

A satellite view of the Earth, showing the Western Hemisphere. The United States, Canada, and Mexico are visible, surrounded by swirling white clouds and deep blue oceans. The curvature of the planet is evident on the right side of the frame.

EQuIS

Air Quality Data Management

Integrated Field Logbooks

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EarthSoft, Inc.

EarthSoft Overview



Who are we?

- ✓ EarthSoft is our company, EQulS is our product
- ✓ Worldwide leader in environmental data management systems
- ✓ Over 100 staff with large Help Desk and Development team
- ✓ EQulS is all we do – continuous development since 1994

What is EQulS?

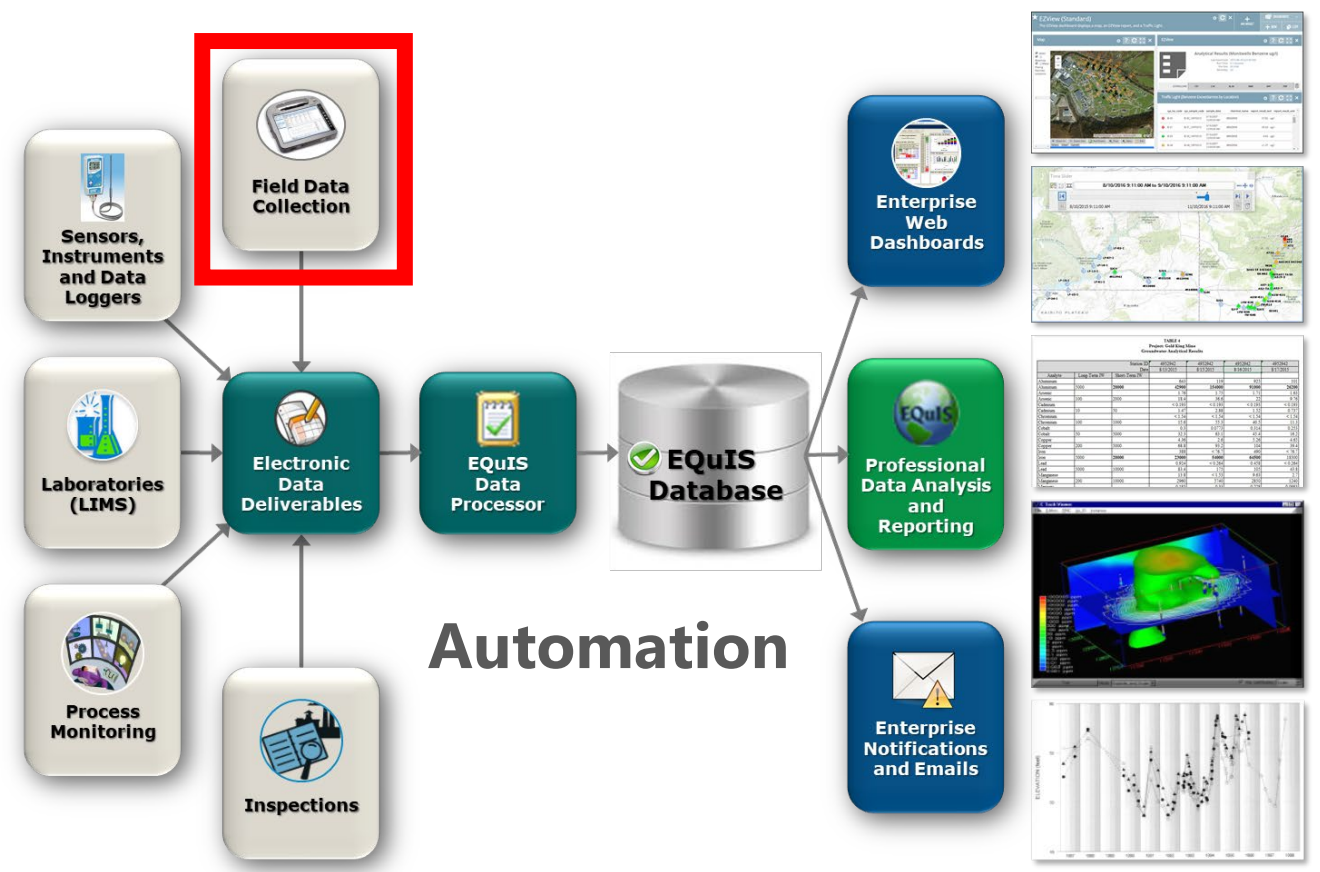
**Environmental
Quality
Information
System**

EQulS™

**An advanced environmental data management
and decision support system**

- ✓ Manage large amounts of air quality data and associated monitoring data
- ✓ Modular and scalable system capable meeting the needs of a multi-site portfolio
- ✓ Meets requirements of power users, casual users, and management
- ✓ Designed for workflow automation and quality control of the entire data management cycle

Data Management Workflow



Automation

- ✓ Field Planning
- ✓ Field Data Collection
- ✓ Sensor/Logger Integration
- ✓ LIMS Integration
- ✓ Data Verification & Validation
- ✓ Reporting (AQS)
- ✓ Visualization

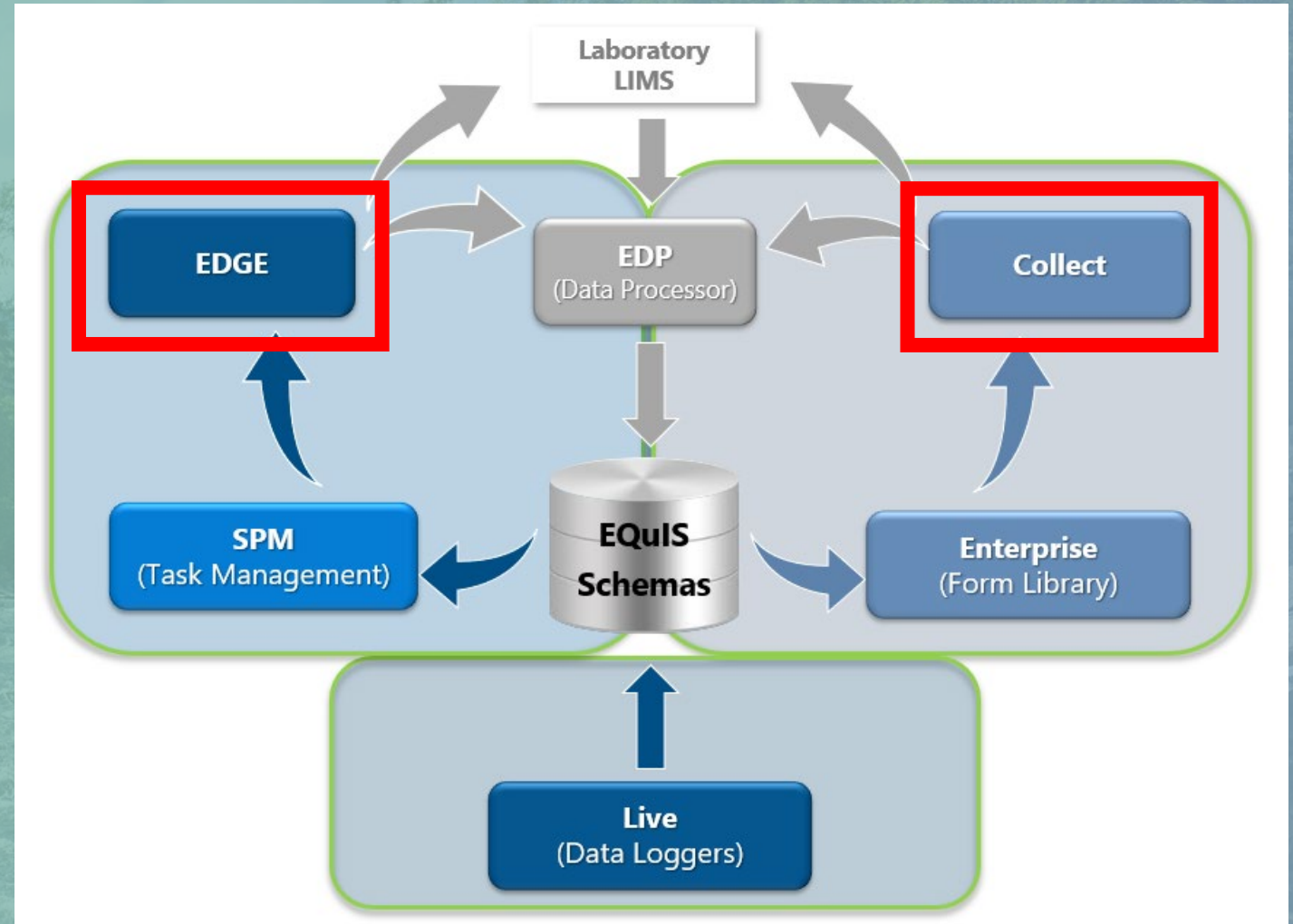
Field Logbooks

Goal: Integrate data collection with your data management workflow

Collect field data –
samples, measurements,
or inspections

Enter data into phones,
tablets or laptops

Submit data to
laboratories and the
database



Data Management Workflow

WORKFLOW AUTOMATION



QA AUDIT WORKSHEET
PM10/PM2.5 CONTINUOUS (BAM) SAMPLERS

Date: _____
Site Name: _____
Address: _____
City: _____ State: _____ Zip: _____

PM10 / PM2.5 Collocated: / Primary / Secondary: / Match One Cert on hand:

Manufacturer: Serial Number:
Calibration Date: Calibration Lab:
Cat. Equip. Cert. Date:

Flow Rate: Assult: Station: Last Date:

Temp: Assult: Station: Meter Date:

MP: Assult: Station:

K-Factor: Compared to factory value:

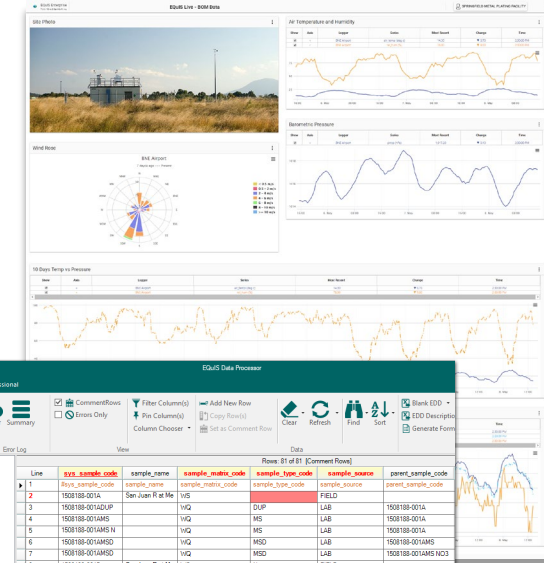
Background: Last Test: Date:

Date recorded and verified by:

Authorized for Recordation:

Report Type: Calibration Date: 11/12/2016 00:00-4/12/2017 23:00 Avg Type: None

Date	Monitor	Units	ZMFL	ZMFL%	SP4	SP4%	Factor	Factor	SCPL%	ZMFL	SP4	Status
11/12/2016 04:14	NEPH	Bacnet	0.0000	-0.0021	0.2012	0.1834	-0.0021	1.039	-9.3	0.0023	0.0015	Valid
11/22/2016 13:48	NEPH	Bacnet	0.0000	-0.0056	0.0000	0.2110	-0.0056	0.000	0.0	0.0007	0.0022	Invalid
11/22/2016 14:42	NEPH	Bacnet	0.0000	0.0012	0.2028	0.1964	0.0012	1.070	-2.8	0.0022	0.0021	Valid
11/28/2016 04:14	NEPH	Bacnet	0.0000	-0.0035	0.1987	0.1964	-0.0035	1.045	-6.1	0.0007	0.0048	Valid
12/12/2016 04:14	NEPH	Bacnet	0.0000	-0.0030	0.2032	0.1964	-0.0030	1.008	-2.3	0.0009	0.0015	Valid
12/26/2016 04:14	NEPH	Bacnet	0.0000	-0.0014	0.2054	0.1862	-0.0014	1.060	-9.3	0.0027	0.0020	Valid
1/9/2017 04:14	NEPH	Bacnet	0.0000	-0.0080	0.2002	0.1782	-0.0080	1.069	-11.0	0.0011	0.0012	Invalid
1/10/2017 14:15	NEPH	Bacnet	0.0000	-0.0031	0.1996	0.2028	-0.0031	0.234	-85.5	0.0016	0.0010	Invalid
1/13/2017 04:14	NEPH	Bacnet	0.0000	-0.0029	0.2000	0.1792	-0.0029	1.055	-62.3	0.0023	0.0023	Invalid
1/26/2017 13:18	NEPH	Bacnet	0.0000	0.0006	0.2087	0.2009	0.0006	1.073	-4.1	0.0016	0.0013	Valid
2/6/2017 04:14	NEPH	Bacnet	0.0000	-0.0055	0.1970	0.1869	-0.0055	1.023	-5.1	0.0061	0.0027	Valid
2/20/2017 04:14	NEPH	Bacnet	0.0000	-0.0035	0.1983	0.1933	-0.0035	1.012	-3.0	0.0020	0.0042	Valid
2/22/2017 13:21	NEPH	Bacnet	0.0000	-0.0012	0.2034	0.1981	-0.0012	1.020	-2.5	0.0038	0.0031	Valid
3/6/2017 04:14	NEPH	Bacnet	0.0000	-0.0010	0.2080	0.1821	-0.0010	1.025	-3.9	0.0011	0.0042	Valid
3/20/2017 04:14	NEPH	Bacnet	0.0000	0.0061	0.2033	0.2124	0.0061	0.985	4.4	0.0020	0.0080	Valid
4/3/2017 04:14	NEPH	Bacnet	0.0000	-0.0072	0.2033	0.2173	-0.0072	0.905	6.8	0.0020	0.0046	Valid



Flow Rate Verification

Monitor Flow Rate (L/min)

Assessment Flow Rate (L/min)

Percent Difference (%)

Flow Rate Verification

General Information

Monitor Serial Number

Test

Assessment Number=1

Devices Used

Task Code

AQS Transaction

FlowRateVerification



EQUS Data Processor

Line	Site	Sample Code	Sample Name	Sample Multi Code	Sample Type Code	Sample Source	Parent Sample Code
1	150818-0014	TestResult_1	San Juan R at Me				
2	150818-0014	TestBack_C_1					
3	150818-0014DUP	Flow_v1			DUP	LAB	150818-0014
4	150818-0014MS				MS	LAB	150818-0014
5	150818-0014MS N				MS	LAB	150818-0014
6	150818-0014MSD				MSD	LAB	150818-0014MS
7	150818-0014MSD				MSD	LAB	150818-0014MS NCD
8	150818-0018		San Juan R at Me		N	FIELD	
9	150818-0018C		San Juan R at Me		N	FIELD	
10	150818-0018MS				MS	LAB	150818-0018
11	150818-0018MSD				MSD	LAB	150818-0018C
12	150818-0018MSD				MSD	LAB	150818-0018MS

```
RD|Action Code|State Code|County Code|Site ID|Parameter ID|Sample Duration|Unit|Method|Date|Start Time|Sample Value|Null Data Code|Sampling Frequency|Monitor Protocol (MP) ID|Qualifier - 1|Qualifier - 2|Qualifier - 3|Qualifier - 4|Qualifier - 5|Qualifier - 6|Qualifier - 7|Qualifier - 8|Qualifier - 9|Qualifier - 10|Alternate Method Detectable Limit|Uncertainty
```

EQUS Collect & EDGE

Task planning/tracking

Discrete samples (eCOC)

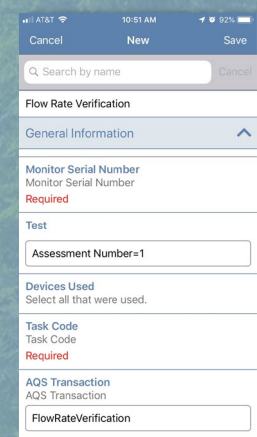
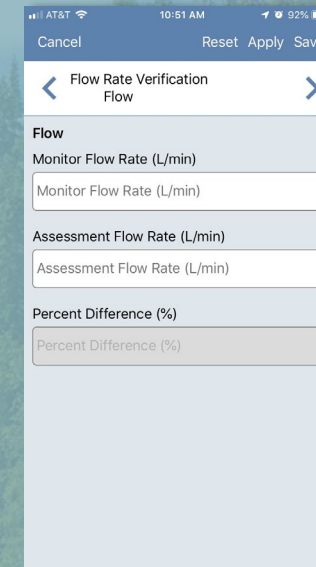
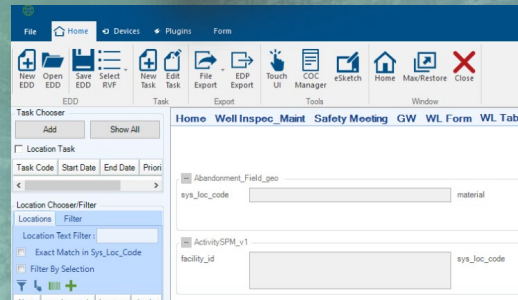
Continuous monitoring

Sensor/logger datafile download

Instrument Calibration/Maintenance

Field Notes

Facility	Plan/Station	Task/Instrument/Station	MAGr	Mag Type	MAGmembers	Sys_Loc_Code	Sys_sample_code
SC0270	A 30day	PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)
		PM2.5 FBM	PM2.5_Field	Lab	Field		
		PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)
	A2 30day	PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)
		PM2.5 FBM	PM2.5_Field	Lab	Field		
		PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)
	A 60day	TSP	TSP_Merats	Lab	Merats List	PCID	Sample_1(Code from EPA)
		TSP	TSP_Mass	Lab	Mass		Sample_1(Code from EPA)
		TSP	TSP_Field	Lab	Field		
	MATES V	PM2.5_Mass	Lab	Mass	PCID		Sample_1
		PM2.5_Merats	Lab	Merats List			Sample_1
		PM2.5_Carbon	Lab	Carbon List			Sample_2
PM2.5_Field		Lab	Field			Sample_3	
TSP_Cr6		Lab	Cr6			Sample_3	
TSP_Merats		Lab	Merats List			Sample_4	
PAMS	PAMS_VOC	Lab	VOC List	PCID		Sample_1(Code from EPA)	
	PAMS_Carbon	Lab	Carbon List			Sample_2(Code from EPA)	
	PAMS_Field	Lab	Field				
B 60day	PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)	
	PM2.5 FBM	PM2.5_Field	Lab	Field			
	PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)	
A 1 Month FB	PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)	
	PM2.5 FBM	PM2.5_Field	Lab	Field			
	PM2.5 FBM	PM2.5_Mass	Lab	Mass	PCID	Sample_1(Code from EPA)	



AQS	Reports
AQS - 1 Point QC	New
AQS - Annual PE	New
AQS - Flow Rate Verification	New
AQS - Calibrations	New
AQS - Maintenance	New
AQS - Pb Analysis Audit	New
AQS - Semi Annual Flow Rate Audit	New

CURRENT STATE

- Redundant and manual systems
- Limited or varied data quality control (QC) procedures
- Limited data ownership
- Limited accessibility
- Limited process automation
- No external collaboration ability
- Limited project management tools



DESIRED STATE

- Single centralized system
- High quality, consistent data
- Established data QC standards
- Full client ownership
- Unlimited web accessibility
- Cost savings via automation
- Easy collaboration outside your internal network
- Efficient tools to help manage projects

- ✓ Hosting & Security: Software-as-a-Service vs. On-premise
- ✓ Hardware & Browsers
- ✓ Flexibility, Supportability, & Integration
- ✓ Implementation: Timeline, Budget, Requirements, UAT, Go-Live
- ✓ Technical: Validation, LIMS Integration, Instrument QC, AQS Deliverables, CARB Deliverables

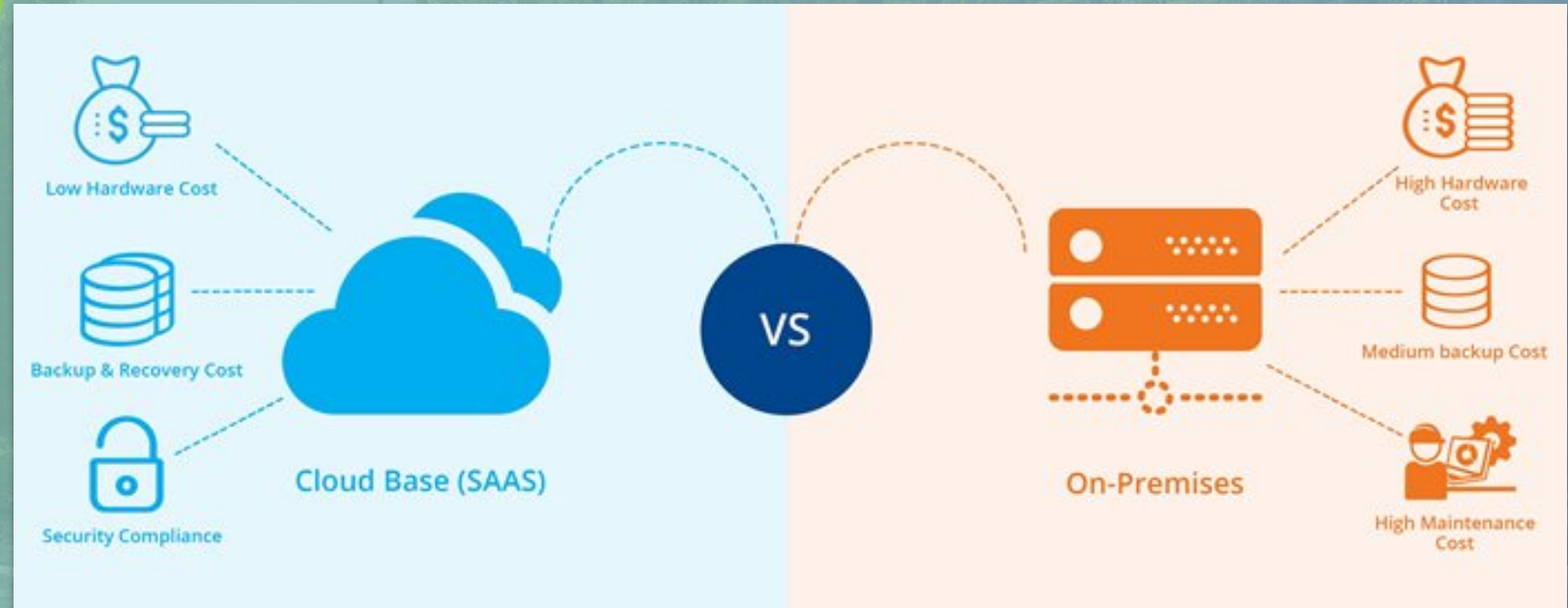


Where to host your data?

Cloud vs. On-Prem

EarthSoft supports both models for a diverse client base

Considerations:
Maintenance, security, upgrades, backups, etc.



Cloud Hosting: Microsoft Azure

Why Azure?

FedRAMP Compliant

Security, Accessibility,
Reliability



Point-in-time restore
Backup Retention
Geographic Redundancy
Integrated Monitoring/Alerts
Threat Detection

SSL Data Encryption (in motion)
Transparent Data Encryption (at rest)
SSMS Access for Power Users



Manage Permissions

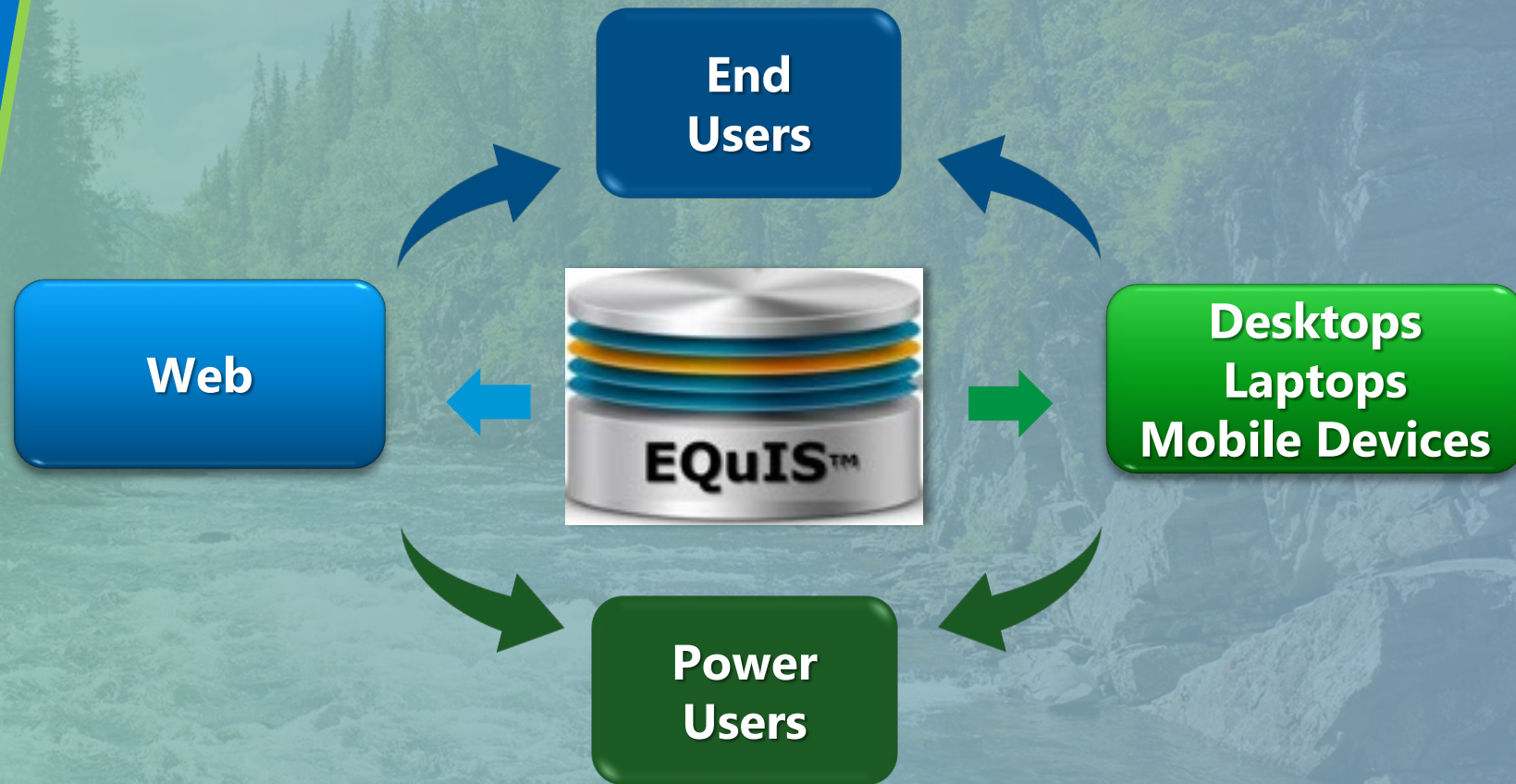
Create data management plan and workflow documentation

Define/assign roles: field, lab, data manager, validator, end user, etc.

Manage User: Multi-factor authentication, Windows authentication, password manager

AUDIT, AUDIT, AUDIT

One Database — Different User Interfaces



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Hardware & Browsers

EQuIS Professional: Laptop + Windows 10

EQuIS Enterprise: Browser

EQuIS Collect: Mobile



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Flexibility Supportability Integration



- Data management workflows have similar objectives but are different in the way tasks are assigned and completed
- System should accommodate these differences while maintaining a sharp focus on quality management and automation
- COTS vs. Custom: EarthSoft supports clients in 52 countries with a team of over 100 people
- Quarterly releases include new tools, bug fixes, patches, and tailored development
- What other systems need to integrate with your database? Field instruments? GIS? Air dispersion models? Statistical software? Public data portals?
- EarthSoft's **Open System Business Model** attracts 3rd party developers to build on top of EQulS

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Implementation

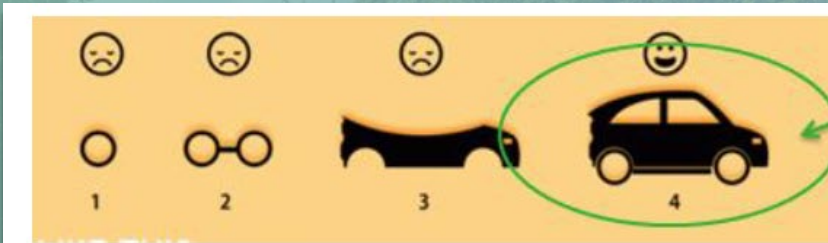
Timeline

Budget

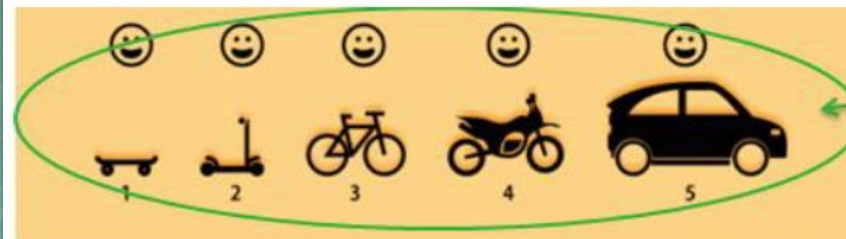
Scope

UAT

Go-Live



Waterfall: Business value realized only at the end of the project.



Agile: Business value delivered in increments, benefits realized sooner.

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- ✓ Implementation: Timeline, Budget, Requirements, UAT, Go-Live
- ✓ Technical: Validation, LIMS Integration, Instrument QC, AQS Deliverables, CARB Deliverables



Technical Functional Requirements

- Data Quality Objectives (Automated Validation)
- LIMS Integration (Onsite vs. 3rd Party Lab)
- Instrument QC: Make sure your database is configured as a vibrant tool in the workflow, not just a black box repository
- AQS Deliverables
- CARB Deliverables
- Internal Reporting
- Public Data Display

Transaction types available for submission:

[AA - Site Basic](#)

[AB - Site Street](#)

[AC - Site Open Path](#)

[AD - Site Sampler](#)

[AE - Site Sampler Channel](#)

[MA - Monitor Basic](#)

[MB - Monitor Sampling Period](#)

[MC - Monitor Type](#)

[MD - Monitor Agency Role](#)

[ME - Monitor Objective](#)

[MF - Monitor Sampling Schedule](#)

[MG - Monitor Tangent Road](#)

[MH - Monitor Obstruction](#)

[MI - Monitor Regulatory Compliance](#)

[MJ - Monitor Collocation Period](#)

[MM - Monitor Method](#)

[MN - Monitor Network Affiliation](#)

[MO - Monitor Primary Period](#)

[MP - Monitor Channel](#)

[MX - Monitor NAAQS Exclusion](#)

[RC - Raw Composite](#)

[RD - Raw Data](#)

[RB - Raw Blanks](#)

[QA - 1-Point QC](#)

[QA - Annual PE](#)

[QA - Flow Rate Verification](#)

[QA - Semi Annual Flow Rate Audit](#)

[QA - Flow Rate Verification for PMc](#)

[QA - Semi Annual Flow Rate Audit for PMc](#)

[QA - Performance Evaluation Program](#)

[QA - National Performance Audit Program](#)

[QA - Field Proficiency Test](#)

[QA - Duplicate](#)

[QA - Replicate](#)

[QA - Pb Analysis Audit](#)

[QA - Lab Proficiency Test](#)

[QA - Ambient Air Protocol Gas Verification Program](#)

[QA - Ozone SRP and Ozone Transfer Standard Verification](#)

[QA - Speciation Flow Rate Verification](#)

[QA - Speciation Semi-Annual Flow Rate Audit](#)



Thank you! Questions?

