

TABLE A-3.2.13 Monthly Duration of Bright Sunshine at Salalah

Monthly Duration Of Bright Sunshine  
Salalah Airport (24.38m a.s.l) (Unit : hours)

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Spt	Oct	Nov	Dec	Mean
1980	-	-	-	-	10.7	5.8	1.4	1.2	6.6	9.4	9.8	9.4	6.8
1981	8.9	10.2	8.5	10.5	5.2	7.6	0.4	1.6	7.4	10.0	10.1	9.4	7.5
1982	8.9	7.3	9.8	9.1	10.2	6.3	2.8	0.8	6.8	10.0	9.6	9.3	7.6
1983	8.4	7.6	9.3	9.0	10.5	7.4	2.0	1.3	5.3	9.8	10.0	9.4	7.5
1984	9.5	10.1	10.0	11.3	10.6	5.1	0.8	0.9	5.8	10.1	10.3	9.9	7.9
1985	8.3	16.2	9.5	7.2	4.6	4.4	1.8	2.5	6.6	10.4	10.2	9.7	7.6
1986	10.3	9.8	7.7	10.0	9.2	11.5	-	0.9	7.3	6.6	10.5	10.3	8.5
1987	10.3	10.2	8.8	10.7	11.5	7.2	3.8	2.0	7.4	10.3	-	-	8.2
ΣT	-	-	-	-	72.5	55.3	-	11.2	53.2	76.6	-	-	61.6
Mean	9.2	10.2	9.1	9.7	9.1	6.9	1.9	1.4	6.7	9.6	10.1	9.7	7.7

Note : "-" indicates no data available

Source : Climate Summary / National Meteorological Service / Sultanate of Oman

TABLE A-3.2.14 Wind Velocity Frequency Distribution on 12-direction  
(Thumrait)

TABLE OF WIND VELOCITY FREQUENCY DISTRIBUTION  
ON 12-DIRECTION

CLASS	WIND DIRECTIONS												TOTAL (NOS)	CLASS RATIO (%)		
	N	NNE	NEE	E	EES	ESS	S	SSW	SWW	W	WNW	WNW				
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	.3
5	2	5	0	0	0	1	4	1	1	1	0	0	0	0	14	3.8
6	8	9	5	2	1	7	6	1	1	1	0	0	0	0	40	11.0
7	4	4	7	0	0	14	18	2	0	1	0	1	0	1	52	14.2
8	3	3	3	1	0	11	17	2	1	1	1	1	5	47	12.9	
9	4	0	1	0	0	10	16	1	1	1	1	1	7	42	11.5	
10	1	0	0	0	0	9	5	0	0	0	0	0	0	16	4.4	
11	0	0	0	0	0	11	7	0	0	0	1	3	22	6.0		
12	0	0	0	0	0	8	4	0	0	0	1	1	14	3.8		
13	0	0	0	0	0	3	8	0	0	0	0	1	12	3.3		
14	0	0	0	0	0	7	6	0	0	0	0	0	13	3.6		
15	0	0	0	0	0	5	6	0	0	0	0	0	11	3.0		
16	0	0	0	0	0	5	6	0	0	0	0	0	11	3.0		
17	0	0	0	0	0	5	9	0	0	0	0	0	14	3.8		
18	0	0	0	0	0	3	1	0	0	0	0	0	4	1.1		
19	0	0	0	0	0	3	7	0	0	0	0	0	10	2.7		
20	0	0	0	0	0	0	5	0	0	0	0	0	5	1.4		
21	0	0	0	0	0	2	7	0	0	0	0	0	9	2.5		
22	0	0	0	0	0	1	5	0	0	0	0	0	6	1.6		
23	0	0	0	0	0	0	6	0	0	0	0	0	6	1.6		
24	0	0	0	0	0	0	2	0	0	0	0	0	2	.5		
25	0	0	0	0	0	0	8	0	0	0	0	0	8	2.2		
26	0	0	0	0	0	0	2	0	0	0	0	0	2	.5		
27	0	0	0	0	0	0	3	0	0	0	0	0	3	.8		
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
29	0	0	0	0	0	0	1	0	0	0	0	0	1	.3		
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
NORE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
SUM(NOS)	23	21	16	3	1	105	161	7	4	2	4	18	355	0.0		
SUM (%)	6.5	5.8	4.4	.8	.3	28.8	44.1	1.9	1.1	.5	1.1	4.9	100.0	0.0		

TABLE OF WIND VELOCITY FREQUENCY DISTRIBUTION  
ON 12-DIRECTION

CLASS	WIND DIRECTIONS													TOTAL (NOS)	CLASS RATIO (%)
	N	NNE	NEE	E	EES	ESS	S	SSW	SWW	W	WNW	WNW			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	1	1	0	0	0	1	0	0	0	0	0	0	1	17
5	4	7	1	0	0	2	2	0	0	0	0	0	0	2	30
6	2	9	4	1	1	5	3	0	1	0	0	0	0	4	55
7	2	12	6	1	0	15	16	1	0	0	0	0	0	2	77
8	1	0	4	1	0	9	6	1	1	0	0	0	0	5	28
9	1	1	1	0	0	10	15	0	0	0	0	2	2	2	32
10	0	0	1	0	0	7	12	1	0	0	0	1	2	2	24
11	0	0	1	0	0	12	8	0	0	0	0	0	2	2	23
12	0	0	0	0	0	10	6	0	1	0	0	1	1	1	19
13	1	0	0	0	0	5	9	0	1	0	0	0	0	0	16
14	0	0	0	0	0	6	6	0	0	0	0	0	1	1	13
15	0	0	0	0	0	7	9	0	0	0	1	0	0	0	17
16	0	0	0	0	0	4	8	0	0	0	0	0	0	0	12
17	0	0	0	0	0	4	4	0	0	0	0	0	0	0	8
18	0	0	0	0	0	2	7	0	0	0	0	0	0	0	9
19	0	0	0	0	0	1	7	0	0	0	0	0	0	0	8
20	0	0	0	0	0	2	6	0	0	0	0	0	0	0	8
21	0	0	0	0	0	2	9	0	0	0	0	0	0	0	11
22	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
23	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
24	0	0	0	0	0	0	6	0	0	0	0	0	0	0	6
25	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
26	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
27	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
28	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
29	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
30	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NORE	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
SUM(NOS)	12	31	19	3	7	105	164	3	4	1	4	20	355	0	0
SUM(%)	3.3	8.5	5.2	.8	1.9	28.2	44.9	.8	1.1	.3	1.1	5.5	100.0	0	0

TABLE OF WIND VELOCITY FREQUENCY DISTRIBUTION  
ON 12-DIRECTION

CLASS	WIND DIRECTIONS													TOTAL (NOS)	CLASS RATIO (%)	
	N	NNE	NEE	E	EES	ESS	S	SSW	SWW	W	WNW	WN				
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
4	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2	.7
5	2	3	2	0	0	5	1	1	0	0	0	1	2	17	5.6	
6	3	4	0	0	0	3	3	1	0	0	0	0	2	16	5.3	
7	7	4	1	0	0	7	11	1	2	0	0	0	2	35	11.5	
8	3	2	2	0	0	5	12	1	0	0	0	0	1	26	8.5	
9	1	0	0	0	0	13	6	0	1	0	1	0	0	22	7.2	
10	0	0	1	0	0	11	9	0	0	0	0	0	1	22	7.2	
11	0	0	0	0	0	12	11	0	1	0	0	0	1	25	8.2	
12	0	0	0	0	0	8	4	0	0	0	0	0	0	12	3.9	
13	0	0	0	0	0	7	7	0	0	0	1	0	0	15	4.9	
14	0	0	0	0	0	3	5	0	0	0	0	0	0	8	2.6	
15	0	0	0	0	0	6	9	0	0	0	0	0	0	15	4.9	
16	0	0	0	0	0	3	10	0	0	0	0	0	0	13	4.3	
17	0	0	0	0	0	3	9	0	0	0	0	0	0	12	3.9	
18	0	0	0	0	0	4	5	0	0	0	0	0	0	9	3.0	
19	0	0	0	0	0	0	8	0	0	0	0	0	0	6	2.0	
20	0	0	0	0	0	2	6	0	0	0	0	0	0	8	2.6	
21	0	0	0	0	0	1	5	0	0	0	0	0	0	6	2.0	
22	0	0	0	0	0	1	9	0	0	0	0	0	0	10	3.3	
23	0	0	0	0	0	1	7	0	0	0	0	0	0	8	2.6	
24	0	0	0	0	0	0	4	0	0	0	0	0	0	4	1.3	
25	0	0	0	0	0	0	6	0	0	0	0	0	0	6	2.0	
26	0	0	0	0	0	0	3	0	0	0	0	0	0	3	1.0	
27	0	0	0	0	0	0	1	0	0	0	0	0	0	1	.3	
28	0	0	0	0	0	0	2	0	0	0	0	0	0	2	.7	
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
31	0	0	0	0	0	0	1	0	0	0	0	0	0	1	.3	
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
NOPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
SUM(NOS)	16	14	6	0	0	95	152	5	4	1	2	9	304	0.0		
SUM(%)	5.3	4.6	2.0	0.0	0.0	31.3	50.0	1.6	1.3	.3	.7	3.0	100.0	0.0		

TABLE OF WIND VELOCITY FREQUENCY DISTRIBUTION  
ON 12-DIRECTION

CLASS	WIND DIRECTIONS													TOTAL (NDS)	CLASS RATIO (%)	
	N	NNE	NEE	E	EES	ESS	S	SSW	SNW	N	WNW	WNW				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
4	2	2	1	0	0	0	1	1	0	0	0	0	0	0	7	.7
5	8	15	3	0	0	8	7	2	1	0	1	3	48	4.6		
6	13	22	9	3	2	15	12	2	2	0	0	6	86	8.3		
7	13	20	14	1	0	38	46	4	2	1	0	11	142	13.7		
8	7	5	9	2	0	25	35	4	2	0	1	11	101	9.8		
9	6	1	2	0	0	33	37	1	2	1	4	9	96	9.3		
10	1	0	2	0	0	27	27	1	0	0	1	3	62	6.0		
11	0	0	1	0	0	35	26	0	1	0	1	6	70	6.8		
12	0	0	0	0	0	26	14	0	1	0	2	2	45	4.4		
13	1	0	0	0	0	15	24	0	1	1	0	1	43	4.2		
14	0	0	0	0	0	16	17	0	0	0	0	1	34	3.3		
15	0	0	0	0	0	18	24	0	0	1	0	0	43	4.2		
16	0	0	0	0	0	12	24	0	0	0	0	0	36	3.5		
17	0	0	0	0	0	12	22	0	0	0	0	0	34	3.3		
18	0	0	0	0	0	9	13	0	0	0	0	0	22	2.1		
19	0	0	0	0	0	4	20	0	0	0	0	0	24	2.3		
20	0	0	0	0	0	1	17	0	0	0	0	0	21	2.0		
21	0	0	0	0	0	5	21	0	0	0	0	0	26	2.5		
22	0	0	0	0	0	2	18	0	0	0	0	0	20	1.9		
23	0	0	0	0	0	1	14	0	0	0	0	0	15	1.5		
24	0	0	0	0	0	0	12	0	0	0	0	0	12	1.2		
25	0	0	0	0	0	0	18	0	0	0	0	0	18	1.7		
26	0	0	0	0	0	0	8	0	0	0	0	0	8	.8		
27	0	0	0	0	0	0	7	0	0	0	0	0	7	.7		
28	0	0	0	0	0	0	6	0	0	0	0	0	6	.6		
29	0	0	0	0	0	0	3	0	0	0	0	0	3	.3		
30	0	0	0	0	0	0	3	0	0	0	0	0	3	.3		
31	0	0	0	0	0	0	1	0	0	0	0	0	1	.1		
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
NORE	0	1	0	0	0	0	0	0	0	0	0	0	1	.1		
SUM(NDS)	91	68	41	6	2	303	477	15	12	4	10	47	1004	100.0		
SUM(%)	4.9	6.4	4.0	.6	.2	29.3	46.1	1.5	1.2	.4	1.0	4.6	100.0	100.0		

TABLE A-3.2.15 Daily Wind Direction

DAILY WIND-DIRECTION

YEAR: 1985

UNIT: DEGREE

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	150.0	150.0	360.0	210.0	180.0	180.0	180.0	180.0	180.0	150.0	180.0	180.0
2	180.0	150.0	180.0	150.0	300.0	240.0	180.0	150.0	60.0	150.0	180.0	150.0
3	150.0	150.0	150.0	150.0	180.0	210.0	180.0	180.0	60.0	150.0	150.0	180.0
4	150.0	180.0	150.0	150.0	180.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0
5	30.0	60.0	30.0	150.0	180.0	360.0	180.0	180.0	180.0	180.0	60.0	360.0
6	30.0	150.0	150.0	150.0	180.0	180.0	180.0	180.0	180.0	150.0	60.0	300.0
7	360.0	360.0	180.0	180.0	150.0	180.0	180.0	150.0	180.0	150.0	30.0	330.0
8	30.0	330.0	180.0	150.0	150.0	180.0	180.0	180.0	180.0	180.0	30.0	360.0
9	360.0	330.0	330.0	30.0	150.0	180.0	180.0	180.0	150.0	210.0	360.0	330.0
10	360.0	330.0	360.0	360.0	180.0	180.0	180.0	180.0	180.0	180.0	360.0	300.0
11	360.0	330.0	30.0	330.0	180.0	180.0	180.0	150.0	150.0	180.0	180.0	30.0
12	360.0	330.0	30.0	330.0	180.0	180.0	180.0	150.0	150.0	150.0	150.0	360.0
13	30.0	360.0	60.0	360.0	180.0	180.0	180.0	150.0	180.0	150.0	180.0	30.0
14	120.0	240.0	180.0	210.0	180.0	180.0	180.0	150.0	180.0	30.0	150.0	30.0
15	180.0	210.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0	360.0	150.0	60.0
16	150.0	180.0	180.0	180.0	180.0	180.0	150.0	180.0	150.0	240.0	60.0	180.0
17	150.0	330.0	180.0	150.0	180.0	180.0	180.0	150.0	150.0	180.0	60.0	180.0
18	150.0	330.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0	180.0	30.0	150.0
19	150.0	330.0	180.0	150.0	180.0	180.0	180.0	150.0	150.0	150.0	180.0	150.0
20	150.0	270.0	180.0	150.0	180.0	180.0	180.0	150.0	150.0	150.0	180.0	150.0
21	150.0	30.0	150.0	150.0	180.0	180.0	150.0	150.0	150.0	180.0	180.0	180.0
22	150.0	60.0	150.0	150.0	180.0	180.0	180.0	150.0	180.0	180.0	180.0	150.0
23	90.0	30.0	150.0	180.0	360.0	180.0	180.0	180.0	180.0	180.0	30.0	180.0
24	90.0	330.0	150.0	180.0	360.0	180.0	180.0	180.0	150.0	180.0	30.0	180.0
25	90.0	180.0	180.0	180.0	330.0	180.0	180.0	180.0	150.0	180.0	240.0	30.0
26	360.0	150.0	180.0	150.0	210.0	180.0	180.0	150.0	180.0	150.0	180.0	150.0
27	30.0	150.0	180.0	150.0	150.0	180.0	180.0	150.0	150.0	180.0	150.0	180.0
28	60.0	360.0	150.0	180.0	180.0	180.0	180.0	150.0	150.0	180.0	60.0	300.0
29	150.0	--	180.0	180.0	360.0	180.0	180.0	150.0	150.0	150.0	60.0	330.0
30	150.0	--	180.0	180.0	270.0	180.0	180.0	150.0	150.0	60.0	60.0	230.0
31	150.0	--	210.0	--	180.0	--	180.0	150.0	--	60.0	--	330.0

DAILY WIND-DIRECTION

YEAR: 1986

UNIT: DEGREE

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	330.0	180.0	180.0	180.0	30.0	150.0	180.0	150.0	180.0	180.0	180.0	150.0
2	330.0	30.0	150.0	150.0	180.0	240.0	180.0	180.0	180.0	180.0	180.0	150.0
3	30.0	30.0	150.0	150.0	180.0	150.0	180.0	180.0	180.0	180.0	180.0	150.0
4	30.0	60.0	60.0	150.0	180.0	150.0	180.0	180.0	180.0	180.0	180.0	120.0
5	360.0	90.0	150.0	180.0	180.0	150.0	180.0	180.0	180.0	150.0	180.0	150.0
6	360.0	180.0	180.0	180.0	180.0	60.0	180.0	180.0	150.0	180.0	30.0	270.0
7	240.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0	180.0	300.0
8	360.0	180.0	150.0	180.0	180.0	180.0	180.0	150.0	150.0	150.0	180.0	330.0
9	180.0	210.0	360.0	180.0	180.0	30.0	150.0	150.0	150.0	180.0	150.0	330.0
10	30.0	180.0	150.0	180.0	180.0	360.0	180.0	180.0	150.0	150.0	180.0	30.0
11	180.0	330.0	180.0	180.0	180.0	330.0	180.0	180.0	150.0	150.0	60.0	30.0
12	150.0	330.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0	150.0	30.0	30.0
13	150.0	60.0	60.0	60.0	180.0	150.0	180.0	150.0	150.0	150.0	180.0	60.0
14	30.0	150.0	150.0	180.0	180.0	180.0	150.0	150.0	150.0	150.0	30.0	150.0
15	60.0	180.0	180.0	30.0	180.0	240.0	150.0	150.0	180.0	180.0	360.0	30.0
16	30.0	180.0	180.0	180.0	180.0	300.0	150.0	180.0	150.0	180.0	360.0	30.0
17	30.0	30.0	360.0	180.0	180.0	330.0	180.0	180.0	150.0	150.0	180.0	30.0
18	30.0	180.0	180.0	180.0	180.0	300.0	180.0	180.0	180.0	150.0	150.0	360.0
19	150.0	330.0	150.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0
20	150.0	330.0	330.0	180.0	180.0	180.0	180.0	180.0	180.0	60.0	90.0	150.0
21	330.0	30.0	60.0	330.0	180.0	330.0	180.0	180.0	150.0	60.0	150.0	30.0
22	330.0	60.0	30.0	180.0	240.0	330.0	180.0	180.0	150.0	180.0	150.0	30.0
23	30.0	150.0	30.0	180.0	150.0	300.0	180.0	180.0	180.0	210.0	150.0	360.0
24	360.0	150.0	150.0	150.0	150.0	180.0	180.0	150.0	150.0	180.0	150.0	360.0
25	60.0	150.0	150.0	180.0	180.0	180.0	180.0	150.0	150.0	180.0	30.0	30.0
26	150.0	150.0	180.0	180.0	180.0	180.0	180.0	180.0	60.0	180.0	180.0	30.0
27	150.0	150.0	330.0	180.0	150.0	330.0	180.0	150.0	150.0	180.0	150.0	60.0
28	150.0	180.0	330.0	180.0	150.0	150.0	180.0	180.0	150.0	210.0	90.0	60.0
29	150.0	--	330.0	150.0	150.0	180.0	180.0	180.0	180.0	180.0	150.0	60.0
30	150.0	--	150.0	180.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0	150.0
31	150.0	--	150.0	--	180.0	--	180.0	180.0	--	180.0	--	60.0

DAILY WIND-DIRECTION

YEAR: 1987

UNIT: DEGREE

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	360.0	240.0	150.0	360.0	180.0	180.0	180.0	180.0	180.0	60.0	--	--
2	240.0	210.0	150.0	360.0	180.0	150.0	180.0	180.0	180.0	180.0	--	--
3	30.0	150.0	150.0	150.0	150.0	180.0	180.0	150.0	180.0	150.0	--	--
4	30.0	180.0	150.0	180.0	150.0	180.0	180.0	180.0	180.0	150.0	--	--
5	30.0	150.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	150.0	--	--
6	150.0	30.0	150.0	180.0	180.0	150.0	180.0	180.0	180.0	150.0	--	--
7	150.0	150.0	150.0	180.0	180.0	330.0	180.0	180.0	180.0	150.0	--	--
8	60.0	180.0	150.0	360.0	150.0	270.0	180.0	180.0	180.0	180.0	--	--
9	210.0	150.0	150.0	180.0	150.0	240.0	180.0	180.0	240.0	180.0	--	--
10	150.0	150.0	180.0	180.0	180.0	210.0	180.0	180.0	180.0	180.0	--	--
11	30.0	150.0	150.0	180.0	150.0	360.0	180.0	150.0	150.0	360.0	--	--
12	30.0	360.0	150.0	330.0	150.0	330.0	180.0	150.0	150.0	180.0	--	--
13	360.0	330.0	180.0	180.0	180.0	180.0	180.0	180.0	150.0	150.0	--	--
14	30.0	330.0	180.0	150.0	150.0	150.0	180.0	180.0	150.0	180.0	--	--
15	330.0	300.0	360.0	180.0	180.0	180.0	180.0	150.0	150.0	180.0	--	--
16	330.0	210.0	180.0	150.0	180.0	150.0	180.0	150.0	180.0	180.0	--	--
17	330.0	150.0	150.0	150.0	180.0	180.0	180.0	150.0	180.0	150.0	--	--
18	360.0	150.0	150.0	180.0	150.0	180.0	180.0	150.0	150.0	180.0	--	--
19	360.0	150.0	150.0	180.0	180.0	180.0	180.0	150.0	150.0	150.0	--	--
20	360.0	150.0	180.0	180.0	180.0	150.0	180.0	150.0	180.0	150.0	--	--
21	30.0	150.0	180.0	180.0	180.0	300.0	180.0	180.0	180.0	150.0	--	--
22	30.0	30.0	150.0	360.0	180.0	180.0	180.0	150.0	180.0	150.0	--	--
23	60.0	30.0	150.0	330.0	180.0	180.0	150.0	180.0	180.0	150.0	--	--
24	60.0	180.0	240.0	30.0	180.0	180.0	180.0	180.0	150.0	150.0	--	--
25	150.0	180.0	150.0	210.0	180.0	150.0	180.0	150.0	180.0	150.0	--	--
26	150.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	60.0	150.0	--	--
27	150.0	150.0	180.0	150.0	180.0	180.0	180.0	180.0	150.0	150.0	--	--
28	60.0	150.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	150.0	--	--
29	30.0	--	150.0	150.0	180.0	180.0	180.0	180.0	180.0	180.0	--	--
30	360.0	--	180.0	180.0	150.0	180.0	180.0	180.0	180.0	180.0	--	--
31	360.0	--	360.0	--	180.0	--	180.0	180.0	--	180.0	--	--



TABLE A-3.2.16 Daily Prevailing Wind Speed

DAILY PREVAILING WIND-SPEED

YEAR: 1985

UNIT: KNOT

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	6.0	12.0	6.0	7.0	9.0	11.0	27.0	22.0	9.0	11.0	7.0	8.0
2	13.0	15.0	5.0	15.0	8.0	9.0	23.0	19.0	9.0	10.0	8.0	7.0
3	12.0	10.0	11.0	15.0	11.0	8.0	25.0	16.0	7.0	9.0	8.0	7.0
4	7.0	8.0	7.0	14.0	17.0	8.0	25.0	19.0	8.0	9.0	8.0	7.0
5	5.0	8.0	6.0	11.0	17.0	7.0	23.0	19.0	10.0	9.0	7.0	8.0
6	6.0	6.0	7.0	11.0	16.0	10.0	21.0	17.0	11.0	9.0	7.0	12.0
7	4.0	8.0	13.0	9.0	12.0	16.0	20.0	21.0	19.0	8.0	8.0	8.0
8	5.0	9.0	13.0	9.0	9.0	17.0	23.0	25.0	16.0	10.0	7.0	6.0
9	6.0	8.0	9.0	7.0	12.0	15.0	26.0	26.0	8.0	7.0	6.0	7.0
10	6.0	11.0	8.0	7.0	15.0	9.0	27.0	22.0	14.0	7.0	7.0	9.0
11	6.0	11.0	7.0	9.0	14.0	13.0	27.0	19.0	11.0	10.0	7.0	7.0
12	5.0	5.0	5.0	8.0	11.0	12.0	25.0	17.0	16.0	11.0	10.0	5.0
13	6.0	7.0	6.0	6.0	8.0	13.0	25.0	19.0	17.0	8.0	8.0	6.0
14	6.0	5.0	7.0	6.0	8.0	19.0	25.0	18.0	15.0	8.0	6.0	6.0
15	6.0	5.0	7.0	9.0	7.0	20.0	23.0	14.0	14.0	9.0	7.0	6.0
16	7.0	7.0	6.0	8.0	9.0	15.0	16.0	15.0	17.0	6.0	7.0	7.0
17	6.0	11.0	8.0	7.0	9.0	18.0	13.0	12.0	13.0	7.0	8.0	12.0
18	6.0	12.0	9.0	10.0	9.0	22.0	13.0	12.0	13.0	8.0	5.0	14.0
19	8.0	13.0	14.0	8.0	9.0	16.0	21.0	15.0	14.0	9.0	5.0	13.0
20	6.0	7.0	14.0	16.0	6.0	17.0	24.0	17.0	12.0	10.0	5.0	12.0
21	7.0	6.0	16.0	19.0	7.0	16.0	15.0	18.0	11.0	11.0	6.0	9.0
22	8.0	6.0	16.0	17.0	8.0	12.0	20.0	22.0	9.0	7.0	6.0	9.0
23	8.0	8.0	10.0	15.0	9.0	14.0	25.0	20.0	8.0	7.0	6.0	7.0
24	6.0	8.0	11.0	17.0	9.0	19.0	21.0	19.0	9.0	7.0	5.0	5.0
25	6.0	7.0	17.0	12.0	9.0	21.0	17.0	22.0	11.0	7.0	8.0	6.0
26	6.0	14.0	10.0	7.0	8.0	20.0	19.0	21.0	11.0	10.0	8.0	5.0
27	5.0	10.0	11.0	6.0	9.0	21.0	25.0	17.0	9.0	8.0	8.0	9.0
28	6.0	9.0	10.0	8.0	9.0	22.0	29.0	14.0	11.0	7.0	7.0	11.0
29	7.0	--	13.0	7.0	10.0	23.0	21.0	7.0	11.0	7.0	7.0	9.0
30	8.0	--	23.0	6.0	9.0	24.0	14.0	7.0	10.0	7.0	8.0	8.0
31	9.0	--	9.0	--	9.0	--	21.0	8.0	--	8.0	--	9.0
MAX	13.0	15.0	23.0	18.0	17.0	24.0	29.0	26.0	19.0	11.0	10.0	14.0

ANNUAL MAX : 29.0 KNOT ( DATE 1985. JUL. 28 )

DAILY PREVAILE WIND-SPEED

YEAR: 1986

UNIT: KNOT

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	8.0	12.0	10.0	16.0	7.0	11.0	15.0	15.0	20.0	16.0	7.0	12.0
2	8.0	7.0	10.0	13.0	9.0	12.0	20.0	22.0	22.0	14.0	7.0	12.0
3	7.0	5.0	8.0	14.0	12.0	9.0	21.0	28.0	19.0	10.0	7.0	10.0
4	6.0	5.0	7.0	14.0	20.0	12.0	24.0	26.0	19.0	10.0	9.0	6.0
5	5.0	7.0	7.0	13.0	21.0	13.0	27.0	16.0	18.0	10.0	7.0	6.0
6	5.0	8.0	12.0	10.0	13.0	8.0	26.0	18.0	17.0	9.0	7.0	15.0
7	6.0	9.0	21.0	17.0	11.0	10.0	30.0	18.0	12.0	9.0	7.0	9.0
8	4.0	8.0	15.0	14.0	9.0	11.0	24.0	15.0	9.0	10.0	9.0	6.0
9	5.0	10.0	8.0	17.0	10.0	9.0	21.0	16.0	11.0	8.0	7.0	6.0
10	6.0	13.0	7.0	18.0	14.0	13.0	22.0	17.0	13.0	12.0	7.0	4.0
11	5.0	8.0	13.0	13.0	19.0	11.0	21.0	19.0	10.0	11.0	8.0	5.0
12	6.0	5.0	10.0	9.0	18.0	14.0	12.0	18.0	12.0	9.0	7.0	6.0
13	6.0	4.0	7.0	9.0	15.0	12.0	16.0	14.0	11.0	13.0	7.0	7.0
14	6.0	11.0	9.0	8.0	16.0	11.0	20.0	16.0	11.0	16.0	7.0	7.0
15	6.0	19.0	14.0	7.0	19.0	13.0	20.0	19.0	14.0	7.0	9.0	7.0
16	5.0	9.0	22.0	6.0	16.0	9.0	21.0	21.0	13.0	7.0	6.0	6.0
17	5.0	5.0	7.0	7.0	16.0	10.0	25.0	25.0	15.0	7.0	4.0	7.0
18	6.0	15.0	6.0	10.0	13.0	10.0	25.0	30.0	10.0	9.0	9.0	5.0
19	5.0	14.0	16.0	12.0	9.0	11.0	27.0	30.0	11.0	8.0	7.0	6.0
20	7.0	10.0	12.0	15.0	9.0	11.0	29.0	28.0	13.0	8.0	6.0	8.0
21	11.0	7.0	7.0	8.0	9.0	9.0	28.0	28.0	12.0	11.0	7.0	7.0
22	7.0	7.0	7.0	10.0	8.0	7.0	25.0	27.0	11.0	8.0	6.0	7.0
23	5.0	8.0	6.0	7.0	10.0	12.0	24.0	24.0	9.0	8.0	11.0	7.0
24	5.0	8.0	8.0	7.0	15.0	9.0	24.0	17.0	8.0	7.0	7.0	6.0
25	6.0	12.0	14.0	10.0	15.0	15.0	21.0	17.0	9.0	9.0	6.0	6.0
26	7.0	11.0	18.0	16.0	15.0	12.0	21.0	19.0	10.0	7.0	9.0	5.0
27	7.0	7.0	9.0	20.0	14.0	8.0	17.0	14.0	10.0	6.0	8.0	8.0
28	8.0	7.0	6.0	21.0	15.0	11.0	24.0	18.0	11.0	7.0	8.0	6.0
29	9.0	--	6.0	11.0	18.0	10.0	26.0	20.0	15.0	7.0	8.0	7.0
30	15.0	--	7.0	11.0	15.0	11.0	29.0	20.0	13.0	7.0	9.0	5.0
31	17.0	--	12.0	--	13.0	--	33.0	21.0	--	7.0	--	6.0
MAX	17.0	19.0	22.0	21.0	21.0	15.0	30.0	30.0	22.0	16.0	11.0	15.0

ANNUAL MAX : 30.0 KNOT ( DATE 1986. JUL. 7 )  
 ( DATE 1986. AUG. 18 )  
 ( DATE 1986. AUG. 19 )

DAILY PREVAIL WIND-SPEED

YEAR: 1987

UNIT: KNOT

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	7.0	7.0	12.0	5.0	12.0	15.0	15.0	23.0	23.0	8.0	--	--
2	4.0	6.0	7.0	5.0	17.0	10.0	17.0	23.0	22.0	7.0	--	--
3	5.0	7.0	9.0	5.0	18.0	10.0	20.0	20.0	24.0	9.0	--	--
4	7.0	7.0	14.0	15.0	12.0	9.0	24.0	22.0	25.0	13.0	--	--
5	6.0	6.0	7.0	26.0	10.0	11.0	19.0	22.0	24.0	13.0	--	--
6	5.0	5.0	10.0	13.0	16.0	9.0	21.0	22.0	21.0	11.0	--	--
7	6.0	5.0	10.0	8.0	12.0	11.0	27.0	21.0	19.0	9.0	--	--
8	5.0	7.0	11.0	6.0	13.0	13.0	31.0	16.0	11.0	7.0	--	--
9	5.0	14.0	13.0	7.0	15.0	11.0	25.0	20.0	9.0	8.0	--	--
10	5.0	18.0	16.0	6.0	16.0	8.0	21.0	19.0	8.0	9.0	--	--
11	6.0	11.0	12.0	8.0	15.0	7.0	20.0	18.0	8.0	7.0	--	--
12	7.0	7.0	20.0	6.0	12.0	8.0	23.0	17.0	8.0	7.0	--	--
13	6.0	5.0	28.0	7.0	13.0	8.0	22.0	22.0	9.0	11.0	--	--
14	6.0	5.0	20.0	9.0	13.0	9.0	19.0	26.0	11.0	11.0	--	--
15	7.0	5.0	8.0	10.0	13.0	17.0	22.0	21.0	9.0	8.0	--	--
16	10.0	4.0	5.0	10.0	11.0	11.0	21.0	15.0	7.0	8.0	--	--
17	7.0	10.0	9.0	11.0	12.0	11.0	19.0	10.0	8.0	7.0	--	--
18	8.0	15.0	12.0	13.0	13.0	16.0	16.0	16.0	12.0	7.0	--	--
19	7.0	22.0	8.0	16.0	15.0	15.0	15.0	17.0	11.0	7.0	--	--
20	7.0	16.0	10.0	14.0	17.0	10.0	20.0	15.0	14.0	7.0	--	--
21	7.0	11.0	16.0	8.0	13.0	9.0	23.0	14.0	12.0	9.0	--	--
22	5.0	8.0	11.0	7.0	17.0	11.0	22.0	15.0	7.0	10.0	--	--
23	7.0	7.0	16.0	6.0	15.0	17.0	23.0	17.0	9.0	8.0	--	--
24	5.0	6.0	7.0	6.0	18.0	16.0	26.0	14.0	8.0	10.0	--	--
25	5.0	6.0	10.0	7.0	14.0	17.0	25.0	9.0	8.0	11.0	--	--
26	6.0	11.0	17.0	9.0	13.0	13.0	25.0	15.0	10.0	9.0	--	--
27	7.0	13.0	23.0	9.0	15.0	11.0	24.0	17.0	12.0	10.0	--	--
28	8.0	12.0	19.0	10.0	18.0	10.0	28.0	18.0	18.0	7.0	--	--
29	8.0	--	18.0	11.0	11.0	9.0	23.0	11.0	16.0	10.0	--	--
30	8.0	--	22.0	11.0	14.0	10.0	25.0	9.0	10.0	8.0	--	--
31	6.0	--	9.0	--	20.0	--	25.0	16.0	--	8.0	--	--
MAX	10.0	22.0	28.0	26.0	20.0	20.0	31.0	26.0	25.0	13.0	--	--

ANNUAL MAX : 31.0 KNOT ( DATE 1987.JUL. 8 )

TABLE A-3.2.17 Daily Gust Wind Speed

DAILY GUST WIND-SPEED

YEAR: 1985

UNIT: KNOT

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	10.0	24.0	13.0	21.0	17.0	20.0	37.0	30.0	19.0	20.0	15.0	--
2	23.0	20.0	8.0	24.0	18.0	21.0	31.0	26.0	20.0	18.0	17.0	--
3	23.0	14.0	23.0	28.0	25.0	15.0	36.0	34.0	18.0	16.0	16.0	--
4	13.0	11.0	14.0	27.0	27.0	15.0	33.0	27.0	14.0	13.0	19.0	--
5	10.0	11.0	14.0	20.0	24.0	14.0	32.0	28.0	18.0	18.0	15.0	--
6	9.0	10.0	14.0	19.0	25.0	20.0	31.0	27.0	22.0	17.0	15.0	--
7	7.0	19.0	27.0	22.0	18.0	26.0	27.0	31.0	30.0	15.0	15.0	--
8	10.0	17.0	24.0	17.0	21.0	31.0	32.0	35.0	24.0	17.0	16.0	--
9	18.0	16.0	18.0	12.0	21.0	24.0	34.0	38.0	20.0	16.0	16.0	--
10	13.0	22.0	16.0	16.0	26.0	19.0	33.0	30.0	24.0	16.0	13.0	--
11	9.0	20.0	12.0	20.0	26.0	24.0	35.0	29.0	23.0	21.0	12.0	--
12	9.0	16.0	13.0	19.0	20.0	25.0	35.0	27.0	26.0	23.0	22.0	--
13	9.0	16.0	13.0	16.0	16.0	24.0	36.0	26.0	27.0	14.0	17.0	--
14	11.0	9.0	13.0	15.0	19.0	28.0	33.0	24.0	24.0	22.0	14.0	--
15	11.0	10.0	15.0	16.0	18.0	28.0	34.0	28.0	22.0	24.0	16.0	--
16	11.0	14.0	11.0	16.0	22.0	26.0	26.0	24.0	25.0	14.0	18.0	--
17	8.0	24.0	18.0	17.0	19.0	28.0	20.0	22.0	22.0	18.0	17.0	--
18	9.0	27.0	18.0	23.0	21.0	30.0	26.0	24.0	21.0	14.0	12.0	--
19	14.0	27.0	29.0	19.0	19.0	26.0	32.0	25.0	22.0	20.0	11.0	--
20	11.0	13.0	22.0	28.0	14.0	24.0	34.0	24.0	18.0	22.0	12.0	--
21	15.0	13.0	25.0	26.0	16.0	23.0	24.0	27.0	20.0	22.0	8.0	--
22	12.0	13.0	23.0	28.0	14.0	24.0	30.0	30.0	20.0	17.0	11.0	--
23	14.0	20.0	20.0	26.0	22.0	24.0	33.0	28.0	16.0	15.0	13.0	--
24	11.0	15.0	23.0	29.0	20.0	28.0	31.0	26.0	20.0	16.0	14.0	--
25	10.0	18.0	28.0	23.0	19.0	29.0	28.0	34.0	26.0	15.0	20.0	--
26	12.0	22.0	20.0	14.0	14.0	26.0	40.0	28.0	24.0	20.0	20.0	--
27	8.0	19.0	20.0	16.0	19.0	33.0	35.0	23.0	22.0	18.0	22.0	--
28	12.0	16.0	20.0	18.0	15.0	32.0	36.0	24.0	20.0	17.0	17.0	--
29	9.0	--	25.0	17.0	20.0	33.0	29.0	17.0	23.0	14.0	19.0	--
30	11.0	--	36.0	10.0	19.0	34.0	25.0	17.0	18.0	16.0	18.0	--
31	17.0	--	23.0	--	16.0	--	31.0	20.0	--	17.0	--	--
MAX	23.0	27.0	36.0	29.0	27.0	34.0	40.0	38.0	30.0	24.0	22.0	--

ANNUAL MAX : 40.0 KNOT ( DATE 1985. JUL. 26 )

## DAILY GUST WIND-SPEED

YEAR: 1986

UNIT: KNOT

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	13.0	23.0	18.0	22.0	18.0	19.0	27.0	26.0	32.0	23.0	16.0	22.0
2	18.0	21.0	14.0	25.0	12.0	18.0	31.0	34.0	30.0	20.0	18.0	24.0
3	15.0	10.0	13.0	25.0	16.0	18.0	33.0	36.0	32.0	15.0	20.0	23.0
4	8.0	10.0	15.0	27.0	30.0	19.0	30.0	32.0	31.0	16.0	22.0	12.0
5	9.0	12.0	15.0	23.0	30.0	25.0	33.0	33.0	30.0	18.0	13.0	14.0
6	10.0	18.0	26.0	18.0	23.0	15.0	34.0	31.0	28.0	17.0	18.0	32.0
7	9.0	16.0	35.0	31.0	17.0	20.0	41.0	30.0	23.0	20.0	14.0	14.0
8	6.0	15.0	33.0	23.0	15.0	24.0	26.0	25.0	18.0	25.0	17.0	17.0
9	8.0	17.0	15.0	32.0	20.0	20.0	31.0	28.0	22.0	19.0	14.0	15.0
10	13.0	21.0	17.0	28.0	24.0	26.0	31.0	27.0	20.0	20.0	17.0	11.0
11	10.0	16.0	25.0	21.0	30.0	18.0	28.0	29.0	22.0	18.0	21.0	11.0
12	9.0	8.0	21.0	14.0	23.0	18.0	19.0	25.0	20.0	22.0	17.0	13.0
13	10.0	7.0	19.0	17.0	22.0	21.0	28.0	20.0	18.0	26.0	15.0	14.0
14	16.0	22.0	17.0	15.0	27.0	22.0	27.0	23.0	21.0	27.0	16.0	13.0
15	11.0	31.0	27.0	12.0	30.0	40.0	26.0	27.0	22.0	16.0	19.0	17.0
16	9.0	18.0	30.0	12.0	25.0	14.0	26.0	32.0	20.0	13.0	12.0	16.0
17	9.0	11.0	15.0	11.0	21.0	15.0	36.0	36.0	24.0	18.0	9.0	18.0
18	10.0	30.0	15.0	18.0	17.0	21.0	33.0	40.0	18.0	22.0	20.0	15.0
19	7.0	28.0	26.0	18.0	19.0	18.0	36.0	40.0	19.0	24.0	14.0	13.0
20	11.0	20.0	18.0	25.0	16.0	16.0	42.0	38.0	22.0	23.0	14.0	15.0
21	17.0	12.0	16.0	24.0	19.0	17.0	42.0	34.0	18.0	28.0	21.0	20.0
22	10.0	13.0	18.0	20.0	16.0	15.0	35.0	35.0	20.0	17.0	14.0	18.0
23	8.0	18.0	11.0	15.0	16.0	29.0	33.0	31.0	18.0	25.0	19.0	21.0
24	9.0	15.0	14.0	15.0	23.0	20.0	32.0	24.0	16.0	17.0	18.0	15.0
25	9.0	22.0	26.0	24.0	25.0	24.0	30.0	24.0	21.0	20.0	13.0	12.0
26	11.0	16.0	29.0	27.0	22.0	18.0	30.0	28.0	24.0	20.0	21.0	15.0
27	13.0	10.0	19.0	27.0	18.0	16.0	32.0	23.0	18.0	15.0	19.0	17.0
28	14.0	9.0	18.0	26.0	20.0	24.0	34.0	27.0	21.0	14.0	22.0	15.0
29	15.0	--	9.0	23.0	27.0	19.0	37.0	28.0	24.0	13.0	21.0	20.0
30	27.0	--	15.0	34.0	24.0	21.0	36.0	31.0	20.0	14.0	20.0	14.0
31	28.0	--	20.0	--	22.0	--	31.0	35.0	--	15.0	--	15.0
MAX	28.0	31.0	35.0	34.0	30.0	40.0	42.0	40.0	35.0	28.0	22.0	32.0

ANNUAL MAX : 42.0 KNOT ( DATE 1986. JUL. 20 )  
 ( DATE 1986. JUL. 21 )

DAILY GUST WIND-SPEED

YEAR: 1987

UNIT: KNOT

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	16.0	15.0	24.0	12.0	22.0	25.0	27.0	31.0	33.0	17.0	--	--
2	8.0	13.0	15.0	11.0	26.0	33.0	29.0	30.0	33.0	14.0	--	--
3	12.0	16.0	16.0	15.0	30.0	24.0	29.0	27.0	31.0	18.0	--	--
4	14.0	17.0	28.0	32.0	23.0	20.0	33.0	30.0	33.0	26.0	--	--
5	17.0	17.0	17.0	40.0	21.0	20.0	26.0	31.0	35.0	23.0	--	--
6	12.0	16.0	17.0	24.0	25.0	20.0	29.0	30.0	33.0	25.0	--	--
7	12.0	14.0	19.0	17.0	21.0	20.0	37.0	33.0	27.0	21.0	--	--
8	14.0	16.0	23.0	35.0	24.0	25.0	40.0	25.0	19.0	13.0	--	--
9	14.0	22.0	23.0	19.0	23.0	24.0	36.0	31.0	16.0	20.0	--	--
10	11.0	29.0	28.0	18.0	26.0	17.0	29.0	27.0	14.0	28.0	--	--
11	14.0	25.0	25.0	21.0	24.0	15.0	34.0	25.0	15.0	10.0	--	--
12	20.0	13.0	33.0	16.0	24.0	17.0	31.0	26.0	16.0	14.0	--	--
13	14.0	10.0	38.0	16.0	22.0	16.0	28.0	33.0	16.0	22.0	--	--
14	13.0	10.0	33.0	20.0	27.0	20.0	26.0	36.0	22.0	22.0	--	--
15	18.0	11.0	18.0	21.0	26.0	26.0	30.0	32.0	20.0	18.0	--	--
16	22.0	9.0	11.0	25.0	21.0	19.0	30.0	25.0	15.0	23.0	--	--
17	16.0	23.0	24.0	20.0	22.0	20.0	30.0	18.0	14.0	21.0	--	--
18	18.0	25.0	22.0	28.0	24.0	29.0	23.0	24.0	19.0	16.0	--	--
19	17.0	35.0	20.0	30.0	27.0	28.0	27.0	26.0	25.0	14.0	--	--
20	17.0	27.0	24.0	24.0	28.0	32.0	31.0	23.0	24.0	12.0	--	--
21	15.0	19.0	27.0	18.0	23.0	20.0	32.0	26.0	23.0	19.0	--	--
22	10.0	16.0	24.0	16.0	27.0	24.0	30.0	27.0	16.0	23.0	--	--
23	16.0	17.0	26.0	17.0	22.0	26.0	30.0	30.0	20.0	17.0	--	--
24	18.0	11.0	26.0	18.0	29.0	24.0	37.0	24.0	17.0	18.0	--	--
25	14.0	15.0	25.0	14.0	24.0	28.0	33.0	18.0	21.0	20.0	--	--
26	13.0	21.0	29.0	21.0	22.0	21.0	33.0	25.0	23.0	18.0	--	--
27	15.0	23.0	34.0	21.0	24.0	23.0	32.0	25.0	24.0	19.0	--	--
28	16.0	21.0	34.0	30.0	30.0	22.0	36.0	29.0	29.0	19.0	--	--
29	15.0	--	29.0	21.0	21.0	18.0	32.0	18.0	23.0	26.0	--	--
30	20.0	--	35.0	24.0	27.0	18.0	35.0	24.0	18.0	22.0	--	--
31	14.0	--	18.0	--	28.0	--	38.0	31.0	--	22.0	--	--
MAX	22.0	35.0	38.0	40.0	30.0	33.0	40.0	36.0	35.0	28.0	--	--

QUINQUA. MAX : 40.0 KNOT ( DATE 1987. APR. 5 )  
 ( DATE 1987. JUL. 8 )

TABLE A-3.2.18 Summary of Field Data Chart

Date				Weather	Wind Direc- tion	Wind Run		HLAN-V m/sec	Temperature °C					Rain (mm)	
Y	H	N	Time			km	Time		Dry	Wet	Time	Max	Min		Time
87	12	9	1000	CLEAR	N	3057.49	1000		19.0	0.0	1005	28.5	12.0	1006	No
87	12	17	935	CLEAR	N	4051.84	935	1.4	19.5	0.0	940	29.0	8.0	942	No
87	12	24	915	CLEAR	N	5564.24	915	2.5	21.5	nil	916	28.5	9.5	918	No
88	1	4	1000	CLEAR	NW	7571.99	1000	2.1	16.5	nil	1002	29.0	7.0	1005	No
88	1	7	910	CLEAR	SE	7869.65	910	1.2	17.0	NR	915	26.0	8.5	918	No
88	1	14	855	CLEAR	SE	8813.21	855	1.4	15.0	nil	900	28.5	5.5	902	No
88	1	24	915	CLEAR	NE	0978.79	915	2.5	14.0	nil	917	29.5	4.5	920	No
88	1	28	928	CLEAR	N	1621.09	928	1.9	20.0	0.0	930	30.0	6.0	932	No
88	2	4	955	DUSTY	N	2972.77	955	2.2	20.5	nil	957	35.0	10.0	nil	No
88	2	11	955	CLEAR	N	4757.63	955	3.0	31.5	nil	957	31.5	5.5	958	No
88	2	18	953	CLEAR	S	7016.57	953	3.7	26.0	nil	955	33.5	6.0	958	No
88	2	25	950	CLEAR	S	8981.15	950	3.2	26.5	nil	952	37.0	17.0	955	No
88	3	3	945	CLEAR	S	0311.98	945	2.2	24.5	nil	947	30.0	10.5	950	No
88	3	10	910	CLEAR	S	2014.33	910	2.8	28.0	nil	912	39.5	14.5	915	No
88	3	17	935	CLEAR	N	3310.48	935	2.1	24.5	nil	938	40.0	15.5	940	No
88	3	24	1010	DUSTY	N	5420.44	1010	3.5	24.0	nil	1012	38.5	9.0	1015	No
88	3	31	910	CLEAR	WE	6833.39	910	2.4	28.5	nil	911	38.0	11.5	912	No
88	4	7	812	CLEAR	WE	7598.07	812	1.1	28.0	nil	815	31.5	19.5	815	No
88	4	14	845	CLEAR	WE	8665.33	845	1.8	28.5	nil	846	31.5	19.5	850	No
88	4	21	nil	CLEAR	SE	8994.99	nil	( 0.5)	30.5	nil	822	42.0	11.5	824	No
88	4	28	805	CLOUDY	NW	428.55	805	( 2.4)	22.5	nil	808	42.0	21.5	810	15.8
88	5	5	745	CLEAR	WN	750.00	745	0.5	27.5	nil	nil	42.0	18.5	nil	No
88	5	12	730	CLEAR	WN	1128.87	730	0.6	29.0	nil	733	43.5	21.5	nil	No
88	5	27	nil	CLEAR	WN	1967.60	nil	( 0.6)	25.0	nil	715	44.5	20.5	716	No
88	6	2	848	nil	SSW	2617.54	845	( 1.2)	33.5	nil	850	44.5	24.5	852	No
88	6	9	705	CLEAR	SSW	3607.69	705	1.7	27.0	nil	710	45.5	21.5	nil	No
88	6	16	925	CLEAR	SN	5716.99	925	3.5	35.5	nil	927	45.5	24.5	930	No
88	6	23	916	CLEAR	SSW	6550.21	916	1.4	37.0	nil	920	47.5	24.5	922	No
88	6	30	800	CLOUDY	NW	7450.43	800	1.5	33.5	nil	802	45.5	24.4	804	IR
88	7	7	815	CLEAR	SW	9755.23	815	3.8	33.0	nil	820	45.5	26.5	822	No
88	7	14	835	CLOUDY	SW	2560.58	835	4.6	32.5	nil	837	47.5	26.5	840	No
88	7	28	838	nil	nil	0577.48	840	6.6	32.5	nil	840	46.5	25.5	843	No
88	8	4	1105	nil	SW	4865.09	1105	7.0	40.5	nil	1110	45.5	25.5	1112	No
88	8	11	1450	nil	W	5991.12	1450	1.8	45.5	nil	1454	47.5	26.5	1455	No
88	8	18	720	CLEAR	SW	6669.03	725	1.2	26.5	nil	725	46.5	25.0	730	No
88	8	25	740	CLEAR	NW	7657.12	740	1.6	28.5	nil	742	46.5	25.0	746	No
88	9	1	1022	CLEAR	E	8507.39	1022	-	37.0	nil	1023	46.0	25.0	1025	No
88	9	8	850	CLEAR	SE	9538.46	852	-	29.0	nil	852	44.5	22.0	854	No
88	9	23	740	CLEAR	W	1361.38	744	-	29.5	nil	744	43.5	22.0	746	No
88	9	29	1150	CLEAR	NW	1555.28	1150	-	39.6	20.0	1153	44.0	20.1	11.5	No
88	10	6	1032	CLEAR	SW	2066.34	1032	-	33.0	22.3	1036	42.2	19.4	1040	No
88	10	12	nil	CLEAR	E	nil	nil	-	34.3	18.6	1030	39.5	16.1	1632	No
88	10	15	nil	CLEAR	SSE	nil	952	-	29.5	22.5	953	35.5	16.5	958	No
88	10	20	945	nil	nil	nil	945	-	31.3	17.5	947	37.5	17.0	950	No
88	10	27	915	nil	nil	nil	915	-	28.5	nil	nil	37.7	17.4	920	No
88	11	3	920	nil	nil	nil	920	-	27.4	17.6	920	31.6	14.2	nil	No
88	11	10	950	nil	nil	nil	950	-	27.0	16.5	950	34.1	12.5	nil	No
88	11	16	940	nil	nil	nil	940	-	24.6	nil	940	32.8	13.3	nil	No
88	11	29	1030	nil	nil	nil	1030	-	25.8	nil	1030	31.8	9.6	nil	No
88	12	7	1005	nil	nil	nil	1005	-	21.2	12.8	1005	29.2	9.0	nil	No
88	12	15	nil	nil	nil	nil	nil	-	25.5	18.5	nil	28.5	20.0	1010	No
88	12	22	nil	CLOUDY	nil	nil	nil	-	19.5	19.5	nil	30.5	12.5	nil	No
88	12	29	nil	nil	nil	nil	nil	-	19.5	15.5	nil	33.0	10.0	920	No
89	1	5	1055	CLOUDY	NW	2065.47	1055	-	20.5	16.5	1055	30.0	8.5	1031	No
89	1	12	1035	CLEAR	W	3702.12	1035	2.7	23.0	20.0	1035	27.5	2.0	1040	No
89	1	19	840	CLEAR	W	5152.48	840	2.4	11.0	6.8	840	28.0	6.2	846	No
89	1	26	1045	CLEAR	NW	6834.67	1045	2.7	17.0	8.7	1045	27.7	4.2	1050	No
89	2	2	1015	CLEAR	SE	8285.68	1015	2.4	25.5	19.5	1015	31.5	4.0	1031	No
89	2	9	920	CLEAR	SW	0118.59	920	3.0	20.0	12.1	920	32.1	9.1	930	No
89	2	16	900	CLEAR	SW	1987.29	900	3.1	18.5	10.2	nil	35.5	9.8	910	No

TABLE A-3.2.19

TABLE A-3.2.19 Meteorological Observation Results at Project Site

DATE	GUST WIND			SUSTAINED WIND												RADIATION (KWH- FM-2)										
	DAILY			DAYTIME			NIGHTTIME			DAILY			DAYTIME				NIGHTTIME									
	MAX. (m/s)	MEAN. (m/s)	MIN. (m/s)	MAX. (m/s)	MEAN. (m/s)	MIN. (m/s)	MAX. (m/s)	MEAN. (m/s)	MIN. (m/s)	MAX. (m/s)	MEAN. (m/s)	MIN. (m/s)	MAX. (m/s)	MEAN. (m/s)	MIN. (m/s)		MAX. (m/s)	MEAN. (m/s)	MIN. (m/s)	MAX. (m/s)	W.DIR. (deg)	MEAN. (m/s)	MIN. (m/s)	MAX. (m/s)	W.DIR. (deg)	
21.10.88	6.00	4.56	6.00	4.00	5.25	4.80	2.80	3.78	9.10	3.50	5.37	9.10	4.50	6.38	150.00	5.50	3.50	4.56	120.00							
22.10.88	0.50	1.00	5.92	10.50	1.00	7.38	6.80	1.00	4.45	10.20	1.20	6.08	10.20	1.50	7.38	90.00	6.70	1.20	4.78	120.00						
23.10.88	7.00	2.00	3.92	7.00	2.20	4.70	4.00	2.20	3.14	8.30	2.30	4.67	8.30	2.50	5.58	120.00	4.30	3.10	3.76	150.00						
24.10.88	9.70	0.30	3.25	9.70	1.80	4.70	4.00	0.30	2.01	10.10	1.80	4.08	10.10	2.80	5.35	90.00	4.20	1.80	2.81	210.00						
25.10.88	8.00	0.50	3.84	8.00	0.50	4.35	3.50	2.00	3.33	7.10	2.80	4.43	7.10	2.80	4.88	60.00	4.90	3.98	180.00							
26.10.88	8.00	0.10	3.68	8.00	1.00	4.71	3.50	1.90	2.56	8.90	0.20	3.99	8.90	0.50	4.94	90.00	3.80	2.30	3.03	210.00						
27.10.88	7.00	0.00	3.23	7.00	0.50	3.88	3.80	0.00	2.53	8.60	0.60	4.05	8.60	0.60	4.84	60.00	4.20	0.70	3.26	180.00						
28.10.88	8.00	0.00	2.88	8.00	0.50	3.30	3.80	1.80	2.45	7.80	0.50	3.77	7.80	1.00	4.34	60.00	4.10	2.50	3.20	180.00						
29.10.88	5.00	0.00	2.75	5.00	2.00	3.51	2.50	0.50	1.99	5.40	0.50	3.24	5.40	2.80	3.95	0.00	2.90	0.50	2.93	210.00						
30.10.88	5.00	0.00	2.42	5.00	0.50	2.71	3.50	0.00	2.13	6.50	0.50	3.11	6.50	1.80	3.55	60.00	3.60	0.50	2.68	150.00						
31.10.88	8.80	2.00	4.70	8.80	2.00	6.00	6.50	2.00	3.40	10.50	2.30	5.26	10.50	2.30	6.48	90.00	6.50	2.90	4.05	120.00						
01.11.88	0.00	1.50	4.84	10.00	1.50	6.46	5.00	2.00	3.22	10.90	2.20	5.41	10.90	3.30	6.97	90.00	6.50	2.20	3.85	120.00						
02.11.88	7.00	0.00	2.85	7.00	0.50	4.05	3.00	0.00	1.65	8.50	0.50	3.35	8.50	0.80	4.60	150.00	3.90	0.50	2.09	210.00						
03.11.88	7.00	1.00	3.73	7.00	1.00	4.03	6.20	2.40	3.43	6.90	2.00	4.37	6.90	2.00	4.73	90.00	6.00	3.00	4.01	180.00						
04.11.88	7.10	0.80	3.62	7.10	0.80	4.01	4.00	2.40	3.43	6.90	1.50	3.98	6.90	1.50	4.01	90.00	4.40	3.40	3.96	150.00						
05.11.88	0.60	0.00	3.68	10.60	0.00	5.04	4.80	0.40	2.33	8.20	0.10	3.90	8.20	0.10	5.05	120.00	5.00	0.60	2.75	210.00						
06.11.88	8.40	0.50	3.43	8.40	1.00	4.59	3.30	0.50	2.26	9.80	0.50	3.92	9.80	1.90	4.95	90.00	4.00	0.50	2.89	90.00						
07.11.88	0.00	1.00	3.59	10.00	1.00	4.56	3.90	1.90	2.62	7.40	1.00	3.82	7.40	1.00	4.53	60.00	4.20	2.00	3.11	180.00						
08.11.88	8.00	1.20	4.04	8.00	1.20	4.88	3.40	2.80	3.20	7.10	2.00	4.31	7.10	2.00	4.76	60.00	4.00	3.50	3.87	300.00						
09.11.88	5.20	1.20	3.39	6.20	1.20	3.64	4.30	2.00	3.13	6.30	2.30	3.92	6.30	2.30	4.09	60.00	5.00	2.80	3.75	210.00						
10.11.88	6.20	2.20	3.52	6.20	2.20	3.98	4.00	2.40	3.25	6.20	2.30	4.17	6.20	2.30	4.47	90.00	4.80	2.80	3.87	90.00						
11.11.88	8.50	1.90	4.03	8.50	2.20	4.95	4.60	1.90	3.12	7.80	2.00	4.38	7.80	2.20	5.23	60.00	4.80	2.00	3.53	150.00						
12.11.88	6.80	2.20	3.96	6.80	2.50	4.60	4.70	2.20	3.32	7.80	2.90	4.73	7.80	3.00	5.43	120.00	5.30	2.90	4.03	150.00						
13.11.88	5.80	1.90	3.62	5.80	1.90	3.38	4.50	2.20	3.85	6.50	1.90	4.01	6.50	1.90	3.60	150.00	5.00	2.90	4.42	90.00						
14.11.88	5.90	1.00	3.22	5.90	1.00	3.81	5.10	1.00	2.63	7.30	1.00	3.81	7.30	1.00	4.50	90.00	5.80	1.00	3.13	120.00						
15.11.88	6.30	0.30	2.28	6.30	0.30	3.05	4.00	0.30	1.52	9.20	0.40	2.96	9.20	0.40	3.85	60.00	4.10	0.50	2.07	240.00						
16.11.88	0.30	0.80	4.05	10.30	1.40	5.57	4.60	0.80	2.54	10.00	1.00	4.43	10.00	1.90	5.80	0.00	5.00	1.00	3.07	300.00						
17.11.88	7.70	1.80	3.96	7.70	1.80	4.67	3.80	2.60	3.25	7.90	3.10	4.64	7.90	3.10	5.33	0.00	3.80	3.20	3.94	270.00						
18.11.88	4.30	1.20	2.91	4.30	2.50	3.47	2.80	2.00	2.36	5.00	2.00	3.43	5.00	2.20	3.79	0.00	3.00	2.80	3.06	300.00						
19.11.88	4.50	0.50	2.50	4.50	1.50	2.85	3.70	0.50	2.14	5.70	0.80	3.25	5.70	2.50	3.77	90.00	4.80	0.80	2.73	180.00						
20.11.88	4.70	1.00	2.37	4.70	1.40	2.78	3.20	1.00	1.97	5.30	1.70	3.15	5.30	2.00	3.67	90.00	5.00	1.70	2.63	120.00						
21.11.88	6.10	0.50	2.84	6.10	2.20	3.59	2.80	0.50	1.98	5.00	1.00	3.39	5.00	3.00	4.08	0.00	3.50	1.20	2.70	2.70						
22.11.88	0.00	0.80	4.55	10.00	2.30	6.53	4.00	0.80	2.58	9.10	1.90	5.12	9.10	3.20	6.79	0.00	4.80	1.90	3.44	1.90						
23.11.88	3.20	2.20	5.03	9.20	3.50	6.72	3.80	3.50	3.34	8.90	3.00	5.38	8.90	4.50	6.58	0.00	4.00	4.20	4.19	4.19						
24.11.88	3.70	0.00	2.18	3.70	0.30	2.07	2.00	2.60	2.28	4.80	0.80	3.28	4.80	1.00	3.30	0.00	2.80	3.20	3.11	3.11						
25.11.88	4.40	0.90	2.50	4.40	2.30	2.98	2.70	1.00	2.03	5.00	0.80	3.28	5.00	2.00	3.85	0.00	2.80	2.10	2.72	2.72						
26.11.88	5.60	1.20	3.33	5.60	3.00	3.88	3.90	1.80	2.78	6.70	2.00	4.43	6.70	4.00	5.17	0.00	4.70	2.70	3.70	3.70						
27.11.88	4.00	0.00	1.50	3.80	0.00	1.66	2.00	1.00	1.34	5.00	0.80	2.70	4.90	0.80	3.00	0.00	3.50	1.80	2.40	2.40						
28.11.88	4.00	0.50	2.11	4.00	0.50	1.87	2.90	1.00	2.36	5.00	2.00	3.30	5.00	2.00	3.26	0.00	3.50	2.00	3.35	3.35						
29.11.88	7.90	1.00	2.43	7.90	1.80	2.78	3.00	1.00	2.08	4.70	1.80	3.32	4.70	2.70	3.60	0.00	3.90	1.80	3.03	3.03						
30.11.88	6.10	1.50	3.02	6.10	2.00	3.53	3.10	1.50	2.51	5.70	2.20	3.63	5.70	2.30	3.76	0.00	4.00	2.20	3.49	3.49						



TABLE A-3.2.19

METEOROLOGICAL OBSERVATION RESULTS AT PROJECT SITE (NJD-37)

DATE	GUST WIND												SUSTAINED WIND												RADIATION (kwh-hr-m-2)
	DAILY				DAYTIME				NIGHTTIME				DAILY				DAYTIME				NIGHTTIME				
	MAX. (m/s)	MIN. (m/s)	MEAN (m/s)	W.DIR. (deg)	MAX. (m/s)	MIN. (m/s)	MEAN (m/s)	W.DIR. (deg)	MAX. (m/s)	MIN. (m/s)	MEAN (m/s)	W.DIR. (deg)	MAX. (m/s)	MIN. (m/s)	MEAN (m/s)	W.DIR. (deg)	MAX. (m/s)	MIN. (m/s)	MEAN (m/s)	W.DIR. (deg)	MAX. (m/s)	MIN. (m/s)	MEAN (m/s)	W.DIR. (deg)	
01.12.88	5.40	0.50	2.53	5.40	0.50	3.06	3.20	1.00	1.99	6.70	2.40	3.50	6.70	2.60	3.91	3.80	2.50	3.10	3.10	1.00	2.21	4.71	5.00		
02.12.88	9.20	0.30	3.13	9.20	0.30	5.03	2.60	0.30	1.24	8.00	0.80	3.54	8.00	0.80	4.87	4.80	1.80	2.78	4.80	1.80	2.78	5.00	5.05		
03.12.88	9.00	0.60	3.52	9.00	0.80	5.18	4.00	0.60	1.86	9.00	1.80	4.34	9.00	1.80	5.90	3.10	1.40	2.52	3.10	1.40	2.52	5.05	5.24		
04.12.88	6.80	0.40	2.95	6.80	1.70	4.12	2.10	1.50	1.78	6.50	1.40	3.35	6.60	2.90	4.19	2.10	2.10	2.59	3.40	0.80	2.28	4.95	5.19		
05.12.88	2.80	0.00	1.59	2.80	0.50	1.73	2.00	0.60	1.46	4.80	0.70	3.06	4.80	2.50	3.53	3.20	2.00	2.73	3.20	2.00	2.73	4.90	4.90		
06.12.88	3.90	0.20	1.86	3.90	0.60	2.42	2.30	0.20	1.31	4.10	0.80	2.69	4.10	1.70	3.10	3.20	0.50	2.82	3.20	0.50	2.82	5.05	5.05		
07.12.88	3.30	0.00	1.62	3.30	0.00	1.27	2.50	2.00	1.98	4.30	0.90	2.66	4.20	1.00	2.23	3.20	1.00	2.65	3.20	1.00	2.65	5.09	5.09		
08.12.88	3.00	0.00	1.78	3.00	0.00	1.84	2.70	0.40	1.73	5.20	0.80	3.12	5.20	1.00	3.51	3.80	0.90	3.12	3.80	0.90	3.12	4.90	4.90		
09.12.88	4.80	0.00	2.15	4.80	0.40	2.44	2.90	0.30	1.86	4.80	0.90	3.30	4.80	1.50	3.49	3.20	0.50	2.82	3.20	0.50	2.82	5.05	5.05		
10.12.88	3.80	0.00	1.95	3.80	0.20	2.19	2.50	0.00	1.71	4.90	0.50	2.93	4.90	1.10	3.04	3.20	1.00	2.65	3.20	1.00	2.65	5.09	5.09		
11.12.88	6.00	0.00	2.24	6.00	0.40	3.00	2.30	0.00	1.48	4.70	1.00	2.99	4.70	1.80	3.33	4.60	1.20	2.98	4.60	1.20	2.98	5.05	5.05		
12.12.88	5.70	0.00	2.44	5.70	0.00	3.06	3.80	0.40	1.82	6.20	1.20	3.22	6.20	1.70	3.47	3.10	1.00	2.41	3.10	1.00	2.41	5.09	5.09		
13.12.88	5.20	0.00	1.62	5.20	0.00	2.04	2.10	0.00	1.20	4.30	1.00	2.82	4.30	1.10	3.23	3.50	0.50	2.75	3.50	0.50	2.75	4.71	4.71		
14.12.88	4.50	0.00	2.09	4.50	0.10	2.58	2.30	0.00	1.60	4.80	0.50	2.80	4.80	1.20	2.86	4.20	0.50	2.61	4.20	0.50	2.61	5.00	5.00		
15.12.88	6.00	0.00	2.53	6.00	0.00	3.40	3.30	0.00	1.55	6.10	0.50	3.10	6.10	0.80	3.59	6.00	2.00	4.18	6.00	2.00	4.18	5.14	5.14		
16.12.88	6.50	0.00	3.04	6.50	0.00	2.74	6.50	1.00	3.34	6.00	0.70	3.95	6.00	0.70	3.73	5.70	2.80	3.93	5.70	2.80	3.93	5.05	5.05		
17.12.88	7.70	0.00	3.19	7.70	0.00	3.45	5.20	1.00	2.93	5.70	2.80	4.01	5.40	2.80	4.09	6.70	1.00	3.98	6.70	1.00	3.98	5.38	5.38		
18.12.88	6.30	0.50	2.79	6.30	0.50	2.23	6.30	0.50	3.34	6.70	1.20	3.64	6.70	2.00	3.54	5.20	1.20	3.67	5.20	1.20	3.67	5.14	5.14		
19.12.88	5.80	0.40	3.15	5.80	1.80	3.36	4.70	0.40	2.93	5.20	1.20	3.59	5.20	2.00	3.43	5.30	2.00	3.74	5.30	2.00	3.74	4.81	4.81		
20.12.88	3.80	0.50	2.62	3.80	0.50	1.57	3.80	2.50	3.03	5.50	0.80	3.07	5.50	0.80	3.07	3.90	2.00	3.07	3.90	2.00	3.07	4.52	4.52		
21.12.88										3.90	0.70	1.71	3.90	0.70	1.92	3.90	0.90	2.03	3.90	0.90	2.03	4.90	4.90		
22.12.88										1.80	2.70	5.80	5.00	4.00	2.50	4.50	2.50	3.50	4.50	2.50	3.50	4.95	4.95		
23.12.88										2.20	2.30											5.05	5.05		
24.12.88																						5.14	5.14		
25.12.88																						5.09	5.09		
26.12.88																						5.09	5.09		
27.12.88																						5.09	5.09		
28.12.88																						5.09	5.09		
29.12.88																						5.09	5.09		
30.12.88																						5.09	5.09		
31.12.88																						5.09	5.09		

TABLE A-3.2.19

METEOROLOGICAL OBSERVATION RESULTS AT PROJECT SITE (NJD-3)

DATE	GUST WIND				SUSTAINED WIND								RADIATION (kwh-km-2)								
	DAILY		DAYTIME		NIGHTTIME		DAILY		DAYTIME		NIGHTTIME										
	MAX. (m/s)	MIN. (m/s)	MEAN. (m/s)	MAX. (m/s)	MIN. (m/s)	MEAN. (m/s)	MAX. (m/s)	MIN. (m/s)	MEAN. (m/s)	MAX. (m/s)	MIN. (m/s)	MEAN. (m/s)		W.DIR. (deg)	W.DIR. (deg)						
01.01.89														5.05							
02.01.89														5.14							
03.01.89														5.14							
04.01.89														5.28							
05.01.89	7.90	4.10	5.33	7.90	4.90	5.77	5.30	4.10	4.70	9.80	4.70	6.28	9.80	5.40	4.70	5.06	330.00	4.14			
06.01.89	7.50	2.10	5.07	7.50	3.30	6.16	4.80	3.50	3.98	8.70	2.70	6.03	8.70	3.90	7.55	330.00	5.30	4.51	270.00	4.90	
07.01.89	7.90	1.00	4.22	7.90	3.40	5.57	3.40	2.50	2.87	8.30	2.00	5.02	8.30	4.10	6.49	330.00	4.10	5.20	3.54	210.00	5.24
08.01.89	4.20	1.50	2.75	4.20	1.90	2.74	2.20	2.00	2.76	5.00	0.90	3.23	5.00	1.80	3.28	0.00	2.70	2.50	3.17	180.00	5.38
09.01.89	4.00	1.00	2.52	3.70	1.00	2.41	4.00	1.00	2.63	5.50	0.90	3.33	5.50	1.50	3.50	90.00	4.30	0.90	3.17	30.00	5.09
10.01.89	5.90	0.60	2.82	5.90	0.60	3.36	3.50	0.90	2.28	7.50	0.00	3.06	7.50	0.00	3.39	60.00	4.30	0.80	2.73	90.00	5.09
11.01.89	5.70	0.90	3.32	5.70	2.20	4.45	3.70	0.90	2.19	6.90	0.90	3.76	6.90	3.00	4.58	90.00	4.20	0.90	2.93	150.00	5.38
12.01.89	4.60	1.30	2.82	4.30	1.30	2.42	4.60	1.40	3.22	5.30	1.00	3.47	5.30	1.00	2.82	30.00	5.30	2.90	4.12	0.00	5.14
13.01.89	5.70	1.90	3.33	5.70	2.20	3.43	3.20	2.20	3.23	5.50	2.30	4.00	5.20	2.30	3.95	330.00	4.00	3.20	4.05	240.00	4.71
14.01.89	5.40	0.20	2.33	5.40	1.20	3.03	2.50	0.90	1.64	7.20	0.90	3.32	7.20	1.60	4.08	330.00	3.80	1.50	2.57	210.00	5.43
15.01.89	5.70	0.50	2.57	5.70	0.50	3.17	2.90	0.70	1.98	8.00	1.40	3.88	8.00	1.40	4.78	30.00	4.00	3.00	2.98	210.00	5.47
16.01.89	6.00	0.40	2.65	6.00	1.90	3.50	3.00	0.40	1.81	5.80	1.00	3.45	5.80	2.80	4.10	30.00	4.00	1.00	2.79	90.00	5.38
17.01.89	4.20	0.50	2.66	4.20	0.50	2.44	3.80	2.20	2.88	5.30	1.80	3.63	5.30	1.80	3.51	60.00	4.60	3.10	3.76	240.00	5.24
18.01.89	4.40	0.40	4.40	4.40	2.50	5.91	4.90	0.40	2.89	7.80	0.60	4.62	7.80	3.20	5.61	0.00	5.80	0.60	3.63	300.00	5.05
19.01.89	8.50	2.00	4.47	8.50	3.30	5.77	2.90	2.60	3.18	7.80	3.20	5.24	7.80	4.50	6.30	330.00	3.90	4.00	4.18	240.00	5.66
20.01.89	6.30	0.30	3.15	6.30	1.00	3.73	2.60	2.80	2.56	6.30	0.40	3.65	6.30	1.90	4.23	0.00	2.50	3.50	3.06	210.00	5.32
21.01.89	5.60	0.30	2.45	5.60	0.70	2.89	2.70	0.30	2.00	5.00	0.40	3.83	5.00	2.00	2.98	60.00	3.50	0.40	2.67	30.00	5.33
22.01.89	6.80	0.50	3.00	6.80	1.50	4.03	3.00	0.50	1.98	6.50	0.60	3.55	6.50	2.30	4.43	90.00	3.90	0.50	2.18	210.00	5.57
23.01.89	7.40	0.40	2.98	7.40	1.50	4.36	3.20	0.40	1.59	9.00	0.00	3.26	9.00	0.00	4.34	30.00	3.90	0.50	2.57	210.00	5.47
24.01.89	8.50	0.40	4.08	8.60	1.30	5.26	5.30	0.40	2.90	7.50	0.80	4.53	7.50	3.20	5.43	30.00	5.40	0.80	3.62	210.00	5.47
25.01.89	0.10	2.40	5.19	10.10	2.80	6.97	4.30	2.40	3.42	10.50	3.30	5.54	10.50	3.90	6.92	300.00	4.80	3.30	4.17	270.00	5.57
26.01.89	7.80	1.60	4.21	7.80	2.00	5.57	3.30	2.50	2.85	8.20	2.10	4.97	8.20	3.00	6.13	330.00	4.00	3.80	3.80	240.00	5.09
27.01.89	3.40	0.50	1.83	3.40	0.50	1.63	2.00	2.10	2.02	4.50	0.80	2.78	4.20	0.80	2.68	120.00	2.60	2.50	2.88	180.00	5.81
28.01.89	7.10	0.50	3.55	7.10	1.80	4.48	4.50	0.50	2.62	5.80	0.70	3.78	5.80	2.90	4.18	120.00	5.10	0.70	3.39	150.00	5.62
29.01.89	6.40	1.00	3.02	6.40	1.00	3.19	4.90	2.50	2.85	6.50	0.80	3.55	6.50	1.50	3.69	120.00	4.80	3.00	3.40	60.00	5.81
30.01.89	7.90	0.50	3.46	7.90	1.00	4.51	4.90	0.50	2.41	7.00	0.60	3.53	7.00	0.90	4.18	60.00	5.20	0.60	2.88	30.00	5.81
31.01.89	6.90	0.70	3.90	6.90	0.70	3.96	3.50	1.00	2.65	7.00	0.80	4.01	7.00	0.80	4.67	60.00	4.10	1.50	3.36	120.00	5.71
01.02.89	9.10	2.00	5.01	9.10	2.00	5.38	6.90	2.70	4.65	9.60	1.50	5.33	9.60	1.50	5.68	180.00	8.20	3.20	4.97	120.00	5.81
02.02.89	0.80	1.70	5.98	9.10	1.70	6.23	10.80	2.20	5.72	10.00	2.70	5.78	10.00	2.70	5.75	180.00	9.80	3.00	5.80	180.00	5.43
03.02.89	9.20	0.30	3.74	9.20	1.00	4.58	4.80	0.30	2.90	8.50	0.50	3.88	8.50	0.90	4.31	300.00	5.00	0.50	3.45	330.00	5.33
04.02.89	8.60	3.20	5.99	8.60	4.80	6.60	5.20	4.70	5.38	8.90	3.80	5.86	8.90	3.80	6.11	0.00	5.30	4.30	5.62	0.00	4.14
05.02.89	8.10	0.40	3.20	8.10	1.40	3.06	8.10	0.40	3.35	7.20	0.80	4.15	5.20	2.10	4.09	330.00	7.20	0.80	4.20	0.00	5.52
06.02.89	6.50	1.10	3.76	6.20	1.40	4.34	6.50	1.10	3.18	6.00	1.70	3.93	5.50	2.10	4.13	330.00	6.00	1.70	3.73	0.00	5.57
07.02.89	6.20	0.30	3.37	6.20	2.00	4.33	4.10	0.30	2.41	6.40	0.60	3.83	6.40	2.80	4.59	0.00	4.80	0.50	3.06	0.00	5.57
08.02.89	6.00	0.40	2.78	6.00	1.90	3.73	3.00	0.40	1.83	5.80	1.00	3.38	5.80	2.00	4.03	30.00	4.00	1.00	2.73	30.00	5.71
09.02.89	5.30	0.60	2.99	5.30	1.70	3.28	4.40	0.60	2.69	6.80	1.50	3.62	6.80	1.80	3.73	120.00	4.60	1.50	3.52	120.00	5.66
10.02.89	9.90	2.70	5.42	9.20	2.30	5.75	9.90	3.50	5.08	9.30	3.00	5.19	9.30	2.50	5.77	120.00	9.30	4.10	5.32	120.00	5.90
11.02.89	8.90	2.30	5.31	8.00	2.30	5.08	8.90	2.60	5.55	8.00	2.50	5.19	7.30	2.20	4.50	150.00	8.00	3.20	5.48	180.00	5.90
12.02.89	7.30	0.90	3.30	7.30	1.40	3.44	3.30	1.50	3.16	7.50	1.10	3.85	7.50	2.00	3.94	300.00	4.00	2.50	3.76	180.00	5.90
13.02.89	4.10	1.50	2.80	4.10	1.60	2.90	3.50	1.50	2.74	4.50	0.30	3.46	4.50	0.30	3.08	210.00	4.50	2.70	3.69	0.00	5.90

TABLE A-3.2.20 Observed Temperature & Humidity Data

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
03.12.87	28.0	19.0	24.5	70.0	34.2	45.2
04.12.87	27.2	13.8	20.4	88.5	30.8	52.4
05.12.87	27.2	10.6	19.1	82.1	22.4	46.8
06.12.87	28.2	11.5	19.4	79.8	27.0	49.5
07.12.87	29.2	11.0	20.0	74.3	21.9	46.5
08.12.87	28.5	11.2	20.0	54.3	24.3	39.7
09.12.87	26.5	14.2	20.1	76.3	37.2	54.6
10.12.87	25.5	10.9	17.6	49.9	27.1	40.6
11.12.87	24.6	9.0	17.1	59.8	33.7	46.2
12.12.87	26.1	9.5	17.7	59.3	33.8	45.9
13.12.87	27.9	8.8	18.2	60.1	27.8	43.3
14.12.87	28.1	8.0	18.2	55.7	21.7	38.1
15.12.87	29.1	9.4	19.4	47.4	22.7	34.5
16.12.87	27.5	11.9	20.0	53.2	35.2	44.3
17.12.87	26.9	11.1	19.1	64.2	39.4	50.6
18.12.87	28.0	9.9	19.1	73.6	37.2	55.1
19.12.87	28.0	13.2	20.4	96.5	29.8	60.7
20.12.87	28.1	12.9	20.5	92.8	25.0	57.8
21.12.87	27.8	11.8	20.1	89.8	30.6	58.8
22.12.87	27.5	13.5	20.9	93.7	28.8	57.3
23.12.87	28.1	15.2	21.3	80.7	31.2	55.6
24.12.87	28.2	13.5	21.2	90.2	31.0	60.5
25.12.87	28.0	14.5	21.1	92.9	31.2	59.5
26.12.87	28.6	12.8	20.5	91.0	23.0	53.1
27.12.87	28.5	12.2	20.4	95.3	30.7	61.0
28.12.87	28.4	13.6	21.1	94.6	33.4	60.6
29.12.87	28.6	14.8	21.3	93.0	28.8	59.6
30.12.87	28.8	13.5	20.6	85.8	31.0	55.7
31.12.87	27.5	14.8	20.9	81.0	32.5	57.0
MAX.	29.2	19.0	24.5	96.5	39.4	61.0
MIN.	24.6	8.0	17.1	47.4	21.7	34.5
MEAN.	27.7	12.3	20.0	76.8	29.8	51.4

TABLE A-3.2.20

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY			DATE			TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
01.01.88	19.6	13.8	16.4	94.8	58.0	79.7	01.02.88	30.4	10.9	20.6	53.0	18.2	33.9		
02.01.88	22.0	11.0	15.8	90.9	37.2	62.3	02.02.88	33.4	13.1	22.4	84.0	16.7	53.2		
03.01.88	21.0	8.2	14.9	65.1	27.0	47.7	03.02.88	35.0	13.5	23.1	95.3	5.9	53.9		
04.01.88	22.0	8.0	14.8	82.0	35.5	57.1	04.02.88	26.8	15.4	20.6	90.0	35.4	55.8		
05.01.88	25.0	9.0	16.5	78.8	35.9	56.3	05.02.88	25.0	11.5	18.2	46.5	11.5	30.7		
06.01.88	26.2	9.2	17.6	74.7	31.2	52.2	06.02.88	23.5	10.9	16.7	33.0	13.2	24.6		
07.01.88	27.0	10.8	18.9	95.2	28.5	58.7	07.02.88	23.9	8.6	15.7	40.3	14.4	26.5		
08.01.88	28.0	11.5	19.7	94.1	31.5	66.2	08.02.88	25.9	5.2	15.9	37.0	17.0	24.3		
09.01.88	27.5	14.5	20.8	93.2	37.6	66.1	09.02.88	28.9	13.0	20.3	90.0	15.2	56.0		
10.01.88	22.0	13.8	17.9	85.3	24.7	50.2	10.02.88	30.8	12.2	21.5	92.3	24.0	58.1		
11.01.88	21.1	6.8	14.0	63.4	24.7	41.9	11.02.88	30.8	15.0	23.2	80.0	29.2	53.6		
12.01.88	25.0	6.0	15.1	51.5	20.9	34.7	12.02.88	30.2	16.0	23.1	81.0	31.5	52.9		
13.01.88	27.8	8.5	17.3	46.0	27.4	37.8	13.02.88	31.4	16.1	23.8	94.0	30.1	57.1		
14.01.88	26.0	9.0	18.2	59.0	31.0	44.3	14.02.88	32.8	17.4	24.6	91.7	23.2	59.5		
15.01.88	24.9	10.8	17.9	57.5	33.9	44.8	15.02.88	33.6	17.4	25.2	90.6	22.0	59.0		
16.01.88	28.8	11.2	19.9	84.0	41.3	54.2	16.02.88	31.0	18.9	24.7	92.0	34.0	65.0		
17.01.88	29.4	15.8	22.2	93.2	27.6	53.7	17.02.88	33.0	18.8	25.6	86.8	32.0	60.8		
18.01.88	29.0	15.8	21.9	93.0	28.0	65.6	18.02.88	35.5	18.9	26.3	89.4	21.2	60.1		
19.01.88	26.6	14.6	20.7	91.2	44.0	62.2	19.02.88	32.0	19.2	25.4	87.8	35.0	61.0		
20.01.88	19.8	10.5	15.4	41.7	15.8	25.7	20.02.88	32.5	18.6	25.7	86.1	36.0	57.7		
21.01.88	19.5	5.0	11.9	31.0	21.0	26.7	21.02.88	33.0	19.0	26.2	90.5	29.0	54.8		
22.01.88	22.8	4.2	13.3	45.0	16.0	29.4	22.02.88	35.0	18.0	26.2	90.2	21.5	51.7		
23.01.88	23.4	4.8	14.6	41.0	13.0	25.9	23.02.88	37.2	19.0	27.0	90.2	8.2	47.9		
24.01.88	25.9	5.9	15.9	34.8	7.3	19.1	24.02.88	34.5	17.6	26.3	91.0	17.9	49.3		
25.01.88	28.0	7.8	17.9	75.5	16.2	31.6	25.02.88	35.0	21.4	27.3	71.0	16.9	40.6		
26.01.88	30.5	11.2	20.1	92.5	25.0	61.4	26.02.88	29.8	18.8	24.1	80.0	37.3	52.3		
27.01.88	28.8	11.0	19.8	90.5	32.5	60.5	27.02.88	28.1	15.5	21.8	72.0	19.2	39.2		
28.01.88	27.1	11.9	19.7	82.2	30.0	53.2	28.02.88	29.1	13.6	21.4	24.0	5.6	16.6		
29.01.88	28.8	11.6	20.2	68.9	27.9	46.2	29.02.88	30.0	12.5	21.7	33.9	15.4	23.5		
30.01.88	28.1	10.8	19.9	63.0	15.8	35.6									
31.01.88	28.0	11.0	19.2	49.0	18.1	31.0									
MAX.	30.5	15.8	22.2	95.2	58.0	79.7	MAX.	37.2	21.4	27.3	95.3	37.3	65.0		
MIN.	19.5	4.2	11.9	31.0	7.3	19.1	MIN.	23.5	5.2	15.7	24.0	5.6	16.6		
MEAN.	25.5	10.1	17.7	71.2	27.9	48.1	MEAN.	31.0	15.4	22.9	75.3	22.0	47.6		

TABLE A-3.2.20

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY			DATE			TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
01.03.88	31.8	11.1	21.7	37.8	13.0	23.8	01.04.88	41.0	20.0	30.9	31.5	5.0	13.6		
02.03.88	31.8	13.8	22.7	82.1	19.0	45.9	02.04.88	39.0	20.8	29.7	26.0	7.5	13.6		
03.03.88	33.3	14.0	23.4	92.0	9.1	53.1	03.04.88	38.0	18.0	28.8	19.5	7.5	13.1		
04.03.88	36.9	13.6	25.0	88.5	3.5	48.0	04.04.88	38.5	17.0	28.6	56.0	12.0	27.6		
05.03.88	38.9	15.2	26.8	84.0	3.7	38.9	05.04.88	39.0	20.5	29.8	48.0	13.0	28.3		
06.03.88	39.4	18.8	28.6	72.8	7.9	34.5	06.04.88	39.5	20.5	30.1	48.0	14.0	29.3		
07.03.88	35.2	20.0	27.5	60.0	23.8	41.1	07.04.88	40.0	20.0	30.4	38.0	11.0	21.6		
08.03.88	38.5	18.2	28.4	87.5	9.2	38.8	08.04.88	39.4	19.5	30.0	44.5	8.0	25.1		
09.03.88							09.04.88	39.0	20.0	30.3	26.5	10.5	17.1		
10.03.88	40.0	23.5	33.2	55.0	2.0	18.0	10.04.88	39.8	19.0	29.8	38.0	10.0	20.1		
11.03.88	38.2	16.2	27.5	86.2	6.2	37.8	11.04.88	40.0	20.0	30.0	30.0	12.0	20.5		
12.03.88	36.6	17.2	26.8	89.8	16.7	48.4	12.04.88	40.4	19.2	30.1	34.5	13.0	23.0		
13.03.88	35.5	16.9	26.9	83.0	14.4	42.1	13.04.88	41.0	22.0	31.1	32.5	8.5	19.9		
14.03.88	36.8	18.0	27.4	36.5	6.3	19.8	14.04.88	40.5	21.0	30.7	34.0	9.0	18.4		
15.03.88	32.8	17.1	25.6	35.0	16.1	24.7	15.04.88	42.0	23.0	32.2	44.0	10.0	26.3		
16.03.88	31.8	16.4	24.6	35.2	12.3	23.3	16.04.88	40.8	22.0	31.6	81.0	15.5	42.6		
17.03.88	30.5	16.2	23.0	31.5	7.0	16.0	17.04.88	41.5	23.0	32.6	82.5	13.0	45.7		
18.03.88	33.0	14.0	23.9	17.0	0.0	7.9	18.04.88	40.0	23.5	32.0	87.5	13.5	44.2		
19.03.88	33.8	13.0	22.9	22.5	4.0	9.6	19.04.88	41.0	24.0	32.6	85.5	8.0	41.2		
20.03.88	34.0	14.5	24.6	70.0	11.0	34.4	20.04.88	42.0	24.5	32.9	74.0	11.0	42.0		
21.03.88	36.0	14.0	25.1	77.0	9.0	37.7	21.04.88	39.0	25.0	32.3	68.5	20.0	41.3		
22.03.88	37.0	14.5	25.9	81.0	5.0	41.1	22.04.88	42.0	24.8	33.3	55.0	15.0	31.8		
23.03.88	38.0	16.0	27.8	83.0	0.0	30.3	23.04.88	42.0	24.0	32.9	61.0	13.0	35.9		
24.03.88	31.0	14.0	23.9	28.0	13.0	21.6	24.04.88	40.0	23.6	32.2	83.0	15.0	43.5		
25.03.88	30.0	13.2	21.4	35.0	8.0	18.6	25.04.88	39.0	24.0	31.6	83.5	18.0	48.6		
26.03.88	32.0	11.8	22.4	21.8	6.0	13.2	26.04.88	38.5	22.0	30.2	89.0	20.0	57.2		
27.03.88	35.5	13.0	24.7	79.0	0.5	28.2	27.04.88	38.0	23.0	29.4	85.0	27.5	63.5		
28.03.88	36.0	15.0	26.1	87.0	5.0	35.5	28.04.88	33.0	22.0	26.7	88.0	25.5	55.9		
29.03.88	36.0	18.0	26.8	21.0	9.0	15.3	29.04.88	35.0	19.5	28.2	77.0	6.5	33.6		
30.03.88	37.0	17.5	27.4	35.0	0.0	15.1	30.04.88	37.0	20.0	29.0	62.0	11.0	33.5		
31.03.88	40.0	18.2	28.9	48.0	3.0	16.0									
MAX.	40.0	23.5	33.2	92.0	23.8	53.1	MAX.	42.0	25.0	33.3	89.0	27.5	63.5		
MIN.	30.0	11.1	21.4	17.0	0.0	7.9	MIN.	33.0	17.0	26.7	19.5	5.0	13.1		
MEAN.	34.1	15.3	24.9	56.8	7.9	28.3	MEAN.	39.5	21.5	30.7	57.1	12.8	32.6		

TABLE A-3.2.20

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY			DATE	TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.		MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
01.05.88	39.0	20.8	30.3	69.0	7.0	31.9	01.06.88	44.0	26.0	35.4	72.0	9.0	37.7
02.05.88	41.0	21.0	31.2	65.0	7.5	32.0	02.06.88	43.0	26.5	34.8	83.5	19.0	49.4
03.05.88	42.0	22.5	32.8	53.0	6.5	25.8	03.06.88	44.0	25.2	34.3	85.5	4.0	45.5
04.05.88	42.0	23.0	32.8	51.5	7.0	23.9	04.06.88	43.0	22.5	33.7	88.0	5.0	41.6
05.05.88	42.8	23.0	32.5	41.0	5.0	21.6	05.06.88	45.0	24.0	34.6	78.0	15.0	51.9
06.05.88	44.0	22.8	33.6	41.5	5.0	19.9	06.06.88	45.8	24.2	34.9	64.5	26.0	48.3
07.05.88	43.5	24.0	34.2	36.5	6.0	19.6	07.06.88	44.0	24.0	34.8	83.5	31.0	65.6
08.05.88	42.5	23.5	32.7	63.5	7.0	35.7	08.06.88	45.2	25.0	35.0	79.0	22.0	60.4
09.05.88	41.0	22.5	32.4	82.5	8.0	36.5	09.06.88	46.0	26.0	35.3			
10.05.88	43.0	23.5	33.7	63.0	6.5	30.6	10.06.88	45.0	25.6	35.1	74.0	60.0	66.8
11.05.88	43.0	25.5	34.6	42.0	8.0	23.9	11.06.88	45.0	25.5	34.7	77.0	60.0	69.8
12.05.88	30.5	25.0	27.5	42.0	28.0	32.1	12.06.88	44.0	26.8	34.1	77.5	60.0	70.8
13.05.88							13.06.88	45.0	24.6	33.5	77.5	58.0	71.3
14.05.88							14.06.88	46.5	25.2	35.2	75.0	68.0	71.6
15.05.88							15.06.88	46.8	27.0	35.6	80.0	72.0	77.6
16.05.88							16.06.88	47.8	25.8	35.3	62.0	1.0	27.3
17.05.88							17.06.88	47.0	26.9	37.0	65.0	4.0	31.1
18.05.88							18.06.88	48.0	28.5	38.3	48.0	3.0	14.3
19.05.88							19.06.88	45.0	29.4	36.7	16.0	7.0	11.9
20.05.88							20.06.88	43.0	27.0	35.9	22.5	9.0	14.7
21.05.88							21.06.88	43.0	26.6	35.1	23.0	11.0	16.0
22.05.88							22.06.88	44.0	26.0	35.6	19.0	9.0	13.9
23.05.88							23.06.88	45.0	26.0	35.7	20.0	5.5	11.9
24.05.88							24.06.88	46.0	26.0	36.5	28.0	5.0	13.3
25.05.88							25.06.88	45.6	26.0	36.2	63.5	6.0	27.9
26.05.88							26.06.88	44.0	27.2	36.1	47.0	9.0	17.4
27.05.88				37.5	8.0	14.1	27.06.88	41.6	28.0	35.2	25.0	11.5	17.6
28.05.88	42.5	24.5	33.9	86.0	12.0	45.6	28.06.88	42.0	28.0	35.5	19.0	8.5	13.2
29.05.88	42.0	25.0	33.8	83.5	21.0	50.0	29.06.88	43.0	29.0	36.6	13.5	7.0	10.3
30.05.88	43.0	26.5	34.9	81.5	11.0	42.6	30.06.88	44.0	29.0	37.0	40.0	10.0	13.1
31.05.88	45.5	27.0	36.9	63.5	2.0	23.4							
MAX.	45.5	27.0	36.9	86.0	28.0	50.0	MAX.	48.0	29.4	38.3	88.0	72.0	77.6
MIN.	30.5	20.8	27.5	36.5	2.0	14.1	MIN.	41.6	22.5	33.5	13.5	1.0	10.3
MEAN.	39.3	22.4	17.0	41.8	6.5	18.2	MEAN.	44.7	26.3	35.5	53.6	20.5	36.1

TABLE A-3.2.20

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY			DATE			TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
01.07.88	45.0	30.5	37.4	64.5	7.0	24.2	01.08.88	44.2	29.7	35.0	70.0	20.9	50.0		
02.07.88	45.0	30.5	37.7	68.0	13.0	34.8	02.08.88	45.0	29.0	35.0	74.5	21.0	53.4		
03.07.88	44.0	30.0	36.4	72.0	6.0	32.5	03.08.88	46.0	29.0	35.3	76.0	12.5	51.1		
04.07.88	46.0	27.8	35.4	80.0	3.5	42.6	04.08.88	48.1	27.8	36.2	69.9	10.9	43.6		
05.07.88	46.4	28.0	35.8	77.5	12.5	46.1	05.08.88	44.3	28.2	35.6	73.0	15.8	43.7		
06.07.88	45.0	29.5	36.7	71.5	4.0	36.7	06.08.88	45.8	28.0	36.9	72.0	18.5	42.1		
07.07.88	46.5	28.5	37.0	70.0	2.0	35.4	07.08.88	46.9	28.9	37.6	71.0	16.8	40.9		
08.07.88	47.0	27.8	35.8	72.5	7.0	43.1	08.08.88	47.1	29.0	37.9	69.0	10.8	37.9		
09.07.88	47.5	27.2	35.6	81.5	5.0	49.4	09.08.88	47.4	29.2	38.4	67.1	9.0	33.8		
10.07.88	46.0	27.2	35.9	82.5	9.5	47.3	10.08.88	47.8	27.9	38.0	69.5	6.8	31.6		
11.07.88	44.6	27.2	35.6	80.5	11.5	44.5	11.08.88	47.0	30.0	38.2	50.0	8.0	27.4		
12.07.88	44.0	27.0	34.7	81.5	21.5	50.2	12.08.88	45.8	28.9	37.9	39.2	16.2	28.1		
13.07.88	45.0	28.2	34.8	76.0	22.0	51.5	13.08.88	43.3	27.1	36.1	72.0	21.3	38.5		
14.07.88	47.0	29.0	35.1	70.0	14.8	50.9	14.08.88	43.8	27.2	36.0	58.9	21.1	36.0		
15.07.88	45.8	28.9	34.9	75.2	10.0	52.7	15.08.88	46.3	29.9	38.2	57.1	14.0	33.3		
16.07.88	41.3	29.5	34.2	73.0	35.8	53.3	16.08.88	46.5	27.5	35.9	77.5	12.2	46.0		
17.07.88	46.0	28.5	35.4	75.0	17.5	49.6	17.08.88	46.1	26.2	35.6	80.9	14.3	46.8		
18.07.88	46.0	27.0	36.6	84.0	3.0	35.1	18.08.88	45.5	26.1	35.6	82.1	12.3	43.0		
19.07.88	46.8	31.0	38.1	58.7	3.8	29.1	19.08.88	44.5	28.5	36.1	61.0	17.9	40.1		
20.07.88	38.0	28.8	33.3	73.0	20.8	46.8	20.08.88	43.8	26.6	35.0	74.0	11.8	40.8		
21.07.88	41.2	30.5	35.0	55.0	27.5	38.6	21.08.88	44.8	26.9	35.4	77.3	16.9	44.0		
22.07.88	40.5	28.0	34.7	54.2	24.0	39.3	22.08.88	45.9	27.0	36.1	74.0	13.2	41.4		
23.07.88	31.8	26.2	29.1	84.0	49.0	63.1	23.08.88	47.5	28.9	37.9	67.6	8.5	39.5		
24.07.88	39.8	26.9	31.2	81.0	31.1	61.3	24.08.88	45.9	27.2	36.0	73.1	13.9	43.0		
25.07.88	41.0	26.4	32.2	79.0	28.7	54.9	25.08.88	46.0	26.1	36.2	74.1	13.0	41.7		
26.07.88	42.3	27.0	32.9	72.1	26.5	48.0	26.08.88	46.5	26.5	36.1	65.8	11.0	39.0		
27.07.88							27.08.88	46.2	27.0	36.4	61.9	12.5	37.0		
28.07.88	44.0	28.7	36.8	74.8	24.5	43.1	28.08.88	45.3	25.9	34.7	79.9	12.9	48.9		
29.07.88	45.0	27.8	33.9	77.9	19.6	52.9	29.08.88	45.0	25.9	33.8	81.5	16.0	51.9		
30.07.88	44.0	26.9	34.1	80.8	18.2	52.1	30.08.88	44.8	27.0	34.6	76.0	20.1	51.4		
31.07.88	41.0	28.0	33.9	80.7	25.3	54.0	31.08.88	44.0	26.3	34.8	81.9	17.9	49.7		
MAX.	47.5	31.0	38.1	84.0	49.0	63.1	MAX.	48.1	30.0	38.4	82.1	21.3	53.4		
MIN.	31.8	26.2	29.1	54.2	2.0	24.2	MIN.	43.3	25.9	33.8	39.2	6.8	27.4		
MEAN.	43.8	28.3	35.0	74.2	16.8	45.4	MEAN.	45.7	27.7	36.2	70.3	14.5	41.8		



TABLE A-3.2.20

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY			DATE			TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
01.09.88	43.5	26.1	35.2	72.0	15.2	40.2	01.10.88	42.0	23.1	32.9	45.0	3.1	17.8		
02.09.88	44.1	27.9	36.1	64.4	18.1	36.0	02.10.88	38.5	22.8	30.5	42.9	8.7	22.3		
03.09.88	45.8	26.8	37.0	39.0	10.9	21.1	03.10.88	35.0	20.8	27.9	58.8	16.1	37.0		
04.09.88	44.2	27.2	35.3	78.0	13.0	29.4	04.10.88	36.1	20.9	28.3	80.3	18.0	52.5		
05.09.88	38.0	23.8	30.9	86.9	21.3	55.0	05.10.88	37.1	21.0	29.1	84.1	16.0	49.4		
06.09.88	37.7	24.9	30.4	81.9	24.1	55.2	06.10.88	38.8	22.6	30.4	77.0	10.3	41.0		
07.09.88	38.7	23.0	30.8	84.0	22.0	52.0	07.10.88	40.1	21.9	31.3	74.9	6.2	36.7		
08.09.88	39.9	24.3	31.9	77.7	15.2	46.5	08.10.88	40.0	21.8	31.0	68.0	2.8	25.4		
09.09.88	41.9	25.1	32.9	75.9	16.0	46.5	09.10.88	40.0	21.1	30.7	70.1	4.2	31.6		
10.09.88	44.2	25.2	34.4	68.9	9.9	37.9	10.10.88	39.8	21.1	29.9	75.9	3.9	40.8		
11.09.88	44.5	26.8	34.8	60.4	10.9	34.8	11.10.88	36.9	17.6	27.1	86.8	0.0	45.5		
12.09.88	39.5	24.1	30.9	83.0	22.8	54.2	12.10.88	36.3	17.4	26.5	83.0	4.5	38.0		
13.09.88	36.8	22.8	29.9	84.9	26.5	56.0	13.10.88	36.5	18.2	27.4	48.5	5.9	26.4		
14.09.88	38.0	23.9	30.0	75.0	20.1	51.5	14.10.88	36.3	18.5	27.6	70.0	7.0	38.3		
15.09.88	39.0	24.2	31.9	72.0	21.0	47.2	15.10.88	34.9	19.4	27.9	79.5	16.0	47.1		
16.09.88	41.0	24.5	32.7	75.2	16.7	42.0	16.10.88	34.8	20.6	28.0	82.2	17.9	48.2		
17.09.88	42.8	25.6	34.1	71.0	11.0	38.4	17.10.88	34.7	20.1	28.2	76.5	17.0	42.8		
18.09.88	44.0	25.8	35.5	69.2	0.0	31.2	18.10.88	35.8	19.2	27.7	79.9	8.9	36.9		
19.09.88							19.10.88	38.5	18.0	27.9	63.0	6.0	24.4		
20.09.88							20.10.88	38.7	20.5	29.7	24.1	8.4	15.4		
21.09.88							21.10.88	38.0	19.9	29.3	59.0	7.0	20.2		
22.09.88							22.10.88	34.0	19.8	27.1	82.8	19.0	51.5		
23.09.88	44.6	31.0	39.4	51.5	4.9	17.9	23.10.88	34.6	19.0	27.0	83.2	14.5	45.5		
24.09.88	44.2	25.6	34.7	59.8	4.0	25.7	24.10.88	36.2	20.0	28.2	55.0	13.0	28.8		
25.09.88	44.0	23.3	33.9	44.2	2.3	21.3	25.10.88	37.1	21.0	28.9	34.0	10.0	21.4		
26.09.88	43.0	24.5	33.3	53.0	4.7	19.9	26.10.88	38.0	19.0	28.1	41.1	1.3	20.1		
27.09.88	41.9	21.5	31.5	84.0	1.8	43.7	27.10.88	36.9	18.9	26.8	44.0	1.1	16.8		
28.09.88	41.2	21.2	31.2	78.2	0.0	30.5	28.10.88	36.0	15.5	26.3	31.7	4.8	15.0		
29.09.88	43.7	22.9	32.8	61.9	1.0	21.3	29.10.88	37.5	15.9	26.9	21.6	5.3	12.9		
30.09.88	42.7	23.0	33.0	69.0	2.0	26.7	30.10.88	36.6	16.9	27.2	59.0	7.1	17.8		
							31.10.88	34.2	17.8	25.8	79.0	11.0	43.1		
MAX.	45.8	31.0	39.4	86.9	26.5	56.0	MAX.	42.0	23.1	32.9	86.8	19.0	52.5		
MIN.	36.8	21.2	29.9	39.0	0.0	17.9	MIN.	34.0	15.5	25.8	21.6	0.0	12.9		
MEAN.	41.9	24.8	33.3	70.0	12.1	37.8	MEAN.	37.1	19.7	28.4	63.3	8.9	32.6		



TABLE A-3.2.20

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY			DATE			TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
01.11.88	34.0	18.1	26.4	76.8	11.9	41.1	01.12.88	29.5	13.0	21.7	54.9	28.0	40.4		
02.11.88	34.8	17.4	26.5	57.8	15.0	33.3	02.12.88	29.1	14.0	21.4	53.0	23.5	39.7		
03.11.88	34.5	18.0	26.1	65.9	13.6	30.8	03.12.88	27.0	12.1	19.7	52.0	35.0	42.6		
04.11.88	33.0	16.5	25.1	41.3	11.8	26.6	04.12.88	27.5	12.0	19.5	60.0	32.0	44.8		
05.11.88	33.2	15.1	24.6	46.1	13.1	29.1	05.12.88	27.8	12.0	19.6	63.8	30.0	44.5		
06.11.88	33.1	13.9	24.0	41.5	10.2	25.2	06.12.88	16.0	10.3	12.8	55.8	43.0	50.3		
07.11.88	33.0	15.1	24.3	57.5	18.0	35.1	07.12.88	28.9	16.3	24.5	34.0	21.0	27.0		
08.11.88	33.0	14.8	24.4	51.8	13.0	28.5	08.12.88	28.5	10.8	19.5	70.0	19.0	34.7		
09.11.88	33.8	15.0	24.3	51.0	13.2	26.8	09.12.88	29.3	11.8	20.2	41.0	18.0	28.7		
10.11.88	33.7	14.6	24.2	54.5	12.2	31.4	10.12.88	28.7	11.2	19.8	45.5	23.0	33.7		
11.11.88	32.4	14.7	23.6	77.2	14.3	40.3	11.12.88	28.0	11.0	19.7	48.3	23.0	34.9		
12.11.88	32.0	15.0	23.9	84.0	23.0	52.1	12.12.88	29.4	13.0	20.7	51.0	27.0	38.1		
13.11.88	31.8	16.0	24.3	81.6	16.1	46.1	13.12.88	29.0	12.0	20.6	55.0	28.5	40.1		
14.11.88	31.0	16.6	24.1	71.9	19.0	44.5	14.12.88	29.0	11.8	17.8	78.0	33.0	48.6		
15.11.88	31.3	16.9	24.5	62.0	24.0	39.7	15.12.88	28.7	13.2	23.4	71.0	34.7	47.7		
16.11.88	30.2	17.0	23.6	49.0	27.8	39.9	16.12.88	30.8	13.3	21.9	87.0	26.0	59.5		
17.11.88	31.2	16.8	23.6	68.5	18.0	40.2	17.12.88	30.8	15.0	22.6	84.0	17.9	53.4		
18.11.88	31.6	16.5	23.8	47.9	25.2	35.8	18.12.88	31.0	13.2	22.0	84.6	17.0	56.8		
19.11.88	32.1	14.7	23.8	50.5	17.0	32.9	19.12.88	30.6	12.8	20.9	84.0	19.0	56.3		
20.11.88	32.0	14.0	23.4	76.0	15.5	39.0	20.12.88	30.5	14.0	22.1	83.5	22.5	56.8		
21.11.88	30.9	13.9	22.8	50.0	20.1	30.9	21.12.88	30.0	14.3	22.2	85.5	34.1	62.0		
22.11.88	30.2	15.8	22.5	39.9	21.8	30.0	22.12.88	29.4	16.0	22.2	84.9	31.0	57.5		
23.11.88	26.0	12.2	16.6	40.0	15.0	30.6	23.12.88	29.8	14.7	21.9	70.0	19.8	42.4		
24.11.88	28.8	11.0	20.2	47.7	24.0	33.8	24.12.88	28.9	12.8	20.8	61.5	15.5	32.7		
25.11.88	23.5	11.0	18.1	46.0	37.2	41.8	25.12.88	31.0	11.0	20.8	46.0	19.0	32.7		
26.11.88							26.12.88	31.8	12.9	21.5	58.0	13.7	36.0		
27.11.88							27.12.88	33.3	12.8	22.5	83.8	0.0	44.0		
28.11.88							28.12.88	27.9	12.8	20.5	84.8	17.2	47.3		
29.11.88	29.9	20.0	26.3	40.0	26.8	32.6	29.12.88	26.3	16.2	20.6	68.0	36.5	50.7		
30.11.88	29.9	12.4	21.7	58.0	26.0	41.9	30.12.88	24.9	13.0	18.7	62.9	21.0	44.1		
31.12.88							31.12.88	25.5	10.8	18.0	51.5	30.0	40.1		
MAX.	34.8	20.0	26.5	84.0	37.2	52.1	MAX.	33.3	16.3	24.5	87.0	43.0	62.0		
MIN.	23.5	11.0	16.6	39.9	10.2	25.2	MIN.	16.0	10.3	12.8	34.0	0.0	27.0		
MEAN.	28.4	13.8	21.2	51.1	16.8	32.0	MEAN.	28.7	12.9	20.6	64.9	24.5	44.1		

TABLE A-3.2.20

Observed Temperature & Humidity Data at Dauka

DATE	TEMPERATURE			HUMIDITY			DATE	TEMPERATURE			HUMIDITY		
	MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.		MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.
01.01.89	26.5	12.0	19.1	64.9	27.9	44.5	01.02.89	31.4	12.0	21.6	67.5	25.1	48.0
02.01.89	28.1	9.8	18.6	62.0	18.7	41.2	02.02.89	32.1	14.9	23.2	85.0	22.0	57.8
03.01.89	30.9	10.5	20.3	55.9	15.0	37.4	03.02.89	29.0	15.8	23.1	82.1	36.0	56.5
04.01.89	30.0	11.0	20.1	85.2	11.8	49.4	04.02.89	24.2	17.0	21.4	49.0	30.5	40.1
05.01.89	25.8	14.0	19.8	86.5	33.9	60.2	05.02.89	23.3	12.0	17.5	64.7	33.0	44.3
06.01.89	20.0	12.0	16.5	57.0	8.8	27.7	06.02.89	22.0	11.1	16.7	44.8	23.0	34.8
07.01.89	18.2	6.2	11.9	21.0	8.0	15.2	07.02.89	24.7	12.8	18.7	57.8	18.0	33.2
08.01.89	7.0	3.2	4.6	19.9	17.0	18.5	08.02.89	25.6	10.3	18.3	29.2	13.8	22.3
09.01.89							09.02.89	26.5	10.8	18.7	51.0	23.5	31.7
10.01.89							10.02.89	28.2	14.1	20.6	81.0	19.0	49.7
11.01.89							11.02.89	31.7	13.5	21.2	81.9	8.0	46.3
12.01.89	30.0	27.6	28.2	80.7	36.0	43.8	12.02.89	32.0	13.5	22.6	72.8	12.0	40.0
13.01.89	27.4	25.3	26.2	45.9	28.0	34.4	13.02.89	33.0	13.7	23.6	65.0	12.0	38.9
14.01.89	26.3	23.6	25.3	27.3	18.0	22.3	14.02.89	34.0	15.2	24.4	77.0	2.0	36.8
15.01.89	26.4	23.3	25.3	19.5	13.5	17.5	15.02.89	24.9	14.6	19.8	38.0	13.5	25.1
16.01.89	26.5	24.8	25.8	24.0	15.0	20.1	16.02.89	18.5	9.0	12.8	78.0	30.0	33.4
17.01.89	26.2	25.0	25.7	35.0	24.0	29.5							
18.01.89	25.8	25.0	25.2	54.0	0.0	31.5							
19.01.89													
20.01.89													
21.01.89													
22.01.89													
23.01.89													
24.01.89													
25.01.89	26.3	25.5	25.9	26.3	7.0	12.8							
26.01.89	25.3	11.0	20.2	25.0	15.2	18.4							
27.01.89	24.3	5.0	14.4	33.5	18.8	26.1							
28.01.89	26.6	7.0	16.8	69.0	30.6	39.4							
29.01.89	28.0	11.6	19.8	86.0	24.8	52.4							
30.01.89	27.5	11.8	19.9	71.0	28.0	47.2							
31.01.89	26.8	11.5	19.3	62.0	23.6	38.7							
MAX.	30.9	27.6	28.2	86.5	36.0	60.2	MAX.	34.0	17.0	24.4	85.0	36.0	57.8
MIN.	7.0	3.2	4.6	19.5	0.0	12.8	MIN.	18.5	9.0	12.8	29.2	2.0	22.3
MEAN.	18.1	10.9	14.5	44.5	16.9	29.1	MEAN.	27.6	13.2	20.3	64.1	20.1	39.9



## A-3.2.2 Soil Survey

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### 3.2.2 Soil Survey

#### (1) Soil Classification in the Study Area

##### a. Fluvisols

Fluvisols were developed on recent alluvial sediments which have no diagnostic horizons other than an ochric or an umbric A horizon, a histic H horizon, or sulfuric horizon. Recent alluvial deposits are fluviatile, morine, lacustrine, or colluvial sediments.

This soil can be classified further into 5 sub-groups, according to soil depth and soil texture. Greater part of this soil is shallow soil type.

##### i) Calcaric Fluvisols, deep 1 (Jc-d1)

This soil occurs in the alluvial fan toeslope in Hanfeet only. Soil depth is more than 100 cm, and soil texture is loam.

This soil has a high suitability (S1) for irrigated agriculture development although the area covered by this soil is very small (40 ha).

##### ii) Calcaric Fluvisols, deep 3 (Jc-d3)

This soil occurs in the big wadi (Wadi Dauka) in Dauka.

It covers 3,710 ha (0.9%).

Soil depth is more than 100 cm, and soil texture is gravelly sand.

This soil has marginal suitability (S3) for irrigated agriculture development due to its gravelly texture (low water holding capacity).

iii) Calcaric Fluvisols, deep 4 (Jc-d4)

This soil occurs in active fan position in Hanfeet only.

It covers 2,850 ha (0.7%).

Soil depth is more than 100 cm, soil texture is gravel.

Currently this soil has no suitability (N1) for irrigated agricultural development due to its very gravelly texture.

iv) Calcaric Fluvisols, moderate deep 2 (Jc-md2)

This soil occurs in active wadi and active fan positions in hanfeet.

It covers 4,735 ha (1.1%).

Soil depth is from 50 cm to 100 cm, and soil texture is from gravel to loam.

This soil permanently has no suitability (N2) for irrigated agricultural development due to its shallow depth and gravelly texture.

v) Calcaric Fluvisols, shallow (Jc-s)

This soil occurs in the wadi and fan in almost the entire study area.

It covers 34,740 ha (8.3%).

Soil depth is about 30 cm, and soil texture is from gravelly sand to loamy sand.

This soil has no suitability (N2) for irrigated agricultural development due to its very shallow depth and gravelly texture.

b. Yermosols

This soil occurs under an aridic moisture regime, having a very weak ochric A horizon and one or more of the following: a cambic B horizon, an argillic B horizon, a calcic horizon, a gypsic horizon.

Soil in the study area are classified as Calcic Yermosols and Gypsic Yermosols.

Calcic Yermosols has a calcic horizon within 125 cm from the surface.

This soil is distributed in the flat plain of old alluvium on the weathered limestone and marl.

This type of soil is classified into 5 sub-groups according to soil depth and soil texture.

Gypsic Yermosols has a gypsic horizon within 125 cm from the surface.

This soil is classified into 2 sub-groups according to soil depth and soil texture.



i) Calcic Yermosols, deep 1 (Yc-d1)

This soil occurs mainly in the flat plain of old alluvium on the weathered limestone and in the non-active wadi on the weathered marl in Wadi Mokhawrim, Dauka, East Dauka, South Dauka, North Hanfeet, Shasr, South Shasr and Qitutbeet.

It covers 11,600 ha (2.8%).

Soil depth is more than 100 cm, and soil texture is sandy loam to loam.

This soil has a moderate suitability (S2) for irrigated agriculture development.

ii) Calcic Yermosols, deep 2 (Yc-d2)

This soil only occurs in the flat plain of old alluvium on the weathered limestone in Wadi Mokhawrim.

It covers 5,450 ha (1.3%).

Soil depth is more than 100 cm, but soil texture is very gravelly.

This soil has a conditional suitability (Sc2) for irrigated agriculture development due to its very gravelly texture.

iii) Calcic Yermosols, moderate deep 1 (Yc-md1)

This soil occurs on the flat plain of old alluvium on the weathered marl in East Dauka.

It covers 3,020 ha (0.7%).

Soil depth is from 50 cm to 100 cm, and soil texture is sandy loam.

This soil has a moderate suitability (S2) for irrigated agriculture development.

iv) Calcic Yermosols, moderate deep 2 (Yc-md2)

This soil occurs on the flat plain of old alluvium on the hard limestone throughout the entire study area.

It covers 19,800 ha (4.7%).

Soil depth is from 50 cm to 100 cm. Soil texture is gravel to sandy loam.

This soil has a marginal suitability (S3) for irrigated agricultural development due to its slightly shallow depth and gravelly texture.

v) Calcic Yermosols, shallow (Yc-s)

This soil occurs on the flat plain of old alluvium over the limestone throughout the entire area except for Hanfeet.

It covers 263,355 ha (63.0%), and is the major soil in the study area.

Soil depth is shallow (about 30 cm). Soil texture is loam.

This soil permanently has no suitability (N2) for irrigated agricultural development due to its very shallow depth.

vi) Gypsic Yermosols, deep (Yy-d)

This soil occurs in fan positions along the main road in Hanfeet.

It covers 2,465 ha (0.6%).

Soil depth is more than 100 cm, and soil texture is loam.

The salinity is high.

This soil has a marginal suitability (S3) for irrigated agricultural development due to its high salinity.

vii) Gypsic Yermosols, shallow (Yy-s)

This soil occurs in gravel hills and terraces in South Dauka-1, South Dauka-2, Shasr, Hanfeet and Qitutbeet.

It covers 20,657 ha (4.9%).

Soil depth is shallow (about 30 cm). Soil texture is gravel.

This soil permanently has no suitability (N2) for irrigated agricultural development due to its gravelly texture.

c. Solonetz (So-d)

Soils of this type is characterized of a natric B horizon and should have columnar or prismatic structure in the B horizon.

The ESP (Exchangeable Sodium Percentage) is more than 15% in the natric B horizon and the salinity content is high.

Orthic Solonetz, deep (So-d), which has an orthic A horizon, is identified in the study area.

This soil occurs on the old alluvial formation deposited in the Wadi Thumrait catchment in Hanfeet.

It covers an area of 1,580 ha (0.4%).

Soil depth is more than 100 cm, and soil texture is loam. The sodium content of this soil is high.

The soil is marginally suitable (S3) for irrigated agricultural development because of its high sodium content in the solum.

d. Solonchaks

Soils, exclusive of those formed from recent alluvial deposits, having a high salinity and having no diagnostic horizon other than an A horizon, a histic H horizon, a cambic B horizon, a calcic or a gypsic horizon.

Orthic Solonchaks, moderate deep (So-md), which has an orthic A horizon, is identified in the study area.

This soil only is distributed in the gravel terraces along the old alluvium in Hanfeet.

It covers 2,480 ha (0.6%).

Soil depth is from 50 cm to 100 cm, and soil texture is gravel.

This soil is permanently not suitable (N2) for irrigated agricultural development because of its high salinity.

e. Regosols

Soils from unconsolidated materials, exclusive of recent alluvial deposits, are characterized of having no diagnostic horizons other than an ochric A horizon. This is very young sedimental soil.

Calcaric Regosols, deep (Rc-d), which has a calcic horizon, is identified in the study area.

This soil is distributed in eorial deposit, alluvial terrace and fan positions in Dauka and Shasr.

It covers 4,480 ha (1.1%).

Soil depth is more than 100 cm. Soil texture is unconsolidated sand. The water capacity is low.

This soil is marginally suitable (S3) for irrigated agricultural development because of its sandy texture.

f. Lithosols

Soils which are limited in depth by continuous coherent hard rock within 10 cm of the surface.

Lithosols, very shallow (L-vs), is identified in the study area.

This soil is distributed in eroded gravel terraces and hills in Dauka, East Dauka, South Dauka-1, Qitutbeet, Hanfeet, and South Dauka-2.

It covers an area of 32,778 ha (7.8%).

This soil is permanently not suitable (N2) for irrigated agricultural development due to its very shallow soil depth.

TABLE A-3.2.21 Soil Classification

Soil Group FAO (1974)	Characteristics	Sub-group	Hape code	Landform	Soil depth cm	Texture	Drainage	pH(1:2.5)	Other Characteristics	Extent ha (%)	Distribution	Land Suitability Unit		
Fluvisols	Developed on recent alluvial sediments which have no diagnostic horizons other than an ochric or an umbric A horizon. In the study area it occurs on hdi and active fan.	Calcaric Fluvisols, deep1	Jc-d1	alluvial toeslope	>100	Fine SL ~SCL	well	~ 8.0	no gypsum non saline	40 (0.01)	H	S1		
		Calcaric Fluvisols, deep2	Jc-d2	Hadi	>100	gravelly LS-SL	well	8.0-8.5	non ~slightly saline	4/ 4,810 (1.2)	D, SD2, S	S2		
		Calcaric Fluvisols, deep3	Jc-d3	Hadi (Hadi Dawkah)	>100	gravelly coarse S	Excessively drain	8.0-8.0	no gypsum	3,710 (0.9)	main D, SD2	S3		
		Calcaric Fluvisols, deep4	Jc-d4	alluvial fan	>100	gravelly S~LS	well	8.0	no gypsum non saline	2,850 (0.7)	H	H		
		Calcaric Fluvisols, moderate deep1	Jc-md1	Hadi	50-100	SL	well	8.5	no gypsum slight saline	4/ 560 (0.1)	SD2	S3		
		Calcaric Fluvisols, moderate deep2	Jc-md2	Hadi ~ alluvial fan	50-100	gravelly SL	well	8.0	no gypsum non saline	4,735 (1.1)	H	X2		
		Calcaric Fluvisols, shallow	Jc-s	Hadi ~ alluvial fan	30	gravelly S~LS	well	8.0	no gypsum slight saline	34,740 (8.3)	whole area except D, SD, Q	X2		
Yermosols	Occured under aridic moisture regime; having a very weak ochric A horizon and one or more following: cambic, argillic, calcic gypsic. In the study area calcic and gypsic soil occurs on the flat plain and hill. Calcic soil is dominant.	Calcic Yermosols, deep1	Yc-d1	flat plain of old alluvium	>100	SL~L	well	8.0	slight gypsum	11,150 (2.7)	main H, D, ED, NI, H, SS, Q	S2		
		Calcic Yermosols, deep2	Yc-d2	flat plain of old alluvium	>100	gravelly LS	Excessively drain	8.0	slight saline	5,450 (1.3)	H	S2		
		Calcic Yermosols, moderate deep1	Yc-md1	flat plain of weathered marl	50-100	SL	well	8.0	no gypsum non saline	3,070 (0.7)	ED	S2		
		Calcic Yermosols, moderate deep2	Yc-md2	flat plain of weathered rock	50-100	gravelly SL	well	8.0	no gypsum slight saline	19,040 (4.6)	whole area except SD, H	S3		
		Calcic Yermosols, shallow	Yc-s	flat plain of old alluvium	15-30	SL	well	8.0	moderate saline	263,355 (63.0)	whole area except H	X2		
		Gypsic Yermosols, deep	Yg-d	alluvial fan	>100	L	moderate well	8.0	gypsum saline	2,465 (0.6)	H	S3		
		Gypsic Yermosols, shallow	Yg-s	eroded gravel terraces and hills	20-30	gravelly SL	well	8.0	gypsum saline	20,657 (4.9)	SD, SD2, S, H, Q	X2		
		Solonetz	having a natric B horizon. In the study area it occurs in the Hadi furat catchment.	Orthic Solonetz, deep	So-d	flat terrain of old alluvial fan	>100	L	imperfect	8.0	High alkali	1,580 (0.4)	H	S3
												330,707 (79.1)		

1/ pH paste  
 2/ In case of complex soil units (ex. Jc-md2/Jc-s), the extent is calculated with even in each soil unit as follows:  
 divide equally Jc-md2/Jc-s 100ha ——— Jc-md2 50ha  
 Jc-s 50ha  
 3/ D : Dauka H : Hadi Hokhawrin H : Hanfeet  
 ED : East Dauka S : Shahr  
 SD, : South Dauka-1 SS : South Shahr  
 SD2 : South Dauka-2 NI : North Hanfeet  
 4/ Jc-ds and Jc-md, occur outside of the study area.

( to be continued )

TABLE A-3.2.21

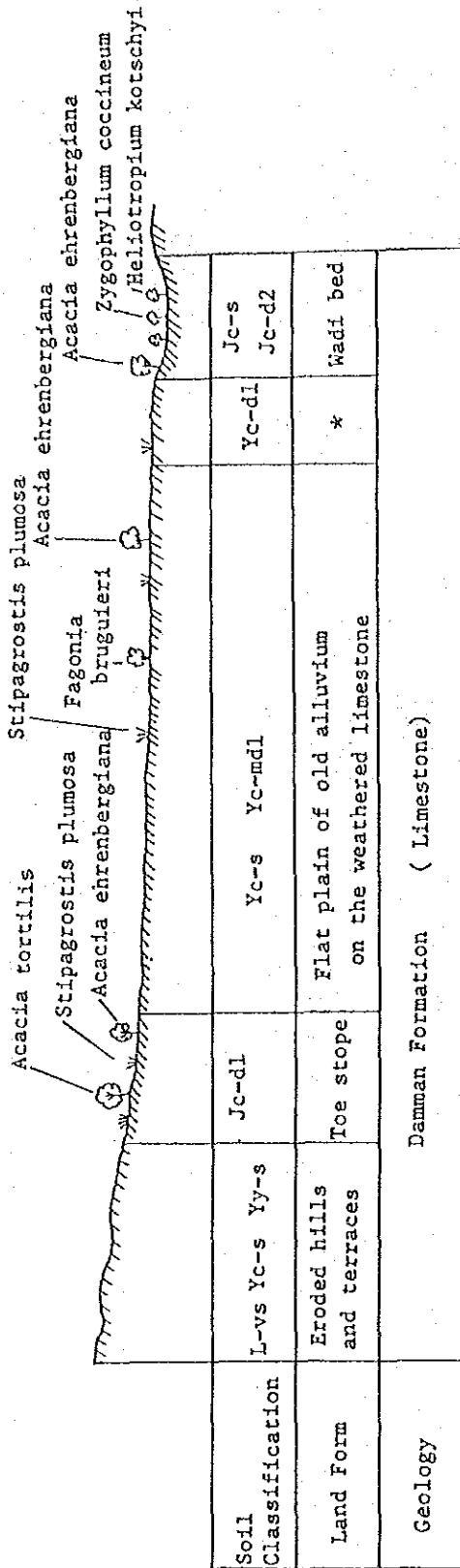
( continued )

( continued )

Soil Group FAO (1974)	Characteristics	Sub-group	Map code	Landform	Soil depth cm	Texture	Drainage	pH(1:2.5)	Other Characteristics	Extent ha (%)	Distribution	Land Suitability Unit
Solonchaks	Soils, exclusive of those formed from recent alluvial deposits, having a high salinity. In the study area it occurs along the Main road in Hanfoet	Orthic Solonchak, moderate deep	16 Zo-ad	degraded gravel terrace on bedrock plain	50~100	gravelly SL	moderate well	~ 8.0	high saline	2,480 (0.6)	H	X2
Regosols	Soils from unconsolidated materials, exclusive of recent alluvial deposits, having no diagnostic horizons other than an ochric A horizon. In the study area it occurs along the Hadi Dauka	Calcic Regosols, deep	17 Re-d	recent alluvial terrace, outwashan, eolian deposits	>100	fine LS	excessively drain	7.5 ~8.0	Loose sand	4,480 (1.1)	0, S	S3
Lithosols	Soils which are limited in depth by bedrock within 10cm of the surface. In the study area it occurs on eroded hills.	Lithosols, very shallow	18 L-vs	eroded gravel terraces and hills	< 10	SL	well	-	very shallow  Total	32,778 (7.8)  418,100 (100)	main D, ED, SD, G, H other SDs	X2



TABLE A-3.2.22 Schematic Soil Cross Section



LEGEND

- Jc-dl : Calcaric Fluvisols, deep1
  - Jc-d2 : Calcaric Fluvisols, deep2
  - Yc-dl : Calcic Yermosols, deep1
  - Yc-mdl : Calcic Yermosols, moderate deep1
  - Yc-s : Calcic Yermosols, Shallow
  - Yy-s : Gypsic Yermosols, Shallow
  - L-vs : Lithosols, very shallow
- \* Banks and terraces of wadi on the weathered alluviums

## (2) Land Suitability Classification

Legends of land suitability classification are as follows:

### a. Class S1: Highly Suitable

Land have no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits. Irrigation input will not be raised above an acceptable level.

The landform is flat; soil depth is deep; soil texture is loam. The chemical and physical conditions of this soil are good.

This class comes under Jc-d1 (Calcic Fluvisols, deep 1) in the study area. This soil exists only in the Hanfeet. It covers only 40 hectares (0.01% of the study area).

### b. Class S2: Moderately Suitable

Land have limitations which, in aggregate, are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use. Although still attractive, it will be appreciably inferior to that expected on Class S1 land.

Though landform is flat to moderate slope (5%), and soil depth is deep, this land has a gravelly texture or high CaCO<sub>3</sub>.

This class comes under, Yc-d1 (Calcic Yermosols, deep 1) and Yc-md1 (Calcic Yermosols, moderate deep 1) in the study area. The main limitations of each soil unit are as follows:

Yc-d1 : high CaCO<sub>3</sub>

Yc-md1 : high CaCO<sub>3</sub> and shallow soil depth

The area of this class is 18.865 ha (4.5% of the study area).

The areas of each block are as follows:

Wadi Mokhawrim	:	5,490 ha (29.3 % of this class)
Shasr	:	4,180 ha (22.3 %)
East Dauka	:	3,460 ha (18.4 %)
North Hanfeet	:	2,810 ha (15.0 %)
Dauka	:	1,430 ha ( 7.6 %)
Hanfeet	:	585 ha ( 3.1 %)
South Dauka-2	:	620 ha ( 3.3 %)
South Shasr	:	150 ha ( 0.8 %)
Qiutbeet	:	140 ha ( 0.7 %)

c. Class S3: marginally Suitable

Land have limitations which, in aggregate, are severe for sustained application of a given use. They will reduce productivity or benefits, or increase required inputs, so much that this expenditure will be only marginally justified.

These lands have coarse texture of shallow soil depth or high CaCO<sub>3</sub> or high salinity or high sodium.

This class comes under Jc-d3 (Calcaric Fluvisols, deep 3), Yc-md2 (Calcic Yermosols, moderate deep 2), Yy-d (Gypsic Yermosols, deep), So-d (Orthic Solonetz, deep), and Rc-d (Calcaric Regosols, deep) in the study area.

The main limitations of each soil unit are as follows:

Jc-d3	:	gravelly texture
Yc-md2	:	gravelly texture and shallow soil depth
Yy-d	:	high salinity
So-d	:	high sodium
Rc-d	:	unconsolidated sandy texture

This class covers an area of 30,620 hectares (7.3%).

The areas of each block are as follows:

Dauka	:	8,580 ha (27.9 % of this class)
South Shasr	:	6,460 ha (21.0 %)
North Hanfeet	:	5,840 ha (19.0 %)
Hanfeet	:	4,260 ha (13.9 %)
East Dauka	:	2,930 ha ( 9.5 %)
Shasr	:	1,140 ha ( 3.7 %)
South Dauka-2	:	990 ha ( 3.2 %)
Quitbeet	:	420 ha ( 1.4 %)

d. Class Sc2: Conditionally Suitable

The lands of this class have been included only after the studies concluded that they has a conditional suitability for agriculture or they were limited to a special agricultural use.

This class comes under Yc-d2 (Calcic Yermosols, deep 2) in the study area. This soil is limited because of a high gravel content in the solum that will restrict the available water capacity and require special cultivation practices.

The area of this class is 5,450 ha (1.3%) in Hanfeet only.

e. Class N1: Currently Not Suitable

Land have limitations which may be surmountable in time but cannot be corrected with existing knowledge at currently acceptable cost; the limitations are so severe as to preclude successful sustained use of the land in the given manner.

This class comes under Jc-d4 (Calcaric Fluvisols, deep 4) in the study area.

The main limitation of this soil is very gravelly texture and very poor water capacity.

This class covers an area of 2,850 ha (0.7%) in Hanfeet only.

f. Class N2: Permanently Not Suitable

Land have limitations which appear so severe as to preclude any possibilities of successful sustained use of the land in the given manner.

This class includes lands with very shallow or stony soils, and high salinity soils.

This class comes under Jc-md2 (Calcaric Fluvisols, moderate deep 2), Jc-s (Calcaric Fluvisols, shallow), Yc-s (Calcic Yermosols, shallow), Yy-s (Gypsic Yermosols, shallow), Zo-md (Orthic Solonchaks, moderate deep), and L-vs (Lithosols very shallow).

The main limitations are as follows:

- Jc-md2 : very gravelly texture
- Jc-s, Yc-s, Yy-s : shallow soil depth and gravelly texture
- Zo-md : gravelly texture and high salinity
- L-vs : very shallow soil depth

This class covers an area of 360,275 ha (86.2% of the study area). This class occupies the greater part of the study area.

The areas of each block are as follows:

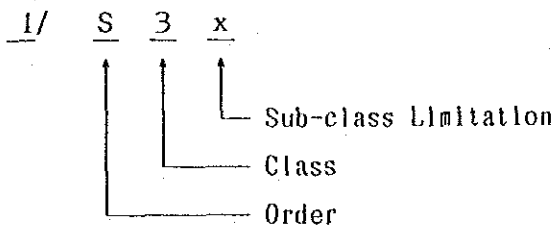
Wadi Mokhawrim	:	73,060 ha	(20.3 % of this class)
East Dauka	:	68,910 ha	(19.1 %)
South Shasr	:	51,590 ha	(14.3 %)
North Hanfeet	:	45,950 ha	(12.8 %)
Hanfeet	:	32,265 ha	(9.0 %)
Shasr	:	21,680 ha	(6.0 %)
South Dauka-2	:	21,190 ha	(5.9 %)
Dauka	:	19,590 ha	(5.4 %)
South Dauka-1	:	16,600 ha	(4.6 %)
Quitbeet	:	9,440 ha	(2.6 %)

TABLE A-3.2.23 Land Evaluation Specification

CHARACTERISTICS	S1 ARABLE	S2 ARABLE	S3 ARABLE	SC CONDITIONAL	LAND SUITABILITY CLASS H
Texture (surface 25 cm)	Sandy loam to silty clay loam	Loamy sand to permeable clay	Loamy sand to permeable clay	Gravelly loamy sand to clay	Those lands do not meet the minimum requirements for other land suitability classes and are not suitable for irrigation. They include lands with very shallow or stony soils, thin soils over bedrock; lands with soils less than 90 cm thick over petrocalcic, petrogy- pale or siliceous bedrock, or other impermeable subsoils. Large sand dunes, steep rocky hills and rolling topography that has soils too thin to warrant land leveling. These lands include major wadi channels where frequency of flooding prohibits irrigated agriculture.
Texture (subsurface 25 to 100 cm)	Sandy loam to clay loam	Loamy sand to silty clay loam	Coarse sand to permeable clay	Coarse sand to permeable clay	
Depth: To Sand, Gravel or Cobble	1.1 m sandy loam to 1.0 m or more fine sandy loam or finer	75 cm sandy loam to loamy sand or 80 cm fine sandy loam or finer	60 cm sandy loam to 46 cm fine sandy loam or finer	30 cm gravelly loamy sand	
To Impervious material (bed rock)	150 cm or more sandy loam or finer	125 cm or more sandy loam or finer	110 cm or more loamy sand or finer	90 cm or more gravelly sandy loam	
To penetrable limestone	45 cm soil plus 150 cm penetrable	35 cm soil plus 125 cm penetrable	25 cm soil plus 90 cm penetrable	20 cm soil plus 60 cm penetrable	
Alkalinity	pH < 9, low EC negligible ESP	pH 9 or less, low EC, negligible ESP	pH 9 or less, low EC, ESP < 10	pH < 9 ESP < 15	
Salinity	EC of saturation extract < 4 mmhos	EC of saturation extract < 8 mmhos	EC of saturation extract < 8 mmhos	EC of saturation extract 8 mmhos with periodic leaching	
TOPOGRAPHY					
Slope	0.1 to 2.0% in general gradient	Less than 5% in general gradient	Less than 8% in general gradient	Flat or depression to 8% in smooth slopes	
Surface	No restrictions No levelling required	Moderate restrictions, moderate levelling	Appreciable restrictions sprinkler irrigation may be required	Smooth to hummocky, sprinkler irrigation may be required	
DRAINAGE					
Drainage	No specific farm drainage required	No specific farm drainage required	Some drainage required but in amounts found feasible	Some drainage may be required	

TABLE A-3.2.24 Land Suitability Classification

Map Code		Soil Classification	Land Suitability <sup>1/</sup> Classification
1	Jc-d <sub>1</sub>	Calcaric Fluvisols, deep1	S1
2 <sup>2/</sup>	Jc-d <sub>2</sub>	Calcaric Fluvisols, deep2	S2k, S2xs
3	Jc-d <sub>3</sub>	Calcaric Fluvisols, deep3	S3x
4	Jc-d <sub>4</sub>	Calcaric Fluvisols, deep4	N1x
5 <sup>2/</sup>	Jc-md <sub>1</sub>	Calcaric Fluvisols, moderate deep1	S3kd
6	Jc-md <sub>2</sub>	Calcaric Fluvisols, moderate deep2	N2x
7	Jc-s	Calcaric Fluvisols, shallow	N2xd
8	Yc-d <sub>1</sub>	Calcic Yermosols, deep1	S2k
9	Yc-d <sub>2</sub>	Calcic Yermosols, deep2	SC2x
10	Yc-md <sub>1</sub>	Calcic Yermosols, moderate deep1	S2kd
11	Yc-md <sub>2</sub>	Calcic Yermosols, moderate deep2	S3xd
12	Yc-s	Calcic Yermosols, shallow	N2d
13	Yy-d	Gypsic Yermosols, deep	S3s
14	Yy-s	Gypsic Yermosols, shallow	N2xdt
15	So-d	Orthic Solonetz, deep	S3n
16	Zo-md	Orthic Solonchaks, moderate deep	N2xdt
17	Re-d	Calcaric Regosols, deep	S3x
18	L-vs	Lithosols, very shallow	N2xd



<sup>2/</sup> Jc-d<sub>2</sub> and Jc-md<sub>1</sub> occur outside of the study area



(3) Soil Conditions of the Existing Farms

Outlines of field surveys are as follows: (Table A 3.2.3-4)

i) Dauka (Since 1985, Cultivated area: about 18 ha)

There are two types of farm, old small local farm (with furrow irrigation) and new big farm (with centre pivot irrigation system), around a well.

<u>Soil Classification</u>	<u>Land Suitability Classification (FAO)</u>
Calcic Yermosols, moderate deep 2 (Yc-md2) -FAO-	S3dk
Typic Calciorthis -USDA-	

Soil depth is limited by hard platy limestone located at 50 cm in depth. In the old small local farm, the water table is located at 50 cm depth, and strong salinization was observed on the surface of the farm. Also, soil profiles are so wet that weed (pharagmites sp.), which grow in the swampy wet land, started to grow at the centre of the farm.

The condition of the crop growth (Rhodes grass, Date palm etc.) is bad due to poor drainage and salinity hazard.

While in the new big farm, where Rhodes grass is mainly cultivated with centre pivot irrigation system, crop growth conditions are relatively good.

But same problem such as old farm may occur in the long time using without an adequate drainage system. Suitable soil (S2 class) is distributed widely in about 3 km north-west of the existing farm.

If water will be made available in that area, then it will be better to shift the existing farms to that area.

ii) Shasr (Since 1973, Cultivated area: about 7 ha)

There are the three types of farm such as old small local farm, new small local farm and new big local farm. All farms use furrow irrigation system only. Main crops are Date palm in the old small farm and the new big farm and Tomato in the new small farm.

<u>Type of Farm</u>	<u>Soil Classification</u>	<u>Land Suitability Classification (FAO)</u>
Old small	Calcaric Regosols, deep (Rc-d) -FAO- Typic Torripsaments -USDA-	S3x
New small	Calcaric Regosols moderate deep (Rc-md) -FAO- Typic Torripsaments -USDA-	S3xd
New big	Calcic Yermosols deep 1 (Yc-d <sub>1</sub> ) -FAO- Typic Calciorthids -USDA-	S2k

Rc-d and Rc-md have loose coarse sand texture and low water holding capacity. Salinization is observed on the surface of RC-d. It may be caused by local irrigation system such as furrow irrigation. Rc-md have shallow soil depth limited by gravel and stone of chert at 80 cm in depth. Yc-d<sub>1</sub> develop on well weathered marl and have deep well weathered layer of marl. Soil texture is coarse sandy to silty loam.

The crop growth condition is not so good in the old small farm. In the new farms, crops are planted just now, and hence it is not able to be described the growth condition.

iii) Hailat Al-Rakah (Since 1980, Cultivated area: about 70 ha)

Farms are located in the bank of Wadi on the weathered marl.

<u>Type of Farm</u>	<u>Soil Classification</u>	<u>Land Suitability Classification (FAO)</u>
Old	Calcic Yermosols, moderate deep 1 (Yc-md <sub>1</sub> ) -FAO- Typic Calciorthids -USDA-	S2xd - S3xd
New	Calcic Yermosols, moderate deep 1 (Yc-md <sub>1</sub> ) -FAO- Typic Calciorthids -USDA-	S3xd - N2xd
	Calcic Yermosols, shallow (Yc-s) -FAO- Typic Calciorthids -USDA-	

In general, old farms are located in relatively deeper soil than new farms. Some new farms in the southern part are located in very shallow soil with limestone and marl being encountered at 20 cm to 40 cm in depth. Also the quality of irrigated water is worse.

Some of the old farms have been damaged by salinization. Rhodes grass died in spot in such farms. Any way the suitable area for agricultural development is marginal. Therefore, adequate guidance of soil & water conditions should be necessary for a new settler in this area.

iv) Quitbeet (Since 1980, Cultivated area: about 0.1 ha)

There are very small local farms in wadi and toeslope. Main crops are Date palm and Rhodes grass. The crop growth condition is bad to moderately well.

<u>Soil Classification</u>	<u>Land Suitability Classification (FAO)</u>
Calcaric Fluvisols, shallow (Jc-s) -FAO- Typic Torriorthents -USDA-	N2xd N2xd

The soil has very gravelly sand profile. The soil depth is limited by rounded gravel and stone at 30 cm in depth. Rounded gravel and stone indicate that the soil should be recent alluvium.

The soil condition is bad. And also the suitable land is very small and marginal. There is no potential for agricultural development.

TABLE A-3.2.25

TABLE A-3.2.25 Soil Conditions of the Existing Farms

Name of Village Starting year /Cultivated area	General										Soil Condition		Condition of crop growth	Problem for Agricultural Development
	Location from the site	Eleva- tion (m)	Parent Material	Landform	Quality of irri. Water	Type of farm (Irr. system)	Main Crops	Soil classification	Land class. (FAO)	Characteristic				
Dauka (1965 / 18 ha)	about 50 km North	200	Alluvium on Limestone (Tertiary)	Fan undulating to Flat plain	EC: 1527 µS/cm	Old small local (furrow irrigation)	Rhodes grass Date palm etc.	FAO Calcic Vertosols, moderate deep 2 (Vc-md2) USDA Typic Calciorthisds	S3dk	Shallow profile limited by limestone at 50cm in depth. Water table of irrigated water at 50cm in depth. Wet profile and strong satinzation on the surface.	Bad	Bad drainage Strong salinization		
Shahr (1973 / 7 ha)	about 40 km West	290	Recent aeolian deposition to Alluvium on weathered marl	Fan undulating to Flat plain	EC: 1410 µS/cm	New big (Center Pivot irrigation)  Old small local (furrow irrigation)  New small local (furrow irrigation)	Rhodes grass Date palm etc.  Tomato Date palm (furrow irrigation)	FAO Calcic Vertosols, moderate deep 2 (Vc-md2) USDA Typic Calciorthisds  FAO Calcic Regosols, deep (Rc-d) USDA Typic Torripsaments  FAO Calcic Regosols, moderate deep (Rc-md) USDA Typic Torripsaments  FAO Calcic Vertosols, deep (Vc-dl) USDA Typic Calciorthisds	S3dk  S3x  S3d  S2k	Shallow profile limited by limestone at 50 cm in depth.  Loose coarse sand texture. Low water holding capacity. Salinization on the surface.  Loose coarse gravelly sand texture. Low water holding capacity. Shallow soil depth limited by gravel and stone at 80 cm depth.  Soil developed on the well weathered mari. Deep profile (more than 2 m in depth). Sandy loam to loam texture. Gypsum visible.	Moderate well  Moderate well  Just starting too early to describe.  Just starting too early to describe.	No problem for the present. But some problems as above may occur in the future.  Salinization may be due to furrow irri- gation system.  Same as left.  Same as left.		

( to be continued )

TABLE A-3.2.25

( continued )

Name of Village Stating year /Cultivated area	General										Soil Condition		Condition of crop growth	Problem for Agricultural Development
	Location from the site	Eleva- tion (m)	Parent Material	Landform	Quality of irri- Water	Type of farm (Irr. system)	Main Crops	Soil classification	Land class. (FAO)	Characteristic				
Hilat Al- Rakah (1980 / 70 ha)	about 20 km West South West	270	Alluvium on weathered marl	Wadi bank	EC: 2640- 3760 µS/cm	Old to new (furrow to sprinkler irrigation)	Rhodes grass Date palm etc.	FAO Calcic Vertosols, moderate deep 1 (Ve-mdl) & Calcic Vertosols, shallow (Ve-s) USDA Typic Calciorthids	S2k - N2xd	The soil developed on the weathered marl. Moderate deep to shallow soil depth. Sandy loam texture. Gypsum rich especially in shallow soil.	Bad to moderate well	Salinization. Quality of irrigated water get worse. Suitable area is marginal.		
Quitbeet (1980 / 0.1 ha)	about 30 km East	310	Recent alluvium	Wadi	EC: 2320 µS/cm	Old small local (furrow irrigation)	Date palm Rhodes grass	FAO Calcic Fluvisols, shallow (Je-s) USDA Typic Torriorthents	N2xd	Shallow depth limited by rounded gravel and stone at 30cm in depth. Very gravelly sand texture.	Bad to moderate well	Shallow soil depth. Low water holding capacity due to coarse soil texture. Very narrow area for agricultural development.		

#### (4) Review of Previous Reports

Most of the study area was already reported in the preliminary soil surveys by Harza (1985) and GDC (1986).

In both reports, soil classification and the land suitability classification were made according to the FAO standard system (Soil Classification, 1974; Land Evaluation, 1976).

However they used their own classification codes in the reports. Therefore, in this report, soil classification units and the land suitability classification units were reviewed with consideration of existing reports and the results of our own field survey.

The review is shown in TABLE A-3.2.25.

FAO system adopted in this study could be tentatively correlated with Soil Taxonomy System of USDA, 1975, as shown in TABLE A-3.2.26. The USDA standard system is one of the typical methods in systematic soil classifications in the world.

TABLE A-3.2.26 Correlation of Soils in Present Study Area  
with Previous Surveys

JICA (1987)		GDC (1986)		Harza (1985)	
Soil Unit	FAO Land Suitability Classification	Equivalent Soil Unit	FAO Land Suitability Classification	Equivalent Soil Unit	FAO Land Suitability Classification
Jc-d <sub>1</sub> Calcic Fluvisols, deep1	S <sub>1</sub>	Jc <sub>1</sub>	S <sub>1</sub>	—	—
Jc-d <sub>2</sub> Calcic Fluvisols, deep2	S <sub>2</sub>	—	—	—	S <sub>2</sub>
Jc-d <sub>3</sub> Calcic Fluvisols, deep3	S <sub>3</sub>	—	—	Wc <sub>1</sub>	S <sub>3</sub>
Jc-d <sub>4</sub> Calcic Fluvisols, deep4	N <sub>1</sub>	Jc <sub>4</sub>	N <sub>1</sub>	—	—
Jc-md <sub>1</sub> Calcic Fluvisols, moderate deep1	S <sub>3</sub>	—	—	—	—
Jc-md <sub>2</sub> Calcic Fluvisols, moderate deep2	N <sub>2</sub>	Jc <sub>2</sub> , Jc <sub>3</sub>	N <sub>2</sub>	—	—
Jc-s Calcic Fluvisols, shallow	N <sub>2</sub>	Jc <sub>5</sub>	N <sub>2</sub>	Wc <sub>3</sub>	N <sub>2</sub>
Yc-d <sub>1</sub> Calcic Yermosols, deep1	S <sub>2</sub>	Yc <sub>1</sub> , Yc <sub>2</sub> , Yc <sub>3</sub>	S <sub>2</sub>	To <sub>1</sub> , Du <sub>1</sub>	S <sub>2</sub>
Yc-d <sub>2</sub> Calcic Yermosols, deep2	Sc <sub>2</sub>	—	—	At <sub>1</sub>	S <sub>2</sub>
Yc-md <sub>1</sub> Calcic Yermosols, moderate deep1	S <sub>2</sub>	—	—	Du <sub>2</sub>	S <sub>2</sub>
Yc-md <sub>2</sub> Calcic Yermosols, moderate deep2	S <sub>3</sub>	Yc <sub>4</sub>	S <sub>3</sub>	DI <sub>2</sub>	S <sub>3</sub>
Yc-s Calcic Yermosols, shallow	N <sub>2</sub>	Yc <sub>5</sub>	N <sub>2</sub>	RS <sub>3</sub> , RG <sub>3</sub> , DC <sub>3</sub> DI <sub>3</sub> , DU <sub>3</sub> , AT <sub>3</sub>	N <sub>2</sub>
Yy-d Gypsic Yermosols, deep	S <sub>3</sub>	Yy <sub>1</sub>	S <sub>3</sub>	—	—
Yy-s Gypsic Yermosols, shallow	N <sub>2</sub>	Yy <sub>2</sub> , Yy <sub>3</sub>	N <sub>2</sub>	Dg <sub>3</sub>	N <sub>2</sub>
So-d Orthic Solonetz, deep	S <sub>3</sub>	So <sub>1</sub>	S <sub>3</sub>	—	—
Zo-md Orthic Solonchaks, moderate deep	N <sub>2</sub>	Zo <sub>1</sub>	N <sub>2</sub>	—	—
Rc-d Calcic Regosols, deep	S <sub>3</sub>	—	—	Tr <sub>1</sub>	S <sub>3</sub>
L-vs Lithosols, very shallow	N <sub>2</sub>	L <sub>1</sub>	N <sub>2</sub>	—	—



TABLE A-3.2.27 Correlation of Soil Classification

FAO Classification (1974)	USDA Taxonomic Classification (1975)
Calcaric Fluvisols	Typic Torriorthents
Calcic Yermosols, deep~ moderate deep	Typic Calciorthids
Calcic Yermosols, Shallow	Typic Calciorthids Lithic Calciorthids Typic Paleorthids
Gypsic Yermosols, deep	Calcic Gypsiorthids
Gypsic Yermosols, shallow	Petrogypsic Gypsiorthids Typic Gypsiorthids
Orthic Solonetz	Typic Natrargids
Orthic Solonchaks	Calcic Gypsiorthids
Calcaric Regosols	Typic Torripsaments
Lithosols	Lithic subgroups

TABLE A-3.2.28 Soil Condition of Proposed Pilot Farm Sites

Site-No.	Location	Elevation(m)	Landform	Vegetation	Soil classification	Suitability classification	Soil depth	Texture	pH	EC mmhos/cm	Remarks	Area (ha)
Site-1	150km north of Salalah along the westside of the main road.	270	Branch of Wadi	Shrubs <1% (Acacia ehrenbergiana) Grasses <1% (Stipagrostis plumosa)	Calcic Vertosols, deeph (Yc-d <sub>1</sub> )	S2k	>100	LS	7.5 ~8.5	0.15 ~2.3		432
Site-2	160km north of Salalah about 500m west of the main road.	260	Branch of Wadi	Herbs 5% (Zygophyllum coccinum) Grasses <1% (Stipagrostis plumosa)	Calcic Vertosols, deeph (Yc-d <sub>1</sub> )	S2k	>100	SL	8.0 ~8.5	0.1 ~0.8		196
Site-3	200km north of Salalah 4km north west of DAWKAH. 500m west of the main road.	200	Recent alluvial terrace ~ flat plain of old alluvium	Herbs 5% (Zygophyllum coccinum, Heliotropium kotschy) Grasses 15% (Stipagrostis plumosa)	Calcic Vertosols, deeph (Yc-d <sub>1</sub> )	S2x~S2k	>100	gravelly coarse S~LS	0.5 ~8.5	0.2 ~0.9		1,330

1. pH: (1:2.5)      2. EC: (1:5)

FIG. A-3.2.2

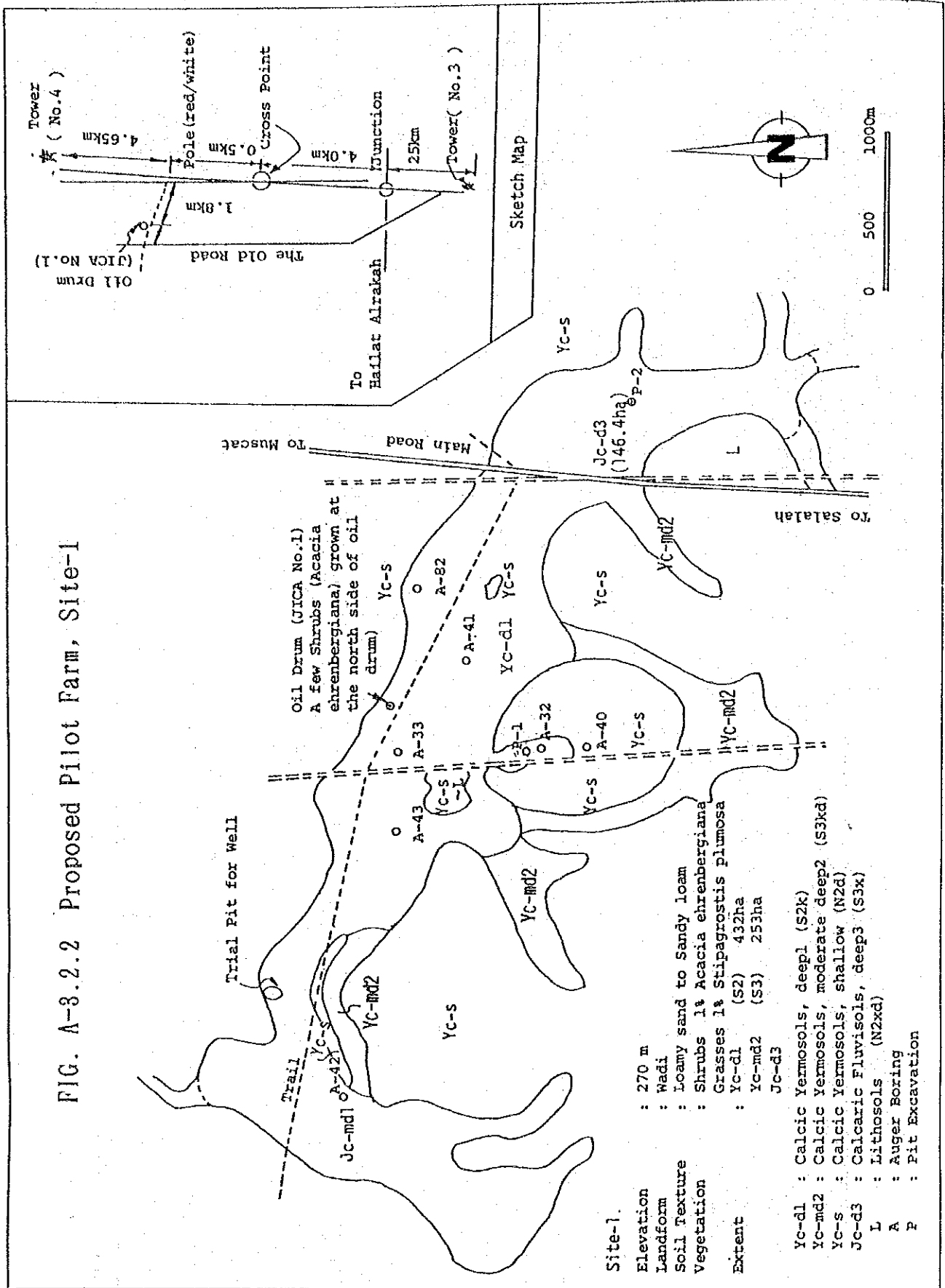


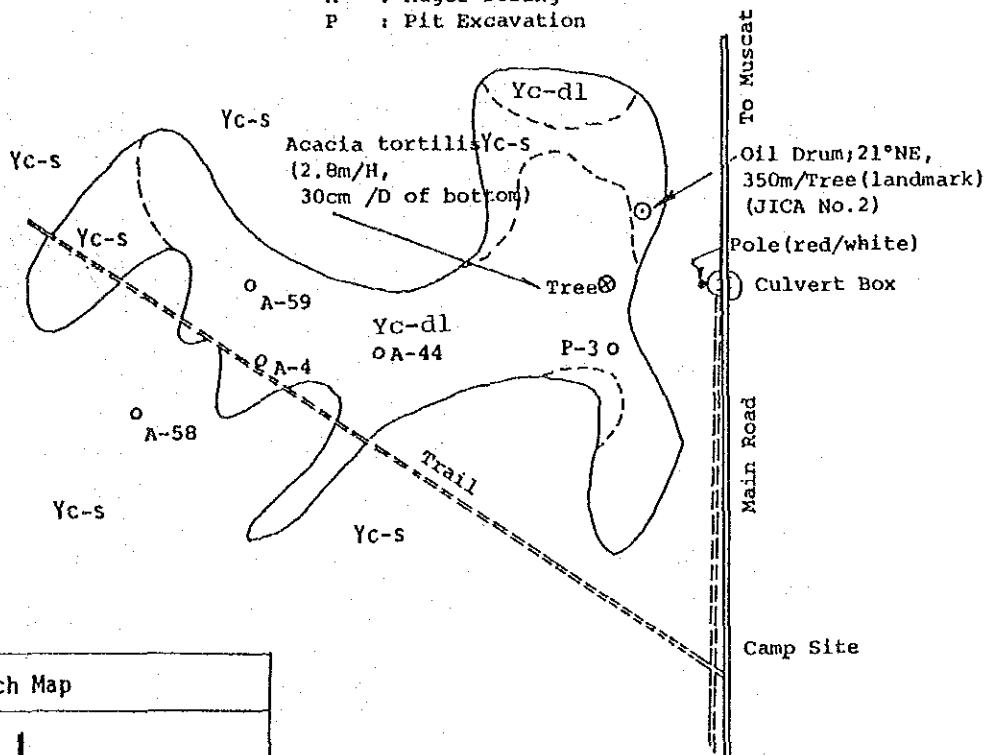
FIG. A-3.2.3 Proposed Pilot Farm, Site-2

Site - 2

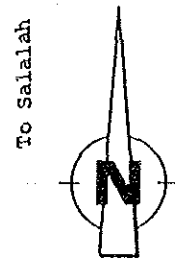
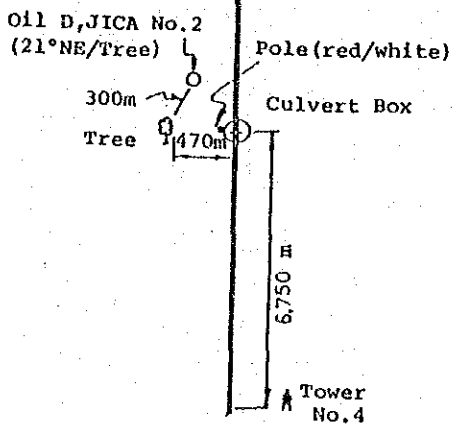
Elevation : 260 m  
 Landform : Wadi  
 Soil Texture : SL/L  
 Vegetation : Herbs 5% (*Zygophyllum coccineum*,  
 Cleome sp (dead) )  
 Grass 5-20% *Stipdgrostis* (dead)  
 Extent : Yc-dl (S2) 196ha

○ A-5

Yc-dl : Calcic Yermosols, deep (S2K)  
 Yc-s : calcic Yermosols, shallow (N2d)  
 A : Auger Boring  
 P : Pit Excavation



Sketch Map



Scale

0 500 1000m

FIG. A-3.2.4

FIG. A-3.2.4 Proposed Pilot Farm, Site-3

Site -3  
 Elevation : 200 m  
 Landform : Wadi and alluvial flat plain  
 Soil Texture : Gravel coarse sand to sandy loam  
 Vegetation : Harbs 20% (*Zygophyllum coccinum*,  
*Holiotropium kotschyi*)  
 Extent : S2 1330 ha

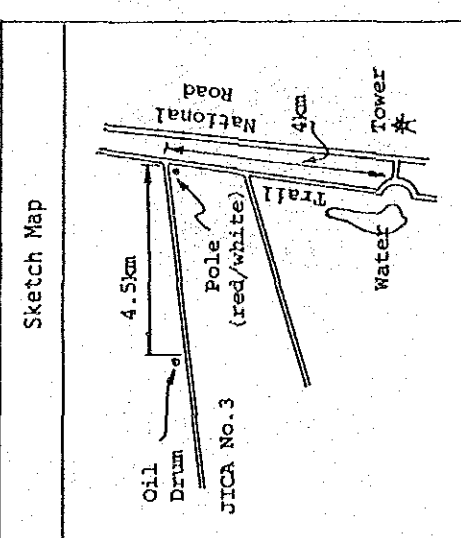
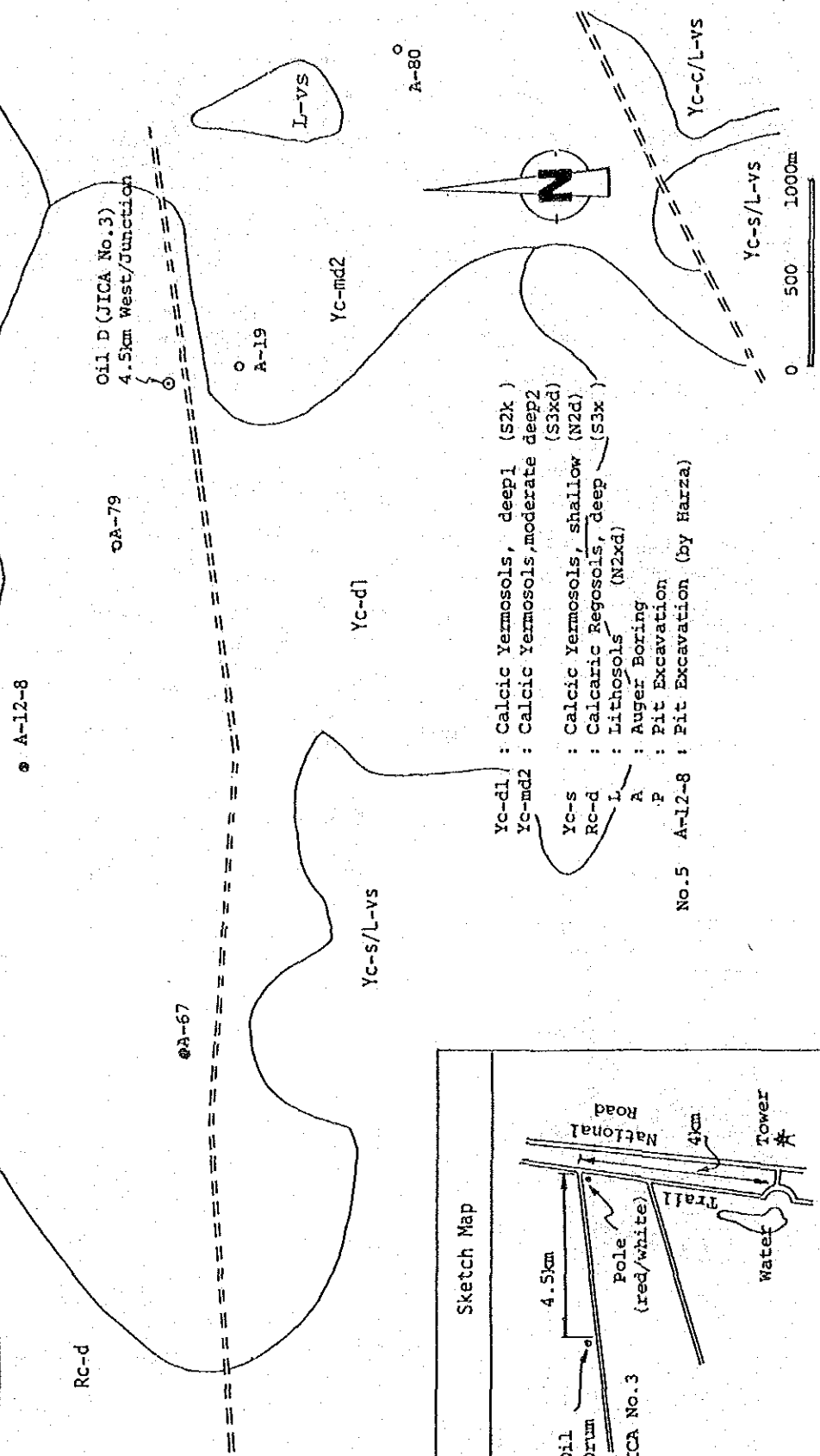
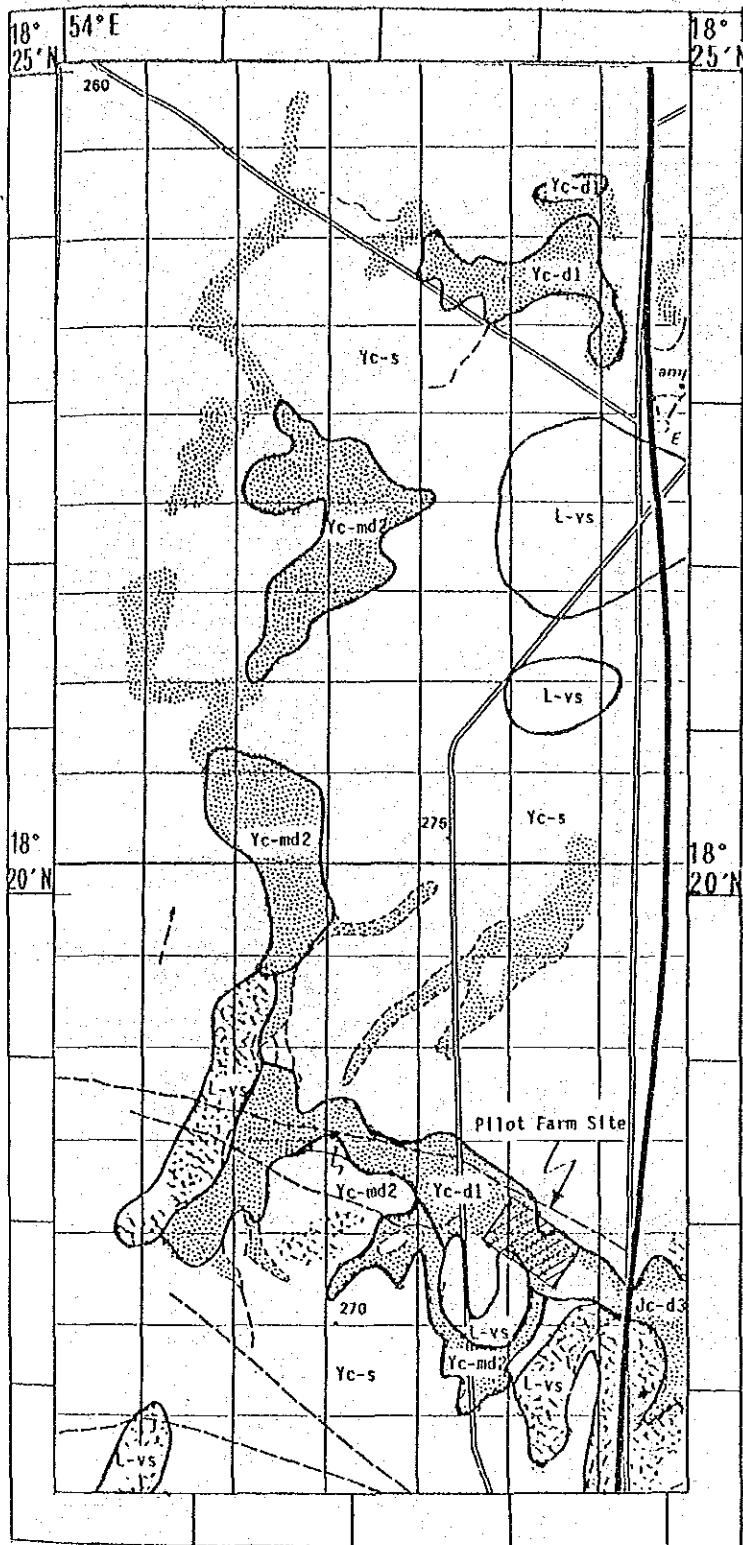


FIG. A-3.2.5 Soil Classification Map around the Pilot Farm Site



LEGEND

- Jc-d3: Calcic Fluvisols, deep3
- Yc-d1: Calcic Yermosols, deep1
- Yc-md2: Calcic Yermosols, moderate deep2
- Yc-s: Calcic Yermosols, shallow
- L-vs: Lithosols, very shallow

- Soil depth (cm)
- 0- 10: very shallow (Lithosols)
  - 0- 30: very shallow
  - 30- 50: shallow
  - 50-100: moderate deep
  - 100- : deep

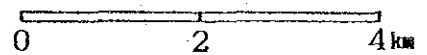
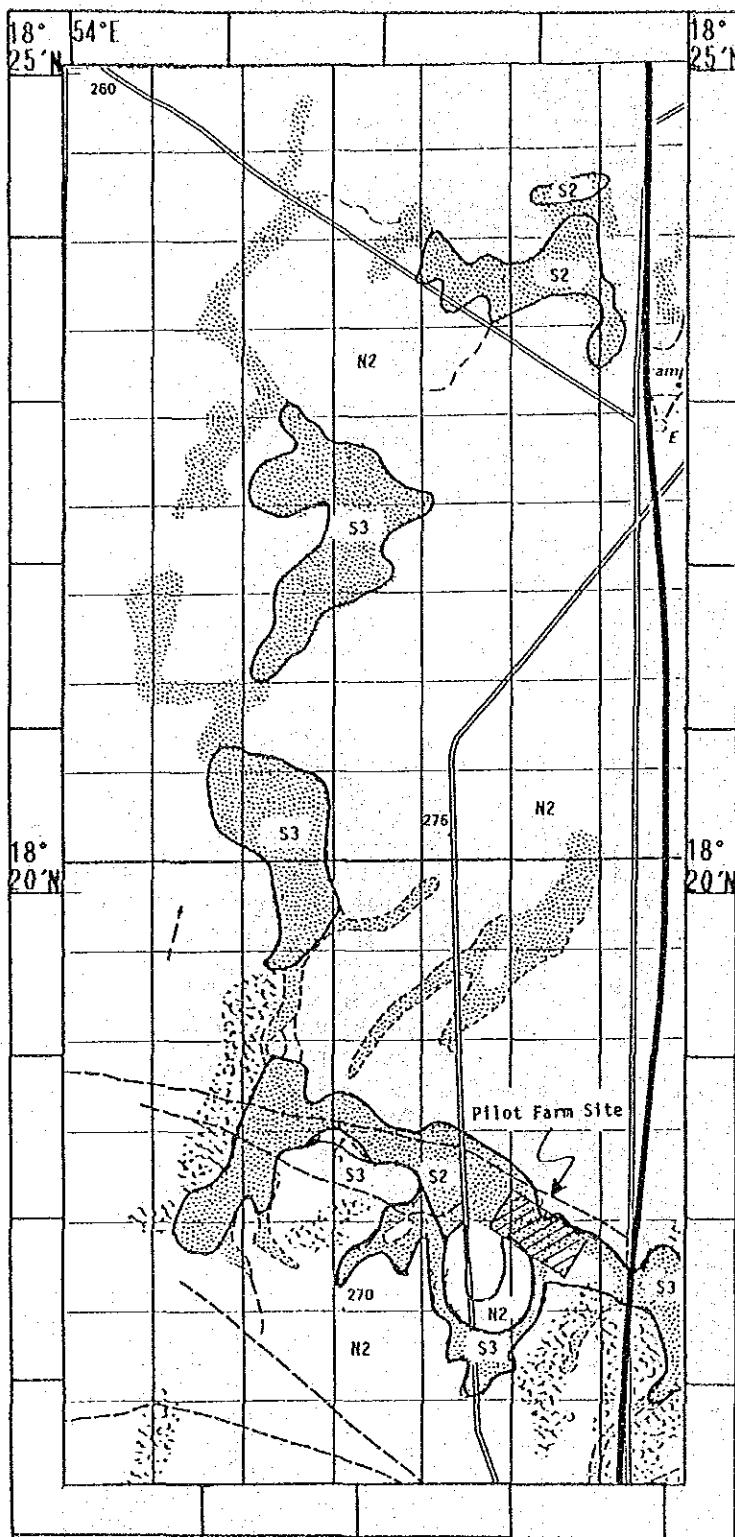


FIG. A-3.2.6 Land Suitability Classification Map around the Pilot Farm Site



Legend of suitability classification  
LAND SUITABILITY MAPS AND CLASSES

- |                                    |   |
|------------------------------------|---|
| <b>Order</b>                       |   |
| <b>S Suitable</b>                  | Land on which sustained use of the land water consideration is expected to yield benefits which justify the inputs without unacceptable risk of damage to land resources.   |
| <b>Class</b>                       |   |
| <b>S1 Highly Suitable</b>          | Land having an insignificant limitation in sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not require inputs above an acceptable level.   |
| <b>S2 Moderate Suitable</b>        | Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to a point that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to Class S1 land. |
| <b>S3 Marginally Suitable</b>      | Land having limitations which in aggregate are too severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs that this expenditure will be only marginally justified.  |
| <b>S4 Conditionally Suitable</b>   | Land having a conditional suitability for agriculture or other use limited to a special agriculture use.  |
| <b>Order</b>                       |   |
| <b>N Not Suitable</b>              | Land which has qualities that appear to preclude sustained use of the land water consideration.   |
| <b>Class</b>                       |   |
| <b>N1 Currently Not Suitable</b>   | Land having limitations which may be surmountable in the long term but which cannot be corrected with existing knowledge at currently acceptable cost/limitations are so severe as to preclude successful sustained use of the land in the given area.  |
| <b>N2 Permanently Not Suitable</b> | Land having limitations which appear so severe as to preclude any possibilities of sustained use of the land in the given area.   |

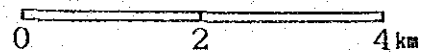
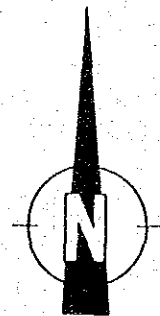


FIG. A-3.2.7

FIG. A-3.2.7 Location Map of the Soil Survey Points

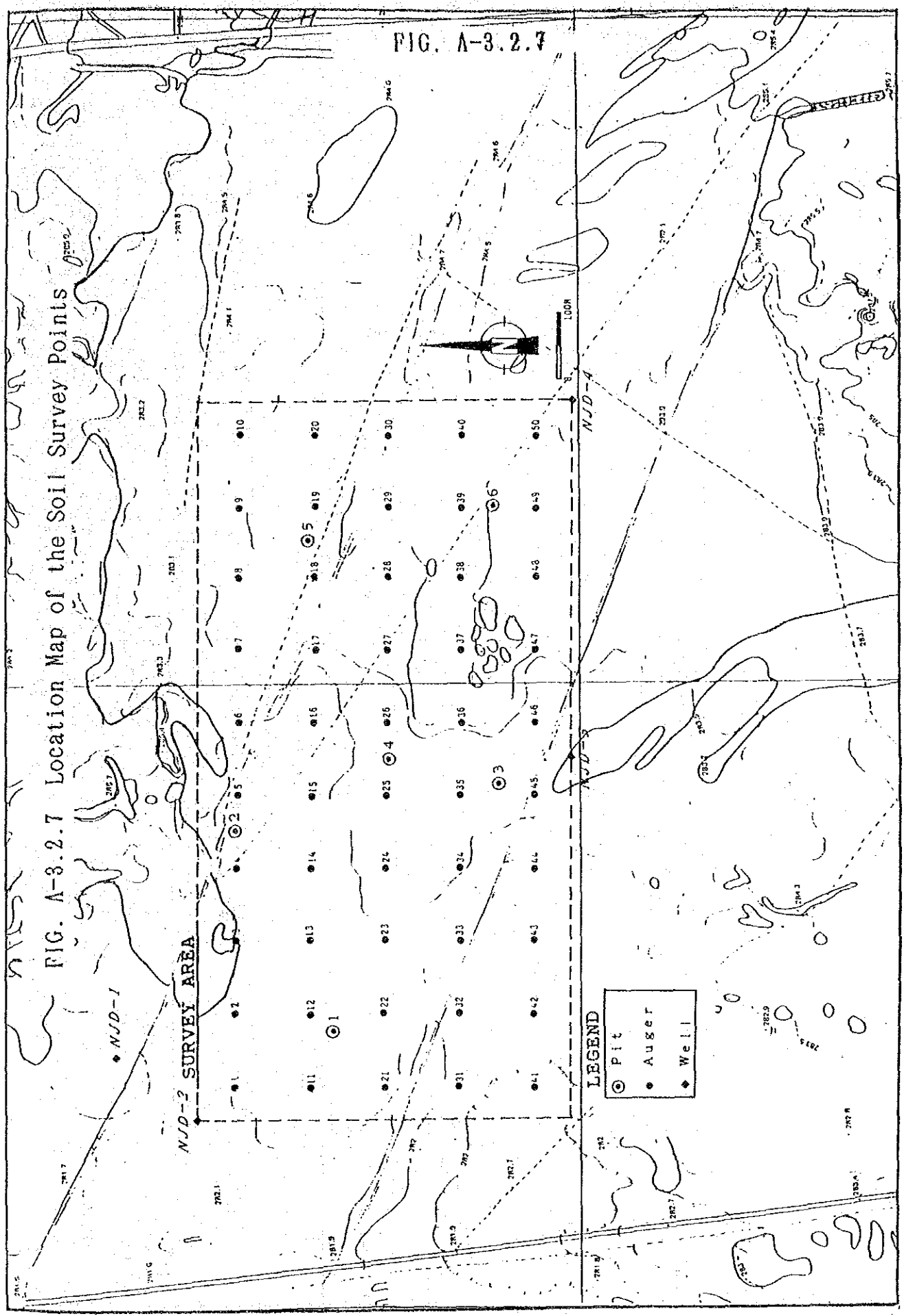
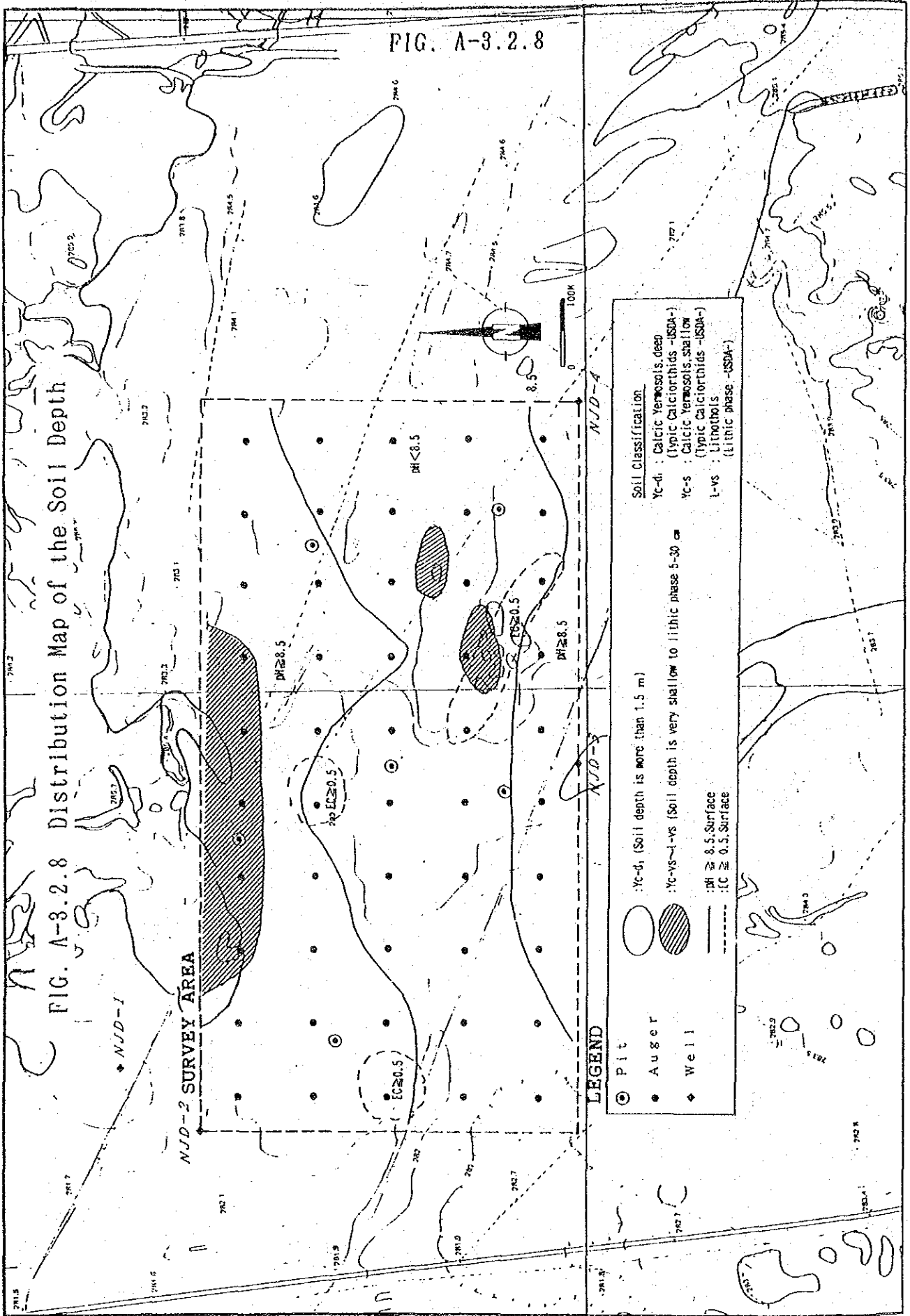




FIG. A-3.2.8

FIG. A-3.2.8 Distribution Map of the Soil Depth



**LEGEND**

- ⊙ Pit
- Auger
- ◆ Well
- : Yc-d (Soil depth is more than 1.5 m)
- ◐ : Yc-vs-l-vs (Soil depth is very shallow to lithic phase 5-30 cm)
- : pH >= 8.5 Surface
- : EC >= 0.5 Surface

**Soil Classification**

- Yc-d : Calcic Vertosols, deep (Typic Calciorthids -USDA-)
- Yc-s : Calcic Vertosols, shallow (Typic Calciorthids -USDA-)
- L-vs : Lithotroils (Lithic phase -USDA-)

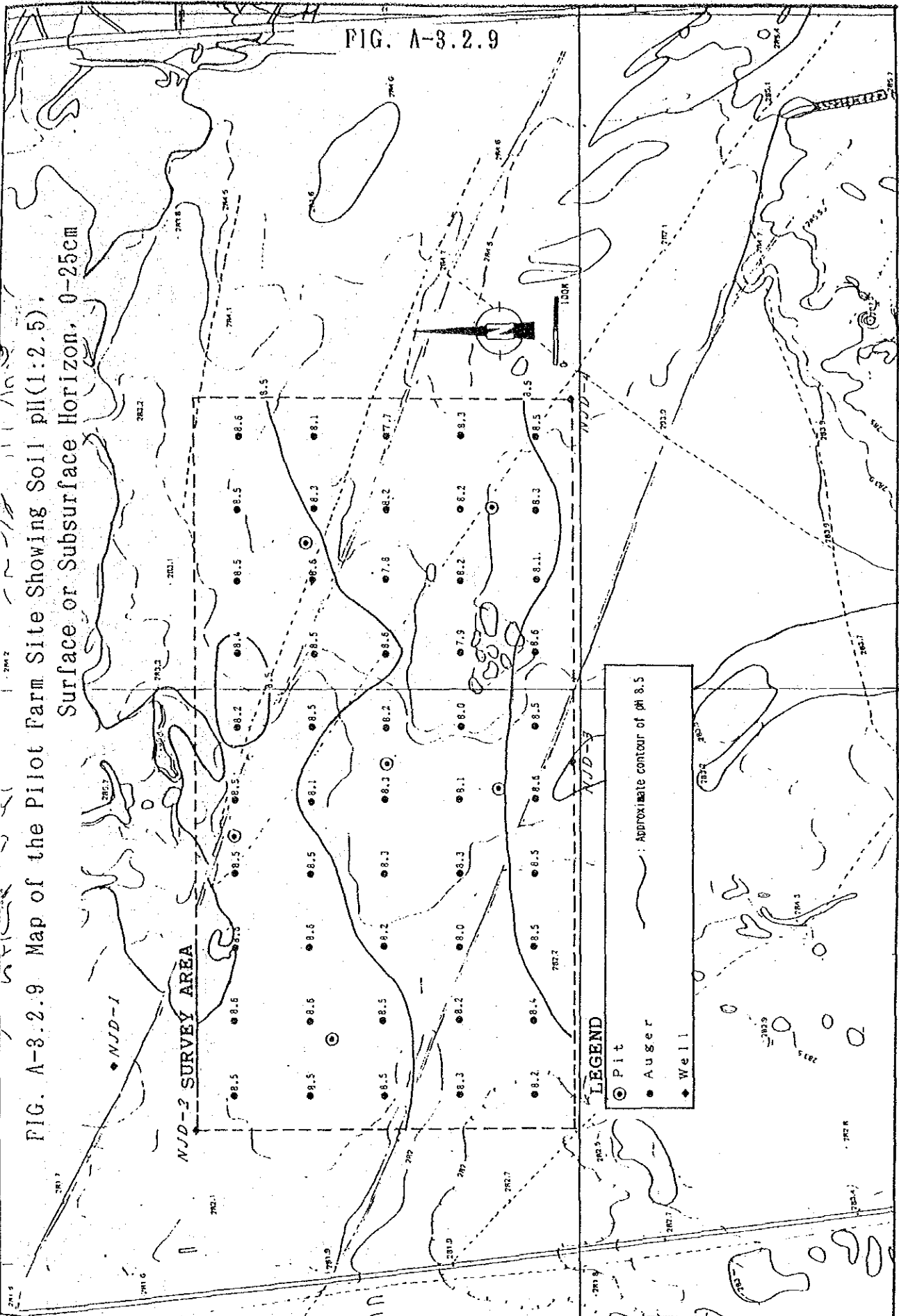
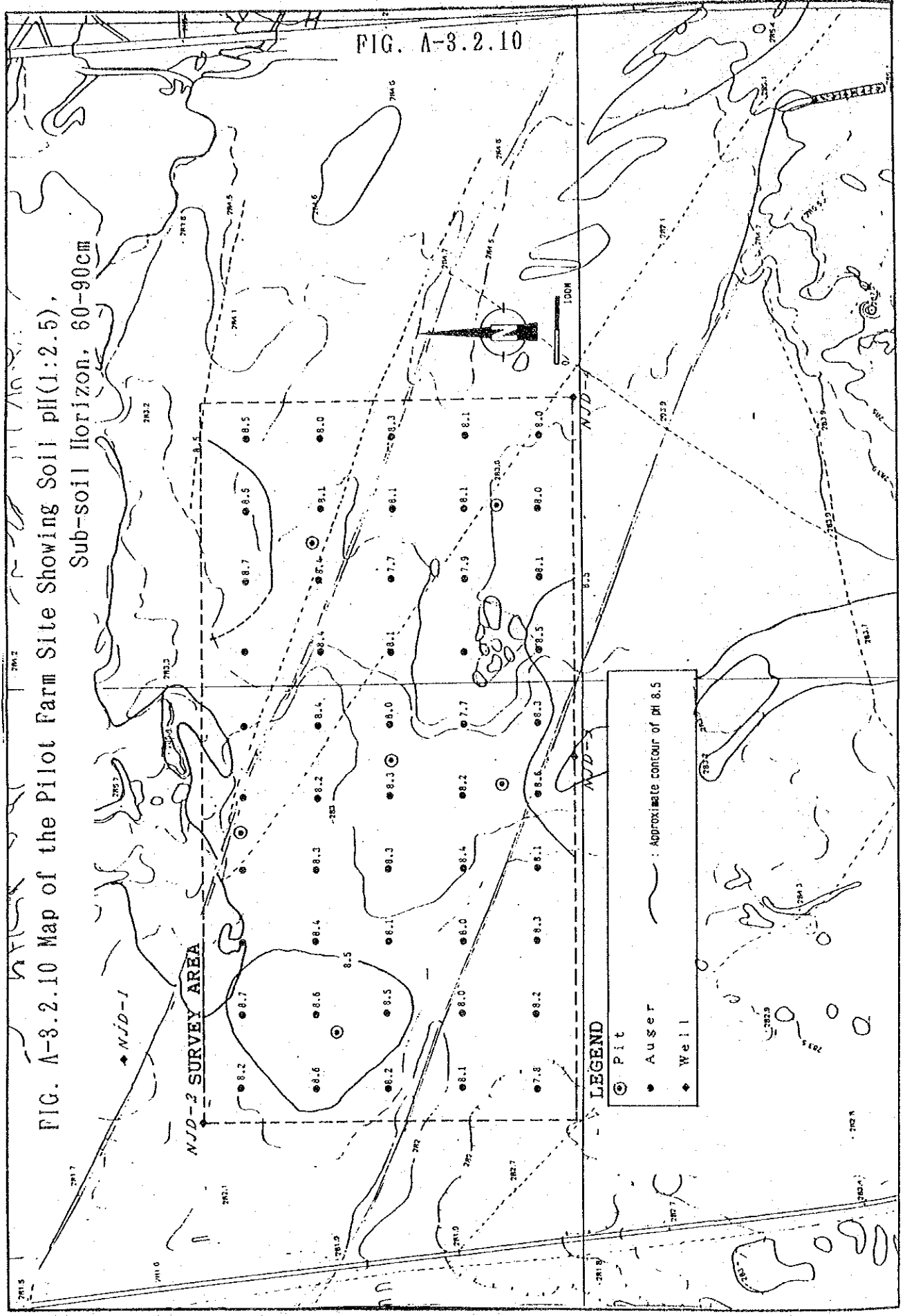


FIG. A-3.2.10 Map of the Pilot Farm Site Showing Soil pH(1:2.5),  
Sub-soil horizon, 60-90cm

FIG. A-3.2.10



**LEGEND**

- ⊙ Pit
- Ausser
- ◆ Well
- : Approximate contour of pH 8.5

FIG. A-3.2.11

FIG. A-3.2.11 Map of the Pilot Farm Site Showing Soil Electrical Conductivity Value (mS/cm). Surface of Subsurface Horizon, 0-25cm

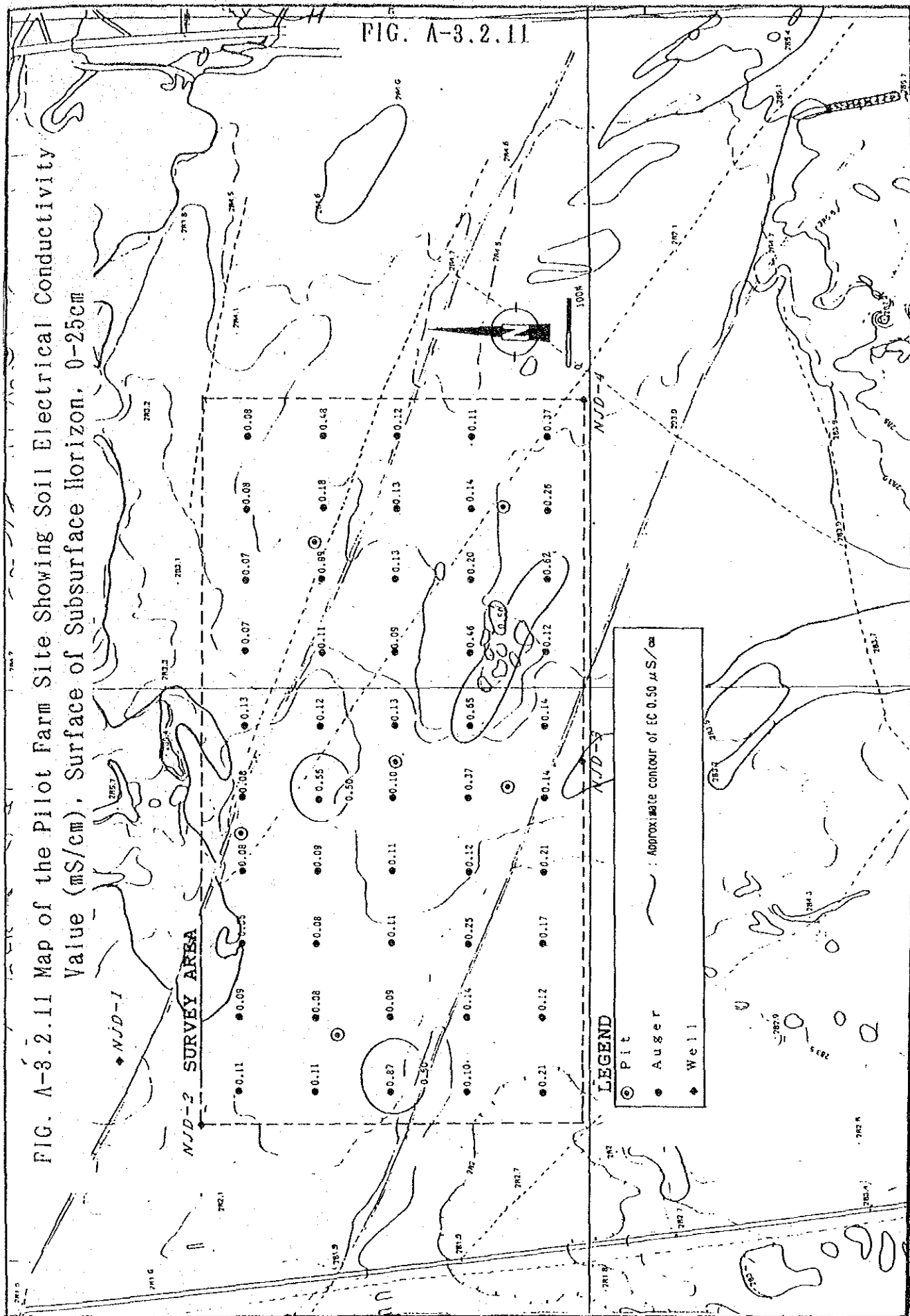


FIG. A-3.2.12 Map of the Pilot Farm Site Showing Soil Electrical Conductivity Values (mS/cm), Subsoil Horizon, 60-90cm

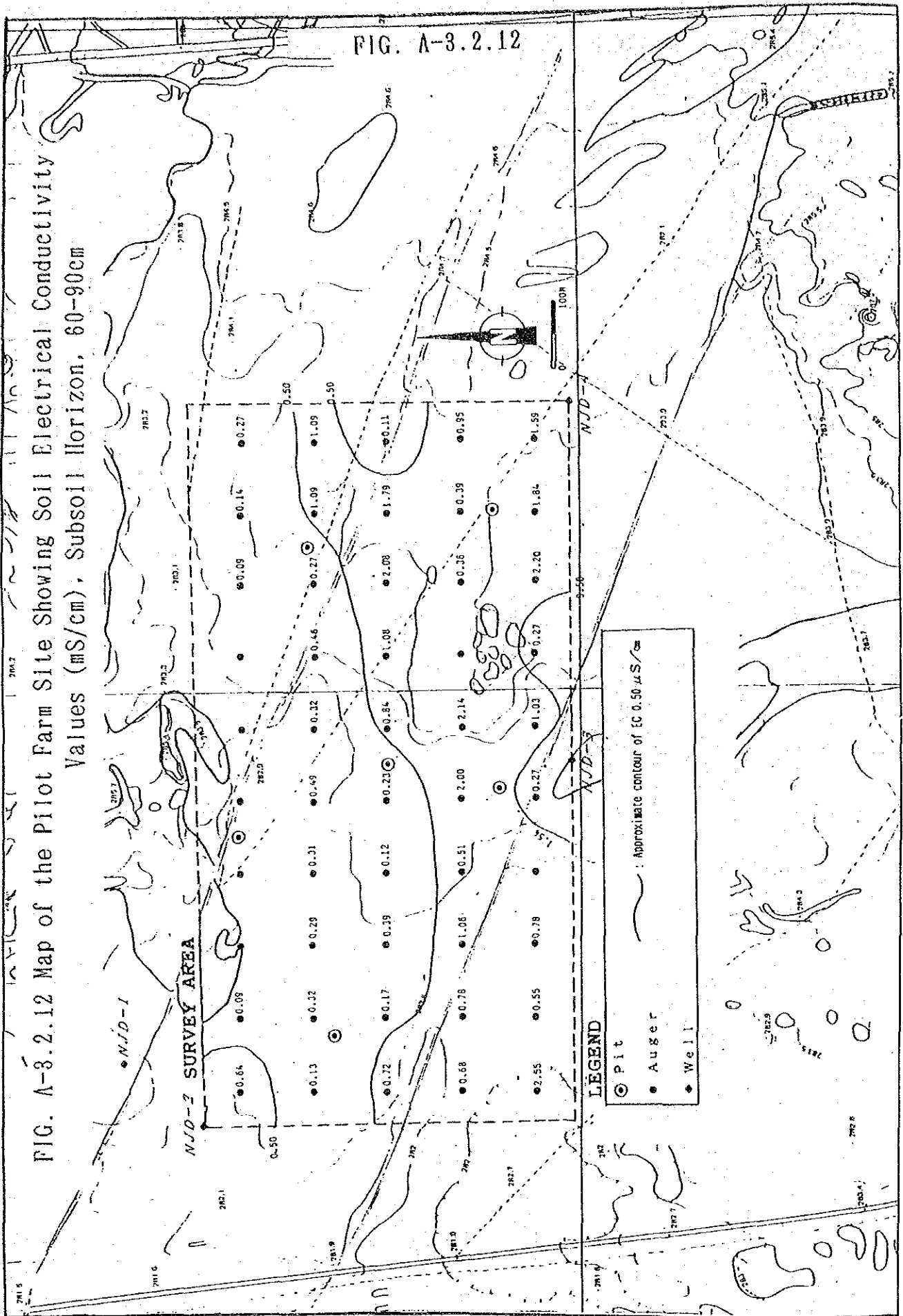


FIG. A-3.2.13

FIG. A-3.2.13 Correlation between EC(1:5) and pH(1:2.5)  
in the Pilot Farm Site

Xmax = 2.55 Ymax = 8.73

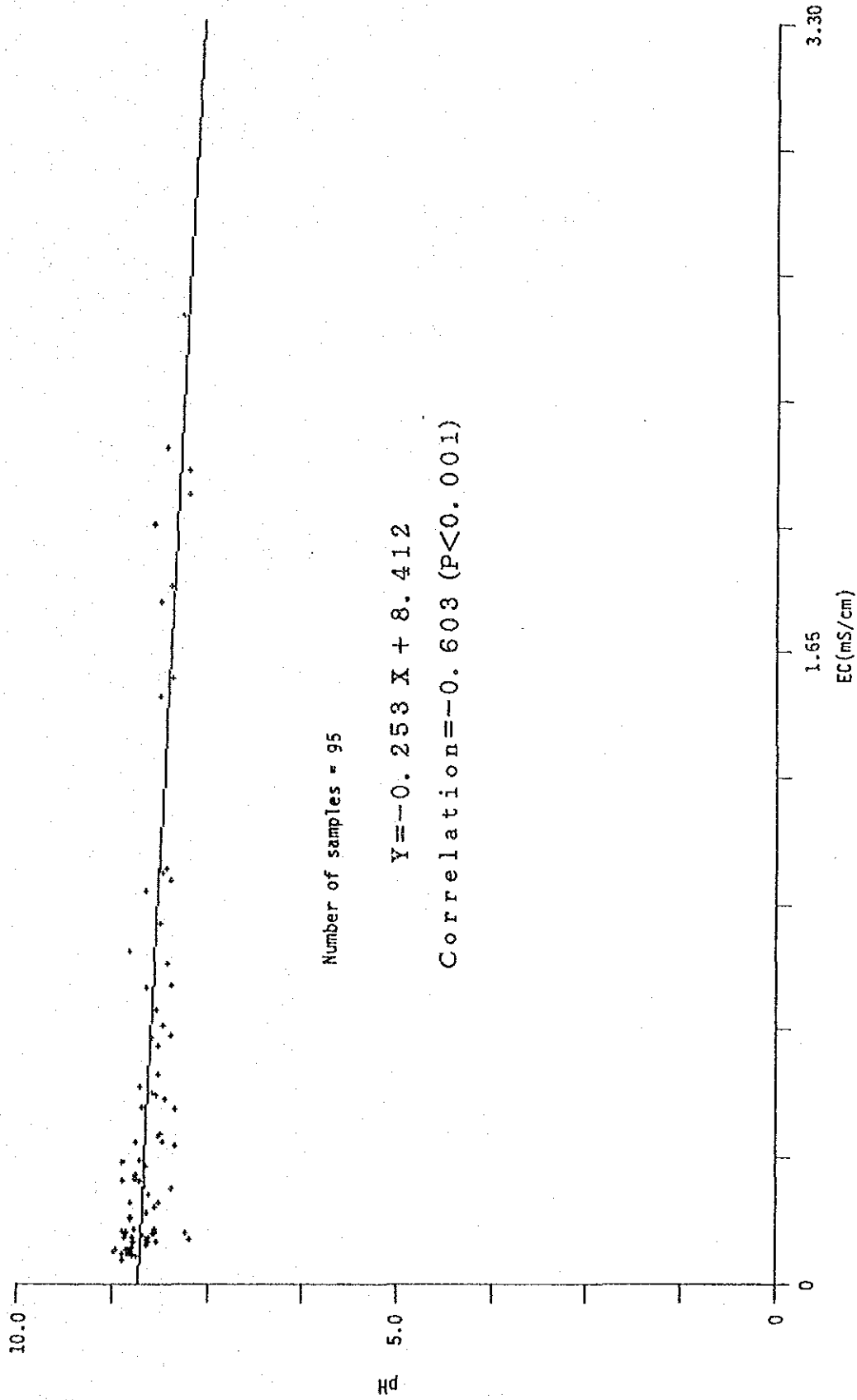
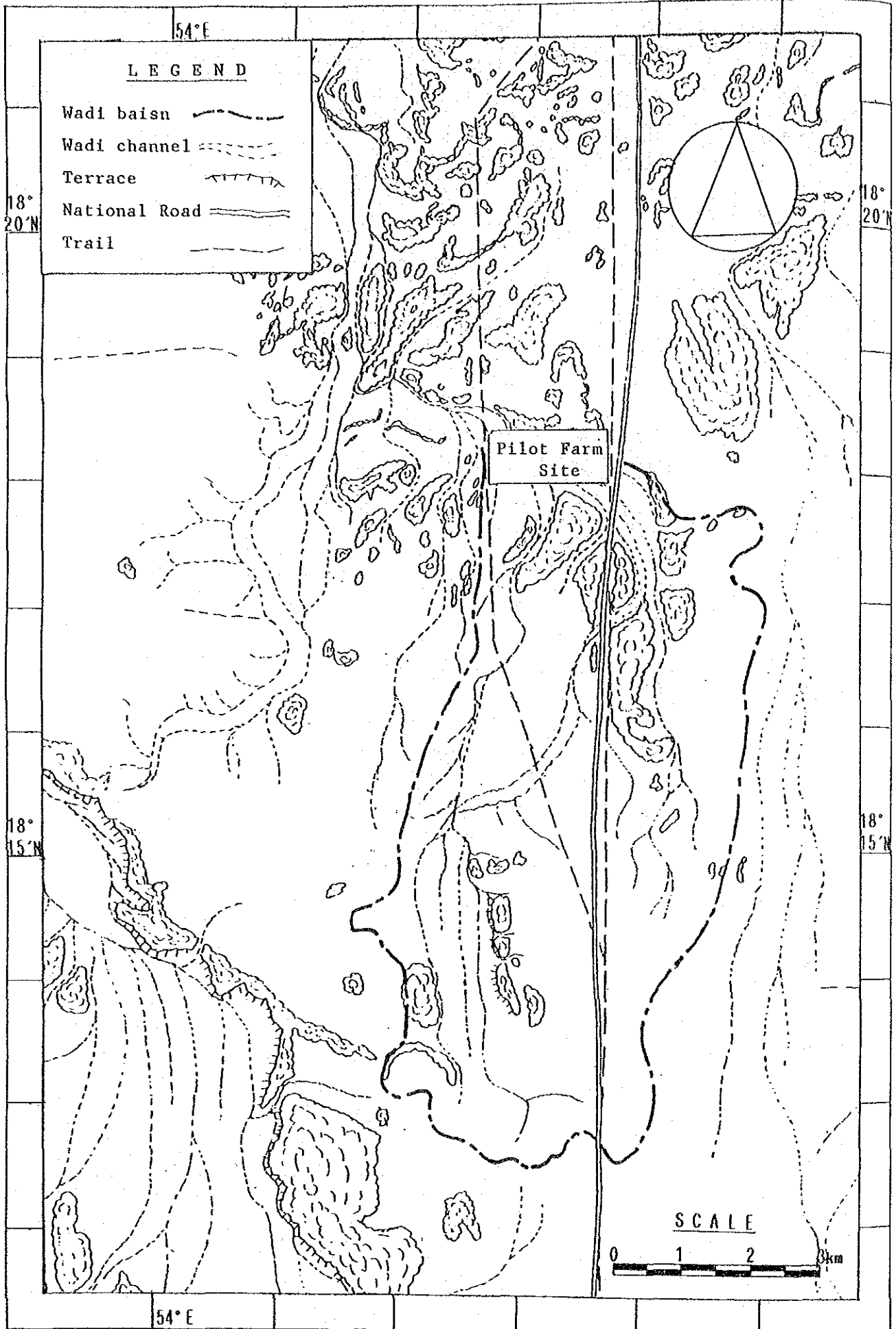


FIG. A-3.2.14 Surface Drainages around the Pilot Farm Site



(5) Summary of Pit Excavation Survey in the Study Area

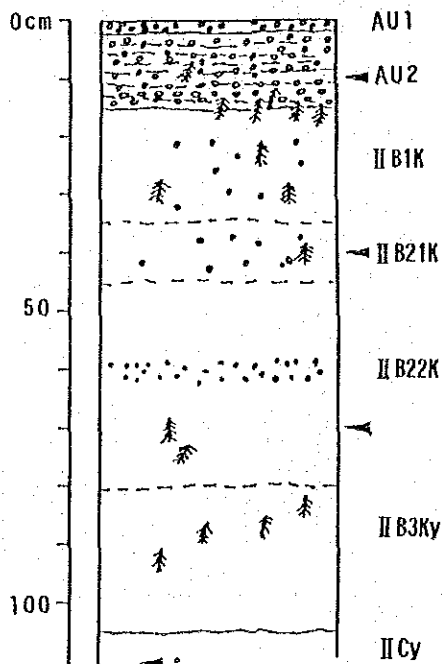
3.2.3-5 (1)	Summary of Pit Excavation Survey (P-1)	in the Study Area
3.2.3-5 (2)	"	(P-2)
		"
3.2.3-5 (3)	"	(P-3)
		"
3.2.3-5 (4)	"	(P-4)
		"
3.2.3-5 (5)	"	(P-5)
		"
3.2.3-5 (6)	"	(P-6: Quitbeet)
		"
3.2.3-5 (7)	"	(P-7: Hilat Al-Rakah)
		"
3.2.3-5 (8)	"	(P-8: Shasr)
		"
3.2.3-5 (9)	"	(P-9: Dauka)
		"
3.2.3-5 (10)	"	(P-10: Dauka)
		"
3.2.3-5 (11)	"	(P-11)
		"
3.2.3-5 (12)	"	(A-12-8)
		"





D. Profile Description (P-1)

Horizon	Depth (cm)	Description
Au1	0 - 2	Yellowish brown (10YR 5/6) gravelly sand; dry loose; moist loose; single grain, 20% roots, strong reaction to HCl, 60% gravel, abrupt smooth to:
Au2	2 - 15	Brownish yellow (10YR 6/6) gravelly loamy sand; dry soft, moist very friable; platy, 20% roots, violent reaction to HCl, 80% gravel, abrupt smooth to:
IIB1K	15 - 35	Brownish yellow (10YR 6/6) fine loamy sand; dry slightly hard, moist very friable, weak subangular blocky, a few fine roots, a few fine pores, violent reaction to HCl, 20% gravel, clear smooth to:
IIB21K	35 - 45	Brownish yellow (10YR 6/6) fine loamy sand; dry hard, moist friable, subangular blocky, a few fine roots, a few fine pores, violent reaction to HCl, 30% gravel, wavy to:
IIB22K	45 - 80	Brownish yellow (10YR 6/6) fine sandy loam; dry hard, moist friable, subangular blocky, a few fine roots, a few pores, violent reaction to HCl, gradual wavy to:
IIB3Ky	80 - 105	Brownish yellow (10YR 6/6) fine loamy sand; dry very hard, moist friable, subangular blocky, a few fine roots, a few fine pores, violent reaction to HCl, clear wavy to:
IICy	105 -	Brownish yellow (10YR 6/8) gypsum, weathered alluvium, a few roots, violent reaction to HCl:



Site-1 (Pit-1)

Depth (cm)	Bulk density (g/cm <sup>3</sup> )	Distribution of three phases			I/Gravel (%)	Soil particle (%)			Texture	Sat'n (%)	CaCO <sub>3</sub> (%)	Gypsum (%)	Avail P (PPM)	pH (1:2.5)	EC (1:5)	
		Solid (%)	Water (%)	Air (%)		C. Sand	F. Sand	Silt								Clay
10	1.41	63.9	1.0	35.1	25	70.3	27.6	—	2.1	coarse sand	16	43	0.4	1.9	8.5	0.184
40	1.69	53.1	4.9	42.0	33	18.2	66.7	13.0	2.1	gravelly loamy sand	33	18	0.5	1.0	8.6	0.133
70	1.40	52.7	5.6	41.7	31	9.9	71.0	12.0	7.1	gravelly loamy sand	36	14	0.5	1.35	8.5	0.176

TSS (%)	Exchangeable cations (me/100g)				CEC (me/100g)	ESP (%)	Soluble cations (me/Q)				SAR (me/Q)	Soluble anions (me/Q)			Base Saturation (%)	Total N (%)
	Ca	Mg	Na	K			Ca	Mg	Na	K		Cl	SO <sub>4</sub>	HCO <sub>3</sub>		
0.05	18.0	1.5	0.9	0.2	8.1	15	0.8	0.3	0.5	0.04	0.7	0.8	0.79	0.05	>100	0.035
0.04	17.6	2.4	0.9	0.5	8.0	11	0.7	0.1	0.5	0.03	0.8	0.6	0.63	0.1	>100	0.070
0.06	16.2	3.0	1.0	0.5	6.8	15	1.0	0.4	0.32	0.04	0.4	0.8	0.86	0.1	>100	0.014

Note 1/ Data of gravel content are not used in this report. Probably hard soilcore have been analysed as gravel. So actual content will be less than these values.

Organic matter (%)
0.7
1.0
0.2

(5)-2 Summary of Pit Excavation Survey, P-2

PROFILE DESCRIPTION

SITE No. : P-2

A. Information of the Site

Soil Mapping Unit : Jc-d3

FAO Classification : Calcaric Fluvisols, deep

Location : South Dauka-2, Approximately 65km north of Thumrait, east side of the main road.

Landform : Active Wadi Land Suitability Classification : S3x

Elevation : 270m

Slope : <1%

Micro relief : Even

Land use : Camel grazing

Vegetation : Shurubs < 1% Acacia ehrenbergiana

herbs 10 Heliotropium kotschyi, Zygophyllum  
coccineum

grasses 10 Stipagrostis plumosa

cover 20-30%, relatively rich

Remarks : There are many nests and footprints of animals (ex. Fox, Lizard, Snake, Ant.,).

B. Information of the Soil

Parent Material : Recent wadi alluvium, gravel sand

Drainage : Somewhat excessive

Flood hazard : Seasonal flooding

Surface feature : Loose gravelly sand, gravel (0.5cm diameter ) 80%  
weak crusting

Evidence of erosion : None

Wind blown sand hazard : Slightly

Root distribution : Up to 65cm

C. Brief Description of the Profile

Profile of stratified gravel and sand of recent origin, and very gravel throughout the profile.

Structure is single grain : low water-holding and no gypsum.

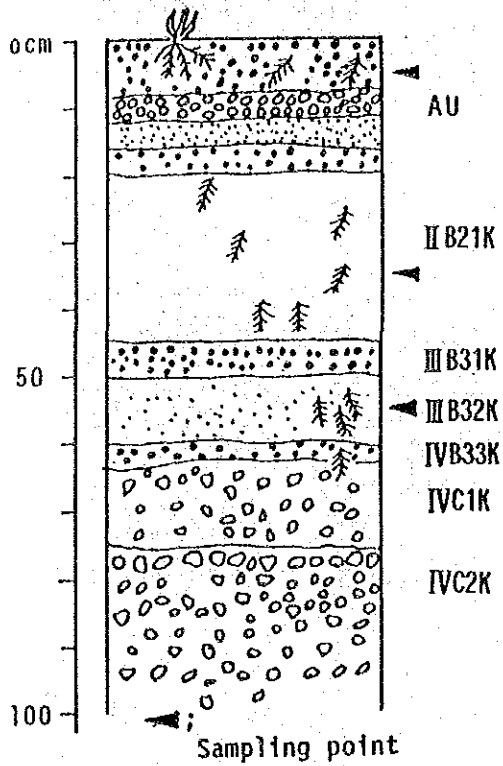
Coarse gravelly texture makes this soil marginally suitable for irrigated agricultural development.

D. Profile Description (P-2)

Horizon	Depth (cm)	Description
Au	0 - 20	Yellowish brown (10YR 5/6) moist, very gravelly sand; dry loose to soft, moist loose, weak platy, 20% medium roots, a few fine pores, strong reaction to HCl, no gypsum, 70% gravel (0.1-2cm diameter), abrupt smooth to:
IIB21K	20 - 45	Yellowish brown (10YR 5/6) moist, very gravelly sand; dry slightly hard, moist very friable, single grain, a few medium to fine roots, a few fine pores, violent reaction to HCl, no gypsum, 60% gravel (0.2cm), abrupt smooth to:
IIIB31K	45 - 50	Yellowish brown (10YR 5/6) moist, very gravelly sand; dry hard, moist friable, weak subangular blocky, a few fine roots, a few fine pores, violent reaction to HCl, no gypsum, 90% gravel (0.3-0.5cm), abrupt smooth to:
IIIB32K	50 - 60	Yellowish brown (10YR 5/6) moist, very gravelly sand; dry hard, moist friable, strong cementation, weak subangular blocky, a few fine roots, a few fine pores, violent reaction to HCl, no gypsum, 40% gravel (0.1cm), abrupt smooth to:
IVB33K	60 - 65	Yellowish brown (10YR 5/6) moist, very gravelly sand; dry strong hard, moist friable, strong cementation, massive structure, a very few fine roots, a few fine pores, violent reaction to HCl, no gypsum, 90% gravel (0.3cm), abrupt smooth to:
IVG1K	65 - 75	Yellowish brown (10YR 5/6) moist, very gravelly sand; dry strong hard, moist friable, indurated cementation, massive structure, no roots, no pores, violent reaction to HCl, no gypsum, 70% gravel (0.3-1.0cm), abrupt smooth to:

IVC2K 75 -

Yellowish brown (10YR 5/6) moist, very  
below 110 gravelly sand; dry strong hard, moist friable,  
indurated cementation, massive structure, no  
roots, no pores, violent reaction to HCl, no  
gypsum, 70% gravel (0.5-1.0cm), abrupt smooth  
to:



PIT-2

Depth (cm)	Bulk density (g/cm <sup>3</sup> )	Distribution of three phases			Gravel (%)	Soil particle (%)				Texture	Sat'n (%)	CaCO <sub>3</sub> (%)	Gypsum (%)	Avail P (PPM)	pH (1:2.5)	EC (1:5)
		Solid (%)	Water (%)	Air (%)		C. Sand	F. Sand	Silt	Clay							
5	1.91	71.9	0.9	27.2	22	48.1	49.8	—	2.1	Sand	19	41	0.7	1.2	8.8	0.153
35	1.79	64.5	2.6	32.9	38	61.6	33.3	3.0	2.1	gravelly sand	23	32	0.6	1.6	8.8	0.134
55	1.72	64.9	3.0	32.1	36	68.4	25.5	3.0	3.1	gravelly sand	23	25	0.5	4.0	8.8	0.145

TSS (%)	Exchangeable cations (me/100g)				CEC (me/100g)	ESP (%)	Soluble cations (me/l)				SAR (me/l)	Soluble anions (me/l)			Base Saturation (%)	Total N (%)
	Ca	Mg	Na	K			Ca	Mg	Na	K		Cl	SO <sub>4</sub>	HCO <sub>3</sub>		
0.05	14.6	0.8	0.9	0.2	5.3	17	0.9	0.3	0.3	0.03	0.4	0.8	0.63	0.1	>100	0.028
0.04	15.8	1.5	0.9	0.2	5.4	17	0.7	0.3	0.32	0.02	0.5	0.8	0.44	0.1	>100	0.028
0.05	15.8	2.0	0.9	0.4	5.4	17	0.8	0.3	0.32	0.03	0.4	0.8	0.56	0.1	>100	0.014

Note 1/ Data of gravel content are not used in this report. Probably hard soilcore have been analysed as gravel. So actual content will be less than these values.

Organic matter (%)
0.5
0.5
0.2

(5)-3 Summary of Pit Excavation Survey, P-3

PROFILE DESCRIPTION

SITE No. : P-3 (Proposed Pilot Farm Site-2)

A. Information of the Site

Soil Mapping Unit : Yc-d1

FAO Classification : Calcic Yermosols, deep

Location : South Dauka-2, Approximately 75km north of Thumrait, west side of the main road.

Landform : Wadi Land Suitability Classification : S2k

Elevation : 260m

Slope : < 1%

Micro relief : Even

Land use : Camel grazing

Vegetation : shrubs < 1% Acacia tortilis  
herbs 5% Zygophyllum coccineum  
grasses < 1% Stipagrostis plumosa

B. Information of the Soil

Parent Material : Recent alluvium over subrecent alluvium

Drainage : Moderately well

Flood hazard : Seasonal flooding by ephemeral floods

Surface feature : Loose sand and gravel (0.3-1.0cm diameter) 80%  
weak crusting

Evidence of erosion : None

Wind blown sand hazard : Slightly

C. Brief Description of the Profile

Deep profile of fine sediments with stratification in both of recent and subrecent. Platy structure develops in B horizon, and compactness and silt increase with depth.

Fine roots distribute until 85cm depth. There is a high content of CaCO<sub>3</sub> throughout the profile.

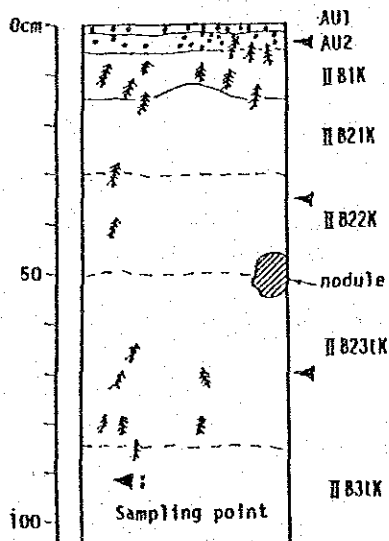
Nodule (20cm in diameter), which is composed of clay and fine sand, occurs at the depth of 50cm.

This soil has a moderate suitability for irrigated agricultural development.



D. Profile Description (P-3)

Horizon	Depth (cm)	Description
Au1	0 - 2	Yellowish brown (10YR 5/4) moist, fine sand; dry loose, moist loose, single grain, few fine roots, strong reaction to HCl, 30% gravel (0.3cm diameter) abrupt smooth to:
Au2	2 - 5	Yellowish brown (10YR 5/4) moist, fine sand; dry soft, moist very friable, single grain, 10% medium-fine roots, few fine pores, violent reaction to HCl, 20% gravel (0.3cm) abrupt smooth to:
IIB1K	5 - 15	Strong brown (7.5YR 5/6) moist, sandy loam; dry hard, moist very friable, strong medium platy, 20% medium-fine roots, few pores, violent reaction to HCl, clear wavy to:
IIB21K	15 - 30	Strong brown (7.5YR 5/6) moist, sandy loam; dry extremely hard, moist friable, medium platy, few fine roots, few fine pores, violent reaction to HCl, gradual smooth to:
IIB22K	30 - 50	Strong brown (7.5YR 5/6) moist, sandy loam; dry extremely hard, moist friable, medium platy, few fine roots, few fine pores, violent reaction to HCl, gradual smooth to:
IIB23tK	50 - 85	Reddish yellow (7.5YR 6/6) moist, sandy loam; dry extremely hard, moist friable, moderate medium subangular blocky, few fine roots, few fine pores, violent reaction to HCl, sand nodule (20cm diameter), gradual smooth to:
IIB3tK	85 -	Reddish yellow (7.5YR 6/6) moist, silty clay loam; more than 100 dry extremely hard, moist friable, moderate medium subangular blocky, no roots, no pores, violent reaction to HCl:



Depth (cm)	Bulk density (g/cm <sup>3</sup> )	Distribution of three phases			Gravel (%)	Soil particle (%)				Texture	Sat'n (%)	CaCO <sub>3</sub> (%)	Gypsum (%)	Avail P (PPM)	pH (1:2.5)	EC (1:5)
		Solid (%)	Water (%)	Air (%)		C. Sand	F. Sand	Silt	Clay							
5	1.61	60.6	1.4	38.0	27	70.5	-	2.1	fine sand	26	20	0.7	1.45	8.6	0.155	
35	1.49	56.3	2.9	40.8	45	56.4	26.0	3.1	gravelly sandy loam	33	20	0.8	1.20	8.1	0.420	
70	1.47	55.3	5.5	39.2	50	52.1	31.0	4.1	gravelly sandy loam	34	18	0.3	1.45	7.9	0.797	

TSS (%)	Exchangeable cations (me/100g)				CFC (me/100g)	ESP (%)	Soluble cations (me/l)				SAR (me/l)	Soluble anions (me/l)			Base Saturation (%)	Total N (%)
	Ca	Mg	Na	K			Ca	Mg	Na	K		Cl	SO <sub>4</sub>	HCO <sub>3</sub>		
0.05	13.0	1.8	0.9	0.2	6.6	14	0.8	0.4	0.32	0.03	0.4	0.6	0.85	0.1	>100	0.028
0.13	14.8	3.1	1.0	0.1	5.2	19	1.6	1.7	0.80	0.10	0.6	2.1	2.0	0.1	>100	0.028
0.26	18.2	2.1	0.9	0.5	6.0	15	2.6	2.5	2.70	0.17	1.7	4.0	3.87	0.1	>100	0.028

Note 1/ Data of gravel content are not used in this report. Probably hard soilcore have been analysed as gravel. So actual content will be less than these values.

Organic matter (%)
0.5
0.5
0.5

(5)-4 Summary of Pit Excavation Survey, P-4

PROFILE DESCRIPTION

SITE No. : P-4

A. Information of the site

Soil Mapping Unit : Yy-s

FAO Classification : Gypsic Yermosols, shallow

Location : South Dauka-2, Approximately 75km north of Thumrait, 2.5km  
east of the main road

Landform : Wadi Flat plain of old alluvium over weathered  
limestone

Elevation : 275m Land Suitability Classification : N2xdt

Slope : <1%

Micro relief : Even

Land use : Camel grazing

Vegetation : grasses < 1% Stipagrostis plumosa  
Poor

B. Information of the Soil

Parent Material : Recent depositions on weathered limestone

Drainage : Moderately well

Flood hazard : None

Surface feature : Loose sand and gravel (0.3-2cm diameter) 70%,  
crusting

Evidence of erosion : None

Wind blown sand hazard : Slightly

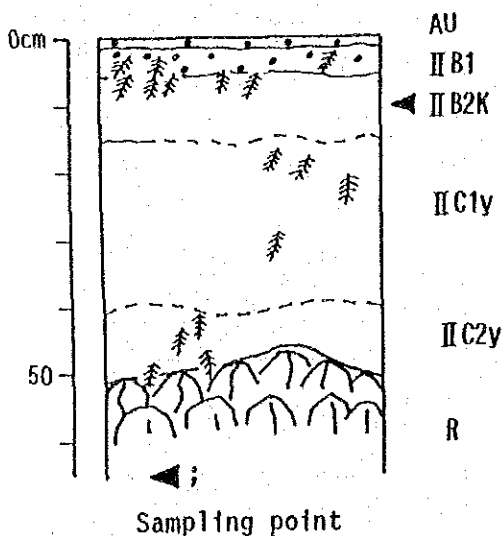
C. Brief Description of the Profile

Shallow gypsic soil in the flat plane of old alluvium on the  
weathered limestone. Fine roots distribution is observed until 50cm  
depth. Hard impenetrable bed rock at 50cm. Gypsum occurs at the  
depth of 15cm and more.

Shallow effective depth makes this soil not suitable for irrigated  
agricultural development.

D. Profile Description (P-4)

Horizon	Depth (cm)	Description
Au	0 - 2	Yellowish brown (10YR 5/4) moist, gravelly sand, dry loose, moist loose, single grain, few fine roots, many fine pores, strong reaction to HCl, 20% gravel (0.5cm diameter), clear smooth to:
IIB1	2 - 5	Yellowish brown (10YR 5/6) moist, gravelly loamy sand, dry soft, moist very friable, weak subangular blocky, 10% fine-medium roots, few fine pores, violent reaction to HCl, 20% gravel (0.5cm), clear smooth to:
IIB2K	5 - 15	Brownish yellow (10YR 6/6) moist, gravelly loamy sand, dry hard, moist friable, medium subangular blocky, few fine roots, no pores, violent reaction to HCl, abundant gypsum, abundant softlime, gradual wavy to:
IIC1y	15 - 40	Weathered limestone, dry extremely hard, moist very firm, few fine roots, no pores, violent reaction to HCl, gypsum, gradual wavy to:
IIC2y	40 - 50	Weathered limestone, dry extremely hard, moist very firm, few fine roots, no pores, violent reaction to HCl, gypsum, clear irregular to:
R	50 -	Hard limestone



P-4

Depth (cm)	Bulk density (g/cm <sup>3</sup> )	Distribution of three phases			I/Gravel (%)	Soil particle (%)			Texture	Sat'n (%)	CaCO <sub>3</sub> (%)	Gypsum (%)	Avail P (PPM)	pH (1:2.5)	EC (1:5)
		Solid (%)	Water (%)	Air (%)		C. Sand	F. Sand	Silt							
10	1.46	55.1	0.5	44.4	31	38.8	42.2	16.9	2.1	30	0.6	1.7	8.5	0.171	

TSS (%)	Exchangeable cations (me/100g)				CEC (me/100g)	ESP (%)	Soluble cations (me/l)				SAR (me/l)	Soluble anions (me/l)			Base Saturation (%)	Total N (%)
	Ca	Mg	Na	K			Ca	Mg	Na	K		Cl	SO <sub>4</sub>	HCO <sub>3</sub>		
0.05	15.6	8.0	0.5	0.5	4.9	10	1.0	0.5	0.2	0.01	0.2	0.7	0.91	0.1	>100	0.028

Note 1/ Data of gravel content are not used in this report. Probably hard soilcore have been analysed as gravel. So actual content will be less than these values.

Organic matter (%)	
0.5	

(5)-5 Summary of Pit Excavation Survey, P-5

PROFILE DESCRIPTION

SITE No. : P-5

A. Information of the Site

Soil Mapping Unit : So-d

FAO Classification : Orthic Solonetz, deep

Location : South Dauka-2, Approximately 75km north of Thumrait, 3km  
west of the main road

Landform : Wadi Land Suitability Classification : S3n

Elevation : 270m

Slope : < 1%

Micro relief : Even

Land use : Camel grazing

Vegetation : shrubs < 1% Acacia ehrenbergiana  
grasses 1 Stipagrostis plumosa

B. Information of the Soil

Parent Material : Recent wadi alluvium over subrecent alluvium on  
weathered limestone

Drainage : Moderately well

Flood hazard : Seasonal flooding by ephemeral floods

Surface feature : Loose sand and gravel (0.3-0.5cm diameter) 96%,  
crusting

Evidence of erosion : None

Wind blown sand hazard : Slightly

C. Brief Description of the Profile

Deep gravelly sandy loam profile in recent alluvium.

Fine Prismatic structure in the sub-soil.

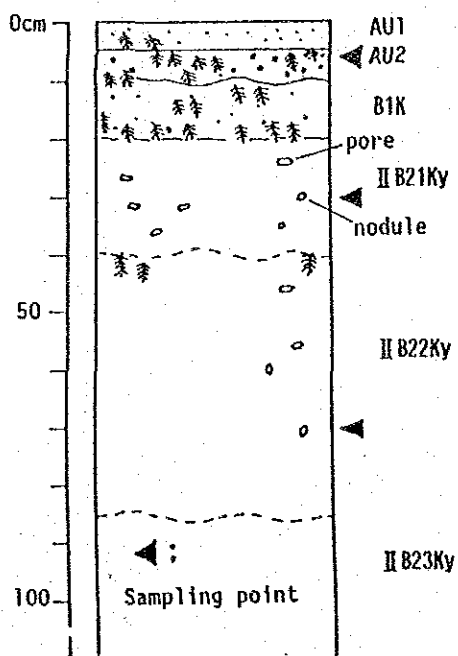
EC(1:5) is high (2.2-2.6mmhos/cm).

Gypsum and extremely hard compactness occurs at 20cm depth and more.

High sodium content makes this soil marginally suitable for irrigated  
agricultural development.

D. Profile Description (P-5)

Horizon	Depth (cm)	Description
Au1	0 - 5	Yellowish brown (10YR 5/4) moist, gravel fine loamy sand; dry loose, moist loose, single grain, 5% fine roots, no pores, strong reaction to HCl, 30% gravel (0.2cm diameter), clear smooth to:
Au2	5 - 10	Yellowish brown (10YR 5/6) moist, gravel fine loamy sand; dry soft, moist very friable, single grain, 20% fine roots, no pores, violent reaction to HCl, 30% gravel (0.3cm), clear wavy to:
B1K	10 - 20	Yellowish brown (10YR 5/6) moist, gravel fine loamy sand; dry hard, moist friable, weak medium platy, 10% fine roots, few fine pores, violent reaction to HCl, 20% gravel (0.3cm), clear smooth to:
IIB21Ky	20 - 40	Reddish yellow (7.5YR 6/6) moist, sandy loam; dry extremely hard, moist friable, medium prismatic, few fine roots, 2% pores (1-3cm diameter), violent reaction to HCl, few nodule (0.3cm), gypsum, gradual wavy to:
IIB22Ky	40 - 85	Reddish yellow (7.5YR 6/8) moist, sandy loam; dry extremely hard, moist friable, medium prismatic, few fine roots (up to 50cm), 2% pores (1-2cm), violent reaction to HCl, gypsum, gradual wavy to:
IIB23Ky	85 - 130	Red (2.5YR 5/6) moist, silty loam; dry extremely hard, moist friable, massive structure, no roots, no pores, violent reaction to HCl, gypsum, below 130cm to hard to excavate:



P-5

Depth (cm)	Bulk density (g/cm <sup>3</sup> )	Distribution of three phases			Gravel (%)	Soil particle (%)				Texture	Sat'n (%)	CaCO <sub>3</sub> (%)	Gypsum (%)	Avail P (PPM)	pH (1:2.5)	EC (1:5)
		Solid (%)	Water (%)	Air (%)		C. Sand	F. Sand	Silt	Clay							
5	1.51	57.0	0.9	42.1	10	24.3	71.3	4.4	—	fine sand	27	27	0.7	1.7	8.5	0.387
30	1.46	55.0	2.6	42.4	28	13.4	65.7	20.9	—	loamy sand	41	18	0.5	1.9	8.3	2.21
70	1.49	58.0	9.8	34.2	54	22.4	49.9	15.6	12.1	gravelly sandy loam	50	11	1.2	1.6	8.2	3.38

TSS (%)	Exchangeable cations (me/100g)				CEC (me/100g)	ESP (%)	Soluble cations (me/l)				SAR (me/l)	Soluble anions (me/l)			Base Saturation (%)	Total N (%)
	Ca	Mg	Na	K			Ca	Mg	Na	K		Cl	SO <sub>4</sub>	HCO <sub>3</sub>		
0.12	14.6	2.1	0.8	0.7	7.4	11	1.7	0.5	1.6	0.07	1.5	2.6	1.12	0.15	>100	0.039
0.71	18.4	3.1	1.9	0.8	8.2	23	4.4	2.6	14.8	0.3	8.3	14.5	7.5	0.1	>100	0.025
1.08	38.8	2.5	1.8	0.8	8.9	20	25.2	4.8	3.4	0.4	0.9	12.0	21.7	0.1	>100	0.028

Note 1/ Data of gravel content are not used in this report.  
Probably hard soilcore have been analysed as gravel.  
So actual content will be less than these values.

Organic matter (%)	
0.7	
0.5	
0.5	



(5)-6 Summary of Pit Excavation Survey, P-6

PROFILE DESCRIPTION

Site No. : P-6

Survey Date : 29 JAN. '89

A. Information of the Site

Soil Mapping Unit : Jc-s

FAO Classification : Calcaric Fluvisols Shallow

USDA Classification : Typic Torriorthents

Land Suitability Classification : N2xd

Location : About 30km east of the pilot farm site. Quitbeet.

Landform : Wadi

Elevation : 300m Slope : <1%

Micro Relief : Even

Land use : Cultivation tree 50% Date palm

Zizyphus spino-christi (L) Wild

grass 60% Rhodes grass

B. Information of the Soil

Parent Material : Recent Alluvium

Drainage : Somewhat excessively drained

Flood Hazard : May occur

Surface Feature : Loose sand

Evidence of Erosion : None

Wind blown Sand Hazard : None

C. Brief Description of the Profile

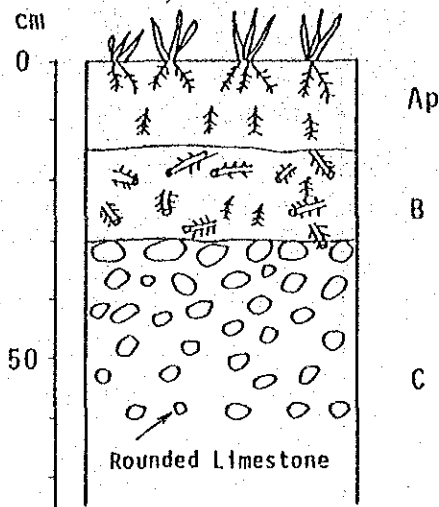
The soil texture is sand. The soil depth is limited by rounded limestone at 30cm in depth.

This soil has low potential for agriculture development.

D. Profile Description (P-6)

Horizon	Depth (cm)	Description
Ap	0 - 15	Dull yellow orange (10YR 6/4) moist; sand; moist loose; single grain; many medium roots; violent reaction to HCl; clear smooth to:

- B 15 - 30 Orange (7.5YR 7/6) moist; sand; moist loose; single grain; many big roots; violent reaction to HCl; clear smooth to:
- C 30 - 60 + Orange (7.5YR 6/8) moist; gravelly sand, 60% rounded limestone (3-5cm in diameter); moist loose; single grain; few fine roots; violent reaction to HCl



P-6 (Quit beet)

Sample Depth (cm)	Bulk density (g/cm <sup>3</sup> )	Distribution of three phases			Gravel (%)	Soil particle (%)			Texture	Sat'n (%)	CaCO <sub>3</sub> (%)	Gypsum (%)	Avail P (PPM)	pH (1:2.5)	EC (1:5) $\mu$ S/cm
		Solid (%)	Water (%)	Air (%)		C. Sand	F. Sand	Silt							
10	1.74	65.7	3.8	30.5	26.7	53.6	42.4	2.0	2.0	22	43	1.2	0.5	6.82	3.00

TSS (%)	Exchangeable cations (me/100g)				CEC* (me/100g)	ESP* (%)	Soluble cations (me/l)				SAR (me/l)	Soluble anions (me/l)			Base Saturation (%)	Total N (%)
	Ca	Mg*	Na*	K			Ca	Mg	Na	K		Cl	SO <sub>4</sub>	HCO <sub>3</sub>		
0.96	24.0	26.0	3.7	0.08	15.0	24.7	17.85	9.8	2.0	0.33	0.5	8.5	21.3	0.15	0.030	

Organic matter (%)	
0.6	

\* Note : Data not used in the analysis of this study. Should be referred with reanalysis at the site.