DATA BASE MANAGEMENT-RETRIEVAL OF GROUNDWATER LEVEL FLUCTUATION DATA

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ABSTRACT

A network of more than thousand observation wells has been established by Central Ground Water Board, all over the state of Orissa. Since 1988 PC/XT is being used for storage and retrieval of voluminous data using programs in D Base III plus which was earlier done manually. Now with advanced computer facilities provided by N.I.C.,Bhubaneshwar, the data are stored in NEC-S-1000,working under the control of ACOS. After each measurement of network hydrograph stations, reports are prepared in the form of tables showing districtwise frequency of water level fluctuations as compared to similar periods of the previous water year, as also premonsoon period of the current water year. This presents, at a glance, the number and percentage of wells falling in different fluctuation intervals with maximum and minimum rise and fall. This is an easy way to depict changes in groundwater regime in response to recharge or draft. Earlier the computation and generation of frequency table was done manually. Now this table is obtained ,using a software developed by N.I.C. The paper discusses generation of the frequency tables showing groundwater level fluctuation using this software.

INTRODUCTION

A network of more than thousand observation wells has been established by Central Ground Water Board all over the state of Orissa. The water levels of these observation wells are monitored four times in a year to study long term and periodical changes of groundwater levels in response to recharge and development. The regional reports are compiled at national level to get a clear picture of the groundwater situation all over the country in different seasons.

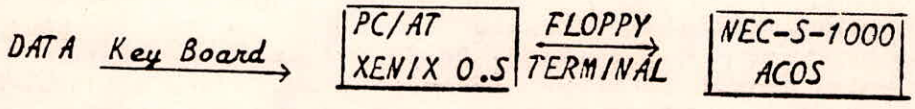
DATA STORAGE

A total of 1016 network hydrograph stations are monitored by CGWB in the state of Orissa. The distribution of the stations is as below:(Table-1)

Table-1
List of National Hydrograph Stations

District	1987	1989	1992
Balasore	39	49	53
Bolangir	27	53	66
Cuttack	54	76	99
Dhenkanal	27	57	67
Ganjam	49	77	140
Kalahandi	42	68	68
Keonjhar	29	56	56
Koraput	64	97	114
Mayurbhanj	37	57	67
Phulbani	34	51	61
Puri	52	68	76
Sambalpur	37	67	108
Sundergarh	30	41	41
Total	521	817	1016

Till 1987, the groundwater monitoring data in Orissa were maintained in ledgers and analysed manually. Afterwards PC -XT was used for storage and retrieval of the voluminous data, using programs in D Base III plus. Now with advanced Computer facilities provided by N.I.C., Bhubaneshwar, the data are first entered in PC/XT under Xenix operating system using programs in FOX plus developed by CGWB, New Delhi Computer centre. The data are then transferred to NEC-S-1000 through terminal by first copying the data in floppies. A software developed by N.I.C.,Bhubaneshwar is used to append the data in the data base already available in NEC-S-1000. This procedure (Fig.1) is followed after each set of measurements to update the data.



REPORT GENERATION ON GROUNDWATER LEVEL FLUCTUATION

After each set of measurements of network hydrograph stations, reports are prepared in the form of tables showing water level data with fluctuation of water level of each well compared to similar period of previous water year, as also premonsoon period of the current water year, with districtwise frequency of the fluctuations in different intervals. The districtwise frequency presents, at a glance, the number and percentage of wells falling in different fluctuation intervals with maximum and minimum rise and fall. This is an easy way to depict changes in groundwater regime mainly in response to rainfall recharge and draft, as also the status of groundwater storage at any point of time.

The wellwise data of depth to water level and fluctuation of water level with district / basin /sub-basin wise distribution could be obtained using a software developed in Fortran 77, in ACOS from 1989 (Fig.2). However, the frequency table showing districtwise water level fluctuation and minimum and maximum rise and fall was obtained manually.

DEVELOPMENT OF SOFTWARE

Now a software is developed by National Informatics Centre,Bhubaneshwar to get the number, percentage, minimum and maximum fluctuation in water level in each district (Annexure-I and II).

Using Information Querry (INQ) of NEC-S-1000, three files are created, of which first two contain the water levels of different periods with the current water level available in the third file are compared. Usually the current water level is subtracted from the water level of the similar period of preceeding year (File 1 to File 3) and Premonsoon water level of the Current year (File 2 to File 3). These three files with a master file containing the details like well number, district, X and Y coordinate are used. The well number is the common field in all the files.

The programs, developed in Fortran 77 first convert the coordinates into a digit (X and Y) then the water levels data in the first file are compared with the third file to get the fluctuations (Z1) and similarly the second file with the third file to get the other required fluctuations (Z2) creating two different files, say in one Z1 with X, Y coordinate and well no. and Z2 with X,Y coordinate and well no. in the other.

These two files containing two fluctuation values are then used by two other programs to give annexures containing number, percentage etc. in different fluctuation zones, districtwise (vide fluctuation frequency table 1 and 2) (Fig.2).

CONCLUSIONS

The files thus generated are independent . Water level data of any period may be compared with the water level data of any other period as per requirement. The programms are almost generalised and may be used by any user of NEC-S-1000. This has saved time and labour in handling the voluminous data and has made the processing fast.

ACKNOWLEDGEMENT

The authors are highly thankful to the Chief Hydrogeologist and Member, Central Ground Water Board for kindly permitting publication of this paper. The authors are also grateful to the National Informatics Centre, Bhubaneshwar for extending facilities for using NEC-S-1000. Thanks are also due to Dr. M S Rao, Principal system analyst and Sri Y V K S Murthy,Scientific Assistant -B who developed the software discussed in this paper.

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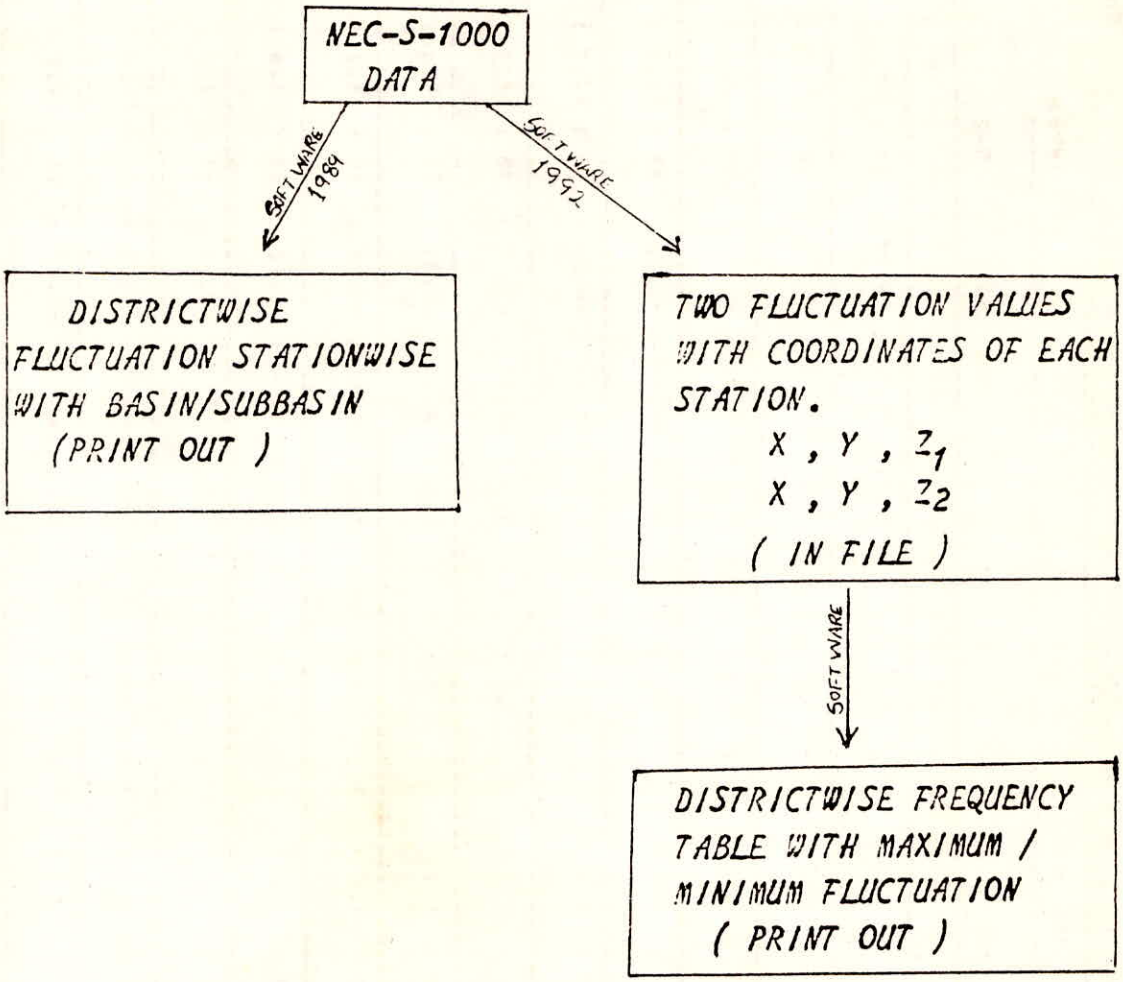
Fig. 2


NEC-S-1000 DATA
SOFT WARE 1989
SOFT WARE 1992
DISTRICTWISE FLUCTUATION STATIONWISE WITH BASIN/SUBBASIN (PRINT OUT)
TWO FLUCTUATION VALUES WITH COORDINATES OF EACH STATION.
X , Y , Z1
X , Y , Z2
(IN FILE)
SOFT WARE
DISTRICTWISE FREQUENCY TABLE WITH MAXIMUM / MINIMUM FLUCTUATION (PRINT OUT)

Annexure - I

CHANGES IN GROUND WATER LEVEL DEPTHS BETWEEN LAST MEASUREMENT(JANUARY 1992) AND PRESENT MEASUREMENT (JAN 1992 TO APR 1992)

DISTRICT	RISE(M)		0-2		2-4		>4		FALL(M)		0-2		2-4		>4	
	MAX	MIN	NO	%	NO	%	NO	%	MAX	MIN	NO	%	NO	%	NO	%
BALASORE	0.54	0.54	1	2.0	0	0.0	0	0.0	-5.96	-0.17	28	57.1	14	28.6	6	12.2
BOLANGIR	3.20	0.05	4	6.2	1	1.6	0	0.0	-3.32	-0.12	48	75.0	11	17.2	0	0.0
CUTTACK	1.95	0.00	9	10.1	0	0.0	0	0.0	-4.94	-0.13	59	66.3	18	20.2	3	3.4
DHENKANAL	0.00	*****	0	0.0	0	0.0	0	0.0	-7.31	-0.32	18	27.3	39	59.1	9	13.6
GANJAM	2.12	0.00	13	9.4	1	0.8	0	0.0	-7.44	-0.06	63	47.7	43	32.6	12	9.1
KALAHANDI	0.81	0.00	4	6.2	0	0.0	0	0.0	-5.73	-0.19	38	58.5	19	29.2	4	6.2
KEONJHAR	0.82	0.82	1	1.9	0	0.0	0	0.0	-8.08	-0.03	35	64.8	11	20.4	7	13.0
KORAPUT	2.11	0.06	5	4.5	1	0.9	0	0.0	-9.27	-0.05	59	53.2	32	28.8	14	12.6
MAYURBHANJ	3.61	0.16	3	4.7	1	1.6	0	0.0	-8.04	-0.12	26	40.6	23	35.9	11	17.2
PHULBANI	1.53	0.53	1	1.8	0	0.0	0	0.0	-3.79	-0.03	39	53.9	21	34.4	0	0.0
PURI	0.30	0.06	10	15.9	0	0.0	0	0.0	-4.92	-0.03	47	74.6	5	7.9	1	1.6
SAMBALPUR	2.75	0.13	23	21.9	2	1.9	0	0.0	-4.65	-0.07	52	49.5	26	24.8	2	1.9
SUNDARGARH	0.55	0.10	2	4.9	0	0.0	0	0.0	-7.54	-0.49	20	48.8	15	36.6	4	9.8

Annexure - II

CHANGES IN GROUND WATER LEVEL DEPTHS BETWEEN LAST MEASUREMENT(PREVIOUS YEAR) AND PRESENT MEASUREMENT APL 1991 TO APL 1992

DISTRICT	RISE(M)		0-2		2-4		>4		FALL(M)		0-2		2-4		>4	
	MAX	MIN	NO	%	NO	%	NO	%	MAX	MIN	NO	%	NO	%	NO	%
BALASORE	0.52	0.04	5	10.2	0	0.0	0	0.0	-3.14	-0.09	40	81.6	4	8.2	0	0.0
BOLANGIR	1.78	0.00	12	18.5	0	0.0	0	0.0	-5.00	-0.03	47	72.3	4	6.2	2	3.1
CUTTACK	2.65	0.06	21	23.6	3	3.4	0	0.0	-4.47	-0.03	62	69.7	2	2.2	1	1.1
DHENKANAL	2.63	0.00	4	6.1	1	1.5	0	0.0	-3.02	-0.02	58	87.9	3	4.5	0	0.0
GANJAM	4.83	0.01	23	17.3	0	0.0	1	0.8	-2.92	-0.01	105	78.9	4	3.0	0	0.0
KALAHANDI	1.11	0.01	13	20.0	0	0.0	0	0.0	-3.16	-0.03	49	75.4	3	4.6	0	0.0
KEONJHAR	4.71	0.01	13	24.1	1	1.9	1	1.9	-5.36	-0.01	33	61.1	5	9.3	1	1.9
KORAPUT	4.09	0.01	28	25.2	2	1.8	1	0.9	-3.00	-0.01	76	68.5	4	3.6	0	0.0
MAYURBHANJ	2.54	0.01	13	20.3	1	1.6	0	0.0	-6.74	-0.15	31	48.4	13	20.3	6	9.4
PHULBANI	0.70	0.02	13	21.3	0	0.0	0	0.0	-1.87	-0.03	48	78.7	0	0.0	0	0.0
PURI	2.60	0.00	30	47.6	2	3.2	0	0.0	-4.26	-0.01	28	44.4	2	3.2	1	1.6
SAMBALPUR	3.12	0.01	36	34.0	3	2.8	0	0.0	-2.22	-0.01	64	60.4	3	2.8	0	0.0
SUNDARGARH	1.65	0.00	16	39.0	0	0.0	0	0.0	-5.48	-0.03	23	56.1	1	2.4	1	2.4