



## **INLAND'S "ONE PASS" WATERWAY INSPECTION SYSTEM**



*Accuracy & Safety  
Our Commitment to the Industry*

**Inland Waterway Inspection Services LLC.**

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**Introduction:**

The directors of Inland Waterway Inspection Services LLC,(IWIS) were originally contacted by major pipeline companies in Texas concerning the possible development of a system, which would have the ability to determine the extent of cover over river crossing pipelines. A system was eventually designed using electromagnetic technology now known as the "One-Pass" Waterway Inspection System.

**Regulations:**

US Government regulations require pipelines crossing inland navigable waterways 100-ft wide or wider maintain a minimum cover of 48". The requirement is for crossings to be inspected at least once every five years. In most cases, the major operating companies conduct inspection surveys every three years or even at greater frequency for fast flowing river crossings where erosion is either a known or suspected factor, or during years where flooding conditions have been experienced.

**Conventional Type Surveys:**

It has, in the past, been the acceptable practice to utilize diver labor in order to probe the pipelines that traverse rivers. For large river crossings this is carried out utilizing a dive boat, two divers and one tender. Smaller crossings may be carried out using less sophisticated equipment and fewer field personnel to operate out of a smaller craft.

A diver, sometimes utilizing an under-water pipeline locator, enters the water equipped with a bar in order to probe until he feels that he has hit the line. The diver measures the depth of cover by utilizing his known anatomy measurements against the bar, either arm or his Leg, then transmits the information to the surface crew who take approximate position by Differential Global Positioning System. There are often instances when the extent of cover is too great for the probe bar, or where the diver has not hit the line but feels that the extent of cover is adequate to satisfy the conditions of the inspection. Most pipeline technicians understand that it is not uncommon to miss a small diameter pipeline even during land surveys, marine surveys are many times more difficult.

At this juncture we would like to provide a simple illustration of a particular problem encountered in a South Texas system.

The 4" pipeline was incorrectly installed and had a huge bend of the designed crossing. This line was caught by currents during the installation process and was removed from its ditch. Divers had given

this crossing a good bill of health for the previous ten years prior to the survey being carried out by the "One-Pass" system. The profile showed the line exposed, it was later found that barges had been scraping the pipe. The line in question was packed with Ethanol at a pressure of 750psi.

**"One-Pass" Electro-magnetic Technology:**

The "One-Pass" system was developed in response to the Industry Requirement for a means to locate and profile pipelines crossing under navigable waterways. Improved electronics technology and much effort have now provided IWIS with an accurate system for both small and large waterways to a depth of 130-ft. The system's accuracy has been proven on major rivers throughout the United States and also in China.



**Preparation work being carried out- Northern China**

The 'One-Pass' System is designed to locate and profile pipelines crossing beneath rivers and produce an engineering drawing that shows both plan and profile of the crossing.

**The system:**

The system utilizes an electro-magnetic receiver to read a signal radiating from the pipe wall. As with any electro-magnetic signal the amplitude of the signal degrades as the distance between the pipe and the receiving antenna system increases.

This serves as a basis for calculating the pipe position and depth of burial, which is handled by a sophisticated Software package 'Ariver' developed in 1995 by Ian D Casey.

The system utilizes two distinct methods of calculating the depth and therefore eliminates the chance of error. All readings are taken from inside the boat thus making it easy to acquire pipe depth readings without dragging any underwater equipment or towing fish along the river bottom.

RTK Global Positioning System coordinates together with water depths from the same plane are utilized to obtain river depth information at the rate of one pulse per second to capture accurate contour information.

Bluetooth wire less technology is utilized throughout in order to eliminate cables. The "One Pass" system can be utilized in boats ranging from as small as 15-ft upwards.



**StarTrak personnel utilizing small fishing type boat in Northern China to conduct survey of 2500-ft river section**

**FIELD OPERATION:**

The system requires a “closed loop” of the pipe crossing utilizing an insulated multi-stranded cable, which is laid across the river bottom parallel to the crossing to a point where electrical contact can be made with the pipeline outer wall. The client is requested to install cathodic test lead stations at approximately 600-ft (200-meters) from the water’s edge. This is not necessary on crossings with valve installation. The entire loop is energized by the low frequency electromagnetic signal utilizing a signal generator to produce an electromagnetic field (250 Hz – 2.2 kHz) on to the pipeline. The data, is stored together with DGPS coordinates. The signal is received into the “One-Pass” system and the resultant signals are recorded and processed by the on-board CPU. The pipeline’s position together with acquired data is displayed on screen in real-time and displayed as an icon referencing the position of the boat.

In order to provide our Clients with a higher degree of information, IWIS has now added SIDE IMAGING SONAR to its already quality services. Land sections are surveyed utilizing GPS – RTK technology for accuracy.

**OFFICE:**

All data collected during the field operation is analyzed. Utilizing the Calibration factors, the data is processed to obtain accurate depth of Pipeline information together with the additional survey data of any pertinent land features, which need to be included in the final drawings. The results are compiled into DXF format for insertion into the drawing. The nodes derived from the DXF file are used to prepare the final drawing, which is prepared in AutoCAD or as selected by our Clients.

**REPORTING:**

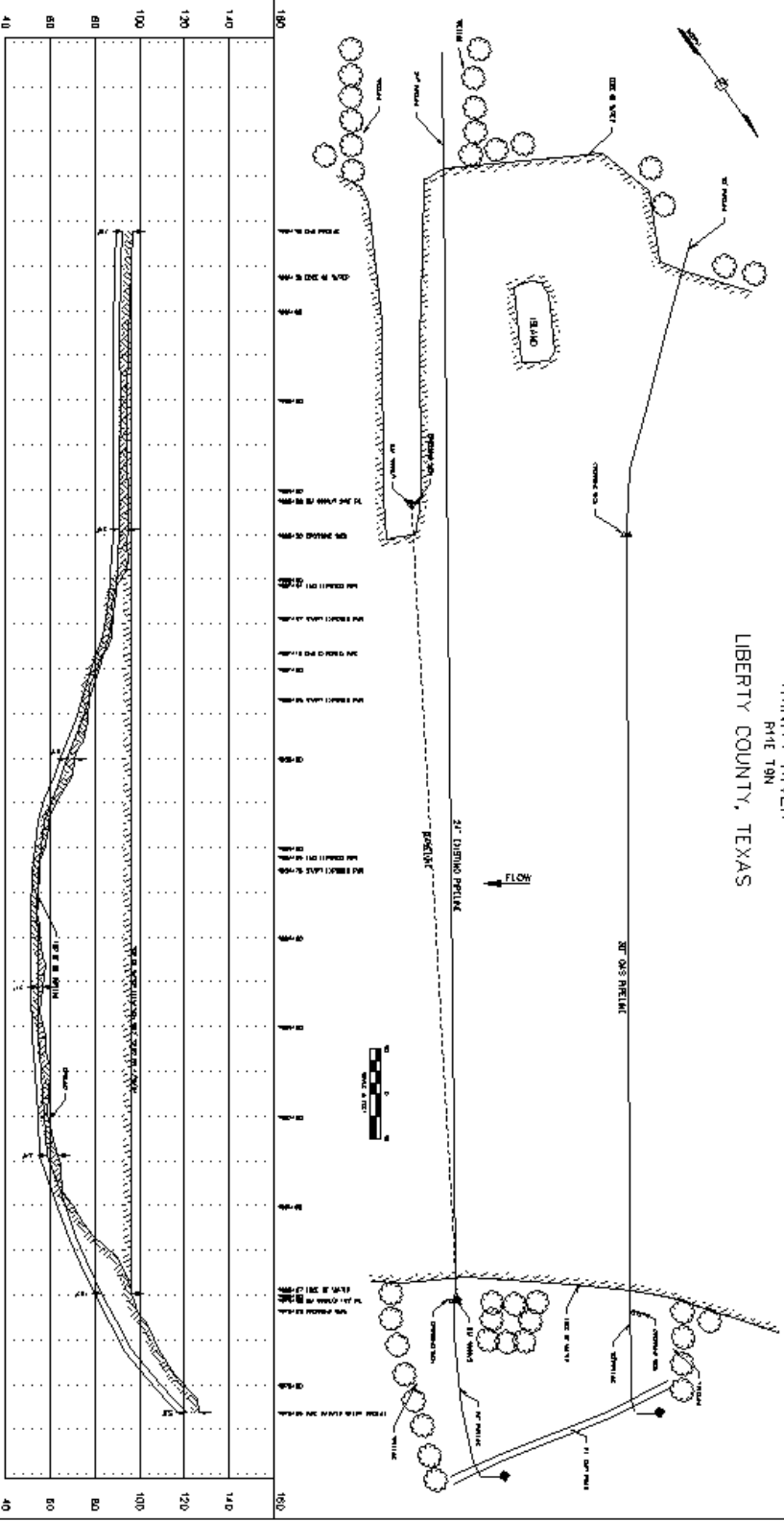
Reports include a “D” sized reproducible drawing, a CD containing CAD drawings, detailed report and photos of the embankment and ROW areas. Coordinate data is available as a Excel file.

**Inland Waterway Inspection Services, LLC.**

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TRINITY RIVER  
 R14E T9N  
 LIBERTY COUNTY, TEXAS



<p><b>NOTES:</b></p> <p>1. THIS PLAN AND PROFILE ARE BASED UPON THE DATA FURNISHED BY THE CLIENT AND THE FIELD SURVEY CONDUCTED BY THE ENGINEER. THE ENGINEER HAS NOT CONDUCTED A GEOTECHNICAL SURVEY OF THE SITE AND IS NOT RESPONSIBLE FOR THE STABILITY OF THE PIPELINE OR THE FOUNDATION THEREON.</p> <p>2. THE PIPELINE SHALL BE INSTALLED AT A DEPTH OF 30 FEET BELOW THE FINISHED GROUND SURFACE.</p> <p>3. THE PIPELINE SHALL BE MADE OF 30\"/&gt; </p>	
<p><b>LEGEND:</b></p> <p>— PROPOSED PIPELINE</p> <p>— EXISTING PIPELINE</p> <p>— EXISTING DITCH</p> <p>— EXISTING ROAD</p> <p>— EXISTING FENCE</p> <p>— EXISTING UTILITY</p> <p>— EXISTING STRUCTURE</p> <p>— EXISTING VEGETATION</p> <p>— EXISTING WATER</p> <p>— EXISTING ELEVATION</p> <p>— PROPOSED ELEVATION</p>	
<p><b>PROJECT:</b></p> <p>30\"/&gt; </p>	
<p><b>CLIENT:</b></p> <p>STARBARK PIPING, INC. - KATY, TEXAS</p>	
<p><b>DATE:</b></p> <p>11/11/2020</p>	
<p><b>SCALE:</b></p> <p>1\"/&gt; </p>	

River Data C:\ArRiver\Data\1395\50.DAT  
 File Setup Timer Equipment Background Colors  
 1226 000 000 000 00 00 000

1000  
 GPS: SV # 0  
 MODE: No Solution  
 DIST: 0.0

#	Northing	Easting	Water De.	Reading-1	Reading-2	Reading-3	Pipe Depth	Time	Notes
30	13.837307690	3.186585990	23.60	63.0	34.0	0.0	57.83	915.41	
31	13.837326680	3.186597120	18.90	71.0	23.0	0.0	55.44	916.61	
32	13.837349500	3.186603230	17.30	78.0	46.0	0.0	53.55	917.83	
33	13.837391860	3.186613650	11.60	80.0	32.0	0.0	53.06	918.96	
34	13.837921230	3.186608920	10.50	90.0	41.0	0.0	50.69	920.09	
35	13.838021660	3.186613180	12.70	94.0	24.0	0.0	49.84	921.09	
36	13.8380491300	3.186626000	12.70	107.0	47.0	0.0	47.24	922.10	
37	13.838093240	3.186639100	10.40	122.0	41.0	0.0	44.63	922.86	
38	13.8380947200	3.186620990	0.00	36.0	50.0	0.0	49.01	923.53	
39	13.838123820	3.186647090	32.10	142.0	62.0	0.0	41.59	924.27	
40	13.838144070	3.186653990	0.00	163.0	90.0	0.0	38.83	925.12	
41	13.838186990	3.186670710	0.00	242.0	144.0	0.0	30.90	926.07	

Dist

Start Contour  
 Start Pipe  
 NOW  
 SAVE

Ariver Software in action