8. MAINTENANCE AND MANAGEMENT SYSTEM

8.1 Outline

Establishment of an effective maintenance management system becomes one of the most important subjects for the flood forecasting and warning system. It is not an exaggeration to say that whether the flood forecasting and warning system installed will effectively function depends on the quality of the maintenance management system.

The following lists general items that should be incorporated into the maintenance management of a flood forecasting and warning system:

- Organizing a maintenance section and studying its improvement
- Training maintenance personnel
- Establishing maintenance procedures
- Establishing storage and control procedures for drawings and other documents
- Establishing storage, control, and replenishment procedures for spare and consumable parts
- Budgeting maintenance and operation expenses

8.2 Maintenance and Management System Structuring

Based on the study items listed in Section 8.1 above, studies are performed below as to the structuring of a maintenance management system for the flood forecasting and warning system.

(1) Organizing a maintenance section and studying its improvement

It is preferable that a maintenance management system for the Seyhan River basin flood forecasting and warning system should be organized as shown in Figure 8.2.1. Actual organization of a maintenance management system, however, is likely to significantly depend on the particular environment and factors associated with the structuring of the organization. An actual maintenance system should therefore be established only after separate studies which will be made on environment and factors.

Personnel placement planning under this maintenance management organization plan covers only the personnel requirement for the maintenance of the flood forecasting and warning system; it does not consider the personnel who will be involved in system operational jobs, such as hydrological gauging, flood forecasting and warning jobs, etc.

(2) Training maintenance personnel

In general, prior to introduction of a flood forecasting and warning system, several types of training such as factory training, site training, operational and maintenance training, etc., are usually carried out and maintenance personnel is correspondingly educated and trained. However, after separate examination of the actual subsequent situations for each existing flood forecasting and warning system, it is usually found that the promotions, replacements, etc. of the initially educated and trained personnel have resulted in the lack of sufficiently educated and trained. This is due to the fact that the education of new personnel or the transfer of technology has not been sufficiently executed. The measures listed below, therefore, should be undertaken.

- Establishing and executing periodic education/training programs
- Executing periodic education by special engineers such as those of the manufacturer of the system
 - Establishing and executing the programs for periodic education in the factories of the manufacturer of the system
 - Introducing simulation systems for education and training
- Other necessary measures

Since the implementation of the measures listed above incurs expenses, the appropriate budges should be set on an annual schedule and on a perennial schedule.

(3) Establishing maintenance management procedures

Standards for failure recovery and periodic maintenance procedures, for emergency and normal contact routes, for report documentation, and for all other necessary items, should be clearly provided for and executed. The following lists standards that should be established as maintenance management procedures:

Routine check and periodic check items, and standards for these checks

- Execution standards for failure or abnormal recovery actions
- Standards that specify control procedures concerning various reports and log
- lists, and their submission routes
- Standards that specify full details of repair request forms and routes
- Standards that specify storage, control, and replenishment procedures concerning spare and consumable parts
- Standards for the control of various maintenance documents and drawings
- Other necessary standards

(4) Establishing storage and control procedures for drawings and other documents

It is not the rare case that several years after installation, the corresponding documents, such as drawings, are gone somewhere on the user site and cannot be found when necessary. Since the drawings and other documents that accompany the system are important ones for maintenance, these documents should be controlled very carefully and using the appropriate methods to allow immediate reference to be made whenever necessary. It is also important that any modifications should be recorded both correctly and accurately and, at the same time, the corresponding documents should also be modified both correctly and accurately.

(5) Establishing storage, control, and replenishment procedures for spare and consumable parts

Even if, during the installation of the system, the user keeps a sufficient stock of spare and consumable parts, the stock may run out after several years and if this is the case, it may not become possible for the necessary maintenance actions to be undertaken and thus for the system itself to be operated smoothly. Such is mainly due to the fact that after the user stock of spare and consumable parts has run short, necessary refills are not procured at the appropriate time. A system should therefore be established that allows timely replenishment, including budgeting.

(6) Budgeting maintenance and operation expenses

It is particularly important that prior to the startup of the flood forecasting and warning system, budgeting and other necessary measures should be set up by estimating maintenance and operation expenses. The appropriate budgets should be set before continued smooth operation of the flood forecasting and warning system can be achieved.

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Tables

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Table 2.2.1 Correlation Matrix for Simple Linear Regression Analysis

elętiuiU	48	5		A			-					-	ALC: NO.			-		-		-											Low Barrier	
- 	ീ	0.61	0.472	0.786	0.629	0.507	0.675	0.348	0.651	0.471	0.819	0.247	0.535	0.516	0.303	0.224	0.195	0.195	8270 1	0.394	0.462	0.599	0:375	0.329	0.268	0.155	0.657	0.821	0.539	0.590	0.880	1.000
abain Migde	0.743	0.743	0,804	0.889	0.815	0.450	0.632	0.435	0.775	0.541	0.829	0.725	0.574	0.524	0.333	0.134	0.130	0.138	0.316	0.265	0.374	0.537	0.498	0.414	0.251	0.167	0.647	0.850	0.298	0.671	1.00	
টিগ্দ্রী	0.503	0,748	0.534	0.573	0.436	0.378	0.520	0.396	0.358	0.327	0.414	0.857	0.575	0.614	0.559	0.311	0.315	0.302	0.453	0.395	0.456	0.505	0.373	0.63	0.373	0.308	0.394	0.669	0.224	0007		
ուննեն	0.566	0.534	0.680	0.760	0.622	0.617	0.595	0.571	0.914	0.553	0,608	0.063	0.722	0.583	0.545	0.322	0.302	162.0	0.348	0.418	0.517	0.696	0.696	0.650	0.611	0.221	0.755	0.540	1.000			
դուսե⊋	0.513	0.678	0.519	0.720	0.524	0,686	0.728	0,404	0.586	0.476	0.734	0.224	0.596	0.769	0.572	0.448	0.415	0.342	0.497	0.555	0.572	0.727	0.513	0.628	0.438	0.303	0.599	1.000				
nvalöD	0.672	0.338	0.829	0.772	0.TT9	0.599	0.679	0.814	0.820	0.688	0.688	0.968	0.361	0.375	0.202	0.176	0.152	0.167	0.298	0.381	0.603	0.647	0.440	0.308	0,411	0.210	1.000					
M. Boşören	0.00	0.00	0.063	0.063	0.045	0.251	0.00	0.089	0.045	0.145	-0.055	0.130	0.292	0.385	0.578	0.749	0.792	0.729	0.638	0.669	0.523	0.302	0.476	0.532	0.683	1.000						
nonqauzU	0.114	0.195	0.349	0.274	0.114	0.490	0.205	0.339	0.332	0.860	0.105	0.161	0.474	0.550	0.683	0.744	0.762	0.807	0.723	0.846	0.784	0.527	0.657	0.674	1.000							
esterno T	0.302	0.567	0.602	0.541	0.292	0.612	0.445	0.521	0.484	0.564	0.307	0.03.2	0.809	0.838	0.872	0.583	0.564	0.462	0.737	0.743	0.700	0.820	0.828	1.00								-
Tokisi	0 040	0.429	0.737	0.688	0.609	0.418	0.429	0.375	0.729	0.606	0.499	0.00	0.853	0.581	0.724	0.473	0.491	0.383	0.553	0.665	0.689	0.701	1.000									
ւրդոչ	0.674	0.601	0.737	0,846	0.727	0.783	0.609	0.663	0.779	0.681	0.563	0.00	0.782	0.803	0.756	0.539	0.424	0.295	0.563	0.669	0.694	1.000								_		
ZHES	0.219	0.349	0.475	0.483	0.207	0.606	0,434	0.521	0.463	0.567	0.245	0.265	0.567	0.632	0.566	0.671	0.628	0.601	0.691	0.755	1.000											
tşixtrenif	0,105	0.307	0.319	0.351	0.095	. :0.604	0.295	0.397	0.295	0,407	0.158	0.155	0.520	0.704	0.806	0.856	0.797	0.742	0.834	1.000												
Pazaröten	0.118	0.224	0.268	0.257	0.095	0.552	0.176	0.409	0.202	0.344	0.105	0.224	- 0.517	0.771	0.749	0.752	0.751	0.665	1.000												_	
ບັນດາຊະນານ	0.063	0.045	0,077	0.045	-0.032	0.414	0.084	0.114	0.095	0.164	-0.055	0.187	0.228	0.429	0.556	0.861	0.903	1.000														
dronexeX	0.089	0.063	0.118	0.089	0.000	0.464	0.100	0.212	0.100	0.202	-0.032	0.241	0.354	0.508	0,661	0.921	1.000															
Kaynar	0.141	0.155	0.173	0.152	0.000	0.507	0.148	0.243	0.134	0.265	0.000	. 0,237	0.348	0.529	0.694	1.000																
ાકેદવ[ન	0.230	0.404	0.451	0.445	0.182	0.609	0.313	0.417	0.363	0.440	0.200	0.032	0.680	0.851	1.000				: 	 												
IJċvċĴi	0.411	0.590	0.579	0.623	0.400	0.686	0.482	0.566	0.510	0.688	0.401	0.071	0.716	1.000												Ŀ						
Bakıtdağ	0.416	0.533	0.706	0.780	0.495	0.527	0.446	0.594	0.675	0.583	0.543	0.126	1.000																			
ПүхдляшТ	0,405	0,118	0.352	0,161	0,355	0.363	0,212	0.359	0.224	0,446	0.221	1.000																				
tift nedvol	0.935	0.875	0.737	0.857	0.528	0.669	0.743	0.387	0.788	0.578	1.000	- 1 - 1 - 1																				
ityədmind	0.607	0.587	0.844	0.685	0.653	0.653	0.677	0,625	0.680	1.000																						
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Table 2.2.2 Effective Rainfall Gauging Station and Its Area Ratio for Subbasins

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		of Repr	Zamoti-Otisru Totot to	CalabalitWL		226.0					0.002	0.045									-									1.000
		election	Zamanti Unito	1306		0.029						0.031		0.081		0.007	0.037	0.056	0.058	0.083	0.035	0.056	0.071	0.095	0.092	060.0	0.110	0.049	0.021	1.000
		ults of S	theme2	1806		0:139						0.150		9389.				0.004							ate o					1.000
		The Res	Zamuch In fo	1823												0.008	0.046	0.070	0.073	0.105	0.0.64	0.070	0.090	0110	0.033	6114	0.139	0.062	0.027	1.000
		2.2.3	Gölösu an to	1802		0.016		-					0.194	0.108	0.286	0.226	0.115	0.054			<u>.</u>			0.001						1.000
		Table	Getsu	180S		0.034					·		0.326	1.22.0····	0.260	0.040		0.113												1.000
			Gökstu tim n	1081									0.074		0310	206.U	0.220							0.002					-	1.000
	2 22		Location	River Basis	Sevhan	Seyhan	Seyhan	Cakut	Cakit	Uçürge	Körkün	Körktin	Goksu	Göksu	Göksu	Göksu	Göksu	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	
			tent Arca	ation attom	10.0) (124.4)	(6.3)	62.5)																•••••							(72.5) (130.6)
			Catchin	Sta Total :/c.	738.2	1.512.7	200.11 (988.4	404.3	815.8	792.1	1,266.3	852.9	1,187.8	1.257.7	1.050.4	829.5	733.3	511.7	734.3	305.5	491.4	627.6	6.688	812.3	794.5	969,4	433.2	187.8	19.337.0
•			Station		Catoran	Keetsanti	Seyhan Bri	日本の日の	Pozonti*	Karaisali*	Hamal	Current +		Manabrus	Sambevli	Tutarbeyh	Sanz [*]	Bakırdağ	Elbası	Kaynar	Kezencile	Örensehir	Pazarören	Pinarbas [*]	12.6	Tokiac	Tomatta	Uzumpinar	M. Bosören	Total
											÷				E	; -	65	5	·											

* : Station with Pluviograph
 () : Reservoir Area
 [[]]: Selected Rainfall Gauging Station

Caker Ban Io	1828		0.005			955.0	0.174	580.0	0.014	0.061																		1.000			÷
Optinge			0.017				0.246	01.708												:								1.000			
Körleten	Seyhan HWL		0.172					0.828																				1.000			
Körterin um to	1820					0.001	0.017	0.070	0.338	0.574																		1.000			
Eglence	Catalan HWL	(neirre) driw)	0.244	0.208				0.548																				1.000			
Eglence	Seyhan R.	(avier) and	0.565	0.105				065-0																			 	1.000			
Eğlence un la	1825	3	<u></u>	0.336				0.051	0.561	0.053												<u>.</u>						1.000			
Catalan Brj.	-Seyhan Brj.		0.528.70.738	<u>ندين</u> 	0.460; (0.862)			E10.B																				1.000 (1.000)			
Zarrantı-Göksu after	Catalan HWL	(with Constant)	0.693 0.952	85400622.0				0.029											-									1.000 1.000			
Zamanti-Geler	Catalan HWL	(without Caralan)	0.664	61 <i>6</i> 1				0.017																				1.000			
Zumert-Görru Jointa	Caralan HWL		<u></u>	256.0					0.002	0.045	. p																	1.000			
Zamanti	9081	Alterpative 2)		0.029						0.031		0.0181		0.007	260.0	0.056	0.058	0.083	0.035	0.056	0.071	22010	0.092	0.090	6.116	0.049	0.021	1.000			
Zamanu un to	1806	Alternative I) (0.139						0.150		0.388				0.004						· · ·	0.319					1.000			
Zamanu un to	1822	Alternative () (0.008	0.046	0.070	0.073	0.105	0.044	0.070	0.090	0.119	0.033	0.114	0.139	0.062	0.027	1.000	· · ·		•
Golesu	1805	Alternative 2) (0.016							0.194		0.286	0.226	0.115	0.054						0.001						1.000		:	
Götsu un to	1805	Attemative I) (0.034							0.326	0.227	0.260	0.040		0.113												1.000	· .		
Gölistu uo to	1081	Alternative I) (0.074		0.310	0.395	0.220							0.002				:		1.000			
Location	River Basin		Sevhan	Seyhan	Sevhan	Cakut	Cakut	Üçürge	Körkun	Korkun	Goksu	Göksu	Goksu	Göksu	Göksu	Zamantı	Zamanta	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı	Zamantı			ng Station	
of Area	Station	(Seyhan); (Catalan)	(10.0) (124.4)	(6.3)	(62.5)			•••••																				(72.5):(130.6)	with Pluviograpi	or Area d Rainfall Gaugi	
Cate		Total	738.2	1.512.7	200.1	988.4	404.3	815.8	792.1	1,266.3	852.9	I. 187.8	1,257.7	1.050.4	829.5	733.3	511.7	734.3	305.5	491.4	627.6	8.628	812.3	794.5	969.4	433.2	187.8	19.337.0	: Station	I: Keservi Selecter	. :
station			Catolian	Karsan)	Seyhan Bri.	CORONAL .	PUZMAN*	A draisati	Frank	F anar D	Pelse.	Manaurius	Samberli	Tufanbeyli	Same?	Bakırdağ	Elbaşı	Kaynar	Kazancık	Orensehir	Pazarören	Programa	Sublu	Toklar	Tomarzo	Uzunpinar	M. Boşören	Total	*		

Table 2.2.4 The Results of Selection of Representative Rainfall Station (Alternative 2)

								d offer		Cooffic	Cion Vois							
							14-	u ardnm	o feco fao		ivili (a.)						Ĭ	Consta
	Sub - basin	Catalan	Karsantı	аваэй)і2	*naszo¶	*ılseisteX	Қатқр	*ibremeQ	эҳэд	*uineastd	Raimbeyli	ilyədneluT	Қахалсıқ	*լջշժյջու9	կաչ	roklar	rstraoT	۹.
1 Zamar	at up to 1822												0.263	0.318		0.129	0.307	0
2 Zamar	ata up to 1806		0.192							0.385					0.346			Ö
3 Göksu	t up to 1801										0.496	0.411						o
4 Göksu	tup to 1805								0.386	0.250	0.244							Ö
5 - Zamar	atı - Göksu joint to Çatalan HWL		679.0															Ö
6 Eğlen	ce up to 1825	1	0.367				0.608											o'
7 Eğlen	ce up to Seyban R.	0.569				0.374								1			-	0
(7) (Eğler	ree up to Çataian HWL)		(0.213)			(0.739)												(0.1
8 Zamaı	ntı-Göksu after Çatalan HWL	0.681	0.325															õ
(8) (۲ (۲	(0.722)	(0.289)							 								0.0-)
9 Körkt	in up to 1820						0.425	0.571										ō
10 Kürkö	in up to Seyhan HWL					0.965										· .		Ö
11 Üçürg	9,				0.273	0.724							<u></u>					Ö
12 Çatala	tu Brj Seyhan Brj.	0.534				0.462												ö
13 Cakit				¥07 V		200		1										c

No,	Name of Station	Kind of Station	Ну	drometeorolog	ical Gauging I	ems
			Rainfall	Temperature	Water Level	Reservoir
-	Seyhan River Basin	:				
1	Çamardı	RG Station	\checkmark			
2	Çiftehan	RG Station	\checkmark			
3	Pozanti	RG/TP Station	\checkmark	\checkmark		
4	Kamışlı	RG/TP Station	\checkmark	. √		
5	Karaisalı	RG Station	•√ •			• • • •
6	Karsantı	RG/TP Station	\checkmark	\checkmark		
7	1825	WL Station			\checkmark	
8	1820	WL Station			:√	
9	1818	WL Station			√ ,	
10	1828	WL Station			\checkmark	
11	Seyhan dam	WL Station	. :			\checkmark
12	Çatalan dam	RG/WL Station	\checkmark			·
	Zamantı River Basin	u t				
13	Kazancık	RG Station	√			
14	Pinarbaşı	RG Station	√	· · ·		•
15	Toklar	RG Station	\checkmark			
16	Tomarza	RG/TP Station	. √	\checkmark	- -	
17	Şeyhli	RG/TP Station	√ .	\checkmark		
18	1822	WL Station			\checkmark	
19	1806	WL Station			\checkmark	н. Т
	Göksu River Basin				f	. 1
20	Tufanbeyli	RG/TP Station	$\sqrt{1}$	\checkmark	.:	
21	Saimbeyli	RG Station	•√ ,	· · · · · · · · · · · · · · · · · · ·		
22	Feke	RG Station	\checkmark	· · · ·		ut e di series A
23	Sarız	RG Station				
24	Mansurlu	RG/TP Station	\sim	\checkmark		
25	1801	WL Station	: -	· · · ·	√	
26	1805	WL Station		·	\checkmark	и 1911 г. – С. –
				:		
					· · ·	:
	Abbreviation					
•	RG: Rainfall					
•	TP: Temperature					
	WL: Water level					

 Table 3.1.1
 List of Intended Gauging Items

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 Table 3.1.2 Comparative Studies of Terrestrial Communications Link Scheme and Satellite Communications Link Scheme

Item	Terrestrial Communications Links Scheme	Satellite Communications Links Scheme
Outline of Scheme	Data is to be collected through VHF radio communications links or micro wave multiplex radio communications links	A VSAT (Very Small Aperture Terminal) is to be installed at gauging stations and data is to be collected through a
	Via repeater stauous.	COMMUNICATIONS SATEMATE.
System Design	System design id flexible since circuit are to be designed considering system requirement.	System design will be restricted since it should be complied with the specifications of the satellite used
Circuit design and radio wave	Both required.	Although circuit design is required, it is easy. However, the
propagation test	· · ·	transmitting output power, antenna type, transmission
		method, etc. of VSAT will be determined from the design o the satellite
Initial investment cost	The approximate estimate of the initial investment costs for	For the VSAT system, VSAT facility should be installed by
-	the VHF radio communications facility and micro wave multiplex radio communications facility based on	the user. The approximate estimate of the initial investmen costs for the VSAT facility based on hydrometeonologica
	hydrometeorological observation network plan 1, are as	observation network plan 1, are as follows:
	follows:	
	VHF radio communications facility: \$892,400	
	Micro wave multiplex radio	
	communications facility: \$2,119,800	VSAT facility: \$3,491,700
	Total \$3,012,200	Total \$3,491,700
	(Power supply facility cost included)	(Power supply facility cost included)
Operation cost	Maintenance expenses only.	In addition to maintenance expenses, circuit usage charge are required. The annual usage charge per one channel of the VCAT evidem of the Demistic of Turkov is as follows:
		A OAT SYSCEME OF THE EXCLUSION OF THE ACT IS AS TOLOWS
		Annual usage charge: Approx. S9,600/channel (based on the monthly charge of \$800, surveyed in Ma)
		1994)
Reliability	The necessary reliability level can be set during design.	Depends on the reliability of the satellite. For a system tha
		does not nave a standby satemic, dangerous sumations and he encountered since the life of a satellite is usually between
		about 7 and 10 years. If satellite is launching fails, sudder
		notice on discontinuation of the services may be given.
Influence of attenuation by rainfall	Because of 2 GHz band, operation is not adversely affected by rainfall.	Because of a Ku band (12/14 GHz), operation is adversel- affected by rainfall. In areas, where snow falls, installation
	· · · · · ·	of heaters are undertaken against the influence of icing o
		snow on antenna.
Maintenance expenses	Compared with those of the satellite communications link	Compared with terrestrial communications link, satellit
	scheme, the maintenance expenses for the terrestrial	communications link usually take sugni maniculance expenses since only terminal stations are required
	CONTRACTORIANS ALLEN SUBCINE INCLOSUL OF ALPAGAINE TIMES	

Initial investment cost (initial equipment cost) is relatively higher than that for the centralized collection scheme. For a large-scale system with wide cover area, however, this method is advantageous in many cases. (Example) If a radio This scheme best fits to a large-scale system with wide cover area because it is possible to allow each sub-monitor station to acquire its own maintenance data, thereby enabling distributed control over the system. Time required for acquiring data can be shortened because data from each sub-monitor station can be acquired independently. This scheme is applicable to larger system because gauging stations can be distributed to each sub-monitor station. automatically to the monitor station (system control center), or only when a This scheme is advantageous in designing the radio circuit because digital regenerative repeater can be used in each sub-monitor station. Independent radio frequency is required for each sub-monitor station. If frequency is commonly used by two or more sub-monitor stations, it is necessary to assure of no interference by means of D/U calculation. Data is acquired first by each sub-monitor station, and then transferred transfer request is received from the monitor station. Data from some observatory stations may be acquired directly by the monitor station. Distributed Collection Method Õ Depends on the capacity of the telemetry monitoring equipment which is installed in the monitor station. If a number of gauging stations are installed, it is necessary to provide the telemetry monitoring equipment with larger (Example) Without installing sub-monitor stations, data is acquired by the monitor station (system control center) directly from the gauging stations. In addition, this scheme is disadvantageous for radio circuit design because the number of spans in the simplex telecommunication line inevitably increases in sufficient maintenance over a wide area because maintenance data can nowhere be acquired except in the monitor station. Cost is of no problem if the cover area is small enough for the monitor station to directly control the gauging stations. However, it is hard to provide Initial investment cost (initial equipment cost) is lower than that for the distributed scheme, however, total cost evaluation including the maintenance cost leads to a question. A system can be built up with the least number of radio frequencies because centralized control over the emission of radio waves can be done by the Time required for acquiring data is longer than in the distributed acquisition method because all gauging stations are to be collected in sequence. For the centralized collection scheme, it is necessary to make radio circuit design in consideration of increased noises because the number of spans between the monitor station and the observatory stations increases. Centralized Collection Method case of data collected in wide area. monitor station. capacity Multiplex radio telecommunication Simplex radio telecommunication System capacity (capacity of gauging station) : Sub-monitor station Problems in radio circuit design : Monitor station Radio frequencies required System configuration System description Data collection time line Maintenance Economy 0 ļ

Table 3.1.3 Comparison of Data Collection Method

		Polling Method	Polling Scheme + Event Reporting Method	Event Reporting Method
1. Desc	ription of function	Scheme by which an observatory station transmits data upon request from the monitor station.	Polling scheme plus an additional function of transmitting data when an event is sensed (e.g. warning level of the water is sensed, or start of rainfall is sensed).	Scheme by which an observatory station automatically transmits data when an event is sensed (e.g. rainfall o mm is sensed).
2. Syste	em diagram			
- 		C (Observatory	Request (in moment	O Pota transmission
		Response	Atmormality start-up	
3. Open	ation sequence			(Evenn] D)
	-	Call signal from monitor station	Call signal from monitor station	Topolar burket. Table of the second s
		Mo.1 observatory station responds.	Mo.1 observatory station responds.	No.1 station transits Bats.
		No.2 observatory station responds.	<pre>Mo.2 observatory station responds and initiates an abnormality start-up. (0currence of almormality)</pre>	Tipping bucket zair og us ir Nc.2 saser recory storior sases tipping m. Mb. á spreinn
4. Trans	smission method	Half-duptex communication method	Half-duplex communication method	Unidirectional communication method
5. Applicited	icable radio communication it	Simplex radio communication circuit is applicable.	Same as in the left.	Same as in the left.
6. Syste obser inclu	em capacity (Number of rvatory stations that can be ded in the system)	Large	Large (However, it is necessary to take into consideration the frequency of event report.)	In order to lower the probability of data missing due simultaneous data transmission by multiple observato stations, it is necessary to build up a system with sma number of observatory stations.
7. Relia	bility in data acquisition	100% reliability is maintained because there is no data missing resulting from the data acquisition method.	100% reliability can be maintained for acquiring data in the normal mode provide that the event report locking method is employed together. However, it is necessary to take into consideration the frequency of event report	When multiple stations transmit data simultaneously, transmitted data collides with each other resulting in a missing. Accordingly, reliability in data acquisition depends upon frequency of data transmission,

Event Reporting Method	Because the data transmission time increases as the number of data items to be transmitted increases, probability of data missing due to collision of the transmitted data increases. Normally, a system is designed to transmit two data items at a time.	Not possible.	Not possible.	A number of radio frequencies are generally required because it is necessary to allocate separate radio frequency for each channel.	Not recommendable from the view point of maintenance because this employs the unidirectional communication method and hence intercommunication is not available.	Disadvantageous because re-transmission function is generally not available to cope with noise or interference which is peculiar to the radio communication link. If the resend code method is employed throughout the operation, transmission time of the codes becomes longer, resulting in higher probability of data missing due to collision of transmitted data.
Polling Scheme + Event Reporting Method	Same as in the left.	Same as in the left. (However, it is necessary to employ the event report lock method together.)	Possible	Same as in the left. (However, a consideration must be given if the frequency of event report is high.)	Same as in the left.	Same as in the left. (However, a consideration must be given to the event report.)
Polling Method	Capacity can be freely determined: up to 10 items/station in general. Transmission of more items is also possible.	Because the same link used for data acquisition can then be used for transmission (distribution) of the data without any additional operation, it is possible to better the efficiency of the radio frequencies in use and the economy of the equipment. Therefore, this method is the most suitable for a system that requires both data acquisition and data transfer (distribution) like in case of the flood forecasting and warning system.	Possible	It is possible to design the system using the smallest possible number of frequencies. Even for a system with multi-channel data acquisition link, it is also possible to design the system using the smallest possible number of radio frequencies because data can be acquired from each channel by way of conducting link control (relay station control).	Advantageous in maintenance because intercommunication is possible and also because data can be acquired at any time from a specified observatory station.	A procedure for re-calling the station (re-acquiring the data) is available when a data error is caused by noise or radio interference. This can complement the weak point in data transmission via radio communication link.
	8. Transmission capacity	 Common use of data transmission link 	10. Joint use of maintenance servicecommunication link	11. Applicable frequency	12. Maintenance	13. Features of transmission via radio communication link

Table 3.1.5 Comparison of Each Telemetering Method (2/3)

Table 3.1.6 Comparison of Each Telemetry Method (3/3)

	ent Reporting Method Event Reporting SMethod	Power supply system of small capacity will generally suffice because no receiver is necessary. Required capacity for a rainfall observatory station can estimated according to the past data. For a water-level observatory station, however, special design consideration shall be given to the capacity of the powe supply system if it is set to report by the change of the level by 1 cm.	In general, it is necessary to keep the relay station alwa ust be given to the event in an operable condition. Consequently, if interference frequent power is unnecessarily consumed in relaying interfered signals, resulting in a problem in many cases	Outdoor cylinder installation type is possible for a rainf observatory station. Construction of a water-level observatory station is about the same as in the polling method, employing the indoor installation normally.	A small-scale system of this method can be built up at lower cost than in the polling method, but there is no remarkable difference in case of a large-scale system.
	Polling Scheme + Eve	Same as in the left.	Same as in the left. However, a consideration mu report.	Same as in the left.	Same as in the left.
فمحمد وغدد والأثاث فالمتعاد والمراجل والمستعمان والمرابعة والمتلاف المتعاد والمتعالي والمتعالي والمتعالية و	Polling Method	Intercommunication is required and hence it is necessary to keep the power on to the receivers all the time. Therefore, the power supply system needs to have higher capacity for the above than in the event reporting scheme.	By implementing the start/stop method, it is possible to actuate the relaying operation only when it is necessary.	Each station generally requires a building. Installation inside the building is more advantageous from the view point of maintenance.	In case of a large-scale system, there is no remarkable difference in economy compared to the event reporting scheme.
		14. Power supply system in observatory station	15. Operation of relay station	16. Considerations in construction	17. Economy

Table 3.1.7 Each Type Water Levle Gauge (1/2)

	WATER LEVEL GAUGE	FLOATLE	SS TYPE	UNTOUCH TYPE
	ITEM	ACOUSTIC TYPE	PRESSURE TYPE	ULTRASONIC TYPE
	MEASURING PRINCIPLE	Water level is measured by detecting time from transmission of acoustic pulses to reception of the wave reflected by water surface	Water level is measured by detecting water pressure corresponded to water level with sensor such as crystal type.	Water level is measured by detecting time from transmission of ultrasonic wave to reception of the wave reflected by water surface.
		Transdurer Gauging Becorder	Pre ssure converter Recorder	Temperature Eccorder Parsons
	EQUIPMENT COMPOSITION	pulses Output to Acoustic ware Relemetry	Output to	Ultrasoni: ware pulses culture telemetry
· E				
71	INSTALLA- NECESSITY OF GAUGING WELL	Disuse (Acoustic wave pipe is needed)	Disuse	Disuse
	TION CONDITION FROM SENSOR TO CONVERTER	Possible Maximum 200 m	Possible Approx. 2,000 m	Possible Approx., 500 m
	INCLINE INSTALLATION ALLOWABLE DECREES	Possible Maximum allowable angle: 30°	Possible	Impossible
	OTHERS	Possible for average water level output	No obstruction under a transducer	
	CONNECTABLE CONVERTER AND MEASURING ACCURACY	±1 cm	± 1cm	±1 cm
	MEASURING RANGE	0 - 10 m/30 m	0 - 5 m/10 m/30 m/50 m/100 m	0 - 10 m
	RECORDER	Separate type (Analogue recorder: 1/3 months)	Separate type (Analogue recorder: 1/3 months)	Separate type (Analogue recorder: 1/3 months)
	POWER SOURCE AND CONSUMPTION	AC 100 V, 50/60 Hz, Approx. 20 VA DC 12 V/DC 24 V, Approx. 15 W	DC 12V, Approx. 6 W	AC 100 V, 50 - 60 Hz, Approx. 20 VA DC 12 V, Approx. 8 W
	APPLICATION OF SOLAR CELLS POWER SUPPLY SYSTEM	Suitable	Suitable	Suitable

		•	Table 3.1.8 Each Type Wate	er Levle Gauge (2/2)	
		WATER LEVEL GAUGE	FLOAT	TYPE	
	ITEM		FLOAT AND WEIGHT TYPE	SENSING POLE TYPE	
	MEASURING	PRINCIPLE	Water level is measured by a rotary degree of pulley which is directly connected to a float balanced with a counter weight in response to up and down motion of water level.	Water level is measured by lead switches which correspond to position of a float with magnet.	
	EQUIPMENT	COMPOSITION	Cost Jorgha	Tik tel	
	and the second state of the se			Fluat Vidi Lizeturi Lizeturi	
E - 1				25115115	
75	-ALLA-	NECESSITY OF GAUGING WELL	Necessity, 650 mm,o or more	Disuse	
<u> </u>	TION CONDITION	INSTALLATION DISTANCE FROM SENSOR TO CONVERTER	Impossible	Possible, Maximum 500 m	
		INCLINE INSTALLATION ALLOWABLE ANGLE	Impossible	Possible with sensing pole for incline Maximum allowable angle: 27°	
		OTHERS	Narrow well type is available (Diameter of well is 200 mmø or less)	Firm installation is needed to avoid sensing pole washed away by a flood	
	CONNECTAB MEASURING	ACCURACY	Shaft encoder ±1 cm	Digital coder ±1 cm	
	MEASURING m/100 m	RANGE 0 - 10 m/20 m/50	0 - 10 m/20 m		
	RECORDER		Equipped type (Analogue record: 1/3 months)	Separate type (Analogue record: 1/3 months)	
	POWER SOUI	RCE AND CONSUMPTION	Power supply is not necessary	DC 12 V, Approx. 6 W	
	APPLICATION SUPPLY SYS7	N OF SOLAR CELLS POWER TEM	Most suitable	Suitable	

Study Item	Ziyaret T. Relay Station	Feke Dağı Relay Station
<u>9</u>	 Ziyaret T., the scheduled installation location of a multiplex radio line relay station 	• Feke Dağı, the scheduled installation location of a multiplex radio line relay station and a telemetering radio line relay station.
upervisory ontrol center	• DSI 6th regional directorate	• DSI 6th regional directorate
ossible ranges of rainfall auging	 Although a quantitative gauging range of 120km is not perfect, it covers the midstream area of the Seyhan River basin. A qualitative gauging range of 200km almost covers the intended Seyhan River basin. 	 A quantitative gauging range of 120km almost covers the intended Seyhan River basin. A qualitative gauging range of 200km almost fully cover the Seyhan River basin.
opographical conditions of he radar site	• The relationship between the positions of neighboring mountains and the allowable emitting radar beam angle should be studied in detail.	• The relationship between the positions of neighboring mountains and the allowable emitting radar beam angle should be studied in detail.
ower receiving situation	 Power distribution lines are present nearby. 	 Power distribution lines are present nearby.
Access to the radar site	 Possible by car 	• Possible by car

Information Related Agencics	Rainfall Data	Water Level Data	Discharge Data	Flood Protection Information	Evacuation Information	Seyhan Dam Operation Information	Catalan Dam Operation Information						Evaluation of Related Agencies	Remarks
DSI 6 th Flood Control Committee	0	0	0	0	0	0	0						A	
DSI General Directorate	Ó	0	0	0	0	0	0						A	
Seyhan Dam Office	0	0	0	-	-	-	0						Α	
Çatalan Dam Office	0	0	O	-	-	0	-						A	
DMI Adana Regional Directorate	0	-	-	1	1	-	-						Α	
EIE Adana Regional Directorate	-	0	0	· 	-	-	-						Α	
Doğankent Office of ASO	-	-	-	0	-	.	~						A	
Yenice Office of ASO	-	-	-	0	-	-	-						Α	
Adana Provincial Governor	-	-	-	-	0	-	-						A	
Seyhan District	-	-	-	-	Ó	-	-						В	
Yüreğir District		-	-	-	0	-	-						В	
Seyhan Municipality	-		-	-	0		-						С	
Yüreğir Municipality	-		-	~	0	-	-						С	
Feke District Office	-	-	-	-	0		-						С	
Pozantı District Office		-	-	-	0	-	-						С	
Saimbeyli District Office	-	~	-	-	0	-	-							
Tufanbeyli District Office	-	-	-	-	0	-	-							
Sarız District Office		-	-	-	0	-	-							
Pinarbası District Office	-	-	-	-	0	_							·	
Karaısalı District Office	-	-	-	-	0	~	-							
Heads of Towns and Villages downstream	-	-	-	-	0	-	-						В	
												·		
														······································
										•				
Note: Siren warning is effect	ctive	e foi	r eva	acua	utior	ı, bı	at it	is e	xclı	ıdeo	i be	caus	se of	f military use.

Table 3.3.1	List of Eva	aluation of I	Related	Agencies'	To Be	Transmitted	of Information
				-			

Legend: A; Transmission media is to be installed preferentially.

B; Transmission media is good to be installed.

Table 3.3.2 List of Kind of Data and Information Transmitted in Present Conditions

Kind of In	formation	Intervals of Transmission	Transmission Media	Content of Information
	Rainfail	Every 1 H	Numerical (Telephone)	Hourly rainfall by gauge read
Hydrometeorological information	Water level	Every 2/1 H	Numerical (Telephone)	Present water level by gauge read
	Discharge	Every 2H/1H	Numerical (Telephone)	Present discharge by conversion table
Flood protection informatic	uo	At any time	Voice (VHF)	Necessary information of flood protection action
Flood protective facility inf	formation	At any time	Numerical/voice (Telephone/VHF)	Information of flood discharge
		At any time	Letter/voice (FAX/Teleohone)	Villages to be evacuated
Evacuation information			Voice (Çukurova radio broadcasting station)	People downstream to be evacuated

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Transmission Media	Description and Features of Media	Examples of Types of Information Provided	Typical Hardware Units
Image information	 * Graphic information and digital information are combined and served in the form of an image. * Suitable for the information that can be better understood in a chart of a diagram. * Suitable to display the time-series data. 	 River basin status chart Water level/flow change chart Rainfall status chart Table of rainfalls Table of water level/discharge Dam status chart Water level/discharge forecast chart Others 	 * CRT display unit * Overhead projector * Hard copy
Data display	 * Display by digital numbers or indicator lamps. * Suitable for the information that is displayed and monitored ali the time. * Applicable also for displaying or instructing a warning or a status of disaster condition. * It is possible for many persons to monitor the data at a time. 	 * Rainfall display * Water level and discharge display * Dam gate discharge * Rainfall warning * Water level warning * Danger warning * Status display * (Command) 	 * Data display panel * Graphic display panel * Warning display panel * Status display panel (c.g. flood fighting action system)
FAX	 It is possible to output a text or a diagram in the form of paper. Automatic transmission is possible, but operation for the transmission and delivery after the receipt are manual. It is possible to exchange detail information in the form of written documents. Effective for recording the command (order). 	 Command/order for operation Guidance for operation Detailed status report flood fighting action 	* Facsimile eqyuipment
Record		 * Record of hourtly/daily report * Record of monthly report * Record of yearly report * Record of warning report 	* Typewriter* Printer* Hard copy
TELEX	* Character transmission via the general-purpose public TELEX line which uses the network service of the post offices.	* Character information	Facilities of post offices are used

 Table 3.3.3
 List of Data Transmission Media Used in Flood Forecasting and Warning System (1/2)

Table 3.3.4 List of Data Transmission Media Used in Flood Forecasting and Warning System (2/2)

	Transfer Media	Description and Features of Media	Examples of Types of Information Provided	Typical Hardware Units
V oice telephone	Private announcement	* Only picking up the handset of the telephone causes the telephone set at the other end to ring. Because a private line is used, this is a transfer medium which assures communication and instruction without fail whenever necessary.	 * Dam operation command * Flood fighting command * Emergency announcement 	 * Multiplex communication facility * Radio.communication facility
	Simultaneous announcement	* A system for simultaneous announcement from a point such as the control center to all relevant places and parties. In general, an alert signal for caution is sent first and then the announcement is sent simultaneously.	 Command regarding the in-alert condition Command to issue warning/alert Announcement of information common to all stations such as information about the status of upstream dams 	 Multiplex communication facility Radio communication facility Mobile communication facility Simultancous announcement facility Simultaneous broadcasting facility
	Individual announcement	* A system for sending the announcement after calling up each station with voice or signal such as bell.	 Individual command regarding the in-alert condition Command to issue warning/alert individually 	 Multiplex communication facility Radio communication facility Mobile communication facility Individual announcement facility
E - 80	General amouncement	* A system for communication by calling up the other end with bell or voice like in general telephony.	 * General operation-related announcement * Maintenance-related announcement 	 Multiplex communication facility Radio communication facility Mobile communication facility
Warning equ	lipment such as siren	* A system for announcing a warning to the general residents by remote or manual operation.	 * Alert for caution * Evacuation warning * Gate operation warning 	 * Siren broadcasting facility * Dam discharge warning facility
Loud-speake	er broadcasting	* To transfer information to the general residents via voice broadcasting by way of remote loud-speaker broadcasting or field manual operation.	 * Alert for caution * Flood information * Evacuation warning/command * General announcement 	 * Simultaneous broadcasting facility * Loud-speaker broadcasting facility
Electric sign	board	 To transfer information by way of displaying in characters by remote control or field manual control. 	 * Alert for caution * Flood information * Evacuation warning/command * General announcement 	* Electric sign board
Rotational w	varning light	 To alert for caution by way of revolving red or yellow lights by remote control or field manual control. 	* Alert for caution	* Rotational warning light

Kinds of Information	Transmission Media	Image Information Display	Data Display-	FAX	TELEX	Recording	Private Telephone	Simultaneous Messaging	Independent Messaging	General Contact Telephone	Siren Warning	Loud Speaker Broadcasting	Electric Sign Board	Rotation Alarm lamp	Remarks
Hydrometeorological	Rainfall	A	A	ċ	-	в	-	-	-	÷	-	~	-	ï	
Information	Water level	A	Å	C	-	В		-		-	-	-	-	-	
	Discharge	A	A	С	-	B	-	-		-		~	-	-	
Flood Protection Info	ormation	A	Ă	В	-	-	в	в	В	C		-	-	-	· · ·
Evacuation Informati	on	A	A	В	-	-		В	В	В	-	С	С	С	· ·
Seyhan Dam Operati	on Information	A	A	В	~		A	В	в	в	-		-	-	
Çatalan Dam Operati	on Information	A	A	В		-	A	в	В	В	-	-		 -	
Maintenance Manage	ment Information	A	A	В		-	-	-	-	A		-	-	-	
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	<u> </u>														
Note:	Siren warning is effec	ctive	e foi	r ev:	acu	atio	n, bi	ut it	is e	xcli	ideo	t be	cau	se o	f military use.

Table 3.3.5 List of Kinds of Information Transmission and Media Recommended

a bi

B; Transmission media is good to be installed.

C; Transmission media is to be installed, if possible.

						ľ								
Transmission Media Related Agencics	Image Information Display	Data Display	FAX	TELEX	Recording	Private Telephone	Simultaneous Messaging	Independent Messaging	General Contact Telephone	Siren Warning	Loud Speaker Broadcasting	Electric Sign Board	Rotation Alarm lamp	Remarks
DSI 6 th Flood Control Committee	A	в	В	-	A	Α	-	·	-	-	-	- :	-	
DSI General Directorate	A	-	В	-	A	A	-	-	-	-	-	,	-	
Seyhan Dam Office	Α		В	-	A	A	-	-	-	÷	-	-	-	
Çatalan Dam Office	Α	-	В	-	A	Ą	-	-	-		-	- 12	-	
DMI Adana Regional Directorate	A	-	-	-	A	-	-	-		-	~	.	-	
EIE Adana Regional Directorate	A	-	-	-	A	-	-			. .	-			
Doğankent Office of ASO	-	-	В	-	-		-	B		-	-	-	-	
Yenice Office of ASO	-	-	В	-	-	-	-	В		-	-	-	-	
Adana Provincial Governor	-	-	A	-	-	A	-	-	-		-		-	
Seyhan District	-	-	В	-			-	-	В	- ·	-		-	
Yüreğir District	-	-	В	-	- 	-	· -	-	В	-	-	-	. 7	
Seyhan Municipality	-	-	-	-	~	-	-	-	-	1	с. 1		-	
Yüreğir Municipality	-	-	-	-	. 7	-	-	- - 4	-	-		· . -	-	
Feke District Office	-		B	+	-	-	-		В	-		1	-	
Pozantı District Office	-	-	В	-	~	-	-	-	В		-	· · ·	-	
Saimbeyli District Office	-	-	-	-	- '	-	-	-	-	· -		1	-	
Tufanbeyli District Office	-	-	-	-	-	-	=	-	-	-	-	-	-	
Sarız District Office	-	-	-	-	-	-	1	-	-			- -	12	
Pinarbası District Office	-	-	-	-		-	-	-		-	-	-	-	
Karaısalı District Office	-		-	-	-	-	-	-	-	4	1	-	-	
Heads of Towns and Villages downstream		-	В	-	- '	-	-	-	-	-	-	-	-	People downstream
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Table 3.3.6 List of Transmission Media Between DSI Flood Control Committee and Related Agencies

Legend: A; Transmission media is to be installed preferentially.

B; Transmission media is good to be installed.

 Table 3.3.7 Comparison of Voice-based Information Transmission Method (1/2)

Method 2 Method 3 Method 3 An Communication Single Channel Radio Dial Communication Method	comprises of the The system comprises of the relay stations and ions Cell-call terminal station, relay stations and terminal stations. The base station connects through a nent installed at the station connects through a controller to the radio equipment (center station) and which is installed in the witching unit of the relay stations for communication with ured station by the terminal stations. Stations to talk with it.	communication Full duplex communication method	hal Dialing	c conversation Bi-directional simulta-neous conversation (the same as in general telephony)	he left. Only several stations are included in one radio communication link because each terminal requires independent radio frequency.	Two waves x number of terminal stations	MHz band, 250 MHz band to 450 MHz and, and 400 MHz band is commonly used. mmonly used.
Method 1 Nethod 1 Noice Call Radio Sele-call Radio Sele-call Radio Method Method	The system comprises of the asset to the system comprises of the base station, terminal station, terminal station, terminal station is called up by voice. The station (tation is called up by voice. The station (terminal station is called up by voice. The station (terminal station) is called up by voice.	Half-duplex communication Half-duptex (method	Voice call Audible sign	Press-to-talk conversation Press-to-talk	Vo particular limita-tion, but Same as in ti several tens of stations are ncluded in one radio communication link.	One wave One wave	50 MHz/70 MHz band, 150 MHz band, and 150 MHz band are commonly 100 MHz band are commonly 1sed.
<u>×ð</u>	General Method 11 matters Method ba ter in ste	Transmission method H. m	How to call the other V(Communication method Pr	System size No size se	Required number of radio frequencies (in case of one radio communication link having no relay station)	Applicable frequency 66 band in considera-tion of 12 the market is

Table 3.3.8 Comparison of Voice-based Information Transmission Method (2/2)

		Method 1 Voice Call Radio Communication Method	Method 2 Sele-call Radio Communication Method	Method 3 Single Channel Radio Dial Communication Method	Method 4 Frequency Division Multi- channel Method (Rural Telephone System)	Method 5 Time Division Multi- channel Method
Appli- cability to mnounce- nent unction	Simultaneous announcement	Difficult	Possible	Impossible	Generally impossible	Generally impossible
	Individual announcement	Possible despite of voice call- up method.	Possible	Possible	Possible	Possible
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0. Name of Station Hydrometeronlogical Counging times 5 Contain RC/TP Station V	2 ¹ 2 2		· · ·		-4	Alternative 1		· . 1		Alter	natiye 2	-			Altı	smative 3	
Radial Tempention Vatur Looi Vatur Looi<	Vo. N	Vame of Station	n Kind of Station		Hydrometeo	rological Ga	uging Iten	St	H	ydrometeorolo,	gical Gau	ging Items		Hy	drometeorol	ogical Gaugini	g Items
Solain Rother bain Solain Rother bain Solain Rother bain P 1 Crimin Roth Satis 2 Crimin Rother bain 2 Crimin Rother bain P P 3 Foundi Roth Satis 2 Crimin Rother bain 2 Crimin Rother bain P P 4 changi Roth Roth Satis 2 Crimin Rother bain 2 Crimin Rother bain P P 7 Stanis Rother bain 2 Crimin Rother bain P P P 7 Rother bain VL Sation 2 Crimin Rother bain P P P 7 Rother bain VL Sation 2 Crimin Rother bain P P P P 1 Solain Roth Sation 2 Crimin Roth Sation 2 Crimin Rother bain P P P P 1 Solain Roth Sation 2 Crimin Roth Sation 2 Crimin Rother bain P				Rainfall	Temper	ature Wate	r Level	Reservoir	Rainfall	Temperature	: Water	Level Rese	rvoir	Rainfall	Temperatu	re Water Lev	el Rese
1 Crimention RCS Stations V 2 Crichain RCS TYP Stations V 4 Kamagi RCO TYP Stations V 5 Kanasalin RCO TYP Stations V 5 Kanasalin RCO TYP Stations V 5 Kanasalin RCO TYP Stations V 7 RS VL Stations V 7 RS VL Stations V 8 RSD VL Stations V 8 RSD VL Stations V 8 RSD VL Stations V 8 RSD VL Stations V 1 Stations RCO PStations V 1 Stations RCO PStation V 2 RCO Pstation V 2 Stations RCO Ps	S	seyhan River B.	asin						-								
2 Critchin RG Station V 3 Prainin RG Station V 4 Stanishi RG Station V 5 Kanishi RG Station V 5 Kanishi RG Station V 5 Kanishi RG Station V 6 Kanishi RG Station V 7 RS2 WL Station V 9 188 WL Station V 10 RS3 WL Station V 11 Roymachin VL Station V 12 RS3 WL Station V 13 RS3 VL Station V 14 RS3 RG Station V 15 Station V V 16 Game KWL Station V 17 RS3 RG Station 18 RS2 WL Station 19 RS4 RG Station 10 Station V 10 Station V 10 Station	Ū.	Zamardı	RG Station	7					>					∕>			
3 Pointin RGTPS Station V V V V 4 Ransain RGTPS Station V V V V 5 Ransain RGTPS Station V V V V 7 BES WL Station V V V V 7 IBS WL Station V V V V 7 IBS WL Station V V V V 9 B18 WL Station V V V V 11 Soyhan dam WL Station V V V V 12 Calchand man WL Station V V V V 13 Statuck RG Station V V V V 14 Philtright RG Station V V V V 15 Tolkits RG Station V V V V 15 Tolkits RG Station V V V V 15 Tolkits RG Station V V V V 15 Statuck RG Station V V V V 15 Statuck RG Station V V V V 16 Station V V V	2.0	Ziftehan	RG Station	>					~					7			
4 Romain RGTP Station /	θ	ozantı	RG/TP Station	~	>		•		~	>				· 	~		
5 Kanishi RG Ration 4 6 Kasini ROTP Station 4 7 R25 WL Station 4 7 R35 WL Station 4 7 R35 WL Station 4 9 R18 WL Station 4 9 R18 WL Station 4 10 R38 WL Station 4 11 Seybar dam ROWL Station 4 12 Chalan dam ROWL Station 4 13 Kzamack RG Station 4 14 Pharidag RG Station 4 15 Chalar RG Station 4 16 Cramiza RGWL Station 4 17 Spill RG Station 4 18 R22 WL Station 4 19 Statemark RG Station 4 19 Sta	4 X	čarnışlı	RG/TP Station	>	· ~				`>	~				Ŕ	À		
6 Karsenty KGransenty KGransenty KGransenty K 7 1825 WL. Sution V V V 9 1830 WL. Sution V V V 10 1828 WL. Sution V V V 11 18-pian dam WL. Sution V V V 12 Septan dam WL. Sution V V V 13 Septan dam KGWL. Sution V V V 13 Septan dam KGWL. Sution V V V 13 Standork KG Station V V V 14 Franknap KG Station V V V 15 Solar KG V V V 15 Statendik KG Station V V V 15 Solar V V V V 16 Tomaza KG Station V V V 15 Solar V V V V 16 Station V V V V 17 Solar KG Station V V V 15 Solar V V V V 15 State KG Station V V V 16 Sta	5 K	Caraisalı	RG Station	7					>					~			
7 1825 WL Station V 8 1820 WL Station V 9 1818 WL Station V 10 1828 WL Station V 11 Seyland fam WL Station V 12 Catalan dam RC/WL Station V 13 Skaznok RO Station V 14 Fhandrag RO Station V 15 Takanok RO Station V 15 Tokan RO Station V 15 Station V V 16 Tomazi RO TP Station V 17 Spejkin RO TP Station V 17 Spejkin RO TP Station V 17 Spejkin RO TP Station V 18 Station V V 19 Soft RO TP Station V 19 Soft RO TP Station V 20 Station V V 21 Station	6 K	Carsan tı	RG/TP Station	7	>				~	~				>	7		
8 1820 WL Station V 9 1818 WL Station V 9 1818 WL Station V 10 1826 WL Station V 11 Seyhar dam WL Station V 12 Station VL Station V 13 Station VL Station V 14 Pharbay KG Station V 15 Station V V 15 Station V V 16 Formera KG Station V 17 Seyhi KG Station V 16 Formera KG Station V 17 Seyhi KG Station V 18 Station V V 17 Seyhi KG Station V 18 Station V V 17 Seyhi KG Station V 18 Station V V 17 Seyhi KG Station V 18 Station V V 18 Station V V 19 Soft WL Station V 18 Station V V	17	825	WL Station		-		~				>				•	~	
9 1818 W.L.Station V 10 8825 W.L.Station V 11 Soyhar dam W.L.Station V 13 Soyhar dam KOTNL Sution V 14 Pharbage RG Station V 15 Tokia RG Station V 16 Soyhar dam RG Station V 17 Catalar dam RG Station V 18 Sobion V V 19 Sobian V V 19 Sobian Silven Basin V V 20 Tudiatbyli RG Station V 21 Sambeyli RG Station V 22 False V V 23 Sam V V 24 Masmulu RG Station V 25 Station V V 25 Station V V	8	820	WL Station				~	•		•	>		·	·	·	>	
[0] R2S W.L. Station V 11 Seyhan dam W.L. Station V 12 Catalan dam R.G.W.L. Station V 12 Catalan dam R.G.W.L. Station V V 13 Kizzmotk R.G. Station V V V 14 Friantog R.G. Station V V V V 15 Foldar R.G.TP Station V V V V V 15 Foldar R.G.TP Station V V V V V V 15 Foldar R.G.TP Station V V V V V V 15 Foldar R.G.TP Station V V V V V V 16 Fondares W.L. Station V V V V V V 18 Science V V V V V V V V V V 18 Science V V V V V V V V V V V V V V V	6	818	WL Station				~				>	1				~	
11 Seyhan dam WL Station V 12 Catalan dam RGWL Station V 13 Kazanok RG Station V 14 Franting RG Station V 15 Kazanok RG Station V 16 Franting RG Station V 17 Fokia RG Station V 16 Franting RG Station V 17 Fokia RGTF Station V 17 Septi RGTF Station V 18 IS2 WL Station V 19 IS66 WL Station V 20 Fulce Resin V V 21 Saimbeyli RGTF Station V 21 Saimbeyli RGTF Station V 22 Fake RG Station V 23 Sanz RG Station V 23 Sanz RG Station V 23 Sanz RG Station V 24 Anarrenthe RGTF Station V	101	828	WL Station				~				*	1				~	
12 Catalan dam RG/WL Station Zamant River Basin 2 Amart River Basin 13 Kazanek RG Station 14 Fharbagi RG Station 15 Tokiar RG Station 15 Tokiar RG Station 16 Tomarza RG TP Station 17 Seyhii RG TP Station 18 1822 WL Station 19 1805 WL Station 10 1805 WL Station 11 1805 WL Station 12 1805 WL Station	11 S	seyhan dam	WL Station					~				*	~				
Zamann River Basin 13 Kazancik RG Station 14 Fharbagi RG Station 15 Tokiar RG Station 16 Tomarza RG Station 17 Seyhii RG Station 16 Tomarza RG TFP Station 17 Seyhii RG TFP Station 18 1822 WL Station 19 1805 WL Station 10 1805 WL Station	12 Ç	Zatalan dam	RG/WL Station	`>				>	~			*	^	>			
13 Kazancık RG Station V 14 Fhanthaga RG Station V 15 Toklar RG Station V 16 Tomatza RG/TP Station V 17 Seyhi RG7TP Station V 18 1822 W1 Station V 19 1806 W1 Station V 19 1805 W1 Station V 19 1805 W1 Station V 20 Tufanbyli R07TP Station V 21 Sainbeyli R0 Station V 22 Fels R0 Station V 23 Sanz R0 Station V 23 Sanz R0 Station V 26 1801 W1 Station V 26 1802 W1 Station V	2	Camantı River I	Basin														
14 Finarbagi RG Station V 15 Toklar RG Station V 16 Tomizza RG/TP Station V 17 Şeyhli RG/TP Station V 18 1822 WL Station V 19 1806 WL Station V 19 1806 WL Station V 20 Tufanbyli RG/TP Station V 20 Tufanbyli RG Station V 21 Saimbeyli RG Station V 22 Feke RG Station V 23 Sanz RG Station V 24 Mannulu RG/TP Station V 25 Feke WL Station V 26 1805 WL Station V	13 K	Xazancık	RG Station	>	*				÷								
15 Tokiar RG Station V 16 Tomarza RG/TP Station V V 17 Şeyhi RG/TP Station V V 17 Seyhi RG/TP Station V V 18 1822 WL Station V V 19 1806 WL Station V V 19 1806 WL Station V V 20 Tufanbeyli RG/TP Station V V 20 Tufanbeyli RG/TP Station V V 20 Tufanbeyli RG/TP Station V V 21 Saimbeyli RG Station V V V 21 Saimbeyli RG Station V V V 22 Feke RG Station V V V 23 Sanz RG Station V V V 25 1801 VL Station V V V 26 1805 WL Station V V V 26 1805 WL Station V V V	14 P	hnarbaşı	RG Station	>					>								
 Tomarza RGTP Station RGTP Station RGTP Station RGTP Station RGTP Station Substration Multiple Substration Multiple Substration Multiple Substration Multiple Multip	15 T	oklar	RG Station	2													
17 Şeyhli RG/TP Station / 18 1822 WL Station / 19 1806 WL Station / 19 1806 WL Station / 19 1806 WL Station / 20 Tufanbeyli RG/TP Station / 20 Tufanbeyli RG/TP Station / 20 Tufanbeyli RG/TP Station / 21 Saimbeyli RG Station / 22 Feke RG Station / 23 Sanz RG Station / 24 Mansurulu RG/TP Station / 25 1801 WL Station / 26 1805 WL Station /	16 T	omarza	RG/TP Station	>	>				>	~		-					
18 18.22 WL Station V 19 1806 WL Station V 19 1806 WL Station V Göksu River Basin Coksu River Basin V V 20 Tufanbeyli RG/TP Station V V 21 Saimbeyli RG Station V V V 22 Feke RG Station V V V V 23 Sanz RG Station V V V V V 23 Sanz RG Station V V V V V V 24 Mansurulu RG/TP Station V V V V V V 25 1801 WL Station V V V V V V V 26 1805 WL Station V V V V V V	17 \$	Şeyhli	RG/TP Station	>	>												
19 1806 WL Station <t< td=""><td>18 1</td><td>1822</td><td>WL Station</td><td></td><td></td><td></td><td>~</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>~</td><td></td></t<>	18 1	1822	WL Station				~									~	
Góksu River Basin 20 Tuťanbeyli RG/TP Station V V V V 20 Tuťanbeyli RG/TP Station V V V V V 21 Saimbeyli RG Station V V V V V V 21 Saimbeyli RG Station V V V V V V 22 Feke RG Station V V V V V V V 23 Sanz RG Station V <td< td=""><td>191</td><td>1806</td><td>WL Station</td><td></td><td></td><td>•</td><td>~</td><td>•</td><td></td><td></td><td>*</td><td>1-</td><td></td><td></td><td></td><td>~</td><td></td></td<>	191	1806	WL Station			•	~	•			*	1-				~	
20 Tufanbeyli RG/TP Station V V V V 21 Saimbeyli RG Station V V V V V 21 Saimbeyli RG Station V V V V V 22 Feke RG Station V V V V V 23 Sanz RG Station V V V V V 24 Mansurulu RG/TP Station V V V V V 25 1801 WL Station V V V V V V 26 1805 WL Station V V V V V V	Q	Göksu River Ba	sin														
21 Saimbeyli RG Station V V 22 Feke RG Station V V 23 Sanz RG Station V V 23 Mansurulu RG/TP Station V V 24 Mansurulu RG/TP Station V V 25 1801 WL Station V V 26 1805 WL Station V V	20 1	ſufanbeyli	RG/TP Station	7	>				>	>				\$	>		
22 Feke RG Station V 23 Sanz RG Station V 24 Mansurulu RG/TP Station V V 25 1801 WL Station V 26 1805 WL Station V	21 S	Saimbeyli	RG Station	>					7					~			
23 Sanz RG Station ✓ 24 Mansurulu RG/TP Station ✓ ✓ ✓ 25 1801 WL Station ✓ ✓ ✓ 26 1805 WL Station ✓ ✓ ✓	22 F	feke	RG Station	7					>					~			
24 Mansurulu RG/TP Station \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark 25 1801 WL Station \checkmark \checkmark \checkmark \checkmark 25 1805 WL Station \checkmark \checkmark	23 S	Sanz	RG Station						~								
25 1801 WL Station \checkmark \checkmark \checkmark 25 1805 WL Station \checkmark \checkmark	24 N	Mansurulu	RG/TP Station	>	~	·		·	7	~				~	~		÷
26 1805 WL Station $$	25 1	1801	WL Station				~				-	/				>	
	26 1	1805	WL Station				~				*	/				~	

Table 4.2.2 Comparison of Alternative Plans for The Data Collection System

	Item	Plan 1	Plan 2	Plan 3	Plan 4
	 Data to be collected Rainfall Dam rainfall River water level Dam water level Air temperature 	15 1 1 2 2 7	667113	Q 8 C N	Q - 8 0 V
Е	 2. Facilities 2. Facilities (1) Gauging stations (2) Radio repeater stations (2) Radio repeater stations (3) Radar rain gauges 	25 14 0	22 13 0	0 10 20	20 11 1
- 86	3. Basin rainfall gauging accuracy	• High accuracy is ensured even for the rainfall only in some specific areas.	 A certain degree of accuracy is ensured even for the rainfall only in some specific areas. 	• High accuracy is not ensured for the rainfall only in some specific areas.	 Although Plan 3 can be complemented, further study based on stored data is required after installation of radar rain gauges.
	4. Water level prediction accuracy	 Changes in regional runoff can be incorporated. Accuracy becomes stable. 	 Accuracy significantly fluctuates according to the particular scale of flooding. 	Same as at left.	Same as at left.
	5. VHF radio frequency required	Implementable with a minimum of 4 frequencies	Same as at left.	Same as at left.	Same as at left.
· · · · ·	6. Behavioral monitoring of rainy zones (Prediction included)	Impossible	Impossible	Impossible	Possible

Table 4.2.3Comparative Studies of Ground Rain Gauges and
Radar Rain Gauges

Item	Ground Rain Gauge	Radar Rain Gauge
Gauging characteristic s	Gauging of the amount of rainfall at a site using a previously ground-installed rain gauge allows that gauged value to be evaluated as a typical amount of rainfall in the corresponding split areas.	Processing of the receiving intensity data of radar beam reflections allows the intensities of rainfall to be calculated and evaluated for each fixed mesh.
Outline of the facilities	A telemetering system for collecting data using the telemeter gauging units installed previously for each rain gauge of each site must be structured.	A system for supervisory control and processing of a previously installed radar site is to be structured.
Areal rainfall calculation accuracy	In general, rainfall data of the past is stored at each site. High accuracy can therefore be obtained by analyzing such past data and then selecting the appropriate measurement positions.	Analytical study based on after-installation stored data is required. Calibration with a ground rain gauge usually becomes necessary, and its technique is currently under analytical research. At present, therefore, a prescribed technique is not yet established since actual data is affected by the topographical environment.
Static monitoring of rain fall	In general, one rain gauge is installed in each split area ranging from several tens of square kilometers to several hundreds of square kilometers. The amounts of rainfall between these areas, therefore, are to be estimated from the amount of rainfall in one specific position.	Static monitoring of rain fall is possible. Accuracy can be improved by using this type of rain gauge together with the ground type.
Dynamic monitoring rain fall	Dynamic monitoring may become possible with image processing that uses data of the past. In general, however, such monitoring is difficult to execute, because of rough meshes.	Possible. Since the situation in fine meshes can be checked, it also becomes possible for the centers of rainy zones, the processes of appearance and disappearance of these zones, and the directions of movement of the zones to be examined.
Actual results of outflow analysis with existing flood prediction/wa rning systems	Data from ground rain gauges is mainly used.	Systems based on radar rain gauges are not yet almost structured by foreign companies. A radar rain gauge combined with a ground rain gauge becomes a powerful instrument in that flood prediction becomes complemented and strengthened in function.

	Remarks										
	Plan 2 (Distributed Processing Method)	• Distributed processing that mainly uses engineering workstations(EWS's)	• The seed can be improved because of load distribution.	• Education on EWS operation is required.	 Addition/modification is possible with each EWS(thus, total adverse effects are minimized). Addition/modification of the EWS section itself by the user may become possible. 	 The EWS section is almost the same as for the minicomputer method. The total maintainability of the system is high since faults can be isolated for each EWS. 	 The hardware is highly reliable. System failures can be minimized by localizing faults. 	 There are not too many limitation on installation conditions, and the system can be installed even in the living room of an office(in terms of power requirements, dimensions, and noise). Power consumption is not significant, a heat release fan is not required, nor does noise almost occur. 	 Low initial investment cost because of standardization of each functional module Insignificant power consumption Very high cost performance 	 Operation possible even in the living room of the section in charge The EWS can be disconnected from the system at any appropriate time to be operated as a personal computer. 	
	Plan 1 (Centralized Processing Method)	• Minicomputer	 Under a single CPU arrangement, the speed is limited because of serial processing. 	 Education is required since the appropriate computer operation skill is needed. 	 The operating system and application programs are recreated with each addition or modification of a program. Actual addition/modification of programs is usually consigned to the manufacturer. 	 Various types of fault diagnostic programs are available. After recovery, the restart of the system may require expertise. The total maintainability of the system is not too high. 	 The hardware is highly reliable. Errors in the CPUs result in immediate system failures. Various types of fault detection are provided. Memory protection is also provided. Duplexing of the system becomes expensive. 	 Installation conditions are slightly strict, and a special room is usually required. Noise arises from the operation of heat release fans. It is preferable that the system should be powered from a CVCF unit. 	 High initial investment cost(compared with that of the distributed processing method) Significant power consumption(compared with that of the distributed processing method) Large quantity of related facility 	 Terminal equipment extendible for operation in other rooms. (Limited functions) (Limited functions) With appropriate memory, operating system, and processing capability margins, programs separate from those of the intended system can be operated 	
والأعديب والمرابعة والمنامع والمرافعة والمستوان والمستوان والمستوان والمستوان والمرابعة والمتعاد والمرابع	Item	System configuration	Processing speed	Operation	Extendibility	Maintainability	Reliability	Installation conditions	Economy	Other factors	
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Table 4.3.1 Comparison of the Methods of Data Processing System Structuring

Information	infail Data	ater Level Data	scharge Data	ood Protection Information	acuation Information	yhan Dam Operation Information	talan Dam Operation Information						aluation of Related Agencies	ternative Plan 1	ternative Plan 2	ternative Plan 3	Remarks
Related Agencies	R.	M	Ð	Η	ы́ С	Se	Š	_			-	-	щ) AJ	M) AJ	
DSI 6 th Hood Control Committee													A 				
DSI General Directorate		0	0	0	0	0	0				ļ		A		0	0	
Seyhan Dam Office			0			-	0						A 	0	0	0	
Çatalan Dam Office		0	0	-	-	0	-						A	0	0	0	
DMI Adana Regional Directorate	0	-	-	-		-	-			ļ	ļ		<u>A</u>	0	0	0	
EIE Adana Regional Directorate	-	0	0	-	-	-	-				 		A	0	0	0	
Doğankent Office of ASO	-		-	0	-	-		<u> </u>					A	0	0	0	
Yenice Office of ASO		-		0	-	-	-	ļ		ļ		L	A	0	0	0	
Adana Provincial Governor	-	-	-	-	0	-	-			ļ	Ļ		A	0	0	0	· · · · · · · · · · · · · · · · · · ·
Seyhan District	-	- 			0		-				 		B		0		
Yüreğir District	-		-	-	0	-	-		ļ		ļ	ļ	B		0		
Seyhan Municipality	-	-	-	-	0		-						С			0	
Yüreğir Municipality	-	-	-	-	0	-	-						С			0	
Feke District Office	-	-	-		0	-	-						C		0		
Pozanti District Office	<u> </u>	-	-	-	0	-	<u>,</u>						С		0		
Sambeylı District Office	-	_	-	-	0	-	-										
Tufanbeylı District Office	÷	-	-	-	0	-	-										
Sarız District Office	-		-	-	0	-	-										
Pinarbası District Office	-	-1	-	-	0	-	•										
Karaısalı District Office	-	-	, i	-	0	-	-										
Heads of Towns and Villages downstream		1	1	,	0	-	-						В	0			
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Note: Siren warning is effectiv Legend: A; Transmission media B; Transmission media	ve fo is to is go	or ev o be i bod i	acua insta to be	atior Illed e ins	, bu pre talle	it it i ferei :d.	s ex ntial	clud ly.	led t	eca	use (of m	uilita	ıry u	se,		

Table 4.4.1 Alternative Plans of Related Agencies To Be Transmitted of Information

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Item	Alternative Plan 1	Alternative Plan 2	Alternative Plan 3
Destinations of data and information transmission	Governmental agencies: 7 places • DSI general directorate • Seyhan dam office • Catalan dam office • EIE Adana regional directorate • DMI Adan regional directorate • DMI Adan regional directorate • DMI enice of ASO • Yenice office of ASO	 Governmental agencies: 7 places DSİ general directorate Seyhan dam office Çatalan dam office EIE Adam regional directorate DMİ Adan regional directorate DMİ Adan regional directorate Venice office of ASO Yenice office of ASO 	 Governmental agencies: 7 places DSl general directorate Seyhan dam office Catalan dam office EIE Adama regional directorate DMI Adan regional directorate DMI Adan regional directorate Vance office of ASO Yenice office of ASO
	Provincial governor: 1 place	Provincial governor: 1 place	Provincial governor: I place
	Heads of towns and villages in downstream area of Seyhan dam: 5 places	Heads of towns and villages in downstream area of Seyhan dam: 5 places	Heads of towns and villages in downstream area of Seyhan dam: 5 places
		Heads of official districts: 4 places	Heads of official districts: 4 places
Flood information monitoring at the DSI general directorate			
Telephone private line between the DSI 6 th flood control committee and Seyhan dam office	~		
Telephone private line between the DSI 6 th flood control committee and Çatalan dam office	*	~	~
Telephone private line between the DSI 6 th flood control committee and Adana provincial governor	*	~	~
Liaison radio telephone link between DSI 6 th flood control committee and ASO branch offices	^	~	~
Liaison radio telephone link between DSI 6 th flood control committee and offices of towns and villages' head in downstream area of Seyhan dam		^	\sim
Liaison radio telephone link between DSI 6 th flood control committee and heads of official districts			×
Liaison radio telephone link between DSI 6 th flood control committee and municipalities			~

Table 4.4.2 Comparison of Alternative Plans for Data Transmission System

No.	Name of Station	Kind of Station	Hye	trometeorological Gaug	ing Items
			Rainfall	Temperature Water La	evel Reservoir
	Seyhan River Basin				
1	Çamardı	RG Station	\checkmark		
2	Çiftehan	RG Station	√ √		
3	Pozanti	RG/TP Station	\checkmark	\checkmark	
4	Kamışlı	RG/TP Station	\checkmark	\checkmark	
5	Karaisalı	RG Station	\checkmark		
6	Karsantı	RG/TP Station	\checkmark	\checkmark	
7	1825	WL Station		\checkmark	
8	1820	WL Station		\checkmark	
9	1818	WL Station		\checkmark	
10	1828	WL Station		\checkmark	
11	Seyhan dam	WL Station			\checkmark
12	Çatalan dam	RG/WL Station	\checkmark		√
	Zamantı River Basin				
13	Kazancık	RG Station	\checkmark		
14	Pinarbaşı	RG Station	\checkmark		
15	Toklar	RG Station	\checkmark		
16	Tomarza	RG/TP Station	√ ,	\checkmark	
17	Şeyhli	RG/TP Station	\checkmark	\checkmark	
18	1822	WL Station		. √	
19	1806	WL Station		\checkmark	
	Göksu River Basin				
20	Tufanbeyli	RG/TP Station	√	\checkmark	
21	Saimbeyli	RG Station	\checkmark		
22	Feke	RG Station	\checkmark		
23	Mansurlu	RG/TP Station	\checkmark	\checkmark	
24	1801	WL Station		\checkmark	
25	1805	WL Station		\checkmark	
	Abbreviation			. •.	
	RG: Rainfall				
	TP: Temperature				· .
	WL: Water level	:			

Table 6.2.1 Hydrometeorological Gauging Items To Be Collected

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Çiftehan	Rainfall Data	>	-	·	~		<u> </u>	>	>	>	>	Ļ	~		>	>	>	>	>	~	>	~		\ \	
Pozantı	Rainfall Data	>	-				<u>.</u>	>	>	>		<u> </u>	~		~	>	>	~	~	~	>	~	>		
Kamışlı	Rainfall Data	-	-				 	>	>	>	~	Ĺ	~ /		>	>	>	>	^	~	~	~	.` ∕~		
Karaisalı	Rainfall Data	>	-	 		-	<u> </u>	>	>	~	>	<u> </u>	~		>	>	>	<i>\</i>	~	V.	~	V .	ر ا		
Karsantı	Rainfall Data	>	-	 	~			>	>	>	>	<u> </u>	~ /		~	~	\sim	~	~	٧.	$^{\sim}$	Ų.	~	< <u>,</u>	
Çatalan dam	Rainfall Data	>			<u> </u>			~	>	~	~		>		~	\mathbf{i}	~	~	. √ .	~	~	\checkmark	^	<	
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Kazancık	Rainfall Data		~	19. 19.			<u>.</u>	>	>	~			^ _ ^		~	$\sum_{i=1}^{n}$	>	^ ∖	\mathbf{z}	~	1	Ņ	1		
Pinarbaşı	Rainfall Data					-	<u> </u>	· ~	>	~	· >		· ~ /		>		· / ·	Υ.	>	~	· ^:	~	ا ر.	<u>ر</u>	
Toklar	Rainfall Data	>	>	L				>	~	2	>		~ ^		~	~	~	$\overline{}$	V	٧	^	~	1	<u>ر ا</u>	
Tomarza	Rainfall Data	>	>					2	>	>	ر الحر		~ ^		∧	>	$\overline{}$	$\overline{}$	\sim	$\overline{}$	~	<u>ر</u> ا	۷	 	
Şeyhli	Rainfall Data	~						>	>	>	~		<u>ر</u> ا		· ∕ ·		~	~	~	$\overline{}$	~	- ~	Ż		
(Göksu Ri	iver Basin)						[_									
Tufanbeyli	Rainfall Data	>						>	>	· /			~ ~		~	3	~	>	>	>	>	>	>	~	
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Mansurlu	Rainfall Data	~	>					>	>	>	~		· /		>	>	>	>	>	~	~	>		~	

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Table 6.2.4 Data Processing Items for Flood Forecasting and Warning System for Seyhan River Basin (3/6)

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Table 6.2.6 Data Processing Items for Flood Forecasting and Warning System for Seyhan River Basin (5/6)

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Table 6.2.7 Data Processing Items for Flood Forecasting and Warning System for Seyhan River Basin (6/6)

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Figures











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		BANDS 3 9997 (1988) (1998)
	Doğankent Flood Control Center Chief engineer Technical chief - Machinery and supply	Technical chief - Maintenance and repair (X) Technical staff - wireless operator
 CONTROL CENTER Secretary of regional directorate Chief of administrative office 	ontrol Center ASO and supply e and repair - Wireless operator d Control Center achinery and supply	laintenance and repair wireless operator
REGIONAL FLOOI Regional director Deputy regional director	ASO Flood C ASO Flood C Director and deputy director of Technical chief - Maintenance Technical chief - Maintenance Chief engineer Technical chief - M	Technical chief - M (X) Technical staff
	Seyhan Dam Evaluation Center Chief of dam operation (X) Technical staff - Wireless operator	(X) Adequate number of
of turkey U işleri	FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN A	TLE Figure 3.3.2 SO SPECIFIC CHART OF DSI 6 7
	REGIONAL FLOOD CONTROL CENTER Regional director Regional director Deputy regional director Deputy regional director Chief of administrative office	Regional director Regional director Regional director Secretary of regional director Depuy regional director Secretary of regional director Depuy regional director Chief of administrative office Depuy regional director Chief of administrative office Depuy regional director Secretary of regional director Depuy regional director Chief of administrative office Director and deputy director of ASO Technical staff Director and deputy director of ASO Technical chief - Machinery and supply Technical chief - Machinery and supply Technical chief - Machinery and supply Marcel Dogankent Flood Control Center Diffector Chief of dam operation Amole Chief of dam operation Chief of dam operation Chief engineer MX Technical chief - Machinery and supply

FIG.NO.

----TH REGIONAL DIRECTORATE OF DSI SECRETARIAT

VERY URGENT

Time : -----

No.: 564/-----

Subject : Evacuation of villages Subject to flood

TO THE GOVERNOR'S OFFICE

Water level in----riverbed is rapidly rising due to the rain.

In order to prevent life and property losses, villages mentioned below must be evacuated starting with the closer ones to the levees.

DSI-----th Regional Director

Villages to be evacuated Right bank URGENT

LESS URGENT

Left bank

URGENT

LESS URGENT

Distribution Governor's office of -----city

Information General Directorate of DSI

THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE Figure 3.3.3 FORM OF EVACUATION MESSAGE TO GOVERNOR










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FIG.NO.

ABBREVIATION

BAT	: STORA	GE BATTERY		
BR	: BRIDGE			
CB	: CONTR	: CONTROL BOX		
CCU	: COMMUNICATION CONTROL UNIT			
CU	: CONTR	CONTROL UNIT		
CVCF	: CONST	CONSTANT VOLTAGE AND CONSTANT FREQUENCY		
DCP	: DC POV	DC POWER SUPPLY EQUIPMENT		
DEG	: DIESEL	DIESEL ENGINE GENERATOR		
DT	: DISPLA	: DISPLAY TERMINAL		
EWS	: ENGINEERING WORK STATION			
EXC	: EXCHA	: EXCHANGE EQUIPMENT		
FAX	: FACSIMILE EQUIPMENT			
HC	: HARD COPY UNIT			
IT	: ISOLATION TRANSFORMER			
ITE	: INTEGRATED TERMINAL EQUIPMENT			
MDE	: MIMIC DISPLAY EQUIPMENT			
MR	: MICRO WAVE RADIO RELAY EQUIPMENT			
MUX	: PCM MULTIPLEX TERMINAL EQUIPMENT			
OC	: OPERATION CONSOLE			
PDB	: POWER DISTRIBUTION BOARD			
PRT	: PRINTER			
REP	: TELEPHONE REPEATER			
RG	: RAINFALL GAUGING EQUIPMENT			
SBP	: SOLAR BATTERY PANEL			
TEL	: TELEPHONE SET			
TIR	: TELEPI	: TELEPHONE INFORMING AND RESPONDING EQUIPMENT		
TM	: TELEM	: TELEMETERING EQUIPMENT		
TMP	: TEMPE	: TEMPERATURE SENSOR		
TMR	: TELEMETERING REPEATER EQUIPMENT			
TSE	: TELEMETERING SUPERVISORY EQUIPMENT			
UHF	: UHF RADIO EQUIPMENT			
UHFR : UHF REPEATER EQUIPMENT				
WL : WATER LEVEL GAUGING EQUIPMENT				
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ		FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN	TITLE Figure 6.1.4 ABBREVIATION OF SCHEMATIC EQUIPMENT COMPOSITION OF FLOOD	
SEABS MODULEOGO		JAPAN INTERNATIONAL COOPERATION AGENCY	FORECASTING AND WARNING SYSTEM	













O KAZANCIK

Control Center (DSI 6th Regional Directorate)

• Rainfall and Temperature gauging station

---- Simplex or Duplex raio link for voice communication 400MHz band ---- Simplex radio link for telemetry 70MHz band

> TITLE Figure 6.2.1 RADIO FREQUENCY ASSIGMENT PLAN OF TELEMETRY RADIO LINK





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SUPPORTING REPORT F

FEASIBILITY GRADE DESIGN AND ESTIMATE OF PROJECT COST