LABORATORY INFORMATION MANAGEMENT SYSTEM

The Solution We Are Looking For?

Dan V. Ridolfi, PE MSCE

"Efficiencies afforded us by QESTLab has allowed us to reduce or eliminate temporary and summer staff without loss in quality."

James Parsons, Director of Laboratory Operations
NTH Consultants, Ltd.

PRESENTER PROFILE: DAN RIDOLFI, PE

Consultant (Kleinfelder)

- 7 years in materials engineering roles
- Managed materials testing for one of busiest offices (Las Vegas, NV)
- Implemented one of America's first fully functional CMT LIMS

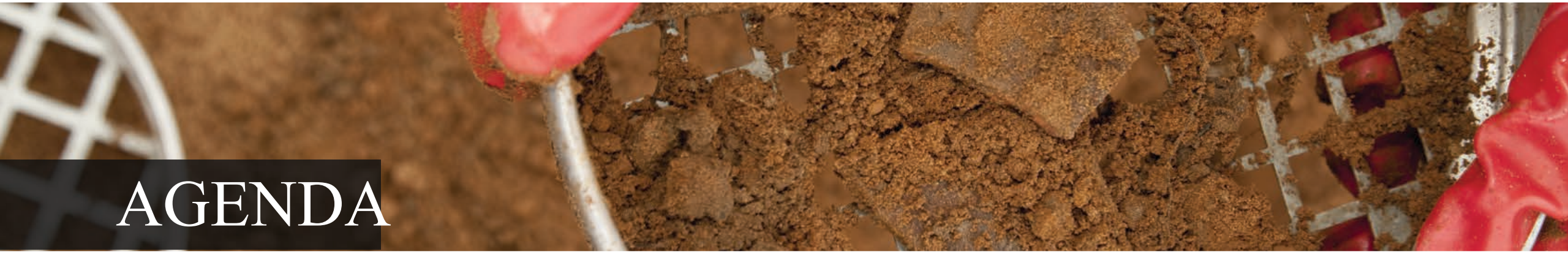
Quality Manager (Granite Construction)

- Almost 10 years managing materials quality
  - Both from materials producer view point, and
  - From construction company perspective

Regional Vice President (Spectra QEST)

- Responsible for fastest growing region of globally leading LIMS vendor

Diverse experience with LIMS: both from user and vendor perspectives



AGENDA

Construction Testing LIMS: Current State of Practice

Adaptable Quality Platform: The Immediate Future

FHWA's EDC-3: e-Construction

DFW Connector: A Case Study

Open Discussion

LIMS: THE FOUNDATION OF A PLATFORM

Information Received in An Organized Manner

Data collection process should change based on point of collection.

Information Validated

Through work flow, approvals, hold points, or other functionality.

Data in a Rational Organized Manner for Construction

Unique information needs to be retrievable by each stakeholder, according to their individual needs.

Data is Secure

Information is presented on a need to know basis.

LIMS FEATURES – DATA ENTRY

Hundreds of test methods

Comprehensive forms for data input

Encourages best test practice

Forms designed for use “on the bench”

Calculation of results in real time

User feedback as per the test method

Integrated with the rest of the LIMS

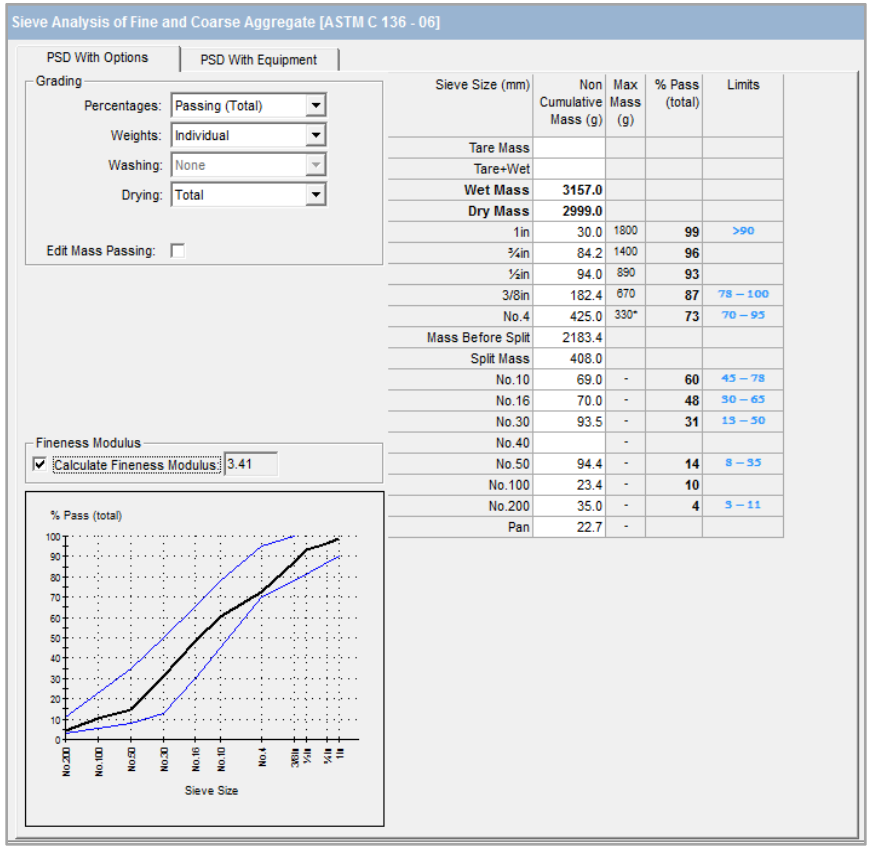
Specifications, calibrations, user access

Flexible and extendable

System can provide simple entry forms too

Bulk entry capability for multiple tests that are done together

Additional tests can be configured using MS Excel



LIMS FEATURES: MANAGEMENT

Equipment Management

Ensure equipment is calibrated and in good working order.

Specifications

Specifications are correct, and available for use by all.

Workflows

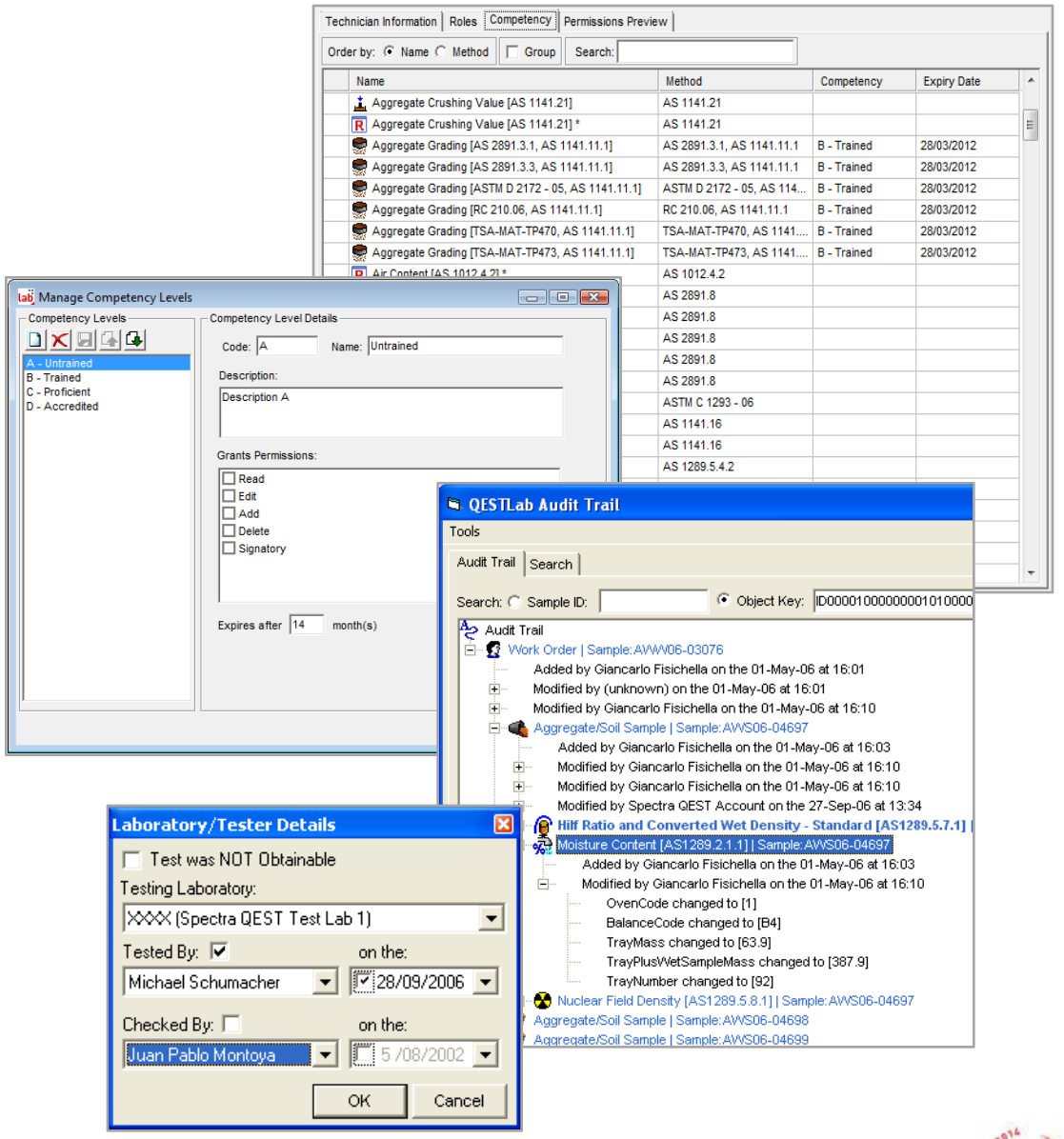
What do I do next?
Who is doing what?

Technician Competencies

Ensure people performing work are qualified.

Quality System Foundation

Ensures overall data integrity.



LIMS FEATURES: CENTRAL DATABASE

Data in once

- All test measurements, for all test results, all observations
  - Whether from job site; or
  - From laboratory
  - Ideally: at point of measure

Ability to track everything

- Samples, whether in field or lab
- All laboratory assets/functions
  - People, specifications, equipment, clients, projects, prices, productivity, etc.

Data available to all (appropriate) stakeholders instantly

- Information is available at appropriate stages of the workflow...
- ...to appropriate people

LIMS FEATURES: REPORTING

User Configurable

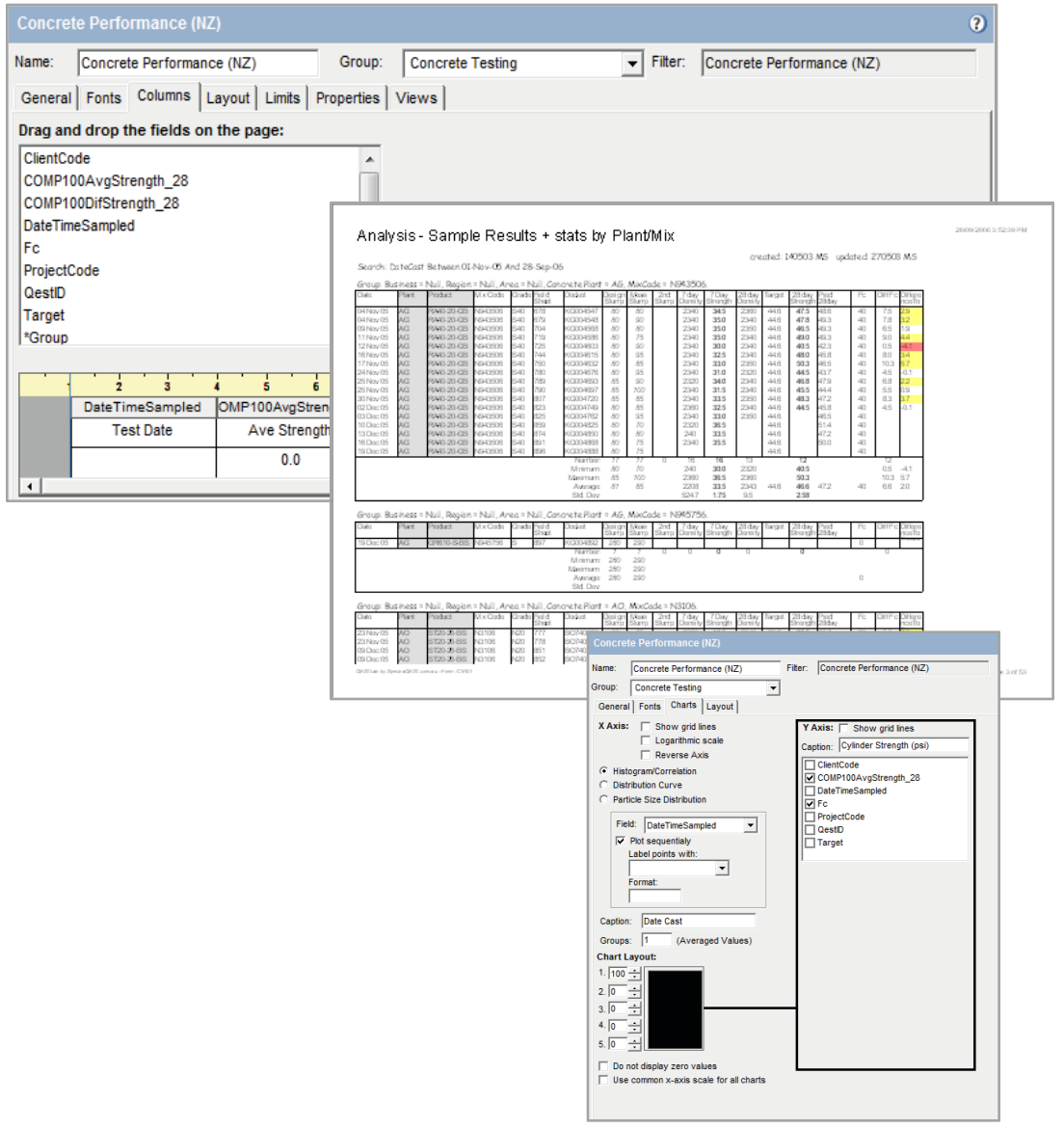
- Filters
- Tabular reports
- Charts
  - Control Charts
  - Cusums
- On virtually all database fields

Statistical Analysis

- Reports automatically calculate
- Exception reporting

Flexibility

- Results can be exported to MS Excel
- Open database allows further mining



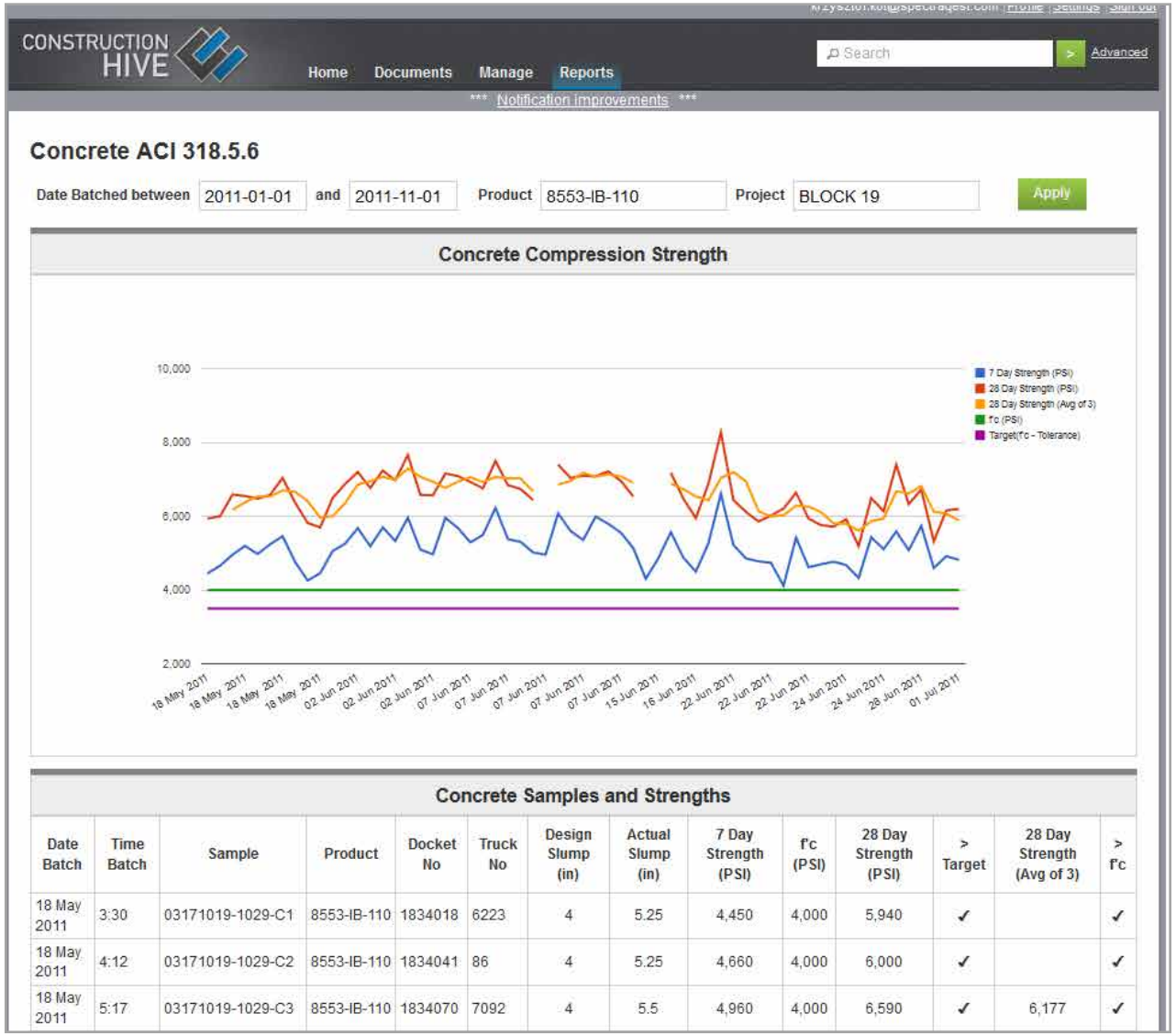
LIMS: CLOUD BASED REPORTING

Cloud Based

Allows for multiple stakeholders to perform pre-predefined analysis based on authorities

On Verified Data

Laboratory only issues reports to the cloud after internal checks and verifications have been applied



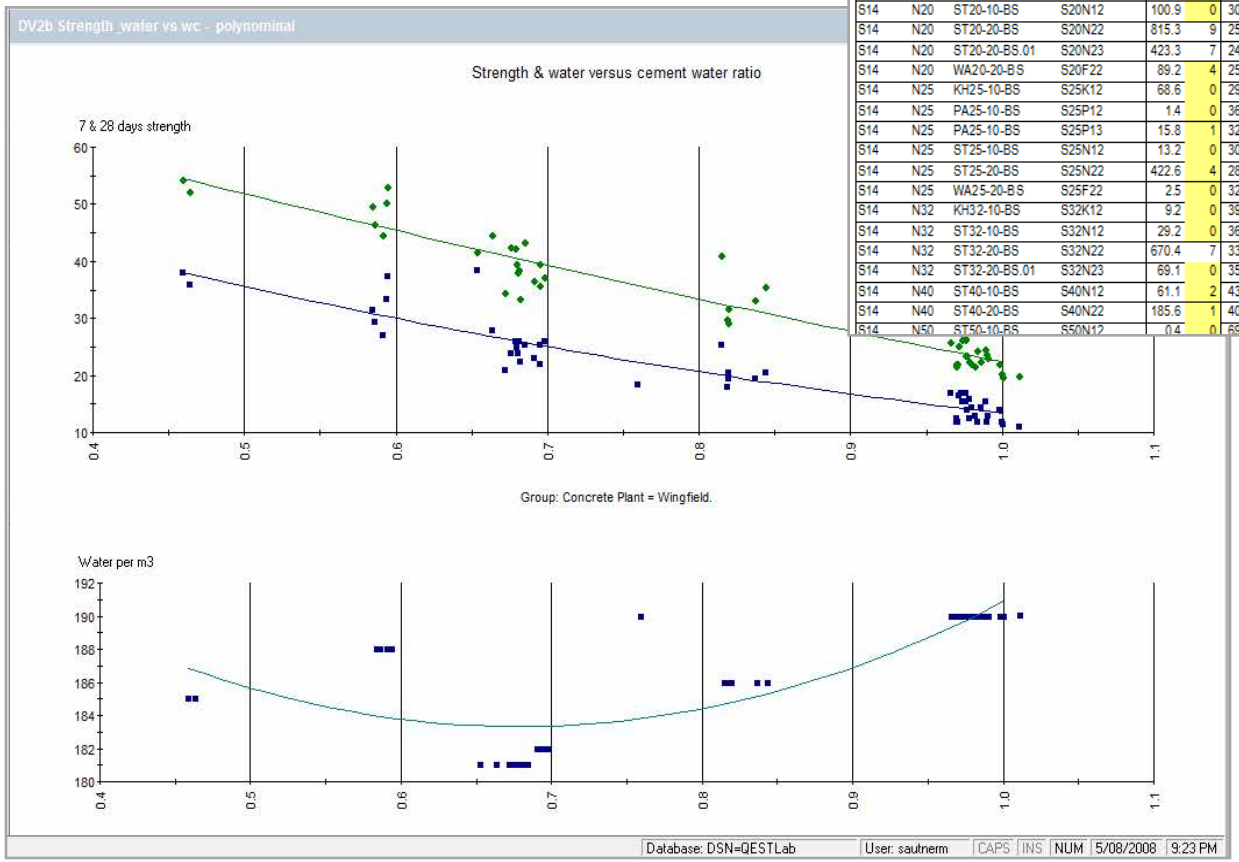
Concrete Samples and Strengths

Date Batch	Time Batch	Sample	Product	Docket No	Truck No	Design Slump (in)	Actual Slump (in)	7 Day Strength (PSI)	f'c (PSI)	28 Day Strength (PSI)	> Target	28 Day Strength (Avg of 3)	> f'c
18 May 2011	3:30	03171019-1029-C1	8553-IB-110	1834018	6223	4	5.25	4,450	4,000	5,940	✓		✓
18 May 2011	4:12	03171019-1029-C2	8553-IB-110	1834041	86	4	5.25	4,660	4,000	6,000	✓		✓
18 May 2011	5:17	03171019-1029-C3	8553-IB-110	1834070	7092	4	5.5	4,960	4,000	6,590	✓	6,177	✓

LIMS: ENGINEERING REPORTING

Complex Reports Possible

- Trend analysis
- Scatter interpretations
- Statistics on calculations



Plant	Grade	Product	Mix	m3 Sum.	No No.	t oem. Avg.	cemnt Avg.	water Avg.	des $ Avg.	act $ Avg.	theo $ Avg.	norm $ Avg.	theo yld Avg.	ds yld Avg.	am yld Avg.	dm Avg.	act Avg.	des Avg.	7den Avg.	28den Avg.	7MPa Avg.	pr28 Avg.	28MPa Avg.	28d S.Dev	targ Avg.	pr-t Avg	act-t Avg	wet %Tr	dry %Tr	fail %Tru
S14	n/a	137464	S25PE22	13.6	0	282.2	225.1	0	82.45	82.69																			
S14	n/a	137560	S20SK12H	2.0	0	263.5	209.0	0	80.50	80.16																			
S14	n/a	137729	S20SP13	4.0	0	266.5	186.0	0	78.74	77.80																			
S14	n/a	137935	S20SN12	7.0	0	271.9	217.9	0	82.04	81.58																			
S14	n/a	SS14:1--BS	SS57	12.0	0	127.8	90.8	270	42.04	43.26	45.09		98.2%	99.0			193	1908											
S14	n/a	SS30:1--BS	SS53	6.6	0	59.4	45.5	270	33.66	35.13	35.18		91.4%	99.0			189	1934											
S14	N10	ST10-10-BS	S10N12	1.8	0	206.7	160.6	180	72.21	74.49	71.33		101.7	99.0			229	2287											
S14	N15	ST15-10-BS	S15N12	7.0	0	226.2	180.8	180	75.12	76.08	74.62		99.5%	99.0			229	2290											
S14	N15	ST15-20-BS	S15N22	5.6	0	210.1	167.3	190	70.66	70.67	70.29		99.3%	99.0			223	2235											
S14	N20	KH20-10-BS	S20K12	99.0	0	285.6	225.1	200	83.33	84.75	79.87		101.6	100.3			226	2258											
S14	N20	PA20-10-BS	S20P13	57.7	1	282.8	194.5	210	79.83	80.76	78.36		102.0	101.1	97.7%	97.7	223	2229	2280	2270	13.0		21.8	0.00				0.0	0.0	0.0
S14	N20	PA20-10-BS.01	S20P12	32.1	1	313.8	243.8	210	87.61	89.82	78.79		101.4	100.3	100.1	99.8	222	2224	2240	2300	14.5		21.0	0.00				0.0	0.0	0.0
S14	N20	PA20-10-BS.01	S20P13	8.8	0	281.5	198.6	190	81.03	81.23	80.35		99.9%	100.0			226	2267											
S14	N20	ST20-10-BS	S20N12	100.9	0	301.7	237.1	180	85.87	88.16	81.79		100.2	99.0			229	2295											
S14	N20	ST20-20-BS	S20N22	815.3	9	250.8	195.7	190	74.40	76.22	74.31		98.7%	99.0	98.7%	98.8	222	2238	2267	2269	13.4	20.6	21.9	1.60	22.5	-1.9	-0.6	33.3	0.0	11.1
S14	N20	ST20-20-BS.01	S20N23	423.3	7	244.7	173.5	190	73.22	73.95	72.62		99.3%	99.0	97.5%	97.5	223	2230	2289	2293	11.4	17.7	20.1	2.50	22.8	-5.1	-2.7	28.6	0.0	42.9
S14	N20	WA20-20-BS	S20F22	89.2	4	254.4	203.8	180	80.45	80.41	79.74		99.0%	99.0	101.6	101.6	230	2300	2265	2278	10.2		17.9	3.56				50.0	0.0	75.0
S14	N25	KH25-10-BS	S25K12	68.6	0	295.0	233.3	196	82.31	83.13	83.80		97.5%	100.1			221	2267											
S14	N25	PA25-10-BS	S25P12	1.4	0	369.5	269.3	190	87.92	92.88	87.45		101.6	100.0			227	2280											
S14	N25	PA25-10-BS	S25P13	15.8	1	327.6	218.8	210	82.47	85.66	82.10		103.4	101.1	99.6%	99.6	223	2231	2240	2240	14.5		30.3	0.00				100.	0.0	0.0
S14	N25	ST25-10-BS	S25N12	13.2	0	308.0	238.5	180	84.94	86.37	84.41		99.8%	99.0			229	2296											
S14	N25	ST25-20-BS	S25N22	422.6	4	284.0	223.5	186	79.77	79.99	80.24		96.7%	98.9	97.7%	97.8	221	2263	2315	2318	20.9	36.1	32.9	5.48	28.0	8.1	4.9	25.0	25.0	0.0
S14	N25	WA25-20-BS	S25F22	2.5	0	327.2	256.4	180	94.77	96.71	82.94		101.1	99.0			231	2303											
S14	N32	KH32-10-BS	S32K12	9.2	0	391.2	297.2	199	91.61	97.64	90.98		103.0	100.2			232	2317											
S14	N32	ST32-10-BS	S32N12	29.2	0	362.4	286.5	180	92.99	95.93	92.37		99.9%	99.0			235	2355											
S14	N32	ST32-20-BS	S32N22	670.4	7	338.2	269.5	181	89.26	89.65	88.39		99.1%	98.9	99.6%	99.6	229	2297	2306	2307	26.0	38.5	37.5	4.05	36.9	1.6	0.6	42.9	0.0	0.0
S14	N32	ST32-20-BS.01	S32N23	69.1	0	357.6	248.7	181	89.81	90.92	86.15		99.7%	99.0			228	2286											
S14	N40	ST40-10-BS	S40N12	61.1	2	434.7	333.1	180	101.94	103.57	100.7		100.1	99.0	101.8	101.8	236	2362	2320	2325	30.8		46.3	6.72				0.0	0.0	0.0
S14	N40	ST40-20-BS	S40N22	185.6	1	400.0	320.2	188	98.29	98.34	97.93		99.0%	99.0	99.0%	99.0	233	2336	2360	2350	31.5	44.2	49.8	0.00	47.1	-2.9	2.7	100.	0.0	0.0
S14	N50	ST50-10-BS	S50N12	0.4	0	697.5	480.0	180	114.79	135.94	114.3		106.3	99.0			237	2373											

LIMS: FOUNDATION OF QUALITY PLATFORM

spectraqest

Laboratory & Technician Accreditation → Test Request → Field Work Allocation → Field Sampling & Testing → Laboratory Testing → Test Reporting → Report Distribution → Analytical Reporting

Construction Material Producers

Testing & Inspection Consultants

Infrastructure Construction

Agencies Owners

LIMS: FOUNDATION OF QUALITY PLATFORM

spectraqest

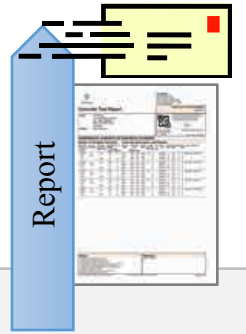
Field System

Field Work Allocation → Field Sampling & Testing

Work
Fiel
Fiel

Work Assignment
Clients, Projects, Specs
Equipment Calibration
Relevant Lab Results

Sample Registration
Time Keeping
Inspection Results
Test Results



LIMS

Laboratory & Technician Accreditation → Test Request → Field Work Allocation → Field Sampling & Testing → Laboratory Testing → Test Reporting → Report Distribution → Analytical Reporting

Fi Review
Sa gistration
Te ment
La Testing

Automation
Data Acquisition
Progress Tracking
Test Report Generation

Test Report Approval
Billing
Analytical Reporting
Dispatch

Clients & Projects
Time Keeping
Billing

Test R Distribution
ns
s Reporting
Analyti Reporting

ERP

Report Distribution → Analytical Reporting

Cloud Access

E-CONSTRUCTION

A FHWA ‘Every Day Counts 3’ Initiative

- Currently systems in construction are
  - Disjointed
  - Paper-based, labour intensive
  - Disconnected
  - Prone to errors as information is entered multiple times
- e-Construction to provide a platform to digitise process

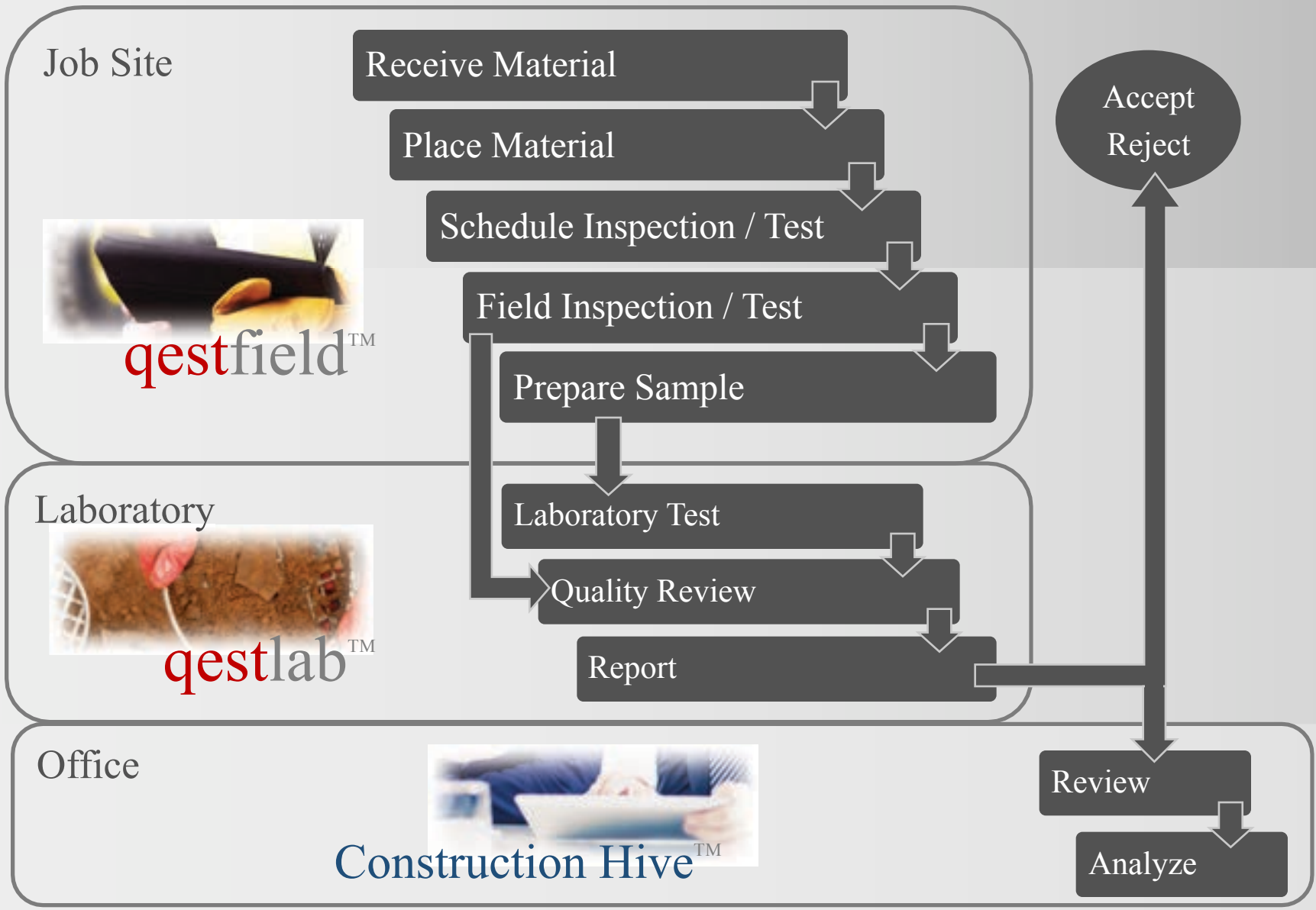
Construction quality

- Complex, technical tests and observations are required
  - In the construction site
  - In the laboratory
- Resulting information generated and consumed by multiple parties

Not a trivial task to manage people, access, data, information, systems

E-CONSTRUCTION: EXAMPLE PLATFORM

spectraqest



PLATFORM BENEFITS: BY STAKEHOLDER

DOT Information Technology

- Stable, professional software vendor; corporate-grade system
- Product popular with major industry players who invest heavily in it

Project Resident Engineer

- Fast notification of failures
- Ability to access raw data and test results, and follow up on re-work

DOT Materials Engineer

- Excellent overview of quality process with ability to forensically analyze
- Quickly get to why data did not validate

DOT Director of Materials

- Ability to benchmark suppliers, materials, performance
- Efficient and thorough project close-out

CASE STUDY: DFW CONNECTOR

QEST SOLUTION FOR THE DFW CONNECTOR

Work Request

QESTField

Field Testing

Field Inspection

Lab Testing

QESTLab

Review/Approve

Construction Hive

Publish/Store

Review/Audit

Search/Analyze

Integrate

DOT: I2MS

Head Contractor: Centric

BENEFITS REALIZED AT DFW CONNECTOR

Efficiency and quality

In the field, the laboratory and the project office. Data in once, faster report turnaround and simpler auditing.

Quality data management

Long term storage of quality data, ordered and searchable. Assists with future quality investigations and claims.

Compliance

TxDOT test methods

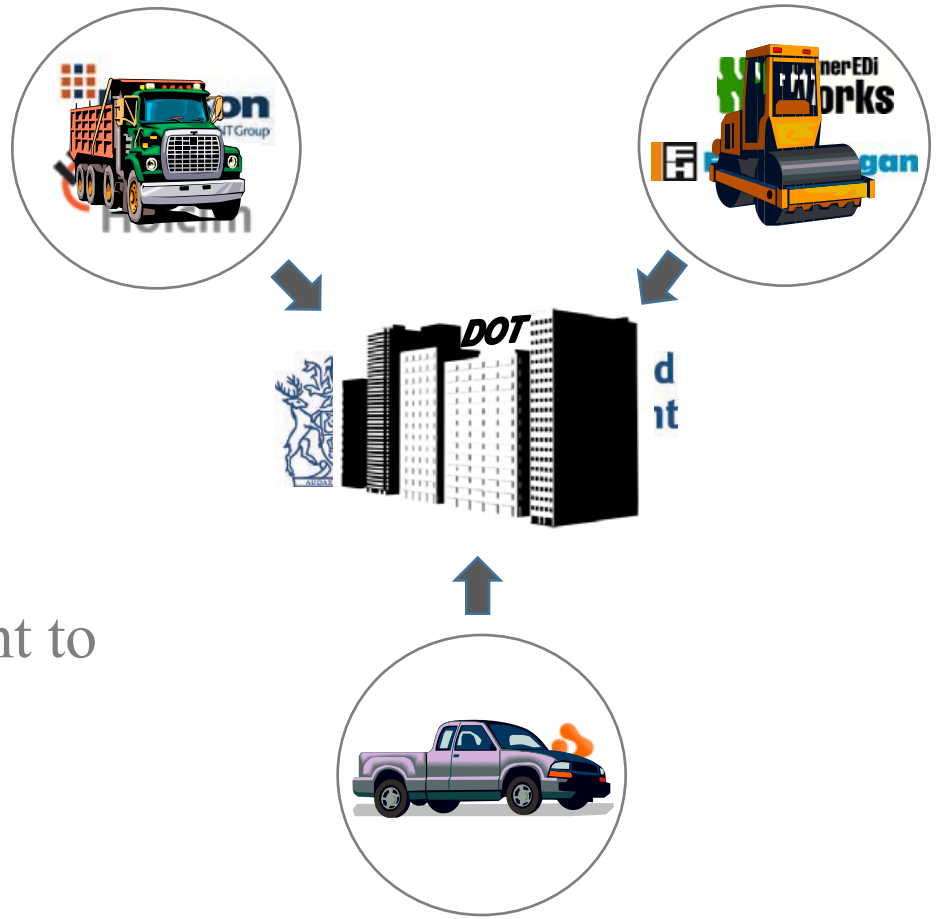
FHWA

TxDOT System (I2MS)

FUTURE VISION

Project Stakeholders

- Materials supplier
- Head contractor
- Testing agency
- Department of Transport



One Platform

- All stakeholders are utilizing platform
- Not because they have to; because they want to

Case Study: QLD DOT

- Currently implementing system
- Materials producers, testing agencies
- and major contractors also on QEST systems
- Possibilities are endless and very exciting

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