The Use of Single and Double Blind Performance Test Samples in Evaluating Laboratory Performance

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Corporate Environmental Data Needs

Environmental Data Must Be;

1. Accurate
2. Defensible
3. Timely
4. Cost Effective

To be able to demonstrate compliance with environmental regulations.

Purpose of the Ford PT Program

- To improve compliance against the Ford specifications – MEETING CLIENT NEEDS
- To improve laboratory work quality for all of their clients – IMPROVING PERFORMANCE

Single vs. Double Blind PTs

Single Blind PTs $

- Required for certification
- Know that it is a PT
- No bottle request
- Clean Matrix
- Non-standard report

Double Blind PTs $$

- Not typically used
- Don't know it is a PT
- Evaluates bottle order
- Real World Matrix
- Standard client report

PT Provider – Results & Statistics

- All results managed by individual PT Providers
- All PT Providers calculate study statistics
- Most PT Providers have a variety of data analysis/reporting tools
- All PT Providers will provide results in EDD format
- No PT Provider has data from other providers

Single Blind Performance Test (PT) Database

- **Previously** - Data summarized into tables manually after review of PT provider report
- **Now** - Data submitted by PT provider using Ford EDD and downloaded into an Access Database

Single Blind PT Summary

PT Type	Provider	Date	No.	Warning	Control	Outlier	% Error
HW013	Phenova	2/1/14	284	4	5	1	3.17
WP414	ERA	5/6/14	299	0	0	0	0.00
WS012	NYDOH	6/3/14	267	4	1	0	1.87
SOIL17	RTC	8/7/17	260	20	8	0	6.92
UST03	ERA	9/5/14	45	2	1	0	4.44
TOTAL		2014	1,155	30	13	1	2.51

$$\%Error = [(C+W+O)/N]*100$$

N = Total number of parameters

C = Number of parameters outside of control limit

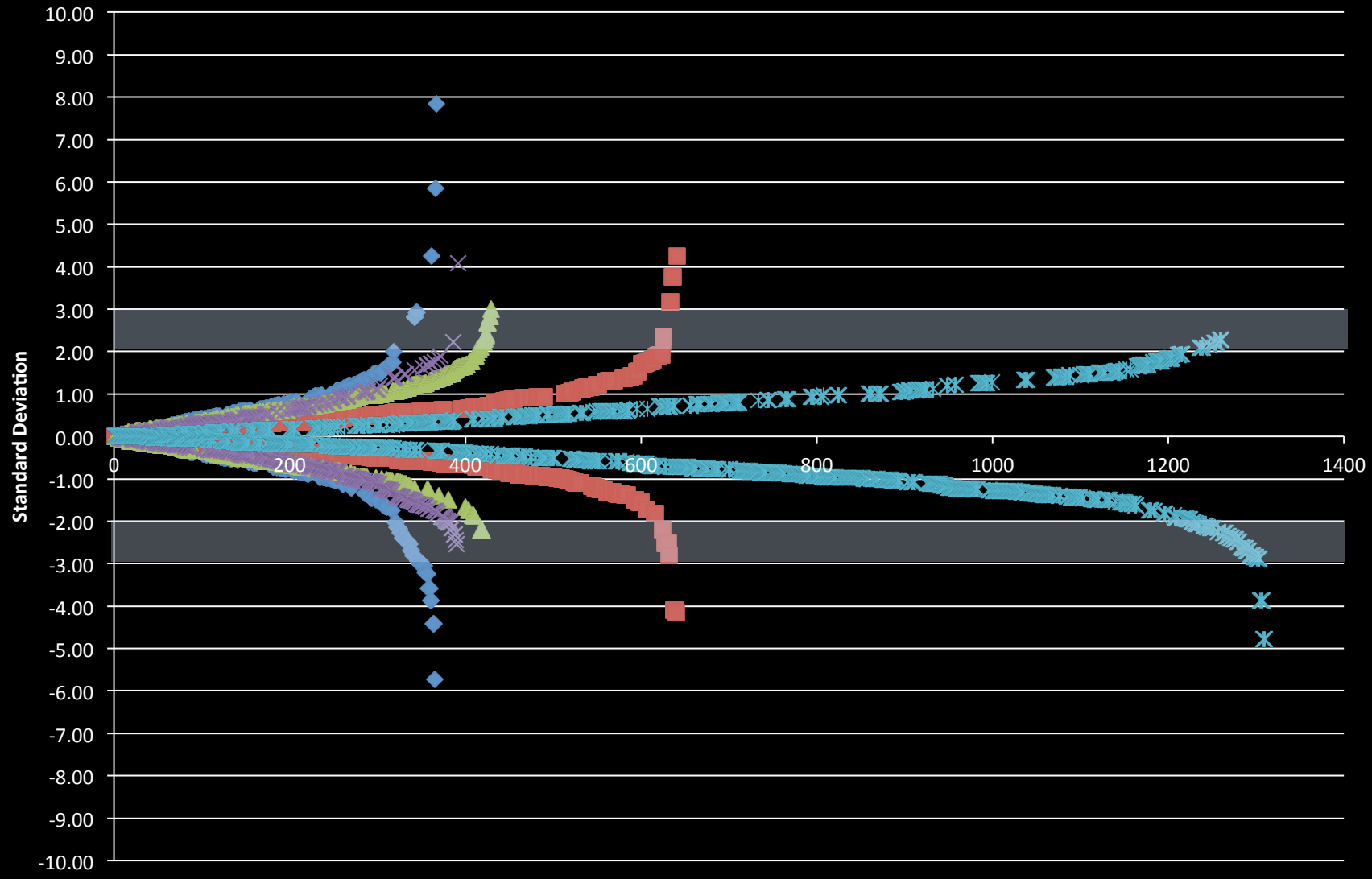
W = 0.5 x number of parameters between the warning and control limit

O = Number of parameters more than an order of magnitude from the true or expected value

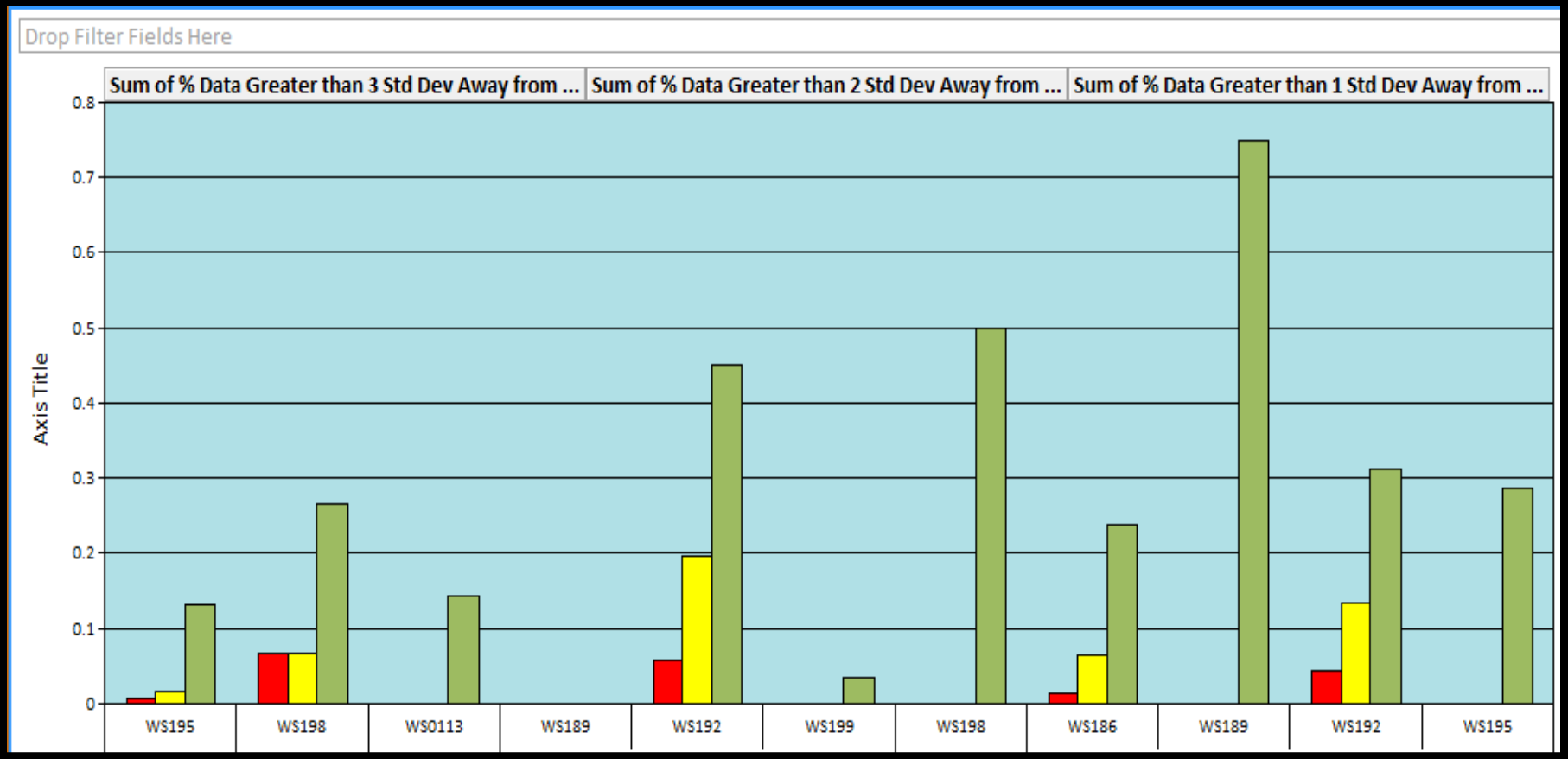
Single Blind PT Summary

PT Type	Comments
HW013	OUTLIER: Hexachlorobenzene NOT ACCEPTABLE: PCBs, Benzene, Carbon Tetrachloride, Heptachlor, Heptachlor Epoxide, DDT
WP414	
WS012	NOT ACCEPTABLE: Hexachlorobenzene, Carbon Tetrachloride, Arsenic, Ammonia
SOIL17	NOT ACCEPTABLE: Lead, PCBs, TPH, O-Cresol, 2,4-Dinitrotoluene, O-Cresol, Pentachlorophenol, DDT
UST03	NOT ACCEPTABLE: Toluene, DRO, TPH

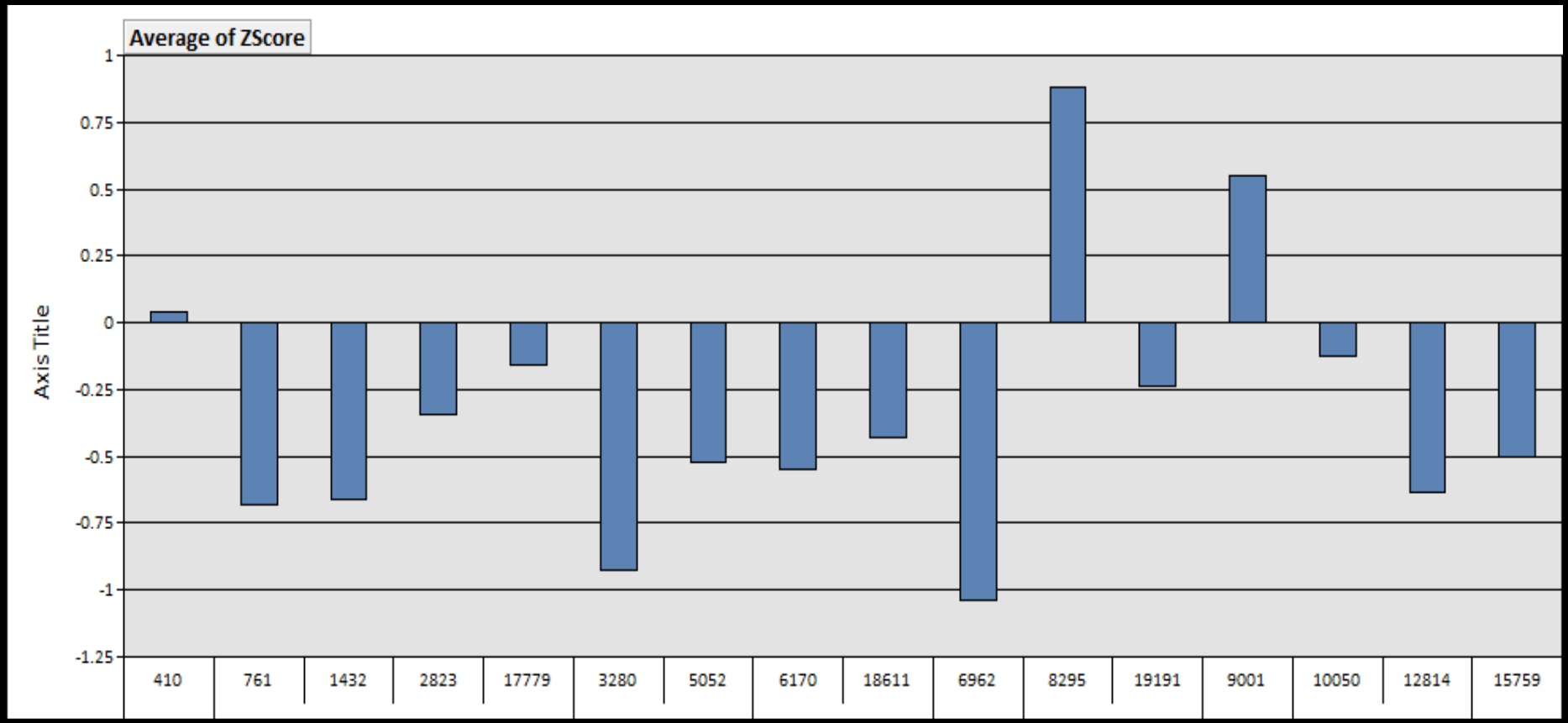
WP204 Study Data (5 labs)



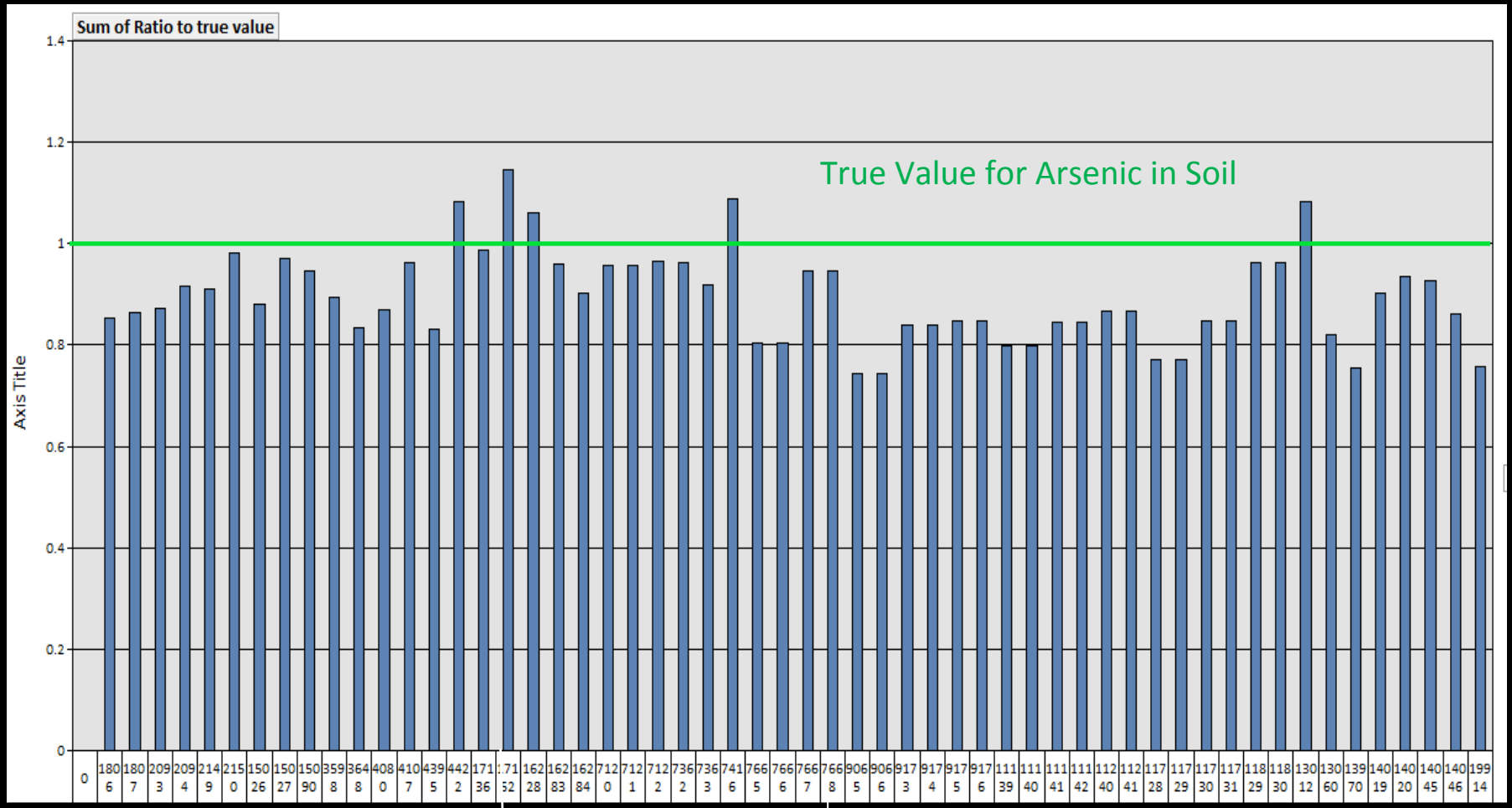
DW PTs all Parameters by Lab
1 stdev, 2 stdev, 3 stdev from Mean



Z-Scores for Phenol in WW by Lab



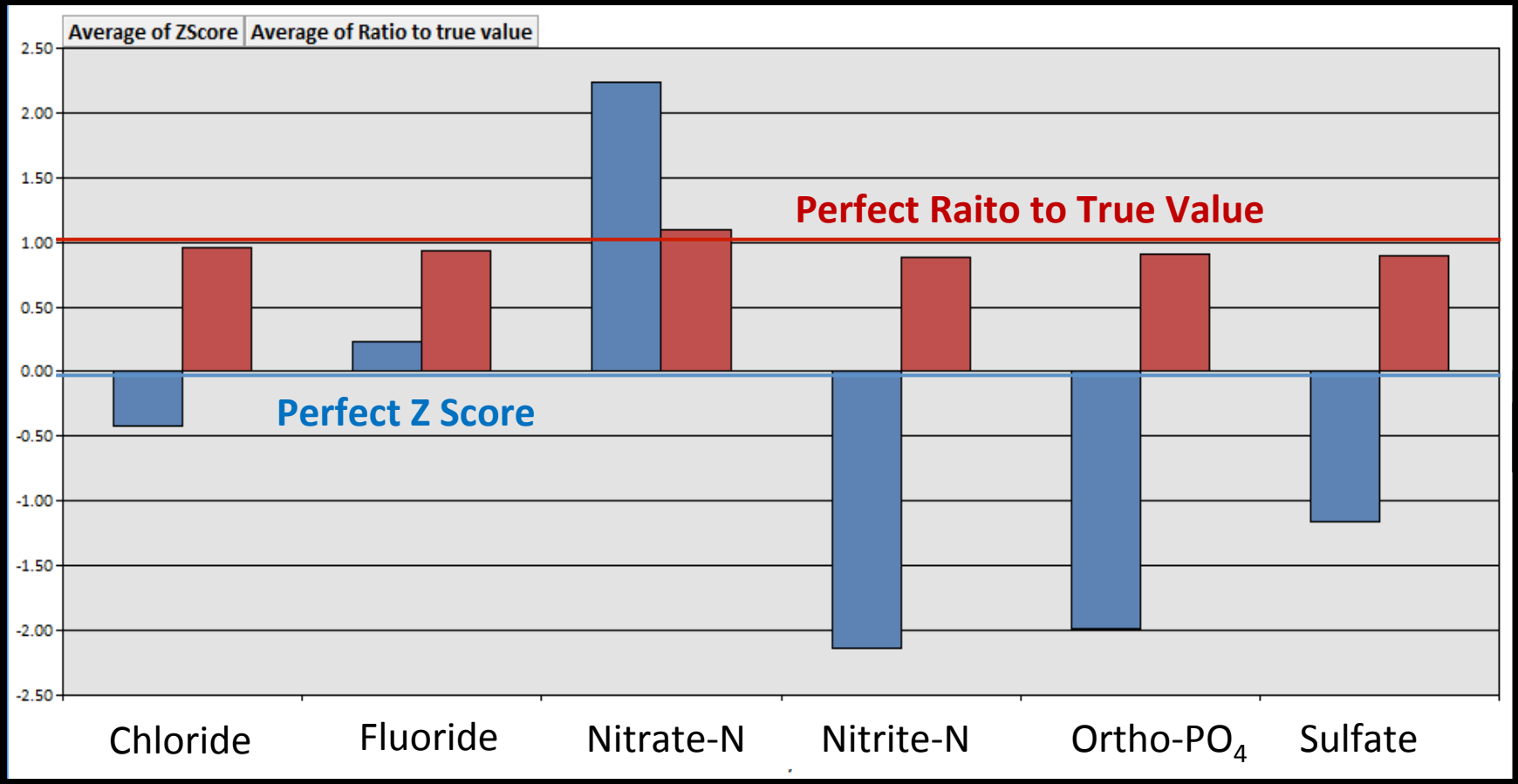
ARSENIC in Soil vs. True Value by all labs



Query Ran: Arsenic Results in Soil for various studies shown by lab as Ratio to True Value of Study

Method 300 in WW

Ave Z-Score, Ave Ratio to True Value



Ford Doubled Blind PT Program Characteristics

- Whole volume samples in provided containers
- Real world matrix, realistic analytes/concentrations
- Submitted following normal procedures (Blind)
- Evaluates every aspect of the process;
  - Bottle order and project management
  - Sampling preservation and handling
  - Analytical and preparation steps
  - Result accuracy in sample matrix
  - Batch QC performance
  - Report content, completeness and accuracy
- Intentional errors introduced to evaluate process

Ford Doubled Blind PT Program

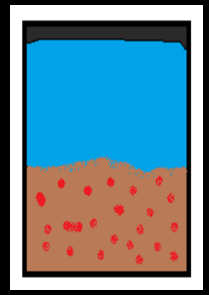
- Low & High level VOCs
- Low level PCBs and Metals
- PCBs
- TPH & O&G
- TCLP VOCs & SVOCs
- VOCs, Metals, PCBs, FP & pH






Ford Doubled Blind PT Program

- TS, TDS, TSS, Metals, PCBs
- Phenols, Wet Chem, BOD, PCBs
- PCBs & Metals
- TCLP & Total VOCs
- pH, FP, Metals, VOCs & SVOCs




CADENA INC.
Ford
2014 Annual Double-Blind Performance Study
LAB DRAFT VERSION - PENDING
CORRECTIVE ACTION RESPONSES (if required)

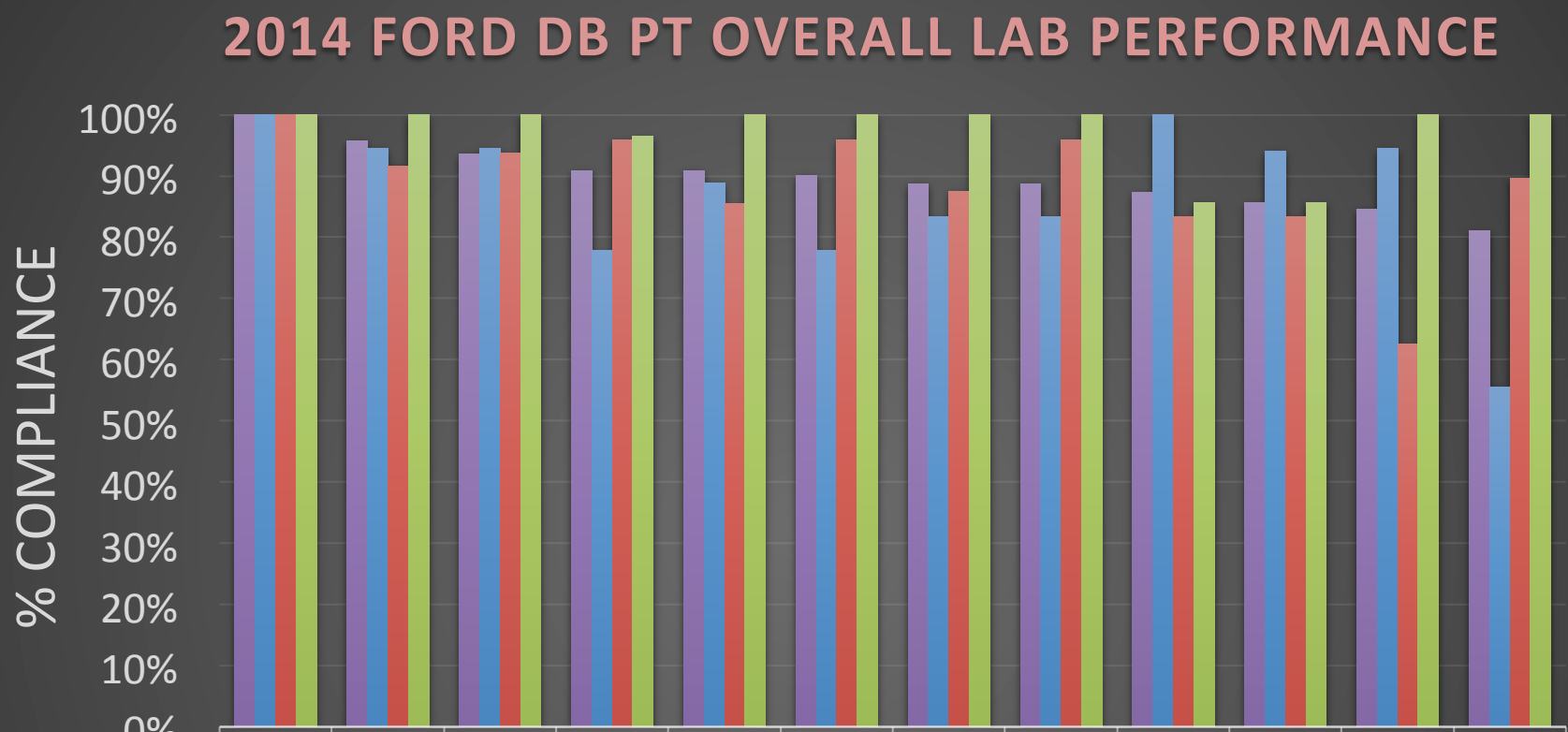
PT Report Contents

- Executive summary
- Sample matrix description
- Sample preparation procedure
- Client requirements
- Performance objectives
- Scores and ranking
- Lessons learned

PT Report Contents

- Performance Objectives
  - Laboratory / Client Communications
  - Bottle order, Preservation, Shipping & Handling
  - Batch QC Performance
  - Deliverables (Certificate of Analysis & EDD)
  - Analytical Performance
  - Program Compliance including TAT
  - Cost Compliance

Overall DB PT Scoring Example



LABORATORY ID	F	B	G	A	D	I	E	C	L	K	H	J
OVERALL SCORE	100%	96%	94%	91%	91%	90%	89%	89%	87%	86%	85%	81%
RESULTS	100%	94%	94%	78%	89%	78%	83%	83%	100%	94%	94%	56%
PROJECT SETUP	100%	92%	94%	96%	85%	96%	88%	96%	83%	83%	63%	90%
REPORT	100%	100%	100%	96%	100%	100%	100%	100%	86%	86%	100%	100%

iDashboard Demonstration

- Live demonstration of interactive presentation of test results and study statistics
- https://eval.ideshboards.com/idashboardsbulb

DB Lessons Learned

PROJECT COMMUNICATIONS

- Data being sent to client prior to Cadena verification
- Client notification procedure not always followed
- Volume correction for low level VOCs in soils
- Bottle order content requirements
- pH was being determined when <20% water
- Ignitability being determined on solid samples
- TCLP procedural errors on multi-phase samples
- OWEP (Method 1330) for metals misapplied
- Correct preservation for Hex Cr not always followed

DB Lessons Learned

MATRIX SPECIFIC FINDINGS

- Sample density correction not always applied
- Certain sample handling procedures caused ZHE losses
- High variability and bias in TS & TSS for samples with particulates >50μm (ASTM D3977 corrects problem)
- ICP/AES yields bias results for As and Se in Anti-Freeze
- MMCs not being reported consistently for OWEP
- CLL Extraction improved acid fraction SVOC recovery
- Heated soxhlet extraction after size reduction improves PCB recovery from concrete
- Salting-out improves PCB recovery from WW

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