According to the design calculation, the extension work at the site of existing Sewage Treatment Plant Hayatabad will be capable of treatment of 0.5 MGD of sewage from a population of 14,000 persons while the total treatment plant capacity of upgraded and extended plant will be about 1.7 MGD. The upgraded existing Sewage Treatment Plant will treat sewage from a population of 46,000 persons satisfactorily.

4- Water Supply

4-1 City Water

Description about the water supply to the Hayatabad Area is given previously in section 1-7. Number of Tube wells installed so far in Hayatabad and the average run of each tube well per day, give an approximate water supply to the Hayatabad residential and commercial areas, which is about 87,847 m^3/day. Locations of the tube wells in Hayatabad is given on the map of Hayatabad in Annexure-B.

The following Table-25 shows the yield of tube wells operated by various agencies in Peshawar region.

TABLE-25

YIELD OF TUBE WELLS OPERATED BY VARIOUS AGENCIES IN PESHAWAR REGION.

No	Responsible Agency/ Organization:	Total No. of Tube wells	Average Discharge (m^3/hr)	Average Operating Time (hrs)	Amount of water being Extracted (m^3/day)
1.	Town-III Hayatabad Township	53	127.5	13	87847
2.	Town-I, Walled city	32	62.43	15	29965
3.	Town-II Outside Walled City	84	60.10	15	75726
4.	Cantonment Board	7	68.07	12	5718
5.	MES	16	73.27	20	23446
6.	PDA	18	104.77	13	24516
7.	Town-IV, Rural Area	27	71.10	15	28795
8.	PHD for Afghan Refugees Tube wells	6	27.22	16	2613
9.	Shallow Wells	131	6.29	-	824

The above table does not cover all parts of Peshawar. This table shows how much water is being extracted from various parts of Peshawar per day. There are so many other agencies operating their tube Wells in Peshawar. Shallow wells data given in the table are much lower than the expected tube wells operating in the city. It is very difficult to get a precise data about the shallow wells being operated in Peshawar region because no such survey has been conducted by any agency in the past.

This figure is reproduced from the survey conducted by the Engineering University, Peshawar two years back. Data about the number of tube wells being operated by the city Government (Town –I—Town-IV) do not reflect the total number of tube wells.

4-2 Industrial Water

Hayatabad industrial estate was established in early 1980s. At that time Hayatabad Township was not established. To arrange the water supply to the industry is the responsibility of the owner of the industry himself. Town-III government is not responsible to supply the water to the industrial estate. Therefore each industry has its own water supply system. No such data exist to know the usage of water by each industrial unit. Each industry extracts water from its own tube well. The only way to know approximately how much water is being used by the Hayatabad industrial estate. The flow of combined industrial units were monitored and found that approximately 8,640 m^3/day industrial water is being used.

4-3 Tube wells location and their discharge for Public Service

Tube wells locations are given on the map of Hayatabad township n Annexure-B. Each phase of Hayatabad is covered by the water supply through tube wells. Town-III is responsible to provide water connections to residential houses, Public and Commercial areas. Town-III charged water consumers on monthly basis on flat rates fixed for each category of houses as well as for commercial activities.

4-4 Ground Water Quality of Hayatabad

A team comprising teachers and students from the University of Engineering and Technology, Peshawar has conducted a study on ground water quality of Hayatabad last year. The following Table-26 shows the results of ground water quality of Hayatabad.

TABLE-26

GROUND WATER QUALITY OF HAYATABAD

Units: mg/l otherwise mentioned

Parameters	Sampling Points	Medical Complex	Phase-I	Phase-II	Phase-III	Phase-IV	Phase-V	Phase-VI
Temperature (°C)	Source	25	28	23.4	25	27.0	20.0	22.1
	Intermediate	25	28.5	22.9	26	26.0	20.0	22.1
	Consumer	25	28.7	23.2	25	26.6	22.4	22.1
pH	Source	7.20	7.03	7.33	7.5	7.29	7.10	8.22
	Intermediate	7.20	7.07	7.27	7.5	7.31	7.07	8.17
	Consumer	7.30	7.05	7.44	7.5	7.39	7.11	8.31
Conductivity (mS/cm)	Source	0.54	0.54	0.65	0.62	0.60	0.50	0.63
	Intermediate	0.55	0.52	0.66	0.62	0.60	0.50	0.63
	Consumer	0.55	0.52	0.65	0.63	0.61	0.49	0.61
TDS	Source	270	222	330	300	300	250	320
	Intermediate	270	195	320	300	300	250	310
	Consumer	280	199	330	310	310	260	310
TSS	Source	20	27	29	30	27	28	28
	Intermediate	20	27	28	33	28	30	27
	Consumer	22	30	30	30	30	30	27
Turbidity (NTU)	Source	2.0	1.5	1.4	4.0	1.8	1.4	0.3
	Intermediate	2.1	1.6	1.5	4.1	1.7	1.7	0.9
	Consumer	2.3	1.8	1.6	4.2	2.5	1.4	0.7
Alkalinity	Source	120	203	60	135	56	52	56
	Intermediate	125	204	40	125	52	50	50
	Consumer	125	207	62	120	58	46	52
Dissolved Oxygen	Source	4.5	8.7	19.9	6.0	12.2	12.4	5.1
	Intermediate	4.9	8.1	15.6	6.1	12.0	12.1	4.9
	Consumer	4.8	8.1	20.4	6.0	12.3	11.7	5.1
Total Hardness	Source	290	87	300	280	280	250	266
	Intermediate	280	103	270	285	182	324	222
	Consumer	285	107	266	290	218	202	246
Hardness as Ca	Source	120	53	76	120	51	101	53
	Intermediate	120	71	74	125	55	79	51
	Consumer	120	73	77	130	77	72	51
Hardness as Mg	Source	170	35	224	160	229	149	213
	Intermediate	160	33	196	160	127	245	171
	Consumer	165	34	189	160	141	130	195

Parameters	Sampling Points	Medical Complex	Phase-I	Phase-II	Phase-III	Phase-IV	Phase-V	Phase-VI
Potassium	Source	5.00	2.05	3.60	3.15	2.80	2.30	2.0
	Intermediate	5.25	2.10	3.20	3.35	2.60	1.70	1.8
	Consumer	5.15	2.08	3.10	3.70	2.70	1.60	1.6
Iron	Source	3.00	0.34	0.10	2.02	0.60	0.45	0.80
	Intermediate	3.15	0.36	0.20	2.50	0.70	0.50	0.50
	Consumer	3.20	0.36	0.15	2.70	0.70	0.65	0.50
Chlorides	Source	145	25	14	142	13	10	15
	Intermediate	144	38	14	144	17	9	17
	Consumer	147	39	13	142	14	10	17
Nitrates	Source	7.50	4.30	9.10	8.20	8.40	8.60	5.10
	Intermediate	8.00	4.15	8.70	8.20	8.50	8.10	5.00
	Consumer	8.10	4.15	8.60	8.20	8.20	8.50	5.10

4-5 Estimation of Number of Private Borehole/Dug wells

Very few private bore holes are present in Hayatabad Township area. As mentioned earlier, Hayatabad Township is a well Planned city with all civic amenities. Presently, water supply for domestic and commercial usage is sufficient. Secondly the water table is also very deep; therefore to make a private bore hole is expansive. Only few houses of 2 or 1 kanal sizes with maximum inhabitants have private bore holes. Exact numbers are not known but the general survey conducted by Pak-EPA reveals that these private bore holes are very few. No dug wells are present in Hayatabad Township.

4-6 Current Water Use and Future Trend

Pakistan, once a water surplus country, is now water deficient country. The rainwater is neither sufficient nor regular, to meet the growing needs of water. About 70% of annual rainfall occurs in the months of July to September. Table-27 gives the comparison of per-capita of water availability in some selected countries of the world.

TABLE-27

PER-CAPITA WATER AVAILABILITY IN SELECTED COUNTRIES (m^3)

Country	1955	1990	2025
China	**4,597**	**2,427**	**1,818**
Mexico	**11,396**	**4,226**	**2,597**
Philippines	**13,507**	**5,173**	**3,072**
USA	**14,934**	**9,913**	**7,695**
Pakistan	**2,490**	**1,672**	**837**

Source: Population action International

The situation in Pakistan indicates that country is nearing conditions of chronic water-stress below 1,000 m^3.

In Hayatabad and Peshawar region depends almost on the ground water resources. With rapid population growth and urbanization, the water usage also increased many fold. Water requirement increases day by day. The continued abstraction of ground water has resulted in over-pumping and consequent lowering of ground water table in many areas. Efforts to recharge the depleting aquifers need to be undertaken immediately.

5-Hydro-Geological Characteristics

5-1 Hydrology

Hayatabad township is bound by Malagori and Khyber hill in west and south, in the east is Peshawar City and in north are small villages and recently developed townships. A very large township under development is the Regi Lalama which is double in size as compared to Hayatabad. On south is the Bara River while down north is River Kabul. Ground water is the major source of public water supply. The Peshawar Municipality, and its surrounding areas like cantonment and other settlements form a part of main hydrological basin. The aquifers, which are encountered here are the parts of the major aquifer system of Peshawar valley basin. As the sediments play an important role in hydraulic and geometric nature of aquifer, hence it is imperative to have a brief understanding about the deposition of alluvial sediments. Peshawar is a closed basin surrounded by hills on all sides, which have made it an intermountain basin. The sediment from the hills were brought into the basin by the stream originating in them and finally terminating into the basin. The basin exhibited semi lacstrin environments of deposition resulting in accumulation of thick clays in the central part, however, Hayatabad township is different than other parts of the basin because there the proximity of the hills resulted in the deposition of coarser material like gravels and boulders.

There are two major aquifer systems: Phratic (water table) aquifer system and Confined (artesian) aquifer system. Water table aquifer is found to a depth of 125 meters below ground surface and is mainly composed of coarse sand and gravels. Pumping test data of various tube wells in Hayatabad satellite town indicate good hydraulic properties of this aquifer system.

5-2 Bore hole logs

The following Table-28 shows information about bore hole logs of several tube wells with in the various Phases of Hayatabad and Peshawar.