

**RESEARCH AND ENGINEERING INSTITUTE
FOR OFFSHORE OIL AND GAS**



**PROJECT NAME : FREE SPAN ASSESSMENT FOR 4 PIPELINES
IN 2025**

DOCUMENT TITLE : SCOPE OF WORK

DOCUMENT NO. : OFSP-324-GE-PL8-SW-001

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	<p style="text-align: center;">FREE SPAN ASSESSMENT FOR 4 PIPELINES IN 2025</p> <p style="text-align: center;">SCOPE OF WORK</p>	OFSP-324-GE-PL8-SW-001		
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1 GENERAL

1.1 INTRODUCTION

The Dragon oil field is located in the South Western portion of the East Sea in the Cuu Long Basin, approximately 120 km offshore from the Vung Tau coast of Vietnam at a water depth of approximately 56 meters. It was discovered in 1984 and developed by Vietsovpetro Joint Venture (VSP), the first oil was in 1994.

RC10 Wellhead Satellite Platform belongs to Vietsovpetro JV. It has been located at wells R-60 pilot, R-60 main, 1001, 1002, 1003 in Block 09-1, Dragon oil field. RC10 is about ~ 3.5-3.6 km from RC.RB1/RP2.

RC8 Wellhead Satellite Platform belongs to Vietsovpetro JV. It has been located at well R-21 in Block 09-1, Dragon oil field, offshore the Socialist Republic of Vietnam. RC8 is about ~ 5.1 km from RC-5/9. Water depth of this location is about 53 ± 0.5 m from MSL.

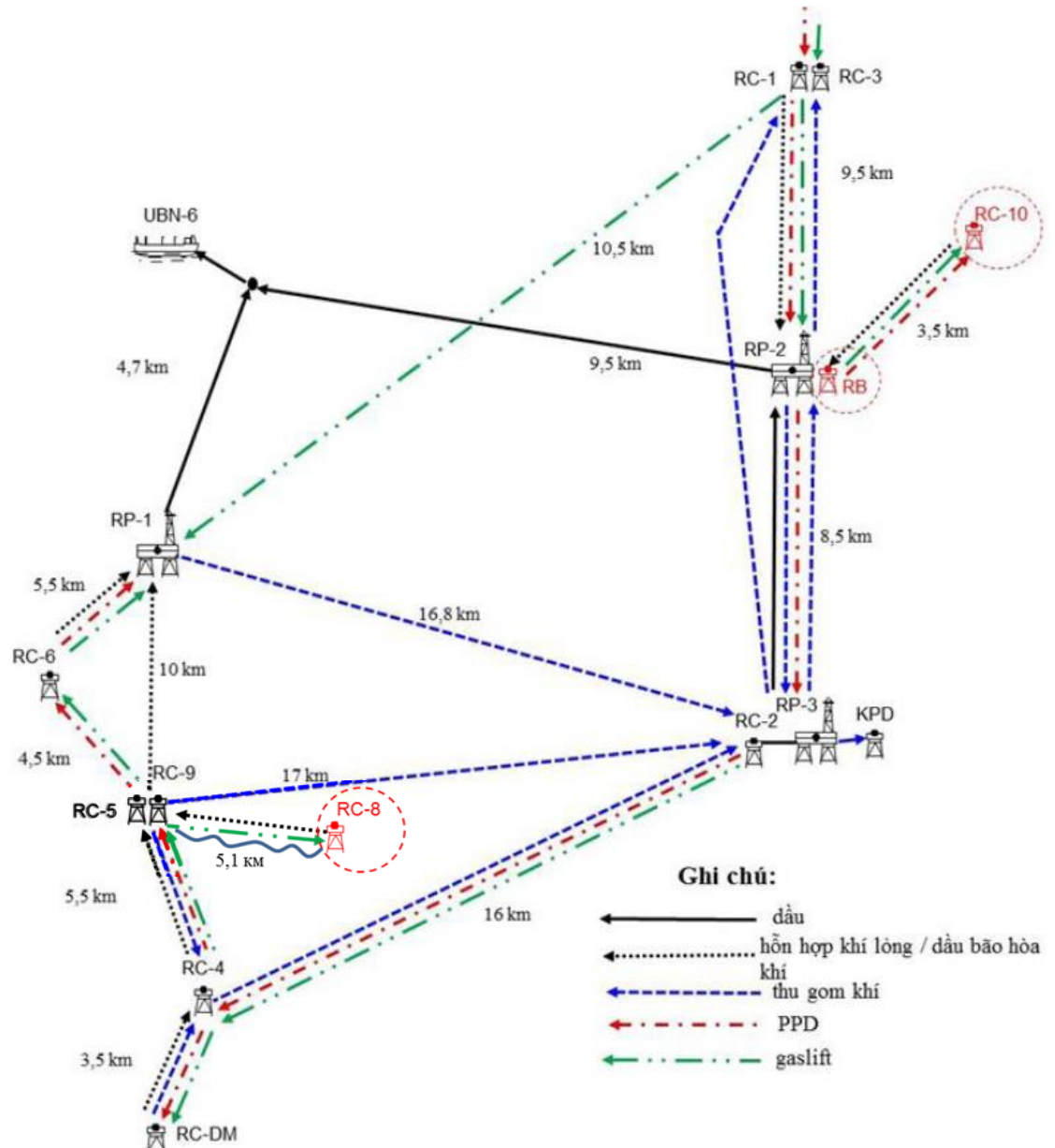


Figure 1: Location of RC8 & RC10





Production fluid (oil, gas and water mixture) of RC8 will be transported to RC5/9 and production fluid (oil, gas and water mixture) of RC10 will be transported to RC.RB1 via subsea pipeline for further processing. Gaslift or injection water for RC8 will be provided from RC5/9 via subsea pipeline, Gaslift and injection water for RC10 will be provided from RC.RB1 via subsea pipelines.

1.2 PURPOSE

This document outlines a scope of Free Span Assessments for Oil and Water Injection and Gaslift Pipelines, to perform FS Assessment, study mobility of Seabed as well as develop a long-term free span mitigation strategy and recommend the best method for free span rectification.

1.3 LANGUAGE

The English Language shall be used in all the project drawings, specifications, calculations, datasheets and reports. The English and Russian Languages could be used in the project communications, correspondences and progress reports.

The Russian, Vietnamese and/or English Languages should be accepted for Cost Estimate Document.

1.4 UNITS OF MEASURES

The design shall be performed using the SI System units.

1.5 ABBREVIATIONS AND DEFINITION

The following abbreviations are used in this document:

AE	Asphalt Enamel
BM	Bending Moment
CEP	Condensate Export Pipeline
CF	Cross Flow
ERW	Electric Resistance Welding
FEA	Finite Element Analysis
FLS	Fatigue Limit State
FS	Free Span
IL	In Line
ILS	In Line Survey
INT	Interacting
KP	Kilometer Post
LAT	Lowest Astronomical Tide
MAOP	Maximum Allowable Operating Pressure
MASL	Maximum Allowable Span Length
OD	Outer Diameter
ROV	Remotely Operated Vehicle



RPV	Return Period Value
SMTS	Specified Minimum Tensile Stress
SMYS	Specified Minimum Yield Stress
TBP	To Be Provided
ULS	Ultimate Limit State
VIV	Vortex Induced Vibration
VSP	Vietsovpetro Joint Venture

1.6 REFERENCES

1.6.1 CODES AND STANDARDS

The following codes and standards, to the extent specified herein, shall form a part of this document. When an edition date is not indicated for a code or standard, the latest edition at date of contract award shall apply.

1.6.2 VIETSOVPETRO REGULATIONS

- [1] Rules for Operation, Inspection and Maintenance of offshore process piping and underwater pipelines, 2009
- [2] Regulations for Technical Operation of Offshore Installation, 2004

1.6.3 STANDARD REFERENCES

- [3] DNVGL-ST-F101 Submarine Pipeline Systems, 2017
- [4] DNVGL-RP-F105 Free Spanning Pipelines, 2017
- [5] DNVGL-RP-C205 Environmental Conditions and Environment Loads, 2017
- [6] DNVGL-RP-C203 Fatigue Design of Offshore Steel Structures, 2016

2 PIPELINE DATA GENERAL

2.1 OIL PIPELINE FROM RC10 TO RC.RB1

Oil & gas mixture of RC10 will be transported to RC.RB1 via 10" subsea pipeline for further processing.

The pipeline data is detailed in the Table 2.1.1 below. Line pipe will be specified in accordance with API 5L (45th edition).

Table 2.1.1: Pipeline Data

Parameters	Unit	Value
Pipe Outer Diameter	mm	273.1
Wall Thickness	mm	15.9
Corrosion Allowance	mm	3
Line Pipe Material	-	API 5L X60





Parameters	Unit	Value
Fabrication Method	-	SMLS, PSL2
Steel Density	kg/m ³	7850
Young's Modulus of Elasticity	MPa	207000
Poisson Ratio	-	0.3
Specified minimum yield stress	N/mm ²	413
Specified minimum tensile stress	N/mm ²	520
Thermal Expansion Coefficient	1/°C	11.7 x 10 ⁻⁶

Table 2.1.2: Pipeline Coating Data

Parameters	Unit	Value
External anti-corrosion coating, Adhesive	mm	~1
Composite Coating with U-value ≤1.86 W/m ² .K	mm	37
	kg/m ³ (dry) density	600
Roll steel weight	mm	Φ6
	kg/m ³ (dry) density	7850
Neoprene Coating	mm	11
	kg/m ³	1400
<u>Riser & spool</u>		
Adhesive Anti-Corrosion	mm	~1
Composite Coating	mm	30
	kg/m ³	600 (±5%)
Neoprene Coating	mm	5
	kg/m ³	1400

Note:

1. Density of total thermal insulation coating is not less than 1560kg/m³.



The approximate pipeline route length is presented in Table: 2.1.3

Table 2.1.3: Pipeline Route Length

Description	Length (km)
Offshore Pipeline Route	3.51

Table 2.1.4 – Shows the Operating parameters used for offshore pipeline.

Table 2.1.4 – Operating Parameters

Parameters	Unit	Value
Design Pressure	barg	35
Hydrotest Pressure	barg	42
Operating Pressure	barg	14.5
Design Temperature	°C	50
Operating Temperature	°C	45

Oil properties are provided in the table below.

Table 2.1.5 – Oil Properties

Description	Unit	Value
Pipeline service	-	Mixture of Oil and gas, two phase
Min density	kg/m ³	28.44
Max density	kg/m ³	90.77
Flowrate of liquid (oil)	ton/d	765
Flowrate of associated gas	Sm ³ /d	240000

2.2 WATER INJECTION PIPELINE FROM RC.RB1 TO RC10

Water injection pipeline for RC10 will be provided from RP-2 via piping system on RC-RB1 and then via 6" subsea pipelines RC.RB1-RC10.

The pipeline data is detailed in the Table 2.2.1 below. Line pipe will be specified in accordance with API 5L (45th edition).

Table 2.2.1: Pipeline Data

Parameters	Unit	Value
Pipe Outer Diameter	mm	168.3
Wall Thickness	mm	14.3
Corrosion Allowance	mm	3





Parameters	Unit	Value
Line Pipe Material	-	API 5L X60
Fabrication Method	-	SMLS, PSL2
Steel Density	kg/m ³	7850
Young's Modulus of Elasticity	MPa	207000
Poisson Ratio	-	0.3
Specified minimum yield stress	N/mm ²	413
Specified minimum tensile stress	N/mm ²	520
Thermal Expansion Coefficient	1/°C	11.7 x 10 ⁻⁶

Table 2.2.2: Pipeline Coating Data

Parameters	Unit	Value
External anti-corrosion coating, Painting	mm	0.5
	kg/m ³	1400
<u>Riser & spool</u>		
External anti-corrosion coating, Painting	mm	1.5
	kg/m ³	1400

The approximate pipeline route length is presented in Table: 2.2.3

Table 2.2.3: Pipeline Route Length

Description	Length (km)
Offshore Pipeline Route	3.55

Table 2.2.4 – Shows the Operating parameters used for offshore pipeline.

Table 2.2.4 – Operating Parameters

Parameters	Unit	Value
Design Pressure	barg	250
Hydrotest Pressure	barg	312.5





Parameters	Unit	Value
Operating Pressure	barg	240
Design Temperature	°C	39
Operating Temperature	°C	25

Fluid properties are provided in the table below. It is noted thereby supplying a treated sea water into the pipeline.

Table 2.2.5 – Fluid Properties

Description	Unit	Value
Pipeline service	-	Injected water, single phase
Content density	kg/m ³	1025
Flowrate	m ³ /d	400

2.3 GASLIFT PIPELINE FROM RC.RB1 TO RC10

Gaslift pipeline for RC10 will be provided from RP-2 via piping system on RC-RB1 and then via 6" subsea pipelines RC.RB1-RC10.

The pipeline data is detailed in the Table 2.3.1 below. Line pipe will be specified in accordance with API 5L (45th edition).

Table 2.3.1: Pipeline Data

Parameters	Unit	Value
Pipe Outer Diameter	mm	168.3
Wall Thickness	mm	14.3
Corrosion Allowance	mm	3
Line Pipe Material	-	API 5L X60
Fabrication Method	-	SMLS, PSL2
Steel Density	kg/m ³	7850
Young's Modulus of Elasticity	MPa	207000
Poisson Ratio	-	0.3
Specified minimum yield stress	N/mm ²	413





Parameters	Unit	Value
Specified minimum tensile stress	N/mm ²	520
Thermal Expansion Coefficient	1/°C	11.7 x 10 ⁻⁶

Table 2.3.2: Pipeline Coating Data

Parameters	Unit	Value
External anti-corrosion coating, Painting	mm	0.5
	kg/m ³	1400
<u>Riser & spool</u>		
External anti-corrosion coating, Painting	mm	1.5
	kg/m ³	1400

The approximate pipeline route length is presented in Table: 2.3.3

Table 2.3.3: Pipeline Route Length

Description	Length (km)
Offshore Pipeline Route	3.55

Table 2.3.4 – Shows the Operating parameters used for offshore pipeline.

Table 2.3.4 – Operating Parameters

Parameters	Unit	Value
Design Pressure	barg	125
Hydrotest Pressure	barg	150
Operating Pressure	barg	100
Design Temperature	°C	35
Operating Temperature	°C	30

Gaslift properties are provided in the table below. It is noted thereby supplying a multiphase into the pipeline.

Table 2.3.5 – Fluid Properties

Description	Unit	Value
Pipeline service	-	Gaslift, single phase





Description	Unit	Value
Content density at 125 barg, 35 deg C	kg/m ³	125
Flowrate	Sm ³ /d	300 000

2.4 OIL PIPELINE FROM RC8 TO RC9

Oil & gas mixture of RC8 will be transported to RC9 via 8" subsea pipeline for further processing.

The pipeline data is detailed in the Table 2.4.1 below. Line pipe will be specified in accordance with API 5L (45th edition).

Table 2.4.1: Pipeline Data

Parameters	Unit	Value
Pipe Outer Diameter	mm	219.1
Wall Thickness	mm	18.3
Corrosion Allowance	mm	3
Line Pipe Material	-	API 5L X60
Fabrication Method	-	SMLS, PSL2
Steel Density	kg/m ³	7850
Young's Modulus of Elasticity	MPa	207000
Poisson Ratio	-	0.3
Specified minimum yield stress	N/mm ²	413
Specified minimum tensile stress	N/mm ²	520
Thermal Expansion Coefficient	1/°C	11.7 x 10 ⁻⁶

Table 2.4.2: Pipeline Coating Data

Parameters	Unit	Value
External anti-corrosion coating, FBE	mm	0.3
Thermal insulation coating, PU Foam, conductivity coefficient ≤0.041 W/m.K	mm	30
	kg/m ³ (dry) density	200





Parameters	Unit	Value
HDPE Coating	mm	5
	kg/m ³ (dry) density	947
Concrete weight Coating	mm	50
	kg/m ³	3040
<u>Riser & spool</u>		
Adhesive Anti-Corrosion	mm	~1
Composite Coating	mm	30
	kg/m ³	600 (±5%)
Neoprene Coating	mm	5
	kg/m ³	1400

The approximate pipeline route length is presented in Table: 2.4.3

Table 2.4.3: Pipeline Route Length

Description	Length (km)
Offshore Pipeline Route	5.012

Table 2.4.4 – Shows the Operating parameters used for offshore pipeline.

Table 2.4.4 – Operating Parameters

Parameters	Unit	Value
Design Pressure	barg	40
Hydrotest Pressure	barg	50
Operating Pressure (Min/max)	barg	10 ÷ 25
Design Temperature	°C	60
Operating Temperature (Min/max)	°C	50 ÷ 55

Oil properties are provided in the table below.

Table 2.4.5 – Oil Properties

Description	Unit	Value
Pipeline service	-	Mixture of Oil and gas, two phase
Min density	kg/m ³	92.2





Description	Unit	Value
Max density	kg/m ³	149.6
Flowrate of liquid (oil)	ton/d	850
Flowrate of associated gas	Sm ³ /d	250000

3 SCOPE OF WORK

3.1 DETAIL OF SCOPE OF WORK

The contractor has to perform including but not limited to:

- Review all related documents: design, construction, installation, operation conditions, reports...and historical surveys (ROV surveys, geophysical surveys, ...) of Oil and Water Injection and gaslift pipelines to get all necessary inputs for fully assessments.
- Performing the Free Spans Assessment (details are described in Appendix 1):
 - For single free span: Contractor to carry out Lv.3's free span assessment (by FEA method) if the span length is exceeded the design's MASL.
 - For interacting free span: Contractor to filter the ROV survey data to establish the list of critical interacting free span need to carry out Lv.3's free span assessment (by FEA method).
- Analysis of free span in three levels based on "DNVGL-RP-F105" (latest version).


3.2 REPORT

- The full reports shall include but not limited to calculation, assessment, conclusion and recommendation for existing free span.
- Contractor is required to provide the master file in excel format that summary in detail all assessment result of 3 levels.

3.3 OTHER REQUIREMENTS

- All working procedures, technical methodology, detail schedule, executive plan, report format etc... shall be submitted to VSP for review and approval prior to commencement.
- The Contractor have to provide the copyright of software license which will be used in project.
- The Contractor shall present all related reports and send the draft report to VSP to review.
- The final reports, Results' assessment, Contractor shall submit VSP with the number of copies: 03 hard copies and 01 soft copy of the approved final (stored in portable hard driver).
- Contractor has to respond and update to all comments on reviewing of VSP prior to be signed Final report.



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- The Contractor is required to complete at least 02 projects free span assessment for subsea pipelines or lifetime extension assessment for offshore oil and gas structures.
- The Contractor's key personnel:
 - 01 Project manager (PM) has at least 02 projects free span assessment for subsea pipelines or lifetime extension assessment for offshore oil and gas structures as PM position;
 - 02 Senior Engineers: Principal/FAE have at least 02 projects free span assessment for subsea pipelines as principal/FAE position;
 - 01 Project Coordination Engineer / Document Controller: has at least 02 projects oil & gas as coordination/ document control position.

3.4 CONFIDENTIALITY

All of information in related to this scope shall be treated as confidential. Contractor shall not disclose to other parties without permission of VSP in written.

3.5 VSP RESPONSIBILITIES

VSP will provide Contractor, as its requirements the appropriate data, historical pipeline data, pipeline specification and all other necessary information to facilitate the work execution.

VSP review/approve Contractor's documents.

3.6 APPENDICES

Appendix 1: The method to choose number of free span to assess the level 3 assessment


Appendix 2: Offshore Pipeline Overall Field Layout

Appendix 3: Basic Design Summary

Appendix 4: ROV report including free span list

Appendix 5: Environment data

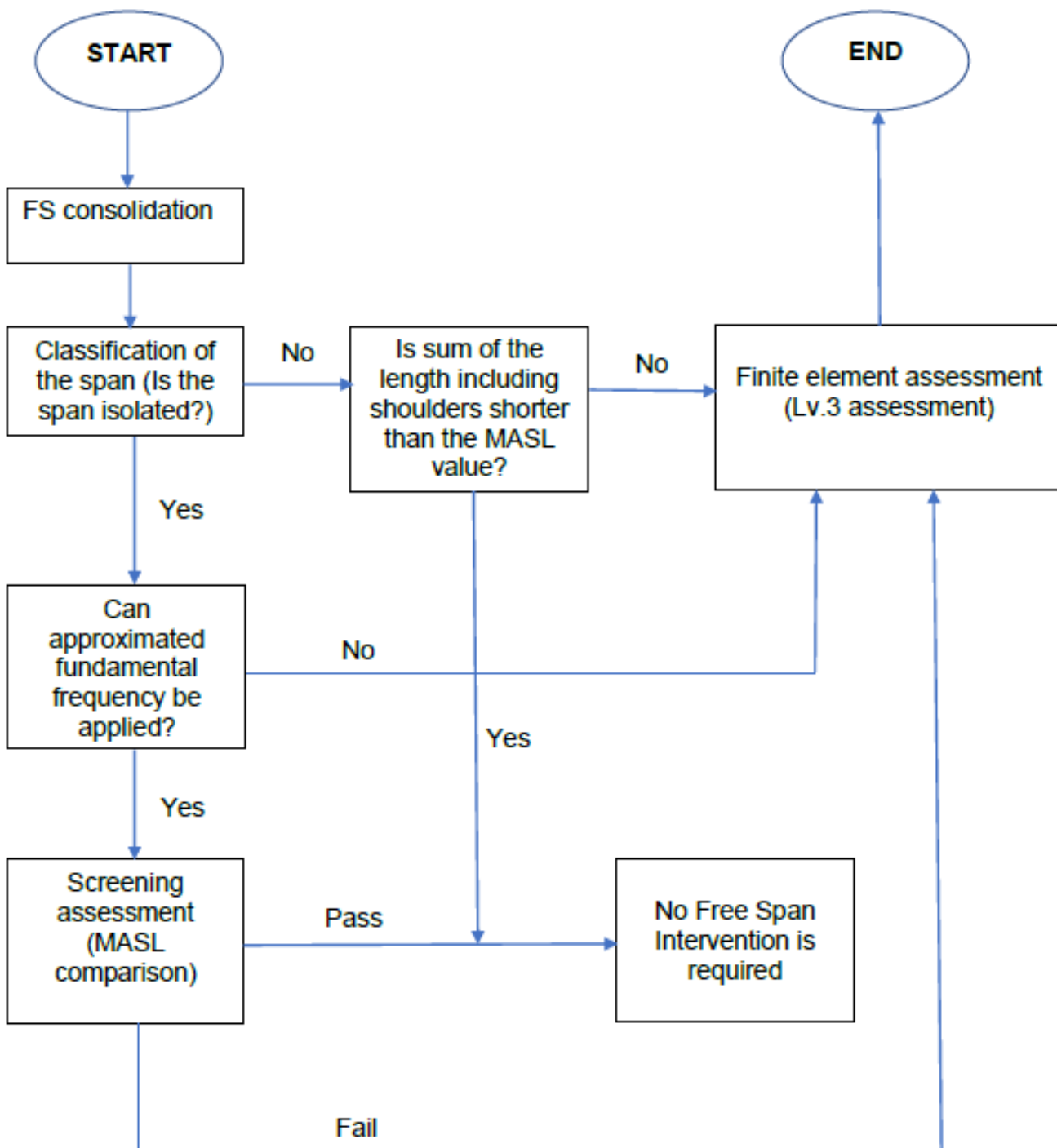



	<p>FREE SPAN ASSESSMENT FOR 4 PIPELINES IN 2025</p> <p>SCOPE OF WORK</p> <p>APPENDIX 1</p>	<p>OFSP-324-GE-PL8-SW-001 Appendix 1</p>			
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APPENDIX 1

THE METHOD TO CHOOSE NUMBER OF FREE SPAN TO ASSESS THE LEVEL 3 ASSESSMENT

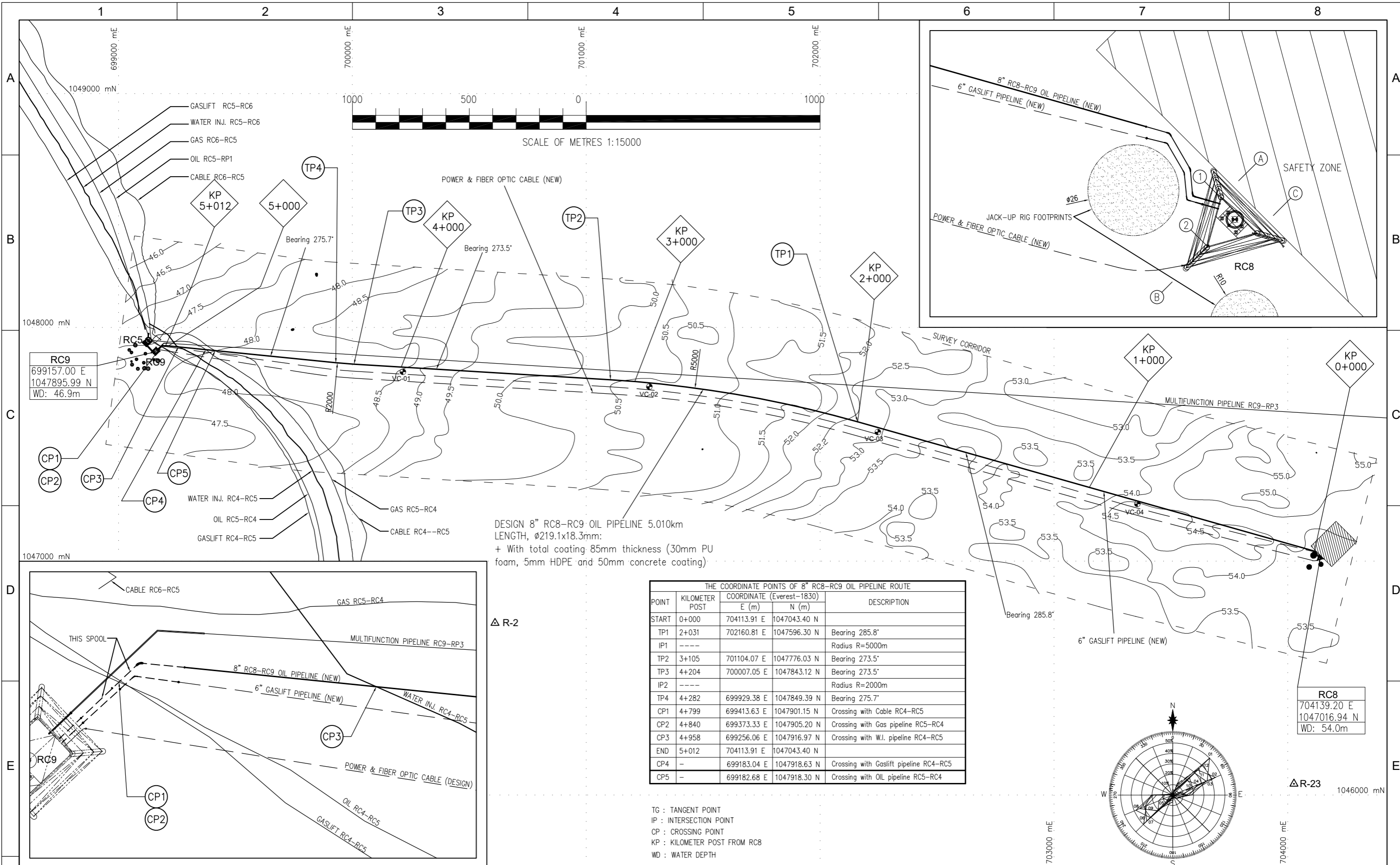




	<p>FREE SPAN ASSESSMENT FOR 4 PIPELINES IN 2025</p> <p>SCOPE OF WORK</p> <p>APPENDIX 2</p>	<p>OFSP-324-GE-PL8-SW-001 Appendix 2</p>		
		Rev.	0	Page

APPENDIX 2
OFFSHORE PIPELINE OVERALL FIELD LAYOUT

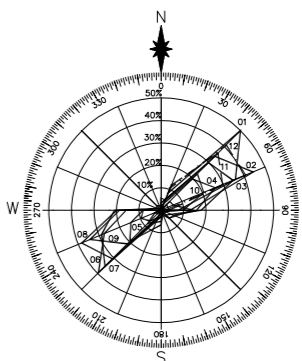




DESIGN 8" RC8-RC9 OIL PIPELINE 5.010km
 LENGTH, $\phi 219.1 \times 18.3$ mm:
 + With total coating 85mm thickness (30mm PU
 foam, 5mm HDPE and 50mm concrete coating)

POINT	KILOMETER POST	COORDINATE (Everest-1830)		DESCRIPTION
		E (m)	N (m)	
START	0+000	704113.91 E	1047043.40 N	
TP1	2+031	702160.81 E	1047596.30 N	Bearing 285.8'
IP1	----			Radius R=5000m
TP2	3+105	701104.07 E	1047776.03 N	Bearing 273.5'
TP3	4+204	700007.05 E	1047843.12 N	Bearing 273.5'
IP2	----			Radius R=2000m
TP4	4+282	699929.38 E	1047849.39 N	Bearing 275.7'
CP1	4+799	699413.63 E	1047901.15 N	Crossing with Cable RC4-RC5
CP2	4+840	699373.33 E	1047905.20 N	Crossing with Gas pipeline RC5-RC4
CP3	4+958	699256.06 E	1047916.97 N	Crossing with W.I. pipeline RC4-RC5
END	5+012	704113.91 E	1047043.40 N	
CP4	-	699183.04 E	1047918.63 N	Crossing with Gaslift pipeline RC4-RC5
CP5	-	699182.68 E	1047918.30 N	Crossing with OIL pipeline RC5-RC4

TG : TANGENT POINT
 IP : INTERSECTION POINT
 CP : CROSSING POINT
 KP : KILOMETER POST FROM RC8
 WD : WATER DEPTH



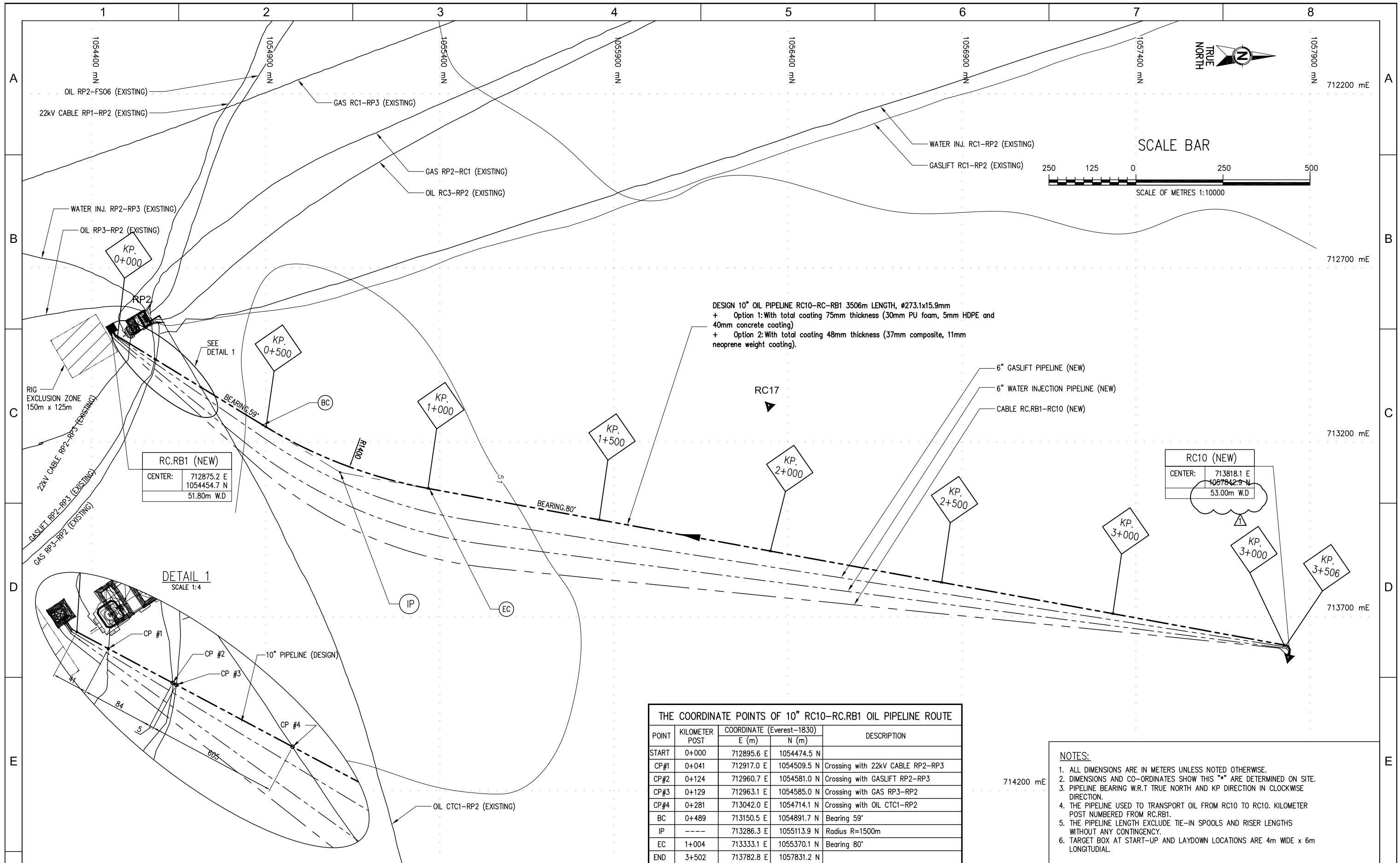
- NOTES:
1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
 2. DIMENSIONS AND CO-ORDINATES SHOW THIS "*" ARE DETERMINED ON SITE.
 3. PIPELINE BEARING W.R.T TRUE NORTH AND KP DIRECTION IN CLOCKWISE DIRECTION.
 4. THE PIPELINE USED TO TRANSPORT OIL FROM RC8 TO RC9. KILOMETER POST NUMBERED FROM RC8.
 5. THE PIPELINE LENGTH EXCLUDE TIE-IN SPOOLS AND RISER LENGTHS WITHOUT ANY CONTINGENCY.
 6. TARGET BOX AT START-UP AND LAYDOWN LOCATIONS ARE 4m WIDE x 6m LONGITUDIAL.

SYSTEM COORDINATE	
DATUM	: VIETNAM
SPHEROID	: EVEREST-1830
CENTRAL MERIDIAL	: 106°E
FALSE EASTING	: 500000

	: HIGH REFLECTOR PATCH
	: As-found PLATFORM
	: POCKMARK
	: DEPTH CONTOUR IN METERS

LEGEND	
	: DESIGNED PIPELINE
	: PIPELINE AND CABLE
	: BK/RC PLATFORM
	: LIMIT OF SIDE SCAN SONAR COVERAGE
	: SAMPLING LOCATION
	: SEABED SCARS
	: JACK-UP RIG FOOTPRINTS

		RESEARCH AND ENGINEERING INSTITUTE FOR OFFSHORE OIL AND GAS						
		PROJECT: RC8 PROJECT	SUB PROJECT: RC8-RC9 OIL PIPELINE					
DRAWING NO.: RC8.RC9-OL.1-001-PL8-DW-002		SCALE: 1/1						
DRAWING TITLE: PIPELINE LAYOUT		PHASE:						
REV.	DATE	DES.	PREPARED	CHECKED	GORKOV IA	H.V.DUONG	B.H.DUONG	B.T.HAN
	05.22	IFA	P.D.THANG	P.D.THANG	DEP.CHIEF DEPART.	DEPT.MGR	ENG.MGR	PRO.MGR

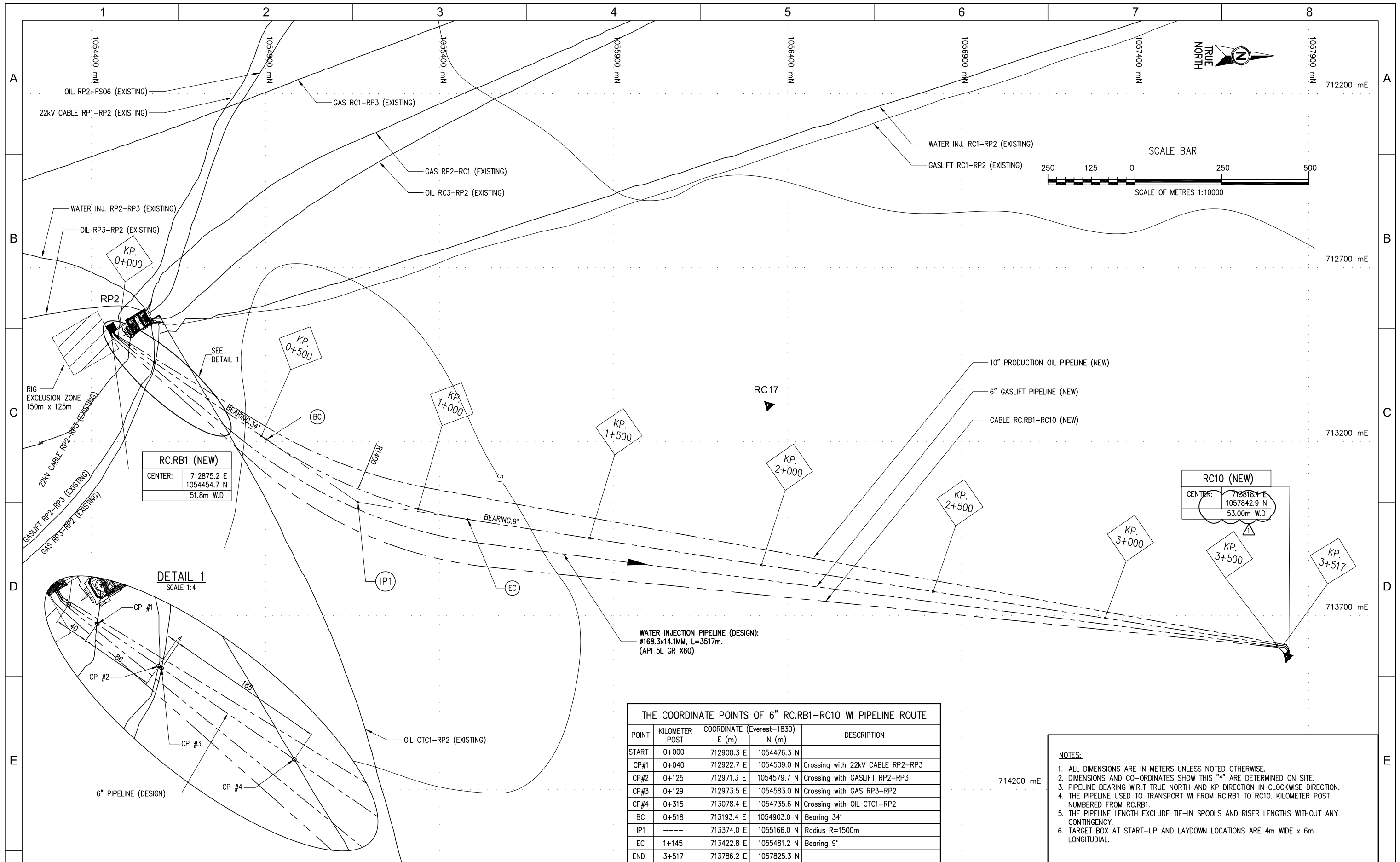


THE COORDINATE POINTS OF 10" RC10-RC.RB1 OIL PIPELINE ROUTE

POINT	KILOMETER POST	COORDINATE (Everest-1830)		DESCRIPTION
		E (m)	N (m)	
START	0+000	712895.6 E	1054474.5 N	
CP#1	0+041	712917.0 E	1054509.5 N	Crossing with 22kV CABLE RP2-RP3
CP#2	0+124	712960.7 E	1054581.0 N	Crossing with GASLIFT RP2-RP3
CP#3	0+129	712963.1 E	1054585.0 N	Crossing with GAS RP3-RP2
CP#4	0+281	713042.0 E	1054714.1 N	Crossing with OIL CTC1-RP2
BC	0+489	713150.5 E	1054891.7 N	Bearing 59°
IP	----	713286.3 E	1055113.9 N	Radius R=1500m
EC	1+004	713333.1 E	1055370.1 N	Bearing 80°
END	3+502	713782.8 E	1057831.2 N	

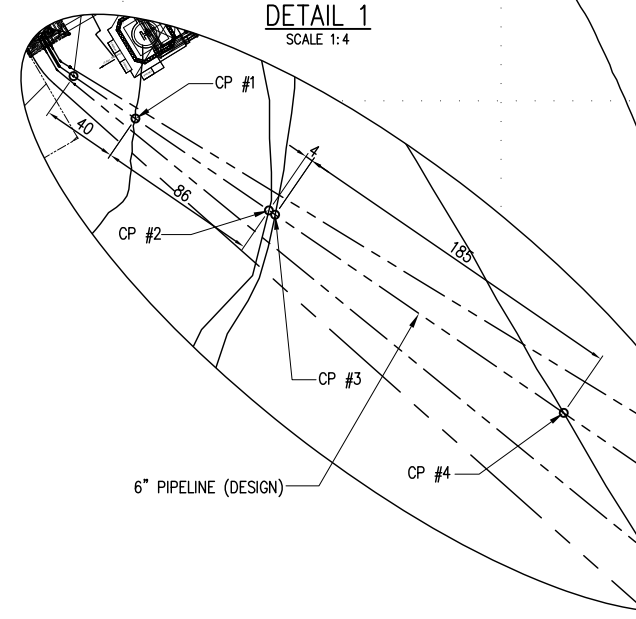
- NOTES:**
- ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
 - DIMENSIONS AND CO-ORDINATES SHOW THIS "*" ARE DETERMINED ON SITE.
 - PIPELINE BEARING W.R.T TRUE NORTH AND KP DIRECTION IN CLOCKWISE DIRECTION.
 - THE PIPELINE USED TO TRANSPORT OIL FROM RC10 TO RC10. KILOMETER POST NUMBERED FROM RC.RB1.
 - THE PIPELINE LENGTH EXCLUDE TIE-IN SPOOLS AND RISER LENGTHS WITHOUT ANY CONTINGENCY.
 - TARGET BOX AT START-UP AND LAYDOWN LOCATIONS ARE 4m WIDE x 6m LONGITUDIAL.

AGREED		REFERENCE													
DIS./DEPT./DIV.	SURNAME	SIGN.	DATE	REF. DRAWING No.	REF. DRAWING TITLE	REV.	DATE	DES.	PREPARED	CHECKED	DEPT.MGR	ENG.MGR	PRO.MGR		
				RCRB1.RC10-GL.1-001-PL8-DW-002	PIPELINE LAYOUT	0	.10.21	IFA	P.D.THANG	L.M.HUNG	GORKOV	IAB.H.DUONG	B.T.HAN		
<p>RESEARCH AND ENGINEERING INSTITUTE FOR OFFSHORE OIL AND GAS</p> <p>PROJECT: RC10 & RC-RB1 PROJECT SUB PROJECT: Oil Pipeline RC10-RC-RB1</p> <p>DRAWING NO.: RC10.RCRB1-OL.1-001-PL8-DW-002 SCALE: -</p> <p>DRAWING TITLE: PIPELINE LAYOUT SHEET: 1/1</p> <p>PHASE: DETAIL</p>															



RC.RB1 (NEW)	
CENTER:	712875.2 E 1054454.7 N 51.8m W.D

RC10 (NEW)	
CENTER:	713818.9 E 1057842.9 N 53.00m W.D



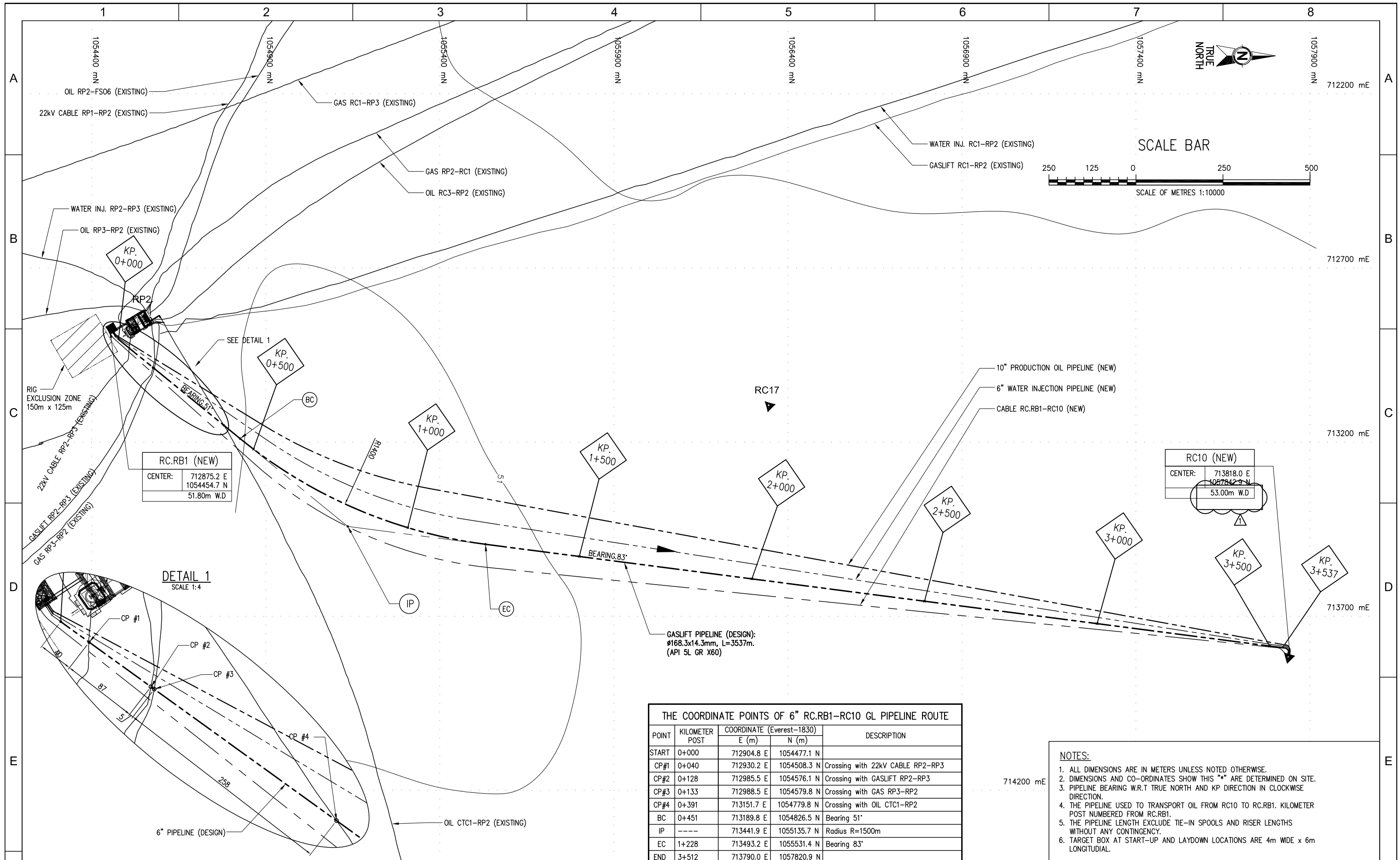
THE COORDINATE POINTS OF 6" RC.RB1-RC10 WI PIPELINE ROUTE				
POINT	KILOMETER POST	COORDINATE (Everest-1830)		DESCRIPTION
		E (m)	N (m)	
START	0+000	712900.3	1054476.3	N
CP#1	0+040	712922.7	1054509.0	N
CP#2	0+125	712971.3	1054579.7	N
CP#3	0+129	712973.5	1054583.0	N
CP#4	0+315	713078.4	1054735.6	N
BC	0+518	713193.4	1054903.0	N
IP1	----	713374.0	1055166.0	N
EC	1+145	713422.8	1055481.2	N
END	3+517	713786.2	1057825.3	N

- NOTES:**
- ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
 - DIMENSIONS AND CO-ORDINATES SHOW THIS "*" ARE DETERMINED ON SITE.
 - PIPELINE BEARING W.R.T TRUE NORTH AND KP DIRECTION IN CLOCKWISE DIRECTION.
 - THE PIPELINE USED TO TRANSPORT WI FROM RC.RB1 TO RC10. KILOMETER POST NUMBERED FROM RC.RB1.
 - THE PIPELINE LENGTH EXCLUDE TIE-IN SPOOLS AND RISER LENGTHS WITHOUT ANY CONTINGENCY.
 - TARGET BOX AT START-UP AND LAYDOWN LOCATIONS ARE 4m WIDE x 6m LONGITUDIAL.

LEGEND & ABBREVIATIONS: NEW PIPELINE/CABLE DESIGN PIPELINE EXISTING PIPELINE/CABLE BATHYMETRIC CONTOUR KILOMETER POST	SYSTEM COORDINATE DATUM : VIETNAM SPHEROID : EVEREST-1830 CENTRAL MERIDIAL : 106°E FALSE EASTING : 500000
	BC : BEGINNING OF CURVE EC : END OF CURVE IP : INTERSECTION POINT WD : WATER DEPTH CP : CROSSING POINT

AGREED				REFERENCE									
DIS./DEPT./DIV.	SURNAME	SIGN.	DATE	REF. DRAWING No.	REF. DRAWING TITLE	REV.	DATE	DES.	PREPARED	CHECKED	DEPT.MGR	ENG.MGR	PRO.MGR
						1	.10.21	RIFA	P.D.THANG	L.M.HUNG	GORKOV.IA	B.H.DUONG	B.T.HAN
						0	27.09.21	IFA	P.D.THANG	L.M.HUNG	GORKOV.IA	B.H.DUONG	B.T.HAN

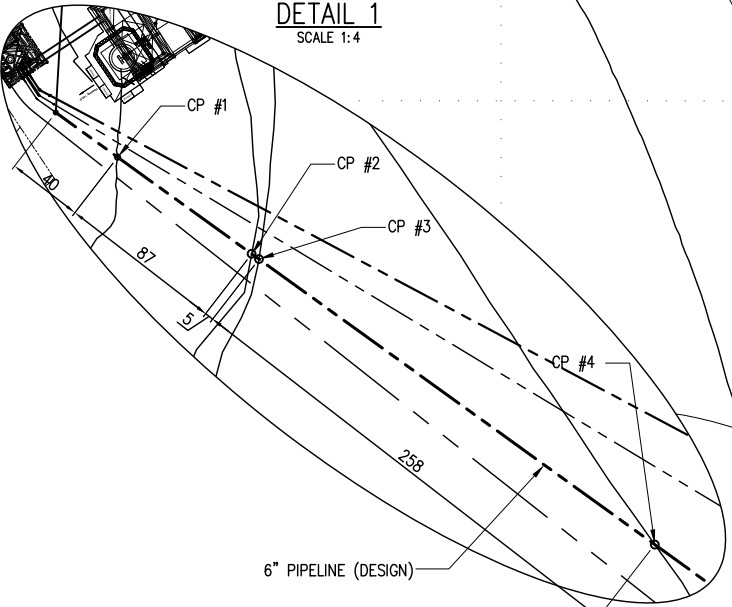
RESEARCH AND ENGINEERING INSTITUTE FOR OFFSHORE OIL AND GAS
 PROJECT: **RC10 & RC-RB1 PROJECT** SUB PROJECT: **WATER INJECTION PIPELINE RC-RB1-RC10**
 DRAWING NO.: **RCRB1,RC10-WI.1-001-PL8-DW-002** SCALE: -
 DRAWING TITLE: **PIPELINE LAYOUT** SHEET: 1/1
 PHASE: DETAIL



RC.RB1 (NEW)	
CENTER:	712875.2 E 1054454.7 N 51.80m W.D

RC10 (NEW)	
CENTER:	713818.0 E 1057742.9 N 53.00m W.D

DETAIL 1
SCALE 1:4



THE COORDINATE POINTS OF 6" RC.RB1-RC10 GL PIPELINE ROUTE

POINT	KILOMETER POST	COORDINATE (Everest-1830)		DESCRIPTION
		E (m)	N (m)	
START	0+000	712904.8 E	1054477.1 N	
CP#1	0+040	712930.2 E	1054508.3 N	Crossing with 22kV CABLE RP2-RP3
CP#2	0+128	712985.5 E	1054576.1 N	Crossing with GASLIFT RP2-RP3
CP#3	0+133	712988.5 E	1054579.8 N	Crossing with GAS RP3-RP2
CP#4	0+391	713151.7 E	1054779.8 N	Crossing with OIL CTC1-RP2
BC	0+451	713189.8 E	1054826.5 N	Bearing 51°
IP	----	713441.9 E	1055135.7 N	Radius R=1500m
EC	1+228	713493.2 E	1055531.4 N	Bearing 83°
END	3+512	713790.0 E	1057820.9 N	

- NOTES:**
- ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
 - DIMENSIONS AND CO-ORDINATES SHOW THIS "*" ARE DETERMINED ON SITE.
 - PIPELINE BEARING W.R.T TRUE NORTH AND KP DIRECTION IN CLOCKWISE DIRECTION.
 - THE PIPELINE USED TO TRANSPORT OIL FROM RC10 TO RC.RB1. KILOMETER POST NUMBERED FROM RC.RB1.
 - THE PIPELINE LENGTH EXCLUDE TIE-IN SPOOLS AND RISER LENGTHS WITHOUT ANY CONTINGENCY.
 - TARGET BOX AT START-UP AND LAYDOWN LOCATIONS ARE 4m WIDE x 6m LONGITUDIAL.

LEGEND & ABBREVIATIONS:

- NEW PIPELINE/CABLE
- DESIGN PIPELINE
- EXISTING PIPELINE/CABLE
- BATHYMETRIC CONTOUR
- ◆ KP. 0+000
- ◆ KILOMETER POST

SYSTEM COORDINATE

DATUM : VIETNAM
 SPHEROID : EVEREST-1830
 CENTRAL MERIDIAL : 106°E
 FALSE EASTING : 500000

BC : BEGINNING OF CURVE
 EC : END OF CURVE
 IP : INTERSECTION POINT
 WD : WATER DEPTH
 CP : CROSSING POINT


AGREED				REFERENCE									
DIS./DEPT./DIV.	SURNAME	SIGN.	DATE	REF. DRAWING No.	REF. DRAWING TITLE	REV.	DATE	DES.	PREPARED	CHECKED	DEPT.MGR	ENG.MGR	PRO.MGR

RESEARCH AND ENGINEERING INSTITUTE FOR OFFSHORE OIL AND GAS

PROJECT: RC10 & RC-RB1 PROJECT
 SUB PROJECT: GASLIFT PIPELINE RC-RB1-RC10

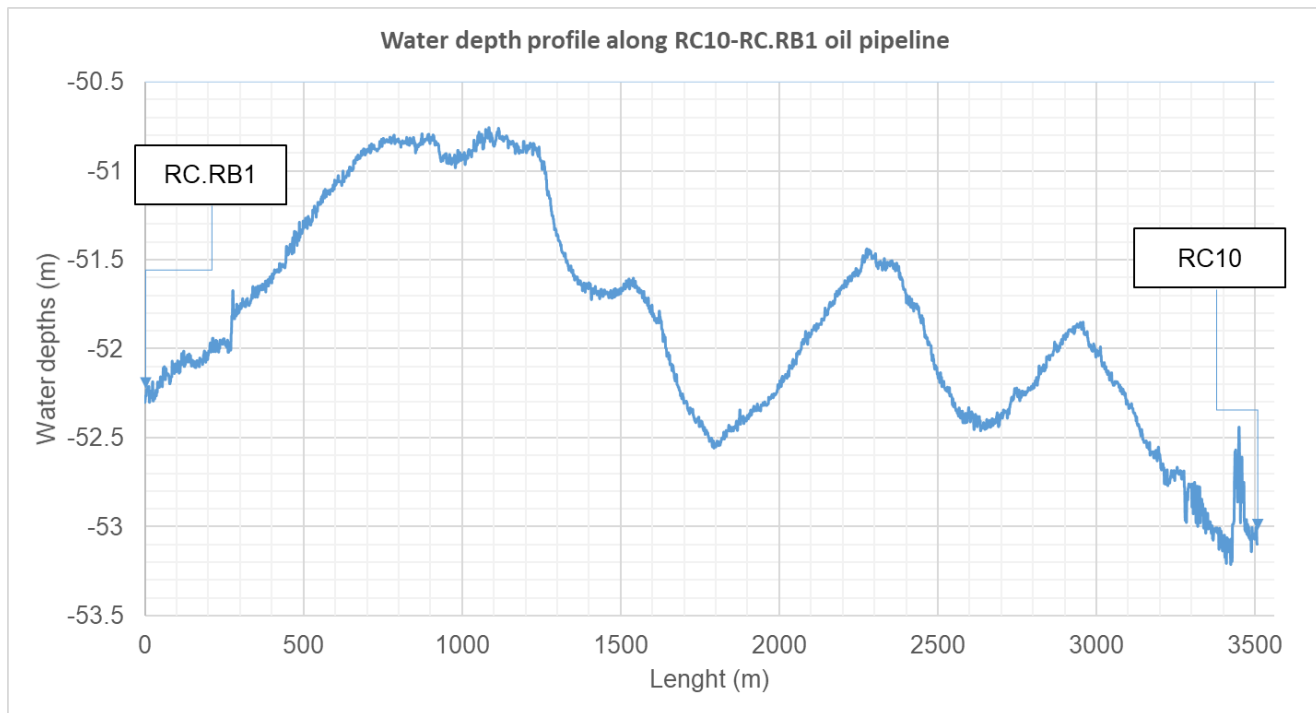
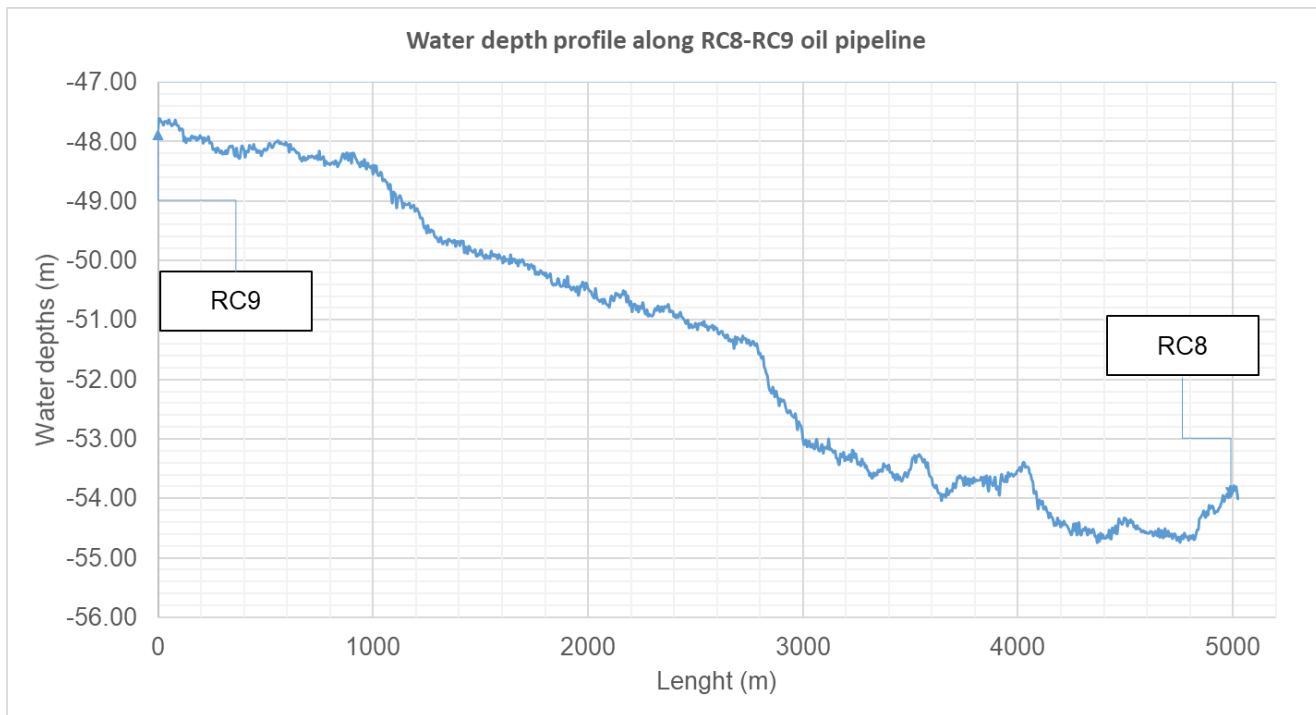
DRAWING NO.: RCRB1,RC10-GL-1-001-PL8-DW-002
 DRAWING TITLE: PIPELINE LAYOUT

SCALE: -
 SHEET: 1/1
 PHASE: DETAIL

	<p>FREE SPAN ASSESSMENT FOR 4 PIPELINES IN 2025</p> <p>SCOPE OF WORK</p> <p>APPENDIX 3</p>	<p>OFSP-324-GE-PL8-SW-001 Appendix 3</p>		
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APPENDIX 3
BASIC DESIGN SUMMARY







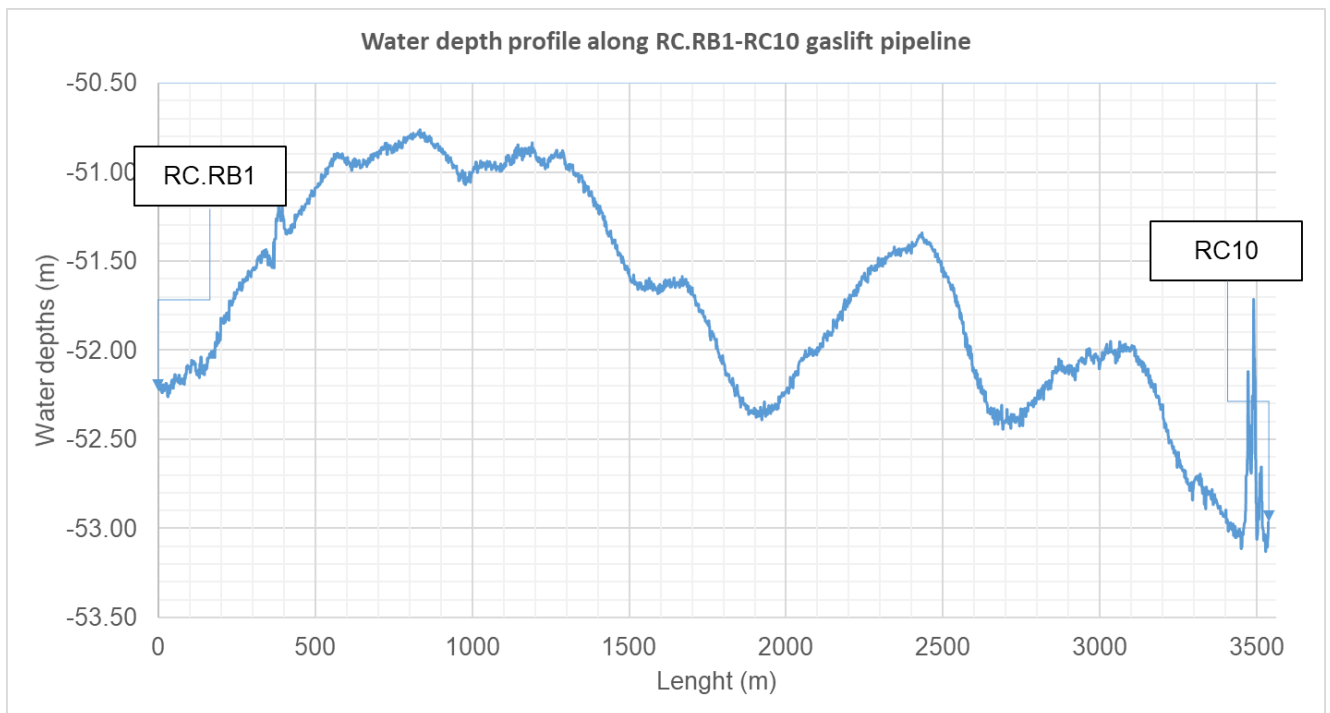
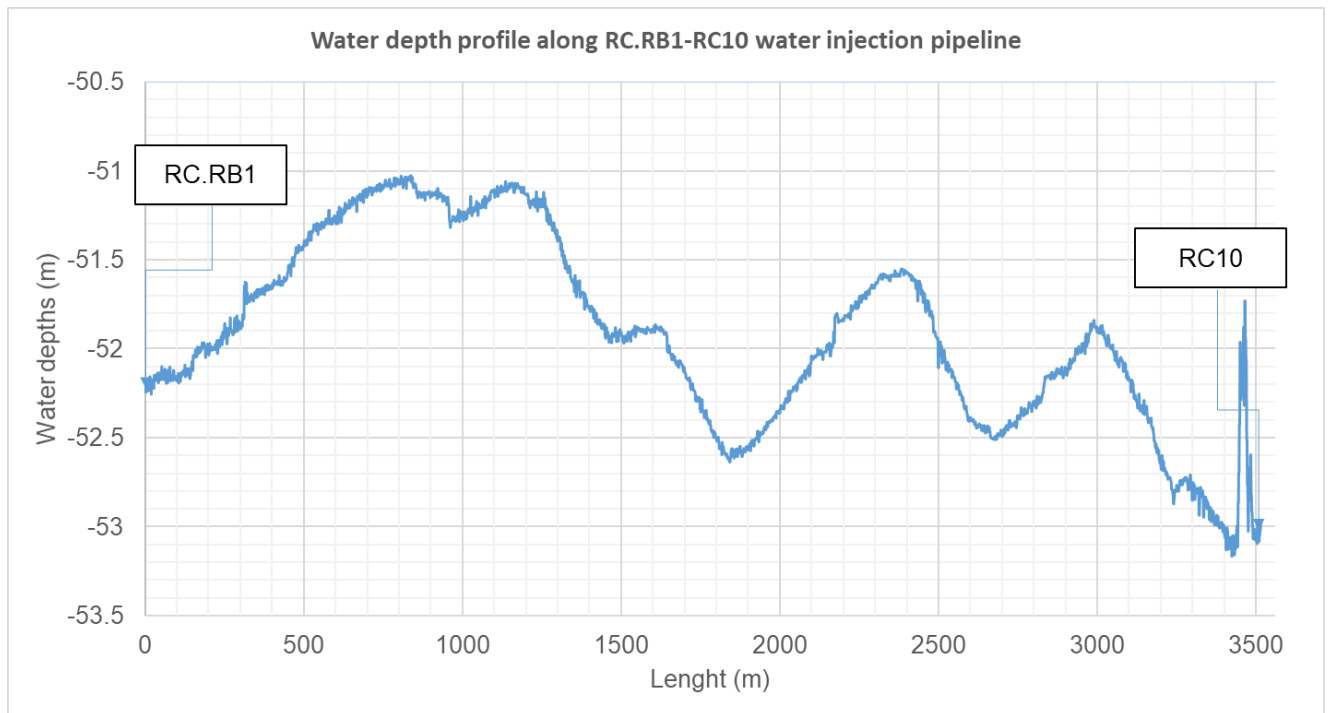
SCOPE OF WORK
APPENDIX 3

Rev.

0

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BASIC DESIGN SUMMARY

No.	Description	RC10-RC.RB1 Oil pipeline	RC.RB1-RC10 Water Injection pipeline	RC.RB1-RC10 Gaslift pipeline	RC8-RC9 Oil pipeline
1	2	3	4	5	6
1	Production	Mix oil & gas	Water Injection	Gaslift	Mix oil & gas
2	Location	Offshore	Offshore	Offshore	Offshore
3	Pipeline design code	DNV-OS-F101	DNV-OS-F101	DNV-OS-F101	DNV-OS-F101
4	Pipeline length	3.51km	3.55km	3.55km	5.01km
5	Pipeline material	API 5L-X60	API 5L-X60	API 5L-X60	API 5L-X60
6	Nominal diameter	273.1mm (10 inch)	168.3mm (6 inch)	168.3mm (6 inch)	219.1mm (8 inch)
7	Wall thickness	15.9mm	14.3mm	14.3mm	18.3mm
8	Allowable corrosion	3mm	3mm	3mm	3mm
9	Design life	15	15	15	25
10	Construction year	2022	2022	2022	2023
11	Start operation year	2022	2022	2022	2023
12	Design pressure	35	250	125	40
13	Hydrotest pressure	42	312.5	150	50
14	Design temperature	50	39	35	60
15	Production density (Min.)	28.44	1025	125	92.2
16	Specified Minimum Yield Strength	443 N/mm ²	443 N/mm ²	443 N/mm ²	443 N/mm ²
17	Cathodic protection/ anode design	Yes	Yes	Yes	Yes
18	Anti-corrosion coating	Painting	Painting	Painting	FBE
19	External coating	Total coating 48mm thickness (37mm composite, 11mm neoprene weight coating)	None	None	Total coating 85mm thickness (30mm PU Foam, 5mm HDPE, 50mm Concrete coating)
20	Working flow rate	765 ton/d 240000 Sm ³ /d	400m ³ /d	300000 Sm ³ /d	850 ton/d 250000 Sm ³ /d
21	Free span	10	10	15	01
22	Free span over allowable	04	07	07	01

Notes:

1. Operating condition could be different between original design phase and current. We will update the current operating condition to Contractor for assessment.



	<p>FREE SPAN ASSESSMENT FOR 4 PIPELINES IN 2025</p> <p>SCOPE OF WORK</p> <p>APPENDIX 4</p>	<p>OFSP-324-GE-PL8-SW-001 Appendix 4</p>			
		Rev.	0	Page	22 of 23

APPENDIX 4
ROV REPORT INCLUDING FREE SPAN LIST





VIETSOVPETRO



MARINE TRANSPORTATION AND DIVING SERVICE DIVISION

AS-BUILT SURVEY OIL PIPELINE

RC8-RC9

FINAL REPORT

Report No. ROV-A.04-23

PANTHER PLUS 932

ATOM 01

Created by: ROV Team

Rev 0	Name	Position	Signature	Date
Written by	Do Binh Minh	Reporter		10/11/2023
Checked by	Bui Minh Tien	Supervisor		10/11/2023
Approved by	Dinh Binh Nam	Diving manager		

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ROV UNDERWATER SURVEY IN 2023

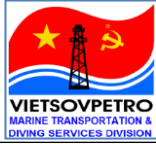
AS-BUILT SURVEY OIL PIPELINE RC8-RC9



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ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



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ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



1 INTRODUCTION

1.1 Abstract

The purpose of this survey was to obtain an overall condition assessment of the Risers at RC9-RC8 platform and the oil pipeline connecting from RC9 to the RC8 with 5100m in length and diameter 219,1x18.3mm to satisfy the 2023 requirement by production task of Marine Transportation & Diving Service Division of Vietsovpetro. And collect all pertinent inspection data to prepare an event file, establish base line data for future uses.

All anomalies and debris in this survey area will be recorded to DVD. They will be reported in event log sheet.





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



1.2 Abbreviations

AB	Abraded
AN	Anode
CD	Coating Damage
CP	Cathodic Protection/Potential
CR	Corrosion
CVI	Close Visual Inspection
DAM	Damage
DWG	Drawing
E	Electrical
EL	Elevation
FJ	Field Joint
GVI	General Visual Inspection
HD	Hard Debris
HDM	Horizontal Diagonal Member
HM	Horizontal Member
KP	Kilometer Point `
L	Length
LK	Leak
M	Meter
MG	Marine Growth
MGT	Marine Growth Thickness
MPI	Magnetic Particle Inspection
MSL	Main Sea Level
NDT	Non Destructive Testing
PL	Pipeline
PLEM	Pipeline End Manifold
ROV	Remotely Operated Vehicle
SD	Soft Debris
STBD	Starboard
TD	Touch Down
USTM	Ultra Sonic Wall thickness Measurement
VM	Vertical Member
VSP	VietsovPetro Joint Venture Company
WHP	Wellhead Platform



2 LOCATION

The Dragon oil field is located in block 09-1 offshore Vietnam in approximately 45-55m water depth operated by VIET NGA Vietsovetro.

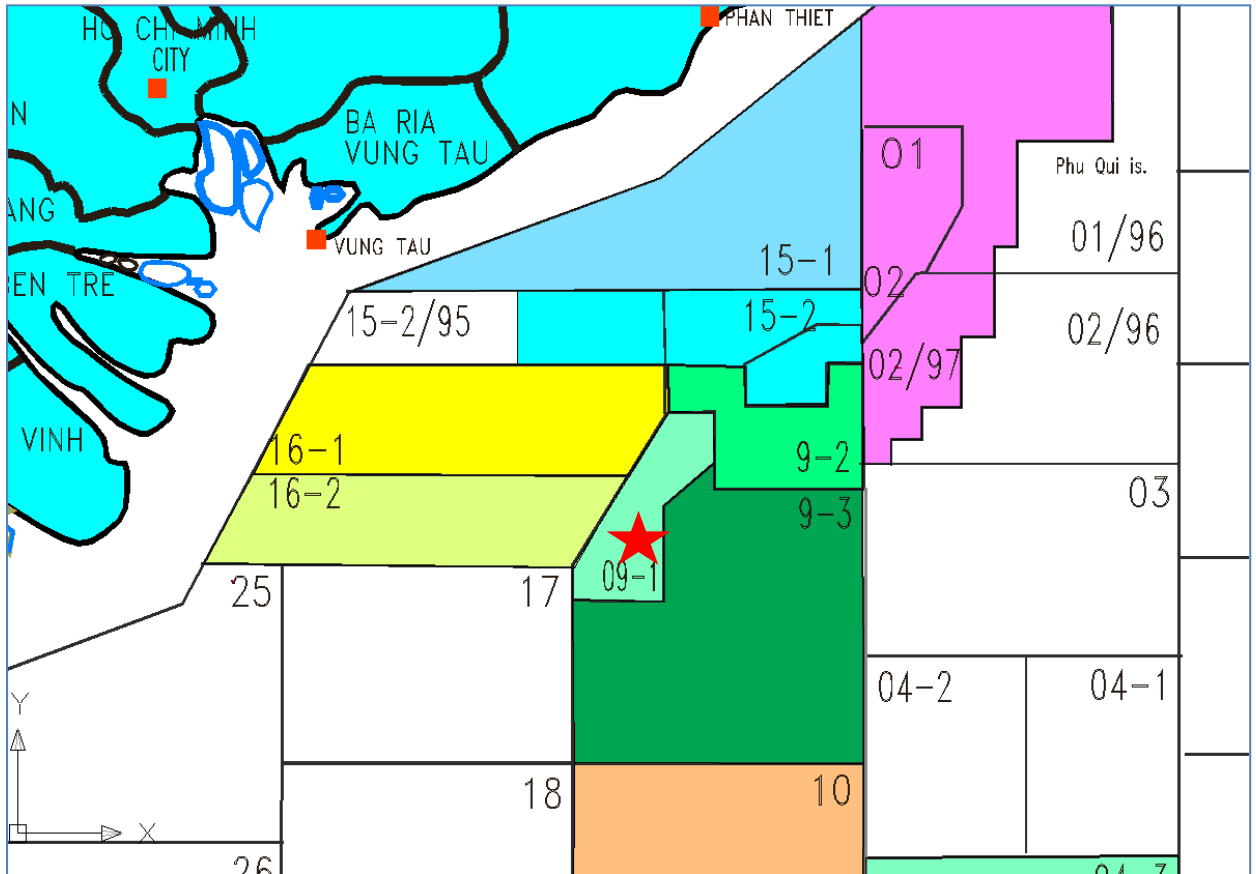


Figure 1: Vietsovetro block

Co-ordinate system used:

Position was fixed by Global Positioning System has named:

Datum Indian 1830

Ellipsoid Everest 1830 India

All equipment's were used and controlled by SEAMAP's personnel.

Standard direction of all survey screen shot, key plan:

Position was fixed with inaccuracy not more than 3 meters.





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



3 STATISTICS, SENSORS UNIT AND PERSONNEL

3.1. Vehicle

ROV: Workclass ROV “ATOM 01” and Observation ROV
“PANTHER PLUS 932”

Altimeter: Trittech Seaking PA-500
Trittech Seaking PA-500 Range of Bathymetric &
Oceanographic Sensors

Gyro: TOGS-NAV & Saab Seaeye

Depth: TOGS completed full set
Trittech Seaking 701/14 Range of Bathymetric &
Oceanographic Sensors

Cameras: Teledyne Bowtech SD-004-B8-B zoom cameras
Bowtech Explorer near SIT camera
Kongsberg color zoom camera
Kongsberg near SIT camera

3.2. Statistics

Water depth: 49-50m.

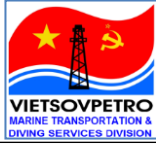
3.3. Vessel

M/V Royal & Sao Mai 03

3.4. List of personnel

ROV Team:	Supervisor:	Bui Minh Tien Nguyen Huy Hoang
	Pilot techs:	Dinh Hong Chuyen
	Report Processor:	Do Binh Minh
	LARS Operator:	Nguyen Minh Quan
Seamap Team:	Surveyors:	Nguyen Dinh Sung Hoang Duy Linh





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



4 SCOPE OF WORK

4.1. Riser survey

The Riser will be inspected and report the following:

- Corroded or leaking riser.
- Damage to riser or coating.
- Dented, kinked or buckled riser.
- Condition of the clamps. If marine growth permits, list down all clamp defects such as loose/missing bolts, miss alignment or signs of riser movement.

All of above points will be fixed and recorded to DVD.

4.2. Pipeline survey

The Pipeline will be inspected and report the following:

- Carry out leaking survey.
- Carry out types of span survey.
- Carry out pipelines crossing survey
- Carry out a general visual inspection (GVI) of the pipeline and attachments. Report all areas of damage, corrosion or debris items present on the pipeline
- To still Photographs of all areas of damage or significant defects are required. Take sufficient photographs to assess the size of, and to accurately locate the defect.
- Verify the presence, condition and security of attachment of all anodes. Estimate the percentage depletion of each anode and the extent of marine growth presents permits.

All of above points will be fixed. Burials, free spans and all of debris along the pipeline will be recorded to DVD.





Figure 3: Riser clamp at EL: -46m



Figure 4: Riser clamp at EL: -38m



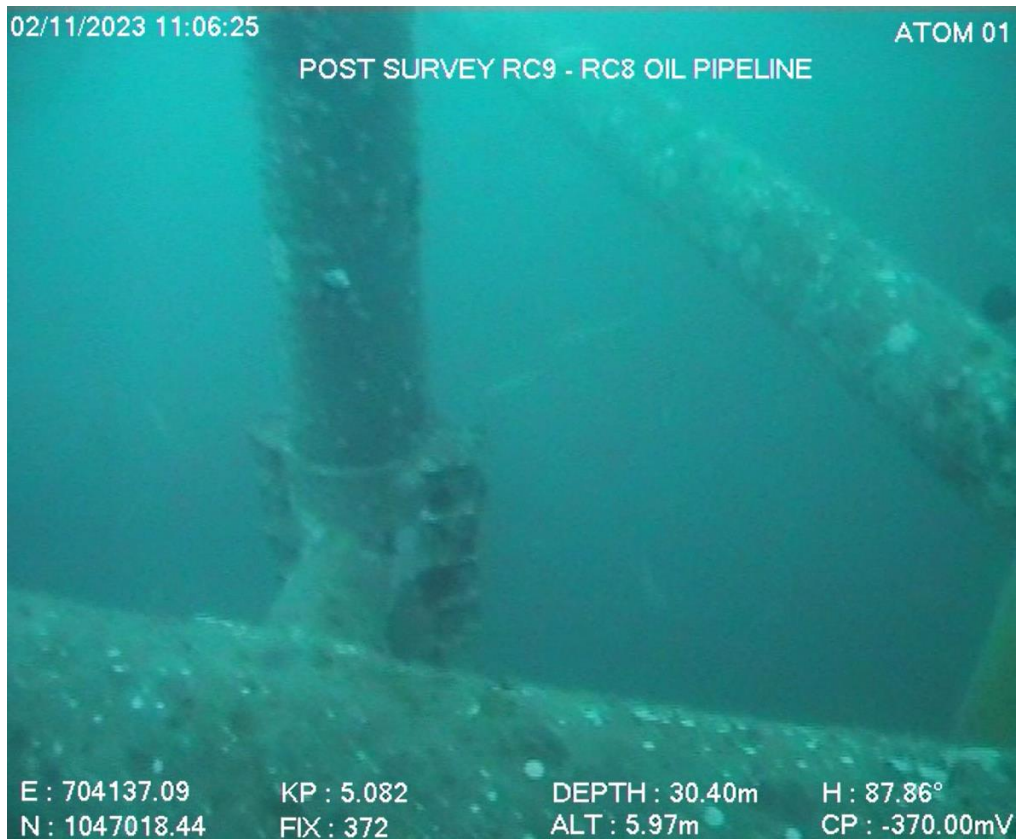


Figure 5: Riser clamp at EL: -32m



Figure 6: Riser clamp at EL: -27m



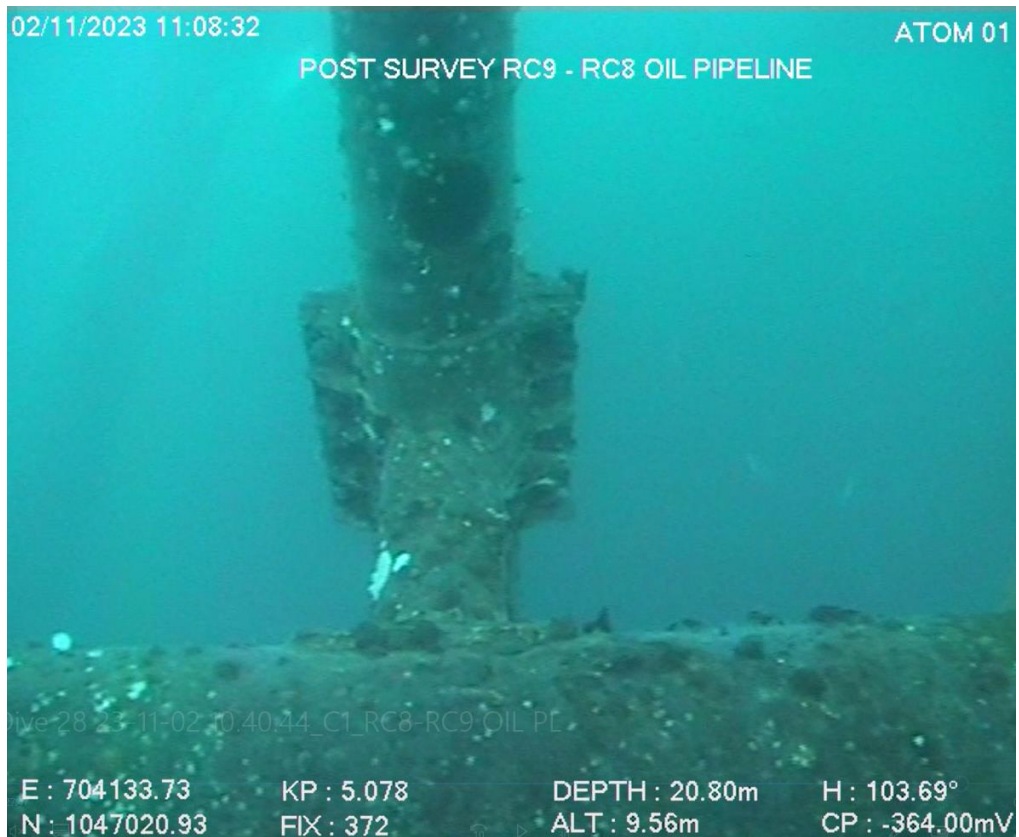


Figure 7: Riser clamp at EL: -21m



Figure 8: Riser clamp at EL: -14m





Figure 9: Riser clamp at EL: -11m

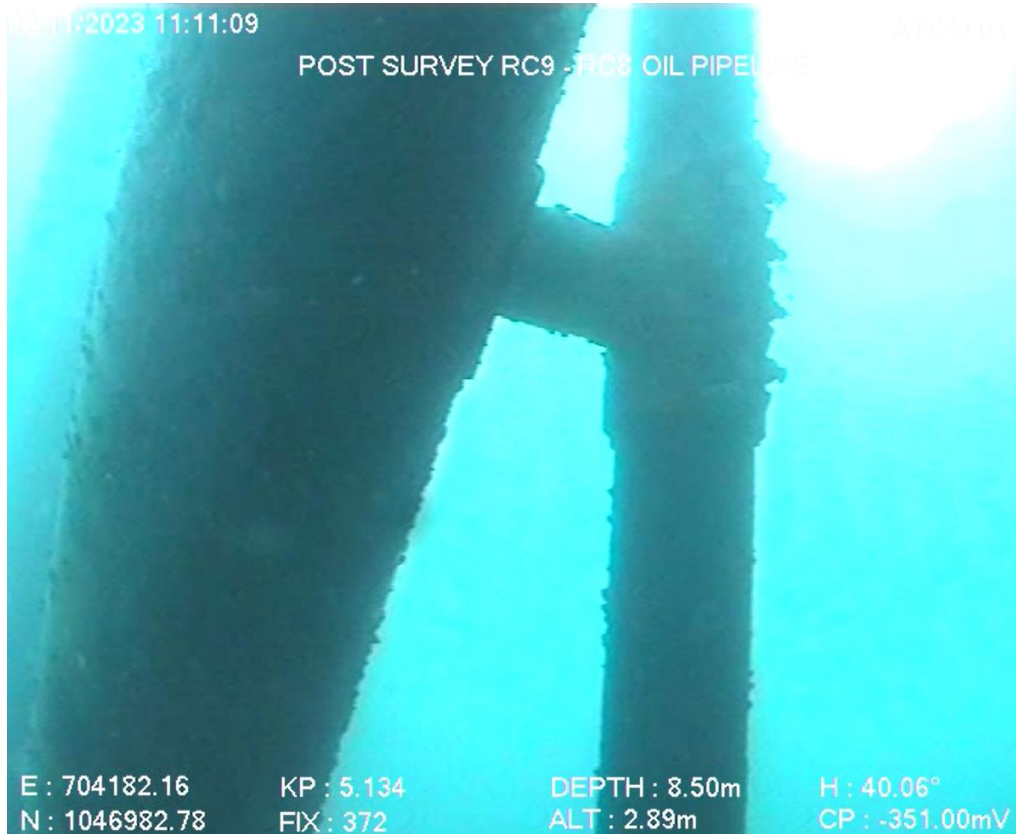


Figure 10: Riser clamp at EL: -6m





Figure 11: RC8 riser elbow condition

5.2. Riser at RC9 platform

ROV surveyed this riser from MSL down to seabed. A total 05 of riser clamps were identified during the inspection at EL -4m, -12m, -21m, -30m and -39m.

The riser clamps were found in normal condition, no indication of physical damage, impact deformation, displacement or movement.



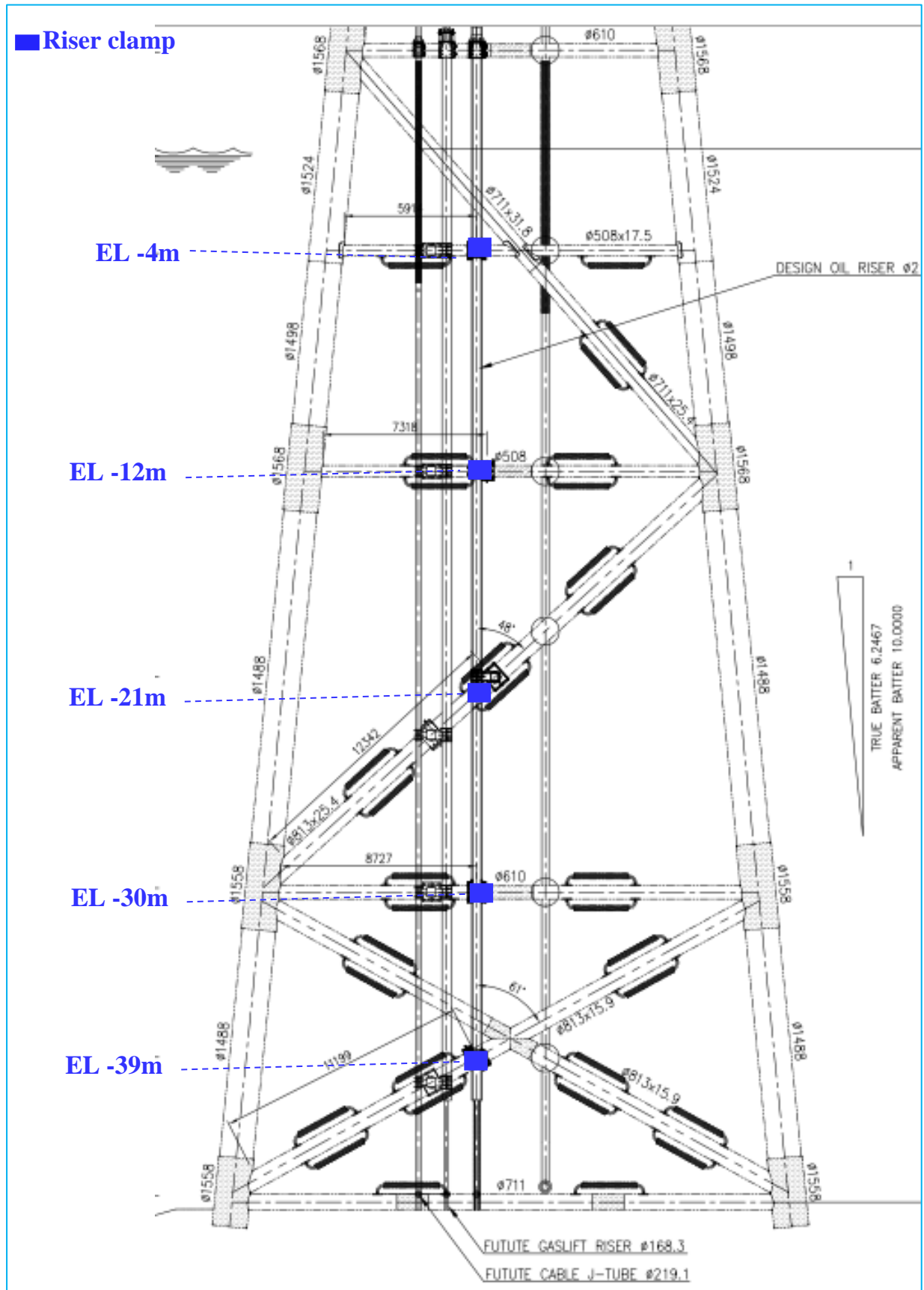


Figure 12: Elevation view of Riser and riser clamp position at RC9



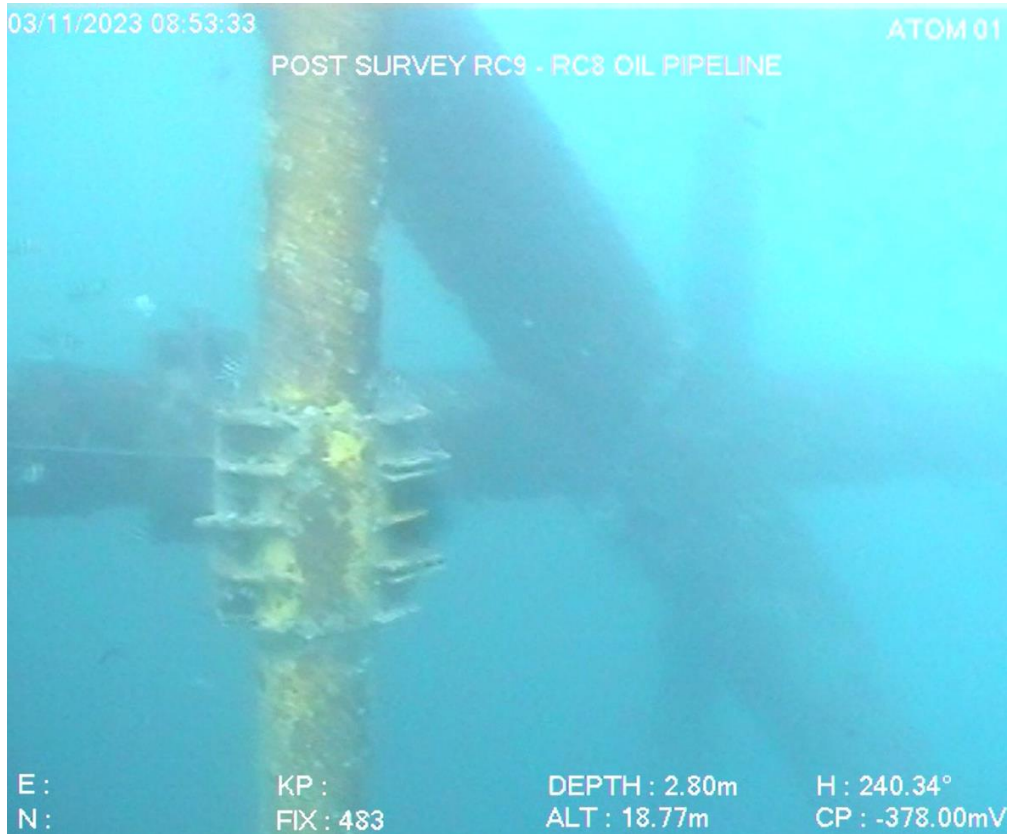


Figure 13: Riser clamp at EL: -4m



Figure 14: Riser clamp at EL: -12m





Figure 15: Riser clamp at EL: -21m



Figure 16: Riser clamp at EL: -30m



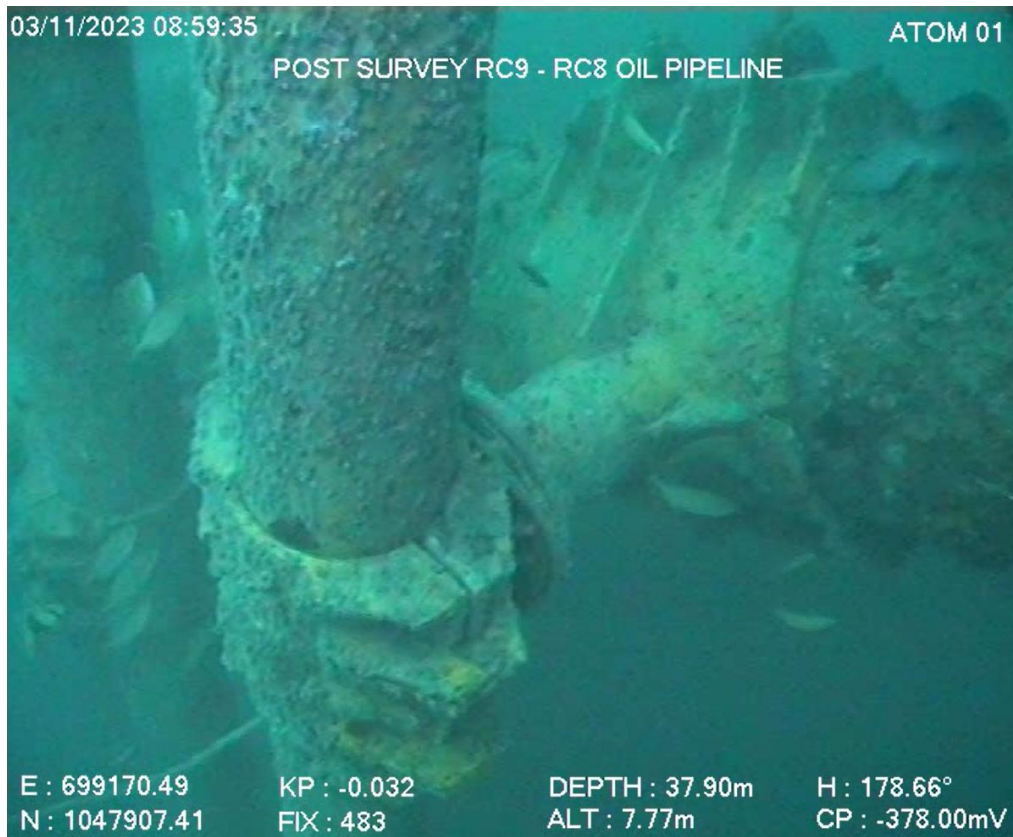


Figure 17: Riser clamp at EL: -39m

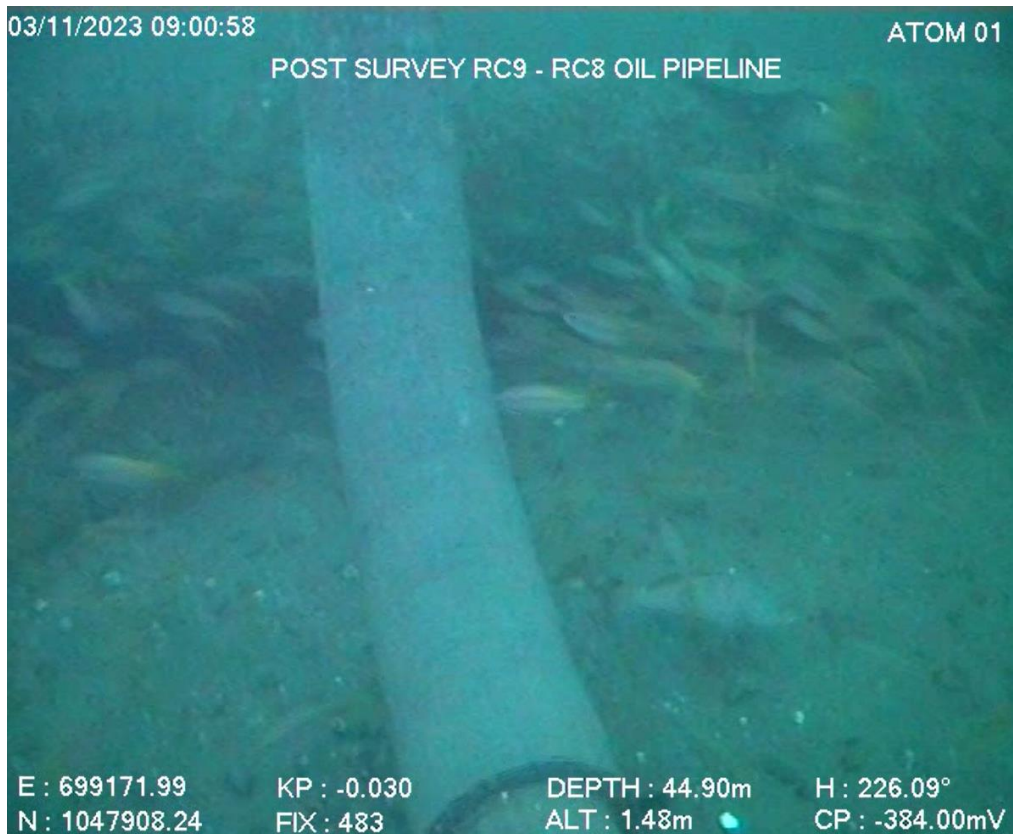


Figure 18: RC9 riser elbow condition





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



6 PIPELINE INSPECTION RESULT

6.1. Pipeline GVI

The pipeline was surveyed from the RC8 to the RC9 platform. Survey started from KP 0.0 at RC9 and ended survey at KP 5.054 of RC8 platform.

6.2. Anodic survey

The pipeline along its length was surveyed for anode. The typical of anode along this pipeline is bracelet anode.

Table 1: List of bracelet anode.

No	Description	Easting	Northing	Fix	KP
1	Anode Bracelet	699702.64	1047873.05	4	0.501
2	Anode Bracelet	699992.01	1047844.47	24	0.792
3	Anode Bracelet	700278.09	1047825.15	44	1.078
4	Anode Bracelet	700421.11	1047817.26	54	1.222
5	Anode Bracelet	700567.68	1047806.88	64	1.368
6	Anode Bracelet	700723.39	1047797.15	75	1.524
7	Anode Bracelet	701010.62	1047781.00	95	1.812
8	Anode Bracelet	701152.27	1047769.61	105	1.954
9	Anode Bracelet	701298.12	1047756.30	115	2.101
10	Anode Bracelet	701439.69	1047740.02	125	2.243
11	Anode Bracelet	701584.11	1047718.80	135	2.390
12	Anode Bracelet	701868.38	1047664.70	157	2.679
13	Anode Bracelet	701998.33	1047637.80	168	2.812
14	Anode Bracelet	702148.95	1047596.00	179	2.968
15	Anode Bracelet	702276.56	1047560.41	188	3.101
16	Anode Bracelet	702417.46	1047522.14	200	3.272
17	Anode Bracelet	702630.08	1047461.63	220	3.495
18	Anode Bracelet	702693.85	1047442.80	226	3.562
19	Anode Bracelet	702838.97	1047403.43	240	3.715
20	Anode Bracelet	703100.58	1047327.14	263	3.989
21	Anode Bracelet	703509.65	1047213.37	300	4.417
22	Anode Bracelet	703655.40	1047172.16	313	4.571
23	Anode Bracelet	703934.18	1047095.10	341	4.865
24	Anode Bracelet	699174.52	1047910.06	372	-0.028
25	Anode Bracelet	699244.69	1047917.23	386	0.042
26	Anode Bracelet	699557.17	1047888.17	426	0.356

Table 2: List of anode CP stab.

No	Description	Easting	Northing	Fix	KP
1	Anode CP Reading -1014mV	699847.71	1047856.83	14	0.647
2	Anode CP Reading -1040mV	701010.62	1047781.00	95	1.812
3	Anode CP Reading -1037mV	701723.99	1047692.30	145	2.532
4	Anode CP Reading -1013mV	702555.76	1047482.53	213	3.417
5	Anode CP Reading -1015mV	703238.49	1047289.17	276	4.133





Figure 19: Anode CP reading: -1014mV at KP 0.647



Figure 20: Anode CP reading: -1037mV at KP 2.532



6.3. Concrete mattress section survey

The pipeline along its length was surveyed for concrete mattress. A total of 08 concrete mattress sections were found during the course of survey as table below.

Table 3: List of concrete mattress section survey

No	Description	Easting	Northing	Fix	KP
1	Grout Mattress Start	704107.26	1047047.25	358	5.046
	Grout Mattress End	704111.58	1047046.10	359	5.050
2	Grout Mattress Start	699227.00	1047919.53	384	0.025
	Grout Mattress End	699237.86	1047917.77	385	0.036
3	Grout Mattress Start	699237.86	1047917.77	385	0.036
	Grout Mattress End	699244.69	1047917.23	386	0.042
4	Grout Mattress Start	699249.43	1047917.28	387	0.047
	Grout Mattress End	699253.60	1047916.39	388	0.051
5	Grout Mattress Start	699361.99	1047905.29	400	0.161
	Grout Mattress End	699365.13	1047905.35	401	0.164
6	Grout Mattress Start	699369.74	1047905.09	402	0.169
	Grout Mattress End	699374.65	1047904.76	404	0.174
7	Grout Mattress Start	699378.92	1047903.93	405	0.178
	Grout Mattress End	699381.73	1047903.89	406	0.181
8	Grout Mattress Start	699461.08	1047897.32	416	0.260
	Grout Mattress End	699468.25	1047896.00	418	0.268

6.4. Pipeline crossing survey

The pipeline along its length was surveyed for crossing. A total of 05 crossing points were found during the course of survey as table below.

Table 4: List of crossings

No	Description	Easting	Northing	Fix	KP
1	Crossing over other pipeline	699178.78	1047917.89	374	-0.024
2	Crossing over other pipeline	699179.72	1047919.32	375	-0.023
3	Crossing over other pipeline	699182.52	1047922.45	376	-0.020
4	Crossing over a Pipeline	699371.76	1047904.89	403	0.171
5	Crossing over with E.cable	699464.36	1047897.30	417	0.264



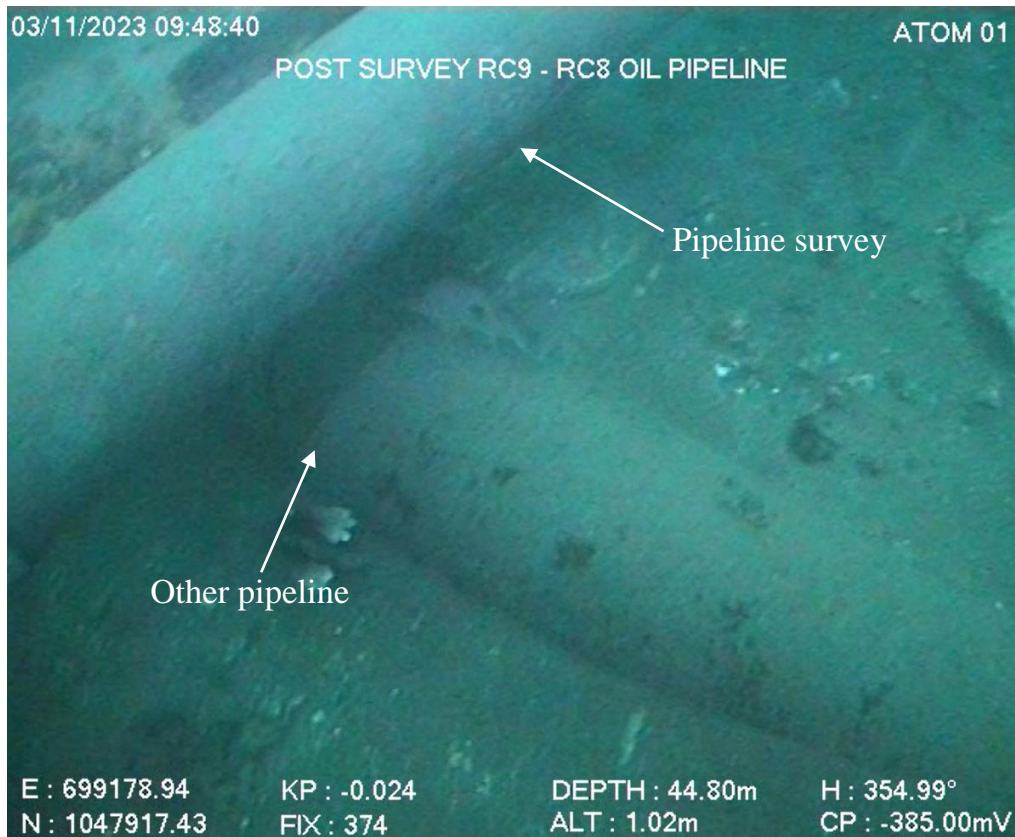


Figure 21: Crossing over other pipeline at KP -0.024

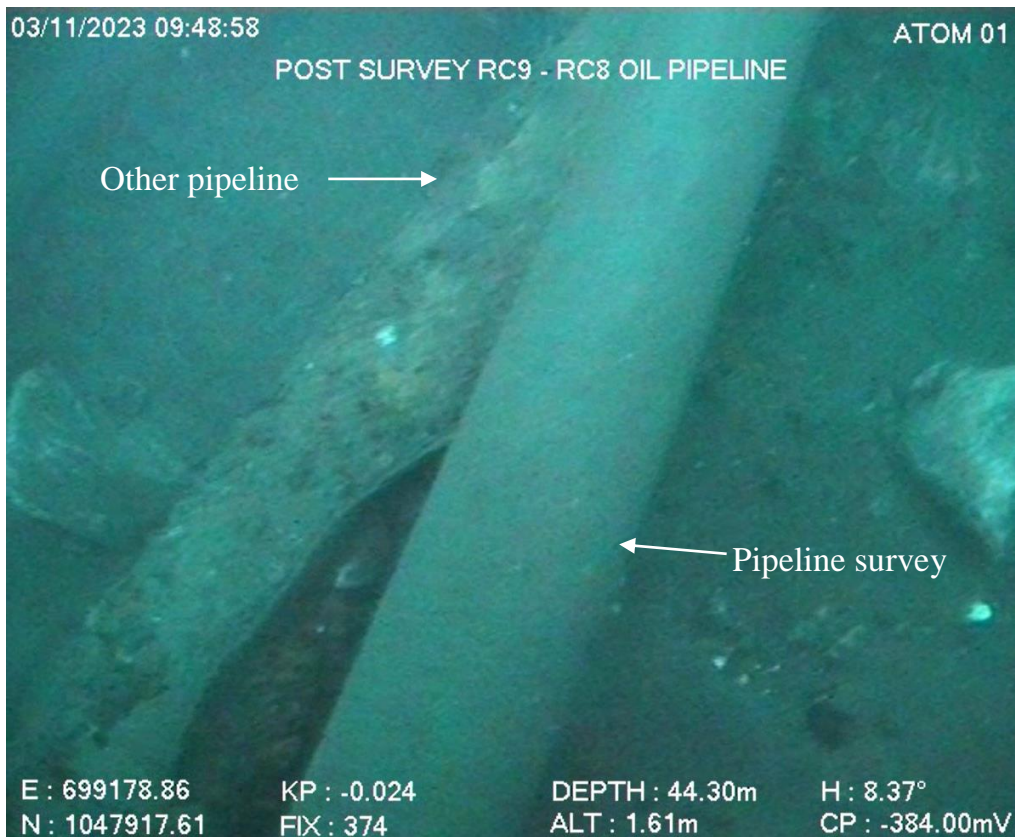


Figure 22: Crossing over other pipeline at KP -0.023



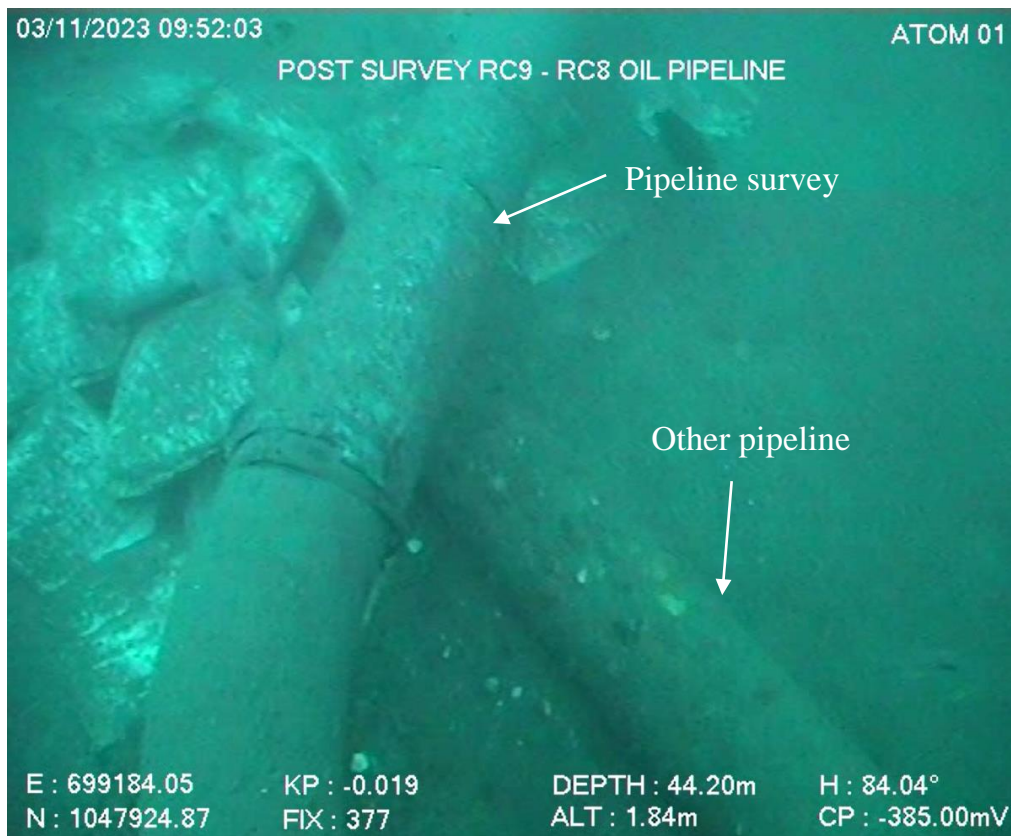


Figure 23: Crossing over other pipeline at KP -0.020

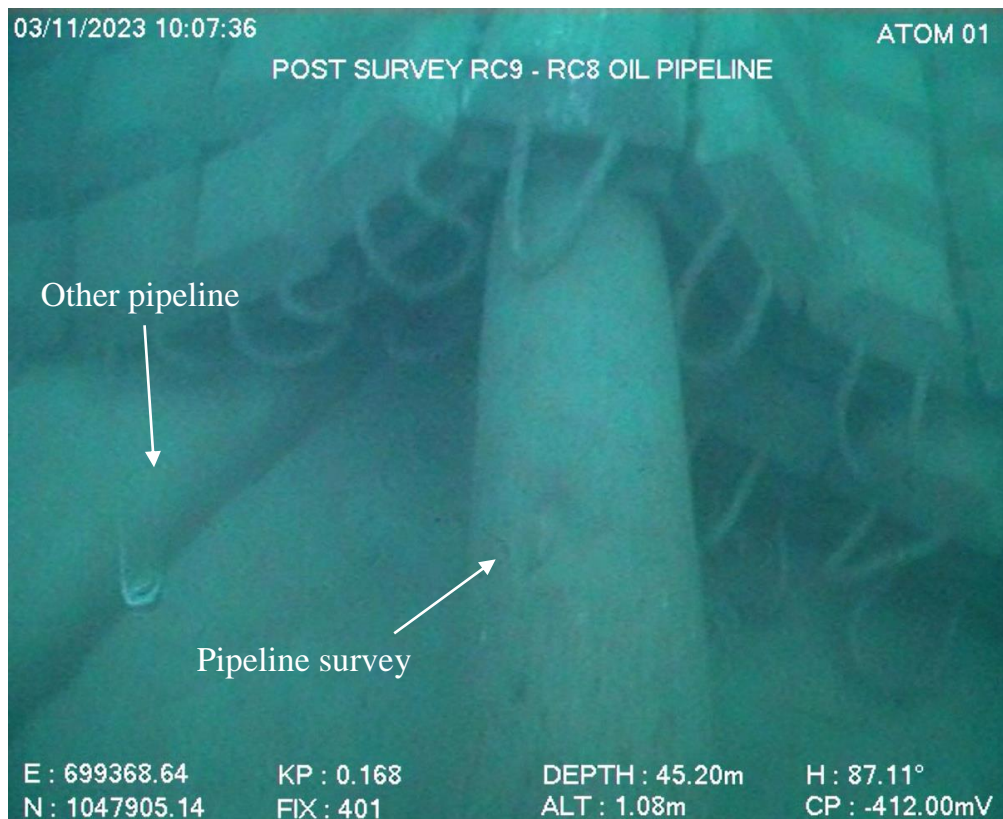
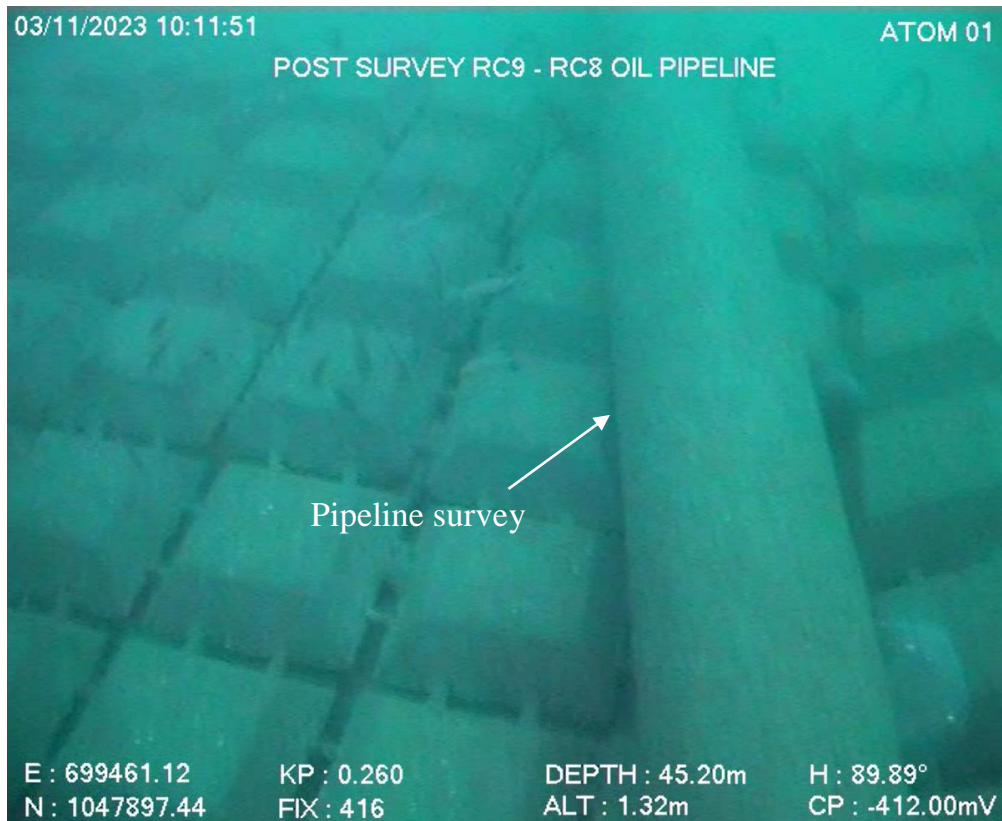


Figure 24: Crossing over other pipeline at KP 0.171
Other pipeline under concrete mattress





*Figure 25: Crossing over power cable at KP 0.264
Power cable under concrete mattress*

6.5. Free span/ Scour survey

The pipeline along its length was surveyed for free span/scour. A total of 01 free spans & 0 scour was found during the course of survey as table below.

Span's gap determining method:

ROV takes up fix at 2 touches down points on the pipeline to determine length of span (KP start – KP end). ROV sits on the pipeline to measure height of span by Altimeter Sensor (Altitude Value – Dia. PL = Span's gap).

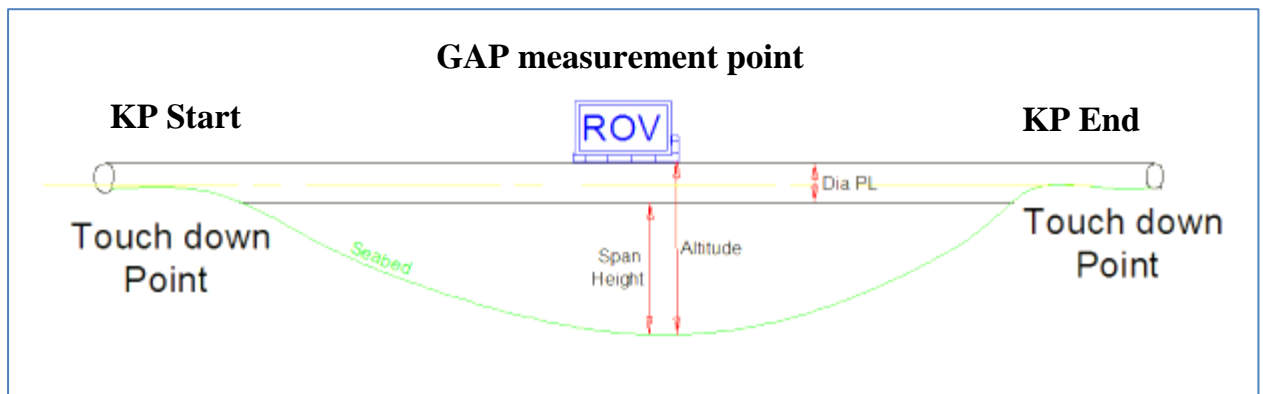
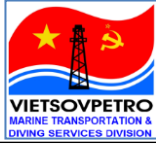


Figure 26: Illustrative figure of span's gap determining method





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Table 5: List of free span/scour section

No	Description	Easting	Northing	Fix	KP
1	Freespan Start	699183,91	1047924,48	377	-0,019
	Freespan End. Max Gap= 0,5m. L= 13m	699196,52	1047923,73	380	-0,006

7 APPENDICES

7.1 DVD Indexes

DVD–RC8-RC9 Oil Pipeline:





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9

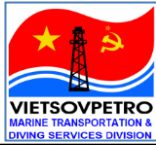


7.2 Co-ordinates

Table 6: Co-ordinates

Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
1	699674,26	1047876,21	9°28.6682'N	107°48.8965'E	0,472
2	699688,60	1047874,95	9°28.6674'N	107°48.9043'E	0,487
3	699700,54	1047873,47	9°28.6666'N	107°48.9108'E	0,499
4	699702,64	1047873,05	9°28.6664'N	107°48.9120'E	0,501
5	699717,33	1047871,60	9°28.6656'N	107°48.9200'E	0,516
6	699731,05	1047870,28	9°28.6648'N	107°48.9275'E	0,529
7	699745,92	1047868,56	9°28.6638'N	107°48.9356'E	0,544
8	699760,98	1047867,07	9°28.6630'N	107°48.9438'E	0,559
9	699775,82	1047865,00	9°28.6618'N	107°48.9520'E	0,574
10	699791,19	1047863,11	9°28.6607'N	107°48.9603'E	0,590
11	699805,83	1047861,32	9°28.6597'N	107°48.9683'E	0,605
12	699821,20	1047859,98	9°28.6589'N	107°48.9767'E	0,620
13	699835,77	1047858,29	9°28.6580'N	107°48.9847'E	0,635
14	699847,71	1047856,83	9°28.6572'N	107°48.9912'E	0,647
15	699862,87	1047855,92	9°28.6566'N	107°48.9995'E	0,662
16	699877,09	1047853,63	9°28.6553'N	107°49.0072'E	0,676
17	699892,28	1047852,39	9°28.6546'N	107°49.0155'E	0,691
18	699906,64	1047850,71	9°28.6537'N	107°49.0234'E	0,706
19	699922,33	1047849,82	9°28.6532'N	107°49.0320'E	0,722
20	699937,39	1047848,53	9°28.6524'N	107°49.0402'E	0,737
21	699952,03	1047847,63	9°28.6519'N	107°49.0482'E	0,751
22	699967,45	1047846,77	9°28.6514'N	107°49.0566'E	0,767
23	699982,43	1047845,26	9°28.6505'N	107°49.0648'E	0,782
24	699992,01	1047844,47	9°28.6501'N	107°49.0700'E	0,792
25	700007,02	1047843,68	9°28.6496'N	107°49.0782'E	0,807
26	700021,85	1047842,53	9°28.6489'N	107°49.0863'E	0,821
27	700036,58	1047841,27	9°28.6482'N	107°49.0943'E	0,836
28	700051,67	1047840,55	9°28.6478'N	107°49.1026'E	0,851
29	700066,42	1047840,05	9°28.6474'N	107°49.1106'E	0,866
30	700081,23	1047839,22	9°28.6470'N	107°49.1187'E	0,881
31	700096,59	1047837,92	9°28.6462'N	107°49.1271'E	0,896
32	700111,46	1047837,07	9°28.6457'N	107°49.1352'E	0,911
33	700126,67	1047836,62	9°28.6454'N	107°49.1436'E	0,926
34	700141,71	1047835,04	9°28.6445'N	107°49.1518'E	0,942
35	700156,59	1047834,10	9°28.6440'N	107°49.1599'E	0,956
36	700171,41	1047832,97	9°28.6433'N	107°49.1680'E	0,971
37	700186,50	1047831,77	9°28.6426'N	107°49.1762'E	0,986
38	700197,88	1047831,04	9°28.6422'N	107°49.1824'E	0,998
39	700213,11	1047830,30	9°28.6417'N	107°49.1908'E	1,013
40	700227,69	1047829,02	9°28.6410'N	107°49.1987'E	1,028
41	700243,19	1047827,70	9°28.6402'N	107°49.2072'E	1,043
42	700257,98	1047826,57	9°28.6396'N	107°49.2153'E	1,058
43	700273,13	1047825,38	9°28.6389'N	107°49.2235'E	1,073
44	700278,09	1047825,15	9°28.6388'N	107°49.2263'E	1,078
45	700292,85	1047824,29	9°28.6383'N	107°49.2343'E	1,093





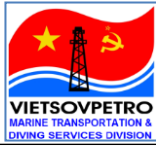
ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
46	700308,06	1047823,71	9°28.6379'N	107°49.2426'E	1,108
47	700322,86	1047822,41	9°28.6371'N	107°49.2507'E	1,123
48	700337,58	1047821,95	9°28.6369'N	107°49.2587'E	1,138
49	700352,85	1047820,99	9°28.6363'N	107°49.2671'E	1,153
50	700367,29	1047820,10	9°28.6358'N	107°49.2750'E	1,168
51	700382,50	1047819,11	9°28.6352'N	107°49.2833'E	1,183
52	700397,54	1047818,35	9°28.6347'N	107°49.2915'E	1,198
53	700412,92	1047817,59	9°28.6343'N	107°49.2999'E	1,213
54	700421,11	1047817,26	9°28.6341'N	107°49.3044'E	1,222
55	700435,55	1047816,28	9°28.6335'N	107°49.3122'E	1,236
56	700450,73	1047815,11	9°28.6328'N	107°49.3205'E	1,251
57	700465,41	1047813,87	9°28.6321'N	107°49.3286'E	1,266
58	700480,31	1047812,96	9°28.6316'N	107°49.3367'E	1,281
59	700495,88	1047811,88	9°28.6309'N	107°49.3452'E	1,296
60	700510,75	1047810,33	9°28.6301'N	107°49.3533'E	1,311
61	700526,27	1047809,31	9°28.6295'N	107°49.3618'E	1,327
62	700541,03	1047808,50	9°28.6290'N	107°49.3699'E	1,342
63	700555,76	1047807,58	9°28.6284'N	107°49.3779'E	1,356
64	700567,68	1047806,88	9°28.6280'N	107°49.3844'E	1,368
65	700582,35	1047805,88	9°28.6274'N	107°49.3924'E	1,383
66	700597,53	1047805,05	9°28.6270'N	107°49.4007'E	1,398
67	700612,13	1047804,27	9°28.6265'N	107°49.4087'E	1,413
68	700627,12	1047803,53	9°28.6260'N	107°49.4169'E	1,428
69	700642,32	1047802,26	9°28.6253'N	107°49.4252'E	1,443
70	700657,36	1047801,48	9°28.6248'N	107°49.4334'E	1,458
71	700672,47	1047800,44	9°28.6242'N	107°49.4416'E	1,473
72	700687,39	1047799,54	9°28.6237'N	107°49.4498'E	1,488
73	700702,53	1047798,33	9°28.6230'N	107°49.4581'E	1,504
74	700717,63	1047797,63	9°28.6226'N	107°49.4663'E	1,519
75	700723,39	1047797,15	9°28.6223'N	107°49.4694'E	1,524
76	700739,13	1047796,54	9°28.6219'N	107°49.4780'E	1,540
77	700753,79	1047795,67	9°28.6214'N	107°49.4861'E	1,555
78	700769,05	1047795,00	9°28.6210'N	107°49.4944'E	1,570
79	700784,20	1047793,65	9°28.6202'N	107°49.5027'E	1,585
80	700798,47	1047793,85	9°28.6203'N	107°49.5105'E	1,600
81	700814,03	1047793,07	9°28.6198'N	107°49.5190'E	1,615
82	700829,50	1047792,26	9°28.6194'N	107°49.5274'E	1,631
83	700843,77	1047790,89	9°28.6186'N	107°49.5352'E	1,645
84	700859,30	1047789,92	9°28.6180'N	107°49.5437'E	1,661
85	700874,37	1047788,63	9°28.6173'N	107°49.5519'E	1,676
86	700889,12	1047788,17	9°28.6170'N	107°49.5600'E	1,690
87	700904,27	1047787,11	9°28.6163'N	107°49.5682'E	1,706
88	700919,38	1047785,96	9°28.6157'N	107°49.5765'E	1,721
89	700934,45	1047784,50	9°28.6149'N	107°49.5847'E	1,736
90	700949,56	1047783,24	9°28.6141'N	107°49.5930'E	1,751
91	700964,40	1047782,90	9°28.6139'N	107°49.6011'E	1,766
92	700979,21	1047782,39	9°28.6136'N	107°49.6092'E	1,781
93	700994,32	1047781,14	9°28.6129'N	107°49.6174'E	1,796
94	701009,43	1047780,85	9°28.6127'N	107°49.6257'E	1,811
95	701010,62	1047781,00	9°28.6127'N	107°49.6263'E	1,812





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Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
96	701025,19	1047780,15	9°28.6122'N	107°49.6343'E	1,827
97	701039,90	1047779,90	9°28.6121'N	107°49.6423'E	1,841
98	701055,84	1047779,25	9°28.6117'N	107°49.6510'E	1,857
99	701075,42	1047776,68	9°28.6102'N	107°49.6617'E	1,877
100	701090,42	1047775,74	9°28.6097'N	107°49.6699'E	1,892
101	701105,55	1047774,55	9°28.6090'N	107°49.6782'E	1,907
102	701120,48	1047773,44	9°28.6083'N	107°49.6863'E	1,922
103	701135,29	1047772,55	9°28.6078'N	107°49.6944'E	1,937
104	701149,89	1047770,34	9°28.6066'N	107°49.7024'E	1,952
105	701152,27	1047769,61	9°28.6062'N	107°49.7037'E	1,954
106	701166,94	1047768,45	9°28.6055'N	107°49.7117'E	1,969
107	701182,03	1047767,21	9°28.6048'N	107°49.7199'E	1,984
108	701196,97	1047766,17	9°28.6042'N	107°49.7281'E	1,999
109	701211,70	1047764,88	9°28.6034'N	107°49.7361'E	2,014
110	701226,48	1047763,45	9°28.6026'N	107°49.7442'E	2,029
111	701241,62	1047762,04	9°28.6018'N	107°49.7525'E	2,044
112	701256,81	1047760,16	9°28.6007'N	107°49.7608'E	2,059
113	701271,50	1047758,84	9°28.6000'N	107°49.7688'E	2,074
114	701286,74	1047757,08	9°28.5990'N	107°49.7771'E	2,089
115	701298,12	1047756,30	9°28.5985'N	107°49.7833'E	2,101
116	701312,75	1047754,84	9°28.5977'N	107°49.7913'E	2,116
117	701327,95	1047753,36	9°28.5968'N	107°49.7996'E	2,131
118	701342,62	1047751,87	9°28.5960'N	107°49.8076'E	2,146
119	701357,79	1047749,84	9°28.5948'N	107°49.8159'E	2,161
120	701372,76	1047748,13	9°28.5939'N	107°49.8241'E	2,176
121	701388,20	1047746,51	9°28.5929'N	107°49.8325'E	2,191
122	701403,42	1047745,18	9°28.5922'N	107°49.8408'E	2,207
123	701417,81	1047742,61	9°28.5908'N	107°49.8487'E	2,221
124	701432,97	1047741,02	9°28.5898'N	107°49.8570'E	2,237
125	701439,69	1047740,02	9°28.5893'N	107°49.8606'E	2,243
126	701454,44	1047738,02	9°28.5882'N	107°49.8687'E	2,258
127	701469,11	1047736,11	9°28.5871'N	107°49.8767'E	2,273
128	701484,37	1047733,72	9°28.5857'N	107°49.8850'E	2,289
129	701498,90	1047731,53	9°28.5845'N	107°49.8930'E	2,303
130	701513,96	1047729,50	9°28.5834'N	107°49.9012'E	2,319
131	701529,11	1047727,38	9°28.5822'N	107°49.9094'E	2,334
132	701543,90	1047724,63	9°28.5806'N	107°49.9175'E	2,349
133	701558,10	1047721,84	9°28.5791'N	107°49.9253'E	2,363
134	701573,43	1047720,64	9°28.5784'N	107°49.9336'E	2,379
135	701584,11	1047718,80	9°28.5774'N	107°49.9395'E	2,390
136	701598,77	1047715,97	9°28.5758'N	107°49.9475'E	2,404
137	701613,57	1047712,84	9°28.5740'N	107°49.9555'E	2,420
138	701628,73	1047709,59	9°28.5722'N	107°49.9638'E	2,435
139	701643,51	1047706,81	9°28.5707'N	107°49.9719'E	2,450
140	701657,56	1047704,44	9°28.5694'N	107°49.9796'E	2,464
141	701673,15	1047701,15	9°28.5675'N	107°49.9881'E	2,480
142	701687,53	1047699,05	9°28.5664'N	107°49.9959'E	2,495
143	701702,39	1047696,79	9°28.5651'N	107°50.0040'E	2,510
144	701717,78	1047693,99	9°28.5635'N	107°50.0124'E	2,526
145	701723,99	1047692,30	9°28.5626'N	107°50.0158'E	2,532





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AS-BUILT SURVEY OIL PIPELINE RC8-RC9



Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
146	701711,32	1047684,88	9°28.5586'N	107°50.0089'E	2,521
147	701730,89	1047690,04	9°28.5613'N	107°50.0196'E	2,539
148	701747,57	1047687,84	9°28.5601'N	107°50.0287'E	2,556
149	701762,45	1047685,02	9°28.5585'N	107°50.0368'E	2,571
150	701777,15	1047681,68	9°28.5567'N	107°50.0448'E	2,586
151	701792,10	1047679,26	9°28.5553'N	107°50.0530'E	2,601
152	701806,60	1047676,61	9°28.5538'N	107°50.0609'E	2,616
153	701821,60	1047673,78	9°28.5523'N	107°50.0691'E	2,632
154	701836,20	1047670,00	9°28.5502'N	107°50.0771'E	2,647
155	701850,75	1047666,80	9°28.5484'N	107°50.0850'E	2,662
156	701865,87	1047664,89	9°28.5473'N	107°50.0932'E	2,677
157	701868,38	1047664,70	9°28.5472'N	107°50.0946'E	2,679
158	701882,63	1047662,11	9°28.5458'N	107°50.1024'E	2,694
159	701897,34	1047659,26	9°28.5442'N	107°50.1104'E	2,709
160	701924,15	1047641,96	9°28.5347'N	107°50.1250'E	2,739
161	701916,16	1047654,86	9°28.5417'N	107°50.1207'E	2,728
162	701916,16	1047654,86	9°28.5417'N	107°50.1207'E	2,728
163	701931,52	1047652,22	9°28.5403'N	107°50.1291'E	2,744
164	701956,48	1047645,89	9°28.5368'N	107°50.1427'E	2,769
165	701956,48	1047645,89	9°28.5368'N	107°50.1427'E	2,769
166	701972,38	1047643,05	9°28.5352'N	107°50.1514'E	2,786
167	701986,93	1047640,34	9°28.5337'N	107°50.1593'E	2,800
168	701998,33	1047637,80	9°28.5322'N	107°50.1655'E	2,812
169	702011,84	1047634,70	9°28.5305'N	107°50.1729'E	2,826
170	702025,79	1047630,69	9°28.5283'N	107°50.1805'E	2,840
171	702040,88	1047626,37	9°28.5259'N	107°50.1887'E	2,856
172	702055,28	1047622,49	9°28.5238'N	107°50.1966'E	2,871
173	702069,81	1047618,55	9°28.5216'N	107°50.2045'E	2,886
174	702084,24	1047614,28	9°28.5192'N	107°50.2124'E	2,901
175	702098,27	1047610,19	9°28.5170'N	107°50.2201'E	2,916
176	702113,47	1047605,78	9°28.5145'N	107°50.2283'E	2,932
177	702127,60	1047601,60	9°28.5122'N	107°50.2361'E	2,946
178	702142,42	1047597,61	9°28.5100'N	107°50.2441'E	2,962
179	702148,95	1047596,00	9°28.5091'N	107°50.2477'E	2,968
180	702163,05	1047592,07	9°28.5070'N	107°50.2554'E	2,983
181	702177,89	1047587,72	9°28.5046'N	107°50.2635'E	2,998
182	702192,82	1047584,04	9°28.5025'N	107°50.2716'E	3,014
183	702207,05	1047579,97	9°28.5003'N	107°50.2794'E	3,029
184	702221,15	1047575,92	9°28.4980'N	107°50.2871'E	3,043
185	702235,49	1047571,79	9°28.4958'N	107°50.2949'E	3,058
186	702249,84	1047567,56	9°28.4934'N	107°50.3027'E	3,073
187	702264,20	1047563,83	9°28.4914'N	107°50.3106'E	3,088
188	702276,56	1047560,41	9°28.4895'N	107°50.3173'E	3,101
189	702290,70	1047556,67	9°28.4874'N	107°50.3250'E	3,115
190	702304,86	1047552,45	9°28.4851'N	107°50.3328'E	3,130
191	702319,88	1047547,91	9°28.4826'N	107°50.3409'E	3,146
192	702334,45	1047544,42	9°28.4806'N	107°50.3489'E	3,161
193	702348,42	1047540,04	9°28.4782'N	107°50.3565'E	3,176
194	702362,93	1047536,11	9°28.4760'N	107°50.3644'E	3,191
195	702372,55	1047533,36	9°28.4745'N	107°50.3697'E	3,201





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
196	702375,32	1047532,96	9°28.4743'N	107°50.3712'E	3,229
197	702387,57	1047530,16	9°28.4727'N	107°50.3779'E	3,241
198	702399,18	1047527,02	9°28.4710'N	107°50.3842'E	3,253
199	702410,61	1047523,36	9°28.4690'N	107°50.3904'E	3,265
200	702417,46	1047522,14	9°28.4683'N	107°50.3942'E	3,272
201	702423,15	1047520,11	9°28.4672'N	107°50.3973'E	3,278
202	702434,97	1047517,40	9°28.4657'N	107°50.4037'E	3,290
203	702446,43	1047514,04	9°28.4638'N	107°50.4100'E	3,302
204	702457,91	1047510,58	9°28.4619'N	107°50.4162'E	3,314
205	702469,40	1047507,72	9°28.4603'N	107°50.4225'E	3,326
206	702480,95	1047504,24	9°28.4584'N	107°50.4288'E	3,338
207	702492,87	1047501,23	9°28.4567'N	107°50.4353'E	3,350
208	702504,19	1047497,91	9°28.4549'N	107°50.4415'E	3,362
209	702515,59	1047494,59	9°28.4531'N	107°50.4477'E	3,375
210	702527,13	1047490,91	9°28.4511'N	107°50.4540'E	3,386
211	702538,67	1047487,45	9°28.4491'N	107°50.4603'E	3,399
212	702550,24	1047484,32	9°28.4474'N	107°50.4666'E	3,411
213	702555,76	1047482,53	9°28.4464'N	107°50.4696'E	3,417
214	702562,47	1047480,80	9°28.4455'N	107°50.4733'E	3,424
215	702573,52	1047477,82	9°28.4438'N	107°50.4793'E	3,435
216	702583,95	1047474,76	9°28.4421'N	107°50.4850'E	3,447
217	702595,32	1047471,76	9°28.4405'N	107°50.4912'E	3,459
218	702606,82	1047468,02	9°28.4384'N	107°50.4975'E	3,471
219	702618,52	1047465,13	9°28.4368'N	107°50.5039'E	3,483
220	702630,08	1047461,63	9°28.4349'N	107°50.5102'E	3,495
221	702641,82	1047458,06	9°28.4329'N	107°50.5166'E	3,507
222	702653,01	1047454,84	9°28.4311'N	107°50.5227'E	3,520
223	702664,81	1047451,46	9°28.4293'N	107°50.5291'E	3,531
224	702676,14	1047447,91	9°28.4273'N	107°50.5353'E	3,544
225	702687,64	1047444,61	9°28.4255'N	107°50.5416'E	3,556
226	702693,85	1047442,80	9°28.4245'N	107°50.5450'E	3,562
227	702699,53	1047441,48	9°28.4237'N	107°50.5480'E	3,568
228	702710,87	1047438,62	9°28.4222'N	107°50.5542'E	3,580
229	702722,47	1047435,43	9°28.4204'N	107°50.5606'E	3,592
230	702734,10	1047432,21	9°28.4186'N	107°50.5669'E	3,604
231	702745,89	1047429,01	9°28.4168'N	107°50.5733'E	3,616
232	702757,62	1047425,88	9°28.4151'N	107°50.5797'E	3,630
233	702769,33	1047423,03	9°28.4135'N	107°50.5861'E	3,642
234	702781,15	1047420,18	9°28.4120'N	107°50.5926'E	3,654
235	702792,75	1047417,11	9°28.4103'N	107°50.5989'E	3,667
236	702804,25	1047413,96	9°28.4085'N	107°50.6052'E	3,679
237	702815,60	1047410,42	9°28.4066'N	107°50.6114'E	3,691
238	702827,03	1047407,06	9°28.4047'N	107°50.6176'E	3,703
239	702833,16	1047405,21	9°28.4037'N	107°50.6210'E	3,709
240	702838,97	1047403,43	9°28.4027'N	107°50.6241'E	3,715
241	702850,83	1047399,91	9°28.4008'N	107°50.6306'E	3,727
242	702862,05	1047396,71	9°28.3990'N	107°50.6367'E	3,740
243	702873,73	1047393,19	9°28.3971'N	107°50.6431'E	3,752
244	702885,08	1047389,68	9°28.3951'N	107°50.6493'E	3,764
245	702896,77	1047386,37	9°28.3933'N	107°50.6556'E	3,776





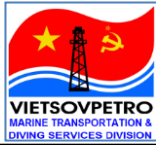
ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
246	702908,53	1047383,04	9°28.3914'N	107°50.6621'E	3,788
247	702919,99	1047379,37	9°28.3894'N	107°50.6683'E	3,800
248	702931,33	1047376,06	9°28.3876'N	107°50.6745'E	3,812
249	702942,76	1047372,81	9°28.3858'N	107°50.6807'E	3,824
250	702954,43	1047369,37	9°28.3839'N	107°50.6871'E	3,836
251	702966,04	1047365,94	9°28.3820'N	107°50.6934'E	3,849
252	702977,75	1047362,58	9°28.3801'N	107°50.6998'E	3,861
253	702989,25	1047359,52	9°28.3785'N	107°50.7061'E	3,873
254	703000,69	1047355,88	9°28.3764'N	107°50.7123'E	3,885
255	703012,02	1047352,86	9°28.3748'N	107°50.7185'E	3,897
256	703023,44	1047349,09	9°28.3727'N	107°50.7247'E	3,909
257	703035,38	1047345,59	9°28.3708'N	107°50.7313'E	3,921
258	703046,77	1047342,49	9°28.3691'N	107°50.7375'E	3,933
259	703058,38	1047338,98	9°28.3671'N	107°50.7438'E	3,945
260	703069,98	1047335,68	9°28.3653'N	107°50.7501'E	3,958
261	703081,31	1047332,58	9°28.3636'N	107°50.7563'E	3,969
262	703092,90	1047329,14	9°28.3617'N	107°50.7626'E	3,982
263	703100,58	1047327,14	9°28.3606'N	107°50.7668'E	3,989
264	703106,34	1047325,75	9°28.3598'N	107°50.7700'E	3,995
265	703117,95	1047322,58	9°28.3581'N	107°50.7763'E	4,008
266	703128,82	1047319,13	9°28.3561'N	107°50.7822'E	4,019
267	703140,41	1047316,13	9°28.3545'N	107°50.7886'E	4,031
268	703152,10	1047313,03	9°28.3528'N	107°50.7949'E	4,043
269	703163,87	1047310,16	9°28.3512'N	107°50.8013'E	4,055
270	703175,39	1047307,39	9°28.3496'N	107°50.8076'E	4,067
271	703186,84	1047303,53	9°28.3475'N	107°50.8139'E	4,079
272	703198,41	1047300,27	9°28.3457'N	107°50.8202'E	4,091
273	703209,95	1047297,10	9°28.3440'N	107°50.8265'E	4,103
274	703221,41	1047293,88	9°28.3422'N	107°50.8327'E	4,115
275	703233,08	1047290,79	9°28.3405'N	107°50.8391'E	4,127
276	703238,49	1047289,17	9°28.3396'N	107°50.8421'E	4,133
277	703244,45	1047287,64	9°28.3387'N	107°50.8453'E	4,139
278	703256,11	1047284,76	9°28.3371'N	107°50.8517'E	4,151
279	703267,35	1047281,28	9°28.3352'N	107°50.8578'E	4,163
280	703278,85	1047278,11	9°28.3335'N	107°50.8641'E	4,175
281	703290,77	1047275,24	9°28.3319'N	107°50.8706'E	4,187
282	703302,32	1047271,89	9°28.3300'N	107°50.8769'E	4,200
283	703313,99	1047268,98	9°28.3284'N	107°50.8832'E	4,211
284	703325,40	1047265,37	9°28.3264'N	107°50.8895'E	4,223
285	703337,02	1047262,17	9°28.3247'N	107°50.8958'E	4,235
286	703348,36	1047259,00	9°28.3229'N	107°50.9020'E	4,247
287	703360,35	1047255,90	9°28.3212'N	107°50.9085'E	4,260
288	703371,83	1047253,00	9°28.3196'N	107°50.9148'E	4,272
289	703383,46	1047249,58	9°28.3177'N	107°50.9211'E	4,283
290	703394,81	1047246,42	9°28.3159'N	107°50.9273'E	4,296
291	703406,47	1047242,79	9°28.3139'N	107°50.9337'E	4,309
292	703417,73	1047239,81	9°28.3123'N	107°50.9398'E	4,319
293	703429,62	1047236,33	9°28.3104'N	107°50.9463'E	4,333
294	703440,53	1047233,42	9°28.3088'N	107°50.9523'E	4,345
295	703451,85	1047230,10	9°28.3069'N	107°50.9584'E	4,356





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
296	703463,36	1047227,15	9°28.3053'N	107°50.9647'E	4,368
297	703474,87	1047223,66	9°28.3034'N	107°50.9710'E	4,381
298	703486,53	1047220,11	9°28.3014'N	107°50.9774'E	4,393
299	703498,28	1047216,83	9°28.2996'N	107°50.9838'E	4,405
300	703509,65	1047213,37	9°28.2977'N	107°50.9900'E	4,417
301	703521,20	1047210,05	9°28.2959'N	107°50.9963'E	4,429
302	703532,64	1047206,90	9°28.2941'N	107°51.0025'E	4,441
303	703544,03	1047203,16	9°28.2921'N	107°51.0087'E	4,453
304	703555,52	1047199,81	9°28.2902'N	107°51.0150'E	4,465
305	703567,18	1047196,61	9°28.2884'N	107°51.0214'E	4,479
306	703578,74	1047192,99	9°28.2864'N	107°51.0277'E	4,490
307	703589,98	1047189,47	9°28.2845'N	107°51.0338'E	4,503
308	703601,60	1047186,38	9°28.2828'N	107°51.0401'E	4,515
309	703613,64	1047184,03	9°28.2815'N	107°51.0467'E	4,527
310	703625,03	1047180,98	9°28.2798'N	107°51.0529'E	4,539
311	703636,54	1047177,29	9°28.2777'N	107°51.0592'E	4,551
312	703648,25	1047174,22	9°28.2761'N	107°51.0656'E	4,563
313	703655,40	1047172,16	9°28.2749'N	107°51.0695'E	4,571
314	703661,04	1047170,47	9°28.2740'N	107°51.0726'E	4,577
315	703672,32	1047167,33	9°28.2722'N	107°51.0787'E	4,589
316	703672,77	1047167,17	9°28.2722'N	107°51.0790'E	4,590
317	703684,58	1047164,27	9°28.2706'N	107°51.0854'E	4,601
318	703684,90	1047164,08	9°28.2704'N	107°51.0856'E	4,602
319	703696,33	1047161,53	9°28.2690'N	107°51.0918'E	4,614
320	703708,95	1047161,10	9°28.2688'N	107°51.0987'E	4,627
321	703719,66	1047155,20	9°28.2655'N	107°51.1045'E	4,638
322	703730,98	1047151,59	9°28.2635'N	107°51.1107'E	4,652
323	703742,68	1047148,12	9°28.2616'N	107°51.1171'E	4,664
324	703754,28	1047144,93	9°28.2599'N	107°51.1234'E	4,676
325	703765,85	1047141,96	9°28.2582'N	107°51.1297'E	4,687
326	703777,11	1047138,37	9°28.2562'N	107°51.1359'E	4,700
327	703788,43	1047134,24	9°28.2540'N	107°51.1420'E	4,714
328	703795,74	1047133,61	9°28.2536'N	107°51.1460'E	4,720
329	703801,73	1047132,21	9°28.2528'N	107°51.1493'E	4,726
330	703812,97	1047128,59	9°28.2508'N	107°51.1554'E	4,739
331	703824,76	1047125,47	9°28.2491'N	107°51.1619'E	4,751
332	703836,07	1047122,25	9°28.2473'N	107°51.1680'E	4,763
333	703847,63	1047118,66	9°28.2453'N	107°51.1743'E	4,775
334	703859,24	1047115,33	9°28.2435'N	107°51.1807'E	4,787
335	703870,62	1047112,03	9°28.2417'N	107°51.1869'E	4,799
336	703882,35	1047108,93	9°28.2400'N	107°51.1933'E	4,811
337	703893,90	1047105,57	9°28.2381'N	107°51.1996'E	4,824
338	703905,51	1047102,33	9°28.2363'N	107°51.2059'E	4,835
339	703917,08	1047099,31	9°28.2346'N	107°51.2122'E	4,848
340	703928,78	1047096,50	9°28.2331'N	107°51.2186'E	4,860
341	703934,18	1047095,10	9°28.2323'N	107°51.2216'E	4,865
342	703939,91	1047093,59	9°28.2315'N	107°51.2247'E	4,871
343	703951,71	1047090,85	9°28.2300'N	107°51.2311'E	4,883
344	703963,43	1047087,69	9°28.2282'N	107°51.2375'E	4,895
345	703975,30	1047084,60	9°28.2265'N	107°51.2440'E	4,908





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
346	703986,88	1047081,35	9°28.2247'N	107°51.2503'E	4,920
347	703998,46	1047078,48	9°28.2231'N	107°51.2566'E	4,932
348	704009,86	1047075,27	9°28.2213'N	107°51.2628'E	4,944
349	704021,28	1047071,51	9°28.2193'N	107°51.2691'E	4,956
350	704033,11	1047068,29	9°28.2175'N	107°51.2755'E	4,968
351	704044,47	1047064,83	9°28.2156'N	107°51.2817'E	4,981
352	704055,99	1047061,57	9°28.2138'N	107°51.2880'E	4,992
353	704067,79	1047058,82	9°28.2122'N	107°51.2944'E	5,004
354	704074,66	1047056,78	9°28.2111'N	107°51.2982'E	5,012
355	704081,16	1047055,40	9°28.2104'N	107°51.3017'E	5,018
356	704092,75	1047052,34	9°28.2087'N	107°51.3081'E	5,031
357	704103,88	1047048,09	9°28.2063'N	107°51.3141'E	5,043
358	704107,26	1047047,25	9°28.2059'N	107°51.3160'E	5,046
359	704111,58	1047046,10	9°28.2052'N	107°51.3183'E	5,050
360	704113,81	1047045,47	9°28.2049'N	107°51.3196'E	5,052
361	704118,52	1047044,60	9°28.2044'N	107°51.3221'E	5,057
362	704119,91	1047044,74	9°28.2045'N	107°51.3229'E	5,059
363	704120,97	1047042,67	9°28.2033'N	107°51.3235'E	5,060
364	704123,02	1047039,90	9°28.2018'N	107°51.3246'E	5,063
365	704124,88	1047036,78	9°28.2001'N	107°51.3256'E	5,065
366	704126,21	1047035,33	9°28.1993'N	107°51.3263'E	5,067
367	704126,88	1047030,60	9°28.1968'N	107°51.3266'E	5,069
368	704127,69	1047025,34	9°28.1939'N	107°51.3271'E	5,071
369	704127,75	1047023,39	9°28.1929'N	107°51.3271'E	5,071
370	704129,35	1047022,25	9°28.1922'N	107°51.3280'E	5,073
371	699171,82	1047907,99	9°28.6868'N	107°48.6221'E	-0,030
372	699174,52	1047910,06	9°28.6879'N	107°48.6236'E	-0,028
373	699177,10	1047915,15	9°28.6907'N	107°48.6250'E	-0,025
374	699178,78	1047917,89	9°28.6922'N	107°48.6259'E	-0,024
375	699179,72	1047919,32	9°28.6930'N	107°48.6264'E	-0,023
376	699182,52	1047922,45	9°28.6946'N	107°48.6280'E	-0,020
377	699183,91	1047924,48	9°28.6957'N	107°48.6287'E	-0,019
378	699185,79	1047924,15	9°28.6956'N	107°48.6298'E	-0,017
379	699189,94	1047923,74	9°28.6953'N	107°48.6320'E	-0,013
380	699196,52	1047923,73	9°28.6953'N	107°48.6356'E	-0,006
381	699202,14	1047922,76	9°28.6948'N	107°48.6387'E	-0,001
382	699209,05	1047922,22	9°28.6944'N	107°48.6425'E	0,006
383	699225,75	1047919,51	9°28.6929'N	107°48.6516'E	0,023
384	699227,00	1047919,53	9°28.6929'N	107°48.6523'E	0,025
385	699237,86	1047917,77	9°28.6919'N	107°48.6582'E	0,036
386	699244,69	1047917,23	9°28.6916'N	107°48.6619'E	0,042
387	699249,43	1047917,28	9°28.6917'N	107°48.6645'E	0,047
388	699253,60	1047916,39	9°28.6912'N	107°48.6668'E	0,051
389	699257,87	1047915,86	9°28.6909'N	107°48.6691'E	0,056
390	699261,94	1047915,77	9°28.6908'N	107°48.6713'E	0,060
391	699273,91	1047914,74	9°28.6902'N	107°48.6779'E	0,072
392	699274,60	1047914,71	9°28.6902'N	107°48.6783'E	0,073
393	699286,47	1047913,43	9°28.6895'N	107°48.6847'E	0,085
394	699298,51	1047911,64	9°28.6885'N	107°48.6913'E	0,097
395	699310,58	1047910,27	9°28.6877'N	107°48.6979'E	0,109





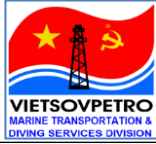
ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



Fix	EVEREST 1830		WGS 84		KP
	Easting	Northing	Latitude	Longitude	
396	699322,41	1047908,89	9°28.6869'N	107°48.7044'E	0,121
397	699334,63	1047907,39	9°28.6860'N	107°48.7110'E	0,133
398	699346,56	1047906,38	9°28.6855'N	107°48.7175'E	0,145
399	699358,34	1047905,61	9°28.6850'N	107°48.7240'E	0,158
400	699361,99	1047905,29	9°28.6848'N	107°48.7260'E	0,161
401	699365,13	1047905,35	9°28.6849'N	107°48.7277'E	0,164
402	699369,74	1047905,09	9°28.6847'N	107°48.7302'E	0,169
403	699371,76	1047904,89	9°28.6846'N	107°48.7313'E	0,171
404	699374,65	1047904,76	9°28.6845'N	107°48.7329'E	0,174
405	699378,92	1047903,93	9°28.6840'N	107°48.7352'E	0,178
406	699381,73	1047903,89	9°28.6840'N	107°48.7368'E	0,181
407	699393,49	1047903,05	9°28.6835'N	107°48.7432'E	0,193
408	699395,13	1047902,78	9°28.6834'N	107°48.7441'E	0,194
409	699400,88	1047902,38	9°28.6831'N	107°48.7472'E	0,200
410	699407,41	1047901,80	9°28.6828'N	107°48.7508'E	0,207
411	699419,78	1047900,81	9°28.6822'N	107°48.7575'E	0,219
412	699420,44	1047900,81	9°28.6822'N	107°48.7579'E	0,220
413	699432,08	1047899,62	9°28.6816'N	107°48.7643'E	0,231
414	699444,49	1047898,82	9°28.6811'N	107°48.7710'E	0,244
415	699456,22	1047897,64	9°28.6804'N	107°48.7774'E	0,256
416	699461,08	1047897,32	9°28.6802'N	107°48.7801'E	0,260
417	699464,36	1047897,30	9°28.6802'N	107°48.7819'E	0,264
418	699468,25	1047896,00	9°28.6795'N	107°48.7840'E	0,268
419	699480,26	1047894,88	9°28.6788'N	107°48.7906'E	0,280
420	699491,88	1047893,45	9°28.6780'N	107°48.7969'E	0,291
421	699504,27	1047892,37	9°28.6774'N	107°48.8037'E	0,304
422	699515,96	1047891,48	9°28.6769'N	107°48.8101'E	0,316
423	699528,09	1047890,70	9°28.6764'N	107°48.8167'E	0,328
424	699539,84	1047889,55	9°28.6758'N	107°48.8231'E	0,340
425	699551,95	1047888,53	9°28.6752'N	107°48.8297'E	0,351
426	699557,17	1047888,17	9°28.6750'N	107°48.8326'E	0,356
427	699563,48	1047887,51	9°28.6746'N	107°48.8360'E	0,364
428	699575,61	1047886,21	9°28.6739'N	107°48.8426'E	0,375
429	699587,52	1047885,02	9°28.6732'N	107°48.8491'E	0,389
430	699599,69	1047883,38	9°28.6723'N	107°48.8558'E	0,401
431	699611,18	1047881,42	9°28.6712'N	107°48.8620'E	0,413
432	699623,27	1047879,83	9°28.6703'N	107°48.8687'E	0,424
433	699635,34	1047878,86	9°28.6697'N	107°48.8752'E	0,437
434	699647,00	1047877,71	9°28.6691'N	107°48.8816'E	0,448
435	699659,16	1047876,45	9°28.6683'N	107°48.8882'E	0,462
436	699671,14	1047875,28	9°28.6677'N	107°48.8948'E	0,474





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9

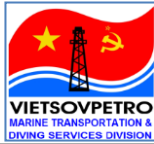


7.3 Event Logs

Table 7: Event logs

ROV:	Panther 932	Contractor:	VSP	Task No.:	
Date:	N/a	Client:	VSP	Report No.:	A.04-23
Dive No.:	N/a	Location:	Dragon oil field	Depth:	49-50m
DVD No.:	A.04-23	Extra Equipment:	N/A	Vessel:	Sao Mai 03
POST SURVEY RC8-RC9 OIL PIPELINE SURVEY					
Date	Time	Code	Events	Fix	KP
14-07-23	7:40	V.SOS	Video Start of Survey		
14-07-23	7:41	F.PL	Fix on Pipeline	1	0.472
14-07-23	7:43	AN.BR	Anode Bracelet	4	0.501
14-07-23	7:50	F.PL	Fix on Pipeline	11	0.605
14-07-23	7:52	AN.CP	Anode CP Reading -1014mV	14	0.647
14-07-23	8:02	AN.BR	Anode Bracelet	24	0.792
14-07-23	8:12	F.PL	Fix on Pipeline	40	1.028
14-07-23	8:15	AN.BR	Anode Bracelet	44	1.078
14-07-23	8:20	AN.BR	Anode Bracelet	54	1.222
14-07-23	8:27	AN.BR	Anode Bracelet	64	1.368
14-07-23	8:33	AN.BR	Anode Bracelet	75	1.524
14-07-23	8:47	AN.BR	Anode Bracelet	95	1.812
14-07-23	8:53	AN.CP	Anode CP Reading -1040mV	95	1.812
14-07-23	9:04	AN.BR	Anode Bracelet	105	1.954
14-07-23	14:07	F.PL	Fix on Pipeline	110	2.029
14-07-23	14:09	AN.BR	Anode Bracelet	115	2.101
14-07-23	14:16	AN.BR	Anode Bracelet	125	2.243
14-07-23	14:22	AN.BR	Anode Bracelet	135	2.390
14-07-23	14:29	AN.CP	Anode CP Reading -1037mV	145	2.532
14-07-23	15:40	AN.BR	Anode Bracelet	157	2.679
14-07-23	15:43	AN.BR	Anode Bracelet	168	2.812
14-07-23	15:49	AN.BR	Anode Bracelet	179	2.968
14-07-23	15:55	AN.BR	Anode Bracelet	188	3.101





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



ROV:	Atom 01	Contractor:	VSP	Task No.:	
Date:	N/a	Client:	VSP	Report No.:	A.04-23
Dive No.:	N/a	Location:	Dragon oil field	Depth:	49-50m
DVD No.:	A.04-23	Extra Equipment:	N/A	Vessel:	Royal
POST SURVEY RC8-RC9 OIL PIPELINE SURVEY					
Date	Time	Code	Events	Fix	KP
02-11-23	9:14	V.COS	Video Continue of Survey		
02-11-23	9:14	F.J	Field joint	196	3.229
02-11-23	9:15	F.J	Field joint	197	3.241
02-11-23	9:16	F.J	Field joint	198	3.253
02-11-23	9:17	F.J	Field joint	199	3.265
02-11-23	9:17	AN.BR	Anode Bracelet	200	3.272
02-11-23	9:18	F.J	Field joint	201	3.278
02-11-23	9:19	F.J	Field joint	202	3.290
02-11-23	9:19	F.J	Field joint	203	3.302
02-11-23	9:20	F.J	Field joint	204	3.314
02-11-23	9:20	F.J	Field joint	205	3.326
02-11-23	9:21	F.J	Field joint	206	3.338
02-11-23	9:22	F.J	Field joint	207	3.350
02-11-23	9:23	F.J	Field joint	208	3.362
02-11-23	9:24	F.J	Field joint	209	3.375
02-11-23	9:24	F.J	Field joint	210	3.386
02-11-23	9:25	F.J	Field joint	211	3.399
02-11-23	9:25	F.J	Field joint	212	3.411
02-11-23	9:26	AN.CP	Anode CP Reading -1013mV	213	3.417
02-11-23	9:27	F.J	Field joint	214	3.424
02-11-23	9:28	F.J	Field joint	215	3.435
02-11-23	9:28	F.J	Field joint	216	3.447
02-11-23	9:29	F.J	Field joint	217	3.459
02-11-23	9:29	F.J	Field joint	218	3.471
02-11-23	9:30	F.J	Field joint	219	3.483
02-11-23	9:31	AN.BR	Anode Bracelet	220	3.495
02-11-23	9:31	F.J	Field joint	221	3.507
02-11-23	9:32	F.J	Field joint	222	3.520
02-11-23	9:32	F.J	Field joint	223	3.531
02-11-23	9:33	F.J	Field joint	224	3.544
02-11-23	9:34	F.J	Field joint	225	3.556
02-11-23	9:34	AN.BR	Anode Bracelet	226	3.562
02-11-23	9:34	F.J	Field joint	227	3.568
02-11-23	9:35	F.J	Field joint	228	3.580
02-11-23	9:35	F.J	Field joint	229	3.592
02-11-23	9:36	F.J	Field joint	230	3.604
02-11-23	9:36	F.J	Field joint	231	3.616
02-11-23	9:37	F.J	Field joint	232	3.630
02-11-23	9:37	F.J	Field joint	233	3.642
02-11-23	9:38	F.J	Field joint	234	3.654
02-11-23	9:38	F.J	Field joint	235	3.667
02-11-23	9:39	F.J	Field joint	236	3.679
02-11-23	9:40	F.J	Field joint	237	3.691
02-11-23	9:41	F.J	Field joint	238	3.703
02-11-23	9:41	F.J	Field joint	239	3.709
02-11-23	9:41	AN.BR	Anode Bracelet	240	3.715
02-11-23	9:42	F.J	Field joint	241	3.727
02-11-23	9:42	F.J	Field joint	242	3.740
02-11-23	9:43	F.J	Field joint	243	3.752
02-11-23	9:44	F.J	Field joint	244	3.764

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ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



ROV:	Atom 01	Contractor:	VSP	Task No.:	
Date:	N/a	Client:	VSP	Report No.:	A.04-23
Dive No.:	N/a	Location:	Dragon oil field	Depth:	49-50m
DVD No.:	A.04-23	Extra Equipment:	N/A	Vessel:	Royal
POST SURVEY RC8-RC9 OIL PIPELINE SURVEY					
Date	Time	Code	Events	Fix	KP
02-11-23	9:44	F.J	Field joint	245	3.776
02-11-23	9:44	F.J	Field joint	246	3.788
02-11-23	9:45	F.J	Field joint	247	3.800
02-11-23	9:47	F.J	Field joint	248	3.812
02-11-23	9:47	F.J	Field joint	249	3.824
02-11-23	9:47	F.J	Field joint	250	3.836
02-11-23	9:48	F.J	Field joint	251	3.849
02-11-23	9:49	F.J	Field joint	252	3.861
02-11-23	9:49	F.J	Field joint	253	3.873
02-11-23	9:50	F.J	Field joint	254	3.885
02-11-23	9:50	F.J	Field joint	255	3.897
02-11-23	9:51	F.J	Field joint	256	3.909
02-11-23	9:51	F.J	Field joint	257	3.921
02-11-23	9:52	F.J	Field joint	258	3.933
02-11-23	9:52	F.J	Field joint	259	3.945
02-11-23	9:53	F.J	Field joint	260	3.958
02-11-23	9:54	F.J	Field joint	261	3.969
02-11-23	9:55	F.J	Field joint	262	3.982
02-11-23	9:55	AN.BR	Anode Bracelet	263	3.989
02-11-23	9:55	F.J	Field joint	264	3.995
02-11-23	9:56	F.J	Field joint	265	4.008
02-11-23	9:56	F.J	Field joint	266	4.019
02-11-23	9:57	F.J	Field joint	267	4.031
02-11-23	9:57	F.J	Field joint	268	4.043
02-11-23	9:58	F.J	Field joint	269	4.055
02-11-23	9:59	F.J	Field joint	270	4.067
02-11-23	9:59	F.J	Field joint	271	4.079
02-11-23	10:00	F.J	Field joint	272	4.091
02-11-23	10:00	F.J	Field joint	273	4.103
02-11-23	10:01	F.J	Field joint	274	4.115
02-11-23	10:01	F.J	Field joint	275	4.127
02-11-23	10:02	AN.CP	Anode CP Reading -1015mV	276	4.133
02-11-23	10:03	F.J	Field joint	277	4.139
02-11-23	10:03	F.J	Field joint	278	4.151
02-11-23	10:04	F.J	Field joint	279	4.163
02-11-23	10:04	F.J	Field joint	280	4.175
02-11-23	10:05	F.J	Field joint	281	4.187
02-11-23	10:05	F.J	Field joint	282	4.200
02-11-23	10:06	F.J	Field joint	283	4.211
02-11-23	10:06	F.J	Field joint	284	4.223
02-11-23	10:07	F.J	Field joint	285	4.235
02-11-23	10:07	F.J	Field joint	286	4.247
02-11-23	10:08	F.J	Field joint	287	4.260
02-11-23	10:09	F.J	Field joint	288	4.272
02-11-23	10:09	F.J	Field joint	289	4.283
02-11-23	10:10	F.J	Field joint	290	4.296
02-11-23	10:11	F.J	Field joint	291	4.309
02-11-23	10:11	F.J	Field joint	292	4.319
02-11-23	10:11	F.J	Field joint	293	4.333
Report No.	A.04-23			294	37 of 39





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



ROV:	Atom 01	Contractor:	VSP	Task No.:	
Date:	N/a	Client:	VSP	Report No.:	A.04-23
Dive No.:	N/a	Location:	Dragon oil field	Depth:	49-50m
DVD No.:	A.04-23	Extra Equipment:	N/A	Vessel:	Royal
POST SURVEY RC8-RC9 OIL PIPELINE SURVEY					
Date	Time	Code	Events	Fix	KP
02-11-23	10:13	F.J	Field joint	295	4.356
02-11-23	10:14	F.J	Field joint	296	4.368
02-11-23	10:14	F.J	Field joint	297	4.381
02-11-23	10:15	F.J	Field joint	298	4.393
02-11-23	10:16	F.J	Field joint	299	4.405
02-11-23	10:16	AN.BR	Anode Bracelet	300	4.417
02-11-23	10:17	F.J	Field joint	301	4.429
02-11-23	10:17	F.J	Field joint	302	4.441
02-11-23	10:18	F.J	Field joint	303	4.453
02-11-23	10:18	F.J	Field joint	304	4.465
02-11-23	10:19	F.J	Field joint	305	4.479
02-11-23	10:19	F.J	Field joint	306	4.490
02-11-23	10:20	F.J	Field joint	307	4.503
02-11-23	10:21	F.J	Field joint	308	4.515
02-11-23	10:22	F.J	Field joint	309	4.527
02-11-23	10:22	F.J	Field joint	310	4.539
02-11-23	10:22	F.J	Field joint	311	4.551
02-11-23	10:23	F.J	Field joint	312	4.563
02-11-23	10:23	AN.BR	Anode Bracelet	313	4.571
02-11-23	10:24	F.J	Field joint	314	4.577
02-11-23	10:24	F.J	Field joint	315	4.589
02-11-23	10:24	F.J	Field joint	316	4.590
02-11-23	10:25	F.J	Field joint	317	4.601
02-11-23	10:25	F.J	Field joint	318	4.602
02-11-23	10:25	F.J	Field joint	319	4.614
02-11-23	10:26	F.J	Field joint	320	4.627
02-11-23	10:26	F.J	Field joint	321	4.638
02-11-23	10:27	F.J	Field joint	322	4.652
02-11-23	10:27	F.J	Field joint	323	4.664
02-11-23	10:28	F.J	Field joint	324	4.676
02-11-23	10:29	F.J	Field joint	325	4.687
02-11-23	10:29	F.J	Field joint	326	4.700
02-11-23	10:30	F.J	Field joint	327	4.714
02-11-23	10:31	F.J	Field joint	328	4.720
02-11-23	10:31	F.J	Field joint	329	4.726
02-11-23	10:32	F.J	Field joint	330	4.739
02-11-23	10:32	F.J	Field joint	331	4.751
02-11-23	10:33	F.J	Field joint	332	4.763
02-11-23	10:33	F.J	Field joint	333	4.775
02-11-23	10:34	F.J	Field joint	334	4.787
02-11-23	10:34	F.J	Field joint	335	4.799
02-11-23	10:35	F.J	Field joint	336	4.811
02-11-23	10:35	F.J	Field joint	337	4.824
02-11-23	10:36	F.J	Field joint	338	4.835
02-11-23	10:36	F.J	Field joint	339	4.848
02-11-23	10:37	F.J	Field joint	340	4.860
02-11-23	10:38	AN.BR	Anode Bracelet	341	4.865
02-11-23	10:39	F.J	Field joint	342	4.871
02-11-23	10:40	F.J	Field joint	343	4.883
02-11-23	10:41	F.J	Field joint	344	4.895





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



ROV:	Atom 01	Contractor:	VSP	Task No.:	
Date:	N/a	Client:	VSP	Report No.:	A.04-23
Dive No.:	N/a	Location:	Dragon oil field	Depth:	49-50m
DVD No.:	A.04-23	Extra Equipment:	N/A	Vessel:	Royal
POST SURVEY RC8-RC9 OIL PIPELINE SURVEY					
Date	Time	Code	Events	Fix	KP
02-11-23	10:41	F.J	Field joint	345	4.908
02-11-23	10:42	F.J	Field joint	346	4.920
02-11-23	10:42	F.J	Field joint	347	4.932
02-11-23	11:43	F.J	Field joint	348	4.944
02-11-23	10:44	F.J	Field joint	349	4.956
02-11-23	10:44	F.J	Field joint	350	4.968
02-11-23	10:45	F.J	Field joint	351	4.981
02-11-23	10:46	F.J	Field joint	352	4.992
02-11-23	10:47	F.J	Field joint	353	5.004
02-11-23	10:48	F.J	Field joint	354	5.012
02-11-23	10:49	F.J	Field joint	355	5.018
02-11-23	10:49	F.J	Field joint	356	5.031
02-11-23	10:50	F.J	Field joint	357	5.043
02-11-23	10:52	GM.S	Grout Mattress Start	358	5.046
02-11-23	10:54	GM.E	Grout Mattress End	359	5.050
02-11-23	10:54	Frame	Frame Support Pie	359	5.050
02-11-23	10:55	Frame	Flange	360	5.052
02-11-23	10:57	Spool	Spool	361	5.057
02-11-23	11:01	R.E	Riser Elbow	369	5.071
02-11-23	11:02	Flange	Flange	370	5.073
02-11-23	11:03	R.C	Riser Clamp at EL -46m		
02-11-23	11:05	R.C	Riser Clamp at EL -38m		
02-11-23	11:06	R.C	Riser Clamp at EL -32m		
02-11-23	11:07	R.C	Riser Clamp at EL -27m		
02-11-23	11:08	R.C	Riser Clamp at EL -21m		
02-11-23	11:09	R.C	Riser Clamp at EL -14m		
02-11-23	11:10	R.C	Riser Clamp at EL -11m		
02-11-23	11:11	R.C	Riser Clamp at EL -6m		
02-11-23	11:11		Pause survey at RC8		
03-11-23	8:53		Continue survey at RC9		
03-11-23	8:53	R.C	Riser Clamp at EL -4m		
03-11-23	8:55	R.C	Riser Clamp at EL -12m		
03-11-23	8:56	R.C	Riser Clamp at EL -21m		
03-11-23	8:58	R.C	Riser Clamp at EL -30m		
03-11-23	3:59	R.C	Riser Clamp at EL -39m		
03-11-23	9:01	R.E	Riser Elbow	371	-0.030
03-11-23	9:01	Flange	Flange	371	-0.030
03-11-23	9:46	AN.BR	Anode Bracelet	372	-0.028
03-11-23	9:47	Bag support	Bag support	373	-0.025
03-11-23	9:48	X.PO	Crossing over other pipeline	374	-0.024
03-11-23	9:49	X.PO	Crossing over other pipeline	375	-0.023
03-11-23	9:51	X.PO	Crossing over other pipeline	376	-0.020
03-11-23	9:52	FS	Freespan Start	377	-0.019
03-11-23	9:52	Bend	Bend of spool	377	-0.019
03-11-23	9:54	FE	Freespan End. Max Gap= 0,5m. L= 13m	380	-0.006
03-11-23	9:55	Flange	Flange	381	-0.001
03-11-23	9:57	GM.S	Grout Mattress Start	384	0.025
03-11-23	9:57	GM.E	Grout Mattress End	385	0.036
03-11-23	9:58	GM.S	Grout Mattress Start	385	0.036
03-11-23	9:58	GM.E	Grout Mattress End	386	0.042





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9



ROV:	Atom 01	Contractor:	VSP	Task No.:	
Date:	N/a	Client:	VSP	Report No.:	A.04-23
Dive No.:	N/a	Location:	Dragon oil field	Depth:	49-50m
DVD No.:	A.04-23	Extra Equipment:	N/A	Vessel:	Royal
POST SURVEY RC8-RC9 OIL PIPELINE SURVEY					
Date	Time	Code	Events	Fix	KP
03-11-23	9:58	AN.BR	Anode Bracelet	386	0.042
03-11-23	9:59	GM.S	Grout Mattress Start	387	0.047
03-11-23	9:59	GM.E	Grout Mattress End	388	0.051
03-11-23	10:02	F.J	Field joint	393	0.085
03-11-23	10:03	F.J	Field joint	394	0.097
03-11-23	10:04	F.J	Field joint	395	0.109
03-11-23	10:06	F.J	Field joint	396	0.121
03-11-23	10:06	F.J	Field joint	397	0.133
03-11-23	10:06	F.J	Field joint	398	0.145
03-11-23	10:06	F.J	Field joint	399	0.158
03-11-23	10:07	GM.S	Grout Mattress Start	400	0.161
03-11-23	10:07	GM.E	Grout Mattress End	401	0.164
03-11-23	10:07	GM.S	Grout Mattress Start	402	0.169
03-11-23	10:07	X.PO	Crossing over a Pipeline	403	0.171
03-11-23	10:08	GM.E	Grout Mattress End	404	0.174
03-11-23	10:08	GM.S	Grout Mattress Start	405	0.178
03-11-23	10:08	GM.E	Grout Mattress End	406	0.181
03-11-23	10:09	F.J	Field joint	407	0.193
03-11-23	10:09	F.J	Field joint	408	0.194
03-11-23	10:08	F.J	Field joint	409	0.200
03-11-23	10:09	F.J	Field joint	410	0.207
03-11-23	10:09	F.J	Field joint	411	0.219
03-11-23	10:09	F.J	Field joint	412	0.220
03-11-23	10:10	F.J	Field joint	413	0.231
03-11-23	10:10	F.J	Field joint	414	0.244
03-11-23	10:11	F.J	Field joint	415	0.256
03-11-23	10:11	GM.S	Grout Mattress Start	416	0.260
03-11-23	10:11	X.CO	Crossing over with E.cable	417	0.264
03-11-23	10:11	GM.E	Grout Mattress End	418	0.268
03-11-23	10:12	F.J	Field joint	419	0.280
03-11-23	10:13	F.J	Field joint	420	0.291
03-11-23	10:13	F.J	Field joint	421	0.304
03-11-23	10:14	F.J	Field joint	422	0.316
03-11-23	10:15	F.J	Field joint	423	0.328
03-11-23	10:16	F.J	Field joint	424	0.340
03-11-23	10:17	F.J	Field joint	425	0.351
03-11-23	10:17	AN.BR	Anode Bracelet	426	0.356
03-11-23	10:17	F.J	Field joint	427	0.364
03-11-23	10:18	F.J	Field joint	428	0.375
03-11-23	10:19	F.J	Field joint	429	0.389
03-11-23	10:19	F.J	Field joint	430	0.401
03-11-23	10:20	F.J	Field joint	431	0.413
03-11-23	10:21	F.J	Field joint	432	0.424
03-11-23	10:21	F.J	Field joint	433	0.437
03-11-23	10:22	F.J	Field joint	434	0.448
03-11-23	10:23	F.J	Field joint	435	0.462
03-11-23	10:23	F.J	Field joint	436	0.474
03-11-23	10:24		End of survey	436	0.474



7.4 Drawing survey

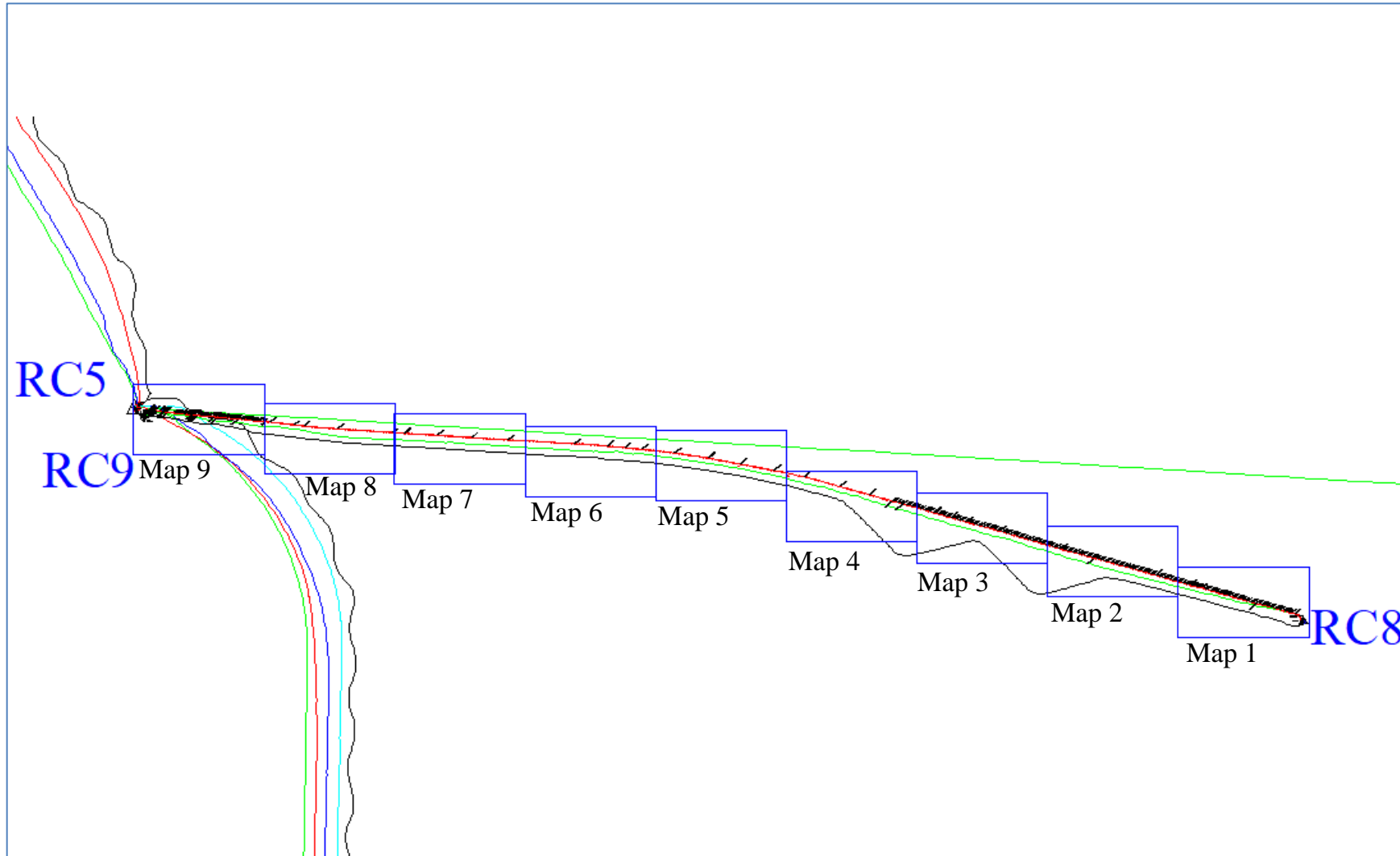


Figure 27: RC8-RC9 oil pipeline route





ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9

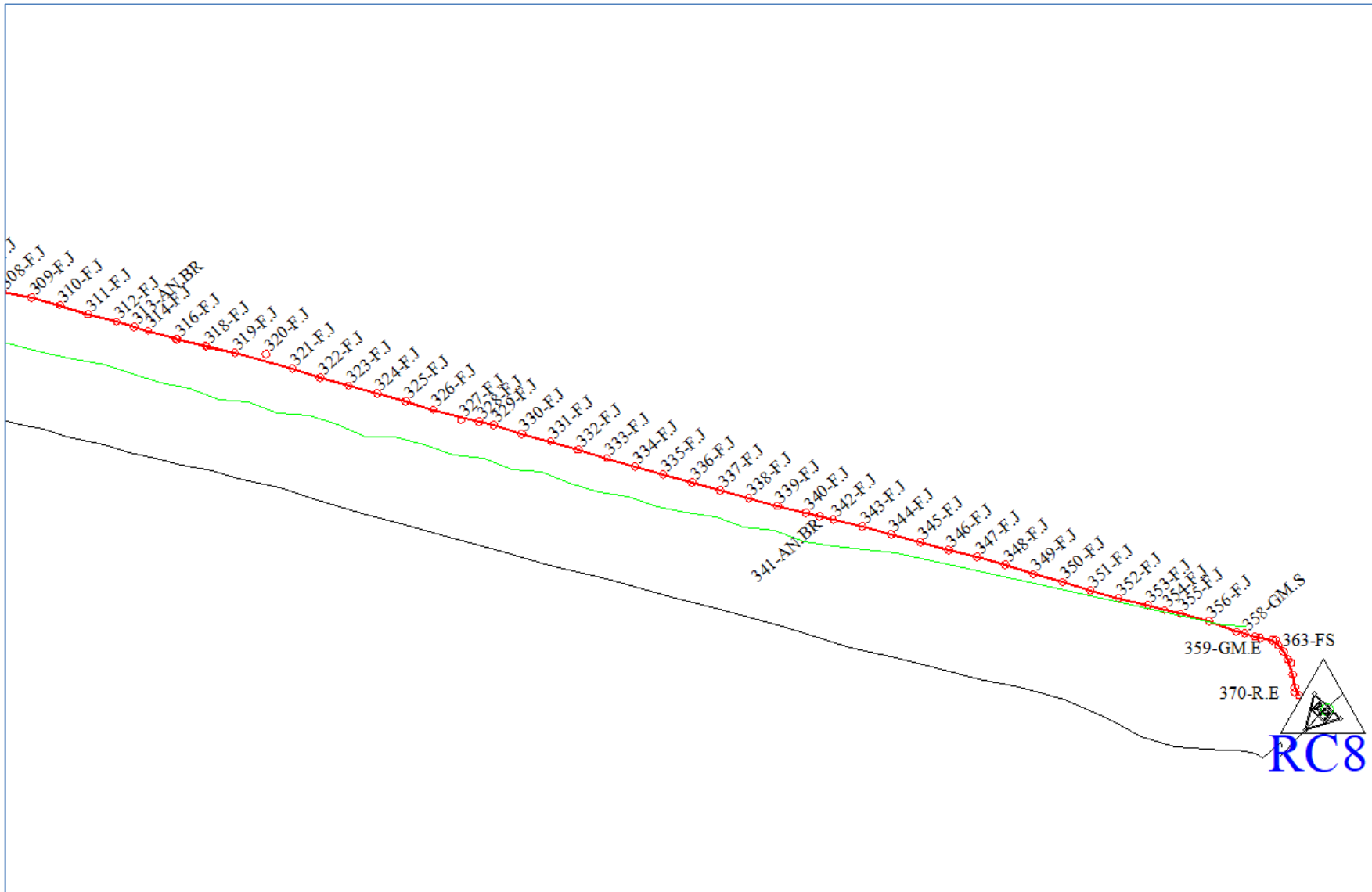


Figure 28: Map 1



ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9

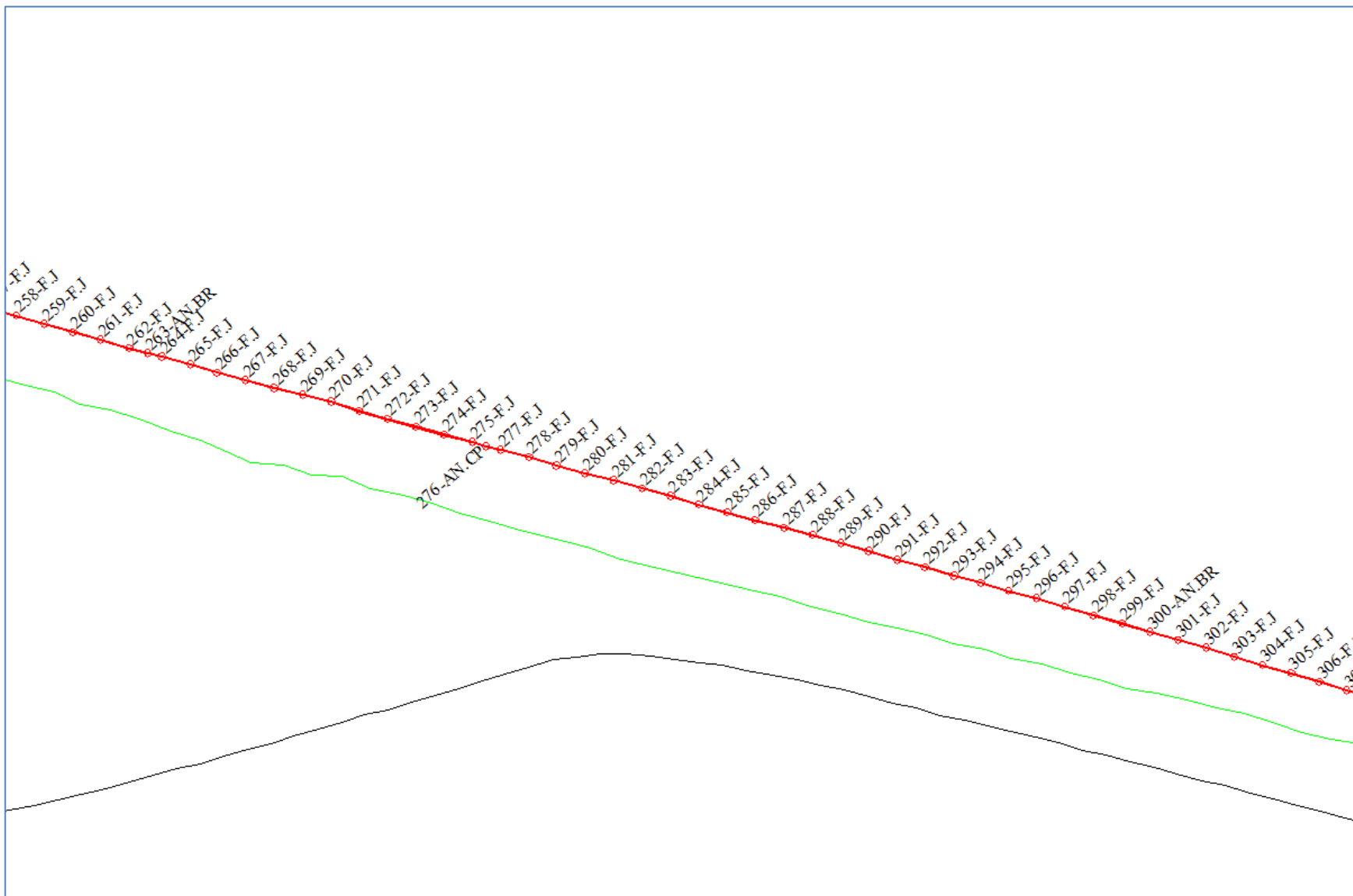


Figure 29: Map 2



ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9

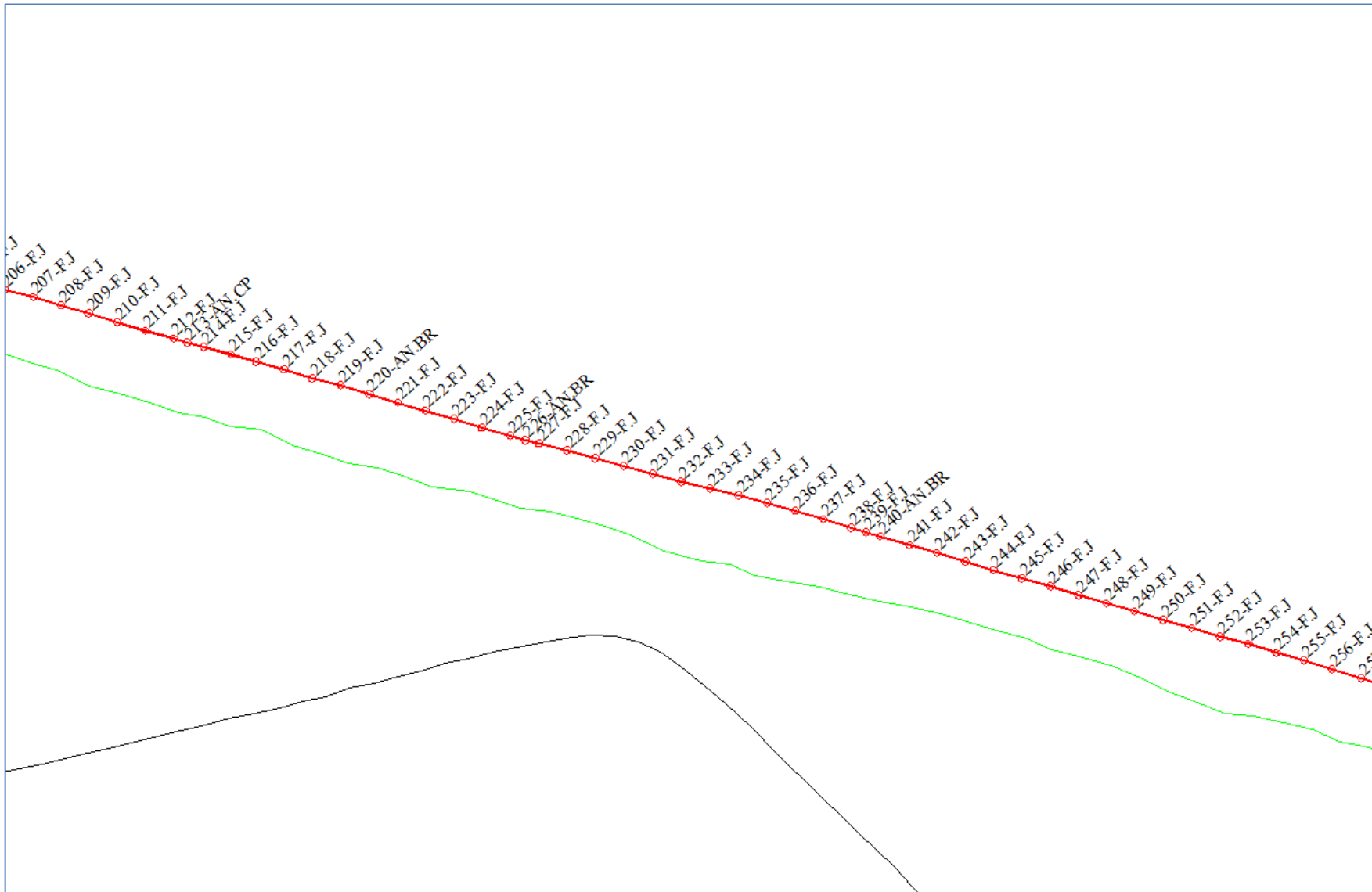


Figure 30: Map 3



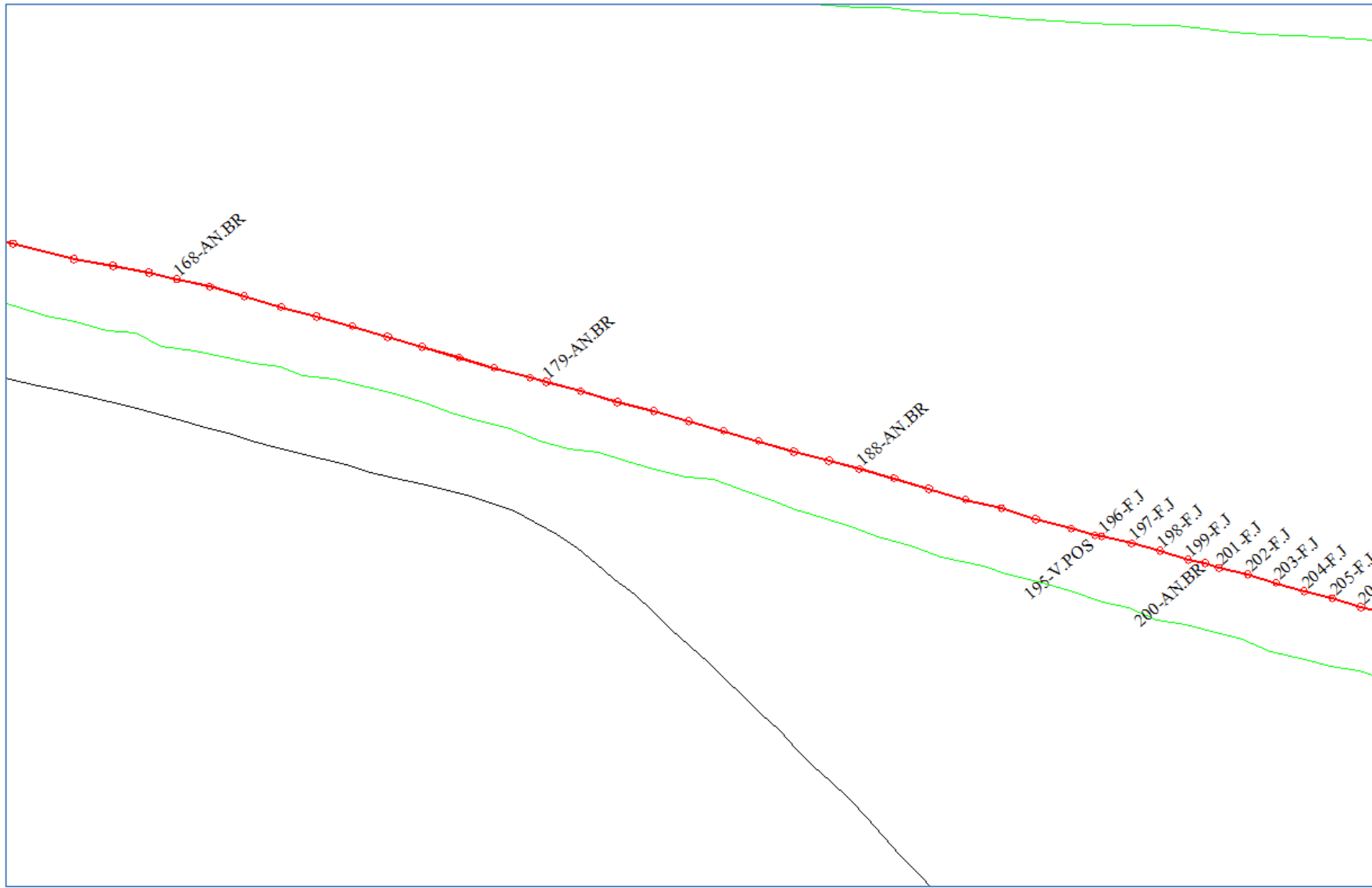


Figure 31: Map 4



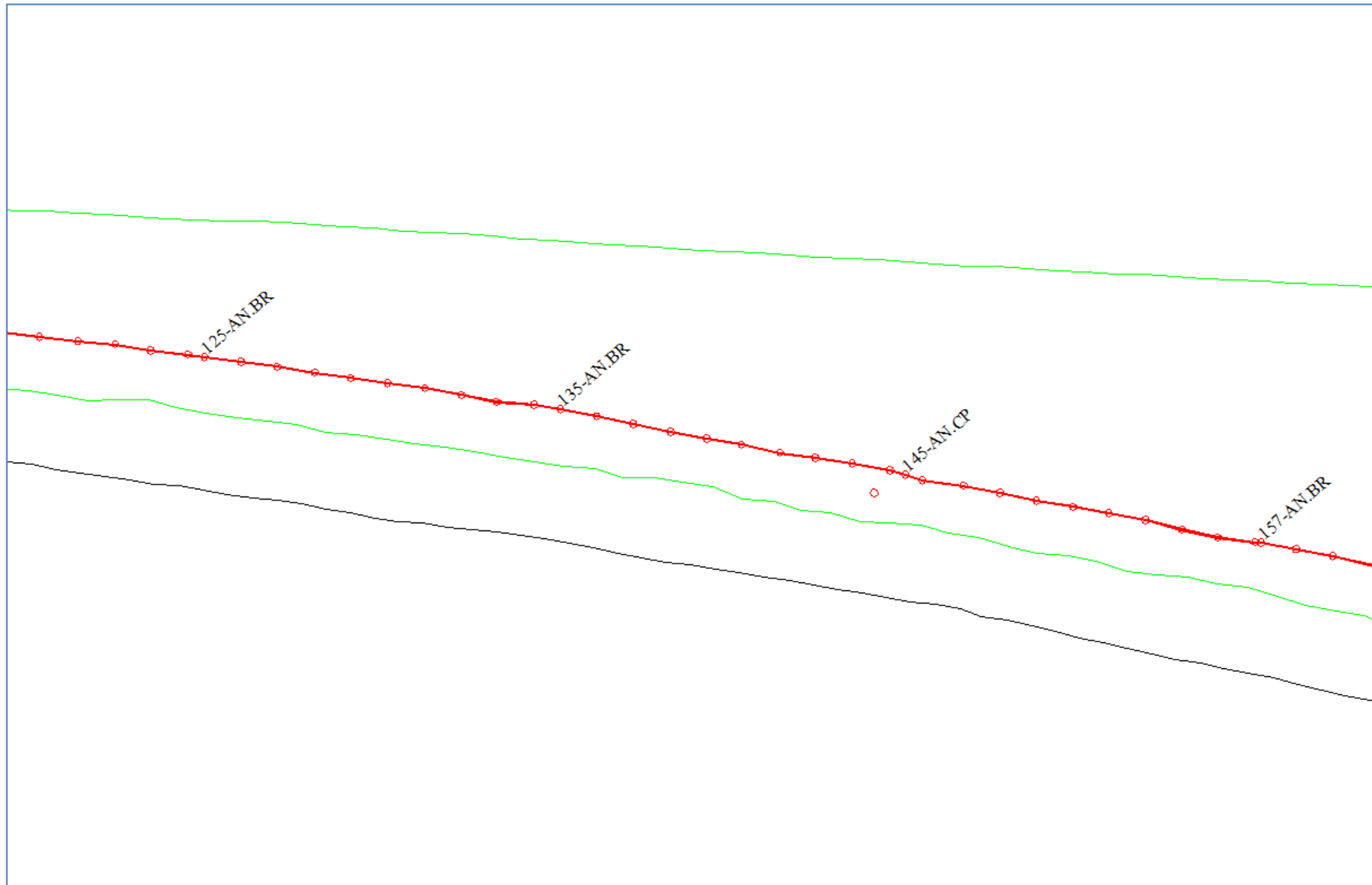


Figure 32: Map 5

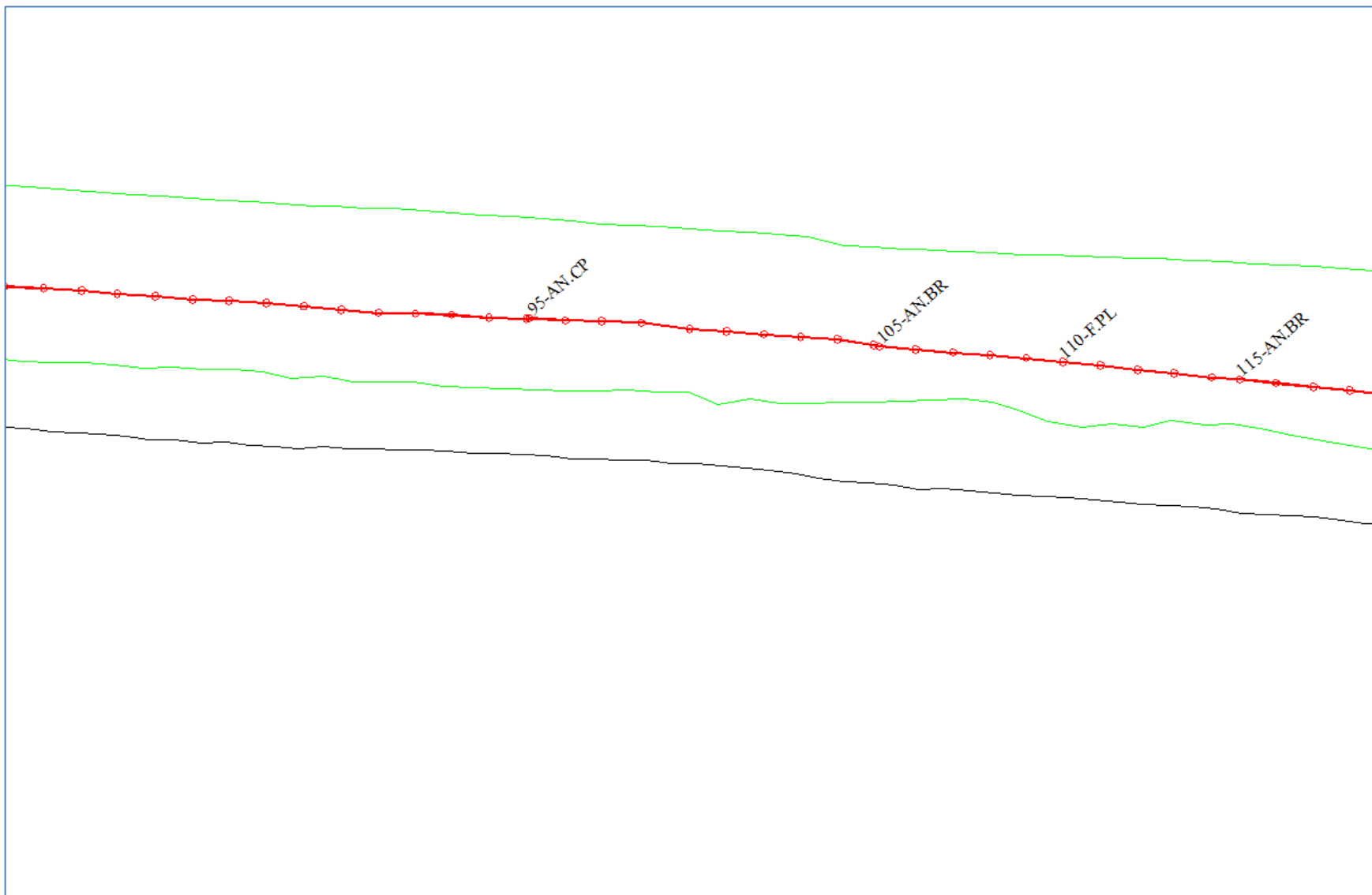


Figure 33: Map 6



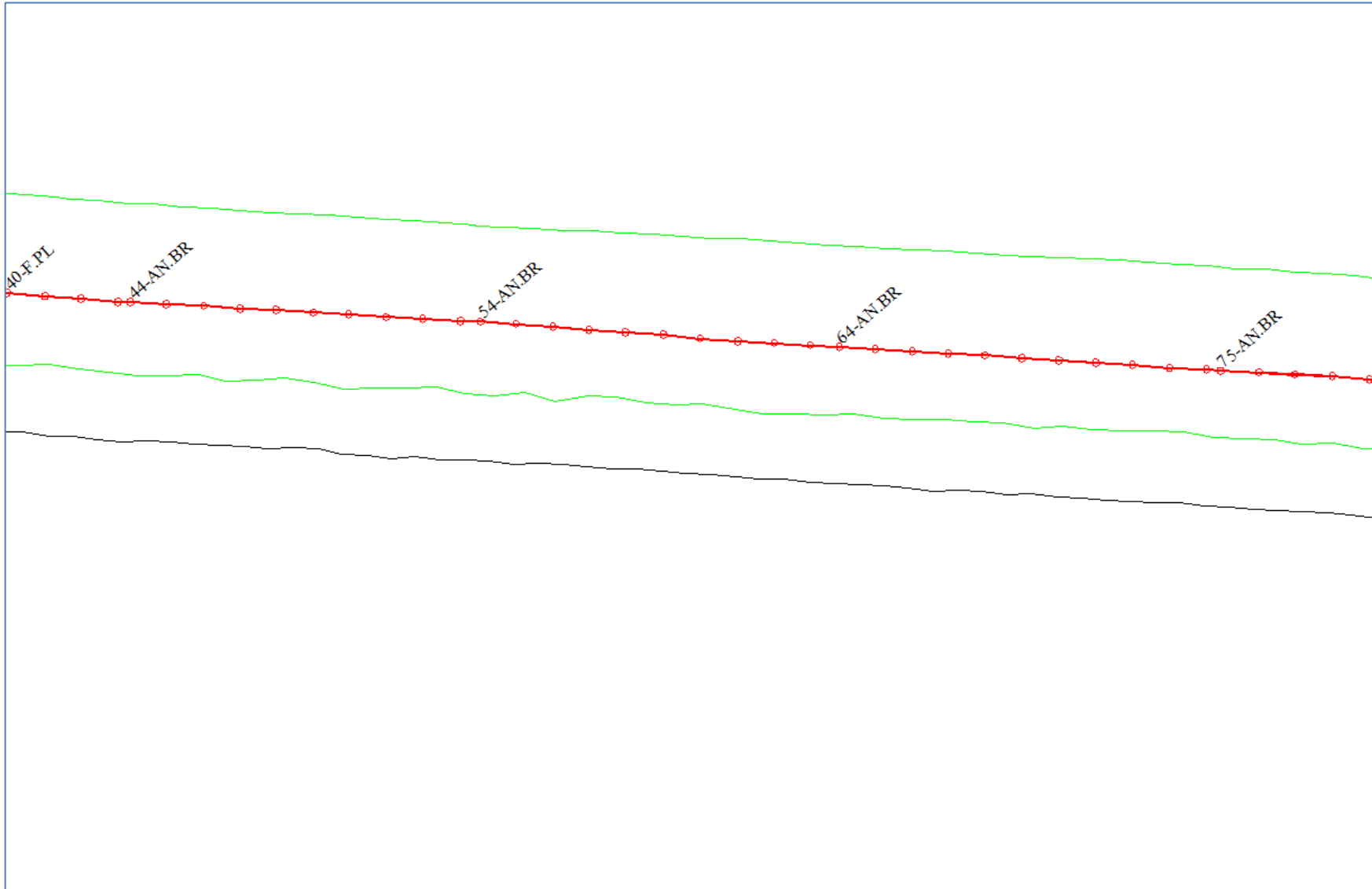


Figure 34: Map 7



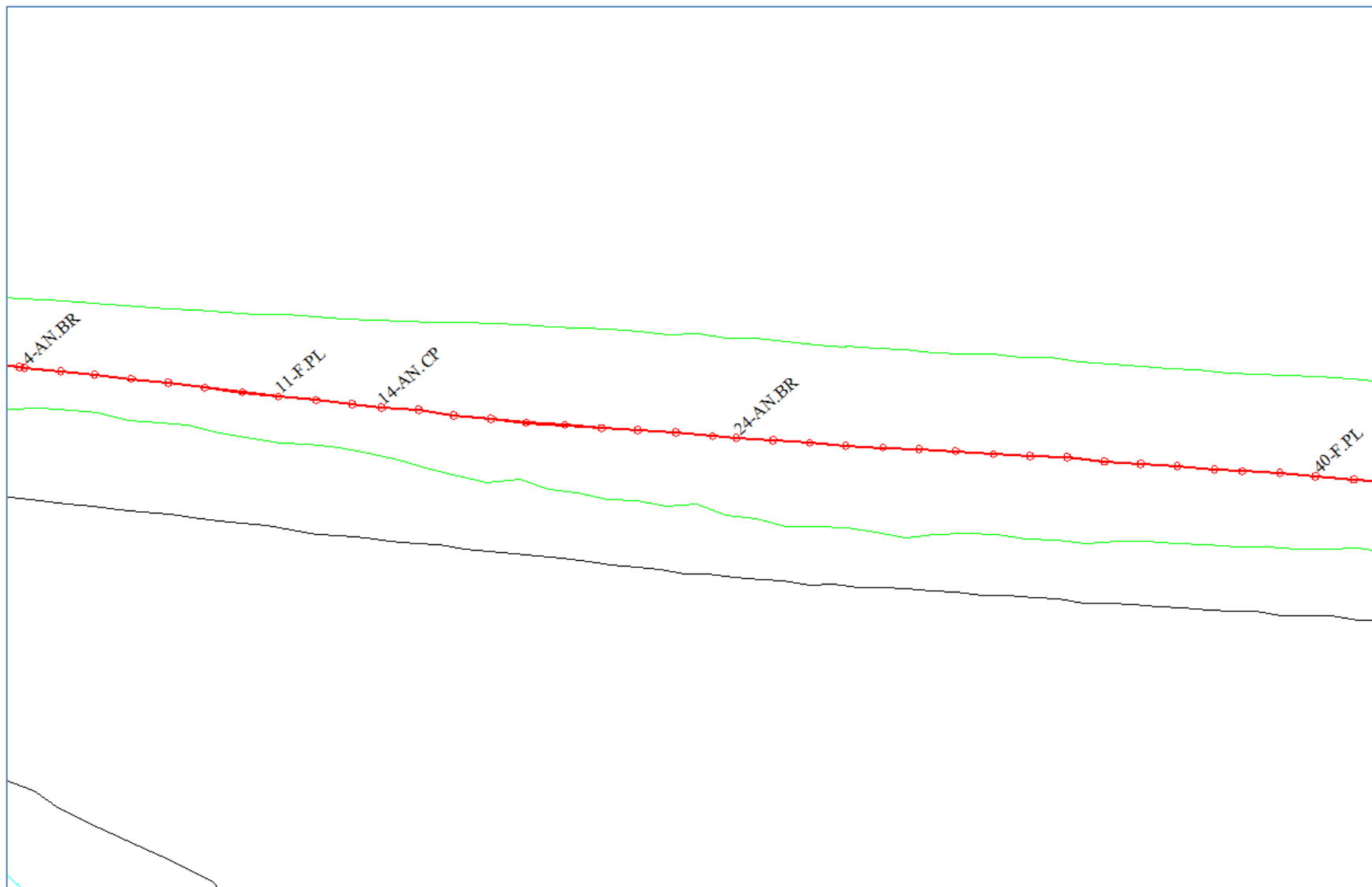


Figure 35: Map 8



ROV UNDERWATER SURVEY IN 2023

AS-BUILT SURVEY OIL PIPELINE RC8-RC9

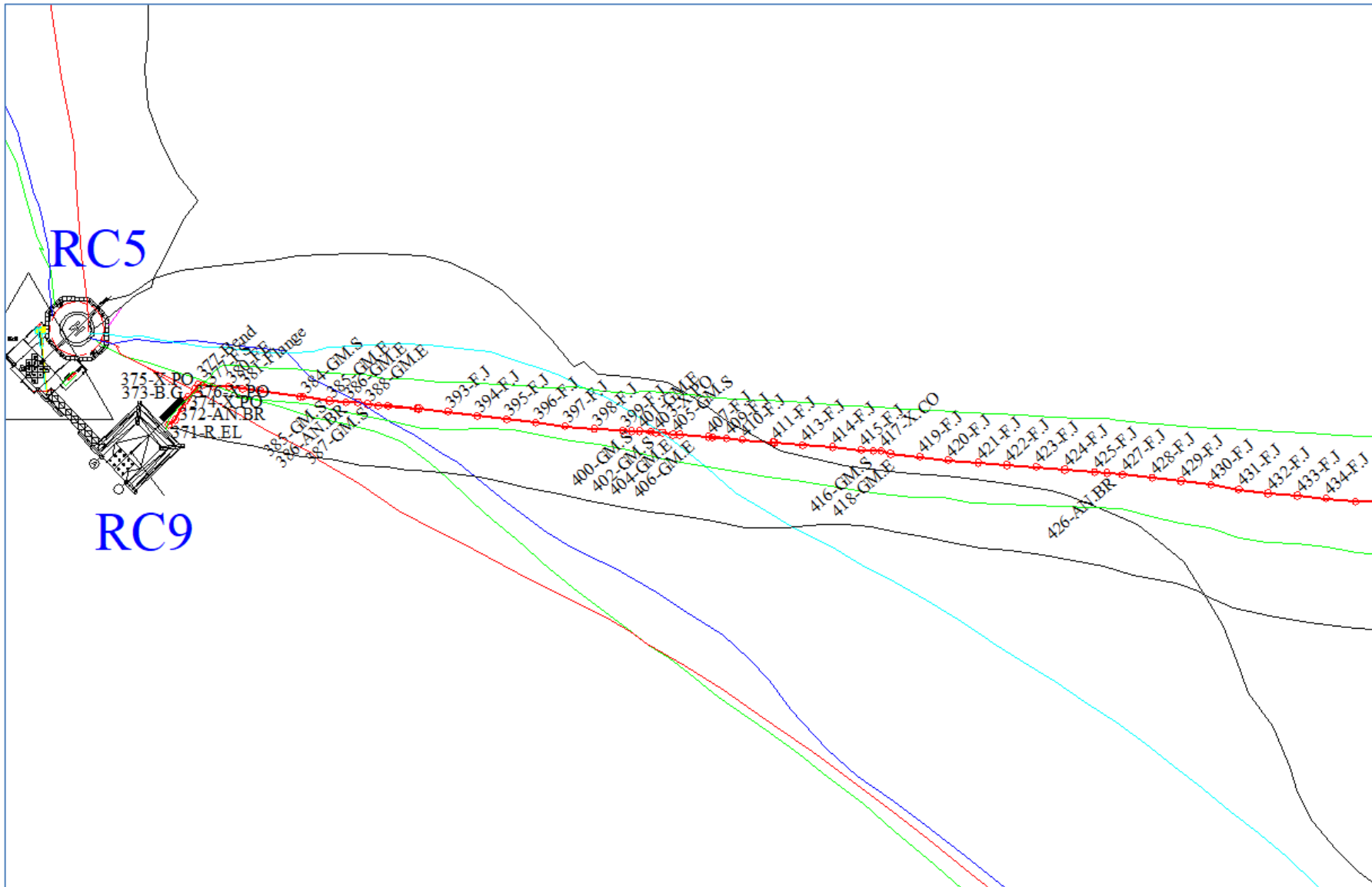


Figure 36: Map 9





VIETSOVPETRO
MARINE TRANSPORTATION AND DIVING SERVICE DIVISION

SURVEY OIL PIPELINE
RC10-RC.RB1 (VR 297/22)

FINAL REPORT
Report No. ROV-P.37-24

PANTHER PLUS 932 REMOTELY OPERATED VEHICLE
Created by: ROV Team

Reviewed by:

Vietnam Register, Branch No.9

Signature:

Date: _____

Issue No.	Issued date	Description	Compiled by		Checked by		Approved by	
			Print name	Signature	Print name	Signature	Print name	Signature
00		For review and approval	Le Ba Giap		Dinh Binh Nam		Phan Hung Duong	



Checked by:

Mr. Nguyen Quoc Dung - Director of Oil & Gas Prod. Division, VSP

Signature:

Date: _____

Mr. Avdeev A.S – Chief Engineer of R&EI, VSP

Signature:

Date: _____

Mr. Nguyen Hong Giang. - Manager of Capital Construction Department, VSP

Signature:

Date: _____





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



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ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



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ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



1 INTRODUCTION

1.1 Abstract

The purpose of this survey was to obtain an overall condition assessment of the Risers at RC.RB1 & RC10 platform and the oil pipeline connecting from RC10 to RC.RB1 with 3510 m in length and diameter 273 x 15,9 mm to satisfy the 2024 requirement by production task of Marine Transportation & Diving Service Division of Vietsovpetro. And collect all pertinent inspection data to prepare an event file, establish base line data for future uses.

All anomalies and debris in this survey area will be recorded on DVD. They will be reported in an event log sheet.





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



1.2 Abbreviations

AB	Abraded
AN	Anode
CD	Coating Damage
CP	Cathodic Protection/Potential
CR	Corrosion
CVI	Close Visual Inspection
DAM	Damage
DWG	Drawing
E	Electrical
EL	Elevation
FJ	Field Joint
GVI	General Visual Inspection
HD	Hard Debris
HDM	Horizontal Diagonal Member
HM	Horizontal Member
KP	Kilometer Point `
L	Length
LK	Leak
M	Meter
MG	Marine Growth
MGT	Marine Growth Thickness
MPI	Magnetic Particle Inspection
MSL	Main Sea Level
NDT	Non Destructive Testing
PL	Pipeline
PLEM	Pipeline End Manifold
ROV	Remotely Operated Vehicle
SD	Soft Debris
STBD	Starboard
TD	Touch Down
USTM	Ultra Sonic Wall thickness Measurement
VM	Vertical Member
VSP	VietsovPetro Joint Venture Company
WHP	Wellhead Platform



2 LOCATION

The White Tiger field is located in block 09-1 offshore Vietnam in approximately 45-55m water depth operated by VIET NGA Vietsovpetro.

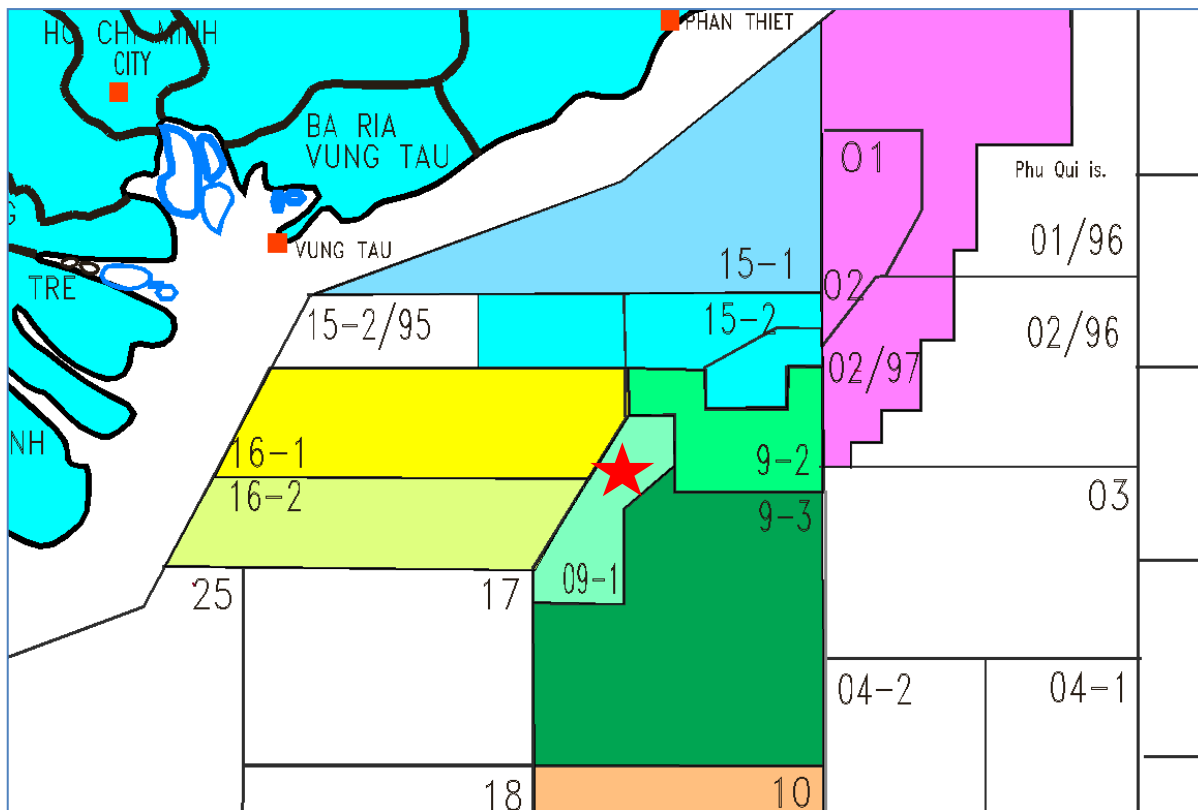


Figure 1: Vietsovpetro block

Co-ordinate system used:

Position was Fixed by Global Positioning System has named:

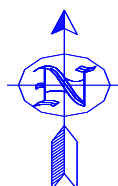
Datum Indian 1830

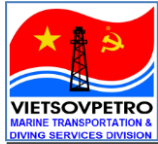
Ellipsoid Everest 1830 India

All equipment's were used and controlled by SEAMAP's personnel.

Standard direction of all survey screen shot key plan:

Position was Fixed with inaccuracy not more than 3 meters.





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



3 STATISTICS, SENSORS UNIT AND PERSONNEL

3.1. Vehicle

ROV: Observation ROV “Panther Plus 932”
Altimeter: Trittech Seaking PA-500 Range of Bathymetric & Oceanographic Sensors
Gyro: Saab Seaeye
Depth: Trittech Seaking 701/14 Range of Bathymetric & Oceanographic Sensors
Cameras: Kongsberg color zoom camera
Kongsberg near SIT camera

3.2. Statistics

Water depth: 49-52m.

3.3. Vessel

M/V Sao Mai 03

3.4. List of personnel

ROV Team: Supervisor: Le Ba Giap
Pilot techs: Nguyen Minh Quan
Pham Quang Hoa
Truong Van Minh
Report Processor: Dang Phi Hung
Do Binh Minh
LARS Operator: Tran Dang Kien
Seamap Team: Surveyors: Tran Quang Huy
Do Van Dung





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



4 SCOPE OF WORK

4.1. Riser survey

The Riser will be inspected and report the following:

- Corroded or leaking riser.
- Damage to riser or coating.
- Dented, kinked or buckled riser.
- Condition of the clamps. If marine growth permits, list down all clamp defects such as loose/missing bolts, miss alignment or signs of riser movement.

All the above points will be Fixed and recorded to DVD.

4.2. Pipeline survey

The Pipeline will be inspected and report the following:

- Carry out leaking survey.
- Carry out types of span survey.
- Carry out pipeline crossing survey.
- Carry out a general visual inspection (GVI) of the pipeline and attachments. Report all areas of damage, corrosion or debris items present on the pipeline.
- To still Photographs of all areas of damage or significant defects are required. Take sufficient photographs to assess the size of, and to accurately locate the defect.
- Verify the presence, condition and security of attachment of all anodes. Estimate the percentage depletion of each anode and the extent of marine growth presents permits.

All above points will be Fixed. Burials, free spans and all of debris along the pipeline will be recorded on DVD.



5 RISER INSPECTION RESULT

5.1. Riser No.11 at RC.RB1 platform

ROV surveyed this riser from MSL down to seabed. A total 06 of clamps were identified during the inspection at EL -7m, -14m, -21m, -26m, -33m and -41m.

All riser clamps were found in normal condition, with no indication of physical damage, impact deformation, displacement or movement.

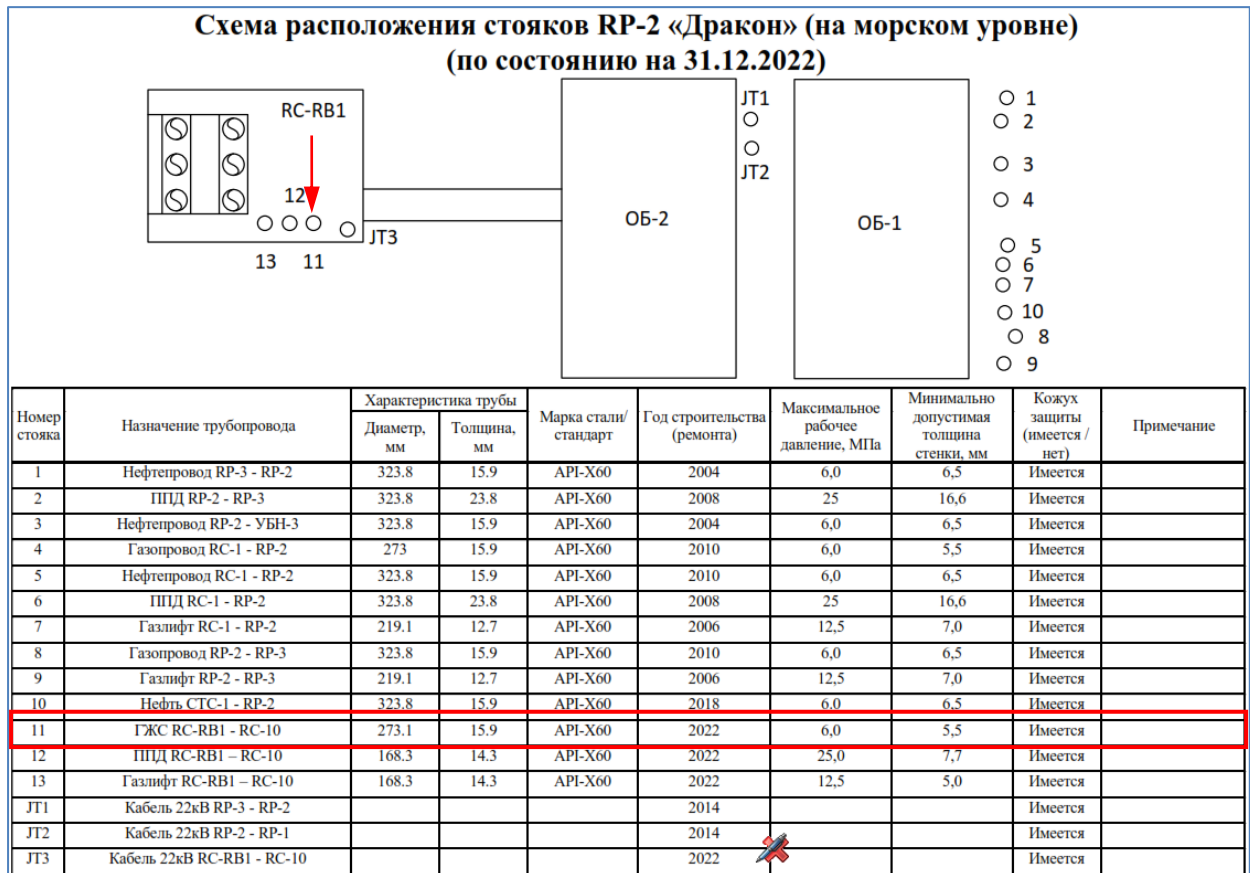


Figure 2: Plan view of Riser position at RC.RB1



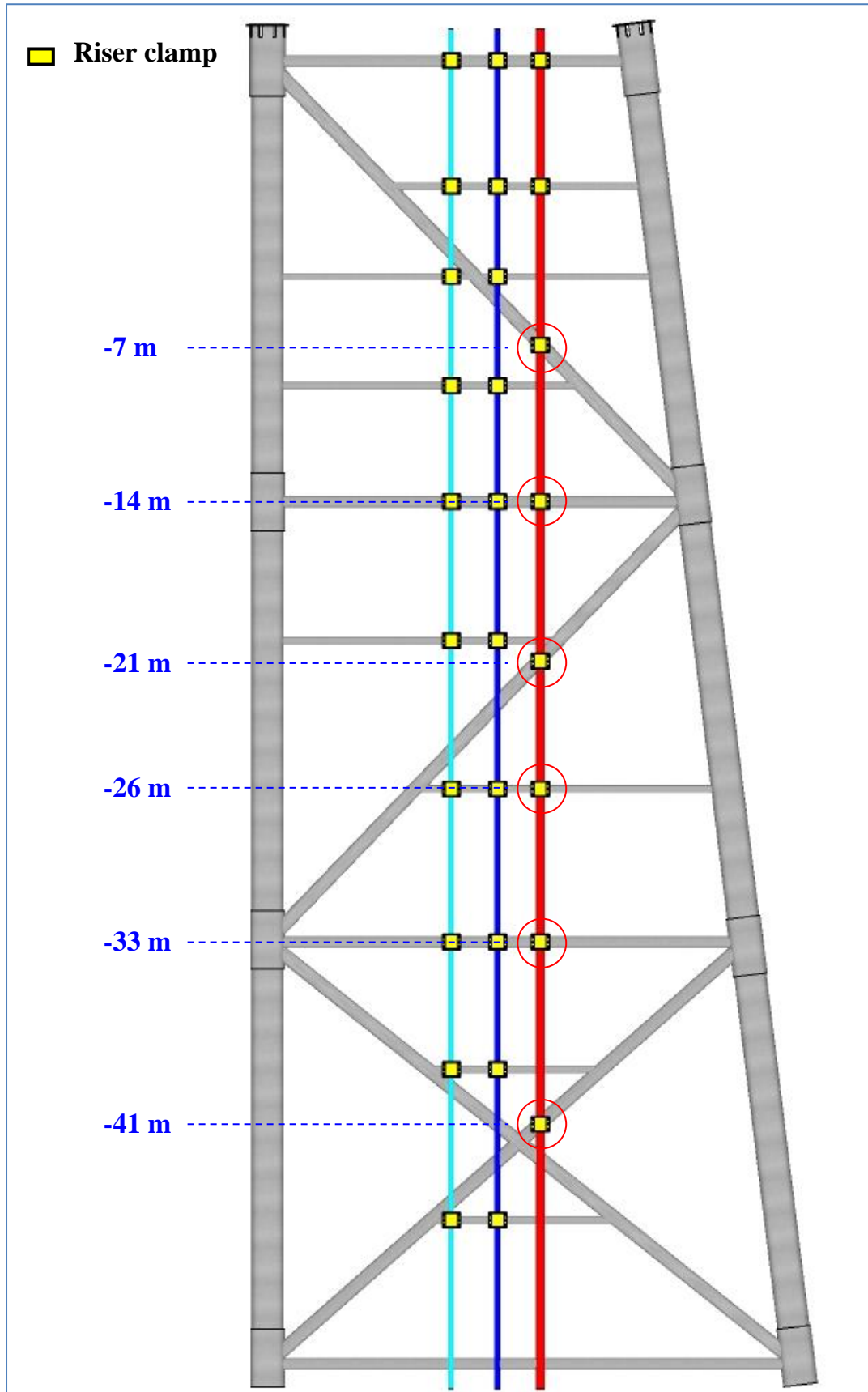


Figure 3: Elevation view of Riser and riser clamp position at RC.RB1





Figure 4: Riser clamp at EL -7m



Figure 5: Riser clamp at EL -14m





Figure 6: Riser clamp at EL -21m



Figure 7: Riser clamp at EL -26m





Figure 8: Riser clamp at EL -33m



Figure 9: Riser clamp at EL -41m





Figure 10: Riser elbow



5.2. Riser No.3 at RC10 platform

ROV surveyed this riser from seabed up to MSL. A total 08 of clamps were identified during the inspection at EL -5m, -10m, -15m, -20m, -24m, -29m, -35m, -41m.

All riser clamps were found in normal condition, with no indication of physical damage, impact deformation, displacement or movement.

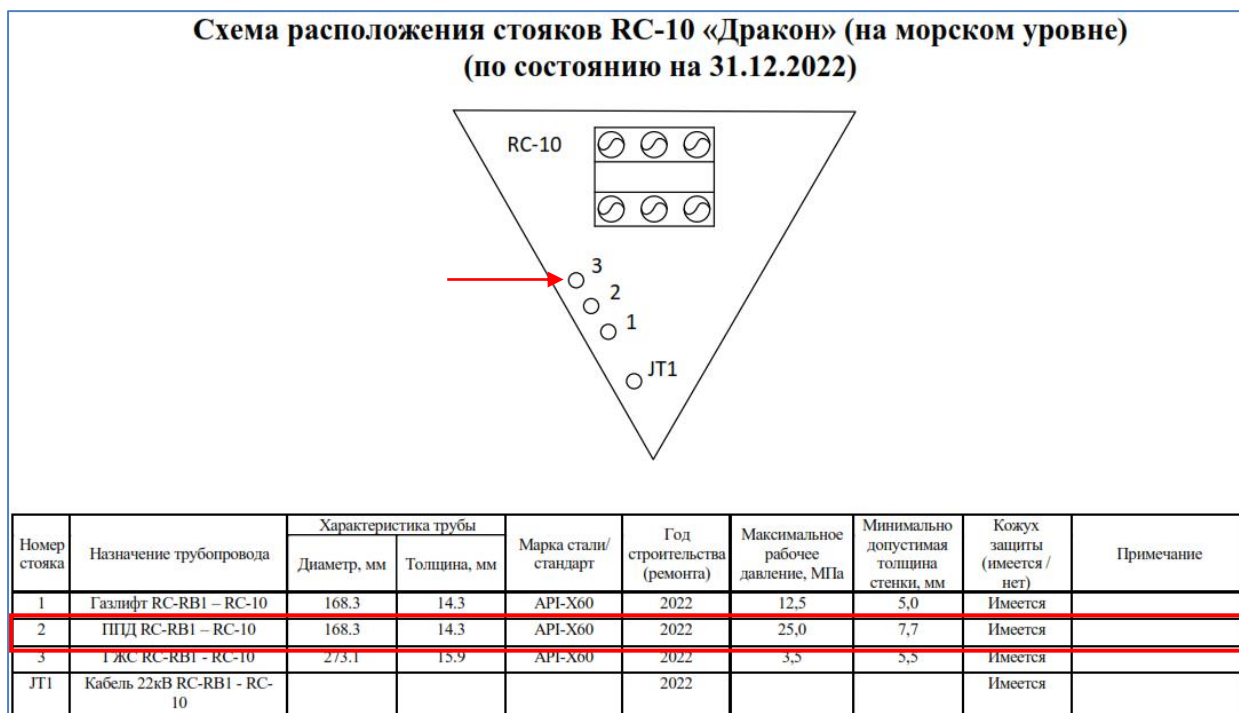


Figure 11: Plan view of Riser position at RC10



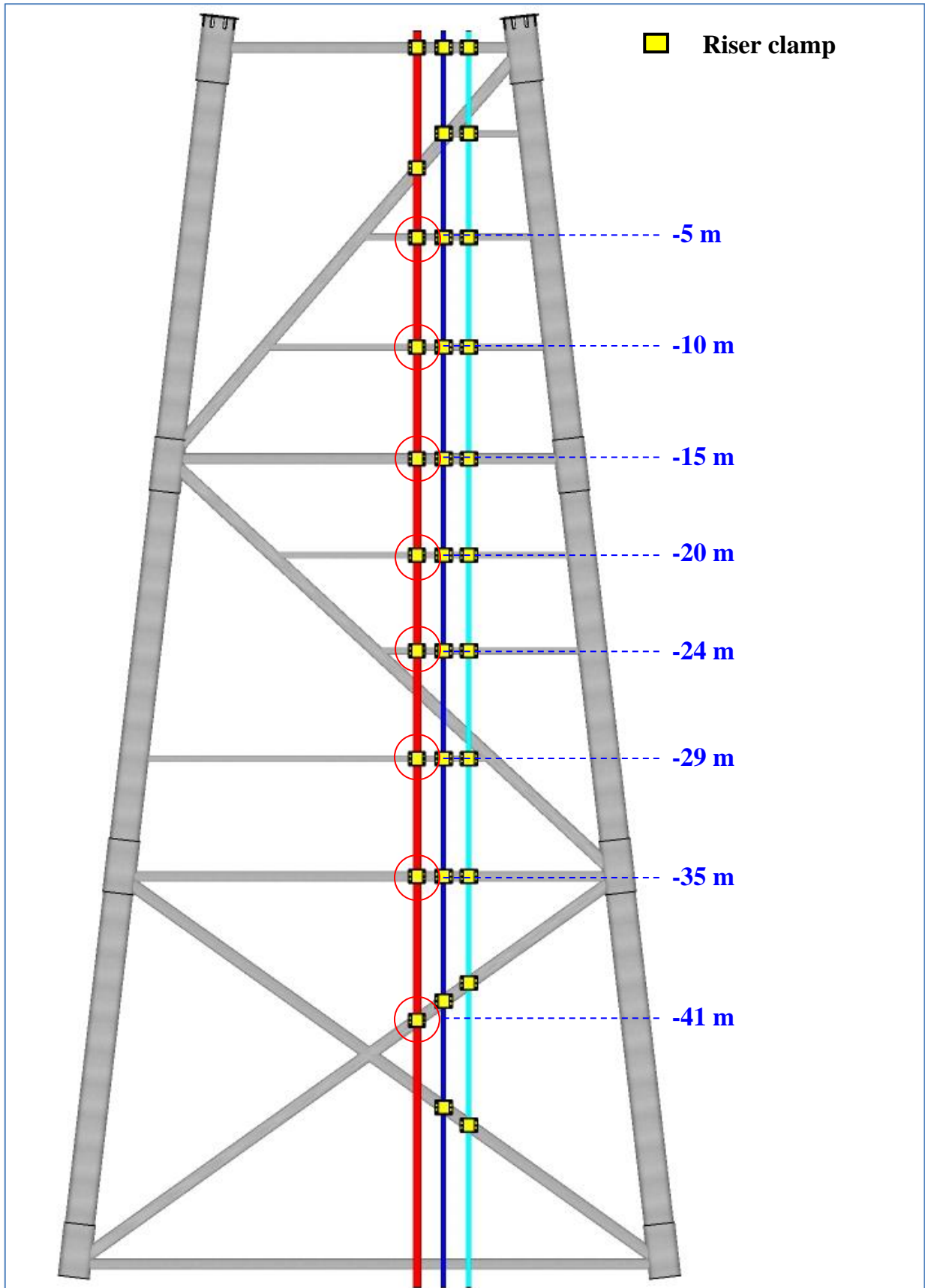


Figure 12: Elevation view of Riser and riser clamp position at RC10





Figure 13: Riser clamp at EL -5m



Figure 14: Riser clamp at EL -10m





Figure 15: Riser clamp at EL -15m

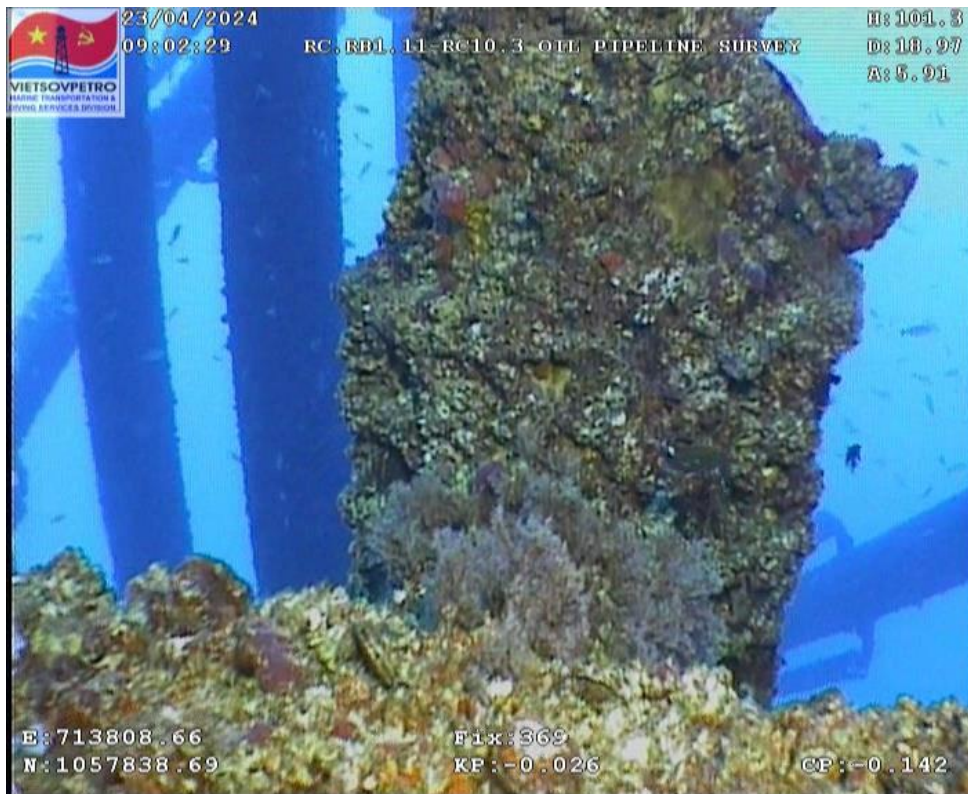


Figure 16: Riser clamp at EL -20m





Figure 17: Riser clamp at EL -24m



Figure 18: Riser clamp at EL -29m





Figure 19: Riser clamp at EL -35m



Figure 20: Riser clamp at EL -41m





Figure 21: Riser elbow

6 PIPELINE INSPECTION RESULT

6.1. Pipeline GVI

The pipeline started survey from RC.RB1 platform at KP 3.515 and ended survey at RC10 platform at KP -0.025.

6.2. Anodic survey

The pipeline along its length was surveyed for anode. The typical anode along this pipeline is bracelet anode. Anodes appear active and 0-25% wastage. The table below shows the detailed location of anodes observed during the survey.

During the survey, the random of anodes was chosen for CP stab. CP reading was in acceptable value between -1.005mV and -1.045mV.



Table 1: List of CP stab location

No.	Description	Fix	Easting	Northing	KP	Depth
1	Anode CP Reading -1045mV	24	712919.99	1054510.18	3.458	51.42
2	Anode CP Reading -1005mV	126	713272.39	1055154.76	2.719	50.71
3	Anode CP Reading -1014mV	216	713479.27	1056160.84	1.687	52.63
4	Anode CP Reading -1027mV	359	713773.65	1057787.98	0.031	53.23



Figure 22: CP stab at Fix.24



Table 2: List of Anodes location

No.	Description	Fix	Easting	Northing	KP	Depth
1	Anode wastage 0-25%	4	712893.03	1054466.04	3.510	51.48
2	Anode wastage 0-25%	24	712919.99	1054510.18	3.458	51.42
3	Anode wastage 0-25%	50	712965.83	1054589.91	3.366	51.89
4	Anode wastage 0-25%	60	712995.92	1054635.23	3.312	51.57
5	Anode wastage 0-25%	87	713069.43	1054762.77	3.165	51.53
6	Anode wastage 0-25%	100	713143.77	1054889.79	3.018	51.14
7	Anode wastage 0-25%	113	713214.82	1055017.66	2.868	50.85
8	Anode wastage 0-25%	139	713316.56	1055294.72	2.569	50.90
9	Anode wastage 0-25%	152	713345.83	1055438.51	2.422	50.93
10	Anode wastage 0-25%	165	713371.32	1055584.16	2.274	50.95
11	Anode wastage 0-25%	178	713398.36	1055729.46	2.127	51.76
12	Anode wastage 0-25%	191	713425.81	1055874.18	1.979	51.79
13	Anode wastage 0-25%	204	713451.65	1056019.02	1.832	52.16
14	Anode wastage 0-25%	229	713504.96	1056307.78	1.538	52.43
15	Anode wastage 0-25%	241	713530.46	1056449.18	1.394	52.06
16	Anode wastage 0-25%	255	713560.15	1056607.15	1.233	51.55
17	Anode wastage 0-25%	268	713586.22	1056753.13	1.085	51.79
18	Anode wastage 0-25%	281	713612.70	1056898.31	0.937	52.54
19	Anode wastage 0-25%	293	713636.54	1057028.53	0.804	52.57
20	Anode wastage 0-25%	318	713688.52	1057321.52	0.506	52.08
21	Anode wastage 0-25%	332	713719.32	1057477.83	0.346	52.48
22	Anode wastage 0-25%	346	713747.88	1057635.57	0.186	52.73
23	Anode wastage 0-25%	364	713781.33	1057829.14	-0.011	53.15

6.3. Debris survey

The pipeline along its length was surveyed for debris. The following table lists out all metallic and nonmetallic. Debris was found during the survey.

Table 3: List of Debris

No.	Description	Fix	Easting	Northing	KP	Depth
1	Debris Hard	2	712888.59	1054464.20	3.514	51.83
2	Debris Soft Netting	89	713081.38	1054782.94	3.141	51.28





Figure 23: Hard debris at Fix .2



Figure 24: Debris soft netting at Fix .89



6.4. Pipeline crossing survey

The pipeline along its length was surveyed for crossing. A total of 03 crossing points were found & 03 crossing fully burial during survey as table below.

Table 4: List of crossings

No.	Description	Fix	Easting	Northing	KP	Depth
1	Crossing Over Power Cable	16	712911.13	1054497.31	3.474	51.33
2	Crossing Over Pipelines (fully burial)	44	712960.82	1054583.02	3.375	50.94
3	Crossing Over a Pipeline	77	713042.50	1054711.39	3.223	50.09



Figure 25: Crossing over power cable at Fix.16





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Figure 26: Crossing over a pipeline at Fix.77



6.5. Free span survey

The pipeline along its length was surveyed for free spans. A total of 10 free spans were found during the survey as table below.

Table 5: List of free spans

No.	Description	Fix	Easting	Northing	KP	Depth	
1	Freespan Start	Riser elbow	2	712888.59	1054464.20	3.514	51.83
	Freespan End. Max Gap = 0.4m. L = 10m	Seabed	5	712895.81	1054471.20	3.504	51.64
2	Freespan Start	Seabed	8	712901.82	1054482.96	3.491	51.89
	Freespan End. Max Gap = 0.35m. L = 12m	Support (pipe)	10	712908.37	1054492.99	3.479	52.26
3	Freespan Start	Support (mattress)	16	712911.13	1054497.31	3.474	51.33
	Freespan End. Max Gap = 0.3m. L = 4m	Support (mattress)	17	712912.86	1054501.14	3.470	52.00
4	Freespan Start	Support (mattress)	22	712915.10	1054503.92	3.466	51.30
	Freespan End. Max Gap = 0.3m. L = 5m	Support (pipe)	23	712918.76	1054507.76	3.461	52.01
5	Freespan Start	Support (pipe)	23	712918.76	1054507.76	3.461	52.01
	Freespan End. Max Gap = 0.3m. L = 12m	Seabed	25	712924.41	1054517.28	3.449	51.88
6	Freespan Start	Seabed	30	712948.64	1054559.25	3.402	51.80
	Freespan End. Max Gap = 0.3m. L = 16m	Support (mattress)	32	712955.05	1054572.18	3.386	51.95
7	Freespan Start	Support (mattress)	55	712967.58	1054592.59	3.363	51.42
	Freespan End. Max Gap = 0.2m. L = 16m	Seabed	57	712977.03	1054606.92	3.347	51.92
8	Freespan Start	Seabed	65	713026.06	1054684.48	3.254	51.51
	Freespan End. Max Gap = 1m. L = 28m	Support (mattress)	71	713040.49	1054708.93	3.226	51.65
9	Freespan Start	Support (mattress)	78	713042.82	1054711.85	3.222	50.20
	Freespan End. Max Gap = 0.3m. L = 28m	Seabed	84	713055.37	1054737.49	3.194	51.59
10	Freespan Start	Seabed	365	713780.71	1057830.67	-0.012	53.18
	Freespan End. Max Gap = 0.3m. L = 12m	Riser elbow	368	713804.30	1057838.15	-0.024	51.98

Span's gap determining method:

ROV takes up Fix at 02 touches down points on the pipeline to determine length of span (KP Start – KP End). ROV sits on the pipeline to measure height of span by Altimeter Sensor (Altitude Value – Dia. PL = Span's gap). Following instructions of typical pipeline inspection program.

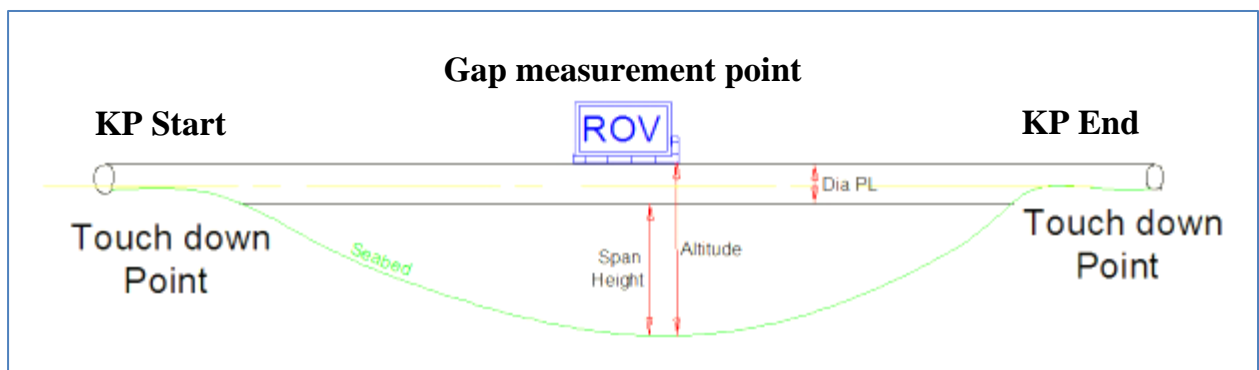


Figure 27: Illustrative figure of span's gap determining method



<p>Free spans (FS)</p>	<p>Spans outside the following lengths:</p> <p><u>26" pipelines:</u> >34m for single spans</p> <p><u>16" pipelines:</u> >21m for single spans</p> <p><u>12" pipelines:</u> >17m for single spans</p> <p><u>10" pipelines:</u> >14m for single spans</p> <p><u>8" pipelines:</u> >12m for single spans</p>	<p>Determine extent of anomalous scour area.</p> <p>To execute per one measurement of the greatest height/depth of each free span and suspended span of pipeline</p> <p>Photography, Video.</p>
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Figure 28: Typical pipeline inspection program

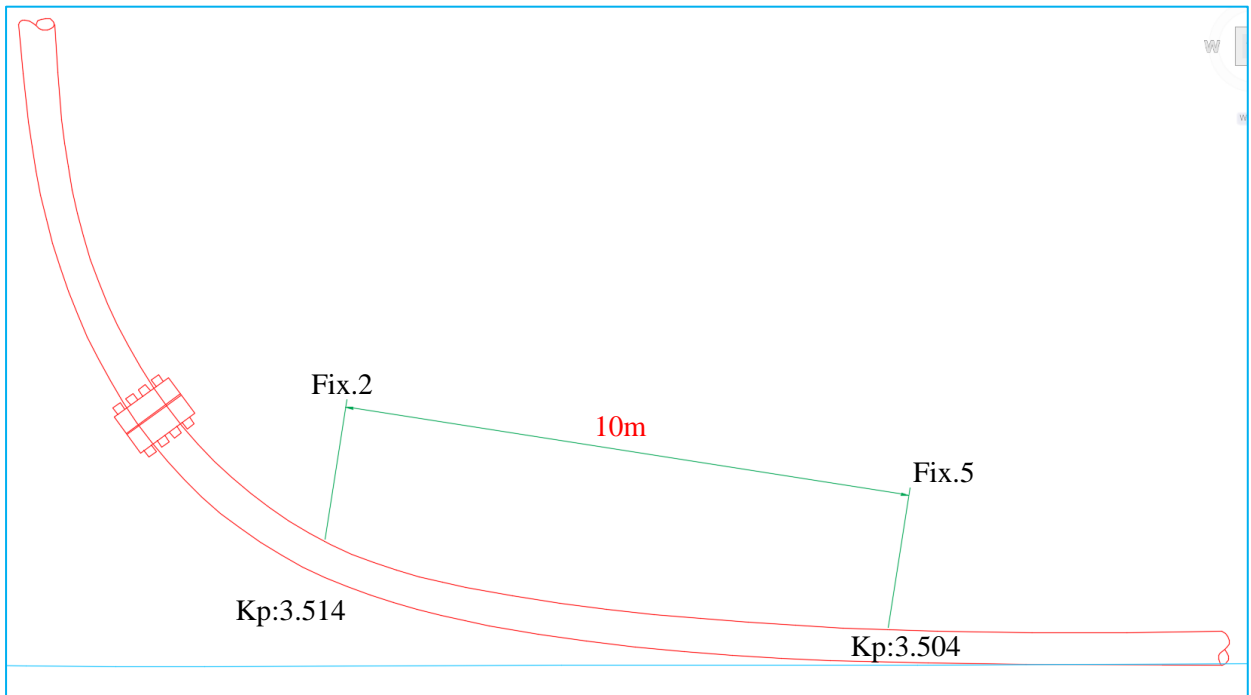


Figure 29: Free span from Fix.2 to Fix.5

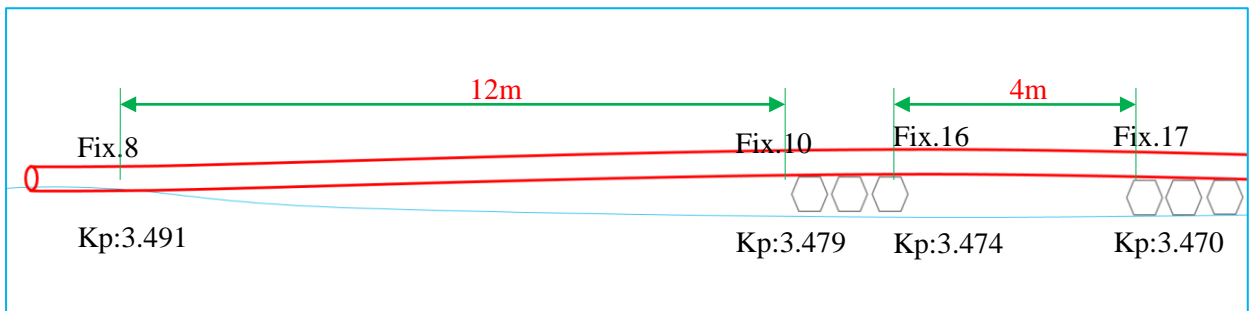


Figure 30: Free spans from Fix.8 to Fix.10 & Fix.16 to Fix.17



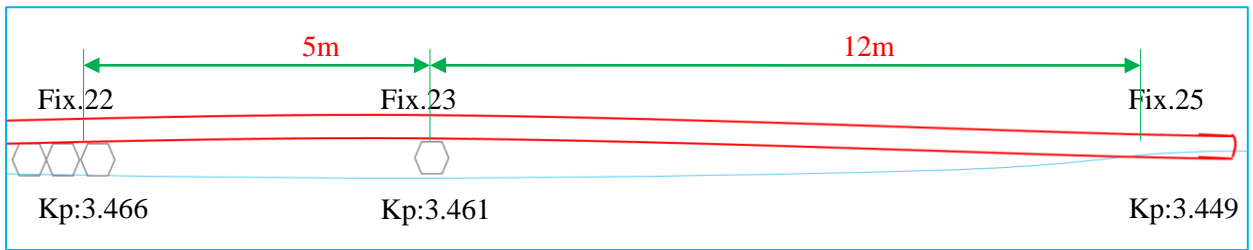


Figure 31: Free spans from Fix.22 to Fix.23 & Fix.23 to Fix.25

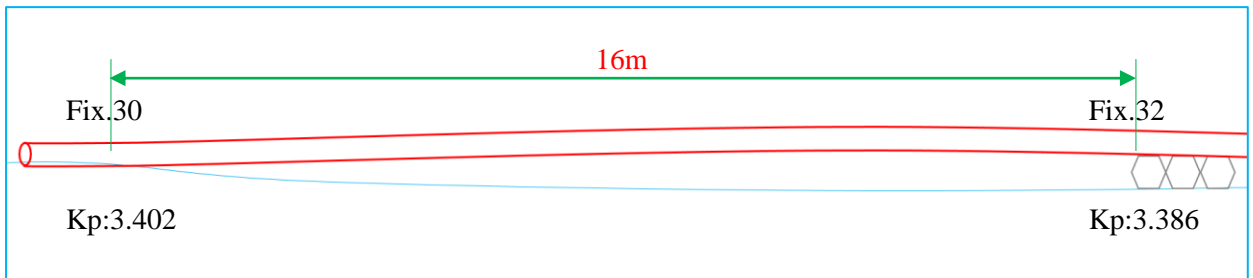


Figure 32: Free span from Fix.30 to Fix.32

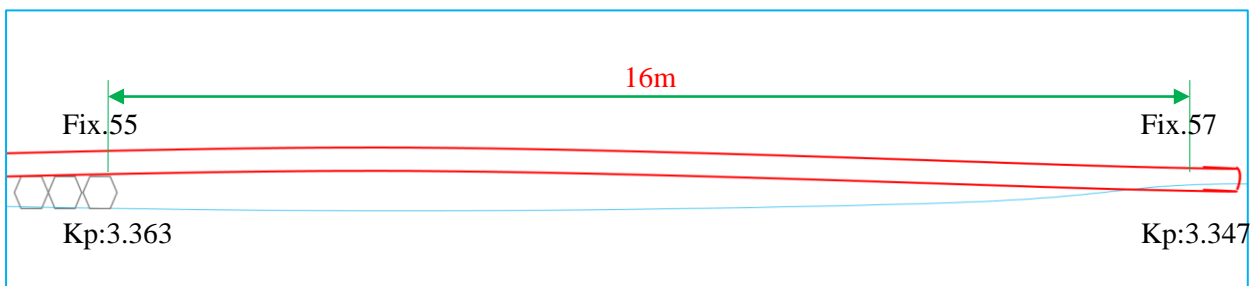


Figure 33: Free span from Fix.55 to Fix.57

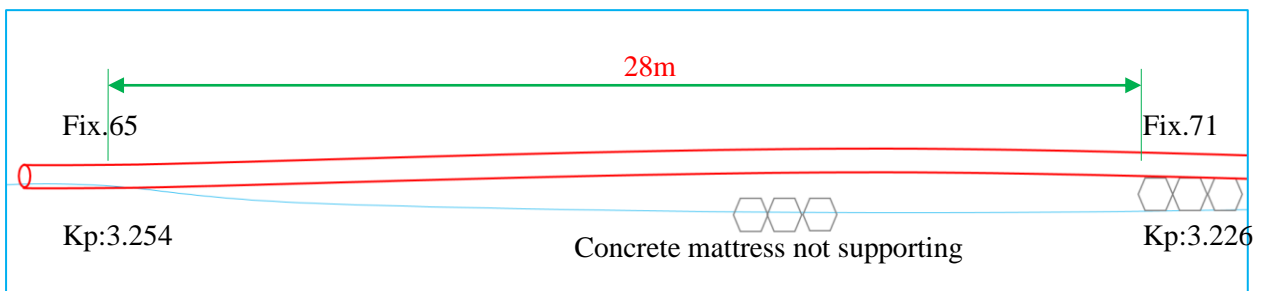


Figure 34: Free span from Fix.65 to Fix.71

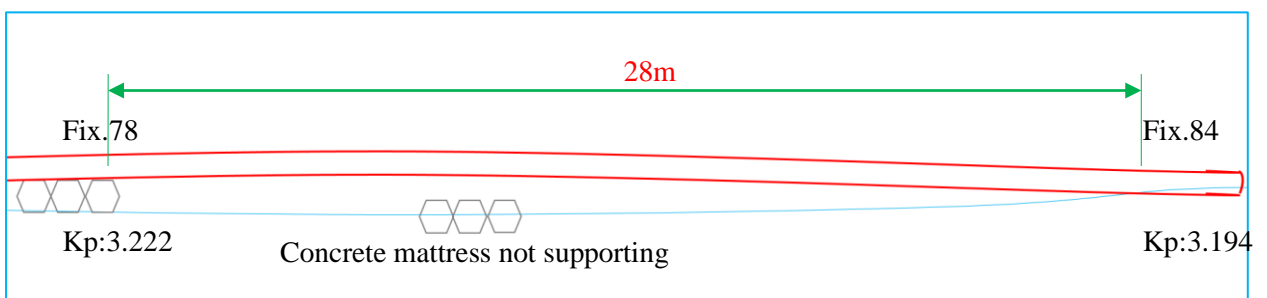


Figure 35: Free span from Fix.78 to Fix.84



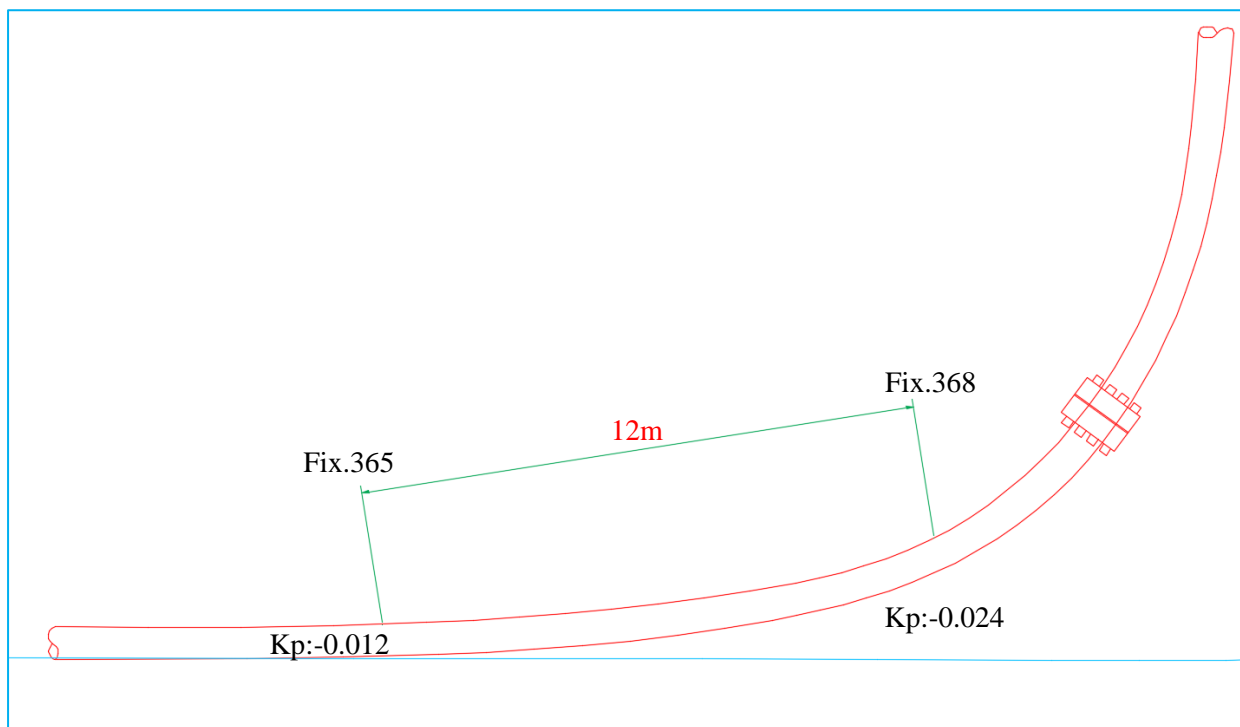


Figure 36: Free span from Fix.365 to Fix.368

6.6. Burial survey

The pipeline along its length was surveyed for burial. No section of burial was found during survey as table below.

6.7. Tie-in point survey

The pipeline along its length was surveyed for tie-in point. A total of 04 tie-in positions were found during the survey as table below.

Table 6: List of tie-in point

No.	Description	Fix	Easting	Northing	KP	Depth
1	Tie-in point	1	712888.36	1054463.30	3.515	51.84
2	Tie-in point	6	712896.14	1054472.32	3.503	51.97
3	Tie-in point	363	713780.72	1057819.85	-0.002	53.06
4	Tie-in point	369	713805.01	1057838.90	-0.025	52.29



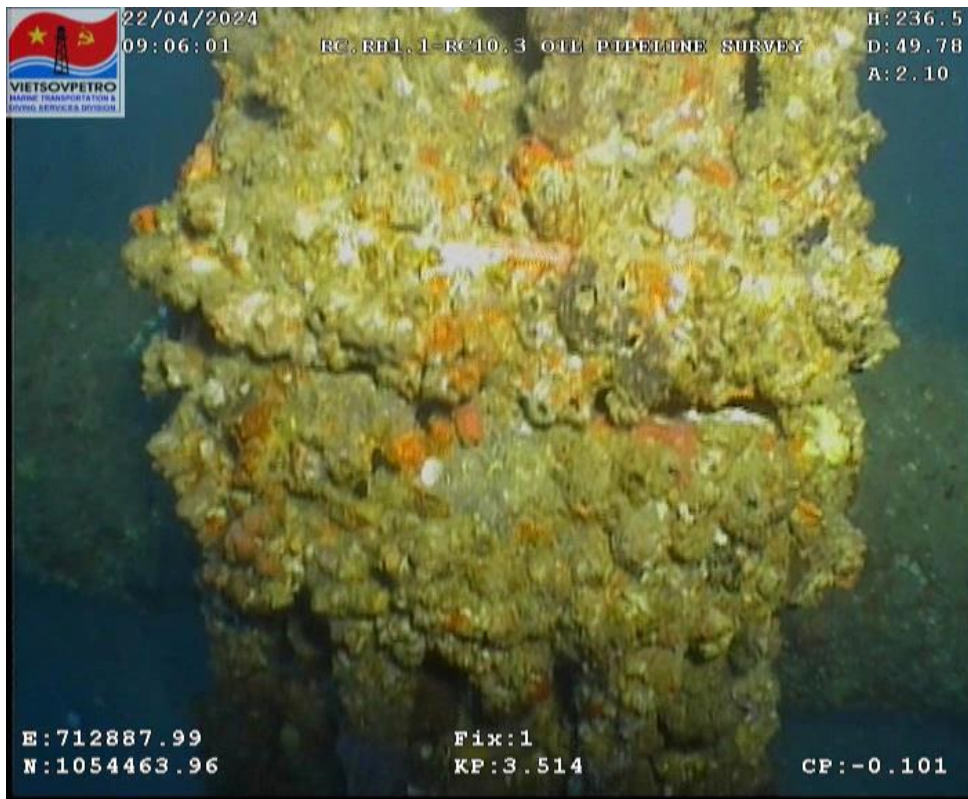


Figure 37: Tie-in point at Fix.1



Figure 38: Tie-in point at Fix.6





Figure 39: Tie-in point at Fix.363



Figure 40: Tie-in point at Fix.369



6.8. Concrete mattress survey

The pipeline along its length was surveyed for concrete mattress. A total of 08 concrete mattress & 02 concrete mattress not supporting among them were found during survey as table below.

Table 7: List of concrete mattresses

No.	Description	Fix	Easting	Northing	KP	Depth
1	Grout Mattress Corner	12	712913.36	1054493.94	3.476	51.85
	Grout Mattress Corner	13	712914.33	1054496.32	3.473	51.62
	Grout Mattress Corner	14	712907.57	1054498.82	3.474	52.07
	Grout Mattress Corner	15	712906.87	1054495.51	3.478	52.03
2	Grout Mattress Corner	18	712915.84	1054500.20	3.469	51.73
	Grout Mattress Corner	19	712916.10	1054502.10	3.468	51.36
	Grout Mattress Corner	20	712911.29	1054506.08	3.466	51.90
	Grout Mattress Corner	21	712910.28	1054504.16	3.468	51.92
3	Grout Mattress Corner	33	712959.01	1054570.93	3.386	51.81
	Grout Mattress Corner	34	712959.76	1054574.05	3.383	51.41
	Grout Mattress Corner	35	712953.42	1054575.15	3.384	51.90
	Grout Mattress Corner	36	712952.97	1054572.86	3.387	51.90
4	Grout Mattress Corner	39	712961.74	1054575.82	3.381	51.72
	Grout Mattress Corner	40	712963.00	1054578.69	3.378	51.20
	Grout Mattress Corner	41	712956.79	1054580.80	3.379	51.73
	Grout Mattress Corner	42	712955.39	1054578.63	3.380	51.82
5	Grout Mattress Corner	45	712966.48	1054581.91	3.373	51.70
	Grout Mattress Corner	46	712967.38	1054585.25	3.370	51.26
	Grout Mattress Corner	47	712960.57	1054586.71	3.372	51.74
	Grout Mattress Corner	48	712960.13	1054583.41	3.375	51.70
6	Grout Mattress Corner	51	712970.30	1054588.23	3.366	51.60
	Grout Mattress Corner	52	712971.25	1054590.89	3.363	51.45
	Grout Mattress Corner	53	712965.48	1054592.78	3.364	51.68
	Grout Mattress Corner	54	712964.52	1054590.69	3.366	51.84
7 (not supporting)	Grout Mattress Corner	67	713033.83	1054703.25	3.234	51.77
	Grout Mattress Corner	68	713036.07	1054705.99	3.231	51.50
	Grout Mattress Corner	69	713040.83	1054702.76	3.231	51.32
	Grout Mattress Corner	70	713039.08	1054699.64	3.235	51.66
8	Grout Mattress Corner	72	713042.34	1054706.52	3.227	51.74
	Grout Mattress Corner	73	713044.15	1054709.68	3.223	51.53
	Grout Mattress Corner	74	713039.90	1054712.84	3.223	51.62
	Grout Mattress Corner	75	713036.16	1054710.97	3.227	51.59
9 (not supporting)	Grout Mattress Corner	79	713042.14	1054718.86	3.216	51.56
	Grout Mattress Corner	80	713043.81	1054720.77	3.214	51.42
	Grout Mattress Corner	81	713048.69	1054719.45	3.213	51.16
	Grout Mattress Corner	82	713046.91	1054717.17	3.216	51.39





Figure 41: Concrete mattress #1



Figure 42: Concrete mattress #2





Figure 43: Concrete mattress #3



Figure 44: Concrete mattress #4





Figure 45: Concrete mattress #5



Figure 46: Concrete mattress #6





Figure 47: Concrete mattress #7 not supporting



Figure 48: Concrete mattress #8





Figure 49: Concrete mattress #9 not supporting





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SURVEY OIL PIPELINE RC10.3-RC.RB1.11



7 APPENDICES

7.1 Event Logs

Table 8: Event logs

ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.36	
Date:	22-04-24	Client: VSP	Report No.:	P.37-24	
Dive No.:	P.3018	Location: Dragon oil field	Depth:	52m	
DVD No.:	P.37-24	Extra Equipment: N/A	Vessel:	Sao Mai 03	
RC10.3 -RC.RB1.11 OIL PIPELINE SURVEY					
Time	Code	Description	Fix	KP	Depth
8:56	V.SOS	Video Start of Survey at RC.RB1			
8:58	R.C	Riser Clamp at EL -7m			
8:59	R.C	Riser Clamp at EL -14m			
9:00	R.C	Riser Clamp at EL -21m			
9:01	R.C	Riser Clamp at EL -26m			
9:02	R.C	Riser Clamp at EL -33m			
9:03	R.C	Riser Clamp at EL -41m			
9:05	TI.PO	Tie-in point at EL -50m	1	3.515	51.84
9:07	R.EL	Riser Elbow (gap=0.4m)	2	3.514	51.83
9:08	F.S	Freespan Start	2	3.514	51.83
9:09	DH	Debris Hard	2	3.514	51.83
9:09	B.PL	Bend of pipeline	3	3.511	51.88
9:10	0-25%A.W	Anode wastage 0-25%	4	3.510	51.48
9:11	F.E	Freespan End. Max Gap = 0.4m. L = 10m	5	3.504	51.64
9:11	TI.PO	Tie-in point	6	3.503	51.97
9:12	F.S	Freespan Start	8	3.491	51.89
9:13	GB.S	Grouts Bag Support	10	3.479	52.26
9:14	F.E	Freespan End. Max Gap = 0.35m. L = 12m	10	3.479	52.26
9:15	GM.S	Grout Mattress Start	11	3.477	51.97
9:16	GM.C	Grout Mattress Corner	12	3.476	51.85
9:16	GM.C	Grout Mattress Corner	13	3.473	51.62
9:17	GM.C	Grout Mattress Corner	14	3.474	52.07
9:18	GM.C	Grout Mattress Corner	15	3.478	52.03
9:18	GM.E	Grout Mattress End	16	3.474	51.33
9:19	F.S	Freespan Start	16	3.474	51.33
9:19	X.CO	Crossing Over Power Cable	16	3.474	51.33
9:20	F.E	Freespan End. Max Gap = 0.3m. L = 4m	17	3.470	52.00
9:20	GM.S	Grout Mattress Start	17	3.470	52.00
9:21	GM.C	Grout Mattress Corner	18	3.469	51.73
9:21	GM.C	Grout Mattress Corner	19	3.468	51.36
9:22	GM.C	Grout Mattress Corner	20	3.466	51.90
9:22	GM.C	Grout Mattress Corner	21	3.468	51.92
9:23	GM.E	Grout Mattress End	22	3.466	51.30
9:23	F.S	Freespan Start	22	3.466	51.30
9:23	F.E	Freespan End. Max Gap = 0.3m. L = 5m	23	3.461	52.01
9:23	GB.S	Grouts Bag Support	23	3.461	52.01
9:25	F.S	Freespan Start	23	3.461	52.01
9:26	0-25%A.W	Anode wastage 0-25%	24	3.458	51.42
9:26	AN.CP	Anode CP Reading -1045mV	24	3.458	51.42





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



ROV:	Panther 932	Contractor:	VSP	Task No.:	B.42.2.36
Date:	22-04-24	Client:	VSP	Report No.:	P.37-24
Dive No.:	P.3018	Location:	Dragon oil field	Depth:	52m
DVD No.:	P.37-24	Extra Equipment:	N/A	Vessel:	Sao Mai 03

RC10.3 -RC.RB1.11 OIL PIPELINE SURVEY

Time	Code	Description	Fix	KP	Depth
9:29	F.E	Freespan End. Max Gap = 0.3m. L = 12m	25	3.449	51.88
9:32	F.S	Freespan Start	30	3.402	51.80
9:33	F.E	Freespan End. Max Gap = 0.3m. L = 16m	32	3.386	51.95
9:33	GM.S	Grout Mattress Start	32	3.386	51.95
9:34	GM.C	Grout Mattress Corner	33	3.386	51.81
9:34	GM.C	Grout Mattress Corner	34	3.383	51.41
9:35	GM.C	Grout Mattress Corner	35	3.384	51.90
9:35	GM.C	Grout Mattress Corner	36	3.387	51.90
9:36	GM.E	Grout Mattress End	37	3.385	51.46
9:36	GM.S	Grout Mattress Start	38	3.380	51.90
9:37	GM.C	Grout Mattress Corner	39	3.381	51.72
9:37	GM.C	Grout Mattress Corner	40	3.378	51.20
9:37	GM.C	Grout Mattress Corner	41	3.379	51.73
9:38	GM.C	Grout Mattress Corner	42	3.380	51.82
9:39	GM.E	Grout Mattress End	43	3.378	51.08
9:39	X.PO	Crossing Over Pipelines (fully burial)	44	3.375	50.94
9:39	GM.S	Grout Mattress Start	44	3.375	50.94
9:39	GM.C	Grout Mattress Corner	45	3.373	51.70
9:40	GM.C	Grout Mattress Corner	46	3.370	51.26
9:40	GM.C	Grout Mattress Corner	47	3.372	51.74
9:40	GM.C	Grout Mattress Corner	48	3.375	51.70
9:41	GM.E	Grout Mattress End	49	3.371	50.87
9:41	0-25% A.W	Anode wastage 0-25%	50	3.366	51.89
9:42	GM.S	Grout Mattress Start	50	3.366	51.89
9:42	GM.C	Grout Mattress Corner	51	3.366	51.60
9:42	GM.C	Grout Mattress Corner	52	3.363	51.45
9:43	GM.C	Grout Mattress Corner	53	3.364	51.68
9:43	GM.C	Grout Mattress Corner	54	3.366	51.84
9:43	GM.E	Grout Mattress End	55	3.363	51.42
9:43	F.S	Freespan Start	55	3.363	51.42
9:45	F.E	Freespan End. Max Gap = 0.2m. L = 16m	57	3.347	51.92
9:46	0-25% A.W	Anode wastage 0-25%	60	3.312	51.57
9:49	F.S	Freespan Start	65	3.254	51.51
9:50	GM.NS	Grout Mattress Not Supporting	67	3.234	51.77
9:50	GM.C	Grout Mattress Corner	67	3.234	51.77
9:51	GM.C	Grout Mattress Corner	68	3.231	51.50
9:52	GM.C	Grout Mattress Corner	69	3.231	51.32
9:52	GM.C	Grout Mattress Corner	70	3.235	51.66
9:53	F.E	Freespan End. Max Gap = 1m. L = 28m	71	3.226	51.65
9:53	GM.S	Grout Mattress Start	71	3.226	51.65
9:55	GM.C	Grout Mattress Corner	72	3.227	51.74
9:55	GM.C	Grout Mattress Corner	73	3.223	51.53
9:55	GM.C	Grout Mattress Corner	74	3.223	51.62
9:56	GM.C	Grout Mattress Corner	75	3.227	51.59
9:58	X.PO	Crossing Over a Pipeline	77	3.223	50.09
9:58	GM.E	Grout Mattress End	77	3.223	50.09

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SURVEY OIL PIPELINE RC10.3-RC.RB1.11



ROV:	Panther 932	Contractor:	VSP	Task No.:	B.42.2.36
Date:	22-04-24	Client:	VSP	Report No.:	P.37-24
Dive No.:	P.3018	Location:	Dragon oil field	Depth:	52m
DVD No.:	P.37-24	Extra Equipment:	N/A	Vessel:	Sao Mai 03

RC10.3 -RC.RB1.11 OIL PIPELINE SURVEY

Time	Code	Description	Fix	KP	Depth
9:59	F.S	Freespan Start	78	3.222	50.20
10:00	GM.NS	Grout Mattress Not Supporting	79	3.216	51.56
10:00	GM.C	Grout Mattress Corner	79	3.216	51.56
10:01	GM.C	Grout Mattress Corner	80	3.214	51.42
10:01	GM.C	Grout Mattress Corner	81	3.213	51.16
10:01	GM.C	Grout Mattress Corner	82	3.216	51.39
10:03	F.E	Freespan End. Max Gap = 0.3m. L = 28m	84	3.194	51.59
10:05	0-25% A.W	Anode wastage 0-25%	87	3.165	51.53
10:06	DS.NT	Debris Soft Netting	89	3.141	51.28
10:09	0-25% A.W	Anode wastage 0-25%	100	3.018	51.14
10:15	0-25% A.W	Anode wastage 0-25%	113	2.868	50.85
10:25	AN.CP	Anode CP Reading -1005mV	126	2.719	50.71
14:13	0-25% A.W	Anode wastage 0-25%	139	2.569	50.90
14:18	0-25% A.W	Anode wastage 0-25%	152	2.422	50.93
14:24	0-25% A.W	Anode wastage 0-25%	165	2.274	50.95
14:29	0-25% A.W	Anode wastage 0-25%	178	2.127	51.76
14:35	0-25% A.W	Anode wastage 0-25%	191	1.979	51.79
14:40	0-25% A.W	Anode wastage 0-25%	204	1.832	52.16
14:46	AN.CP	Anode CP Reading -1014mV	216	1.687	52.63
14:53	0-25% A.W	Anode wastage 0-25%	229	1.538	52.43
14:58	0-25% A.W	Anode wastage 0-25%	241	1.394	52.06
15:04	0-25% A.W	Anode wastage 0-25%	255	1.233	51.55
8:08	0-25% A.W	Anode wastage 0-25%	268	1.085	51.79
8:14	0-25% A.W	Anode wastage 0-25%	281	0.937	52.54
8:18	0-25% A.W	Anode wastage 0-25%	293	0.804	52.57
8:29	0-25% A.W	Anode wastage 0-25%	318	0.506	52.08
8:34	0-25% A.W	Anode wastage 0-25%	332	0.346	52.48
8:38	0-25% A.W	Anode wastage 0-25%	346	0.186	52.73
8:45	AN.CP	Anode CP Reading -1027mV	359	0.031	53.23
8:49	TI.PO	Tie-in point	363	-0.002	53.06
8:49	0-25% A.W	Anode wastage 0-25%	364	-0.011	53.15
8:50	F.S	Freespan Start	365	-0.012	53.18
8:50	B.PL	Bend of pipeline	366	-0.018	53.49
8:51	B.PL	Bend of pipeline	367	-0.026	53.21
8:53	F.E	Freespan End. Max Gap = 0.3m. L = 12m	368	-0.024	51.98
8:53	R.EL	Riser Elbow (gap=0.3m)	368	-0.024	51.98
8:54	TI.PO	Tie-in point at EL -50m	369	-0.025	52.29
8:57	R.C	Riser Clamp at EL -41m			
8:59	R.C	Riser Clamp at EL -35m			
8:59	R.C	Riser Clamp at EL -29m			
9:01	R.C	Riser Clamp at EL -24m			
9:02	R.C	Riser Clamp at EL -20m			
9:03	R.C	Riser Clamp at EL -15m			
9:04	R.C	Riser Clamp at EL -10m			
9:04	R.C	Riser Clamp at EL -5m			
9:05	V.EQS	Video End of Survey at RC10			





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7.2 Co-ordinates

Table 9: Co-ordinates

Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
1	712888.36	1054463.30	9°32.2022'N	107°56.1357'E	3.515	51.84
2	712888.59	1054464.20	9°32.2027'N	107°56.1358'E	3.514	51.83
3	712891.08	1054465.67	9°32.2035'N	107°56.1372'E	3.511	51.88
4	712893.03	1054466.04	9°32.2037'N	107°56.1383'E	3.510	51.48
5	712895.81	1054471.20	9°32.2065'N	107°56.1398'E	3.504	51.64
6	712896.14	1054472.32	9°32.2071'N	107°56.1400'E	3.503	51.97
7	712899.68	1054479.44	9°32.2110'N	107°56.1419'E	3.495	51.71
8	712901.82	1054482.96	9°32.2129'N	107°56.1431'E	3.491	51.89
9	712906.73	1054490.38	9°32.2169'N	107°56.1458'E	3.482	52.01
10	712908.37	1054492.99	9°32.2183'N	107°56.1467'E	3.479	52.26
11	712909.48	1054495.35	9°32.2195'N	107°56.1473'E	3.477	51.97
12	712913.36	1054493.94	9°32.2188'N	107°56.1495'E	3.476	51.85
13	712914.33	1054496.32	9°32.2201'N	107°56.1500'E	3.473	51.62
14	712907.57	1054498.82	9°32.2214'N	107°56.1463'E	3.474	52.07
15	712906.87	1054495.51	9°32.2196'N	107°56.1459'E	3.478	52.03
16	712911.13	1054497.31	9°32.2206'N	107°56.1483'E	3.474	51.33
17	712912.86	1054501.14	9°32.2227'N	107°56.1492'E	3.470	52.00
18	712915.84	1054500.20	9°32.2222'N	107°56.1508'E	3.469	51.73
19	712916.10	1054502.10	9°32.2232'N	107°56.1510'E	3.468	51.36
20	712911.29	1054506.08	9°32.2254'N	107°56.1484'E	3.466	51.90
21	712910.28	1054504.16	9°32.2243'N	107°56.1478'E	3.468	51.92
22	712915.10	1054503.92	9°32.2242'N	107°56.1504'E	3.466	51.30
23	712918.76	1054507.76	9°32.2263'N	107°56.1525'E	3.461	52.01
24	712919.99	1054510.18	9°32.2276'N	107°56.1531'E	3.458	51.42
25	712924.41	1054517.28	9°32.2314'N	107°56.1556'E	3.449	51.88
26	712927.47	1054524.21	9°32.2351'N	107°56.1573'E	3.442	51.61
27	712931.82	1054532.70	9°32.2397'N	107°56.1597'E	3.433	51.40
28	712938.57	1054542.85	9°32.2452'N	107°56.1634'E	3.420	51.70
29	712944.72	1054553.26	9°32.2509'N	107°56.1668'E	3.409	51.79
30	712948.64	1054559.25	9°32.2541'N	107°56.1689'E	3.402	51.80
31	712953.08	1054567.54	9°32.2586'N	107°56.1714'E	3.393	51.87
32	712955.05	1054572.18	9°32.2611'N	107°56.1725'E	3.386	51.95
33	712959.01	1054570.93	9°32.2604'N	107°56.1746'E	3.386	51.81
34	712959.76	1054574.05	9°32.2621'N	107°56.1751'E	3.383	51.41
35	712953.42	1054575.15	9°32.2627'N	107°56.1716'E	3.384	51.90
36	712952.97	1054572.86	9°32.2615'N	107°56.1713'E	3.387	51.90
37	712956.47	1054573.69	9°32.2619'N	107°56.1733'E	3.385	51.46
38	712959.06	1054577.18	9°32.2638'N	107°56.1747'E	3.380	51.90
39	712961.74	1054575.82	9°32.2630'N	107°56.1761'E	3.381	51.72
40	712963.00	1054578.69	9°32.2646'N	107°56.1768'E	3.378	51.20
41	712956.79	1054580.80	9°32.2658'N	107°56.1735'E	3.379	51.73





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
42	712955.39	1054578.63	9°32.2646'N	107°56.1727'E	3.380	51.82
43	712958.66	1054580.24	9°32.2654'N	107°56.1745'E	3.378	51.08
44	712960.82	1054583.02	9°32.2669'N	107°56.1757'E	3.375	50.94
45	712966.48	1054581.91	9°32.2663'N	107°56.1788'E	3.373	51.70
46	712967.38	1054585.25	9°32.2681'N	107°56.1793'E	3.370	51.26
47	712960.57	1054586.71	9°32.2689'N	107°56.1755'E	3.372	51.74
48	712960.13	1054583.41	9°32.2672'N	107°56.1753'E	3.375	51.70
49	712963.44	1054586.08	9°32.2686'N	107°56.1771'E	3.371	50.87
50	712965.83	1054589.91	9°32.2707'N	107°56.1784'E	3.366	51.89
51	712970.30	1054588.23	9°32.2697'N	107°56.1809'E	3.366	51.60
52	712971.25	1054590.89	9°32.2712'N	107°56.1814'E	3.363	51.45
53	712965.48	1054592.78	9°32.2722'N	107°56.1782'E	3.364	51.68
54	712964.52	1054590.69	9°32.2711'N	107°56.1777'E	3.366	51.84
55	712967.58	1054592.59	9°32.2721'N	107°56.1794'E	3.363	51.42
56	712973.17	1054599.39	9°32.2758'N	107°56.1825'E	3.355	51.82
57	712977.03	1054606.92	9°32.2799'N	107°56.1846'E	3.347	51.92
58	712984.83	1054617.30	9°32.2855'N	107°56.1889'E	3.333	51.68
59	712991.20	1054627.19	9°32.2908'N	107°56.1924'E	3.322	51.52
60	712995.92	1054635.23	9°32.2952'N	107°56.1950'E	3.312	51.57
61	713001.48	1054644.28	9°32.3000'N	107°56.1981'E	3.302	51.56
62	713008.10	1054654.50	9°32.3056'N	107°56.2017'E	3.290	51.49
63	713014.30	1054665.63	9°32.3116'N	107°56.2051'E	3.276	51.41
64	713020.42	1054676.99	9°32.3177'N	107°56.2085'E	3.264	51.64
65	713026.06	1054684.48	9°32.3218'N	107°56.2116'E	3.254	51.51
66	713031.58	1054694.30	9°32.3271'N	107°56.2147'E	3.243	51.19
67	713033.83	1054703.25	9°32.3319'N	107°56.2159'E	3.234	51.77
68	713036.07	1054705.99	9°32.3334'N	107°56.2172'E	3.231	51.50
69	713040.83	1054702.76	9°32.3316'N	107°56.2197'E	3.231	51.32
70	713039.08	1054699.64	9°32.3300'N	107°56.2188'E	3.235	51.66
71	713040.49	1054708.93	9°32.3350'N	107°56.2196'E	3.226	51.65
72	713042.34	1054706.52	9°32.3337'N	107°56.2206'E	3.227	51.74
73	713044.15	1054709.68	9°32.3354'N	107°56.2216'E	3.223	51.53
74	713039.90	1054712.84	9°32.3371'N	107°56.2193'E	3.223	51.62
75	713036.16	1054710.97	9°32.3361'N	107°56.2172'E	3.227	51.59
76	713038.71	1054707.04	9°32.3340'N	107°56.2186'E	3.228	51.55
77	713042.50	1054711.39	9°32.3363'N	107°56.2207'E	3.223	50.09
78	713042.82	1054711.85	9°32.3366'N	107°56.2209'E	3.222	50.20
79	713042.14	1054718.86	9°32.3404'N	107°56.2205'E	3.216	51.56
80	713043.81	1054720.77	9°32.3414'N	107°56.2214'E	3.214	51.42
81	713048.69	1054719.45	9°32.3407'N	107°56.2241'E	3.213	51.16
82	713046.91	1054717.17	9°32.3394'N	107°56.2231'E	3.216	51.39
83	713049.94	1054726.70	9°32.3446'N	107°56.2248'E	3.206	51.47
84	713055.37	1054737.49	9°32.3504'N	107°56.2278'E	3.194	51.59





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
85	713062.48	1054750.33	9°32.3574'N	107°56.2317'E	3.179	51.45
86	713068.51	1054760.86	9°32.3631'N	107°56.2351'E	3.167	51.27
87	713069.43	1054762.77	9°32.3641'N	107°56.2356'E	3.165	51.53
88	713075.39	1054772.47	9°32.3693'N	107°56.2388'E	3.154	51.31
89	713081.38	1054782.94	9°32.3750'N	107°56.2422'E	3.141	51.28
90	713086.97	1054793.40	9°32.3807'N	107°56.2452'E	3.129	51.20
91	713093.00	1054803.75	9°32.3863'N	107°56.2486'E	3.118	51.20
92	713099.12	1054814.30	9°32.3920'N	107°56.2519'E	3.106	51.29
93	713105.21	1054824.30	9°32.3974'N	107°56.2553'E	3.093	50.54
94	713111.01	1054834.97	9°32.4031'N	107°56.2585'E	3.079	51.25
95	713116.75	1054845.52	9°32.4088'N	107°56.2617'E	3.069	51.29
96	713123.17	1054856.00	9°32.4145'N	107°56.2652'E	3.056	51.25
97	713129.15	1054866.14	9°32.4200'N	107°56.2685'E	3.045	51.25
98	713135.61	1054876.78	9°32.4257'N	107°56.2721'E	3.033	51.22
99	713141.85	1054886.93	9°32.4312'N	107°56.2755'E	3.021	51.15
100	713143.77	1054889.79	9°32.4328'N	107°56.2766'E	3.018	51.14
101	713149.63	1054899.98	9°32.4383'N	107°56.2798'E	3.005	51.04
102	713155.98	1054910.54	9°32.4440'N	107°56.2833'E	2.993	50.97
103	713161.90	1054920.55	9°32.4494'N	107°56.2866'E	2.979	51.08
104	713167.90	1054931.37	9°32.4552'N	107°56.2899'E	2.969	51.14
105	713173.65	1054941.51	9°32.4607'N	107°56.2931'E	2.957	51.05
106	713179.71	1054951.92	9°32.4664'N	107°56.2964'E	2.943	51.04
107	713185.49	1054962.79	9°32.4722'N	107°56.2996'E	2.933	50.94
108	713191.08	1054973.05	9°32.4778'N	107°56.3027'E	2.919	50.97
109	713197.12	1054983.70	9°32.4835'N	107°56.3060'E	2.909	50.99
110	713202.55	1054994.30	9°32.4893'N	107°56.3090'E	2.895	50.95
111	713208.27	1055005.08	9°32.4951'N	107°56.3122'E	2.883	51.00
112	713213.55	1055015.70	9°32.5009'N	107°56.3151'E	2.870	50.88
113	713214.82	1055017.66	9°32.5019'N	107°56.3158'E	2.868	50.85
114	713220.18	1055028.45	9°32.5077'N	107°56.3187'E	2.858	50.72
115	713225.60	1055039.25	9°32.5136'N	107°56.3217'E	2.844	50.72
116	713230.68	1055049.99	9°32.5194'N	107°56.3245'E	2.833	50.90
117	713235.61	1055060.94	9°32.5253'N	107°56.3273'E	2.821	50.67
118	713240.60	1055072.09	9°32.5314'N	107°56.3300'E	2.808	50.85
119	713245.30	1055083.11	9°32.5373'N	107°56.3326'E	2.796	50.80
120	713249.86	1055094.17	9°32.5433'N	107°56.3352'E	2.784	50.79
121	713254.40	1055105.30	9°32.5493'N	107°56.3377'E	2.773	50.80
122	713258.48	1055116.59	9°32.5554'N	107°56.3399'E	2.759	50.92
123	713263.05	1055127.73	9°32.5615'N	107°56.3425'E	2.745	50.77
124	713267.15	1055139.03	9°32.5676'N	107°56.3447'E	2.735	50.72
125	713271.31	1055150.19	9°32.5736'N	107°56.3471'E	2.723	50.87
126	713272.39	1055154.76	9°32.5761'N	107°56.3477'E	2.719	50.71
127	713277.87	1055165.36	9°32.5818'N	107°56.3507'E	2.705	50.68





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
128	713281.81	1055176.57	9°32.5879'N	107°56.3529'E	2.695	50.64
129	713286.03	1055188.23	9°32.5942'N	107°56.3552'E	2.681	50.61
130	713289.00	1055199.83	9°32.6005'N	107°56.3569'E	2.670	50.65
131	713292.31	1055211.50	9°32.6068'N	107°56.3587'E	2.657	50.93
132	713295.71	1055223.05	9°32.6131'N	107°56.3606'E	2.645	50.90
133	713299.22	1055234.34	9°32.6192'N	107°56.3626'E	2.634	50.86
134	713303.10	1055245.93	9°32.6254'N	107°56.3647'E	2.621	50.71
135	713305.95	1055257.63	9°32.6318'N	107°56.3663'E	2.608	50.90
136	713309.31	1055269.01	9°32.6379'N	107°56.3682'E	2.596	50.90
137	713312.45	1055280.32	9°32.6441'N	107°56.3699'E	2.584	50.92
138	713315.94	1055292.02	9°32.6504'N	107°56.3719'E	2.571	50.88
139	713316.56	1055294.72	9°32.6519'N	107°56.3722'E	2.569	50.90
140	713319.46	1055306.45	9°32.6582'N	107°56.3738'E	2.556	50.95
141	713321.03	1055318.45	9°32.6647'N	107°56.3747'E	2.545	51.16
142	713324.55	1055329.92	9°32.6709'N	107°56.3767'E	2.533	51.01
143	713327.24	1055341.62	9°32.6773'N	107°56.3782'E	2.521	51.05
144	713329.12	1055353.54	9°32.6837'N	107°56.3793'E	2.509	51.12
145	713332.29	1055364.92	9°32.6899'N	107°56.3810'E	2.497	51.00
146	713334.87	1055376.71	9°32.6963'N	107°56.3825'E	2.485	50.99
147	713337.63	1055388.46	9°32.7026'N	107°56.3840'E	2.473	50.98
148	713340.40	1055400.31	9°32.7091'N	107°56.3856'E	2.461	50.22
149	713342.70	1055411.83	9°32.7153'N	107°56.3869'E	2.449	50.80
150	713343.44	1055423.93	9°32.7219'N	107°56.3873'E	2.437	51.10
151	713345.06	1055432.27	9°32.7264'N	107°56.3882'E	2.429	50.89
152	713345.83	1055438.51	9°32.7298'N	107°56.3887'E	2.422	50.93
153	713348.26	1055450.57	9°32.7363'N	107°56.3900'E	2.410	50.85
154	713349.83	1055462.16	9°32.7426'N	107°56.3909'E	2.398	50.87
155	713351.53	1055474.44	9°32.7492'N	107°56.3919'E	2.386	50.95
156	713353.34	1055486.27	9°32.7556'N	107°56.3929'E	2.374	50.89
157	713355.26	1055497.84	9°32.7619'N	107°56.3940'E	2.362	50.91
158	713357.37	1055509.55	9°32.7683'N	107°56.3952'E	2.350	50.87
159	713359.72	1055521.56	9°32.7748'N	107°56.3965'E	2.338	50.91
160	713362.23	1055533.16	9°32.7811'N	107°56.3979'E	2.326	50.97
161	713364.67	1055545.30	9°32.7876'N	107°56.3993'E	2.314	50.97
162	713366.58	1055557.08	9°32.7940'N	107°56.4004'E	2.302	50.95
163	713368.44	1055568.66	9°32.8003'N	107°56.4014'E	2.290	50.93
164	713370.39	1055580.56	9°32.8067'N	107°56.4025'E	2.278	50.97
165	713371.32	1055584.16	9°32.8087'N	107°56.4030'E	2.274	50.95
166	713373.38	1055595.65	9°32.8149'N	107°56.4042'E	2.263	50.94
167	713375.75	1055607.87	9°32.8215'N	107°56.4055'E	2.250	50.90
168	713378.22	1055619.79	9°32.8280'N	107°56.4069'E	2.238	51.05
169	713379.87	1055631.52	9°32.8343'N	107°56.4078'E	2.226	50.29
170	713382.48	1055643.23	9°32.8407'N	107°56.4093'E	2.214	51.28





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
171	713384.58	1055655.11	9°32.8471'N	107°56.4105'E	2.202	51.46
172	713386.88	1055667.00	9°32.8536'N	107°56.4118'E	2.190	51.53
173	713389.36	1055678.41	9°32.8597'N	107°56.4132'E	2.178	51.64
174	713391.72	1055690.41	9°32.8663'N	107°56.4145'E	2.166	51.66
175	713393.59	1055702.07	9°32.8726'N	107°56.4156'E	2.154	51.66
176	713395.70	1055713.95	9°32.8790'N	107°56.4168'E	2.142	51.70
177	713397.75	1055725.75	9°32.8854'N	107°56.4179'E	2.130	51.73
178	713398.36	1055729.46	9°32.8874'N	107°56.4183'E	2.127	51.76
179	713400.59	1055741.34	9°32.8938'N	107°56.4195'E	2.114	51.77
180	713403.09	1055753.02	9°32.9002'N	107°56.4209'E	2.102	51.16
181	713404.68	1055764.70	9°32.9065'N	107°56.4218'E	2.091	51.88
182	713407.45	1055776.46	9°32.9129'N	107°56.4234'E	2.079	51.81
183	713409.90	1055788.18	9°32.9192'N	107°56.4247'E	2.067	51.89
184	713412.11	1055799.92	9°32.9256'N	107°56.4260'E	2.055	51.85
185	713414.66	1055811.82	9°32.9320'N	107°56.4274'E	2.042	51.81
186	713416.53	1055823.55	9°32.9384'N	107°56.4285'E	2.031	51.89
187	713418.74	1055835.67	9°32.9450'N	107°56.4297'E	2.018	51.82
188	713420.97	1055847.12	9°32.9512'N	107°56.4310'E	2.007	51.79
189	713423.15	1055858.96	9°32.9576'N	107°56.4322'E	1.994	51.81
190	713425.13	1055870.72	9°32.9639'N	107°56.4333'E	1.983	51.76
191	713425.81	1055874.18	9°32.9658'N	107°56.4337'E	1.979	51.79
192	713427.70	1055885.80	9°32.9721'N	107°56.4348'E	1.967	51.72
193	713429.85	1055897.41	9°32.9784'N	107°56.4360'E	1.955	51.74
194	713432.26	1055909.48	9°32.9849'N	107°56.4373'E	1.943	51.75
195	713434.19	1055921.09	9°32.9912'N	107°56.4384'E	1.931	51.75
196	713436.46	1055933.27	9°32.9978'N	107°56.4397'E	1.919	51.80
197	713438.43	1055944.90	9°33.0041'N	107°56.4408'E	1.907	51.85
198	713440.80	1055956.87	9°33.0106'N	107°56.4421'E	1.895	51.85
199	713443.20	1055968.36	9°33.0168'N	107°56.4435'E	1.883	51.88
200	713445.21	1055980.18	9°33.0233'N	107°56.4446'E	1.871	51.96
201	713447.24	1055992.02	9°33.0297'N	107°56.4458'E	1.859	52.07
202	713449.85	1056003.89	9°33.0361'N	107°56.4472'E	1.847	52.13
203	713451.46	1056015.49	9°33.0424'N	107°56.4481'E	1.835	52.13
204	713451.65	1056019.02	9°33.0443'N	107°56.4483'E	1.832	52.16
205	713453.66	1056031.38	9°33.0510'N	107°56.4494'E	1.819	52.21
206	713455.95	1056042.89	9°33.0572'N	107°56.4507'E	1.807	52.25
207	713458.68	1056054.73	9°33.0636'N	107°56.4522'E	1.795	52.32
208	713461.23	1056066.04	9°33.0698'N	107°56.4536'E	1.784	52.41
209	713463.19	1056077.95	9°33.0762'N	107°56.4547'E	1.772	52.49
210	713465.34	1056089.69	9°33.0826'N	107°56.4560'E	1.760	52.48
211	713467.77	1056101.80	9°33.0891'N	107°56.4573'E	1.747	52.60
212	713469.81	1056113.48	9°33.0955'N	107°56.4585'E	1.735	52.63
213	713472.76	1056125.49	9°33.1020'N	107°56.4601'E	1.723	52.62





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
214	713475.03	1056137.03	9°33.1082'N	107°56.4614'E	1.711	52.54
215	713477.29	1056148.93	9°33.1147'N	107°56.4627'E	1.699	52.66
216	713479.27	1056160.84	9°33.1211'N	107°56.4638'E	1.687	52.63
217	713481.74	1056172.38	9°33.1274'N	107°56.4652'E	1.675	52.71
218	713483.97	1056184.31	9°33.1339'N	107°56.4664'E	1.663	52.63
219	713485.85	1056196.07	9°33.1402'N	107°56.4675'E	1.651	52.60
220	713487.11	1056208.08	9°33.1467'N	107°56.4682'E	1.639	52.63
221	713489.26	1056219.91	9°33.1531'N	107°56.4694'E	1.627	52.55
222	713491.49	1056231.52	9°33.1594'N	107°56.4707'E	1.615	52.51
223	713493.40	1056243.44	9°33.1659'N	107°56.4718'E	1.603	52.47
224	713495.41	1056255.28	9°33.1723'N	107°56.4729'E	1.591	52.48
225	713497.43	1056267.45	9°33.1789'N	107°56.4740'E	1.579	52.42
226	713499.55	1056278.92	9°33.1851'N	107°56.4752'E	1.567	52.43
227	713501.57	1056291.10	9°33.1917'N	107°56.4764'E	1.555	52.36
228	713503.95	1056302.68	9°33.1980'N	107°56.4777'E	1.543	52.42
229	713504.96	1056307.78	9°33.2008'N	107°56.4783'E	1.538	52.43
230	713507.19	1056319.55	9°33.2071'N	107°56.4795'E	1.526	52.38
231	713509.35	1056331.36	9°33.2135'N	107°56.4807'E	1.514	52.33
232	713511.19	1056343.22	9°33.2200'N	107°56.4818'E	1.502	52.36
233	713513.15	1056354.72	9°33.2262'N	107°56.4829'E	1.490	52.31
234	713515.26	1056366.93	9°33.2328'N	107°56.4841'E	1.478	52.29
235	713517.07	1056378.70	9°33.2392'N	107°56.4851'E	1.466	52.24
236	713519.28	1056390.77	9°33.2457'N	107°56.4864'E	1.453	52.22
237	713521.23	1056402.60	9°33.2521'N	107°56.4875'E	1.442	52.21
238	713523.30	1056414.00	9°33.2583'N	107°56.4886'E	1.430	51.62
239	713525.66	1056426.07	9°33.2648'N	107°56.4900'E	1.418	52.12
240	713528.03	1056437.83	9°33.2712'N	107°56.4913'E	1.406	52.11
241	713530.46	1056449.18	9°33.2774'N	107°56.4926'E	1.394	52.06
242	713531.25	1056453.81	9°33.2799'N	107°56.4931'E	1.389	52.10
243	713533.52	1056465.60	9°33.2863'N	107°56.4944'E	1.377	51.99
244	713535.97	1056477.72	9°33.2928'N	107°56.4957'E	1.365	51.97
245	713538.07	1056489.19	9°33.2990'N	107°56.4969'E	1.353	51.94
246	713540.63	1056501.22	9°33.3056'N	107°56.4984'E	1.341	51.93
247	713542.74	1056512.68	9°33.3118'N	107°56.4995'E	1.329	51.93
248	713544.96	1056524.64	9°33.3182'N	107°56.5008'E	1.317	51.80
249	713547.30	1056536.24	9°33.3245'N	107°56.5021'E	1.305	51.79
250	713549.01	1056548.47	9°33.3312'N	107°56.5031'E	1.293	51.75
251	713551.19	1056559.94	9°33.3374'N	107°56.5043'E	1.281	51.69
252	713552.92	1056571.98	9°33.3439'N	107°56.5053'E	1.269	51.72
253	713555.39	1056583.86	9°33.3503'N	107°56.5067'E	1.257	51.71
254	713557.90	1056595.72	9°33.3568'N	107°56.5081'E	1.245	51.69
255	713560.15	1056607.15	9°33.3630'N	107°56.5094'E	1.233	51.55
256	713562.48	1056618.74	9°33.3692'N	107°56.5107'E	1.221	51.60





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
257	713564.75	1056630.93	9°33.3758'N	107°56.5119'E	1.209	51.57
258	713566.66	1056642.43	9°33.3821'N	107°56.5130'E	1.197	51.57
259	713568.98	1056654.53	9°33.3886'N	107°56.5143'E	1.185	51.61
260	713571.01	1056666.18	9°33.3949'N	107°56.5155'E	1.173	51.67
261	713572.82	1056677.92	9°33.4013'N	107°56.5165'E	1.161	51.71
262	713575.04	1056689.70	9°33.4077'N	107°56.5177'E	1.149	51.69
263	713577.38	1056701.69	9°33.4142'N	107°56.5191'E	1.137	51.67
264	713579.53	1056713.59	9°33.4206'N	107°56.5203'E	1.125	51.69
265	713581.60	1056725.68	9°33.4272'N	107°56.5214'E	1.112	51.76
266	713583.55	1056736.94	9°33.4333'N	107°56.5225'E	1.101	51.68
267	713585.23	1056748.84	9°33.4397'N	107°56.5235'E	1.089	51.80
268	713586.22	1056753.13	9°33.4421'N	107°56.5240'E	1.085	51.79
269	713588.19	1056765.04	9°33.4485'N	107°56.5252'E	1.073	51.77
270	713590.22	1056776.56	9°33.4547'N	107°56.5263'E	1.061	51.96
271	713591.77	1056788.86	9°33.4614'N	107°56.5272'E	1.048	52.04
272	713594.15	1056800.69	9°33.4678'N	107°56.5285'E	1.036	51.97
273	713595.73	1056812.50	9°33.4742'N	107°56.5294'E	1.024	52.20
274	713598.19	1056824.30	9°33.4806'N	107°56.5308'E	1.012	52.17
275	713600.30	1056836.03	9°33.4870'N	107°56.5320'E	1.000	52.20
276	713602.42	1056847.82	9°33.4934'N	107°56.5332'E	0.988	52.30
277	713604.28	1056859.70	9°33.4998'N	107°56.5342'E	0.976	52.34
278	713606.44	1056871.19	9°33.5060'N	107°56.5355'E	0.964	52.39
279	713609.43	1056883.25	9°33.5126'N	107°56.5371'E	0.952	52.36
280	713611.99	1056894.93	9°33.5189'N	107°56.5386'E	0.940	52.05
281	713612.70	1056898.31	9°33.5207'N	107°56.5390'E	0.937	52.54
282	713615.00	1056909.94	9°33.5270'N	107°56.5403'E	0.925	52.40
283	713616.85	1056921.99	9°33.5335'N	107°56.5413'E	0.913	52.59
284	713619.74	1056933.87	9°33.5400'N	107°56.5429'E	0.901	52.61
285	713622.25	1056945.48	9°33.5463'N	107°56.5443'E	0.889	52.55
286	713624.73	1056956.97	9°33.5525'N	107°56.5457'E	0.877	52.55
287	713627.09	1056969.29	9°33.5592'N	107°56.5470'E	0.864	52.51
288	713629.09	1056980.47	9°33.5652'N	107°56.5482'E	0.853	52.55
289	713630.74	1056992.56	9°33.5718'N	107°56.5491'E	0.841	52.50
290	713632.65	1057004.65	9°33.5783'N	107°56.5502'E	0.828	52.59
291	713634.55	1057016.72	9°33.5849'N	107°56.5513'E	0.816	52.60
292	713636.45	1057028.09	9°33.5910'N	107°56.5523'E	0.805	52.58
293	713636.54	1057028.53	9°33.5913'N	107°56.5524'E	0.804	52.57
294	713638.95	1057040.23	9°33.5976'N	107°56.5537'E	0.792	52.57
295	713640.69	1057051.90	9°33.6039'N	107°56.5547'E	0.780	52.51
296	713642.90	1057064.04	9°33.6105'N	107°56.5560'E	0.768	52.45
297	713645.06	1057075.59	9°33.6168'N	107°56.5572'E	0.756	52.42
298	713646.97	1057087.36	9°33.6231'N	107°56.5583'E	0.744	52.41
299	713648.94	1057099.63	9°33.6298'N	107°56.5594'E	0.732	52.32





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
300	713650.77	1057111.12	9°33.6360'N	107°56.5604'E	0.720	52.33
301	713653.49	1057122.93	9°33.6424'N	107°56.5619'E	0.708	52.24
302	713655.56	1057134.62	9°33.6487'N	107°56.5631'E	0.696	52.18
303	713657.80	1057146.55	9°33.6552'N	107°56.5644'E	0.684	52.08
304	713659.71	1057158.71	9°33.6618'N	107°56.5655'E	0.671	52.29
305	713661.52	1057170.22	9°33.6680'N	107°56.5665'E	0.660	52.19
306	713663.48	1057182.02	9°33.6744'N	107°56.5676'E	0.648	52.20
307	713665.85	1057193.89	9°33.6809'N	107°56.5689'E	0.636	52.12
308	713667.82	1057205.73	9°33.6873'N	107°56.5700'E	0.624	52.09
309	713669.67	1057217.67	9°33.6937'N	107°56.5711'E	0.612	52.14
310	713672.17	1057229.15	9°33.7000'N	107°56.5725'E	0.600	52.13
311	713673.94	1057241.40	9°33.7066'N	107°56.5735'E	0.588	51.44
312	713675.87	1057253.11	9°33.7129'N	107°56.5746'E	0.575	52.12
313	713677.82	1057264.51	9°33.7191'N	107°56.5757'E	0.564	52.05
314	713679.92	1057276.85	9°33.7258'N	107°56.5769'E	0.552	52.07
315	713682.06	1057288.64	9°33.7322'N	107°56.5781'E	0.539	52.12
316	713684.15	1057300.36	9°33.7386'N	107°56.5792'E	0.527	52.19
317	713686.63	1057312.19	9°33.7450'N	107°56.5806'E	0.515	52.13
318	713688.52	1057321.52	9°33.7500'N	107°56.5817'E	0.506	52.08
319	713690.74	1057333.22	9°33.7564'N	107°56.5829'E	0.494	52.13
320	713692.79	1057344.88	9°33.7627'N	107°56.5841'E	0.482	52.21
321	713695.61	1057356.73	9°33.7691'N	107°56.5857'E	0.470	52.18
322	713698.17	1057368.23	9°33.7753'N	107°56.5871'E	0.458	52.26
323	713700.68	1057380.09	9°33.7817'N	107°56.5885'E	0.446	52.23
324	713703.31	1057391.76	9°33.7881'N	107°56.5900'E	0.434	52.33
325	713705.79	1057403.82	9°33.7946'N	107°56.5914'E	0.421	52.29
326	713707.97	1057415.22	9°33.8008'N	107°56.5926'E	0.410	52.35
327	713709.87	1057427.42	9°33.8074'N	107°56.5937'E	0.398	52.47
328	713712.32	1057439.02	9°33.8137'N	107°56.5951'E	0.386	51.44
329	713714.67	1057450.68	9°33.8200'N	107°56.5964'E	0.374	52.42
330	713716.95	1057462.56	9°33.8264'N	107°56.5977'E	0.362	52.28
331	713718.84	1057472.62	9°33.8319'N	107°56.5987'E	0.351	52.49
332	713719.32	1057477.83	9°33.8347'N	107°56.5990'E	0.346	52.48
333	713721.36	1057489.84	9°33.8412'N	107°56.6002'E	0.334	52.54
334	713723.55	1057501.53	9°33.8475'N	107°56.6014'E	0.322	52.60
335	713725.84	1057513.35	9°33.8539'N	107°56.6027'E	0.310	52.65
336	713727.56	1057525.01	9°33.8603'N	107°56.6037'E	0.298	52.62
337	713729.29	1057536.88	9°33.8667'N	107°56.6046'E	0.286	52.69
338	713732.55	1057548.82	9°33.8732'N	107°56.6065'E	0.274	52.47
339	713734.42	1057560.38	9°33.8794'N	107°56.6075'E	0.262	52.59
340	713736.44	1057572.65	9°33.8861'N	107°56.6087'E	0.250	52.67
341	713738.69	1057583.91	9°33.8922'N	107°56.6099'E	0.238	52.64
342	713740.76	1057595.90	9°33.8987'N	107°56.6111'E	0.226	52.58





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
343	713743.16	1057607.72	9°33.9051'N	107°56.6124'E	0.214	52.62
344	713744.96	1057619.30	9°33.9114'N	107°56.6135'E	0.202	52.68
345	713747.04	1057631.43	9°33.9179'N	107°56.6146'E	0.190	52.63
346	713747.88	1057635.57	9°33.9202'N	107°56.6151'E	0.186	52.73
347	713749.95	1057647.39	9°33.9266'N	107°56.6163'E	0.174	52.66
348	713751.81	1057659.09	9°33.9329'N	107°56.6173'E	0.162	52.72
349	713753.64	1057670.98	9°33.9394'N	107°56.6184'E	0.150	52.80
350	713755.85	1057682.75	9°33.9457'N	107°56.6196'E	0.138	52.78
351	713757.92	1057694.92	9°33.9523'N	107°56.6208'E	0.125	52.81
352	713759.85	1057706.46	9°33.9586'N	107°56.6219'E	0.114	52.85
353	713761.90	1057718.49	9°33.9651'N	107°56.6230'E	0.102	52.79
354	713763.67	1057730.57	9°33.9716'N	107°56.6240'E	0.089	52.79
355	713765.57	1057742.71	9°33.9782'N	107°56.6251'E	0.077	52.93
356	713768.04	1057755.73	9°33.9853'N	107°56.6265'E	0.064	52.95
357	713770.77	1057770.75	9°33.9934'N	107°56.6280'E	0.048	52.82
358	713772.54	1057781.84	9°33.9994'N	107°56.6290'E	0.037	53.08
359	713773.65	1057787.98	9°34.0028'N	107°56.6297'E	0.031	53.23
360	713776.57	1057795.96	9°34.0071'N	107°56.6313'E	0.022	53.22
361	713779.00	1057806.43	9°34.0127'N	107°56.6326'E	0.012	53.13
362	713779.88	1057816.03	9°34.0179'N	107°56.6331'E	0.002	53.06
363	713780.72	1057819.85	9°34.0200'N	107°56.6336'E	-0.002	53.06
364	713781.33	1057829.14	9°34.0251'N	107°56.6340'E	-0.011	53.15
365	713780.71	1057830.67	9°34.0259'N	107°56.6336'E	-0.012	53.18
366	713782.98	1057836.41	9°34.0290'N	107°56.6349'E	-0.018	53.49
367	713793.15	1057842.55	9°34.0323'N	107°56.6405'E	-0.026	53.21
368	713804.30	1057838.15	9°34.0299'N	107°56.6466'E	-0.024	51.98
369	713805.01	1057838.90	9°34.0303'N	107°56.6469'E	-0.025	52.29



7.3 Drawings

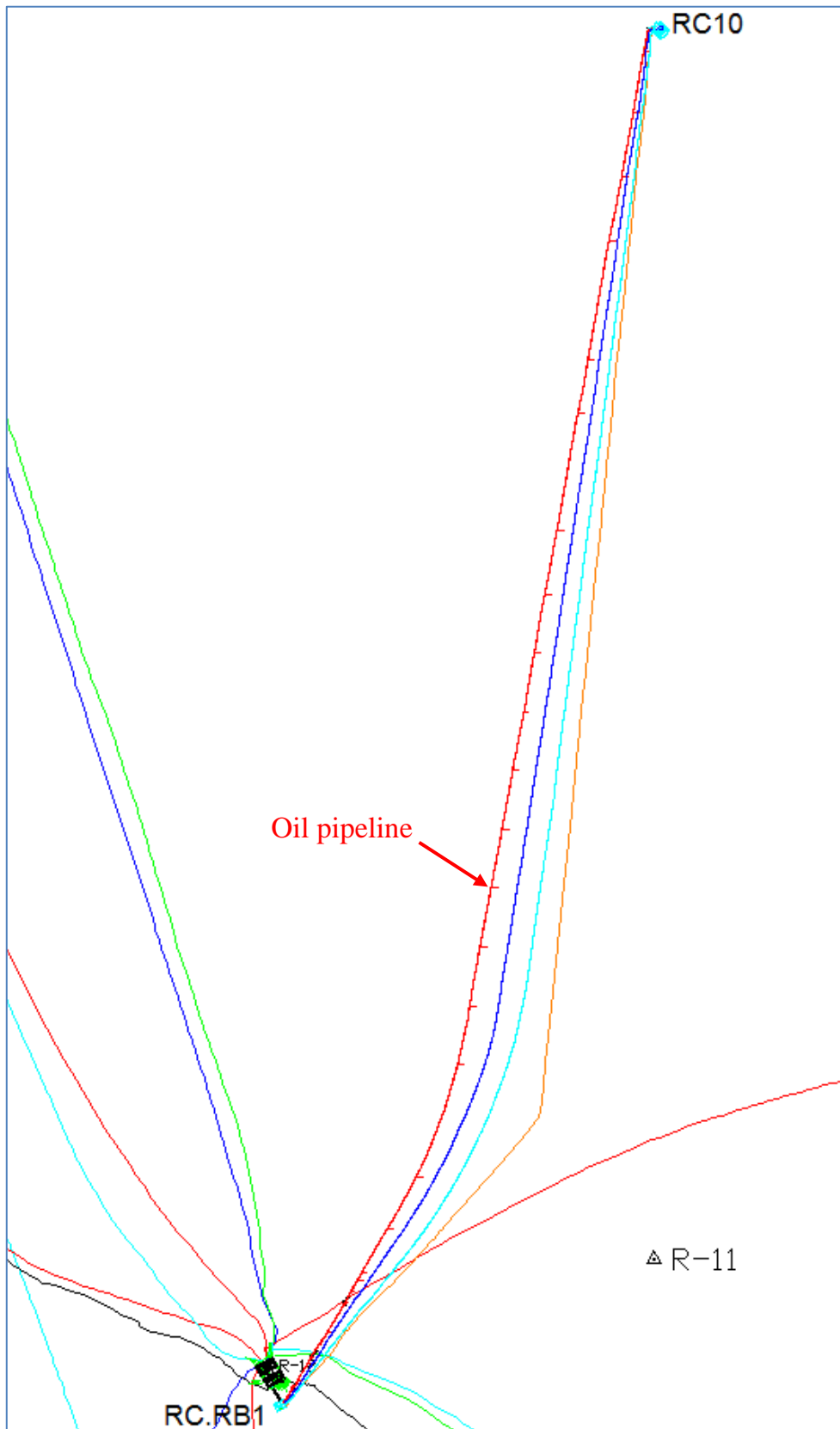


Figure 50: RC10-RC.RB1 oil pipeline route



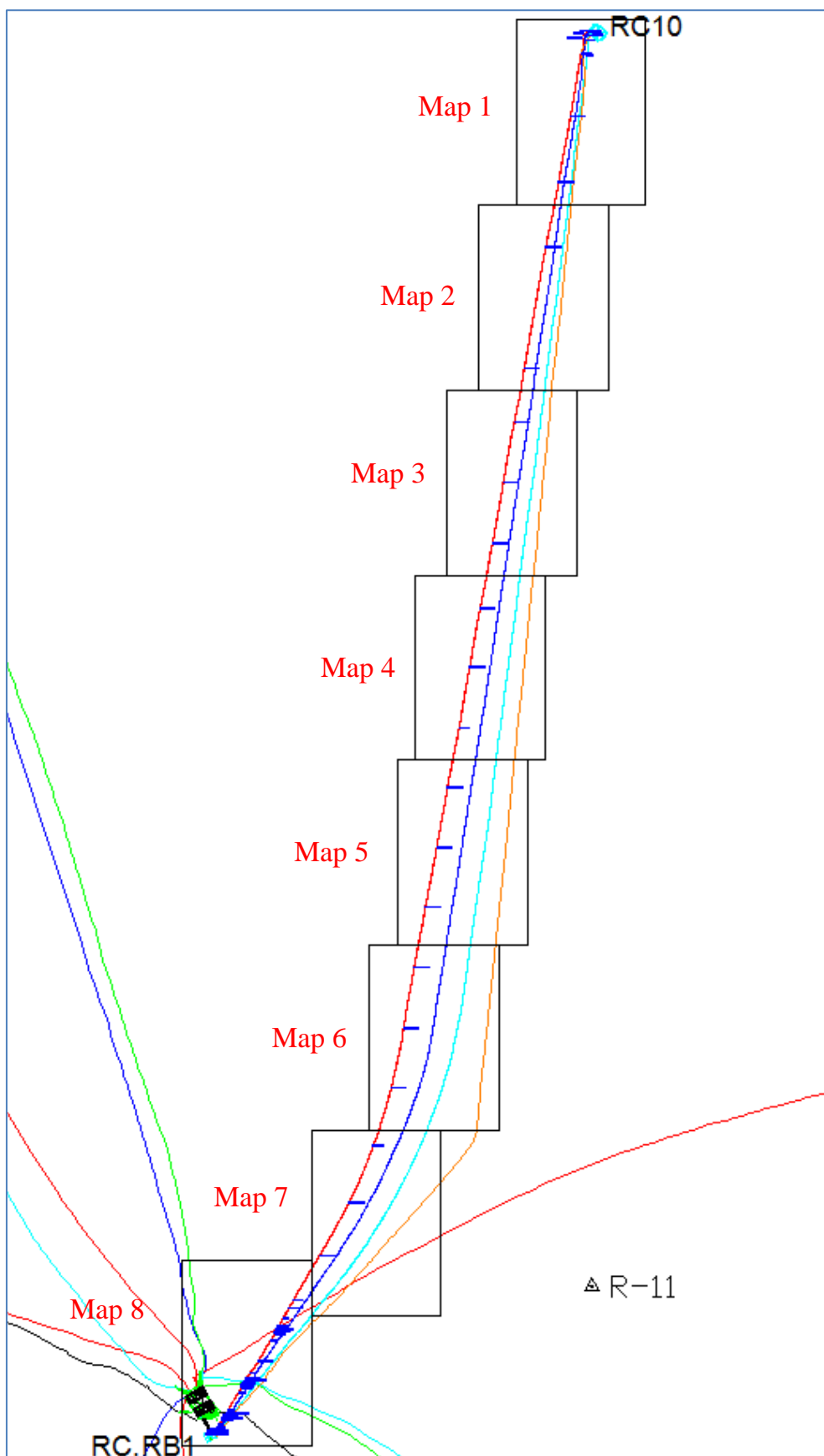


Figure 51: Pipeline sections drawing



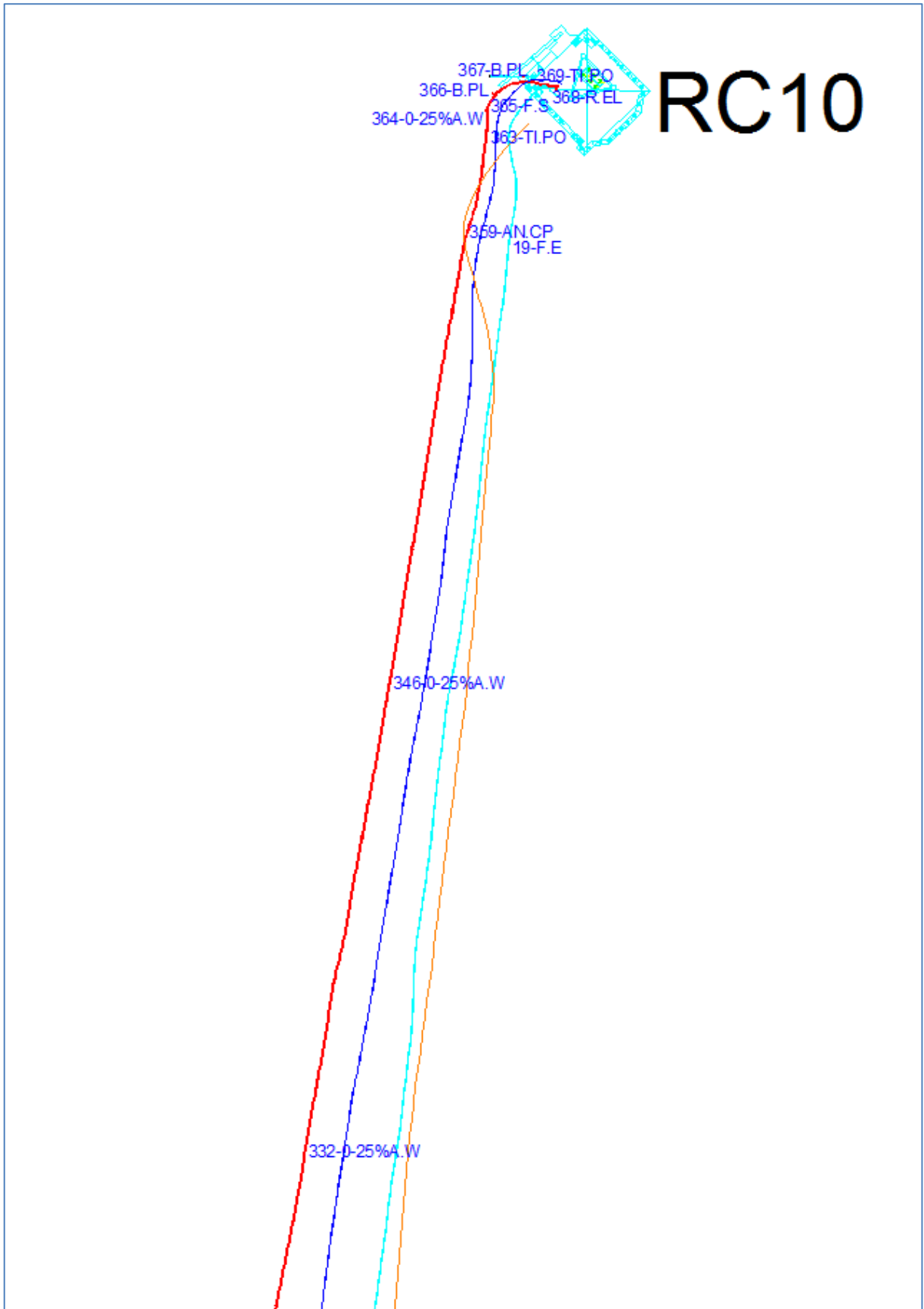


Figure 52: Map 1



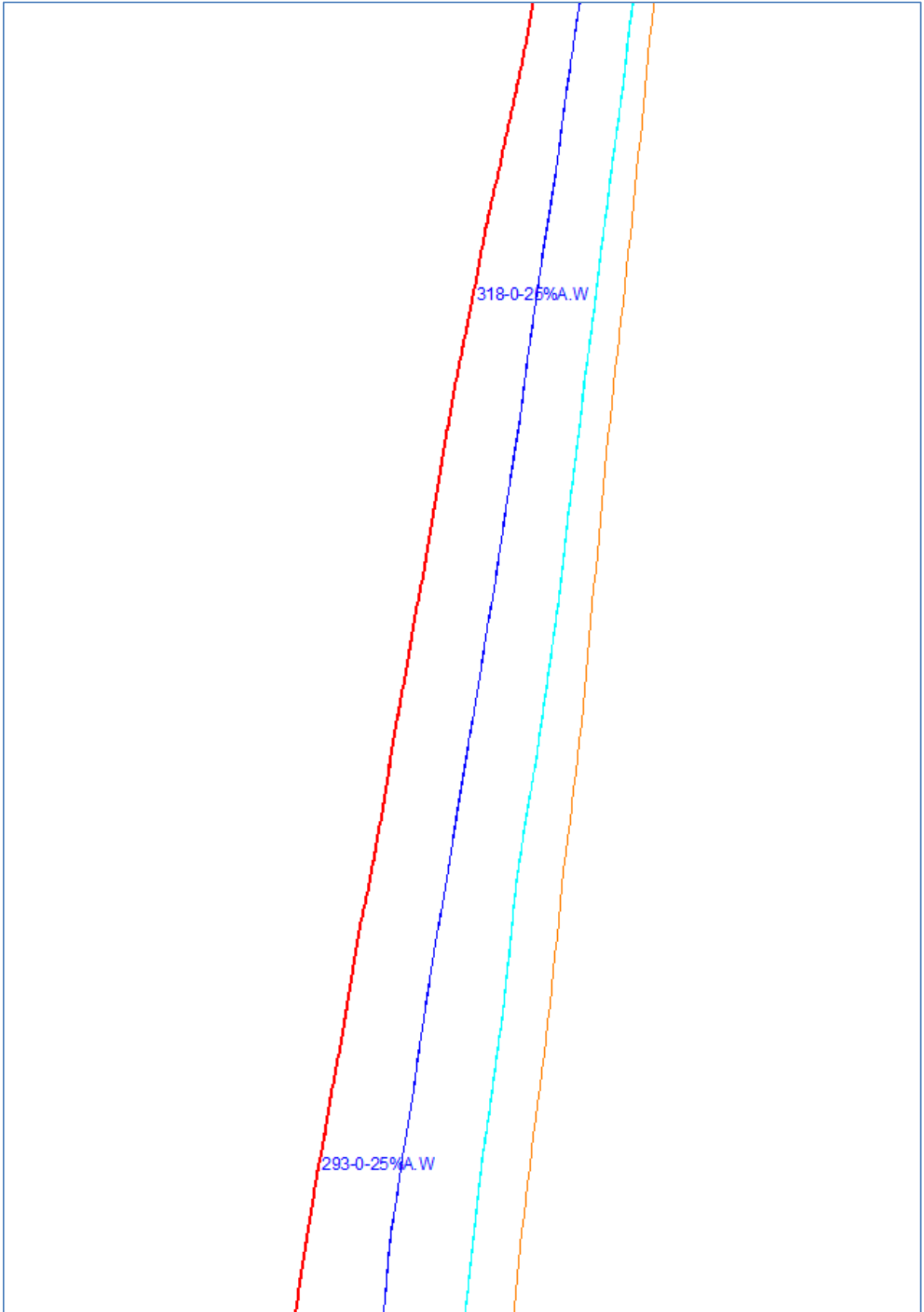


Figure 53: Map 2



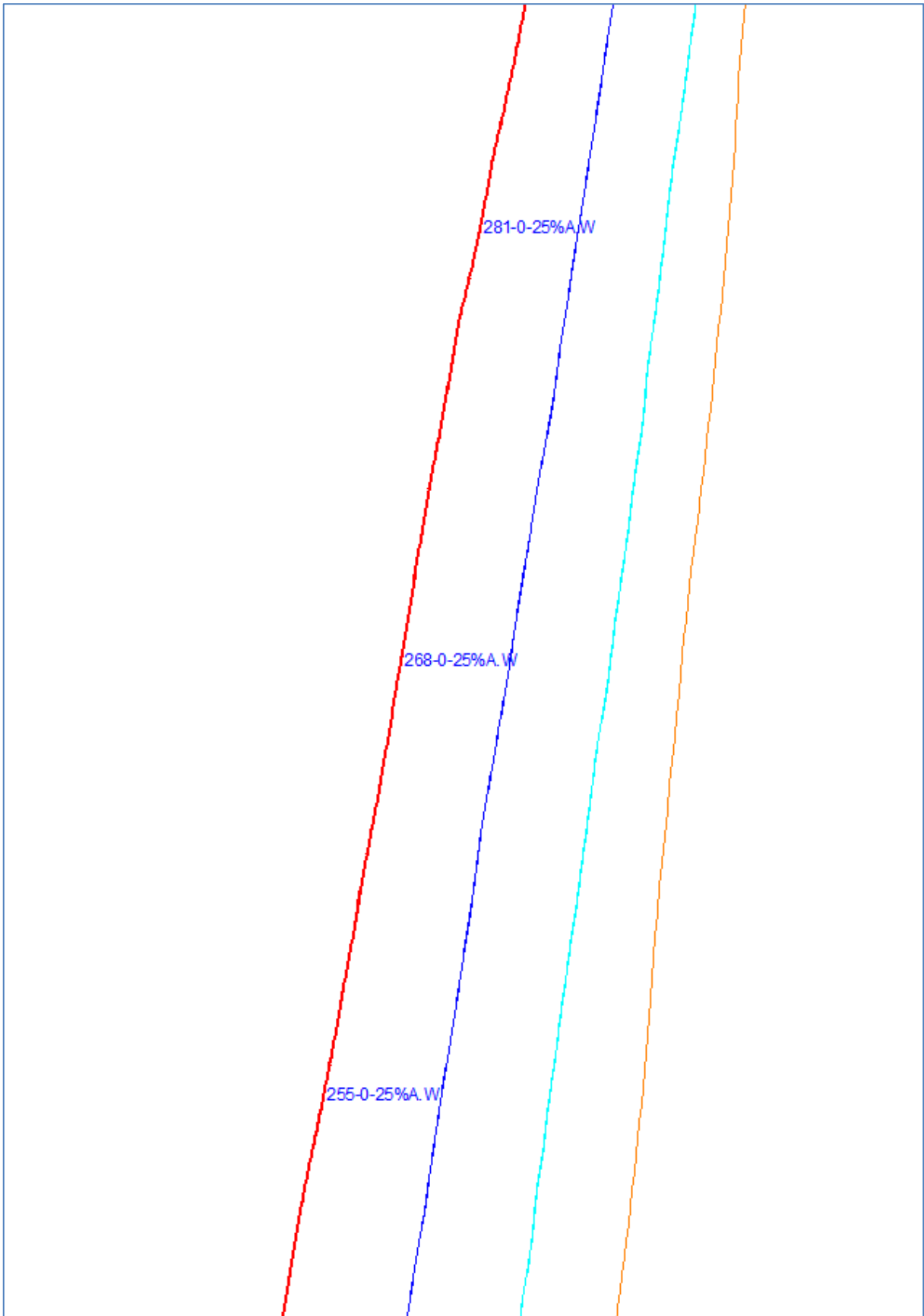


Figure 54: Map 3



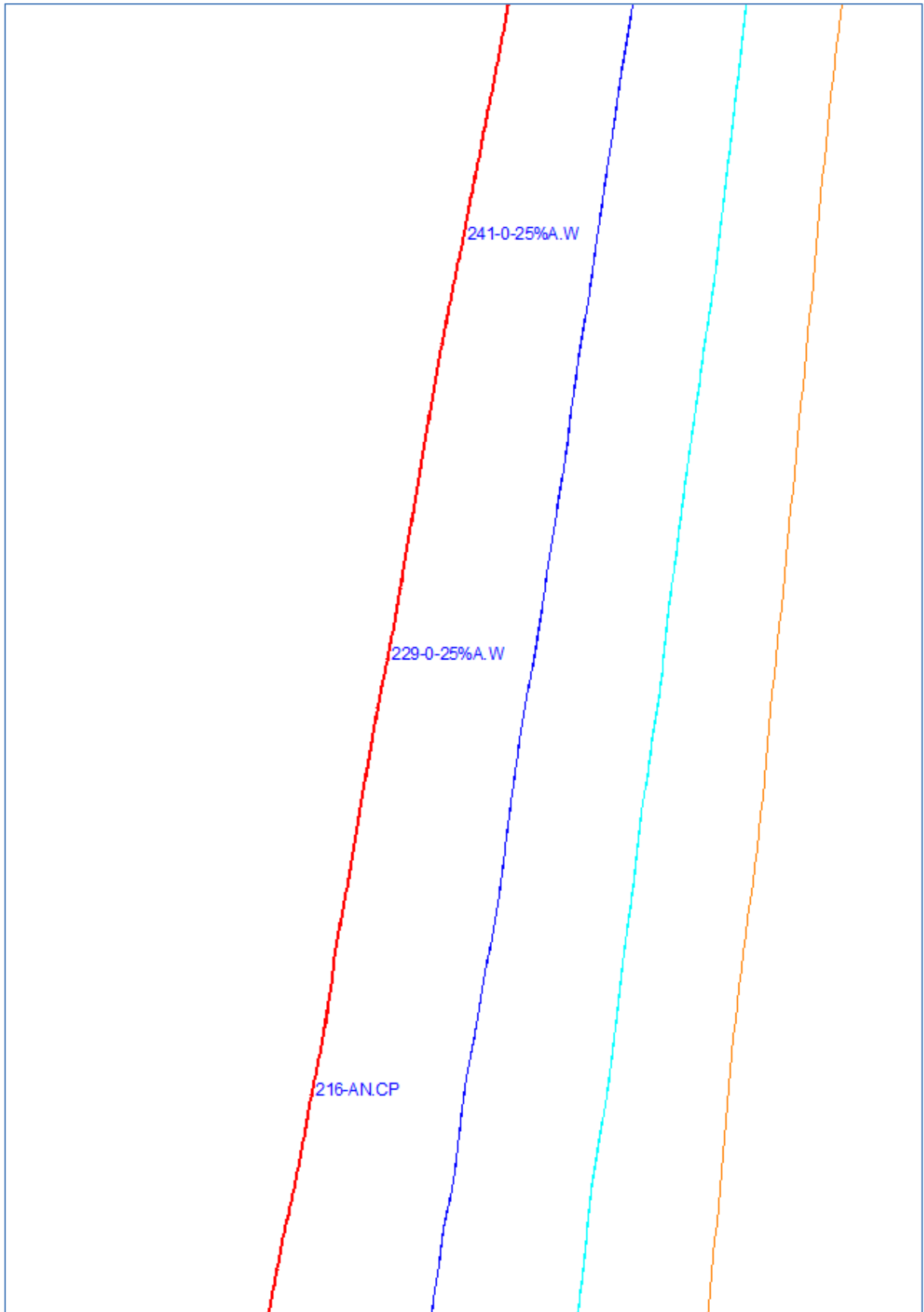


Figure 55: Map 4



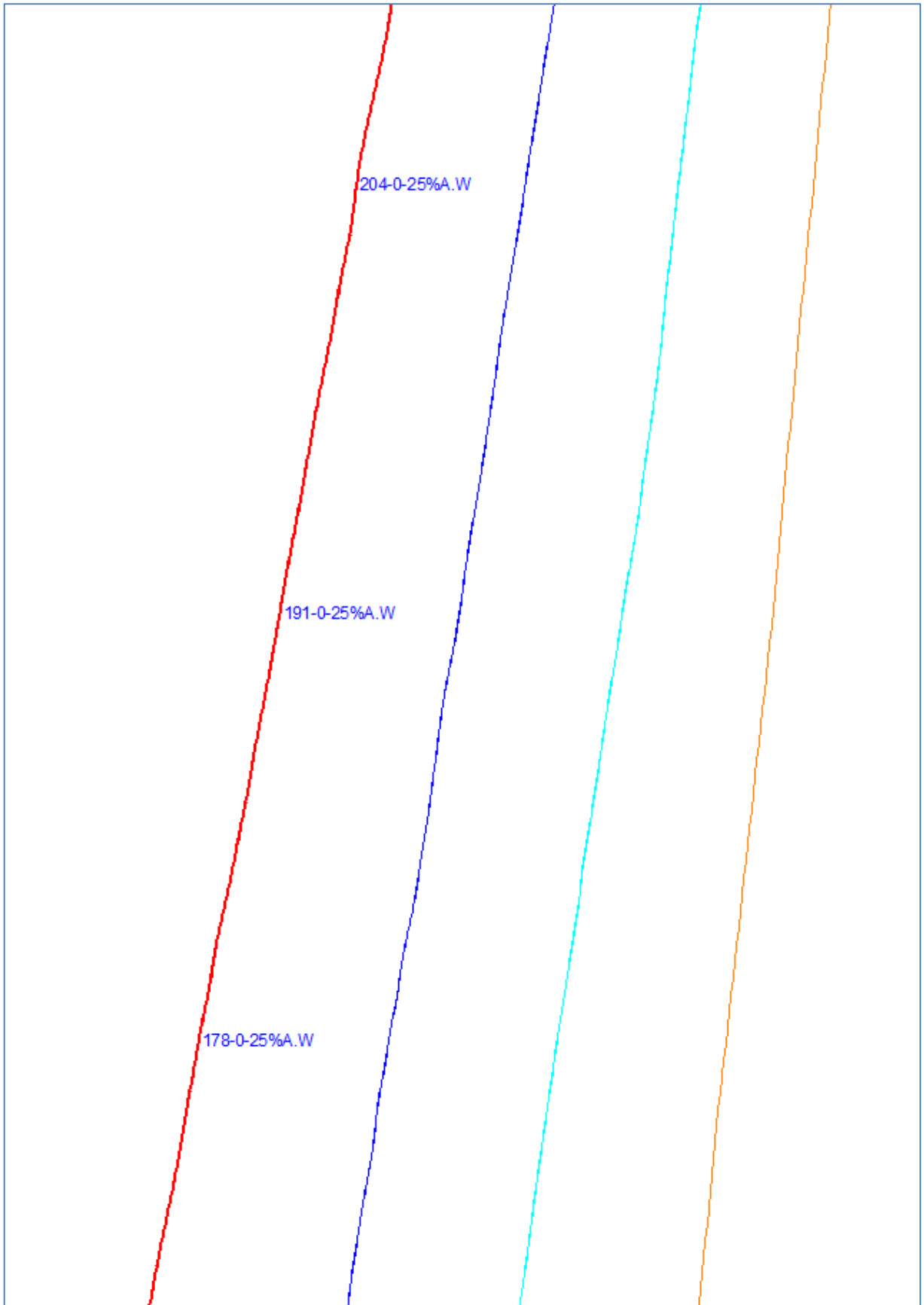


Figure 56: Map 5



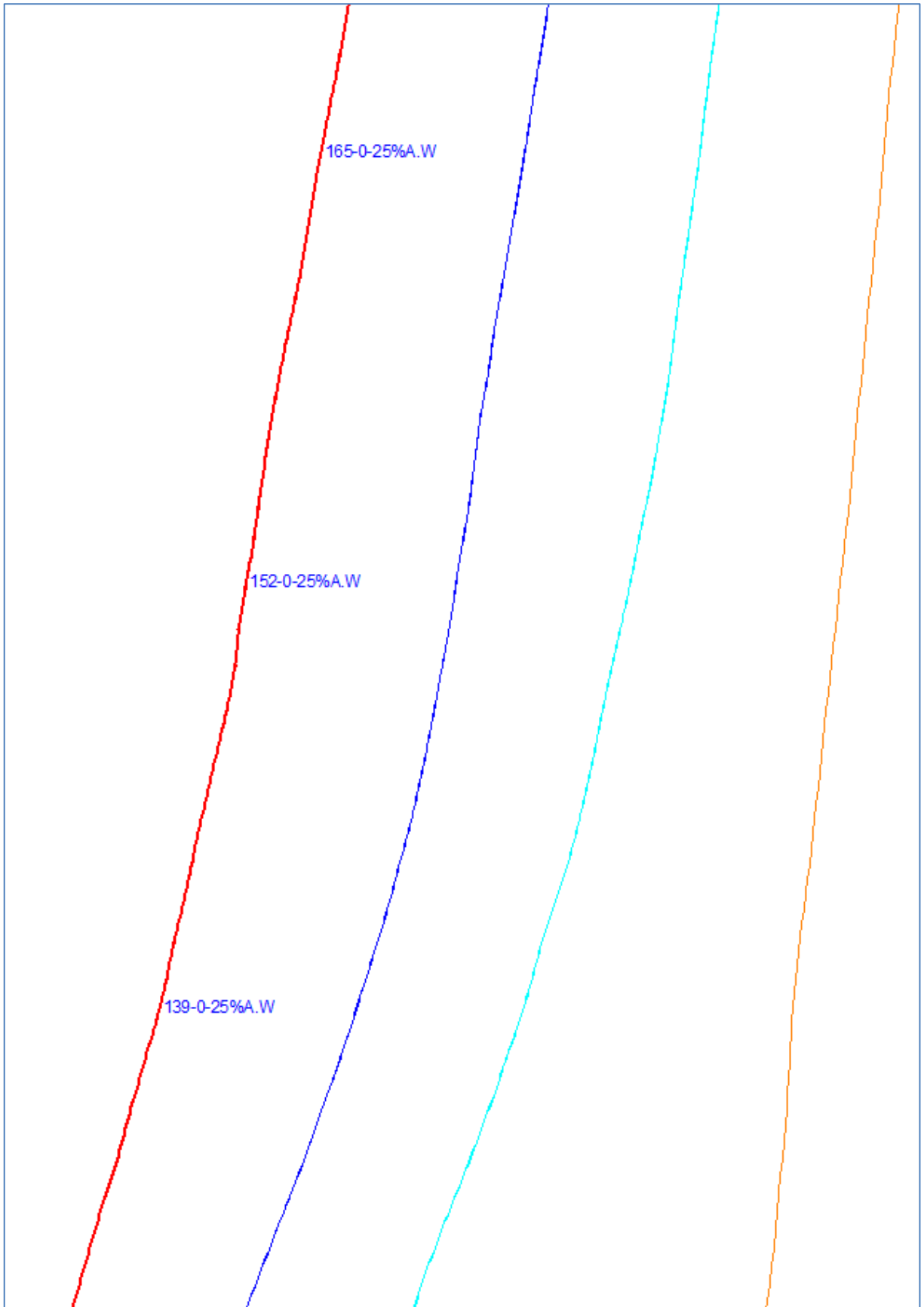


Figure 57: Map 6



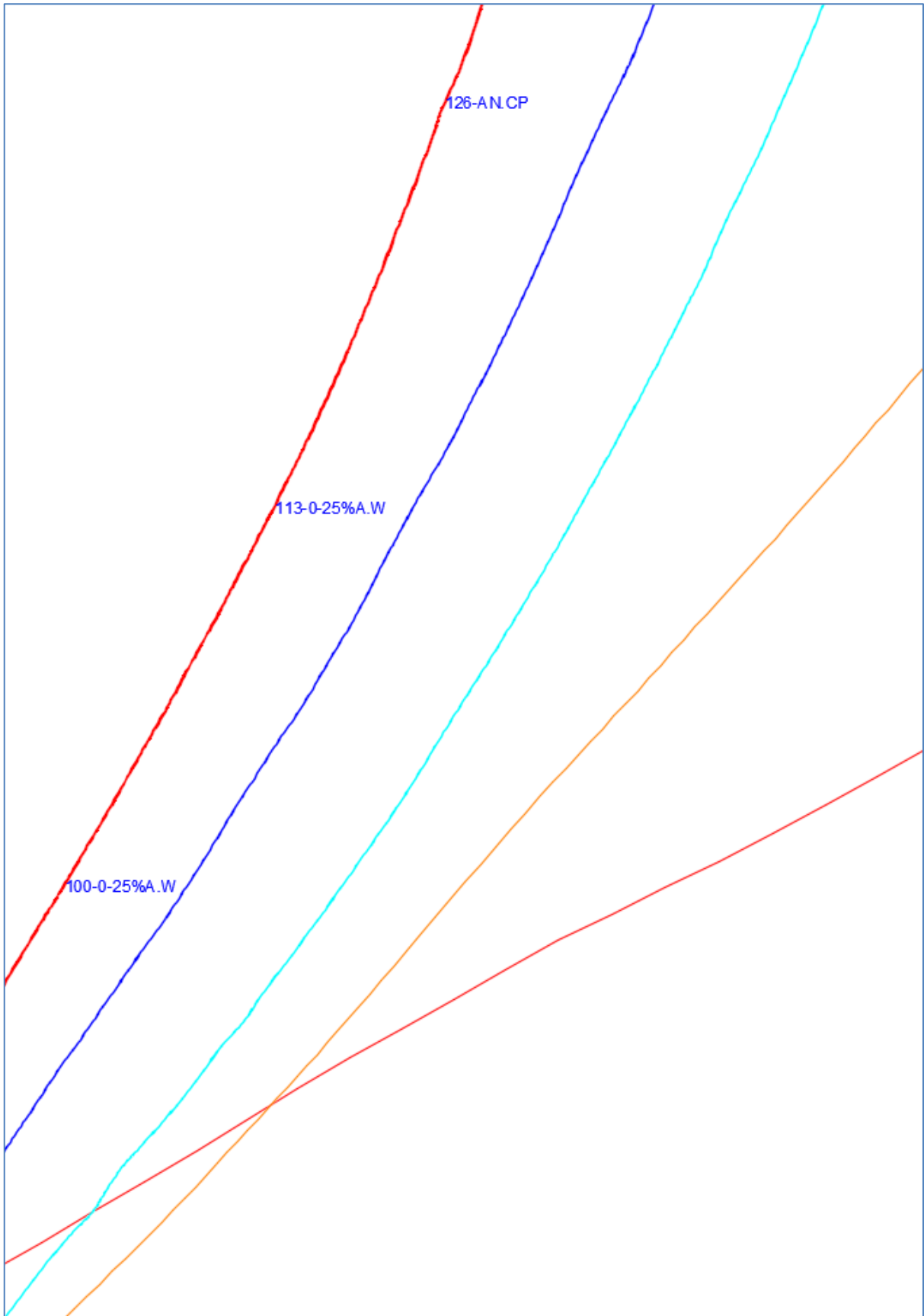


Figure 58: Map 7



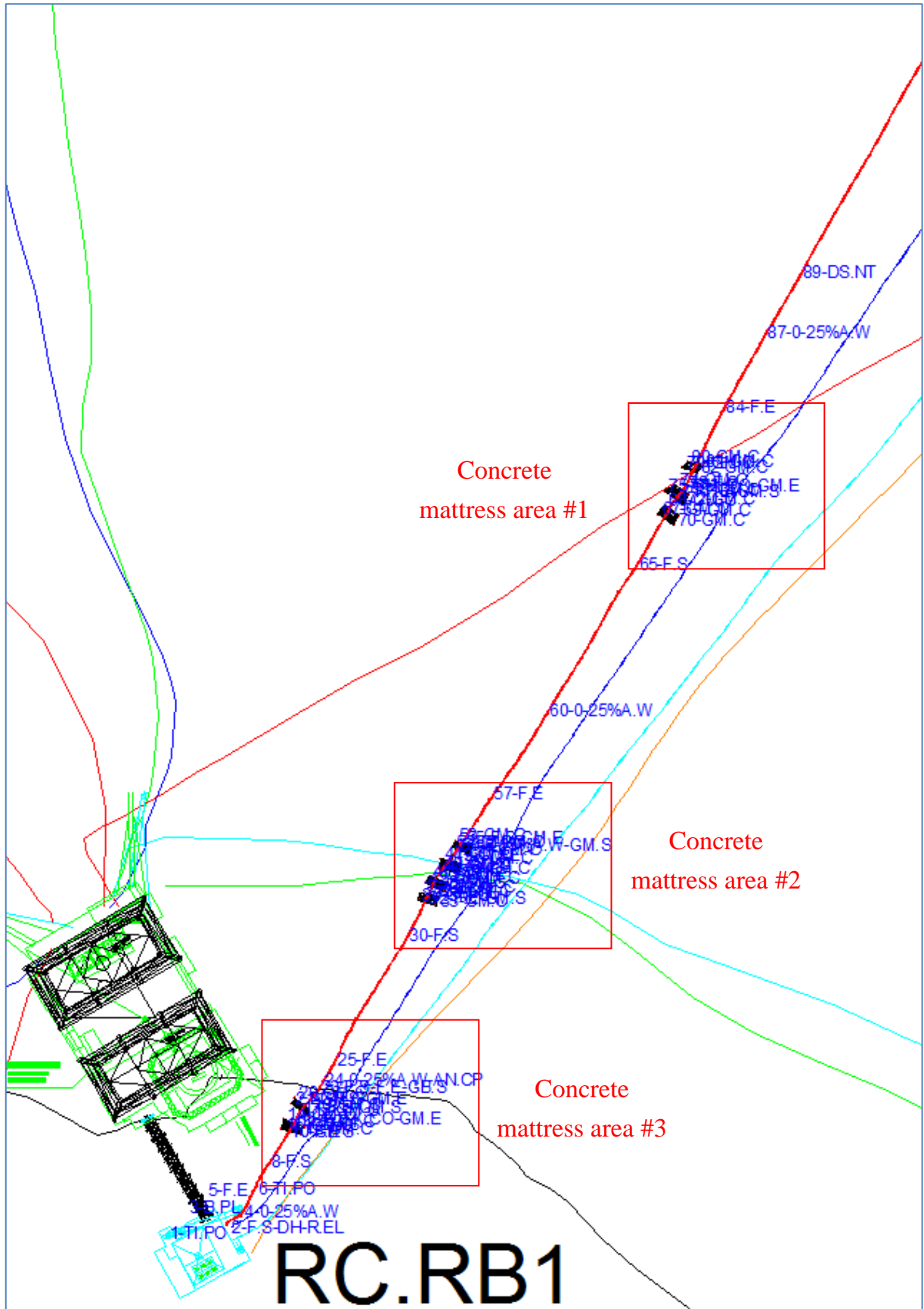


Figure 59: Map 8



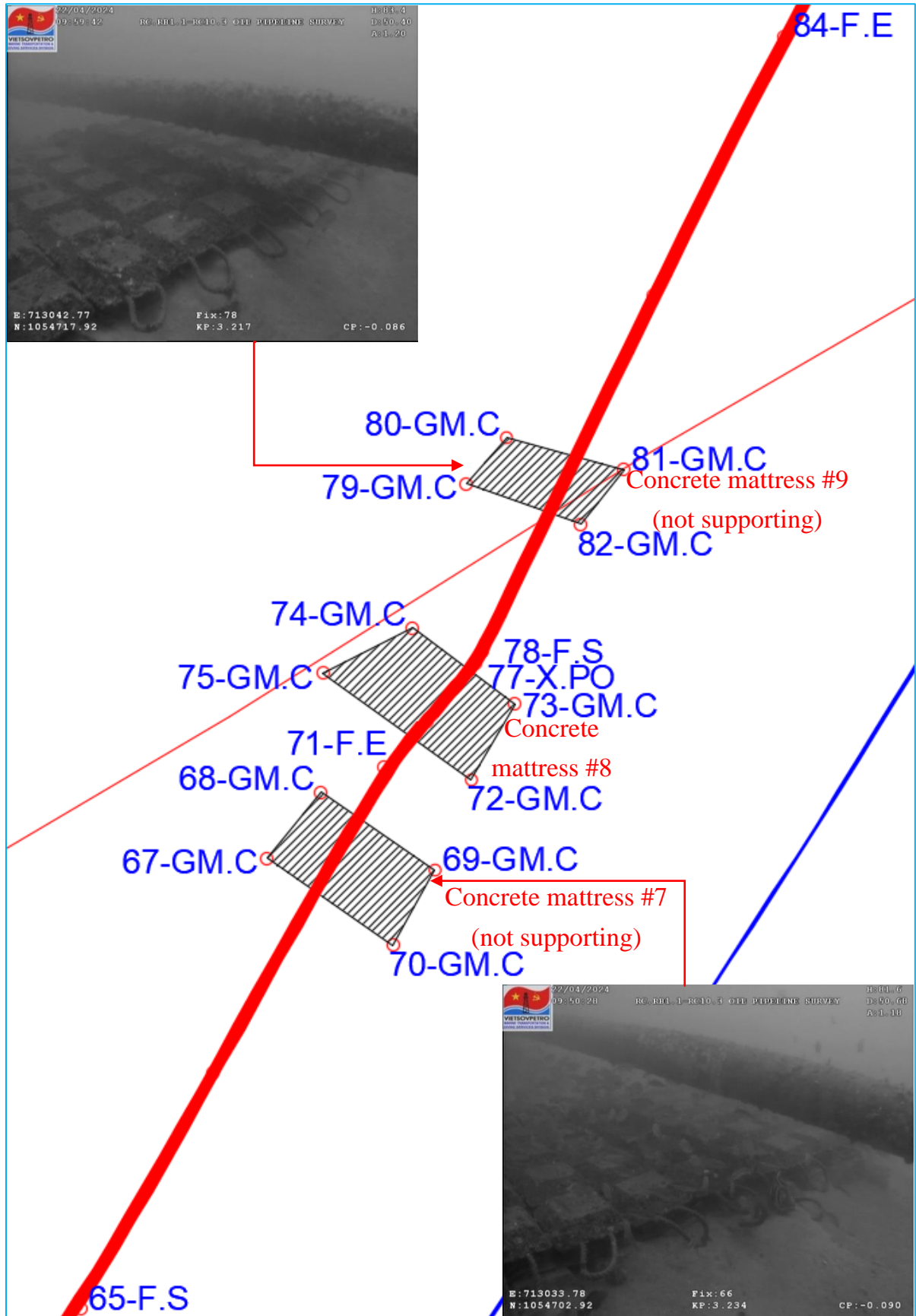


Figure 60: Concrete mattress area #1 (Concrete mattress not supporting)



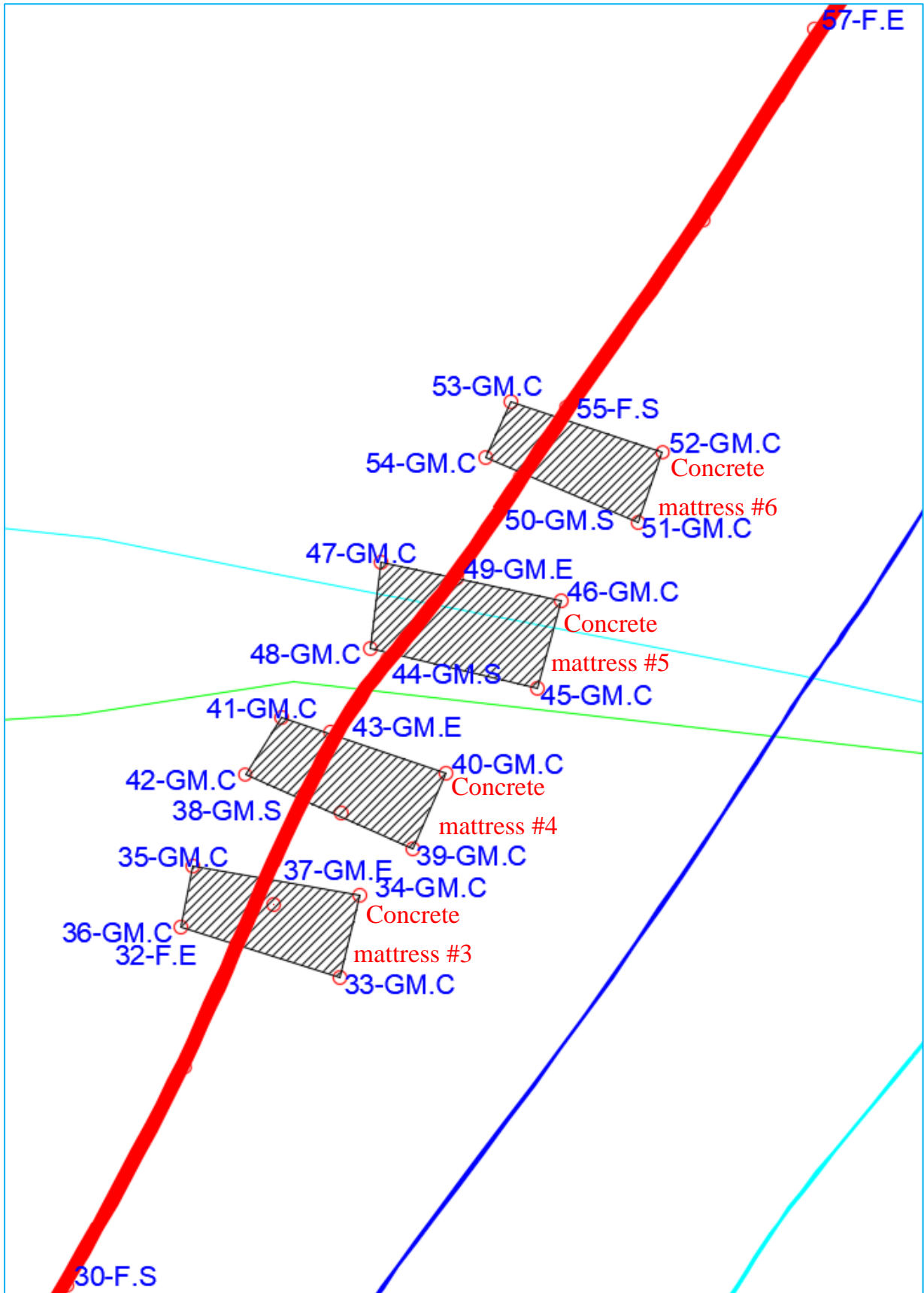


Figure 61: Concrete mattress area #2



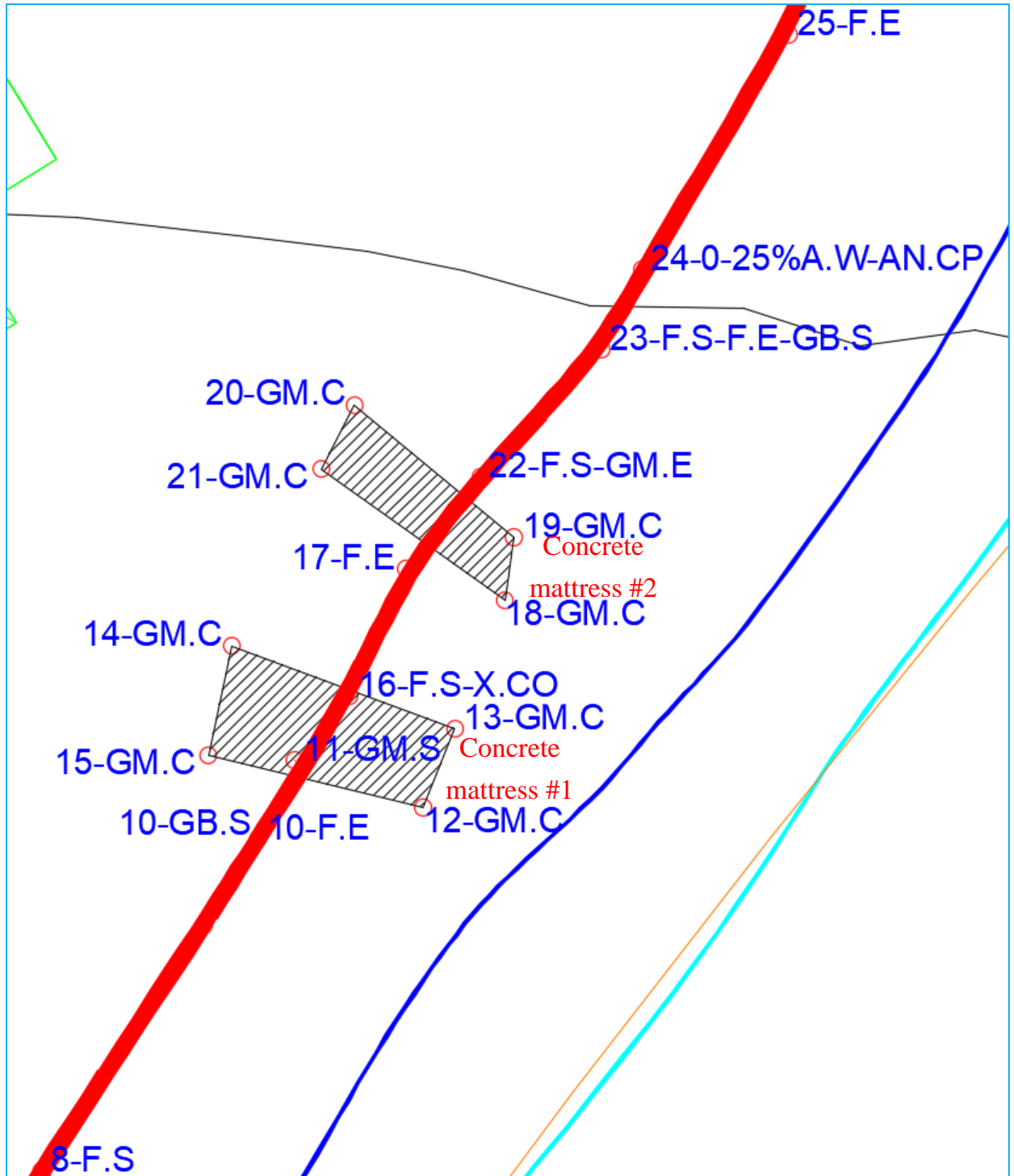


Figure 62: Concrete mattress area #3





ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



7.4 Non-conformances

7.4.1. List of non-conformances (list of anomalies)

UNDERWATER SURVEY OF PIPELINE IN 2024												
VIETSOVPETRO		Object	Year	LIST OF NON-CONFORMANCES							From	To
		Oil Pipeline	2024								RC10	RC.RB1
№	Defect code	Non-conformances Description	Location			Dimension mm			o/c	Photo & Video References	Status	
			Latitude	Longitude	Depth	L	W	D			Rised	Assessment/Action
1	2	3	4	5	6	7	8	9	10	11	12	13
1	FS	Freespan at KP 3.402-3.386 (L= 16 m)	9°32.2541'N	107°56.1689'E	50m	-	-	-	-	DVD P.37-24	4/27/2024	Monitor
			9°32.2611'N	107°56.1725'E								
2	FS	Freespan at KP 3.363-3.347 (L= 16 m)	9°32.2721'N	107°56.1794'E	50m	-	-	-	-	DVD P.37-24	4/27/2024	Monitor
			9°32.2799'N	107°56.1846'E								
3	FS	Freespan at KP 3.254-3.226 (L= 28 m)	9°32.3218'N	107°56.2116'E	50m	-	-	-	-	DVD P.37-24	4/27/2024	Monitor
			9°32.3350'N	107°56.2196'E								
4	FS	Freespan at KP 3.222-3.194 (L= 28 m)	9°32.3366'N	107°56.2209'E	50m	-	-	-	-	DVD P.37-24	4/27/2024	Monitor
			9°32.3504'N	107°56.2278'E								
<p>Action:- Monitor: - No deterioration defects, no anomaly report required. Defects were not changed.</p> <p>- Rec. Inspection: - Defect Recommend to inspect in the next survey (Dimension survey, Debris removal, Repair, WT Measurement, Anomaly report)</p> <p>- Inspection report: - Defect required to inspection report (Dimension survey, WT Measurement, Anomaly report)</p> <p>* For detail information, please see section 6.3 of debris survey.</p> <p>* For detail information, please see section 6.5 of freespan survey.</p>												
Inspector:		Dang Phi Hung			Check:			Le Ba Giap				



ROV UNDERWATER SURVEY IN 2024

SURVEY OIL PIPELINE RC10.3-RC.RB1.11



7.4.2. Anomaly report.

BLANK





VIETSOVPETRO

MARINE TRANSPORTATION AND DIVING SERVICE DIVISION

SURVEY WATER INJECTION PIPELINE RC.RB1-RC10 (VR 298/22)

FINAL REPORT

Report No. ROV-P.36-24

PANTHER PLUS 932 REMOTELY OPERATED VEHICLE

Created by: ROV Team

Reviewed by:

Vietnam Register, Branch No.9

Signature:

Date: _____

Issue No.	Issued date	Description	Compiled by		Checked by		Approved by	
			Print name	Signature	Print name	Signature	Print name	Signature
00		For review and approval	Le Ba Giap		Dinh Binh Nam		Phan Hung Duong	



Checked by:

Mr. Nguyen Quoc Dung - Director of Oil & Gas Prod. Division, VSP

Signature:

Date: _____

Mr. Avdeev A.S – Chief Engineer of R&EI, VSP

Signature:

Date: _____

Mr. Nguyen Hong Giang. - Manager of Capital Construction Department, VSP

Signature:

Date: _____





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



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ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



1 INTRODUCTION

1.1 Abstract

The purpose of this survey was to obtain an overall condition assessment of the Risers at RC.RB1 & RC10 platform and the water injection pipeline connecting from RC.RB1 to RC10 with 3550 m in length and diameter 168,3 x 14,3 mm to satisfy the 2024 requirement by production task of Marine Transportation & Diving Service Division of Vietsovpetro. And collect all pertinent inspection data to prepare an event file, establish base line data for future uses.

All anomalies and debris in this survey area will be recorded on DVD. They will be reported in an event log sheet.





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



1.2 Abbreviations

AB	Abraded
AN	Anode
CD	Coating Damage
CP	Cathodic Protection/Potential
CR	Corrosion
CVI	Close Visual Inspection
DAM	Damage
DWG	Drawing
E	Electrical
EL	Elevation
FJ	Field Joint
GVI	General Visual Inspection
HD	Hard Debris
HDM	Horizontal Diagonal Member
HM	Horizontal Member
KP	Kilometer Point `
L	Length
LK	Leak
M	Meter
MG	Marine Growth
MGT	Marine Growth Thickness
MPI	Magnetic Particle Inspection
MSL	Main Sea Level
NDT	Non Destructive Testing
PL	Pipeline
PLEM	Pipeline End Manifold
ROV	Remotely Operated Vehicle
SD	Soft Debris
STBD	Starboard
TD	Touch Down
USTM	Ultra Sonic Wall thickness Measurement
VM	Vertical Member
VSP	VietsovPetro Joint Venture Company
WHP	Wellhead Platform



2 LOCATION

The White Tiger field is located in block 09-1 offshore Vietnam in approximately 45-55m water depth operated by VIET NGA Vietsovpetro.

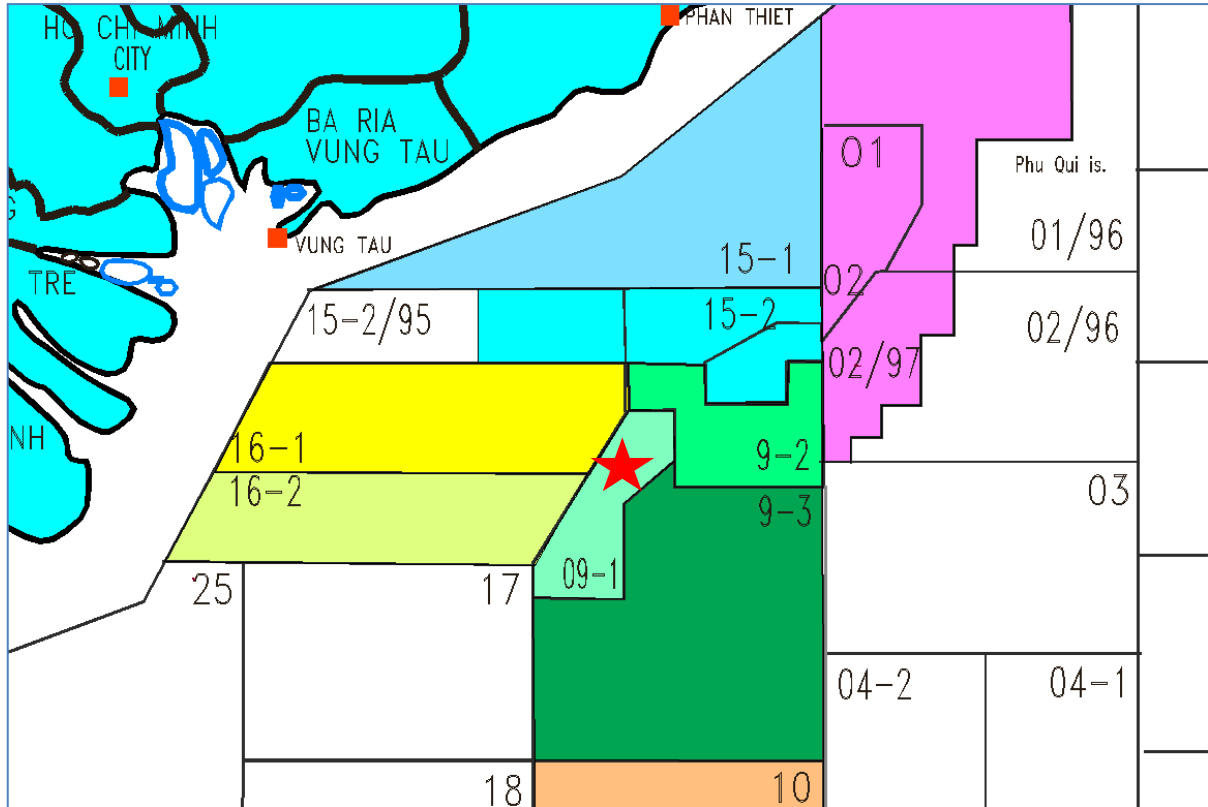


Figure 1: Vietsovpetro block

Co-ordinate system used:

Position was Fixed by Global Positioning System has named:

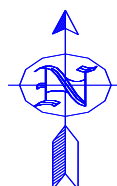
Datum Indian 1830

Ellipsoid Everest 1830 India

All equipment's were used and controlled by SEAMAP's personnel.

Standard direction of all survey screen shot key plan:

Position was Fixed with inaccuracy not more than 3 meters.





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



3 STATISTICS, SENSORS UNIT AND PERSONNEL

3.1. Vehicle

ROV: Observation ROV “Panther Plus 932”

Altimeter: Tritech Seaking PA-500 Range of Bathymetric & Oceanographic Sensors

Gyro: Saab Seaeye

Depth: Tritech Seaking 701/14 Range of Bathymetric & Oceanographic Sensors

Cameras: Kongsberg color zoom camera
Kongsberg near SIT camera

3.2. Statistics

Water depth: 49-52m.

3.3. Vessel

M/V Sao Mai 03

3.4. List of personnel

ROV Team:	Supervisor:	Le Ba Giap
	Pilot techs:	Nguyen Minh Quan Pham Quang Hoa Truong Van Minh
	Report Processor:	Dang Phi Hung Do Binh Minh
	LARS Operator:	Tran Dang Kien
Seamap Team:	Surveyors:	Tran Quang Huy Do Van Dung





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



4 SCOPE OF WORK

4.1. Riser survey

The Riser will be inspected and report the following:

- Corroded or leaking riser.
- Damage to riser or coating.
- Dented, kinked or buckled riser.
- Condition of the clamps. If marine growth permits, list down all clamp defects such as loose/missing bolts, miss alignment or signs of riser movement.

All the above points will be Fixed and recorded to DVD.

4.2. Pipeline survey

The Pipeline will be inspected and report the following:

- Carry out leaking survey.
- Carry out types of span survey.
- Carry out pipeline crossing survey.
- Carry out a general visual inspection (GVI) of the pipeline and attachments. Report all areas of damage, corrosion or debris items present on the pipeline.
- To still Photographs of all areas of damage or significant defects are required. Take sufficient photographs to assess the size of, and to accurately locate the defect.
- Verify the presence, condition and security of attachment of all anodes. Estimate the percentage depletion of each anode and the extent of marine growth presents permits.

All above points will be Fixed. Burials, free spans and all of debris along the pipeline will be recorded on DVD.



5 RISER INSPECTION RESULT

5.1. Riser No.12 at RC.RB1 platform

ROV surveyed this riser from MSL down to seabed. A total 08 of clamps were identified during the inspection at EL -5m, -10m, -15m, -21m, -27m, -34m, -39m, -46m and 02 half shell bracelet anodes at EL -7m, -24m.

All riser clamps were found in normal condition, with no indication of physical damage, impact deformation, displacement or movement.



Figure 2: Plan view of Riser position at RC.RB1



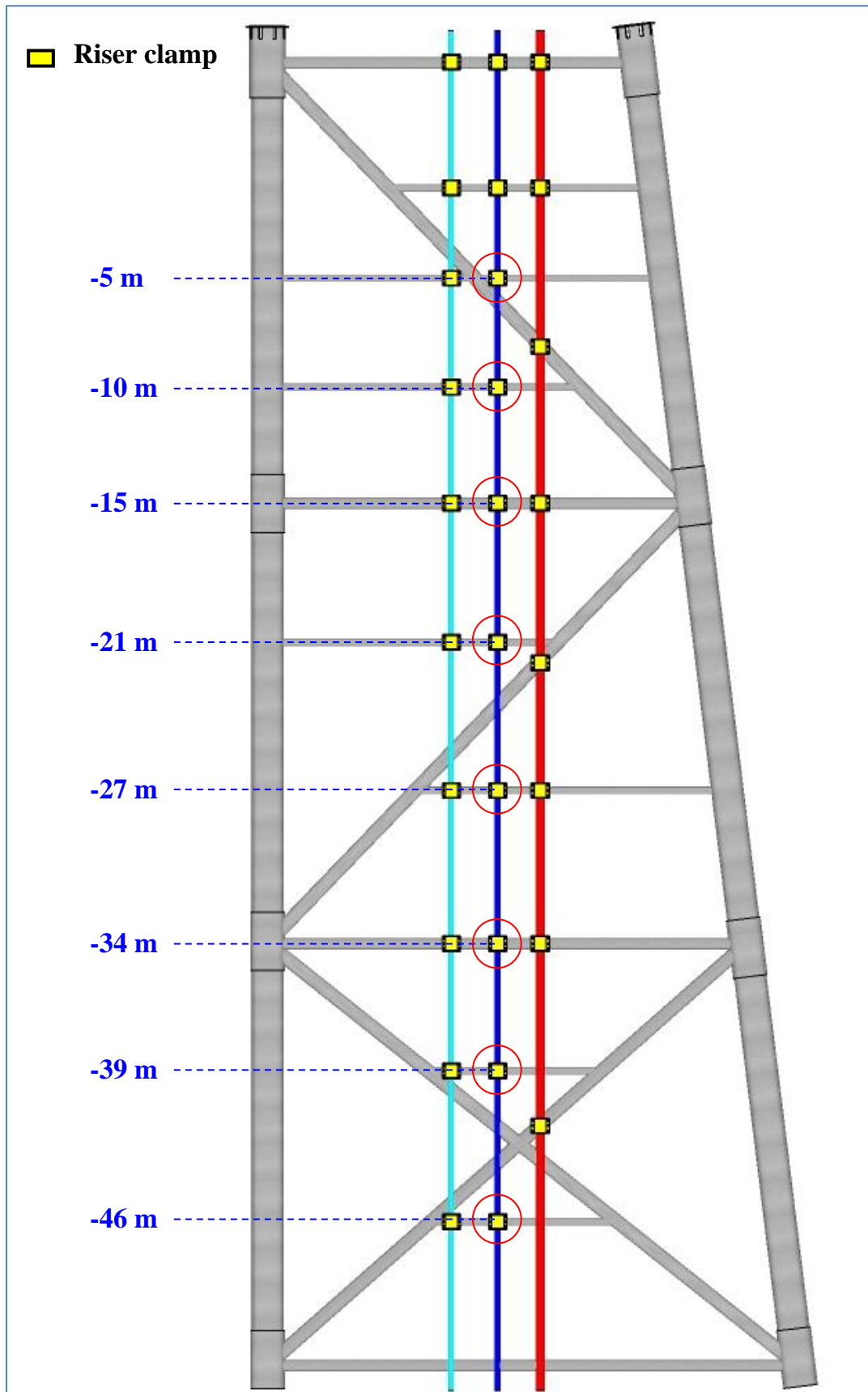


Figure 3: Elevation view of Riser and riser clamp position at RC.RB1





Figure 4: Riser clamp at EL -5m



Figure 5: Riser clamp at EL -10m





Figure 6: Riser clamp at EL -15m



Figure 7: Riser clamp at EL -21m





Figure 8: Riser clamp at EL -27m



Figure 9: Riser clamp at EL -34m





Figure 10: Riser clamp at EL -39m



Figure 11: Riser clamp at EL -46m





Figure 12: Riser elbow



5.2. Riser No.2 at RC10 platform

ROV surveyed this riser from seabed up to MSL. A total 09 of clamps were identified during the inspection at EL -5m, -10m, -15m, -20m, -24m, -29m, -34m, -40m, -46m and 02 half shell bracelet anodes at EL -24m, -12m.

All riser clamps were found in normal condition, with no indication of physical damage, impact deformation, displacement or movement.



Figure 13: Plan view of Riser position at RC10



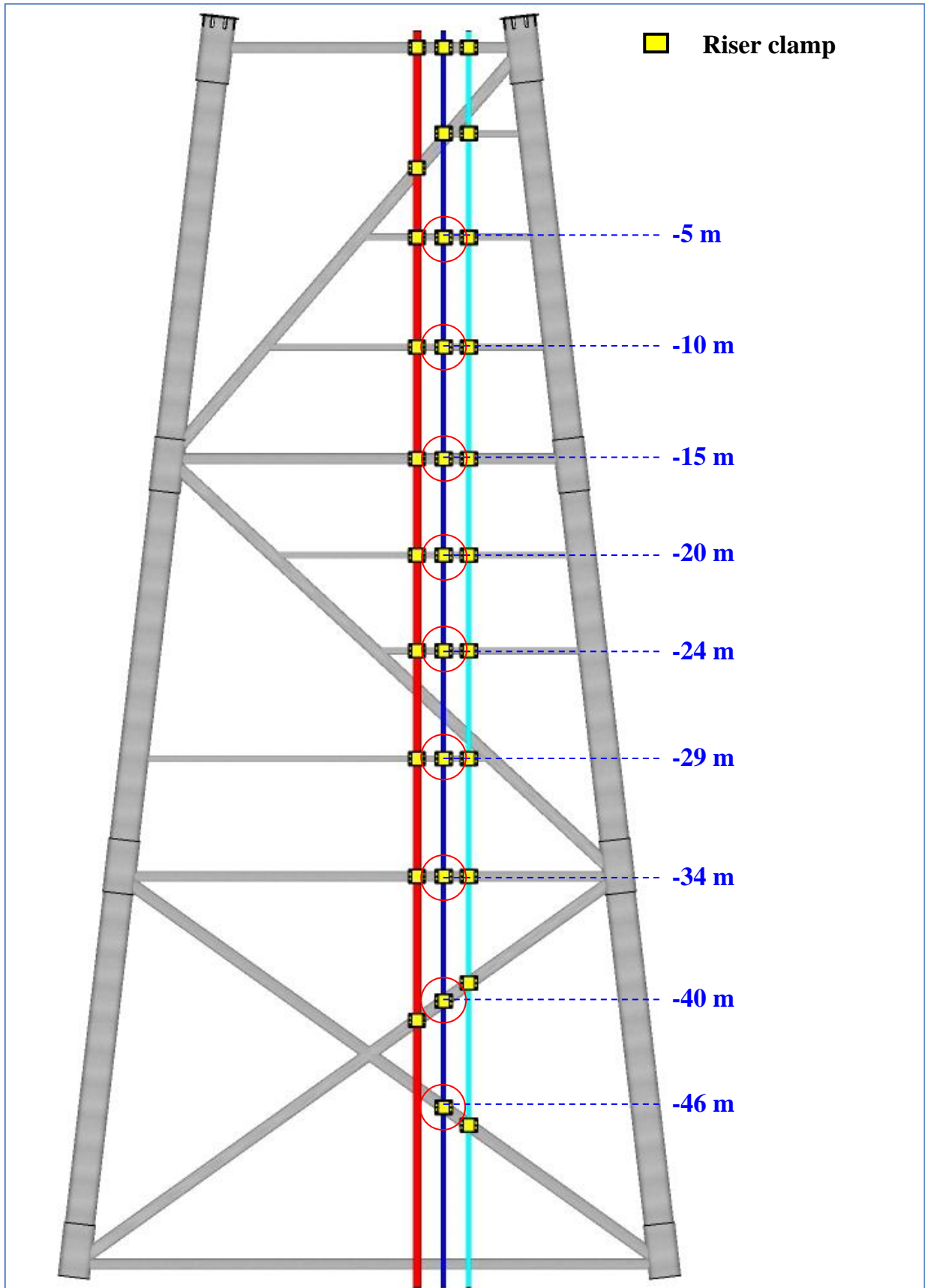


Figure 14: Elevation view of Riser and riser clamp position at RC10





Figure 15: Riser clamp at EL -5m



Figure 16: Riser clamp at EL -10m





Figure 17: Riser clamp at EL -15m



Figure 18: Riser clamp at EL -20m





Figure 19: Riser clamp at EL -24m



Figure 20: Riser clamp at EL -29m





Figure 21: Riser clamp at EL -34m



Figure 22: Riser clamp at EL -40m



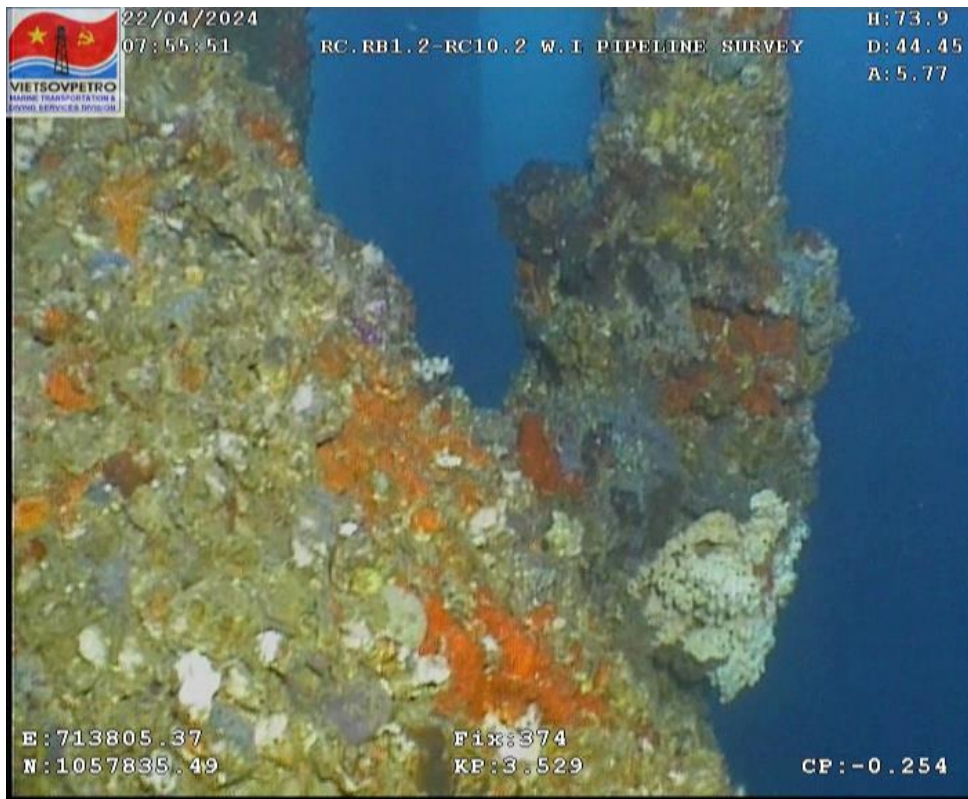


Figure 23: Riser clamp at EL -46m



Figure 24: Riser elbow



6 PIPELINE INSPECTION RESULT

6.1. Pipeline GVI

The pipeline was started survey from RC.RB1 platform at KP -0.034 and ended survey at RC10 platform at KP 3.533.

6.2. Anodic survey

The pipeline along its length was surveyed for anode. The typical anode along this pipeline is a half shell bracelet anode. Anodes appear active and 0-25% wastage. The table below shows the detailed location of anodes observed during the survey.

During the survey, the random of anodes was chosen for CP stab. CP reading was in acceptable value between -1.033mV and -1.040mV.

Table 1: List of CP stab location

No.	Description	Fix	Easting	Northing	KP	Depth
1	Anode CP Reading -1040mV	5	712904.33	1054474.97	-0.016	52.27
2	Anode CP Reading -1039mV	133	713360.07	1055230.19	0.874	50.99
3	Anode CP Reading -1039mV	216	713523.84	1056116.79	1.780	52.59
4	Anode CP Reading -1038mV	297	713661.07	1057007.69	2.682	52.75
5	Anode CP Reading -1033mV	371	713790.54	1057837.20	3.524	52.91



Figure 25: CP stab at Fix.17





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Table 2: List of Anodes location

No.	Description	Fix	Easting	Northing	KP	Depth
1	Anode wastage 0-25% at EL -7m on RC.RB1 riser					7.00
2	Anode wastage 0-25% at EL -24m on RC.RB1 riser					24.00
3	Anode wastage 0-25%	5	712904.33	1054474.97	-0.016	52.27
4	Anode wastage 0-25%	8	712913.97	1054489.66	0.001	52.07
5	Anode wastage 0-25%	25	712935.51	1054519.83	0.038	51.92
6	Anode wastage 0-25%	31	712960.82	1054559.62	0.086	51.89
7	Anode wastage 0-25%	54	712987.70	1054600.91	0.135	51.92
8	Anode wastage 0-25%	58	713006.55	1054630.62	0.170	51.84
9	Anode wastage 0-25%	63	713040.08	1054679.62	0.229	51.69
10	Anode wastage 0-25%	74	713075.29	1054730.14	0.291	50.90
11	Anode wastage 0-25%	88	713102.92	1054770.25	0.340	51.61
12	Anode wastage 0-25%	92	713129.25	1054808.78	0.387	51.51
13	Anode wastage 0-25%	96	713156.17	1054848.21	0.434	51.45
14	Anode wastage 0-25%	100	713183.89	1054887.59	0.483	51.32
15	Anode wastage 0-25%	104	713209.43	1054928.22	0.531	51.21
16	Anode wastage 0-25%	108	713234.89	1054968.86	0.579	51.26
17	Anode wastage 0-25%	112	713258.29	1055011.07	0.628	51.17
18	Anode wastage 0-25%	116	713281.10	1055052.92	0.676	50.81
19	Anode wastage 0-25%	120	713302.40	1055095.80	0.724	51.04
20	Anode wastage 0-25%	124	713321.76	1055140.04	0.775	51.03
21	Anode wastage 0-25%	128	713341.81	1055183.76	0.822	51.03
22	Anode wastage 0-25%	138	713376.92	1055275.58	0.922	51.17
23	Anode wastage 0-25%	142	713391.27	1055320.27	0.969	51.30
24	Anode wastage 0-25%	147	713406.29	1055378.81	1.030	51.34
25	Anode wastage 0-25%	152	713413.08	1055414.89	1.067	51.25
26	Anode wastage 0-25%	159	713424.11	1055486.31	1.141	51.20
27	Anode wastage 0-25%	163	713431.33	1055532.90	1.188	51.19
28	Anode wastage 0-25%	170	713443.22	1055604.30	1.260	51.26
29	Anode wastage 0-25%	175	713450.25	1055651.59	1.308	51.40
30	Anode wastage 0-25%	179	713458.19	1055698.28	1.356	51.60
31	Anode wastage 0-25%	184	713465.96	1055747.30	1.405	51.87
32	Anode wastage 0-25%	188	713473.94	1055794.90	1.454	52.01
33	Anode wastage 0-25%	192	713480.56	1055841.79	1.501	52.04
34	Anode wastage 0-25%	196	713488.61	1055889.49	1.549	51.94
35	Anode wastage 0-25%	200	713496.18	1055936.88	1.597	51.89
36	Anode wastage 0-25%	204	713503.13	1055984.13	1.645	52.04
37	Anode wastage 0-25%	211	713516.31	1056067.08	1.729	52.41
38	Anode wastage 0-25%	221	713533.41	1056176.03	1.840	52.82
39	Anode wastage 0-25%	226	713541.86	1056223.03	1.888	52.67
40	Anode wastage 0-25%	229	713546.46	1056258.71	1.924	52.74
41	Anode wastage 0-25%	234	713556.02	1056317.78	1.983	52.60





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



No.	Description	Fix	Easting	Northing	KP	Depth	
42	Anode wastage 0-25%	238	713563.16	1056365.15	2.032	52.43	
43	Anode wastage 0-25%	242	713569.88	1056413.16	2.080	52.43	
44	Anode wastage 0-25%	246	713577.25	1056460.48	2.128	52.34	
45	Anode wastage 0-25%	251	713584.31	1056509.25	2.177	52.11	
46	Anode wastage 0-25%	253	713588.13	1056531.89	2.201	52.00	
47	Anode wastage 0-25%	255	713591.64	1056555.39	2.224	51.96	
48	Anode wastage 0-25%	261	713599.34	1056604.02	2.274	51.82	
49	Anode wastage 0-25%	265	713606.77	1056651.02	2.321	51.81	
50	Anode wastage 0-25%	269	713613.53	1056698.69	2.369	51.91	
51	Anode wastage 0-25%	273	713621.64	1056744.65	2.416	51.93	
52	Anode wastage 0-25%	278	713629.47	1056794.50	2.467	52.12	
53	Anode wastage 0-25%	282	713637.49	1056840.75	2.513	52.35	
54	Anode wastage 0-25%	287	713644.38	1056888.51	2.562	52.61	
55	Anode wastage 0-25%	291	713651.74	1056935.88	2.610	52.66	
56	Anode wastage 0-25%	300	713664.80	1057032.41	2.707	52.75	
57	Anode wastage 0-25%	304	713672.30	1057080.04	2.756	52.60	
58	Anode wastage 0-25%	308	713680.10	1057127.29	2.804	52.42	
59	Anode wastage 0-25%	312	713687.53	1057174.38	2.851	52.35	
60	Anode wastage 0-25%	316	713695.59	1057221.99	2.899	52.26	
61	Anode wastage 0-25%	320	713702.60	1057269.56	2.948	52.13	
62	Anode wastage 0-25%	324	713709.38	1057317.11	2.996	52.21	
63	Anode wastage 0-25%	328	713716.70	1057364.72	3.044	52.26	
64	Anode wastage 0-25%	333	713723.31	1057412.82	3.093	52.39	
65	Anode wastage 0-25%	337	713729.95	1057460.52	3.141	52.46	
66	Anode wastage 0-25%	341	713737.63	1057507.83	3.189	52.66	
67	Anode wastage 0-25%	345	713745.78	1057554.89	3.237	52.73	
68	Anode wastage 0-25%	349	713753.58	1057602.48	3.285	52.73	
69	Anode wastage 0-25%	353	713762.07	1057649.50	3.333	52.81	
70	Anode wastage 0-25%	357	713768.79	1057697.12	3.381	52.85	
71	Anode wastage 0-25%	361	713775.93	1057744.37	3.429	52.95	
72	Anode wastage 0-25%	364	713777.14	1057780.36	3.465	52.94	
73	Anode wastage 0-25%	371	713790.54	1057837.20	3.524	52.91	
74	Anode wastage 0-25% at EL -24m on RC10 riser						24.00
75	Anode wastage 0-25% at EL -12m on RC10 riser						12.00



6.3. Debris survey

The pipeline along its length was surveyed for debris. The following table lists out all metallic and nonmetallic. Debris was found during the survey.

Table 3: List of Debris

No.	Description	Fix	Easting	Northing	KP	Depth
1	Debris Soft Netting	68	713066.11	1054718.47	0.276	51.78



Figure 26: Debris soft netting at Fix .68

6.4. Pipeline crossing survey

The pipeline along its length was surveyed for crossing. A total of 03 crossing points were found & 03 crossing fully burial during survey as table below.

Table 4: List of crossings

No.	Description	Fix	Easting	Northing	KP	Depth
1	Crossing Over Power Cable (fully burial)	23	712929.33	1054508.16	0.025	51.92
2	Crossing Over Pipelines (fully burial)	37	712976.16	1054581.25	0.112	51.36
3	Crossing Over a Pipeline (gap=0.3m)	74	713075.29	1054730.14	0.291	50.90
4	Crossing Under Power Cable	359	713770.82	1057709.01	3.393	52.18
5	Crossing Under Power Cable	367	713783.84	1057812.46	3.498	52.95





Figure 27: Crossing over a pipeline at Fix.74



Figure 28: Gap between 02 pipelines at Fix.74





Figure 29: Crossing under power cable without support at Fix.359



Figure 30: Crossing under power cable without support at Fix.367



6.5. Free span survey

The pipeline along its length was surveyed for free spans. A total of 10 free spans were found during the survey as table below.

Table 5: List of free spans

No.	Description	Fix	Easting	Northing	KP	Depth	
1	Freespan Start	Riser elbow	2	712889.98	1054463.34	-0.034	51.59
	Freespan End. Max Gap = 0.3m. L = 2m	Seabed	3	712892.83	1054463.64	-0.032	51.89
2	Freespan Start	Seabed	7	712911.67	1054486.21	-0.003	52.06
	Freespan End. Max Gap = 0.2m. L = 7m	Support (mattress)	9	712915.73	1054491.80	0.004	52.04
3	Freespan Start	Support (mattress)	15	712918.56	1054494.11	0.008	51.41
	Freespan End. Max Gap = 0.3m. L = 3m	Support (mattress)	16	712920.78	1054496.97	0.011	51.87
4	Freespan Start	Support (mattress)	21	712922.79	1054498.79	0.014	51.25
	Freespan End. Max Gap = 0.25m. L = 11m	Seabed	23	712929.33	1054508.16	0.025	51.92
5	Freespan Start	Seabed	31	712960.82	1054559.62	0.086	51.89
	Freespan End. Max Gap = 0.3m. L = 14m	Support (mattress)	32	712969.71	1054571.15	0.100	51.85
6	Freespan Start	Support (mattress)	36	712971.74	1054572.54	0.102	51.44
	Freespan End. Max Gap = 0.2m. L = 10m	Support (mattress)	37	712976.16	1054581.25	0.112	51.36
7	Freespan Start	Support (mattress)	52	712979.55	1054588.15	0.120	51.15
	Freespan End. Max Gap = 0.2m. L = 12m	Seabed	53	712987.10	1054598.35	0.132	51.90
8	Freespan Start	Seabed	67	713063.49	1054715.55	0.272	51.63
	Freespan End. Max Gap = 0.3m. L = 16m	Support (mattress)	69	713074.01	1054727.50	0.288	51.77
9	Freespan Start	Support (mattress)	74	713075.29	1054730.14	0.291	50.90
	Freespan End. Max Gap = 0.3m. L = 11m	Support (mattress)	79	713082.05	1054738.69	0.302	51.44
10	Freespan Start	Support (mattress)	84	713083.11	1054741.10	0.305	51.24
	Freespan End. Max Gap = 0.2m. L = 9m	Seabed	85	713088.96	1054748.97	0.314	51.64

Span's gap determining method:

ROV takes up Fix at 02 touches down points on the pipeline to determine length of span (KP Start – KP End). ROV sits on the pipeline to measure height of span by Altimeter Sensor (Altitude Value – Dia. PL = Span's gap). Following instructions of typical pipeline inspection program.

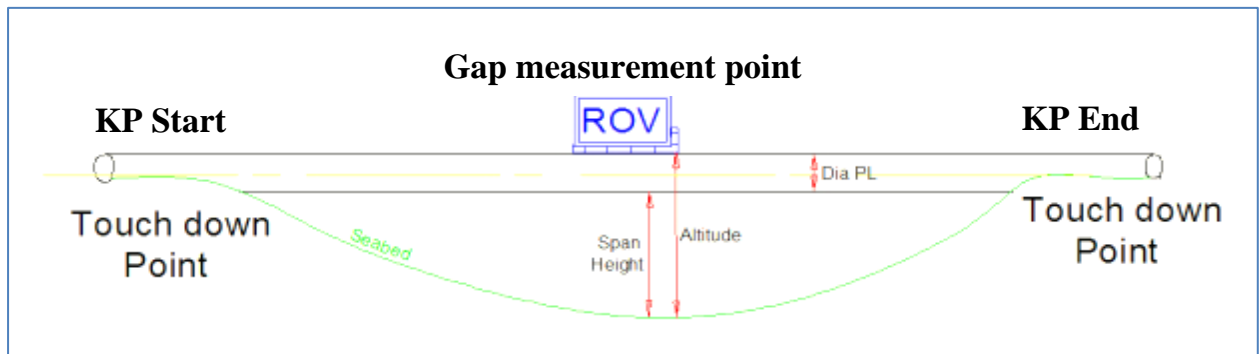


Figure 31: Illustrative figure of span's gap determining method



<p>Free spans (FS)</p>	<p>Spans outside the following lengths:</p> <p><u>26" pipelines:</u> >34m for single spans</p> <p><u>16" pipelines:</u> >21m for single spans</p> <p><u>12" pipelines:</u> >17m for single spans</p> <p><u>10" pipelines:</u> >14m for single spans</p> <p><u>8" pipelines:</u> >12m for single spans</p>	<p>Determine extent of anomalous scour area.</p> <p>To execute per one measurement of the greatest height/depth of each free span and suspended span of pipeline</p> <p>Photography, Video.</p>
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Figure 32: Typical pipeline inspection program

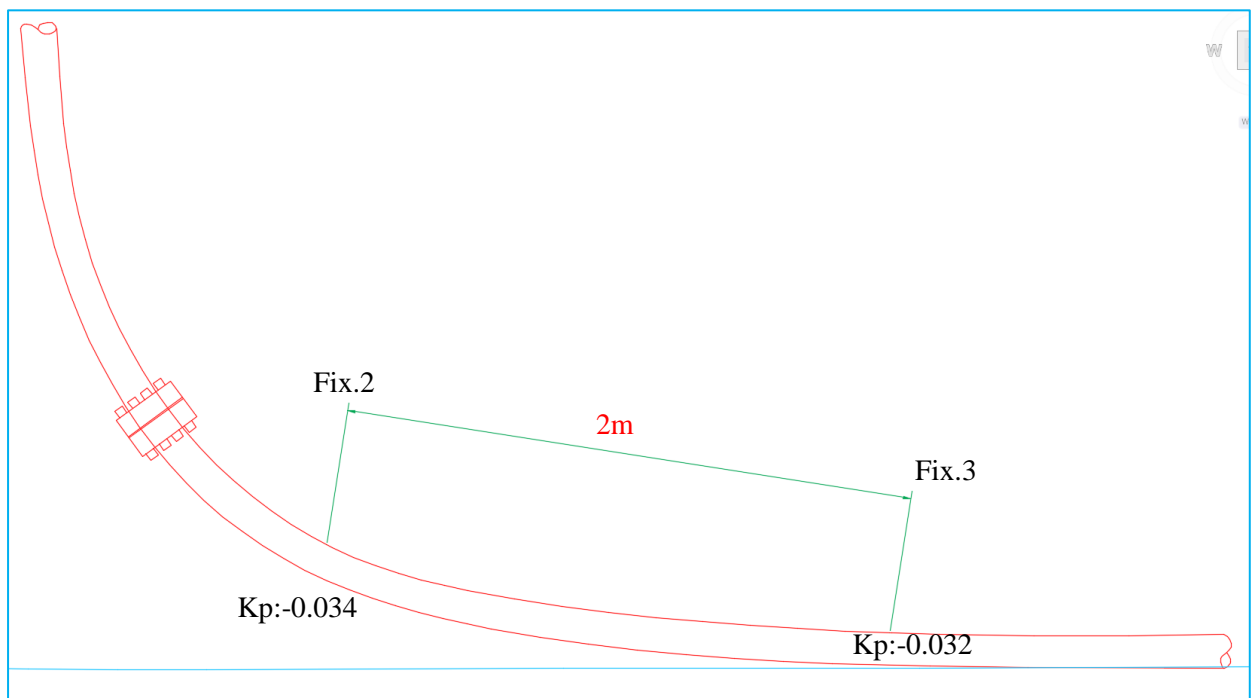


Figure 33: Free span from Fix.2 to Fix.3

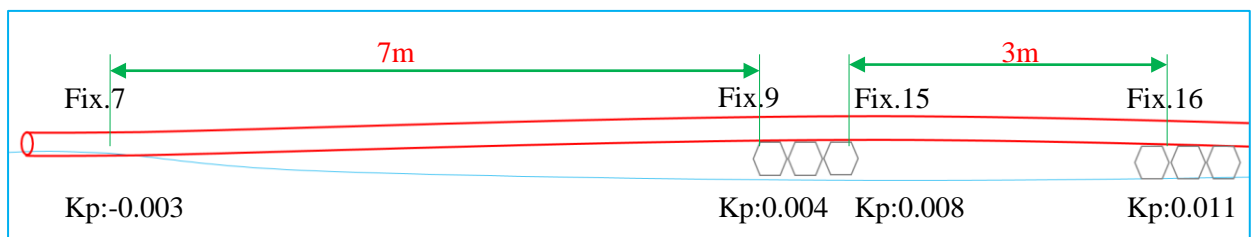


Figure 34: Free spans from Fix.7 to Fix.9 & Fix.15 to Fix.16



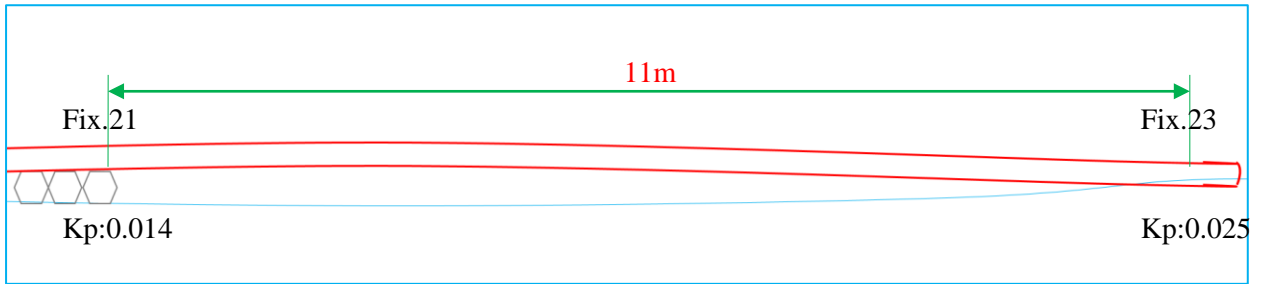


Figure 35: Free span from Fix.21 to Fix.23

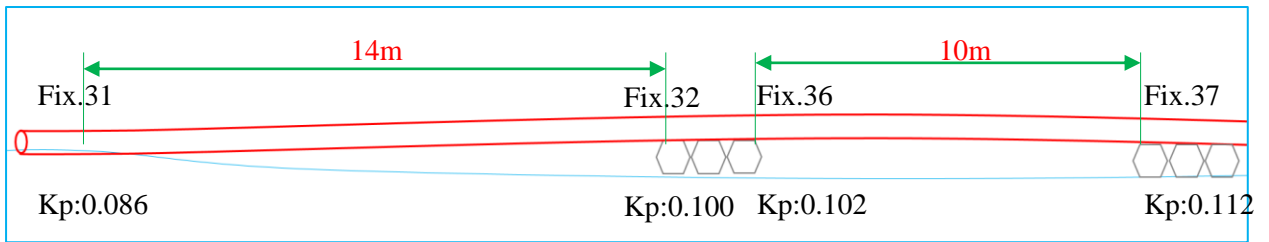


Figure 36: Free spans from Fix.31 to Fix.32 & Fix.36 to Fix.37

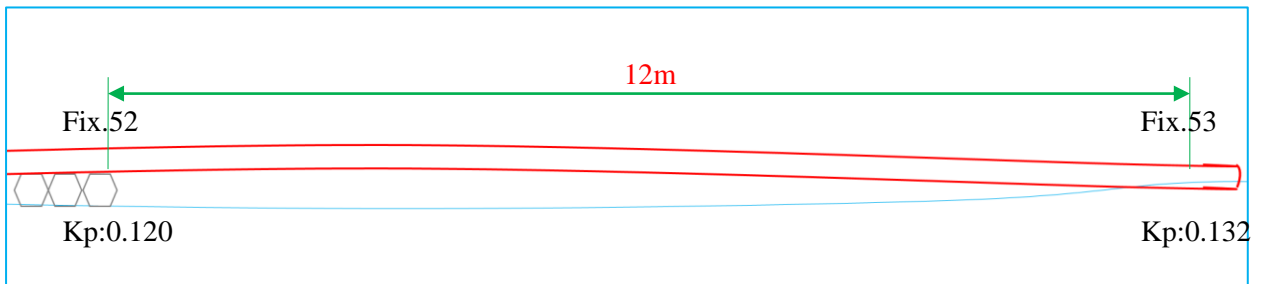


Figure 37: Free span from Fix.52 to Fix.53

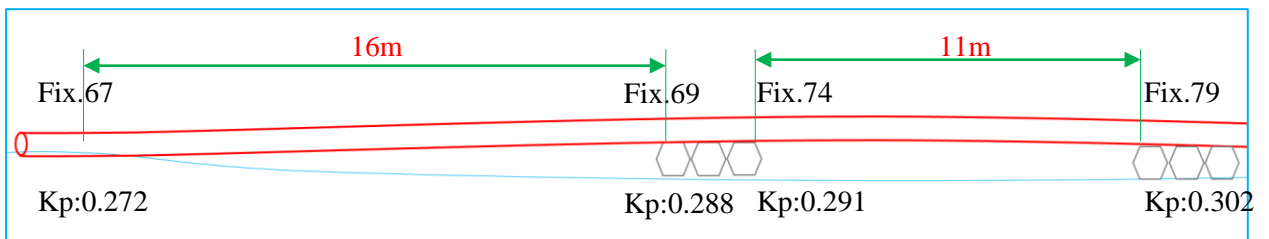


Figure 38: Free spans from Fix.67 to Fix.69 & Fix.74 to Fix.79

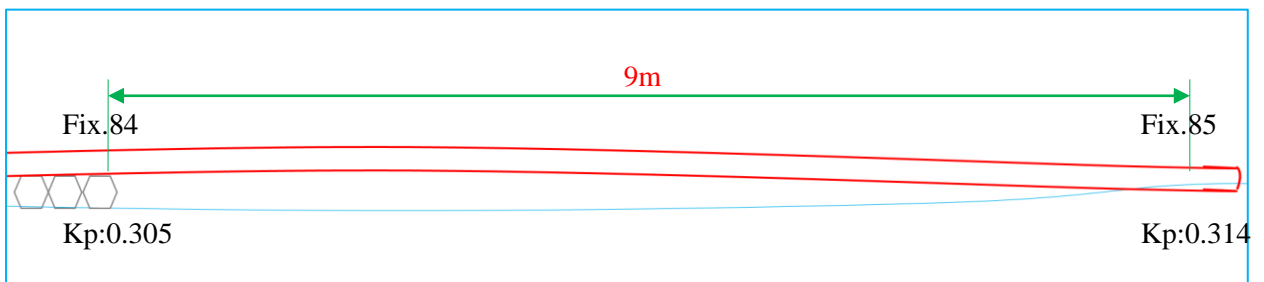


Figure 39: Free span from Fix.84 to Fix.85



6.6. Burial survey

The pipeline along its length was surveyed for burial. No section of burial was found during survey as table below.

6.7. Tie-in point survey

The pipeline along its length was surveyed for tie-in point. A total of 04 tie-in positions were found during the survey as table below.

Table 6: List of tie-in point

No.	Description	Fix	Easting	Northing	KP	Depth
1	Tie-in poin	1	712890.34	1054462.51	-0.034	51.76
2	Tie-in point	7	712911.67	1054486.21	-0.003	52.06
3	Tie-in point	369	713784.21	1057824.48	3.510	53.00
4	Tie-in point	374	713806.13	1057839.90	3.533	52.27



Figure 40: Tie-in point at Fix.1





Figure 41: Tie-in point at Fix.7



Figure 42: Tie-in point at Fix.369





Figure 43: Tie-in point at Fix.374



6.8. Concrete mattress survey

The pipeline along its length was surveyed for concrete mattress. A total of 08 concrete mattress & 01 concrete mattress making a roll were found during survey as table below.

Table 7: List of concrete mattresses

No.	Description	Fix	Easting	Northing	KP	Depth
1	Grout Mattress Corner #1	10	712912.38	1054493.59	0.004	51.75
	Grout Mattress Corner #2	11	712913.34	1054496.38	0.007	51.71
	Grout Mattress Corner #3	12	712924.60	1054490.29	0.008	51.55
	Grout Mattress Corner #4	14	712922.75	1054488.53	0.005	51.84
2	Grout Mattress Corner #1	17	712916.11	1054500.44	0.011	51.71
	Grout Mattress Corner #2	18	712917.34	1054502.43	0.014	51.56
	Grout Mattress Corner #3	19	712930.29	1054495.99	0.016	51.80
	Grout Mattress Corner #4	20	712929.18	1054493.33	0.013	51.87
3	Grout Mattress Corner #1	33	712969.96	1054570.52	0.100	51.83
	Grout Mattress Corner #2	34	712965.44	1054573.07	0.099	51.81
	Grout Mattress Corner #3	35	712967.11	1054576.14	0.103	51.43
	Grout Mattress Corner #4	36	712971.74	1054572.54	0.102	51.44
4	Grout Mattress Corner #1	38	712969.98	1054580.96	0.109	51.78
	Grout Mattress Corner #2	39	712970.23	1054583.62	0.111	51.33
	Grout Mattress Corner #3	44	712979.57	1054582.49	0.115	51.52
	Grout Mattress Corner #4	45	712977.59	1054580.42	0.112	51.56
5	Grout Mattress Corner #1	48	712980.26	1054583.69	0.117	51.66
	Grout Mattress Corner #2	49	712982.80	1054586.70	0.121	51.67
	Grout Mattress Corner #3	50	712976.15	1054590.73	0.120	51.79
	Grout Mattress Corner #4	51	712975.03	1054588.80	0.118	51.77
6	Grout Mattress Corner #1	70	713072.09	1054728.44	0.288	51.43
	Grout Mattress Corner #2	71	713074.12	1054730.17	0.290	51.07
	Grout Mattress Corner #3	72	713078.28	1054726.51	0.289	51.34
	Grout Mattress Corner #4	73	713076.36	1054725.13	0.288	51.64
7	Grout Mattress Corner #1	75	713075.50	1054734.26	0.295	51.18
	Grout Mattress Corner #2	76	713075.43	1054737.19	0.296	51.41
	Grout Mattress Corner #3	77	713082.92	1054732.83	0.298	51.59
	Grout Mattress Corner #4	78	713080.29	1054729.49	0.293	51.62
8	Grout Mattress Corner #1	80	713079.73	1054739.57	0.302	51.48
	Grout Mattress Corner #2	81	713081.32	1054742.84	0.305	51.22
	Grout Mattress Corner #3	82	713085.59	1054739.23	0.304	51.20
	Grout Mattress Corner #4	83	713083.47	1054737.14	0.301	51.29
9	Grout Mattress Making a Roll	74	713075.29	1054730.14	0.291	50.90





Figure 44: Concrete mattress #1



Figure 45: Concrete mattress #2





Figure 46: Concrete mattress #3



Figure 47: Concrete mattress #4





Figure 48: Concrete mattress #5



Figure 49: Concrete mattress #6





Figure 50: Concrete mattress #7



Figure 51: Concrete mattress #8





Figure 52: Concrete mattress making a roll (#9)



Figure 53: Concrete mattress making a roll (#9)





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



7 APPENDICES

7.1 Event Logs

Table 8: Event logs

ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.35	
Date:	21-04-24	Client: VSP	Report No.:	P.36-24	
Dive No.:	P.3017	Location: Dragon oil field	Depth:	52m	
DVD No.:	P.36-24	Extra Equipment: N/A	Vessel:	Sao Mai 03	
RC.RB1.12-RC10.2 WATER INJECTION PIPELINE SURVEY					
Time	Code	Description	Fix	KP	Depth
7:55	V.SOS	Video Start of Survey at RC.RB1			
7:58	R.C	Riser Clamp at EL -5m			
7:59	AN.BA	Anode Bar at EL -7m			
8:00	R.C	Riser Clamp at EL -10m			
8:01	R.C	Riser Clamp at EL -15m			
8:02	R.C	Riser Clamp at EL -21m			
8:04	AN.BA	Anode Bar at EL -24m			
8:04	R.C	Riser Clamp at EL -27m			
8:07	R.C	Riser Clamp at EL -34m			
8:08	R.C	Riser Clamp at EL -39m			
8:11	R.C	Riser Clamp at EL -46 m			
8:12	TI.PO	Tie-in poin	1	-0.034	51.76
8:14	R.EL	Riser Elbow (gap = 0.3m)	2	-0.034	51.59
8:18	F.S	Freespan Start	2	-0.034	51.59
8:19	F.E	Freespan End. Max Gap = 0.3m. L = 2m	3	-0.032	51.89
8:20	B.PL	Bend of pipeline	4	-0.025	51.90
8:21	0-25% A.W	Anode wastage 0-25%	5	-0.016	52.27
8:22	AN.CP	Anode CP Reading -1040mV	5	-0.016	52.27
8:23	TI.PO	Tie-in point	7	-0.003	52.06
8:24	F.S	Freespan Start	7	-0.003	52.06
8:24	0-25% A.W	Anode wastage 0-25%	8	0.001	52.07
8:25	F.E	Freespan End. Max Gap = 0.2m. L = 7m	9	0.004	52.04
8:26	GM.S	Grout Mattress Start	9	0.004	52.04
8:26	GM.C	Grout Mattress Corner	10	0.004	51.75
8:26	GM.C	Grout Mattress Corner	11	0.007	51.71
8:28	GM.C	Grout Mattress Corner	12	0.008	51.55
8:28	GM.C	Grout Mattress Corner	14	0.005	51.84
8:29	GM.E	Grout Mattress End	15	0.008	51.41
8:29	F.S	Freespan Start	15	0.008	51.41
8:30	F.E	Freespan End. Max Gap = 0.3m. L = 3m	16	0.011	51.87
8:30	GM.S	Grout Mattress Start	16	0.011	51.87
8:32	GM.C	Grout Mattress Corner	17	0.011	51.71
8:33	GM.C	Grout Mattress Corner	18	0.014	51.56
8:34	GM.C	Grout Mattress Corner	19	0.016	51.80
8:35	GM.C	Grout Mattress Corner	20	0.013	51.87
8:36	GM.E	Grout Mattress End	21	0.014	51.25
8:37	F.S	Freespan Start	21	0.014	51.25
8:38	F.E	Freespan End. Max Gap = 0.25m. L = 11m	23	0.025	51.92
8:38	X.CO	Crossing Over Power Cable (fully burial)	23	0.025	51.92





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.35
Date:	21-04-24	Client: VSP	Report No.:	P.36-24
Dive No.:	P.3017	Location: Dragon oil field	Depth:	52m
DVD No.:	P.36-24	Extra Equipment: N/A	Vessel:	Sao Mai 03

RC.RB1.12-RC10.2 WATER INJECTION PIPELINE SURVEY

Time	Code	Description	Fix	KP	Depth
8:40	0-25% A.W	Anode wastage 0-25%	25	0.038	51.92
8:43	0-25% A.W	Anode wastage 0-25%	31	0.086	51.89
8:43	F.S	Freespan Start	31	0.086	51.89
8:45	F.E	Freespan End. Max Gap = 0.3m. L = 14m	32	0.100	51.85
8:45	GM.C	Grout Mattress Corner	33	0.100	51.83
8:46	GM.C	Grout Mattress Corner	34	0.099	51.81
8:47	GM.C	Grout Mattress Corner	35	0.103	51.43
8:48	GM.C	Grout Mattress Corner	36	0.102	51.44
8:48	GM.E	Grout Mattress End	36	0.102	51.44
8:48	F.S	Freespan Start	36	0.102	51.44
8:48	F.E	Freespan End. Max Gap = 0.2m. L = 10m	37	0.112	51.36
8:48	X.PO	Crossing Over Pipelines (fully burial)	37	0.112	51.36
8:49	GM.S	Grout Mattress Start	37	0.112	51.36
8:50	GM.C	Grout Mattress Corner	38	0.109	51.78
8:50	GM.C	Grout Mattress Corner	39	0.111	51.33
8:51	GM.C	Grout Mattress Corner	40	0.112	51.32
8:52	GM.C	Grout Mattress Corner	41	0.115	51.09
8:53	GM.C	Grout Mattress Corner	42	0.112	51.23
8:53	GM.C	Grout Mattress Corner	43	0.115	51.21
8:54	GM.C	Grout Mattress Corner	44	0.115	51.52
8:55	GM.C	Grout Mattress Corner	45	0.112	51.56
8:56	GM.E	Grout Mattress End	46	0.115	51.15
8:56	GM.S	Grout Mattress Start	47	0.118	51.34
8:56	GM.C	Grout Mattress Corner	48	0.117	51.66
8:56	GM.C	Grout Mattress Corner	49	0.121	51.67
8:57	GM.C	Grout Mattress Corner	50	0.120	51.79
8:57	GM.C	Grout Mattress Corner	51	0.118	51.77
8:58	GM.E	Grout Mattress End	52	0.120	51.15
8:59	F.S	Freespan Start	52	0.120	51.15
9:00	F.E	Freespan End. Max Gap = 0.2m. L = 12m	53	0.132	51.90
9:00	0-25% A.W	Anode wastage 0-25%	54	0.135	51.92
9:02	0-25% A.W	Anode wastage 0-25%	58	0.170	51.84
9:04	0-25% A.W	Anode wastage 0-25%	63	0.229	51.69
9:06	F.S	Freespan Start	67	0.272	51.63
9:07	DB.S	Debris Soft	68	0.276	51.78
9:07	F.E	Freespan End. Max Gap = 0.3m. L = 16m	69	0.288	51.77
9:07	GM.S	Grout Mattress Start	69	0.288	51.77
9:08	GM.C	Grout Mattress Corner	70	0.288	51.43
9:09	GM.C	Grout Mattress Corner	71	0.290	51.07
9:10	GM.C	Grout Mattress Corner	72	0.289	51.34
9:10	GM.C	Grout Mattress Corner	73	0.288	51.64
9:10	GM.E	Grout Mattress End	74	0.291	50.90
9:10	0-25% A.W	Anode wastage 0-25%	74	0.291	50.90
9:11	X.PO	Crossing Over a Pipeline (gap=0.3m)	74	0.291	50.90
9:11	F.S	Freespan Start	74	0.291	50.90





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



ROV:	Panther 932	Contractor:	VSP	Task No.:	B.42.2.35
Date:	21-04-24	Client:	VSP	Report No.:	P.36-24
Dive No.:	P.3017	Location:	Dragon oil field	Depth:	52m
DVD No.:	P.36-24	Extra Equipment:	N/A	Vessel:	Sao Mai 03

RC.RB1.12-RC10.2 WATER INJECTION PIPELINE SURVEY

Time	Code	Description	Fix	KP	Depth
9:14	GM.MR	Grout Mattress Making a Roll	74	0.291	50.90
9:16	GM.C	Grout Mattress Corner	75	0.295	51.18
9:16	GM.C	Grout Mattress Corner	76	0.296	51.41
9:17	GM.C	Grout Mattress Corner	77	0.298	51.59
9:17	GM.C	Grout Mattress Corner	78	0.293	51.62
9:19	F.E	Freespan End. Max Gap = 0.3m. L = 11m	79	0.302	51.44
9:19	GM.S	Grout Mattress Start	79	0.302	51.44
9:20	GM.C	Grout Mattress Corner	80	0.302	51.48
9:20	GM.C	Grout Mattress Corner	81	0.305	51.22
9:21	GM.C	Grout Mattress Corner	82	0.304	51.20
9:21	GM.C	Grout Mattress Corner	83	0.301	51.29
9:21	GM.E	Grout Mattress End	84	0.305	51.24
9:22	F.S	Freespan Start	84	0.305	51.24
9:22	F.E	Freespan End. Max Gap = 0.2m. L = 9m	85	0.314	51.64
9:24	0-25% A.W	Anode wastage 0-25%	88	0.340	51.61
9:26	0-25% A.W	Anode wastage 0-25%	92	0.387	51.51
9:28	0-25% A.W	Anode wastage 0-25%	96	0.434	51.45
9:30	0-25% A.W	Anode wastage 0-25%	100	0.483	51.32
9:31	0-25% A.W	Anode wastage 0-25%	104	0.531	51.21
9:33	0-25% A.W	Anode wastage 0-25%	108	0.579	51.26
9:35	0-25% A.W	Anode wastage 0-25%	112	0.628	51.17
9:37	0-25% A.W	Anode wastage 0-25%	116	0.676	50.81
9:39	0-25% A.W	Anode wastage 0-25%	120	0.724	51.04
9:41	0-25% A.W	Anode wastage 0-25%	124	0.775	51.03
9:43	0-25% A.W	Anode wastage 0-25%	128	0.822	51.03
9:45	AN.CP	Anode CP Reading -1039mV	133	0.874	50.99
9:48	0-25% A.W	Anode wastage 0-25%	138	0.922	51.17
9:50	0-25% A.W	Anode wastage 0-25%	142	0.969	51.30
9:53	0-25% A.W	Anode wastage 0-25%	147	1.030	51.34
9:54	0-25% A.W	Anode wastage 0-25%	152	1.067	51.25
9:57	0-25% A.W	Anode wastage 0-25%	159	1.141	51.20
9:59	0-25% A.W	Anode wastage 0-25%	163	1.188	51.19
10:01	0-25% A.W	Anode wastage 0-25%	170	1.260	51.26
10:03	0-25% A.W	Anode wastage 0-25%	175	1.308	51.40
10:04	0-25% A.W	Anode wastage 0-25%	179	1.356	51.60
10:05	0-25% A.W	Anode wastage 0-25%	184	1.405	51.87
10:07	0-25% A.W	Anode wastage 0-25%	188	1.454	52.01
10:09	0-25% A.W	Anode wastage 0-25%	192	1.501	52.04
14:31	0-25% A.W	Anode wastage 0-25%	196	1.549	51.94
14:33	0-25% A.W	Anode wastage 0-25%	200	1.597	51.89
14:34	0-25% A.W	Anode wastage 0-25%	204	1.645	52.04
14:38	0-25% A.W	Anode wastage 0-25%	211	1.729	52.41
14:41	AN.CP	Anode CP Reading -1039mV	216	1.780	52.59
14:43	0-25% A.W	Anode wastage 0-25%	221	1.840	52.82
14:45	0-25% A.W	Anode wastage 0-25%	226	1.888	52.67





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.35
Date:	21-04-24	Client: VSP	Report No.:	P.36-24
Dive No.:	P.3017	Location: Dragon oil field	Depth:	52m
DVD No.:	P.36-24	Extra Equipment: N/A	Vessel:	Sao Mai 03

RC.RB1.12-RC10.2 WATER INJECTION PIPELINE SURVEY

Time	Code	Description	Fix	KP	Depth
14:46	0-25% A.W	Anode wastage 0-25%	229	1.924	52.74
14:49	0-25% A.W	Anode wastage 0-25%	234	1.983	52.60
14:50	0-25% A.W	Anode wastage 0-25%	238	2.032	52.43
14:52	0-25% A.W	Anode wastage 0-25%	242	2.080	52.43
14:53	0-25% A.W	Anode wastage 0-25%	246	2.128	52.34
14:54	SF.SC	Seabed Feature Scour	246	2.128	52.34
14:55	SF.SC	Seabed Feature Scour	249	2.155	52.21
14:55	0-25% A.W	Anode wastage 0-25%	251	2.177	52.11
14:56	0-25% A.W	Anode wastage 0-25%	253	2.201	52.00
14:57	0-25% A.W	Anode wastage 0-25%	255	2.224	51.96
14:58	SF.SC	Seabed Feature Scour	257	2.239	51.87
14:58	SF.SC	Seabed Feature Scour	259	2.251	51.84
14:59	0-25% A.W	Anode wastage 0-25%	261	2.274	51.82
15:01	0-25% A.W	Anode wastage 0-25%	265	2.321	51.81
15:03	0-25% A.W	Anode wastage 0-25%	269	2.369	51.91
15:04	0-25% A.W	Anode wastage 0-25%	273	2.416	51.93
15:06	0-25% A.W	Anode wastage 0-25%	278	2.467	52.12
15:08	0-25% A.W	Anode wastage 0-25%	282	2.513	52.35
15:10	0-25% A.W	Anode wastage 0-25%	287	2.562	52.61
15:11	0-25% A.W	Anode wastage 0-25%	291	2.610	52.66
15:14	AN.CP	Anode CP Reading -1038mV	297	2.682	52.75
15:16	SF.SC	Seabed Feature Scour	298	2.692	52.68
15:17	0-25% A.W	Anode wastage 0-25%	300	2.707	52.75
15:18	0-25% A.W	Anode wastage 0-25%	304	2.756	52.60
15:20	0-25% A.W	Anode wastage 0-25%	308	2.804	52.42
15:22	0-25% A.W	Anode wastage 0-25%	312	2.851	52.35
7:24	0-25% A.W	Anode wastage 0-25%	316	2.899	52.26
7:25	0-25% A.W	Anode wastage 0-25%	320	2.948	52.13
7:27	0-25% A.W	Anode wastage 0-25%	324	2.996	52.21
7:29	0-25% A.W	Anode wastage 0-25%	328	3.044	52.26
7:30	0-25% A.W	Anode wastage 0-25%	333	3.093	52.39
7:32	0-25% A.W	Anode wastage 0-25%	337	3.141	52.46
7:33	0-25% A.W	Anode wastage 0-25%	341	3.189	52.66
7:35	0-25% A.W	Anode wastage 0-25%	345	3.237	52.73
7:37	0-25% A.W	Anode wastage 0-25%	349	3.285	52.73
7:39	0-25% A.W	Anode wastage 0-25%	353	3.333	52.81
7:41	0-25% A.W	Anode wastage 0-25%	357	3.381	52.85
7:42	X.CU	Crossing Under Power Cable	358	3.393	52.18
7:43	0-25% A.W	Anode wastage 0-25%	361	3.429	52.95
7:44	0-25% A.W	Anode wastage 0-25%	364	3.465	52.94
7:46	X.CU	Crossing Under Power Cable	367	3.498	52.95
7:47	TI.PO	Tie-in point	369	3.510	53.00
7:48	B.PL	Bend of pipeline	370	3.517	53.02
7:49	0-25% A.W	Anode wastage 0-25%	371	3.524	52.91
7:50	AN.CP	Anode CP Reading -1033mV	371	3.524	52.91





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



ROV:	Panther 932	Contractor:	VSP	Task No.:	B.42.2.35
Date:	21-04-24	Client:	VSP	Report No.:	P.36-24
Dive No.:	P.3017	Location:	Dragon oil field	Depth:	52m
DVD No.:	P.36-24	Extra Equipment:	N/A	Vessel:	Sao Mai 03
RC.RB1.12-RC10.2 WATER INJECTION PIPELINE SURVEY					
Time	Code	Description	Fix	KP	Depth
7:51	B.PL	Bend of pipeline	372	3.531	52.79
7:52	R.EL	Riser Elbow	373	3.533	52.19
7:53	TI.PO	Tie-in point	374	3.533	52.27
7:55	R.C	Riser Clamp at EL -46m			
7:56	R.C	Riser Clamp at EL -40m			
7:58	R.C	Riser Clamp at EL -34m			
8:00	R.C	Riser Clamp at EL -29m			
8:01	0-25% A.W	Anode wastage 0-25% at EL -24m			
8:01	R.C	Riser Clamp at EL -24m			
8:02	R.C	Riser Clamp at EL -20m			
8:03	R.C	Riser Clamp at EL -15m			
8:04	0-25% A.W	Anode wastage 0-25% at EL -12m			
8:04	R.C	Riser Clamp at EL -10m			
8:05	R.C	Riser Clamp at EL -5m			
8:06	V.EOS	Video End of Survey at RC10			



7.2 Co-ordinates

Table 9: Co-ordinates

Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
1	712890.34	1054462.51	9°32.2018'N	107°56.1368'E	-0.034	51.76
2	712889.98	1054463.34	9°32.2022'N	107°56.1366'E	-0.034	51.59
3	712892.83	1054463.64	9°32.2024'N	107°56.1381'E	-0.032	51.89
4	712898.84	1054467.59	9°32.2045'N	107°56.1414'E	-0.025	51.90
5	712904.33	1054474.97	9°32.2085'N	107°56.1445'E	-0.016	52.27
6	712909.43	1054482.02	9°32.2123'N	107°56.1473'E	-0.007	52.09
7	712911.67	1054486.21	9°32.2146'N	107°56.1485'E	-0.003	52.06
8	712913.97	1054489.66	9°32.2164'N	107°56.1498'E	0.001	52.07
9	712915.73	1054491.80	9°32.2176'N	107°56.1508'E	0.004	52.04
10	712912.38	1054493.59	9°32.2186'N	107°56.1489'E	0.004	51.75
11	712913.34	1054496.38	9°32.2201'N	107°56.1495'E	0.007	51.71
12	712924.60	1054490.29	9°32.2168'N	107°56.1556'E	0.008	51.55
13	712922.91	1054488.19	9°32.2156'N	107°56.1547'E	0.005	51.83
14	712922.75	1054488.53	9°32.2158'N	107°56.1546'E	0.005	51.84
15	712918.56	1054494.11	9°32.2188'N	107°56.1523'E	0.008	51.41
16	712920.78	1054496.97	9°32.2204'N	107°56.1535'E	0.011	51.87
17	712916.11	1054500.44	9°32.2223'N	107°56.1510'E	0.011	51.71
18	712917.34	1054502.43	9°32.2234'N	107°56.1517'E	0.014	51.56
19	712930.29	1054495.99	9°32.2198'N	107°56.1587'E	0.016	51.80
20	712929.18	1054493.33	9°32.2184'N	107°56.1581'E	0.013	51.87
21	712922.79	1054498.79	9°32.2214'N	107°56.1546'E	0.014	51.25
22	712927.08	1054504.92	9°32.2247'N	107°56.1570'E	0.021	51.87
23	712929.33	1054508.16	9°32.2264'N	107°56.1582'E	0.025	51.92
24	712933.15	1054515.25	9°32.2303'N	107°56.1603'E	0.033	51.69
25	712935.51	1054519.83	9°32.2327'N	107°56.1616'E	0.038	51.92
26	712940.40	1054526.83	9°32.2365'N	107°56.1643'E	0.047	51.90
27	712944.76	1054533.89	9°32.2403'N	107°56.1667'E	0.055	51.92
28	712949.33	1054541.20	9°32.2443'N	107°56.1693'E	0.064	51.93
29	712953.76	1054548.45	9°32.2482'N	107°56.1717'E	0.072	51.92
30	712958.19	1054555.66	9°32.2521'N	107°56.1741'E	0.081	51.92
31	712960.82	1054559.62	9°32.2543'N	107°56.1756'E	0.086	51.89
32	712969.71	1054571.15	9°32.2605'N	107°56.1805'E	0.100	51.85
33	712969.96	1054570.52	9°32.2601'N	107°56.1806'E	0.100	51.83
34	712965.44	1054573.07	9°32.2615'N	107°56.1782'E	0.099	51.81
35	712967.11	1054576.14	9°32.2632'N	107°56.1791'E	0.103	51.43
36	712971.74	1054572.54	9°32.2612'N	107°56.1816'E	0.102	51.44
37	712976.16	1054581.25	9°32.2659'N	107°56.1840'E	0.112	51.36
38	712969.98	1054580.96	9°32.2658'N	107°56.1807'E	0.109	51.78
39	712970.23	1054583.62	9°32.2672'N	107°56.1808'E	0.111	51.33
40	712974.90	1054581.42	9°32.2660'N	107°56.1834'E	0.112	51.32
41	712975.81	1054584.58	9°32.2677'N	107°56.1839'E	0.115	51.09





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
42	712973.15	1054583.15	9°32.2670'N	107°56.1824'E	0.112	51.23
43	712974.42	1054585.68	9°32.2683'N	107°56.1831'E	0.115	51.21
44	712979.57	1054582.49	9°32.2666'N	107°56.1859'E	0.115	51.52
45	712977.59	1054580.42	9°32.2655'N	107°56.1848'E	0.112	51.56
46	712977.59	1054583.24	9°32.2670'N	107°56.1848'E	0.115	51.15
47	712979.40	1054585.75	9°32.2684'N	107°56.1858'E	0.118	51.34
48	712980.26	1054583.69	9°32.2672'N	107°56.1863'E	0.117	51.66
49	712982.80	1054586.70	9°32.2689'N	107°56.1877'E	0.121	51.67
50	712976.15	1054590.73	9°32.2711'N	107°56.1841'E	0.120	51.79
51	712975.03	1054588.80	9°32.2700'N	107°56.1834'E	0.118	51.77
52	712979.55	1054588.15	9°32.2697'N	107°56.1859'E	0.120	51.15
53	712987.10	1054598.35	9°32.2752'N	107°56.1901'E	0.132	51.90
54	712987.70	1054600.91	9°32.2766'N	107°56.1904'E	0.135	51.92
55	712993.41	1054611.20	9°32.2821'N	107°56.1936'E	0.147	51.86
56	712998.00	1054618.47	9°32.2861'N	107°56.1961'E	0.155	51.88
57	713004.17	1054626.84	9°32.2906'N	107°56.1995'E	0.166	51.82
58	713006.55	1054630.62	9°32.2926'N	107°56.2008'E	0.170	51.84
59	713012.44	1054639.82	9°32.2976'N	107°56.2040'E	0.181	51.82
60	713019.47	1054649.44	9°32.3028'N	107°56.2079'E	0.193	51.84
61	713026.79	1054660.16	9°32.3086'N	107°56.2119'E	0.206	51.79
62	713033.86	1054670.70	9°32.3143'N	107°56.2158'E	0.219	51.83
63	713040.08	1054679.62	9°32.3191'N	107°56.2193'E	0.229	51.69
64	713047.68	1054690.79	9°32.3251'N	107°56.2235'E	0.243	51.75
65	713054.95	1054701.65	9°32.3310'N	107°56.2275'E	0.256	51.74
66	713062.25	1054713.51	9°32.3374'N	107°56.2315'E	0.270	51.67
67	713063.49	1054715.55	9°32.3385'N	107°56.2322'E	0.272	51.63
68	713066.11	1054718.47	9°32.3401'N	107°56.2336'E	0.276	51.78
69	713074.01	1054727.50	9°32.3450'N	107°56.2380'E	0.288	51.77
70	713072.09	1054728.44	9°32.3455'N	107°56.2369'E	0.288	51.43
71	713074.12	1054730.17	9°32.3464'N	107°56.2380'E	0.290	51.07
72	713078.28	1054726.51	9°32.3444'N	107°56.2403'E	0.289	51.34
73	713076.36	1054725.13	9°32.3437'N	107°56.2392'E	0.288	51.64
74	713075.29	1054730.14	9°32.3464'N	107°56.2387'E	0.291	50.90
75	713075.50	1054734.26	9°32.3486'N	107°56.2388'E	0.295	51.18
76	713075.43	1054737.19	9°32.3502'N	107°56.2388'E	0.296	51.41
77	713082.92	1054732.83	9°32.3478'N	107°56.2428'E	0.298	51.59
78	713080.29	1054729.49	9°32.3460'N	107°56.2414'E	0.293	51.62
79	713082.05	1054738.69	9°32.3510'N	107°56.2424'E	0.302	51.44
80	713079.73	1054739.57	9°32.3515'N	107°56.2411'E	0.302	51.48
81	713081.32	1054742.84	9°32.3533'N	107°56.2420'E	0.305	51.22
82	713085.59	1054739.23	9°32.3513'N	107°56.2443'E	0.304	51.20
83	713083.47	1054737.14	9°32.3502'N	107°56.2431'E	0.301	51.29
84	713083.11	1054741.10	9°32.3523'N	107°56.2430'E	0.305	51.24





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
85	713088.96	1054748.97	9°32.3566'N	107°56.2462'E	0.314	51.64
86	713094.12	1054757.98	9°32.3614'N	107°56.2490'E	0.325	51.66
87	713101.80	1054768.26	9°32.3670'N	107°56.2533'E	0.338	51.64
88	713102.92	1054770.25	9°32.3681'N	107°56.2539'E	0.340	51.61
89	713108.73	1054779.03	9°32.3728'N	107°56.2571'E	0.350	51.60
90	713117.35	1054791.24	9°32.3794'N	107°56.2618'E	0.365	51.53
91	713123.96	1054801.12	9°32.3847'N	107°56.2655'E	0.377	51.55
92	713129.25	1054808.78	9°32.3889'N	107°56.2684'E	0.387	51.51
93	713136.05	1054818.80	9°32.3943'N	107°56.2721'E	0.399	51.57
94	713142.37	1054828.92	9°32.3998'N	107°56.2756'E	0.411	51.52
95	713149.74	1054838.49	9°32.4049'N	107°56.2797'E	0.423	51.49
96	713156.17	1054848.21	9°32.4102'N	107°56.2832'E	0.434	51.45
97	713163.31	1054858.23	9°32.4156'N	107°56.2871'E	0.447	51.46
98	713169.84	1054867.94	9°32.4208'N	107°56.2907'E	0.458	51.40
99	713177.08	1054877.49	9°32.4260'N	107°56.2947'E	0.470	51.33
100	713183.89	1054887.59	9°32.4315'N	107°56.2985'E	0.483	51.32
101	713190.34	1054897.58	9°32.4369'N	107°56.3020'E	0.495	51.35
102	713196.69	1054907.82	9°32.4424'N	107°56.3055'E	0.507	51.37
103	713202.65	1054918.27	9°32.4480'N	107°56.3088'E	0.519	51.24
104	713209.43	1054928.22	9°32.4534'N	107°56.3126'E	0.531	51.21
105	713215.75	1054938.73	9°32.4591'N	107°56.3160'E	0.543	51.29
106	713222.70	1054948.15	9°32.4642'N	107°56.3199'E	0.555	50.85
107	713229.15	1054958.45	9°32.4697'N	107°56.3234'E	0.567	51.24
108	713234.89	1054968.86	9°32.4754'N	107°56.3266'E	0.579	51.26
109	713241.39	1054978.94	9°32.4808'N	107°56.3302'E	0.591	51.23
110	713247.18	1054989.70	9°32.4866'N	107°56.3334'E	0.602	51.25
111	713252.31	1055000.41	9°32.4924'N	107°56.3362'E	0.614	51.26
112	713258.29	1055011.07	9°32.4982'N	107°56.3395'E	0.628	51.17
113	713263.57	1055021.31	9°32.5037'N	107°56.3424'E	0.638	51.25
114	713269.95	1055031.90	9°32.5095'N	107°56.3459'E	0.650	51.14
115	713275.99	1055042.23	9°32.5150'N	107°56.3493'E	0.663	51.17
116	713281.10	1055052.92	9°32.5208'N	107°56.3521'E	0.676	50.81
117	713286.86	1055063.76	9°32.5267'N	107°56.3553'E	0.689	51.11
118	713292.11	1055074.29	9°32.5324'N	107°56.3582'E	0.701	51.05
119	713297.19	1055085.04	9°32.5382'N	107°56.3610'E	0.712	51.03
120	713302.40	1055095.80	9°32.5440'N	107°56.3639'E	0.724	51.04
121	713307.30	1055107.02	9°32.5501'N	107°56.3666'E	0.736	51.05
122	713312.13	1055118.00	9°32.5560'N	107°56.3693'E	0.748	51.06
123	713316.90	1055129.33	9°32.5622'N	107°56.3719'E	0.761	51.09
124	713321.76	1055140.04	9°32.5680'N	107°56.3746'E	0.775	51.03
125	713326.73	1055150.75	9°32.5738'N	107°56.3773'E	0.787	51.00
126	713332.16	1055161.66	9°32.5797'N	107°56.3803'E	0.800	51.03
127	713337.44	1055172.46	9°32.5855'N	107°56.3833'E	0.812	51.02





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
128	713341.81	1055183.76	9°32.5916'N	107°56.3857'E	0.822	51.03
129	713346.30	1055194.58	9°32.5975'N	107°56.3882'E	0.835	51.09
130	713350.86	1055206.02	9°32.6037'N	107°56.3907'E	0.847	51.07
131	713355.07	1055217.35	9°32.6098'N	107°56.3930'E	0.859	51.05
132	713359.37	1055228.16	9°32.6156'N	107°56.3954'E	0.872	51.06
133	713360.07	1055230.19	9°32.6167'N	107°56.3958'E	0.874	50.99
134	713364.69	1055241.21	9°32.6227'N	107°56.3984'E	0.885	51.08
135	713368.47	1055252.77	9°32.6290'N	107°56.4005'E	0.897	51.11
136	713372.26	1055263.79	9°32.6349'N	107°56.4026'E	0.909	51.13
137	713376.72	1055274.83	9°32.6409'N	107°56.4050'E	0.921	51.16
138	713376.92	1055275.58	9°32.6413'N	107°56.4051'E	0.922	51.17
139	713380.55	1055287.08	9°32.6475'N	107°56.4072'E	0.934	51.30
140	713384.40	1055298.24	9°32.6536'N	107°56.4093'E	0.946	51.27
141	713387.80	1055309.58	9°32.6597'N	107°56.4112'E	0.958	51.26
142	713391.27	1055320.27	9°32.6655'N	107°56.4131'E	0.969	51.30
143	713394.88	1055332.23	9°32.6720'N	107°56.4151'E	0.981	51.35
144	713397.70	1055343.80	9°32.6782'N	107°56.4167'E	0.994	51.33
145	713401.07	1055355.19	9°32.6844'N	107°56.4186'E	1.005	51.35
146	713403.61	1055366.68	9°32.6906'N	107°56.4200'E	1.017	51.33
147	713406.29	1055378.81	9°32.6972'N	107°56.4215'E	1.030	51.34
148	713406.29	1055378.81	9°32.6972'N	107°56.4215'E	1.030	51.31
149	713408.70	1055390.66	9°32.7036'N	107°56.4229'E	1.042	50.93
150	713410.75	1055402.37	9°32.7100'N	107°56.4240'E	1.055	51.32
151	713412.96	1055414.44	9°32.7165'N	107°56.4253'E	1.067	51.30
152	713413.08	1055414.89	9°32.7168'N	107°56.4253'E	1.067	51.25
153	713415.13	1055426.63	9°32.7231'N	107°56.4265'E	1.081	51.27
154	713417.06	1055438.26	9°32.7294'N	107°56.4276'E	1.092	51.34
155	713418.65	1055450.46	9°32.7360'N	107°56.4285'E	1.104	51.24
156	713421.10	1055462.02	9°32.7423'N	107°56.4299'E	1.115	51.22
157	713422.56	1055473.96	9°32.7488'N	107°56.4307'E	1.128	51.28
158	713424.07	1055485.89	9°32.7552'N	107°56.4316'E	1.140	51.25
159	713424.11	1055486.31	9°32.7555'N	107°56.4316'E	1.141	51.20
160	713425.51	1055497.96	9°32.7618'N	107°56.4324'E	1.152	51.17
161	713428.15	1055510.02	9°32.7683'N	107°56.4339'E	1.164	51.11
162	713429.44	1055521.69	9°32.7746'N	107°56.4346'E	1.176	51.14
163	713431.33	1055532.90	9°32.7807'N	107°56.4357'E	1.188	51.19
164	713433.56	1055544.85	9°32.7872'N	107°56.4369'E	1.200	51.19
165	713435.44	1055556.45	9°32.7935'N	107°56.4380'E	1.212	51.20
166	713437.53	1055568.00	9°32.7997'N	107°56.4392'E	1.223	51.23
167	713439.45	1055579.95	9°32.8062'N	107°56.4402'E	1.235	51.22
168	713441.49	1055591.84	9°32.8126'N	107°56.4414'E	1.248	51.23
169	713443.16	1055603.90	9°32.8192'N	107°56.4423'E	1.260	51.22
170	713443.22	1055604.30	9°32.8194'N	107°56.4424'E	1.260	51.26





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
171	713445.21	1055616.07	9°32.8258'N	107°56.4435'E	1.272	51.23
172	713447.24	1055627.78	9°32.8321'N	107°56.4446'E	1.284	51.27
173	713448.92	1055639.64	9°32.8385'N	107°56.4456'E	1.296	50.65
174	713450.25	1055651.59	9°32.8450'N	107°56.4464'E	1.308	51.36
175	713450.25	1055651.59	9°32.8450'N	107°56.4464'E	1.308	51.40
176	713452.27	1055663.22	9°32.8513'N	107°56.4475'E	1.320	51.38
177	713453.98	1055675.62	9°32.8580'N	107°56.4485'E	1.333	51.49
178	713456.37	1055687.54	9°32.8645'N	107°56.4498'E	1.345	51.54
179	713458.19	1055698.28	9°32.8703'N	107°56.4508'E	1.356	51.60
180	713458.94	1055710.01	9°32.8767'N	107°56.4513'E	1.367	51.77
181	713461.70	1055721.72	9°32.8830'N	107°56.4528'E	1.379	51.78
182	713463.05	1055733.57	9°32.8894'N	107°56.4536'E	1.391	51.86
183	713465.60	1055745.36	9°32.8958'N	107°56.4550'E	1.403	51.92
184	713465.96	1055747.30	9°32.8969'N	107°56.4552'E	1.405	51.87
185	713467.39	1055759.09	9°32.9033'N	107°56.4561'E	1.417	51.96
186	713470.03	1055770.86	9°32.9096'N	107°56.4575'E	1.429	51.97
187	713472.49	1055782.69	9°32.9161'N	107°56.4589'E	1.441	51.90
188	713473.94	1055794.90	9°32.9227'N	107°56.4598'E	1.454	52.01
189	713476.20	1055806.46	9°32.9289'N	107°56.4610'E	1.465	51.93
190	713477.63	1055818.28	9°32.9353'N	107°56.4618'E	1.477	51.94
191	713479.34	1055830.18	9°32.9418'N	107°56.4628'E	1.489	51.95
192	713480.56	1055841.79	9°32.9481'N	107°56.4635'E	1.501	52.04
193	713482.71	1055853.74	9°32.9546'N	107°56.4647'E	1.513	52.04
194	713485.12	1055865.54	9°32.9610'N	107°56.4661'E	1.525	52.02
195	713487.20	1055877.55	9°32.9675'N	107°56.4673'E	1.537	51.94
196	713488.61	1055889.49	9°32.9739'N	107°56.4681'E	1.549	51.94
197	713490.40	1055901.54	9°32.9805'N	107°56.4691'E	1.562	51.97
198	713492.56	1055913.14	9°32.9867'N	107°56.4703'E	1.573	51.92
199	713494.36	1055924.77	9°32.9931'N	107°56.4713'E	1.585	51.93
200	713496.18	1055936.88	9°32.9996'N	107°56.4723'E	1.597	51.89
201	713497.89	1055948.79	9°33.0061'N	107°56.4733'E	1.610	51.93
202	713499.66	1055960.40	9°33.0124'N	107°56.4743'E	1.621	51.89
203	713501.05	1055972.37	9°33.0188'N	107°56.4751'E	1.633	51.97
204	713503.13	1055984.13	9°33.0252'N	107°56.4763'E	1.645	52.04
205	713505.11	1055996.03	9°33.0317'N	107°56.4774'E	1.657	52.10
206	713507.13	1056008.20	9°33.0383'N	107°56.4785'E	1.670	52.10
207	713509.00	1056019.92	9°33.0446'N	107°56.4796'E	1.682	52.21
208	713510.59	1056031.92	9°33.0511'N	107°56.4805'E	1.694	52.25
209	713512.82	1056043.79	9°33.0575'N	107°56.4818'E	1.706	52.32
210	713514.43	1056055.70	9°33.0640'N	107°56.4827'E	1.718	52.37
211	713516.31	1056067.08	9°33.0702'N	107°56.4837'E	1.729	52.41
212	713518.47	1056079.07	9°33.0767'N	107°56.4850'E	1.741	52.53
213	713520.38	1056090.90	9°33.0831'N	107°56.4860'E	1.753	52.56





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
214	713522.28	1056102.96	9°33.0896'N	107°56.4871'E	1.766	52.52
215	713523.74	1056114.60	9°33.0959'N	107°56.4879'E	1.778	52.57
216	713523.84	1056116.79	9°33.0971'N	107°56.4880'E	1.780	52.59
217	713526.76	1056128.26	9°33.1033'N	107°56.4896'E	1.792	52.68
218	713528.30	1056140.31	9°33.1098'N	107°56.4905'E	1.804	52.71
219	713529.74	1056152.47	9°33.1164'N	107°56.4913'E	1.816	52.72
220	713531.08	1056163.95	9°33.1227'N	107°56.4921'E	1.828	52.79
221	713533.41	1056176.03	9°33.1292'N	107°56.4934'E	1.840	52.82
222	713533.50	1056176.41	9°33.1294'N	107°56.4935'E	1.841	52.79
223	713535.68	1056188.02	9°33.1357'N	107°56.4947'E	1.852	52.83
224	713537.22	1056199.95	9°33.1422'N	107°56.4956'E	1.864	52.79
225	713539.96	1056211.67	9°33.1485'N	107°56.4971'E	1.876	52.71
226	713541.86	1056223.03	9°33.1547'N	107°56.4982'E	1.888	52.67
227	713543.58	1056234.73	9°33.1610'N	107°56.4992'E	1.900	52.69
228	713544.89	1056246.77	9°33.1675'N	107°56.4999'E	1.912	52.69
229	713546.46	1056258.71	9°33.1740'N	107°56.5008'E	1.924	52.74
230	713548.19	1056270.60	9°33.1805'N	107°56.5018'E	1.936	52.66
231	713549.75	1056282.63	9°33.1870'N	107°56.5027'E	1.948	52.65
232	713551.64	1056294.25	9°33.1933'N	107°56.5037'E	1.960	52.22
233	713554.07	1056305.88	9°33.1996'N	107°56.5051'E	1.972	52.57
234	713556.02	1056317.78	9°33.2060'N	107°56.5062'E	1.983	52.60
235	713557.82	1056329.69	9°33.2125'N	107°56.5072'E	1.995	52.57
236	713559.32	1056341.74	9°33.2190'N	107°56.5081'E	2.008	52.56
237	713561.40	1056353.34	9°33.2253'N	107°56.5093'E	2.020	52.15
238	713563.16	1056365.15	9°33.2317'N	107°56.5103'E	2.032	52.43
239	713565.36	1056377.41	9°33.2383'N	107°56.5115'E	2.044	52.48
240	713566.53	1056389.41	9°33.2448'N	107°56.5122'E	2.056	52.48
241	713568.31	1056401.30	9°33.2513'N	107°56.5132'E	2.068	52.38
242	713569.88	1056413.16	9°33.2577'N	107°56.5141'E	2.080	52.43
243	713572.00	1056424.75	9°33.2640'N	107°56.5153'E	2.092	52.35
244	713573.88	1056436.77	9°33.2705'N	107°56.5163'E	2.104	52.30
245	713575.39	1056448.74	9°33.2770'N	107°56.5172'E	2.116	52.33
246	713577.25	1056460.48	9°33.2833'N	107°56.5182'E	2.128	52.34
247	713578.78	1056472.18	9°33.2897'N	107°56.5191'E	2.140	52.17
248	713580.84	1056484.48	9°33.2964'N	107°56.5203'E	2.152	52.13
249	713581.19	1056487.64	9°33.2981'N	107°56.5205'E	2.155	52.21
250	713582.87	1056499.29	9°33.3044'N	107°56.5214'E	2.168	52.11
251	713584.31	1056509.25	9°33.3098'N	107°56.5223'E	2.177	52.11
252	713586.52	1056521.04	9°33.3162'N	107°56.5235'E	2.189	52.15
253	713588.13	1056531.89	9°33.3220'N	107°56.5244'E	2.201	52.00
254	713590.13	1056543.76	9°33.3285'N	107°56.5255'E	2.213	52.04
255	713591.64	1056555.39	9°33.3348'N	107°56.5264'E	2.224	51.96
256	713594.03	1056567.32	9°33.3412'N	107°56.5277'E	2.236	51.91





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
257	713594.50	1056569.65	9°33.3425'N	107°56.5280'E	2.239	51.87
258	713595.96	1056581.61	9°33.3490'N	107°56.5288'E	2.251	51.86
259	713595.96	1056581.61	9°33.3490'N	107°56.5288'E	2.251	51.84
260	713597.76	1056593.30	9°33.3553'N	107°56.5299'E	2.263	51.83
261	713599.34	1056604.02	9°33.3611'N	107°56.5308'E	2.274	51.82
262	713601.14	1056615.76	9°33.3675'N	107°56.5318'E	2.285	51.84
263	713603.29	1056627.58	9°33.3739'N	107°56.5330'E	2.298	51.81
264	713605.09	1056639.60	9°33.3804'N	107°56.5340'E	2.310	51.88
265	713606.77	1056651.02	9°33.3866'N	107°56.5350'E	2.321	51.81
266	713608.68	1056663.24	9°33.3932'N	107°56.5360'E	2.334	51.75
267	713610.61	1056675.09	9°33.3996'N	107°56.5371'E	2.346	51.89
268	713611.97	1056687.00	9°33.4061'N	107°56.5379'E	2.358	51.82
269	713613.53	1056698.69	9°33.4124'N	107°56.5388'E	2.369	51.91
270	713615.56	1056710.60	9°33.4189'N	107°56.5399'E	2.382	51.79
271	713617.87	1056722.50	9°33.4253'N	107°56.5412'E	2.394	51.82
272	713619.31	1056732.71	9°33.4309'N	107°56.5421'E	2.404	51.81
273	713621.64	1056744.65	9°33.4373'N	107°56.5434'E	2.416	51.93
274	713623.38	1056756.42	9°33.4437'N	107°56.5444'E	2.428	51.89
275	713625.16	1056768.52	9°33.4503'N	107°56.5454'E	2.440	51.89
276	713626.91	1056780.25	9°33.4566'N	107°56.5464'E	2.452	52.13
277	713629.04	1056792.21	9°33.4631'N	107°56.5476'E	2.464	52.04
278	713629.47	1056794.50	9°33.4644'N	107°56.5478'E	2.467	52.12
279	713631.15	1056806.36	9°33.4708'N	107°56.5488'E	2.479	52.09
280	713633.21	1056818.42	9°33.4773'N	107°56.5499'E	2.491	52.19
281	713635.44	1056830.13	9°33.4837'N	107°56.5512'E	2.503	52.30
282	713637.49	1056840.75	9°33.4894'N	107°56.5523'E	2.513	52.35
283	713639.06	1056852.69	9°33.4959'N	107°56.5532'E	2.525	52.29
284	713640.55	1056864.74	9°33.5024'N	107°56.5541'E	2.538	52.38
285	713642.62	1056876.48	9°33.5088'N	107°56.5552'E	2.550	52.42
286	713644.23	1056888.08	9°33.5151'N	107°56.5562'E	2.561	52.45
287	713644.38	1056888.51	9°33.5153'N	107°56.5562'E	2.562	52.61
288	713646.13	1056900.57	9°33.5218'N	107°56.5572'E	2.575	52.55
289	713648.25	1056912.60	9°33.5283'N	107°56.5584'E	2.586	52.56
290	713649.80	1056923.89	9°33.5345'N	107°56.5593'E	2.598	52.61
291	713651.74	1056935.88	9°33.5410'N	107°56.5604'E	2.610	52.66
292	713653.60	1056947.86	9°33.5475'N	107°56.5615'E	2.622	52.63
293	713655.28	1056959.98	9°33.5540'N	107°56.5624'E	2.634	52.79
294	713657.10	1056971.57	9°33.5603'N	107°56.5634'E	2.646	52.67
295	713659.21	1056983.46	9°33.5668'N	107°56.5646'E	2.658	52.68
296	713659.96	1056995.70	9°33.5734'N	107°56.5651'E	2.670	52.79
297	713661.07	1057007.69	9°33.5799'N	107°56.5657'E	2.682	52.75
298	713662.91	1057017.43	9°33.5852'N	107°56.5668'E	2.692	52.68
299	713664.55	1057029.41	9°33.5917'N	107°56.5677'E	2.704	52.71





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
300	713664.80	1057032.41	9°33.5933'N	107°56.5678'E	2.707	52.75
301	713667.12	1057044.46	9°33.5998'N	107°56.5692'E	2.720	52.66
302	713668.89	1057056.14	9°33.6061'N	107°56.5702'E	2.731	52.63
303	713670.44	1057068.16	9°33.6127'N	107°56.5710'E	2.744	52.56
304	713672.30	1057080.04	9°33.6191'N	107°56.5721'E	2.756	52.60
305	713674.15	1057091.92	9°33.6255'N	107°56.5731'E	2.768	52.53
306	713675.84	1057103.82	9°33.6320'N	107°56.5741'E	2.780	52.50
307	713678.11	1057115.50	9°33.6383'N	107°56.5754'E	2.792	52.48
308	713680.10	1057127.29	9°33.6447'N	107°56.5765'E	2.804	52.42
309	713681.93	1057139.30	9°33.6512'N	107°56.5775'E	2.816	52.43
310	713683.77	1057151.24	9°33.6577'N	107°56.5786'E	2.828	52.38
311	713685.83	1057162.67	9°33.6639'N	107°56.5797'E	2.839	52.37
312	713687.53	1057174.38	9°33.6702'N	107°56.5807'E	2.851	52.35
313	713689.86	1057186.77	9°33.6769'N	107°56.5820'E	2.864	52.35
314	713691.59	1057198.03	9°33.6830'N	107°56.5830'E	2.875	52.52
315	713693.30	1057210.08	9°33.6896'N	107°56.5840'E	2.887	52.24
316	713695.59	1057221.99	9°33.6960'N	107°56.5853'E	2.899	52.26
317	713697.34	1057233.92	9°33.7025'N	107°56.5862'E	2.912	52.24
318	713699.05	1057245.87	9°33.7090'N	107°56.5872'E	2.924	52.19
319	713700.83	1057257.67	9°33.7153'N	107°56.5882'E	2.936	52.21
320	713702.60	1057269.56	9°33.7218'N	107°56.5892'E	2.948	52.13
321	713704.74	1057281.42	9°33.7282'N	107°56.5904'E	2.960	52.14
322	713705.93	1057293.12	9°33.7346'N	107°56.5911'E	2.972	52.17
323	713707.60	1057304.95	9°33.7410'N	107°56.5921'E	2.984	52.21
324	713709.38	1057317.11	9°33.7476'N	107°56.5931'E	2.996	52.21
325	713710.99	1057328.65	9°33.7538'N	107°56.5940'E	3.007	52.23
326	713712.83	1057340.85	9°33.7604'N	107°56.5950'E	3.020	52.20
327	713714.79	1057352.60	9°33.7668'N	107°56.5961'E	3.032	52.18
328	713716.70	1057364.72	9°33.7734'N	107°56.5972'E	3.044	52.26
329	713718.28	1057376.56	9°33.7798'N	107°56.5981'E	3.056	52.34
330	713719.65	1057388.11	9°33.7860'N	107°56.5989'E	3.068	51.78
331	713721.50	1057399.95	9°33.7925'N	107°56.6000'E	3.080	52.30
332	713723.20	1057412.16	9°33.7991'N	107°56.6009'E	3.092	52.35
333	713723.31	1057412.82	9°33.7994'N	107°56.6010'E	3.093	52.39
334	713725.19	1057424.58	9°33.8058'N	107°56.6020'E	3.104	52.36
335	713726.59	1057436.65	9°33.8123'N	107°56.6029'E	3.117	52.41
336	713728.10	1057448.41	9°33.8187'N	107°56.6037'E	3.129	52.46
337	713729.95	1057460.52	9°33.8253'N	107°56.6048'E	3.141	52.46
338	713731.59	1057472.10	9°33.8316'N	107°56.6057'E	3.153	52.53
339	713733.62	1057483.70	9°33.8378'N	107°56.6068'E	3.164	52.60
340	713735.15	1057495.94	9°33.8445'N	107°56.6077'E	3.177	52.66
341	713737.63	1057507.83	9°33.8509'N	107°56.6091'E	3.189	52.66
342	713739.87	1057519.68	9°33.8573'N	107°56.6104'E	3.201	52.71





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
343	713742.06	1057531.04	9°33.8635'N	107°56.6116'E	3.212	52.71
344	713743.94	1057543.28	9°33.8701'N	107°56.6127'E	3.225	52.81
345	713745.78	1057554.89	9°33.8764'N	107°56.6137'E	3.237	52.73
346	713747.91	1057566.92	9°33.8829'N	107°56.6149'E	3.249	52.72
347	713749.86	1057578.90	9°33.8894'N	107°56.6160'E	3.261	52.72
348	713751.89	1057590.46	9°33.8957'N	107°56.6172'E	3.273	52.70
349	713753.58	1057602.48	9°33.9022'N	107°56.6181'E	3.285	52.73
350	713755.59	1057614.27	9°33.9086'N	107°56.6192'E	3.297	52.75
351	713758.06	1057626.16	9°33.9150'N	107°56.6206'E	3.310	52.76
352	713760.26	1057638.06	9°33.9215'N	107°56.6219'E	3.322	52.74
353	713762.07	1057649.50	9°33.9277'N	107°56.6229'E	3.333	52.81
354	713764.00	1057661.46	9°33.9342'N	107°56.6240'E	3.345	52.85
355	713765.97	1057673.55	9°33.9407'N	107°56.6251'E	3.358	52.80
356	713766.87	1057685.24	9°33.9470'N	107°56.6256'E	3.369	52.83
357	713768.79	1057697.12	9°33.9535'N	107°56.6267'E	3.381	52.85
358	713770.82	1057709.01	9°33.9599'N	107°56.6279'E	3.393	52.18
359	713772.74	1057720.88	9°33.9664'N	107°56.6289'E	3.405	52.89
360	713775.01	1057732.47	9°33.9726'N	107°56.6302'E	3.417	52.96
361	713775.93	1057744.37	9°33.9791'N	107°56.6308'E	3.429	52.95
362	713776.39	1057756.40	9°33.9856'N	107°56.6311'E	3.441	52.92
363	713775.97	1057768.62	9°33.9922'N	107°56.6309'E	3.453	53.00
364	713777.14	1057780.36	9°33.9986'N	107°56.6315'E	3.465	52.94
365	713779.82	1057792.64	9°34.0053'N	107°56.6330'E	3.478	52.94
366	713783.28	1057804.08	9°34.0115'N	107°56.6350'E	3.489	52.95
367	713783.84	1057812.46	9°34.0160'N	107°56.6353'E	3.498	52.95
368	713784.21	1057824.37	9°34.0225'N	107°56.6355'E	3.509	52.14
369	713784.21	1057824.48	9°34.0225'N	107°56.6355'E	3.510	53.00
370	713785.30	1057832.09	9°34.0266'N	107°56.6362'E	3.517	53.02
371	713790.54	1057837.20	9°34.0294'N	107°56.6390'E	3.524	52.91
372	713796.31	1057842.91	9°34.0325'N	107°56.6422'E	3.531	52.79
373	713805.59	1057840.13	9°34.0309'N	107°56.6473'E	3.533	52.19
374	713806.13	1057839.90	9°34.0308'N	107°56.6476'E	3.533	52.27



7.3 Drawings

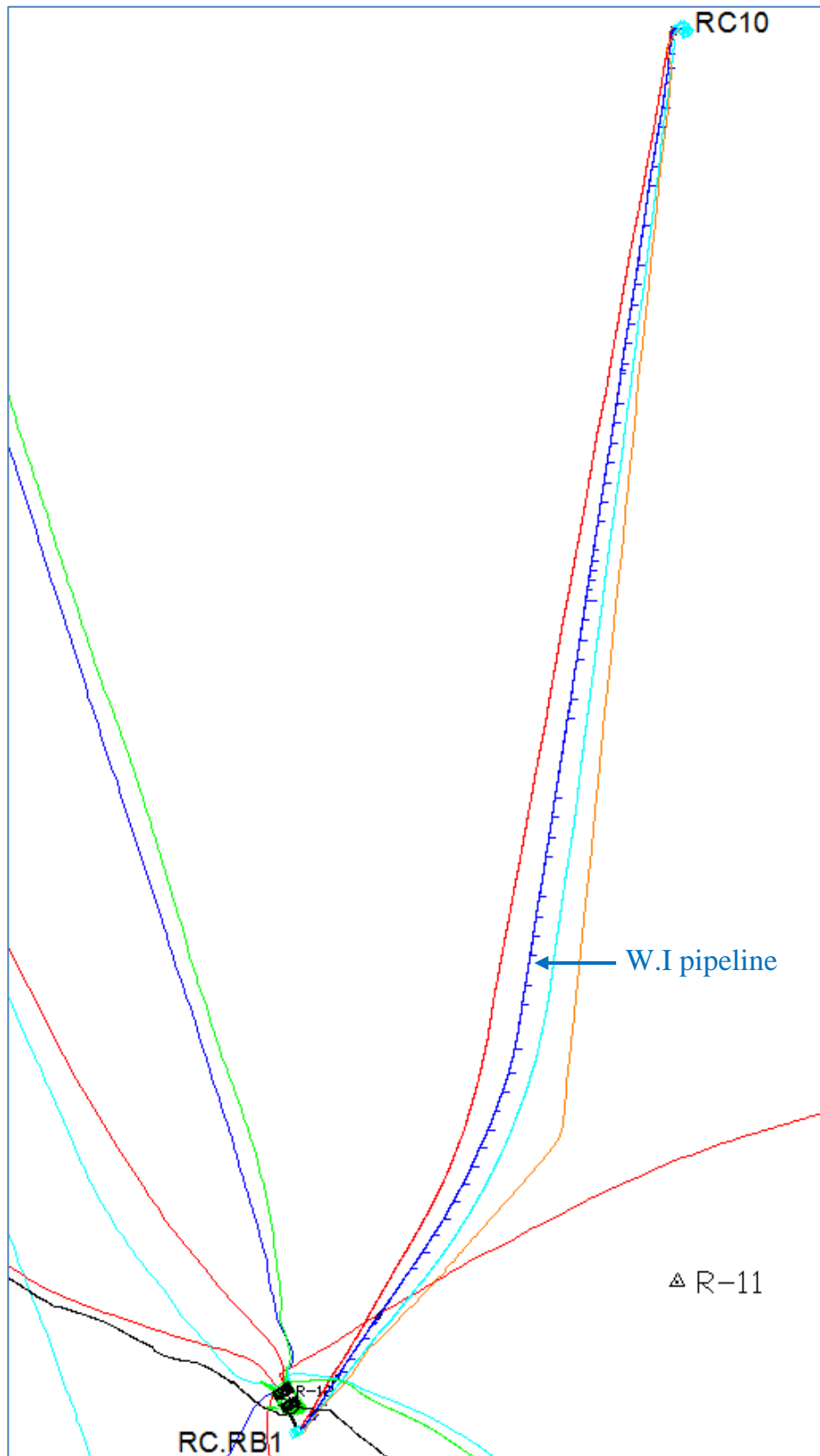


Figure 54: RC.RB1-RC10 water injection pipeline route



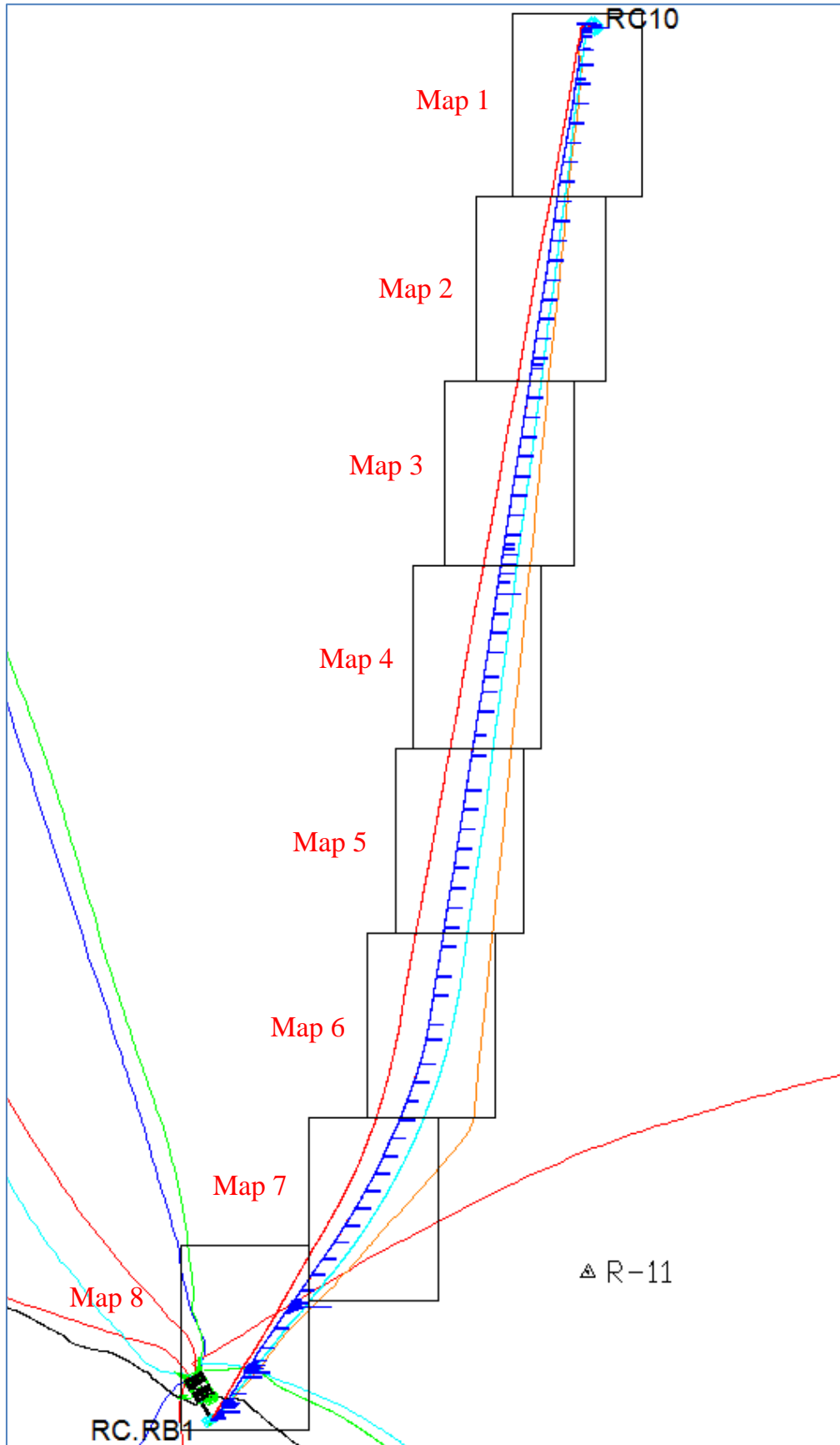


Figure 55: Pipeline sections drawing



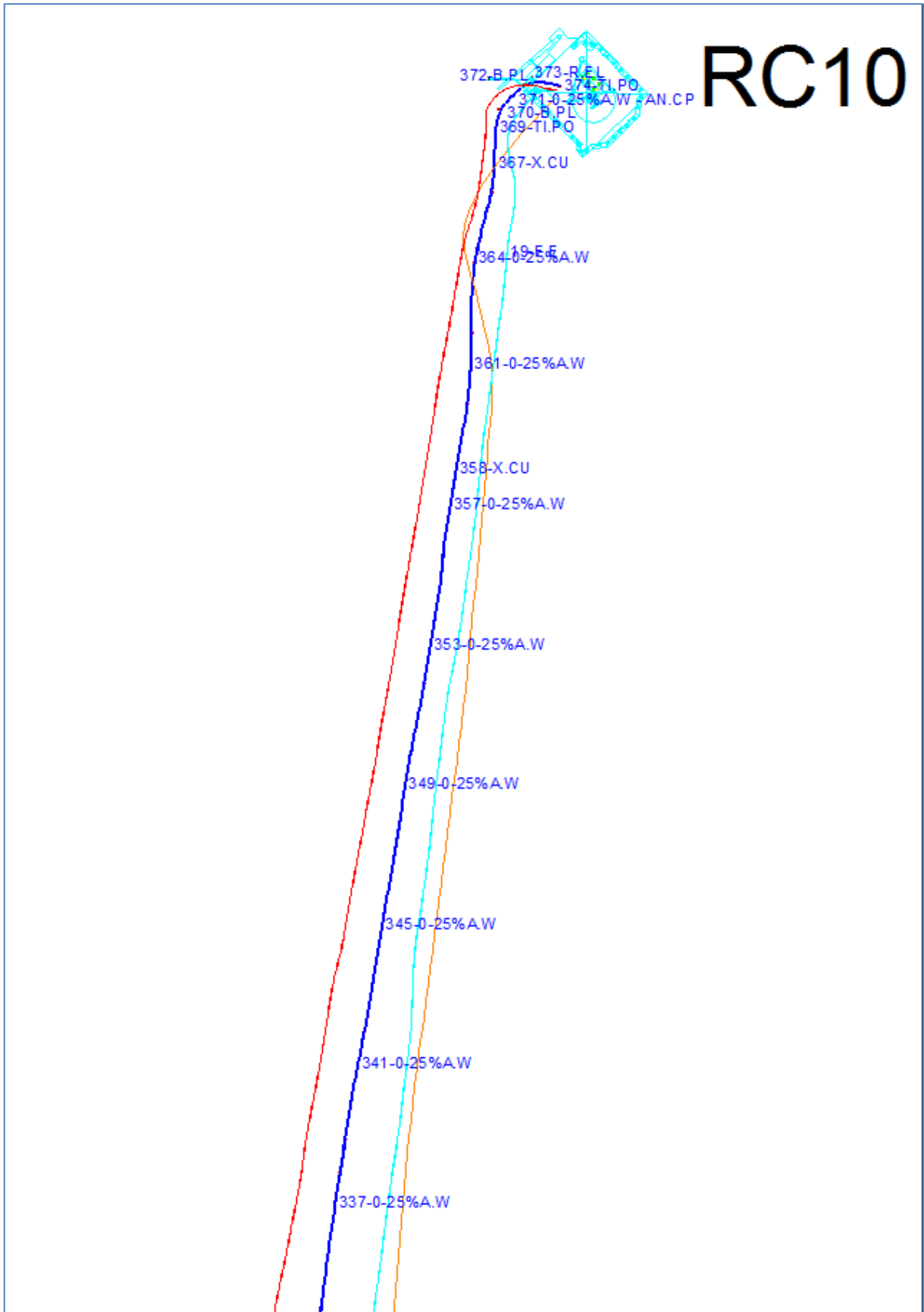


Figure 56: Map 1



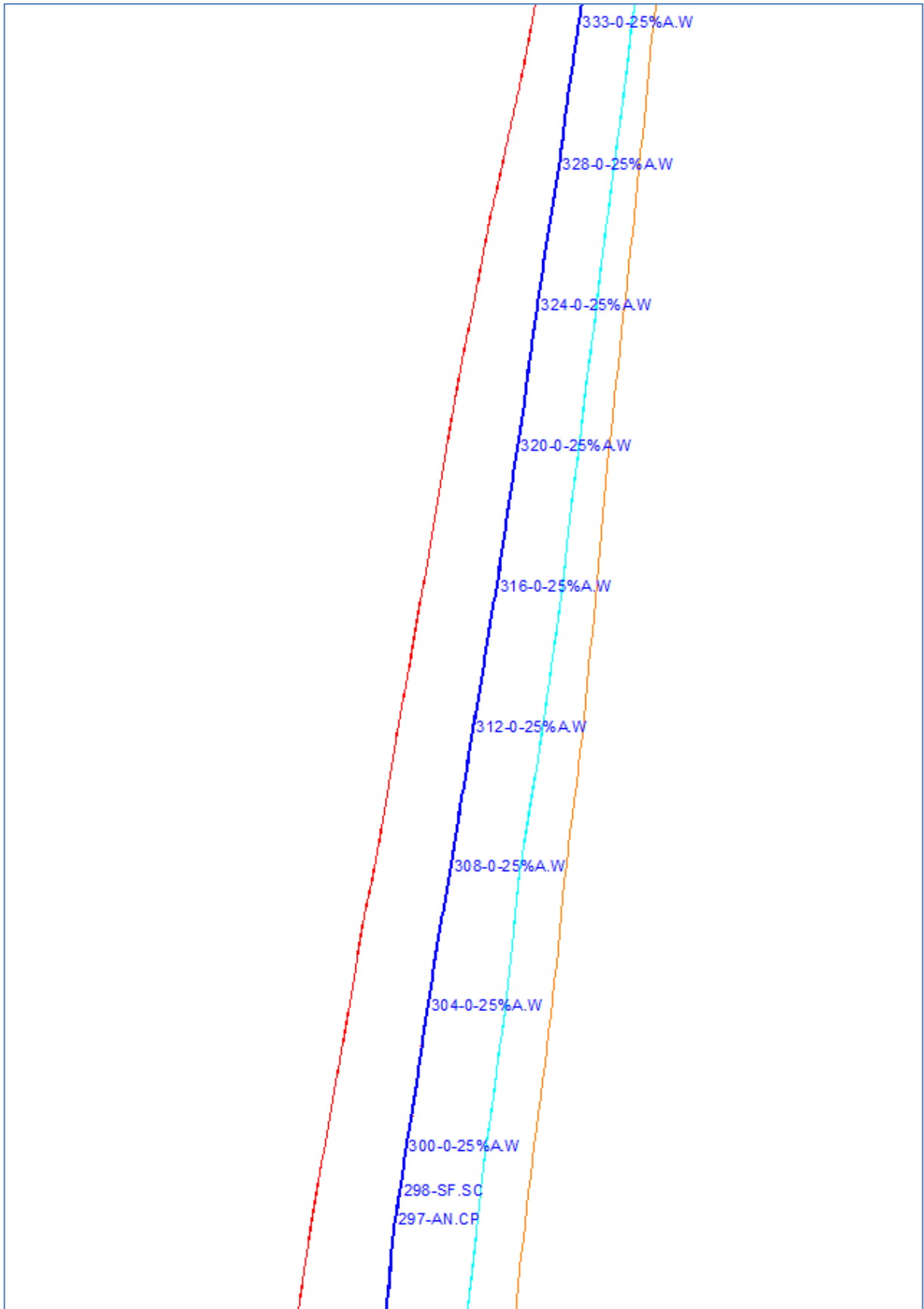


Figure 57: Map 2



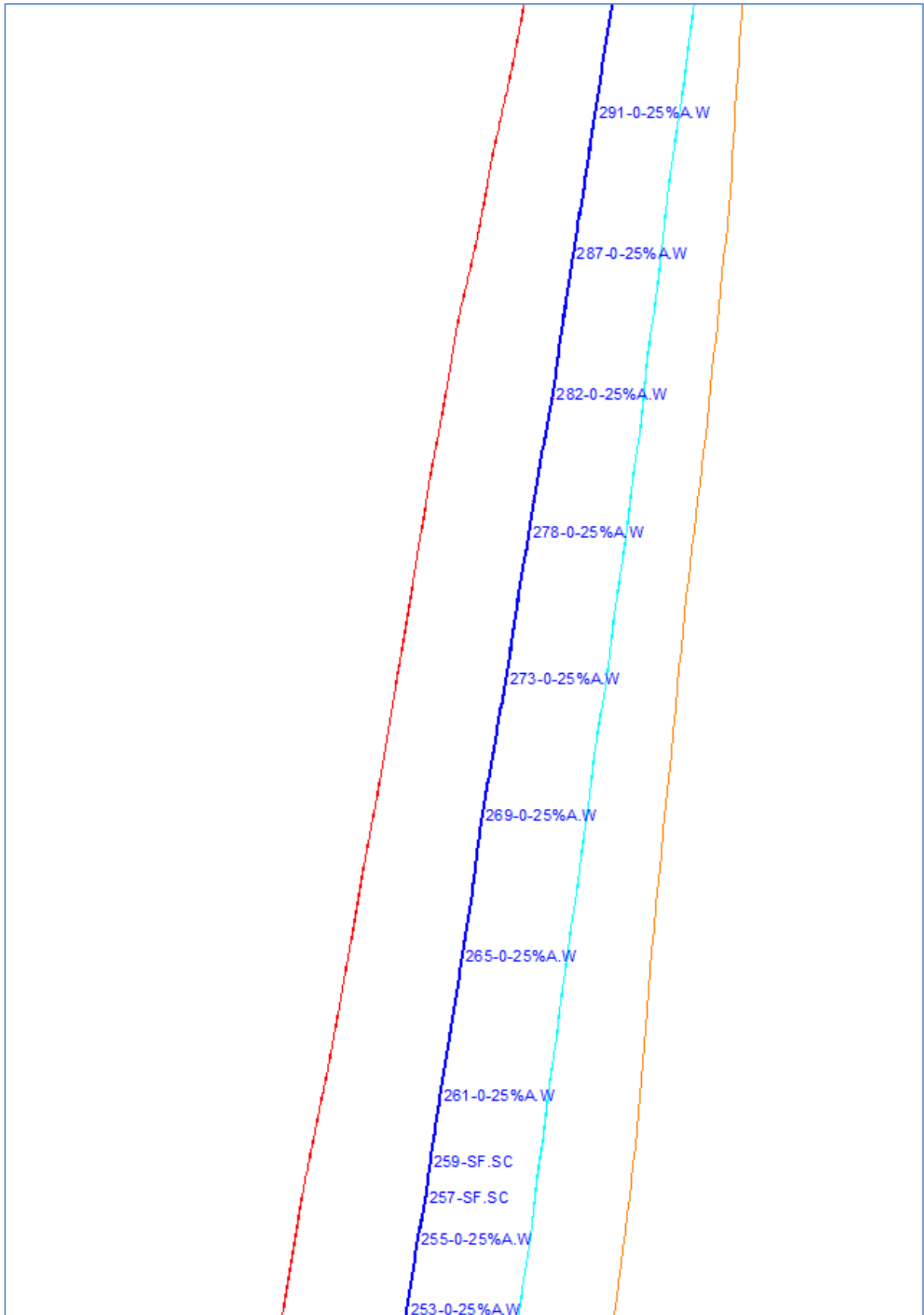


Figure 58: Map 3



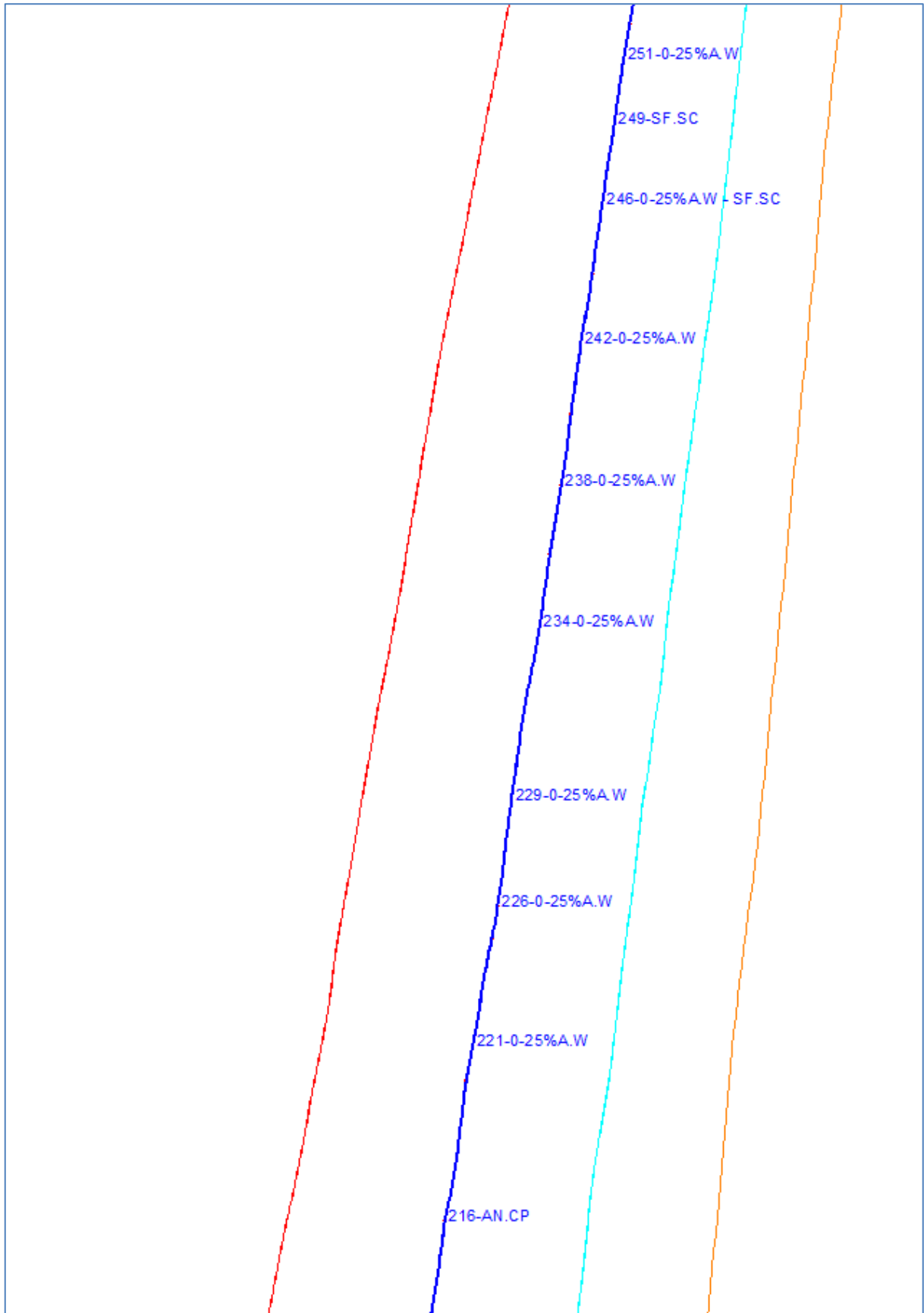


Figure 59: Map 4



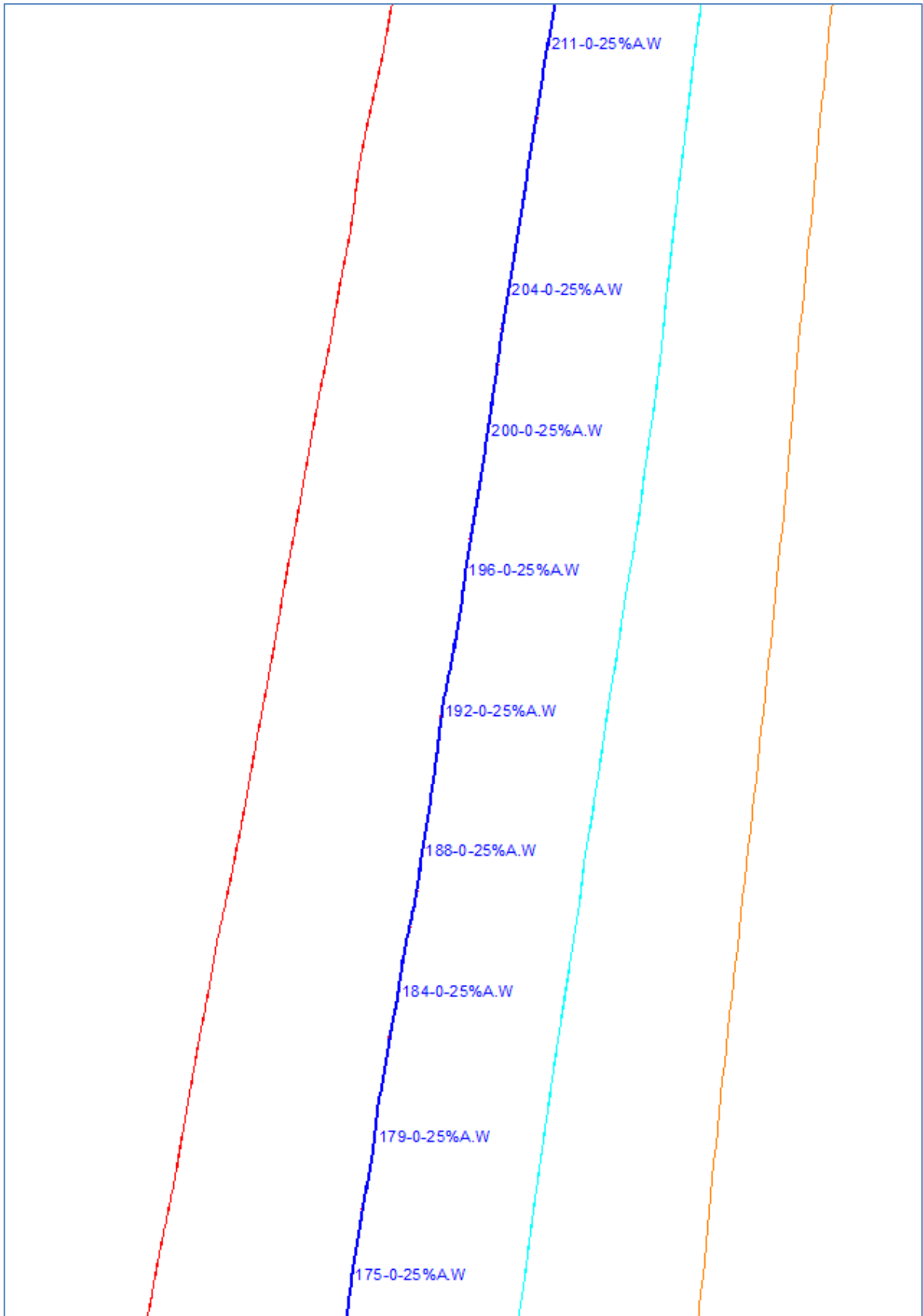


Figure 60: Map 5



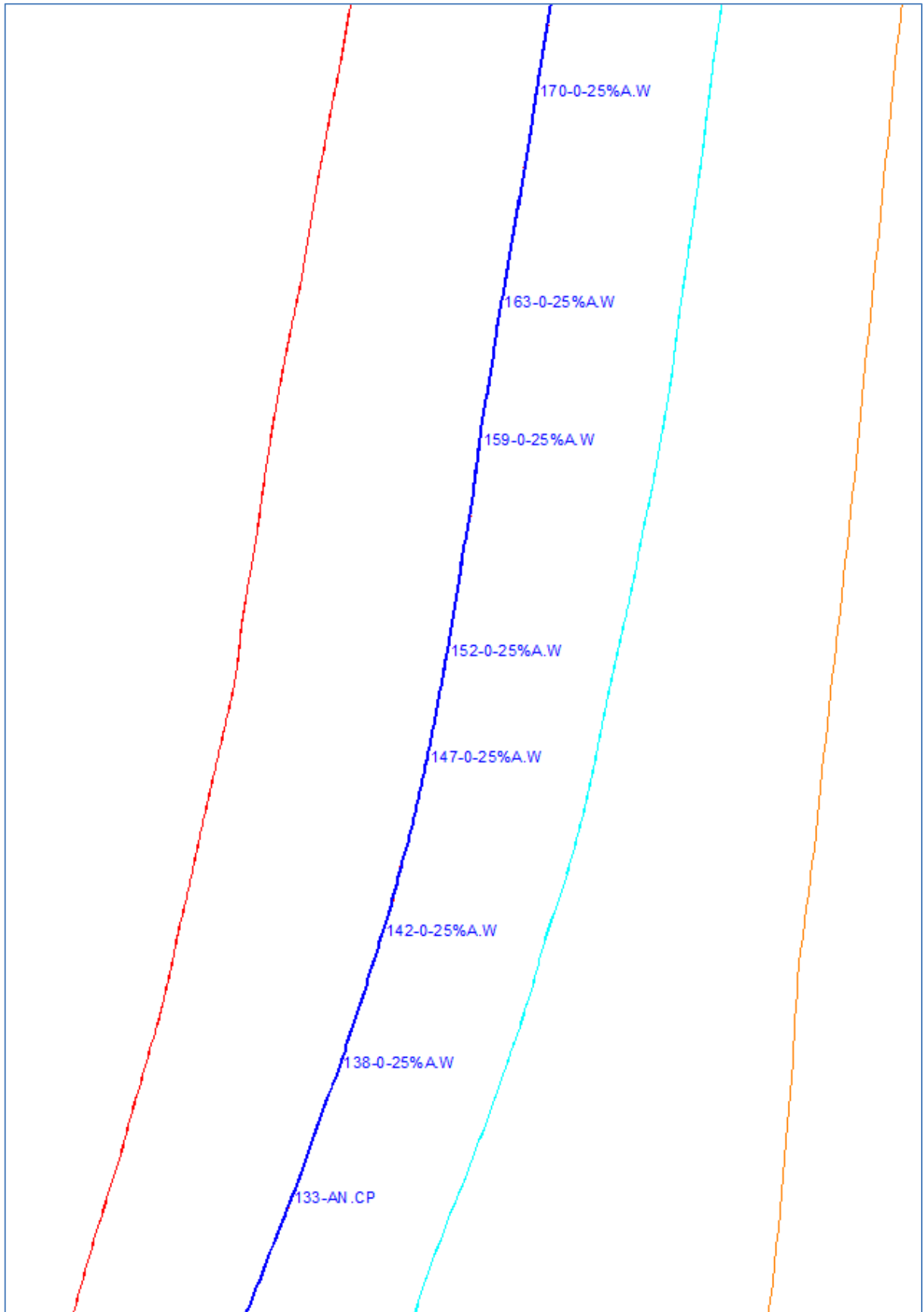


Figure 61: Map 6



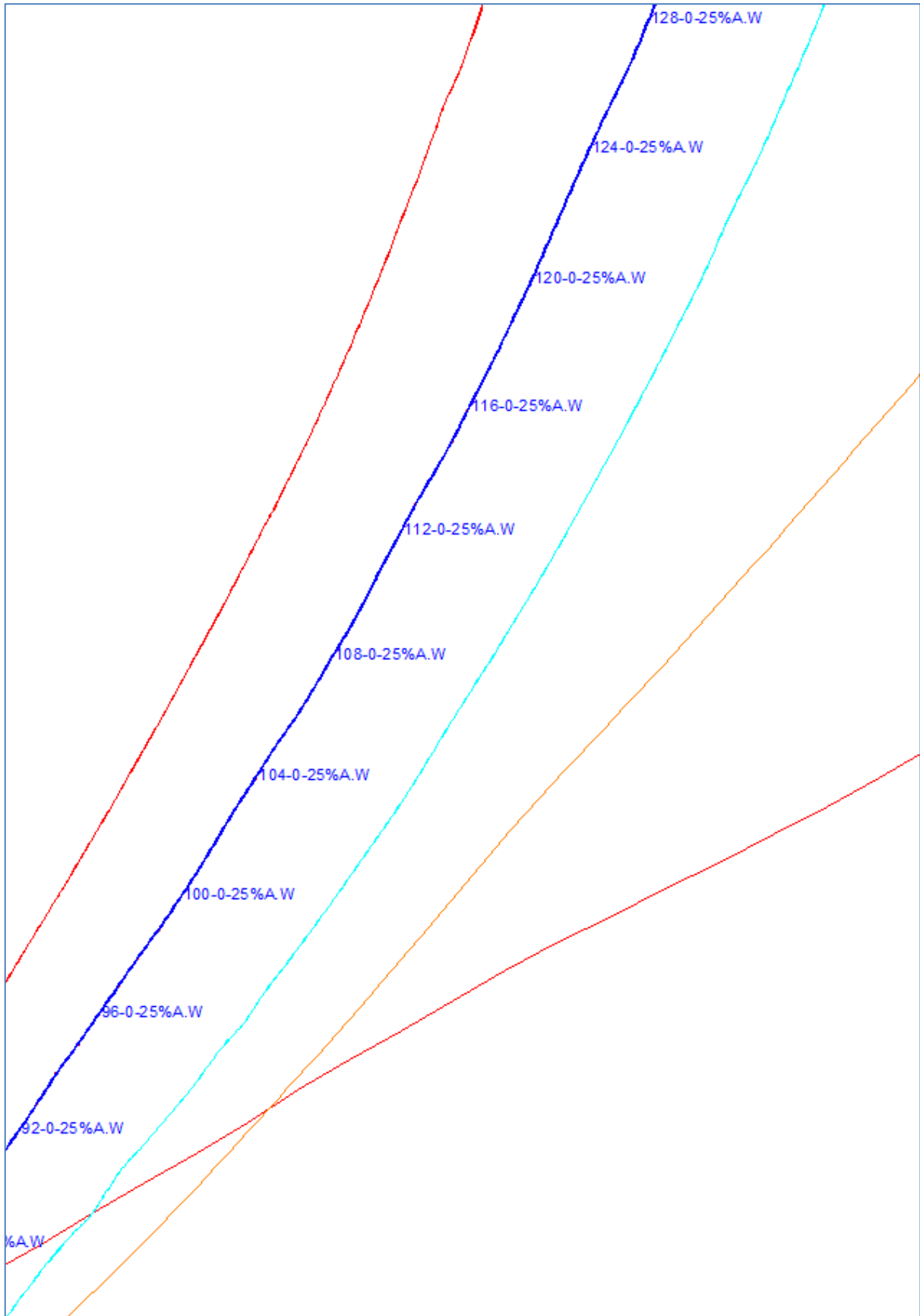


Figure 62: Map 7



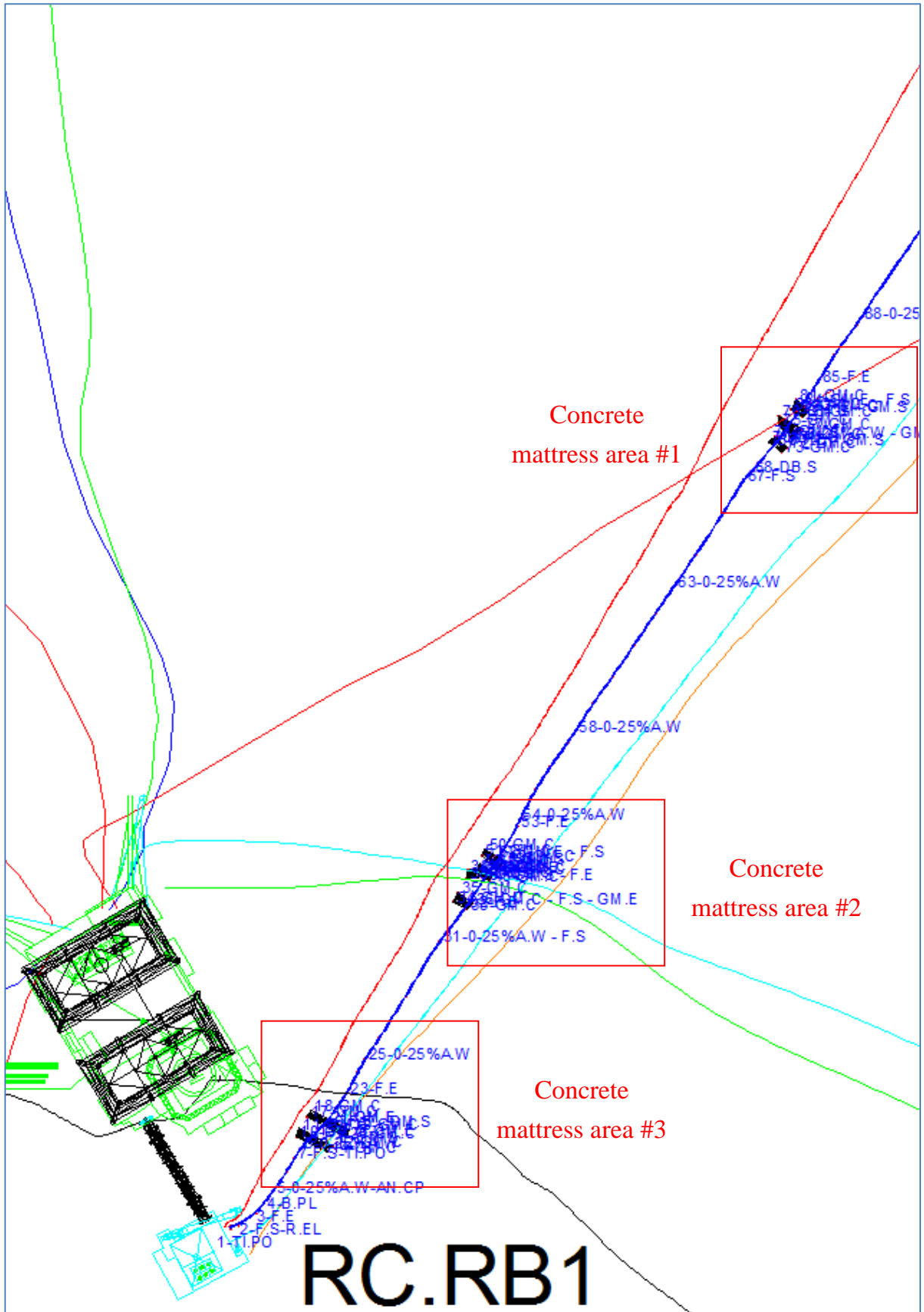


Figure 63: Map 8



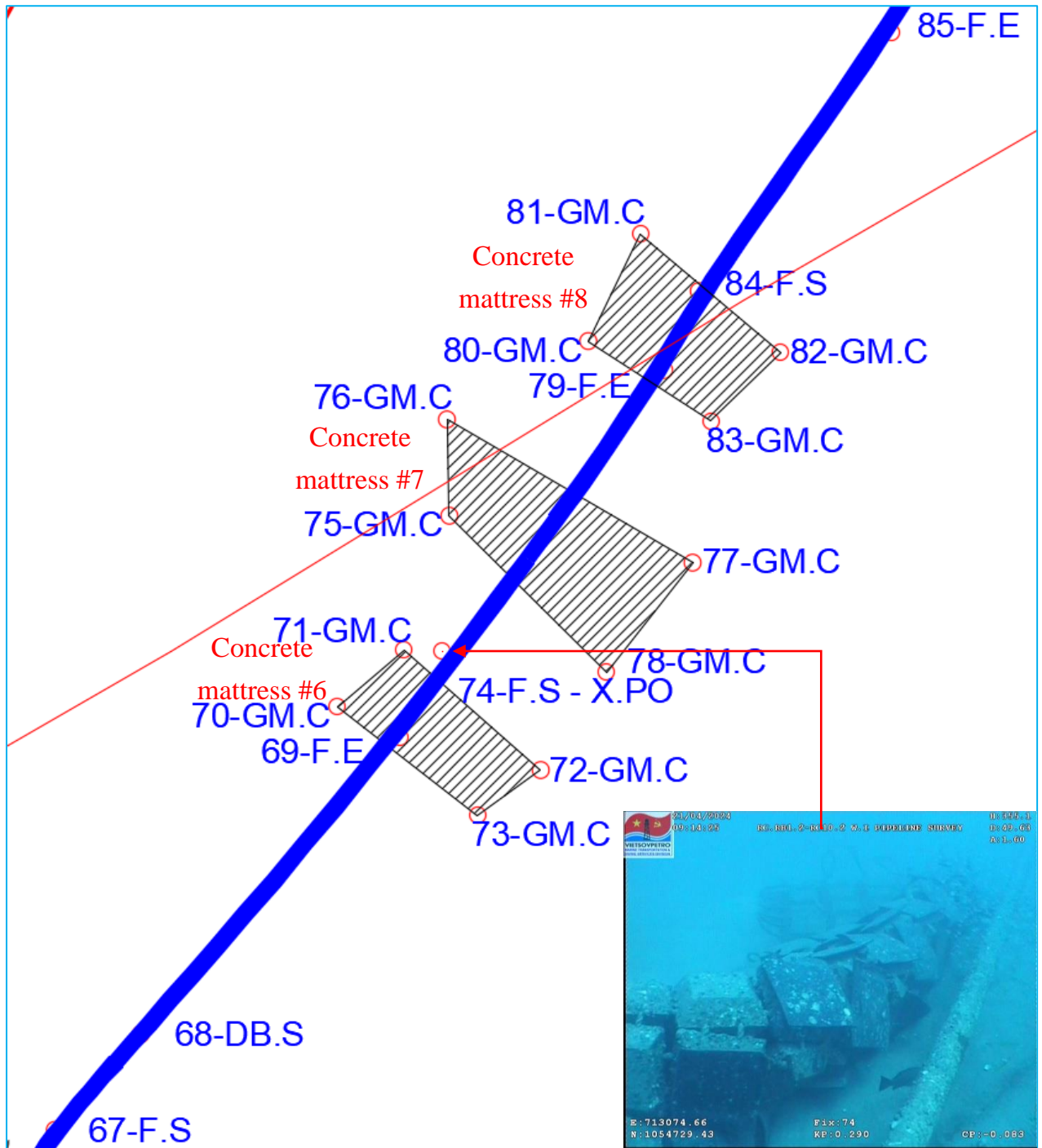


Figure 64: Concrete mattress area #1 (Concrete mattress making a roll position)



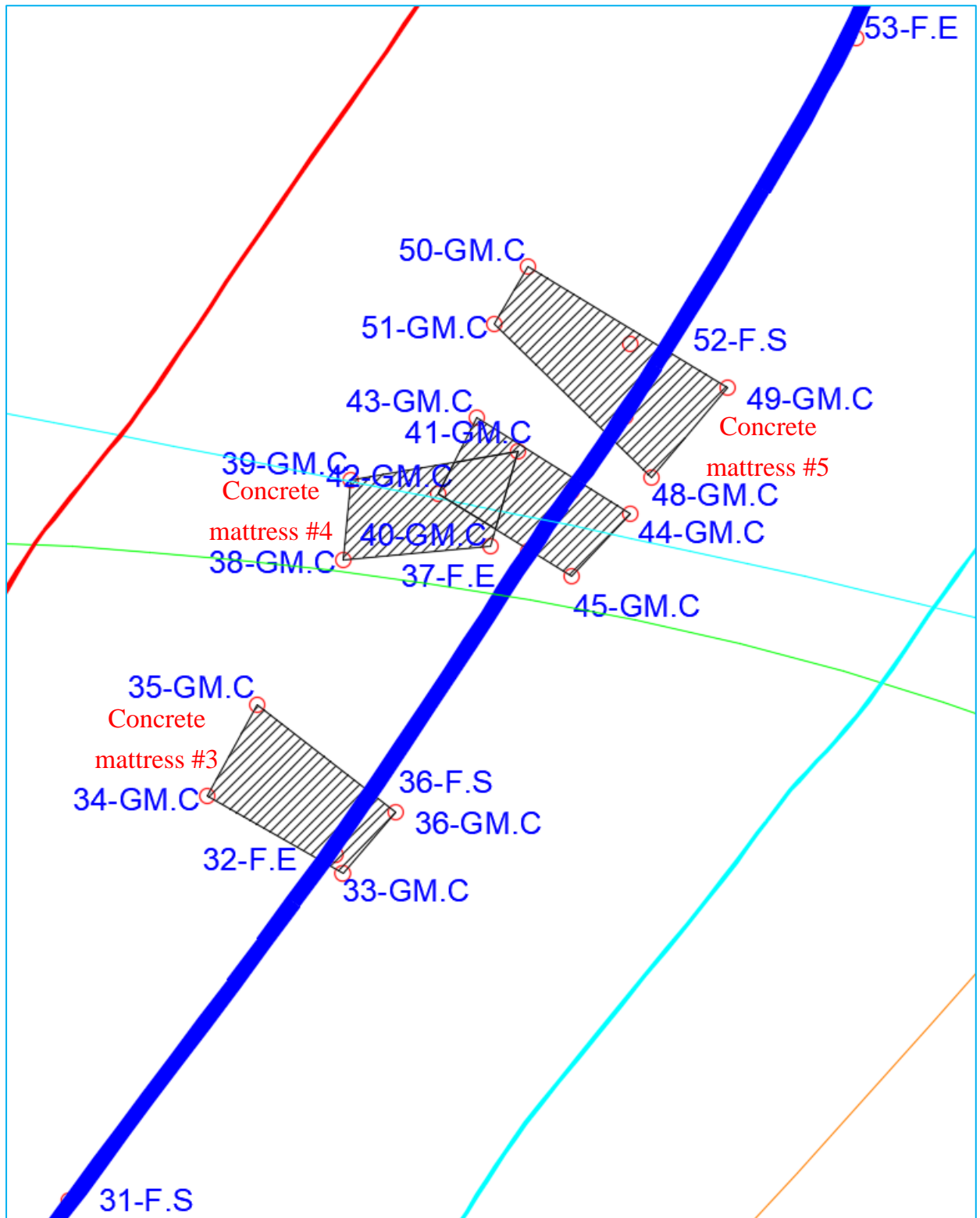


Figure 65: Concrete mattress area #2



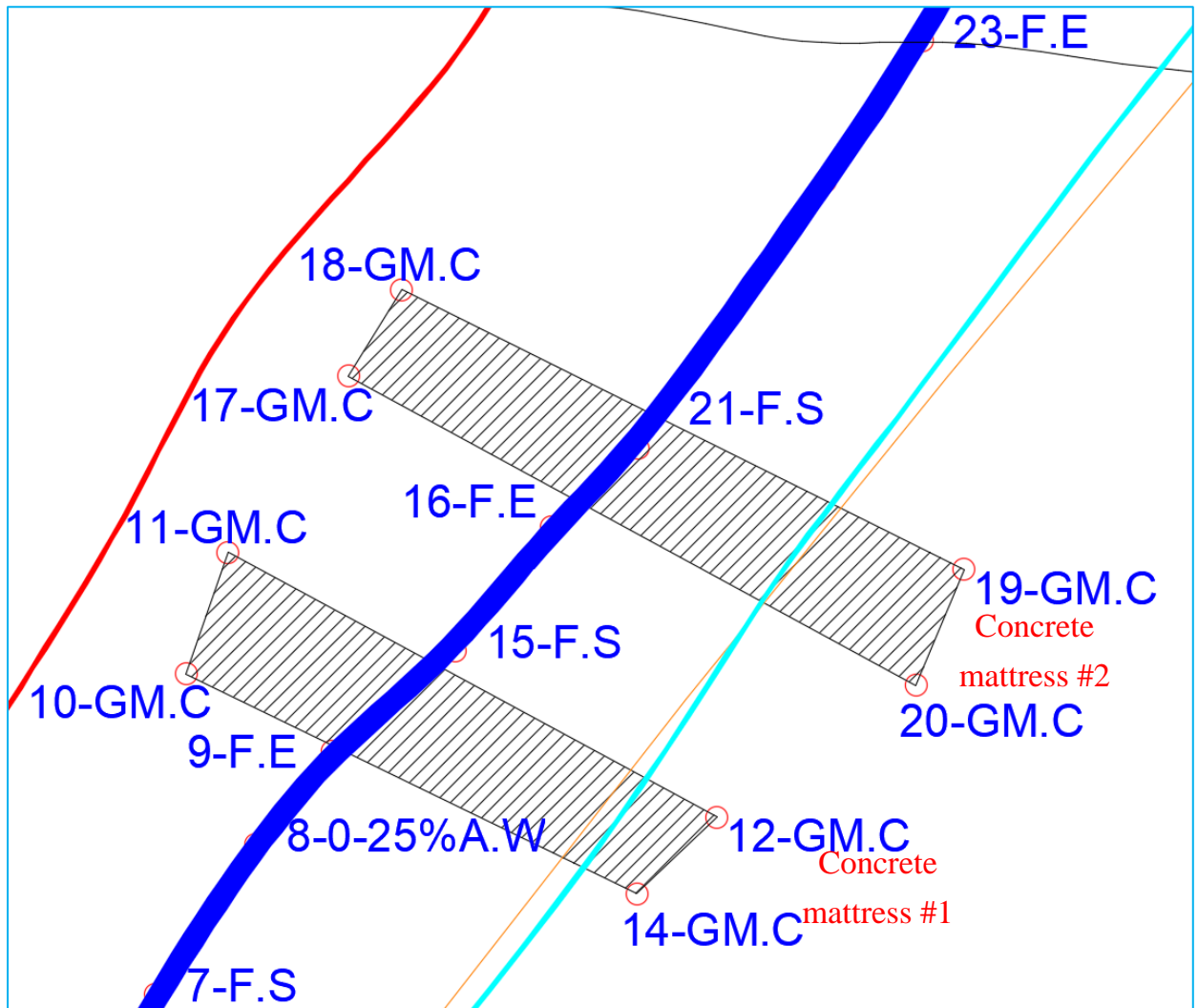


Figure 66: Concrete mattress area #3





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



7.4 Non-conformances

7.4.1. List of non-conformances (list of anomalies)

VIETSOVPETRO	UNDERWATER SURVEY OF PIPELINE IN 2024											
	Object	Year	LIST OF NON-CONFORMANCES								From	To
	W.I Pipeline	2024									RC.RB1	RC10
№	Defect code	Non-conformances Description	Location			Dimension mm			o/c	Photo & Video References	Status	
1	2	3	Latitude	Longitude	Depth	L	W	D	10	11	Rised	Assessment/ Action
4	5	6	7	8	9	10	11	12	13	12	13	
1	FS	Freespan at KP 0.014-0.025 (L= 11 m)	9°32.2214'N	107°56.1546'E	50m	-	-	-	-	DVD P.36-24	4/27/2024	Monitor
			9°32.2264'N	107°56.1582'E								
2	FS	Freespan at KP 0.086-0.100 (L= 14 m)	9°32.2543'N	107°56.1756'E	50m	-	-	-	-	DVD P.36-24	4/27/2024	Monitor
			9°32.2605'N	107°56.1805'E								
3	FS	Freespan at KP 0.102-0.112 (L= 10 m)	9°32.2612'N	107°56.1816'E	50m	-	-	-	-	DVD P.36-24	4/27/2024	Monitor
			9°32.2659'N	107°56.1840'E								
4	FS	Freespan at KP 0.120-0.132 (L= 12 m)	9°32.2697'N	107°56.1859'E	50m	-	-	-	-	DVD P.36-24	4/27/2024	Monitor
			9°32.2752'N	107°56.1901'E								
5	FS	Freespan at KP 0.272-0.288 (L= 16 m)	9°32.3385'N	107°56.2322'E	50m	-	-	-	-	DVD P.36-24	4/27/2024	Monitor
			9°32.3450'N	107°56.2380'E								
6	FS	Freespan at KP 0.291-0.302 (L= 11 m)	9°32.3464'N	107°56.2387'E	50m	-	-	-	-	DVD P.36-24	4/27/2024	Monitor
			9°32.3510'N	107°56.2424'E								





ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



Action:- Monitor: - No deterioration defects, no anomaly report required. Defects were not changed.
- Rec. Inspection: - Defect Recommend to inspect in the next survey (Dimension survey, Debris removal, Repair, WT Measurement, Anomaly report)
- Inspection report: - Defect required to inspection report (Dimension survey, WT Measurement, Anomaly report)
* For detail information, please see section 6.3 of debris survey.
* For detail information, please see section 6.5 of freespan survey.

Noted:

Inspector:	Dang Phi Hung		Check:	Le Ba Giap	
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ROV UNDERWATER SURVEY IN 2024

SURVEY WATER INJECTION PIPELINE RC.RB1.12-RC10.2



7.4.2. Anomaly report.

BLANK





VIETSOVPETRO

MARINE TRANSPORTATION AND DIVING SERVICE DIVISION

SURVEY GASLIFT PIPELINE RC10-RC.RB1 (VR 299/22)

FINAL REPORT

Report No. ROV-P.35-24

PANTHER PLUS 932 REMOTELY OPERATED VEHICLE

Created by: ROV Team

Reviewed by:

Vietnam Register, Branch No.9

Signature:

Date: _____

Issue No.	Issued date	Description	Compiled by		Checked by		Approved by	
			Print name	Signature	Print name	Signature	Print name	Signature
00		For review and approval	Le Ba Giap		Dinh Binh Nam		Phan Hung Duong	



Checked by:

Mr. Nguyen Quoc Dung - Director of Oil & Gas Prod. Division, VSP

Signature:

Date: _____

Mr. Avdeev A.S – Chief Engineer of R&EI, VSP

Signature:

Date: _____

Mr. Nguyen Hong Giang. - Manager of Capital Construction Department, VSP

Signature:

Date: _____





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



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ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



1 INTRODUCTION

1.1 Abstract

The purpose of this survey was to obtain an overall condition assessment of the Risers at RC10 & RC.RB1 platform and the gaslift pipeline connecting from RC10 to RC.RB1 with 3550 m in length and diameter 168,3 x 14,3 mm to satisfy the 2024 requirement by production task of Marine Transportation & Diving Service Division of Vietsovpetro. And collect all pertinent inspection data to prepare an event file, establish base line data for future uses.

All anomalies and debris in this survey area will be recorded on DVD. They will be reported in an event log sheet.



1.2 Abbreviations

AB	Abraded
AN	Anode
CD	Coating Damage
CP	Cathodic Protection/Potential
CR	Corrosion
CVI	Close Visual Inspection
DAM	Damage
DWG	Drawing
E	Electrical
EL	Elevation
FJ	Field Joint
GVI	General Visual Inspection
HD	Hard Debris
HDM	Horizontal Diagonal Member
HM	Horizontal Member
KP	Kilometer Point `
L	Length
LK	Leak
M	Meter
MG	Marine Growth
MGT	Marine Growth Thickness
MPI	Magnetic Particle Inspection
MSL	Main Sea Level
NDT	Non Destructive Testing
PL	Pipeline
PLEM	Pipeline End Manifold
ROV	Remotely Operated Vehicle
SD	Soft Debris
STBD	Starboard
TD	Touch Down
USTM	Ultra Sonic Wall thickness Measurement
VM	Vertical Member
VSP	VietsovPetro Joint Venture Company
WHP	Wellhead Platform



2 LOCATION

The White Tiger field is located in block 09-1 offshore Vietnam in approximately 45-55m water depth operated by VIET NGA Vietsovpetro.

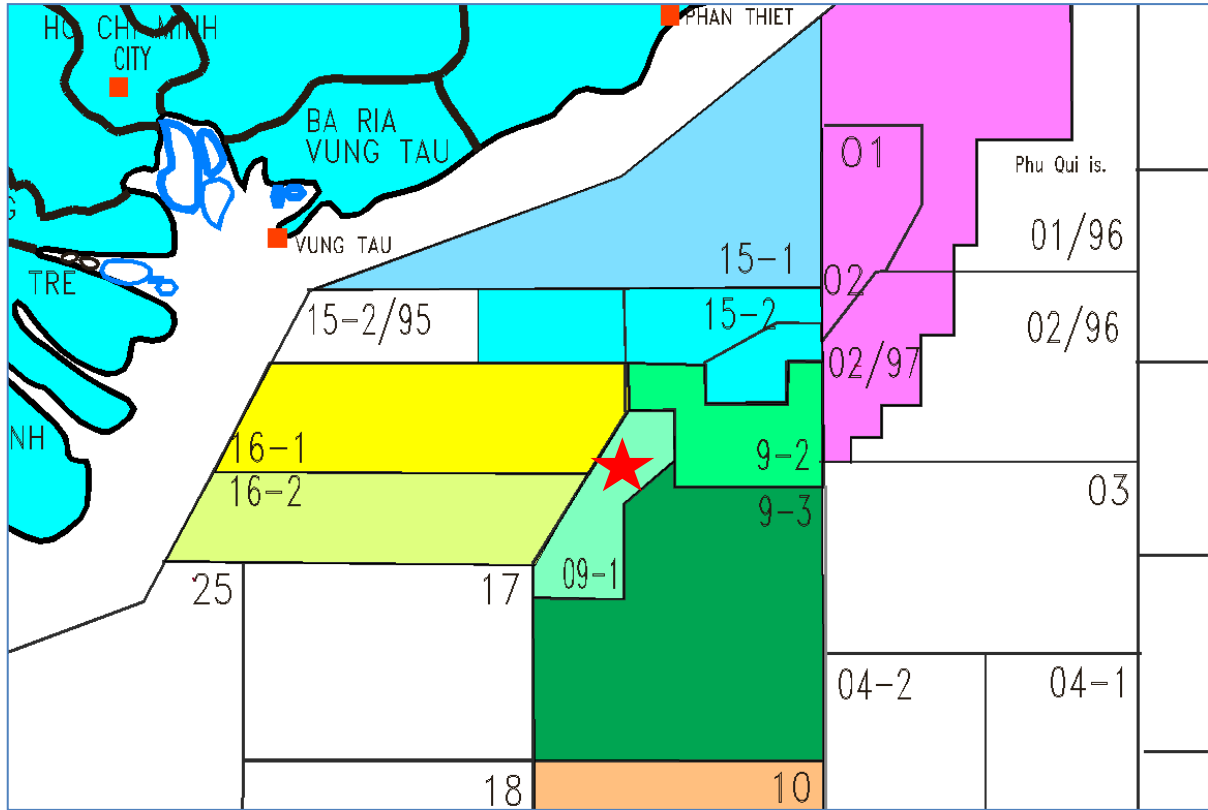


Figure 1: Vietsovpetro block

Co-ordinate system used:

Position was Fixed by Global Positioning System has named:

Datum Indian 1830

Ellipsoid Everest 1830 India

All equipment's were used and controlled by SEAMAP's personnel.

Standard direction of all survey screen shot key plan:

Position was Fixed with inaccuracy not more than 3 meters.





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



3 STATISTICS, SENSORS UNIT AND PERSONNEL

3.1. Vehicle

ROV: Observation ROV “Panther Plus 932”

Altimeter: Trittech Seaking PA-500 Range of Bathymetric & Oceanographic Sensors

Gyro: Saab Seaeye

Depth: Trittech Seaking 701/14 Range of Bathymetric & Oceanographic Sensors

Cameras: Kongsberg color zoom camera
Kongsberg near SIT camera

3.2. Statistics

Water depth: 49-52m.

3.3. Vessel

M/V Sao Mai 03

3.4. List of personnel

ROV Team:

Supervisor:	Le Ba Giap
Pilot techs:	Nguyen Minh Quan Pham Quang Hoa Truong Van Minh
Report Processor:	Dang Phi Hung Do Binh Minh
LARS Operator:	Tran Dang Kien

Seamap Team:

Surveyors:	Tran Quang Huy Do Van Dung
------------	-------------------------------



5 RISER INSPECTION RESULT

5.1. Riser No.1 at RC10 platform

ROV surveyed this riser from MSL down to seabed. A total 09 of clamps were identified during the inspection at EL -5m, -10m, -15m, -20m, -24m, -29m, -35m, -39m, -46m and 01 half shell bracelet anode at EL -25m.

All riser clamps were found in normal condition, with no indication of physical damage, impact deformation, displacement or movement.



Figure 2: Plan view of Riser position at RC10



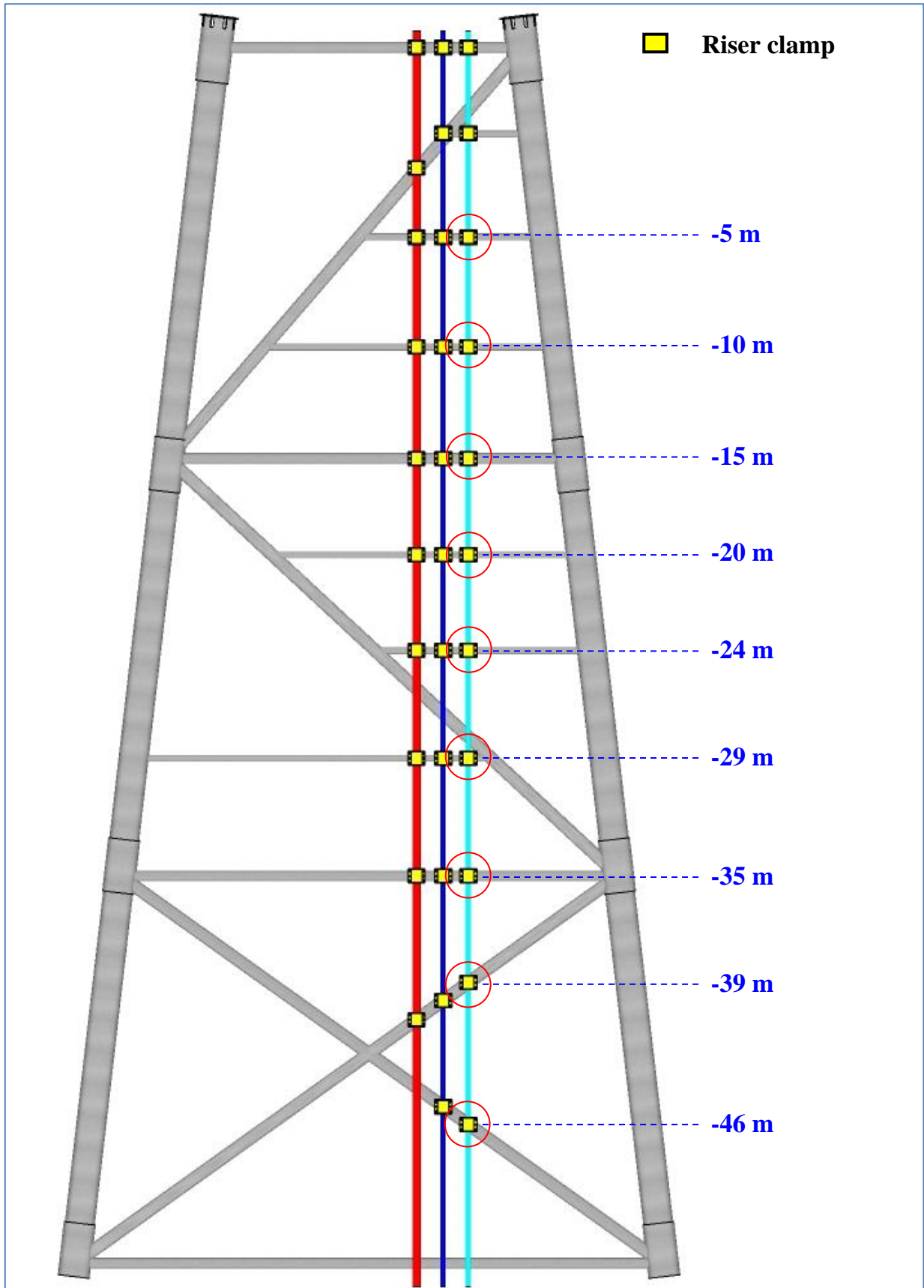


Figure 3: Elevation view of Riser and riser clamp position at RC10





Figure 4: Riser clamp at EL -5m



Figure 5: Riser clamp at EL -10m





Figure 6: Riser clamp at EL -15m



Figure 7: Riser clamp at EL -20m





Figure 8: Riser clamp at EL -24m

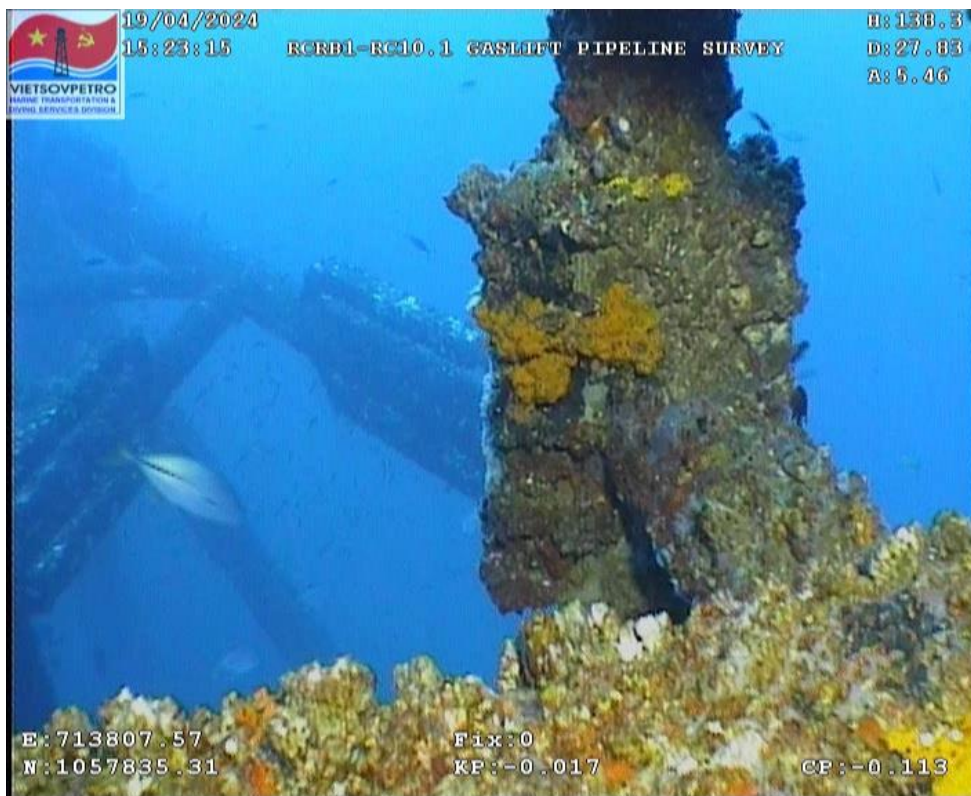


Figure 9: Riser clamp at EL -29m





Figure 10: Riser clamp at EL -35m



Figure 11: Riser clamp at EL -39m





Figure 12: Riser clamp at EL -46m



Figure 13: Riser elbow



5.2. Riser No.13 at RC.RB1 platform

ROV surveyed this riser from seabed up to MSL. A total 09 of clamps were identified during the inspection at EL -46m, -40m, -34m, -28m, -21m, -15m, -10m, -6m, -1m and 02 half shell bracelet anode at EL -44m, -25m.

All riser clamps were found in normal condition, with no indication of physical damage, impact deformation, displacement or movement.



Figure 14: Plan view of Riser position at RC.RB1



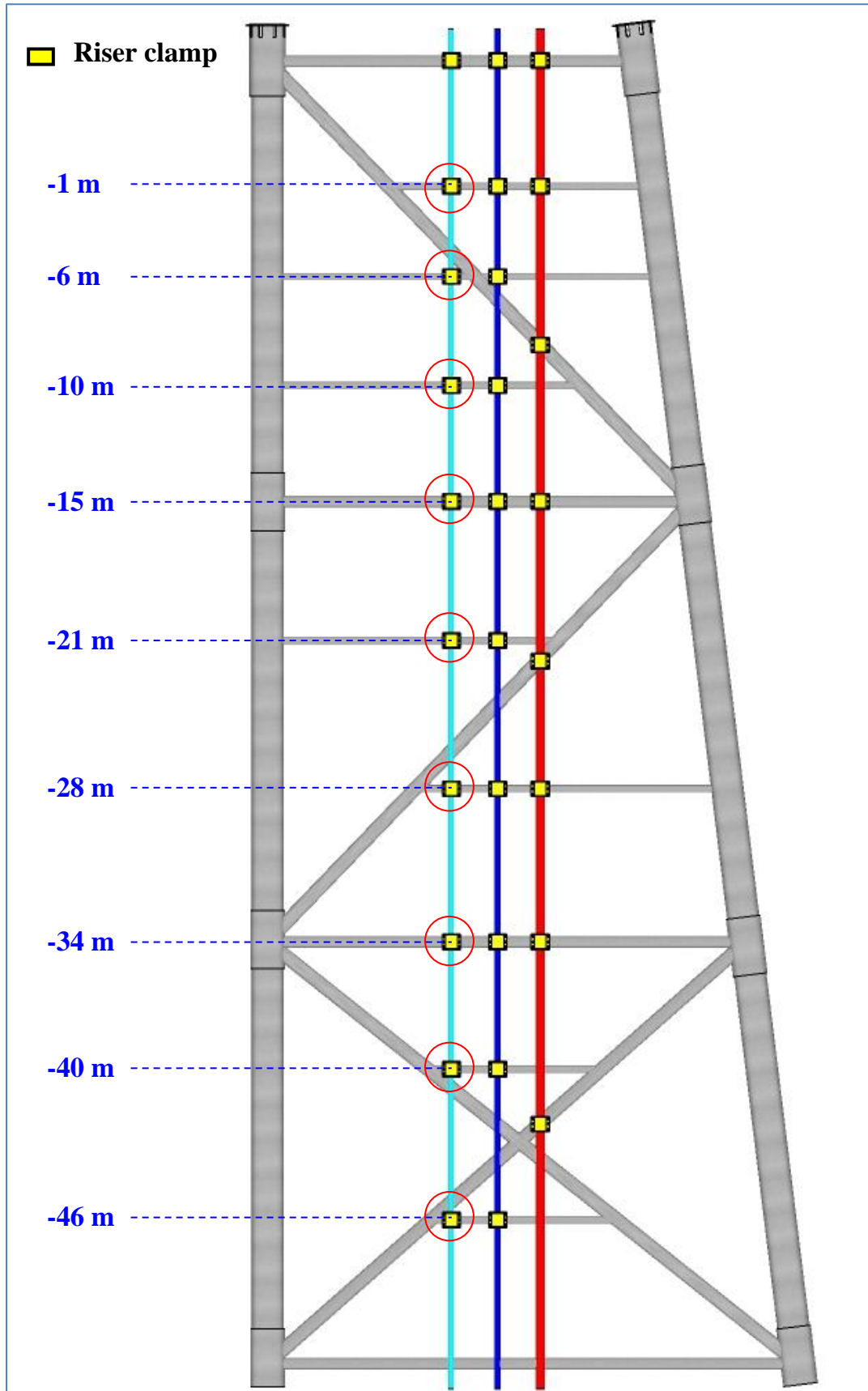


Figure 15: Elevation view of Riser and riser clamp position at RC.RB1





Figure 16: Riser clamp at EL -1m



Figure 17: Riser clamp at EL -6m





Figure 18: Riser clamp at EL -10m



Figure 19: Riser clamp at EL -15m





Figure 20: Riser clamp at EL -21m



Figure 21: Riser clamp at EL -28m





Figure 22: Riser clamp at EL -34m



Figure 23: Riser clamp at EL -40m





Figure 24: Riser clamp at EL -46m



Figure 25: Riser elbow



6 PIPELINE INSPECTION RESULT

6.1. Pipeline GVI

The pipeline started survey from RC10 platform at KP -0.017 and ended survey at RC.RB1 platform at KP 3.573.

6.2. Anodic survey

The pipeline along its length was surveyed for anode. The typical anode along this pipeline is a half shell bracelet anode. Anodes appear active and 0-25% wastage. The table below shows the detailed location of anodes observed during the survey.

During the survey, the random of anodes was chosen for CP stab. CP reading was in acceptable value between -1.023mV and -1.037mV.

Table 1: List of CP stab location

No.	Description	Fix	Easting	Northing	KP	Depth
1	Anode CP Reading -1023mV	17	713790.04	1057795.10	0.025	52.84
2	Anode CP Reading -1025mV	101	713680.34	1056936.90	0.891	52.43
3	Anode CP Reading -1036mV	146	713615.19	1056435.51	1.397	52.32
4	Anode CP Reading -1037mV	184	713557.89	1055994.68	1.842	52.08
5	Anode CP Reading -1037mV	248	713434.83	1055281.60	2.574	51.65
6	Anode CP Reading -1026mV	294	713177.06	1054810.45	3.120	51.86



Figure 26: CP stab at Fix.17



Table 2: List of Anodes location

No.	Description	Fix	Easting	Northing	KP	Depth
1	Anode wastage 0-25% at EL -25m on RC10 riser					25.00
2	Anode wastage 0-25%	6	713797.06	1057836.95	-0.018	52.26
3	Anode wastage 0-25%	17	713790.04	1057795.10	0.025	52.84
4	Anode wastage 0-25%	23	713784.25	1057749.65	0.071	52.68
5	Anode wastage 0-25%	28	713778.21	1057699.82	0.121	52.59
6	Anode wastage 0-25%	32	713771.89	1057653.61	0.168	52.51
7	Anode wastage 0-25%	37	713764.42	1057606.12	0.216	52.48
8	Anode wastage 0-25%	42	713758.27	1057556.90	0.265	52.42
9	Anode wastage 0-25%	46	713754.33	1057509.51	0.313	52.43
10	Anode wastage 0-25%	50	713747.97	1057461.46	0.362	52.20
11	Anode wastage 0-25%	55	713741.24	1057413.24	0.410	52.04
12	Anode wastage 0-25%	59	713735.38	1057365.80	0.458	52.07
13	Anode wastage 0-25%	63	713729.67	1057319.05	0.505	51.96
14	Anode wastage 0-25%	68	713723.71	1057271.68	0.553	51.97
15	Anode wastage 0-25%	73	713718.01	1057223.76	0.601	52.00
16	Anode wastage 0-25%	77	713711.45	1057176.48	0.649	52.13
17	Anode wastage 0-25%	82	713703.51	1057127.18	0.699	52.32
18	Anode wastage 0-25%	85	713699.87	1057091.72	0.735	52.34
19	Anode wastage 0-25%	92	713691.81	1057032.01	0.795	52.68
20	Anode wastage 0-25%	97	713686.60	1056984.60	0.843	52.55
21	Anode wastage 0-25%	101	713680.34	1056936.90	0.891	52.43
22	Anode wastage 0-25%	105	713674.19	1056889.22	0.939	52.31
23	Anode wastage 0-25%	110	713668.11	1056839.32	0.989	52.01
24	Anode wastage 0-25%	114	713661.95	1056792.04	1.037	51.80
25	Anode wastage 0-25%	118	713655.71	1056744.59	1.085	51.71
26	Anode wastage 0-25%	122	713648.74	1056697.27	1.133	51.76
27	Anode wastage 0-25%	125	713643.59	1056661.98	1.169	51.80
28	Anode wastage 0-25%	129	713637.17	1056614.08	1.217	51.80
29	Anode wastage 0-25%	135	713631.06	1056565.98	1.265	51.87
30	Anode wastage 0-25%	139	713624.65	1056518.66	1.313	52.04
31	Anode wastage 0-25%	143	713619.36	1056471.37	1.361	52.21
32	Anode wastage 0-25%	146	713615.19	1056435.51	1.397	52.32
33	Anode wastage 0-25%	152	713606.56	1056375.88	1.457	52.44
34	Anode wastage 0-25%	156	713600.08	1056328.30	1.505	52.56
35	Anode wastage 0-25%	160	713594.09	1056280.57	1.554	52.63
36	Anode wastage 0-25%	164	713588.04	1056233.04	1.602	52.71
37	Anode wastage 0-25%	168	713582.00	1056185.54	1.649	52.70
38	Anode wastage 0-25%	176	713569.52	1056089.89	1.746	52.42
39	Anode wastage 0-25%	180	713563.45	1056042.85	1.794	52.24
40	Anode wastage 0-25%	188	713552.54	1055946.95	1.890	51.95
41	Anode wastage 0-25%	193	713545.60	1055897.77	1.940	51.27
42	Anode wastage 0-25%	197	713537.82	1055850.62	1.988	52.05





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



No.	Description	Fix	Easting	Northing	KP	Depth
43	Anode wastage 0-25%	201	713530.71	1055803.05	2.036	52.00
44	Anode wastage 0-25%	205	713523.69	1055755.60	2.084	51.85
45	Anode wastage 0-25%	209	713516.42	1055708.02	2.132	51.67
46	Anode wastage 0-25%	213	713509.91	1055660.87	2.180	51.40
47	Anode wastage 0-25%	218	713503.00	1055612.82	2.228	51.34
48	Anode wastage 0-25%	222	713496.73	1055564.95	2.276	51.42
49	Anode wastage 0-25%	226	713490.07	1055516.90	2.325	51.49
50	Anode wastage 0-25%	231	713482.22	1055469.78	2.374	51.42
51	Anode wastage 0-25%	235	713472.36	1055422.75	2.423	51.50
52	Anode wastage 0-25%	239	713462.55	1055375.57	2.472	51.56
53	Anode wastage 0-25%	243	713449.98	1055329.47	2.521	50.87
54	Anode wastage 0-25%	252	713419.09	1055237.23	2.620	51.45
55	Anode wastage 0-25%	256	713402.59	1055192.02	2.668	51.27
56	Anode wastage 0-25%	260	713383.76	1055148.09	2.717	51.31
57	Anode wastage 0-25%	264	713363.54	1055104.41	2.767	51.33
58	Anode wastage 0-25%	268	713342.04	1055061.58	2.815	51.37
59	Anode wastage 0-25%	272	713318.90	1055019.30	2.861	51.44
60	Anode wastage 0-25%	276	713294.71	1054977.91	2.916	51.52
61	Anode wastage 0-25%	281	713263.02	1054926.78	2.975	51.53
62	Anode wastage 0-25%	285	713235.83	1054887.22	3.023	51.60
63	Anode wastage 0-25%	290	713205.93	1054845.62	3.074	51.78
64	Anode wastage 0-25%	315	713147.02	1054771.82	3.169	51.94
65	Anode wastage 0-25%	320	713115.50	1054733.47	3.218	52.07
66	Anode wastage 0-25%	324	713083.52	1054697.85	3.266	52.15
67	Anode wastage 0-25%	328	713053.56	1054660.33	3.314	52.13
68	Anode wastage 0-25%	332	713024.12	1054623.57	3.362	52.30
69	Anode wastage 0-25%	358	712964.49	1054546.08	3.460	52.34
70	Anode wastage 0-25%	362	712935.77	1054508.60	3.507	52.47
71	Anode wastage 0-25%	377	712914.88	1054480.89	3.542	52.61
72	Anode wastage 0-25%	379	712904.67	1054467.55	3.558	52.51
73	Anode wastage 0-25% at EL -44m on RC.RB1 riser					44.00
74	Anode wastage 0-25% at EL -25m on RC.RB1 riser					25.00



6.3. Debris survey

The pipeline along its length was surveyed for debris. The following table lists out all metallic and nonmetallic. Debris was found during survey.

Table 3: List of Debris

No.	Description	Fix	Easting	Northing	KP	Depth
1	Debris Soft Netting	52	713744.98	1057438.80	0.385	52.11



Figure 27: Debris soft netting at Fix .52

6.4. Pipeline crossing survey

The pipeline along its length was surveyed for crossing. A total of 03 crossing points were found & 03 crossing fully burial during survey as table below.

Table 4: List of crossings

No.	Description	Fix	Easting	Northing	KP	Depth
1	Crossing Under Power Cable	12	713788.38	1057819.79	0.001	52.56
2	Crossing Under Power Cable	34	713769.06	1057639.66	0.182	52.52
3	Crossing Over a Pipeline	309	713150.46	1054777.06	3.162	51.28
4	Crossing Over Pipelines (fully burial)	348	712987.36	1054575.72	3.422	51.64
5	Crossing Over Power Cable (fully burial)	363	712933.98	1054506.58	3.510	52.50





Figure 28: Crossing under power cable without support at Fix.12



Figure 29: Crossing under power cable without support at Fix.34





Figure 30: Crossing over other pipeline at Fix.309



6.5. Free span survey

The pipeline along its length was surveyed for free spans. A total of 15 free spans were found during the survey as table below.

Table 5: List of free spans

No.	Description		Fix	Easting	Northing	KP	Depth
1	Freespan Start	Riser elbow	2	713804,11	1057835,75	-0,017	51,87
	Freespan End. Max Gap = 0.25m. L = 2m	Seabed	3	713801,53	1057837,97	-0,019	52,01
2	Freespan Start	Seabed	10	713788,71	1057825,28	-0,005	52,73
	Freespan End. Max Gap = 0.1m. L = 6m	Support (pipe)	12	713788,38	1057819,79	0,001	52,56
3	Freespan Start	Support (pipe)	12	713788,38	1057819,79	0,001	52,56
	Freespan End. Max Gap = 0.3m. L = 10m	Seabed	14	713790,78	1057809,38	0,011	52,61
4	Freespan Start	Seabed	18	713788,85	1057789,68	0,031	52,77
	Freespan End. Max Gap = m. L = 7m	Seabed	19	713788,04	1057782,48	0,038	52,89
5	Freespan Start	Seabed	296	713164,87	1054797,37	3,137	51,94
	Freespan End. Max Gap = 0.2m. L = 12m	Support (mattress)	297	713158,29	1054787,58	3,149	51,84
6	Freespan Start	Support (mattress)	302	713156,49	1054784,04	3,153	51,54
	Freespan End. Max Gap = 0.2m. L = 5m	Support (mattress)	303	713153,43	1054779,96	3,158	51,32
7	Freespan Start	Support (mattress)	308	713152,96	1054777,36	3,161	51,09
	Freespan End. Max Gap = 0.2m. L = 19m	Seabed	316	713139,01	1054764,24	3,180	52,21
8	Freespan Start	Seabed	335	713001,42	1054595,06	3,398	52,33
	Freespan End. Max Gap = 0.2m. L = 12m	Support (mattress)	337	712994,70	1054585,37	3,410	52,26
9	Freespan Start	Support (mattress)	342	712993,34	1054584,90	3,411	51,85
	Freespan End. Max Gap = 0.4m. L = 4m	Support (mattress)	343	712990,82	1054581,32	3,415	52,38
10	Freespan Start	Support (mattress)	348	712987,36	1054575,72	3,422	51,64
	Freespan End. Max Gap = 0.4m. L = 3m	Support (mattress)	349	712984,72	1054573,30	3,425	52,37
11	Freespan Start	Support (mattress)	354	712983,12	1054570,70	3,428	52,00
	Freespan End. Max Gap = 0.3m. L = 13m	Seabed	355	712975,37	1054561,55	3,441	52,44
12	Freespan Start	Seabed	363	712933,98	1054506,58	3,510	52,50
	Freespan End. Max Gap = 0.2m. L = 9m	Support (mattress)	364	712928,17	1054498,63	3,519	52,32
13	Freespan Start	Support (mattress)	370	712925,86	1054495,82	3,523	51,97
	Freespan End. Max Gap = 0.3m. L = 4m	Support (mattress)	371	712922,66	1054493,27	3,527	52,41
14	Freespan Start	Support (mattress)	376	712922,22	1054489,68	3,530	51,85
	Freespan End. Max Gap = 0.3m. L = 12m	Seabed	377	712914,88	1054480,89	3,542	52,61
15	Freespan Start	Seabed	382	712898,53	1054462,03	3,567	52,52
	Freespan End. Max Gap = 0.3m. L = 6m	Riser elbow	383	712892,15	1054458,66	3,573	52,46



Span's gap determining method:

ROV takes up Fix at 02 touches down points on the pipeline to determine length of span (KP Start – KP End). ROV sits on the pipeline to measure height of span by Altimeter Sensor (Altitude Value – Dia. PL = Span's gap). Following instructions of typical pipeline inspection program.

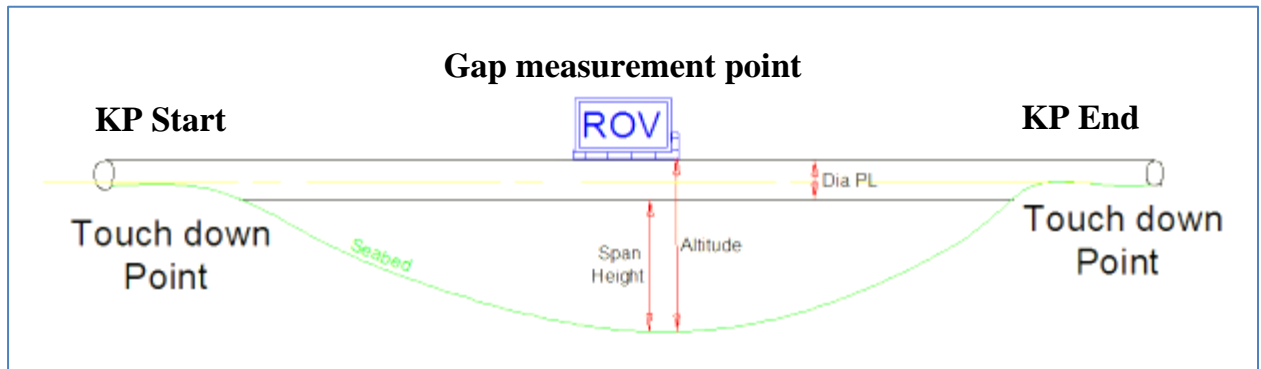


Figure 31: Illustrative figure of span's gap determining method

Free spans (FS)	Spans outside the following lengths: <u>26" pipelines:</u> >34m for single spans <u>16" pipelines:</u> >21m for single spans <u>12" pipelines:</u> >17m for single spans <u>10" pipelines:</u> >14m for single spans <u>8" pipelines:</u> >12m for single spans	Determine extent of anomalous scour area. To execute per one measurement of the greatest height/depth of each free span and suspended span of pipeline Photography, Video.
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Figure 32: Typical pipeline inspection program



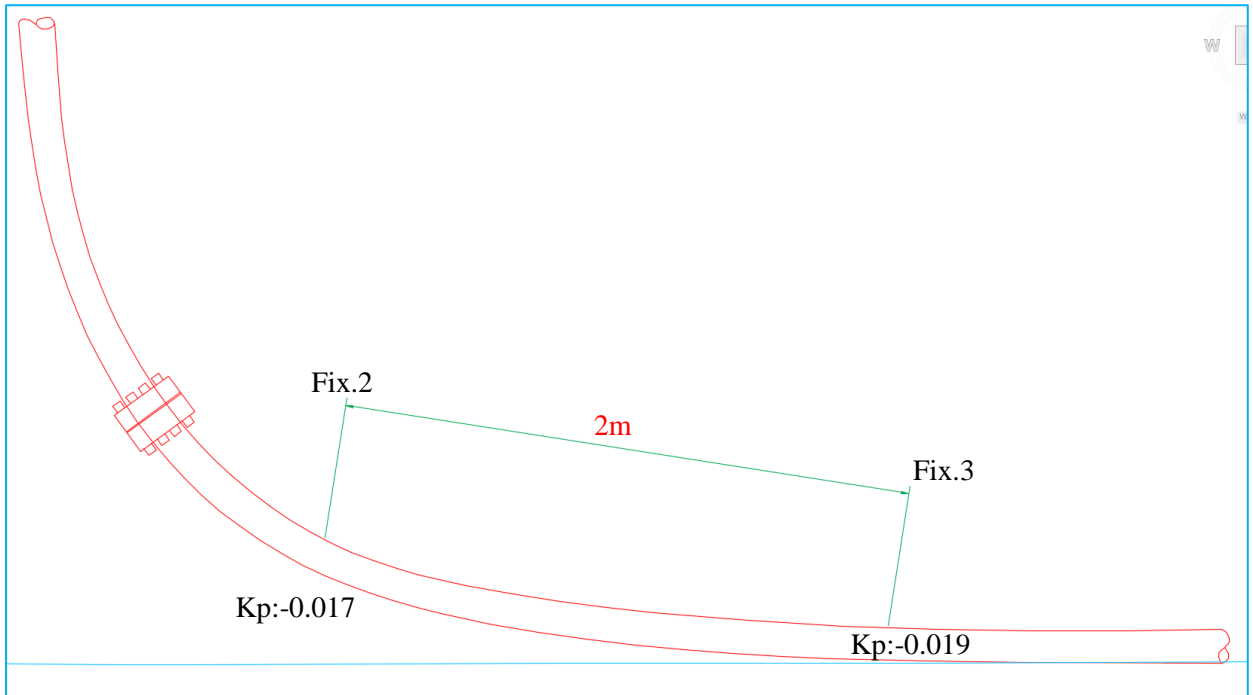


Figure 33: Free span from Fix.2 to Fix.3

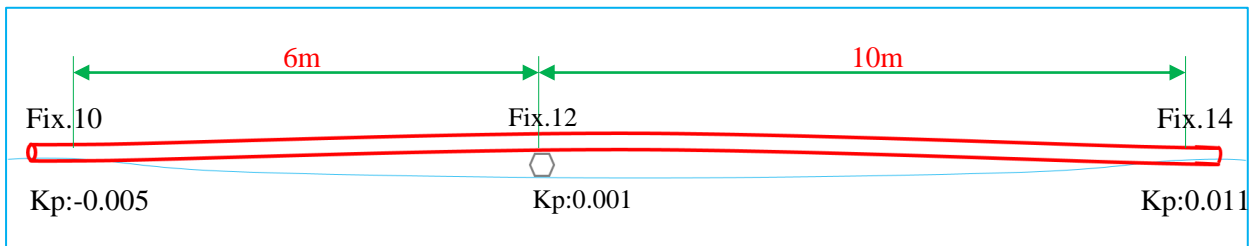


Figure 34: Free spans from Fix.10 to Fix.12 & Fix.12 to Fix.14

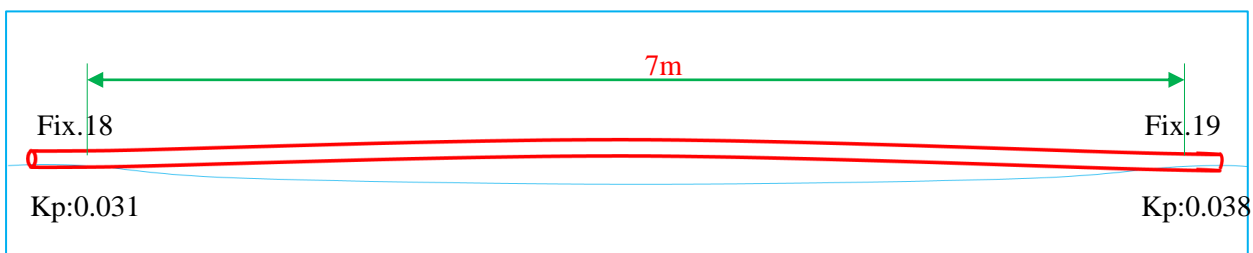


Figure 35: Free span from Fix.18 to Fix.19

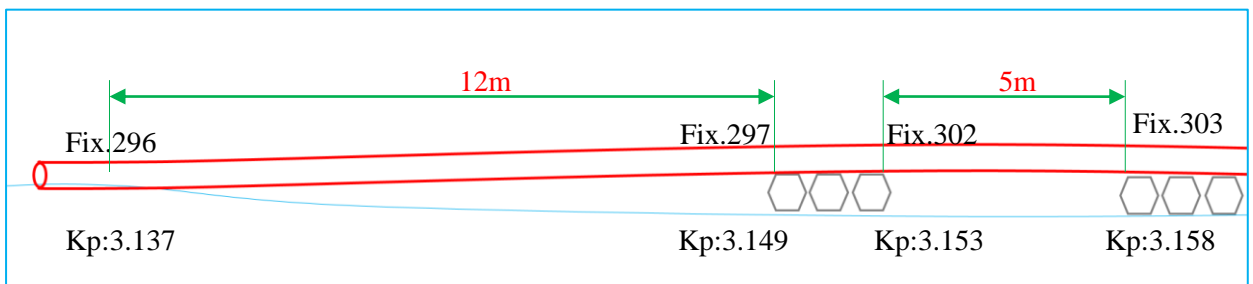


Figure 36: Free spans from Fix.296 to Fix.297 & Fix.302 to Fix.303



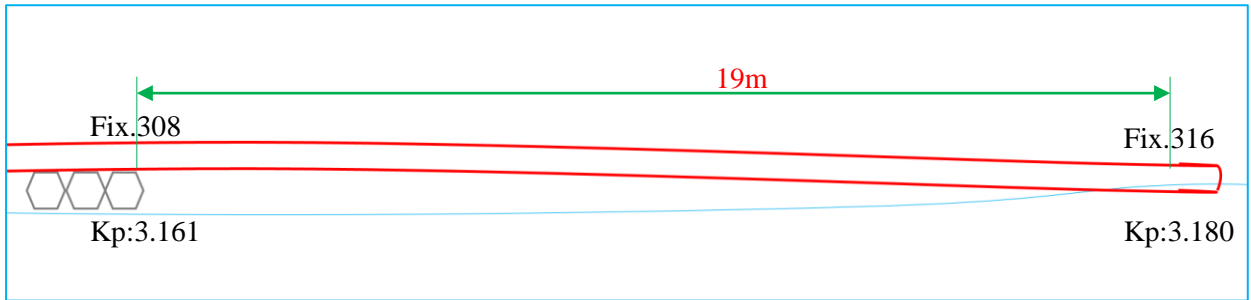


Figure 37: Free span from Fix.308 to Fix.316

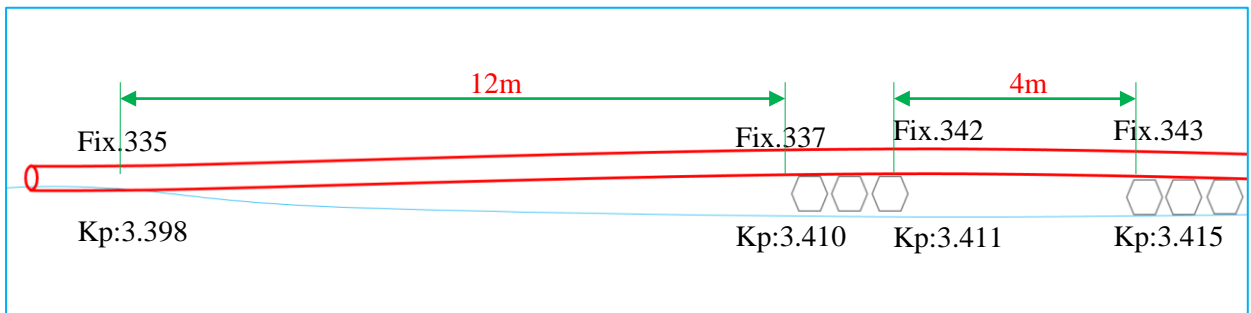


Figure 38: Free spans from Fix.335 to Fix.337 & Fix.342 to Fix.343

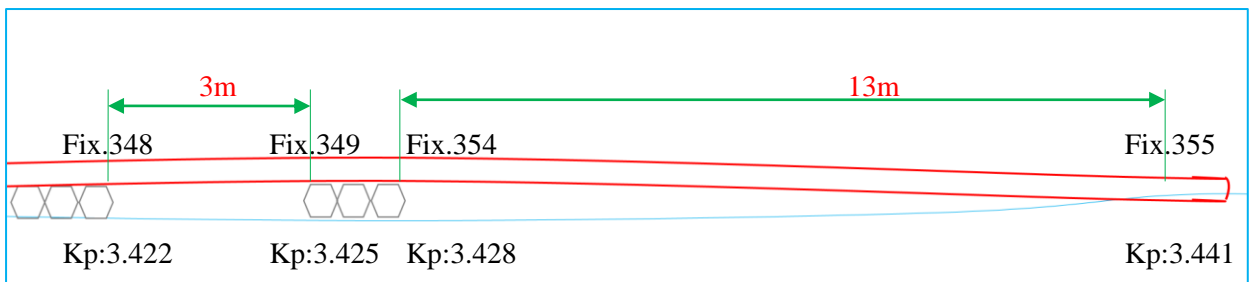


Figure 39: Free spans from Fix.348 to Fix.349 & Fix.354 to Fix.355

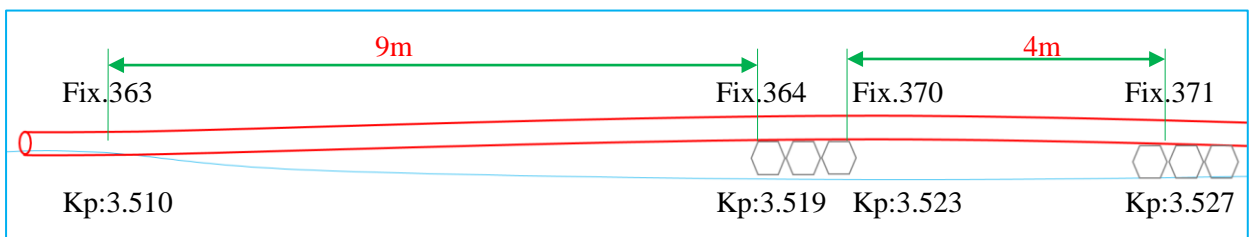


Figure 40: Free spans from Fix.363 to Fix.364 & Fix.370 to Fix.371

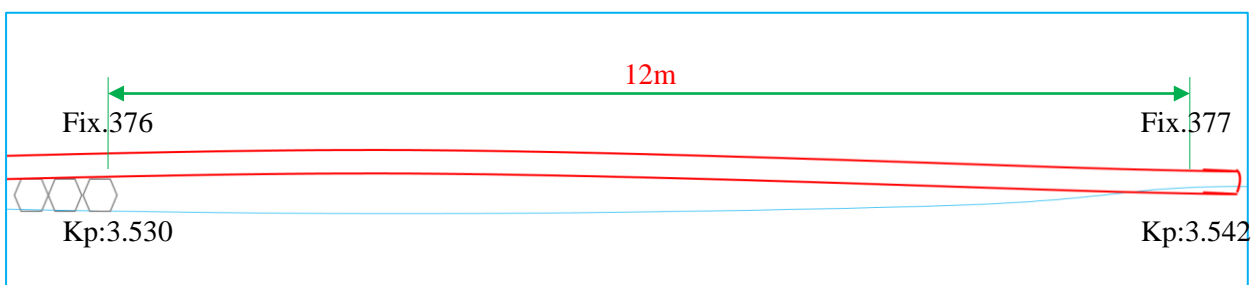


Figure 41: Free span from Fix.376 to Fix.377



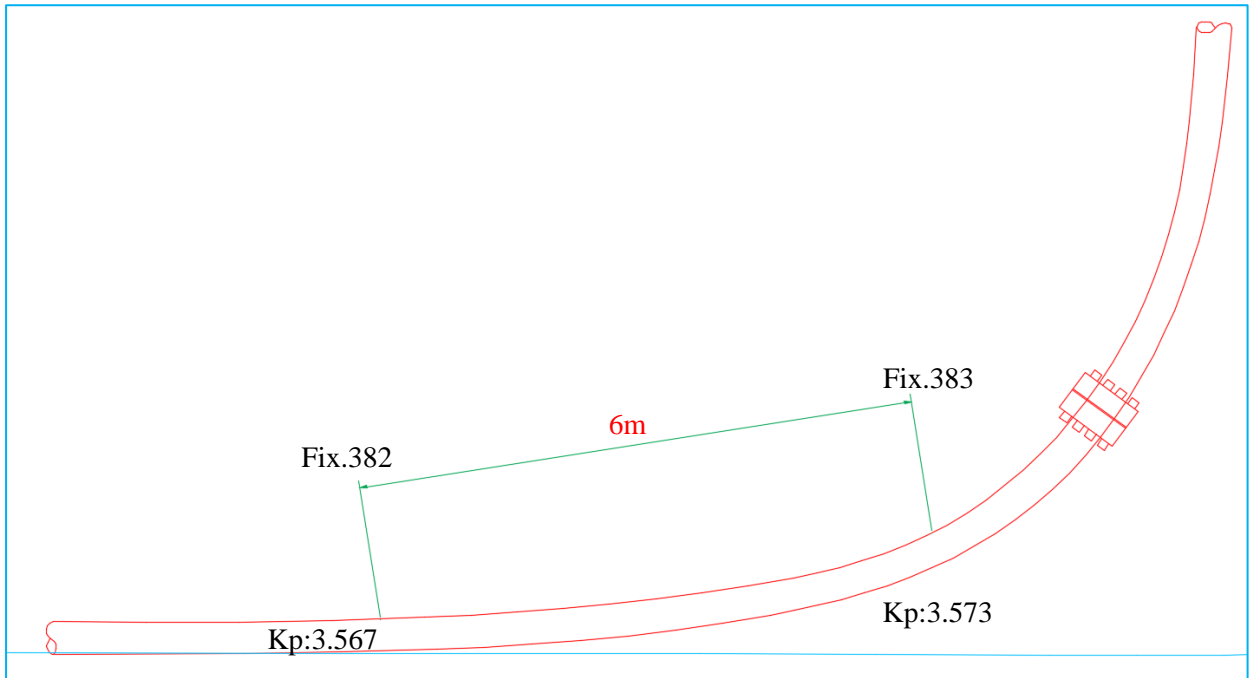


Figure 42: Free span from Fix.382 to Fix.383

6.6. Burial survey

The pipeline along its length was surveyed for burial. No section of burial was found during survey as table below.

6.7. Tie-in point survey

The pipeline along its length was surveyed for tie-in point. A total of 04 tie-in positions were found during the survey as table below.

Table 6: List of tie-in point

No.	Description	Fix	Easting	Northing	KP	Depth
1	Tie-in point	1	713805.59	1057835.55	-0.017	51.55
2	Tie-in point	11	713788.26	1057820.45	0.000	52.75
3	Tie-in point	378	712911.01	1054475.96	3.548	52.53
4	Tie-in point	384	712891.93	1054459.30	3.573	52.11





Figure 43: Tie-in point at Fix.1



Figure 44: Tie-in point at Fix.11





Figure 45: Tie-in point at Fix.378



Figure 46: Tie-in point at Fix.384



6.8. Concrete mattress survey

The pipeline along its length was surveyed for concrete mattress. A total of 08 concrete mattresses were found during the survey as table below.

Table 7: List of concrete mattresses

No.	Description	Fix	Easting	Northing	KP	Depth
1	Grout Mattress Corner #1	298	713154.45	1054789.39	3.150	51.81
	Grout Mattress Corner #2	299	713153.28	1054787.44	3.152	51.56
	Grout Mattress Corner #3	300	713158.87	1054783.56	3.152	50.81
	Grout Mattress Corner #4	301	713159.23	1054785.75	3.150	51.78
2	Grout Mattress Corner #1	304	713150.40	1054781.04	3.160	52.01
	Grout Mattress Corner #2	305	713149.77	1054780.53	3.160	51.43
	Grout Mattress Corner #3	306	713154.40	1054775.67	3.161	52.04
	Grout Mattress Corner #4	307	713155.93	1054778.65	3.158	51.76
3	Grout Mattress Corner #1	311	713146.05	1054774.06	3.167	51.58
	Grout Mattress Corner #2	312	713145.09	1054772.25	3.169	51.92
	Grout Mattress Corner #3	313	713150.81	1054769.78	3.168	52.00
	Grout Mattress Corner #4	314	713151.94	1054772.45	3.165	52.05
4	Grout Mattress Corner #1	338	712991.80	1054587.31	3.410	52.21
	Grout Mattress Corner #2	339	712990.07	1054584.74	3.413	52.02
	Grout Mattress Corner #3	340	712996.21	1054582.50	3.411	52.24
	Grout Mattress Corner #4	341	712997.29	1054584.99	3.409	52.23
5	Grout Mattress Corner #1	344	712984.52	1054582.61	3.419	52.34
	Grout Mattress Corner #2	345	712983.69	1054577.75	3.422	51.80
	Grout Mattress Corner #3	346	712991.93	1054576.83	3.418	52.04
	Grout Mattress Corner #4	347	712991.73	1054580.19	3.416	52.23
6	Grout Mattress Corner #1	350	712981.59	1054575.43	3.425	52.26
	Grout Mattress Corner #2	351	712981.22	1054573.64	3.427	51.91
	Grout Mattress Corner #3	352	712985.09	1054569.34	3.428	52.18
	Grout Mattress Corner #4	353	712986.20	1054571.20	3.426	52.32
7	Grout Mattress Corner #1	366	712918.21	1054504.29	3.519	52.30
	Grout Mattress Corner #2	367	712916.58	1054501.60	3.523	52.13
	Grout Mattress Corner #3	368	712928.71	1054495.70	3.522	52.42
	Grout Mattress Corner #4	369	712928.95	1054497.64	3.520	52.35
8	Grout Mattress Corner #1	372	712915.44	1054498.35	3.526	52.53
	Grout Mattress Corner #2	373	712914.04	1054495.16	3.531	52.17
	Grout Mattress Corner #3	374	712924.14	1054489.40	3.529	52.45
	Grout Mattress Corner #4	375	712925.27	1054490.88	3.528	52.31





Figure 47: Concrete mattress #1



Figure 48: Concrete mattress #2





Figure 49: Concrete mattress #3



Figure 50: Concrete mattress #4





Figure 51: Concrete mattress #5



Figure 52: Concrete mattress #6





Figure 53: Concrete mattress #7



Figure 54: Concrete mattress #8



7 APPENDICES

7.1 Event Logs

Table 8: Event logs

ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.34	
Date:	19-04-24	Client: VSP	Report No.:	P.35-24	
Dive No.:	P.3016	Location: Dragon oil field	Depth:	52m	
DVD No.:	P.35-24	Extra Equipment: N/A	Vessel:	Sao Mai 03	
RCRB1.3-RC10.1 GASLIFT PIPELINE SURVEY					
Time	Code	Description	Fix	KP	Depth
15:15	V.SOS	Video Start of Survey at RC10			
15:15	R.C	Riser Clamp at EL -5m			
15:18	R.C	Riser Clamp at EL -10m			
15:19	R.C	Riser Clamp at EL -15m			
15:20	R.C	Riser Clamp at EL -20m			
15:21	R.C	Riser Clamp at EL -24m			
15:22	0-25% A.W	Anode wastage 0-25% at EL -25m			
15:22	R.C	Riser Clamp at EL -29m			
15:24	R.C	Riser Clamp at EL -35m			
15:25	R.C	Riser Clamp at EL -39m			
15:26	R.C	Riser Clamp at EL -46m			
15:28	TI.PO	Tie-in point	1	-0.017	51.55
15:30	R.EL	Riser Elbow (gap = 0.25m)	2	-0.017	51.87
15:32	F.S	Freespan Start	2	-0.017	51.87
15:36	F.E	Freespan End. Max Gap = 0.25m. L = 2m	3	-0.019	52.01
15:37	B.PL	Bend of pipeline	5	-0.021	51.99
15:38	0-25% A.W	Anode wastage 0-25%	6	-0.018	52.26
15:39	B.PL	Bend of pipeline	8	-0.011	52.53
15:40	F.S	Freespan Start	10	-0.005	52.73
15:41	TI.PO	Tie-in point	11	0.000	52.75
15:42	F.E	Freespan End. Max Gap = 0.1m. L = 6m	12	0.001	52.56
15:42	X.CU	Crossing Under Power Cable	12	0.001	52.56
15:42	S.P	Support pipe	12	0.001	52.56
15:42	F.S	Freespan Start	12	0.001	52.56
15:44	F.E	Freespan End. Max Gap = 0.3m. L = 10m	14	0.011	52.61
15:45	0-25% A.W	Anode wastage 0-25%	17	0.025	52.84
15:50	AN.CP	Anode CP Reading -1023mV	17	0.025	52.84
15:51	F.S	Freespan Start	18	0.031	52.77
15:51	F.E	Freespan End. Max Gap = m. L = 7m	19	0.038	52.89
15:53	0-25% A.W	Anode wastage 0-25%	23	0.071	52.68
15:57	0-25% A.W	Anode wastage 0-25%	28	0.121	52.59
15:59	0-25% A.W	Anode wastage 0-25%	32	0.168	52.51
16:00	SF.SC	Seabed Feature Scour	34	0.182	52.52
16:00	X.CU	Crossing Under Power Cable	34	0.182	52.52
16:02	0-25% A.W	Anode wastage 0-25%	37	0.216	52.48
16:05	0-25% A.W	Anode wastage 0-25%	42	0.265	52.42
16:07	0-25% A.W	Anode wastage 0-25%	46	0.313	52.43
16:09	0-25% A.W	Anode wastage 0-25%	50	0.362	52.20
16:10	DS.NT	Debris Soft Netting	52	0.385	52.11





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RCB1.1-RCRB1.13



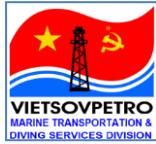
ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.34
Date:	19-04-24	Client: VSP	Report No.:	P.35-24
Dive No.:	P.3016	Location: Dragon oil field	Depth:	52m
DVD No.:	P.35-24	Extra Equipment: N/A	Vessel:	Sao Mai 03

RCRB1.3-RC10.1 GASLIFT PIPELINE SURVEY

Time	Code	Description	Fix	KP	Depth
16:10	0-25% A.W	Anode wastage 0-25%	55	0.410	52.04
16:12	0-25% A.W	Anode wastage 0-25%	59	0.458	52.07
16:14	0-25% A.W	Anode wastage 0-25%	63	0.505	51.96
7:31	0-25% A.W	Anode wastage 0-25%	68	0.553	51.97
7:32	0-25% A.W	Anode wastage 0-25%	73	0.601	52.00
7:33	0-25% A.W	Anode wastage 0-25%	77	0.649	52.13
7:35	0-25% A.W	Anode wastage 0-25%	82	0.699	52.32
7:37	0-25% A.W	Anode wastage 0-25%	85	0.735	52.34
7:38	SF.SC	Seabed Feature Scour	91	0.792	52.49
7:39	0-25% A.W	Anode wastage 0-25%	92	0.795	52.68
7:40	0-25% A.W	Anode wastage 0-25%	97	0.843	52.55
7:42	0-25% A.W	Anode wastage 0-25%	101	0.891	52.43
7:43	AN.CP	Anode CP Reading -1025mV	101	0.891	52.43
7:46	0-25% A.W	Anode wastage 0-25%	105	0.939	52.31
7:48	0-25% A.W	Anode wastage 0-25%	110	0.989	52.01
7:50	0-25% A.W	Anode wastage 0-25%	114	1.037	51.80
7:51	0-25% A.W	Anode wastage 0-25%	118	1.085	51.71
7:53	0-25% A.W	Anode wastage 0-25%	122	1.133	51.76
7:55	0-25% A.W	Anode wastage 0-25%	125	1.169	51.80
7:56	0-25% A.W	Anode wastage 0-25%	129	1.217	51.80
7:58	0-25% A.W	Anode wastage 0-25%	135	1.265	51.87
7:59	0-25% A.W	Anode wastage 0-25%	139	1.313	52.04
8:01	0-25% A.W	Anode wastage 0-25%	143	1.361	52.21
8:03	0-25% A.W	Anode wastage 0-25%	146	1.397	52.32
8:03	AN.CP	Anode CP Reading -1036mV	146	1.397	52.32
8:06	0-25% A.W	Anode wastage 0-25%	152	1.457	52.44
8:07	0-25% A.W	Anode wastage 0-25%	156	1.505	52.56
8:09	0-25% A.W	Anode wastage 0-25%	160	1.554	52.63
8:10	0-25% A.W	Anode wastage 0-25%	164	1.602	52.71
8:12	0-25% A.W	Anode wastage 0-25%	168	1.649	52.70
8:15	0-25% A.W	Anode wastage 0-25%	176	1.746	52.42
8:17	0-25% A.W	Anode wastage 0-25%	180	1.794	52.24
8:19	AN.CP	Anode CP Reading -1037mV	184	1.842	52.08
8:21	0-25% A.W	Anode wastage 0-25%	188	1.890	51.95
8:23	0-25% A.W	Anode wastage 0-25%	193	1.940	51.27
8:25	0-25% A.W	Anode wastage 0-25%	197	1.988	52.05
8:26	0-25% A.W	Anode wastage 0-25%	201	2.036	52.00
8:27	0-25% A.W	Anode wastage 0-25%	205	2.084	51.85
10:01	0-25% A.W	Anode wastage 0-25%	209	2.132	51.67
10:03	0-25% A.W	Anode wastage 0-25%	213	2.180	51.40
10:04	0-25% A.W	Anode wastage 0-25%	218	2.228	51.34
10:05	0-25% A.W	Anode wastage 0-25%	222	2.276	51.42
10:07	0-25% A.W	Anode wastage 0-25%	226	2.325	51.49
10:08	0-25% A.W	Anode wastage 0-25%	231	2.374	51.42
10:10	0-25% A.W	Anode wastage 0-25%	235	2.423	51.50
10:11	0-25% A.W	Anode wastage 0-25%	239	2.472	51.56
10:14	0-25% A.W	Anode wastage 0-25%	241	2.521	51.61
10:15	0-25% A.W	Anode wastage 0-25%	243	2.570	51.66
10:16	0-25% A.W	Anode wastage 0-25%	245	2.619	51.71

Report No. P.35-24





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RCB1.1-RCRB1.13



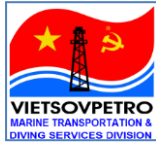
ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.34
Date:	19-04-24	Client: VSP	Report No.:	P.35-24
Dive No.:	P.3016	Location: Dragon oil field	Depth:	52m
DVD No.:	P.35-24	Extra Equipment: N/A	Vessel:	Sao Mai 03

RCRB1.3-RC10.1 GASLIFT PIPELINE SURVEY

Time	Code	Description	Fix	KP	Depth
10:13	0-25% A.W	Anode wastage 0-25%	243	2.521	50.87
10:15	AN.CP	Anode CP Reading -1037mV	248	2.574	51.65
10:18	0-25% A.W	Anode wastage 0-25%	252	2.620	51.45
10:19	0-25% A.W	Anode wastage 0-25%	256	2.668	51.27
10:20	0-25% A.W	Anode wastage 0-25%	260	2.717	51.31
10:22	0-25% A.W	Anode wastage 0-25%	264	2.767	51.33
10:23	0-25% A.W	Anode wastage 0-25%	268	2.815	51.37
10:25	0-25% A.W	Anode wastage 0-25%	272	2.861	51.44
15:01	0-25% A.W	Anode wastage 0-25%	276	2.916	51.52
15:03	0-25% A.W	Anode wastage 0-25%	281	2.975	51.53
15:04	0-25% A.W	Anode wastage 0-25%	285	3.023	51.60
15:07	0-25% A.W	Anode wastage 0-25%	290	3.074	51.78
15:10	AN.CP	Anode CP Reading -1026mV	294	3.120	51.86
15:11	F.S	Freespan Start	296	3.137	51.94
15:12	F.E	Freespan End. Max Gap = 0.2m. L = 12m	297	3.149	51.84
15:13	GM.C	Grout Mattress Corner	298	3.150	51.81
15:14	GM.C	Grout Mattress Corner	299	3.152	51.56
15:14	GM.C	Grout Mattress Corner	300	3.152	50.81
15:15	GM.C	Grout Mattress Corner	301	3.150	51.78
15:15	F.S	Freespan Start	302	3.153	51.54
15:15	F.E	Freespan End. Max Gap = 0.2m. L = 5m	303	3.158	51.32
15:16	GM.C	Grout Mattress Corner	304	3.160	52.01
15:16	GM.C	Grout Mattress Corner	305	3.160	51.43
15:17	GM.C	Grout Mattress Corner	306	3.161	52.04
15:17	GM.C	Grout Mattress Corner	307	3.158	51.76
15:18	F.S	Freespan Start	308	3.161	51.09
15:18	X.PO	Crossing Over a Pipeline	309	3.162	51.28
15:19	GM.C	Grout Mattress Corner	311	3.167	51.58
15:20	GM.C	Grout Mattress Corner	312	3.169	51.92
15:20	GM.C	Grout Mattress Corner	313	3.168	52.00
15:20	GM.C	Grout Mattress Corner	314	3.165	52.05
15:21	0-25% A.W	Anode wastage 0-25%	315	3.169	51.94
15:22	F.E	Freespan End. Max Gap = 0.2m. L = 19m	316	3.180	52.21
15:24	0-25% A.W	Anode wastage 0-25%	320	3.218	52.07
15:26	0-25% A.W	Anode wastage 0-25%	324	3.266	52.15
15:28	0-25% A.W	Anode wastage 0-25%	328	3.314	52.13
15:30	0-25% A.W	Anode wastage 0-25%	332	3.362	52.30
15:31	F.S	Freespan Start	335	3.398	52.33
15:32	F.E	Freespan End. Max Gap = 0.2m. L = 12m	337	3.410	52.26
15:33	GM.C	Grout Mattress Corner	338	3.410	52.21
15:33	GM.C	Grout Mattress Corner	339	3.413	52.02
15:33	GM.C	Grout Mattress Corner	340	3.411	52.24
15:34	GM.C	Grout Mattress Corner	341	3.409	52.23
15:34	F.S	Freespan Start	342	3.411	51.85
15:35	F.E	Freespan End. Max Gap = 0.4m. L = 4m	343	3.415	52.38
15:35	GM.C	Grout Mattress Corner	344	3.419	52.31

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ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RCB1.1-RCRB1.13



ROV:	Panther 932	Contractor: VSP	Task No.:	B.42.2.34	
Date:	19-04-24	Client: VSP	Report No.:	P.35-24	
Dive No.:	P.3016	Location: Dragon oil field	Depth:	52m	
DVD No.:	P.35-24	Extra Equipment: N/A	Vessel:	Sao Mai 03	
RCRB1.3-RC10.1 GASLIFT PIPELINE SURVEY					
Time	Code	Description	Fix	KP	Depth
15:36	GM.C	Grout Mattress Corner	345	3.422	51.80
15:36	GM.C	Grout Mattress Corner	346	3.418	52.04
15:37	GM.C	Grout Mattress Corner	347	3.416	52.23
15:38	X.PO	Crossing Over Pipelines (fully burial)	348	3.422	51.64
15:38	F.S	Freespan Start	348	3.422	51.64
15:38	F.E	Freespan End. Max Gap = 0.4m. L = 3m	349	3.425	52.37
15:39	GM.C	Grout Mattress Corner	350	3.425	52.26
15:39	GM.C	Grout Mattress Corner	351	3.427	51.91
15:39	GM.C	Grout Mattress Corner	352	3.428	52.18
15:40	GM.C	Grout Mattress Corner	353	3.426	52.32
15:41	F.S	Freespan Start	354	3.428	52.00
15:41	F.E	Freespan End. Max Gap = 0.3m. L = 13m	355	3.441	52.44
15:43	0-25% A.W	Anode wastage 0-25%	358	3.460	52.34
15:45	0-25% A.W	Anode wastage 0-25%	362	3.507	52.47
15:45	X.CO	Crossing Over Power Cable (fully burial)	363	3.510	52.50
15:45	F.S	Freespan Start	363	3.510	52.50
15:46	F.E	Freespan End. Max Gap = 0.2m. L = 9m	364	3.519	52.32
15:47	GM.C	Grout Mattress Corner	366	3.519	52.30
15:47	GM.C	Grout Mattress Corner	367	3.523	52.13
15:51	GM.C	Grout Mattress Corner	368	3.522	52.42
15:51	GM.C	Grout Mattress Corner	369	3.520	52.35
15:52	F.S	Freespan Start	370	3.523	51.97
15:52	F.E	Freespan End. Max Gap = 0.3m. L = 4m	371	3.527	52.41
15:53	GM.C	Grout Mattress Corner	372	3.526	52.53
15:53	GM.C	Grout Mattress Corner	373	3.531	52.17
15:54	GM.C	Grout Mattress Corner	374	3.529	52.45
15:55	GM.C	Grout Mattress Corner	375	3.528	52.31
15:55	F.S	Freespan Start	376	3.530	51.85
15:56	F.E	Freespan End. Max Gap = 0.3m. L = 12m	377	3.542	52.61
15:56	0-25% A.W	Anode wastage 0-25%	377	3.542	52.61
15:57	TI.PO	Tie-in point	378	3.548	52.53
15:58	0-25% A.W	Anode wastage 0-25%	379	3.558	52.51
15:59	B.PL	Bend of pipeline	381	3.564	52.56
16:00	F.S	Freespan Start	382	3.567	52.52
16:02	F.E	Freespan End. Max Gap = 0.3m. L = 6m	383	3.573	52.46
16:03	TI.PO	Tie-in point	384	3.573	52.11
16:06	R.C	Riser Clamp at EL -46m			
16:06	0-25% A.W	Anode wastage 0-25% at EL -44m			
16:07	R.C	Riser Clamp at EL -40m			
16:08	R.C	Riser Clamp at EL -34m			
16:10	R.C	Riser Clamp at EL -28m			
16:10	0-25% A.W	Anode wastage 0-25% at EL -25m			
16:11	R.C	Riser Clamp at EL -21m			
16:12	R.C	Riser Clamp at EL -15m			
16:13	R.C	Riser Clamp at EL -10m			
16:14	R.C	Riser Clamp at EL -6m			
16:14	R.C	Riser Clamp at EL -1m			
16:15	V.EOS	Video End of Survey at RC.RB1			



7.2 Co-ordinates

Table 9: Co-ordinates

Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
1	713805.59	1057835.55	9°34.0285'N	107°56.6473'E	-0.017	51.55
2	713804.11	1057835.75	9°34.0286'N	107°56.6464'E	-0.017	51.87
3	713801.53	1057837.97	9°34.0298'N	107°56.6450'E	-0.019	52.01
4	713801.71	1057838.18	9°34.0299'N	107°56.6451'E	-0.019	52.00
5	713800.47	1057839.80	9°34.0308'N	107°56.6445'E	-0.021	51.99
6	713797.06	1057836.95	9°34.0292'N	107°56.6426'E	-0.018	52.26
7	713795.42	1057834.74	9°34.0280'N	107°56.6417'E	-0.015	52.37
8	713792.07	1057830.98	9°34.0260'N	107°56.6399'E	-0.011	52.53
9	713789.89	1057827.67	9°34.0242'N	107°56.6386'E	-0.007	52.59
10	713788.71	1057825.28	9°34.0229'N	107°56.6380'E	-0.005	52.73
11	713788.26	1057820.45	9°34.0203'N	107°56.6377'E	0.000	52.75
12	713788.38	1057819.79	9°34.0200'N	107°56.6378'E	0.001	52.56
13	713789.74	1057812.05	9°34.0158'N	107°56.6385'E	0.009	52.71
14	713790.78	1057809.38	9°34.0143'N	107°56.6391'E	0.011	52.61
15	713791.12	1057803.62	9°34.0112'N	107°56.6392'E	0.016	52.58
16	713791.05	1057797.84	9°34.0080'N	107°56.6392'E	0.022	52.60
17	713790.04	1057795.10	9°34.0066'N	107°56.6386'E	0.025	52.84
18	713788.85	1057789.68	9°34.0036'N	107°56.6380'E	0.031	52.77
19	713788.04	1057782.48	9°33.9997'N	107°56.6375'E	0.038	52.89
20	713787.43	1057774.75	9°33.9955'N	107°56.6371'E	0.045	52.82
21	713786.58	1057765.97	9°33.9908'N	107°56.6366'E	0.054	52.83
22	713784.98	1057756.84	9°33.9858'N	107°56.6357'E	0.064	52.65
23	713784.25	1057749.65	9°33.9819'N	107°56.6353'E	0.071	52.68
24	713782.89	1057740.55	9°33.9770'N	107°56.6346'E	0.080	52.65
25	713781.83	1057732.13	9°33.9724'N	107°56.6339'E	0.088	52.65
26	713779.73	1057722.95	9°33.9675'N	107°56.6328'E	0.098	52.63
27	713781.11	1057709.61	9°33.9602'N	107°56.6335'E	0.111	52.65
28	713778.21	1057699.82	9°33.9549'N	107°56.6319'E	0.121	52.59
29	713776.98	1057689.37	9°33.9493'N	107°56.6312'E	0.131	52.56
30	713774.92	1057675.01	9°33.9415'N	107°56.6300'E	0.146	52.52
31	713773.22	1057662.71	9°33.9348'N	107°56.6290'E	0.158	52.52
32	713771.89	1057653.61	9°33.9299'N	107°56.6283'E	0.168	52.51
33	713769.79	1057641.83	9°33.9235'N	107°56.6271'E	0.180	52.53
34	713769.06	1057639.66	9°33.9223'N	107°56.6267'E	0.182	52.52
35	713767.12	1057627.88	9°33.9159'N	107°56.6256'E	0.194	52.52
36	713765.92	1057615.93	9°33.9095'N	107°56.6249'E	0.206	52.53
37	713764.42	1057606.12	9°33.9041'N	107°56.6240'E	0.216	52.48
38	713763.19	1057594.20	9°33.8977'N	107°56.6233'E	0.228	52.51
39	713762.08	1057582.20	9°33.8912'N	107°56.6227'E	0.240	52.50
40	713760.36	1057570.26	9°33.8847'N	107°56.6217'E	0.252	52.48
41	713758.67	1057558.45	9°33.8783'N	107°56.6208'E	0.264	52.44





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
42	713758.27	1057556.90	9°33.8775'N	107°56.6205'E	0.265	52.42
43	713756.58	1057544.83	9°33.8709'N	107°56.6196'E	0.278	52.41
44	713756.25	1057533.42	9°33.8647'N	107°56.6194'E	0.289	52.41
45	713755.91	1057520.90	9°33.8579'N	107°56.6191'E	0.301	52.41
46	713754.33	1057509.51	9°33.8518'N	107°56.6182'E	0.313	52.43
47	713752.85	1057497.28	9°33.8451'N	107°56.6174'E	0.325	52.35
48	713751.60	1057485.27	9°33.8386'N	107°56.6167'E	0.338	52.34
49	713749.42	1057473.44	9°33.8322'N	107°56.6154'E	0.349	52.21
50	713747.97	1057461.46	9°33.8257'N	107°56.6146'E	0.362	52.20
51	713746.46	1057449.67	9°33.8193'N	107°56.6138'E	0.373	52.16
52	713744.98	1057438.80	9°33.8135'N	107°56.6129'E	0.385	52.11
53	713743.30	1057426.68	9°33.8069'N	107°56.6120'E	0.397	52.13
54	713741.67	1057414.77	9°33.8004'N	107°56.6110'E	0.409	52.11
55	713741.24	1057413.24	9°33.7996'N	107°56.6108'E	0.410	52.04
56	713740.18	1057401.58	9°33.7933'N	107°56.6102'E	0.422	52.04
57	713738.75	1057389.54	9°33.7868'N	107°56.6094'E	0.434	52.08
58	713737.07	1057377.67	9°33.7803'N	107°56.6084'E	0.446	52.04
59	713735.38	1057365.80	9°33.7739'N	107°56.6074'E	0.458	52.07
60	713734.01	1057354.09	9°33.7675'N	107°56.6067'E	0.470	52.02
61	713732.36	1057341.88	9°33.7609'N	107°56.6057'E	0.482	51.99
62	713730.87	1057330.42	9°33.7547'N	107°56.6049'E	0.494	51.96
63	713729.67	1057319.05	9°33.7486'N	107°56.6042'E	0.505	51.96
64	713728.21	1057307.31	9°33.7422'N	107°56.6033'E	0.517	51.89
65	713726.24	1057295.11	9°33.7356'N	107°56.6022'E	0.529	51.95
66	713725.18	1057283.22	9°33.7291'N	107°56.6016'E	0.541	51.96
67	713723.71	1057271.68	9°33.7229'N	107°56.6008'E	0.553	51.92
68	713723.71	1057271.68	9°33.7229'N	107°56.6008'E	0.553	51.97
69	713722.22	1057259.58	9°33.7163'N	107°56.5999'E	0.565	51.97
70	713720.56	1057247.90	9°33.7100'N	107°56.5990'E	0.577	52.02
71	713719.39	1057235.59	9°33.7033'N	107°56.5983'E	0.589	51.99
73	713718.01	1057223.76	9°33.6969'N	107°56.5975'E	0.601	52.00
73	713718.01	1057223.76	9°33.6969'N	107°56.5975'E	0.601	52.00
74	713716.46	1057211.67	9°33.6904'N	107°56.5966'E	0.614	52.03
75	713714.73	1057199.95	9°33.6840'N	107°56.5956'E	0.625	52.04
76	713713.05	1057187.94	9°33.6775'N	107°56.5947'E	0.637	52.10
77	713711.45	1057176.48	9°33.6713'N	107°56.5938'E	0.649	52.13
78	713709.65	1057164.41	9°33.6647'N	107°56.5928'E	0.661	52.19
79	713707.56	1057152.29	9°33.6582'N	107°56.5916'E	0.674	52.27
80	713705.63	1057140.53	9°33.6518'N	107°56.5905'E	0.686	52.22
81	713703.90	1057128.93	9°33.6455'N	107°56.5895'E	0.697	52.32
82	713703.51	1057127.18	9°33.6446'N	107°56.5893'E	0.699	52.32
83	713702.28	1057115.39	9°33.6382'N	107°56.5886'E	0.711	52.28
84	713701.28	1057103.70	9°33.6318'N	107°56.5880'E	0.723	52.34





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
85	713699.87	1057091.72	9°33.6253'N	107°56.5872'E	0.735	52.34
86	713698.62	1057079.58	9°33.6188'N	107°56.5865'E	0.747	52.37
87	713698.62	1057079.58	9°33.6188'N	107°56.5865'E	0.747	52.36
88	713696.77	1057067.80	9°33.6124'N	107°56.5854'E	0.759	52.37
89	713695.37	1057056.18	9°33.6061'N	107°56.5846'E	0.771	52.41
90	713693.78	1057044.30	9°33.5996'N	107°56.5837'E	0.783	52.45
91	713692.22	1057035.17	9°33.5947'N	107°56.5828'E	0.792	52.49
92	713691.81	1057032.01	9°33.5930'N	107°56.5826'E	0.795	52.68
93	713690.54	1057020.31	9°33.5866'N	107°56.5819'E	0.807	52.43
94	713689.21	1057008.26	9°33.5801'N	107°56.5811'E	0.819	52.48
95	713688.04	1056996.50	9°33.5737'N	107°56.5804'E	0.831	52.60
96	713686.60	1056984.60	9°33.5673'N	107°56.5796'E	0.843	52.52
97	713686.60	1056984.60	9°33.5673'N	107°56.5796'E	0.843	52.55
98	713685.27	1056972.80	9°33.5609'N	107°56.5788'E	0.855	52.53
99	713683.37	1056960.73	9°33.5544'N	107°56.5778'E	0.867	52.48
100	713682.11	1056948.65	9°33.5478'N	107°56.5770'E	0.879	52.45
101	713680.34	1056936.90	9°33.5414'N	107°56.5760'E	0.891	52.43
102	713678.52	1056925.20	9°33.5351'N	107°56.5750'E	0.903	52.40
103	713676.74	1056913.10	9°33.5285'N	107°56.5740'E	0.915	52.34
104	713675.44	1056901.14	9°33.5221'N	107°56.5733'E	0.927	52.35
105	713674.19	1056889.22	9°33.5156'N	107°56.5725'E	0.939	52.31
106	713672.73	1056877.36	9°33.5092'N	107°56.5717'E	0.951	52.24
107	713671.19	1056865.73	9°33.5029'N	107°56.5708'E	0.963	52.17
108	713669.19	1056853.41	9°33.4962'N	107°56.5697'E	0.976	52.09
109	713668.45	1056841.89	9°33.4899'N	107°56.5693'E	0.987	51.99
110	713668.11	1056839.32	9°33.4885'N	107°56.5691'E	0.989	52.01
111	713666.83	1056827.19	9°33.4820'N	107°56.5683'E	1.002	51.93
112	713664.67	1056815.61	9°33.4757'N	107°56.5671'E	1.013	51.89
113	713663.55	1056803.42	9°33.4691'N	107°56.5665'E	1.026	51.88
114	713661.95	1056792.04	9°33.4629'N	107°56.5655'E	1.037	51.80
115	713660.22	1056780.28	9°33.4566'N	107°56.5646'E	1.049	51.77
116	713658.47	1056768.59	9°33.4502'N	107°56.5636'E	1.061	51.81
117	713656.24	1056756.53	9°33.4437'N	107°56.5623'E	1.073	51.70
118	713655.71	1056744.59	9°33.4372'N	107°56.5620'E	1.085	51.71
119	713653.42	1056732.65	9°33.4307'N	107°56.5607'E	1.097	51.68
120	713651.62	1056721.02	9°33.4244'N	107°56.5597'E	1.109	51.66
121	713650.31	1056708.87	9°33.4178'N	107°56.5589'E	1.121	51.72
122	713648.74	1056697.27	9°33.4116'N	107°56.5580'E	1.133	51.76
123	713647.00	1056685.16	9°33.4050'N	107°56.5570'E	1.145	51.72
124	713645.67	1056673.34	9°33.3986'N	107°56.5563'E	1.157	51.74
125	713643.59	1056661.98	9°33.3924'N	107°56.5551'E	1.169	51.80
126	713642.21	1056649.72	9°33.3858'N	107°56.5543'E	1.181	51.83
127	713640.32	1056637.99	9°33.3794'N	107°56.5533'E	1.193	51.74





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
128	713639.02	1056626.01	9°33.3729'N	107°56.5525'E	1.205	51.73
129	713637.17	1056614.08	9°33.3665'N	107°56.5515'E	1.217	51.80
130	713637.17	1056614.08	9°33.3665'N	107°56.5515'E	1.217	51.80
131	713635.52	1056602.13	9°33.3600'N	107°56.5505'E	1.229	51.82
132	713634.46	1056590.24	9°33.3536'N	107°56.5499'E	1.241	51.85
133	713632.23	1056578.57	9°33.3472'N	107°56.5486'E	1.253	51.95
134	713631.08	1056566.48	9°33.3407'N	107°56.5480'E	1.265	51.89
135	713631.06	1056565.98	9°33.3404'N	107°56.5480'E	1.265	51.87
136	713629.76	1056554.08	9°33.3340'N	107°56.5472'E	1.277	51.91
137	713627.49	1056542.39	9°33.3276'N	107°56.5460'E	1.289	51.96
138	713626.12	1056530.11	9°33.3210'N	107°56.5452'E	1.302	52.00
139	713624.65	1056518.66	9°33.3148'N	107°56.5443'E	1.313	52.04
140	713623.46	1056506.43	9°33.3081'N	107°56.5436'E	1.326	52.11
141	713622.02	1056494.76	9°33.3018'N	107°56.5428'E	1.337	52.12
142	713620.67	1056482.29	9°33.2950'N	107°56.5420'E	1.350	52.15
143	713619.36	1056471.37	9°33.2891'N	107°56.5413'E	1.361	52.21
144	713617.89	1056459.25	9°33.2826'N	107°56.5404'E	1.373	52.23
145	713616.59	1056447.44	9°33.2762'N	107°56.5397'E	1.385	52.31
146	713615.19	1056435.51	9°33.2697'N	107°56.5389'E	1.397	52.32
147	713613.37	1056423.71	9°33.2633'N	107°56.5379'E	1.409	52.35
148	713613.22	1056422.42	9°33.2626'N	107°56.5378'E	1.410	52.16
149	713611.30	1056410.66	9°33.2562'N	107°56.5367'E	1.422	52.36
150	713609.94	1056398.82	9°33.2498'N	107°56.5359'E	1.434	52.42
151	713608.03	1056387.02	9°33.2434'N	107°56.5348'E	1.446	52.40
152	713606.56	1056375.88	9°33.2374'N	107°56.5340'E	1.457	52.44
153	713604.88	1056364.30	9°33.2311'N	107°56.5330'E	1.469	52.39
154	713603.38	1056351.96	9°33.2244'N	107°56.5322'E	1.481	52.47
155	713602.02	1056340.46	9°33.2182'N	107°56.5314'E	1.493	52.47
156	713600.08	1056328.30	9°33.2116'N	107°56.5303'E	1.505	52.56
157	713598.68	1056316.21	9°33.2050'N	107°56.5295'E	1.518	52.59
158	713597.75	1056304.04	9°33.1984'N	107°56.5290'E	1.530	52.59
159	713596.14	1056292.37	9°33.1921'N	107°56.5281'E	1.541	52.59
160	713594.09	1056280.57	9°33.1857'N	107°56.5269'E	1.554	52.63
161	713592.80	1056268.72	9°33.1793'N	107°56.5262'E	1.565	52.68
162	713590.45	1056256.86	9°33.1729'N	107°56.5248'E	1.578	52.62
163	713589.38	1056244.86	9°33.1664'N	107°56.5242'E	1.590	52.68
164	713588.04	1056233.04	9°33.1600'N	107°56.5234'E	1.602	52.71
165	713586.45	1056221.10	9°33.1535'N	107°56.5225'E	1.614	52.71
166	713584.69	1056208.99	9°33.1469'N	107°56.5215'E	1.626	52.74
167	713583.38	1056197.17	9°33.1405'N	107°56.5208'E	1.638	52.71
168	713582.00	1056185.54	9°33.1342'N	107°56.5200'E	1.649	52.70
169	713580.64	1056173.23	9°33.1275'N	107°56.5192'E	1.662	52.71
170	713579.07	1056161.46	9°33.1212'N	107°56.5183'E	1.674	52.66





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
171	713577.07	1056149.64	9°33.1148'N	107°56.5172'E	1.686	52.64
172	713574.91	1056137.74	9°33.1083'N	107°56.5160'E	1.698	52.58
173	713573.23	1056126.15	9°33.1020'N	107°56.5150'E	1.710	52.52
174	713572.17	1056114.11	9°33.0955'N	107°56.5144'E	1.722	51.81
175	713570.94	1056101.81	9°33.0888'N	107°56.5137'E	1.734	52.47
176	713569.52	1056089.89	9°33.0824'N	107°56.5129'E	1.746	52.42
177	713567.82	1056078.45	9°33.0762'N	107°56.5119'E	1.758	51.86
178	713566.03	1056066.74	9°33.0698'N	107°56.5109'E	1.770	52.30
179	713564.82	1056054.61	9°33.0633'N	107°56.5102'E	1.782	52.27
180	713563.45	1056042.85	9°33.0569'N	107°56.5094'E	1.794	52.24
181	713562.01	1056030.93	9°33.0504'N	107°56.5086'E	1.806	52.20
182	713560.45	1056018.39	9°33.0436'N	107°56.5077'E	1.818	52.15
183	713559.07	1056006.58	9°33.0372'N	107°56.5069'E	1.830	52.13
184	713557.89	1055994.68	9°33.0308'N	107°56.5062'E	1.842	52.08
185	713556.31	1055983.07	9°33.0245'N	107°56.5053'E	1.854	51.96
186	713555.50	1055971.02	9°33.0179'N	107°56.5049'E	1.867	51.98
187	713554.06	1055958.94	9°33.0114'N	107°56.5040'E	1.879	51.99
188	713552.54	1055946.95	9°33.0049'N	107°56.5032'E	1.890	51.95
189	713550.77	1055935.05	9°32.9985'N	107°56.5022'E	1.902	52.04
190	713549.04	1055923.57	9°32.9922'N	107°56.5012'E	1.914	52.07
191	713547.74	1055911.54	9°32.9857'N	107°56.5004'E	1.926	52.04
192	713545.73	1055899.69	9°32.9793'N	107°56.4993'E	1.938	52.08
193	713545.60	1055897.77	9°32.9782'N	107°56.4992'E	1.940	51.27
194	713543.35	1055886.15	9°32.9720'N	107°56.4980'E	1.952	52.07
195	713541.46	1055874.19	9°32.9655'N	107°56.4969'E	1.965	52.03
196	713539.98	1055862.55	9°32.9592'N	107°56.4960'E	1.976	52.10
197	713537.82	1055850.62	9°32.9527'N	107°56.4948'E	1.988	52.05
198	713536.03	1055839.16	9°32.9465'N	107°56.4938'E	2.000	52.06
199	713534.38	1055826.90	9°32.9398'N	107°56.4929'E	2.012	52.02
200	713532.55	1055815.41	9°32.9336'N	107°56.4918'E	2.024	51.98
201	713530.71	1055803.05	9°32.9269'N	107°56.4908'E	2.036	52.00
202	713528.40	1055791.33	9°32.9206'N	107°56.4895'E	2.048	51.89
203	713527.57	1055779.48	9°32.9141'N	107°56.4890'E	2.060	52.00
204	713525.35	1055767.56	9°32.9077'N	107°56.4878'E	2.072	51.89
205	713523.69	1055755.60	9°32.9012'N	107°56.4868'E	2.084	51.85
206	713521.73	1055743.74	9°32.8948'N	107°56.4857'E	2.096	51.84
207	713519.84	1055731.75	9°32.8883'N	107°56.4846'E	2.108	51.80
208	713518.21	1055720.28	9°32.8821'N	107°56.4837'E	2.120	51.13
209	713516.42	1055708.02	9°32.8754'N	107°56.4827'E	2.132	51.67
210	713514.80	1055696.33	9°32.8691'N	107°56.4818'E	2.144	51.63
211	713512.97	1055684.22	9°32.8625'N	107°56.4807'E	2.156	51.55
212	713511.47	1055672.73	9°32.8563'N	107°56.4799'E	2.168	51.40
213	713509.91	1055660.87	9°32.8499'N	107°56.4790'E	2.180	51.40





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
214	713508.32	1055648.46	9°32.8431'N	107°56.4781'E	2.192	51.39
215	713506.21	1055636.93	9°32.8369'N	107°56.4769'E	2.204	51.36
216	713504.70	1055625.27	9°32.8306'N	107°56.4760'E	2.216	51.31
217	713502.85	1055613.43	9°32.8242'N	107°56.4750'E	2.228	51.38
218	713503.00	1055612.82	9°32.8238'N	107°56.4751'E	2.228	51.34
219	713501.32	1055600.58	9°32.8172'N	107°56.4741'E	2.242	51.46
220	713500.09	1055588.98	9°32.8109'N	107°56.4734'E	2.252	51.40
221	713498.47	1055576.83	9°32.8043'N	107°56.4725'E	2.266	51.41
222	713496.73	1055564.95	9°32.7979'N	107°56.4715'E	2.276	51.42
223	713495.08	1055553.10	9°32.7915'N	107°56.4706'E	2.289	51.38
224	713493.28	1055541.14	9°32.7850'N	107°56.4695'E	2.302	51.34
225	713491.63	1055529.44	9°32.7786'N	107°56.4686'E	2.313	51.46
226	713490.07	1055516.90	9°32.7718'N	107°56.4677'E	2.325	51.49
227	713488.66	1055505.48	9°32.7657'N	107°56.4669'E	2.338	51.43
228	713486.49	1055493.86	9°32.7594'N	107°56.4657'E	2.349	51.41
229	713484.48	1055481.71	9°32.7528'N	107°56.4645'E	2.363	51.40
230	713482.22	1055469.78	9°32.7463'N	107°56.4633'E	2.374	51.44
231	713482.22	1055469.78	9°32.7463'N	107°56.4633'E	2.374	51.42
232	713479.63	1055458.41	9°32.7402'N	107°56.4618'E	2.388	51.47
233	713477.43	1055446.06	9°32.7335'N	107°56.4606'E	2.400	51.56
234	713475.07	1055434.66	9°32.7273'N	107°56.4593'E	2.410	51.51
235	713472.36	1055422.75	9°32.7208'N	107°56.4577'E	2.423	51.50
236	713469.80	1055411.27	9°32.7146'N	107°56.4563'E	2.436	51.50
237	713467.18	1055399.51	9°32.7082'N	107°56.4548'E	2.446	51.56
238	713465.02	1055387.94	9°32.7020'N	107°56.4536'E	2.461	51.55
239	713462.55	1055375.57	9°32.6953'N	107°56.4522'E	2.472	51.56
240	713459.92	1055364.08	9°32.6891'N	107°56.4508'E	2.483	51.56
241	713457.11	1055352.71	9°32.6829'N	107°56.4492'E	2.498	51.58
242	713453.94	1055341.05	9°32.6766'N	107°56.4474'E	2.508	51.59
243	713449.98	1055329.47	9°32.6703'N	107°56.4452'E	2.521	50.87
244	713445.86	1055317.98	9°32.6641'N	107°56.4429'E	2.536	51.60
245	713443.08	1055306.20	9°32.6577'N	107°56.4414'E	2.545	51.56
246	713439.68	1055294.91	9°32.6516'N	107°56.4395'E	2.561	51.69
247	713435.89	1055283.49	9°32.6454'N	107°56.4374'E	2.571	51.65
248	713434.83	1055281.60	9°32.6444'N	107°56.4368'E	2.574	51.65
249	713431.45	1055270.48	9°32.6384'N	107°56.4349'E	2.583	51.48
250	713427.28	1055259.01	9°32.6322'N	107°56.4326'E	2.593	51.08
251	713423.00	1055247.92	9°32.6262'N	107°56.4302'E	2.606	51.51
252	713419.09	1055237.23	9°32.6204'N	107°56.4281'E	2.620	51.45
253	713414.26	1055226.07	9°32.6143'N	107°56.4254'E	2.634	51.43
254	713410.15	1055214.81	9°32.6082'N	107°56.4231'E	2.645	51.42
255	713405.68	1055203.68	9°32.6022'N	107°56.4206'E	2.657	51.24
256	713402.59	1055192.02	9°32.5959'N	107°56.4189'E	2.668	51.27





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
257	713397.91	1055181.00	9°32.5899'N	107°56.4163'E	2.681	51.34
258	713393.39	1055169.94	9°32.5840'N	107°56.4138'E	2.692	51.30
259	713388.40	1055159.11	9°32.5781'N	107°56.4111'E	2.706	51.35
260	713383.76	1055148.09	9°32.5721'N	107°56.4085'E	2.717	51.31
261	713378.89	1055137.04	9°32.5662'N	107°56.4058'E	2.730	51.25
262	713373.30	1055126.19	9°32.5603'N	107°56.4027'E	2.743	51.29
263	713368.13	1055115.67	9°32.5546'N	107°56.3999'E	2.754	51.26
264	713363.54	1055104.41	9°32.5485'N	107°56.3973'E	2.767	51.33
265	713358.30	1055093.33	9°32.5425'N	107°56.3944'E	2.778	51.34
266	713352.75	1055082.74	9°32.5368'N	107°56.3913'E	2.791	51.36
267	713347.57	1055072.19	9°32.5311'N	107°56.3885'E	2.801	51.39
268	713342.04	1055061.58	9°32.5253'N	107°56.3854'E	2.815	51.37
269	713336.36	1055051.08	9°32.5197'N	107°56.3823'E	2.828	51.37
270	713330.61	1055040.21	9°32.5138'N	107°56.3791'E	2.838	51.43
271	713324.77	1055029.84	9°32.5082'N	107°56.3759'E	2.852	51.42
272	713318.90	1055019.30	9°32.5025'N	107°56.3727'E	2.861	51.44
273	713313.31	1055009.04	9°32.4969'N	107°56.3696'E	2.875	51.50
274	713307.25	1054998.67	9°32.4913'N	107°56.3662'E	2.887	51.42
275	713300.90	1054988.00	9°32.4856'N	107°56.3627'E	2.899	51.45
276	713294.71	1054977.91	9°32.4801'N	107°56.3593'E	2.916	51.52
277	713288.41	1054967.46	9°32.4745'N	107°56.3558'E	2.927	51.51
278	713282.01	1054957.72	9°32.4692'N	107°56.3523'E	2.941	51.47
279	713275.49	1054947.34	9°32.4636'N	107°56.3487'E	2.950	51.44
280	713269.43	1054937.34	9°32.4582'N	107°56.3454'E	2.961	50.80
281	713263.02	1054926.78	9°32.4525'N	107°56.3418'E	2.975	51.53
282	713256.40	1054916.59	9°32.4470'N	107°56.3382'E	2.986	51.47
283	713249.52	1054906.76	9°32.4417'N	107°56.3344'E	2.999	51.44
284	713242.76	1054897.20	9°32.4365'N	107°56.3307'E	3.011	51.54
285	713235.83	1054887.22	9°32.4311'N	107°56.3269'E	3.023	51.60
286	713228.70	1054877.54	9°32.4259'N	107°56.3229'E	3.035	51.61
287	713221.88	1054868.11	9°32.4208'N	107°56.3192'E	3.047	51.65
288	713214.22	1054858.56	9°32.4156'N	107°56.3150'E	3.059	51.10
289	713207.52	1054848.68	9°32.4103'N	107°56.3113'E	3.071	51.71
290	713205.93	1054845.62	9°32.4086'N	107°56.3104'E	3.074	51.78
291	713199.12	1054839.09	9°32.4051'N	107°56.3067'E	3.083	51.65
292	713192.09	1054829.20	9°32.3998'N	107°56.3028'E	3.096	51.78
293	713184.88	1054819.60	9°32.3946'N	107°56.2988'E	3.108	51.82
294	713177.06	1054810.45	9°32.3896'N	107°56.2945'E	3.120	51.86
295	713168.89	1054801.36	9°32.3847'N	107°56.2900'E	3.132	51.83
296	713164.87	1054797.37	9°32.3826'N	107°56.2878'E	3.137	51.94
297	713158.29	1054787.58	9°32.3773'N	107°56.2842'E	3.149	51.84
298	713154.45	1054789.39	9°32.3783'N	107°56.2821'E	3.150	51.81
299	713153.28	1054787.44	9°32.3772'N	107°56.2814'E	3.152	51.56





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
300	713158.87	1054783.56	9°32.3751'N	107°56.2845'E	3.152	50.81
301	713159.23	1054785.75	9°32.3763'N	107°56.2847'E	3.150	51.78
302	713156.49	1054784.04	9°32.3754'N	107°56.2832'E	3.153	51.54
303	713153.43	1054779.96	9°32.3732'N	107°56.2815'E	3.158	51.32
304	713150.40	1054781.04	9°32.3738'N	107°56.2799'E	3.160	52.01
305	713149.77	1054780.53	9°32.3735'N	107°56.2795'E	3.160	51.43
306	713154.40	1054775.67	9°32.3708'N	107°56.2820'E	3.161	52.04
307	713155.93	1054778.65	9°32.3725'N	107°56.2829'E	3.158	51.76
308	713152.96	1054777.36	9°32.3718'N	107°56.2812'E	3.161	51.09
309	713150.46	1054777.06	9°32.3716'N	107°56.2799'E	3.162	51.28
310	713147.50	1054774.34	9°32.3701'N	107°56.2783'E	3.166	52.01
311	713146.05	1054774.06	9°32.3700'N	107°56.2775'E	3.167	51.58
312	713145.09	1054772.25	9°32.3690'N	107°56.2769'E	3.169	51.92
313	713150.81	1054769.78	9°32.3677'N	107°56.2800'E	3.168	52.00
314	713151.94	1054772.45	9°32.3691'N	107°56.2807'E	3.165	52.05
315	713147.02	1054771.82	9°32.3688'N	107°56.2780'E	3.169	51.94
316	713139.01	1054764.24	9°32.3647'N	107°56.2736'E	3.180	52.21
317	713131.70	1054754.96	9°32.3597'N	107°56.2696'E	3.191	52.06
318	713124.50	1054744.90	9°32.3542'N	107°56.2656'E	3.204	52.02
319	713117.29	1054735.62	9°32.3492'N	107°56.2616'E	3.216	52.03
320	713115.50	1054733.47	9°32.3481'N	107°56.2606'E	3.218	52.07
321	713108.00	1054723.90	9°32.3429'N	107°56.2565'E	3.231	52.03
322	713100.15	1054714.90	9°32.3380'N	107°56.2522'E	3.243	52.06
323	713092.15	1054706.25	9°32.3334'N	107°56.2478'E	3.254	52.10
324	713083.52	1054697.85	9°32.3289'N	107°56.2431'E	3.266	52.15
325	713075.18	1054689.14	9°32.3242'N	107°56.2385'E	3.278	52.08
326	713067.78	1054679.82	9°32.3191'N	107°56.2344'E	3.290	52.20
327	713060.65	1054669.67	9°32.3136'N	107°56.2305'E	3.303	52.16
328	713053.56	1054660.33	9°32.3086'N	107°56.2266'E	3.314	52.13
329	713045.90	1054651.17	9°32.3036'N	107°56.2224'E	3.326	52.22
330	713038.63	1054641.33	9°32.2983'N	107°56.2184'E	3.339	52.19
331	713031.33	1054632.18	9°32.2934'N	107°56.2143'E	3.350	52.27
332	713024.12	1054623.57	9°32.2887'N	107°56.2104'E	3.362	52.30
333	713016.62	1054613.97	9°32.2836'N	107°56.2062'E	3.374	52.30
334	713009.49	1054604.02	9°32.2782'N	107°56.2023'E	3.386	52.38
335	713001.42	1054595.06	9°32.2734'N	107°56.1979'E	3.398	52.33
336	713001.42	1054595.06	9°32.2734'N	107°56.1979'E	3.398	52.33
337	712994.70	1054585.37	9°32.2681'N	107°56.1942'E	3.410	52.26
338	712991.80	1054587.31	9°32.2692'N	107°56.1926'E	3.410	52.21
339	712990.07	1054584.74	9°32.2678'N	107°56.1917'E	3.413	52.02
340	712996.21	1054582.50	9°32.2666'N	107°56.1950'E	3.411	52.24
341	712997.29	1054584.99	9°32.2679'N	107°56.1956'E	3.409	52.23
342	712993.34	1054584.90	9°32.2679'N	107°56.1934'E	3.411	51.85





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RCRB1.13



Fix No.	EVEREST 1830		WGS84		KP	Depth (m)
	Easting	Northing	Latitude	Longitude		
343	712990.82	1054581.32	9°32.2659'N	107°56.1921'E	3.415	52.38
344	712984.52	1054582.61	9°32.2666'N	107°56.1886'E	3.419	52.34
345	712983.69	1054577.75	9°32.2640'N	107°56.1881'E	3.422	51.80
346	712991.93	1054576.83	9°32.2635'N	107°56.1926'E	3.418	52.04
347	712991.73	1054580.19	9°32.2653'N	107°56.1925'E	3.416	52.23
348	712987.36	1054575.72	9°32.2629'N	107°56.1901'E	3.422	51.64
349	712984.72	1054573.30	9°32.2616'N	107°56.1887'E	3.425	52.37
350	712981.59	1054575.43	9°32.2628'N	107°56.1870'E	3.425	52.26
351	712981.22	1054573.64	9°32.2618'N	107°56.1868'E	3.427	51.91
352	712985.09	1054569.34	9°32.2594'N	107°56.1889'E	3.428	52.18
353	712986.20	1054571.20	9°32.2605'N	107°56.1895'E	3.426	52.32
354	712983.12	1054570.70	9°32.2602'N	107°56.1878'E	3.428	52.00
355	712975.37	1054561.55	9°32.2553'N	107°56.1835'E	3.441	52.44
356	712974.69	1054559.93	9°32.2544'N	107°56.1832'E	3.442	52.50
357	712967.82	1054550.03	9°32.2490'N	107°56.1794'E	3.454	52.33
358	712964.49	1054546.08	9°32.2469'N	107°56.1776'E	3.460	52.34
359	712957.20	1054536.59	9°32.2418'N	107°56.1735'E	3.471	52.37
360	712949.79	1054527.28	9°32.2367'N	107°56.1695'E	3.483	52.39
361	712942.45	1054517.63	9°32.2315'N	107°56.1654'E	3.496	52.35
362	712935.77	1054508.60	9°32.2267'N	107°56.1617'E	3.507	52.47
363	712933.98	1054506.58	9°32.2256'N	107°56.1608'E	3.510	52.50
364	712928.17	1054498.63	9°32.2213'N	107°56.1576'E	3.519	52.32
365	712918.21	1054505.03	9°32.2248'N	107°56.1521'E	3.519	52.33
366	712918.21	1054504.29	9°32.2244'N	107°56.1521'E	3.519	52.30
367	712916.58	1054501.60	9°32.2229'N	107°56.1512'E	3.523	52.13
368	712928.71	1054495.70	9°32.2197'N	107°56.1579'E	3.522	52.42
369	712928.95	1054497.64	9°32.2207'N	107°56.1580'E	3.520	52.35
370	712925.86	1054495.82	9°32.2198'N	107°56.1563'E	3.523	51.97
371	712922.66	1054493.27	9°32.2184'N	107°56.1545'E	3.527	52.41
372	712915.44	1054498.35	9°32.2212'N	107°56.1506'E	3.526	52.53
373	712914.04	1054495.16	9°32.2194'N	107°56.1498'E	3.531	52.17
374	712924.14	1054489.40	9°32.2163'N	107°56.1553'E	3.529	52.45
375	712925.27	1054490.88	9°32.2171'N	107°56.1560'E	3.528	52.31
376	712922.22	1054489.68	9°32.2164'N	107°56.1543'E	3.530	51.85
377	712914.88	1054480.89	9°32.2117'N	107°56.1503'E	3.542	52.61
378	712911.01	1054475.96	9°32.2090'N	107°56.1481'E	3.548	52.53
379	712904.67	1054467.55	9°32.2045'N	107°56.1446'E	3.558	52.51
380	712902.97	1054465.67	9°32.2035'N	107°56.1437'E	3.561	52.56
381	712901.15	1054463.87	9°32.2025'N	107°56.1427'E	3.564	52.56
382	712898.53	1054462.03	9°32.2015'N	107°56.1413'E	3.567	52.52
383	712892.15	1054458.66	9°32.1997'N	107°56.1378'E	3.573	52.46
384	712891.93	1054459.30	9°32.2000'N	107°56.1376'E	3.573	52.11



7.3 Drawings

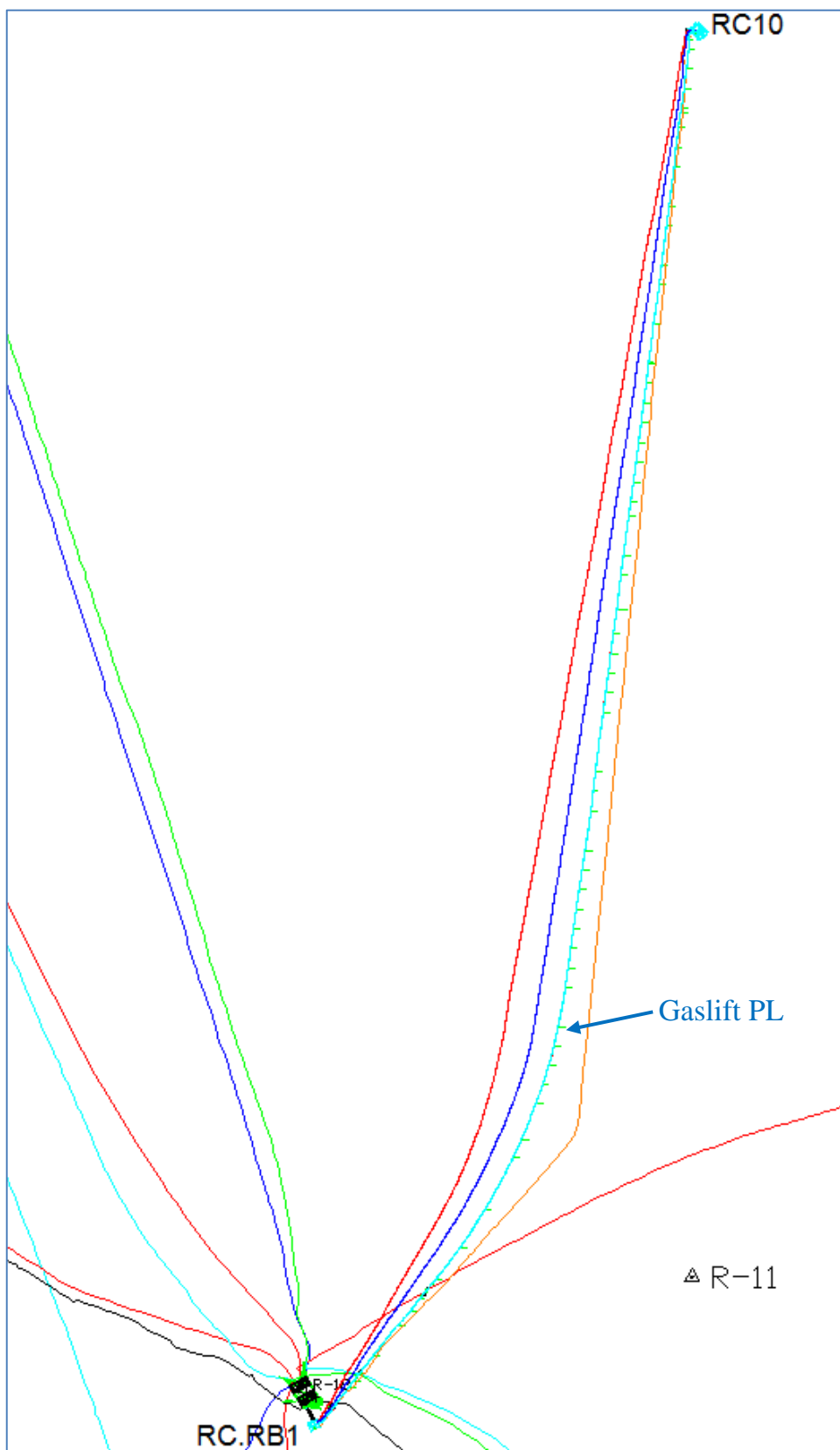


Figure 55: RC10-RC.RB1 gaslift pipeline route



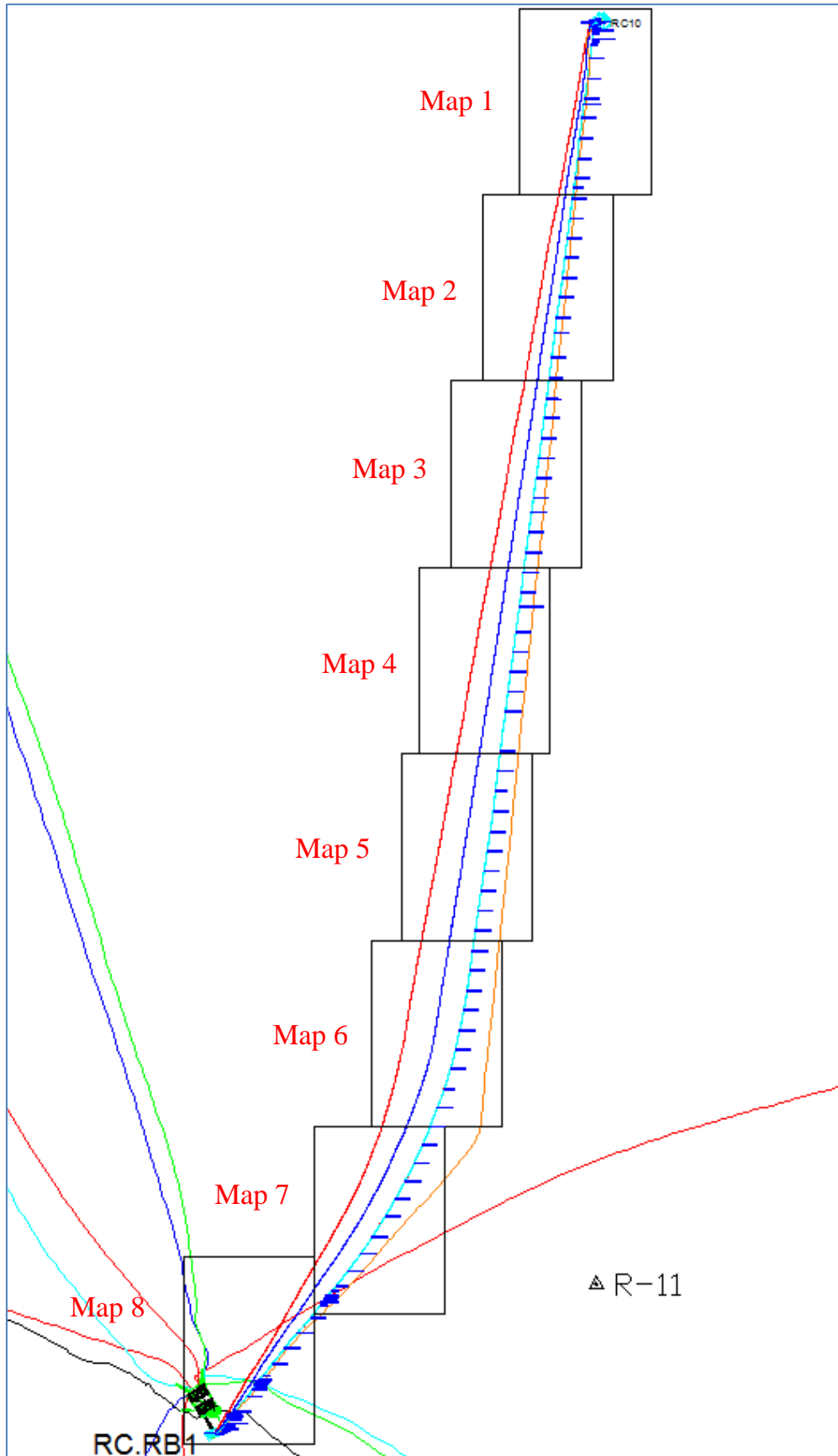


Figure 56: Pipeline sections drawing



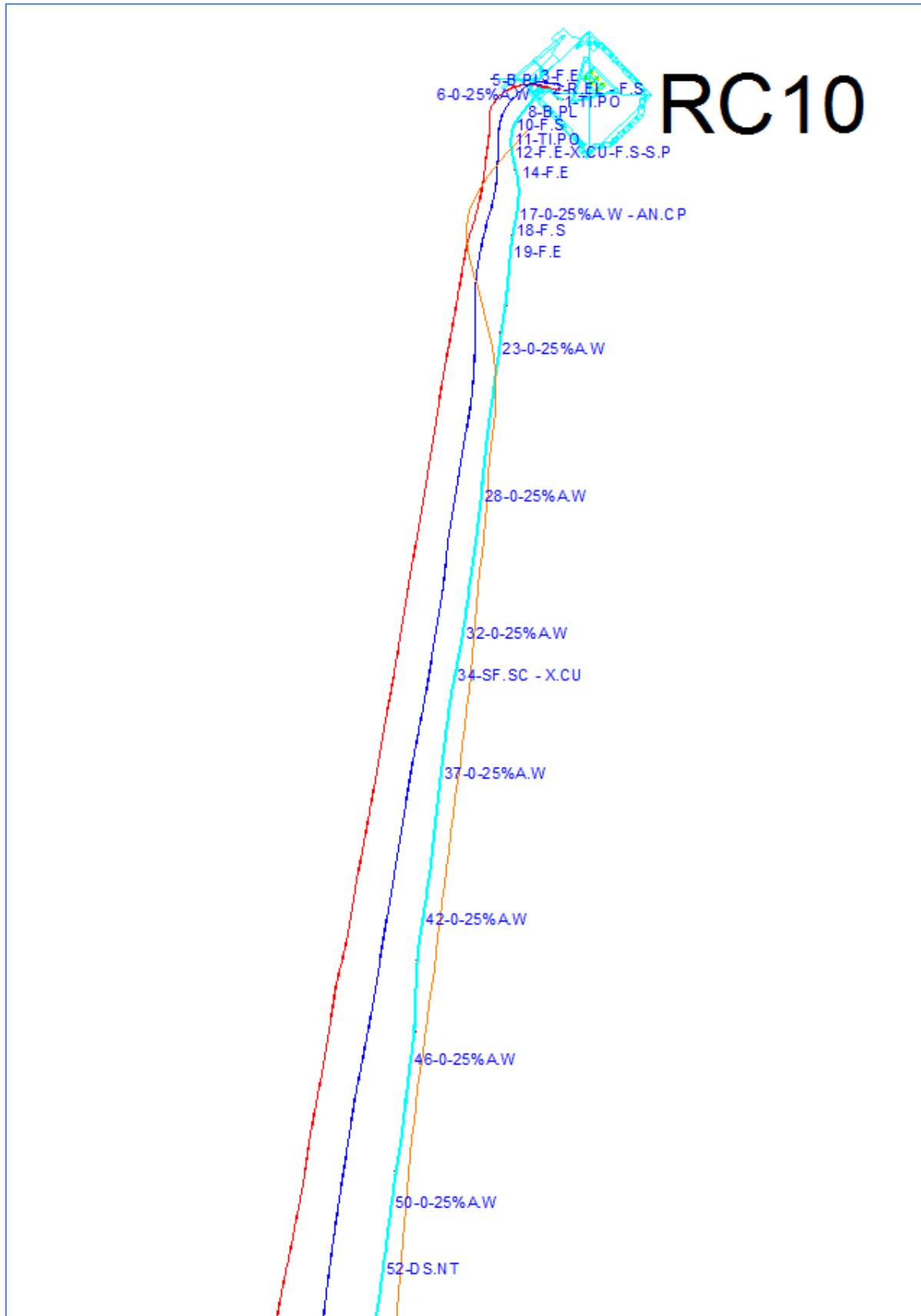


Figure 57: Map 1



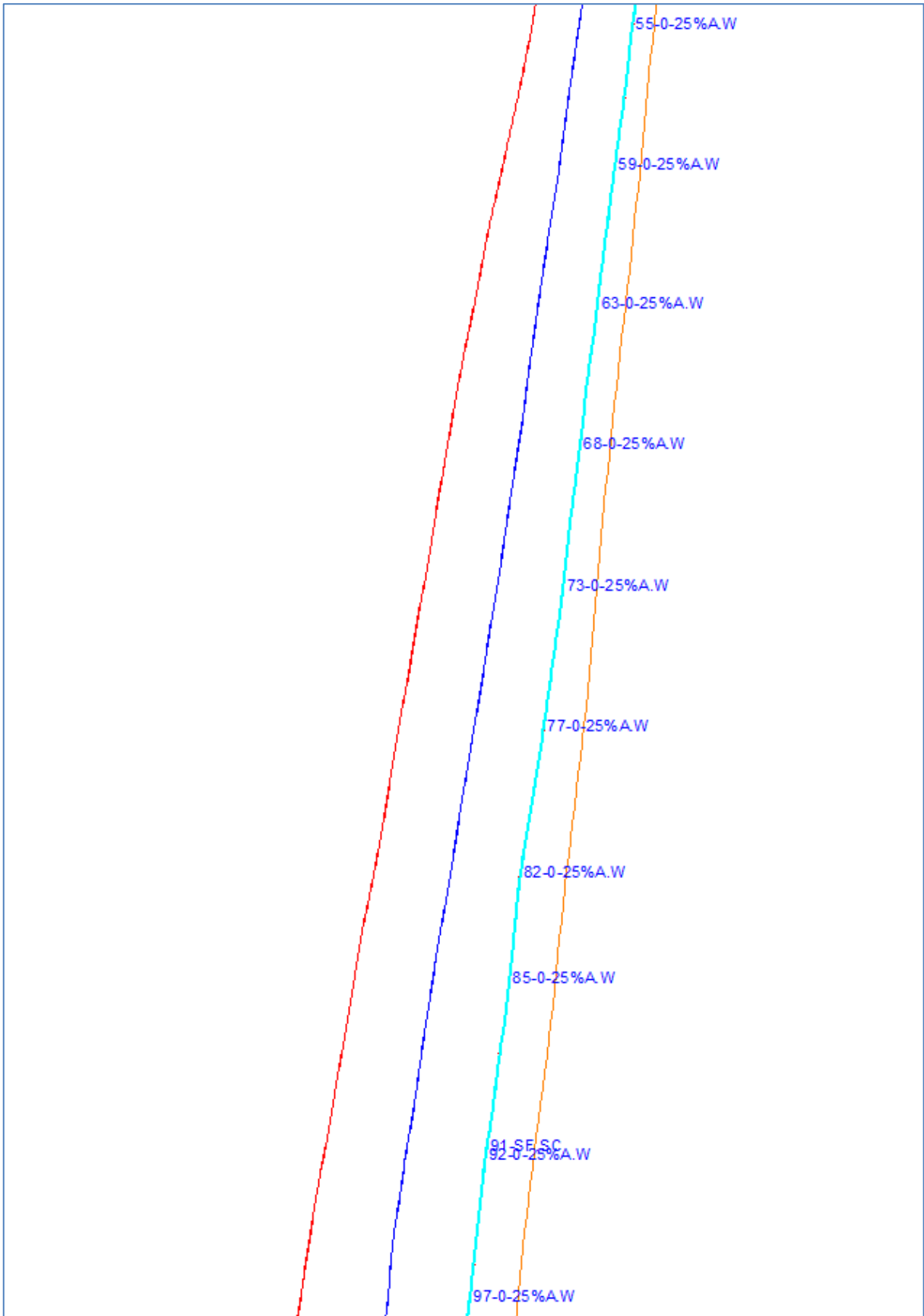


Figure 58: Map 2



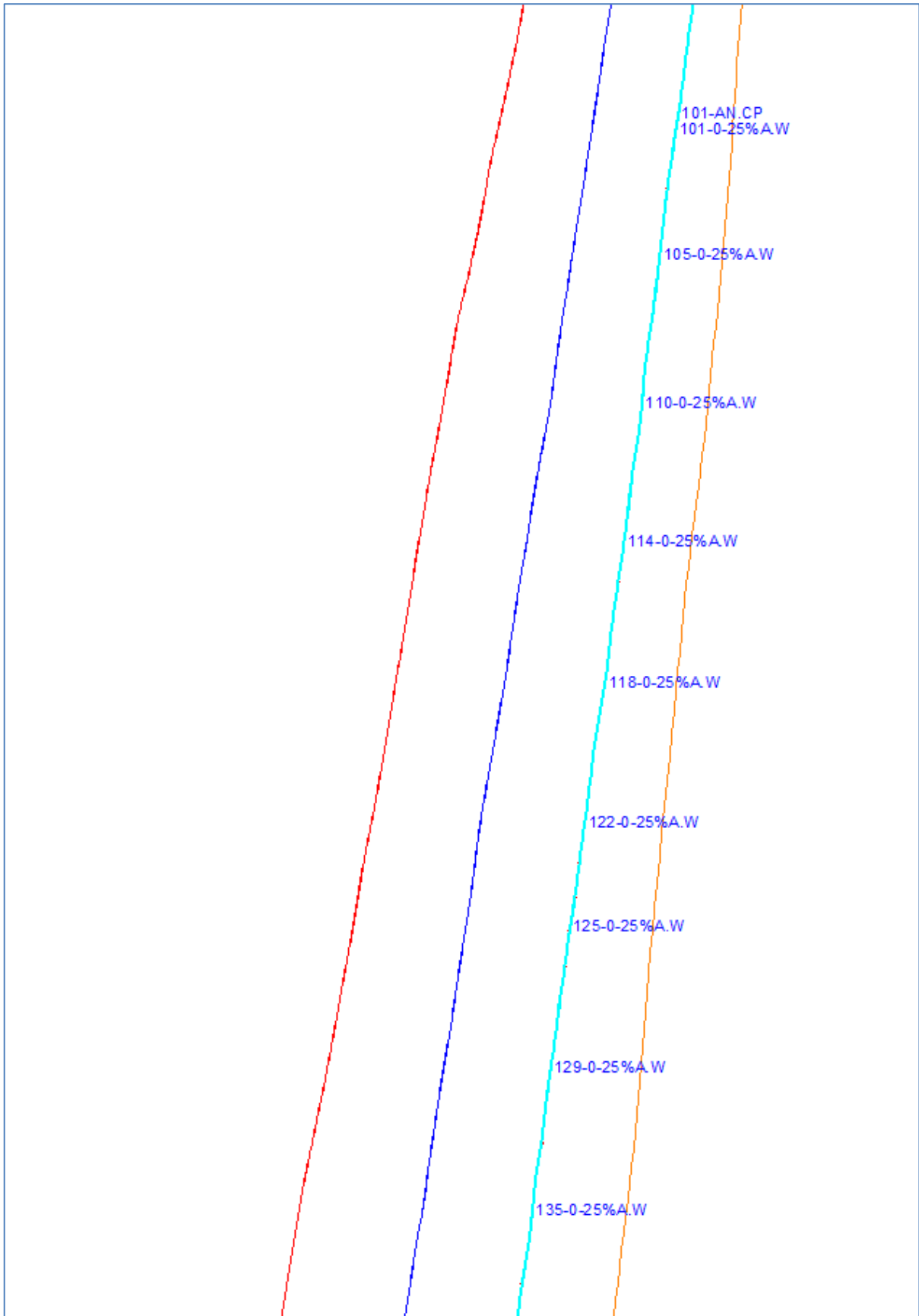


Figure 59: Map 3



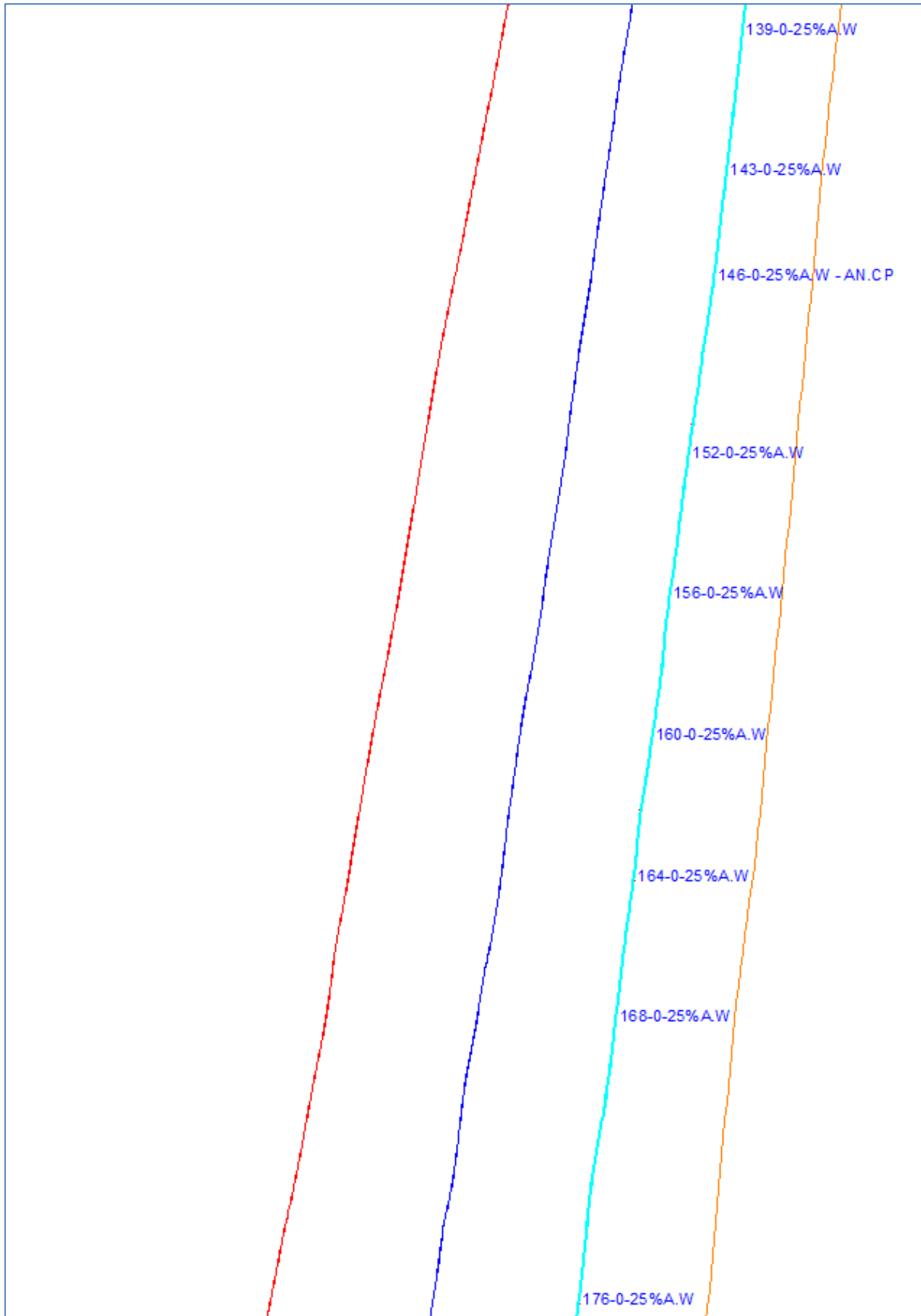


Figure 60: Map 4



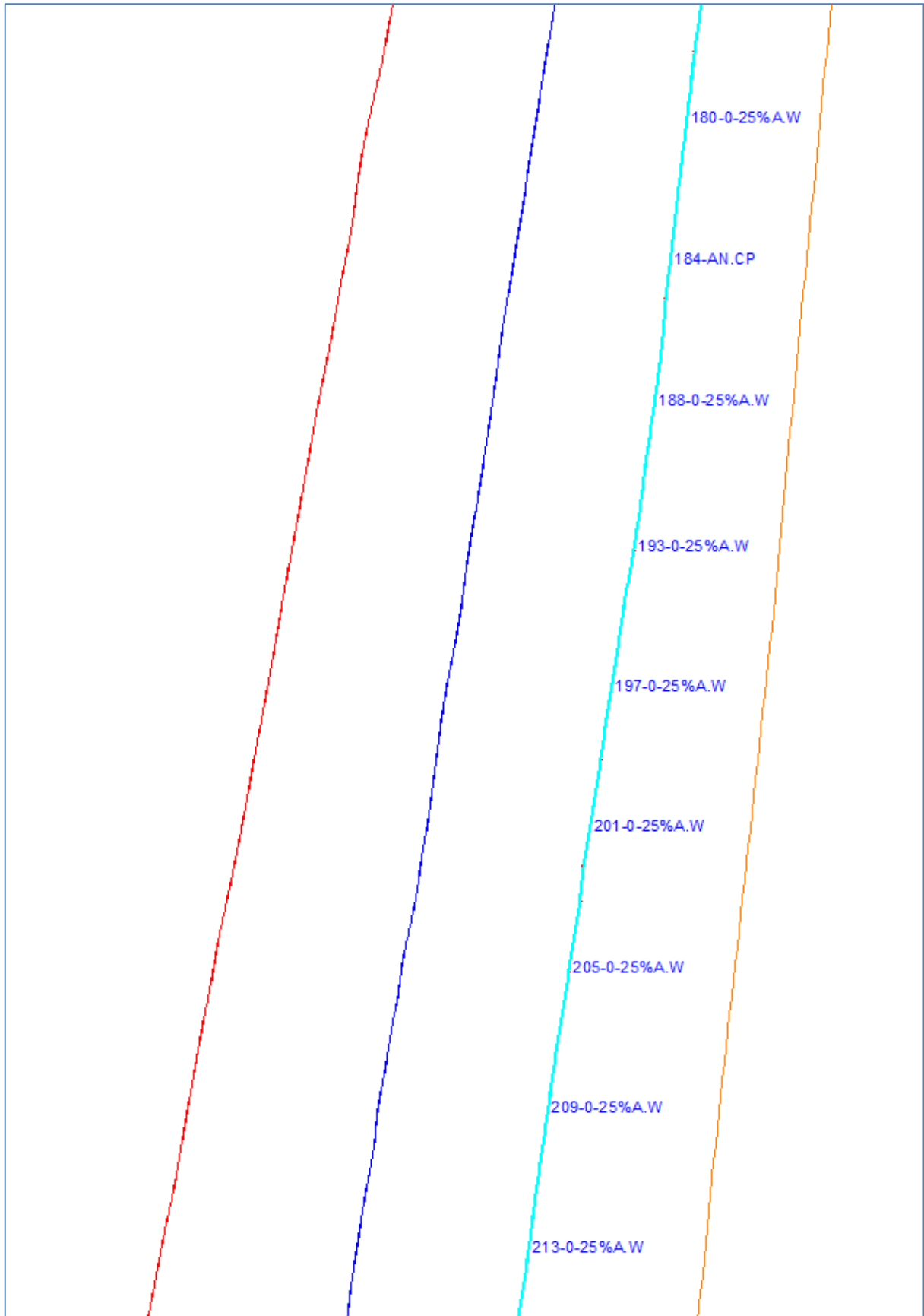


Figure 61: Map 5



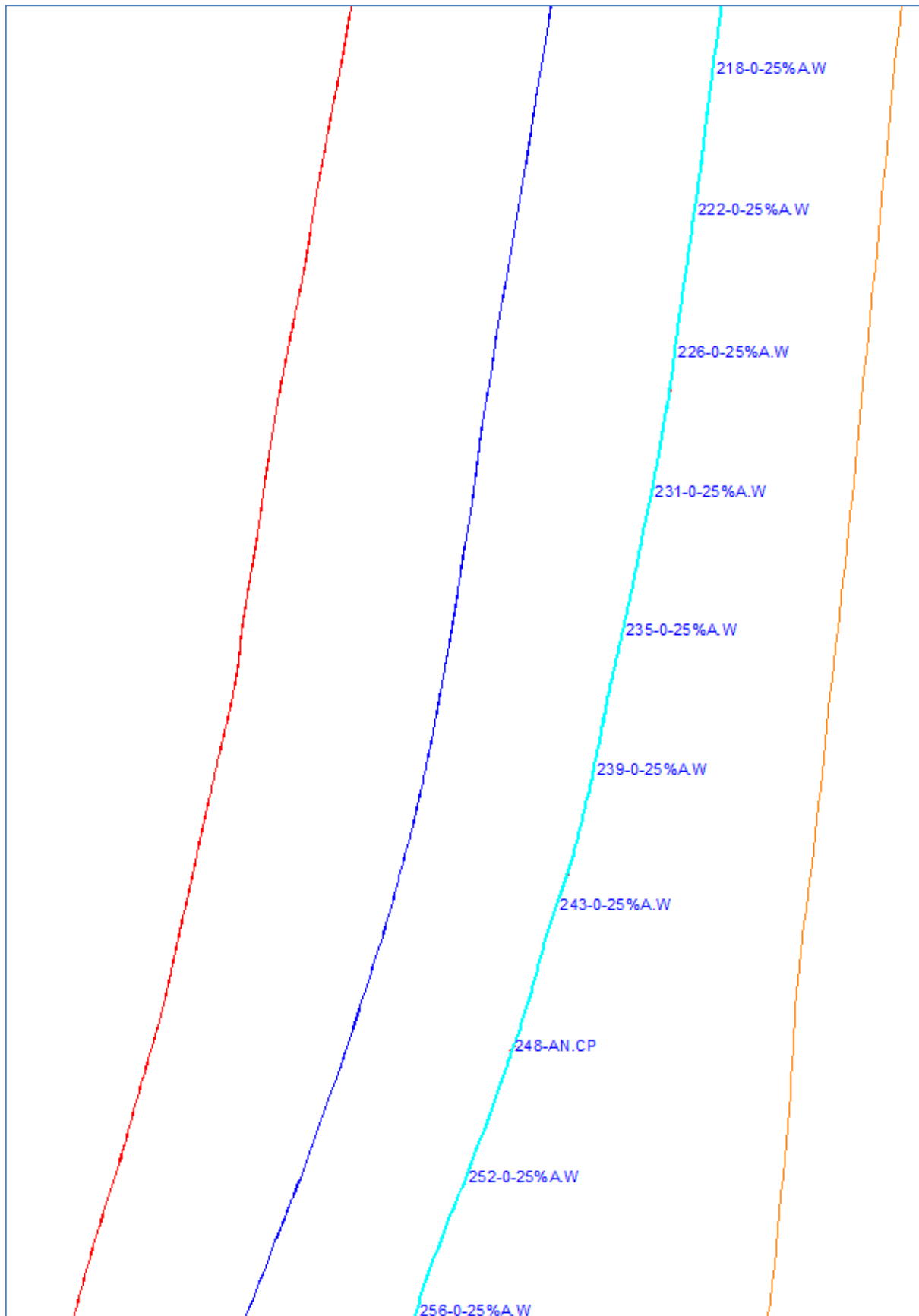


Figure 62: Map 6



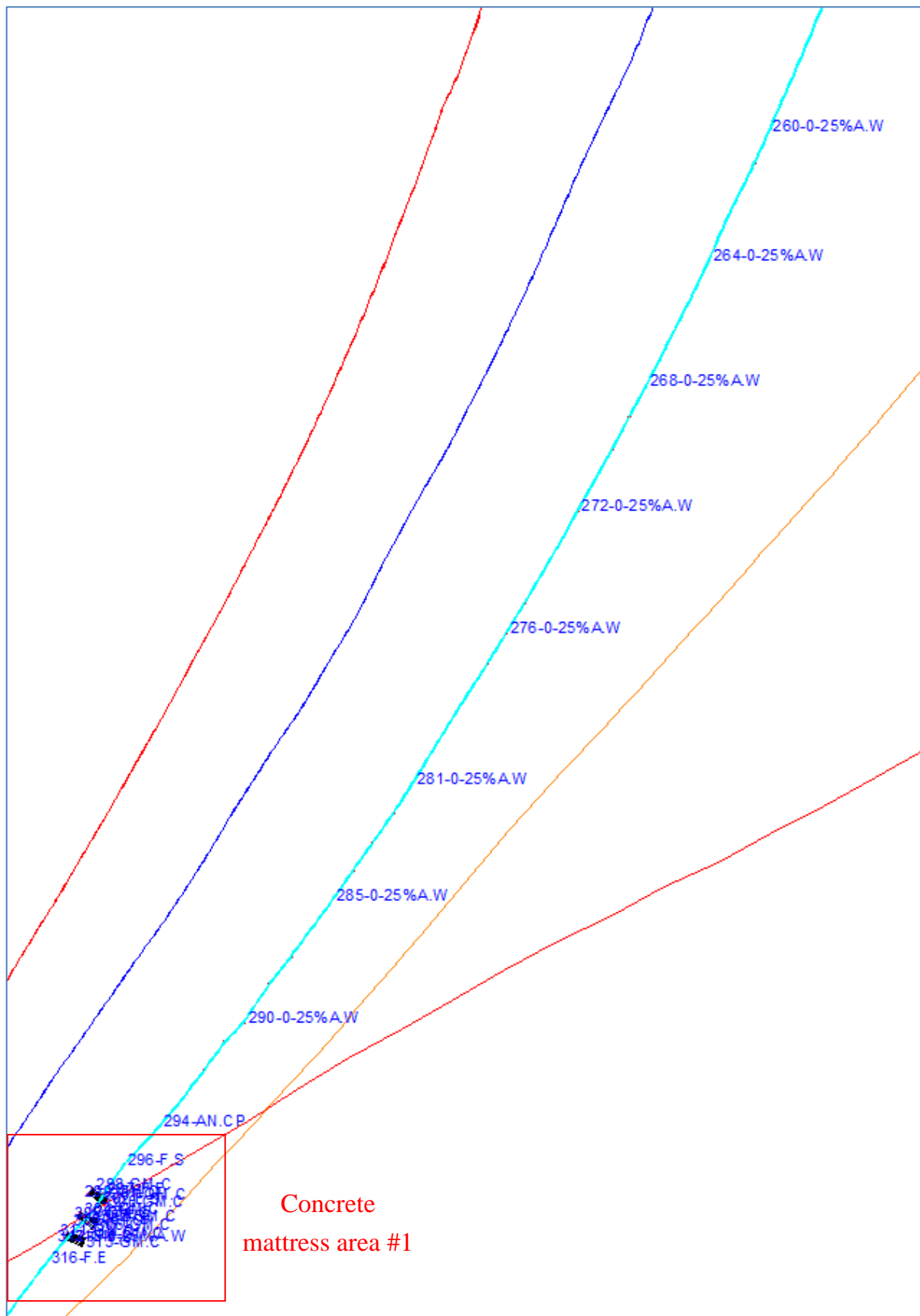


Figure 63: Map 7



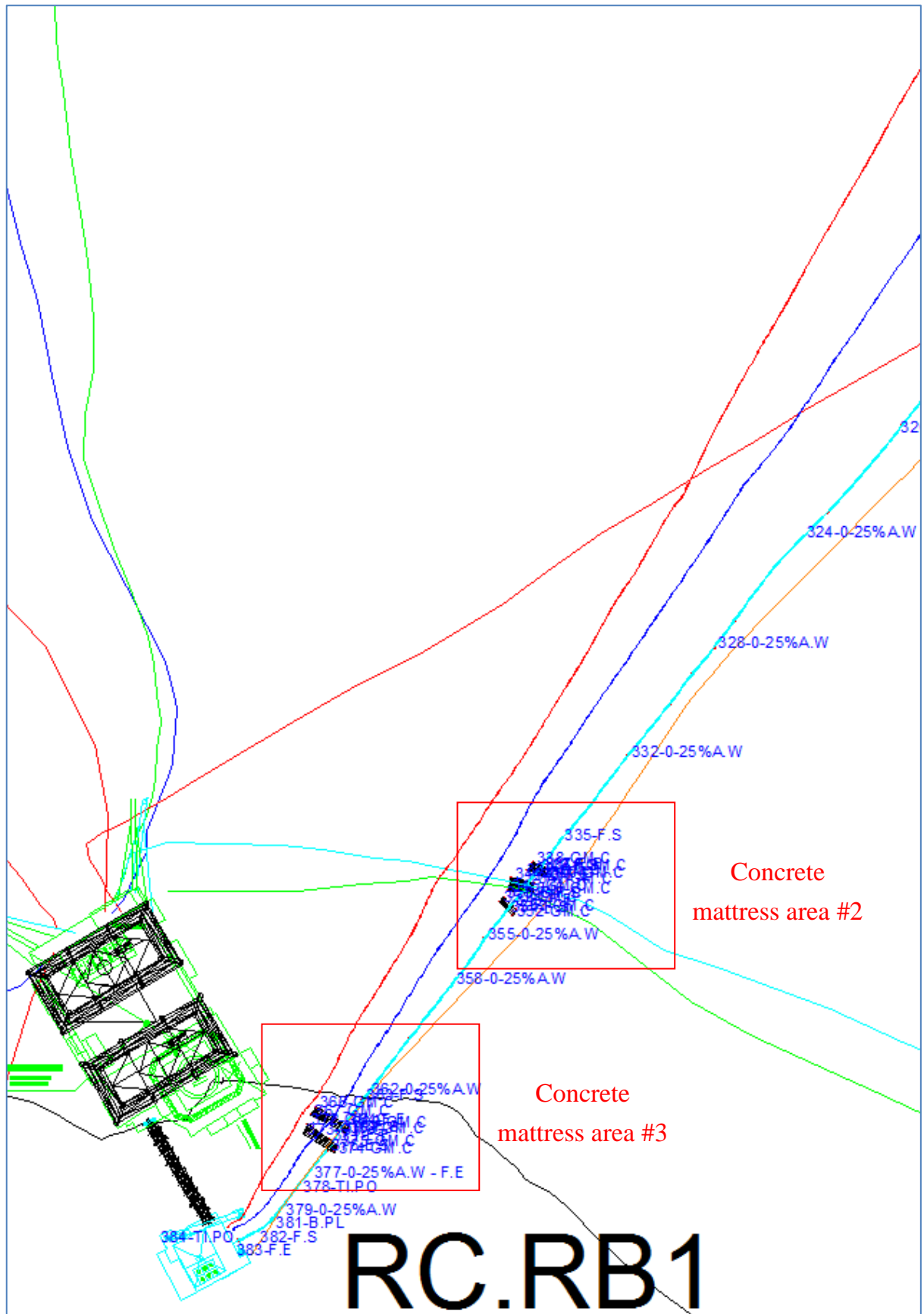


Figure 64: Map 8



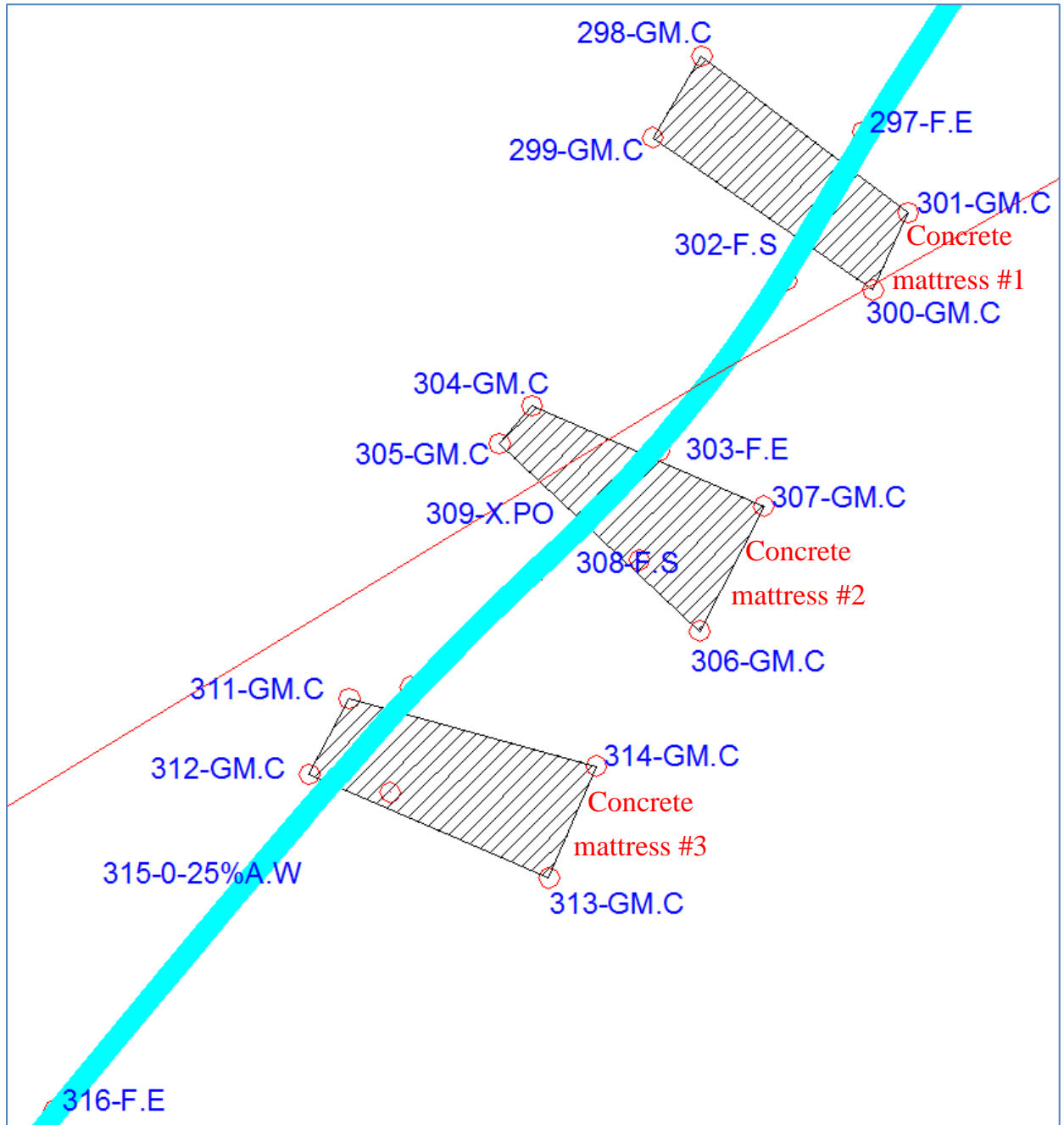


Figure 65: Concrete mattress area #1



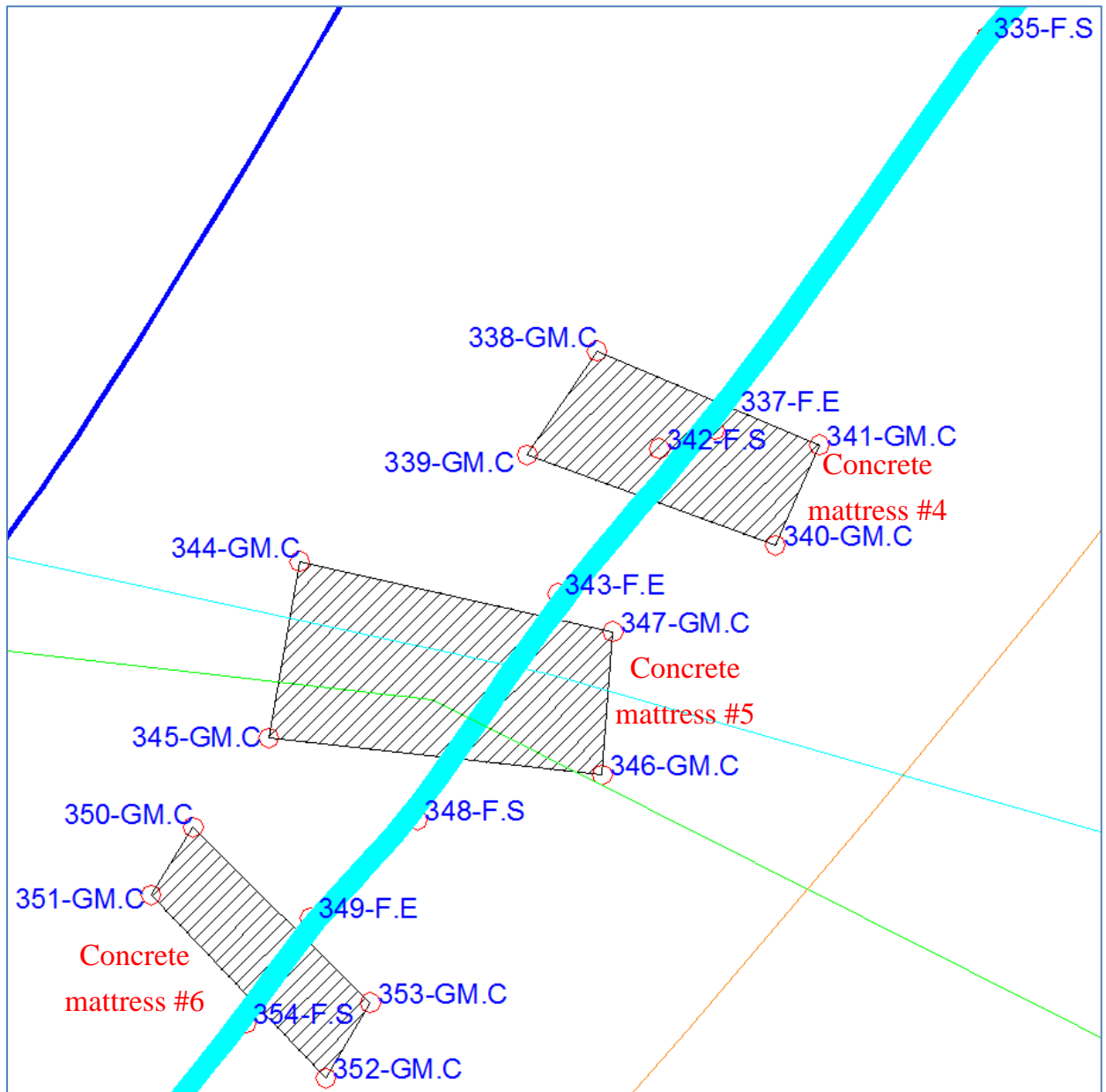


Figure 66: Concrete mattress area #2



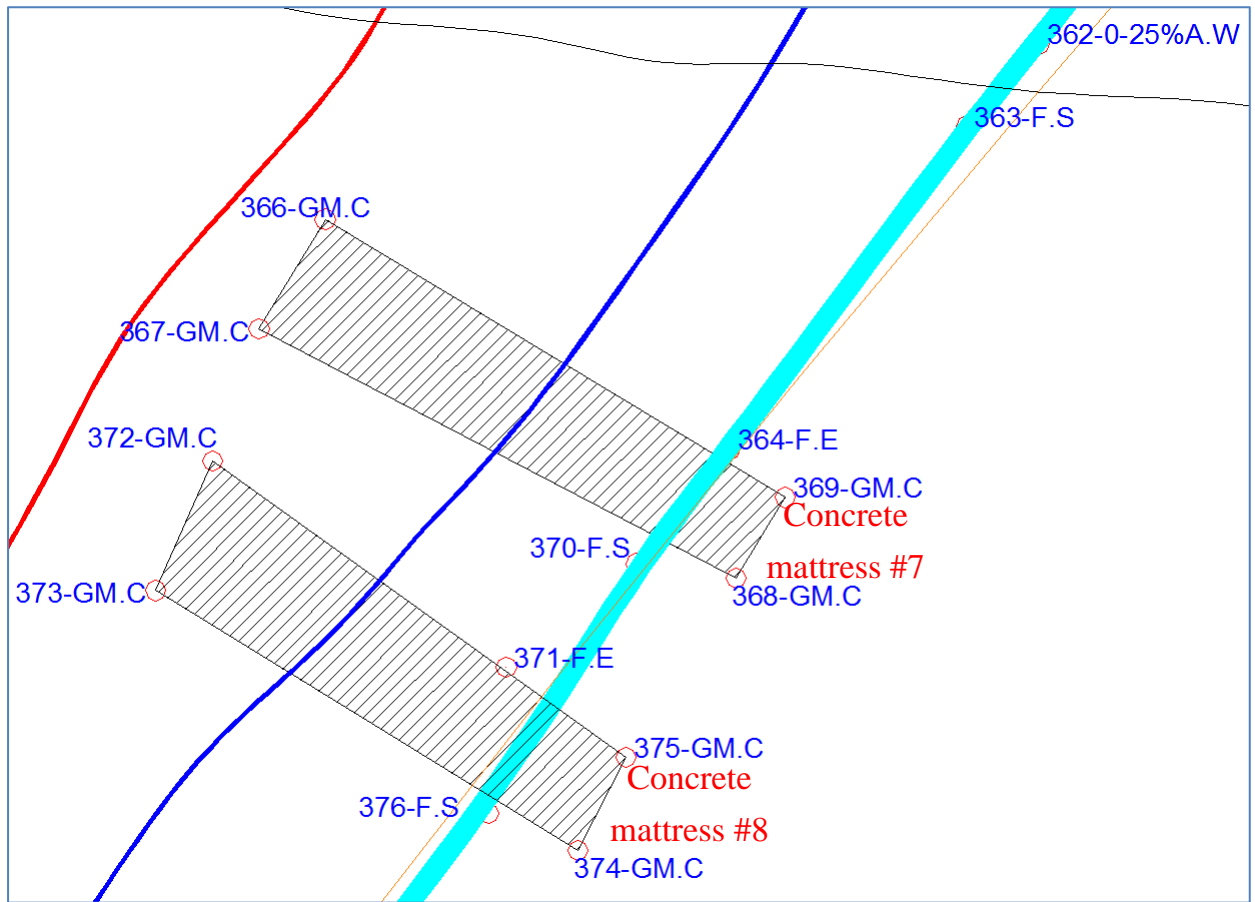
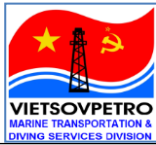


Figure 67: Concrete mattress area #3





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RC.RB1.13



7.4 Non-conformances

7.4.1. List of non-conformances (list of anomalies)

VIETSOVPETRO		UNDERWATER SURVEY OF PIPELINE IN 2024										
		Object	Year	LIST OF NON-CONFORMANCES							From	To
		Gaslift Pipeline	2024								RC10	RC.RB1
№	Defect code	Non-conformances Description	Location			Dimension mm			o/c	Photo & Video References	Status	
			Latitude	Longitude	Depth	L	W	D			Rised	Assessment/Action
1	2	3	4	5	6	7	8	9	10	11	12	13
1	FS	Freestpan at KP 0.001-0.011 (L= 10 m)	9°34.0200'N	107°56.6378'E	50m	-	-	-	-	DVD P.35-24	4/27/2024	Monitor
			9°34.0143'N	107°56.6391'E								
2	FS	Freestpan at KP 3.137-3.149 (L= 12 m)	9°32.3826'N	107°56.2878'E	50m	-	-	-	-	DVD P.35-24	4/27/2024	Monitor
			9°32.3773'N	107°56.2842'E								
3	FS	Freestpan at KP 3.161-3.180 (L= 19 m)	9°32.3718'N	107°56.2812'E	50m	-	-	-	-	DVD P.35-24	4/27/2024	Monitor
			9°32.3647'N	107°56.2736'E								
4	FS	Freestpan at KP 3.398-3.410 (L= 12 m)	9°32.2734'N	107°56.1979'E	50m	-	-	-	-	DVD P.35-24	4/27/2024	Monitor
			9°32.2681'N	107°56.1942'E								
5	FS	Freestpan at KP 3.428-3.441 (L= 13 m)	9°32.2602'N	107°56.1878'E	50m	-	-	-	-	DVD P.35-24	4/27/2024	Monitor
			9°32.2553'N	107°56.1835'E								
6	FS	Freestpan at KP 3.530-3.542 (L= 12 m)	9°32.2164'N	107°56.1543'E	50m	-	-	-	-	DVD P.35-24	4/27/2024	Monitor
			9°32.2117'N	107°56.1503'E								





ROV UNDERWATER SURVEY IN 2024

SURVEY GASLIFT PIPELINE RC10.1-RC.RB1.13



Action:- Monitor: - No deterioration defects, no anomaly report required. Defects were not changed.
- Rec. Inspection: - Defect Recommend to inspect in the next survey (Dimension survey, Debris removal, Repair, WT Measurement, Anomaly report)
- Inspection report: - Defect required to inspection report (Dimension survey, WT Measurement, Anomaly report)
* For detail information, please see section 6.3 of debris survey.
* For detail information, please see section 6.5 of freespan survey.

Noted:

Inspector:	Dang Phi Hung		Check:	Le Ba Giap	
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ROV UNDERWATER SURVEY IN 2024


SURVEY GASLIFT PIPELINE RC10.1-RC.RB1.13



7.4.2. Anomaly report.

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	<p>FREE SPAN ASSESSMENT FOR 4 PIPELINES IN 2025</p> <p>SCOPE OF WORK</p> <p>APPENDIX 5</p>	<p>OFSP-324-GE-PL8-SW-001 Appendix 5</p>		
		Rev.	0	Page

APPENDIX 5
ENVIRONMENT DATA





REPORT

LOCAL TECHNICAL CONDITION

HYDROMETEOROLOGY CONDITION

OF WHITE TIGER- DRAGON FIELD

FOR DESIGNING PURPOSES

PREPARED BY

DEPARTMENT OF FLUID STUDY UNDER STANDARD CONDITION

VUNG TAU – 01.2018



"Approved"
Deputy General Director J.V. Vietsovetro



CAO TUNG SON

Vung Tau, 29/01/2018

REPORT

LOCAL TECHNICAL CONDITION

HYDROMETEOROLOGY CONDITION OF WHITE TIGER- DRAGON FIELD FOR DESIGNING PURPOSES

Director of R&E Institute

PHAM XUAN SON

Chief Engineer

MAKUTENKO V. D

Deputy Director of R&E Institute

LE VIET DUNG

Deputy Chief Engineer

29.01.2018

HOANG LE NGOC VINH



Deputy Chief Engineer of R&E Institute

TONG CANH SON

VUNG TAU – 01.2018



Performed by:

1. **Le Khanh Huy**  Manager of Dept. of Fluid Study STP
2. **Pham Van Dong**  Engineer 4rd Class



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SUMMARY

The report consists of 30 pages, 24 tables, 23 picture

Objective of this report:

To produce a legal document about hydrometeorology conditions of White Tiger- Dragon Oilfield, to serve designing purposes.

To update and upgrade “ЛОКАЛЬНЫЕ ТЕХНИЧЕСКИЕ УСЛОВИЯ – 2007”

To statistics for hydro-meteorology parameters measured to execute our action plans during the most favorable weather period of the year.

To provide extreme value of hydro-meteorology parameters for a period of 1 year, 5 years, 10 years, 25 years, 50 years and 100 years.

Object of Study:

The hydro-meteorological parameters measured from 1985 to 2016 at White Tiger – Dragon Oilfield.

Contents of the report:

Update, statistics and analyze data measured in the period 2007 - 2016 into “ЛОКАЛЬНЫЕ ТЕХНИЧЕСКИЕ УСЛОВИЯ – 2007”.

Extreme values of the hydro-meteorological parameters could make appearance with a return period of 1 year, 5 years, 10 years, 25 years, 50 years and 100 years. This content is based on the report “ЛОКАЛЬНЫЕ ТЕХНИЧЕСКИЕ УСЛОВИЯ – 2007” (ЛТУ-2007).

Proposal:

Extreme values of hydro-meteorological parameters written in this report are taken from the report “ЛОКАЛЬНЫЕ ТЕХНИЧЕСКИЕ УСЛОВИЯ – 2007” (ЛТУ – 2007), which may not be acceptable in the meantime. External services might be required to upgrade our data processing software (МЕТОСЕН), as well as evaluate and recalculate these parameters.



1. INTRODUCTION

White Tiger – Dragon Oilfield is oil and gas exploration activities area of Joint Venture Vietsovpetro, located on the South East continental shelf of Vietnam, approximately 120 kilometers away from Vung Tau. The depth of this region is about 50 meters, and the weather is influenced by the tropical monsoon climate.

The NorthEast wind is strong and steady, trending from November to March of the following year. The SouthWest wind is steady and has lower speed compared to that of NorthEast wind, trending from June to September. The two transition periods happen during April, May and October of the same year, with unsteady wind direction and low speed wind.

Storms usually occurs from October to January of the following year, where November and December has the highest frequency of storm in the year; on average, there are 3-5 storms and tropical cyclones per year, their intensities are moderate and they move in the West-SouthWest direction. During recent years, weather conditions vary drastically, resulting in higher intensity storms frequenting the region.

Wave regime in the year has two distinctive seasons, corresponding to two monsoons (NorthEast and SouthWest), have two opposite wave direction. During the NorthEast monsoon, the dominant wave direction is NorthEast, followed by the North or the East direction. During the SouthWest monsoon, the dominant wave direction is SouthWest, followed by the West or the South direction. During the transitional period (April, May or October), wave direction is unstable and wave height is rather small. In this region, two types of waves can be observed: wind wave and swell wave.

The current regime was developed under the influence of monsoon and tides. Wind current is strong only when the monsoon is stable and strong; gradient current is almost trivial. In the summer, current prevails in the NorthEast direction. During the transition period from summer to winter, current prevails Eastward. During the winter to summer transition period, current prevails northward.

The “Local technical Condition 2017” Standard determines the hydro-meteorological conditions and provide the extreme values of hydro-meteorological parameters such as waves, wind, currents, water level, etc., in the White Tiger – Dragon Oilfield. This information is critical in the design and planning of marine operations.

The “Local technical Condition 2017” report is upgraded, in replacement for the JITY – 2007. This report is completed by the Hydro-meteorological team, Department of Fluid Study Under Standard Conditions, Research & Engineering Institute, J.V.Vietsovpetro.



2. INPUT DATA

The collection and storage of Hydro-meteorological data at White Tiger – Dragon Oilfield has great significance in the planning of work performed on marine projects, as well as work performed on marine projects, as well as producing a report for design purposes. Vietsovpetro has built a Hydro-meteorological station at Bach Ho – Dragon Oilfield with equipment of great reliability and high accuracy. Every year, the equipment is maintained, serviced and tested on time.

Hydro-meteorological equipment and data collected during the 1985 - 2006 period have been presented in the report “ЛОКАЛЬНЫЕ ТЕХНИЧЕСКИЕ УСЛОВИЯ – 2007” (JITY – 2007). This report only presents the equipment and data collected in the period of 2007 to 2016.

There are 3 hydro-meteorological measuring systems on CTP-2 platform, White tiger – Dragon Oilfield (2007 – 2016):

- YOUNG system
 - Country of origin: America
 - Parameters measured: wind speed (m/s), wind direction (in 16 directions), air temperature (°C), air humidity (%) and atmospheric pressure (hPa).
 - Equipment inspection: every two years, at Ha Noi Center of Hydrometeorology
- WAVERADAR system
 - Country of origin: Sweden
 - Parameters measured: wave height (m) and wave period (s), tide (cm).
- AANDERAA system
 - Country of origin: Norway
 - Parameters measured: current speed (cm/s), direction (8 directions), and sea water temperature(°C) on the two horizons: surface (7 m) and bottom (45 m).

Each system provides instantaneous data in minutes and automatically stores measured data on a computer hard drive. Every month, data collected will be retrieved (restored) within hours to serve the analysis and synthesis of data.

The collection and processing of data is performed by the Department of Fluid Study Under Standard Conditions, Research & Engineering Institute, J.V.Vietsovpetro.



3. RESEARCH METHODS

3.1. Basic theory

This section has been presented in the report “ЛОКАЛЬНЫЕ ТЕХНИЧЕСКИЕ УСЛОВИЯ – 2007” (JTY– 2007), and therefore not presented in this report.

3.2. Software support

Hydro-meteorological parameters presented in this report are calculated by the METOCEAN software. This software has been upgraded from the MDEC software (used in the JTY - 2007) in 2012.

4. RESEARCH RESULTS

4.1. Wind

Like presented, wind regime White Tiger – Dragon Oilfield has two distinct seasons in the NorthEast and SouthWest directions. Table 1 and Figure 1 show that the average wind speed is higher during the activities of NorthEast monsoon (November, December, January, February, March) and SouthWest Monsoon (June, July, August, September); speed of NorthEast monsoon is higher than that of SouthWest monsoon; wind speed is slower and wind direction is unstable during transitional period (April, May and October).

The average wind speed in the NorthEast monsoon months is 10.5 m/s, the average wind speed in the southwest monsoon months is 7.8 m/s, the average wind speed in the transitional months is 6.1 m/s.

Average annual wind speed (1985 -2016) achieved 8.5 m /s, the maximum wind speed measured up to 45.6 m /s on April 1, 2012. The reason for this is the influence of storm No. 1 activity (international name: PAKHAR) in the South of Vietnam.

Frequency of wind occurrence (%) in 8 different directions is shown in Tables 2 and Figure 2.

Table 1.

Wind speed statistics(m/s) at White Tiger – Dragon Oilfield (1985-2016)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (m/s)	12.1	10.0	8.1	6.0	5.5	7.3	7.9	8.4	7.4	6.8	10.0	12.4	8.5
Maximum (m/s)	32.0	26.7	29.5	45.6	33.2	27.7	31.4	33.8	30.2	25.4	30.5	32.2	45.6



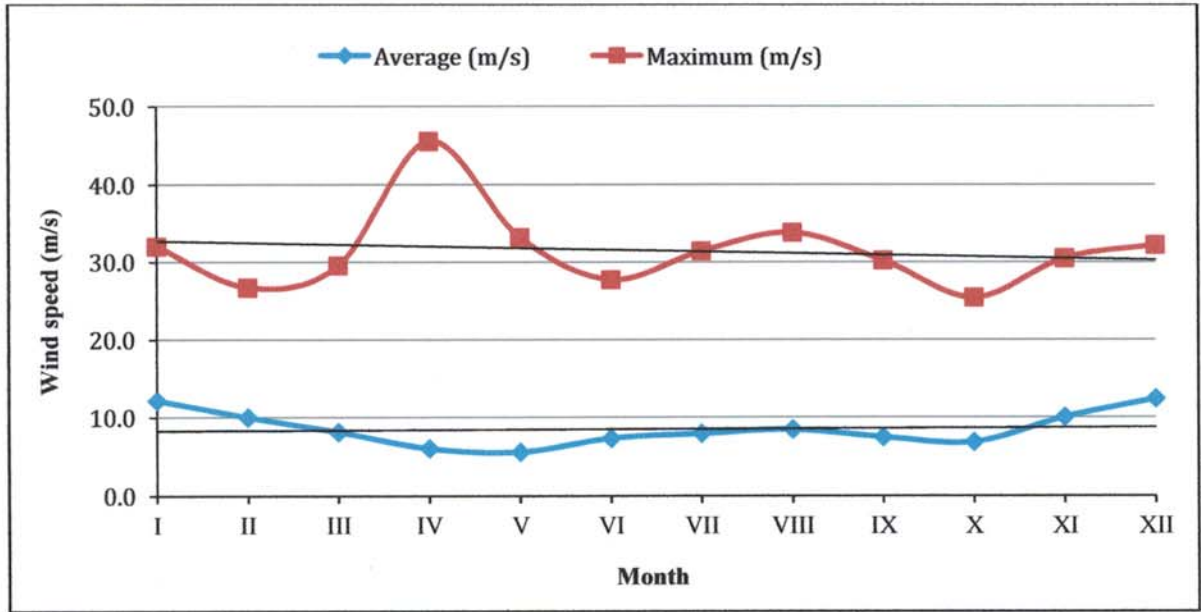


Figure 1. Graph showing wind speed (1985 – 2016)

Table 2.
Wind Speed/Direction Frequency of Occurrence (%) at White Tiger-Dragon Oilfield (1985-2016)

Wind speed (m/s)	Direction								Sum (%)	GRT (%)
	N	NE	E	SE	S	SW	W	NW		
< 2.0	0.17	0.3	0.8	0.71	0.61	0.42	0.36	0.25	3.63	100
2.0-3.9	0.31	0.93	3.1	1.93	1.58	2.18	1.38	0.55	11.95	96.37
4.0-5.9	0.26	1.95	3.92	0.79	1.24	4.01	2.95	0.58	15.7	84.42
6.0-7.9	0.15	3.22	3.71	0.13	0.4	4.34	4.14	0.53	16.62	68.71
8.0-9.9	0.16	5.02	3.18	0.05	0.16	3.88	4.64	0.35	17.43	52.09
10.0-11.9	0.21	6.38	2.39	0.01	0.09	2.51	3.07	0.17	14.83	34.66
12.0-13.9	0.16	5.82	1.52	0.01	0.02	0.92	1.21	0.08	9.73	19.83
14.0-15.9	0.15	4.38	0.74	-	0.01	0.16	0.35	0.04	5.82	10.1
16.0-17.9	0.1	2.32	0.31	-	0	0.06	0.12	0.01	2.91	4.28
18.0-29.9	0.08	1.12	0.1	-	-	0.01	0.04	0.01	1.37	1.37
Sum (%)	1.75	31.43	19.78	3.63	4.11	18.48	18.26	2.56	100	
Average (m/s)	8.39	11.19	7.44	3.23	4.13	7.28	8.01	5.93	8.38	
Max (m/s)	23.3	25.1	24.2	13.8	16.3	26.0	23.2	21.0	26.0	



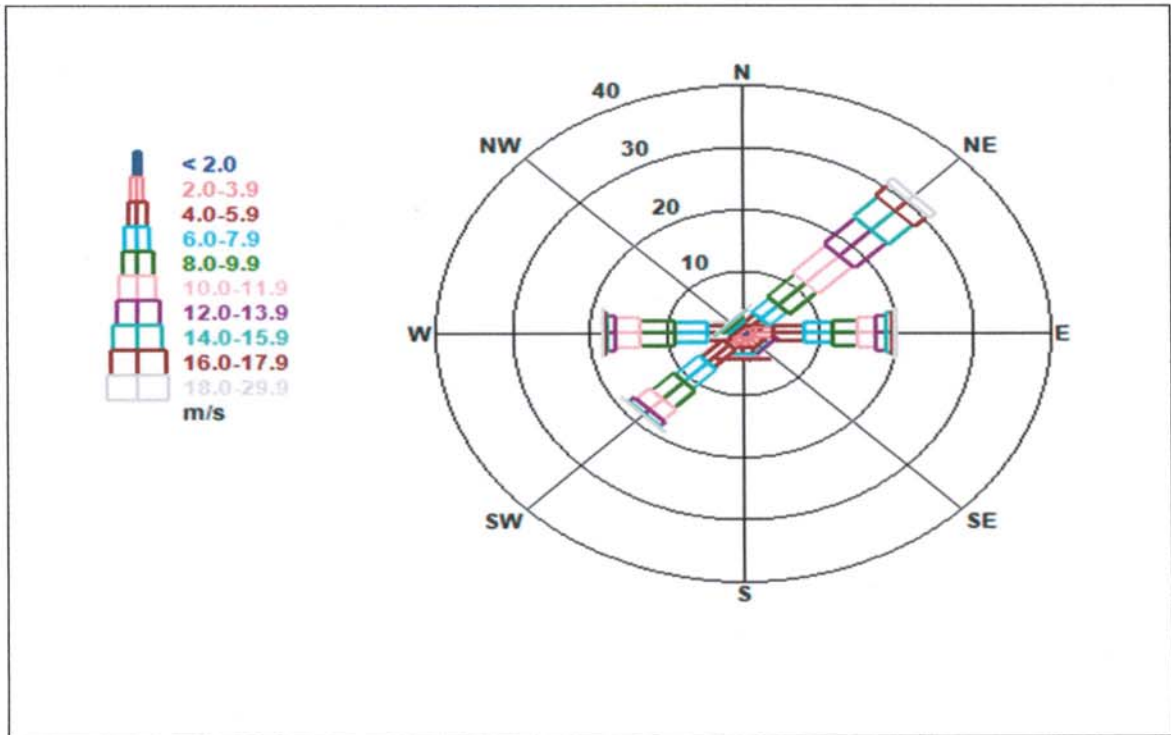


Figure 2. Wind Rose (1985 – 2016)

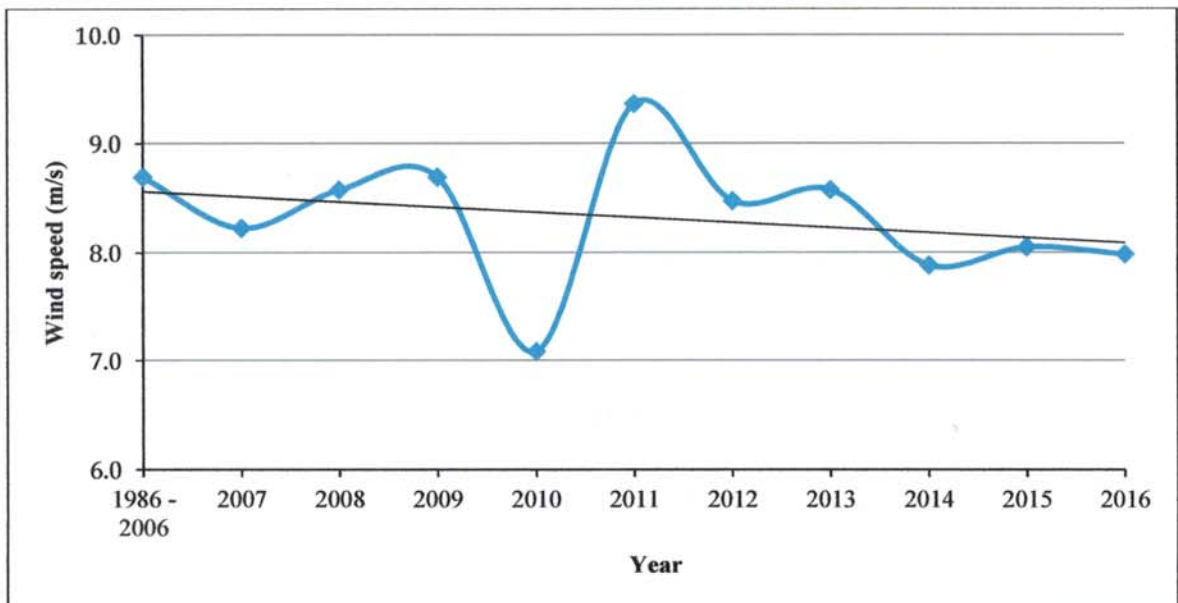


Figure 3. Wind speed trends (2007-2016)

During the last 10 years (2007 - 2016), the highest average wind speed of 9.4 m/s was recorded in 2011, and the lowest average wind speed of 7.1 m/s recorded in 2010. The average wind speed has the tendency to decrease from 2007 to 2016 (Figure 3).



The design criteria wind speed (m/s)

N – Years	N	NE	E	SE	S	SW	W	NW
Average wind speed within 10 minute								
100	35.7	45.8	28.3	19.3	20.9	33.8	33.1	31.2
50	33.7	41.8	27.4	18.2	19.9	31.3	30.4	29.6
25	31.8	40.6	26.7	17.0	16.2	27.9	26.8	27.3
10	28.5	34.9	25.6	15.6	14.4	25.2	24	24.7
5	26.5	32.2	23.4	14.4	13.2	24.4	21.4	19.8
1	21.3	24.1	20.4	11.8	10.1	19.5	17.8	16.7

N – Years	N	NE	E	SE	S	SW	W	NW
Average wind speed within 2 minute								
100	37.6	48.3	29.8	20.3	22	35.6	34.9	32.9
50	35.5	44	29.2	19.2	19.9	33	32	31.2
25	33.5	42.8	28.1	17.9	17	29.4	28.2	28.8
10	30	36.8	26.9	16.4	14.9	26.6	25.3	26
5	27.9	33.9	24.7	15.2	13.9	25.7	22.5	20.9
1	22.4	25.4	21.5	12.4	10.6	20.5	18.7	17.6

N – Years	N	NE	E	SE	S	SW	W	NW
Average wind speed within 1 minute								
100	39.2	50.3	31.1	21.2	29.9	37.2	36.4	34.3
50	37	45.9	30.5	20	27.6	34.4	33.4	32.5
25	34.9	44.6	29.3	18.7	24.2	30.7	29.4	30
10	31.3	38.4	28.1	17.1	21.4	27.7	26.4	27.1
5	29.1	35.4	25.7	15.8	17.7	26.8	23.5	21.8
1	23.4	26.5	22.4	13	14.5	21.4	19.5	18.4

N – Years	N	NE	E	SE	S	SW	W	NW
Average wind speed within 3 seconds								
100	43.9	56.3	34.8	23.7	33.5	41.6	40.7	38.3
50	41.4	51.4	34.1	22.4	30.8	35.8	37.4	36.4
25	39.1	49.9	32.8	20.9	27.1	34.3	32.9	33.6
10	35	42.9	31.8	19.2	24	31	29.5	30.4
5	32.6	39.6	28.8	17.7	19.8	30	26.3	24.3
1	26.2	29.6	25.1	14.5	16.2	24	21.9	20.5



4.2. Wave

The wave regime at White Tiger - Dragon Oilfield is mainly a mixture of wind waves and swell. According to Table 3 and Table 4, the average wave height during the years 1986 -2016 is 1.4m, the average wave period is 4.4s, the highest wave height measured on April 1, 2012 is 11.5m (due to the influence of storm No.1 PAKHAR) and the largest wave period achieved 10.5s.

Due to the influence of wind regime, the wave regime also has two distinct seasons in correspondence with the two wind seasons (NorthEast and SouthWest).

During the NorthEast monsoon, waves are characterized by stable wave direction and high wave height. The average wave height is approximately 1.9 m, the average wave period is about 5.1 s, the maximum wave height achieves 10.5 m and the maximum wave period is 10.5 s.

During the SouthWest monsoon, the wave direction is stable, the wave height is lower than that of the NorthEast monsoon. The average wave height and average wave period are 1.1m and 3.9 s respectively, and the highest wave height and wave period is 8.1 m and 6.2 s respectively.

During the transition period, wave direction is unstable and average wave height is about 1 m.

Table 3.

Wave height (m) statistics at White Tiger – Dragon Oilfield (1985-2016)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (m)	2.3	1.7	1.4	0.9	0.8	1.0	1.1	1.2	1.1	1.1	1.8	2.4	1.4
Maximum (m)	9.1	8.1	8.7	11.5	7.3	4.7	5	6.6	8.1	6.6	8.6	10.5	11.5

Table 4.

Wave period (Tz) statistics at White Tiger – Dragon Oilfield (1985- 2016)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (s)	5.1	5.3	4.6	3.8	3.8	3.7	3.7	4.1	4.0	4.3	5.0	5.6	4.4
Maximum (s)	7.4	7.3	7.7	6.4	9.1	5.7	5.6	6.2	6	7	10.5	9.6	10.5



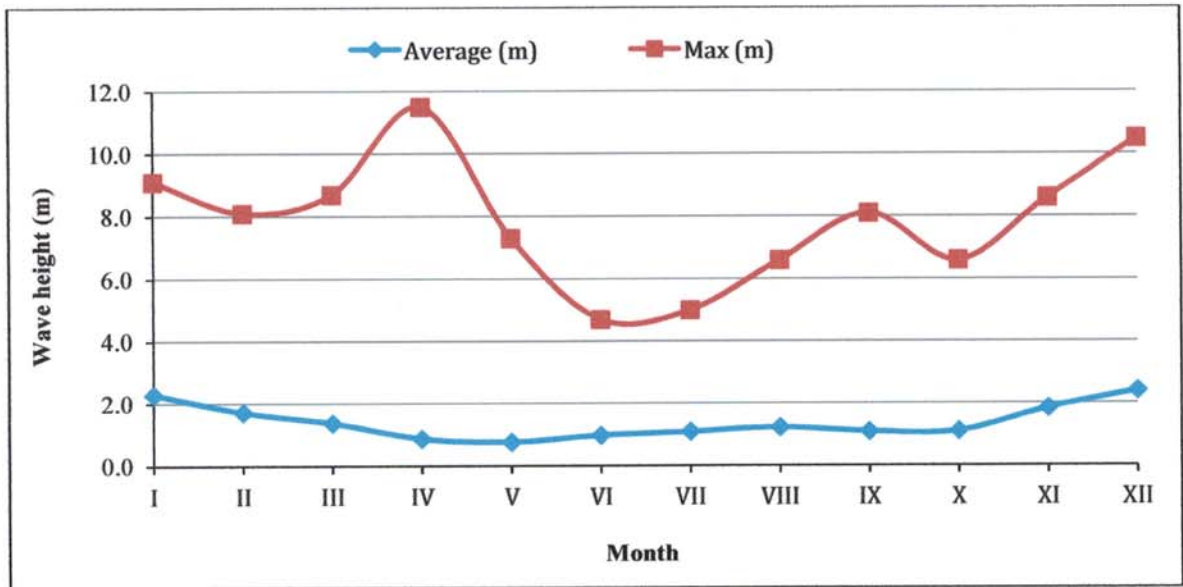


Figure 4. Graph showing wave height (1985-2016)

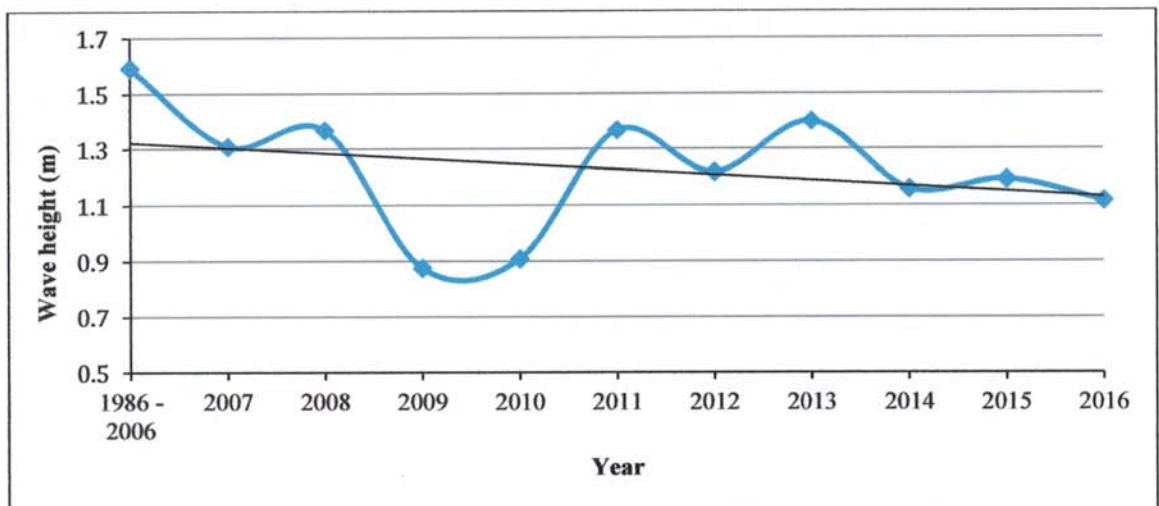


Figure 5. Trends in wave height (2007-2016)

During the last 10 years (2007 - 2016), the average wave height tends to decrease, as shown in Figure 5.

The maximum wave height for each day during the year 1986 - 2016 is shown in Table 5.

Frequency (%) of significant wave height (H_s) in various directions is shown in Tables 6 and Figure 6.



Table 5.

Statistical maximum wave height by date

Day	Month											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	7.1	5.9	6.6	11.5	2.0	1.7	2.6	3.3	2.4	4.6	4.7	6.7
2	6.4	6.4	5.4	4.2	2.1	1.9	3.0	4.2	2.5	4.4	4.8	7.1
3	6.7	7.0	5.5	2.9	2.0	2.7	3.3	3.2	3.6	3.9	4.8	6.0
4	5.9	5.9	5.7	3.8	2.5	2.2	3.4	3.9	2.4	3.6	5.2	5.8
5	5.8	7.4	5.8	4.3	2.5	2.6	3.1	5.1	3.1	5.4	4.7	6.0
6	6.8	7.7	6.1	4.6	2.3	2.8	3.1	4.0	3.2	4.3	4.8	5.9
7	8.0	8.1	5.4	3.8	3.0	2.8	3.4	3.3	4.0	3.7	3.7	5.7
8	7.1	6.9	5.5	3.5	1.7	2.5	4.0	3.7	3.0	4.4	3.4	6.3
9	7.7	5.9	5.3	3.8	2.1	1.9	3.9	4.1	2.7	4.1	4.6	6.1
10	6.7	5.7	5.2	4.1	2.4	2.6	3.8	3.6	4.8	4.0	3.8	5.6
11	5.7	5.2	5.9	7.2	3.0	2.5	3.2	3.6	7.3	3.4	4.5	6.1
12	6.5	5.7	4.8	3.6	4.2	3.4	25.5	3.1	3.6	3.3	4.8	5.5
13	7.8	5.9	4.2	4.1	3.1	3.0	3.6	3.3	3.1	3.8	4.4	4.8
14	6.9	5.7	4.7	7.2	2.5	3.2	3.2	3.2	3.6	5.4	4.9	6.8
15	6.4	5.9	5.1	6.3	2.2	2.9	3.8	3.5	4.6	4.6	4.5	5.3
16	6.0	5.2	6.1	3.1	3.9	3.4	4.8	3.4	8.1	3.9	4.9	6.4
17	7.2	5.1	4.8	2.5	2.5	3.0	2.9	5.0	3.3	3.5	5.0	8.4
18	7.9	5.2	4.0	2.8	2.5	3.1	3.9	3.2	3.5	3.9	8.4	7.5
19	7.1	5.3	3.7	2.3	1.8	3.5	4.7	3.1	3.8	4.7	5.6	8.1
20	5.8	6.9	3.9	3.0	2.1	3.2	4.1	3.7	3.3	4.9	6.3	6.5
21	6.3	6.6	4.1	1.9	1.6	3.8	2.7	3.1	3.4	3.9	5.4	6.7
22	6.3	6.8	4.0	1.9	2.6	3.9	3.3	3.2	3.0	3.9	5.5	8.7
23	5.8	7.2	4.2	2.8	2.7	3.8	3.2	3.3	3.2	4.8	5.1	7.7
24	8.7	5.0	6.0	4.2	3.5	3.1	3.0	2.8	3.6	4.4	5.4	8.4
25	9.1	5.1	5.2	4.1	3.2	3.0	3.7	2.8	3.4	3.6	4.9	7.4
26	6.9	5.4	6.2	3.6	2.6	3.1	2.6	2.8	3.3	4.0	4.9	7.1
27	6.8	6.6	5.7	4.0	2.2	3.3	3.9	2.6	3.7	3.9	6.0	7.2
28	7.6	6.4	6.4	3.7	2.5	3.2	4.7	3.0	3.7	5.4	8.6	8.4
29	6.9	7.4	6.3	5.4	2.0	3.1	3.4	2.4	4.1	6.6	7.0	7.1
30	6.2		6.0	1.8	2.1	3.1	3.4	2.4	3.7	5.0	7.4	6.6
31	6.7		5.4		1.9	0.6	3.4	2.9		6.1		7.8



Table 6.

Wave Height /Direction Frequency of Occurrence (%)
at White Tiger-Dragon Oilfield (1985-2016)

Wave height (m)	Direction								Sum (%)	GRT (%)
	N	NE	E	SE	S	SW	W	NW		
0.0-0.9	0.1	6.69	8.24	2.46	2.01	10.96	10.31	0.47	41.24	100
1.0-1.9	0.07	15.53	3.76	0.05	0.13	5.74	10.49	0.31	36.08	58.76
2.0-2.9	0.02	11.3	1.31	0.01	0.02	1.53	1.09	0.05	15.33	22.68
3.0-3.9	0.01	5.16	0.21	-	0.01	0.24	0.13	0.01	5.76	7.35
4.0-4.9	0.02	1.12	0.02	-	-	0.02	0.01	0	1.19	1.59
5.0-5.9	0.01	0.18	-	-	-	0	0	-	0.19	0.4
6.0-6.9	0.05	0.05	-	-	-	-	-	-	0.1	0.21
7.0-7.9	0.08	0.01	-	-	-	-	-	-	0.08	0.11
8.0-8.9	0.02	-	-	-	-	-	-	-	0.02	0.02
9.0-9.9	-	-	-	-	-	0	-	-	0	0
Sum (%)	0.37	40.03	13.54	2.52	2.17	18.49	22.03	0.84	100	
Average (m)	3.92	1.93	0.98	0.36	0.45	0.98	1.06	0.99	1.36	
Max (m)	8.6	7.4	4.5	2.8	3.3	9.6	5.5	4.2	9.6	

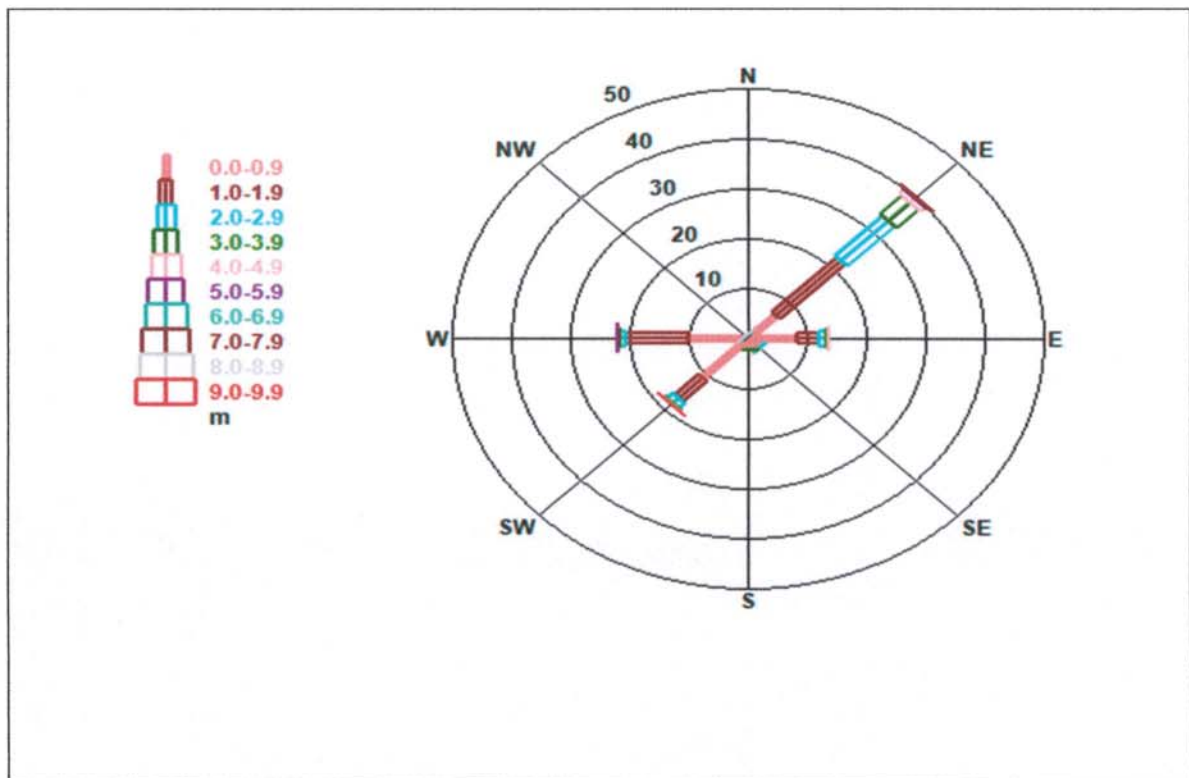


Figure 6. Wave Rose (1985 – 2016)

Wave designing parameters

Table 7.

Directional wave heights (Hs) with a return period of N year

N - Years		N	NE	E	SE	S	SW	W	NW
100	Hs (m)	5.8	8.7	4.8	3.3	4.3	6.3	4.8	4.9
	T (s)	8.7	10.6	8.9	7.4	8.1	8.9	8.5	8.6
50	Hs (m)	4.9	8.3	4.3	2.9	3.8	5.8	4.4	4.3
	T (s)	7.8	10.1	8.2	6.8	7.6	8.7	7.9	7.8
25	Hs (m)	4.0	7.9	3.9	2.5	3.2	5.2	4.1	3.7
	T (s)	7.0	9.4	7.5	6.2	6.9	8.3	7.4	7.1
10	Hs (m)	2.9	7.4	3.3	2.1	2.7	4.7	3.7	3.0
	T (s)	6.0	8.8	6.7	5.6	6.3	7.9	6.7	6.2
5	Hs (m)	2.2	7.0	2.9	1.7	2.2	4.2	3.4	2.6
	T (s)	5.4	8.3	6.2	5.1	5.8	7.3	6.2	5.6

Table 8.

Directional wave heights (H_{max}) with a return period of N year

N - Years		N	NE	E	SE	S	SW	W	NW
100	H _{max} (m)	11.1	16.4	9.1	6.4	8.2	12.0	9.2	9.4
	T (s)	12.0	14.5	12.3	10.3	11.2	12.3	11.7	11.9
50	H _{max} (m)	9.4	15.7	8.2	5.6	7.3	11.1	8.4	8.3
	T (s)	10.8	13.9	11.3	9.5	10.5	12.0	10.9	10.8
25	H _{max} (m)	8.0	15.5	7.8	5.0	6.4	10.3	8.2	7.4
	T (s)	9.9	13.2	10.6	8.8	9.8	11.7	10.5	10.0
10	H _{max} (m)	5.9	14.6	6.6	4.3	5.4	9.3	7.4	6.1
	T (s)	8.5	12.4	9.5	8.0	8.9	11.1	9.5	8.8
5	H _{max} (m)	4.5	13.9	5.9	3.5	4.5	8.4	6.9	5.3
	T (s)	7.7	11.7	8.8	7.3	8.3	10.3	8.8	8.0

4.3. Current

The current regime of White Tiger – Dragon Oilfield was created under the influence of monsoon and tides.

The average current velocity on the surface (7m below sea level) is 20.1 cm/s, and the maximum surface current velocity is 173 cm/s. The average current velocity at the bottom (45m below sea level) is 20.8 cm/s, and the maximum current velocity at the bottom is 126.0 cm/s (shown in Table 9 and Table 11).



The different surface current velocities and their frequency of occurrence in different directions are demonstrated in Table 8 and Figure 8. Surface current is likely to flow 18.28% in the East direction, 18.23% in the NorthEast direction, 18.28% in the SouthWest direction, and 17.84% in the West direction.

Table 10 and Figure 7 show the frequency of occurrence (%) of bottom current in different directions. Similar to surface current direction, bottom current is likely to flow 13.37% in the East direction, 18.32% in the NorthEast direction, 11.24% in the SouthWest direction, and 28.38% in the West direction

During the last 10 years (2007- 2015), the average current velocity on the surface and bottom are seen to decrease (Figure 8 and Figure 9).

Maximum velocity of surface and bottom current with period of N years is shown in Table 13, Table 14, Table 15 and Table 16.

Table 9.
Surface current velocity statistics at White Tiger – Dragon Oilfield (1988- 2015)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (cm/s)	20.1	20.1	20.3	20.5	21.0	21.3	20.8	20.1	19.3	19.4	19.7	19.9	20.1
Maximum (cm/s)	87.1	99.0	128.0	147.0	128.7	128.1	173.3	148.5	142.3	122.0	113.0	105.8	173.3

Table 10.
Surface Current Velocity/Direction Frequency of Occurrence (%)
at White Tiger – Dragon Oilfield (1988-2015)

Surface current (cm/s)	Direction									Sum (%)	GRT (%)
	N	NE	E	SE	S	SW	W	NW			
< 2.0	0.2	0.2	0.13	0.26	0.21	0.34	0.21	0.22	1.77	100	
2.0-9.9	1.94	2.04	1.96	2.14	2.27	2.93	2.07	2.34	17.68	98.23	
10.0-19.9	2.37	4.35	3.83	2.64	2.55	5.11	3.5	2.79	27.14	80.55	
20.0-29.9	1.22	5.09	4.09	1.36	0.51	4.77	4.88	1.73	23.65	53.4	
30.0-39.9	0.48	3.84	3.31	0.45	0.11	2.92	4.01	0.71	15.83	29.75	
40.0-49.9	0.09	1.47	2.06	0.13	0.04	1.17	1.79	0.19	6.94	13.92	
50.0-59.9	0.03	0.7	1.41	0.06	0.02	0.58	0.88	0.06	3.74	6.98	
60.0-69.9	0.01	0.29	0.81	0.04	0.01	0.27	0.34	0.03	1.8	3.24	
70.0-79.9	0	0.12	0.38	0.03	0.01	0.1	0.09	0.01	0.76	1.44	
80.0-89.9	0.01	0.06	0.15	0.01	0.01	0.04	0.04	0	0.32	0.68	
90.0-99.9	0	0.03	0.08	0.01	0	0.02	0.02	0	0.16	0.36	
100.0-109.9	-	0.01	0.03	0.01	0	0.01	0	-	0.06	0.2	
110.0-119.9	0	0.02	0.01	0	0	0	0	-	0.04	0.14	



120.0-129.9	-	0.01	0.01	0	0	0	0	0	0.03	0.1
130.0-139.9	-	0	0.01	0	0	-	0	-	0.01	0.06
140.0-149.9	0	0	0	0	0	0	-	0	0.02	0.05
150.0-159.9	-	-	0	0	0	0	0	-	0.01	0.04
160.0-169.9	-	-	-	-	0	0	0	-	0	0.03
170.0-179.9	-	-	-	0	0	0	0	0	0.01	0.02
180.0-189.9	-	-	0	0	0	0	-	-	0.01	0.01
> 200.0	-	0	-	0	-	-	-	-	0	0
Sum (%)	6.36	18.23	18.28	7.15	5.76	18.28	17.84	8.1	100	
Average (cm/s)	15.68	26.33	30.77	16.45	12.73	23.46	27.37	16.94	23.87	
Max (cm/s)	140	198.7	187.4	196.6	187.1	186.7	173.3	174.1	198.7	

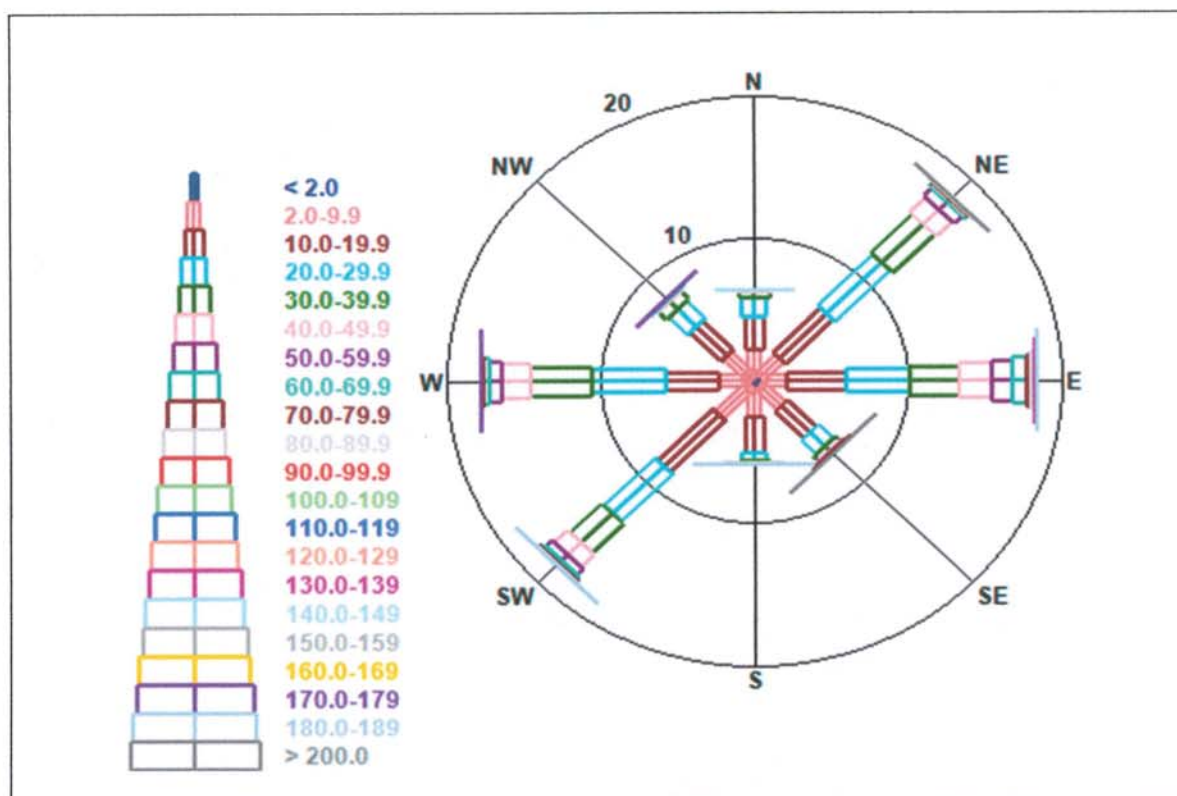


Figure 7. Surface Current Rose (1988 – 2015)



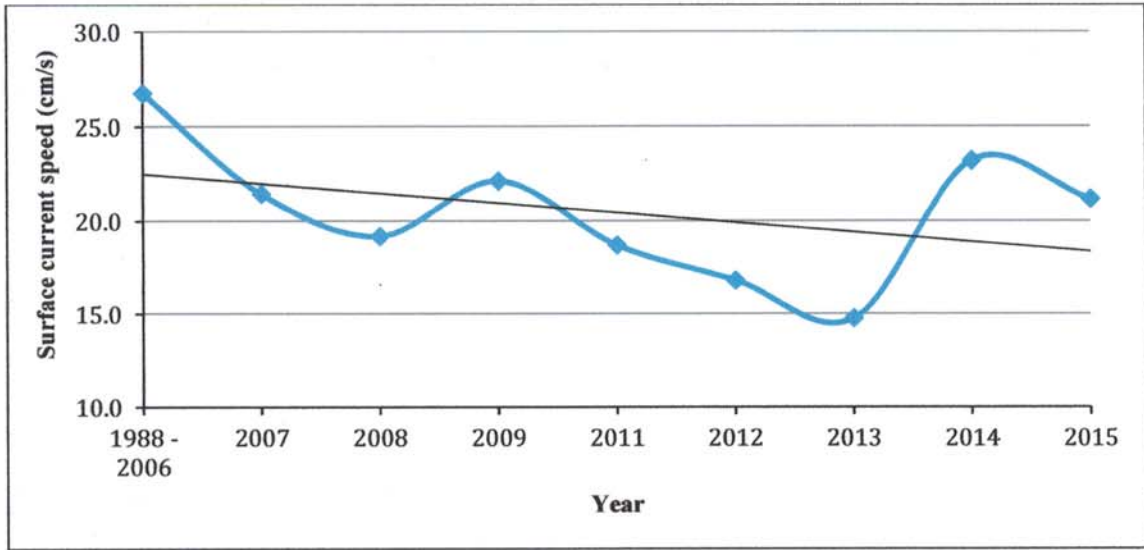


Figure 8. Surface current velocity trend (2007-2015)

Table 11.

Bottom current velocity statistics at White Tiger – Dragon Oilfield (1988 – 2015)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (cm/s)	21.3	18.1	17.8	18.0	19.6	22.4	24.9	24.1	23.7	18.7	19.2	21.8	20.8
Max (cm/s)	89.6	75.0	71.3	70.9	99.1	126.0	111.4	98.8	99.6	106.6	93.6	92.4	126.0

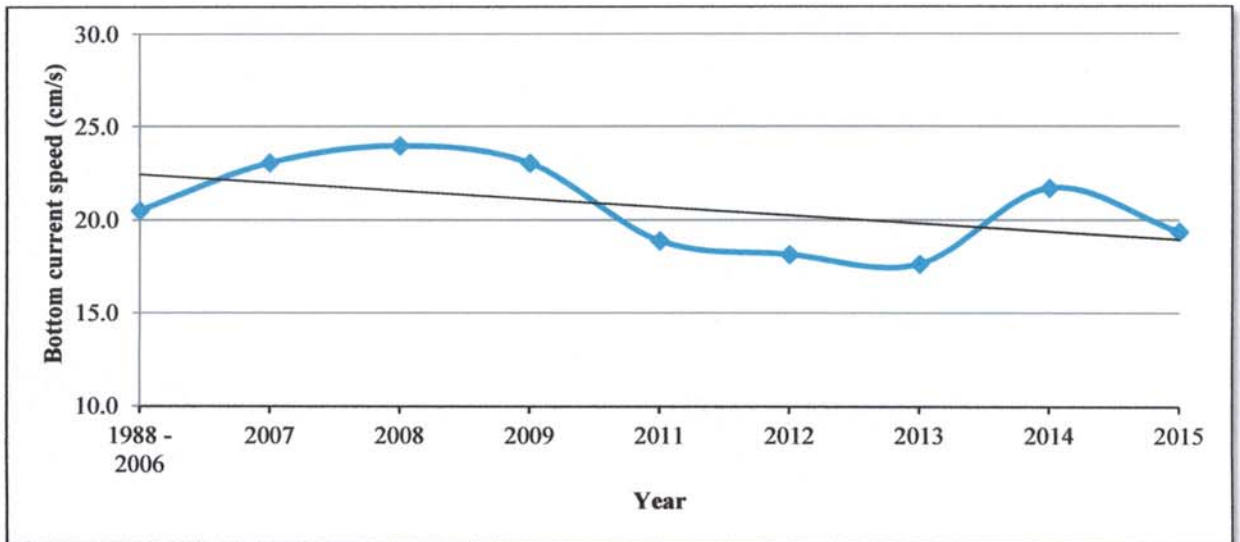


Figure 9. Bottom current velocity trend (2007-2015)



Table 12.

Bottom Current Velocity/Direction Frequency of Occurrence (%)
at White Tiger – Dragon Oilfield (1988-2015)

Bottom current (cm/s)	Direction								Sum	GRT
	N	NE	E	SE	S	SW	W	NW	(%)	(%)
< 2.0	0.22	0.2	0.23	0.29	0.32	0.27	0.22	0.17	1.91	100
2.0-9.9	1.03	2.81	5.52	4.62	3.72	3.8	4.3	2.51	28.31	98.09
10.0-19.9	0.62	3.68	5.18	3.58	1.95	3.13	7.41	2.96	28.5	69.78
20.0-29.9	0.35	2.49	2.55	0.99	0.45	1.97	7.05	2.29	18.15	41.28
30.0-39.9	0.23	1.54	1.52	0.19	0.09	1.18	4.95	1.07	10.77	23.14
40.0-49.9	0.12	1.16	1.13	0.04	0.03	0.57	2.76	0.45	6.26	12.37
50.0-59.9	0.07	0.82	0.88	0.01	0.01	0.2	1.2	0.12	3.32	6.1
60.0-69.9	0.02	0.38	0.68	0.01	0.01	0.06	0.37	0.01	1.53	2.78
70.0-79.9	0.01	0.12	0.41	0.01	0	0.02	0.06	0	0.64	1.25
80.0-89.9	0	0.04	0.15	0	0.01	0.01	0.02	-	0.23	0.61
90.0-99.9	-	0.01	0.03	0	0.01	0	0	-	0.06	0.38
100.0-109.9	0	0.01	0.01	0	0.01	0	0.01	0	0.04	0.31
110.0-119.9	0	0.01	0	0.01	0.01	0.01	0.01	-	0.05	0.27
120.0-129.9	-	0.02	0.01	0.01	0	0.01	-	-	0.04	0.22
130.0-139.9	-	0.01	0	0	0.01	0.01	0	-	0.03	0.18
140.0-149.9	0	0.02	-	-	0	-	0	-	0.02	0.15
150.0-159.9	-	0.01	0	0.01	0	0.01	-	0	0.03	0.13
160.0-169.9	0	0.01	0	0	0	0.01	0	0	0.03	0.1
170.0-179.9	0	0.01	-	0	-	0	-	-	0.02	0.06
180.0-189.9	-	0.01	0	0	0	0	0	0.01	0.03	0.04
> 200.0	-	0.01	0	0	0	-	-	0	0.02	0.02
Sum (%)	2.68	13.37	18.32	9.78	6.63	11.24	28.38	9.6	100	
Average (cm/s)	16.2	25.28	22.79	11.99	10.78	18.17	24.89	18.98	20.8	
Max (cm/s)	179.8	199.2	193.3	193	193.7	182.6	185.9	198.8	199.2	



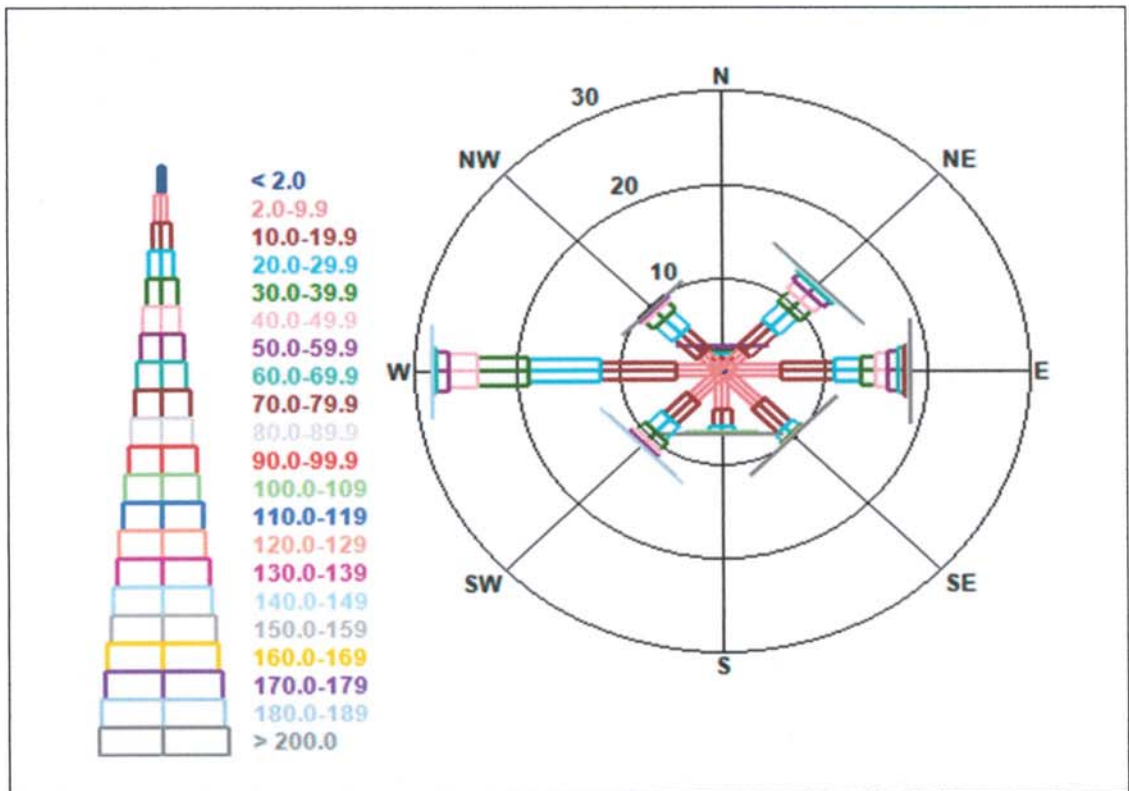


Figure 10. Bottom Current Rose (1988 – 2015)

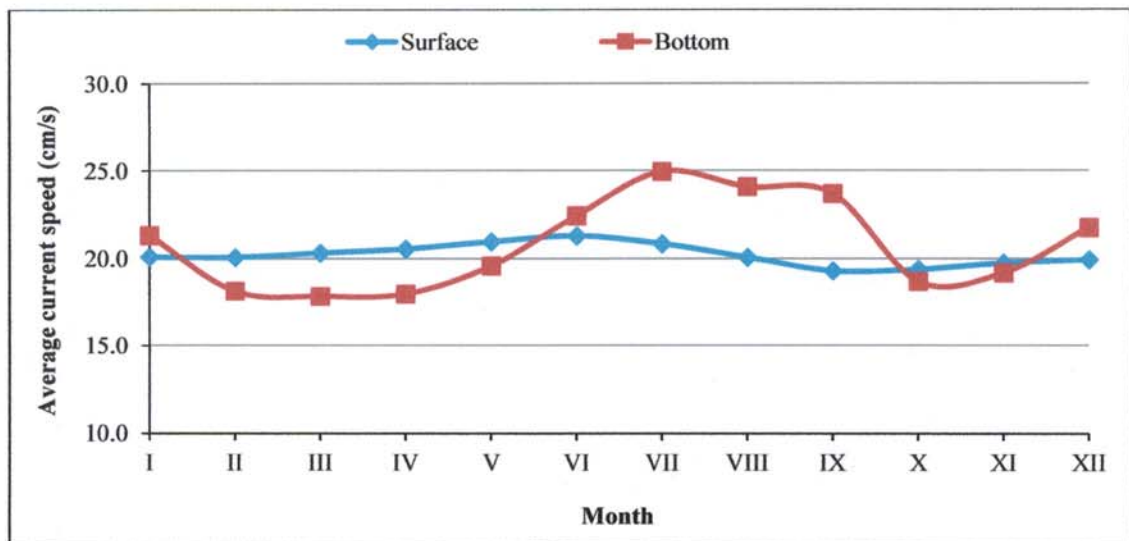


Figure 11. Graph showing the average current velocity at the surface and bottom



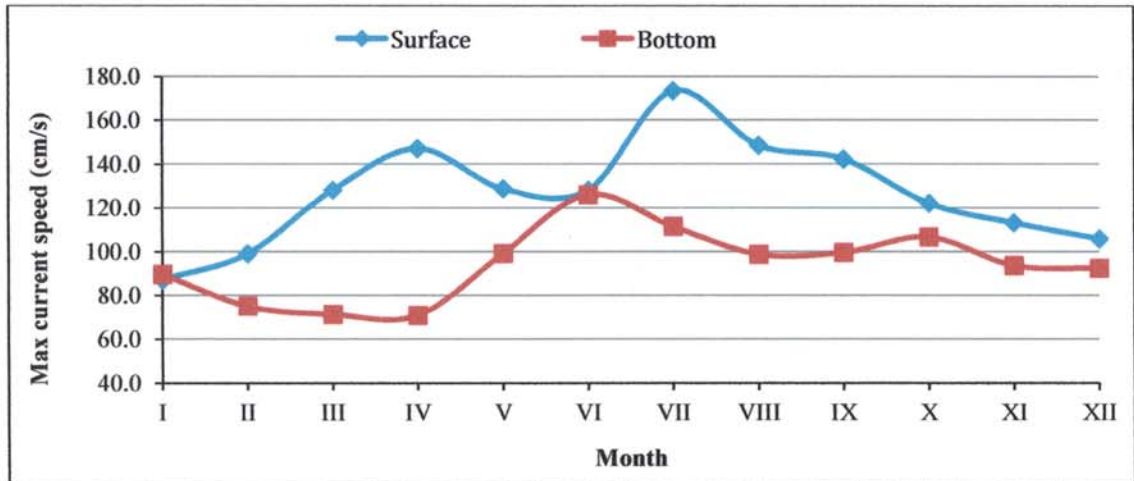


Figure 12. Graph showing the maximum current velocity at the surface and bottom

Maximum current velocity at the surface

Table 13.

Maximum surface current velocity (cm/s) with return period of N years under the influence of waves

N - year	WAVE DIRECTION							
	N	NE	E	SE	S	SW	W	NW
	CURRENT DIRECTION (DEGREE)							
	240	244	294	56	68	131	56	134
100	93	183	116	175	224	153	200	121
50	85	165	102	157	197	134	173	107
25	77	140	89	133	173	116	147	94
10	67	120	73	114	142	95	116	79
5	59	100	62	95	121	80	95	67
1	26	85	44	84	69	56	61	49

Table 14.

Maximum surface current velocity (cm/s) with return period of N years

N - year	DIRECTION							
	N	NE	E	SE	S	SW	W	NW
100	113.0	220.4	190.1	152.6	136.8	183.2	162.8	115.8
50	97.1	197.8	168.4	133.8	115.8	164.5	149.5	101.8
25	82.1	167.6	148	116	96.1	139.6	131.8	86.8
10	63.9	144.3	123.3	94.5	72.2	120.3	118	72.5
5	51.6	116.3	106.6	79.9	56	100.5	90.8	61.7
1	31.6	95.5	79.3	56.2	29.6	84.5	73.3	44.1



Table 15.

Maximum bottom current velocity (cm/s) with return period of N years
under the influence of waves

N - year	WAVE DIRECTION							
	N	NE	E	SE	S	SW	W	NW
	CURRENT DIRECTION (DEGREE)							
	85	247	76	82	338	76	177	72
100	87	124	119	112	91	145	165	101
50	76	109	103	99	80	128	134	93
25	66	95	92	87	69	112	115	84
10	53	79	75	72	57	92	85	72
5	45	68	61	61	48	79	65	61
1	31	49	41	36	35	57	33	34

Table 16.

Maximum bottom current velocity (cm/s) with return period of N years

N - year	DIRECTION							
	N	NE	E	SE	S	SW	W	NW
100	154.2	150	135.3	115.1	153.2	119.9	116	93.8
50	137.3	129.5	119.9	98.9	129.1	105.5	106.2	83.3
25	114.8	110.2	105.5	83.6	106.4	91.8	97	73.4
10	97.3	86.8	87.9	65	78.9	75.3	85.8	61.1
5	65.5	70.9	76.1	52.5	60.4	64.1	78.3	52.2
1	42.7	45.1	56.7	32	30	45.9	65.9	28.9

4.4. Sea level

The sea level in Bach Ho - Dragon Oilfield is mainly affected by tides. The tides in this area are characterized by mixed semidiurnal tides. The average sea level throughout the year varies.

In the winter, sea level is 10.6 cm higher than mean sea level (MLS). In the summer, sea level is 12.5 cm lower than MLS. The average sea level for all years (1986, 2000 - 2016) is 367 cm, the highest sea level is 510 cm, and the lowest is - 168 cm.

Sea level statistics in the period 1986, 2000 - 2016 is presented in Table 17.

The range of tides in this area does not exceed 310 cm, the maximum astronomical tide level is 113cm above MLS, the minimum astronomical tide level is 179 cm lower than MLS. The maximum storm surge and maximum storm fall is 77 cm and 51 cm respectively



During the period of 10 years (2006-2016), sea levels seemed to decrease (Figure 13).

Frequency (%) of sea level is shown in tables 18 and figure 14, and extreme sea level is demonstrated in Table 19.

Table 17.

Sea level statistics at White Tiger – Dragon Oilfield (1986, 2000 - 2016)

Tide	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average(cm)	378	373	369	362	357	352	352	357	366	376	384	384	367
Max(cm)	500	490	472	460	470	470	460	470	460	480	510	510	510
Min (cm)	200	210	227	211	178	168	173	194	226	220	210	196	168

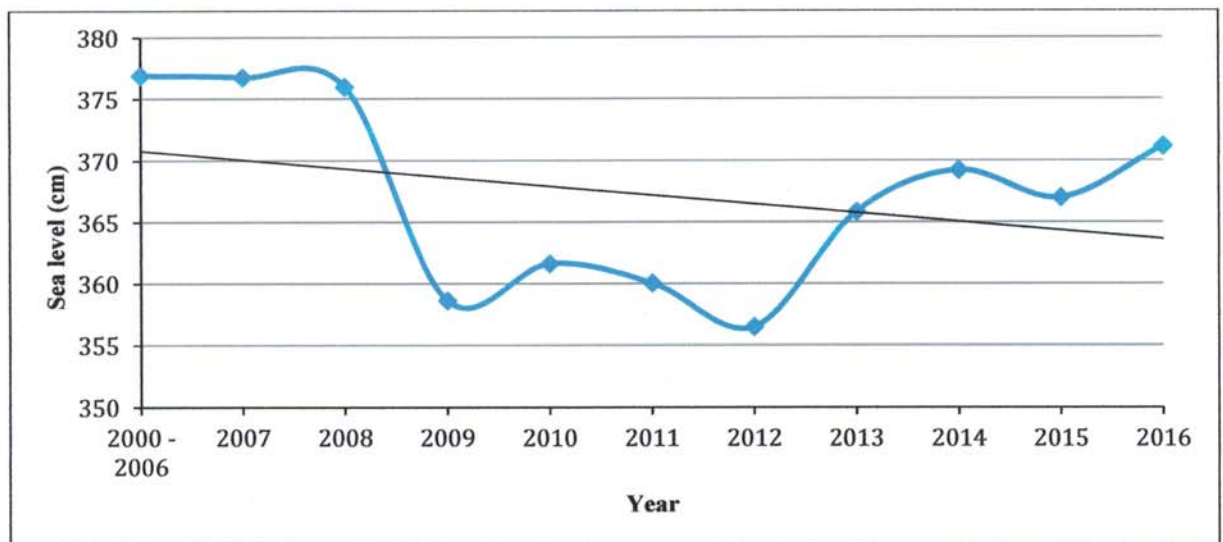


Figure 13. Sea level trend (2000, 2006 - 2016)

Table 18.

Frequency (%) of sea level at White Tiger – Dragon Oilfield (1986, 2000 - 2016)

Sea level (cm)	Frequency (%)	Cumulative (%)	Guarantee (%)
< 220	0.27	0.27	100.00
220-239	0.82	1.09	99.73
240-259	1.78	2.87	98.91
260-279	3.20	6.07	97.13
280-299	4.92	10.99	93.93
300-319	6.15	17.14	89.01



320-339	6.89	24.03	82.86
340-359	8.19	32.22	75.97
360-379	10.28	42.51	67.78
380-399	13.31	55.82	57.49
400-419	17.71	73.52	44.18
420-439	16.89	90.42	26.48
440-459	7.54	97.96	9.58
460-479	1.79	99.75	2.04
> 500	0.25	100.00	0.25

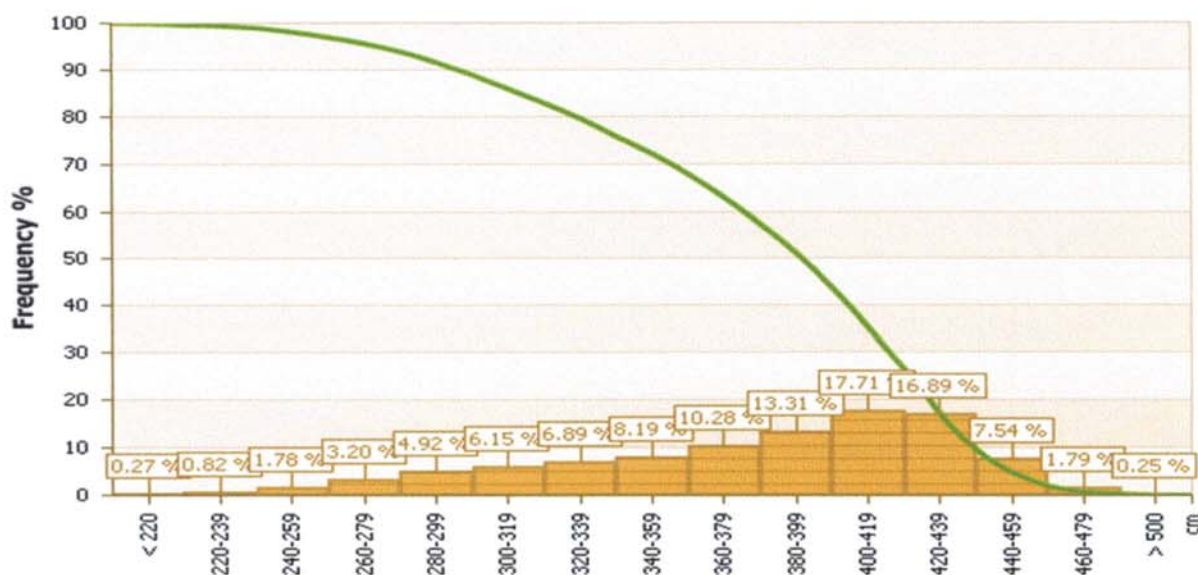


Figure 14. Graph showing frequency of sea level (1986, 2000 - 2016)

Extreme sea level

Table 19.

Maximum sea level with return period of N year

N-Year	Sea level (cm)
100	567
50	542
25	533
10	525
5	519



4.5. Sea water temperature

On the surface (5m below sea level), the average swater temperature is 27.59 °C, maximum temperature is 32.94 °C and minimum temperature is 21.49 °C (Table 20).

On the bottom (45m below sea level), the average sea water temperature is 25.59 °C, the maximum temperature is 32.57 °C and minimum temperature is 18.90 °C (Table 21).

During the 10 year period (2007-2016), the surface and the bottom sea water temperature seemed to increase (Figure 17).

Table 20.

Surface seawater temperature statistics at White Tiger – Dragon Oilfield (2000-2015)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (°C)	24.43	24.73	26.41	28.27	29.29	29.39	28.73	28.80	28.87	28.38	27.51	26.26	27.59
Max (°C)	26.57	27.04	29.75	30.87	31.77	32.94	31.11	30.97	30.80	31.07	29.21	29.02	32.94
Min (°C)	21.49	22.19	23.01	23.27	25.13	23.76	23.95	24.51	25.80	25.03	23.98	22.39	21.49

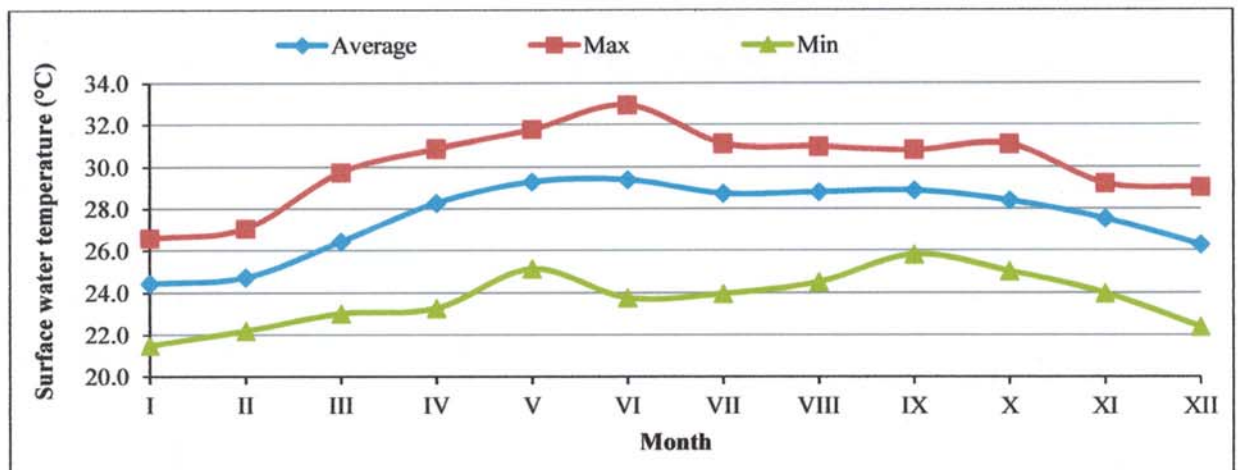


Figure 15. Graph showing trends of surface sea water temperature (2000-2015)

Table 21.

Bottom sea water temperature statistics at White Tiger – Dragon Oilfield (2000-2015)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (°C)	24.52	24.54	26.10	26.72	25.43	24.63	24.54	24.73	25.39	27.20	27.46	26.22	25.59
Max (°C)	27.11	32.57	28.30	29.48	30.00	30.98	29.67	29.94	30.14	30.06	29.18	29.70	32.57
Min (°C)	22.00	22.09	22.94	21.99	20.29	19.60	19.44	18.90	19.30	21.05	20.72	22.37	18.90

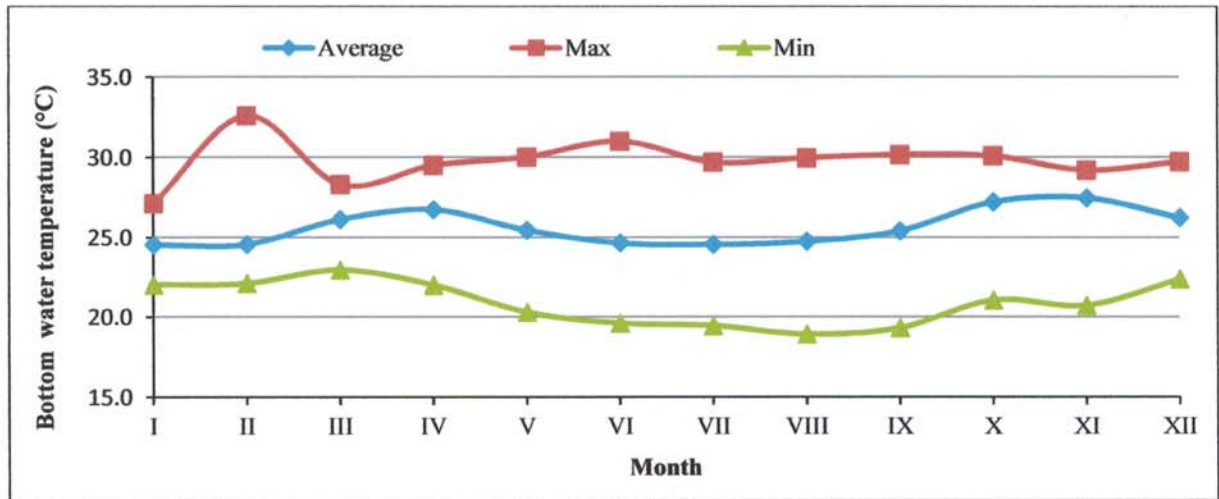


Figure 16. Graph showing trends of bottom sea water temperature (2000-2015)

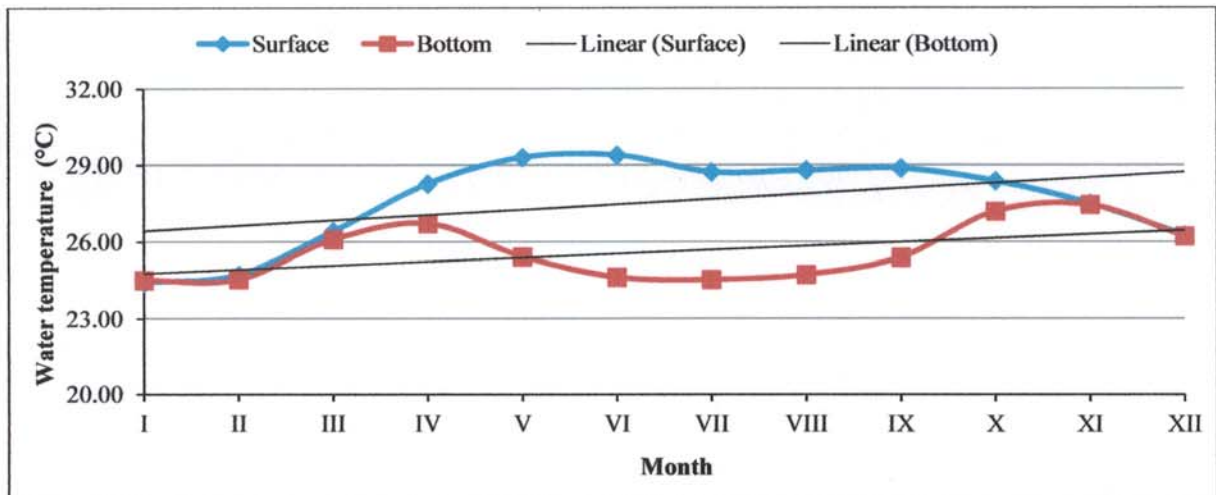


Figure 17. Graph showing trends of sea water temperature (2000-2015)

4.6. Atmospheric temperature

The average temperature at the White Tiger – Dragon Oilfield is 27.1 °C, with maximum of 39.0 °C and minimum of 20.5 °C (Table 22).

During the year, the maximum temperatures are recorded during the summer months, especially during May and June, with the maximum temperatures of 37.5 - 38 °C; the minimum temperatures are recorded in January and February, with average monthly temperature of 24.6-24.8°C.

Air temperatures tended to increase in recent years (Figure 19).



Table 22.

Air temperature statistics at White Tiger – Dragon Oilfield (1985- 2016)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (°C)	24.6	24.8	26.3	27.8	28.8	28.4	28.0	28.1	28.0	27.6	27.0	25.9	27.1
Max (°C)	33.6	33.7	39.0	37.0	37.5	38.0	34.0	33.6	37.0	36.2	36.0	35.0	39.0
Min (°C)	21.7	21.7	22.0	22.9	22.0	21.4	22.0	21.0	21.5	21.8	21.1	20.5	20.5

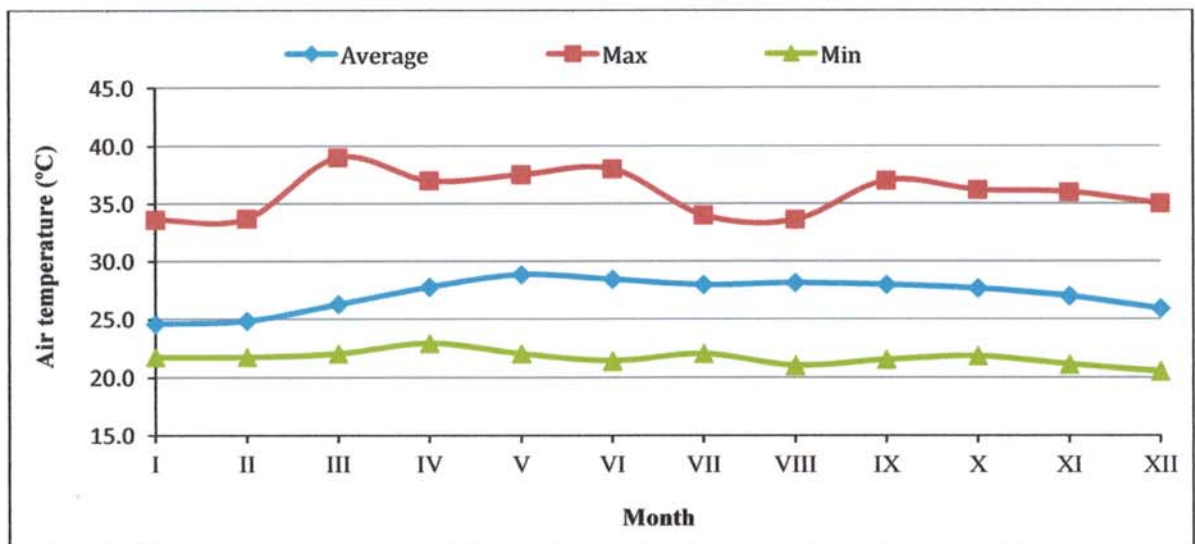


Figure 18. Graph showing trends in atmospheric temperature (1985- 2016)

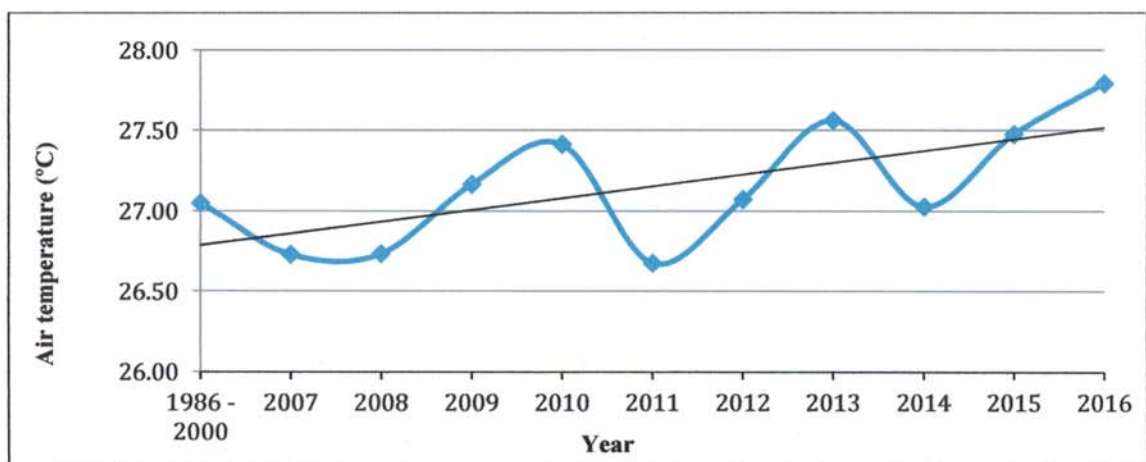


Figure 19. Air temperature trends (2007 - 2016)



4.7. Air humidity

Air humidity is almost 100% during the majority of the year, with the average humidity being 80%, and the minimum humidity being 20% (Table 23).

Air humidity tends to increase in recent years (Figure 20).

Table 23.

Air moisture statistics at White Tiger – Dragon Oilfield (1985-2016)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (%)	77	80	80	78	78	80	80	80	80	81	83	80	80
Max (%)	100	99	100	100	100	100	100	100	100	100	100	100	100
Min (%)	30	24	25	20	37	29	54	52	55	24	47	28	20

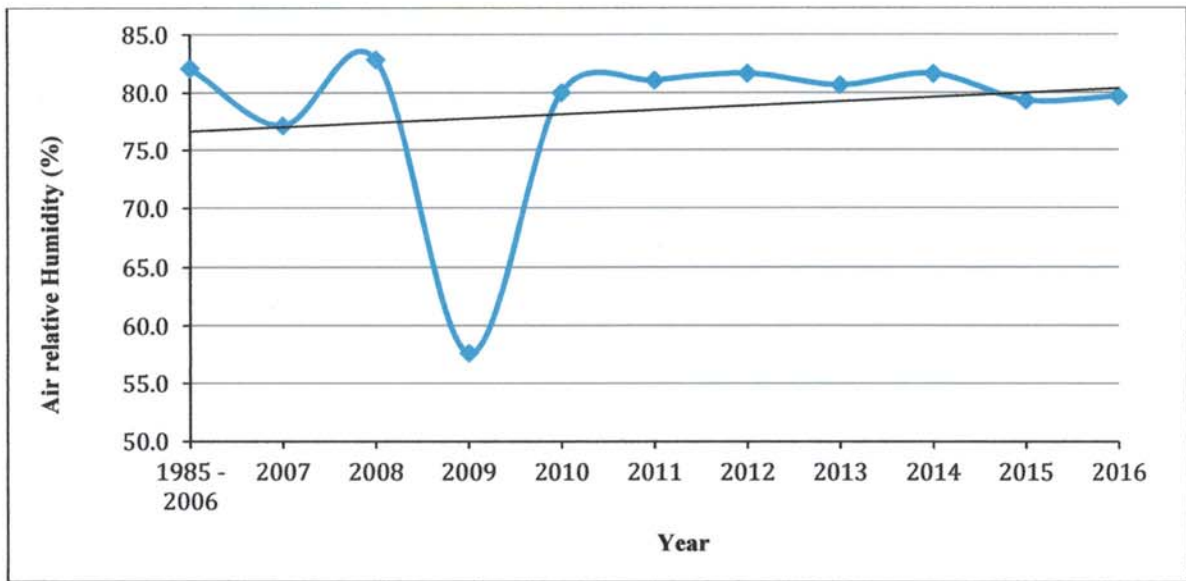


Figure 20. Air humidity trends (2007- 2016)

4.8. Atmospheric pressure

The average atmospheric pressure is 1005.3 hPa, the maximum and minimum value is 1124 hPa and 533.9 hPa respectively (Table 24).

Figure 22 shows the trend of atmospheric pressure in the last 10 years.



Table 24.
Atmospheric pressure statistics at White Tiger – Dragon Oilfield (1985-2016)

	Month												All year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average (hPa)	1008.9	1008.0	1005.6	1004.3	995.4	1005.1	1005.1	1005.2	1005.5	1006.6	1006.2	1007.2	1005.3
Max (hPa)	1021.1	1022.2	1022.9	1061.9	1124.9	1015.4	1032.5	1018.2	1019.0	1019.8	1019.1	1019.1	1124.9
Min (hPa)	629.6	764.1	544.9	533.9	562.5	998.6	996.0	877.8	838.6	890.4	614.3	602.8	533.9

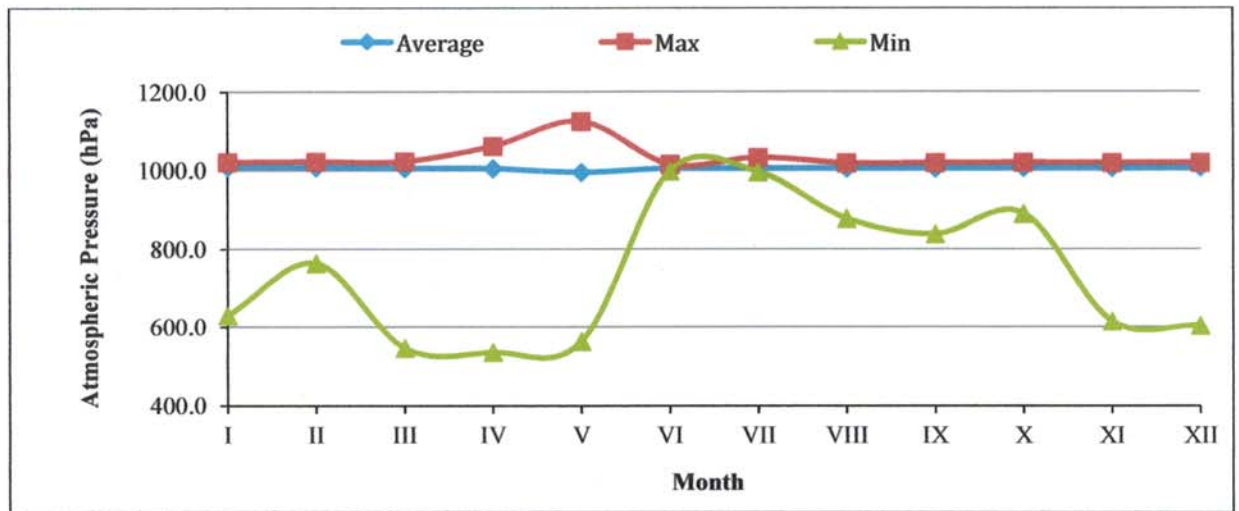


Figure 21. Graph showing trends in atmospheric pressure (1985 - 2016)

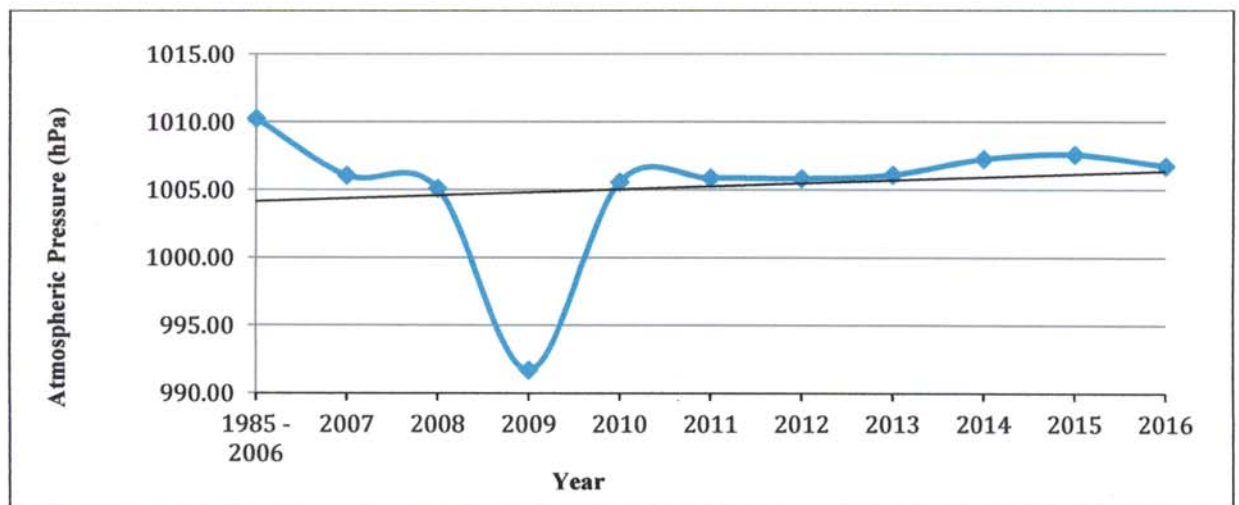


Figure 22. Atmospheric pressure trend (2007 - 2016)



5. DESIGN VALUES OF HYDROMETEOROLOGICAL PARAMETERS WITH RETURN PERIOD OF 100 YEARS

5.1. Wind

Wind direction	NE
Wind speed 1 minute sustained 10m above MLS	50.3 m/s
Wind speed 3 second sustained 10m above MLS	56.3 m/s

5.2. Wave

Wave direction	NE
Average wave height	5.4 m
Average period	9.9 s
Significant wave height (Hs)	8.7m
Maximum wave height (Hmax)	16.4 m
Maximum period	14.5 s
Wave hieght crest of Hmax	10.2 m

5.3. Current

Maximum surface current velocity	220.4 cm/s
Surface current direction	68°
Maximum bottom current velocity	154.2 cm/s
Bottom current direction	356°

5.4. Sea level

Maximum level	+1.9 m
Minimum level	-2.3 m



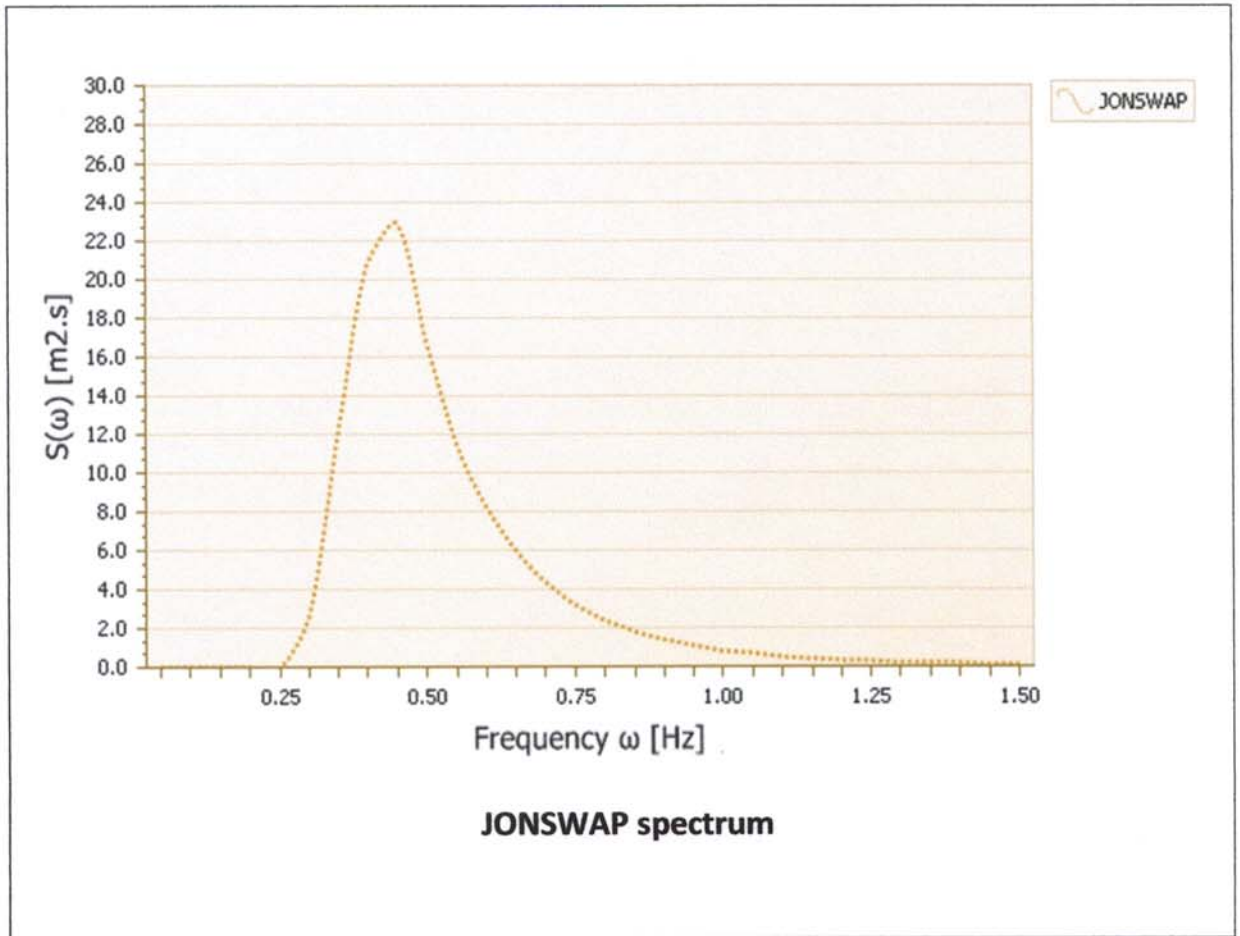


Figure 23. JONSWAP spectrum

Where :

$$U_{10} = 10.0 \text{ (m/s)}$$

$$H_s = 8.7 \text{ (m)}$$

$$T_0 = 10.0 \text{ (sec)}$$

$$\alpha = 0.00905$$

$$\gamma = 1.28$$

$$\omega_m = 0.446 \text{ (Hz)}$$

$$\sigma = 0.096 \text{ } (\omega \leq \omega_m)$$

$$\sigma = 0.104 \text{ } (\omega > \omega_m)$$



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