जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

Government of India

Ministry of Water Resources

CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET

UNA DISTRICT, HIMACHAL PRADESH

NORTHERN HIMALAYAN REGION

DHARMSALA

2007

Contributors

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Scientist-B

Prepared under the guidance of

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Our Vision

Water security through sound groundwater management

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

UNA DISTRICT AT A GLANCE

Sl. No	*ITEMS*	Statistics
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	1542
	ii) Administrative Divisions (2001)	
	• Number of Tehsil & sub-tehsils	4 &1
	• Number of CD Blocks	5
	• Number of Panchayats	235
	• Number of Villages	814
	iii) Population (2001 Census)	
	• Total population	4,48,273
	• Population Density (pers/sq km)	290
	• Rural & Urban Population	91% & 9%
	• SC & ST Population (in percent)	22 % & 0.01%
	• Sex Ratio	997
	iv) Average Annual Rainfall (mm)	1040
2.	GEOMORPHOLOGY	
	Major Physiographic units	• Structural hills & upland (elevation 650–1041 m asl) • Valley/ alluvial plain (elevation 360-550 m asl)
	Major Drainages	
	• Satjuj basin (95%)	Soan River, Lunkhar khad
	• Beas basin	Sohan Nadi
3.	LAND USE (sq km)	
	• Forest area	181
	• Cultivated area	399
	• Net area sown	416
4.	MAJOR SOIL TYPES	• Alluvial soil • Non-calcic soil
5.	AREA UNDER PRINCIPAL CROPS (2005-2006) in sq km	760
	• Rice	27
	• Wheat	368
	• Maize	291
	• Potato	78
	• Sugarcane	3
6.	IRRIGATION BY DIFFERENT SOURCES (MI census) (sq km)	
	• Net area irrigated by maj / med scheme	1.97
	• Net area irrigated through Ground	66.40

	water	
	• Net area irrigated through surfacewater	16.66
	• Net area irrigated (Total)	85.03
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.3.2007)	
	• Number of Dug Wells	20
	• Number of Piezometers	Nil
8.	PREDOMINANT GEOLOGICAL FORMATIONS	• Alluvium/valley-fill (Quaternary) • Siwalik Group (Tertiary)
9.	HYDROGEOLOGY	
	Major Water Bearing Formations	
	1. *Semi consolidated sediments (Siwalik Group)*	Covers major part (70%)
	• Yield prospects	Low to moderate (1-5 lps)
	• GW structures	Springs, open wells & tube wells
	2. *Unconsolidated porous sediments (Alluvium)*	In Una valley
	• Yield prospects	High (10-25 lps)
	• GW structures feasible	Open wells & tube wells
	Avg. Depth to water level -pre-monsoon	2.00 – 65 m
	-post-monsoon	1.50 – 60 m
	Long term water level trend (1997-2006)	0-2 m fall in major part of valley area
10	GROUND WATER EXPLORATION BY CGWB (as on 31.3.2007)	
	• No of wells drilled	40 (EW-38: OW-2)
	• Depth Range (m)	50.00 - 200
	• Discharge (lps)	2.00 - 55.00
	• Static Water Level	1.45 m agl - 43.00 m bgl
	• Transmissivity (m^2/day)	85 - 2600
11.	GROUND WATER QUALITY	
	Presence of Chemical constituents more than permissible limits (eg. EC, F, As, Fe)	Nil
	Quality of Ground Water	Good
	(EC Range in µS/cm)	(345 – 1380)
12.	DYNAMIC GROUND WATER RESOURCES (2004) in MCM (Una valley)	
	• Annual Replenishable Ground Water Resources	132.76

	• Net Annual Ground Water Draft	61.5
	• Projected Demand for Domestic and industrial Uses up to 2025	13.90
	• Stage of Ground Water Development	51%
13.	AWARENESS AND TRAINING ACTIVITY	
	• Mass Awareness Programmes	1
	• Date	28-03-2006
	• Place	KVK, Rampur, Una
	• No of participants in persons	500
14.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	Nil
15.	GROUND WATER CONTROL AND REGULATION	
	• Number of OE & Critical Blocks	Nil
	• No of blocks notified	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	
	• Depletion of water table	In valley area mild declining trend in parts
	• Water scarcity & Deep water levels	In upland, *Beet* areas very deep water level; require exploration
	• Water logging	In patches along Soan river- requires remedial measures

DISTRICT GROUND WATER BOOKLET
UNA DISTRICT, HIMACHAL PRADESH

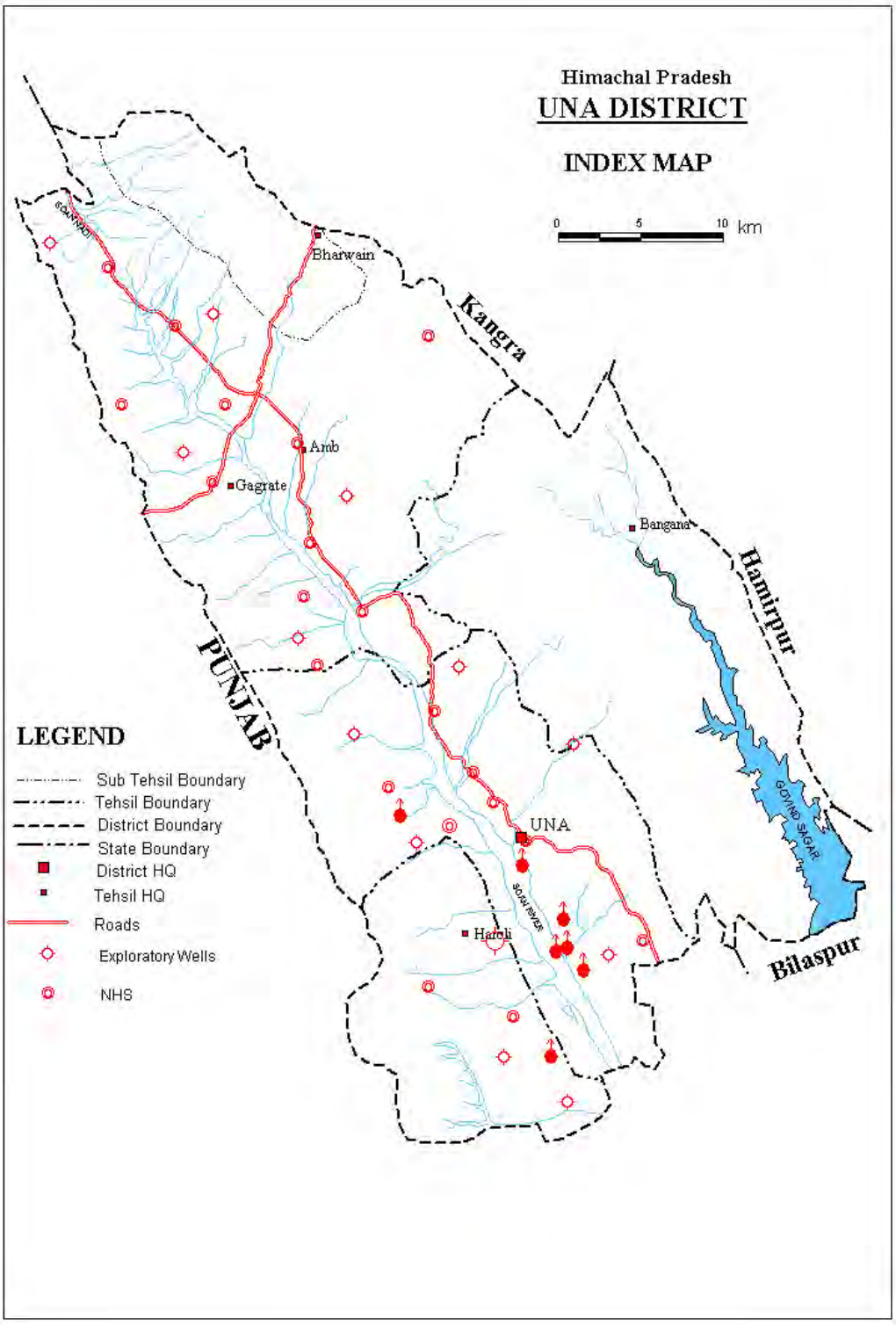
1.0 INTRODUCTION

Una district came in to existence on 1 September 1972 and is situated in the southwestern part of the State of Himachal Pradesh. The district, with its headquarter at Una town, has a geographical area of 1542 sq km and covers 2.8 % area of the State. It lies between North latitude 31°18'00" & 31°55'00" and East longitude 75°55'00" & 76°28'00" and is covered in survey of India degree sheet No.53A & 44M. Towards north it is bounded Kangra district, towards north- & east by Hamirpur & Bilaspur districts and towards south-west by State of Punjab.

Administratively, the district has been divided into two sub-divisions (Una & Amb) and comprises of 4 tehsils [Una, Amb, Bangana, Haroli] & 1 sub-tehsil (Bharwain). Further, there are 5 CD blocks [Una, Amb, Gagret, Dhundla (Bangana) & Haroli]. There are 5 towns (Una, Mehtpur Badshera, Gagret, Santhokhgarh and Daulatpur), 758 inhabited villages, 56 uninhabited and 235 Gram Panchayats in the district. Una district is well developed in the industrial sector due to close proximity to Punjab state with Mehatpur, Gagret, Tahliwal & Amb as main industrial centers. The district is well connected by rail and road network. The nearest airport is at Chandigarh.

As per 2001 census, district has a population of 448,237 with 290 persons /sq km density of population. The male/female sex ratio is 997. Rural population is about 91% indicating thereby that the district has a agricultural economy. Scheduled caste population constitutes about 22% of the total population.

Agriculture is the major occupation of the people of the district with more than 70% population engaged in the agriculture and allied sector. Major crops like maize, wheat, rice, sugarcane and pulses are grown apart from the vegetables in the district. Total cultivable area is 443 sq km and net area sown is 388 sq km. Net area irrigated in the district is about 85 sq km. Ground water is the major source of water in the district for irrigation and


Himachal Pradesh
UNA DISTRICT
INDEX MAP
0
5
10
km
Bharwain
Kangra
Amb
Gagrate
Bangana
Hamirpur
PUNJAB
UNA
Haroli
SOAN RIVER
GOVIND SAGAR
Bilaspur
LEGEND
Sub Tehsil Boundary
Tehsil Boundary
District Boundary
State Boundary
District HQ
Tehsil HQ
Roads
Exploratory Wells
NHS

domestic use. There are large numbers of water supply wells & tube wells, springs, *kulhs* (water channels) and lift irrigation schemes implemented exclusively for irrigation purposes. The irrigated command area under the Bhabaur Sahib lift irrigation scheme, phase I and Phase II are 923 hectare and 2640 hectare respectively.

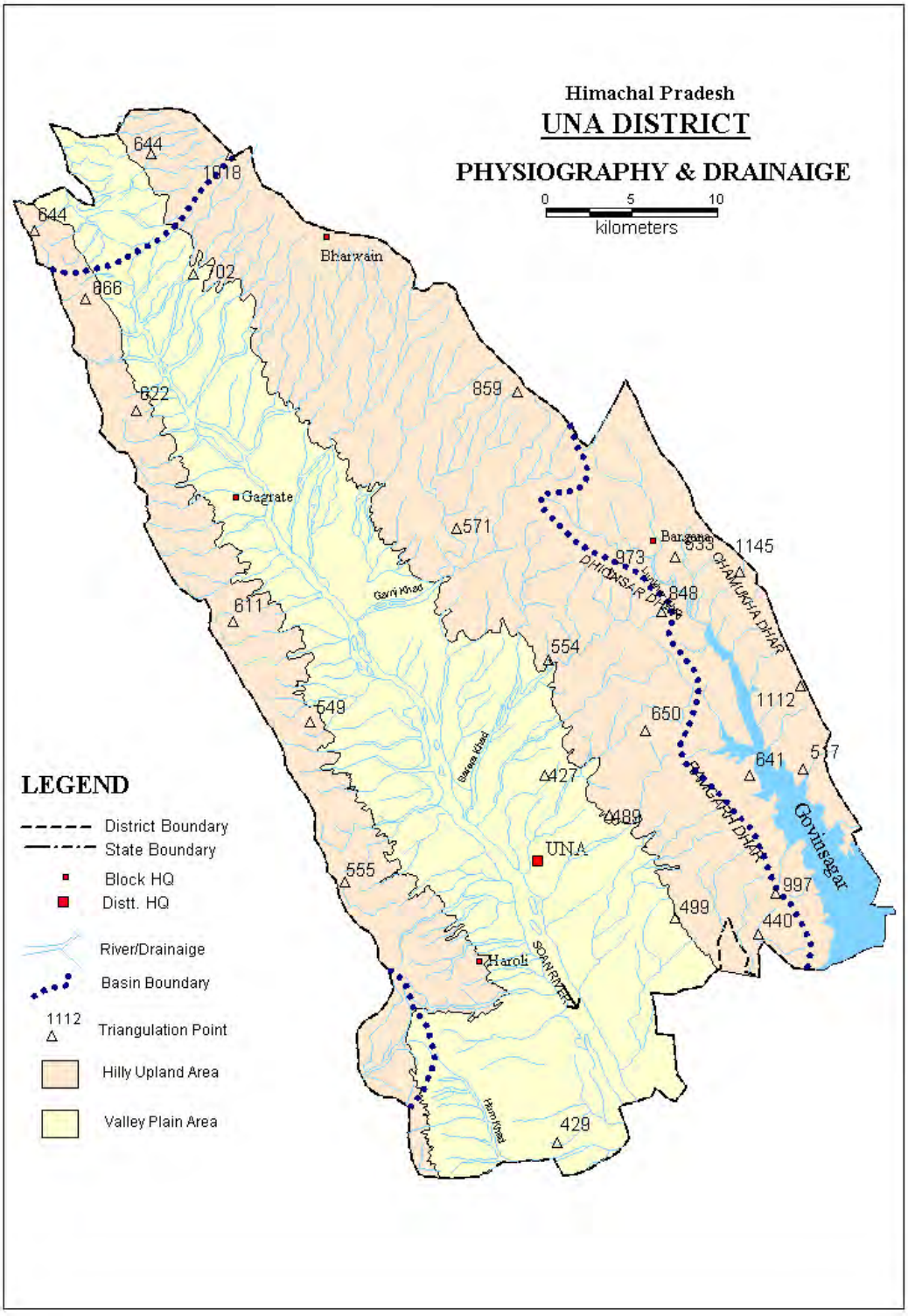
Central Ground Water Board (CGWB) has carried out extensive hydro-geological studies and ground water exploration in the district. Hydrogeological studies and exploration commenced in sixties, and under exploratory drilling programme 40 exploratory wells ranging in depth from 42 to +200 m bgl have been drilled. CGWB under its national network maintains 20 stations for ground water regime monitoring where water level and ground water quality is monitored.

2.0 CLIMATE & RAINFALL

Climate of the district is tropical to temperate in nature as the terrain varies from plains to high hills. Temperature varies from minimum of 4°C in winter to the maximum of 46°C in summer. The area receives rainfall during monsoon period extending from June to September and also non-monsoon period (winter). The annual average rainfall in the area is about 1040 mm with about 55 average rainy days. The winter season starts from the November and continues till the middle of March. Thereafter the mercury continues rising till the set of Monsoon which starts from the last weak of June and continues till the middle of September.

3.0 GEOMORPHOLOGY & SOILS

Una district nestles between Siwalik ranges and forms part of the lesser Himalaya. It has a diverse landscape made of the hills, valleys with piedmont zone, terraces. The elevations of the land surface in the district vary from 340 m in south-eastern part to 1041 m above sea level (ASL) in eastern part of the district. There are three hill ranges i.e. *Chamukha Dhar* with maximum elevation of 1041m amsl which borders with district Hamirpur, *Dhionsar Dhar* with maximum elevation of 950m amsl and *Ramgarh Dhar* with maximum elevation of 997m amsl. In the southwest


Himachal Pradesh
UNA DISTRICT
PHYSIOGRAPHY & DRAINAIGE
0 5 10
kilometers
644
1018
644
666
702
622
Bharwain
859
Gagrate
571
973
933
1145
848
611
554
649
650
1112
641
517
427
489
555
UNA
997
499
440
Haroli
429
LEGEND
District Boundary
State Boundary
Block HQ
Distt. HQ
River/Drainaige
Basin Boundary
1112
Triangulation Point
Hilly Upland Area
Valley Plain Area

border with Punjab, Siwalik hill ranges form hilly upland or plateau area with elevation up to 666 m above mean sea level. The vast area between the northwesterly & southeasterly hill ranges, on both sides of river Soan is the *UNA valley*. The undulating to plain fertile Una valley has an area of about 455 sq km and it extends from Daulatpur in the north west to Santokhgarh in the south east.

Soan or Swan River, a tributary of river Satluj, drains the major part (80%) of the Una district. Soan is an intermittent river and maintains base flow in the lower reaches. Soan river has about 80% catchments area in Una district and divides the district into two parts. Soan river flows in a southeastern direction and has a wide channel and exhibits braided nature. It originates near Daulatpur in the northeastern part and leaves the district near Santokhgarh and subsequently joins river Satluj. Number of local streams (about 73 *khads*) joins the river within the district. During monsoon Soan river gets flooded due to shallow bank heights & large area on both sides get affected. GoHP has initiated riverbank protection cum flood controls measures and the work is in progress.

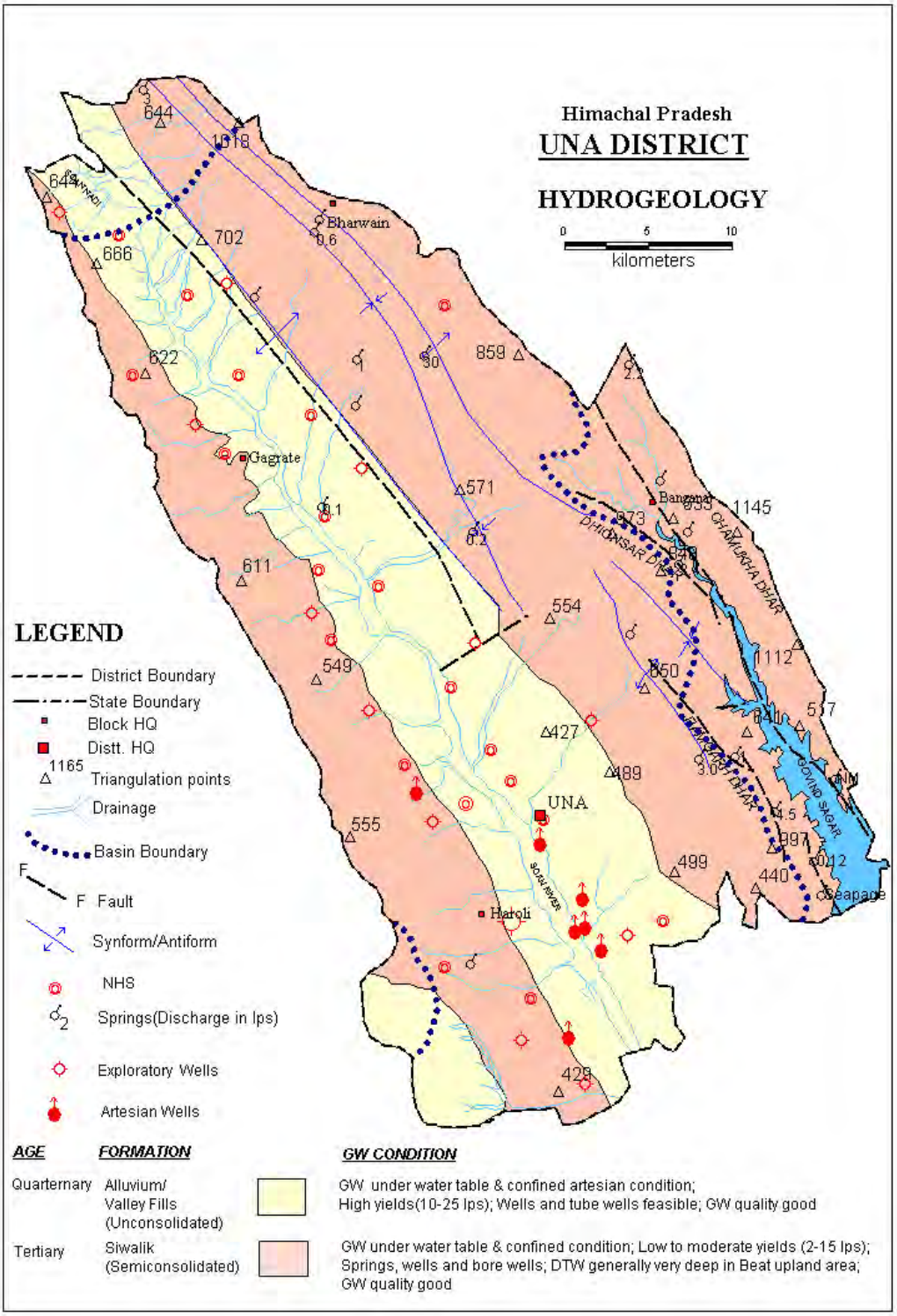
In the Bangana area, another stream (*Khad*), flowing parallel to Soan river, is Lunkhar khad, which debouches in the Govind Sagar lake. Also, in the extreme north-western part of the district small area forms the catchments of a tributary of Beas river basin.

Two types of soils are observed in the district viz., alluvial soil and non-calcic brown soil. Most of the area in district is covered with alluvial soil and only about 25% of the area i.e. hilly area in the district is covered with Non-calcic brown soil. Soils are rich in nutrients and thus are fertile

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The rock formations occupying the district range in age from pre-Cambrian to Quaternary period. The generalized geological succession in the district is given below

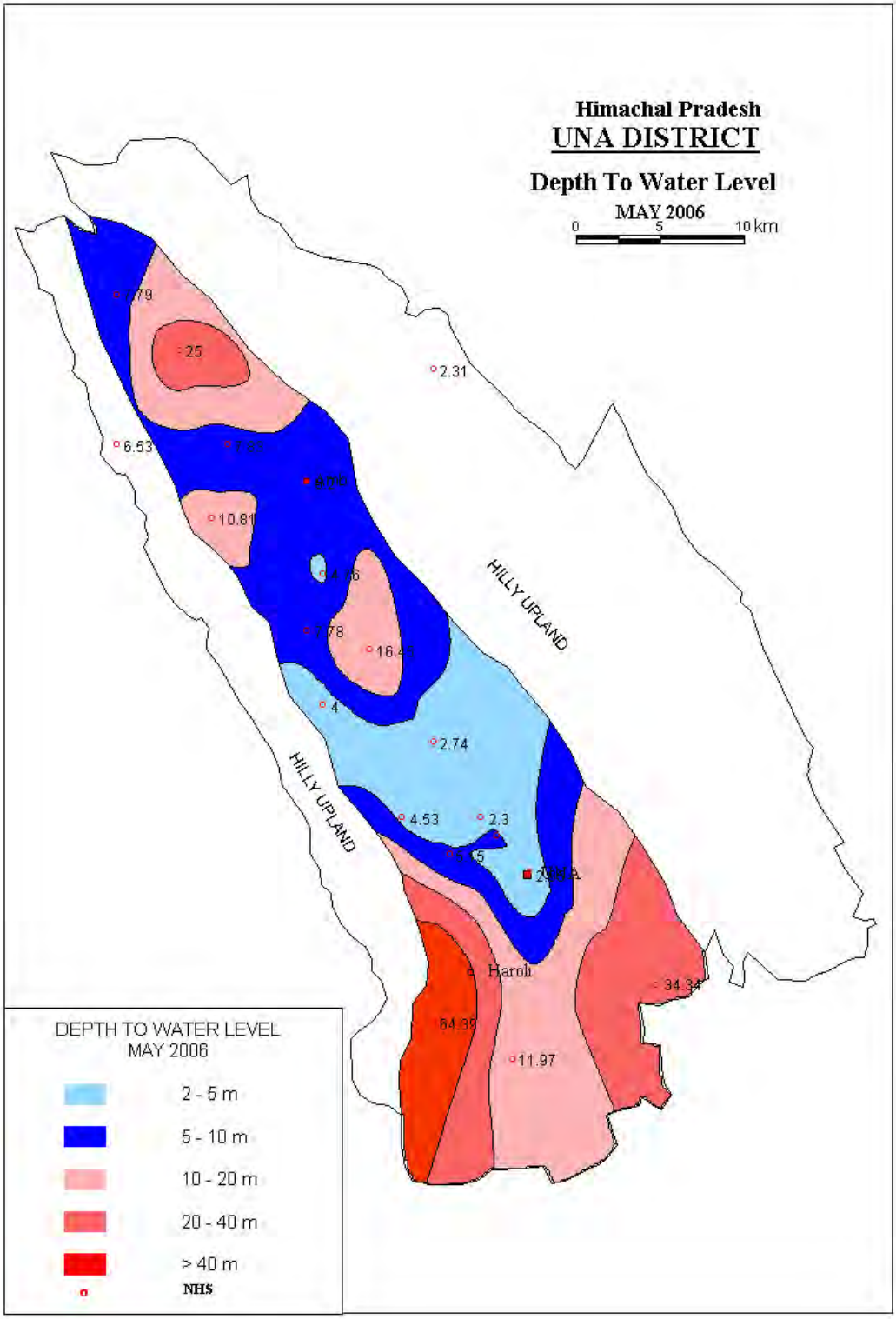

Himachal Pradesh
UNA DISTRICT
HYDROGEOLOGY
0 5 10
kilometers
Bharwain
Gagrate
Bangana
UNA
Haroli
Seapage
644
1018
702
666
622
859
571
611
554
549
427
489
555
499
440
1145
1112
997
973
LEGEND
District Boundary
State Boundary
Block HQ
Distt. HQ
1165 Triangulation points
Drainage
Basin Boundary
F Fault
Synform/Antiform
NHS
Springs(Discharge in lps)
Exploratory Wells
Artesian Wells
AGE
FORMATION
GW CONDITION
Quarternary
Alluvium/ Valley Fills (Unconsolidated)
GW under water table & confined artesian condition; High yields(10-25 lps); Wells and tube wells feasible; GW quality good
Tertiary
Siwalik (Semiconsolidated)
GW under water table & confined condition; Low to moderate yields (2-15 lps); Springs, wells and bore wells; DTW generally very deep in Beat upland area; GW quality good

ERA	*PERIOD*	*FORMATION*	*DESCRIPTION*
Quaternary	Recent to sub-Recent	Alluvium; fluvial, terrace, piedmont	Sand, silt, clay, gravel, pebble and cobble etc.
		Undifferentiated	Sand, clay, gravel, pebble, cobble and boulders
Tertiary	Pliocene to Mid. Miocene	Upper Siwalik	Soft sandstone, brownish clay, shale, poorly sorted, crudely bedded conglomerate & boulder beds.
		Middle Siwalik	Gray sandstone, and brownish clay/ shale
		Lower Siwalik	Red and purple sandstone and shale

Hydro-geologically, both the unconsolidated valley fill or alluvial formation occurring in the valley area and semi-consolidated sediments belonging to Siwalik Group form aquifer system in the district. Porous alluvial formation forms the most prolific aquifer system in the valley area where as the sedimentary semi-consolidated formation for aquifer of low yield prospect.

The ground water in the Siwalik group of rocks occur under the unconfined to semi confined conditions mainly in the arenaceous rocks viz., sandstone, siltstone, gravel boulder beds etc. The occurrence and movement of ground water is controlled by inter granular pore spaces and also the fracture porosity. Siwalik sediments underlie Hilly/undulating areas where springs (mostly gravity/contact type) and *bowries* are the main ground water structures apart from the hand pumps. The discharges of the springs, varies from seepages to 0.50 lps. B*owries* are dug well type constructed on the hill slopes/ nalas for tapping the seepages. In the low lying areas underlain by Siwalik rocks, dug wells and hand pumps are the main ground water structures that range in depth from 3.00 to 25.00 m bgl where in depth to water level ranges from 2.50 to 15.00 m bgl. In upland/plateau areas the water level is generally deep. In B*eet* area water level more than 60 m below land surface are observed.

In Una valley area, the ground water occurs in porous unconsolidated / alluvial formation (valley fills) comprising sand, silt, gravel, cobbles / pebbles etc., & forms prolific aquifer. Ground water occurs both under


Himachal Pradesh
UNA DISTRICT
Depth To Water Level
MAY 2006
0 5 10 km
7.79
25
2.31
6.53
10.81
4.76
7.78
16.43
4
2.74
HILLY UPLAND
HILLY UPLAND
4.53
2.3
Haroli
34.34
64.99
11.97
DEPTH TO WATER LEVEL
MAY 2006
2 - 5 m
5 - 10 m
10 - 20 m
20 - 40 m
> 40 m
NHS

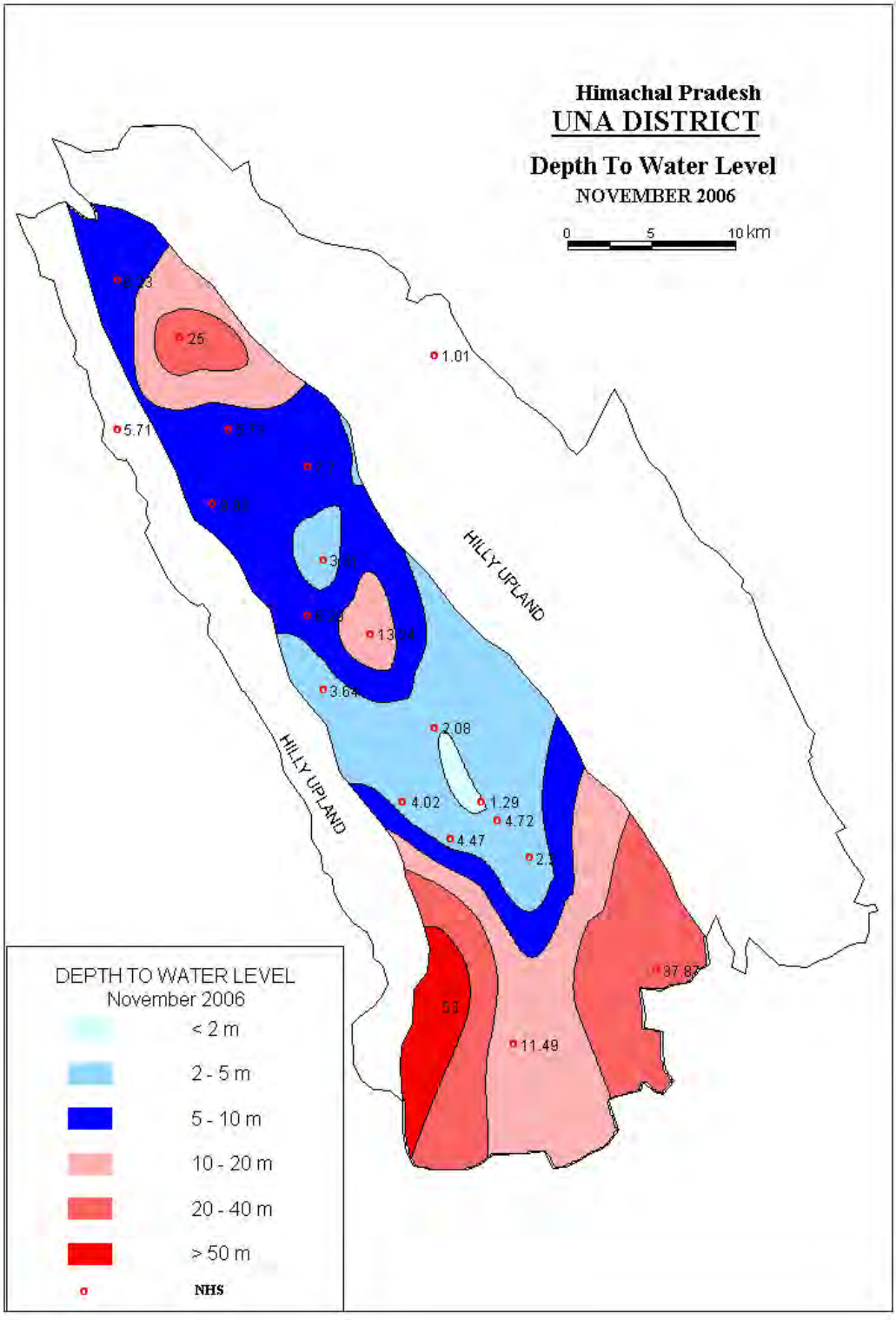
phreatic & confined artesian conditions. Free flowing wells are also observed in the lower part of Soan river. Ground water is being extensively developed in the area by medium to deep tube wells, dugwells, dug cum borewells and also by hand pumps. Depth of dugwells and dug cum bored well in area ranges from 4.00 to 70.00 m bgl whereas depth to water level ranges from near surface to 26.46 mbgl in pre monsoon Yield of shallow aquifer is moderate with well discharges up to 10 lps.

CGWB has drilled/constructed 40 exploratory wells in the district in the depth range of 51.00 to 220.00 mbgl. Static water level of the tubewells ranges from 0.16 to 43.20 mbgl and discharge ranges from 553 to 3500 lpm with the drawdown less than 8-10 m Free flowing bore wells are observed along the terrace deposits on the both banks of Soan river.

In Una valley depth to water level shows wide variation. During pre-monsoon period (May 2006) it ranged from less than 2.00 to 65.00 m bgl. Deeper water levels are confined mainly in south west (*Beet* area) and localized patches in north eastern and central part of Una valley. In major parts of Una valley, depth to water level ranged between 2.00 & 10.00 m bgl. Some areas in discharge zone along the river Soan, show water logging conditions where water level is less than 1.5 m bgl. Seasonal fluctuation (rise) up to 3.56 m was observed between pre and post monsoon (2006) period. Long-term water level fluctuation was analysed for the period of May 2007 with respect to decadal average of 1998 to 2006. In general, fall in water level up to 2 m is observed in most part of the valley. However, in isolated pockets in north western and south eastern part of Una valley rise of water level up to 4 m is also observed.

4.2 Ground Water Resources

Rainfall is the major source recharge to the groundwater body apart from the influent seepage from the rivers, irrigated fields and inflow from upland areas whereas discharge from ground water mainly takes place from wells and tube wells; effluent seepages of ground water in the form of springs and base flow in streams etc.


Himachal Pradesh
UNA DISTRICT
Depth To Water Level
NOVEMBER 2006
0 5 10 km
1.01
5.71
7.7
HILLY UPLAND
13.24
3.64
2.08
HILLY UPLAND
4.02
1.29
4.72
4.47
11.49
DEPTH TO WATER LEVEL
November 2006
< 2 m
2 - 5 m
5 - 10 m
10 - 20 m
20 - 40 m
> 50 m
NHS

Ground water resources and irrigation potential for Una valley of the district have been computed as per the GEC-97 methodology the resources for the year 2004 are presented below.

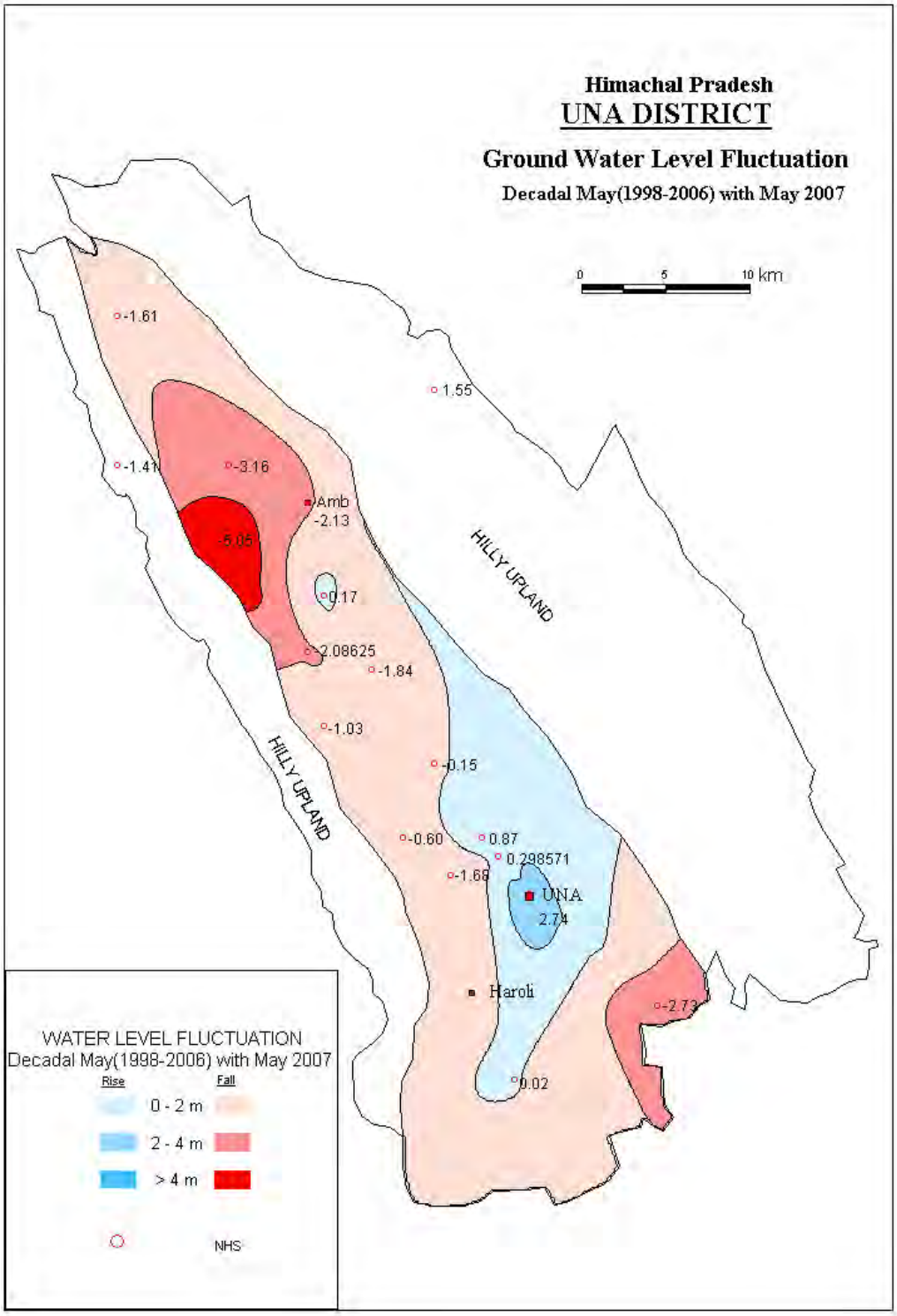
1.	Area of Una valley considered for GW Assessment	453	sq km
2.	Annual Replenishable GW Resource during monsoon & non-monsoon period	132.75	mcm
3.	Natural Discharge during Non-monsoon Season	13.28	mcm
4.	Net Annual Ground Water Availability	119.48	mcm
5.	Annual Ground Water Draft	61.51	mcm
6.	Demand for Domestic and Industrial uses (Projected up to 2025)	13.90	mcm
7.	Ground Water Availability for Future Irrigation	52.44	mcm
8.	Stage of Ground Water Development	51	%

The stage of ground water development in the valley area of Una district is 51% and falls under "s*afe category*". There is thus scope for further ground water development as on 2004.

4.3 Ground Water Quality

Chemical quality data of ground water from shallow as well as deep aquifer in the district indicates that ground water is generally alkaline in nature and suitable for both domestic and irrigation use. All the parameters analysed are well within the permissible limit of safe drinking water set by Bureau of Indian Standard (BIS). The range of chemical parameters hydrograph network stations of CGWB in the district are summarized below

S. No	*Parameter*		*Range*	
			Min	*Max*
1.	pH		7.95	8.46
2.	EC	µS/cm	345	1380
3.	HCO_3	(mg/l)	129	460
4.	Cl	(mg/l)	7	185


Himachal Pradesh
UNA DISTRICT
Ground Water Level Fluctuation
Decadal May(1998-2006) with May 2007
0 5 10 km
-1.61
1.55
-1.41
-3.16
Amb
-2.13
-5.05
0.17
-2.08625
-1.84
-1.03
-0.15
-0.60
0.87
0.298571
-1.68
UNA
2.74
Haroli
-2.73
0.02
HILLY UPLAND
HILLY UPLAND
WATER LEVEL FLUCTUATION
Decadal May(1998-2006) with May 2007
Rise
Fall
0 - 2 m
2 - 4 m
> 4 m
NHS

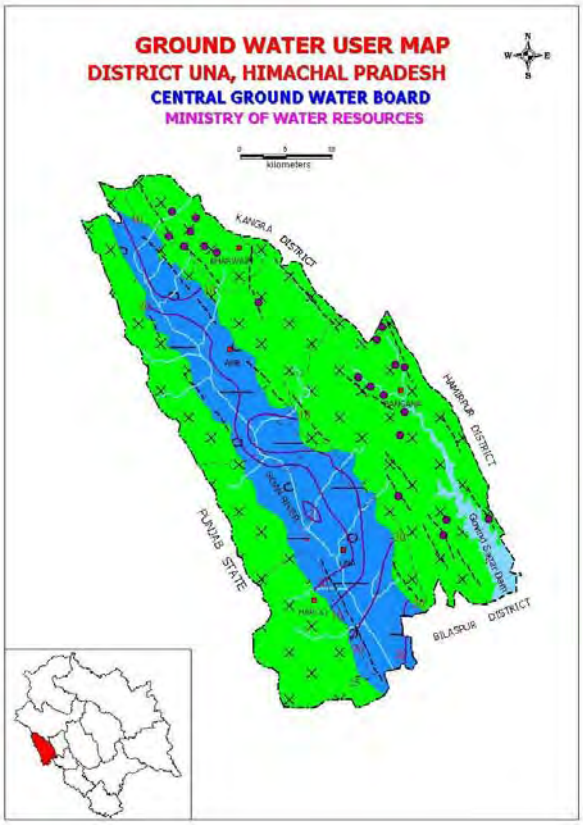
5.	NO_3	(mg/l)	0.78	65
6.	F	(mg/l)	0.19	0.71
7.	Ca	(mg/l)	58	148
8.	Mg	(mg/l)	2.6	58
9.	Na	(mg/l)	5	133
10.	K	(mg/l)	0.7	6.2
11.	TH as CaCO3	(mg/l)	177	446

Quality of ground water in shallow aquifer is good for domestic and irrigation purpose in the district.

4.4 Status of Ground Water Development

Ground water development particularly in valley areas, underlain by alluvium/valley fills, of the district is moderate to high scale. In these areas, all the major irrigation and drinking water supplies depend on ground water viz., open wells & tube wells. The deeper aquifers in the area are being extensively developed by tube wells and about 400 tube wells have been constructed in the Una valley most of them in govt. sector. The tube wells range in depth from 51.0 to 220.0 m bgl with water level rest above ground level (FF) to 45.00 m bgl in valley area. The well yields are high with discharge ranging from 553 to 3500 lpm for 7-10 m draw down. An average tube well of about 100m depth yields about 20 - 25 lps. In the sedimentary areas (Siwalik Group) deep exploration has not been carried out. The piezometric head in tube wells are reported to be more than 100m in upland areas.

State departments has also drilled shallow bores or handpumps in the district with the depth ranging from 25 to 60 m depending upon the lithology of the area with a discharge varying from 0.5 lps to 3 lps. Few of them energized with submersible pumps fitted. As per MI census, there are about 227 dug wells and 1448 shallow tube wells in the district.



LEGEND

	Wells feasible	Rigs suitable	Depth of Well (m)	Discharge (lpm)	Suitable artificial Recharge structures
Soft rock aquifers	Tube well Dug well	Percussion & Percussion cum Rotary Manual	100-120 10-20	1200-2500 300-500	Check dam, Check dam cum ground water dam, Recharge shaft
Hard rock aquifers	Dug well Spring development	Manual	10-20	300-500 30-2000	
• Spring			5 Water level contour (m bgl) (Pre monsoon decadal mean, 1993-2002)		
Major drainage Reservoir			Fault/lineament Tehsil boundary District boundary State boundary		

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

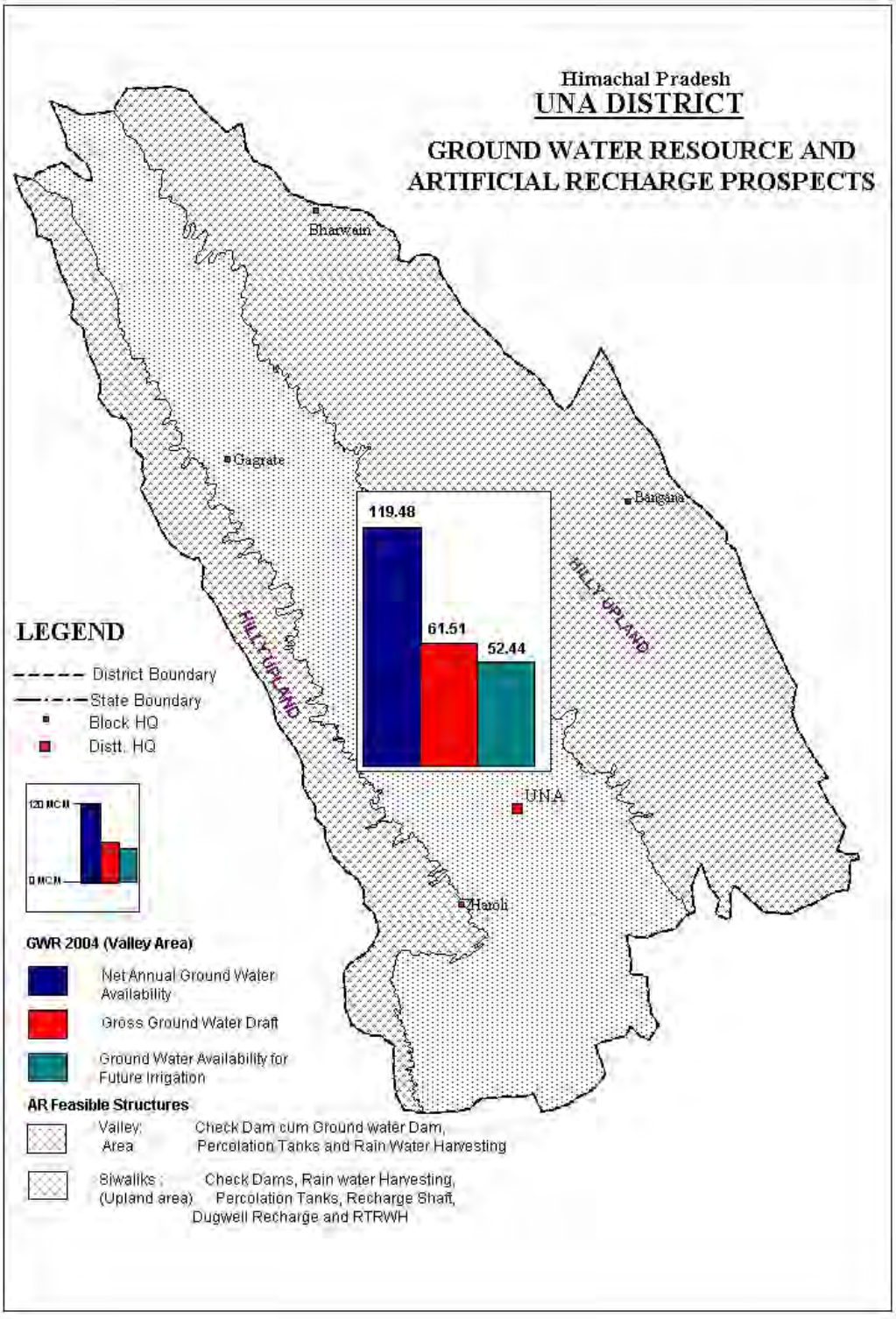
As on 2004, the stage of groundwater development in Una valley of the district is 51% and falls in *safe category* of development. There is thus scope for further ground water development by constructing additional wells and tube wells in the valley area where construction of such wells are feasible. Considering average draft per well as 0.20 MCM/year, about 160 additional wells can be constructed (since 2004) in the valley area for irrigation purposes. However, there is urgent need to simultaneously monitor the behavior of deeper aquifers in order to take preventive measures in future. Water logged areas along the Soan river should be developed for water supply schemes & for irrigated agriculture in the district.

In hilly upland and plateau areas underlain by Siwalik sedimentary formation, there is need to explore deep aquifers say down to 300 m depth to evaluate aquifer potentialities as these areas are in general water scarce due to typical hydro-geomorphic set up.

5.2 Water Conservation & Artificial Recharge

Ground water is the major source for irrigation & domestic water supply in both rural and urban areas. Water level observation data has revealed declining trend in water level in some parts of the district. Though the stage of ground water development in valley is still in *safe category*, however, declining water levels in patches suggest need for cautious and well-planned ground water development. Further, there is an urgent need to monitor development pattern by the implementing agencies.

In some parts the availability of water during summer is limited particularly in drought years and requires immediate attention to conserve and augment this resource. Based upon the climatic conditions, topography, hydro-geology of the area, suitable structure for rain water harvesting and artificial recharge to ground water body need to be planned and implemented. There is need to switch over from development phase to management phase in GW sector. Roof top rainwater harvesting in


Himachal Pradesh
UNA DISTRICT
GROUND WATER RESOURCE AND ARTIFICIAL RECHARGE PROSPECTS
Bharwain
Gagrate
Bangana
UNA
Haroli
HILLY UPLAND
HILLY UPLAND
119.48
61.51
52.44
LEGEND
District Boundary
State Boundary
Block HQ
Distt. HQ
120 MCM
0 MCM
GWR 2004 (Valley Area)
Net Annual Ground Water Availability
Gross Ground Water Draft
Ground Water Availability for Future Irrigation
AR Feasible Structures
Valley Area
Check Dam cum Ground water Dam, Percolation Tanks and Rain Water Harvesting
Siwaliks (Upland area)
Check Dams, Rain water Harvesting, Percolation Tanks, Recharge Shaft, Dugwell Recharge and RTRWH

urban/rural areas and water harvesting in rural area need to be adopted and proper scientific intervention for spring development and revival of traditional water storage is required in water scarce hilly upland areas.

In the hilly areas structures like nalla bunds, gabion structures, check dams, check dam cum ground water dams, subsurface dykes, revival of ponds are recommended while in low hill ranges, check dam and roof top rain water harvesting structures can be adopted.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

Most of the ground water issues and problems in the district are localized and need to be treated independently by taking the micro level studies in a particular area. The most common issues are deeper water level and development of deep aquifer in some areas, viz, the *Beet* area where water level are more than 100 m bgl. In valley area extensive development has resulted in depleting water levels in parts and there is need to conserve and augment resources by adopting appropriate recharge measures.

Further, in the Una valley due to extensive ground water development for irrigation & the recently set up industrial units, the water levels are likely to show depleting trend. There is urgent need for the State government to initiate water level monitoring network both in shallow and deep aquifer to monitor its behavior on short as well as long term basis.

In both sides of Soan River, localized areas remain waterlogged through out the year. There is need to develop ground water resources in such areas so that the water levels are 3-4 m below ground level and area can be reclaimed for use.

7.0 AWARENESS & TRAINING ACTIVITY

Mass Awareness Programme (MAP) & Water Management Training Programme (WMTP) by CGWB

CGWB, under the aegis of CGWA, conducted one Mass Awareness Programme on Rainwater Harvesting and Water Management on 28th March, 2006 at Krishi Vigyan Kendra at Rampur in Una district.

About 500 farmers including the officers and officials of Agriculture and I&PH department attended the programme. Lectures were delivered by CGWB and agriculture department officers on the need for harvesting water for various uses and artificial recharge to ground water for future use. The Regional Director, CGWB and the Vice Chancellor, Holticulture University, Palampur stressed the need for change in cropping pattern, optimum utilization of water to various crops and to adopt water conservation measures.

An exhibition displaying roof top rainwater harvesting models, charts, maps and other displays were arranged by CGWB to aware the gathering on the theme.

Participation in Exhibition, Mela, Fair etc

CGWB exhibited its models, posters, displays during the mass awareness programmes at KVK UNA in the district.

Presentation & Lectures delivered in public forum / Radio/TV/Institution of repute/Grassroots association /NGO/Academic institutions etc

So far presentation and lectures are delivered amongst the gathering during the MAP and WMTP only.

8.0 AREAS NOTIFIED BY CGWA / SGWA

The stage of ground water development in Una valley of the district as on 2004 is 51% only. No area or block has been notified for groundwater development point of view.

9.0 RECOMMENDATIONS

- The stage of ground water development in the valley area of Una district (2004) is 51% only and area falls in *safe category*. There exists scope for developing the ground water resource in the district.
- Groundwater development by constructing open wells and shallow tube wells can be constructed in both sides of Soan river where water level is shallow or has water-logging.
- There is need to take up deep exploration in upland plateau and hilly areas underlain by sedimentary formations to effectively tackle water scarcity problems.
- Construction of roof top rain water harvesting structures should be made mandatory in all new construction and rain water harvesting in rural areas should be promoted. Traditional water storage systems need to be revived.
- There should be mandatory provision of water level monitoring in all tube wells by implementing departments. Extensive ground water monitoring is required in and around industrial areas in the district.
- Traditional resources like springs & *bowries* needs to be revived and developed/protected for use. Public participation in water resource development projects should be encouraged.

For Technical Assistance Relating to Rainwater Harvesting & Artificial Recharge to Ground Water

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