

Trends & Tools in Constructability Review



Partnering Conference
September 11, 2012



Presentation Points

Constructability review program overview

What are we supposed to do?

What do we try to do?

What have we done?

Where can we improve?

Constructability review database

What can it do?

What trends exist?

Where do we go from here?

What to expect?



Constructability Review Program Overview

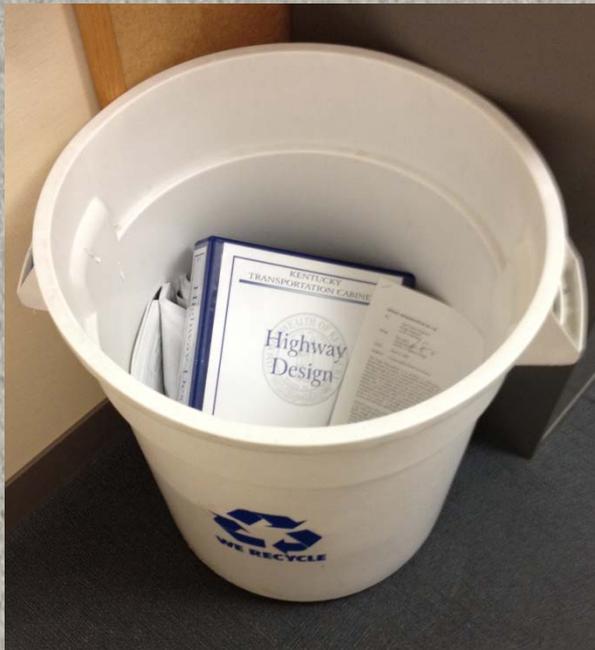
What are we supposed to do?



Constructability Review Program Overview

What do we try to do?

Step 1:



Step 2:

- Rely on project managers to keep us in the loop
- Monitor the pipeline
- Check what we can
- Follow up to gauge what we have done



Constructability Review Program Overview

Item Number	CR Review Status	Comments	Letting Date	PLG	Jl	County	Est. Cost	Work Type	Remarks	CID
500393.04	Not Reviewed	Late add; LPA parks project; no plans in PW	5/11/2012	7/1/2009	7/1/2009	JEFFERSON	\$ 11,910,800.00	TRANSP ENHANCEMENT(P)	21ST CENTURY PARKS PROJECT IN LOUISVILLE, KY. CONSTRUCTION OF PROJECT 3A-BECKLEY CREEK PARK. SOUTH	121315
501054.00	Reviewed By GMR		5/18/2012	1/20/2012	1/20/2012	HENRY	\$ 468,000.00	BRIDGE REPLACEMENT(P)	REPLACE BRIDGE ON KY-193 (MP 2.458) OVER EMILY RUN CREEK; 2.5 MI N. OF JCT US 421; (STRUCTURALLY DEFICIENT,	121316
500048.20	Reviewed By GMR	Now 5.6 mill	5/18/2012	#N/A	4/13/2011	JEFFERSON	\$ 13,000,000.00	RECONSTRUCTION(O)	INTERIM IMPROVEMENTS ON I-71 INCLUDING ADDITION OF NB AND SB	121318
808632.00	Reviewed By BLJ	Proposal only	5/18/2012	#N/A	2/8/2012	ROCKCASTLE	\$ 1,975,000.00	SAFETY-HAZARD ELIM(P)	MAKE SPOT IMPROVEMENTS AND ERECT GUARDRAIL ON KY-1249 FROM THE	121319
808632.00	Not Reviewed	Proposal only; Will be MAY	5/18/2012	#N/A	2/8/2012	ROCKCASTLE	\$ 1,975,000.00	SAFETY-HAZARD ELIM(P)	MAKE SPOT IMPROVEMENTS AND ERECT GUARDRAIL ON KY-1249 FROM THE	121319
700122.50	Reviewed By CRL		6/15/2012	11/1/2002	11/29/2007	FAYETTE	\$ 13,000,000.00	MAJOR WIDENING(O)	LEXINGTON-GEORGETOWN; RECONSTRUCT AND WIDEN US-25 FROM	121320
200138.10	Reviewed By GMR/BLJ		4/20/2012	#N/A	11/17/2005	MUHLENBERG	\$ 740,000.00	SPOT IMPROVEMENTS(O)	RECONSTRUCT THE US-62/KY-181 INTERSECTION BY ADDING TURN LANES	121321
200138.20	Reviewed By GMR/BLJ		4/20/2012	#N/A	11/17/2005	MUHLENBERG	\$ 1,160,000.00	SPOT IMPROVEMENTS(O)	RECONSTRUCT THE US-62/KY-171 INTERSECTION BY ADDING TURN LANES	121321
1201082.00	Reviewed by GMR		6/15/2012	#N/A	5/31/2011	KNOTT	\$ 756,000.00	BRIDGE REPLACEMENT(P)	REPLACE BRIDGE AND APPROACHES ON	121323
200125.00	Reviewed by BLJ(BLJ)		6/15/2012	#N/A	9/27/2011	HANCOCK	\$ 940,000.00	MAJOR WIDENING(O)	WIDEN US-60 TO 4 LANES NEAR	121325
402038.10	Missed Review	Late addition to June	6/15/2012	5/6/2011	5/6/2011	NELSON	\$ 6,600,000.00	PAVEMENT REHAB-PRK(P)	STRUCTURAL OVERLAY ON THE MARTHA LAYNE COLLINS BLUEGRASS PARKWAY EB	121327
407030.00	Missed Review	Letting date in system was July; let in June	7/13/2012	#N/A	1/22/2004	HARDIN	\$ 8,640,000.00	RECONSTRUCTION(O)	EXTEND MILES STREET FROM PEAR ORCHARD TO RING ROAD.	121328
500052.00	Reviewed by GMR	!!!!will slip	6/15/2012	#N/A	6/21/2011	JEFFERSON	\$ 30,000,000.00	I-CHANGE RECONST(O)	RECONSTRUCT I-64/HURSTBOURNE PARKWAY INTERCHANGE AND RAMP	121329
1201074.00	Reviewed By CRL/BLJ	Slipped to June	6/15/2012	#N/A	9/29/2008	FLOYD	\$ 410,000.00	BRIDGE REPLACEMENT(P)	REPLACE BRIDGE OVER RIGHT FORK BEAVER CREEK (C59) 300' WEST JCT. KY-7.	121330
700244.00	Last Chance Reviewed by RES	Cursory review. Good for letting. Sent comments to district.	6/15/2012	12/22/2005	12/22/2005	MONTGOMERY	\$ 2,311,500.00	MAJOR WIDENING(O)	WIDEN KY 11 FROM US 460 TO THE MOUNT STERLING BYPASS, MONTGOMERY COUNTY. (2005HPP-	121331



Constructability Review Program Overview

What have we done?

This
year...

Letting (# SYP Projects)	Not Reviewed	Reviewed	Missed
January (6)	2	2	2
February (8)	4	3	1
March (5)	2	3	0
April (12)	4	8	0
May (10)	4	5	1
June(19)	4	12	3
July(16)	9	5	2
August(23)	16	5	2



Constructability Review Program Goals

- Provide efficient constructability review to projects
- Provide construction expertise when district construction/maintenance forces may not have time



Are we doing any good?

Year	1000's Projects	Bid Amount	C. O. \$	# C. O.
2006	105	\$ 772,301,597.64	\$ 40,120,662.42	387
2007	133	\$ 1,057,042,627.77	\$ 24,992,191.13	560
2008	40	\$ 205,925,170.04	\$ 9,623,558.91	89
2009	104	\$ 565,678,464.67	\$ 37,672,387.12	349
2010	149	\$ 550,565,973.46	\$ 20,244,029.76	413
2011	93	\$ 751,772,984.47	\$ 14,526,686.85	240

- Overall Average: 3.8% Project Increase
3.27 Change Orders Per Project
- 2010-2011 Average: 2.7% Project Increase
2.70 Change Orders Per Project



Are we doing any good?

- The data for two reviewers we have had over the same time period shows...

Year	1000's Projects	Bid Amount	C. O. \$	# C. O.
2010	25	\$ 180,610,359.72	\$ 7,553,725.71	96
2011	52	\$ 441,784,390.26	\$ 4,886,370.42	125

- Average: 2.00% Project Increase
 2.87 Change Orders Per Project

Constructability Review Program Overview

- Where can we improve?



- Capture the knowledge from each review



- Make the knowledge available...analyze it, report it, learn from it...may be able to focus reviews in a time crunch and make them count



- Try to build consistency

- Continue to build the program and try to develop permanency



Presentation Points



Constructability review program overview
Where are we supposed to do?
What do we try to do?
What have we done?
Where can we improve?

Constructability review database

What can it do?
What trends exist?

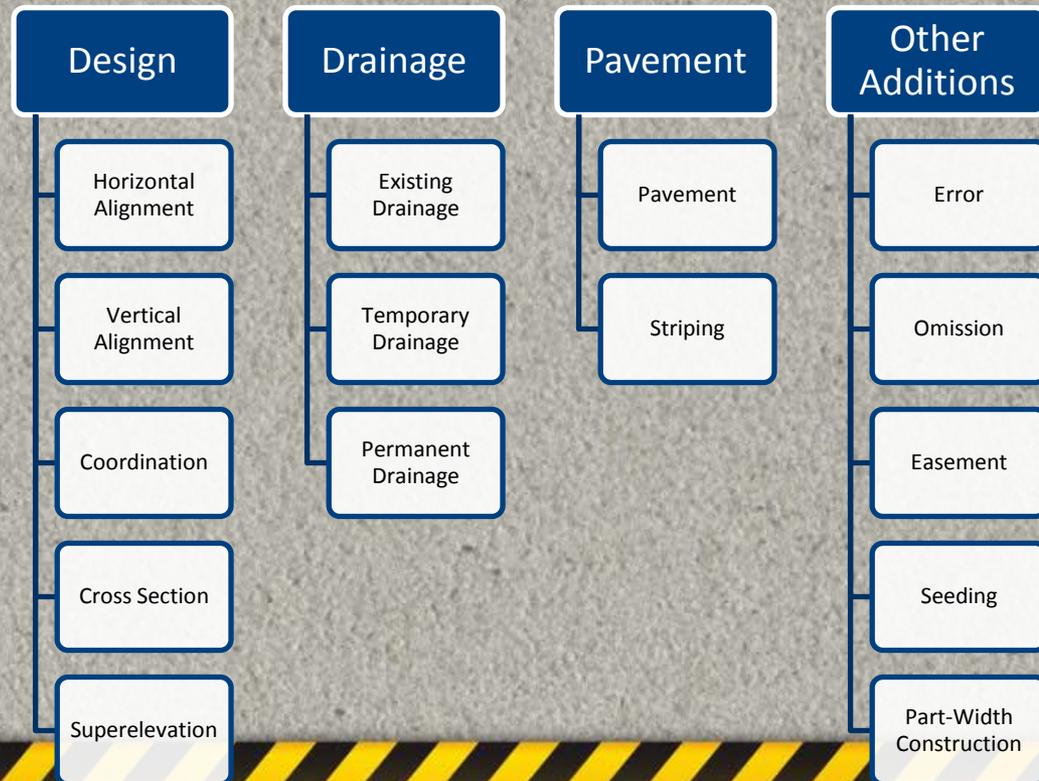
Where do we go from here?

What to expect?



Constructability Review Database

- Category Development
 - Organized over 1,000 Comments from previously conducted Constructability Reviews



Category Development

- Geotechnical
- Pavement
- Signalization
- Surveying
- Earthwork
- Environmental
- Maintenance of Traffic
- Phasing
- Design
- Right of Way
- Structures
- Utilities
- Plan Note Content
- Horizontal Alignment
- Vertical Alignment
- Coordination
- Cross-Section
- Superelevation
- Existing Drainage
- Proposed Drainage
- Temporary Drainage
- Easements
- Geotechnical
- Seeding
- Part-Width Construction
- Error
- Omission



Project Information

- Item Number
- Review Date
- Reviewer
- District
- County
- Review Type
- Design Phase
- Designer



Design Phase

- Preliminary Line and Grade
- Final Joint Inspection
- Check Prints
- Unknown
 - With the database live, “unknowns” will not be an issue



Comment Information

- Comment
- Category (ies)
- Severity



Severity

COST

- 1 – Less than 3.5%
- 2 – 3.5% to 10.5%
- 3 – Greater than 10.5%

SCHEDULE - binary factor.

- 0 – NO DELAY
- 1 – DELAY

- Add score together to determine Severity Level

- LOW 1
- MEDIUM 2
- HIGH 3

*Average cost of a change order is 3.5% of Original Budget

*Standard Deviation is 7%



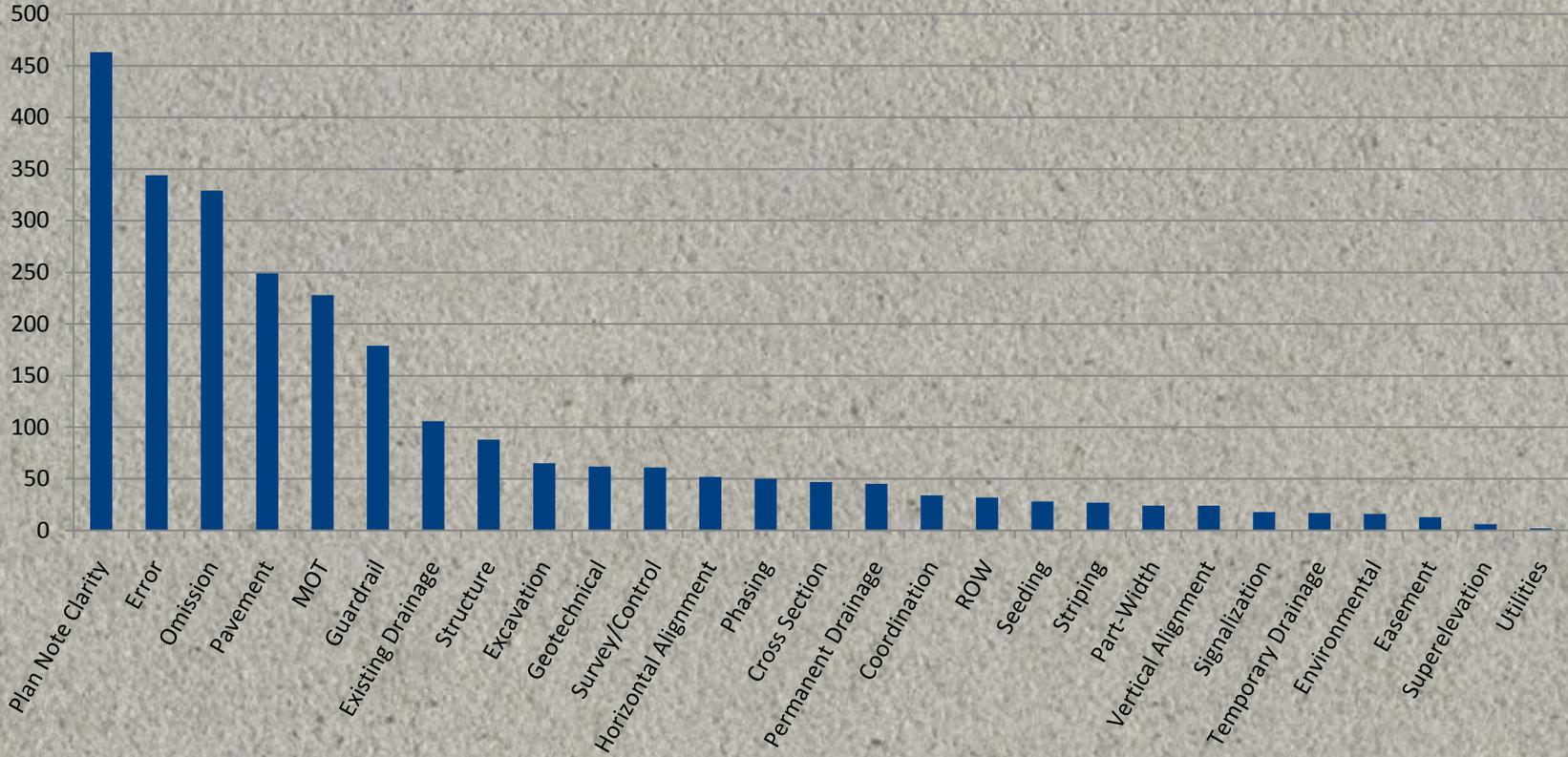
Database Analysis

- Sample Size:
 - 112 Reviews
 - 1053 Comments

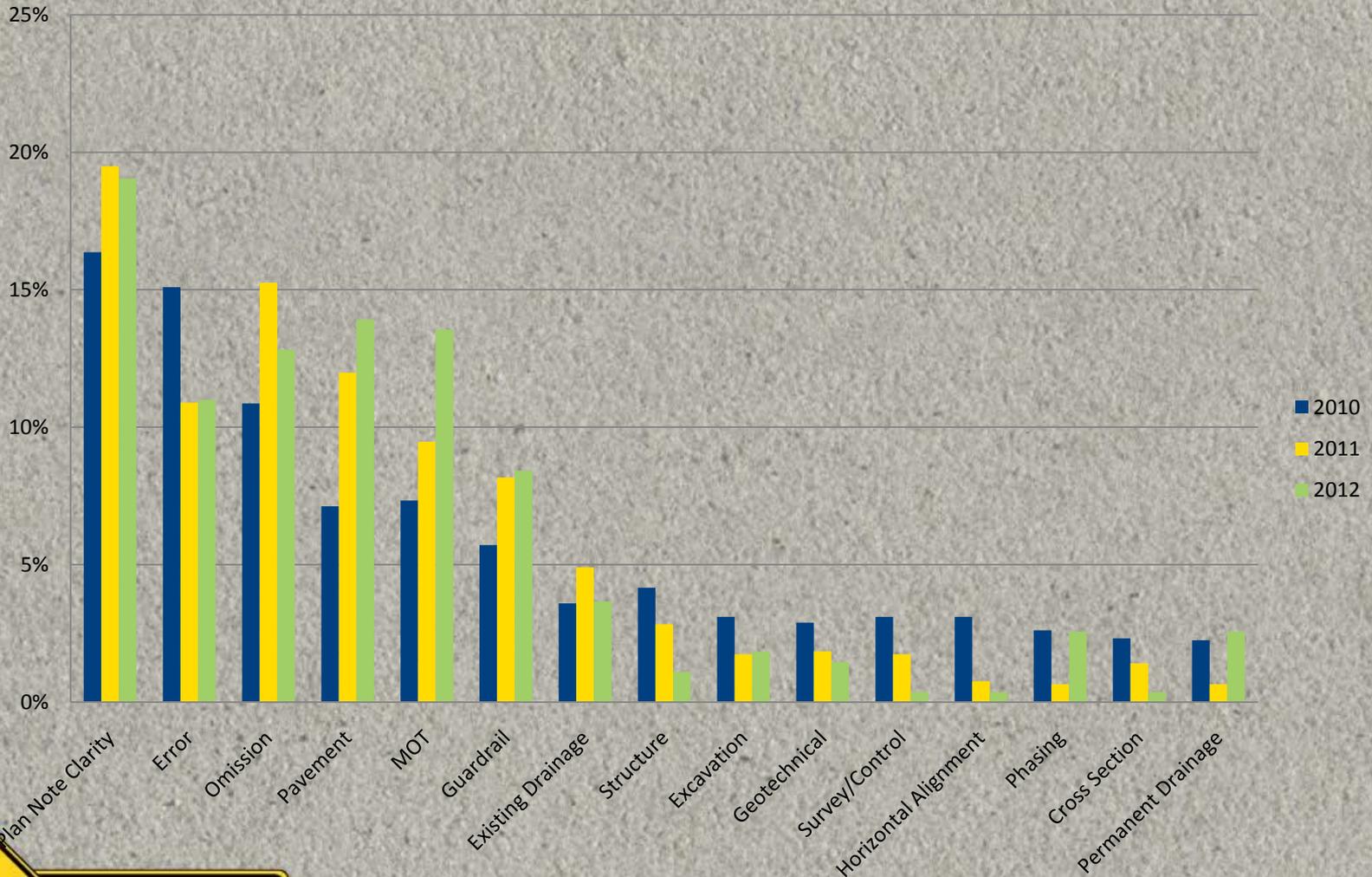


Overview

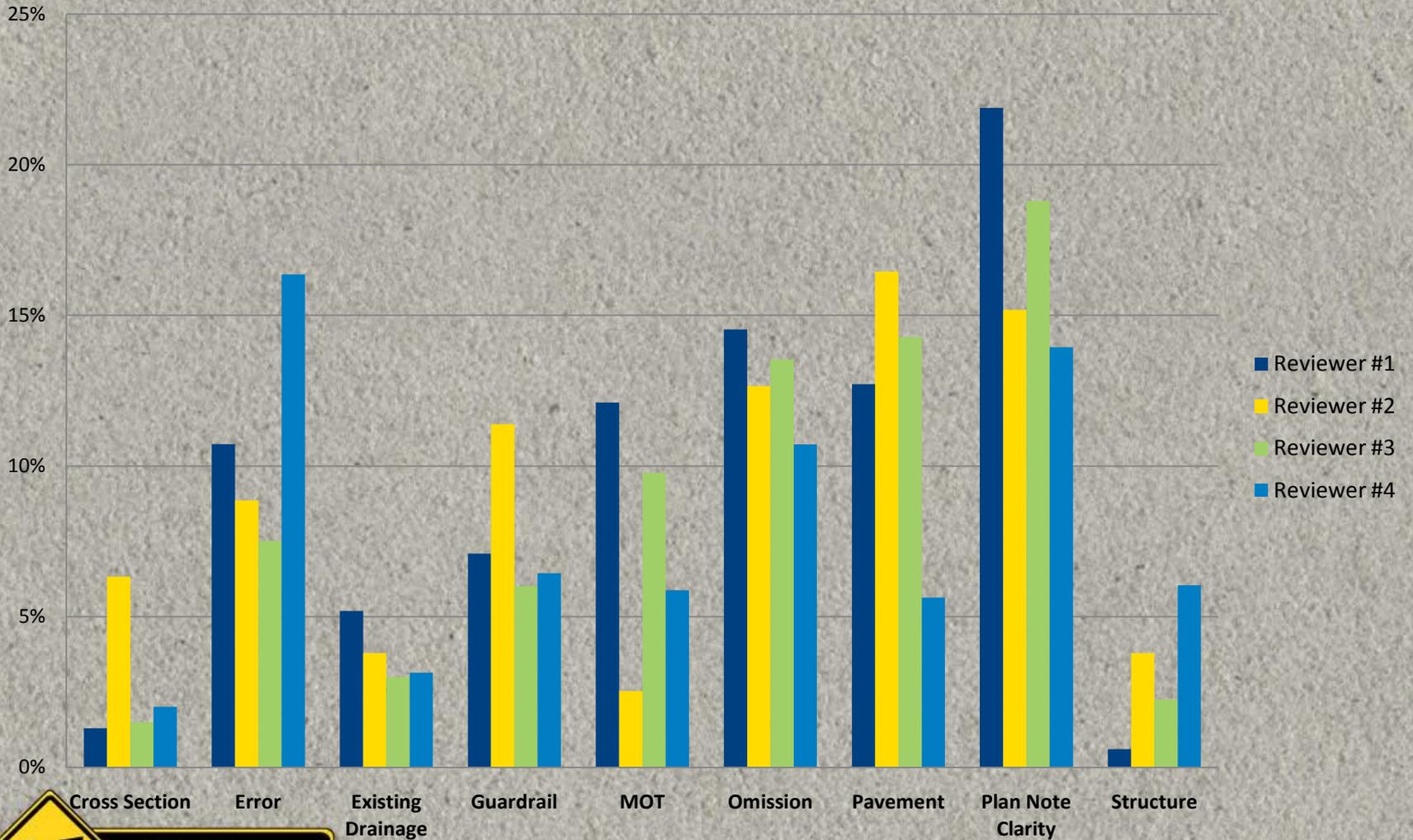
Comment Count



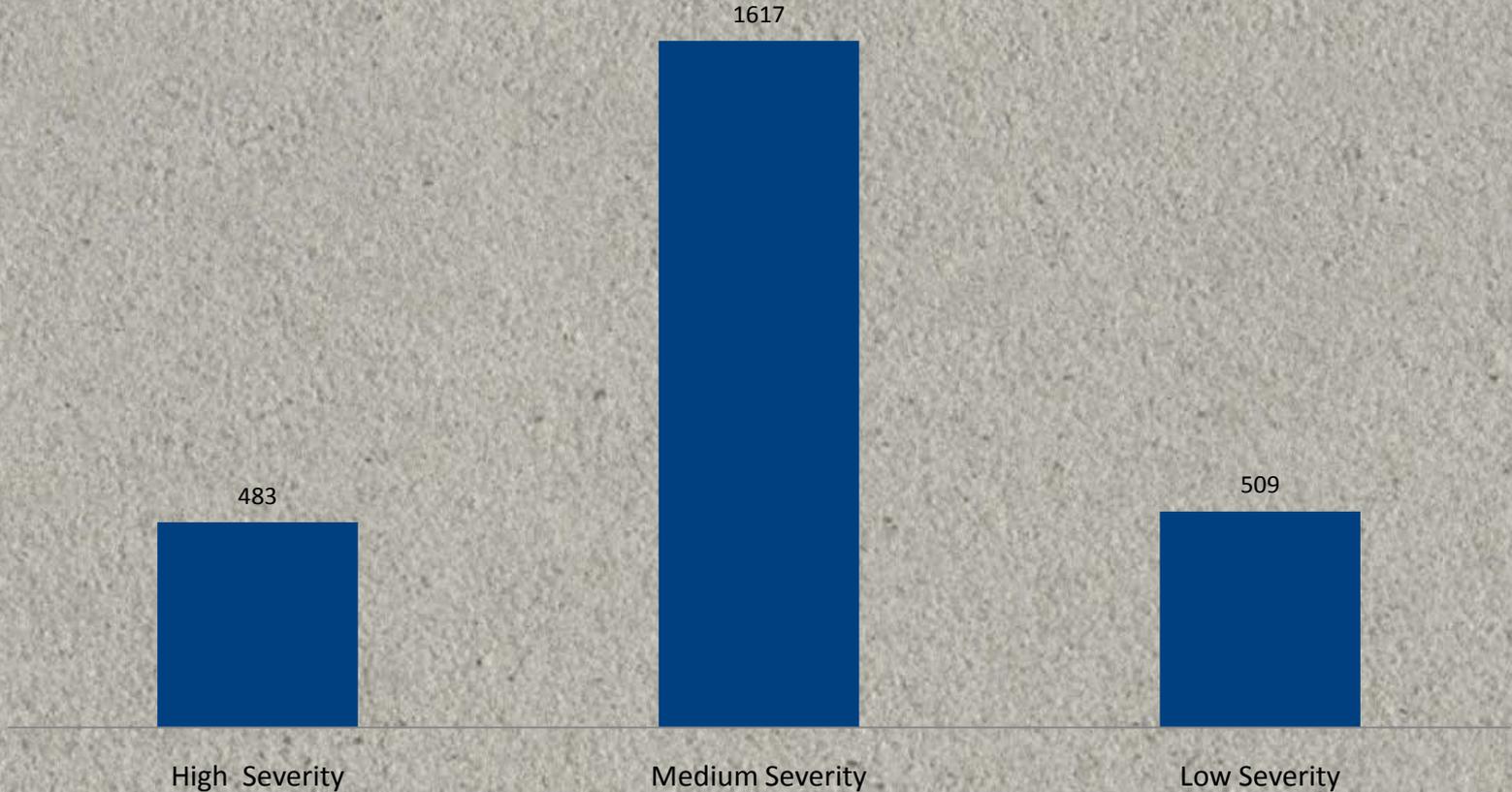
Category Frequency by Year



Categories by Reviewer



Severity by Count

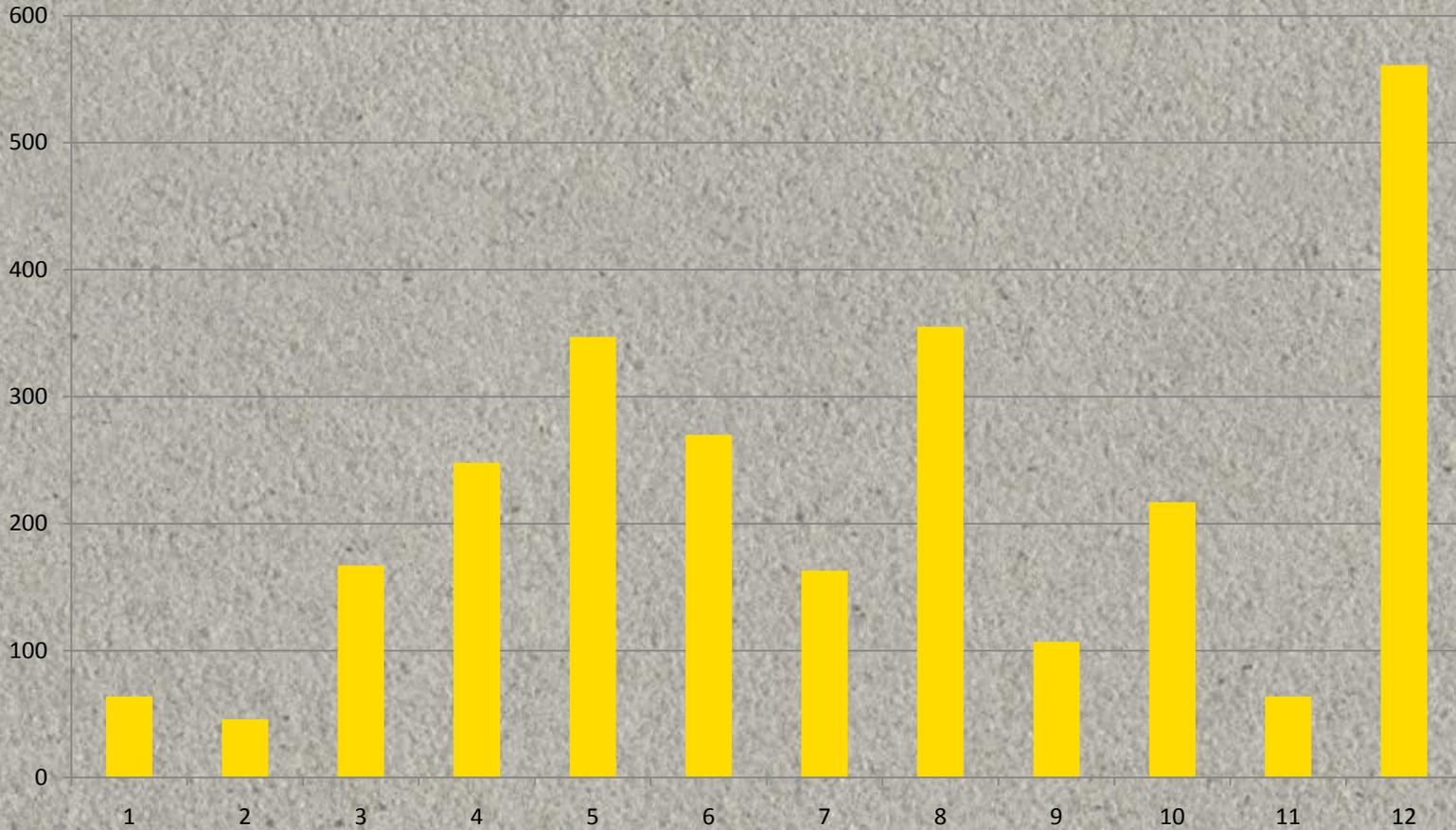


Severity - Summary

	High		Medium		Low	
1	Omission	23%	Plan Note Clarity	19%	Plan Note Clarity	21%
2	Plan Note Clarity	11%	Error	14%	Error	12%
3	Error	10%	Omission	10%	Omission	11%
4	Guardrail	10%	Pavement	10%	MOT	9%
5	Pavement	9%	MOT	9%	Pavement	9%
6	MOT	7%	Guardrail	5%	Guardrail	8%
7	Existing Drainage	4%	Existing Drainage	4%	Survey	4%
8	Structure	4%	Structure	4%	Existing Drainage	3%



Districts



**KENTUCKY
TRANSPORTATION
CABINET**

Category	1	2	3	4	5	6	7	8	9	10	11	12
Coordination	4.7%	10.9%	1.2%	0.8%	0.3%	0.4%	0.6%	3.1%	0.9%	1.8%	0.0%	0.5%
Cross Section	0.0%	0.0%	4.2%	1.2%	1.7%	1.1%	0.0%	2.8%	4.7%	1.8%	0.0%	1.6%
Easement	1.6%	0.0%	0.6%	0.4%	0.0%	0.4%	0.0%	1.4%	0.0%	0.5%	1.6%	0.4%
Environmental	1.6%	0.0%	0.0%	0.0%	1.7%	1.5%	0.6%	0.0%	0.0%	0.0%	0.0%	0.7%
Error	3.1%	10.9%	8.4%	11.7%	10.4%	10.0%	10.4%	17.2%	13.1%	16.6%	10.9%	17.1%
Excavation	1.6%	2.2%	0.0%	2.4%	0.6%	1.5%	3.7%	3.7%	6.5%	4.6%	4.7%	2.1%
Existing Drainage	4.7%	6.5%	4.2%	6.0%	4.0%	4.4%	8.0%	1.1%	0.9%	0.0%	7.8%	5.2%
Geotechnical	3.1%	0.0%	1.8%	0.8%	0.6%	1.9%	3.1%	4.2%	0.9%	3.7%	6.3%	2.7%
Guardrail	3.1%	6.5%	7.8%	4.8%	5.5%	9.3%	8.6%	7.3%	5.6%	6.9%	4.7%	7.3%
Horizontal Alignment	0.0%	0.0%	1.2%	0.8%	0.0%	1.1%	1.8%	2.5%	4.7%	4.6%	3.1%	2.9%
MOT	9.4%	8.7%	8.4%	6.9%	16.7%	12.2%	9.8%	6.5%	8.4%	5.5%	7.8%	5.5%
Omission	20.3%	13.0%	16.2%	9.3%	13.0%	20.4%	9.8%	10.1%	13.1%	11.1%	15.6%	10.7%
Part-Width	0.0%	0.0%	1.8%	0.0%	3.7%	0.4%	0.6%	0.3%	1.9%	0.9%	0.0%	0.2%
Pavement	9.4%	17.4%	17.4%	14.1%	12.4%	11.9%	9.8%	6.2%	5.6%	5.5%	4.7%	6.6%
Permanent Drainage	3.1%	0.0%	0.6%	2.4%	0.6%	1.5%	0.6%	3.4%	1.9%	5.1%	0.0%	0.7%
Phasing	0.0%	0.0%	1.2%	2.4%	0.9%	0.4%	3.1%	3.9%	6.5%	4.6%	0.0%	0.4%
Plan Note Clarity	20.3%	21.7%	20.4%	27.8%	23.6%	15.9%	19.6%	8.7%	9.3%	11.5%	14.1%	18.7%
ROW	3.1%	0.0%	0.6%	0.0%	0.0%	0.0%	0.6%	2.3%	1.9%	1.8%	0.0%	2.5%
Seeding	0.0%	0.0%	0.0%	0.0%	1.7%	2.6%	2.5%	1.4%	0.0%	0.5%	1.6%	0.7%
Signalization	3.1%	0.0%	0.6%	1.2%	1.2%	1.1%	0.6%	1.1%	0.0%	0.0%	0.0%	0.0%
Striping	1.6%	0.0%	2.4%	2.0%	0.0%	0.0%	1.2%	1.7%	0.9%	0.9%	6.3%	0.4%
Structure	3.1%	2.2%	0.6%	0.4%	0.6%	0.7%	0.0%	6.2%	3.7%	6.9%	4.7%	6.2%
Superelevation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.7%
Survey/Control	1.6%	0.0%	0.6%	0.8%	0.0%	0.0%	4.3%	3.4%	6.5%	2.8%	3.1%	4.1%
Temporary Drainage	1.6%	0.0%	0.0%	2.0%	0.6%	0.0%	0.6%	0.3%	0.9%	0.9%	0.0%	0.7%
Utilities	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Vertical Alignment	0.0%	0.0%	0.0%	1.2%	0.3%	1.1%	0.0%	0.6%	1.9%	1.4%	3.1%	1.4%

Note: Averages higher than one Standard Deviation above State Average



KENTUCKY
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Presentation Points



Stability review program overview
Where are we supposed to do?
What do we try to do?
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Stability review database
What can it do?
What trends exist?

Where do we go from here?
What to expect?



What We Have

Item Number	ReviewDate	Reviewer	District	County	ReviewType	DesignPhase	Rot	Rout	Designer	Work Type
1201076.00	5/7/2012	Raymer	12	Pike	Roadway	Check Prints	KY 40	0		RELOCATION(C
0600344.50	10/6/2010	Raymer	6	Kenton	Roadway	Check Prints	KY 22		HAWORTH, MEYER & BOLEYN, INC.	RECONSTRUCT
0600363.00	3/28/2011	Raymer	6	Kenton	Roadway	Check Prints	KY 1931	0		SAFETY(P)
0601048.00	5/16/2011	Raymer	6	Pendleton	Roadway	Check Prints	CS 1088		DEPARTMENT-D09	SAFETY(P)
ID	Comment					Comment Typ	Category		Severity	
1477	I recommend a bid item for Type III Barricades and the sign quantity seems to be low.					Omission	Guardrail, MOT		Low	
1478	Are Detectable Warnings needed for the sidewalk ramps, if so a bid item is needed for the:					Omission	MOT		Low	
1479	There is a bid item for Asphalt Pavement Milling, I haven't found where that it is to be used					Note Clarity	Pavement		Low	
1480	Is a borrow site going to be provided, Geotech Notes seem to indicate this, if so should this					Note Clarity	Geotechnical		Low	
1481	Sheet R3: At KY 22 right station 101+55(100+90 approach road right) has a guardrail end treat					Error	Guardrail		Low	
1482	Note 6 states the construction at station 118+10 to 119+05 must be completed promptly, I re					Note Clarity	MOT		Low	
1483	Private property entrances doesn't seem to be impacted much but there are only 30 tons o					Error	MOT, Pavement		Low	
* (New)										
0901038.00	5/18/2011	Raymer	9	Greenup	Roadway	Check Prints	KY 1649		CRAWFORD, J.M. AND AS	SAFETY(P)
1208101.00	9/14/2010	Little	12	Pike	Roadway	Check Prints	KY 1303		URS CORPORATION	CONGESTION
1101082.00	6/12/2012	Raymer	11	Knox	Roadway	Final Joint Inspec				
1001092.00	5/23/2012	Raymer	10	Magoffin	Roadway	Final Joint Inspec				
0500320.30	3/10/2011	Raymer	5	Jefferson	Roadway	Final Joint Inspec	KY 22		Metro Louisville/BTM	SAFETY(P)
1101083.00	6/12/2012	Raymer	11	Bell	Roadway	Final Joint Inspec				
0500972.00	3/23/2011	Raymer	5	Jefferson	Roadway	Final Joint Inspec	KY 22		Metro Louisville/BTM	MINOR WIDEN
0400297.21	4/23/2010	Raymer	4	Hardin	Roadway	Final Joint Inspec	I 64		QK4	MAJOR WIDEN
1208400.00	6/14/2010	Little	12	Martin	Roadway	Prem Line & Grad	KY 1303		URS CORPORATION	CONGESTION
1200154.04	3/24/2011	Little	12	Martin	Roadway	Prem Line & Grad	CS 1105		DEPARTMENT-D03	RELOCATION(C
0800907.00	4/19/2011	Little	8	Lincoln	Roadway	Prem Line & Grad	I 24		QK4	I-CHANGE REC



What We Have

ID	TableID	Comment	Comment Typ	Category	Severity
8	3	Need to use Mod Curb & Gutter as a bid item for Detail "A" and Detail "D". We can show the	Omission	Pavement	Medium
9	3	Detail "C" can still use Standard Curb & Gutter however this will require a separate bid item	Error	Guardrail, Pavement	Low
10	3	Need to show a depth on the 18" Longitudinal Edge Key	Omission	Pavement, Cross Section	Medium
11	3	Usually a note to widen shoulder where there is guardrail	Omission	Guardrail, Pavement, Cross Se	Medium
12	4	District review and consider utilizing EMBANKMENT-IN-PLACE bid item in lieu of ROADWAY	Note Clarity	Earthwork	Low
13	4	Delete bid item for TEMPORARY GUARDRAIL. There was no temporary rail shown to be used	Error	Guardrail, MOT	Medium
14	4	Add bid item for REMOVE GUARDRAIL.	Omission	Guardrail	Low
15	4	Increase quantity for SIGNS for 2 additional 4 x 4 Road Work signs.	Error	MOT, Signalization	Low
16	4	Delete bid item for SPECIAL SEEDING CROWN VETCH. Ground cover for slopes greater 3:1 is	Note Clarity	Seeding	Low
17	4	Add bid item of CRASH CUSHION TYPE VI CLASS BT TL3 for use with temporary concrete barr	Error	Guardrail	Low
18	4	Recommend deleting bid item for SEEDING & PROTECTION and increasing quantity of EROS	Note Clarity	Seeding, Environmental	Low
19	4	I would recommend that the asphalt thickness be established, either by a theoretical desig	Note Clarity	Pavement	Medium
20	4	Recommend including in Pipe Removal note that removal of existing headwalls will also be	Note Clarity	Existing Drainage	Low
21	4	Add station limits for begin & end of turn lane taper	Omission	Horizontal Alignment	Medium
22	4	construction note for removal of existing guardrail and also include in note where guardrai	Omission	Guardrail	Medium
23	4	On Coordinate Control Points table, recommend that the station & offset of control points	Omission	Survey/Control	Low
24	4	Detail sheet R9C appears to be a duplicate of R9; if so delete R9C from plan set.	Note Clarity		Low
25	4	Add ROAD WORK 1500 FT and ROAD WORK 1000 FT signs to west end of project and increas	Omission	MOT	Medium
26	4	Proposed note requires minimum 10' lane width. Need to determine existing pavement w	Error	Guardrail, Pavement	High
27	4	Recommend adding the following general note: "THERE WILL BE NO DIRECT PAYMENT FOR I	Omission	Coordination, Guardrail, MOT	Medium
28	4	Add following step after the Construct Erosion Controls item: "INSTALL TEMPORARY CONRE	Error	Phasing	Medium
29	5	REMOVE PAVEMENT (02091). Normally this pay item is only used for removal of pavement	Error	Earthwork, Pavement	Low
31	5	Recommend increasing (~double) quantity of temporary striping. MOT plan indicates lane s	Error	Striping, MOT, Pavement	Medium
32	5	Recommend adding bid item of EROSION CONTROL BLANKET (05950) in order to use ECB in	Omission	Seeding, Geotechnical	Low



What We Have



Constructability Review

from the Quality Assurance Branch (QAB) of Highway Design

Item Number	1001092.00	Review Type	Roadway
Review Date	5/23/2012	Design Phase	Final Joint Inspection
Reviewer	Raymer	Route Name	
District	10	Route Number	
County	Magoffin	Designer	

Comments from Review	Type	Category	Severity
Do school buses cross this bridge and if so do we need to be specific about when the bridge must be built?	Note Clarity	Phasing, MOT	Medium
The Mot states that traffic must be maintained to all dwellings affected so I think the intent is to maintain traffic on the old bridge while the new bridge is built but the plan sheet shows signs with the Road Closed	Note Clarity	MOT, Part-Width	Medium
At rt station 23+97.47, why not use a Type 7 end treatment in lieu of the Type 1?	Error	Guardrail	Medium



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Where do we go from here?

- Integration into the GIS Web App
- Unite QAB Data
- Possible Interface in Clear View
- Phase II of Kentucky Transportation Center Study



Questions or Feedback

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