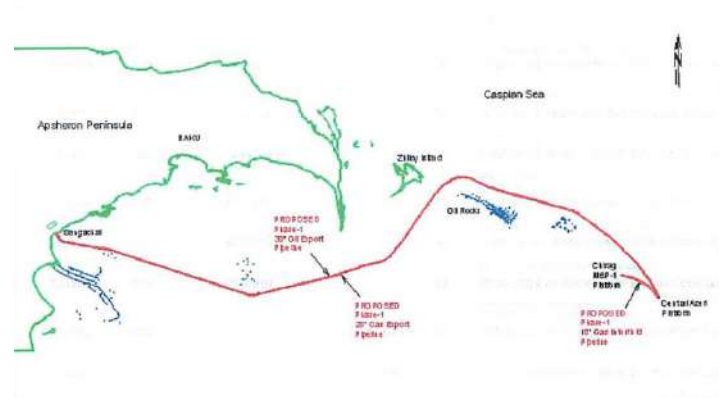


**53 MCDERMOTT LAB TESTS–CASPIAN SEA–
AZERI PROJECT 30” - 28” - 30”**

53 MCDERMOTT – AZERI PROJECT BAKU – AZERBAIJAN

General project Overview and Reference



Caspian Sea – Pipeline Location

1 Scope of work

Post-trenching

Pipeline	Trench Cover (T.O.P.)	Length	Water Depth	
			Min	Max
30"	1 M	1.013 Meters	0 M	5 M
30"	1 M	1.013 Meters	0 M	5 M
28"	1 M	1.013 Meters	0 M	5 M

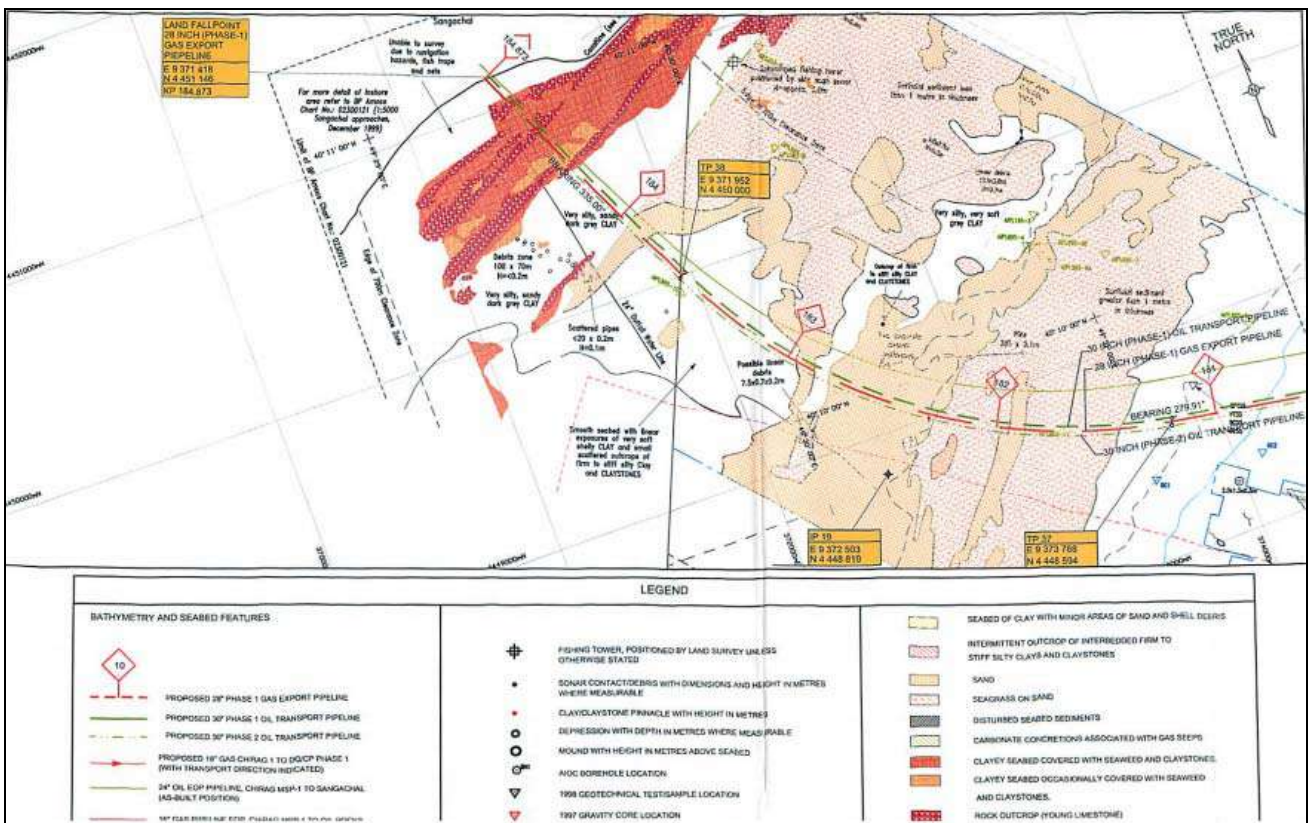
2 Soil condition encountered

In the offshore part of the routes, the seabed is comprised of clay with minor areas of sand. From there, going towards the shore, there are sediments comprising mainly of sand (covered with sea-grass) with some clay.

In the nearshore area, the seabed is characterized by the presence of soft shelly clay with scattered outcrops of firm to stiff silty clay and CLAYSTONE rock (the light ORANGE colour in the map below);

In the inshore and shore line area, ridges of young LIMESTONE rock emerge. (the RED colour in the map below) and CLAYSTONE (the dark ORANGE colour in the same map);

Geological Map of the area:



A first campaign of Point Load Strength laboratory tests performed on the limestone rock samples revealed a rock hardness ranging from 17 to 50 Mpa (UCS value).

URS

Storia & Moore
 02/06/02 02/06/02
 Modulo Collaudo

Point Load Strength Index

Sample No	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7
Date	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02
Type	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone
Depth (m)	0.86-0.43	0.43-0.55	0.43-0.55	0.55-0.62	0.75-0.83	0.83-0.9	0.9-1.0	0.9-1.0	0.9-1.0	0.9-1.0	1.07-1.19
Test Type (DI = Diametral, AX=axial, IL=irregular lump)	A	D	A	A	A	A	D	A	A	D	A
W- Width (mm); i.e. smallest specimen width perpendicular to load direction	74	73	73	73	70	70	69	70	70	69	70
D - Distance between platens at start (mm)	58	73	58	51	64	65	69	53	55	69	45
D' = Distance between platens at end (mm)	48	67	50	50	56	55	64	45	48	64	35
P- Point Load at Failure (kN)	10	5	9	11	8	9	6	7	7	4	4.5
Type of failure sketch diagram											
For DI $De^2 = D \times D'$ For IL/AX $De^2 = 4 / \pi \times (W \times D')$ (mm ²)	4522	6226	4648	4646	4990	4901	5622	4010	4277	5622	3119
De=effective core diameter (mm)	67	79	68	68	71	70	75	63	65	75	56
$Is = P \times 1000 / De^2$ (MPa)	2.21	0.86	1.94	2.37	1.60	1.84	1.07	1.75	1.64	0.71	1.44
SCF- Size Correction Factor = $(De/50)^{0.45}$	1.14	1.23	1.15	1.15	1.17	1.16	1.20	1.11	1.13	1.20	1.05
$Is(50)$ - Point Load Index = $SCF \times Is$ (MPa)	2.53	1.18	2.23	2.72	1.87	2.14	1.28	1.94	1.85	0.85	1.52
Correlated UCS (20:1) (MPa)	50.54	23.67	44.54	54.43	37.46	42.73	25.62	38.83	36.93	17.08	30.33
Rock strength	S	MS	MS	S	MS	MS	MS	MS	MS	MS	MS

URS

Storia & Moore
 02/06/02 02/06/02
 Modulo Collaudo

Point Load Strength Index

Sample No	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7
Date	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02	02-Jun-02
Type	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone	Sandy limst	Sandy limst	Sandy limst	Sandy limst	Sandy limst
Depth (m)	1.07-1.19	1.25-1.31	1.43-1.51	1.43-1.51	1.51-1.60	1.51-1.60	1.80-1.90	1.80-1.90	1.80-1.90	1.80-1.90	1.95-2.00
Test Type (DI = Diametral, AX=axial, IL=irregular lump)	A	A	D	A	D	A	D	A	A	A	D
W- Width (mm); i.e. smallest specimen width perpendicular to load direction	70	73	69	64	69	80	69	70	70	69	63
D - Distance between platens at start (mm)	70	67	69	54	69	54	69	48	40	61	63
D' = Distance between platens at end (mm)	58	50	65	38	64	45	64	40	34	54	58
P- Point Load at Failure (kN)	6.2	6	3	7	5	5	5	8	7	6.5	5
Type of failure sketch diagram											
For DI $De^2 = D \times D'$ For IL/AX $De^2 = 4 / \pi \times (W \times D')$ (mm ²)	5168	4646	5709	3036	5622	4583	5622	3564	3030	4743	4652
De=effective core diameter (mm)	72	68	76	56	75	68	75	60	55	69	68
$Is = P \times 1000 / De^2$ (MPa)	1.20	1.29	0.83	2.26	0.89	1.09	0.89	2.24	2.31	1.37	1.07
SCF- Size Correction Factor = $(De/50)^{0.45}$	1.18	1.15	1.20	1.05	1.20	1.15	1.20	1.08	1.04	1.15	1.15
$Is(50)$ - Point Load Index = $SCF \times Is$ (MPa)	1.41	1.48	0.63	2.37	1.07	1.26	1.07	2.43	2.41	1.58	1.24
Correlated UCS (20:1) (MPa)	28.25	29.69	12.65	47.46	21.95	25.01	21.35	48.62	48.25	31.86	24.72
Rock strength	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS



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The following campaign in limestone rock, shows the data from samples analyzed in a Geotechnical Laboratory in Italy, revealing increased UCS values up to 71 Mpa.

LABORATORIO GEOMECCANICO VIA CORPO ITALIANO DI LIBERAZIONE 42 61100 PESARO

COMMITTENTE S.E.A. SERVIZI ECOLOGICI AFFOSSAMENTI

CAMPIONE 1

POINT LOAD TEST (PLT)
Suggested Methods ISRM

PROVA	N°	1	2	3	4	5
CARICO DI ROTTURA [P]	(kg)	1529,6	999,3	1060,5	876,9	978,9
DIAMETRO EQUIVALENTE [De] ² [De]	(cm ²)	74,9	45,5	29,8	25,5	38,2
	(cm)	8,7	6,7	5,5	5,0	6,2
INDICE DI RESISTENZA [Is]	(kg/cm ²)	20,4	21,9	35,6	34,4	25,6
	(M Pa)	2,0	2,2	3,5	3,4	2,5
FATTORE CORRETTIVO	(-)	1,3	1,1	1,0	1,0	1,1
INDICE POINT LOAD [Is ₃₀₀]	(kg/cm ²)	26,1	25,1	37,0	34,6	28,2
	(M Pa)	2,6	2,5	3,6	3,4	2,8
RESISTENZA ALLA COMPRESSIONE [UCS]	(kg/cm ²)	627,3	602,7	888,3	829,3	678,4
	(M Pa)	61,5	59,1	87,1	81,4	66,3

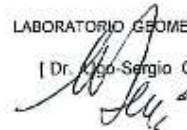
Note: PROVA SU ELOCC-II

	(kg/cm ²)	(M Pa)
[Is ₃₀₀]	30,2	3,0
[UCS]	724,9	71,1

Tipo di materiale : Calcare grigiastro a grana variabile [da media a grossolana], complessivamente molto poroso, con inclusi resti di conchiglie fossilizzate [tessitura organogena]

LABORATORIO GEOMECCANICO

[Dr. Geo-Sergio Orzi]



POINT LOAD TEST

Another collecting campaign in limestone rock, shows the data from samples analyzed at ENCOTEC Laboratory in Azerbaijan, confirming high UCS values up to 69 Mpa.

ENCOTEC

RESULTS OF SAMPLE TESTING FOR HARDNESS STRENGTH

SAMPLE No.	LOAD, P (kg)	SQUARE (cm ²)	HARDNESS STRENGTH, kgf/cm ²	kPa
A	2460	25	98	9610
B	5400	36	150	14700
C	17640	25	705.6	69136
D	48500	25	1940	195152
E	4500	25	180	17651

ATTACHMENT: Photos of samples before and after the test (10 Nos.)

Client: SEA

Samples obtained on: 16.04.2004

Samples tested on: 17.04.2004

Responsible person



/Azer Rahimly/



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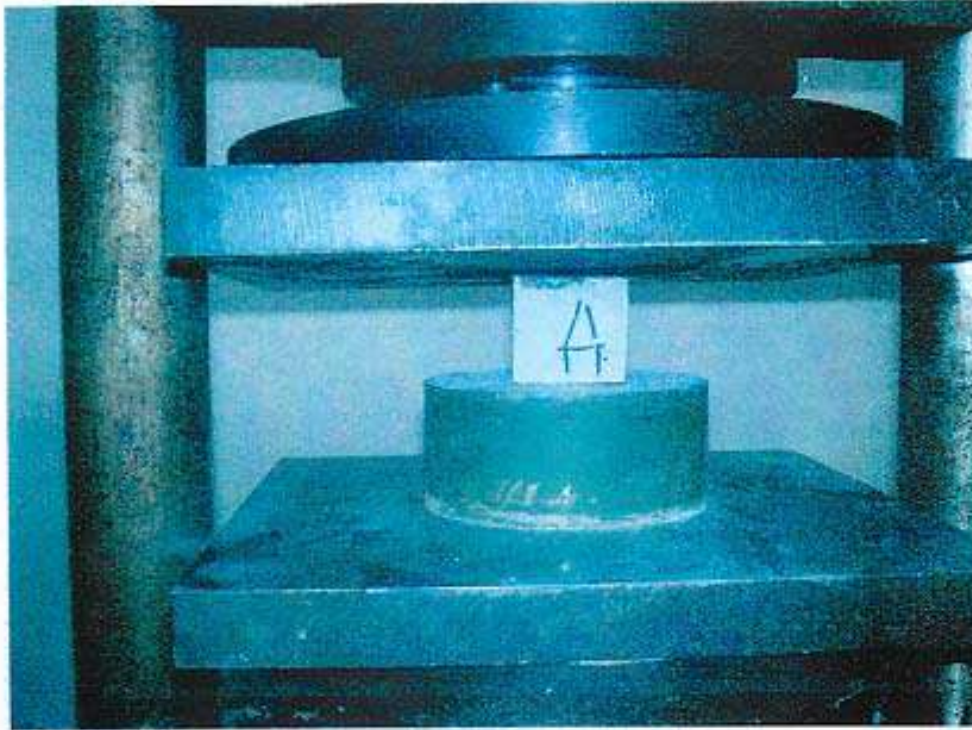
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Photos taken from the laboratory tests carried out on limestone rock:



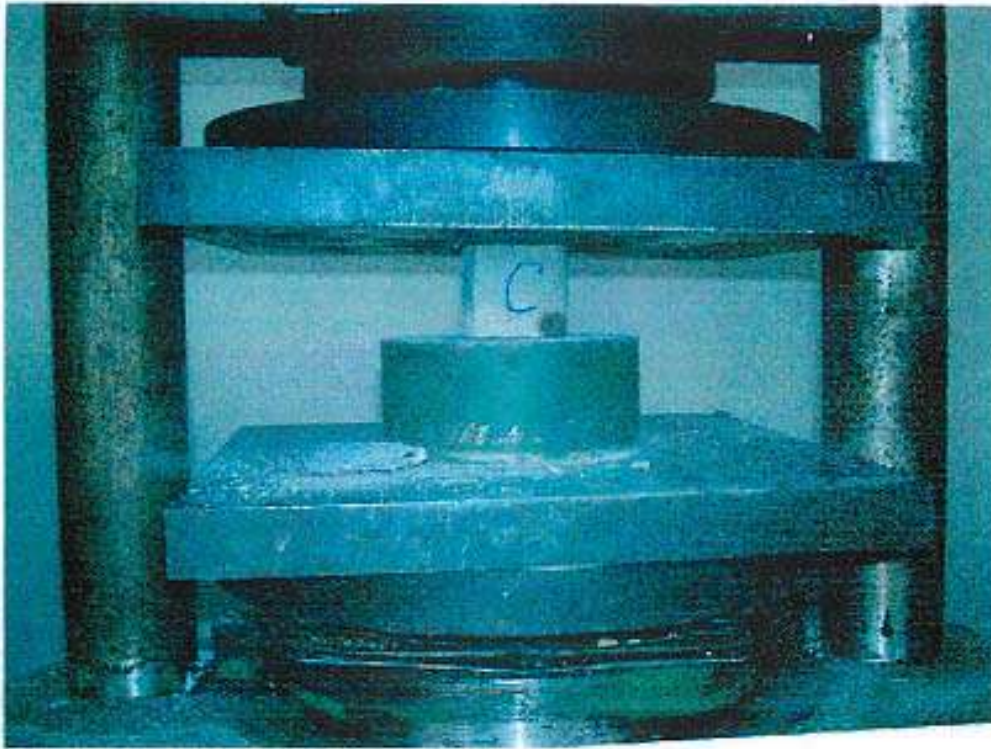


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Some tests were performed also on claystone rock samples from EUPEC Laboratory in Azerbaijan which revealed a rock hardness ranging from 5,50 to 11,61 Mpa (UCS value)

	<u>Report</u>		Proc:
	Compressive strength		Page 1 / 1

Client:		
Diameter : mm	Concrete thickness : mm	Type of Coating : kg/m ²
Wall thickness : mm		

COATING SYSTEM :

APPARATUS:

Compressive machine : V03018

METHOD :

Tests have been carried out according to : Contract Specification Standards

- 1) Ensure that there is no foreign matter on the surfaces of the compressive machine.
- 2) Ensure that the faces of samples submitted to the compression test have no protuberances that may affect test results.
- 3) Place the sample at the center of the compressive machine platters. Bring the compression platter gently into contact.
- 4) Observe the operations and record the result after sample failure.

RESULTS :

Production date :
Test date :
Cure time :

Pipe and sample N°	Specimen size L/D		Ratio L/D	Compressive area mm ²	Compressive force Mpa	Compressive strength KN	Density kg/m ³	Results
#1 KP187.170	40	40	1	1256,6	5.50	7.02	2316	
KP187.101	40	40	1	1256,6	11.61	14.62	2226	
#3 KP187.170	40	40	1	1256,6	10.06	12.64	2259	

	EUPEC AZERBAIJAN Inspection Department	CLIENT Inspection department
Name		
Lab Tech.		
DATE 19/05/04		
Sign		

WITNESSES = P. GAZAF H. VESSARI (SEA)
KUMAR (MCCI)

JAN HURRY } BP.
RAY COLE }
DESMOND JORDAN (EUPEC) + TECHS