Automated Collection for Distress Data:
Getting What You Need

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Agenda

1. **Introduction**
2. **Needs Assessment**
3. **Verification**
4. **Questions?**

Introduction

- Need to ensure consistent, accurate data

- Why is this a challenge?
  - Subjectivity inherent to rating schemes
  - Different providers year to year
  - "Black Box" or "Blind" condition assessments

- Steps to ensure that data fits expectations

Needs Assessment

Definition of Protocols

- Standard or regional preference
    - ASTM D6433
    - SHRP
    - MTO, MTC, MDOT, etc.

Needs Assessment

Definition of Protocols
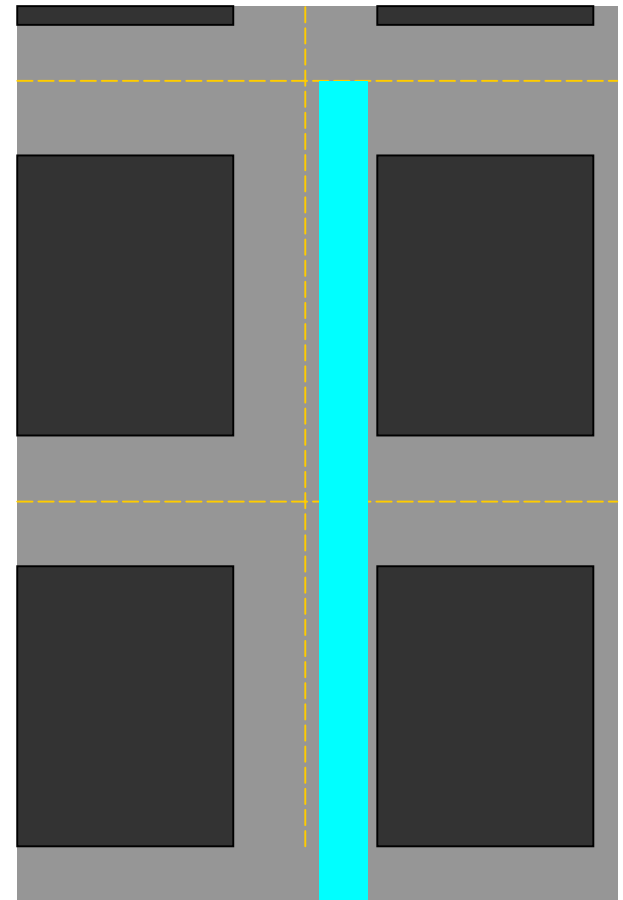
Severities: Moderate? Severe?

Needs Assessment

- Define Rating Protocols
- Select and Define Benchmark/Verification Sites
- Collect and Compare
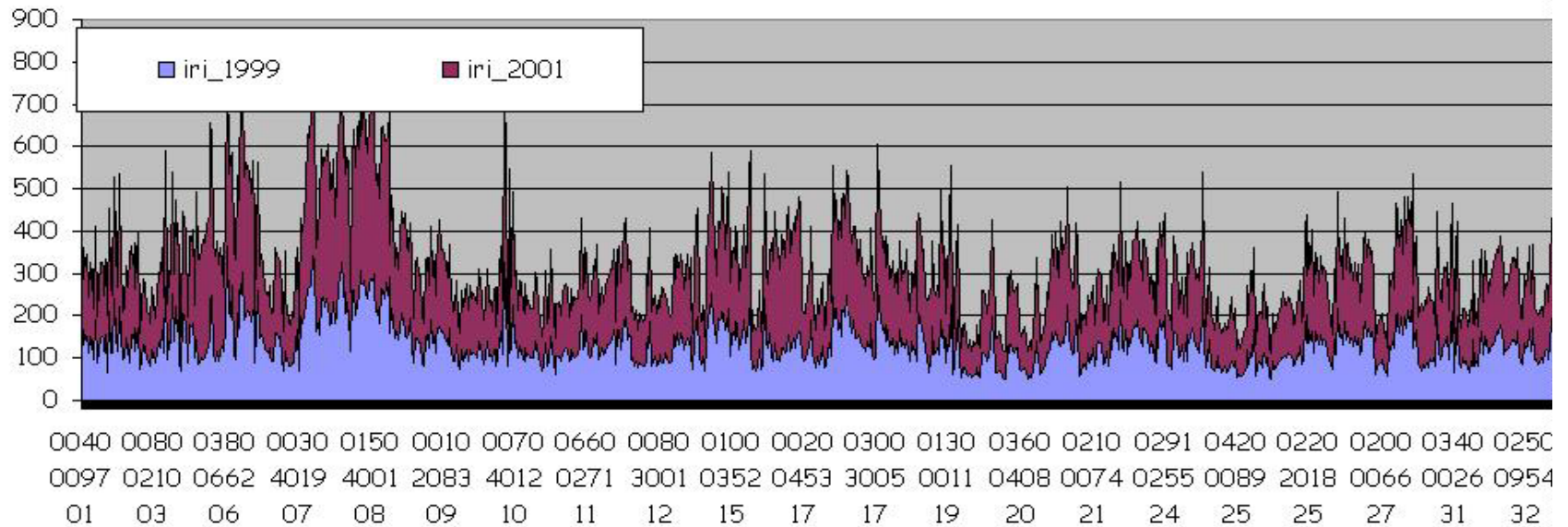
Verification - Benchmark Sites

- Define Benchmarks

- Criteria Represented

- Define Rated Area
  - ▶ Section Start/End
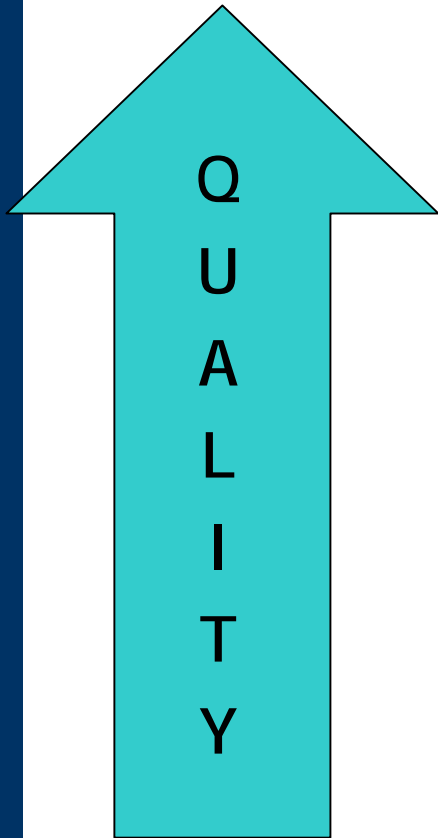 - ▶ Lane Width

Verification

Data Analysis Tools
- Improve Year to Year comparisons
- Section Verification (QA/QC)

Distress Rating Options

QUALITY (arrow pointing up)

- Automated Distress Analysis

- Semi-automated Distress Analysis

- Visual Distress Analysis

- Windshield Rating

Distress Description	ARAN Sensors	Windshield	Data Processing	WiseCrax	DV-Rate	Comments
1. Route ID	✓		✓			Table provided by Client will all Route labels
2. Date Tested	✓					
3. Maintenance Jurisdiction	✓		✓			Table provided by Client will all Route labels
4. Number of Lanes		✓				
5. Survey Direction		✓				
6. Begin Mile Point	✓		✓			
7. End Mile Point	✓		✓			
8. Length in Mile	✓					
9. Collection Speed	✓					
10. Roughness Left WP	✓					
11. Roughness Right WP	✓					
12. Roughness Average	✓		✓			
13. Average Deeper Rut in Inch			✓			
14. Rut Severity Percent (3 Severities)	✓	✓	✓			3 Severity Levels
15. Rut None Percent (<0.25")		✓	✓			
16. Pavement Type		✓			✓	DV-Rate will verify all pavement types
17. Index Value Load Distress		✓				
18. Index Value Non Load Distress		✓				
19. Alligator Cracking (WPs)				✓		Severity 1 = Longitudinal; Area
				✓		Severity 2 = Alligator with Adjacent Crk'g; Area
				✓		Severity 3 = Alligator with Adj. Crk'g & Spalling; Area
20. Block Cracking				✓		Sev1= > 3' x 3' blocks; Sev2= < 3' x 3' w Adj. Crk'g; Area
21. Longitudinal Cracking (NonWPs)				✓		Sev1 = Sealant & Cracking, Sev2 = Crk'g; Linear Feet
22. Transverse Cracking				✓		Sev1 = Sealant & Cracking, Sev2 = Crk'g; Linear Feet
23. Reflective Longitudinal Crk'g				✓		2 Severity Levels; Post Process to ID as Reflective (LF)
24. Reflective Transverse Crk'g				✓		2 Severity Levels; Post Process to ID as Reflective (LF)
25. Patching					✓	Reported as Area and Count
26. Potholes					✓	Reported as Count
27. Delaminations					✓	Reported as Area and Count
28. Bleeding					✓	2 Severity Levels; Reported as Area
29. Shoulder Type					✓	
30. Shoulder Width					✓	Reported as Linear Feet
31. Shoulder Condition					✓	3 Severity Levels
32. Crack Sealant					✓	Sev1= Sealed, Sev2 = Unsealed/not completely

Distress Rating Options
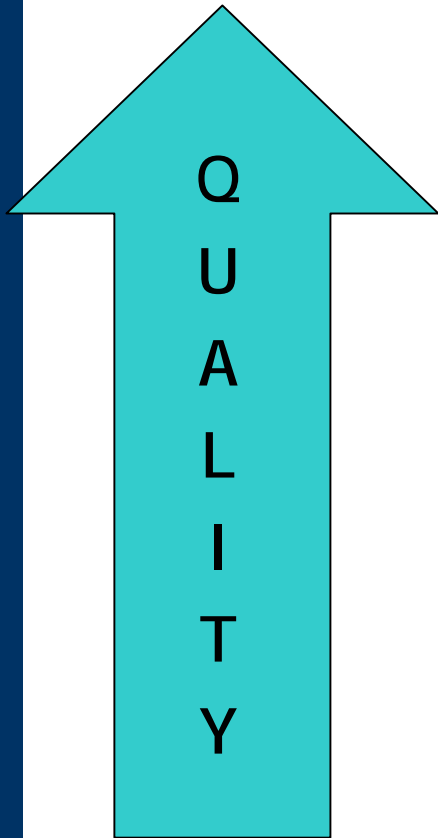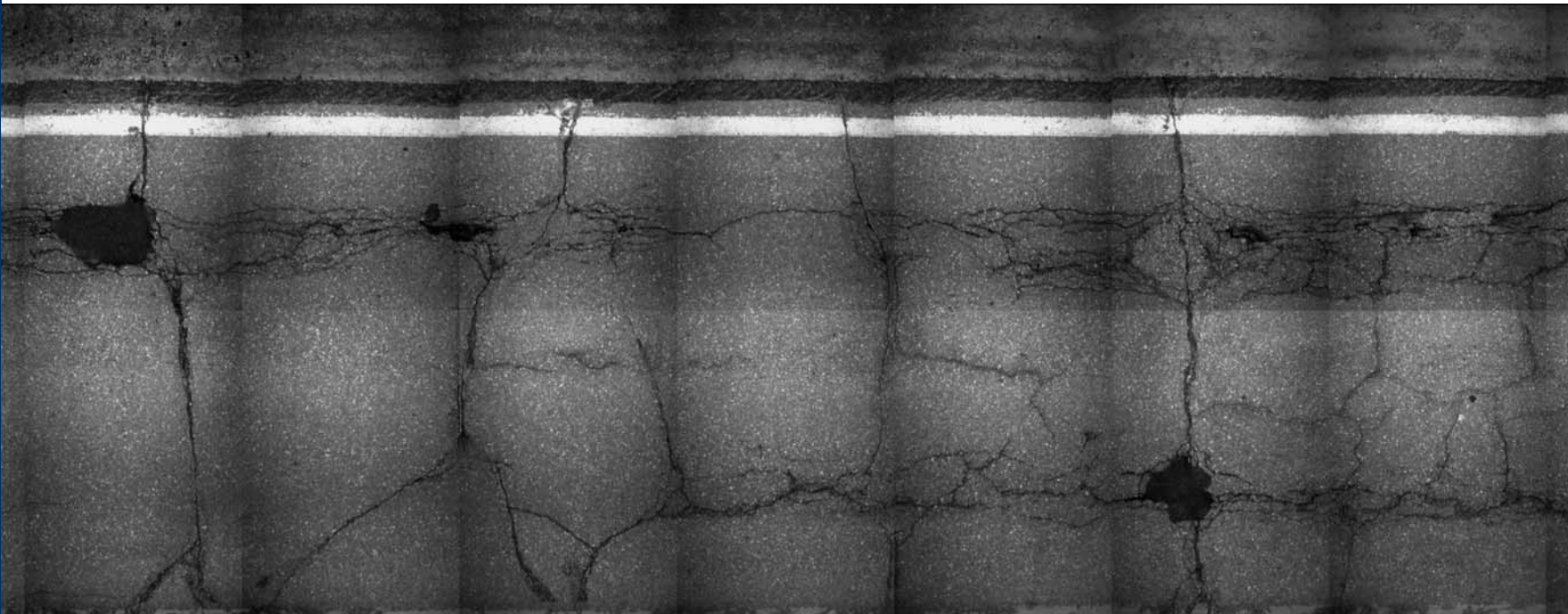
QUALITY (arrow pointing up)

- Automated Distress Analysis

- Semi-automated Distress Analysis

- Visual Distress Analysis

- Windshield Rating

Rater Calibration
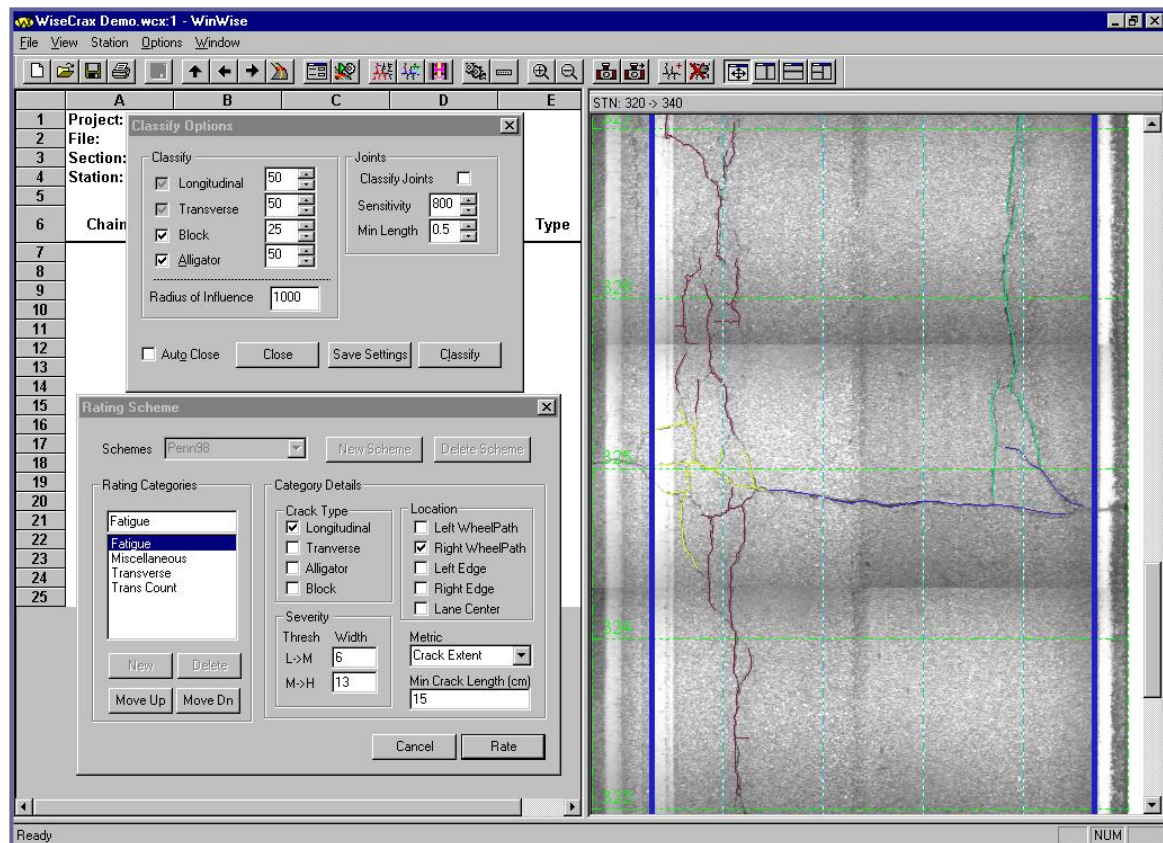
Block or Longitudinal and Transverse?

Fatigue in wheel path?

Software - Automated

● Distress detected and classified through user-defined criteria

● Results can be reviewed and manually modified

Software – Semi-Automated

● Distress identified and rated by user

● Results can be reviewed and modified

Benchmark Site Comparisons

- Easy to use comparison software
- Data Pass/Fail
- Benchmark
- History
- Charting
- Tolorences
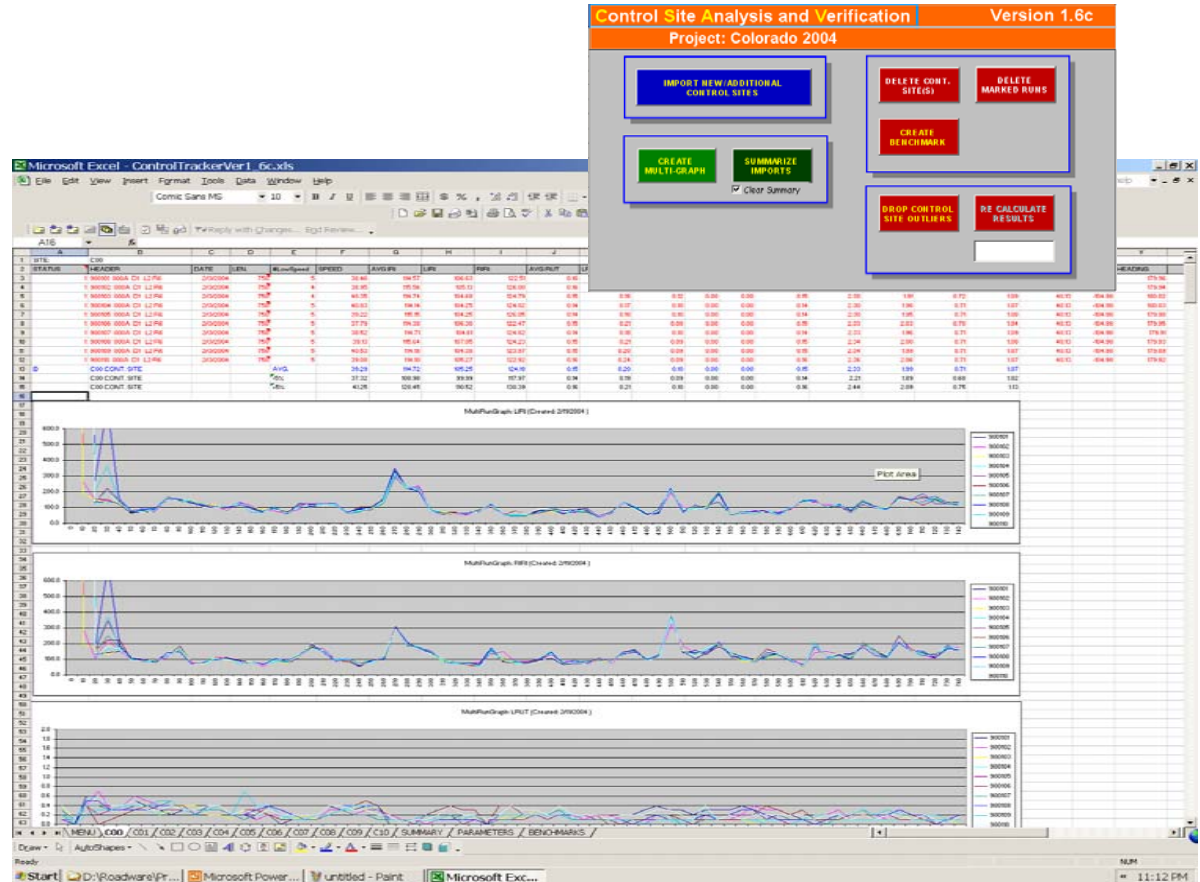
Distress Rating Quality Assurance

- **Customer Calibration**
  - Distress interpretation verified between the Lead rater on the project and the Client
- **Rater Approval**
  - Rating team must compare accurately to the Lead rater before rating the network
- **Inter-rater Consistency**
  - Daily comparison between the rating team and the Lead rater to ensure inter-rater consistency

Distress Rating Quality Assurance

- Ideally: Rate from same collected data
  - Same timeframe of collection
  - Eliminate error of varied perspective
- Timely Feedback

Results – DOT vs. Lead Rater

REFERENCE STANDARD (Lead Rater results)

RATER	FILENAME	site	SECT	CSECT	Dir	NBLOWOUT	BLOWOUT	TRANSC_H	TRANSC_M	TRANSC_L
300	47T09B00	2	902040	06002	1	0	0	0	0	0
300	47T0OB00	1	901030	25502	1	0	0	0	0	0
300	47T10B00	7	907010	01902	2	0	0	0	0	0
300	47T18B00	6	906010	01903	1	0	0	0	0	0
300	47T24B00	4	904010	25204	1	0	0	0	0	0
300	47U0AB00	3	903050	25001	1	0	0	0	0	0
300	47U0MB00	5	905050	01931	1	0	0	0	0	0

RATER	FILENAME	site	SECT	CSECT	Dir	N_PATCH_L	N_PATCH_M	N_PATCH_H	PATCH_L	PATCH_M
300	47T09B00	2	902040	06002	1	1	0	0	0	0
300	47T0OB00	1	901030	25502	1	0	0	0	0	0
300	47T10B00	7	907010	01902	2	0	0	0	0	0
300	47T18B00	6	906010	01903	1	0	0	0	0	0
300	47T24B00	4	904010	25204	1	15	0	0	5	74
300	47U0AB00	3	903050	25001	1	1	0	0	5	0
300	47U0MB00	5	905050	01931	1	0	3	0	0	26

RATER	FILENAME	site	SECT	CSECT	Dir	PATCH_H	N_POTHOLE	A_POTHOLE	ALGCRK_L	ALGCRK_M
300	47T09B00	2	902040	06002	1	2	0	0	0	0
300	47T0OB00	1	901030	25502	1	0	0	0	0	0
300	47T10B00	7	907010	01902	2	0	0	0	0	0
300	47T18B00	6	906010	01903	1	0	0	0	0	0
300	47T24B00	4	904010	25204	1	105	5	13.4	1435	4432
300	47U0AB00	3	903050	25001	1	0	0	0	246	0
300	47U0MB00	5	905050	01931	1	0	5	5.79	0	1612

Results – Lead Rater vs. Raters

Overall: +/- 4%

Alternate Implementation

- **Benchmark Sites**
  - Each site tested numerous times
    - Before and after project data collection
    - Verify data is still within tolerances (every 4 weeks)

- **Blind sites – Verification Sites**
  - Random sites tested throughout the project
  - Data comparison (DOT vs. Data Collector)

- **External Verification (Independent Quality Firm)**
  - Verifies 10% all rated data

Summary

- Interpretive differences cause discrepancies in rated sections
- A program of parallel rating on defined sections ensures that expectations are met for the duration of a project.
  - ▸ Benchmark Sites
  - ▸ Blind Sites

Questions?