SECTION 7

STRESS REPORT

STRESS ENGINEERING SERVICES, INC.

Houston ♦ Cincinnati ♦ New Orleans ♦ Denver ♦ Atlanta

13800 Westfair East Drive, Houston, Texas 77041-1101

Tel: (281) 955-2900 Fax: (281)955-2638 Web Site: www.stress.com e-mail: info@stress.com

November 5, 2001 PN1007039CRA/GRR

Chris Auer
Win Thornton
Winmar Consulting Services
Email: chris@winmarconsulting.com win@winmarconsulting.com
Phone: (713) 895-8240
Fax: (713) 895-8270

Subject: Pipe Survey and Coupon Tests

Dear Sirs,

This letter report describes the results from the survey of the samples from P.O.P. Line 25. The line was tested in June 2001 and the samples were shipped to Stress Engineering Services (SES). When received at SES, the barnacles were cleaned from the pipe, photographs of the pipe were taken, and the pipe was stored in our outside lot.

On September 27, 2001, SES received instructions from Win Thornton to proceed with the following tasks;

1. Survey the pipe samples
   a) record wall thicknesses at uniform distances along pipe length
   b) record pipe diameters at uniform distances along pipe length
   c) document areas of corrosion
   d) take detailed photographs of the pipe

2. Conduct the following materials tests
   a) Tensile
   b) Hardness
   c) Charpy Impact
   d) Chemistry

This letter report summarizes the results from the pipe survey and the material tests.

Pipe Survey

The first step in surveying the pipe was to lay out each pipe and take photographs of the pipe in the as-received condition. Figures 1 through 4 show the pipe as received.

Figure 1. Pipe As-received (View 1)

Figure 2. Pipe As-received (View 2)

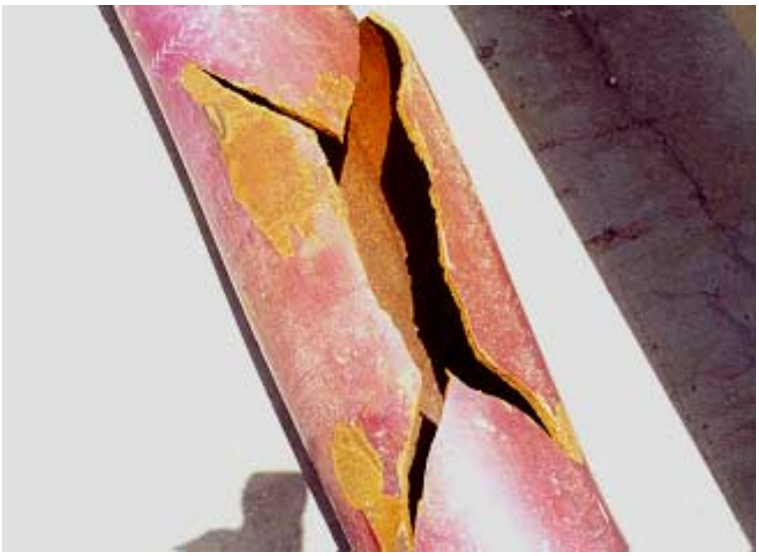


Figure 3. Fractured Pipe As-received (View 1)

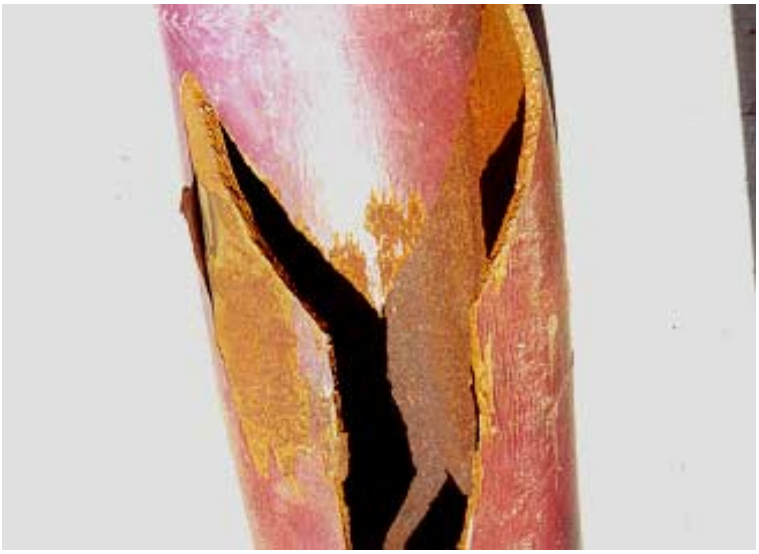


Figure 4. Fractured Pipe As-received (View 2)

When the survey was performed, each pipe was laid out, marks were made at two foot intervals along each pipe, and each of the two foot marks were labeled alphabetically. Once this was done, diameter and wall thickness measurments were taken at these marks.

Table 1 is a summary of the pipes surveyed. A total of 9 pipes were surveyed. SES received a sketch from Winmar Consulting which showed a total of seven pipes. This sketch is provided in Attachment A. In Table 1, we have cross referenced the numbering used in the sketch from Winmar with the numbering used during the survey. The sketch shows the layout of the first four pipes in relation to the platform. We do not have any information on the layout of the remaining pipe samples.

Table 1 Summary of Pipes Surveyed

SES Number	Winmar Number	Position in Relation to Platform	Pipe Length	Label End 1/End 2	Notes
9	1	1st	30 ft 9 in	A/B	Red Marks
7	2	2nd	25 ft 8 in	B/C	Red Marks
5	3	3rd	33 ft 1 in	C/D	Red Marks
8	4	4th	36 ft 11 in	D/E	Red Marks
4	5	unknown	20 ft 11 in	none	
6	6	unknown	25 ft 8 in	flanged piece	
3	7	unknown	21 ft 7 in	fractured piece	
1	none	unknown	24 ft 4 in	B/C	Yellow Marks
2	none	unknown	24 ft 10 in*	A/C	Yellow Marks

* Length taken after approximately 2 ft of pipe cut off for taking magnetic testing samples

The results from the pipe survey are presented in Attachment B of this report. A separate section is included for each pipe. A number of photographs were taken during the survey and selected photographs of each section are included in the appropriate section of Attachment B.

After the survey was complete, a piece of pipe from SES number 5 was cut from the pipe and sent to Bodycote for material tests. Samples from the fractured pipe were also cut from the fracture piece of pipe and sent out for material tests.

Material Tests

The material tests conducted on the pipe sample consisted of the following;

1. Hardness Tests
2. Tensile Tests

3. Charpy Impact Tests
4. Chemistry Test

The hardness readings were taken at SES and a Brinell hardness of 163 was obtained. The chemistry, charpy impact, and tensile tests were conducted by Bodycote. The longitudinal tensile tests were conducted on samples oriented along the axis of the pipe. The transverse tensile tests were conducted on subsized samples oriented in the hoop direction of the pipe.

Attachment C contains the results from the tensile, charpy, and chemistry tests. The average yield strength of the material taken away from the fracture was 47.2 ksi in the longitudinal direction. The average ultimate strength was 80 ksi.

For samples taken near the fracture, the average yield stress was 53.6 ksi and the average ultimate stress was 71.6 ksi in the longitudinal direction. In the transverse direction, the average yield stress was 60.1 ksi and the average ultimate stress was 69.4 ksi.

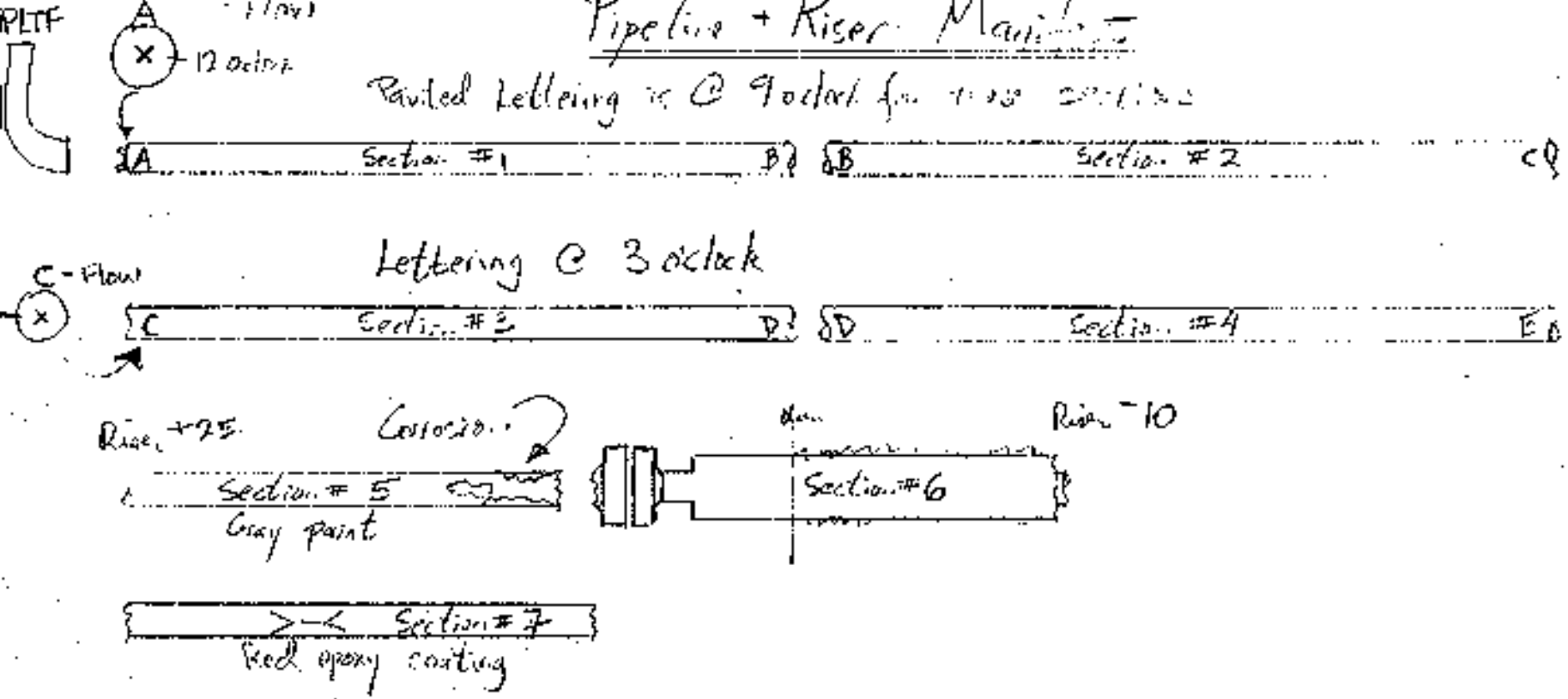
Thank you for your business. If you have any questions, please contact me by phone, email, or FAX.

Sincerely,

George R. Ross, Ph. D.
Senior Associate

Attachment A
Sketch of Pipe Locations
(Per Winmar Consulting)

Pipeline + Riser Main



Attachment B
Photographs and Pipe Survey Data

SES Pipe #9 (Winmar #1)

This was the 1st sample counting from the platform.

End B End A

	0 ft	2 ft	4 ft	6 ft	8 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	22 ft	24 ft	26 ft	28 ft	30 ft
Pipe 9	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
Wall thickness 1 (inches)	0.483	0.489	0.472	0.502	0.465	0.495	0.471	0.475	0.485	0.466	0.484	N/A	0.449	0.497	0.480	0.491
Wall thickness 2 (inches)	0.496	0.473	0.498	0.476	0.486	0.473	0.457	0.485	0.440	0.476	0.425	N/A	0.498	0.495	0.487	0.467
Wall thickness 3 (inches)	0.473	0.468	0.477	0.452	0.481	0.452	0.471	0.468	0.457	0.478	0.462	N/A	0.463	0.457	0.445	0.457
Wall thickness 4 (inches)	0.461	0.476	0.457	0.469	0.478	0.483	0.488	0.458	0.511	0.464	0.514	N/A	0.448	0.454	0.449	0.474
Average Wall Thickness (in	0.478	0.477	0.476	0.475	0.478	0.476	0.472	0.472	0.473	0.471	0.471		0.465	0.476	0.465	0.472
Max. Dia. (inches)	8.71	8.71	8.7	8.720	8.710	8.730	8.730	8.730	8.730	8.730	8.730	N/A	8.800	8.790	8.810	8.790
Min. Dia (inches)	8.71	8.7	8.7	8.71	8.7	8.71	8.73	8.73	8.72	8.72	8.73	N/A	8.79	8.78	8.8	8.79
% Ovality	0.0	0.1	0.0	0.1	0.1	0.2	0.0	0.0	0.1	0.1	0.0		0.1	0.1	0.1	0.0

$$Ovality = \frac{2(D_{max} - D_{min})}{(D_{max} + D_{min})}$$

Pipe 9 View 1

Pipe 9 View 2

SES Pipe #7 (Winmar #2)

This was the 2nd sample counting from the platform.

	End B																	End C
	0 ft	2 ft	4 ft	6 ft	8 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	22 ft	24 ft	26 ft	28 ft	30 ft	32 ft	34 ft	36 ft
Pipe 7	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**
Wall thickness 1 (inches)	0.469	0.483	0.472	0.489	0.487	0.501	0.497	0.500	0.491	0.478	0.442	0.494	0.472	0.506	0.454	0.473	0.452	0.468	0.485
Wall thickness 2 (inches)	0.495	0.489	0.496	0.491	0.499	0.498	0.501	0.505	0.474	0.428	0.491	0.459	0.470	0.454	0.459	0.481	0.469	0.510	0.473
Wall thickness 3 (inches)	0.492	0.481	0.496	0.481	0.502	0.499	0.490	0.486	0.491	0.458	0.487	0.451	0.486	0.457	0.492	0.486	0.495	0.491	0.476
Wall thickness 4 (inches)	0.484	0.476	0.469	0.482	0.472	0.481	0.478	0.488	0.505	0.517	0.467	0.490	0.478	0.506	0.517	0.495	0.498	0.451	0.498
Average Wall Thickness (in	0.485	0.482	0.483	0.486	0.490	0.495	0.492	0.495	0.490	0.470	0.472	0.474	0.477	0.481	0.481	0.484	0.479	0.480	0.483
Max. Dia. (inches)	8.65	8.66	8.65	8.620	8.620	8.620	8.620	8.610	8.600	8.600	8.590	8.610	8.600	8.600	8.610	8.610	8.600	8.620	8.610
Min. Dia (inches)	8.64	8.65	8.6	8.61	8.61	8.61	8.6	8.59	8.58	8.6	8.59	8.61	8.6	8.6	8.6	8.6	8.59	8.6	8.6
% Ovality	0.1	0.1	0.6	0.1	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1

$$Ovality = \frac{2(D_{max} - D_{min})}{(D_{max} + D_{min})}$$

Pipe 7

SES Pipe #5 (Winmar #3)

This was the 3rd sample counting from the platform.

End D End C

	0 ft	2 ft	4 ft	6 ft	8 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	22 ft	24 ft	26 ft	28 ft	30 ft	32 ft
Pipe 5	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Wall thickness 1 (inches)	0.469	0.449	0.474	0.454	0.469	0.486	0.526	0.535	0.509	0.488	0.505	0.497	0.519	0.497	0.487	0.485	0.510
Wall thickness 2 (inches)	0.485	0.49	0.496	0.476	0.496	0.489	0.475	0.528	0.502	0.522	0.508	0.518	0.496	0.491	0.500	0.498	0.503
Wall thickness 3 (inches)	0.465	0.487	0.481	0.472	0.483	0.484	0.461	0.491	0.485	0.501	0.494	0.518	0.484	0.500	0.482	0.481	0.458
Wall thickness 4 (inches)	0.488	0.487	0.487	0.509	0.488	0.504	0.491	0.476	0.502	0.496	0.493	0.489	0.483	0.493	0.476	0.487	0.465
Average Wall Thickness (in	0.477	0.478	0.485	0.478	0.484	0.491	0.488	0.508	0.500	0.502	0.500	0.506	0.496	0.495	0.486	0.488	0.484
Max. Dia. (inches)	8.64	8.63	8.64	8.630	8.640	8.660	N/A	8.700	8.620	8.700	8.610	8.610	8.690	8.700	8.670	8.680	8.660
Min. Dia (inches)	8.63	8.63	8.63	8.62	8.63	8.61	N/A	8.58	8.62	8.57	8.6	8.61	8.59	8.69	8.62	8.58	8.57
% Ovality	0.1	0.0	0.1	0.1	0.1	0.6		1.4	0.0	1.5	0.1	0.0	1.2	0.1	0.6	1.2	1.0

$$Ovality = \frac{2(D_{max} - D_{min})}{(D_{max} + D_{min})}$$

Pipe 5

SES Pipe #8 (Winmar #4)

This was the 4th sample counting from the platform.

	End D																	End E
	0 ft	2 ft	4 ft	6 ft	8 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	22 ft	24 ft	26 ft	28 ft	30 ft	32 ft	34 ft	36 ft
Pipe 8	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**
Wall thickness 1 (inches)	0.509	0.493	0.508	0.485	0.491	0.495	0.488	0.485	0.461	0.498	0.464	0.506	0.469	0.484	0.475	0.457	0.472	0.486	0.476
Wall thickness 2 (inches)	0.491	0.49	0.49	0.481	0.519	0.484	0.492	0.486	0.487	0.485	0.495	0.500	0.473	0.486	0.442	0.455	0.498	0.465	0.486
Wall thickness 3 (inches)	0.467	0.473	0.47	0.496	0.482	0.470	0.479	0.486	0.484	0.453	0.483	0.446	0.477	0.472	0.503	0.492	0.497	0.470	0.493
Wall thickness 4 (inches)	0.507	0.493	0.506	0.493	0.472	0.489	0.483	0.496	0.477	0.470	0.470	0.485	0.481	0.473	0.526	0.499	0.465	0.535	0.491
Average Wall Thickness (in	0.494	0.487	0.494	0.489	0.491	0.485	0.486	0.488	0.477	0.477	0.478	0.484	0.475	0.479	0.487	0.476	0.483	0.489	0.487
Max. Dia. (inches)	8.47	8.73	8.7	8.700	8.690	8.700	8.710	8.690	8.660	8.700	8.700	8.690	8.720	8.720	8.710	8.710	8.710	8.720	8.730
Min. Dia (inches)	8.47	8.69	8.7	8.69	8.69	8.7	8.7	8.66	8.66	8.69	8.7	8.69	8.69	8.71	8.7	8.71	8.71	8.71	8.7
% Ovality	0.0	0.5	0.0	0.1	0.0	0.0	0.1	0.3	0.0	0.1	0.0	0.0	0.3	0.1	0.1	0.0	0.0	0.1	0.3

$$Ovality = \frac{2(D_{max} - D_{min})}{(D_{max} + D_{min})}$$

Pipe 8 View 1

Pipe 8 View 1

SES Pipe #4 (Winmar #5)

This pipe is from an unknown location in the line.

End Furthest from Corrosion — Corroded end (was next to flange in line)

	0 ft	2 ft	4 ft	6 ft	8 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft
Pipe 4	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Wall thickness 1 (inches)	0.496	0.496	0.51	0.490	0.459	0.489	0.483	0.460	0.471	0.479	0.334
Wall thickness 2 (inches)	0.488	0.488	0.469	0.433	0.464	0.476	0.491	0.460	0.494	0.498	0.462
Wall thickness 3 (inches)	0.47	0.47	0.454	0.476	0.485	0.462	0.477	0.450	0.489	0.462	0.417
Wall thickness 4 (inches)	0.499	0.494	0.497	0.519	0.478	0.469	0.483	0.448	0.488	0.483	0.402
Average Wall Thickness (in	0.488	0.487	0.483	0.480	0.472	0.474	0.484	0.455	0.486	0.481	0.404
Max. Dia. (inches)	8.6	8.6	8.59	8.590	8.580	8.600	8.640	8.640	8.630	8.550	8.490
Min. Dia (inches)	8.58	8.6	8.5	8.58	8.58	8.54	8.47	8.5	8.49	8.43	8.43
% Ovality	0.2	0.0	1.1	0.1	0.0	0.7	2.0	1.6	1.6	1.4	0.7

Notes

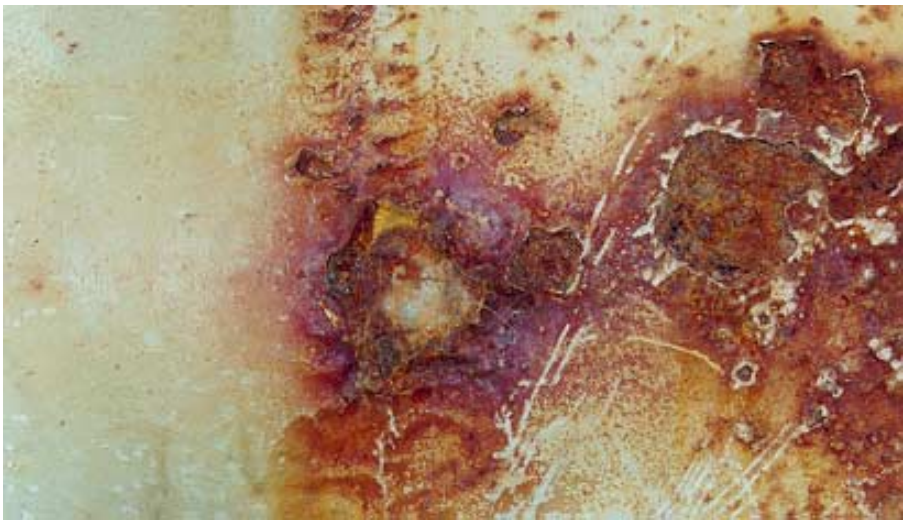
Between H and I from the 12” mark to the 17” mark deep pitting and heavy corrosion found. Buffed small area and took UT Thk. Reading at location. Base wall was .474 and pitted area was .361 for a difference of .133. Photo’s taken.

Between J and K, Weld and immediate surrounding area heavily scaled with wall loss. Photo’s taken.

$$Ovality = \frac{2(D_{max} - D_{min})}{(D_{max} + D_{min})}$$

Pipe 4 View 1

Pipe 4 View 2



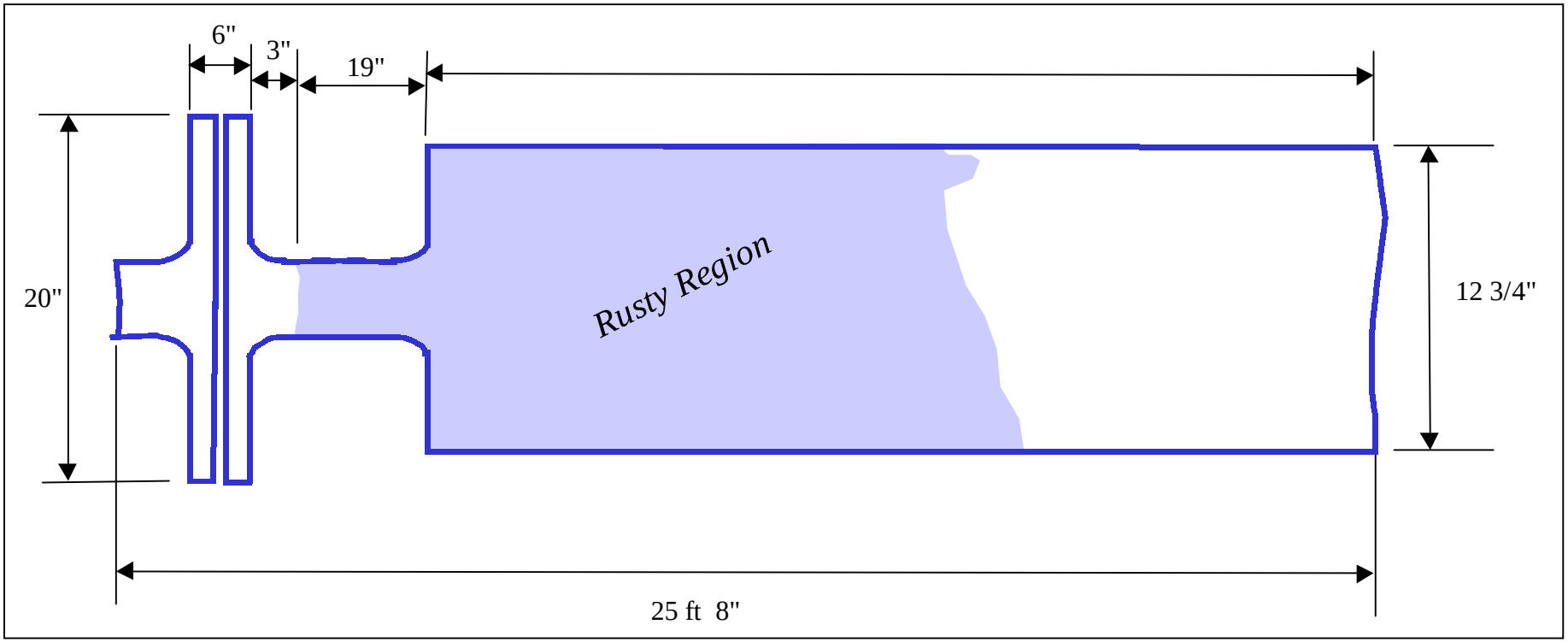
Pipe 4 View 3

SES Pipe #6 (Winmar #6)

This pipe is from an unknown location in the line.

Pipe 6 Photo's taken and Sketch made.

This was the pipe with the Flange which consisted primarily of the flange and a pipe-in-pie section.



Pipe 6 View 1

Pipe 6 View 2

Pipe 6 View 3

Pipe 6 View 4