GL Noble Denton

Stoner Pipeline Simulator (SPS)

INTERNATIONAL GAS UNION
UNION INTERNATIONALE DU GAZ

IGU WOC3 Meeting (Houston, Texas, USA)
SPS and Uptime Solution Presentation
October 3, 2013

Agenda

- Introduction to GL Noble Denton
- Stoner Pipeline Simulator Overview
- Uptime Integrity Management Solution Overview
- Questions and Discussion

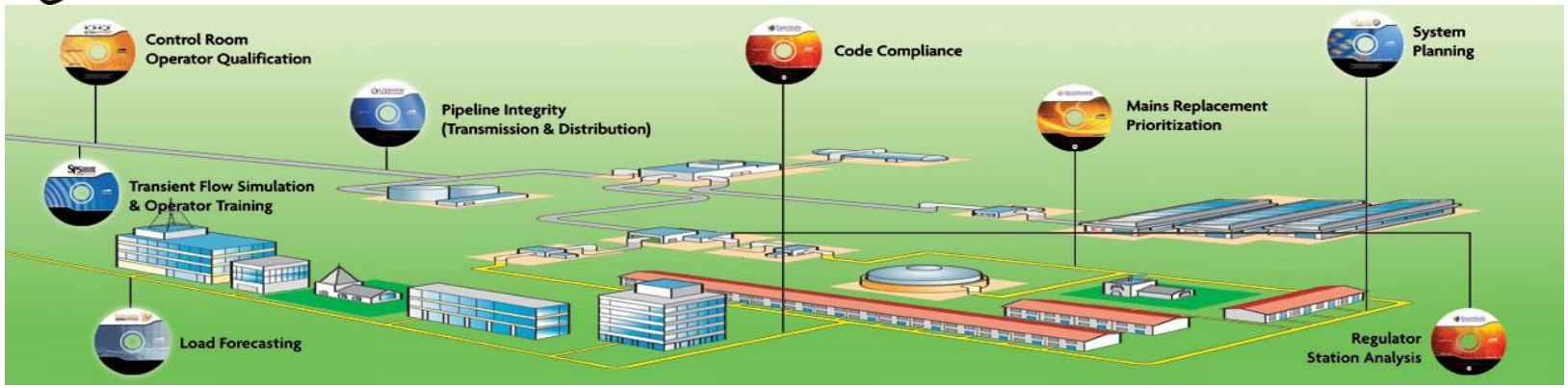
Jim Short – Senior Consultant
Geoff Craig – Senior Consultant

GL Noble Denton's Oil and Gas Business

Assurance	Advanced Engineering & Consulting	Software Solutions	Marine Operations	Project Execution
Certification	Analysis and engineering consulting	Regulatory compliance	Marine warranty	Project management
Verification	Field development planning	Asset optimisation	Marine consulting	Design
Inspection and quality assurance	Testing services	Control room management	Marine casualty investigations	Transportation and installation
	Asset integrity management	Simulation	Marine operations	Due diligence
	Asset optimisation	Leak Detection	Dynamic positioning	Construction monitoring
	Safety and risk	Asset Integrity Management		
	Transmission and distribution			

… Full range of planning, operations and decision support products

STONERSOFTWARE



GL Noble Denton

A Trusted Solution Provider

- STONERSOFTWARE®, family of Integrated Products and Solutions
- Commitment to Client Services and Satisfaction
- Dedication to Energy Industry – Quality Products and Services
- Continued Product Growth and Evolution
- Pipeline Industry Participation
  - American Petroleum Institute (API)
  - International Pipeline Conference (IPC)
  - Pipeline Simulation Interest Group (PSIG)
  - Gas Technology Institute (GTI)
  - Pipeline Research Council International (PRCI)
  - International Gas Union (IGU)

A Trusted Advisor

A Broad Range of Oil & Gas, Water and Power Clients

Utilities (Gas, Water & Power)

National Oil & Gas Companies

International Oil & Gas Companies

Independent Oil & Gas Companies

Gas Pipeline Simulation Offerings

- SynerGEE
- Gas Transient Optimization (GTO)
- Stoner Pipeline Simulator (SPS)

The Building Blocks of SPS

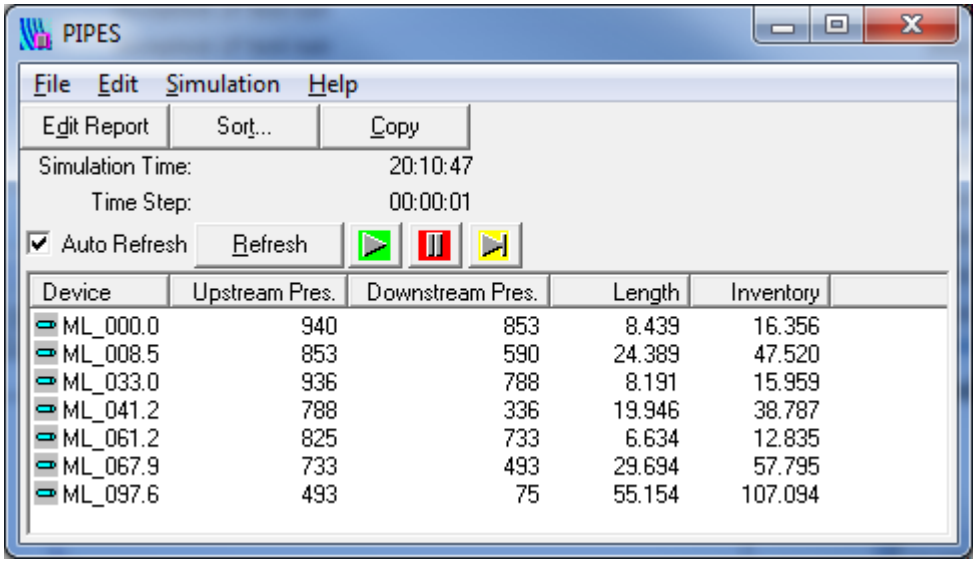
Typical SPS Offline Applications

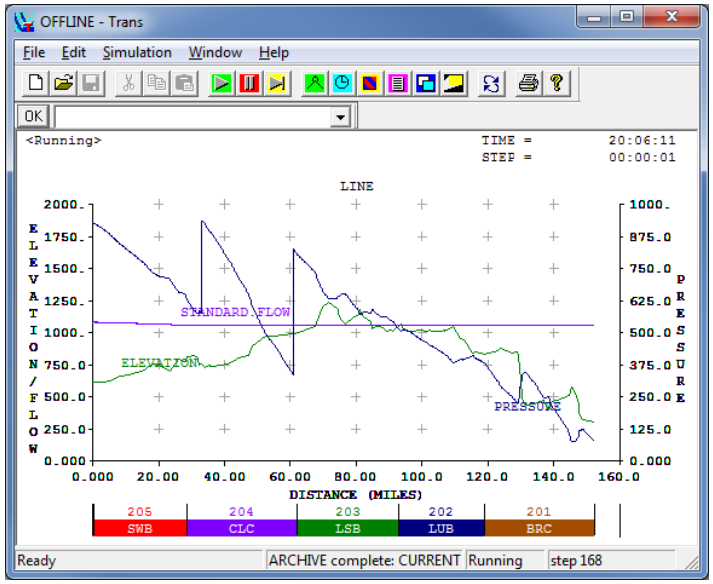
- Pipeline and control system design
- Capacity studies
- Analyzing startup and shutdown procedures
- Studying economics of design / operating strategies
- Surge analysis / Relief systems
- Pipeline expansion / De-bottlenecking
- Studying survival time for gas delivery systems
- Leak Simulation

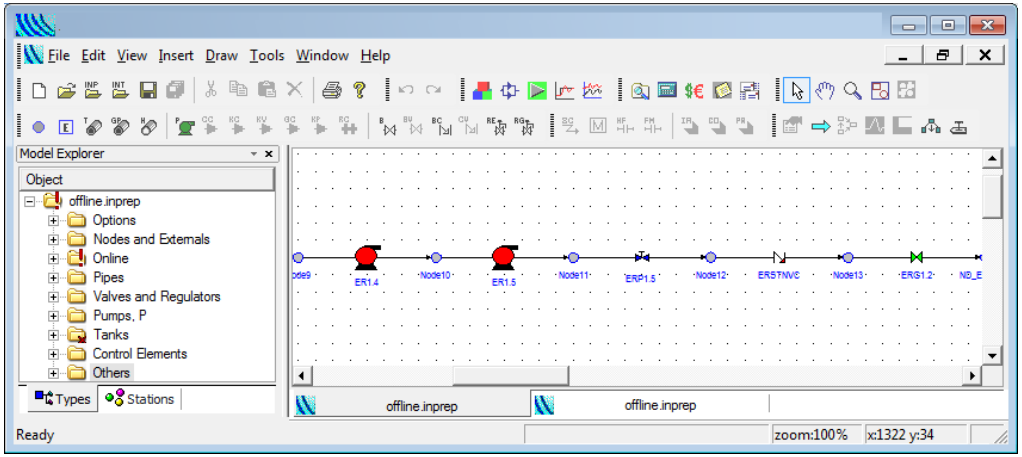
Typical SPS Control Room Applications

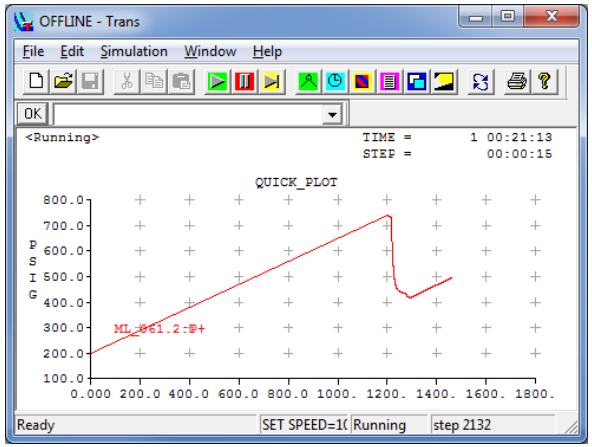
- Leak Detection
- Linepack analysis
- Maintenance and short-term planning (planning predictor model - PPM)
- Survival time calculations (automatic look-ahead - ALAM)
- Short-term planning
- Long-term planning

Native "Engineering" GUI









Case History - Sasol Gas

”Sasol Gas has decided to implement a Pipeline Management System utilizing simulation software to benefit the operation, planning and management of their gas networks”

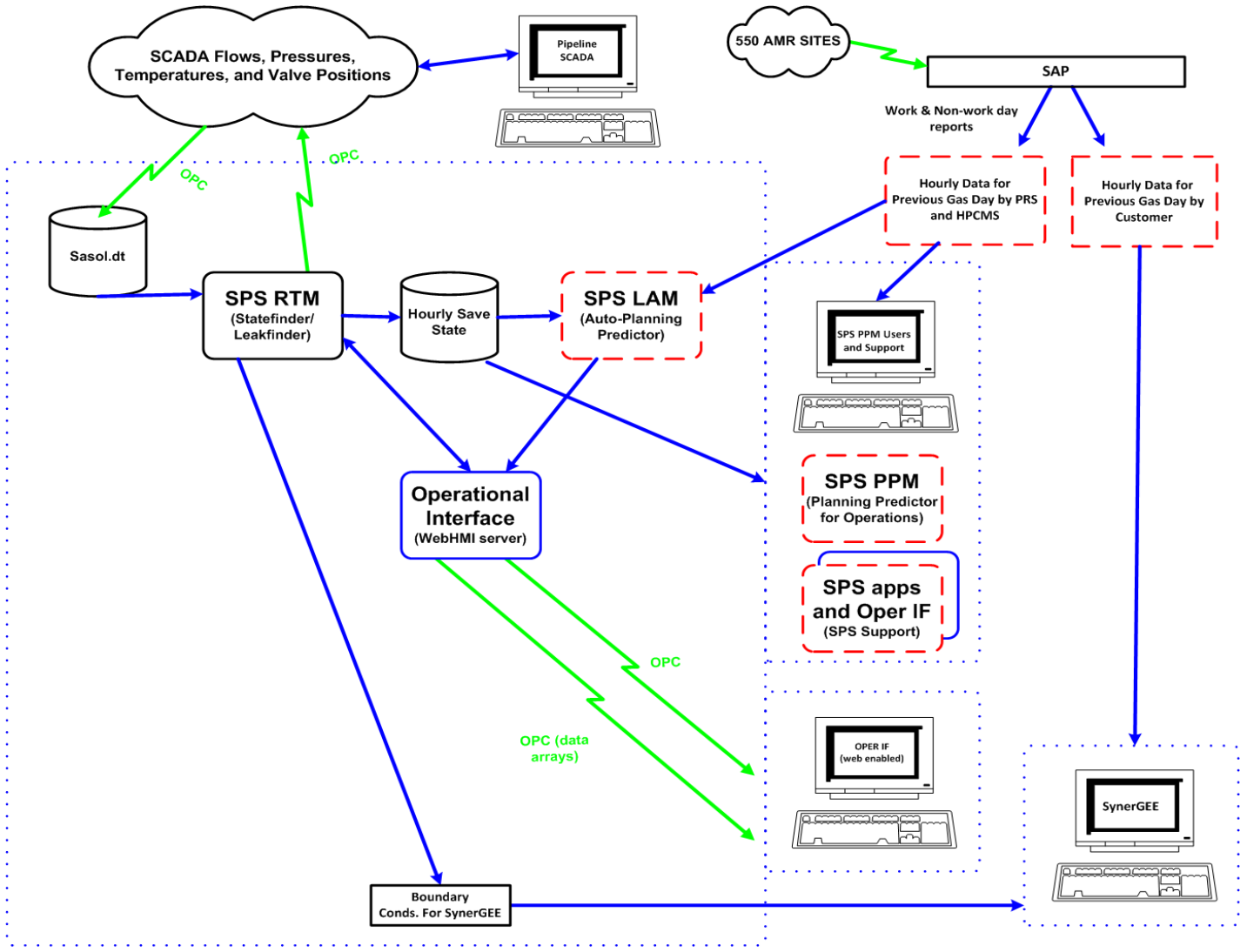
Real-time Simulation Capabilities (SPS)

- Operations support (Real-time, Predictor, and Survival Time)
- Linepack calculations; planning tools
- “Virtual SCADA” flow and pressure calculations
- Leak detection

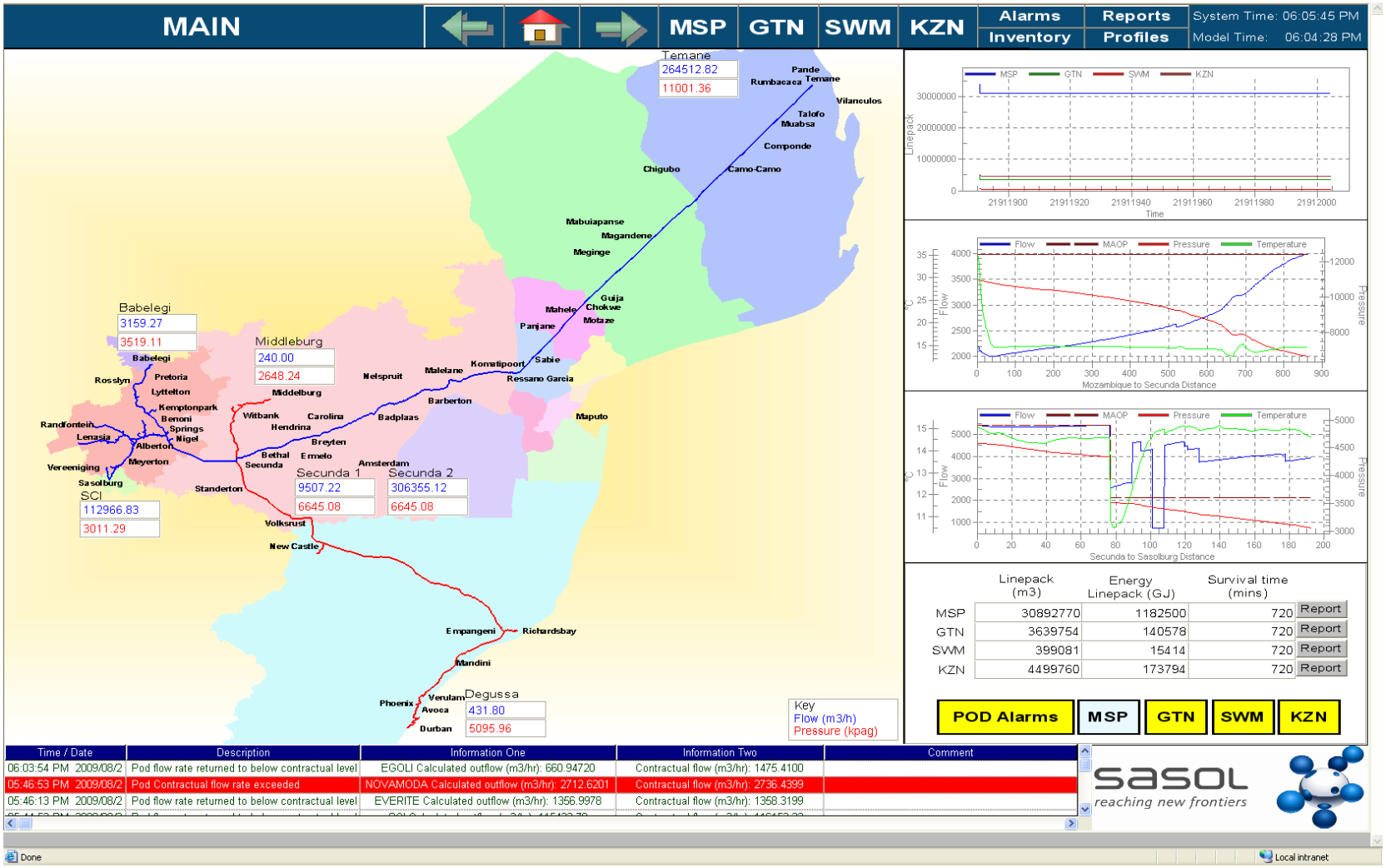
Offline Simulation Capabilities (SynerGEE)

- Network planning; regulator sizing; de-bottlenecking
- Users
  - Marketing department
  - Engineering
  - Sastech
- GIS based interface

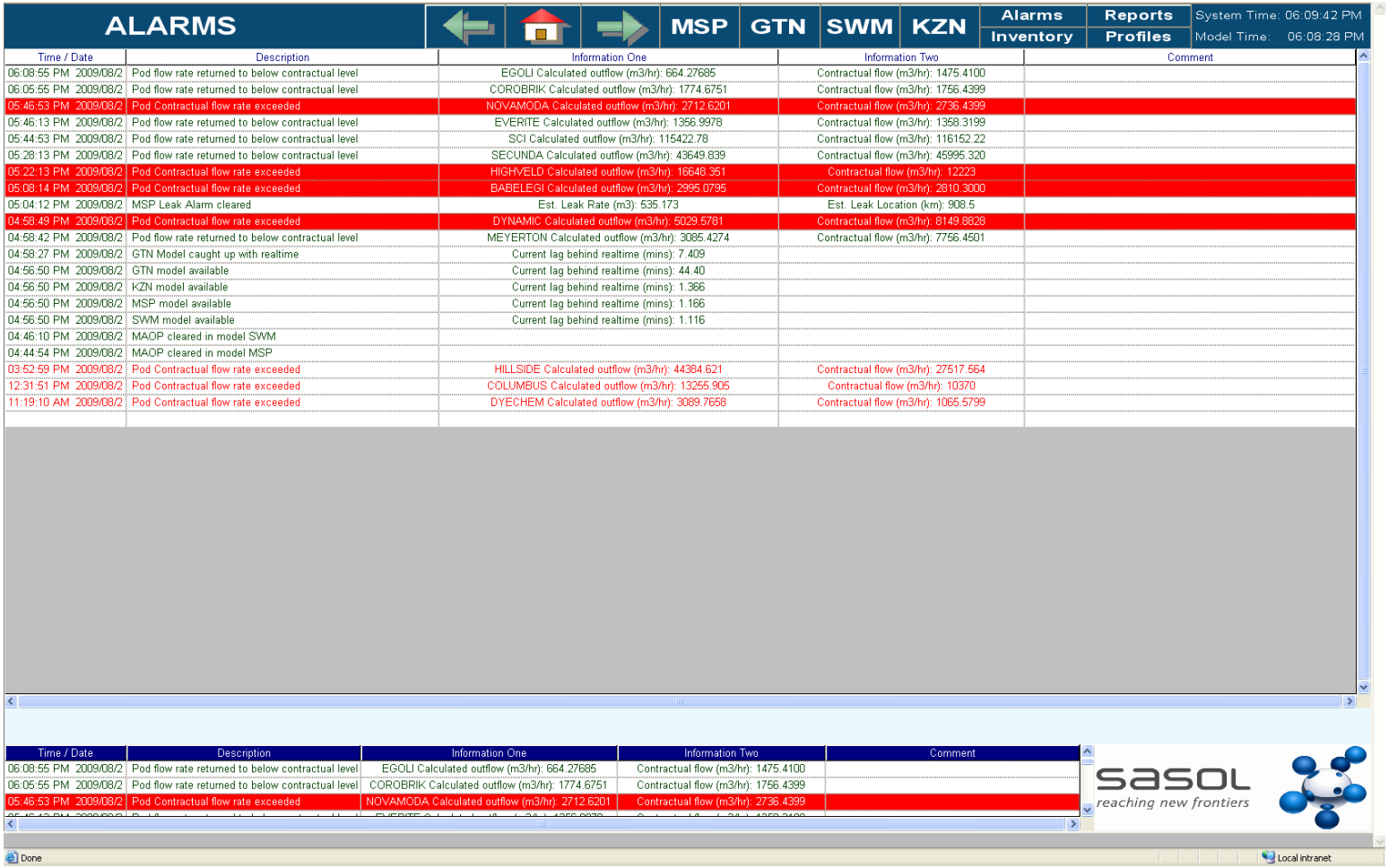
SPS System Architecture



Control Room Displays



Alarms


ALARMS
MSP
GTN
SWM
KZN
Alarms
Reports
Inventory
Profiles
System Time: 06:09:42 PM
Model Time: 06:08:28 PM
Time / Date | Description | Information One | Information Two | Comment
06:08:55 PM 2009/08/2 | Pod flow rate returned to below contractual level | EGOLI Calculated outflow (m3/hr): 664.27685 | Contractual flow (m3/hr): 1475.4100
06:05:55 PM 2009/08/2 | Pod flow rate returned to below contractual level | COROBRIK Calculated outflow (m3/hr): 1774.6751 | Contractual flow (m3/hr): 1756.4399
05:46:53 PM 2009/08/2 | Pod Contractual flow rate exceeded | NOVAMODA Calculated outflow (m3/hr): 2712.6201 | Contractual flow (m3/hr): 2736.4399
05:46:13 PM 2009/08/2 | Pod flow rate returned to below contractual level | EVERITE Calculated outflow (m3/hr): 1356.9978 | Contractual flow (m3/hr): 1358.3199
05:44:53 PM 2009/08/2 | Pod flow rate returned to below contractual level | SCI Calculated outflow (m3/hr): 115422.78 | Contractual flow (m3/hr): 116152.22
05:28:13 PM 2009/08/2 | Pod flow rate returned to below contractual level | SECUNDA Calculated outflow (m3/hr): 43649.839 | Contractual flow (m3/hr): 45995.320
05:22:13 PM 2009/08/2 | Pod Contractual flow rate exceeded | HIGHVELD Calculated outflow (m3/hr): 16648.351 | Contractual flow (m3/hr): 12223
05:08:14 PM 2009/08/2 | Pod Contractual flow rate exceeded | BABELEGI Calculated outflow (m3/hr): 2995.0795 | Contractual flow (m3/hr): 2810.3000
05:04:12 PM 2009/08/2 | MSP Leak Alarm cleared | Est. Leak Rate (m3): 535.173 | Est. Leak Location (km): 908.5
04:58:49 PM 2009/08/2 | Pod Contractual flow rate exceeded | DYNAMIC Calculated outflow (m3/hr): 5029.5781 | Contractual flow (m3/hr): 8149.8628
04:58:42 PM 2009/08/2 | Pod flow rate returned to below contractual level | MEYERTON Calculated outflow (m3/hr): 3085.4274 | Contractual flow (m3/hr): 7756.4501
04:58:27 PM 2009/08/2 | GTN Model caught up with realtime | Current lag behind realtime (mins): 7.409
04:56:50 PM 2009/08/2 | GTN model available | Current lag behind realtime (mins): 44.40
04:56:50 PM 2009/08/2 | KZN model available | Current lag behind realtime (mins): 1.366
04:56:50 PM 2009/08/2 | MSP model available | Current lag behind realtime (mins): 1.166
04:56:50 PM 2009/08/2 | SWM model available | Current lag behind realtime (mins): 1.116
04:46:10 PM 2009/08/2 | MAOP cleared in model SWM
04:44:54 PM 2009/08/2 | MAOP cleared in model MSP
03:52:59 PM 2009/08/2 | Pod Contractual flow rate exceeded | HILLSIDE Calculated outflow (m3/hr): 44384.621 | Contractual flow (m3/hr): 27517.564
12:31:51 PM 2009/08/2 | Pod Contractual flow rate exceeded | COLUMBUS Calculated outflow (m3/hr): 13255.905 | Contractual flow (m3/hr): 10370
11:19:10 AM 2009/08/2 | Pod Contractual flow rate exceeded | DYECHEM Calculated outflow (m3/hr): 3089.7658 | Contractual flow (m3/hr): 1065.5799
Time / Date | Description | Information One | Information Two | Comment
06:08:55 PM 2009/08/2 | Pod flow rate returned to below contractual level | EGOLI Calculated outflow (m3/hr): 664.27685 | Contractual flow (m3/hr): 1475.4100
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sasol
reaching new frontiers
Done
Local intranet

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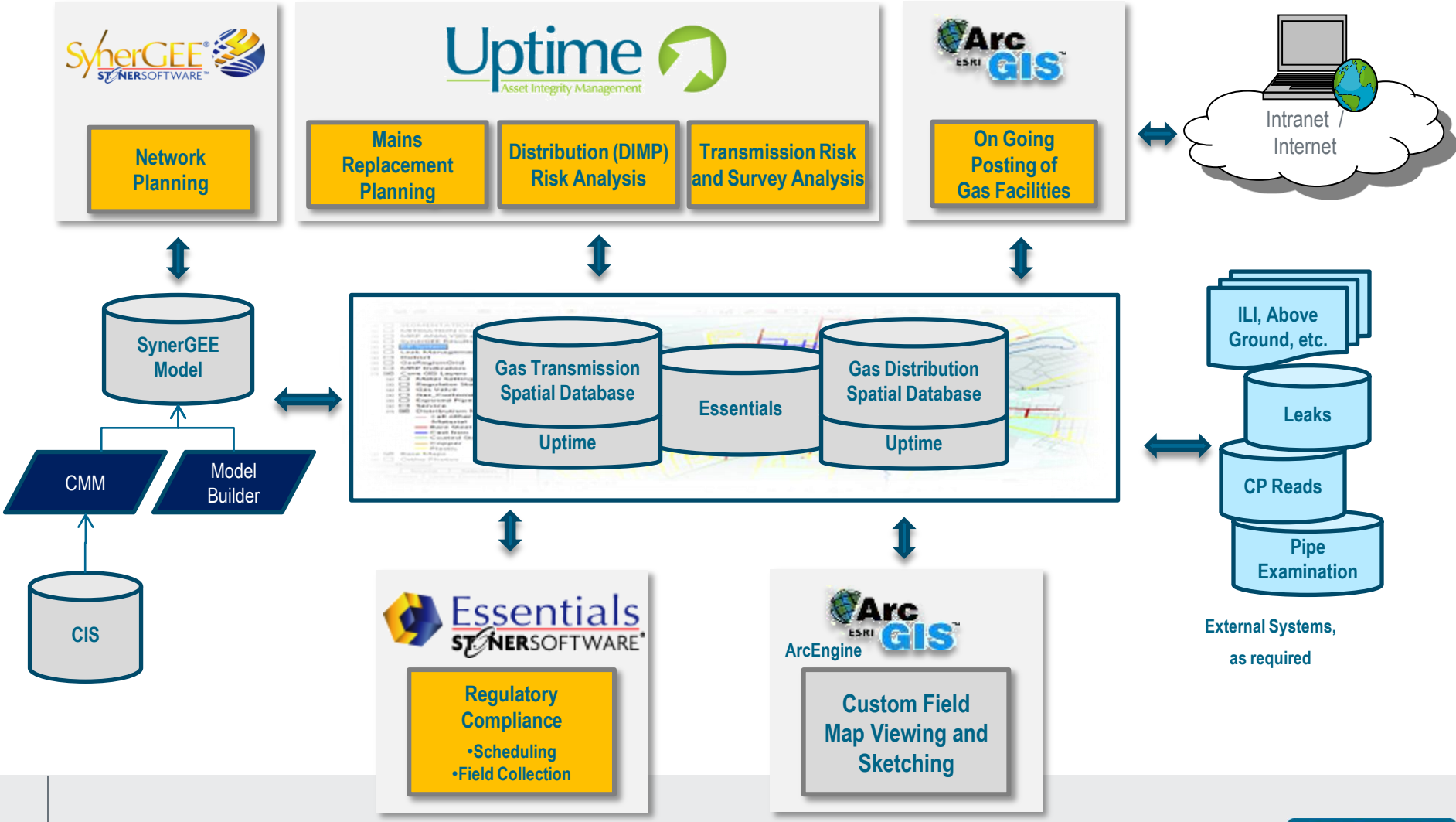
Uptime Integrity Management Solution

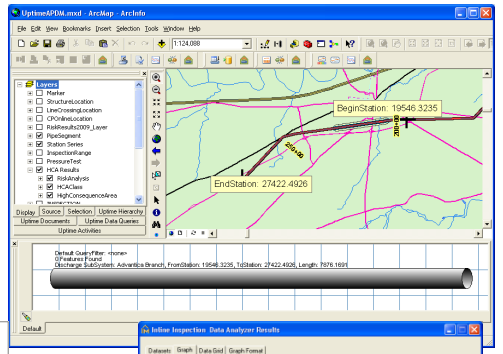
Geoff Craig, Senior Consultant

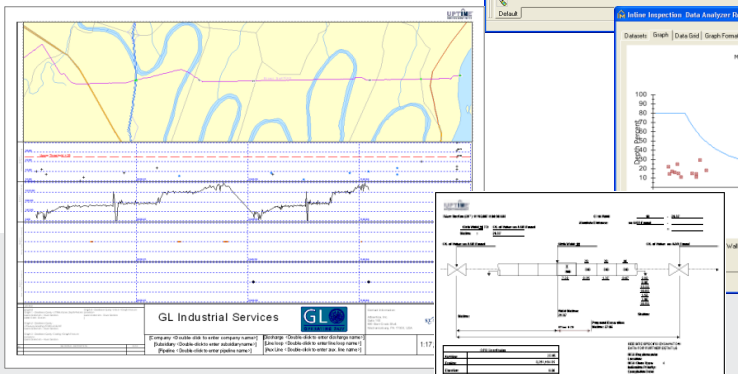
Part of the STONERSOFTWARE® ly of Integrated Products and Solutions.

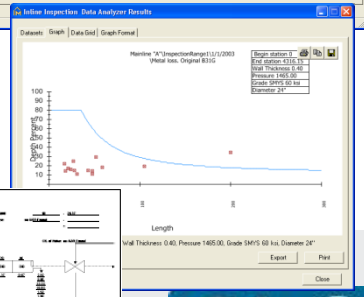


Uptime Integrity Management Solution

- **Single platform for both transmission and distribution systems**
- **Open architecture analytical platform**
- **Functional support to meet integrity needs**
  - **Distribution;** Risk Assessment, Replacement Planning, etc…
  - **Transmission;** Facility Maintenance, Class Location, HCA, Threat Assessment, Risk Assessment, Integrity tool-box, Bulk data alignment, Alignment sheets, MAOP, etc…
- **Activity driven integrity tasks with audit trail**
- **Intuitive visual analysis**







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Single Solution for Pipeline and Distribution

Uptime Asset Integrity Management

Pipeline | **Distribution**

Pipeline Integrity Analysis
- Class Location
- HCA
- ILI Analyzer
- DA Analyzer
- Excavation Manager
- Dynamic Segmentation

Information Administration
- Data Alignment
- Data Administrator
- Facility Editor

Viewing & Reporting
- Alignment Sheet Generator
- Asset Information Reporter
- Pipeline Navigator

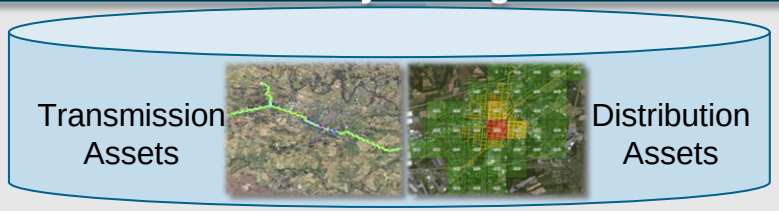
Mains Replacement Prioritization (MRP)
- Scenario Manager
- Indicator Manager
- Risk and Condition Mgr
- MRP Administrator

Risk Assessment
- Asset Intelligence Viewer
- Risk Analyzer
- Risk Model Manager
- Threat Assessment

Industry Processes
- Report Manager
- Data Query Manager
- Document Manager
- Activity Manager

Core Components with Configuration for Pipelines or Gas Distribution Network Assets

Geodatabase Asset Repository



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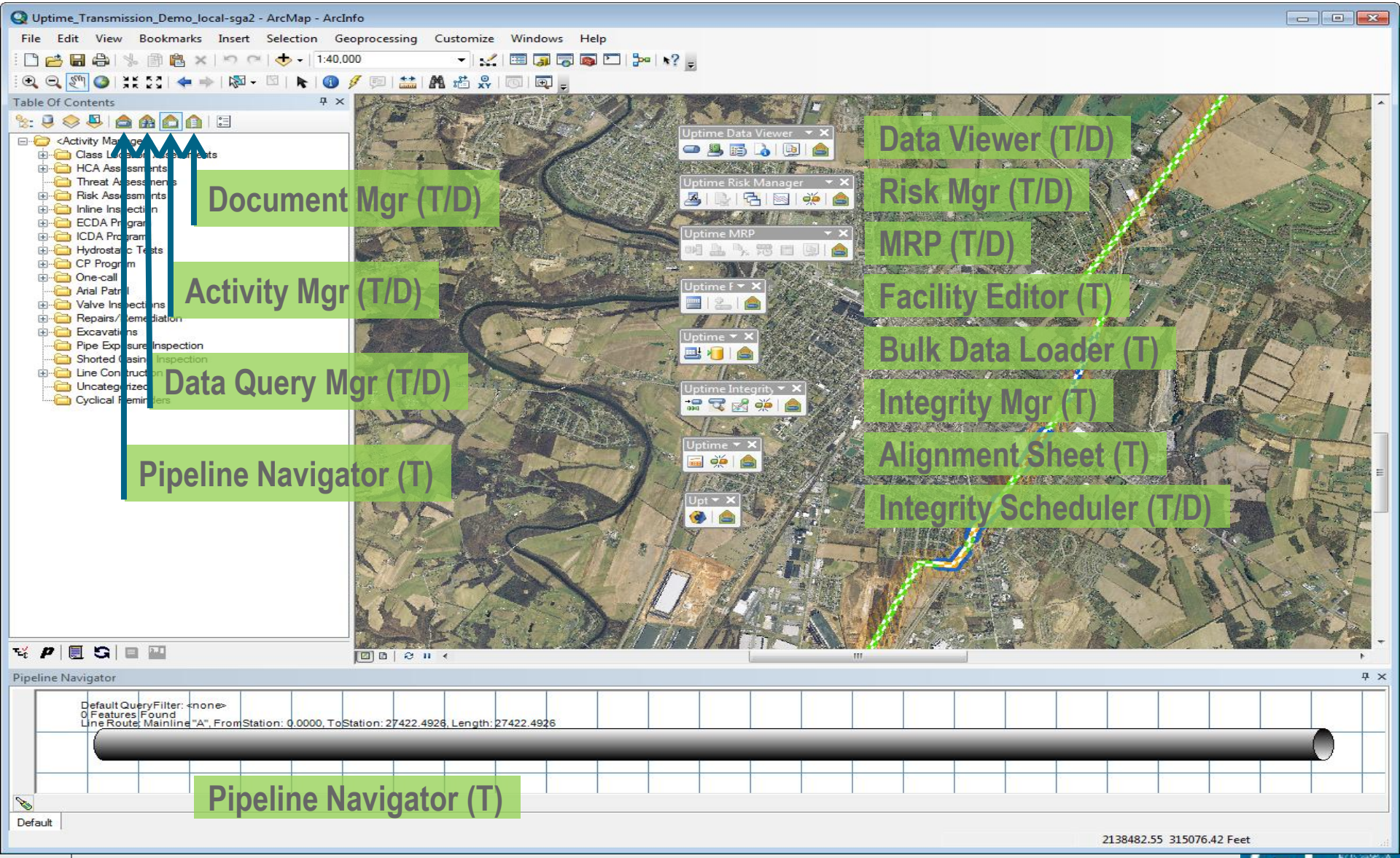
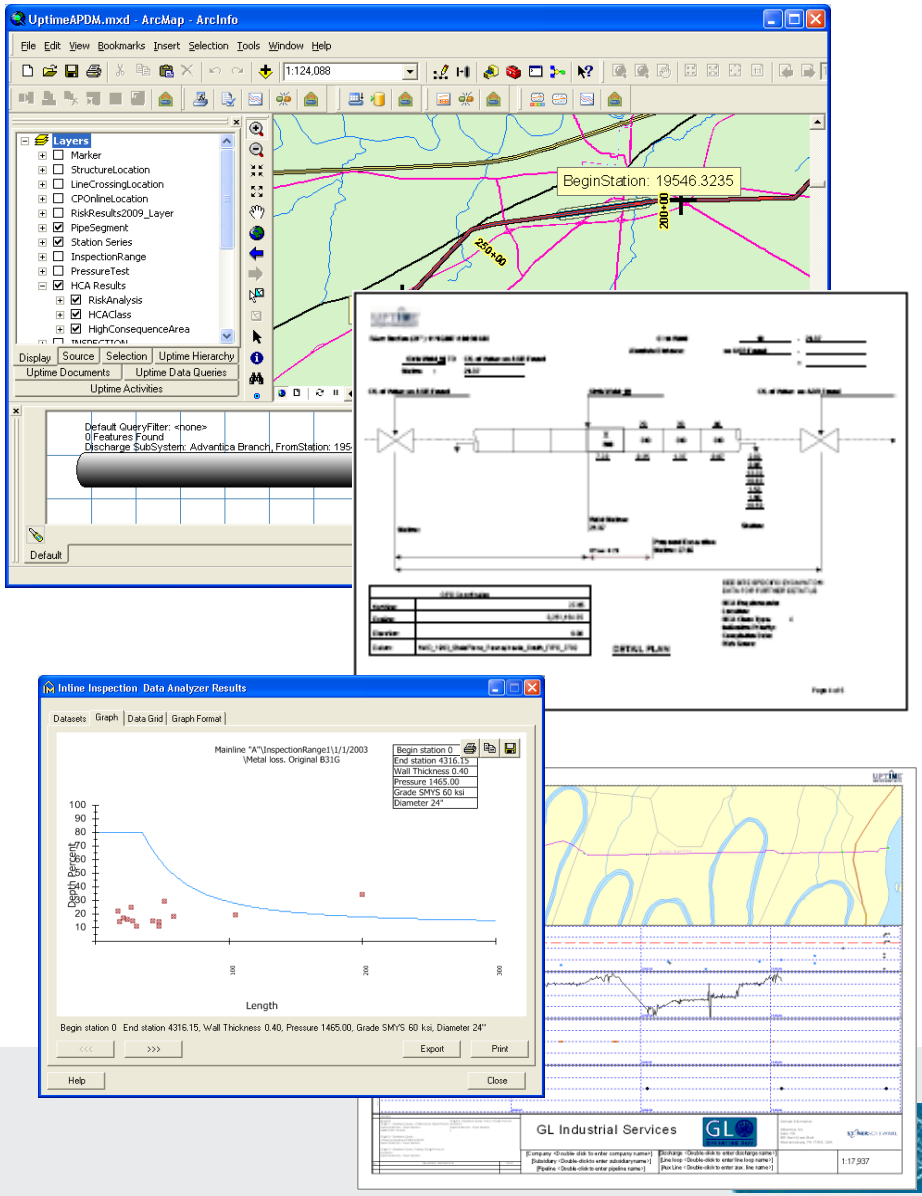
Seamless Integration with GIS



Uptime For Pipeline Assets

- **Class Location and HCA Calculator**
  - CFER Circle, Sliding Mile, Clustering
- **Develop and Execute Risk Models**
  - Preconfigured NGA (Kiefner) Model
  - Others – Muhlbauer, etc.
- **Integrity Assessment Data Management**
  - Multi-vendor support
  - Import, Align, Analyze
  - ILI, CIS, DCVG, ECDA, etc.
- **Defect Analysis**
  - B31G, RSTRENG
  - MAOP, Safe Op Pressure, etc.
- **Productivity and Analysis Tools**
  - Excavation Management, Dig Sheets, etc.
  - Interactive Alignment Sheet Generator
- **MAOP Verification and Tracking**



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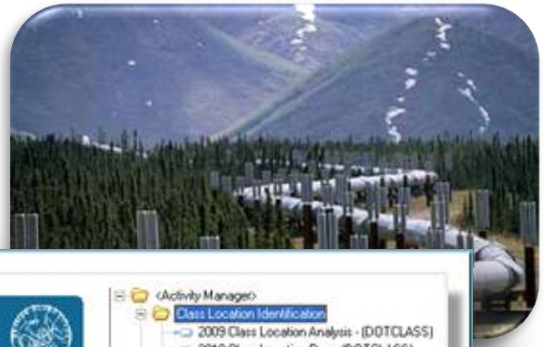
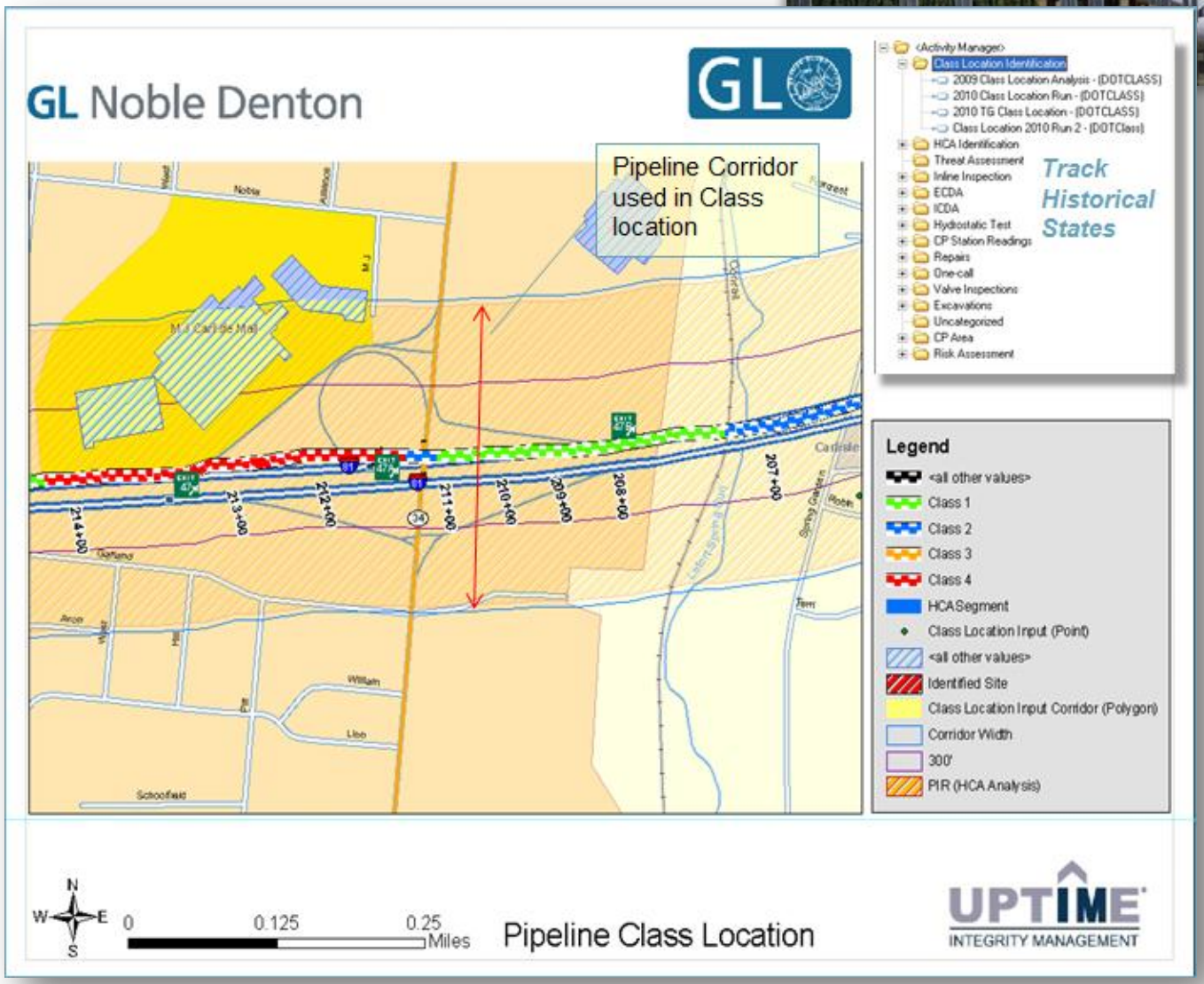
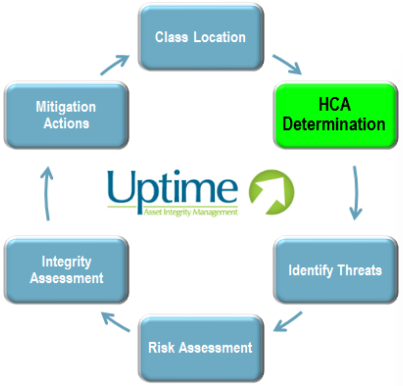
Uptime:
Pipeline Integrity Management





Uptime:
Pipeline Integrity Management



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ILI Metal Loss and crack defects in HCA

Navigate to HCA Segments

Company
Susquehanna Transmission
LineLoop
Mainline "A"
Discharge SubSystem
Advantica Branch
Casing
21151.8728
UTExcavation
Valve
HCASegment
20140.9445
20140.9468
21144.0604
21150.3809
21330.0386
21871.348
21871.348
Huntington Ridge
River Section
SubSystem
Cumberland County Pipeline System

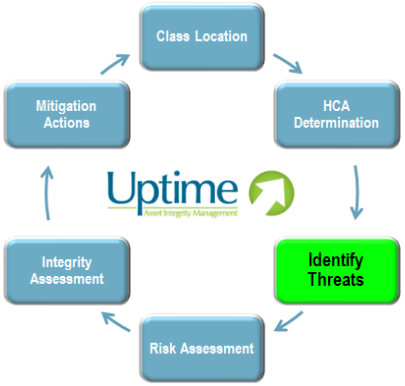
HCASegment
Defect Depth (%)
Depth Percent
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
World Imagery
Low-Resolution (15m) Imagery

N W E S
0 0.025 0.05 Miles

Pipeline HCA Analysis

UPTIME INTEGRITY MANAGEMENT

Uptime:
Pipeline Integrity Management



Threat Assessment - Threat Assessment Questionnaires - Uptime Threat Assessment...

Items to analyze: 5 polylines from feature class Casing

Answer the following questions to assess the threat credibility for the items to analyze.

AC current density > 2A/ft?

Equipment Failure | External Corrosion | Incorrect Operation | Internal Corrosion | Mai

Nu...	Question	Answer
	Questions...	
1	Evidence of external corrosion from in-pipe inspection or dir...	Yes
2	History of failures from external corrosion?	Unknown
3	History of external corrosion failures requiring repair?	Yes
4	Cathodic protection quality?	Unknown
5	Mainline coating type?	Tape
6	Field joint coating type?	Bitumen
7	Pipe Coating Condition?	Poor
8	Soil Type?	Clay or Rocks
	Evidence of AC corrosion...	
9	Presence of high voltage cables?	No
10	Power line voltage > 110 kv?	Yes
11	Distance between power line and pipeline < 550yds?	Unknown
12	Parallelism between power line and pipeline > 1100yds?	Unknown
13	AC current density > 2A/ft?	Yes

Expert Advice:

Threat Is Credible - External Corrosion may occur on this pipeline. It is recommended that a corrosion mitigation scheme is produced and integrity assessment performed.

Additional Guidance
Threat Is Credible - AC Corrosion is a Credible Threat - This threat can be mitigated through the use of gradient control wires.

Comments:

Interactive SME Dialog

Report... | Import... | Export... | Cancel

UPTIME — Threat Assessment Report — STONERSOFTWARE

Threat Summary

Threat Name	Is Threat Credible?
External Corrosion	True

Threat Information

Questions:	13
Credible Score:	5.00
Credible Threshold:	1.00
Credible Formula:	Question1 + Question2 + Question3 + Question4 + Question7 + Question9

Threat "Scoring"

Questions External Corrosion

Question Number	Question	Answer	Answer Score
	Questions...		
1	Evidence of external corrosion from in -pipe inspection or direct assessment?	Yes	1
2	History of failures from external corrosion?	Unknown	1
3	History of external corrosion failures requiring repair?	Yes	1
4	Cathodic protection quality?	Unknown	1

Threat report = Expert Advice

UPTIME — Threat Assessment Report — STONERSOFTWARE

Threat Is Credible - External Corrosion may occur on this pipeline . It is recommended that a corrosion mitigation scheme is produced and integrity assessment performed .

Additional Guidance
Threat Is Credible - AC Corrosion is a Credible Threat - This threat can be mitigated through the use of gradient control wire

Additional Guidance
MIC is a Credible Threat - A more onerous inspection, rehabilitation and repair program may be required on segments that are susceptible to MIC .

Integrity Assessment
The operator has a choice of three integrity assessment methods . The methods are in -line inspection with a tool capable of detecting wall loss such as an MFL tool; performing a pressure test; or, conducting direct assessment . Consultation with Section 6 of ASMEB31.8S should be made to ensure that the integrity assessment is carried out correctly .

Mitigation
In-line inspection
The response is dependent on the severity of corrosion as determined by calculating critical failure pressure of indications (See ASME B31G or equivalent) and a reasonably anticipated or scientifically proven rate of corrosion . Refer to Section 7 of ASME B31.8S for responses to integrity assessment .

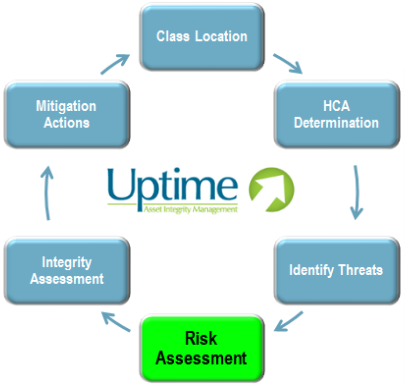
Direct Assessment
The response is dependent on the number of indications examined, evaluated and repaired . Refer to Section 7 of ASME B31.8S for responses to integrity assessment .

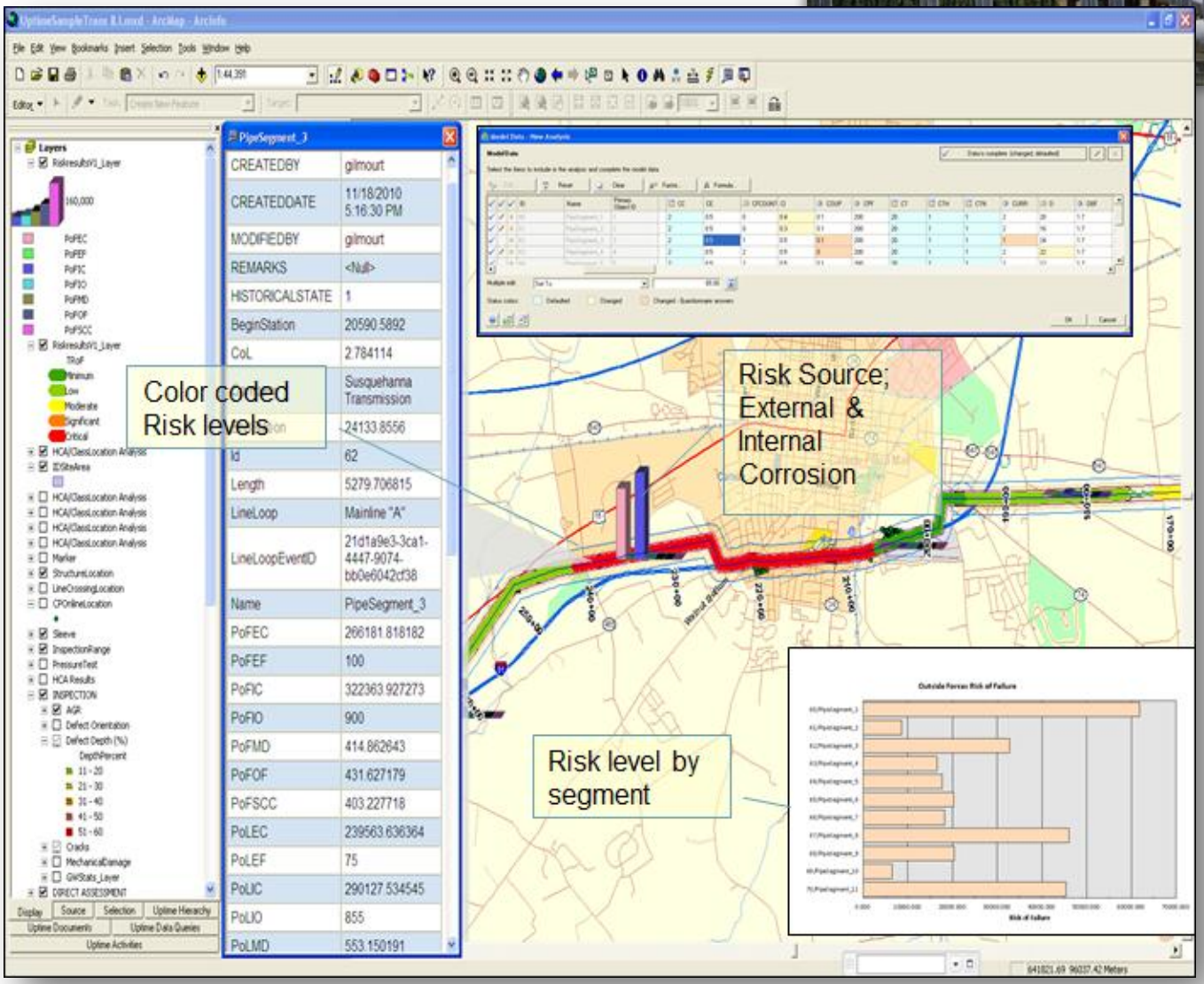
Pressure Testing
The interval is dependent on the test pressure . If the test pressure was at least 1.39 times MAOP, the interval shall be 10 years. If the test pressure was at least 1.25 times MAOP, the interval shall be 5 years (Refer to Section 7 of ASME B31.8(S for responses to integrity assessment .

The operator shall select the appropriate repair methods as outlined in Section 7 of ASME B31.8(S).

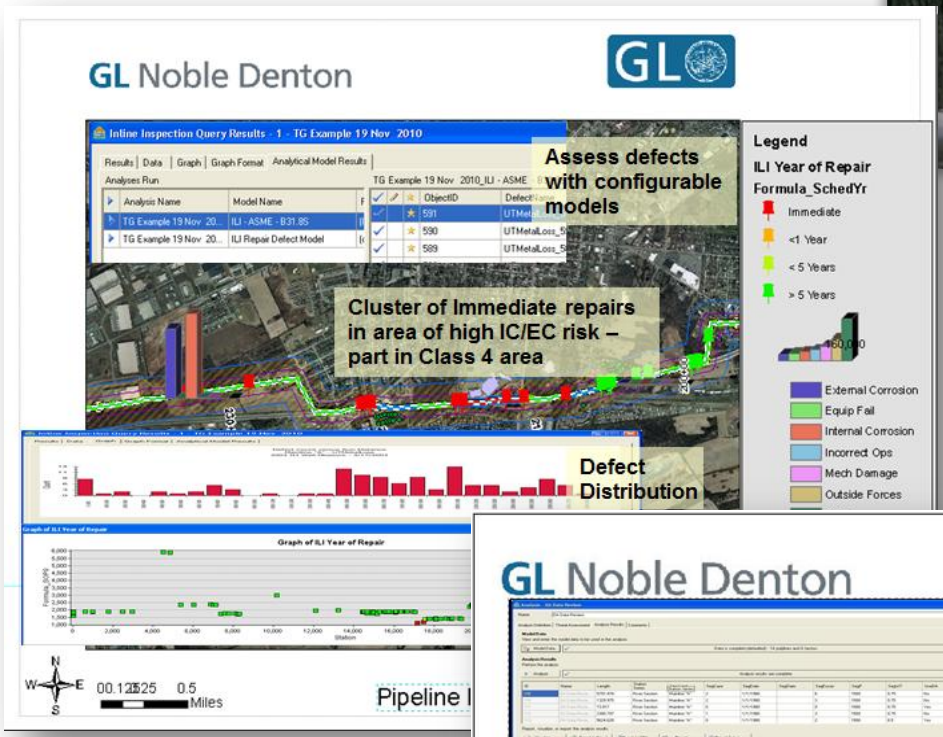
Uptime:

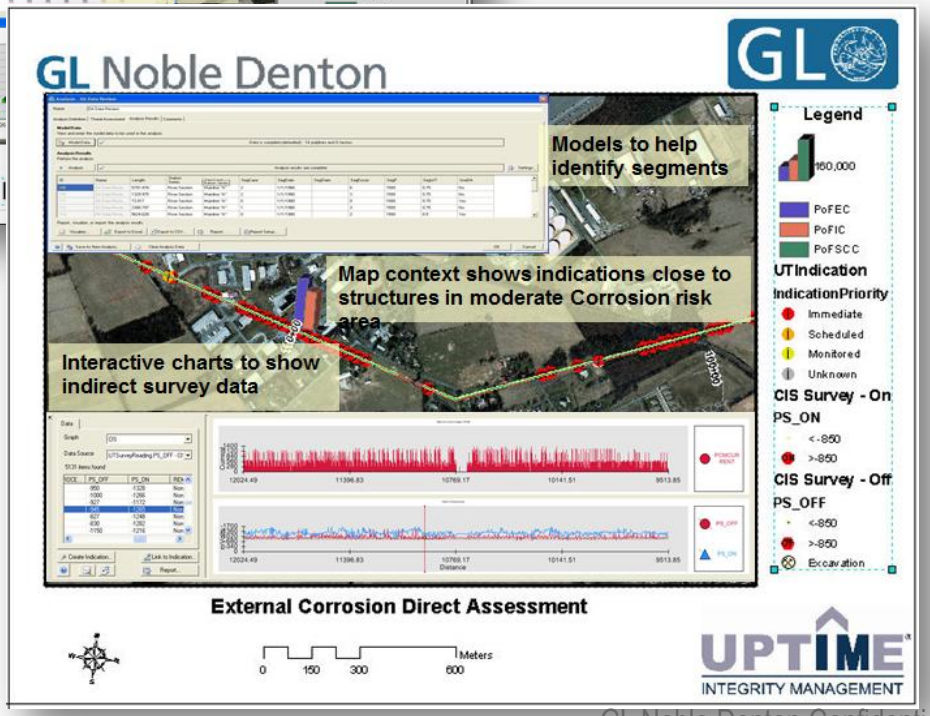
Pipeline Integrity Management





Uptime:
Pipeline Integrity Management





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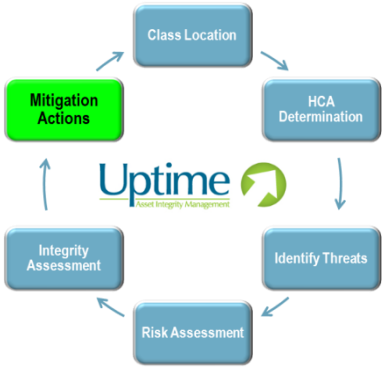
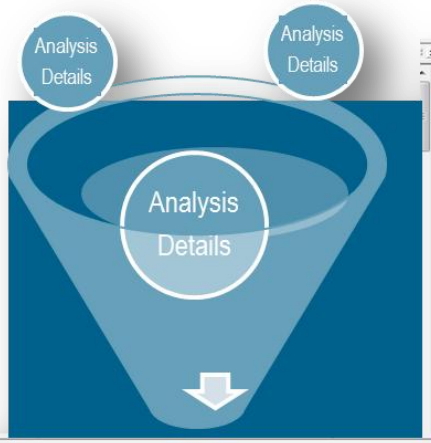
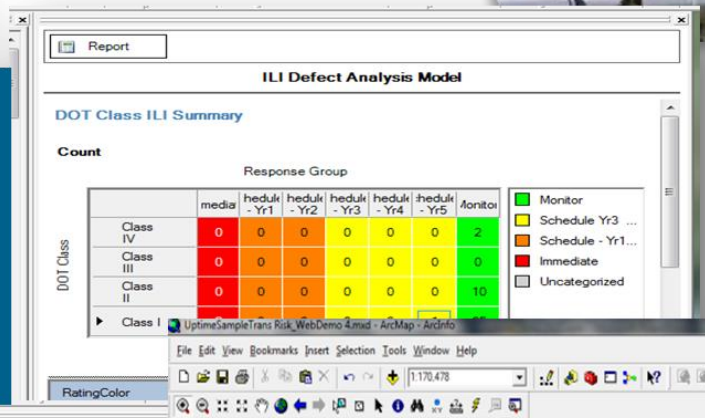
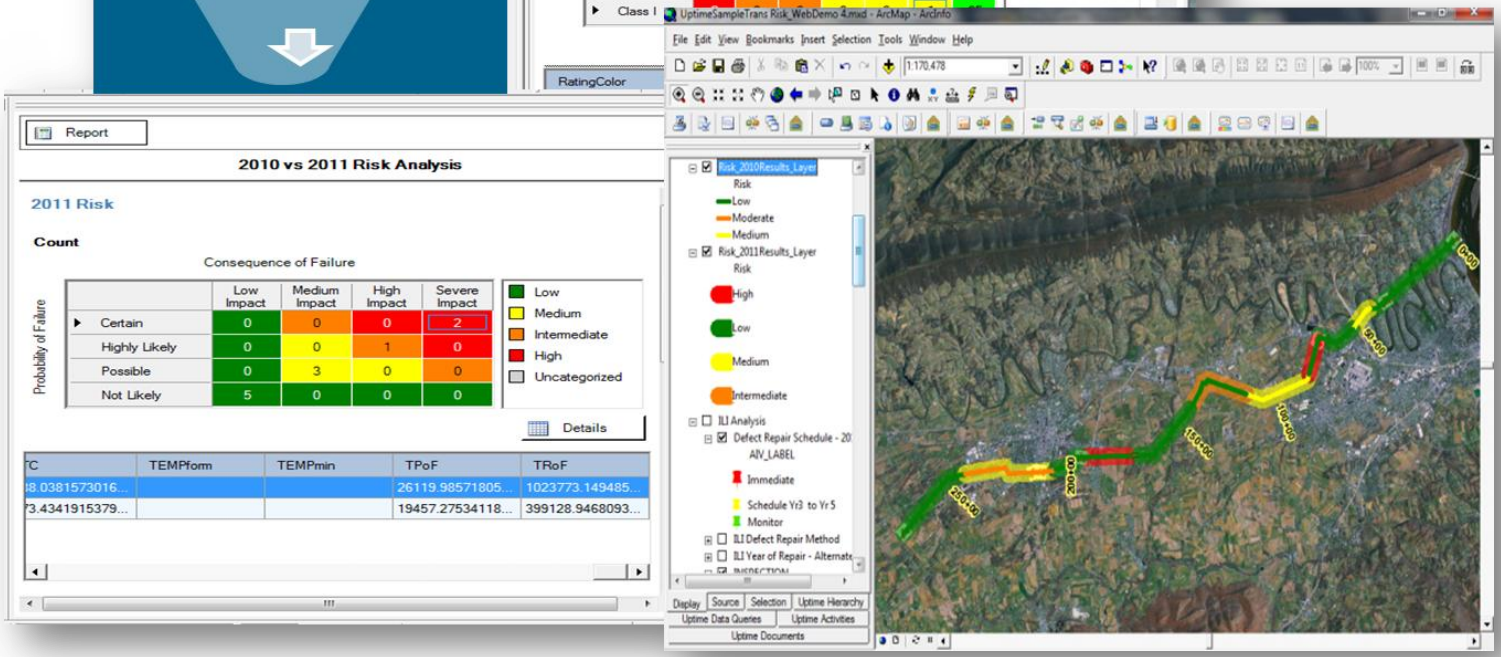
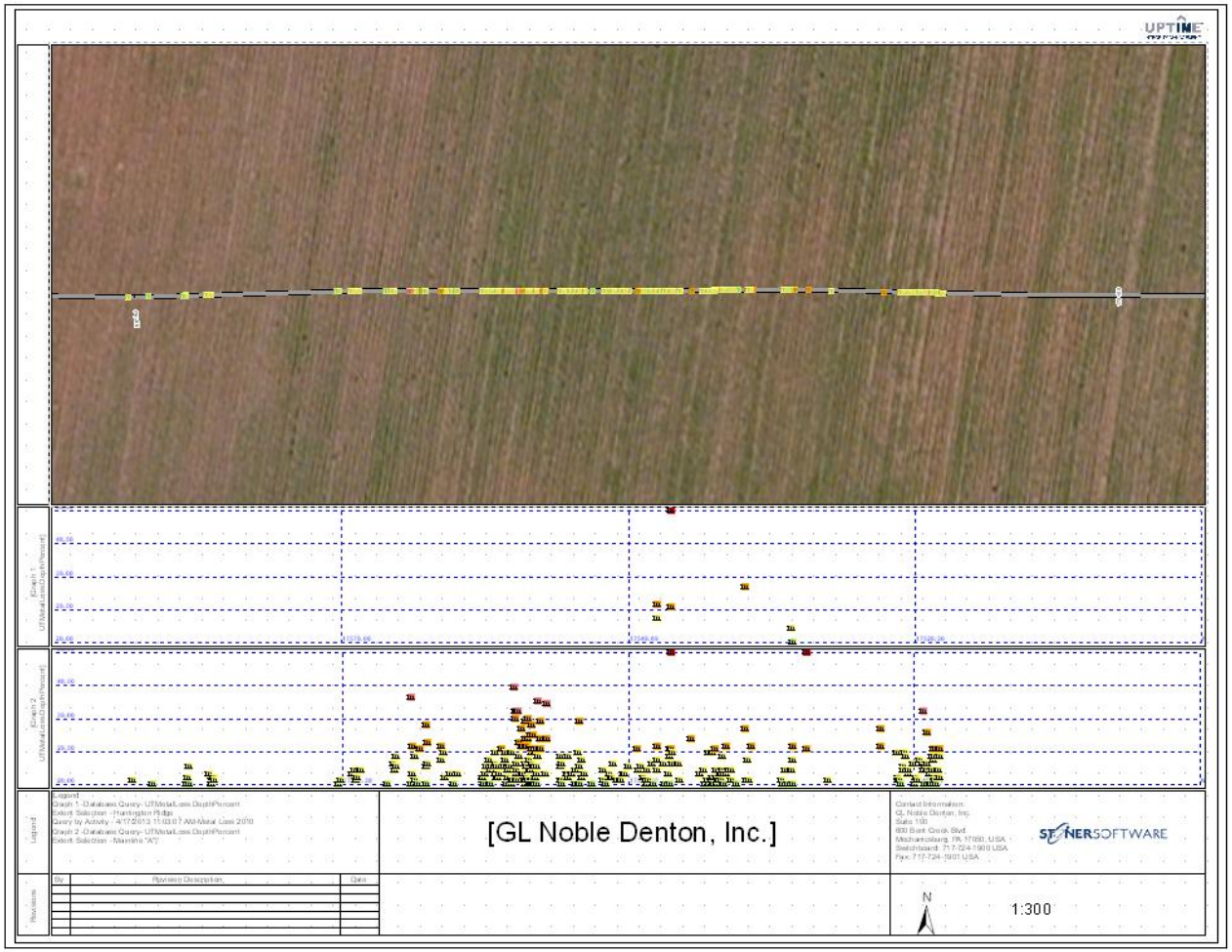




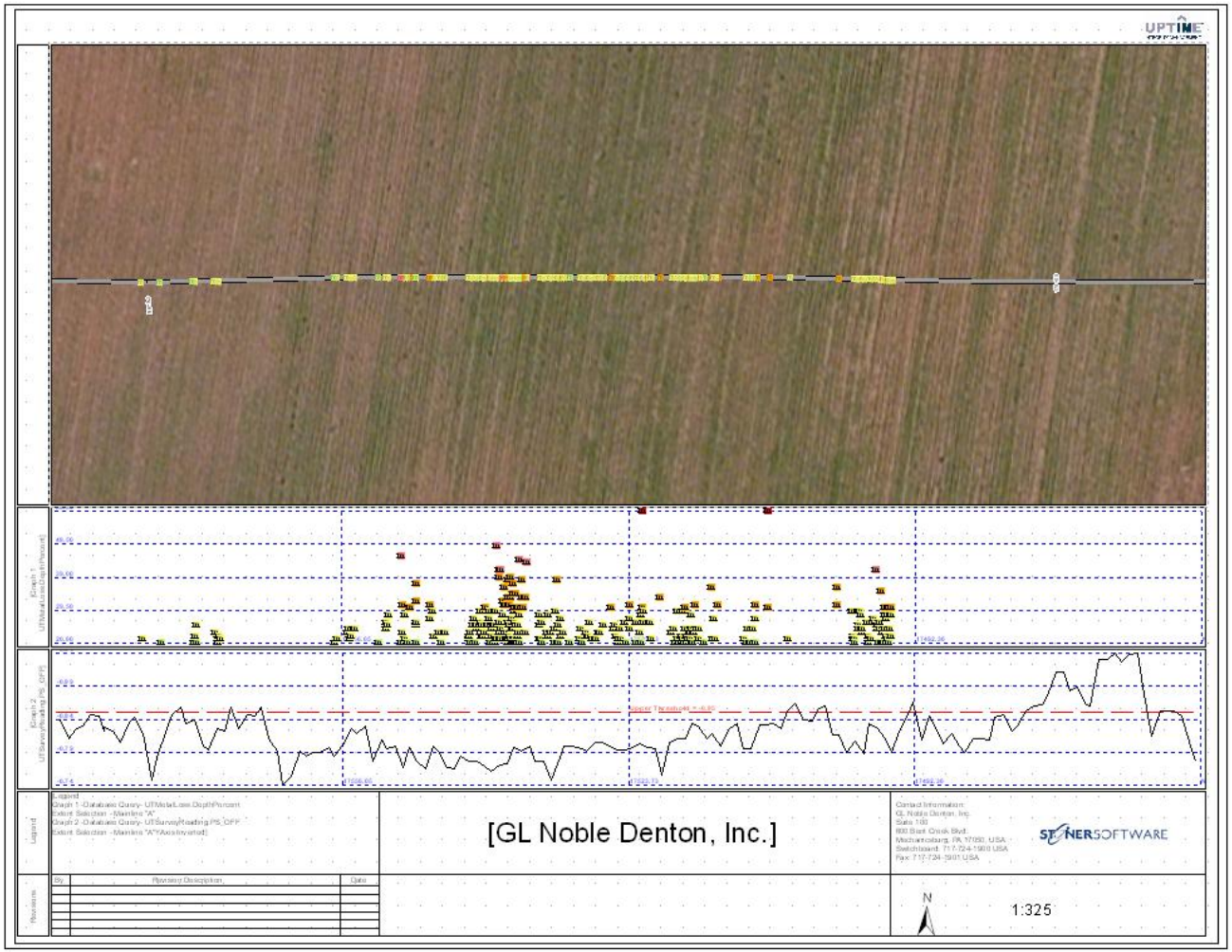




Uptime:
Worked Example



Uptime:
Worked Example



Uptime:
Worked Example

Results | Data | Graph Format | Graph | Analytical Model Results

Defects

Type	STATION	StationSeries	LENGTH	WIDTH	Depth	Depth Percent	Long Sear Orientatior
Metal Loss	17,519.41	Huntington Ridge	13.00	17.00		41.00	
Metal Loss	17,531.34	Huntington Ridge	81.00	133.00		58.00	
Metal Loss	17,558.09	Huntington Ridge	646.00	653.00		43.00	
Metal Loss	17,558.99	Huntington Ridge	53.00	97.00		44.00	
Metal Loss	17,561.04	Huntington Ridge	142.00	68.00		41.00	
Metal Loss	17,561.09	Huntington Ridge	18.00	17.00		41.00	
Metal Loss	17,561.22	Huntington Ridge	21.00	20.00		41.00	
Metal Loss	17,561.42	Huntington Ridge	129.00	399.00		48.00	
Metal Loss	17,571.98	Huntington Ridge	131.00	189.00		45.00	
Metal Loss	17,713.64	Huntington Ridge	22.00	29.00		44.00	

Uptime:
Worked Example

New ILI Query_2_ILI - ASME - B31.8S - Defect Analysis - (10 Defects Analyzed)

cvStatus	FP0	FPMratio	ImInd	InHca	MeasDepthMI	MitTypes	MitTypes1	NF	NF2	PercSMYS	SchedYr	SOP0
portional	2637.62064...	1.75841376...		0				System.__C...	System.__C...	63	10	1899.08686...
portional	2586.26384...	1.72417589...		0				System.__C...	System.__C...	63	10	1862.10997...
portional	2380.15748...	1.58677165...		0				System.__C...	System.__C...	63	10	1713.71338...
portional	2609.70048...	1.73980032...		0				System.__C...	System.__C...	63	10	1878.98435...
portional	2549.12313...	1.69941542...		0				System.__C...	System.__C...	63	10	1835.36865...
portional	2635.52068...	1.75701379...		0				System.__C...	System.__C...	63	10	1897.57489...
portional	2633.98482...	1.75598988...		0				System.__C...	System.__C...	63	10	1896.46907...
portional	2555.39969...	1.70359979...		0				System.__C...	System.__C...	63	10	1839.88778...
portional	2554.38352...	1.70292234...		0				System.__C...	System.__C...	63	10	1839.15613...
portional	2633.43059...	1.75562039...		0				System.__C...	System.__C...	63	10	1896.07002...

Uptime:
Worked Example

Defect Depth v Defect Length

Count

Defect Length

Defect Depth	Low	Medium	High
Repair	9.00	1.00	0.00
Monitor	250.00	10.00	1.00
OK	55.00	0.00	0.00

Low
Medium
High
Uncategorized

Details

Data source Metal Loss

Visualize

Uptime:
Worked Example

Defect Depth v Defect Length

Count

Defect Length

Defect Depth	Low	Medium	High
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Low
Medium
High
Uncategorized

Details

RatingColor	RatingLabel	VirtualDataRowII	ClusterNo	ClusterRPR	CLValidityTolerar	DeepestPointDe	DeepestPointDe	DeepestPointHH	DeepestPointHH	DepthMM	DepthPercent	DepthPercent
	Medium	139			0			630			28	
	Medium	254			0			615			32	
	Medium	268			0			645			28	
	Medium	293			0			545			21	

Data source Metal Loss

Visualize

Uptime:

Questions