



## MAOP VALIDATION PROGRAM



# AGENDA

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- **Proposed Regulation**
- **MAOP Validation Program**
  - **Data Gathering**
  - **MAOP Calculation**
  - **Field Verification**
  - **Remediate MAOP**
- **Uprating**





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# PROPOSED REGULATION



## NPRM – “MEGA-RULE”

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- Requires a systematic approach to verify a pipeline's maximum allowable operating pressure (MAOP).
  - Speculation around content and timing of final rule.





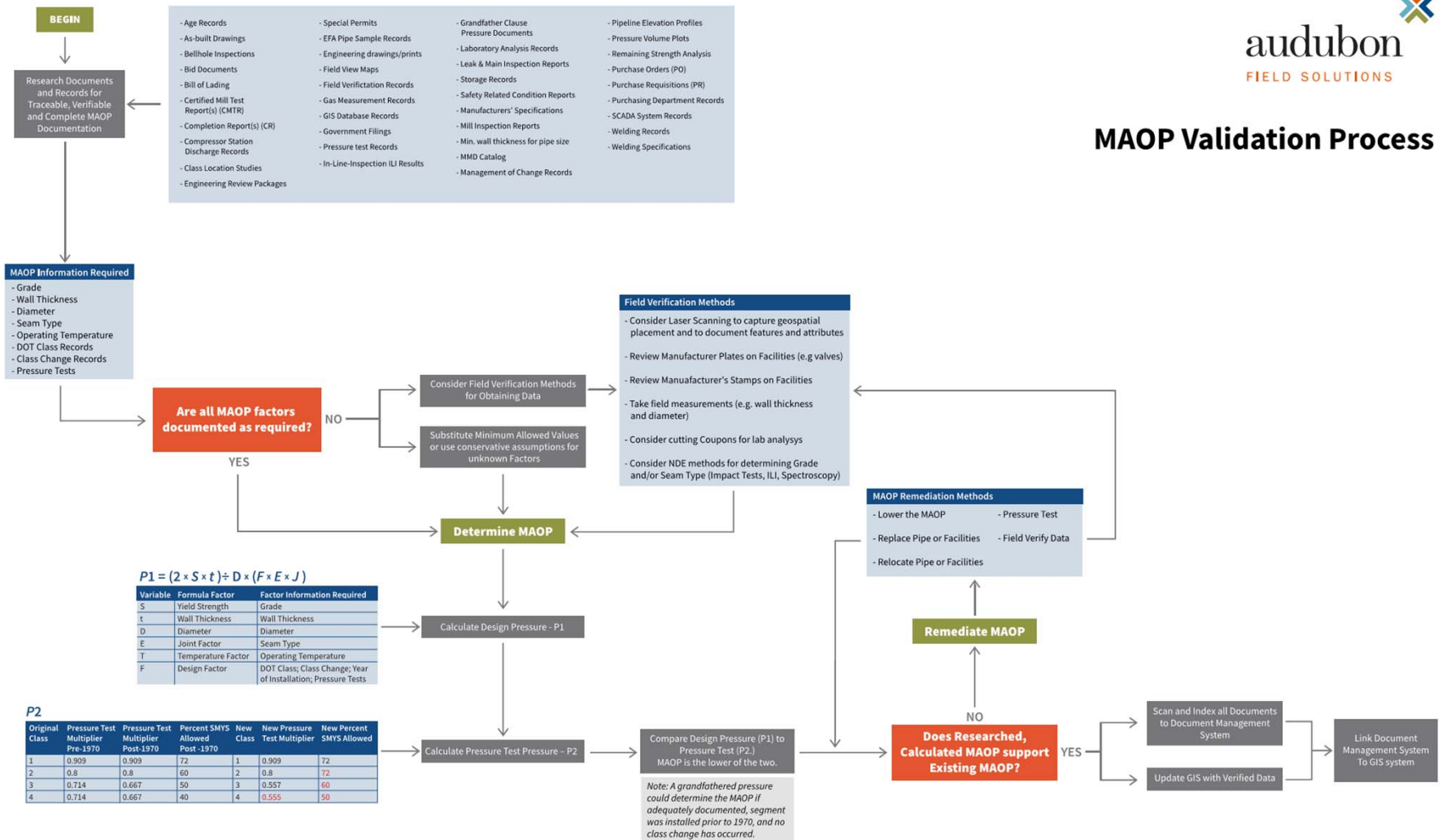
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# MAOP VALIDATION PROCESS



# BEGIN WITH THE END IN MIND

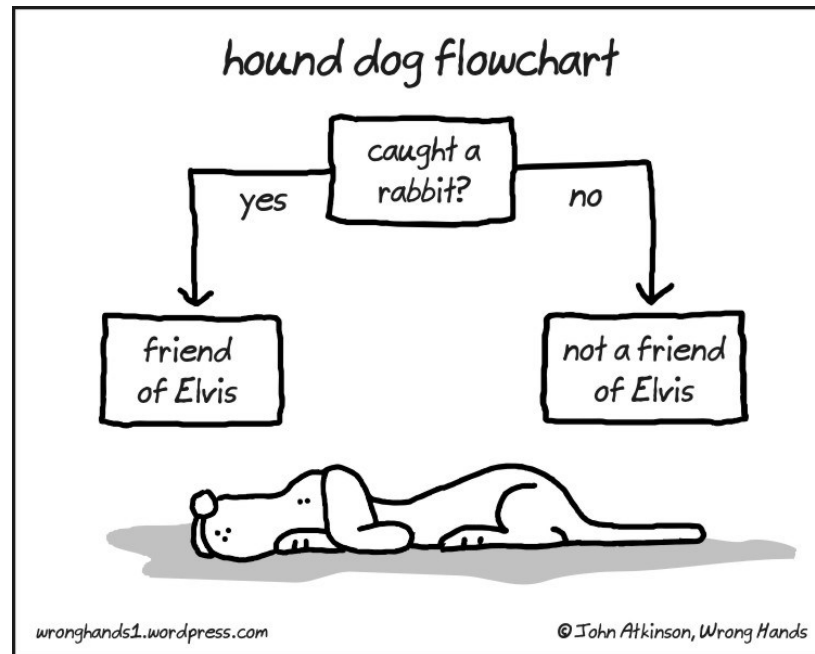
## MAOP Validation Process



# PROGRAMMATIC APPROACH

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- Data Gathering
- MAOP Calculation
- Field Verification
- Remediate MAOP



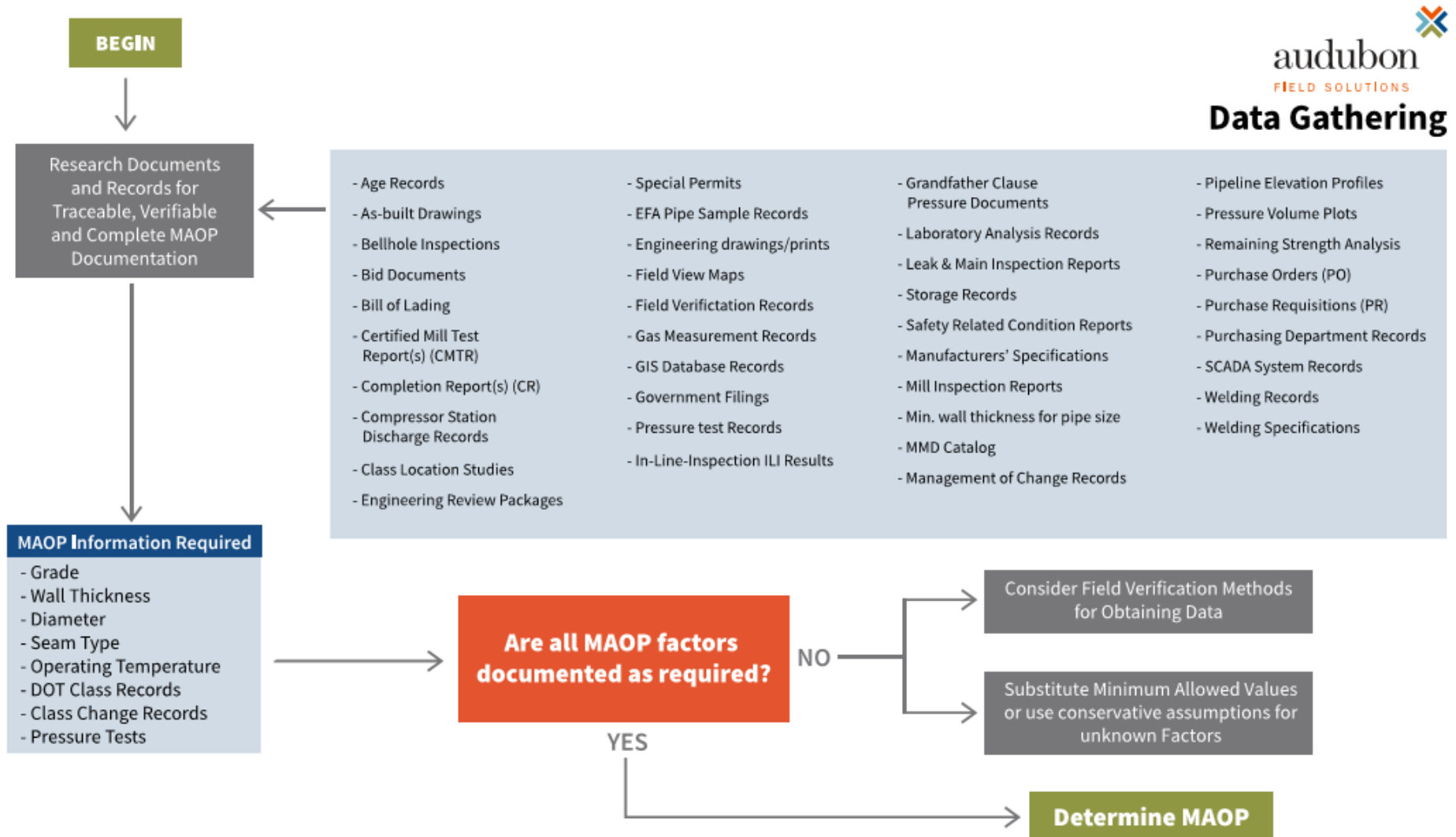
# WHERE DO I START?

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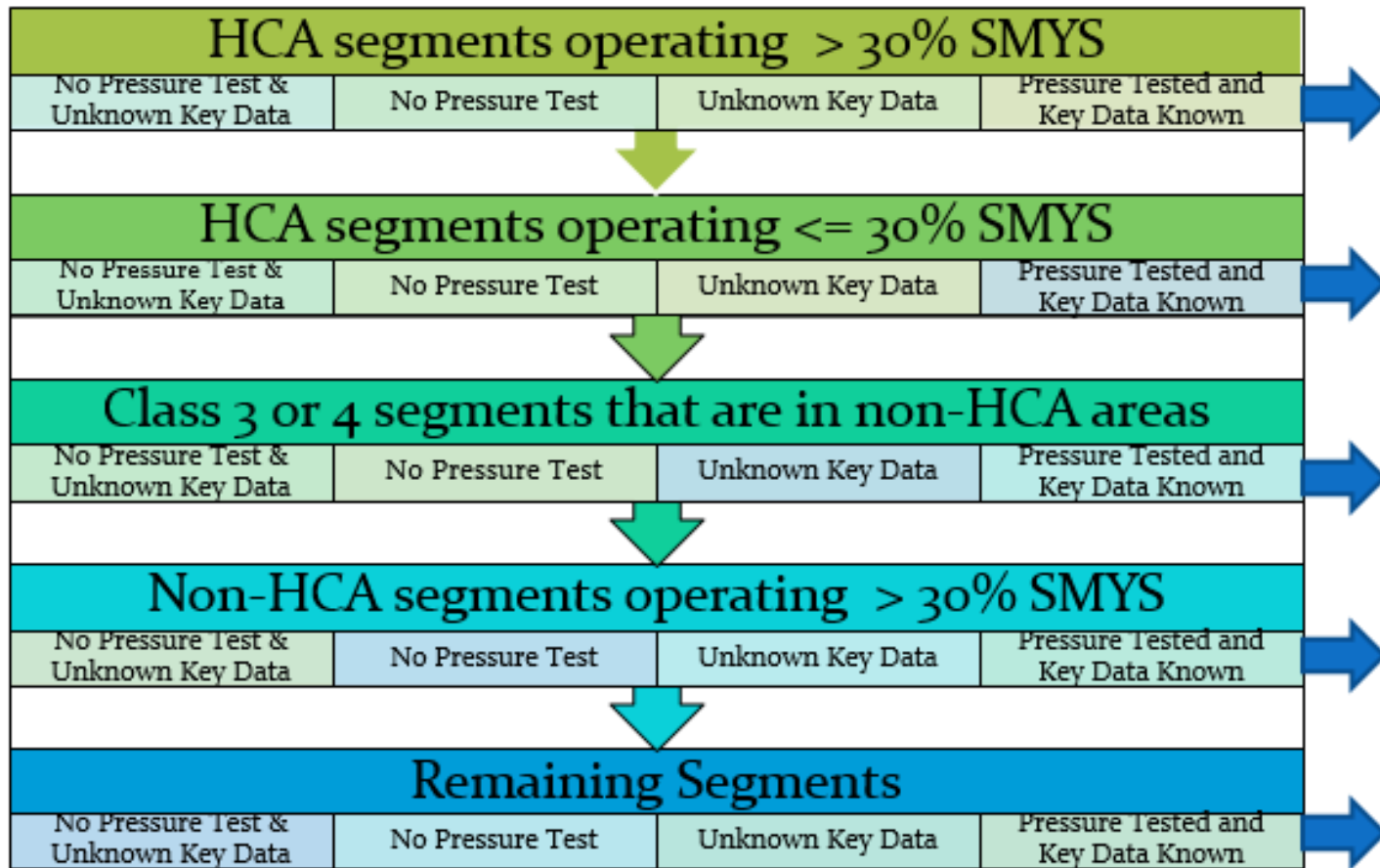
# ONE – GATHER RECORDS





# PRIORITIZATION?

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# RECORD REQUIREMENTS (PROPOSED)

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- **Traceable** - Linked to original information about a pipeline segment or facility.
  - MTR's, requisitions, or as-built documentation indicating SMYS, seam type, wall thickness and diameter.
- **Verifiable** - Complementary, but separate
  - Line segment pressure test specs inclusive of pressure charts or field logs.
  - Pipe mill PO / specification inclusive of coupon metallurgical test results.
- **Complete** - Evidenced by signature, date or other marking.
  - Hydrotest records that identify, testing contractor, test duration, test medium, temperatures, pressure measurements, and elevation information as applicable.



# FIELD DATA COLLECTION – HOW?

- **ArcGIS Linked Pipeline Model**
  - QC “engineered” into the process.

Survey123 for ArcGIS

MAOP Valve Survey

StationSeries \*  
Route A

Location  
36°1'N 96°45'W  
Position source closed error

Serial Number

Type

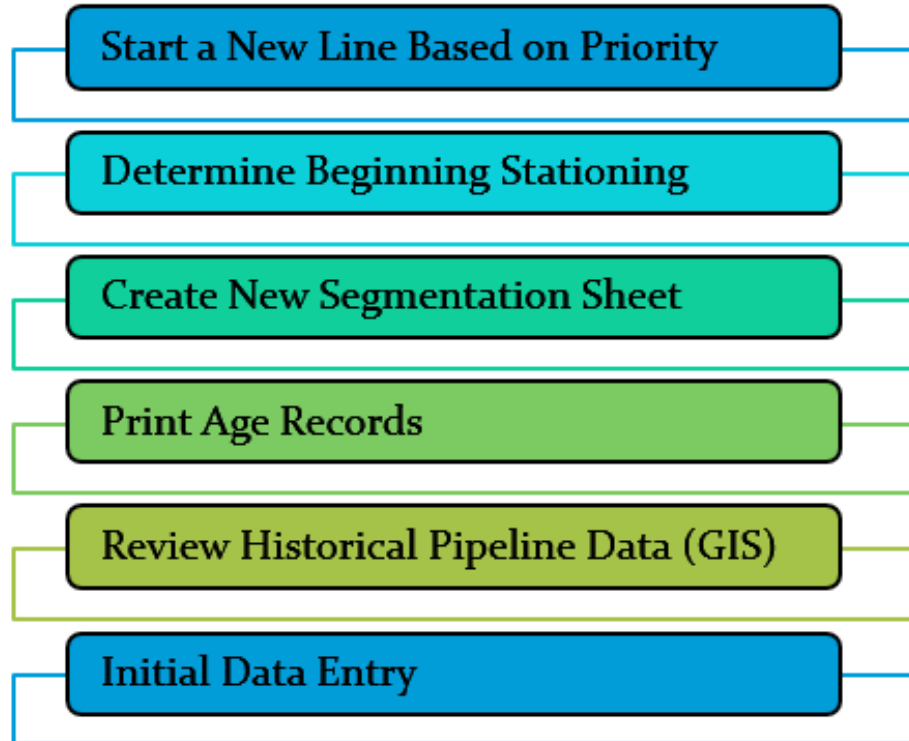
Size

Manufacturer

audubon  
FIELD SOLUTIONS

# INITIAL SEGMENTATION

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- Segment Length
- Stationing
- Year Booked
- Completion Report
- Facility Type
- Install Date
- Town Code
- Current DOT Class
- Outside Diameter
- Location of road crossings



# ATTRIBUTES TO BE CONSIDERED FOR COLLECTION

General Information	Pipe Segment	Coating Information	Pressure Types	Fitting Information
Segment Number	Length	Primary External Coating	Grandfather Pressure	Inlet Diameter
Comments	Begin Station	Primary External Sub-Type	Operator Pressure	Inlet Wall
Year Booked	End Station	Secondary External Coating	Alternative Pressure	Outlet Diameter
Completion Report #	Pipe Source	Secondary External Sub-Type	Special Permit Pressure	Outlet Wall
Companion Job #	Design Factor		Certificated Pressure	Branch Diameter
Companion Job Date	Design Factor Type			Branch Wall
Facility Type	Outside Diameter			Specification
Install Date	Pipe Material			
Town Code	Wall Thickness			
Current DOT Class	Pipe Grade			
Original DOT Class	Seam Type			
Listed MAOP				
Verification ID				
Additional Remarks				
RAM Segment # (pre-GIS Database)				

# ATTRIBUTES COLLECTED (CONTINUED)

Valve Information	Casing Information	Tap Information	Flange Information	Miscellaneous Information	Pressure Test Information (1-5)
Facility Size	Casing Diameter	Tap Type	Flange Type	Sleeve Type	Test Date
Pressure Rating	Casing Length	Tap Size	Flange Specification	Coupling Type	Project Number
Inlet Connection Type	Crossing Type		Flange Pressure Rating	Control Fitting Mfg/Type	Test Type
Outlet Connection Type	Year Booked			Closure Type	Installation
Specification	Completion Report Number			Common Safe Working Pressure	MAOP Validation
					Integrity Assessment (Y/N)
					Pressure Volume Plot (Y/N)
					Test Medium
					Minimum Adjusted Pressure
					Test Duration
					Spike Pressure
					Spike Duration



# LEGACY DATA CONVERSION

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## SCAN

- + Scanning is performed by location
- + Metadata accompanies image
- + High-definition scanning can be provided by third party

## EXTRACT

- + Data is identified by regulatory compliance
- + Key information is automatically extracted
- + Documents are automatically categorized and grouped

## OUTPUT

- + Data is managed by REV, the Blue Sky database
- + "Gap" analysis is provided to document what is or isn't there
- + Data can be loaded to PODS, PODS Spatial, UPDM, and more

# LEGACY PAPER RECORD



WELSPUN TUBULAR LINE PIPES, COATINGS		MATERIAL TEST CERTIFICATE (As per BS EN 10204:2004 3.2)										Format No. WTL/ HFW/QC/13, Rev.4 06/01/16							
Customer : [REDACTED]		Marking : Welspun API SPEC 5L-0953										Document No. [REDACTED]							
P.O.No : [REDACTED]		MM YY, 12.75 X 0.375 X52M PSL2 HFW										Revision 0							
PROJECT : [REDACTED]		ASL NO: [REDACTED]										Date [REDACTED]							
Description : OD 12.75" X 0.375" WT API 5L X52M PSL 2		TESTED 2920 PSI																	
Technical Specification : High Frequency Welded (HFW) plain end pipes as per API 5L 45th Edition July 1, 2013		PIPE NO: [REDACTED] HEAT NO: [REDACTED]																	
		LENGTH: (in feet to 10ths of a foot), ALSO MEETS ASTM A53 GR B E																	
		PROJECT : BUYER: [REDACTED]																	
		P.O. NO.: [REDACTED]																	
		MADE IN USA																	
Approved QAP No : QAP/HFW/SL/STOCK/09 Rev. 0		Color Marking : [REDACTED]																	
Steel Making : Hadeed, Saudi Arabia		Steel Rolling : Hadeed, Saudi Arabia																	
CHEMICAL ANALYSIS																			
Coil No. / Pipe No.	C%	SP%	Mn%	P%	S%	Ni%	Cr%	Mo%	Cu%	Al%	Ti%	V%	N%	B%	Ca %	Nb%	Nb+V+Ti	CE(PCM)	CE(IIW)
Requirement	Min.	0.22	0.45	1.40	0.025	0.015	0.30	0.15	0.50	---	---	---	---	---	0.001	---	0.15	0.25	---
	Max.	0.08	0.20	1.25	0.009	0.001	0.01	0.00	0.01	0.038	0.017	0.006	0.002	0.0001	0.0019	0.025	0.047	0.154	---
Z08975A (Heat)		0.08	0.20	1.25	0.009	0.001	0.01	0.00	0.01	0.038	0.017	0.006	0.002	0.0001	0.0019	0.025	0.047	0.154	---
Z16026901 (P)		0.05	0.18	1.19	0.010	0.003	0.04	0.03	0.01	0.03	0.054	0.020	0.008	0.003	0.0003	0.0012	0.030	0.058	0.126
Z16026920 (P)		0.06	0.19	1.18	0.010	0.003	0.04	0.03	0.01	0.03	0.047	0.019	0.010	0.003	0.0002	0.0016	0.031	0.060	0.130
MECHANICAL TESTS																			
Coil No. / Pipe No.	Tensile Test (T180)			TWT (U.T.S)	Hardness Test		**Microscopic Examination	Charpy Impact Test Results in ft-lbs at 32° F for pipe and 14° for raw material ( Transverse Specimen full size 55 x 10 x 7.5 mm and 55 x 10 x 10 mm for raw material)								Drop Weight Tear Test (DWTT) % Shear Area	Flattening Test		
	Y.S. (PSI)	U.T.S. (PSI)	% EL		Y.S./U.T.S	Scale HV 10		Gradient HV 10	Base (T90)				Shear Area (base)						
Requirement	Min.	52200	66700	26	---	66700	---	---	Set Avg.: 15 Ind: 12				For information only				HAZ		
	Max.	76900	110200	---	0.93	---	270	---	01	02	03	Avg	01	02	03	Avg			
Z16026901 (P) (T180)		67475	78683	36	0.86	80870	157-189	32	SATISFACTORY	113	90	86	96	100	100	100	100	N/A	N/A
MPI		Seam Normalizing			Ultrasonic Testing of Weld Seam (Ref. Std: Two longitudinal N10 notches (one at internal & one at external surface) and one 3.2 mm through drilled hole at weld centerline)				Hydro Test				Visual and Dimensional Inspection						
N.A		1902° F to 2183° F			SATISFACTORY				Tested at 2920 PSI for 10s minimum				SATISFACTORY						
Note :- Y.S.-Yield Strength, U.T.S.-Ultimate Tensile Strength, TWT- Transverse Weld Tensile, Elong. - Elongation,Heat- Raw material Test Certificate-Transverse Specimen, (P) -Product, T180- Transverse specimen at 180° from the weld, L90- Longitudinal specimen 90° from the weld, Tensile testing was done according to the 2 inch gage length strip specimen standard of ASTM A370, - # - First Day Production Test, SAT. -Satisfactory, N.A. -Not Applicable, CE (PCM) = C + Si / 30 + ( Mn + Cu + Cr ) / 20 + Ni / 60 + Mo / 15 + V / 10 + 5 * B, CE (IIW) = C + Mn / 6 + ( Cr + Mo + V ) / 5 + ( Cu + Ni ) / 15. ** No untempered martensite observed & uniformly distributed ferritic structure found. Grain size is finer than 8. Found proper fusion line Observed normalisation of weld seam area through the entire wall thickness.																			
ADDITIONAL INFORMATION: 1. FIRST DAY PRODUCTION TEST CARRIED OUT AND FOUND SATISFACTORY. 2. TWO BAR CODES WILL BE PLACED ON ID ON ONE END OF THE PIPE. THE BAR CODE DETAILS ARE PIPE NO., HEAT NO., ASL NO., AND LENGTH 3. RESIDUAL MAGNETISM (1 PIPE/ 4 HOURS/ SHIFT) WAS MEASURED AND FOUND SATISFACTORY 4. HARDNESS/ MICRO TEST CARRIED OUT ON PIPE/SHIFT - FOUND SATISFACTORY 5. HARDNESS AS PER NACE MR0175														WE HEREBY CERTIFY THAT THE MATERIALS DESCRIBED HEREIN HAVE BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT AND THE TEST RESULTS PRESENTED ARE TRUE AND CORRECT. THE COPIES OF THE TEST RESULTS ARE CONTAINED IN THE RECORDS OF THE COMPANY.					
THE CERTIFICATE ISSUED FOR HEAT NO. 1436339																			
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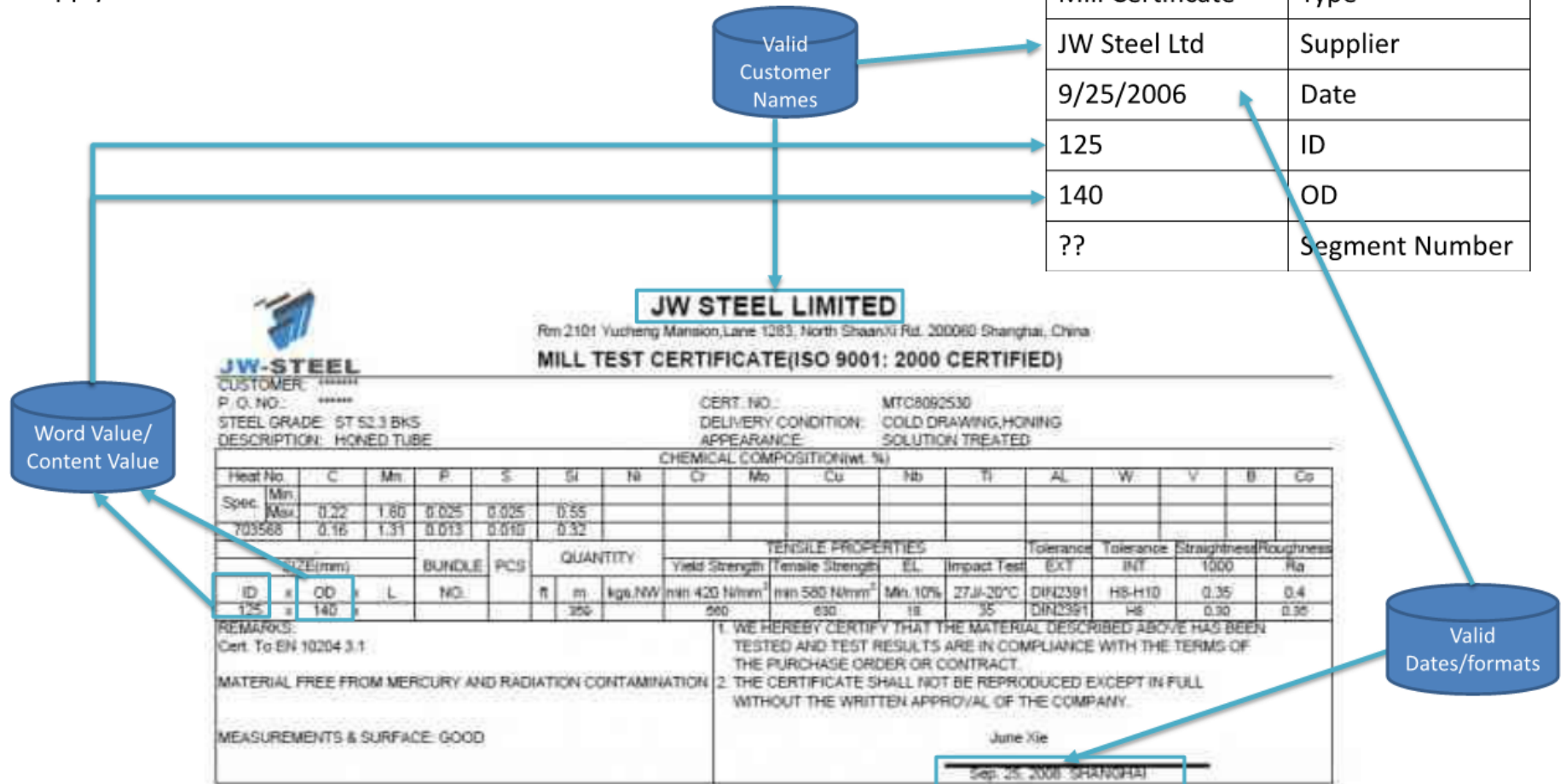


# DISCRETE INFORMATION

Apply Content Rules

Table

Mill Certificate	Type
JW Steel Ltd	Supplier
9/25/2006	Date
125	ID
140	OD
??	Segment Number





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# GEOSPATIAL INTEGRATION



# TOOLS

---

## ➤ ArcMap / ArcPro (Automated Processes)

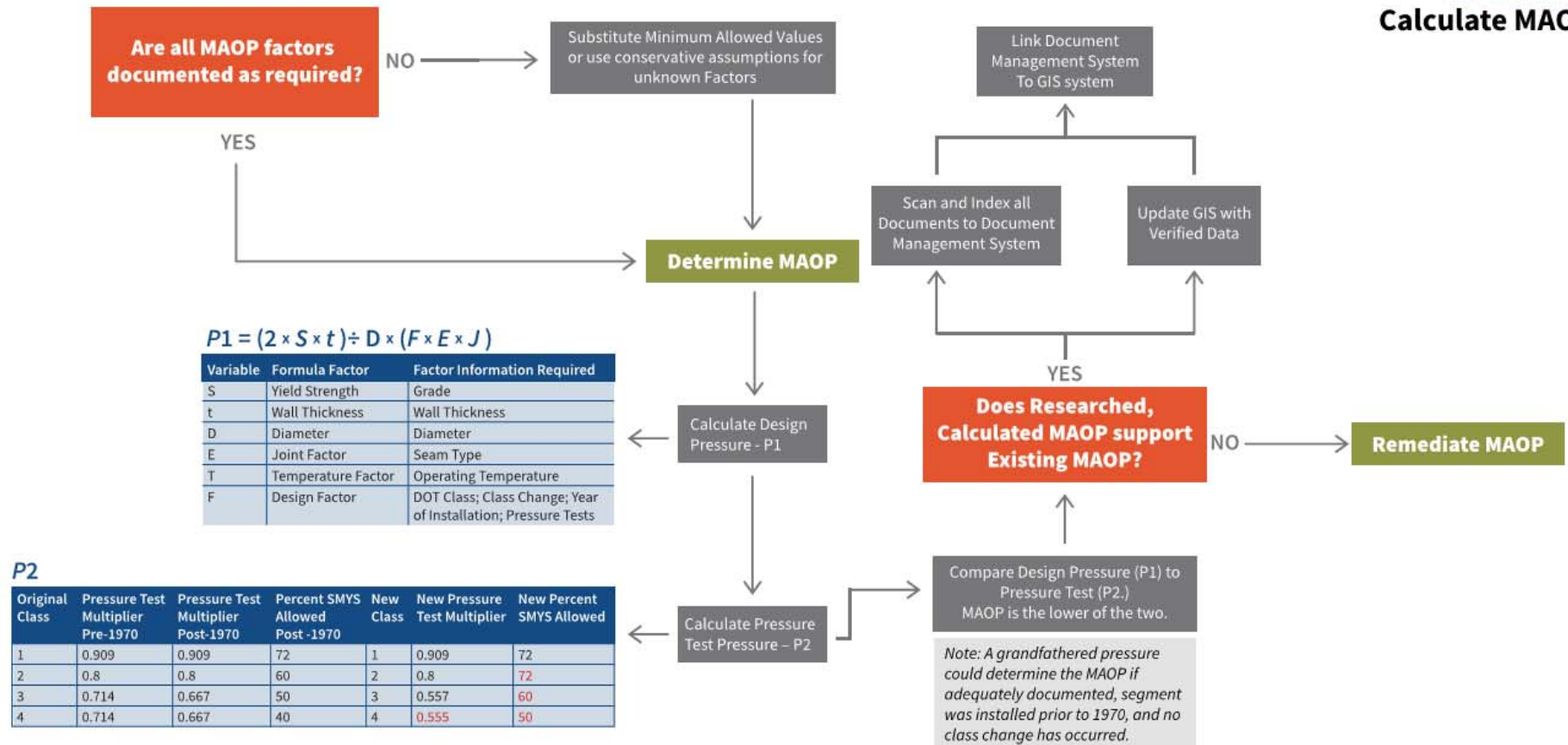
- Model Builder
- Python Scripts
- ArcGIS Enterprise
- ArcGIS Online Environment
  - Development Tools



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# TWO – CALCULATE MAOP

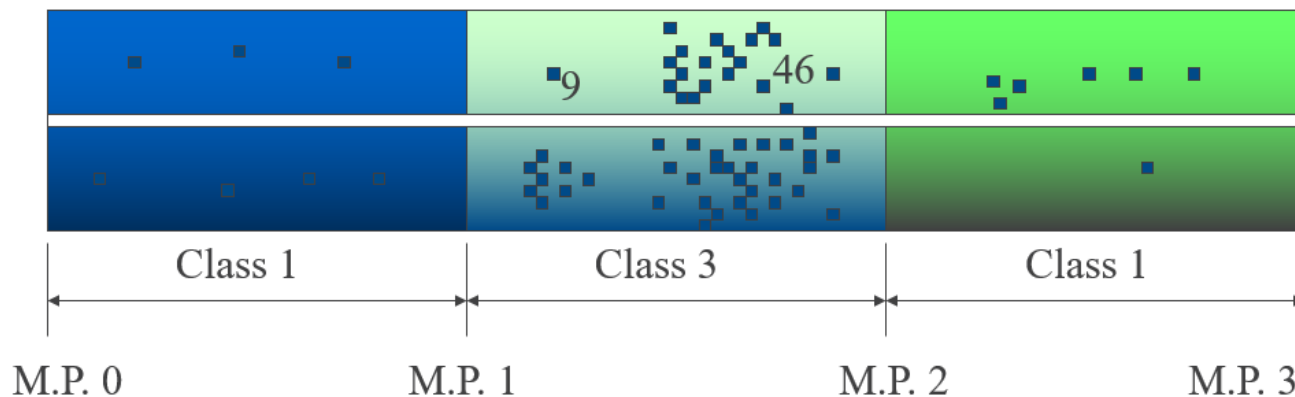




# CALCULATION

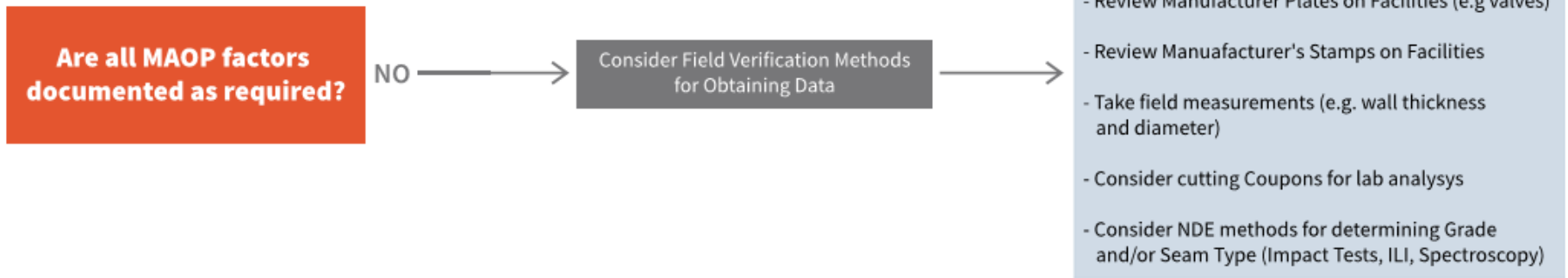
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- The Data Collection Segmentation Process Calculates:
  - Design Pressure - for each segment (P1)
  - Hydro Test Pressure - for each segment (P2)
  - Calculate MAOP – for each protected line segment
- Calculations Take Class and Class Changes into Account



# THREE – FIELD VERIFY

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# VERIFICATION

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- Highlight Relevant Information to Be Collected
- Associate Information with Segmented Records
- Export Verification Package for Validation

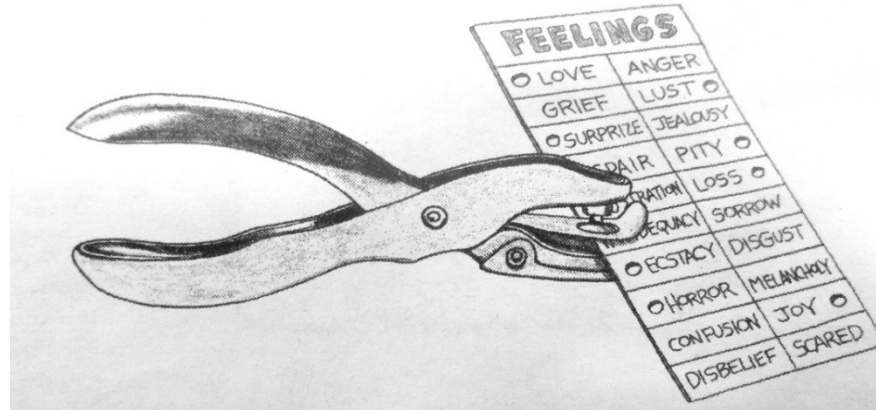




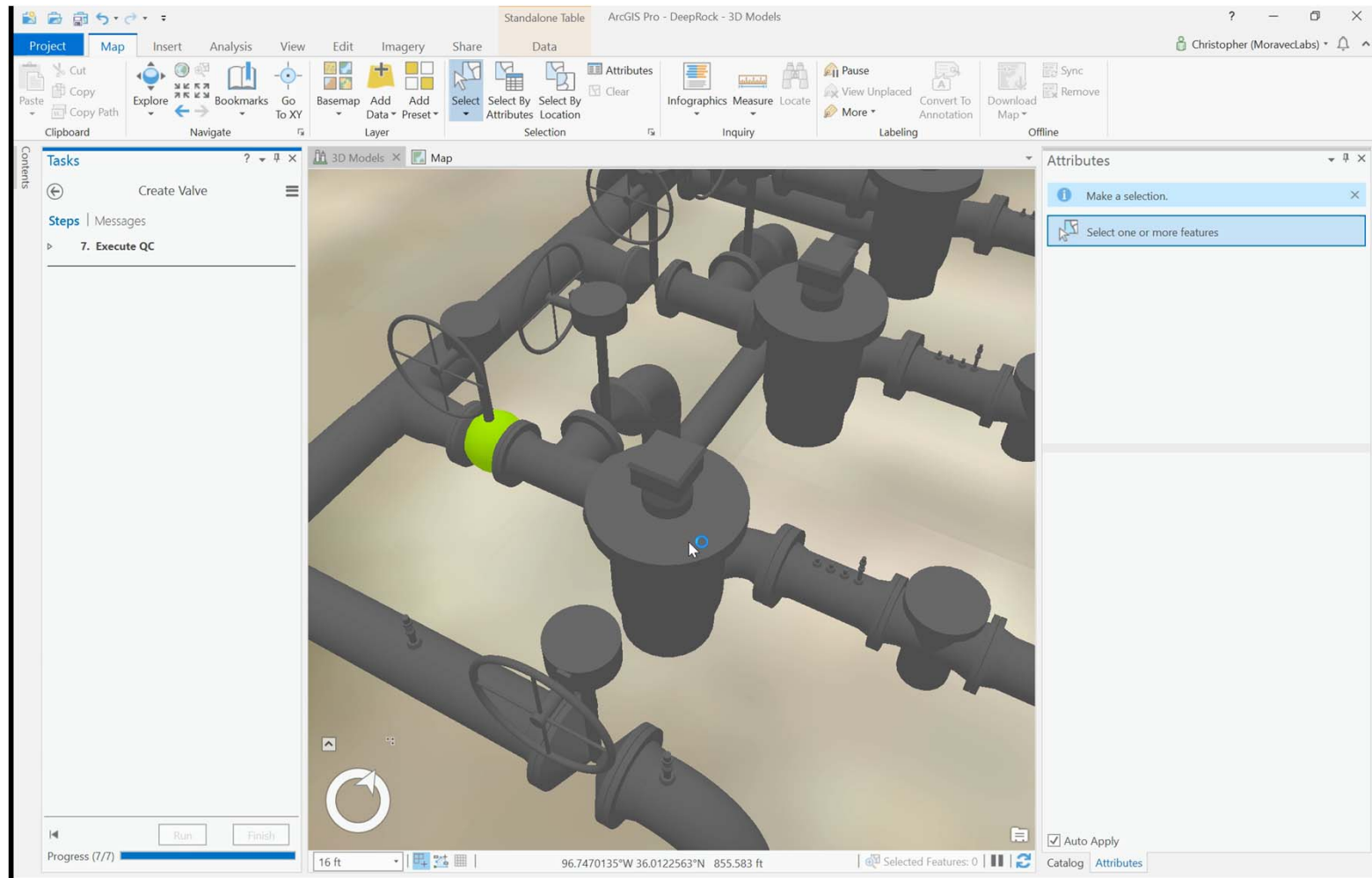
# AUTOMATED VALIDATION

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- Verify All Required Attributes are Accounted For.
- Verify Minimum Set (or combination of) Required Documents are Accounted For.
- Compare Against Upstream and Downstream Feature Data for Sanity Check.

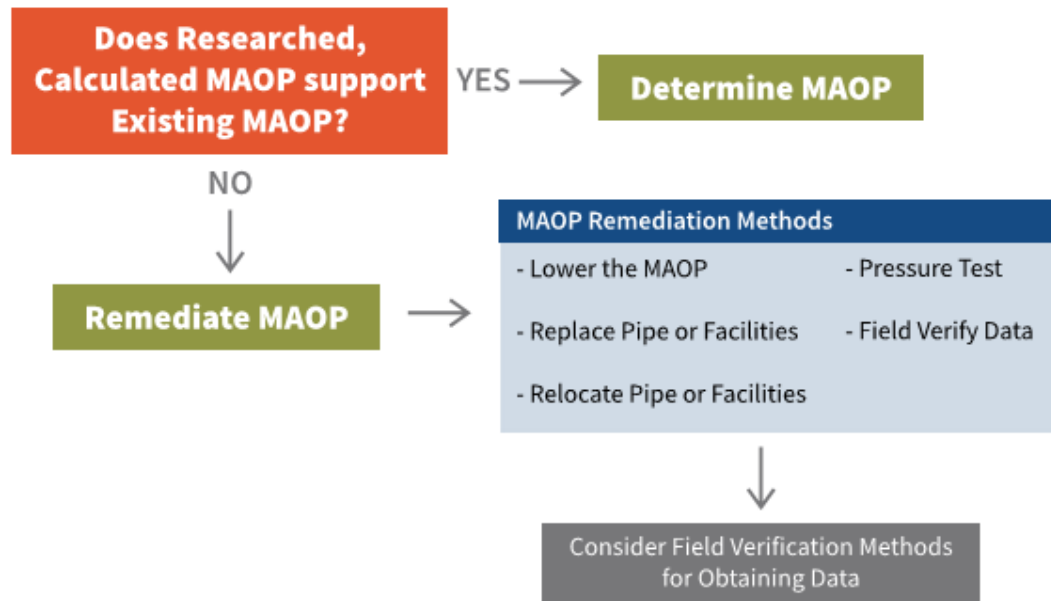


# AUTOMATED ROUTINE



## FOUR – REMEDIATE MAOP (IF REQUIRED)

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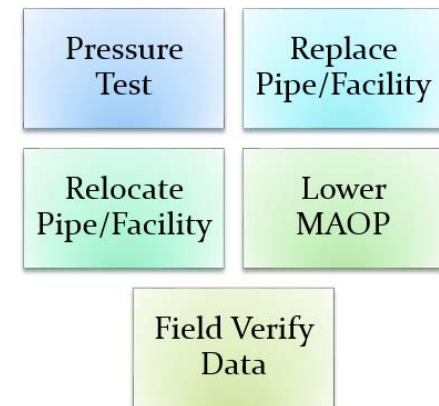




# REMEDIATION OPTIONS

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- Pressure Test
- Field Verification
  - Grade stamped, wall thickness readings, valve tags, etc.
- Management of Change to Lower MAOP
  - In situ pressure test
- Replacement
- Discuss Remediation Items
  - Further research required
  - Schedule according to safety and priority



## ADVERSELY IMPACT MAOP (TYP)

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- **Uncased Road Crossings Causing Class insufficiency**
- **Valves/Flanges Not Properly Rated**
- **Pressure Tests**
  - **Missing or incomplete records**
  - **Not pressure tested high enough**
  - **Documentation without duration and/or pressure listed**
  - **Pipe pre-tested, but no fabrication tests**
  - **Change in elevation not taken into account**
- **Missing Documentation**



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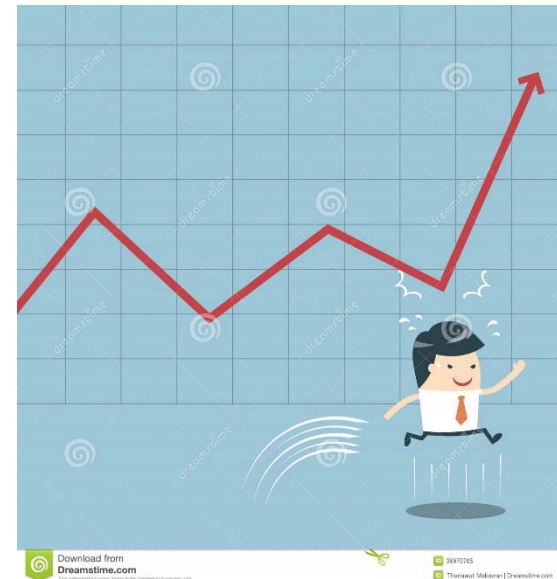
# UPRATING



# UPRATING TO ESTABLISH MAOP

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- 49 CFR Subpart K – Minimum Requirements for MAOP Increase
- PHMSA Interpretation 09-0021
  - Acceptance varies by state
  - Submit plan for approval
- Applied to Distribution Systems
  - No design records
  - No hydro data
  - Affidavits no longer accepted by state



# PLASTIC PIPE

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## > HDPE

- Previous 5 year NOP starting point
- Incrementally increase pressure from NOP to 1.5 X uprate pressure
- Perform leak survey after each incremental increase
- Make repairs as necessary
- Uprate pressure = MAOP

## > PVC

- Replace...



# STEEL PIPE

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- Uprate Pressure May Not Exceed 30% SMYS
  - 24 ksi yield
  - 0.8 seam factor
- Previous 5 Year NOP Starting Point
- Incrementally Increase Pressure from NOP to Uprate Pressure.
- Perform Leak Survey After Incremental Increases
- Make Repairs as Necessary
- Uprate Pressure = MAOP



# STEEL PIPE

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- **Application Above 30% SMYS**
  - No hydro data
  - Must have valid design records
- **Uprate Pressure = NOP**
  - $\text{MAOP} = \text{NOP} \text{ divided by class factor (1.1, 1.25 or 1.5)}$
  - Class 1,  $\text{MAOP} = 80\%$  of what would be allowed for a new line of the same design in the same location

# QUESTIONS?

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