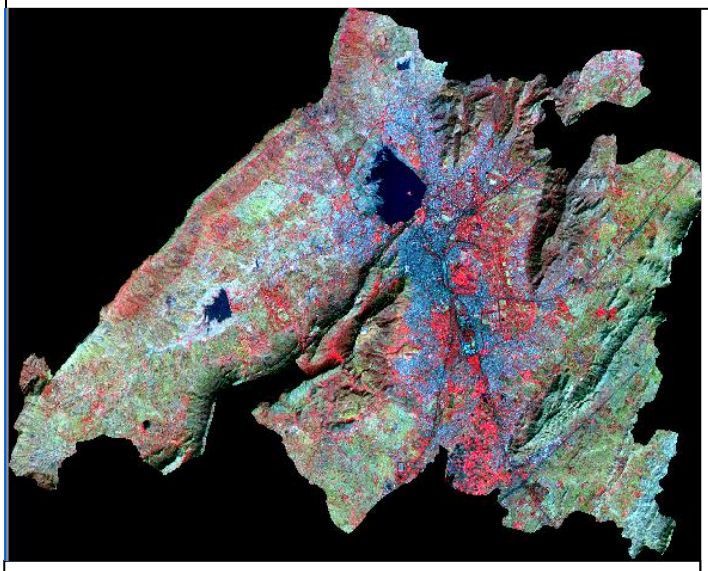
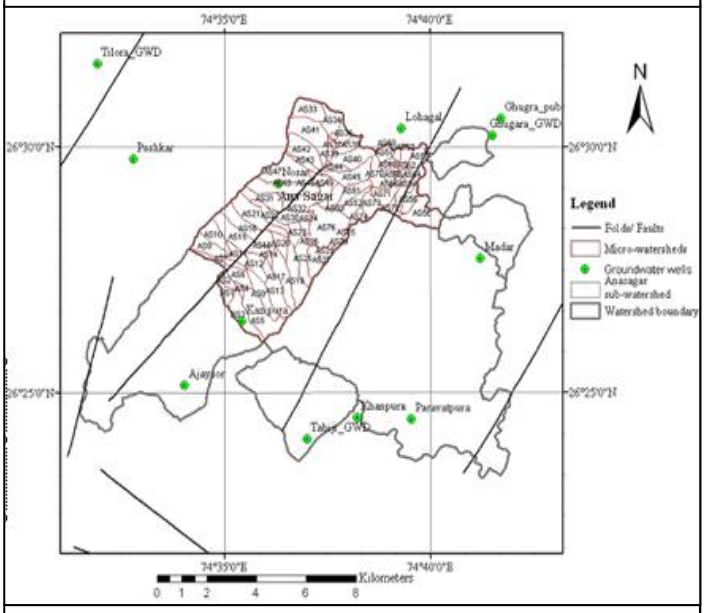
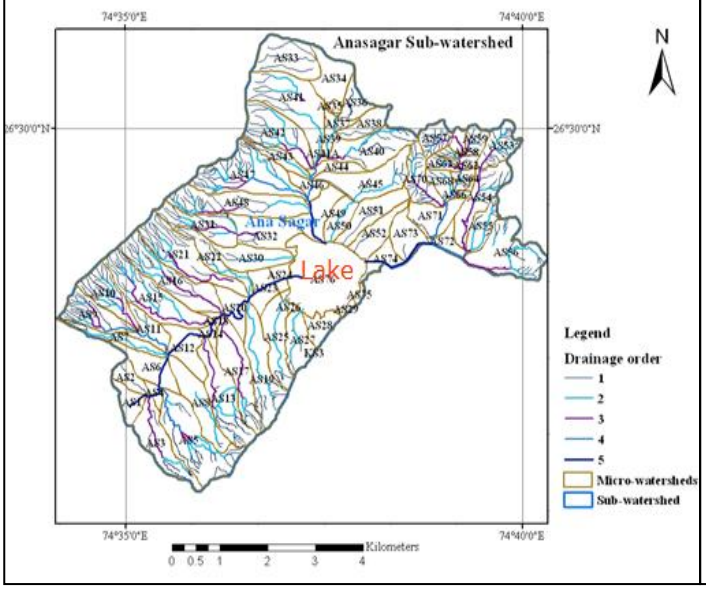
Ground Water Mapping and Recharge Estimation



Watershed Map





Ground Water

Ground water is an important factor in Soil Conservation Service operations. A large amount of water is being lost by runoff and evaporation in the same areas where ground-water supplies are depleted. Conservation and use of excess runoff are possibilities for increased underground storage.

Ground Water Mapping

Ground water mapping is a method of assessing and recording the results of subsurface hydrological investigations. The first step in developing a ground water mapping protocol is to establish the purpose of the assessment followed by the formulation of a conceptual model of the ground water flow system.

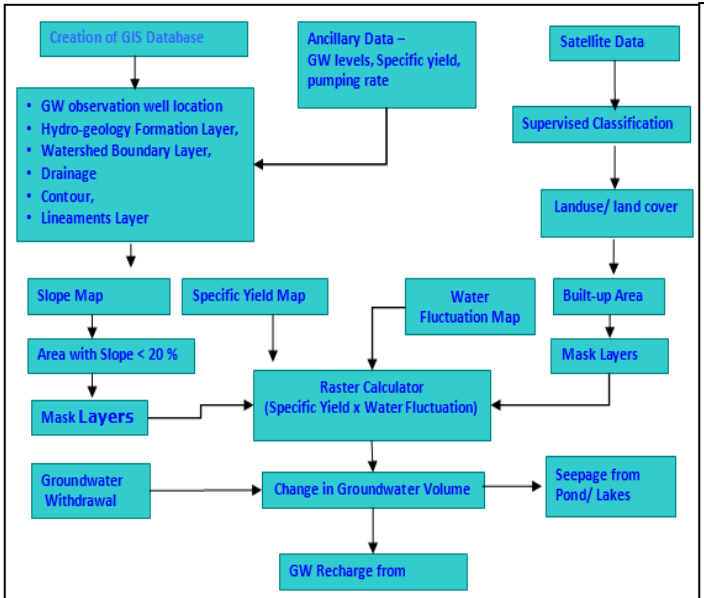
A conceptual model is a pictorial representation of the ground water flow system. The purpose of developing a conceptual model is to simplify the field problem and organize the associated field data so that the ground water system can be analyzed more readily. The data requirements for the conceptual ground water flow model are listed below:

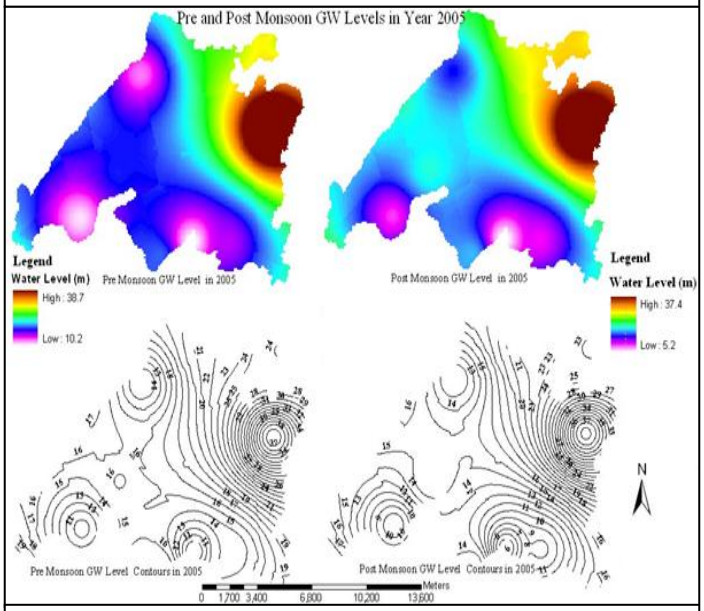
Physical Characteristics

- Geologic map and cross sections showing the areal and vertical extent and boundaries of the system.
- Topographic map showing surface water bodies and divides.
- Contour maps showing the elevation of the base of the aquifers and confining beds.
- Isopach maps showing the thickness of aquifers and confining beds.

Hydrogeologic Characteristics

- Water table and potentiometric maps for all aquifers.
- Hygrographs of ground water and surface water levels and discharge rates.
- Maps and cross sections showing hydraulic conductivity and/or transmissivity distribution.
- Maps and cross sections showing the storage properties of the aquifers and confining beds.
- Spatial and temporal distribution of rates of evapotranspiration, ground water recharge; surface water-ground water interaction, ground water pumping and natural ground water discharge.





Impact of Urbanisation on Groundwater recharge from rainfall

Urban area of Year	GW recharge monsoon season (Cum) for year 2004	Loss of recharge due to urbanization (Cum)	Urban area (ha)
2004 (without urban area)	746711	0	-
2005	389717	356994	1463
2002	413019	333692	1259.8
2000	422503	324208	1139.4
1997	452618	294093	1071.5
1994	472984	273727	979.5
1991	508455	238256	909
1989	509835	236876	738.4
1977	562476	184235	488.03

There are three steps in developing the conceptual ground water model:

1) Defining the hydro-geologic setting

2) Preparing a water budget

3) Defining the flow system

Defining the Hydro-geologic Setting

Geologic information, including geologic maps, cross sections and well logs, are combined with information on hydrologic properties to define the hydro-geologic setting for the conceptual model. A hydro-geologic setting is a composite description of all the major geologic and hydrologic factors which affect and control the movement of ground water into, through and out of an area.

Preparing the Water Budget

The sources of water to the system as well as the expected flow directions and exit points should be part of the ground water map. The field-estimated inflows may include ground water recharge from precipitation, overland flow, or recharge from surface water bodies. Outflows may include springflow, baseflow to streams, evapotranspiration and pumping. A water budget should be prepared from the field data to summarize the magnitudes of these flows and changes in storage.

Defining the Flow System

Hydrologic information is used to conceptualize the movement of ground water through the system. Hydrologic information of precipitation, evaporation, and surface water runoff, as well as head data and geochemical information are used in this analysis. Water level measurements are used to estimate the general direction of ground water flow, the location of recharge and discharge areas, and the connection between aquifers and surface water systems. Water chemistry data can be used to infer flow directions, identify sources and amounts of recharge, estimate ground water flow rates, and define local, intermediate, and regional flow systems.

Ground Water Recharge

There are some of key factors which need to be considered under the ground water recharge polices/procedures:

- Prior appropriation of surface waters.
- Diversion of water from streams where a sustained flow is needed to remove waste, debris, or pollutants.
- Recharge of polluted, untreated, or otherwise undesirable water.