

# QA/QC: Oklahoma DOT

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Presented by:  
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Oklahoma Department of Transportation



# QA/QC: Oklahoma DOT

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Planning & Research Division  
Pavement Management Branch

Special Thanks to:

ODOT Pavement Management Branch

- ◆ Ginger McGovern, P.E., Pavement Management Engineer
- ◆ Bill Dickinson, Transportation Manager

# Checking Data Quality

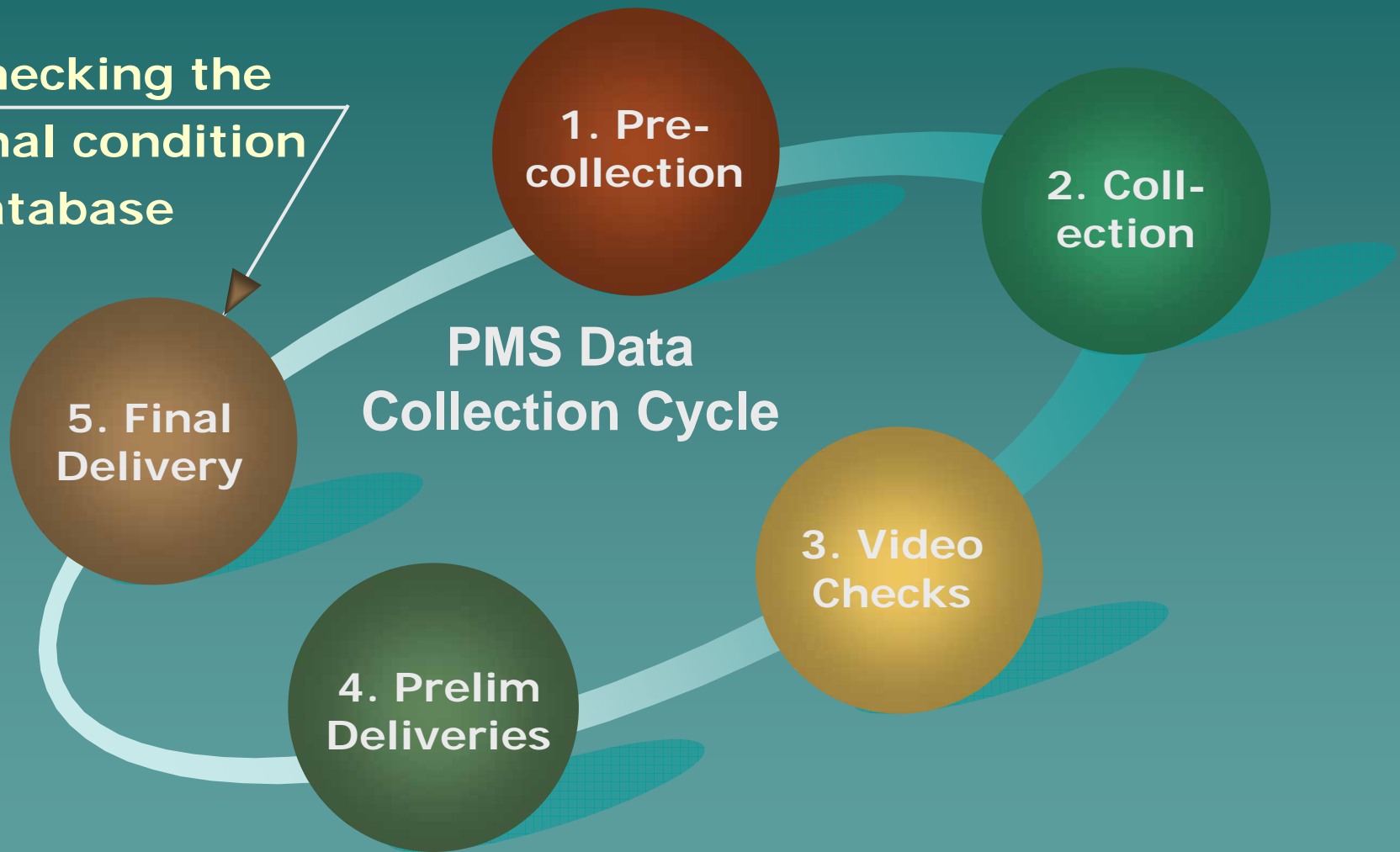
1. Why?

2. What?

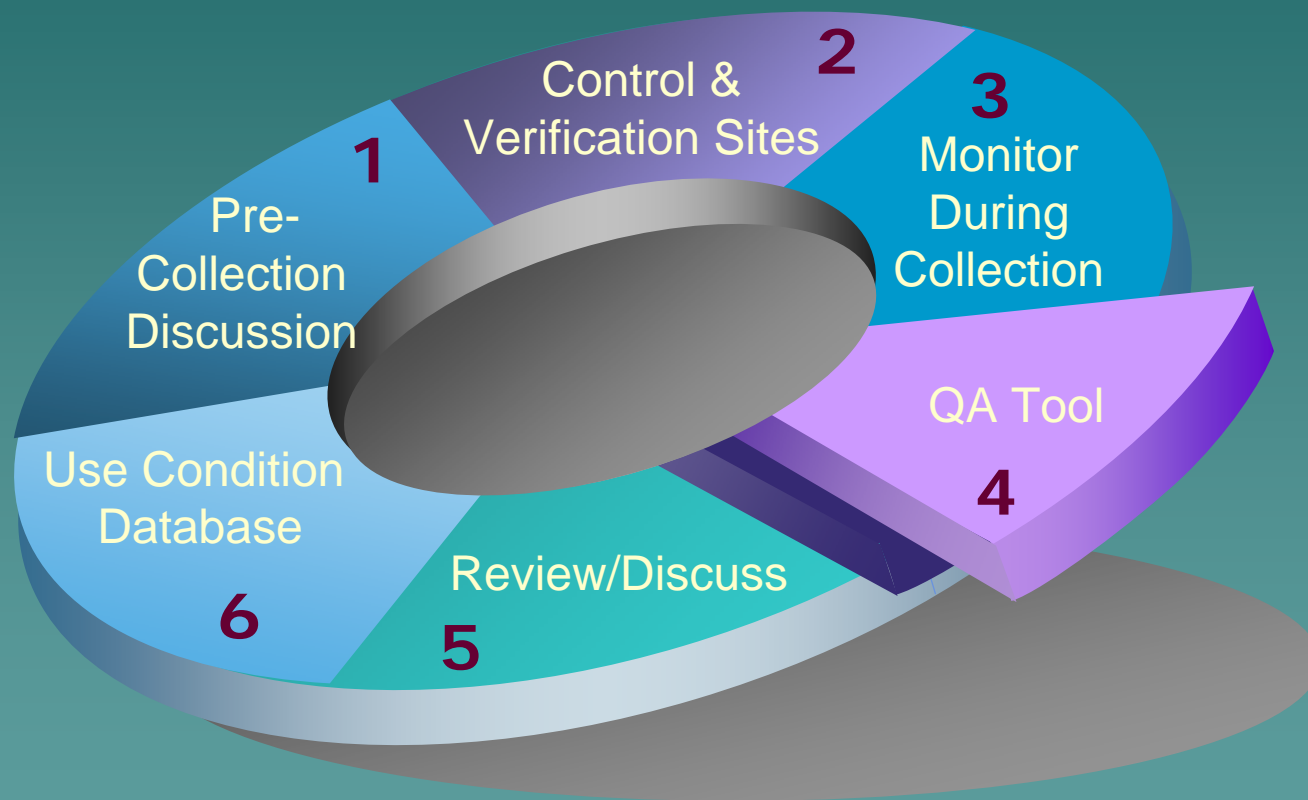
3. How?

# Overall QC/QA Process

Checking the  
final condition  
database



# Bringing it All Together



# How Did The Process Evolve?

- ◆ Started out with individual queries
- ◆ Contract with APTech
  - Checked distress ratings
  - Document process
  - Combine into one process/interface
- ◆ Evolved into QA Tool

# Why Use A Tool?

- ◆ **Lots of data**

- 8,000 miles collected every 0.01-miles or **800,000 records annually**

- ◆ **65 data fields**

- 10 supplied by ODOT in shell
- 55 collected by contractor

- ◆  $800,000 \times 65 = \underline{\mathbf{52\ million}}$  pieces of data annually!

# The QA Tool - What Is It?

## 1. QA Tool

- An interface/program

## 2. Condition Database

- Shell filled in by the contractor

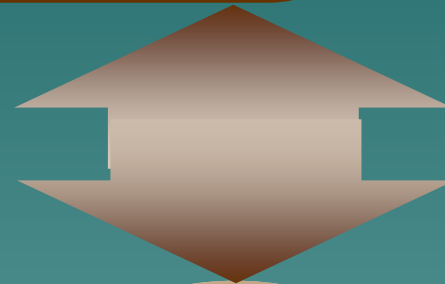
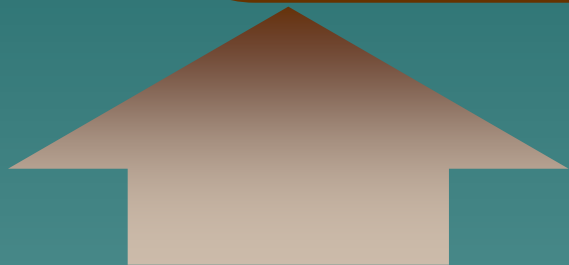
## 3. QA Database

- ODOT-Inventory tables
- Utility tables
- Tables for tracking results



# How Does It Work?

**1. QA Tool**




**2. PMS  
Condition  
Database**

**3. QA Database**  
Inventory Tables  
Utilities Tables  
Tracking Tables

# QA Tool – The Interface

**ODOT QA Tool: Main Menu**



## Oklahoma Department of Transportation *PMS Data Quality Assurance (QA) Investigator*

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QA Database Link: `C:\usr2\Planning\PMS\APTech\QADatabase.mdb`

**Step 2. Select Division**  
Select the division on which to run distress checks.  
Division:

**Step 3. Preliminary Checks**

**Step 4. Sensor Data Checks**

**Step 5. Distress Checks**

**Distress Check Type**

- AC or COMP Distress Data
- JCP Distress Data
- CRCP Distress Data
- Special Checks

**AC/Composite Pavement Distress Category**

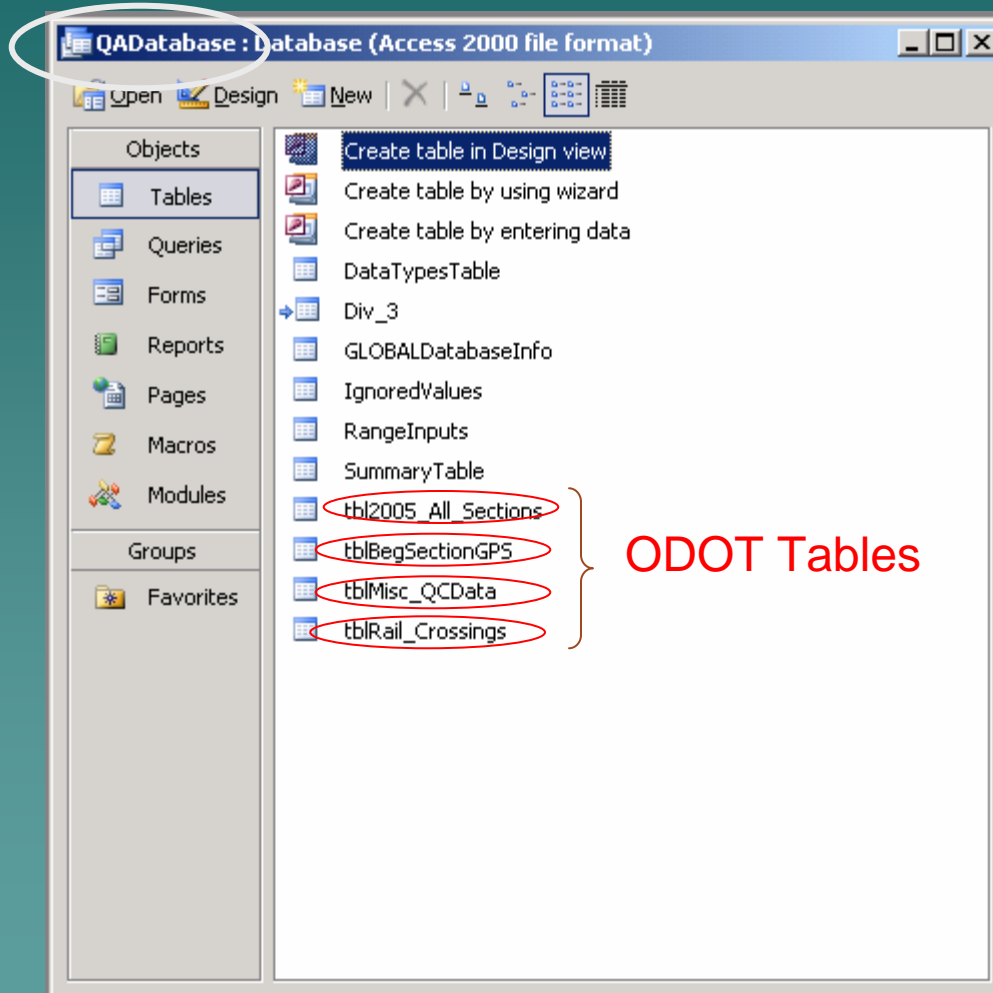
- ALL AC/COMP DISTRESS GROUPS
  - Transverse Cracking
  - Alligator Cracking
  - Miscellaneous Cracking
  - Raveling
  - Patching

Hide Ignored Values      Status:      

           It is recommended that the database be compacted often to control database size. Please be patient during this process.

# QA Database

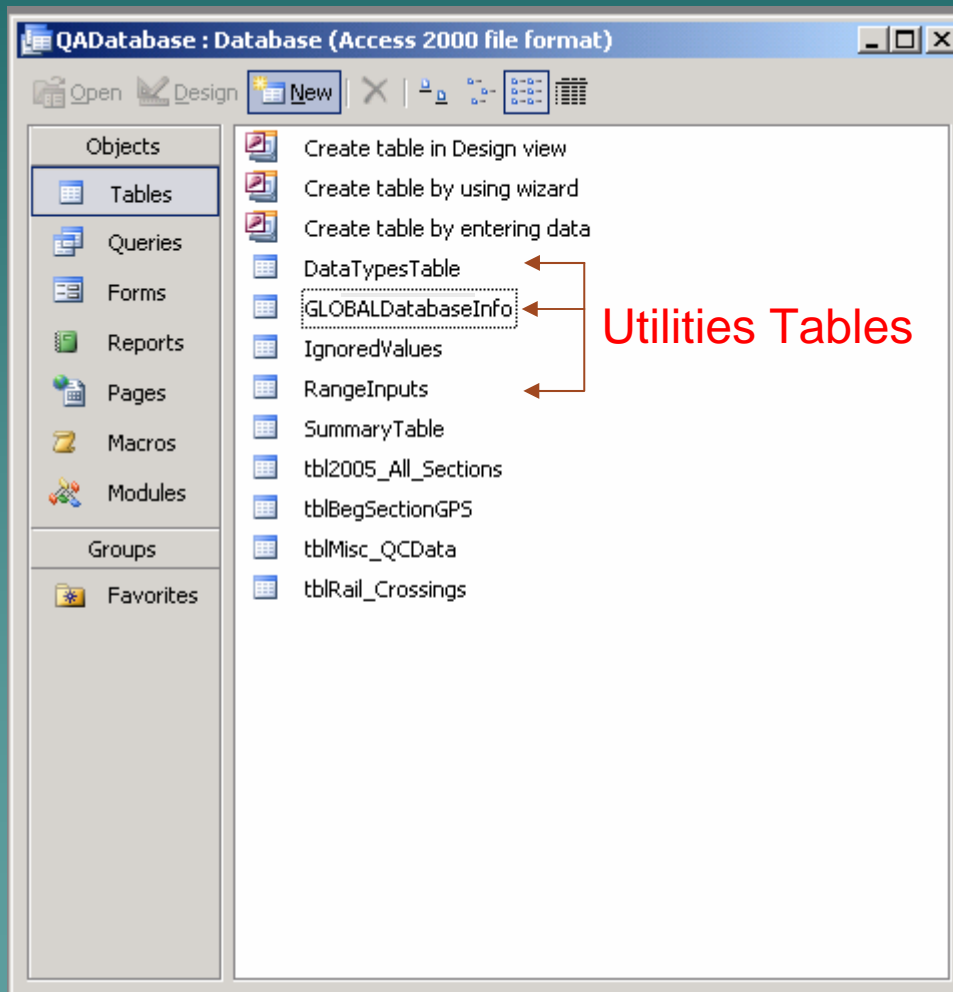
## ODOT Tables



- ◆ All\_Sections
  - Section lengths
  - Section IDs
- ◆ BegSectionGPS
  - Coordinates of each beginning point
- ◆ Misc\_QCData
  - Number of bridges in each section
- ◆ Rail\_Crossings
  - Location of each RR crossing

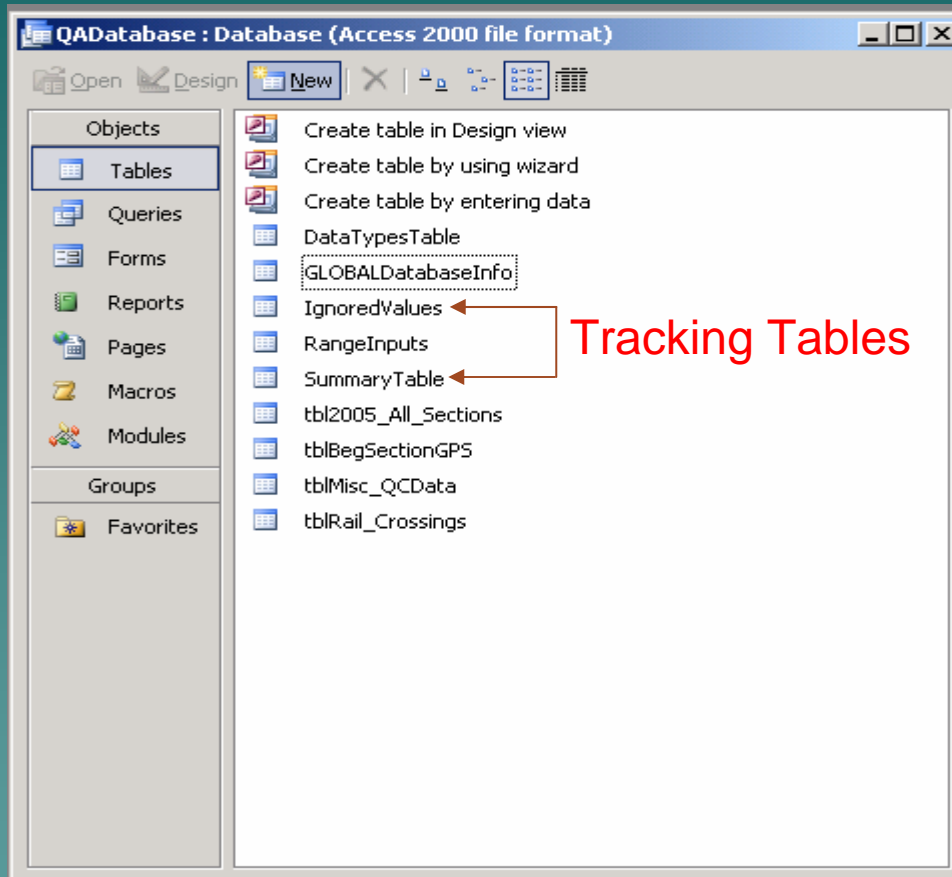
# QA Database

## Utilities Tables



- ◆ Data Types Table
  - What is the field supposed to be?
- ◆ GlobalDatabaseInfo
  - Stores links to the QA Tool
- ◆ RangeInputs
  - Expected highs and lows for sensor and distress data

# QA Database



## Tracking Tables

- ◆ Ignored Values
  - We investigated and want to ignore an error
- ◆ Summary Table
  - What has passed the checks and what hasn't

# Simplified Work Flow

1. Divide up database
  - By field divisions
  - More manageable size
  - Easier to keep track
2. Set up the QA Tool (link the tables)
3. Do the Checks

# QA Tool Detail Process

## Setup

- Divide Condition DB
- Establish Links
- Create Ignored and Summary Tables

## Check


- Preliminary Checks
- Sensor Checks
- Distress Checks
- Misc Checks

## Summarize

- Resolve Data Problems
- Summarize Results in QC/QA Report

# QA Tool – Getting Started

ODOT QA Tool: Main Menu



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Establish QA Database Link

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Division:

**Step 3. Preliminary Checks**

Conduct Preliminary Checks

**Step 4. Sensor Data Checks**

Conduct Sensor Data Checks

**Step 5. Distress Checks**

Distress Check Type

- AC or COMP Distress Data
- JCP Distress Data
- CRCP Distress Data
- Special Checks

AC/Composite Pavement Distress Category

- ALL AC/COMP DISTRESS GROUPS
- Transverse Cracking
- Alligator Cracking
- Miscellaneous Cracking
- Raveling
- Patching

Hide Ignored Values

Status:

Generate Category Report

View Summary Report

Compact Database

It is recommended that the database be compacted often to control database size. Please be patient during this process.



# Set Up Database Links

**ODOT QA Tool: Database Setup Tool**

**Database Utilities** Close

**Step-By-Step Database Setup Procedure**

Step 1. Establish the link to the "QA database"

QA Database Path  
C:\usr2\Planning\PMS\APTech\QADatabase.mdb Link QA Database  
Status **Complete**

'All\_Sections' table: 2005\_All\_Sections  
'MiscQCData' table: tblMisc\_QCData  
'RailCrossings' table: tblRail\_Crossings  
'BegSectionGPS' table: tblBegSectionGPS  
'RangeInputs' table: RangeInputs

Step 2. Establish the link to the condition database

Condition Database Path  
C:\usr2\Planning\PMS\APTech\2005\_Div8.mdb Link Condition Database  
Status **Complete**

'Condition' table: Div\_8

Step 3. Create the 'IgnoredValues' and 'SummaryTables' in the QA Database

Create and Link 'IgnoredValues' and 'SummaryTable' Tables Status **Complete**

**Database Manager Tools**

Database Manager Password Setup

Use these controls to change the database manager password. Save Password


Current password: "odot"

New password:  Re-enter new password:

Set Valid Variable Data Ranges Set Valid Variable Data Ranges

# QA Tool – Start The Checks

**ODOT QA Tool: Main Menu**



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Hide Ignored Values      Status:

           It is recommended that the database be compacted often to control database size. Please be patient during this process.

# Preliminary Checks

**ODOT QA Tool: Preliminary Checks**

## Preliminary Checks

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'Preliminary Checks' check general pavement section information. The summary table below provides information regarding which checks have been conducted for each division. Using the Export GPS Information button at the bottom of the screen, the user can create a spreadsheet summary of the GPS failed information.

Initial Checks for All Divisions

Check that 'Division' values in the distress table are valid.	Division Check	Status: <b>Passed</b>
Checks the data types of the fields in the distress table.	Data Types Check	Status: <b>Passed</b>

Preliminary Checks By Division

**Current Division:** 8

Check Type	Status of Check By Division							
	1	2	3	4	5	6	7	8
ODOT Supplied Fields								<b>Passed</b>
GPS Blanks								
Long/Lat Difference								
GPS Duplicates								
Pavetype/Surface								
Events								
Geometric Values								
CtlSect Grade								
Visidata Fields								
Export GPS								

Note: Checks of 'ODOT Supplied Fields' must be completed before continuing with the additional checks below.

# ODOT-Supplied Fields

**Preliminary Check - ODOT Supplied Fields**

## Preliminary Checks of ODOT Supplied Fields

Click on each of the buttons below to run preliminary checks on the different ODOT supplied fields.  
Please be patient as many of these check may take 5 to 10 minutes to complete for large condition databases.

**Current Division:** 8

Check Type	Status of Check By Division							
	1	2	3	4	5	6	7	8
NLF_ID Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks 'NLF_ID' values in the distress table against the acceptable list of 'NLF_ID' values in the 'tblAll_Sections' table.								
CtISect Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks 'CtISect' values in the distress table against the acceptable list of 'CtISect' values in the 'tblBegSectionGPS' table.								
Direction Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks that the 'Direction' values in the distress table are equal to '5' or '6'.								
Chainage Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks that 'Chainage' values in the distress table are > '0' and less than the maximum chainage value for the 'CtISect'.								
GRP Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks that the 'GRP' values in the distress table are equal to 'I', 'N', 'O', 'TI', or 'TN'.								

# Preliminary Checks

**ODOT QA Tool: Preliminary Checks**

## Preliminary Checks

[Return to Main Page](#)

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Initial Checks for All Divisions

Check that 'Division' values in the distress table are valid.  Status:

Checks the data types of the fields in the distress table.  Status:

Preliminary Checks By Division

**Current Division:**

Check Type	Status of Check By Division							
	1	2	3	4	5	6	7	8
<input type="button" value="ODOT Supplied Fields"/>								<input type="button" value="Passed"/>
Note: Checks of 'ODOT Supplied Fields' must be completed before continuing with the additional checks below.								
<input type="button" value="GPS Blanks"/>								
<input type="button" value="Long/Lat Difference"/>								
<input type="button" value="GPS Duplicates"/>								
<input type="button" value="Pavetype/Surface"/>								
<input type="button" value="Events"/>								
<input type="button" value="Geometric Values"/>								
<input type="button" value="CtlSect Grade"/>								
<input type="button" value="Visidata Fields"/>								
<input type="button" value="Export GPS"/>								

Most Critical

Where are we?

What kind of pavement is it?

# Check Beginning Point

**Preliminary Check - Longitude/Latitude Difference Check**

**Preliminary Check - Longitude and Latitude Checks** Close

Section ID Information  
Division  CtlSect  Direction  Chainage  NLF\_ID

GPS Checks

LONGITUDE

Value	ODOT Control Section Value	Computed Difference	Valid Difference	Status	Ignore?
<input type="text"/>	<input type="text" value="-97.1413"/>	<input type="text" value="97.14132103"/>	<input type="text" value="± 0.0005* of ODOT Value"/>	<b>Out of Range</b>	<input type="checkbox"/>

LATITUDE

Value	ODOT Control Section Value	Computed Difference	Valid Ranges	Status	Ignore?
<input type="text"/>	<input type="text" value="35.65171"/>	<input type="text" value="35.65170714"/>	<input type="text" value="± 0.0005* of ODOT Value"/>	<b>Out of Range</b>	<input type="checkbox"/>

Note: This check only checks records with a Chainage = 0.

Record:        of 1

- ◆ Start with location
  - Check their beginning GPS vs. ours
  - Flag if off by more than 0.05 mi


# What Type of Pavement?

The screenshot shows a software window titled "Preliminary Check - Surface Type Check" with a subtitle "Preliminary Check - 'Surface' vs. 'PaveType'". The window contains several input fields and a "Close" button. The "Section ID Information" section includes fields for Division (8), CtlSect (66-05), Direction (5), and Chainage (0.01). Below this, there are three rows of data: "PaveType" (CRCP) with "Provided by ODOT" and an "Ignore ODOT PaveType" checkbox; "Surface" (JCP) with "Entered by RoadWare"; and "Expected Surface" (CRCP) with "Expected Surface Type". At the bottom, there is an "Events" field (000) with a note: "No records with 'Events' codes of '##1', '##2', or '##3#' should be visible." The record navigation bar shows "Record: 1 of 64".

- ◆ Check Surface (theirs) vs. Pavetype (ours)
  - Resolve discrepancies with video

# QA Tool – Run Sensor Checks

**ODOT QA Tool: Main Menu**



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AC/Composite Pavement Distress Category

- ALL AC/COMP DISTRESS GROUPS
  - Transverse Cracking
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Hide Ignored Values      Status:       Generate Category Report

View Summary Report      Compact Database      It is recommended that the database be compacted often to control database size. Please be patient during this process.



# Sensor Data Checks

## ODOT QA Tool: Sensor Data Checks

### Sensor Data Checks

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The 'Sensor Checks' allow you to check the sensor-related data on a division-by-division basis. The summary table below provides information regarding which checks have been conducted for each division.

Current Division: **3**

#### Control of Ignored IRI Values

Click the included check box if you want the -1 IRI values to be excluded from the 'Data Range Checks' below.

Ignore -1 IRI Values

#### Sensor Data Checks

##### Status of Check By Division

	1	2	3	4	5	6	7	8
IRI Triplicate Check			Errors					
Data Range Checks			Errors					



# Sensor Data Checks

**Sensor Data Check - Data Range Checks**

**Sensor Data Check** Close

Section ID Information

Division  CtlSect  Direction  Chainage

Date

Var	Value	Valid Range	Status	Ignore?
DATE	<input type="text" value="10/20/2005"/>	3/1/2002 to 1/2/2006	Passed	<input type="checkbox"/>

Number of Sensors

Variable	Value	Valid Value	Status	Ignore?
SENSORS	<input type="text" value="31"/>	25	Ignored	<input checked="" type="checkbox"/>

IRI Data

Variable	Value	Valid Range	Status	Ignore?
IRI_RT	<input type="text" value="87"/>	30 to 600; -1	Passed	<input type="checkbox"/>
IRI_LT	<input type="text" value="99"/>	30 to 600; -1	Passed	<input type="checkbox"/>
IRI_AVG	<input type="text" value="93"/>	30 to 600; -1	Passed	<input type="checkbox"/>

Faulting Data

Variable	Value	Valid Range	Status	Ignore?
FAULT_AVG	<input type="text" value="0"/>	0 to 0.8	Ignored	<input checked="" type="checkbox"/>
FAULT_MAX	<input type="text" value="0"/>	0 to 1	Ignored	<input checked="" type="checkbox"/>
FAULT_DEV	<input type="text" value="0"/>	0 to 0.4	Ignored	<input checked="" type="checkbox"/>
FAULT_CNT	<input type="text" value="0"/>	0 to 5	Ignored	<input checked="" type="checkbox"/>

Rutting Data

Variable	Value	Valid Range	Status	Ignore?
RUT_AVG	<input type="text" value="0.21"/>	0 to 1.25	Passed	<input type="checkbox"/>
RUT_MAX	<input type="text" value="0.31"/>	0 to 2	Passed	<input type="checkbox"/>
RUT_1	<input type="text" value="100"/>	0 to 100	Passed	<input type="checkbox"/>
RUT_2	<input type="text" value="0"/>	0 to 100	Passed	<input type="checkbox"/>


Macrotexture Data

Variable	Value	Valid Range	Status	Ignore?
TEXTURE	<input type="text" value="2.681"/>	0 to 2.5	Out of Range	<input type="checkbox"/>

Record:       of 39

# Distress Data Checks

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# Distress Data Checks

**Distress Data - ALL AC and Composite Pavement Distress**

**Category Check - AC and Composite Pavement Distress** [Return to Main Page](#)

Section ID Information

Division  CtlSect  Direction  Chainage

Transverse Cracking					Miscellaneous Cracking				
Variable	Value	Valid Range	Status	Ignore?	Variable	Value	Valid Range	Status	Ignore?
TRANSV_1	<b>9</b>	<b>0 to 8</b>	<b>Out of Range</b>	<input type="checkbox"/>	MISC_1	<input type="text" value="52"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>
TRANSV_2	<input type="text" value="0"/>	0 to 8	<b>Passed</b>	<input type="checkbox"/>	MISC_2	<input type="text" value="0"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>
TRANSV_3	<input type="text" value="0"/>	0 to 6	<b>Passed</b>	<input type="checkbox"/>	MISC_3	<input type="text" value="0"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>
TRANSV_4	<input type="text" value="0"/>	0 to 3	<b>Passed</b>	<input type="checkbox"/>	Total MISC	<input type="text" value="52"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>

Alligator Cracking					AC Patching				
Variable	Value	Valid Range	Status	Ignore?	Variable	Value	Valid Range	Status	Ignore?
ALLIG_1	<input type="text" value="0"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>	ACPATCH	<input type="text" value="0"/>	0 to 636	<b>Passed</b>	<input type="checkbox"/>
ALLIG_2	<input type="text" value="53"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>					
ALLIG_3	<input type="text" value="0"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>					
Total ALLIG	<input type="text" value="53"/>	0 to 53	<b>Passed</b>	<input type="checkbox"/>					

Note: The 'Total ALLIG' will be blank if one of the corresponding individual values (e.g., ALLIG\_1) is blank. This is also the case for the 'Total MISC' value.

Raveling				
Variable	Value	Valid Range	Status	Ignore?
RAVEL	<input type="text" value="0"/>	0	<b>Passed</b>	<input type="checkbox"/>

When 'TEXTURE' < 0.75, valid value for 'RAVEL' = 0  
 When 'TEXTURE' >= 0.75, valid range for 'RAVEL' = 0 to 53

TEXTURE  (for the current section)

Record:        of 46

# What's for the Future?

**Based on aggregated data**  
Sum/Average to PMS sections

**Logic Checks**  
e.g., If  $IRI > 120$  we should see some type of cracking

**Year to Year Comparison**  
What is the expected change in values for two years

**Check one side against the other on divided highways**

# Questions?

## Contact Info

Justin Calvarese, P.E.

Oklahoma DOT

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Pavement Management Branch

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