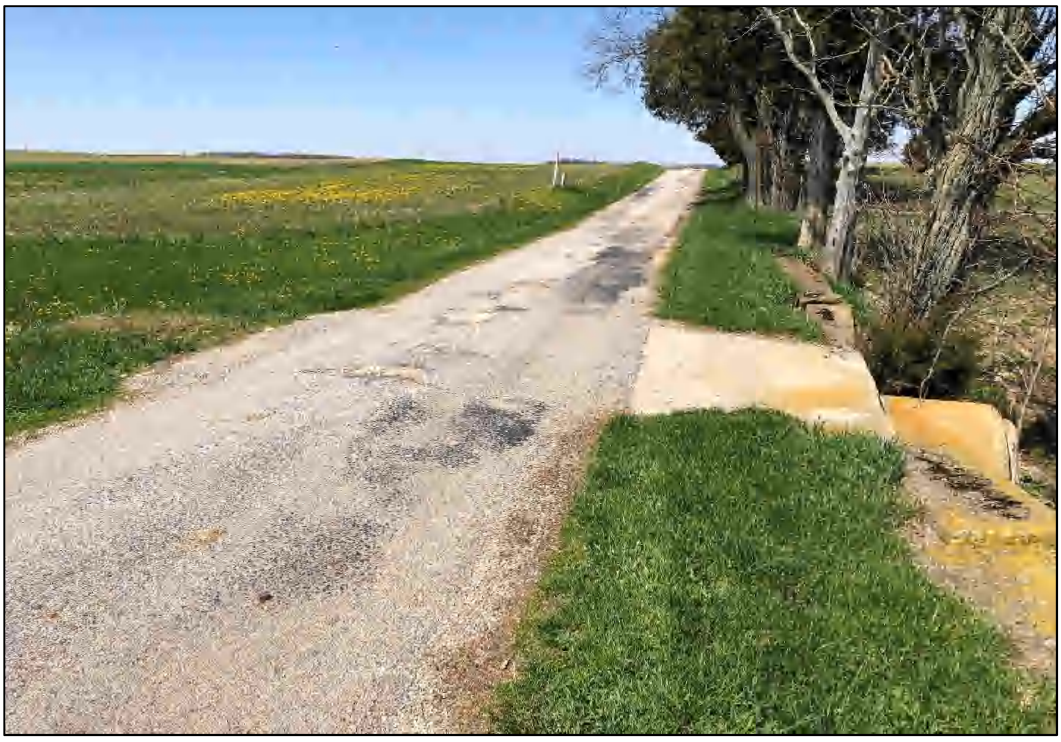

PHOTO 12: View of large RCP culvert on Call Road. Note minimal cover and concrete slab over culvert.

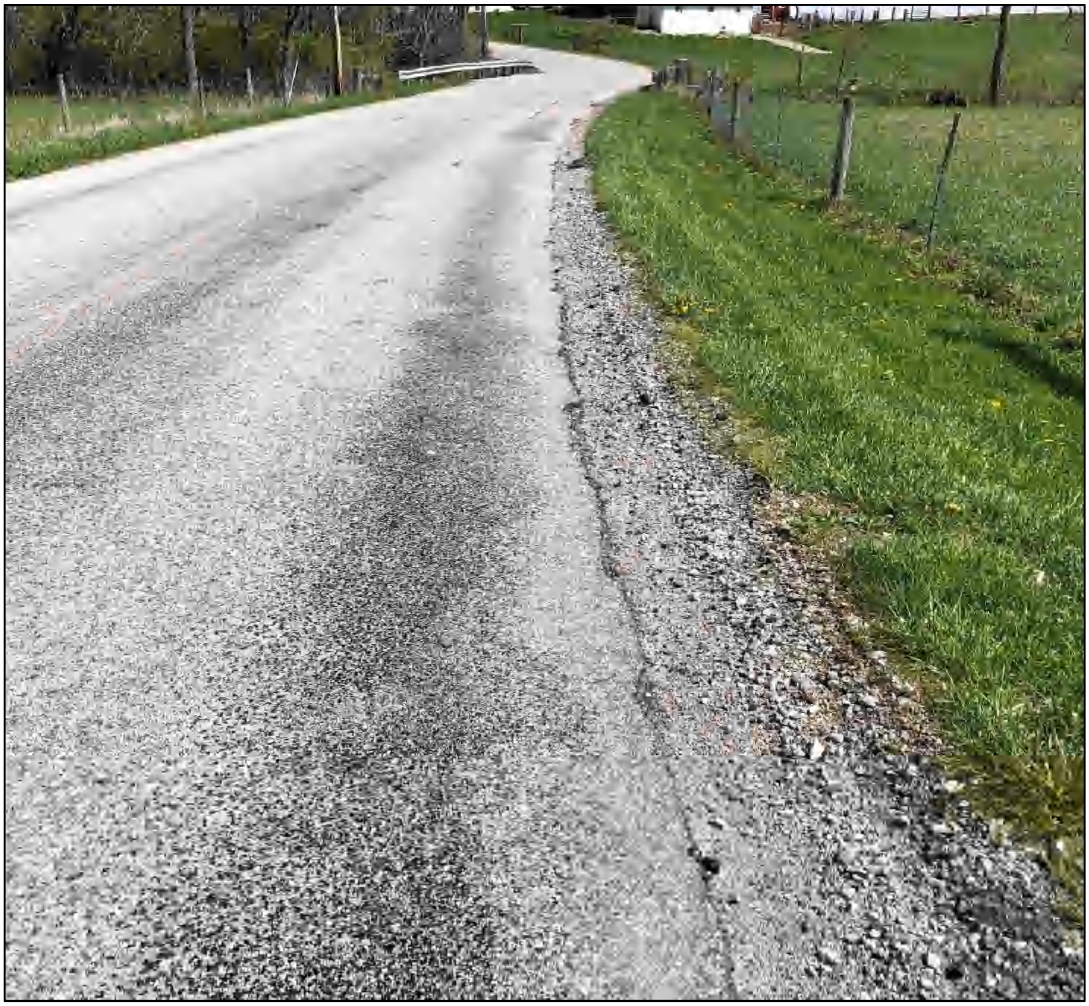

PHOTO 13: View of pavement edge deterioration on Mann Road likely due to poor drainage.

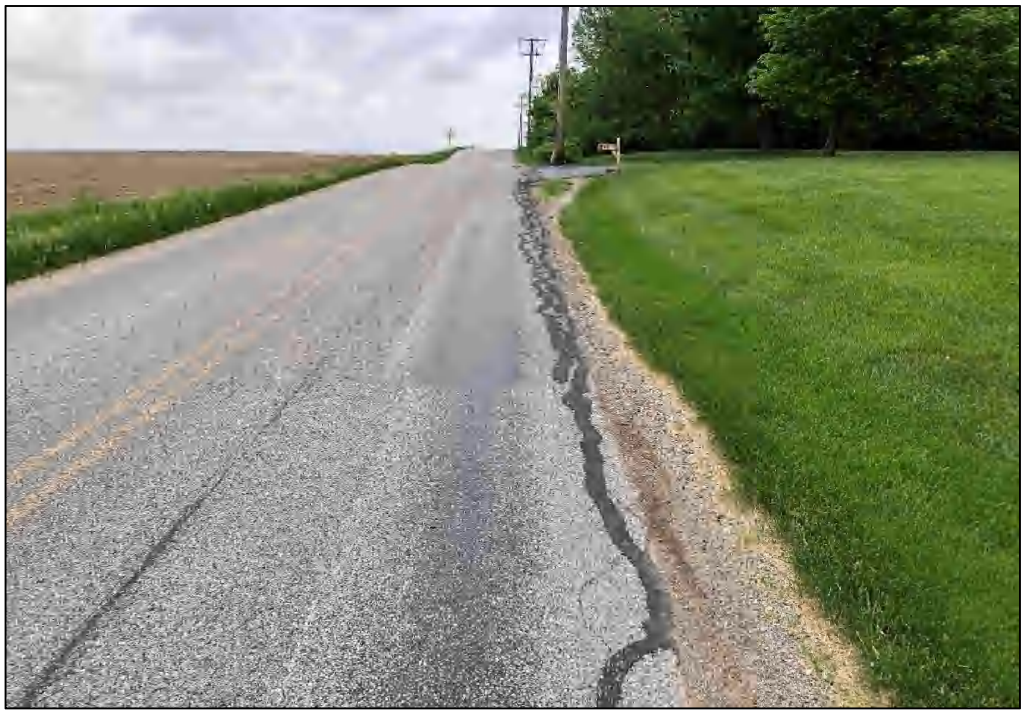

PHOTO 14: View of pavement edge deterioration on Mann Road likely due to poor drainage.

PHOTO 15: View of depressed pavement over RCP culvert on Mann Road.

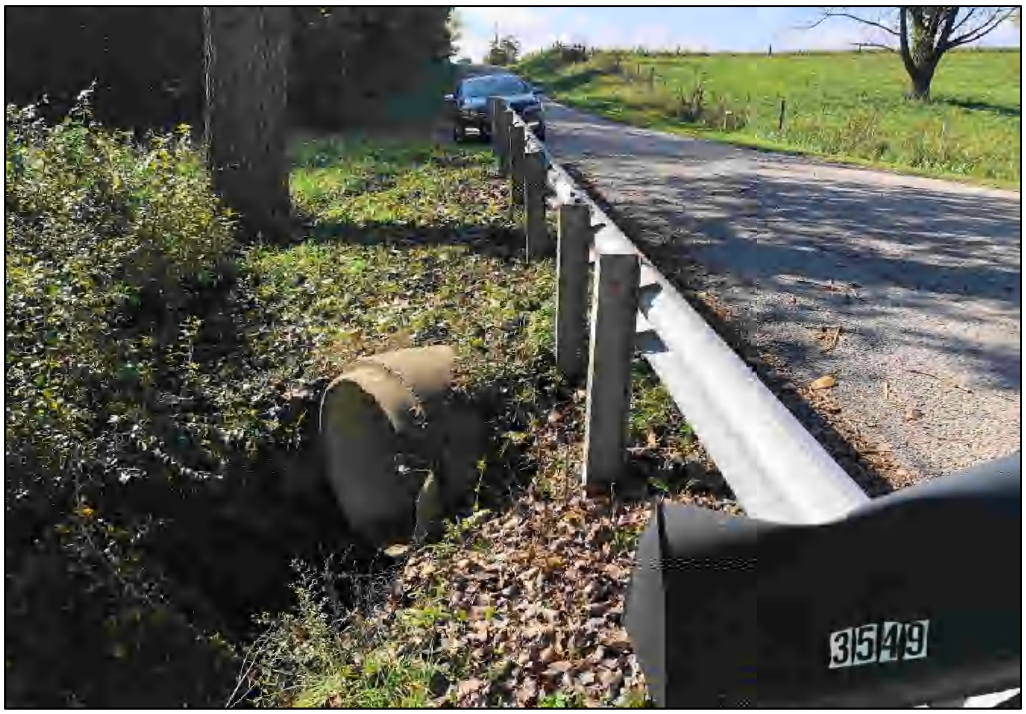

PHOTO 16: View of embankment erosion on east side of RCP culvert.

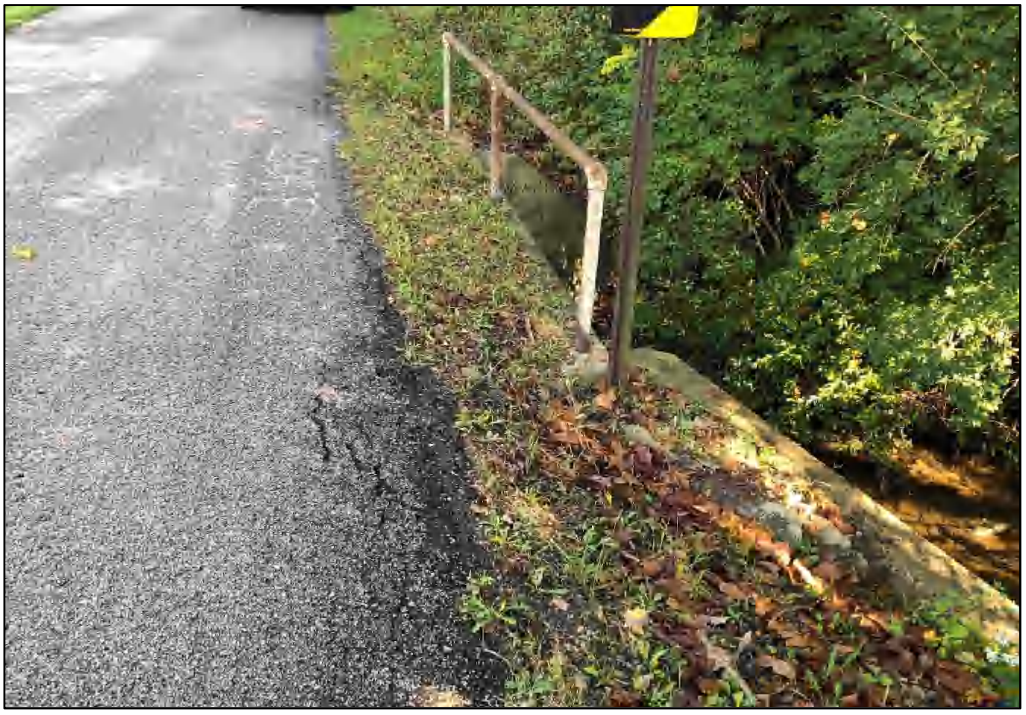

PHOTO 17: View of unstable embankment next to east side of the bridge.

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Summary: Application Exhibit D electronically filed by Mr. Michael J. Settineri on behalf of Alamo Solar I, LLC