LR Senergy

A member of the Lloyd's Register group

Using geospatial technology, web-mapping and digital data services to deliver offshore project efficiencies

IOGP / IMCA / THSiS Industry Day
20th April 2016

Martin Day
Head of Survey & Geospatial
LR Senergy Survey & GeoEngineering

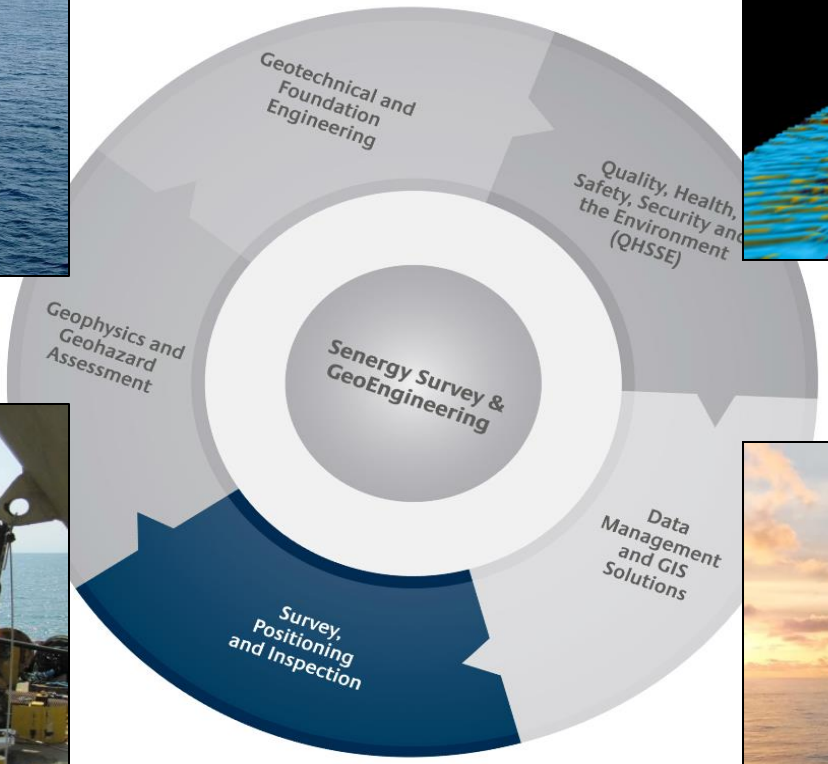
www.lr-senergy.com

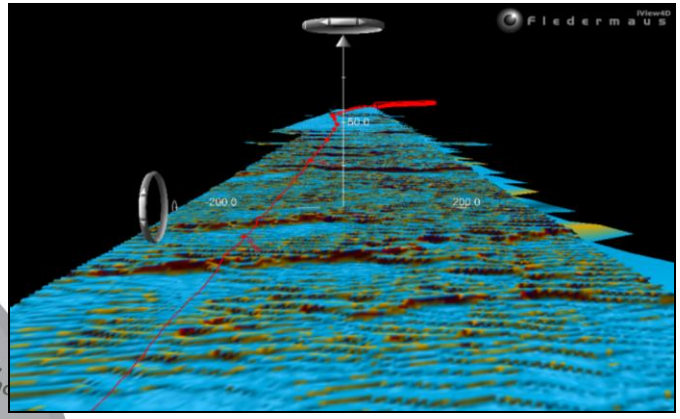
LR Senergy Survey & GeoEngineering

- Primary Services
  - Consultancy
  - Project Management
  - Client Representation
  - *GIS, Data Management & Data Delivery Services*

- Core discipline areas
  - Geophysical survey project management
  - Geotechnical site investigation project management
  - Geophysics and geo-hazards consultancy
  - Geotechnical and foundation engineering consultancy
  - Strategic integrated geo site characterisation
  - Ground risk management
  - Data management & data delivery
  - Cable installation
  - Offshore construction support
  - Subsea facilities inspection project management
  - Positioning QA/QC services

LR Senergy Survey & GeoEngineering



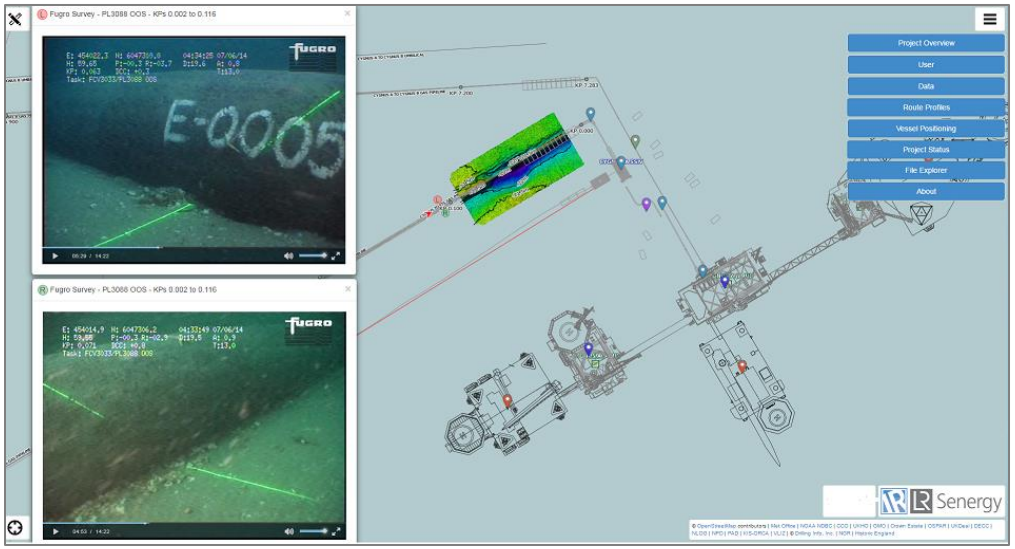


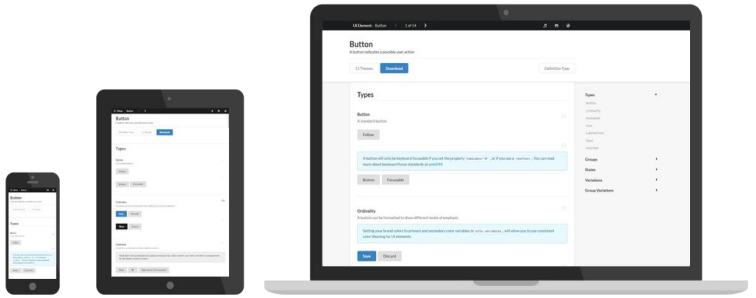
Introduction

- Web Mapping Services
  - Cloud data management
    - Static data
    - Shape files, MXD Databases
    - Images, video, documents
  - Project planning
    - Cable routing
    - Offshore Wind farm consenting
  - Emergency response
    - Vessel tracking
    - Helicopter tracking

  - Project Management Use Case
    - Visualise status and progress of offshore projects
      - Vessel tracking ; metocean
    - Challenge is to identify tangible cost efficiencies
      - Digital data services
      - Software development within the browser

  - Three case Studies
    - Lay and trench project support
    - Rig Positioning QA/QC
    - Marine planning for OWF's





Digital Data Services

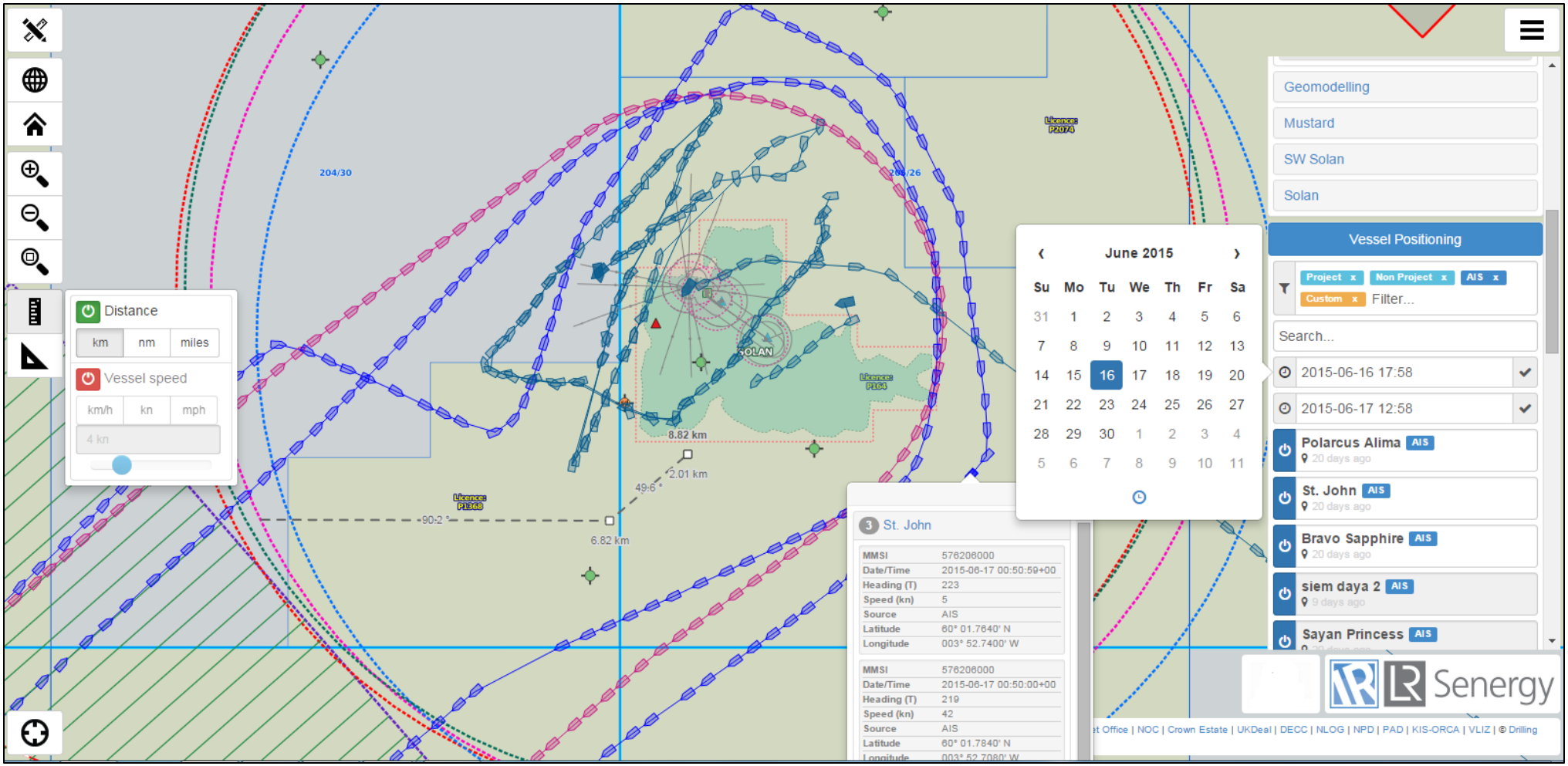
- Example data types and sources
  - Web map services
  - Vessel positions
  - Metocean data
  - Proprietary data feeds
  - Video streaming
  - File share through 3rd party synchronization services
- Create a valuable database
  - Project performance data
  - HSEQ Data
  - Vessel, simops data
  - Metocean data….

timestamp	vessel_x	vessel_y	vessel_rkp	plough_x	plough_y	plough_rkp	bathy_depth	tow_force	plough_speed	burial_depth	pitch	roll
2015-11-05 15:59:55+00	399496.04	5973240.97	121.4031	399722.57	5973213.94	121.1775	66.01	36.8	259.1	1.68	1.4	-0.1
2015-11-05 15:59:45+00	399497.1	5973241.74	121.402	399722.83	5973213.82	121.1772	66.01	38.7	257	1.67	1.4	-0.1
2015-11-05 15:59:35+00	399498.31	5973242.29	121.4008	399724.48	5973213.56	121.1755	66.01	34.6	254.1	1.66	1.4	-0.1
2015-11-05 15:59:25+00	399499.41	5973242.57	121.3997	399725.43	5973213.14	121.1745	66	34.6	252	1.66	1.5	-0.2
2015-11-05 15:59:15+00	399500.23	5973243.08	121.3989	399726.44	5973213.44	121.1736	66.02	35.5	251.2	1.67	1.4	-0.2
2015-11-05 15:59:05+00	399500.86	5973243.68	121.3982	399726.67	5973213.66	121.1734	66.02	37.3	250.2	1.67	1.5	-0.1
2015-11-05 15:58:55+00	399501.51	5973243.76	121.3976	399727.2	5973213.27	121.1728	66	38.4	248.1	1.67	1.5	-0.1
2015-11-05 15:58:45+00	399502.1	5973243.74	121.397	399727.92	5973214.05	121.1721	66	39.4	246.2	1.69	1.5	0
2015-11-05 15:58:35+00	399502.74	5973244.39	121.3963	399728.42	5973213.56	121.1716	66.01	38.7	244.6	1.69	1.5	0
2015-11-05 15:58:25+00	399503.37	5973244.91	121.3957	399728.83	5973213.75	121.1712	66.03	37.8	244	1.69	1.4	0
2015-11-05 15:58:15+00	399503.98	5973245.02	121.3951	399729.62	5973213.53	121.1704	66.04	37.2	245.2	1.69	1.5	-0.1
2015-11-05 15:58:05+00	399504.43	5973244.76	121.3946	399729.67	5973212.76	121.1703	66.02	33.9	248.7	1.69	1.4	-0.1
2015-11-05 15:57:55+00	399504.63	5973244.38	121.3944	399730.19	5973213.02	121.1698	66.02	34.4	253.1	1.69	1.5	-0.1
2015-11-05 15:57:45+00	399504.88	5973244.34	121.3942	399730.46	5973213.42	121.1696	66.03	37.3	257.1	1.69	1.5	-0.1
2015-11-05 15:57:35+00	399505.09	5973244.31	121.394	399730.77	5973212.92	121.1692	66.02	36.4	259.3	1.69	1.5	-0.1
2015-11-05 15:57:25+00	399505.43	5973244.33	121.3936	399730.92	5973212.63	121.169	66.01	28.8	261.1	1.69	1.5	-0.1
2015-11-05 15:57:15+00	399505.57	5973244.4	121.3935	399731.11	5973213.42	121.1689	66	26.7	262.5	1.69	1.4	-0.1
2015-11-05 15:57:05+00	399505.39	5973244.47	121.3937	399730.96	5973213.4	121.1691	66	43.2	263.2	1.69	1.5	-0.1
2015-11-05 15:56:55+00	399505.67	5973244.88	121.3934	399731.52	5973213.28	121.1685	66.01	45.1	260.4	1.67	1.5	-0.1
2015-11-05 15:56:45+00	399507.01	5973245.2	121.392	399732.78	5973212.86	121.1672	66.01	31.7	255.9	1.64	1.4	0.1
2015-11-05 15:56:35+00	399508.72	5973245.41	121.3903	399733.86	5973215.51	121.1664	66	29.7	251.8	1.64	1.5	0.1
2015-11-05 15:56:25+00	399510.44	5973245.68	121.3886	399735.62	5973213.47	121.1644	66.01	30.2	248.8	1.64	1.4	0
2015-11-05 15:56:15+00	399511.87	5973246.23	121.3871	399737.33	5973213.22	121.1627	66.02	38.5	246.5	1.64	1.4	0
2015-11-05 15:56:05+00	399513.22	5973246.67	121.3858	399738.62	5973212.61	121.1614	66.02	38.2	243.9	1.64	1.4	0
2015-11-05 15:55:55+00	399514.65	5973246.65	121.3844	399739.82	5973212.34	121.1601	66.03	35.8	241.1	1.64	1.4	0
2015-11-05 15:55:45+00	399516.06	5973246.68	121.3829	399741.43	5973212.37	121.1585	66.05	35.9	238.2	1.62	1.5	-0.1
2015-11-05 15:55:35+00	399517.37	5973246.6	121.3816	399742.72	5973211.63	121.1572	66.05	32.6	234.9	1.63	1.5	-0.1
2015-11-05 15:55:25+00	399518.57	5973246.54	121.3804	399743.57	5973211.56	121.1563	66.07	33	232.1	1.62	1.4	-0.1
2015-11-05 15:55:15+00	399519.53	5973246.46	121.3795	399744.77	5973211.96	121.1552	66.08	33.6	230	1.62	1.4	-0.1
2015-11-05 15:55:05+00	399520.33	5973246.26	121.3787	399745.36	5973212.25	121.1546	66.08	34.3	228.2	1.64	1.5	-0.1
2015-11-05 15:54:55+00	399520.9	5973245.95	121.3781	399746.18	5973211.56	121.1537	66.1	37.3	226.6	1.65	1.5	-0.1
2015-11-05 15:54:45+00	399521.37	5973245.54	121.3777	399746.69	5973212.15	121.1533	66.1	40.8	225	1.68	1.4	-0.1
2015-11-05 15:54:35+00	399522.02	5973245.37	121.377	399747.37	5973211.62	121.1525	66.1	35.8	223.4	1.69	1.4	-0.1
2015-11-05 15:54:25+00	399522.61	5973245.5	121.3764	399747.8	5973212.04	121.1519	66.1	39.8	222.7	1.69	1.4	-0.1
2015-11-05 15:54:15+00	399522.98	5973245.65	121.3761	399748.07	5973210.77	121.1518	66.1	38.6	222.5	1.69	1.5	-0.1
2015-11-05 15:54:05+00	399523.3	5973245.7	121.3757	399748.43	5973211.66	121.1515	66.11	34.7	222.6	1.69	1.5	-0.1
2015-11-05 15:53:55+00	399523.51	5973245.67	121.3755	399748.55	5973211.66	121.1514	66.1	32.5	223.6	1.7	1.4	-0.1
2015-11-05 15:53:45+00	399523.62	5973245.75	121.3754	399748.71	5973210.98	121.1512	66.11	30.7	225.6	1.69	1.5	-0.1
2015-11-05 15:53:35+00	399523.6	5973245.9	121.3754	399748.76	5973211.08	121.1511	66.1	33.8	227.6	1.69	1.5	-0.1
2015-11-05 15:53:25+00	399523.67	5973245.96	121.3754	399748.89	5973211.8	121.151	66.1	36.9	228.5	1.69	1.5	-0.1
2015-11-05 15:53:15+00	399524.32	5973245.87	121.3747	399749.58	5973210.76	121.1503	66.1	36.2	226.7	1.69	1.5	-0.1
2015-11-05 15:53:05+00	399525.45	5973245.64	121.3736	399750.52	5973211.49	121.1494	66.09	29.2	225	1.67	1.5	-0.2
2015-11-05 15:52:55+00	399526.53	5973245.59	121.3725	399751.89	5973211.19	121.148	66.1	28.5	224.5	1.63	1.4	-0.3
2015-11-05 15:52:45+00	399527.46	5973246.14	121.3716	399752.42	5973211.6	121.1475	66.11	31	224.8	1.62	1.5	-0.3
2015-11-05 15:52:35+00	399528.38	5973246.77	121.3706	399753.12	5973210.39	121.1467	66.14	33.1	225.4	1.63	1.4	-0.5
2015-11-05 15:52:25+00	399529.25	5973246.93	121.3698	399754.07	5973210.8	121.1458	66.14	31.4	225.8	1.66	1.5	-0.5
2015-11-05 15:52:15+00	399529.8	5973245.95	121.3692	399754.87	5973210.58	121.145	66.14	29.4	225.5	1.67	1.4	-0.6
--More--												

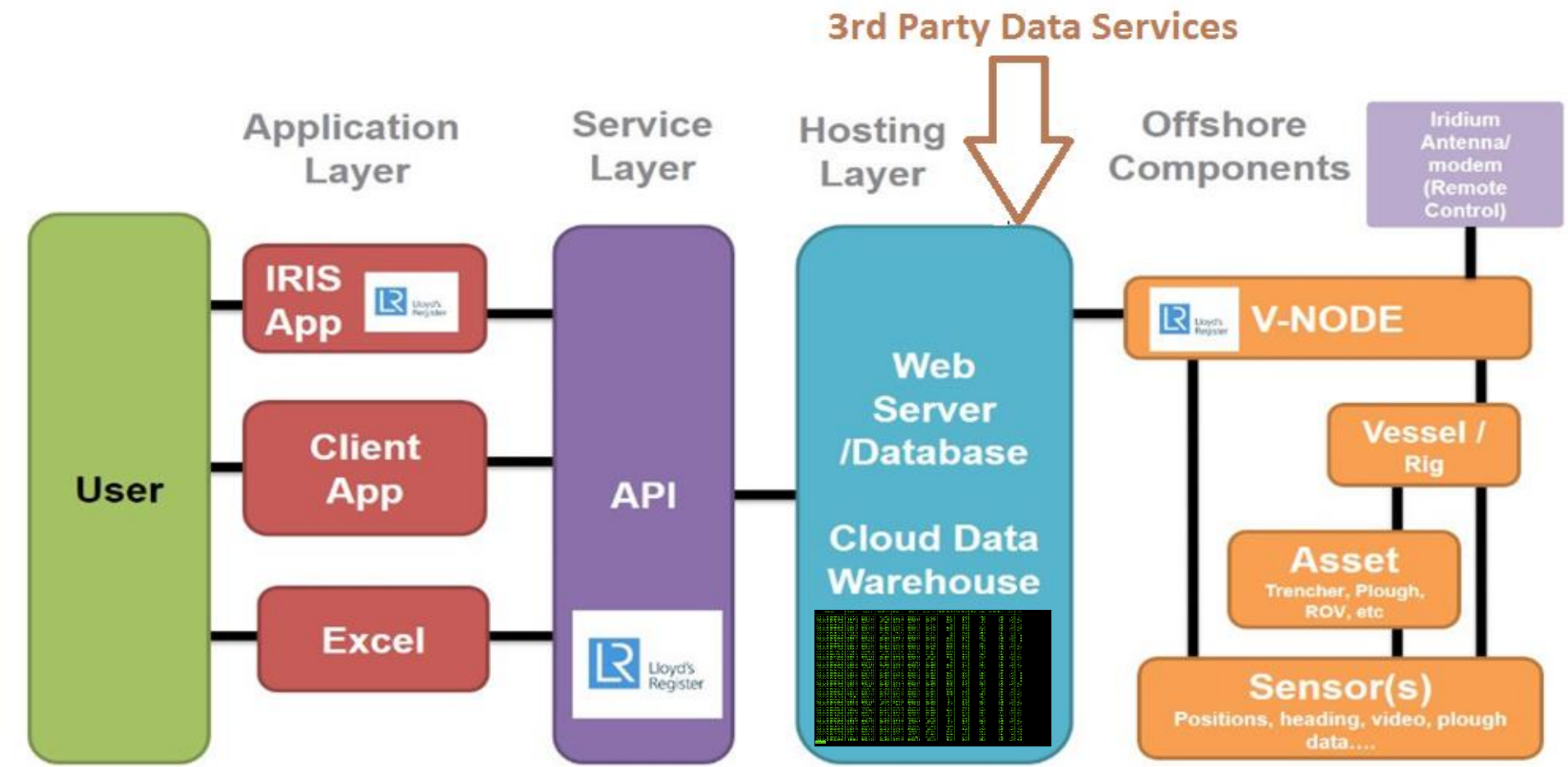
Example Data Services

#	Data Type/Source	Web Service Type	Document Type
1	Vessel Positions GPS Unit Vendor	Pull API	XML
2	Vessel Positions Contractor Supplied	TCP/IP data stream	NMEA 0183
3	Vessel Positions V-NODE Unit Vendor	TCP/IP data stream	Bespoke Comma Separated ASCII
4	Vessel Positions Contractor Supplied	UDP data stream	NMEA 0183
5	Vessel Positions 3rd Party AIS Data Vendor	Pull API	JSON
6	Metocean Forecast MeteoGroup	Email attachment	CSV
7	Metocean Forecast Met Office	FTP upload	CSV
8	Metocean Forecast GMO	Email attachment	CSV
9	Metocean Forecast StormGeo	Pull API	XML
10	Metocean Ovservations Met Office	Pull API	JSON
11	Metocean Observations NOAA	Pull API	HTML
12	Metocean Observations CCO	Pull API	GML
13	Telemetry Contractor Supplied	UDP data stream	Bespoke Comma Separated ASCII
14	Geospatial BGS Open GeoScience	Web Map Service	XML (capablities) & PNG (imagery)
15	Geospatial DECC Oil & Gas Maps	N/A: Programatic File Download	ZIP/SHAPE
16	Geospatial CDA (Formerly DEAL)	N/A: Manual	ZIP/SHAPE
17	Geospatial Numerous 3rd Party Sources	Web Feature Service	GML

Vessel Tracking Example

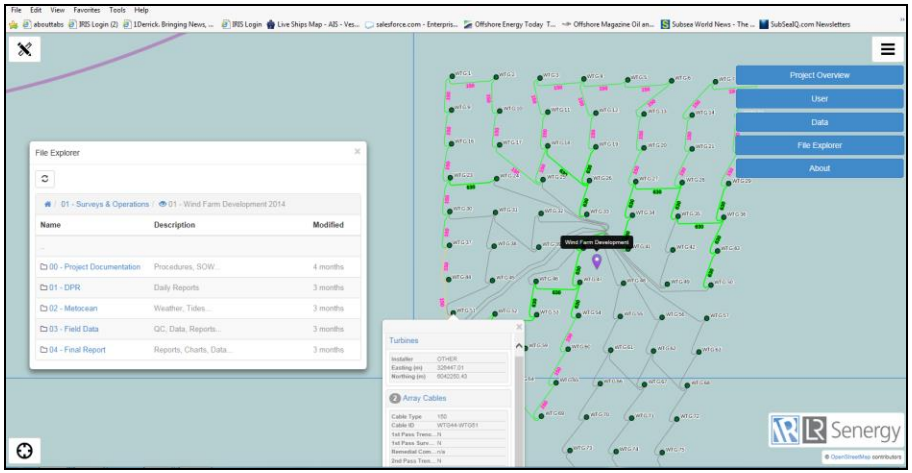


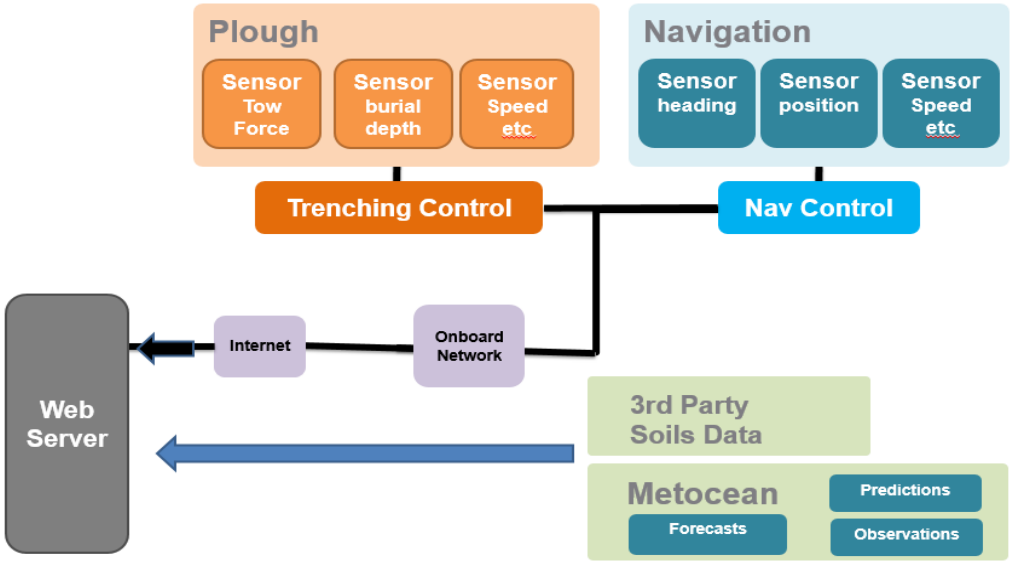
System Architecture



Example 1- Lay & Trench Project

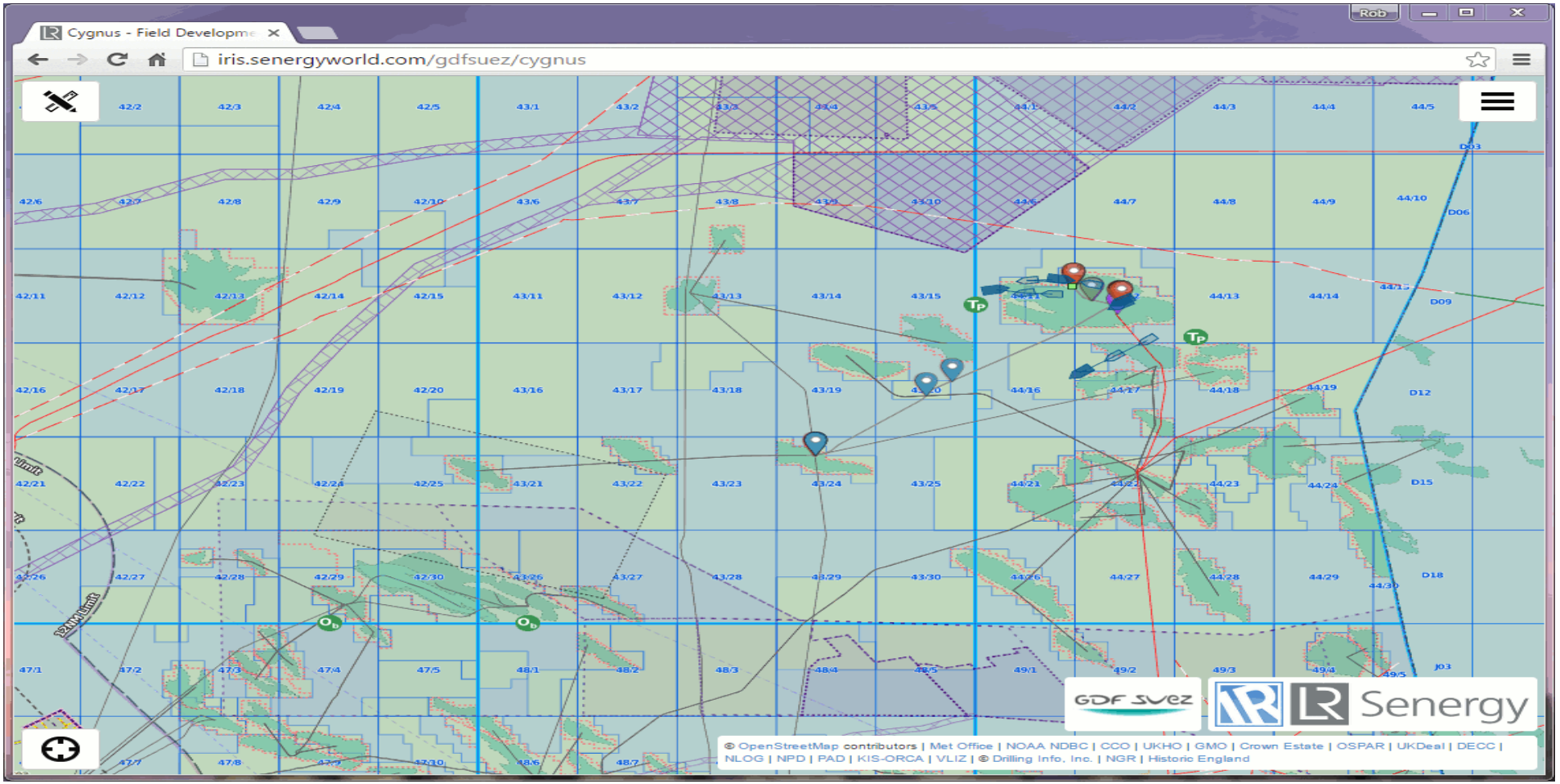
- Client : Major Lay & Trench Contractor
- Project Type : Lay & Trench
- Requirements
  - Close access to project status and progress
  - Trenching performance / contractual targets
  - Early notification/warning of performance/system issues
  - Access to live and forecast metocean data to support planning
  - Independent recording and replay of projects operations
  - Use proprietary message service and format



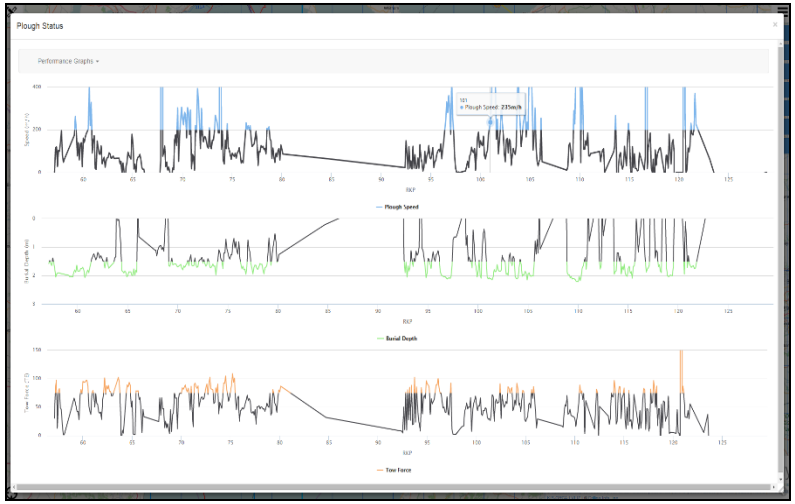


Plough Status Monitoring

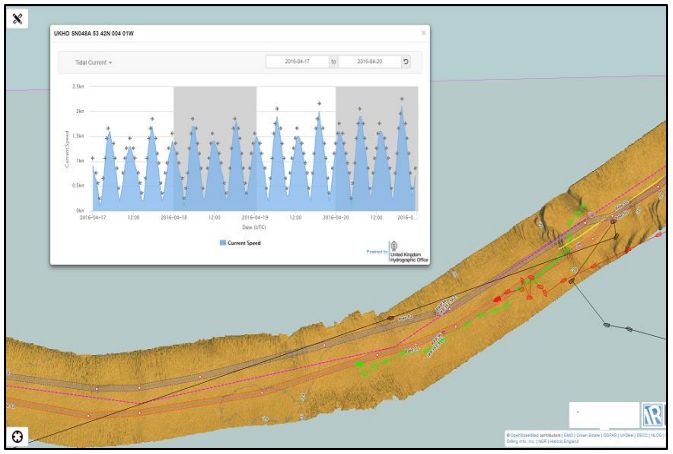
Longitudinal and Cross Profiles QC



Project Monitoring – Benefits

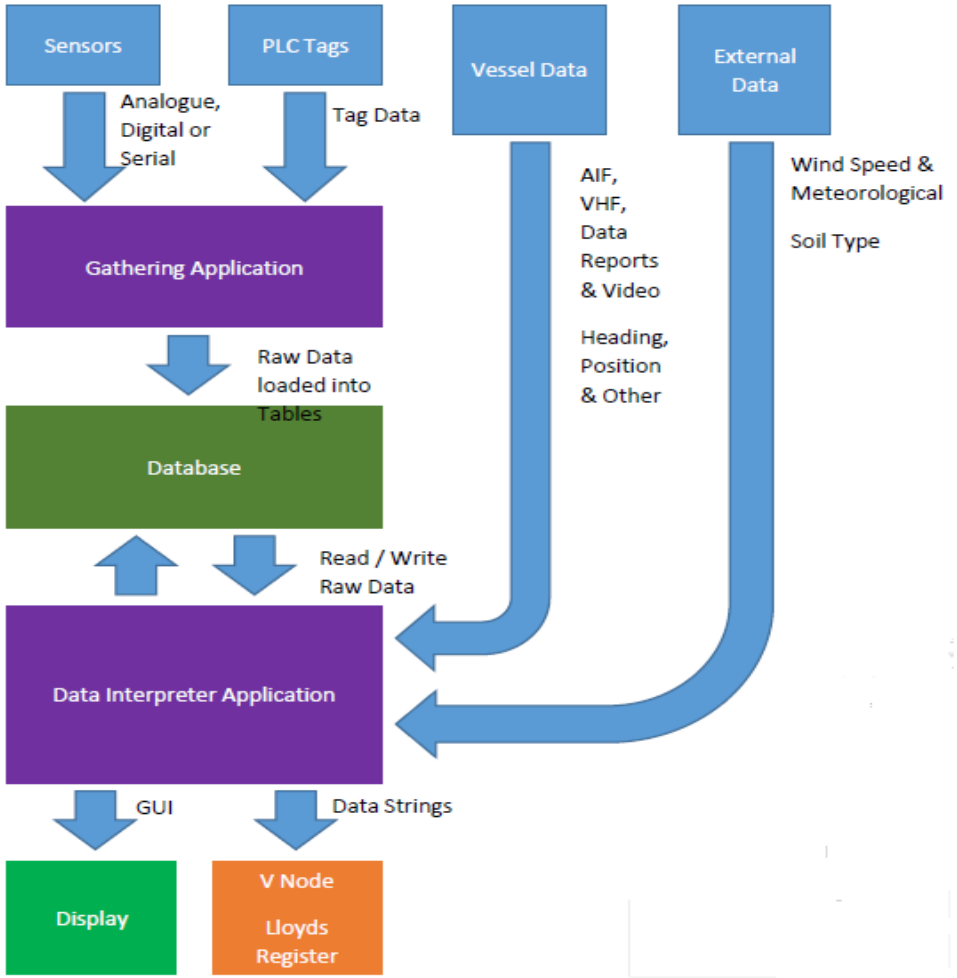


- Sharing of data
- Performance status monitoring
- Generation of alerts
- Simops and third party activities
- Planning / intervention optimised
- 24/7 visibility
- = maximise project efficiency

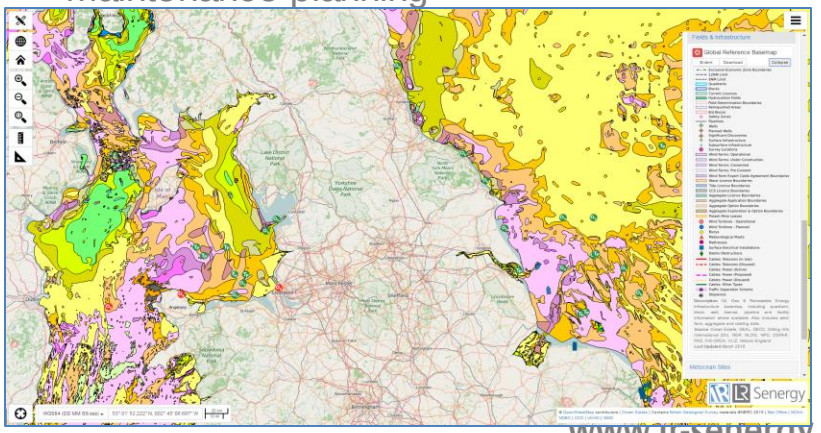


- Next Steps
- OEM Partnership
- Systems Monitoring
- Trenchers, ROV, subsea mining vehicles
- System performance monitoring
- Maintenance planning

Integrating & Accessing Offshore Systems Data

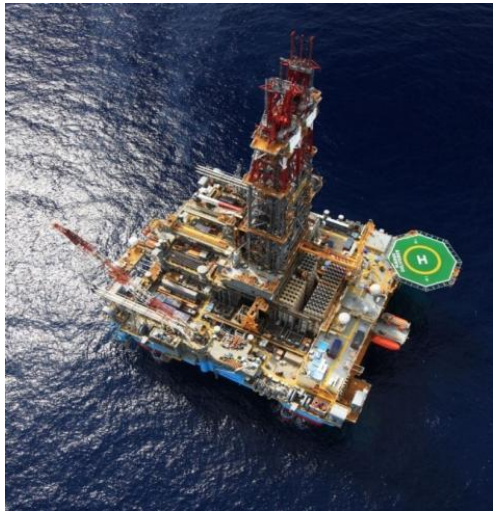


- Maximise value of acquired/observed data in the field - to support ongoing operations
- Retain data value & project experience
- Control data access to approved parties
- Review/replay data within project context
- Implement learning for subsequent projects
- Optimise systems' performance and maintenance planning



Example 2
Rig Positioning ~ QC or not QC?!

- Offshore positioning of the following assets where a third party positioning provider is contracted:
  - Semi-submersibles
  - Jack ups
  - FPSO
  - Heavy Lift vessels



- Primary Issues
  - Geodesy
  - Offsets
    - measurement
    - implementation
  - Gyro
    - Installation
    - calibration

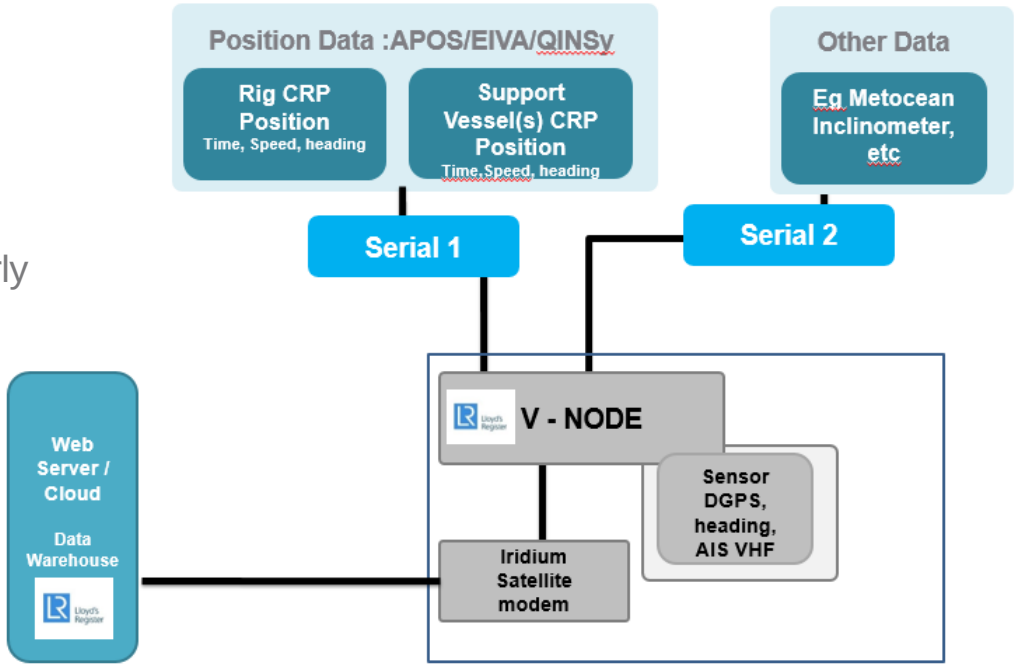
- Client approaches
  - Risk Assessment
  - Trust that all will be OK…

- *OR* provide for a positioning client representative
  - Assurance…..hopefully
  - Cost…~£15K

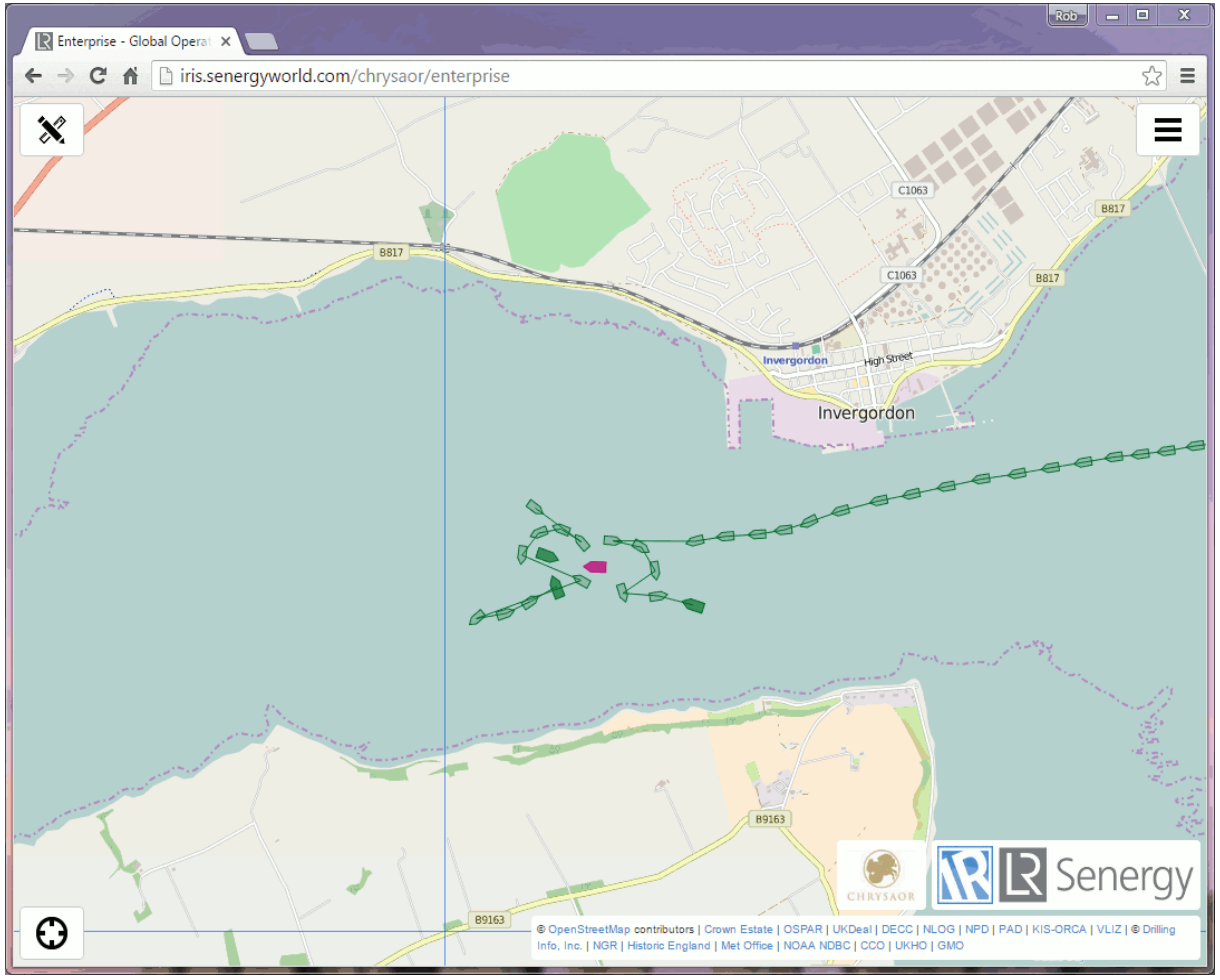
Remote Positioning QA/QC Service

Using web mapping and digital services

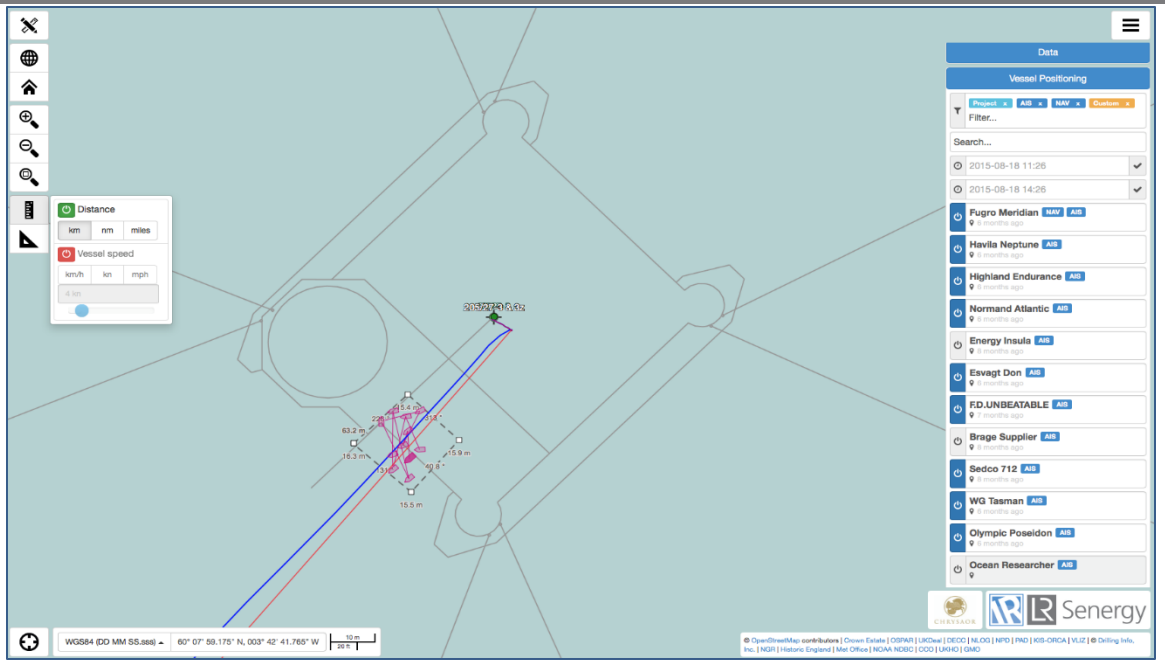
- Stand-alone hardware unit - VNode
  - DGPS (SBAS – Space Based Augmentation Systems)
  - GPS Heading
  - AIS
- Contractor, or other approved body, installs hardware unit
  - Power-on; no user controls
- Offsets measured independently
  - Gross check against GA (LR)
  - Potentially installed next to contractor antennae or clearly identifiable location

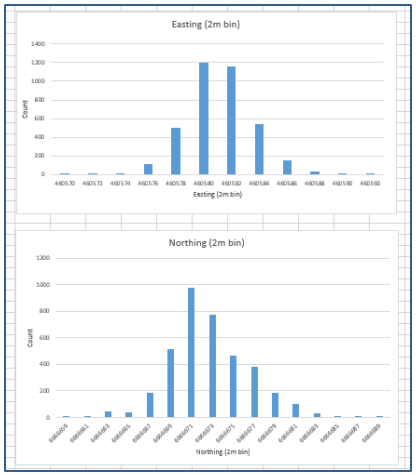


Project Example
Sedco 712; Chrysaor Mustard Well, WOS

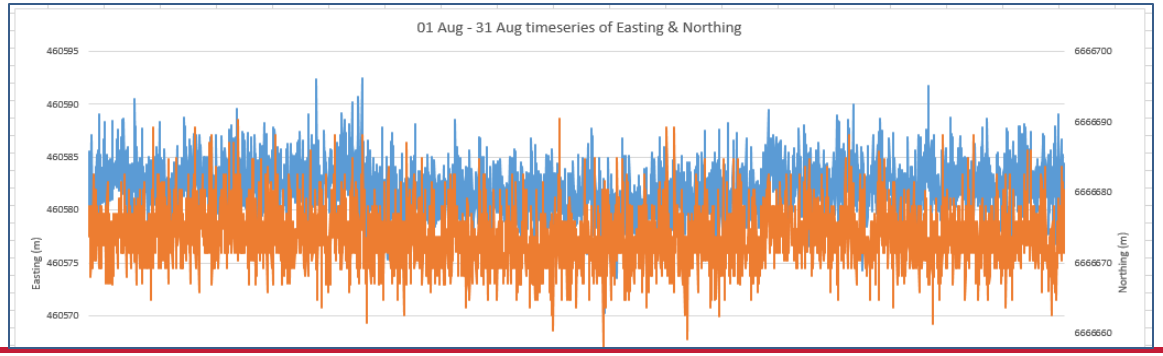


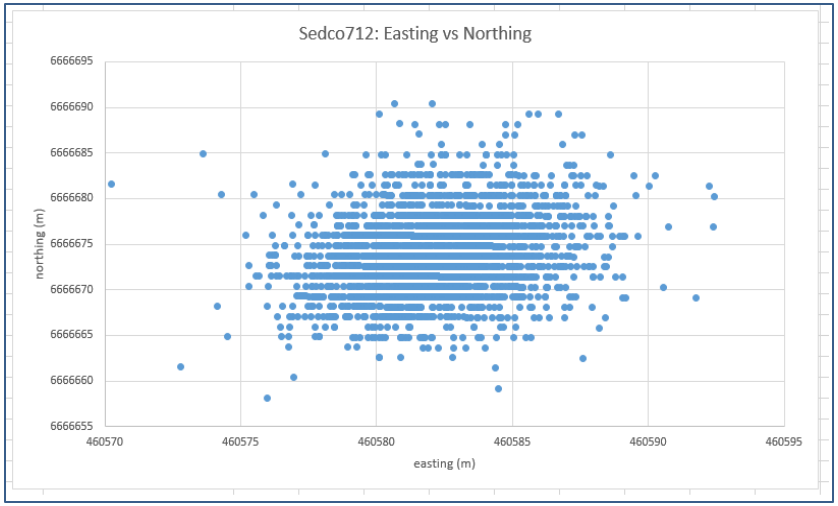
Project Example
Sedco 712; Chrysaor Mustard Well, WOS





- Sd East (2σ)
  - ~4m
- Sd North (2σ)
  - ~6m
- Range to CRP
  - ~3m



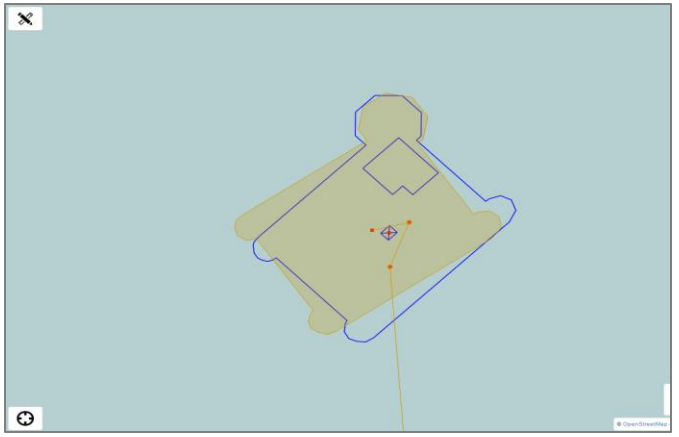


Rig Positioning QA/QC

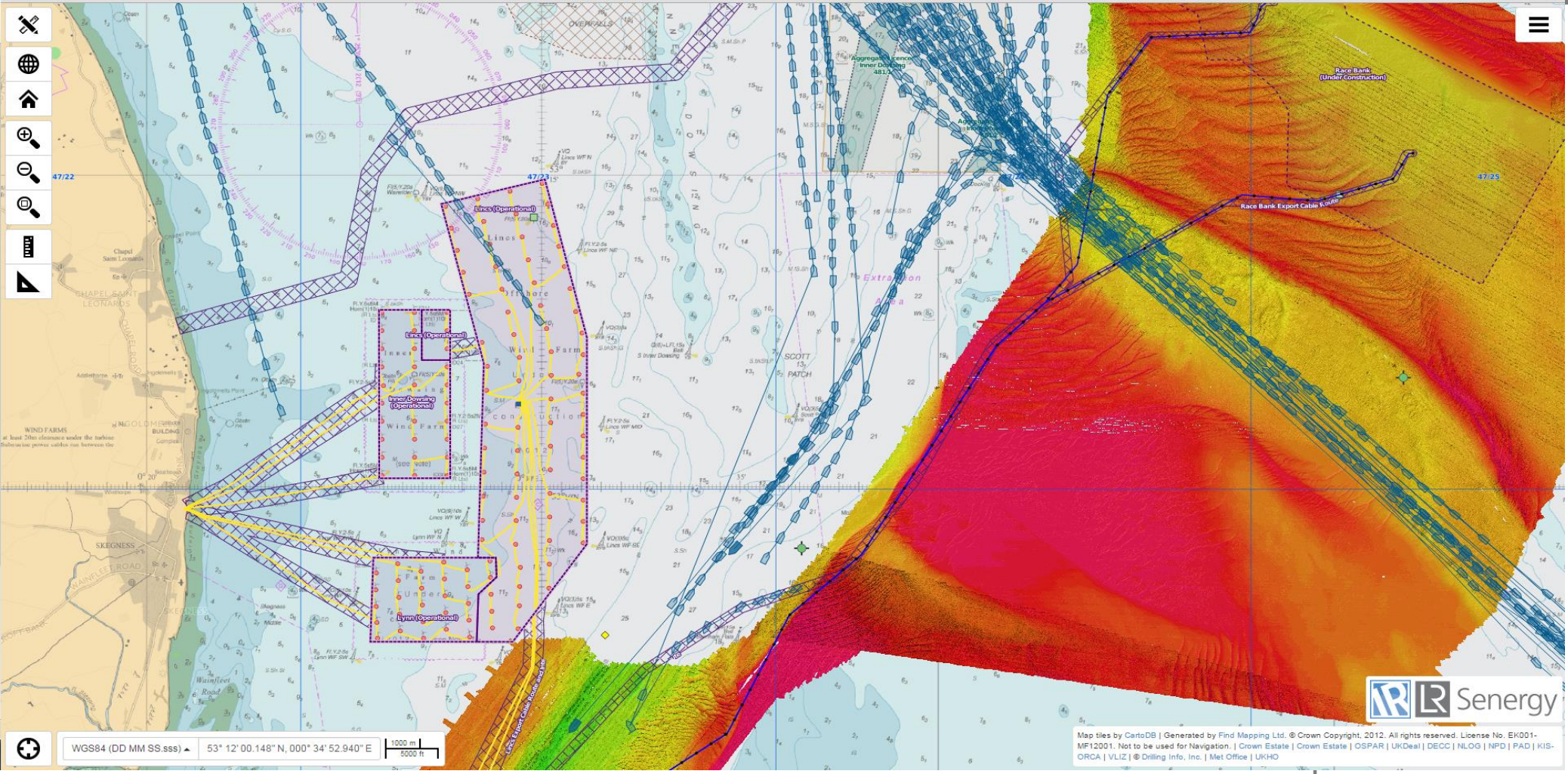
- Stand-alone hardware unit
- Installed by Client or Contractor
  - Power ON/OFF only
- Offsets checked independently
  - Gross check against GA (LR)
  - Potentially installed next to contractor antennae or clearly identifiable location
- Gyro calibration email for QA/QC
  - V-Node heading accuracy ($\pm 2^0$), plus misalignment
  - IRIS also receives rig AIS heading
- Comparison with contractor position data
  - Rig CRP and support vessels
- All raw data in WGS84
  - Independent geodetic transformation on IRIS

- Challenge - is this process sufficient QA/ QC to detect significant errors or blunders?

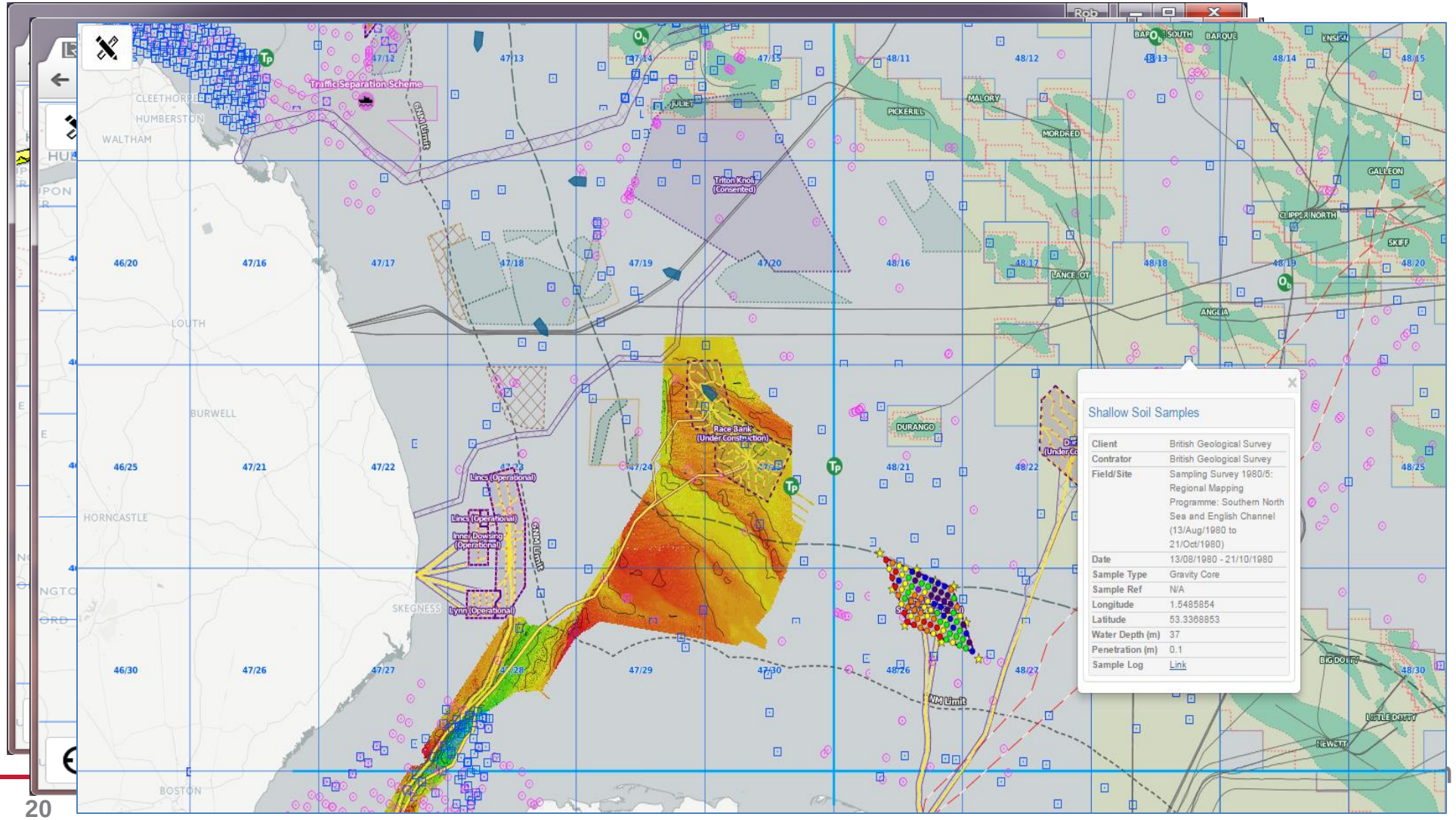
- Project Efficiencies
  - No client representative
  - No mob/demob fees, standby fees etc
  - Daily cost for hardware/service



Data Availability

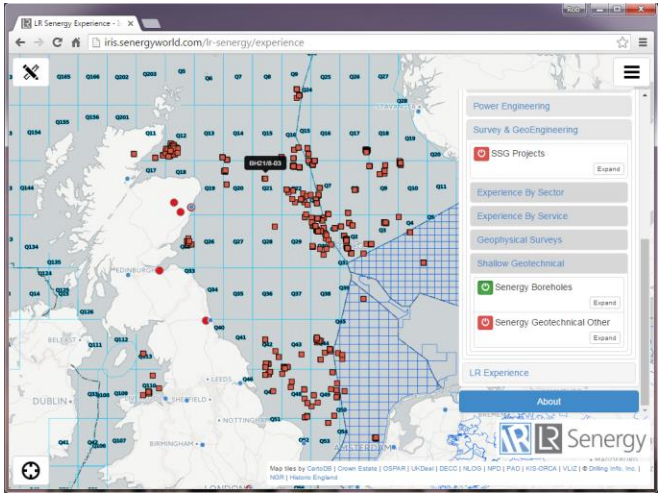


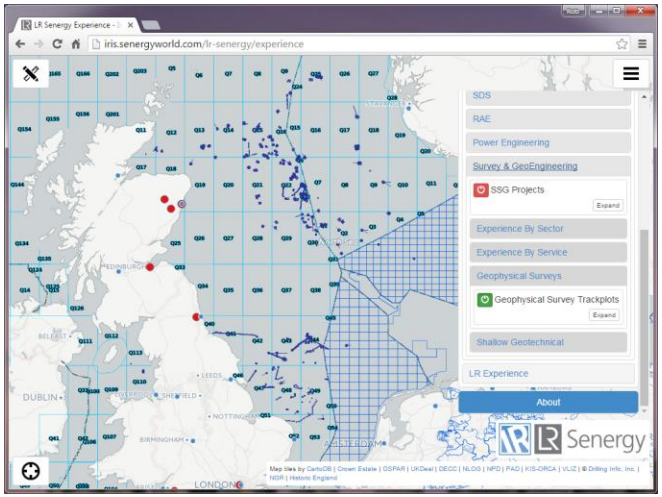
Data availability – example BGS

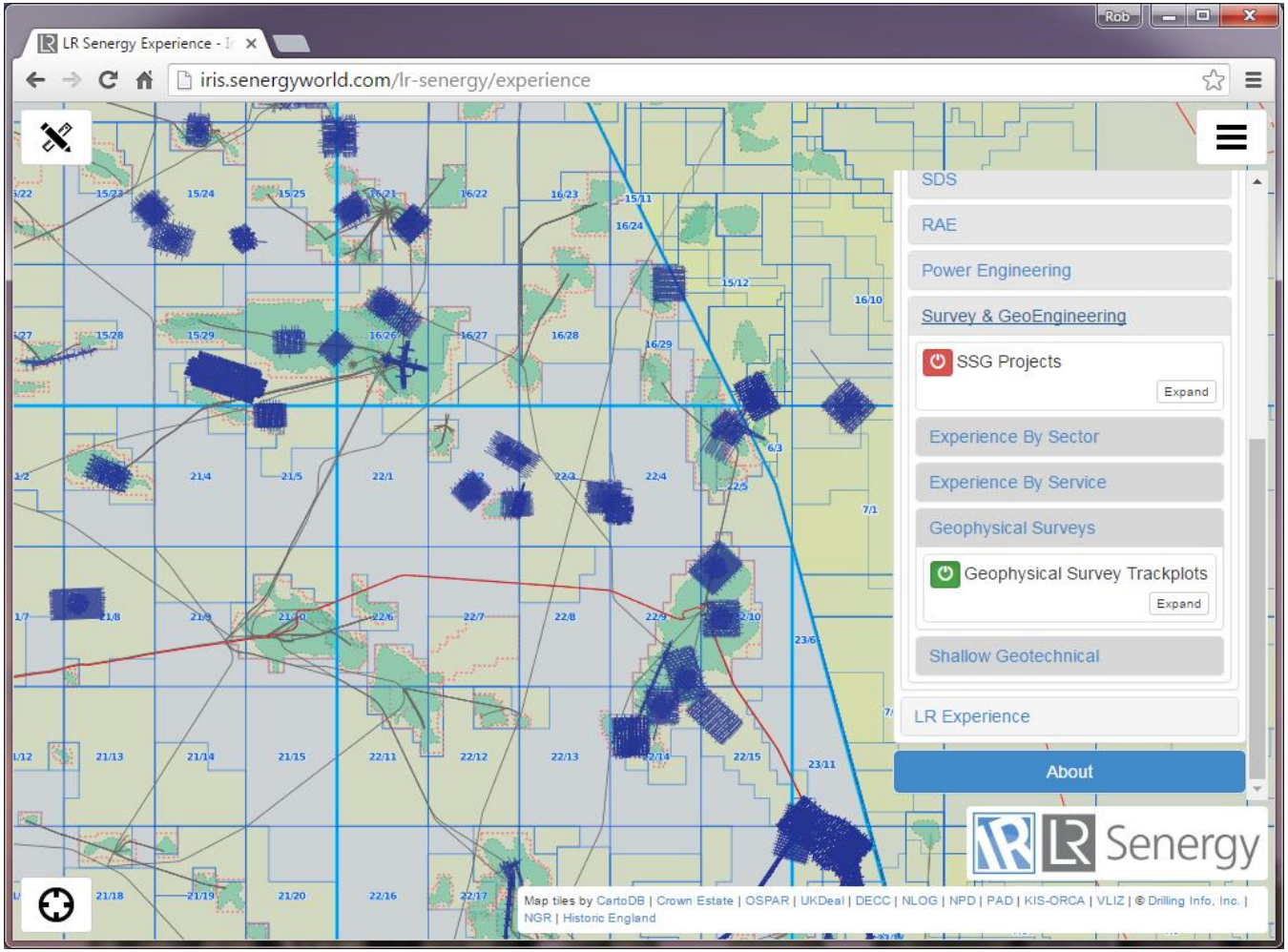


LR Senergy held survey & SI data

Not in the public domain….







Summary

- More data and information ensures the client/operator is better informed regarding a particular, very nice, but does it save money?
- Three ‘live’ project examples shown where cost efficiencies can be demonstrated
- Range of tangibility, but all developed to drive operational effectiveness
- A range of digital data service types and formats required to drive a ‘live’ web map, requires flexibility and capability.
- Serve data as well as consume

Together further