TRANSPORTATION EFFECT AND ROUTE EVALUATION STUDY

FOR

New Market Solar I, 65 MW Site

Clay and White Oak Townships, Highland County, Ohio

Developer:

Hecate Energy

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Prepared By:

FISHER ASSOCIATES

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I. Project Overview

Fisher Associates, P.E., L.S., L.A., D.P.C (FA) has been contracted by Hecate Energy Highland 4 LLC (Hecate Energy) to complete a Transportation Study for the proposed New Market Solar I, 65 MW solar project. This study has been prepared to satisfy the relevant portions of the Ohio Power Siting Board (OPSB) requirements specified in the Ohio Administrative Code, Sections 4906-4-06(F)(3) and 4906-4-06(F)(4).

Section 4906-4-06(F)(3) states: *"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."*

Section 4906-4-06(F)(4) states: *"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."*

The proposed New Market Solar I project is located in Clay and White Oak Townships, Highland County, Ohio as depicted on the location map in Appendix A, Exhibit 1. However the project haul routes utilizes additional roads in Hamer Township. The proposed project, including the distribution line, layout is shown on the exhibits provided in Appendix A.

A. Transportation Access Points

All construction equipment, aggregate, supplies, and general construction traffic should approach the project area from the north off State Route 138. Unless authorized by the developer, this traffic will use the existing state routes until it reaches the project's designated public roads. The two possible routes off of State Route 138, are New Market road (CH 5) heading east and Hollowtown road (CH 24) heading south.

The jurisdictions of the project's designated public roads proposed to be used as shown in Appendix B are:

- Highland County – New Market Road (CH 5), Hollowtown Road (CH 24), Gath Road (CH 2), Stringtown Road (CH 60) & Edwards Road (CH 56)

Based on the proposed project, it is estimated that there will be a minimum of nine (9) individual site access points to the solar panels. The project will utilize one access off Edwards Road (CH 56), two (2) access locations off Hollowtown (CH 24) Road and six (6) access locations off New Market Road (CH 5). The project is otherwise landlocked from adjacent public roadways.

II. Pre-Construction Roadway Characteristics

A. Traffic Volumes and Accident Data

Existing data on vehicle traffic volumes and accidents within the study area was obtained from the ODOT Transportation Information Mapping System (TIMS) and can be found in Appendix C. The Annual Average Daily Traffic (AADT) is listed for the State and county roads, but the local town roads had limited traffic volume data. Detailed capacity analysis was not completed for this study, however, field observation of the transportation network did not reveal any locations where traffic flow and/or capacity appeared to create undue delay for the traveling public.

The table below summarizes the traffic conditions on the roads within the study area.

Roadway Name		Total Road Widths	AADT
County Highway 5	New Market Road	18’ - 21’	558
County Highway 24	Hollowtown Road	16’ – 17’	NA
County Highway 2	Gath Road	19’ – 20’	220
County Highway 56	Edwards Road	18’ – 20’	NA
County Highway 60	Stringtown Road	19’	NA

* AADT = Average Annual Daily Traffic
** Traffic volumes obtained from ODOT Transportation Information Mapping System (TIMS) on 02/03/2020. Traffic volumes for Hollowtown Road, Edwards Road, & Stringtown Road were unavailable.

According to TIMS, between 2017 and 2019, there were three (3) accidents within the transportation study area. Of the three accidents, two were at intersections; one at the intersection of State Route 138 and New Market Road and one at the intersection of New Market Road and Hollowtown Road. The other accident occurred on New Market Road between Euverard Road and Hollowtown Road. State Route 138 has a posted speed limit of 45 mph and, therefore, extra caution must be taken while turning onto and off of that highway. Of the three total accidents, none were fatal. Therefore, the fatal accident rate (fatal accidents/million vehicle miles) is zero (0) compared to the 2018 Ohio statewide average fatal accident rate of 0.93 fatal accidents/100 million vehicle miles, as found on the United State Department of Transportation’s National Highway Traffic Safety Administration’s website.

B. School Bus Route Information and Mass Transit Systems

The students in the project area attend the Lynchburg-Clay School District in Lynchburg. The high school and elementary school are located on the same campus, which is located about 10.4 miles north of the project site at 6762 & 6760 State Route 134 (SR 134) respectively. The middle school is about 12.8 miles north of the project site at 8250 State Route 134 (SR 134). Due to the distance from the schools and lack of sidewalks, most of the students are picked-up/dropped-off at their place of residence. The number of stops and buses within the project area is limited due to the low density of houses within and adjacent to the project area. Because the majority of the project activities and deliveries will likely occur during the middle of the day, the impacts to the local school bus routes should be minimal.

There are no public rail or bus mass transit systems in the project area.

C. Emergency Service Responder Information

Highland County is served by Mercy Health – Mount Orab Medical Center and Mercy Health – Clermont Hospital. These emergency services are located approximately 15 miles southwest of the project site. They can be reached by travelling southwest on Route 138, south on Route 86 and west on Route 32.

An Emergency Response Plan for the project will be implemented which will include procedures (preconstruction through project operation) for fire and emergency services. This plan will outline on-site equipment and the procedures for fire suppression, medical and weather emergency evacuation as well as other critical areas. In addition, regularly scheduled meetings will be held with local emergency providers. As with any large-scale development, project components will meet all state and federal safety and fire codes.

D. Traffic Routes Load Bearing and Structural Rating Information

A field review of existing conditions along the roads within the project area was conducted by Fisher Associates on January 27, 2020. Data observed during the site visit as depicted in Appendices A and D, includes:

- Bridge and road load postings
- Road widths, type, and pavement condition
- Culvert cover and conditions
- Posted signs of caution

Bridge and Road Load Posting Restrictions

There are no posted loading restrictions to the bridges located on the transport route. As shown in Appendix A, the ODOT bridges along the transportation public roads all are rated as good condition:

ODOT Bridge Number	Roadway Name		Feature Intersected	Sufficiency Rating	National Bridge Inventory Rating
3634345	County Highway 2	Gath Road	Flat Run Creek	99.9	Good

Road Surface Type and Widths

As depicted on the Road Width and Conditions Exhibit (Appendix A, Exhibit 2), the road surface types along the transport route are all asphalt. The table below summarizes the road conditions along the transport route.

Roadway Name		Total Road Widths	Road Condition
County Highway 5	New Market Road	18' - 21'	Road Patch Depressed
County Highway 24	Hollowtown Road	16' – 17'	Shallow Culvert Cover
County Highway 2	Gath Road	19' – 20'	No apparent deficiencies
County Highway 56	Edwards Road	18' – 20'	No apparent deficiencies
County Highway 60	Stringtown Road	19'	No apparent deficiencies

The roads that are less than 18' in overall width may require a construction traffic plan so as to not negatively impact the landowners/residents and limit trucks driving off the pavement. There are some pavement repair locations and depressions which are depicted on the Areas of Concern Exhibit (Appendix A, Exhibit 3) and corresponding photographs in Appendix D. The least stable pavement section of the study area, which should be monitored during hauling and peak construction activities, was a patched section over a 24" culvert pipe on New Market road. See Area of Concern 1, in Appendix D The remainder of the transport roads do not appear to exhibit any underlying issues, but rather normal aging that requires routine maintenance. Hecate Energy will consult with the County Engineer regarding any necessary pre-construction work. However at the time of the study, there does not appear to be any significant structural concerns to the existing roads from a transportation perspective.

Culvert Cover and Conditions

During the site visit, it was observed that there are culverts of varying sizes that have recently been replaced and appear to be in good structural condition. Some have minimal cover; however, these are either small or are made of concrete in order to handle the vehicle and equipment loads. Two larger culverts, both located along Hollowtown Road, have shallow cover and may need repair work done during/after construction. Each pipe should be analyzed to determine if necessary improvements are needed to accommodate the construction traffic. As noted on the Areas of Concern Exhibit (Appendix A, Exhibit 3) and corresponding photographs in Appendix D, some asphalt patches at these new culvert locations are deteriorating faster than the remaining road surface or there is some settlement on either end of the culvert. In these cases, the additional traffic may increase the rate of degradation and will need to be monitored during construction for possible upgrades.

- New Market Road: concrete patch depressed over 24 inch (Area of Concern 1).
- Hollowtown Road: shallow cover over 72 inch concrete elliptical pipe (Area of Concern 3).
- Hollowtown Road: shallow cover over 36 inch concrete culvert (Area of Concern 4).

Hecate Energy will consult with the County Engineer regarding any necessary pre-construction work.

Posted Signs of Caution

As depicted on the Areas of Concern Exhibit (Appendix A, Exhibit 3) and corresponding photographs in Appendix D, there is one area that has been posted for flood water potential, on Gath Road (CH 2) just outside the study limits. During and after heavy storm events, construction vehicles traveling along Gath Road should use caution and be aware of standing water along or adjacent to the cartway.

Overhead Clearance

Because the construction vehicles for the project will be legal heights and no intersection improvements are proposed, there will not be any issues with vehicle clearance to overhead electric crossings and potential vegetation or tree branch overhang concerns.

III. Trip Generation Characteristics

A. Vehicle Trips Frequency

A truck load estimate calculation during the construction phase is included in Appendix E. Any assumptions in the calculations are based on anticipated solar project loads. Based on the site visit, potential locations for proposed access roads off of the transport roads are depicted on the exhibits in Appendix A. As the construction traffic volumes do not appear to exceed capacities, the roadways should not be significantly impacted by standard construction traffic.

During operation and maintenance, the facility will not generate a significant volume of traffic, with the anticipation of only a few pickup trucks during routine scheduled maintenance as well as unanticipated unscheduled maintenance periods.

IV. Traffic and Transportation Impacts of the Facility

A. Projected Future Traffic Conditions

While construction vehicles are traveling along project area and delivery route roadways, the existing traffic may experience minor delays to allow for the safe passage of these vehicles.

During development of the potential road use agreements if necessary, the Applicant will coordinate with appropriate authorities to determine applicable thresholds and procedures for implementing temporary or permanent road closures, lane closures, road access restrictions, and traffic control.

During operation and maintenance, the facility will not generate a significant volume of traffic. Therefore, any projected additional future traffic will be negligible.

B. Adequacy of the Road System to Accommodate Projected Traffic

Truck load assumptions are based on typical solar projects that will need to be finalized in conjunction with the anticipated county road use agreements, if required. Roads with low strength and/or poor surface conditions may require improvement after construction traffic. All the transport roads do not appear to exhibit an underlying issue, but just normal aging that requires routine maintenance. During the pre-construction period, the applicant will coordinate with the county and townships to determine if any pre-construction road maintenance will be needed, but significant structural improvements are not anticipated. However, due to the width of some of the roads (less than 16' wide), limited construction traffic management plans may need to be created to avoid negatively impacting the residents/local traffic.

To calculate the number of trucks in Appendix E, we assumed WB-50's (8.5 ft wide x 42.5 ft long x 10 ft high) for the solar panel delivery and standard dump trucks for gravel & asphalt delivery. An estimation of 3.800-4,200 trucks will be needed for the project, but none of the vehicles will be oversized or overweight. Roads will need to be monitored prior to, and during construction and reviewed afterwards to determine the required repairs, if any. Roads will be returned to pre-construction conditions.

During operation and maintenance, the facility will not generate a significant volume of traffic. Therefore improvements and continuous monitoring to the road system are not necessary to accommodate projected operations traffic.

C. Traffic and Transportation Mitigation Measures

In conjunction with the anticipated county road use, mitigation measures to address maintenance will be developed as the project's layout is finalized. Final engineering design will be required prior to construction activities to ensure all transportation related impacts have been addressed to the satisfaction of the local county highway department. High traffic areas include all of New Market road which serves as the primary thoroughfare through the project site.

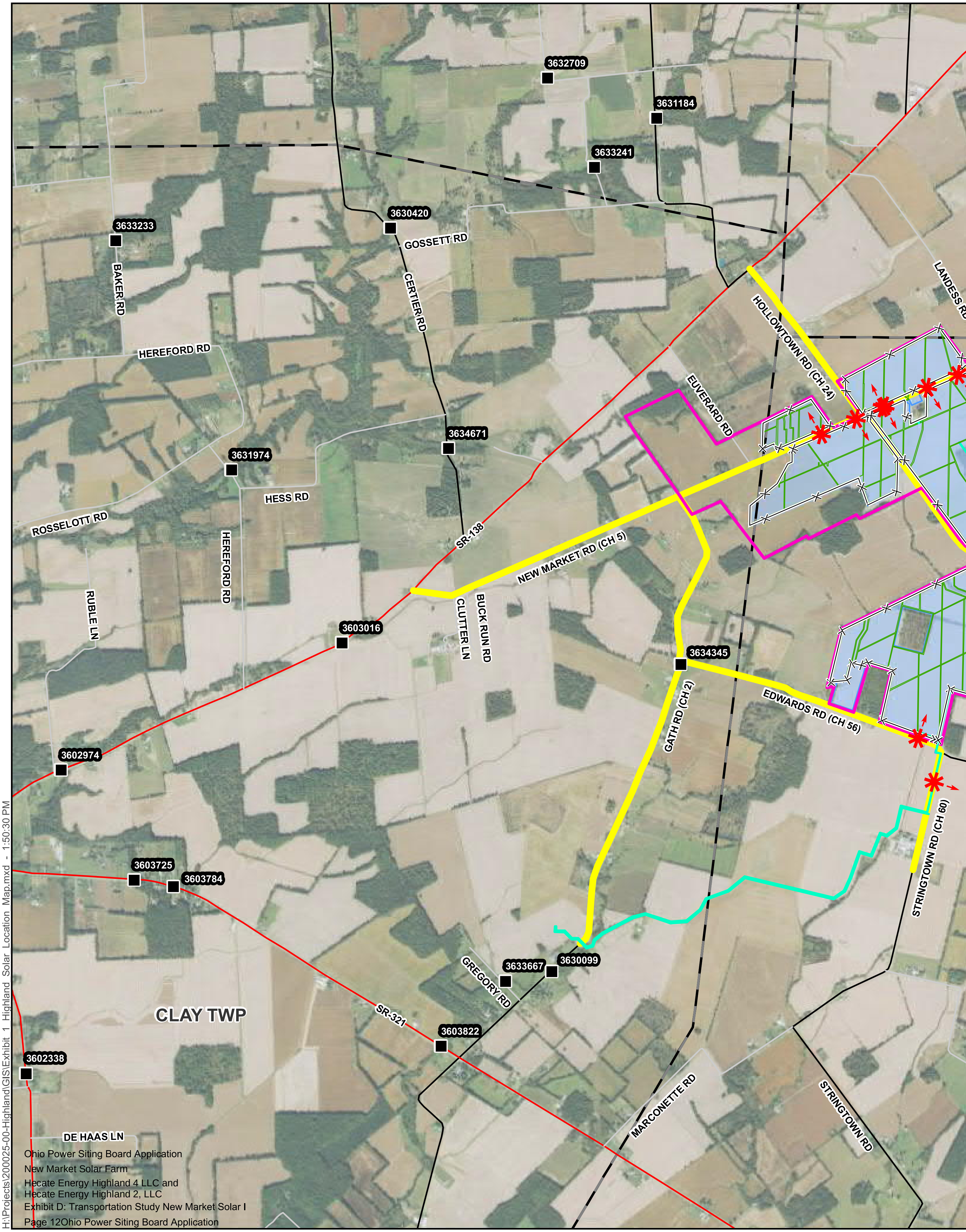
All roads should be monitored during construction for potholing and deterioration of the pavement to ensure they are safe for general construction and local roadway traffic. The volume and weight of both the general construction traffic may cause some distress that could require temporary repair. These temporary repairs/improvements could include repaving with asphalt, temporary traffic signs, etc. and be as a condition of a road use agreement with the county or township. After completion of construction activities, there may be some improvements needed due to any damage caused by the high frequency of vehicle traffic (especially on any roads that had temporary repairs made during the construction activities). Repairing the roadways to pre-construction conditions may include using treatments such as oil and stone or hot or cold mix asphalt, which may be required should a road use agreement be required. Other repairs will likely require some asphalt patching or possibly some asphalt removal, subgrade compaction, and asphalt patching.

Although many of the eight (8) identified culverts appear to be structurally sound, there are two (2) locations that may require more thorough monitoring throughout construction. Both culverts, located along Hollowtown Road, have shallow cover and may need repair work done during/after construction. Each pipe should be analyzed to determine if necessary improvements are needed to accommodate the construction traffic. There is also one (1) additional deteriorating pavement area that was identified and marked on Exhibit 3 of Appendix A. This location should be monitored during hauling and construction activities to ensure no further pavement failure develops. If conditions do worsen, maintenance repairs may be required to fix the damaged roadway sections.

D. Special Hauling Requirements

Due to the size of the transformer required for the substation, an overweight/oversize permit may be necessary. However, the remainder of the construction vehicles for the project will be legal heights, widths, and weights, and would not require obtaining special hauling permits. All permits necessary to transport the transformer will be secured as necessary during final engineering and design.

APPENDIX A



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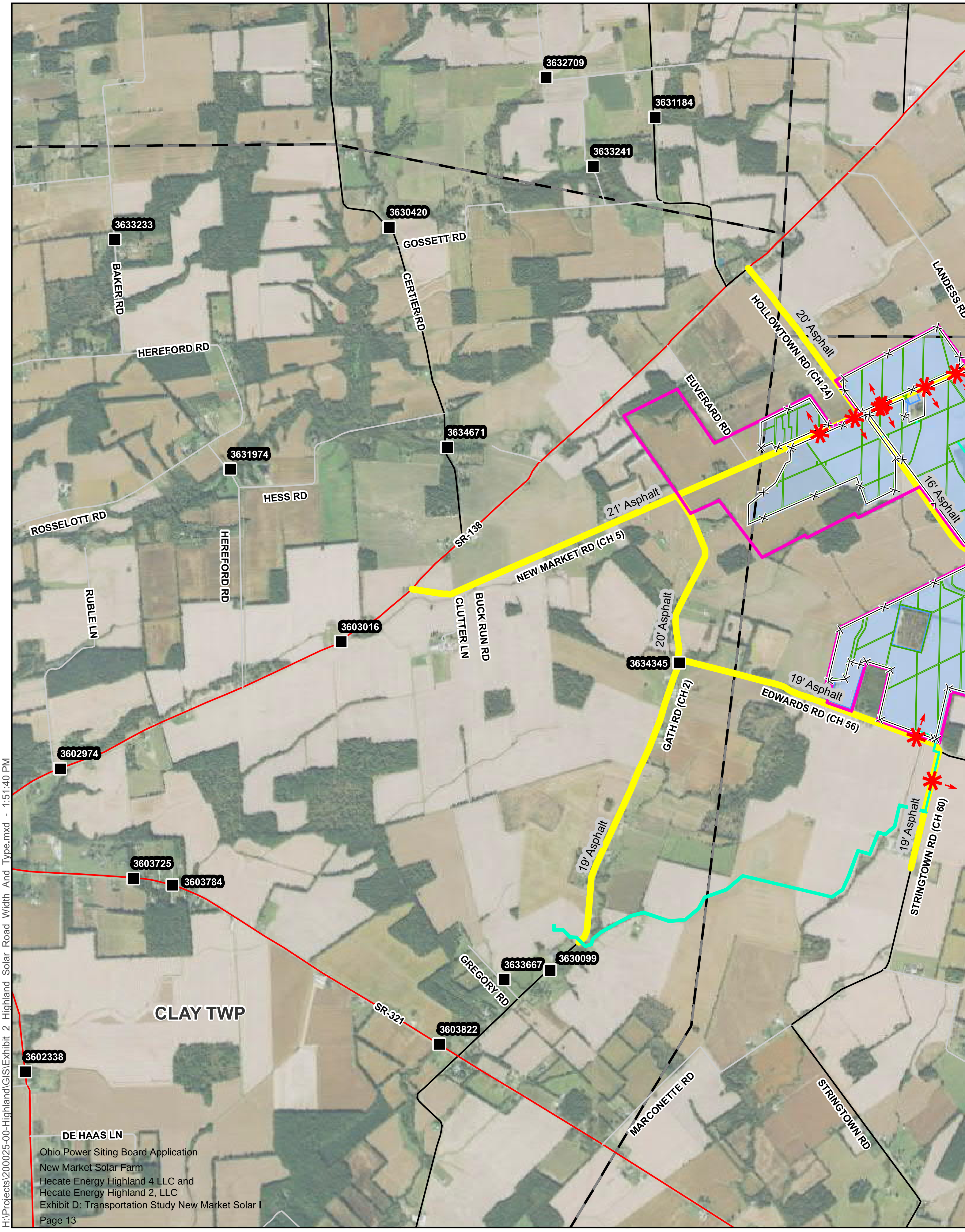
Ohio Power Siting Board Application
New Market Solar Farm
Hecate Energy Highland 4 LLC and



Ohio Power Siting Board Application
New Market Solar Farm
Hecate Energy Highland 4 LLC and
Hecate Energy Highland 2, LLC
Exhibit D: Transportation Study New Market Solar I

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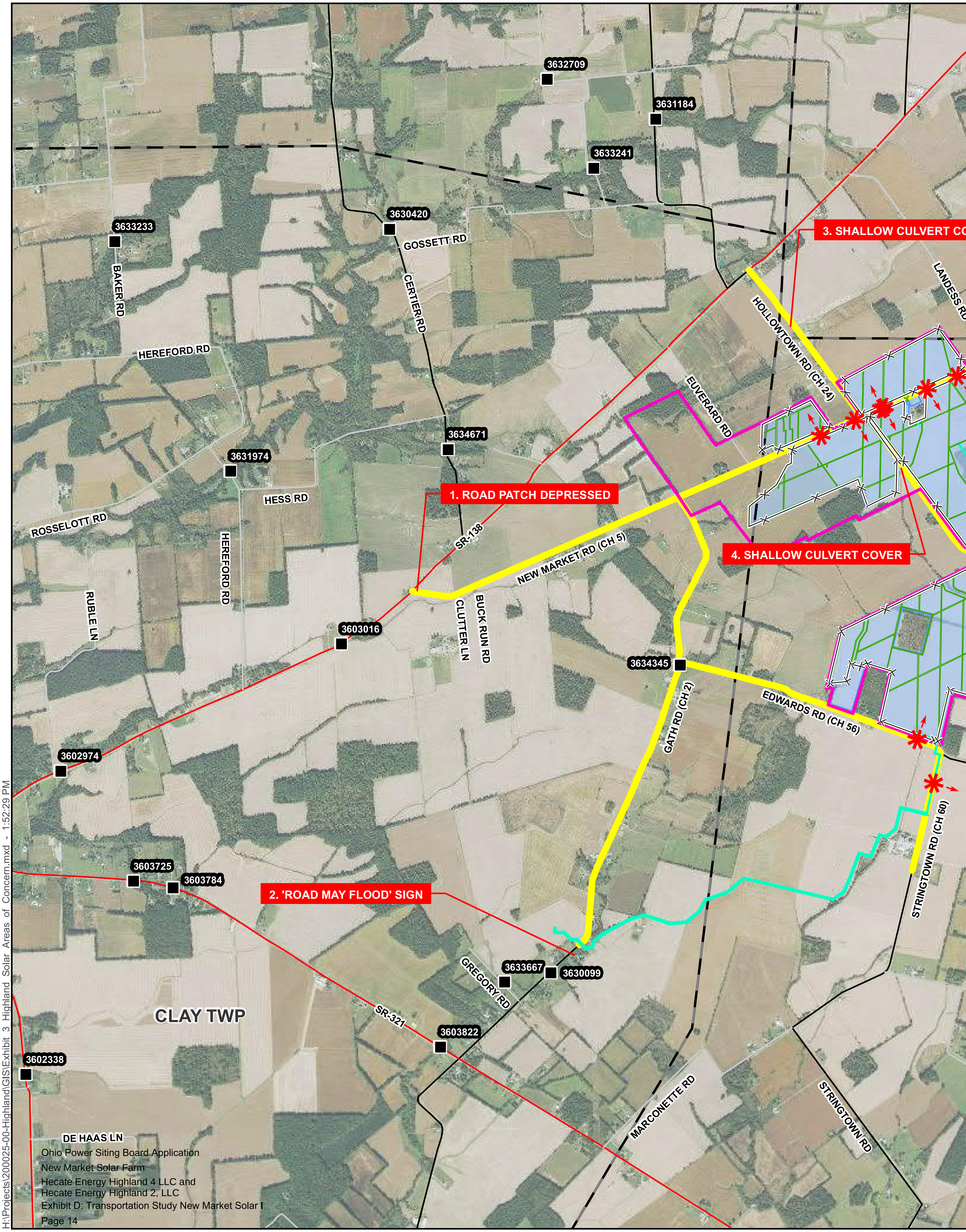
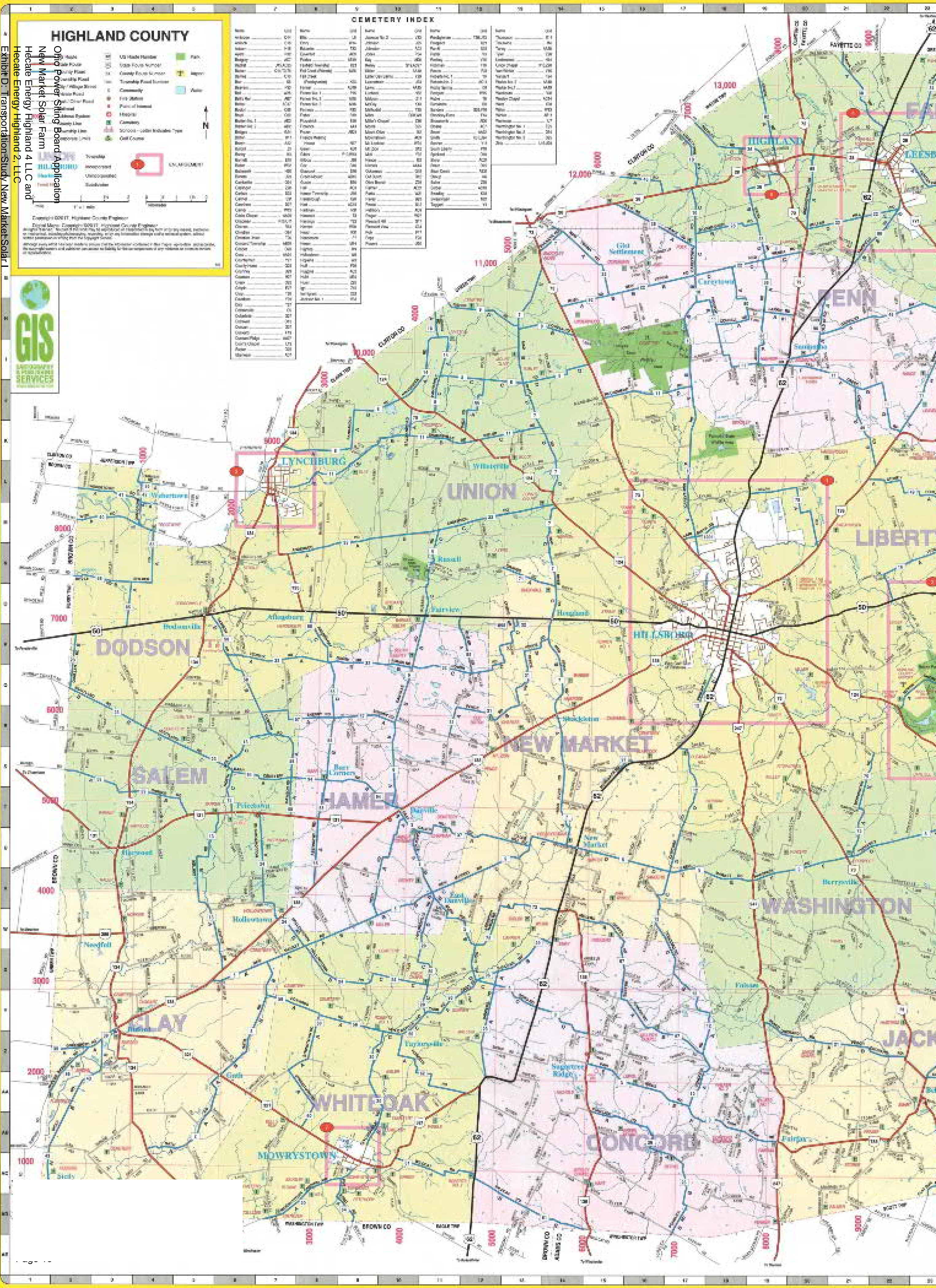


Ohio Power Siting Board Application
New Market Solar Farm
Hecate Energy Highland 4 LLC and
Hecate Energy Highland 2, LLC
Exhibit D: Transportation Study New Market Solar I

APPENDIX B

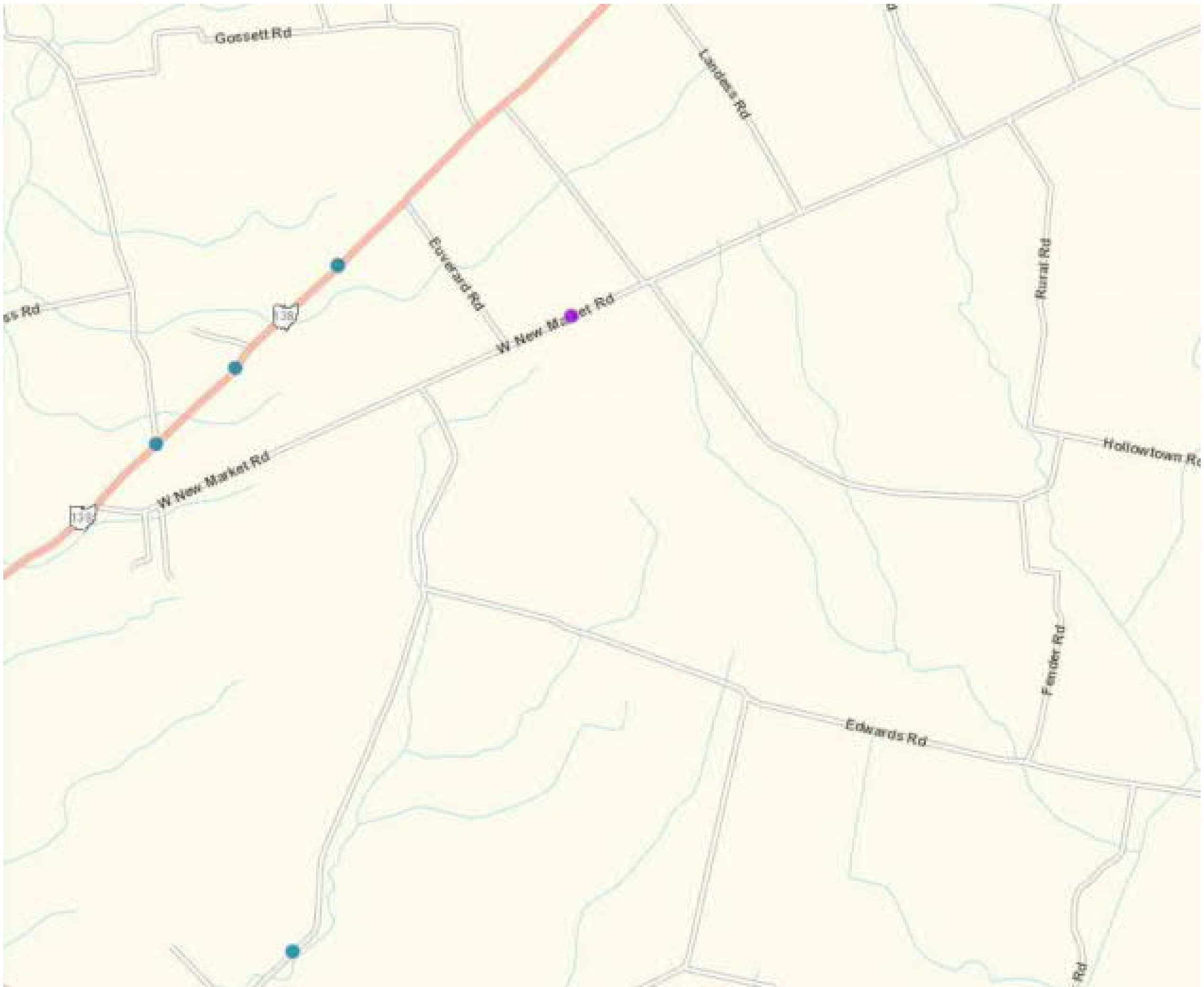

HIGHLAND COUNTY
CEMETERY INDEX
GIS
UNION
PENN
LIBERTY
DODSON
NEW MARKET
SALEM
HAMER
WASHINGTON
CLAY
WHITEOAK
CONCORD
LYNCHBURG
HIGHLAND
HILLSBORO
MOWRYSTOWN
BROWN CO

APPENDIX C

Route/Road Name		From	To
County Highway 5	New Market Road	SR 138	Landess Road
County Highway 24	Hollowtown Road	SR 138	Hollowtown Road
County Highway 2	Gath Road	New Market Road	Gath Road
County Highway 56	Edwards Road	Gath Road	Stringtown Road

Highland Solar, Phase 2 65 MW – Accident Data

2017 Crash Data



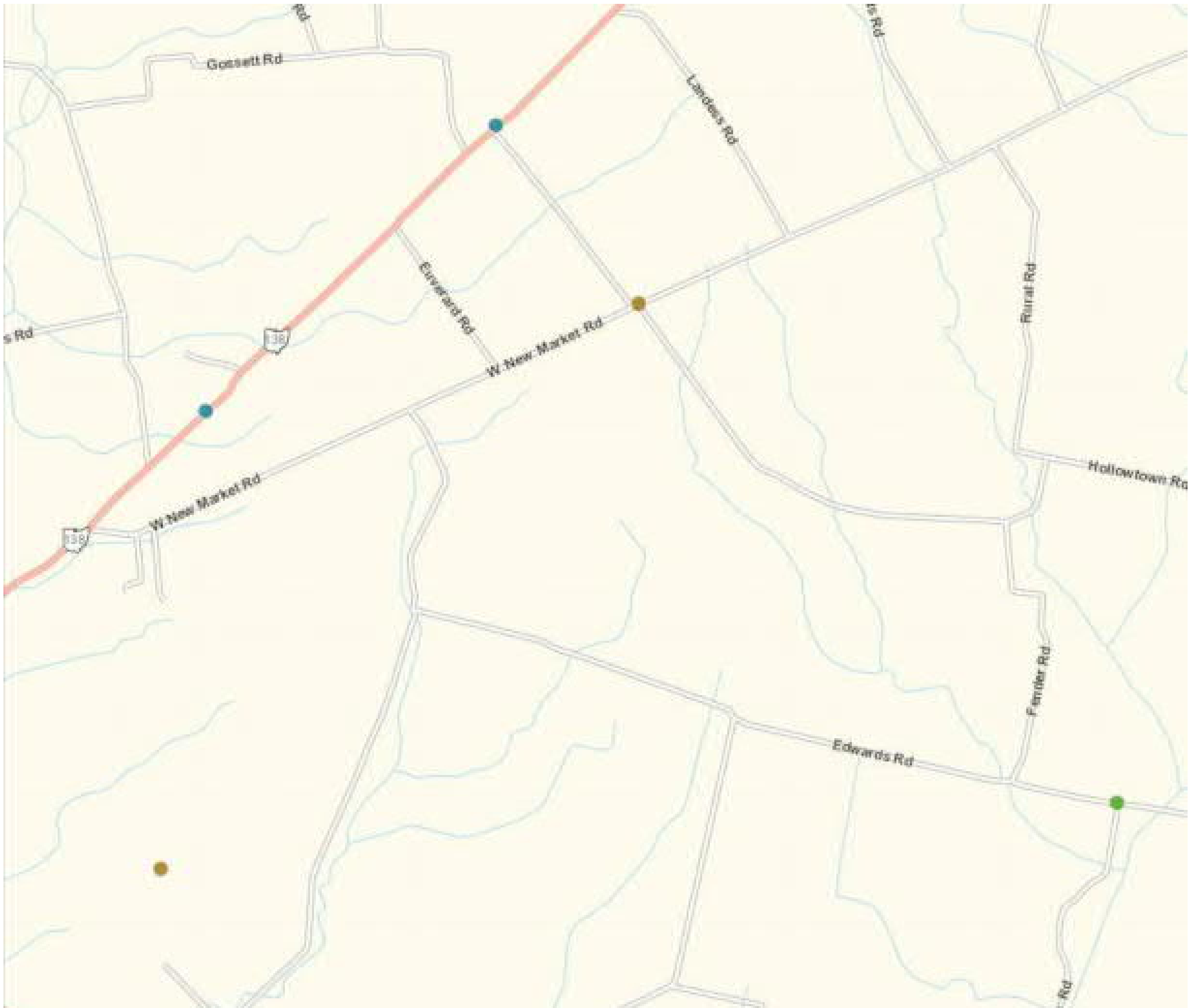
Legend

https://gis.dot.state.oh.us/tims/map

- *PDO / No Injury*
- *Possible Injury*
- *Visible Injury*
- *Serious Injury*
- *Fatal Injury*

Highland Solar, Phase 2 65 MW – Accident Data

2018 Crash Data



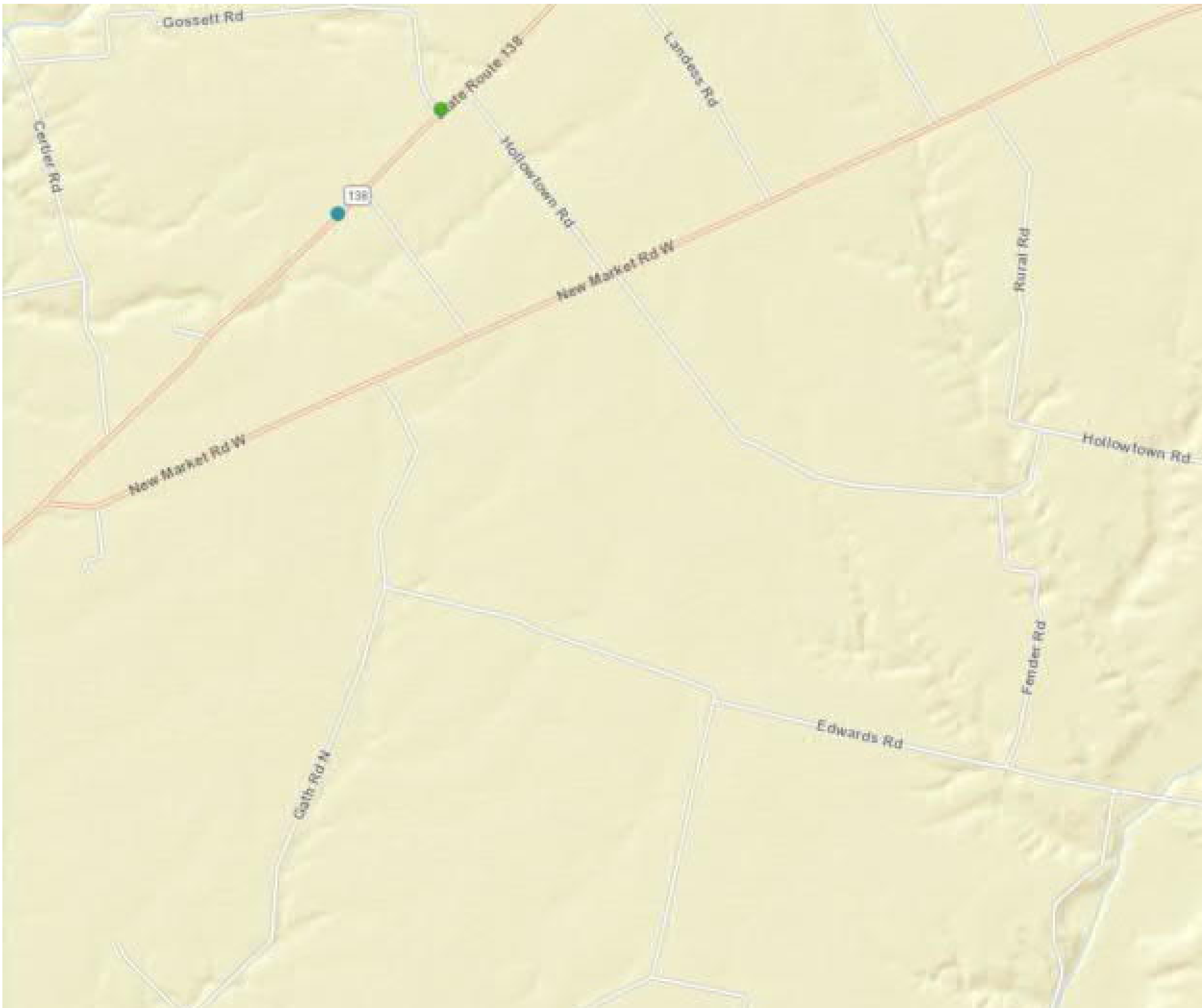
Legend

https://gis.dot.state.oh.us/tims/map

- *PDO / No Injury*
- *Possible Injury*
- *Visible Injury*
- *Serious Injury*
- *Fatal Injury*

Highland Solar, Phase 2 65 MW – Accident Data

2019 Crash Data



Legend

https://gis.dot.state.oh.us/tims/map

- PDO / No Injury
- Possible Injury
- Visible Injury
- Serious Injury
- Fatal Injury

Fatality Facts 2018

State by state

Overview

The number and types of motor vehicle crash deaths differ widely among the 50 states and the District of Columbia. A state's population has an obvious effect on the number of motor vehicle deaths. Fatality rates per capita and per vehicle miles traveled provide a way of examining motor vehicle deaths relative to the population and amount of driving. However, many factors can affect these rates, including types of vehicles driven, travel speeds, rates of licensure, state traffic laws, emergency care capabilities, weather, and topography.

The following facts are based on analysis of data from the U.S. Department of Transportation's (https://www-fars.nhtsa.dot.gov) Fatality Analysis Reporting System (FARS).

Posted December 2019.

Fatal crash totals

There were 33,654 fatal motor vehicle crashes in the United States in 2018 in which 36,560 deaths occurred. This resulted in 11.2 deaths per 100,000 people and 1.13 deaths per 100 million miles traveled. The fatality rate per 100,000 people ranged from 4.4 in the District of Columbia to 22.2 in Mississippi. The death rate per 100 million miles traveled ranged from 0.54 in Massachusetts to 1.83 in South Carolina.[1] (#fn1)

Population, fatal motor vehicle crashes, motor vehicle crash deaths and motor vehicle crash death rates per state, 2018

State	Population	Vehicle miles traveled (millions)	Fatal crashes	Deaths	Deaths per 100,000 population	Deaths per 100 million vehicle miles traveled
Alabama	4,887,871	71,167	876	953	19.5	1.34
Alaska	737,438	5,487	69	80	10.8	1.46
Arizona	7,171,646	66,145	916	1,010	14.1	1.53
Arkansas	3,013,825	36,675	472	516	17.1	1.41

Population, fatal motor vehicle crashes, motor vehicle crash deaths and motor vehicle crash death rates per state, 2018

State	Population	Vehicle miles traveled (millions)	Fatal crashes	Deaths	Deaths per 100,000 population	Deaths per 100 million vehicle miles traveled
California	39,557,045	348,796	3,259	3,563	9.0	1.02
Colorado	5,695,564	53,954	588	632	11.1	1.17
Connecticut	3,572,665	31,596	276	294	8.2	0.93
Delaware	967,171	10,179	104	111	11.5	1.09
District of Columbia	702,455	3,691	30	31	4.4	0.84
Florida	21,299,325	221,816	2,915	3,133	14.7	1.41
Georgia	10,519,475	131,456	1,407	1,504	14.3	1.14
Hawaii	1,420,491	10,887	110	117	8.2	1.07
Idaho	1,754,208	17,709	212	231	13.2	1.30
Illinois	12,741,080	107,954	948	1,031	8.1	0.96
Indiana	6,691,878	81,529	774	858	12.8	1.05
Iowa	3,156,145	33,282	291	318	10.1	0.96
Kansas	2,911,505	32,190	366	404	13.9	1.26
Kentucky	4,468,402	49,544	664	724	16.2	1.46
Louisiana	4,659,978	50,045	716	768	16.5	1.53
Maine	1,338,404	14,784	128	137	10.2	0.93
Maryland	6,042,718	59,775	474	501	8.3	0.84
Massachusetts	6,902,149	66,772	343	360	5.2	0.54
Michigan	9,995,915	102,398	905	974	9.7	0.95
Minnesota	5,611,179	60,438	349	381	6.8	0.63
Mississippi	2,986,530	40,730	597	664	22.2	1.63
Missouri	6,126,452	76,595	848	921	15.0	1.20
Montana	1,062,305	12,700	168	182	17.1	1.43
Nebraska	1,929,268	20,975	201	230	11.9	1.10
Nevada	3,034,392	28,319	300	330	10.9	1.17
New Hampshire	1,356,458	13,776	134	147	10.8	1.07
New Jersey	8,908,520	77,539	525	564	6.3	0.73
New Mexico	2,095,428	27,288	350	391	18.7	1.43
New York	19,542,209	123,510	889	943	4.8	0.76
North Carolina	10,383,620	121,127	1,321	1,437	13.8	1.19
	760,077	9,856	95	105	13.8	1.07
	11,689,442	114,474	996	1,068	9.1	0.93

Population, fatal motor vehicle crashes, motor vehicle crash deaths and motor vehicle crash death rates per state, 2018						
State	Population	Vehicle miles traveled (millions)	Fatal crashes	Deaths	Deaths per 100,000 population	Deaths per 100 million vehicle miles traveled
Oklahoma	3,943,079	45,433	603	655	16.6	1.44
Oregon	4,190,713	36,848	450	506	12.1	1.37
Pennsylvania	12,807,060	102,109	1,103	1,190	9.3	1.17
Rhode Island	1,057,315	8,009	56	59	5.6	0.74
South Carolina	5,084,127	56,801	970	1,037	20.4	1.83
South Dakota	882,235	9,719	110	130	14.7	1.34
Tennessee	6,770,010	81,321	974	1,041	15.4	1.28
Texas	28,701,845	282,037	3,305	3,642	12.7	1.29
Utah	3,161,105	32,069	237	260	8.2	0.81
Vermont	626,299	7,346	60	68	10.9	0.93
Virginia	8,517,685	85,336	778	820	9.6	0.96
Washington	7,535,591	62,367	497	546	7.2	0.88
West Virginia	1,805,832	19,447	265	294	16.3	1.51
Wisconsin	5,813,568	65,885	530	588	10.1	0.89
Wyoming	577,737	10,438	100	111	19.2	1.06
U.S. total	327,167,434	3,240,323	33,654	36,560	11.2	1.13

Deaths by road user

In 2018, the types of motor vehicle crash deaths varied across states. For example, Wyoming had the highest percentage of deaths involving SUV and pickup occupants (49 percent) and a relatively low percentage of deaths involving car occupants (23 percent). In contrast, Vermont had the highest percentage of deaths involving car occupants (49 percent) and a relatively low percentage of deaths involving SUV and pickup occupants (26 percent). Hawaii reported relatively low proportions of fatalities for both cars (15 percent) and SUVs and pickups (15 percent), but a high percentage of motorcyclist deaths (29 percent) and the highest percentage of pedestrian deaths (36 percent). The District of Columbia had the highest percentage of crash deaths involving bicyclists (10 percent) and a high percentage involving pedestrians (35 percent) and motorcyclists (26 percent).

Motor vehicle crash deaths by road user type and state, 2018
*Total includes other and/or unknowns

Motor vehicle crash deaths by road user type and state, 2018

State	Car occupants		Pickup and SUV occupants		Large truck occupants		Motorcyclists		Pedestrians		Bicyclists		Total
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number
State	Car occupants		Pickup and SUV occupants		Large truck occupants		Motorcyclists		Pedestrians		Bicyclists		Total
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number
Alabama	415	44	305	32	17	2	82	9	107	11	9	1	953
Alaska	22	28	25	31	1	1	12	15	14	18	0	0	80
Arizona	269	27	217	21	14	1	149	15	237	23	23	2	1,010
Arkansas	163	32	187	36	24	5	66	13	62	12	3	1	516
California	1,248	35	654	18	38	1	488	14	893	25	154	4	3,563
Colorado	186	29	210	33	12	2	103	16	89	14	22	3	632
Connecticut	125	43	49	17	5	2	49	17	60	20	1	0	294
Delaware	39	35	24	22	1	1	17	15	23	21	6	5	111
District of Columbia	7	23	1	3	0	0	8	26	11	35	3	10	31
Florida	1,009	32	562	18	42	1	574	18	704	22	160	5	3,133
Georgia	550	37	426	28	31	2	154	10	261	17	30	2	1,504
Hawaii	17	15	18	15	0	0	34	29	42	36	2	2	117
Idaho	76	33	72	31	7	3	38	16	17	7	2	1	231
Illinois	419	41	241	23	23	2	119	12	165	16	24	2	1,031
Indiana	357	42	198	23	19	2	117	14	114	13	22	3	858
Iowa	128	40	92	29	7	2	43	14	22	7	7	2	318
Kansas	139	34	148	37	11	3	64	16	29	7	5	1	404
Kentucky	298	41	214	30	14	2	95	13	73	10	10	1	724
Louisiana	248	32	214	28	10	1	79	10	164	21	28	4	768
Maine	60	44	40	29	0	0	23	17	7	5	2	1	137
Maryland	196	39	95	19	9	2	62	12	128	26	5	1	501
Massachusetts	129	36	75	21	4	1	59	16	78	22	4	1	360
Michigan	377	39	250	26	8	1	143	15	142	15	21	2	974
Minnesota	144	38	105	28	3	1	59	15	42	11	7	2	381
Mississippi	262	39	228	34	16	2	41	6	88	13	6	1	664
Missouri	367	40	286	31	22	2	113	12	95	10	2	0	921
Montana	48	26	85	47	4	2	21	12	15	8	2	1	182
Nebraska	88	38	77	33	11	5	23	10	24	10	0	0	230
Nevada	103	31	67	20	2	1	59	18	79	24	8	2	330
New	52	35	47	32	3	2	28	19	9	6	2	1	147

and/or unknowns

Motor vehicle crash deaths by road user type and state, 2018

State	Car occupants		Pickup and SUV occupants		Large truck occupants		Motorcyclists		Pedestrians		Bicyclists		Total
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number
New Jersey	205	36	84	15	13	2	53	9	173	31	18	3	564
New Mexico	112	29	114	29	8	2	45	12	83	21	11	3	391
New York	301	32	163	17	8	1	149	16	262	28	29	3	943
North Carolina	567	39	372	26	21	1	191	13	225	16	18	1	1,437
North Dakota	25	24	49	47	2	2	16	15	6	6	2	2	105
Ohio	469	44	251	24	23	2	145	14	127	12	22	2	1,068
Oklahoma	236	36	207	32	25	4	91	14	60	9	16	2	655
Oregon	156	31	129	25	11	2	78	15	80	16	9	2	506
Pennsylvania	469	39	273	23	14	1	165	14	197	17	18	2	1,190
Rhode Island	18	31	12	20	0	0	18	31	7	12	1	2	59
South Carolina	389	38	285	27	16	2	141	14	165	16	23	2	1,037
South Dakota	50	38	44	34	4	3	16	12	10	8	0	0	130
Tennessee	402	39	284	27	17	2	168	16	136	13	8	1	1,041
Texas	1,160	32	1,191	33	98	3	416	11	612	17	69	2	3,642
Utah	86	33	69	27	8	3	47	18	36	14	3	1	260
Vermont	33	49	18	26	2	3	7	10	6	9	0	0	68
Virginia	349	43	200	24	22	3	100	12	118	14	12	1	820
Washington	186	34	139	25	5	1	80	15	102	19	16	3	546
West Virginia	107	36	90	31	10	3	39	13	22	7	5	2	294
Wisconsin	251	43	164	28	7	1	83	14	56	10	4	1	588
Wyoming	26	23	54	49	6	5	15	14	6	5	0	0	111
U.S. total	13,138	36	9,404	26	678	2	4,985	14	6,283	17	854	2	36,560

*Total includes other and/or unknowns

Crash types

Nationwide, 53 percent of motor vehicle crash deaths in 2018 occurred in single-vehicle crashes. Montana had the highest percentage of deaths in single-vehicle crashes (71 percent), while Nebraska had the highest percentage of deaths in multiple-vehicle crashes (57 percent).

Deaths by crash type and state, 2018

State	Single-vehicle		Multiple-vehicle		All crashes	
	Number	%	Number	%	Number	%
Alabama	514	54	439	46	953	100
Alaska	45	56	35	44	80	100
Arizona	581	58	429	42	1,010	100
Arkansas	285	55	231	45	516	100
California	1,956	55	1,607	45	3,563	100
Colorado	346	55	286	45	632	100
Connecticut	166	56	128	44	294	100
Delaware	55	50	56	50	111	100
District of Columbia	20	65	11	35	31	100
Florida	1,621	52	1,512	48	3,133	100
Georgia	831	55	673	45	1,504	100
Hawaii	72	62	45	38	117	100
Idaho	129	56	102	44	231	100
Illinois	528	51	503	49	1,031	100
Indiana	427	50	431	50	858	100
Iowa	143	45	175	55	318	100
Kansas	201	50	203	50	404	100
Kentucky	378	52	346	48	724	100
Louisiana	448	58	320	42	768	100
Maine	83	61	54	39	137	100
Maryland	260	52	241	48	501	100
Massachusetts	214	59	146	41	360	100
Michigan	460	47	514	53	974	100
Minnesota	188	49	193	51	381	100
Mississippi	367	55	297	45	664	100
Missouri	478	52	443	48	921	100
Montana	129	71	53	29	182	100
Nebraska	98	43	132	57	230	100
Nevada	173	52	157	48	330	100
New Hampshire	87	59	60	41	147	100
New Jersey	309	55	255	45	564	100
New Mexico	220	56	171	44	391	100
New York	562	60	381	40	943	100
	745	52	692	48	1,437	100
	53	50	52	50	105	100

Deaths by crash type and state, 2018						
State	Single-vehicle		Multiple-vehicle		All crashes	
	Number	%	Number	%	Number	%
Ohio	535	50	533	50	1,068	100
Oklahoma	300	46	355	54	655	100
Oregon	275	54	231	46	506	100
Pennsylvania	629	53	561	47	1,190	100
Rhode Island	36	61	23	39	59	100
South Carolina	573	55	464	45	1,037	100
South Dakota	82	63	48	37	130	100
Tennessee	543	52	498	48	1,041	100
Texas	1,840	51	1,802	49	3,642	100
Utah	137	53	123	47	260	100
Vermont	37	54	31	46	68	100
Virginia	470	57	350	43	820	100
Washington	325	60	221	40	546	100
West Virginia	154	52	140	48	294	100
Wisconsin	312	53	276	47	588	100
Wyoming	61	55	50	45	111	100
U.S. total	19,481	53	17,079	47	36,560	100

Alcohol involvement

Some states report blood alcohol concentration (BAC) for only a small percentage of passenger vehicle drivers. If BAC is missing for a driver, it is estimated by the U.S. Department of Transportation's multiple imputation model. However, BAC information is most precise in states that report a high percentage of crashes where BAC information is reported. In the following table, estimated percentages of fatally injured passenger vehicle drivers with BACs at or above 0.08 percent are shown only for states in which BAC reporting for fatally injured drivers was 70 percent or higher.[2 (#fn2)] Estimated percentages are based on known BAC when available and imputed BAC for the remaining drivers.

For the nation in 2018, BAC was reported for 65 percent of fatally injured passenger vehicle drivers. Reporting rates varied substantially, from a high of 100 percent (District of Columbia) to a low of 26 percent (Indiana).

Thirty-one states and the District of Columbia had BAC reporting rates of at least 70 percent. Among these states, Montana had the highest estimated percentage of fatally injured drivers with BACs of 0.08 percent or higher (45 percent) and West Virginia had the lowest (12 percent).

Estimated number and percent of fatally injured passenger vehicle drivers with BAC ≥ 0.08 percent by state, 2018

State	Total drivers killed	Drivers killed with known BAC results		Estimated drivers killed with BACs ≥ 0.08	
	Number	Number	%	Number	%
Alabama	566	325	57	‡	‡
Alaska	32	20	63	‡	‡
Arizona	353	219	62	‡	‡
Arkansas	280	202	72	73	26
California	1,369	896	65	‡	‡
Colorado	286	252	88	96	34
Connecticut	127	62	49	‡	‡
Delaware	46	37	80	16	34
District of Columbia	5	5	100	1	20
Florida	1,162	687	59	‡	‡
Georgia	754	397	53	‡	‡
Hawaii	26	21	81	9	34
Idaho	114	80	70	29	26
Illinois	509	435	85	151	30
Indiana	435	115	26	‡	‡
Iowa	180	107	59	‡	‡
Kansas	229	70	31	‡	‡
Kentucky	401	286	71	74	18
Louisiana	363	312	86	108	30
Maine	78	64	82	18	23
Maryland	210	159	76	48	23
Massachusetts	169	153	91	56	33
Michigan	483	257	53	‡	‡
Minnesota	193	169	88	56	29
Mississippi	378	177	47	‡	‡
Missouri	505	389	77	124	25
Montana	108	94	87	48	45

ata have insufficient reporting of results for reliably estimating percent of fatally injured 08 Percent.

Estimated number and percent of fatally injured passenger vehicle drivers with BAC ≥ 0.08 percent by state, 2018					
State	Total drivers killed	Drivers killed with known BAC results		Estimated drivers killed with BACs ≥ 0.08	
	Number	Number	%	Number	%
Nebraska	115	88	77	33	28
Nevada	134	93	69	‡	‡
New Hampshire	80	75	94	22	27
New Jersey	210	171	81	56	27
New Mexico	158	113	72	47	30
New York	359	239	67	‡	‡
North Carolina	724	354	49	‡	‡
North Dakota	56	47	84	17	30
Ohio	569	464	82	147	26
Oklahoma	351	318	91	69	20
Oregon	199	140	70	54	27
Pennsylvania	584	302	52	‡	‡
Rhode Island	21	17	81	7	35
South Carolina	542	384	71	163	30
South Dakota	68	60	88	25	37
Tennessee	518	242	47	‡	‡
Texas	1,760	883	50	‡	‡
Utah	110	96	87	28	25
Vermont	37	33	89	10	27
Virginia	437	377	86	135	31
Washington	237	193	81	73	31
West Virginia	148	130	88	18	12
Wisconsin	328	275	84	116	35
Wyoming	62	25	40	‡	‡
U.S. total	17,168	11,109	65	4,946	29

‡ Cells with missing data have insufficient reporting of results for reliably estimating percent of fatally injured drivers with BACs ≥ 0.08 Percent.

Restraint use

Based on daytime observational surveys conducted by the states, the nationwide rate of seat belt use among front seat passenger vehicle occupants in 2018 was 90 percent. The state with the highest observed seat belt use for front seat occupants was Hawaii, at 98 percent, while the lowest was New Hampshire at 76 percent.[3] (#fn3)

Rates of restraint use among fatally injured motor vehicle occupants will be lower than the overall observed restraint use rate because unrestrained occupants are more likely than restrained ones to be fatally injured in a crash. Restrained fatally injured occupants include occupants in child safety seats and occupants restrained by seat belts. In 2018, fatally injured occupants were approximately half as likely to have been restrained compared with the nationwide average. California had the highest restraint use percentage among fatally injured occupants at 61 percent. New Hampshire had the lowest restraint use among fatally injured occupants at just 28 percent.

Rates of observed daytime front-seat belt use and number and percent of fatally injured passenger vehicle occupants by restraint use and state, 2018

State and percent of observed seat belt use		Restrained fatally injured occupants		Unrestrained fatally injured occupants		Unknown restraint status of fatally injured occupants		Total fatally injured passenger vehicle occupants
		Number	%	Number	%	Number	%	Number
Alabama	**92**	301	42	359	50	63	9	723
Alaska	**92**	20	43	22	47	5	11	47
Arizona	**86**	197	39	235	47	69	14	501
Arkansas	**78**	144	41	178	51	30	9	352
California	**96**	1,170	61	594	31	160	8	1,924
Colorado	**86**	172	43	216	54	15	4	403
Connecticut	**92**	76	43	69	39	32	18	177
Delaware	**92**	29	46	33	52	1	2	63
District of Columbia	**95**	3	38	1	12	4	50	8
Florida	**91**	844	53	703	44	45	3	1,592
Georgia	**96**	448	45	442	44	105	11	995
Hawaii	**98**	12	33	15	42	9	25	36
Idaho	**85**	59	38	82	53	13	8	154
Illinois	**95**	330	49	249	37	96	14	675
Indiana	**93**	272	48	214	38	79	14	565
Iowa	**94**	120	54	78	35	26	12	224
Kansas	**84**	133	46	130	45	25	9	288
		236	46	281	54	0	0	517
		212	45	223	47	36	8	471

Ohio Power Siting Board Application
New Market Solar Farm
Hecate Energy Highland 4 LLC and
Hecate Energy Highland 2, LLC
Exhibit D: Transportation Study New Market Solar I
Page 31

State and percent of observed seat belt use		Restrained fatally injured occupants		Unrestrained fatally injured occupants		Unknown restraint status of fatally injured occupants		Total fatally injured passenger vehicle occupants
		Number	%	Number	%	Number	%	Number
Maine	**89**	51	50	50	50	0	0	101
Maryland	**90**	159	54	104	36	29	10	292
Massachusetts	**82**	65	31	103	49	42	20	210
Michigan	**93**	354	55	182	28	104	16	640
Minnesota	**92**	123	48	84	33	47	19	254
Mississippi	**80**	208	42	281	57	5	1	494
Missouri	**87**	233	35	385	58	46	7	664
Montana	**87**	45	33	87	64	3	2	135
Nebraska	**86**	57	35	88	53	20	12	165
Nevada	**92**	89	51	77	45	7	4	173
New Hampshire	**76**	29	28	71	70	2	2	102
New Jersey	**95**	159	53	126	42	13	4	298
New Mexico	**90**	90	39	116	51	23	10	229
New York	**93**	259	55	153	33	57	12	469
North Carolina	**91**	522	54	395	41	44	5	961
North Dakota	**83**	29	39	37	49	9	12	75
Ohio	**85**	321	44	334	46	77	11	732
Oklahoma	**86**	205	46	209	46	36	8	450
Oregon	**96**	156	54	76	26	57	20	289
Pennsylvania	**89**	266	35	386	51	104	14	756
Rhode Island	**89**	13	43	13	43	4	13	30
South Carolina	**90**	318	47	332	49	33	5	683
South Dakota	**79**	29	31	60	63	6	6	95
Tennessee	**91**	345	50	293	42	52	8	690
Texas	**91**	1,241	52	946	40	200	8	2,387
Utah	**89**	87	55	50	32	20	13	157
Vermont	**90**	20	39	29	57	2	4	51
Virginia	**84**	255	46	296	53	6	1	557
Washington	**93**	186	56	109	33	39	12	334
West Virginia	**91**	94	47	72	36	33	17	199
		204	48	158	38	59	14	421
		33	40	43	52	7	8	83

Rates of observed daytime front-seat belt use and number and percent of fatally injured passenger vehicle occupants by restraint use and state, 2018								
State and percent of observed seat belt use		Restrained fatally injured occupants		Unrestrained fatally injured occupants		Unknown restraint status of fatally injured occupants		Total fatally injured passenger vehicle occupants
		Number	%	Number	%	Number	%	Number
U.S. total	**90**	11,023	48	9,869	43	1,999	9	22,891

Rural versus urban

Nationwide, 45 percent of motor vehicle crash deaths in 2018 occurred in rural areas. The states with the highest percentage of crash deaths on rural roads were South Dakota (90 percent), Vermont (88 percent), and North Dakota (87 percent). The states with the lowest percentage were New Jersey (8 percent) Massachusetts (10 percent), and Connecticut (13 percent). The District of Columbia had 0 crash deaths in rural areas because its entirety is coded as an urban area.

Number and percent of motor vehicle crash deaths by land use and state, 2018							
State	Urban		Rural		Unknown		Total
	Number	%	Number	%	Number	%	Number
Alabama	412	43	541	57	0	0	953
Alaska	39	49	41	51	0	0	80
Arizona	680	67	318	31	12	1	1,010
Arkansas	210	41	306	59	0	0	516
California	2,490	70	1,072	30	1	<1	3,563
Colorado	373	59	259	41	0	0	632
Connecticut	252	86	39	13	3	1	294
Delaware	57	51	54	49	0	0	111
District of Columbia	31	100	0	0	0	0	31
Florida	1,860	59	724	23	549	18	3,133
Georgia	996	66	508	34	0	0	1,504
Hawaii	91	78	26	22	0	0	117
Idaho	63	27	168	73	0	0	231
Illinois	645	63	386	37	0	0	1,031
Indiana	333	39	524	61	1	<1	858
[illegible]	64	20	254	80	0	0	318
[illegible]	95	24	308	76	1	<1	404

Number and percent of motor vehicle crash deaths by land use and state, 2018

State	Urban		Rural		Unknown		Total
	Number	%	Number	%	Number	%	Number
Kentucky	208	29	515	71	1	<1	724
Louisiana	463	60	304	40	1	<1	768
Maine	19	14	117	85	1	1	137
Maryland	403	80	90	18	8	2	501
Massachusetts	323	90	36	10	1	<1	360
Michigan	566	58	407	42	1	<1	974
Minnesota	160	42	218	57	3	1	381
Mississippi	224	34	440	66	0	0	664
Missouri	409	44	512	56	0	0	921
Montana	28	15	154	85	0	0	182
Nebraska	59	26	171	74	0	0	230
Nevada	239	72	89	27	2	1	330
New Hampshire	69	47	78	53	0	0	147
New Jersey	509	90	45	8	10	2	564
New Mexico	158	40	231	59	2	1	391
New York	477	51	466	49	0	0	943
North Carolina	593	41	843	59	1	<1	1,437
North Dakota	14	13	91	87	0	0	105
Ohio	580	54	471	44	17	2	1,068
Oklahoma	225	34	429	65	1	<1	655
Oregon	178	35	328	65	0	0	506
Pennsylvania	660	55	524	44	6	1	1,190
Rhode Island	43	73	15	25	1	2	59
South Carolina	356	34	681	66	0	0	1,037
South Dakota	13	10	117	90	0	0	130
Tennessee	570	55	471	45	0	0	1,041
Texas	2,110	58	1,520	42	12	<1	3,642
Utah	165	63	93	36	2	1	260
Vermont	7	10	60	88	1	1	68
Virginia	346	42	471	57	3	<1	820
Washington	305	56	235	43	6	1	546
West Virginia	116	39	178	61	0	0	294
Wisconsin	199	34	386	66	3	1	588
	14	13	96	86	1	1	111
	19,499	53	16,410	45	651	2	36,560

Footnotes

1

Federal Highway Administration. 2019. Highway statistics, 2018. Washington, DC: US Department of Transportation.

↑ (#fn1ref1)

2

Subramanian, R. 2002. Transitioning to multiple imputation — a new method to impute missing blood alcohol concentration (BAC) values in FARS. Report no. DOT HS-809-403. Washington, DC: National Highway Traffic Safety Administration.

↑ (#fn2ref1)

3

National Highway Traffic Safety Administration. 2019. Seat belt use in 2018 — use rates in the states and territories. Report no. DOT HS-812-763. Washington, DC: U.S. Department of Transportation.

↑ (#fn3ref1)

The Insurance Institute for Highway Safety (IIHS) is an independent, nonprofit scientific and educational organization dedicated to reducing the losses — deaths, injuries and property damage — from motor vehicle crashes.

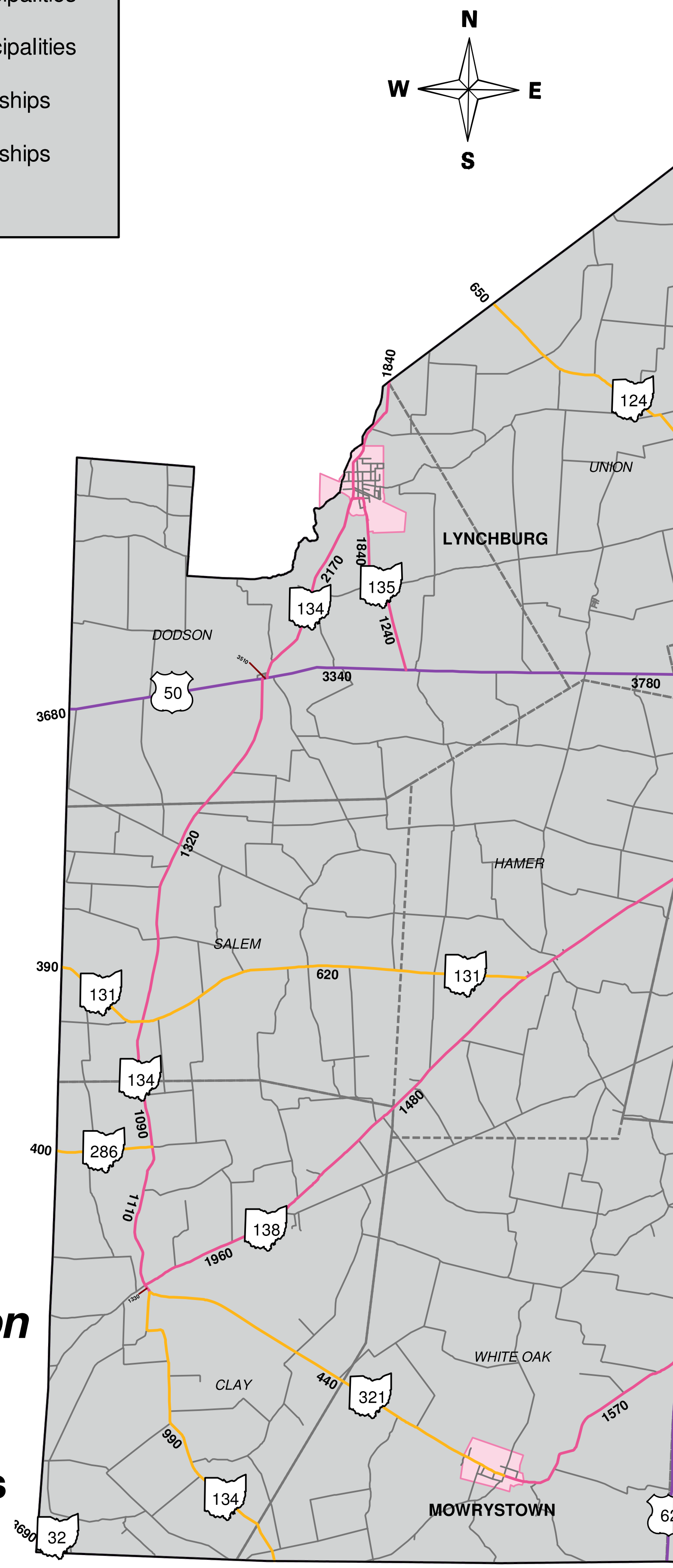
The Highway Loss Data Institute (HLDI) shares and supports this mission through scientific studies of insurance data representing the human and economic losses resulting from the ownership and operation of different types of vehicles and by publishing insurance loss results by vehicle make and model.

Both organizations are wholly supported by these auto insurers and insurance associations (/about-us/member-groups) .

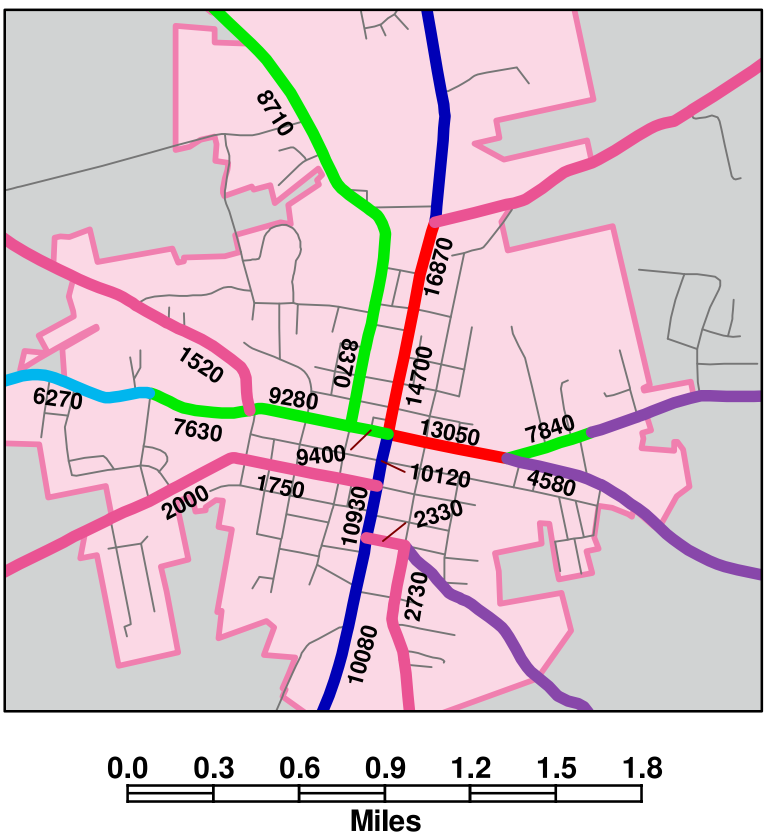
Highland Count
Annual Average Daily T

2013 Annual Average Daily Traffic	
0 to 1000	12000 to 17000
1000 to 3000	Other Roads
3000 to 5000	Municipalities
5000 to 7000	A Municipalities
7000 to 9500	Townships
9500 to 12000	*A* Townships

0 1 2 3 4 5
Miles



Hillsboro



Ohio Department of Transportation
Office of Technical Services
Traffic Monitoring Section

ODOT.Traffic.Counts@dot.state.oh.us

GIS NAME	AVERAGE_DA	BORDER_BRG	BRIDGE_ROA	CTL_BEGIN_	CULVERTS	DECK_STRUC	DEFIC_FUNC	DESIGN_LOA	FACILITY_C	FEATURES_
ONLINE NAME	AVERAGE DAILY TRAFFIC	BORDER BRG	BRIDGE ROAD WIDTH	CTL BEGIN NBR	CULVERTS	DECK STRUCTURE TYPE	DEFIC FUNC RAITING	DESIGN LOAD	FACILITY CARRIED BY STRUCT	FEATURES INTER
	456		20	5.23	N	1	2	5	SR 321	TRIB OF E. FORK WHIT
	385		0	0.41	8	N	0	A	COUNTY RD #13	LICK RUN CREEK
	2020		0	1.85	7	N	0	5	SR 138	RUBLE RUN
	324		0	0.62	8	N	0	4	TOWNSHIP RD #113	BRANCH OF BRUSH RU
	155		0	0.48	8	N	0	A	TOWNSHIP RD #221	LITTLE NORTH FORK C
	385		0	1.36	4	N	0	5	COUNTY RD #24	E FORK WHITEOAK CR
	1016		0	3.49	A	N	0	5	SR 134	TRIB N FK WHITE OAK
	2020		0	0.54	5	N	0	6	SR 138	RUBLE RUN
	1870		0	5.26	5	N	0	5	COUNTYRD #20	STREAM
	96		0	0.68	8	N	0	4	TOWNSHIP RD #138	FLAT RUN
	221		0	0.35	8	N	2	8	CR2 GATH RD.	BRANCH OF FLANT RU
	456		0	0.72	2	N	0	2	SR 321	TRIB OF RUBLE CREEK
	456		0	0.89	2	N	0	2	SR 321	TRIB OF RUBLE CREEK
	1377		0	4.69	5	N	0	6	SR 134	RUBLE RUN
	385		24	2.2	N	1	0	5	COUNTY RD #56	BRANCH WHITE OAK C
	274		0	4.7	8	N	0	9	COUNTY RD #2	FLAT RUN CREEK
	274		24	3.22	N	1	0	5	COUNTY RD #2	FLATRUN
	351		20	0.1	N	1	0	5	TOWNSHIP RD #206	FLAT RUN
	324		22	1.39	N	1	0	3	TOWNSHIP RD #139	FLAT RUN
	302		28	0.96	N	1	0	6	COUNTY RD #2	FLATRUN
	385		24	1.69	N	1	0	5	COUNTY RD. #62	BRANCH E FORK WHIT
	96		24	1.59	N	1	0	9	TOWNSHIP RD #138	FLAT RUN CREEK
	456		30	2.21	N	1	0	A	ST RT 321	FLAT RUN
	456		30	4	N	1	0	A	ST RT 321	BELLS RUN
	155		20	0.13	N	1	0	5	TOWNSHIP RD #406	LITTLE N FORK WHITE(
	153		24	3.64	N	1	0	5	COUNTY RD #43	NORTH FORK WHITEO
	78		23.6	2.57	N	1	0	6	TOWNSHIP RD #210	N FORK WHITE OAK CR
	78		22	0.94	N	N	0	6	TOWNSHIP RD #210	WHITE OAK CREEK
	385		28	1.4	N	N	0	6	COUNTY RD #13	NORTH FORK WHITE C
	1870		28	5.63	N	1	0	5	COUNTY RD #20	EAST FORK WHITEOAK
	1146		32	6.02	N	1	0	9	ST RT 134	N FORK WHITE OAK CR
	1870		32	1.36	N	1	0	A	COUNT RD #39	WHITE OAK CREEK

APPENDIX D

Area of Concern 1- New Market Road

24 inch concrete patch depressed in road.

Area of Concern 2- Gath Road

"Road May Flood" sign present.

Area of Concern 3- Hollowtown Road

Shallow cover over existing elliptical concrete pipe.

Area of Concern 4- Hollowtown Road

Shallow cover over existing elliptical concrete pipe.

APPENDIX E

Highland Solar, Phase 2 65MW - Truck Load Estimation
August-20

Solar Panel Truck Estimation

Solar Panels Assumed for Project	219284	
# Solar Panels/Truck	648	
Trucks Needed for Solar Panel Delivery	**338**	**trucks**

Notes/Assumptions:
1. Panels are assumed to be 72-cell modules (JKM400M072L-V).
2. Number of solar panels taken from drawing HIGHLAND-GA-004

Gravel Truck Estimation

Length of Access Road	109187	ft
Width of Access Road	20	ft
Depth of Aggregate for Access Road	0.5	ft
Volume of Access Road Aggregate	1091870	cf
Total Gravel Volume of All Access Roads	40440	cy
Trucks Needed for Gravel Delivery	**3370**	**trucks**

Notes/Assumptions:
1. For consistency of calculations paved roads were assumed to use the same gravel section as stone roads.
2. Assumed 12 cy/truck for gravel delivery.

Other Facilities Truck Estimation

Length of Fencing	50143	ft
Linear Feet per Truck	10000	
Trucks Needed for Fencing	**8**	**trucks**
Other Facilities	**232**	**trucks**

Notes/Assumptions:
1. Assuming three trucks will be necessary for posts and gates.
2. Number of trucks assumed for other facilities is based off of the assumption from other solar projects that solar panels make up 60% of non-aggregate/earthwork number of trucks needed for project.

Total Estimation of Trucks for Project	**3948**	**trucks**

DUE TO THE HIGH NUMBER OF ACCESS ROADS WE ESTIMATE THE HIGHLAND SOLAR, PHASE 2 65 MW PROJECT WILL HAVE BETWEEN 3,800 AND 4,200 TRUCKS FOR THE PROJECT, WITH THE VAST MAJORITY OF HAULING OCCURING DURING ACCESS ROAD CONSTRUCTION AND PAVING ACTIVITIES.

FISHER
ASSOCIATES