DYNAMIC GROUND WATER RESOURCES OF HARYANA STATE (AS ON 31st MARCH 2024)

CENTRAL GROUND WATER BOARD
NORTH WESTERN REGION
CHANDIGARH
AND
GROUND WATER CELL
IRRIGATION & WATER RESOURCE DEPARTMENT
HARYANA

March, 2025

REPORT ON DYNAMIC GROUND WATER RESOURCES OF HARYANA STATE AS ON MARCH 2024

Prepared by

CENTRAL GROUND WATER BOARD
NORTH WESTERN REGION
CHANDIGARH
AND
GROUND WATER CELL
DEPARTMENT OF IRRIGATION & WATER RESOURCES, HARYANA
SINCHAI BHAWAN, SECTOR-5, PANCHKULA

MARCH, 2025

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FOREWORD

Monitoring and assessment of natural resources pave the path to follow to sustain existence of life on the planet. Due to urbanization, industrialization and heavy exploitation of ground water, the water table depleting day by day Water is critical for all form of life; its conservation and preservation are of utmost importance. In order to keep pace with the fast changing scenario i.e. growing population and its demand to cope up with new life style and to ensure National food security, regular monitoring and periodic assessment of water resources is an utmost necessity.

In the hydrological cycle, the sub-surface water and its route. though lately recognized, are most valuable to tide over all types of natural or man-made calamities, especially drought and its assessment.

The ground water resources of Haryana as on march, 2024 have been completed by Ground Water Cell of Irrigation & Water Resource Department in close association with Central Ground Water Board, Govt. of India, North- Western Region, Chandigarh based on the latest guidelines of Ground Water Estimation Committee, 2015 GEC 2015) through InGres web portal (http://ingres.iith.ac.in/). The report is highly informative and dwells on all important specifies, such as, ground water resources, recharge, draft, balance availability with stage of development in each block, the smallest administrative unit

I am sure that present report will be of immense use to planners, administrators and agencies involved in the process, who will use in the most useful manner for the development of State.

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PREFACE

In a time of growing water crisis, accurate data and knowledge of existing water reservoirs, whether surface or underground, becomes extremely important for its judicious use and development planning.

Ground Water Resource, although replenishable is not inexhaustible. The increasing demand on the resource over the years has led to water scarcity in many parts of the world. During the past two decades, the water level in several parts of the country has been falling rapidly due to an increase in extraction and resulted in over exploitation of this resource. There is a continuous growth in demand especially in critical and over exploited areas of the country. In the state of Haryana, he overall stage of Ground Water Development is estimated to be 135.96% (as on 31st March, 2024), ranging from 51% in Jhajjar district to 228% in Kurukshetra district.

The report on Ground Water Resources Estimation as on 31st March 2024, of Haryana has been prepared by the joint efforts of Central Ground Water Board, North Western Region, Chandigarh and Ground Water Cell, I&WRD, Haryana. The report is prepared on guidelines by the Ground Water Resource Estimation Committee (GEC 2015) through InGres web portal (http://ingres.iith.ac.in/) gives details on Total Annual Replenishable Ground Water Resources, its present draft and scope for future development.

The report gives alarming news by concluding that 88 assessment units are falling under "Over Exploited" category. The State can plan further aquifer rejuvenation instead of ground water developmental activities.

I would like to appreciate the efforts of each person associated with data collection, analysis and preparation of this report by officers of Central Ground Water Board, North Western Region, Chandigarh and Ground Water Cell, I&WRD, Haryana

I personally feel that this report will be of immense use to the administrators, planners and agencies engaged in the development and regulation of ground water resources.

SATBIR SINGH KADIAN

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन, नदी विकास एवं गंगा संरक्षण विभाग
केन्द्रीय भूमिजल बोर्ड, उत्तर पश्चिमी क्षेत्र, चंडीगढ़
Government of India
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विद्या नन्द नेगी
(कार्यालय प्रमुख)

प्रस्तावना

भूजल की महत्व दिन प्रतिदिन बढ़ती जा रही है। यह लगभग सभी जगह आसानी से उपलब्ध रहता है। भूजल देश की खेती और पेयजल आवश्यकताओं के साथ व्यवसायिक जरूरतों के लिये भी अति आवश्यक है। हरियाणा राज्य मैं भूजल की उपलब्धता सतही जल के अपेक्षाकृत काफी अधिक है। भूजल स्तर में निरंतर गिरावट के कारण भूजल की उपलब्धता, भूजल दोहन एवं भविष्य में भूजल के आंकलन की नियमित रूप से जरूरत महसूस होती रही है।

भारत सरकार के भूजल संसाधन आंकलन (GEC-2015) संबंधी दिशा-निर्देशों एवं InGres web portal (http://ingres.iith.ac.in/) के आधार पर 31 मार्च, 2024 तक भूजल का क्रियाशील आंकलन किया गया और केंद्रीय भूमिजल बोर्ड (CGWB) एवं हरियाणा सरकार के सिंचाई एवंजल संसाधन विभाग के भूजल प्रकोष्ठ के संयुक्त प्रयास से यह रिपोर्ट तैयार की गई है।

इस रिपोर्ट में पुनर्भरण माध्यम से भूजल की वार्षिक उपलब्धता, भूजल के मौजूदा दोहन एवं भविष्य में भूजल की शेष उपलब्धता का ब्लॉक स्तर पर किये गये विस्तृत आंकलन व अध्ययन का पूर्ण वर्णन दिया गया है। यह अध्ययन हरियाणा के 141 ब्लॉक तथा 2 शहरी क्षेत्र (गुडगाँव & फरीदाबाद) में किया गया जो समूचे राज्य में भूजल की उपलब्धता एवं दोहन के आकड़ों को दर्शाता है। हाल ही में किये गये आंकलन के अनुसार हरियाणा राज्य के 88 ब्लॉक अत्यधिक दोहन (Over Exploited) तथा 11 ब्लॉक विकट (Critical) श्रेणी में एवं 8 ब्लॉक अर्द्ध विकट (Semi Critical) श्रेणी में आ गये हैं। अभी हरियाणा राज्य के मात्र 36 ब्लॉक ही सुरक्षित (Safe) श्रेणी में हैं। मैं श्री अनुराग अग्रवाल IAS, आयुक्त एवं सचिव, सिंचाई एवंजल संसाधन विभाग, हरियाणा सरकार एवं अध्यक्ष, भूजल संसाधन आकलन एवं आंकड़ा संशोधन समिति, हरियाणा (Committee for Estimation of Ground Water Resources Potential and Refinement of Figure in State of Haryana) के मार्ग-दर्शन एवं रिपोर्ट की स्वीकृति के लिये मैं आभारी रहूँगा। में डॉ. सतबीर सिंह कादियान, इंजीनियर इन चीफ, सिंचाई एवंजल संसाधन विभाग, हरियाणा सरकार के द्वारा दिये गये मार्ग दर्शन एवं रिपोर्ट की संस्तुति के लिये आभार व्यक्त करता हूं।

मैं केंद्रीय भूमिजल बोर्ड के, श्री आयुष केशरवानी, वैज्ञानिक 'बी' (भूजल) श्री आदित्य शर्मा, वैज्ञानिक 'बी' (मौसमविद्), व श्री किरण लाले, वरिष्ट तकनिकी सहायक (रसायन) एवं भूजल प्रकोष्ठ, सिंचाई एवंजल संसाधन विभाग हरियाणा सरकार के सभी क्षेत्र भुजलविद् द्वारा इस रिपोर्ट के तैयार करने में दिये गये उनके महत्वपूर्ण योगदान के लिये भी उनका आभार व्यक्त करता हूँ।

मैं श्री साकिब, वरिष्ट तकनिकी सहायक (भूजल) जिन्होंने इस रिपोर्ट को तयार किया है एवं जिनके पर्यवेक्षण में यह रिपोर्ट तैयार की गई है, का भी आभारी हूँ। मैं साथ ही श्री पंकज महाला, मुख्य भुजलविद्, हरियाणा जल संसाधन प्राधिकरण, हरियाणा सरकार का भी आभार व्यक्त करता हूँ जिन्होंने इस रिपोर्ट को तैयार करने में महत्वपूर्ण भुमिका निभाई है।

मैं आशा करता हूँ कि यह रिपोर्ट योजनाकारों, प्रशासकों एवं जल व्यवस्थापन (सूत्रीकरण) से जुड़े समस्त विभाग के लिये निश्चित ही फायदेमंद रहेगी।

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हरियाणा राज्य के भूजल संसाधन अनुमान का सारांश, 31 मार्च, 2024

हरियाणा राज्य मुख्य रूप से जलोढ़ जमा राशि का कब्जा है, जो राज्य के लगभग 98 % को कवर करता है जबकि हार्डरॉक लगभग 2 % कवर करता है। जलोढ़ जमा पुराने और नए प्रकार के होते हैं और मुख्य रूप से मिट्टी, गाद और मध्यम रेत से ठीक होते हैं। अन्य डिपॉजिट पीडमोंट डिपॉजिट हैं, जो एक संकीर्ण क्षेत्र तक ही सीमित हैं, लगभग 2 से 4 किमी चौड़ी, सिवलिक हिल्स और जलोढ़ मैदानों के बीच। रेत-ड्यून्स भिवानी, महेंद्रगढ़, हिसार और सिरसा के जिलों में पाए जाते हैं। मोटे रेत, बजरी और बोल्डर को पीडमोंट क्षेत्रों में और आसन्न जलोढ़ ट्रैक्ट में पाया जाता है। हार्ड रॉक फॉर्मेशन प्री-कैम्ब्रियन एज के दिल्ली सिस्टम के गठन से संबंधित हैं और राज्य के दक्षिणी भाग पर कब्जा कर लेते हैं, जबकि तृतीयक उम्र के शिवलिक प्रणाली राज्य के उत्तरी अधिकांश भाग पर कब्जा कर रही हैं।

राज्य के कुल वार्षिक भूजल पुनर्भरण का मूल्यांकन **10.31** बीसीएम के रूप में किया गया है और वार्षिक निकालने योग्य भूजल संसाधन **9.35** बीसीएम है। कुल वर्तमान वार्षिक भूजल निष्कर्षण **12.72** बीसीएम है और भूजल निष्कर्षण का चरण **135.96 %** है।

कुल 143 मूल्यांकन इकाइयों (ब्लॉक/शहरी) में से, 88 इकाइयों (61.54 %) को 'अति-शोषित', 11 इकाइयों (7.69 %) के रूप में 'विकट' के रूप में वर्गीकृत किया गया है, 8 इकाइयों (6.29 %) को ' अर्द्धविकट और 36 इकाइयों (24.48 %) के रूप में 'सुरक्षित' श्रेणियों के रूप में वर्गीकृत किया गया है। इसी तरह राज्य के 43205.82 वर्ग कि.मी रिचार्ज योग्य क्षेत्र में से, 26131.63 वर्ग किमी (60.50 %) क्षेत्र 'अतिदोहित' किए गए, 2675.05 वर्ग किमी (6.2 %) के तहत 'विकट', 2129.8 वर्ग किमी (4.9 %) के तहत 'अर्द्धविकट', 12269.36 वर्ग किमी (28 %) मूल्यांकन इकाइयों की 'सुरक्षित' श्रेणियों के तहत हैं।

राज्य के कुल 9358.58 MCM वार्षिक निकालने योग्य भूजल संसाधनों में से, 6104.07 MCM (65.20 %) 'अतिदोहित' किए गए', 547.44 MCM (5.9 %) के तहत ''विकट'', 568.22 MCM (6.1 %) के तहत 'अर्द्धविकट' और 2131.84 MCM (22.29 %) %) मूल्यांकन इकाइयों की 'सुरक्षित' श्रेणियों के तहत हैं। 2023 के आकलन की तुलना में, कुल वार्षिक भूजल पुनर्भरण 2024 में 9.55 से बढ़कर 10.31 बीसीएम हो गया है, वार्षिक निकालने योग्य संसाधन 8.69 से बढ़कर 9.35 बीसीएम और वार्षिक भूजल निष्कर्षण 11.80 से 12.72 बीसीएम तक बढ़ गए हैं। भूजल निष्कर्षण का चरण 135.74 % बढ़कर 135.96 % हो गया है।

CHAPTER-1
INTRODUCTION

1.1 INTRODUCTION

Haryana State is located in Northwest of India and was carved out in 1966 when the present state of Punjab was reorganized. It is one of the smallest states in India with geographical area of 44,212 Sq. Kms. Administratively it is divided into 6 divisions, 72 sub- division, 22 districts, 93 tehsils, 50 sub-tehsils and 142 development blocks. The state is chronically deficit in water resources. Most of the land is either arid or semi arid and drought conditions are common in large tracts of the state particularly in Mahendragarh, Bhiwani, Rewari, Sirsa and Hisar districts. Almost entire southwestern half of the state is a part of desert belt extending to Rajasthan. This area is exposed chronically to drought, crops fail for lack of adequate soil moisture and intense heat accompanied by variation between day and night temperatures.

The present requirement of water for irrigation in the state is much more than the available surface and sub surface resources. The surface water available for utilization in the state is extremely limited. The main perennial rivers of composite Punjab, viz the Satluj, the Beas and Ravi do not pass through the state of Haryana. The share of Haryana in the water in these rivers is being utilized through Bhakra Canal in the western part of the state. The other source of surface water supply is from river Yamuna which is insufficient and is shared by Haryana with UP.

Ground water is the largest available source of fresh water. Natural process replenishes it and if balance could be maintained between utilization and replenishment, a perennial supply can be assured. Unfortunately, only 92% of the area is suitable for the groundwater development through shallow and deep tubewells. In the remaining area either the water is highly saline or thickness of granular zone is inadequate. The state is therefore in need of detailed and thorough groundwater investigation for optimum utilization of theresource.

The state has varied hydrogeological characteristics due to which ground water potentials differ from place to place. Increasing urbanization and growing dependence on ground water for irrigation in the state has called for judicious and planned exploitation of the ground water resources. For proper planning and management of ground water development in a judicious and socio-economically equitable manner, quantification of ground water resources is one of the most important prerequisites. Central Ground Water Board (CGWB) in association with other Central Government as well as State Governments agencies has assessed the ground water resources of the state according to the methodology recommended by the Ground Water Estimation Committee constituted by Government of India time to time. The ground water resources have been estimated as on 2004, 2009, 2011, 2013, 2017, 2020, 2022 & 2023 in the past. The present report embodies the quantified ground water resources of Haryana state assessed based on the latest methodology recommended by Government of India (GEC-2015) as on 31st March, 2024.

1.2 BACKGROUND FOR RE-ESTIMATING THE GROUND WATER RESOURCES OF THESTATE.

The first attempt to estimate the ground water resources of the country was made in the year 1979. A committee known as Ground Water Over-exploitation committee was constituted by Agriculture Refinance and Development Corporation (ARDC) of Govt. of India. Based on the methodology and norms recommended by the above Committee, the ground water resources were assessed. Subsequently, the necessity was felt to refine the methodologies and the "Ground water Estimation Committee (GEC)" headed by the Chairman, CGWB came into existence. Based on the detailed surveys and studies by the various offices and projects of CGWB, the Committee recommended the revised methodology in 1984 (GEC-84) for estimation of ground water resources. Again in 1997 the Ground Water Estimation Committee reviewed the previous studies and work done in various states and suggested a modified methodology in 1997 (GEC'97) for computation of ground water resources. Accordingly, ground water estimation was carried out in the 2004 for the assessment period 1998-2002, in the year 2009 for the assessment period 2004-2008, in the year 2011 for the assessment period 2006-2010, the re- estimation as on 31.03.2013 has been carried out for the assessment period 2008-12. Government of India has constituted Ground Water Estimation Committee for revising the methodology GEC-1997. GEC, 2015 has revised GEC-97 and recommended various new approaches for integrated ground water resources estimation including Static ground water resources and ground water resources of saline aquifers. In the estimation done as on 31stMarch, 2024, the methodology recommended by GEC, 2015 has been adopted and resources have been calculated as per the revised norms recommended by GEC, 2015 for the assessment period 2015-15. Re-estimation of ground water resources as on 31.03.2023 has been carried out for the assessment period 2022-23. The present report embodies the ground water estimation as on 31st March, 2024.

1.3 CONSTITUTION OF STATE-LEVEL COMMITTEE FOR GROUND WATER RESOURCESESTIMATION.

In an attempt to re-assess the ground water resources of all the blocks of the state based on GEC'2015 methodology by Central Ground Water Board and Irrigation and Water Resources Department, Government of Haryana, a permanent committee for Estimation of Ground Water resources Potential & Refinement of Figures in the State, was constituted by the State Government.

The committee was formed on dated 28.02.2023 vide letter No. 11A-690001/6/2023-Ground Water Cell (Annexure-1) and its constitution is as under:		
1.	Additional Chief Secretary to Govt. Haryana, Irrigation& Water ResorceDeptt.	Chairman
2.	Vice Chancellor, C.C.S. Haryana Agricultural University, Hisar	Member
3.	Director General Agriculture & Farmers Welfare Department, Haryana	Member
4.	Managing Director, Haryana State Industrial & Infrastructure Development Corporation	Member
5.	Administrator, Command Area Development Authority, Haryana, Panchkula	Member
6.	Director, Rural Development Department, Haryana	Member
7.	Director, Industries and Mines & Geology Department, Haryana	Member
8.	Managing Director, Haryana State Cooperative Agricultural & Rural Development Bank Ltd.	Member
9.	Chairman, Haryana State Pollution Control Board	Member
10.	General Manager, NABARD, Chandigarh	Member
11.	Engineer-in-Chief, Irrigation Department, Haryana	Member
12.	Engineer-in-Chief, LCU, Irrigation Department, Haryana	Member
13.	Engineer-in-Chief, Public Health Engineering Department, Haryana	Member
14.	Director, HARSAC	Member
15.	Director, HIRMI, Kurukshetra	Member
16.	Member secretary, Haryana Ponds and Waste Water Management Authority	Member
17.	Cheif Hydrologist, Ground Water cell	Member
18.	Cheif Hydrologist, Haryana Water Resource Authority	Member
19.	Regional Director, Central Ground Water Board, Mionistry of Jal Shakti, Govt. of India Chandigarh	Member Secretary

The committee may co-opt any other member (s)/ Special invitee(s) if necessary. The functions of the committee shall be as under: -

I. To estimate annual replenishable ground water resources of the State in accordance withthe Ground Water Resource EstimationMethodology.

II. To estimate the status of utilization of annual replenishable ground waterresource.

First meeting of the Committee was held on 02.07.2024 under the Chairmanship of Engineer-In-Chief, Irrigation and Water Resources and important issues regarding estimation of ground water resources of Haryana as on 31st March, 2024 were discussed. Various organizations for the data sources for estimation have been identified and nodal officers have been requested to submit the data required as per the data sheets circulated by CGWB. The minutes of Meeting are at Annexure-2

CHAPTER-2
HYDROGEOLOGICAL CONDITIONS OF THESTATE

2.1 DESCRIPTION OF ROCK TYPES WITH AREACOVERAGE

All the three major physiographic units viz. Peninsula, Extra-Peninsula and Indo- Gangetic areas, terminating in the hard rock formations of Delhi systems (Pre-Cambrian age) towards South, Shivalik system (Tertiary age) in the North and in between the alluvial formations (Recent to sub recent age) are observed in the state.

The general geological succession of the various units of the Peninsula and Indo- Gangetic plains traversing the Haryana state are given in table-1

Table 1 General Geological Succession in Haryana state

Age		**Formation**	**Lithology**
Quaternary	Recent	Newer alluvium	Aeolian deposits
			Wind Blown fine sand, silt, sand dunes
			Fluvial deposits, unconsolidated sand, silt, clay, boulder, gravel, kankar etc.
	Pleistocene	Older Alluvium	Fluvial deposits: unconsolidated gravel, sands, silts, clay, and kankar.
Tertiary	Middle Miocene -	Siwalik system	Sandstone, boulders, conglomerate, siltstone,
	Lower Pleistocene		
	Oligocene	Kasauli beds Sirmur series	Sandstone, Claystone, siltstone and purple shales.
	Eocene	Subathu beds,	Limestone, Shales
		ThundaPathar Series	(Gypseous)
Post Delhi		Intrusive	Erinpura Granites
			Pegmatites quartz, veins and amphibolite
Pre-Cambrian	Delhi and Aravalli System		
i)	Ajabgarh series		Slates, phyllites, mica- schists, quartzites.
ii)	Horn stones &breccia		
iii)	Khushalgarh series		Lime Stone.
iv)	Alwar series		Quarzitic arkose grits conglomerates
			Limestones mica schists
			Contemporaneous volcanic rocks.

In the extra peninsular region (northern part of Panchkula district) Shivalik system (upper tertiary) and Sabathu series (lower tertiary) are exposed. Sabathu comprises of greenish grey and red gypseous shales with thin bands of sand stones and limestone. Shales and limestones are richly fossiliferrous. Shivalik system comprises of mainlygraywackes, sandstones, grits, clays, siltstones, conglomerates and pseudo-conglomerates. These are fluviatile deposits and are rich in mammalianfossils.

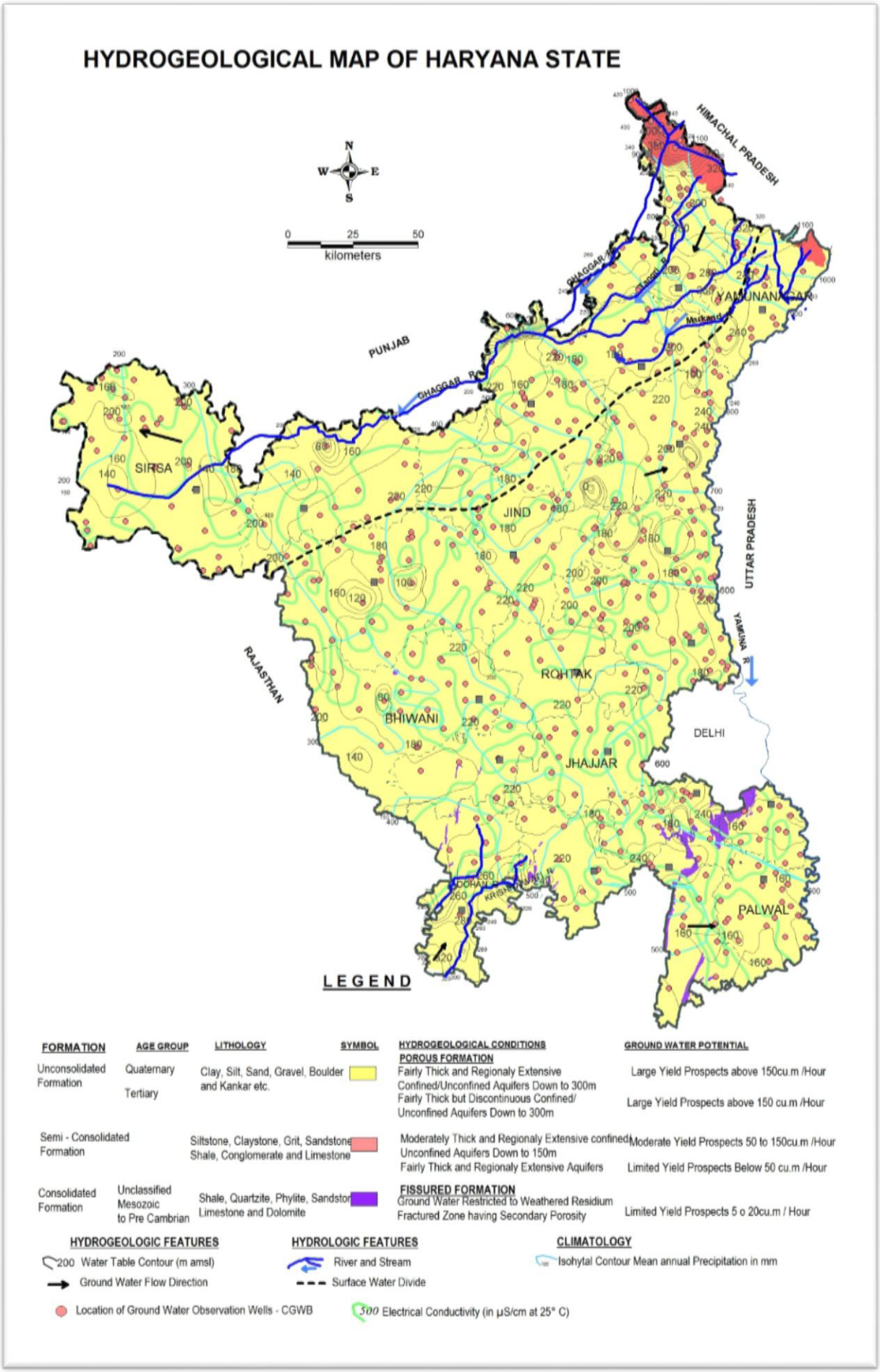


Figure 1 Hydrogeology Map of Haryana

The area in Ambala, Panchkula &Yamunanagaris underlain by the 'Kandi' (equivalent of Bhabar Belt in Uttaranchal), Sirowal (equivalent of Tarai belt in Uttaranchal) and the Alluvium. The Kandi belt which forms the upper higher portions of the composite fan deposits is 2 to 4 kms wide running more or less parallel to the Shivalik foothills. The sediments comprise boulders, pebbles, gravel and sand with clays mixed in varying proportions. Sirowalbelt and the adjoining Gangetic plain on the south of the Kandi belt are underlain by silt, fine to medium sand and clays. Gravel and pebbles also occur occasionally.

The area in Gurgaon district is underlain by the rocks of Delhi system and by Quaternary alluvium. The Ajabgarh shales and quartzite form the basement in the western part of the area where the thickness of alluvium is very less.

In Hisar and Bhiwani districts, area is underlain by unconsolidated sediments of Quaternary age. The sediments comprise sand, silt clay and kankar. In Sonepat, Jind, Karnal and Kurukshetra districts the area is underlain by alluvial deposits of Quaternary age. Alluvium comprises clay, silt, and sands of various grades, kankar, gravel and pebbles. The alluvial deposits are generally lenticular in shape.

In Mahendragarh and part of Bhiwani districts, the following geological succession is encountered:

- Recent to Sub-Recent- Alluvium and wind-blown sands etc.
- Post Delhi intrusives-Pegmatites, quartz veins, granites etc.
- Algonkian Delhi system-Ajabgarh Series, Kushalgarh Limestone, Alwar Series.

The alluvium in the area belonging to the Older Alluvium comprises of sand, silt, clay loam and kankar. Newer alluvium is mainly confined to the sides of the river watercourses. The alluvium is the fresh water deposit of the Indo-Gangetic River system. The sub-aerial deposits are represented by the talus material on the hill slopes and wind-blown sands.

Rohtak district is underlain by alluvial deposits of Quaternary age. The alluvium overlies the rocks of Algonkian system outcrops of which are seen outside the district. The alluvium consists of clay, silt and various grades of sand. Winds blown sand occurring as sand dunes are often seen overlying the alluvium in various parts of the district.

The unconsolidated alluvial sediments cover around 98% of the state while hard rocks cover just around 2%. Alluvial deposits are of older and newer types and consist chiefly of clay, silt and fine to medium sand. Other deposits are piedmont deposits, which are confined to a narrow zone, about 2 to 4 kms wide, between Siwalik Hills and alluvial plains. Sand-dunes are found in the districts of Bhiwani, Mahendragarh, Hissar and Sirsa Coarse sand, gravels and boulders are found to occur in piedmont areas and in the adjacent alluvial tracts. These deposits have been developed in the north part of Ambala district.

The thickness of alluvial sediments is more than 600 meter and along Yamunanagar-Karnal stretch it is reported to be more than 3000 meters. However, the thickness of sediments progressively decreases towards Delhi and hard rock areas of Bhiwani, Gurgaon, Faridabad and Mahendragarh districts.

2.2 HYDROMETEOROLOGY- CLIMATE, RAINFALLDISTRIBUTION

2.2.1 CLIMATE

The climate of Haryana state is subtropical, semi-arid to sub-humid, continental and monsoon type. The major part of the state comes under the fertile Indo-Gangetic belt. Most of the year, the climate of Haryana is of a pronounced continental character, very hot in summer and markedly cold in winter. In between are the pleasant months of spring. Haryana is extremely hot in summer at around 45 °C and mild in winter. The hottest months are May and June and the coldest are December and January. The air over the entire state is dry during the greater part of the year. Humidity is high in the monsoon months. April and May are the driest months with relative humidity of about 30% in the morning and less than 20% in the afternoons. Winds are generally light during the post monsoon and winter months. They strengthen during the summer and monsoon months. Except during the monsoon months, winds are predominantly from a westerly or northwesterly direction and tend to be more northerly in the afternoon. Easterly and southeasterly winds are more common in the monsoon months. There are two seasons of rainfall in the state. The average rainfall varies from less than 300 mm in south-western parts to over 1000 mm in the hilly tracks of Shivalik hills (Table-2). The south-west monsoon season, the principal source of ground water sets in last week of June and withdraws towards end of September and contributes about 80% of annual average rainfall. Another period of rainfall is winter rain from December to March is about 20% of total rainfall which is mostly absorbed into the soil. More than 50% of the annual rainfall received in the four rainy months for June to September, only there by leading to large variations on temporal scale. Rainfall is highly variable in time and space. The Normal Rainfall for the State of Haryana is 614 mm, but it has great spatial variations.

2.2.2 RAINFALL DISTRIBUTION

- During 2023-24, highest annual rainfall was observed for Ambala district i.e. 1267 mm and lowest rainfall was 258 mm at Bhiwani district.
- During 2022-23, highest annual rainfall was observed for Ambala district i.e. 886 mm and lowest rainfall was 268 mm at Sirsa district.
- During 2023-24 Bhiwani district observed (-41%) negative departure from normal and Mahendragarh district (+78%) positive departure from normal Rainfall.
- During 2022-23 Panchkula district observed (-37%) departure from normal and Mahendragarh district (+89%) positive departure from normal Rainfall.

Table 2 District wise Actual Annual Rainfall of Haryana State (2012, 2015, 2018, 2021, 2022)

S.No.	DISTRICT	Actual Rainfall (mm) 2012	Actual Rainfall (mm) 2015	Actual Rainfall (mm) 2018	Actual Rainfall (mm) 2021	Actual Rainfall (mm) 2022	NORMAL Rainfall (mm)
1	AMBALA	861	921	937	689	849	963
2	BHIWANI	397	328	373	533	468	428
3	CHARKHI DADRI	450	599	325	535	470	535
4	FARIDABAD	469	489	437	611	522	521
5	FATEHABAD	485	220	203	596	651	376
6	GURUGRAM	397	627	514	988	842	583
7	HISAR	419	371	294	518	501	415
8	JHAJJAR	313	521	482	929	728	442
9	JIND	390	472	479	698	642	529
10	KAITHAL	477	443	660	693	718	583
11	KARNAL	477	643	943	708	854	724
12	KURUKSHETRA	633	495	731	580	792	696
13	MAHENDRAGARH	468	400	442	715	684	502
14	MEWAT	497	499	431	697	732	572
15	PALWAL	496	435	391	572	678	508
16	PANCHKULA	981	1261	1216	959	1374	1112
17	PANIPAT	432	610	542	697	624	615
18	REWARI	395	489	554	901	835	562
19	ROHTAK	316	501	459	860	676	601
20	SIRSA	396	311	229	388	431	320
21	SONIPAT	405	584	560	858	570	629
22	YAMUNA NAGAR	1024	1036	1236	1159	1326	1109

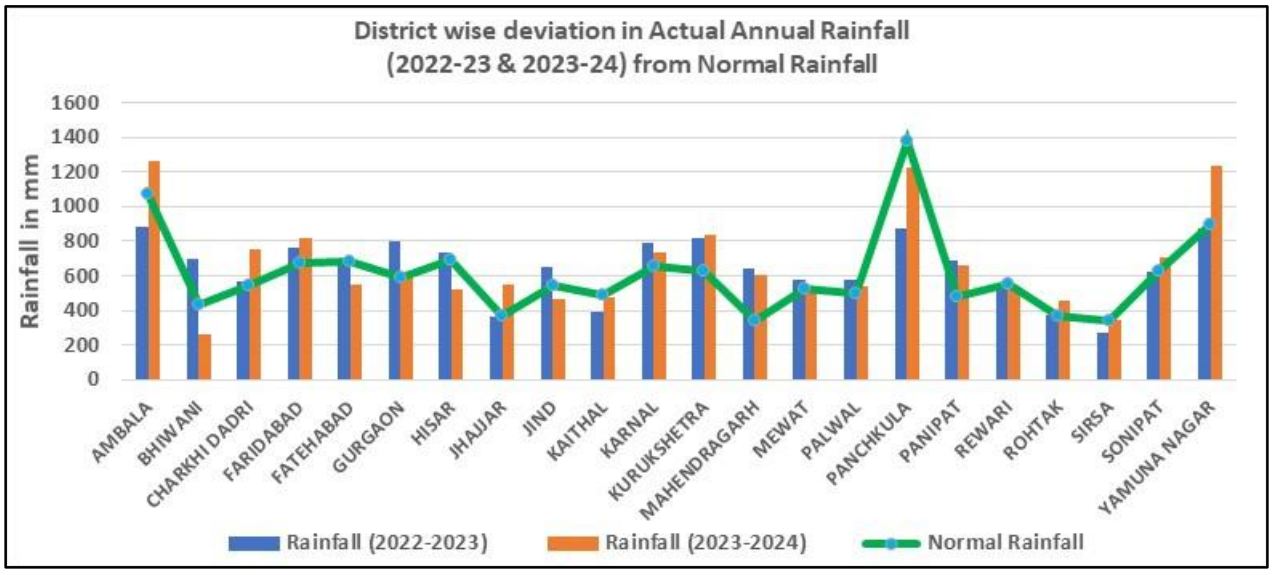
Deviation in 2023 rainfall from 2022 annual rainfall and from normal Rainfall is given in table 3. Given below and Isohyetal Map, rainfall pattern maps 2022 & 2021, comparison map between 2022 & 2021and their corresponding graphs are given below as fig. 2, 3, & 4. The Isohyetal Normal Rainfall Map of Haryana State is given in Fig. 5.

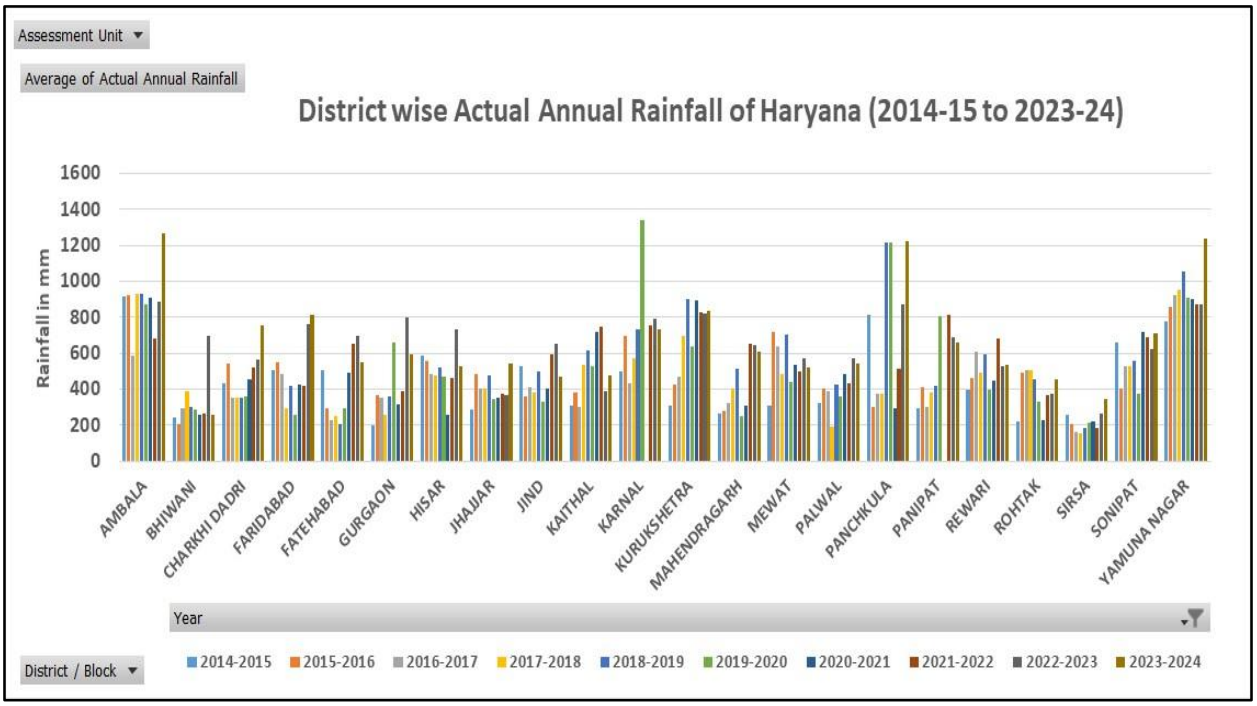
Table3: Deviationin 2023 rainfall from 2022 rainfall and Normal rainfall -Haryana

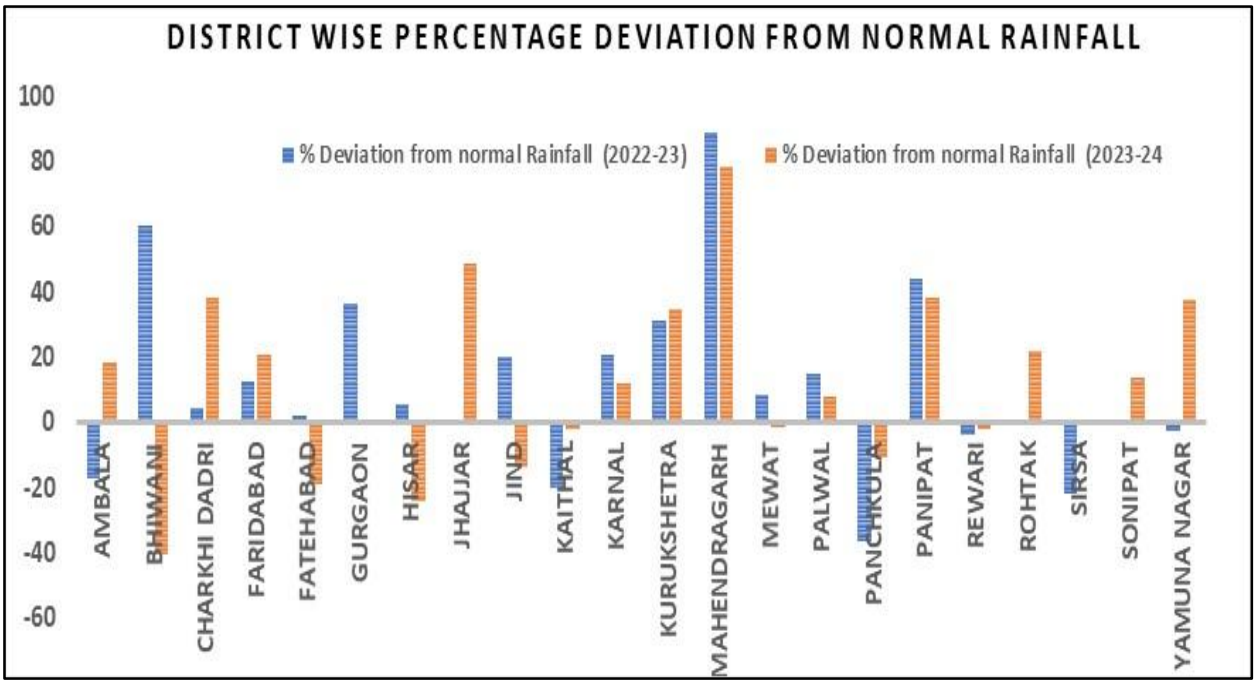
S. N	Districts	Rainfall in mm (2022-2023)	Rainfall in mm (2023-2024)	Normal Rainfall (in mm)	% Deviation from normal Rainfall (2022-23)	% Deviation from normal Rainfall 2023-24
1	AMBALA	886	1267	1074	-17	18
2	BHIWANI	696	258	435	60	-41
3	CHARKHI DADRI	568	754	546	4	38
4	FARIDABAD	760	817	677	12	21
5	FATEHABAD	694	551	681	2	-19
6	GURGAON	801	592	588	36	1

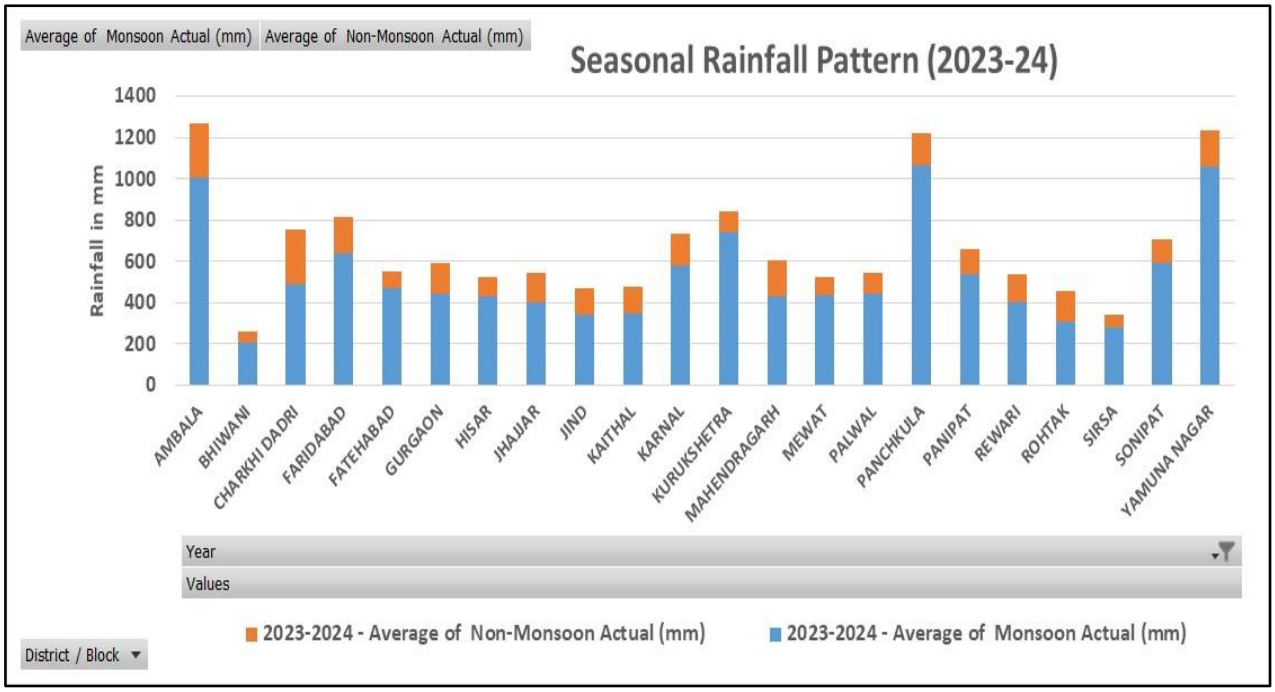
7	HISAR	732	526	693	6	-24
8	JHAJJAR	368	546	368	0	48
9	JIND	653	470	543	20	-14
10	KAITHAL	389	477	488	-20	-2
11	KARNAL	790	735	656	20	12
12	KURUKSHETRA	818	839	624	31	34
13	MAHENDRAGARH	643	607	341	89	78
14	MEWAT	574	522	530	8	-2
15	PALWAL	574	541	501	15	8
16	PANCHKULA	872	1224	1379	-37	-11
17	PANIPAT	687	660	478	44	38
18	REWARI	529	538	550	-4	-2
19	ROHTAK	373	453	373	0	22
20	SIRSA	268	343	344	-22	0
21	SONIPAT	624	710	624	0	14
22	YAMUNA NAGAR	876	1236	901	-3	37

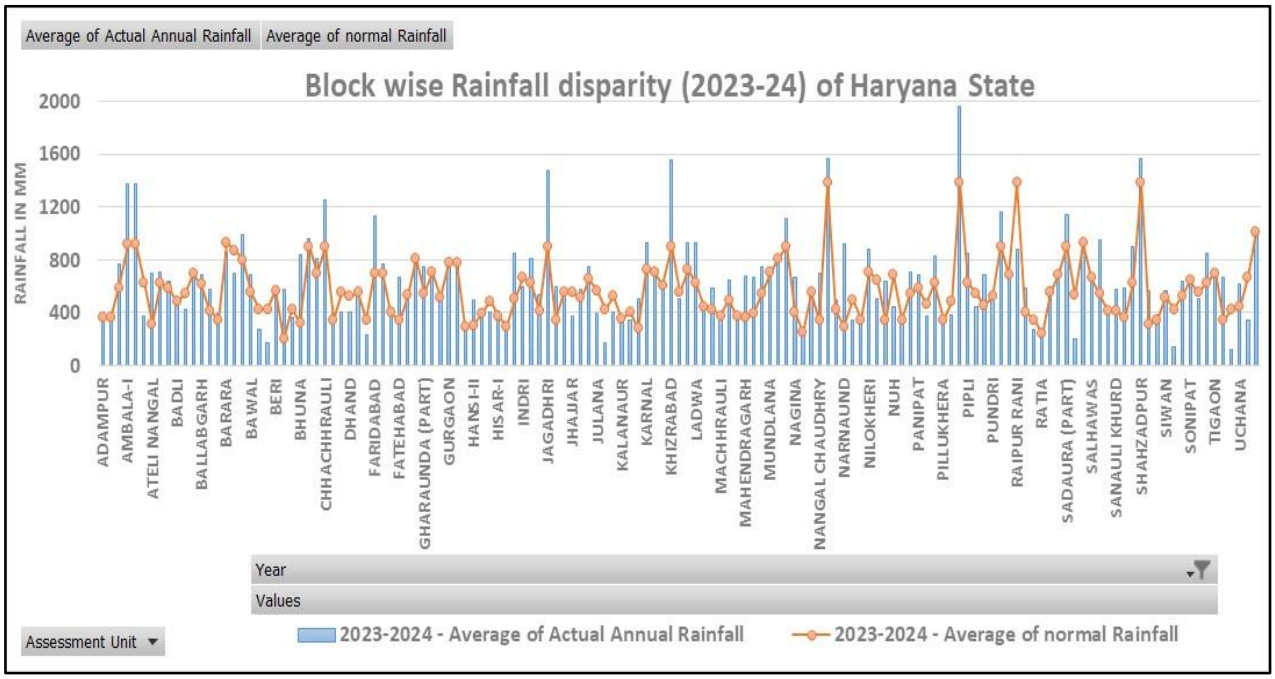
Fig.2: Deviation in Actual Annual Rainfall of Haryana State (2021V/S2022)

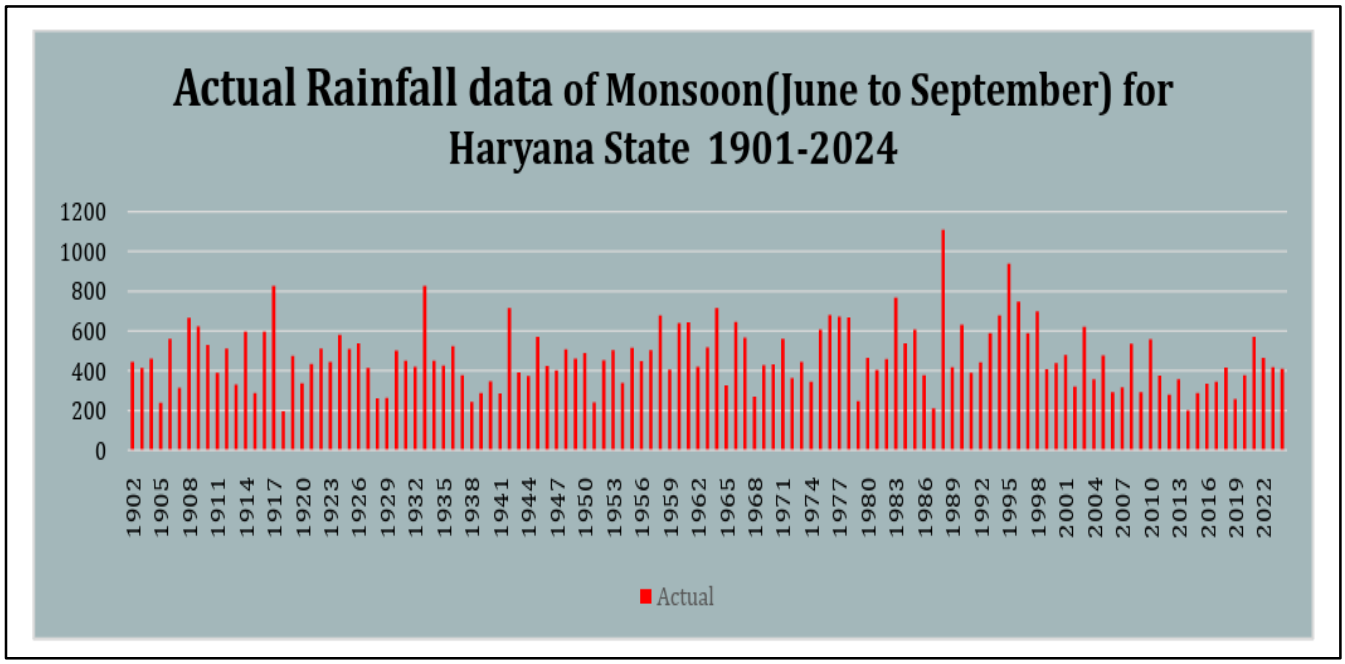



Assessment Unit
Average of Actual Annual Rainfall
District wise Actual Annual Rainfall of Haryana (2014-15 to 2023-24)
Rainfall in mm
1600
1400
1200
1000
800
600
400
200
0
AMBALA
BHIWANI
CHARKHI DADRI
FARIDABAD
FATEHABAD
GURGAON
HISAR
JHAJJAR
JIND
KAITHAL
KARNAL
KURUKSHETRA
MAHENDRAGARH
MEWAT
PALWAL
PANCHKULA
PANIPAT
REWARI
ROHTAK
SIRSA
SONIPAT
YAMUNA NAGAR
Year
District / Block
2014-2015
2015-2016
2016-2017
2017-2018
2018-2019
2019-2020
2020-2021
2021-2022
2022-2023
2023-2024


DISTRICT WISE PERCENTAGE DEVIATION FROM NORMAL RAINFALL
100
80
60
40
20
0
-20
-40
-60
% Deviation from normal Rainfall (2022-23)
% Deviation from normal Rainfall (2023-24
AMBALA
BHIWANI
CHARKHI DADRI
FARIDABAD
FATEHABAD
GURGAON
HISAR
JHAJJAR
JIND
KAITHAL
KARNAL
KURUKSHETRA
MAHENDRAGARH
MEWAT
PALWAL
PANCHKULA
PANIPAT
REWARI
ROHTAK
SIRSA
SONIPAT
YAMUNA NAGAR


Average of Monsoon Actual (mm)
Average of Non-Monsoon Actual (mm)
Seasonal Rainfall Pattern (2023-24)
Rainfall in mm
1400
1200
1000
800
600
400
200
0
AMBALA
BHIWANI
CHARKHI DADRI
FARIDABAD
FATEHABAD
GURGAON
HISAR
JHAJJAR
JIND
KAITHAL
KARNAL
KURUKSHETRA
MAHENDRAGARH
MEWAT
PALWAL
PANCHKULA
PANIPAT
REWARI
ROHTAK
SIRSA
SONIPAT
YAMUNA NAGAR
Year
Values
2023-2024 - Average of Non-Monsoon Actual (mm)
2023-2024 - Average of Monsoon Actual (mm)
District / Block


Average of Actual Annual Rainfall
Average of normal Rainfall
Block wise Rainfall disparity (2023-24) of Haryana State
RAINFALL IN MM
2000
1600
1200
800
400
0
ADAMPUR
AMBALA-I
ATELI NANGAL
BADLI
BALLABGARH
BARARA
BAWAL
BERI
BHUNA
CHHACHHRAULI
DHAND
FARIDABAD
FATEHABAD
GHARAUNDA (PART)
GURGAON
HANSI-II
HISAR-I
INDRI
JAGADHRI
JHAJJAR
JULANA
KALANAUR
KARNAL
KHIZRABAD
LADWA
MACHHRAULI
MAHENDRAGARH
MUNDLANA
NAGINA
NANGAL CHAUDHRY
NARNAUND
NILOKHERI
NUH
PANIPAT
PILLUKHERA
PIPLI
PUNDRI
RAIPUR RANI
RATIA
SADAURA (PART)
SALHAWAS
SANAULI KHURD
SHAHZADPUR
SIWAN
SONIPAT
TIGAON
UCHANA
Year
Values
2023-2024 - Average of Actual Annual Rainfall
2023-2024 - Average of normal Rainfall
Assessment Unit


Actual Rainfall data of Monsoon(June to September) for Haryana State 1901-2024
1200
1000
800
600
400
200
0
1902 1905 1908 1911 1914 1917 1920 1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977 1980 1983 1986 1989 1992 1995 1998 2001 2004 2007 2010 2013 2016 2019 2022
Actual

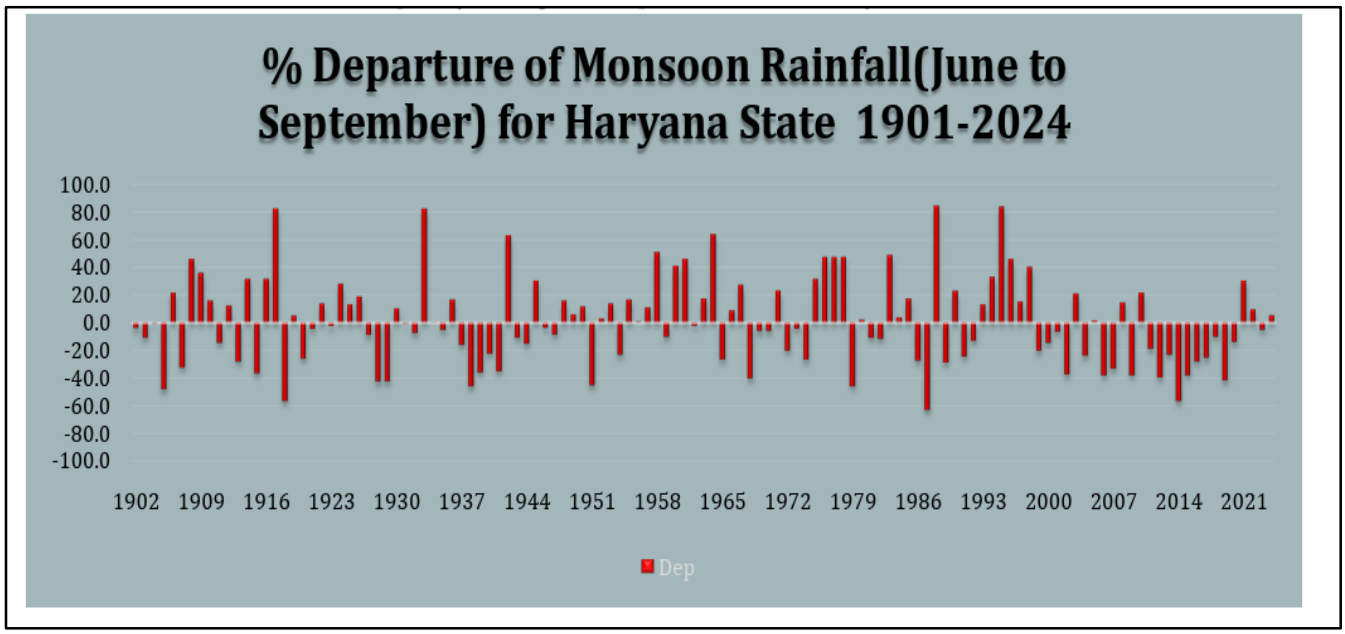

% Departure of Monsoon Rainfall(June to September) for Haryana State 1901-2024
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
1902 1909 1916 1923 1930 1937 1944 1951 1958 1965 1972 1979 1986 1993 2000 2007 2014 2021
Dep

Fig. 3 Actual Annual Rainfall Map of Haryana State–2022

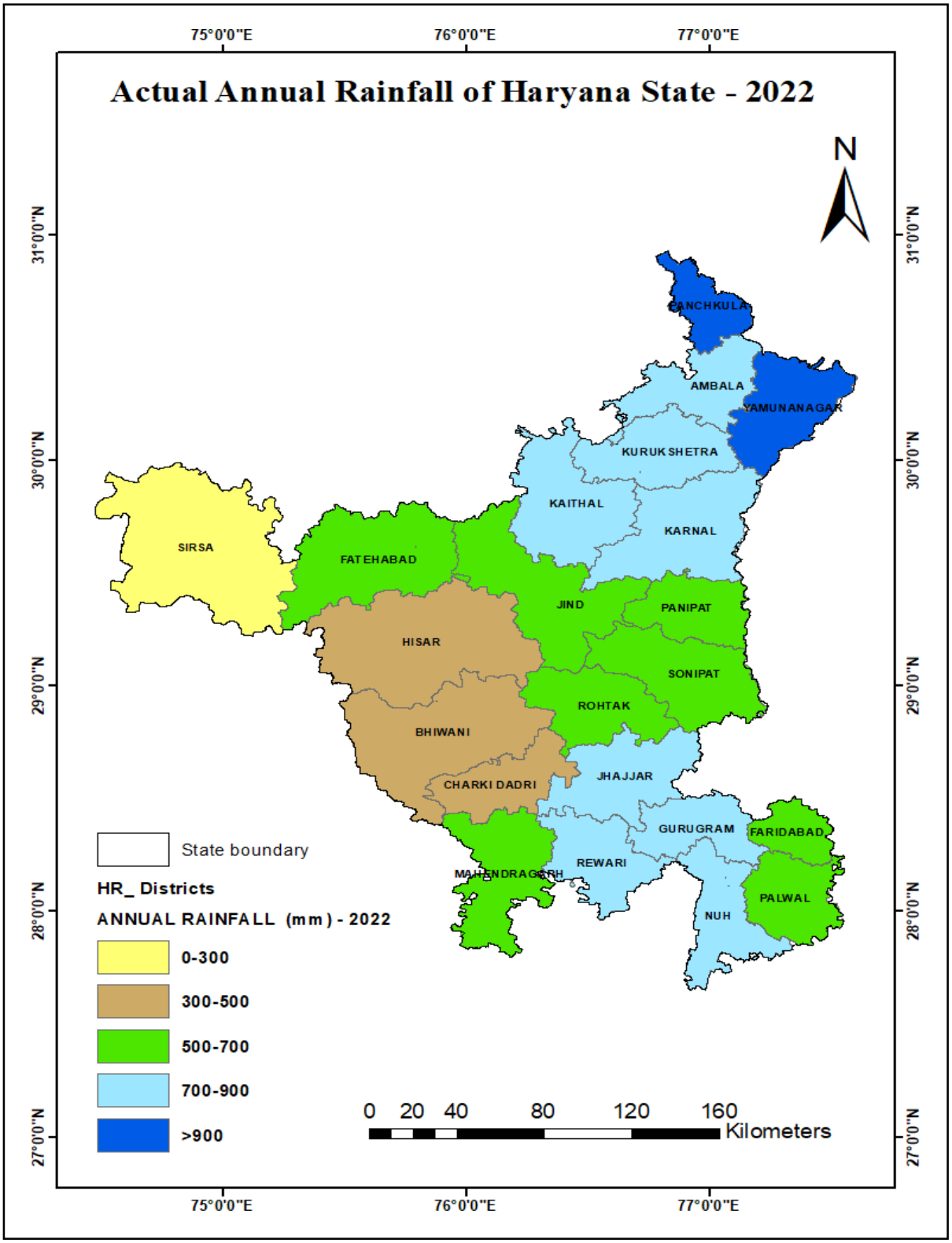


Fig. 4: Comparison Map of Actual Annual Rainfall-Haryana State (2021V/S2022)

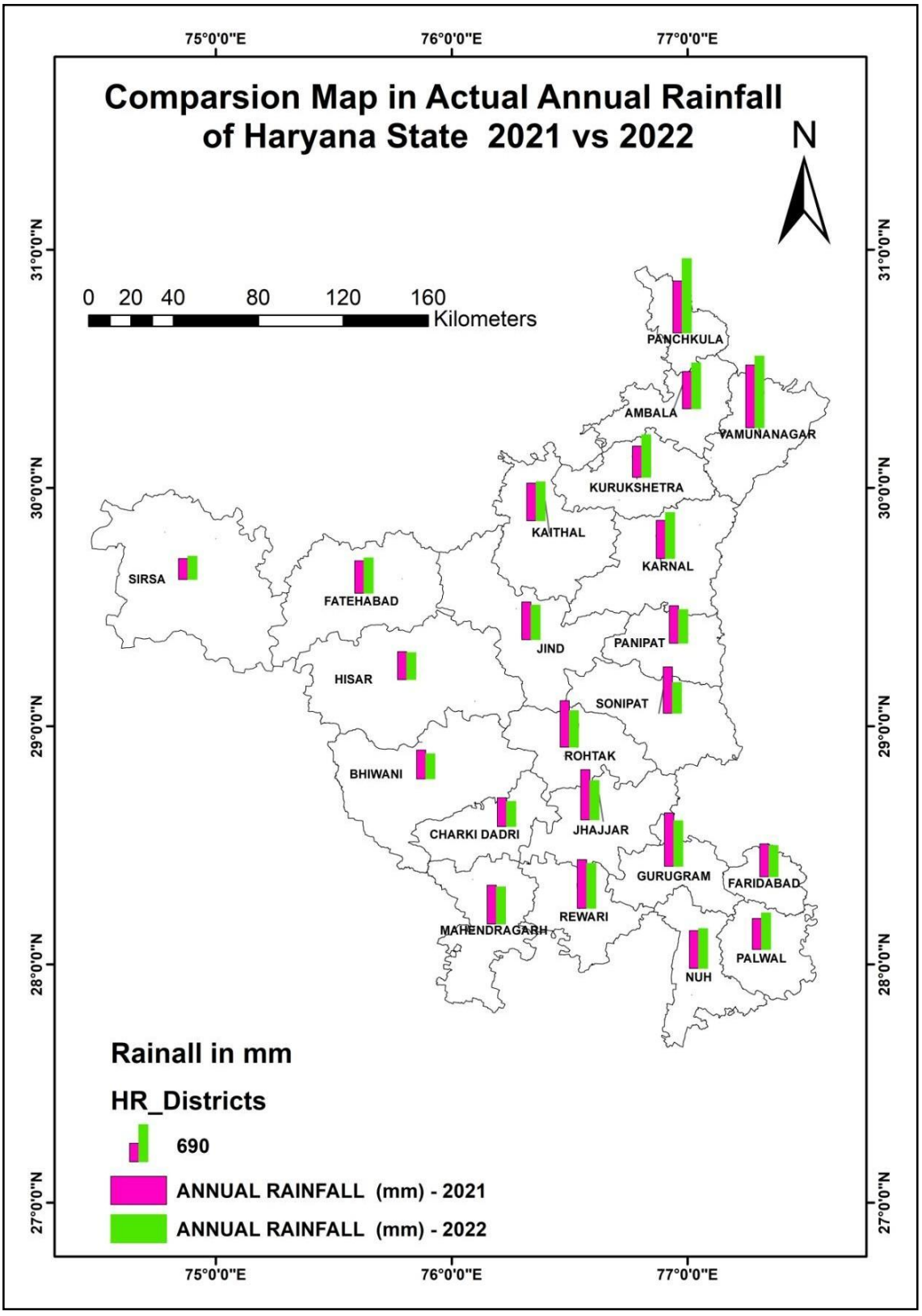
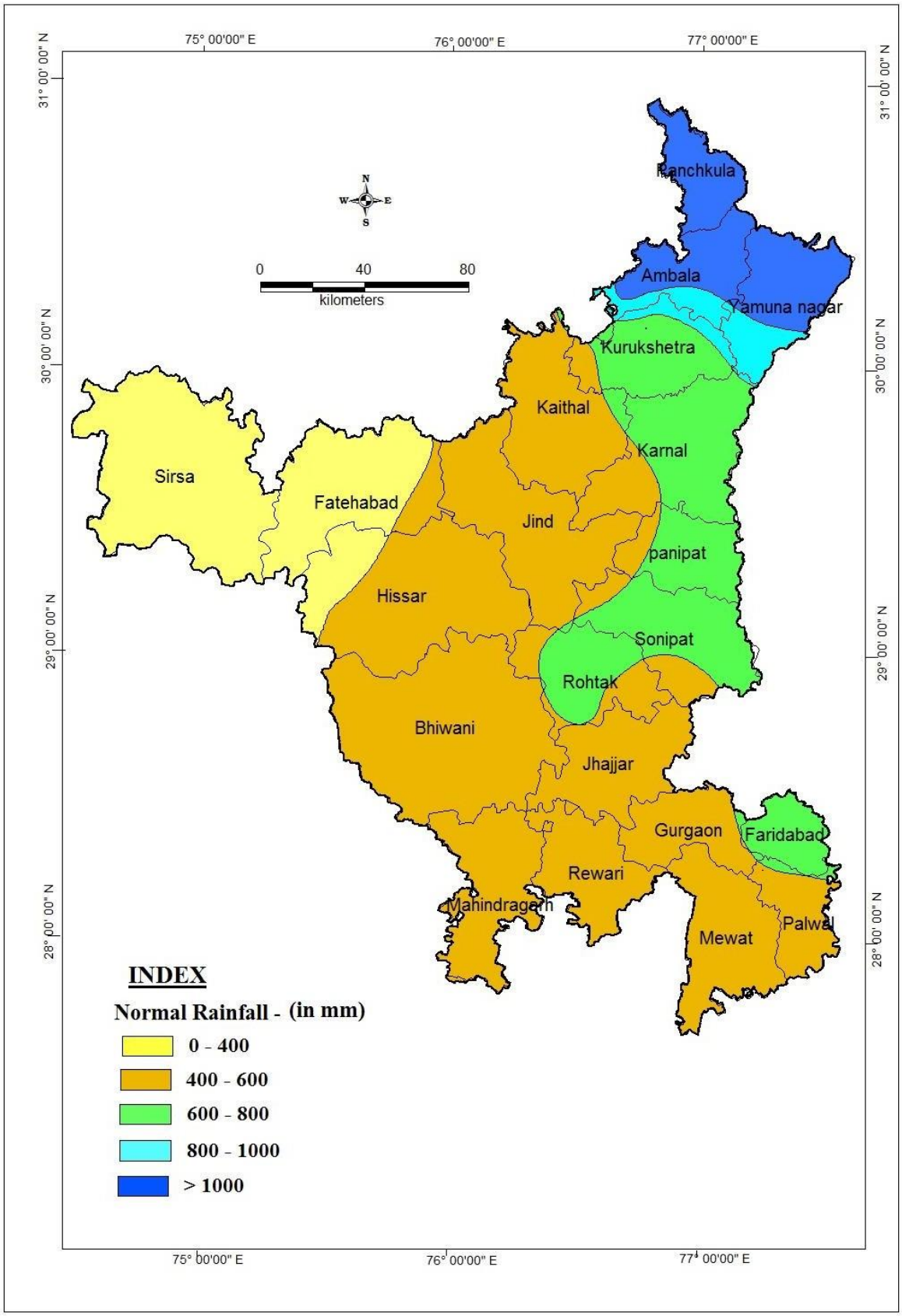


Fig. 5: Isohyetal Normal Rainfall Map of Haryana State



2.3 DESCRIPTION OF HYDROGEOLOGICAL UNITS, AQUIFERPARAMETERS.

On the basis of geohydrological conditions as well as groundwater movement and surface drainage pattern, the entire state is divided into the following basins:

1) Yamunabasin
   a) Upper
   b) Lower
2) GhaggarBasin
   a) Upper
   b) Lower
3) Inland AlluvialBasin
4) KrishnawatiBasin
5) SahibiBasin
6) Landoha NalaBasin
7) Kanti Sub Basin (Loharu Satnaliarea)

Ground water occurs both under confined and unconfined conditions in the alluvial formation whereas it is mostly under un-confined conditions in Shivalik and piedmont deposits and semi-confined conditions in hard rocks. Broadly, three-aquifer groups down to the depth of 450 mbglhave been deciphered by Central Ground Water Board in the depth range of 40 to 167 mbgl, 65 to 294 mbgl and 197 to 383 mbglin Ambala-Karnal-Panipat region. The studies carried out by Haryana State Minor Irrigation Tubewells Corporation (now closed) indicate that down to the depth of 120 mbgl in the upper reaches of Yamuna and Ghaggar basins covering Ambala, Karnal and Kurukshetra districts the percentage of sand is more than clay and silt. In these areas a number of clay layers of variable thickness are present, but only 2 to 3 are regionally extensive. The aquifers in these areas contain fresh quality water and derive supplies from Yamuna and Ghaggar Basins. South of district Karnal, sand content decreases and aquifers become thinner and quality of ground water also deteriorates to marginal and saline category. In rest of the districts of the state, below 60 m depth, clay invariably forms the major portion of alluvium. Aquifers in these districts, particularly in the saline areas, are mostly thin and pinch out at short distances, thus restricting the movementof ground water. In the clay predominantregion (South of Karnal district) Kankar (nodules of $CaCO_3$ of secondary origin) is mixed with clay and also occasionally present in the sand layers. Kankar layers are distinctly present at different depth ranges in Bhiwani, Faridabad and Sirsa districts. This is considered to be a characteristic of older alluvium and is mostly associated with saline ground water regime. The aquifer parameters for the different aquifer groups are given in table-4.

Table 3 Aquifer Parameters for different Aquifer Groups

Aquifer Group	Depth Range (m bgl)	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)	Storativity	Yield (m^3/hr)
I	40 to 167	800- 5210	8.75 – 47.10	--	
II	65 to 294	350– 1050	3.95 – 10.70	$5.60 * 10^{-4}$ to $1.90 * 10^{-3}$	--
III	197 to 383	345- 830	3.50 – 10.70	$6.60 * 10^{-4}$ to $2.40 * 10^{-4}$	5 – 50

2.1 GROUND WATER LEVELS CONDITIONS

The behavior of water level in all four seasons January 2023, June 2023 (Fig. 6a), August 2023 and November 2023 (Fig.6b) along with maps is discussed in following paragraphs. The maximum and minimum water levels recorded in four seasons is given below Table 5

Table 5 Range of depth to water levels during the period

Range	June 2023	August 2023	November 2023	January 2024
Minimum	0.35mbgl Baroda mor (Sonipat district)	0.10 mbgl Kulasi (Jhajjar district)	0.09 mbgl Mulana (Ambala district)	0.35 mbgl Majri (Kaithal district)
Maximum	90.84 mbgl Gopalwas PZ (Charkhi Dadri district)	57.37 mbgl Ratia-PZ (Fatehabad district)	57.64 mbgl Ratia-PZ (Fatehabad district)	99.3 mbgl Satnali (Mahendragarh district)

Figure 6a Depth to Water Level Map Haryana State June 2023

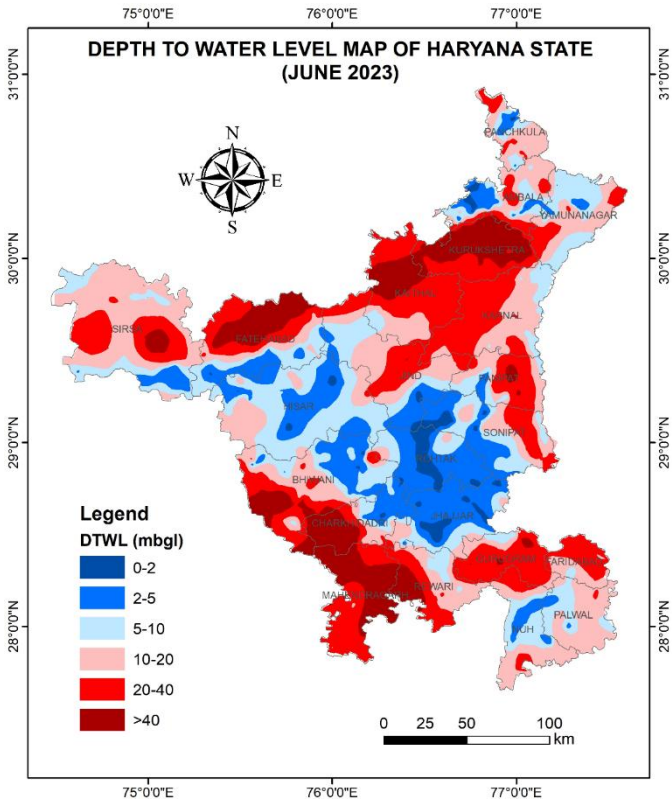
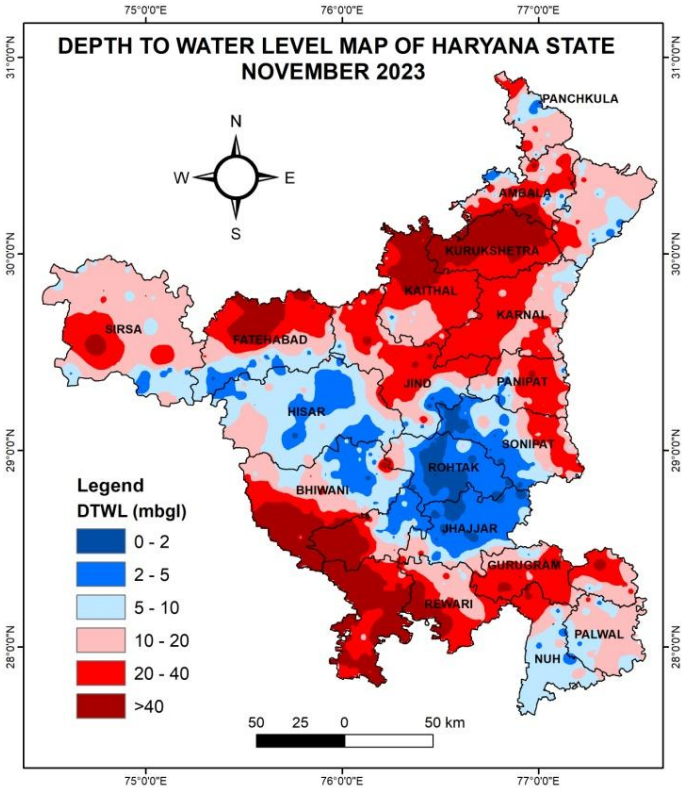


Figure 6b Depth to Water Level Map Haryana State November 2023



2.4.1 Decadal Water level fluctuation JUNE (2012:2021) & JUNE 2022

Changes in water level behaviour since last one decade are determined using decadal mean data. Water level mean of past one decade for each ground water observation well is computed and compared with the respective water level data of the given monitoring to determine the decadal mean water level fluctuation.

2.4.1.1 JUNE (2013:2022) & JUNE 2023

Changes in water level behaviour since last one decade are determined using decadal mean data. Water level mean of past one decade (2013-2022) for each ground water observation well is computed and compared with the respective water level data of June 2023. The behaviour of water level over the period under reference is discussed in paragraph below along with Fig.7.

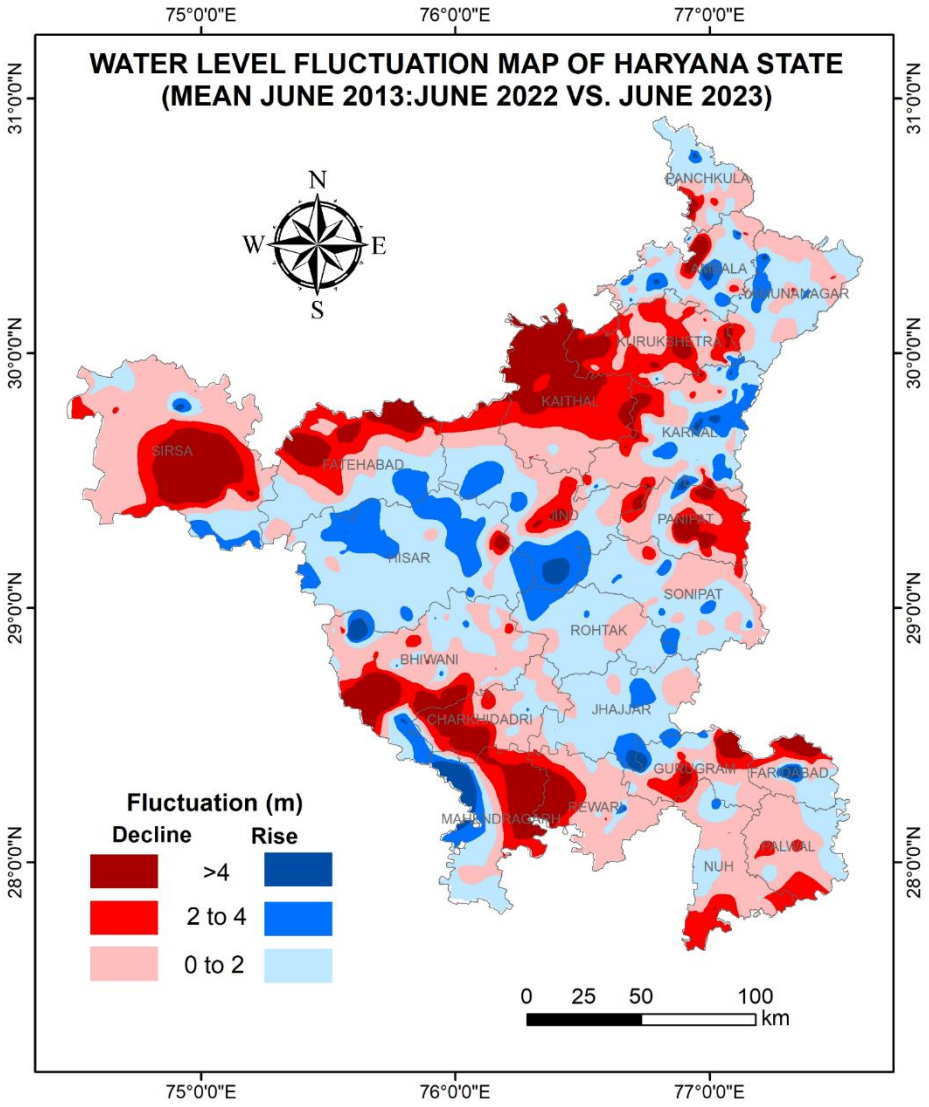
The interpretations of decadal mean fluctuations indicate water level decline in 46% of wells which covers about 57% area in parts of all districts of the State. Water level decline in the range of 0-2m has been reported from 32% of the wells covering 32% of area of the state. Water level decline between 2-4 m has been reported from 10% of wells covering 13% area of the state. Water level decline of more than 4m has been observed in 4% wells and 11% of the area of state in isolated patches in Sirsa, Fatehabad, Kaithal, Kurukshetra, Bhiwani, Charkhi dadri, Mahendragarh, Rewari, Ambala, Panchkula, Panipat, Faridabad & Gurugram districts.

The water level rise has been observed in 54% of wells and 43% area in parts of all the districts. Water level rise in the range of 0-2m has been observed in 38% wells covering 39% area of the state. Water level rise between 2-4 m has been observed in small patches in 12% wells and 9% area of the state. Water level rise of more than 4m has been observed in 4% wells and 1% of the area of state. Summarised details of Decadal Mean water level fluctuation is given in table below:

Table 6 Decadal water level fluctuation, June (2013:2022) & June 2023

Water Level Fluctuation Range		Wells Monitored		Area Covered	
		No.	%Age	Km2	%Age
Decline	>4	31	4	4746	11
	4--2	78	10	5950	13
	2--0	250	32	14290	32
Rise	0--2	301	38	14890	39
	2--4	97	12	3821	9
	>4	29	4	515	1

Fig. 7 Decadal Water Level Fluctuation Map of Haryana State (June 2013-2022 vs June 2023)



2.4.1.2 Mean November (2013:2022) & November 2023

Changes in water level behaviour since last one decade are determined using decadal mean data. Water level mean of past one decade (2013-2022) for each ground water observation well is computed and compared with the respective water level data of November 2023. The behaviour of water level over the period under reference is discussed in paragraph below along with Fig.8.

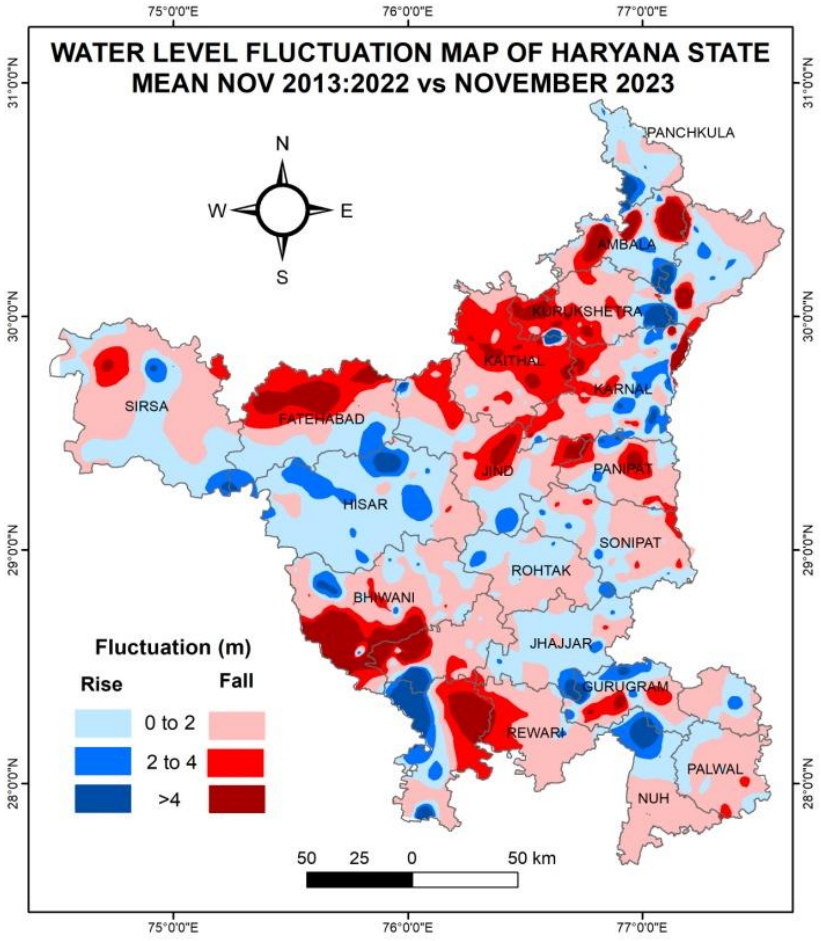
The interpretations of decadal mean fluctuations so arrived at indicate general water level decline in 60% of wells and 60% area covering all Districts of the State. Water level decline in the range of 0-2m has been reported from 38% of the wells covering 40% of area of the state. Water level decline between 2-4 m has been reported from 12% of wells covering 13% area of the state falling in Sirsa, Fatehabad, Jind, Kaithal, Kurukshetra, Karnal, Ambala, Yamunanagr, Panipat, Bhiwani, Mahendragarh, Rewari, Gurugram, Sonipat and Palwal districts. Water level decline of more than 4m has been observed in 9% wells and 7% of the area of state falling in Sirsa, Fatehabad, Ambala, Kurukshetra, Kaithal, Karnal, Rewari, Bhiwani, Panipat, Jind Yamunanagar and Gurugram districts.

The water level rise has been observed in 40% of wells and 40% area falling majorly in central districts. Water level rise in the range of 0-2m has been observed in 27% wells covering 32% area of the state. Water level rise of 2-4m has been observed in 9% wells and 6% area of the state falling in Sirsa, Fatehabad, Jind, Hisar, Bhiwani, Mahendragarh, Jimd, Panchkula, Ambala, Yamunanagar, Karnal, Panipat, Sonipat, Rohtak, Jhajjar, Gurugram Nuh and Faridabad districts. Water level rise of >4m has been observed in more than 4% wells and more than 2% area of the state as isolated patches in Panchkula, Ambala, Sirsa, Hisar, Bhiwani, Charki dadri, Mahendargarh, Gurugram and Nuh districts. Summarised details of Decadal Mean water level fluctuation given in table below:

Table 7 Decadal water level fluctuation, November (2013:2022) & November 2023

Water Level Fluctuation Range		Wells Monitored		Area Covered	
		No.	%Age	Km2	%Age
Decline	**>4**	75	9	2919	7
	4--2	99	12	5721	13
	2--0	309	38	17780	40
Rise	**0--2**	225	27	14227	32
	2--4	77	9	2571	6
	>4	37	4	994	2

Fig. 8 Decadal Water Level Fluctuation Map of Haryana State (Nov 2013-2022 vs Nov 2023)



2.1 GROUND WATER QUALITY

Character of ground water quality is dependent on geological characteristics and climatic conditions. It is further influenced and generally degraded by human activities. Indiscriminate extraction of groundwater for day to day uses, application of fertilizers in agriculture and unscientific disposal of industrial waste has great impact on ground water quality. The quality of ground water is normally ascertained through concentration values of number of physical, chemical and biological parameters present in it. Concentration of these parameters affects its acceptability and usefulness for domestic, agriculture, industrial and other purposes. It is, therefore, essential to know the chemical composition of ground water to determine its suitability for the intended use. Knowledge of quality of ground water not only helps in finding its suitability for various purposes, but it also helps in taking effective remedial measures for its improvement on scientific lines. In rural as well as in urban area of Haryana State, ground water is a major resource for drinking and other uses. Wherever surface water is inadequate or unavailable, ground water is exploited for drinking and irrigation purposes.

During June 2023, 881 number of ground water samples were collected from these structures spread uniformly over 22 districts of Haryana and no specific treatment such as acidification or filtration was given at the time of sampling. The water samples were analyzed for major cations (Ca, Mg, Na, K) and anions (CO3, HCO3, Cl, NO3, SO4) in addition to pH, EC, F, SiO2, PO4 and TH as CaCO3 in Regional Chemical Laboratory of CGWB, NWR Chandigarh by following 'Standard analytical procedures' as given in American Public Health Agency (APHA) 23rd Edition 2017.

2.1.1 COMPOSITION OF WATERS

Chemical analysis shows that the ground water is moderately alkaline in nature. The pH values ranges from 6.95 at Dhabi Kalan in Fatehabad district to 8.98 at Sampla in Rohtak district. Salinity of ground water is measured in terms of EC. The ground water is found to have low to very high salt content as the EC of well water ranges from 130 µS/cm at Kherla in Gurugram district to 23412 µS/cm at Jharli in Jhajjar district. Hardness reported in terms of CaCO3 ranges from 40 mg/L at Dhigana in Jind district to 8847 mg/L at Jharli in Jhajjar district. The concentration of calcium ranges between 4 mg/L and 1114 mg/L. Magnesium concentration ranges between 0.0 mg/L at Megha Majra in Kurukshetra district and 1474 mg/L at Jharli in Jhajjar district. About 86% samples of ground water contain calcium below 100 mg/L. Calcium is very low in some districts, though it is very essential element for drinking and irrigation purposes. However, magnesium is less than the desirable limit of 30 mg/L in 27% samples and about 48% of samples falls in the range of 31- 100 mg/L i.e. desirable limit as per BIS 10500:2012 for drinking water. 25% of samples are having Magnesium concentration above permissible limit of 100 mg/L as per BIS 10500:2012 for drinking water. In about 55% of the total samples, Ca+Mg are the dominant cations having concentration more than 50% of the total cations in the particular sample.

Sodium is the dominant cation in the majority of ground waters except for the samples in the districts of Ambala, Karnal, Kurukshetra, Panchkula, Yamunanagar its concentration varies widely from 3.8 mg/L at Nathanpur in Yamunanagar district to 2904 mg/L at Nagpur in Fatehabad district. Sodium concentration is less than 100 mg/L in 42% of samples. Potassium is found to be present in low concentration except in some samples where its concentration is even more than 100 mg/L. In 66% of the samples analyzed, the potassium content is less than 10 mg/L. It ranges from less than 1.0 mg/L at various locations to 680 mg/L at Mandothi in Jhajjar district. High concentration of potassium (>100mg/L) is found in about 5% samples. Its higher concentration indicates contamination of ground water from various point (industry, sewage) as well as non-point sources (agriculture).

Carbonate is found in a few samples and it varies from 0 mg/L at various locations to 372 mg/L at Khanpur Kalan in Sonipat district. Bicarbonate is the dominant anion and it ranges from 16 mg/L at Kherla in Gurugram district to 1172 mg/L at Samain in Fatehabad district. The Chloride concentration in ground water varies between 7.0 mg/L at Ganauli in the Ambala district and 5913 mg/L at Jharli in Jhajjar district. The Sulphate (SO4) content in ground waters was found to be BDL at several places in the State. The highest value of 3125 mg/L of Sulphate has been observed at Nagpur in Fatehabad district. In 78% ground water samples the concentration of sulphate is below 200 mg/L. Nitrate, an indicator of domestic, agricultural and industrial contamination, is found in significant number of samples. Its concentration in groundwater ranges from less 0 (BDL) at several places to 781 mg/L at Channaut in Hisar district. The fluoride (F) content in ground water of the State is generally less than 1.0 mg/L (55%). It ranges from less than 0.01 mg/L at several places in the State to 22.0 mg/L at Haibtatpur in Jind district and Nagoki in Sirsa district. Phosphate concentration in sampled ground waters is 0 (BDL) to 0.70 mg/L at Kaithal, while Silica concentration, measured as SiO2, ranges between 0 (BDL) to 31 mg/L.

The district-wise concentration range of various chemical components in ground water is depicted in Table 8.

Table 8 Range of Chemical Constituents in Groundwater of Haryana State

Sr. No.	District	Number of Samples	Conc.	pH	EC in µS/cm	CO3	HCO3	Cl	SO4	NO3	F	PO4	Ca	Mg	Na	K	SiO2	TH as CaCO3	SAR	RSC in meq/L
			Range		at 25^{0}C	(<---------- mg/L----------->)														
1	Ambala	30	Min	7.25	432	0	146	7	0	0.04	0.07	0	20	5	11	1.3	6	80	0.31	-5.80
			Max	8.38	4410	24	854	822	698	324	1.50	0	148	148	525	299	27	901	9.74	3.00
2	Bhiwani	72	Min	7.25	369	0	127	21	0	0.18	0.25	0	8	7	15	0.6	6	80	0.31	-42.39
			Max	8.66	7942	48	939	2414	1014	75	16.00	0	372	545	895	400	25	2420	21.77	9.00
3	Charkhi Dadri	18	Min	7.52	438	0	183	43	0	0.43	0.39	0	28	2	14	0.5	11	100	0.45	-31.98
			Max	8.06	7127	0	598	2308	601	43	3.00	0	256	338	760	289	25	1850	14.10	5.20
4	Faridabad	12	Min	7.40	588	0	116	35	0	0.77	0.35	0	36	16	49	1.9	12	165	1.57	-31.18
			Max	8.10	6426	0	744	1732	476	103	1.40	0	268	289	796	116	22	1860	11.48	-0.15
5	Fatehabad	34	Min	6.95	306	0	96	14	0	0.67	0.07	0	8	10	12	2.3	10	70	0.37	-21.07
			Max	8.23	15540	0	1172	2401	3125	127	8.71	0	409	248	2904	355	31	1311	34.90	14.00
6	Gurugram	47	Min	7.65	130	0	16	12	0	0.01	0.18	0	8	2	8	0.6	9	60	0.31	-58.78
			Max	8.85	17485	156	903	4821	1048	397	13.00	0	389	591	2450	108	24	3403	29.19	8.81
7	Hisar	58	Min	7.10	293	0	94	35	0	0.21	0.47	0	8	7	6	1.7	7	120	0.19	-47.37
			Max	8.43	11150	48	756	3152	864	781	9.80	0	344	457	1338	116	24	2700	15.58	5.80
8	Jhajjar	33	Min	7.63	193	0	37	14	0	0.04	0.26	0	4	10	5	0.3	1	50	0.23	-172.20
			Max	8.81	23412	84	879	5913	1729	210	6.20	0	1114	1474	850	680	21	8847	12.50	2.61
9	Jind	59	Min	7.53	271	0	49	14	0	0	0.35	0	4	7	6	2	3	40	0.21	-64.02
			Max	8.77	9890	156	830	2680	620	280	22.00	0	305	708	1200	210	29	3643	17.59	10.80
10	Kaithal	43	Min	7.15	347	0	122	36	0	0	0.01	0	8	4	13	2.4	6	70	0.36	-40.99
			Max	8.95	7190	48	854	2016	920	234	1.40	0.7	236	484	729	157	23	2370	14.84	8.40
11	Karnal	54	Min	7.31	350	0	110	28	0	0	0.36	0	8	7	12	1.1	0	90	0.18	-10.98
			Max	8.52	2800	96	781	348	535	180	9.70	0.2	184	185	425	59	24	910	11.25	10.60
12	Kurukshetra	36	Min	7.41	445	0	207	28	0	0	0.08	0	20	0	12	1.3	12	50	0.25	-4.39
			Max	8.42	1456	12	756	178	157	111	1.50	0	100	97	215	23.2	23	600	7.51	6.40
13	Mahendragarh	27	Min	7.62	304	0	146	36	0	0.5	0.25	0	16	7	24	1.0	8	100	0.97	-10.97
			Max	8.71	5350	61.44	647	1443	306	81	4.01	0	144	119	897	200	27	831	13.54	4.77
14	Mewat	27	Min	7.35	332	0	141	26	0	3.6	0.20	0	38	10	7	2.5	11	138	0.26	-87.22
			Max	8.62	19780	30.72	969	4809	3041	317	1.54	0	862	834	2450	401	29	4634	20.14	0.91
15	Palwal	30	Min	7.00	618	0	189	71	0	5.2	0.62	0	20	38	22	0.5	8	312	0.54	-43.81
			Max	8.20	9592	0	793	1974	1987	578	2.80	0	540	515	1167	115	27	2347	13.88	-0.54
16	Panchkula	30	Min	7.54	289	0	98	14	0	0.01	0.55	0	29	2	6.5	1.8	7	130	0.23	-1.80
			Max	8.37	3331	36	891	510	178	95	2.10	0	108	107	475	12.1	20	681	7.93	1.60
17	Panipat	53	Min	7.63	378	0	37	14	0	0.12	0.42	0	8	7	25	0.7	8	50	0.57	-23.98

			Max	8.67	8298	48	830	1567	961	456	7.20	0	116	384	918	406	26	1651	15.23	8.00
18	Rewari	27	Min	7.20	320	0	122	14	0	2.6	0.36	0	20	9	9	0.3	4	117	0.31	-29.20
			Max	8.21	5104	0	475	1652	581	78	2.60	0	170	360	481	17	28	1631	5.78	1.66
19	Rohtak	32	Min	7.54	279	0	49	35	0	0	0.32	0	4	10	24	2	2	50	0.88	-38.41
			Max	8.98	9106	84	891	2113	939	240	6.70	0	405	450	958	504	21	2272	16.59	2.40
20	Sirsa	67	Min	7.39	329	0	61	14	0	0.5	0.04	0	12	10	6	2	7	120	0.15	-39.85
			Max	8.45	9684	132	842	2878	1441	440	22.00	0	289	421	1560	160	25	2452	26.48	10.83
21	Sonipat	56	Min	7.71	409	0	110	14	0	0	0.40	0	4	17	12	1	0	90	0.32	-21.62
			Max	8.93	9960	372	1001	2290	1088	520	9.30	0	196	272	1590	549	23	1501	20.06	6.96
22	Yamunanagar	36	Min	7.63	198	0	85	14	0	0.02	0.45	0	16	2	3.8	2.2	4	80	0.14	-1.60
			Max	8.62	1098	36	513	128	31.2	56	1.20	0	84	41	103	50	21	350	2.63	2.20
	Haryana	881	**Min**	**6.95**	**130**	**0**	**16**	**7**	**0**	**0**	**0.01**	**0.2**	**4**	**0**	**3.8**	**0.3**	**0**	**40**	**0.14**	**-172.20**
			Max	**8.98**	**23412**	**372**	**1172**	**5913**	**3125**	**781**	**22.00**	**0.7**	**1114**	**1474**	**2904**	**680**	**31**	**8847**	**34.90**	**14.00**

2.1.2 DISTRIBUTION OF ELECTRICAL CONDUCTANCE (EC)

The EC value of ground waters in the State varies from 130 to 23412 µS/cm at 25°C. Grouping water samples based on EC values, it is found that 26.79 % of them have EC less than 750 µS/cm, 51.87 % have between 750 and 3000 µS/cm and the remaining 21.34 % of the samples have EC above 3000µS/cm. The map showing aerial distribution of EC with intervals corresponding to limits assigned for desirable, permissible and unsuitable classes of waters indicates that desirable class of waters occur throughout the state in patches but in high proportion is in northern and central parts of the State (Fig 9). The ground water occurring in the southern, central and some part in west comprising of parts of Sirsa, Hisar, Jind, Jhajjar, Rohtak, Bhiwani, Mewat, Mahendragarh, Rewari and Faridabad districts is mostly saline and is not suitable for drinking purpose in terms of Electrical Conductance (Table 9) .

Figure 9 Distribution of Electrical Conductance (EC).

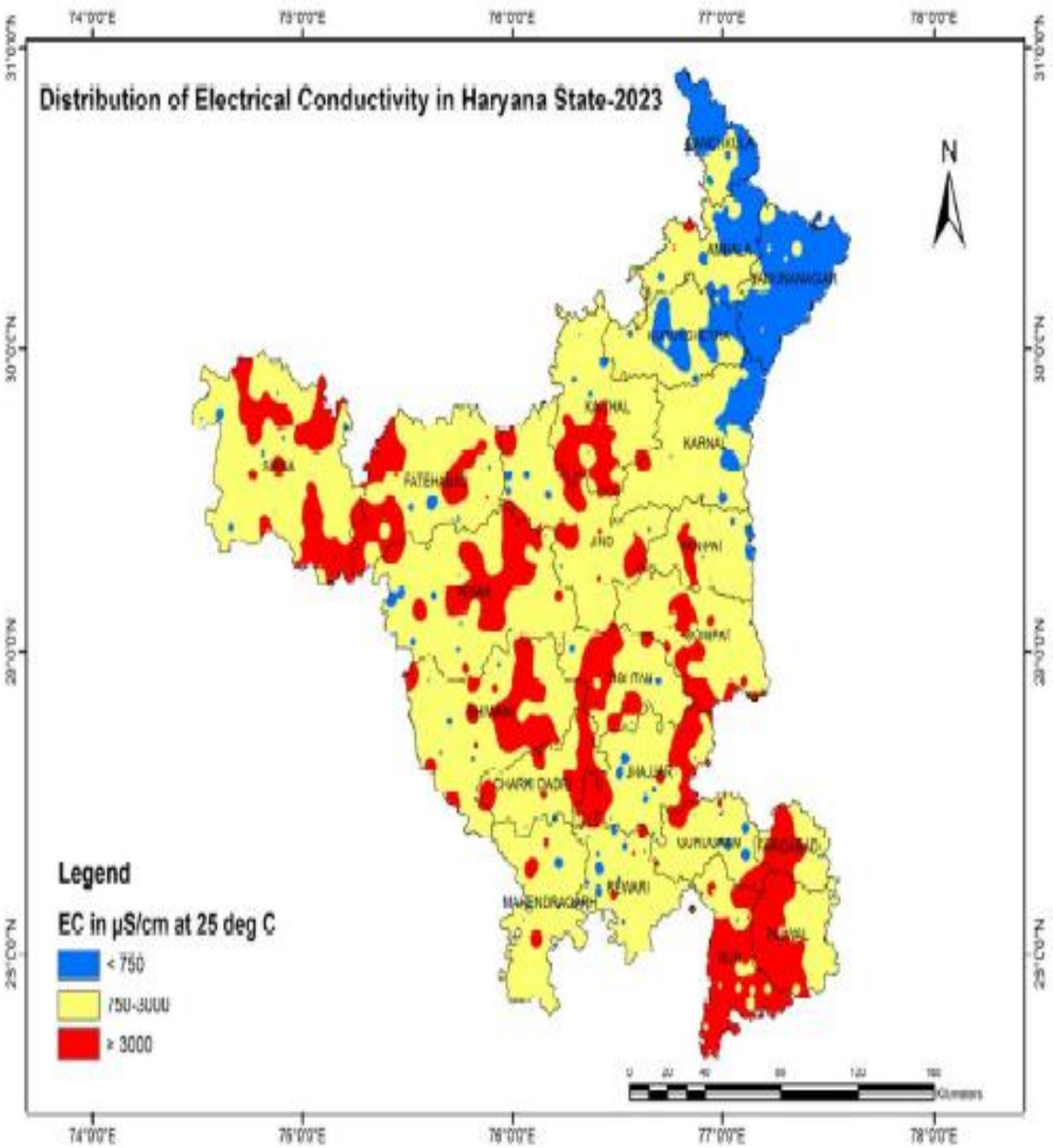


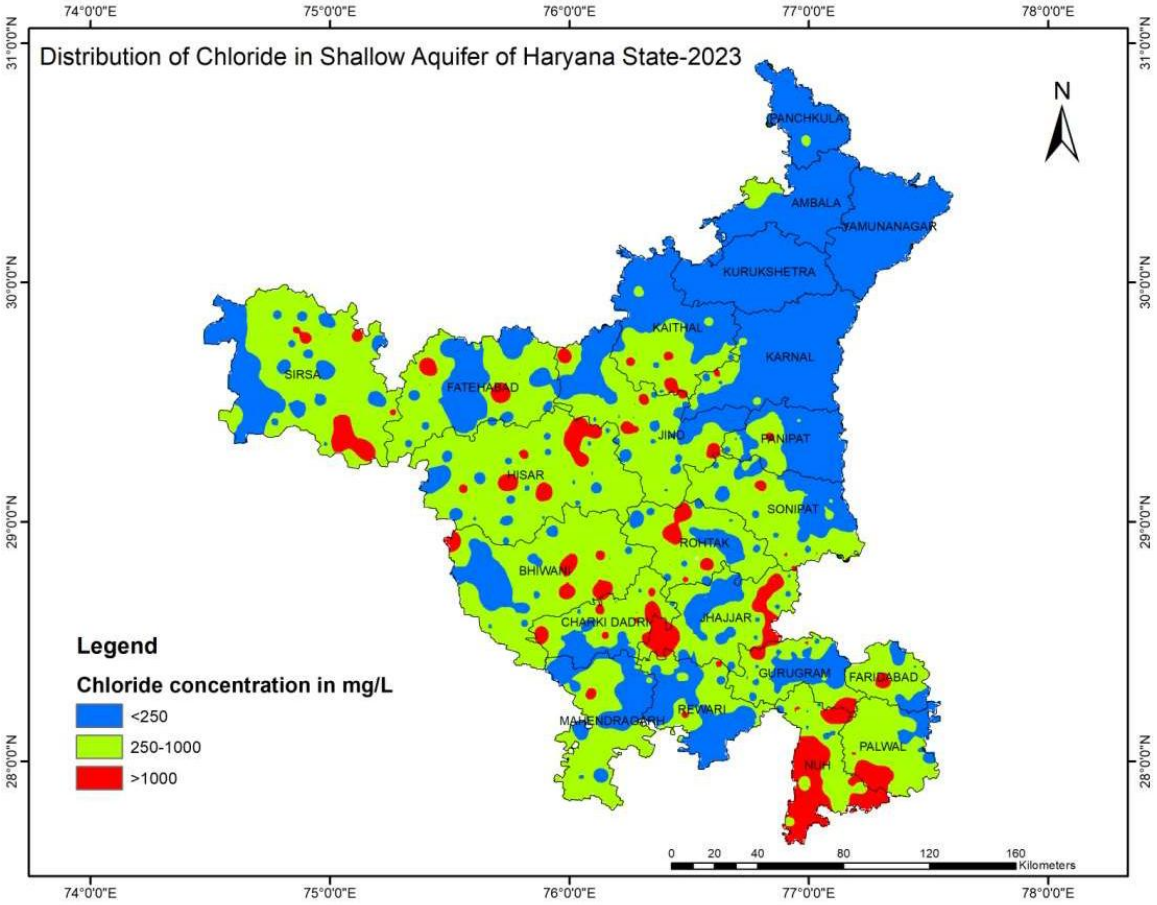
Table 9. Distribution of Electrical Conductivity in shallow Ground water of Haryana State

E.C. <750 µS/cm	E.C. 750-3000 µS/cm	E.C.>3000 µS/cm
Ambala	Ambala	Ambala
Bhiwani	Bhiwani	Bhiwani
Charkhi Dadri	Charkhi Dadri	Charkhi Dadri
Faridabad	Faridabad	Faridabad
Fatehabad	Fatehabad	Fatehabad
Gurugram	Gurugram	Gurugram
Hisar	Hisar	Hisar
Jhajjar	Jhajjar	Jhajjar
Jind	Jind	Jind
Kaithal	Kaithal	Kaithal
Karnal	Karnal	Mahendragarh
Kurukshetra	Kurukshetra	Mewat
Mahendragarh	Mahendragarh	Palwal
Mewat	Mewat	Panchkula
Palwal	Palwal	Panipat
Panchkula	Panchkula	Rewari
Panipat	Panipat	Rohtak
Rewari	Rewari	Sirsa
Rohtak	Rohtak	Sonipat
Sirsa	Sirsa	
Sonipat	Sonipat	
Yamunanagar	Yamunanagar	

2.1.3 DISTRIBUTION OF CHLORIDE

Chloride content of ground water normally follows the distribution pattern of EC and it ranges from 7.0 mg/L to 5913 mg/L in the entire State. Chloride concentration above 400 mg/L gives salty taste to water and based on these aesthetic considerations, BIS has recommended a desirable limit of 250 mg/L for chloride in drinking water. This limit can be extended to 1000 mg/L in case of absence of a source with desirable concentration. Grouping of samples in these categories based on chloride content, it is found that Chloride is less than 250 mg/L in 63.90 % of the samples, between 250 and 1000 mg/L in 26.22 % samples and only 9.87 % of the samples are found to have Chloride above 1000 mg/L. Map showing spatial distribution of Cl contents in ground water (Fig 10) indicates that Cl is below 250 mg/L in most of the districts, it is between 250 and 1000 mg/L in Sirsa, Bhiwani, Hisar, Fatehabad, Kaithal Jind, Gurugram Mahendragarh, Mewat, Palwal and Faridabad districts. Cl is more than 1000 mg/L in isolated places in Sirsa, Fatehabad, Hisar, Kaithal, Jind, Panipat, Sonipat, Jind, Jhajjar, Rohtak, Charkhi Dadri, Bhiwani, Mahendragarh, Mewat, Palwal, Faridabad, Rewari and Gurugram districts.

Fig. 10 Distribution of Chloride in Haryana



2.1.4 DISTRIBUTION OF NITRATE

Occurrence of nitrate in ground water above 5.0 mg/L reflects contamination at some stage of its percolation and circulation. The probable sources of nitrate contamination of ground water are through excessive application of fertilizers, bacterial nitrification of organic nitrogen, and seepage from animal and human wastes and atmospheric inputs. In the State, nitrate in ground water samples varies from BDL i.e. less than 0 (BDL) mg/L to 781 mg/L. BIS permits a maximum concentration of 45 mg/L nitrate in drinking water. Considering this limit, it is found that 85.13 % of the samples, spread over the entire State, have nitrate below 45 and 14.87 % have more than 45 mg/L. Spatial distribution of nitrate indicates that ground water with permissible nitrate content generally occurs in the northern, central and some pockets in southern part of the state. A considerable area of the western and southern part of state have nitrate concentration exceeding 45 mg/L (Fig. 11) Furthermore, quite a significant number of water samples from Sirsa, Mewat, Palwal, Fatehabad, Faridabad, Rohtak, Rewari, Sonepat found to have nitrate above 45 mg/L (Table 10).

Fig. 11 Distribution of Nitrate in Haryana

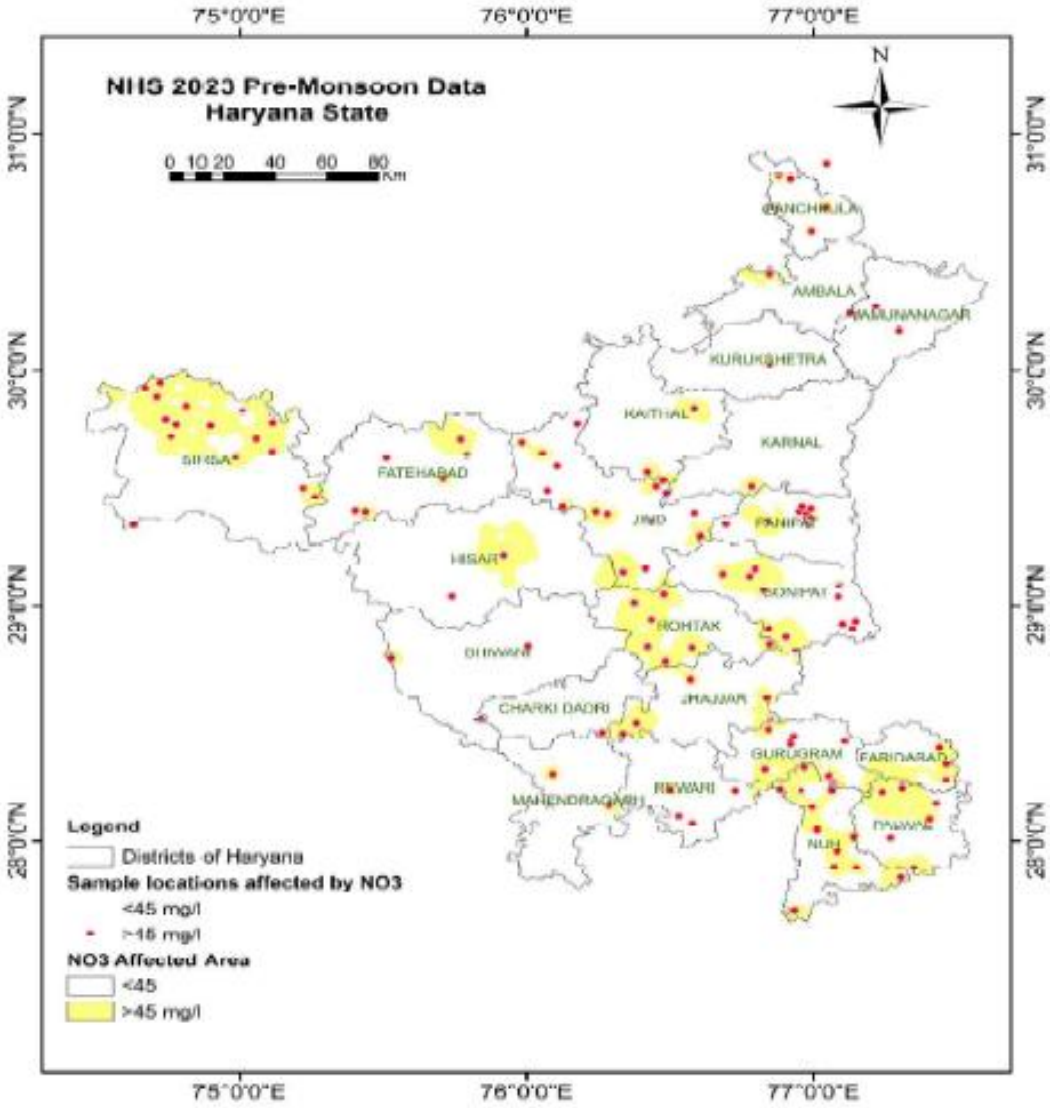


Table 10 District wise distribution of Nitrate in shallow Ground water of Haryana State

Nitrate < 45mg/L	Nitrate > 45mg/L
Ambala	Ambala
Bhiwani	Bhiwani
Charkhi Dadri	Faridabad
Faridabad	Fatehabad
Fatehabad	Gurugram
Gurugram	Hisar
Hisar	Jhajjar
Jhajjar	Jind
Jind	Kaithal
Kaithal	Karnal
Karnal	Kurukshetra
Kurukshetra	Mahendragarh
Mahendragarh	Mewat
Mewat	Palwal
Palwal	Panchkula
Panchkula	Panipat
Panipat	Rewari
Rewari	Rohtak
Rohtak	Sirsa
Sirsa	Sonipat
Sonipat	Yamunanagar
Yamunanagar	

2.1.5 DISTRIBUTION OF FLUORIDE

Fluoride in small amounts in drinking water is beneficial for the dental health while in large amounts it is injurious. The fluoride content in ground water ranges from <0.01 to 22 mg/L. BIS recommends that fluoride concentration up to 1.0 mg/L in drinking water is desirable, up to 1.50 mg/L its is permitted and above 1.50 mg/L is injurious. Classification of samples based on this recommendation, it is found that 54.71 % samples have fluoride in desirable range, 21.68 % in the permissible and the remaining 23.61 % have fluoride above 1.50 mg/L. Map showing spatial distribution of fluoride contents in ground water (Fig. 12) indicates that ground water in most parts of the State has desirable concentration of fluoride. Ground waters with fluoride above 1.50 mg/L are found mainly in Jind, Sirsa, Fatehabad, Hisar, Bhiwani, Panipat, Sonipat, Rohtka, Rewari, Mahendragarh, Palwal and Jhajjar districts of the State. It is worth mentioning that high fluoride waters are encountered in areas where high salinity is encountered and extensive agriculture activities are predominant. Extensive use of phosphatic fertilizers, which have fluoride as impurity can be the potential source of the fluoride while geogenic sources also play important role in fluoride concentration in the ground water (Table 10).

Figure 12 Fluoride Concentration in Ground Water in Haryana State.

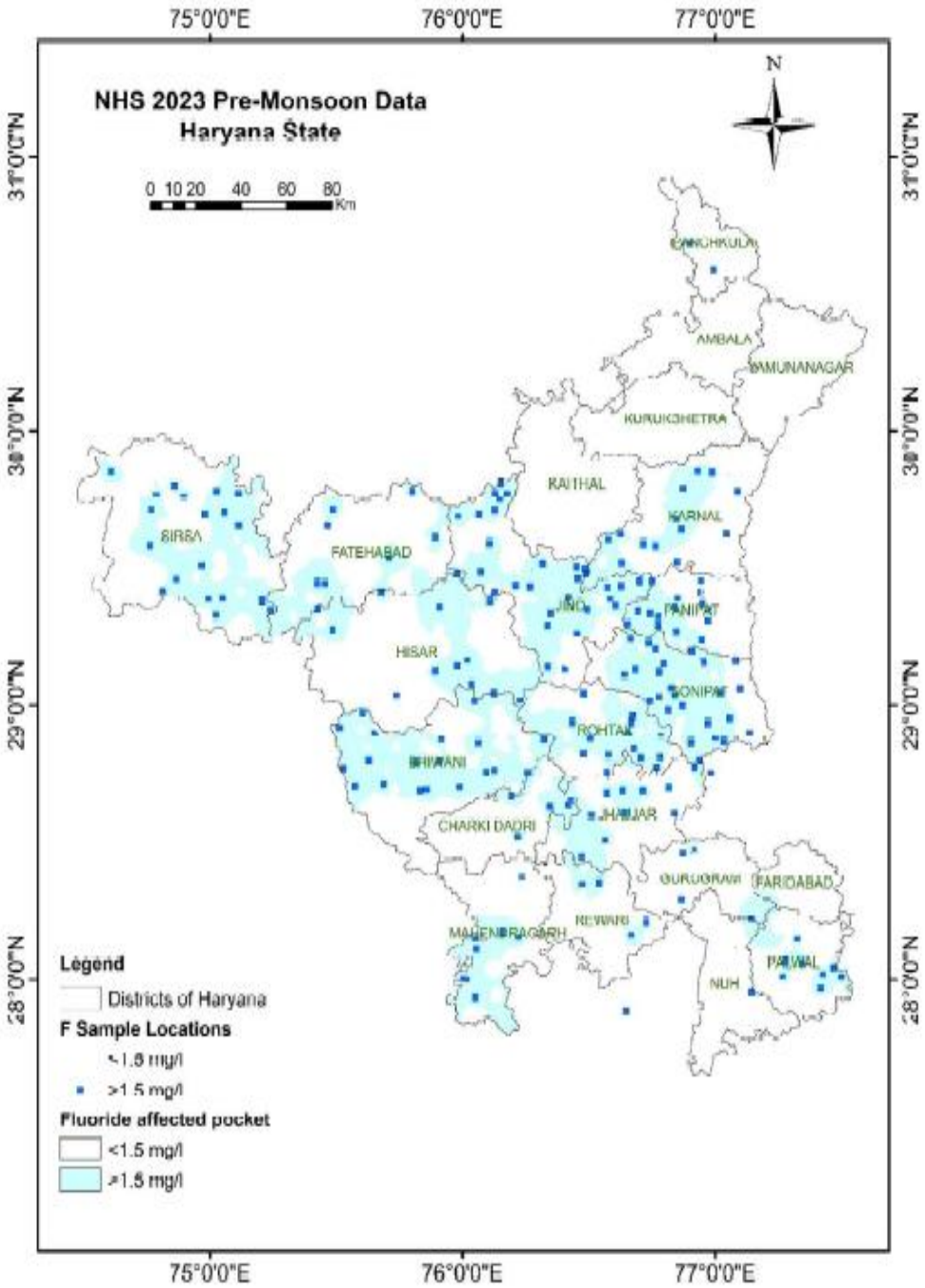


Table 10 District wise distribution of Fluoride in shallow Ground water of Haryana State

Fluoride <1.00mg/L	**Fluoride 1.01-1.50mg/L**	**Fluoride >1.50mg/L**
Ambala	Ambala	Bhiwani
Bhiwani	Bhiwani	Charkhi Dadri
Charkhi Dadri	Charkhi Dadri	Fatehabad
Faridabad	Faridabad	Gurugram
Fatehabad	Fatehabad	Hisar
Gurugram	Gurugram	Jhajjar
Hisar	Hisar	Jind
Jhajjar	Jhajjar	Karnal
Jind	Jind	Mahendragarh
Kaithal	Kaithal	Mewat
Karnal	Karnal	Palwal
Kurukshetra	Kurukshetra	Panchkula
Mahendragarh	Mahendragarh	Panipat
Mewat	Mewat	Rewari
Palwal	Palwal	Rohtak
Panchkula	Panchkula	Sirsa
Panipat	Panipat	Sonipat
Rewari	Rewari	
Rohtak	Rohtak	
Sirsa	Sirsa	
Sonipat	Sonipat	
Yamunanagar	Yamunanagar	

2.1.6 TYPES OF WATERS

Considering the predominance of the cation and anion in the chemical composition of ground water, its type is determined and its relation with its occurrence in an area as well as with its salinity is studied. It is found that no discernible relationship between type of water and its occurrence in any particular area could be established. Nearly all types of waters are available in each district of the State. However, study of salinity of the water clearly indicates that nearly 79 % ground waters of the State are fresh i.e. electrical conductivity less than 3000 µS/cm and predominance of calcium or magnesium or calcium + magnesium cations and bicarbonate as anion. Ground waters having intermediate salinity are mostly mixed cation type - HCO_3 type. At some places HCO_3-type of waters with sodium as dominant cation are also encountered in low to moderately saline ground waters. This can be attributed either to precipitation of $CaCO_3$ due to loss of CO_2 or dissolution of Na-salts from the topsoil layers or to ion exchange reaction during the downward percolation of water. At some isolated locations sulphate is found to be dominant anion. In ground water, where salinity is high; mostly Na is the dominant cation and Cl or Cl + SO_4+NO_3 (Mixed anion) are dominant. Permanent hardness is observed at few locations in Hisar, Jhajjar and Bhiwani districts depicted by dominance of Ca-Cl. Nevertheless, a few exceptions have also been found in these samples and well-defined types of ground waters.

2.1.7 SUITABILITY FOR DRINKING

Salinity, chloride, fluoride and nitrate are the important parameters that are normally considered for evaluating the suitability of ground water for drinking uses. Based on recommendations made for these parameters by the BIS, it is found that ground water at quite a few places is not suitable for drinking uses because of either EC/Cl/F/NO3 or all of them. It is observed that unsuitable quality of ground water occurs in the western parts of central and southwestern regions, while in the northern and north eastern areas ground water is of suitable quality for drinking uses. Table-11 below shows district-wise distribution of ground waters in different classes of suitability based upon EC, Cl, F and NO3 contents.

Table 11 District wise variations in quality of ground water viz-aviz suitability for drinking water (BIS standards)

S. No.	District		Electrical Conductivity			Chloride			Nitrate		Fluoride		
		No. of Samples	<750	750-3000	>3000	<250	250-1000	>1000	<45	>45	<1.00	1.00-1.50	>1.50
1	Ambala	30	15	13	2	27	3	0	27	3	22	8	0
2	Bhiwani	72	10	39	23	27	36	9	68	4	31	17	24
3	Charkhi Dadri	18	5	7	6	10	3	5	18	0	10	6	2
3	Faridabad	12	1	7	4	6	4	2	9	3	8	4	0
4	Fatehabad	34	10	13	11	21	12	1	29	5	19	8	7
5	Gurugram	47	11	27	9	28	14	5	37	10	39	4	4
6	Hisar	58	13	26	19	26	23	9	56	2	28	16	14
7	Jhajjar	33	12	15	6	19	10	4	29	4	13	8	12
8	Jind	59	15	30	14	39	14	6	43	16	18	9	32
9	Kaithal	43	6	26	11	29	11	3	41	2	38	5	0
10	Karnal	54	17	37	0	52	2	0	53	1	22	20	12
11	Kurukshetra	36	14	22	0	36	0	0	35	1	34	2	0
12	Mahendragarh	27	4	18	5	14	12	1	25	2	11	7	9
13	Mewat	27	3	12	12	7	9	11	17	10	21	5	1
14	Palwal	30	1	18	11	7	20	3	21	8	14	7	9
15	Panchkula	30	22	7	1	28	2	0	25	5	25	3	2
16	Panipat	53	12	37	4	48	4	1	44	9	23	16	14
17	Rewari	27	11	13	3	21	4	2	22	4	17	7	3
18	Rohtak	32	7	17	8	16	10	6	25	7	7	10	15
19	Sirsa	67	11	32	24	35	20	12	49	18	40	6	21
20	Sonipat	56	7	34	15	31	18	7	43	13	11	18	27
21	Yamunanagar	36	29	7	0	36	0	0	34	2	31	5	0
Grand Total		**881**	**236**	**457**	**188**	**563**	**231**	**87**	**750**	**129**	**482**	**191**	**208**

The bar diagram clearly shows that most of the groundwater occurring in the districts of Ambala, Kaithal, Karnal, Kurukshetra, Panchkula and Yamunanagar occupy almost 75% length of

the bar and has almost all the parameters within desirable limit for drinking purposes, thus can be considered as potable. Ground waters from the districts of Bhiwani, Faridabad, Jhajjar, Jind, Mewat, Palwal, Rohtak, Sirsa and Sonipat have bar length less than 50% indicating low potable rating. Lowest percentage of potable waters found in the districts of Mewat and Palwal i.e. only 29% and 26% respectively of the samples are suitable for drinking out of the all collected samples while more than 90% of the samples collected from Kurukshetra and Yamunanagar are suitable for drinking purpose.

Figure 13 District wise Distribution of Potable Waters in Haryana

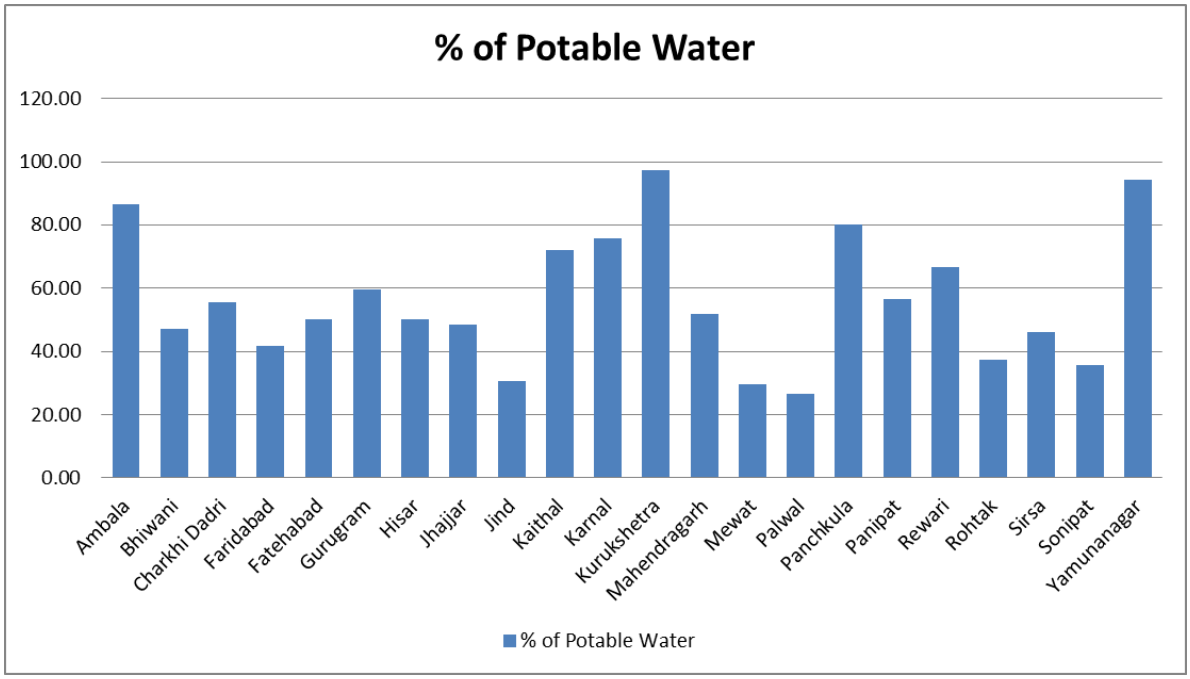


Table 12 Percentage wise classification chart for Portable water in Haryana state

Sr. No.	**% Wise classification**	**Name of the districts**	**Remarks**
1.	>80	Ambala, Kurukshetra, Yamunanagar.	Samples have been classified on the basis of Salinity as EC, Chloride, Fluoride and Nitrate. (EC,Cl,F,NO_3)
2.	50-80	Charkhi Dadri, Fatehabad, Gurugram, Hisar, Kaithal, Karnal, Mahendragarh, Panchkula, Panipat, Rewari.	
3.	<50	Bhiwani, Faridabad, Jhajjar, Jind, Mewat, Palwal, Rohtak, Sirsa, Sonipat.	

2.1.8 SUITABILITY FOR IRRIGATION

The suitability of ground water for irrigation is generally assessed considering salinity expressed as EC, sodium in relation to calcium and magnesium in terms of SAR, sodium in relation to carbonate in terms of RSC. EC and SAR range from 130 to 23412 µS/cm at 25°C and 0.14 to 34.90 respectively. Waters having high values of EC and SAR causes salinity and sodium hazards respectively when used for customary irrigation.

USSL: By plotting the values of EC and SAR in USSL diagram, it is observed that ground water occurring in the northern and central parts of the State falls under C2S1 and C3S1 classes of irrigation waters. It indicates that most of these waters are suitable for irrigating semi-salt tolerant crops on all soils. Ground water mostly from the southern, western and southwestern parts comprising of Bhiwani, Faridabad, Fatehabad, Hisar, Jhajjar, Mahendragarh, Mewat, Palwal, Rewari, Sirsa districts falls under C3S2,C3S3, C3S4, C4S1, C4S2, C4S3 and C4S4 classes of irrigation classification. Such waters when used continuously for irrigation, they are likely to cause salinity hazards and lead to reduction in crop yields. They may also cause sodium hazards and lead to hardening of soils when used for irrigation without the addition of adequate quantity of gypsum.

RSC: Alkali hazards of irrigation ground waters are estimated through the computation of Residual Sodium Carbonate (RSC), also known as Eaton's Index. Waters with RSC value <1.25 meq/L are safe for irrigational uses, RSC between 1.25 and 2.5 are marginal and waters with RSC value >2.5 meq/L are unsafe. Based on RSC values of ground waters, it is found that 79.79 % of the waters are safe, 8.17% marginal and the remaining 12.03% are unfit for irrigational uses. RSC of ground waters are found to vary from below zero (-172) to 14 meq/l. The district wise distribution of ground waters in different categories of suitability for irrigational uses based on USSL and RSC considerations is given in Table 13.

Table 13 District wise rating for ground water samples of Haryana. Based on Eaton's index and USSL Classification)

Sl.No.	District	No. of Samples	IRRIGATION SUITABILITY			
			EATON's INDEX (RSC in meq/L)			USSL Classification
			Safe	Marginal	Unsafe	
			<1.25	1.25-2.50	>2.50	
1	Ambala	30	21	6	3	C2S1, C3S1, C3S2, C4S1, C4S2
2	Bhiwani	72	62	3	7	C2S1, C3S1, C4S1, C3S2, C4S2, C4S4
3	Charkhi Dadri	18	12	3	3	C3S1, C3S2, C4S2, C4S3, C4S4
4	Faridabad	12	12	0	0	C2S1, C3S1, C4S1, C4S3
5	Fatehabad	34	19	4	11	C2S1, C3S1, C2S2, C4S2, C4S3, C4S4
6	Gurugram	47	32	2	13	C1S1, C2S1, C3S1, C4S1, C3S2, C4S2, C3S3, C4S1, C4S2, C4S3, C4S4
7	Hisar	58	54	2	2	C2S1, C3S1, C4S1, C3S2, C4S2, C4S4, C4S3, C4S4
8	Jhajjar	33	31	1	1	C1S1, C2S1, C3S1, C3S2, C4S2, C4S3, C4S4
9	Jind	59	44	6	9	C2S1, C3S1, C3S2, C4S1, C4S2, C3S3, C4S3
10	Kaithal	43	30	1	12	C2S1, C3S1, C3S2, C4S2, C3S3, C4S3, C4S3
11	Karnal	54	38	9	7	C2S1, C3S1, C3S2, C4S1, C4S3
12	Kurukshetra	36	27	2	7	C2S1, C3S1, C2S2, C3S2
13	Mahendragarh	27	15	5	7	C2S1, C3S1, C3S2, C4S1, C4S3, C4S4
14	Mewat	27	27	0	0	C2S1, C3S1, C4S1, C4S2
15	Palwal	30	30	0	0	C2S1, C3S1, C4S2, C4S3
16	Panchkula	30	29	1	0	C2S1, C3S1, C4S3
17	Panipat	53	42	4	7	C2S1, C3S1, C2S2, C3S2, C4S2, C3S3, C4S3, C4S4
18	Rewari	27	25	2	0	C2S1, C3S1, C4S2
19	Rohtak	32	29	3	0	C2S1, C3S1, C4S1, C4S2,
20	Sirsa	67	56	4	7	C2S1, C3S1, C2S2, C3S2, C4S2, C3S3, C4S3, C4S4
21	Sonipat	56	40	6	10	C2S1, C3S1, C4S1, C3S2, C4S2, C4S3
22	Yamunanagar	36	28	8	0	C1S1, C2S1, C3S1
	Total	**881**	**703**	**72**	**106**	

Most of ground waters from Ambala, Yamunanagar, Sonipat, Panipat, Karnal, Kurukshetra, and Panchkula are suitable for irrigation for semi-salt tolerant crops on adequately drained soils. The waters from districts of Bhiwani, Gurugram, Fatehabad, Sirsa, Hisar, Kaithal, Jhajjar, Sonipat, Rohtak, and Jind show wide variability in irrigation rating.

2.1.9 SUITABILITY FOR INDUSTRIES

Industries, in general, use water for variety of works depending upon the nature and size of the industry. As such specifications for suitability of water for industries vary widely depending upon the process in each industry. Therefore, chemical quality of water and its suitability could not be discussed due to diversified nature of industries.

2.1.10 TEMPORAL VARIATION

Presence of Heavy/Trace metals in ground water is also periodically monitored by CGWB and some elements such as Fe, Mn, Zn, Cu, Se, Sn, Mo are essential in trace amounts for growth and development of living organisms as well as plants. Nevertheless, these are hazardous in large amounts. In addition, some metals like Pb, As, Cd, Hg, Cr, Be, Ba, are hazardous even in small amounts. As per studies carried out during 2023, the minimum and maximum Concentration of Heavy Metals has been depicted in Table 14:

Table 14 Range of Heavy Metals in Groundwater of Haryana State

District	No. of	Range	Cd	Pb	Mn	Cu	Zn
	Samples		ppb		ppm		
Ambala	30	Min	0.011	0.076	0.000	0.000	0.026
		Max	0.631	66.097	1.084	0.162	0.790
Bhiwani	72	Min	0.006	-0.091	0.000	0.000	-0.001
		Max	0.458	3.173	0.188	0.006	0.228
Charkhi Dadri	18	Min	0.000	-0.098	0.000	0.000	-0.001
		Max	0.441	1.208	0.199	0.005	0.544
Faridabad	12	Min	0.024	-0.053	0.000	0.000	0.001
		Max	1.094	0.841	0.308	0.007	1.767
Fatehabad	34	Min	0.030	-0.104	0.000	0.000	0.009
		Max	0.635	5.206	0.163	0.007	0.774
Gurugram	47	Min	0.006	-0.065	0.000	0.000	-0.004
		Max	0.172	0.128	0.067	0.007	0.176
Hisar	58	Min	0.002	-0.119	0.000	0.000	0.001
		Max	0.540	26.566	0.218	0.089	7.477
Jhajjar	33	Min	0.086	0.168	0.001	0.001	0.010
		Max	0.875	1.575	0.329	0.017	1.411
Jind	59	Min	0.049	-0.050	0.000	0.000	0.003
		Max	0.861	2.907	0.090	0.318	5.322
Kaithal	43	Min	0.002	-0.044	0.000	0.000	0.001
		Max	0.687	2.494	0.376	0.005	8.107
Karnal	54	Min	0.048	0.147	0.001	0.001	0.020
		Max	0.729	2.146	0.167	0.033	2.623
Kurukshetra	36	Min	0.003	-0.198	0.000	0.000	0.001
		Max	0.888	7.503	0.091	0.012	0.785
Mahendragarh	27	Min	0.006	-0.062	0.000	0.000	-0.003
		Max	0.086	0.069	0.001	0.005	0.106
Mewat	27	Min	0.015	-0.063	0.000	0.000	-0.004
		Max	0.091	0.060	0.113	0.002	0.100
Palwal	30	Min	0.051	-0.008	0.001	0.001	0.016

		Max	1.169	7.304	0.532	0.007	5.567
Panchkula	30	Min	0.098	0.068	0.001	0.001	0.024
		Max	1.167	5.825	0.126	0.040	2.765
Panipat	53	Min	0.057	0.073	0.001	0.001	0.014
		Max	1.003	2.610	0.283	0.016	0.547
Rewari	27	Min	0.003	-0.090	0.001	0.000	0.004
		Max	0.665	1.646	0.466	0.006	1.446
Rohtak	32	Min	0.080	0.096	0.001	0.001	0.005
		Max	0.437	1.683	0.254	0.053	0.187
Sirsa	67	Min	0.027	-0.115	0.000	0.000	-0.001
		Max	1.114	7.457	0.162	0.008	1.580
Sonipat	56	Min	0.046	-0.047	0.001	0.000	0.006
		Max	1.290	3.409	0.232	0.012	5.219
Yamunanagar	36	Min	0.063	0.146	0.001	0.001	0.037
		Max	1.035	2.527	1.073	0.017	1.717

2.5.11 Ground water Quality in respect of Heavy Metals

Cadmium:

The concentrations of cadmium in shallow ground water in Haryana State are within the permissible limit. Permissible limit as per BIS 10500:2012 is 0.003 mg/L.

Copper:

The concentrations of copper in shallow ground water in Haryana State are within the permissible limit. Permissible limit as per BIS 10500:2012 is 1.5 mg/L.

Manganese:

Manganese above 0.3 mg/L with higher concentration being reported from Ambala, Faridabad, Jhajjar, Kaithal, Palwal, Rewari and Yamunanagar districts. It ranges from BDL to 1.08 mg/L at Dhanora in Ambala district.

Lead:

Lead above 0.01 mg/L is found at one location each in Ambala and Hisar district. In the rest of ground water samples concentrations of Lead in the state of Haryana are found within the permissible limits. Permissible limit as per BIS 10500:2012 is 0.01 mg/L.

Zinc:

The concentrations of Zinc in shallow ground water in Haryana State are within the permissible limit. Permissible limit as per BIS 10500:2012 is 15.0 mg/L.

Arsenic:

Arsenic above 0.01 mg/L with higher concentration being reported from Rohtak, Karnal, Sonipat, Fatehabad, Bhiwani districts. Sporadic case of highest Arsenic value have been reported at Samain (0.047 mg/L) in Fatehabad district.

Uranium:

Uranium is found above permissible limit (0.03 mg/L) in almost every district of Haryana. Uranium above 0.03 mg/L with higher concentration being reported from Ambala, Bhiwani, Faridabad, Fatehabad, Hisar, Jhajjar, Jind, Karnal, Kaithal, Kurukshetra, Mewat, Palwal, Panipat, Sirsa, Sonipat districts. Sporadic case of highest uranium value has been reported at Surbrah village 0.138 mg/L) of Jind district.

2.5.12 CONCLUSION & RECOMMENDATIONS OF GROUND WATER QUALITY VARIATIONS

On perusal of above carried study, it can be concluded that in Haryana:

- Chemical quality in shallow ground water occurring in northern and northeastern parts is suitable for drinking as well as forirrigation.
- Shallow ground water occurring in central parts has intermediate quality and is permitted for drinking use in case there is no alternative source. However, it is suitable for irrigation on well-drained soil for salt tolerant crops such as wheat, maize, barley etc.
- Quality of shallow ground water occurring in southern and western parts is not suitable for drinking as well as for customary irrigation. The reason for unsuitability for drinking uses is high concentrations of either salinity or nitrate or fluoride. The reason for rejection for irrigation uses are high salinity coupled with high SAR and RSC values more than 2.5 meq/l. However, these waters can be used for irrigation in conjunction with surface water.
- Groundwater is the largest available source of fresh water. It gets replenished by natural process and if balance could be maintained between utilization and replenishment, a perennial supply can be assured. Unfortunately, only 92% of the State's area is suitable for groundwaterdevelopment. In the remaining area either the water is unfit for irrigation or thickness of granular zones is inadequate.
- Continued development of the fresh groundwater area located in North Eastern part of the state has resulted in decline of water table. Farmers have to construct deeper wells involving more investment. Another major problem faced by farmers of south and southwestern part of Haryana is the poor quality of groundwater and low discharge from tubewells. This problem is further compounded because of undulating topography and light soils, particularly in the districts of Bhiwani, Rohtak, Mahendragarh, Jhajjar and Hisar. The third problem is in areas where water table is rising and creating water logging problems and salinity hazards.
- Suitable management practices are, therefore, called for groundwater development for augmenting agricultural production on a continual basis. The farmers have taken initiative in this direction by constructing tubewells with submersible pumps. But the water table depletion needs to be contained by curtailment of the groundwater exploitation, conservation practices, rainwater harvesting, change in cropping pattern, suitable land use practices, irrigation management, conjunctive use of surface and groundwater, adoption of efficient method of water application and artificial re-charge practices. The water management in saline area's where water table is rising and creating water logging and salinity problems needs improvement in water use efficiency and surface and sub surface drainages.
- Ground water potential has been worked out as per the guidelines issued by the Govt. of India. **As on 31st March 2024, 88 assesment units fall under "Over Exploited", 11 assesment units are "Critical", 08 assesment units are "Semi-Critical" and 36 assesment units are of "Safe" category.** The detail of assessment units falling under various categories is annexed.
- The over exploited blocks are marked by over development of groundwater resources due to good quality of water and hence higher withdrawal, high growth of tubewells and also high density of tubewells, steep decline in water levels, with no or low critical and water-logged area. The "Critical" blocks area characterized by moderate development of ground water due to mixed quality of ground water, nominal growth and moderate density of tubewells, decline in water level and critical and water-logged area. In semi-critical and safe blocks there is low

development of ground water due to poor quality of ground water and hence lesser withdrawal, less growth of tubewells, less density of tubewells, continuous rise of water level, large critical & water-logged area. In these areas, there is a thin fresh ground water lens over the saline water, which is only being exploited.

CHAPTER- 3
GROUND WATER RESOURCES ESTIMATION METHODOLOGY, 2015

The revised methodology GEC 2015 recommends aquifer wise ground water resource assessment. Ground water resources have two components – Replenishable ground water resources or Dynamic Ground Water Resources and In-storage Resources or Static Resources. GEC 2015 recommends estimation of Replenishable and in-storage ground water resources for both unconfined and confined aquifer. Wherever the aquifer geometry has not been firmly established for the unconfined aquifer, the in-storage ground water resources have to be assessed in the alluvial areas up to the depth of bed rock or 300 m whichever is less. In case of hard rock aquifers, the depth of assessment would be limited to 100 m. In case of confined aquifers, if it is known that ground water extraction is being taken place from this aquifer, the dynamic as well as in-storage resources are to be estimated. If it is firmly established that there is no ground water extraction from this confined aquifer, then only instorage resources of that aquifer has to be estimated

3.1 PERIODICITY OFASSESSMENT

Keeping in view of the rapid change in Ground Water Extraction, the committee recommends more frequent estimation of Ground Water Resources. The committee observes that the comprehensive assessment of Ground Water Resources is a time intensive exercise. Hence as a tradeoff, it recommends that the resources should be assessed once in every three years. As per the present practice, there is a considerable time lag between assessment and publication of the results. Hence the committee recommends to make all out efforts to reduce the time lag and the results may be reported with in the successive water year.

3.2 GROUND WATER ASSESSMENTUNIT

This methodology recommends aquifer wise ground water resource assessment. An essential requirement for this is to demarcate lateral as well as vertical extent and disposition of different aquifers. A watershed with well-defined hydrological boundaries is an appropriate unit for ground water resource estimation if the principal aquifer is other than alluvium. Ground water resources worked out on watershed as a unit may be apportioned and presented on administrative units (block/ taluka/ mandal/ firka). This would facilitate local administration in planning of ground water management programmes. Areas occupied by unconsolidated sediments (alluvial deposits, aeolian deposits, coastal deposits etc.) usually have flat topography and demarcation of watershed boundaries may not be possible in such areas. Until Aquifer Geometry is established on appropriate scale, the existing practice of using watershed in hard rock areas and blocks/ mandals/ firkasin soft rock areas may becontinued.

The ground water resources assessment were carried out based on the guidelines of Ministry of Water Resources, RD & GR which broadly follows the methodology recommended by Ground Water Resources Estimation Committee, 2015. The salient features of the methodology are enumerated in the following paragraphs.

The ground water recharge is estimated season-wise both for monsoon season and non-monsoon season separately. The following recharge and discharge components are assessed in the resource assessment - recharge from rainfall, recharge from canal, return flow from irrigation, recharge from tanks and ponds and recharge from water conservation structures and discharge through ground water draft.

The ground water resources of any assessment unit is the sum of the total ground water availability in the principal aquifer (mostly unconfined aquifer) and the total ground water availability of semi-confined and confined aquifers existing in that assessment unit. The total ground water availability of any aquifer is the sum of Dynamic ground water resources and the In-storage or Static resources of the aquifer.

3.3 GROUND WATER ASSESSMENT OF UNCONFINED AQUIFERSYSTEM

As mentioned earlier, assessment of ground water includes assessment of dynamic and in- storage ground water resources. The development planning should mainly depend on dynamic resource only as it gets replenished every year. Changes in static or in-storage resources reflect impacts of ground water mining. Such resources may not be replenishable annually and may be allowed to be extracted only during exigencies with proper recharge planning in the succeeding excess rainfallyears.

Dynamic Ground Water Resources

The methodology for ground water resources estimation is based on the principle of water balance as given below –

Inflow – Outflow = Change in Storage (of an aquifer)

Equation 1 can be further elaborated as -

$$\Delta S = R_{RF} + R_{STR} + R_C + R_{SWI} + R_{GWI} + R_{TP} + R_{WCS} \pm VF \pm LF - GE - T - E - B$$

Where,

ΔS – Change in storage R_{RF} – Rainfall recharge

R_{STR}- Recharge from stream channels Rc – Recharge from canals

R_{SWI} – Recharge from surface water irrigation R_{GWI}- Recharge from ground water irrigation

R_{TP}- Recharge from Tanks and Ponds

R_{WCS} – Recharge from water conservation structures VF – Vertical flow across the aquifer system

LF- Lateral flow along the aquifer system (through flow) GE- Ground Water Extraction

T- Transpiration E- Evaporation B-Base flow

It is preferred that all the components of water balance equation should be estimated in an assessment unit. The present status of database available with Government and non- government agencies is not adequate to carry out detailed ground water budgeting in most of the assessment units. Therefore, it is proposed that at present the water budget may be restricted to the major components only taking into consideration certain reasonable assumptions. The estimation is to be carried out using lumped parameter estimation approach keeping in mind that data from many more sources if available may be used for refining theassessment.

Rainfall Recharge

It is recommended that ground water recharge should be estimated on ground water level fluctuation and specific yield approach since this method takes into account the response of ground water levels to ground water input and output components. This, however, requires adequately spaced representative water level measurement for a sufficiently long period. It is proposed that there should be at least three spatially well distributed observation wells in the assessment unit, or one observation well per 100 sq. Km. Water level data should also be available for a minimum period of 5 years (preferably 10years), along with corresponding rainfall data. Regarding frequency of water level data, three water level readings during pre and post monsoon seasons and in the month of January/ May preferably in successive years, are the minimum requirements. It would be ideal to have monthly water level measurements to record the peak rise and maximum fall in the ground water levels. In units or subareas where adequate data on ground water level fluctuations are not available as specified above, ground water recharge may be estimated using rainfall infiltration factor method only. The rainfall recharge during non-monsoon season may be estimated using rainfall infiltration factor methodonly.

Ground water level fluctuation method

The ground water level fluctuation method is to be used for assessment of rainfall recharge in the monsoon season. The ground water balance equation in non-command areas is given by

$$\Delta S = R_{RF}+R_{STR}+R_{SWI}+R_{GWI}+R_{TP}+R_{WCS} \pm VF \pm LF - GE - T - E - B \qquad 3$$

Where,

ΔS – Change in storage R_{RF} – Rainfall recharge
R_{STR}- Recharge from stream channels

R_{SWI} – Recharge from surface water irrigation (Lift Irrigation) R_{GWI}- Recharge from ground water irrigation
R_{TP}- Recharge from tank and ponds

R_{WCS} – Recharge from water conservation structures VF – Vertical flow across the aquifer system
LF- Lateral flow along the aquifer system (through flow) GE-Ground water Extraction
T- Transpiration E- Evaporation

B-Base flow

Whereas the water balance equation in command area will have another term Recharge due to canals (R_C) and the equation will be as follows:

$$\Delta S = R_{RF}+R_{STR}+R_C+R_{SWI}+R_{GWI}+R_T+R_{WCS}\pm VF \pm LF - GE - T - E - B \quad (4)$$

A couple of important observations in the context of water level measurement must be followed. It is important to bear in mind that while estimating the quantum of ground water extraction, the depth from which ground water is being extracted should be considered, and certain limit should be fixed. First, by estimating recharge by Water Level Fluctuation method, rise in water level (pre to post monsoon Water Level observed in a dug well) is considered and inestimating the draft from dug wells and bore wells (shallow and deep) drop in water level is considered. One should consider only the draft from the same aquifer for which the resource is beingestimated.

The change in storage can be estimated using the following equation:

$$\Delta S = \Delta h * A * S_Y \quad (5)$$

Where

ΔS – Change in storage

Δh - rise in water level in the monsoon season A - area for computation of recharge

Sy - Specific Yield

Substituting the expression in equation 5 for storage increase ΔS in terms of water level fluctuation and specific yield, the equations 3 and 4 becomes,

$$R_{RF} = h \times Sy \times A - R_{STR} - R_{SWI} - R_{GWI} - R_{TP} - R_{WCS} \pm VF \pm LF + GE + T + E + B \quad (6)$$

$$R_{RF} = h \times Sy \times A - R_C - R_{STR} - R_{SWI} - R_{GWI} - R_{TP} - R_{WCS} \pm VF \pm LF + GE + T + E + B \quad (7)$$

The recharge calculated from equation 6 in case of non-command sub units and equation 7 in case of command sub units and poor ground water quality sub units gives the rainfall recharge for the particular monsoon season. However, it may be noted that in case base flow/ recharge from stream and through flow have not been estimated, the same may be assumed to be zero.

The rainfall recharge obtained by using equation 6 and equation 7 provides the recharge in any particular monsoon season for the associated monsoon season rainfall. This estimate is to be normalised for the normal monsoon season rainfall as per the procedure indicated below.

Normalization of Rainfall Recharge

Let Ri be the rainfall recharge and ribe the associated rainfall. The subscript i takes values 1 to N where N is number of years data is available which is at least 5. The rainfall recharge, Ri is obtained as per equation 6 and equation 7 depending on the sub unit for which the normalization is beingdone.

$$R_i = h \times Sy \times A - R_{STR} - R_{SWI} - R_{GWI} - R_{TP} - R_{WCS} \pm VF \pm LF + GE + T + E + B \quad (8)$$

$$R_i = h \times Sy \times A - R_C - R_{STR} - R_{SWI} - R_{GWI} - R_{TP} - R_{WCS} \pm VF \pm LF + GE + T + E + B \quad (9)$$

Where

Ri = Rainfall recharge estimated in the monsoon season for the i^{th} particular year

h = Rise in ground water level in the monsoon season for the i^{th} particular year

Sy =Specificyield

A = Area for computation ofrecharge

GE = Ground water extraction in monsoon season for the i^{th} particular year

B= Base flow the monsoon season for the i^{th} particularyear

R_C = Recharge from canals in the monsoon season for i^{th} particular year

R_{STR}= Recharge from stream channels in the monsoon season for i^{th} particular year

R_{SWI}= Recharge from surface water irrigation including lift irrigation in themonsoon Season for the i^{th} particular year

R_{GWI}= Recharge from groundwater irrigation in the monsoon season for the i^{th}particularyear

R_{WCS}=Recharge from water conservation structures in the monsoon season for the i^{th}particularyear

R_{TP} = Recharge from tanks and ponds in the monsoon season for the i^{th} particular year

LF = Recharge through Lateral flow/ through flow across assessment unit boundary in the monsoon season for the i^{th} particularyear

VF – Vertical flow across the aquifer system in the monsoon season for the i^{th} particular year

T- Transpiration in the monsoon season for the i^{th} particular year E- Evaporation in the monsoon season for the i^{th} particular year

After the pairs of data on Ri and ri have been obtained as described above, a normalisation procedure is to be carried out for obtaining the rainfall recharge corresponding to the normal monsoon season rainfall. Let r(normal) be the normal monsoon season rainfall obtained on the basis of recent 30 to 50 years of monsoon season rainfall data. Two methods are possible for the normalisation procedure.

The first method is based on a linear relationship between recharge and rainfall of the form

$$R = ar \quad (10)$$

Where,

R = Rainfall recharge during monsoon season r = Monsoon season rainfall

a = a constant

The computational procedure to be followed in the first method is as given below:

$$R_{rf}(normal) = \frac{\sum_{i=1}^{N}\left[R_i \times \frac{r(normal)}{r_i}\right]}{N} \quad (11)$$

Where,

$R_{rf\ (normal)}$ - Normalized Rainfall Recharge in the monsoon season. R_i- Rainfall Recharge in the monsoon season for the i^{th} year.
R (normal) - Normal monsoon Season rainfall.
r_i- Rain fall in the monsoon season for the i^{th} year. N - No, of years data is available.

The second method is also based on a linear relation between recharge and rainfall.

However, this linear relationship is of the form,

$$R = ar+b \qquad 12$$

where,

R = Rainfall recharge during monsoon season r = Monsoon season rainfall
a and b =constants.
The two constants "a" and "b" in the above equation are obtained through a linear regression analysis. The computational procedure to be followed in the second method is as given below:

$$a = \frac{NS_4 - S_1 S_2}{NS_3 - S_1^2} \qquad 13$$

$$b = \frac{S_2 - aS_1}{N} \qquad 14$$

$$S_1 = \sum_{i=1}^{N} r_i \qquad S_2 = \sum_{i=1}^{N} R_i \qquad S_3 = \sum_{i=1}^{N} r_i^2 \qquad S_4 = \sum_{i=1}^{N} r_i R_i$$

The rainfall recharge during monsoon season for normal monsoon rainfall condition is computed as below:

$$\mathbf{R_{rf}\ (normal) = a \times r(normal) + b} \qquad \mathbf{15}$$

Rainfall Infiltration Factor method

The rainfall recharge estimation based on Water level fluctuation method reflects actual field conditions since it takes into account the response of ground water level. However, the ground water extraction estimation included in the computation of rainfall recharge using Water Level Fluctuation approach is often subject to uncertainties. Therefore, it is recommended to compare the rainfall recharge obtained from Water Level Fluctuation approach with that estimated using Rainfall Infiltration Factor Method.
Recharge from rainfall is estimated by using the following relationship -

$$\mathbf{R_{rf} = RFIF * A * (R - a)/1000} \qquad \mathbf{16}$$

Where,

R_{rf} = Rainfall recharge in ham A = Area in Hectares
RFIF = Rainfall Infiltration Factor R = Rainfall in mm
a = Minimum threshold value above which rainfall induces ground water recharge in mmThe relationship between rainfall and ground water recharge is a complex phenomenon depending on several factors like runoff coefficient, moisture balance, hydraulic conductivity and Storativity/ Specific yield of the aquifer etc. In this report, certain assumptions have been adopted for computation of Rainfall recharge factor. These assumptions may be replaced with actual data in case such area specific studies are available. At the same time, it is important to bring in elements of rainfall distribution and variability into sharpening the estimates of precipitation. Average rainfall data from nearby rain gauge stations may be considered for the Ground water assessment unit and the average rainfall may be estimated by the Theisen polygon or isohyet methods. Alternatively other advanced methods may also beused.

The threshold limit of minimum and maximum rainfall event which can induce recharge to the aquifer is to be considered while estimating ground water recharge using rainfall infiltration factor. The minimum threshold limit is in accordance with the relation shown in equation 16 and the maximum threshold limit is based on the premise that after a certain limit, the rate of storm rainsis too high to infiltrate the ground and they will only contribute to surface runoff. It is suggested that 10% of Normal annual rainfall be taken as Minimum Rainfall Threshold and 3000 mm as Maximum Rainfall limit. While computing the rainfall recharge, 10% of the normal annual rainfall is to be deducted from the monsoon rainfall and balance rainfall would be considered for computation of rainfall recharge. The same recharge factor may be used for both monsoon and non-monsoon rainfall, with the condition that the recharge due to non-monsoon rainfall may be taken as zero, if the normal rainfall during the non-monsoon season is less than 10% of normal annual rainfall. In using the method based on the specified norms, recharge due to both monsoon and non-monsoon rainfall may be estimated for normal rainfall, based on recent 30 to 50 years ofdata.

Percent Deviation

After computing the rainfall recharge for normal monsoon season rainfall using the water table fluctuation method and Rainfall Infiltration Factor method these two estimates have to be compared with each other. A term, Percent Deviation (PD) which is the difference between the two expressed as a percentage of the former is computed as

$$PD = \frac{R_{rf}(normal,wtfm) - R_{rf}(normal,rifm)}{R_{rf}(normal,wtfm)} \times 100 \qquad \textbf{17}$$

where,

Rrf (normal, wlfm) = Rainfall recharge for normal monsoon season rainfall estimated by the

water level fluctuation method
Rrf (normal, rifm) = Rainfall recharge for normal monsoon season rainfall estimated by the rainfall infiltration factor method

The rainfall recharge for normal monsoon season rainfall is finally adopted as per the criteria given below:

- If PD is greater than or equal to -20%, and less than or equal to +20%, Rrf (normal) is taken as the value estimated by the water level fluctuationmethod.
- If PD is less than -20%, Rrf (normal) is taken as equal to 0.8 times the value estimated by the rainfall infiltration factormethod.
- If PD is greater than +20%, Rrf (normal) is taken as equal to 1.2 times the value estimated by the rainfall infiltration factormethod.

Recharge from other Sources

Recharge from other sources constitute recharges from canals, surface water irrigation, ground water irrigation, tanks and ponds and water conservation structures in command areas where as in non-command areas the recharge due to surface water irrigation, ground water irrigation, tanks and ponds and water conservation structures are possible.

Recharge from Canals: Recharge due to canals is to be estimated based on the following formula:

$$\mathbf{R_C = WA * SF * Days} \qquad \mathbf{18}$$

Where:

R_C= Recharge from Canals WA=Wetted Area
SF= Seepage Factor

Days= Number of Canal Running Days.

Recharge from Surface Water Irrigation: Recharge due to applied surface water irrigation, either by means of canal outlets or by lift irrigation schemes is to be estimated based on the following formula:

$$\mathbf{R_{SWI} = AD*Days*RFF} \qquad \mathbf{19}$$

Where:

R_{SWI} = Recharge due to applied surface water irrigation AD= Average Discharge
Days=Number of days water is discharged to the Fields RFF= Return Flow Factor

Recharge from Ground Water Irrigation: Recharge due to applied ground water irrigation is to be estimated based on the following formula:

$$\mathbf{R_{GWI} = GE_{IRR}*RFF} \qquad \mathbf{20}$$

Where:

R_{GWI} = Recharge due to applied ground water irrigation GE_{IRR}= Ground Water Extraction for Irrigation
RFF= Return Flow Factor

Recharge due to Tanks and Ponds: Recharge due to Tanks and Ponds is to be estimated based on the following formula:

$$\mathbf{R_{TP} = AWSA * RF} \qquad \mathbf{21}$$

Where:

R_{TP} = Recharge due to Tanks and Ponds AWSA= Average Water Spread Area RF= Recharge Factor

Recharge due to Water Conservation Structures: Recharge due toWater Conservation Structures is to be estimated based on the followingformula:

$$\mathbf{R_{WCS} = GS * RF} \qquad \mathbf{22}$$

Where:

R_{WCS} = Recharge due to Water Conservation Structures

GS= Gross Storage = Storage Capacity multiplied by number of fillings.
RF= Recharge Factor

Lateral flow along the aquifer system (Through flow)

In equations 6 and 7, if the area under consideration is a watershed, the lateral flow across boundaries can be considered as zero in case such estimates are not available. If there is inflow and outflow across the boundary, theoretically, the net inflow may be calculated using Darcy law, by delineating the inflow and outflow sections of the boundary. Besides such delineation, the calculation also requires estimate of transmissivity and hydraulic gradient across the inflow and outflow sections. These calculations are most conveniently done in a computer model. It is recommended to initiate regional scale modelling with well-defined flow boundaries. Once the modelling is complete, the lateral through flows (LF) across boundaries for any assessment unit can be obtained from the model. In case Lateral Flow is calculated using computer model, the same should be included in the water balanceequation.

Base flow and Stream Recharge

If stream gauge stations are located in the assessment unit, the base flow and recharge from streams can be computed using Stream Hydrograph Separation method, Numerical Modelling and Analytical solutions. If the assessment unit is a watershed, a single stream monitoring station at the mouth of the watershed can provide the required data for the calculation of base flow. Any other information on local-level base flows such as those collected by research centres, educational institutes or NGOs may also be used to improve the estimates on baseflows.

Base flow separation methods can be divided into two main types: non-tracer-based and tracer-based separation methods. Non-tracer methods include Stream hydrograph analysis, water balance method and numerical ground water modelling techniques. Digital filters are available for separating base flow component of the stream hydrograph.

Hydro-chemical tracers and environmental isotope methods also use hydrograph separation techniques based on mass balance approach. Stream recharge can also be estimated using the above techniques.

Base flow assessment and Stream recharge should be carried out in consultation with Central Water Commission in order to avoid any duplicity in the estimation of total water availability in a river basin.

Vertical Flow from Hydraulically Connected Aquifers

This can be estimated provided aquifer geometry and aquifer parameters are known. This can be calculated using the Darcy‟slaw if the hydraulic heads in both aquifers and thehydraulic conductivity and thickness of the aquitard separating both the aquifers are known. Ground water flow modelling is an important tool to estimate such flows. As envisaged in this report regional scale modelling studies will help in refining vertical flowestimates.

Evaporation and Transpiration

Evaporation can be estimated for the aquifer in the assessment unit if water levels in the aquifer are within the capillary zone. It is recommended to compute the evaporation through field studies. If field studies are not possible, for areas with water levels within 1.0 mbgl, evaporation can be estimated using the evaporation rates available for other adjoining areas. If depth to water level is more than 1.0m bgl, the evaporation losses from the aquifer should be taken aszero.

Transpiration through vegetation can be estimated if water levels in the aquifer are within the maximum root zone of the local vegetation. It is recommended to compute the transpiration through field studies. Even though it varies from place to place depending on type of soil and vegetation, in the absence of field studies the following estimation can be followed. If water levels are within 3.5m bgl, transpiration can be estimated using the transpiration rates available for other areas. If it is greater than 3.5m bgl, the transpiration should be taken aszero.

For estimating evapotranspiration, field tools like Lysimeters can be used to estimate actual evapotranspiration. Usually, agricultural universities and IMD carry out lysimeter experiments and archive the evapotranspiration data. Remote sensing-based techniques like SEBAL (Surface Energy Balance Algorithm for Land) can be used for estimation of actual evapotranspiration. Assessing offices may apply available lysimeter data or other techniques for estimation of evapotranspiration. In case where such data is not available, evapotranspiration losses can be empirically estimated from PET data provided by IMD.

Recharge during Monsoon Season

The sum of normalized monsoon rainfall recharge and the recharge from other sources and lateral and vertical flows into the sub unit and stream inflows during monsoon season is the total recharge during monsoon season for the sub unit. Similarly, this is to be computed for all the sub units available in the assessmentunit.

Recharge during Non-Monsoon Season

The rainfall recharge during non-monsoon season is estimated using Rainfall Infiltration factor Method only when the non-monsoon season rainfall is more than 10% of normal annual rainfall. The sum of non-monsoon rainfall recharge and the recharge from other sources and

lateral and vertical flows into the sub unit and stream inflows during non-monsoon season is the total recharge during non-monsoon season for the sub unit. Similarly, this is to be computed for all the sub units available in the assessment unit.

Total Annual Ground Water Recharge

The sum of the recharge during monsoon and non-monsoon seasons is the total annual ground water recharge for the sub unit. Similarly, this is to be computed for all the sub units available in the assessment unit.

Annual Extractable Ground Water Recharge (EGR)

The Total Annual Ground Water Recharge cannot be utilised for human consumption, since ecological commitments need to be fulfilled, before the extractable resources is defined. The National Water Policy, 2012 stresses that the ecological flow of rivers should be maintained. Therefore, Ground water base flow contribution limited to the ecological flow of the river should be determined which will be deducted from Annual Ground Water Recharge to determine Annual Extractable Ground Water Resources (EGR). The ecological flows of the rivers are to be determined in consultation with Central Water Commission and other concerned river basinagencies.

In case base flow contribution to the ecological flow of rivers is not determined then following assumption is to be followed. In the water level fluctuation method, a significant portion of base flow is already accounted for by taking the post monsoon water level one month after the end of rainfall. The base flow in the remaining non-monsoon period is likely to be small, especially in hard rock areas. In the assessment units, where river stage data are not available and neither the detailed data for quantitative assessment of the natural discharge are available, present practice (GEC 1997) of allocation of unaccountable natural discharges to 5% or 10% of annual recharge may be retained. If the rainfall recharge is assessed using water level fluctuation method this will be 5% of the annual recharge and if it is assessed using rainfall infiltration factor method, it will be 10% of the annual recharge. The balance will account for Annual Extractable Ground Water Resources(EGR).

Estimation of Ground Water Extraction

Groundwater draft or extraction is to be assessed as follows.

$$\mathbf{GE_{ALL} = GE_{IRR} + GE_{DOM} + GE_{IND}} \qquad \mathbf{23}$$

Where,

GE_{ALL}=Ground water extraction for all uses GE_{IRR}=Ground water extraction for irrigation GE_{DOM} =Ground water extraction for domestic uses GE_{IND} = Ground water extraction for industrial uses

Ground Water Extraction for Irrigation (GE_{IRR}): The single largest component of the groundwater balance equation in large regions of India is the groundwater extraction and, the precise estimation of ground water extraction is riddled with uncertainties. Therefore,it is recommended that at least two of the three methods for estimation of ground water extraction may be employed in each assessment subunit.

The methods for estimation of ground water extraction are as follows:

***Unit Draft Method:* –** In this method, season-wise unit draft of each type of well in an assessment unit is estimated. The unit draft of different types (eg. Dug well, dug cum bore well, shallow tube well, deep tube well, bore well etc.) is multiplied with the number of wells of that particular type to obtain season-wise ground water extraction by that particular structure. This method is being widely practiced in the country. There are several sources which maintain records on well census. These include Minor Irrigation Census conducted by MoWR, RD, GR, Government of India, and data maintained at the Tehsil level. It is recommended that a single source of well census should be maintained for resources computation at all India level. Minor Irrigation Census of MoWR, RD, GR would be the preferred option.

***Crop Water Requirement Method:* –** For each crop, the season-wise net irrigation water requirement is determined. This is then multiplied with the area irrigated by ground water abstraction structures. The database on crop area is obtained from Revenue records in Tehsil office, Agriculture Census and also by using Remote Sensing techniques.

***Power Consumption Method:* –** Ground water extraction for unit power consumption (electric) is determined. Extraction per unit power consumption is then multiplied with number of units of power consumed for agricultural pump sets to obtain total ground water extraction for irrigation. Direct metering of ground water draft in select irrigation and domestic wells and in all wells established for industrial purpose may be initiated. Enforcing fitting of water meters and recording draft in all govt. funded wells could also be a feasible option. The unit drafts obtained from these sample surveys can be used to assess ground water extraction. In addition to metering, dedicated field sample surveys (instantaneous discharge measurements) can also be takenup.

Ground Water Extraction for Domestic Use (GE_{DOM}): There are several methods for estimation of extraction for domestic use (GE_{DOM}). Some of the commonly adopted methods are described here.

***Unit Draft Method:* –** In this method, unit draft of each type of well is multiplied by the number of wells used for domestic purpose to obtain the domestic ground water draft.

***Consumptive Use Method:* –** In this method, population is multiplied with per capita consumption usually expressed in litre per capita per day (lpcd). It can be expressed using following equation.

$$GE_{DOM} = \text{Population} \times \text{Consumptive Requirement} \times Lg \qquad 24$$

Where,

Lg = Fractional Load on Ground Water for Domestic Water Supply

The Load on Ground water can be obtained from the Information based on Civic water supply agencies in urban areas.

Ground water Extraction for Industrial use (GE_{IND}): The commonly adopted methods for estimating the extraction for industrial use are as below:

Unit Draft Method: - In this method, unit draft of each type of well is multiplied by the number

of wells used for industrial purpose to obtain the industrial ground water extraction.

Consumptive Use Pattern Method: **–** In this method, water consumption of different industrial units are determined. Numbers of Industrial units which are dependent on ground water are multiplied with unit water consumption to obtain ground water draft for industrial use.

$$GE_{IND} = \text{Number of industrial units X Unit Water Consumption X Lg} \qquad 25$$

Where,

Lg = Fractional load on ground water for industrial water supply

The load on Ground water for Industrial water supply can be obtained from water supply agencies in the Industrial belt. Other important sources of data on ground water extraction for industrial uses are - Central Ground Water Authority, State Ground Water Authority, National Green Tribunal and other Environmental Regulatory Authorities.

Ground water extraction obtained from different methods need to be compared and based on field 7checks, the seemingly best value may be adopted. At times, ground water extraction obtained by different methods may vary widely. In such cases, the value matching the field situation should be considered. The storage depletion during a season where other recharges are negligible can be taken as ground water extraction during that particularperiod.

Stage of Ground Water Extraction

The stage of ground water extraction is defined by,

$$\text{Stage of Ground Water Extraction} = \frac{\text{Existing gross ground water extraction for all use}}{\text{Annual Extractable Ground water Resources}} \times 100 \qquad 26$$

The existing gross ground water extraction for all uses refers to the total of existing gross ground water extraction for irrigation and all other purposes. The stage of ground water extraction should be obtained separately for command areas, non-command areas and poor ground water quality areas.

Validation of Stage of Ground Water Extraction

The assessment based on the stage of ground water extraction has inherent uncertainties. The estimation of ground water extraction is likely to be associated with considerable uncertainties as it is based on indirect assessment using factors such as electricity consumption, well census and area irrigated from ground water. The denominator in equation 26, namely Annual Extractable Ground Water Resources also has uncertainties due to limitations in the assessment methodology, as well as uncertainties in the data. In view of this, it is desirable to validate the „Stage of Ground Water Extraction" with long term trend of ground water levels.

Long term Water Level trends are to be prepared for a minimum period of 10 years for both pre-monsoon and post-monsoon period. The Water level Trend would be average water level trend as obtained from the different observation wells in thearea.

In interpreting the long-term trend of ground water levels, the following points may be kept in view. If the pre and post monsoon water levels show a fairly stable trend, it does not necessarily mean that there is no scope for further ground water development. Such a trend

indicates that there is a balance between recharge, extraction and natural discharge in the unit. However, further ground water development may be possible, which may result in a new stable trend at a lower ground water level with associated reduced natural discharge.

If the ground water resource assessment and the trend of long-term water levels contradict each other, this anomalous situation requires a review of the ground water resource computation, as well as the reliability of water level data. The mismatch conditions are enumerated below (Table15).

Table 15 Stage of Ground Water Development in relation to Water Level Trends

SOGWD	Ground Water level trend	Remarks
≤70%	Decline trend in both pre-monsoon and post- monsoon	Not acceptable and needs reassessment
>100%	No significant decline in both pre-monsoon and post-monsoon long term trend	Not acceptable and needs reassessment

In case, the category does not match with the water level trend given above, a reassessment should be attempted. If the mismatch persists even after reassessment, the sub unit may be categorized based on Stage of Ground Water Extraction of the reassessment. However, the sub unit should be flagged for strengthening of observation well network and parameter estimation.

Categorisation of Assessment Units

As emphasised in the National Water Policy, 2012, a convergence of Quantity and Quality of ground water resources is required while assessing the ground water status in an assessment unit. Therefore, it is recommended to separate estimation of resources where water quality is beyond permissible limits for the parameter salinity.

Categorization of Assessment Units Based on Quantity: The categorization based on statusofgroundwaterquantityisdefinedbyStageofGroundWaterextractionasgivenbelow:

Table 16 Stage of Ground Water Development

Stage of Ground Water Extraction	Category
≤70%	Safe
> 70%and ≤90%	Semi-Critical
> 90%and ≤100%	Critical
> 100%	Over Exploited

In addition to this Category every assessment sub unit should be tagged with potentiality tag indicating its ground water potentiality viz. Poor Potential (Unit Recharge <0.025m), Moderately Potential (Unit Recharge in between 0.025 and 0.15m) and Highly Potential (Unit Recharge >0.15m).

Categorization of Assessment Units Based on Quality

To adequately inform management decisions, quality of ground water is also an essential criterion. The Committee deliberated upon the possible ways of categorizing the assessment units based on ground water quality in the assessment units. It was realized that based on the available water quality monitoring mechanism and available database on ground water quality it may not be possible to categorize the assessment units in terms of the extent of quality hazard. As a trade-off, the Committee recommends that each assessment unit, inadditionto the Quantity based categorization (safe, semi-critical, critical and over-exploited) should bear a quality hazard identifier. Such quality hazards are to be based on available ground water monitoring data of State Ground Water Departments and/or Central Ground Water Board. If any of the three quality hazards in terms of Arsenic, Fluoride and Salinity are encountered in the assessment sub unit in mappable units, the assessment sub unit may be tagged with the particular Qualityhazard.

Allocation of Ground Water Resource for Utilisation

The Annual Extractable Ground Water Resources are to be apportioned between domestic, industrial and irrigation uses. Among these, as per the National Water Policy, requirement for domestic water supply is to be accorded priority. This requirement has to be based on population as projected to the year 2025, per capita requirement of water for domestic use, and relative load on ground water for urban and rural water supply. The estimate of allocation for domestic water requirement may vary for one sub unit to the other in different states. In situations where adequate data is not available to make this estimate, the following empirical relation is recommended.

$$\textbf{Alloc} = 22 \times N \times L_g \text{ mm per year} \qquad 27$$

Where

Alloc= Allocation for domestic water requirement

N = population density in the unit in thousands per sq. km.

L_g = fractional load on ground water for domestic and industrial water supply (1.0)

In deriving equation 27, it is assumed that the requirement of water for domestic use is 60 lpcd. The equation can be suitably modified in case per capita requirement is different. If by chance, the estimation of projected allocation for future domestic needs is less than the current domestic extraction due to any reason, the allocation must be equal to the present-day extraction. It can never be less than the present-day extraction as it isunrealistic.

Net Annual Ground Water Availability for Future Use

The water available for future use is obtained by deducting the allocation for domestic use and current extraction for Irrigation and Industrial uses from the Annual extractable Ground water recharge. The resulting ground water potential is termed as the net annual ground

water availability for future use. The Net annual ground water availability for future use should be calculated separately for non-command areas and command areas. As per the recommendations of the R&D Advisory committee, the ground water available for future use can never be negative. If it becomes negative, the future allocation of Domestic needs can be reduced to current extraction for domestic use. Even then if it is still negative, then the ground water available for future uses will bezero.

Additional Potential Resources under Specific Conditions

Potential Resource Due to Spring Discharge: Spring discharge constitutes an additional source of ground water in hilly areas which emerges at the places where ground water level cuts the surface topography. The spring discharge is equal to the ground water recharge minus the outflow through evaporation and evapotranspiration and vertical and lateral sub- surfaceflow.

Thus, Spring Discharge is a form of "Annual Extractable Ground Water Recharge". It is a renewable resource, though not to be used for Categorisation. Spring discharge measurement is to be carried out by volumetric measurement of discharge of the springs. Spring discharges multiplied with time in days of each season will give the quantum of spring resources available during that season. The committee recommends that in hilly areas with substantial potential of spring discharges, the discharge measurement should be made at least 4 times a year in parity with the existing water level monitoring schedule.

Potential ground water resource due to springs = Q x No of days

Where

Q = Spring Discharge

No of days= No of days spring yields.

Potential Resource in Waterlogged and Shallow Water Table Areas: The quantum of water available for development is usually restricted to long term average recharge or in other words "Dynamic Resources". But the resource calculated by water level fluctuation approach is likely to lead to under-estimation of recharge in areas with shallow water table, particularly in discharge areas of sub-basin/ watershed/ block/ taluka and waterlogged areas. In such cases rejected recharge may be substantial and water level fluctuations are subdued resulting in under-estimation of recharge component. It is therefore, desirable that the ground water reservoir should be drawn to optimum limit before the onset of monsoon, to provide adequate scope for its recharge during the following monsoonperiod.

In the area where the ground water level is less than 5m below ground level or in waterlogged areas, the resources up to 5m below ground level are potential and would be

available for development in addition to the annual recharge in the area. It is therefore recommended that in such areas, ground water resources may be estimated up to 5m bgl only assuming that where water level is less than 5m bgl, the same could be depressed by pumping to create space to receive recharge from natural resources. It is further evident that these potential recharges would be available mostly in the shallow water table areas which would have to be

demarcated in each sub-basin/ watershed/ block/ taluka/ mandal.

The computation of potential resource to ground water reservoir can be done by adopting the following equation:

Potential ground water resource in shallow water table areas = (5-D) x A x S_Y **29**

Where

D = Depth to water table below ground surface in pre-monsoon period in shallow aquifers.

A = Area of shallow water table zone. S_Y = Specific Yield

The planning of future minor irrigation works in the waterlogged and shallow water table areas as indicated above should be done in such a way that there should be no long-term adverse effects of lowering of water table up to 5m and the water level does not decline much below 5m in such areas. The behaviour of water table in the adjoining area which is not water logged should be taken as a bench mark for developmentpurposes.

This potential recharge to ground water is available only after depression of water level up to 5m bgl. This is not an annual resource and should be recommended for development on a very cautious approach so that it does not adversely affect the ground water potentials in the overallarea.

Potential Resource in Flood Prone Areas: Ground water recharge from a flood plain is mainly the function of the following parameters-

- Areal extent of floodplain
- Retention period offlood
- Type of sub-soil strata and silt charge in the river water which gets deposited and controls seepage

Since collection of data on all these factors is time taking and difficult, in the meantime, the potential recharge from flood plain may be estimated on the same norms as for ponds, tanks and lakes. This has to be calculated over the water spread area and only for the retention period using the following formula.

Potential ground water resource in Flood Prone Areas = 1.4 x N x A/1000 **30**

Where

N = No of Days Water is Retained in the Area A = Flood Prone Area

Apportioning of Ground Water Assessment from Watershed to Development Unit:

Where the assessment unit is a watershed, there is a need to convert the ground water assessment in terms of an administrative unit such as block/ taluka/ mandal. This may be done as follows.

A block may comprise of one or more watersheds, in part or full. First, the ground water assessment in the subareas, command, non-command and poor ground water quality areas of the watershed may be converted into depth unit (mm), by dividing the annual recharge by the respective area. The contribution of this subarea of the watershed to the block is now calculated by multiplying this depth with the area in the block occupied by this sub-area. This procedure must be followed to calculate the contribution from the sub-areas of all watersheds occurring in the block, to work out the total ground water resource of the block.

The total ground water resource of the block should be presented separately for each type of sub-area, namely for command areas, non-command areas and poor ground water quality areas, as in the case of the individual watersheds.

Assessment of In-Storage Ground Water Resources or Static Ground Water Resources

The quantum of ground water available for development is usually restricted to long term average recharge or dynamic resources. Presently there is no fine demarcation to distinguish the dynamic resources from the static resources. While water table hydrograph could be an indicator to distinguish dynamic resources, at times it is difficult when water tables are deep. For sustainable ground water development, it is necessary to restrict it to the dynamic resources. Static or in-storage ground water resources could be considered for development during exigencies that also for drinking water purposes. It is also recommended that no irrigation development schemes based on static or in-storage ground water resources be taken up at this stage.

Assessment of In-storage ground water resources has assumed greater significance in thepresent context, when an estimation of Storage Depletion needs to be carried out in Over- exploited areas. Recently Remote Sensing techniques have been used in GRACE studies, to estimate the depletion of Ground Water Resources in North West India. Such estimation presents larger scale scenario. More precise estimation of ground water depletion in the over- exploited area based on actual field data can be obtained by estimating the Change in In-storage during successive assessments. Thus In-storage computation is necessary not only for estimation of emergency storage available for utilisationin case of natural extremities (like drought) but also for an assessment of storage depletion in over-exploited areas for sensitising stakeholders about the damage done to theenvironment.

The computation of the static or in-storage ground water resources may be done after delineating the aquifer thickness and specific yield of the aquifer material. The computations can be done as follows: -

$$SGWR = A * (Z_2 - Z_1) * S_Y \qquad 31$$

Where,

SGWR= Static or in-storage Ground Water Resources

A= Area of the AssessmentUnit

Z_2= Bottom of Unconfined Aquifer

Z_1= Pre-monsoon waterlevel

S_Y= Specific Yield in the In storageZone

Assessment of Total Ground Water Availability in Unconfined Aquifer

The sum of Annual Exploitable Ground Water Recharge and the in-storage ground water resources of an unconfined aquifer is the Total Ground Water Availability of that aquifer.

3.4 GROUND WATER ASSESSMENT OF CONFINED AQUIFERSYSTEM

Assessment of ground water resources of confined aquifers assumes crucial importance, since over-exploitation of these aquifers may lead to far more detrimental consequences than to those of shallow unconfined aquifers. If the piezometric surface of the confined aquifer is lowered below the upper confining layer so that desaturation of the aquifer occurs, the coefficient

of storage is no longer related to the elasticity of the aquifer but to its specific yield. In view of the small amounts of water released from storage in the confined aquifers, large scale pumpage from confined aquifers may cause decline in piezometric levels amounting to over a hundred metre and subsidence of land surface posing serious geotectonicalproblems.

It is recommended to use ground water storage approach to assess the ground water resources of the confined aquifers. The co-efficient of storage or storativity of an aquifer is defined as the volume of water it releases or takes into storage per unit surface area of the aquifer per unit change in head. Hence the quantity of water added to or released from the aquifer (□V) can be calculated as follows

$$\Delta V = S\,\Delta h \qquad 32$$

If the areal extent of the confined aquifer is A then the total quantity of water added to or released from the entire aquifer is

$$Q = A\,\Delta V = SA\Delta h \qquad 33$$

Where

Q = Quantity of water confined aquifer can release (m^3) S = Storativity

A = Areal extent of the confined aquifer (m^2)

Δh= Change in Piezometric head (m)

Most of the storage in confined aquifer is associated with compressibility of the aquifer matrix and compressibility of water. Once the piezometric head reaches below the top confining bed, it behaves like an unconfined aquifer and directly dewaters the aquifer and there is a possibility of damage to the aquifer as well as topography. Hence ground water potential of a confined aquifer is nothing but the water available for use without damaging the aquifer. Hence the resources available under pressure are only considered as the ground water potential. The quantity of water released in confined aquifer due to change in pressure can be computed between piezometric head (h_t) at any given time 't' and the bottom of the top confining layer (h_o) by using the following equation.

$$Q_p = SA\Delta h = SA\,(h_t - h_0) \qquad 34$$

If any development activity is started in the confined aquifer, then there is a need to assess the dynamic as well as in storage resources of the confined aquifer. To assess the ground water resources of the confined aquifer, there is a need to have sufficient number of observation wells tapping exclusively that particular aquifer and proper monitoring of the piezometric heads is alsoneeded.

Dynamic Ground Water Resources of Confined Aquifer

To assess the dynamic ground water resources the following equation can be used with the pre and post monsoon piezometric heads of the particular aquifer.

$$Q_D = SA\Delta h = SA\,(h_{POST} - h_{PRE}) \qquad 35$$

Where

Q_D = Dynamic Ground Water Resource of Confined Aquifer (m^3) S = Storativity

A = Areal extent of the confined aquifer (m^2)

Δh = Change in Piezometric head (m)

h_{post} =Piezometric head during post-monsoon period (mamsl) h_{PRE} = Piezometric head during pre-monsoon period (m amsl)

In storage Ground Water Resources of Confined Aquifer

For assessing the In-storage ground water potential of a confined aquifer, one has tocompute the resources between the pre monsoon piezometric head and bottom of the top confining layer. That can be assessed using the following formula:

$$\mathbf{Q_I = SA\Delta h = SA\ (h_{PRE} - h_0)} \qquad \mathbf{36}$$

Where

Q_I =In-storage Ground Water Resource of Confined Aquifer (m^3) S = Storativity

A = Areal extent of the confined aquifer (m^2)

Δh = Change in Piezometric head (m)

h_0 = Bottom level of the top confining layer (m amsl)

h_{PRE} = Piezometric head during pre-monsoon period (m amsl)

If the confined aquifer is not being exploited for any purpose, the dynamic and static resources of the confined aquifer need not be estimated separately. Instead, the in storage of the aquifer can be computed using the following formula.

$$\mathbf{Q_p = SA\Delta h = SA\ (h_{POST} - h_0)} \qquad \mathbf{37}$$

Where

Q_p = In storage Ground Water Resource of the confined aquifer or the Quantity of water under pressure (m^3)

S = Storativity

A = Areal extent of the confined aquifer (m^2)

Δh = Change in Piezometric head (m)

H_{POST} =Piezometric head during post-monsoon period (m amsl) h_0 = Bottom of the Top Confining Layer (m amsl)

The calculated resource includes small amount of dynamic resource of the confined aquifer also, which replenishes every year. But to make it simpler this was also computed as part of the static or in-storage resource of the confined aquifer.

Assessment of Total Ground Water Availability of Confined Aquifer

If the confined aquifer is being exploited, the Total Ground Water Availability of the confined aquifer is the sum of Dynamic Ground Water Resources and the In-storage ground water resources of that confined aquifer whereas if it is not being exploited, the Total Ground Water Availability of the confined aquifer comprises of only one component i.e.,the In-storage of the confinedaquifer.

3.5 GROUND WATER ASSESSMENT OF SEMI-CONFINED AQUIFERSYSTEM

The Assessment of Ground Water Resources of a semi-confined aquifer has some more complications. Unless and until, it is well studied that the recharge to this is not computed in the over lying unconfined aquifer or underlying/overlying semi confined aquifers, it should not be assessed separately. If it is assessed separately, there is a possibility of duplication of estimating the same resource by direct computation in one aquifer and as leakage in the other aquifer. As it is advisable to under estimate rather than to overestimate the resources, it is recommended not to assess these resources separately as long as there is no study indicating its non-estimation. If it is found through field studies that the resources are not assessed in any of the aquifers in the area, these resources are to be assessed following the methodology similar to that used in assessing the resources of Confinedaquifers.

3.6 TOTAL GROUND WATER AVAILABILITY OF AN AREA

The Total Ground water availability in any area is the Sum of Dynamic Ground Water Resources, the total static/ in-storage ground water resources in the unconfined aquifer and the dynamic and In-storage resources of the Confined aquifers and semi-confined aquifers in the area.

CHAPTER-4
PROCEDURE FOLLOWED IN THE PRESENT ASSESSMENT

The present assessement has been made as per the methodology recommended by GEC, 2015. The norms recommended by the GEC, 2015 were followed. In-GRES software developed by Central Ground Water Board has been used for estimation of ground water resources. As discussed in the first meeting of SLC on 02.07.2024, the estimation has been done considering the following facts:

1. The dynamic ground water resource assessment of 143 assesment units of Haryana State as on 31st March 2024 was carried out as per GEC, 2015 norms. During present estimation, the estimation needs to be carried out for 143 assesment units including two urbanareas i.e. Gurgaon and Faridabad in Haryana State which are having population of more than 10 lakh. The organization of data for 143 assesment units need boundary shape files with properly demarcated boundaries of the Blocks. These shape files available with HARSAC, Haryana were shared which form the basis for further data collection and organization.
2. The Rainfall data and Evapo-transpiration data was obtained from IMD and Agriculture Department has shared the data on Rainfall and Evapo-transpiration available with the department.
3. GW Extraction Data which includes Number of irrigations tubewells or crop water requirements and area under various crops was arranged by AgricultureDepartment.
4. Number of Industrial tubewells and groundwater draft by various industries was shared by Industry Department or HSPCB.
5. Data on Drinking and Domestic Water Requirement was arranged by PHED.
6. Canal Flow data Length of the canal falling in each block shall be revised and supplied by Irrigation Department. Irrigation Department shall also arrange for the data on Area irrigated by surface water and ground water to estimate the return seepages from the Irrigation.
7. Data on Water Conservation structures like Check dams, percolation ponds or village and urban ponds was arranged by Haryana Ponds and Waste Water Management Authority and Department of Rural Development (SLNA).
8. Data on Aquifer Parameters were utilized based on the recent NAQUIM studies
9. Updated water quality data was arranged by CGWB and GW Cell, Haryana

The norms used in the present assessment for computations of canal seepage, rainfall infiltration factor, specific yield etc have been taken as per GEC-2015 specified norms. As regards to the unit well draft, the figures used in computation are based on the actual field conditions.

CHAPTER-5
COMPUTATION OF GROUND WATER RESOURCES ESTIMATION IN THE STATE

The ground water resources estimation for Haryana State has been carried out for 143 Assesment Units (AU). In 62% area of Haryana ground water development is more than 100% causing depletion of ground water at an alarming rate (88 Assesment Units of 143 assessed Units are over-exploited). In 25% of area falls in Safe Category. In this estimation (GWRE, 2024) The Assesment Units are categorized into four categories as per recent estimation methodology.

- Over-exploited: 88
- Critical: 11
- Semi-Critical: 08
- Safe: 36

Stage of development for whole State is 135.96%

5.1 SALIENT FEATURES OF DYNAMIC GROUND WATERRESOURCES ASSESSMENT

Assessment period	2023-2024
Type of Assessment Units	Blocks & Urban areas (population > 10 lacs)
Total Number of Blocks in State	142
No. of Assessment Units (Blocks & Urban area) taken for Study	143 (1 Blocks could not be assessed as the block is totally hilly) including 2 urban areas (Gurgaon & Faridabad).
Base Year of Collection of Data	2014-2023
(Water Level trends computed from 2014-2023 data)	
Year of Projection of Data	2024

(Domestic & Industrial Water Use Projection for the year 2028 have been made)

Demarcation of data under command and non command could not be made due to the reason that no assessment unit (block) is either completely canal irrigated or tubewell irrigated. So, the computation has been made entirely on block basis.

Out of total 143 Blocks taken for study 88 Blocks (62%) are over-exploited, 11 Blocks (8%) are critical, 08 Blocks (6%) are semi critical and 36 Blocks (25%) are in safe category. While categorizing, long term water level fluctuation of both pre-monsoon and post-monsoon periods has been considered with annual fall of more than 10 cm. per year as significant.

5.2 METHOD ADOPTED FOR COMPUTING RAIN FALL RECHARGE DURING MONSOON SEASON

The administrative block and urban areas which are having population of more than 10 lakh has been taken as assessment unit and for computing the block-wise rainfall recharge during monsoon season; Rainfall Infiltration Factor (RIF) Method and Level Fluctuations (WLF) Method has been used.

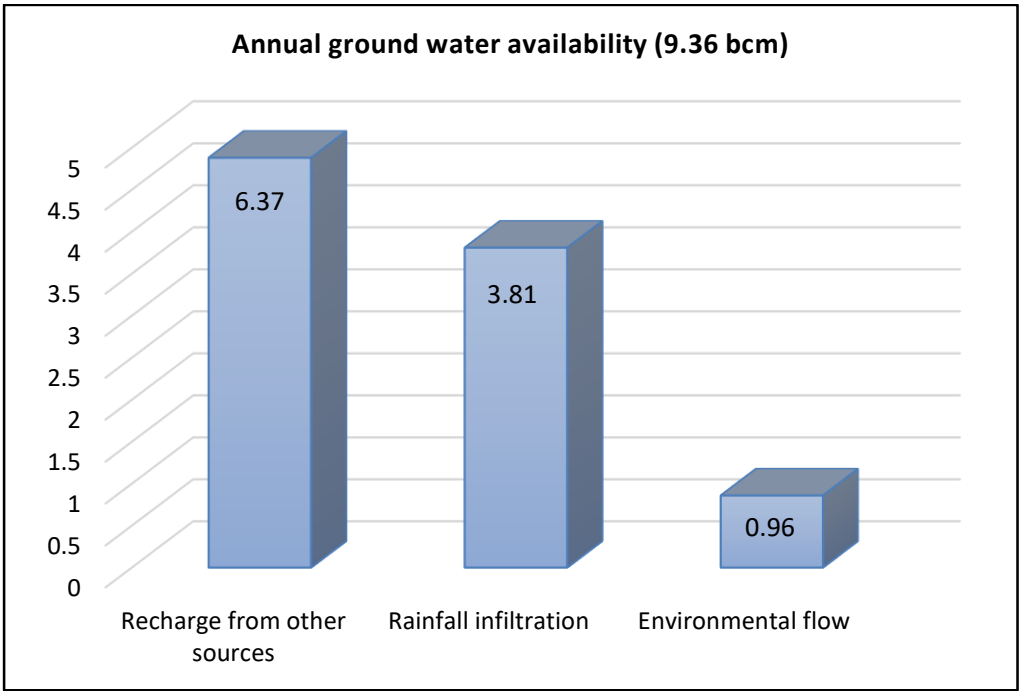
5.3 GROUND WATER RESOURCEASSESSMENT

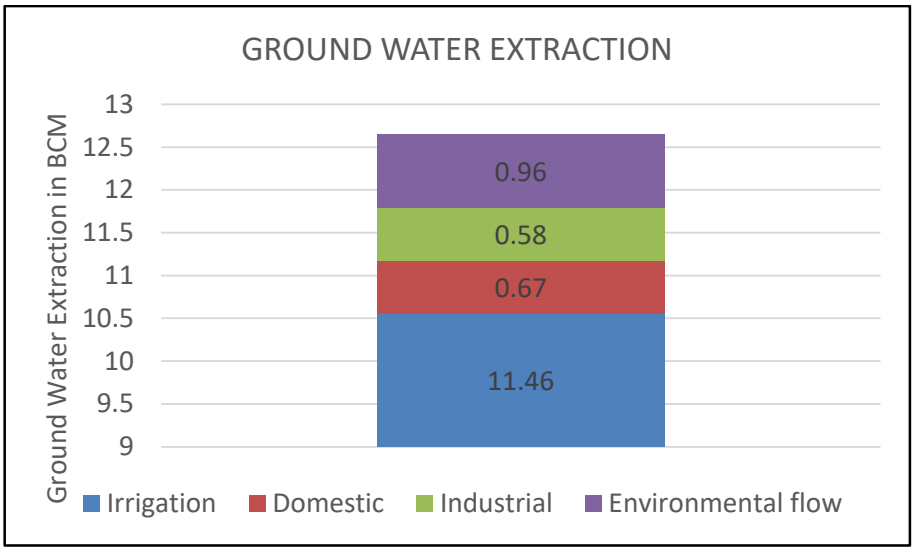
The Ground Water Resource Assessment of Haryana State has been computed as per GEC-2015 Methodology and the abstract of Dynamic Ground Water Assessment is as follows:

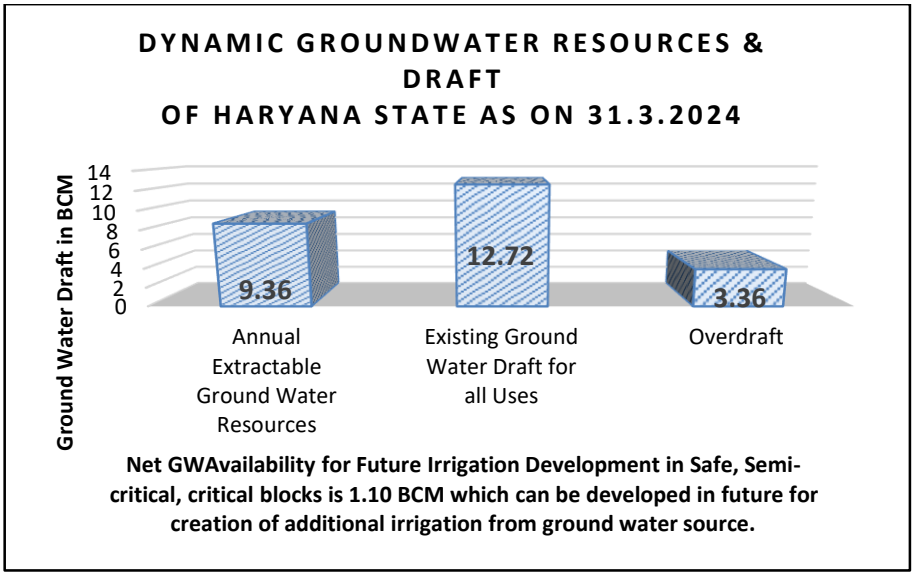
Table 17 Dynamic Ground Water Assessment

1	**Annual Extractable Ground water Resources (Fresh water)**	**9,35,856 ham**	**9,359 MCM**
2	Existing GW Draft for irrigation	Fresh- 11,46,871 Ham	11,469 MCM
		Saline- 88,697 Ham	887 MCM
		Total- 12,35,568 Ham	12,356 MCM
3	Existing GW Draft for Domestic and Industrial Use	1,25,487 Ham	1,255 MCM
4	Existing GW Draft for all Uses	Fresh- 12,72,358 Ham	12,724 MCM
		Saline- 88,697 Ham	887 MCM
		Total- 13,61,055 Ham	13,611 MCM
5	Net GW Availability for Future Irrigation Development in Safe, semi-critical and critical blocks	1,10,179 Ham	1102 MCM
6	Average Stage of GW Extraction of State	135.96%	

The Net Annual Ground Water Availability for the period 2023-2024 (as on March 2024) works out to be 935857 Ham (9.36 BCM). The Average Normal Recharge figures for all the districts from rainfall and other resources have been calculated. It has been observed that the Net Ground Water Availability for future irrigation development in the State is 1,10,178 Ham (1.10 BCM). Dynamic Ground Water Resources of Haryana as on March 2024 is given in Annexure XIV.







Comparison of Groundwater status of Haryana since 2009

Category of Assesment Units	2009	2011	2013	2017	2020	2022	2023	2024
Over-Exploited	69(59%)	71 (61%)	64 (54%)	78 (61%)	85 (60%)	88(62%)	88(62%)	88(62%)
Critical	21(18%)	15 (13%)	14 (12%)	03 (2%)	12 (09%)	09(6%)	11(7%)	11(8%)
Semi-Critical	9 (8%)	7 (6%)	11(9%)	21 (16%)	14 (10%)	10(7%)	09(6%)	08(6%)
Safe	18 (15%)	23 (20%)	30 (25%)	26 (21%)	30 (21%)	36(25%)	35(25%)	36(25%)
TOTAL	117	116	119	128	141	143	143	143

AREA OF ASSESSMENT UNITS UNDER DIFFERENT CATEGORIES IN INDIA (2024)											
HARYANA											
S. No.	Total Recharge Worthy Area of Assessed Units (sq.km)	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
		Recharge Worthy Area (in sq.km)	%	Recharge Worthy Area (in sq.km)	%	Recharge Worthy Area (in sq.km)	%	Recharge Worthy Area (in sq.km)	%	Recharge Worthy Area (in sq.km)	%
1	40391.06	12269.36	28	2129.8	4.9	2675.04	6.2	26131.63	60.50	-	-

GROUNDWATER RESOURCES INSALINEAREAS&ADDITIONAL

POTENTIAL FRESH WATER

RESOURCES

GEC, 2015 also recommends estimation of saline Ground Water Resources in areas where salinity is more than 3000 ms/cm.
GROUNDWATER RESOURCES IN SALINE AREAS

The In-storage GW Resources in poor quality areas have been calculated as 14562 Ham (0.14BCM)

Additional potential fresh water Resources in water logged and shallow water level area 2,60,253 Ham (2.60BCM)

Table 18 Districtwise Details of Ground water Recharge

S. No	District	Ground Water Recharge				Total Annual Ground Water Recharge	Total Natural Discharge	Annual Extractable Ground Water Recharge (Ham) (12=10-11)
		Monsoon Season		Non-monsoon season				
		Recharge from Rainfall	Recharge from Other Sources	Recharge from Rainfall	Recharge from Other Sources			
1	3	6	7	8	9	10	11	12
1	Ambala	23442.63	8196.61	5060.25	7063.24	43762.73	4376.27	39386.46
2	Bhiwani	16336.92	13726.56	1917.12	12232.77	44213.37	4421.33	39792.04
3	Charki Dadri	10197.24	5160.27	5128.86	4323.34	24809.71	2480.98	22328.73
4	Faridabad	5803.66	3278.17	1003.9	4269.93	14355.66	1261.1	13094.56
5	Fatehabad	11977.84	27872.28	2655.64	22278.51	64784.27	6478.43	58305.84
6	Gurugram	9806.15	5125.95	3206.15	4349.35	22487.6	2154.21	20333.39
7	Hisar	22240.86	15237.18	3360.99	21018.33	61857.36	4963.75	56893.61
8	Jhajjar	13547.16	17546.44	2919.87	14046.45	48059.92	3630.13	44429.79
9	Jind	19302.46	31580.15	7590.42	27663.62	86136.65	7866.01	78270.64
10	Kaithal	16567.36	15674	2786.69	11974.34	47002.39	4700.24	42302.15
11	Karnal	29058.72	60764.43	3860.04	23925.01	117608.2	11760.83	105847.37
12	Kurukshetra	16243.26	12011.47	2636.87	10098.55	40990.15	3901.59	37088.56
13	Mahendragarh	8218.39	4220.93	2350.06	7611.54	22400.92	2240.11	20160.81
14	Mewat	6854.16	4386.47	2301.14	4841.5	18383.27	1838.33	16544.94
15	Palwal	9814.9	14838.72	1088.83	17513.18	43255.63	4015	39240.63
16	Panchkula	10580.17	1310.96	1650.97	1027.63	14569.73	1136.24	13433.49
17	Panipat	11118.38	29488.63	1784.34	9014.35	51405.7	5140.56	46265.14
18	Rewari	10097.56	5555.22	3485.23	9828.24	28966.25	2564.61	26401.64
19	Rohtak	10788.98	9906.05	3850.53	11028.14	35573.7	3557.37	32016.33
20	Sirsa	19799.69	19635.89	1280.52	21085.04	61801.14	5226.56	56574.58
21	Sonipat	23995.87	29684.73	2118.55	23347.25	79146.4	6637.49	72508.91
22	Yamunanagar	20624.75	16278.93	5197.82	17931.88	60033.38	5395.43	54637.95
Total (Ham)		**326417.11**	**351480.04**	**67234.79**	**286472.19**	**1031604.13**	**95746.57**	**935857.56**
Total (Bcm)		**3.26**	**3.51**	**0.67**	**2.86**	**10.32**	**0.96**	**8.69**

Table 19: Districtwise Details of Ground water Draft

District	Current Annual Ground Water Extraction				Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)
	Irrigation Use(Ham)	Industrial Use(Ham)	Domestic Use(Ham)	Total Extraction (Ham)			
1	2	3	4	5	6	7	8
Ambala	35677.36	7575	6915.1	50167.46	6915.1	1314.52	127.37
Bhiwani	38885.89	1993.2	767.6	41646.69	797.68	9102.87	104.66
Charki Dadri	23033.78	28	1253.5	24315.28	1265.99	7958.05	108.9
Faridabad	14148.07	5104	4434.37	23686.44	4455.12	260.26	180.89
Fatehabad	101448.09	98.2	1651.04	103197.33	1713.29	514.74	176.99
Gurugram	20980.7	17117.17	5164.97	43262.84	5164.97	0	212.77
Hisar	49830.75	230.22	366.2	50427.17	366.2	14471.95	88.63
Jhajjar	22140.2	115	408.15	22663.35	408.15	21766.44	51.01
Jind	86124.82	612.26	1954.54	88691.62	2722.83	6595.39	113.31
Kaithal	77138.99	633.75	2702.33	80475.07	3073.65	0	190.24
Karnal	172316.96	3603.45	8100.38	184020.79	8100.38	0	173.85
Kurukshetra	68017.9	12575.88	4125	84718.78	4125	0	228.42
Mahendragarh	26081.16	31.08	3221.08	29333.32	3221.08	249.8	145.5
Mewat	10488.38	19.91	2062.87	12571.16	2062.87	4649.46	75.98
Palwal	34078.33	732.5	2263.33	37074.16	2263.33	7223.11	94.48
Panchkula	7133.21	90	1143.18	8366.39	1143.18	5067.1	62.28
Panipat	97545.74	2768	2443.48	102757.22	2443.48	0	222.11
Rewari	31590.68	1452	1995.45	35038.13	1995.45	233.96	132.71
Rohtak	15684.24	166.06	523.22	16373.52	523.22	15642.81	51.14
Sirsa	84597.76	266.07	1476.33	86340.16	1476.33	1774.06	152.61
Sonipat	65960.54	939.29	8951.35	75851.18	8951.35	9806.63	104.61
Yamunanagar	63967.78	2340	5072.96	71380.74	5072.96	3547.79	130.64
Total (Ham)	**1146871.33**	**58491.04**	**66996.43**	**1272358.80**	**68261.61**	**110178.94**	**135.96**
Total (Bcm)	**11.47**	**0.58**	**0.67**	**12.72**	**0.68**	**1.10**	**135.96**

The block- wise ground water development varies from 25 % in Baund block of Charkhi Dadri district to maximum of 342% in Fardidabad Urban assessment unit inFaridabad district respectively. The District wise Ground Water Development has been computed and given in Table 18. It varies from 54 % in Jhajjar district to 226% in Kurukshetra district.

In general, the variation in stage of ground water development has been observed which seems to be mainly due to change in rainfall, construction of water conservation structures and ground water draft.

5.4 CATEGORIZATION OF THEBLOCKS/ASSESMENT UNITS

The list of blocks falling under different categorization is tabulated in table-20

Table 20 Categorization of Blocks/ Assesment units

SR. NO.	DISTRICT	SAFE	SEMI-CRITICAL	CRITICAL	OVER EXPLOITED
1	Ambala		1. Shazadpur	1.Ambala-II	1. Ambala-I
					2.Barara
					3.Naraingarh
					4.Saha
	TOTAL	0	1	1	4
2	Bhiwani	1. Siwani			1.Behal
		2. Bhiwani			2.Kairu
		3.Bawani Khera			3.Loharu
					4.Tosham
	TOTAL	3	0	0	4
3	Charki Dadri	1.Baund			1.Badhra
		2.Charki Dadri			2.Jhojhu
	TOTAL	2	0	0	2
4	Faridabad			1.Taigaon	1.Ballabgarh
					2.Faridabad
					3.Faridabad Urban
	TOTAL	0	0	1	3
5	Fatehabad		1. Bhattu Kalan		1.Bhuna
					2. Fatehabad
					3. Jakhal
					4. Ratia
					5. Tohana
					6. Nagpur
	TOTAL	0	1	0	6

SR. NO.	DISTRICT	SAFE	SEMI-CRITICAL	CRITICAL	OVER EXPLOITED
6	Gurugram				1.Farukh nagar
					2.Gurgaon
					3.Pataudi
					4.Sohna
					5. Gurgaon Urban
	TOTAL	0	0	0	5
7	Hisar	1.Hansi-II		1.Agroha	1.Narnaud
		2.Uklana		2.Barwala	
		3. Hansi-1			
		4.Hisar-I			
		5.Hisar-II			
		6.Adampur			
	TOTAL	6		2	1
8	Jhajjar	1.Bahadurgarh			
		2.Beri			
		3.Jhajjar			
		4.Salhawas			
		5.Matanhail			
		6.Machhrauli			
		7. Badli			
	TOTAL	7	0	0	0
9	Jind	1.Julana	1.Pillukhera		1.Alewa
		2.Narwana			2.Jind
					3.Safidon
					4.Uchana
					5.Ujhana
	TOTAL	2	1	0	5
10	Kaithal				1.Dhand
					2.Gulha
					3.Kaithal
					4.Kalayat
					5.Pundri
					6.Rajound
					7.Siwan
	TOTAL	0	0	0	7

SR. NO.	DISTRICT	SAFE	SEMI-CRITICAL	CRITICAL	OVER EXPLOITED
11	Karnal				1.Assandh
					2.Gharaunda (part)
					3.Karnal
					4.Nilokheri
					5.Nissing at Chirao
					6.Kanjpura
					7.Munak
					8.Indri
	TOTAL	0	0	0	8
12	Kurukshetra				1.Babain
					2.Ismailabad
					3.Ladwa
					4.Pehowa
					5.Pipli
					6.Shahbad
					7.Thanesar
	TOTAL	0	0	0	7
13	Mahendragarh		1. Satnali	1.Nizampur	1.Kanina
					2.Mahendragarh
					3. Sihma
					4.Narnaul
					5.Nangal Choudhury
					6.Ateli Nangal
	TOTAL	0	1	1	6
14	Mewat	1.Nagina		1.FerozepurJhirka	1. Taoru
		2.Nuh		2. Punahana	
		3.Pingwan			
		4. Indri			
	TOTAL	4		2	1
15	Palwal	1. Hathin	1. Hodal	1.Hassanpur	1.Badoli
		2.Palwal			2.Prithla
	TOTAL	2	1	1	2
16	Panchkula	1.Barwala		1.Raipur Rani	
		2.Pinjore			
	TOTAL	2	0	1	0
17	Panipat				1.Bapoli
					2.Israna
					3.Madlauda
					4.Panipat
					5.Samalkha
					6.Sanauli Khurd
	TOTAL	0	0	0	6

SR. NO.	DISTRICT	SAFE	SEMI-CRITICAL	CRITICAL	OVER EXPLOITED
18	Rewari			1.Dahina	1.Khol at Rewari
					2.Nahar
					3.Rewari
					4.Bawal
					5.Jatusana
					6.Dharuhera
	TOTAL	0	0	1	6
19	Rohtak	1.Kalanaur			
		2.Lakhan Majra			
		3.Rohtak			
		4.Maham			
		5.Sampla			
	TOTAL	5	0	0	0
20	Sirsa		1.Baragudha		1.Dabwali
					2.Ellenabad
					3.NathusariChopta
					4.Odhan
					5.Rania
					6.Sirsa
	TOTAL	0	1	0	6
21	Sonipat	1.Kathura		1.Mundlana	1.Ganaur
		2.Kharkhoda			2.Rai
		3.Gohana			3.Sonipat
					4.Murthal
	TOTAL	3	0	1	4
22	Yamunanagar		1.Khizrabad		1.Sadaura
			2.Chhachhrauli		2.Jagadhri
					3.Mustafabad
					4.Radaur
					5.Bilaspur
	TOTAL	0	2	0	5
TOTAL (in whole State)		**36**	**8**	**11**	**88**

55 GROUND WATER RECHARGE IN POOR GROUND WATER QUALITY ZONE

The ground water recharge in poor ground water quality zones has been worked out and block-wise details are given in Annexure X and the district-wise detail is given in table-21. The table depicts that the ground water recharge in poor ground water quality zones ismaximum in Sirsa district with minimum in Karnal district.

Table 21 District-wise details of Total annual ground water recharge in poor ground water quality zone

Sr. No.	Name of District	Total Annual Ground Water Recharge (Ham)
1	AMBALA	0
2	BHIWANI	3830.180002
3	CHARKI DADRI	188.8909
4	FARIDABAD	928.606272
5	FATEHABAD	59.642396
6	GURUGRAM	103.19364
7	HISAR	88.189244
8	JHAJJAR	3531.630692
9	JIND	493.900462
10	KAITHAL	354.722808
11	KARNAL	21.613944
12	KURUKSHETRA	0
13	MAHENDRAGARH	255.838187
14	MEWAT	3204.578608
15	PALWAL	1347.847666
16	PANCHKULA	0
17	PANIPAT	49.46172
18	REWARI	192.61528
19	ROHTAK	1230.75073
20	SIRSA	2892.038606
21	SONIPAT	1911.698426
22	YAMUNANAGAR	0
	TOTAL	**41370.79917**

5.6 ADDITIONAL POTENTIALRECHARGE

Additional potential recharge is computed for waterlogged, shallow water table or flood prone area of the state in Table 22. It could be observed that potential recharge is maximum in Jhajjar district. Shallow water level areas having depth to water table less than 5 m bgl in the State are about 7457 Km^2, which is in pockets and lying mainly in the central parts of the Haryana State. Block-wise Additional Annual Potential Recharge has been worked out to be 260253.57 Ham for water logged and shallow water table areas of the State.

Table 22 Additional Potential Recharge

S.No.	Name of District	Total Annual Additional Potential Recharge (Ham)
1	AMBALA	1564.61
2	BHIWANI	2540.74
3	CHARKHI DADRI	9790.50
4	FARIDABAD	0
5	FATEHABAD	4700.43
6	GURGAON	0
7	HISAR	0
8	JHAJJAR	79143.27
9	JIND	28734.67
10	KAITHAL	0
11	KARNAL	0
12	KURUKSHETRA	0
13	MAHENDRAGARH	0
14	MEWAT	9531.85
15	PALWAL	5885.05
16	PANCHKULA	0
17	PANIPAT	0
18	REWARI	0
19	ROHTAK	87115.85
20	SIRSA	2631.47
21	SONIPAT	28821.15
22	YAMUNA NAGAR	64.58
Total		**260253.57 HAM**
		2.60 (BCM)

5.7 COMPARISION WITH THE EARLIER GROUND WATER RESOURCES ESTIMATE

The comparative statement of the blocks falling under different categories based on the stage of ground water development in the earlier and present computation are given in the following Table-23.

Table 23 Comparison of Ground WaterResources

Period of Assessment	No. of Blocks falling under			
	Over Exploited	Critical	Semi Critical	Safe
2008-2009 (As on March 2009)	68	21	9	18
2010-11 (As on March 2011)	71	15	7	23
2012-13 (As on March 2013)	64	14	11	30
2016-17 (As on March 2017)	78	3	21	26
2019-20 (As on March 2020)	85	12	14	30
2021-22 (As on March 2022)	88	10	9	36
2022-23 (As on March 2023)	88	11	9	35
2023-24 (As on March 2024)	88	11	8	36

The stage of ground water extraction has slightly increased from 135.74% to 135.96 %. Adoption of threshold value at same rate for pre-monsoon and post monsoon seasons and re-organisation of blocks and block boundaries also resulted in slight reduction in rainfall recharge. The decrease in draft is due to identification of irrigation tubewells located in saline areas and same has been reduced and draft from fresh water tubwellsis considered in estimation. There is slight increase in number of abstraction structures of drinking and domestic use tubewells for which exact number of tubewells and yield of the tubewells has been provided by PHED, Haryana.

5.8 SPATIAL VARIATIONOFGROUNDWATERDEVELOPMENT SCENARIO

The Stage of Ground Water Development and Categorization for each block/Assesment Unit and district as a whole has also been compared for previous 2022-23 (as on 31st March 2023) study and for present 2023-24 (as on 31st March 2024) study are shown in Table- 23**.** It has been observed that only 04 AUs have shown change to higher category owing to increased ground water draft for irrigation while 06 AUs have shown change to lower category owing to decreased ground water draft for irrigation and other uses and 133 AUs shows no change in their category.

Table 24 Block/Assesment Unit wise comparison of Stage of Ground Water Development and Category with previousAssessment

S.No	District	Block	SOGWD In 2023	Categorization	SOGWD In 2024	Categorization	Remarks
1	Ambala	Ambala-I	98.05	Critical	103.57	Over Exploited	Deteriorated
2	Ambala	Ambala-II	85.18	Semi Critical	98.39	Critical	Deteriorated
3	Ambala	Barara	146.83	Over Exploited	146.86	Over Exploited	No Change
4	Ambala	Naraingarh	150.39	Over Exploited	151.10	Over Exploited	No Change
5	Ambala	Saha	175.77	Over Exploited	180.67	Over Exploited	No Change
6	Ambala	Shahzadpur	76.31	Semi Critical	77.14	Semi Critical	No Change
7	Bhiwani	Bawani Khera	60.41	Safe	54.31	Safe	No Change
8	Bhiwani	Behal	154.19	Over Exploited	149.91	Over Exploited	No Change
9	Bhiwani	Bhiwani	68.73	Safe	66.58	Safe	No Change
10	Bhiwani	Kairu	163.09	Over Exploited	184.81	Over Exploited	No Change
11	Bhiwani	Loharu	161.56	Over Exploited	163.48	Over Exploited	No Change
12	Bhiwani	Siwani	48.33	Safe	48.19	Safe	No Change
13	Bhiwani	Tosham	152.65	Over Exploited	149.95	Over Exploited	No Change
14	Charki Dadri	Badhra	227.23	Over Exploited	231.65	Over Exploited	No Change
15	Charki Dadri	Baund	25.49	Safe	17.36	Safe	No Change
16	Charki Dadri	Charkhi Dadri	60.98	Safe	49.29	Safe	No Change
17	Charki Dadri	Jhojhu	142.78	Over Exploited	129.13	Over Exploited	No Change
18	Faridabad	Ballabgarh	246.75	Over Exploited	247.23	Over Exploited	No Change
19	Faridabad	Faridabad	152.29	Over Exploited	152.78	Over Exploited	No Change
20	Faridabad	Faridabad Urban	342.02	Over Exploited	323.89	Over Exploited	No Change
21	Faridabad	Tigaon	145.6	Over Exploited	92.15	Critical	Improved
22	Fatehabad	Bhattu Kalan	97.06	Critical	86.19	Semi Critical	Improved
23	Fatehabad	Bhuna	97.52	Critical	103.79	Over Exploited	Deteriorated
24	Fatehabad	Fatehabad	198.28	Over Exploited	193.31	Over Exploited	No Change
25	Fatehabad	Jakhal	213.01	Over Exploited	215.84	Over Exploited	No Change
26	Fatehabad	Nagpur	230.51	Over Exploited	238.96	Over Exploited	No Change
27	Fatehabad	Ratia	242.88	Over Exploited	243.91	Over Exploited	No Change
28	Fatehabad	Tohana	130.77	Over Exploited	127.03	Over Exploited	No Change
29	Gurugram	Farrukh Nagar	158.03	Over Exploited	158.30	Over Exploited	No Change

S.No	District	Block	SOGWD In 2023	Categorization	SOGWD In 2024	Categorization	Remarks
30	Gurugram	Gurgaon	120.26	Over Exploited	111.09	Over Exploited	No Change
31	Gurugram	Gurgaon Urban	326.41	Over Exploited	326.52	Over Exploited	No Change
32	Gurugram	Pataudi	195.73	Over Exploited	196.06	Over Exploited	No Change
33	Gurugram	Sohna	176.64	Over Exploited	177.04	Over Exploited	No Change
34	Hisar	Adampur	52.87	Safe	63.42	Safe	No Change
35	Hisar	Agroha	97.79	Critical	95.92	Critical	No Change
36	Hisar	Barwala	89.72	Semi Critical	92.41	Critical	Deteriorated
37	Hisar	Bass	63.77	Safe	64.62	Safe	No Change
38	Hisar	Hansi	60.65	Safe	62.87	Safe	No Change
39	Hisar	Hisar-I	57.7	Safe	69.90	Safe	No Change
40	Hisar	Hisar-II	68.44	Safe	68.94	Safe	No Change
41	Hisar	Narnaund	218.01	Over Exploited	216.51	Over Exploited	No Change
42	Hisar	Uklana	37.1	Safe	36.99	Safe	No Change
43	Jhajjar	Badli	67.24	Safe	49.23	Safe	No Change
44	Jhajjar	Bahadurgarh	63.72	Safe	58.09	Safe	No Change
45	Jhajjar	Beri	46	Safe	49.60	Safe	No Change
46	Jhajjar	Jhajjar	64.48	Safe	68.86	Safe	No Change
47	Jhajjar	Machhrauli	67.2	Safe	40.59	Safe	No Change
48	Jhajjar	Matannail	35.8	Safe	25.15	Safe	No Change
49	Jhajjar	Salhawas	46.03	Safe	59.08	Safe	No Change
50	Jind	Alewa	124.75	Over Exploited	138.42	Over Exploited	No Change
51	Jind	Jind	118.7	Over Exploited	141.84	Over Exploited	No Change
52	Jind	Julana	44.79	Safe	51.85	Safe	No Change
53	Jind	Narwana	52.09	Safe	65.71	Safe	No Change
54	Jind	Pillukhera	84.73	Semi Critical	80.83	Semi Critical	No Change
55	Jind	Safidon	135.75	Over Exploited	139.32	Over Exploited	No Change
56	Jind	Uchana	107.9	Over Exploited	108.79	Over Exploited	No Change
57	Jind	Ujhana	125.59	Over Exploited	115.11	Over Exploited	No Change
58	Kaithal	Dhand	202.23	Over Exploited	202.66	Over Exploited	No Change
59	Kaithal	Guhla	222.48	Over Exploited	223.57	Over Exploited	No Change
60	Kaithal	Kaithal	180.15	Over Exploited	158.30	Over Exploited	No Change
61	Kaithal	Kalayat	154.46	Over Exploited	168.63	Over Exploited	No Change
62	Kaithal	Pundri	193.36	Over Exploited	172.25	Over Exploited	No Change

S.No	District	Block	SOGWD In 2023	Categorization	SOGWD In 2024	Categorization	Remarks
63	Kaithal	Rajound	190.31	Over Exploited	182.44	Over Exploited	No Change
64	Kaithal	Siwan	206.82	Over Exploited	219.55	Over Exploited	No Change
65	Karnal	Assandh	175.16	Over Exploited	184.55	Over Exploited	No Change
66	Karnal	Gharaunda (Part)	160.57	Over Exploited	168.34	Over Exploited	No Change
67	Karnal	Indri	95.92	Critical	146.99	Over Exploited	Deteriorated
68	Karnal	Karnal	164.54	Over Exploited	144.00	Over Exploited	No Change
69	Karnal	Kunjpura	173.79	Over Exploited	186.15	Over Exploited	No Change
70	Karnal	Munak	228.73	Over Exploited	210.60	Over Exploited	No Change
71	Karnal	Nilokheri	208.31	Over Exploited	192.58	Over Exploited	No Change
72	Karnal	Nissing At Chirao	187.16	Over Exploited	185.41	Over Exploited	No Change
73	Kurukshetra	Babain	230.49	Over Exploited	213.06	Over Exploited	No Change
74	Kurukshetra	Ismailabad	240.57	Over Exploited	227.25	Over Exploited	No Change
75	Kurukshetra	Ladwa	290.27	Over Exploited	256.14	Over Exploited	No Change
76	Kurukshetra	Pehowa	186.74	Over Exploited	194.37	Over Exploited	No Change
77	Kurukshetra	Pipli	224.66	Over Exploited	227.14	Over Exploited	No Change
78	Kurukshetra	Shahbad	194.77	Over Exploited	220.82	Over Exploited	No Change
79	Kurukshetra	Thanesar	261.51	Over Exploited	271.97	Over Exploited	No Change
80	Mahendragarh	Ateli Nangal	122.72	Over Exploited	117.37	Over Exploited	No Change
81	Mahendragarh	Kanina	193.15	Over Exploited	200.92	Over Exploited	No Change
82	Mahendragarh	Mahendragarh	130.78	Over Exploited	128.48	Over Exploited	No Change
83	Mahendragarh	Nangal Chaudhry	154.69	Over Exploited	159.42	Over Exploited	No Change
84	Mahendragarh	Narnaul	108.89	Over Exploited	107.58	Over Exploited	No Change
85	Mahendragarh	Nizmpur	94.5	Critical	95.38	Critical	No Change
86	Mahendragarh	Satnali	98.25	Critical	88.64	Semi Critical	Improved
87	Mahendragarh	Sihma	150.18	Over Exploited	150.47	Over Exploited	No Change
88	Mewat	Ferozepur Jhirka	103.53	Over Exploited	92.14	Critical	Improved
89	Mewat	Indri	71.04	Semi Critical	63.38	Safe	Improved
90	Mewat	Nagina	60.84	Safe	60.90	Safe	No Change
91	Mewat	Nuh	33.55	Safe	34.17	Safe	No Change
92	Mewat	Pingwan	49.68	Safe	40.19	Safe	No Change

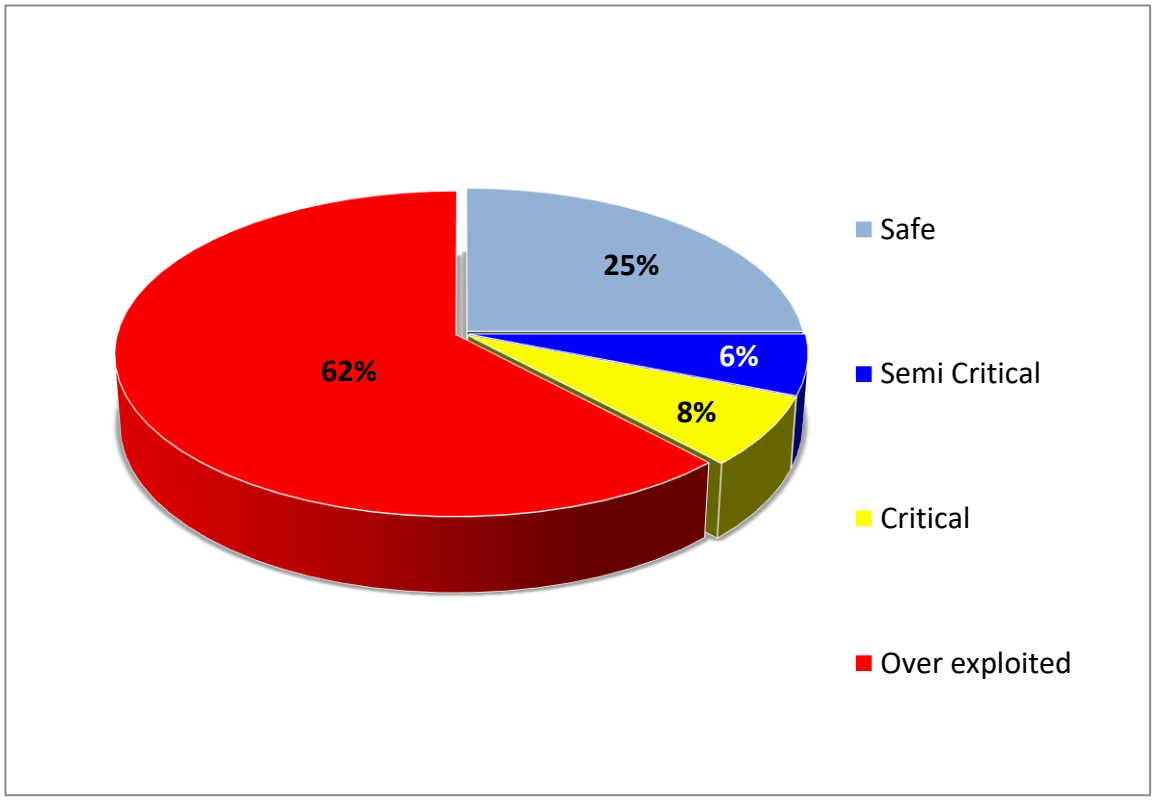
S.No	District	Block	SOGWD In 2023	Categorization	SOGWD In 2024	Categorization	Remarks
93	Mewat	Punahana	93.36	Critical	93.69	Critical	No Change
94	Mewat	Taoru	124.49	Over Exploited	123.61	Over Exploited	No Change
95	Palwal	Badoli	196.82	Over Exploited	157.73	Over Exploited	No Change
96	Palwal	Hassanpur	93.06	Critical	91.85	Critical	No Change
97	Palwal	Hathin	62.73	Safe	62.96	Safe	No Change
98	Palwal	Hodal	83.18	Semi Critical	83.30	Semi Critical	No Change
99	Palwal	Palwal	69.98	Safe	66.78	Safe	No Change
100	Palwal	Prithla	146.7	Over Exploited	139.41	Over Exploited	No Change
101	Panchkula	Barwala	52.87	Safe	52.21	Safe	No Change
102	Panchkula	Morni	NA	NA			Not Assesed
103	Panchkula	Pinjore	43.73	Safe	43.64	Safe	No Change
104	Panchkula	Raipur Rani	98.64	Critical	96.75	Critical	No Change
105	Panipat	Bapoli	240.05	Over Exploited	264.69	Over Exploited	No Change
106	Panipat	Israna	164.25	Over Exploited	205.69	Over Exploited	No Change
107	Panipat	Madlauda	155.17	Over Exploited	174.54	Over Exploited	No Change
108	Panipat	Panipat	199.17	Over Exploited	221.14	Over Exploited	No Change
109	Panipat	Samalkha	223.59	Over Exploited	260.57	Over Exploited	No Change
110	Panipat	Sanauli Khurd	249.65	Over Exploited	224.61	Over Exploited	No Change
111	Rewari	Bawal	123.49	Over Exploited	121.63	Over Exploited	No Change
112	Rewari	Dahina	93.29	Critical	95.53	Critical	No Change
113	Rewari	Dharuhera	147.52	Over Exploited	153.96	Over Exploited	No Change
114	Rewari	Jatusana	169.02	Over Exploited	174.75	Over Exploited	No Change
115	Rewari	Khol At Rewari	143.31	Over Exploited	143.41	Over Exploited	No Change
116	Rewari	Nahar	165.71	Over Exploited	164.48	Over Exploited	No Change
117	Rewari	Rewari	121.17	Over Exploited	113.99	Over Exploited	No Change
118	Rohtak	Kalanaur	31.78	Safe	39.99	Safe	No Change
119	Rohtak	Lakhan Majra	60.06	Safe	66.95	Safe	No Change
120	Rohtak	Maham	56.11	Safe	58.65	Safe	No Change
121	Rohtak	Rohtak	60.31	Safe	47.35	Safe	No Change
122	Rohtak	Sampla	68.19	Safe	49.36	Safe	No Change
123	Mewat	Punahana	93.36	Critical	93.69	Critical	No Change

S.No	District	Block	SOGWD In 2023	Categorization	SOGWD In 2024	Categorization	Remarks
124	Sirsa	Baragudha	79.5	Semi Critical	83.03	Semi Critical	No Change
125	Sirsa	Dabwali	133.18	Over Exploited	140.65	Over Exploited	No Change
126	Sirsa	Ellenabad	231.25	Over Exploited	232.35	Over Exploited	No Change
127	Sirsa	NathusariChopta	116.82	Over Exploited	123.66	Over Exploited	No Change
128	Sirsa	Odhan	194.44	Over Exploited	200.99	Over Exploited	No Change
129	Sirsa	Rania	149.03	Over Exploited	136.40	Over Exploited	No Change
130	Sirsa	Sirsa	205.15	Over Exploited	201.65	Over Exploited	No Change
131	Sonipat	Ganaur	130.22	Over Exploited	138.12	Over Exploited	No Change
132	Sonipat	Gohana	54.01	Safe	61.19	Safe	No Change
133	Sonipat	Kathura	44.13	Safe	53.96	Safe	No Change
134	Sonipat	Kharkhoda	54.89	Safe	57.48	Safe	No Change
135	Sonipat	Mundlana	126.74	Over Exploited	99.83	Critical	Improved
136	Sonipat	Murthal	170.38	Over Exploited	140.99	Over Exploited	No Change
137	Sonipat	Rai	161.13	Over Exploited	115.45	Over Exploited	No Change
138	Sonipat	Sonipat	119.19	Over Exploited	144.07	Over Exploited	No Change
139	Yamunanagar	Bilaspur	120.45	Over Exploited	113.30	Over Exploited	No Change
140	Yamunanagar	Chhachhrauli	80.76	Semi Critical	78.14	Semi Critical	No Change
141	Yamunanagar	Jagadhri	154.66	Over Exploited	157.14	Over Exploited	No Change
142	Yamunanagar	Khizrabad	87.98	Semi Critical	89.62	Semi Critical	No Change
143	Yamunanagar	Mustafabad	201.64	Over Exploited	190.16	Over Exploited	No Change
144	Yamunanagar	Radaur	205.93	Over Exploited	188.89	Over Exploited	No Change

5.9 Conclusions

The analysis of the figures of the groundwater resources of state indicates that there exists enough scope for development of existing resource in 36 blocks which are considered safe from ground water development point of view but these blocks are safe only due to the unavialibity of good quality of ground water, almost all the safe blocks has poor ground water quality due to which the water is of no use in Irrigation and domestic use. 88 blocks have attained stage of development more than 100% and long-term water level trends during pre and post monsoon period in the block showing declining trend, they are categorized as over exploited (Fig. 14).

Figure 14 Percentage of Assesment Units under different categories



The analysis of present ground water resource assessment indicates that there is marginal increase in net availability of ground water resources as compared to previous assessment.

The ground water draft has increased by about 1.42%. The major change in ground water draft is for irrigation & Insdustrial use. The increase is reflected in increase in overall Stage of Development from 135.74 % to 135.95%. The number of Safe blocks/AUs accordingly has increased from 35 to 36 because of increase in Groundwater Draft.

5.10 Recommendations

The major use of ground water in the state is in agriculture sector. Out of 3.5 million Ha of total area under cultivation, 1.121 m Ha area is under tubewell irrigation. There are approximately 8.50 lakh irrigation tubewells are present in the state. There is urgent need to launch a massive awareness programme to educate the farmers about judicious use of ground water. In order to have an effective & efficient utilization of ground water, incentives can be mooted to the

farmers to use water sustainably. Awards may be launched and incentives be provided for the farmers, Panchayats and industries who have taken excellent measures for conservation of water measures and consuming less water. Governemnt of Haryana has taken the following measures for promotion of ground water conservation in the state:

- ✓ Establishment of **Haryana Water Resources Authority** to take action for Ground Water management.
- ✓ For Ground Water management, the State Government, through its notification dated 07.12.2020 had enacted **"The Haryana Water Resources (Conservation, Regulation and Management) Authority Act, 2020"** for conservation, management and regulation of water resources i.e., Ground Water and surface water within the State.
- ✓ **"The Haryana State Preservation of Sub Soil Water Act, 2009"** has been enacted which prohibits sowing of Paddy before 15th of May and transplanting of Paddy before 15th of June.
- ✓ The Department encourages the farmers to adopt Drip Irrigation System. Subsidy @85% is being provided to all categories of farmers limited to 5 Ha perbeneficiary.
- ✓ The Department encourages the farmers to adopt Sprinkler Irrigation System.Subsidy @85% is being provided to all categories of farmers limited to 5 Ha perbeneficiary.
- ✓ To reduce seepage and evaporation losses, subsidy is being provided to the farmers for laying Underground Pipeline System. Subsidy @50% to the cost of systemlimited to Rs. 25000/- per hectare with maximum of Rs. 60000/- per beneficiary isapplicable.
- ✓ Crop Diversification programmes have been launched in the State, namely **'Mera Pani Meri Virasat'** has been launched in the State during 2020-21, the subsidy benefit of Rs. 7000.00 per acre is provided to thefarmers.
- ✓ An area of 96590.14 acre has been covered under **'Mera Pani Meri Virasat'** during 2020.
- ✓ Roof-top Rain-Water Harvesting Structures are constructed in the Govt. buildings such as Schools/ Colleges/ Govt. offices on demonstration basis for artificially recharging the groundwater aquifers.
- ✓ New World Bank funded scheme namely **"Atal Bhujal Yojana (ABHY)"** has been launched in the State for sustainable groundwater management. The scheme has been designed as a pilot with the principal objective of strengthening the institutional framework for participatory ground water management in the 36 Blocks, 1669 GPs of 14 Districts of Haryana.
- ✓ It has been observed that major ground water draft is for paddy cultivation. There is urgent need to promote crops requiring less water by providing incentives to the farmers. Paddy cultivation based on ground water development and irrigation should be banned.
- ✓ Micro-irrigation techniques, such as drip irrigation, & sprinkler irrigation, under groundpipe lines may be adopted for enhancing water use efficiency especially in over exploited blocks. Metering system be introduced to encourage users to avoid excessive use of ground water resources. Farm ponds in the cultivation areas especially in the fields of farmers where farm holding is morethan 2 Ha shall be made mandatory so that the overflow water during rainy season can be stored and can be used during no-rainyperiods.
- ✓ A comprehensive action plan for augmenting ground water by utilizing surplus rainwater runoff and flood waters may be drawn and implemented in Over-exploited and Critical blocks.

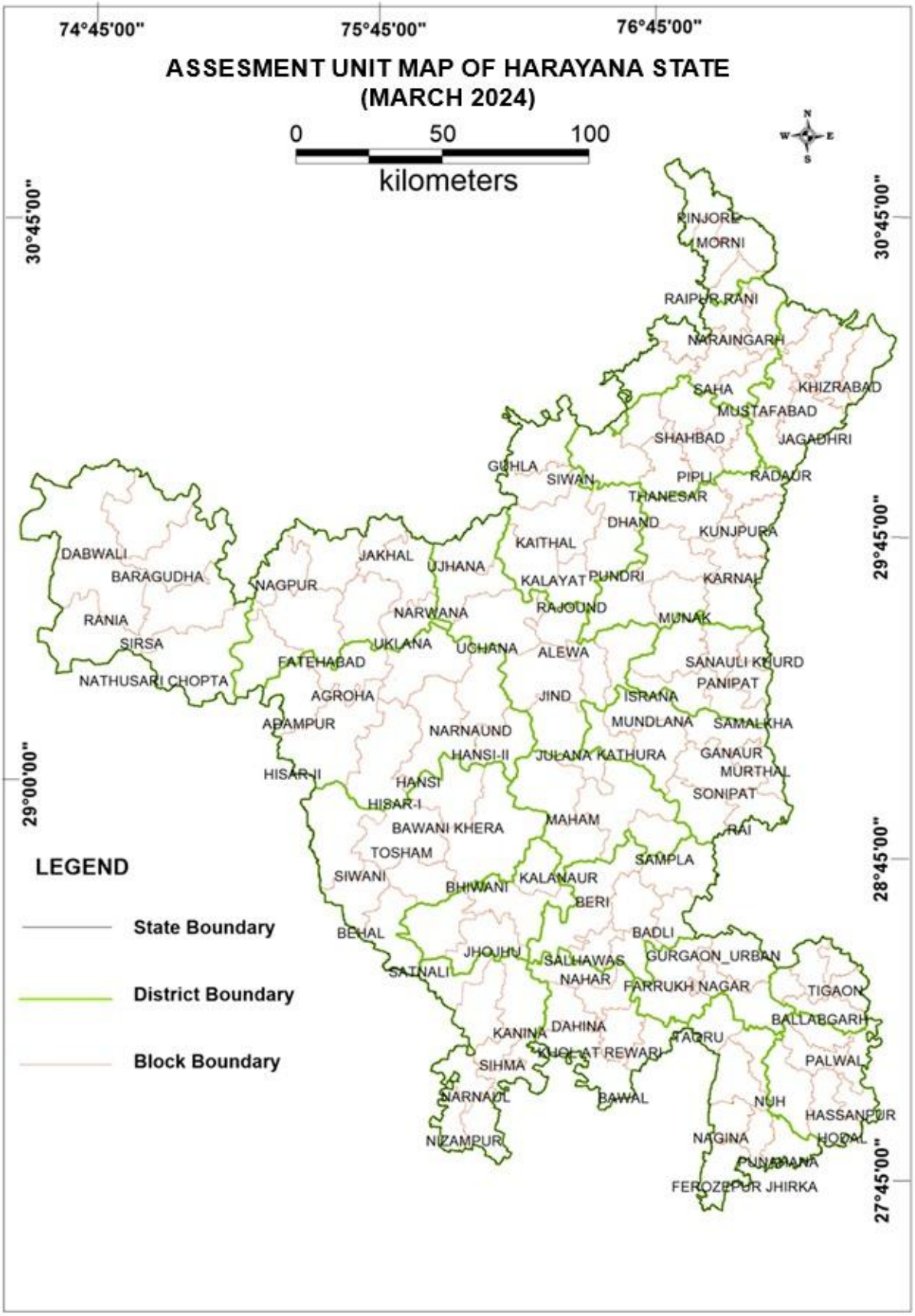
Consolidation and expansion of programme for renovation, repair and rejuvenation of water bodies may be taken up in these areas. Haryana ponds and Waste Water Management Authority shall takeup renovation of all the ponds in thestate.

- ✓ Development of flood plain aquifers for irrigation and domestic uses in adjacent areas be taken up to meet the requirement which may help in reducing stress on ground water resources in over-exploited and critical blocks.
- ✓ Groundwater Cell, Irrigation and Water Resources Department shall be strengthened to takeup the assigned tasks in efficientmanner.
- ✓ Conjunctive use of surface and ground water may be promoted for maximizing the gains from IWRM in brackish/saline ground water areas. Possibilities of Ground water development in waterlogged areas may be workedout.
- ✓ Efforts be made to promote use of Sodic waters by applying gypsum and supplementing the tubewell irrigation with canal water. The cropping pattern in water quality problematic areas should be modified and saline resistant crops should be encouraged.
- ✓ Comprehensive assessment of static ground water resources (deeper aquifers) to be taken up to ensure additional water availability to the farmers during stress periods.
- ✓ Ground water management requires multi-disciplinary approach and micro-level studies. There is urgent need for strengthening of state department dealing with ground water and also their capacitybuilding.
- ✓ Strengthening of ground water monitoring network through construction of piezometers and involvement of Panchayati Raj Institution be considered to get the data at micro-level.
- ✓ The quality of ground water is equally important. Excessive use of fertilizers and pesticides should be discouraged to avoid pollution of water and use of bio-fertilizers be propagated.
- ✓ Industries should install ETPs, so that the untreated effluent does not pollute the ground water. Recycling of waste water may be made mandatory for industries.
- ✓ There is urgent need for micro-level data collection, updation, validation and processing related to various parameters and norms used in the report which will help in further refining the estimates.

Wayforward:

- To encourage the farmers to adopt micro irrigation systems such as Drip Irrigation System, Sprinkler Irrigation system, Mini sprinkler Irrigation system.
- To reduce seepage and evaporation losses, encourage the farmers to adopt Underground Pipeline System.
- To aware and encourage farmers to diversify the paddy and other water guzzling crops by adapting Crop Diversification programmes launched in the State for conservation of natural groundwater resource, alternate crops e.g., maize, sunflower, cotton, vegetables, bajra and summer moong etc. are being promoted in place of waterguzzlingcrops.
- Enforcement of Treated Waste Water Policy of 2019.
- The initiatives like catch the rain have been be launched to conserve every drop of rain. The project for construction of rainwater harvesting structures has been taken up at large scale and make mandatory for housing societies, infrastructure projects in water stressed areas.
- The construction of Roof-Top Rain-Water Harvesting Structure (RTRWHS) should be made mandatory in all Govt. building including Schools/ Colleges/ Govt. offices for artificially recharging the groundwater aquifers and creating awareness among students and generalpublic.
- To increase the existing canal network in the State.
- To increase supply of canal water during rainy season for recharging Ground Water in water stressedareas.
- Digging of ponds and Ponds rejuvenation.
- All ponds and tanks to be filled with water all times through the surplus water available in canals passing through nearby areas.
- No flood irrigation to be allowed.

Figure 15 Administrative base map/assessment unit demarcation



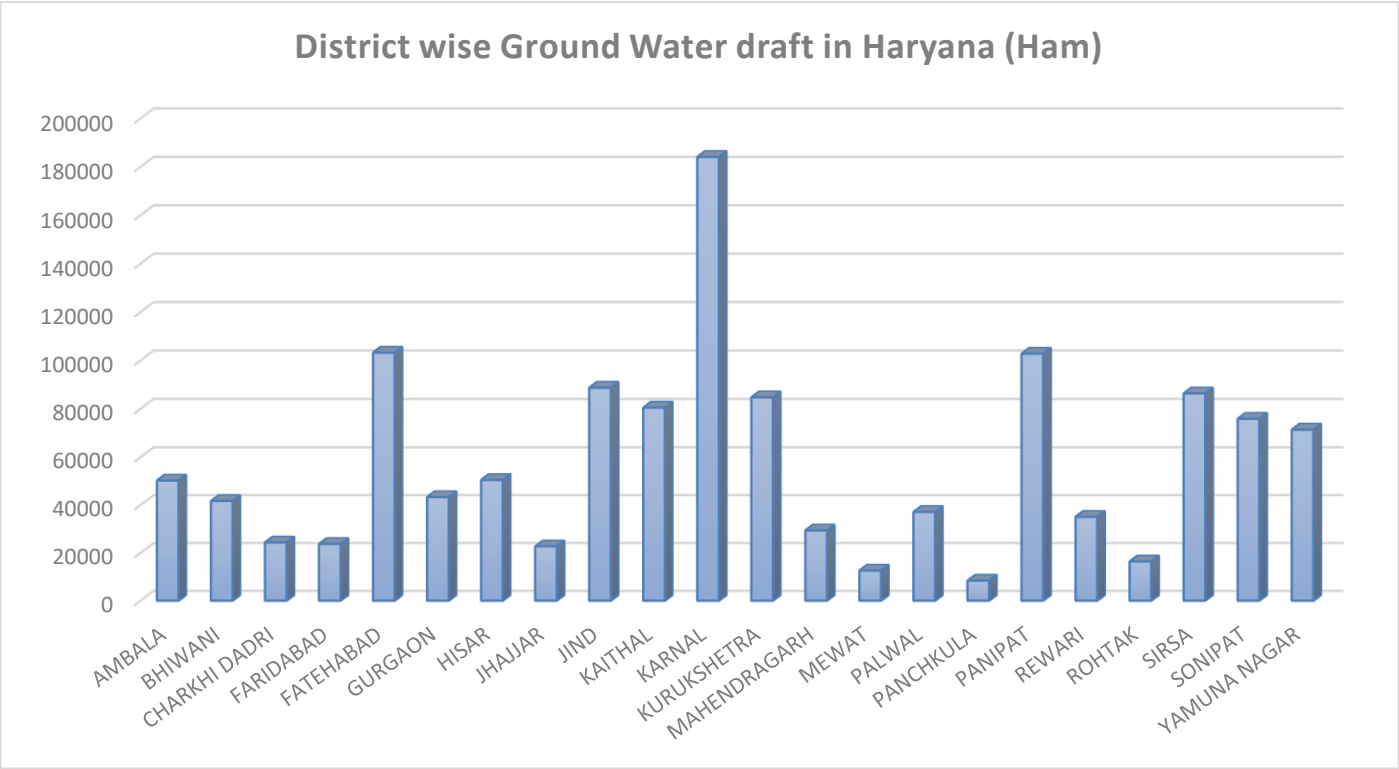


Figure 16 District wise Annual Ground water Draft

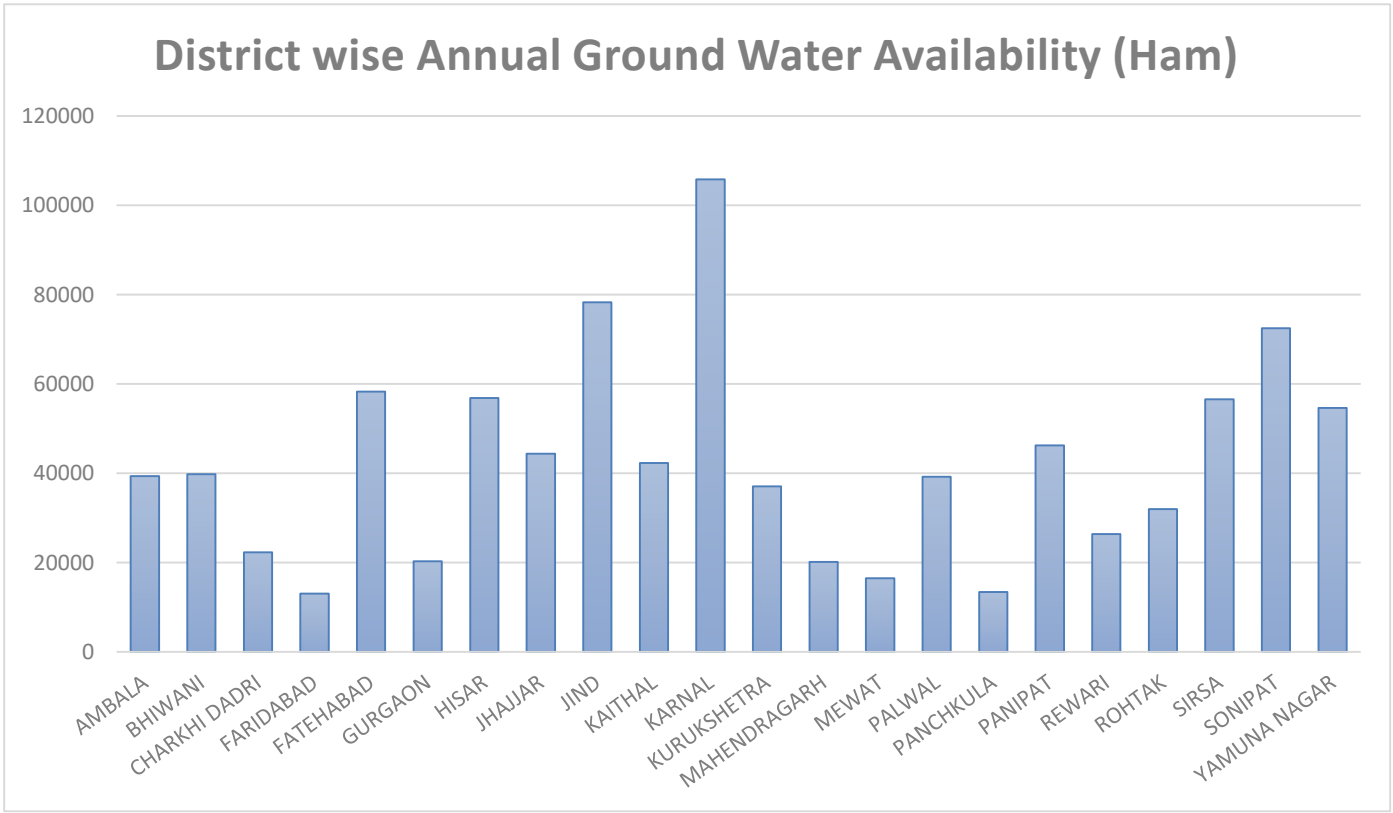


Figure 17 District wise Annual Ground water availability

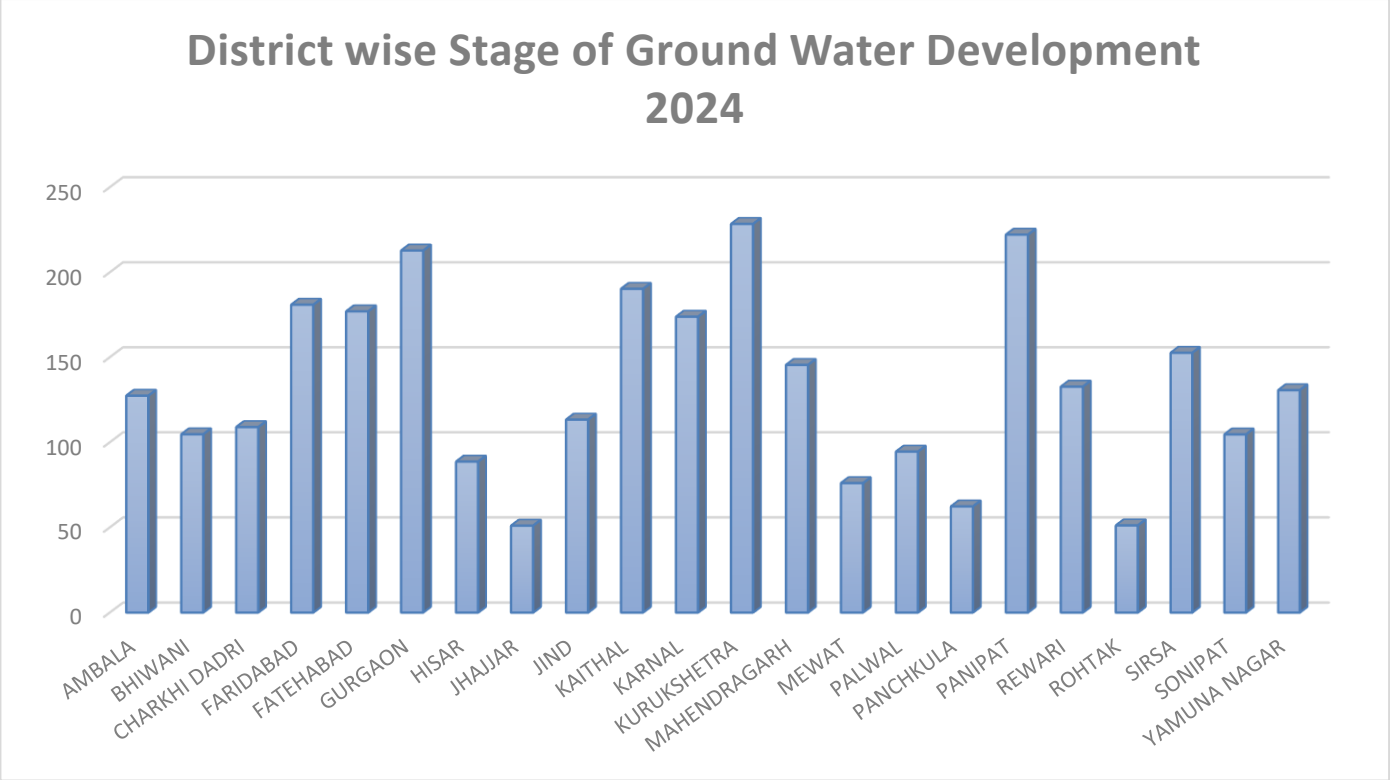


Figure 18 District wise Stage of Groundwater Development

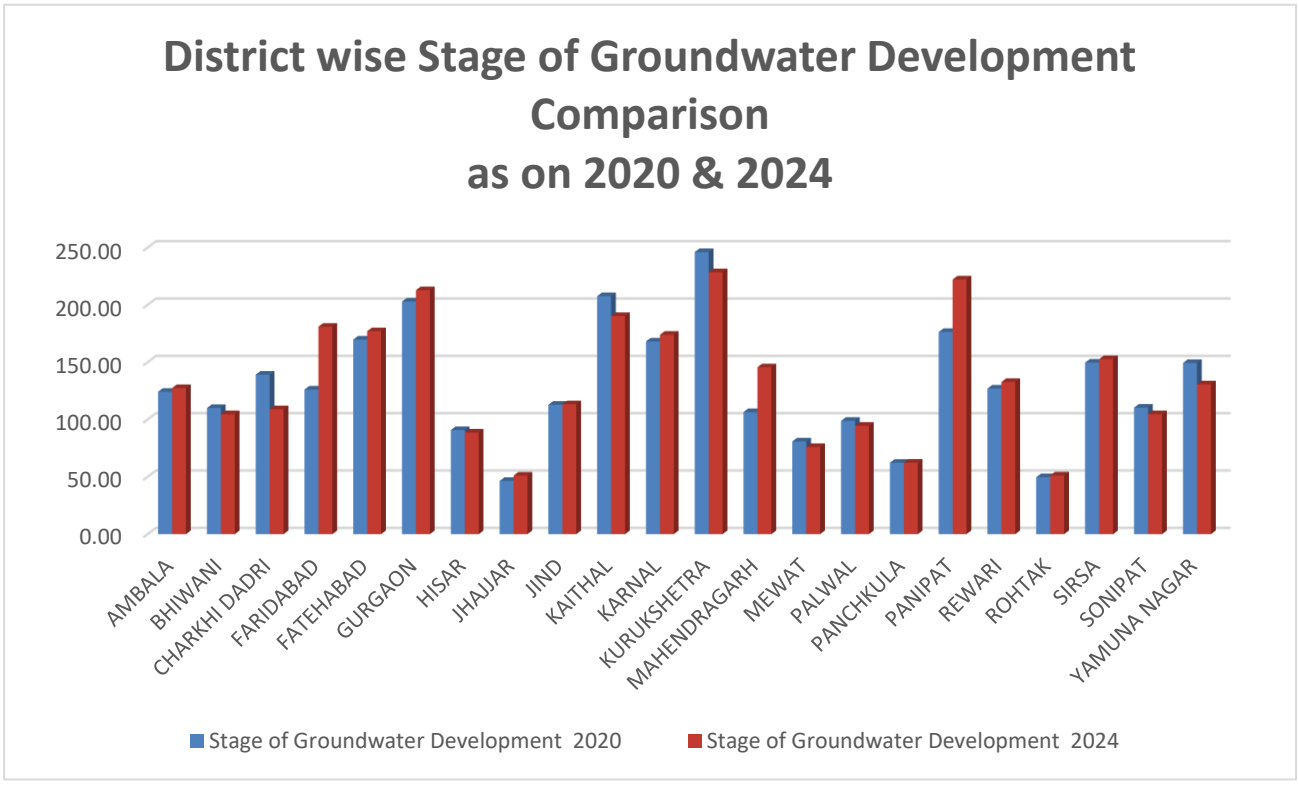
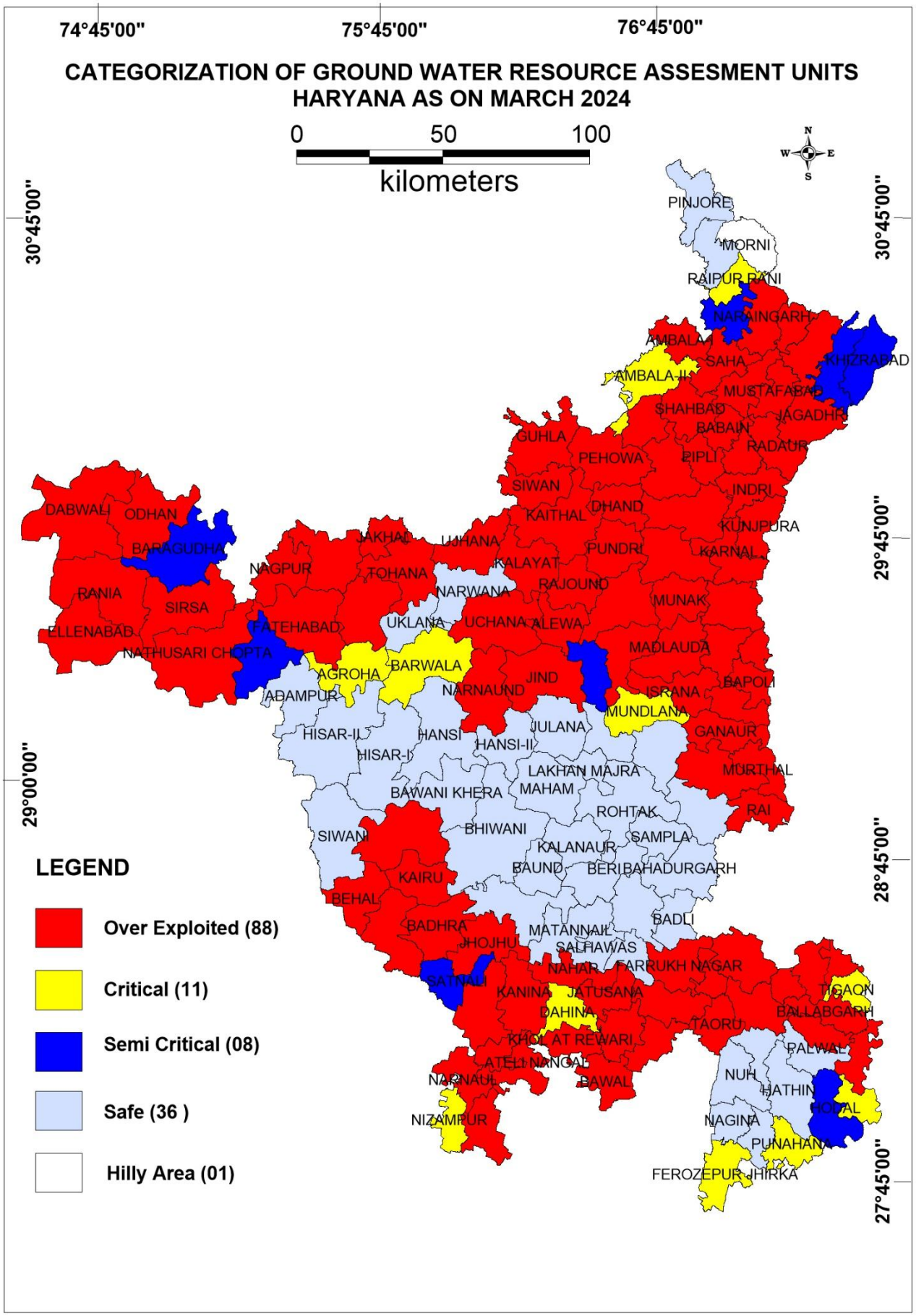


Figure 19 District wise Stage of Groundwater Development Comparison as on 2020 to 2024

Figure 20 Categorization of Ground Water Resource Assesment Units (As on March 2024)



Constitution of Permanent State Level Committee for Ground Water Resource Assessment of Haryana State

Diary No. 158
Date 28-02-2023
Haryana Water Resources Authority

HARYANA GOVERNMENT
IRRIGATION & WATER RESOURCES DEPARTMENT
ORDER

The Governor of Haryana pleased to constitute the permanent State Level Committee for Estimation of Ground Water Resource Potential & Refinement of figures in the State. The composition of the Permanent State Level committee will be as under :

1.	Commissioner & Secretary to Govt. Haryana, Irrigation & Water Resources Department	Chairman
2.	Vice Chancellor, C.C.S Haryana Agriculture University, Hisar	Member
3.	Director General, Agriculture & Farmers Welfare Deptt. Haryana	Member
4.	Managing Director, Haryana State Industrial & Infrastructure Development Corporation.	Member
5.	Administrator, Command Area Development Authority, Haryana, Panchkula	Member
6.	Director, Rural Development Department, Haryana	Member
7.	Director, Industries and Mines & Geology Department, Haryana	Member
8.	Managing Director, Haryana State Cooperative Agriculture & Rural Development Bank Ltd.	Member
9.	Chairman, Haryana State Pollution Control Board	Member
10.	General Manager, NABARD, Chandigarh	Member
11.	Engineering-in-Chief, Irrigation Department, Haryana	Member
12.	Engineering-in-Chief, LCU, Irrigation Department, Haryana	Member
13.	Engineering-in-Chief, Public Health Engineering Department, Haryana	Member
14.	Director, HARSAC	Member
15.	Director, HIRMI, Kurukshetra	Member
16.	Member Secretary, Haryana Ponds & Waste Water Management Authority	Member
17.	Chief Hydrologist, Ground Water Cell, I&WRD	Member
18.	Chief Hydrologist, Haryana Water Resources Authority	Member
19.	Regional Director, Central Ground Water Board, Chandigarh	Member Secretary

The committee may co-opt any other member (s)/ Special invitee(s) if necessary. The function of the committee shall be as under :-

(i) To estimate annual replenishable ground water resources of the state in accordance with the Ground Water Resources Estimation Methodology.

(ii) To estimate the status utilization of annual replenishable ground water resources.

The Headquarters of the committee shall be at Chandigarh. The member shall draw their TA/DA from respective organization.

Dated Chandigarh
the 15th February, 2023

Pankaj Agarwal, IAS
Commissioner & Secretary to Govt. of Haryana,
Irrigation & Water Resources Department

Annexure-II

Minutes of the meeting of working group for Ground Water Resource Estimation of Haryana as March 2024 held on 02.07.2024 at 12.30 pm in the office room of Dr. Satbir Singh Kadian, Engineer-In-Chief, Irrigation and Water Resource Department, Haryana, Panchkula at Sinchai Bhawan, Panchkula.

List of participant of the meeting attached.

At the very outset Sh. Pankaj Mahala, Hydrologist, Ground Water Cell a welcomed all the members of Working Group for Ground Water Resource Estimation of Haryana he also briefed about the agenda points of the meeting and apprised the Chairman Dr. Satbir S. Kadian about current status of the ground water resource in State of Haryana.

The Chairman shown his displeasure on the inefficient working of Ground Water Cell field officers and instructed them to work in the field of groundwater with full dedication and interest. He asked to change the old methodology and directed to include the accurate/authentic data on technical basis for Ground Water Resource Estimation 2024. He further directed all GWC officers to collect and upload appropriate data and any negligence on wrong data uploading, the GWC officer concerned will be responsible. The agenda points for the meeting in specific were as follows:

1. Sh. Vidya Nand Negi, Scientist-D CGWB, Chandigarh briefed about the unit draft calculation. He emphasize on draft calculation from water flow meters installed under Atal Bhujal Yojana shows 80-90% accuracy in groundwater extraction from Agriculture tube wells. He further requested to take maximum number of sites a block for calculation of unit draft. The template of Babain block of Kurukshetra district has also been shared on whatsapp group.

(GWC field officers)

2. Power Department will provide the block-wise number of tube wells

Sr. No.	District	Block	No. of tubewells		
			Agriculture	Domestic	Industrial
1	2	3	4	5	6

(Power department)

1. All fields officers and their technical staff were instructed to submitted and upload the data sheets on Ingres portal within given time line.

(CGWB and GWC field offices)

2. Data should be uploaded on In-gres portal same as previous years.

(GWC field officers)

Meeting ended with the vote of thanks.

****

List of participants attended the 1st meeting of Ground Water Resource Estimation of Haryana as March 2024 held on 02.07.2024 at 12.30 pm in the office room of Dr. Satbir Singh Kadian, Engineer-In-Chief, Irrigation and W.R. Department, Haryana, Panchkula at Sinchai Bhawan, Panchkula.

Sr. No.	Name	Designation
1.	Sh. O. P. Godara	Joint Director, Agriculture & F.W. Department
2.	Sh. Sundeep Kumar	SE, DHBVN, Hisar
3.	Sh. V. S. Lamba	Hydrologist, GWC, Gurugram
4.	Sh. Dalvir Singh	Hydrologist, GWC, Rohtak & Karnal
5.	Sh. Rakesh Kumar	Hydrologist, GWC, Ch. Dadri, Hisar & Ambala
6.	Sh. Pankaj Mahala	Hydrologist, HQ, GWC, Panchkula
7.	Sh. Vidya Nand Negi	Scientist 8D9, CGWB, Chandigarh.
8.	Sh. Ayush Kesharwani	Scientist 8B9, CGWB, Chandigarh.
9.	Smt. Ruchika Nehra	Assistant Geologist, GWC, Jind
10.	Sh. Chander Prakash	Assistant Geologist, GWC, Bhiwani & Sirsa
11.	Sh. Ajit Singh	Assistant Geologist, GWC, Kurukshetra
12.	Sh. Mahavir Singh	Technical Assistant, GWC, Karnal
13.	Sh. Abhinav	Technical Assistant, GWC, Ambala
14.	Sh. Amit Kumar	Technical Associate (Geology), GWC, Panchkula
15.	Sh. Rajiv Kumar	Technical Associate (Geology), GWC, Ambala

ANNEXURE III

Minutes of the meeting of State Level Committee for Ground Water Resource Estimation of Haryana as on March, 2024 held on 26.11.2024 at 11:30 AM under the Chairmanship of Commissioner & Secretary to Government, Haryana, Irrigation & Water Resources Department, Haryana in Conference Hall, 6thFloor, Haryana New Civil Secretariat, Sector 17, Chandigarh

State Level Committee meeting for Ground Water Resource Estimation of Haryana as on March, 2024 was held on 26.11.2024 at 11:30 AM under the Chairmanship of Sh. Anurag Agarwal (IAS), Commissioner & Secretary, Irrigation & Water Resources Department, Government of Haryana in Conference Hall, 6th Floor, Haryana New Civil Secretariat, Sector 17, Chandigarh. The meeting held in hybrid mode and the officers from line department of Haryana state joined through video conferencing. The list of Members/officers attending the meeting attending in physical mode is give in Annexure - I.

At the very outset, Dr. Satbir Singh Kadiyan, Engineer-In-Cheif welcomed all the members of State Level Committee for "Ground Water Resources Estimation of Haryana 2024". He also briefed about the agenda points of the meeting and gives a brief introduction of Groundwater Resource Estimation of Haryana state. The agendas discussed during the above meeting are as given below:

1. Sh. Ayush Kesharwani, Scientist 'B' CGWB, Chandigarh briefed about Ground Water Resource Estimation of Haryana to be carried out as on March 2024 through power point presentation. He gave a brief overview of the Ground Water Resource Estimation Methodology 2015 and the different data required from line departments. He provided a summary of GWRE 2024 and also presented the comparison of Stage of ground water development (SOGWD) as on March 2023 with 2024 highlighting the changes in the categorization of assessment units. A summary of GWRE-2024 has been enclosed in Anexure-I

2. Sh Anurag Aggarwal (ACS) emphasized to incorporate all the water level data collected manually or by telemetry by CGWB, GW cell Haryana, DWLRs installed in Atal Bhujal Yojna on one platform. To provide a better picture of Haryana state water level data should be reflected aquiferwise on common platform.

3. Smt. Keshni Anand Arora raised the suggestion that the Morni Block in Panchkula should be included in the groundwater resource estimation as there is presence of numerous recharge structures in that area, indicating the potential for significant groundwater recharge.

4. Dr. Satbir Singh Kadian told that the categorization done by CGWB is at Block Level, while it has been observed that within a block there are huge variation i.e. some villages may be over exploited and others may be safe but because the Block has been declared as 'OE' thus all villages are treated as 'OE' and this causes lot of public distress as policies are aligned in accordance with the CGWB categorization. To address this, it was suggested to conduct the estimation at the village level which would ensure that policies and measures are tailored to the specific needs of each village.

5. It was highlighted that certain assessment units categorized as "safe" have poor quality groundwater, such as in Jhajjar, Rohtak, Jind, etc districts. It was proposed to establish a criteria to distinguish between such assessment units and categorize them separately.

6. It was suggested to automate the data entry in the IN-GRES platform to simplify the data collection process. This automation would involve inputting the data directly by all departments into the platform, easing the process of data collection.

7. Dr Satbir Singh Kadiyan emphasized that the final report should contain affirmative recommendations based on the findings of the groundwater resource estimation which would guide future actions and policies on groundwater.

8. Sh. Dinesh Tewari (Sc-E) told that the recharge due to other sources (recharge due to pond, water conservation structure & ground water recharge structures) in Haryana state is increased significantly which shows the sustainable efficiency of works done in water sector. In addition to this he also admired the works done for shifting industries on treated water by HWRA to reduce industrial ground water extraction. A brief note is enclosed afterwards.

   Sh. Dinesh Tewari (Sc-E) and Sh. Saquib (STA-HG), CGWB clarifies all the queries raised by Chairperson and officers from state department attending the meeting.

Meeting ended with the vote of thanks.

****

STATE LEVEL COMMITTEE FOR GROUND WATER RESOURCE ESTIMATION OF HARYANA STATE AS ON MARCH, 2024

26/11/2024

S. No.	Name	Designation	Department	Contact	Signature
1	Rajiv Batra	Chief Engineer	PHED	9872617131	
2.	Nitin Pal	S.E (mech)	PHED	98129-98177	
3	Deepak Hooda	State Geologist	Mines & Geology	9493290000	
4.	Mukesh Gupta	HOD (Engg)	HSIIDC	9996259028	
5.	Dr. Vimal Kumar	Divisional Soil Conservation Officer DSCO, PKL	Agriculture & Farmer, welfare	9466721383	28/11
6	Dr Deepa	Research officer	Inigo HWRA	7986668473	
7.	Manavjeet Sykh	DGM,	NABARD	9816099935	

8.	Ishwar Pal	Asstt. Engineer	HPWWMA	9815983223	
9.	Dr. Sonica	Sci - B	HSPCB, PKL	8295259397	
10.	HansRaj Sharma	Joint Director	HIRMI/KKR, Irrigation & W/R.	9416743887	
11	PANKAJ MAHAJAN	Chief Hyd.	HWRA	9418644474	
12	Dr. Rajbir Garg	Director of Research CCSHAU, Hisar	CCSHAU, Hisar	9416572469	
13.	Sanjay Mandaha	Member, HWRA.	HWRA	9560093032	
14.	Ayush Kesharwani	CGWB Sc-B	CGWB Chandigarh	8962723416	STA(T)
15	Dinesh Tewari	CGWB Sct-D	CGWB, D Chandigarh.	7986629916	
16.	Saquib	STA-NG	CGWB	8081106760	
17.	~~Keshri~~ Anand Arora	Chairperson	HWRA		

ANNEXURE V

BLOCKWISE AREA DEPTH TO WATER LEVEL (PERIOD JUNE, 2023)

S.NO.	DISTRICT / BLOCK	TOTAL GEO. AREA IN ACRE	HILLY AREA IN ACRE	Area Under Different Zone Of Depth To Water Table (m)						
				0-1.5	1.5-3	3.0-5	5.0-10	10.0-20	20-30	30 Above
1	AMBALA									
	Shahzadpur	49791.23	.		6.80	644.33	8347.00	39533.54	1254.00	5.56
	Ambala-1	47734.82	-		1780.00	7649.93	28572.48	9374.00	358.41	
	Ambala-2	86791.11	-		2186.09	43539.00	20878.25	19419.53	768.24	
	Barara	56928.18	-			14557.00	13998.00	18421.00	4125.00	5827.18
	Naraingarh	68519.31	-				2277.06	58394.35	5158.00	2689.90
	Saha	63870.78	-			305.55	1955.00	47541.00	7660.00	6409.23
	TOTAL	**373635.43**	**0**	**0.00**	**3972.89**	**66695.81**	**76027.79**	**192683.42**	**19323.65**	**14931.87**
2	BHIWANI									
	Siwani	140251.65	-				2377.15	79634.41	31695.29	26544.8
	Bawani Khera	100243.8	-		1097.56	74634.07	24512.17			
	Bhiwani	211187.63	17.3		1175.45	151614.63	57204.81	1175.44		
	Behal	73087.94	-						2068.53	71019.41
	Loharu	90759.87	4.94							90754.93
	Tosham	128203.0	2013.9			3726.83	27279.94	83629.15	11553.18	
	Kairu	70941.38	-				1943.6	38224.12	5182.93	25590.73
	TOTAL	**814675.27**	**2036.14**	**0**	**2273.01**	**229975.53**	**113317.67**	**202663.12**	**50499.93**	**213909.87**
3	CH. DADRI									
	Dadri	106594.08	1227.59		17456.18	33571.28	35514.25	11325.76	5754.61	1744.41
	Jhoju	84019.96	3897.66				1263.55	23662.8	12530.86	42665.09
	Bond	57912.96	-		8449.67	46443.8	3019.49			
	Badhra	90871.47	466.83						392.15	90012.49
	Total	**339398.47**	**5592.08**	**0**	**25905.85**	**80015.08**	**39797.29**	**34988.56**	**18677.62**	**134421.99**

4	FARIDABAD									
	Faridabad	96734.23	18305.54				4127.83	33022.6	41278.26	
	Ballabgarh	53519.88	3234.6			2646.59	7939.78	26465.93	12174.34	1058.64
	Tigaon	33257.27	0					12093.55	21163.72	
	TOTAL	**183511.38**	**21540.14**	**0.00**	**0.00**	**2646.59**	**12067.61**	**71582.08**	**74616.32**	**1058.64**
5	FATEHABAD									
	Fatehabad	136980.74	-	5479.26	4109.42	17237.05	10661.61	20250.25	11346.51	67896.64
	Tohana	99451.93	-				1989.02	28841.06	24863.01	43758.84
	Jakhal	37785.42	-							37785.42
	Ratia	93376.17	-							93376.17
	Bhattu Kalan	89852.6	-		29651.34	18869.05	32346.93	4492.63	3594.13	898.52
	Bhuna	95336.96	-		2383.42	8103.66	18114.02	22880.87	13347.17	30507.82
	Nagpur	71187.86	-						2135.63	69052.23
	TOTAL	**623971.68**	**0**	**5479.26**	**36144.18**	**44209.76**	**63111.58**	**76464.81**	**55286.45**	**343275.64**
6	GURGAON									
	F. Nagar	70770.87	76.6				4712.95	20198.35	37030.32	8752.65
	Pataudi	68072.05	111.18					3576.89	25038.22	39345.76
	Gurugram	84599.15	3182.71		1302.66	3256.66	5210.65	3256.66	32566.57	35823.24
	Sohna	87996.05	5992.3			5466.92	7653.68	10933.83	43735.34	14213.98
	TOTAL	**311438.12**	**9362.79**	**0.00**	**1302.66**	**8723.58**	**17577.28**	**37965.73**	**138370.45**	**98135.63**
7	HISAR									
	Adampur	90669.85	-	3626.79	14507.18	24480.86	22667.46	25387.56		
	Barwala	125117.52	-	6005.64	22521.15	68189.07	19017.86	9383.8		
	Hansi	145366.17	-	10175.63	61780.6	37795.2	24712.29	10902.45		
	Bass	73940.39	-	2957.66	52497.63	14788.08	3697.02			
	Hisar-1	153929.29	-	5387.52	73886.06	58796.67	14623.28	1235.76		
	Hisar-2	178431.89	-		14274.55	42823.65	70480.24	46392.29	1834.65	2626.51
	Narnaund	101277.37	-		444.31	555.38	43562.35	56715.33		
	Agroha	81518.54	-		2445.55	8151.85	61383.48	9537.66		
	Uklana	56770.87	-		2270.83	24411.45	7947.93	22140.66		
	TOTAL	**1007021.89**	**0**	**28153.24**	**244627.9**	**279992.21**	**268091.91**	**181695.51**	**1834.65**	**2626.51**

8	JIND									
	Alewa	58185.82	-					7723.78	20596.75	29865.29
	Julana	86911.61	-	8737.14	49663.78	18393.99	5978.05	4138.65		
	Narwana	82273.19	-		5674.01	37826.75	34989.75	3782.68		
	Pillukhera	53250.14	-		7294.54	9118.18	9482.9	18965.8	6929.81	1458.91
	Safidon	77674.54	-		1265.06	3542.16	13156.60	31373.43	28337.29	
	Uchana	125333.15	-			10637.13	11099.61	88796.92	13874.52	924.97
	Ujhana	78271.79	-			1142.65	18282.46	26281.04	15425.83	17139.81
	Jind	117865.52	-		10793.54	3885.68	12088.77	24177.54	45332.89	21587.1
	TOTAL	**679765.76**	**0.00**	**8737.14**	**74690.93**	**84546.54**	**105078.14**	**205239.84**	**130497.09**	**70976.08**
9	JHAJJAR									
	Bahadurgarh	95492	-	5130	32357	44984	7497	5524		
	Beri	81029	-	2555	71539	6935				
	Jhajjar	75568	-	3009	41128	30762	669			
	Matanhail	87017	-	337	45532	7420	8095	25633		
	Sahlawas	37712	-	11038	11651	10424	3373	1226		
	Badli	51589	-	1164	17843	31807	775			
	Machhroli	41629	-	6875	7638	4965	14513	7638		
	TOTAL	**470036.00**	**0.00**	**30108.00**	**227688.00**	**137297.00**	**34922.00**	**40021.00**	**0.00**	**0.00**
10	K. KSHETRA									
	Thanesar	77837.22	-							77837.22
	Shahabad	68196.35	-							68196.35
	Pehowa	104805.48	-							104805.48
	Ladwa	38733.86	-					1902.59	5806.07	31025.2
	Babain	33101.22	-							33101.22
	Ismailabad	49684.72	-							49684.72
	Pipli	43816.72	-							43816.72
	TOTAL	**416175.57**	**0**	**0**	**0**	**0**	**0**	**1902.59**	**5806.07**	**408466.91**
11	KAITHAL									
	Guhla	96766.64	-							96766.64
	Kaithal	126253.65	-					22725.66	31563.41	71964.58

	Pundri	76004.02	-					2329.34	36002.02	37672.66
	Kalayat	80776.54	-				46213.69	34205.4	126.97	230.48
	Rajound	60498.28	-					58883.1	1615.18	
	Siwan	67293.81	-							67293.81
	Dhand	54359.68	-						15.35	54344.33
	TOTAL	**561952.62**	**0**	**0**	**0**	**0**	**46213.69**	**118143.5**	**69322.93**	**328272.5**
12	KARNAL									
	Karnal	71195.51	-				10521.5	43488.88	17185.13	
	Indri	60048.53	-				35238.06	13663.74	5393.58	5753.15
	Gharaunda	70735.16	-				10463.78	22183.22	28042.93	10045.23
	Nilokheri	98737.23	-					1001.39	6809.46	90926.38
	Assandh	97106.06	-					8333.73	83337.29	5435.04
	Nissing	88594.83	-				619.55	9499.68	38824.77	39650.83
	Kunjpura	57062.29	-				27770.31	29291.98		
	Munak	66998.42	-				1440.83	26655.29	37101.27	1801.03
	TOTAL	**610478.03**	**0.00**	**0.00**	**0.00**	**0.00**	**86054.03**	**154117.91**	**216694.43**	**153611.66**
13	M. GARH									
	Ateli	55137.2	2243.72				614.72	1593.63	1180.13	49505
	Kanina	87385.94	-				1465.4	6813.28	14973.5	64133.76
	M.garh	88668.5	2515.53					405.2	2954.35	82793.42
	N. Chaudhary	61874.6	911.82					346	9075.42	51541.36
	Narnaul	52145.48	-				394	4876.34	12970.62	33904.52
	Nizampur	41615.62	2735.45				910	4036	13566.23	20367.94
	Sihma	34162.79	-					1843	7806.54	24513.25
	Satnali	58598.83	3073.99							55524.84
	TOTAL	**479588.96**	**11480.51**	**0**	**0**	**0**	**3384.12**	**19913.45**	**62526.79**	**382284.09**
14	NUH									
	F.P.Zhirka	68308.50	12861.81				7392.88	44357.36	3696.45	
	Nuh	72513.38	7400.79	1532.07	13788.55	38301.52	7660.30	3830.15		
	Nagina	43842.99	3612.67		3094.64	21662.48	9283.92	6189.28		
	Punhana	51493.37	247.10		3202.89	9608.67	12811.57	25623.14		

	Taoru	54278.58	8305.20					2873.34	11493.34	31606.70
	Pingawan	38417.23	1171.28			10641.71	5320.84	21283.40		
	Indri	42377.83	741.31		1189.61	8922.11	17844.22	13680.58		
	TOTAL	**371231.88**	**34340.16**	**1532.07**	**21275.69**	**89136.49**	**60313.73**	**117837.25**	**15189.79**	**31606.70**
15	PALWAL									
	Palwal	49313.19	-		1408.95	2113.42	8453.69	31701.34	5635.79	
	Hassanpur	38202.30	-				3820.23	30561.84	3820.23	
	Hodel	74265.92	-				15634.93	58630.99		
	Hathin	89006.84	318.76	4005.27	11443.62	20026.34	13160.17	40052.68		
	Pirthala	40482.64	-		1245.61	4359.64	15570.14	16192.95	3114.30	
	Badoli	44681.66	-					15123.02	27496.41	2062.23
	TOTAL	**335952.55**	**318.76**	**4005.27**	**14098.18**	**26499.40**	**56639.16**	**192262.82**	**40066.73**	**2062.23**
16	PANIPAT									
	Panipat	52584.72	-				557.44	2972.99	4831.1	44223.19
	Israna	67691.48	-			2361.33	33452.19	15742.2	12200.21	3935.55
	Samalkha	46752.93	-					9896.61	13650.49	23205.83
	Madlauda	89911.78	-			438.59	13157.82	69736.45	6140.32	438.6
	Bapoli	38719.90	-				430.22	15487.96	9034.64	13767.08
	Sanoli Khurd	26251.24	-				1988.73	10739.14	11534.64	1988.73
	TOTAL	**321912.05**	**0**	**0**	**0**	**2799.92**	**49586.4**	**124575.35**	**57391.4**	**87558.98**
17	PANCHKULA									
	Pinjore	72164.48	27750				766.17	31546.00	9722.00	2380.31
	Barwala	53719.91	-				3801.23	42559.57	5605.22	1753.89
	R.P.Rani	34663.7	8000				1179.76	23297.99	2185.95	
	Morni	57613.23	57613.23							
	TOTAL	**218161.32**	**93363.23**	**0**	**0**	**0**	**5747.16**	**97403.56**	**17513.17**	**4134.2**
18	ROHTAK									
	Rohtak	144109	-	14146	78243	34480	9725	7515		
	Meham	110467	-	20759	74510	9638	3336	2224		
	Kalanaur	70477	-	3556	49140	17134	647			
	Lakhan Majra	31355	-		23016	5337	2668	334		

	Sampla	56028	-	709	13120	37943	4256			
	TOTAL	**412436**	**0**	**39170**	**238029**	**104532**	**20632**	**10073**	**0**	**0**
19	REWARI									
	Bawal	59316.63	1179.16					10968.43	25692.51	21476.53
	Jatusana	50907.40	-				11674	26153.6	13079.8	
	Khol	46726.76	3355.69					230	2736.4	40404.67
	Rewari	56338.66	-				13482.6	36107.4	6545.66	203
	Nahar	57897.15	-				5319.45	28657.32	23920.38	
	Dahina	51931.5	568.34					4378.2	17483.53	29501.43
	Dharuhera	49733.76						24879.42	22779.64	2074.7
	TOTAL	**372851.86**	**5103.19**	**0**	**0**	**0**	**30476.05**	**131374.37**	**112237.92**	**93660.33**
20	SONEPAT									
	Gohana	77947	-		21517	39379	16645	406		
	Rai	53566	-	0	951	5705	11094	23455	12361	
	Kharkhoda	75996	-	1836	6241	45891	22028			
	Sonepat	90940	-			21204	27800	21204	17434	3298
	Ganaur	62238	-	0	0	648	10373	17180	17505	16532
	Kathura	48454	-	2160	28085	14505	1543	2161		
	Mundlana	71875	-	4054	19904	13269	34648			
	Murthal	47045						13482	17498	16065
	TOTAL	**528061**	**0**	**8050**	**76698**	**140601**	**124131**	**77888**	**64798**	**35895**
21	SIRSA									
	Ellenabad	130438.76	-				29603.63	26954.17	24779.26	49101.7
	Odhan	127456.74	-				5217.34	122239.4		
	Dabwali	197994.94	-				20204.51	155566.7	22223.73	
	N.S.Chopta	187068.53	-		18289.1	29910.09	66676.82	32710.3	16865.52	22616.7
	Baragudha	131915.62	-				21013.58	104639.26	6262.78	
	Sirsa	134565.64	-				1734.99	1549.63	25906.26	105374.76
	Rania	145681.83	-					22797.12	32522.47	90362.24
	TOTAL	**1055122.06**	**0**	**0**	**18289.1**	**29910.09**	**144450.87**	**466456.58**	**128560.02**	**267455.4**
22	Y. NAGAR									

	Jagadhari	74096.64	-			424.40	11542.83	60059.00	2070.41	
	Bilaspur	68109.87	2750			287.88	30180.35	34587.00	125.41	179.23
	Chhachhrauli	64195.33	15500		89.45	1168.26	31645.87	15791.75		
	Sadhaura	36731.71	2500			635.20	18144.71	14366.00	1085.80	
	Radhaur	60920.31	-				15441.00	27364.00	15863.00	2252.31
	Mustafabad	50766.84	-			85.23	10059.41	37116.18	3445.68	60.34
	Khizrabad	69650.17	17500				21745.00	28566.00	1839.17	
	TOTAL	**424470.87**	**38250**	**0**	**89.45**	**2600.97**	**138759.17**	**217849.93**	**24429.47**	**2491.88**
	Total Area	**10911848.77**	**221387.00**	**125234.98**	**985084.80**	**1330181.97**	**1496378.65**	**2773102.38**	**1303642.88**	**2676836.11**
	%age	**100**	**2**	**1**	**9**	**12**	**14**	**25**	**12**	**25**

ANNEXURE VI

DISTRICTWISE DEPTH TO WATER TABLE AREA JUNE, 2023 (AREA IN ACRE)

S.NO.	DISTRICT	TOTAL GEO. AREA IN ACRE	HILLY AREA IN ACRE	Area Under Different Zone Of Depth To Water Table (m)						
				0-1.5	1.5-3	3.0-5	5.0-10	10.0-20	20-30	30 Above
1	AMBALA	373635.43	0	0.00	3972.89	66695.81	76027.79	192683.42	19323.65	14931.87
2	BHIWANI	814675.27	2036.14	0	2273.01	229975.53	113317.67	202663.12	50499.93	213909.87
3	CH. DADRI	339398.47	5592.08	0	25905.85	80015.08	39797.29	34988.56	18677.62	134421.99
4	FARIDABAD	183511.38	21540.14	0.00	0.00	2646.59	12067.61	71582.08	74616.32	1058.64
5	FATEHABAD	623971.68	0	5479.26	36144.18	44209.76	63111.58	76464.81	55286.45	343275.64
6	GURGAON	311438.12	9362.79	0.00	1302.66	8723.58	17577.28	37965.73	138370.45	98135.63
7	HISAR	1007021.89	0	28153.24	244627.86	279992.21	268091.91	181695.51	1834.65	2626.51
8	JIND	679765.76	0.00	8737.14	74690.93	84546.54	105078.14	205239.84	130497.09	70976.08
9	JHAJJAR	470036.00	0.00	30108.00	227688.00	137297.00	34922.00	40021.00	0.00	0.00
10	K. KSHETRA	416175.57	0	0	0	0	0	1902.59	5806.07	408466.91
11	KAITHAL	561952.62	0	0	0	0	46213.69	118143.5	69322.93	328272.5
12	KARNAL	610478.03	0.00	0.00	0.00	0.00	86054.03	154117.91	216694.43	153611.66
13	M. GARH	479588.96	11480.51	0	0	0	3384.12	19913.45	62526.79	382284.09
14	NUH	371231.88	34340.16	1532.07	21275.69	89136.49	60313.73	117837.25	15189.79	31606.70
15	PALWAL	335952.55	318.76	4005.27	14098.18	26499.40	56639.16	192262.82	40066.73	2062.23
16	PANIPAT	321912.05	0	0	0	2799.92	49586.4	124575.35	57391.4	87558.98
17	PANCHKULA	218161.32	93363.23	0	0	0	5747.16	97403.56	17513.17	4134.2
18	ROHTAK	412436	0	39170	238029	104532	20632	10073	0	0
19	REWARI	372851.86	5103.19	0	0	0	30476.05	131374.37	112237.92	93660.33
20	SONEPAT	528061	0	8050	76698	140601	124131	77888	64798	35895
21	SIRSA	1055122.06	0	0	18289.1	29910.09	144450.87	466456.58	128560.02	267455.4
22	Y. NAGAR	424470.87	38250	0	89.45	2600.97	138759.17	217849.93	24429.47	2491.88
Total Area		**10911848.77**	**221387.00**	**125234.98**	**985084.80**	**1330181.97**	**1496378.65**	**2773102.38**	**1303642.88**	**2676836.11**
%age		**100**	**2**	**1**	**9**	**12**	**14**	**25**	**12**	**25**

ANNEXURE VII

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2022with 2023 IN STATE OF HARYANA

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA												
S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**AMBALA**	Ambala-I	4.95	5.56	4.74	4.64	6.79	6.34	-1.39	-0.78	-1.60	-1.70	0.45
2		Ambala-II	6.25	6.29	6.34	5.39	8.79	7.08	-0.83	-0.79	-0.74	-1.69	1.71
3		Brara	5.53	6.00	5.93	13.38	15.86	15.47	-9.94	-9.47	-9.54	-2.09	0.39
4		Saha	5.32	5.10	5.88	13.62	24.40	23.76	-18.44	-18.66	-17.88	-10.14	0.64
5		Naraingarh	7.82	7.84	10.71	14.61	18.93	20.17	-12.35	-12.33	-9.46	-5.56	-1.24
6		Shahzapur	6.98	6.71	6.88	9.81	11.95	12.27	-5.29	-5.56	-5.39	-2.46	-0.32
		AVERAGE	**6.14**	**6.25**	**6.75**	**10.24**	**14.45**	**14.18**	**-8.04**	**-7.93**	**-7.44**	**-3.94**	**0.27**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA												
S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**PANCHKULA**	Pinjore	13.14	16.26	15.73	17.73	19.54	18.89	-5.75	-2.63	-3.16	-1.16	0.65
2		Barwala	11.24	12.07	12.63	16.60	17.59	17.67	-6.43	-5.60	-5.04	-1.07	-0.08

3		Raipur rani	10.48	10.61	11.61	14.35	17.04	16.81	-6.33	-6.20	-5.20	-2.46	0.23
		AVERAGE	**11.62**	**12.98**	**13.32**	**16.23**	**18.06**	**17.79**	**-6.17**	**-4.81**	**-4.47**	**-1.56**	**0.27**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**YAMUNANAGAR**	Jagadhari	7.20	7.74	8.55	15.76	14.64	14.06	-6.86	-6.32	-5.51	1.70	0.58
2		Mustafabad	6.91	8.34	7.97	13.05	12.31	11.27	-4.36	-2.93	-3.30	1.78	1.04
3		Radour	6.02	6.23	6.51	20.73	17.96	18.61	-12.59	-12.38	-12.10	2.12	-0.65
4		Sadhoura	6.16	6.62	6.99	8.48	9.05	8.18	-2.02	-1.56	-1.19	0.30	0.87
5		Chachhrauli	7.62	7.68	8.40	7.30	7.78	6.81	0.81	0.87	1.59	0.49	0.97
6		Bilaspur	5.99	6.55	7.32	8.28	11.84	11.52	-5.53	-4.97	-4.20	-3.24	0.32
7		Khizrabad	11.23	11.24	11.36	13.29	14.63	13.86	-2.63	-2.62	-2.50	-0.57	0.77
		AVERAGE	**7.30**	**7.77**	**8.16**	**12.41**	**12.60**	**12.04**	**-4.74**	**-4.27**	**-3.89**	**0.37**	**0.56**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**BHIWANI**	Bhiwani	9.83	8.58	7.24	5.11	6.20	6.28	3.55	2.30	0.96	-1.17	-0.08
2		Bhiwani Khera	16.50	14.35	11.43	6.40	5.00	5.06	11.44	9.29	6.37	1.34	-0.06
3		Tosham	18.36	17.50	15.83	14.32	14.15	14.84	3.52	2.66	0.99	-0.52	-0.69
4		Loharu	37.92	40.04	40.23	57.20	67.73	80.04	-42.12	-40.00	-39.81	-22.84	-12.31
5		Kairu	18.12	17.92	16.34	20.44	24.08	26.12	-8.00	-8.20	-9.78	-5.68	-2.04

6		Siwani	24.23	23.81	22.64	22.91	23.93	24.51	-0.28	-0.70	-1.87	-1.60	-0.58
7		Bahal	38.27	40.26	42.58	54.79	68.04	80.76	-42.49	-40.50	-38.18	-25.97	-12.72
		AVERAGE	**23.32**	**23.21**	**22.33**	**25.88**	**29.88**	**33.94**	**-10.63**	**-10.74**	**-11.62**	**-8.06**	**-4.07**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**CH DADRI**	Dadri	8.50	9.72	9.11	9.00	9.79	10.27	-1.77	-0.55	-1.16	-1.27	-0.48
2		Badhra	30.64	31.57	36.74	60.41	68.90	69.94	-39.30	-38.37	-33.20	-9.53	-1.04
3		Jhojhu	21.95	22.94	23.17	33.08	40.87	41.70	-19.75	-18.76	-18.53	-8.62	-0.83
4		Bond	5.17	5.09	5.05	2.76	3.84	3.78	1.39	1.31	1.27	-1.02	0.06
		AVERAGE	**16.57**	**17.33**	**18.52**	**26.31**	**30.85**	**31.42**	**-14.86**	**-14.09**	**-12.91**	**-5.11**	**-0.57**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**GURUGRAM**	Gurugram	11.23	13.03	16.07	31.45	33.45	33.55	-22.32	-20.52	-17.48	-2.10	-0.10
2		F-Nagar	7.07	8.33	11.48	17.67	22.97	22.77	-15.70	-14.44	-11.29	-5.10	0.20
3		Patodi	8.05	10.67	18.37	30.40	38.39	38.25	-30.20	-27.58	-19.88	-7.85	0.14
4		Sohna	6.48	8.98	12.59	22.79	25.56	25.67	-19.19	-16.69	-13.08	-2.88	-0.11

		AVERAGE	**8.21**	**10.25**	**14.63**	**25.58**	**30.09**	**30.06**	**-21.85**	**-19.81**	**-15.43**	**-4.48**	**0.03**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**FARIDABAD**	Faridabad	8.44	9.46	9.86	18.45	24.35	24.50	-16.06	-15.04	-14.64	-6.05	-0.15
2		B.Garh	7.24	8.29	9.91	12.96	17.01	17.09	-9.85	-8.80	-7.18	-4.13	-0.08
3		Tigaon				18.10	21.65	21.59				-3.49	0.06
		AVERAGE	**7.84**	**8.88**	**9.89**	**16.50**	**21.00**	**21.06**	**-13.22**	**-12.19**	**-11.18**	**-4.56**	**-0.06**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**NUH**	Taoru	10.64	12.08	16.52	22.70	31.15	31.42	-20.78	-19.34	-14.90	-8.72	-0.27
2		Nuh	4.94	5.47	5.44	4.78	6.02	6.06	-1.12	-0.59	-0.62	-1.28	-0.04
3		Nagina	4.45	5.23	6.22	5.07	5.67	5.84	-1.39	-0.61	0.38	-0.77	-0.17
4		F.B Jhirka	5.08	6.04	9.87	13.97	16.51	16.44	-11.36	-10.40	-6.57	-2.47	0.07
5		Punhana	5.02	4.98	7.95	8.19	8.90	8.88	-3.86	-3.90	-0.93	-0.69	0.02
6		Indri				6.06	6.36	6.36				-0.30	0.00

7		Pingwan				13.09	10.42	10.68				2.41	-0.26
		AVERAGE	**6.03**	**6.76**	**9.20**	**10.55**	**12.15**	**12.24**	**-6.21**	**-5.48**	**-3.04**	**-1.69**	**-0.09**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**PALWAL**	Palwal	6.38	7.37	8.80	11.07	12.05	12.11	-5.73	-4.74	-3.31	-1.04	-0.06
2		Hodal	5.88	6.27	7.69	7.58	12.00	12.04	-6.16	-5.77	-4.35	-4.46	-0.04
3		Hassanpur	6.92	8.42	9.04	11.19	13.99	14.53	-7.61	-6.11	-5.49	-3.34	-0.54
4		Hathin	5.22	5.32	6.30	7.48	9.56	9.70	-4.48	-4.38	-3.40	-2.22	-0.14
5		Pirthla	5.35	6.30	7.27		11.44	11.26	-5.91	-4.96	-3.99	-11.26	0.18
6		Badoli				13.85	17.55	17.77				-3.92	-0.22
		AVERAGE	**5.95**	**6.74**	**7.82**	**10.23**	**12.77**	**12.90**	**-6.95**	**-6.17**	**-5.08**	**-2.67**	**-0.14**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**HISAR**	Adumpur	13.25	10.71	9.04	8.64	7.21	6.95	6.30	3.76	2.09	1.69	0.26
2		Agroha	19.48	17.02	12.16	9.43	8.65	8.09	11.39	8.93	4.07	1.34	0.56
3		Bass	8.29	7.28	5.44	3.57	3.54	2.97	5.32	4.31	2.47	0.60	0.57
4		Barwala	22.71	19.58	13.17	6.94	5.55	4.44	18.27	15.14	8.73	2.50	1.11
5		Hansi	10.57	8.05	6.51	5.60	5.05	4.12	6.45	3.93	2.39	1.48	0.93
6		Hisar-1	12.97	11.83	9.80	6.56	5.51	4.71	8.26	7.12	5.09	1.85	0.80

7		Hisar-11	15.23	14.87	12.76	11.10	10.61	9.36	5.87	5.51	3.40	1.74	1.25
8		Narnaund	11.85	10.77	10.33	9.30	12.21	11.09	0.76	-0.32	-0.76	-1.79	1.12
9		Uklana	15.95	12.07	9.36	7.47	8.57	7.48	8.47	4.59	1.88	-0.01	1.09
		AVERAGE	**14.48**	**12.46**	**9.84**	**7.62**	**7.43**	**6.58**	**7.90**	**5.89**	**3.26**	**1.04**	**0.85**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**JIND**	Alewa	13.57	13.01	13.58	24.68	31.09	31.19	-17.62	-18.18	-17.61	-6.51	-0.10
2		Julana	10.98	7.83	6.67	5.17	3.92	3.45	7.53	4.38	3.22	1.72	0.47
3		Narwana	11.30	9.83	7.71	6.10	6.61	6.00	5.30	3.83	1.71	0.10	0.61
4		Pillukhera	4.68	3.77	4.06	5.80	5.87	5.40	-0.72	-1.63	-1.34	0.40	0.47
5		Safidon	4.29	5.02	6.96	12.01	16.01	15.65	-11.36	-10.63	-8.69	-3.64	0.36
6		Uchana	21.98	19.08	15.15	13.83	16.33	15.39	6.59	3.69	-0.24	-1.56	0.94
7		Ujhana	11.30	10.28	9.92	18.54	24.27	23.41	-12.11	-13.13	-13.49	-4.87	0.86
8		Jind	8.96	8.73	10.97	16.01	20.23	19.20	-10.24	-10.47	-8.23	-3.19	1.03
		AVERAGE	**10.88**	**9.69**	**9.38**	**12.77**	**15.54**	**14.96**	**-4.08**	**-5.27**	**-5.58**	**-2.19**	**0.58**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**

1		Ganaur	6.61	7.63	9.1	17.32	19.75	20.53	-13.92	-12.90	-11.43	-3.21	-0.78
2		Gohana	3.76	3.77	3.46	5.28	4.55	4.78	-1.02	-1.01	-1.32	0.50	-0.23
3		Kathura	3.42	3.26	3.23	2.96	3.22	3.53	-0.11	-0.27	-0.30	-0.57	-0.31
4		Kharkhoda	4.81	4.43	5.47	4.74	4.79	4.90	-0.09	-0.47	0.57	-0.16	-0.11
5	**SONIPAT**	Mundlana	2.86	3.38	3.07	5.16	5.32	5.79	-2.93	-2.41	-2.72	-0.63	-0.47
6		Sonipat	6.27	6.31	8.22	10.03	5.95	6.57	-0.30	-0.26	1.65	3.46	-0.62
7		Murthal	6.55	8.11	8.52	21.40	26.12	26.83	-20.28	-18.72	-18.31	-5.43	-0.71
8		Rai	6.43		7.71	13.56	14.29	14.96	-8.53		-7.25	-1.40	-0.67
		AVERAGE	**5.09**	**5.27**	**6.10**	**10.06**	**10.50**	**10.99**	**-5.90**	**-5.72**	**-4.89**	**-0.93**	**-0.49**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1		Karnal	7.41	7.29	7.89	15.36	17.18	16.11	-8.70	-8.82	-8.22	-0.75	1.07
2		Kunjpura	6.80	7.33	7.33	11.54	12.08	10.32	-3.52	-2.99	-2.99	1.22	1.76
3		Munak	5.32	5.97	4.72	16.21	19.31	19.31	-13.99	-13.34	-14.59	-3.10	0.00
4		Indri	7.28	7.54	8.60	12.99	12.66	13.29	-6.01	-5.75	-4.69	-0.30	-0.63
5	**KARNAL**	Nilokheri	8.09	8.19	10.26	20.31	27.10	26.79	-18.70	-18.60	-16.53	-6.48	0.31
6		Nissing	7.46	8.24	9.93	20.24	27.11	27.25	-19.79	-19.01	-17.32	-7.01	-0.14
7		Gharaunda	9.80	9.64	13.34	21.40	23.20	22.78	-12.98	-13.14	-9.44	-1.38	0.42
8		Assandh	6.87	7.40	10.62	19.37	26.36	26.51	-19.64	-19.11	-15.89	-7.14	-0.15
		AVERAGE	**7.38**	**7.70**	**9.09**	**17.18**	**20.63**	**20.30**	**-12.92**	**-12.60**	**-11.21**	**-3.12**	**0.33**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	DISTRICT	BLOCK	DEPTH TO WATER TABLE (bgl) IN Mtrs						PERIODIC FLUCTUATIONS				
			Jun-74	Jun-84	Jun-95	Jun-13	Jun-22	Jun-23	Historical Jun 1974-Jun 2023	Historical Jun 1984-Jun 2023	Long Term Jun 1995-Jun 2023	Decadal Jun 2013-Jun 2023	Annual Jun 22-Jun23
1	KURUKSHETRA	Thanesar	11.85	13.86	16.31	30.20	36.76	37.04	-25.19	-23.18	-20.73	-6.84	-0.28
2		Shahbad	15.27	17.34	19.59	37.85	47.36	47.15	-31.88	-29.81	-27.56	-9.30	0.21
3		Pehowa	9.41	12.20	14.51	31.02	39.21	40.00	-30.59	-27.80	-25.49	-8.98	-0.79
4		Ladwa	12.95	14.75	17.04	27.71	34.64	34.46	-21.51	-19.71	-17.42	-6.75	0.18
5		Babain	11.68	12.13	13.17	35.55	41.83	41.00	-29.32	-28.87	-27.83	-5.45	0.83
6		Isamailabad	12.12	15.52	17.97	36.56	44.50	44.68	-32.56	-29.16	-26.71	-8.12	-0.18
7		Pipli	17.09	17.61	19.28	35.41	42.23	42.61	-25.52	-25.00	-23.33	-7.20	-0.38
		AVERAGE	**12.91**	**14.77**	**16.84**	**33.47**	**40.93**	**40.99**	**-28.08**	**-26.22**	**-24.15**	**-7.52**	**-0.06**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	DISTRICT	BLOCK	DEPTH TO WATER TABLE (bgl) IN Mtrs						PERIODIC FLUCTUATIONS				
			Jun-74	Jun-84	Jun-95	Jun-13	Jun-22	Jun-23	Historical Jun 1974-Jun 2023	Historical Jun 1984-Jun 2023	Long Term Jun 1995-Jun 2023	Decadal Jun 2013-Jun 2023	Annual Jun 22-Jun23
1	KAITHAL	Gulha	8.90	11.39	15.28	31.41	44.12	43.35	-34.45	-31.96	-28.07	-11.94	0.77
2		Kaithal	6.76	8.52	10.94	25.52	33.37	33.26	-26.50	-24.74	-22.32	-7.74	0.11

3		Pundari	6.57	8.31	9.62	20.98	31.38	29.70	-23.13	-21.39	-20.08	-8.72	1.68
4		Rajound	6.25	5.59	4.37	12.15	17.48	17.21	-10.96	-11.62	-12.84	-5.06	0.27
5		Siwan	9.45	10.60	11.73	38.23	51.20	52.15	-42.70	-41.55	-40.42	-13.92	-0.95
6		Dhand	7.71	9.45	12.00	24.27	34.62	35.37	-27.66	-25.92	-23.37	-11.10	-0.75
7		Kalayat	5.30	5.26	4.96	8.03	12.46	12.72	-7.42	-7.46	-7.76	-4.69	-0.26
		AVERAGE	**7.28**	**8.45**	**9.84**	**22.94**	**32.09**	**31.97**	**-24.69**	**-23.52**	**-22.12**	**-9.02**	**0.12**

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S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**PANIPAT**	Panipat	10.19	10.83	13.02	25.70	35.50	36.16	-25.97	-25.33	-23.14	-10.46	-0.66
2		Israna	3.86	4.65	5.90	8.55	11.86	11.91	-8.05	-7.26	-6.01	-3.36	-0.05
3		Samalkha	9.83	10.77	12.78	22.48	28.85	28.97	-19.14	-18.20	-16.19	-6.49	-0.12
4		Madlauda	4.95	5.16	7.06	11.52	13.92	14.18	-9.23	-9.02	-7.12	-2.66	-0.26
5		Bopoli	8.72	9.07	9.67	19.12	26.63	25.24	-16.52	-16.17	-15.57	-6.12	1.39
6		Sanalikhurd	4.33	6.14	3.19	11.35	15.52	15.89	-11.56	-9.75	-12.70	-4.54	-0.37
		AVERAGE	**6.98**	**7.77**	**8.60**	**16.45**	**22.05**	**22.06**	**-15.08**	**-14.29**	**-13.46**	**-5.61**	**-0.01**

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			Jun-74	Jun-84	Jun-95	Jun-13	Jun-22	Jun-23	Historical Jun 1974-Jun 2023	Historical Jun 1984-Jun 2023	Long Term Jun 1995-Jun 2023	Decadal Jun 2013-Jun 2023	Annual Jun 22-Jun23
1	**ROHTAK**	Rohtak	2.91	3.32	3.50	3.26	3.67	3.29	-0.38	0.03	0.21	-0.03	0.38
2		Meham	12.31	8.91	7.12	4.62	4.14	3.47	8.84	5.44	3.65	1.15	0.67
3		Kalanaur	5.26	5.35	5.60	3.10	3.30	2.66	2.60	2.69	2.94	0.44	0.64
4		Lakhan Majra	4.96	4.00	5.15	3.84	4.21	3.76	1.20	0.24	1.39	0.08	0.45
5		Sampla	3.74	3.68	4.19	3.64	3.39	3.46	0.28	0.22	0.73	0.18	-0.07
		AVERAGE	**5.84**	**5.05**	**5.11**	**3.69**	**3.74**	**3.33**	**2.51**	**1.72**	**1.78**	**0.36**	**0.41**

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			Jun-74	Jun-84	Jun-95	Jun-13	Jun-22	Jun-23	Historical Jun 1974-Jun 2023	Historical Jun 1984-Jun 2023	Long Term Jun 1995-Jun 2023	Decadal Jun 2013-Jun 2023	Annual Jun 22-Jun23
1	**JHAJJAR**	Jhajjar	5.42	5.91	6.19	4.75	4.61	4.15	1.27	1.76	2.04	0.60	0.46
2		Bahadurgarh	3.97	4.26	5.15	4.47	3.67	3.72	0.25	0.54	1.43	0.75	-0.05
3		Beri	5.10	4.66	4.26	2.39	2.29	2.41	2.69	2.25	1.85	-0.02	-0.12
4		Matanhail	6.99	7.17	6.74	6.20	6.70	6.49	0.50	0.68	0.25	-0.29	0.21
5		Sahlawas	4.38	4.78	4.90	3.95	3.88	3.95	0.43	0.83	0.95	0.00	-0.07
6		Badli	3.61	4.60	5.24	5.17	3.44	3.50	0.11	1.10	1.74	1.67	-0.06

7		Machhroli				7.54	5.56	4.95				2.59	0.61
		AVERAGE	**4.91**	**5.23**	**5.41**	**4.92**	**4.31**	**4.17**	**0.74**	**1.06**	**1.25**	**0.76**	**0.14**

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			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**REWARI**	Bawal	12.48	13.56	18.04	27.36	32.00	32.52	-20.04	-18.96	-14.48	-5.16	-0.52
2		Jatusana	8.72	8.45	11.87	11.03	15.56	15.73	-7.01	-7.28	-3.86	-4.70	-0.17
3		Khol	17.28	15.58	26.68	46.14	55.76	56.47	-39.19	-40.89	-29.79	-10.33	-0.71
4		Rewari	11.95	12.47	14.40	10.31	14.93	14.96	-3.01	-2.49	-0.56	-4.65	-0.03
5		Nahar	12.07	12.69	12.67	13.77	18.78	18.88	-6.81	-6.19	-6.21	-5.11	-0.10
6		Dahina				47.06	55.51	55.82				-8.76	-0.31
7		Dharuhera				18.80	22.70	22.67				-3.87	0.03
		AVERAGE	**12.50**	**12.55**	**16.73**	**24.92**	**30.75**	**31.01**	**-18.51**	**-18.46**	**-14.28**	**-6.08**	**-0.26**

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			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**SIRSA**	Ellenabad	7.26	7.52	9.74	23.29	30.12	30.13	-22.87	-22.61	-20.39	-6.84	-0.01
2		Odhan	18.28	18.61	12.06	12.15	14.59	14.80	3.48	3.81	-2.74	-2.65	-0.21

3		Dabwali	19.03	19.53	13.10	11.57	14.69	14.64	4.39	4.89	-1.54	-3.07	0.05
4		N.S Chopta	11.83	12.31	9.22	10.43	10.45	10.31	1.52	2.00	-1.09	0.12	0.14
5		Baragudha	3.72	3.91	3.88	9.02	11.75	12.18	-8.46	-8.27	-8.30	-3.16	-0.43
6		Sirsa	9.38	9.74	12.65	37.11	49.63	49.87	-40.49	-40.13	-37.22	-12.76	-0.24
7		Raina	10.08	10.47	12.50	23.52	34.24	33.86	-23.78	-23.39	-21.36	-10.34	0.38
		AVERAGE	**11.37**	**11.73**	**10.45**	**18.16**	**23.64**	**23.68**	**-12.32**	**-11.96**	**-13.23**	**-5.53**	**-0.05**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA

S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**FATEHABAD**	Fatehabad	13.22	13.99	15.83	29.47	33.26	33.67	-20.45	-19.68	-17.84	-4.20	-0.41
2		Ratia	8.51	9.43	12.07	31.86	46.43	47.10	-38.59	-37.67	-35.03	-15.24	-0.67
3		Tohana	7.97	7.72	11.26	24.18	31.31	29.70	-21.73	-21.98	-18.44	-5.52	1.61
4		Battu kalan	8.61	7.08	5.34	6.56	6.90	6.28	2.33	0.80	-0.94	0.28	0.62
5		Jakhal	7.14	9.95	12.04	29.94	43.61	44.44	-37.30	-34.49	-32.40	-14.50	-0.83
6		Bhuna	9.12	8.86	8.82	16.29	21.68	20.96	-11.84	-12.10	-12.14	-4.67	0.72
7		Nagpur				34.99	46.85	46.52				-11.53	0.33
		AVERAGE	**9.10**	**9.51**	**10.89**	**24.76**	**32.86**	**32.67**	**-23.57**	**-23.16**	**-21.77**	**-7.91**	**0.20**

BLOCK-WISE DEPTH TO WATER TABLE & FLUCTUATIONS IN WATER TABLE SINCE 1974 TO 2023 IN STATE OF HARYANA													
S.NO.	**DISTRICT**	**BLOCK**	**DEPTH TO WATER TABLE (bgl) IN Mtrs**						**PERIODIC FLUCTUATIONS**				
			Jun-74	**Jun-84**	**Jun-95**	**Jun-13**	**Jun-22**	**Jun-23**	**Historical Jun 1974-Jun 2023**	**Historical Jun 1984-Jun 2023**	**Long Term Jun 1995-Jun 2023**	**Decadal Jun 2013-Jun 2023**	**Annual Jun 22-Jun23**
1	**M/GARH**	Ateli	22.49	24.77	28.54	63.65	73.64	74.80	-52.31	-50.03	-46.26	-11.15	-1.16
2		Kanina	18.37	17.15	17.63	26.75	32.47	36.91	-18.54	-19.76	-19.28	-10.16	-4.44
3		M garh	21.29	22.22	25.54	41.65	51.54	55.84	-34.55	-33.62	-30.30	-14.19	-4.30
4		Narnaul	26.54	28.32	34.84	57.24	50.22	44.60	-18.06	-16.28	-9.76	12.64	5.62
5		N/Choudhary	16.36	19.47	24.75	40.46	46.28	53.58	-37.22	-34.11	-28.83	-13.12	-7.30
6		Shima	21.31	23.56	27.21	41.06	40.07	40.00	-18.69	-16.44	-12.79	1.06	0.07
7		Nizampur	20.94	21.81	27.84	27.24	32.89	33.56	-12.62	-11.75	-5.72	-6.32	-0.67
8		Satnali	39.56	40.78	43.80	63.17	67.04	68.17	-28.61	-27.39	-24.37	-5.00	-1.13
		AVERAGE	**23.36**	**24.76**	**28.77**	**45.15**	**49.27**	**50.93**	**-27.58**	**-26.17**	**-22.16**	**-5.78**	**-1.66**

ANNEXURE VIII

GROUND WATER QUALITY PERIOD JUNE, 2023 (E.C. IN MICRO.MHOS/CM) (AREA IN ACRE)

S.NO.	DISTRICT / BLOCK	TOTAL GEO. AREA	HILLY AREA	FRESH	SUB. MARGINAL	MARGINAL	SALINE
				0-2000	2000-4000	4000-6000	>-6000
1	**AMBALA**						
	Shahzadpur	**49791.23**	-	46782	3009.23	-	-
	Ambala-1	**47734.82**	-	14374.02	30590.58	2770.22	-
	Ambala-2	**86791.11**	-	17186.23	60753.78	6075.38	2775.72
	Barara	**56928.18**	-	56359	569.18	-	-
	Naraingarh	**68519.31**	-	67834.12	685.19	-	-
	Saha	**63870.78**	-	63870.78	-	-	-
	TOTAL	**373635.43**	0	266406.15	95607.96	8845.6	2775.72
2	**BHIWANI**						
	Siwani	**140251.65**	-	-	85577.28	45958.17	8716.2
	Bawani Khera	**100243.8**	-	-	79024.31	17195.11	4024.38
	Bhiwani	**211187.63**	17.29	-	66982.86	133608.5	10578.98
	Behal	**73087.94**	-	-	62400.55	10687.39	
	Loharu	**90759.87**	4.94	-	82288.52	8466.41	
	Tosham	**128203**	2013.9	-	101108.23	23217.45	1863.42
	Kairu	**70941.38**	-	-	58631.91	10365.87	1943.6
	TOTAL	**814675.27**	2036.13	0	536013.66	249498.9	27126.58
3	**CH. DADRI**						
	Dadri	**106594.08**	1227.59	1278.2	51769.71	27842.15	24476.43
	Jhoju	**84019.96**	3897.66	17691.21	51402.23	11028.86	
	Bond	**57912.96**	-		22242.41	27757.73	7912.82
	Badhra	**90871.47**	466.83	37455.98	52948.66		
	Total	**339398.47**	5592.08	56425.39	178363.01	66628.74	32389.25
4	**FARIDABAD**						
	Faridabad	**96734.23**	18305.54	75952	2476.69	-	-
	Ballabgarh	**53519.88**	3234.6	37052.30	9527.74	3705.24	-
	Tigaon	**33257.27**	0	31443.24	1814.03	-	-
	TOTAL	**183511.38**	21540.14	144447.54	13818.46	3705.24	0
5	**FATEHABAD**						
	Fatehabad	**136980.74**	-	67120.56	63011.14	4109.43	2739.61
	Tohana	**99451.93**	-	90501.26	8950.67	-	-
	Jakhal	**37785.42**	-	37785.42	-	-	-
	Ratia	**93376.17**	-	91041.77	2334.4	-	-
	Bhattu Kalan	**89852.60**	-	6289.68	70983.56	11231.58	1347.78
	Bhuna	**95336.96**	-	51481.42	41948.41	1907.13	-
	Nagpur	**71187.86**	-	59797.8	11390.06	-	-
	TOTAL	**623971.68**	0	404017.91	198618.24	17248.14	4087.39

6	**GURUGRAM**						
	F. Nagar	**70770.87**	76.6	65308.04	5386.23	-	-
	Pataudi	**68072.05**	111.18	64383.98	3576.89	-	-
	Gurugram	**84599.15**	3182.71	76857.12	3256.66	1302.66	-
	Sohna	**87996.05**	5992.29	60136.09	16400.75	5466.92	-
	TOTAL	**311438.12**	9362.78	266685.23	28620.53	6769.58	0.00
7	**HISAR**						
	Adampur	**90669.85**	-	3626.8	43521.53	40801.43	2720.09
	Barwala	**125117.52**	-	70691.4	54426.12	-	-
	Hansi	**145366.17**	-	58146.47	80678.22	6541.48	-
	Hansi-Bass	**73940.39**	-	5545.53	64697.84	3697.02	-
	Hisar-1	**153929.29**	-	70807.47	76964.65	6157.17	-
	Hisar-2	**178431.89**	-	112412.09	48176.61	14274.55	3568.64
	Narnaund	**101277.37**	-	26332.12	73932.48	1012.77	
	Agroha	**81518.54**	-	35868.16	39128.9	4891.11	1630.37
	Uklana	**56770.87**	-	31223.97	25546.9	-	-
	TOTAL	**1007021.89**	0	414654.01	507073.25	77375.53	7919.1
8	**JIND**						
	Alewa	**58185.82**	-	5059.64	24876.55	24033.27	4216.36
	Julana	**86911.61**	-	15634.89	17474.3	41386.48	12415.94
	Narwana	**82273.19**	-	914.15	43421.96	26510.25	11426.83
	Pillukhera	**53250.14**	-	1458.91	41578.88	4376.72	5835.63
	Safidon	**77674.54**	-	20343.33	39946.91	11096.36	6287.94
	Uchana	**125333.15**	-	9115.14	72921.11	36460.55	6836.35
	Ujhana	**78271.79**		41744.95	19828.86	10436.24	6261.74
	Jind	**117865.52**	-	29013.05	82052.53	4533.29	2266.65
	TOTAL	**679765.76**	0.00	123284.06	342101.10	158833.16	55547.44
9	**JHAJJAR**						
	Bahadurgarh	**95492**	-	14206	74578	4735	1973
	Beri	**81029**	-	9490	51099	13140	7300
	Jhajjar	**75568**	-	24075	42131	6018	3344
	Matanhail	**87017**	-	14503	52278	9781	10455
	Sahlawas	**37712**	-	0	22688	14104	920
	Badli	**51589**		8533	39178	1939	1939
	Machhroli	**41629**		0	35518	4201	1910
	TOTAL	**470036**	0	70807	317470	53918	27841
10	**K. KSHETRA**						
	Thanesar	**77837.22**	-	77837.22	-	-	-
	Shahabad	**68196.35**	-	68196.35	-	-	-
	Pehowa	**104805.48**	-	104805.48	-	-	-
	Ladwa	**38733.86**	-	38733.86	-	-	-
	Babain	**33101.22**	-	33101.22	-	-	-
	Ismailabad	**49684.72**	-	49684.72	-	-	-
	Pipli	**43816.72**	-	43816.72	-	-	-
	TOTAL	**416175.57**	0	416175.57	0	0	0

11	**KAITHAL**						
	Guhla	**96766.64**	-	96766.64	-	-	-
	Kaithal	**126253.65**	-	118014.91	-		-
	Pundri	**76004.02**	-	75977.36	26.66		-
	Kalayat	**80776.54**	-	2865.95	49230.05	28680.54	-
	Rajound	**60498.28**	-	50641.58	9856.7		-
	Siwan	**67293.81**	-	67293.81			-
	Dhand	**54359.68**	-	54359.68			-
	TOTAL	**561952.62**	0	465919.93	59113.41	28680.54	0
12	**KARNAL**						
	Karnal	**71195.51**	-	71195.51	-	-	-
	Indri	**60048.53**	-	60048.53	-	-	-
	Gharaunda	**70735.16**	-	70735.16	-	-	-
	Nilokheri	**98737.23**	-	98737.23	-	-	-
	Assandh	**97106.06**	-	92214.53	4891.53	-	-
	Nissing	**88594.83**	-	88594.83	-	-	-
	Kunjpura	**57062.29**	-	57062.29	-	-	-
	Munak	**66998.42**	-	66998.42	-	-	-
	TOTAL	**610478.03**	0	605586.5	4891.53	0	0
13	**M. GARH**						
	Ateli	**55137.2**	2243.72	29016.54	23876.94		-
	Kanina	**87385.94**	-	61777.23	24174.71	1434	-
	M.garh	**88668.5**	2515.53	20063.4	66089.57		-
	N. Chaudhary	**61874.6**	911.82	53877.46	7085.32		-
	Narnaul	**52145.48**	-	47982.35	4163.13		-
	Nizampur	**41615.62**	2735.45	38880.17			-
	Sihma	**34162.79**	-	19057.49	14022.9	1082.4	-
	Satnali	**58598.83**	3073.99	45118.14	10406.7		-
	TOTAL	**479588.96**	11480.51	315772.78	149819.27	2516.4	0
14	**NUH**						
	F.P.Zhirka	**68308.5**	12861.81	45835.93	7392.89	2217.87	
	Nuh	**72513.38**	7400.79	7660.30	22980.92	15320.61	19150.76
	Nagina	**43842.99**	3612.67	3094.64	24757.12	10521.78	1856.78
	Punhana	**51493.37**	247.1	7686.94	38434.70	5124.63	
	Taoru	**54278.58**	8305.2	43100.05	2873.34		
	Pingawan	**38417.23**	1171.28	7449.19	26604.25	3192.51	
	Indri	**42377.83**	741.31		12490.96	26766.34	2379.23
	TOTAL	**371231.88**	34340.16	114827.05	135534.17	63143.73	23386.77
15	**PALWAL**						
	Palwal	**49313.19**	-	14089.48	35223.71		
	Hassanpur	**38202.3**	-	15280.92	22921.38		
	Hodel	**74265.92**	-	19543.66	54722.26		
	Hathin	**89006.84**	318.76	5721.81000	68661.74	13160.17	1144.36
	Pirthala	**40482.64**	-	9342.15	21798.34	9342.15	
	Badoli	**44681.66**	-	30933.45	13748.21		

	TOTAL	**335952.55**	318.76	94911.47	217075.64	22502.32	1144.36
16	**PANIPAT**						
	Panipat	**52584.72**	-	52120.19	464.53	-	-
	Israna	**67691.48**	-	58738.1	8953.38	-	-
	Samalkha	**46752.93**	-	46241.04	511.89		
	Madlauda	**89911.78**	-	88376.7	1535.08	-	-
	Bapoli	**38719.9**	-	38719.9		-	
	Sanoli Khurd	**26251.24**	-	26251.24		-	-
	TOTAL	**321912.05**	0	310447.17	11464.88	0	0
17	**PANCHKULA**						
	Pinjore	**72164.48**	27750	44414.48	-	-	-
	Barwala	**53719.91**	-	52038.38	1681.53	-	-
	R.P.Rani	**34663.7**	8000	23996.7	2133.04	533.96	-
	Morni	**57613.23**	57613.23	-	-	-	-
	TOTAL	**218161.32**	93363.23	120449.56	3814.57	533.96	0
18	**ROHTAK**						
	Rohtak	**144109**	-	43763	64540	23871	11935
	Meham	**110467**	-	43371	48561	18535	
	Kalanaur	**70477**	-	5819	40088	18104	6466
	Lakhan Majra	**31355**	-	16011	11341	1668	2335
	Sampla	**56028**	-	7801	36525	6028	5674
	TOTAL	**412436**	0	116765	201055	68206	26410
19	**REWARI**						
	Bawal	**59316.63**	1179.16	9968.74	48168.73		
	Jatusana	**50907.40**	-	1892.81	47946.3	1068.29	
	Khol	**46726.76**	3355.69	18923.6	24447.47		
	Rewari	**56338.66**	-		54174.36	2164.3	
	Nahar	**57897.15**	-	8045.9	47448.25	2403	
	Dahina	**51931.5**	568.34	17587	33776.16		
	Dharuhera	**49733.76**		3042.4	46095.36	596	
	TOTAL	**372851.86**	5103.19	59460.45	302056.63	6231.59	0
20	**SONIPAT**						
	Gohana	**77947**	-	38162	30854	7308	1623
	Rai	**53566**	-	46276	5388	951	951
	Kharkhoda	**75996**	-	29370	35612	7710	3304
	Sonipat	**90940**	-	70208	20261	471	
	Ganaur	**62238**	-	45058	15559	1621	
	Kathura	**48454**	-	21295	23147	2777	1235
	Mundlana	**71875**	-	6635	34279	23221	7740
	Murthal	**47045**		41882	4016	1147	
	TOTAL	**528061**	0	298886	169116	45206	14853
21	**SIRSA**						
	Ellenabad	**130438.76**	-	24734.65	94218.67	8769.76	2715.68
	Odhan	**127456.74**	-	9461.63	41985.61	48983.62	27025.88
	Dabwali	**197994.94**	-	6720.26	148302.54	36653.67	6318.47

	N.S.Chopta	**187068.53**	-	2110.28	121269.41	34137.55	29551.29
	Baragudha	**131915.62**	-	920.32	40317.65	56720.48	33957.17
	Sirsa	**134565.64**	-	11139.16	119141.68	2999.85	1284.95
	Rania	**145681.83**	-	18726.69	85098.02	31454	10403.12
	TOTAL	**1055122.06**	0	73812.99	650333.58	219718.93	111256.56
22	**Y. NAGAR**						
	Jagadhari	**74096.64**	-	74096.64	-	-	-
	Bilaspur	**68109.87**	2750	62259.74	2054.13	1046	-
	Chhachhrauli	**64195.33**	15500	48695.33	-	-	-
	Sadhaura	**36731.71**	2500	33511.71	720	-	-
	Radhaur	**60920.31**	-	60920.31	-	-	-
	Mustafabad	**50766.84**	-	48199.09	1520.19	1047.56	-
	Khizrabad	**69650.17**	17500	52150.17	-	-	-
	TOTAL	**424470.87**	38250	379832.99	4294.32	2093.56	0
	Total Area	**10911848.77**	221386.98	5119574.75	4126255.22	1101655.92	334737.17
	%age	**100**	2	47	38	10	3
19	**REWARI**						
	Bawal	59316.63	1179.16	12027.3	46110.17		
	Jatusana	50907.4	-	1023.6	48476.39	1407.45	
	Khol	46726.76	3355.69	18111.75	25259.32		
	Rewari	56338.66	-		53395.81	2047.2	895.65
	Nahar	57897.15	-	8572.65	46765.5	2559	
	Dahina	51931.5	568.34	15937.5	35425.66		
	Dharuhera	49733.76		3326.7	45831.29	575.77	
	TOTAL	**372851.86**	**5103.19**	**58999.5**	**301264.14**	**6589.42**	**895.65**
20	**SONIPAT**						
	Gohana	77947	-	33290	25170	17457	2030
	Rai	53566	-	50396	3170		
	Kharkhoda	75996	-	32675	28636	6608	8077
	Sonipat	90940	-	71150	19790		
	Ganaur	62238	-	62238			
	Kathura	48454	-	13888	4629	25924	4013
	Mundlana	71875	-	17692	12901	36490	4792
	Murthal	47045		43603	3442		
	TOTAL	**528061**	**0**	**324932**	**97738**	**86479**	**18912**
21	**SIRSA**						
	Ellenabad	130438.76	-	31035.43	86359.46	8545.98	4497.89
	Odhan	127456.74	-	2430.54	19395.59	8992.94	96637.67
	Dabwali	197994.94	-	12611.98	127778.08	20510.83	37094.05
	N.S.Chopta	187068.53	-	17840.32	117843.37	22937.56	28447.28
	Baragudha	131915.62	-	4015.27	62409.83	18115.05	47375.47
	Sirsa	134565.64	-	7902.71	100320.55	12293.11	14049.27
	Rania	145681.83	-	10468.69	94174.15	14515.4	26523.59
	TOTAL	**1055122.06**	**0**	**86304.94**	**608281.03**	**105910.87**	**254625.22**

22	**Y. NAGAR**						
	Jagadhari	74096.64	-	74096.64	-	-	-
	Bilaspur	68109.87	2750	65359.87	-	-	-
	Chhachhrauli	64195.33	15500	48695.33	-	-	-
	Sadhaura	36731.71	2500	34231.71	-	-	-
	Radhaur	60920.31	-	60920.31	-	-	-
	Mustafabad	50766.84	-	50766.84	-	-	-
	Khizrabad	69650.17	17500	52150.17	-	-	-
	TOTAL	**424470.87**	**38250**	**386220.87**	**0**	**0**	**0**
	Total Area	**10911848.77**	**221386.98**	**5406793.94**	**3868470.36**	**863680.31**	**551517.20**
	%age	**100**	**2**	**50**	**35**	**8**	**5**

ANNEXURE IX

CATEGORIZATION OF ASSESSMENT UNITS, 2024

SR. NO.	DISTRICT	SAFE	SEMI-CRITICAL	CRITICAL	OVER EXPLOITED
1	Ambala		1. Shazadpur	1.Ambala-II	1. Ambala-I
					2.Barara
					3.Naraingarh
					4.Saha
2	Bhiwani	1. Siwani			1.Behal
		2. Bhiwani			2.Kairu
		3.Bawani Khera			3.Loharu
					4.Tosham
3	Charki Dadri	1.Baund			1.Badhra
		2.Charki Dadri			2.Jhojhu
4	Faridabad			1.Taigaon	1.Ballabgarh
					2.Faridabad
					3.Faridabad Urban
5	Fatehabad		1. Bhattu Kalan		1.Bhuna
					2. Fatehabad
					3. Jakhal
					4. Ratia
					5. Tohana
					6. Nagpur
6	Gurugram				1.Farukh nagar
					2.Gurgaon
					3.Pataudi
					4.Sohna
					5. Gurgaon Urban
7	Hisar	1.Hansi-II		1.Agroha	1.Narnaud
		2.Uklana		2.Barwala	
		3. Hansi-1			
		4.Hisar-I			
		5.Hisar-II			
		6.Adampur			
8	Jhajjar	1.Bahadurgarh			
		2.Beri			
		3.Jhajjar			
		4.Salhawas			
		5.Matanhail			
		6.Machhrauli			
		7. Badli			
9	Jind	1.Julana	1.Pillukhera		1.Alewa

		2.Narwana			2.Jind
					3.Safidon
					4.Uchana
					5.Ujhana
10	Kaithal				1.Dhand
					2.Gulha
					3.Kaithal
					4.Kalayat
					5.Pundri
					6.Rajound
					7.Siwan
11	Karnal				1.Assandh
					2.Gharaunda (part)
					3.Karnal
					4.Nilokheri
					5.Nissing at Chirao
					6.Kanjpura
					7.Munak
					8.Indri
12	Kurukshetra				1.Babain
					2.Ismailabad
					3.Ladwa
					4.Pehowa
					5.Pipli
					6.Shahbad
					7.Thanesar
13	Mahendragarh		1. Satnali	1.Nizampur	1.Kanina
					2.Mahendragarh
					3. Sihma
					4.Narnaul
					5.Nangal Choudhury
					6.Ateli Nangal
14	Mewat	1.Nagina		1.FerozepurJhirka	1. Taoru
		2.Nuh		2. Punahana	
		3.Pingwan			
		4. Indri			
15	Palwal	1. Hathin	1. Hodal	1.Hassanpur	1.Badoli
		2.Palwal			2.Prithla
16	Panchkula	1.Barwala		1.Raipur Rani	
		2.Pinjore			
17	Panipat				1.Bapoli
					2.Israna
					3.Madlauda
					4.Panipat

					5.Samalkha
					6.Sanauli Khurd
18	Rewari			1.Dahina	1.Khol at Rewari
					2.Nahar
					3.Rewari
					4.Bawal
					5.Jatusana
					6.Dharuhera
19	Rohtak	1.Kalanaur			
		2.Lakhan Majra			
		3.Rohtak			
		4.Maham			
		5.Sampla			
20	Sirsa		1.Baragudha		1.Dabwali
					2.Ellenabad
					3.NathusariChopta
					4.Odhan
					5.Rania
					6.Sirsa
21	Sonipat	1.Kathura		1.Mundlana	1.Ganaur
		2.Kharkhoda			2.Rai
		3.Gohana			3.Sonipat
					4.Murthal
22	Yamunanagar		1.Khizrabad		1.Sadaura
			2.Chhachhrauli		2.Jagadhri
					3.Mustafabad
					4.Radaur
					5.Bilaspur

ANNEXURE X

SALINE DYNAMIC GROUND WATER RESOURCES

Saline Dynamic Ground Water Resources							
Sr. No.	**District**	**Assessment Unit Name**	**Poor Ground Water Quality (Ha)**	**Average Annual Rainfall (2016-23) mm)**	**Infiltration Factor**		**Saline Dynamic Ground Water Resources(Ham)**
			Saline		**Value**	**Norms / Field Value**	
1	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	AMBALA	AMBALA-I	0	773.8	22	Norms	0
2	AMBALA	AMBALA-II	0	773.8	22	Norms	0
3	AMBALA	BARARA	0	474.6	22	Norms	0
4	AMBALA	NARAINGARH	0	1424.5	22	Norms	0
5	AMBALA	SAHA	0	474.6	22	Norms	0
6	AMBALA	SHAHZADPUR	0	1424.5	22	Norms	0
	AMBALA						**0**
7	BHIWANI	BAWANI KHERA	10753	230.98	22	Norms	546.4201468
8	BHIWANI	BEHAL	4078	300.607	22	Norms	269.6925761
9	BHIWANI	BHIWANI	17453	635.54	22	Norms	2440.257516
10	BHIWANI	KAIRU	10196	215.8	22	Norms	484.065296
11	BHIWANI	LOHARU	1515	425.54	22	Norms	141.832482
12	BHIWANI	SIWANI	15191	254.42	22	Norms	850.2767284
13	BHIWANI	TOSHAM	2014	178.52	22	Norms	79.0986416
	BHIWANI						**4811.643387**
14	CHARKI DADRI	BADHRA	0	434.1	22	Norms	0
15	CHARKI DADRI	BAUND	750	503.1111111	22	Norms	83.01333333
16	CHARKI DADRI	CHARKHI DADRI	497	478.5	22	Norms	52.31919
17	CHARKI DADRI	JHOJHU	1578	458.2	22	Norms	159.068712
	CHARKI DADRI						**294.4012353**
18	FARIDABAD	BALLABGARH	7064	585.6	22	Norms	910.069248
19	FARIDABAD	FARIDABAD	772	451.6	22	Norms	76.699744
	FARIDABAD	FARIDABAD_URBAN	0	365.42	22	Norms	0
20	FARIDABAD	TIGAON	0	571.85	22	Norms	0
	FARIDABAD						**986.768992**
21	FATEHABAD	BHATTU KALAN	158	511.9172727	22	Norms	17.7942444
22	FATEHABAD	BHUNA	504	485.1772727	22	Norms	53.796456
23	FATEHABAD	FATEHABAD	0	391	22	Norms	0
24	FATEHABAD	JAKHAL	0	350.1445455	22	Norms	0
25	FATEHABAD	NAGPUR	0	447.0909091	22	Norms	0
26	FATEHABAD	RATIA	0	326	22	Norms	0
27	FATEHABAD	TOHANA	0	463.7272727	22	Norms	0
	FATEHABAD						**71.5907004**
28	GURUGRAM	FARRUKH NAGAR	0	422.65	22	Norms	0
29	GURUGRAM	GURGAON	0	380.15	22	Norms	0
30	GURUGRAM	PATAUDI	0	368.8	22	Norms	0

	GURUGRAM	GURUGRAMURBAN	0	497	22	Norms	0
31	GURUGRAM	SOHNA	1133	479.25	22	Norms	119.457855
	GURUGRAM						**119.457855**
32	HISAR	ADAMPUR	0	499	22	Norms	0
33	HISAR	AGROHA	0	460.2727273	22	Norms	0
34	HISAR	BARWALA	689	561	22	Norms	85.03638
35	HISAR	HANSI	0	449.5454545	22	Norms	0
36	HISAR	HANSI-II	0	543.4545455	22	Norms	0
37	HISAR	HISAR-I	0	506.6209091	22	Norms	0
38	HISAR	HISAR-II	0	429.7954545	22	Norms	0
39	HISAR	NARNAUND	0	490.7272727	22	Norms	0
40	HISAR	UKLANA	0	677.1818182	22	Norms	0
	HISAR						**85.03638**
41	JHAJJAR	BADLI	0	411.9090909	22	Norms	0
42	JHAJJAR	BAHADURGARH	9236	448.3636364	24	Norms	993.8607709
43	JHAJJAR	BERI	5989	406.5454545	24	Norms	584.3521745
44	JHAJJAR	JHAJJAR	7259	328.2727273	22	Norms	524.24498
45	JHAJJAR	MACHHRAULI	3862	379.5555556	22	Norms	322.4855822
46	JHAJJAR	MATANNAIL	6915	487.4545455	22	Norms	741.5646
47	JHAJJAR	SALHAWAS	6544	383.4545455	22	Norms	552.05184
	JHAJJAR						**3718.559948**
48	JIND	ALEWA	0	557.6	22	Norms	0
49	JIND	JIND	0	496.78	22	Norms	0
50	JIND	JULANA	789	510.3	22	Norms	88.577874
51	JIND	NARWANA	1671	484.81	22	Norms	178.2258522
52	JIND	PILLUKHERA	1932	284.4	22	Norms	120.881376
53	JIND	SAFIDON	0	462.6	22	Norms	0
54	JIND	UCHANA	2672	341	22	Norms	200.45344
55	JIND	UJHANA	0	571.01	22	Norms	0
	JIND						**588.1385422**
56	KAITHAL	DHAND	0	543.4	22	Norms	0
57	KAITHAL	GUHLA	0	560.45	22	Norms	0
58	KAITHAL	KAITHAL	0	552.9	22	Norms	0
59	KAITHAL	KALAYAT	720	352.23	22	Norms	55.793232
60	KAITHAL	PUNDRI	0	568.5	22	Norms	0
61	KAITHAL	RAJOUND	3822	389.93	22	Norms	327.8687412
62	KAITHAL	SIWAN	0	541.73	22	Norms	0
	KAITHAL						**383.6619732**
63	KARNAL	ASSANDH	186	699.3111111	22	Norms	28.61581067
64	KARNAL	GHARAUNDA (PART)	0	605.7555556	22	Norms	0
65	KARNAL	INDRI	0	809.56666	22	Norms	0

				67			
66	KARNAL	KARNAL	0	804.0555556	22	Norms	0
67	KARNAL	KUNJPURA	0	804.0555556	22	Norms	0
68	KARNAL	MUNAK	0	605.7555556	22	Norms	0
69	KARNAL	NILOKHERI	0	789.1555556	22	Norms	0
70	KARNAL	NISSING AT CHIRAO	0	713.4222222	22	Norms	0
	KARNAL						**28.61581067**
71	KURUKSHETRA	BABAIN	0	751.22	22	Norms	0
72	KURUKSHETRA	ISMAILABAD	0	649.92	22	Norms	0
73	KURUKSHETRA	LADWA	0	671.64	22	Norms	0
74	KURUKSHETRA	PEHOWA	0	595.935	22	Norms	0
75	KURUKSHETRA	PIPLI	0	819.75	22	Norms	0
76	KURUKSHETRA	SHAHBAD	0	546.65	22	Norms	0
77	KURUKSHETRA	THANESAR	0	737.65	22	Norms	0
	KURUKSHETRA						0
78	MAHENDRAGARH	ATELI NANGAL	677	427.8636364	22	Norms	63.72601
79	MAHENDRAGARH	KANINA	478	348.4545455	22	Norms	36.64348
80	MAHENDRAGARH	MAHENDRAGARH	0	488.7181818	22	Norms	0
81	MAHENDRAGARH	NANGAL CHAUDHRY	0	352.9727273	22	Norms	0
82	MAHENDRAGARH	NARNAUL	0	446.5818182	22	Norms	0
83	MAHENDRAGARH	NIZAMPUR	369	370.0954545	22	Norms	30.044349
84	MAHENDRAGARH	SATNALI	1244	477.6863636	22	Norms	130.733204
85	MAHENDRAGARH	SIHMA	478	404.5272727	22	Norms	42.540088
	MAHENDRAGARH						**303.687131**
86	MEWAT	FEROZEPUR JHIRKA	1224	507.2	22	Norms	136.578816
87	MEWAT	INDRI	0	533.21	22	Norms	0
88	MEWAT	NAGINA	3390	503.6	22	Norms	375.58488
89	MEWAT	NUH	11017	673.2	22	Norms	1631.661768
90	MEWAT	PINGWAN	0	443.76	22	Norms	0
91	MEWAT	PUNAHANA	10573	519.7	22	Norms	1208.853382
92	MEWAT	TAORU	0	608.8	22	Norms	0
	MEWAT						**3352.678846**
93	PALWAL	BADOLI	0	409.8	22	Norms	0
94	PALWAL	HASSANPUR	0	344.4	22	Norms	0
95	PALWAL	HATHIN	5721	350.6	22	Norms	441.272172
96	PALWAL	HODAL	2751	518.96	22	Norms	314.0849712
97	PALWAL	PALWAL	7334	466	22	Norms	751.88168
98	PALWAL	PRITHLA	0	386.74	22	Norms	0
	PALWAL						**1507.238823**
99	PANCHKULA	BARWALA	0	612	22	Norms	0
100	PANCHKULA	MORNI	0	970.5	22	Norms	0
101	PANCHKULA	PINJORE	0	575.6	22	Norms	0
102	PANCHKULA	RAIPUR RANI	0		22	Norms	0

	PANCHKULA						0
103	PANIPAT	BAPOLI	0	459.8333333	22	Norms	0
104	PANIPAT	ISRANA	636	463.3555556	22	Norms	64.83270933
105	PANIPAT	MADLAUDA	0	551.7444444	22	Norms	0
106	PANIPAT	PANIPAT	0	647.7222222	22	Norms	0
107	PANIPAT	SAMALKHA	0	603.0444444	22	Norms	0
108	PANIPAT	SANAULI KHURD	0	459.8333333	22	Norms	0
	PANIPAT						**64.83270933**
109	REWARI	BAWAL	0	616.1555556	22	Norms	0
110	REWARI	DAHINA	0	380.3888889	22	Norms	0
111	REWARI	DHARUHERA	0	538.822	22	Norms	0
112	REWARI	JATUSANA	0	479.1222222	22	Norms	0
113	REWARI	KHOL AT REWARI	1810	433.8333333	22	Norms	172.7524333
114	REWARI	NAHAR	340	423.76	22	Norms	31.697248
115	REWARI	REWARI	0	679.7	24	Norms	0
	REWARI						**204.4496813**
116	ROHTAK	KALANAUR	3420	369.4545455	22	Norms	277.9776
117	ROHTAK	LAKHAN MAJRA	5219	402.1111111	22	Norms	461.6959356
118	ROHTAK	MAHAM	1883	367.8181818	22	Norms	152.37236
119	ROHTAK	ROHTAK	4388	385.7272727	22	Norms	372.36568
120	ROHTAK	SAMPLA	1608	415.3636364	22	Norms	146.93904
	ROHTAK						**1411.350616**
121	SIRSA	BARAGUDHA	3709	228	22	Norms	186.04344
122	SIRSA	DABWALI	17750	187.5	22	Norms	732.1875
123	SIRSA	ELLENABAD	6961	161.1	22	Norms	246.711762
124	SIRSA	NATHUSARI CHOPTA	16987	238.1	22	Norms	889.813034
125	SIRSA	ODHAN	16404	203.3	22	Norms	733.685304
126	SIRSA	RANIA	12893	164.8	22	Norms	467.448608
127	SIRSA	SIRSA	189	350.9	24	Norms	15.916824
	SIRSA						**3271.806472**
128	SONIPAT	GANAUR	0	526.3636364	22	Norms	0
129	SONIPAT	GOHANA	3165	544.4545455	22	Norms	379.1037
130	SONIPAT	KATHURA	4909	494.1818182	22	Norms	533.70648
131	SONIPAT	KHARKHODA	2660	595.5454545	22	Norms	348.5132
132	SONIPAT	MUNDLANA	4629	551.8181818	22	Norms	561.9606
133	SONIPAT	MURTHAL	0	618.8181818	22	Norms	0
134	SONIPAT	RAI	591	581.09090	22	Norms	75.55344

				91			
135	SONIPAT	SONIPAT	127	599.8181818	22	Norms	16.75892
	SONIPAT						**1915.59634**
136	YAMUNANAGAR	BILASPUR	0	847.55	22	Norms	0
137	YAMUNANAGAR	CHHACHHRAULI	0	1030.95	22	Norms	0
138	YAMUNANAGAR	JAGADHRI	0	1105.05	22	Norms	0
139	YAMUNANAGAR	KHIZRABAD	0	1060.75	22	Norms	0
140	YAMUNANAGAR	MUSTAFABAD	0	745.35	22	Norms	0
141	YAMUNANAGAR	RADAUR	0	918.55	22	Norms	0
142	YAMUNANAGAR	SADAURA (PART)	0	843.05	22	Norms	0
	YAMUNANAGAR						0
						Total	**23119.51544**

ANNEXURE XI

BLOCK/AU WISE NUMBERS OF IRRIGATION, DOMESTIC & INDUSTRIAL TUBEWELLS

S. NO.	DISTRICT / BLOCK/ Assesment Unit	TOTAL GEO. AREA	IRRIGATION			DEEP (DOMESTIC T/W)	DEEP (INDUSTIAL T/W)
			SHALLOW T/W	DEEP T/W	SALINE T/W		
1	AMBALA						
	Ambala-1	19317.60	5712		1000	369	22
	Ambala-2	35123.11	1782			319	30
	Barara	23038.02	5180			121	3
	Naraingarh	27728.78	4078			151	177
	Saha	25847.59	3622			118	249
	Shahzadpur	20149.80	4198			110	33
	TOTAL	151204.9					
2	BHIWANI						
	Bawani Khera	40587.23	2949		1170	13	33
	Behal	29577.64		4084	1520	32	45
	Bhiwani	85484.60	6568		2940	6	3
	Kairu	28708.96		2120	2129	22	152
	Loharu	36729.22	5030			93	22
	Siwani	56757.83	4120		950	4	6
	Tosham	51881.92	6339	40	40	25	25
	TOTAL	329727.4					
3	CHARKI DADRI						
	Badhra	36774.38	7670			184	7
	Baund	23436.54	2500		2531	25	0
	Charki Dadri	43137.09	3055		744	113	0
	Jhojhu	34001.67	3138		843	184	0
	TOTAL	137350					
4	FARIDABAD						
	Ballabgarh	17172.72	3829		256	30	646
	Faridabad	24146.20	3625		465	97	272
	Faridabad Urban	19500.75	104			1615	353
	Tigaon	13458.74	1902			117	5
	TOTAL	74278.41					
5	FATEHABAD						
	Bhattu Kalan	36362.06	2882			4	0
	Bhuna	38581.50	4606			7	0
	Fatehabad	55434.14	4089			27	23
	Jakhal	15291.22	5225			31	0
	Nagpur	28808.70	4197			22	0
	Ratia	37788.00	8027			56	16
	Tohana	40246.77	8153			28	11
	TOTAL	252512					

S. NO.	DISTRICT / BLOCK/ Assesment Unit	TOTAL GEO. AREA	IRRIGATION			DEEP (DOMESTIC T/W)	DEEP (INDUSTIAL T/W)
			SHALLOW T/W	DEEP T/W	SALINE T/W		
6	GURGAON						
	Farrukh Nagar	28639.9	2999			108	0
	Gurgaon	9619.00	362			517	0
	Gurgaon_Urban	31911.4	32			349	9056
	Pataudi	27547.7	5766			13072	1
	Sohna	28316.5	3967			265	0
	TOTAL	126034.9					
7	HISAR						
	Adampur	36692.79	3978		1056	7	0
	Agroha	32989.38	3745		1180	6	0
	Barwala	50633.26	12000		1457	10	0
	Hansi	58827.60	10555		3496	15	2
	Hansi-II	29922.61	9035		1493	20	0
	Hisar-1	62292.97	3810		1614	25	206
	Hisar-2	72208.82	4388		1617	20	0
	Narnaund	40985.50	6607		750	5	0
	Uklana	22974.36	1170		127	30	0
	TOTAL	407527					
8	JIND						
	Alewa	23546.97	6238		792	97	45
	Jind	47698.48	16328		1684	58	50
	Julana	35171.88	5449		4917	84	46
	Narwana	33294.78	4350		3770	3	100
	Pillukhera	21549.57	7155		1945	25	23
	Safidon	31433.77	9098		572	97	28
	Uchana	50720.53	13867		183	8	20
	Ujhana	31675.47	7467		323	28	10
	TOTAL	275091					
9	JHAJJAR						
	Badli	20877.44	3323			10	0
	Bahadurgarh	39644.16	11000			5	206
	Beri	32791.16	7485			20	0
	Jhajjar	30829.17	5300		4324	32	16
	Machhrauli	16846.85	4300			20	0
	Matanhail	36214.35	3142			25	0
	Sahlawas	16261.65	5295			18	8
	TOTAL	193465					
10	K. KSHETRA						
	Babain	13395.59	3408			60	224
	Ismailabad	20106.69	3763			74	776
	Ladwa	15675.04	3828			98	887
	Pehowa	42413.27	7991			144	840
	Pipli	17732.00	4387			83	489

S. NO.	DISTRICT / BLOCK/ Assesment Unit	TOTAL GEO. AREA	IRRIGATION			DEEP (DOMESTIC T/W)	DEEP (INDUSTIAL T/W)
			SHALLOW T/W	DEEP T/W	SALINE T/W		
	Shahabad	27598.08	6038			140	776
	Thanesar	31499.61	8043			226	2956
	TOTAL	168420					
11	KAITHAL						
	Dhand	21998.58	5261			82	28
	Guhla	39160.07	10713			62	88
	Kaithal	51093.04	10730			198	150
	Kalayat	32689.11	7248			54	19
	Pundri	30757.73	8001			91	22
	Rajound	24482.79	4820			42	16
	Siwan	27232.84	5009			82	22
	TOTAL	227414					
12	KARNAL						
	Assandh	39297.43	10247			100	53
	Gharaunda	28625.50	6003			100	194
	Indri	24300.78	11262			106	45
	Karnal	28811.80	6502			78	374
	Kunjpura	23092.29	4888			88	21
	Munak	27113.30	5070			81	7
	Nilokheri	39957.54	12215			161	129
	Nissing	35853.05	12395			100	71
	TOTAL	247052					
13	M. GARH						
	Ateli	22313.23	5580			226	0
	Kanina	35363.83	7910			129	0
	M.garh	35882.87	6150			81	0
	N.chaudhary	25039.76	875			97	10
	Narnaul	21102.53	1020			148	1
	Nizampur	16841.24	270			71	0
	Satnali	23714.10	2346			88	0
	Sihma	13825.19	2620			52	0
	TOTAL	194083					
14	MEWAT						
	F.P.Zhirka	27643.47	2412		805	168	0
	Indri	17149.70	772		150	69	0
	Nagina	17742.63	412		719	128	0
	Nuh	29345.12	761		2337	174	10
	Pingwan	15546.90	416		84	54	0
	Punhana	20838.63	2016			120	0
	Taoru	21965.76	4478			126	1
	TOTAL	150232					
15	PALWAL						
	Badoli	18082.03	4444			87	35

S. NO.	DISTRICT / BLOCK/ Assesment Unit	TOTAL GEO. AREA	IRRIGATION			DEEP (DOMESTIC T/W)	DEEP (INDUSTIAL T/W)
			SHALLOW T/W	DEEP T/W	SALINE T/W		
	Hassanpur	15459.92	3599			65	0
	Hathin	36019.79	4829			127	8
	Hodel	30054.35	5988			77	6
	Palwal	19956.34	3492		397	82	81
	Prithla	16382.74	3303			13	34
	TOTAL	135955					
16	PANIPAT						
	Bapoli	15669.39	3770			53	67
	Israna	27393.77	6180		1408	68	73
	Madlauda	36386.01	8430			64	42
	Panipat	21280.28	6044			92	437
	Samalkha	18920.24	6267			113	73
	Sanauli Khurd	10623.50	2835			38	50
	TOTAL	130273					
17	PANCHKULA						
	Barwala	21739.68	1542			93	34
	Morni	23315.24	-			5	-
	Pinjore	29203.93	572			120	4
	R.P.Rani	14027.90	1827			77	0
	TOTAL	88287					
18	ROHTAK						
	Kalanaur	28521.04	3100		3005	22	6
	Lakhan Majra	12689.09	1892		1500	12	4
	Meham	44704.29	5500		2979	14	4
	Rohtak	58318.89	9000		2190	80	22
	Sampla	22673.80	4400		349	16	11
	TOTAL	166907					
19	REWARI						
	Bawal	24004.59	4266		191	103	122
	Dahina	21015.93	4920			78	6
	Dharuhera	20126.54	1890			110	134
	Jatusana	20601.51	6000		354	49	6
	Khol	18909.65	3420			117	3
	Nahar	23430.14	6220		115	58	4
	Rewari	22799.45	2830		175	64	88
	TOTAL	150888					
20	SONEPAT						
	Ganaur	27210.10	10447			240	75
	Gohana	31544.21	9520		3005	65	11
	Kathura	19608.78	5645		948	15	3
	Kharkhoda	30754.62	6000		3852	224	5
	Mundlana	29086.88	8843		4100	40	5
	Murthal	19038.36	5406			89	102

S. NO.	DISTRICT / BLOCK/ Assesment Unit	TOTAL GEO. AREA	IRRIGATION			DEEP (DOMESTIC T/W)	DEEP (INDUSTIAL T/W)
			SHALLOW T/W	DEEP T/W	SALINE T/W		
	Rai	21677.20	6890			748	91
	Sonepat	36802.17	11400			132	104
	TOTAL	215722					
21	SIRSA*						
	Baragudha	53384.36	4809		4219	3	10
	Dabwali	80125.71	8659	256	6560	22	22
	Ellenabad	52786.70	7891		1722	32	8
	N.S.Chopta	75703.95	3292		2321	8	11
	Odhan	51579.91	5360		4627	11	25
	Rania	58955.35	6149		3700	63	14
	Sirsa	54456.78	9777		513	59	78
	TOTAL	426993					
22	Y. NAGAR						
	Bilaspur	27563.09	3253			125	0
	Chhachhrauli	25978.93	3556			43	150
	Jagadhari	29985.85	7119			95	2
	Khizrabad	28186.42	1718			110	15
	Mustafabad	20544.61	6792			76	0
	Radhaur	24653.58	7625			108	0
	Sadhaura	14864.80	2162			130	0
	TOTAL	171777					
	TOTAL (HARYANA STATE)	**4421200**					

ANNEXURE XII

BLOCK/AU WISE UNIT DRAFT OF TUBE WELLS FOR IRRIGATION, DOMESTIC & INDUSTRIAL

S.NO.	DISTRICT/ BLOCK	TOTAL GEOGRAPHICAL AREA	IRRIGATION Annual Draft per unitGW Structure (SHALLOW T/W) (Ham)	DOMESTIC Annual Draft per unitGW Structure (DOMESTIC T/W) (Ham)	INDUSTRIAL Annual Draft per unit GW Structure (IDUSTRIAL T/W) (Ham)
1	AMBALA				
	Ambala-1	19317.60	1.2	3.5	15
	Ambala-2	35123.11	1.7	7.52	15
	Barara	23038.02	1.56	9.22	15
	Naraingarh	27728.78	1.81	5.26	15
	Saha	25847.59	1.96	7.88	15
	Shahzadpur	20149.80	0.77	3.5	15
	TOTAL	151204.9			
2	BHIWANI				
	Bawani Khera	40587.23	1	4	4
	Behal	29577.64	1.36	3.5	
	Bhiwani	85484.60	0.75	3.5	
	Kairu	28708.96	2.8	4.3	4.6
	Loharu	36729.22	1.25	4	4
	Siwani	56757.83	0.8	4	
	Tosham	51881.92	1.5	4	
	TOTAL	329727.4			
3	CHARKI DADRI				
	Badhra	36774.38	1.81	3.85	4
	Baund	23436.54	0.45	3.95	
	Charki Dadri	43137.09	0.8	3.95	
	Jhojhu	34001.67	1.51	3.95	
	TOTAL	137350			
4	FARIDABAD				
	Ballabgarh	17172.72	1.25	2.37	4
	Faridabad	24146.20	1.60	2.67	4
	Faridabad_Urban	19500.75	1.45	2.37	4
	Tigaon	13458.74	1.45	2.37	4
	TOTAL	74278.418			
5	FATEHABAD				
	Bhattu Kalan	36362.06	1.1	10.5	
	Bhuna	38581.50	1.48	4	
	Fatehabad	55434.14	3.55	5.26	1.8
	Jakhal	15291.22	2.78	10.5	
	Nagpur	28808.70	2.51	10.5	
	Ratia	37788.00	4.09	10.5	5.6

S.NO.	DISTRICT/ BLOCK	TOTAL GEOGRAPHICAL AREA	IRRIGATION Annual Draft per unitGW Structure (SHALLOW T/W) (Ham)	DOMESTIC Annual Draft per unitGW Structure (DOMESTIC T/W) (Ham)	INDUSTRIAL Annual Draft per unit GW Structure (IDUSTRIAL T/W) (Ham)
	Tohana	40246.77	2.35	10.5	3.56
	TOTAL	252512			
6	GURGAON				
	F. Nagar	28639.95	1.81	4.5	
	Gurgaon	9619.00	1.5	2.81	
	Gurgaon_Urban	31911.45	1.36	1.56	1.81
	Pataudi	27547.78	1.35	4.5	1.81
	Sohna	28316.51	1.81	4.5	
	TOTAL	126034.6			
7	HISAR				
	Adampur	36692.79	0.7	2.15	
	Agroha	32989.38	1.6	2.15	
	Barwala	50633.26	0.7	3.55	
	Hansi	58827.60	0.44	2.15	1.81
	Hansi-II	29922.61	0.4	2.15	
	Hisar-1	62292.97	1.2	2.15	1.1
	Hisar-2	72208.82	0.65	2.15	
	Narnaund	40985.50	2.25	2.15	
	Uklana	22974.36	1.8	4	
	TOTAL	407527			
8	JIND				
	Alewa	23546.97	1.25	5.0	4.03
	Jind	47698.48	1.51	5.0	1.81
	Julana	35171.88	0.65	5.0	1.23
	Narwana	33294.78	0.81	5.0	1.81
	Pillukhera	21549.57	0.7	5.0	1.23
	Safidon	31433.77	1.6	5.0	1.91
	Uchana	50720.53	1.11	5.0	1.1
	Ujhana	31675.47	1.11	7.88	
	TOTAL	275091			
9	JHAJJAR				
	Badli	20877.44	1.2	3.29	
	Bahadurgarh	39644.16	0.51	3.29	4
	Beri	32791.16	0.51	3.29	
	Jhajjar	30829.17	0.64	3.29	3
	Machhrauli	16846.85	0.32	3	
	Matanhail	36214.35	0.4	2.74	
	Sahlawas	16261.65	0.51	3.29	3
	TOTAL	193465			

S.NO.	DISTRICT/ BLOCK	TOTAL GEOGRAPHICAL AREA	IRRIGATION Annual Draft per unitGW Structure (SHALLOW T/W) (Ham)	DOMESTIC Annual Draft per unitGW Structure (DOMESTIC T/W) (Ham)	INDUSTRIAL Annual Draft per unit GW Structure (IDUSTRIAL T/W) (Ham)
10	KURUKSHETRA				
	Babain	13395.59	1.65	5	1.81
	Ismailabad	20106.69	2.6	5	1.81
	Ladwa	15675.04	1.79	5	1.81
	Pehowa	42413.27	1.81	5	1.81
	Pipli	17732.00	1.81	5	1.81
	Shahabad	27598.08	1.81	5	1.81
	Thanesar	31499.61	1.45	5	1.81
	TOTAL	168420			
11	KAITHAL				
	Dhand	21998.58	1.43	7.88	1.6
	Guhla	39160.07	1.81	6.88	1.81
	Kaithal	51093.04	1.25	7.88	1.81
	Kalayat	32689.11	1	1.81	1.81
	Pundri	30757.73	1.23	1.81	1.81
	Rajound	24482.79	1.62	1.81	1.81
	Siwan	27232.84	2.25	7.88	2.50
	TOTAL	227414			
12	KARNAL				
	Assandh	39297.43	2.26	7.88	4
	Gharaunda	28625.50	2.46	7.88	4
	Indri	24300.78	2.47	7.88	4.61
	Karnal	28811.80	2.74	7.88	4
	Kunjpura	23092.29	2.58	7.88	
	Munak	27113.30	2.46	12.81	
	Nilokheri	39957.54	2.38	12.81	4
	Nissing	35853.05	2.41	12.81	4
	TOTAL	247052			
13	M. GARH				
	Ateli	22313.23	0.67	4.2	
	Kanina	35363.83	1.39	4.2	
	M.garh	35882.87	0.63	4.24	
	N.chaudhary	25039.76	1.32	4.2	3.01
	Narnaul	21102.53	0.82	4.2	0.98
	Nizampur	16841.24	0.88	4.2	
	Satnali	23714.10	0.64	4.2	
	Sihma	13825.19	1.42	4.2	
	TOTAL	194083			
14	MEWAT				
	Firozpur Zhirka	27643.47	0.79	2.07	

S.NO.	DISTRICT/ BLOCK	TOTAL GEOGRAPHICAL AREA	IRRIGATION Annual Draft per unitGW Structure (SHALLOW T/W) (Ham)	DOMESTIC Annual Draft per unitGW Structure (DOMESTIC T/W) (Ham)	INDUSTRIAL Annual Draft per unit GW Structure (IDUSTRIAL T/W) (Ham)
	Indri	17149.70	1.25	4.27	
	Nagina	17742.63	0.85	2.9	
	Nuh	29345.12	1.05	1.81	1.81
	Pingwan	15546.90	1.05	2.83	
	Punhana	20838.63	1.37	2.62	
	Taoru	21965.76	0.73	2.12	1.81
	TOTAL	150232			
15	PALWAL				
	Badoli	18082.03	1.81	9.63	4.5
	Hassanpur	15459.92	1.44	3.65	
	Hathin	36019.79	0.9	4	4
	Hodel	30054.35	1	3.95	4
	Palwal	19956.34	1.3	3.95	4.51
	Prithla	16382.74	1.81	3.95	4.51
	TOTAL	135955			
16	PANIPAT				
	Bapoli	15669.39	3.93	6.57	4
	Israna	27393.77	2.21	3.57	4
	Madlauda	36386.01	2.26	4	4
	Panipat	21280.28	2.7	6.57	4
	Samalkha	18920.24	4.56	6.57	4
	Sanuli Khurd	10623.50	2.1	3.57	
	TOTAL	130273			
17	PANCHKULA				
	Barwala	21739.68	1.81	3.94	6
	Morni	23315.24			
	Pinjore	29203.93	1.81	3.94	6
	R.P.Rani	14027.90	1.81	3.94	
	TOTAL	88287			
18	ROHTAK				
	Kalanaur	28521.04	0.54	3.5	3.5
	Lakhan Majra	12689.09	0.97	3	3
	Meham	44704.29	0.81	3	3
	Rohtak	58318.89	0.54	4	4
	Sampla	22673.80	0.65	3	3
	TOTAL	166907			
19	REWARI				
	Bawal	24004.59	0.98	3.29	4
	Dahina	21015.93	0.96	3.22	4
	Dharuhera	20126.54	1.81	4.44	4

S.NO.	DISTRICT/ BLOCK	TOTAL GEOGRAPHICAL AREA	IRRIGATION Annual Draft per unitGW Structure (SHALLOW T/W) (Ham)	DOMESTIC Annual Draft per unitGW Structure (DOMESTIC T/W) (Ham)	INDUSTRIAL Annual Draft per unit GW Structure (IDUSTRIAL T/W) (Ham)
	Jatusana	20601.51	0.96	3.95	4.0
	Khol	18909.65	0.96	2.36	4.0
	Nahar	23430.14	0.82	3.29	4.0
	Rewari	22799.45	1.81	3.99	4.0
	TOTAL	150888			
20	SONEPAT				
	Ganaur	27210.10	1.15	5.91	3.0
	Gohana	31544.21	0.54	3.74	3.0
	Kathura	19608.78	0.65	2.94	1.81
	Kharkhoda	30754.62	0.5	5.75	3.0
	Mundlana	29086.88	0.97	5.69	3.0
	Murthal	19038.36	1.06	5.91	1.81
	Rai	21677.20	1.5	5.91	3.0
	Sonepat	36802.17	1.3	5.91	1.81
	TOTAL	215722			
21	SIRSA				
	Baragudha	53384.36	1.8	7.23	
	Dabwali	80125.71	2	4.0	
	Ellenabad	52786.70	2	10.29	1.81
	N.S.Chopta	75703.95	1.64	4	
	Odhan	51579.91	2	4	
	Rania	58955.35	2	7.88	1.81
	Sirsa	54456.78	1.65	7.88	1.81
	TOTAL	426993			
22	Y. NAGAR				
	Bilaspur	27563.09	1.81	7.88	
	Chhachhrauli	25978.93	1.81	7.88	15.0
	Jagadhari	29985.85	1.81	7.88	15.0
	Khizrabad	28186.42	4.65	7.88	4
	Mustafabad	20544.61	2.02	7.88	
	Radhaur	24653.58	2.02	7.88	
	Sadhaura	14864.80	1.58	5.25	
	TOTAL	171777			

ANNEXURE XIII

BLOCK / AU WISE UNIT RECHARGE (IN METER)

Sr. No.	District	Assessment Unit Name	Recharge Worthy Area	Annual Extractable Ground Water Resource (Ham)	Unit Recharge (in meters)
1	2	3	4	5	6
1	AMBALA	SHAHZADPUR	20149.80	5330.96	0.3
2	AMBALA	NARAINGARH	27428.78	7167.94	0.3
3	AMBALA	SAHA	25847.59	6436.73	0.2
4	AMBALA	AMBALA-I	19317.60	8184.02	0.4
5	AMBALA	AMBALA-II	35123.11	5974.30	0.2
6	AMBALA	BARARA	23038.02	6292.51	0.3
7	BHIWANI	SIWANI	56757.83	7079.83	0.1
8	BHIWANI	KAIRU	28708.96	3317.98	0.1
9	BHIWANI	BHIWANI	85484.60	8343.57	0.1
10	BHIWANI	TOSHAM	50849.92	7093.45	0.1
11	BHIWANI	BAWANI KHERA	40587.23	5857.55	0.1
12	BHIWANI	BEHAL	29577.64	3766.44	0.1
13	BHIWANI	LOHARU	36729.22	4333.22	0.1
14	CHARKHI DADRI	BADHRA	23436.54	6675.21	0.3
15	CHARKHI DADRI	BAUND	36585.38	6479.18	0.2
16	CHARKHI DADRI	CHARKHI DADRI	43137.09	5159.11	0.1
17	CHARKHI DADRI	JHOJHU	34001.67	4015.23	0.1
18	FARIDABAD	FARIDABAD_URBAN	19500.75	1664.25	0.1
19	FARIDABAD	FARIDABAD	16738.21	5105.47	0.3
20	FARIDABAD	BALLABGARH	15863.72	3009.95	0.2
21	FARIDABAD	TIGAON	13458.74	3314.89	0.2
22	FATEHABAD	FATEHABAD	55434.14	7603.94	0.1
23	FATEHABAD	TOHANA	40246.77	15320.62	0.4
24	FATEHABAD	BHUNA	38581.50	6595.02	0.2
25	FATEHABAD	JAKHAL	15291.22	6839.49	0.4
26	FATEHABAD	BHATTU KALAN	36362.06	3727.02	0.1
27	FATEHABAD	RATIA	37788.00	13714.50	0.4
28	FATEHABAD	NAGPUR	28808.70	4505.25	0.2
29	GURGAON	GURGAON	8331.00	1796.55	0.2
30	GURGAON	SOHNA	25891.51	4683.54	0.2
31	GURGAON	GURGAON_URBAN	31911.45	5538.43	0.2
32	GURGAON	FARRUKH NAGAR	28608.95	3736.16	0.1
33	GURGAON	PATAUDI	27502.78	4578.71	0.2

Sr. No.	District	Assessment Unit Name	Recharge Worthy Area	Annual Extractable Ground Water Resource (Ham)	Unit Recharge (in meters)
34	HISAR	AGROHA	32989.38	6260.00	0.19
35	HISAR	HANSI-II	29922.61	5816.34	0.19
36	HISAR	BARWALA	50633.26	9128.82	0.18
37	HISAR	ADAMPUR	36692.79	4414.50	0.12
38	HISAR	HISAR-I	62292.97	6942.13	0.11
39	HISAR	HANSI	58827.60	7242.87	0.12
40	HISAR	UKLANA	22974.36	6018.51	0.26
41	HISAR	HISAR-II	72208.82	4199.45	0.06
42	HISAR	NARNAUND	40985.50	6870.99	0.17
43	JHAJJAR	BADLI	20877.44	8167.53	0.39
44	JHAJJAR	BERI	32791.16	7828.22	0.24
45	JHAJJAR	JHAJJAR	30829.17	5113.82	0.17
46	JHAJJAR	MACHHRAULI	16846.85	3537.43	0.21
47	JHAJJAR	SALHAWAS	16261.65	4716.66	0.29
48	JHAJJAR	BAHADURGARH	39644.16	9796.72	0.25
49	JHAJJAR	MATANNAIL	36214.35	5269.41	0.15
50	JIND	JULANA	35171.88	7749.97	0.22
51	JIND	UCHANA	50720.53	14206.00	0.28
52	JIND	UJHANA	31675.47	7392.07	0.23
53	JIND	ALEWA	23546.97	6023.49	0.26
54	JIND	SAFIDON	31433.77	10834.75	0.34
55	JIND	JIND	47698.48	20019.66	0.42
56	JIND	NARWANA	33294.78	5658.68	0.17
57	JIND	PILLUKHERA	21549.57	6386.02	0.30
58	KAITHAL	DHAND	21998.58	4012.71	0.18
59	KAITHAL	KALAYAT	32689.11	4376.57	0.13
60	KAITHAL	RAJOUND	24482.79	4477.18	0.18
61	KAITHAL	GUHLA	39160.07	8962.95	0.23
62	KAITHAL	KAITHAL	51093.04	8870.69	0.17
63	KAITHAL	PUNDRI	30757.73	5832.04	0.19
64	KAITHAL	SIWAN	27232.84	5770.01	0.21

Sr. No.	District	Assessment Unit Name	Recharge Worthy Area	Annual Extractable Ground Water Resource (Ham)	Unit Recharge (in meters)
65	KARNAL	NISSING AT CHIRAO	35853.05	19424.19	0.54
66	KARNAL	KARNAL	28811.80	13837.75	0.48
67	KARNAL	KUNJPURA	23092.29	7192.28	0.31
68	KARNAL	MUNAK	27113.30	6428.21	0.24
69	KARNAL	GHARAUNDA (PART)	28625.50	9701.37	0.34
70	KARNAL	NILOKHERI	39957.54	16435.15	0.41
71	KARNAL	INDRI	24300.78	19738.08	0.81
72	KARNAL	ASSANDH	39297.43	13090.34	0.33
73	KURUKSHETRA	THANESAR	31499.61	6670.95	0.21
74	KURUKSHETRA	SHAHBAD	27598.08	5902.27	0.21
75	KURUKSHETRA	BABAIN	13395.59	2970.40	0.22
76	KURUKSHETRA	ISMAILABAD	20106.69	5131.32	0.26
77	KURUKSHETRA	LADWA	15675.04	3751.18	0.24
78	KURUKSHETRA	PEHOWA	42413.27	8594.19	0.20
79	KURUKSHETRA	PIPLI	17732.00	4068.25	0.23
80	MAHENDRAGARH	ATELI NANGAL	21405.23	3666.02	0.17
81	MAHENDRAGARH	KANINA	35363.83	5641.65	0.16
82	MAHENDRAGARH	MAHENDRAGARH	34864.87	3335.79	0.10
83	MAHENDRAGARH	NANGAL CHAUDHRY	24670.76	1133.31	0.05
84	MAHENDRAGARH	NARNAUL	21102.53	1055.55	0.05
85	MAHENDRAGARH	NIZAMPUR	16841.24	636.64	0.04
86	MAHENDRAGARH	SATNALI	23714.10	1940.20	0.08
87	MAHENDRAGARH	SIHMA	13825.19	2751.65	0.20
88	MEWAT	NUH	26050.12	3313.29	0.13
89	MEWAT	PUNAHANA	20838.63	3283.38	0.16
90	MEWAT	TAORU	18604.76	2862.19	0.15
91	MEWAT	FEROZEPUR JHIRKA	22435.47	2445.50	0.11
92	MEWAT	NAGINA	16280.63	1184.49	0.07
93	MEWAT	INDRI	17149.70	1989.12	0.12
94	MEWAT	PINGWAN	15546.90	1466.97	0.09
95	PALWAL	HASSANPUR	15459.92	5900.68	0.38
96	PALWAL	HATHIN	35890.79	7760.97	0.22
97	PALWAL	HODAL	30054.35	7582.24	0.25
98	PALWAL	PALWAL	19956.34	7830.09	0.39
99	PALWAL	PRITHLA	16382.74	4435.35	0.27
100	PALWAL	BADOLI	18082.03	5731.30	0.32

Sr. No.	District	Assessment Unit Name	Recharge Worthy Area	Annual Extractable Ground Water Resource (Ham)	Unit Recharge (in meters)
101	PANCHKULA	MORNI	0.00	0.00	0.00
102	PANCHKULA	PINJORE	18103.93	3607.70	0.20
103	PANCHKULA	BARWALA	21739.68	6094.04	0.28
104	PANCHKULA	RAIPUR RANI	10827.90	3731.75	0.34
105	PANIPAT	BAPOLI	15669.39	5443.63	0.35
106	PANIPAT	ISRANA	27393.77	6899.98	0.25
107	PANIPAT	MADLAUDA	36386.01	11158.59	0.31
108	PANIPAT	PANIPAT	21280.28	9232.38	0.43
109	PANIPAT	SAMALKHA	18920.24	10768.87	0.57
110	PANIPAT	SANAULI KHURD	10623.50	2761.69	0.26
111	REWARI	KHOL AT REWARI	17321.65	2491.16	0.14
112	REWARI	BAWAL	23284.59	4117.09	0.18
113	REWARI	JATUSANA	19395.51	3420.60	0.18
114	REWARI	NAHAR	23430.14	3226.58	0.14
115	REWARI	REWARI	22799.45	5026.49	0.22
116	REWARI	DAHINA	19809.93	5232.32	0.26
117	REWARI	DHARUHERA	20126.54	2887.40	0.14
118	ROHTAK	SAMPLA	22673.80	5957.96	0.26
119	ROHTAK	KALANAUR	28521.04	4432.28	0.16
120	ROHTAK	LAKHAN MAJRA	12689.09	2812.83	0.22
121	ROHTAK	MAHAM	44704.29	7688.11	0.17
122	ROHTAK	ROHTAK	58318.89	11125.15	0.19
123	SIRSA	BARAGUDHA	53384.36	10451.95	0.20
124	SIRSA	DABWALI	80125.71	12767.44	0.16
125	SIRSA	ELLENABAD	52786.70	5717.75	0.11
126	SIRSA	NATHUSARI CHOPTA	75703.95	5350.20	0.07
127	SIRSA	ODHAN	51579.91	5381.09	0.10
128	SIRSA	RANIA	58955.35	7820.88	0.13
129	SIRSA	SIRSA	54456.78	9085.27	0.17
130	SONIPAT	GOHANA	31544.21	8852.22	0.28
131	SONIPAT	KHARKHODA	30754.62	7486.56	0.24
132	SONIPAT	GANAUR	27210.10	9888.33	0.36
133	SONIPAT	KATHURA	19608.78	6891.15	0.35
134	SONIPAT	MUNDLANA	29086.88	8836.07	0.30
135	SONIPAT	RAI	21677.20	13786.75	0.64
136	SONIPAT	SONIPAT	36802.17	12199.49	0.33
137	SONIPAT	MURTHAL	19038.36	4568.34	0.24

Sr. No.	District	Assessment Unit Name	Recharge Worthy Area	Annual Extractable Ground Water Resource (Ham)	Unit Recharge (in meters)
138	YAMUNA NAGAR	BILASPUR	26463.09	6065.91	0.23
139	YAMUNA NAGAR	CHHACHHRAULI	12778.93	11549.94	0.90
140	YAMUNA NAGAR	JAGADHRI	29985.85	8629.50	0.29
141	YAMUNA NAGAR	MUSTAFABAD	20544.61	7054.99	0.34
142	YAMUNA NAGAR	RADAUR	24653.58	8246.01	0.33
143	YAMUNA NAGAR	SADAURA (PART)	13864.80	3238.23	0.23
144	YAMUNA NAGAR	KHIZRABAD	14986.42	9853.37	0.66

DYNAMIC GROUND WATER RESOURCES OF HARYANA AS ON MARCH 2023 Annexure- XIV

District	Assessment Unit Name	Assessment Unit code	Predominant Rock formation	Total area (Ha)	Hilly Area (Ha)	Recharge Worthy Area (Ha)	Poor Ground Water Quality (Ha)			Command Area (Ha)	Non-Command Area (Ha)	Normal Annual Rainfall (mm)	Normal Monsoon Rainfall (mm)	Specific Yield		Water Level Fluctuation (m)	Method adopted for computing rainfall recharge during Monsoon recharge (WLF/ RIF Method)	Infiltration Factor	
							As	Saline	F					Value	Norm /Field Value			Value	Norms / Field Value
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
AMBALA	AMBALA-I	HR010100	Alluvium	19318	0	19318	NA	0	NA	19318	0	917	694	15	Norms	-2.4	RIF	22	Norms
AMBALA	AMBALA-II	HR010200	Alluvium	35123	0	35123	NA	0	NA	35123	0	917	694	15	Norms	0.11	RIF	22	Norms
AMBALA	BARARA	HR010300	Alluvium	23038	0	23038	NA	0	NA	23038	0	924	697	15	Norms	0.99	RIF	22	Norms
AMBALA	NARAINGARH	HR010400	Alluvium	27429	300	27429	NA	0	NA	27429	0	1381	1048	15	Norms	0.19	RIF	22	Norms
AMBALA	SAHA	HR010500	Alluvium	25848	0	25848	NA	0	NA	25848	0	924	697	15	Norms	0.93	RIF	22	Norms
AMBALA	SHAHZADPUR	HR010600	Alluvium	20150	0	20150	NA	0	NA	20150	0	1381	1048	15	Norms	-0.59	RIF	22	Norms
BHIWANI	BAWANIKHERA	HR020100	Alluvium	40587	0	40587	NA	10753	NA	29834	0	426.23	351.03	10	Norms	0.481	RIF	22	Norms
BHIWANI	BEHAL	HR020200	Alluvium	29578	0	29578	NA	4078	NA	25500	0	426.23	351.03	10	Norms	-0.461	RIF	22	Norms
BHIWANI	BHIWANI	HR020300	Alluvium	85465	0	85485	NA	17433	NA	68032	0	426.23	351.03	10	Norms	-0.11	RIF	22	Norms
BHIWANI	KAIRU	HR020400	Alluvium	28709	0	28709	NA	10196	NA	18513	0	426.23	351.03	10	Norms	-1.245	RIF	22	Norms
BHIWANI	LOHARU	HR020500	Alluvium	36729	0	36729	NA	1515	NA	35214	0	426.23	351.0`q3	10	Norms	-0.38	RIF	22	Norms
BHIWANI	SIWANI	HR020600	Alluvium	56758	0	56758	NA	15191	NA	41567	0	426.23	351.03	10	Norms	0.06	RIF	22	Norms
BHIWANI	TOSHAM	HR020700	Alluvium	51882	1032	50849.9	NA	2014	NA	48836	0	426.23	351.03	12	Norms	-0.07	RIF	22	Norms
CHARKHI DADRI	BADHRA	HR030100	Alluvium	23437	0	23437	NA	750	NA	22687	0	589	432	12	Norms	-0.63	RIF	22	Norms
CHARKHI DADRI	BAUND	HR030200	Alluvium	36774	189	36585	NA	750	NA	36585	0	800	450	12	Norms	0.261	RIF	22	Norms
CHARKHI DADRI	CHARKHIDADRI	HR030300	Alluvium	43137	0	43137.1	NA	497	NA	42640	0	700	450	12	Norms	0.36	RIF	22	Norms
CHARKHI DADRI	JHOJHU	HR030400	Alluvium	34002	0	34001.7	NA	1578	NA	32424	0	510	350	12	Norms	-0.09	RIF	22	Norms
FARIDABAD	BALLABGARH	HR040100	Alluvium	17173	1309	15863.7	NA	5264	NA	10600	0	612.96	499.26	10	Norms	-0.17	RIF	22	Norms
FARIDABAD	FARIDABAD	HR040200	Alluvium	24146	7408	16738.2	NA	272	NA	16466	0	699	542	10	Norms	-0.29	RIF	22	Norms
FARIDABAD	FARIDABAD URBAN	HR040400	Alluvium	19501	0	19501	NA	2300	NA	17201	0	699	542	10	Norms	0.35	RIF	22	Norms
FARIDABAD	TIGAON	HR040300	Alluvium	13459	0	13458.7	NA	0	NA	13459	0	699	542	10	Norms	0.08	WTFM	22	Norms
FATEHABAD	BHATTUKALAN	HR050100	Alluvium	36362	0	36362.1	NA	158	NA	36204	0	198	148	12	Norms	0.02	RIF	22	Norms
FATEHABAD	BHUNA	HR050200	Alluvium	38581	0	38581.5	NA	504	NA	38077	0	324	257	12	Norms	-0.28	RIF	22	Norms

FATEHABAD	FATEHABAD	HR050300	Alluvium	55434	0	55434.1	NA	0	NA	55434	0	340	250	12	Norms	-0.9	RIF	22	Norms
FATEHABAD	JAKHAL	HR050400	Alluvium	15291	0	15291.2	NA	0	NA	15291	0	345	250	12	Norms	-0.004	RIF	22	Norms
FATEHABAD	NAGPUR	HR050700	Alluvium	28809	0	28808.7	NA	0	NA	28809	0	250	155	12	Norms	-0.15	RIF	22	
FATEHABAD	RATIA	HR050500	Alluvium	37788	0	37788	NA	0	NA	37788	0	240	180	12	Norms	-0.62	RIF	22	Norms
FATEHABAD	TOHANA	HR050600	Alluvium	40247	0	40246.8	NA	0	NA	40247	0	340	250	12	Norms	0.49	RIF	22	Norms
GURGAON	FARRUKH NAGAR	HR060100	Alluvium	28640	31	28609	NA	0	NA	28609	0	401.6	270.05	10	Norms	0.2	RIF	22	Norms
GURGAON	GURGAON	HR060200	Alluvium	9619	1288	8331	NA	0	NA	8331	0	773.87	486.36	10	Norms	-0.11	WTFM	22	Norms
GURGAON	GURGAON URBAN	HR060500	Alluvium	31911	0	31911.4	NA	0	NA	31911	0	773.87	486.36	10	Norms	0.3	RIF	22	Norms
GURGAON	PATAUDI	HR060300	Alluvium	27548	45	27502.8	NA	0	NA	27503	0	466	321	10	Norms	0.4	RIF	22	Norms
GURGAON	SOHNA	HR060400	Alluvium	28317	2425	25892	NA	1133	NA	24759	0	522.94	400.55	10	Norms	0.196	RIF	22	Norms
HISAR	ADAMPUR	HR070100	Alluvium	36693	0	36692.8	NA	0	NA	36693	0	360	320	12	Norms	0.145	RIF	22	Norms
HISAR	AGROHA	HR070200	Alluvium	32989	0	32989.4	NA	0	NA	32989	0	360	320	12	Norms	0.218	WTFM	22	Norms
HISAR	BARWALA	HR070300	Alluvium	50633	0	50633	NA	689	NA	49944	0	360	300	12	Norms	0.347	RIF	22	Norms
HISAR	HANSI	HR070500	Alluvium	58828	0	58827.6	NA	0	NA	58828	0	296	246	12	Norms	0.44	RIF	22	Norms
HISAR	HANSI-II	HR071000	Alluvium	29923	0	29922.6	NA	0	NA	29923	0	300	250	12	Norms	0.27	WTFM	22	Norms
HISAR	HISAR-I	HR070600	Alluvium	62293	0	62293	NA	0	NA	62293	0	370	310	12	Norms	0.22	WTFM	22	Norms
HISAR	HISAR-II	HR070700	Alluvium	72209	0	72208.8	NA	0	NA	72209	0	295	175	12	Norms	0.08	WTFM	22	Norms
HISAR	NARNAUND	HR070800	Alluvium	40985	0	40985.5	NA	0	NA	40985	0	295	245	12	Norms	0.14	RIF	22	Norms
HISAR	UKLANA	HR070900	Alluvium	22974	0	22974.4	NA	0	NA	22974	0	1010	770	12	Norms	0.94	RIF	22	Norms
JHAJJAR	BADLI	HR080600	Alluvium	20877	0	20877.4	NA	0	NA	20877	0	483	328	12	Norms	0.92	RIF	22	Norms
JHAJJAR	BAHADURGARH	HR080100	Alluvium	39644	0	39644	NA	9236	NA	30408	0	695	536	12	Norms	0.94	WTFM	24	Norms
JHAJJAR	BERI	HR080200	Alluvium	32791	0	32791.2	NA	5989	NA	26802	0	569	420	12	Norms	1.15	WTFM	24	Norms
JHAJJAR	JHAJJAR	HR080300	Alluvium	30829	0	39829	NA	7259	NA	23570	0	550	407	12	Norms	0.99	RIF	22	Norms
JHAJJAR	MACHHRAULI	HR080700	Alluvium	16847	0	16846.9	NA	3862	NA	12985	0	375	232	12	Norms	0.78	RIF	22	Norms
JHAJJAR	MATANNAIL	HR080400	Alluvium	35214	0	36214.3	NA	6915	NA	29299	0	390	305	12	Norms	0.8	RIF	22	Norms
JHAJJAR	SALHAWAS	HR080500	Alluvium	16262	0	16262	NA	6544	NA	9718	0	662	535	12	Norms	-1.17	WTFM	22	Norms
JIND	ALEWA	HR090100	Alluvium	23547	0	23547	NA	0	NA	23547	0	587	357	12	Norms	-0.75	RIF	22	Norms
JIND	JIND	HR090200	Alluvium	47698	0	47698.5	NA	0	NA	47698	0	653	388	12	Norms	0.78	RIF	22	Norms
JIND	JULANA	HR090300	Alluvium	35172	0	35171.9	NA	789	NA	34383	0	560.39	410.15	12	Norms	-0.11	RIF	22	Norms
JIND	NARWANA	HR090400	Alluvium	33295	0	33294.8	NA	1671	NA	31624	0	497.60	351	12	Norms	0.58	RIF	22	Norms
JIND	PILLUKHERA	HR090500	Alluvium	21550	0	21549.6	NA	1932	NA	19618	0	343.29	209.29	12	Norms	-1.22	RIF	22	Norms
JIND	SAFIDON	HR090600	Alluvium	31434	0	31433.8	NA	0	NA	31434	0	531.55	384	12	Norms	0.13	RIF	22	Norms
JIND	UCHANA	HR090700	Alluvium	50721	0	50720.5	NA	2672	NA	48049	0	440	290	12	Norms	-1.3	WTFM	22	Norms
JIND	UJHANA	HR090800	Alluvium	31675	0	31675.5	NA	0	NA	31675	0	668.19	455.33	12	Norms	-1.34	RIF	22	Norms

KAITHAL	DHAND	HR100700	Alluvium	21999	0	21998.6	NA	0	NA	21999	0	523.07	410.01	12	Norms	-1.4	RIF	22	Norms
KAITHAL	GUHLA	HR100100	Alluvium	39160	0	39160.1	NA	0	NA	39160	0	518.31	399.47	12	Norms	-1.11	RIF	22	Norms
KAITHAL	KAITHAL	HR100200	Alluvium	51093	0	51093	NA	0	NA	51093	0	523.07	410.01	12	Norms	-0.35	RIF	22	Norms
KAITHAL	KALAYAT	HR100300	Alluvium	32689	0	32689.1	NA	720	NA	31969	0	403.45	326.84	12	Norms	-0.47	RIF	22	Norms
KAITHAL	PUNDRI	HR100400	Alluvium	30758	0	30757.7	NA	0	NA	30758	0	523.07	410.01	12	Norms	-0.71	RIF	22	Norms
KAITHAL	RAJOUND	HR100500	Alluvium	24483	0	24482.8	NA	3822	NA	20661	0	403.45	326.84	12	Norms	-7.48	WTFM	22	Norms
KAITHAL	SIWAN	HR100600	Alluvium	27233	0	27232.8	NA	0	NA	27233	0	518.31	399.47	12	Norms	-0.43	RIF	22	Norms
KARNAL	ASSANDH	HR110100	Alluvium	39297	0	39297.4	NA	186	NA	39111	0	629.38	516.05	15	Norms	0.1	RIF	22	Norms
KARNAL	GHARAUNDA (PART)	HR110200	Alluvium	28626	0	28625.5	NA	0	NA	28626	0	545.18	434.98	15	Norms	0.7	RIF	22	Norms
KARNAL	INDRI	HR110300	Alluvium	24301	0	24300.8	NA	0	NA	24301	0	728.61	72.86	15	Norms	0.6	RIF	22	Norms
KARNAL	KARNAL	HR110400	Alluvium	28812	0	28811.8	NA	0	NA	28812	0	723.65	552.31	15	Norms	0.73	RIF	22	Norms
KARNAL	KUNJPURA	HR110700	Alluvium	23092	0	23092.3	NA	0	NA	23092	0	723.65	552.31	15	Norms	-0.42	RIF	22	Norms
KARNAL	MUNAK	HR110800	Alluvium	27113	0	27113.3	NA	0	NA	27113	0	545.18	434.98	15	Norms	-0.08	RIF	22	Norms
KARNAL	NILOKHERI	HR110500	Alluvium	39958	0	39957.5	NA	0	NA	39958	0	710.24	541.44	15	Norms	-0.42	RIF	22	Norms
KARNAL	NISSING AT GHRAO	HR110600	Alluvium	35853	0	35853.1	NA	0	NA	35853	0	642.08	527.95	12	Norms	-0.82	RIF	22	Norms
KURUKSHETRA	BABAIN	HR120100	Alluvium	13396	0	13395.6	NA	0	NA	13396	0	624.24	490.65	12	Norms	0.64	RIF	22	Norms
KURUKSHETRA	ISMAILABAD	HR120200	Alluvium	20107	0	20106.7	NA	0	NA	20107	0	624.24	490.65	12	Norms	-1.41	RIF	22	Norms
KURUKSHETRA	LADWA	HR120300	Alluvium	15675	0	15675	NA	0	NA	15675	0	624.24	490.65	12	Norms	-1.87	WTFM	22	Norms
KURUKSHETRA	PEHOWA	HR120400	Alluvium	42413	0	42413.3	NA	0	NA	42413	0	624.24	490.65	12	Norms	-1	RIF	22	Norms
KURUKSHETRA	PIPLI	HR120500	Alluvium	17732	0	17732	NA	0	NA	17732	0	624.24	490.65	12	Norms	-0.319	RIF	22	Norms
KURUKSHETRA	SHAHBAD	HR120600	Alluvium	27598	0	27598.1	NA	0	NA	27598	0	624.24	490.65	12	Norms	-1.572	RIF	22	Norms
KURUKSHETRA	THANESAR	HR120700	Alluvium	31500	0	31499.6	NA	0	NA	31500	0	624.24	490.65	12	Norms	-0.254	RIF	22	Norms
MAHENDRAGARH	ATELI NANGAL	HR130100	Alluvium	22313	908	21405	NA	677	NA	20728	0	314	220	12	Norms	0.26	RIF	22	Norms
MAHENDRAGARH	KANINA	HR130200	Alluvium	35364	0	35363.8	NA	478	NA	34886	0	278	195	12	Norms	-0.93	RIF	22	Norms
MAHENDRAGARH	MAHENDRAGARH	HR130300	Alluvium	35883	1018	34864.9	NA	0	NA	34865	0	360	252	12	Norms	0.9	RIF	22	Norms
MAHENDRAGARH	NANGAL CHAUDHRY	HR130400	Alluvium	25040	369	24670.8	NA	0	NA	24671	0	339	237	12	Norms	1.42	RIF	22	Norms
MAHENDRAGARH	NARNAUL	HR130500	Alluvium	21103	0	21102.5	NA	0	NA	21103	0	420	294	12	Norms	1.02	RIF	22	Norms
MAHENDRAGARH	NIZAMPUR	HR130600	Alluvium	16841	0	16841.2	NA	369	NA	16472	0	339	237	12	Norms	-0.24	RIF	22	Norms
MAHENDRAGARH	SATNALI	HR130700	Alluvium	23714	0	23714.1	NA	1244	NA	22470	0	360	252	12	Norms	0.19	RIF	22	Norms
MAHENDRAGARH	SIHMA	HR130800	Alluvium	13825	0	13825.2	NA	478	NA	13347	0	314	220	12	Norms	0.24	RIF	22	Norms
MEWAT	FEROZEPUR JHIRKA	HR140100	Alluvium	27643	5208	22435.5	NA	1224	NA	21211	0	534	402	10	Norms	0.19	RIF	22	Norms
MEWAT	INDRI	HR140600	Alluvium	17150	0	17149.7	NA	0	NA	17150	0	599.98	471.22	10	Norms	0.27	RIF	22	Norms
MEWAT	NAGINA	HR140200	Alluvium	17743	1462	16280.6	NA	3390	NA	12891	0	408	302	10	Norms	0.29	RIF	22	Norms

MEWAT	NUH	HR140300	Alluvium	29345	3295	26050.1	NA	11017	NA	15033	0	683	498	10	Norms	0.16	RIF	22	Norms
MEWAT	PINGWAN	HR140700	Alluvium	15547	0	15546.9	NA	0	NA	15547	0	483.22	300.28	10	Norms	-0.39	RIF	22	Norms
MEWAT	PUNAHANA	HR140400	Alluvium	20839	0	20838.6	NA	10573	NA	10266	0	450	300.28	10	Norms	0.29	RIF	22	Norms
MEWAT	TAORU	HR140500	Alluvium	21966	3361	18604.8	NA	0	NA	18605	0	552.3	395	10	Norms	0.33	RIF	22	Norms
PALWAL	BADOLI	HR150600	Alluvium	18082	0	18082	NA	0	NA	18082	0	542	432	10	Norms	0.44	RIF	22	Norms
PALWAL	HASSANPUR	HR150100	Alluvium	15460	0	15459.9	NA	0	NA	15460	0	392.17	304.26	10	Norms	0.26	RIF	22	Norms
PALWAL	HATHIN	HR150200	Alluvium	36020	129	35890.8	NA	5721	NA	30170	0	486.80	433.78	10	Norms	0.34	RIF	22	Norms
PALWAL	HODAL	HR150300	Alluvium	30054	0	30054.4	NA	2751	NA	27303	0	499.82	396.43	10	Norms	0.03	RIF	22	Norms
PALWAL	PALWAL	HR150400	Alluvium	19956	0	19956.3	NA	7334	NA	12622	0	542	432	10	Norms	0.77	RIF	22	Norms
PALWAL	PRITHLA	HR150500	Alluvium	16383	0	16382.7	NA	0	NA	16383	0	545.79	436.64	10	Norms	0.73	RIF	22	Norms
PANCHKULA	BARWALA	HR160100	Alluvium	21740	0	21739.7	NA	0	NA	21740	0	1379	1093	15	Norms	0.76	WTFM	22	Norms
PANCHKULA	MORNI	HR160200																	
PANCHKULA	PINJORE	HR160300	Alluvium	29204	11100	18103.9	NA	0	NA	18104	0	1379	1093	15	Norms	0.59	RIF	22	Norms
PANCHKULA	RAIPURRANI	HR160400	Alluvium	14028	3200	10827.9	NA	0	NA	10828	0	1379	1093	15	Norms	-0.37	RIF	22	Norms
PANIPAT	BAPOLI	HR170100	Alluvium	15669	0	15669.4	NA	0	NA	15669	0	413.85	317.72	12	Norms	-0.03	RIF	22	Norms
PANIPAT	ISRANA	HR170200	Alluvium	27394	0	27393.8	NA	636	NA	26758	0	417.02	314.70	12	Norms	0.37	RIF	22	Norms
PANIPAT	MADLAUDA	HR170300	Alluvium	36386	0	36386	NA	0	NA	36386	0	496.57	399.60	15	Norms	-0.18	RIF	22	Norms
PANIPAT	PANIPAT	HR170400	Alluvium	21280	0	21280.3	NA	0	NA	21280	0	582.95	442.97	15	Norms	-0.37	RIF	22	Norms
PANIPAT	SAMALKHA	HR170500	Alluvium	18920	0	18920.2	NA	0	NA	18920	0	542.74	404.46	12	Norms	0.13	RIF	22	Norms
PANIPAT	SANAULI KHURD	HR170600	Alluvium	10624	0	10623.5	NA	0	NA	10624	0	413.85	317.72	12	Norms	0.13	RIF	22	Norms
REWARI	BAWAL	HR180100	Alluvium	24005	720	23284.6	NA	0	NA	23285	0	550	385	12	Norms	-0.34	RIF	22	Norms
REWARI	DAHINA	HR180600	Alluvium	21016	1206	19809.9	NA	0	NA	19810	0	550	385	12	Norms	-0.06	RIF	22	Norms
REWARI	DHARUHERA	HR180700	Alluvium	20127	0	20126.5	NA	0	NA	20127	0	550	385	12	Norms	0.15	WTFM	22	Norms
REWARI	JATUSANA	HR180200	Alluvium	20602	1206	19395.5	NA	0	NA	19396	0	550	385	12	Norms	1.16	WTFM	22	Norms
REWARI	KHOLAT REWARI	HR180300	Alluvium	18910	1588	17321.6	NA	1810	NA	15512	0	550	385	12	Norms	0.82	RIF	22	Norms
REWARI	NAHAR	HR180400	Alluvium	23430	0	23430.1	NA	340	NA	23090	0	550	385	12	Norms	0.86	RIF	22	Norms
REWARI	REWARI	HR180500	Alluvium	22799	0	22799.4	NA	0	NA	22799	0	550	385	12	Norms	0.76	RIF	22	Norms
ROHTAK	KALANAUR	HR190100	Alluvium	28521	0	28521	NA	3420	NA	25101	0	349	254	12	Norms	1.05	RIF	22	Norms
ROHTAK	LAKHAN MAJRA	HR190200	Alluvium	12689	0	12689.1	NA	5219	NA	7470.1	0	441	313	12	Norms	-0.21	RIF	24	Norms
ROHTAK	MAHAM	HR190300	Alluvium	44704	0	44704.3	NA	1883	NA	42821	0	370	234	12	Norms	0.06	RIF	22	Norms
ROHTAK	ROHTAK	HR190400	Alluvium	58319	0	58318.9	NA	4388	NA	53931	0	688	439	12	Norms	-0.95	RIF	22	Norms
ROHTAK	SAMPLA	HR190500	Alluvium	22674	0	22673.8	NA	1608	NA	21066	0	418	312	12	Norms	-0.25	RIF	22	Norms
SIRSA	BARAGUDHA	HR200100	Alluvium	53384	0	53384.4	NA	3709	NA	49675	0	343.90	293.06	12	Norms	-0.13	RIF	22	Norms

SIRSA	DABWALI	HR200200	Alluvium	80126	0	80125.7	NA	17750	NA	62376	0	343.9 0	293.06	12	Norms	-0.47	WTFM	22	Norms
SIRSA	ELLENABAD	HR200300	Alluvium	52787	0	52786.7	NA	6961	NA	45826	0	343.99	293.06	12	Norms	-0.46	RIF	22	Norms
SIRSA	NATHUSA RICHORTA	HR200400	Alluvium	75704	0	75703.9	NA	16987	NA	58717	0	343.99	293.06	12	Norms	-0.55	WTFM	22	Norms
SIRSA	ODHAN	HR200500	Alluvium	51580	0	51579.9	NA	16404	NA	35176	0	343.99	293.06	12	Norms	1	WTFM	22	Norms
SIRSA	RANIA	HR200600	Alluvium	58955	0	58955.3	NA	12893	NA	46062	0	343.99	293.06	12	Norms	0.82	RIF	22	Norms
SIRSA	SIRSA	HR200700	Alluvium	54457	0	54456.8	NA	189	NA	54268	0	343.99	293.06	12	Norms	0.77	RIF	22	Norms
SONIPAT	GANAUR	HR210100	Alluvium	27210	0	27210.1	NA	0	NA	27210	0	809	684	12	Norms	0.76	WTFM	22	Norms
SONIPAT	GOHANA	HR210200	Alluvium	31544	0	31544.2	NA	3165	NA	28379	0	706	621	12	Norms	0.3	RIF	24	Norms
SONIPAT	KATHURA	HR210300	Alluvium	19609	0	19608.8	NA	4909	NA	14700	0	706	621	12	Norms	0.13	WTFM	22	Norms
SONIPAT	KHARKHODA	HR210400	Alluvium	30755	0	30754.6	NA	2660	NA	28095	0	608	465	12	Norms	0.71	WTFM	22	Norms
SONIPAT	MUNDLANA	HR210500	Alluvium	29087	0	29086.9	NA	4629	NA	24458	0	706	621	12	Norms	0.87	RIF	22	Norms
SONIPAT	MURTHAL	HR210800	Alluvium	19038	0	19038.4	NA	0	NA	19038	0	809	684	12	Norms	0.93	RIF	22	Norms
SONIPAT	RAI	HR210600	Alluvium	21677	0	21677.2	NA	591	NA	21086	0	688	529	12	Norms	1.08	WTFM	22	Norms
SONIPAT	SONIPAT	HR210700	Alluvium	36802	0	36802.2	NA	127	NA	36675	0	644	515	12	Norms	1.19	RIF	22	Norms
YAMUNANAGAR	BILASPUR	HR220100	Alluvium	27563	1100	26463.1	NA	0	NA	26463	0	901	646	15	Norms	1.09	RIF	22	Norms
YAMUNANAGAR	CHHACHHRAULI	HR220200	Alluvium	25979	13200	12778.9	NA	0	NA	12779	0	901	646	15	Norms	0.68	WTFM	22	Norms
YAMUNANAGAR	JAGADHRI	HR220300	Alluvium	29986	0	29985.8	NA	0	NA	29986	0	901	646	15	Norms	0.83	RIF	22	Norms
YAMUNANAGAR	KHIZRABAD	HR220700	Alluvium	28186	13200	14986.4	NA	0	NA	14986	0	901	646	15	Norms	-2.4	RIF	22	Norms
YAMUNANAGAR	MUSTAFABAD	HR220400	Alluvium	20545	0	20544.6	NA	0	NA	20545	0	901	646	15	Norms	0.11	RIF	22	Norms
YAMUNANAGAR	RADAUR	HR220500	Alluvium	24654	0	24653.6	NA	0	NA	24654	0	901	646	15	Norms	0.99	RIF	22	Norms
YAMUNANAGAR	SADAURA (PART)	HR220600	Alluvium	14865	1000	13864.8	NA	0	NA	13865	0	901	646	15	Norms	0.19	RIF	22	Norms

Sl. No	District	Assessment Unit Name	Total Area of Assessment Unit (Ha)	Recharge Worthy Area(Ha)	Recharge from Rainfall (Ham)	Recharge from Other Sources (Ham)	Total Annual Ground Water Recharge (Ham)	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Ground Water Extraction for Irrigation Use(Ham)	Ground Water Extraction for Industrial Use (Ham)	Ground Water Extraction for Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for Domestic Use as on 2027 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)	Categorization (Over-Exploited/ Critical/ Semi critical/ Safe/Saline)
1	AMBALA	AMBALA-I	19317.59655	19317.59655	3117.71	5975.65	9093.36	909.34	8184.02	6854.4	330	1291.5	8475.9	1291.5	0	103.57	overexploited
2	AMBALA	AMBALA-II	35123.1141	35123.1141	5668.59	969.52	6638.11	663.81	5974.3	3029.4	450	2398.88	5878.28	2398.88	96.02	98.39	critical
3	AMBALA	BARARA	23038.0183	23038.0183	4359.4	2632.28	6991.68	699.17	6292.51	8080.8	45	1115.62	9241.42	1115.62	0	146.86	overexploited
4	AMBALA	NARAINGARH	27728.78003	27428.78003	5568.6	2395.77	7964.37	796.43	7167.94	7381.18	2655	794.26	10830.44	794.26	0	151.10	overexploited
5	AMBALA	SAHA	25847.58621	25847.58621	4891.05	2260.87	7151.92	715.19	6436.73	7099.12	3600	929.84	11628.96	929.84	0	180.67	overexploited
6	AMBALA	SHAHZADPUR	20149.79697	20149.79697	4897.53	1025.76	5923.29	592.33	5330.96	3232.46	495	385	4112.46	385	1218.5	77.14	semi critical
Total			**151204.8922**	**150904.8922**	**28502.88**	**15259.85**	**43762.73**	**4376.27**	**39386.46**	**35677.36**	**7575**	**6915.1**	**50167.46**	**6915.1**	**1314.52**		
7	BHIWANI	BAWANI KHERA	40587.22978	29834.22978	2238.06	4270.33	6508.39	650.84	5857.55	2949	180	52	3181	52	2676.55	54.31	safe
8	BHIWANI	BEHAL	29577.64083	25499.64083	1912.89	2272.04	4184.93	418.49	3766.44	5522.42	12	112	5646.42	112	0	149.91	overexploited
9	BHIWANI	BHIWANI	85484.60195	68031.60195	4180.31	5090.32	9270.63	927.06	8343.57	4926	608	21	5555	51.08	2758.49	66.58	safe
10	BHIWANI	KAIRU	28708.95793	18512.95793	1639.99	2046.66	3686.65	368.67	3317.98	5936	101.2	94.6	6131.8	94.6	0	184.81	overexploited
11	BHIWANI	LOHARU	36729.21756	35214.21756	2163.79	2650.9	4814.69	481.47	4333.22	6687.97	24	372	7083.97	372	0	163.48	overexploited
12	BHIWANI	SIWANI	56757.82916	41566.82916	3118.2	4748.27	7866.47	786.64	7079.83	3296	100	16	3412	16	3667.83	48.19	safe
13	BHIWANI	TOSHAM	51881.91729	48835.91729	3000.8	4880.81	7881.61	788.16	7093.45	9568.5	968	100	10636.5	100	0	149.95	overexploited
Total			**329727.3945**	**267495.3945**	**18254.04**	**25959.33**	**44213.37**	**4421.33**	**39792.04**	**38885.89**	**1993.2**	**767.6**	**41646.69**	**797.68**	**9102.87**		
14	CHARKHI DADRI	BADHRA	23436.54332	22686.54332	2724.21	4692.69	7416.9	741.69	6675.21	14726.4	28	708.4	15462.8	708.4	0	231.65	overexploited
15	CHARKHI DADRI	BAUND	36774.37829	36585.37829	5151.22	2047.87	7199.09	719.91	6479.18	1125	0	0	1125	12.49	5341.69	17.36	safe
16	CHARKHI DADRI	CHARKHI DADRI	43137.09395	42640.09395	4540.32	1192.03	5732.35	573.24	5159.11	2444	0	98.75	2542.75	98.75	2616.36	49.29	safe
17	CHARKHI DADRI	JHOJHU	34001.67312	32423.67312	2910.35	1551.02	4461.37	446.14	4015.23	4738.38	0	446.35	5184.73	446.35	0	129.13	overexploited
Total			**137349.6887**	**134335.6887**	**15326.1**	**9483.61**	**24809.71**	**2480.98**	**22328.73**	**23033.78**	**28**	**1253.5**	**24315.28**	**1265.99**	**7958.05**		
18	FARIDABAD	BALLABGARH	17172.72199	10599.72199	1347.77	1996.62	3344.39	334.44	3009.95	4786.25	2584	71.1	7441.35	91.85	0	247.23	overexploited
19	FARIDABAD	FARIDABAD	24146.20633	16466.20633	2367.79	3304.95	5672.74	567.27	5105.47	6453.125	1088	258.99	7800.12	258.99	0	152.78	overexploited
20	FARIDABAD	FARIDABAD_URBAN	19500.75	17200.75	1644.97	204.2	1849.17	184.92	1664.25	150.8	1412	3827.55	5390.35	3827.55	0	323.89	overexploited

21	FARIDABAD	TIGAON	13458.73977	13458.73977	1447.03	2042.33	3489.36	174.47	3314.89	2757.9	20	276.7284	3054.63	276.73	260.26	92.15	critical
Total			**74278.41809**	**57725.41809**	**6807.56**	**7548.1**	**14355.66**	**1261.1**	**13094.56**	**14148.075**	**5104**	**4434.3684**	**23686.45**	**4455.12**	**260.26**		
22	FATEHABAD	BHATTU KALAN	36362.05748	36204.05748	1465.86	2675.27	4141.13	414.11	3727.02	3170.2	0	42.08	3212.28	42.08	514.74	86.19	semi critical
23	FATEHABAD	BHUNA	38581.4988	38077.4988	2171.34	5156.46	7327.8	732.78	6595.02	6816.88	0	28	6844.88	35.71	0	103.79	overexploited
24	FATEHABAD	FATEHABAD	55434.13968	55434.13968	3844.03	4604.79	8448.82	844.88	7603.94	14515.95	41.4	142.02	14699.37	196.56	0	193.31	overexploited
25	FATEHABAD	JAKHAL	15291.21661	15291.21661	1073.48	6525.96	7599.44	759.95	6839.49	14436.54	0	325.5	14762.04	325.5	0	215.84	overexploited
26	FATEHABAD	NAGPUR	28808.70461	28808.70461	1432.36	3573.47	5005.83	500.58	4505.25	10534.47	0	231.44	10765.91	231.44	0	238.96	overexploited
27	FATEHABAD	RATIA	37787.99728	37787.99728	1855.54	13382.8	15238.34	1523.84	13714.5	32806.349	56.8	588	33451.15	588	0	243.91	overexploited
28	FATEHABAD	TOHANA	40246.76763	40246.76763	2790.87	14232.04	17022.91	1702.29	15320.62	19167.703	0	294	19461.7	294	0	127.03	overexploited
Total			**252512.3821**	**251850.3821**	**14633.48**	**50150.79**	**64784.27**	**6478.43**	**58305.84**	**101448.092**	**98.2**	**1651.04**	**103197.33**	**1713.29**	**252512.3821**		
29	GURGAON	FARRUKH NAGAR	28639.9534	28608.9534	2311.51	1839.78	4151.29	415.13	3736.16	5428.19	0	486	5914.19	486	0	158.30	overexploited
30	GURGAON	GURGAON	9619	8331	1223.28	667.82	1891.1	94.55	1796.55	543	0	1452.77	1995.77	1452.77	0	111.09	overexploited
31	GURGAON	GURGAON_URBAN	31911.4468	31911.4468	4231.69	1922.13	6153.82	615.39	5538.43	45.14	17115.36	923.528	18084.03	923.53	0	326.52	overexploited
32	GURGAON	PATAUDI	27547.78308	27502.78308	2587.73	2499.73	5087.46	508.75	4578.71	7784.1	1.81	1191.175	8977.09	1191.17	0	196.06	overexploited
33	GURGAON	SOHNA	28316.50715	24758.50715	2658.09	2545.84	5203.93	520.39	4683.54	7180.27	0	1111.5	8291.77	1111.5	0	177.04	overexploited
Total			**126034.6904**	**121112.6904**	**13012.3**	**9475.3**	**22487.6**	**2154.21**	**20333.39**	**20980.7**	**17117.17**	**5164.973**	**43262.85**	**=**	**0.0**		
34	HISAR	ADAMPUR	36692.7869	36692.7869	1866.34	3038.66	4905	490.5	4414.5	2784.6	0	15.05	2799.65	15.05	1614.85	63.42	safe
35	HISAR	AGROHA	32989.38412	32989.38412	1737.09	4852.38	6589.47	329.47	6260	5992	0	12.9	6004.9	12.9	255.1	95.92	critical
36	HISAR	BARWALA	50633.26336	49944.26336	3164.47	6978.67	10143.14	1014.32	9128.82	8400	0	35.5	8435.5	35.5	693.32	92.41	critical
37	HISAR	HANSI	58827.6	58827.6	3624.82	4422.82	8047.64	804.77	7242.87	4644.2	3.62	32.25	4680.07	32.25	2562.8	64.62	safe
38	HISAR	HANSI-II	29922.61496	29922.61496	1781	4341.47	6122.47	306.13	5816.34	3614	0	43	3657	43	2159.34	62.87	safe
39	HISAR	HISAR-I	62292.97211	62292.97211	3369.31	3938.19	7307.5	365.37	6942.13	4572	226.6	53.75	4852.35	53.75	2089.78	69.90	safe
40	HISAR	HISAR-II	72208.82246	72208.82246	3458.3	962.18	4420.48	221.03	4199.45	2852.2	0	43	2895.2	43	1304.25	68.94	safe
41	HISAR	NARNAUND	40985.49776	40985.49776	2516.59	5117.84	7634.43	763.44	6870.99	14865.75	0	10.75	14876.5	10.75	0	216.51	overexploited
42	HISAR	UKLANA	22974.35525	22974.35525	4083.93	2603.3	6687.23	668.72	6018.51	2106	0	120	2226	120	3792.51	36.99	safe
Total			**407527.2969**	**406838.2969**	**25601.85**	**36255.51**	**61857.36**	**4963.75**	**56893.61**	**49830.75**	**230.22**	**366.2**	**50427.17**	**366.2**	**14471.95**		
43	JHAJJAR	BADLI	20877.4447	20877.4447	1774.75	7300.28	9075.03	907.5	8167.53	3987.6	0	32.9	4020.5	32.9	4147.03	49.23	safe
44	JHAJJAR	BAHADURGARH	39644.16482	30408.16482	4421.8	5890.54	10312.34	515.62	9796.72	5610	64	16.45	5690.45	16.45	4106.27	58.09	safe
45	JHAJJAR	BERI	32791.16074	26802.16074	3359.21	4881.03	8240.24	412.02	7828.22	3817.35	0	65.8	3883.15	65.8	3945.07	49.60	safe

46	JHAJJAR	JHAJJAR	30829.1746	23570.1746	2646.65	3035.37	5682.02	568.2	5113.82	3392	24	105.28	3521.28	105.28	1592.54	68.86	safe
47	JHAJJAR	MACHHRAULI	16846.85044	12984.85044	968.13	2962.35	3930.48	393.05	3537.43	1376	0	60	1436	60	2101.43	40.59	safe
48	JHAJJAR	MATANNAIL	36214.34682	29299.34682	2354.03	3500.87	5854.9	585.49	5269.41	1256.8	0	68.5	1325.3	68.5	3944.11	25.15	safe
49	JHAJJAR	SALHAWAS	16261.64512	9717.645115	942.46	4022.45	4964.91	248.25	4716.66	2700.45	27	59.22	2786.67	59.22	1929.99	59.08	safe
Total			**193464.7872**	**153659.7872**	**16467.03**	**31592.89**	**48059.92**	**3630.13**	**44429.79**	**22140.2**	**115**	**408.15**	**22663.35**	**408.15**	**21766.44**		
50	JIND	ALEWA	23546.96642	23546.96642	2741.74	3951.03	6692.77	669.28	6023.49	7797.5	181.35	358.9	8337.75	358.9	0	138.42	overexploited
51	JIND	JIND	47698.48393	47698.48393	5481.9	16762.17	22244.07	2224.41	20019.66	28015.935	90.5	290	28396.44	403.09	0	141.84	overexploited
52	JIND	JULANA	35171.88231	34382.88231	3926.85	4684.23	8611.08	861.11	7749.97	3541.85	56.58	420	4018.43	420	3731.54	51.85	safe
53	JIND	NARWANA	33294.78001	31623.78001	2769.54	3517.88	6287.42	628.74	5658.68	3523.5	180	15	3718.5	259.75	1695.43	65.71	safe
54	JIND	PILLUKHERA	21549.56866	19617.56866	1185.28	5910.3	7095.58	709.56	6386.02	5008.5	28.29	125	5161.79	180.81	1168.42	80.83	semi critical
55	JIND	SAFIDON	31433.7717	31433.7717	2940.72	9097.9	12038.62	1203.87	10834.75	14556.8	53.48	485	15095.28	485	0	139.32	overexploited
56	JIND	UCHANA	50720.52676	48048.52676	4121.77	10831.92	14953.69	747.69	14206	15392.37	22	40	15454.37	387.87	0	108.79	overexploited
57	JIND	UJHANA	31675.47038	31675.47038	3725.08	4488.34	8213.42	821.35	7392.07	8288.37	0.06	220.64	8509.07	227.41	0	115.11	overexploited
Total			**275091.4502**	**268027.4502**	**26892.88**	**59243.77**	**86136.65**	**7866.01**	**78270.64**	**86124.825**	**612.26**	**1954.54**	**88691.63**	**2722.83**	**6595.39**		
58	KAITHAL	DHAND	21998.58068	21998.58068	2025.2	2433.37	4458.57	445.86	4012.71	7523.23	44.8	564.16	8132.19	564.16	0	202.66	overexploited
59	KAITHAL	GUHLA	39160.06913	39160.06913	3572.28	6386.55	9958.83	995.88	8962.95	19390.53	159.28	488.56	20038.37	488.56	0	223.57	overexploited
60	KAITHAL	KAITHAL	51093.0386	51093.0386	4703.64	5152.69	9856.33	985.64	8870.69	13412.5	271.5	358.38	14042.38	420.27	0	158.30	overexploited
61	KAITHAL	KALAYAT	32689.10568	31969.10568	2270.04	2592.81	4862.85	486.28	4376.57	7248	34.39	97.74	7380.13	97.74	0	168.63	overexploited
62	KAITHAL	PUNDRI	30757.73369	30757.73369	2831.57	3648.47	6480.04	648	5832.04	9841.23	39.82	164.71	10045.76	474.14	0	172.25	overexploited
63	KAITHAL	RAJOUND	24482.78577	20660.78577	1467.07	3507.57	4974.64	497.46	4477.18	7808.4	28.96	330.96	8168.32	330.96	0	182.44	overexploited
64	KAITHAL	SIWAN	27232.8398	27232.8398	2484.25	3926.88	6411.13	641.12	5770.01	11915.1	55	697.82	12667.92	697.82	0	219.55	overexploited
Total			**227414.1534**	**222872.1534**	**19354.05**	**27648.34**	**47002.39**	**4700.24**	**42302.15**	**77138.99**	**633.75**	**2702.33**	**80475.07**	**3073.65**	**0**		
65	KARNAL	ASSANDH	39297.4309	39111.4309	5112.17	9432.66	14544.83	1454.49	13090.34	23158.22	212	788	24158.22	788	0	184.55	overexploited
66	KARNAL	GHARAUNDA (PART)	28625.50386	28625.50386	3225.86	7553.44	10779.3	1077.93	9701.37	14767.38	776	788	16331.38	788	0	168.34	overexploited
67	KARNAL	INDRI	24300.7791	24300.7791	3667.43	18263.77	21931.2	2193.12	19738.08	27970.9545	207.45	835.28	29013.69	835.28	0	146.99	overexploited
68	KARNAL	KARNAL	28811.8015	28811.8015	4277.97	11097.31	15375.28	1537.53	13837.75	17815.48	1496	614.64	19926.12	614.64	0	144.00	overexploited
69	KARNAL	KUNJPURA	23092.29028	23092.29028	3428.74	4562.68	7991.42	799.14	7192.28	12611.04	84	693.44	13388.48	693.44	0	186.15	overexploited
70	KARNAL	MUNAK	27113.29953	27113.29953	2601.57	4540.89	7142.46	714.25	6428.21	12472.2	28	1037.61	13537.81	1037.61	0	210.60	overexploited
71	KARNAL	NILOKHERI	39957.54021	39957.54021	5821.84	12439.44	18261.28	1826.13	16435.15	29071.7	516	2062.41	31650.11	2062.41	0	192.58	overexploited
72	KARNAL	NISSING AT	35853.05382	35853.05382	4783.18	16799.25	21582.43	2158.24	19424.19	34449.984	284	1281	36014.98	1281	0	185.41	overexploited

		CHIRAO															
Total			**247051.6992**	**246865.6992**	**32918.76**	**84689.44**	**117608.2**	**11760.83**	**105847.37**	**172316.9585**	**3603.45**	**8100.38**	**184020.79**	**8100.38**	**0**		
73	KURUKSHETRA	BABAIN	13395.58944	13395.58944	1471.72	1828.72	3300.44	330.04	2970.4	5623.2	405.44	300	6328.64	300	0	213.06	overexploited
74	KURUKSHETRA	ISMAILABAD	20106.69293	20106.69293	2587.9	3113.57	5701.47	570.15	5131.32	9886.45	1404.56	370	11661.01	370	0	227.25	overexploited
75	KURUKSHETRA	LADWA	15675.03766	15675.03766	1719.74	2228.87	3948.61	197.43	3751.18	7512.945	1605.47	490	9608.41	490	0	256.14	overexploited
76	KURUKSHETRA	PEHOWA	42413.27306	42413.27306	4659.78	4889.33	9549.11	954.92	8594.19	14463.71	1520.4	720	16704.11	720	0	194.37	overexploited
77	KURUKSHETRA	PIPLI	17731.99942	17731.99942	1948.15	2572.13	4520.28	452.03	4068.25	7940.47	885.09	415	9240.56	415	0	227.14	overexploited
78	KURUKSHETRA	SHAHBAD	27598.08286	27598.08286	3032.1	3525.98	6558.08	655.81	5902.27	10928.78	1404.56	700	13033.34	700	0	220.82	overexploited
79	KURUKSHETRA	THANESAR	31499.60601	31499.60601	3460.74	3951.42	7412.16	741.21	6670.95	11662.35	5350.36	1130	18142.71	1130	0	271.97	overexploited
Total			**168420.2814**	**168420.2814**	**18880.13**	**22110.02**	**40990.15**	**3901.59**	**37088.56**	**68017.905**	**12575.88**	**4125**	**84718.78**	**4125**	**0**		
80	MAHENDRAGARH	ATELI NANGAL	22313.2338	20728.2338	1317.54	2755.82	4073.36	407.34	3666.02	3760.92	0	541.8	4302.72	541.8	0	117.37	overexploited
81	MAHENDRAGARH	KANINA	35363.83487	34885.83487	1706.89	4561.61	6268.5	626.85	5641.65	10994.9	0	340.2	11335.1	340.2	0	200.92	overexploited
82	MAHENDRAGARH	MAHENDRAGARH	35882.87054	34864.87054	2540.39	1166.05	3706.44	370.65	3335.79	3874.5	0	411.28	4285.78	411.28	0	128.48	overexploited
83	MAHENDRAGARH	NANGAL CHAUDHRY	25039.76252	24670.76252	923.14	336.1	1259.24	125.93	1133.31	1155	30.1	621.6	1806.7	621.6	0	159.42	overexploited
84	MAHENDRAGARH	NARNAUL	21102.52549	21102.52549	978.48	194.35	1172.83	117.28	1055.55	836.4	0.98	298.2	1135.58	298.2	0	107.58	overexploited
85	MAHENDRAGARH	NIZAMPUR	16841.24245	16472.24245	616.36	91.02	707.38	70.74	636.64	237.6	0	369.6	607.2	369.6	29.44	95.38	critical
86	MAHENDRAGARH	SATNALI	23714.10344	22470.10344	1637.27	518.51	2155.78	215.58	1940.2	1501.44	0	218.4	1719.84	218.4	220.36	88.64	semi critical
87	MAHENDRAGARH	SIHMA	13825.19055	13347.19055	848.38	2209.01	3057.39	305.74	2751.65	3720.4	0	420	4140.4	420	0	150.47	overexploited
Total			**194082.7637**	**188541.7637**	**10568.45**	**11832.47**	**22400.92**	**2240.11**	**20160.81**	**26081.16**	**31.08**	**3221.08**	**29333.32**	**3221.08**	**249.8**		
88	MEWAT	FEROZEPUR JHIRKA	27643.47178	21211.47178	1668.19	1049.04	2717.23	271.73	2445.5	1905.48	0	347.76	2253.24	347.76	192.26	92.14	critical
89	MEWAT	INDRI	17149.70195	17149.70195	1810.94	399.19	2210.13	221.01	1989.12	965.9886964	0	294.63	1260.62	294.63	728.5	63.38	safe
90	MEWAT	NAGINA	17742.6302	12890.6302	777.5	538.6	1316.1	131.61	1184.49	350.2	0	371.2	721.4	371.2	463.09	60.90	safe
91	MEWAT	NUH	29345.12365	15033.12365	1522.87	2158.56	3681.43	368.14	3313.29	799.05	18.1	314.94	1132.09	314.94	2181.2	34.17	safe
92	MEWAT	PINGWAN	15546.9017	15546.9017	1149.86	480.1	1629.96	162.99	1466.97	436.8	0	152.82	589.62	152.82	877.35	40.19	safe
93	MEWAT	PUNAHANA	20838.62813	10265.62813	695.6	2952.61	3648.21	364.83	3283.38	2761.92	0	314.4	3076.32	314.4	207.06	93.69	critical
94	MEWAT	TAORU	21965.76344	18604.76344	1530.34	1649.87	3180.21	318.02	2862.19	3268.94	1.81	267.12	3537.87	267.12	0	123.61	overexploited
Total			**150232.2208**	**110702.2208**	**9155.3**	**9227.97**	**18383.27**	**1838.33**	**16544.94**	**10488.3787**	**19.91**	**2062.87**	**12571.16**	**2062.87**	**4649.46**		

95	PALWAL	BADOLI	18082.02523	18082.02523	2025.46	4342.66	6368.12	636.82	5731.3	8043.64	157.85	838.68	9040.17	838.68	0	157.73	overexploited
96	PALWAL	HASSANPUR	15459.92172	15459.92172	1044.79	5166.45	6211.24	310.56	5900.68	5182.56	0	237.25	5419.81	237.25	480.87	91.85	critical
97	PALWAL	HATHIN	36019.79055	30169.79055	2584.85	6038.45	8623.3	862.33	7760.97	4346.1	32	508	4886.1	508	2874.87	62.96	safe
98	PALWAL	HODAL	30054.35038	27303.35038	1985.63	6439.08	8424.71	842.47	7582.24	5988	24	304.15	6316.15	304.15	1266.09	83.30	semi critical
99	PALWAL	PALWAL	19956.34047	12622.34047	1413.89	7286.21	8700.1	870.01	7830.09	4539.6	365.31	323.9	5228.81	323.9	2601.28	66.78	safe
100	PALWAL	PRITHLA	16382.74245	16382.74245	1849.11	3079.05	4928.16	492.81	4435.35	5978.43	153.34	51.35	6183.12	51.35	0	139.41	overexploited
Total			**135955.1708**	**120020.1708**	**10903.73**	**32351.9**	**43255.63**	**4015**	**39240.63**	**34078.33**	**732.5**	**2263.33**	**37074.16**	**2263.33**	**7223.11**		
101	PANCHKULA	BARWALA	21739.67863	21739.67863	5515.04	899.74	6414.78	320.74	6094.04	2791.02	24	366.606	3181.63	366.61	2912.41	52.21	safe
102	PANCHKULA	MORNI	23315.24	0	0	0	-		0					0	0		Hilly Area
103	PANCHKULA	PINJORE	29203.93073	18103.93073	3633.09	375.47	4008.56	400.86	3607.7	1035.32	66	473.04	1574.36	473.04	2033.34	43.64	safe
104	PANCHKULA	RAIPUR RANI	14027.90369	10827.90369	3083.01	1063.38	4146.39	414.64	3731.75	3306.87	0	303.534	3610.4	303.53	121.35	96.75	critical
Total			**88286.75306**	**50671.51306**	**12231.14**	**2338.59**	**14569.73**	**1136.24**	**13433.49**	**7133.21**	**90**	**1143.18**	**8366.39**	**1143.18**	**5067.1**		
105	PANIPAT	BAPOLI	15669.38622	15669.38622	1331.84	4716.64	6048.48	604.85	5443.63	13792.5765	268	348.21	14408.78	348.21	0	264.69	overexploited
106	PANIPAT	ISRANA	27393.77133	26757.77133	2285.31	5381.33	7666.64	766.66	6899.98	13657.8	292	242.76	14192.56	242.76	0	205.69	over_exploited
107	PANIPAT	MADLAUDA	36386.00542	36386.00542	3740.26	8658.17	12398.43	1239.84	11158.59	19051.8	168	256	19475.8	256	0	174.54	overexploited
108	PANIPAT	PANIPAT	21280.27991	21280.27991	2543.52	7714.68	10258.2	1025.82	9232.38	18064.083	1748	604.44	20416.53	604.44	0	221.14	overexploited
109	PANIPAT	SAMALKHA	18920.23857	18920.23857	2098.83	9866.58	11965.41	1196.54	10768.87	27025.978	292	742.41	28060.39	742.41	0	260.57	overexploited
110	PANIPAT	SANAULI KHURD	10623.50069	10623.50069	902.96	2165.58	3068.54	306.85	2761.69	5953.5	0	249.66	6203.16	249.66	0	224.61	overexploited
Total			**130273.1821**	**129637.1821**	**12902.72**	**38502.98**	**51405.7**	**5140.56**	**46265.14**	**97545.7375**	**2768**	**2443.48**	**102757.22**	**2443.48**	**0**		
111	REWARI	BAWAL	24004.58689	23284.58689	2253.95	2320.59	4574.54	457.45	4117.09	4180.68	488	338.87	5007.55	338.87	0	121.63	overexploited
112	REWARI	DAHINA	21015.93324	19809.93324	1917.6	3896.09	5813.69	581.37	5232.32	4723.2	24	251.16	4998.36	251.16	233.96	95.53	critical
113	REWARI	DHARUHERA	20126.53661	20126.53661	2001.83	1037.54	3039.37	151.97	2887.4	3420.9	536	488.4	4445.3	488.4	0	153.96	overexploited
114	REWARI	JATUSANA	20601.50906	19395.50906	1801.03	1799.6	3600.63	180.03	3420.6	5760	24	193.55	5977.55	193.55	0	174.75	overexploited
115	REWARI	KHOL AT REWARI	18909.64996	15511.64996	1501.53	1266.42	2767.95	276.79	2491.16	3283.2	12	277.29	3572.49	277.29	0	143.41	overexploited
116	REWARI	NAHAR	23430.14368	23090.14368	1899.86	1685.23	3585.09	358.51	3226.58	5100.4	16	190.82	5307.22	190.82	0	164.48	overexploited
117	REWARI	REWARI	22799.44851	22799.44851	2206.99	3377.99	5584.98	558.49	5026.49	5122.3	352	255.36	5729.66	255.36	0	113.99	overexploited
Total			**150887.8079**	**144017.8079**	**13582.79**	**15383.46**	**28966.25**	**2564.61**	**26401.64**	**31590.68**	**1452**	**1995.45**	**35038.13**	**1995.45**	**233.96**		
118	ROHTAK	KALANAUR	28521.0388	25101.0388	1541.81	3382.95	4924.76	492.48	4432.28	1674	21.06	77.22	1772.28	77.22	2660	39.99	safe
119	ROHTAK	LAKHAN MAJRA	12689.09284	7470.092844	728.93	2396.43	3125.36	312.53	2812.83	1835.24	12	36	1883.24	36	929.59	66.95	safe

120	ROHTAK	MAHAM	44704.28506	42821.28506	3159.7	5382.64	8542.34	854.23	7688.11	4455	12	42	4509	42	3179.11	58.65	safe
121	ROHTAK	ROHTAK	58318.88968	53930.88968	7408.86	4952.42	12361.28	1236.13	11125.15	4860	88	320	5268	320	5857.15	47.35	safe
122	ROHTAK	SAMPLA	22673.80214	21065.80214	1800.21	4819.75	6619.96	662	5957.96	2860	33	48	2941	48	3016.96	49.36	safe
Total			**166907.1085**	**150389.1085**	**14639.51**	**20934.19**	**35573.7**	**3557.37**	**32016.33**	**15684.24**	**166.06**	**523.22**	**16373.52**	**523.22**	**15642.81**		
123	SIRSA	BARAGUDHA	53384.356	49675.356	2442.1	9171.18	11613.28	1161.33	10451.95	8656.2	0	21.69	8677.89	21.69	1774.06	83.03	semi critical
124	SIRSA	DABWALI	80125.70831	62375.70831	3697.77	9741.64	13439.41	671.97	12767.44	17830	39.82	88	17957.82	88	0	140.65	overexploited
125	SIRSA	ELLENABAD	52786.695	45825.695	2252.84	4100.22	6353.06	635.31	5717.75	12941.24	14.48	329.28	13285	329.28	0	232.35	overexploited
126	SIRSA	NATHUSARI CHOPTA	75703.94796	58716.94796	3465.69	2166.1	5631.79	281.59	5350.2	6584	0	32	6616	32	0	123.66	overexploited
127	SIRSA	ODHAN	51579.91097	35175.91097	2529.97	3449.02	5978.99	597.9	5381.09	10726	45.25	44	10815.25	44	0	200.99	overexploited
128	SIRSA	RANIA	58955.34551	46062.34551	2788.72	5901.15	8689.87	868.99	7820.88	10145.85	25.34	496.44	10667.63	496.44	0	136.40	overexploited
129	SIRSA	SIRSA	54456.78401	54267.78401	3903.12	6191.62	10094.74	1009.47	9085.27	17714.47	141.18	464.92	18320.57	464.92	0	201.65	overexploited
Total			**426992.7478**	**352099.7478**	**21080.21**	**40720.93**	**61801.14**	**5226.56**	**56574.58**	**84597.76**	**266.07**	**1476.33**	**86340.16**	**1476.33**	**1774.06**		
130	SONIPAT	GANAUR	27210.09593	27210.09593	4337.87	6070.9	10408.77	520.44	9888.33	12014.05	225	1419.12	13658.17	1419.12	0	138.12	overexploited
131	SONIPAT	GOHANA	31544.21409	28379.21409	3097.1	6738.7	9835.8	983.58	8852.22	5140.8	33	243.1	5416.9	243.1	3435.32	61.19	safe
132	SONIPAT	KATHURA	19608.78142	14699.78142	2167.64	5086.2	7253.84	362.69	6891.15	3669.25	5.43	44.1	3718.78	44.1	3172.37	53.96	safe
133	SONIPAT	KHARKHODA	30754.62497	28094.62497	3411.79	4468.8	7880.59	394.03	7486.56	3000	15	1288	4303	1288	3183.56	57.48	safe
134	SONIPAT	MUNDLANA	29086.88295	24457.88295	2446.72	7371.14	9817.86	981.79	8836.07	8577.69	15	228	8820.69	228	15.38	99.83	critical
135	SONIPAT	MURTHAL	19038.36286	19038.36286	3215.97	1859.97	5075.94	507.6	4568.34	5730.36	184.62	525.99	6440.97	525.99	0	140.99	overexploited
136	SONIPAT	RAI	21677.19788	21086.19788	2553.28	12765.33	15318.61	1531.86	13786.75	11220.7625	273	4422.924	15916.68	4422.92	0	115.45	overexploited
137	SONIPAT	SONIPAT	36802.16639	36675.16639	4884.05	8670.94	13554.99	1355.5	12199.49	16607.625	188.24	780.12	17575.99	780.12	0	144.07	overexploited
Total			**215722.3265**	**199641.3265**	**26114.42**	**53031.98**	**79146.4**	**6637.49**	**72508.91**	**65960.5375**	**939.29**	**8951.354**	**75851.18**	**8951.35**	**9806.63**		
138	YAMUNA NAGAR	BILASPUR	27563.08515	26463.08515	4843.69	1896.21	6739.9	673.99	6065.91	5887.93	0	985	6872.93	985	0	113.30	overexploited
139	YAMUNA NAGAR	CHHACHHRAULI	25978.92783	12778.92783	1936.72	10221.11	12157.83	607.89	11549.94	6436.36	2250	338.84	9025.2	338.84	2524.74	78.14	semi critical
140	YAMUNA NAGAR	JAGADHRI	29985.84641	29985.84641	5488.48	4099.85	9588.33	958.83	8629.5	12782.2025	30	748.6	13560.8	748.6	0	157.14	overexploited
141	YAMUNA NAGAR	KHIZRABAD	28186.42268	14986.42268	2743.05	8205.14	10948.19	1094.82	9853.37	7903.525	60	866.8	8830.32	866.8	1023.05	89.62	semi critical
142	YAMUNA NAGAR	MUSTAFABAD	20544.61022	20544.61022	3760.4	4078.47	7838.87	783.88	7054.99	12817.0525	0	598.88	13415.93	598.88	0	190.16	overexploited
143	YAMUNA NAGAR	RADAUR	24653.57611	24653.57611	4512.48	4649.75	9162.23	916.22	8246.01	14724.75	0	851.04	15575.79	851.04	0	188.89	overexploited
144	YAMUNANAGAR	SADAURA (PART)	171777.3	143277.3	25963.2	36891.5	62854.6	5661.9	57192.7	71959.7	2340.0	4928.3	79228.0	4928.3	3456.8	145.013	Over Exploited

Total	**171777.2636**	**143277.2636**	**25822.57**	**34210.81**	**60033.38**	**5395.43**	**54637.95**	**63967.78**	**2340**	**5072.96**	**71380.73**	**5072.96**	**3547.79**		
Grand total	**393651.9**	**637952.23**	**1031604.13**	**95746.57**	**935857.56**	**1146871.34**	**58491.04**	**66996.44**	**1272358.82**	**68261.61**	**110178.94**	**135.96**	**393651.9**	**637952.23**	

DYNAMIC GROUND WATER RESOURCES OF HARYANA AS ON MARCH 2024 **Annexure- XIV…..continued**

S. No.	Name of District	Ground Water Recharge			Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Current Annual Ground Water Extraction				Annual GW Allocation for forDomestic Use as on 2027 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)
		Monsoon Season		Total Annual Ground Water Recharge (Ham)			Irrigation (Ham)	Industrial (Ham)	Domestic (Ham)	Total (Ham)			
		Recharge from rainfall (Ham)	Recharge fromother sources (Ham)										
1	2	3	4	7	8	9	10	11	12	13	14	15	16
1	AMBALA	23442.63	8196.61	43762.73	4376.27	39386.46	35677.36	7575	6915.1	50167.46	6915.1	1314.52	127.37
2	BHIWANI	16336.92	13726.56	44213.37	4421.33	39792.04	38885.89	1993.2	767.6	41646.69	797.68	9102.87	104.66
3	CHARKHIDADRI	10197.24	5160.27	24809.71	2480.98	22328.73	23033.78	28	1253.5	24315.28	1265.99	7958.05	108.9
4	FARIDABAD	5803.66	3278.17	14355.66	1261.1	13094.56	14148.07	5104	4434.37	23686.45	4455.12	260.26	180.89
5	FATEHABAD	11977.84	27872.28	64784.27	6478.43	58305.84	101448.09	98.2	1651.04	103197.33	1713.29	514.74	176.99
6	GURGAON	9806.15	5125.95	22487.6	2154.21	20333.39	20980.7	17117.17	5164.97	43262.85	5164.97	0	212.77
7	HISAR	22240.86	15237.18	61857.36	4963.75	56893.61	49830.75	230.22	366.2	50427.17	366.2	14471.95	88.63
8	JHAJJAR	13547.16	17546.44	48059.92	3630.13	44429.79	22140.2	115	408.15	22663.35	408.15	21766.44	51.01
9	JIND	19302.46	31580.15	86136.65	7866.01	78270.64	86124.82	612.26	1954.54	88691.63	2722.83	6595.39	113.31
10	KAITHAL	16567.36	15674	47002.39	4700.24	42302.15	77138.99	633.75	2702.33	80475.07	3073.65	0	190.24
11	KARNAL	29058.72	60764.43	117608.2	11760.83	105847.37	172316.96	3603.45	8100.38	184020.79	8100.38	0	173.85
12	KURUKSHETRA	16243.26	12011.47	40990.15	3901.59	37088.56	68017.9	12575.88	4125	84718.78	4125	0	228.42
13	MAHENDRAGARH	8218.39	4220.93	22400.92	2240.11	20160.81	26081.16	31.08	3221.08	29333.32	3221.08	249.8	145.5
14	MEWAT	6854.16	4386.47	18383.27	1838.33	16544.94	10488.38	19.91	2062.87	12571.16	2062.87	4649.46	75.98
15	PALWAL	9814.9	14838.72	43255.63	4015	39240.63	34078.33	732.5	2263.33	37074.16	2263.33	7223.11	94.48
16	PANCHKULA	10580.17	1310.96	14569.73	1136.24	13433.49	7133.21	90	1143.18	8366.39	1143.18	5067.1	62.28
17	PANIPAT	11118.38	29488.63	51405.7	5140.56	46265.14	97545.74	2768	2443.48	102757.22	2443.48	0	222.11
18	REWARI	10097.56	5555.22	28966.25	2564.61	26401.64	31590.68	1452	1995.45	35038.13	1995.45	233.96	132.71
19	ROHTAK	10788.98	9906.05	35573.7	3557.37	32016.33	15684.24	166.06	523.22	16373.52	523.22	15642.81	51.14
20	SIRSA	19799.69	19635.89	61801.14	5226.56	56574.58	84597.76	266.07	1476.33	86340.16	1476.33	1774.06	152.61
21	SONIPAT	23995.87	29684.73	79146.4	6637.49	72508.91	65960.54	939.29	8951.35	75851.18	8951.35	9806.63	104.61
22	YAMUNANAGAR	20624.75	16278.93	60033.38	5395.43	54637.95	63967.78	2340	5072.96	71380.73	5072.96	3547.79	130.64
Total (Ham)		326417.11	351480.04	1031604.13	95746.57	935857.56	1146871.34	58491.04	66996.44	1272358.82	68261.61	110178.94	135.96

ANNEXURE- XV

DISTRICT WISE RECHARGE WORTHY AREA IN ALL CATEGORIES

Sr. No.	Name of District	Total Recharge Worthy Area of Assessed Units (in sq.km)	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
			Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%
1	**AMBALA**	1509.05	-	-	201.5	13.4	351.23	23.3	956.32	63.4	-	-
2	**BHIWANI**	3286.95	1828.3	55.6	-	-	-	-	1458.66	44.4	-	-
3	**CHARKHI DADRI**	1371.61	797.22	58.1	-	-	-	-	574.38	41.9	-	-
4	**FARIDABAD**	655.61	-	-	-	-	134.59	20.5	521.03	79.5	-	-
5	**FATEHABAD**	2525.12	-	-	363.62	14.4	-	-	2161.5	85.6	-	-
6	**GURGAON**	1222.46	-	-	-	-	-	-	1222.46	100	-	-
7	**HISAR**	4075.27	2829.19	69.4	-	-	836.23	20.5	409.85	10.1	-	-
8	**JHAJJAR**	1934.65	1934.65	100	-	-	-	-	-	-	-	-
9	**JIND**	2750.91	684.67	24.9	215.5	7.83	-	-	1850.75	67.3	-	-
10	**KAITHAL**	2274.14	-	-	-	-	-	-	2274.14	100	-	-
11	**KARNAL**	2470.52	-	-	-	-	-	-	2470.52	100	-	-
12	**KURUKSHETRA**	1684.2	-	-	-	-	-	-	1684.2	100	-	-
13	**MAHENDRAGARH**	1917.88	-	-	237.14	12.4	168.41	8.78	1512.32	78.9	-	-
14	**MEWAT**	1369.06	750.27	54.8	-	-	432.74	31.6	186.05	13.6	-	-
15	**PALWAL**	1358.26	558.47	41.1	300.54	22.1	154.6	11.4	344.65	25.4	-	-
16	**PANCHKULA**	506.72	398.44	78.6	-	-	108.28	21.4	-	-	-	-
17	**PANIPAT**	1302.73	-	-	-	-	-	-	1302.73	100	-	-
18	**ROHTAK**	1669.07	1669.07	100	-	-	-	-	-	-	-	-
19	**REWARI**	1461.68	-	-	-	-	198.1	13.6	1263.58	86.5	-	-
20	**SIRSA**	4269.93	-	-	533.84	12.5	-	-	3736.08	87.5	-	-
21	**SONIPAT**	2157.22	819.08	38	-	-	290.87	13.5	1047.28	48.6	-	-
22	**YAMUNA NAGAR**	1432.77	-	-	277.65	19.4	-	-	1155.12	80.6	-	-
	Total	**43205.82**	**12269.36**	**28.4**	**2129.8**	**4.93**	**2675.04**	**6.19**	**26131.63**	**60.5**	**-**	**-**

DISTRICT WISE STAGE OF DEVELOPMENT & TEMPORAL VARIATIONS IN ANNUAL OVERDRAFT

Sr. No.	Name of District	SOD (%)						Temporal variations in District wise Annual overdraft (in Ham)					
		2013	2017	2020	2022	2023	2024	2013	2017	2020	2022	2023	2024
1	AMBALA	102	101	124	113	123	127	-1160.00	-281.00	-10428.00	-5394.65	-9106.39	-10781.00
2	BHIWANI	169	117	110	103	107	105	-43018.00	-6938.00	-3806.00	-1044.88	-2790.26	-1854.65
3	CHARKHI DADRI	0	160	139	132	126	109	0.00	-9963.00	-6803.00	-5972.19	-4823.08	-1986.55
4	FARIDABAD	99	126	126	201	200	181	628.00	-3812.00	-3876.00	-11117.53	-11823.35	-10591.89
5	FATEHABAD	184	161	170	181	182	177	-52894.00	-35376.00	-37328.00	-48199.72	-53350.09	-44891.49
6	GURGAON	133	221	203	213	214	213	-7923.00	-23045.00	-21001.00	-22729.49	-23009.35	-22929.46
7	HISAR	112	104	91	82	88	89	-8122.00	-2324.00	4986.00	11365.37	6552.45	6466.44
8	JHAJJAR	83	62	46	50	54	51	7165.00	13120.00	18252.00	15226.70	15315.07	21766.44
9	JIND	113	130	113	107	105	113	-12959.00	-23324.00	-9898.00	-5908.35	-4138.90	-10420.99
10	KAITHAL	226	228	208	193	194	190	-67180.00	-58797.00	-58904.00	-40899.38	-40112.88	-38172.92
11	KARNAL	121	170	168	172	173	174	-15218.00	-48837.00	-49696.00	-53313.16	-62715.30	-78173.42
12	KURUKSHETRA	281	244	246	228	226	228	-93416.00	-43085.00	-51439.00	-47965.61	-47142.02	-47630.22
13	MAHENDRAGARH	86	94	106	147	147	146	3472.00	1733.00	-1650.00	-8728.24	-9323.45	-9172.51
14	MEWAT	74	100	81	80	80	76	5617.00	35.00	3382.00	3463.48	3164.12	3973.78
15	PALWAL	102	107	99	94	94	94	-970.00	-3262.00	412.00	2083.96	1978.59	2166.47
16	PANCHKULA	80	68	62	59	63	62	2901.00	3908.00	5292.00	5919.63	4921.52	5067.10
17	PANIPAT	163	188	176	193	198	222	-20960.00	-26211.00	-24442.00	-27748.40	-29597.73	-56492.08
18	REWARI	92	91	127	132	133	133	2623.00	3351.00	-7493.00	-8622.78	-8665.90	-8636.49
19	ROHTAK	70	57	50	56	55	51	14411.00	14514.00	14978.00	11728.02	13547.65	15642.81
20	SIRSA	175	198	150	153	148	153	-47922.00	-63659.00	-27144.00	-30261.01	-27159.09	-29765.58
21	SONIPAT	111	96	110	103	100	105	-8666.00	2677.00	-6113.00	-2156.21	-267.11	-3342.27
22	YAMUNA NAGAR	135	157	149	145	139	131	-17822.00	-27411.00	-25492.00	-23512.80	-22035.26	-16742.78

ANNEXURE XVII

DISTRICT WISE ANNUAL EXTRACTABLE GW RESOURCES & ANNUAL GW EXTRACTION FROM 2013-24

Sr. No.	Name of District	Total Geographical Area (ha)	Annual Extractable GW Resources (Ham)						Annual GW Extraction (Ham)					
			2013	2017	2020	2022	2023	2024	2013	2017	2020	2022	2023	2024
1	AMBALA	150905	56306	50854	43224	40408	39497	39386	57466	51135	53652	45803	48604	50167
2	BHIWANI	267495	62121	40779	38137	38220	41925	39792	105139	47717	41943	39265	44716	41647
3	CHARKHI DADRI	134335		16712	17417	18675	18649	22329		26675	24220	24647	23472	24315
4	FARIDABAD	57731	17637	14739	14847	11034	11771	13095	17009	18551	18723	22152	23594	23686
5	FATEHABAD	251850	63229	57588	53528	59866	64700	58306	116123	92964	90856	108066	118050	103197
6	GURGAON	121112	23827	19077	20422	20089	20184	20333	31750	42122	41423	42819	43193	43263
7	HISAR	406838	70178	63946	53589	64834	55386	56894	78300	66270	48603	53468	48833	50427
8	JHAJJAR	153659	42462	34292	34042	30343	33393	44430	35297	21172	15789	15117	18078	22663
9	JIND	268027	102178	78713	77097	79695	78515	78271	115137	102037	86995	85603	82654	88692
10	KAITHAL	222872	53507	45978	54756	44082	42762	42302	120687	104775	113659	84981	82874	80475
11	KARNAL	246865	71946	69859	73090	73629	85998	105847	87164	118696	122786	126942	148714	184021
12	KURUKSHETRA	168420	51699	29923	35241	37426	37324	37089	145115	73008	86680	85392	84466	84719
13	MAHENDRAGARH	188541	25630	28032	25622	18757	20045	20161	22158	26299	27271	27485	29368	29333
14	MEWAT	110702	21813	18760	17624	17400	15994	16545	16196	18725	14242	13936	12830	12571
15	PALWAL	120020	46124	46880	34862	35843	35062	39241	47094	50142	34451	33759	33083	37074
16	PANCHKULA	50671	14553	12223	14003	14612	13304	13433	11652	8315	8711	8692	8383	8366
17	PANIPAT	129637	33281	29861	32041	29839	30152	46265	54241	56072	56483	57587	59750	102757
18	REWARI	144017	30962	38430	27829	26721	26409	26402	28339	35079	35323	35344	35075	35038
19	ROHTAK	150389	47795	33569	29747	26496	30229	32016	33384	19055	14768	14768	16682	16374
20	SIRSA	352099	63678	65224	54746	57137	56016	56575	111600	128883	81890	87398	83175	86340
21	SONIPAT	199641	80195	69531	59355	63312	54545	72509	88861	66854	65469	65469	54812	75851
22	YAMUNA NAGAR	143277	51040	48081	51759	52204	57193	54638	68862	75492	77251	75716	79228	71381