

## V. BRIDGES AND OVERPASSES

The Purchase Parkway has eighty-five bridge structures; a detailed table of data for these structures is included in **Appendix F**. A mainline bridge is a structure that carries the parkway through traffic. An overpass bridge is a structure that carries traffic over the mainline roadway. The following table illustrates the breakdown of mainline and overpass bridges and culverts on the Purchase Parkway. Only overpass bridge structures on I-24 were evaluated for this study since it is already an interstate. There are five overpass bridge structures on I-24 within the project study area.

TYPE	NUMBER OF STRUCTURES
MAINLINE BRIDGES	46
OVERPASSES	35
CULVERTS	6
TOTAL	87

**Table 5-1 Summary of Structure Types for Purchase Parkway**

The concerns for mainline bridge structures on the Parkway and overpass bridge structures passing above the Parkway and I-24 are the lateral widths and vertical height clearance. In addition to geometric design, functional and structural condition of these bridges is a concern. Given the increased traffic, especially truck traffic, the functional and structural capacity of these structures is a safety concern. The following discussions include lateral and vertical clearance issues, condition, and safety appurtenances to identify structures in the project area that are deficient under current design guidelines.

### A. Lateral Clearances of Bridges

Lateral clearance is defined as the width of a mainline bridge, measured from curb to curb. The lateral clearances of the Parkway's mainline bridges were evaluated to determine if they were too narrow to meet current design guidelines.

According to the latest AASHTO guidelines, *A Policy on Design Standards Interstate System* (American Association of State Highway Officials, 2005), the width of a mainline bridge, less than 200 feet in length, shall equal the full paved width of the approach roadway. The full paved width of the approach roadway includes the two 12 foot travel lanes, 4 foot inside paved shoulder and 10 foot outside paved shoulder for a total of 38 feet. AASHTO guidelines allow bridges over 200 feet in length be evaluated individually and that the minimum distance between the travel lane and barrier shall be at least 3.5 feet for these bridges. Therefore, a bridge over 200 feet can have a minimum clearance of 31 feet (2-12 foot lanes and 3.5 foot inside and outside shoulders). Further guidance is given on evaluating long bridges, over 200 feet in length. From page 506 the Green Book:



**The mainline bridges that do not meet minimum lateral clearance are greater than 200 ft long.**

“On bridges longer than 60 m [200 ft], some economy in substructure costs may be gained by building a single structure rather than twin parallel structures. In such cases, the approach shoulder widths are provided and a median barrier is extended across the bridge.”

Further discussion of lateral clearance on long bridges is found on page 760 of the same reference:

“On long bridges, particularly on long-span structures where cost per square meter [yard] is greater than the cost on short-span structures, widths that are less than ideal may be acceptable; however, economy alone should not be the governing factor in determining structure widths. The analysis of traffic characteristics, safety features, emergency contingencies, and benefit/cost ratios should be fully considered before the desirable structure width is compromised.”

The following paragraph taken from *A Policy on Design Standard Interstate System*, 2005 addresses existing bridges to remain in place when a route is to be incorporated in the interstate system:

“Mainline bridges on the interstate system and bridges on routes to be incorporated into the system may remain in place if, as a minimum, they meet the following: a) the bridge cross section consists of 3.6 m (12 ft) lanes, 3.0 m (10 ft) shoulder on the right and 1.1 m (3.5 ft) shoulder on the left; b) for long bridges, the offset to the face of parapet or bridge rail on both the left and right is 1.1 m (3.5 ft) measured from the edge of the nearest traveled lane; c) bridge railing shall meet or be upgraded to current standards.”

The following table (**Table 5-2**) summarizes the length and horizontal width of the Purchase Parkway mainline bridges. The horizontal clearance is measured from curb to curb.

All bridges less than 200 feet in length meet the minimum horizontal clearance criteria. All of the bridges that do not meet the minimum horizontal clearance, of which there are 10, are over 200 feet in length.

In addition to the lateral clearance, mainline bridge side railings/barriers are a concern for bridges on the interstate system. Since the construction of the bridges on the Purchase Parkway, side railings/barriers design guidelines have been modified to improve crash worthiness. Mainline bridges on the Purchase Parkway are constructed with a vertical barrier railing with aluminum handrail and a 10 inch high curb, or brush block, which does not meet current specifications. Retrofitting options are available to update the bridge railing to meet current crash worthy criteria.



**Figures 5-1 through 5-5** show the locations of the bridges that do not meet the minimum lateral clearance. The bridge lateral clearance was not collected for I-24 structures.

**All of the Purchase Parkway mainline bridges have side railings/barriers that do not meet current standards.**

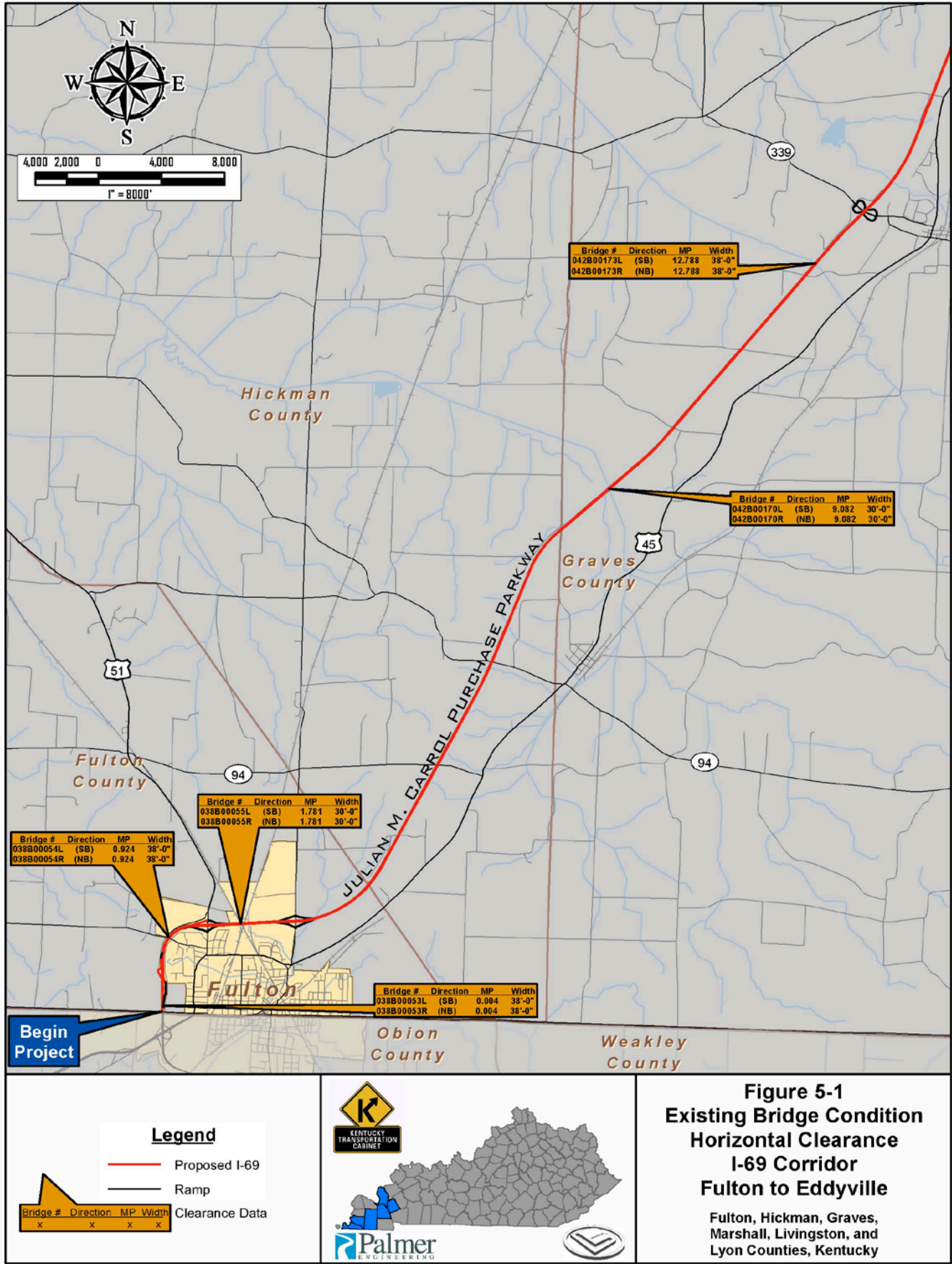
COUNTY	BRIDGE NO.	MP	FEATURES INTERSECTED	LENGTH (ft)	WIDTH (GUTTER TO GUTTER)(ft)
Fulton	B00053L	0.004	KY 116 (W. State Line St)	153	38
Fulton	B00053R	0.004	KY 116 (W. State Line St)	153	38
Fulton	B00054L	0.924	KY 166 (Middle Rd)	142	38
Fulton	B00054R	0.924	KY 166 (Middle Rd)	142	38
Fulton	B00055L	1.781	Illinois Central RR	539	30
Fulton	B00055R	1.781	Illinois Central RR	485	30
Graves	B00170L	9.082	Bayou Du Chien Creek	310	30
Graves	B00170R	9.082	Bayou Du Chien Creek	310	30
Graves	B00173L	12.788	Bush Creek	127	38
Graves	B00173R	12.788	Bush Creek	127	38
Graves	B00176L	16.751	Obion Creek	208	38
Graves	B00176R	16.751	Obion Creek	208	38
Graves	B00177L	17.777	Opossum Creek	211	38
Graves	B00177R	17.777	Opossum Creek	211	38
Graves	B00154L	21.285	US 45 (Mayfield Bypass)	208	24
Graves	B00154R	21.285	US 45 (Mayfield Bypass)	201	24
Graves	B00155L	24.726	US 45 (Paducah Rd)	238	38
Graves	B00155R	24.726	US 45 (Paducah Rd)	238	38
Graves	B00156L	25.068	Illinois Central RR	172	38
Graves	B00156R	25.068	Illinois Central RR	172	38
Graves	B00157L	25.405	Mayfield Creek	208	38
Graves	B00157R	25.405	Mayfield Creek	208	38
Graves	B00158L	25.637	Mayfield Creek Overflow No. 1	97	38
Graves	B00158R	25.637	Mayfield Creek Overflow No. 1	97	38
Graves	B00159L	25.863	Mayfield Creek Overflow No. 2	97	38
Graves	B00159R	25.863	Mayfield Creek Overflow No. 2	97	38
Graves	B00162L	31.402	Panther Creek	189	38
Graves	B00162R	31.402	Panther Creek	189	38
Graves	B00163L	31.573	Panther Creek Overflow	97	38
Graves	B00163R	31.573	Panther Creek Overflow	97	38
Graves	B00165L	33.524	West Fork Clarks River Overflow 1	97	38
Graves	B00165R	33.524	West Fork Clarks River Overflow 1	97	38
Graves	B00166L	33.686	West Fork Clarks River	208	38
Graves	B00166R	33.686	West Fork Clarks River	208	38
Graves	B00167L	34.012	West Fork Clarks River Overflow 2	108	38
Graves	B00167R	34.012	West Fork Clarks River Overflow 2	108	38
Graves	B00168L	34.330	KY 564 (Wayne Freeman Rd)	132	38
Graves	B00168R	34.330	KY 564 (Wayne Freeman Rd)	132	38
Marshall	B00074L	42.748	NC & St. Louis RR	158	38
Marshall	B00074R	42.748	NC & St. Louis RR	158	38
Marshall	B00075L	43.277	Clarks River Relief No. 1	291	30
Marshall	B00075R	43.277	Clarks River Relief No. 1	291	30
Marshall	B00076L	43.614	East Fork Clarks River	519	30
Marshall	B00076R	43.614	East Fork Clarks River	519	30
Marshall	B00064L	43.872	Clarks River Relief No. 2	387	30
Marshall	B00064R	43.872	Clarks River Relief No. 2	387	30

Bridge over 200' long with horizontal clearance less than 38'

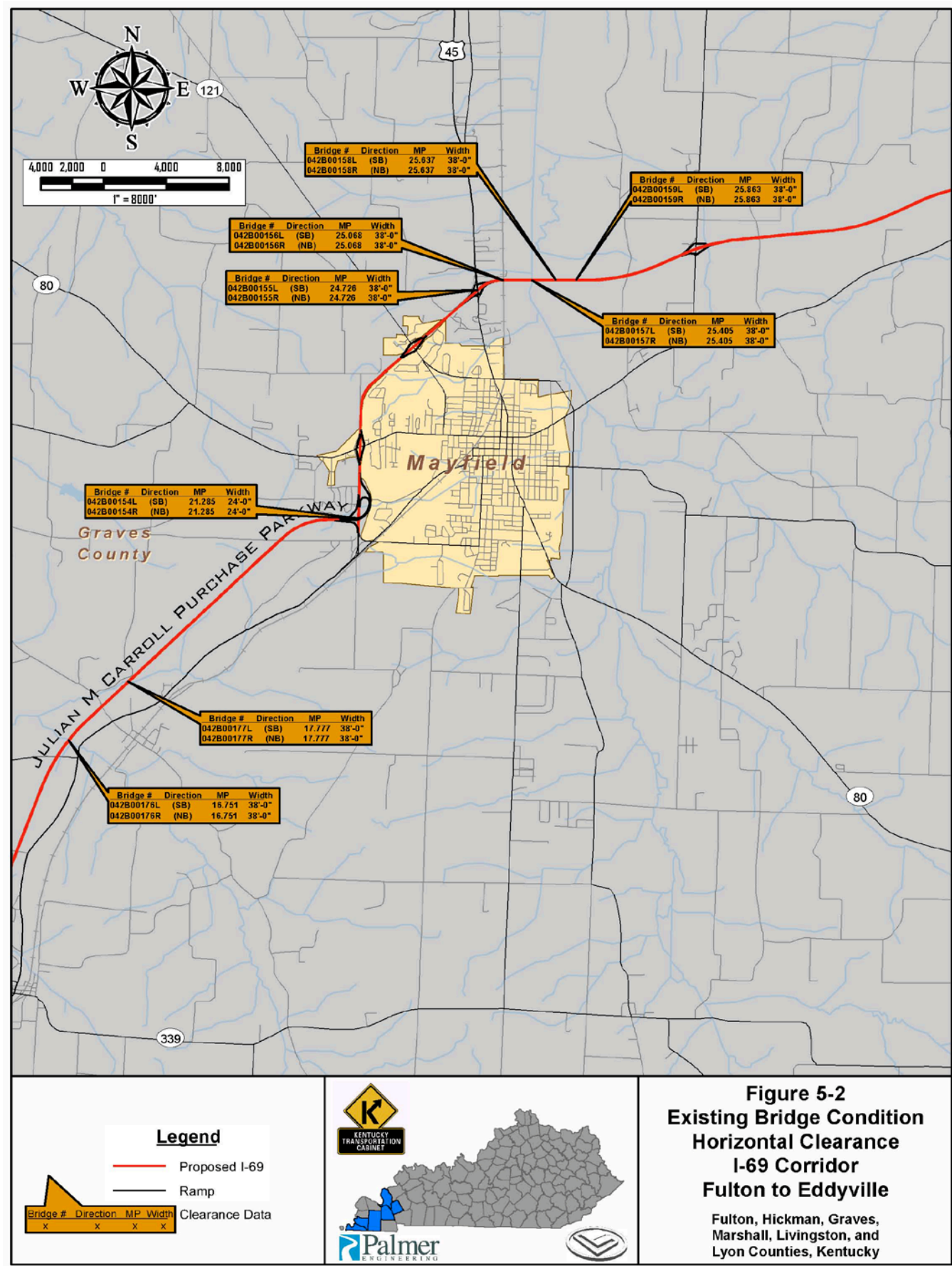
One lane bridge - Mayfield Bypass Trumpet

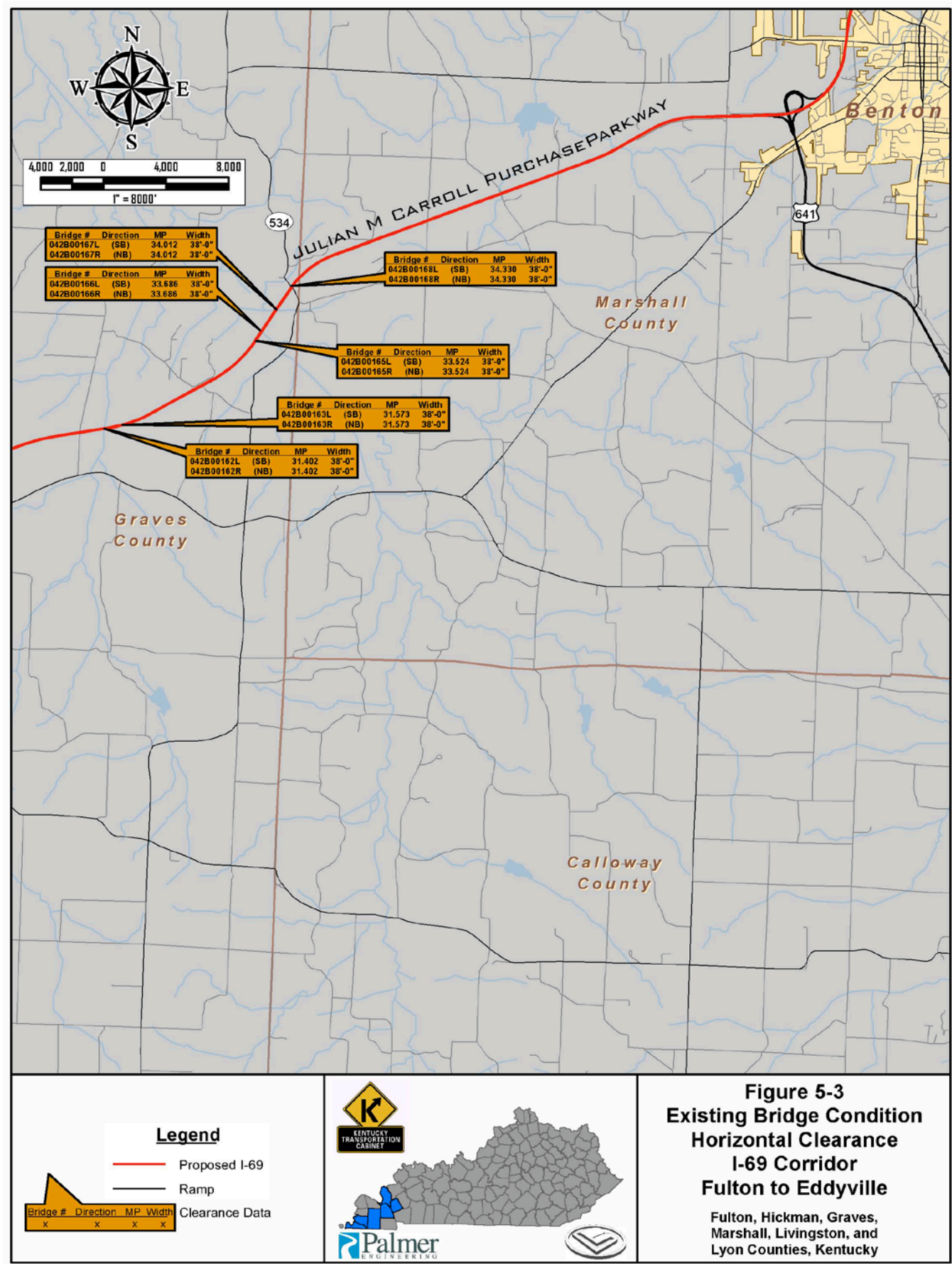
**Table 5- 2 Summary of Substandard Lateral Clearances**



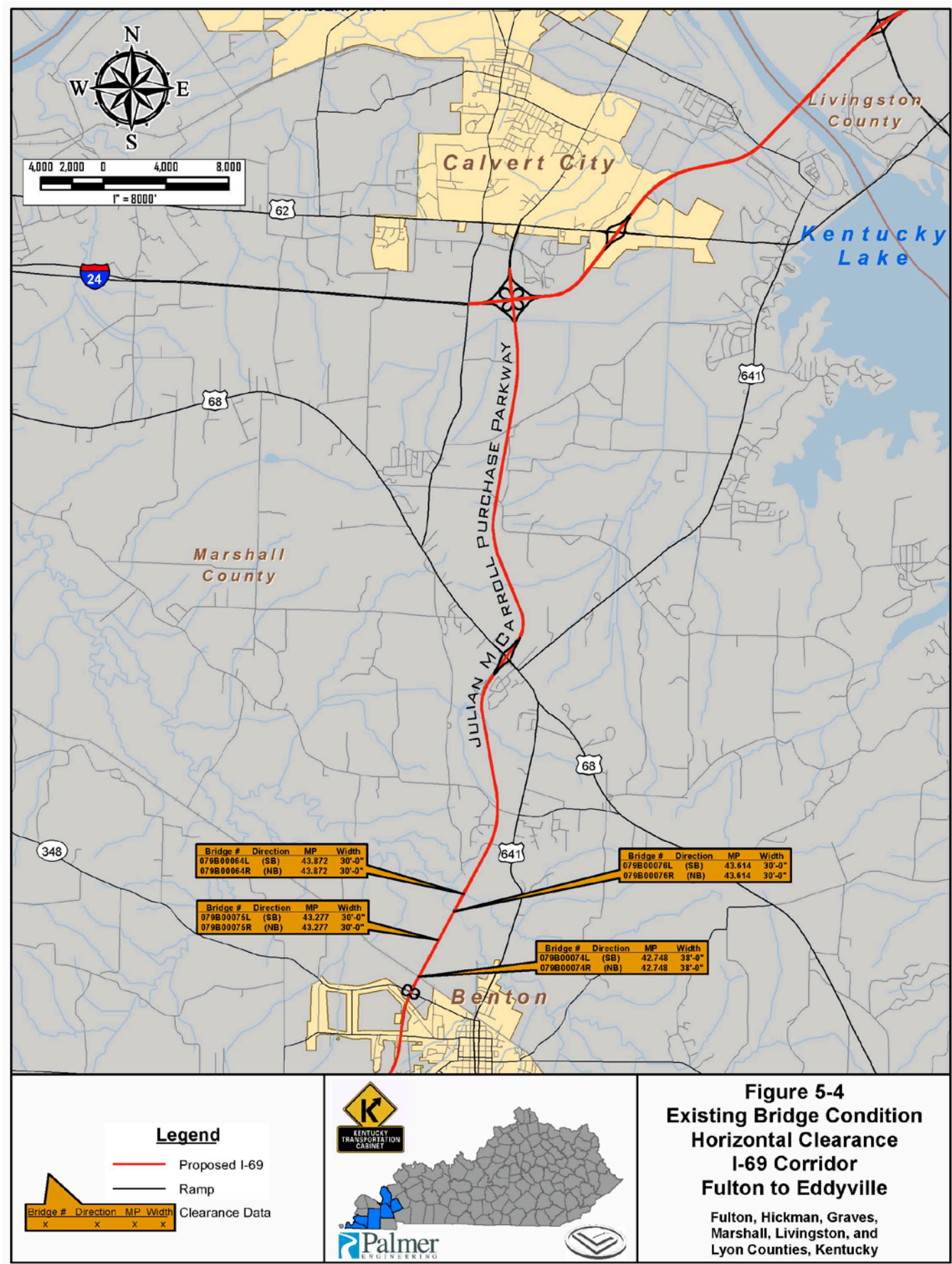




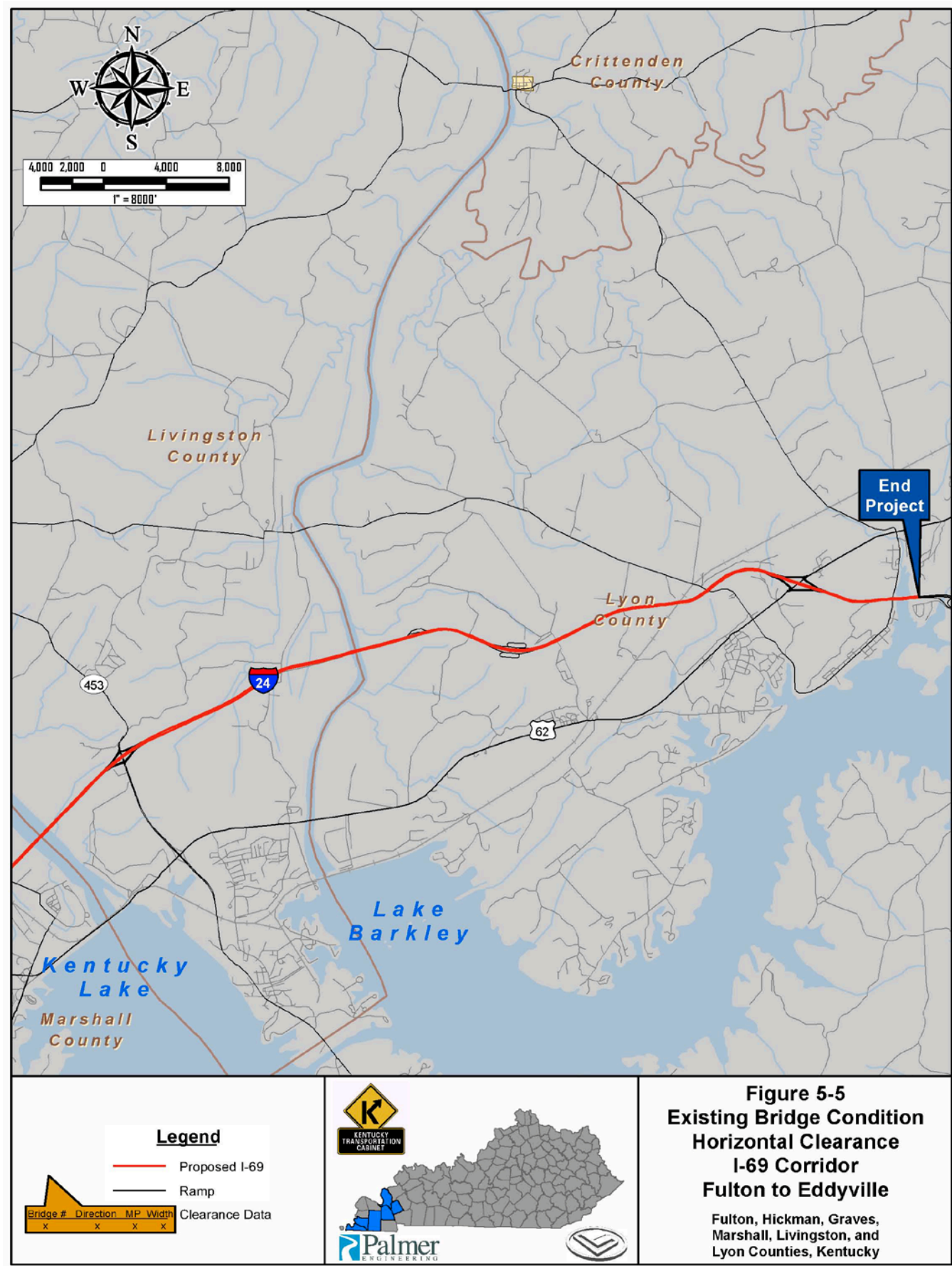












## B. Vertical Clearance of Overpasses and Sign Trusses

The vertical clearance of an overpass bridge is defined as the minimum height between the pavement and the bottom of the overpass structure and should be at least 16 feet across the entire width of the roadway, including the auxiliary lanes and the width of paved shoulder. The vertical clearance for a sign truss that crosses over the highway is minimum 17 feet for the entire width of the roadway.

The vertical clearance for the overpass bridges on the Purchase Parkway and I-24 were measured in the field to obtain the most accurate results for this study. The vertical clearance of sign trusses that cross over the Purchase Parkway were measured in the field as well. The clearance values depicted in **Table 5-3** are the minimum clearance measured by location on the roadway. Also noted are bridges that are less than 16.5 feet. The vertical clearance of these bridges will need to be monitored closely with future pavement rehabilitation.

As shown in the table, the Purchase Parkway has 4 bridges that have clearances less than 16 feet, all located in Graves County. The lowest clearances are 15.12 feet (southbound) and 15.30 feet (northbound) at the KY 80 interchange bridges. The other two bridges that do not meet minimum clearance are the KY 58 and Tater Road overpass bridges. The vertical bridge clearance information is provided in **Figure 5-6** through **Figure 5-10**.

## C. Crash Worthy Pier Protection

There are currently earthen mound bridge pier protections that do not meet current standards. These protections are located at the following overpass bridge locations: MP 1.424 (US 51), MP 10.186 (KY 1763), MP 11.428 (Grissom Road), MP 12.607 (KY 944), MP 15.302 (Tater Road), MP 16.526 (KY 58), MP 17.334 (KY 1748), and MP 20.229 (Cardinal Road).

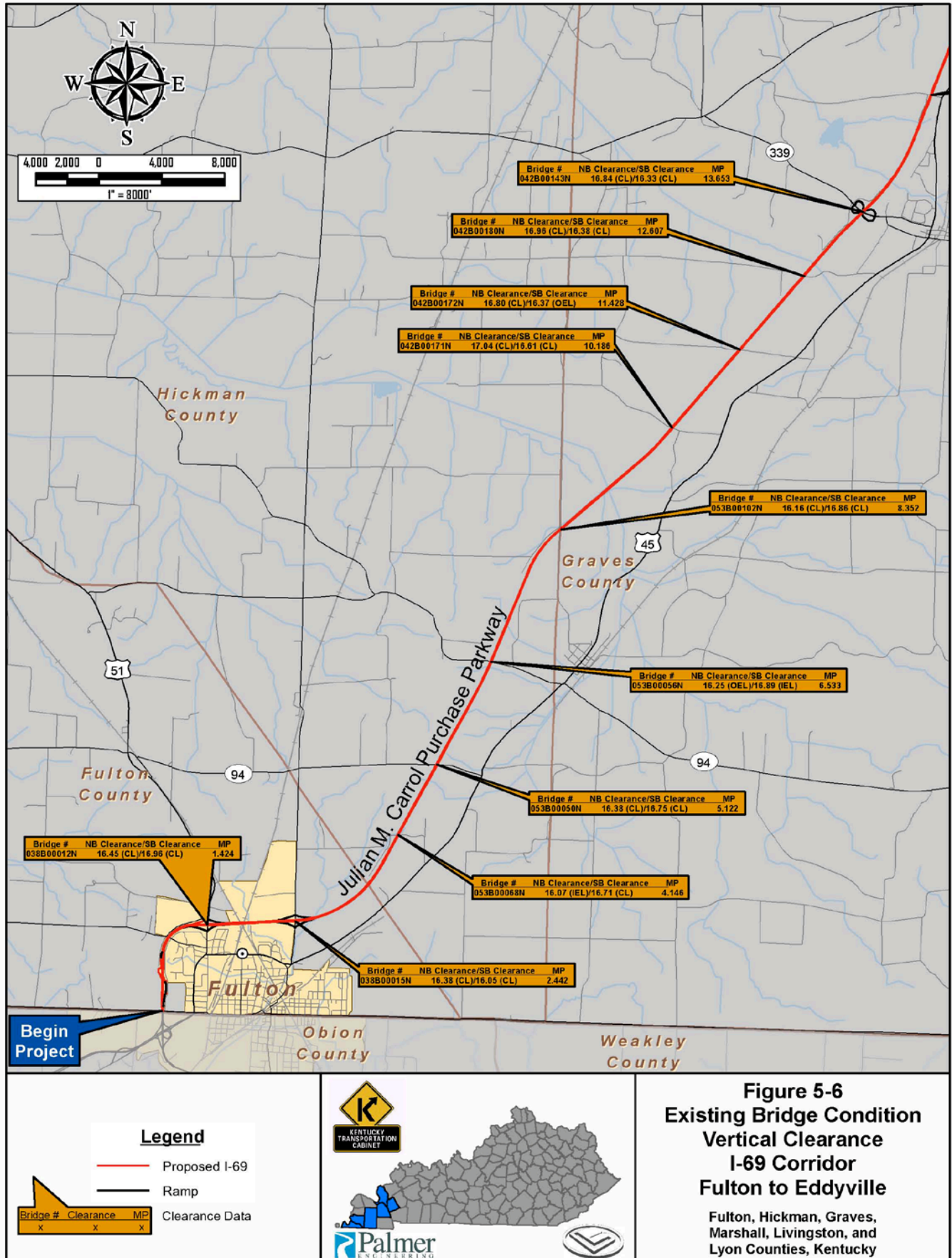


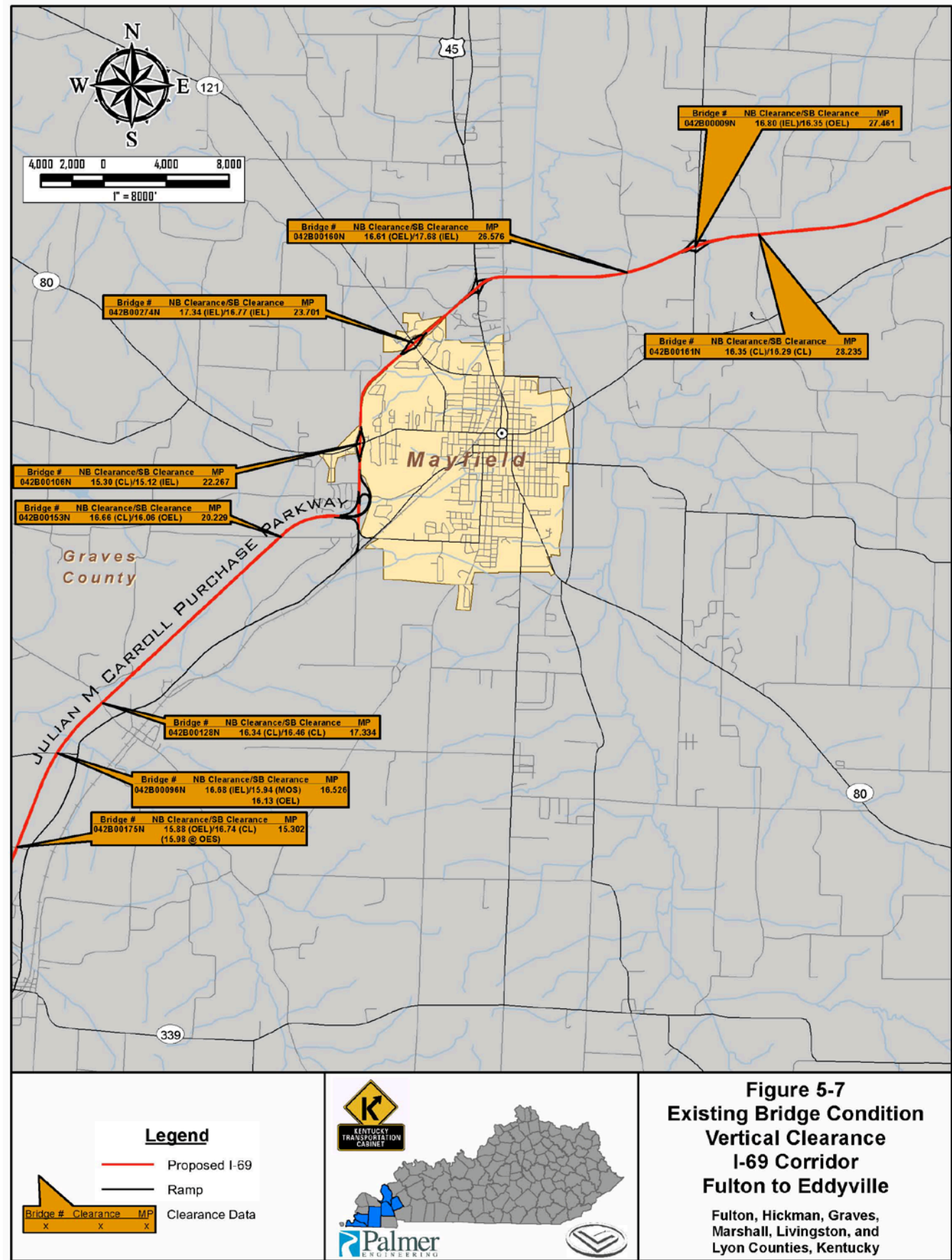
Eight overpass bridges have crash pier protection that does not meet current standard

MP	COUNTY	BRIDGE NO.	FEATURES INTERSECTED	MINIMUM VERTICAL CLEARANCE (ft)	
				NB	SB
PURCHASE PARKWAY					
1.424	Fulton	B00012	US 51	16.45 (CL)	16.96 (CL)
2.442	Fulton	B00015	KY 307 (Fulgham Rd)	16.38 (CL)	16.05 (CL)
4.146	Hickman	B00068	KY 2569 (Holland Rd)	16.07 (IEL)	16.71 (CL)
5.122	Hickman	B00050	KY 94	16.38 (CL)	16.75 (CL)
6.533	Hickman	B00056	KY 1529	16.25 (OEL)	16.89 (IEL)
8.352	Hickman	B00102	KY 1283	16.16 (CL)	16.86 (CL)
10.186	Graves	B00171	KY 1763	17.04 (CL)	16.61 (CL)
11.428	Graves	B00172	Grissom Rd	16.80 (CL)	16.37 (OEL)
12.607	Graves	B00180	KY 944	16.96 (CL)	16.38 (CL)
13.653	Graves	B00143	KY 339/Relocated KY 58	16.84 (CL)	16.33 (CL)
15.302	Graves	B00175	Tater Rd	15.88 (OEL) 15.98 (OES)	16.74 (CL)
16.526	Graves	B00096	KY 58	16.68 (IEL)	15.94 (MOS) 16.13 (OEL)
17.334	Graves	B00128	KY 1748	16.34 (CL)	16.46 (CL)
20.229	Graves	B00153	Cardinal Rd (Pryorsburg-Macedonia Rd)	16.66 (CL)	16.06 (OEL)
22.267	Graves	B00106	KY 80 (Fancy Farm Rd)	15.30 (CL)	15.12 (IEL)
23.701	Graves	B00274	KY 121	17.34 (IEL)	16.77 (IEL)
26.576	Graves	B00160	Hopewell Rd	16.61 (OEL)	17.68 (IEL)
27.461	Graves	B00009	KY 131	16.80 (IEL)	16.35 (OEL)
28.235	Graves	B00161	Twin Hill Rd (Spence Chapel Rd)	16.35 (CL)	16.29 (CL)
31.129	Graves	B00028	KY 301	16.22 (CL)	16.53 (CL)
32.734	Graves	B00164	Panther Creek (School) Rd	16.24 (CL)	16.38 (CL)
36.197	Marshall	B00068	KY 2603 / Vanzora Church Rd (Hale Springs Rd)	16.26 (CL)	16.54 (CL)
37.868	Marshall	B00071	Bondurant Ln / KY 2604 (Marvin Jones Rd)	16.33 (CL)	16.40 (CL)
40.054	Marshall	B00073	Jackson School Rd / KY 2606 (KY 299)	16.77 (CL)	16.42 (CL)
40.809	Marshall	B00126L	US 641 SB / Benton Bypass	16.98 (OEL)	17.45 (IEL)
40.809	Marshall	B00144R	US 641 NB / Benton Bypass	16.45 (OEL)	17.05 (IEL)
42.017	Marshall	B00103	KY 408 / Oak Level Rd	16.89 (CL)	16.20 (CL)
42.555	Marshall	B00102	KY 348 / Symsonia Rd	16.88 (CL)	16.43 (CL)
45.024	Marshall	B00012	KY 795 / Scale Rd (Scale-Briensburg Rd)	16.38 (OEL)	16.88 (IEL)
46.942	Marshall	B00001R	US 68 EB	16.29 (CL)	16.07 (CL)
46.942	Marshall	B00001L	US 68 WB	16.84 (CL)	16.61 (CL)
48.979	Marshall	B00050	Palma Rd (Palma-Birmingham Rd Relocation)	16.14 (OEL)	16.58 (CL)
49.84	Marshall	B00066	KY 2595 / Lakeview Church Rd	16.67 (CL)	16.32 (CL)
51.398 / 24.941	Marshall	B00114R	I-24 EB	18.26 (IEL)	17.25 (CL)
51.398 / 24.941	Marshall	B00114L	I-24 WB over Pkwy	17.27 (CL)	16.27 (CL)
MP	COUNTY	BRIDGE NO.	FEATURES INTERSECTED	MINIMUM VERTICAL CLEARANCE (ft)	
				EB	WB
I-24					
30.696	Livingston	B00064	KY 453	19.48 (OES)	16.51 (OEL)
35.293	Lyon	B00032	KY 6008 (Hopewell Church Rd)	16.27 (OEL)	17.46 (OEL)
36.413	Lyon	B00033	KY 810 (Martins Chapel Rd)	16.46 (CL)	16.00 (CL)
37.305	Lyon	B00034	KY 6010 (Poplar Creek Rd)	16.30 (OES)	16.59 (OES)
40.744	Lyon	B00038	KY 295	16.66 (CL)	16.24 (CL)
Bridge with Vertical Clearance less than the ASSHTO recommended minimum of 16 feet					
Bridge with Vertical Clearance less than 16.5 feet					
IEL- Inside Edge of Lane; CL-Center Line; OEL-Outside Edge of Lane; OES-Outside Edge of Shoulder; MOS-Middle of Outside Shoulder					

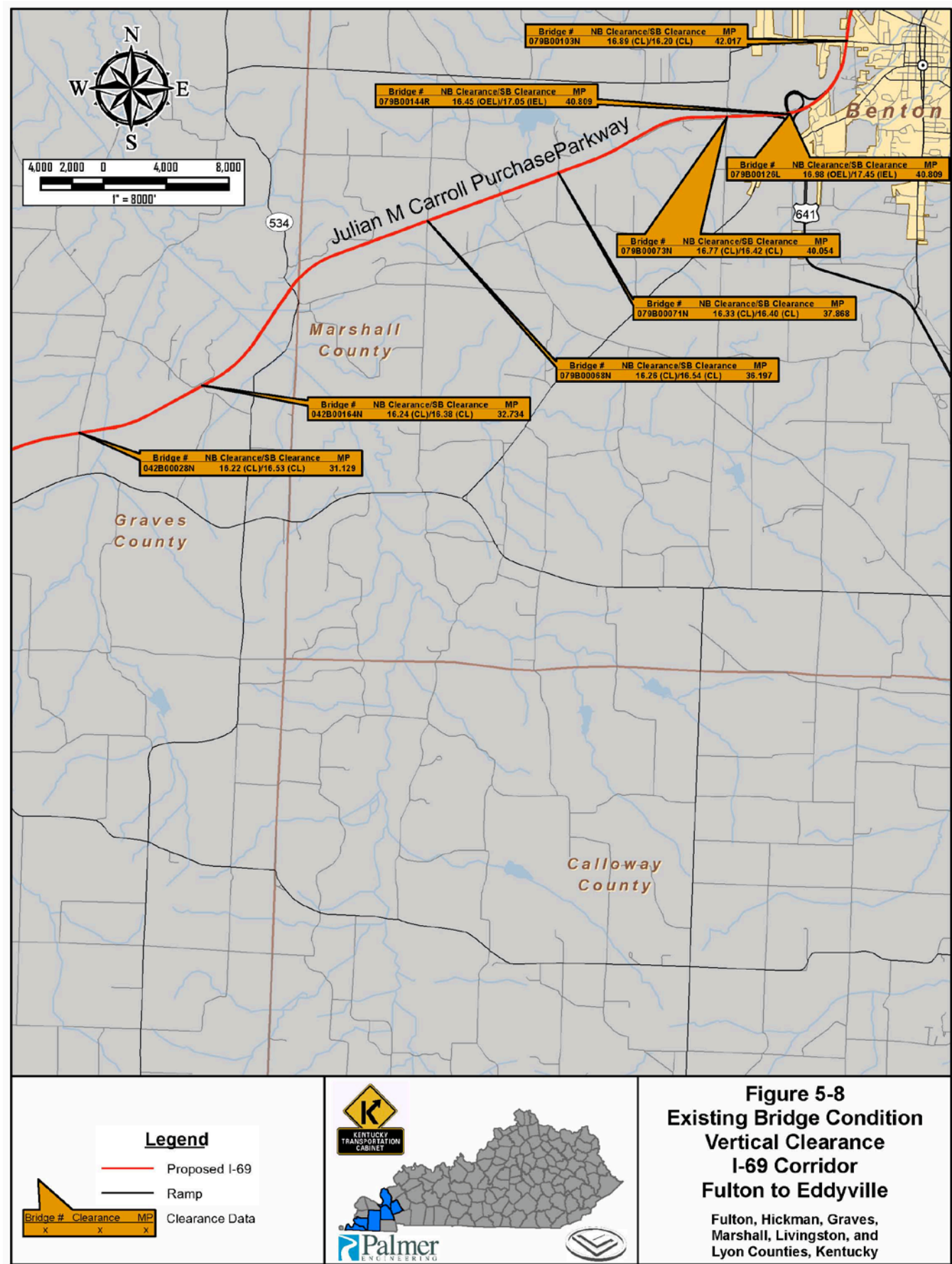
Table 5- 3 Summary of Substandard Vertical Clearances



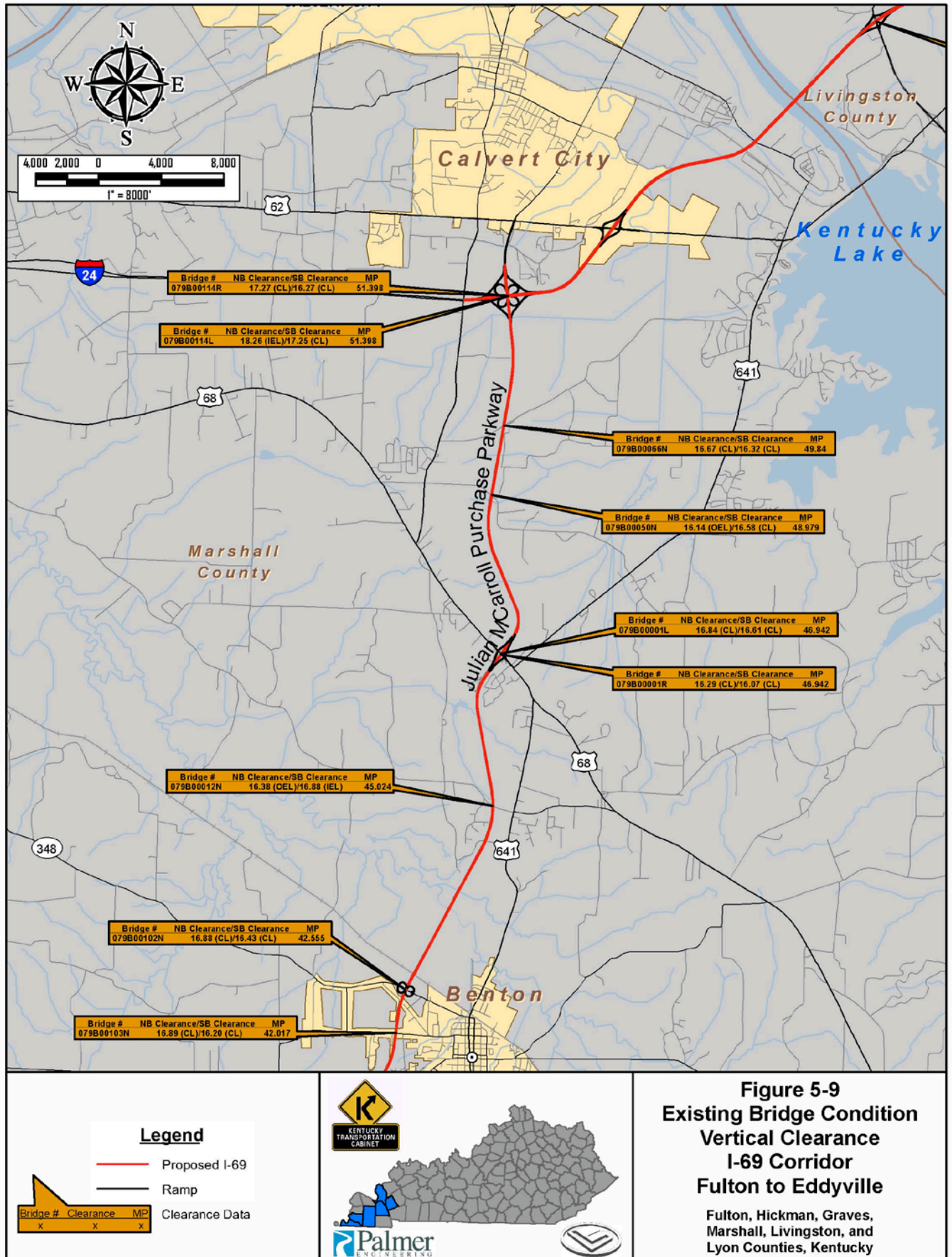


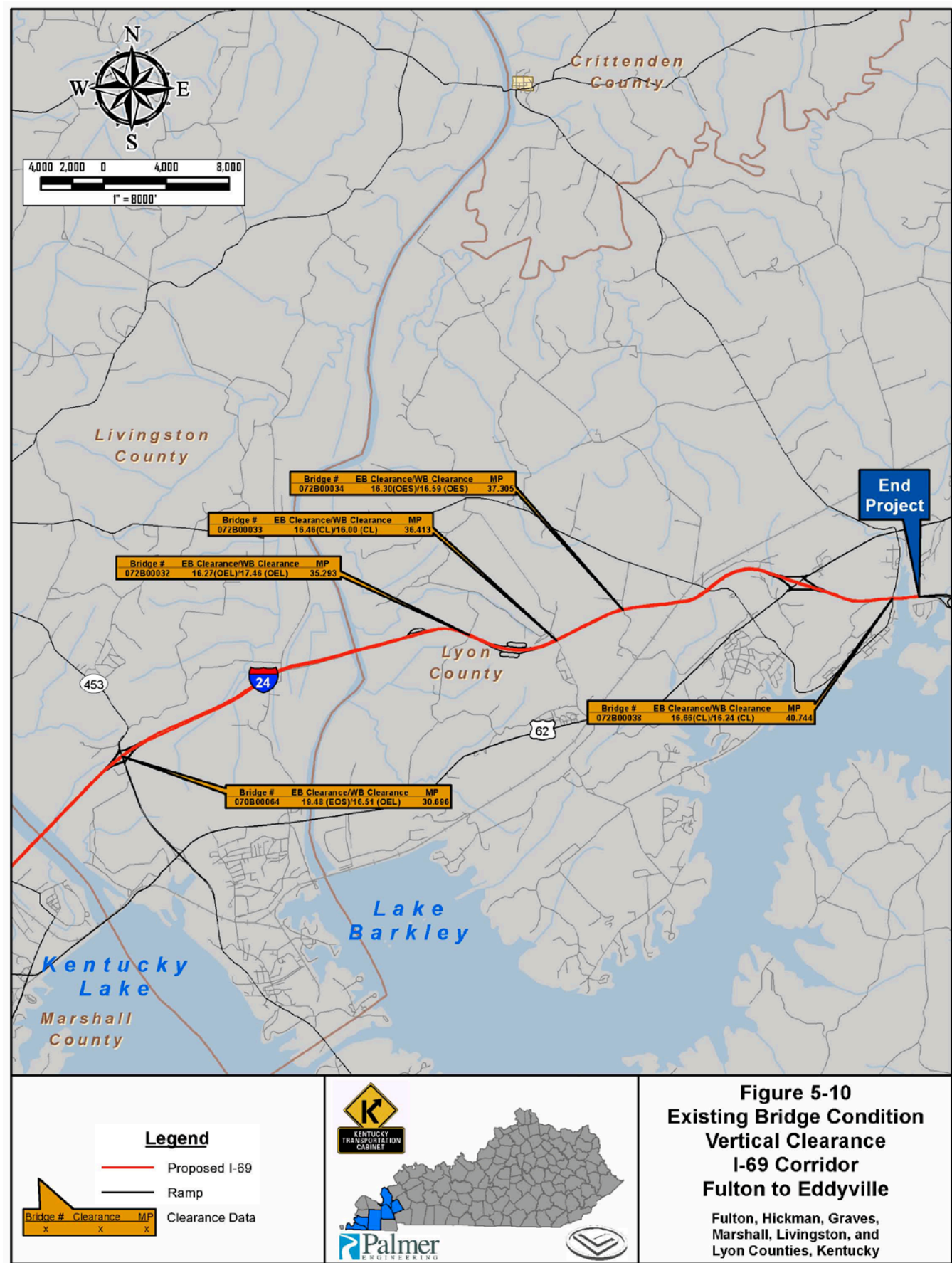












## D. Bridge Conditions

For this study the structural and functional capacity of each bridge was evaluated. The structural capacity of a bridge is determined by its sufficiency rating. A bridge that can no longer carry the vehicle weight it was originally designed to carry is classified as structurally deficient. A bridge that does not meet current geometric design guidelines, such as lane width, approach alignment, overhead clearance, etc is defined as functionally obsolete. Sufficiency and inventory ratings for bridges on the Purchase Parkway are provided in **Appendix F**. The following is a summary of the bridge sufficiency ratings on the Purchase Parkway.

- Currently, all Purchase Parkway mainline and overpass bridges have a sufficiency rating greater than 60.0.
- There are two overpass bridges at MP 46.942 in Marshall County that have a sufficiency rating of 66.2.
- The culvert at MP 38.687 in Marshall County has a sufficiency rating of 49.3, an inventory rating of HS 11.1 and an operating rating of HS 33.3
- The culverts at MP 37.135 and MP 44.587 in Marshall County have sufficiency ratings of 68.9 and 66.9, respectfully.

According to the KYTC Bridge Division, there is one bridge identified as functionally obsolete in the study area. It is a mainline bridge located in Graves County at MP 21.285. This bridge is part of the Exit 21 interchange on the Mayfield Bypass section of the Purchase Parkway. This identification is not in comparison to Interstate standards. Additional bridges can be expected to be identified as functionally obsolete when compared to interstate standards.

## E. Overhead Signs

The minimum vertical clearance for an overhead sign truss is 17 feet according to current guidelines. The vertical clearances of the overhead sign trusses on the Purchase Parkway were measured in the field and none were found to be less than 17 feet. The overhead sign attached to the overpass bridge at MP 22.2 in the southbound direction is less than the 17 foot minimum. For this study, the overhead sign truss, cantilever sign trusses, and signs connected to overpass bridges were measured. The following table shows the locations and vertical clearance of overhead signs on the Purchase Parkway.

COUNTY	DIRECTION	MP	TYPE	VERTICAL CLEARANCE (ft)
Graves	NB	13.6	Bridge	18.1
Graves	NB	20	Overhead Truss	18.2
Graves	NB	20.9	Overhead Truss	18.1
Graves	NB	22	Overhead Truss	17.7
Marshall	NB	40.8	Bridge	17
Marshall	NB	42.5	Bridge	> Bottom of Bridge
Marshall	NB	51.1	Overhead Truss	18.5
Marshall	NB	51.4	Bridge	> Bottom of Bridge
Marshall	SB	51.5	Bridge	> Bottom of Bridge
Marshall	SB	42.6	Bridge	> Bottom of Bridge
Graves	SB	22.2	Bridge	15.93
Graves	SB	21.9	Overhead Truss	17.6
Graves	SB	21.6	Overhead Truss	17.9
Graves	SB	13.7	Bridge	> Bottom of Bridge
Fulton	SB	0.2	Cantilever	> 20

**Table 5- 4 Overhead Sign Vertical Clearance**