H: LEAKAGE SURVEY

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C O N T E N T S

1. OBJECTIVE OF SURVEY

The primary purpose of this survey is to find the present statuses and characteristics of the distribution system leakage in the WASA water supply system in Trinidad and Tobago.

For this purpose, ten (10)small hydraulically isolated areas (receiving 24-hour water-service) of distribution system were selected and conducted a pilot leakage survey under the present study.

2. METHOD OF LEAKAGE ESTIMATION AND QUANTIFICATION

Leakage losses of the whole WASA system cannot be directly investigated and determined. Since, it is difficult to make a detailed survey for the entire water service area in the country under the present study. Therefore, a total 10 representative residential areas, of which distribution system could be hydraulically isolated to a small service block, were selected and carried out for a pilot leakage survey in the present study.

A master meter was installed on each water mains supplying water to each isolated block, and hourly meter readings were made for 24 hours and recorded to determine the daily demand patterns.

The night time minimum-flow in the respective selected service block was measured through 24 hours meter reading . The midnight-time minimum water flow, when the distribution system has a stable water pressure in higher level while no water usage , could be considered as a leakage loss amount in that service block.

Further, the system pressure in the service block was monitored for 24 hours in parallel with the flow metering and recording.

The total leakage loss amount a day is estimated from the total supplied water amount and system pressure variation in the respective service blocks/areas.

3. SURVEY WORKS CONDUCTED

3.1 Isolated Survey Blocks Selection

Following processes were taken for the survey blocks selection in the present study:

(1) Several candidate areas were listed for the potential survey area, according to the following criteria:

- Pssibility to isolate the areas hydraulically from the system is confirmed; preferably each area should have a single dead-end supply main.
- Reasonably typical urban development is made and water supply conditions are sufficient.
- At least 50 and preferably 100 service connections are covered.

(2) The candidate or potential area were inspected, and plimary choises were made.

(3) Investigations were made to ascertain whether the areas could practically be isolated from the distribution system.

(4) Final selection was made.

Out of a total 17 candidate areas/locations (ref. Table 3.1), the following eight areas were listed up under the reasonably typical urban development and water supply conditions:

(Trinidad): Port of Spain, St Joseph, ARIMA, Diego Martin, San Fernando, Trin city, Chagouras, and

(Tobago): Plymouth.

3.2 Survey/Study Activities

3.2.1 Water flow mwasurement

Following activities were conducted for the water flow measurement in the respective survey block:

- Control and close the distribution system valve to isolate hydraulically the survey block completely.

- Install a water flow meter at the inflow point and on the distribution main pipe of the isolated block.

- Measure and record the water flow amount conteniously for 24 hours.

3.2.2 System water pressure record

During the water flow measuring time, the system water pressure was monitored and recorded at a water tap for 24 hours in the same survey block.

4. SURVEY RESULTS

A total 10 small blocks in the water service area were conducted the pilot leakage survey, all which were isolated hydrauricaly in the distribution system.

Of which, 8 blocks field survey works and leakage investigations were carried out by the mid January 1990 , and the remaining 2 blocks survey were conducted by the end of March 1990.

Major findings from the distribution main flows and system pressure recordings are presented in the followings and Section 5. Findings and Leakage Survey Data, and its general analyses are made as presented in the followings.

The following items of data are obtained through the survey, and its

survey-results are analized for the above each servey/study area :

(1) Daily supplied water amount,

(2) Night time minimum water flow amount,

(3) Night time system water pressures,

(4) Estimated leakage amounts/losses,

(5) Estimated unit water consumption, LPCD (litters per capita per day), and

(6) Estimated unit leak amount (cubic meters per 1 km distribution pipeline : m3/km)

5. Findings and Leakage Survey Data

5.1 General of Findings

The estimated leakage losses/ amounts in the servey area are ranging from 30% to 80% of the total supplied amount. The average ratio of leakage losses to the total daily supplied water (or sometimes produced and distributed water) is estimated high at 45 to 50 % from the above results tentatively, since the investigation was conducted on the limited part of the existing system.

The rate of leakage losses are varying depending to the characteristics of the total system pipeline length, number of house connections, and the system facility aging conditions in the respective service area.

Generally, in the nighttime (during about 4 hours from midnight to 4 a.m.), the distribution system water pressure is stable in the higher level. While, the water flow amount decreases to the lower level and becomes in stable.

No. 001

Area : DIEGO MARTIN(JEDE st)

Date : Dec. 13-14, 1989

$Qx = Qo \times (Hx/Ho)^{n}$

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	16	:40	3.84	2.1	---	14.55	---	---	---	---
	16	:50	4.17	2.0	0.668	15.35	0.319	0.349	0.226	0.442
	17	:00	4.62	2.1	0.733	15.96	0.327	0.406	0.239	0.494
	17	:10	4.23	1.8	0.738	15.87	0.303	0.435	0.200	0.537
	17	:20	4.32	1.9	0.713	15.82	0.311	0.402	0.213	0.500
	17	:30	4.47	1.9	0.733	16.10	0.311	0.422	0.213	0.520
	17	:40	3.50	1.9	0.664	14.24	0.311	0.353	0.213	0.451
	17	:50	4.29	1.9	0.649	15.77	0.311	0.338	0.213	0.436
18	18	:00	4.59	1.8	0.740	16.53	0.303	0.437	0.200	0.540
	18	:10	4.29	1.9	0.740	15.77	0.311	0.429	0.213	0.527
	18	:20	5.26	1.9	0.796	17.46	0.311	0.485	0.213	0.583
	18	:30	3.84	1.9	0.758	14.92	0.311	0.447	0.213	0.545
	18	:40	4.65	1.7	0.708	16.88	0.294	0.413	0.187	0.520
	18	:50	4.02	1.9	0.723	15.26	0.311	0.412	0.213	0.510
	19	:00	4.35	1.8	0.698	16.09	0.303	0.395	0.200	0.497
	19	:10	4.93	2.0	0.773	16.69	0.319	0.454	0.226	0.547
	19	:20	5.08	1.8	0.834	17.39	0.303	0.532	0.200	0.634
	19	:30	4.41	1.9	0.791	15.99	0.311	0.480	0.213	0.578
	19	:40	3.75	2.1	0.680	14.38	0.327	0.353	0.239	0.441
	19	:50	3.84	2.0	0.633	14.73	0.319	0.314	0.226	0.407
20	20	:00	4.38	2.1	0.685	15.54	0.327	0.358	0.239	0.446
	20	:10	4.96	2.2	0.778	16.34	0.334	0.444	0.252	0.526
	20	:20	4.02	2.2	0.748	14.71	0.334	0.414	0.252	0.496
	20	:30	4.14	2.3	0.680	14.77	0.342	0.338	0.265	0.415
	20	:40	4.11	2.3	0.688	14.71	0.342	0.345	0.265	0.422
	20	:50	4.29	2.4	0.700	14.87	0.349	0.351	0.279	0.421
	21	:00	3.90	2.3	0.683	14.33	0.342	0.340	0.265	0.417
	21	:10	4.99	2.4	0.741	16.04	0.349	0.391	0.279	0.462
	21	:20	3.96	2.3	0.746	14.44	0.342	0.404	0.265	0.481
	21	:30	3.53	2.6	0.624	13.22	0.364	0.261	0.305	0.319
	21	:40	3.17	2.5	0.558	12.66	0.357	0.202	0.292	0.266
	21	:50	3.08	2.6	0.521	12.35	0.364	0.157	0.305	0.215
22	22	:00	2.87	2.5	0.496	12.04	0.357	0.139	0.292	0.204
	22	:10	3.14	2.5	0.501	12.60	0.357	0.144	0.292	0.209
	22	:20	3.96	2.6	0.592	14.01	0.364	0.228	0.305	0.286
	22	:30	3.32	2.5	0.607	12.95	0.357	0.250	0.292	0.315
	22	:40	3.23	2.7	0.546	12.53	0.371	0.175	0.319	0.227
	22	:50	3.08	2.7	0.526	12.24	0.371	0.155	0.319	0.207
	23	:00	2.78	2.8	0.488	11.52	0.377	0.111	0.333	0.156
	23	:10	3.47	2.6	0.521	13.11	0.364	0.157	0.305	0.215
	23	:20	3.32	2.8	0.566	12.59	0.377	0.188	0.333	0.233
	23	:30	2.57	2.8	0.491	11.08	0.377	0.113	0.333	0.158
	23	:40	2.75	3.2	0.443	11.08	0.403	0.040	0.388	0.056
	23	:50	2.51	3.2	0.438	10.59	0.403	0.035	0.388	0.051
0	0	:00	2.57	3.2	0.423	10.71	0.403	0.020	0.388	0.036
	0	:10	2.78	3.2	0.446	11.14	0.403	0.042	0.388	0.058
	0	:20	2.87	3.2	0.471	11.32	0.403	0.067	0.388	0.083
	0	:30	2.57	3.3	0.453	10.63	0.410	0.044	0.402	0.052
	0	:40	2.96	3.2	0.461	11.50	0.403	0.057	0.388	0.073
	0	:50	2.57	3.2	0.461	10.71	0.403	0.057	0.388	0.073
	1	:00	2.54	3.2	0.426	10.65	0.403	0.022	0.388	0.038
	1	:10	2.54	3.3	0.423	10.57	0.410	0.014	0.402	0.022
	1	:20	2.60	3.3	0.428	10.69	0.410	0.019	0.402	0.027
	1	:30	2.54	3.4	0.428	10.49	0.416	0.013	0.416	0.013
	1	:40	2.48	3.4	0.418	10.37	0.416	0.003	0.416	0.003
	1	:50	2.51	3.4	0.416	10.43	0.416	0.000	0.416	0.000

No. 001

Area : DIEGO MARTIN(JEDE st)

Date : Dec. 13-14. 1989

Qx = Qo x (Hx/Ho)^n

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
2	2	:00	2.54	3.4	0.421	10.49	0.416	0.005	0.416	0.005
	2	:10	2.48	3.4	0.418	10.37	0.416	0.003	0.416	0.003
	2	:20	2.66	3.4	0.428	10.74	0.416	0.013	0.416	0.013
	2	:30	2.54	3.4	0.433	10.49	0.416	0.018	0.416	0.018
	2	:40	2.66	3.4	0.433	10.74	0.416	0.018	0.416	0.018
	2	:50	2.54	3.4	0.433	10.49	0.416	0.018	0.416	0.018
	3	:00	2.51	3.4	0.421	10.43	0.416	0.005	0.416	0.005
	3	:10	2.81	3.4	0.443	11.03	0.416	0.027	0.416	0.027
	3	:20	2.54	3.4	0.446	10.49	0.416	0.030	0.416	0.030
	3	:30	2.78	3.4	0.443	10.97	0.416	0.027	0.416	0.027
	3	:40	2.51	3.4	0.441	10.43	0.416	0.025	0.416	0.025
	3	:50	2.78	3.4	0.441	10.97	0.416	0.025	0.416	0.025
4	4	:00	2.72	3.3	0.458	10.94	0.410	0.049	0.402	0.057
	4	:10	2.90	3.3	0.468	11.29	0.410	0.059	0.402	0.067
	4	:20	2.60	3.2	0.458	10.78	0.403	0.055	0.388	0.071
	4	:30	2.66	3.2	0.438	10.90	0.403	0.035	0.388	0.051
	4	:40	2.66	3.3	0.443	10.82	0.410	0.034	0.402	0.042
	4	:50	3.35	3.2	0.501	12.23	0.403	0.097	0.388	0.113
	5	:00	2.66	3.1	0.501	10.99	0.397	0.104	0.374	0.127
	5	:10	3.08	3.0	0.478	11.92	0.391	0.088	0.360	0.118
	5	:20	2.90	3.0	0.498	11.57	0.391	0.108	0.360	0.138
	5	:30	2.99	2.9	0.491	11.84	0.384	0.107	0.346	0.145
	5	:40	3.17	2.7	0.513	12.41	0.371	0.143	0.319	0.194
	5	:50	3.47	2.5	0.553	13.24	0.357	0.197	0.292	0.261
6	6	:00	3.87	2.4	0.612	14.13	0.349	0.262	0.279	0.333
	6	:10	4.05	2.3	0.660	14.61	0.342	0.318	0.265	0.395
	6	:20	4.41	2.2	0.705	15.41	0.334	0.371	0.252	0.453
	6	:30	4.53	1.9	0.745	16.20	0.311	0.434	0.213	0.532
	6	:40	5.14	2.0	0.806	17.04	0.319	0.487	0.226	0.580
	6	:50	4.50	1.9	0.803	16.15	0.311	0.492	0.213	0.590
	7	:00	4.50	2.0	0.750	15.94	0.319	0.431	0.226	0.524
	7	:10	3.81	2.0	0.693	14.67	0.319	0.374	0.226	0.467
	7	:20	5.11	1.9	0.743	17.21	0.311	0.432	0.213	0.530
	7	:30	5.71	2.0	0.902	17.96	0.319	0.583	0.226	0.676
	7	:40	5.17	2.0	0.907	17.09	0.319	0.588	0.226	0.681
	7	:50	4.11	1.8	0.773	15.64	0.303	0.471	0.200	0.573
8	8	:00	5.05	2.0	0.763	16.89	0.319	0.444	0.226	0.537
	8	:10	5.65	1.9	0.892	18.10	0.311	0.581	0.213	0.679
	8	:20	4.26	1.9	0.826	15.71	0.311	0.515	0.213	0.613
	8	:30	5.62	1.8	0.823	18.29	0.303	0.521	0.200	0.623
	8	:40	4.56	2.0	0.848	16.05	0.319	0.529	0.226	0.622
	8	:50	4.08	1.9	0.720	15.38	0.311	0.409	0.213	0.507
	9	:00	5.50	2.0	0.798	17.63	0.319	0.479	0.226	0.572
	9	:10	5.29	1.9	0.899	17.51	0.311	0.588	0.213	0.686
	9	:20	4.20	2.0	0.791	15.40	0.319	0.472	0.226	0.565
	9	:30	4.87	2.0	0.756	16.59	0.319	0.437	0.226	0.530
	9	:40	4.84	2.0	0.809	16.54	0.319	0.490	0.226	0.583
	9	:50	5.86	2.0	0.892	18.19	0.319	0.573	0.226	0.666
10	10	:00	4.47	1.9	0.861	16.10	0.311	0.550	0.213	0.648
	10	:10	5.47	2.0	0.828	17.58	0.319	0.509	0.226	0.602
	10	:20	5.17	1.9	0.887	17.31	0.311	0.576	0.213	0.674
	10	:30	4.47	2.0	0.803	15.89	0.319	0.484	0.226	0.577
	10	:40	5.65	2.1	0.843	17.65	0.327	0.517	0.239	0.604
	10	:50	4.17	2.0	0.818	15.35	0.319	0.499	0.226	0.592
	11	:00	4.56	1.9	0.728	16.26	0.311	0.417	0.213	0.515
	11	:10	4.77	2.1	0.778	16.22	0.327	0.451	0.239	0.539

No. 001
Area : DIEGO MARTIN(JEDE st)
Date : Dec. 13-14. 1989

Qx = Qo x (Hx/Ho)^n

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
11	:20	5.11	2.2	0.823	16.59	0.334	0.489	0.252	0.571
11	:30	4.93	2.2	0.837	16.30	0.334	0.502	0.252	0.585
11	:40	5.95	2.1	0.907	18.11	0.327	0.580	0.239	0.668
11	:50	5.92	2.2	0.989	17.86	0.334	0.655	0.252	0.737
12	:00	4.87	2.0	0.899	16.59	0.319	0.580	0.226	0.673
12	:10	5.80	2.1	0.889	17.88	0.327	0.562	0.239	0.650
12	:20	4.44	2.3	0.853	15.29	0.342	0.511	0.265	0.588
12	:30	4.99	2.2	0.786	16.39	0.334	0.451	0.252	0.534
12	:40	4.90	2.3	0.824	16.07	0.342	0.482	0.265	0.559
12	:50	4.41	2.4	0.776	15.08	0.349	0.426	0.279	0.497
13	:00	4.56	2.4	0.748	15.33	0.349	0.398	0.279	0.469
13	:10	3.75	2.4	0.693	13.91	0.349	0.343	0.279	0.414
13	:20	3.53	2.4	0.607	13.49	0.349	0.257	0.279	0.328
13	:30	4.26	2.3	0.649	14.98	0.342	0.307	0.265	0.384
13	:40	4.17	2.3	0.703	14.82	0.342	0.360	0.265	0.437
13	:50	4.08	2.3	0.688	14.66	0.342	0.345	0.265	0.422
14	:00	4.20	2.5	0.690	14.57	0.357	0.333	0.292	0.398
14	:10	4.77	2.0	0.748	16.42	0.319	0.429	0.226	0.522
14	:20	4.11	2.2	0.740	14.88	0.334	0.406	0.252	0.488
14	:30	4.65	2.2	0.730	15.83	0.334	0.396	0.252	0.478
14	:40	3.63	2.1	0.690	14.15	0.327	0.363	0.239	0.451
14	:50	2.81	2.1	0.537	12.45	0.327	0.210	0.239	0.298
15	:00	2.90	2.2	0.476	12.50	0.334	0.141	0.252	0.224
15	:10	2.08	2.1	0.415	10.71	0.327	0.088	0.239	0.176
15	:20	2.63	2.1	0.393	12.04	0.327	0.066	0.239	0.154
15	:30	2.51	2.0	0.428	11.91	0.319	0.109	0.226	0.202
15	:40	2.60	2.0	0.426	12.12	0.319	0.107	0.226	0.200
15	:50	3.20	2.1	0.483	13.28	0.327	0.157	0.239	0.244
16	:00	2.42	2.0	0.468	11.69	0.319	0.149	0.226	0.242
16	:10	2.60	1.9	0.418	12.28	0.311	0.107	0.213	0.205
16	:20	2.51	1.9	0.426	12.06	0.311	0.115	0.213	0.213
16	:30	3.11	2.0	0.468	13.25	0.319	0.149	0.226	0.242
16	:40	2.81	1.9	0.493	12.76	0.311	0.182	0.213	0.280
TOTAL		---	---	91.554	---	50.268	41.286	40.769	50.786
Average		3.81	2.42	0.636	14.029	54.91%	45.09%	44.53%	55.47%
MAX		5.95	3.40	0.989	18.293	0.416	0.655	0.416	0.737
MIN		2.08	1.70	0.393	10.366	0.294	0.000	0.187	0.000

	kg/cm2	m3/10 min		
Leakage at Night:	3.40	0.416	10.428	: 1:50 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	69	houses
persons/house	[B]	4.4	pesons/house
A * B	[C]	303.6	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	41.29	M3	50.79	M3
l/day/capita	D/C	135.99	l/d/c	167.28	l/d/c

No. 002
Area : VICTORIA GARDEN-01
Date : Dec. 7-8. 1989

Qx = Qo x (Hx/Ho)^n

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(cracks)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	15	:35	24.98	1.1	---	43.62	---	---	---	---
	15	:45	23.60	1.1	4.048	42.40	2.905	1.144	1.661	2.388
	15	:55	24.92	1.0	4.043	44.62	2.770	1.274	1.488	2.555
16	16	:05	27.54	1.0	4.372	46.91	2.770	1.602	1.488	2.883
	16	:15	24.71	1.0	4.354	44.43	2.770	1.585	1.488	2.866
	16	:25	24.54	1.0	4.104	44.28	2.770	1.335	1.488	2.616
	16	:35	25.61	1.0	4.179	45.23	2.770	1.410	1.488	2.691
	16	:45	25.16	1.1	4.231	43.78	2.905	1.326	1.661	2.570
	16	:55	24.40	1.1	4.130	43.11	2.905	1.225	1.661	2.469
	17	:05	26.37	1.1	4.231	44.82	2.905	1.326	1.661	2.570
	17	:15	25.30	1.1	4.306	43.90	2.905	1.401	1.661	2.645
	17	:25	24.54	1.1	4.153	43.23	2.905	1.249	1.661	2.493
	17	:35	22.74	1.0	3.940	42.62	2.770	1.170	1.488	2.452
	17	:45	22.36	1.0	3.758	42.26	2.770	0.989	1.488	2.270
	17	:55	23.09	1.0	3.788	42.95	2.770	1.018	1.488	2.299
18	18	:05	25.92	1.0	4.084	45.50	2.770	1.315	1.488	2.596
	18	:15	24.67	1.0	4.216	44.39	2.770	1.446	1.488	2.728
	18	:25	23.47	1.0	4.012	43.30	2.770	1.242	1.488	2.523
	18	:35	24.23	1.0	3.975	44.00	2.770	1.205	1.488	2.487
	18	:45	23.98	1.0	4.018	43.77	2.770	1.248	1.488	2.529
	18	:55	25.88	1.0	4.155	45.47	2.770	1.385	1.488	2.667
	19	:05	26.33	1.0	4.351	45.86	2.770	1.581	1.488	2.863
	19	:15	25.12	1.0	4.288	44.80	2.770	1.518	1.488	2.799
	19	:25	19.19	1.0	3.693	39.15	2.770	0.923	1.488	2.204
	19	:35	26.54	1.2	3.811	43.99	3.034	0.777	1.835	1.975
	19	:45	23.85	0.9	4.199	44.82	2.627	1.572	1.318	2.881
	19	:55	27.02	1.2	4.239	44.39	3.034	1.205	1.835	2.404
20	20	:05	28.44	1.2	4.622	45.54	3.034	1.588	1.835	2.786
	20	:15	28.37	1.3	4.734	44.58	3.158	1.576	2.012	2.722
	20	:25	25.99	1.1	4.530	44.49	2.905	1.625	1.661	2.869
	20	:35	26.43	1.1	4.368	44.87	2.905	1.464	1.661	2.708
	20	:45	27.54	1.3	4.498	43.93	3.158	1.340	2.012	2.485
	20	:55	29.33	1.3	4.739	45.33	3.158	1.581	2.012	2.727
	21	:05	27.99	1.4	4.777	43.47	3.277	1.500	2.191	2.585
	21	:15	28.75	1.4	4.728	44.06	3.277	1.451	2.191	2.537
	21	:25	29.20	1.6	4.829	42.94	3.503	1.326	2.555	2.274
	21	:35	27.12	1.6	4.693	41.39	3.503	1.190	2.555	2.138
	21	:45	27.02	1.7	4.512	40.69	3.611	0.901	2.740	1.772
	21	:55	27.37	1.7	4.533	40.95	3.611	0.921	2.740	1.793
22	22	:05	27.54	1.7	4.576	41.08	3.611	0.965	2.740	1.836
	22	:15	27.88	1.8	4.618	40.74	3.716	0.903	2.926	1.693
	22	:25	29.64	1.9	4.793	41.45	3.818	0.976	3.114	1.680
	22	:35	29.26	2.1	4.908	40.16	4.014	0.895	3.493	1.415
	22	:45	27.57	2.1	4.736	38.99	4.014	0.722	3.493	1.243
	22	:55	29.61	2.2	4.765	39.93	4.108	0.657	3.685	1.080
	23	:05	29.06	2.3	4.889	39.13	4.200	0.689	3.879	1.011
	23	:15	28.85	2.3	4.826	38.98	4.200	0.626	3.879	0.947
	23	:25	28.95	2.4	4.817	38.64	4.291	0.526	4.073	0.744
	23	:35	28.33	2.4	4.773	38.22	4.291	0.483	4.073	0.700
	23	:45	30.20	2.5	4.878	39.06	4.379	0.498	4.269	0.609
	23	:55	28.71	2.5	4.909	38.09	4.379	0.530	4.269	0.640
0	0	:05	29.68	2.5	4.866	38.72	4.379	0.487	4.269	0.597
	0	:15	28.64	2.4	4.860	38.43	4.291	0.569	4.073	0.787
	0	:25	29.47	2.6	4.843	38.21	4.466	0.377	4.466	0.377
	0	:35	28.71	2.6	4.848	37.71	4.466	0.383	4.466	0.383
	0	:45	27.92	2.7	4.719	36.84	4.551	0.168	4.664	0.055

No. 002

Area : VICTORIA GARDEN-01

Date : Dec. 7-8. 1989

$Qx = Qo \times (Hx/Ho)^{n}$

	TIME		METERED Q	METERED PRESSURE	Qtotal	Leak hole	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak	Demand	--(n = 1.15)-- --(cracks)-- < TYPE - B > Leak	Demand
	hour	min	(m3/h)	(kg/cm2)	m3	d(mm)	QA1(m3)	QA2(m3)	QB1(m3)	QB2(m3)
	0	:55	27.85	2.6	4.648	37.15	4.466	0.182	4.466	0.182
	1	:05	26.43	2.5	4.523	36.54	4.379	0.144	4.269	0.254
	1	:15	26.71	2.4	4.428	37.11	4.291	0.138	4.073	0.355
	1	:25	27.44	2.5	4.513	37.23	4.379	0.133	4.269	0.244
	1	:35	28.92	2.6	4.697	37.85	4.466	0.231	4.466	0.231
	1	:45	26.47	2.6	4.616	36.21	4.466	0.150	4.466	0.150
	1	:55	27.12	2.6	4.466	36.66	4.466	0.000	4.466	0.000
2	2	:05	27.68	2.6	4.567	37.03	4.466	0.101	4.466	0.101
	2	:15	27.64	2.6	4.610	37.01	4.466	0.144	4.466	0.144
	2	:25	27.57	2.5	4.601	37.32	4.379	0.222	4.269	0.332
	2	:35	26.68	2.5	4.521	36.72	4.379	0.142	4.269	0.252
	2	:45	26.68	2.6	4.447	36.36	4.466	-0.019	4.466	-0.019
	2	:55	26.95	2.6	4.469	36.54	4.466	0.003	4.466	0.003
	3	:05	27.47	2.6	4.535	36.89	4.466	0.069	4.466	0.069
	3	:15	26.81	2.6	4.523	36.45	4.466	0.058	4.466	0.058
	3	:25	26.95	2.6	4.480	36.54	4.466	0.014	4.466	0.014
	3	:35	27.33	2.7	4.523	36.45	4.551	-0.028	4.664	-0.141
	3	:45	27.26	2.6	4.549	36.75	4.466	0.083	4.466	0.083
	3	:55	26.81	2.6	4.506	36.45	4.466	0.040	4.466	0.040
4	4	:05	26.16	2.6	4.414	36.00	4.466	-0.052	4.466	-0.052
	4	:15	26.05	2.6	4.351	35.93	4.466	-0.115	4.466	-0.115
	4	:25	25.74	2.5	4.316	36.06	4.379	-0.063	4.269	0.047
	4	:35	25.99	2.4	4.311	36.61	4.291	0.020	4.073	0.238
	4	:45	27.09	2.4	4.423	37.38	4.291	0.133	4.073	0.350
	4	:55	27.12	2.4	4.518	37.40	4.291	0.227	4.073	0.444
	5	:05	27.06	2.6	4.515	36.62	4.466	0.049	4.466	0.049
	5	:15	26.81	2.6	4.489	36.45	4.466	0.023	4.466	0.023
	5	:25	27.02	2.6	4.486	36.59	4.466	0.020	4.466	0.020
	5	:35	27.88	2.6	4.575	37.17	4.466	0.109	4.466	0.109
	5	:45	27.40	2.5	4.607	37.21	4.379	0.228	4.269	0.338
	5	:55	28.71	2.5	4.676	38.09	4.379	0.297	4.269	0.407
6	6	:05	29.54	2.3	4.854	39.45	4.200	0.654	3.879	0.976
	6	:15	27.02	2.2	4.713	38.15	4.108	0.605	3.685	1.028
	6	:25	26.78	2.0	4.483	38.89	3.917	0.567	3.303	1.181
	6	:35	27.61	1.4	4.533	43.18	3.277	1.255	2.191	2.341
	6	:45	25.74	1.3	4.446	42.47	3.158	1.288	2.012	2.433
	6	:55	26.64	1.0	4.365	46.13	2.770	1.595	1.488	2.877
	7	:05	23.16	0.9	4.150	44.16	2.627	1.523	1.318	2.832
	7	:15	24.33	0.8	3.958	46.62	2.477	1.480	1.151	2.806
	7	:25	21.12	0.4	3.788	51.65	1.752	2.036	0.519	3.269
	7	:35	20.74	0.4	3.488	51.18	1.752	1.737	0.519	2.969
	7	:45	19.05	0.4	3.316	49.05	1.752	1.564	0.519	2.797
	7	:55	19.01	0.5	3.172	46.34	1.958	1.213	0.671	2.501
8	8	:05	18.84	0.5	3.154	46.14	1.958	1.196	0.671	2.484
	8	:15	21.39	0.5	3.353	49.16	1.958	1.394	0.671	2.682
	8	:25	21.91	0.5	3.608	49.75	1.958	1.650	0.671	2.938
	8	:35	24.12	0.5	3.836	52.20	1.958	1.877	0.671	3.165
	8	:45	23.43	0.5	3.963	51.45	1.958	2.004	0.671	3.292
	8	:55	25.16	0.5	4.049	53.32	1.958	2.091	0.671	3.379
	9	:05	24.60	0.5	4.147	52.72	1.958	2.188	0.671	3.476
	9	:15	24.60	0.4	4.100	55.74	1.752	2.348	0.519	3.581
	9	:25	25.61	0.4	4.184	56.88	1.752	2.433	0.519	3.665
	9	:35	24.78	0.5	4.199	52.91	1.958	2.241	0.671	3.529
	9	:45	25.26	0.6	4.170	51.04	2.145	2.025	0.827	3.343
	9	:55	25.26	0.6	4.210	51.04	2.145	2.065	0.827	3.383
10	10	:05	25.16	0.6	4.202	50.94	2.145	2.056	0.827	3.375

No. 002

Area : VICTORIA GARDEN-01

Date : Dec. 7-8. 1989

$Qx = Qo \times (Hx/Ho)^{n}$

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(cracks)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
10	:15	24.23	0.6	4.116	49.99	2.145	1.971	0.827	3.289
10	:25	24.50	0.6	4.061	50.27	2.145	1.916	0.827	3.234
10	:35	22.46	0.6	3.913	48.13	2.145	1.768	0.827	3.086
10	:45	20.67	0.5	3.594	48.32	1.958	1.636	0.671	2.924
10	:55	19.81	0.5	3.373	47.31	1.958	1.415	0.671	2.703
11	:05	20.50	0.4	3.359	50.89	1.752	1.608	0.519	2.840
11	:15	19.67	0.3	3.348	53.56	1.517	1.831	0.373	2.975
11	:25	19.46	0.3	3.261	53.28	1.517	1.744	0.373	2.888
11	:35	17.98	0.3	3.120	51.21	1.517	1.603	0.373	2.747
11	:45	18.56	0.4	3.045	48.42	1.752	1.293	0.519	2.526
11	:55	18.56	0.4	3.093	48.42	1.752	1.342	0.519	2.574
12	:05	19.70	0.3	3.188	53.60	1.517	1.671	0.373	2.816
12	:15	20.67	0.3	3.364	54.91	1.517	1.847	0.373	2.991
12	:25	21.74	0.5	3.534	49.56	1.958	1.576	0.671	2.864
12	:35	22.33	0.6	3.673	47.99	2.145	1.527	0.827	2.845
12	:45	23.02	0.7	3.779	46.88	2.317	1.462	0.988	2.792
12	:55	21.12	0.8	3.678	43.43	2.477	1.201	1.151	2.527
13	:05	22.53	0.8	3.638	44.86	2.477	1.160	1.151	2.486
13	:15	21.08	0.8	3.634	43.39	2.477	1.157	1.151	2.483
13	:25	21.22	0.8	3.525	43.54	2.477	1.048	1.151	2.374
13	:35	23.12	0.8	3.695	45.44	2.477	1.218	1.151	2.544
13	:45	20.50	0.8	3.635	42.79	2.477	1.158	1.151	2.484
13	:55	23.91	0.7	3.701	47.78	2.317	1.384	0.988	2.713
14	:05	23.67	0.8	3.965	45.98	2.477	1.488	1.151	2.814
14	:15	24.60	0.9	4.023	45.51	2.627	1.395	1.318	2.704
14	:25	24.33	0.9	4.078	45.26	2.627	1.450	1.318	2.759
14	:35	24.23	0.6	4.047	49.99	2.145	1.901	0.827	3.220
14	:45	24.05	1.0	4.023	43.83	2.770	1.254	1.488	2.535
14	:55	23.64	1.0	3.974	43.46	2.770	1.205	1.488	2.486
15	:05	22.67	1.0	3.859	42.56	2.770	1.090	1.488	2.371
15	:15	23.57	0.8	3.853	45.88	2.477	1.376	1.151	2.702
15	:25	23.53	1.0	3.925	43.36	2.770	1.155	1.488	2.437
15	:35	22.78	1.2	3.859	40.76	3.034	0.825	1.835	2.024
TOTAL		---	---	605.137	---	453.311	151.825	329.259	275.878
Average		25.20	1.41	4.202	43.351	74.91%	25.09%	54.41%	45.59%
MAX		30.20	2.70	4.909	56.876	4.551	2.433	4.664	3.665
MIN		17.98	0.30	3.045	35.925	1.517	-0.115	0.373	-0.141

	kg/cm2	m3/10 min		
Leakage at Night:	2.60	4.466	36.656	: 1:55 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	91	houses
persons/house	[B]	4.4	pesons/house
A * B	[C]	400.4	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	151.83	M3	275.88	M3
l/day/capita	D/C	379.18	l/d/c	689.00	l/d/c

No. 003

Area : VICTORIA GARDEN-02

Date : Dec. 12-13. 1989

$Qx = Qo \times (Hx/Ho)^{n}$

	TIME hour	TIME min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	13	40	12.11	1.8	---	26.85	---	---	---	---
	13	50	8.76	1.5	1.739	23.90	0.948	0.791	0.527	1.212
14	14	0	8.70	1.5	1.455	23.82	0.948	0.507	0.527	0.928
	14	10	12.87	1.4	1.798	29.48	0.916	0.881	0.487	1.310
	14	20	11.89	1.5	2.063	27.85	0.948	1.115	0.527	1.536
	14	30	11.51	1.5	1.950	27.40	0.948	1.002	0.527	1.423
	14	40	11.58	1.7	1.924	26.64	1.009	0.915	0.609	1.315
	14	50	10.34	1.6	1.827	25.55	0.979	0.847	0.568	1.259
	15	0	10.88	1.7	1.768	25.82	1.009	0.759	0.609	1.159
	15	10	10.37	1.6	1.771	25.59	0.979	0.792	0.568	1.203
	15	20	9.68	1.7	1.671	24.35	1.009	0.661	0.609	1.062
	15	30	10.12	1.8	1.650	24.55	1.039	0.611	0.650	1.000
	15	40	9.27	1.7	1.616	23.83	1.009	0.606	0.609	1.007
	15	50	10.22	1.7	1.624	25.02	1.009	0.615	0.609	1.015
16	16	0	6.93	1.7	1.429	20.61	1.009	0.420	0.609	0.820
	16	10	9.39	1.7	1.360	23.99	1.009	0.351	0.609	0.751
	16	20	10.63	1.8	1.668	25.16	1.039	0.630	0.650	1.018
	16	30	7.78	1.8	1.534	21.52	1.039	0.495	0.650	0.884
	16	40	10.56	1.7	1.528	25.44	1.009	0.519	0.609	0.919
	16	50	9.17	1.6	1.644	24.07	0.979	0.665	0.568	1.076
	17	0	10.66	1.7	1.653	25.56	1.009	0.643	0.609	1.044
	17	10	9.65	1.7	1.693	24.32	1.009	0.683	0.609	1.084
	17	20	11.73	1.7	1.782	26.81	1.009	0.772	0.609	1.173
	17	30	11.23	1.6	1.913	26.63	0.979	0.934	0.568	1.345
	17	40	12.46	1.6	1.974	28.05	0.979	0.995	0.568	1.406
	17	50	11.55	1.8	2.001	26.22	1.039	0.962	0.650	1.351
18	18	0	7.72	1.8	1.606	21.44	1.039	0.567	0.650	0.956
	18	10	8.82	1.5	1.378	23.99	0.948	0.430	0.527	0.851
	18	20	11.77	1.6	1.716	27.26	0.979	0.737	0.568	1.148
	18	30	10.98	1.6	1.896	26.33	0.979	0.917	0.568	1.328
	18	40	11.01	1.6	1.833	26.37	0.979	0.853	0.568	1.265
	18	50	9.93	1.8	1.745	24.32	1.039	0.706	0.650	1.095
	19	0	9.30	1.8	1.603	23.53	1.039	0.564	0.650	0.952
	19	10	10.88	1.8	1.682	25.45	1.039	0.643	0.650	1.031
	19	20	9.33	1.8	1.684	23.57	1.039	0.645	0.650	1.034
	19	30	12.53	1.7	1.822	27.71	1.009	0.812	0.609	1.213
	19	40	12.43	1.8	2.080	27.21	1.039	1.041	0.650	1.430
	19	50	14.01	1.7	2.203	29.30	1.009	1.194	0.609	1.594
20	20	0	13.89	1.8	2.325	28.76	1.039	1.286	0.650	1.675
	20	10	13.54	2.0	2.286	27.66	1.095	1.191	0.734	1.552
	20	20	11.86	2.0	2.117	25.88	1.095	1.022	0.734	1.383
	20	30	12.15	2.1	2.001	25.88	1.122	0.879	0.776	1.224
	20	40	10.44	2.3	1.883	23.45	1.174	0.708	0.862	1.021
	20	50	11.61	2.1	1.838	25.30	1.122	0.716	0.776	1.061
	21	0	14.11	2.1	2.143	27.89	1.122	1.021	0.776	1.367
	21	10	11.55	2.3	2.138	24.67	1.174	0.964	0.862	1.276
	21	20	11.39	2.4	1.912	24.24	1.199	0.712	0.905	1.006
	21	30	11.80	2.5	1.933	24.42	1.224	0.708	0.949	0.984
	21	40	11.86	2.6	1.972	24.24	1.248	0.723	0.993	0.979
	21	50	11.32	2.7	1.932	23.46	1.272	0.660	1.037	0.895
22	22	0	11.61	2.8	1.911	23.54	1.295	0.615	1.081	0.830
	22	10	8.98	3.0	1.716	20.35	1.341	0.375	1.170	0.546
	22	20	8.16	3.0	1.428	19.40	1.341	0.087	1.170	0.258
	22	30	9.01	3.1	1.431	20.22	1.363	0.068	1.215	0.216
	22	40	9.46	3.1	1.539	20.72	1.363	0.176	1.215	0.324
	22	50	7.84	3.0	1.442	19.02	1.341	0.101	1.170	0.272

No. 003

Area : VICTORIA GARDEN-02

Date : Dec. 12-13. 1989

Qx = Qo x (Hx/Ho)^n

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
23	0	8.79	3.2	1.386	19.81	1.385	0.001	1.260	0.126
23	10	8.89	3.3	1.473	19.77	1.406	0.067	1.306	0.168
23	20	9.49	3.6	1.532	19.99	1.469	0.063	1.443	0.089
23	30	8.35	3.7	1.487	18.62	1.489	-0.002	1.489	-0.002
23	40	9.01	3.7	1.447	19.34	1.489	-0.042	1.489	-0.042
23	50	8.00	3.6	1.418	18.35	1.469	-0.051	1.443	-0.025
0	0	8.51	3.8	1.376	18.67	1.509	-0.133	1.536	-0.160
0	10	9.68	3.4	1.516	20.48	1.428	0.088	1.351	0.165
0	20	9.52	3.7	1.600	19.88	1.489	0.111	1.489	0.111
0	30	9.52	3.9	1.587	19.62	1.529	0.058	1.582	0.005
0	40	9.74	3.8	1.605	19.98	1.509	0.096	1.536	0.069
0	50	9.39	3.9	1.594	19.49	1.529	0.065	1.582	0.012
1	0	9.80	3.7	1.599	20.17	1.489	0.110	1.489	0.110
1	10	8.87	3.6	1.556	19.33	1.469	0.087	1.443	0.113
1	20	9.24	3.6	1.509	19.72	1.469	0.040	1.443	0.066
1	30	9.20	3.6	1.537	19.68	1.469	0.068	1.443	0.094
1	40	9.99	3.6	1.599	20.51	1.469	0.130	1.443	0.156
1	50	9.99	3.6	1.665	20.51	1.469	0.196	1.443	0.222
2	0	9.01	3.6	1.583	19.48	1.469	0.114	1.443	0.140
2	10	9.55	3.6	1.547	20.05	1.469	0.078	1.443	0.104
2	20	9.36	3.6	1.576	19.85	1.469	0.107	1.443	0.133
2	30	9.27	3.6	1.553	19.76	1.469	0.084	1.443	0.110
2	40	9.20	3.7	1.539	19.55	1.489	0.050	1.489	0.050
2	50	9.52	3.7	1.560	19.88	1.489	0.071	1.489	0.071
3	0	8.95	3.7	1.539	19.28	1.489	0.050	1.489	0.050
3	10	8.92	3.7	1.489	19.25	1.489	0.000	1.489	0.000
3	20	10.50	3.7	1.618	20.88	1.489	0.129	1.489	0.129
3	30	9.99	3.7	1.708	20.37	1.489	0.218	1.489	0.218
3	40	9.55	3.7	1.628	19.92	1.489	0.139	1.489	0.139
3	50	9.11	3.6	1.555	19.58	1.469	0.086	1.443	0.112
4	0	9.11	3.4	1.518	19.87	1.428	0.091	1.351	0.167
4	10	8.32	3.4	1.453	18.99	1.428	0.025	1.351	0.101
4	20	8.70	3.1	1.418	19.87	1.363	0.055	1.215	0.203
4	30	8.60	3.2	1.442	19.60	1.385	0.057	1.260	0.181
4	40	9.27	3.2	1.489	20.35	1.385	0.104	1.260	0.229
4	50	9.17	3.3	1.537	20.08	1.406	0.130	1.306	0.231
5	0	7.40	3.3	1.381	18.04	1.406	-0.026	1.306	0.075
5	10	7.65	2.6	1.254	19.47	1.248	0.006	0.993	0.262
5	20	7.81	3.0	1.288	18.98	1.341	-0.053	1.170	0.118
5	30	7.65	2.9	1.288	18.94	1.318	-0.030	1.125	0.163
5	40	9.61	2.7	1.438	21.62	1.272	0.166	1.037	0.402
5	50	8.41	2.7	1.502	20.22	1.272	0.230	1.037	0.465
6	0	7.30	2.4	1.309	19.40	1.199	0.110	0.905	0.404
6	10	11.48	2.2	1.565	24.87	1.148	0.417	0.819	0.746
6	20	13.89	1.7	2.114	29.17	1.009	1.105	0.609	1.505
6	30	14.46	1.5	2.363	30.71	0.948	1.414	0.527	1.835
6	40	15.25	1.0	2.476	34.90	0.774	1.702	0.331	2.145
6	50	13.16	1.4	2.368	29.81	0.916	1.451	0.487	1.880
7	0	18.03	1.4	2.599	34.89	0.916	1.683	0.487	2.112
7	10	15.88	1.3	2.826	33.36	0.883	1.943	0.447	2.379
7	20	14.80	1.3	2.557	32.20	0.883	1.674	0.447	2.109
7	30	14.01	1.3	2.401	31.33	0.883	1.518	0.447	1.954
7	40	13.29	1.3	2.275	30.52	0.883	1.392	0.447	1.828
7	50	11.70	1.2	2.083	29.21	0.848	1.234	0.408	1.675
8	0	12.87	1.2	2.048	30.64	0.848	1.199	0.408	1.640
8	10	13.25	1.2	2.177	31.09	0.848	1.329	0.408	1.769

No. 003

Area : VICTORIA GARDEN-02

Date : Dec. 12-13. 1989

Qx = Qo x (Hx/Ho)^n

TIME hour	TIME min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
8	20	10.91	1.2	2.013	28.21	0.848	1.165	0.408	1.605
8	30	14.08	1.0	2.083	33.54	0.774	1.308	0.331	1.752
8	40	15.09	0.9	2.431	35.65	0.734	1.696	0.293	2.138
8	50	12.27	0.8	2.280	33.10	0.692	1.588	0.256	2.024
9	0	14.36	1.2	2.219	32.36	0.848	1.371	0.408	1.811
9	10	11.92	1.0	2.190	30.86	0.774	1.416	0.331	1.859
9	20	14.84	1.1	2.230	33.62	0.812	1.418	0.369	1.861
9	30	13.92	1.2	2.397	31.86	0.848	1.549	0.408	1.989
9	40	12.15	1.0	2.173	31.16	0.774	1.398	0.331	1.842
9	50	12.94	1.3	2.091	30.11	0.883	1.208	0.447	1.644
10	0	12.62	0.8	2.130	33.57	0.692	1.438	0.256	1.874
~~10~~	10	12.49	1.4	2.093	29.04	0.916	1.176	0.487	1.605
10	20	7.43	1.4	1.660	22.40	0.916	0.744	0.487	1.173
10	30	9.11	1.4	1.378	24.80	0.916	0.462	0.487	0.891
10	40	8.73	1.4	1.487	24.28	0.916	0.571	0.487	1.000
10	50	9.84	1.3	1.548	26.26	0.883	0.665	0.447	1.100
11	0	10.63	1.2	1.706	27.84	0.848	0.858	0.408	1.298
11	10	12.15	1.3	1.898	29.18	0.883	1.016	0.447	1.451
11	20	9.49	1.4	1.803	25.31	0.916	0.887	0.487	1.316
11	30	11.36	1.2	1.738	28.78	0.848	0.889	0.408	1.330
11	40	9.61	1.4	1.748	25.47	0.916	0.831	0.487	1.260
11	50	11.45	1.4	1.755	27.80	0.916	0.839	0.487	1.268
12	0	12.18	1.4	1.969	28.68	0.916	1.053	0.487	1.482
12	10	9.24	1.6	1.785	24.16	0.979	0.806	0.568	1.217
12	20	10.88	1.6	1.677	26.21	0.979	0.697	0.568	1.109
12	30	9.08	1.6	1.663	23.95	0.979	0.684	0.568	1.095
12	40	8.89	1.7	1.498	23.34	1.009	0.488	0.609	0.889
12	50	11.80	1.6	1.724	27.30	0.979	0.745	0.568	1.156
13	0	8.41	1.6	1.684	23.05	0.979	0.705	0.568	1.116
13	10	7.75	1.5	1.347	22.48	0.948	0.398	0.527	0.819
13	20	12.34	1.5	1.674	28.37	0.948	0.726	0.527	1.147
13	30	10.56	1.7	1.908	25.44	1.009	0.899	0.609	1.299
13	40	8.92	1.7	1.623	23.38	1.009	0.614	0.609	1.014
TOTAL		---	---	254.373	---	161.764	92.609	119.760	134.613
Average		10.60	2.20	1.766	24.578	63.59%	36.41%	47.08%	52.92%
MAX		18.03	3.90	2.826	35.647	1.529	1.943	1.582	2.379
MIN		6.93	0.80	1.254	18.040	0.692	-0.133	0.256	-0.160

	kg/cm2	m3/10 min	
Leakage at Night:	3.70	1.489	19.247 : 3:10 a.m.
Estimated night demand :		0.000	

Nos. of house	[A]	91	houses
persons/house	[B]	4.4	pesons/house
A * B	[C]	400.4	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	92.61	M3	134.61	M3
l/day/capita	D/C	231.29	l/d/c	336.20	l/d/c

No. 004
Area : DIEGO MARTIN(PAREL PARK)
Date : Dec. 18-19. 1989

Qx = Qo x (Hx/Ho)^n

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
10	20	5.53	1.1	---	20.52	---	---	---	---
10	30	6.08	1.2	0.968	21.06	0.479	0.488	0.305	0.662
10	40	6.29	1.3	1.031	20.99	0.499	0.532	0.335	0.696
10	50	6.89	1.3	1.098	21.97	0.499	0.600	0.335	0.764
11	0	6.41	1.3	1.108	21.19	0.499	0.610	0.335	0.774
11	10	6.38	1.4	1.066	20.75	0.517	0.548	0.365	0.701
11	20	6.89	1.4	1.106	21.57	0.517	0.588	0.365	0.741
11	30	6.80	1.3	1.141	21.83	0.499	0.642	0.335	0.806
11	40	7.56	1.3	1.197	23.02	0.499	0.698	0.335	0.862
11	50	6.98	1.2	1.212	22.56	0.479	0.733	0.305	0.906
12	0	6.20	1.2	1.098	21.26	0.479	0.619	0.305	0.793
12	10	6.62	1.3	1.068	21.54	0.499	0.570	0.335	0.734
12	20	6.23	1.4	1.071	20.51	0.517	0.553	0.365	0.706
12	30	6.65	1.5	1.073	20.83	0.536	0.538	0.395	0.679
12	40	6.20	1.5	1.071	20.11	0.536	0.535	0.395	0.676
12	50	7.04	1.5	1.103	21.43	0.536	0.568	0.395	0.709
13	0	6.80	1.5	1.153	21.06	0.536	0.618	0.395	0.759
13	10	6.29	1.5	1.091	20.26	0.536	0.555	0.395	0.696
13	20	6.83	1.5	1.093	21.11	0.536	0.558	0.395	0.699
13	30	6.80	1.5	1.136	21.06	0.536	0.600	0.395	0.741
13	40	5.92	1.5	1.060	19.65	0.536	0.524	0.395	0.665
13	50	6.77	1.6	1.058	20.68	0.553	0.504	0.425	0.632
14	0	5.77	1.6	1.045	19.09	0.553	0.492	0.425	0.620
14	10	6.47	1.4	1.020	20.90	0.517	0.503	0.365	0.655
14	20	6.89	1.4	1.113	21.57	0.517	0.596	0.365	0.749
14	30	5.83	1.4	1.060	19.84	0.517	0.543	0.365	0.695
14	40	7.50	1.4	1.111	22.50	0.517	0.593	0.365	0.746
14	50	5.89	1.5	1.116	19.60	0.536	0.580	0.395	0.721
15	0	6.01	1.4	0.992	20.14	0.517	0.474	0.365	0.627
15	10	5.95	1.4	0.997	20.04	0.517	0.479	0.365	0.632
15	20	7.10	1.3	1.088	22.30	0.499	0.589	0.335	0.753
15	30	4.65	1.3	0.979	18.05	0.499	0.481	0.335	0.644
15	40	4.44	1.3	0.758	17.64	0.499	0.259	0.335	0.423
15	50	6.08	1.4	0.877	20.26	0.517	0.359	0.365	0.512
16	0	5.95	1.3	1.003	20.42	0.499	0.504	0.335	0.668
16	10	5.26	1.4	0.934	18.85	0.517	0.417	0.365	0.570
16	20	6.41	1.2	0.973	21.62	0.479	0.493	0.305	0.667
16	30	6.11	1.2	1.043	21.11	0.479	0.564	0.305	0.738
16	40	5.95	1.3	1.005	20.42	0.499	0.506	0.335	0.670
16	50	5.50	1.4	0.954	19.27	0.517	0.437	0.365	0.590
17	0	7.01	1.3	1.043	22.16	0.499	0.544	0.335	0.708
17	10	7.50	1.3	1.209	22.92	0.499	0.711	0.335	0.874
17	20	7.04	1.3	1.212	22.21	0.499	0.713	0.335	0.877
17	30	6.17	1.3	1.101	20.79	0.499	0.602	0.335	0.766
17	40	7.59	1.3	1.147	23.06	0.499	0.648	0.335	0.812
17	50	6.68	1.2	1.189	22.07	0.479	0.710	0.305	0.884
18	0	7.38	1.2	1.172	23.20	0.479	0.693	0.305	0.866
18	10	5.98	1.2	1.113	20.88	0.479	0.634	0.305	0.808
18	20	6.65	1.0	1.053	23.05	0.437	0.615	0.248	0.805
18	30	7.01	0.8	1.138	25.02	0.391	0.747	0.192	0.947
18	40	6.98	1.1	1.166	23.06	0.459	0.707	0.276	0.890
18	50	7.32	1.3	1.192	22.65	0.499	0.693	0.335	0.857
19	0	8.62	1.3	1.328	24.58	0.499	0.830	0.335	0.994
19	10	6.50	1.4	1.260	20.95	0.517	0.743	0.365	0.895
19	20	6.98	1.3	1.123	22.11	0.499	0.625	0.335	0.789
19	30	6.01	1.4	1.083	20.14	0.517	0.565	0.365	0.718

No. 004

Area : DIEGO MARTIN(PAREL PARK)

Date : Dec. 18-19. 1989

Qx = Qo x (Hx/Ho)^n

	TIME		METERED Q	METERED PRESSURE	Qtotal	Leak hole	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak	Demand	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak	Demand
	hour	min	(m3/h)	(kg/cm2)	m3	d(mm)	QA1(m3)	QA2(m3)	QB1(m3)	QB2(m3)
	19	40	7.10	1.4	1.093	21.89	0.517	0.575	0.365	0.728
	19	50	7.13	1.4	1.186	21.94	0.517	0.668	0.365	0.821
20	20	0	6.38	1.4	1.126	20.75	0.517	0.608	0.365	0.761
	20	10	6.83	1.5	1.101	21.11	0.536	0.565	0.395	0.706
	20	20	6.77	1.5	1.133	21.01	0.536	0.598	0.395	0.739
	20	30	8.74	1.6	1.293	23.49	0.553	0.739	0.425	0.867
	20	40	6.62	1.7	1.280	20.14	0.570	0.710	0.456	0.824
	20	50	8.19	1.7	1.234	22.40	0.570	0.664	0.456	0.778
	21	0	7.13	1.6	1.277	21.22	0.553	0.723	0.425	0.852
	21	10	6.86	1.6	1.166	20.81	0.553	0.613	0.425	0.741
	21	20	7.19	1.8	1.171	20.69	0.587	0.584	0.487	0.684
	21	30	6.38	1.8	1.131	19.49	0.587	0.544	0.487	0.644
	21	40	7.80	1.8	1.182	21.55	0.587	0.595	0.487	0.695
	21	50	7.04	2.0	1.237	19.94	0.618	0.618	0.549	0.687
22	22	0	8.07	1.9	1.259	21.63	0.603	0.656	0.518	0.741
	22	10	7.74	1.9	1.318	21.18	0.603	0.715	0.518	0.800
	22	20	7.13	1.9	1.239	20.33	0.603	0.636	0.518	0.721
	22	30	6.59	1.9	1.143	19.54	0.603	0.541	0.518	0.625
	22	40	5.11	1.9	0.975	17.21	0.603	0.372	0.518	0.457
	22	50	6.44	2.0	0.963	19.07	0.618	0.344	0.549	0.413
	23	0	6.41	2.0	1.071	19.03	0.618	0.452	0.549	0.521
	23	10	5.14	2.1	0.963	16.83	0.634	0.329	0.581	0.381
	23	20	4.96	2.0	0.842	16.74	0.618	0.223	0.549	0.292
	23	30	5.11	2.0	0.839	16.99	0.618	0.221	0.549	0.290
	23	40	4.68	2.2	0.816	15.88	0.649	0.167	0.613	0.203
	23	50	5.50	2.1	0.848	17.41	0.634	0.215	0.581	0.267
0	0	0	6.11	2.2	0.968	18.14	0.649	0.319	0.613	0.355
	0	10	5.83	2.2	0.995	17.72	0.649	0.346	0.613	0.382
	0	20	5.35	2.2	0.932	16.98	0.649	0.283	0.613	0.319
	0	30	4.93	2.2	0.857	16.30	0.649	0.208	0.613	0.244
	0	40	5.11	2.2	0.837	16.59	0.649	0.188	0.613	0.224
	0	50	4.26	2.2	0.781	15.15	0.649	0.132	0.613	0.168
	1	0	4.77	2.2	0.753	16.03	0.649	0.104	0.613	0.140
	1	10	5.62	2.2	0.866	17.40	0.649	0.217	0.613	0.253
	1	20	4.20	2.3	0.818	14.87	0.663	0.155	0.645	0.173
	1	30	4.68	2.3	0.740	15.70	0.663	0.077	0.645	0.095
	1	40	4.05	2.4	0.728	14.45	0.678	0.050	0.678	0.050
	1	50	4.26	2.4	0.693	14.82	0.678	0.015	0.678	0.015
2	2	0	4.41	2.4	0.723	15.08	0.678	0.045	0.678	0.045
	2	10	4.99	2.4	0.783	16.04	0.678	0.106	0.678	0.106
	2	20	3.81	2.4	0.733	14.02	0.678	0.056	0.678	0.056
	2	30	3.99	2.4	0.650	14.34	0.678	0.027	0.678	-0.027
	2	40	4.17	2.4	0.680	14.66	0.678	0.003	0.678	0.003
	2	50	3.96	2.4	0.678	14.29	0.678	0.000	0.678	0.000
	3	0	4.32	2.4	0.690	14.93	0.678	0.013	0.678	0.013
	3	10	4.44	2.4	0.730	15.13	0.678	0.053	0.678	0.053
	3	20	4.77	2.4	0.768	15.68	0.678	0.090	0.678	0.090
	3	30	4.50	2.4	0.773	15.23	0.678	0.095	0.678	0.095
	3	40	4.44	2.4	0.745	15.13	0.678	0.068	0.678	0.068
	3	50	3.96	2.4	0.700	14.29	0.678	0.023	0.678	0.023
4	4	0	4.84	2.4	0.733	15.80	0.678	0.056	0.678	0.056
	4	10	3.93	2.4	0.731	14.24	0.678	0.053	0.678	0.053
	4	20	4.47	2.3	0.700	15.34	0.663	0.037	0.645	0.055
	4	30	5.53	2.3	0.833	17.07	0.663	0.170	0.645	0.188
	4	40	4.41	2.3	0.828	15.24	0.663	0.165	0.645	0.183
	4	50	4.32	2.2	0.728	15.25	0.649	0.079	0.613	0.115

No. 004

Area : DIEGO MARTIN(PAREL PARK)

Date : Dec. 18-19. 1989

$Qx = Qo \times (Hx/Ho)^n$

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
5	0	4.47	2.2	0.733	15.52	0.649	0.084	0.613	0.120
5	10	5.14	2.1	0.801	16.83	0.634	0.167	0.581	0.220
5	20	4.53	2.1	0.806	15.80	0.634	0.172	0.581	0.225
5	30	5.38	2.0	0.826	17.43	0.618	0.207	0.549	0.276
5	40	4.59	1.9	0.831	16.31	0.603	0.228	0.518	0.313
5	50	4.62	1.8	0.768	16.59	0.587	0.181	0.487	0.281
6	0	6.44	1.7	0.922	19.86	0.570	0.351	0.456	0.466
6	10	6.62	1.6	1.088	20.45	0.553	0.535	0.425	0.663
6	20	6.77	1.3	1.116	21.78	0.499	0.617	0.335	0.781
6	30	6.68	1.2	1.121	22.07	0.479	0.642	0.305	0.816
6	40	6.95	1.2	1.136	22.51	0.479	0.657	0.305	0.831
6	50	5.26	1.2	1.018	19.59	0.479	0.538	0.305	0.712
7	0	4.71	1.2	0.831	18.53	0.479	0.352	0.305	0.526
7	10	6.44	1.2	0.929	21.67	0.479	0.450	0.305	0.624
7	20	7.68	1.0	1.177	24.77	0.437	0.739	0.248	0.929
7	30	7.22	1.1	1.242	23.45	0.459	0.783	0.276	0.965
7	40	7.16	1.1	1.198	23.35	0.459	0.740	0.276	0.922
7	50	6.98	1.1	1.178	23.06	0.459	0.720	0.276	0.902
8	0	6.71	1.1	1.141	22.61	0.459	0.682	0.276	0.865
8	10	6.08	1.2	1.066	21.06	0.479	0.587	0.305	0.761
8	20	5.77	1.2	0.988	20.51	0.479	0.508	0.305	0.682
8	30	6.98	1.1	1.063	23.06	0.459	0.604	0.276	0.786
8	40	5.44	1.0	1.035	20.85	0.437	0.598	0.248	0.787
8	50	4.99	1.2	0.869	19.08	0.479	0.390	0.305	0.564
9	0	6.26	1.2	0.938	21.37	0.479	0.458	0.305	0.632
9	10	6.14	1.1	1.033	21.63	0.459	0.575	0.276	0.757
9	20	6.14	1.1	1.023	21.63	0.459	0.565	0.276	0.747
9	30	5.62	1.1	0.980	20.69	0.459	0.521	0.276	0.704
9	40	4.62	1.1	0.853	18.76	0.459	0.395	0.276	0.577
9	50	6.53	1.2	0.929	21.82	0.479	0.450	0.305	0.624
10	0	6.35	1.0	1.073	22.52	0.437	0.636	0.248	0.826
10	10	5.65	1.0	1.000	21.25	0.437	0.563	0.248	0.752
10	20	7.47	1.1	1.093	23.85	0.459	0.635	0.276	0.817
TOTAL		---	---	144.450	---	79.438	65.067	62.595	81.855
Average		6.02	1.62	1.003	19.662	54.99%	45.04%	43.33%	56.67%
MAX		8.74	2.40	1.328	25.022	0.678	0.830	0.678	0.994
MIN		3.81	0.80	0.650	14.017	0.391	0.000	0.192	-0.027

	kg/cm2	m3/10 min		
Leakage at Night:	2.40	0.678	14.290	: 2:50 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	58	houses
persons/house	[B]	4.4	pesons/house
A * B	[C]	255.2	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	65.07	M3	81.85	M3
l/day/capita	D/C	254.96	l/d/c	320.75	l/d/c

No. 005

Area : TRAIN CITY(9th WEST Ave)

Date : Dec. 18-19. 1989

$Qx = Qo \times (Hx/Ho)^n$

	TIME		METERED Q	METERED PRESSURE	Qtotal	Leak hole	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak	Demand	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak	Demand
	hour	min	(m3/h)	(kg/cm2)	m3	d(mm)	QA1(m3)	QA2(m3)	QB1(m3)	QB2(m3)
	15	0	6.80	1.4	---	21.43	---	---	---	---
	15	10	4.28	1.3	0.923	17.32	0.149	0.774	0.095	0.828
	15	20	4.28	1.3	0.713	17.32	0.149	0.564	0.095	0.618
	15	30	5.09	1.3	0.781	18.88	0.149	0.632	0.095	0.686
	15	40	4.91	1.3	0.833	18.55	0.149	0.684	0.095	0.738
	15	50	3.63	1.2	0.712	16.27	0.143	0.568	0.087	0.625
16	16	0	3.84	1.1	0.623	17.10	0.137	0.485	0.078	0.544
	16	10	4.20	1.1	0.670	17.89	0.137	0.533	0.078	0.592
	16	20	4.78	1.1	0.748	19.08	0.137	0.611	0.078	0.670
	16	30	3.90	1.1	0.723	17.24	0.137	0.586	0.078	0.645
	16	40	3.39	1.1	0.608	16.07	0.137	0.470	0.078	0.529
	16	50	3.16	1.1	0.546	15.51	0.137	0.409	0.078	0.467
	17	0	3.23	1.1	0.533	15.69	0.137	0.395	0.078	0.454
	17	10	3.88	1.1	0.593	17.19	0.137	0.455	0.078	0.514
	17	20	4.06	1.2	0.662	17.21	0.143	0.518	0.087	0.575
	17	30	3.77	1.2	0.653	16.58	0.143	0.509	0.087	0.566
	17	40	3.27	1.2	0.587	15.44	0.143	0.443	0.087	0.500
	17	50	4.31	1.2	0.632	17.73	0.143	0.488	0.087	0.545
18	18	0	3.61	1.2	0.660	16.23	0.143	0.517	0.087	0.573
	18	10	4.71	1.2	0.693	18.53	0.143	0.550	0.087	0.607
	18	20	3.59	1.2	0.692	16.18	0.143	0.548	0.087	0.605
	18	30	3.43	1.1	0.585	16.16	0.137	0.448	0.078	0.507
	18	40	4.82	1.1	0.688	19.16	0.137	0.550	0.078	0.609
	18	50	3.97	1.3	0.733	16.68	0.149	0.583	0.095	0.637
	19	0	5.34	1.4	0.776	18.99	0.155	0.621	0.103	0.672
	19	10	4.28	1.4	0.802	17.00	0.155	0.647	0.103	0.698
	19	20	3.48	1.6	0.647	14.83	0.165	0.481	0.121	0.526
	19	30	5.36	1.7	0.737	18.12	0.170	0.566	0.129	0.607
	19	40	4.44	1.7	0.817	16.49	0.170	0.646	0.129	0.687
	19	50	4.80	1.7	0.770	17.15	0.170	0.600	0.129	0.641
20	20	0	3.41	1.7	0.684	14.45	0.170	0.514	0.129	0.555
	20	10	2.74	1.8	0.513	12.77	0.175	0.337	0.138	0.374
	20	20	2.76	2.0	0.458	12.49	0.185	0.273	0.156	0.302
	20	30	2.60	2.0	0.447	12.12	0.185	0.262	0.156	0.291
	20	40	1.86	2.0	0.372	10.25	0.185	0.187	0.156	0.216
	20	50	2.58	2.0	0.370	12.07	0.185	0.185	0.156	0.214
	21	0	2.80	2.0	0.448	12.58	0.185	0.263	0.156	0.292
	21	10	1.21	1.9	0.334	8.37	0.180	0.154	0.147	0.187
	21	20	2.42	2.0	0.303	11.69	0.185	0.118	0.156	0.147
	21	30	2.26	2.2	0.390	11.03	0.194	0.196	0.174	0.216
	21	40	3.39	2.2	0.471	13.51	0.194	0.277	0.174	0.297
	21	50	2.60	2.1	0.499	11.97	0.189	0.310	0.165	0.334
22	22	0	2.11	2.0	0.393	10.92	0.185	0.208	0.156	0.237
	22	10	2.67	2.0	0.398	12.28	0.185	0.213	0.156	0.242
	22	20	3.32	1.9	0.499	13.87	0.180	0.319	0.147	0.352
	22	30	3.57	1.9	0.574	14.38	0.180	0.394	0.147	0.427
	22	40	2.20	1.8	0.481	11.45	0.175	0.305	0.138	0.343
	22	50	2.69	2.3	0.408	11.90	0.198	0.209	0.183	0.224
	23	0	3.72	2.4	0.534	13.85	0.203	0.332	0.192	0.342
	23	10	2.08	2.8	0.483	9.97	0.219	0.265	0.230	0.254
	23	20	1.25	1.8	0.278	8.63	0.175	0.102	0.138	0.139
	23	30	2.26	1.8	0.293	11.60	0.175	0.117	0.138	0.154
	23	40	1.52	1.8	0.315	9.51	0.175	0.140	0.138	0.177
	23	50	1.81	2.1	0.278	9.99	0.189	0.088	0.165	0.113
0	0	0	1.75	2.2	0.297	9.71	0.194	0.103	0.174	0.123
	0	10	1.63	2.2	0.282	9.37	0.194	0.088	0.174	0.108

No. 005

Area : TRAIN CITY(9th WEST Ave)

Date : Dec. 18-19. 1989

Qx = Qo x (Hx/Ho)^n

	TIME		METERED Q	METERED PRESSURE	Qtotal	Leak hole	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak	Demand	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak	Demand
	hour	min	(m3/h)	(kg/cm2)	m3	d(mm)	QA1(m3)	QA2(m3)	QB1(m3)	QB2(m3)
	0	20	1.66	2.7	0.274	8.98	0.215	0.059	0.220	0.054
	0	30	1.61	2.2	0.273	9.31	0.194	0.079	0.174	0.099
	0	40	1.34	2.3	0.246	8.40	0.198	0.048	0.183	0.063
	0	50	1.37	2.3	0.226	8.50	0.198	0.028	0.183	0.043
	1	0	1.21	2.3	0.215	7.98	0.198	0.017	0.183	0.032
	1	10	1.75	2.3	0.247	9.60	0.198	0.048	0.183	0.064
	1	20	1.32	2.4	0.256	8.25	0.203	0.053	0.192	0.064
	1	30	1.28	2.6	0.217	7.96	0.211	0.006	0.211	0.006
	1	40	1.50	2.6	0.232	8.62	0.211	0.021	0.211	0.021
	1	50	2.08	2.6	0.298	10.15	0.211	0.088	0.211	0.088
2	2	0	1.32	2.5	0.283	8.17	0.207	0.077	0.202	0.082
	2	10	2.06	2.6	0.282	10.10	0.211	0.071	0.211	0.071
	2	20	1.25	2.6	0.276	7.87	0.211	0.065	0.211	0.065
	2	30	1.28	2.6	0.211	7.96	0.211	0.000	0.211	0.000
	2	40	1.25	2.6	0.211	7.87	0.211	0.000	0.211	0.000
	2	50	1.30	2.6	0.213	8.03	0.211	0.002	0.211	0.002
	3	0	1.34	2.8	0.220	8.00	0.219	0.001	0.230	-0.010
	3	10	1.34	2.6	0.223	8.15	0.211	0.013	0.211	0.013
	3	20	1.32	2.6	0.222	8.09	0.211	0.011	0.211	0.011
	3	30	1.34	2.6	0.222	8.15	0.211	0.011	0.211	0.011
	3	40	1.39	2.6	0.228	8.30	0.211	0.017	0.211	0.017
	3	50	1.34	2.5	0.228	8.23	0.207	0.021	0.202	0.026
4	4	0	1.34	2.6	0.223	8.15	0.211	0.013	0.211	0.013
	4	10	1.34	2.5	0.223	8.23	0.207	0.017	0.202	0.022
	4	20	1.32	2.4	0.222	8.25	0.203	0.019	0.192	0.029
	4	30	1.75	2.3	0.256	9.60	0.198	0.058	0.183	0.073
	4	40	1.72	2.2	0.289	9.62	0.194	0.095	0.174	0.115
	4	50	1.99	2.1	0.309	10.47	0.189	0.120	0.165	0.144
	5	0	1.61	1.8	0.300	9.79	0.175	0.125	0.138	0.162
	5	10	1.41	2.2	0.252	8.71	0.194	0.058	0.174	0.078
	5	20	3.00	1.6	0.368	13.76	0.165	0.202	0.121	0.247
	5	30	2.24	1.5	0.437	12.09	0.160	0.277	0.112	0.325
	5	40	2.15	1.2	0.366	12.52	0.143	0.223	0.087	0.279
	5	50	1.63	1.7	0.315	9.99	0.170	0.145	0.129	0.186
6	6	0	1.75	1.4	0.282	10.87	0.155	0.127	0.103	0.178
	6	10	1.86	1.3	0.301	11.42	0.149	0.152	0.095	0.206
	6	20	2.49	1.4	0.363	12.97	0.155	0.208	0.103	0.259
	6	30	5.72	1.0	0.684	21.38	0.131	0.553	0.070	0.614
	6	40	3.36	1.5	0.757	14.80	0.160	0.597	0.112	0.645
	6	50	4.13	1.3	0.624	17.01	0.149	0.475	0.095	0.529
	7	0	3.21	1.2	0.612	15.30	0.143	0.468	0.087	0.525
	7	10	3.95	1.2	0.597	16.97	0.143	0.453	0.087	0.510
	7	20	4.60	1.0	0.713	19.17	0.131	0.582	0.070	0.642
	7	30	3.95	0.8	0.713	18.78	0.117	0.596	0.054	0.658
	7	40	3.99	1.0	0.662	17.85	0.131	0.531	0.070	0.591
	7	50	3.52	0.9	0.626	17.22	0.124	0.502	0.062	0.564
8	8	0	4.40	0.8	0.660	19.82	0.117	0.543	0.054	0.606
	8	10	4.46	0.7	0.738	20.64	0.109	0.629	0.047	0.692
	8	20	4.55	0.7	0.751	20.84	0.109	0.641	0.047	0.704
	8	30	5.00	0.7	0.796	21.85	0.109	0.686	0.047	0.749
	8	40	4.85	0.7	0.821	21.52	0.109	0.711	0.047	0.774
	8	50	3.45	0.6	0.692	18.86	0.101	0.590	0.039	0.653
	9	0	3.81	1.0	0.605	17.45	0.131	0.474	0.070	0.535
	9	10	3.70	0.9	0.626	17.65	0.124	0.502	0.062	0.564
	9	20	4.02	1.1	0.643	17.50	0.137	0.506	0.078	0.565
	9	30	3.34	0.9	0.613	16.77	0.124	0.489	0.062	0.551

No. 005

Area : TRAIN CITY(9th WEST Ave)

Date : Dec. 18-19. 1989

$Qx = Qo \times (Hx/Ho)^{n}$

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
9	40	3.39	0.9	0.561	16.90	0.124	0.437	0.062	0.499
9	50	4.22	0.8	0.634	19.41	0.117	0.517	0.054	0.580
10	0	3.81	0.8	0.669	18.45	0.117	0.552	0.054	0.615
10	10	4.15	0.7	0.663	19.91	0.109	0.554	0.047	0.617
10	20	2.98	0.7	0.594	16.87	0.109	0.485	0.047	0.548
10	30	4.44	1.0	0.618	18.83	0.131	0.488	0.070	0.548
10	40	5.14	1.5	0.798	18.31	0.160	0.638	0.112	0.686
10	50	4.33	1.2	0.789	17.77	0.143	0.646	0.087	0.703
11	0	3.93	1.0	0.688	17.72	0.131	0.558	0.070	0.618
11	10	4.94	0.9	0.739	20.40	0.124	0.615	0.062	0.677
11	20	6.78	0.8	0.977	24.61	0.117	0.860	0.054	0.922
11	30	4.67	1.2	0.954	18.45	0.143	0.811	0.087	0.868
11	40	4.91	1.0	0.798	19.81	0.131	0.668	0.070	0.728
11	50	3.81	0.8	0.727	18.45	0.117	0.610	0.054	0.672
12	0	4.15	1.2	0.663	17.40	0.143	0.520	0.087	0.577
12	10	2.02	1.3	0.514	11.90	0.149	0.365	0.095	0.419
12	20	4.49	1.2	0.543	18.10	0.143	0.399	0.087	0.456
12	30	3.27	1.3	0.647	15.14	0.149	0.498	0.095	0.552
12	40	3.75	1.4	0.585	15.91	0.155	0.430	0.103	0.482
12	50	1.43	1.4	0.432	9.83	0.155	0.277	0.103	0.328
13	0	2.62	1.6	0.338	12.86	0.165	0.172	0.121	0.217
13	10	1.72	1.4	0.362	10.78	0.155	0.207	0.103	0.258
13	20	3.52	1.3	0.437	15.70	0.149	0.288	0.095	0.342
13	30	4.11	1.8	0.636	15.64	0.175	0.460	0.138	0.498
13	40	3.57	1.6	0.640	15.02	0.165	0.475	0.121	0.519
13	50	2.74	1.8	0.526	12.77	0.175	0.350	0.138	0.388
14	0	3.88	1.2	0.552	16.82	0.143	0.408	0.087	0.465
14	10	2.35	1.4	0.519	12.60	0.155	0.364	0.103	0.416
14	20	4.06	1.1	0.534	17.59	0.137	0.397	0.078	0.456
14	30	3.79	1.3	0.654	16.30	0.149	0.505	0.095	0.559
14	40	3.99	1.0	0.648	17.85	0.131	0.518	0.070	0.578
14	50	1.43	1.4	0.452	9.83	0.155	0.297	0.103	0.348
15	0	2.76	1.6	0.349	13.20	0.165	0.184	0.121	0.229
TOTAL		---	---	73.908	---	23.415	50.493	17.614	56.294
Average		3.09	1.60	0.513	14.118	31.68%	68.32%	23.83%	76.17%
MAX		6.80	2.80	0.977	24.608	0.219	0.860	0.230	0.922
MIN		1.21	0.60	0.211	7.870	0.101	0.000	0.039	-0.010

	kg/cm2	m3/10 min		
Leakage at Night:	2.60	0.211	7.870	: 2:40 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	43	houses
persons/house	[B]	4.3	pesons/house
A * B	[C]	184.9	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	50.49	M3	56.29	M3
l/day/capita	D/C	273.08	l/d/c	304.46	l/d/c

No. 006

Area : VALSAYEN

Date : Dec. 28-29. 1989

Qx = Qo x (Hx/Ho)^n

	TIME hour	TIME min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	14	40	13.80	0.6	---	37.73	---	---	---	---
	14	50	13.20	0.6	2.250	36.90	2.440	-0.190	3.175	-0.925
	15	0	14.70	0.6	2.325	38.94	2.440	-0.115	3.175	-0.850
	15	10	14.40	0.6	2.425	38.54	2.440	-0.015	3.175	-0.750
	15	20	14.10	0.6	2.375	38.13	2.440	-0.065	3.175	-0.800
	15	30	14.90	0.3	2.417	46.62	1.725	0.692	1.431	0.986
	15	40	14.00	0.3	2.408	45.19	1.725	0.683	1.431	0.977
	15	50	14.10	0.3	2.342	45.35	1.725	0.617	1.431	0.911
16	16	0	14.40	0.3	2.375	45.83	1.725	0.650	1.431	0.944
	16	10	14.00	0.3	2.367	45.19	1.725	0.642	1.431	0.936
	16	20	14.90	0.3	2.408	46.62	1.725	0.683	1.431	0.977
	16	30	14.90	0.3	2.483	46.62	1.725	0.758	1.431	1.052
	16	40	14.70	0.3	2.467	46.30	1.725	0.742	1.431	1.036
	16	50	14.20	0.3	2.408	45.51	1.725	0.683	1.431	0.977
	17	0	14.20	0.3	2.367	45.51	1.725	0.642	1.431	0.936
	17	10	15.10	0.3	2.442	46.93	1.725	0.717	1.431	1.011
	17	20	14.20	0.3	2.442	45.51	1.725	0.717	1.431	1.011
	17	30	14.00	0.3	2.350	45.19	1.725	0.625	1.431	0.919
	17	40	13.60	0.3	2.300	44.54	1.725	0.575	1.431	0.869
	17	50	13.70	0.3	2.275	44.70	1.725	0.550	1.431	0.844
18	18	0	13.00	0.3	2.225	43.54	1.725	0.500	1.431	0.794
	18	10	13.40	0.3	2.200	44.21	1.725	0.475	1.431	0.769
	18	20	13.00	0.3	2.200	43.54	1.725	0.475	1.431	0.769
	18	30	12.80	0.3	2.150	43.21	1.725	0.425	1.431	0.719
	18	40	12.60	0.3	2.117	42.87	1.725	0.392	1.431	0.686
	18	50	13.70	0.3	2.192	44.70	1.725	0.467	1.431	0.761
	19	0	13.50	0.3	2.267	44.37	1.725	0.542	1.431	0.836
	19	10	13.80	0.3	2.275	44.86	1.725	0.550	1.431	0.844
	19	20	14.70	0.3	2.375	46.30	1.725	0.650	1.431	0.944
	19	30	15.30	0.3	2.500	47.24	1.725	0.775	1.431	1.069
	19	40	15.40	0.3	2.558	47.39	1.725	0.833	1.431	1.127
	19	50	14.20	0.3	2.467	45.51	1.725	0.742	1.431	1.036
20	20	0	15.00	0.3	2.433	46.77	1.725	0.708	1.431	1.002
	20	10	14.50	0.4	2.458	42.80	1.992	0.466	1.992	0.466
	20	20	14.70	0.4	2.433	43.09	1.992	0.441	1.992	0.441
	20	30	14.90	0.4	2.467	43.38	1.992	0.475	1.992	0.475
	20	40	15.20	0.4	2.508	43.82	1.992	0.516	1.992	0.516
	20	50	15.30	0.4	2.542	43.96	1.992	0.550	1.992	0.550
	21	0	15.00	0.4	2.525	43.53	1.992	0.533	1.992	0.533
	21	10	12.20	0.4	2.267	39.26	1.992	0.275	1.992	0.275
	21	20	11.30	0.4	1.958	37.78	1.992	-0.034	1.992	-0.034
	21	30	11.70	0.4	1.917	38.44	1.992	-0.075	1.992	-0.075
	21	40	11.60	0.4	1.942	38.28	1.992	-0.050	1.992	-0.050
	21	50	12.40	0.4	2.000	39.58	1.992	0.008	1.992	0.008
22	22	0	12.50	0.4	2.075	39.74	1.992	0.083	1.992	0.083
	22	10	12.20	0.4	2.058	39.26	1.992	0.066	1.992	0.066
	22	20	13.10	0.3	2.108	43.71	1.725	0.383	1.431	0.677
	22	30	12.60	0.3	2.142	42.87	1.725	0.417	1.431	0.711
	22	40	12.10	0.3	2.058	42.01	1.725	0.333	1.431	0.627
	22	50	12.70	0.3	2.067	43.04	1.725	0.342	1.431	0.636
	23	0	12.40	0.3	2.092	42.53	1.725	0.367	1.431	0.661
	23	10	13.10	0.3	2.125	43.71	1.725	0.400	1.431	0.694
	23	20	13.50	0.3	2.217	44.37	1.725	0.492	1.431	0.786
	23	30	12.50	0.3	2.167	42.70	1.725	0.442	1.431	0.736
	23	40	12.20	0.3	2.058	42.18	1.725	0.333	1.431	0.627
	23	50	12.20	0.3	2.033	42.18	1.725	0.308	1.431	0.602

No. 006

Area : VALSAYEN

Date : Dec. 28-29. 1989

$Qx = Qo \times (Hx/Ho)^{n}$

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
0	0	0	12.10	0.3	2.025	42.01	1.725	0.300	1.431	0.594
	0	10	12.00	0.3	2.008	41.84	1.725	0.283	1.431	0.577
	0	20	12.60	0.3	2.050	42.87	1.725	0.325	1.431	0.619
	0	30	13.00	0.3	2.133	43.54	1.725	0.408	1.431	0.702
	0	40	14.00	0.3	2.250	45.19	1.725	0.525	1.431	0.819
	0	50	14.00	0.3	2.333	45.19	1.725	0.608	1.431	0.902
	1	0	13.80	0.3	2.317	44.86	1.725	0.592	1.431	0.886
	1	10	13.30	0.3	2.258	44.04	1.725	0.533	1.431	0.827
	1	20	14.20	0.3	2.292	45.51	1.725	0.567	1.431	0.861
	1	30	13.50	0.3	2.308	44.37	1.725	0.583	1.431	0.877
	1	40	13.60	0.4	2.258	41.45	1.992	0.266	1.992	0.266
	1	50	13.10	0.4	2.225	40.68	1.992	0.233	1.992	0.233
2	2	0	13.30	0.4	2.200	40.99	1.992	0.208	1.992	0.208
	2	10	12.70	0.4	2.167	40.05	1.992	0.175	1.992	0.175
	2	20	13.10	0.4	2.150	40.68	1.992	0.158	1.992	0.158
	2	30	12.50	0.4	2.133	39.74	1.992	0.141	1.992	0.141
	2	40	12.40	0.4	2.075	39.58	1.992	0.083	1.992	0.083
	2	50	12.30	0.4	2.058	39.42	1.992	0.066	1.992	0.066
	3	0	12.40	0.4	2.058	39.58	1.992	0.066	1.992	0.066
	3	10	12.20	0.4	2.050	39.26	1.992	0.058	1.992	0.058
	3	20	12.20	0.4	2.033	39.26	1.992	0.041	1.992	0.041
	3	30	12.30	0.4	2.042	39.42	1.992	0.050	1.992	0.050
	3	40	12.20	0.4	2.042	39.26	1.992	0.050	1.992	0.050
	3	50	12.60	0.4	2.067	39.89	1.992	0.075	1.992	0.075
4	4	0	12.00	0.4	2.050	38.93	1.992	0.058	1.992	0.058
	4	10	11.80	0.4	1.983	38.61	1.992	-0.009	1.992	-0.009
	4	20	12.20	0.4	2.000	39.26	1.992	0.008	1.992	0.008
	4	30	12.20	0.4	2.033	39.26	1.992	0.041	1.992	0.041
	4	40	11.70	0.4	1.992	38.44	1.992	-0.000	1.992	-0.000
	4	50	12.30	0.4	2.000	39.42	1.992	0.008	1.992	0.008
	5	0	16.50	0.4	2.400	45.65	1.992	0.408	1.992	0.408
	5	10	16.60	0.4	2.758	45.79	1.992	0.766	1.992	0.766
	5	20	16.90	0.4	2.792	46.20	1.992	0.800	1.992	0.800
	5	30	16.90	0.4	2.817	46.20	1.992	0.825	1.992	0.825
	5	40	17.60	0.4	2.875	47.15	1.992	0.883	1.992	0.883
	5	50	16.60	0.4	2.850	45.79	1.992	0.858	1.992	0.858
6	6	0	17.40	0.5	2.833	44.34	2.227	0.606	2.575	0.259
	6	10	15.90	0.5	2.775	42.38	2.227	0.548	2.575	0.200
	6	20	16.30	0.5	2.683	42.91	2.227	0.456	2.575	0.109
	6	30	14.90	0.5	2.600	41.03	2.227	0.373	2.575	0.025
	6	40	16.20	0.5	2.592	42.78	2.227	0.365	2.575	0.017
	6	50	15.10	0.5	2.608	41.30	2.227	0.381	2.575	0.034
	7	0	16.10	0.5	2.600	42.65	2.227	0.373	2.575	0.025
	7	10	16.30	0.5	2.700	42.91	2.227	0.473	2.575	0.125
	7	20	15.60	0.5	2.658	41.98	2.227	0.431	2.575	0.084
	7	30	14.70	0.5	2.525	40.75	2.227	0.298	2.575	-0.050
	7	40	14.50	0.5	2.433	40.47	2.227	0.206	2.575	-0.141
	7	50	14.30	0.4	2.400	42.50	1.992	0.408	1.992	0.408
8	8	0	14.00	0.4	2.358	42.05	1.992	0.366	1.992	0.366
	8	10	13.80	0.4	2.317	41.75	1.992	0.325	1.992	0.325
	8	20	14.80	0.4	2.383	43.24	1.992	0.391	1.992	0.391
	8	30	15.10	0.4	2.492	43.67	1.992	0.500	1.992	0.500
	8	40	13.80	0.4	2.408	41.75	1.992	0.416	1.992	0.416
	8	50	13.10	0.4	2.242	40.68	1.992	0.250	1.992	0.250
	9	0	14.20	0.4	2.275	42.35	1.992	0.283	1.992	0.283
	9	10	14.20	0.4	2.367	42.35	1.992	0.375	1.992	0.375

No. 006
Area : VALSAYEN
Date : Dec. 28-29. 1989

$Qx = Qo \times (Hx/Ho)^{n}$

TIME hour	TIME min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
9	20	13.50	0.3	2.308	44.37	1.725	0.583	1.431	0.877
9	30	14.00	0.3	2.292	45.19	1.725	0.567	1.431	0.861
9	40	14.80	0.3	2.400	46.46	1.725	0.675	1.431	0.969
9	50	13.70	0.4	2.375	41.60	1.992	0.383	1.992	0.383
10	0	14.00	0.4	2.308	42.05	1.992	0.316	1.992	0.316
10	10	14.10	0.4	2.342	42.20	1.992	0.350	1.992	0.350
10	20	14.40	0.4	2.375	42.65	1.992	0.383	1.992	0.383
10	30	13.90	0.4	2.358	41.90	1.992	0.366	1.992	0.366
10	40	14.10	0.4	2.333	42.20	1.992	0.341	1.992	0.341
10	50	13.30	0.4	2.283	40.99	1.992	0.291	1.992	0.291
11	0	13.60	0.4	2.242	41.45	1.992	0.250	1.992	0.250
11	10	14.40	0.4	2.333	42.65	1.992	0.341	1.992	0.341
11	20	13.90	0.4	2.358	41.90	1.992	0.366	1.992	0.366
11	30	13.90	0.4	2.317	41.90	1.992	0.325	1.992	0.325
11	40	14.20	0.4	2.342	42.35	1.992	0.350	1.992	0.350
11	50	14.80	0.4	2.417	43.24	1.992	0.425	1.992	0.425
12	0	14.80	0.4	2.467	43.24	1.992	0.475	1.992	0.475
12	10	14.30	0.4	2.425	42.50	1.992	0.433	1.992	0.433
12	20	14.60	0.4	2.408	42.94	1.992	0.416	1.992	0.416
12	30	14.20	0.4	2.400	42.35	1.992	0.408	1.992	0.408
12	40	14.10	0.4	2.358	42.20	1.992	0.366	1.992	0.366
12	50	14.00	0.4	2.342	42.05	1.992	0.350	1.992	0.350
13	0	13.50	0.4	2.292	41.29	1.992	0.300	1.992	0.300
13	10	13.60	0.4	2.258	41.45	1.992	0.266	1.992	0.266
13	20	14.40	0.4	2.333	42.65	1.992	0.341	1.992	0.341
13	30	13.80	0.5	2.350	39.49	2.227	0.123	2.575	-0.225
14	40	13.10	0.5	2.242	38.47	2.227	0.015	2.575	-0.333
13	50	14.20	0.5	2.275	40.05	2.227	0.048	2.575	-0.300
14	0	14.10	0.5	2.358	39.91	2.227	0.131	2.575	-0.216
14	10	14.40	0.6	2.375	38.54	2.440	-0.065	3.175	-0.800
14	20	14.70	0.6	2.425	38.94	2.440	-0.015	3.175	-0.750
14	30	14.00	0.6	2.392	38.00	2.440	-0.048	3.175	-0.784
14	40	13.70	0.6	2.308	37.59	2.440	-0.131	3.175	-0.867
TOTAL		---	---	333.125	---	280.346	52.779	276.440	56.685
Average		13.88	0.39	2.313	42.450	84.16%	15.84%	82.98%	17.02%
MAX		17.60	0.60	2.875	47.394	2.440	0.883	3.175	1.127
MIN		11.30	0.30	1.917	36.897	1.725	-0.190	1.431	-0.925

	kg/cm2	m3/10 min		
Leakage at Night:	0.40	1.992	38.440	: 4:40 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	80	houses
persons/house	[B]	4.3	pesons/house
A * B	[C]	344	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	52.78	M3	56.68	M3
l/day/capita	D/C	153.43	l/d/c	164.78	l/d/c

No. 007
Area : Plymouth
Date : Jan. 3-4. 1990

$Qx = Qo \times (Hx/Ho)^{n}$

TIME hour	TIME min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	15 :05	15.01	2.0	---	29.1	---	---	---	---
	15 :15	15.97	2.0	2.582	30.0	1.069	1.513	0.622	1.960
	15 :25	16.10	2.1	2.673	29.8	1.096	1.577	0.658	2.014
	15 :35	15.81	1.8	2.659	30.7	1.014	1.645	0.551	2.108
	15 :45	16.07	1.9	2.657	30.5	1.042	1.614	0.587	2.070
	15 :55	16.60	1.8	2.723	31.4	1.014	1.708	0.551	2.171
16	16 :05	16.34	1.8	2.745	31.2	1.014	1.731	0.551	2.194
	16 :15	17.00	1.6	2.778	32.8	0.956	1.822	0.481	2.297
	16 :25	17.21	1.8	2.851	32.0	1.014	1.836	0.551	2.300
	16 :35	18.08	1.9	2.941	32.4	1.042	1.899	0.587	2.354
	16 :45	19.61	1.8	3.141	34.2	1.014	2.126	0.551	2.590
	16 :55	17.71	1.7	3.110	32.9	0.986	2.124	0.516	2.594
	17 :05	16.55	1.8	2.855	31.4	1.014	1.841	0.551	2.304
	17 :15	17.84	2.1	2.866	31.4	1.096	1.770	0.658	2.208
	17 :25	19.96	2.5	3.150	31.8	1.196	1.954	0.804	2.346
	17 :35	21.41	2.6	3.448	32.6	1.219	2.228	0.841	2.606
	17 :45	18.85	3.1	3.355	29.2	1.331	2.024	1.030	2.325
	17 :55	19.32	2.8	3.181	30.4	1.265	1.916	0.916	2.265
18	18 :05	18.27	2.1	3.133	31.7	1.096	2.037	0.658	2.474
	18 :15	17.21	2.0	2.957	31.2	1.069	1.887	0.622	2.334
	18 :25	17.55	2.4	2.897	30.1	1.171	1.725	0.767	2.129
	18 :35	20.38	2.4	3.161	32.4	1.171	1.989	0.767	2.393
	18 :45	18.08	2.8	3.205	29.4	1.265	1.940	0.916	2.289
	18 :55	18.80	3.2	3.073	29.0	1.353	1.721	1.068	2.005
	19 :05	17.47	3.2	3.023	27.9	1.353	1.670	1.068	1.954
	19 :15	17.37	3.0	2.903	28.3	1.310	1.594	0.992	1.911
	19 :25	17.00	3.0	2.864	28.0	1.310	1.555	0.992	1.872
	19 :35	16.15	3.4	2.763	26.5	1.394	1.368	1.145	1.617
	19 :45	15.30	3.6	2.621	25.4	1.435	1.186	1.223	1.398
	19 :55	15.17	3.9	2.539	24.8	1.493	1.046	1.341	1.198
20	20 :05	13.96	4.1	2.428	23.5	1.531	0.897	1.421	1.007
	20 :15	14.04	3.7	2.333	24.1	1.454	0.879	1.262	1.071
	20 :25	14.27	4.5	2.359	23.2	1.604	0.755	1.581	0.778
	20 :35	13.24	4.5	2.293	22.3	1.604	0.689	1.581	0.711
	20 :45	14.59	4.6	2.319	23.3	1.622	0.698	1.622	0.698
	20 :55	14.25	4.5	2.403	23.2	1.604	0.799	1.581	0.822
	21 :05	13.40	4.6	2.304	22.3	1.622	0.682	1.622	0.682
	21 :15	13.27	4.7	2.223	22.1	1.639	0.583	1.662	0.560
	21 :25	12.45	4.0	2.143	22.3	1.512	0.631	1.381	0.762
	21 :35	13.80	3.4	2.188	24.5	1.394	0.793	1.145	1.042
	21 :45	13.45	4.0	2.271	23.2	1.512	0.759	1.381	0.890
	21 :55	13.80	4.2	2.271	23.2	1.550	0.721	1.461	0.810
22	22 :05	11.02	4.4	2.068	20.5	1.586	0.482	1.541	0.527
	22 :15	12.21	4.5	1.936	21.4	1.604	0.332	1.581	0.355
	22 :25	12.90	4.6	2.093	21.9	1.622	0.471	1.622	0.471
	22 :35	11.55	4.7	2.038	20.6	1.639	0.398	1.662	0.375
	22 :45	12.71	4.6	2.022	21.8	1.622	0.400	1.622	0.400
	22 :55	11.50	4.7	2.018	20.6	1.639	0.378	1.662	0.355
	23 :05	11.02	4.4	1.877	20.5	1.586	0.291	1.541	0.336
	23 :15	10.65	4.5	1.806	20.0	1.604	0.202	1.581	0.225
	23 :25	11.02	4.7	1.806	20.2	1.639	0.167	1.662	0.144
	23 :35	11.18	4.7	1.850	20.3	1.639	0.211	1.662	0.188
	23 :45	10.55	4.6	1.811	19.8	1.622	0.189	1.622	0.189
	23 :55	10.81	4.6	1.780	20.1	1.622	0.158	1.622	0.158
0	0 :05	10.07	4.5	1.740	19.5	1.604	0.136	1.581	0.159
	0 :15	10.18	4.6	1.688	19.5	1.622	0.066	1.622	0.066

No. 007
Area : Plymouth
Date : Jan. 3-4. 1990

$Qx = Qo \times (Hx/Ho)^{n}$

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
0	:25	9.51	4.6	1.641	18.8	1.622	0.019	1.622	0.019
0	:35	9.88	4.6	1.616	19.2	1.622	-0.006	1.622	-0.006
0	:45	9.83	4.7	1.643	19.0	1.639	0.003	1.662	-0.020
0	:55	9.75	4.7	1.632	19.0	1.639	-0.008	1.662	-0.031
1	:05	9.80	4.8	1.629	18.9	1.657	-0.027	1.703	-0.074
1	:15	10.20	4.7	1.667	19.4	1.639	0.027	1.662	0.004
1	:25	9.73	4.7	1.661	18.9	1.639	0.022	1.662	-0.001
1	:35	9.73	4.6	1.622	19.0	1.622	0.000	1.622	0.000
1	:45	9.99	4.6	1.643	19.3	1.622	0.022	1.622	0.022
1	:55	9.86	4.5	1.654	19.3	1.604	0.050	1.581	0.073
2	2 :05	10.10	4.6	1.663	19.4	1.622	0.042	1.622	0.042
2	:15	10.28	4.8	1.698	19.4	1.657	0.042	1.703	-0.005
2	:25	10.04	4.6	1.693	19.3	1.622	0.072	1.622	0.072
2	:35	9.67	4.6	1.643	19.0	1.622	0.021	1.622	0.021
2	:45	9.59	4.5	1.605	19.0	1.604	0.001	1.581	0.024
2	:55	9.96	4.5	1.629	19.4	1.604	0.025	1.581	0.048
3	:05	9.57	4.7	1.628	18.8	1.639	-0.012	1.662	-0.035
3	:15	10.20	4.6	1.648	19.5	1.622	0.026	1.622	0.026
3	:25	9.91	4.6	1.676	19.2	1.622	0.054	1.622	0.054
3	:35	10.47	4.5	1.698	19.9	1.604	0.094	1.581	0.117
3	:45	9.94	4.7	1.701	19.1	1.639	0.062	1.662	0.039
3	:55	9.78	4.7	1.643	19.0	1.639	0.004	1.662	-0.019
4	4 :05	10.41	4.6	1.683	19.7	1.622	0.061	1.622	0.061
4	:15	9.83	4.6	1.687	19.1	1.622	0.065	1.622	0.065
4	:25	10.25	4.0	1.673	20.2	1.512	0.161	1.381	0.292
4	:35	9.65	3.8	1.658	19.9	1.474	0.184	1.302	0.357
4	:45	10.02	3.6	1.639	20.5	1.435	0.205	1.223	0.416
4	:55	8.24	3.6	1.522	18.6	1.435	0.087	1.223	0.298
5	:05	7.82	3.9	1.338	17.8	1.493	-0.155	1.341	-0.003
5	:15	7.80	3.7	1.302	18.0	1.454	-0.153	1.262	0.039
5	:25	8.14	3.9	1.328	18.1	1.493	-0.165	1.341	-0.013
5	:35	9.80	3.9	1.495	19.9	1.493	0.002	1.341	0.154
5	:45	9.17	3.6	1.581	19.6	1.435	0.146	1.223	0.358
5	:55	10.73	3.0	1.658	22.2	1.310	0.349	0.992	0.666
6	6 :05	11.15	2.5	1.823	23.7	1.196	0.628	0.804	1.019
6	:15	13.64	1.6	2.066	29.4	0.956	1.109	0.481	1.584
6	:25	16.15	1.5	2.483	32.5	0.926	1.556	0.447	2.036
6	:35	15.91	1.3	2.672	33.4	0.862	1.810	0.379	2.293
6	:45	15.94	1.1	2.654	34.8	0.793	1.861	0.313	2.341
6	:55	18.00	1.1	2.828	37.0	0.793	2.035	0.313	2.515
7	:05	16.63	1.0	2.886	36.4	0.756	2.130	0.280	2.605
7	:15	16.73	0.8	2.780	38.7	0.676	2.104	0.217	2.563
7	:25	17.16	0.8	2.824	39.1	0.676	2.148	0.217	2.607
7	:35	16.42	0.8	2.798	38.3	0.676	2.122	0.217	2.581
7	:45	16.26	1.0	2.723	36.0	0.756	1.967	0.280	2.443
7	:55	16.86	1.1	2.760	35.8	0.793	1.967	0.313	2.447
8	8 :05	17.50	1.1	2.863	36.5	0.793	2.070	0.313	2.550
8	:15	16.31	1.2	2.818	34.5	0.828	1.989	0.346	2.472
8	:25	15.28	1.2	2.633	33.4	0.828	1.804	0.346	2.287
8	:35	17.13	1.2	2.701	35.3	0.828	1.873	0.346	2.355
8	:45	16.42	1.0	2.796	36.2	0.756	2.040	0.280	2.515
8	:55	18.05	1.0	2.873	38.0	0.756	2.116	0.280	2.592
9	:05	17.31	1.1	2.947	36.3	0.793	2.154	0.313	2.634
9	:15	16.12	1.0	2.786	35.9	0.756	2.030	0.280	2.505
9	:25	16.55	1.0	2.723	36.4	0.756	1.966	0.280	2.442
9	:35	16.44	1.2	2.749	34.6	0.828	1.921	0.346	2.403

No. 007

Area : Plymouth

Date : Jan. 3-4. 1990

$Qx = Qo \times (Hx/Ho)^n$

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
9	:45	17.42	1.2	2.822	35.6	0.828	1.993	0.346	2.476
9	:55	15.99	1.2	2.784	34.1	0.828	1.956	0.346	2.438
10	10 :05	18.13	1.3	2.843	35.6	0.862	1.981	0.379	2.464
10	:15	16.10	1.3	2.853	33.6	0.862	1.990	0.379	2.473
10	:25	19.32	1.0	2.952	39.3	0.756	2.196	0.280	2.671
10	:35	19.38	1.0	3.225	39.3	0.756	2.469	0.280	2.945
10	:45	18.05	1.2	3.119	36.3	0.828	2.291	0.346	2.773
10	:55	16.42	1.1	2.873	35.4	0.793	2.079	0.313	2.560
11	:05	15.30	1.0	2.643	35.0	0.756	1.887	0.280	2.363
11	:15	14.96	1.0	2.522	34.6	0.756	1.766	0.280	2.241
11	:25	14.99	1.1	2.496	33.8	0.793	1.703	0.313	2.183
11	:35	16.34	1.1	2.611	35.3	0.793	1.818	0.313	2.298
11	:45	15.20	1.2	2.628	33.3	0.828	1.800	0.346	2.283
11	:55	15.46	1.2	2.555	33.6	0.828	1.727	0.346	2.209
12	12 :05	16.71	1.2	2.681	34.9	0.828	1.853	0.346	2.335
12	:15	19.01	1.3	2.977	36.5	0.862	2.115	0.379	2.598
12	:25	16.42	1.6	2.953	32.2	0.956	1.996	0.481	2.471
12	:35	16.49	1.9	2.743	30.9	1.042	1.700	0.587	2.156
12	:45	16.34	2.1	2.736	30.0	1.096	1.640	0.658	2.078
12	:55	15.52	2.0	2.655	29.6	1.069	1.586	0.622	2.033
13	:05	16.26	2.0	2.648	30.3	1.069	1.579	0.622	2.026
13	:15	15.60	2.2	2.655	29.0	1.121	1.534	0.694	1.961
13	:25	16.07	2.5	2.639	28.5	1.196	1.444	0.804	1.835
13	:35	15.70	2.3	2.648	28.8	1.147	1.501	0.731	1.917
13	:45	15.52	2.5	2.602	28.0	1.196	1.406	0.804	1.797
13	:55	16.84	2.7	2.697	28.6	1.242	1.454	0.879	1.818
14	14 :05	15.04	2.4	2.657	27.8	1.171	1.485	0.767	1.889
14	:15	15.52	2.0	2.547	29.6	1.069	1.477	0.622	1.924
14	:25	15.41	2.1	2.578	29.1	1.096	1.482	0.658	1.919
14	:35	16.68	2.1	2.674	30.3	1.096	1.578	0.658	2.016
14	:45	15.12	2.4	2.650	27.9	1.171	1.479	0.767	1.883
14	:55	15.46	2.7	2.548	27.4	1.242	1.306	0.879	1.670
15	:05	17.18	2.4	2.720	29.8	1.171	1.549	0.767	1.953
TOTAL		---	---	342.924	---	178.571	164.353	139.358	203.566
Average		14.30	2.88	2.381	27.3	52.07%	47.93%	40.64%	59.36%
MAX		21.41	4.80	3.448	39.3	1.657	2.469	1.703	2.945
MIN		7.80	0.80	1.302	17.8	0.676	-0.165	0.217	-0.074

	kg/cm2	m3/10 min		
Leakage at Night:	4.60	1.622	19.037	: 1:35 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	280	houses
persons/house	[B]	4.7	pesons/house
A * B	[C]	1316	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	164.35	M3	203.57	M3
l/day/capita	D/C	124.89	l/d/c	154.69	l/d/c

No. 008

Area : ARIMA (NETTOVILE)

Date : Jan. 9-10. 1990

Qx = Qo x (Hx/Ho)^n

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	11	20	6.00	2.1	---	18.19	---	---	---	---
	11	30	5.15	1.9	0.929	17.28	0.517	0.412	0.411	0.518
	11	40	4.23	1.9	0.782	15.66	0.517	0.265	0.411	0.370
	11	50	6.95	1.8	0.932	20.34	0.503	0.429	0.386	0.545
12	12	0	5.83	2.0	1.065	18.15	0.530	0.535	0.436	0.629
	12	10	3.66	2.2	0.791	14.04	0.556	0.235	0.487	0.304
	12	20	4.06	2.1	0.643	14.96	0.543	0.100	0.461	0.182
	12	30	3.28	2.2	0.612	13.29	0.556	0.056	0.487	0.125
	12	40	5.35	2.2	0.719	16.98	0.556	0.163	0.487	0.232
	12	50	4.57	2.3	0.827	15.52	0.569	0.258	0.512	0.314
	13	0	3.52	2.1	0.674	13.93	0.543	0.131	0.461	0.213
	13	10	4.54	2.2	0.672	15.64	0.556	0.116	0.487	0.185
	13	20	4.81	2.2	0.779	16.10	0.556	0.223	0.487	0.292
	13	30	5.18	2.3	0.833	16.52	0.569	0.264	0.512	0.320
	13	40	5.69	2.2	0.906	17.51	0.556	0.350	0.487	0.419
	13	50	5.35	2.1	0.920	17.17	0.543	0.377	0.461	0.459
14	14	0	6.68	2.1	1.003	19.19	0.543	0.459	0.461	0.541
	14	10	5.35	2.1	1.003	17.17	0.543	0.459	0.461	0.541
	14	20	6.17	2.0	0.960	18.67	0.530	0.430	0.436	0.524
	14	30	5.35	2.2	0.960	16.98	0.556	0.404	0.487	0.473
	14	40	6.00	2.2	0.946	17.98	0.556	0.390	0.487	0.459
	14	50	6.57	2.3	1.048	18.60	0.569	0.479	0.512	0.535
	15	0	5.66	2.4	1.019	17.03	0.584	0.435	0.546	0.473
	15	10	5.76	2.3	0.952	17.42	0.569	0.383	0.512	0.439
	15	20	4.27	2.3	0.836	15.00	0.569	0.267	0.512	0.324
	15	30	4.88	2.4	0.763	15.86	0.581	0.182	0.538	0.225
	15	40	4.44	2.3	0.777	15.29	0.569	0.208	0.512	0.264
	15	50	6.03	2.3	0.873	17.82	0.569	0.304	0.512	0.360
16	16	0	6.00	2.3	1.003	17.78	0.569	0.434	0.512	0.490
	16	10	6.61	2.3	1.051	18.66	0.569	0.482	0.512	0.539
	16	20	5.32	2.2	0.994	16.93	0.556	0.438	0.487	0.507
	16	30	6.64	2.1	0.997	19.13	0.543	0.453	0.461	0.535
	16	40	5.42	2.1	1.005	17.29	0.543	0.462	0.461	0.544
	16	50	6.44	2.0	0.988	19.07	0.530	0.458	0.436	0.552
	17	0	4.37	2.1	0.901	15.52	0.543	0.358	0.461	0.439
	17	10	5.08	2.3	0.788	16.36	0.569	0.219	0.512	0.275
	17	20	4.20	2.2	0.773	15.04	0.556	0.217	0.487	0.287
	17	30	4.44	2.3	0.720	15.29	0.569	0.151	0.512	0.208
	17	40	4.61	2.2	0.754	15.76	0.556	0.198	0.487	0.267
	17	50	4.61	2.4	0.768	15.42	0.581	0.188	0.538	0.230
18	18	0	7.46	2.2	1.006	20.04	0.556	0.450	0.487	0.519
	18	10	5.05	2.4	1.043	16.14	0.581	0.462	0.538	0.505
	18	20	4.98	2.2	0.836	16.38	0.556	0.280	0.487	0.349
	18	30	3.59	2.3	0.714	13.75	0.569	0.146	0.512	0.202
	18	40	6.61	2.5	0.850	18.27	0.593	0.257	0.564	0.286
	18	50	5.73	2.7	1.028	16.69	0.616	0.412	0.616	0.412
	19	0	5.64	2.8	0.948	16.41	0.627	0.320	0.642	0.305
	19	10	7.63	3.0	1.106	18.76	0.649	0.457	0.695	0.410
	19	20	9.49	2.9	1.427	21.10	0.638	0.788	0.669	0.758
	19	30	10.85	2.9	1.695	22.56	0.638	1.057	0.669	1.026
	19	40	10.10	3.2	1.746	21.24	0.671	1.075	0.749	0.997
	19	50	9.66	3.1	1.647	20.94	0.660	0.987	0.722	0.925
20	20	0	7.46	2.6	1.427	19.22	0.604	0.822	0.590	0.837
	20	10	10.17	2.1	1.469	23.68	0.543	0.926	0.461	1.008
	20	20	4.78	2.1	1.246	16.23	0.543	0.703	0.461	0.784
	20	30	8.13	2.3	1.076	20.69	0.569	0.507	0.512	0.564

No. 008

Area : ARIMA (NETTOVILE)

Date : Jan. 9-10. 1990

$Qx = Qo \times (Hx/Ho)^{n}$

TIME hour	TIME min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
20	40	6.78	2.3	1.243	18.90	0.569	0.674	0.512	0.730
20	50	8.30	2.4	1.257	20.69	0.581	0.676	0.538	0.719
21	0	7.97	2.4	1.356	20.27	0.581	0.775	0.538	0.818
21	10	8.03	2.5	1.333	20.14	0.593	0.741	0.564	0.770
21	20	8.37	2.5	1.367	20.56	0.593	0.774	0.564	0.803
21	30	8.85	2.8	1.435	20.56	0.627	0.808	0.642	0.793
21	40	8.30	2.8	1.429	19.91	0.627	0.802	0.642	0.787
21	50	7.66	2.8	1.330	19.12	0.627	0.703	0.642	0.688
22	0	8.03	2.8	1.308	19.58	0.627	0.680	0.642	0.665
22	10	8.68	2.8	1.393	20.36	0.627	0.765	0.642	0.750
22	20	9.29	3.0	1.498	20.70	0.649	0.848	0.695	0.802
22	30	7.66	2.9	1.413	18.96	0.638	0.774	0.669	0.744
22	40	8.17	2.9	1.319	19.58	0.638	0.681	0.669	0.650
22	50	8.47	2.8	1.387	20.11	0.627	0.759	0.642	0.744
23	0	8.75	2.7	1.435	20.63	0.616	0.819	0.616	0.819
23	10	5.83	2.7	1.215	16.84	0.616	0.599	0.616	0.599
23	20	5.12	2.7	0.913	15.78	0.616	0.297	0.616	0.297
23	30	4.47	2.7	0.799	14.74	0.616	0.183	0.616	0.183
23	40	3.90	2.7	0.698	13.77	0.616	0.082	0.616	0.082
23	50	3.49	2.7	0.616	13.03	0.616	-0.000	0.616	-0.000
0	0	4.13	2.7	0.635	14.17	0.616	0.019	0.616	0.019
0	10	4.47	2.8	0.717	14.61	0.627	0.089	0.642	0.074
0	20	4.30	2.8	0.731	14.33	0.627	0.104	0.642	0.089
0	30	3.93	2.8	0.686	13.70	0.627	0.059	0.642	0.044
0	40	4.00	2.8	0.661	13.82	0.627	0.034	0.642	0.019
0	50	3.93	2.8	0.661	13.70	0.627	0.034	0.642	0.019
1	0	4.37	2.8	0.692	14.44	0.627	0.064	0.642	0.049
1	10	4.13	2.8	0.708	14.04	0.627	0.081	0.642	0.066
1	20	4.13	2.8	0.688	14.04	0.627	0.061	0.642	0.046
1	30	3.86	2.8	0.666	13.58	0.627	0.039	0.642	0.024
1	40	4.34	2.8	0.683	14.39	0.627	0.056	0.642	0.041
1	50	4.17	3.0	0.709	13.87	0.649	0.060	0.695	0.014
2	0	4.03	2.9	0.683	13.75	0.638	0.045	0.669	0.015
2	10	4.34	2.8	0.698	14.39	0.627	0.070	0.642	0.055
2	20	3.79	2.8	0.678	13.45	0.627	0.050	0.642	0.035
2	30	4.17	2.8	0.663	14.11	0.627	0.036	0.642	0.021
2	40	4.13	2.8	0.692	14.04	0.627	0.064	0.642	0.049
2	50	4.54	2.8	0.723	14.72	0.627	0.095	0.642	0.080
3	0	4.74	2.8	0.773	15.04	0.627	0.146	0.642	0.131
3	10	4.54	2.8	0.773	14.72	0.627	0.146	0.642	0.131
3	20	4.61	2.8	0.763	14.84	0.627	0.135	0.642	0.120
3	30	4.37	2.8	0.748	14.44	0.627	0.121	0.642	0.106
3	40	4.30	2.8	0.723	14.33	0.627	0.095	0.642	0.080
3	50	4.27	2.8	0.714	14.28	0.627	0.087	0.642	0.072
4	0	4.13	2.8	0.700	14.04	0.627	0.073	0.642	0.058
4	10	4.17	3.0	0.692	13.87	0.649	0.042	0.695	-0.004
4	20	4.03	3.0	0.683	13.63	0.649	0.034	0.695	-0.012
4	30	4.81	3.0	0.737	14.89	0.649	0.087	0.695	0.041
4	40	6.03	2.8	0.903	16.97	0.627	0.276	0.642	0.261
4	50	4.71	2.9	0.895	14.86	0.638	0.257	0.669	0.226
5	0	4.64	2.9	0.779	14.75	0.638	0.141	0.669	0.110
5	10	5.42	2.8	0.838	16.09	0.627	0.211	0.642	0.196
5	20	2.10	2.8	0.627	10.01	0.627	-0.001	0.642	-0.016
5	30	4.54	2.7	0.553	14.86	0.616	-0.063	0.616	-0.063
5	40	1.52	2.6	0.505	8.68	0.604	-0.099	0.590	-0.085
5	50	2.67	2.3	0.349	11.86	0.569	-0.219	0.512	-0.163

No. 008

Area : ARIMA (NETTOVILE)

Date : Jan. 9-10. 1990

$Qx = Qo \times (Hx/Ho)^{n}$

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
6	6	0	2.00	2.2	0.389	10.38	0.556	-0.167	0.487	-0.098
	6	10	3.08	2.0	0.423	13.19	0.530	-0.107	0.436	-0.013
	6	20	3.01	1.9	0.508	13.21	0.517	-0.009	0.411	0.096
	6	30	5.73	1.8	0.728	18.47	0.503	0.225	0.386	0.342
	6	40	7.29	1.7	1.085	21.13	0.489	0.596	0.362	0.723
	6	50	6.74	1.6	1.169	20.63	0.474	0.695	0.337	0.832
	7	0	5.35	1.6	1.008	18.38	0.474	0.533	0.337	0.670
	7	10	6.78	1.7	1.011	20.38	0.489	0.522	0.362	0.649
	7	20	7.93	1.6	1.226	22.38	0.474	0.752	0.337	0.888
	7	30	6.00	1.7	1.161	19.17	0.489	0.672	0.362	0.799
	7	40	7.32	1.7	1.110	21.18	0.489	0.621	0.362	0.748
	7	50	6.07	1.7	1.116	19.29	0.489	0.627	0.362	0.754
8	8	0	6.40	1.7	1.039	19.80	0.489	0.550	0.362	0.677
	8	10	4.71	1.8	0.926	16.75	0.503	0.423	0.386	0.539
	8	20	5.15	1.9	0.822	17.28	0.517	0.305	0.411	0.410
	8	30	5.49	1.9	0.887	17.84	0.517	0.370	0.411	0.475
	8	40	3.83	1.8	0.777	15.14	0.500	0.277	0.382	0.395
	8	50	6.88	1.8	0.893	20.24	0.503	0.390	0.386	0.506
	9	0	5.66	2.0	1.045	17.88	0.530	0.515	0.436	0.609
	9	10	6.51	1.9	1.014	19.42	0.517	0.497	0.411	0.603
	9	20	6.07	1.9	1.048	18.76	0.517	0.532	0.411	0.637
	9	30	7.42	1.9	1.124	20.74	0.517	0.607	0.411	0.713
	9	40	7.02	1.3	1.203	22.18	0.427	0.776	0.266	0.938
	9	50	8.51	1.9	1.294	22.21	0.517	0.777	0.411	0.883
10	10	0	16.07	2.0	2.048	30.13	0.530	1.518	0.436	1.612
	10	10	8.37	2.0	2.037	21.74	0.530	1.506	0.436	1.600
	10	20	7.63	2.1	1.333	20.51	0.543	0.790	0.461	0.872
	10	30	6.03	2.2	1.138	18.02	0.556	0.582	0.487	0.652
	10	40	8.13	1.5	1.180	23.03	0.459	0.721	0.313	0.867
	10	50	6.07	2.1	1.183	18.29	0.543	0.640	0.461	0.722
	11	0	17.46	3.0	1.961	28.38	0.649	1.312	0.695	1.265
	11	10	7.02	2.1	2.040	19.67	0.543	1.497	0.461	1.579
	11	20	7.08	2.1	1.175	19.76	0.543	0.632	0.461	0.714
TOTAL			---	---	140.192	---	83.028	57.163	77.113	63.078
Average			5.85	2.38	0.974	17.219	59.22%	40.78%	55.01%	44.99%
MAX			17.46	3.20	2.048	30.129	0.671	1.518	0.749	1.612
MIN			1.52	1.30	0.349	8.678	0.427	-0.219	0.266	-0.163

	kg/cm2	m3/10 min		
Leakage at Night:	2.70	0.616	13.030	: 23:50 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	91	houses
persons/house	[B]	4.4	pesons/house
A * B	[C]	400.4	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	57.16	M3	63.08	M3
l/day/capita	D/C	142.77	l/d/c	157.54	l/d/c

No. 009

Area : ARIMA (TUMPUNA)

Date : Jan. 9-10. 1990

Qx = Qo x (Hx/Ho)^n

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
14	14	0	30.25	3.4	---	36.20	---	---	---	---
	14	10	26.48	3.3	4.728	34.12	0.564	4.164	0.482	4.246
	14	20	23.36	3.2	4.153	32.30	0.555	3.598	0.465	3.688
	14	30	25.26	3.1	4.052	33.85	0.546	3.505	0.448	3.603
	14	40	20.58	3.1	3.820	30.56	0.546	3.274	0.448	3.372
	14	50	24.69	3.2	3.773	33.21	0.555	3.217	0.465	3.307
	15	0	26.48	3.3	4.264	34.12	0.564	3.701	0.482	3.782
	15	10	21.73	3.3	4.018	30.91	0.564	3.454	0.482	3.536
	15	20	22.96	3.4	3.724	31.54	0.572	3.152	0.499	3.226
	15	30	24.75	3.5	3.976	32.51	0.580	3.395	0.516	3.460
	15	40	21.73	3.2	3.873	31.15	0.555	3.318	0.465	3.408
	15	50	16.51	3.5	3.187	26.55	0.580	2.606	0.516	2.671
16	16	0	21.56	3.7	3.173	29.92	0.597	2.576	0.550	2.623
	16	10	18.31	3.2	3.323	28.60	0.555	2.767	0.465	2.857
	16	20	14.92	3.5	2.769	25.24	0.580	2.189	0.516	2.254
	16	30	14.75	3.0	2.473	26.08	0.537	1.935	0.432	2.041
	16	40	16.04	2.8	2.566	27.67	0.519	2.047	0.399	2.167
	16	50	14.71	2.6	2.563	27.00	0.500	2.062	0.366	2.196
	17	0	14.99	1.2	2.475	33.06	0.340	2.135	0.151	2.324
	17	10	15.43	1.0	2.535	35.11	0.310	2.225	0.122	2.413
	17	20	16.78	0.8	2.684	38.71	0.278	2.407	0.094	2.590
	17	30	15.09	1.3	2.656	32.52	0.354	2.302	0.165	2.491
	17	40	16.78	1.1	2.656	35.75	0.325	2.330	0.136	2.520
	17	50	10.37	1.0	2.263	28.78	0.310	1.952	0.122	2.140
18	18	0	8.20	1.2	1.548	24.45	0.340	1.208	0.151	1.397
	18	10	11.02	2.0	1.602	24.95	0.439	1.163	0.271	1.331
	18	20	9.08	1.3	1.675	25.22	0.354	1.321	0.165	1.510
	18	30	13.12	1.9	1.850	27.58	0.428	1.422	0.255	1.595
	18	40	11.56	2.1	2.057	25.24	0.450	1.607	0.287	1.770
	18	50	9.93	2.1	1.791	23.40	0.450	1.341	0.287	1.504
	19	0	9.46	2.1	1.616	22.84	0.450	1.166	0.287	1.329
	19	10	8.81	2.1	1.523	22.04	0.450	1.073	0.287	1.236
	19	20	10.14	2.2	1.579	23.37	0.460	1.119	0.302	1.277
	19	30	14.21	2.4	2.029	27.07	0.481	1.549	0.334	1.695
	19	40	13.36	2.1	2.298	27.14	0.450	1.848	0.287	2.011
	19	50	9.66	2.3	1.918	22.56	0.471	1.448	0.318	1.600
20	20	0	11.36	2.4	1.752	24.20	0.481	1.271	0.334	1.418
	20	10	8.00	2.3	1.613	20.53	0.471	1.143	0.318	1.295
	20	20	6.20	2.5	1.183	17.70	0.491	0.693	0.350	0.833
	20	30	8.34	2.7	1.212	20.14	0.510	0.702	0.383	0.829
	20	40	12.07	2.8	1.701	24.01	0.519	1.182	0.399	1.302
	20	50	8.85	2.7	1.743	20.74	0.510	1.234	0.383	1.361
	21	0	10.68	1.8	1.628	25.22	0.416	1.211	0.240	1.388
	21	10	7.46	2.4	1.512	19.61	0.481	1.031	0.334	1.178
	21	20	5.18	2.8	1.053	15.73	0.519	0.534	0.399	0.654
	21	30	6.61	3.3	0.983	17.05	0.564	0.419	0.482	0.501
	21	40	6.40	2.4	1.084	18.17	0.481	0.604	0.334	0.750
	21	50	6.57	2.4	1.081	18.41	0.481	0.600	0.334	0.747
22	22	0	7.22	2.3	1.149	19.50	0.471	0.679	0.318	0.831
	22	10	6.03	3.7	1.104	15.83	0.597	0.507	0.550	0.555
	22	20	7.29	3.8	1.110	17.28	0.605	0.505	0.567	0.543
	22	30	5.18	3.8	1.039	14.57	0.605	0.434	0.567	0.472
	22	40	4.68	3.8	0.822	13.85	0.605	0.217	0.567	0.255
	22	50	4.23	3.9	0.743	13.08	0.613	0.130	0.584	0.159
	23	0	4.44	4.0	0.723	13.32	0.621	0.102	0.601	0.121
	23	10	3.90	4.0	0.695	12.48	0.621	0.074	0.601	0.094

No. 009
Area : ARIMA (TUMPUNA)
Date : Jan. 9-10. 1990

Qx = Qo x (Hx/Ho)^n

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	23	20	3.86	4.0	0.647	12.42	0.621	0.026	0.601	0.046
	23	30	4.61	4.0	0.706	13.57	0.621	0.085	0.601	0.105
	23	40	4.06	4.0	0.723	12.73	0.621	0.102	0.601	0.121
	23	50	5.83	4.3	0.824	14.99	0.643	0.181	0.653	0.171
0	0	0	4.71	4.0	0.878	13.72	0.621	0.258	0.601	0.277
	0	10	4.03	4.1	0.728	12.61	0.628	0.100	0.618	0.110
	0	20	4.20	4.2	0.686	12.80	0.636	0.050	0.636	0.050
	0	30	4.98	4.2	0.765	13.93	0.636	0.129	0.636	0.129
	0	40	4.51	4.2	0.791	13.26	0.636	0.155	0.636	0.155
	0	50	4.00	4.2	0.709	12.49	0.636	0.073	0.636	0.073
	1	0	4.20	4.2	0.683	12.80	0.636	0.047	0.636	0.047
	1	10	4.10	4.2	0.692	12.64	0.636	0.056	0.636	0.056
	1	20	4.03	4.3	0.678	12.46	0.643	0.034	0.653	0.024
	1	30	3.76	4.2	0.649	12.11	0.636	0.013	0.636	0.013
	1	40	4.06	4.2	0.652	12.58	0.636	0.016	0.636	0.016
	1	50	4.03	4.2	0.674	12.53	0.636	0.038	0.636	0.038
2	2	0	3.90	4.2	0.661	12.33	0.636	0.025	0.636	0.025
	2	10	3.73	4.2	0.636	12.06	0.636	0.000	0.636	0.000
	2	20	4.27	4.3	0.667	12.83	0.643	0.023	0.653	0.013
	2	30	4.44	4.2	0.726	13.16	0.636	0.090	0.636	0.090
	2	40	4.00	4.2	0.703	12.49	0.636	0.068	0.636	0.068
	2	50	4.03	4.4	0.669	12.39	0.651	0.018	0.671	-0.002
	3	0	4.13	4.3	0.680	12.61	0.643	0.037	0.653	0.027
	3	10	4.10	4.3	0.686	12.57	0.643	0.042	0.653	0.033
	3	20	4.98	4.2	0.757	13.93	0.636	0.121	0.636	0.121
	3	30	4.03	4.2	0.751	12.53	0.636	0.115	0.636	0.115
	3	40	4.27	4.2	0.692	12.90	0.636	0.056	0.636	0.056
	3	50	4.06	4.2	0.694	12.58	0.636	0.058	0.636	0.058
4	4	0	4.13	4.2	0.683	12.69	0.636	0.047	0.636	0.047
	4	10	4.13	4.2	0.688	12.69	0.636	0.052	0.636	0.052
	4	20	4.20	4.2	0.694	12.80	0.636	0.058	0.636	0.058
	4	30	3.45	4.2	0.638	11.60	0.636	0.002	0.636	0.002
	4	40	4.64	4.2	0.674	13.45	0.636	0.038	0.636	0.038
	4	50	3.86	3.4	0.708	12.93	0.572	0.136	0.499	0.210
	5	0	4.00	3.8	0.655	12.80	0.605	0.050	0.567	0.088
	5	10	6.07	3.7	0.839	15.88	0.597	0.242	0.550	0.290
	5	20	7.46	3.2	1.128	18.25	0.555	0.572	0.465	0.662
	5	30	7.32	3.0	1.232	18.37	0.537	0.694	0.432	0.800
	5	40	5.73	3.0	1.088	16.26	0.537	0.550	0.432	0.656
	5	50	8.30	3.0	1.169	19.57	0.537	0.632	0.432	0.737
6	6	0	5.25	3.0	1.129	15.56	0.537	0.592	0.432	0.697
	6	10	7.39	2.4	1.053	19.52	0.481	0.573	0.334	0.719
	6	20	10.37	2.7	1.480	22.45	0.510	0.970	0.383	1.097
	6	30	13.46	2.7	1.986	25.58	0.510	1.476	0.383	1.603
	6	40	13.97	2.1	2.286	27.75	0.450	1.836	0.287	1.999
	6	50	10.61	2.1	2.048	24.18	0.450	1.599	0.287	1.762
	7	0	12.71	2.2	1.943	26.16	0.460	1.483	0.302	1.641
	7	10	12.54	2.1	2.104	26.29	0.450	1.655	0.287	1.818
	7	20	14.27	1.9	2.234	28.76	0.428	1.807	0.255	1.979
	7	30	11.80	1.8	2.173	26.51	0.416	1.756	0.240	1.933
	7	40	14.27	1.6	2.173	30.02	0.392	1.780	0.210	1.963
	7	50	13.39	1.7	2.305	28.64	0.405	1.900	0.225	2.080
8	8	0	13.80	1.7	2.266	29.08	0.405	1.861	0.225	2.041
	8	10	13.59	1.7	2.283	28.86	0.405	1.878	0.225	2.058
	8	20	15.46	1.7	2.421	30.78	0.405	2.016	0.225	2.196
	8	30	17.87	1.7	2.778	33.09	0.405	2.373	0.225	2.553

No. 009

Area : ARIMA (TUMPUNA)

Date : Jan. 9-10. 1990

$Qx = Qo \times (Hx/Ho)^{n}$

TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
8	40	13.66	1.0	2.628	33.03	0.310	2.317	0.122	2.505
8	50	12.17	1.5	2.153	28.17	0.380	1.773	0.195	1.958
9	0	12.54	1.4	2.059	29.10	0.367	1.692	0.180	1.879
9	10	11.36	1.7	1.992	26.38	0.405	1.587	0.225	1.767
9	20	9.39	1.9	1.729	23.33	0.428	1.302	0.255	1.474
9	30	9.86	2.2	1.604	23.04	0.460	1.144	0.302	1.302
9	40	10.75	2.6	1.718	23.08	0.500	1.217	0.366	1.351
9	50	12.07	2.6	1.902	24.45	0.500	1.401	0.366	1.535
10	0	11.76	2.5	1.986	24.38	0.491	1.495	0.350	1.636
10	10	6.98	2.7	1.562	18.42	0.510	1.052	0.383	1.179
10	20	10.14	2.6	1.427	22.41	0.500	0.926	0.366	1.060
10	30	7.56	2.7	1.475	19.17	0.510	0.965	0.383	1.092
10	40	5.69	2.7	1.104	16.63	0.510	0.594	0.383	0.722
10	50	6.51	2.6	1.017	17.96	0.500	0.516	0.366	0.650
11	0	8.41	2.7	1.243	20.22	0.510	0.734	0.383	0.861
11	10	7.32	2.2	1.311	19.86	0.460	0.851	0.302	1.009
11	20	8.34	2.8	1.305	19.95	0.519	0.786	0.399	0.906
11	30	8.44	2.8	1.398	20.07	0.519	0.879	0.399	0.999
11	40	10.37	2.9	1.568	22.06	0.528	1.039	0.415	1.152
11	50	5.42	2.9	1.316	15.95	0.528	0.787	0.415	0.901
12	0	5.25	2.8	0.889	15.83	0.519	0.370	0.399	0.490
12	10	6.78	2.9	1.003	17.83	0.528	0.474	0.415	0.587
12	20	6.37	3.0	1.096	17.14	0.537	0.558	0.432	0.664
12	30	6.17	3.0	1.045	16.87	0.537	0.508	0.432	0.613
12	40	7.18	3.1	1.113	18.05	0.546	0.566	0.448	0.664
12	50	5.05	3.3	1.019	14.90	0.564	0.456	0.482	0.537
13	0	8.17	3.4	1.102	18.81	0.572	0.530	0.499	0.603
13	10	9.22	3.5	1.449	19.84	0.580	0.869	0.516	0.934
13	20	5.86	3.5	1.257	15.82	0.580	0.676	0.516	0.741
13	30	5.08	3.2	0.912	15.06	0.555	0.357	0.465	0.447
13	40	6.30	3.3	0.948	16.64	0.564	0.385	0.482	0.466
13	50	5.96	3.3	1.022	16.19	0.564	0.458	0.482	0.540
14	0	7.66	3.4	1.135	18.22	0.572	0.563	0.499	0.636
TOTAL		---	---	230.256	---	75.931	154.325	62.122	168.133
Average		9.66	2.98	1.599	20.875	32.98%	67.02%	26.98%	73.02%
MAX		30.25	4.40	4.728	38.714	0.651	4.164	0.671	4.246
MIN		3.45	0.80	0.636	11.597	0.278	0.000	0.094	-0.002

	kg/cm2	m3/10 min		
Leakage at Night:	4.20	0.636	12.06	: 2:10 a.m.
Estimated night demand :		0.000		

Nos. of house	[A]	102	houses
persons/house	[B]	4.4	pesons/house
A * B	[C]	448.8	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	154.32	M3	168.13	M3
l/day/capita	D/C	343.86	l/d/c	374.63	l/d/c

No. 011

Area : RANGE PARK. CHAGUANAS

Date : Jan. 24-25. 1990

$Qx = Qo \times (Hx/Ho)^{n}$

	TIME		METERED Q	METERED PRESSURE	Qtotal	Leak hole	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak	Demand	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak	Demand
	hour	min	(m3/h)	(kg/cm2)	m3	d(mm)	QA1(m3)	QA2(m3)	QB1(m3)	QB2(m3)
	10	:30	7.66	1.6	---	22.00	---	---	---	---
	10	:40	7.76	1.6	1.285	22.14	0.683	0.602	0.498	0.787
	10	:50	7.86	1.6	1.302	22.28	0.683	0.619	0.498	0.803
	11	:00	7.86	0.8	1.310	26.50	0.483	0.827	0.225	1.085
	11	:10	7.49	1.5	1.279	22.10	0.661	0.618	0.463	0.817
	11	:20	7.29	2.4	1.232	19.39	0.837	0.395	0.794	0.437
	11	:30	4.57	1.7	0.988	16.73	0.704	0.284	0.534	0.454
	11	:40	5.32	1.7	0.824	18.05	0.704	0.120	0.534	0.290
	11	:50	5.49	1.2	0.901	20.01	0.592	0.309	0.358	0.543
12	12	:00	5.66	1.2	0.929	20.32	0.592	0.338	0.358	0.571
	12	:10	5.79	2.1	0.954	17.87	0.783	0.172	0.681	0.273
	12	:20	4.84	1.8	0.886	16.98	0.725	0.161	0.571	0.315
	12	:30	4.44	1.6	0.773	16.75	0.683	0.090	0.498	0.275
	12	:40	5.46	1.8	0.825	18.03	0.725	0.100	0.571	0.254
	12	:50	6.88	1.5	1.028	21.18	0.661	0.367	0.463	0.566
	13	:00	5.93	1.3	1.068	20.38	0.616	0.452	0.392	0.675
	13	:10	4.51	1.4	0.870	17.45	0.639	0.231	0.427	0.443
	13	:20	3.45	2.0	0.663	13.96	0.764	-0.100	0.644	0.019
	13	:30	3.12	1.9	0.548	13.45	0.744	-0.197	0.607	-0.060
	13	:40	3.90	2.0	0.585	14.84	0.764	-0.179	0.644	-0.059
	13	:50	4.40	1.9	0.692	15.97	0.744	-0.053	0.607	0.085
14	14	:00	4.20	1.7	0.717	16.04	0.704	0.013	0.534	0.182
	14	:10	3.69	1.9	0.658	14.62	0.744	-0.087	0.607	0.050
	14	:20	4.71	1.8	0.700	16.75	0.725	-0.025	0.571	0.129
	14	:30	3.69	1.6	0.700	15.27	0.683	0.017	0.498	0.202
	14	:40	3.66	1.8	0.613	14.76	0.725	-0.112	0.571	0.042
	14	:50	3.18	1.8	0.570	13.76	0.725	-0.155	0.571	-0.001
	15	:00	3.45	1.8	0.553	14.33	0.725	-0.172	0.571	-0.018
	15	:10	4.03	1.8	0.623	15.49	0.725	-0.101	0.571	0.053
	15	:20	4.95	1.8	0.748	17.17	0.725	0.024	0.571	0.178
	15	:30	3.25	1.8	0.683	13.91	0.725	-0.041	0.571	0.113
	15	:40	4.88	2.0	0.678	16.60	0.764	-0.086	0.644	0.033
	15	:50	4.98	2.1	0.822	16.57	0.783	0.039	0.681	0.140
16	16	:00	4.91	1.5	0.824	17.90	0.661	0.163	0.463	0.362
	16	:10	3.01	1.4	0.660	14.26	0.639	0.021	0.427	0.233
	16	:20	3.66	1.2	0.556	16.34	0.592	-0.036	0.358	0.198
	16	:30	4.68	1.5	0.695	17.47	0.661	0.034	0.463	0.232
	16	:40	3.32	1.7	0.667	14.26	0.704	-0.037	0.534	0.132
	16	:50	4.40	3.0	0.643	14.25	0.935	-0.292	1.027	-0.383
	17	:00	2.71	1.2	0.593	14.06	0.592	0.001	0.358	0.235
	17	:10	3.25	1.2	0.497	15.40	0.592	-0.095	0.358	0.139
	17	:20	2.17	1.4	0.452	12.10	0.639	-0.187	0.427	0.024
	17	:30	5.15	1.4	0.610	18.65	0.639	-0.029	0.427	0.183
	17	:40	6.44	1.3	0.966	21.24	0.616	0.350	0.392	0.573
	17	:50	4.20	1.3	0.887	17.15	0.616	0.271	0.392	0.494
18	18	:00	4.78	1.4	0.748	17.96	0.639	0.109	0.427	0.321
	18	:10	7.05	1.4	0.986	21.82	0.639	0.347	0.427	0.559
	18	:20	4.78	1.2	0.986	18.67	0.592	0.394	0.358	0.628
	18	:30	5.05	1.4	0.819	18.47	0.639	0.180	0.427	0.392
	18	:40	6.03	1.2	0.923	20.97	0.592	0.332	0.358	0.565
	18	:50	4.91	1.0	0.912	19.81	0.540	0.372	0.290	0.621
	19	:00	5.62	1.3	0.878	19.84	0.616	0.262	0.392	0.485
	19	:10	6.13	1.1	0.979	21.61	0.566	0.413	0.324	0.655
	19	:20	6.10	1.0	1.019	22.08	0.540	0.479	0.290	0.729
	19	:30	6.20	1.4	1.025	20.46	0.639	0.386	0.427	0.598
	19	:40	7.22	1.3	1.118	22.49	0.616	0.503	0.392	0.726

No. 011

Area : RANGE PARK. CHAGUANAS

Date : Jan. 24-25. 1990

$Qx = Qo \times (Hx/Ho)^{n}$

	TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
	19	:50	6.88	1.5	1.175	21.18	0.661	0.514	0.463	0.712
20	20	:00	6.74	1.5	1.135	20.97	0.661	0.474	0.463	0.672
	20	:10	6.47	1.4	1.101	20.90	0.639	0.462	0.427	0.674
	20	:20	6.40	1.6	1.073	20.10	0.683	0.389	0.498	0.574
	20	:30	5.08	1.8	0.957	17.39	0.725	0.232	0.571	0.386
	20	:40	4.27	1.6	0.779	16.42	0.683	0.096	0.498	0.281
	20	:50	5.01	1.8	0.773	17.27	0.725	0.049	0.571	0.203
	21	:00	4.78	1.6	0.816	17.37	0.683	0.133	0.498	0.318
	21	:10	4.54	1.8	0.777	16.44	0.725	0.052	0.571	0.206
	21	:20	5.56	2.0	0.842	17.72	0.764	0.078	0.644	0.198
	21	:30	5.56	2.4	0.927	16.93	0.837	0.090	0.794	0.132
	21	:40	5.42	2.0	0.915	17.50	0.764	0.151	0.644	0.271
	21	:50	5.39	2.1	0.901	17.24	0.783	0.118	0.681	0.220
22	22	:00	5.83	2.2	0.935	17.72	0.801	0.134	0.719	0.216
	22	:10	4.91	2.2	0.895	16.26	0.801	0.094	0.719	0.176
	22	:20	4.84	1.4	0.813	18.08	0.639	0.173	0.427	0.385
	22	:30	4.40	2.0	0.770	15.77	0.764	0.006	0.644	0.126
	22	:40	6.07	2.3	0.873	17.88	0.819	0.053	0.756	0.116
	22	:50	5.79	2.3	0.988	17.46	0.819	0.169	0.756	0.232
	23	:00	6.57	2.3	1.030	18.60	0.819	0.211	0.756	0.274
	23	:10	6.10	2.3	1.056	17.93	0.819	0.237	0.756	0.300
	23	:20	5.79	2.3	0.991	17.46	0.819	0.172	0.756	0.235
	23	:30	6.17	2.3	0.997	18.03	0.819	0.178	0.756	0.240
	23	:40	5.83	2.3	1.000	17.52	0.819	0.181	0.756	0.244
	23	:50	5.39	2.4	0.935	16.67	0.837	0.098	0.794	0.141
0	0	:00	5.59	2.4	0.915	16.98	0.837	0.078	0.794	0.121
	0	:10	5.25	2.5	0.903	16.29	0.854	0.049	0.832	0.071
	0	:20	5.56	2.5	0.901	16.76	0.854	0.047	0.832	0.068
	0	:30	5.29	2.5	0.904	16.35	0.854	0.050	0.832	0.072
	0	:40	5.62	2.5	0.909	16.85	0.854	0.055	0.832	0.077
	0	:50	5.52	2.5	0.928	16.70	0.854	0.074	0.832	0.096
	1	:00	5.66	2.5	0.932	16.91	0.854	0.078	0.832	0.099
	1	:10	5.69	2.5	0.946	16.96	0.854	0.092	0.832	0.113
	1	:20	5.59	2.6	0.940	16.64	0.871	0.069	0.871	0.069
	1	:30	5.25	2.6	0.903	16.13	0.871	0.033	0.871	0.033
	1	:40	5.76	2.6	0.918	16.89	0.871	0.047	0.871	0.047
	1	:50	6.00	2.7	0.980	17.08	0.887	0.093	0.909	0.071
2	2	:00	5.39	2.7	0.949	16.19	0.887	0.062	0.909	0.040
	2	:10	5.59	2.7	0.915	16.49	0.887	0.028	0.909	0.006
	2	:20	5.62	2.7	0.934	16.53	0.887	0.047	0.909	0.025
	2	:30	5.56	2.7	0.932	16.44	0.887	0.044	0.909	0.022
	2	:40	5.49	2.6	0.921	16.49	0.871	0.050	0.871	0.050
	2	:50	5.32	2.6	0.901	16.24	0.871	0.030	0.871	0.030
	3	:00	5.59	2.7	0.909	16.49	0.887	0.022	0.909	-0.000
	3	:10	5.42	2.7	0.918	16.23	0.887	0.030	0.909	0.008
	3	:20	5.79	2.6	0.934	16.94	0.871	0.063	0.871	0.063
	3	:30	5.12	2.6	0.909	15.93	0.871	0.038	0.871	0.038
	3	:40	6.24	2.7	0.947	17.42	0.887	0.059	0.909	0.037
	3	:50	6.07	2.7	1.026	17.18	0.887	0.138	0.909	0.116
4	4	:00	5.35	2.6	0.952	16.28	0.871	0.081	0.871	0.081
	4	:10	5.10	2.6	0.871	15.90	0.871	0.000	0.871	0.000
	4	:20	5.59	2.6	0.891	16.64	0.871	0.020	0.871	0.020
	4	:30	5.86	2.6	0.954	17.04	0.871	0.083	0.871	0.083
	4	:40	5.32	2.6	0.932	16.24	0.871	0.061	0.871	0.061
	4	:50	5.18	2.7	0.875	15.87	0.887	-0.012	0.909	-0.034
	5	:00	5.08	2.7	0.855	15.72	0.887	-0.032	0.909	-0.054

No. 011

Area : RANGE PARK. CHAGUANAS

Date : Jan. 24-25. 1990

$Qx = Qo \times (Hx/Ho)^n$

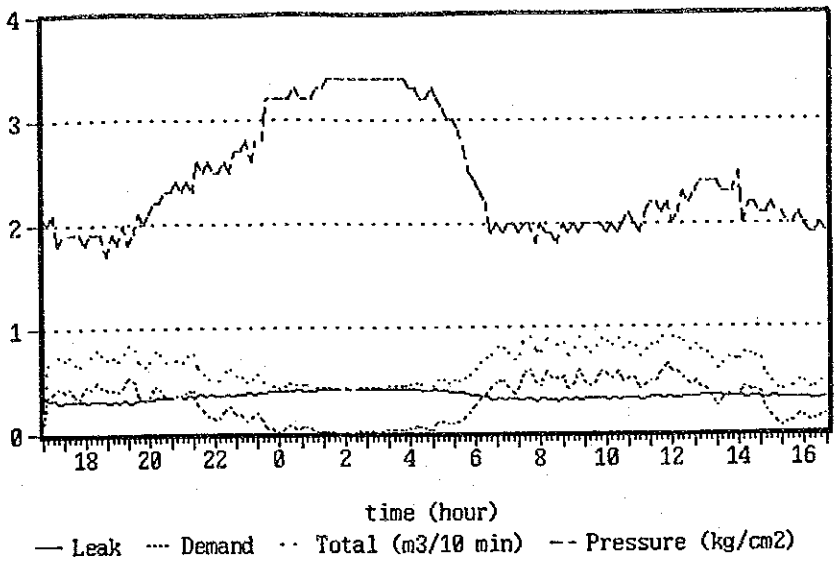
TIME hour	min	METERED Q (m3/h)	METERED PRESSURE (kg/cm2)	Qtotal m3	Leak hole d(mm)	--(n = 0.5)-- --(orifice)-- < TYPE - A > Leak QA1(m3)	Demand QA2(m3)	--(n = 1.15)-- --(crack)-- < TYPE - B > Leak QB1(m3)	Demand QB2(m3)
5	:10	5.12	1.9	0.850	17.23	0.744	0.106	0.607	0.243
5	:20	4.95	2.0	0.839	16.72	0.764	0.075	0.644	0.195
5	:30	5.05	2.2	0.833	16.49	0.801	0.032	0.719	0.115
5	:40	4.78	2.2	0.819	16.05	0.801	0.018	0.719	0.101
5	:50	5.93	2.3	0.893	17.67	0.819	0.073	0.756	0.136
6	6 :00	5.12	2.3	0.921	16.42	0.819	0.102	0.756	0.165
6	:10	6.61	2.2	0.978	18.87	0.801	0.176	0.719	0.259
6	:20	6.44	1.9	1.088	19.32	0.744	0.343	0.607	0.480
6	:30	5.83	1.8	1.023	18.63	0.725	0.298	0.571	0.452
6	:40	5.16	2.4	0.916	16.31	0.837	0.079	0.794	0.122
6	:50	6.20	1.6	0.947	19.79	0.683	0.264	0.498	0.448
7	:00	4.91	1.4	0.926	18.21	0.639	0.287	0.427	0.499
7	:10	6.61	1.2	0.960	21.96	0.592	0.368	0.358	0.602
7	:20	4.40	1.6	0.918	16.67	0.683	0.234	0.498	0.419
7	:30	4.95	1.4	0.779	18.28	0.639	0.140	0.427	0.352
7	:40	4.27	1.3	0.768	17.30	0.616	0.153	0.392	0.376
7	:50	4.88	1.6	0.763	17.56	0.683	0.079	0.498	0.264
8	8 :00	3.66	1.4	0.712	15.72	0.639	0.073	0.427	0.284
8	:10	3.12	1.6	0.565	14.04	0.683	-0.118	0.498	0.067
8	:20	3.59	1.6	0.559	15.06	0.683	-0.124	0.498	0.061
8	:30	3.86	1.5	0.621	15.87	0.661	-0.041	0.463	0.158
8	:40	4.37	1.4	0.686	17.18	0.639	0.047	0.427	0.259
8	:50	6.57	1.4	0.912	21.06	0.639	0.273	0.427	0.484
9	:00	3.76	1.4	0.861	15.93	0.639	0.222	0.427	0.434
9	:10	4.91	1.3	0.723	18.55	0.616	0.107	0.392	0.330
9	:20	5.76	1.2	0.889	20.50	0.592	0.298	0.358	0.531
9	:30	4.84	1.4	0.883	18.08	0.639	0.244	0.427	0.456
9	:40	4.17	1.6	0.751	16.23	0.683	0.068	0.498	0.253
9	:50	5.05	1.5	0.768	18.15	0.661	0.107	0.463	0.306
10	10 :00	5.56	1.5	0.884	19.04	0.661	0.223	0.463	0.422
10	:10	4.95	1.5	0.876	17.97	0.661	0.214	0.463	0.413
10	:20	2.91	1.5	0.655	13.78	0.661	-0.006	0.463	0.192
10	:30	4.84	1.5	0.646	17.77	0.661	-0.016	0.463	0.183
TOTAL			---	124.708	---	105.783	18.925	87.210	37.498
Average		5.20	1.88	0.866	17.464	84.82%	15.18%	69.93%	30.07%
MAX		7.86	3.00	1.310	26.496	0.935	0.827	1.027	1.085
MIN		2.17	0.80	0.452	12.104	0.483	-0.292	0.225	-0.383

	kg/cm2	m3/10 min	
Leakage at Night:	2.60	0.871	15.90 : 4:10 a.m.
Estimated night demand :		0.000	

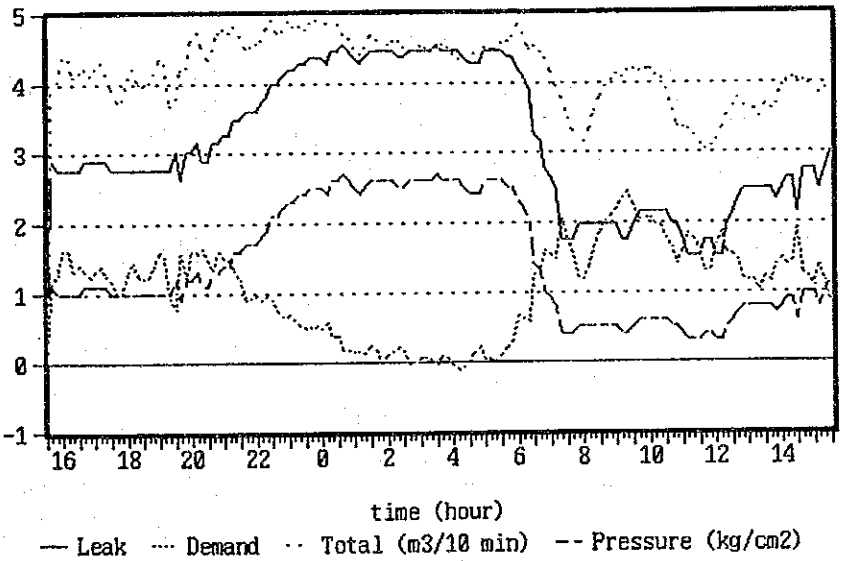
Nos. of house	[A]	79	houses
persons/house	[B]	3.8	pesons/house
A * B	[C]	300.2	persons

		< TYPE - A >		< TYPE - B >	
Water Demand	[D]	18.93	M3	37.50	M3
l/day/capita	D/C	63.04	l/d/c	124.91	l/d/c

No.001


4
3
2
1
0
18
20
22
0
2
4
6
8
10
12
14
16
time (hour)
Leak
Demand
Total (m3/10 min)
Pressure (kg/cm2)

No.002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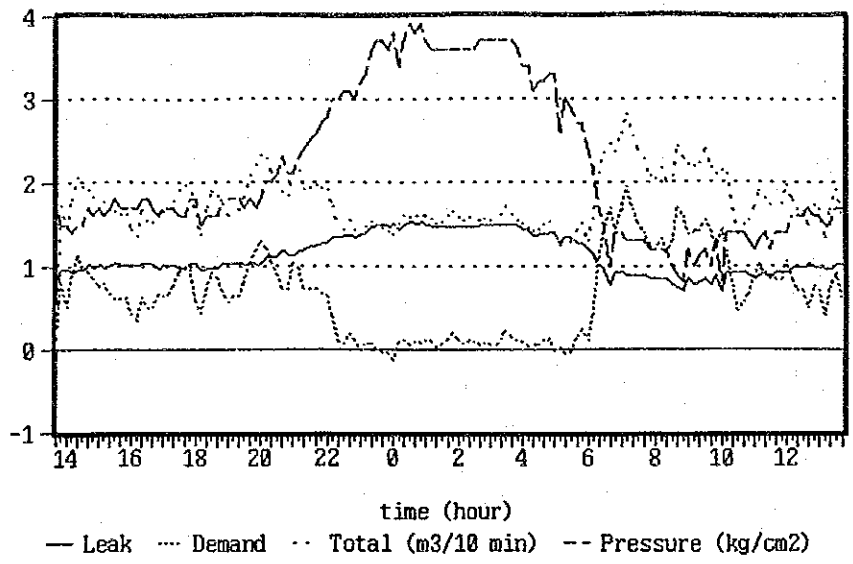
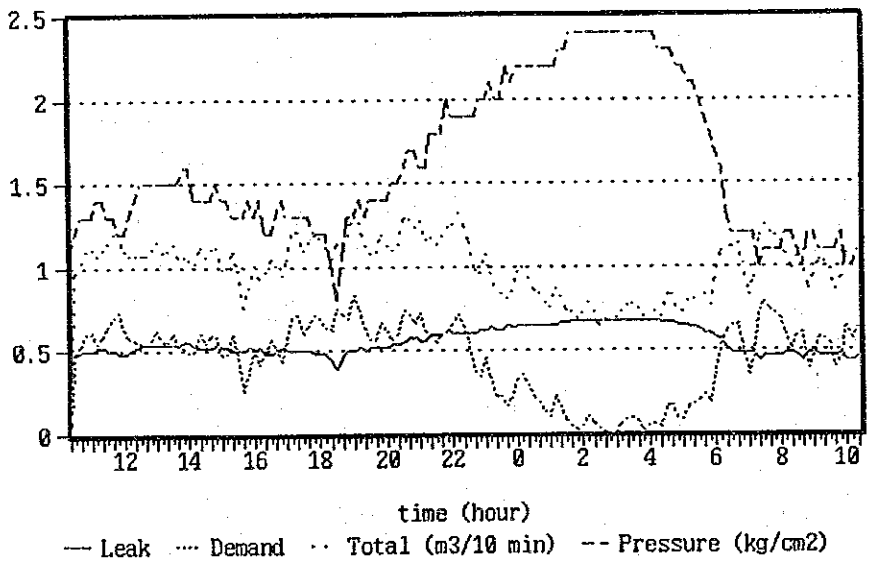
4
3
2
1
0
-1
16
18
20
22
0
2
4
6
8
10
12
14
time (hour)
Leak
Demand
Total (m3/10 min)
Pressure (kg/cm2)

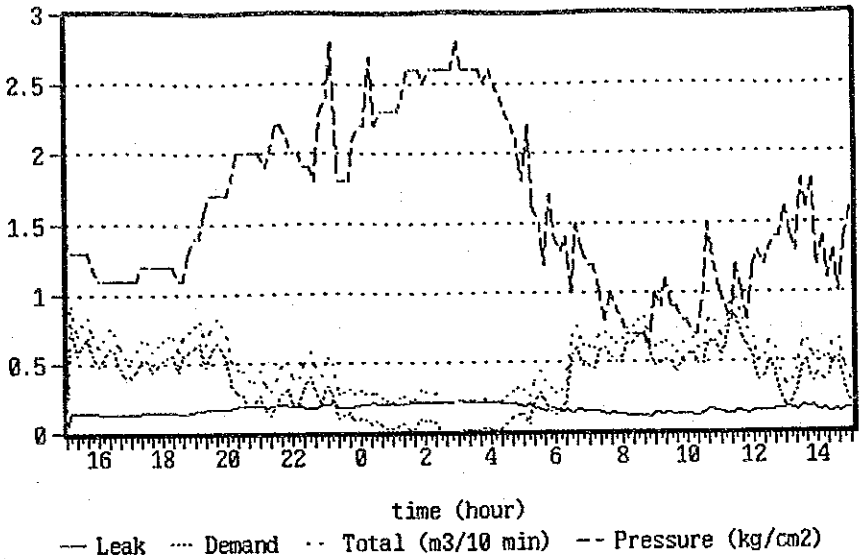
No.003


4
3
2
1
0
-1
14
16
18
20
22
0
2
4
6
8
10
12
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

No.004


2.5
2
1.5
1
0.5
0
12
14
16
18
20
22
0
2
4
6
8
10
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

No.005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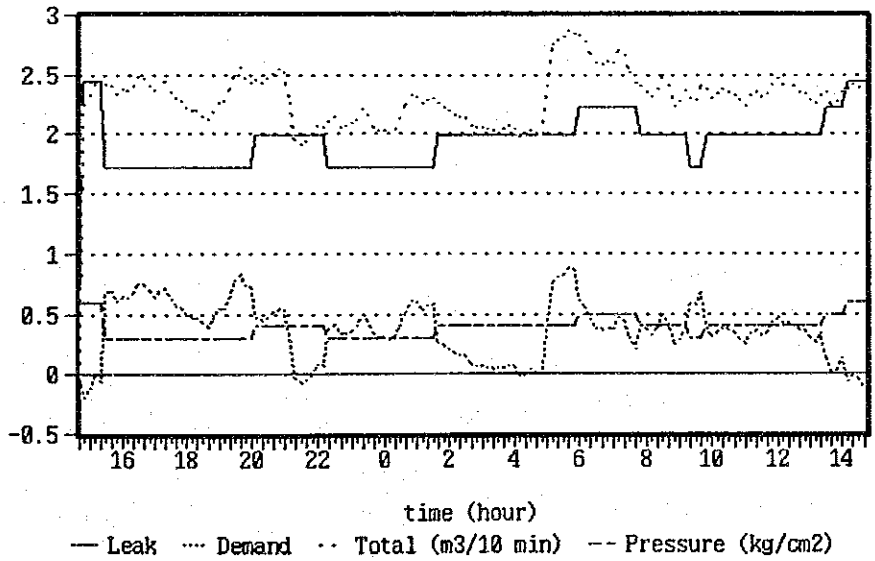
2.5
2
1.5
1
0.5
0
16 18 20 22 0 2 4 6 8 10 12 14
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

No.006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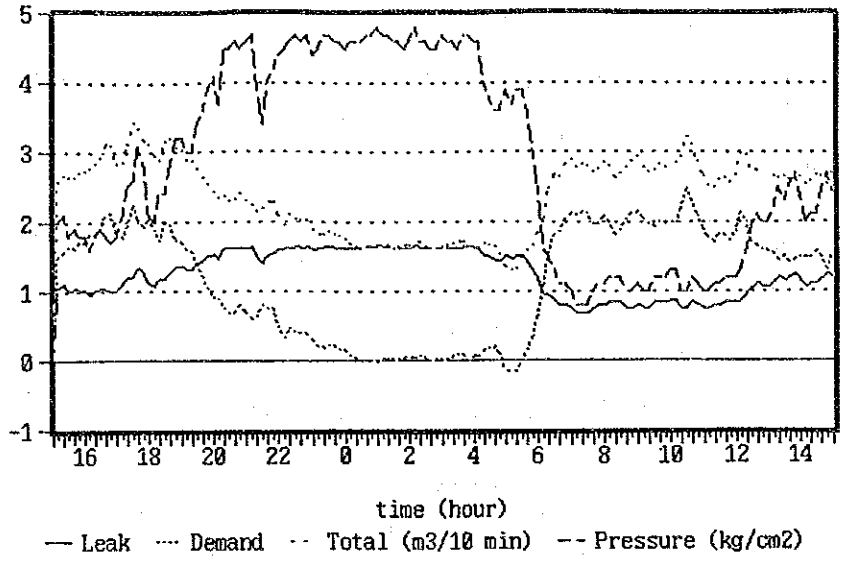
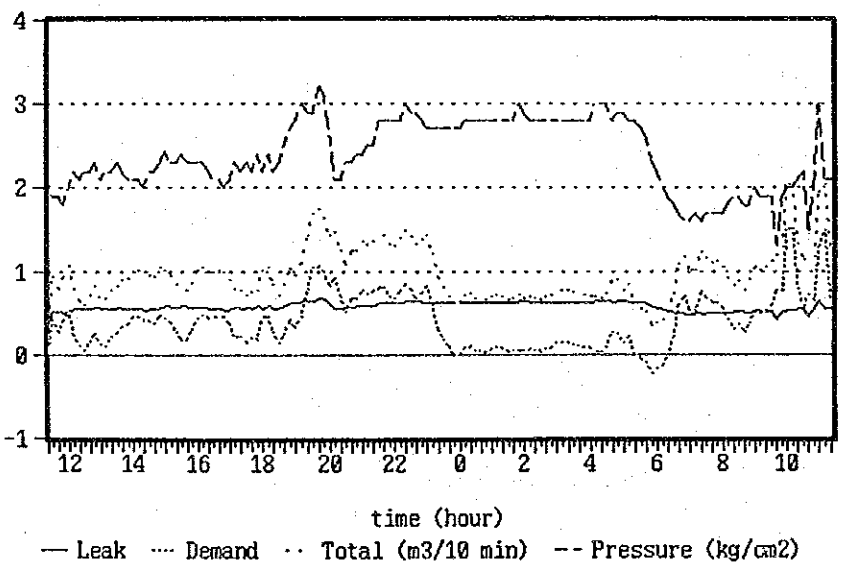
2
1.5
1
0.5
0
-0.5
16 18 20 22 0 2 4 6 8 10 12 14
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

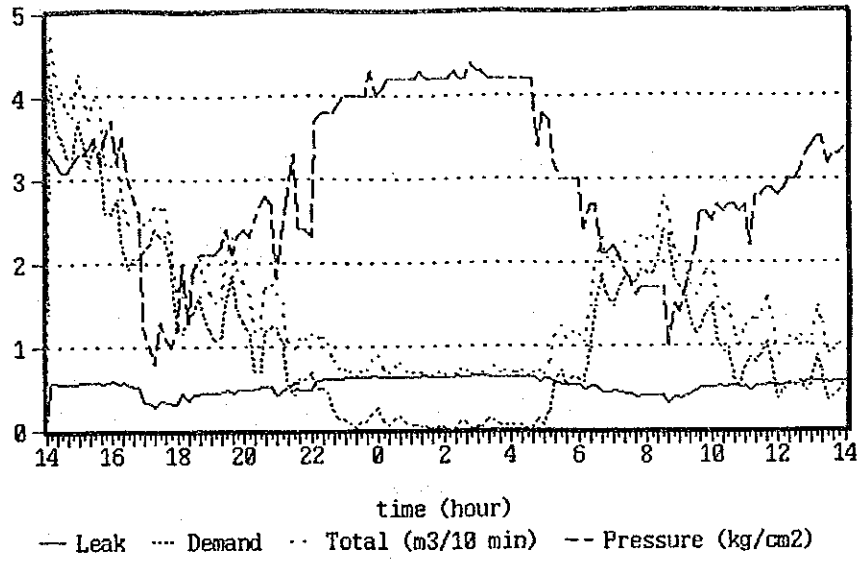
No.007


5
4
3
2
1
0
-1
16 18 20 22 0 2 4 6 8 10 12 14
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

No.008


4
3
2
1
0
-1
12 14 16 18 20 22 0 2 4 6 8 10
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

No.009


5
4
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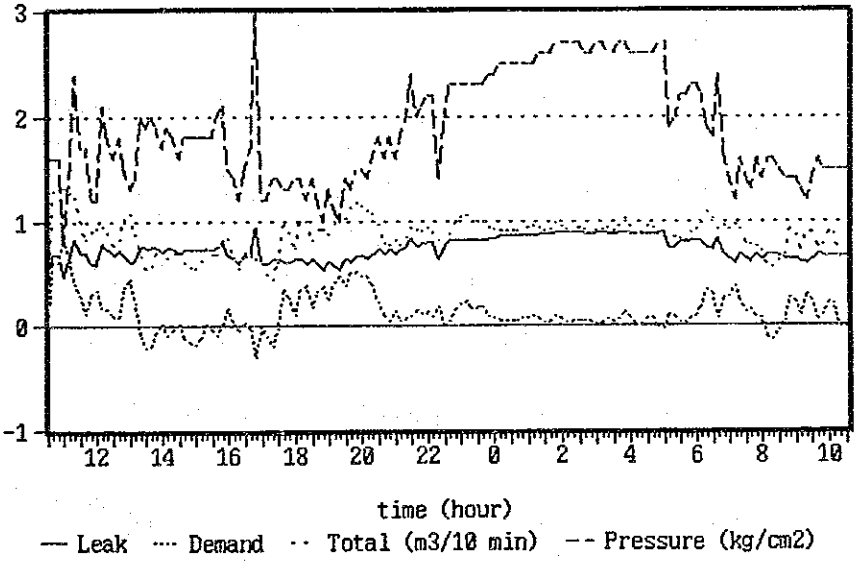
1
0
14
16
18
20
22
0
2
4
6
8
10
12
14
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

No.011


3
2
1
0
-1
12
14
16
18
20
22
0
2
4
6
8
10
time (hour)
— Leak ···· Demand ·· Total (m3/10 min) -- Pressure (kg/cm2)

I: EXISTING WATER SUPPLY FACILITIES

Table 3.3.1 WATER SUPPLY FACILITIES IN THE DISTRICT OF NORTH CENTRAL

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	PRODUCT. CAPACITY DRY	STORAGE CAPACITY (m3)	STORAGE CAPACITY (I.G)	H.W.L (m)	H.W.L (TGL f)	H.W.L (MSL f)	L.W.L (m)	L.W.L (TGL f)	L.W.L (MSL f)	** COORDINATES ***** to EAST	to NORTH
[A]	PRODUCTION FACILITIES			(m3/day)	(m3/day)										
1	N/Cent	WELL	Arouca (Well)	653	653									683.000	75.000
2	N/Cent	W.W	Caroni	272,760	272,760									681.165	70.920
3	N/Cent	W.W	Caura	11,360	9,310									678.090	78.755
4	N/Cent	W.W	Las Lomas (Well)	11,360	11,360									686.065	67.950
5	N/Cent	W.W	Loango/Naranjo	3,180	2,500									672.975	84.300
6	N/Cent	W.W	Tacarigua (Well)	14,550	14,550									678.100	76.785
			Tacarigua Well # 2												
			Tacarigua Well # 3												
			Tacarigua Well # 4												
			Tacarigua Well # 5												
			Tacarigua Well # 6												
			Tacarigua Well # 8												
			Tacarigua Well # 9												
			Tacarigua Well #10												
			Tacarigua Well #11												
			Tacarigua Well #13												
			Tacarigua Well #14												
7	N/Cent	W.W	Valsayn (Well)	27,280	27,280									673.310	77.013
8	N/Cent	INT	Loango	59	59										
9	N/Cent	INT	Lopinot	35	35									682.825	85.500
10	N/Cent	INT	Mt. D'or	88	88									671.500	79.500
11	N/Cent	INT	St John's Road	454	454									686.200	79.800
12	N/Cent	INT	Surrey Village	18	18									681.560	79.600
13	N/Cent	INT	Waterfall Rd.Intake	59	59										
			TOTAL	341,856	339,126				HWL			LWL			
[B]	TRANSMISSION/DISTRIBUTIION FACILITIES					(m3)	(I.G.)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)		
1	N/Cent	STO	Caura Hospital			164	36,000	143.82	471.86	471.86	141.51	464.26	464.26	677.875	78.500
2	N/Cent	STO	Las Lomas			246	54,000	85.61	280.87	280.87	82.09	269.34	269.34	685.460	65.196
3	N/Cent	STO	Mt. Hope			22,750	5,000,000	91.52	-	-	82.91	-	-	671.526	78.411
4	N/Cent	STO	Santa Margarita			91	20,000	159.17	522.20	522.20	156.67	514.00	514.00	674.695	78.525
5	N/Cent	STO	St Augustine			16,835	3,700,000	140.21	460.00	460.00	134.11	440.00	440.00	674.165	78.630
6	N/Cent	STO	St Johns			91	20,000	145.50	477.35	477.35	143.05	469.31	469.31	675.700	79.085
7	N/Cent	STO	St Joseph			13,650	3,000,000	108.20	355.00	355.00	103.63	340.00	340.00	673.053	78.477
8	N/Cent	STO	Valley View			1,024	225,000	****	-	-	****	-	-	673.400	81.250
			TOTAL			54,851	12,055,000								
1	N/Cent	BPS	Caura Royal Road											678.270	77.755
2	N/Cent	BPS	Gordon Street											674.800	77.800
3	N/Cent	BPS	Irving Street											670.450	77.715
4	N/Cent	BPS	Mendes Drive											672.230	77.570
5	N/Cent	BPS	Tunapuna											675.500	76.750

Table 3.3.2 WATER SUPPLY FACILITIES IN THE DISTRICT OF NORTH EAST (1)

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH	
[A]	PRODUCTION FACILITIES			(m3/day)	(m3/day)											
1	N/E	W.W	Aripo (New)	9,030	8,490									693.600	78.715	
2	N/E	W.W	Guanapo	6,880	6,880									690.920	78.635	
3	N/E	W.W	Hollis	31,826	31,826									697.725	82.725	
4	N/E	W.W	North Oropuche	49,125	44,825									702.963	79.850	
5	N/E	W.W	Toco	2,400	1,740									723.250	92.600	
6	N/E	WELL	Arima #6	644	644									687.050	76.600	
7	N/E	INT	Aripo	35	35											
8	N/E	INT	Brasso Seco Paria	27	27									692.000	86.450	
9	N/E	INT	Cumaca	45	45									720.450	83.450	
10	N/E	INT	Four Roads Tamana	70	70									710.155	57.500	
11	N/E	INT	Grande Riviere	35	35									713.925	97.500	
12	N/E	INT	Los Armadillos	105	105									701.100	62.300	
13	N/E	INT	Matelot	35	35									707.200	96.400	
14	N/E	INT	Matura	35	35									710.500	80.650	
15	N/E	INT	Montevideo	35	35									715.475	97.000	
16	N/E	INT	Morne La Croix	27	27									687.053	86.100	
17	N/E	INT	Quare (Rd.) (Valencia	2,935	2,935									697.240	79.650	*
18	N/E	INT	Salibea	35	35									714.450	83.120	
19	N/E	INT	Sans Souci	493	493									722.100	97.300	
			TOTAL	103,817	98,317			H.W.L			L.W.L					
[B]	TRANSMISSION/DISTRIBUTION FACILITIES					(m3)	(I.G)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)			
1	N/E	STO	Arima New			2,275	500,000	133.88	439.25	439.25	133.84	439.10	439.10	687.362	77.175	
2	N/E	STO	Arima Old			819	180,000	130.15	427.00	427.00	127.10	417.00	417.00	687.643	77.265	
3	N/E	STO	Calvary Hill	(not in use)		455	100,000	198.27	650.50	650.50	193.82	635.90	635.90	687.280	77.510	
4	N/E	STO	Cleaver Road			1,024	225,000	127.71	419.00	419.00	118.57	389.00	389.00	686.150	76.750	
5	N/E	STO	Comparo			159	35,000	****	-	-	****	-	-	710.764	65.252	
6	N/E	STO	Cumana			91	20,000	82.07	269.27	269.27	79.26	260.03	260.03	724.252	93.641	
7	N/E	STO	Fort Read			7,599	1,670,000	147.52	484.00	484.00	124.55	408.63	408.63	693.692	77.812	
8	N/E	STO	Guaico			2,275	500,000	76.60	251.31	251.31	65.93	216.31	216.31	701.900	70.400	
9	N/E	STO	Malabar			1,820	400,000	91.59	300.50	300.50	86.61	284.14	284.14	688.141	79.949	
10	N/E	STO	Nestor	(not in use)		23	5,000	87.64	287.52	287.52	85.93	281.93	281.93	703.928	65.872	
11	N/E	STO	North Oropuche			45,500	0	****	-	-	126.49	-	-	702.963	79.500	
12	N/E	STO	O'Meara	(not in use)		27	6,000	79.46	260.70	260.70	78.09	256.20	256.20	687.224	75.508	
13	N/E	STO	Sangre Gpande			382	84,000	61.83	202.85	202.85	58.93	193.35	193.35	705.900	69.383	
14	N/E	STO	Talparo			182	40,000	76.20	250.00	250.00	73.15	240.00	240.00	689.430	62.212	
15	N/E	STO	Tamana Hill Road	(not in use)		91	20,000	****	-	-	****	-	-	698.864	62.226	
16	N/E	STO	Toco	(not in use)		455	100,000	132.22	433.80	433.80	129.33	424.30	424.30	724.800	96.300	
			TOTAL			63,177	3,885,000									
1	N/E	BPS	Arima											687.990	75.450	
2	N/E	BPS	Aripo											694.100	76.950	
3	N/E	BPS	Caigual											707.753	68.100	

Table 3.3.2 WATER SUPPLY FACILITIES IN THE DISTRICT OF NORTH EAST (2)

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	PRODUCT. CAPACITY DRY	STORAGE CAPACITY (m3)	STORAGE CAPACITY (I.G)	H.W.L (m)	H.W.L (TGL f)	H.W.L (MSL f)	L.W.L (m)	L.W.L (TGL f)	L.W.L (MSL f)	** COORDINATES ***** to EAST	to NORTH	
4	N/E	BPS	Calvary Hill											687.750	78.700	*
5	N/E	BPS	Caparo	(not in use)										681.412	58.696	
6	N/E	BPS	Guaico											702.454	70.525	
7	N/E	BPS	Quare											697.800	79.260	

Table 3.3.3 WATER SUPPLY FACILITIES IN THE DISTRICT OF NORTH WEST (1)

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH	
[A]	PRODUCTION FACILITIES			(m3/day)	(m3/day)											
1	N/W	W.W	Acono	2,100	1,560									674.950	83.645	
2	N/W	W.W	Dorrington Gardens	5,400	5,400									658.320	84.435	
3	N/W	W.W	El Socorro (Well)	24,126	24,126									669.250	75.200	?
4	N/W	W.W	Four Roads (Well)	28,900	28,900									575.750	81.750	*
			Four Roads D/M # 9													
			Four Roads D/M #11													
			Four Roads D/M #12													
			Four Roads D/M #10											657.814	83.820	
			Four Roads D/M #14											657.860	84.990	
			Four Roads D/M #15													
5	N/W	W.W	River Estate (Well)	6,820	6,820									657.370	86.390	
			River Estate Well #2													
			River Estate Well #3													
			River Estate Well #4													
			River Estate Well #5													
			River Estate Well #6													
			River Estate Well #7													
			River Estate Well #8													
6	N/W	WELL	La Pastora Wells	2,900	2,900											
			La Pastora Well #1											667.333	84.863	?
			La Pastora Well #2											666.917	86.045	?
			La Pastora Well #3													
			La Pastora Well #4													
7	N/W	WELL	Tucker Valley Wells	13,640	13,640											
			Tucker Valley # 4	(incl. Chaguaramas Wells)										651.816	82.502	
			Tucker Valley # 6A											652.074	83.122	
			Tucker Valley # 7											651.539	83.014	
			Tucker Valley #10											651.201	85.673	
			Tucker Valley #13											651.475	86.061	
			Tucker Valley #15													
			Tucker Valley #16A											652.192	83.287	
			Tucker Valley #17											651.747	82.689	
			Tucker Valley #25											651.963	83.918	
			Chaguaramas #30													
			Chaguaramas #32													
8	N/W	INT	Blanchisseuse	44	44									684.500	93.350	
9	N/W	INT	Covigne											655.500	85.750	
10	N/W	INT	Damier	358	358									680.600	93.900	
11	N/W	INT	La Canoa	200	200									670.600	85.250	
12	N/W	INT	La Pastora Res. Road	94	94									667.750	87.250	
13	N/W	INT	La Pastora/Capriata	88	88									667.000	87.600	
14	N/W	INT	Las Cuevas	266	266									675.150	91.000	
15	N/W	INT	Mon Repos	45	45									666.750	79.750	
16	N/W	INT	Pipiol	90	90									665.850	83.550	
17	N/W	INT	Tyrico	305	305									671.750	89.100	

Table 3.3.3 WATER SUPPLY FACILITIES IN THE DISTRICT OF NORTH WEST (2)

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH	
			TOTAL	85,376	84,836											
[B]	TRANSMISSION/DISTRIBUTION FACILITIES					(m3)	(I.G)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)			
1	N/W	STO	Alocoa			500	109,890	****	-	-	****	-	-	653.125	81.380	
2	N/W	STO	Carenage	(not in use)		910	200,000	90.22	296.00	296.00	85.65	281.00	281.00	653.325	81.500	?
3	N/W	STO	Chaguaramas(U)			1,138	250,000	****	-	-	****	-	-	651.548	86.740	
4	N/W	STO	Covigne			9,100	2,000,000	125.58	412.00	412.00	118.87	390.00	390.00	656.100	85.860	
5	N/W	STO	Dundonald Hill			182	40,000	154.84	507.99	507.99	151.63	497.49	497.49	660.130	81.250	
6	N/W	STO	La Pastora	(not in use)		910	200,000	158.80	521.00	521.00	****	-	-	668.400	85.600	?
7	N/W	STO	Mallick			22,700	5,000,000	54.41	-	-	47.24	-	-	668.339	78.475	
8	N/W	STO	Morvant			1,820	400,000	108.20	355.00	355.00	103.63	340.00	340.00	666.562	79.208	
9	N/W	STO	Point Cumana	(not in use)		2,275	500,000	116.43	382.00	382.00	111.86	367.00	367.00	656.335	81.250	
10	N/W	STO	Richplain	(not in use)		27	6,000	154.68	507.48	507.48	152.96	501.84	501.84	656.140	84.540	
11	N/W	STO	River Estate	(not in use)		700	0	****	-	-	****	-	-	658.100	87.700	
12	N/W	STO	Tyrico			37	8,100	****	-	-	****	-	-	671.250	89.250	
			TOTAL			40,299	8,713,990									
1	N/W	HLPS	Morvant											666.562	79.208	
2	N/W	HLPS	Tucker Valley											652.200	82.650	
3	N/W	BPS	83 Rd											647.000	80.900	
4	N/W	BPS	Carenage											654.250	81.250	
5	N/W	BPS	Covigne											656.560	85.250	
6	N/W	BPS	Harts Cut											649.750	80.925	
7	N/W	BPS	Hutton Road No.1											662.920	81.075	*
8	N/W	BPS	La Canoa Road											669.220	80.470	
9	N/W	BPS	Lady Young											666.550	79.140	
10	N/W	BPS	Pichplain											656.800	84.525	
11	N/W	BPS	Quarry Road											669.770	78.315	
12	N/W	BPS	Ross Lands											659.655	80.780	
13	N/W	BPS	Simeon Road											658.315	82.805	

Table 3.3.4 WATER SUPPLY FACILITIES IN THE DISTRICT OF PORT OF SPAIN (1)

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH
[A]	PRODUCTION FACILITIES			(m3/day)	(m3/day)										
1	P.O.S.	W.W	Maraval	5,910	4,770									662.375	83.000
2	P.O.S.	W.W	Paramin	390	390									662.450	84.400
3	P.O.S.	W.W	St. Anns	840	840									663.425	81.175
4	P.O.S.	WELL	KingGeorgeV Park	10,340	10,340										
			KingGeorgeV Park #2											661.247	79.653
			KingGeorgeV Park #3											661.874	79.533 ?
			KingGeorgeV Park #4											660.872	79.635
5	P.O.S.	WELL	Moka Wells	1,590	1,590										
			Moka #1											663.349	84.629
			Moka #2											663.687	84.902
			Moka #5												
6	P.O.S.	WELL	Savannah Wells	12,270	12,270										
			Savannah #1											662.528	79.092
			Savannah #2											662.521	79.596
			Savannah #3											661.874	79.521
			Savannah #4											662.136	79.341
			Savannah #5											662.141	79.116
			Savannah #6											662.338	79.079
			Savannah #7												
7	P.O.S.	WELL	St Clair	1,820	1,820										
8	P.O.S.	INT	Ariapita	138	138										
9	P.O.S.	INT	Cascade	207	207										
10	P.O.S.	INT	Dibe	145	145									660.200	83.425
			TOTAL	33,650	32,510			H.W.L			L.W.L				
[B]	TRANSMISSION/DISTRIBUTION FACILITIES					(m3)	(I.G)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)		
1	P.O.S.	STO	Ariapita			91	20,000	268.25	880.09	880.09	264.72	868.50	868.50	665.030	81.860
2	P.O.S.	STO	Cascade			341	75,000	114.30	375.00	375.00	111.25	365.00	365.00	664.475	80.800
3	P.O.S.	STO	Gonzales			46	10,000	****	-	-	****	-	-	664.330	78.690
4	P.O.S.	STO	Hololo			1,138	250,000	199.26	653.75	653.75	193.17	633.75	633.75	664.075	81.100
5	P.O.S.	STO	Knaggs Hill			27,300	3,090,000	99.46	326.32	326.32	92.96	305.00	305.00	661.905	80.450
6	P.O.S.	STO	Laventille			5,915	1,300,000	87.01	285.45	285.45	83.35	273.45	273.45	663.830	77.650
7	P.O.S.	STO	Maraval			3,346	735,366	81.43	267.16	267.16	78.08	256.16	256.16	661.600	83.250
8	P.O.S.	STO	Mc Shine			546	120,000	127.86	419.49	419.49	124.71	409.14	409.14	663.909	78.195
9	P.O.S.	STO	Paramin			?	?	****	-	-	****	-	-	662.300	86.900
10	P.O.S.	STO	Picton No.1			13,650	3,000,000	137.77	452.00	452.00	131.06	430.00	430.00	664.255	77.900
11	P.O.S.	STO	Picton No.2			22,750	5,000,000	99.36	326.00	326.00	90.53	297.00	297.00	664.100	77.500
12	P.O.S.	STO	Picton No.3			45,500	10,000,000	124.03	406.92	406.92	113.36	371.90	371.90	664.383	77.733
13	P.O.S.	STO	Red Hill	(not in use)		900		152.73	-	-	149.38	-	-	665.580	78.855
14	P.O.S.	STO	St Barbs			1,024	225,000	225.38	739.43	739.43	222.64	730.43	730.43	664.871	78.800
			TOTAL			122,547	23,825,366								
1	P.O.S.	HLPS	Farrell	(not in use)										657.675	80.870

Table 3.3.4 WATER SUPPLY FACILITIES IN THE DISTRICT OF PORT OF SPAIN (2)

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH	
2	P.O.S.	HLPS	Paramin No.2											662.100	84.800	
3	P.O.S.	HLPS	Paramin No.3											661.800	85.250	
4	P.O.S.	HLPS	Paramin No.4											661.950	86.100	
5	P.O.S.	BPS	Brieves Road											660.915	81.020	
6	P.O.S.	BPS	Foncette Road											663.990	80.725	
7	P.O.S.	BPS	Gonzales											663.885	78.700	
8	P.O.S.	BPS	Hutton Road No.2											662.595	81.075	
9	P.O.S.	BPS	Knaggs Hill											661.930	80.435	?
10	P.O.S.	BPS	Second Avenue											663.430	80.315	

Table 3.3.5 WATER SUPPLY FACILITIES IN THE DISTRICT OF SAN FERNAND/SOUTH CENTRAL

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH
[A]	PRODUCTION FACILITIES			(m3/day)	(m3/day)										
1	S/C	W.W	Carlsen Field	11,175	11,175									675.240	59.740 *
2	S/C		Carlsen Field Well #5											677.783	60.800
3	S/C	W.W	Freeport	6,165	6,165									672.636	53.780
			TOTAL	11,175	11,175			H.W.L			L.W.L				
[B]	TRANSMISSION/DISTRIBUTION FACILITIES					(m3)	(I.G)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)		
1	S/C	STO	Basta Hall			3,413	750,000	122.22	401.00	401.00	117.65	386.00	386.00	670.950	49.320
2	S/C	STO	California			22,750	5,000,000	59.84	-	-	49.38	-	-	670.985	48.105
3	S/C	STO	Chacon Street			7,280	1,600,000	77.72	255.00	255.00	73.15	240.00	240.00	688.355	36.900
4	S/C	STO	Freeport	(not in use)		4,550	1,000,000	115.82	380.00	380.00	111.25	365.00	365.00	678.784	56.372
5	S/C	STO	Marryat Street			13,423	2,950,000	108.81	357.00	357.00	104.39	342.50	342.50	668.840	36.555
6	S/C	STO	Naparima			9,100	2,000,000	103.63	340.00	340.00	99.06	325.00	325.00	668.850	36.550
7	S/C	STO	Pepper Village			1,820	400,000	229.97	754.50	754.50	****	-	-	678.992	49.604
8	S/C	STO	San Fernando			22,750	5,000,000	51.97	-	-	44.20	-	-	669.209	48.105
9	S/C	STO	Springlands	(not in use)		?	?	****	-	-	****	-	-	672.570	41.700
			TOTAL			85,086	18,700,000								
1	S/C	BPS	California											668.270	50.240
2	S/C	BPS	Marryat Street											668.900	36.525
3	S/C	BPS	San Fernando											669.247	36.855
4	S/C	BPS	Gran Couva												
5	S/C	BPS	Springland												

Table 3.3.6 WATER SUPPLY FACILITIES IN DISTRICT OF SOUTH EAST

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	PRODUCT. CAPACITY DRY	STORAGE CAPACITY (m3)	STORAGE CAPACITY (I.G)	H.W.L (m)	H.W.L (TGL f)	H.W.L (MSL f)	L.W.L (m)	L.W.L (TGL f)	L.W.L (MSL f)	** COORDINATES ***** to EAST	to NORTH
[A]	PRODUCTION FACILITIES			(m3/day)	(m3/day)										
1	S/E	W.W	Biche	259	259									703.000	53.450
2	S/E	W.W	Navet	77,280	77,280									691.235	50.189
3	S/E	WELL	Guayaguayare #1	897	897										
4	S/E	WELL	Maloney	1,358	1,358									717.800	31.700
5	S/E	WELL	Mayaro	792	792										
6	S/E	WELL	Tournebridge Wells	1,194	1,194										
			Tournebride #1											718.000	30.280
			Tournebride #2											717.700	30.250
7	S/E	SPR	Guaracara	1,136	1,136									680.750	46.700
8	S/E	SPR	Mayo	630	630									677.250	46.000
9	S/E	SPR	Morichal	718	718									680.000	45.250
			TOTAL	84,264	84,264			H.W.L			L.W.L				
[B]	TRANSMISSION/DISTRIBUTION FACILITIES					(m3)	(I.G)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)		
1	S/E	STO	Devenish Hill			228	50,000	183.18	601.00	601.00	****	-	-	683.628	49.080
2	S/E	STO	Dunmore Hill			2,275	500,000	154.23	506.00	506.00	143.26	470.00	470.00	682.628	35.644
3	S/E	STO	Guaracara			1,392	306,000	136.70	448.50	448.50	133.58	438.25	438.25	680.700	46.032
4	S/E	STO	Guayaguayare			82	18,000	****	-	-	****	-	-	713.550	21.250
5	S/E	STO	Kelly Village			1,138	250,000	199.26	653.75	653.75	****	-	-	679.080	42.300
6	S/E	STO	La Lune	(not in use)		91	20,000	59.34	194.67	194.67	56.54	185.51	185.51	682.636	14.500
7	S/E	STO	Maloney			1,024	225,000	66.90	219.50	219.50	59.59	195.50	195.50	718.122	33.012
8	S/E	STO	Marac	(not in use)		82	18,000	58.56	192.13	192.13	56.45	185.19	185.19	680.708	14.492
9	S/E	STO	Mayaro			364	80,000	66.75	219.00	219.00	62.79	206.00	206.00	717.525	38.500
10	S/E	STO	Mayo			91	20,000	132.10	433.40	433.40	128.90	422.90	422.90	677.720	45.360
11	S/E	STO	Morichal			159	35,000	113.39	372.00	372.00	110.34	362.00	362.00	679.316	45.284
12	S/E	STO	Ortoire Hill Road			91	20,000	49.80	163.39	163.39	47.34	155.33	155.33	719.200	41.850
			TOTAL			7,017	1,542,000								
1	S/E	BPS	Guayaguayare											718.750	25.050
2	S/E	BPS	Malgretoute											676.900	36.650
3	S/E	BPS	Maloney											718.352	32.950
4	S/E	BPS	St Julien (Post Office Trace)											682.584	36.560
5	S/E	BPS	St Marys											684.680	26.780
6	S/E	BPS	Tabaquite											688.000	47.000
7	S/E	BPS	T.C.O.											687.300	45.700
8	S/E	BPS	Biche												
9	S/E	BPS	Whiteland												
10	S/E	BPS	Bermont												

Table 3.3.7 WATER SUPPLY FACILITIES IN DISTRICT OF SOUTH WEST

ORG. NO.	NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH
	[A]			PRODUCTION FACILITIES	(m3/day)	(m3/day)										
260	1	S/W	buy	Trintoc to Pt. Fortin	69	69										
260	2	S/W	buy	Trintoc to Techier	155	155										
	3	S/W	buy	Texaco to Guayaguayare	180	180										
239	4	S/W	W.W	Cap De Ville (Well)	1,006	1,006									642.975	19.525
241	5	S/W	W.W	Carapal (Well)	1,400	1,400									648.676	14.964
242	6	S/W	W.W	Chatham (Well)	4,385	4,385									640.250	20.000
246	7	S/W	W.W	Fyzabad (Well)	1,500	1,500									659.000	25.750
248	8	S/W	W.W	Granville (Well) to Cap De Ville to Cedros to Granville Tank	2,800	2,800									631.450	19.800
256	9	S/W	W.W	Penal (Well)	3,500	3,500									666.685	22.500
260	10	S/W	W.W	Point Fortin (Well)	980	980									647.600	25.392
245	11	S/W	W.W	Siparia (Coora) (Well)	3,033	3,033									663.975	20.000
243	12	S/W	WELL	Clarke Road #4 & #5	623	623										
				TOTAL	19,631	19,631			H.W.L			L.W.L				
	[B]			TRANSMISSION/DISTRIBUTION FACILITIES			(m3)	(I.G)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)		
236	1	S/W	STO	Bennett Village			?	?	****	-	-	****	-	-	655.500	18.330
238	2	S/W	STO	Buenos Ayres	(not in use)		296	65,000	99.06	325.00	325.00	96.32	316.00	316.00	645.000	16.212
240	3	S/W	STO	Cap De Ville			910	200,000	78.18	256.50	256.50	73.61	241.50	241.50	642.064	20.992
243	4	S/W	STO	Clarke Road			1,820	400,000	94.64	310.50	310.50	90.52	296.98	296.98	673.674	23.615
247	5	S/W	STO	Gonzales Street	(not in use)		1,820	400,000	109.27	358.50	358.50	104.39	342.50	342.50	664.705	22.500
249	6	S/W	STO	Granville			455	100,000	101.50	333.00	333.00	96.93	318.00	318.00	630.924	19.200
252	7	S/W	STO	K.T.O.	(not in use)		2,730	600,000	83.97	275.50	275.50	79.32	260.25	260.25	650.275	27.440
253	8	S/W	STO	Los Gallos			91	20,000	50.44	165.50	165.50	47.24	155.00	155.00	620.504	15.200
254	9	S/W	STO	New Village	(not in use)		23	5,000	76.14	249.80	249.80	73.46	241.00	241.00	644.232	22.392
257	10	S/W	STO	Penal	(not in use)		319	70,000	79.25	260.01	260.01	74.38	244.04	244.04	668.548	24.096
258	11	S/W	STO	Penal Rock Road No.1			91	20,000	79.30	260.18	260.18	76.80	251.96	251.96	676.040	20.164
259	12	S/W	STO	Penal Rock Road No.2	(not in use)		910	200,000	79.28	260.10	260.10	74.71	245.10	245.10	668.700	23.740
261	13	S/W	STO	Siparia No.1	(not in use)		432	95,000	111.56	366.00	366.00	106.98	351.00	351.00	663.944	21.628
				TOTAL			9,897	2,175,000								
237	1	S/W	BPS	Boodoosingh											653.490	30.620
255	2	S/W	BPS	Oropouche											660.000	30.700
262	3	S/W	BPS	**Benett Village												
263	4	S/W	BPS	**Clark Road												

Table 3.3.8 WATER SUPPLY FACILITIES IN DISTRICT OF TOBAGO

NO.	WASA REGION	CODE FACI	NAMES OF FACILITIES	PRODUCT. CAPACITY RAINY	DRY	STORAGE CAPACITY (m3)	(I.G)	H.W.L (m)	(TGL f)	(MSL f)	L.W.L (m)	(TGL f)	(MSL f)	** COORDINATES ***** to EAST	to NORTH
[A]	PRODUCTION FACILITIES			(m3/day)	(m3/day)										
1	TOBAGO	INT	Parlatuvier	70	70										
2	TOBAGO	W.W	Courland	7,368	7,368									743.350	40.250
3	TOBAGO	W.W	Hillsborough	8,582	8,582									753.950	41.450
4	TOBAGO	W.W	Kings Bay	2,994	2,994									767.400	48.900
5	TOBAGO	W.W	Richmond	2,467	2,467									760.900	41.700
6	TOBAGO	WELL	Government Farm #3	335	335									745.550	36.600
7	TOBAGO	INT	Bloody Bay	24	24									760.600	48.250
8	TOBAGO	INT	Castara	80	80									752.300	47.800
9	TOBAGO	INT	Charlotteville	388	388									766.600	51.700
10	TOBAGO	INT	Craig Hall	2,461	2,461									748.800	42.200
11	TOBAGO	INT	Green Hill	3,360	3,360									754.000	40.200
12	TOBAGO	INT	L'Anse Fourmi	34	34									762.650	51.400
13	TOBAGO	INT	Speyside	86	86									767.850	49.200
14	TOBAGO	INT	Hillsborough West River	3,150	3,150	(under construction)									
			TOTAL	31,399	31,399			H.W.L			L.W.L				
[B]	TRANSMISSION/DISTRIBUTION FACILITIES					(m3)	(I.G)	(m)	(TGL f)	(MSL f)	(m)	(TGL f)	(MSL f)		
1	TOBAGO	STO	Bad Hill			1,024	225,000	****	-	-	****	-	-	744.600	40.250
2	TOBAGO	STO	Castara			23	5,000	****	-	-	****	-	-	752.000	47.550
3	TOBAGO	STO	Charlotteville			168	37,000	****	-	-	****	-	-	765.250	50.950
4	TOBAGO	STO	Fort George			1,456	320,000	149.96	492.00	492.00	146.91	482.00	482.00	748.150	36.850
5	TOBAGO	STO	Green Hill			2,275	500,000	****	-	-	****	-	-	753.850	40.250
6	TOBAGO	STO	Hospital			202	44,500	****	-	-	****	-	-	748.050	36.350
7	TOBAGO	STO	Les Coteaux	(not in use)		9	1,875	124.97	410.00	410.00	123.44	405.00	405.00	746.350	42.300
8	TOBAGO	STO	Mason Hall			228	50,000	227.99	748.00	748.00	194.79	-	-	749.150	41.000
9	TOBAGO	STO	Moriah			455	100,000	361.19	1185.00	1185.00	327.99	-	-	750.250	44.750
10	TOBAGO	STO	Parlatuvier			?	?	****	-	-	****	-	-	757.000	49.250
11	TOBAGO	STO	Patience Hill			46	10,000	190.27	624.25	624.25	187.83	616.25	616.25	743.850	37.950
12	TOBAGO	STO	Toco Hill			?	?	****	-	-	****	-	-	761.300	43.625
13	TOBAGO	STO	Whim			159	35,000	179.22	588.00	588.00	146.63	-	-	746.150	39.550
14	TOBAGO	STO	Zion Hill			1,138	250,000	****	-	-	****	-	-	761.100	42.950
15	TOBAGO	STO	Signal Hill			2,275	500,000	115.88	380.00	380.00	103.63	340.00	340.00		
			TOTAL			9,458	2,078,375								
1	TOBAGO	BPS	Highlands Road											748.850	42.900
2	TOBAGO	BPS	Zion Hill											761.800	43.000
3	TOBAGO	BPS	Mt. Gomery												
4	TOBAGO	BPS	King Peter												

J: FIELD FLOW MEASUREMETN OF TRANSMISSION/DISTRIBUTION MAINS

J: FIELD FLOW MEASUREMENT OF TRANSMISSION/DISTRIBUTION MAINS

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J FIELD FLOW MEASUREMENT ON TRANSMISSION/DISTRIBUTION MAINS

1. General

Continuous 24-hour flow measurement was carried out to examine flow conditions in the transmission/distribution mains including water flow rate, water pressure, leakage and conveyance capability of the mains.

In the course of the flow measurement, the measurement team organized for this purpose has faced numerous difficulties. The results obtained from this measurement are not necessarily desirable one. Some are not accurate. All results as presented herein, however, may suggest some facets of the existing water supply conditions.

2. Survey Method

In due consideration of the survey objectives and accuracy of the survey equipment, survey method was formulated as follows:

Flow measurement is at 10 minute intervals for continuous 24 hours and a method of simultaneous two-point measurement at a distance of minimum 1 km on the same main installing ultra-sonic flow meters. Pressure measurement is continuous 24 hours at the same points. The measurement team is organized from WASA's engineers and staff to conduct the survey under supervision of the Study Team.

On the other hand, level survey is conducted under responsibility of WASA to obtain distance and differentials of ground level between two points.

3. Selection of Survey Points

Prior to the measurement survey, the Study Team conducted a preliminary survey to select 8 survey points. Selection was made from the following view-points:

1) Transmission/distribution mains principally from the four large scale waterworks, i.e., Caroni, North Oropouche, Navet and Hollis in order to obtain flow capability of mains severally which might be installed under different projects and methods.

2) Mains installed on the ground where measurement can be easily conducted and pipe excavation is not required, to save time as much as possible.

3) Mains which have less offtakes due to a limited number of the flow meters.

4) Straight pipelines where any valves, bends and branches are not installed principally for a distance of 15 times the diameter, a minimum span length required for flow measurement (10 times diameter upper and 5 times diameter downward from the meter installation point).