

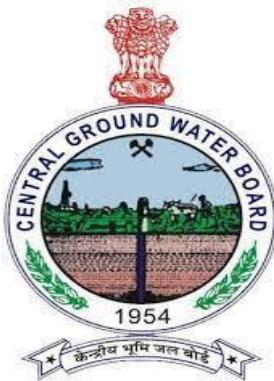
April 2023

GROUND WATER QUALITY IN GUJARAT STATE AND UT OF DAMAN & DIU

(AAP 2022-23)



REGIONAL CHEMICAL LABORATORY
CENTRAL GROUND WATER BOARD , WEST CENTRAL
REGION, AHMEDABAD



**GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
DEPT. OF WATER RESOURCES, RIVER DEVELOPMENT & GANGA
REJUVENATION
CENTRAL GROUND WATER BOARD**

**GROUND WATER QUALITY IN GUJARAT STATE
AND
UT OF Daman & Diu, Dadra & Nagar Haveli
(AAP 2022-23)**

by

Dr. H.B.Meena (Asst. Chemist)

Adiba Khan (STA-Chemical)

**CENTRAL GROUND WATER BOARD,
WCR, AHMEDABAD**

April -2023

CONTENTS**Foreword****Executive Summary****कार्यकारी सारांश**

S.No	Topic	Page No.
1	Introduction	11
2.	Hydrogeology	12
3.	Hydrochemistry	
3.1	Groundwater Quality Monitoring	13
3.2	Groundwater Quality Scenario in the State	13
3.2.1	Electrical Conductivity	14
3.2.2	Chloride	17
3.2.3	Nitrate	19
3.2.4	Fluoride	21
4.	Uranium	
5	SUITABILITY FOR AGRICULTURAL AND GENERAL DOMESTIC USE	
5.1	Salinity Index	37
5.2	Sodicity Index	37
5.3	%Na	38
5.4	Soluble Sodium Percentage (SSP)	38
5.5	Residual Sodium Carbonate (RSC)	39
5.6	Permeability Index (PI)	39
5.7	Kelly's Index (KI)	40
5.8	Magnesium Hazard (MH)	40
6	Suitability for Drinking Use (Ground water quality Index)	41
7	Districtwise Water Quality Scenario in Gujarat	
7.1	Ahmedabad	
7.2	Amreli	
7.3	Anand	
7.4	Arvalli	
7.5	Banaskantha	
7.6	Bharuch	
7.7	Bhavnagar	
7.8	Botad	
7.9	Chhota udepur	
7.10	Dahod	
7.11	Daman	
7.12	Dang	
7.13	Devbhoomi Dwarka	
7.14	Diu	
7.15	DNH	
7.16	Gandhinagar	
7.17	Gir Somnath	
7.18	Jamnagar	
7.19	Junagadh	
7.20	Kachchh	

7.21	Kheda	
7.22	Mahesana	
7.23	Mahisagar	
7.24	Morbi	
7.25	Narmada	
7.26	Navsari	
7.27	Panchmahal	
7.28	Patan	
7.29	Porbandar	
7.30	Rajkot	
7.31	Sabarkantha	
7.32	Surat	
7.33	Surendranagar	
7.34	Tapi	
7.35	Vadodara	
7.36	Valsad	
8	Major Quality Findings	42
9	Comparative study of NHS 2020-21, 2021-22 and NHS 2022-23	43
10	Conclusion	44
11.	List of Tables	
Table 1	Frequency distribution of Electrical Conductivity	15
Table 2	Frequency distribution of Chloride	17
Table 3	Frequency Distribution of Nitrate	19
Table 4	Frequency Distribution of Fluoride	21
Table 10	Frequency distribution of Uranium	35
Table 11	Classification of waters based on of EC.	37
Table 12	grouping of groundwater samples with respect to SAR	38
Table 13	The classification of groundwater samples with respect to percent sodium	38
Table 14	Grouping as per Todd's classification of SSP values	39
Table 15	Classification on the basis of RSC	39
Table 16	Classification of irrigation water based on the permeability index	40
Table 17	Classification based on Kelley's ratio.	40
Table 18	Classification as per MH.	40
Table 19	Groundwater quality index value for drinking and Domestic use for NHS 2022-23.	41
11	List of Hotspots	
Table A	List of Locations with EC>3000 μ S/cm	
Table B	Hot spot with respect to Chloride(Cl- > 1000 mg/l)	
Table C	Hot spot with respect to Nitrate (NO3- > 45 mg/l)	
Table D	Hot Spot with respect to Fluoride(F - > 1.50 mg/l)	
Table E	Hotspot with respect to TH (TH >600 mg/l)	
12	List of charts	
Chart 1	EC range in shallow Ground water of Gujarat.	15
Chart 2	Range of Chloride in shallow ground water of Gujarat	17
Chart 3	Nitrate range in shallow ground water of Gujarat	19
Chart 4	Fluoride range in shallow ground water of Gujarat	21
Chart 5	range of Uranium in shallow ground water of Gujarat	35
Chart 6	Chart Showing Districtwise Maximum EC obtained during NHS 2022	
Chart 7	Chart Showing Districtwise Maximum Fluoride obtained during NHS 2022	
Chart 8	Chart Showing Districtwise Maximum Nitrate obtained during NHS	

	2022	
13	List of Maps	
Map 1	Map showing Electrical Conductivity in the state	16
Map 2	Map showing Chloride concentration in the state	18
Map 3	Map showing distribution of nitrate in the state	20
Map 4	Map showing distribution of Fluoride in the state	22
14	List of Annexures	
Annxure I	Water Quality data w.r.t Basic Parameters	
Annxure II	Water Quality data w.r.t Uranium	
Annexure III	Agricultural Index Calculation	
Annexure IV	Calculation of WQI	
Annexure IV	Districtwise Maximum and Minimum values of Basic parameters.	

FOREWORD

Central Ground Water Board, West Central Region, has been issuing State Water Quality Report annually for Gujarat state by compiling the hydro-chemical data collected from the Groundwater Monitoring Wells established by the Board in the state of Gujarat and UT of Daman and Diu.

Monitoring of chemical quality furnish valuable information on the groundwater regime characteristics of the different hydrogeological units and moreover, analysis of these valuable data collected from existing observation wells during May in each year indicate the qualitative changes of groundwater quality in time and space. It also helps in identifying and delineating areas prone to decline of water quality due to natural or anthropogenic causes.

The scientific officers of the Regional Chemical Laboratory, West Central Region Ahmedabad have systematically analysed water quality data from the Groundwater Monitoring Network Wells collected during May 2022 and the analysis of same has been presented in this report along with explanations to bring out chemical characteristic of groundwater. The major quality findings of groundwater is discussed in details in this report. The water quality maps , frequency distributions have been prepared and presented in this report along with detailed discussion. As a special drive to monitor presence of Uranium in groundwater, the concentration of Uranium has been measured and produced in the report. The suitability of Groundwater for the purpose of irrigation, drinking and Domestic use has been discussed. Also, Districtwise Water quality scenario with respect to basic parameters has been discussed in details in the report.

I hope the report would be extremely useful to various agencies engaged in groundwater development and management for fruitful planning in time and space.

(Kartik P Dongre)
Regional Director O/C

EXECUTIVE SUMMARY

Behavior of groundwater in the state is highly complicated due to the occurrence of diversified geological formations with considerable lithological and chronological variations, complex tectonic framework, climatological dissimilarities and various hydro chemical conditions. This has given rise to diversified groundwater situations in different parts of Gujarat State. The groundwater quality of Gujarat is variable and complex as its quality is influenced by local geology, coastal salinity, inherent salinity, contamination and heavy withdrawal of groundwater.

A total number of 1363 water samples were collected and analyzed for different chemical parameters from National Groundwater monitoring network stations during May 2022, out of which 682 were analyzed for basic parameters (pH, EC, TDS, CO_3 , HCO_3 , Cl, NO_3 , SO_4 , F, Ca, Mg, TH, Alkalinity, Na, K and SAR), 681 for Uranium analysis spread over 33 districts of Gujarat and UT of Daman & Diu.

Electrical conductivity or Total dissolved solids or Salinity is the dissolved salt content of a water body. In many parts of the state the EC value is found to be very high i.e. 3000 $\mu\text{S}/\text{cm}$ to 25940 $\mu\text{S}/\text{cm}$. About 50 % samples had EC in the range of 751-2250 $\mu\text{S}/\text{cm}$.

Chloride is present in all natural waters being highly soluble and moves freely through soil and rock. A total of 62 % water samples fall within the desirable limit prescribed by BIS (2012) .

Nitrate in groundwater generally originates from non-point sources such as leaching of chemical fertilizers and animal manure, groundwater pollution from septic and sewage discharges etc. High Nitrate $> 45\text{mg/l}$, have been found in 24 % samples while Nitrate concentration has been found to be above 100mg/l at 45 locations in the state of Gujarat.

The type of rocks, climatic conditions, nature of hydro geological strata and time of contact between rock and the circulating groundwater affect the occurrence of **fluoride** in natural water. High Fluoride $> 1.5\text{mg/l}$, which is mainly attributed due to geogenic conditions, have been observed 79 water samples out of 682 water samples analyzed

Uranium was found to be within the permissible limit of 30 ppb in all the samples collected from Groundwater monitoring network stations except two samples at 55.24 ppb at Barvala, Botad District and 40.64 ppb at Govindpura, Chota udepur district cause of which may be of geogenic in nature.

The suitability of irrigation water mainly depends on the amounts and type of salts present in water. It is found that most of the samples (50%) collected during NHS 2022-23 are categorized under high salinity classes. (**Salinity Index**).The SAR value of most of the samples were found to S1 and are classified as Excellent for irrigation as per **sodicity Index**.The classification of groundwater samples with respect to percent sodium shows that majority samples (34%) fall under Good category while only 4% samples were found to be unsuitable for irrigation.As per Todd's classification of SSP, 80% samples suitable for irrigation, 20% samples unsuitable for irrigation.Based on the RSC values, only 9.53 % samples reflected to unsuitable for irrigation while 86% samples were categorized as Good for Irrigation.The soil permeability is affected by long-term use of irrigation water and According to **permeability Index**, 76% of the samples fall under class 2 corresponding to Good (PI ranged from 25% to 75%) and 18% samples belong to class unsuitable (PI $< 25\%$) in the NHS 2022-23. The A **Kelly's index** of more than 1 in 50 % samples shows an extra concentration of sodium in waters. The **magnesium hazard (MH)** parameter indicates that 52% samples are harmful and unsuitable for irrigation indicating their adverse effect on crop yield.

Suitability for drinking and Domestic purpose: Water Quality Index (WQI) provides a single number that expresses the overall water quality at a certain location and time, based on several water quality parameters. The objective of WQI is to turn complex water quality data into information that is understandable and usable by the public. The Ground- water quality index value was calculated for all the samples. It was found that 43.4 % ground water samples belong to the Class II category, representative that

the water is of good quality. (**Water Quality Index**) While it can also be inferred that about 6.3% water samples were unsuitable for drinking.

In comparison to 2021 Although the samples having high values of Electrical Conductivity , Chloride, Total Hardness and Nitrate has decreased marginally, there is a significant increase in number of samples having higher values of Fluoride and Uranium during NHS 2022 as compared to NHS 2021. In general, it is observed that the maximum values of parameters like Nitrate , TH and Uranium has increased in the state while that of Fluoride,EC, Chloride has decreased during NHS 2022 as compared to NHS 2021.

Districtwise water Quality scenario with respect to basic parameters have been discussed for 33 districts and UTs in Gujarat viz. Ahmedabad, Amreli, Anand, Arvalli, Banaskantha, Bharuch, Bhavnagar, Botad, Chhota udepur, Dahod, Dang, Devbhoomi Dwarka, , Gandhinagar,Gir Somnath, Jamnagar, Junagadh, Kachchh, Kheda, Mahesana, Mahisagar, Morbi, Narmada, Navsari, Panchmahal, Patan, Porbandar, Rajkot, Sabarkantha, Surat, Surendranagar, Tapi, Vadodara and Valsad and the Union Terretories of Daman, Diu,Dadra & nagar Haveli.

From the analytical results it has been observed that majority of water samples collected from observation wells of CGWB in a major part of the state fall under desirable or permissible category and hence are suitable for drinking purposes. However, a small percentage of well waters are found to have concentrations of some constituents beyond the permissible limits. Such waters are not fit for human consumption and are likely to be harmful to health on continuous use.

कार्यकारी सारांश

विविध भौवैज्ञानिक संरचनाओं, लिथोलॉजिकल और कालानुक्रमिक विविधताओं, जटिल विवर्तनिक ढांचे, जलवायु संबंधी असमानताओं और विभिन्न जल रासायनिक स्थितियों की घटना के कारण राज्य में भूजल का व्यवहार अत्यधिक जटिल है। इसने गुजरात राज्य के विभिन्न हिस्सों में विविध भूजल स्थितियों को जन्म दिया है। गुजरात की भूजल गुणवत्ता परिवर्तनशील और जटिल है क्योंकि इसकी गुणवत्ता स्थानीय भूवैज्ञान, तटीय लवणता, अंतर्निहित लवणता, संदूषण और भूजल की भारी निकासी से प्रभावित है।

मई 2022 के दौरान राष्ट्रीय भूजल निगरानी नेटवर्क स्टेशनों से विभिन्न रासायनिक मापदंडों के लिए कुल 1363 पानी के नमूने एकत्र किए गए और उनका विश्लेषण किया गया जो कि गुजरात के 33 जिलों और दमन और दीव के UT में फैले हुए है। जिनमें से 682 का विश्लेषण बुनियादी मापदंडों (pH, EC, TDS, CO₃, HCO₃, Cl, NO₃, SO₄, F, Ca, Mg, TH, क्षारीयता, Na, K और SAR) के लिए किया गया एवं 681 नमूने यूरेनियम विश्लेषण के लिए एकत्र किये गए।

विद्युत चालकता (EC) या कुल घुलित ठोस पदार्थ या लवणता एक जल निकाय की घुली हुई नमक सामग्री है। राज्य के कई हिस्सों में EC मान बहुत अधिक यानी 3000 μS/cm से 25940 μS/cm तक पाया गया है। लगभग 50% नमूनों में EC 751-2250 μS/cm की सीमा में था।

फ्लोराइड अत्यधिक घुलनशील होने के कारण सभी प्राकृतिक जल में मौजूद होता है और मिट्टी और चट्टान के माध्यम से स्वतंत्र रूप से चलता है। कुल 62% पानी के नमूने BIS (2012) द्वारा निर्धारित वांछनीय सीमा के भीतर आते हैं। भूजल में **नाइट्रेट** आम तौर पर गैर-बिंदु स्रोतों से उत्पन्न होता है जैसे कि रासायनिक उर्वरकों और पशु खाद की लीचिंग, सेप्टिक और सीवेज डिस्चार्ज से भूजल प्रदूषण आदि। उच्च नाइट्रेट > 45mg/l, 24% नमूनों में पाया गया है जबकि नाइट्रेट की सघनता गुजरात राज्य में 45 स्थानों पर 100mg/l से ऊपर पाई गई है।

चट्टानों के प्रकार, जलवायु परिस्थितियाँ, जल भौवैज्ञानिक स्तर की प्रकृति और चट्टान और परिसंचारी भूजल के बीच संपर्क का समय प्राकृतिक जल में **फ्लोराइड** की उपस्थिति को प्रभावित करता है। उच्च फ्लोराइड > 1.5mg/l, जो मुख्य रूप से भूगर्भीय स्थितियों के कारण जिम्मेदार है, विश्लेषण किए गए 682 पानी के नमूनों में से 79 पानी के नमूने देखे गए हैं।

बरवाला, बोटाड जिले में 55.24 पीपीबी और गोविंदपुरा, छोटा उदेपुर जिले में 40.64 पीपीबी पर दो नमूनों को छोड़कर भूजल निगरानी नेटवर्क स्टेशनों से एकत्र किए गए सभी नमूनों में यूरेनियम 30 पीपीबी की अनुमेय सीमा के भीतर पाया गया, जिसका कारण प्रकृति में भूगर्भीयहो सकता है।

सिंचाई के पानी की उपयुक्तता मुख्य रूप से पानी में मौजूद लवणों की मात्रा और प्रकार पर निर्भर करती है।

यह पाया गया है कि NHS 2022-23 के दौरान एकत्र किए गए अधिकांश नमूने (50%) उच्च लवणता वाले वर्गों के तहत वर्गीकृत किए गए हैं। (**लवणता सूचकांक**)। अधिकांश नमूनों का SAR मान S1 पाया गया और उन्हें लवणता सूचकांक के अनुसार सिंचाई के लिए उत्कृष्ट के रूप में वर्गीकृत किया गया है। **प्रतिशत सोडियम** के संबंध में भूजल के नमूनों के वर्गीकरण से पता चलता है कि अधिकांश नमूने (34%) अच्छे के अंतर्गत आते हैं। जबकि केवल 4% नमूने सिंचाई के

लिए अनुपयुक्त पाए गए। **SSP** के टॉड के वर्गीकरण के अनुसार, 80% नमूने सिंचाई के लिए उपयुक्त, 20% नमूने सिंचाई के लिए अनुपयुक्त पाए गए हैं। **RSC** मूल्यों के आधार पर, केवल 9.53% नमूने सिंचाई के लिए अनुपयुक्त पाए गए। जबकि 86% नमूनों को सिंचाई के लिए अच्छा के रूप में वर्गीकृत किया गया था। मिट्टी की पारगम्यता सिंचाई के पानी के दीर्घकालिक उपयोग से प्रभावित होती है और पारगम्यता सूचकांक के अनुसार, 76% नमूने वर्ग 2 के अंतर्गत आते हैं जो अच्छे (PI 25% से 75% तक) के अनुरूप हैं और 18% नमूने NHS 2022-23 में अनुपयुक्त वर्ग (PI <25%) के हैं। 50% नमूनों में 1 से अधिक का ए केली का सूचकांक पानी में सोडियम की अतिरिक्त सांद्रता दर्शाता है। **मैत्रीशियम खतरा (MH)** पैरामीटर इंगित करता है कि 52% नमूने हानिकारक हैं और सिंचाई के लिए अनुपयुक्त हैं जो फसल की उपज पर उनके प्रतिकूल प्रभाव को दर्शाता है।

पीने और घरेलू उद्देश्य के लिए उपयुक्तता: जल गुणवत्ता सूचकांक (WQI) एक एकल संख्या प्रदान करता है जो पानी की गुणवत्ता के कई मापदंडों के आधार पर एक निश्चित स्थान और समय पर समग्र जल गुणवत्ता को व्यक्त करता है। WQI का उद्देश्य जटिल जल गुणवत्ता डेटा को ऐसी जानकारी में बदलना है जो जनता द्वारा समझने योग्य और उपयोग करने योग्य हो। सभी नमूनों के लिए भूजल गुणवत्ता सूचकांक मूल्य की गणना की गई। यह पाया गया कि 43.4% भूजल के नमूने द्वितीय श्रेणी की श्रेणी के हैं, यह दर्शाता है कि पानी अच्छी गुणवत्ता का जबकि यह भी अनुमान लगाया जा सकता है कि लगभग 6.3% पानी के नमूने पीने के लिए अनुपयुक्त थे।

2021 की तुलना में हालांकि विद्युत चालकता, क्लोराइड, कुल कठोरता और नाइट्रेट के उच्च मूल्यों वाले नमूनों में मामूली कमी आई है, एनएचएस 2021 की तुलना में एनएचएस 2022 के दौरान फ्लोराइड और यूरेनियम के उच्च मूल्यों वाले नमूनों की संख्या में उल्लेखनीय वृद्धि हुई है। सामान्य तौर पर, यह देखा गया है कि एनएचएस 2021 की तुलना में एनएचएस 2022 के दौरान राज्य में नाइट्रेट, टीएच और यूरेनियम जैसे मापदंडों के अधिकतम मूल्यों में वृद्धि हुई है जबकि फ्लोराइड, EC, क्लोराइड के मूल्यों में कमी आई है।

गुजरात में 33 जिलों और केंद्रशासित प्रदेशों के लिए बुनियादी मापदंडों के संबंध में जिलेवार जल गुणवत्ता परिवर्तन पर चर्चा की गई है-अहमदाबाद, अमरेली, आनंद, अरवल्ली, बनासकांठा, भरुच, भावनगर, बोटाद, छोटा उदयपुर, दाहोद, डांग, देवभूमि द्वारका, गांधीनगर, गिर सोमनाथ, जामनगर, जूनागढ़, कच्छ, खेड़ा, महेसाणा, महिसागर, मोरबी, नर्मदा, नवसारी, पंचमहल, पाटन, पोरबंदर, राजकोट, साबरकांठा, सूरत, सुरेंद्रनगर, तापी, वडोदरा और वलसाड और दमन, दीव, दादरा और नगर हवेली के केंद्र शासित प्रदेश।

विश्लेषणात्मक परिणामों से यह देखा गया है कि राज्य के एक बड़े हिस्से में CGWB के अवलोकन कुओं से एकत्र किए गए अधिकांश पानी के नमूने वांछनीय या अनुमेय श्रेणी के अंतर्गत आते हैं और इसलिए पीने के उद्देश्यों के लिए उपयुक्त हैं। हालाँकि, कुओं के पानी के एक छोटे प्रतिशत में कुछ घटकों की सांद्रता अनुमेय सीमा से अधिक पाई गई है। इस तरह के पानी मानव उपभोग के लिए उपयुक्त नहीं हैं और निरंतर उपयोग पर स्वास्थ्य के लिए हानिकारक होने की संभावना है।

GROUNDWATER QUALITY IN SHALLOW AQUIFER OF GUJARAT STATE AND UT OF DAMAN & DIU, D&N Haveli-2022

1. INTRODUCTION

Groundwater is an essential and vital component of our life support system. The ground water resources are being utilized for drinking, irrigation and industrial purposes. However, due to rapid growth of population, urbanization, industrialization and agriculture activities, groundwater resources are under stress. There is growing concern on the deterioration of groundwater quality due to geogenic and anthropogenic activities. The natural chemical composition of ground water is influenced predominantly by type & depth of soils and subsurface geological formations through which groundwater passes. Groundwater quality is also influenced by contribution from, the atmosphere and surface water bodies.

Quality of groundwater is also influenced by anthropogenic factors, for example, Overexploitation of groundwater in coastal regions may result in seawater ingress and consequent increase in salinity of groundwater and excessive use of fertilizers and pesticides in agriculture and improper disposal of urban/industrial waste can cause contamination of groundwater resources.

Groundwater contains a wide variety of dissolved inorganic chemical constituents in various concentrations, resulting from chemical and biochemical interactions between water and the geological materials. Inorganic contaminants including salinity, chloride, fluoride, nitrate and iron are important in determining the suitability of ground water for drinking purposes.

The Central Ground Water Board, West Central Region, Ahmedabad has jurisdiction over the State of Gujarat and Union Territory (UT) of Daman & Diu covering an area of 1,96,136 sq km. The Gujarat State is situated between North latitudes 20° 06' 00" to 24° 42' 00" and East longitudes 68° 10' 00" to 74° 28' 00". Gujarat has nearly 1600 km long coastline, which is the longest as compared to any other state in the country. It is extending from Lakhpat in north to Daman in south. The State has common boundaries with the states of Rajasthan, Madhya Pradesh and Maharashtra and shares international border with Pakistan in northwest. UT of Daman & Diu has an area of 106 sq. km. Diu is an Island just south of Saurashtra coast and Daman is situated west of Vapi in the south.

Gujarat along with UT of Daman and Diu is a vast state with varied hydro geological situations resulting from diversified geological, climatological and topographic settings. Water bearing rock formations (aquifers), range in age from Archaean to Recent. Similarly, the landform varies from the hilly tract to the uplands of Kachchh and Saurashtra, the alluvial plains extending from Banaskantha in the north to Valsad in the south, the low lying coastal tract surrounding the Kachchh and Saurashtra uplands and the marshy to saline tracts of the Rann of Kachchh and little Rann of Kachchh.

Central Ground Water Board, as a part of its national programme, has established Groundwater monitoring wells in the state of Gujarat and U.T. of Daman and Diu for periodic monitoring of groundwater levels and to study its quality variation in time and space.

Large rivers like Narmada, Mahi, Tapi, and Sabarmati flow through the state and form their own basins. Other minor rivers have been grouped together to form river basins. In all, eight river basins have been identified by the All India Soil Survey & Land Use Department as listed below:

1. Sabarmati river basin.
2. Mahi river basin.
3. Narmada river basin.
4. Tapti river basin.
5. Luni and other draining in to Great Rann of Kachchh
6. Draining in to Gulf of Kachchh
 - a. Southern Kathiawar

b. Sharavati to Tapti

2. HYDROGEOLOGY

Behavior of groundwater in the state is highly complicated due to the occurrence of diversified geological formations with considerable lithological and chronological variations, complex tectonic framework, climatological dissimilarities and various hydro chemical conditions. Broadly two groups of rock formations have been identified, depending on characteristically different hydraulics of groundwater viz. Porous and fissured formations. The high relief areas in the eastern and northeastern parts of the state occupied by the Deccan Traps and the Archeans respectively have steep topographic gradients resulting in high run-off, and therefore, provide little scope for groundwater recharge.

The groundwater potential in this terrain is limited. The large alluvial tract extending from Banaskantha district in the north to Surat and Valsad districts in the south constitutes the largest most potential groundwater reservoir in the state. The aquifers are extensive, thick, hydraulically connected and are moderate to high yielding. To the west of this alluvial tract, especially around the discharge areas, characteristic artesian free flow conditions are observed.

Almost the entire Saurashtra and Kachchh regions are occupied by a variety of hard and fissured formations including basalt and consolidated sedimentary formations with semi-consolidated sediments along the low-lying coastal areas. The compact and fissured nature of rocks gives rise to discontinuous aquifers with moderate yield potential. The friable semi-consolidated sandstone forms an aquifer with moderate yield potential.

The coastal and deltaic areas in the state form a narrow linear strip and are underlain by Tertiary sediments and Alluvium. Though highly potential aquifers occur in these areas, salinity is a constraint for groundwater development. Groundwater withdrawal requires to be strictly regulated so that it does not exceed the annual recharge and also that it does not disturb the hydro-chemical balance leading to seawater ingress.

The quality of ground water in both hard rock and alluvial terrain is, by and large, suitable except in the coastal areas, estuarine tract and the Rann where the degree of mineralization in groundwater is rather high and salinity is common. Salinity in groundwater is also noticed in the arid and semi-arid tract. The different conditions of groundwater occurrence in the state have led to divergent ground water situations in the areas occupied by different geological formations.

A number of abandoned river channels and valley fills occur in the rocky areas. These are of great significance for the development of groundwater in an otherwise less promising terrain.

Groundwater in the alluvium occurs under unconfined conditions at shallow depths. In deeper horizons, it occurs under semi-confined to confined and artesian conditions. Detailed study in Mehsana, Banaskantha, Rajkot, Surendranagar, Kheda, Sabarkantha, Kachchh and Ahmedabad districts has revealed that multiple aquifers exist in a major part of the alluvial plains of Gujarat up to a depth of 500 m.

3.

HYDROCHEMISTRY

Hydrochemistry is an interdisciplinary science that deals with the chemistry of water in the natural environment. The classical use of chemical characteristics in hydrochemistry is to provide information about the regional distribution of water qualities. At the same time, hydrochemistry has a potential use for tracing the origin and history of water. The hydrochemistry can also be of immense help in yielding information about the environment through which water has circulated. Hydrochemistry can be helpful in knowing about residence time, flow path and aquifer characteristics, as the chemical reactions are time and space dependent.

The diverse physiographic, climatic, topographic and geologic conditions have given rise to diversified groundwater situations in different parts of Gujarat State. Physiographically, Gujarat State is categorized as the Mainland, Saurashtra and Kacchh. The groundwater quality of Gujarat is variable and complex as its quality is influenced by local geology, coastal salinity, inherent salinity, contamination and heavy withdrawal of groundwater. Gujarat has the longest coastline in the country with several creeks, as a result, during tides sea water invades inland through these creeks which in turn has impact on groundwater quality along its coasts. High chemical concentrations mostly occur in coastal regions due to seawater intrusion brought by upcoming or reversal in hydraulic gradient.

3.1 Groundwater Quality Monitoring

Monitoring of groundwater quality is an effort to obtain information on chemical quality through representative sampling in different hydro geological units. Groundwater is commonly tapped from phreatic aquifers through dug wells in major part of the state.

Central Ground Water Board (WCR), Ahmedabad has monitored a total number of **682** water samples collected during May 2022, for basic parameters determining pH, EC, TDS, CO₃, HCO₃, Cl, NO₃, SO₄, F, Ca, Mg, TH, Alkalinity, Na, K and SAR, involving use of instruments such as pH meter, EC meter, flame photometer, UV-Visible Spectrophotometer and titrimetric methods. Uranium analysis of **681** samples was carried out on Florigrometer.

3.2 Ground water quality scenario in the state

From the analytical results it has been observed that majority of water samples collected from observation wells of CGWB in a major part of the state fall under desirable or permissible category and hence are suitable for drinking purposes. However, a small percentage of well waters are found to have concentrations of some constituents beyond the permissible limits. Such waters are not fit for human consumption and are likely to be harmful to health on continuous use.

Based on the results it is found that groundwater in the state is mostly of calcium bicarbonate type when the Electrical conductivity is below 750 μ S/cm. There are mixed cation and mixed anions type groundwater in the state when the electrical conductance is between 750 and 3200 μ S/cm and waters with electrical conductance more than 3200 μ S/cm are generally of sodium chloride type.

A total number of 1363 water samples were collected and analyzed for different chemical parameters from National Groundwater monitoring network stations, out of which 682 were analyzed for basic parameters, 681 for Uranium analysis spread over 33 districts of Gujarat and UT of Daman & Diu, Dadra & Nagar Haveli. The overall results of Basic hydro chemical analysis are attached in **Annexure I** and Uranium analysis are attached in **Annexure II**. District wise Hotspot locations of different parameters observed during analysis is summarized in **Table A,B,C,D,E** for basic parameters. The calculated values of various indices used for finding suitability of groundwater for irrigation purpose are summarized in **Annexure III** while the Water Quality Index has been calculated in **Annexure IV** while results of districtwise statistical analysis are attached as **Annexure V**

Major quality findings are described as under:-

3.2.1 The Electrical conductivity (EC)

Electrical conductivity or Total dissolved solids or Salinity is the dissolved salt content of a water body. Different substances dissolve in water giving it taste and odour. In fact, human beings have developed senses, which are able to evaluate the potability of water. Electrical conductivity represents total number of cations and anions present in groundwater, indicating ionic mobility of different ions, total dissolved solids and saline nature of water.

In general water having EC < 1500 μ S/cm, is considered as fresh water, EC 1500 –15000 μ S/cm, is considered as brackish water and >15000 μ S/cm is considered as saline water.

In many parts of the state the EC value is found to be very high i.e. 3000 $\mu\text{S}/\text{cm}$ to 25940 $\mu\text{S}/\text{cm}$. It was observed that out of 682 water samples 8 samples show EC value more than 10000 $\mu\text{S}/\text{cm}$ indicating brackish nature of water while 2 samples show EC value more than 20000 $\mu\text{S}/\text{cm}$ indicating salinity problem in the area.

A close observation of the **Table A** reveals High EC Values $> 3000 \mu\text{S}/\text{cm}$ have been found in 114 number of samples out of 682 total number of samples analyzed indicating saline nature of water in those parts of the state. In other parts of the state water is almost fresh with respect to EC & salinity.

EC $> 10000 \mu\text{S}/\text{cm}$, was found at 10 locations namely ; Kumarkhan 11870 $\mu\text{S}/\text{cm}$, (**Ahmedabad**), Ukhrala 10030 $\mu\text{S}/\text{cm}$ (Bhavnagar) ,Varvada 11870 $\mu\text{S}/\text{cm}$ (**Devbhoomi dwarka**), Zolawadi 12890 $\mu\text{S}/\text{cm}$ (**Diu**), Hadiyana 13980 $\mu\text{S}/\text{cm}$ and Bedanpur 10950 $\mu\text{S}/\text{cm}$ (**Jamnagar**), Osa 12380 $\mu\text{S}/\text{cm}$ (**Junagah**), Gangad 12070 $\mu\text{S}/\text{cm}$ (**Surendranagar**) while EC $>25000 \mu\text{S}/\text{cm}$ was found at Motichander 25940 $\mu\text{S}/\text{cm}$ (**Patan**), , Kharaghoda 24790 $\mu\text{S}/\text{cm}$ (**Surendranagar**) showing brackish and saline water problem. The map showing Electrical Conductivity in the state is represented in Map1

The frequency distribution is of Electrical Conductivity is shown in the following table:

EC ranges in $\mu\text{S}/\text{cm}$ at 25°C	0-250	251 - 750	751-2250	2251-5000	>5000
No. of samples	2	164	341	125	50
% of samples	0.29	24	50	18	7.33

TABLE 1: Frequency distribution of Electrical Conductivity

Chart 1 depicts the range of Electrical Conductivity in shallow ground water of Gujarat

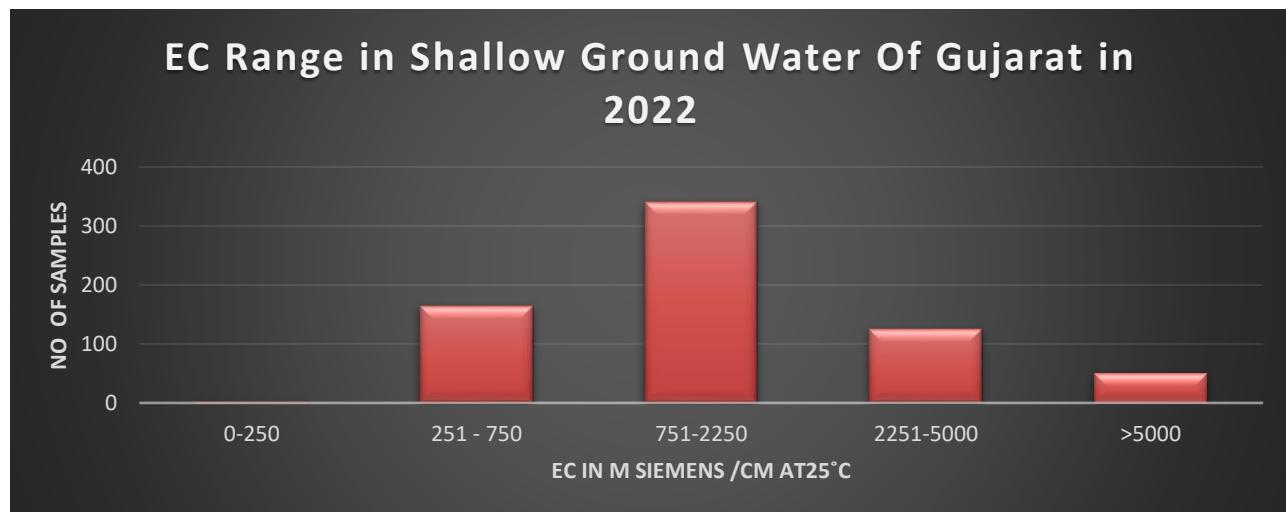
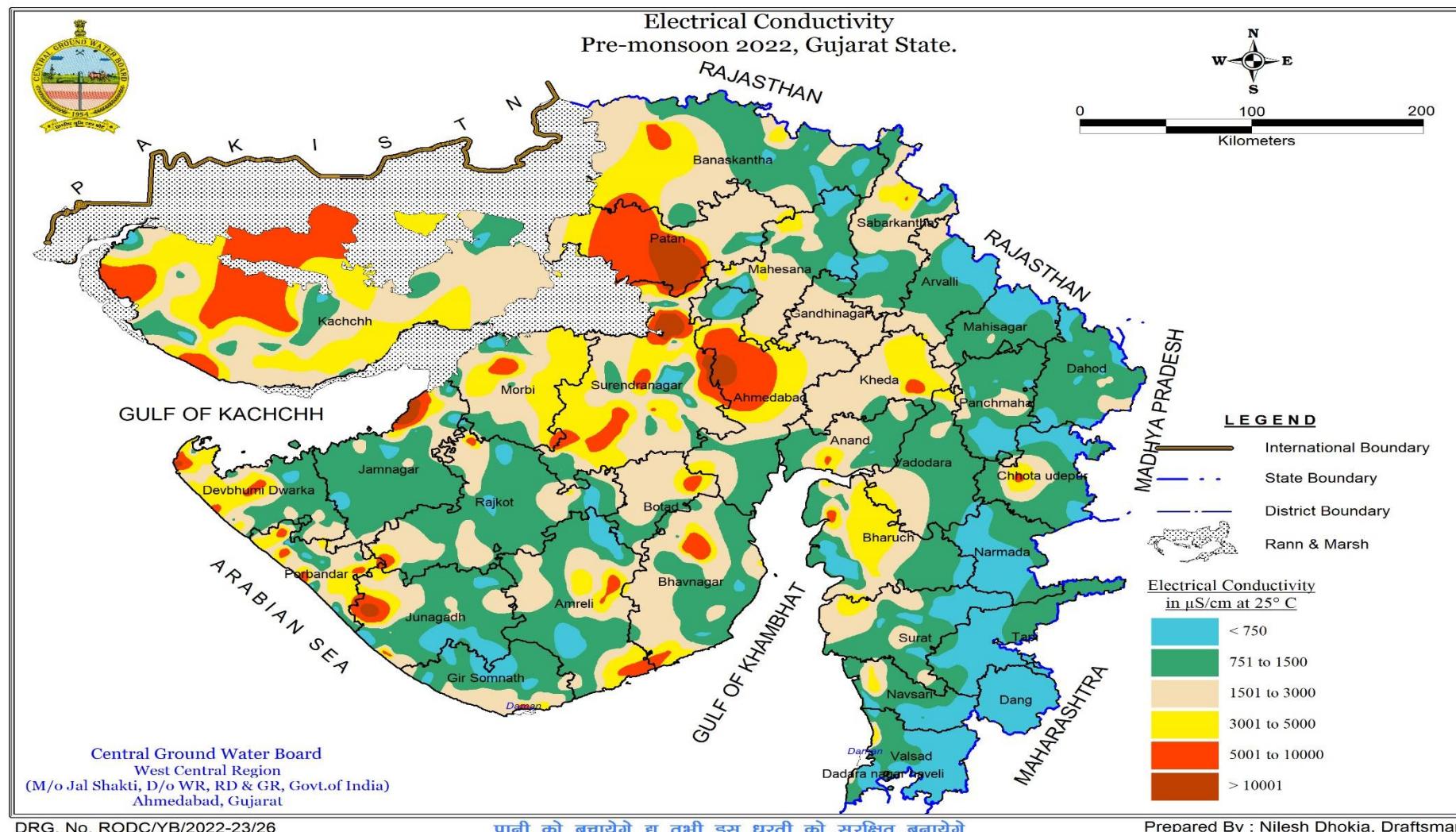


Chart 1

It is observed that majority of samples collected during NHS 2022 belong to High Salinity group since 50% samples had EC ranging from 751-2250 $\mu\text{S}/\text{cm}$.



Map 1

3.2.2 Chloride

Chloride is present in all natural waters being highly soluble and moves freely through soil and rock. In groundwater Chloride content is mostly below 250 mg/l except in cases where inland salinity is prevalent and in coastal areas. BIS have recommended a desirable limit of 250mg/l of chloride in drinking water; this concentration limit can be extended to 1000 mg/l of chloride in cases where no alternative source of water with desired concentration is available.

A close observation of the **Table B** shows that high Chloride $> 1000\text{mg/l}$ has been found in 66 numbers of samples out of 682 total numbers of samples analyzed indicating saline nature of water in that part of the state. In most of the other places chloride problem is not evident. The very high chloride values where Chloride concentration is $>3000\text{ mg/l}$, have been observed in 6 locations namely Kumarkhan 3013 mg/l, (**Ahmedabad**), Varvada 4260 mg/l (**Devbhoomi dwarka**), Zolawadi 4580 mg/l (**Diu**), Hadiyana 4480 mg/l and Bedanpur 3067 mg/l (**Jamnagar**), Osa 4027 mg/l (**Junagah**), while cl $>8000\text{ mg/l}$ was found at Motichander 8933 mg/l (**Patan**), Kharaghoda 8520 mg/l (**Surendranagar**) showing brackish and saline water problem.

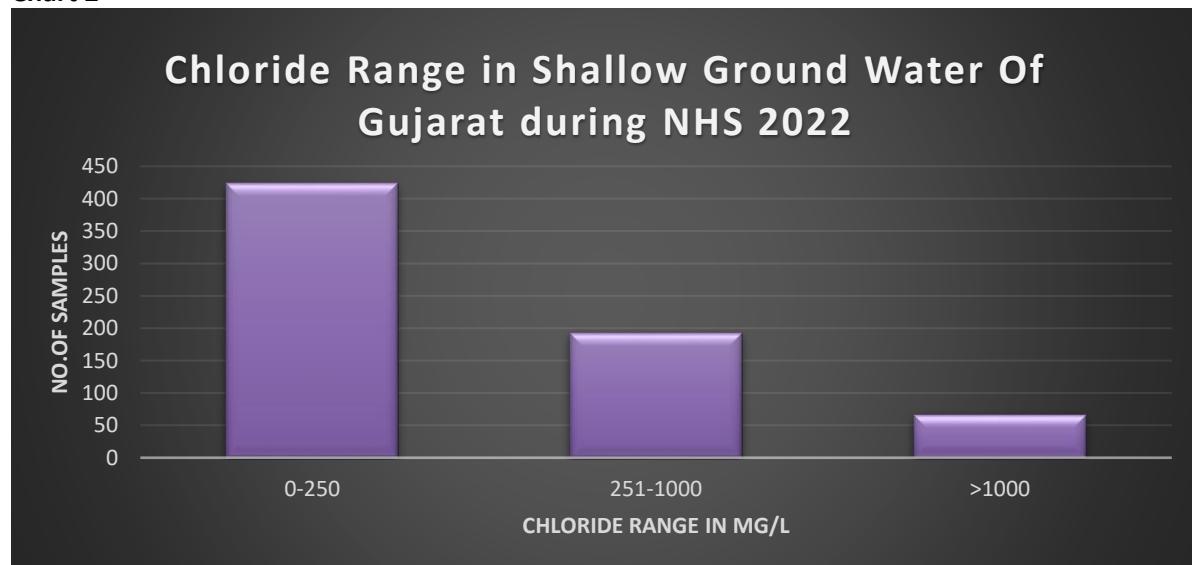
From Table 2 it is clear that a total of 62 % water samples fall within the desirable limit while 28 % contain chloride within the maximum permissible limit prescribed by BIS (2012). 10 % samples exhibit Chloride values $> 1000\text{ mg/l}$. The frequency distribution is shown in the following table:

TABLE 2 : Frequency distribution of Chloride

Range of Chloride in mg/l	0-250	251-1000	>1000
No. of samples	423	193	66
% of samples	62	28	9.68

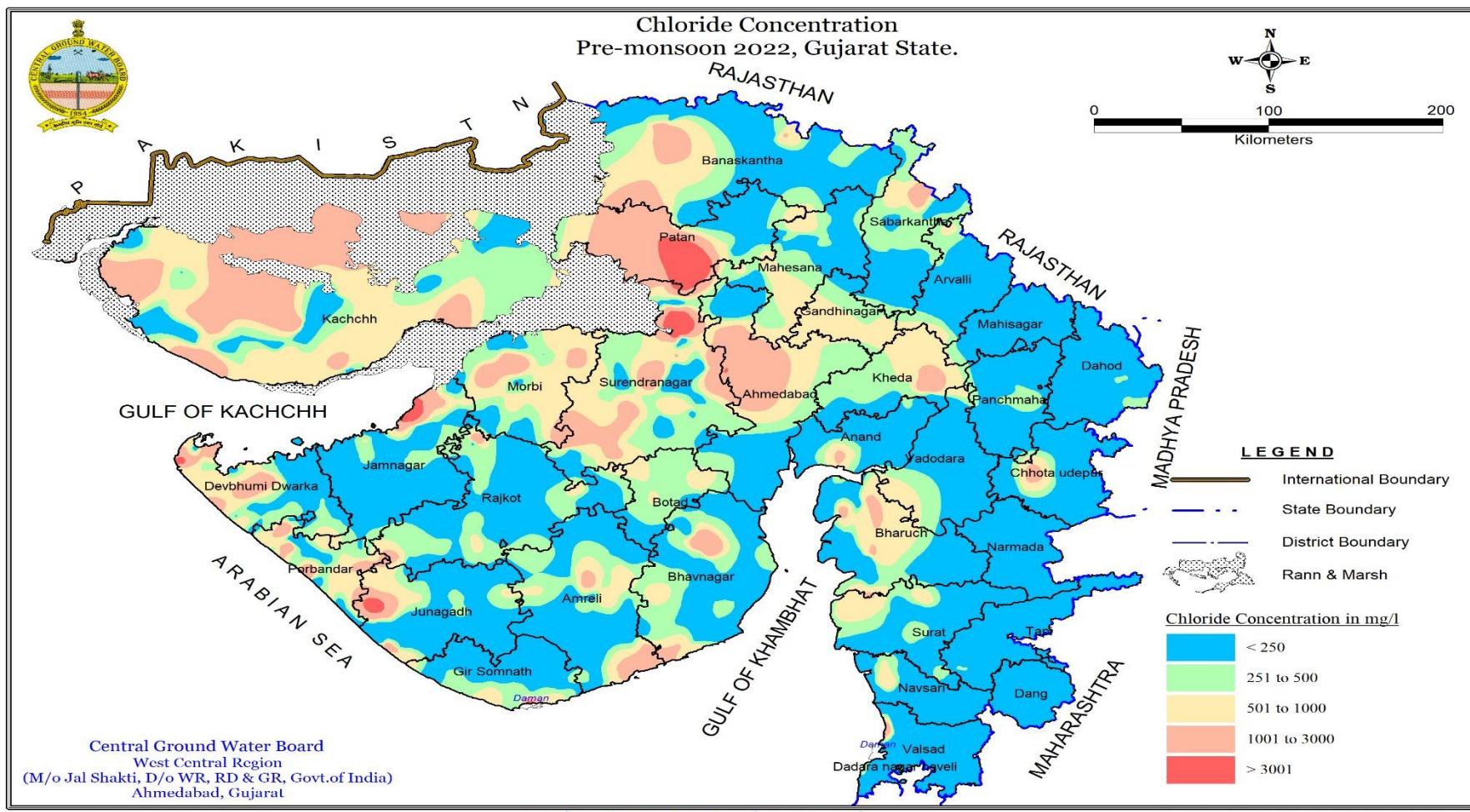
Chart 2 .depicts the range of Chloride in shallow ground water of Gujarat

Chart 2



The map showing Chloride concentration in the state is represented in Map 2.

Map 2



3.2.3 Nitrate

Nitrate is a naturally occurring compound that is formed in the soil when nitrogen and oxygen combine. The primary source of all nitrates is atmospheric nitrogen gas. This is converted into organic nitrogen by some plants by a process called nitrogen fixation. Dissolved nitrogen in the form of nitrate is the most common contaminant of groundwater.

Nitrate in groundwater generally originates from non-point sources such as leaching of chemical fertilizers and animal manure, groundwater pollution from septic and sewage discharges etc. It is difficult to identify the natural and man-made sources of nitrogen contamination of ground water. Some chemical and microbiological processes such as nitrification and denitrification also influence the nitrate concentration in ground water.

As per the BIS standard for drinking water the maximum desirable limit of nitrate concentration in groundwater is 45 mg/l .Though nitrate is considered relatively non-toxic, a high nitrate concentration in drinking water is an environmental health concern arising from increased risks of methaemoglobinemia particularly to infants. Adults can tolerate little higher concentration.

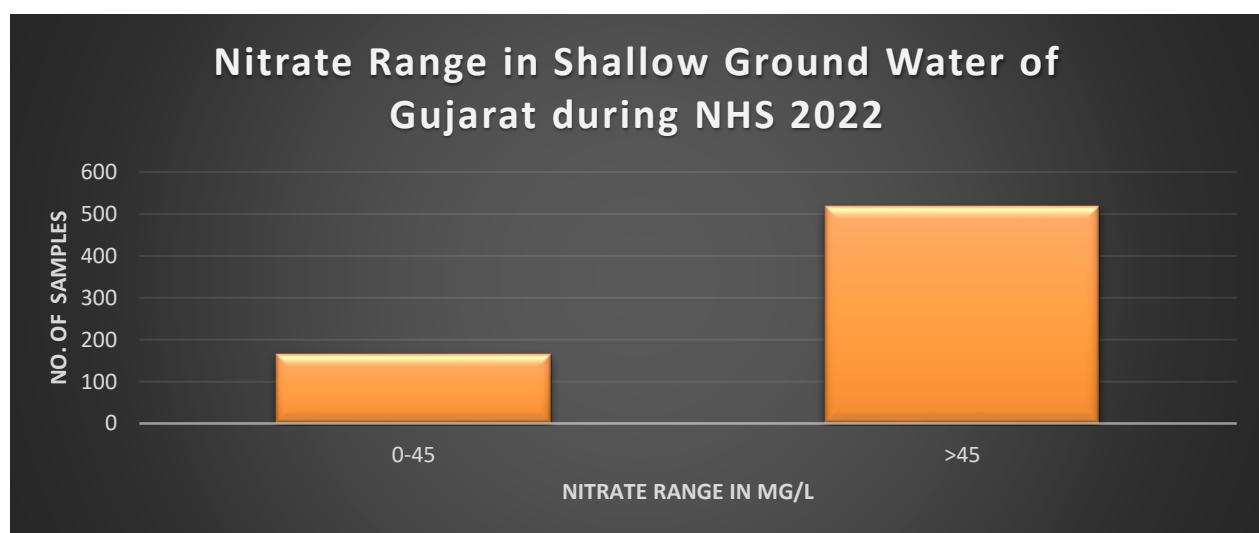
High Nitrate > 45mg/l, (Table C) have been found in 165 number of samples out of 682 total number of samples analyzed indicating high nitrate pollution due to use of nitrogen containing fertilizer, domestic and agriculture waste and anthropogenic activities.

Nitrate concentration has been found to be above 100mg/l at 45 locations highlighted in Table C. The highest being reported at Gangad, Surendranagar with NO₃ concentration 513 mg/l.

In other locations where nitrate content is below 45mg/l there is no problem with respect to nitrate pollution. The frequency distribution of Nitrate is shown in the table. **TABLE 3 : Frequency Distribution of Nitrate**

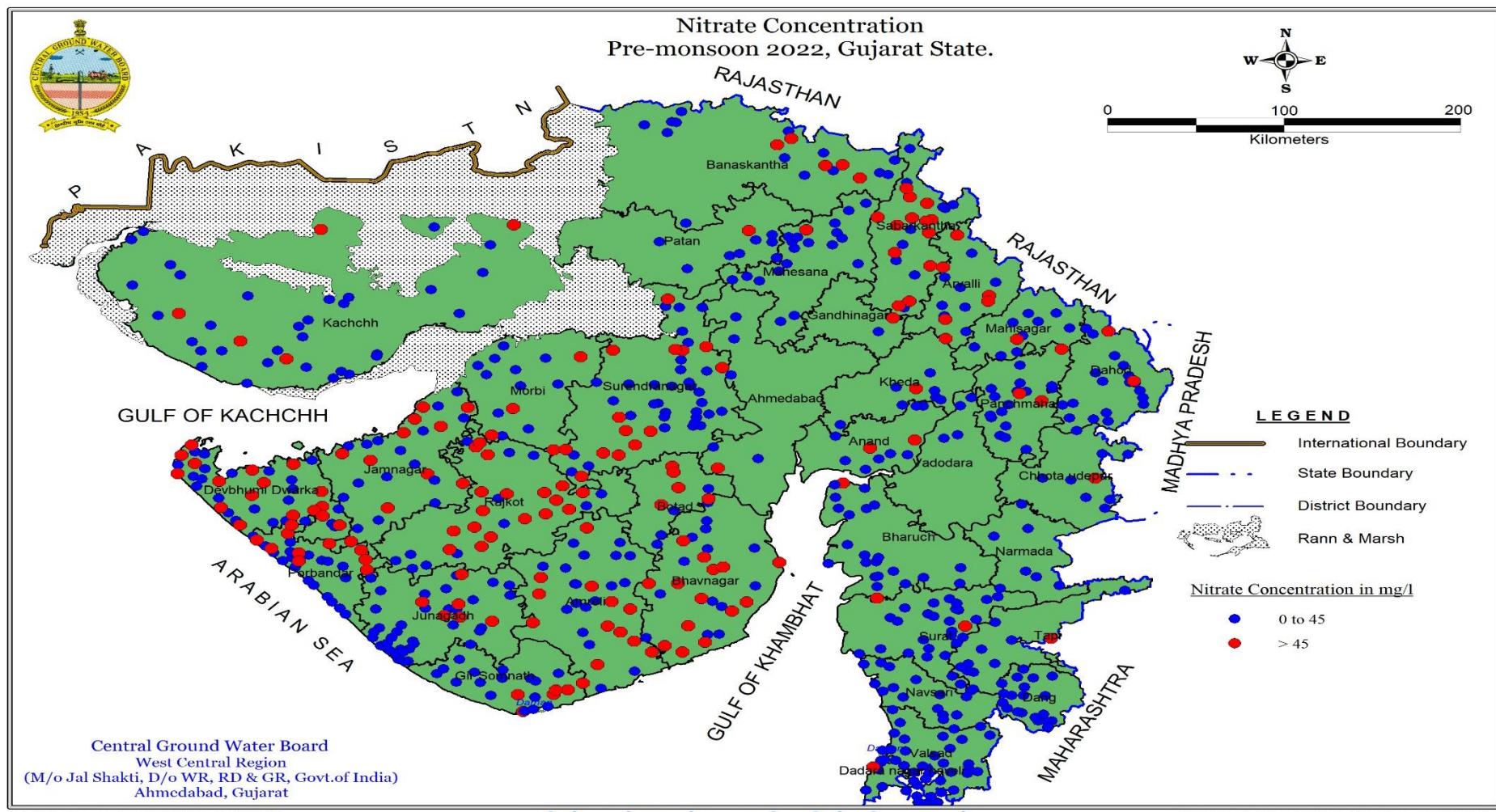
Range of Nitrate in mg/l	0-45	>45
No. of Samples	165	517
% of samples	24	76

Chart 3 depicts the Nitrate range in shallow ground water of Gujarat.



The map showing distribution of nitrate in the state is represented in **Map 3**.

Map 3



3.2.4 Fluoride

Fluorine is a fairly common element but it does not occur in the elemental state in nature because of its high reactivity. Fluorine is the most electronegative and reactive of all elements that occur naturally within many types of rocks. It exists in the form of fluorides in a number of minerals of which Fluorspar , Cryolite, Fluorite & Fluorapatite are the most common.

Most of the fluoride found in groundwater is naturally occurring from the breakdown of rocks and soils or weathering and deposition of atmospheric particles. Most of the fluorides are sparingly soluble and are present in groundwater in small amount. The type of rocks, climatic conditions, nature of hydro geological strata and time of contact between rock and the circulating groundwater affect the occurrence of fluoride in natural water. Presence of other ions particularly bicarbonate and calcium ions also affects the concentration of fluoride in groundwater.

It is well known that small amount of fluoride ($>1.0 \text{ mg/l}$) have proven to be beneficial in reducing tooth decay. However, high concentrations ($>1.5\text{mg/l}$) have resulted in staining of tooth enamel while at still higher levels of fluoride ($> 5.0 \text{ mg/l}$) further critical problems such as stiffness of bones occur.

BIS has recommended a desirable limit of 1.0 mg/l of fluoride concentration in drinking water and maximum permissible limit of 1.5 mg/l in case no alternative source of drinking water is available. Water having fluoride concentration more than 1.5mg/l is not suitable for drinking purposes.

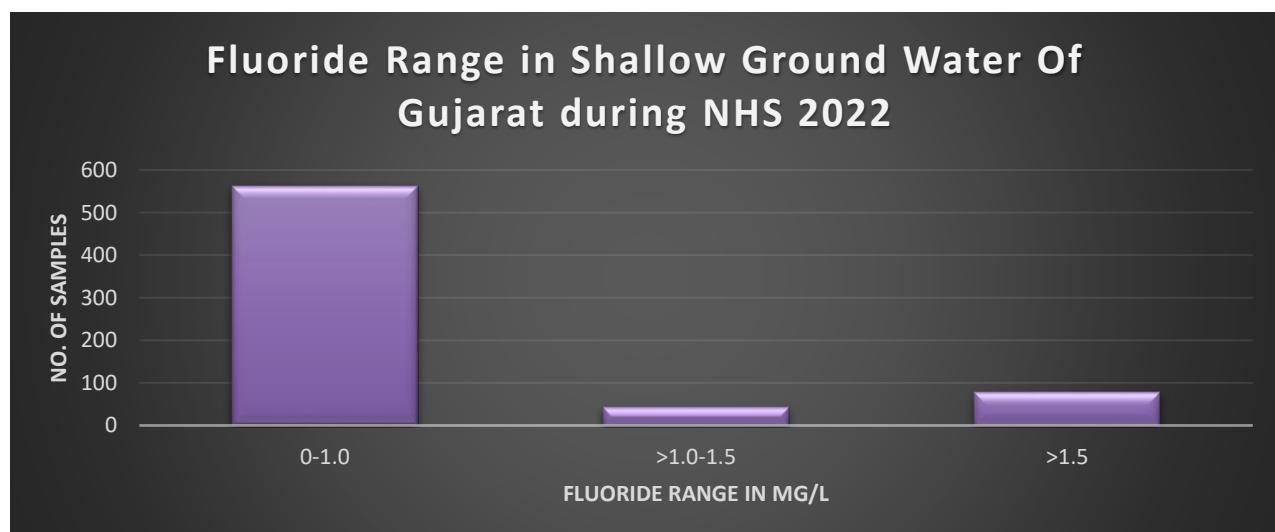
High Fluoride $>1.5\text{mg/l}$, (Table D) which is mainly attributed due to geogenic conditions, have been observed in 79 water samples out of 682 water samples analyzed. Highest Fluoride concentration (5.65 mg/l) was observed in the sample collected from Patan2 , Patan district .

The distribution of samples in different Fluoride ranges has been tabulated in the table

TABLE 4: Frequency Distribution of Fluoride

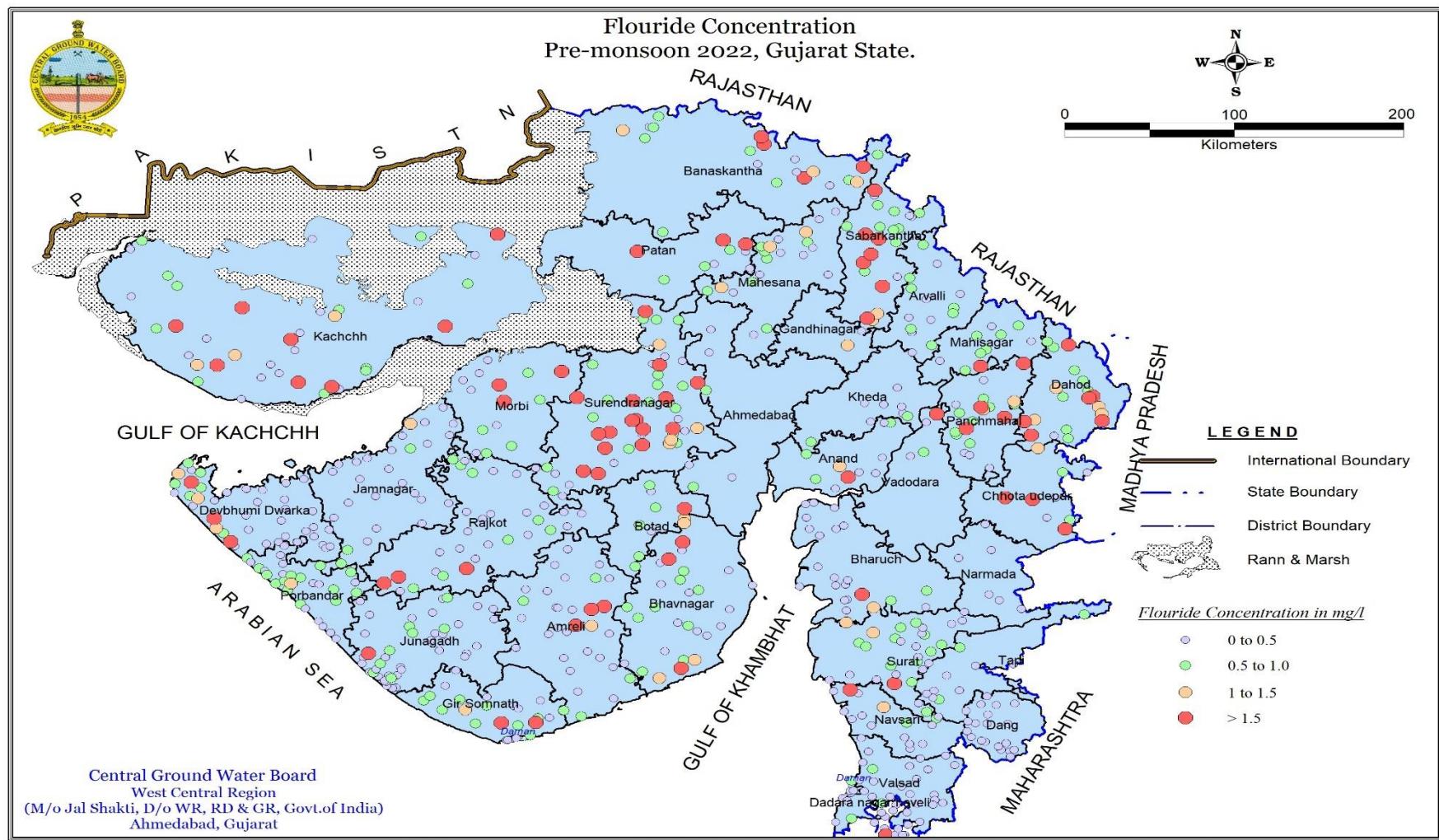
Range of Fluoride in mg/l	0-1.0	>1.0-1.5	>1.5
No. of Samples	561	42	79
% of samples	82.25	6.2	11.58

Chart 4 depicts the fluoride range in shallow ground water of Gujarat



The map showing distribution of Fluoride in the state is represented in **Map 4**.

Map 4



4. Uranium

Uranium is a naturally occurring element that can be found in low levels within all rock, soil, and water. Uranium is the 51st element in order of abundance in the Earth's crust. Uranium occurs naturally in low concentrations of a few parts per million in soil, rock and water, and is commercially extracted from uranium-bearing minerals such as uraninite. In nature, uranium is found as uranium-238 (99.2739–99.2752%), uranium-235 (0.7198–0.7202%), and a very small amount of uranium-234 (0.0050–0.0059%). Salts of many oxidation states of uranium are water-soluble and may be studied in aqueous solutions. The most common ionic forms are U³⁺ (brown-red), U⁴⁺(green), UO₂₊ (unstable), and UO₂²⁺ (yellow), for U(III), U(IV), U(V), and U(VI), respectively.

Uranium is present in the environment as a result of leaching from natural deposits, release in mill tailings, emissions from the nuclear industry, the combustion of coal and other fuels and the use of phosphate fertilizers that contain uranium. Uranium-235 is the only naturally occurring fissile isotope, which makes it widely used in nuclear power plants and nuclear weapons. Uranium is used mainly as fuel in nuclear power stations, although some uranium compounds are also used as catalysts and staining pigments.

Intake through drinking-water is normally low; however, in circumstances in which uranium is present in a drinking-water source, the majority of intake can be through drinking-water. The direct evidence of impact of uranium exposure to human health is present as it has been proved that consumption of drinking water contaminated with uranium can cause chronic kidney disease, deformity of bones and liver. Normal functioning of the kidney, brain, liver, heart, and other systems can be affected by uranium exposure, because, besides being weakly radioactive, uranium is a toxic metal. Uranium is also a reproductive toxicant. Radiological effects are generally local because alpha radiation, the primary form of ²³⁸U decay, has a very short range, and will not penetrate skin. Alpha radiation from inhaled Uranium has been demonstrated to cause lung cancer in exposed nuclear workers.

Chronic exposure of Uranium radionuclide in drinking water is a potential health risk (Blantz, Pelayo, Gushwa, Myers, & Evan, 1985). Although ubiquitous in the environment, Uranium has no known metabolic function in animals and is currently regarded as non-essential. Uranium accumulated in human results in chemical and radioactive effects. The principal sites of Uranium deposition in the body are the kidneys, the liver and the bones. The toxicity of Uranium is a function of the route of exposure, particle solubility, contact time, and route of elimination (ATSDR, 1999). The concentrations of radiotoxic elements like Uranium in drinking water are hence kept under vigil by different health organizations.

The World Health Organization (WHO, 2004) had earlier recommended a reference level 15 µg/l but now the permissible limit of U in drinking water by WHO is 30 µg/l (WHO, 2011). The reference level is derived from epidemiological studies, based on the assumption of a 60 kg adult consuming 2 litres of drinking water per day and 80% allocation of the Tolerable Daily Intake (TDI) to drinking water. Maximum acceptable level of U in drinking water as per guidelines of India's Atomic Energy Regulatory Board, Department of Atomic Energy, is 60 µg/l (AERB, 2004).

The following techniques may be used for the removal of Uranium -

1. Combined removal of Uranium and Radium can be achieved using a mixed bed containing 10% strong base anion resin (for removal of Uranium) and strong acid cation resin (for removal of Radium) (Clifford & Zhang, 1994).
2. A domestic-scale reverse osmosis unit removed greater than 99.9% of Uranium from initial concentrations of 69 and 183 µg/litre (Fox & Sorg, 1987).

3. Five nanofiltration membranes were tested for the removal of Uranium (1 mg/litre) from synthetic solutions. In test waters containing bicarbonate and around neutral pH, all the membranes gave removals of 95% or more (Raff & Wilken, 1999).

4. Other techniques that can be used for removal of Uranium include adsorption onto modified GAC (Coleman et al., 2003), bone charcoal and apatite (Bostick et al., 2000) and chitosan (Gerente et al., 1999). Zero valent iron can also be used for Uranium removal (Abdelouas et al., 1999; Farrell et al., 1999; Morrison et al., 2003).

A total of 681 Samples for analysing Uranium in shallow aquifers of Gujarat were collected during NHS 2022 which was analysed using Fluorimeter at Regional Chemical laboratory. Uranium was found to be within the permissible limit of 30 ppb in all the samples collected from Groundwater monitoring network stations except two samples . at 55.24 ppb at Barvala, Botad District and 40.64 ppb at Govindpura, Chota udepur district.

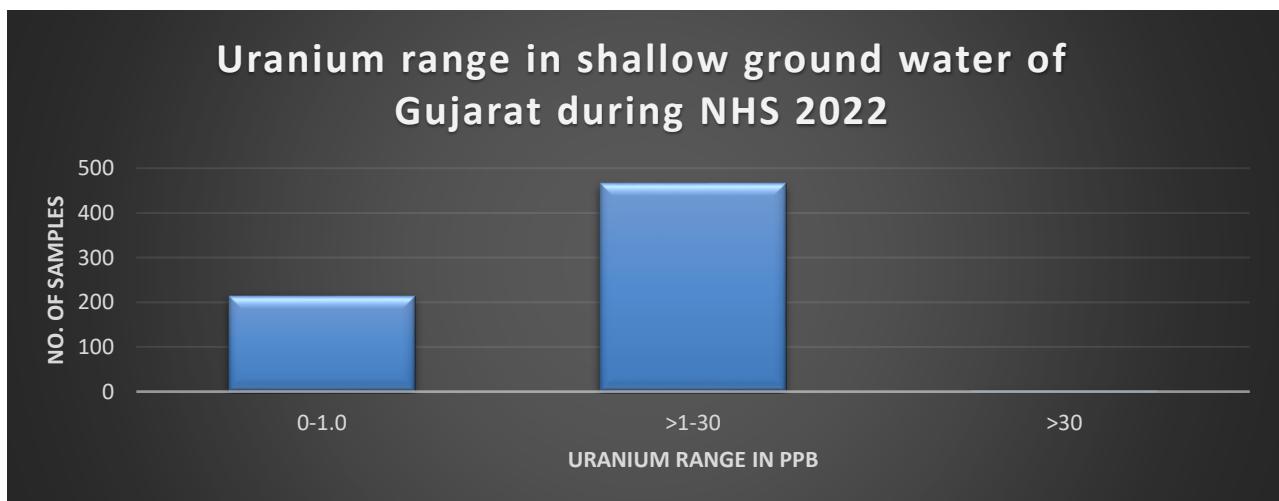
Uranium was found to be in the range of nd to 55 ppb. Most of the high Uranium groundwater tested also had issues like high salinity, fluoride, and nitrate, which makes them unsuitable for human consumption. It seems that the plausible source of high Uranium observed in this region may be of geogenic in nature.

The frequency distribution is of Uranium is shown in the following table:

TABLE 5: Frequency distribution of Uranium

Range of Uranium in ppb	0-1.0	>1-30	>30
No. of Samples	214	465	2
% of samples	31	68	0

Chart 5. depicts the range of Uranium in shallow ground water of Gujarat



5. SUITABILITY FOR AGRICULTURAL AND GENERAL DOMESTIC USE

The suitability of irrigation water is mainly depends on the amounts and type of salts present in water. The productivity of irrigation has been hampered by high amounts of soluble ions in irrigation water; this water affects crop and soil fertility. The biochemical effects disturb crop metabolism. The main soluble constituents are calcium, magnesium, sodium as cations and chloride, sulphate, bicarbonate as anions. The other ions are present in minute quantities are boron, selenium, molybdenum and fluorine which are harmful to animals fed on plants grown with excess concentration of these ions. The important parameters that affect the suitability of water for irrigation, which can be utilized to verify the suitability, are explained below. The calculation of various Indices is summarized in Annexure 4.

5. 1. Salinity Index

Based on the analysis, the groundwater samples have been classified and are given in table below.

EC	0-250	251 - 750	751-2250	2251-5000	>5000
Salinity	Low	Medium	High	Very high	Extensively high
No of samples	2	164	341	125	50
%	0.29	24	50	18	7.33

Table 11. Classification of waters based on of EC.

It is found that most of the samples (50%) collected during NHS 2022-23 are categorized under high salinity classes.

5.2. SAR or Sodicity Index

High sodium-depositing waters are largely not appropriate for watering the soils, as developed deposition of sodium may worsen the soil physical characteristics. Therefore, SAR is reflected a superior quantity of sodium threat in irrigation, as SAR of water is directly connected to the adsorption of sodium by topsoil and is a valued measure for decisive the appropriateness of the water for irrigation. The SAR is used to predict the sodium hazard of high carbonate waters, particularly if they contain no residual alkali. The SAR which is computed as below.

$$SAR = \frac{Na^+}{\left\{ \frac{Ca^{2+} + Mg^{2+}}{2} \right\}^{0.5}}$$

where all cationic concentrations are expressed in equivalents per million or mill equivalents per litre.

The grouping of groundwater samples from state of Gujarat with respect to SAR is represented in Table 12 .

During NHS 2022-23, the SAR value of most of the samples were found to S1 and are classified as Excellent for irrigation

SAR values	Sodium hazard class	Remark	Sample	% of samples
<10	S1	Excellent	611	89.59
10 to 18	S2	Good	56	8.21
19 - 26	S3	Doubtful/fair poor	9	1.32
>26	S4 and S5	Unsuitable	6	0.88

5.3. Percent Na:

The Wilcox (1995) and Richards (1954) have been used to categorize and recognize the elementary properties of the chemical composition of groundwater, since the mineral properties of water that effects plants and soil are measured by the suitability groundwater for irrigation. Percent sodium can be determined using the following formula:

$$\% \text{Na} = \left(\frac{\text{Na}^+ + \text{K}^+}{(\text{Ca}^{2+} + \text{Mg}^{2+} + \text{Na}^+ + \text{K}^+)} \right) * 100$$

where the quantities of Ca^{2+} , Mg^{2+} , Na^+ and K^+ are expressed in milliequivalents per liter or equivalents per million.

The classification of groundwater samples with respect to percent sodium is shown in Table 13 and it was found that majority samples (34%) fall under Good category while only 4% samples were found to be unsuitable for irrigation.

Table 13. Shallow aquifer groundwater classification based on percent sodium.

Sodium (%)	Water class	No of samples	Range (% samples)
<20	Excellent	91	13.34
20 - 40	Good	232	34.02
41 - 60	Permissible	209	30.65
61 - 80	Doubtful	121	17.74
>80	Unsuitable	29	4.25

5.4. Soluble Sodium Percentage (SSP)

Groundwater quality for agricultural purposes in the Gujarat State shows **good quality water and suitable for irrigation** based on Todd's classification of SSP values, which is calculated as:

$$\text{SSP} = \left(\frac{\text{Na}^+}{(\text{Ca}^{2+} + \text{Mg}^{2+} + \text{Na}^+)} \right) * 100$$

where all concentrations are in milliequivalents per liter.
Out of 682 samples, 80% samples suitable for irrigation, 20% samples unsuitable for irrigation.

Table 14 Classification of groundwater on the basis of SSP

SSP of water	suitability	No of samples	Range (% samples)
< 60 per cent	good quality and suitable for irrigation	543	79.62
> 60 per cent	poor quality water and unsuitable for irrigation	139	20.38

5.5. Residual Sodium Carbonate (RSC)

In addition to the SAR and %Na, the additional carbonate in groundwater over the sum of calcium and magnesium also influences the suitability of groundwater for irrigation. The high concentration sodium bicarbonate and carbonate is measured the damaging physical properties of soils, as there is tendency for calcium and magnesium to precipitate as the water in the soil. The relative proportion of sodium in the water is increased in the form of sodium carbonate, and this excess, denoted by RSC, is calculated as follows

$$RSC = (CO_3 + HCO_3) - (Ca + Mg)$$

where all ionic concentrations are expressed in milliequivalents per liter.

The groundwater during NHS 2022-23 is classified on the basis of RSC after Richards 1954 and the results are presented in Table 15 . Based on the RSC values, 9.53% samples showed RSC values more than 2.50 epm, reflected to unsuitable for irrigation. The negative RSC values in 504 samples indicated that dissolve Ca^{2+} and Mg^{2+} ion contents was more than the CO_3^{2-} and HCO_3^- contents. The majority samples (86%) were having a RSC value below 1.25 epm, and only 4% belong to the doubtful category.

Table 9. Groundwater quality based on RSC

RSC (epm)	Remark on quality	No of samples	% of samples
<1.25	Good	588	86.22
1.25 - 2.50	Doubtful	29	4.25
>2.50	Unsuitable	65	9.53

5.6. Permeability Index (PI)

The PI values also indicate suitability of groundwater for irrigation, as the soil permeability is affected by long-term use of irrigation water, influenced by the Na^+ , Ca^{2+} , Mg^{2+} , and HCO_3^- contents of the soil. Ragunath (1987) and Doneen (1964) evolved a standard for measuring the suitability of water for irrigation based on PI, and waters can be classified as classes 1, 2, and 3.

The PI can be written as follows:

$$PI = \frac{Na^+ + \sqrt{HCO_3^-}}{(Ca^{2+} + Mg^{2+} + Na^+)} * 100$$

where the concentrations are reported in milliequivalents per liter.

According to the permeability index values, 76% of the samples fall under class 2 corresponding to Good (PI ranged from 25% to 75%) and 18% samples belong to class unsuitable (PI < 25%) in the NHS 2022-23

Table 16. Classification of irrigation water based on the permeability index.

PI	Indication	No of samples	Range (% samples)
>75%	Excellent	46	6.74
25% - 75%	Good	516	75.66
<25%	Unsuitable	120	17.60

5.7. Kelly's Index (KI)

Sodium measured against Ca^{2+} and Mg^{2+} is used to calculate Kelley's ratio. A Kelly's index of more than 1 shows an extra concentration of sodium in waters (Table 11). Hence, groundwater's with a Kelly's index less than 1 are suitable for irrigation, while those with a ratio more than 1 are unsuitable. Kelly's index calculation in the NHS 2022-23 reflected that 50% samples are suitable while 50% samples were unsuitable for irrigation.

Table 17. Kelley's ratio

K.I.	Indication	No of samples	Range (% samples)
<1	Suitable	343	50.29
>1	Unsuitable	339	49.71

5.8. Magnesium Hazard (MH)

The Calcium and magnesium do not behave equally in the soil system, and magnesium deteriorates soil structure particularly when waters are sodium dominated and highly saline. A high level of Mg is usually due to the presence of exchangeable Na in irrigated soils. Paliwal (1972) introduced an important ratio called index of magnesium hazard. Magnesium hazard value of more than 50% would adversely affect the crop yield as the soils become more alkaline:

The magnesium hazard (MH) parameter is widely used to evaluate the water quality for the irrigation, it was given as:

$$MH = \frac{Mg^{2+}}{(Ca^{2+} + Mg^{2+})} \times 100$$

Table 18: Classification as per MH.

MH	Indication	No of samples	Range (% samples)
<50	suitable and not harmful	327	47.95
>50	harmful and unsuitable for irrigation	355	52.05

Out the 682 samples, 48% of the samples showed a magnesium ratio below 50, suggesting their suitability, while 52% fall in the unsuitable category with MH more than 50, indicating their adverse effect on crop yield (Table 12).

6. Suitability for Drinking Use (Ground water quality Index)

Water Quality Index(WQI) provides a single number that expresses the overall water quality at a certain location and time, based on several water quality parameters. The objective of WQI is to turn complex water quality data into information that is understandable and usable by the public.

A number of indices have been developed to summarize water quality data in an easily expressible and easily understood format. The WQI is basically a mathematical means of calculating a single value from multiple test results. The WQI is based on the measurement of different water Quality parameters. Thus, providing a mechanism for presenting a cumulatively derived numerical expression for defining water Quality.

The method follows three steps mainly:

1. Selection of parameters.
2. Determination of quality function for each parameter
3. Aggregation through mathematical equation.

The WQI is calculated by averaging the individual index values of some or all of the parameters within quality parameter categories that depicts the pollution level or status of the water.

The weighted arithmetic WQI method (Yisa J, Jimoh T.) was applied to assess water suitability for drinking purposes. In this method, water quality rating scale, relative weight, and overall WQI were calculated by the following formulae:

$$q_i = \frac{C_i}{S_i} \times 100$$

where q_i , C_i , and S_i indicated quality rating scale, concentration of i parameter, and standard value of i parameter, respectively.

Relative weight was calculated by

$$w_i = \frac{1}{S_i}$$

where the standard value of the i parameter is inversely proportional to the relative weight. Finally, overall WQI was calculated according to the following expression:

$$WQI = \frac{\sum q_i w_i}{\sum w_i}$$

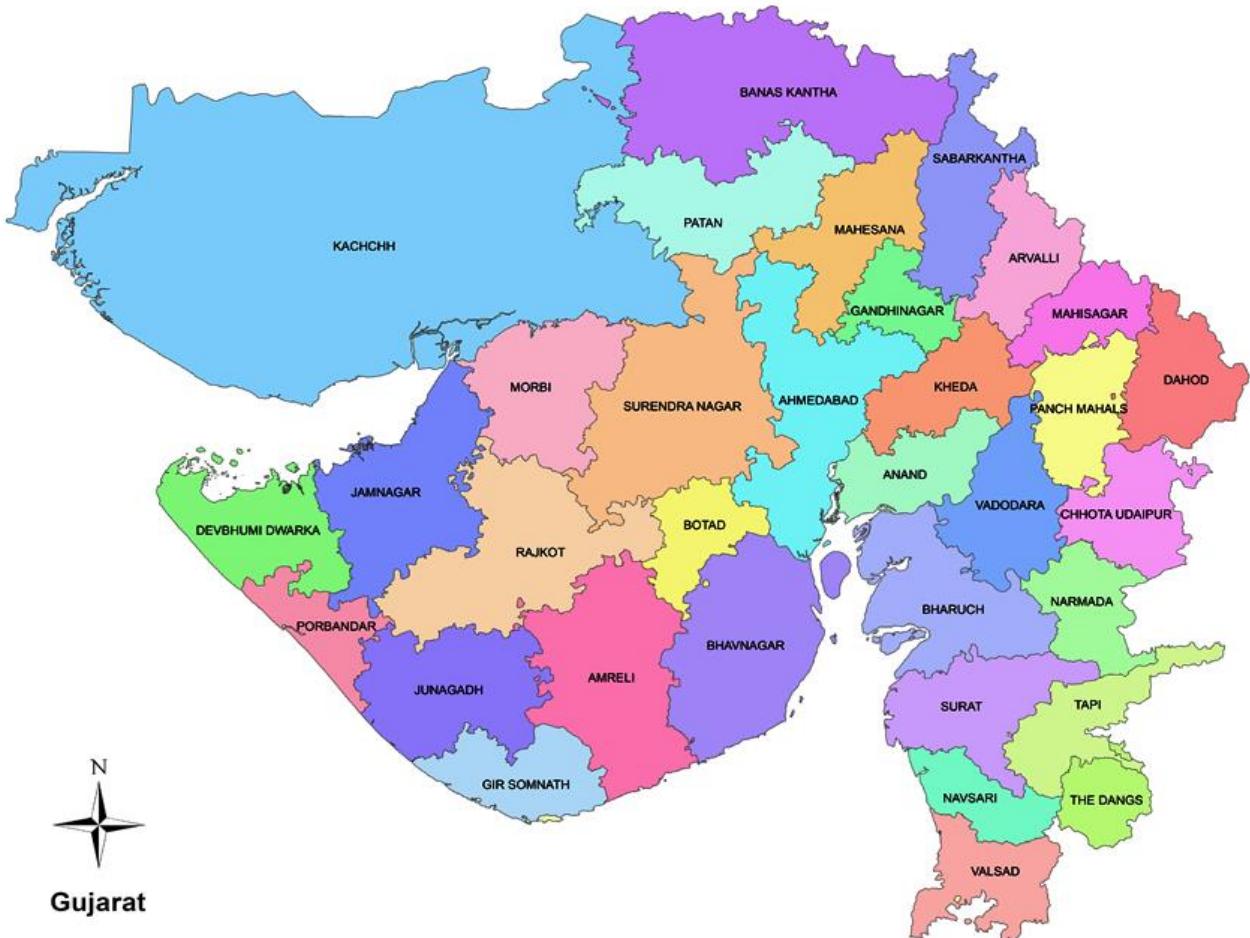
The Ground- water quality index value for irrigation is calculated for each sample (Annexure 5). It has been observed that the majority of the samples (43 %) belong to the Class II category, representative that the water is of good quality. While it can also be inferred that about 6.3% water samples were unsuitable for drinking.

WQI range and water type:	Indication	Class	No. Of samples	% of samples
< 50	Excellent water;	I	78	11.44
50- 100	Good water;	II	296	43.40
101- 200	Poor water;	III	202	29.62
201– 300	Very poor water;	IV	63	9.24
> 300	Water unsuitable for drinking.	V	43	6.30

Table 19. Groundwater quality Index value for drinking and Domestic use for NHS 2022-23.

7. Districtwise Water Quality Scenario in Gujarat

The Water quality with respect to Basic Parameters in 33 Districts of Gujarat and UT of Daman, Diu, Dadra Nagar Haveli has been described below.



7.1 AHMEDABAD

- EC found in Ahmedabad district ranges from 550 $\mu\text{S}/\text{cm}$ to 11870 $\mu\text{S}/\text{cm}$ with an average of 4913 $\mu\text{S}/\text{cm}$. The locations showing higher EC are Kumarkhan (11870) , Tagadi1 (3790) , Viramgam2 (6920)
- The Concentration of Chloride in ground water in Ahmedabad district varies between 64 mg/l and 3013 mg/l with an average of 1051 mg/l. The locations showing higher chloride concentration are Kumarkhan (3013),Viramgam 2 (1560)
- Fluoride concentration in Ahmedabad district varies from 0 mg/l to 0.96 mg/l with an average of 0.49 mg/l.
- The Concentration of Nitrate in ground water in Ahmedabad district varies between 0.68 mg/l to 70 mg/l with an average of 18 mg/l.The location showing higher nitrate concentration is Tagadi1 (70)
- Alkalinity in ground water in the district ranges from 190 mg/l to 1161 mg/l having an average of 604 mg/l while Total hardness in ground water in the district is found between 190 mg/l and 1952 mg/l with an average of 715 mg/l.
- In this district, the concentration of sodium ranges from 42 mg/l to 2109 mg/l and has an average of 858 mg/l while the Concentration of Potassium in ground water in the district varies between 9.3mg/l and 37 mg/l with an average of 23.5 mg/l.

7.2 AMRELI

- EC found in Amreli district ranges from 950 $\mu\text{S}/\text{cm}$ to 4900 $\mu\text{S}/\text{cm}$ with an average of 2123 $\mu\text{S}/\text{cm}$. The locations showing higher EC are Sanaria(6050), Bhuva(5000), Bherai(5122), Mandal(4700)

- The Concentration of Chloride in ground water in Amreli district varies between 128 mg/l and 1370 mg/l with an average of 498 mg/l. The locations showing higher chloride concentration are Jafrabad(1285), Rajula(1136)
- Fluoride concentration in Amreli district varies from 0.32 mg/l to 0.41 mg/l with an average of 0.36 mg/l.
- The Concentration of Nitrate in ground water in Amreli district varies between 18.88mg/l to 151 mg/l with an average of 69 mg/l. The locations showing higher nitrate concentration are Piyava(80), Bhuvu (85), Trakuda (55) , Mandal (228), Vanot (48), Goradka (85), Badhda (85), Boradi (71), Bagasara (164), Vaghania juna (51), Untvad (110), Devaliya (151)
- Alkalinity in ground water in the district ranges from 110mg/l to 240 mg/l having an average of 170 mg/l while Total hardness in ground water in the district is found between 330 mg/l and 1830 mg/l with an average of 660 mg/l.
- In this district, the concentration of sodium ranges from 63 mg/l to 241 mg/l and has an average of 156 mg/l while the Concentration of Potassium in ground water in the district varies between 0.4 mg/l and 10 mg/l with an average of 2.8 mg/l.

7.3 ANAND

- EC found in district ranges from 720 $\mu\text{S}/\text{cm}$ to 5223 $\mu\text{S}/\text{cm}$ with an average of 2556 $\mu\text{S}/\text{cm}$. The location showing higher EC is Kansari1(5223)
- The Concentration of Chloride in ground water in district varies between 43mg/l and 1141 mg/l with an average of 397 mg/l. The location showing higher chloride concentration is Kansari1 (1141)
- Fluoride concentration in district varies from 0.32 mg/l to 1.5 mg/l with an average of 0.77 mg/l.
- The Concentration of Nitrate in ground water in district varies between 12.63 mg/l to 106 mg/l with an average of 40 mg/l. The locations showing higher nitrate concentration are Adas_DW (91), Dharmaj (106)
- Alkalinity in ground water in the district ranges from 280 mg/l to 721mg/l having an average of 534 mg/l while Total hardness in ground water in the district is found between 240 mg/l and 791 mg/l with an average of 462 mg/l.
- In this district, the concentration of sodium ranges from 56 mg/l to 958 mg/l and has an average of 381 mg/l while the Concentration of Potassium in ground water in the district varies between 0.9 mg/l and 23 mg/l with an average of 7.4 mg/l.

7.4 ARVALLI

- EC found in district ranges from 535 $\mu\text{S}/\text{cm}$ to 3080 $\mu\text{S}/\text{cm}$ with an average of 1319 $\mu\text{S}/\text{cm}$. The location showing higher EC is Boral (3080)
- The Concentration of Chloride in ground water in district varies between 36 mg/l and 675 mg/l with an average of 209 mg/l.
- Fluoride concentration in district varies from 0.12 mg/l to 0.98 mg/l with an average of 0.53 mg/l.
- The Concentration of Nitrate in ground water in district varies between 3.27 mg/l to 100 mg/l with an average of 44 mg/l. The locations showing higher nitrate concentration are Gadada (100), Takatuka_1 (72), Hamirpur (66), Malpur_1 (64), Boral (76), Bibipur1 (78)
- Alkalinity in ground water in the district ranges from 140mg/l to 440mg/l having an average of 230 mg/l while Total hardness in ground water in the district is found between 190 mg/l and 890 mg/l with an average of 443 mg/l.
- In this district, the concentration of sodium ranges from 29 mg/l to 345mg/l and has an average of 115 mg/l while the Concentration of Potassium in ground water in the district varies between 0.6 mg/l and 3.12 mg/l with an average of 1.7 mg/l.

7.5 BANASKANTHA

- EC found in district ranges from 525 $\mu\text{S}/\text{cm}$ to 6225 $\mu\text{S}/\text{cm}$ with an average of 1555 $\mu\text{S}/\text{cm}$. The locations showing higher EC are Gangodra(4220), DUDHVA (6225)
- The Concentration of Chloride in ground water in district varies between 43 mg/l and 1583 mg/l with an average of 274mg/l. The locations showing higher chloride concentration are Gangodra (1044), DUDHVA(1583)
- Fluoride concentration in district varies from 0.16 mg/l to 2.15 mg/l with an average of 0.94 mg/l.
- The Concentration of Nitrate in ground water in district varies between 8.52 mg/l to 81 mg/l with an average of 36 mg/l.The locations showing higher nitrate concentration are Meda (46), Gangodra (63)
- Alkalinity in ground water in the district ranges from 120mg/l to 700mg/l having an average of 296 mg/l while Total hardness in ground water in the district is found between 170 mg/l and 1770 mg/l with an average of 468 mg/l.
- In this district, the concentration of sodium ranges from 29 mg/l to 494mg/l and has an average of 140 mg/l while The Concentration of Potassium in ground water in the district varies between 0.7 mg/l and 274 mg/l with an average of 39.2 mg/l.

7.6 BHARUCH

- EC found in district ranges from 380 $\mu\text{S}/\text{cm}$ to 6860 $\mu\text{S}/\text{cm}$ with an average of 1926 $\mu\text{S}/\text{cm}$. The locations showing higher EC are Kavi(3710), Tankari (6860), Jambusar2(4375), Navetha(3780), Sajod (3261), Sahol (3940)
- The Concentration of Chloride in ground water in district varies between 28 mg/l and 1418 mg/l with an average of 363mg/l. The locations showing higher chloride concentration are Tankari(1418), Jambusar2(1049), Navetha(1042), Sahol(1049)
- Fluoride concentration in district varies from 0.1 mg/l to 4 mg/l with an average of 0.68 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0.02 mg/l to 85 mg/l with an average of 12 mg/l.The locations showing higher nitrate concentration are Kavi(85), Sahol(53)
- Alkalinity in ground water in the district ranges from 140mg/l to 1221 mg/l having an average of 374 mg/l while Total hardness in ground water in the district is found between 100 mg/l and 1241 mg/l with an average of 412 mg/l.
- In this district, the concentration of sodium ranges from 18 mg/l to 940 mg/l and has an average of 251 mg/l while The Concentration of Potassium in ground water in the district varies between 0.5 mg/l and 903 mg/l with an average of 26.6 mg/l.

7.7 BHAVNAGAR

- EC found in district ranges from 650 $\mu\text{S}/\text{cm}$ to 10030 $\mu\text{S}/\text{cm}$ with an average of 2157 $\mu\text{S}/\text{cm}$. The locations showing higher EC are Vallbhipur(4460), Ukhrala(10030), Ghogha(3120), Mahuva(5130)
- The Concentration of Chloride in ground water in district varies between 43 mg/l and 2812 mg/l with an average of 375mg/l. The locations showing higher chloride concentration are Ukhrala (2812), Mahuva (1058)
- Fluoride concentration in district varies from 0.21 mg/l to 2.18 mg/l with an average of 0.72 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0.00 mg/l to 360 mg/l with an average of 71 mg/l.The locations showing higher nitrate concentration are Lonjdhara(75), Timbi2(79), Piparla(80), Amargadh(60), Ghogha(166), Trapaj(83), Talaja2(71), Bora(69), Mahuva(100), Dudhala(175), Khari (151), Kajavadar(360), Panchpipla(91), Gariyadhar(130), Vadal (102), Timbi2(180)

- Alkalinity in ground water in the district ranges from 35 mg/l to 820 mg/l having an average of 317 mg/l while Total hardness in ground water in the district is found between 70 mg/l and 1450 mg/l with an average of 444 mg/l.
- In this district, the concentration of sodium ranges from 38 mg/l to 1498 mg/l and has an average of 278 mg/l while The Concentration of Potassium in ground water in the district varies between 0.2 mg/l and 59 mg/l with an average of 5.6 mg/l.

7.8 BOTAD

- EC found in district ranges from 1150 $\mu\text{S}/\text{cm}$ to 6280 $\mu\text{S}/\text{cm}$ with an average of 2476 $\mu\text{S}/\text{cm}$. The location showing higher EC is Barvala(6280)
- The Concentration of Chloride in ground water in district varies between 227 mg/l and 760 mg/l with an average of 399mg/l.
- Fluoride concentration in district varies from 0.39 mg/l to 1.87 mg/l with an average of 0.75 mg/l.
- The Concentration of Nitrate in ground water in district varies between 1.60 mg/l to 300 mg/l with an average of 105 mg/l.The locations showing higher nitrate concentration are Tatam(226), Senthali(92), Kundali(92), Rajpada(300)
- Alkalinity in ground water in the district ranges from 60 mg/l to 1190 mg/l having an average of 356 mg/l while Total hardness in ground water in the district is found between 160 mg/l and 750 mg/l with an average of 394 mg/l.
- In this district, the concentration of sodium ranges from 166 mg/l to 1303 mg/l and has an average of 364 mg/l while The Concentration of Potassium in ground water in the district varies between 0.6 mg/l and 3.79 mg/l with an average of 1.8 mg/l.

7.9 CHHOTA UDEPUR

- EC found in district ranges from 548 $\mu\text{S}/\text{cm}$ to 5430 $\mu\text{S}/\text{cm}$ with an average of 1402 $\mu\text{S}/\text{cm}$. The location showing higher EC is Govindpura(5430)
- The Concentration of Chloride in ground water in district varies between 28mg/l and 1347 mg/l with an average of 211mg/l. The location showing higher chloride concentration is Govindpura (1347)
- Fluoride concentration in district varies from 0.29 mg/l to 2.15 mg/l with an average of 1.06 mg/l.
- The Concentration of Nitrate in ground water in district varies between 1.92 mg/l to 51 mg/l with an average of 22 mg/l.The location showing higher nitrate concentration is Panwad(51)
- Alkalinity in ground water in the district ranges from 160 mg/l to 741mg/l having an average of 318 mg/l while Total hardness in ground water in the district is found between 180 mg/l and 911 mg/l with an average of 379mg/l
- In this district, the concentration of sodium ranges from 27 mg/l to 866mg/l and has an average of 157 mg/l while the Concentration of Potassium in ground water in the district varies between 1.1 mg/l and 10 mg/l with an average of 4.1 mg/l.

7.10 DAHOD

- EC found in district ranges from 440 $\mu\text{S}/\text{cm}$ to 2400 $\mu\text{S}/\text{cm}$ with an average of 1084 $\mu\text{S}/\text{cm}$.
- The Concentration of Chloride in ground water in district varies between 14mg/l and 433 mg/l with an average of 126mg/l.
- Fluoride concentration in district varies from 0.23 mg/l to 2.7 mg/l with an average of 1.29 mg/l.

- The Concentration of Nitrate in ground water in district varies between 4.58 mg/l to 120 mg/l with an average of 32mg/l. The locations showing higher nitrate concentration are Garada(115), Dahod Urban-2(120)
- Alkalinity in ground water in the district ranges from 120 mg/l to 550mg/l having an average of 271mg/l while Total hardness in ground water in the district is found between 140 mg/l and 640 mg/l with an average of 311 mg/l.
- In this district, the concentration of sodium ranges from 35 mg/l to 390mg/l and has an average of 118 mg/l while the Concentration of Potassium in ground water in the district varies between 0.7 mg/l and 11 mg/l with an average of 3.6 mg/l.

7.11 DAMAN

- EC found in district ranges from 534 μ S/cm to 2377 μ S/cm with an average of 1059 μ S/cm.
- The Concentration of Chloride in ground water in district varies between 28mg/l and 390mg/l with an average of 167mg/l.
- Fluoride concentration in district varies from 0.15 mg/l to 0.62 mg/l with an average of 0.30 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0.08 mg/l to 7.20 mg/l with an average of 2.95mg/l.
- Alkalinity in ground water in the district ranges from 120 mg/l to 470mg/l having an average of 248mg/l while Total hardness in ground water in the district is found between 210 mg/l and 350 mg/l with an average of 274 mg/l.
- In this district, the concentration of sodium ranges from 13mg/l to 410mg/l and has an average of 112mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 16 mg/l with an average of 4.1 mg/l.

7.12 DANG

- EC found in district ranges from 362 μ S/cm to 651 μ S/cm with an average of 482 μ S/cm.
- The Concentration of Chloride in ground water in district varies between 14mg/l and 85mg/l with an average of 31mg/l.
- Fluoride concentration in district varies from 0.04 mg/l to 0.38 mg/l with an average of 0.18 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0.47 mg/l to 8.11 mg/l with an average of 1.49mg/l.
- Alkalinity in ground water in the district ranges from 150 mg/l to 250mg/l having an average of 190mg/l while Total hardness in ground water in the district is found between 130 mg/l and 300 mg/l with an average of 206 mg/l.
- In this district, the concentration of sodium ranges from 11mg/l to 84mg/l and has an average of 24mg/l while the Concentration of Potassium in ground water in the district varies between 0.2mg/l and 0.94 mg/l with an average of 0.4 mg/l.

7.13 DEVBHOOMI DWARKA

- EC found in district ranges from 517 μ S/cm to 11870 μ S/cm with an average of 2619 μ S/cm. The locations showing higher EC are Khakharda(5119), Gurgadh(3554), Kalyanpur(4966), Gorinja(3103), Gojines(5572)
- The Concentration of Chloride in ground water in district varies between 64mg/l and 4260mg/l with an average of 607 mg/l. The locations showing higher chloride concentration are Khakharda (1392), Kalyanpur(1136), Gojines(1491)
- Fluoride concentration in district varies from 0 mg/l to 2.45 mg/l with an average of 0.56 mg/l.

- The Concentration of Nitrate in ground water in district varies between 1.16 mg/l to 331 mg/l with an average of 54mg/l.The locations showing higher nitrate concentration are Bajana (93), Jampar(47), Asotamota(48), Khakharda(129), Gurgadh(230), Kalyanpur(331), Gojines(45), Mota gunda(71), Nawagam(117), Ambardi(123), Salaya(56), Hanzdapur(52), Mojap(52), Aramda(67), Dwarka(55), Lambha 1(47), Khirsara(61)
- Alkalinity in ground water in the district ranges from 30mg/l to 570mg/l having an average of 233mg/l while Total hardness in ground water in the district is found between 140 mg/l and 2450 mg/l with an average of 559mg/l.
- In this district, the concentration of sodium ranges from 46mg/l to 1771mg/l and has an average of 323mg/l while the Concentration of Potassium in ground water in the district varies between 0.4mg/l and 172 mg/l with an average of 12.7 mg/l.

7.14 DIU

- EC found in district ranges from 2000 μ S/cm to 12890 μ S/cm with an average of 5855 μ S/cm. The location showing higher EC is Zolawadi (12890)
- The Concentration of Chloride in ground water in district varies between 419 mg/l and 4580 mg/l with an average of 1832 mg/l. The locations showing higher chloride concentration are Zolawadi (4580)
- Fluoride concentration in district varies from 0.16 mg/l to 0.49 mg/l with an average of 0.35 mg/l.
- The Concentration of Nitrate in ground water in district varies between 2.73 mg/l to 125 mg/l with an average of 51 mg/l.The location showing higher nitrate concentration is Vanakbara(125)
- Alkalinity in ground water in the district ranges from 120mg/l to 440mg/l having an average of 247mg/l while Total hardness in ground water in the district is found between 560 mg/l and 3460 mg/l with an average of 1537mg/l.
- In this district, the concentration of sodium ranges from 150mg/l to 1364mg/l and has an average of 600mg/l while the Concentration of Potassium in ground water in the district varies between 7.2mg/l and 41 mg/l with an average of 27.7 mg/l.

7.15 DADRA NAGAR HAVELI

- EC found in district ranges from 219 μ S/cm to 1237 μ S/cm with an average of 538 μ S/cm.
- The Concentration of Chloride in ground water in district varies between 7 mg/l and 142 mg/l with an average of 57 mg/l.
- Fluoride concentration in district varies from 0.16 mg/l to 1.6 mg/l with an average of 0.38 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0.00 mg/l to 26mg/l with an average of 5 mg/l.
- Alkalinity in ground water in the district ranges from 70mg/l to 360mg/l having an average of 166mg/l while Total hardness in ground water in the district is found between 80mg/l and 330 mg/l with an average of 197mg/l.
- In this district, the concentration of sodium ranges from 11mg/l to 129mg/l and has an average of 37mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 1.82mg/l with an average of 0.9 mg/l.

7.16 GANDHINAGAR

- Only one sample was collected in the district whose EC was recorded as 2876 μ S/cm, the Concentration of Chloride in ground water in district is 503 mg/l, Fluoride concentration is 1.14 mg/l.The Concentration of Nitrate is 23 mg/l.Alkalinity in ground water in the district is 721 mg/l while Total

hardness in ground water in the district is 831 mg/l. In this district, the concentration of sodium is 329 mg/l while the Concentration of Potassium is 21 mg/l.

7.17 GIR SOMNATH

- EC found in district ranges from 468 μ S/cm to 3720 μ S/cm with an average of 1257 μ S/cm. The location showing higher EC is Nadiya Mandavi(3720)
- The Concentration of Chloride in ground water in district varies between 28 mg/l and 966 mg/l with an average of 213mg/l.
- Fluoride concentration in district varies from 0.09 mg/l to 1.9 mg/l with an average of 0.66 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0.41 mg/l to 105mg/l with an average of 34 mg/l. The locations showing higher nitrate concentration are Sametar(64), Una2 (46), Kansari (105), Dolasa(80)
- Alkalinity in ground water in the district ranges from 120mg/l to 460 mg/l having an average of 224mg/l while total hardness in ground water in the district is found between 160mg/l and 690 mg/l with an average of 333mg/l.
- In this district, the concentration of sodium ranges from 31mg/l to 451mg/l and has an average of 126mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 19mg/l with an average of 4.1 mg/l.

7.18 JAMNAGAR

- EC found in district ranges from 387 μ S/cm to 13980 μ S/cm with an average of 2268 μ S/cm. The locations showing higher EC are Jambuda(4533), Hadiyana (13980), Bedanpur (10950), Kesiya(4453)
- The Concentration of Chloride in ground water in district varies between 36 mg/l and 4480mg/l with an average of 531mg/l. The locations showing higher chloride concentration are Jambuda (1157), Hadiyana (4480), Bedanpur(3067), Kesiya(1250)
- Fluoride concentration in district varies from 0.00 mg/l to 1.06 mg/l with an average of 0.36 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0.31 mg/l to 149mg/l with an average of 44 mg/l. The locations showing higher nitrate concentration are Jambuda (71), Hadiyana(149), Bedanpur (65), Pithad(78), Dhrol2(55), Moti khavdi(58), Satapar(61)
- Alkalinity in ground water in the district ranges from 100mg/l to 490mg/l having an average of 210mg/l while Total hardness in ground water in the district is found between 70mg/l and 4120 mg/l with an average of 589mg/l.
- In this district, the concentration of sodium ranges from 25mg/l to 1892mg/l and has an average of 247mg/l while the Concentration of Potassium in ground water in the district varies between 0.2mg/l and 14mg/l with an average of 2.8 mg/l.

7.19 JUNAGADH

- EC found in district ranges from 372 μ S/cm to 12380 μ S/cm with an average of 1945 μ S/cm. The locations showing higher EC are Bantva(3025), Osa(12380), Shardagram(5304), Kanek(3665), Khorada1(6113), Arena(5927)
- The Concentration of Chloride in ground water in district varies between 14 mg/l and 4027mg/l with an average of 461mg/l. The locations showing higher chloride concentration are Osa(4027), Shardagram(1595), Kanek(1212), Khorada1(1943), Arena(1879)
- Fluoride concentration in district varies from 0.03 mg/l to 3.85 mg/l with an average of 0.39 mg/l.

- The Concentration of Nitrate in ground water in district varies between 0.05 mg/l to 80mg/l with an average of 29 mg/l. The locations showing higher nitrate concentration are Khokharda(80), Moti Kodiyar(77), Mendarda1(78), Anandpur(65), Chokli(70), Prempara(77)
- Alkalinity in ground water in the district ranges from 80mg/l to 440mg/l having an average of 212mg/l while Total hardness in ground water in the district is found between 120mg/l and 2102 mg/l with an average of 526mg/l.
- In this district, the concentration of sodium ranges from 12mg/l to 1894mg/l and has an average of 204mg/l while The Concentration of Potassium in ground water in the district varies between 0.2mg/l and 97mg/l with an average of 7.5 mg/l.

7.20 KUTCHCH

- EC found in district ranges from $430\mu\text{S}/\text{cm}$ to $7493\mu\text{S}/\text{cm}$ with an average of $3040\mu\text{S}/\text{cm}$. The locations showing higher EC are Ratanpur Khadir(4149), Sukhpar(6779), Lodai(3924), Kotaya(4156), Khavda(6234), Devisar(7493), Kharai_1(7162), Tera(4148), Mothala(5308), Bambhdai(7026), Mota Asambia (3537), Karagoga(3140), Vadala(4979), Shinaya(5795), Samkhiari(4636), Dolatpar(3874), Nani Tumbdi(4195)
- The Concentration of Chloride in ground water in district varies between 28 mg/l and 2092mg/l with an average of 715mg/l. The locations showing higher chloride concentration are Ratanpur Khadir(1064), Sukhpar(1595), Khavda(1631), Devisar(2092), Kharai_1(1843), Mothala(1489), Bambhdai(2092), Vadala(1205), Shinaya(1702), Samkhiari(1290)
- Fluoride concentration in district varies from 0.07 mg/l to 3.95 mg/l with an average of 1.05 mg/l.
- The Concentration of Nitrate in ground water in district varies between 0mg/l to 110mg/l with an average of 20mg/l. The locations showing higher nitrate concentration are Khavda(54), Tera(72), Ratanpur(maum.)(60), Kuda(110), Nani Tumbdi(78)
- Alkalinity in ground water in the district ranges from 60mg/l to 831mg/l having an average of 283mg/l while Total hardness in ground water in the district is found between 110mg/l and 2002 mg/l with an average of 652mg/l.
- In this district, the concentration of sodium ranges from 15mg/l to 987mg/l and has an average of 417mg/l while the Concentration of Potassium in ground water in the district varies between 1.0mg/l and 77mg/l with an average of 17 mg/l.

7.21 KHEDA

- EC found in district ranges from $895\mu\text{S}/\text{cm}$ to $7589\mu\text{S}/\text{cm}$ with an average of $2813\mu\text{S}/\text{cm}$. The locations showing higher EC are Ladvel(3480), Muliyad(7589)
- The Concentration of Chloride in ground water in district varies between 35 mg/l and 2162mg/l with an average of 591mg/l. The locations showing higher chloride concentration are Ladvel(1021), Muliyad(2162)
- Fluoride concentration in district varies from 0.0 mg/l to 0.98 mg/l with an average of 0.25 mg/l.
- The Concentration of Nitrate in ground water in district varies between 2.88 mg/l to 115mg/l with an average of 26mg/l. The location showing higher nitrate concentrationis Alina(115)
- Alkalinity in ground water in the district ranges from 190mg/l to 620mg/l having an average of 402mg/l while Total hardness in ground water in the district is found between 200mg/l and 1902 mg/l with an average of 694mg/l.
- In this district, the concentration of sodium ranges from 51mg/l to 987mg/l and has an average of 342mg/l while the Concentration of Potassium in ground water in the district varies between 0.9mg/l and 49mg/l with an average of 23.1 mg/l.

7.22 MAHESANA

- EC found in district ranges from $395\mu\text{S}/\text{cm}$ to $4105\mu\text{S}/\text{cm}$ with an average of $1776\mu\text{S}/\text{cm}$. The locations showing higher EC are Dasaj(4105), Maguna(4000), Dharpura(3800)
- The Concentration of Chloride in ground water in district varies between 14mg/l and 873mg/l with an average of 307mg/l .
- Fluoride concentration in district varies from 0.10 mg/l to 1.42 mg/l with an average of 0.60 mg/l .
- The Concentration of Nitrate in ground water in district varies between 0.31 mg/l to 58mg/l with an average of 20mg/l .The location showing higher nitrate concentration is Dasaj (58)
- Alkalinity in ground water in the district ranges from 120mg/l to 870mg/l having an average of 370mg/l while total hardness in ground water in the district is found between 160mg/l and 1290 mg/l with an average of 377mg/l .
- In this district, the concentration of sodium ranges from 16mg/l to 650mg/l and has an average of 230mg/l while the Concentration of Potassium in ground water in the district varies between 0.7mg/l and 150mg/l with an average of 45.3 mg/l .

7.23 MAHISAGAR

- EC found in district ranges from $505\mu\text{S}/\text{cm}$ to $1650\mu\text{S}/\text{cm}$ with an average of $968\mu\text{S}/\text{cm}$.
- The Concentration of Chloride in ground water in district varies between 28mg/l and 220mg/l with an average of 107mg/l .
- Fluoride concentration in district varies from 0.22 mg/l to 3.1 mg/l with an average of 0.86mg/l .
- The Concentration of Nitrate in ground water in district varies between 3.91 mg/l to 52mg/l with an average of 17mg/l .The location showing higher nitrate concentration is Lunawada(52)
- Alkalinity in ground water in the district ranges from 180mg/l to 460mg/l having an average of 285mg/l while total hardness in ground water in the district is found between 200mg/l and 670 mg/l with an average of 318mg/l .
- In this district, the concentration of sodium ranges from 36mg/l to 198mg/l and has an average of 92mg/l while the Concentration of Potassium in ground water in the district varies between 1.4mg/l and 29mg/l with an average of 5.8 mg/l .

7.24 MORBI

- EC found in district ranges from $528\mu\text{S}/\text{cm}$ to $7684\mu\text{S}/\text{cm}$ with an average of $2500\mu\text{S}/\text{cm}$. The locations showing higher EC are Modpar1(4700), Amar nagar(7684), Mathak(3999), Halvad2(4766)
- The Concentration of Chloride in ground water in district varies between 28mg/l and 2229mg/l with an average of 566mg/l . The locations showing higher chloride concentration are Modpar1 (1320.6), Amar nagar(2229.4), Halvad2(1150.2)
- Fluoride concentration in district varies from 0.26 mg/l to 2.75 mg/l with an average of 1.02mg/l .
- The Concentration of Nitrate in ground water in district varies between 2.37 mg/l to 102mg/l with an average of 28mg/l .The locations showing higher nitrate concentration are Neknam(77), Hadmatia(49.48), Halvad2(101.75)
- Alkalinity in ground water in the district ranges from 120mg/l to 440mg/l having an average of 265mg/l while Total hardness in ground water in the district is found between 200mg/l and 1560 mg/l with an average of 567mg/l .
- In this district, the concentration of sodium ranges from 36mg/l to 922mg/l and has an average of 294mg/l while The Concentration of Potassium in ground water in the district varies between 0.6mg/l and 24mg/l with an average of 7.7 mg/l .

7.25 NARMADA

- EC found in district ranges from $384\mu\text{S}/\text{cm}$ to $857\mu\text{S}/\text{cm}$ with an average of $636\mu\text{S}/\text{cm}$.
- The Concentration of Chloride in ground water in district varies between 14mg/l and 142mg/l with an average of 48mg/l .
- Fluoride concentration in district varies from 0.16 mg/l to 0.39 mg/l with an average of 0.31mg/l .
- The Concentration of Nitrate in ground water in district varies between 1.56 mg/l to 31mg/l with an average of 13mg/l .
- Alkalinity in ground water in the district ranges from 150mg/l to 340mg/l having an average of 220mg/l while Total hardness in ground water in the district is found between 170mg/l and 320 mg/l with an average of 243mg/l .
- In this district, the concentration of sodium ranges from 15mg/l to 85mg/l and has an average of 34mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 87mg/l with an average of 13.4 mg/l .

7.26 NAVSARI

- EC found in district ranges from $498\mu\text{S}/\text{cm}$ to $3700\mu\text{S}/\text{cm}$ with an average of $1186\mu\text{S}/\text{cm}$. The locations showing higher EC are Chinnam(3075), Abrama(3700)
- The Concentration of Chloride in ground water in district varies between 50mg/l and 950mg/l with an average of 175mg/l .
- Fluoride concentration in district varies from 0.15 mg/l to 1.56 mg/l with an average of 0.49mg/l .
- The Concentration of Nitrate in ground water in district varies between 1.06 mg/l to 36mg/l with an average of 12mg/l .
- Alkalinity in ground water in the district ranges from 160mg/l to 540mg/l having an average of 292mg/l while Total hardness in ground water in the district is found between 170mg/l and 961mg/l with an average of 333mg/l .
- In this district, the concentration of sodium ranges from 18mg/l to 365mg/l and has an average of 106mg/l while the Concentration of Potassium in ground water in the district varies between 0.4mg/l and 379mg/l with an average of 39.8 mg/l .

7.27 PANCHMAHAL

- EC found in district ranges from $495\mu\text{S}/\text{cm}$ to $2210\mu\text{S}/\text{cm}$ with an average of $1062\mu\text{S}/\text{cm}$.
- The Concentration of Chloride in ground water in district varies between 21mg/l and 362mg/l with an average of 129mg/l .
- Fluoride concentration in district varies from 0.28 mg/l to 3.0 mg/l with an average of 0.96mg/l .
- The Concentration of Nitrate in ground water in district varies between 6.32 mg/l to 90mg/l with an average of 27mg/l .The locations showing higher nitrate concentration are Godhra UR_2 (50), Suliyat(54), Ranipura(90)
- Alkalinity in ground water in the district ranges from 120mg/l to 490mg/l having an average of 268mg/l while total hardness in ground water in the district is found between 130mg/l and 810mg/l with an average of 357mg/l .
- In this district, the concentration of sodium ranges from 34mg/l to 174mg/l and has an average of 90mg/l while the Concentration of Potassium in ground water in the district varies between 0.2mg/l and 100mg/l with an average of 9.5 mg/l .

7.28 PATAN

- EC found in district ranges from $412\mu\text{S}/\text{cm}$ to $25940\mu\text{S}/\text{cm}$ with an average of $5208\mu\text{S}/\text{cm}$. The locations showing higher EC are Moti chander(25940), Gochanad (9451)
- The Concentration of Chloride in ground water in district varies between 21mg/l and 8933mg/l with an average of 1491mg/l . The locations showing higher chloride concentration are Moti chander(8933), Gochanad (2730)
- Fluoride concentration in district varies from 0.0 mg/l to 5.65 mg/l with an average of 1.38mg/l .
- The Concentration of Nitrate in ground water in district varies between 1.92 mg/l to 52mg/l with an average of 18mg/l .The location showing higher nitrate concentration is Patan2 (52)
- Alkalinity in ground water in the district ranges from 170mg/l to 896mg/l having an average of 419mg/l while Total hardness in ground water in the district is found between 190mg/l and 5404mg/l with an average of 1054mg/l .
- In this district, the concentration of sodium ranges from 15mg/l to 4143mg/l and has an average of 824mg/l while The Concentration of Potassium in ground water in the district varies between 4.5mg/l and 58mg/l with an average of 37.3 mg/l .

7.29 PORBANDAR

- EC found in district ranges from $404\mu\text{S}/\text{cm}$ to $7455\mu\text{S}/\text{cm}$ with an average of $2600\mu\text{S}/\text{cm}$. The locations showing higher EC are Bhavpura(3704), Visavada(3340), Kuchhadi(4450), Babda(7455), Mojiwana(6515), Hanumangadh1(3285), Kutiyana1(6002), Bhoddar(4365), Oddar(7002), Ratia(3156)
- The Concentration of Chloride in ground water in district varies between 43mg/l and 2276mg/l with an average of 610mg/l . The locations showing higher chloride concentration are Kuchhadi (1099), Babda (2276), Mojiwana(1893), Kutiyana1(1560), Oddar(1985)
- Fluoride concentration in district varies from 0.0 mg/l to 1.34 mg/l with an average of 0.50mg/l .
- The Concentration of Nitrate in ground water in district varies between 0.5 mg/l to 112mg/l with an average of 39mg/l . The locations showing higher nitrate concentration are Bhavpura(97), Palkhada1(105), Mojiwana(52), Adwana2(57), Bakharla(112), Kolikhada village-2(67), Hanumangadh1(52), Khageshri(66), Dhruvala(53), Kutiyana1(97)
- Alkalinity in ground water in the district ranges from 70mg/l to 500mg/l having an average of 250mg/l while Total hardness in ground water in the district is found between 140mg/l and 1821mg/l with an average of 494mg/l .
- In this district, the concentration of sodium ranges from 26mg/l to 1281mg/l and has an average of 362mg/l while the Concentration of Potassium in ground water in the district varies between 0.5mg/l and 235mg/l with an average of 31.7 mg/l .

7.30 RAJKOT

- EC found in district ranges from $405\mu\text{S}/\text{cm}$ to $7177\mu\text{S}/\text{cm}$ with an average of $1859\mu\text{S}/\text{cm}$. The locations showing higher EC are Kamlapur(3131), Ganod(5853), Jetpur pithad.(4083), Movaiya(7177)
- The Concentration of Chloride in ground water in district varies between 28mg/l and 2031mg/l with an average of 346mg/l . The locations showing higher chloride concentration are Ganod(1185.7), Movaiya(2030.6)
- Fluoride concentration in district varies from 0.19 mg/l to 3.7 mg/l with an average of 0.60mg/l .
- The Concentration of Nitrate in ground water in district varies between 2.67 mg/l to 180mg/l with an average of 57mg/l .The locations showing higher nitrate concentration are Kamlapur(180), Bhadla(101), Lodhika1(53.68), Kolithad1(81.3), Jasapur(84), Dhoraji1(88), Jetpur pithad.(54.05), Umrali(71.1), Ribda

(50.08), Virpur1(73.4), Gogavadar(107), Mota dadwa(75.55), Viranagar(54.04), Halenda(136), Sardhar2(55.88), Targhari(64.34), Khamta(59.38), Movaiya(77)

- Alkalinity in ground water in the district ranges from 70mg/l to 610mg/l having an average of 249mg/l while Total hardness in ground water in the district is found between 140mg/l and 2880mg/l with an average of 596mg/l.
- In this district, the concentration of sodium ranges from 27mg/l to 970mg/l and has an average of 163mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 67mg/l with an average of 4.6 mg/l.

7.31 SABARKANTHA

- EC found in district ranges from 490 μ S/cm to 5040 μ S/cm with an average of 1775 μ S/cm. The locations showing higher EC are Khedbramha_1(3560), Silwad(5040)
- The Concentration of Chloride in ground water in district varies between 21mg/l and 1377mg/l with an average of 329mg/l. The location showing higher chloride concentration is Silwad(1377)
- Fluoride concentration in district varies from 0.12 mg/l to 4.45 mg/l with an average of 1.27mg/l.
- The Concentration of Nitrate in ground water in district varies between 7.2mg/l to 125mg/l with an average of 57mg/l. The locations showing higher nitrate concentration are Boriya(72), Harsol1(58), Kesarpura(Mayal)(81), Gadha1(66), Sabalwad(62), Chandap_DW(56), Wadali(82), Khedbramha_1(85), Matoda(60), Silwad(47), Mathasuliya(80), Kesharpura(80), Choriwad(125), Revas(125)
- Alkalinity in ground water in the district ranges from 110mg/l to 550mg/l having an average of 260mg/l while Total hardness in ground water in the district is found between 210mg/l and 1380mg/l with an average of 526mg/l.
- In this district, the concentration of sodium ranges from 26mg/l to 531mg/l and has an average of 189mg/l while the Concentration of Potassium in ground water in the district varies between 0.2mg/l and 29mg/l with an average of 4.8 mg/l.

7.32 SURAT

- EC found in district ranges from 441 μ S/cm to 2557 μ S/cm with an average of 995 μ S/cm.
- The Concentration of Chloride in ground water in district varies between 21mg/l and 695mg/l with an average of 133mg/l.
- Fluoride concentration in district varies from 0.04 mg/l to 1.7 mg/l with an average of 0.54mg/l.
- The Concentration of Nitrate in ground water in district varies between 3.54mg/l to 59mg/l with an average of 19mg/l. The locations showing higher nitrate concentration are Uchchhal(47), Mandvi(59)
- Alkalinity in ground water in the district ranges from 80mg/l to 440mg/l having an average of 259mg/l while Total hardness in ground water in the district is found between 200mg/l and 761mg/l with an average of 334mg/l.
- In this district, the concentration of sodium ranges from 6mg/l to 448mg/l and has an average of 90mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 20mg/l with an average of 2.2 mg/l.

7.33 SURENDRANAGAR

- EC found in district ranges from 506 μ S/cm to 24790 μ S/cm with an average of 3089 μ S/cm. The locations showing higher EC are Gangad(12070), Vaghela(5224), Limbdi1(6466), Surendranagar2(3121), Muli(5942), Gadah(4070), Nava Sudamda(6321), Dhajala(4545), Piprali(5018), Moti Moladi(5686), Ratanpur1(4032), Moti majethi(3606), Dhama(3037), Kharaghoda(24790), Kherwa(4093), Pipli (4385), Rajsitapur(6309)

- The Concentration of Chloride in ground water in district varies between 36mg/l and 8520mg/l with an average of 668mg/l. The locations showing higher chloride concentration are Gangad(2520.5), Muli(1427.1), Nava Sudama(1221.2), Dhajala(1121.8), Moti Moladi (1554.9), Kharaghoda (8520), Kherwa(1057.9), Rajsitapur(1988)
- Fluoride concentration in district varies from 0.27 mg/l to 5.15 mg/l with an average of 1.39mg/l.
- The Concentration of Nitrate in ground water in district varies between 0mg/l to 513mg/l with an average of 53mg/l. The locations showing higher nitrate concentration are Gangad(513), Navi Morvad(74.3), Gadah(66.9), Nava Sudamda(115.55), Sudamda(121.4), Dhajala(66.25). Piprali(237), Parabadi(131.85), Bamanbor(54.36), Moti Moladi (114.85), Kukavati(55.76), Moti majethi(164), Dhama(51.32), Malvan(95.95), Pipli(234.6)
- Alkalinity in ground water in the district ranges from 120mg/l to 580mg/l having an average of 269mg/l while Total hardness in ground water in the district is found between 60mg/l and 7090mg/l with an average of 664mg/l.
- In this district, the concentration of sodium ranges from 31mg/l to 2830mg/l and has an average of 398mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 233mg/l with an average of 25.6 mg/l.

7.34 TAPI

- EC found in district ranges from 459 μ S/cm to 1491 μ S/cm with an average of 834 μ S/cm.
- The Concentration of Chloride in ground water in district varies between 21mg/l and 262mg/l with an average of 111mg/l.
- Fluoride concentration in district varies from 0.1 mg/l to 0.63 mg/l with an average of 0.33mg/l.
- The Concentration of Nitrate in ground water in district varies between 7.61mg/l to 38mg/l with an average of 19mg/l.
- Alkalinity in ground water in the district ranges from 140mg/l to 340mg/l having an average of 226mg/l while Total hardness in ground water in the district is found between 230mg/l and 600mg/l with an average of 357mg/l.
- In this district, the concentration of sodium ranges from 8mg/l to 103mg/l and has an average of 41mg/l while the Concentration of Potassium in ground water in the district varies between 0.3mg/l and 6mg/l with an average of 1.5 mg/l.

7.35 VADODARA

- EC found in district ranges from 1174 μ S/cm to 3650 μ S/cm with an average of 1946 μ S/cm. The location showing higher EC is Vejpur2(3650)
- The Concentration of Chloride in ground water in district varies between 78mg/l and 596mg/l with an average of 264mg/l.
- Fluoride concentration in district varies from 0.25 mg/l to 2.8 mg/l with an average of 1.10mg/l.
- The Concentration of Nitrate in ground water in district varies between 9.2mg/l to 33mg/l with an average of 22mg/l.
- Alkalinity in ground water in the district ranges from 360mg/l to 891mg/l having an average of 508mg/l while Total hardness in ground water in the district is found between 320mg/l and 350mg/l with an average of 333mg/l.
- In this district, the concentration of sodium ranges from 98mg/l to 720mg/l and has an average of 285mg/l while the Concentration of Potassium in ground water in the district varies between 1.6mg/l and 94mg/l with an average of 38.3 mg/l.

7.36 VALSAD

- EC found in district ranges from $309\mu\text{S}/\text{cm}$ to $4667\mu\text{S}/\text{cm}$ with an average of $817\mu\text{S}/\text{cm}$. The location showing higher EC is Magod(4667)
- The Concentration of Chloride in ground water in district varies between 7mg/l and 1446mg/l with an average of 123mg/l . The location showing higher chloride concentration is Magod(1446)
- Fluoride concentration in district varies from 0.14 mg/l to 0.7 mg/l with an average of 0.31mg/l .
- The Concentration of Nitrate in ground water in district varies between 0.1mg/l to 74mg/l with an average of 9mg/l .The location showing higher nitrate concentration is Mangalwad Fansa(74)
- Alkalinity in ground water in the district ranges from 100mg/l to 450mg/l having an average of 196mg/l while Total hardness in ground water in the district is found between 120mg/l and 1111mg/l with an average of 253mg/l .
- In this district, the concentration of sodium ranges from 11mg/l to 548mg/l and has an average of 71mg/l while the Concentration of Potassium in ground water in the district varies between 0.2mg/l and 34mg/l with an average of 4.3 mg/l .

A comparative analysis of maximum value of Electrical Conductivity in various Districts and UTs of Gujarat during NHS 2022 has been illustrated in figure below. It can be well observed that maximum Districts have locations in which $\text{EC} > 3000 \mu\text{S}/\text{cm}$ is found.

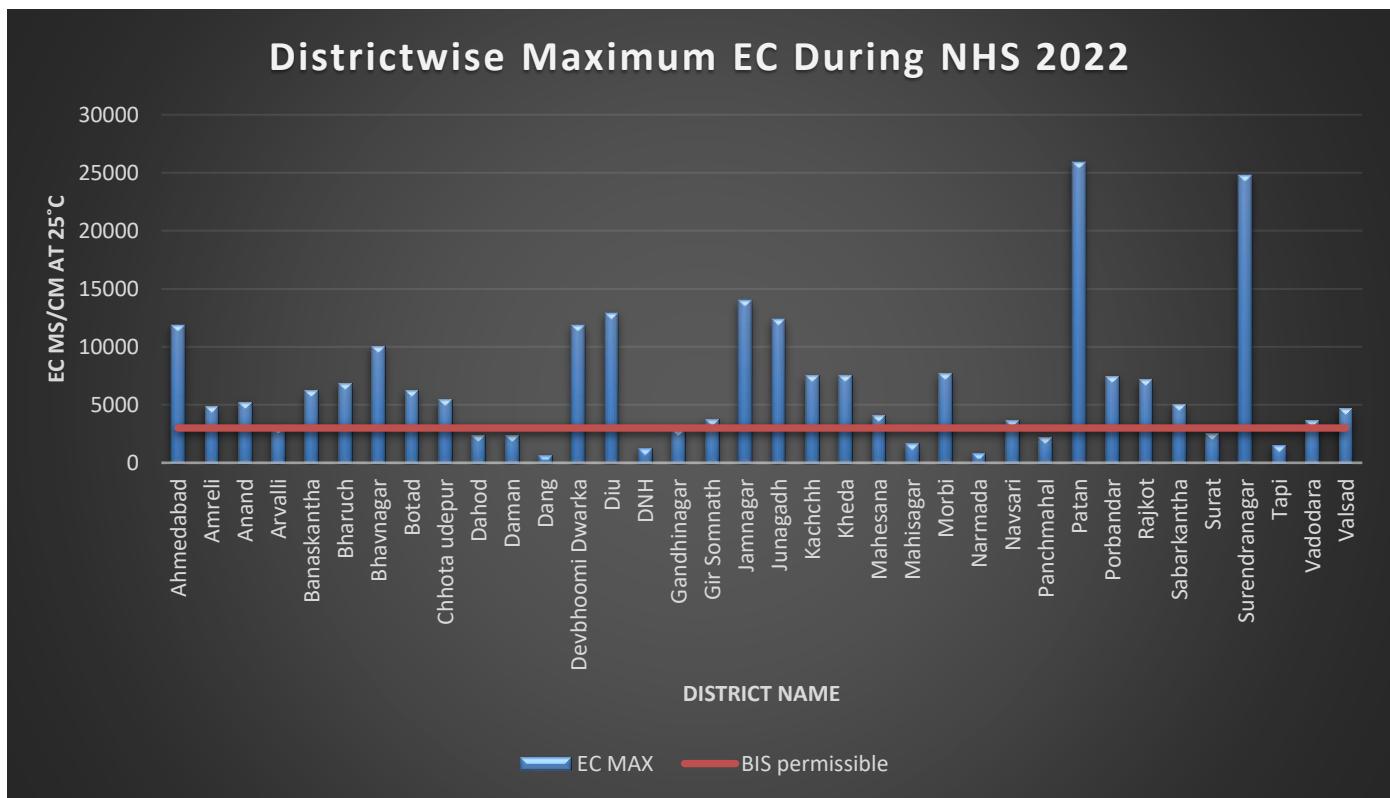


Chart 6: Chart Showing Districtwise Maximum EC obtained during NHS 2022.

A comparative analysis of maximum value of Fluoride in various Districts and UTs of Gujarat during NHS 2022 has been illustrated in figure below.

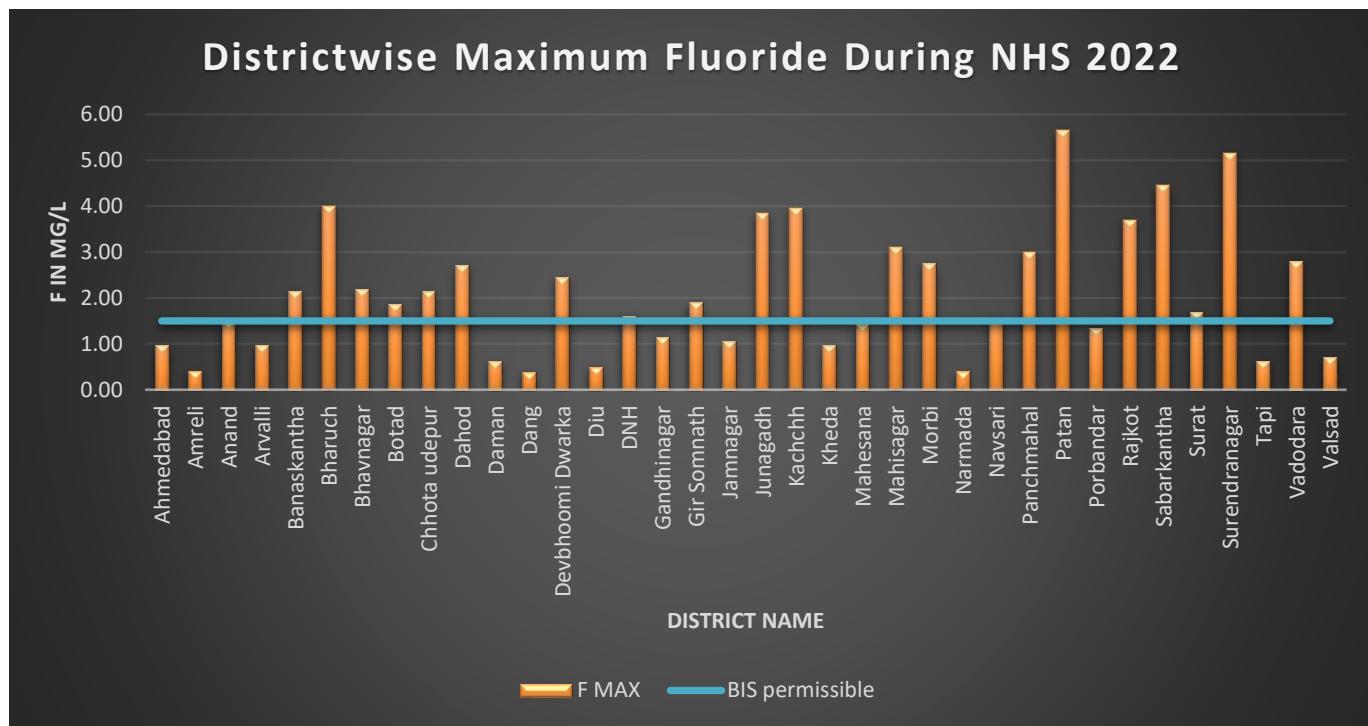


Chart 7: Chart Showing Districtwise Maximum Fluoride obtained during NHS 2022.

It can be observed that except few districts, all have High Fluoride in groundwater at various locations.

A comparative analysis of maximum value of Nitrate in various Districts and UTs of Gujarat during NHS 2022 has been illustrated in figure below.

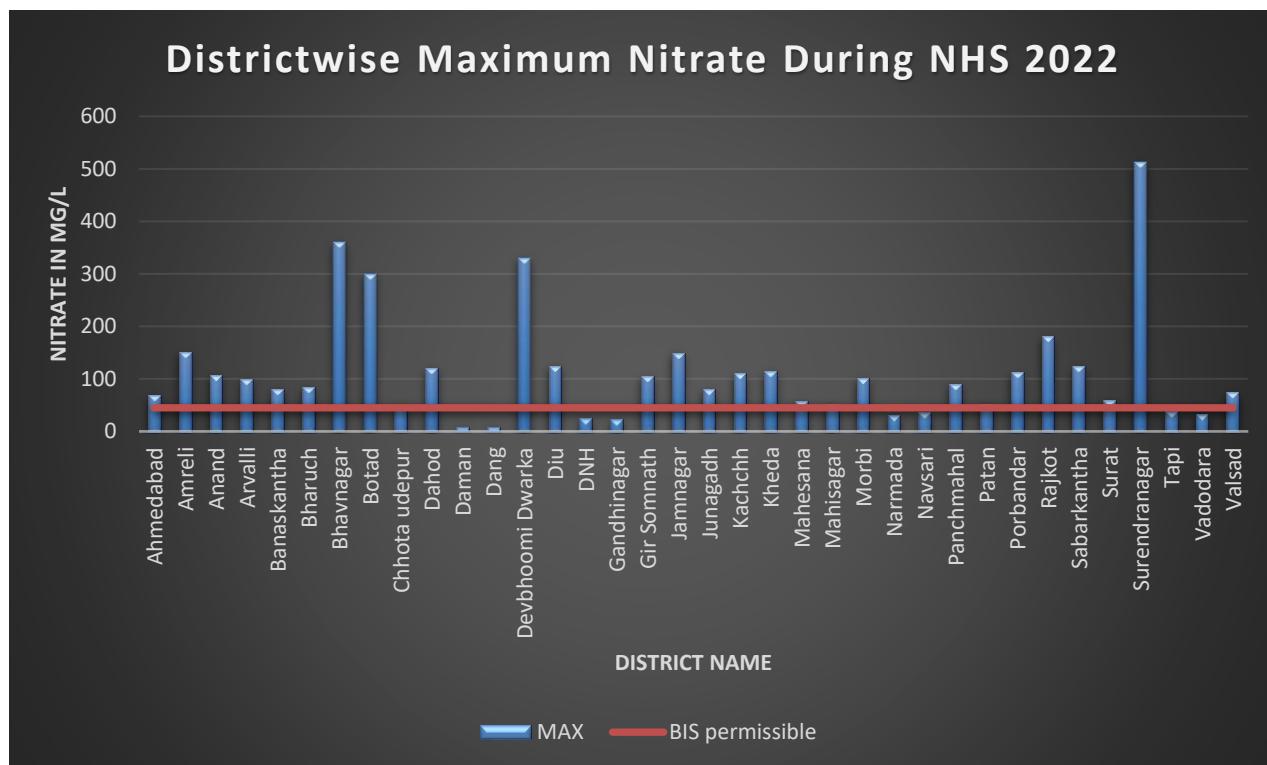


Chart 8: Chart Showing Districtwise Maximum Nitrate obtained during NHS 2022.

It can be observed that almost all districts have High Nitrate in groundwater at various locations.

8. Major Quality Findings

The evaluation of the ground water quality of the study area for drinking purposes with respect to standards prescribed by BIS (2012) for Basic and heavy metals reveals that-

1. It is observed that **pH** of most of the waters belonging to Gujarat State and UT of Daman and Diu fall within the desirable range of 6.5 to 8.5 during NHS 2022 and about 35 samples showed higher pH. The pH value of all the waters ranged between 7.05 to 9.28.
2. High **EC** Values $> 3000 \mu\text{S}/\text{cm}$ have been found in 114 number of samples out of 682 total number of samples analyzed indicating saline nature of water in those parts of the state. Very high EC $> 10000 \mu\text{S}/\text{cm}$, was found at 10 locations namely ; Kumarkhan 11870 $\mu\text{S}/\text{cm}$, (**Ahmedabad**), Ukhrala 10030 $\mu\text{S}/\text{cm}$ (Bhavnagar) ,Varvada 11870 $\mu\text{S}/\text{cm}$ (**Devbhoomi dwarka**), Zolawadi 12890 $\mu\text{S}/\text{cm}$ (**Diu**), Hadiyana 13980 $\mu\text{S}/\text{cm}$ and Bedanpur 10950 $\mu\text{S}/\text{cm}$ (**Jamnagar**), Osa 12380 $\mu\text{S}/\text{cm}$ (**Junagah**), Gangad 12070 $\mu\text{S}/\text{cm}$ (**Surendranagar**) while EC $> 25000 \mu\text{S}/\text{cm}$ was found at Motichander 25940 $\mu\text{S}/\text{cm}$ (**Patan**), , Kharaghoda 24790 $\mu\text{S}/\text{cm}$ (**Surendranagar**) showing brackish and saline water problem.
3. High **Chloride** $> 1000\text{mg/l}$ has been found in 66 numbers of samples out of 682 total numbers of samples analyzed indicating saline nature of water in that part of the state.. 6 locations namely Kumarkhan 3013 mg/l, (**Ahmedabad**), ,Varvada 4260 mg/l (**Devbhoomi dwarka**), Zolawadi 4580 mg/l (**Diu**), Hadiyana 4480 mg/l and Bedanpur 3067 mg/l (**Jamnagar**), Osa 4027 mg/l (**Junagah**), while cl $> 8000 \text{ mg/l}$ was found at Motichander 8933 mg/l (**Patan**), , Kharaghoda 8520 mg/l (**Surendranagar**) showing brackish and saline water problem.
4. High Fluoride $> 1.5\text{mg/l}$, which is mainly attributed due to geogenic conditions, have been observed in 79 water samples out of 682 water samples analyzed. Highest Fluoride concentration (5.65 mg/l) was observed in the sample collected from Patan2 , Patan district .
5. High **Nitrate** $> 45\text{mg/l}$ have been found in 167 locations out of 682 total number of samples analyzed indicating high nitrate pollution due to use of nitrogen containing fertilizer, domestic and agriculture waste and anthropogenic activities.The highest being reported at Gangad, Surendranagar with NO₃ concentration 513 mg/l.
6. **Uranium** was found to be within the permissible limit of 30 ppb in all the samples collected from Groundwater monitoring network stations except two samples at 55.24 ppb at Barvala, Botad District and 40.64 ppb at Govindpura, Chota udepur district.Uranium was found to be in the range of nd to 55 ppb It seems that the plausible source of high Uranium observed in this region may be of geogenic in nature.
7. **Suitability for Agriculture:**
 - It is found that most of the samples (50%) collected during NHS 2022-23 are categorized under high salinity classes. (**Salinity Index**).
 - The SAR value of most of the samples were found to S1 and are classified as Excellent for irrigation as per **sodicity Index**,
 - The classification of groundwater samples with respect to percent sodium shows that majority samples (34%) fall under Good category while only 4% samples were found to be unsuitable for irrigation.
 - As per Todd's classification of SSP, 80% samples suitable for irrigation, 20% samples unsuitable for irrigation.

- Based on the RSC values, only 9.53 % samples reflected to unsuitable for irrigation while 86% samples were categorized as Good for Irrigation.
 - The soil permeability is affected by long-term use of irrigation water and According to **permeability Index**, 76% of the samples fall under class 2 corresponding to Good (PI ranged from 25% to 75%) and 18% samples belong to class unsuitable (PI < 25%) in the NHS 2022-23
 - The A **Kelly's index** of more than 1 in 50 % samples shows an extra concentration of sodium in waters.
 - The **magnesium hazard (MH)** parameter indicates that 52% samples are harmful and unsuitable for irrigation indicating their adverse effect on crop yield.
8. **Suitability for drinking and Domestic purpose:** 43.4 % ground water samples belong to the Class II category, representative that the water is of good quality. (**Water Quality Index**)

9. Comparative study of NHS 2020-21, 2021-22 and NHS 2022-23

In comparison to 2020 and 2021, it is observed that there is a marginal change in no. of samples showing values of EC, nitrate, Fluoride, TH , Chloride and Uranium in 2022.

S.No.	Parameter	samples showing higher values in 2020		samples showing higher values in 2021		samples showing higher values in 2022	
		%	Locations	%	Locations	%	Locations
1.	EC> 3000 μ S/cm	15.8%	95	18.4%	104	16.71%	114
2.	Cl >1000 mg/l	8.8%	53	12.2%	69	9.6%	66
3.	NO ₃ > 45 mg/l	32.1%	193	28.5%	161	24.19%	165
4.	F >1.5 mg/l	13.8%	83	8.67%	49	11.58%	79
5.	TH >600 mg/l	19.96%	120	23.5%	133	19.8%	135
6.	U > 30 ppb	0.49%	3	0.17%	1	0.29%	2

Although the samples having high values of Electrical Conductivity , Chloride, Total Hardness and Nitrate has decreased marginally, there is a significant increase in number of samples having higher values of Fluoride and Uranium during NHS 2022 as compared to NHS 2021.

Looking at the Maximum values of few parameters in the entire state of Gujarat, following are the observations:

S.No	Parameter	Max during NHS 2020		Max during NHS 2021		Max during NHS 2021	
		Value	Location	Value	Location	Value	Location
1.	Electrical Conductivity (μ S/cm)	16640	Dalod, Ahmedabad	26200	Kadegi, Porbander	25940	Motichander, Patan
2.	Chloride (mg/l)	5361	Motichander, Patan	9075	Kadegi, Porbander	8933	Motichander, Patan
3.	Nitrate (mg/l)	822	Garbara, Dahod	372	Garbara, Dahod	513	Gangad, Surendranagar
4.	Fluoride (mg/l)	6.95	Piprala, Patan	7.2	Piprala, Patan	5.65	Patan2 , Patan
5.	Total Hardness (mg/l)	4424	Motimoladi, Surendranagar	5454	Kharaghoda, Surendranagar	7090	Kharaghoda, Surendranagar
6.	Uranium (ppb)	59	Barvala, Botad	39	Barvala, Botad	55.24	Barvala, Botad

In general, it is observed that the maximum values of parameters like Nitrate , TH and Uranium has increased in the state while that of Fluoride,EC, Chloride has decreased during NHS 2022 as compared to NHS 2021.

10. Conclusion

In general groundwater quality is good in hard rock areas occupying eastern hilly part of the state, central part of Kachchh and Saurashtra plateau. In soft rock and unconsolidated formations ground water quality is variable. Quality of ground water is inferior along the coast, the Rann and in the low-lying saline tract between Saurashtra and main land Gujarat. The deterioration in groundwater quality in the coastal areas is mainly due to over withdrawals causing seawater ingress which needs to be arrested.

Thus from the analytical results it has been observed that majority of water samples collected from observation wells of Central Ground Water Board in a major part of the state fall under desirable or permissible category as far as basic parameters and heavy metal concentration is concerned and hence are suitable for drinking purposes. However, some well waters are found to have concentrations of some constituents beyond the permissible limits with respect to basic parameters and heavy metals. Such waters are not fit for human consumption and are likely to be harmful to health on continuous use.

Table A: Hotspots with respect to EC (NHS 2022)

	District	Taluka	Location	Latitude	Longitude	EC µS/cm at 25°C
1	Ahmedabad	Viramgam	Kumarkhan	22.90060	72.02072	11870
2	Ahmedabad	Viramgam	Viramgam2	23.13669	72.03836	6920
3	Ahmedabad	Dhandhuka	Tagadi1	22.29710	71.94673	3790
4	Amreli	Lilia	Sanaria	21.55006	71.43192	6050
5	Amreli	Jafrabad	Bherai	20.97403	71.48683	5122
6	Amreli	Savar-Kundla	Bhuva	21.42771	71.35965	5000
7	Amreli	Amreli	Devaliya	21.52768	71.25053	4900
8	Amreli	Rajula	Mandal	21.09944	71.57929	4700
9	Anand	Khambhat	Kansari1	22.34128	72.65155	5223
10	Arvalli	Bayad	Boral	23.12906	73.21503	3080
11	Banaskantha	Tharad	Dudhva	24.47940	71.66902	6225
12	Banaskantha	Dantiwada	Gangodra	24.43968	72.36474	4220
13	Bharuch	Jambusar	Tankari	21.98822	72.66913	6860
14	Bharuch	Jambusar	Jambusar2	22.04936	72.80864	4375
15	Bharuch	Hansot	Sahol	21.44464	72.81835	3940
16	Bharuch	Bharuch	Navetha	21.70914	72.82814	3780
17	Bharuch	Jambusar	Kavi	22.19536	72.63672	3710
18	Bharuch	Anklesvar	Sajod	21.61920	72.91082	3261
19	Bhavnagar	Sihor	Ukharala	21.77000	71.88667	10030
20	Bhavnagar	Mahuva1	Mahuva	21.09996	71.74701	5130
21	Bhavnagar	Vallabhipur	Vallabhipur	21.90037	71.87841	4460
22	Bhavnagar	Ghogha	Ghogha	21.68028	72.28174	3120
23	Botad	Barwala	Barvala	22.16242	71.89420	6280
24	Chhota udepur	Bodeli	Govindpura	22.21554	73.73999	5430
25	Devbhoomi Dwarka	Kalyanpur	Gojines	22.02384	69.20365	5572
26	Devbhoomi Dwarka	Kalyanpur	Khakharda	22.10477	69.37210	5119
27	Devbhoomi Dwarka	Kalyanpur	Kalyanpur	22.30758	69.05421	4966
28	Devbhoomi Dwarka	Kalyanpur	Gurgadh	22.19470	69.19093	3554
29	Devbhoomi Dwarka	Okhamandal	Gorinja	22.15932	69.06644	3103
30	Devbhumi Dwarka	Okhamandal	Varwada	22.29772	68.96145	11870
31	Devbhumi Dwarka	Okhamandal	Mojap	22.36145	68.97956	5339
32	Devbhumi Dwarka	Khambhalia	Hanzdapur	22.18885	69.43681	5268
33	Devbhumi Dwarka	Okhamandal	Samrasar1	22.36993	69.10628	4943
34	Devbhumi Dwarka	Kalyanpur	Lambha 1	21.91130	69.30844	3816
35	Devbhumi Dwarka	Okhamandal	Aramda	22.42753	69.03503	3470
36	Devbhumi Dwarka	Kalyanpur	Bhogat1	21.99049	69.24428	3061
37	Devbhumi Dwarka	Kalyanpur	Vamansa	22.08400	69.18870	3052
38	Diu	Diu	Zolawadi	20.72420	70.93060	12890
39	Gir Somnath	Una	Nadiya Mandavi	20.74254	71.01207	3720
40	Jamnagar	Jodiya	Hadiyana	22.61176	70.26588	13980
41	Jamnagar	Jodiya	Bedanpur	22.68747	70.31252	10950
42	Jamnagar	Jamnagar	Jambuda	22.52148	70.20643	4533

43	Jamnagar	Jodiya	Kesiya	22.69661	70.39706	4453
44	Junagadh	Mangrol	Osa	21.37289	70.06416	12380
45	Junagadh	Mangrol	Khorada1	21.07218	70.18758	6113
46	Junagadh	Mangrol	Arena	21.08075	70.17712	5927
47	Junagadh	Mangrol	Shardagram	21.10378	70.14308	5304
48	Junagadh	Malia	Kanek	21.03597	70.24389	3665
49	Junagadh	Manavadar	Bantva	21.49107	70.08955	3025
50	Kachchh	Nakhatrana	Devisar	23.40278	69.32917	7493
51	Kachchh	Lakhpat	Kharai_1	23.46306	68.68556	7162
52	Kachchh	Mandvi	Bambhdai	22.93889	69.08278	7026
53	Kachchh	Bhuj	Sukhpar	23.20833	69.61667	6779
54	Kachchh	Nakhatrana	Khavda	23.83889	69.73056	6234
55	Kachchh	Gandhidham	Shinaya	23.03333	70.05417	5795
56	Kachchh	Abdasa	Mothala	23.20833	69.12500	5308
57	Kachchh	Mundra	Vadala	22.91611	69.85556	4979
58	Kachchh	Bhachau	Samkhiari	23.30000	70.50833	4636
59	Kachchh	Mandvi	Kotaya	23.04167	69.07500	4156
60	Kachchh	Bhachau	Ratanpur Khadir	23.86083	70.36306	4149
61	Kachchh	Abdasa	Tera	23.28333	68.94722	4148
62	Kachchh	Bhuj	Lodai	23.40000	69.89167	3924
63	Kachchh		Mota Asambia			3537
64	Kachchh	Mundra	Karagoga	22.94167	69.66250	3140
65	Kheda	Thasra	Muliyad	22.79080	73.14970	7589
66	Kheda	Kathlal	Ladvel	22.90857	73.12620	3480
67	Kutchch	Mundra	Nani Tumbdi	22.99611	69.54917	4195
68	Kutchch	Lakhpat	Dolatpar	23.59778	68.89361	3874
69	Mahesana	Unjha	Dasaj	23.84451	72.44647	4105
70	Mahesana	Mahesana	Maguna	23.57722	72.29041	4000
71	Mahesana	Becharaji	Dharpura	23.54398	72.11183	3800
72	Morbi	Morvi	Amar nagar	22.93485	70.82435	7684
73	Morbi	Halvad	Halvad2	23.01955	71.18535	4766
74	Morbi	Morvi	Modpar1	22.90168	70.66245	4700
75	Morbi	Halvad	Mathak	22.84253	71.06150	3999
76	Navsari	Jalalpore	Abrama	20.86058	72.90331	3700
77	Navsari	Jalalpore	Chinnam	20.99858	72.88301	3075
78	Patan	Sankheswar	Moti chander	23.59444	71.78056	25940
79	Patan	Radhanpur	Gochanad	23.77083	71.62444	9451
80	Porbandar	Porbandar	Babda	21.74062	69.59028	7455
81	Porbandar	Porbandar	Oddar	21.55290	69.69211	7002
82	Porbandar	Porbandar	Mojiwana	21.85995	69.57426	6515
83	Porbandar	Kutiyana	Kutiyana1	21.62841	70.01126	6002
84	Porbandar	Porbandar	Kuchhadi	21.68100	69.54887	4450
85	Porbandar	Ranavav	Bhoddar	21.57514	69.89493	4365
86	Porbandar	Porbandar	Bhavpura	21.81337	69.40296	3704
87	Porbandar	Porbandar	Visavada	21.77523	69.45382	3340
88	Porbandar	Ranavav	Hanumangadh1	21.79555	69.80243	3285

89	Porbandar	Porbandar	Ratia	21.41630	69.82131	3156
90	Rajkot	Paddhari	Movaiya	22.45793	70.62754	7177
91	Rajkot	Upleta	Ganod	21.68879	70.16931	5853
92	Rajkot	Jetpur	Jetpur pithad.	21.78348	70.64083	4083
93	Rajkot	Jasdan	Kamlapur	22.13821	71.19993	3131
94	Sabarkantha	Khedbrahma	Silwad	24.01280	73.12410	5040
95	Sabarkantha	Khedbrahma	Khedbramha_1	24.05409	73.02759	3560
96	Surendranagar	Dasada	Kharaghoda	23.18770	71.75222	24790
97	Surendranagar	Lakhtar	Gangad	22.94889	71.97278	12070
98	Surendranagar	Limbdi	Limbdi1	22.57000	71.81000	6466
99	Surendranagar	Sayla	Nava Sudamda	22.53972	71.43583	6321
100	Surendranagar	Dhrangadhra	Rajsitapur	22.83803	71.59667	6309
101	Surendranagar	Muli	Muli	22.63895	71.46444	5942
102	Surendranagar	Chotila	Moti Moladi	22.41789	71.10400	5686
103	Surendranagar	Wadhwan	Vaghela	22.65778	71.65694	5224
104	Surendranagar	Sayla	Piprali	22.39528	71.31167	5018
105	Surendranagar	Sayla	Dhajala	22.38056	71.39778	4545
106	Surendranagar	Dasada	Pipli	23.06868	71.71234	4385
107	Surendranagar	Dasada	Kherwa	23.00061	71.74376	4093
108	Surendranagar	Muli	Gadah	22.62778	71.40000	4070
109	Surendranagar	Dhrangadhra	Ratanpur1	22.85552	71.27473	4032
110	Surendranagar	Dasada	Moti majethi	23.08653	71.88530	3606
111	Surendranagar	Wadhwan	Surendranagar2	22.71755	71.61667	3121
112	Surendranagar	Dasada	Dhamma	23.39613	71.67148	3037
113	Vadodara	Desar	Vejpur2	22.74351	73.35385	3650
114	Valsad	Vapi	Magod	20.56590	72.90485	4667

Table B: Hotspots with respect to Chloride>1000 mg/l

S.No.	District	Taluka	Location	Latitude	Longitude	Cl
1	Ahmedabad	Viramgam	Kumarkhan	22.90060	72.02072	3013
2	Ahmedabad	Viramgam	Viramgam2	23.13669	72.03836	1560
3	Amreli	Amreli	Devaliya	21.52768	71.25053	1370
4	Amreli	Jafrabad	Bherai	20.97403	71.48683	1285
5	Amreli	Rajula	Mandal	21.09944	71.57929	1136
6	Anand	Khambhat	Kansari1	22.34128	72.65155	1141
7	Banaskantha	Tharad	Dudhva	24.47940	71.66902	1583
8	Banaskantha	Dantiwada	Gangodra	24.43968	72.36474	1044
9	Bharuch	Jambusar	Tankari	21.98822	72.66913	1418
10	Bharuch	Jambusar	Jambusar2	22.04936	72.80864	1049
11	Bharuch	Hansot	Sahol	21.44464	72.81835	1049
12	Bharuch	Bharuch	Navetha	21.70914	72.82814	1042
13	Bhavnagar	Sihor	Ukharala	21.77000	71.88667	2812
14	Bhavnagar	Mahuva1	Mahuva	21.09996	71.74701	1058
15	Chhota udepur	Bodeli	Govindpura	22.21554	73.73999	1347
16	Devbhoomi Dwarka	Kalyanpur	Gojines	22.02384	69.20365	1491
17	Devbhoomi Dwarka	Kalyanpur	Khakharda	22.10477	69.37210	1392
18	Devbhoomi Dwarka	Kalyanpur	Kalyanpur	22.30758	69.05421	1136
19	Devbhumi Dwarka	Okhamandal	Varwada	22.29772	68.96145	4260
20	Devbhumi Dwarka	Khambhalia	Hanzdapur	22.18885	69.43681	1413
21	Devbhumi Dwarka	Okhamandal	Samrasar1	22.36993	69.10628	1328
22	Devbhumi Dwarka	Okhamandal	Mojap	22.36145	68.97956	1207
23	Diu	Diu	Zolawadi	20.72420	70.93060	4580
24	Jamnagar	Jodiya	Hadiyana	22.61176	70.26588	4480
25	Jamnagar	Jodiya	Bedanpur	22.68747	70.31252	3067
26	Jamnagar	Jodiya	Kesiya	22.69661	70.39706	1250
27	Jamnagar	Jamnagar	Jambuda	22.52148	70.20643	1157
28	Junagadh	Mangrol	Osa	21.37289	70.06416	4027
29	Junagadh	Mangrol	Khorada1	21.07218	70.18758	1943
30	Junagadh	Mangrol	Arena	21.08075	70.17712	1879
31	Junagadh	Mangrol	Shardagram	21.10378	70.14308	1595
32	Junagadh	Malia	Kanek	21.03597	70.24389	1212
33	Kachchh	Nakhatrana	Devisar	23.40278	69.32917	2092
34	Kachchh	Mandvi	Bambhdai	22.93889	69.08278	2092
35	Kachchh	Lakhpat	Kharai_1	23.46306	68.68556	1843
36	Kachchh	Gandhidham	Shinaya	23.03333	70.05417	1702
37	Kachchh	Nakhatrana	Khavda	23.83889	69.73056	1631
38	Kachchh	Bhuj	Sukhpar	23.20833	69.61667	1595
39	Kachchh	Abdasa	Mothala	23.20833	69.12500	1489

40	Kachchh	Bhachau	Samkhiari	23.30000	70.50833	1290
41	Kachchh	Mundra	Vadala	22.91611	69.85556	1205
42	Kachchh	Bhachau	Ratanpur Khadir	23.86083	70.36306	1064
43	Kheda	Thasra	Muliyad	22.79080	73.14970	2162
44	Kheda	Kathlal	Ladvel	22.90857	73.12620	1021
45	Morbi	Morvi	Amar nagar	22.93485	70.82435	2229
46	Morbi	Morvi	Modpar1	22.90168	70.66245	1321
47	Morbi	Halvad	Halvad2	23.01955	71.18535	1150
48	Patan	Sankheswar	Moti chander	23.59444	71.78056	8933
49	Patan	Radhanpur	Gochanad	23.77083	71.62444	2730
50	Porbandar	Porbandar	Babda	21.74062	69.59028	2276
51	Porbandar	Porbandar	Oddar	21.55290	69.69211	1985
52	Porbandar	Porbandar	Mojiwana	21.85995	69.57426	1893
53	Porbandar	Kutiyana	Kutiyana1	21.62841	70.01126	1560
54	Porbandar	Porbandar	Kuchhadi	21.68100	69.54887	1099
55	Rajkot	Paddhari	Movaiya	22.45793	70.62754	2031
56	Rajkot	Upleta	Ganod	21.68879	70.16931	1186
57	Sabarkantha	Khedbrahma	Silwad	24.01280	73.12410	1377
58	Surendranagar	Dasada	Kharaghoda	23.18770	71.75222	8520
59	Surendranagar	Lakhtar	Gangad	22.94889	71.97278	2521
60	Surendranagar	Dhrangadhra	Rajsitapur	22.83803	71.59667	1988
61	Surendranagar	Chotila	Moti Moladi	22.41789	71.10400	1555
62	Surendranagar	Muli	Muli	22.63895	71.46444	1427
63	Surendranagar	Sayla	Nava Sudamda	22.53972	71.43583	1221
64	Surendranagar	Sayla	Dhajala	22.38056	71.39778	1122
65	Surendranagar	Dasada	Kherwa	23.00061	71.74376	1058
66	Valsad	Vapi	Magod	20.56590	72.90485	1446

Table C: Hotspots with respect to Nitrate>45 mg/l

S.No.	District	Taluka	Location	Latitude	Longitude	NO3
1	Ahmedabad	Dhandhuka	Tagadi1	22.297095	71.946725	70
2	Amreli	Rajula	Mandal	21.099438	71.579290	228
3	Amreli	Bagasara	Bagasara	21.476752	70.960818	164
4	Amreli	Amreli	Devaliya	21.527678	71.250533	151
5	Amreli	Babra	Untvad	21.906801	71.222832	110
6	Amreli	Savar-Kundla	Bhuva	21.427712	71.359647	85
7	Amreli	Savar-Kundla	Goradka	21.228019	71.408080	85
8	Amreli	Savar-Kundla	Badhda	21.266366	71.338387	85
9	Amreli	Savar-Kundla	Piyava	21.379547	71.460227	80
10	Amreli	Dhari	Boradi	21.288725	70.927033	71
11	Amreli	Khambha	Trakuda	21.016512	71.282878	55
12	Amreli	Bagasara	Vaghania junia	21.583441	70.969502	51
13	Amreli	Savarkundla	Vanot	21.170104	71.483750	48
14	Anand	Petlad	Dharmaj	22.42074	72.78741	106
15	Anand	Anand	Adas_DW	22.47249	73.03515	91
16	Arvalli	Modasa	Gadada	23.595173	73.205982	100
17	Arvalli	Bayad	Bibipur1	23.254033	73.214998	78
18	Arvalli	Bayad	Boral	23.129060	73.215027	76
19	Arvalli	Bhiloda	Takatuka_1	23.803101	73.289506	72
20	Arvalli	Malpur	Hamirpur	23.406324	73.460597	66
21	Arvalli	Malpur	Malpur_1	23.371505	73.455499	64
22	Banaskantha	Danta	Ratanpur2	24.17842	72.74823	81
23	Banaskantha	Amirgadh	Rampura (Vadla)	24.26328	72.55534	70
24	Banaskantha	Dantiwada	Gangodra	24.439679	72.364741	63
25	Banaskantha	Amirgadh	Virampur	24.2664	72.65233	63
26	Banaskantha	Deesa	Meda	24.39793	72.28531	46
27	Bharuch	Jambusar	Kavi	22.19536	72.63672	85
28	Bharuch	Hansot	Sahol	21.44464	72.81835	53
29	Bhavnagar	Sihor	Kajavadar	21.651111	71.973333	360
30	Bhavnagar	Jafrabad	Timbi2	20.897224	71.202105	180
31	Bhavnagar	Mahuva	Dudhala	21.140915	71.651062	175
32	Bhavnagar	Ghogha	Ghogha	21.680277	72.281740	166
33	Bhavnagar	Mahuva	Khari	21.268889	71.778889	151
34	Bhavnagar	Gariadhar	Gariyadhar	21.544340	71.563631	130
35	Bhavnagar	Palitana	Vadal	21.447377	71.853459	102
36	Bhavnagar	Mahuva1	Mahuva	21.099956	71.747011	100
37	Bhavnagar	Palitana	Panchpipla	21.544559	71.724855	91
38	Bhavnagar	Talaja	Trapaj	21.424365	72.099832	83
39	Bhavnagar	Sihor	Piparla	21.636389	71.918889	80
40	Bhavnagar	Umrala	Timbi2	21.822775	71.753401	79
41	Bhavnagar	Vallabhipur	Lonjdhara	22.096372	71.893154	75
42	Bhavnagar	Talaja	Talaja2	21.365747	72.020761	71
43	Bhavnagar	Mahuva	Bora	21.162940	71.872592	69
44	Bhavnagar	Sihor	Amargadh	21.714722	71.867778	60

45	Bhavnagar	Gariadhar	Bhandariya	21.478056	71.627500	45
46	Botad	Ranpur	Rajpada	22.308438	71.694484	300
47	Botad	Gadhada	Tatam	22.058333	71.633333	226
48	Botad	Ranpur	Kundali	22.269444	71.700000	92
49	Botad	Botad	Senthali	22.168333	71.726667	92
50	Chhota udepur	Kavant	Panwad	22.21018	74.03093	51
51	Dahod	Dahod	Dahod Urban-2	22.840906	74.255661	120
52	Dahod	Zalod	Garada	23.1647222	74.1227778	115
53	Devbhoomi Dwarka	Kalyanpur	Kalyanpur	22.30758	69.054212	331
54	Devbhoomi Dwarka	Kalyanpur	Gurgadh	22.194701	69.190933	230
55	Devbhoomi Dwarka	Kalyanpur	Khakharda	22.104767	69.372104	129
56	Devbhoomi Dwarka	Bhanvad	Nawagam	21.976718	69.763591	117
57	Devbhoomi Dwarka	Khambhalia	Bajana	22.135626	69.755954	93
58	Devbhoomi Dwarka	Bhanvad	Mota gunda	22.011529	69.718961	71
59	Devbhoomi Dwarka	Kalyanpur	Asota mota	22.269933	69.37326	48
60	Devbhoomi Dwarka	Bhanvad	Jampar	22.036355	69.761227	47
61	Devbhoomi Dwarka	Kalyanpur	Gojines	22.023838	69.203649	45
62	Devbhumi Dwarka	Bhanvad	Ambardi	21.916623	69.85825	123
63	Devbhumi Dwarka	Okhamandal	Aramda	22.427527	69.035033	67
64	Devbhumi Dwarka	Kalyanpur	Khirsara	21.978315	69.600732	61
65	Devbhumi Dwarka	Khambhalia	Salaya	22.309853	69.598427	56
66	Devbhumi Dwarka	Okhamandal	Dwarka	22.240679	68.960442	55
67	Devbhumi Dwarka	Khambhalia	Hanzdapur	22.18885	69.436812	52
68	Devbhumi Dwarka	Okhamandal	Mojap	22.361451	68.979564	52
69	Devbhumi Dwarka	Kalyanpur	Lambha 1	21.911297	69.30844	47
70	Diu	Diu	Vanakbara	20.709905	70.875295	125
71	Gir Somnath	Una	Kansari	20.849463	71.055315	105
72	Gir Somnath	Kodinar	Dolasa	20.819369	70.847198	80
73	Gir Somnath	Una	Sametar	20.851642	71.120666	64
74	Gir Somnath	Una	Una2	20.822393	71.041565	46
75	Jamnagar	Jodiya	Hadiyana	22.611758	70.265875	149
76	Jamnagar	Kalavad	Nikava	22.193598	70.535732	138
77	Jamnagar	Jamjodhpur	Seth vadala	22.031705	70.121977	120

78	Jamnagar	Jodiya	Pithad	22.689	70.559215	78
79	Jamnagar	Jamnagar	Jambuda	22.521481	70.20643	71
80	Jamnagar	Jodiya	Bedanpur	22.687466	70.312517	65
81	Jamnagar	Jamjodhpur	Satapar	21.811204	69.921972	61
82	Jamnagar	Jamnagar	Moti khavdi	22.383024	69.86689	58
83	Jamnagar	Dhrol	Dhrol2	22.564368	70.412855	55
84	Jamnagar	Jamnagar	Changa	22.340132	70.025314	53
85	Jamnagar	Kalavad	Haripur2	22.25304	70.34114	53
86	Junagadh	Vanthali	Khokharda	21.420102	70.31756	80
87	Junagadh	Mendarda	Mendarda1	21.3336	70.439672	78
88	Junagadh	Visavadar	Prempara	21.298319	70.703284	77
89	Junagadh	Mendara	Moti Kodiyar	21.324754	70.52885	77
90	Junagadh	Junagadh	Chokli	21.60208	70.53252	70
91	Junagadh	Junagadh	Anandpur	21.407193	70.5167	65
92	Kachchh	Rapar	Kuda	23.8777778	70.8086111	110
93	Kachchh	Abdasa	Tera	23.2833333	68.9472222	72
94	Kachchh	Mandvi	Ratanpur(maum.)	23.1083333	69.2916667	60
95	Kachchh	Nakhatrana	Khavda	23.8388889	69.7305556	54
96	Kachchh	Bhuj	Sukhpar	23.2083333	69.6166667	45
97	Kheda	Mahudha	Alina	22.805672	73.04766	115
98	Kutchch	Mundra	Nani Tumbdi	22.9961111	69.5491667	78
99	Mahesana	Unjha	Dasaj	23.84451	72.44647	58
100	Mahisagar	Lunawada	Lunawada	23.119491	73.610981	52
101	Morbi	Halvad	Halvad2	23.0195501	71.185353	102
102	Morbi	Tankara	Neknam	22.508998	70.693453	77
103	Morbi	Tankara	Hadmatia	22.6821781	70.811068	49
104	Panchmahal	Ghoghamba	Ranipura	22.717143	73.744204	90
105	Panchmahal	Morwa hadaf	Suliyat	23.052441	73.859510	54
106	Panchmahal	Godhra	Godhra UR_2	22.76800	73.62226	50
107	Patan	Patan	Patan2	23.8416667	72.1236111	52
108	Porbandar	Porbandar	Bakharla	21.733563	69.63639	112
109	Porbandar	Porbandar	Palkhada1	21.760323	69.484914	105
110	Porbandar	Porbandar	Bhavpura	21.813367	69.402955	97
111	Porbandar	Kutiyana	Kutiyana1	21.628408	70.011264	97
112	Porbandar	Porbandar	Kolikhada village-2	21.681572	69.63681	67
113	Porbandar	Kutiyana	Khageshri	21.755838	69.978712	66
114	Porbandar	Porbandar	Adwana2	21.915437	69.594681	57
115	Porbandar	Kutiyana	Dhruvala	21.693996	70.004364	53
116	Porbandar	Ranavav	Hanumangadh1	21.795546	69.802432	52
117	Porbandar	Porbandar	Mojiwana	21.859954	69.574263	52
118	Rajkot	Jasdan	Kamlapur	22.1382131	71.199928	180
119	Rajkot	Rajkot	Halenda	22.0876181	71.054113	136
120	Rajkot	Gondal	Gogavadar	21.964722	70.88	107
121	Rajkot	Jasdan	Bhadla	22.1790381	71.086635	101
122	Rajkot	Dhoraji	Dhoraji1	21.7634981	70.465823	88

123	Rajkot	Jamkandorna	Jasapur	21.884838	70.488115	84
124	Rajkot	Gondal	Kolithad1	22.0171781	70.646875	81
125	Rajkot	Paddhari	Movaiya	22.4579281	70.627538	77
126	Rajkot	Gondal	Mota dadwa	21.998056	70.994167	76
127	Rajkot	Jetpur	Virpur1	21.8466231	70.692883	73
128	Rajkot	Jetpur	Umrali	21.9087221	70.602252	71
129	Rajkot	Paddhari	Targhari	22.3821451	70.67279	64
130	Rajkot	Paddhari	Khamta	22.429995	70.606147	59
131	Rajkot	Rajkot	Sardhar2	22.1354831	70.987188	56
132	Rajkot	Jetpur	Jetpur pithad.	21.783483	70.640828	54
133	Rajkot	Jasdan	Viranagar	22.027832	71.123152	54
134	Rajkot	Lodhika	Lodhika1	22.14	70.64	54
135	Rajkot	Gondal	Ribda	22.1267021	70.778533	50
136	Sabarkantha	Idar	Revas	23.819912	73.130537	125
137	Sabarkantha	Vadali	Choriwad	23.896346	73.117443	125
138	Sabarkantha	Khedbrahma	Khedbrahma_1	24.054091	73.027585	85
139	Sabarkantha	Vadali	Wadali	23.916904	73.037258	82
140	Sabarkantha	Talod	Kesarpura(Mayal)	23.346198	72.958236	81
141	Sabarkantha	Himatnagar	Mathasuliya	23.603733	73.136615	80
142	Sabarkantha	Vadali	Kesharpura	23.905493	73.146426	80
143	Sabarkantha	Talod	Boriya	23.267065	72.923944	72
144	Sabarkantha	Himatnagar	Gadha1	23.693615	72.937741	66
145	Sabarkantha	Idar	Sabalwad	23.870901	72.953352	62
146	Sabarkantha	Khedbrahma	Matoda	24.111496	73.007728	60
147	Sabarkantha	Talod	Harsol1	23.374833	73.015640	58
148	Sabarkantha	Idar	Chandap_DW	23.922815	72.844333	56
149	Sabarkantha	Khedbrahma	Silwad	24.012799	73.124099	47
150	Surat	Mandvi	Mandvi	21.25736	73.300333	59
151	Surat	Surat city	Uchchhal	21.171927	73.769107	47
152	Surendranagar	Lakhtar	Gangad	22.948889	71.972778	513
153	Surendranagar	Sayla	Piprali	22.395278	71.311667	237
154	Surendranagar	Dasada	Pipli	23.0686781	71.712338	235
155	Surendranagar	Dasada	Moti majethi	23.086527	71.885297	164
156	Surendranagar	Chotila	Parabadi	22.2419444	71.191389	132
157	Surendranagar	Sayla	Sudamda	22.4460031	71.488002	121
158	Surendranagar	Sayla	Nav Sudamda	22.5397222	71.4358333	116
159	Surendranagar	Chotila	Moti Moladi	22.4178931	71.104003	115
160	Surendranagar	Dasada	Malvan	23.061389	71.750278	96
161	Surendranagar	Chuda	Navi Morvad	22.5356639	71.5747313	74
162	Surendranagar	Muli	Gadah	22.627778	71.4	67
163	Surendranagar	Sayla	Dhajala	22.380556	71.397778	66
164	Surendranagar	Dhrangadhra	Kukavati	23.0638851	71.36521	56
165	Surendranagar	Chotila	Bamanbor	22.4147351	71.037288	54
166	Surendranagar	Dasada	Dhama	23.3961251	71.671483	51
167	Valsad	Umergaon	Mangalwad Fansa	20.344796	72.786512	74

Table D: Hotspots with respect to Fluoride > 1.5 mg/l

S.No.	District	Taluka	Location	Latitude	Longitude	F
1	Amreli	Lilia	Punjapadar	21.530495	71.359185	1.94
2	Amreli	Lilia	Sanaria	21.550064	71.431922	1.58
3	Amreli	Savarkundla	Simran	21.431075	71.270169	1.52
4	Anand	Borsad	Ras	22.35132	72.83582	2.55
5	Anand	Petlad	Dharmaj	22.42074	72.78741	1.50
6	Banaskantha	Danta	Ganapipli	24.29364	72.94666	2.15
7	Banaskantha	Palanpur	Hathidra	24.22769	72.59879	1.88
8	Banaskantha	Dantiwada	Gangodra	24.439679	72.364741	1.70
9	Banaskantha	Dantiwada	jhat	24.48682	72.35129	1.70
10	Bharuch	Anklesvar	Sajod	21.61920	72.91082	4.00
11	Bharuch	Anklesvar	Panoli	21.53694	72.97481	1.50
12	Bhavnagar	Mahuva	Bora	21.162940	71.872592	2.18
13	Bhavnagar	Vallabhipur	Ayodhyapuram	21.952183	71.884463	1.76
14	Bhavnagar	Umrala	Umrala	21.846001	71.802588	1.71
15	Botad	Barwala	Barvala	22.162421	71.894201	1.87
16	Chhota udepur	Jetpur pavi	Bhindol	22.20107	73.89710	2.15
17	Chhota udepur	Bodeli	Govindpura	22.21554	73.73999	2.15
18	Chhota udepur	Kavant	Moti chikhali	22.01515	74.08063	1.75
19	Dahod	Dahod	Dahod Urban-2	22.840906	74.255661	2.70
20	Dahod	Devgadh baria	Badpa	22.688938	73.858010	2.58
21	Dahod	Garbada	Navagam Faliya	22.686775	74.306084	2.40
22	Dahod	Devgadh baria	Khandania	22.604363	73.896609	2.22
23	Dahod	Dahod	Dahod2	22.831100	74.232840	2.00
24	Dahod	Zalod	Garada	23.16472222	74.12277778	1.95
25	Devbhoomi Dwarka	Kalyanpur	Kalyanpur	22.30758	69.054212	2.45
26	Devbhoomi Dwarka	Kalyanpur	Navadra	21.939942	69.286489	2.00
27	Devbhumi Dwarka	Kalyanpur	Vamansa	22.084	69.1887	1.72
28	DNH		Kherdi(Kathepada)	20.113181	73.032064	1.60
29	Gir Somnath	Una	Una2	20.822393	71.041565	1.90
30	Gir Somnath	Kodinar	Dolasa	20.819369	70.847198	1.90
31	Junagadh	Mangrol	Kalej	21.249625	70.084995	3.85
32	Kachchh	Bhachau	Samkhiari	23.3	70.50833333	3.95
33	Kachchh	Mandvi	Kotadi	23.04166667	69.19166667	3.75
34	Kachchh	Abdasa	Tera	23.28333333	68.94722222	3.30
35	Kachchh	Nakhatrana	Devisar	23.40277778	69.32916667	3.00
36	Kachchh	Mundra	Karagoga	22.94166667	69.6625	2.55
37	Kachchh	Bhuj	Sukhpar	23.20833333	69.61666667	2.45
38	Kachchh	Rapar	Kuda	23.87777778	70.80861111	2.20
39	Kachchh	Mundra	Vadala	22.91611111	69.85555556	2.20
40	Mahisagar	Lunawada	Jokha	23.038525	73.610476	3.10
41	Morbi	Morvi	Morvi	22.8314521	70.85285	2.75
42	Morbi	Morvi	Amar nagar	22.9348481	70.82435	2.30

43	Morbi	Halvad	Halvad2	23.0195501	71.185353	2.12
44	Morbi	Morvi	Jetpur Pithad/Jetpur	21.7834831	70.640828	2.06
45	Navsari	Navsari	Parujan	21.023132	72.836253	1.56
46	Panchmahal	Ghoghamba	Ranipura	22.717143	73.744204	3.00
47	Panchmahal	Morwa hadaf	Suliyat	23.052441	73.859510	1.86
48	Panchmahal	Kalol	Khadki Vadiya	22.650791	73.522082	1.76
49	Panchmahal	Godhra	Godhra UR_3	22.784327	73.609319	1.52
50	Patan	Patan	Patan2	23.84166667	72.12361111	5.65
51	Patan	Radhanpur	Gochanad	23.77083333	71.62444444	2.00
52	Patan	Patan	Balisana	23.81444444	72.25416667	1.90
53	Rajkot	Upleta	Upleta1	21.7295101	70.252017	3.70
54	Rajkot	Upleta	Ganod	21.688792	70.169307	3.30
55	Sabarkantha	Idar	Sabalwad	23.870901	72.953352	4.45
56	Sabarkantha	Talod	Kesarpura(Mayal)	23.346198	72.958236	3.20
57	Sabarkantha	Idar	Idar	23.841674	73.030427	3.20
58	Sabarkantha	Khedbrahma	Hingatiya	24.146837	73.010451	2.45
59	Sabarkantha	Idar	Bhadreshwar(Daramli)	23.745197	72.983189	1.96
60	Sabarkantha	Himatnagar	Sakrodiya	23.545419	73.047996	1.90
61	Sabarkantha	Himatnagar	Gadha1	23.693615	72.937741	1.74
62	Surat	Bardoli	Sarbhon	21.060293	73.088866	1.70
63	Surendranagar	Sayla	Nava Sudamda	22.53972222	71.43583333	5.15
64	Surendranagar	Dasada	Malvan	23.061389	71.750278	5.05
65	Surendranagar	Sayla	Piprali	22.395278	71.311667	4.75
66	Surendranagar	Lakhtar	Gangad	22.948889	71.972778	4.30
67	Surendranagar	Muli	Muli	22.6389501	71.464442	3.55
68	Surendranagar	Dhrangadhra	Ratanpur1	22.8555231	71.274728	3.35
69	Surendranagar	Sayla	Dhajala	22.380556	71.397778	2.55
70	Surendranagar	Wadhwan	Surendranagar2	22.7175501	71.616668	2.35
71	Surendranagar	Wadhwan	Kherali	22.71379	71.593877	2.30
72	Surendranagar	Muli	Gadah	22.627778	71.4	2.20
73	Surendranagar	Wadhwan	Vaghela	22.657778	71.656944	2.10
74	Surendranagar	Dasada	Dhama	23.3961251	71.671483	2.10
75	Surendranagar	Wadhwan	Vadod	22.559444	71.652222	2.00
76	Surendranagar	Dhrangadhra	Rajsitapur	22.8380271	71.596673	1.70
77	Surendranagar	Limbdi	Shiyani	22.6626071	71.829693	1.65
78	Surendranagar	Lakhtar	Lakhtar	22.8541001	71.78666	1.55
79	Vadodara	Desar	Vejpur2	22.74351	73.35385	2.80

Table E: Hotspots with respect to Total Hardness >600 mg/l

S.No	District	Taluka	Location	Latitude	Longitude	TH mg/l
1	Ahmedabad	Mandal	Dalod	23.36667	71.96667	1290
2	Ahmedabad	Dhandhuka	Dhandhuka1	22.37500	71.98611	1300
3	Ahmedabad	Daskroi	Ghuma	23.03333	72.44583	750
4	Ahmedabad	Viramgam	Kumarkhan	22.90000	72.01667	760
5	Ahmedabad	Dhandhuka	Vagad	22.29710	71.94673	1460
6	Ahmedabad	Mandal	Dalod	23.35278	71.96750	1271
7	Amreli	Jafrabad	Kadiyali	20.86175	71.30227	750
8	Amreli	Rajula	Mandal	21.09944	71.57929	1310
9	Anand	Anand	Adas_DW	22.47249	73.03515	625
10	Anand	Anklav	Anklav2	22.37637	72.99713	640
11	Anand	Petlad	Bandhani	22.53797	72.81221	720
12	Anand	Khambhat	Dali	22.28320	72.76294	650
13	Anand	Umreth	Ghora	22.69264	73.04956	690
14	Anand	Khambhat	Kansari1	22.34128	72.65155	700
15	Arvalli	Bayad	Boral	23.12906	73.21503	861
16	Banaskantha	Dantiwada	Gangundra	24.43964	72.36480	1000
17	Banaskantha	Amirgadh	Amirgadh	24.40072	72.64781	880
18	Bharuch	Hansot	Jetpur1	21.58398	72.81075	1550
19	Bharuch	Anklesvar	Motwan	22.55401	72.88333	950
20	Bharuch	Bharuch	Navetha	21.70914	72.82814	1700
21	Bharuch	Hansot	Sahol	21.44464	72.81835	1250
22	Bharuch	Jambusar	Tankari	21.98822	72.66913	1900
23	Bharuch	Jambusar	Bhadkodara	22.05727	72.58730	1100
24	Bhavnagar	Mahuva	Dudhala	21.14092	71.65106	840
25	Bhavnagar	Gariadhar	Gariyadhar	21.54434	71.56363	820
26	Bhavnagar	Umrala	Jalia	21.79995	71.61096	1050
27	Bhavnagar	Talaja	Talaja2	21.36575	72.02076	790
28	Bhavnagar	Talaja	Trapaj	21.42437	72.09983	670
29	Botad	Ranpur	Rajpada	22.30833	71.69167	1130
30	Botad	Gadhada	Tatam	22.05833	71.63333	1870
31	Chhota udepur	Bodeli	Govindpura	22.21554	73.73999	1925
32	Dahod	Dahod	Dahod Urban-2	22.84091	74.25566	781
33	Dahod	Garbada	Garbara	22.68487	74.31505	1501
34	Devbhumi Dwarka	Bhanvad	Ambardi	21.91667	69.85833	610
35	Devbhumi Dwarka	Kalyanpur	Bhogat1	21.99167	69.24583	641
36	Devbhumi Dwarka	Kalyanpur	Juvanpur	22.17083	69.36667	901
37	Devbhumi Dwarka	Kalyanpur	Khirsara	21.97917	69.60000	671
38	Devbhumi Dwarka	Okhamandal	Mojap	22.36667	68.98333	711
39	Devbhumi Dwarka	Kalyanpur	Raval	21.99306	69.24583	1001
40	Devbhumi Dwarka	Okhamandal	Varwada	22.29167	68.96667	1341
41	Devbhumi Dwarka	Kalyanpur	Vamansa	22.08400	69.18870	1281
42	Gandhinagar	Dehgam	Paliya	23.17917	72.84167	750
43	Gir Somnath	Kodinar	Kodinar1	20.81364	70.69736	620

44	Jamnagar	Jamnagar	Gordhanpur	22.45000	70.00139	605
45	Jamnagar	Kalavad	Haripur2	22.27083	70.33333	701
46	Jamnagar	Jamnagar	Jambuda	22.52500	70.20417	641
47	Jamnagar	Jodia	Haryana			3623
48	Jamnagar	Jodia	Kesya	22.69720	70.39700	1681
49	Jamnagar	Jamjodhpur	Samana	22.11000	70.16980	600
50	Junagadh	Mangrol	Arena	21.08056	70.17639	2392
51	Junagadh	Mangrol	Bamanwara	21.22083	70.05556	1201
52	Junagadh	Malia	Chorwad	21.04167	70.21667	3163
53	Junagadh	Mangrol	Kalej	21.24861	70.05833	2052
54	Junagadh	Malia	Kanek	21.03056	70.24167	1261
55	Junagadh	Malia	Khambalia1	21.04444	70.19167	1041
56	Junagadh	Vanthali	Khokharda	21.42083	70.31667	831
57	Junagadh	Mendarda	Mendarda1	21.32500	70.43333	701
58	Junagadh	Mangrol	Shardagram	21.10417	70.15278	1942
59	Kheda	Mahudha	Alina	22.80833	73.05833	750
60	Kheda	Matar	Kheda	22.73750	72.70417	1660
61	Kheda	Kathlal	Ladvel	22.90833	73.12083	930
62	Kheda	Thasra	Muliyad	22.78306	73.17667	1400
63	Kutchch	Bhachau	Ratanpar Khadir	23.86210	70.36230	701
64	Kutchch	Bhuj	Sukhpar	23.19869	69.60709	1351
65	Kutchch	Bhuj	Lodai	23.39703	69.90000	1121
66	Kutchch	Bhuj	Khavda	23.83750	69.72731	661
67	Kutchch	Nakhatrana	Devisar	23.40664	69.33391	1651
68	Kutchch	Lakhpat	Lakhpat	23.82330	68.77525	850
69	Kutchch	Bhachau	Kharoi	23.47229	68.68397	1120
70	Kutchch	Abdasa	Mothala	23.20307	69.13545	1120
71	Kutchch	Mandvi	Bambhdai	22.94148	69.08258	1100
72	Kutchch	Mundra	Vadala	22.91678	69.85413	790
73	Kutchch	Bhachau	Samakhiali	23.30665	70.50414	910
74	Mahisagar	Lunawada	Lunawada	23.11949	73.61098	620
75	Mehsana	Mehsana	Maguna	23.57727	72.29040	1080
76	Morbi	Wankaner	Bhalgam	22.43556	71.08250	861
77	Morbi	Tankara	Lajai	22.71583	70.78028	2372
78	Morbi	Morvi	Modpar	22.90167	70.66278	641
79	Morbi	Morvi	Amarnagar	22.93444	70.82417	1731
80	Morbi	Halvad	Halvad 2	23.01917	71.18500	851
81	Navsari	Bansda	Kantasvel	20.59761	73.69487	661
82	Navsari	Jalalpore	Abrama	20.86250	72.90000	901
83	Navsari	Bansda	Navsari 1	20.80500	73.26667	991
84	Panchmahal	Ghoghamba	Ranipura	22.71714	73.74420	721
85	Panchmahal	Kalol	Kalol UR_2	22.62826	73.45678	631
86	Patan	Sami	Moti Chander	23.59921	71.77013	5104
87	Patan	Santalpur	Piprala	23.64604	71.09687	891
88	Porbandar	Porbandar	Bhavpura	21.80972	69.40833	1661
89	Porbandar	Ranavav	Bhod	21.65889	69.82111	721

90	Porbandar	Porbandar	Degam	21.71028	69.60556	751
91	Porbandar	Kutiyana	Kadegi	21.45056	69.98333	801
92	Porbandar	Porbandar	Kuchhadi	21.68333	69.55000	600
93	Porbandar	Porbandar	Palkhada1	21.75833	69.48750	701
94	Porbandar	Porbandar	Ratadi	21.72028	69.51194	1001
95	Porbandar	Porbandar	Visavada	21.78556	69.44639	1861
96	Rajkot	Rajkot	Rafala	22.29028	70.98361	1041
97	Rajkot	Rajkot	Halenda	22.08750	71.05417	921
98	Rajkot	Jasdan	Kamlapur	22.13806	71.20000	921
99	Rajkot	Vinchhiya	Vinchhiya	22.20806	71.37806	1421
100	Rajkot	Gondal	Mota Dadwa	21.99806	70.99417	600
101	Rajkot	Jetpur	Jetpur Pithad	21.78306	70.64083	1641
102	Rajkot	Upleta	Ganod	21.68861	70.16917	851
103	Rajkot	Dhoraji	Dhoraji 1	21.76333	70.46583	711
104	Rajkot	Lodhika	Taravada	21.80611	70.47889	1081
105	Rajkot	Jetpur	Umrali	21.90861	70.60194	651
106	Rajkot	Gondal	Kalithad	22.01889	70.65167	721
107	Rajkot	Paddhari	Targhari	22.38306	70.66944	811
108	Rajkot	Paddhari	Moviya	22.45639	70.62528	3102
109	Rajkot	Gondal	Hadmatiya	22.68222	70.81139	1061
110	Sabarkantha	Idar	Chandap_DW	23.92282	72.84433	681
111	Sabarkantha	Khedbrahma	Matoda	24.11150	73.00773	831
112	Sabarkantha	Khedbrahma	Hingatiya	24.14659	73.01063	600
113	Sabarkantha	Khedbrahma	Khedbramha_1	24.05409	73.02759	1241
114	Sabarkantha	Khedbrahma	Silwad	24.01280	73.12410	1191
115	Sabarkantha	Vadali	Choriwad	23.89635	73.11744	861
116	Sabarkantha	Idar	Revas	23.81991	73.13054	671
117	Surat	Surat city	Jiav	21.11472	72.83528	801
118	Surat	Mahuva	Puna1	20.92917	73.22917	1651
119	Surat	Kamrej	Sayan	21.30556	72.91083	651
120	Surendranagar	Chuda	Chuda	22.48639	71.70111	661
121	Surendranagar	Chuda	Navi Morvad	22.53566	71.57473	701
122	Surendranagar	Sayla	Sudamda	22.44583	71.48806	971
123	Surendranagar	Sayla	Nav Sudamda	22.53972	71.43583	861
124	Surendranagar	Chotila	Moti Moladi	22.41778	71.10417	3253
125	Surendranagar	Dharagadhra	Rajsitapur	22.83778	71.59667	801
126	Surendranagar	Muli	Muli	22.63889	71.46417	1211
127	Surendranagar	Muli	Sadla/Sarla	22.73389	71.36889	620
128	Surendranagar	Muli	Nav Raisngpur	22.73694	71.27028	1191
129	Surendranagar	Thangadh	Tarnetar	22.64222	71.21139	751
130	Surendranagar	Dharagadhra	Ratanpur 1	22.85528	71.27444	851
131	Surendranagar	Dasada	Kharaghoda	23.18750	71.75083	5454
132	Tapi	Dolvan	Bedchit	20.95000	73.35139	600
133	Vadodara	Vaghodia	Patiyapura	22.27704	73.42524	1850

Annexure I : Analysis of Basic Parameters Result

S.No.	District	Taluka	Location	Latitude	Longitude	Source of sample	Date of Collection	pH	EC	TDS	CO3	HCO3	Cl	F
									µS/cm at 25°C					
1	Ahmedabad	Viramgam	Endla	23.28028	72.048878	DW	24.05.22	8.38	550	368	6	220	64	0.0
2	Ahmedabad	Dholera	Gamph	22.35636	72.167418	DW	29.05.22	8.33	1434	961	30	512	191	0.3
3	Ahmedabad	Viramgam	Kumarkhan	22.9006	72.020723	DW	25.05.22	7.60	11870	7953	0	1415	3013	0.9
4	Ahmedabad	Dhandhuka	Tagadi1	22.2971	71.946725	DW	29.05.22	7.99	3790	2539	0	464	425	1.0
5	Ahmedabad	Viramgam	Viramgam2	23.13669	72.038363	DW	24.05.22	8.47	6920	4636	18	964	1560	0.3
6	Amreli	Lathi	Chavand	21.811050	71.405740	DW	23-05-2022	8.25	510	342	0	268	28	0.39
7	Amreli	Lathi	Tajpur	21.725370	71.461433	DW	23-05-2022	8.36	590	395	48	134	50	0.42
8	Amreli	Lathi	Lathi	21.726976	71.382977	DW	23-05-2022	8.4	1430	958	60	256	241	0.59
9	Amreli	Savar-Kundla	Piyava	21.379547	71.460227	DW	23-05-2022	8.36	1550	1039	60	415	206	0.34
10	Amreli	Lilia	Sanaria	21.550064	71.431922	DW	23-05-2022	8.34	6050	4054	24	390	916	1.58
11	Amreli	Savar-Kundla	Bhuva	21.427712	71.359647	DW	23-05-2022	8.55	5000	3350	120	573	909	1.3
12	Amreli	Lilia	Punjapadar	21.530495	71.359185	DW	23-05-2022	8.56	2406	1612	120	525	348	1.94
13	Amreli	Khambha	Khamba	21.146447	71.238110	DW	24-05-2022	8.33	652	437	48	195	50	0.25
14	Amreli	Khambha	Trakuda	21.016512	71.282878	DW	24-05-2022	8.05	951	637	0	244	114	0.31
15	Amreli	Jafrabad	Kadiyali	20.861747	71.302268	DW	24-05-2022	8.13	822	551	0	207	135	0.58
16	Amreli	Jafrabad	Bherai	20.974028	71.486826	DW	24-05-2022	8.02	5122	3432	0	500	1285	0.31
17	Amreli	Rajula	Mandal	21.099438	71.579290	DW	24-05-2022	7.72	4700	3149	0	207	1136	0.58
18	Amreli	Savarkundla	Vanot	21.170104	71.483750	DW	24-05-2022	7.99	1155	774	0	342	142	0.49
19	Amreli	Savar-Kundla	Goradka	21.228019	71.408080	DW	24-05-2022	8.04	1164	780	0	183	170	0.21
20	Amreli	Savar-Kundla	Badhda	21.266366	71.338387	DW	24-05-2022	7.98	1142	765	0	268	149	0.22
21	Amreli	Savarkundla	Simran	21.431075	71.270169	DW	24-05-2022	8.74	1615	1082	108	549	135	1.52
22	Amreli	Dhari	Kerala	21.389715	71.217799	DW	25-05-2022	8.25	1865	1250	0	476	341	0.36
23	Amreli	Dhari	Chalala	21.414865	71.165137	DW	25-05-2022	8.42	706	473	36	195	78	0.21
24	Amreli	Dhari	Morjhar	21.375768	71.113977	DW	25-05-2022	7.85	937	628	0	268	135	0.17
25	Amreli	Khambha	Ingoralia	21.226835	71.202566	DW	25-05-2022	8.32	602	403	36	220	36	0.27
26	Amreli	Dhari	Boradi	21.288725	70.927033	DW	25-05-2022	8.06	1035	693	0	305	114	0.21
27	Amreli	Bagasara	Bagasara	21.476752	70.960818	DW	25-05-2022	7.98	2882	1931	0	232	540	0.29
28	Amreli	Bagasara	Vaghania junia	21.583441	70.969502	DW	25-05-2022	8.45	1790	1199	96	317	249	0.58
29	Amreli	Kunkavav Vadia	Kunkavav	21.655500	70.980484	DW	25-05-2022	8.01	1645	1102	0	61	362	0.4

30	Amreli	Amreli	Ankadia mota	21.645288	71.106121	DW	25-05-2022	8.18	1032	691	0	342	121	0.38
31	Amreli	Amreli	Govadka	21.542967	71.157289	DW	25-05-2022	8.23	785	526	0	232	107	0.37
32	Amreli	Amreli	Vankiya	21.539569	71.165526	DW	25-05-2022	8.22	1830	1226	0	207	426	0.41
33	Amreli	Amreli	Jaswantgadh	21.729134	71.206648	DW	25-05-2022	8.29	1735	1162	0	268	376	0.35
34	Amreli	Babra	Untvad	21.906801	71.222832	DW	25-05-2022	8.26	950	637	0	134	128	0.38
35	Amreli	Babra	Dharai (Balmukund)	21.807739	71.148092	DW	25-05-2022	8.35	1200	804	36	220	192	0.33
36	Amreli	Amreli	Devaliya	21.527678	71.250533	DW	26-05-2022	7.62	4900	3283	0	134	1370	0.32
37	Anand	Anand	Adas_DW	22.47249	73.03515	DW	28-05-2022	8.41	1215	814	24	354	106	0.3
38	Anand	Anklav	Anklav2	22.37637	72.99713	DW	29-05-2022	8.35	1160	777	30	415	85	0.4
39	Anand	Borsad	Bhadran (Utiyapara)	22.38449	72.90135	DW	29-05-2022	8.09	697	467	0	342	35	0.2
40	Anand	Borsad	Ras	22.35132	72.83582	DW	29-05-2022	8.47	1353	907	30	537	106	2.6
41	Anand	Khambhat	Dali	22.28320	72.76294	DW	29-05-2022	8.55	1530	1025	36	390	248	0.4
42	Anand	Khambhat	Kansari1	22.34128	72.65155	DW	29-05-2022	8.47	5223	3499	42	659	1141	0.6
43	Anand	Petlad	Dharmaj	22.42074	72.78741	DW	29-05-2022	8.55	2505	1678	36	805	227	1.5
44	Anand	Tarapur	Tol	22.49961	72.59696	DW	30-05-2022	8.31	720	482	18	305	43	0.7
45	Anand	Umreth	Parvata	22.69117	73.08490	DW	31-05-2022	8.47	1510	1012	36	525	113	0.8
46	Anand	Umreth	Ghora	22.69264	73.04956	DW	31-05-2022	8.30	2820	1889	48	598	461	0.3
47	Arvalli	Modasa	Gadada	23.59517	73.205982	Dug well	22-05-2022	7.7	1755	1176	0	220	298	0.98
48	Arvalli	Bhiloda	Shamlaji	23.683	73.368425	Dug well	22-05-2022	8.06	535	358	0	171	92	0.35
49	Arvalli	Bhiloda	Takatuka_1	23.8031	73.289506	Dug well	22-05-2022	7.67	2560	1715	0	390	525	0.6
50	Arvalli	Modasa	Medasana	23.52886	73.216442	Dug well	23-05-2022	8.02	892	598	0	183	135	0.66
51	Arvalli	Modasa	Modasa2	23.46114	73.302663	Dug well	23-05-2022	7.78	892	598	0	195	128	0.12
52	Arvalli	Meghraj	Megraj_1	23.493030	73.498575	Dug well	23-05-2022	7.85	535	358	0	220	36	0.21
53	Arvalli	Malpur	Hamirpur	23.40632	73.460597	Dug well	23-05-2022	7.68	1245	834	0	183	213	0.76
54	Arvalli	Malpur	Malpur_1	23.37151	73.455499	Dug well	23-05-2022	7.84	780	523	0	171	64	0.66
55	Arvalli	Dhansura	Karanpur	23.332410	73.326940	Dug well	23-05-2022	8	900	603	0	317	135	0.43
56	Arvalli	Dhansura	Dhansura	23.34719	73.199478	Dug well	23-05-2022	7.83	1050	704	0	317	114	0.42

57	Arvalli	Bayad	Boral	23.129060	73.215027	Dug well	23-05-2022	7.98	3080	2064	0	390	675	0.46
58	Arvalli	Bayad	Bibipur1	23.25403	73.214998	Dug well	23-05-2022	7.72	2130	1427	0	293	334	0.43
59	Arvalli	Bayad	Alwa Kampa	23.277	73.210617	Dug well	23-05-2022	8.56	920	616	48	244	78	0.63
60	Arvalli	Bayad	Sathamba	23.173370	73.330404	Dug well	24-05-2022	8.25	1195	801	0	537	99	0.7
61	Banaskantha	Palanpur	Palanpur2	24.1995	72.43833	DW	31-05-2022	7.84	1340	898	0	378	192	0.77
62	Banaskantha	Danta	Ratanpur2	24.17842	72.74823	DW	04-06-2022	7.88	1205	807	0	146	192	0.32
63	Banaskantha	Danta	Kunvarsingh	24.21192	72.86002	DW	31-05-2022	8.18	525	352	0	207	64	0.62
64	Banaskantha	Danta	Beda	24.2006	72.90689	DW	03-06-2022	8.04	960	643	0	317	142	1.16
65	Banaskantha	Danta	Ganapipli	24.29364	72.94666	DW	03-06-2022	8.01	785	526	0	293	57	2.15
66	Banaskantha	Amirgadh	Virampur	24.2664	72.65233	DW	03-06-2022	7.91	1710	1146	0	232	327	1.34
67	Banaskantha	Palanpur	Hathidra	24.22769	72.59879	DW	31-05-2022	8.08	648	434	0	232	57	1.88
68	Banaskantha	Amirgadh	Rampura (Vadla)	24.26328	72.55534	DW	03-06-2022	7.98	1121	751	0	244	121	0.35
69	Banaskantha	Amirgadh	Iqbalgarh	24.34483	72.54678	DW	29-05-2022	7.95	728	488	0	232	64	0.36
70	Banaskantha	Dantiwada	Dantiwada1	24.31457	72.32671	DW	04-06-2022	7.94	565	379	0	183	43	0.44
71	Banaskantha	Deesa	Meda	24.39793	72.28531	DW	02-06-2022	7.43	1220	817	0	305	206	0.68
72	Banaskantha	Dantiwada	Gangodra	24.43968	72.364741	DW	04-06-2022	7.88	4220	2827	0	427	1044	1.70
73	Banaskantha	Dantiwada	jhat	24.48682	72.35129	DW	01-06-2022	8.28	1770	1186	0	488	291	1.70
74	Banaskantha	Tharad	Dudhva	24.4794	71.66902	DW	02-06-2022	8.22	6225	4171	0	793	1583	0.88
75	Banaskantha	Tharad	Piluda	24.55095	71.69464	DW	03-06-2022	8.38	1546	1036	24	256	312	0.16
76	Banaskantha	Tharad	Dantiya	24.54713	71.71943	DW	03-06-2022	8.47	860	576	48	293	64	0.87
77	Banaskantha	Tharad	Miyal	24.61678	71.74831	DW	02-06-2022	8.32	960	643	36	378	57	0.68
78	Banaskantha	Tharad	Bharol1	24.52944	71.540178	DW	03-06-2022	8.39	1980	1327	72	708	234	1.15
79	Banaskantha	Kankrej	Un	23.89094	71.77151	DW	04-06-2022	8.35	1168	783	84	207	149	0.59
80	Bharuch	Jambusar	Sarod	22.16102	72.75574	DW	21-05-2022	8.79	1596	1069	36	635	92	0.4
81	Bharuch	Jambusar	Kavi	22.19536	72.63672	DW	21-05-2022	8.94	3710	2486	66	1342	347	0.1
82	Bharuch	Jambusar	Dahegam	22.18464	72.59017	DW	21-05-2022	8.23	1018	682	0	439	92	0.0
83	Bharuch	Jambusar	Chhindra	22.10140	72.59498	DW	21-05-2022	9.28	1010	677	36	232	128	0.0
84	Bharuch	Jambusar	Sindhav	22.03062	72.61067	DW	21-05-2022	9.25	1030	690	30	390	85	0.1
85	Bharuch	Jambusar	Tankari	21.98822	72.66913	DW	21-05-2022	8.50	6860	4596	42	1403	1418	0.2
86	Bharuch	Jambusar	Kalak_1	22.02876	72.76415	DW	21-05-2022	8.24	1098	736	0	451	99	0.4
87	Bharuch	Jambusar	Jambusar2	22.04936	72.80864	DW	21-05-2022	8.65	4375	2931	48	598	1049	0.5

88	Bharuch	Vagra	Nirnavi	21.79446	72.65811	DW	22-05-2022	8.19	590	395	0	281	35	0.3
89	Bharuch	Vagra	Luhara	21.67211	72.55233	DW	22-05-2022	8.75	949	636	30	329	85	0.4
90	Bharuch	Vagra	Bhensli	21.72439	72.75247	DW	22-05-2022	8.26	950	637	0	378	99	0.2
91	Bharuch	Bharuch	Mahegam1	21.67619	72.75987	DW	22-05-2022	8.27	380	255	0	171	28	0.3
92	Bharuch	Bharuch	Kaswa (Koswa)	21.68163	72.81538	DW	22-05-2022	7.54	711	476	0	281	85	0.1
93	Bharuch	Bharuch	Navetha	21.70914	72.82814	DW	22-05-2022	7.63	3780	2533	0	305	1042	0.1
94	Bharuch	Anklesvar	Sajod	21.61920	72.91082	DW	22-05-2022	9.25	3261	2185	66	927	475	4.0
95	Bharuch	Hansot	Utraj	21.58766	72.82431	DW	22-05-2022	7.92	814	545	0	268	113	0.4
96	Bharuch	Hansot	Jetpur1	21.58398	72.81075	DW	22-05-2022	8.28	548	367	0	244	43	0.1
97	Bharuch	Hansot	Raymal	21.51905	72.81970	DW	22-05-2022	8.21	960	643	0	293	149	0.4
98	Bharuch	Hansot	Sahol	21.44464	72.81835	DW	22-05-2022	7.45	3940	2640	0	268	1049	1.2
99	Bharuch	Anklesvar	Panoli	21.53694	72.97481	DW	22-05-2022	8.14	2450	1642	0	451	496	1.5
100	Bharuch	Valia	Kondh	21.57764	73.07601	DW	22-05-2022	7.99	1105	740	0	268	170	0.8
101	Bharuch	Valia	Mokhdi	21.53561	73.27513	DW	24-05-2022	8.23	1020	683	0	500	50	0.4
102	Bharuch	Valia	Jokhla	21.63768	73.28153	DW	24-05-2022	8.27	880	590	0	403	50	0.9
103	Bhavnagar	Vallabhipur	Lonjdhara	22.096372	71.893154	DW	20-05-2022	8.42	1720	1152	60	305	277	1.28
104	Bhavnagar	Vallabhipur	Panvi1	22.070075	71.892011	DW	20-05-2022	7.51	882	591	0	342	64	1.39
105	Bhavnagar	Vallabhipur	Ayodhyapuram	21.952183	71.884463	DW	20-05-2022	8.61	2820	1889	120	756	327	1.76
106	Bhavnagar	Vallabhipur	Vallbhipur	21.900369	71.878412	DW	20-05-2022	8.42	4460	2988	96	586	675	0.43
107	Bhavnagar	Umrala	Umrala	21.846001	71.802588	DW	20-05-2022	8.53	1411	945	84	451	121	1.71
108	Bhavnagar	Umrala	Timbi2	21.822775	71.753401	DW	20-05-2022	7.59	2110	1414	0	232	433	0.37
109	Bhavnagar	Umrala	Jalia	21.799946	71.610959	DW	20-05-2022	8.08	2010	1347	0	390	170	0.51
110	Bhavnagar	Sihor	Sandhida	21.687500	71.758333	DW	20-05-2022	7.95	950	637	0	207	128	0.22
111	Bhavnagar	Sihor	Piparla	21.636389	71.918889	DW	21-05-2022	8.07	810	543	0	232	64	0.38
112	Bhavnagar	Sihor	Amargadh	21.714722	71.867778	DW	21-05-2022	8.06	2100	1407	0	293	383	0.98
113	Bhavnagar	Sihor	Ukharala	21.770000	71.886667	DW	21-05-2022	7.77	10030	6720	0	342	2812	0.56
114	Bhavnagar	Bhavnagar	Bhavnagar1	21.773634	72.145504	DW	21-05-2022	7.72	1220	817	0	281	206	0.31
115	Bhavnagar	Ghogha	Ghogha	21.680277	72.281740	DW	21-05-2022	8.44	3120	2090	84	525	426	0.31
116	Bhavnagar	Ghogha	Vavdi	21.529157	72.148943	DW	21-05-2022	8.45	650	436	48	171	43	0.47
117	Bhavnagar	Talaja	Trapaj	21.424365	72.099832	DW	21-05-2022	8.08	1190	797	48	293	121	0.5
118	Bhavnagar	Talaja	Talaja2	21.365747	72.020761	DW	21-05-2022	7.88	2281	1528	0	268	497	0.45
119	Bhavnagar	Talaja	Datha	21.213852	71.950052	DW	21-05-2022	8.4	715	479	60	159	85	1.04
120	Bhavnagar	Mahuva	Longadi	21.213247	71.886063	DW	21-05-2022	8.15	750	503	0	329	57	0.66

121	Bhavnagar	Mahuva	Bora	21.162940	71.872592	DW	21-05-2022	8.65	1565	1049	48	659	78	2.18
122	Bhavnagar	Mahuva1	Mahuva	21.099956	71.747011	DW	21-05-2022	8.46	5130	3437	36	756	1058	1.03
123	Bhavnagar	Mahuva	Dudhala	21.140915	71.651062	DW	21-05-2022	7.97	2635	1765	0	293	511	0.57
124	Bhavnagar	Mahuva	Khari	21.268889	71.778889	DW	21-05-2022	8.08	1660	1112	0	366	220	0.39
125	Bhavnagar	Sihor	Kajavadar	21.651111	71.973333	DW	22-05-2022	7.9	2430	1628	0	220	334	0.58
126	Bhavnagar	Palitana	Panchpipla	21.544559	71.724855	DW	22-05-2022	8.08	2010	1347	0	293	412	0.72
127	Bhavnagar	Gariadhar	Gariyadhar	21.544340	71.563631	DW	22-05-2022	8.16	2430	1628	0	305	398	0.67
128	Bhavnagar	Gariadhar	Bhandariya	21.478056	71.627500	DW	22-05-2022	7.96	2643	1771	0	244	632	0.54
129	Bhavnagar	Palitana	Vadal	21.447377	71.853459	DW	22-05-2022	8.24	1060	710	0	195	156	0.42
130	Bhavnagar	Palitana	Sajnasar	21.428723	71.914439	DW	22-05-2022	8.01	745	499	0	43	50	0.51
131	Bhavnagar	Talaja	Kundheli	21.394341	71.963773	DW	22-05-2022	8.1	1410	945	0	220	277	0.21
132	Bhavnagar	Mahuva	Motividal	21.191504	71.549098	DW	24-05-2022	8.18	1383	927	0	415	213	0.26
133	Bhavnagar	Jafrabad	Timbi2	20.897224	71.202105	DW	26-05-2022	8.32	2542	1703	0	415	412	0.91
134	Botad	Barwala	Barvala	22.162421	71.894201	DW	20-05-2022	8.48	6280	4208	144	1159	760	1.87
135	Botad	Gadhada	Rajpipla	21.862778	71.633056	DW	28-05-2022	8.33	1150	771	36	146	227	0.63
136	Botad	Gadhada	Ningala	22.019141	71.702341	DW	28-05-2022	8.2	1387	929	0	256	270	0.39
137	Botad	Gadhada	Tatam	22.058333	71.633333	DW	28-05-2022	8.06	2656	1780	0	256	511	0.52
138	Botad	Botad	Senthali	22.168333	71.726667	DW	29-05-2022	8.29	1907	1278	0	451	320	0.6
139	Botad	Ranpur	Kundali	22.269444	71.700000	DW	29-05-2022	8.06	1600	1072	0	73	348	0.46
140	Botad	Ranpur	Rajpada	22.308438	71.694484	DW	29-05-2022	8.19	2350	1575	0	329	355	0.78
141	Chhota udepur	Nasvadi	Sengpur	22.08659	73.97762	DW	26-05-2022	7.78	790	529	0	268	85	0.4
142	Chhota udepur	Kavant	Vagudan	22.07119	74.10902	DW	26-05-2022	8.14	810	543	0	415	43	0.6
143	Chhota udepur	Kavant	Moti chikhali	22.01515	74.08063	DW	26-05-2022	7.96	646	433	0	305	28	1.8
144	Chhota udepur	Kavant	Panwad	22.21018	74.03093	DW	26-05-2022	8.03	1200	804	0	195	191	0.4
145	Chhota udepur	Chhota udaipur	Ghamodi	22.36908	74.07344	DW	26-05-2022	8.18	548	367	0	244	35	0.8
146	Chhota udepur	Chhota udaipur	Ferkuva	22.36392	74.21430	DW	26-05-2022	8.03	940	630	0	354	71	0.3
147	Chhota udepur	Chhota udaipur	Kevadi	22.52256	73.93433	DW	26-05-2022	8.10	645	432	0	268	43	1.0
148	Chhota udepur	Jetpur pavi	Bhindol	22.20107	73.89710	DW	27-05-2022	8.70	1613	1081	48	805	57	2.2
149	Chhota udepur	Bodeli	Govindpura	22.21554	73.73999	DW	28-05-2022	8.06	5430	3638	0	537	1347	2.2
150	Dahod	Garbada	Navagam Faliya	22.68678	74.306084	Dug well	29-05-2022	8.18	2370	1588	0	671	341	2.4
151	Dahod	Fatepura	Sukhsar	23.1491	74.034781	Dug well	26-05-2022	8.02	710	476	0	244	43	0.68
152	Dahod	Zalod	Garada	23.16472	74.122778	Dug	26-05-2022	7.89	1395	935	0	146	163	1.95

						well									
153	Dahod	Zalod	Limbdi	23.00571	74.153553	Dug well	26-05-2022	8.05	730	489	0	305	85	1	
154	Dahod	Zalod	Mirakhedi	22.93982	74.201505	Dug well	26-05-2022	7.94	840	563	0	195	99	0.78	
155	Dahod	Dahod	Dahod Urban-1	22.87508	74.229245	Dug well	26-05-2022	7.89	648	434	0	220	28	0.95	
156	Dahod	Dahod	Dahod Urban-2	22.84091	74.255661	Dug well	26-05-2022	7.85	2400	1608	0	329	433	2.7	
157	Dahod	Dahod	Dahod Urban-3	22.82589	74.263640	Dug well	26-05-2022	7.81	1335	894	0	342	156	0.23	
158	Dahod	Dahod	Dahod2	22.831100	74.232840	Dug well	26-05-2022	8.24	1705	1142	0	366	284	2	
159	Dahod	Limkheda	Nava Vadiya	22.894760	74.045213	Dug well	28-05-2022	8.25	1030	690	0	476	71	1.16	
160	Dahod	Limkheda	Dadhela	22.84035	74.083503	Dug well	28-05-2022	8.12	710	476	0	281	57	0.86	
161	Dahod	Dhanpur	Dhanpur	22.63602	74.098783	Dug well	28-05-2022	8.2	1230	824	0	561	85	0.6	
162	Dahod	Dhanpur	Kanjetha	22.57994	74.109453	Dug well	28-05-2022	7.96	646	433	0	305	36	0.51	
163	Dahod	Dhanpur	Tokarba	22.59677	74.028464	Dug well	28-05-2022	7.94	969	649	0	342	142	0.29	
164	Dahod	Devgadh baria	Khandania	22.60436	73.896609	Dug well	28-05-2022	8.48	440	295	0	171	14	2.22	
165	Dahod	Devgadh baria	Devgadh Baria	22.69974	73.916801	Dug well	28-05-2022	7.86	865	580	0	281	99	1.2	
166	Dahod	Devgadh baria	Badpa	22.68894	73.858010	Dug well	28-05-2022	8.07	973	652	0	403	92	2.58	
167	Dahod	Dahod	Varamkheda	22.775180	74.288661	Dug well	29-05-2022	8.27	815	546	0	305	107	1.01	
168	Dahod	Garbada	Panchwada	22.72895	74.305387	Dug well	29-05-2022	8.54	790	529	0	342	50	1.4	
169	Daman	Daman	Pariyari	20.37658	72.832087	DW	06-06-2022	7.79	889	596	0	146	220	0.23	
170	Daman	Daman	Bhathaiya	20.38854	72.831426	DW	06-06-2022	8.04	629	421	0	268	50	0.15	
171	Daman	Daman	Singha Faliya	20.39255	72.850033	DW	06-06-2022	8.00	534	358	0	293	28	0.30	
172	Daman	Daman	Devka	20.453	72.838228	DW	06-06-2022	7.69	2377	1593	0	573	390	0.62	
173	Daman	Daman	Nani Vankad	20.4579	72.884907	DW	06-06-2022	7.90	865	580	0	232	149	0.20	
174	Dang	Waghai	Kalivel	20.92318	73.581488	DW	31-05-2022	8.05	605	405	0	305	35	0.05	

175	Dang	Waghai	Sodmal	20.85907	73.619375	DW	31-05-2022	8.15	430	288	0	220	21	0.25
176	Dang	Subir	Bardipada	20.97488	73.615465	DW	31-05-2022	8.05	649	435	0	268	78	0.17
177	Dang	Subir	Mahal	20.91768	73.66925	DW	31-05-2022	8.47	651	436	18	183	85	0.22
178	Dang	Waghai	Subir	20.92648	73.773917	DW	31-05-2022	7.90	499	334	0	244	35	0.12
179	Dang	Ahwa	Guvitha	20.79945	73.73205	DW	31-05-2022	8.31	401	269	6	207	14	0.20
180	Dang	Ahwa	Umbarpada	20.6799	73.722016	DW	31-05-2022	8.03	468	314	0	256	14	0.06
181	Dang	Ahwa	Dhumkal	20.63654	73.767325	DW	31-05-2022	8.09	391	262	0	207	21	0.23
182	Dang	Ahwa	Jakhana	20.62805	73.741954	DW	31-05-2022	7.54	563	377	0	244	35	0.25
183	Dang	Ahwa	Malegaon	20.59381	73.744688	DW	01-06-2022	8.16	396	265	0	183	21	0.17
184	Dang	Subir	Bardipada	20.63729	73.690691	DW	01-06-2022	7.67	376	252	0	195	21	0.15
185	Dang	Ahwa	Chikhali(Samagham)	20.65964	73.676433	DW	01-06-2022	8.20	438	293	0	232	14	0.18
186	Dang	Waghai	Nana Pada	20.69011	73.603042	DW	01-06-2022	8.18	408	273	0	232	14	0.13
187	Dang	Waghai	Sakar Patal	20.69604	73.581168	DW	01-06-2022	8.22	362	243	0	183	21	0.17
188	Dang	Waghai	Jamal Pada	20.71973	73.52465	DW	01-06-2022	8.06	562	377	0	220	43	0.04
189	Dang	Waghai	Amба Pada(Waghai)	20.75757	73.500671	DW	01-06-2022	8.19	482	323	0	256	21	0.14
190	Dang	Waghai	Chichimagautha	20.8052	73.549724	DW	01-06-2022	7.94	520	348	0	183	57	0.17
191	Dang	Ahwa	Nagagkhadi	20.80306	73.613134	DW	01-06-2022	8.09	473	317	0	256	21	0.12
192	Dang	Waghai	Vazat Amba	20.88335	73.495577	DW	01-06-2022	8.02	451	302	0	232	28	0.36
193	Dang	Waghai	Bori Gautha	20.81703	73.506463	DW	01-06-2022	8.15	511	342	0	268	21	0.38
194	Devbhoomi Dwarka	Khambhalia	Bajana	22.135626	69.755954	DW	11-06-2022	8.28	1238	829	0	195	199	0.32
195	Devbhoomi Dwarka	Bhanvad	Jampar	22.036355	69.761227	DW	11-06-2022	8.00	1357	909	0	207	270	0.28
196	Devbhoomi Dwarka	Bhanvad	Fotdi	22.022393	69.851151	DW	11-06-2022	8.35	763	511	72	146	85	0.41
197	Devbhoomi Dwarka	Khambhalia	Beh	22.26416	69.464456	DW	13-06-2022	8.38	1398	937	96	24	298	0.00
198	Devbhoomi Dwarka	Kalyanpur	Asota mota	22.269933	69.37326	DW	13-06-2022	7.95	2796	1873	0	171	660	0.09
199	Devbhoomi Dwarka	Kalyanpur	Khakharda	22.104767	69.372104	DW	13-06-2022	7.97	5119	3430	0	256	1392	0.14
200	Devbhoomi Dwarka	Kalyanpur	Gurgadh	22.194701	69.190933	DW	13-06-2022	7.65	3554	2381	0	134	731	0.38
201	Devbhoomi Dwarka	Okhamandal	Mulvasar	22.27538	69.11079	DW	13-06-2022	8.69	2549	1708	48	598	398	0.78
202	Devbhoomi Dwarka	Okhamandal	Korada	22.223922	69.047924	DW	13-06-2022	8.00	2895	1940	0	305	611	0.80

203	Devbhoomi Dwarka	Kalyanpur	Kalyanpur	22.30758	69.054212	DW	13-06-2022	8.08	4966	3327	0	451	1136	2.45
204	Devbhoomi Dwarka	Okhamandal	Gorinja	22.159324	69.066439	DW	14-06-2022	8.22	3103	2079	0	366	760	0.47
205	Devbhoomi Dwarka	Kalyanpur	Gojines	22.023838	69.203649	DW	14-06-2022	7.86	5572	3733	0	207	1491	1.08
206	Devbhoomi Dwarka	Kalyanpur	Navadra	21.939942	69.286489	DW	14-06-2022	8.33	1338	896	60	220	220	2.00
207	Devbhoomi Dwarka	Kalyanpur	Nagadiya	21.940849	69.562182	DW	15-06-2022	8.10	1025	687	0	37	262	0.2
208	Devbhoomi Dwarka	Bhanvad	Mota gunda	22.011529	69.718961	DW	15-06-2022	8.07	921	617	0	207	106	0.3
209	Devbhoomi Dwarka	Bhanvad	Nawagam	21.976718	69.763591	DW	15-06-2022	8.11	1937	1298	0	329	333	0.4
210	Devbhumi Dwarka	Mevasa	Mewasha	21.925583	69.815962	DW	11-06-2022	8.17	1287	862	0	244	263	0.37
211	Devbhumi Dwarka	Bhanvad	Mota kalawad	21.906092	69.834259	DW	11-06-2022	7.88	1506	1009	0	195	334	0.34
212	Devbhumi Dwarka	Bhanvad	Ambardi	21.916623	69.85825	DW	11-06-2022	8.05	1635	1095	0	305	256	0.47
213	Devbhumi Dwarka	Khambhalia	Kajuda	22.336515	69.701521	DW	12-06-2022	8.49	814	545	60	159	92	0.39
214	Devbhumi Dwarka	Khambhalia	Salaya	22.309853	69.598427	DW	12-06-2022	7.85	1100	737	0	390	92	0.20
215	Devbhumi Dwarka	Khambhalia	Kuvadia	22.207455	69.591871	DW	13-06-2022	8.26	517	346	0	183	64	0.13
216	Devbhumi Dwarka	Khambhalia	Hanzdapur	22.18885	69.436812	DW	13-06-2022	7.84	5268	3530	0	183	1413	0.23
217	Devbhumi Dwarka	Kalyanpur	Kalyanpur2	22.016875	69.389275	DW	13-06-2022	8.33	1170	784	36	183	185	0.12
218	Devbhumi Dwarka	Kalyanpur	Pindara1	22.247597	69.258901	DW	13-06-2022	8.17	842	564	0	171	142	0.43
219	Devbhumi Dwarka	Okhamandal	Amaliya Chokri	22.208143	69.095493	DW	13-06-2022	8.21	2626	1759	0	403	561	1.36
220	Devbhumi Dwarka	Okhamandal	Samrasar1	22.369932	69.106284	DW	13-06-2022	8.97	4943	3312	12	122	1328	0.85
221	Devbhumi Dwarka	Okhamandal	Hambusar	22.383711	69.054188	DW	13-06-2022	8.55	817	547	24	293	78	0.14
222	Devbhumi Dwarka	Okhamandal	Mojap	22.361451	68.979564	DW	13-06-2022	8.42	5339	3577	30	397	1207	1.26
223	Devbhumi Dwarka	Okhamandal	Aramda	22.427527	69.035033	DW	13-06-2022	8.10	3470	2325	0	573	611	0.71
224	Devbhumi Dwarka	Okhamandal	Varwada	22.29772	68.961451	DW	13-06-2022	7.59	11870	7953	0	183	4260	0.72

225	Devbhumi Dwarka	Okhamandal	Dwarka	22.240679	68.960442	DW	14-06-2022	8.20	2670	1789	0	378	540	0.11
226	Devbhumi Dwarka	Kalyanpur	Vamansa	22.084	69.1887	DW	14-06-2022	8.13	3052	2045	0	293	682	1.72
227	Devbhumi Dwarka	Kalyanpur	Bhogat1	21.990491	69.244275	DW	14-06-2022	8.08	3061	2051	0	183	710	0.94
228	Devbhumi Dwarka	Kalyanpur	Lambha 1	21.911297	69.30844	DW	14-06-2022	7.96	3816	2557	0	293	817	0.33
229	Devbhumi Dwarka	Kalyanpur	Raval	21.929758	69.492043	DW	15-06-2022	8.10	1362	913	0	207	291	0.2
230	Devbhumi Dwarka	Kalyanpur	Khirsara	21.978315	69.600732	DW	15-06-2022	7.72	1962	1315	0	256	475	0.2
231	Devbhumi Dwarka	Khambhalia	Bhadthar	22.075398	69.57614	DW	15-06-2022	8.08	1292	866	0	293	191	0.3
232	Devbhumi Dwarka	Khambhalia	Vinjalpur	22.148287	69.599643	DW	15-06-2022	7.65	1210	811	0	451	142	0.2
233	Diu	Diu	Vanakbara	20.709905	70.875295	DW	26-05-2022	8.22	2675	1792	0	537	419	0.49
234	Diu	Diu	Wadiwadi	20.712535	70.883229	DW	26-05-2022	8.07	2000	1340	0	220	497	0.4
235	Diu	Diu	Zolawadi	20.724196	70.930604	DW	26-05-2022	7.54	12890	8636	0	146	4580	0.16
236	DNH		Kilavani	20.30031	73.090657	DW	05-06-2022	8.30	380	255	0	207	7	0.19
237	DNH		UmarKui	20.26534	73.074152	DW	05-06-2022	8.29	414	277	0	183	35	0.21
238	DNH		Rakhali 1	20.22542	73.027509	DW	05-06-2022	7.89	863	578	0	220	142	0.25
239	DNH		Surangi	20.15451	73.025223	DW	05-06-2022	8.06	495	332	0	195	64	0.40
240	DNH		Rudana	20.11328	73.085934	DW	05-06-2022	8.17	520	348	0	171	71	0.16
241	DNH		Mandoni	20.11115	73.136757	DW	05-06-2022	8.28	220	147	0	98	21	0.26
242	DNH		Chinsda	20.11149	73.125014	DW	05-06-2022	8.07	258	173	0	134	14	0.17
243	DNH		Dudhani	20.17476	73.156872	DW	05-06-2022	8.24	460	308	0	220	28	0.22
244	DNH		Shelti	20.1504	73.100919	DW	05-06-2022	8.00	373	250	0	195	14	0.27
245	DNH		Kherdi(Ghoda amba)	20.11297	73.036352	DW	05-06-2022	8.03	463	310	0	159	57	0.20
246	DNH		Kherdi(Kathepada)	20.11318	73.032064	DW	05-06-2022	8.20	799	535	0	195	85	1.60
247	DNH		Samarvarni	20.25118	73.009278	DW	06-06-2022	8.05	1237	829	0	439	142	0.42
248	DNH		Luhari Dunga ripda	20.18969	72.96723	DW	06-06-2022	7.96	219	147	0	85	21	0.35
249	DNH		Waghchipa	20.30973	73.009197	DW	07-06-2022	8.20	835	559	0	329	99	0.60
250	Gandhinagar	Dehgam	Paliya	23.17855	72.841247	DW	28.05.22	8.00	2876	1927	0	879	503	1.1
251	Gir Somnath	Una	Sametar	20.851642	71.120666	DW	26-05-2022	8.16	1400	938	0	439	170	0.34
252	Gir Somnath	Una	Una2	20.822393	71.041565	DW	26-05-2022	8.27	2383	1597	0	561	355	1.9
253	Gir Somnath	Una	Kansari	20.849463	71.055315	DW	26-05-2022	7.95	1300	871	0	293	170	0.52

254	Gir Somnath	Gir Gadhda	Dhokadva	20.958549	71.068182	DW	26-05-2022	8.24	820	549	0	366	50	0.14
255	Gir Somnath	Una	Girgadhada	20.925231	70.916764	DW	26-05-2022	8.05	824	552	0	256	57	0.09
256	Gir Somnath	Una	Jargla Jargali	20.908646	70.942049	DW	26-05-2022	8.2	470	315	0	195	28	0.28
257	Gir Somnath	Una	Nadiya Mandavi	20.742537	71.012074	DW	26-05-2022	7.95	3720	2492	0	244	966	0.85
258	Gir Somnath	Una	Kesariyaji_1	20.803794	70.940308	DW	27-05-2022	8.04	1203	806	0	256	256	0.67
259	Gir Somnath	Kodinar	Dolasa	20.819369	70.847198	DW	27-05-2022	8.32	1875	1256	0	317	376	1.9
260	Gir Somnath	Kodinar	Kodinar1	20.813637	70.697361	DW	27-05-2022	8.19	2412	1616	0	232	561	0.8
261	Gir Somnath	Kodinar	Ghotwad	20.927121	70.760484	DW	27-05-2022	8.22	713	478	0	232	78	0.78
262	Gir Somnath	Gir Gadhda	Jamvala1	20.981547	70.763637	DW	27-05-2022	8.13	468	314	0	220	36	0.28
263	Gir Somnath	Talala	Bhim Deval	20.964576	70.606822	DW	27-05-2022	8.17	827	554	0	220	99	0.56
264	Gir Somnath	Kodinar	Prasil	20.899416	70.639029	DW	27-05-2022	8.45	834	559	36	146	107	1.2
265	Gir Somnath	Patan-Veraval	Ajotha	20.900157	70.508230	DW	27-05-2022	8.08	1526	1022	0	159	334	0.51
266	Gir Somnath	Patan-Veraval	Govindpura2	20.955074	70.402115	DW	28-05-2022	7.98	640	429	0	232	71	0.63
267	Gir Somnath	Patan-Veraval	Moraj	20.985910	70.437244	DW	28-05-2022	7.96	905	606	0	146	170	0.72
268	Gir Somnath	Talala	Talala1	21.049050	70.526153	DW	28-05-2022	8.04	726	486	0	305	71	0.16
269	Gir Somnath	Gir Sasan	Chitorpatia	21.146213	70.585466	DW	28-05-2022	8.16	828	555	0	293	85	0.18
270	Jamnagar	Kalavad	Nikava	22.193598	70.535732	DW	09-06-2022	8.23	1256	842	0	317	135	0.45
271	Jamnagar	Kalavad	Toda	22.064919	70.383904	DW	09-06-2022	8.16	877	588	0	281	121	0.24
272	Jamnagar	Kalavad	Kalawad	22.214123	70.381035	DW	09-06-2022	8.16	759	509	0	195	121	0.29
273	Jamnagar	Kalavad	Haripur2	22.25304	70.34114	DW	09-06-2022	8.01	1243	833	0	183	241	0.44
274	Jamnagar	Kalavad	Moti matli	22.317584	70.268141	DW	09-06-2022	8.20	1610	1079	0	256	327	0.48
275	Jamnagar	Jamnagar	Vijarkha	22.404244	70.190598	DW	09-06-2022	8.14	595	399	0	220	85	0.38
276	Jamnagar	Jamnagar	Changa	22.340132	70.025314	DW	11-06-2022	7.94	1353	907	0	171	277	0.15
277	Jamnagar	Lalpur	Lalpur1	22.190653	69.958777	DW	11-06-2022	7.99	1335	894	0	390	199	0.37
278	Jamnagar	Lalpur	Bangour	22.0964	69.879	DW	11-06-2022	8.24	515	345	0	207	43	0.20
279	Jamnagar	Jamjodhpur	Balwa	21.894758	69.958595	DW	11-06-2022	8.26	1485	995	0	598	170	0.60
280	Jamnagar	Jamjodhpur	Meghpar Ambardi (Drafa)	21.95109	70.072225	DW	11-06-2022	8.14	1186	795	0	244	199	0.41
281	Jamnagar	Jamjodhpur	Seth vadala	22.031705	70.121977	DW	11-06-2022	7.99	1378	923	0	232	192	0.27
282	Jamnagar	Lalpur	Vad panchasara	22.233333	70.116667	DW	11-06-2022	7.82	844	565	0	281	85	0.50
283	Jamnagar	Jamnagar	Jamnagar2	22.468636	70.065535	DW	11-06-2022	8.47	773	518	60	207	71	0.30
284	Jamnagar	Jamnagar	Jambuda	22.521481	70.20643	DW	12-06-2022	7.69	4533	3037	0	244	1157	0.41
285	Jamnagar	Jodiya	Hadiyana	22.611758	70.265875	DW	12-06-2022	7.67	13980	9367	0	146	4480	0.00

286	Jamnagar	Jodiya	Bedanpur	22.687466	70.312517	DW	12-06-2022	8.07	10950	7337	0	305	3067	1.06
287	Jamnagar	Jodiya	Kesiya	22.696608	70.397057	DW	12-06-2022	7.95	4453	2984	0	122	1250	0.37
288	Jamnagar	Jodiya	Dudhai2	22.791042	70.501873	DW	12-06-2022	8.53	630	422	60	159	50	0.25
289	Jamnagar	Jodiya	Pithad	22.689	70.559215	DW	12-06-2022	7.98	2744	1838	0	195	568	0.17
290	Jamnagar	Dhrol	Latipur	22.61878	70.53982	DW	12-06-2022	8.25	387	259	0	159	36	0.24
291	Jamnagar	Dhrol	Dhrol2	22.564368	70.412855	DW	12-06-2022	8.19	1641	1099	0	354	249	0.38
292	Jamnagar	Jamnagar	Falla	22.5336	70.3141	DW	12-06-2022	8.71	735	492	60	171	71	0.56
293	Jamnagar	Jamnagar	Gordhanpur	22.445474	70.002674	DW	12-06-2022	8.05	2073	1389	0	183	540	0.28
294	Jamnagar	Jamnagar	Bed1	22.432165	69.901321	DW	12-06-2022	8.36	938	628	48	195	99	0.16
295	Jamnagar	Jamnagar	Moti khavdi	22.383024	69.86689	DW	12-06-2022	8.07	1312	879	0	268	142	0.13
296	Jamnagar	Jamjodhpur	Satapar	21.811204	69.921972	DW	16-06-2022	8.05	1649	1105	0	183	362	0.5
297	Junagadh	Manavadar	Saradiya	21.57387	70.035815	DW	16-06-2022	8.07	2536	1699	0	171	638	0.3
298	Junagadh	Manavadar	Bantva	21.491068	70.089552	DW	16-06-2022	8.11	3025	2027	0	464	631	0.3
299	Junagadh	Mangrol	Osa	21.372894	70.064164	DW	16-06-2022	7.92	12380	8295	0	293	4027	0.2
300	Junagadh	Mangrol	Kalej	21.249625	70.084995	DW	17-06-2022	8.93	1405	941	30	476	135	3.9
301	Junagadh	Mangrol	Bamanwara	21.22338	70.055492	DW	17-06-2022	7.97	645	432	0	195	106	0.0
302	Junagadh	Mangrol	Sil	21.18606	70.049218	DW	17-06-2022	7.86	372	249	0	171	14	0.2
303	Junagadh	Mangrol	Maktupur1	21.134653	70.093368	DW	17-06-2022	7.05	1144	766	0	317	170	0.1
304	Junagadh	Mangrol	Mangrol	21.129676	70.114491	DW	17-06-2022	8.22	1141	764	0	244	213	0.6
305	Junagadh	Mangrol	Shardagram	21.103776	70.143078	DW	17-06-2022	8.04	5304	3554	0	268	1595	0.1
306	Junagadh	Mangrol	Sepa	21.112305	70.2025	DW	17-06-2022	8.00	723	484	0	195	106	0.3
307	Junagadh	Malia	Seriakhan	21.115428	70.250101	DW	17-06-2022	8.06	1016	681	0	256	149	0.2
308	Junagadh	Malia	Juthal	21.16403	70.268856	DW	17-06-2022	8.37	753	505	18	244	85	0.1
309	Junagadh	Malia	Galodar	21.149514	70.273629	DW	17-06-2022	8.11	805	539	0	232	113	0.2
310	Junagadh	Malia	Kanek	21.035966	70.243894	DW	18-06-2022	7.56	3665	2456	0	98	1212	0.1
311	Junagadh	Malia	Chorwad	21.032406	70.224773	DW	18-06-2022	7.74	1847	1237	0	146	518	0.1
312	Junagadh	Malia	Khambalia1	21.047049	70.190539	DW	18-06-2022	8.25	1768	1185	0	207	475	0.1
313	Junagadh	Mangrol	Khorada1	21.072176	70.18758	DW	18-06-2022	7.40	6113	4096	0	122	1943	0.2
314	Junagadh	Mangrol	Arena	21.080751	70.177117	DW	18-06-2022	7.48	5927	3971	0	110	1879	0.1
315	Junagadh	Malia	Budhecha	21.094877	70.2162	DW	18-06-2022	7.93	1641	1099	0	171	376	0.5
316	Junagadh	Mangrol	Manketara	21.150086	70.128346	DW	18-06-2022	7.90	1084	726	0	146	241	0.5
317	Junagadh	Mangrol	Goraj1	21.186037	70.153446	DW	18-06-2022	8.08	951	637	0	305	113	0.9
318	Junagadh	Keshod	Bhatsimroli	21.226237	70.180342	DW	18-06-2022	8.36	1521	1019	30	390	220	0.4

319	Junagadh	Keshod	Kewarda	21.268473	70.204758	DW	18-06-2022	8.13	1217	815	0	427	149	0.75
320	Junagadh	Vanthali	Vanthali II	21.473408	70.33266	DW	18-06-2022	8.21	1686	1130	0	464	284	0.47
321	Junagadh	Vanthali	Khokharda	21.420102	70.31756	DW	18-06-2022	7.95	2917	1954	0	305	625	0.55
322	Junagadh	Vanthali	Khoras ahir	21.378787	70.335653	DW	18-06-2022	8.06	1408	943	0	305	256	0.63
323	Junagadh	Mendarda	Kanedipur	21.271192	70.489312	DW	18-06-2022	8.10	469	314	0	220	43	0.14
324	Junagadh	Mendara	Moti Kodiyar	21.324754	70.52885	DW	18-06-2022	7.91	1730	1159	0	207	320	0.35
325	Junagadh	Visavadar	Sobhavadla	21.467188	70.802236	DW	18-06-2022	8.23	2354	1577	0	122	547	0.19
326	Junagadh	Mendarda	Mendarda1	21.3336	70.439672	DW	18-06-2022	7.97	1403	940	0	305	227	0.34
327	Junagadh	Mendara	Dantrana	21.376888	70.464501	DW	18-06-2022	8.25	907	608	0	232	142	0.19
328	Junagadh	Mendara	Bagadi	21.373585	70.508591	DW	18-06-2022	7.93	1357	909	0	207	263	0.42
329	Junagadh	Junagadh	Anandpur	21.407193	70.5167	DW	18-06-2022	7.82	2011	1347	0	220	468	0.64
330	Junagadh	Junagadh City	Junagadh1	21.50745	70.449805	DW	19-06-2022	7.84	1011	677	0	220	163	0.16
331	Junagadh	Junagadh	Vadal	21.594702	70.506023	DW	19-06-2022	8.20	1319	884	0	329	220	0.31
332	Junagadh	Junagadh	Chokli	21.60208	70.53252	DW	19-06-2022	8.29	1257	842	0	281	184	0.58
333	Junagadh	Junagadh	Bhesan	21.549542	70.706109	DW	19-06-2022	8.02	583	391	0	220	64	0.26
334	Junagadh	Junagadh	Bilkha	21.43534	70.597453	DW	19-06-2022	8.04	1212	812	0	390	170	0.36
335	Junagadh	Visavadar	Prempara	21.298319	70.703284	DW	19-06-2022	8.14	1047	701	0	244	121	0.25
336	Junagadh	Visavadar	Kasia Naka Check Post	21.253285	70.645625	DW	19-06-2022	8.45	556	373	24	232	35	0.06
337	Junagadh	Mendarda	Alwani	21.23371	70.636344	DW	19-06-2022	8.36	705	472	24	329	35	0.11
338	Junagadh	Bhesan	Juni Dhari Gundali	21.532885	70.797274	DW	19-06-2022	8.71	755	506	12	85	106	0.16
339	Kachchh	Rapar	Deshalpur rapar	23.74722	70.679167	DW	15-Jun	8.08	430	288	0	110	57	0.3
340	Kachchh	Bhachau	Ratanpur Khadir	23.86083	70.363056	DW	15-Jun	7.84	4149	2780	0	390	1064	0.7
341	Kachchh	Rapar	Rapar2	23.56667	70.6375	DW	15-Jun	8.02	2472	1656	0	195	447	0.8
342	Kachchh	Rapar	Kuda	23.87778	70.808611	DW	16-Jun	7.71	1198	803	0	354	177	2.2
343	Kachchh	Bhachau	Kharoi	23.45417	70.35	DW	16-Jun	7.86	1099	736	0	268	191	0.4
344	Kachchh	Bhuj	Sedat	23.14028	69.638889	DW	16-Jun	7.90	945	633	0	293	121	0.2
345	Kachchh	Bhuj	Sukhpar	23.20833	69.616667	DW	16-Jun	7.62	6779	4542	0	317	1595	2.5
346	Kachchh	Bhuj	Bhuj1	23.25	69.666667	DW	16-Jun	7.46	1248	836	0	281	191	0.4
347	Kachchh	Bhuj	Haboi	23.35833	69.866667	DW	16-Jun	7.67	1423	953	0	256	234	1.2
348	Kachchh	Bhuj	Lodai	23.4	69.891667	DW	16-Jun	7.89	3924	2629	0	378	801	0.9
349	Kachchh	Mandvi	Kotaya	23.04167	69.075	DW	16-Jun	7.87	4156	2785	0	390	879	1.1
350	Kachchh	Nakhatrana	Khavda	23.83889	69.730556	DW	16-Jun	7.49	6234	4177	0	293	1631	0.2

351	Kachchh	Nakhatrana	Devisar	23.40278	69.329167	DW	16-Jun	7.63	7493	5020	0	293	2092	3.0
352	Kachchh	Lakhpat	Lakhpat1	23.81194	68.738889	DW	17-Jun	8.10	2254	1510	0	305	440	0.7
353	Kachchh	Lakhpat	Moti cher	23.75833	68.675	DW	17-Jun	7.95	471	316	0	220	28	0.2
354	Kachchh	Lakhpat	Kharai_1	23.46306	68.685556	DW	17-Jun	7.65	7162	4799	0	342	1843	0.2
355	Kachchh	Abdasa	Naliya1	23.26667	68.833333	DW	17-Jun	8.19	1389	931	0	525	156	0.7
356	Kachchh	Abdasa	Tera	23.28333	68.947222	DW	17-Jun	8.00	4148	2779	0	598	950	3.3
357	Kachchh	Abdasa	Mothala	23.20833	69.125	DW	17-Jun	7.81	5308	3556	0	305	1489	0.4
358	Kachchh	Abdasa	Vinjhan1	23.1	69.025	DW	17-Jun	8.20	494	331	0	256	28	0.5
359	Kachchh	Mandvi	Bambhdai	22.93889	69.082778	DW	17-Jun	7.64	7026	4707	0	366	2092	0.9
360	Kachchh	Mandvi	Kotadi	23.04167	69.191667	DW	17-Jun	8.36	1237	829	24	415	163	3.8
361	Kachchh	Mandvi	Ratanpur(maum.)	23.10833	69.291667	DW	17-Jun	7.94	1523	1020	0	354	241	1.0
362	Kachchh	Mandvi	Mandvi-3	22.83333	69.333333	DW	18-Jun	8.00	2040	1367	0	134	532	0.1
363	Kachchh		Mota Asambia			DW	18-Jun	7.73	3537	2370	0	378	893	0.1
364	Kachchh	Mandvi	Dunai	23.05	69.5	DW	18-Jun	8.11	1183	793	0	366	163	0.5
365	Kachchh	Mundra	Karagoga	22.94167	69.6625	DW	18-Jun	8.27	3140	2104	0	73	624	2.6
366	Kachchh	Mundra	Luni	22.87333	69.811667	DW	19-Jun	8.02	2622	1757	0	390	666	0.5
367	Kachchh	Mundra	Vadala	22.91611	69.855556	DW	19-Jun	8.15	4979	3336	0	1013	1205	2.2
368	Kachchh	Mundra	Bhadreshwar	22.9	69.9	DW	19-Jun	7.95	1049	703	0	305	213	0.2
369	Kachchh	Gandhidham	Shinaya	23.03333	70.054167	DW	19-Jun	7.60	5795	3883	0	293	1702	0.7
370	Kachchh	Bhachau	Samkhiari	23.3	70.508333	DW	19-Jun	7.75	4636	3106	0	439	1290	4.0
371	Kachchh	Lakhpat	Mata no madh	23.53333	68.95	DW	17-Jun	7.60	1368	917	0	232	248	0.8
372	Kheda	Mahudha	Alina	22.80567	73.04766	DW	27.05.22	8.09	2605	1745	0	342	475	0.1
373	Kheda	Nadiad	Alindra	22.69963	72.969042	DW	26.05.22	8.39	895	600	18	451	35	0.0
374	Kheda	Thasra	Dakor	22.7488	73.15785	DW	27.05.22	8.18	2300	1541	0	757	340	0.1
375	Kheda	Thasra	Kalesar	22.73128	73.18404	DW	27.05.22	8.48	1225	821	18	549	78	0.8
376	Kheda	Kathlal	Ladvel	22.90857	73.1262	DW	27.05.22	7.70	3480	2332	0	329	1021	0.0
377	Kheda	Mahudha	Mahudha	22.81589	72.937823	DW	27.05.22	8.20	2430	1628	0	500	411	0.0
378	Kheda	Thasra	Muliyad	22.7908	73.149697	DW	27.05.22	7.67	7589	5085	0	232	2162	0.0
379	Kheda	Matar	Shekhupura	22.575	72.625	DW	26.05.22	8.60	1980	1327	30	622	206	1.0
380	Kutchch	Lakhpat	Dolatpar	23.59778	68.893611	DW	17-Jun	7.80	3874	2596	0	366	950	0.8
381	Kutchch	Bhuj	Kotay	23.38444	69.784722	DW	17-Jun	7.92	622	417	0	305	50	0.2
382	Kutchch	Mundra	Nani Tumbdi	22.99611	69.549167	DW	18-Jun	7.98	4195	2811	0	488	978	0.5
383	Kutchch	Anjar	Tuna	23.01917	70.050833	DW	19-Jun	8.24	866	580	0	451	43	0.6

384	Mahesana	Kadi	Budasan	23.28638	72.37476	DW	03-06-2022	7.25	2935	1966	0	610	696	0.6
385	Mahesana	Kadi	Vidaj	23.24804	72.29759	DW	02-06-2022	8.14	1825	1223	0	549	320	0.32
386	Mahesana	Visnagar	Bhandupara	23.72454	72.37772	DW	03-06-2022	8.28	1330	891	0	390	192	0.69
387	Mahesana	Unjha	Unawa	23.76696	72.36544	DW	03-06-2022	8.26	1995	1337	0	537	312	0.82
388	Mahesana	Unjha	Sihı	23.79958	72.34737	DW	02-06-2022	8.06	865	580	0	293	107	0.52
389	Mahesana	Unjha	Unjha	23.79763	72.3946	DW	01-06-2022	8.07	2985	2000	0	573	454	1.3
390	Mahesana	Unjha	Dasaj	23.84451	72.44647	DW	03-06-2022	7.76	4105	2750	0	464	873	0.49
391	Mahesana	Kheralu	Kheralu1	23.88716	72.60754	DW	31-05-2022	8.00	1564	1048	0	439	277	1.13
392	Mahesana	Visnagar	Tarabh	23.75921	72.45713	DW	01-06-2022	7.74	780	523	0	293	99	0.33
393	Mahesana	Mahesana	Panchot	23.62346	72.33593	DW	30-05-2022	7.87	1610	1079	0	488	312	0.25
394	Mahesana	Mahesana	Maguna	23.57722	72.29041	DW	31-05-2022	8.15	4000	2680	0	1061	781	0.56
395	Mahesana	Becharaji	Dharpura	23.54398	72.11183	DW	03-06-2022	8.28	3800	2546	0	1037	604	1.42
396	Mahesana	Becharaji	Sankhalpur	23.52152	72.02998	DW	03-06-2022	8.14	1590	1065	0	439	270	0.56
397	Mahesana	Becharaji	Asjol	23.51342	72.18147	DW	04-06-2022	7.95	395	265	0	146	14	0.20
398	Mahesana	Vijapur	\	23.62151	72.7327	DW	31-05-2022	8.15	595	399	0	207	64	0.50
399	Mahesana	Visnagar	Gunga	23.74574	72.59052	DW	03-06-2022	7.96	1880	1260	0	451	284	0.48
400	Mahesana	Vadnagar	Kesimpa	23.82484	72.61571	DW	31-05-2022	8.25	1275	854	0	232	234	0.93
401	Mahesana	Vadnagar	Vadnagar (M)	23.78928	72.6461	DW	05-06-2022	8.07	985	660	0	415	135	0.10
402	Mahesana	Kheralu	Varetha	23.96708	72.6846	DW	02-06-2022	7.71	418	280	0	171	57	0.50
403	Mahesana	Satlasana	Vav	24.01548	72.78247	DW	02-06-2022	7.85	582	390	0	232	50	0.39
404	Mahisagar	Khanpur	Limbadia peti	23.22965	73.591001	Dug well	24-05-2022	8.11	800	536	0	354	57	0.93
405	Mahisagar	Khanpur	Khanpur	23.28778	73.678475	Dug well	24-05-2022	8.09	655	439	0	220	64	0.42
406	Mahisagar	Kadana	Kadana (Ratan kuva)	23.28889	73.833333	Dug well	24-05-2022	8.11	720	482	0	403	28	0.72
407	Mahisagar	Lunawada	Malekpur1	23.23574	73744005	Dug well	24-05-2022	7.98	682	457	0	268	57	0.69
408	Mahisagar	Lunawada	Kantha	23.1433	73.643253	Dug well	24-05-2022	8.12	881	590	0	305	107	0.92
409	Mahisagar	Lunawada	Lunawada	23.11949	73.610981	Dug well	24-05-2022	8.21	1650	1106	0	476	220	0.61
410	Mahisagar	Balasinor	Juna vasadra	23.07433	73.374659	Dug well	24-05-2022	8.38	1395	935	0	561	170	0.22
411	Mahisagar	Lunawada	Kothamba	23.01457	73.521825	Dug well	24-05-2022	8.12	1121	751	0	366	149	0.7

412	Mahisagar	Lunawada	Jokha	23.03853	73.610476	Dug well	24-05-2022	8.45	1150	771	0	427	99	3.1
413	Mahisagar	Santrampur	Santrampur1	23.19012	73.905591	Dug well	26-05-2022	7.71	1090	730	0	220	192	0.47
414	Mahisagar	Santrampur	Sarsava	23.186000	74.000274	Dug well	26-05-2022	7.98	505	338	0	232	36	0.63
415	Morbi	Wankaner	Sindhavadar	22.55153	70.897487	DW	25/05/2022	8.07	1290	864.3	0	353.8	192	0.82
416	Morbi	Tankara	Neknam	22.509	70.693453	DW	26/05/2022	8.02	1065	713.55	0	244	142	0.31
417	Morbi	Tankara	Chhatar	22.50547	70.753148	DW	26/05/2022	7.85	1493	1000.3	0	231.8	284	0.62
418	Morbi	Tankara	Kalyanpur2	22.65216	70.730895	DW	26/05/2022	8.24	1491	998.97	0	536.8	213	0.93
419	Morbi	Tankara	Hadmatia	22.68218	70.811068	DW	26/05/2022	7.61	2793	1871.3	0	146.4	667	0.28
420	Morbi	Morvi	Modpar1	22.90168	70.66245	DW	26/05/2022	8.02	4700	3149	0	158.6	1321	0.26
421	Morbi	Maliya	Mota dhansura	22.96214	70.613903	DW	26/05/2022	8.11	1702	1140.3	0	341.6	376	0.42
422	Morbi	Maliya	Sarvad	23.0065	70.70714	DW	26/05/2022	8.11	1793	1201.3	0	414.8	348	0.37
423	Morbi	Maliya	Malia	23.08861	70.756888	DW	26/05/2022	8.03	528	353.76	0	268.4	28.4	0.29
424	Morbi	Morvi	Amar nagar	22.93485	70.82435	DW	26/05/2022	8.12	7684	5148.3	0	378.2	2229	2.3
425	Morbi	Morvi	Morvi	22.83145	70.85285	DW	27/05/2022	8.16	1348	903.16	0	402.6	178	2.75
426	Morbi	Halvad	Mathak	22.84253	71.061503	DW	27/05/2022	8.3	3999	2679.3	72	305	895	0.94
427	Morbi	Halvad	Juna Devliya 1	23.01148	70.990812	DW	27/05/2022	8.16	1493	1000.3	0	378.2	249	0.76
428	Morbi	Morvi	Jetpur Pithad/Jetpur	21.78348	70.640828	DW	27/05/2022	8.27	1355	907.85	0	317.2	220	2.06
429	Morbi	Halvad	Halvad2	23.01955	71.185353	DW	27/05/2022	7.77	4766	3193.2	0	219.6	1150	2.12
430	Narmada	Nandod	Ringani	21.84144	73.46601	DW	23-05-2022	8.18	675	452	0	342	28	0.3
431	Narmada	Dediapada	Jankh	21.50217	73.49507	DW	24-05-2022	8.28	384	257	0	183	14	0.4
432	Narmada	Sagbara	Salemba 1	21.51625	73.82048	DW	25-05-2022	8.04	857	574	0	183	142	0.3
433	Narmada	Dediapada	Kanbi pitha	21.57322	73.69625	DW	25-05-2022	7.99	520	348	0	220	28	0.2
434	Narmada	Dediapada	Ralda	21.61120	73.63758	DW	25-05-2022	8.15	410	275	0	207	21	0.3
435	Narmada	Garudeshwar	Garudeshwar	21.88914	73.65355	DW	26-05-2022	8.00	849	569	0	329	71	0.4
436	Narmada	Tilakwada	Namaria	22.04910	73.62350	DW	26-05-2022	8.34	760	509	36	342	28	0.4
437	Navsari	Navsari	Parujan	21.02313	72.836253	DW	30-05-2022	8.50	1148	769	48	451	57	1.56
438	Navsari	Jalalpore	Ubhrat	21.01413	72.742299	DW	30-05-2022	8.22	740	496	0	329	50	0.50
439	Navsari	Jalalpore	Chinnam	20.99858	72.883006	DW	30-05-2022	8.35	3075	2060	30	598	532	0.20
440	Navsari	Jalalpore	Dandi	20.88702	72.802485	DW	30-05-2022	8.03	1054	706	0	488	71	0.15
441	Navsari	Jalalpore	Onjal	20.83816	72.844718	DW	30-05-2022	8.15	607	407	0	268	71	0.31
442	Navsari	Jalalpore	Abrama	20.86058	72.903312	DW	30-05-2022	8.18	3700	2479	0	390	950	0.25

443	Navsari	Bansda	Chadhav	20.83727	73.326704	DW	02-06-2022	7.93	924	619	0	293	142	0.55
444	Navsari	Navsari	Khadsupa	20.91137	73.027415	DW	02-06-2022	8.47	962	645	36	342	71	1.15
445	Navsari	Navsari	Sarikhurd			DW	02-06-2022	8.29	885	593	0	342	128	0.31
446	Navsari	Chikhli	Rankua	20.81328	73.156397	DW	02-06-2022	8.10	1252	839	0	305	206	0.66
447	Navsari	Bansda	Moti Walzar	20.79783	73.302846	DW	02-06-2022	8.35	798	535	18	220	64	0.49
448	Navsari	Chikhli	Mandav Khadak	20.67995	73.246529	DW	03-06-2022	8.01	645	432	0	244	71	0.41
449	Navsari	Khergam	Pani Khadak	20.65097	73.173444	DW	03-06-2022	8.22	715	479	0	293	78	0.33
450	Navsari	Chikhli	Rumla	20.68027	73.171668	DW	03-06-2022	8.20	780	523	0	305	78	0.29
451	Navsari	Chikhli	Kaliyari	20.72116	73.143803	DW	03-06-2022	8.08	498	334	0	195	57	0.19
452	Panchmahal	Shehera	Shehra	22.9515	73.627413	Dug well	24-05-2022	8.2	1270	851	0	598	92	0.5
453	Panchmahal	Godhra	Chhabanpur	22.83649	73.624929	Dug well	24-05-2022	7.85	729	488	0	256	57	0.69
454	Panchmahal	Godhra	Tuwa	22.80067	73.465391	Dug well	25-05-2022	8.21	750	503	0	354	64	0.48
455	Panchmahal	Godhra	Godhra UR_2	22.76800	73.622226	Dug well	26-05-2022	7.88	814	545	0	207	71	1.03
456	Panchmahal	Morwa hadaf	Santroad_1	22.79666	73.803885	Dug well	26-05-2022	7.84	740	496	0	281	57	0.76
457	Panchmahal	Morwa hadaf	Natapur	22.81607	73.801371	Dug well	26-05-2022	7.96	720	482	0	146	78	1.42
458	Panchmahal	Morwa hadaf	Suliyat	23.05244	73.859510	Dug well	26-05-2022	8.00	1130	757	0	366	121	1.86
459	Panchmahal	Godhra	Godhra UR_3	22.78433	73.609319	Dug well	27-05-2022	8	1290	864	0	390	178	1.52
460	Panchmahal	Godhra	Godhra2	22.7815	73.657004	Dug well	27-05-2022	7.83	1585	1062	0	244	284	0.51
461	Panchmahal	Kalol	Vejalpur	22.69473	73.559758	Dug well	27-05-2022	7.95	1670	1119	0	390	284	0.91
462	Panchmahal	Kalol	Khadki Vadiya	22.65079	73.522082	Dug well	27-05-2022	8.45	1250	838	60	464	64	1.76
463	Panchmahal	Kalol	Kalol UR_1	22.61252	73.463070	Dug well	27-05-2022	8.36	1220	817	60	403	121	0.51
464	Panchmahal	Kalol	Kalol UR_2	22.62826	73.456781	Dug well	27-05-2022	8.34	1860	1246	48	342	348	0.56
465	Panchmahal	Godhra	Dhanol	22.74789	73.483636	Dug well	27-05-2022	8.24	708	474	0	244	92	0.93
466	Panchmahal	Halol	Tarkanda	22.556100	73.540960	Dug well	27-05-2022	7.84	495	332	0	183	36	0.62

467	Panchmahal	Halol	Timbi2	22.49702	73.509572	Dug well	27-05-2022	7.93	550	369	0	244	21	0.46					
468	Panchmahal	Halol	Pavagadh	22.48311	73.537615	Dug well	27-05-2022	7.83	675	452	0	244	64	0.28					
469	Panchmahal	Jambughoda	Javan	22.40203	73.652444	Dug well	27-05-2022	7.96	505	338	0	146	64	0.35					
470	Panchmahal	Ghoghamba	Ranipura	22.71714	73.744204	Dug well	27-05-2022	7.9	2210	1481	0	366	362	3					
471	Patan	Chanasma	Dhinoj1	23.6625	72.279167	DW	10-Jun	7.60	2476	1659	0	415	546	0.2					
472	Patan	Patan	Sander	23.76667	72.254167	DW	10-Jun	7.84	412	276	0	207	21	0.0					
473	Patan	Patan	Balisana	23.81444	72.254167	DW	10-Jun	8.3	1645	1102	0	488	248	1.9					
474	Patan	Patan	Patan2	23.84167	72.123611	DW	10-Jun	7.60	2348	1573	0	1092	170	5.7					
475	Patan	Patan	Shankhari	23.77917	72.1625	DW	10-Jun	7.19	797	534	0	415	43	1.0					
476	Patan	Chanasma	Kamboi	23.6775	72.016944	DW	11-Jun	8.12	2575	1725	0	390	603	0.8					
477	Patan	Sankheswar	Moti chander	23.59444	71.780556	DW	11-Jun	7.60	25940	17380	0	415	8933	0.7					
478	Patan	Radhanpur	Gochanad	23.77083	71.624444	DW	11-Jun	8.10	9451	6332	0	635	2730	2.0					
479	Patan	Chanasma	Dharmoda1	23.69167	72.070833	DW	12-Jun	8.14	1230	824	0	537	128	0.2					
480	Porbandar	Porbandar	Miyani	21.839352	69.384026	DW	14-06-2022	8.36	953	639	48	317	92	0.90					
481	Porbandar	Porbandar	Bhavpura	21.813367	69.402955	DW	14-06-2022	7.80	3704	2482	0	159	937	0.11					
482	Porbandar	Porbandar	Visavada	21.775232	69.453815	DW	14-06-2022	8.08	3340	2238	0	183	893	0.9					
483	Porbandar	Porbandar	Palkhada1	21.760323	69.484914	DW	14-06-2022	7.73	2945	1973	0	195	730	0.4					
484	Porbandar	Porbandar	Ratadi	21.734696	69.498146	DW	14-06-2022	8.03	2258	1513	0	403	411	0.9					
485	Porbandar	Porbandar	Kuchhadi	21.680999	69.548865	DW	14-06-2022	8.02	4450	2982	0	415	1099	0.6					
486	Porbandar	Porbandar	Porbandar1	21.640998	69.616681	DW	14-06-2022	8.14	1675	1122	0	488	248	0.6					
487	Porbandar	Porbandar	Degam	21.70013	69.599758	DW	15-06-2022	7.72	2463	1650	0	500	518	0.9					
488	Porbandar	Porbandar	Babda	21.740623	69.590283	DW	15-06-2022	7.77	7455	4995	0	85	2276	0.2					
489	Porbandar	Porbandar	Khambodar	21.80389	69.589193	DW	15-06-2022	8.55	404	271	12	122	57	0.3					
490	Porbandar	Porbandar	Mojiwana	21.859954	69.574263	DW	15-06-2022	7.80	6515	4365	0	171	1893	0.3					
491	Porbandar	Porbandar	Adwana2	21.915437	69.594681	DW	15-06-2022	8.16	1338	896	0	427	191	0.2					
492	Porbandar	Porbandar	Simar	21.941425	69.668998	DW	15-06-2022	8.10	1180	791	0	317	170	0.2					
493	Porbandar	Porbandar	Bakharla	21.733563	69.63639	DW	15-06-2022	7.81	1709	1145	0	293	305	0.6					
494	Porbandar	Ranavav	Adityana	21.720079	69.688842	DW	15-06-2022	8.04	550	369	0	171	57	0.7					
495	Porbandar	Porbandar	Kolikhada village-2	21.681572	69.63681	DW	15-06-2022	8.77	2166	1451	36	537	298	1.3					
496	Porbandar	Ranavav	Ranavav2	21.686755	69.762471	DW	16-06-2022	8.35	789	529	6	122	149	0.4					
497	Porbandar	Ranavav	Hanumangadh1	21.795546	69.802432	DW	16-06-2022	7.83	3285	2201	0	268	830	0.7					

498	Porbandar	Kutyana	Khageshri	21.755838	69.978712	DW	16-06-2022	8.21	1514	1014	0	329	241	0.7
499	Porbandar	Kutyana	Dhruvala	21.693996	70.004364	DW	16-06-2022	8.05	1211	811	0	98	305	0.5
500	Porbandar	Kutiyana	Kutiyana1	21.628408	70.011264	DW	16-06-2022	7.94	6002	4021	0	232	1560	0.9
501	Porbandar	Ranavav	Bhoddar	21.575139	69.894928	DW	16-06-2022	8.53	4365	2925	36	537	950	0.6
502	Porbandar	Ranavav	Kandorna	21.649215	69.880993	DW	16-06-2022	8.06	2562	1717	0	293	581	0.9
503	Porbandar	Ranavav	Bhod	21.680399	69.798285	DW	16-06-2022	8.13	708	474	0	122	135	0.4
504	Porbandar	Porbandar	Oddar	21.552897	69.692113	DW	17-06-2022	8.05	7002	4691	0	329	1985	0.8
505	Porbandar	Porbandar	Tukda	21.525107	69.72124	DW	17-06-2022	8.30	550	369	24	195	43	0.0
506	Porbandar	Porbandar	Navibandar	21.449058	69.796652	DW	17-06-2022	8.00	2270	1521	0	427	461	0.1
507	Porbandar	Porbandar	Ratia	21.416295	69.821309	DW	17-06-2022	8.69	3156	2115	54	500	674	0.0
508	Porbandar	Porbandar	Balej	21.376321	69.865436	DW	17-06-2022	8.06	523	350	0	195	64	0.1
509	Porbandar	Porbandar	Mocha	21.338147	69.897452	DW	17-06-2022	8.18	965	647	0	281	156	0.0
510	Rajkot	Jasdan	Kamlapur	22.13821	71.199928	DW	22/05/2022	7.72	3131	2097.8	0	195.2	653	0.38
511	Rajkot	Vinchchiya	Lalavadar	22.12887	71.303195	DW	22/05/2022	8.18	565	378.55	0	244	49.7	0.35
512	Rajkot	Jasdan	Bhadla	22.17904	71.086635	DW	22/05/2022	8.26	1634	1094.8	0	341.6	241	0.46
513	Rajkot	Lodhika	Lodhika1	22.14	70.64	DW	23/05/2022	7.94	1641	1099.5	0	231.8	298	0.27
514	Rajkot	Gondal	Kolithad1	22.01718	70.646875	DW	23/05/2022	8.17	1266	848.22	0	170.8	213	0.26
515	Rajkot	Jamkandorna	Jasapur	21.88484	70.488115	DW	23/05/2022	8.15	901	603.67	0	219.6	99.4	0.31
516	Rajkot	Dhoraji	Dhoraji1	21.7635	70.465823	DW	23/05/2022	7.66	1761	1179.9	0	256.2	334	0.32
517	Rajkot	Jetpur	Motagundala	21.73684	70.508615	DW	23/05/2022	8.35	946	633.82	48	170.8	170	0.54
518	Rajkot	Upleta	Upleta1	21.72951	70.252017	DW	23/05/2022	8.58	2439	1634.1	108	524.6	341	3.7
519	Rajkot	Upleta	Ganod	21.68879	70.169307	DW	23/05/2022	8.21	5853	3921.5	0	353.8	1186	3.3
520	Rajkot	Dhoraji	Patanvav	21.63929	70.262422	DW	23/05/2022	8.34	849	568.83	60	244	85.2	0.43
521	Rajkot	Dhoraji	Bhada jodiya	21.65898	70.337203	DW	23/05/2022	8.46	1345	901.15	72	329.4	185	0.56
522	Rajkot	Jetpur	Jetpur pithad.	21.78348	70.640828	DW	23/05/2022	7.44	4083	2735.6	0	231.8	944	0.29
523	Rajkot	Jetpur	Umrali	21.90872	70.602252	DW	23/05/2022	7.68	1774	1188.6	0	85.4	405	0.37
524	Rajkot	Gondal	Ribda	22.1267	70.778533	DW	24/05/2022	7.87	998	668.66	0	280.6	128	0.2
525	Rajkot	Gondal	Dadia	22.09583	70.7325	DW	24/05/2022	8.02	405	271.35	0	170.8	28.4	0.32
526	Rajkot	Gondal	Jamwali	21.93403	70.76505	DW	24/05/2022	7.82	761	509.87	0	195.2	128	0.27
527	Rajkot	Jetpur	Virpur1	21.84662	70.692883	DW	24/05/2022	7.95	1037	694.79	0	292.8	121	0.19
528	Rajkot	Gondal	Gogavadar	21.96472	70.88	DW	24/05/2022	8.15	1390	931.3	0	292.8	163	0.53
529	Rajkot	Gondal	Mota dadwa	21.99806	70.994167	DW	24/05/2022	7.77	1259	843.53	0	268.4	199	0.38
530	Rajkot	Jasdan	Jasdan2	22.05102	71.219082	DW	24/05/2022	8.23	1048	702.16	0	390.4	114	0.34

531	Rajkot	Jasdan	Viranagar	22.02783	71.123152	DW	24/05/2022	8.07	2109	1413	0	414.8	433	0.58
532	Rajkot	Rajkot	Halenda	22.08762	71.054113	DW	24/05/2022	7.86	2410	1614.7	0	463.6	412	0.53
533	Rajkot	Rajkot	Sardhar2	22.13548	70.987188	DW	24/05/2022	8.23	1411	945.37	0	549	156	0.31
534	Rajkot	Rajkot	Ranpur1	22.37732	70.927442	DW	24/05/2022	8.04	975	653.25	0	244	163	0.34
535	Rajkot	Rajkot	Gavridad	22.39546	70.793733	DW	26/05/2022	8.14	496	332.32	0	183	56.8	0.31
536	Rajkot	Paddhari	Targhari	22.38215	70.67279	DW	26/05/2022	7.76	2474	1657.6	0	219.6	476	0.52
537	Rajkot	Paddhari	Khamta	22.43	70.606147	DW	26/05/2022	8.13	1773	1187.9	0	475.8	234	0.53
538	Rajkot	Paddhari	Movaiya	22.45793	70.627538	DW	26/05/2022	7.62	7177	4808.6	0	170.8	2031	0.42
539	Sabarkantha	Talod	Boriya	23.26707	72.923944	Dug well	20-05-2022	7.68	2395	1605	0	317	498	0.38
540	Sabarkantha	Talod	Umedpura	23.33343	72.986801	Dug well	20-05-2022	7.96	1400	938	0	415	199	1.46
541	Sabarkantha	Talod	Harsol1	23.37483	73.015640	Dug well	20-05-2022	8.01	1375	921	0	549	99	1.48
542	Sabarkantha	Talod	Kesarpura(Mayal)	23.3462	72.958236	Dug well	21-05-2022	8.16	1565	1049	0	415	178	3.2
543	Sabarkantha	Himatnagar	Virpur_1(Himmat)	23.63929	72.946265	Dug well	21-05-2022	7.67	490	328	0	183	21	0.6
544	Sabarkantha	Himatnagar	Gadha1	23.69362	72.937741	Dug well	21-05-2022	7.75	2235	1497	0	342	355	1.74
545	Sabarkantha	Idar	Bhadreshwar(Daramli)	23.7452	72.983189	Dug well	21-05-2022	8.00	2000	1340	0	451	355	1.96
546	Sabarkantha	Idar	Idar	23.84167	73.030427	Dug well	21-05-2022	7.77	1810	1213	0	671	270	3.2
547	Sabarkantha	Idar	Sabalwad	23.8709	72.953352	Dug well	21-05-2022	7.75	1040	697	0	256	142	4.45
548	Sabarkantha	Idar	Chandap_DW	23.92282	72.844333	Dug well	21-05-2022	7.59	1740	1166	0	220	398	0.76
549	Sabarkantha	Vadali	Wadali	23.9169	73.037258	Dug well	21-05-2022	7.62	1495	1002	0	195	277	0.91
550	Sabarkantha	Khedbrahma	Khedbramha_1	24.05409	73.027585	Dug well	21-05-2022	7.54	3560	2385	0	281	873	0.76
551	Sabarkantha	Khedbrahma	Matoda	24.1115	73.007728	Dug well	21-05-2022	7.46	2940	1970	0	220	753	0.12
552	Sabarkantha	Khedbrahma	Hingatiya	24.14684	73.010451	Dug well	21-05-2022	7.94	1710	1146	0	390	312	2.45
553	Sabarkantha	Poshina	Poshina2	24.36841	73.031107	Dug well	21-05-2022	7.74	1450	972	0	268	263	0.73
554	Sabarkantha	Khedbrahma	Silwad	24.0128	73.124099	Dug	21-05-2022	7.48	5040	3377	0	354	1377	0.98

						well									
555	Sabarkantha	Himatnagar	Mathasuliya	23.60373	73.136615	Dug well	22-05-2022	7.84	1130	757	0	134	170	0.3	
556	Sabarkantha	Vijaynagar	Abhapur	24.00133	73.269011	Dug well	22-05-2022	7.71	595	399	0	305	36	0.51	
557	Sabarkantha	Vijaynagar	Atarsumba1	23.97735	73.223548	Dug well	22-05-2022	7.65	900	603	0	195	142	0.24	
558	Sabarkantha	Vijaynagar	Atarsumba_2	23.98583	73.211944	Dug well	22-05-2022	7.85	830	556	0	293	85	0.25	
559	Sabarkantha	Vadali	Kesharpura	23.90549	73.146426	Dug well	22-05-2022	7.20	1440	965	0	305	213	0.64	
560	Sabarkantha	Vadali	Choriwad	23.89635	73.117443	Dug well	22-05-2022	7.45	2360	1581	0	244	426	0.65	
561	Sabarkantha	Idar	Revas	23.81991	73.130537	Dug well	22-05-2022	7.44	2210	1481	0	244	383	0.84	
562	Sabarkantha	Himatnagar	Sakrodiya	23.54542	73.047996	Dug well	23-05-2022	8.05	900	603	0	354	78	1.9	
563	Surat	Bardoli	Singod			DW	27-05-2022	8.10	876	587	0	439	43	0.86	
564	Surat	Mandvi	Miyawadi	21.22412	73.227235	DW	27-05-2022	8.00	1112	745	0	415	128	0.5	
565	Surat	Mandvi	Kasal	21.29109	73.214503	DW	27-05-2022	7.87	882	591	0	342	92	0.41	
566	Surat	Mandvi	Raghipura	21.36292	73.264168	DW	27-05-2022	7.85	579	388	0	244	35	0.55	
567	Surat	Mandvi	parvat	21.36965	73.250554	DW	27-05-2022	8.27	692	464	0	378	28	0.46	
568	Surat	Mandvi	Ognisha	21.40569	73.256352	DW	27-05-2022	8.03	564	378	0	220	50	0.40	
569	Surat	Mangrol	Vankal	21.43715	73.217617	DW	27-05-2022	7.90	1153	773	0	159	227	0.67	
570	Surat	Mangrol	Dungari	21.41016	73.129191	DW	27-05-2022	7.92	2339	1567	0	98	695	0.66	
571	Surat	Mandvi	Ushker Ramkund	21.34063	73.098036	DW	27-05-2022	7.95	647	433	0	268	50	0.54	
572	Surat	Mandvi	Nogama	21.32243	73.127214	DW	27-05-2022	7.57	520	348	0	244	35	0.44	
573	Surat	Mangrol	Bhatkal	21.37883	72.969919	DW	27-05-2022	8.1	1003	672	0	329	135	1.06	
574	Surat	Kamrej	Sayan	21.31582	72.890686	DW	27-05-2022	7.97	2199	1473	0	427	454	0.59	
575	Surat	Kamrej	Kathor	21.29343	72.930051	DW	27-05-2022	8.42	676	453	18	293	35	0.88	
576	Surat	Surat city	Uchchhal	21.17193	73.769107	DW	28-05-2022	7.99	817	547	0	305	50	0.43	
577	Surat	Mangrol	Nizar	21.47869	74.181049	DW	28-05-2022	8.20	993	665	0	439	78	1.00	
578	Surat	Mandvi	moti Sarkui	21.30009	73.360362	DW	28-05-2022	7.93	681	456	0	256	71	0.59	
579	Surat	Mandvi	Mandvi	21.25736	73.300333	DW	28-05-2022	8.03	942	631	0	293	106	0.68	
580	Surat	Bardoli	Allu	21.06759	73.188143	DW	29-05-2022	8.16	701	470	0	256	64	0.80	
581	Surat	Bardoli	Surali	21.1459	73.252555	DW	29-05-2022	7.96	976	654	0	281	99	0.09	

582	Surat	Bardoli	Bedkua	21.18506	73.288145	DW	29-05-2022	7.75	1071	718	0	220	170	0.06
583	Surat	Umerpada	Katra devi	21.43011	73.420239	DW	29-05-2022	8.16	649	435	0	317	43	0.11
584	Surat	Umerpada	Pinpur	21.44774	73.481512	DW	29-05-2022	8.10	441	295	0	220	21	0.23
585	Surat	Bardoli	Mota	21.17062	73.069725	DW	29-05-2022	8.19	2557	1713	0	537	468	0.78
586	Surat	Bardoli	Ten(bardoli)	21.11534	73.100489	DW	29-05-2022	8.41	630	422	18	305	35	0.48
587	Surat	Palsana	Palsana	21.08555	72.98642	DW	30-05-2022	8.12	922	618	0	317	121	0.04
588	Surat	Surat city	Jiav	21.11507	72.835349	DW	30-05-2022	7.96	764	512	0	232	113	0.16
589	Surat	Surat city	Sultanabad	21.08419	72.719262	DW	30-05-2022	8.18	1044	699	0	451	99	0.15
590	Surat	Bardoli	Sarbhon	21.06029	73.088866	DW	31-05-2022	8.03	1020	683	0	427	71	1.70
591	Surat	Mahuva	Unai	20.84873	73.33773	DW	02-06-2022	8.09	653	438	0	256	71	0.42
592	Surat	Mahuva	Vaheval	20.88012	73.271397	DW	02-06-2022	8.29	952	638	0	305	149	0.76
593	Surat	Mahuva	Puna	20.93376	73.22623	DW	02-06-2022	8.27	1786	1197	0	451	298	0.39
594	Surendranagar	Lakhtar	Gangad	22.94889	71.972778	DW	20/05/2022	8.24	12070	8086.9	0	707.6	2521	4.3
595	Surendranagar	Limdi	Parnala	22.66472	71.968333	DW	20/05/2022	8.18	1873	1254.9	0	305	348	1.01
596	Surendranagar	Limdi	Ramrajpar	22.64667	71.897222	DW	20/05/2022	7.99	2165	1450.6	0	207.4	497	0.41
597	Surendranagar	Wadhwan	Vaghela	22.65778	71.656944	DW	21/05/2022	8.07	5224	3500.1	0	268.4	902	2.1
598	Surendranagar	Wadhwan	Timba	22.62972	71.650833	DW	21/05/2022	8.05	1389	930.63	0	256.2	270	0.32
599	Surendranagar	Wadhwan	Vadod	22.55944	71.652222	DW	21/05/2022	8.74	1126	754.42	36	378.2	107	2
600	Surendranagar	Chuda	Navi Morvad	22.53566	71.574731	DW	21/05/2022	8.08	1993	1335.3	0	329.4	369	0.77
601	Surendranagar	Chuda	Vanala	22.43359	71.921972	DW	21/05/2022	8.25	1349	903.83	0	268.4	206	0.27
602	Surendranagar	Limbdi	Limbdi1	22.57	71.81	DW	21/05/2022	8.13	6466	4332.2	0	488	767	1.35
603	Surendranagar	Limdi	Choraniya	22.57194	71.850833	DW	21/05/2022	7.95	1240	830.8	0	183	298	0.51
604	Surendranagar	Limdi	Bhalgamda	22.59111	71.819167	DW	21/05/2022	8.33	1073	718.91	84	207.4	99.4	1.15
605	Surendranagar	Limbdi	Ghaghretiya	26.62583	71.828611	DW	21/05/2022	8.14	1090	730.3	0	292.8	128	0.7
606	Surendranagar	Limbdi	Shiyani	22.66261	71.829693	DW	21/05/2022	8.31	2994	2006	36	268.4	540	1.65
607	Surendranagar	Lakhtar	Tavi 1	22.72229	71.857953	DW	21/05/2022	8.16	506	339.02	0	195.2	42.6	0.41
608	Surendranagar	Lakhtar	Devaliya	22.78944	71.843889	DW	21/05/2022	8.19	1682	1126.9	0	329.4	369	0.9
609	Surendranagar	Lakhtar	Talvani	22.83	71.796389	DW	21/05/2022	8.21	753	504.51	0	329.4	35.5	1.16
610	Surendranagar	Lakhtar	Lakhtar	22.8541	71.78666	DW	21/05/2022	8.21	578	387.26	0	244	42.6	1.55
611	Surendranagar	Wadhwan	Surendranagar2	22.71755	71.616668	DW	22/05/2022	8.37	3121	2091.1	96	451.4	511	2.35
612	Surendranagar	Wadhwan	Kherali	22.71379	71.593877	DW	22/05/2022	8.57	1150	770.5	60	390.4	99.4	2.3
613	Surendranagar	Muli	Muli	22.63895	71.464442	DW	22/05/2022	8.31	5942	3981.1	60	451.4	1427	3.55
614	Surendranagar	Muli	Gadah	22.62778	71.4	DW	22/05/2022	7.9	4070	2726.9	0	207.4	888	2.2

615	Surendranagar	Sayla	Nava Sudamda	22.53972	71.435833	DW	22/05/2022	7.98	6321	4235.1	0	341.6	1221	5.15			
616	Surendranagar	Sayla	Sudamda	22.446	71.488002	DW	22/05/2022	7.66	2167	1451.9	0	280.6	426	0.4			
617	Surendranagar	Sayla	Dhajala	22.38056	71.397778	DW	22/05/2022	7.79	4545	3045.2	0	207.4	1122	2.55			
618	Surendranagar	Sayla	Piprali	22.39528	71.311667	DW	22/05/2022	8.02	5018	3362.1	0	488	987	4.75			
619	Surendranagar	Chotila	Lakhanka	22.31	71.23	DW	22/05/2022	8.1	1574	1054.6	0	268.4	277	0.47			
620	Surendranagar	Chotila	Parabadi	22.24194	71.191389	DW	22/05/2022	7.71	1325	887.75	0	292.8	149	0.44			
621	Surendranagar	Chotila	Gunda	22.27056	71.138611	DW	22/05/2022	8.17	747	500.49	0	219.6	92.3	0.64			
622	Surendranagar	Chotila	Bamanbor	22.41474	71.037288	DW	25/05/2022	7.62	1661	1112.9	0	183	391	0.45			
623	Surendranagar	Chotila	Moti Moladi	22.41789	71.104003	DW	25/05/2022	7.95	5686	3809.6	0	292.8	1555	0.52			
624	Surendranagar	Chotila	Kalasar	22.38083	71.150556	DW	25/05/2022	8.33	785	525.95	36	231.8	78.1	0.37			
625	Surendranagar	Dhrangadhra	Kukavati	23.06389	71.36521	DW	27/05/2022	7.78	1735	1162.5	0	280.6	327	0.79			
626	Surendranagar	Dhrangadhra	Ratanpur1	22.85552	71.274728	DW	27/05/2022	7.7	4032	2701.4	0	378.2	873	3.35			
627	Surendranagar	Muli	Sarla/Sadla	22.73372	71.36817	DW	27/05/2022	8.26	2457	1646.2	0	524.6	405	0.91			
628	Surendranagar	Lakhtar	Olak	22.92799	71.886083	DW	28/05/2022	7.72	842	564.14	0	292.8	71	0.68			
629	Surendranagar	Dasada	Moti majethi	23.08653	71.885297	DW	28/05/2022	7.95	3606	2416	0	439.2	618	0.46			
630	Surendranagar	Dasada	Gavana	23.34111	71.863056	DW	28/05/2022	8.07	1712	1147	0	390.4	320	0.75			
631	Surendranagar	Dasada	Visawadi	23.34259	71.734975	DW	28/05/2022	8.43	665	445.55	96	36.6	99.4	0.67			
632	Surendranagar	Dasada	Dhama	23.39613	71.671483	DW	28/05/2022	8.26	3037	2034.8	0	427	618	2.1			
633	Surendranagar	Dasada	Jhinjhuwada	23.34903	71.657187	DW	28/05/2022	7.92	1070	716.9	0	341.6	163	0.84			
634	Surendranagar	Dasada	Kharaghoda	23.1877	71.752215	DW	28/05/2022	7.83	24790	16609	0	231.8	8520	1.48			
635	Surendranagar	Dasada	Bajana	23.11367	71.78319	DW	28/05/2022	8.12	1005	673.35	0	280.6	121	0.47			
636	Surendranagar	Dasada	Malvan	23.06139	71.750278	DW	28/05/2022	8.19	2611	1749.4	0	317.2	213	5.05			
637	Surendranagar	Dasada	Kherwa	23.00061	71.743758	DW	28/05/2022	7.9	4093	2742.3	0	146.4	1058	0.7			
638	Surendranagar	Lakhtar	Modhvana	22.93548	71.741168	DW	28/05/2022	8.32	673	450.91	24	122	92.3	0.56			
639	Surendranagar	Wadhwan	Anindra	22.82961	71.692348	DW	28/05/2022	8.33	533	357.11	36	146.4	42.6	0.59			
640	Surendranagar	Dhrangadhra	Gamda(Khamda)	22.46634	70.560382	DW	29/05/2022	8.43	2449	1640.8	48	475.8	362	0.51			
641	Surendranagar	Dhrangdhra	Mota Ankevaliya	22.84309	71.454513	DW	29/05/2022	8.3	738	494.46	72	85.4	92.3	0.7			
642	Surendranagar	Dasada	Pipli	23.06868	71.712338	DW	29/05/2022	8.02	4385	2938	0	329.4	632	0.48			
643	Surendranagar	Dhrangadhra	Rajsitapur	22.83803	71.596673	DW	29/05/2022	7.74	6309	4227	0	183	1988	1.7			
644	Tapi	Vyara	Vyara	21.10606	73.388921	DW	28-05-2022	7.10	702	470	0	329	50	0.32			
645	Tapi	Songadh	Sonarpada	21.16466	73.553462	DW	28-05-2022	7.96	693	464	0	378	21	0.39			
646	Tapi	Songadh	Kherwada	21.28091	73.464395	DW	28-05-2022	7.96	716	480	0	232	99	0.63			
647	Tapi	Valod	Kelkui	21.01218	73.31441	DW	29-05-2022	8.0	459	308	0	183	50	0.12			

648	Tapi	Dolvan	Bedchit	20.95647	73.342619	DW	29-05-2022	7.95	1491	999	0	415	255	0.63
649	Tapi	Valod	Buhari	20.96747	73.308166	DW	29-05-2022	7.61	1361	912	0	256	262	0.10
650	Tapi	Valod	Hathuka	20.99292	73.273582	DW	29-05-2022	7.88	754	505	0	244	99	0.20
651	Tapi	Vyara	Karanjvel	21.01281	73.458668	DW	31-05-2022	7.69	496	332	0	171	50	0.26
652	Vadodara	Desar	Vejpur2	22.74351	73.35385	DW	20-05-2022	8.56	3650	2446	66	952	596	2.8
653	Vadodara	Desar	Chhaliyar	22.69198	73.29089	DW	20-05-2022	8.47	1174	787	24	464	78	0.5
654	Vadodara	Savli	Juna samalya	22.50406	73.27419	DW	20-05-2022	8.89	1599	1071	24	390	234	0.9
655	Vadodara	Savli	Tundav	22.48168	73.19740	DW	20-05-2022	8.37	1360	911	18	403	149	0.3
656	Valsad	Valsad	Malwan Kakwadi	20.71846	72.896894	DW	02-06-2022	7.86	515	345	0	232	43	0.38
657	Valsad	Valsad	Valsad(Lilapore)	20.63373	72.936728	DW	02-06-2022	7.95	998	669	0	476	64	0.39
658	Valsad	Dharampur	Amba Talat	20.58909	73.231077	DW	03-06-2022	7.96	545	365	0	232	57	0.32
659	Valsad	Dharampur	Chasmandava	20.60488	73.375841	DW	03-06-2022	7.96	352	236	0	207	7	0.18
660	Valsad	Dharampur	Kosim Pada	20.5459	73.427283	DW	03-06-2022	8.17	386	259	0	232	7	0.33
661	Valsad	Dharampur	Awadha	20.51964	73.275475	DW	03-06-2022	8.15	430	288	0	195	35	0.25
662	Valsad	Dharampur	Dharampar	20.54143	73.171056	DW	03-06-2022	8.02	590	395	0	232	50	0.42
663	Valsad	Dharampur	Phulwari	20.46152	73.20914	DW	04-06-2022	8.19	467	313	0	207	35	0.14
664	Valsad	Kaprada	Nana Pondha	20.41453	73.123051	DW	04-06-2022	7.90	1090	730	0	183	227	0.25
665	Valsad	Kaprada	Mandva	20.36715	73.171405	DW	04-06-2022	8.29	660	442	0	159	113	0.20
666	Valsad	Kaprada	Khadak val	20.30751	73.212246	DW	04-06-2022	8.09	403	270	0	183	21	0.17
667	Valsad	Kaprada	Kistoniya	20.25328	73.154226	DW	04-06-2022	8.29	457	306	0	195	28	0.17
668	Valsad	Kaprada	Ghanveri	20.1917	73.224293	DW	04-06-2022	8.19	388	260	0	195	14	0.14
669	Valsad	Kaprada	Bhavada Jagiri	20.36039	73.308969	DW	04-06-2022	8.29	309	207	0	122	21	0.19
670	Valsad	Kaprada	Chavsala	20.32758	73.310073	DW	04-06-2022	8.20	541	362	0	232	43	0.19
671	Valsad	Kaprada	Mota Faliya(Amba Jungle)	20.30003	73.300273	DW	04-06-2022	8.10	339	227	0	159	14	0.22
672	Valsad	Kaprada	Fali	20.30958	73.357264	DW	04-06-2022	8.11	354	237	0	183	14	0.27
673	Valsad	Kaprada	Mota Pondha	20.35025	73.057878	DW	05-06-2022	7.97	402	269	0	146	35	0.45
674	Valsad	Umbergaon	Tumb	20.21769	72.837468	DW	06-06-2022	8.20	743	498	0	256	99	0.61
675	Valsad	Umbergaon	Umargam	20.19413	72.747668	DW	06-06-2022	8.05	1017	681	0	281	135	0.19
676	Valsad	Umergaon	Fansa	20.32928	72.814599	DW	06-06-2022	8.07	404	271	0	207	14	0.44
677	Valsad	Umergaon	Mangalwad Fansa	20.3448	72.786512	DW	06-06-2022	8.43	2551	1709	30	488	390	0.35
678	Valsad	Vapi	Balitha(Vapi)	20.38624	72.911442	DW	06-06-2022	7.97	716	480	0	244	85	0.35
679	Valsad	Vapi	Karvad	20.35283	72.956192	DW	07-06-2022	7.85	761	510	0	268	78	0.15

680	Valsad	Vapi	Pariya	20.44756	72.964167	DW	07-06-2022	8.01	1103	739	0	305	163	0.38
681	Valsad	Pardi	Pardi	20.52481	72.959341	DW	07-06-2022	8.10	873	585	0	378	71	0.70
682	Valsad	Vapi	Magod	20.5659	72.904854	DW	07-06-2022	7.76	4667	3127	0	207	1446	0.47

Annexure III Important Parameters that affect the suitability of water for irrigation

S.No	WQI	SAR	%Na	SSP	RSC	PI	MH	KI
1	43	1.32	35.78	32.31	0.00	33.78	63.11	0.73
2	95	7.45	73.78	72.46	5.40	72.48	44.95	3.67
3	590	20.76	70.36	70.14	-15.82	70.14	66.62	3.66
4	254	7.71	58.85	57.96	-8.01	57.98	70.47	2.19
5	295	28.74	87.18	87.13	7.40	87.13	77.74	11.20
6	48	1.14	28.81	28.75	0.40	29.59	45.00	0.56
7	50	1.53	36.03	35.71	0.00	39.39	42.11	0.76
8	87	6.10	65.88	65.86	1.20	66.23	76.00	3.16
9	108	5.47	60.08	60.07	2.20	60.12	84.85	2.59
10	329	14.91	71.96	71.89	-9.80	71.91	60.00	3.85
11	254	26.26	89.49	89.25	8.40	89.25	76.00	13.60
12	132	18.41	89.02	88.98	10.00	88.99	46.15	11.33
13	53	2.01	41.60	41.52	0.80	43.11	75.00	1.16
14	80	1.71	32.81	32.63	-2.20	33.31	54.84	0.71
15	59	3.18	54.74	54.20	-0.20	55.41	44.44	1.65
16	254	9.14	60.23	59.47	-11.20	59.48	79.38	2.45
17	306	4.37	37.34	37.12	-24.00	37.34	95.62	1.09
18	92	2.29	37.82	37.65	-1.60	37.83	58.33	0.90
19	97	1.33	24.83	24.77	-5.20	25.92	51.22	0.47
20	98	1.62	28.88	28.80	-3.60	29.22	62.50	0.62
21	97	13.26	85.84	85.82	10.20	85.83	58.33	9.02
22	92	12.44	83.12	83.10	4.60	83.13	50.00	7.04
23	58	1.82	37.77	37.50	-0.20	38.97	65.22	0.93
24	66	1.31	26.62	26.49	-2.20	27.01	45.45	0.50
25	55	1.43	32.76	32.59	0.40	33.85	68.18	0.76
26	90	1.41	26.64	26.59	-2.60	26.90	73.68	0.59
27	189	5.02	49.45	49.42	-9.40	49.69	60.61	1.47
28	114	7.25	68.95	68.43	2.80	68.58	75.00	3.53
29	100	4.38	53.59	53.55	-6.20	56.78	30.56	1.51
30	77	3.37	51.35	51.12	0.40	51.31	53.85	1.52
31	57	3.05	53.47	53.19	0.20	54.13	50.00	1.63
32	100	5.78	61.42	61.40	-3.20	61.95	57.58	2.36

33	106	3.88	48.09	48.04	-4.40	48.32	68.18	1.45
34	99	1.51	31.32	29.38	-4.40	31.71	48.48	0.59
35	85	2.17	36.29	36.07	-2.60	36.78	35.14	0.75
36	298	1.94	18.55	18.50	-34.40	18.98	55.19	0.33
37	108	1.31	23.44	23.26	-2.80	23.41	91.47	0.54
38	85	3.19	47.70	47.49	1.60	47.56	83.84	1.55
39	57	0.66	16.80	16.30	-0.21	16.60	37.88	0.26
40	109	8.00	75.69	75.41	6.40	75.43	58.78	4.58
41	90	9.00	77.78	77.52	4.20	77.60	76.43	5.66
42	243	17.29	78.23	78.20	0.59	78.20	67.20	5.60
43	166	12.31	79.26	79.24	9.20	79.24	80.74	6.42
44	64	1.57	35.10	33.58	0.80	34.02	41.62	0.69
45	108	3.19	43.47	43.18	1.00	43.19	68.14	1.19
46	172	4.35	44.79	43.60	-4.42	43.60	25.28	0.99
47	144	2.32	31.16	30.93	-9.80	31.35	58.21	0.67
48	46	1.48	35.43	34.96	-1.00	37.42	36.84	0.72
49	157	5.93	54.03	53.96	-6.40	54.00	48.44	1.66
50	77	2.03	37.19	36.97	-3.00	38.28	56.67	0.87
51	66	2.27	41.37	40.86	-2.20	42.05	29.63	0.90
52	48	1.28	31.98	31.19	-0.40	32.61	30.00	0.59
53	100	1.60	27.16	27.01	-6.40	27.98	27.66	0.48
54	79	0.66	15.05	14.90	-4.40	16.60	44.44	0.24
55	65	2.90	48.22	47.82	0.20	48.11	48.00	1.30
56	79	1.98	34.71	34.55	-1.80	34.81	48.57	0.75
57	180	5.06	47.26	47.20	-9.60	47.24	72.50	1.44
58	153	1.13	16.10	15.93	-13.00	16.10	49.44	0.27
59	73	2.73	45.00	44.91	0.00	45.53	71.43	1.30
60	96	1.11	19.80	19.48	-1.80	19.50	54.72	0.35
61	97	3.62	49.02	48.83	-1.00	48.92	38.89	1.29
62	98	1.83	31.18	30.43	-6.40	31.92	34.09	0.58
63	52	1.30	32.49	31.52	-0.60	33.14	30.00	0.60
64	81	1.85	33.65	33.13	-1.80	33.39	28.57	0.64
65	87	1.85	36.37	35.99	-0.60	36.42	29.63	0.73
66	135	1.68	25.30	24.50	-9.60	24.90	47.76	0.46
67	78	1.66	35.08	34.83	-1.00	35.80	37.50	0.72
68	96	1.03	19.72	19.06	-5.60	19.59	33.33	0.31
69	67	1.15	25.44	24.96	-2.20	25.86	43.33	0.46

70	56	0.79	20.28	20.06	-2.00	22.05	28.00	0.32
71	99	2.52	38.40	37.76	-3.60	37.99	41.86	0.83
72	257	5.11	43.46	42.45	-17.00	42.47	42.50	1.02
73	122	8.07	71.27	71.06	2.60	71.08	66.67	3.82
74	458	5.10	44.58	37.74	-22.40	37.74	62.71	0.92
75	108	3.74	51.08	48.65	-2.80	49.01	28.21	1.23
76	81	4.00	64.21	60.54	3.00	60.96	64.71	2.36
77	96	3.75	62.42	57.01	3.40	57.16	65.00	2.05
78	254	1.71	50.10	27.09	3.40	27.09	49.06	0.53
79	93	2.53	42.39	39.69	-1.20	40.46	29.73	0.86
80	102	3.60	46.70	46.47	3.00	46.47	83.69	1.49
81	616	4.93	83.69	58.32	18.00	58.32	83.84	2.40
82	89	1.30	34.41	26.00	0.39	26.07	44.07	0.49
83	103	2.42	54.53	44.40	0.40	45.26	78.23	1.32
84	81	3.33	56.45	52.28	2.80	52.40	65.17	1.69
85	428	11.61	64.96	62.23	-0.40	62.23	87.07	2.88
86	92	1.55	32.34	28.47	-0.21	28.52	42.06	0.55
87	213	14.97	77.13	76.63	0.99	76.63	38.41	4.44
88	53	1.33	35.68	32.58	0.80	33.31	42.06	0.67
89	88	2.00	45.46	37.79	0.99	38.07	44.40	0.85
90	65	3.94	59.36	58.16	2.20	58.31	64.95	2.15
91	39	0.63	20.98	19.90	-0.40	23.49	62.45	0.38
92	59	1.12	30.93	26.13	-0.41	26.74	39.95	0.48
93	237	4.06	41.16	37.62	-17.62	37.71	64.56	0.93
94	192	31.65	94.10	94.06	15.40	94.06	89.98	28.11
95	60	2.17	41.72	41.17	-0.40	41.75	45.78	0.98
96	49	1.21	32.46	29.85	0.00	30.94	34.95	0.57
97	67	2.83	48.21	47.24	-0.20	47.62	51.95	1.29
98	228	5.52	45.28	45.14	-18.03	45.26	26.75	1.06
99	137	11.21	77.02	77.00	1.80	77.02	64.24	5.14
100	80	5.23	65.27	64.86	0.40	65.28	49.95	2.64
101	80	0.76	16.07	15.40	-0.41	15.44	32.51	0.24
102	74	2.61	45.31	45.23	1.60	45.34	75.96	1.35
103	121	5.04	57.11	57.05	-0.20	57.24	69.44	2.10
104	67	7.78	81.35	81.30	4.00	81.54	62.50	6.62
105	145	18.53	88.12	87.99	13.20	87.99	37.50	9.88
106	209	19.81	84.37	84.30	6.00	84.31	79.41	8.97

107	89	15.11	90.12	90.03	8.80	90.07	42.86	12.48
108	147	2.25	29.66	29.22	-11.00	29.56	45.95	0.58
109	129	4.03	48.08	47.89	-3.20	47.96	87.50	1.61
110	79	0.84	18.79	17.48	-4.40	18.48	46.15	0.30
111	83	1.11	24.09	23.99	-2.40	24.87	61.29	0.48
112	131	6.51	63.17	63.17	-2.40	63.35	58.33	2.56
113	426	17.10	69.20	69.18	-23.40	69.21	82.76	3.82
114	74	3.17	47.62	47.37	-1.60	47.72	45.16	1.26
115	212	9.42	71.78	70.19	3.40	70.20	50.00	3.37
116	56	1.44	32.95	32.72	0.00	34.92	63.64	0.75
117	112	0.83	15.10	14.91	-4.80	15.19	50.00	0.25
118	155	2.00	26.05	26.02	-11.80	26.24	69.14	0.55
119	56	4.10	64.55	64.26	2.00	66.53	53.85	2.62
120	69	3.49	63.27	59.60	2.60	59.94	35.71	1.97
121	123	15.21	88.42	88.38	10.40	88.38	60.00	11.44
122	248	27.78	89.43	89.42	8.20	89.42	74.07	13.70
123	189	4.37	45.58	45.42	-9.00	45.56	69.57	1.32
124	149	2.56	35.84	35.29	-5.00	35.39	63.64	0.84
125	248	1.63	20.87	20.80	-15.60	21.14	69.79	0.42
126	139	4.91	52.60	52.59	-5.00	52.76	65.31	1.71
127	181	2.82	33.45	33.37	-10.80	33.50	51.90	0.72
128	157	3.47	38.84	38.78	-11.00	39.03	69.33	1.00
129	99	1.69	30.91	30.83	-4.00	31.87	61.11	0.67
130	69	1.65	35.14	34.29	-4.30	42.38	44.00	0.73
131	94	2.85	41.07	41.04	-4.80	41.62	59.52	1.04
132	103	2.47	37.89	36.57	-2.40	36.63	69.57	0.91
133	178	9.32	71.57	71.36	-0.20	71.40	74.29	4.04
134	296	35.84	91.89	91.89	18.80	91.89	60.00	17.04
135	66	5.91	70.08	70.03	0.40	71.81	43.75	3.24
136	80	5.61	65.02	64.91	-0.40	65.33	52.17	2.67
137	202	3.55	39.41	39.34	-10.80	39.56	60.00	0.97
138	134	5.43	57.82	57.60	-0.60	57.64	70.00	2.15
139	107	6.83	69.41	69.26	-3.40	72.17	34.78	3.00
140	214	2.65	32.93	32.78	-9.40	32.89	54.05	0.71
141	69	0.81	18.60	17.91	-2.41	18.48	44.07	0.30
142	71	0.63	16.29	14.64	-0.01	14.75	32.31	0.23
143	75	1.36	31.20	30.92	0.40	31.39	65.17	0.69

144	100	1.09	21.50	19.86	-6.41	20.77	37.45	0.33
145	52	1.54	36.75	36.37	0.40	37.48	33.29	0.76
146	82	0.65	15.01	13.85	-2.41	14.03	36.54	0.22
147	67	1.25	30.51	29.23	-0.21	29.96	26.05	0.53
148	119	6.79	66.63	66.58	9.00	66.58	86.18	3.46
149	285	12.49	67.49	67.41	-9.40	67.42	84.59	3.56
150	150	9.33	72.05	71.98	4.40	71.98	72.73	4.13
151	67	2.08	40.95	40.65	-0.60	41.45	43.48	0.95
152	128	3.80	50.26	50.06	-4.80	51.37	36.11	1.34
153	65	2.65	49.11	48.37	1.00	48.77	50.00	1.34
154	75	1.48	29.78	29.62	-3.00	30.85	25.81	0.54
155	69	1.08	25.29	25.06	-1.60	26.25	23.08	0.42
156	191	4.90	49.42	49.19	-7.40	49.28	64.06	1.49
157	94	4.31	54.46	54.25	-1.00	54.39	54.55	1.73
158	127	6.01	62.11	61.98	-0.80	62.07	70.59	2.59
159	93	1.48	28.22	27.07	-0.20	27.11	37.50	0.50
160	68	1.57	33.33	32.72	-0.60	33.25	61.54	0.74
161	103	0.98	19.14	17.44	-1.60	17.45	33.33	0.28
162	57	1.64	35.49	35.07	0.40	35.51	52.17	0.78
163	73	0.76	17.11	15.78	-2.60	15.99	26.83	0.24
164	69	1.62	40.80	40.57	0.00	43.62	78.57	1.13
165	82	1.57	33.03	31.12	-1.40	31.59	33.33	0.60
166	93	5.54	68.17	67.98	3.20	68.07	47.06	2.99
167	70	2.25	42.04	41.62	0.00	41.99	52.00	1.03
168	73	2.46	46.35	45.91	1.40	46.18	52.38	1.23
169	60	0.964	20.56	20.45	-4.61	22.60	25.68	0.33
170	51	1.564	35.73	35.03	0.20	35.77	57.09	0.80
171	49	0.356	10.31	10.11	-0.21	10.75	23.96	0.14
172	122	12.018	80.56	80.19	5.00	80.20	63.59	6.20
173	63	1.074	22.60	22.54	-3.01	23.35	49.95	0.42
174	44	2.534	49.37	49.25	1.60	49.71	17.62	1.20
175	41	0.430	13.55	13.19	-0.41	14.97	9.98	0.18
176	55	0.636	15.78	15.50	-1.60	16.16	69.96	0.29
177	46	2.882	53.29	53.21	0.39	55.03	6.24	1.34
178	44	0.421	12.14	11.95	-0.81	13.10	16.64	0.17
179	38	0.477	15.27	15.09	0.00	17.32	44.40	0.25
180	41	0.405	12.27	12.00	-0.20	13.09	36.32	0.18

181	38	0.379	12.16	12.05	-0.41	14.24	10.51	0.16
182	48	0.412	11.77	11.53	-1.00	12.63	59.95	0.20
183	37	0.475	15.75	15.38	-0.40	18.48	29.37	0.24
184	36	0.356	11.83	11.71	-0.40	14.38	38.84	0.18
185	40	0.338	10.80	10.67	-0.20	12.27	44.95	0.17
186	39	0.369	11.63	11.53	-0.20	13.11	39.95	0.18
187	36	0.446	14.70	14.58	-0.40	17.71	35.25	0.23
188	45	0.330	9.51	9.44	-1.40	10.93	47.95	0.15
189	43	0.451	13.25	13.18	-0.20	14.25	45.41	0.21
190	43	0.605	17.01	16.92	-1.41	19.28	36.32	0.27
191	39	2.301	50.32	50.20	1.60	51.24	46.10	1.42
192	45	0.492	14.79	14.50	-0.40	15.96	42.81	0.23
193	51	0.412	11.80	11.53	-0.61	12.36	39.95	0.18
194	100	3.40	48.81	48.75	-3.20	49.62	53.13	1.38
195	90	4.20	54.43	54.38	-2.80	55.08	35.48	1.59
196	60	2.69	47.66	47.56	0.40	49.82	50.00	1.30
197	85	2.12	33.72	33.61	-5.20	39.33	54.55	0.74
198	170	2.51	29.04	28.94	-16.20	29.48	46.32	0.57
199	276	5.83	44.52	44.34	-22.60	44.45	62.69	1.21
200	241	4.52	43.23	42.71	-16.20	43.39	29.35	0.97
201	158	7.89	68.08	66.37	3.40	66.38	67.50	3.09
202	156	8.12	65.89	65.67	-4.00	65.79	57.78	2.84
203	337	11.13	66.22	66.16	-8.80	66.18	85.19	3.38
204	152	8.75	66.37	66.19	-4.00	66.24	76.00	3.21
205	280	9.20	58.68	58.56	-17.80	58.74	56.60	2.09
206	107	3.09	45.41	44.91	-1.60	45.54	38.89	1.11
207	74	2.32	40.03	39.27	-5.81	45.52	46.83	0.91
208	83	1.80	33.97	33.75	-2.81	34.76	51.56	0.73
209	149	3.14	38.92	38.86	-6.80	38.98	77.01	1.05
210	86	2.78	42.05	41.95	-3.40	42.44	60.81	1.09
211	102	1.90	29.37	29.26	-7.40	29.99	47.17	0.58
212	134	3.55	45.74	45.27	-4.20	45.45	65.22	1.28
213	57	4.02	64.60	62.93	1.80	65.12	50.00	2.43
214	89	4.07	59.94	57.85	2.00	57.96	45.45	1.92
215	41	1.58	38.63	38.51	-0.20	40.91	56.25	0.92
216	278	6.37	46.35	46.33	-24.20	46.57	63.24	1.32
217	80	2.79	43.96	43.84	-2.20	44.94	68.75	1.23

218	64	1.88	37.90	36.77	-2.40	38.52	42.31	0.80
219	154	4.56	47.07	46.82	-6.80	46.86	41.79	1.21
220	236	13.33	73.35	72.97	-9.80	73.52	85.25	4.66
221	61	2.82	53.38	50.59	1.80	51.06	42.11	1.41
222	335	14.33	77.39	75.17	-3.70	75.20	64.29	4.66
223	204	10.95	72.62	71.86	0.20	71.86	91.30	4.57
224	569	15.56	61.25	61.11	-46.00	61.21	81.63	2.66
225	151	11.49	77.90	77.13	0.40	77.19	55.17	4.95
226	165	9.18	69.04	68.89	-3.80	69.02	46.51	3.11
227	165	7.97	64.32	64.06	-7.00	64.51	50.00	2.55
228	205	8.46	61.22	61.18	-9.60	61.28	61.11	2.38
229	85	4.11	53.18	53.08	-3.21	53.75	54.50	1.65
230	130	2.06	27.48	27.41	-10.62	27.68	44.55	0.53
231	96	2.32	36.54	36.40	-3.41	36.67	63.37	0.88
232	83	3.58	51.98	50.36	1.20	50.41	51.56	1.46
233	189	5.28	54.43	52.72	-2.40	52.73	78.57	1.85
234	121	2.68	36.24	35.60	-8.20	36.05	64.41	0.85
235	635	10.08	46.59	46.15	-66.80	46.29	87.57	1.50
236	36	0.491	16.45	16.23	0.20	18.71	43.70	0.27
237	38	0.962	28.01	27.53	-0.20	30.36	37.45	0.51
238	61	1.707	33.24	32.98	-2.41	33.90	43.28	0.68
239	47	0.884	23.71	23.34	-1.00	25.33	42.81	0.42
240	43	1.299	32.13	32.00	-1.00	34.56	31.54	0.62
241	29	0.502	22.63	21.04	-0.19	35.61	55.23	0.39
242	29	0.485	19.23	18.76	0.00	26.79	36.32	0.31
243	45	0.600	17.54	17.14	-0.60	18.76	42.81	0.29
244	37	0.464	16.04	15.48	0.00	18.35	31.21	0.24
245	41	0.467	14.60	14.47	-1.20	18.17	42.06	0.23
246	83	0.644	15.13	15.03	-3.41	16.43	33.29	0.23
247	83	3.135	46.80	46.69	0.80	46.75	74.96	1.43
248	29	0.676	28.71	27.39	-0.20	44.56	37.45	0.51
249	64	2.526	44.98	44.89	0.60	45.17	66.62	1.27
250	190	4.97	47.20	46.27	-2.21	46.27	68.63	1.35
251	112	2.45	38.87	37.17	-1.40	37.22	67.44	0.92
252	157	6.88	62.86	62.66	0.80	62.67	71.43	2.68
253	107	3.82	52.69	52.41	-1.20	52.70	50.00	1.58
254	61	1.20	26.30	25.81	0.00	26.00	56.67	0.51

255	61	1.98	39.71	39.46	-0.40	40.18	52.17	0.94
256	41	1.05	29.70	29.43	0.00	31.83	43.75	0.58
257	183	7.46	59.26	58.67	-9.80	58.86	62.32	2.16
258	93	2.97	44.86	44.24	-2.80	44.67	42.86	1.10
259	150	3.48	42.88	42.82	-5.60	42.96	75.93	1.23
260	150	3.88	42.55	42.48	-10.00	42.78	72.46	1.19
261	66	1.89	40.30	39.47	-0.40	40.51	52.38	0.94
262	44	0.97	26.36	26.01	-0.20	27.62	36.84	0.47
263	68	2.25	43.14	42.59	-1.00	43.62	52.17	1.07
264	75	3.14	55.60	53.93	0.00	56.36	55.56	1.72
265	102	2.57	38.17	37.99	-6.20	39.15	59.09	0.92
266	62	0.97	24.04	23.54	-1.20	24.64	52.00	0.44
267	65	3.06	52.04	51.99	-1.60	54.26	25.00	1.38
268	61	1.69	35.06	34.79	0.00	35.20	56.00	0.79
269	68	1.79	35.45	35.26	-0.60	35.69	59.26	0.82
270	124	3.78	52.09	51.00	-1.40	51.20	69.70	1.65
271	70	2.11	38.74	38.22	-1.20	38.66	51.72	0.89
272	58	3.10	55.58	54.33	-0.20	55.79	70.59	1.89
273	94	1.84	30.79	30.72	-5.60	31.73	46.51	0.62
274	105	4.47	53.18	53.09	-3.60	53.41	64.10	1.74
275	49	1.60	36.36	36.10	-0.40	37.42	40.00	0.77
276	102	1.41	23.31	23.22	-8.00	24.24	46.30	0.42
277	92	3.30	45.93	45.85	-1.20	45.93	50.00	1.21
278	49	1.52	36.17	36.09	-0.20	37.77	50.00	0.81
279	119	1.80	29.03	27.42	-1.60	27.43	35.09	0.50
280	83	2.96	45.37	45.28	-2.40	45.81	50.00	1.18
281	118	2.02	31.88	31.82	-5.60	32.34	55.32	0.69
282	64	2.99	51.11	50.79	0.40	51.27	42.86	1.43
283	53	2.78	49.91	49.53	1.40	50.73	45.00	1.37
284	258	2.71	25.85	25.74	-26.60	25.90	52.94	0.50
285	723	9.28	41.99	41.97	-80.00	42.10	61.89	1.10
286	490	22.47	75.44	75.43	-21.80	75.46	65.67	4.75
287	234	3.90	34.98	34.93	-24.40	35.55	57.58	0.80
288	43	3.35	59.73	59.50	2.00	62.07	46.15	2.06
289	167	3.51	39.15	38.89	-12.00	39.33	56.58	0.94
290	38	0.87	27.31	26.20	-0.40	30.26	53.33	0.52
291	112	4.36	52.21	52.13	-2.20	52.24	65.00	1.68

292	47	7.13	81.03	80.99	3.40	82.94	42.86	5.89
293	108	4.56	51.21	50.99	-6.60	51.63	47.92	1.47
294	65	4.21	61.40	61.05	1.20	62.23	44.44	2.18
295	100	2.57	39.15	39.13	-3.60	39.49	55.00	0.94
296	110	5.22	58.74	58.56	-3.81	59.32	44.07	1.96
297	154	3.21	36.09	36.04	-13.42	36.61	38.22	0.76
298	152	12.51	76.50	76.46	0.20	76.48	59.41	4.87
299	527	17.97	66.36	66.21	-37.23	66.24	67.58	3.06
300	130	10.23	83.10	82.35	6.40	82.38	66.62	7.26
301	51	0.79	22.53	20.03	-1.81	21.77	31.96	0.33
302	42	0.42	16.20	14.25	-0.40	18.09	18.72	0.21
303	114	2.69	58.04	46.48	0.39	46.78	29.13	1.13
304	83	2.47	40.41	40.13	-2.81	40.68	47.01	0.94
305	250	10.30	61.92	61.82	-15.82	61.91	41.54	2.22
306	61	1.71	36.42	36.02	-1.41	37.53	39.08	0.76
307	76	2.12	37.50	36.81	-2.41	37.33	54.50	0.85
308	60	0.82	19.50	18.72	-1.81	19.51	43.70	0.32
309	60	1.44	30.52	30.11	-1.80	31.01	57.09	0.64
310	204	2.66	27.99	26.80	-24.84	27.71	21.94	0.46
311	103	4.60	52.38	52.24	-6.41	53.27	18.15	1.35
312	100	4.39	52.46	51.68	-5.01	52.23	21.39	1.34
313	300	6.60	43.93	43.83	-33.66	44.23	17.39	0.96
314	303	6.50	45.33	44.63	-30.65	45.12	19.10	1.00
315	113	3.75	48.16	47.20	-6.01	48.06	49.95	1.28
316	91	1.73	34.06	31.01	-5.01	32.77	35.09	0.60
317	80	2.56	43.56	43.28	-0.60	43.59	49.95	1.09
318	106	2.69	38.46	37.99	-2.21	38.07	39.54	0.83
319	95	2.19	36.13	35.35	-1.00	35.42	37.50	0.74
320	101	4.83	55.38	55.35	0.00	55.38	71.05	1.98
321	167	5.92	54.75	54.72	-7.00	54.83	66.67	1.88
322	102	1.52	25.89	25.21	-5.20	25.44	43.14	0.47
323	41	0.91	25.02	24.90	-0.20	26.53	52.63	0.48
324	134	0.97	15.24	15.18	-11.40	15.72	58.11	0.27
325	134	3.85	43.26	43.20	-10.80	44.31	25.00	0.97
326	114	1.10	18.79	18.71	-6.40	18.94	63.16	0.35
327	64	1.63	32.42	31.96	-2.20	32.77	53.33	0.68
328	99	1.37	23.46	23.41	-6.60	24.14	56.00	0.45

329	141	1.90	25.83	25.75	-11.41	26.16	62.62	0.53
330	79	1.48	28.21	27.81	-3.81	28.61	40.49	0.53
331	91	2.19	34.82	34.57	-3.21	34.75	65.07	0.82
332	100	3.10	45.34	45.32	-2.40	45.64	68.53	1.30
333	51	1.42	33.86	32.88	-0.60	34.20	47.57	0.69
334	85	2.07	35.06	34.33	-1.40	34.43	66.62	0.81
335	93	1.04	20.32	20.26	-4.41	20.85	59.48	0.38
336	45	0.91	23.18	23.11	0.00	24.31	65.17	0.46
337	52	1.28	29.19	28.80	1.20	29.13	67.96	0.63
338	61	4.02	62.94	62.90	-1.00	67.91	35.67	2.27
339	53	0.82	31.93	24.98	-1.20	32.15	46.62	0.47
340	243	7.14	53.83	53.15	-13.41	53.18	65.61	1.76
341	176	4.16	45.81	43.97	-10.82	44.40	38.52	1.06
342	145	2.22	39.72	35.64	-2.21	35.78	39.95	0.75
343	80	2.30	37.75	37.05	-3.21	37.45	52.58	0.85
344	74	1.36	27.47	25.85	-2.81	26.20	57.85	0.52
345	409	9.97	54.81	54.70	-28.83	54.73	55.83	1.78
346	96	2.35	37.80	36.12	-4.01	36.42	32.51	0.75
347	111	3.42	46.47	45.43	-4.21	45.78	52.33	1.20
348	238	7.99	58.19	57.50	-11.22	57.53	51.67	1.95
349	252	8.08	57.16	56.59	-12.81	56.62	68.71	2.05
350	336	10.81	60.82	60.43	-20.23	60.49	47.95	2.16
351	473	8.84	50.89	49.68	-35.23	49.73	64.95	1.52
352	140	3.96	44.67	44.30	-7.41	44.44	59.63	1.19
353	56	0.45	21.70	13.79	-0.41	15.57	24.96	0.20
354	402	9.22	52.57	52.08	-30.41	52.11	91.09	1.94
355	85	8.84	78.46	78.29	5.60	78.31	66.62	5.61
356	271	13.47	73.98	73.65	-1.80	73.66	87.91	4.91
357	256	10.38	62.20	62.12	-15.01	62.18	67.96	2.57
358	52	0.91	26.89	24.39	0.20	25.42	59.95	0.48
359	342	11.68	61.52	61.36	-21.03	61.38	48.10	2.25
360	114	9.29	81.12	80.90	5.20	80.97	66.62	6.59
361	120	4.63	54.99	54.62	-1.60	54.73	62.12	1.83
362	105	5.59	58.82	58.24	-5.81	59.37	19.97	1.74
363	181	7.90	59.35	59.17	-8.62	59.21	37.79	1.96
364	80	4.49	59.96	59.15	1.20	59.28	58.28	2.16
365	175	19.28	87.23	87.20	-2.80	88.59	74.96	11.09

366	136	10.11	73.33	72.97	-0.60	73.02	57.09	4.00
367	290	11.64	66.87	66.21	-1.01	66.21	56.77	2.90
368	80	1.43	27.66	25.80	-3.40	26.08	72.58	0.56
369	268	12.96	67.97	67.87	-14.01	67.93	63.78	3.24
370	291	8.91	59.82	59.22	-11.60	59.23	85.08	2.51
371	98	3.24	45.78	45.00	-4.01	45.51	33.29	1.08
372	184	3.79	41.01	40.57	-9.81	40.64	79.19	1.14
373	70	1.15	23.90	23.04	0.60	23.11	67.52	0.47
374	140	5.64	57.45	55.99	2.60	55.99	65.26	1.97
375	90	4.74	58.67	58.60	4.00	58.61	78.54	2.35
376	181	5.63	49.07	48.52	-12.42	48.59	51.64	1.36
377	156	4.23	47.09	45.31	-4.80	45.33	83.05	1.41
378	411	9.84	53.74	53.02	-34.23	53.11	63.11	1.72
379	141	10.87	80.56	79.34	7.20	79.35	69.96	6.09
380	215	7.98	60.61	59.43	-8.81	59.47	56.03	2.16
381	57	1.33	35.05	30.90	0.60	31.39	49.95	0.64
382	215	13.21	74.34	74.33	-2.40	74.34	82.66	4.93
383	61	6.30	75.28	75.00	5.20	75.07	45.41	4.20
384	174	6.52	56.88	55.75	-3.40	55.75	43.28	1.74
385	167	4.78	65.02	56.79	2.40	56.81	30.30	1.72
386	97	5.74	65.24	64.49	1.40	64.57	76.00	2.97
387	140	7.53	70.82	68.49	2.80	68.50	53.33	3.16
388	92	2.12	48.47	40.61	0.00	41.05	58.33	1.02
389	213	8.33	68.88	66.25	0.40	66.26	71.11	3.13
390	249	11.78	74.66	72.69	-2.20	72.71	57.14	3.94
391	103	5.53	61.14	61.10	1.00	61.14	64.52	2.42
392	64	1.42	34.08	30.57	-0.40	31.05	42.31	0.61
393	126	5.34	64.49	60.27	1.80	60.30	61.29	2.30
394	262	5.23	43.28	42.15	-8.40	42.15	82.95	1.24
395	224	12.28	73.44	72.72	6.40	72.72	69.81	4.22
396	132	3.65	49.97	46.24	-1.80	46.29	42.22	1.19
397	44	0.57	22.05	18.29	-0.80	23.12	12.50	0.27
398	58	1.39	32.27	31.44	-1.20	32.85	34.78	0.61
399	190	4.02	58.60	49.19	-1.20	49.23	60.47	1.46
400	86	5.68	65.48	65.17	-0.80	65.72	47.83	2.65
401	79	4.02	60.92	57.52	2.40	57.61	59.09	2.03
402	43	1.20	33.56	32.23	-0.40	35.27	50.00	0.68

403	54	1.18	28.44	27.93	-0.80	29.05	21.74	0.49
404	72	1.39	28.99	28.70	-0.20	28.91	63.33	0.62
405	60	1.28	29.21	28.84	-1.40	30.01	48.00	0.57
406	61	2.55	47.87	47.43	2.60	47.56	50.00	1.29
407	63	1.28	28.64	28.05	-1.00	28.68	44.44	0.54
408	73	2.65	44.81	44.60	-0.40	44.92	55.56	1.18
409	131	1.68	26.25	24.50	-5.60	24.52	26.87	0.42
410	108	2.38	38.29	35.21	-0.40	35.22	54.17	0.79
411	83	3.41	49.85	49.64	0.00	49.77	56.67	1.46
412	115	6.09	68.54	68.28	3.00	68.34	60.00	3.24
413	79	2.07	35.54	35.30	-3.60	36.04	25.00	0.70
414	50	1.09	28.38	27.91	-0.20	29.20	35.00	0.52
415	91	5.18	62.20	62.10	0.80	62.23	52.00	2.37
416	97	1.83	31.56	31.43	-4.00	31.96	52.50	0.66
417	109	2.26	33.68	33.61	-6.20	34.08	54.00	0.74
418	103	3.86	49.84	49.41	1.00	49.43	51.28	1.41
419	169	1.82	22.40	22.31	-17.80	23.03	38.61	0.39
420	217	8.35	58.72	58.33	-15.20	58.71	53.93	2.04
421	107	3.61	45.65	44.94	-4.20	45.05	48.98	1.16
422	102	6.47	64.74	64.38	0.40	64.43	56.25	2.67
423	51	1.10	30.53	27.96	0.40	28.81	50.00	0.56
424	377	10.15	56.40	56.23	-25.00	56.25	70.51	2.04
425	120	4.54	56.66	56.34	0.40	56.41	54.84	1.89
426	216	8.41	60.86	60.24	-8.00	60.32	45.45	2.12
427	104	5.06	59.09	58.56	-0.20	58.65	59.38	2.12
428	108	5.06	61.23	60.63	-0.20	60.82	62.96	2.35
429	268	9.26	61.91	61.65	-13.00	61.84	60.24	2.42
430	57	0.53	13.85	13.28	-0.41	13.58	49.95	0.22
431	41	0.50	16.27	16.08	-0.40	19.16	58.78	0.29
432	65	2.29	41.58	41.45	-2.20	42.86	53.80	1.03
433	51	0.52	14.69	14.58	-1.00	16.11	56.47	0.25
434	40	0.59	18.27	17.94	-0.20	20.10	49.95	0.31
435	74	1.35	28.00	27.45	-1.00	27.72	68.71	0.60
436	98	0.66	40.40	17.58	2.00	17.94	45.78	0.30
437	84	6.669	71.99	71.87	5.60	71.92	52.89	3.71
438	105	0.674	43.45	18.50	1.00	18.94	40.86	0.31
439	323	5.457	72.05	57.69	2.80	57.69	67.46	2.13

440	103	2.805	52.86	46.02	2.60	46.06	51.80	1.23
441	52	1.376	32.20	31.18	-0.21	31.88	21.71	0.57
442	194	5.122	46.18	45.23	-12.81	45.27	63.50	1.26
443	76	1.087	21.74	21.35	-3.21	21.70	52.45	0.39
444	83	3.956	56.71	56.58	2.20	56.78	56.47	1.92
445	68	3.123	52.58	50.71	1.00	50.93	56.47	1.52
446	93	2.864	44.52	42.99	-2.21	43.24	52.73	1.09
447	69	1.482	29.89	29.59	-2.01	30.53	45.11	0.59
448	57	0.909	21.73	21.35	-1.61	22.23	46.38	0.38
449	61	0.566	14.01	13.29	-2.01	13.75	38.19	0.21
450	68	0.756	16.87	16.60	-2.21	16.96	33.29	0.26
451	47	0.502	14.33	14.18	-1.41	16.21	39.08	0.22
452	132	3.17	58.38	48.63	4.20	48.64	60.71	1.43
453	66	1.88	38.17	37.77	-0.60	38.47	33.33	0.80
454	65	1.71	37.66	35.10	0.80	35.33	12.00	0.65
455	80	1.46	29.94	29.72	-2.60	30.83	40.00	0.58
456	69	1.30	28.16	27.63	-1.20	28.14	51.72	0.55
457	74	1.82	37.47	37.06	-2.40	39.54	37.50	0.79
458	117	1.35	27.18	24.18	-3.00	24.31	26.67	0.41
459	110	2.02	31.74	31.60	-3.20	31.68	68.75	0.73
460	108	2.94	40.17	40.13	-5.60	40.52	54.17	0.98
461	126	2.56	35.06	34.29	-5.60	34.35	76.67	0.86
462	99	4.47	57.28	57.18	4.00	57.22	75.00	2.18
463	92	1.53	26.46	25.71	-1.20	25.79	53.06	0.50
464	126	3.06	38.32	38.28	-5.00	38.38	90.16	1.10
465	66	4.27	66.76	65.19	1.40	66.03	69.23	2.96
466	52	1.20	30.74	30.30	-0.80	32.60	31.58	0.57
467	54	0.97	24.39	24.32	-0.60	25.35	56.52	0.47
468	57	0.93	22.37	21.98	-1.40	22.89	48.15	0.40
469	45	1.28	35.65	33.66	-0.80	37.59	31.25	0.67
470	188	2.11	27.22	27.03	-10.20	27.10	74.07	0.60
471	163	4.87	51.09	48.65	-6.41	48.69	43.89	1.32
472	40	0.47	16.77	14.63	-0.41	16.75	26.28	0.22
473	134	7.52	71.38	69.98	2.80	70.00	61.49	3.53
474	235	7.20	64.71	62.63	8.69	62.63	54.30	2.45
475	83	2.83	54.76	49.98	2.80	50.09	54.95	1.46
476	143	13.83	81.55	81.08	1.20	81.12	42.26	5.91

477	1255	24.51	62.70	62.50	#####	62.51	69.40	2.63
478	467	17.45	68.37	68.21	-22.62	68.21	60.56	3.24
479	107	2.13	41.18	34.73	0.79	34.75	52.45	0.77
480	101	1.09	29.80	22.26	-0.40	22.56	27.78	0.37
481	206	5.36	47.29	47.05	-15.60	47.53	41.76	1.22
482	196	9.12	66.85	65.61	-8.41	65.98	45.56	2.67
483	196	6.57	58.63	57.05	-9.01	57.43	50.77	1.91
484	129	9.24	72.52	72.38	0.39	72.42	38.66	3.55
485	246	14.83	77.63	76.64	-3.41	76.66	64.66	5.05
486	110	7.74	73.74	72.28	3.60	72.31	59.04	3.90
487	172	4.02	47.22	44.08	-4.81	44.10	49.18	1.12
488	337	12.87	63.61	63.45	-26.03	63.96	39.37	2.36
489	39	0.91	28.16	26.98	-0.60	33.06	46.62	0.52
490	344	7.26	46.01	45.95	-33.62	46.16	65.34	1.31
491	103	2.50	37.27	37.10	-2.01	37.15	62.18	0.90
492	79	3.35	48.83	48.77	-1.00	48.99	70.93	1.52
493	136	3.67	47.09	46.09	-4.41	46.30	54.30	1.25
494	55	2.24	49.44	48.57	0.00	51.20	35.67	1.26
495	134	15.91	86.69	86.66	7.00	86.67	86.64	11.31
496	65	2.90	50.74	50.56	-1.80	53.64	34.95	1.36
497	196	4.93	45.19	45.09	-13.61	45.23	57.73	1.22
498	141	6.31	72.76	68.52	1.20	68.69	57.09	3.22
499	89	2.72	42.29	42.03	-5.41	44.75	25.68	0.93
500	391	9.49	60.77	57.99	-19.82	58.12	55.04	2.02
501	220	17.87	81.85	81.52	1.80	81.52	78.01	7.31
502	149	8.23	66.33	66.23	-4.01	66.37	59.04	2.93
503	58	2.13	43.58	42.92	-2.01	46.48	29.96	0.98
504	329	19.69	77.97	77.67	-10.61	77.70	69.96	5.51
505	47	1.09	32.12	28.38	0.19	30.43	26.28	0.51
506	128	8.24	69.19	68.76	-0.01	68.79	54.24	3.21
507	249	12.33	82.31	78.33	4.19	78.35	44.78	5.04
508	48	1.45	43.07	37.09	0.20	39.37	33.29	0.78
509	61	5.55	71.02	70.08	1.80	70.52	42.81	3.24
510	218	2.99	31.75	31.68	-17.60	32.03	42.31	0.64
511	52	1.39	33.07	32.37	-0.20	33.37	57.14	0.71
512	138	1.32	20.36	20.16	-8.00	20.28	61.76	0.38
513	113	2.61	36.50	36.40	-6.60	36.84	44.23	0.80

514	106	1.26	21.90	21.81	-7.40	22.91	37.25	0.38
515	89	1.57	29.94	29.83	-3.20	30.68	55.88	0.63
516	138	1.18	17.82	17.66	-11.00	17.96	46.05	0.30
517	65	2.61	43.94	43.85	-1.20	45.29	39.29	1.06
518	160	17.75	88.25	88.24	9.40	88.25	64.29	11.53
519	327	15.50	74.02	74.01	-9.00	74.04	58.11	4.24
520	73	1.55	34.31	30.92	0.00	31.64	10.00	0.54
521	82	7.51	73.18	73.14	4.00	73.31	57.89	4.05
522	281	1.12	11.14	11.06	-36.40	11.22	42.79	0.17
523	121	3.54	44.41	44.20	-8.60	46.31	10.00	0.95
524	82	1.58	29.20	29.15	-2.80	29.55	51.35	0.59
525	40	0.97	29.64	28.44	-0.20	31.86	26.67	0.51
526	57	1.80	37.08	36.30	-1.80	37.69	48.00	0.81
527	88	3.24	49.58	49.17	-0.80	49.50	50.00	1.38
528	126	2.35	35.03	34.89	-4.80	35.14	43.75	0.74
529	107	1.47	24.63	24.53	-5.80	24.88	47.06	0.46
530	84	1.03	20.05	19.47	-2.60	19.58	35.56	0.32
531	146	3.67	42.19	41.86	-6.20	41.91	73.85	1.17
532	188	2.32	28.10	27.74	-10.60	27.76	64.84	0.59
533	131	4.92	64.01	59.53	3.40	59.55	50.00	2.10
534	77	1.58	29.37	29.15	-3.40	29.75	35.14	0.55
535	46	1.06	29.48	28.32	-0.60	30.81	44.44	0.55
536	169	2.69	31.58	31.55	-13.40	31.88	58.82	0.69
537	122	4.20	50.16	50.06	-1.00	50.08	63.64	1.54
538	411	2.38	18.19	18.16	-54.80	18.37	53.47	0.32
539	142	7.33	62.67	62.60	-4.40	62.71	56.25	2.47
540	109	3.58	47.59	47.55	-1.00	47.61	71.79	1.45
541	111	5.72	63.15	63.07	3.40	63.09	64.29	2.63
542	140	7.72	71.37	71.35	2.00	71.41	62.50	3.79
543	53	0.78	21.29	21.21	-1.20	23.55	33.33	0.36
544	152	8.53	69.30	69.21	-1.60	69.30	44.44	3.13
545	146	8.09	67.25	67.19	-0.40	67.22	64.10	3.15
546	158	3.73	44.22	43.64	-0.60	43.64	48.28	1.10
547	136	3.46	49.29	49.16	-2.20	49.59	31.25	1.27
548	123	2.97	39.26	38.74	-7.40	39.20	40.00	0.86
549	118	2.88	39.88	39.44	-6.60	40.12	38.78	0.88
550	220	2.39	24.50	24.32	-23.00	24.43	30.43	0.42

551	183	2.75	32.07	30.29	-16.40	30.58	42.00	0.60
552	142	3.89	47.12	46.55	-3.60	46.61	62.00	1.32
553	112	2.72	38.45	37.84	-5.60	38.13	56.00	0.90
554	269	6.48	47.73	47.63	-19.60	47.67	62.20	1.38
555	94	2.22	36.13	35.66	-5.80	37.41	47.50	0.78
556	58	1.04	29.29	25.61	0.40	26.12	13.04	0.42
557	74	1.51	29.33	28.76	-3.80	29.87	37.14	0.54
558	70	1.53	32.09	30.29	-1.40	30.69	29.03	0.56
559	114	2.46	35.28	35.00	-5.40	35.20	11.54	0.65
560	162	2.10	26.85	26.60	-12.80	26.87	9.52	0.43
561	162	2.18	28.03	27.84	-12.00	28.13	36.25	0.52
562	87	3.73	55.26	55.13	1.20	55.31	56.52	1.82
563	77	2.338	42.09	41.11	1.60	41.19	60.67	1.05
564	85	2.373	38.33	38.14	-0.60	38.21	64.82	0.95
565	78	0.566	12.19	12.00	-3.01	12.21	44.14	0.19
566	58	0.715	19.04	18.42	-1.01	19.44	31.96	0.30
567	64	0.681	16.44	15.97	-0.21	16.14	40.58	0.26
568	53	1.231	29.51	29.31	-0.80	30.63	40.86	0.57
569	81	2.594	41.51	41.26	-4.21	42.68	35.25	0.94
570	124	5.609	54.95	54.88	-9.02	56.28	15.07	1.49
571	62	1.645	35.56	35.13	-0.21	35.79	21.71	0.68
572	53	1.020	27.00	26.01	-0.20	27.11	42.81	0.49
573	87	2.115	36.35	36.10	-1.60	36.31	68.53	0.89
574	146	2.676	32.76	32.67	-8.21	32.70	71.01	0.77
575	63	2.081	41.37	41.20	0.99	41.68	31.77	0.92
576	78	0.687	15.39	15.33	-2.21	15.69	58.28	0.27
577	85	2.138	36.43	36.35	0.20	36.41	74.25	0.93
578	65	0.766	17.94	17.84	-2.01	18.56	45.11	0.30
579	90	1.582	29.22	29.13	-2.60	29.47	62.12	0.62
580	67	0.427	11.18	10.96	-1.80	11.77	66.62	0.19
581	74	0.903	19.26	18.59	-3.21	19.02	53.80	0.33
582	83	0.292	6.17	6.11	-6.41	6.89	33.96	0.09
583	58	0.212	5.56	5.44	-1.61	5.81	41.13	0.08
584	44	0.172	5.69	5.36	-1.00	7.06	43.43	0.08
585	141	10.126	72.49	72.45	1.40	72.46	64.82	4.06
586	62	0.716	16.99	16.89	-0.60	17.31	58.02	0.30
587	68	1.768	32.64	32.40	-1.60	32.67	70.55	0.76

588	58	2.490	47.52	46.18	-0.40	47.10	33.29	1.13
589	87	2.301	40.80	38.06	0.40	38.12	74.25	1.00
590	89	4.419	61.13	60.95	3.00	61.03	59.95	2.35
591	59	0.961	22.68	22.30	-1.40	23.05	49.95	0.41
592	80	1.627	29.84	29.71	-2.40	30.01	67.52	0.66
593	107	9.267	74.61	74.55	2.40	74.58	67.96	4.59
594	690	31.71	84.30	84.16	-6.20	84.17	69.66	8.41
595	131	6.43	63.29	62.24	-2.60	62.40	57.89	2.45
596	127	4.39	48.04	47.70	-8.20	48.12	39.66	1.24
597	308	12.93	68.70	68.67	-13.00	68.75	57.47	3.25
598	93	4.49	58.03	56.48	-1.80	56.87	40.00	1.77
599	95	6.39	71.10	71.02	4.00	71.14	70.59	3.90
600	139	4.08	47.33	47.22	-5.00	47.34	65.38	1.38
601	91	3.42	47.92	47.37	-2.80	47.71	41.67	1.24
602	374	20.61	79.39	79.34	-6.40	79.35	61.11	5.81
603	99	3.77	58.31	53.93	-2.20	55.04	61.54	1.77
604	86	3.89	56.44	55.64	1.40	56.52	58.33	1.87
605	75	3.30	51.96	51.10	-0.20	51.45	28.00	1.35
606	171	11.69	75.99	75.75	-1.40	75.92	60.00	4.70
607	53	1.43	36.35	35.48	-0.20	37.54	41.18	0.75
608	112	5.52	59.38	58.91	-2.00	59.04	56.76	2.12
609	77	1.51	32.50	31.05	-0.20	31.34	21.43	0.57
610	72	2.28	49.10	47.42	0.80	48.45	56.25	1.33
611	182	13.27	78.04	78.01	3.60	78.02	68.57	5.58
612	88	14.71	90.48	90.47	7.20	90.56	66.67	14.78
613	312	13.87	70.22	70.16	-8.00	70.17	54.02	3.43
614	239	7.19	55.05	54.92	-14.00	55.17	43.68	1.69
615	395	16.10	73.44	73.41	-11.40	73.44	60.00	4.15
616	160	3.66	41.52	41.41	-8.80	41.59	46.27	0.99
617	250	8.38	59.04	58.98	-13.60	59.21	42.35	1.98
618	346	15.52	75.74	75.71	-4.40	75.72	70.97	4.97
619	99	4.32	53.20	52.91	-3.00	53.21	62.16	1.71
620	126	1.80	29.20	28.70	-5.20	28.96	40.00	0.55
621	68	1.74	35.21	35.04	-1.60	36.07	46.15	0.76
622	118	1.25	19.55	19.29	-10.60	20.04	22.06	0.30
623	384	1.26	10.87	10.82	-48.80	10.88	62.69	0.18
624	68	0.89	19.70	19.39	-1.80	20.24	32.35	0.32

625	116	4.53	53.66	53.45	-3.20	53.69	41.03	1.57
626	240	7.80	57.91	57.82	-10.00	57.86	59.26	2.05
627	178	3.53	44.10	40.55	-4.80	40.57	35.82	0.91
628	66	1.94	41.34	39.01	0.20	39.48	17.39	0.79
629	307	8.95	72.15	67.13	-2.40	67.16	58.33	3.05
630	110	4.64	55.39	54.34	-1.20	54.41	65.79	1.84
631	55	1.77	41.58	38.49	-0.20	48.63	45.00	0.87
632	290	9.02	76.54	70.67	0.00	70.71	65.71	3.73
633	85	2.60	44.12	42.51	-0.60	42.70	58.06	1.10
634	1278	14.61	46.68	46.46	#####	46.48	89.84	1.54
635	78	2.33	40.43	39.47	-1.80	39.86	68.75	1.03
636	286	5.66	59.67	55.13	-5.40	55.25	58.49	1.83
637	207	5.75	48.28	47.89	-17.20	48.39	39.80	1.25
638	56	2.18	46.42	44.80	-0.80	48.64	33.33	1.07
639	52	0.92	26.44	24.07	-0.60	27.50	38.10	0.43
640	174	5.67	62.16	57.49	0.60	57.51	31.82	1.78
641	69	2.01	43.30	40.35	-0.60	45.49	45.45	0.95
642	389	6.54	57.49	51.89	-13.00	51.95	58.70	1.61
643	321	6.71	45.38	45.31	-29.80	45.51	47.56	1.17
644	61	0.939	22.94	21.30	-0.61	21.61	16.64	0.33
645	64	0.574	13.86	13.64	-0.40	13.82	54.50	0.23
646	64	1.054	23.39	23.31	-2.21	24.23	46.62	0.43
647	44	0.229	7.36	7.02	-1.61	9.54	39.08	0.10
648	113	1.828	27.22	27.16	-5.21	27.22	69.96	0.59
649	97	1.379	23.39	23.02	-6.41	23.41	33.92	0.40
650	62	0.574	13.85	13.64	-2.61	14.46	51.47	0.23
651	50	0.459	13.24	13.12	-1.80	15.83	43.43	0.21
652	199	17.50	83.11	83.02	11.40	83.02	74.96	7.96
653	83	3.16	47.06	46.88	2.00	46.92	68.71	1.39
654	131	4.49	58.39	54.90	0.40	54.97	76.43	2.00
655	135	2.28	48.81	37.82	0.20	37.92	71.39	0.97
656	49	0.960	26.50	24.86	-0.40	26.15	47.57	0.47
657	85	2.117	38.42	36.44	0.99	36.48	32.31	0.75
658	48	0.745	19.91	19.71	-0.80	20.96	43.43	0.34
659	36	0.376	12.73	12.58	0.00	15.01	29.37	0.19
660	40	0.503	15.91	15.78	0.20	17.45	33.29	0.25
661	43	0.691	20.15	20.02	-0.60	22.30	36.80	0.34

662	51	0.758	19.83	19.63	-1.00	20.84	49.95	0.35
663	42	0.480	14.33	14.19	-0.80	16.12	42.81	0.23
664	70	2.244	37.88	37.79	-3.81	38.93	23.49	0.77
665	48	2.401	48.67	47.90	-0.81	50.42	17.62	1.14
666	43	0.619	22.21	19.63	-0.20	22.76	31.21	0.32
667	46	1.452	43.34	38.88	0.60	41.43	46.10	0.89
668	38	0.478	17.96	15.88	0.00	18.73	37.45	0.25
669	33	0.476	19.08	17.83	-0.40	26.38	16.64	0.27
670	49	0.745	22.52	20.42	-0.40	21.78	33.29	0.34
671	34	0.572	20.30	20.03	0.00	25.10	38.41	0.34
672	37	0.432	16.16	14.99	0.00	18.52	33.29	0.23
673	42	0.509	16.05	15.94	-1.20	20.35	27.74	0.24
674	61	1.299	28.11	27.95	-1.40	28.65	64.24	0.60
675	74	2.407	43.39	42.26	-0.80	42.70	66.62	1.14
676	41	0.640	19.92	19.69	0.00	21.92	41.13	0.34
677	151	14.352	84.45	83.88	5.20	83.90	73.65	8.41
678	55	1.271	28.81	28.65	-1.00	29.54	51.95	0.58
679	62	1.138	28.16	25.70	-1.00	26.35	51.80	0.50
680	76	1.514	28.03	27.96	-2.60	28.26	65.74	0.60
681	78	0.905	18.75	18.64	-1.60	18.78	76.89	0.38
682	228	7.151	51.87	51.75	-18.82	51.95	64.82	1.65

S.No.	District name	EC			Chloride			Fluoride			Nitrate			Alkalinity			TH			Sodium		
		MAX	MIN	Average	MAX	MIN	Average	MAX	MIN	Average	MAX	MIN	Average	MAX	MIN	Average	MAX	MIN	Average	MAX	MIN	Average
1	Ahmedabad	11870	550	4913	3013	64	1051	0.96	0	0.49	70	0.7	18	1161	190	604	1952	190	715	2109	42	858
2	Amreli	4900	950	2123	1370	128	498	0.41	0.32	0.36	151	18.9	69	240	110	170	1830	330	660	241	63	156
3	Anand	5223	720	2556	1141	43	397	1.5	0.32	0.77	106	12.6	40	721	280	534	791	240	462	958	56	381
4	Arvalli	3080	535	1319	675	36	209	0.98	0.12	0.53	100	3.3	44	440	140	230	890	190	443	345	29	115
5	Banaskantha	6225	525	1555	1583	43	274	2.15	0.16	0.94	81	8.5	36	700	120	296	1770	170	468	494	29	140
6	Bharuch	6860	380	1926	1418	28	363	4	0.1	0.68	85	0	12	1221	140	374	1241	100	412	940	18	251
7	Bhavnagar	10030	650	2157	2812	43	375	2.18	0.21	0.72	360	0	71	820	35	317	1450	70	444	1498	38	278
8	Botad	6280	1150	2476	760	227	399	1.87	0.39	0.75	300	1.6	105	1190	60	356	750	160	394	1303	166	364
9	Chhota udepur	5430	548	1402	1347	28	211	2.15	0.29	1.06	51	1.9	22	741	160	318	911	180	379	866	27	157
10	Dahod	2400	440	1084	433	14	126	2.7	0.23	1.29	120	4.6	32	550	120	271	640	140	311	390	35	118
11	Daman	2377	534	1059	390	28	167	0.62	0.15	0.3	7	0.1	3	470	120	248	350	210	274	410	13	112
12	Dang	651	362	482	85	14	31	0.38	0.04	0.18	8	0.5	1	250	150	190	300	130	206	84	11	24
13	Devbhoomi Dwarka	11870	517	2619	4260	64	607	2.45	0	0.56	331	1.2	54	570	30	233	2450	140	559	1771	46	323
14	Diu	12890	2000	5855	4580	419	1832	0.49	0.16	0.35	125	2.7	51	440	120	247	3460	560	1537	1364	150	600
15	DNH	1237	219	538	142	7	57	1.6	0.16	0.38	26	0	5	360	70	166	330	80	197	129	11	37
16	Gandhinagar	2876	2876	2876	503	503	503	1.14	1.14	1.14	23	23.4	23	721	721	721	831	831	831	329	329	329
17	Gir Somnath	3720	468	1257	966	28	213	1.9	0.09	0.66	105	0.4	34	460	120	224	690	160	333	451	31	126
18	Jamnagar	13980	387	2268	4480	36	531	1.06	0	0.36	149	0.3	44	490	100	210	4120	70	589	1892	25	247
19	Junagadh	12380	372	1945	4027	14	461	3.85	0.03	0.39	80	0.1	29	440	80	212	2102	120	526	1894	12	204
20	Kachchh	7493	430	3040	2092	28	715	3.95	0.07	1.05	110	0	20	831	60	283	2002	110	652	417	15	426
21	Kheda	7589	895	2813	2162	35	591	0.98	0	0.25	115	2.9	26	620	190	402	1902	200	694	987	51	342
23	Mahesana	4105	395	1776	873	14	307	1.42	0.1	0.6	58	0.3	20	870	120	370	1290	160	377	650	16	230
24	Mahisagar	1650	505	968	220	28	107	3.1	0.22	0.86	52	3.9	17	460	180	285	670	200	318	198	36	92
25	Morbi	7684	528	2500	2229	28	566	2.75	0.26	1.02	102	2.4	28	440	120	265	1560	200	567	922	36	294
26	Narmada	857	384	636	142	14	48	0.39	0.16	0.31	31	1.6	13	340	150	220	320	170	243	85	15	34
27	Navsari	3700	498	1186	950	50	175	1.56	0.15	0.49	36	1.1	12	540	160	292	961	170	333	365	18	106
28	Panchmahal	2210	495	1062	362	21	129	3	0.28	0.96	90	6.3	27	490	120	268	810	130	357	174	34	90
29	Patan	25940	412	5208	8933	21	1491	5.65	0	1.38	52	1.9	18	896	170	419	5404	190	1054	4143	15	824

30	Porbandar	7455	404	2600	2276	43	610	1.34	0	0.5	112	0.5	39	500	70	250	1821	140	494	1281	26	362
31	Rajkot	7177	405	1859	2031	28	346	3.7	0.19	0.6	180	2.7	57	610	70	249	2880	140	596	970	27	163
32	Sabarkantha	5040	490	1775	1377	21	329	4.45	0.12	1.27	125	7.2	57	550	110	260	1380	210	526	531	26	189
33	Surat	2557	441	995	695	21	133	1.7	0.04	0.54	59	3.5	19	440	80	259	761	200	334	448	6	90
34	Surendranagar	24790	506	3089	8520	36	668	5.15	0.27	1.39	513	0	53	580	120	269	7090	60	664	2830	31	398
35	Tapi	1491	459	834	262	21	111	0.63	0.1	0.33	38	7.6	19	340	140	226	600	230	357	103	8	41
36	Vadodara	3650	1174	1946	596	78	264	2.8	0.25	1.1	33	9.2	22	891	360	508	350	320	333	720	98	285
37	Valsad	4667	309	817	1446	7	123	0.7	0.14	0.31	74	0.1	9	450	100	196	1111	120	253	548	11	71