Document 6.

Conditions naturelles

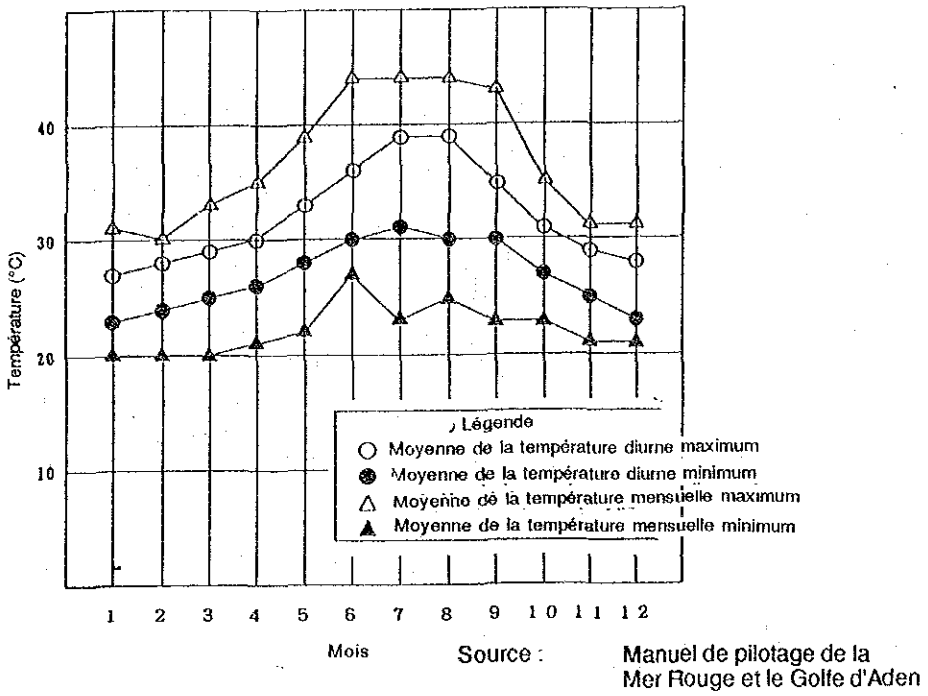


Figure A-6-1 Température à Djibouti (1941 - 1970)

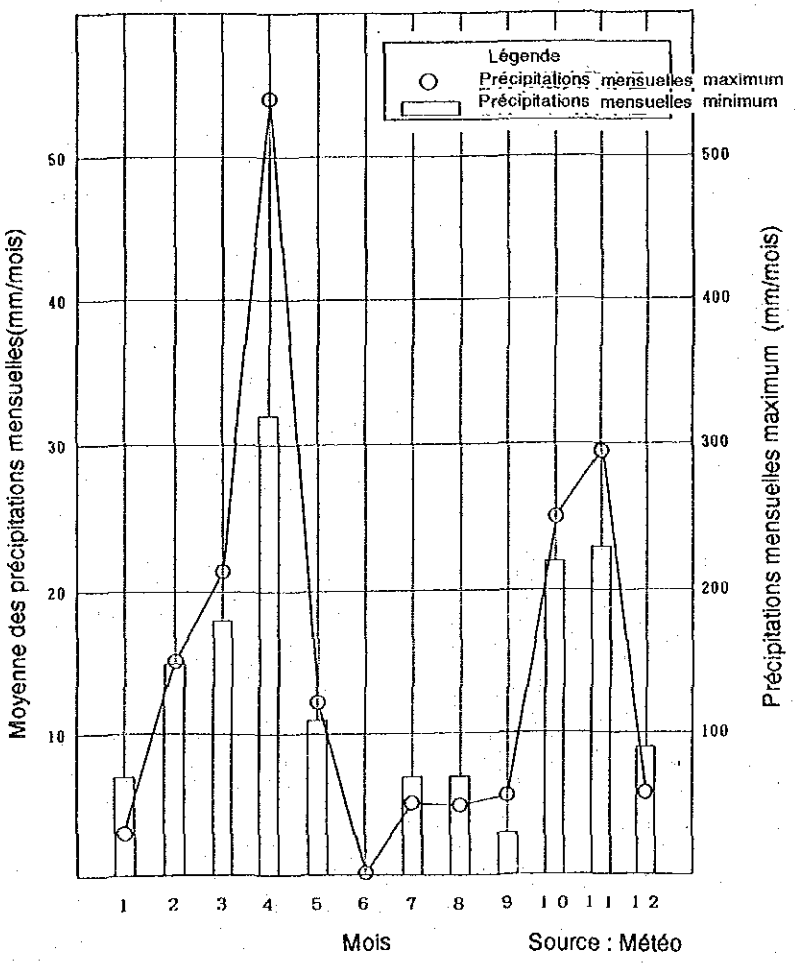
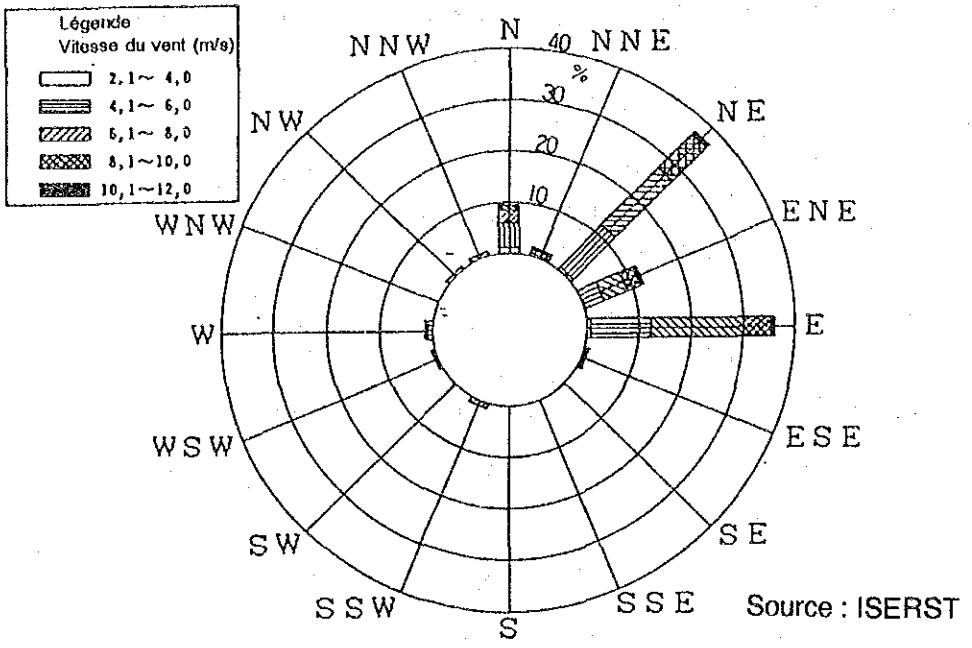
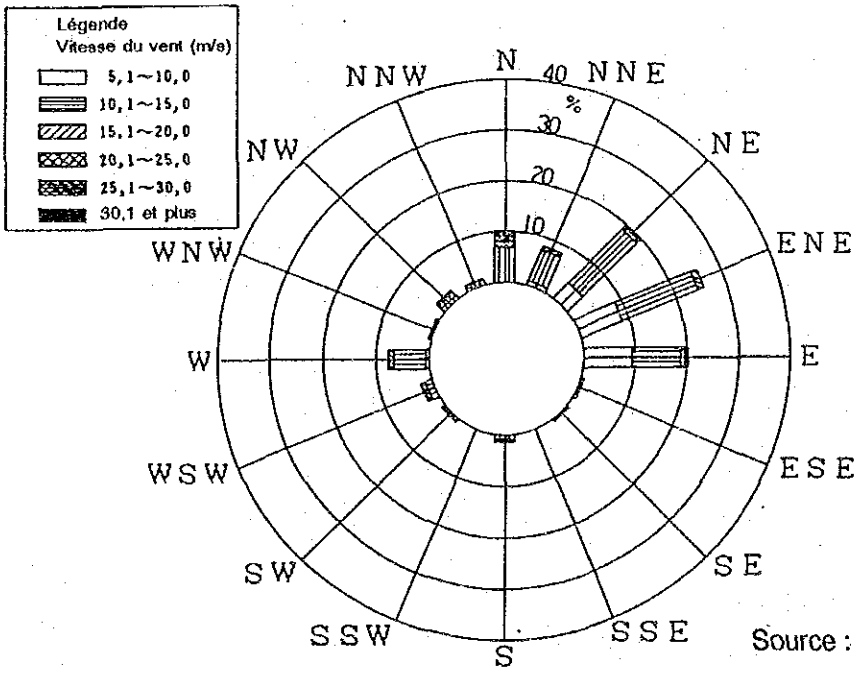


Figure A-6-2 Précipitations à Djibouti (1961 - 1980)



Note : Moyenne de la Vitesse maximum d'une heure de chaque jour

Figure A-6-3 Répartition des vents à Djibouti (1984)



Note : Moyenne de la Vitesse maximum de dix minutes de chaque mois

Figure A-6-4 Répartition des vents à Djibouti (1971 - 1990)

6-2 Estimation des vagues

Fetch effectif

Les vagues de 30 années de probabilité et de 50 années de probabilité ont été estimées en s'appuyant sur le calcul du fetch effectif pour les six directions du NNE à W. Les résultats en sont mentionnés dans le tableau A-6-1 et les figures A-6-5 et A-6-10.

Direction	Fetch effectif (km)
NNE	15,1
N	21,4
NNW	25,2
NW	28,3
WNW	28,1
W	22,2

Direction principale de NNE

θ i	cosθ i	(cosθ i)^2	F i(km)	F i(cosθ)^2
-42	0.743	0.552	23.5	13.0
-36	0.809	0.655	25.4	16.8
-30	0.866	0.750	27.0	20.3
-24	0.914	0.835	30.2	25.2
-18	0.951	0.905	34.7	31.4
-12	0.978	0.957	37.7	36.1
-6	0.995	0.989	11.2	11.1
0	1.000	1.000	11.0	11.0
6	0.995	0.989	11.3	11.2
12	0.978	0.957	13.4	12.8
18	0.951	0.905	13.8	12.5
24	0.914	0.835	0.9	0.6
30	0.866	0.750	0.9	0.7
36	0.809	0.655	0.9	0.6
42	0.743	0.552	0.9	0.5
TOTAL	13.512	----	----	203.8

D'après les chiffres ci-dessus, le fetch effectif de la direction principale du NNE peut être calculé comme suit :

$$Fe = \Sigma F i(\cos\theta i)^2 / \Sigma \cos\theta i = 203.8 / 13.512 = 15.1 \text{ km}$$

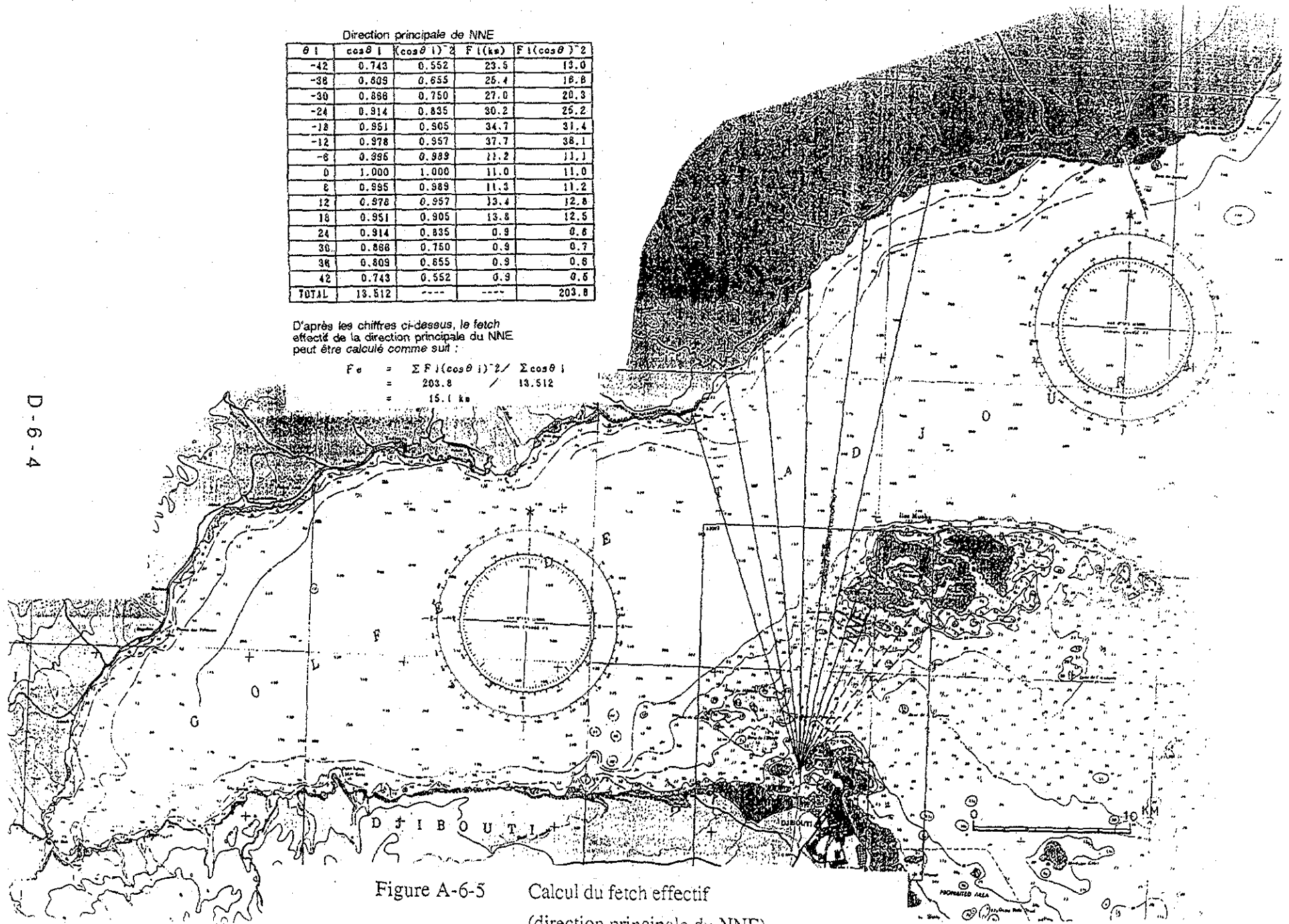


Figure A-6-5 Calcul du fetch effectif (direction principale du NNE)

Direction principale de N

θ i	cosθ i	(cosθ i)^2	F i (km)	F i (cosθ)^2
-42	0.743	0.552	26.2	14.5
-36	0.809	0.655	26.1	17.1
-30	0.866	0.750	24.5	18.4
-24	0.914	0.835	23.8	19.9
-18	0.951	0.905	23.7	21.4
-12	0.978	0.957	25.4	24.3
-6	0.995	0.989	27.2	26.9
0	1.000	1.000	31.4	31.4
6	0.995	0.988	34.9	34.5
12	0.978	0.957	37.8	36.2
18	0.951	0.905	11.0	10.0
24	0.914	0.835	11.1	9.3
30	0.866	0.750	11.2	8.4
36	0.809	0.655	13.4	8.8
42	0.743	0.552	13.9	7.7
TOTAL	13.512	----	----	288.8

D'après les chiffres ci-dessus, le fetch effectif de la direction principale du N peut être calculé comme suit :

$$Fe = \Sigma F i(\cos\theta i)^2 / \Sigma \cos\theta i$$
$$= 288.8 / 13.512$$
$$= 21.4 \text{ km}$$

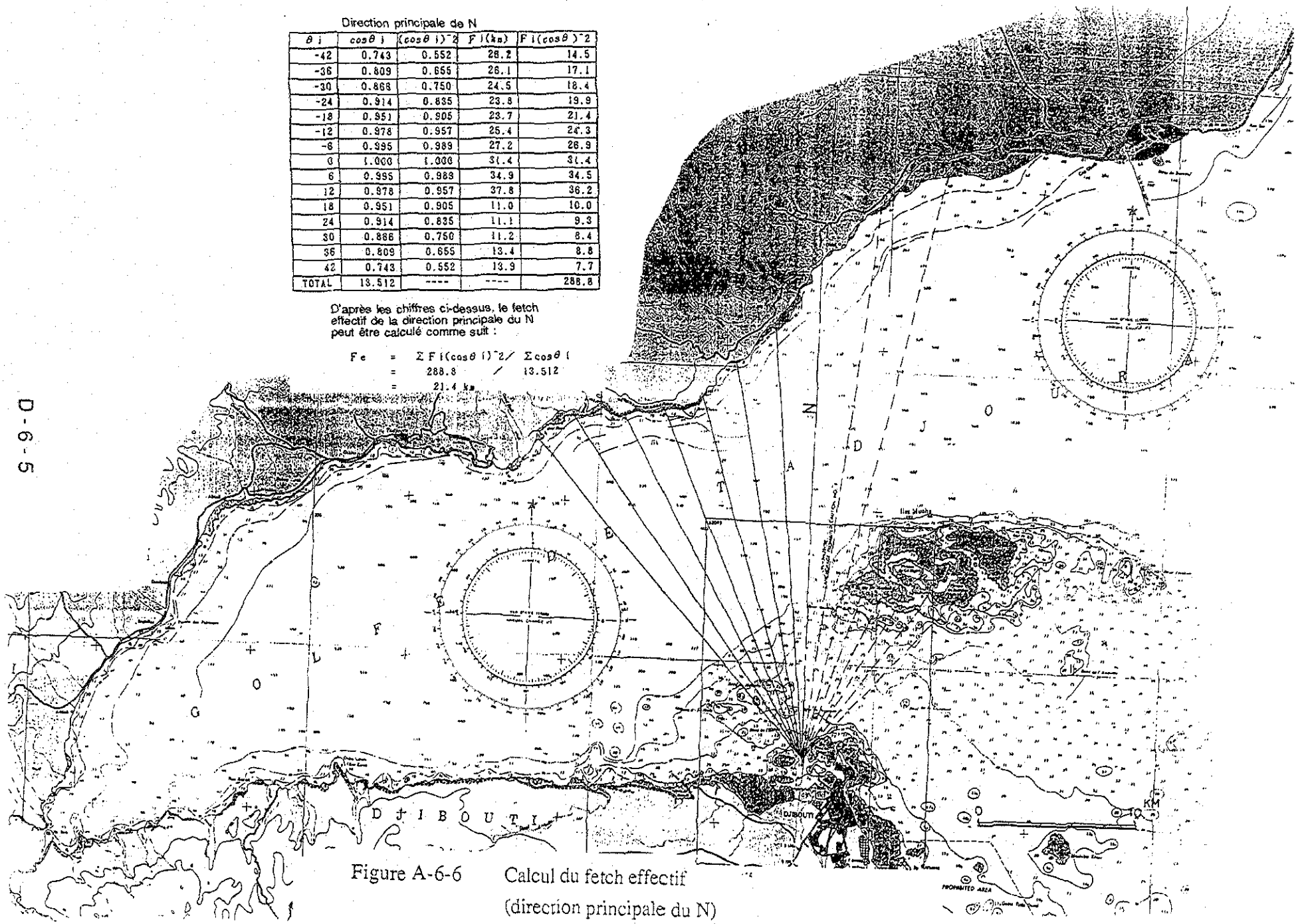


Figure A-6-6 Calcul du fetch effectif (direction principale du N)

Direction principale de NNW

θ i	cosθ i	(cosθ i)^2	F i(km)	F i(cosθ)^2
-42	0.743	0.552	36.5	20.1
-36	0.809	0.655	34.2	22.4
-30	0.866	0.750	30.5	22.9
-24	0.914	0.835	25.8	21.5
-18	0.951	0.905	26.6	24.1
-12	0.978	0.957	25.6	24.5
-6	0.995	0.989	24.4	24.1
0	1.000	1.000	23.6	23.6
6	0.995	0.989	24.2	23.9
12	0.978	0.957	25.5	24.4
18	0.951	0.905	27.5	24.9
24	0.914	0.835	32.0	26.7
30	0.866	0.750	35.8	26.9
36	0.809	0.655	38.1	25.0
42	0.743	0.552	11.1	6.1
TOTAL	13.512	----	----	341.1

D'après les chiffres ci-dessus, le fetch effectif de la direction principale du NNW peut être calculé comme suit :

$$F_e = \Sigma F_i(\cos\theta_i)^2 / \Sigma \cos\theta_i = 341.1 / 13.512 = 25.2 \text{ km}$$

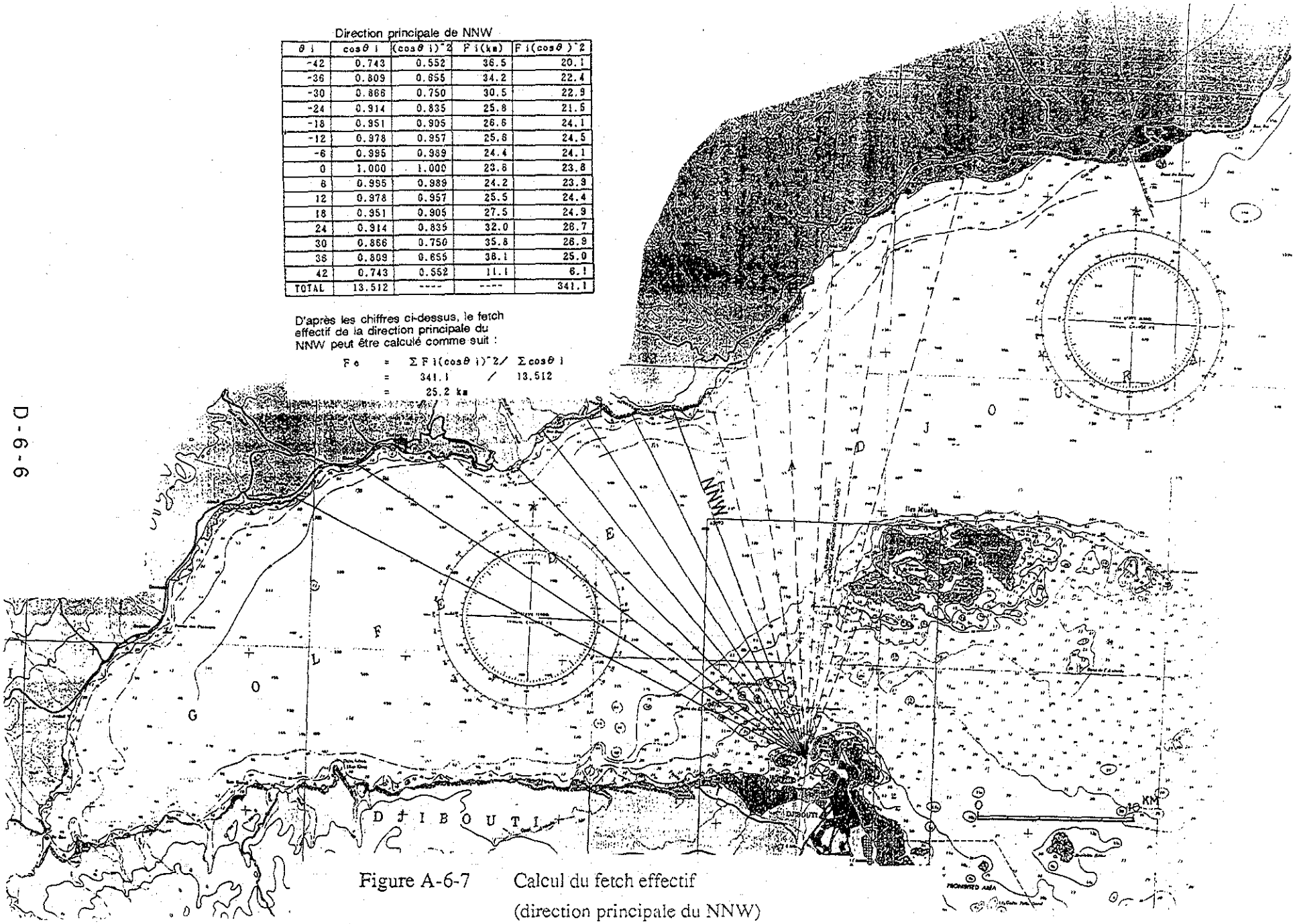


Figure A-6-7 Calcul du fetch effectif
(direction principale du NNW)

Direction principale de NW

θ i	cosθ i	(cosθ i)^2	F i(km)	F i(cosθ)^2
-42	0.743	0.552	46.7	25.8
-36	0.809	0.655	42.7	28.0
-30	0.866	0.750	41.5	31.1
-24	0.914	0.835	40.3	33.7
-13	0.951	0.905	36.1	32.7
-12	0.978	0.957	33.7	32.3
-6	0.995	0.989	29.4	29.1
0	1.000	1.000	26.0	26.0
6	0.995	0.989	26.4	26.1
12	0.978	0.957	25.5	24.4
18	0.951	0.905	24.0	21.7
24	0.914	0.835	23.3	19.5
30	0.866	0.750	24.6	18.5
36	0.809	0.655	26.3	17.2
42	0.743	0.552	28.6	15.8
TOTAL	13.512	----	----	381.9

D'après les chiffres ci-dessus, le fetch effectif de la direction principale du NW peut être calculé comme suit :

$$F_e = \Sigma F_i(\cos\theta_i)^2 / \Sigma \cos\theta_i = 381.9 / 13.512 = 28.3 \text{ km}$$

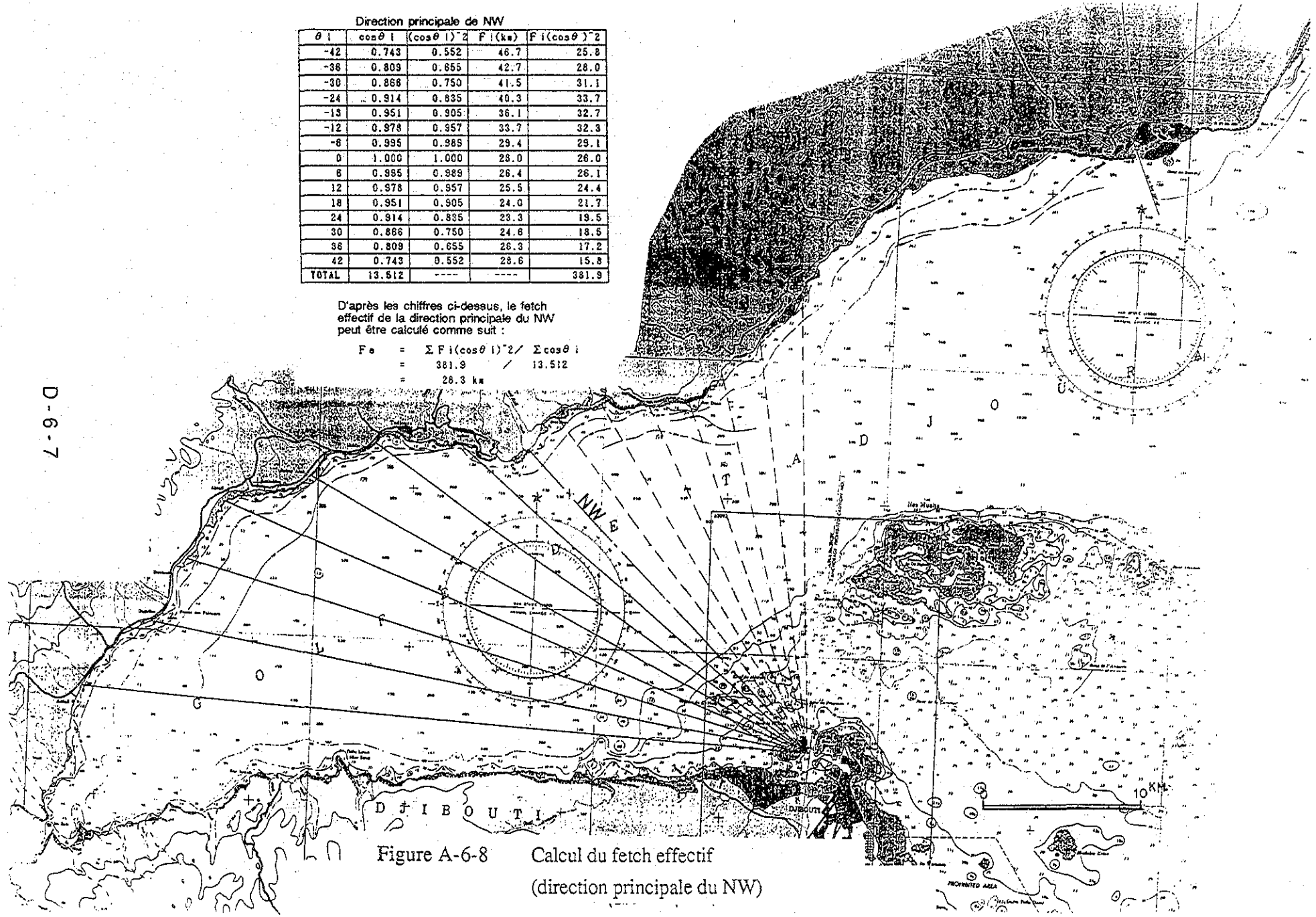


Figure A-6-8 Calcul du fetch effectif (direction principale du NW)

Direction principale de WNW

θ i	cosθ i	(cosθ i)^2	F i (km)	F i (cosθ)^2
-42	0.743	0.552	3.4	1.9
-36	0.809	0.655	5.0	3.3
-30	0.866	0.750	16.0	12.0
-24	0.914	0.835	47.3	39.5
-18	0.951	0.905	45.5	41.2
-12	0.978	0.957	41.8	40.0
-6	0.995	0.989	41.0	40.5
0	1.000	1.000	38.7	38.7
6	0.995	0.989	35.9	35.5
12	0.978	0.957	32.7	31.3
18	0.951	0.905	27.2	24.6
24	0.914	0.835	26.2	21.9
30	0.866	0.750	26.4	19.8
36	0.809	0.655	24.7	16.2
42	0.743	0.552	23.7	13.1
TOTAL	13.512	----	----	379.5

D'après les chiffres ci-dessus, le fetch effectif de la direction principale du WNW peut être calculé comme suit :

$$F_e = \Sigma F_i(\cos\theta_i)^2 / \Sigma \cos\theta_i = 379.5 / 13.512 = 28.1 \text{ km}$$

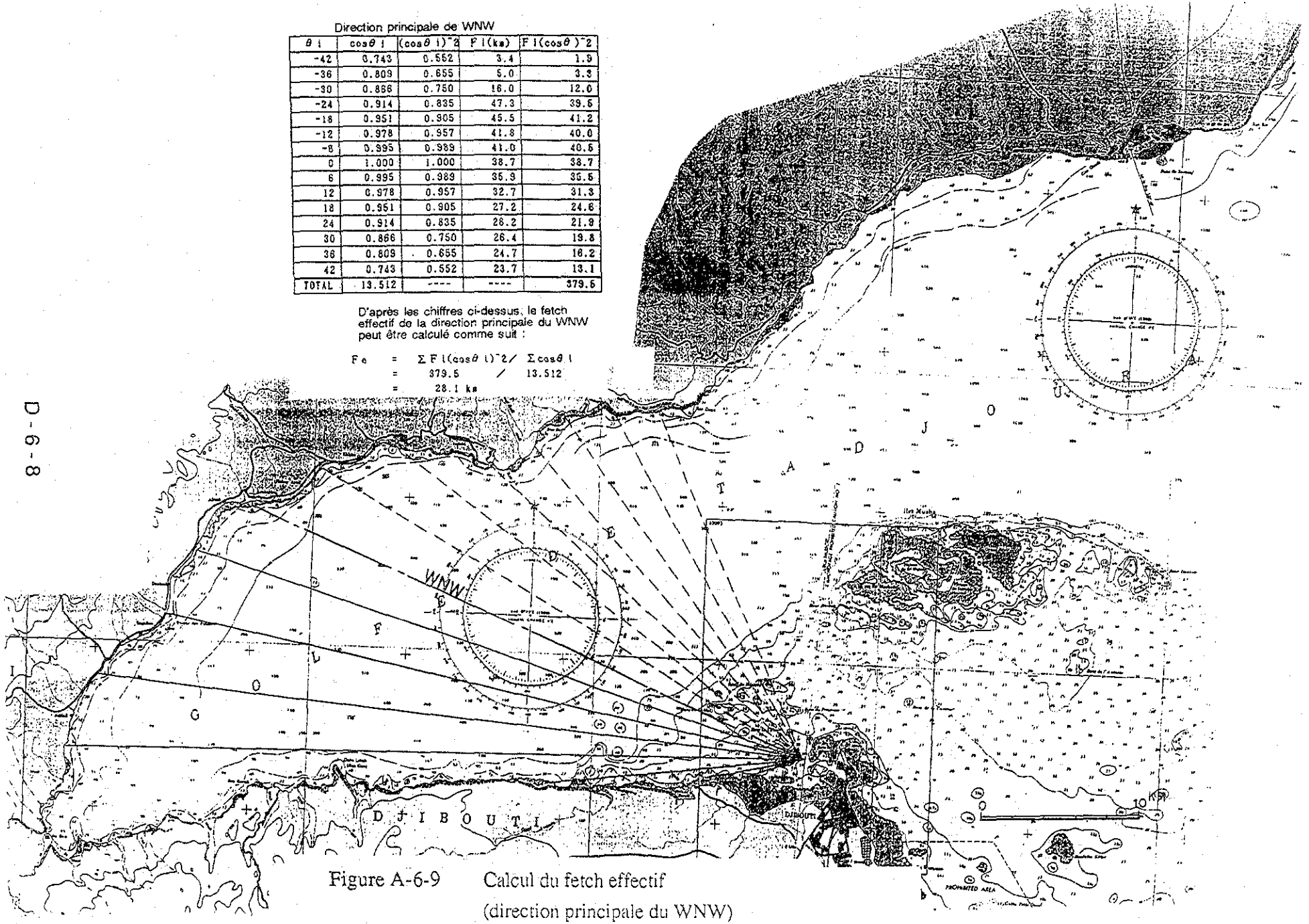


Figure A-6-9 Calcul du fetch effectif (direction principale du WNW)

Direction principale de W

θ i	cosθ i	(cosθ i)^2	F i(km)	F i(cosθ)^2
-42	0.743	0.552	1.7	0.9
-38	0.809	0.655	2.8	1.8
-30	0.866	0.750	2.7	2.0
-24	0.914	0.835	3.1	2.6
-18	0.951	0.905	4.4	4.0
-12	0.978	0.957	9.7	9.3
-6	0.995	0.989	18.1	17.9
0	1.000	1.000	47.1	47.1
6	0.995	0.989	45.0	44.5
12	0.978	0.957	41.9	40.1
18	0.951	0.905	41.1	37.2
24	0.914	0.835	37.2	31.1
30	0.866	0.750	35.4	26.6
36	0.809	0.655	31.4	20.6
42	0.743	0.552	26.4	14.6
TOTAL	13.512	----	----	300.3

D'après les chiffres ci-dessus, le fetch effectif de la direction principale du W peut être calculé comme suit :

$$F_e = \Sigma F_i(\cos\theta_i)^2 / \Sigma \cos\theta_i = 300.3 / 13.512 = 22.2 \text{ km}$$

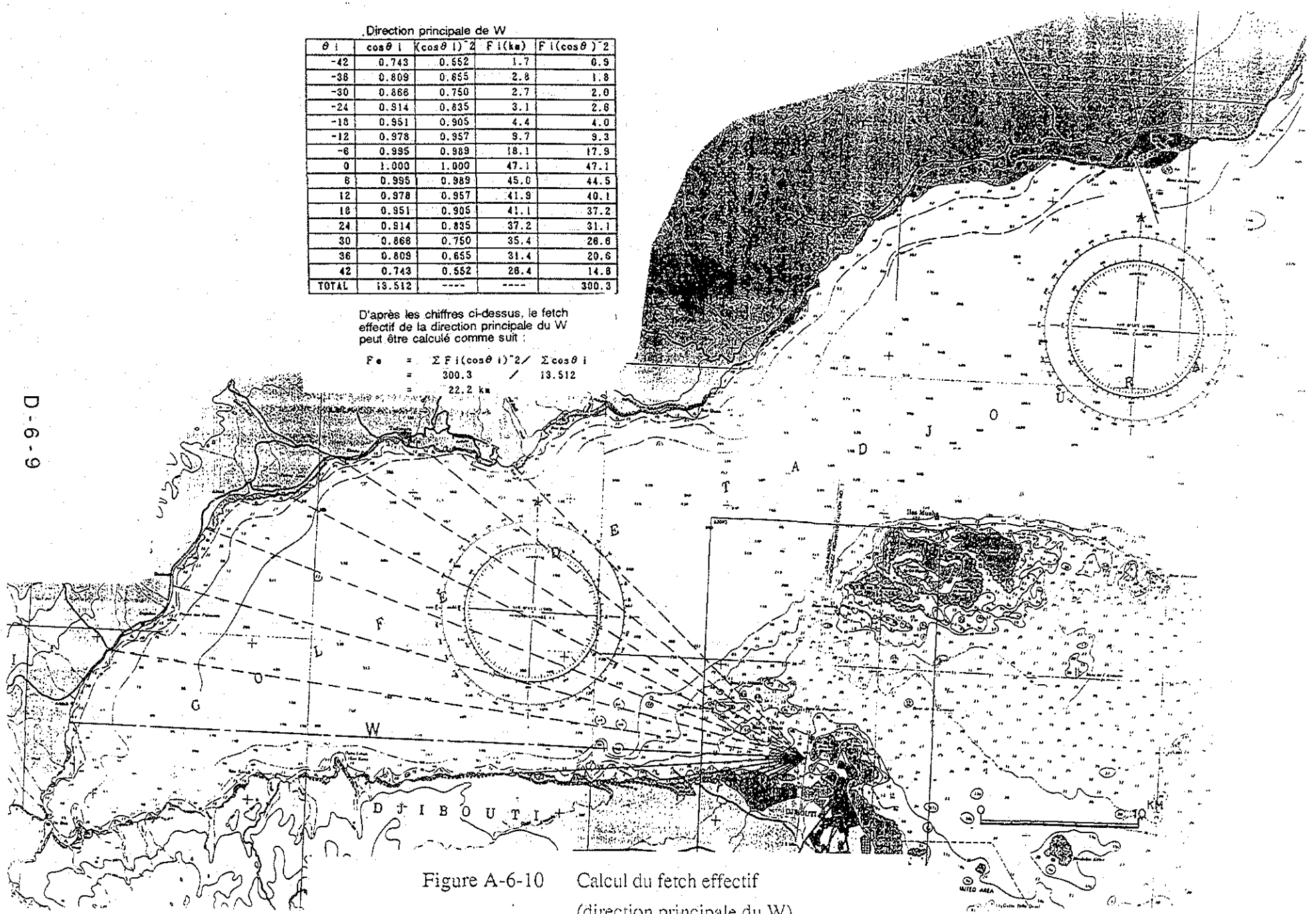


Figure A-6-10 Calcul du fetch effectif (direction principale du W)

Données portant sur la vitesse du vent pour l'estimation des vagues et résultats d'estimation.

Comme l'indique le tableau A-6-2, les données utilisées pour l'estimation des vagues portent sur la vitesse du vent maximum mensuelle d'une intervalle de 10 minutes en moyenne. L'estimation de la hauteur de vague sinificative s'est appuyée sur la méthode SMB, en considérant le fetch effectif des valeurs de la direction du NNE à l'ouest extraites par ces données. Les résultats en sont indiqués dans le tableau A-6-3.

Tableau A-6-2 Moyenne de vitesse du vent maximum mensuelle d'une intervalle de 10 minutes

Année	Jan.	Fév.	Mar.	Avr.	Mai	Juin	Juil.	Aoû.	Sep.	Oct.	Nov.	Dec.
1971	08008	08008	06012	08010	04010	06009	27014	27012	06011	08009	06014	02011
1972	08009	08011	08008	08010	08010	35012	27011	36013	08022	02018	08008	08012
1973	08011	08009	06012	06008	06011	06010	34012	27012	27010	06010	08009	06014
1974	08011	08011	06010	06008	18015	22016	32018	24013	36016	04009	08009	08008
1975	08009	08012	06008	08011	06009	06011	27015	36024	27012	36011	08010	06010
1976	04010	04010	04012	04010	04011	36016	34018	24017	02012	04011	04010	06011
1977	04013	04012	06011	27014	06011	04012	27012	27017	08011	06011	08009	08012
1978	08013	08013	08010	06010	02015	32015	30026	36021	27012	06012	04014	06019
1979	06014	06018	04011	02010	36013	37014	24014	36014	18014	06017	04013	04013
1980	02013	08013	08012	04011	04011	36015	36014	04013	02017	06012	06010	06013
1981	06014	*****	*****	06011	06011	06012	32021	27016	04012	04010	06011	06011
1982	02013	02014	04014	22016	36015	02012	27016	06012	06012	12012	04014	04013
1983	04012	04016	02012	27013	22014	06013	14036	04032	04013	06012	08010	08012
1984	08012	03012	06010	08010	02014	27012	04012	04012	02015	08011	06012	06014
1985	08013	02014	08009	08017	36012	36013	36036	36021	02012	08011	08011	08013
1986	08011	06013	06010	04011	08010	36012	36012	27011	24013	04011	08013	06011
1987	08010	06010	06011	06010	06010	04013	06011	04011	36015	06012	04010	04011
1988	04013	06011	02011	04011	02010	36016	36015	32020	32015	36015	04010	06011
1989	04012	06012	24017	04015	06010	36017	27014	34017	04011	04013	06012	02014
1990	04015	02011	06009	06015	06010	04011	27012	04011	04011	06008	08008	08011

Source: Météo

Note) ddduu ddd = Direction du vent (N=360°, E=90°)
uu = Vitesse du vent (m/s)

Tableau A-6-3 Résultat de la hauteur de houle et la période effectives

Année	NNE			N			NNW			NW			WNW			W		
	(m/s) U	(m) H1/3	(s) T1/3	(m/s) U	(m) H1/3	(s) T1/3	(m/s) U	(m) H1/3	(s) T1/3	(m/s) U	(m) H1/3	(s) T1/3	(m/s) U	(m) H1/3	(s) T1/3	(m/s) U	(m) H1/3	(s) T1/3
1971	11	0.9	3.3													14	1.3	4.0
1972	18	1.5	4.1	13	1.2	3.9										11	1.0	3.6
1973							12	1.2	3.9							12	1.1	3.7
1974				16	1.3	3.9				18	1.6	4.2						
1975				24	1.5	3.8										15	1.4	4.2
1976	12	0.9	3.4	16	1.3	3.9	18	1.6	4.2									
1977																17	1.5	4.0
1978	15	1.2	3.8	21	1.3	3.4				15	1.6	4.4	28	1.8	4.0	12	1.1	3.7
1979	10	0.8	3.1	14	1.3	4.0												
1980	17	1.4	4.0	15	1.4	4.1												
1981										21	1.3	3.4				16	1.3	3.9
1982	14	1.1	3.6	15	1.4	4.1										16	1.3	3.9
1983	12	0.9	3.4													13	1.2	3.9
1984	15	1.2	3.8													12	1.1	3.7
1985	14	1.1		36	----	----												
1986				12	1.1	3.7										11	1.0	3.6
1987				15	1.4	4.1												
1988	11	0.9	3.3	16	1.3	3.9				20	1.8	4.5						
1989	14	1.1	3.6	17	1.5	4.0	17	1.5	4.0							14	1.3	4.0
1990	11	0.9	3.3													12	1.1	3.7

6-3 Mesures des marées

Les marées observées lors de la bathymétrie et de l'étude des courants de marées sont présentées dans le tableau A-6-4. Le tableau A-6-5 montre la comparaison des marégrammes fournies par ISERST et de l'Annuaire des marées marines.

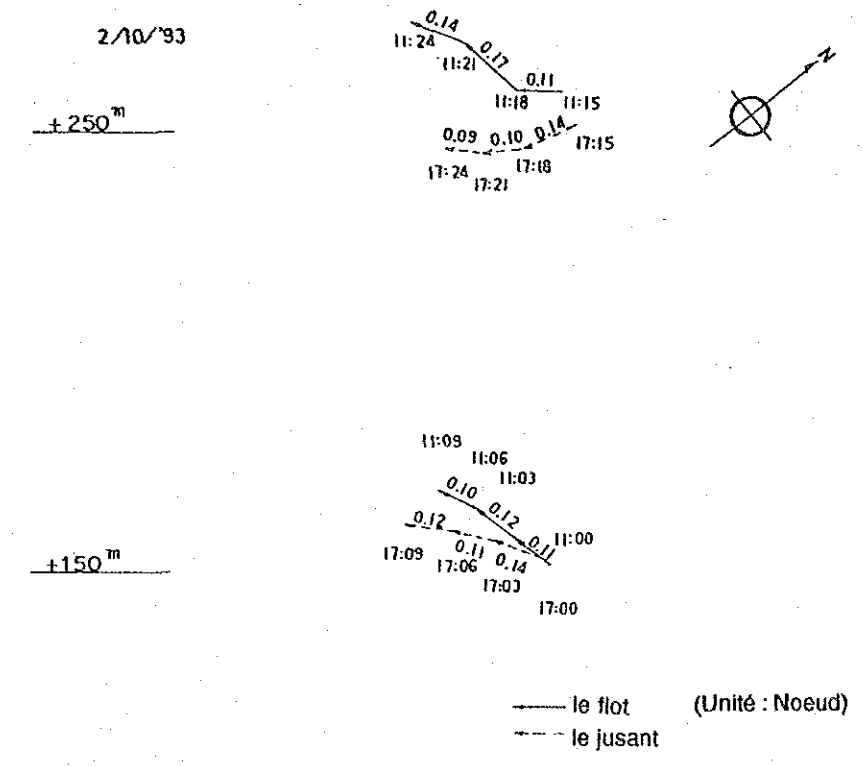
Tableau A-6-4 Valeurs des mesures de marées

Date	Heure	Marée	Date	Heure	Marée
11/9	7:00	+1.87	27/9	14:00	+1.57
	8:00	+1.81		14:30	+1.67
	9:00	+1.76		15:00	+1.79
	10:00	+1.79		15:30	+1.91
	11:00	+1.85		16:00	+2.01
	12:00	+1.94			
	13:00	+2.00	28/9	14:30	+1.50
	14:00	+2.05		15:00	+1.57
	14:56	+2.08		15:30	+1.75
	15:00	+2.06		16:00	+1.87
				16:30	+2.01
12/9	7:00	+2.00		17:00	+2.14
	8:00	+1.86			
	9:00	+1.71	29/9	8:00	+2.35
	10:00	+1.63		8:30	+2.23
13/9	7:00	+2.15	30/9	7:30	+2.50
	8:00	+1.94		8:00	+2.47
	9:00	+1.74		8:30	+2.38
	10:00	+1.53		9:00	+2.27
	11:00	+1.43		9:30	+2.10
	12:00	+1.42		10:00	+1.97
	13:00	+1.54			
23/9	12:00	+2.10	2/10	7:00	+2.59
	12:30	+2.09		8:00	+2.60
	13:00	+2.08		9:00	+2.47
	13:30	+2.06		10:00	+2.14
	14:00	+2.02		11:00	+1.81
	14:30	+1.98		12:00	+1.37
	15:00	+1.91		13:00	+1.06
	15:30	+1.87		14:00	+0.90
	16:00	+1.80		15:00	+0.95
				16:00	+1.15
25/9	15:00	+1.98		17:00	+1.45
	15:30	+2.00		18:00	+1.78
	16:00	+2.04			
	16:30	+2.06			
	17:00	+2.05			
	17:30	+2.01			
26/9	14:00	+1.82			
	14:30	+1.81			
	15:00	+1.90			
	15:30	+1.98			
	16:00	+2.06			

Tableau A-6-5 Comparaison des données de marées fournies par ISERST avec celles de l'Annuaire des marées marines

Date	Heure	Marée		Date	Heure	Marée		Date	Heure	Marée	
		Annuaire	ISERST			Annuaire	ISERST			Annuaire	ISERST
Sept 13	0629	2.3	2.30	23	0416	2.0	2.03	3	0247	1.4	1.50
	1201	1.4	1.49		0817	1.9	1.90		0832	2.5	2.62
	1733	2.3	2.38		1245	2.0	2.08		1527	0.8	----
					2102	1.0	1.16		2158	2.2	2.31
14	0020	0.8	----	24	0535	2.1	2.13	4	0309	1.5	1.56
	0655	2.4	2.47		1101	1.8	1.81		0852	2.4	2.58
	1248	1.2	1.24		1501	1.9	1.99		1558	0.8	----
	1835	2.4	2.51		2228	1.1	1.18		2236	2.1	2.22
15	0103	0.8	----	25	0610	2.2	2.19	5	0331	1.6	1.59
	0724	2.6	2.60		1200	1.6	1.68		0915	2.4	2.49
	1333	0.9	----		1654	1.9	2.03		1633	0.8	----
	1930	2.5	2.57		2330	1.1	1.21		2321	2.0	2.12
16	0145	0.9	----	26	0631	2.2	2.29	6	0354	1.7	1.64
	0758	2.7	2.74		1236	1.5	1.52		0943	2.4	2.40
	1417	0.7	----		1759	2.0	2.18		1714	0.9	----
	2022	2.5	2.62								
17	0225	0.9	----	27	0010	1.2	1.21	7	0018	2.0	2.04
	0833	2.9	2.85		0645	2.3	2.34		0426	1.7	1.74
	1502	0.6	----		1303	1.3	1.43		1015	2.3	2.33
	2115	2.5	2.59		1842	2.1	2.20		1806	0.9	1.03
18	0306	1.2	1.13	28	0040	1.2	1.24	8	0137	1.9	1.97
	0909	2.8	2.87		0700	2.3	2.38		0526	1.8	1.82
	1549	0.5	----		1326	1.2	1.28		1059	2.2	2.21
	2209	2.4	2.52		1916	2.2	2.30		1915	1.0	1.14
19	0347	1.2	1.35	29	0106	1.2	1.24	9	0319	2.0	2.02
	0944	2.7	2.79		0717	2.4	2.45		0737	1.8	1.86
	1638	0.5	----		1346	1.1	1.19		1236	2.0	2.11
	2307	2.3	2.32		1947	2.2	2.34		2034	1.1	1.15
20	0430	1.4	1.50	30	0132	1.3	1.32	10	0422	2.1	2.11
	1020	2.6	2.65		0736	2.4	2.52		0939	1.7	1.72
	1731	0.6	----		1407	1.0	1.07		1436	2.0	2.02
					2018	2.3	2.36		2148	1.1	1.13
21	0015	2.1	2.19	Oct 1	0158	1.3	1.36	11	0458	2.2	2.28
	0519	1.6	1.67		0757	2.4	2.60		1056	1.5	1.51
	1057	2.4	2.47		1431	0.9	----		1617	2.1	2.17
	1830	0.8	----		2049	2.3	2.34		2251	1.1	1.08
22	0145	2.0	2.06	2	0223	1.3	1.44	12	0531	2.4	2.46
	0624	1.8	1.80		0815	2.5	2.60		1148	1.2	1.23
	1140	2.2	2.27		1458	0.8	----		1738	2.2	2.30
	1939	0.9	1.03		2124	2.2	2.38		2345	1.1	1.10

6-4 Mesure de courant



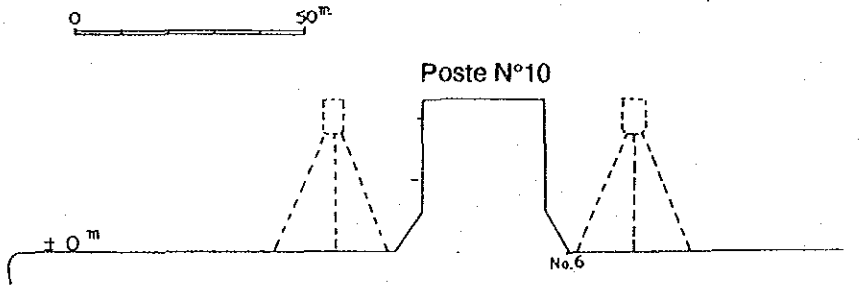
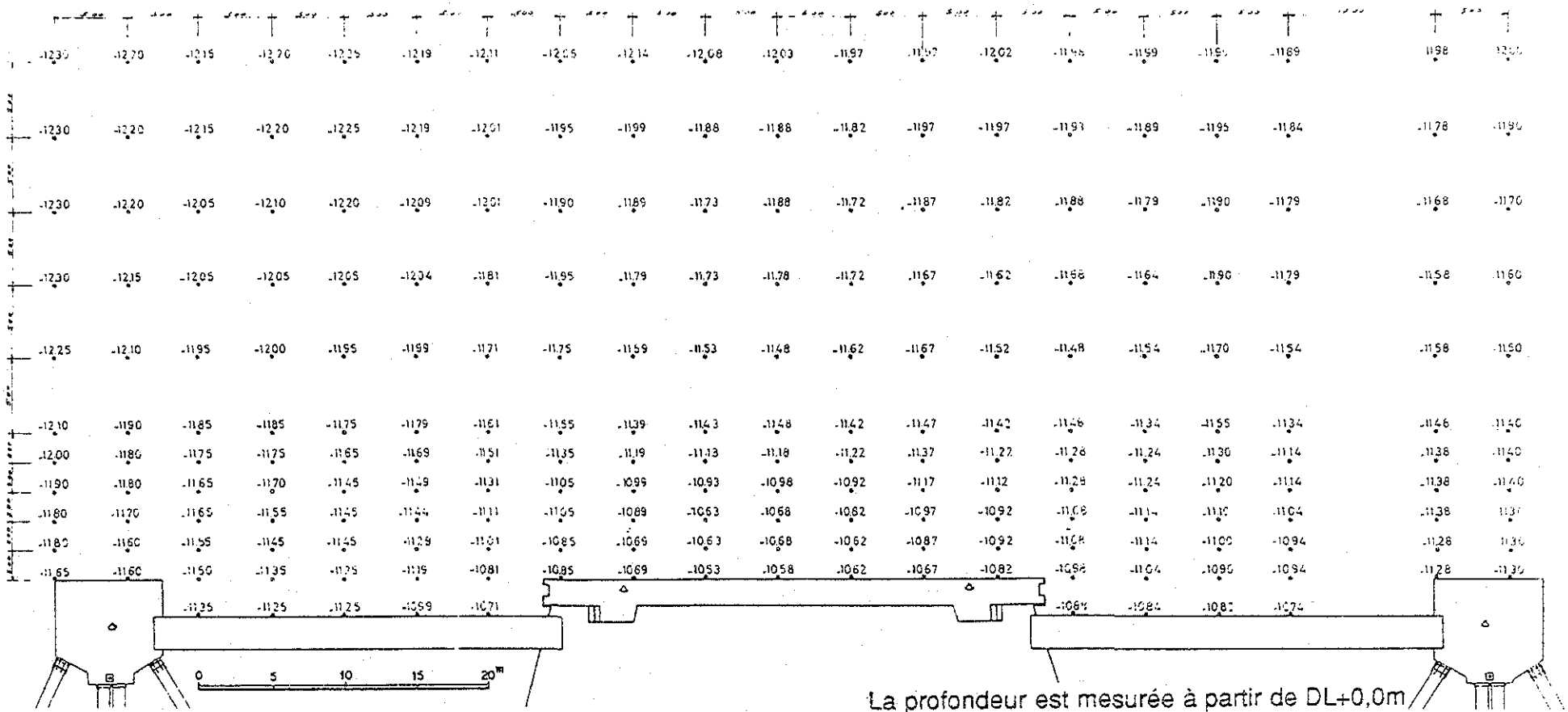


Figure A-6-11 Résultat de la mesure de courant

6-5 Levé hydrographique existant

Les résultas de la bathymétrie sont presentés dans les figures A-6-12 à A-6-14.



:Poste N°12

La profondeur est mesurée à partir de DL+0,0m
(Unité : m)

Source

PORT DE DJIBOUTI
SONDAGE AU
DROIT DU POSTE 9

Figure A-6-12 Levé hydrographique existante (1967)

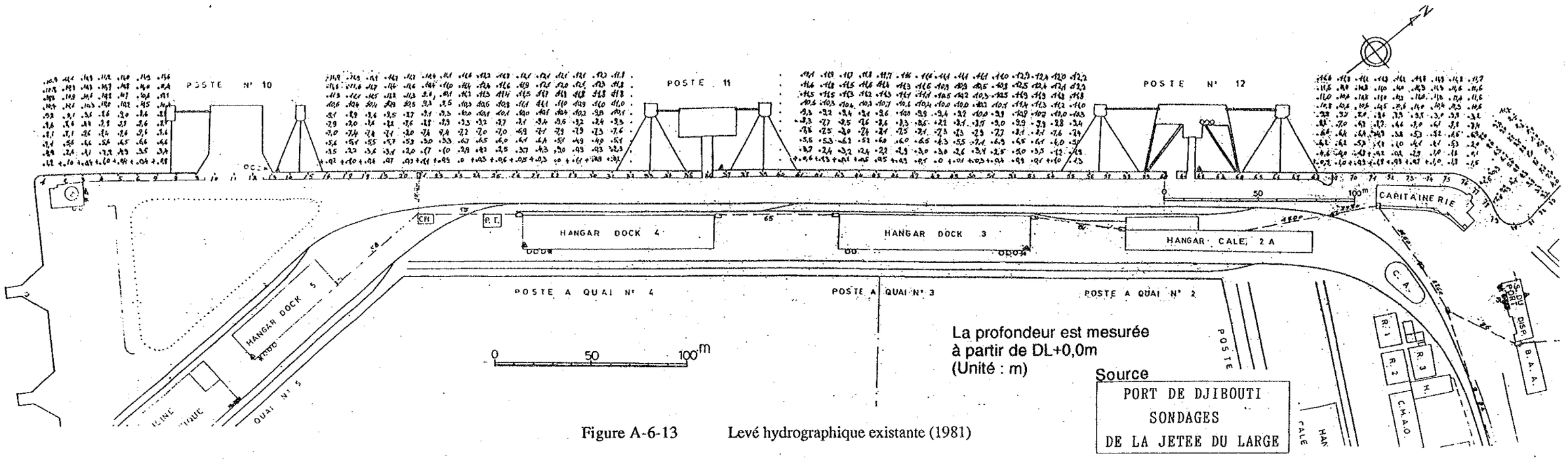


Figure A-6-13 Levé hydrographique existante (1981)

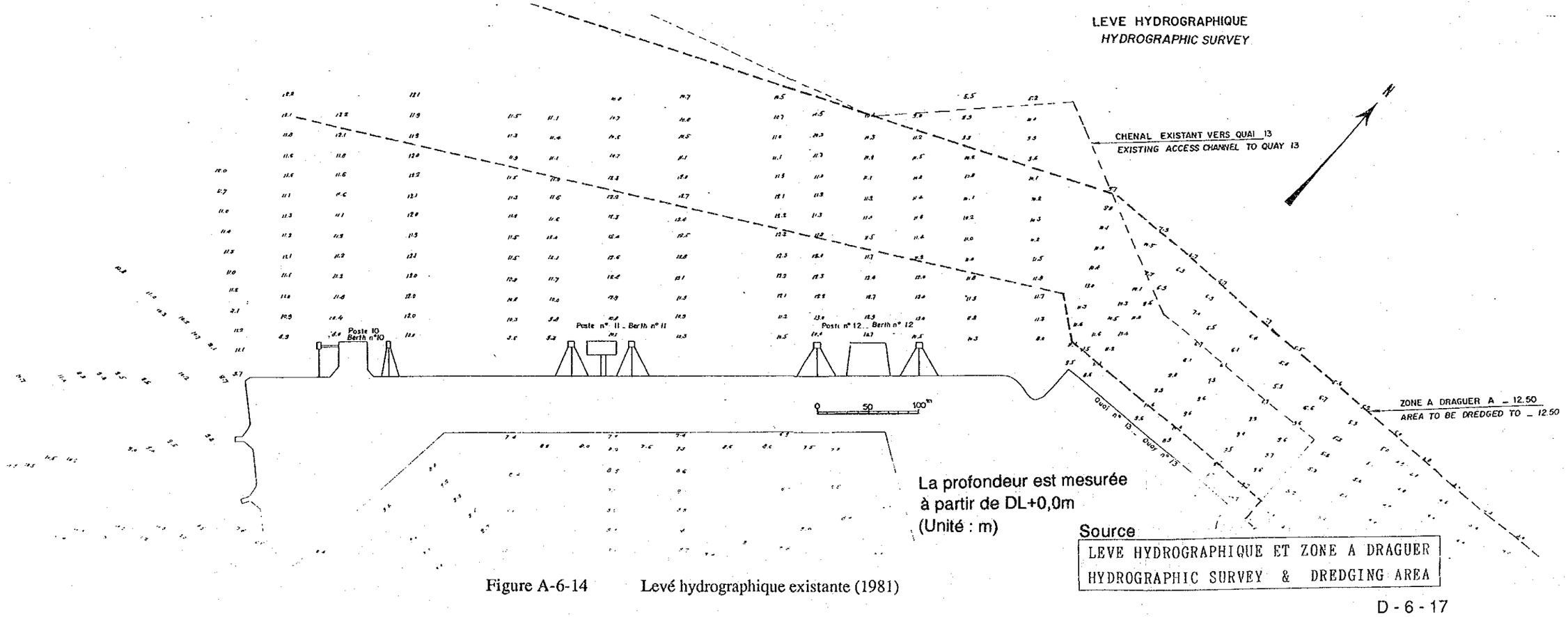


Figure A-6-14 Levé hydrographique existante (1981)

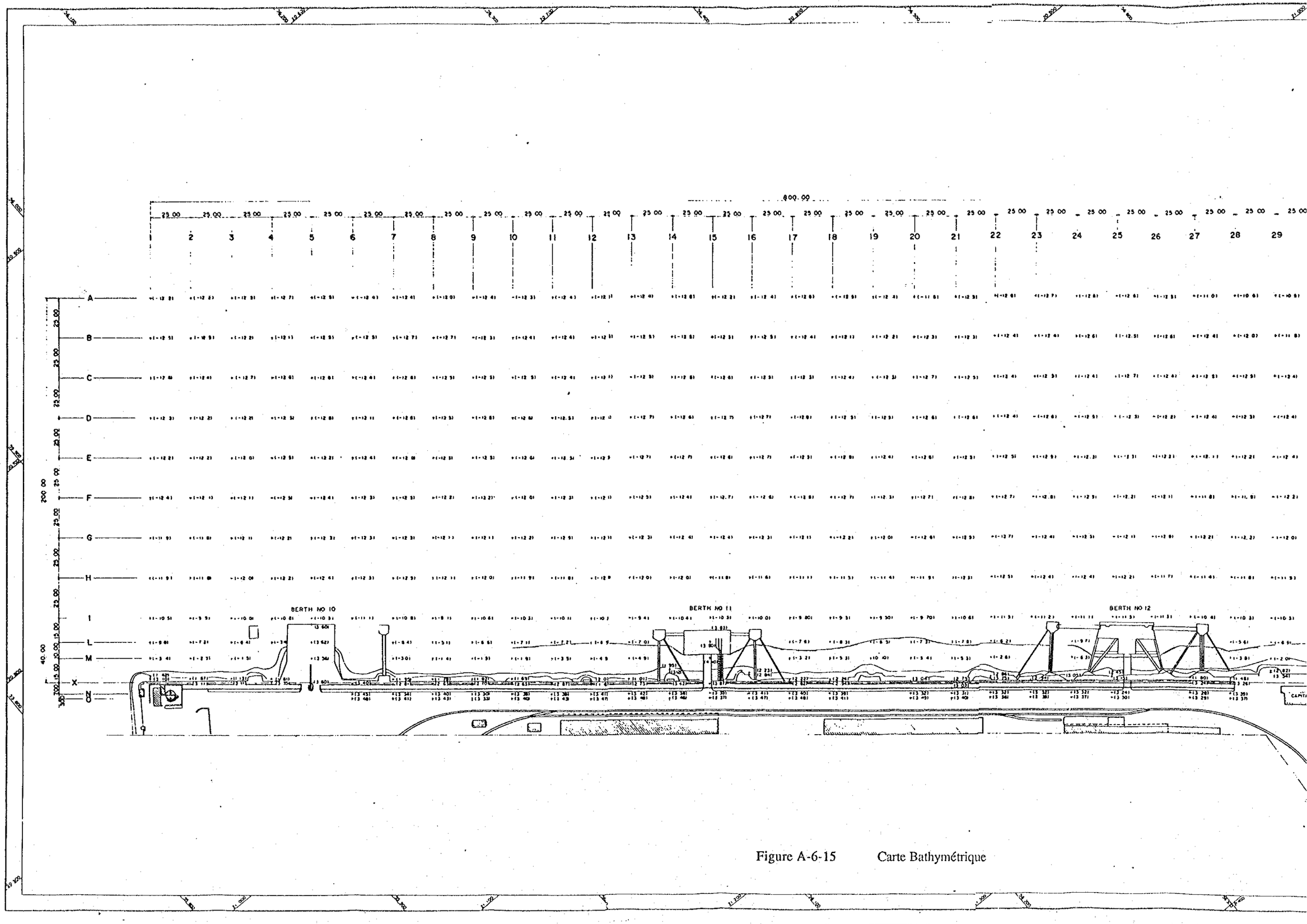


Figure A-6-15 Carte Bathymétrique

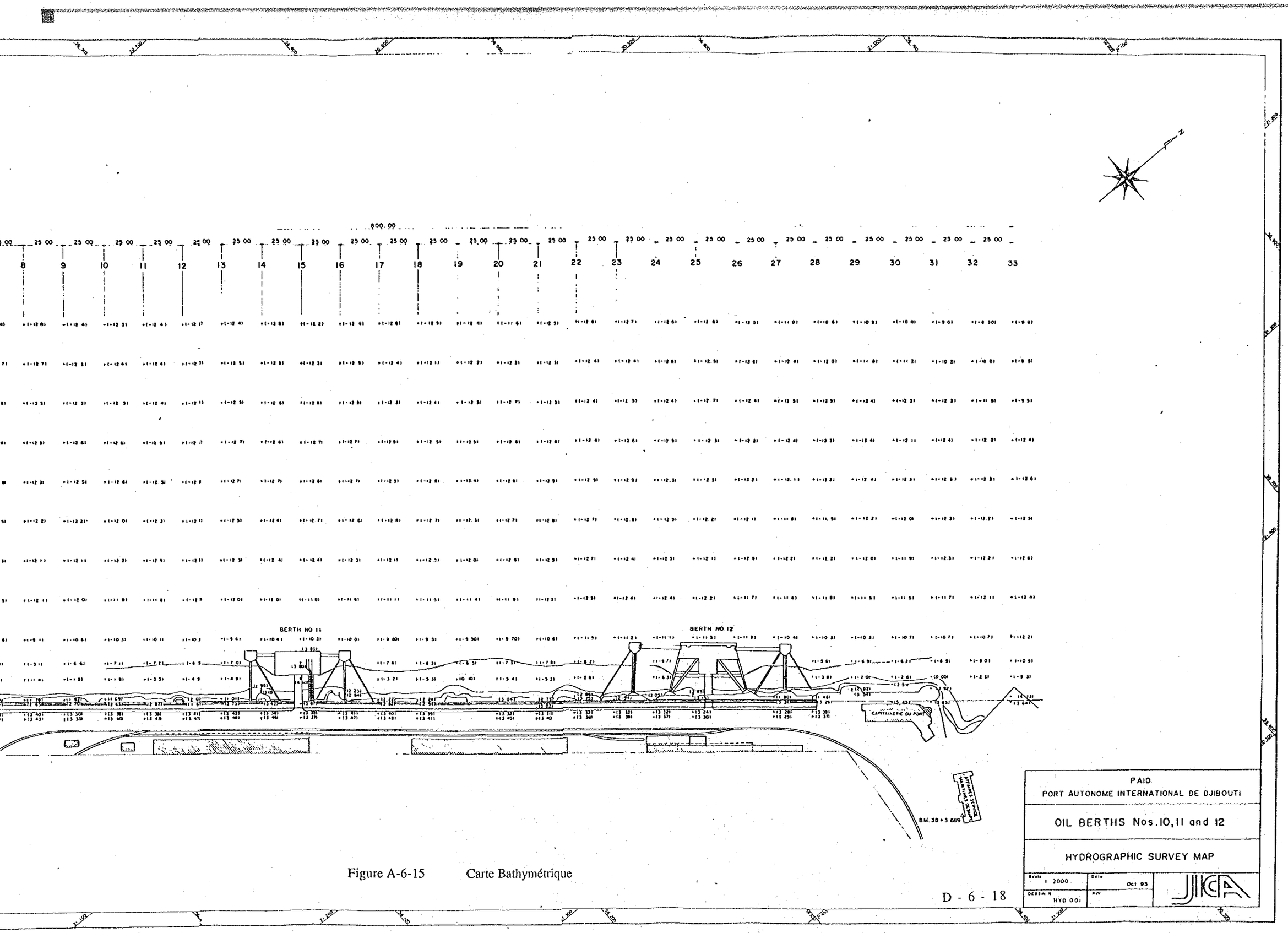
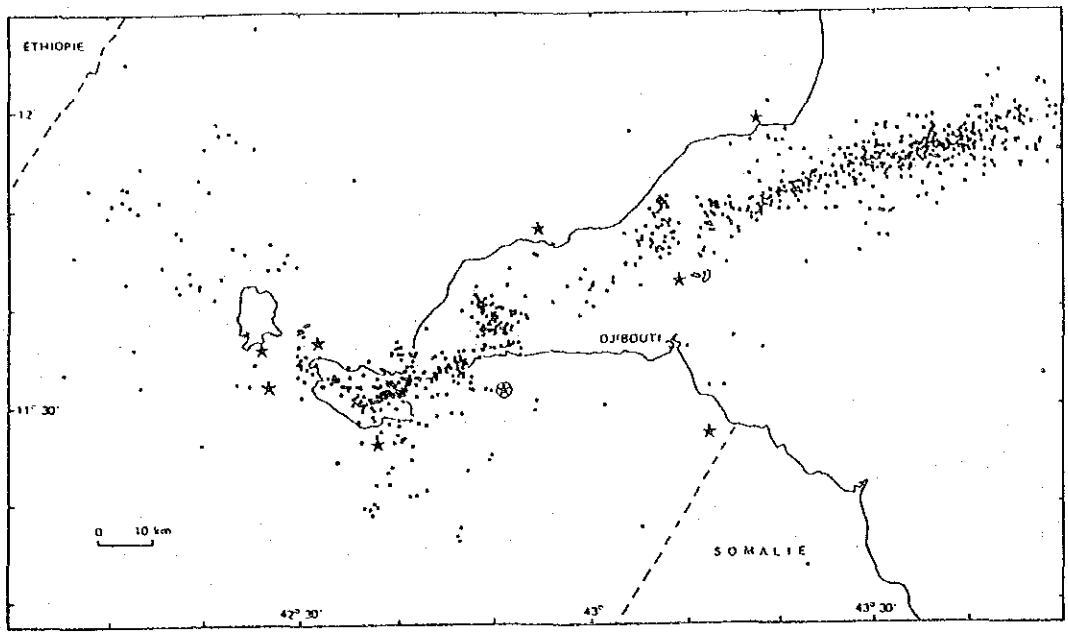


Figure A-6-15 Carte Bathymétrique

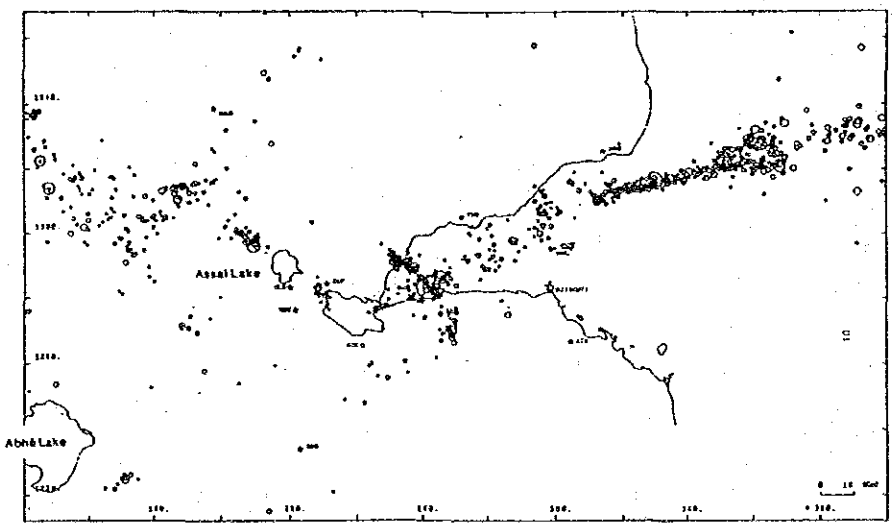
6-7 Conditions géologique et du sol



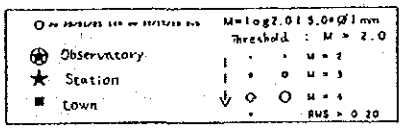
Source : Rapport sommaire sur la sismicité de Djibouti de Ahmed Omar

ISERST, 22/8/1993

Figure A-6-16 Répartition des épicentres (1974 - 1980)



Source : Rapport sommaire sur la sismicité de Djibouti de Ahmed Omar



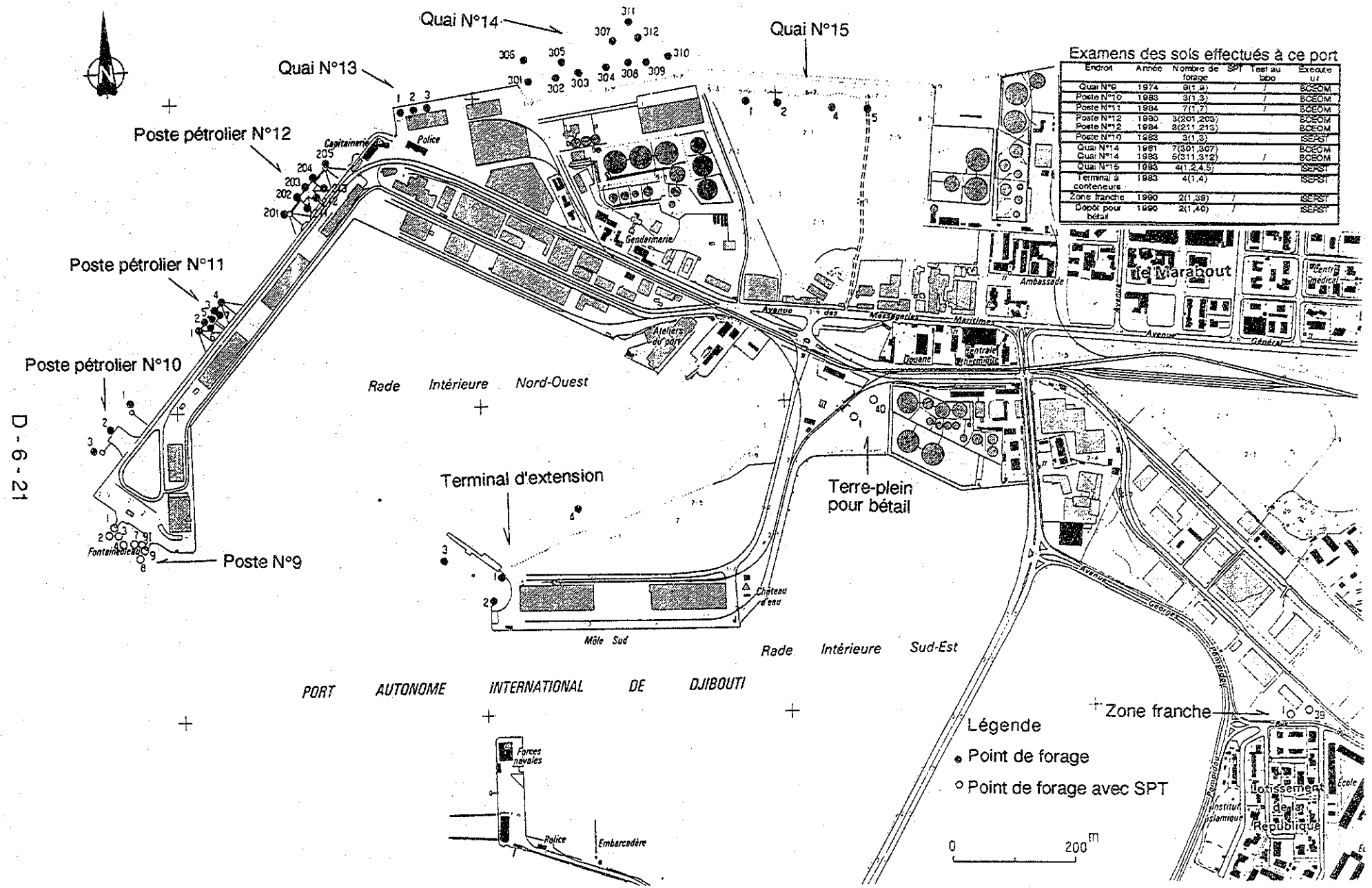
ISERST, 22/8/1993

Figure A-6-17 Répartition des épicentres (1990 - 1992)

Tableau A-6-6 Séismes enregistrés à Djibouti

Date	Magnitude	Distance depuis Djibouti	Intensité Mercalli à Djibouti	Intensité équivalente	Accélération maximum	Coefficient sismique équivalent	
						K e	Ke. moyen
1899/2	5.6	50	7	4	25 - 80	0.10 - 0.14	0.12
1899/11	3.7	40	4	2	3 - 8	0.05 - 0.07	0.06
1906/1	4.3	40	5	2	3 - 8	0.05 - 0.07	0.06
1907/1	5.0	50	6	3	8 - 25	0.07 - 0.10	0.08
1907/10	3.7	50	4	2	3 - 8	0.05 - 0.07	0.06
1909/2	3.7	50	4	2	3 - 8	0.05 - 0.07	0.06
1910/8	3.7	50	4	2	3 - 8	0.05 - 0.07	0.06
1912/5	5.6	50	7	4	25 - 80	0.10 - 0.14	0.12
1912/8	5.6	40	7	4	25 - 80	0.10 - 0.14	0.12
1926/10	5.5	90	6	3	8 - 25	0.07 - 0.10	0.08
1929/1	6.0	60	7	4	25 - 80	0.10 - 0.14	0.12
1930/10	5.6	70	7	4	25 - 80	0.10 - 0.14	0.12
1932/2	5.0	80	5	2	3 - 8	0.05 - 0.07	0.06
1938/3	4.5	80	4	2	3 - 8	0.05 - 0.07	0.06
1941/3	5.5	130	5	2	3 - 8	0.05 - 0.07	0.06
1945/10	5.6	40	7	4	25 - 80	0.10 - 0.14	0.12
1949/6	5.5	80	6	3	8 - 25	0.07 - 0.10	0.08
1953/11	4.4	70	5	2	3 - 8	0.05 - 0.07	0.06
1957/4	5.0	60	5	2	3 - 8	0.05 - 0.07	0.06
1958/5	5.5	120	5	2	3 - 8	0.05 - 0.07	0.06
1960/1	5.0	80	5	2	3 - 8	0.05 - 0.07	0.06
1961/3	6.0	60	7	4	25 - 80	0.10 - 0.14	0.12
1963/10	5.3	80	6	3	8 - 25	0.07 - 0.10	0.08
1965/7	4.5	130	3	1	1 - 3	0.03 - 0.05	0.04
1969/3	6.4	220	5	2	3 - 8	0.05 - 0.07	0.06
1973/4	5.5	35	7	4	25 - 80	0.10 - 0.14	0.12
1978/11	5.3	80					
1983/9	4.5	20					
1983/9	4.2	20					
1985/4	4.3	40					
1989/8	6.3	175					
1992/3	5.0	35					

Source: Bref rapport sur la Sismicité de Djibouti par Ahmed Omar, ISERST, 22 août 1993.
Observations effectuées par la Mission d'Etude de la JICA.



Endroit	Année	Nombre de forage	SPT	Test au labo	Exécuté par
Quai N°9	1974	9(1,9)	/	/	BCEOM
Poste N°10	1983	3(1,3)		/	BCEOM
Poste N°11	1984	7(1,7)		/	BCEOM
Poste N°12	1980	3(201,203)			BCEOM
Poste N°12	1984	3(211,213)			BCEOM
Poste N°10	1983	3(1,3)			ISEPST
Quai N°14	1981	7(301,307)			BCEOM
Quai N°14	1983	5(311,312)		/	BCEOM
Quai N°15	1983	4(1,2,4,5)			ISEPST
Terminal à conteneurs	1983	4(1,4)			ISEPST
Zone franche	1990	2(1,39)	/		ISEPST
Dépôt pour bétail	1990	2(1,40)	/		ISEPST

Figure A-6-18 Localisation des forages effectués

Sable madréporique (d'après le sondage du môle du Fontainebleau)

Poids par volume unitaire : $\gamma = 1{,}6$ tf/m^3

Essais triaxiaux (pour matière non-saturée) :

$C_{uu} = 1{,}5$ tf/m^2, $\varnothing d = 32°$

Constantes adoptées pour le projet :

$C = 0$ tf/m^2, $\varnothing = 32°$

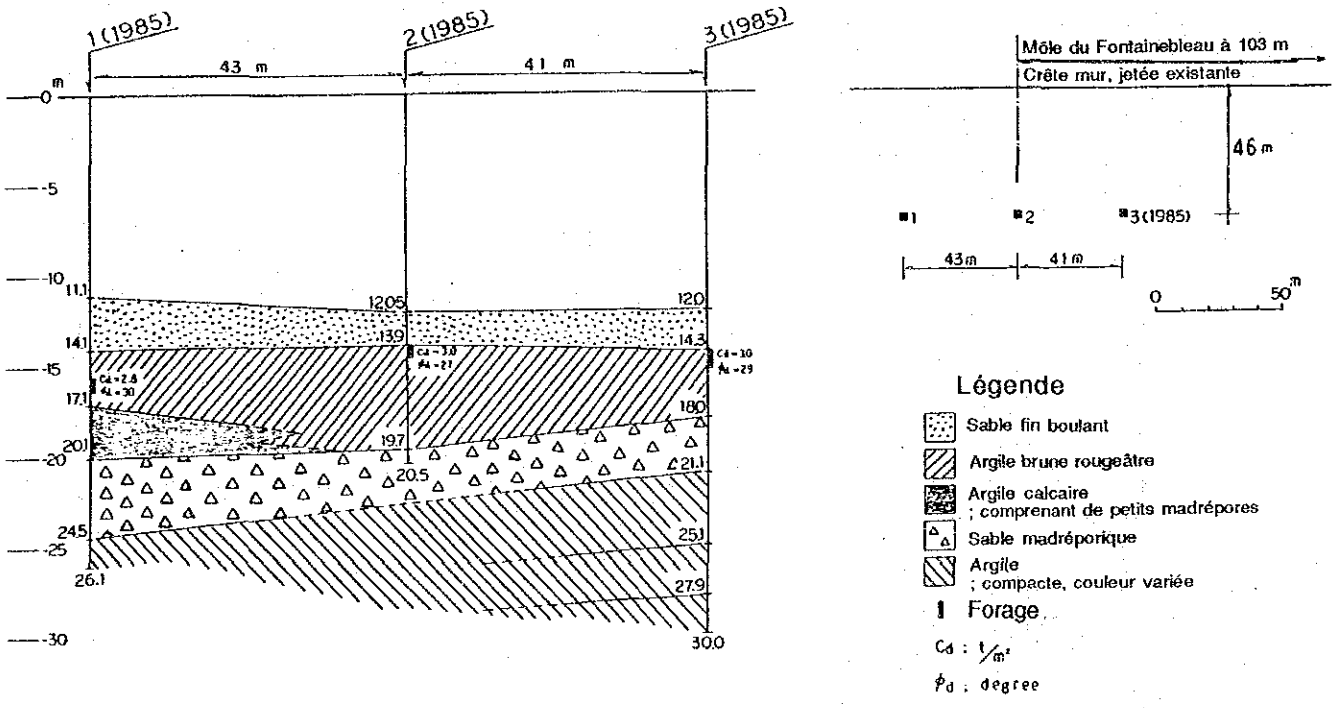
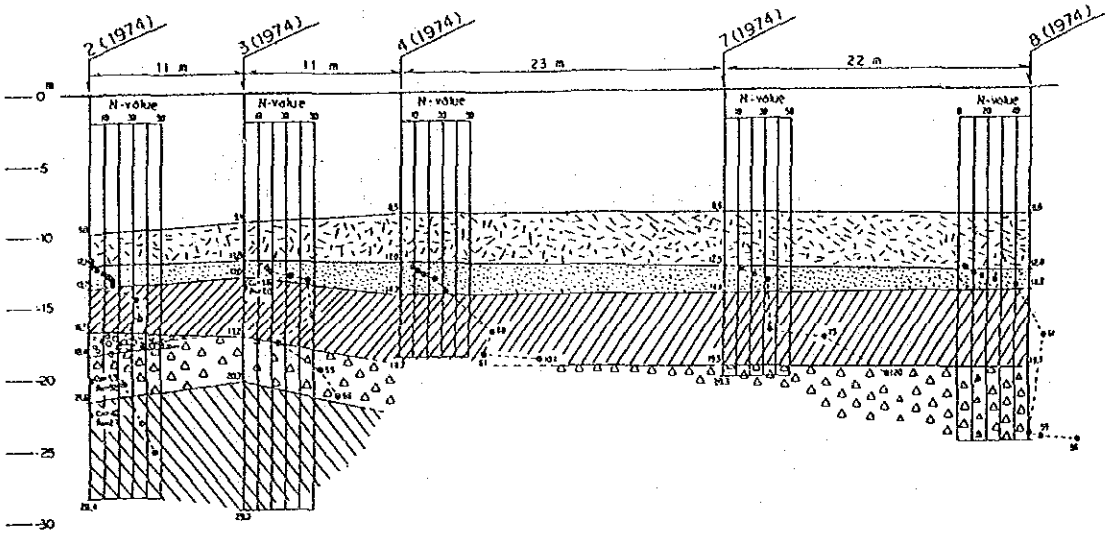
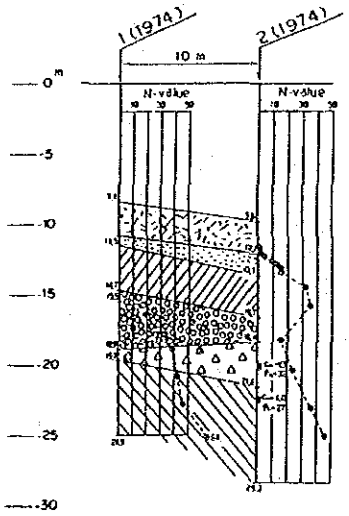


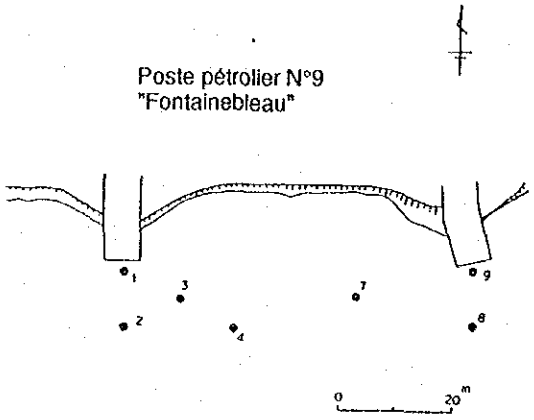
Figure A-6-19 Profil du sol près du poste N°10

Berth No. 9 (Fontainebleau Môle)

On Berth No. 9 located at the edge of the Jetée du Large, the Standard Penetration Test (SPT) was carried out in 1974 as shown in Fig. 2-14. The results of SPT show N-values in each layer are relatively high.







Légende

1 Vase 2 Sable, sable argileux ou argile sableuse 3 Argile 4 Sable argileux ou argile sableuse
5 Madrépore(avec argile ou sable) 6 Argile 7 Forage

Cu : T/m² φu : degree

Figure A-6-20 Résultat de SPT près du poste N°9 (1974)

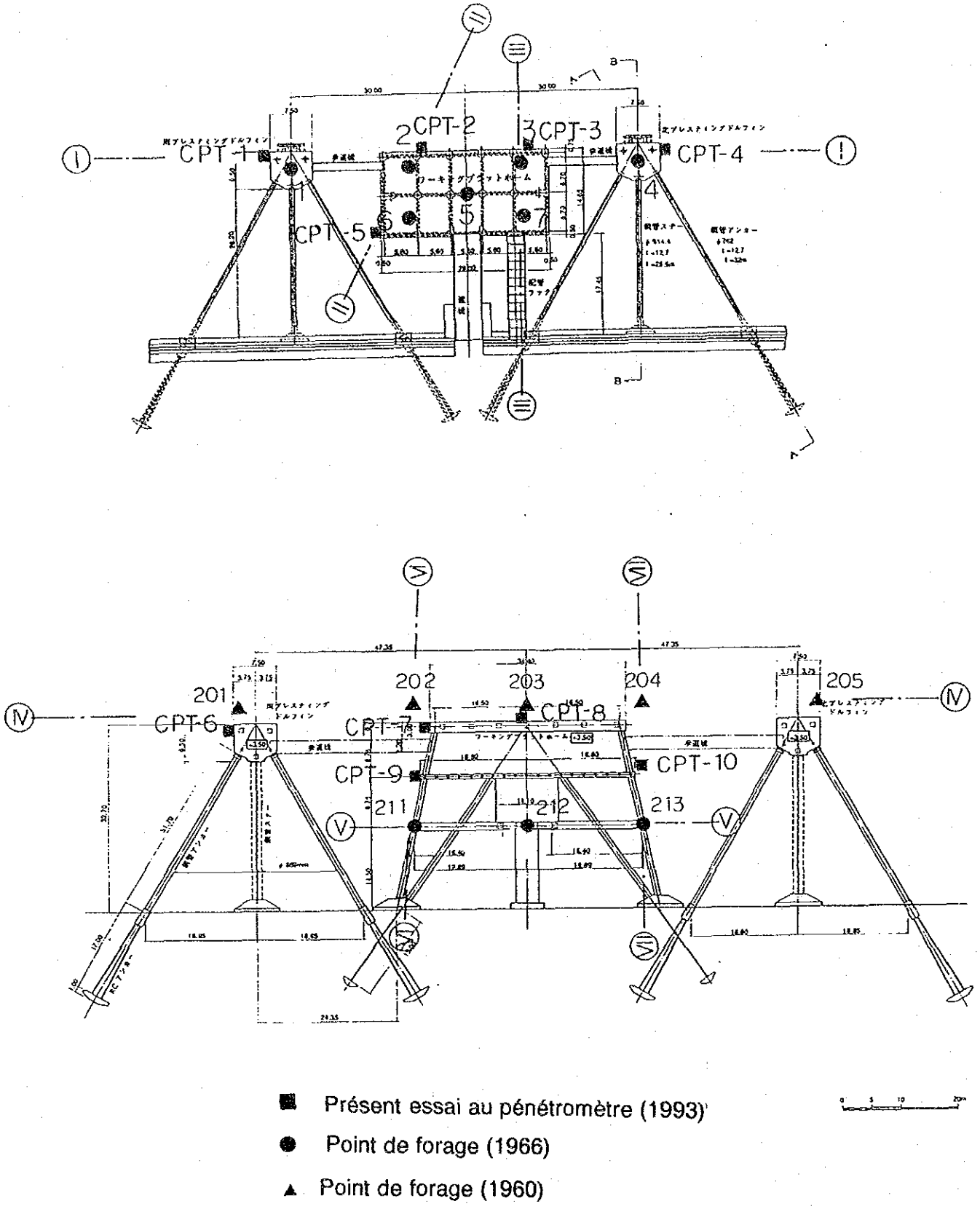


Figure A-6-21 Localisation des endroits examinés au pénétromètre

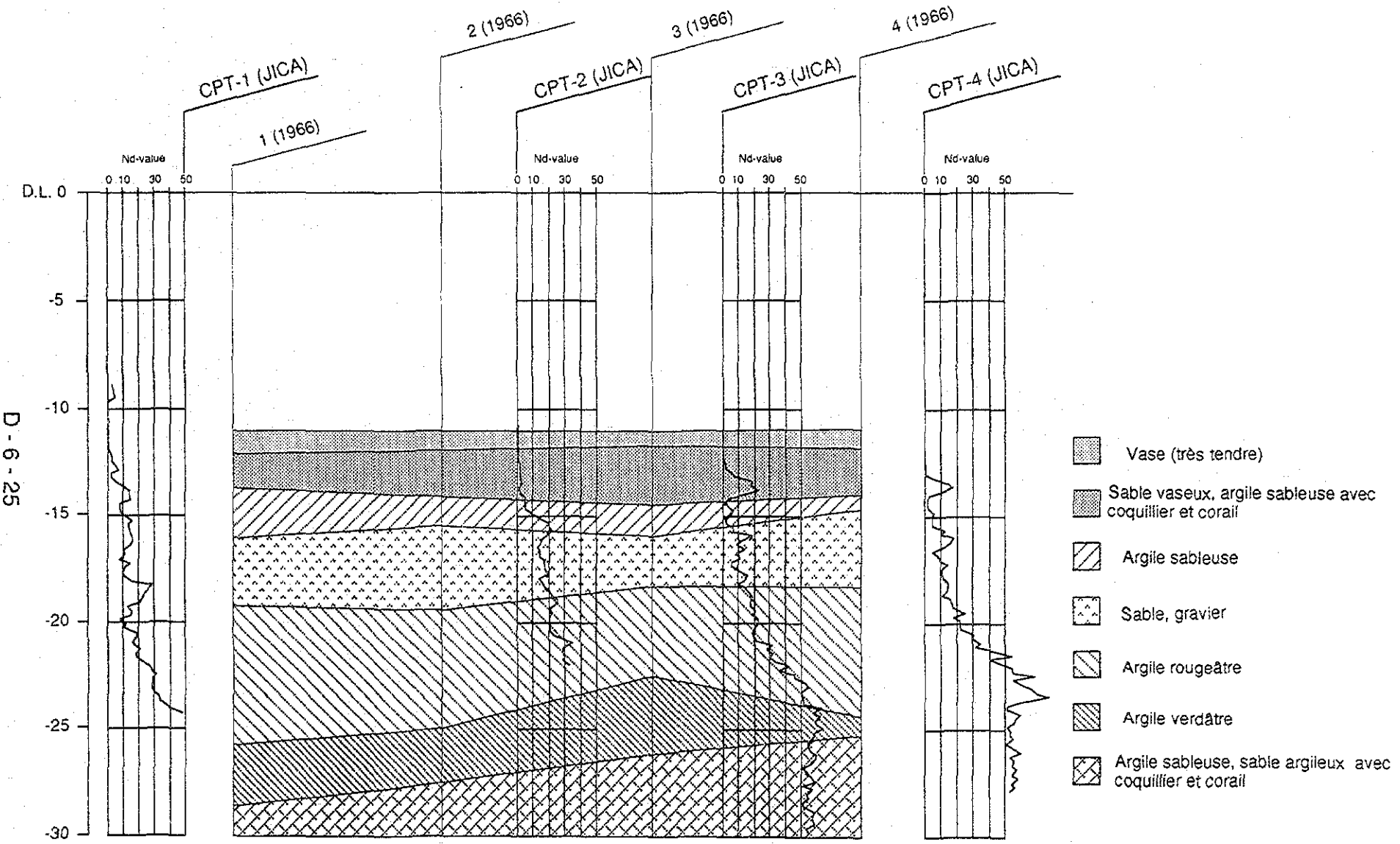


Figure A-6-22 Profil du sol près du poste N°11 (I-I)

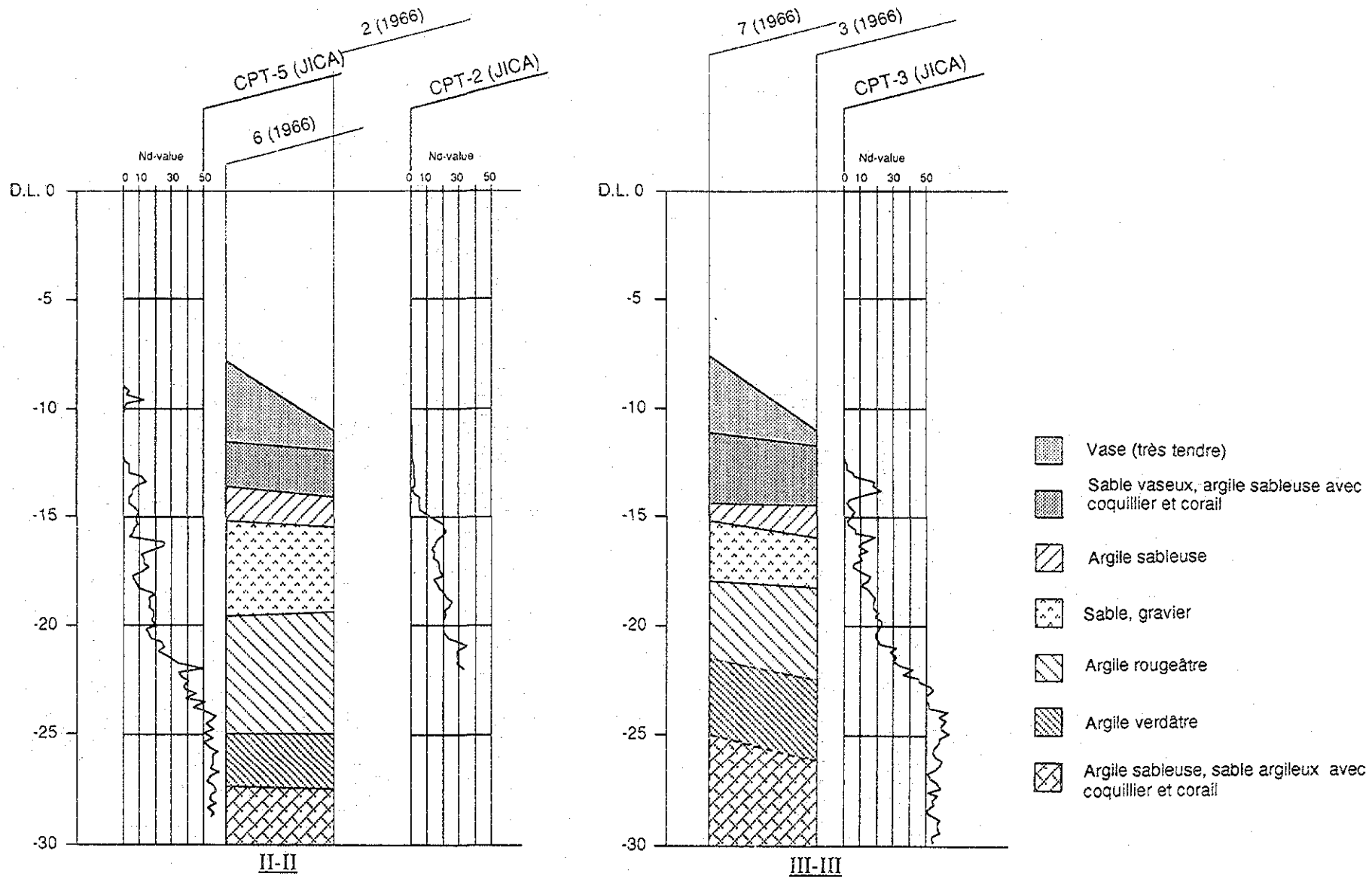


Figure A-6-23 Profil du sol près du poste N°11 (II-II, III-III)

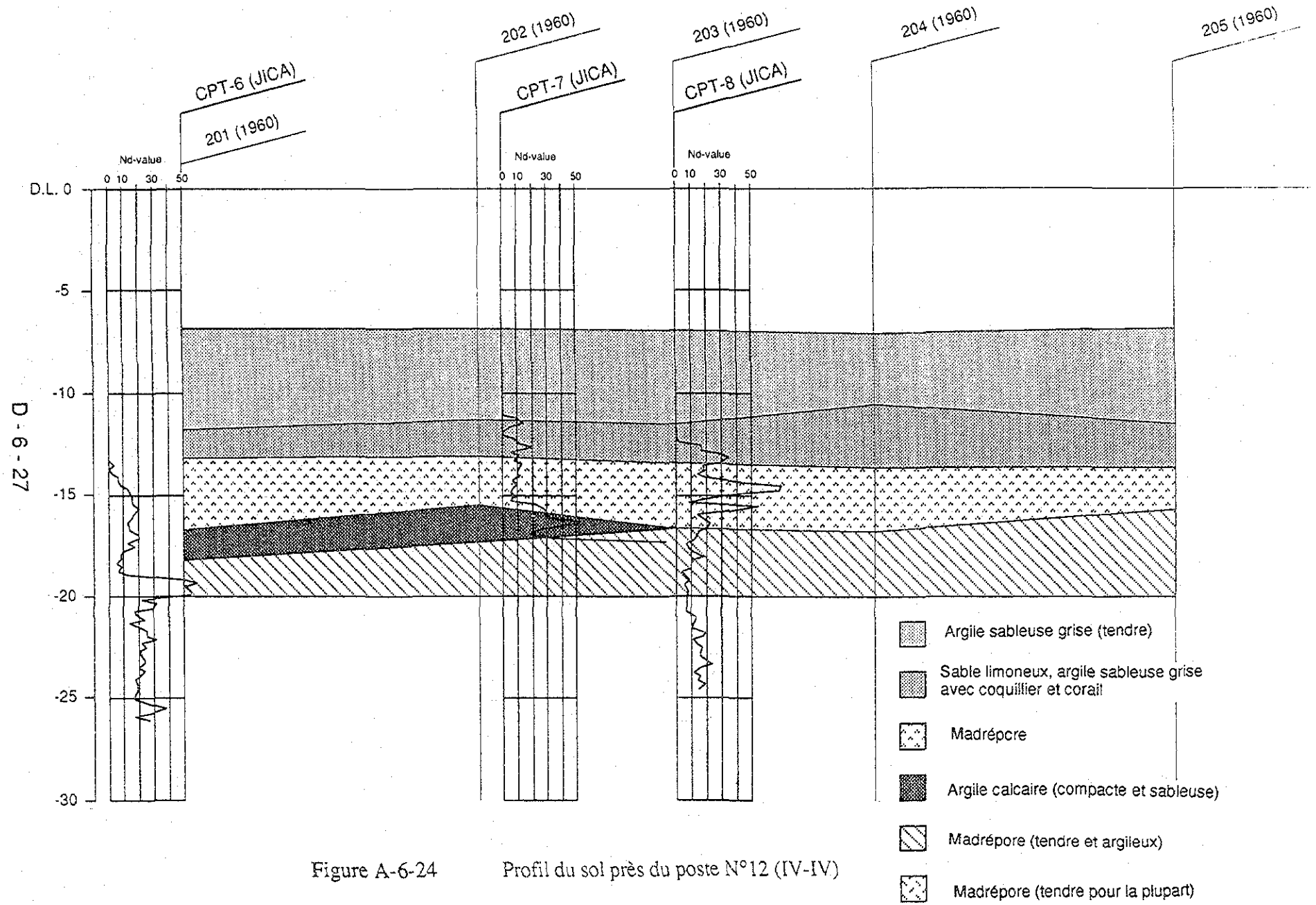


Figure A-6-24 Profil du sol près du poste N°12 (IV-IV)

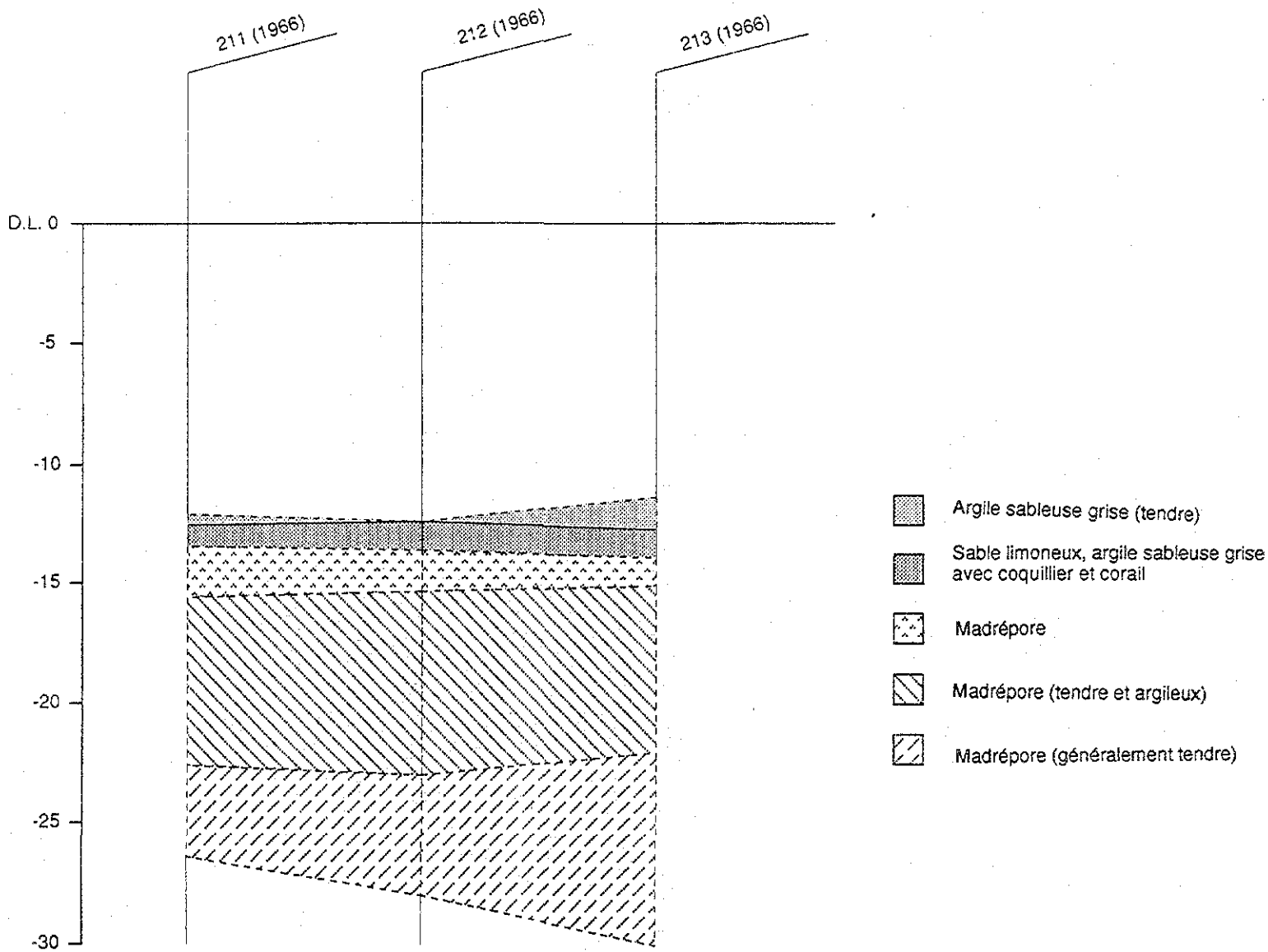


Figure A-6-25 Profil du sol près du poste N°12 (V-V)

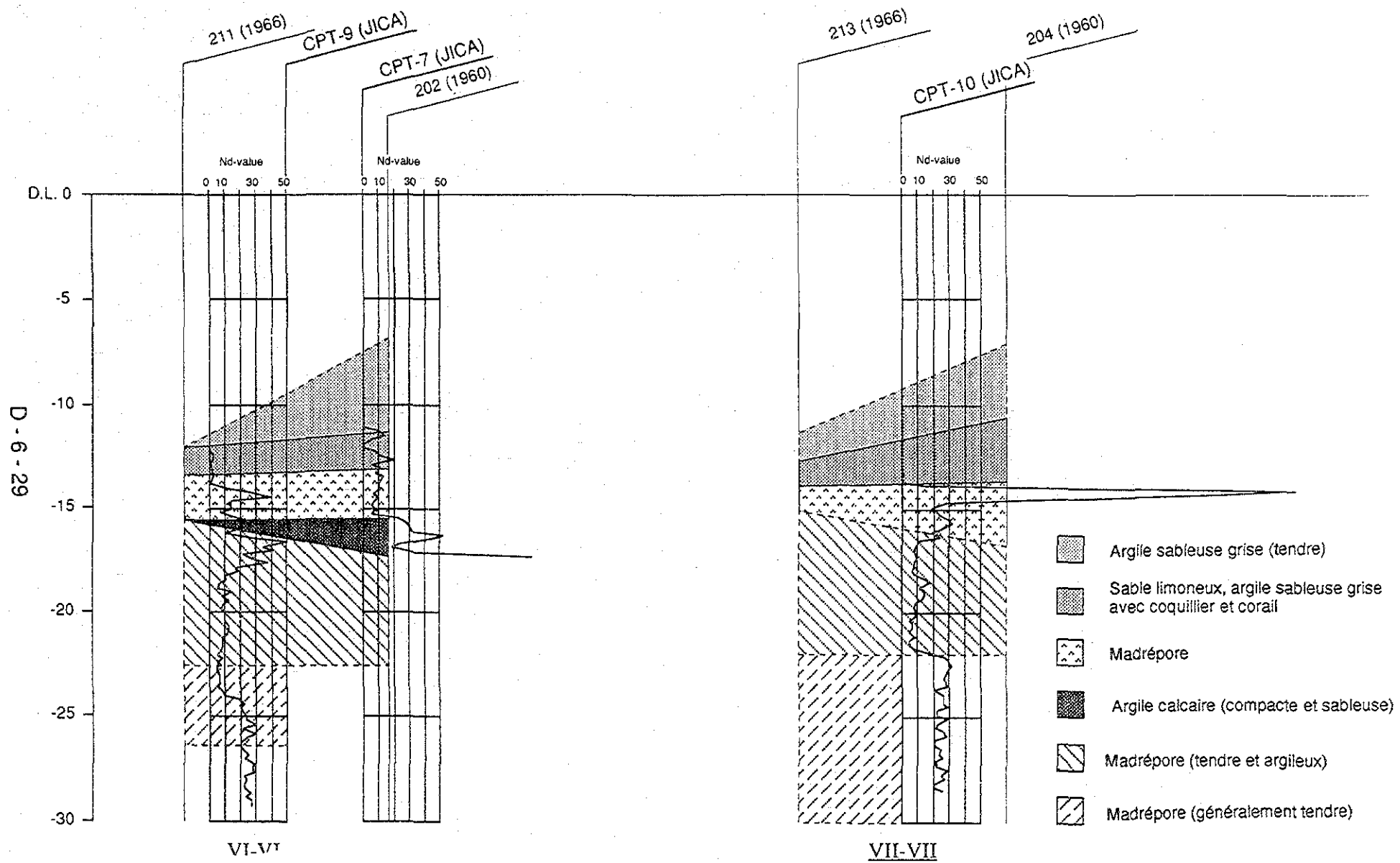


Figure A-6-26 Profil du sol près du poste N°12 (VI-VI, VII-VII)

Figure A-6-27 Résultat de l'essai au pénétromètre

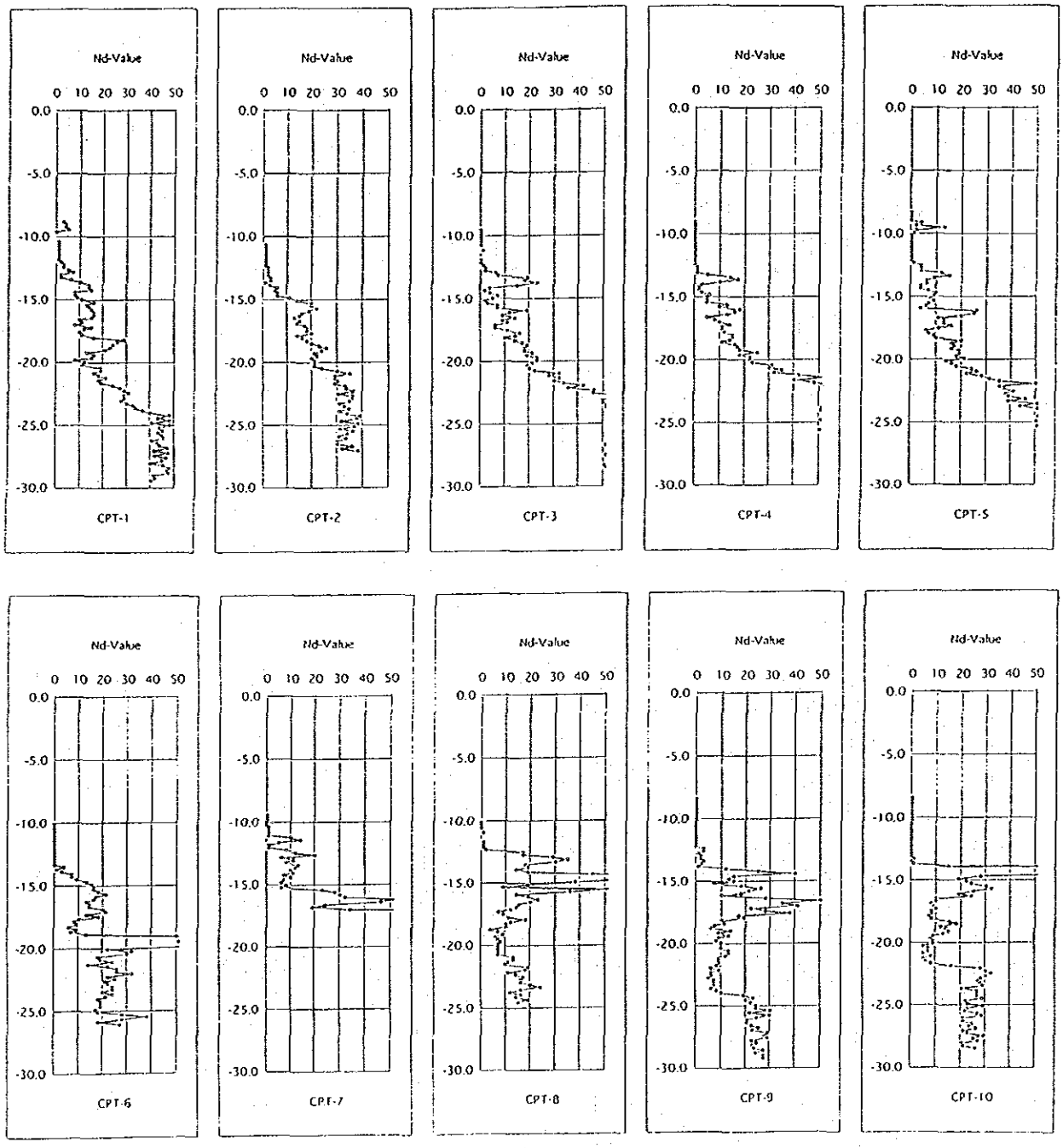
Spécification de l'essai

Drop Height : 0.5 m

Weight of the ram : 63.5 kg

Diameter of the cone : ϕ 45 mm

Number of Blows (N_d) : equivalent to SPT N value (N_d=N)



Document 7.

Dépôts pétroliers

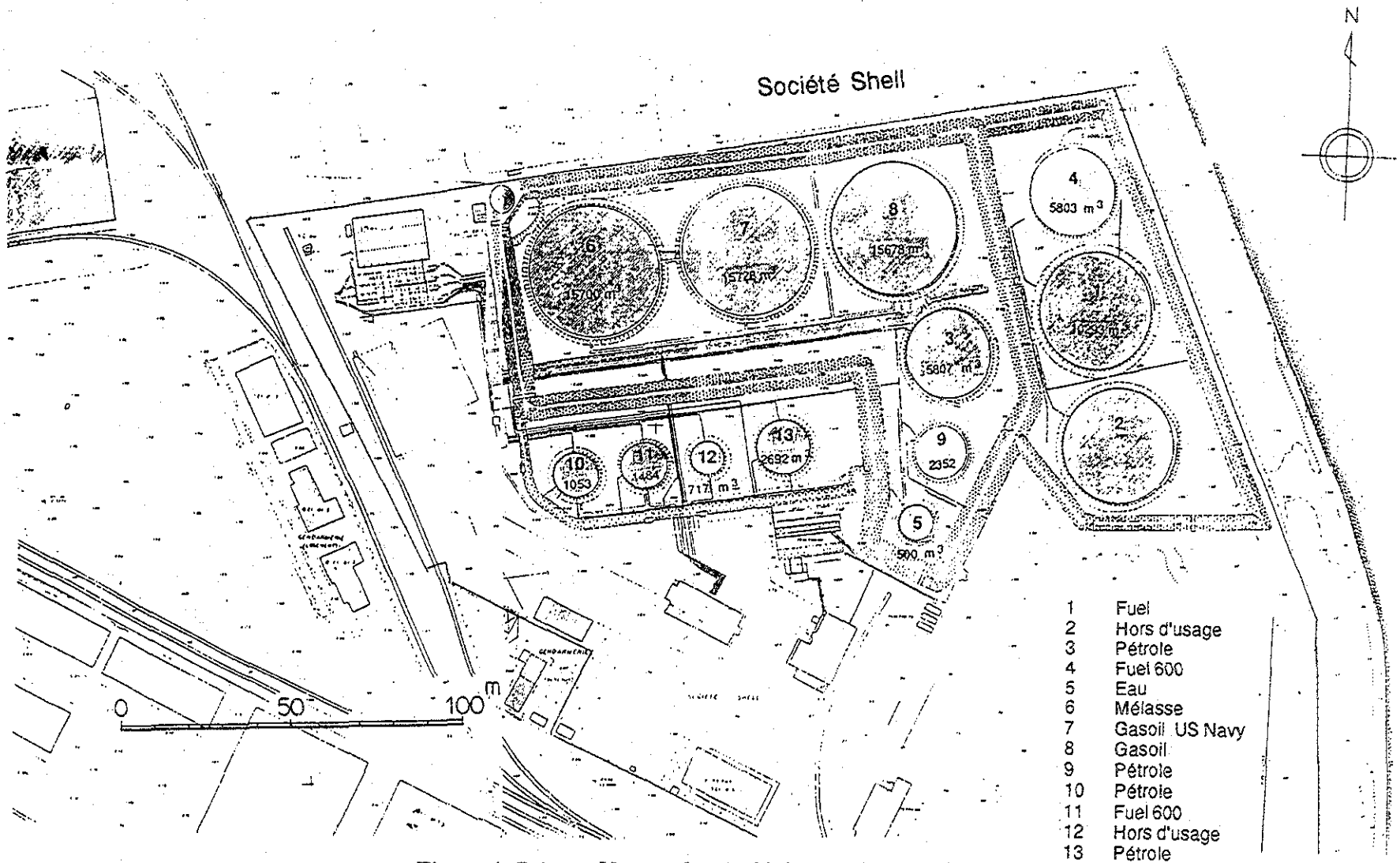


Figure A-7-1 Vue en plan du dépôt pétrolier (Shell)

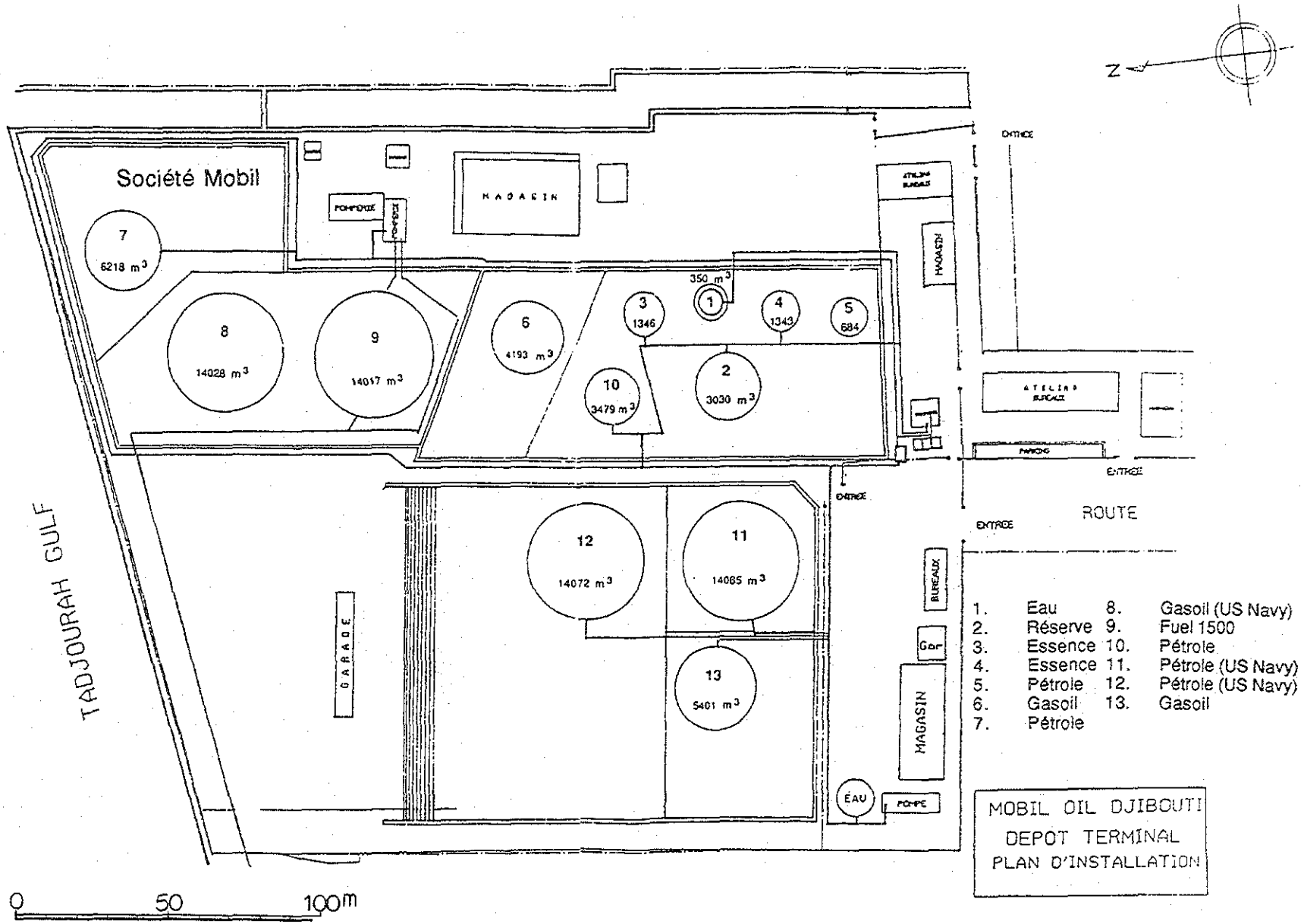


Figure A-7-2 Vue en plan du dépôt pétrolier (Mobil)

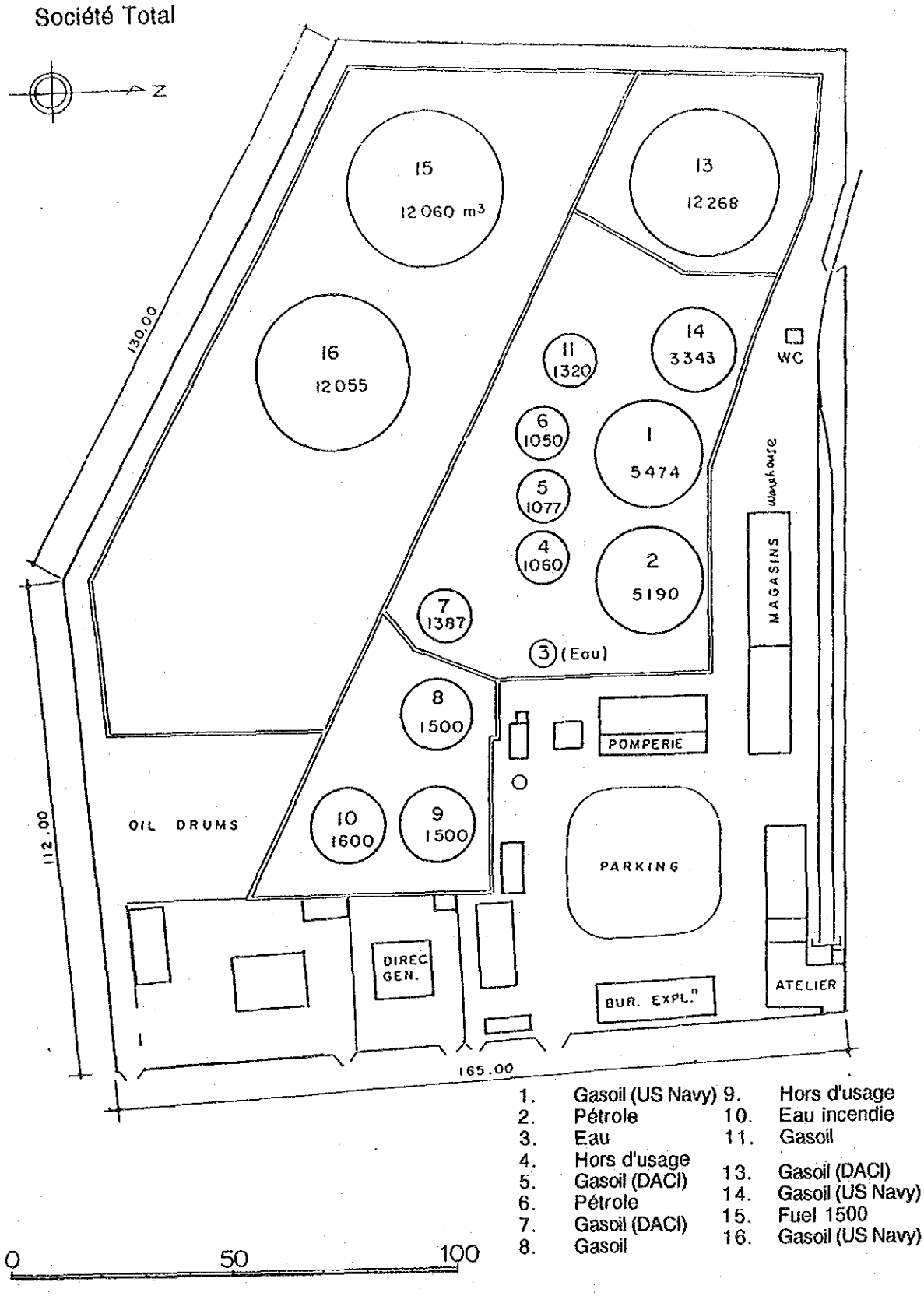


Figure A-7-3 Vue en plan du dépôt pétrolier (Total)

Document 8.

Chemin de fer
Djibouto - Ethiopien

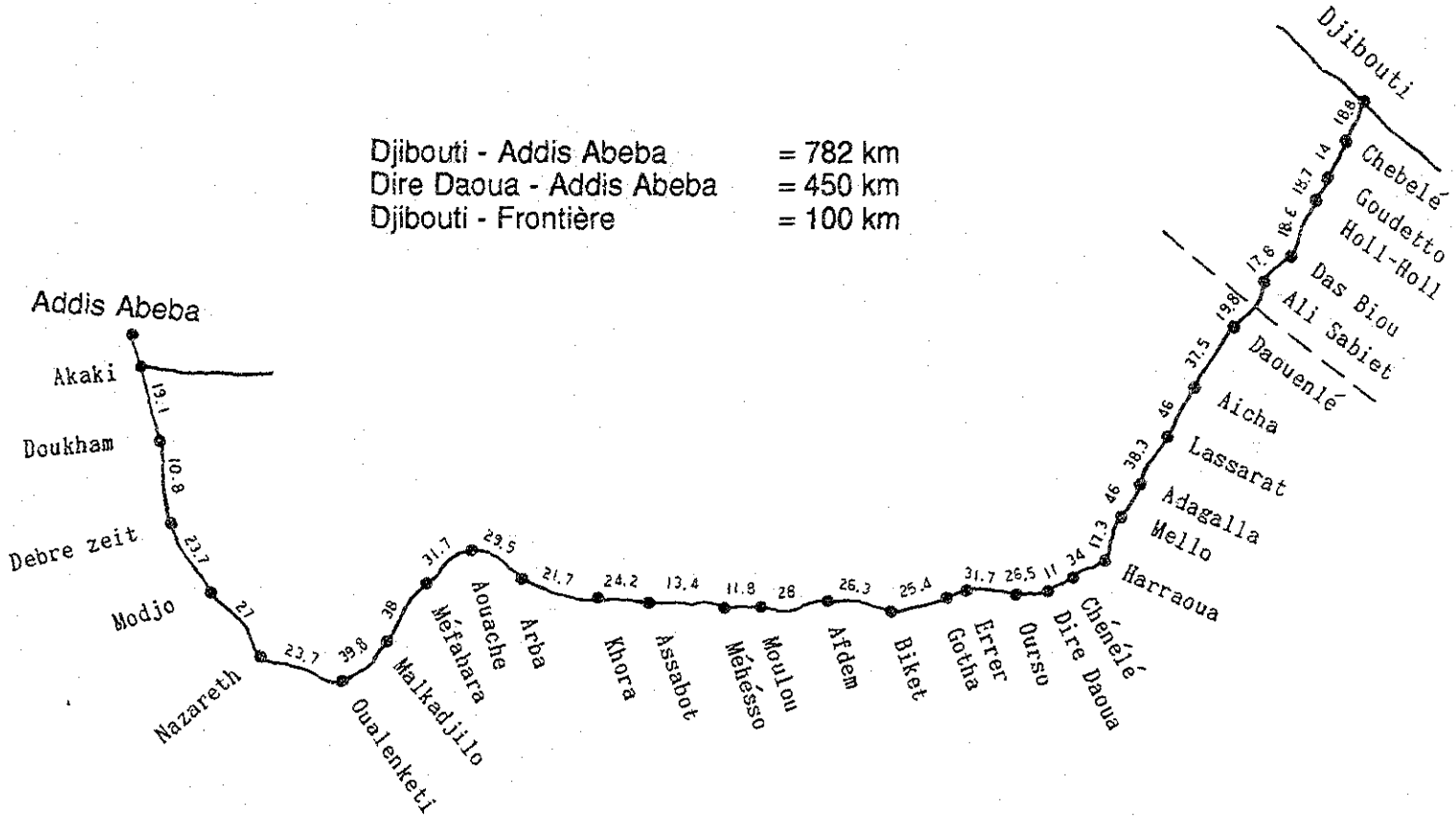


Figure A-8-1 Ligne commerciale du Chemin de Fer Djibouto - Ethiopien

Tableau A-8-1 Prévision de transport de marchandises par le chemin de fer (1991/92 à 1995/96)

	Marchandises principales	1990-91 (tonnes)	1991/92 (tonnes)	1992/93 (tonnes)	1993/94 (tonnes)	1994/95 (tonnes)	1995/96 (tonnes)
1.	Djibouti Æ Ethiopie						
	Acier	25.000	25.000	35.000	35.000	40.000	40.000
	Céréales	30.000	30.000	30.000	20.000	20.000	20.000
	Produits pétroliers	50.000	50.000	60.000	60.000	65.000	65.000
	Engrais	15.000	20.000	30.000	40.000	40.000	45.000
	Produits chimiques	5.000	5.000	5.000	9.000	9.000	9.000
	Véhicules	2.000	2.000	3.000	4.000	4.000	4.000
	Autres	40.000	40.000	53.000	58.000	58.000	63.000
	Sous-total	167.000	172.000	216.000	226.000	236.000	246.000
2.	Ethiopie Æ Djibouti						
	Mélasses	45.000	45.000	53.000	54.000	54.000	60.000
	Sucre	48.000	48.000	72.000	80.000	83.000	83.000
	Légumes secs	2.000	5.000	10.000	10.000	10.000	10.000
	Bestiaux	5.000	5.000	5.000	5.000	5.000	7.000
	Légumes, fruits	20.000	20.000	25.000	25.000	28.000	28.000
	Autres	5.000	8.000	10.000	10.000	10.000	10.000
	Sous-total	125.000	131.000	175.000	184.000	190.000	198.000
3.	Marché intérieur						
	Céréales	15.000	20.000	30.000	30.000	30.000	35.000
	Sucre	6.000	9.000	12.000	15.000	20.000	22.000
	Bestiaux	8.000	8.000	8.000	8.000	8.000	9.000
	Produits manufacturés	10.000	10.000	10.000	10.000	10.000	12.000
	Légumes, fruits	6.000	6.000	10.000	10.000	10.000	10.000
	Ciment	6.000	6.000	17.000	20.000	25.000	25.000
	Autres	15.000	15.000	15.000	20.000	20.000	20.000
	Sous-total	66.000	74.000	102.000	113.000	123.000	133.000
	Total	358.000	377.000	493.000	523.000	549.000	577.000

Source: Chemin de fer Djibouto-Ethiopien

Document 9.

Examen des ouvrages de postes existents

Plan développé sur la dégradation des structures en béton

Nous avons répertorié les fissures, les épaufrures, les armature et les agrégats exposées sur les structures en béton pour en établir un plan developpé.

Les figures A-9-1 ~ A-9-3 montre les résultats.

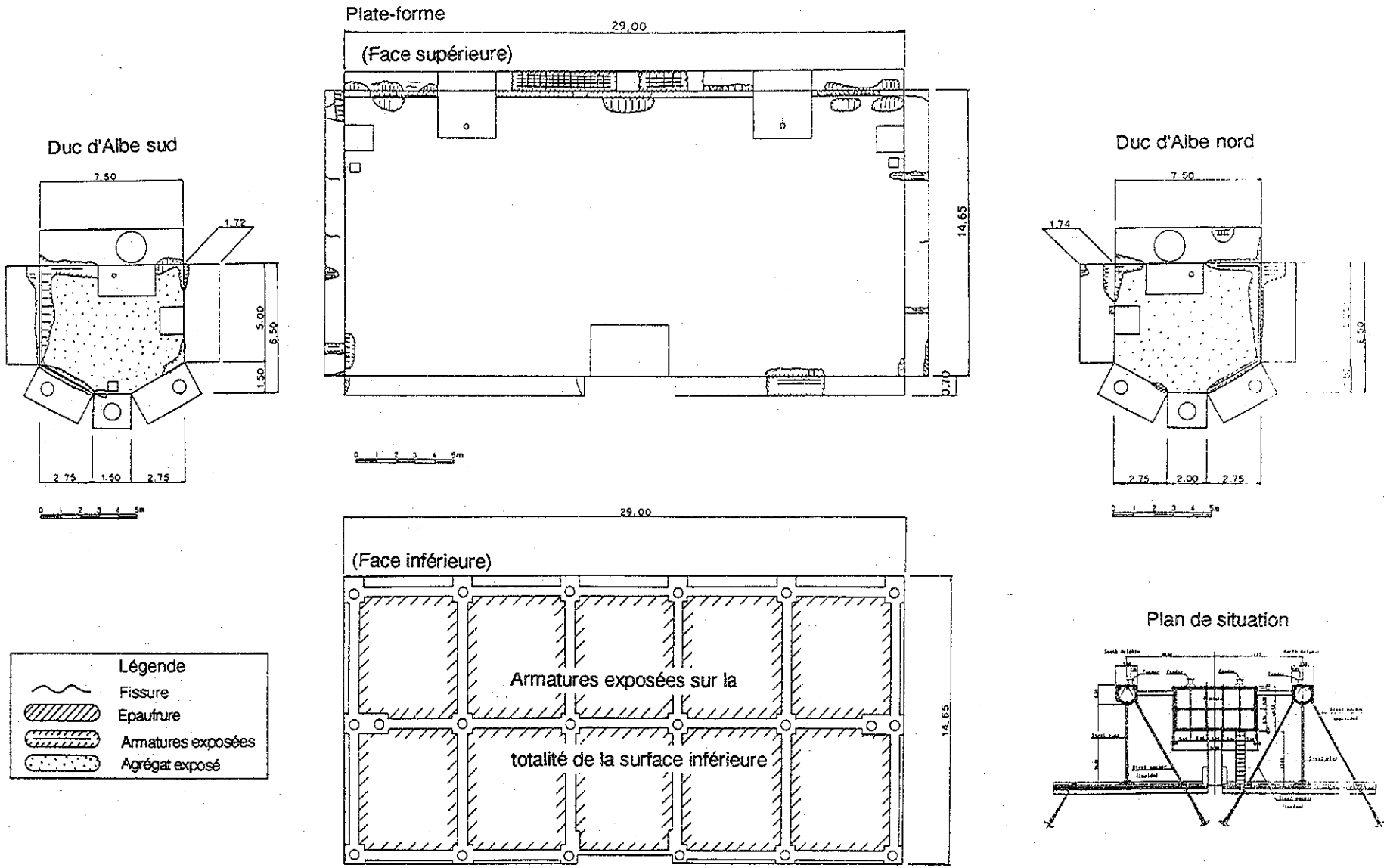


Figure A-9-1 Vue développée des dégradations des structures en béton du poste N°11

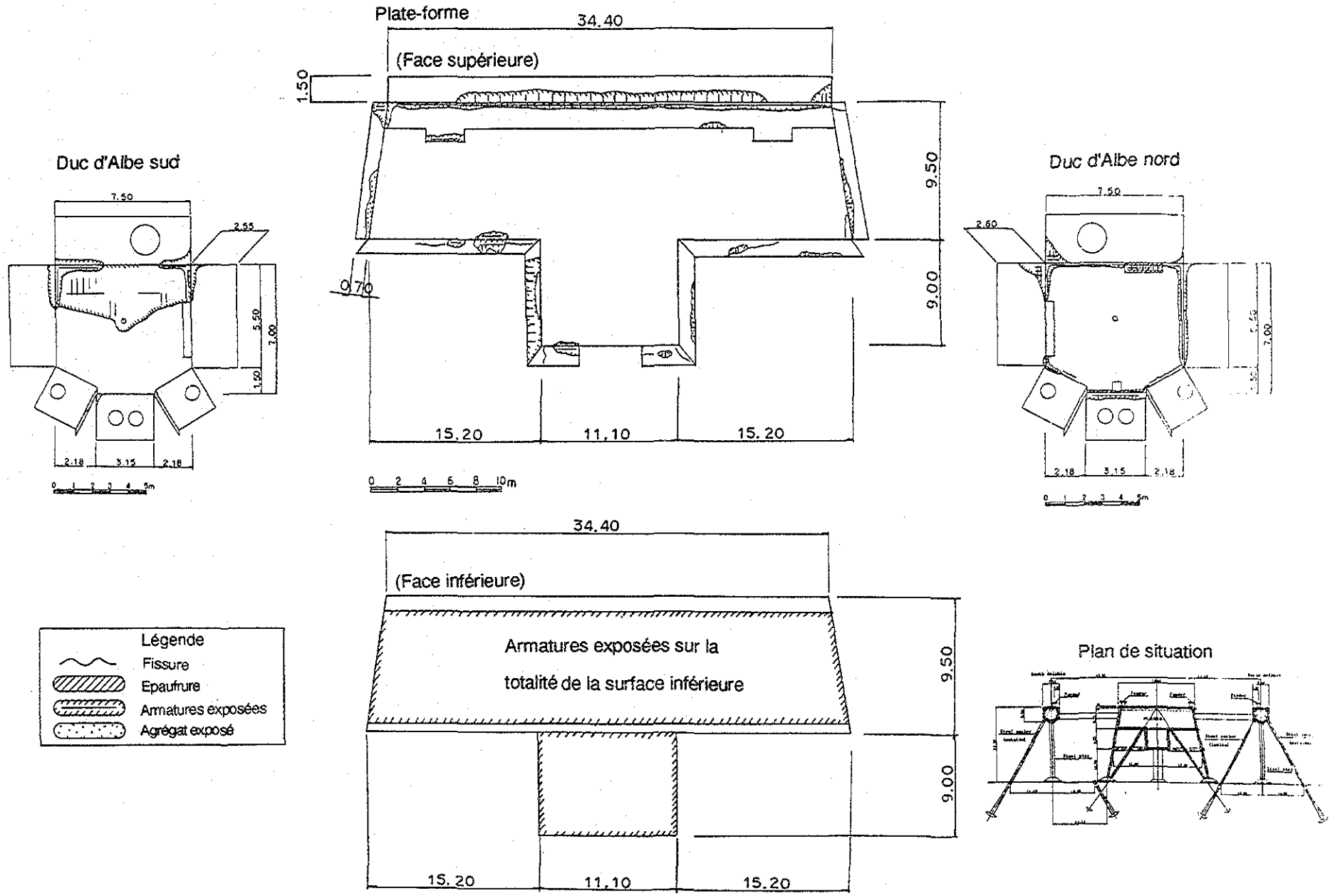


Figure A-9-2 Vue développée des dégradations des structures en béton du poste N°12

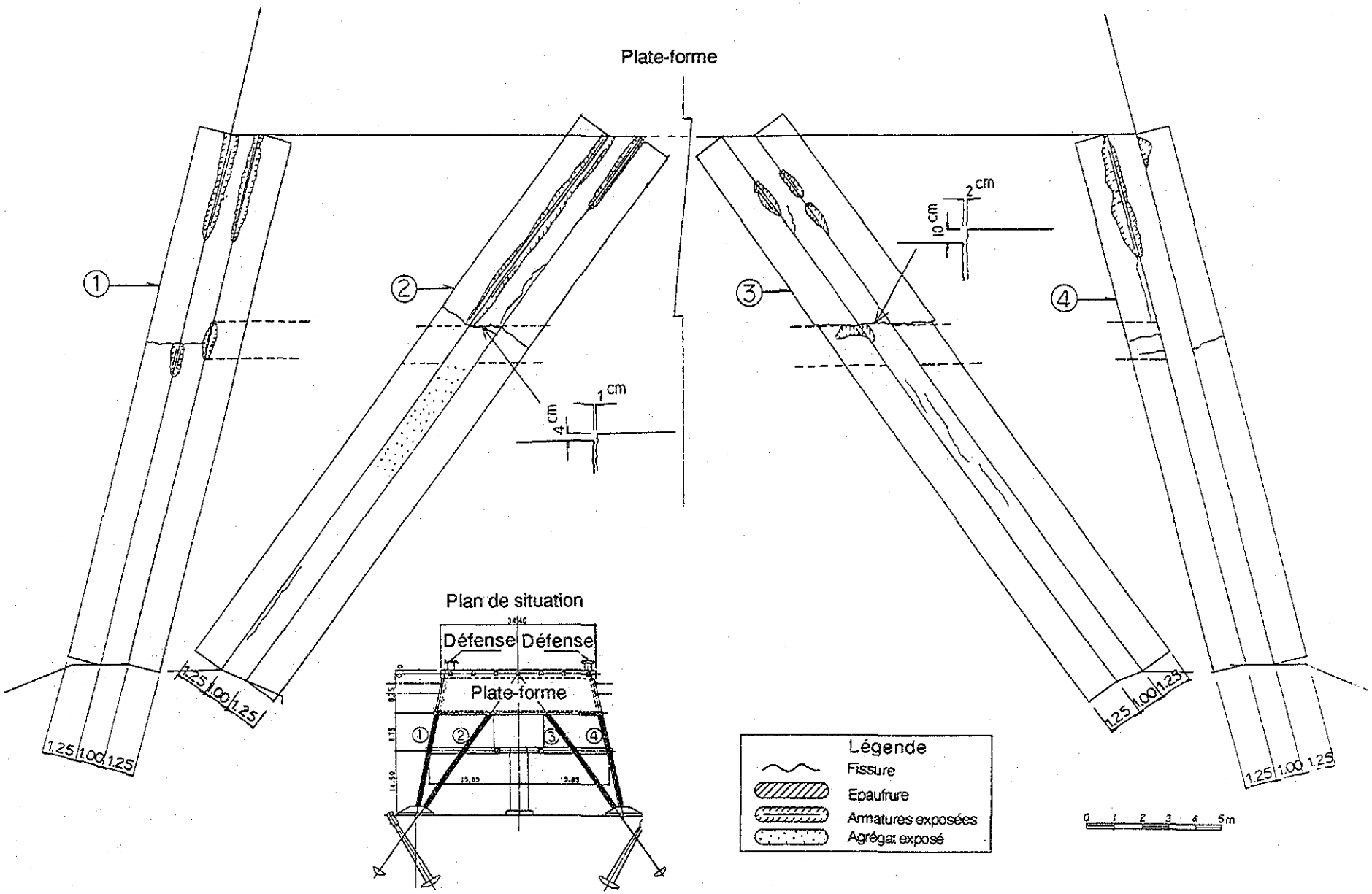


Figure A-9-3 Vue développée des dégradations des poutres en béton du poste N°12

Document 10.

Résultat des examens d'eau

Figure A-10-1 *Résultat des examens de l'eau (1)*

Points de prélèvement	Poste N°11		Poste N°12			
Critères	Point 1 Devant	Point 2 200m au large	Point 3 Devant	Point 4 200m au large	Point 5	Point 6
Date	20/9/93	25/9/93	21/9/93	25/9/93	13/10/93	13/10/93
Heure	7h30	16h30	7h00	17h00	8h00	8h30
Temps	Beau	Beau	Beau	Beau	Beau	Beau
Température de l'air (°C)	29,8	31,0	30,5	30,0	30,2	32,8
Température de l'eau (°C)	30,6	31,4	30,6	31,4	31,2	31,2
ph	8,0	8,0	8,0	8,0	8,0	8,0
DO (ppm)	4,9	6,0	4,4	4,6	5,0	4,2
COD (mg/l)	2,0	2,0	2,0	2,0	2,0	2,0
PO_4 (ppm)	négligeable	négligeable	négligeable	négligeable	négligeable	négligeable
NH_4 (ppm)	0,40	0,30	0,25	0,30	0,40	0,09
NO_2 (ppm)	négligeable	négligeable	négligeable	négligeable	négligeable	négligeable
NO_3 (ppm)	0,08	0,08	0,06	0,07	0,10	0,11

Source : Mission d'étude de la JICA

Tableau A-10-2 Résultat des examens de l'eau (2)

Elément	Concentration	
	mmole/l	mg/l
Cl-	577,72	20482
Bicarbonates	2,70	165
CO3 2-	0,00	0
SO4 2-	32,70	3141
NO3-	0,09	6
Na+	557,00	12805
K+	14,00	547
Ca+	6,30	253
Mg 2+	40,42	982

ph (à 20°C)	:	7,77
Conductivité	:	20.000 µS/cm
Minéralisation totale calculée	:	38,4 g/l
Résidu sec à 105°C	:	42,5 g/l

Date	:	1/1/1993 (prélèvement) 2/1/1993 (au laboratoire)
Lieu	:	Iles Mousha et Maskali
Source	:	ISERST (voir page D-10-2)

RESULTATS ANALYSE
PHYSICO-CHIMIQUE
COMPLETE

Laboratoire d Hydrochimie.

Echantillon N°:

Tableau A-10-3 Résultat des examens de l'eau (3)

PRELEVEMENT

Effectué par : L'ISERST
Pour le compte de : L'ISERST
Date : 1/01/1993
Lieu : ILES MOUSHA ET MASKALI
Paramètres mesurés sur place :

LABORATOIRE

Date d arrivée : 2/01/1993

pH (à 20 °C) : 7.77

Conductivité (à 20 °C) : >20 000 µS

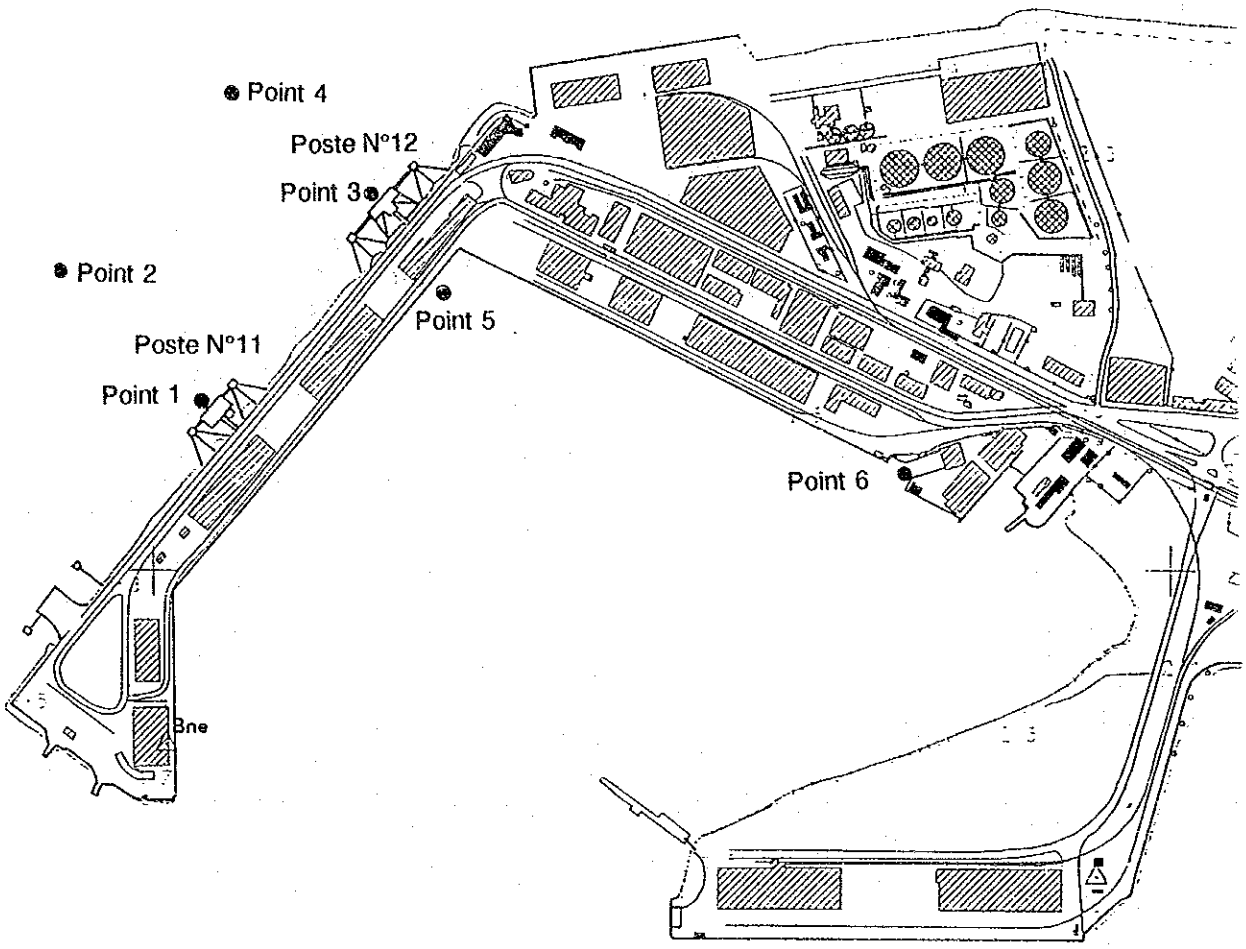
Elément analysé	Concentration (en mmole/l)	Concentration (en mg/l)
Chlorures Cl -	577.72	20482
Bicarbonates	2.70	165
Carbonates CO3 2-	0.00	0
Sulfates SO4 2-	32.70	3141
Nitrates NO3 -	0.09	6
Sodium Na +	557.00	12805
Potassium K +	14.00	547
Calcium Ca 2+	6.30	253
Magnesium Mg 2+	40.42	982

Minéralisation totale calculée : 38381 mg/l (R) 38.4 g/l

Résidu Sec à 105 °C : 42 512 mg/l

Déséquilibre électrique : 1.41 %

Le Responsable du Laboratoire



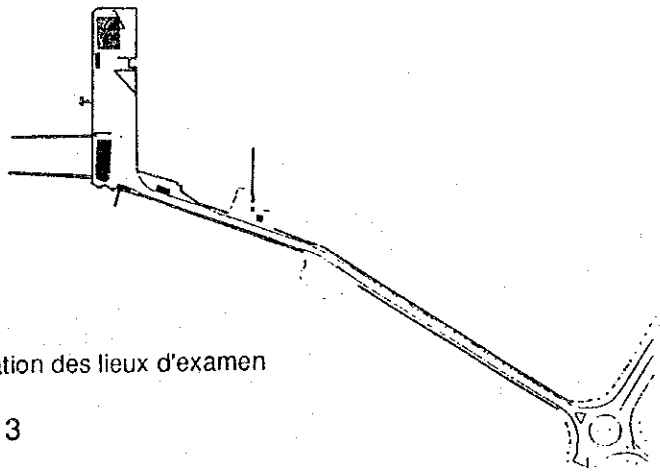


Fig. A-10-1 Localisation des lieux d'examen

Document 11.

(1) Liste de vérification sur la sécurité bord/terre

(2) Directive de vérification sur la sécurité bord/terre

(3) Directive pour remplir sur la sécurité bord/terre

(4) Joint d'isolation typique

Appendix A

This Appendix comprises the Ship/Shore Safety Check List, Guidelines relating to the Check List and a specimen letter for issue by the terminal representative to masters of tankers at terminals.

SHIP/SHORE SAFETY CHECK LIST

Ship's Name _____

Berth _____ Port _____

Date of Arrival _____ Time of Arrival _____

INSTRUCTIONS FOR COMPLETION

The safety of operations requires that all questions should be answered affirmatively ☑ If an affirmative answer is not possible, the reason should be given and agreement reached upon appropriate precautions to be taken between the ship and the terminal. Where any question is not considered to be applicable a note to that effect should be inserted in the remarks column.

☐ – the presence of this symbol in the columns 'ship' and 'terminal' indicates that checks shall be carried out by the party concerned.

The presence of the letters A and P in the column 'Code' indicates the following:

A — the mentioned procedures and agreements shall be in writing and signed by both parties.

P — in the case of a negative answer the operation shall not be carried out without the permission of the Port Authority.

	Ship	Terminal	Code	Remarks
1 Is the ship securely moored?	☐	☐		
2 Are emergency towing wires correctly positioned?	☐	☐		
3 Is there safe access between ship and shore?	☐	☐		
4 Is the ship ready to move under its own power?	☐		P	
5 Is there an effective deck watch in attendance on board and adequate supervision on the terminal and on the ship?	☐	☐		
6 Is the agreed ship/shore communication system operative?	☐	☐	A	
7 Have the procedures for cargo, bunker and ballast handling been agreed?	☐	☐	A	
8 Has the emergency shut down procedure been agreed?	☐	☐	A	
9 Are fire hoses and fire fighting equipment on board and ashore positioned and ready for immediate use?	☐	☐		
10 Are cargo and bunker hoses/arms in good condition and properly rigged and, where appropriate, certificates checked?	☐	☐		
11 Are scuppers effectively plugged and drip trays in position, both on board and ashore?	☐	☐		

	Ship	Terminal	Code	Remarks
12 Are unused cargo and bunker connections including the stern discharge line, if fitted, blanked?	☐	☐		
13 Are sea and overboard discharge valves, when not in use, closed and lashed?	☐	☐		
14 Are all cargo and bunker tank lids closed?	☐	☐		
15 Is the agreed tank venting system being used?	☐	☐	A	
16 Are hand torches of an approved type?	☐	☐		
17 Are portable VHF/UHF transceivers of an approved type?	☐	☐		
18 Are the ship's main radio transmitter aerials earthed and radars switched off?	☐			
19 Are electric cables to portable electrical equipment disconnected from power?	☐	☐		
20 Are all external doors and ports in the amidships accommodation closed?	☐	☐		
21 Are all external doors and ports in the after accommodation leading onto or overlooking the tank deck closed?	☐	☐		
22 Are air conditioning intakes which may permit the entry of cargo vapours closed?	☐	☐		
23 Are window-type air conditioning units disconnected?	☐	☐		
24 Are smoking requirements being observed?	☐	☐		
25 Are the requirements for the use of galley and other cooking appliances being observed?	☐	☐		
26 Are naked light requirements being observed?	☐	☐		
27 Is there provision for an emergency escape possibility?	☐	☐		
28 Are sufficient personnel on board and ashore to deal with an emergency?	☐	☐		
29 Are adequate insulating means in place in the ship/shore connection?	☐	☐		
30 Have measures been taken to ensure sufficient pumproom ventilation?	☐			

	Ship	Shore
Are tank cleaning operations planned during the ship's stay alongside the shore installation?	Yes/No*	
If so, have the port authority and terminal been informed?	Yes/No*	Yes/No*

** Delete Yes or No as appropriate*

Declaration

We have checked, where appropriate jointly, the items on this check list, and have satisfied ourselves that the entries we have made are correct to the best of our knowledge, and arrangements have been made to carry out repetitive checks as necessary.

For Ship	For Terminal
Name _____	Name _____
Rank _____	Position _____
Signature _____	Signature _____

Time _____

Date _____

SHIP/SHORE SAFETY CHECK LIST GUIDELINES

Introduction

The IMO Recommendations on the Safe Transport, Handling and Storage of Dangerous Substances in Port Areas contain the requirement that:

The master of a ship and the berth operator should, before liquid bulk dangerous substances are pumped into or out of any ship or into a shore installation:

1. agree in writing on the handling procedures including the maximum loading or unloading rates;

2. complete and sign the appropriate safety check list, showing the main safety precautions to be taken before and during such handling operations; and

3. agree in writing on the action to be taken in the event of an emergency during handling operations.

Annexed to the Recommendations is the safety check list reproduced on pages D-11-1 to D-11-3 covering the arrangements and conditions under which the loading and discharging of bulk liquid dangerous cargoes and associated operations such as bunkering, ballasting or tank cleaning may be carried out safely. The following guidelines have been produced to assist berth operators and ships' masters in their joint use of the check list.

The Mutual Safety Examination

A tanker presenting itself to a loading or discharging terminal needs to check its own preparations and its fitness for the safety of the intended cargo operation. Additionally, the master of a ship has a responsibility to assure himself that the terminal operator has likewise made proper preparations for the safe operation of his terminal.

Equally the terminal needs to check its own preparations and to be assured that the tanker has carried out its checks and has made appropriate arrangements.

The Check List, by its questions and its requirements for exchange of written agreements for certain procedures, is a minimum basis for the essential considerations which should be included in such a mutual examination.

Some of the Check List's questions are directed to considerations for which the ship has prime responsibility, others apply to both ship and terminal. It is not suggested that every item should be the subject of personal checking by both representatives conducting the examination.

All items lying within the responsibility of the tanker should be personally checked by the tanker's representative and similarly all items of the terminal's responsibility personally checked by the terminal representative. In carrying out their full responsibilities however, both representatives, by questioning the other, by sighting of records and, where felt appropriate, by joint visual inspection should assure themselves that the standards of safety on both sides of the operation are fully acceptable.

The joint declaration should not be signed until such mutual assurance is achieved.

Thus all applicable questions should result in an affirmative mark in the boxes provided. If a difference of opinion arises on the adequacy of any arrangements made or conditions found, the operation should not be started until measures taken are jointly accepted.

A negative answer to the questions coded "P" does not necessarily mean that the intended operation cannot be carried out. In such cases, however, permission to proceed should be obtained from the designated port officer.

Where an item is agreed to be not applicable to the ship, to the terminal or to the operation envisaged a note to that affect should be entered in the "Remarks" column.

While the Check List is based upon cargo handling operations, it is recommended that the same mutual examination, using the Check List as appropriate, be carried out when a tanker presents itself at a berth for tank cleaning after carriage of substances covered by these Guidelines.

Deviations

The conditions under which the operation takes place may change during the process. The changes may be such that safety can no longer be regarded as guaranteed. The party noticing or causing the unsafe condition is under an obligation to take all necessary actions, which may include stopping the operation, to re-establish safe conditions. The presence of the unsafe condition should be reported to the other party and where necessary, co-operation with the other party should be sought.

Tank Cleaning Activities

The questions on tank cleaning, including "crude oil washing", are included in the list in order to inform the terminal and the port authorities of the ship's intentions regarding these activities.

GUIDELINES FOR COMPLETING THE SHIP/SHORE SAFETY CHECK LIST

1 **Is the ship securely moored?**

In answering this question, due regard should be given to the need for adequate fendering arrangements.

Ships should remain adequately secured in their moorings. Alongside piers or quays ranging of the ship should be prevented by keeping all mooring lines taut; attention should be given to the movement of the ship caused by currents or tides and the operation in progress.

Wire ropes and fibre ropes should not be used together in the same direction (i.e. breasts, springs, head or stern) because of the difference in their elastic properties.

Once moored, ships fitted with automatic tension winches should not use such winches in the automatic mode.

Means should be provided to enable quick and safe release of the ship in case of an emergency.

The method used for the emergency release operation should be agreed, taking into account the possible risks involved.

Anchors not in use should be properly secured.

2 **Are emergency towing wires correctly positioned?**

Emergency towing wires should be positioned both on the off-shore bow and quarter of the ship. At a buoy mooring, towing wires should be positioned on the side opposite to the hose string.

The eyes of these wires should be maintained about the waterline and regularly checked and adjusted if necessary during the operations. They should be properly made fast on the ship's bollards, while having sufficient slack on deck.

Means should be provided to prevent the slack from accidentally running into the water. These means should be so arranged that they can easily be broken by a tug boat's crew.

3 **Is there safe access between ship and shore?**

The access should be positioned as far away from the manifolds as practicable.

The means of access to the ship should be safe and may consist of an appropriate gangway or accommodation ladder with a properly secured safety net fitted beneath it.

Particular attention to safe access should be given where the difference in level between the point of access on the vessel and the jetty or quay is large or likely to become large.

When terminal access facilities are not available and a ship's gangway is used, there should be an adequate landing area on the berth so as to provide the gangway with a sufficient clear run of space and so maintain safe and convenient access to the ship at all states of tide and changes in the ship's freeboard.

Near the access ashore suitable life-saving equipment should be available. A lifebuoy should be available on board the ship near the gangway or accommodation ladder.

The access should be safely and properly illuminated during darkness.

Persons who have no legitimate business on board, or who do not have the master's permission, should be refused access to the ship.

The terminal should control access to the jetty or berth in agreement with the ship.

4 **Is the ship ready to move under its own power?**

The ship should be able to move under its own power at short notice, unless permission to immobilize the ship has been granted by the harbourmaster and the terminal manager. Certain conditions may have to be met for permission to be granted.

5 **Is there an effective deck watch in attendance on board and adequate supervision on the terminal and on the ship?**

The operation should be under constant control both on ship and shore.

Supervision should be aimed at preventing the development of hazardous situations; if, however, such a situation arises the controlling personnel should have adequate means available to take corrective action.

The controlling personnel on ship and shore should maintain an effective communication with their respective supervisors.

All personnel connected with the operations should be familiar with the dangers of the substances handled.

6 **Is the agreed ship/shore communication system operative?**

Communication should be maintained in the most efficient way between the responsible officer on duty on the ship and the responsible person ashore.

When telephones are used, the telephone both on board and ashore should be continuously manned by a person who can immediately contact his respective supervisor. Additionally, the supervisor should have the possibility to override all calls. When RT/VHF systems are used the units should preferably be portable and carried by the supervisor or a person who can get in touch with his respective supervisor immediately. Where fixed systems are used the guidelines for telephones should apply.

The selected system of communication together with the necessary information on telephone numbers and/or channels to be used should be recorded on the appropriate form. This form should be signed by both ship and shore representatives.

The telephone and portable RT/VHF systems should comply with the appropriate safety requirements.

7 **Have the procedures for cargo, bunker and ballast handling been agreed?**

The procedures for the intended operation should be pre-planned. They should be discussed and agreed upon by the ship and shore representatives prior to the start of the operations. The agreed arrangements should be recorded on a form and contain at least the information shown in the annex to these guidelines. The form should be signed by both representatives. Any change in the agreed procedure that could affect the operation should be discussed by both parties and agreed upon. After agreement has been reached by both parties substantial changes should be laid down in writing as soon as possible and in sufficient time before the change in procedure takes place. In any case the change should be laid down in writing within the working period of those supervisors on board and ashore in whose working period agreement on the change was reached. The operations should be suspended and all deck and vent openings closed on the approach of an electrical storm.

The properties of the substances handled, the equipment of ship and shore installation, the ability of the ship's crew and the shore personnel to execute the necessary operations and to sufficiently control the operations are factors which should be taken into account when ascertaining the possibility of handling a number of substances concurrently.

The manifold area both on board and ashore should be safely and properly illuminated during darkness.

The initial and maximum loading rates, topping off rates and normal stopping times should be agreed, having regard to:

— the nature of the cargo to be handled;
— the arrangement and capacity of the ship's cargo lines and gas venting systems;
— the maximum allowable pressure and flow rate in the ship/shore hoses and loading arms;

— precautions to avoid accumulation of static electricity;
— any other flow control limitations.

A note to this effect should be entered on the form referred to above.

If the static electricity properties of the substance handled and the situation in the tank so require, no conducting object should be inserted into that tank during loading and during a period of at least 30 minutes after the cessation of loading.

8 **Has the emergency shut down procedure been agreed?**
An emergency shut down procedure should be agreed between ship and shore and recorded on an appropriate form.

The agreement should designate in which cases the operations have to be stopped immediately.

Due regard should be given to the possible introduction of dangers associated with the emergency shut down procedure.

9 **Are fire hoses and fire fighting equipment on board and ashore positioned and ready for immediate use?**
Fire fighting equipment both on board and ashore should be correctly positioned and ready for immediate use.

Adequate units of fixed or portable equipment should be stationed to cover the ship's cargo deck and on the jetty. The ship and shore fire main systems should be pressurized, or be capable of being pressurized at short notice.

Both ship and shore should ensure that their fire main systems can be connected in a quick and easy way utilising if necessary the international ship/shore connection.

10 **Are cargo and bunker hoses/arms in good condition and properly rigged and, where appropriate, certificates checked?**
Cargo hoses and metal arms should be in a good condition and should be properly fitted and rigged so as to prevent strain and stress beyond design limitations. All flange connections should be fully bolted.

Other types of connections should be properly secured. It should be ensured that the hoses or metal arms are constructed of a material suitable for the substance to be handled taking into account its temperature and the maximum operating pressure.

Cargo hoses should be identifiable with regard to their suitability for the intended operation.

11 **Are scuppers effectively plugged and drip trays in position, both on board and ashore?**
Where applicable all scuppers on board and drainholes ashore should be properly plugged during the operations. Accumulation of water should be drained off periodically.

Both ship and jetty should ideally be provided with fixed drip trays; in their absence portable drip trays may be used.

All drip trays should be emptied in an appropriate manner whenever necessary but always after completion of the specific operation.

Where corrosive liquids or refrigerated gases are being handled, the scuppers may be kept open, provided that an ample supply of water is available at all times in the vicinity of the manifolds.

12 **Are unused cargo and bunker connections including the stern discharge line, if fitted, blanked?**
Unused cargo and bunker line connections should be closed and blanked. Blank flanges should be fully bolted and other types of fittings, if used, properly secured.

13 **Are sea and overboard discharge valves, when not in use, closed and lashed?**
Experience shows the importance of this item in pollution avoidance on ships where cargo lines and ballast systems are interconnected.

The security of the valves in question should be checked visually.

14 **Are all cargo and bunker tank lids closed?**
Apart from the openings in use for tank venting (see question 15) all openings to cargo tanks should be closed gastight.

Ullaging and sampling points may be opened for the short periods necessary for ullaging and sampling.

Closed ullaging and sampling systems should be used where required by international, national and local regulations and agreements.

15 **Is the agreed tank venting system being used?**

Agreement should be reached by both parties, as to the venting system for the operation, taking into account the nature of the cargo and international, national and local regulations and agreements.

There are three basic systems for venting tanks:

1. Open to atmosphere via open ullage ports, protected by suitable flame screens.
2. Fixed venting systems which includes inert gas systems.
3. To shore through other vapour handling systems.

16 **Are hand torches of an approved type?**

and,

17 **Are portable VHF/UHF transceivers of an approved type?**

Battery operated hand torches and VHF radio-telephone sets should be of a safe type which is approved by a competent authority. Ship/shore telephones should comply with the requirements for explosion-proof construction except when placed in a safe space in the accommodation.

VHF radio-telephone sets may operate in the internationally agreed wave bands only.

The above-mentioned equipment should be well maintained and damaged units, though capable of operation, should not be used.

18 **Are the ship's main radio transmitter aerials earthed and radars switched off?**

The ship's main radio transmitter should not be used during the ship's stay in port, except for receiving purposes. The main transmitting aerials must be disconnected and earthed.

The ship's radar installation should not be used unless the master, in consultation with the terminal manager, has established the conditions under which the installation may be used safely.

19 **Are electric cables to portable electrical equipment disconnected from power?**

The use of portable electrical equipment on wandering leads is prohibited in hazardous zones.

The supply cables should be disconnected and preferably removed from the hazardous zone.

Telephone cables in use in the ship/shore communication system should preferably be routed outside the hazardous zone. Wherever this is not feasible, the cable should be so positioned and protected that no danger arises from its use.

20 **Are all external doors and ports in the amidships accommodation closed?**

and,

21 **Are all external doors and ports in the after accommodation leading onto or overlooking the tank deck closed?**

External doors, windows and portholes in the amidship's accommodation should be closed during the operations.

In the after accommodation external doors, windows and portholes facing or near the cargo zone should be closed during operations. These doors should be clearly marked, but at no time should they be locked.

22 **Are air conditioning intakes which may permit the entry of cargo vapours closed?**

and,

23 **Are window-type air conditioning units disconnected?**

Air conditioning and ventilator intakes which are likely to draw in air from the cargo area should be closed.

Air conditioning units which are located wholly within the accommodation and which do not draw in air from the outside may remain in operation.

Window-type air conditioners should be disconnected from their power supply.

24 **Are smoking requirements being observed?**

Smoking on board the ship may only take place in places specified by the master in consultation with the terminal manager or his representative.

No smoking is allowed on the jetty and the adjacent area except in buildings and places specified by the terminal manager in consultation with the master.

Places which are directly accessible from the outside should not be designated as places where smoking is permitted. Buildings, places and rooms designated as places where smoking is permitted should be clearly marked as such.

25 **Are the requirements for the use of galley and other cooking appliances being observed?**

Open fire may be used in galleys whose construction, location and ventilation system provides protection against entry of flammable gases.

In cases where the galley does not comply with the above, open fire may be used provided the master, in consultation with the terminal manager, has ensured that precautions have been taken against the entry or build up of flammable gases.

On ships fitted with stern discharge lines no open fire in galley-furnaces and cooking appliances is allowed when these lines are used, unless the construction of the ship's accommodation allows for the safe use of open fire.

26 **Are naked light requirements being observed?**

Naked light or open fire comprises the following: fire, spark formation, naked light and any surface with a temperature that is equal to or higher than the minimum ignition temperature of the products handled in the operations.

The use of open fire on board the ship — other than covered in questions 24 and 25 — and within a distance of 25 m of the ship is prohibited, unless all applicable regulations have been met and subject to agreement by the port authority, terminal manager and the master.

27 **Is there provision for an emergency escape possibility?**

In addition to the means of access referred to in question 3, a safe and quick emergency escape should be available both on board and ashore.

On board the ship it may consist of a lifeboat ready for immediate use, preferably at the after end of the ship.

28 **Are sufficient personnel on board and ashore to deal with an emergency?**

At all times during the ship's stay at the terminal, a sufficient number of personnel should be present on board the ship and in the shore installation to deal with an emergency.

29 **Are adequate insulating means in place in the ship/shore connection?**

Unless measures are taken to break the continuous electrical path between ship and shore pipework provided by the ship/shore hoses or metallic arms, stray electric currents, mainly from corrosion protection systems, can cause electric sparks at the flange faces when hoses are being connected and disconnected.

The passage of these currents is prevented by an insulating flange inserted at each jetty manifold outlet or incorporated in the construction of metallic arms.

Alternatively, the electrical discontinuity may be provided by the inclusion of one length of electrically discontinuous hose in each hose string.

It should be ascertained that the means of electrical discontinuity is in place and in good condition and that it is not being by-passed by contact with external metal.

30 **Have measures been taken to ensure sufficient pumproom ventilation?**

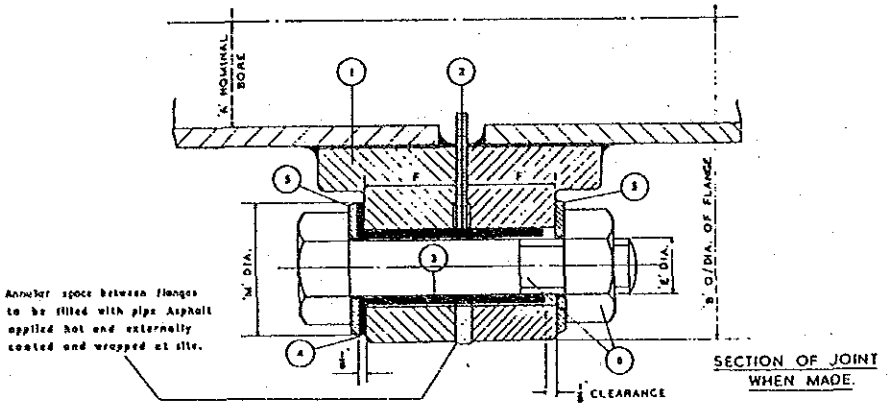
Ship's pumprooms should be mechanically ventilated and the ventilation should be kept running throughout the operation. Ventilation should be aimed at maintaining a safe atmosphere throughout the pumproom.

A-10 Typical Insulating Flange Joint

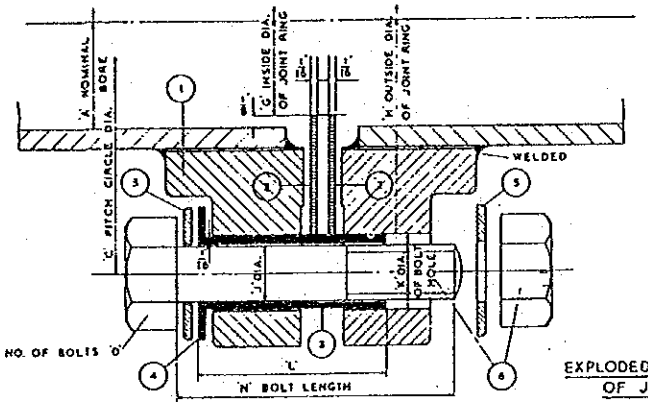
Appendix D

TYPICAL INSULATING FLANGE JOINT

TYPICAL INSULATING FLANGE JOINT.



SECTION OF JOINT WHEN MADE.



EXPLODED SECTION OF JOINT.

SCHEDULE OF DIMENSIONS IN INCHES

A	1	1 1/2	2	2 1/2	3	4	6	8	10	12	13 1/4	15 1/4
B	4 1/4	5	6	7	7 1/2	9	11	13 1/2	16	19	21	23 1/2
C	3 1/8	3 7/8	4 3/4	5 1/2	6	7 1/2	9 1/2	11 3/4	14 1/4	17	18 3/4	21 1/4
D	4	4	4	4	4	8	8	8	12	12	12	16
E	1/2	1/2	5/8	5/8	5/8	5/8	3/4	3/4	7/8	7/8	1	1
F	9/16	11/16	3/4	7/8	15/16	15/16	1	1 1/8	1 3/16	1 1/4	1 3/8	1 7/16
G	3/4	1 1/4	1 3/4	2 1/4	2 3/4	3 3/4	5 3/4	7 3/4	9 3/4	11 5/4	13	15
H	2 3/8	3 1/8	3 7/8	4 5/8	5 1/8	6 5/8	8 1/2	10 3/4	13 1/8	15 7/8	17 1/2	20
J	9/16	9/16	11/16	11/16	11/16	11/16	13/16	13/16	15/16	15/16	1 1/16	1 1/16
K	3/4	3/4	7/8	7/8	7/8	7/8	1	1	1 1/8	1 1/8	1 1/4	1 1/4
L	1 1/4	1 1/2	1 5/8	1 7/8	2	2	2 1/8	2 3/8	2 1/2	2 5/8	2 7/8	3
M	1 5/16	1 5/16	1 1/2	1 1/2	1 1/2	1 1/2	1 3/4	1 3/4	1 15/16	1 15/16	2 1/8	2 1/8
N	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/4	3 1/2	3 3/4	4	4	4 1/2	4 1/2

SCHEDULE OF MATERIALS

ITEM	MATERIAL	DESCRIPTION
1	Steel	Flange to ANSI B 16.5 – Bolt holes drilled to suit dimensions scheduled opposite. Can be screw-on, slip on, or weld neck type.
2	Klingerite	Joint rings 1/16" thick. See note.
3	'Tufnol'	Bolt insulating sleeves. – Crow Grade.
4	'Tufnol'	Bolt washer 1/8" thick. Crow Grade.
5	Steel	Plain round washer B.S.
6	Steel	B.S.W. Bright bolts and nuts.

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