FOR OFFICIAL USE ONLY
No. GWYB -01/2015-16

Government of India

Ministry of Water Resources, River Development & Ganga Rejuvenation

Central Ground Water Board

GROUND WATER YEAR BOOK GOA STATE (2014 - 15)

GW Monitoring station, Gulem Velipada

CENTRAL GROUND WATER BOARD
SOUTH WESTERN REGION
BANGALORE
AUGUST 2015

FOREWORD

Groundwater is a dynamic and replenishable precious natural resource; it requires to be monitored regularly and also to be appraised of the changes that are taking place in its regime. In this regard, Central Ground Water Board collects the groundwater level and quality data from the Water Level Monitoring stations. The water levels are monitored four times a year during the months of May, August, November and January. The samples for determination of the quality of the groundwater are collected once a year during the month of May. This report consists of the ground water level for the year 2014-15 and chemical quality data collected during the year 2014 in respect of Goa State. Maps showing the depth to groundwater level in different parts of Goa and the changes observed in the water level in the last one-year and last one decade are included and discussed in the report. The report also consists aspects on distribution and variation of rainfall, chemical quality of groundwater of the samples collected during May 2014.

The data has been compiled and interpreted by Shri.H.P.Jayaprakash Scientist'C, Smt. Rakhi U.R., Scientist'B', Dr. Lubna Kouser, Asst. Hydrologist, Smt. Hemalatha STA(HG), Shri.Rahul Vashistha STA (Chem.). A lot of effort has been put in by various personnel of SWR, Bangalore and WKSU Belgaum office for the collection of field data. The water samples were analysed by the Regional Chemical Laboratory to bring out the aspects of groundwater. Shri.S.S.Hegde Scientist'C' & OIC, Report Processing Section has carried out the necessary processing of the report to bring the report to the final stage.

It is hoped that the information contained in this yearbook will be useful for planners, administrators and other user agencies associated with development and management of water resources in the State.

Bangalore
August 2015

(G.SUDARSHAN)
Regional Director

ABSTRACT

Goa State has a geographical area of 3702 Sq.kms and is divided into 2 districts with 11 taluks. The Central Ground Water Board has collected water level data of the phreatic aquifer from 103 National Hydrograph Network Stations during the months of May, August, November, 2014 and January 2015. This report contains the analysis and interpretation of the data.

Thematic maps depicting the groundwater scenario during the period are prepared and discussed. Average annual rainfall is of the order of 320 cm, increasing from 270 cm in the west (coast) to 400cm in the east. Similarly, rainfall decreases from south to north along the coast as well as interiors. While the annual rainfall in the North Goa district averages 316 cm, it is 330 cm in the south Goa district. June and July are the wettest months with around 100 cm rainfall each month. Rainfall during the months of January and February is negligible. Valpoi in the north Goa and Quepem in the south Goa, both in the interior hilly areas, are the wettest places in the State.

The pre-monsoon depth to water level recorded in the State reveals that about 87% of the wells have water levels less than 10 mbgl and the rest show in the range of 10-20 mbgl. The depth to water level recorded in the State of Goa during pre-monsoon season ranged from 0.8 mbgl to 18.72 mbgl. It is seen that, out of 94 stations analyzed during the month, 9% wells have water level less than 2 mbgl, 41% wells have 2 to 5 mbgl water level, 37% wells have 5 to 10 mbgl water level, 13% wells have 10 to 20 mbgl water level. The water level in the range of 2 to 5 and 5 to 10 m bgl is the general water level in the State. Water level in the range of 10 to 20 mbgl is seen in Bicholim, Satari, Bardez, Cancona, Salcete, Quepem and Sanguem taluks as patches. Small patches with water levels of less than 2 mbgl are noticed in Salcete, Quepem, Ponda, Bicholim, Bardez taluks of North Goa.

During post-monsoon season about 90% of the wells recorded less than 10 mbgl water level and the remaining 10% wells have water level 10-20 mbgl. The depth to water level recorded in the State of Goa during postmonsoon season ranged from 0.74 mbgl to 16.0 mbgl. It is seen that out of 94 stations analyzed 31.9% wells have less than 2 mbgl water levels, 40.4% wells have 2 to 5 mbgl water levels, 18.1% wells have 5 to 10 mbgl water level and the remaining 9.6% wells have 10 to 20 mbgl water level. Major part of the State shows depth to water level in the range of <2 m bgl, 2 to 5 mbgl and 5-10 m bgl during post-monsoon. Depth to water level of 0-2 mbgl is observed in all taluks, 2-5 m bgl is observed in all the taluks except Tiswadi and 5-10 mbgl is observed as isolated patches in all the taluks except Quepem taluk and 10-20 m bgl is observed in Sanguem, Mormugao, Cancona, Bicholim and Bardez taluks.

Results of chemical analysis of the samples show that all the samples are suitable for domestic, irrigation and industrial purposes.

GROUND WATER YEAR BOOK 2014-15, GOA STATE

C O N T E N T S

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

GROUND WATER YEAR BOOK 2014-15

GOA STATE

1. GENERAL FEATURES

1.1. Introduction

Central Ground Water Board, South Western Region, Bangalore, is monitoring water levels in the State of Goa from the established network of 103 monitoring stations, as a part of 'Ground Water Regime Monitoring'. This monitoring is done four times in a water year during May, August, November and January for water level. Water samples from these stations are collected once in a year during the month of May to assess the ground water quality.

The State of Goa located between 14°53'54" and 15°48'00" north latitudes and 73° 40' 33"and 74° 20' 13" east longitudes is situated on the west coast of Peninsular India. It is bounded on the north by Maharashtra State, on the east and south by Karnataka State and on the west by the Arabian Sea. The State has a total geographical area of 3702 Sq. km., which is administratively divided into two districts with 11 taluks. The taluk wise distribution of Ground water monitoring stations being monitored by the Region is given in **Table1.1.**

Table 1.1: Districtwise distribution of Ground water monitoring stations

Sl.No.	Taluk	Geographical Area (Sq. km)*	No. of Ground water monitoring stations
District: North Goa			
1	Tiswadi	213.6	6
2	Bardez	264.0	13
3	Pernem	251.7	9
4	Bicholim	238.8	10
5	Satari	495.1	11
6	Ponda	292.8	6
District: South Goa			
7	Sanguem	873.7	18
8	Cancona	352.0	10
9	Quepem	318.3	5
10	Salcete	292.9	13
11	Mormugao	109.1	2

** Source: Statistical Pocket Book of Goa 1993-94, Directorate of Planning, Statistics and Evaluation, Government of Goa*

1.2 Physiography

Goa State forms part of coastal tract of the west coast of India. Physiographically, the Goa State is divided into four morphological units namely, 1.Costal plains with dominant Marie land forms on the west, followed successively towards the east 2. Vast plain. 3. Low dissected denudation hills and tableland and 4.Deeply dissected high Western Ghat's denudation hills occurring all along the eastern part of Goa rising to a maximum of 832m above MSL. The Alluvial landforms are limited in areal extent.

1.3 Drainage

The State of Goa is drained by the west flowing rivers, Terekhol, Chapora, Mandovi and Zuari. The Sahyadri hill ranges in the east form the main watershed. The streams originating here flow in westerly and northwesterly direction to join the Arabian Sea. Major portion of the State is drained by the two rivers, viz. Mandovi and Zuari **(Fig.1.1)**. The river Terekhol forms the northern boundary of Goa State and separates it from the Maharashtra State. The other smaller rivers draining the State are the rivers Chapora, Baga, Saleri, Sal, Talpona and Galgibaga **(Table1.2)**. Primarily, the underlying rocks govern the drainage system in the area. The drainage pattern is generally dendritic type. The major river Zuari follows the major NW synclinal axis. The river valleys are 'V' shaped in the western high hill ranges, but, broaden in central midlands and become 'U' shaped in the low lands and coastal plains.

Table1.2: Details of the Major/Minor river Basin area in Goa State

Drainage Basin / Sub Basin	**Area**		**Taluks**
	Sq. km	**%**	
Terekhol	71	1.93	Pernem
Chapora	255	6.88	Pernem, Bicholim, Bardez
Baga	50	1.35	Bardez
Mandovi	1580	42.68	Bicholim, Bardez, Satari, Sanguem, Tiswadi & Ponda
Zuari	973	26.28	Tiswadi, Ponda, Salcete, Quepem, Mormugao, Sanguem & Cancona
Sal	301	8.13	Mormugao, Salcete, Quepem, & Cancona
Saleri	149	4.03	Quepem, & Cancona
Talpona	233	6.29	Cancona & Sanguem
Galgibaga	90	2.43	Cancona
Total	3702	100	

1.4 Hydrogeological Conditions

Major part of the Goa State is underlain by rocks of Precambrian age comprising banded biotite gneisses, Metavolcanics, phyllites, biotite and chlorite schists, greywacke, conglomerate (tilloid), pink phyllites with associated banded ferruginous quartzite and chart breccia. These rocks are intruded by ultrabasic and basic sills and dykes, followed by granites and pegmatites. Dolerite dykes and quartz veins form the youngest intrusives in the area (Table1.3).

The Deccan Trap basalts of Late Cretaceous to Early Eocene age occupy a small portion in the northeastern part in the high altitudes.

Almost all formations in the State have undergone lateritisation to various degrees depending upon the climate and parent rock type. The lateritisation is more pronounced in the coastal areas than in the hilly regions. Phyllites, Schists and Metavolcanics are more susceptible to lateritisation and the gneissic / granitic rocks are least susceptible. In general, the thickness of laterites varies from about 3 to 30 mts. Laterites are highly porous due to the process of leaching and weathering. Hence, they have very good capacity to hold and transmit groundwater. Groundwater in laterites occurs under phreatic condition.

Major portion of the State is occupied mainly by crystalline rocks and consolidated and metamorphosed sedimentaries, which do not possess primary porosity. Secondary porosity introduced through weathering, fracturing and jointing, produces the void spaces to hold and transmit ground water. Groundwater in these rocks occurs under water table conditions in the weathered zone and under semi-confined and confined conditions in the deeper fractured zone.

Beach sands along the coast and alluvium along major rivers have limited occurrence and the ground water occurs in the primary porosity under water table conditions. Geological map of Goa State is given in figure 1.2.

FIG.1.1

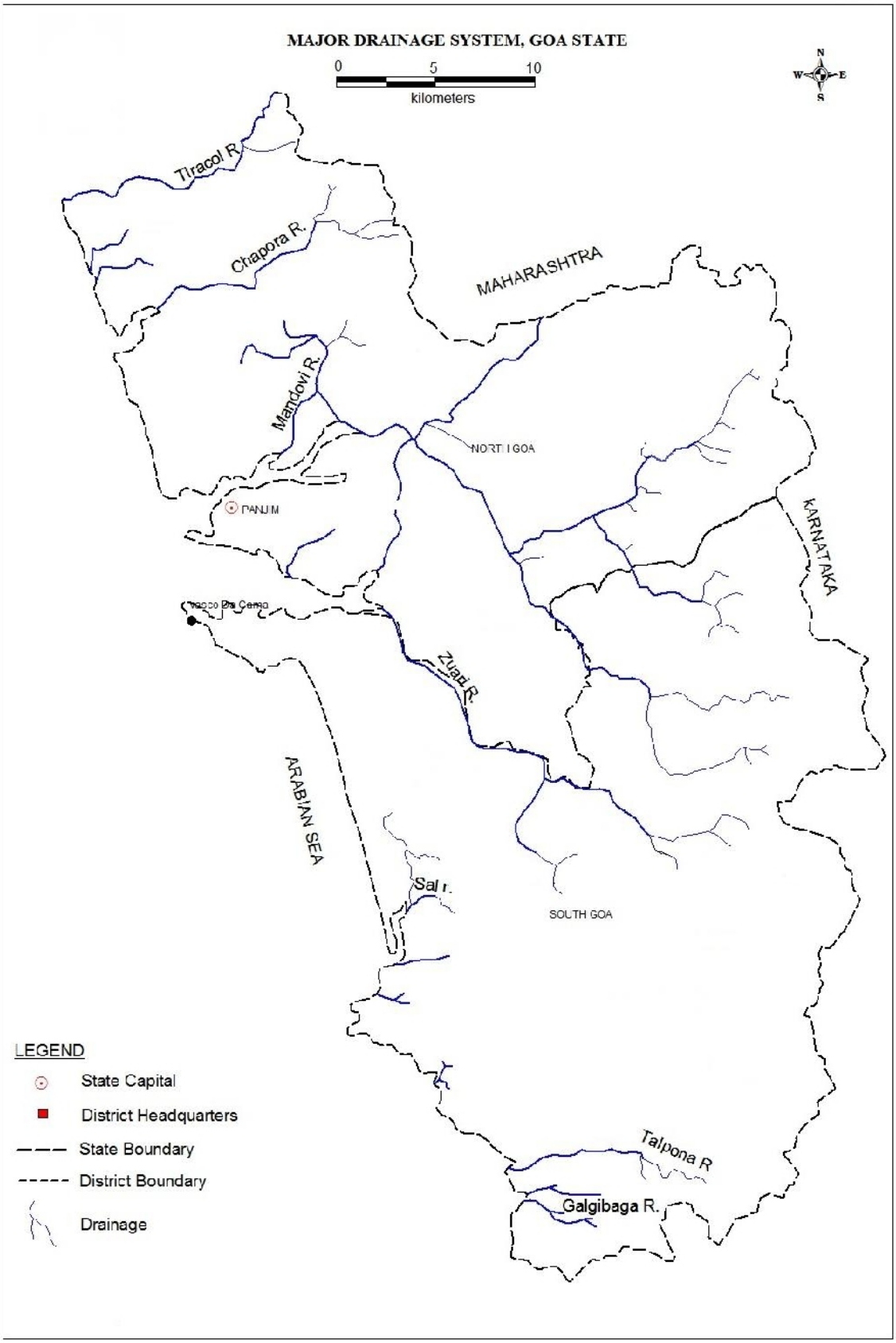

Fig. 1.1. River basins of Goa State

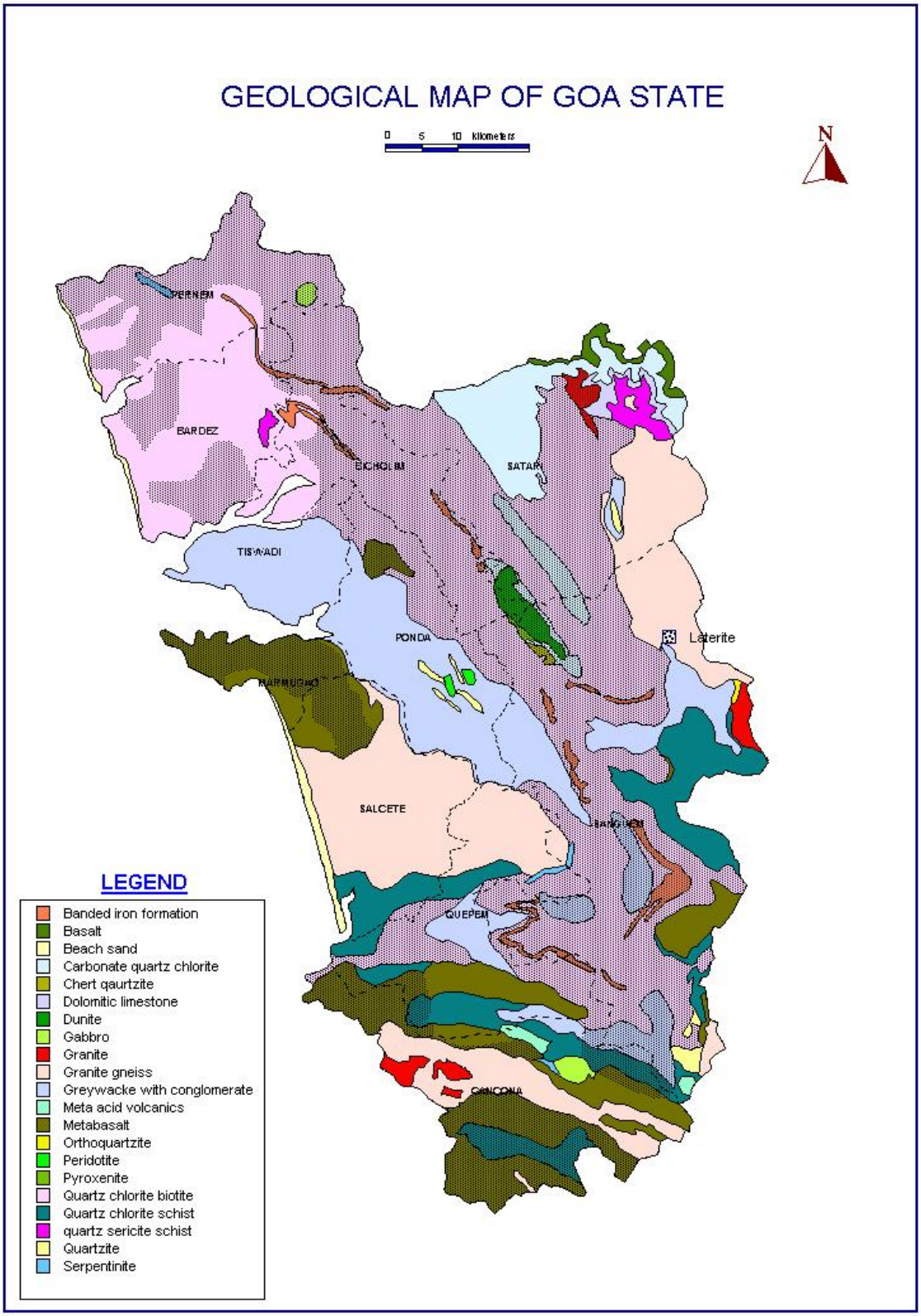

Fig. 1.2. Geological map of Goa State

2. CLIMATE AND RAINFALL

The State has a tropical-maritime monsoonal type climate with distinct orographic influence. The climate is equable and humid throughout the year. Due to the maritime climate, the diurnal variation in temperature is not much. The months of January and February are dry with clear skies and generally pleasant. May is the hottest month with temperature around 30°C and January the coolest month with temp 25°C

2.1Rainfall

Rain occurs during the monsoon period from June to September. Over 90 percent of the annual rainfall occurs during monsoon period. The balance of 10 percent occurs during the pre-monsoon period from March to May and post-monsoon period from October to December. However, the rainy period extends from May to November.

The analysis of Rainfall data for the period of 1970 to 2000 from 12 stations over the Goa state indicates that the monsoon rainfall is in the order of 3460mm (90 % of annual rainfall), 218.1mm (6%) during post-monsoon period of October to December and 102.5 mm (4%) are from January to May months. The average annual rainfall over the State based on 30 years rainfall data is of 3483.3mm. The minimum rainfall of 2611.7mm is recorded at Mormugao station falling in South Goa district and maximum of 5090mm is in Sanguem station which also falls in South Goa.

The annual normal rainfall in North Goa ranges from 2766.9 at Panaji along the west coast and the highest at Valpoi in the east (Ghats section) indicating rainfall increase from west to east. Average rainfall in North Goa is 3400.1mm. Similarly, in South Goa it rangesfrom 2611.7 mm at Mormugaoon the west coast and the maximum at Sanguem in the east, again, in Ghat section indicating that an increase in rainfall from west to east. Average annual rainfall in south Goa is 3733.13mm.

The months of June (840.7mm) and July (1246.9mm) are the wettest months with around 2187.6mm (62.80% of annual normal rainfall) rainfall in two months. Rainfall during the months of January and February is negligible. Valpoi in the north Goa and Sanguem in the south Goa, both in the interior hilly areas, are the wettest places in the State. Isohyetal Map of Goa State for the period 1970 to 2000 has been presented in **Fig. 2.1** and the Isohyetal Map of monsoon rainfall is in **Fig.2.2**. Normal monthly rainfall in respect of 12 stations of Goa state is presented in **Annexure-II**.

Fig 2.1

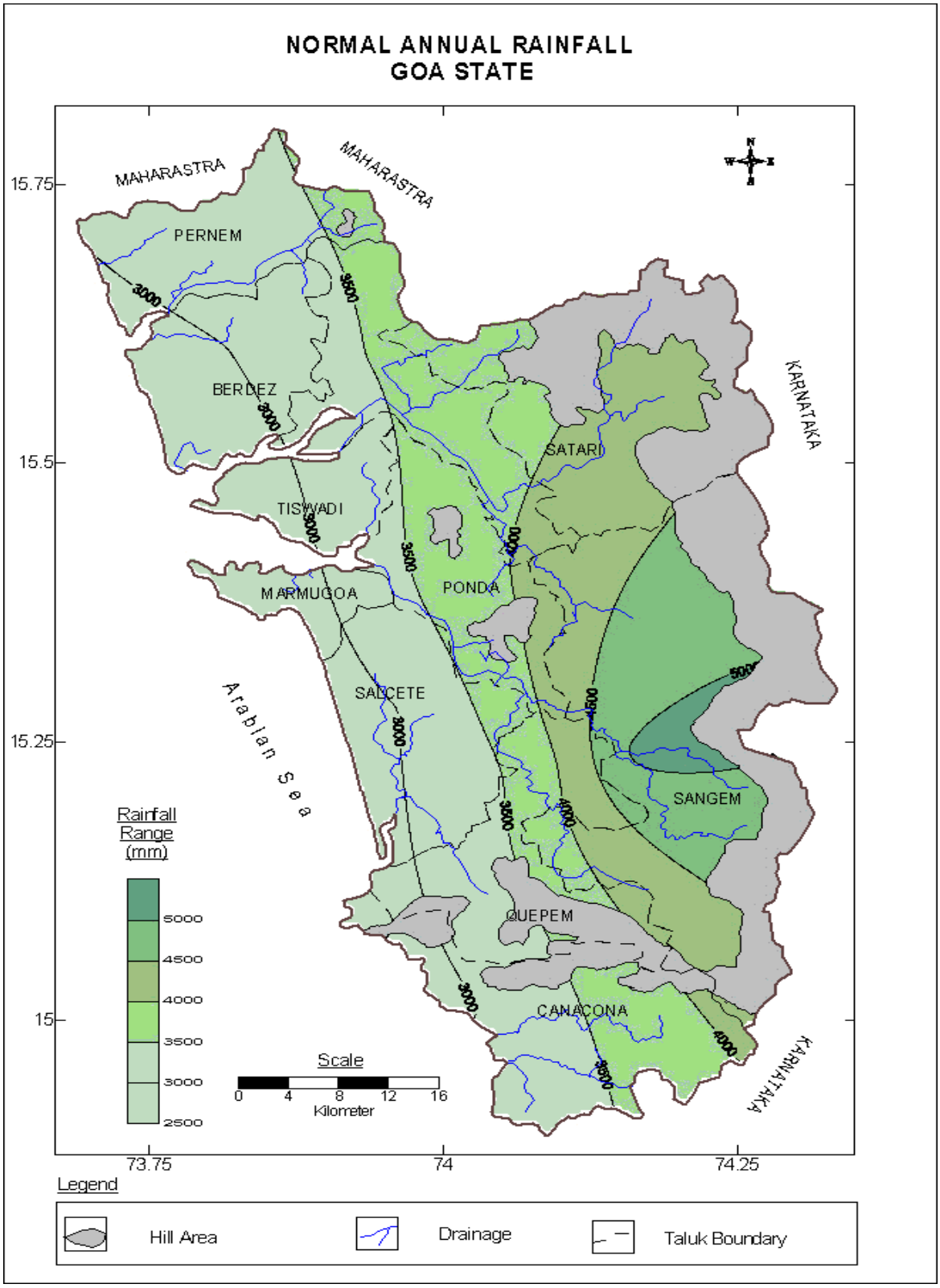

Fig.2.1. Normal Annual rainfall

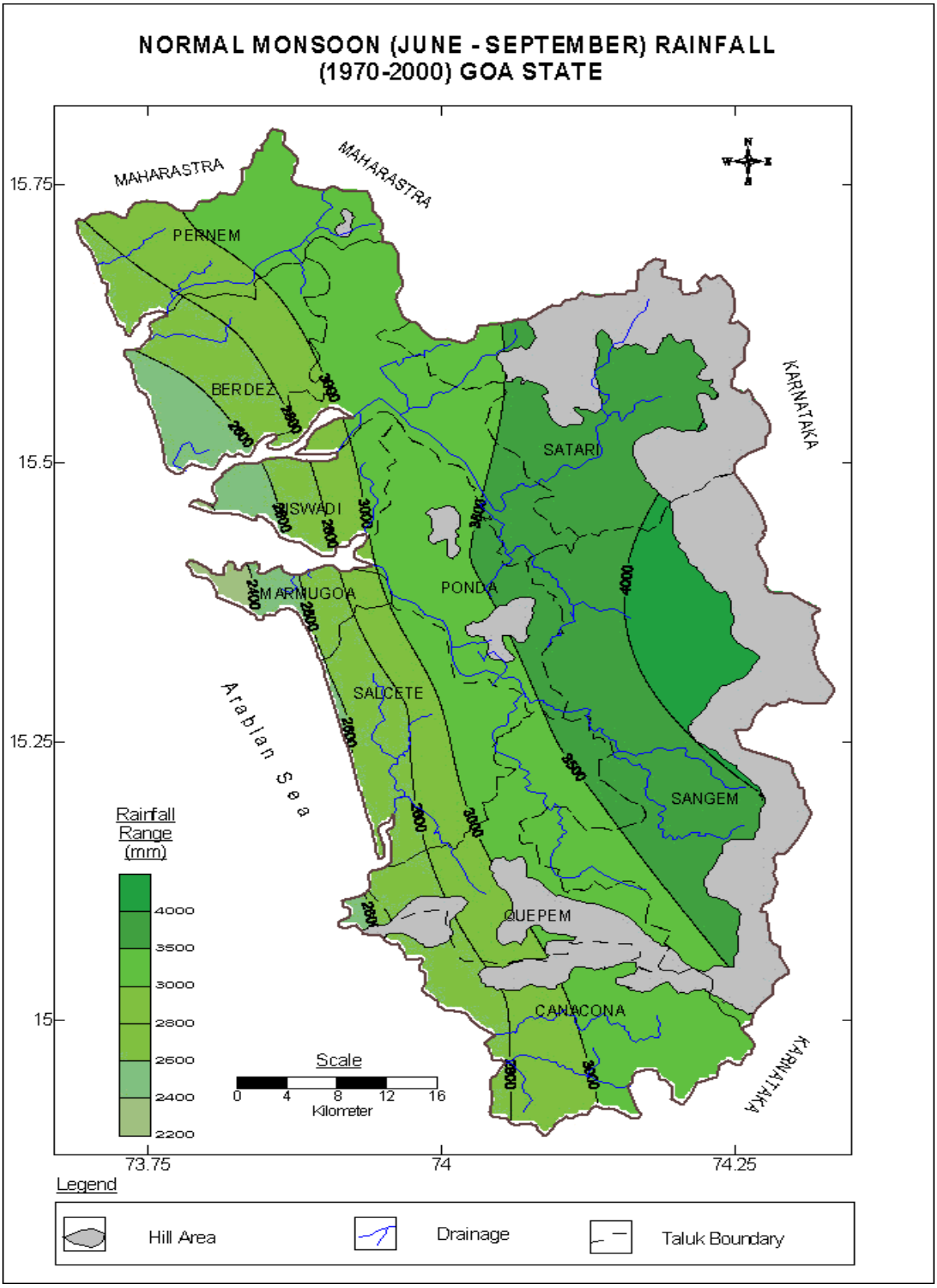

Fig.2.2. Normal Monsoon (June-September) rainfall

3. GROUND WATER LEVELS IN GOA DURING WATER YEAR 2014-15

Central Ground Water Board, South Western Region, Bangalore has a network of 103Ground Water Monitoring stations in Goa under the Programme 'Ground Water Regime Monitoring' of the Board, which works out to one Ground Water Monitoring Station in 36sq. km.

The above network comprises 103stations, which are predominantly domestic dug wells and are monitored four times a year during the months of January, May, August and November for water levels and once a year for quality during the month of May. These wells are monitored between 1st to 10th during the months of January and November and between 20th and 30th during the months of May and August. General details of Goa State Ground Water Monitoring Stations are furnished in **Annexure-I**.

3.1 Depth to Ground Water Levels:

Monitoring of Ground Water Monitoring stations in Goa was carried out during May, August, November 2014 and January 2015. The analysis/findings are as below:

Depth to Water Level: May 2014

The depth to water level recorded in the State of Goa during May 2014 ranged from 0.8mbgl to 18.72mbgl. It is seen that, out of 94 stations analysed during the month, 9% wells have water level less than 2 mbgl, 41% wells have 2 to 5 mbgl water level, 37% wells have 5 to 10 mbgl water level, 13% wells have 10 to 20 mbgl water level**(Table 3.1).**

A map showing the depth to water level in the ranges of <2, 2 to 5, 5 to10 and 10 to 20 mbgl is enclosed as **Fig 3.1**. The depth to water level map shows that, the water level in the range of 2 to 5 and 5 to 10 m bgl is the general water level in the State. Water level in the range of 10 to 20 mbgl is seen in Bicholim, Satari, Bardez, Cancona, Salcete, Quepem and Sanguem taluks as patches. Small patches of water level less than 2 mbgl is noticed in Salcete, Quepem, Ponda, Bicholim, Bardez taluks of North Goa.

Depth to Water Level: August 2014

The depth to water level recorded in the State of Goa during August 2014 ranged from 0.5mbgl to 16.85mbgl.It is seen that out of 96 stations analysed during the month, 36.5% wells have less than 2 mbgl water levels, 39.6% wells have 2 to 5 mbgl water level, 18.8% wells have 5 to 10 mbgl water level and the remaining 5.2% wells have 10 to 20mbgl water level **(Table3.2).**

A map showing the depth to water level in the ranges of <2, 2 to 5, 5 to10 and 10 to 20 mbgl is enclosed as **Fig.3.2**. It is observed from the map that, general water level in the State is between 0 – 2mbgl and 2 – 5mbgl. Water level in the range of 5 – 10 mbgl is noticed in all the taluks except parts of Tiswadi, Mormugao and Bicholim. Further, more than 10 mbgl water level is observed in parts of Bicholim, Bardez and Cancona taluks.

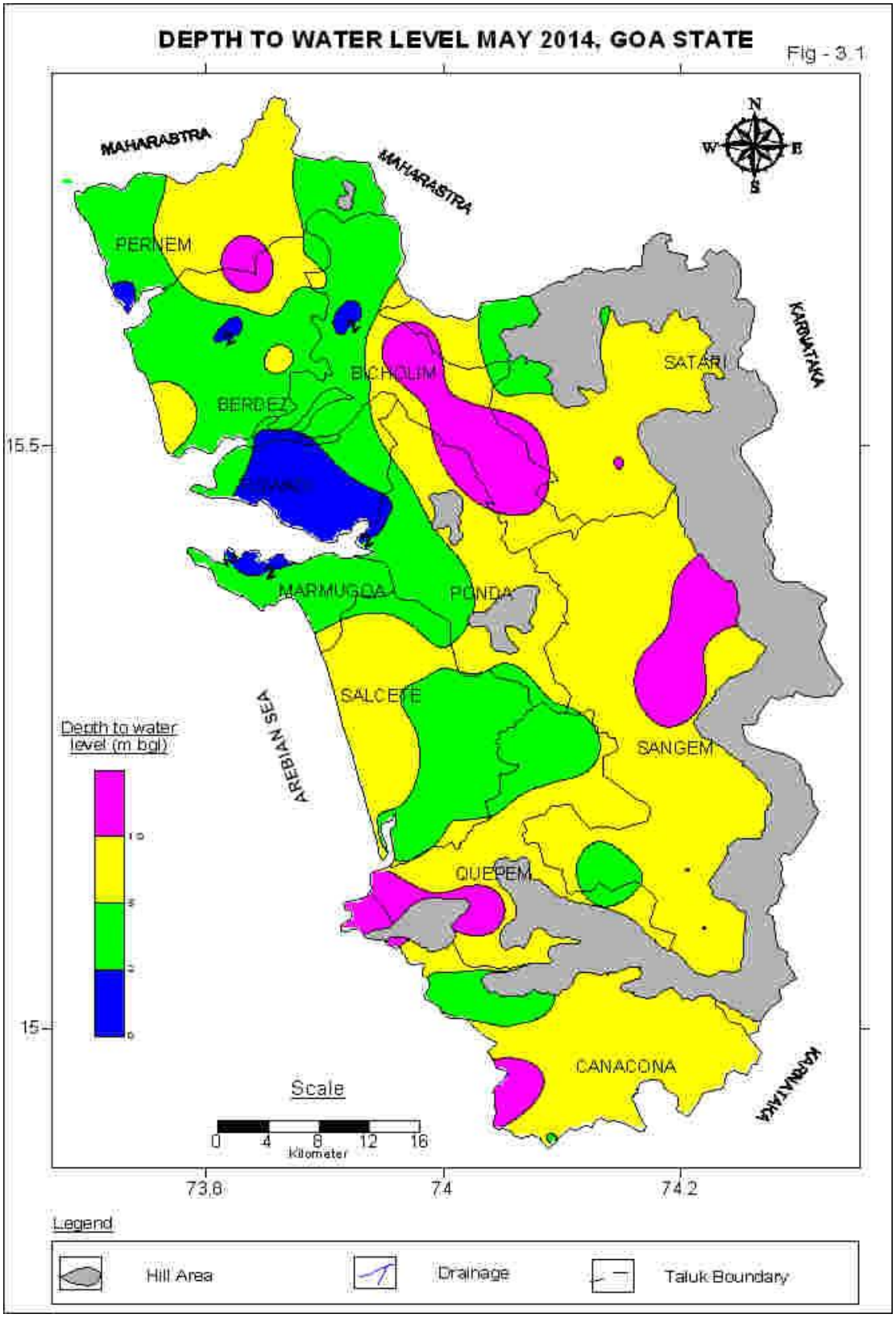

Fig.3.1. Depth to Water level, May 2014

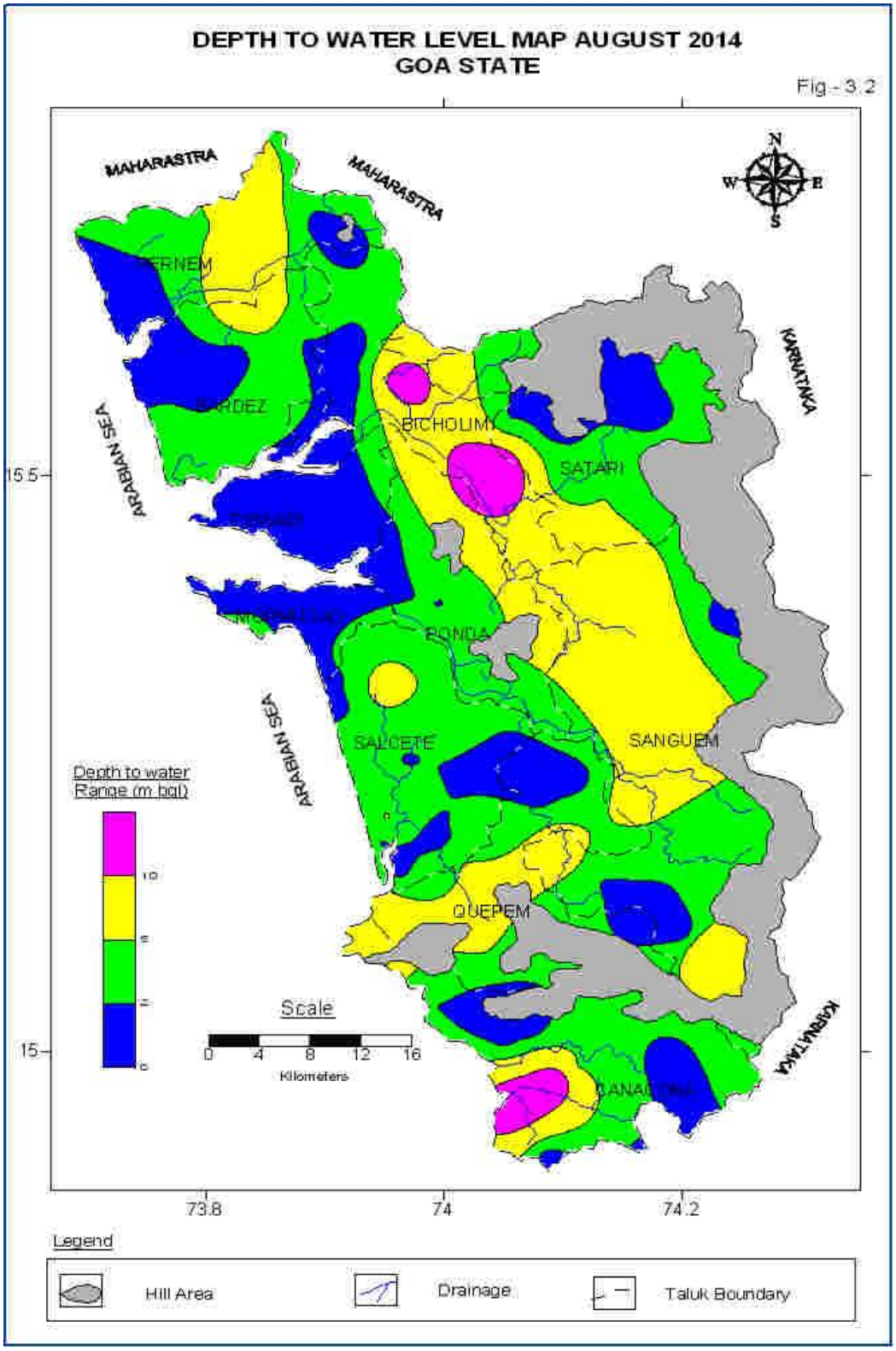

Fig. 3.2. Depth to water level, August 2014

Depth to Water Level: November 2014

The depth to water level recorded in the State of Goa during November 2014 ranged from 0.74mbgl to 16.0mbgl. It is seen that out of 94 stations analysed during the month, 31.9% wells have less than 2 mbgl water levels, 40.4% wells have 2 to 5 mbgl water levels, 18.1% wells have 5 to 10 mbgl water level and the remaining 9.6% wells have 10 to 20 mbgl water level **(Table 3.3).**

Map showing the depth to water level in the ranges of <2, 2 to 5, 5 to10 and 10 to 20 mbgl is enclosed as **Fig. 3.3**.Major part of the State shows depth to water level in the range of <2 m bgl, 2 to 5 mbgl and 5 – 10 m bgl. Depth to water level of 0-2 mbgl is observed in all taluks, 2 – 5 m bgl is observed in all taluks except Tiswadiand5-10 mbgl is observed as isolated patches in all taluks except Quepem taluk and 10 – 20 m bgl is observed in Sanguem, Mormugao, Cancona, Bicholim and Bardez.

Depth to Water Level: January 2015

The depth to water level recorded in the State of Goa during January 2015 ranged from1.14 mbgl to 19.15 mbgl. It is seen that out of 89 stations monitored during the month, 11 % wells have less than 2 mbgl water levels, 48 % wells have 2 to 5 mbgl water levels, 31 % wells have 5 to 10 mbgl water level and the remaining 10 % wells have 10 to 20mbgl water level**(Table 3.4).**

Map showing the depth to water level in the ranges of <2, 2 to 5, 5 to10 and 10 to 20 mbgl is enclosed as **Fig. 3.4.** Water level of less than 2 mbgl is observed as isolated patches in North western side of the Goa. Depth to water level in the range of 2 to 5 mbgl is observed as major part in the state covering almost all the taluks in the State. Depth to water level more than 10 mbgl is noticed as small patches in Bicholim, Sanguem, Bardez and Cancona taluks.

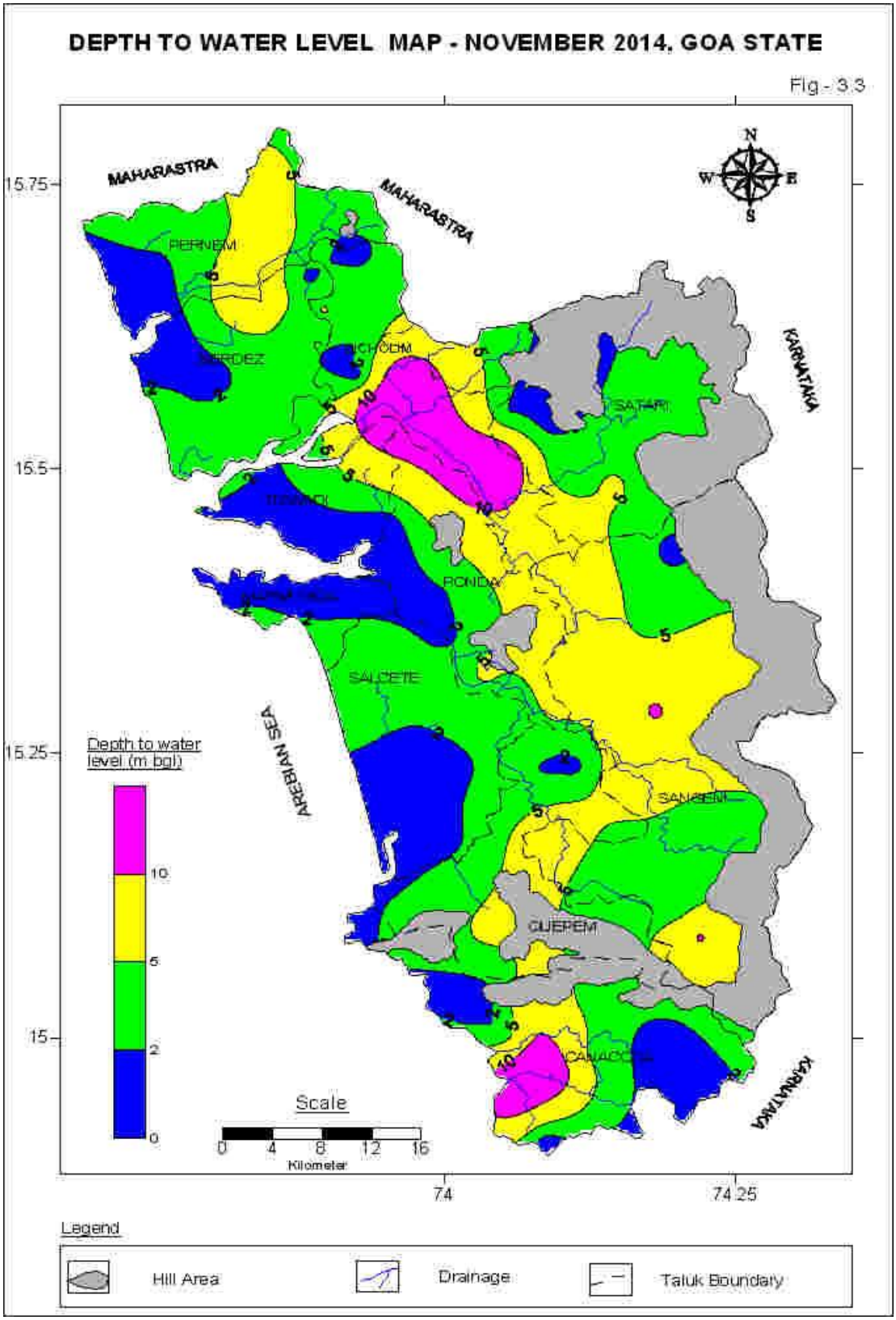

Fig.3.3. Depth to water level, November 2014

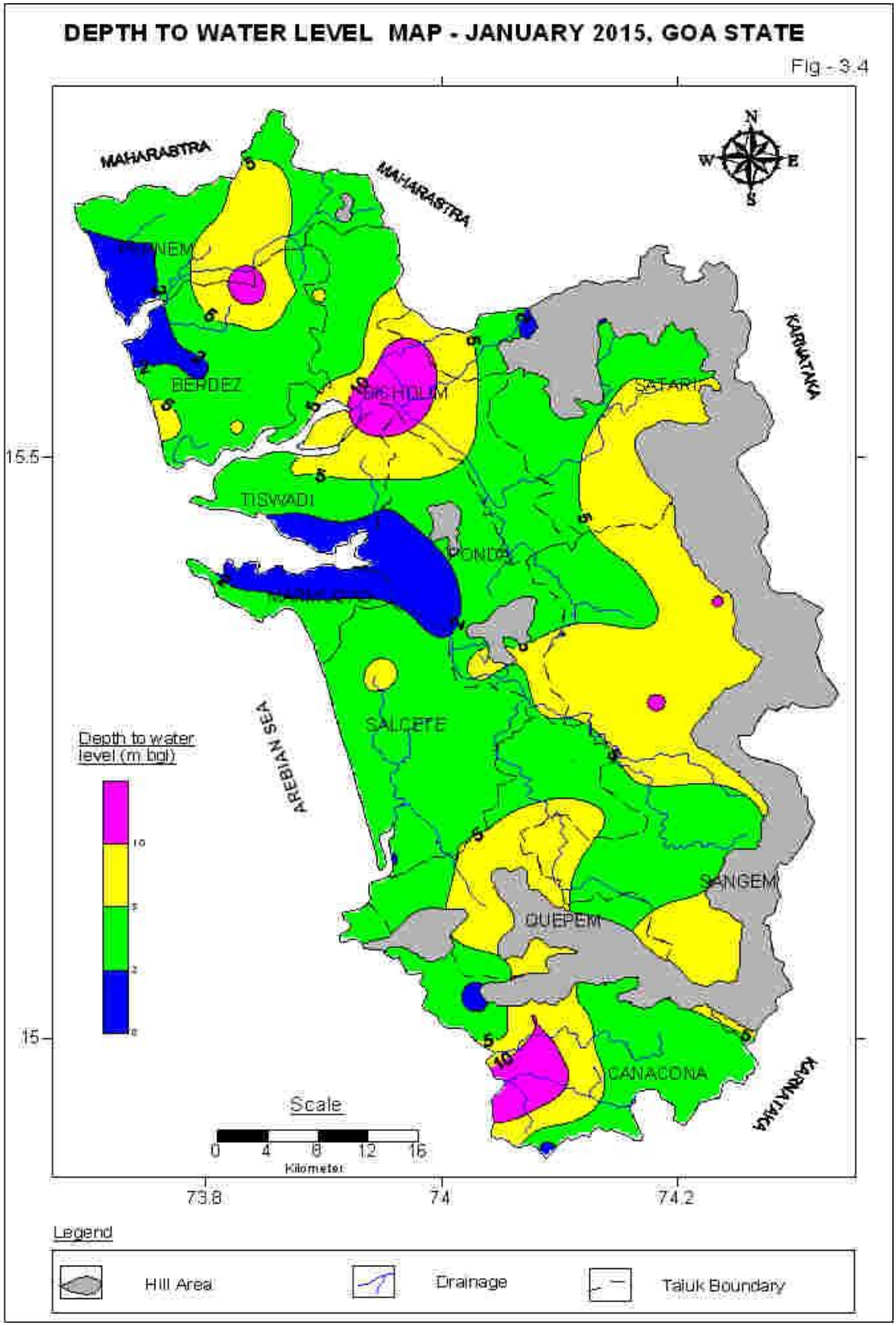

Fig.3.4. Depth to water level, January 2015

3.2 Fluctuations in Ground Water Levels

Analysis of fluctuation / rise and fall of ground water levels measured during the different periods was carried out. Pre-monsoon water levels measured during May 2014 are compared with water

levels during August 2014, November 2014 and January 2015 to know the Seasonal Fluctuations. Water levels measured for a given month during consecutive years are compared to know the annual fluctuations. Further, water levels of each measurement are compared with the mean water levels pertaining to the same months of the preceding decade to know the long term changes. The fluctuation details are given in **Annexure-IV**. Summary of the analysis is given below.

Change in Groundwater Level: May 2014 to August 2014

Water levels from 94 stations were compared to know the change in groundwater level in August 2014 as compared with May 2014 in the State of Goa. Almost all the 94 analysed wells have a recorded rise in water level during August 2014 as compared to May **(Table 3.5)**.

Rise of water level in the range 0-2 m is observed in 50 wells accounting for 53% of the analysed wells. Rise in water level in the range of 2 to 4 m and >4m is recorded in 29 wells (31%) and 15 wells (16%) respectively.

A map depicting the change in groundwater level in August 2014 as compared to May 2014, showing rise/fall in the ranges of 0 to 2 m, 2 to 4 m and >4 m is enclosed as **Fig. 3.5**. The water level rise in the range of 0 to 2 m is the general trend of the Goa State. Rise in water level of 2 to 4 m is observed in almost all the taluks and more than 4 m is observed in Pernem, Bardez, Tiswadi, Satari, Salcete, Sanguem, Quepem and Cancona taluks.

Change in Groundwater Level: May 2014 to November 2014

Water levels from 92 stations were compared to know the change in groundwater level in November 2014 as compared with May 2014 in the State of Goa. Amongst the 92 analysed, 81 wells have a recorded rise in water level during November 2014 as compared to May **(Table 3.6)**.

Rise of water level in the range 0-2 m is observed in 40 wells accounting for 44% of the analysed wells. Rise in water level in the range of 2 to 4 m and >4m is recorded in 24 wells (26%) and 17 wells (19%) respectively.

A map depicting the change in groundwater level in November 2014 as compared to May 2014, showing rise/fall in the ranges of 0 to 2 m, 2 to 4 m and >4 m is enclosed as **Fig. 3.6**. The water level rise in the range of 0 to 2 m is the general trend of the Goa State. Rise in water level of 2 to 4 m is observed in almost all the taluks and more than 4 m is observed in Pernem, Bardez, Satari, Salcete, Sanguem, Quepem and Cancona taluks.

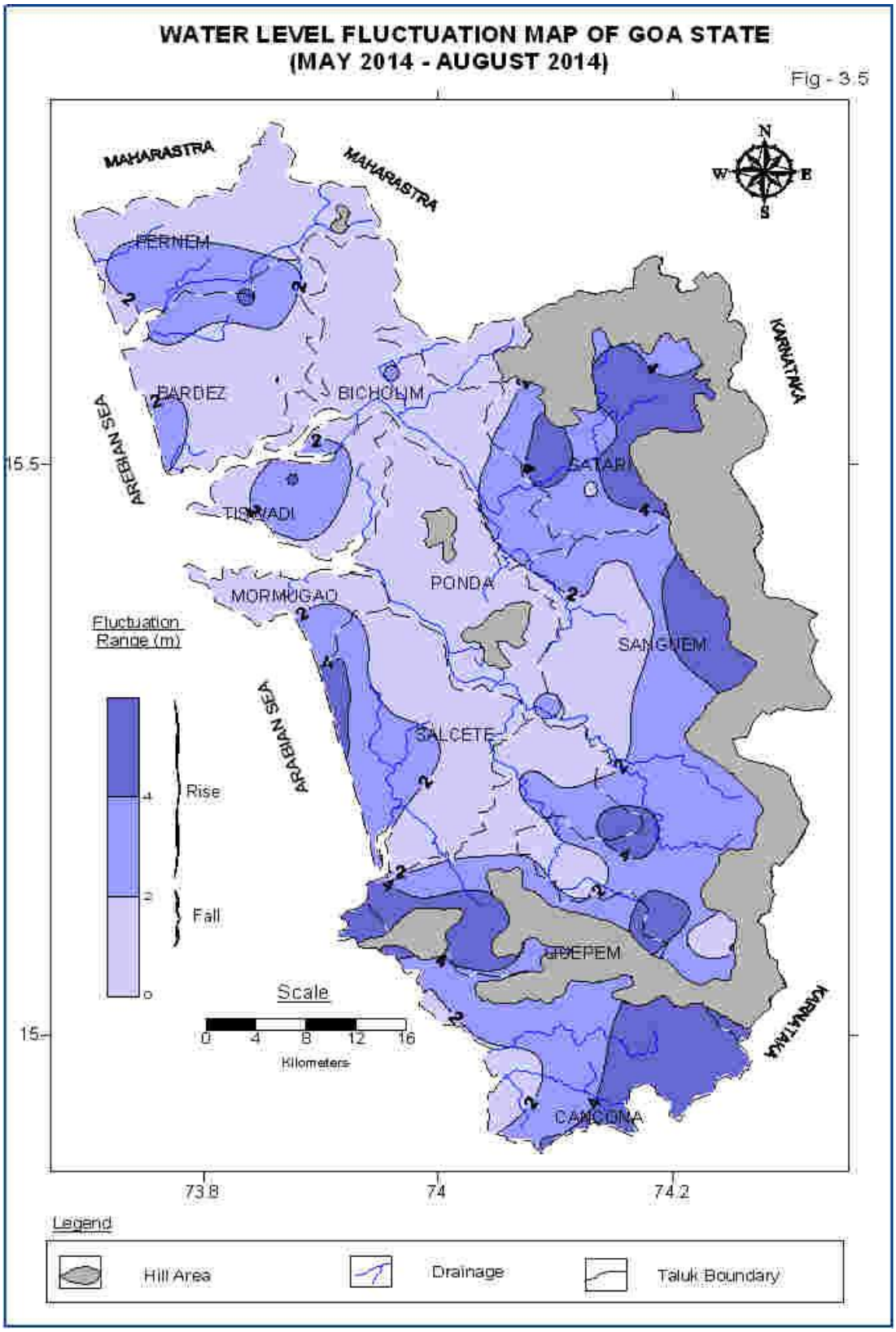

Fig.3.5. Water level fluctuation, (May 2014 – August 2014)

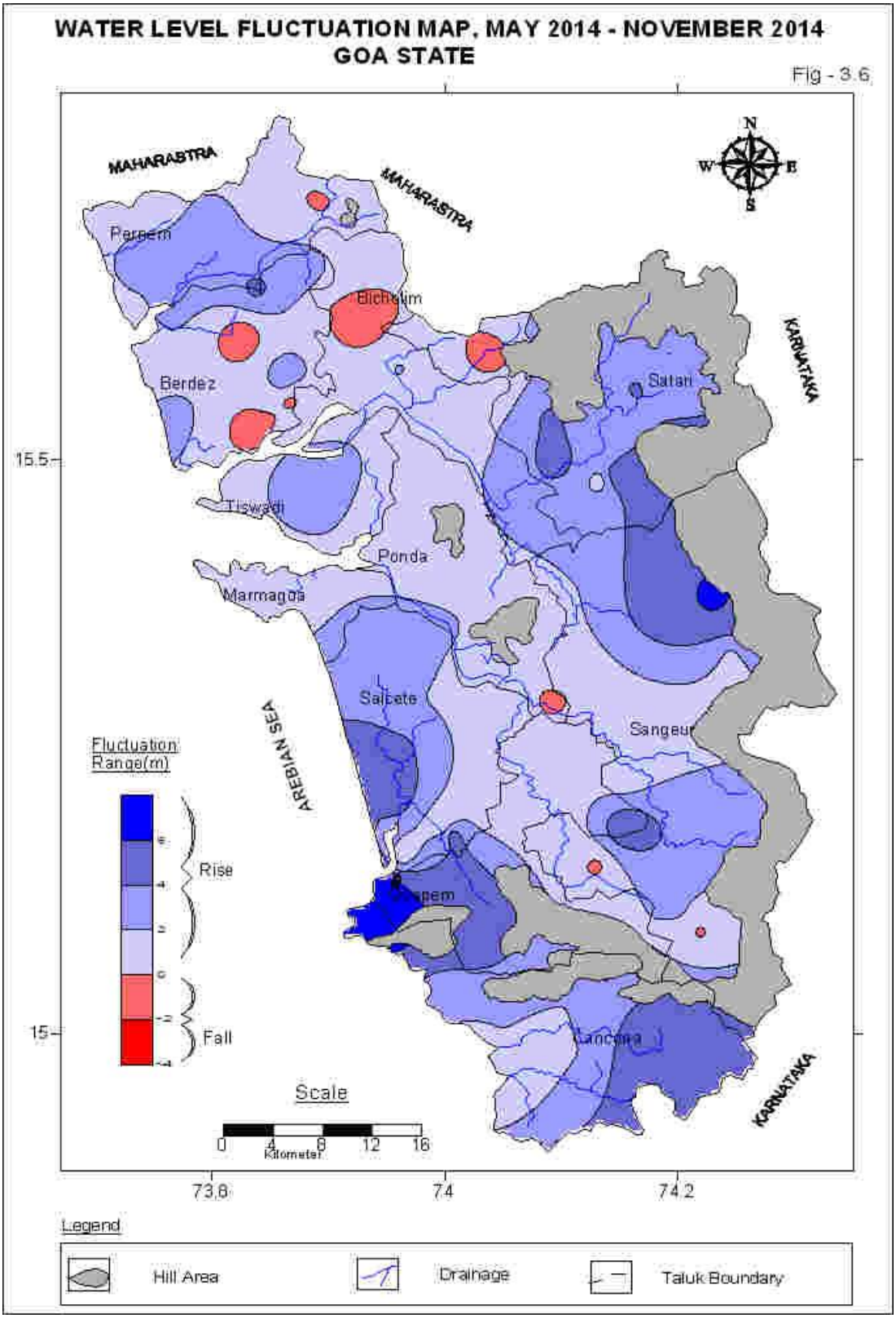

Fig.3.6. Water level fluctuation, (May 2014 – November 2014)

Change in Groundwater Level: May 2014 to January 2015

Water levels from 87 stations were compared to know the change in groundwater level in January 2015 as compared with May 2014 in the State of Goa. On the whole 66 wells accounting for 76% of the analysed wells have recorded a rise in water level during January 2015 as compared with the period May 2014. The remaining 21 wells (24%) have recorded fall in water level **(Table 3.7).**

In the rise category, the rise of water level in the range 0-2 m is observed in 42 wells accounting for 48% of the analyzed wells. Rise in water level in the range of 2 to 4 m is recorded in 19 wells (22%) and more than 4 m is recorded in 5 wells (6%) respectively. In the fall category, 17 wells (20%) have recorded a fall in the range of 0 to 2m.Fall in water level in the range of 2-4 is recorded in 2 wells (2%) and more than 4 m is recorded in 2 wells (2%) respectively.

A map showing the change in groundwater level in January 2015 as compared to May 2014, showing rise/fall in the ranges of 0 to 2 m, 2 to 4 m and >4 m is enclosed as **Fig. 3.7**. Major part of the State showing rise in water level in the range of 0 to 2m and 2-4 m of rise is observed in almost all taluks of Goa State. Rise in water level of >4 m is observed in Satari, Sanguem, Quepem and Cancona taluks. Fall in water level in the range of 0-2 m is observed as patches in Pernem, Bardez, Bicholim, Ponda, Salcete, Sanguem, Quepem and Cancona taluks. Fall in water level in the range of 2-4 m is noticed in Bardez, Tiswadi, Bicholim, Ponda and Cancona taluks. Fall in water level of >4 m is observed in Bicholim, Tiswadi and Cancona taluks.

Change in Groundwater Level: May 2013 to May 2014

Water levels from 78 stations were compared to know the change in groundwater level in May 2014 as compared with May 2013 in the State of Goa. It is seen from the table that 81% of the stations monitored have recorded a rise in water level during May 2014 as compared to May 2013 and 19% have shown fall in water level. Rise in water level in the range of 0-2 m is observed in 54 wells accounting for 69% and 2-5 m is observed in 9 wells accounting for 12% respectively. Fall in water level in the range of 0-2 m is recorded in 12 wells accounting for 15% and 2-5 m is recorded in 3 wells accounting for 12% respectively **(Table 3.8).**

A map depicting the change in groundwater level in May 2014 as compared to May 2013, showing rise/fall in the ranges of <2 m, 2 to 4 m and >4 m is enclosed as **Fig. 3.8**. Rise in water level in the range of 0-2 m is observed in almost all parts of Goa State. Rise in water level in the range of >2 m is observed in parts of Bardez, Bicholim, Quepem and Cancona taluks. Fall in water level in the range of 0-2m is observed in parts of Pernem, Bardez, Mormugao, Salcete, Quepem, Sanguem, Satari and Cancona taluks. Fall in water level in the range of >2 m is observed in parts of Salcete and Sanguem taluks.

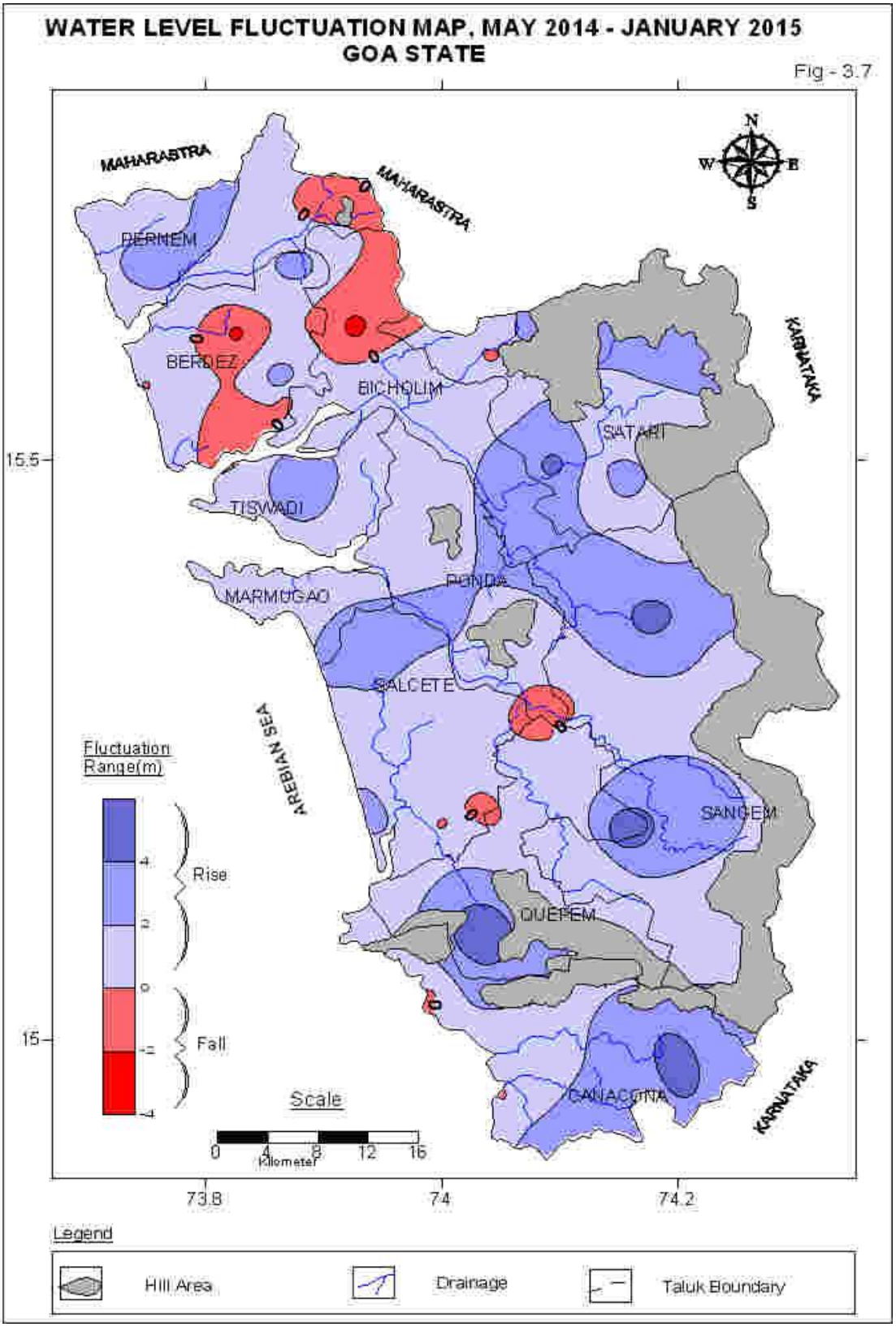

Fig.3.7. Water level fluctuation, (May 2014 – January 2015)

Change in Groundwater Level: August 2013 to August 2014

Water levels from 75 stations were compared to know the change in groundwater level in August 2014 as compared with August 2013 in the State of Goa. It is seen from the table that 61% of the stations monitored have recorded a fall in water level during August 2014 as compared to August 2013 and 39% have shown rise in water level. Rise in water level in the range of 0-2 m is observed in 29 wells accounting for 39%. It is observed that, no well has recorded a rise in water level in the range of 2-4 and more than 4 m. Fall in water level in the range of 0-2 m is recorded in 40 wells accounting for 53%, 2-4 m is recorded in 4 wells accounting for 5% and greater than 4 m is recorded in 2 wells accounting for 3% respectively **(Table3.9)**.

A map depicting the change in groundwater level in August 2014 as compared to August 2013, showing rise/fall in the ranges of <2 m, 2 to 4 m and >4 m is enclosed as **Fig. 3.9**. Rise in water level in the range of 0-2 m is observed as patches in almost all part of the State. Fall in water level in the range of 0-2 m is observed in major portion of the Goa State.

Change in Groundwater Level: November 2013 to November 2014

Water levels from 75 stations were compared to know the change in groundwater level in November 2014 as compared with November 2013 in the State of Goa. It is seen from the table that, 75% of the stations monitored have recorded a rise in water level during November 2014 as compared to November 2013 and 25% have shown fall in water level. Rise in water level in the range of 0-2 m is observed in 49 wells accounting for 67%. Water level in the range and 2 – 4 m and > 4m is observed in 2 wells (3%) and 4 wells (6%) respectively. Fall in water level in the range of 0-2 m is recorded in 17 wells accounting for 23%, 2-4 m is recorded in 1 well accounting for 1% and no well has recorded >4 m water level **(Table 3.10)**.

A map depicting the change in groundwater level in November 2014 as compared to November 2013, showing rise/fall in the ranges of <2 m, 2 to 4 m and >4 m is enclosed as **Fig. 3.10**. Rise in water level in the range of 0-2 m is observed as patches in Tiswadi, Satari, Sanguem, Quepem and Salcete taluks. Water level rise in the range of 2-4 and >4 is noticed as isolated patches in Quepem and Satari taluks. Fall in water level in the range of 0-2m is observed in major portion of the Goa State. Fall in water level in the range of 2-4 m is observed in parts of Pernem, Bardez, Bicholim, Ponda, Salcete and Cancona taluks. Fall in water level of greater than 4 m is observed as a small patch in Salcete taluk.

Change in Groundwater Level: January 2014to January 2015

Water levels from 77 stations were compared to know the annual change in groundwater level in January 2015 as compared to January 2014 in the State of Goa. It is seen from the data that out of

77 stations, 45 wells have rise in water level in the range of 0-2 m accounting for 58%. Rise in water level in the range of 2-4 m is recorded in 8 wells (11%) and 1 well (1%) shows rise in water level of >4 m. Fall in water level in the range of 0 to 2 m and more than 4 m is observed in 22 (29%), and 1 (1%) respectively **(Table3.11).**

A map showing the change in groundwater level in January 2015 as compared to January 2014, showing rise/fall in the ranges of 0 to 2 and 2 to 4m and > 4m is enclosed as **Fig. 3.11**. Major part of the State shows rise in water level in the range of 0-2 m. Rise in water level of 2-4 m is observed as patches in Pernem, Bardez, Bicholim, Mormugao, Sanguem, Salcete, Ponda and Quepem taluks and >4 m rise is recorded in Sanguem taluk of Goa State. Fall in water levels in the range of 0-2m is recorded in almost all taluks of Goa State. Fall in water level of 2-4 m and >4 m is observed only in Cancona taluk of Goa State.

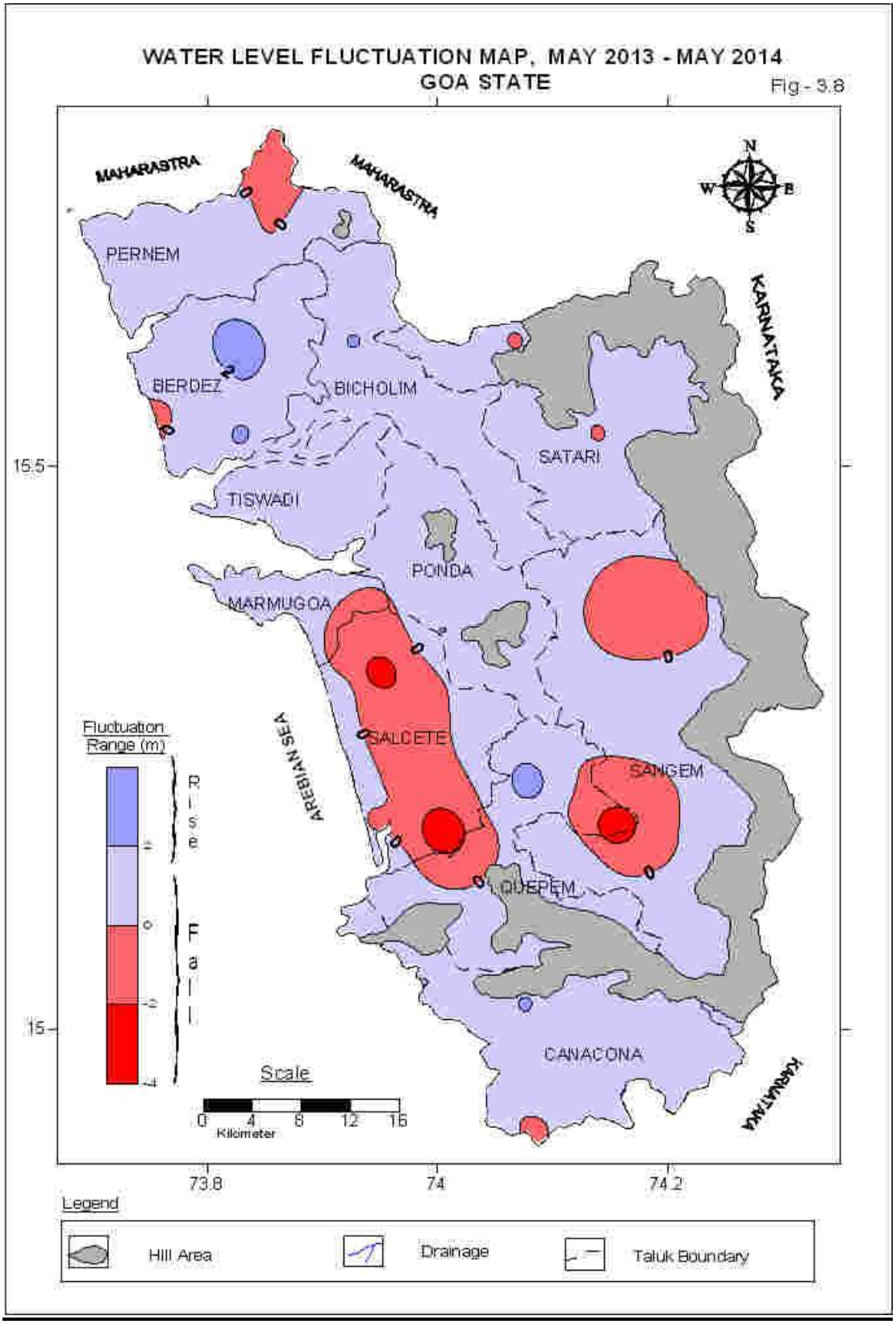

Fig. 3.8. Water level fluctuation, (May 2013 – May 2014)

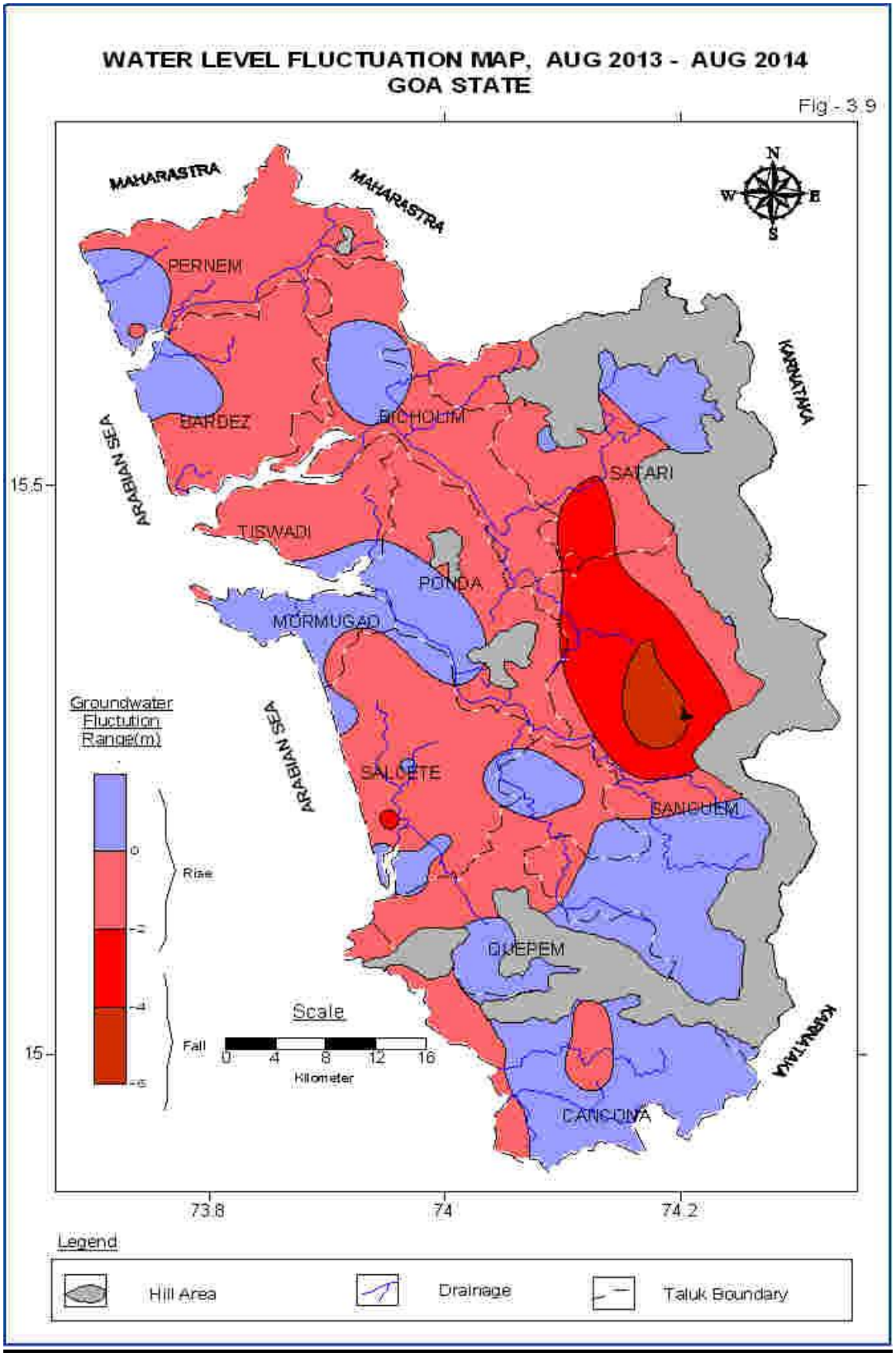

Fig. 3.9. Water level fluctuation, (August 2013 – August 2014)

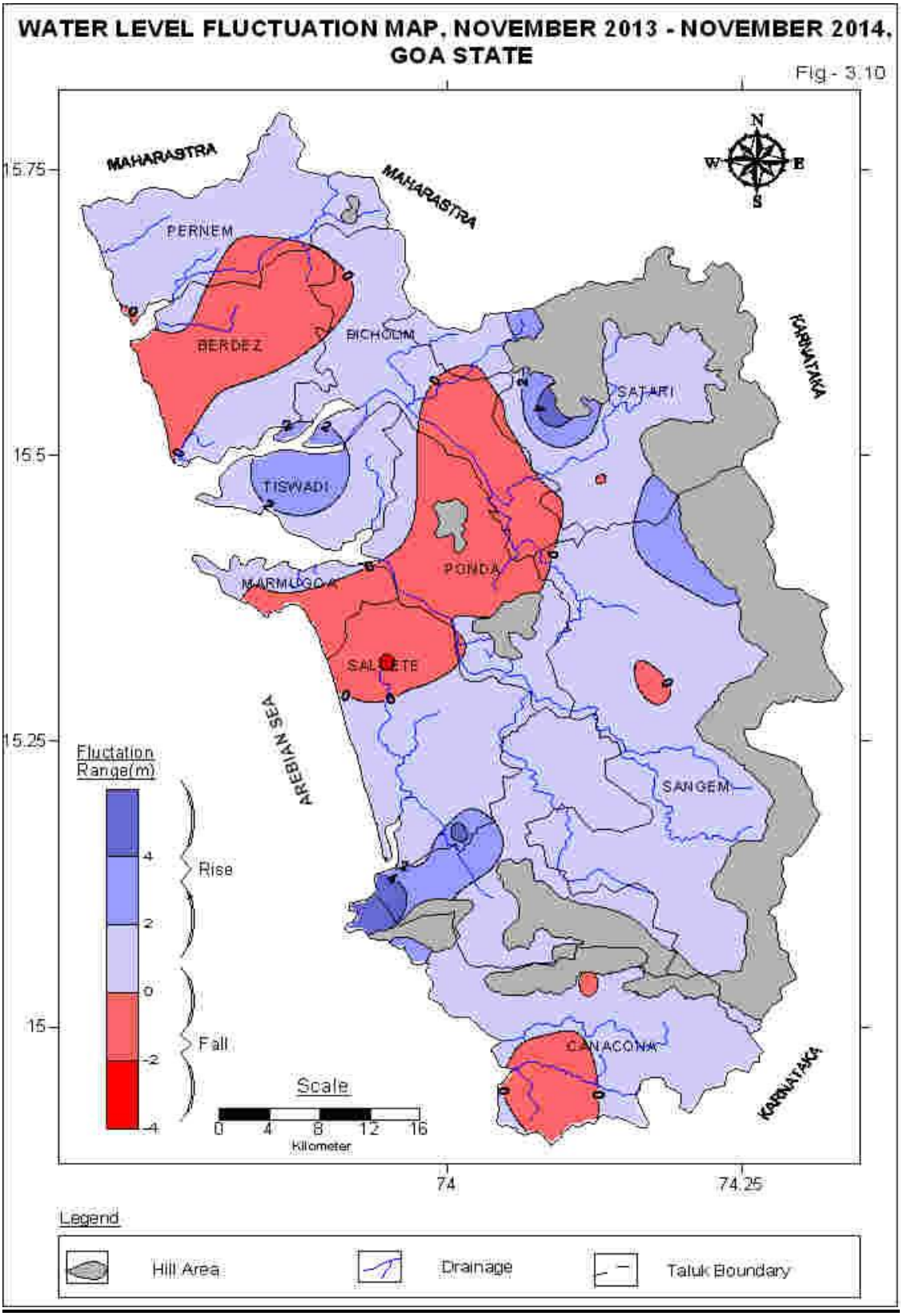

Fig. 3.10.Water level fluctuation, (November 2013 – November 2014)

Change in Groundwater Level: Mean (May 2004 to May2013) – May2014

Water levels from 78 stations were compared to know the change in groundwater level in May 2014 as compared with May 2013 in the State of Goa. It is seen from the table that 81% of the stations monitored have recorded a rise in water level during May 2014 as compared to May 2013 and 19% have shown fall in water level. Rise in water level in the range of 0-2 m is observed in 54 wells accounting for 69% and 2-5 m is observed in 9 wells accounting for 12% respectively. Fall in water level in the range of 0-2 m is recorded in 12 wells accounting for 15% and 2-5 m is recorded in 3 wells accounting for 12% respectively **(Table3.12)**.

A map depicting the change in groundwater level in May 2014 as compared to May 2013, showing rise/fall in the ranges of <2 m, 2 to 4 m and >4 m is enclosed as **Fig-3.12**. Rise in water level in the range of 0-2 m is observed in almost all parts of Goa State. Rise in water level in the range of >2 m is observed in parts of Bardez, Bicholim, Quepem and Cancona taluks. Fall in water level in the range of 0-2m is observed in parts of Pernem, Bardez, Mormugao, Salcete, Quepem, Sanguem, Satari and Cancona taluks. Fall in water level in the range of >2 m is observed in parts of Salcete and Sanguem taluks.

Change in Groundwater Level: August 2013 to August 2014

Water levels from 75 stations were compared to know the change in groundwater level in August 2014 as compared with August 2013 in the State of Goa. It is seen from the table that 61% of the stations monitored have recorded a fall in water level during August 2014 as compared to August 2013 and 39% have shown rise in water level. Rise in water level in the range of 0-2 m is observed in 29 wells accounting for 39%. It is observed that no well has recorded a rise in water level in the range of 2-4 m and more than 4 m. Fall in water level in the range of 0-2 m is recorded in 40 wells accounting for 53%, 2-4 m is recorded in 4 wells accounting for 5% and greater than 4 m is recorded in 2 wells accounting for 3% respectively **(Table3.13)**.

A map depicting the change in groundwater level in August 2014 as compared to August 2013, showing rise/fall in the ranges of <2 m, 2 to 4 m and >4 m is enclosed as **Fig. 3.13**. Rise in water level in the range of 0-2 m is observed as patches in almost all part of the State. Fall in water level in the range of 0-2m is observed in major portion of the Goa State. Fall in water level in the range of 2-4 m is observed in parts of Satari, Salcete and Sanguem taluks. Fall in water level of greater than 4 m is observed in Sanguem taluk.

Change in Water Level: Mean (November 2004 to November 2013) – November 2014

Mean groundwater level for the period November 2004 to November 2013 was compared with the groundwater level in November 2014 in the State of Goa. It is seen that out of the 40 stations compared, 29 stations accounting for 73% of analyzed wells have shown a rise in water level.

The remaining 11 wells accounting for 27% had shown a fall in water level**(Table 3.14).** A map showing the change in water levels, with rise/fall in the ranges of 0-2 m, 2-4m and >4m is enclosed as **Fig. 3.14**. Rise in water levels of 0-2 m is observed in Satari, Sanguem, Salcete, Quepem and Cancona taluks. Water level range >4m is observed in Salcete, Quepem and Cancona taluks. Fall in water level in the range of 0-2m is observed as major portion of the Goa State. Fall in water level of >2 m is observed in Pernem, Ponda, Bicholim, Sanguem, and Cancona taluks.

Change in Groundwater Level: Mean (Jan 2005 to Jan 2014) – Jan 2015

Mean groundwater level for the period January 2005 to January 2014 (decadal mean water level) was compared with the groundwater level in January 2015 in the State of Goa. It is seen that out of the 40 stations compared, 26 wells accounting for 65% of analysed wells have shown a rise in the range of 0 to 2 m and 2-4m water level rise is observed in 2 stations (5%) respectively. 12 wells accounting for 30% showed a fall in water level of 0 to 2 m during January 2015 as compared to preceding decadal mean **(Table 3.15).**

A map showing the change in water levels, with rise/fall in the ranges of 0-2 m and 2-4 m and >4m is enclosed as **Fig. 3.15**. Major part of the state showing rise in water levels in the range of 0 to 2m. Rise in water level in the range of >2 m is observed as an isolated patches in Bardez, Bicholim and Tiswadi taluks of Goa State. Fall in water level of 0 to 2 m is noticed in major portions of Pernem, Satari, Mormugao, Salcete, Quepem, Sanguem, Cancona taluks and as small patch in Bicholim and Bardez taluk of Goa State.

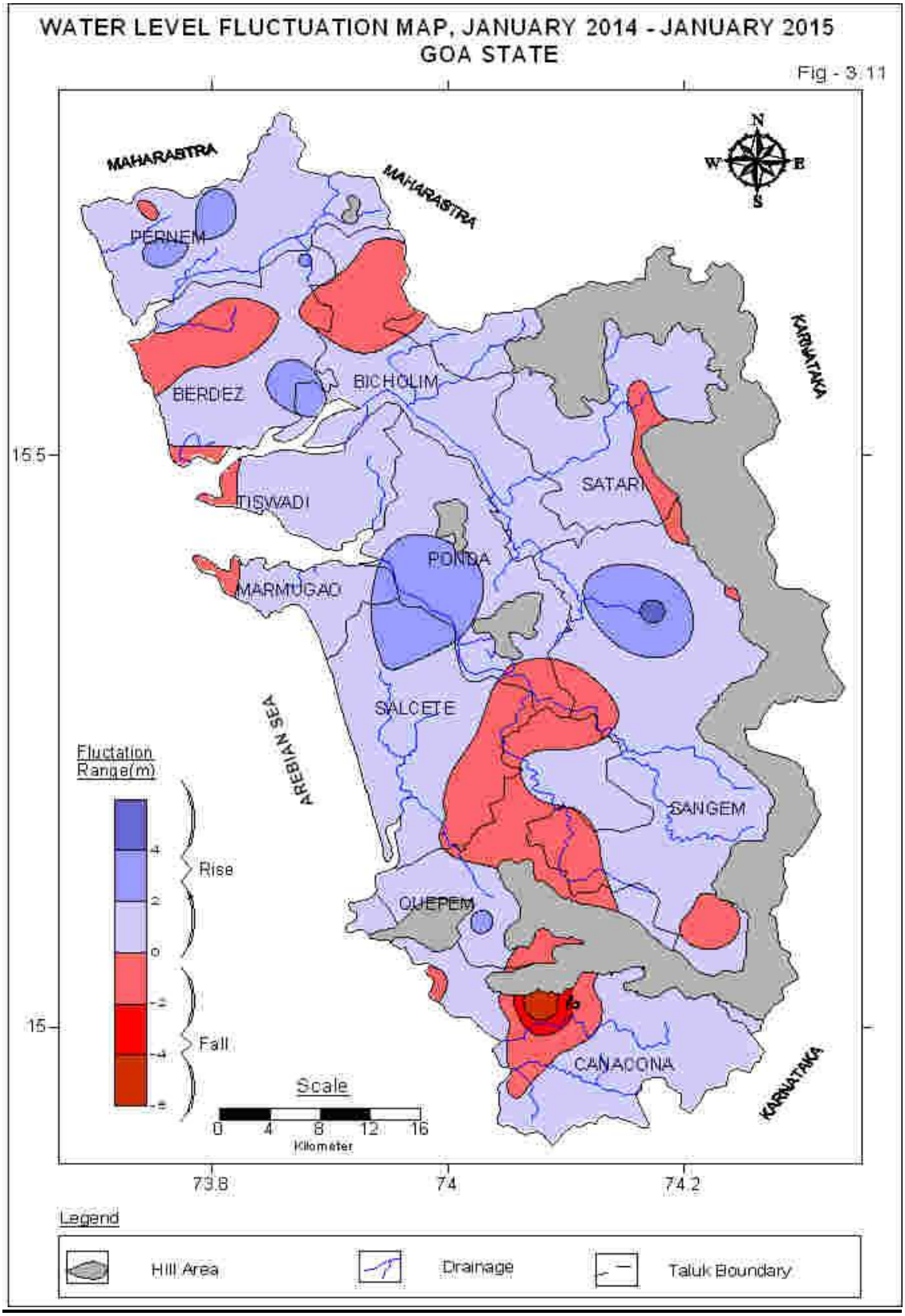

Fig. 3.11. Water level fluctuation, (January 2014 – January 2015)

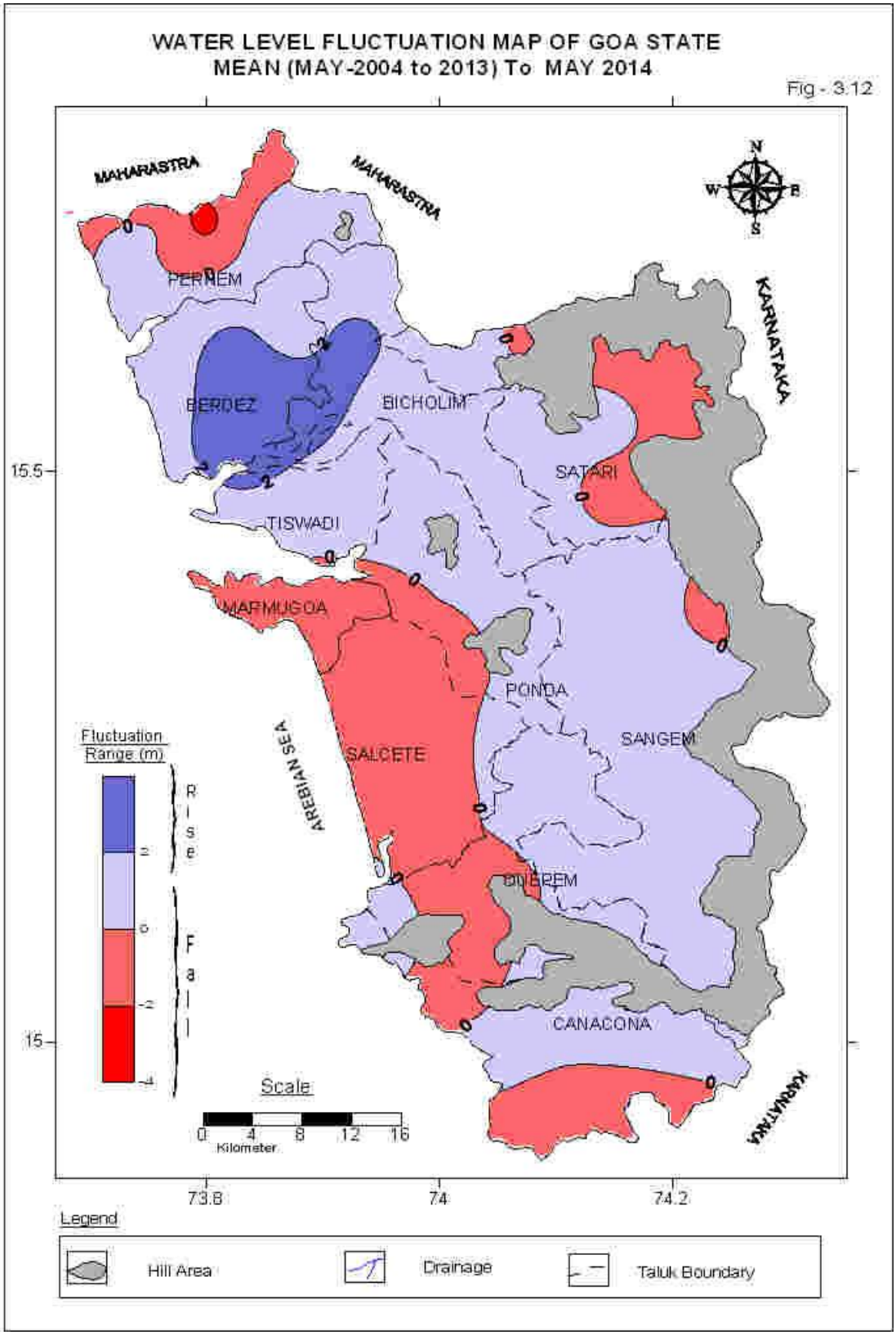

Fig. 3.12. Water level fluctuation, Mean (May 2004 to 2013) to May 2014

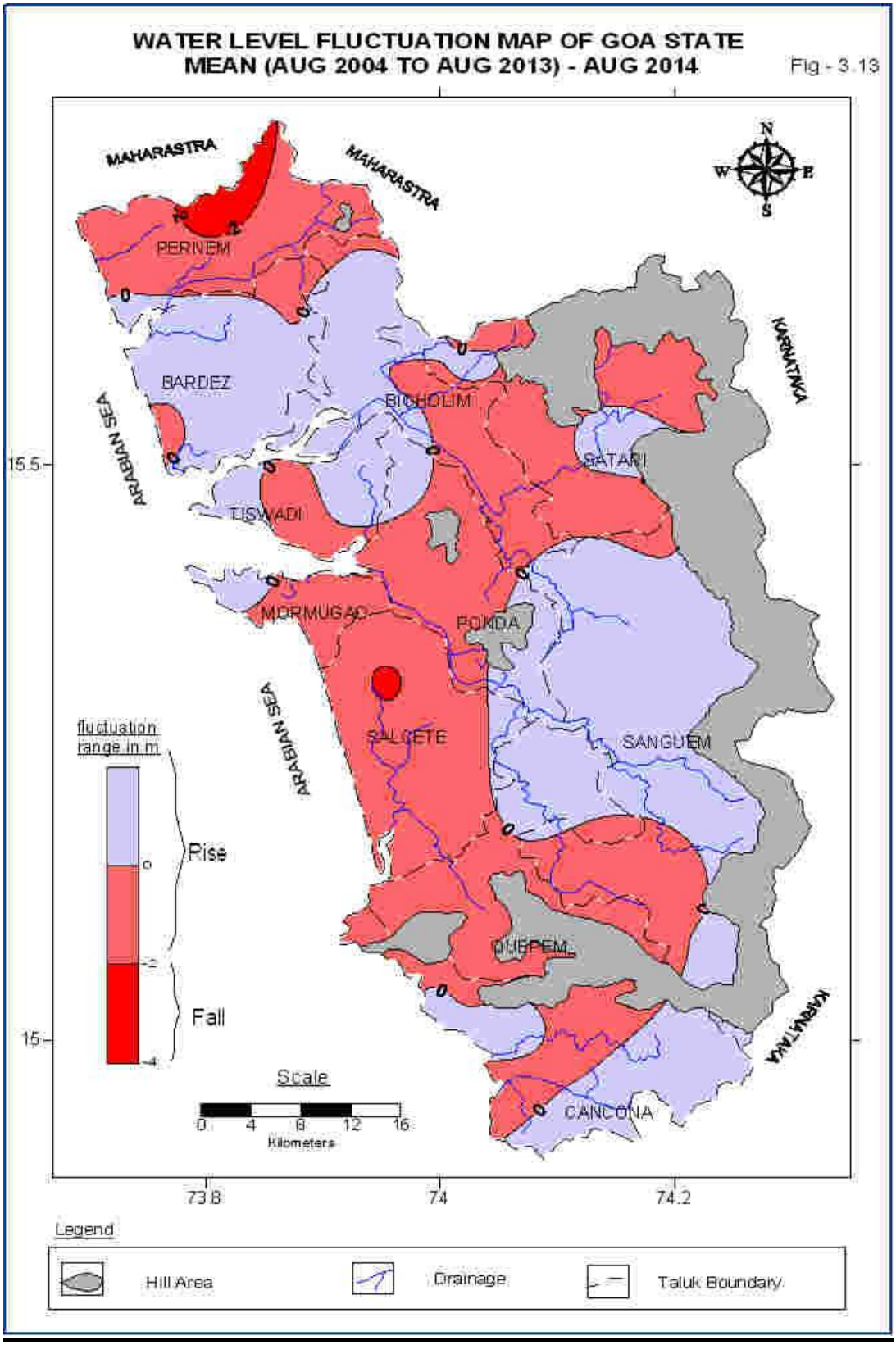

Fig.3.13. Water level fluctuation, Mean (August 2004 to 2013) to August 2014

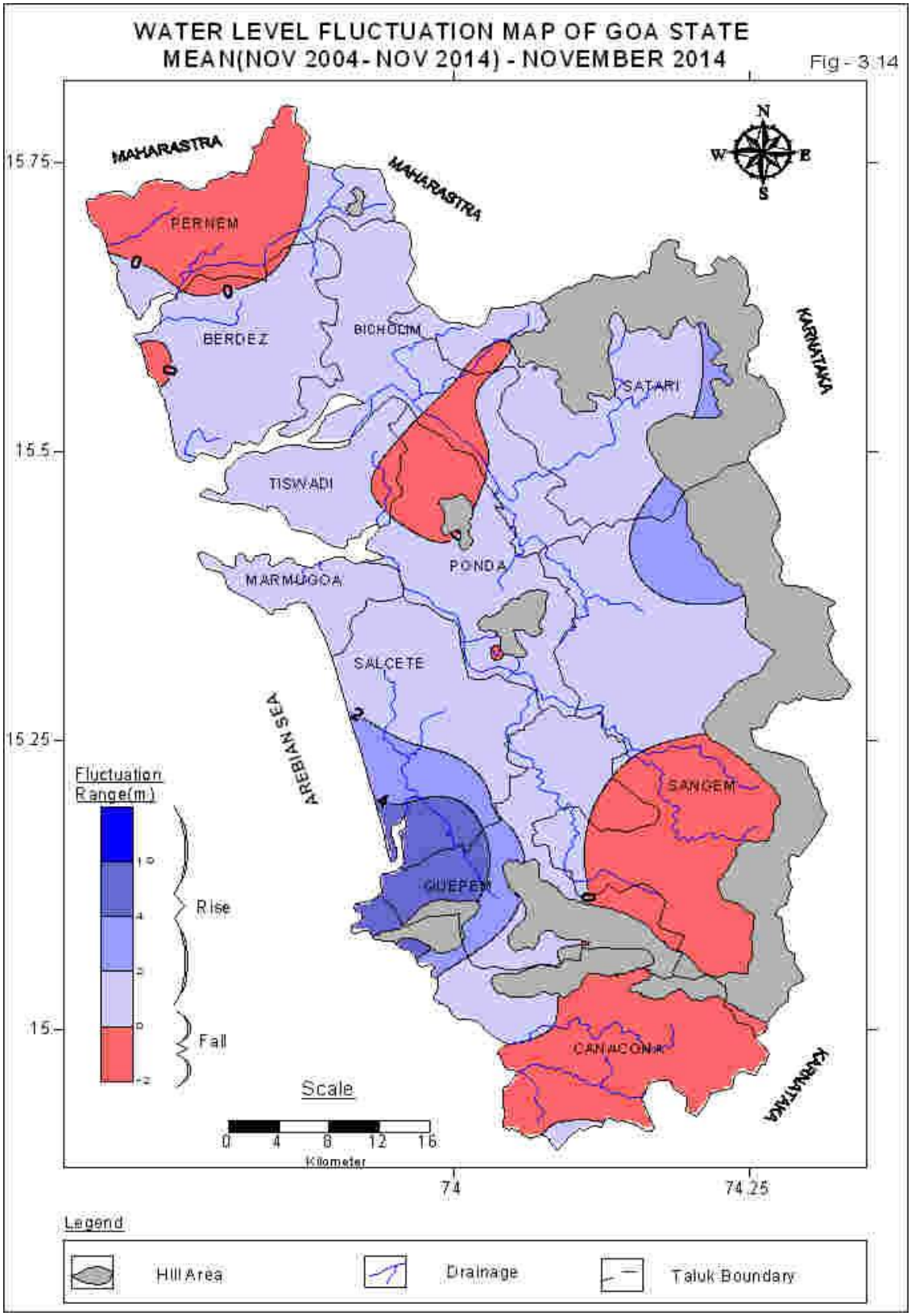

Fig. 3.14. Water level fluctuation, Mean (November 2004 to 2013) to November 2014

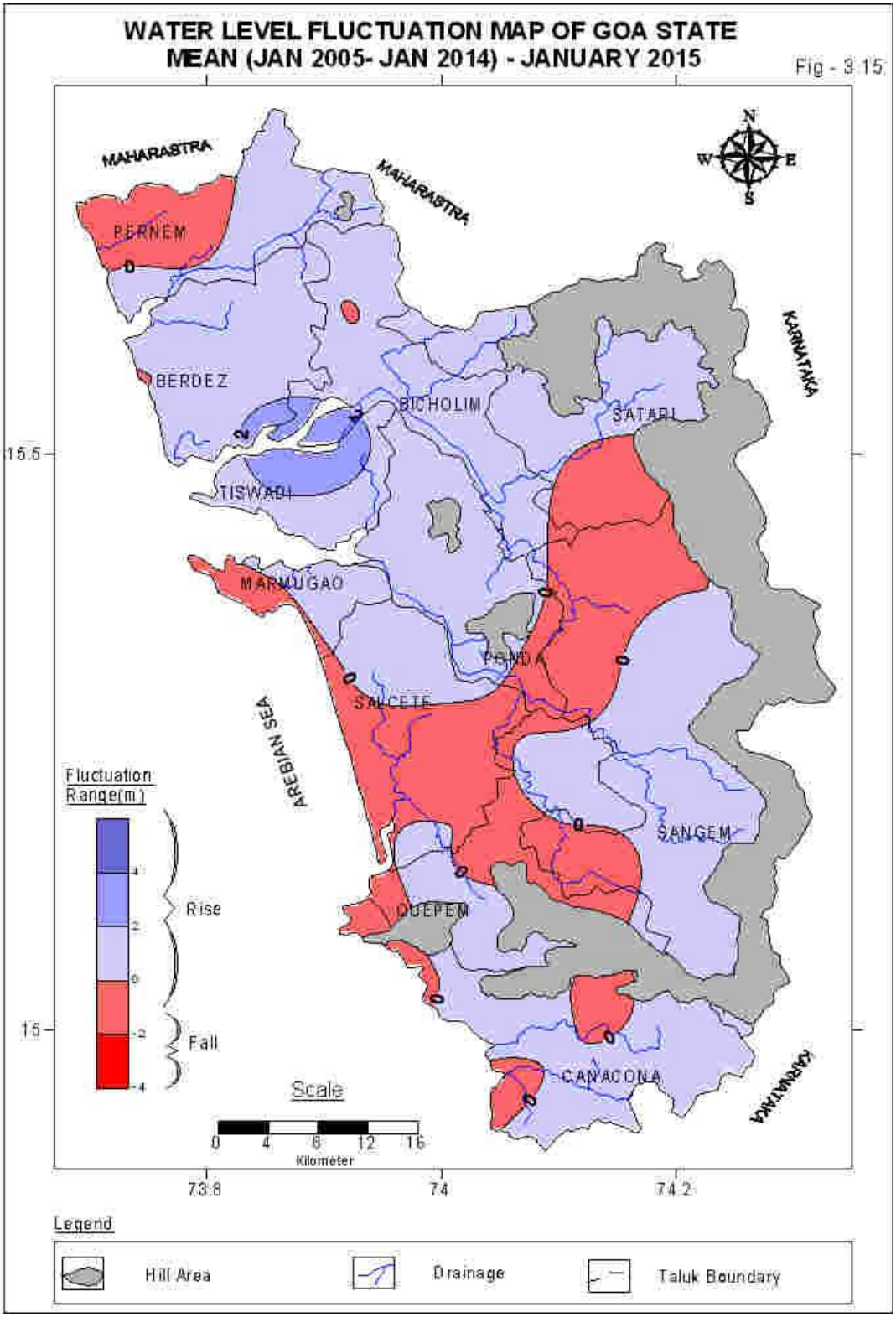

Fig.3.15. Water level fluctuation, Mean (January 2005 to 2014) to January 2015

3.3 Depth to Water Level – Piezometers

CGWB has a network of 49 piezometers drilled in Goa State under Hydrology Project II. These piezometers are also monitored for manual water level along with the dug well four times in a year. The water level data of these piezometers during the water year 2013-14 is given in **Annexure-V**. However the piezometers water levels are not incorporated in the preparation of water level and fluctuation maps discussed below.

3.4 Participatory monitoring program in Goa state

Participatory monitoring has been started in Goa state from November 2014. Four observers are identified and they are sending data twice in a month. These stations are 1. Molem, 2.Morjem, 3.Panchwadi, 4.Guddemol and observers have been trained in measuring the water levels fortnightly. They have been provided with one measuring tape and a register to note down the water levels. Apart from noting down the data in register they are sending the water levels through SMS and Post cards. The data collected since Nov 2014 is shown in **Annexure VII**.

4. HYDROCHEMISTRY

Water samples from the NHS are collected once a year during the month of May. The assessment of chemical quality of ground water samples from Ground Water Monitoring Stations (GWMS) of Goa State for the year 2014 is presented in the following sections.

The water samples from 85monitoring stations of shallow aquifers from 2 districts were collected during the month of May 2014. These samples were analysed in the Regional Chemical Laboratory, SWR, Bangalore for 15 parameters (EC, pH, major cations, major anions(Cl, HCO_3,SO_4) and also Nitrate, Fluoride, Phosphate and Boron) by employing Standard methods. Based on the hydrochemical data, the potability of these samples has been assessed as per the Standards prescribed by the 'Bureau of Indian Standards' and classified into 'Desirable', 'Permissible' and 'Unsuitable' classes. The details of chemical samples analyzed are presented in **Annexure-VI**.

4.1 Distribution of PH

The hydrogen ion concentration (pH) of water is a measure of its acidity or alkalinity. A neutral pH, neither acid nor alkaline, is 7.0; waters with pH below 7 are acidic and above 7 are alkaline. The distribution of pH values in Goa State varies from 5.0 to 8.1 which indicate acidic to alkaline nature of Ground Water.

4.2 Distribution of Electrical Conductivity

The Electrical Conductivity (EC) of a solution is a measure of its ability to carry an electric current., The more dissolved ionic solutes in water, greater is its electrical conductivity. BIS has recommended a drinking water standard for total dissolved solids a limit of 500 mg/L (corresponding to about EC of 750 µS/cm at 25°C) that can be extended to a TDS of 2000 mg/L (corresponding to about 3000 µS/cm at 25°C) in case of no alternate source. Waters having TDS more than 2000 mg/litre are not suitable for drinking purpose.

The perusal of the data indicates that the distribution of electrical conductivity in the State shows wide variations (60–840 µS/cm at 25˚C). The maximum value for the parameter was recorded in the samples collected from Baga, North Goa district.

About 98% of the samples collected all over the State show EC values generally below 650 µS/cm at 25˚ C, rendering the samples suitable for drinking. Distribution of Electrical Conductivity during may 2014 in Goa state is presented in **Fig. 4.1**.

4.3 Distribution of Chloride

It is the most common constituent in natural waters. Physiologically of little concern at lower concentration, but, at higher levels it may be injurious to people suffering from diseases of heart and

kidneys. The ‘desirable’ and ‘permissible’ limits are 250 mg/L and 1000 mg/L, respectively. The highest value recorded is for the samples collected from Baga of North Goa district. The data indicated that all of the samples are in the ‘desirable’ limits for drinking water. Distribution of Chloride during may 2014 in Goa state is presented in **Fig. 4.2.**

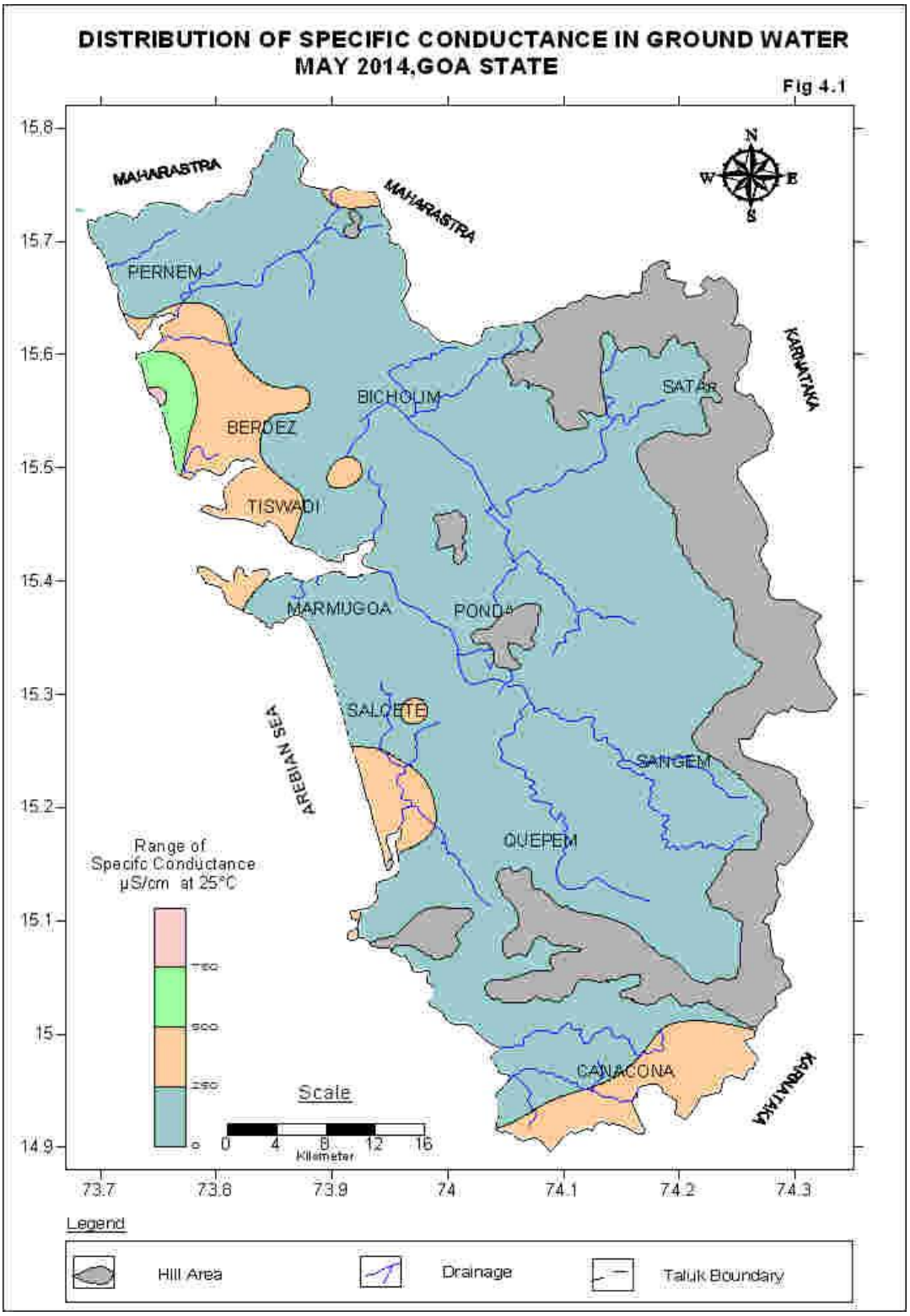

Fig. 4.1.Isoconductivity map

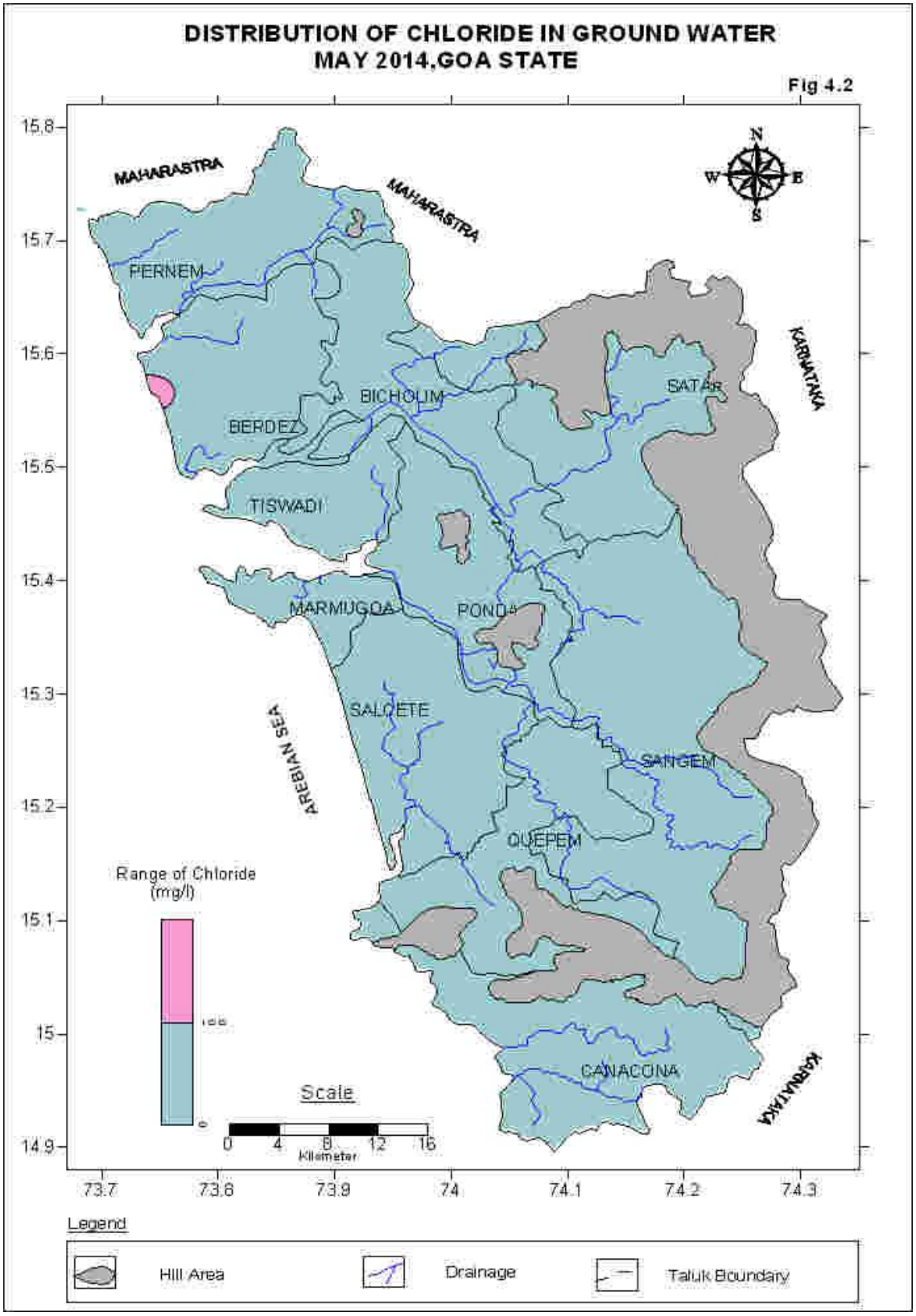

Fig.4.2. Isochlor map

4.4 Distribution of Nitrate

Nitrate is an anthropogenic pollutant contributed by nitrogen fertilizer, human and animal waste through biochemical activities of nitrifying bacteria. Excessive concentration of nitrate in drinking water may cause methemoglobinemia in small children. The BIS has recommended the desirable and permissible limit of nitrate is 45 mg/L.

The occurrence of Nitrate in ground waters of Goa State shows variation from 0.1 mg/L to 55 mg/L. About 97% of the samples collected all over the State are showing Nitrate values below 45 mg/L indicating suitability of water for drinking. Distribution of Nitrate during may 2014 in Goa State is presented in **Fig. 4.3**.

4.5 Distribution of Fluoride

Flouride is found in all natural water at some concentration. Fluoride is an essential element at low levels and harmful at higher levels. In ground water however, low or high concentration of fluoride can occur depending on the nature of parent rocks and the occurrence of fluoride bearing minerals.

The occurrence of fluoride in ground water in the State has exhibited wide variations from 0.01 mg/L to 0.18 mg/L. All the samples are in well within ‘desirable’ limit as per the drinking water standards.

4.6 Distribution of Calcium

It is a natural constituent in waters resulting from the dissolution of limestone, dolomite and gypsum. It is essential for nervous and muscular system and coagulation of blood. High concentration leads to kidney stones and irritation in urinary passage. The ‘desirable’ and the ‘permissible’ limits are 75 mg/L and 200 mg/L, respectively.

The occurrence of Calcium in ground waters of Goa State shows variation from 2 mg/L to 72 mg/L. All the samples are in well within the limit.

The analysis is carried out for Phospahte and Boron in ground water samples and are found to be within the permissible limits.

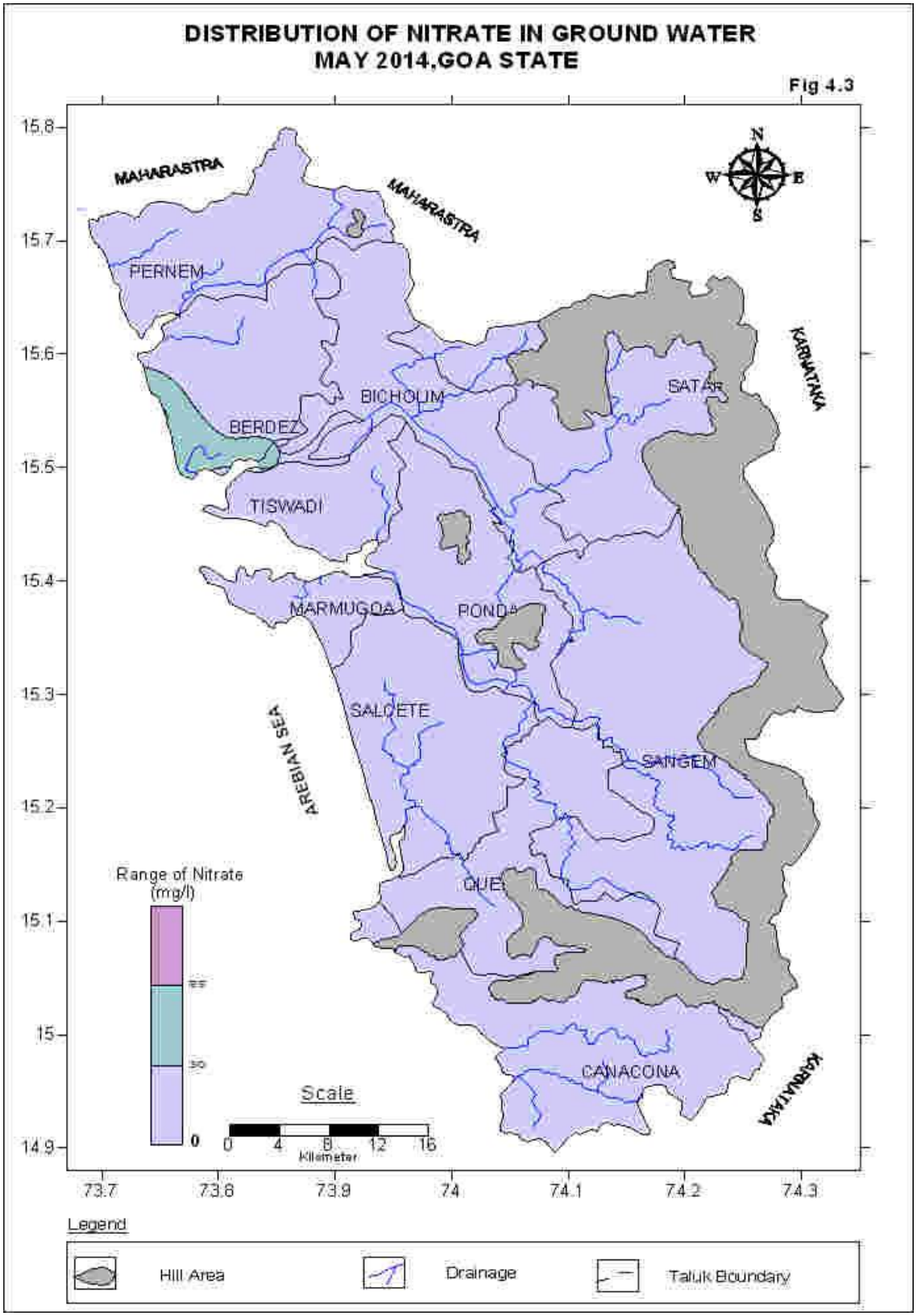

Fig.4.3. Distribution of Nitrate

5. CONCLUSION

The present report includes results of a study on the behavior of the Ground Water Regime in the State of Goa through a network 103 National Groundwater monitoring Stations tapping the phreatic aquifer.

Out of the 103 stations, 35% of the stations fall in the Mandovi basin, 24% fall in the Zuari basin, 16% fall in the Sal basin, and the remaining 25% fall in the West flowing minor river basins. Quartz –Chlorite- Biotite schist occupies the largest area in the State and 52% of stations fall in these areas. This is followed by Metabasalt rocks and Granite gneiss, in which 12% and 11% respectively of the monitoring stations are located. The remaining 25% of the stations are in Greywacke, Carbonate - quartz -chlorite and Recent alluvium.

The data of depth to water levels shows that, during the pre-monsoon period of 2014 about 87% of the analysed wells have water levels within 10 mbgl. Moderately deep water levels of 10 to 20 mbgl are seen in about 13% wells. No well shows deep water level of >20 mbgl. The depth to water level during August 2014 ranged from 0.5 mbgl to 16.85 mbgl, about 36.5% of analysed wells have less than 2 mbgl water levels, 39.6% wells have 2 to 5 mbgl water level, 18.8% wells have 5 to 10 mbgl water level and the remaining 5.2% wells have 10 to 20mbgl water level. During post-monsoon period of 2014(November), about 90% of the analysed wells have water level within 10 mbgl. Moderately deep water levels of 10 to 20 mbgl are seen in 10% wells.The depth to water level during January 2015 ranged from1.14 mbgl to 19.15 mbgl, about 11 % analysed wells have less than 2 mbgl water levels, 48 % wells have 2 to 5 mbgl water levels, 31 % wells have 5 to 10 mbgl water level and the remaining 10 % wells have 10 to 20 mbgl water level.

The chemical quality of ground water collected from 86 water level monitoring stations representing the shallow aquifers during May 2014 indicate that, the quality of all the samples are good and suitable for domestic, irrigation and industrial purpose.

Table 1.3: GEOLOGICAL SUCCESSION IN GOA STATE

AGE	GROUP	FORMATION	ROCK TYPE
Quarternary			Beach Sand
Cenozoic			Laterites
Upper Cretaceous to Eocene	Deccan Trap		Basalt
Lower Proterozoic	Clospet Granite		Granite
		Peridotite, Gabbro, Norite	Pyroxenite, Periditite, Serpentinite, Gabbro
Archaean to Lower Proterozoic	Goa Group	Vageri Formation	Carbonate-quatz-chlorite schist with Greywacke
		Bicholim Formation	Dolomitic limestone
			Quartz- Sericite schist
			Banded iron formation
			Chert and quartzite
			Quartz-chlorite-biotite schist with layeres of chert, iron oxide, carbonate, metabasalt and meta gabbro
		Sanvordem Formation	Greywacke with conglomerate
			Quartzite
		Barcem Formation	Quartz-chlorite schist
			Meta-acid volcanics
			Metabasalt
			Orthoquartzite
Archaean	Peninsular Gneissic complex		Granite Gneiss, Migmatites and Granites

Table 3.1

Talukwise Well Frequency for Different Ranges of Depth to Water Level

Month / Year : May-2014

Taluk	No of WL measured	D.T.W. (m bgl)		0 - 2 (m)		2 - 5 (m)		5 - 10 (m)		10 - 20 (m)		> 20 (m)	
		Min.	Max.	No.	%	No.	%	No.	%	No.	%	No.	%
Tiswadi	3	2.53	8.78	0	0.0	1	33.3	2	66.7	0	0.0	0	0.0
Sattari	11	2.83	10.77	0	0.0	4	36.4	6	54.5	1	9.1	0	0.0
Sangeum	15	2.31	13.83	0	0.0	2	13.3	9	60.0	4	26.7	0	0.0
Salcete	13	1.42	12.53	2	15.4	4	30.8	6	46.2	1	7.7	0	0.0
Quepem	5	1.75	15.82	1	20.0	3	60.0	0	0.0	1	20.0	0	0.0
Ponda	6	1.65	6.73	1	16.7	3	50.0	2	33.3	0	0.0	0	0.0
Pernem	9	1.80	7.80	1	11.1	5	55.6	3	33.3	0	0.0	0	0.0
Marmugoa	1	3.15	3.15	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Canacona	9	3.34	14.92	0	0.0	5	55.6	3	33.3	1	11.1	0	0.0
Bicholim	9	0.80	18.72	1	11.1	3	33.3	3	33.3	2	22.2	0	0.0
Bardez	13	1.25	14.91	2	15.4	8	61.5	1	7.7	2	15.4	0	0.0
Total	94			8	8.5	39	41.5	35	37.2	12	12.8	0	0.0

Table 3.2

Talukwise Well Frequency for Different Ranges of Depth to Water Level

Month / Year : August - 2014

Taluk	No of WL Measured	D.T.W. (m bgl)		0 - 2 (m)		2 - 5 (m)		5 -10 (m)		10 - 20 (m)		> 20 (m)	
		Min.	Max.	No.	%	No.	%	No.	%	No.	%	No.	%
Tiswadi	4	0.61	4.30	2	50.0	2	50.0	0	0.0	0	0.0	0	0.0
Satari	11	0.75	5.03	4	36.4	6	54.5	1	9.1	0	0.0	0	0.0
Sanguem	15	0.55	9.32	3	20.0	4	26.7	8	53.3	0	0.0	0	0.0
Salcete	13	0.98	7.66	6	46.2	4	30.8	3	23.1	0	0.0	0	0.0
Quepem	5	0.77	9.47	2	40.0	2	40.0	1	20.0	0	0.0	0	0.0
Ponda	6	1.10	5.20	2	33.3	3	50.0	1	16.7	0	0.0	0	0.0
Pernem	9	0.08	7.34	3	33.3	4	44.4	2	22.2	0	0.0	0	0.0
Mormugao	1	2.49	2.49	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Cancona	10	0.61	14.80	5	50.0	2	20.0	1	10.0	2	20.0	0	0.0
Bicholim	9	0.21	16.65	3	33.3	4	44.4	0	0.0	2	22.2	0	0.0
Bardez	13	0.62	10.37	5	38.5	6	46.2	1	7.7	1	7.7	0	0.0
Total	96			35	36.5	38	39.6	18	18.8	5	5.2	0	0.0

Table-3.3

Talukwise Well Frequency for Different Ranges of Depth to Water Level

Month / Year : Nov-2014

Taluk measured	No of WL	D.T.W. (m bgl) Min.	Max.	0-2(m) No.	%	2-5(m) No.	%	5-10(m) No.	%	10-20 (m) No.	%	>20(m) No.	%
Tiswadi	4	0.86	6.98	3	75.0	0	0.0	1	25.0	0	0.0	0	0.0
Sattari	10	1.09	5.74	2	20.0	6	60.0	2	20.0	0	0.0	0	0.0
Sangeum	15	1.26	10.45	1	6.7	6	40.0	6	40.0	2	13.3	0	0.0
Salcete	12	0.66	5.75	7	58.3	4	33.3	1	8.3	0	0.0	0	0.0
Quepem	5	1.40	3.65	2	40.0	3	60.0	0	0.0	0	0.0	0	0.0
Ponda	6	0.72	5.95	3	50.0	1	16.7	2	33.3	0	0.0	0	0.0
Pernem	9	0.13	7.43	2	22.2	5	55.6	2	22.2	0	0.0	0	0.0
Marmugoa	1	2.57	2.57	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Canacona	10	0.20	15.39	4	40.0	2	20.0	1	10.0	3	30.0	0	0.0
Bicholim	9	1.38	16.56	2	22.2	3	33.3	1	11.1	3	33.3	0	0.0
Bardez	13	0.90	10.45	4	30.8	7	53.8	1	7.7	1	7.7	0	0.0
Total	94			30	31.9	38	40.4	17	18.1	9	9.6	0	0.0

Table 3.4

Talukwise Well Frequency for Different Ranges of Depth to Water Level

Month / Year: January-2015

Taluk	No of WL measured	D.T.W. (m bgl)		0 - 2 (m)		2 - 5 (m)		5 -10 (m)		10 - 20 (m)		> 20 (m)	
		Min.	Max.	No.	%	No.	%	No.	%	No.	%	No.	%
Tiswadi	4	1.11	7.78	2	50.0	1	25.0	1	25.0	0	0.0	0	0.0
Sattari	10	1.53	7.70	2	20.0	4	40.0	4	40.0	0	0.0	0	0.0
Sangeum	13	2.27	10.60	0	0.0	5	38.5	6	46.2	2	15.4	0	0.0
Salcete	12	1.20	6.59	2	16.7	8	66.7	2	16.7	0	0.0	0	0.0
Quepem	4	1.77	4.40	1	25.0	3	75.0	0	0.0	0	0.0	0	0.0
Ponda	5	1.12	6.50	2	40.0	1	20.0	2	40.0	0	0.0	0	0.0
Pernem	9	0.38	7.29	2	22.2	5	55.6	2	22.2	0	0.0	0	0.0
Marmugoa	1	2.97	2.97	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Canacona	10	0.61	15.34	2	20.0	4	40.0	1	10.0	3	30.0	0	0.0
Bicholim	8	2.45	14.95	0	0.0	5	62.5	1	12.5	2	25.0	0	0.0
Bardez	13	1.52	13.80	3	23.1	6	46.2	3	23.1	1	7.7	0	0.0
Total	89			16	18.0	43	48.3	22	24.7	8	9.0	0	0.0

Table 3.5

Talukwise Categorisation of Water Level Fluctuation

(May - 2014 to August - 2014)

Taluk	Number of Station Analysed	Fall in m						Rise in m					
		0 - 2	%	2 - 4	%	>4	%	0- 2	%	2- 4	%	> 4	%
Bardez	13	0	0.0	0	0.0	0	0.0	8	61.5	3	23.1	2	15.4
Bicholim	9	0	0.0	0	0.0	0	0.0	5	55.6	3	33.3	1	11.1
Cancona	9	0	0.0	0	0.0	0	0.0	2	22.2	6	66.7	1	11.1
Mormugao	1	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
Pernem	9	0	0.0	0	0.0	0	0.0	8	88.9	1	11.1	0	0.0
Ponda	6	0	0.0	0	0.0	0	0.0	5	83.3	1	16.7	0	0.0
Quepem	5	0	0.0	0	0.0	0	0.0	3	60.0	1	20.0	1	20.0
Salcete	13	0	0.0	0	0.0	0	0.0	7	53.8	3	23.1	3	23.1
Sanguem	15	0	0.0	0	0.0	0	0.0	5	33.3	7	46.7	3	20.0
Satari	11	0	0.0	0	0.0	0	0.0	4	36.4	4	36.4	3	27.3
Tiswadi	3	0	0.0	0	0.0	0	0.0	2	66.7	0	0.0	1	33.3
Total	94	0	0.0	0	0.0	0	0.0	50	53.2	29	30.9	15	16.0

Table-3.6

Talukwise Categorisation of Water Level Fluctuation

(May-14 to Nov-14)

Taluk	Number of Station Analysed	Fall						Rise					
		0 - 2 (m)	%	2 - 4 (m)	%	> 4 (m)	%	0 - 2 (m)	%	2 - 4 (m)	%	> 4 (m)	%
Bardez	13	3	23.1	0	0.0	0	0.0	5	38.5	3	23.1	2	15.4
Bicholim	9	1	11.1	0	0.0	1	11.1	3	33.3	2	22.2	2	22.2
Canacona	9	0	0.0	0	0.0	1	11.1	2	22.2	5	55.6	1	11.1
Marmugoa	1	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
Pernem	9	1	11.1	0	0.0	0	0.0	6	66.7	2	22.2	0	0.0
Ponda	6	1	16.7	0	0.0	0	0.0	4	66.7	1	16.7	0	0.0
Quepem	5	0	0.0	0	0.0	0	0.0	4	80.0	0	0.0	1	20.0
Salcete	12	0	0.0	0	0.0	0	0.0	4	33.3	4	33.3	4	33.3
Sangeum	15	2	13.3	0	0.0	0	0.0	4	26.7	5	33.3	4	26.7
Sattari	10	1	10.0	0	0.0	0	0.0	5	50.0	1	10.0	3	30.0
Tiswadi	3	0	0.0	0	0.0	0	0.0	2	66.7	1	33.3	0	0.0
Total	92	9	9.8	0	0.0	2	2.2	40	43.5	24	26.1	17	18.5

Table 3.7

Talukwise Categorisation of Water Level Fluctuation

(May-2014 to January-2015)

Taluk	Number of Station Analysed	Fall in m						Rise in m					
		0 - 2	%	2 - 4	%	>4	%	0 - 2	%	2 - 4	%	> 4	%
Bardez	13	5	38.5	1	7.7	0	0.0	6	46.2	1	7.7	0	0.0
Bicholim	8	0	0.0	1	12.5	1	12.5	4	50.0	1	12.5	1	12.5
Canacona	9	2	22.2	0	0.0	1	11.1	3	33.3	2	22.2	1	11.1
Marmugoa	1	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
Pernem	9	3	33.3	0	0.0	0	0.0	3	33.3	3	33.3	0	0.0
Ponda	5	1	20.0	0	0.0	0	0.0	3	60.0	1	20.0	0	0.0
Quepem	4	2	50.0	0	0.0	0	0.0	2	50.0	0	0.0	0	0.0
Salcete	12	1	8.3	0	0.0	0	0.0	7	58.3	3	25.0	1	8.3
Sangeum	13	1	7.7	0	0.0	0	0.0	8	61.5	2	15.4	2	15.4
Sattari	10	2	20.0	0	0.0	0	0.0	3	30.0	5	50.0	0	0.0
Tiswadi	3	0	0.0	0	0.0	0	0.0	2	66.7	1	33.3	0	0.0
Total	87	17	19.5	2	2.3	2	2.3	42	48.3	19	21.8	5	5.7

Table 3.8

Talukwise Categorisation of Water Level Fluctuation

(May-13 to May-14)

Taluk	Number of Station Analysed	Fall in m						Rise in m					
		0 - 2	%	2 - 4	%	> 4	%	0 - 2	%	2 - 4	%	> 4	%
Bardez	11	1	9.1	0	0.0	0	0.0	8	72.7	2	18.2	0	0.0
Bicholim	5	0	0.0	0	0.0	0	0.0	4	80.0	1	20.0	0	0.0
Canacona	9	1	11.1	0	0.0	0	0.0	6	66.7	2	22.2	0	0.0
Pernem	6	1	16.7	0	0.0	0	0.0	5	83.3	0	0.0	0	0.0
Ponda	4	0	0.0	0	0.0	0	0.0	3	75.0	1	25.0	0	0.0
Quepem	3	1	33.3	0	0.0	0	0.0	1	33.3	1	33.3	0	0.0
Salcete	12	3	25.0	2	16.7	0	0.0	7	58.3	0	0.0	0	0.0
Sangeum	15	3	20.0	1	6.7	0	0.0	10	66.7	1	6.7	0	0.0
Sattari	10	2	20.0	0	0.0	0	0.0	7	70.0	1	10.0	0	0.0
Tiswadi	3	0	0.0	0	0.0	0	0.0	3	100.0	0	0.0	0	0.0
Total	78	12	15.4	3	3.8	0	0.0	54	69.2	9	11.5	0	0.0

Table 3.9

Talukwise Categorisation of Water Level Fluctuation

(August – 2013 to August - 2014)

Taluk	Number of Station Analysed	Fall in m						Rise in m					
		0 - 2	%	2 - 4	%	> 4	%	0 - 2	%	2 - 4	%	> 4	%
Bardez	8	4	50.0	0	0.0	0	0.0	4	50.0	0	0.0	0	0.0
Bicholim	4	3	75.0	0	0.0	0	0.0	1	25.0	0	0.0	0	0.0
Cancona	10	6	60.0	0	0.0	0	0.0	4	40.0	0	0.0	0	0.0
Pernem	6	5	83.3	0	0.0	0	0.0	1	16.7	0	0.0	0	0.0
Ponda	4	3	75.0	0	0.0	0	0.0	1	25.0	0	0.0	0	0.0
Quepem	4	2	50.0	0	0.0	0	0.0	2	50.0	0	0.0	0	0.0
Salcete	13	5	38.5	1	7.7	0	0.0	7	53.8	0	0.0	0	0.0
Sanguem	13	5	38.5	1	7.7	2	15.4	5	38.5	0	0.0	0	0.0
Satari	10	4	40.0	2	20.0	0	0.0	4	40.0	0	0.0	0	0.0
Tiswadi	3	3	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	75	40	53.3	4	5.3	2	2.7	29	38.7	0	0.0	0	0.0

Table 3.10

Talukwise Categorisation of Water Level Fluctuation

(Nov-13 to Nov-14)

Taluk	Number of Station Analysed	Fall						Rise					
		0 - 2 (m)	%	2 - 4 (m)	%	> 4 (m)	%	0 - 2 (m)	%	2 - 4 (m)	%	> 4 (m)	%
Bardez	8	5	62.5	0	0.0	0	0.0	3	37.5	0	0.0	0	0.0
Bicholim	4	2	50.0	0	0.0	0	0.0	2	50.0	0	0.0	0	0.0
Canacona	10	5	50.0	0	0.0	0	0.0	5	50.0	0	0.0	0	0.0
Pernem	6	0	0.0	0	0.0	0	0.0	6	100.0	0	0.0	0	0.0
Ponda	4	0	0.0	0	0.0	0	0.0	4	100.0	0	0.0	0	0.0
Quepem	4	0	0.0	0	0.0	0	0.0	3	75.0	0	0.0	1	25.0
Salcete	11	2	18.2	1	9.1	0	0.0	7	63.6	0	0.0	1	9.1
Sangeum	14	2	14.3	0	0.0	0	0.0	10	71.4	1	7.1	1	7.1
Sattari	10	1	10.0	0	0.0	0	0.0	7	70.0	1	10.0	1	10.0
Tiswadi	2	0	0.0	0	0.0	0	0.0	2	100.0	0	0.0	0	0.0
Total	73	17	23.3	1	1.4	0	0.0	49	67.1	2	2.7	4	5.5

Table 3.11

Talukwise Categorisation of Water Level Fluctuation

(January-2014 to January-2015)

Taluk	Number of Station Analysed	Fall						Rise					
		0 - 2	%	2 - 4	%	> 4	%	0 - 2	%	2- 4	%	> 4	%
Bardez	11	3	27.3	0	0.0	0	0.0	7	63.6	1	9.1	0	0.0
Bicholim	5	2	40.0	0	0.0	0	0.0	2	40.0	1	20.0	0	0.0
Canacona	10	3	30.0	0	0.0	1	10.0	6	60.0	0	0.0	0	0.0
Pernem	6	2	33.3	0	0.0	0	0.0	2	33.3	2	33.3	0	0.0
Ponda	4	2	50.0	0	0.0	0	0.0	1	25.0	1	25.0	0	0.0
Quepem	3	1	33.3	0	0.0	0	0.0	2	66.7	0	0.0	0	0.0
Salcete	12	3	25.0	0	0.0	0	0.0	7	58.3	2	16.7	0	0.0
Sangeum	13	4	30.8	0	0.0	0	0.0	8	61.5	0	0.0	1	7.7
Sattari	10	1	10.0	0	0.0	0	0.0	9	90.0	0	0.0	0	0.0
Tiswadi	3	1	33.3	0	0.0	0	0.0	1	33.3	1	33.3	0	0.0
Total	77	22	28.6	0	0.0	1	1.3	45	58.4	8	10.4	1	1.3

Table 3.12

Talukwise Categorisation of Change in Water Level

10 Yrs Mean (May-04 - May-13) to May-14

Taluk	Number of Station Analysed	Range in m				Rise						Fall					
		Rise		Fall		0 - 2		2 - 4		> 4		0-2		2 - 4		> 4	
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Bardez	5	0.13	4.59			3	60.0	1	20.0	1	20.0	0	0.0	0	0.0	0	0.0
Bicholim	4	0.28	3.05			3	75.0	1	25.0	0	0.0	0	0.0	0	0.0	0	0.0
Canacona	7	0.03	0.38	0.06	0.86	3	42.9	0	0.0	0	0.0	4	57.1	0	0.0	0	0.0
Pernem	5	0.23	1.40	2.72	2.72	4	80.0	0	0.0	0	0.0	0	0.0	1	20.0	0	0.0
Ponda	3	0.06	1.86	0.21	0.21	2	66.7	0	0.0	0	0.0	1	33.3	0	0.0	0	0.0
Quepem	4	0.07	0.50			4	100.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Salcete	4			0.15	1.90	0	0.0	0	0.0	0	0.0	4	100.	0	0.0	0	0.0
Sangeum	4	0.08	0.50	0.22	0.22	3	75.0	0	0.0	0	0.0	1	25.0	0	0.0	0	0.0
Sattari	5	0.24	0.75	0.28	0.31	3	60.0	0	0.0	0	0.0	2	40.0	0	0.0	0	0.0
Tiswadi	2	0.09	0.55			2	100.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	43					27	62.8	2	4.7	1	2.3	12	27.9	1	2.3	0	0.0

Table 3.13

Talukwise Categorisation of Change in Water Level

10 Yrs Mean (August- 2004 -August - 2013) - August-2014

Taluk	Number of Station Analysed	Range in m				Rise in m						Fall in m					
		Rise		Fall		0 - 2		2 - 4		> 4		0-2		2 - 4		>4	
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Bardez	5	0.55	1.59	0.21	0.60	3	60.0	0	0.0	0	0.0	2	40.0	0	0.0	0	0.0
Bicholim	4	0.02	1.86	0.16	0.29	2	50.0	0	0.0	0	0.0	2	50.0	0	0.0	0	0.0
Cancona	7	0.04	0.28	0.06	0.33	3	42.9	0	0.0	0	0.0	4	57.1	0	0.0	0	0.0
Pernem	5	0.15	0.62	0.79	2.90	2	40.0	0	0.0	0	0.0	2	40.0	1	20.0	0	0.0
Ponda	2	1.20	1.20	0.08	0.08	1	50.0	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0
Quepem	3	0.41	0.67	0.19	0.19	2	66.7	0	0.0	0	0.0	1	33.3	0	0.0	0	0.0
Salcete	4			0.28	2.43	0	0.0	0	0.0	0	0.0	3	75.0	1	25.0	0	0.0
Sanguem	4	0.02	1.07	0.14	0.57	2	50.0	0	0.0	0	0.0	2	50.0	0	0.0	0	0.0
Satari	5	0.19	0.25	0.05	1.33	2	40.0	0	0.0	0	0.0	3	60.0	0	0.0	0	0.0
Tiswadi	3	0.32	0.77			3	100.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	42					20	47.6	0	0.0	0	0.0	20	47.6	2	4.8	0	0.0

Table 3.14

Talukwise Categorisation of Change in Water Level

10 Yrs Mean (Nov-04 - Nov-13) - Nov-14

Taluk	Number of Station Analysed	Range in m				Rise						Fall					
		Rise		Fall		0 - 2 m		2- 4m		>4m		0 - 2 m		2- 4 m		> 4 m	
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Bardez	5	0.28	1.34	0.22	0.22	4	80.0	0	0.0	0	0.0	1	20.0	0	0.0	0	0.0
Bicholim	3	0.07	1.06			3	100.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Canacona	7	0.16	1.36	0.00	1.10	4	57.1	0	0.0	0	0.0	3	42.9	0	0.0	0	0.0
Pernem	5	0.20	0.89	0.35	0.94	2	40.0	0	0.0	0	0.0	3	60.0	0	0.0	0	0.0
Ponda	2	0.28	0.28	0.03	0.03	1	50.0	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0
Quepem	4	0.28	9.63			3	75.0	0	0.0	1	25.0	0	0.0	0	0.0	0	0.0
Salcete	3	0.81	6.30			1	33.3	1	33.3	1	33.3	0	0.0	0	0.0	0	0.0
Sangeum	4	2.28	3.80	0.22	0.59	0	0.0	2	50.0	0	0.0	2	50.0	0	0.0	0	0.0
Sattari	5	0.29	1.86	0.12	0.12	4	80.0	0	0.0	0	0.0	1	20.0	0	0.0	0	0.0
Tiswadi	2	0.22	0.48			2	100.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	40					24	60.0	3	7.5	2	5.0	11	27.5	0	0.0	0	0.0

Table 3.15

Talukwise Categorisation of Change in Water Level

10 Yrs Mean (January -2005 to January -2014) - January -2015

Taluk	Number of Station Analysed	Range in m				Rise in m						Fall in m					
		Rise		Fall		0 - 2		2 -4		> 4		0 -2		2 -4		>4	
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Bardez	5	0.15	2.02	0.06	0.06	3	60.0	1	20.0	0	0.0	1	20.0	0	0.0	0	0.0
Bicholim	3	0.21	1.29	0.06	0.06	2	66.7	0	0.0	0	0.0	1	33.3	0	0.0	0	0.0
Canacona	7	0.01	2.02	0.13	0.38	3	42.9	1	14.3	0	0.0	3	42.9	0	0.0	0	0.0
Pernem	5	0.11	0.84	0.55	0.70	3	60.0	0	0.0	0	0.0	2	40.0	0	0.0	0	0.0
Ponda	2	0.24	0.24	0.44	0.44	1	50.0	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0
Quepem	3	0.32	0.74	1.69	1.69	2	66.7	0	0.0	0	0.0	1	33.3	0	0.0	0	0.0
Salcete	3	0.03	0.16			3	100.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Sangeum	4	0.02	0.30	0.11	0.28	2	50.0	0	0.0	0	0.0	2	50.0	0	0.0	0	0.0
Sattari	5	0.33	1.28	0.55	0.55	4	80.0	0	0.0	0	0.0	1	20.0	0	0.0	0	0.0
Tiswadi	3	0.17	0.71			3	100.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	40					26	65.0	2	5.0	0	0.0	12	30.0	0	0.0	0	0.0

ANNEXURE - I

GENERAL DETAILS OF HYDROGRAPH NETWORK STATIONS
SOUTH WESTERN REGION
GOA STATE

Sl No.	Well No.	District	Talulk	Village	Latitude	Longitude	Total Depth (mbgl)
1	GAJY1307	North Goa	Bicholim	Adavapal	15°38'23"	73°53'45"	9.48
2	48E2D12	North Goa	Bardoz	Alto Betim Porvorim	15°31'25"	73°49'49"	17.6
3		North Goa	Pernem	Ambernem	15°44'26"	73°49'28"	8
4	GAJY1302	North Goa	Bardez	Anjuna Beach	15°35'03"	74°44'17"	13.12
5	48E2D10	North Goa	Bardoz	Baga	15°33'37"	73°45'03"	3.37
6	48I2A2	North Goa	Sattari	Bayalwadikeri(querim)	15°36'36"	74°04'00"	8.45
7	GAJY1303	North Goa	Sattari	Bhamber(Nanoda Cross)	15°35'16"	74°11'28"	7.26
8	GAJY1311	North Goa	Sattari	Bhujpal	15°32'21"	74°05'17"	8.35
9	48E2D8	North Goa	Bicholim	Bicholim	15°35'05"	73°57'27"	6.81
10	48E2D9	North Goa	Bicholim	Bicholim(pz)	15°35'00"	73°57'40"	46.7
11	GAJY1310	North Goa	Ponda	Bori	15°21'10"	74°00'12"	7.92
12	GAMY1301	North Goa	Bardez	Britona	15°30'45"	73°50'34"	4.1
13	48I3A6	North Goa	Tiswadi	Collem(kolamba)	15°20'03"	74°14'39"	10.5
14	48E2D11	North Goa	Bardoz	Calangute	15°32'43"	73°45'29"	9.7
15	GAJY1312	North Goa	Sattari	Charayode	15°37'40"	74°07'50"	7.32
16	GAMY1303	North Goa	Bardez	Colval	15°38'38"	73°50'14"	30
17		North Goa	Bicholim	Devulawada Narve	15°33'16"	73°56'14"	5.4
18		North Goa	Bicholim	Dhatwado Vante	15°29'46"	74°05'51"	15.2
19	GAMY1305	North Goa	Tiswadi	Gauli Mola	15°27'41"	73°53'53"	5.4
20	GAJY1305	North Goa	Tiswadi	Gavalebhat, Chimbel(kirl)	15°29'22"	73°52'27"	8.3
21	48E3D3	North Goa	Tiswadi	Goa Velha	15°26'29"	73°52'47"	2.4
22		North Goa	Pernem	Hasapur	15°44'15.5"	73°54'13"	7.1
23		North Goa	Pernem	Hasaravanni Vaipal	15°43'17"	73°53'39'	4.6
24	48I2A1	North Goa	Sattari	Hivre Budruk	15°37'55"	74°08'47"	9.8
25	48I2A4	North Goa	Sattari	Honda	15°32'48"	74°03'02"	6.16
26		North Goa	Bicholim	Jambhul Batt	15°34'49.7"	73°55'34"	4.1
27	48E3D2	North Goa	Tiswadi	Karanjhalen	15°27'29"	73°48'15"	6.38
28	48I3A1	North Goa	Sattari	Khadki(harijanwada)	15°29'04"	74°08'26"	14.47
29	GAJY1313	North Goa	Sattari	Khotodem	15°28'58"	74°08'13"	8.5
30	48E2D3	North Goa	Pernem	Korgaon	15°42'29"	73°45'05"	6.9
31		North Goa	Ponda	Kundel Dassalwada	15°27'10"	73°57'10'	6.95
32	GAJY1309	North Goa	Ponda	Mankem	15°18'19"	74°02'54"	7.22
33	48E2D7	North Goa	Bardoz	Mapuca	15°36'34"	73°49'35"	8.55
34	48E2C1	North Goa	Pernem	Morji	15°38'15"	73°44'12"	3.71
35	48I2A3	North Goa	Sattari	Morlem	15°35'35"	74°02'47"	6.51
36	48E2D6	North Goa	Bicholim	Mulgaon Shivalkherwad	15°36'49"	73°55'35"	5.04
37	GAJY1304	North Goa	Sattari	Nagargoan	15°33'41"	74°09'47"	8
38	48E2D2	North Goa	Pernem	Nagjhar	15°42'31"	73°51'18"	7.95
39	GAMY1302	North Goa	Bicholim	Olaulim	15°34'10"	73°51'48"	9.6
40	48I3A8	North Goa	Ponda	Panchawadi(pz)	15°16'57"	74°05'45"	-
41	GAJY1301	North Goa	Bardez	Parra	15°34'22"	73°47'33"	7.85
42	48E2D1	North Goa	Pernem	Pernem	15°43'03"	73°47'56"	4.25
43	GAMY1304	North Goa	Bardez	Pirna	15°40'06"	73°52'53"	6.8
44		North Goa	Bardez	Pomburpa Palmar	15°33'33.2"	73°52'03"	4.8
45	48I3A4	North Goa	Ponda	Ponda(pz)	15°23'27"	74°00'01"	30
46	48E2D4	North Goa	Bicholim	Sal	15°41'11"	73°55'38"	5.82
47		North Goa	Bardez	Salwardhar Dumun	15°32'15"	73°52'07'	4.35
48	GAJY1306	North Goa	Pernem	Sawanthwada(mandrem)	15°40'53"	73°45'08"	6.27
49	48I3A7	North Goa	Ponda	Shiroda	15°19'12"	74°02'08"	10.91
50	GAJY1308	North Goa	Bardez	Shivoli (brahmanwada)	15°37'24"	73°46'03"	5.2
51	48E2D5	North Goa	Bardoz	Sirsaim	15°37'36"	73°52'35"	5.21

ANNEXURE - I

GENERAL DETAILS OF HYDROGRAPH NETWORK STATIONS
SOUTH WESTERN REGION
GOA STATE

Sl No.	Well No.	District	Talulk	Village	Latitude	Longitude	Total Depth (mbgl)
52	48I2A6	North Goa	Bicholim	Surla(pz)	15°30'26"	74°02'47"	41.76
53	48E1D1	North Goa	Pernem	Uguem(ugawe)	15°45'08"	74°50'20"	6.2
54	48I2A5	North Goa	Sattari	Valpoi	15°31'55"	74°08'18"	9.13
55	48E3D1	North Goa	Tiswadi	Velha Goa	15°29'59"	73°55'00"	14.4
56	48I4D3	South Goa	Canacona	Agonda Desaiwada	15°02'25"	73°59'32"	7.9
57	48I4A5	South Goa	Quepem	Akamol Ambavalli	15°11'25"	74°02'17"	8.21
58		South Goa	Mormugoa	Bagmola	15°22'17"	73°50'15"	4.17
59	48E3D6	South Goa	Salcete	Ballynuvhen	15°18'56"	73°56'55"	10.77
60	Jy13117	South Goa	Salcete	Barodi Velni (betul)	15°08'59"	73°57'39"	5.4
61	Jy13116	South Goa	Salcete	Betalbatti	15°18'02"	73°55'12"	7.5
62	Jy13114	South Goa	Sanguem	Bhati	15°10'54"	74°13'35"	7.7
63	48I3A2	South Goa	Sanguem	Bolkharnem	15°25'42"	74°11'36"	8.24
64	48I4A12	South Goa	Canacona	Canacona	15°00'23"	74°03'02"	8.8
65	48E4D1	South Goa	Salcete	Carmona	15°12'10"	73°57'09"	9.42
66	Jy1306	South Goa	Salcete	Chikalim	15°23'53"	73°50'12"	3.5
67	Jy13118	South Goa	Salcete	Cuncalim	15°10'48"	74°00'00"	4.3
68	48I4A6	South Goa	Salcete	Cuncalim(pz)	15°10'28"	74°00'22"	20
69	48J1A2	South Goa	Canacona	Daptamol Lolien	14°56'56"	74°03'22"	16.27
70	48I3A3	South Goa	Sanguem	Darbandahra(pz)	15°23'25"	74°07'28"	14.07
71	48I4A7	South Goa	Sanguem	Deulwada Kolamba	15°08'56"	74°07'55"	4.52
72	48I3D7	South Goa	Salcete	Fathorda Margao(pz)	15°17'17"	73°58'10"	-
73	48I4A1	South Goa	Quepem	Ghadiawada	15°14'17"	74°06'50"	7.78
74	Jy1312	South Goa	Sanguem	Guddemal	15°17'08"	74°46'08"	13.5
75	48I4A11	South Goa	Canacona	Gulem Velipwada	15°02'12"	74°01'52"	5.6
76	48J1A1	South Goa	Canacona	Hattipal Poinguinem	14°59'00"	74°06'33"	9.41
77	Jy13120	South Goa	Sanguem	Jambavli	15°11'11"	74°05'43"	13.31
78	Jy1311	South Goa	Sanguem	Kalay	15°17'18"	74°10'48"	13.45
79	48E4D2	South Goa	Quepem	Kanagini(pz)	15°07'24	73°56'48"	42.12
80		South Goa	Quepem	Kapsa	15°16'24"	74°06'02"	7.6
81	Jy1305	South Goa	Salecete	Kaveslium	15°11'08"	73°56'50"	6.14
82	48E3D5	South Goa	Salcete	Majorda Bpada Curilo	15°19'28"	73°55'04"	6.17
83	Jy1301	South Goa	Sangeum	Malkarnem	15°10'41"	74°09'06"	11.28
84	48E3D4	South Goa	Marmugoa	Marmagoa	15°24'22"	73°47'54"	7.1
85	Jy1309	South Goa	Salcete	Mashe	14°01'30"	74°08'49"	5.6
86	48I3A5	South Goa	Sanguem	Molem	15°22'33"	74°13'49"	15.49
87	Jy13115	South Goa	Salcete	Navelim	15°15'16"	73°58'02"	7.41
88	48I4A9	South Goa	Sanguem	Netrolim	15°05'22"	74°13'00"	11.42
89	Jy13119	South Goa	Salcete	Padi	15°05'34"	74°01'50"	14.2
90	48J1A3	South Goa	Canacona	Polem(polen)	14°54'39"	74°05'11"	6.57
91	Jy1308	South Goa	Canacona	Ponquini	14°58'31"	74°05'43"	18.1
92	48I4A4	South Goa	Quepem	Quepem	15°13'01"	74°04'53"	9.13
93	Jy13121	South Goa	Sanguem	Revona	15°09'51"	74°06'24"	10.62
94	48I4A10	South Goa	Canacona	Shrishtal Gaondongar	15°02'07"	74°07'08"	25
95	Jy1307	South Goa	Canacona	Sristal	15°01'12"	74°04'31"	7.9
96	Jy1310	South Goa	Sanguem	Suktali (molem)	15°21'49"	74°10'31"	7.45
97	Jy13113	South Goa	Sanguem	Themchewada	15°13'10"	74°09'27"	15.58
98	48I4A2	South Goa	Sanguem	Ugem(pz)	15°13'47"	74°10'55"	6.2
99	Jy1303	South Goa	Sangeum	Vadam	15°07'50"	74°12'27"	9.15
100	48I4A3	South Goa	Sanguem	Valkinim	15°13'12"	74°12'53"	26.3
101	Jy1302	South Goa	Sangeum	Vichundrem	15°06'12"	74°12'11"	8.26
102	48I4A8	South Goa	Sanguem	Waddem(pz)	15°07'27"	74°12'37"	24.45
103	Jy1304	South Goa	Canacona	Yedda	14°59'52"	74°11'28"	16.12

Annexure-II

MONTHLY NORMAL RAINFALL OF GOA STATE

Station	JAN	FEB	Winter	MAR	APR	MAY	Pre Mon	JUN	JUL	AUG	SEP	SW Mon	OCT	NOV	DEC	NE mon	ANNUAL
PERNEM	1.0	0.3	1.3	0.8	13.6	69.5	83.9	923.8	1220.8	623.3	277.7	3045.6	146.4	34.0	2.9	183.3	3314.1
MAPUSA	1.1	0.2	1.3	0.2	15.8	89.8	105.8	870.0	1009.3	538.9	276.0	2694.2	127.5	33.8	2.6	163.9	2965.3
BICHOLIM	1.0	0.2	1.2	0.1	10.0	64.4	74.5	957.5	1264.9	659.6	312.1	3194.1	196.7	50.0	3.6	250.3	3520.1
PONDA	1.2	0.1	1.3	0.3	21.0	91.0	112.3	1072.6	1358.0	691.2	323.3	3445.1	177.4	46.4	2.7	226.5	3785.2
VALPOI	1.4	0.1	1.5	0.9	13.7	92.3	106.9	955.5	1486.3	849.0	378.4	3669.2	216.6	51.2	4.1	271.9	4049.5
COLEM	1.4	0.3	1.7	1.7	19.8	111.5	133.0	1075.2	1800.1	1091.7	516.7	4483.7	266.3	60.8	5.3	332.4	4950.8
MARGAO	1.3	0.4	1.7	0.1	16.4	86.8	103.3	913.1	1054.4	505.8	257.2	2730.5	117.8	40.1	3.9	161.8	2997.3
QUEPEM	0.2	0.3	0.5	0.0	12.2	93.1	105.3	960.9	1378.2	712.7	320.2	3372.0	165.0	56.4	0.3	221.7	3699.5
SANGUEM	0.6	0.0	0.6	1.6	11.5	78.9	92.0	1010.5	1537.2	774.7	391.6	3714.0	215.0	64.5	3.9	283.4	5090.0
CANACONA	0.6	0.0	0.6	0.4	16.2	96.2	112.8	902.0	1025.0	537.4	293.2	2757.6	130.1	41.2	7.2	178.5	3049.5
PANAJI	1.7	0.1	1.8	0.7	18.4	86.6	105.7	869.4	923.4	456.2	252.7	2501.7	118.9	35.8	3.0	157.7	2766.9
MORMUGOA	1.8	0.0	1.8	0.4	20.3	81.3	102.0	777.8	905.1	412.9	225.9	2321.7	138.7	42.6	4.9	186.2	2611.7
MEAN	1.1	0.2	1.3	0.6	15.7	86.2	102.5	940.7	1246.9	954.3	318.7	3460.6	168.0	46.4	3.7	218.1	3483.3

ANNEXURE - III

WATER LEVEL DATA OF GROUND WATER MONITORING STATIONS FOR WATER YEAR 2014-2015

SOUTH WESTERN REGION, GOA

Sl No.	Well No	District	Location	Depth to water level (mbgl)								Decadal mean water levels (mbgl)			
				May-13	Aug-13	Nov-13	Jan-14	May-14	Aug-14	Nov-14	Jan-15	May-14	Aug-14	Nov-14	Jan-15
1	GAJY1307	North Goa	Adavapal	6.4	4.3	4.9	5.45	5.64	4.41	5.29	5.54	-	-	-	-
2	48E2D12	North Goa	Alto Betim Porvorim	6.5	3.3	6.72	6.6	3.63	3.57	4.6	5.45	8.216	4.119	5.94	7.465
3		North Goa	Amberem	-	-	-	-	7.32	6.48	5.94	5.1	-	-	-	-
4	GAJY1302	North Goa	Anjuna Beach	12.1	6.8	8.48	12.09	11.53	6.44	6.23	9.9	-	-	-	-
5	48E2D10	North Goa	Baga	3	2.33	1.28	2.85	2.68	1.72	2.62	2.82	2.81	2.322	2.404	2.757
6	48I2A2	North Goa	Bayalwadikeri(querim)	4.47	2	5.95	4.34	4.29	3.21	2.33	1.93	4.014	1.879	4.191	3.211
7	GAJY1303	North Goa	Bhamber(Nanoda Cross)	6.4	3.5	4.97	5.52	5.85	2.62	3.92	3.48	-	-	-	-
8	GAJY1311	North Goa	Bhujpal	7	1.6	7.98	4.15	5.46	1.08	1.09	3.04	-	-	-	-
9		North Goa	Bicholim	-	-	-	-	-	-	-	-	-	-	-	-
10	48E2D9	North Goa	Bicholim(pz)	-	-	-	15.68	15.57	13.41	13.47	14.37	16.617	13.248		15.656
11	GAJY1310	North Goa	Bori	5.8	3.7	2.43	4.95	3.6	2.64	1.29	1.12	-	-	-	-
12		North Goa	Britona	-	-	-	-	1.88	1.41	-	-	-	-	-	-
13		North Goa	Collem(kolamba)	-	-	-	-	8.78	3.62	-	-	8.87	-	-	-
14	48E2D11	North Goa	Calangute	8	3.6	3.35	6.82	7.95	4.48	4.08	6	8.186	3.879	4.609	6.522
15	GAJY1312	North Goa	Charayode	6.7	1.8	3.72	2.83	4.55	1.28	1.26	1.53	-	-	-	-
16		North Goa	Colval	-	-	-	-	14.91	10.37	-	-	-	-	-	-
17		North Goa	Devulawada Narve	-	-	-	-	4.76	3.12	14.25	14.95	-	-	-	-
18		North Goa	Dhatwad Vante	-	-	-	-	8.48	3.06	3.5	3.88	-	-	-	-
19		North Goa	Gauli Mola					-	-			-	-	-	-
20	GAJY1305	North Goa	Gavalebhat Chimbel(kirl)	3.05	3.8	2.19	5.95	-	-		1.53	6.45	3.8	1.59	5.35
21	48E3D3	North Goa	Goa Velha	3.62	1.6	-	-	-	-	0.86	1.11	-		1.081	1.59
22		North Goa	Hasapur	-	-	-	-	4.12	3.51	3.8	4.2	-	-	-	-
23		North Goa	Hasaravanni Vaipal	-	-	-	-	2.12	0.56	2.35	2.98	-	-	-	-
24		North Goa	Hivre Budruk	-	-	-	-	5.35	1.67	-	-	-	-	-	-
25	48I2A4	North Goa	Honda	4.5	1.65	3.14	3.46	3.65	2.24	2.18	2.63	4.084	1.89	2.47	3.41
26		North Goa	Jambhul Bhatt	-	-	-	-	2.7	1.1	1.38	2.45	-	-	-	-
27	48E3D2	North Goa	Karanjhalen	4.2	-	-	3.18	2.53	1.13	1.62	2.52	3.083	1.747		2.688
28	48I3A1	North Goa	Khadki(harijanwada)	12	3.9	7.92	8.59	10.77	4.32	5.74	7.7	-	4.267	6.289	7.147
29	GAJY1313	North Goa	Khotodem	7.1	1.8	5.62	7.13	6.07	5.03	5.12	6.19	-	-	-	-
30	48E2D3	North Goa	Korgaon	5.7	4.1	4.73	4.93	4.58	3.4	3.67	4.36	4.845	2.61	3.312	3.662
31		North Goa	Kundel Dassolwada	-	-	-	-	1.65	1.1	0.72	1.61	-	-	-	-
32	GAJY1309	North Goa	Mankem	5.05	2.2	4.18	4.2	3.95	2.57	3.25	3.58	-	-	-	-
33	48E2D7	North Goa	Mapuca	5	1.2	2.16	2.84	1.25	1.11	3.19	3.85	4.21	2.703	3.516	4.252
34	48E2C1	North Goa	Morji	2.4	0.5	0.74	1.14	1.8	0.08	0.13	0.38	2.025	0.233	0.331	0.807
35	48I2A3	North Goa	Morlem	4.6	2.8	4.8	4	2.83	2.64	3.7	2.98	3.582	2.826	3.578	3.562

Sl No.	Well No	District	Location	Depth to water level (mbgl)								Decadal mean water levels (mbgl)			
				May-13	Aug-13	Nov-13	Jan-14	May-14	Aug-14	Nov-14	Jan-15	May-14	Aug-14	Nov-14	Jan-15
36	48E2D6	North Goa	Mulgaon Shivalkherwad	3.8	1.8	3.85	2.78	0.8	0.21	2.22	3.48	3.845	2.071	2.736	3.42
37	GAJY1304	North Goa	Nagargoan	8.55	1.1	3.95	6.08	7.28	0.75	3	5.5	-	-	-	-
38	48E2D2	North Goa	Nagjhar	-	7.2	8.55	9.08	7.8	7.34	7.43	7.29	9.201	5.826	7.08	8.128
39		North Goa	Olaulim	-	-	-	-	6.88	4.73	-	-	-	-	-	-
40	48I3A8	North Goa	Panchawadi(pz)	-	3.35	7.21	5.18	5.51	3.17	5.95	6.36	7.37	4.37	6.233	5.923
41	GAJY1301	North Goa	Parra	3.05	1.2	1.24	2.25	2.17	0.62	0.9	1.52	-			
42	48E2D1	North Goa	Pernem	7	3.8	3.97	6.78	5.77	4.66	3.14	3.42	3.047	1.757	2.199	2.87
43		North Goa	Pirna	-	-	-	-	4.95	2.91	-	-	-	-	-	-
44		North Goa	Pomburpa Palmar	-	-	-	-	3.22	2.85	3.36	3.27	-	-	-	-
45	48I3A4	North Goa	Ponda(pz)	4.25	-	-	3.55	3.43	1.96	1.89	-	3.491	-	-	-
46	48E2D4	North Goa	Sal	4	1.65	3.39	3.44	2.82	1.86	1.72	2.72	3.099	1.881	-	2.927
47		North Goa	Salwardhar Dumun	-	-	-	-	2.82	2.11	3.65	2.85	-	-	-	-
48	GAJY1306	North Goa	Sawanthwada(mandrem)	6	2	3.3	5.25	4.87	1.58	1.1	1.65	-	-	-	-
49	48I3A7	North Goa	Shiroda	8.1	5.9	7.1	7.64	6.73	5.2	5.95	6.5	6.52	5.124	5.92	6.74
50	GAJY1308	North Goa	Shivoli (brahmanwada)	4	0.75	2.05	2.78	3.4	0.73	0.9	1.98	-	-	-	-
51	48E2D5	North Goa	Sirsaim	13	1.6	2.32	3.95	3.79	2.07	2.52	3.55	4.221	1.859	2.8	3.969
52	48I2A6	North Goa	Surla(pz)	19.56	16.85	15.68	19.15	18.72	16.65	16.56	-	19.784	16.355	16.628	-
53	48E1D1	North Goa	Uguem(ugawe)	4.6	-	4.15	3.92	3.06	2.55	3.02	3.13	3.804	3.17	3.907	3.237
54	48I2A5	North Goa	Valpoi	6.05	1.7	5.48	6.2	5.46	3	3.53	5.22	5.696	3.252	-	5.548
55	48E3D1	North Goa	Velha Goa	2	0.8	1.21	1.6	-	0.61	-	-	-	1.379	-	-
56	48I4D3	South Goa	Agonda Desaiwada	6.7	2.45	3.56	4.28	3.94	2.03	1.53	4.1	3.812	2.072	2.894	3.722
57	48I4A5	South Goa	Akamol Ambavalli	4.4	3.7	5.67	3.09	4.09	3.68	3.61	4.36	4.157	3.489	5.162	2.667
58		South Goa	Bagmola	-	-	-	-	3.15	2.49	2.57	-	-			
59	48E3D6	South Goa	Ballynuvhen	6.3	7.2	3.4	9.19	8.53	7.66	4.85	6.11	6.633	5.226	5.658	6.267
60	Jy13117	South Goa	Barodi Velni (betul)	3.9	2.4	2.78	3.14	2.44	1.72	1.55	1.89	-	-	-	-
61	Jy13116	South Goa	Betalbatti	7.1	2.17	3.57	5.15	6.29	1.84	3.29	4.49	-	-	-	-
62	Jy13114	South Goa	Bhati	5.85	4.2	4	4.9	5.17	2.29	2.2	2.7	-	-	-	-
63	48I3A2	South Goa	Bolkharnem	7.85	4.9	6.21	6.62	6.77	4.58	1.26	5.92	6.97	4.442	5.061	5.808
64	48I4A12	South Goa	Canacona	5.7	2.2	3.05	4.53	4.29	1.5	2.22	3.51	4.67	1.738	-	3.834
65	48E4D1	South Goa	Carmona	8.55	3.1	-	7.25	8.06	5.24	1.26	-	7.908	3.3	-	-
66	Jy1306	South Goa	Chikalim	2.75	1.35	1.14	1.74	1.42	0.98	0.66	1.2	-	-	-	-
67	Jy13118	South Goa	Cuncalim	2.75	1.6	2.28	2.58	1.86	1.13	1.33	2.02	-	-	-	-
68	48I4A6	South Goa	Cuncalim(pz)	6.9	4.2	6.99	4.55	5.84	4.75	1.23	4.66	4.738	4.46	-	4.798
69	48J1A2	South Goa	Daptamol Lolien	16.1	15.5	15.74	16	14.92	14.8	14.75	14.95	14.856	14.475	13.648	14.741
70	48I3A3	South Goa	Darbandahra(pz)	10.5	-	-	10.02	9.59	7.42	7.36	-	-	-	-	-
71	48I4A7	South Goa	Deulwada Kolamba	4.1	2.8	3.81	3.28	2.31	1.91	2.71	2.27	2.392	-	2.116	-
72		South Goa	Fathorda Margao(pz)	-	-	-	-	4.5	-	-	-	-	-	-	-
73	48I4A1	South Goa	Ghadiawada	2.7	1.66	2.36	2.72	1.75	0.77	1.4	1.77	2.195	1.18	1.679	2.093

Sl No.	Well No	District	Location	Depth to water level (mbgl)								Decadal mean water levels (mbgl)			
				May-13	Aug-13	Nov-13	Jan-14	May-14	Aug-14	Nov-14	Jan-15	May-14	Aug-14	Nov-14	Jan-15
74	Jy1312	South Goa	Guddemal	13.1	4.65	8.74	10.05	9.93	6.7	7.6	8.94	-	-	-	-
75	48I4A11	South Goa	Gulem Velipwada	4.33	1.25	1.26	3.15	3.34	0.61	0.55	0.61	3.131	0.55	0.72	2.632
76	48J1A1	South Goa	Hattipal Poinguinem	9.3	5.8	7.01	7.31	8.11	5.66	6.36	6.53	8.14	5.597	6.358	6.544
77	Jy13120	South Goa	Jambavli	9.4	5.27	9.57	9.5	9.05	7.05	8.45	8.85	-	-	-	-
78	Jy1311	South Goa	Kalay	12.9	3.7	11.38	12	11.72	9.32	10.39	10.6	-	-	-	-
79	48E4D2	South Goa	Kanagini(pz)	-	8.35	8.19	16.79	15.82	9.47	1.93	-	16.318	-	11.56	-
80		South Goa	Kapsa	-	-	-	-	4.5	2.98	3.65	4.4	-	-	-	-
81	Jy1305	South Goa	Kaveslium	4.55	2.15	2.41	4.3	4.93	1.95	1.36	2.56	-	-	-	-
82	48E3D5	South Goa	Majorda Bpada Curilo	6.55	2.5	3	5.47	6.36	2.07		3.46	4.803	1.794	-	3.489
83	Jy1301	South Goa	Malkarnem	6.7	5.3	5.98	6.74	10.14	3.75	3.66	4.52	-	-	-	-
84		South Goa	Marmagoa	-	-	-	-	-	-	-	-	-	-	-	-
85	Jy1309	South Goa	Mashe	5.4	2.9	3.86	4.2	4.1	3.15	3.44	3.85	-	-	-	-
86	48I3A5	South Goa	Molem	14.65	1.75	7.93	11.21	13.83	1	4.72	10.29	13.614	2.074	3.516	10.31
87	Jy13115	South Goa	Navelim	6.35	2.1	3.4	5.53	5.52	1.83	1.27	3.79	-	-	-	-
88	48I4A9	South Goa	Netrolim	11	9.8	11.2	10.06	10.11	9.21	10.45	9.74	10.605	9.228	10.227	10.044
89	Jy13119	South Goa	Padi	13.6	6.4	6.56	9.85	12.53	5.79	5.75	6.59	-	-	-	-
90	48J1A3	South Goa	Polem(polen)	5.8	2	1.92	2.69	4.88	0.89	1.02	1.72	4.02	1.174	1.182	2.02
91	Jy1308	South Goa	Ponquini	-	14.9	16	16.24	-	13.79	15.39	15.34	-	-	-	-
92	48I4A4	South Goa	Quepem	7.3	2.35	3.4	4.25	3.72	1.21	2.44	2.61	4.147	1.883	3.061	3.351
93	Jy13121	South Goa	Revona	9.1	5.5	8.06	7.05	7.59	5.73	6.81	7.61	-	-	-	-
94		South Goa	Shrishtal Gaondongar	-	-	-	-	6.2	-	-	-	6.57	-	-	-
95	Jy1307	South Goa	Sristal	5.8	1.4	11.31	4.01	3.53	0.68	10.18	10.34	-	-	-	-
96	Jy1310	South Goa	Suktali (molem)	7.7	4.35	5	9.9	8.89	8.41	3.76	4.06	-	-	-	-
97	Jy13113	South Goa	Themchewada	8.55	6.15	9.98	8.87	9.23	6.9	8.53	-	-	-	-	-
98		South Goa	Ugem(pz)	-	-	-	-	3.06	-	-	-	3.804	-	-	-
99	Jy1303	South Goa	Vadam	4.9	3.4	3.93	4.13	4.9	2.55	2.26	3.55	-	-	-	-
100		South Goa	Valkinim	-	-	-	-	-	-	-	-	-	-	-	-
101	Jy1302	South Goa	Vichundrem	8.6	1.05	6.25	7.82	7.4	0.55	5.23	7.03	-	-	-	-
102		South Goa	Waddem(pz)	-	-	-	-	-	-	-	-	-	-	-	-
103	Jy1304	South Goa	Yedda	7.9	1.9	1.26	4.8	7.23	0.98	0.2	2.86	-	-	-	-

ANNEXURE - IV

FLUCTUATION DATA OF GROUND WATER MONITORING STATIONS FOR WATER YEAR 2014-2015

SOUTH WESTERN REGION

GOA STATE

Sl No.	Well No	Location	District	Seasonal Water Level Fluctuation (m)			Annual Water Level Fluctuation (m)				Water Level Fluctuation with respect to decadal mean water level (m)			
				May14-Aug14	May14-Nov14	May14-Jan14	May13-May14	Aug13-Aug14	Nov13-Nov14	Jan14-Jan15	May(2004-2013) to May2014	Mean Aug(2004-2013) to Aug2014	Nov(2004-2013) to Nov2014	Jan(2004-2013) to Jan201
1	GAJY1307	Adavapal	North Goa	1.23	0.35	0.1	0.76	-0.11	-1.2	-0.9	-	-	-	-
2	48E2D12	Alto Betim Porvorim	North Goa	0.06	-0.97	-1.82	2.3	-1.14	1.25	0.28	4.586	0.549	1.34	2.015
3		Ambernem	North Goa	0.84	1.38	2.22	-	-	-	-	-	-	-	-
4	GAJY1302	Anjuna Beach	North Goa	5.09	5.3	1.63	0.57	0.36	1.38	1.32	-	-	-	-
5	48E2D10	Baga	North Goa	0.96	0.06	-0.14	0.04	0.33	-1.62	-0.25	0.13	0.602	-0.216	-0.063
6	48I2A2	Bayalwadikeri(querim)	North Goa	1.08	1.96	2.36	-0.26	-1.65	3.18	1.97	-0.276	-1.331	1.861	1.281
7	GAJY1303	Bhamber(Nanoda cross)	North Goa	3.23	1.93	2.37	0.55	0.88	0.05	1.04	-	-	-	-
8	GAJY1311	Bhujpal	North Goa	4.38	4.37	2.42	1.54	0.52	6.05	0.27	-	-	-	-
9		Bicholim	North Goa	-	-	-	-	-	-	-	-	-0.162	-	-
10	48E2D9	Bicholim(pz)	North Goa	2.16	2.1	1.2		-	-	0.81	1.048	-	-	1.286
11	GAJY1310	Bori	North Goa	0.96	2.31	2.48	2.2	1.06	0.04	2.73	-	-	-	-
12	GAMY1301	Britona	North Goa	0.47	0.11	-0.05	0.92	-	-	0.04	-	-	-	-
13		Collem(kolamba)	North Goa	-	-	-	-	-1.27	0.5	0.62	0.09	0.322		0.715
14	48E2D11	Calangute	North Goa	3.47	3.87	1.95	-	-1.38	-1.03	0.32	0.236	-0.601	0.529	0.522
15	GAJY1312	Charayode	North Goa	3.27	3.29	3.02	2.15	0.52	1.74	0.58	-	-	-	-
16	GAMY1303	Colval	North Goa	4.54	4.46	1.11	1.39	-	-	0.47	-	-	-	-
17		Devulawada Narve	North Goa	1.64	-9.49	-10.19	-	-	-	-	-	-	-	-
18		Dhatwado Vante	North Goa	5.42	4.98	4.6	-	-	-	-	-	-	-	-
19		Gauli Mola	North Goa	-	-	-	-		-	-	-	-	-	-
20	GAJY1305	Gavalebhat	North Goa	1	3.92	3.77	-	-	-	-	1.15	-0.5	0.21	-
21	48E3D3	Goa Velha	North Goa	-	-		-	-	-	-	-	-	0.221	-
22		Hasapur	North Goa	0.61	0.32	-0.08	-	-	-	-	-	-	-	-
23		Hasaravanni Vaipal	North Goa	1.56	-0.23	-0.86	-	-	-	-	-	-	-	-
24		Hivre Budruk	North Goa	3.68	-	-	-	-1.34		-	-	-	-	-
25	48I2A4	Honda	North Goa	1.41	1.47	1.02	0.1	-	0.21	0.08	0.434	-0.35	0.29	0.78

Sl No.	Well No	Location	District	Seasonal Water Level Fluctuation (m)			Annual Water Level Fluctuation (m)				Water Level Fluctuation with respect to decadal mean water level (m)			
				May14-Aug14	May14-Nov14	May14-Jan14	May13-May14	Aug13-Aug14	Nov13-Nov14	Jan14-Jan15	May(2004-2013) to May2014	Mean Aug(2004-2013) to Aug2014	Nov(2004-2013) to Nov2014	Jan(2004-2013) to Jan201
26		Jambhul Batt	North Goa	1.6	1.32	0.25	-	-1.18	-	-0.3	-	-	-	
27	48E3D2	Karanjhalen	North Goa	1.4	0.91	0.01	0.77	-3.23	-	-0.24	-	0.617	-	0.168
28	48I3A1	Khadki(harijanwada)	North Goa	6.45	5.03	3.07	0.47	-0.15	1.42	0.13	-	0.053	0.549	-0.553
29	GAJY1313	Khotodem	North Goa	1.04	0.95	-0.12	1.03	-	-0.31	0.13	-	-	-	-
30		Kundel Dassalwada	North Goa	0.55	0.93	0.22	-	-	-	-	-	-	-	-
31	48E2D3	Korgaon	North Goa	1.18	0.91	0.04	0.27	-	0.21	-0.28	-	-0.79	-0.358	-0.698
32	GAJY1309	Mankem	North Goa	1.38	0.7	0.37	1.1	-0.37	0.28	-0.03	-	-	-	-
33	48E2D7	Mapuca	North Goa	0.14	-1.94	-2.6	3	-0.66	-1.78	-1.76	2.96	1.593	0.326	-
34	48E2C1	Morji	North Goa	1.72	1.67	1.42	0.13	-0.05	0.14	0.07	0.225	0.153	0.201	-
35	48I2A3	Morlem	North Goa	0.19	-0.87	-0.15	1.07	-0.54	2.36	0.29	0.752	0.186	-0.122	-
36	48E2D6	Mulgaon Shivalkherwad	North Goa	0.59	-1.42	-2.68	2.13	0.72	0.76	-1.57	3.045	1.861	0.516	-
37	GAJY1304	Nagargoan	North Goa	6.53	4.28	1.78	1.27	0.35	0.25	-0.12	-	-	-	-
38	48E2D2	Nagjhar	North Goa	0.46	0.37	0.51	-0.07	-0.91	0.35	1.02	1.401	-1.514	-0.35	0.838
39	GAMY1302	Olaulim	North Goa	2.15	4.16	3.68	1.42	-0.52		3.46	-	-	-	-
40	48I3A8	Panchawadi(pz)	North Goa	2.34	-0.44	-0.85		0.58	0.56	-1.88	1.86	1.2	0.283	-0.438
41	GAJY1301	Parra	North Goa	1.55	1.27	0.65	0.88	-1.64	-0.26	0.13	-	-	-	-
42	48E2D1	Pernem	North Goa	1.11	2.63	2.35	0.45	-	0.05	2.58	-2.723	-	-0.941	-0.55
43	GAMY1304	Pirna	North Goa	2.04	3.42	2.92	1.25	-	-	2.27	-	-	-	-
44		Pomburpa Palmar	North Goa	0.37	-0.14	-0.05		-	-	-	-	-	-	-
45	48I3A4	Ponda(pz)	North Goa	1.47	1.54	-	0.32	-	-	-	0.061	-	-	-
46	48E2D4	Sal	North Goa	0.96	1.1	0.1	0.49	-0.9	0.98	0.03	0.279	0.021	1.056	0.207
47		Salwardhar Dumun	North Goa	0.71	0.16	-0.03				-	-	-	-	-
48	GAJY1306	Sawanthwada(mandrem)	North Goa	3.29	3.77	3.22	1.13	0.42	1.48	2.88	-	-	-	-
49	48I3A7	Shiroda	North Goa	1.53	0.78	0.23	0.32	-0.35	0.1	0.09	-0.21	-0.076	-0.03	0.24
50	GAJY1308	Shivoli (brahmanwada)	North Goa	2.67	2.5	1.42	0.6	0.02	0.63	0.28	-	-	-	-
51	48E2D5	Sirsaim	North Goa	1.72	1.27	0.24	0.76	-0.92	-0.65	-0.05	0.431	-0.211	0.28	-
52	48I2A6	Surla(pz)	North Goa	2.07	2.16		0.14	-0.5	-1.58		1.064	-0.295	0.068	-
53	48E1D1	Uguem(ugawe)	North Goa	0.51	0.04	-0.07	0.74	-0.05	0.33	-0.01	0.744	0.62	0.887	0.107
54	48I2A5	Valpoi	North Goa	2.46	1.93	0.24	-0.21	-2.1	1.15	0.18	-	0.252	1.064	0.328

Sl No.	Well No	Location	District	Seasonal Water Level Fluctuation (m)			Annual Water Level Fluctuation (m)				Water Level Fluctuation with respect to decadal mean water level (m)			
				May14-Aug14	May14-Nov14	May14-Jan14	May13-May14	Aug13-Aug14	Nov13-Nov14	Jan14-Jan15	May(2004-2013) to May2014	Mean Aug(2004-2013) to Aug2014	Nov(2004-2013) to Nov2014	Jan(2004-2013) to Jan201
55	48E3D1	Velha Goa	North Goa	-	-	-	-	-0.13	-	-	-	0.769	-	-
56	48I4D3	Agonda Desaiwada	South Goa	1.91	2.41	-0.16	2.04	-0.3	1.31	-0.54	-0.128	0.042	1.364	-0.378
57	48I4A5	Akamol Ambavalli	South Goa	0.41	0.48	-0.27	-0.25	-0.54	1.5	-1.83	0.067	-0.191	1.552	-1.693
58		Bagmola	South Goa	0.66	0.58	0.18		-	-		-	-	-	-
59	48E3D6	Ballynuvhen	South Goa	0.87	3.68	2.42	-3.15	-1.38	-2.37	2.16	-1.897	-2.434	0.808	0.157
60	Jy13117	Barodi Velni (betul)	South Goa	0.72	0.89	0.55	1.46	0.68	0.5	0.52	-	-	-	-
61	Jy13116	Betalbatti	South Goa	4.45	3	1.8	0.81	0.33	-0.3	0.08	-	-	-	-
62	Jy13114	Bhati	South Goa	2.88	2.97	2.47	0.68	1.91	1.02	1.42	-	-	-	-
63	48I3A2	Bolkharnem	South Goa	2.19	5.51	0.85	0.16	-0.6	4.03	-0.22	0.2	-	3.801	-0.112
64	48I4A12	Canacona	South Goa	2.79	2.07	0.78	0.67	-0.04	0.09	0.28	0.38	0.238	0.507	0.324
65	48E4D1	Carmona	South Goa	2.82	6.8	0.22	0.19	-2.74	-	0.58	-0.152	-1.94	3.148	-
66	Jy1306	Chikalim	South Goa	0.44	0.76	1	1.33	0.37	0.06	0.12	-	-	-	-
67	Jy13118	Cuncalim	South Goa	0.73		-0.16		0.47	0.35	0.62	-	-	-	-
68	48I4A6	Cuncalim(pz)	South Goa	1.09	1.8	1.18	-3.79	-1.25	5.06	-0.81	-1.102	-0.29	6.299	0.138
69	48J1A2	Daptamol Lolien	South Goa	0.12	0.53	-0.03	0.08	-0.32	-0.11	-0.05	-0.064	-0.325	-1.102	-0.209
70	48I3A3	Darbandahra(pz)	South Goa	2.17	4.61	-	0.13	-	-	-	-	-	-	-
71	48I4A7	Deulwada Kolamba	South Goa	0.4	0.17	0.04	0.9	-	0.21	-	0.082	-0.57	-0.594	-
72	48I3D7	Fathorda	South Goa	1.2	2.23	0.92		-1.42	0.54	1.08	-	-	-	-
73	48I4A1	Ghadiawada	South Goa	0.98	-0.4	-0.02	0.22	0.16	0.23	0.22	0.445	0.41	0.279	0.323
74	Jy1312	Guddemal	South Goa	3.23	2.33	0.99	3.17	-2.05	0.34	0.31	-	-	-	2.022
75	48I4A11	Gulem Velipwada	South Goa	2.73	2.79	2.73	0.28	-0.07	.	1.83	-0.209	-0.06	0.17	-
76	48J1A1	Hattipal Poinguinem	South Goa	2.45	1.75	1.58	0.5	-0.55	-0.04	0.09	0.03	-0.063	-0.002	-
77	Jy13120	Jambavli	South Goa	2	0.6	0.2	0.35	-1.78	0.17	-0.3	-	-	-	-
78	Jy1311	Kalay	South Goa	2.4	1.33	1.12	1.18	-5.62	-0.06	0.35	-	-	-	-
79	48E4D2	Kanagini(pz)	South Goa	6.35	13.89			1.74	5.64	1.24	0.498	-	9.63	-
80	Jy1305	Kaveslium	South Goa	1.52	0.85	2.37	-0.38	0.2	0.55	-	-	-	-	-
81		Kapsa	South Goa	2.98	3.57	0.1	-	-	-	-	-	-	-	-
82	48E3D5	Majorda Bpada Curilo	South Goa	4.29		2.9	-0.53	-0.29		1.29	-1.557	-0.276		0.029
83	Jy1301	Malkarnem	South Goa	6.39	6.48	5.62	-3.44	1.55	1.6	1.5	-	-	-	-

Sl No.	Well No	Location	District	Seasonal Water Level Fluctuation (m)			Annual Water Level Fluctuation (m)				Water Level Fluctuation with respect to decadal mean water level (m)			
				May14-Aug14	May14-Nov14	May14-Jan14	May13-May14	Aug13-Aug14	Nov13-Nov14	Jan14-Jan15	May(2004-2013) to May2014	Mean Aug(2004-2013) to Aug2014	Nov(2004-2013) to Nov2014	Jan(2004-2013) to Jan201
84		Marmagoa	South Goa	-	0.66	-	-	-	-	-	-	-	-	-
85	Jy1309	Mashe	South Goa	0.95	9.11	0.25	1.3	-0.25	-0.06	-0.13	-	-	-	-
86	48I3A5	Molem	South Goa	12.83	4.25	3.54	-0.03	-0.1	2.36	0.32	-0.216	1.074	2.282	0.02
87	Jy13115	Navelim	South Goa	3.69	-0.34	1.73	-0.47	0.27	1.45	1.06	-	-	-	-
88	48I4A9	Netrolim	South Goa	0.9		0.37	0.13	-	-0.01	-0.44	0.495	0.018	-0.223	0.304
89	Jy13119	Padi	South Goa	6.74	6.78	5.94	1.07	0.61	0.03	2.48	-	-	-	-
90	48J1A3	Polem(polen)	South Goa	3.99	3.86	3.16	-0.04	0.15	-0.06	0.01	-0.86	0.284	0.163	0.3
91	Jy1308	Ponquini	South Goa	-	-	-	-	1.11	-0.15	0.14	-	-	-	-
92	48I4A4	Quepem	South Goa	2.51	1.28	1.11	2.98	0.54	0.36	1.04	0.427	0.673	0.621	0.741
93	Jy13121	Revona	South Goa	1.86	0.78	-0.02	1.51	-0.23	0.64	-1.17	-	-	-	-
94	48I4A10	Shrishtal Gaondongar	South Goa	2.52	2.05	1.75	0.8	-0.18	-0.03	-0.05	0.37		-0.381	-0.13
95	Jy1307	Sristal	South Goa	2.85	-6.65	-6.81	2.27	0.72		-7.15	-	-	-	-
96	Jy1310	Suktali (molem)	South Goa	0.48	5.13	4.83	-1.19	-4.06	0.2	4.8	-	-	-	-
97	Jy13113	Themchewada	South Goa	2.33	0.7	-	-0.68	-0.75	0.78		-	-	-	-
98		Ugem(pz)	South Goa	-	-	-	0.74	-0.05	0.33	-0.01	0.744	0.62	0.887	0.107
99	Jy1303	Vadam	South Goa	2.35	2.64	1.35	-	0.85	1.15	0.06	-	-	-	-
100		Valkinim	South Goa	-	-	-	-	-	-	-	-	-	-	-
101	Jy1302	Vichundrem	South Goa	6.85	2.17	0.37	1.2	0.5	0.32	0.09	-	-	-	-
102		Waddem(pz)	South Goa	-	-	-	-	-	-	-	-	-	-	-
103	Jy1304	Yedda	South Goa	6.25	7.03	4.37	0.67	0.92	0.56	1.44	-	-	-	-

ANNEXURE - V

Depth to Water Level of Piezometers in Goa State during 2014-15

Sl No.	District	Taluk	Location	Depth to Water Level			
				May-14	Aug-14	Nov-14	Jan-15
1	North Goa	Bardez	Adavapal	5.32	4.76	4.77	4.58
2	North Goa	Tiswadi	Ajosi	4.92	2.35	3.14	4.3
3	North Goa	Bardez	Aldona	16.7	8.24	16.24	14.7
4	North Goa	Bardez	Aropora	3.1	Ground level	2.16	0.93
5	South Goa	Canacona	Aven	10.25	6.66	9.94	8.03
6	North Goa	Ponda	Betki	17.25	14.46	16.8	15.45
7	South Goa	Mormugao	Bogmola	0.98	0.59	-	0.15
8	South Goa	Salcete	Canabonulim	6.41	4.21	6	4.15
9	South Goa	Salcete	Carmona	7.24	4.12	-	-
10	South Goa	Salcete	Chandvar	3.05	1.97	2.4	1.74
11	South Goa	Salcete	Chinchinim	-	0.76	1.04	1.04
12	South Goa	Sanquem	Collem	6.53	3.26	6.1	5.66
13	North Goa	Pernem	Colvale	-	12.09	13.07	12.63
14	South Goa	Canacona	Dabel	12.17	6.72	13.05	9.9
15	South Goa	Sanquem	Dhat Farm	-	-	-	-
16	South Goa	Salcete	Dovorlim	5.31	4.36	5.2	4.5
17	North Goa	Pernem	Hassapur	-	4.1	5.3	5.11
18	South Goa	Sanquem	Kalay	5.38	2.97	4.9	2.68
19	North Goa	Bicholim	Kasar Pal	9.78	8.57	8.47	9.43
20	South Goa	Salcete	Kavelosim	3.05	1.17	2.55	1.28
21	North Goa	Bardez	Kirl Pirna	9.45	5.42	9.2	7.7
22	North Goa	Pernem	Korgoan	-	10.45	10.3	11.12
23	North Goa	Tiswadi	Krilwada	1.84	1.37	1.5	1.33
24	South Goa	Canacona	Kuske	14.45	12.12	14.3	-
25	North Goa	Ponda	Madakai	19.92	9.34	22.3	18.16
26	South Goa	Salcete	Manora Rai	-	4.35	5.2	4.93
27	North Goa	Bicholim	Mayam	6.37	5.18	5.15	5.66
28	South Goa	Sanquem	Meidawada	11.85	6.47	11.35	11.01
29	North Goa	Tiswadi	Mola	1.17	1.09	0.64	1
30	South Goa	Sanquem	Molem	9.4	1.45	9.3	6.23
31	North Goa	Pernem	Morjum	3.29	1.97	2.5	1.7
32	North Goa	Satari	Morlem	-	2.18	2.13	3.37
33	North Goa	Satari	Nanoda	21.03	17.57	21.13	18.97
34	North Goa	Bicholim	Narve	-	11.62	12.35	11.93
35	South Goa	Sanquem	Natravlim	-	-	-	-
36	North Goa	Pernem	Parsekarwada	18.72	17.59	18.34	17.95
37	South Goa	Canacona	Patnem	7.91	1.86	7.9	4.5
38	South Goa	Canacona	Ponquini	9.57	8.4	9.2	8.67
39	South Goa	Quepem	Quiescond	15.73	11.4	15.9	14.07

40	North Goa	Bicholim	Sanqulim	25.32	18.09	21	23.44
41	North Goa	Satari	Sanvordam	15.2	11.15	14.55	14.47
42	North Goa	Pernem	Sawanthwada	9.55	2.03	5.33	4.32
43	North Goa	Pernem	Silolium	5.63	4.02	5.06	4.12
44	North Goa	Satari	Thane	9.92	6.03	9.8	7.33
45	North Goa	Bardez	Tivim	21.25	17.57	18.01	19.97
46	North Goa	Pernem	Tuem	11.21	2.23	14.05	9.95
47	North Goa	Pernem	Varkhand	15.01	12.32	15.1	16.8
48	South Goa	Salcete	Verna	2.38	0.96	0.5	1.54
49	South Goa	Canacona	Yedda	10.72	1.48	8.2	8.21

ANNEXURE - VI

HYDROCHEMICAL DATA OF GROUND WATER MONITORING STATIONS, GOA STATE

SAMPLE No.	LOCATION	pH	Specifc Conduct. in µS/cm at 25°C	$C0_3^{--}$ (mg/L)	$HC0_3^{-}$ (mg/L)	CI^{-} (mg/L)	$N0_3$ (mg/L)	$S0_4$ (mg/L)	F^{-} (mg/L)	Ca^{++} (mg/L)	Mg^{++} (mg/L)	TH (mg/L)	Na^{+} (mg/L)	K^{+} (mg/L)	PO_4 (mg/L)	B (mg/L)
1	BAGA	6.8	840	0	171	131	54	48	0.12	72	12	230	78	12.6	0.10	0.002
2	BAYALWADIKERI(QUERIM)	6.9	170	0	49	21	4.0	5	0.08	14	6	60	9	1.2	0.11	0.001
3	CALANGUTE	6.7	590	0	140	71	55	31	0.08	48	14	180	45	6.8	0.11	0.004
4	HIVRE BUDRUK	7.0	240	0	61	36	10	7	0.07	18	3.6	60	25	3.5	0.15	0.001
5	HONDA	7.1	120	0	18	25	6.0	2	0.05	3.6	5	30	13	0.3	0.12	0.002
6	KARANJHALEN	6.8	430	0	134	39	8.0	36	0.10	44	12	160	23	1.5	0.11	0.002
7	KHADKI(HARIJANWADA)	6.4	140	0	43	21	1.0	1	0.04	10	1.2	30	16	0.1	0.15	0.005
8	KORGAON	6.6	120	0	18	28	4.0	1	0.04	6	6	40	8	1.4	0.16	0.021
9	MAPUCA	6.5	180	0	30	35	0.9	10	0.03	8	2	30	24	2.1	0.14	0.001
10	MORJI	6.7	190	0	49	32	1.0	5	0.04	12	7	60	14	0.4	0.12	0.035
11	MORLEM	6.8	200	0	24	50	2.0	4	0.04	6	8	50	20	1.5	0.11	0.006
12	MULGAON SHIVALKHERWAD	6.9	160	0	37	28	6.0	4	0.03	8	2.4	30	21	1.7	0.07	0.007
13	NAGJHAR	7.0	130	0	18	25	9.0	2	0.03	6	8	50	5	1.0	0.11	0.003
14	PANCHAWADI	6.9	150	0	30	32	3.0	2	0.03	4	7	40	15	1.2	0.10	0.001
15	PERNEM	7.0	170	0	49	28	1.0	3	0.03	8	7	50	14	2.1	0.25	0.006
16	SAL	7.1	170	0	49	21	4.0	10	0.03	12	2.4	40	13	13.4	0.01	0.001
17	SHIRODA	6.9	150	0	49	25	9.0	7	0.03	16	5	60	11	2.9	0.37	0.002
18	SIRSAIM	7.2	130	0	37	18	1.0	8	0.02	2	11	50	6	1.0	0.16	0.003
19	UGUEM(UGAWE)	7.3	120	0	18	25	6.0	4	0.03	8	5	40	8	2.0	0.11	0.002
20	VALPOI	6.9	220	0	55	32	3.0	14	0.03	12	7	60	19	5.3	0.01	0.006
21	VELHA GOA	6.9	290	0	116	21	8.0	8	0.06	30	8	110	14	0.4	0.16	0.001
22	AGONDA DESAIWADA	7.2	220	0	55	32	10	10	0.04	18	6	70	16	2.5	0.15	0.027
23	AKAMOL AMBAVALLI	6.7	60	0	12	11	1.0	3	0.02	2	3.6	20	4	0.5	0.06	0.001
24	BALLYNUVHEN	7.3	130	0	37	21	1.1	2	0.03	10	4	40	10	1.1	0.09	0.002
25	BOLKHARNEM	6.9	140	0	55	14	1.0	2	0.02	10	6	50	8	1.4	0.11	0.001
26	CANACONA	7.1	230	0	67	36	3.0	4	0.04	14	11	80	14	0.8	0.11	0.021
27	COLLEM(KOLAMBA)	6.9	70	0	12	14	0.5	1	0.02	6	1	40	5	0.1	0.07	0.001

SAMPLE No.	LOCATION	pH	Specifc Conduct. in µS/cm at 25°C	$C0_3^{--}$ (mg/L)	$HC0_3^{-}$ (mg/L)	CI^{-} (mg/L)	$N0_3$ (mg/L)	$S0_4$ (mg/L)	F^{-} (mg/L)	Ca^{++} (mg/L)	Mg^{++} (mg/L)	TH (mg/L)	Na^{+} (mg/L)	K^{+} (mg/L)	PO_4 (mg/L)	B (mg/L)
28	DAPTAMOL LOLIEN	7.0	90	0	18	18	0.2	1	0.02	6	3.6	30	4.6	0.8	0.06	0.002
29	DEULWADA KOLAMBA	7.5	160	0	55	21	0.4	4	0.02	12	5	50	12	1.2	0.10	0.003
30	FATHORDA MARGAO	7.3	290	0	61	43	17	18	0.02	20	12	100	17	2.6	0.19	0.011
31	GHADIAWADA	6.9	120	0	24	18	0.8	10	0.02	4	4.8	30	11	3.1	0.06	0.004
32	GULEM VELIPWADA	6.8	210	0	67	25	3.5	8	0.03	16	2	50	23	1.7	0.17	0.001
33	HATTIPAL POINGUINEM	7.3	140	0	30	28	1.1	2	0.06	10	1	30	17	1.8	0.11	0.014
34	MAJORDA BPADA CURILO	7.0	160	0	18	36	0.2	10	0.02	8	2.4	30	21	1.8	0.24	0.006
35	MOLEM	7.1	210	0	79	21	5	1	0.03	24	5	80	9	1.8	0.11	0.002
36	NETROLIM	6.6	160	0	49	21	1.2	8	0.05	16	5	60	8.4	1.10	0.08	0.002
37	POLEM(POLEN)	6.9	430	0	152	50	4.5	14	0.06	28	10	110	46	1	0.20	0.001
38	SHRISHTAL GAONDONGAR	7.2	130	0	43	18	0.5	2	0.03	8	5	40	10	1.8	0.11	0.005
39	SAWANTHWADA	6.8	100	0	18	14	1.7	10	0.02	6	1	20	12	1.3	0.07	0.002
40	ANJUNA BEACH	6.9	160	0	24	36	6.6	2	0.03	8	2	30	21	1.9	0.14	0.001
41	SHIVOLI(SILOLIUM)	6.9	400	0	171	32	1	10	0.05	22	6	80	50	6.7	0.21	0.035
42	ADAVAPAL	7.0	130	0	24	25	4	6	0.02	8	2.4	30	15	0.6	0.13	0.004
43	BHUIPAL	7.2	190	0	61	25	1	8	0.03	10	8.4	60	15	0.4	0.06	0.002
44	CHARAYOD	7.3	210	0	61	28	1	10	0.03	10	6	50	24	0.9	0.09	0.012
45	NAGARGAON	6.9	210	0	61	28	1	10	0.03	8	7.2	50	23	1	0.03	0.004
46	BAMBER	7.3	190	0	61	25	0.1	8	0.10	10	6	50	19	1.2	0.11	0.008
47	KOTADEN	6.8	220	0	61	32	3	8	0.06	8	7.2	50	26	0.5	0.16	0.001
48	PARRA	7.0	420	0	122	60	0.1	22	0.01	28	7.2	100	47	5.2	0.07	0.003
49	GAVALEBHAT	6.9	240	0	61	36	10	8	0.06	8	5	40	34	0.4	0.03	0.024
50	BETALBATTI	6.9	120	0	18	14	10	12	0.10	4	7.2	40	7	1.2	0.08	0.001
51	BORI	7.0	120	0	37	14	1	6	0.13	8	7.2	50	3.5	0.51	0.1	0.027
52	MANKEN	5.6	90	0	24	14	1	4	0.04	4	2	20	10.4	1.80	0.03	0.001
53	NAVELIM	6.9	210	0	37	43	0.8	10	0.08	12	5	50	23	1.7	0.16	0.007
54	KAVASELIUM	7.8	440	0	146	28	24	34	0.18	44	10	150	28	6.9	0.09	0.021
55	BARODIVELNI(BETUL)	8.1	180	0	18	36	6	18	0.06	8	7.2	50	17	0.12	0.07	0.001
56	CUNCULIUM	7.3	220	0	67	28	1.7	10	0.10	20	5	70	15	2.6	0.22	0.031
57	PADI	7.1	140	0	37	21	0.8	4	0.09	16	2.4	50	7.2	0.1	0.15	0.006
58	SRISTAL	7.1	150	0	37	14	7	14	0.08	12	7	60	5	0.8	0.18	0.004
59	MASHE	7.0	100	0	12	21	3	4	0.05	8	2.4	30	7	0.7	0.1	0.002
60	YEDDA	7.2	270	0	104	28	2.2	5	0.12	20	12	100	10	8.7	0.11	0.001

SAMPLE No.	LOCATION	pH	Specifc Conduct. in µS/cm at 25°C	$C0_3^{--}$ (mg/L)	$HC0_3^{-}$ (mg/L)	CI^{-} (mg/L)	$N0_3$ (mg/L)	$S0_4$ (mg/L)	F^{-} (mg/L)	Ca^{++} (mg/L)	Mg^{++} (mg/L)	TH (mg/L)	Na^{+} (mg/L)	K^{+} (mg/L)	PO_4 (mg/L)	B (mg/L)
61	VINCHURDEM	5.9	80	0	18	14	1.2	1	0.04	4	2	20	7	1.80	0.06	0.002
62	BHATI	7.3	60	0	12	7	1.3	4	0.05	4	2.4	20	2.4	0.4	0.12	0.008
63	VADDEM	5.0	70	0	12	14	1.8	2	0.03	4	2	20	5.7	1.30	0.08	0.014
64	REVONA	7.2	140	0	24	28	6.3	2	0.05	8	5	40	11	3	0.11	0.001
65	JAMBAVALI	6.8	100	0	24	14	2.5	4	0.06	4	5	30	7.3	0.4	0.03	0.011
66	MALKARNEM	6.3	170	0	37	28	4	8	0.07	16	5	60	9	2.60	0.017	0.004
67	TEMCHEWADA	6.6	80	0	18	14	2.4	2	0.05	8	2.4	30	4	0.2	0.12	0.004
68	GUDEMAL	7.2	170	0	30	21	3	24	0.06	12	7	60	10	1.2	0.25	0.011
69	KALAY	7.2	70	0	12	14	0.8	4	0.05	4	2.4	20	6.4	0.08	0.16	0.0075
70	SUTKALI	7.0	80	0	18	14	0.9	2	0.06	8	2.4	30	3.2	0.5	0.14	0.004
71	BRITONA	7.0	230	0	37	28	40	10	0.07	16	2.4	50	27	1.2	0.12	0.002
72	COLVOL	6.9	360	0	98	36	6.1	38	0.08	32	10	120	22	7.4	0.11	0.001
73	OLAULIM	7.0	240	0	24	50	4	20	0.07	8	10	60	25	1.3	0.07	0.002
74	PIRNA	7.1	80	0	12	14	5	4	0.05	4	2.4	20	8	0.7	0.11	0.008
75	JAMBHULBATT	7.3	90	0	12	21	2	2	0.06	4	4.8	30	6	1.1	0.10	0.022
76	KUNDAI DASOOLWADA	6.9	100	0	12	21	2.4	4	0.05	8	2.4	30	6.7	0.3	0.25	0.001
77	KAPSA	6.8	190	0	30	28	12	16	0.07	12	5	50	18	2.8	0.01	0.011
78	BAGMOLA	6.7	210	0	49	28	3	20	0.07	12	10	70	15	1.6	0.37	0.002
79	DHAT-WADO – VANTE	6.8	130	0	30	21	2.6	6	0.06	12	5	50	6	0.7	0.16	0.002
80	DEVULAWADA NARVE	7.0	70	0	12	14	2.3	2	0.05	4	2.4	20	5.7	0.25	0.11	0.003
81	HASAPUR	7.4	290	0	55	43	14	22	0.13	16	10	80	21	12.5	0.01	0.002
82	HASARAVANNI VAIPOL	7.2	160	0	43	14	1.5	20	0.13	12	7	60	7	1.8	0.16	0.006
83	AMBEREM	6.7	170	0	18	28	10	20	0.08	8	5	40	17	3.3	0.15	0.001
84	POMBURPA – PALMAR	6.8	360	0	49	85	7	10	0.06	16	12	90	38	0.4	0.11	0.027
85	SALWARDHAR DUMUN	6.5	130	0	12	21	7	14	0.05	12	2.4	40	7	4.5	0.02	0.001

ANNEXURE-VII

PARTICIPATORY MONITORING WATERLEVEL DATA OF GOA STATE

Sl.No	DISTRICT	NHS LOCATION	01/11/2014	15/11/2014	01/12/2014	15/12/2014	01/01/2015	15/01/2015	01/02/2015	15/02/2015	01/03/2015	15/03/2015
1	SOUTH GOA	Molem	5.57	7.77	9.05	9.7	9.7	10.45	11.9	12.65	13.25	13.6
2	SOUTH GOA	Morjem	-	-	-	-	-	-	-	-	-	-
3	NORTH GOA	Panchwadi	6.65	7.14	7.3	7.4	6.7	7.57	7.35	7.39	7.31	7.33
4	NORTH GOA	Guddemol	8.4	8.85	9.18	9.3	9.7	10.45	10.75	11	11.25	11.4