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Geo Spatial Technology Based Studies of Water Quality of a Town due to Urbanization Effects from Telangana State, India

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Abstract

Water quality Indices (WQI) survey a single number description the entire water quality excellence at different locations and time, based ib several water quality parameters. WQI is a means by which water quality data is summarized for reporting to the public in a consistent manner. Our basic study is to estimate the quality of water and usage for drinking purpose based on WHO terms by generating a TIN (Triangulated irregular Network) using Arc GIS software which we can find the WQI (Water Quality Index / Water Quality Indices) of any unknown area in that particular location. Gadwal town, Jogulamba Gadwal District, Telangana is selected as the study area. The methodology includes extraction of map from Google Earth pro and collection of water samples from different locations and perform water quality standards test in the environmental Engineering Laboratory followed by generation of TIN (Triangulated Irregular Network) using Arc GIS Software. The WQI values for the selected study area ranges from 39.3393 to 93.1859 & most of the areas fall under poor category.

Keywords: - Water Quality Index Drinking water, Ground water, Gadwal Town, chemicals in water and, Geology and GIS.

Introduction: -

In recent years, the assessment and monitoring of groundwater quality on a regular basis is being carried out using Arc GIS (Geographic Information System) technique added with the interpolation method and has proved itself as a powerful tool for evaluating & analysing spatial information of water resources.

The two important criteria for the healthy life of human being at this moment are the adequate supply of drinking water with safety in its quality. In order to satisfy the purity of drinking water, the Hydro geologists have made detailed studies and brought out certain standards for quality there should for almost all the elements dissolved in ground water that is being used by humans. Further, several studies have also

been made on determining the groundwater quality of certain areas through conventionally analysing the hydro chemical data derived through ground water samples. A GIS based attempt has been made for the first time in the state of Tamil Nadu to estimate &characterize the quality of groundwater in karur district through water quality indices (WQI) method for drinking purpose. Geographical information system and water quality indices method had been applied to visualize the spatial pattern of the groundwater quality in the study area. In addition to earth navigation, google earth provides a series of other tools through the desktop application, including a measure distance tool as well as a tool for viewing the night sky is available other features allow users to view imageries from various places uploaded to panorama, information provided by Wikipedia on some locations and street view imagery. The web-based version of google earth also included. Reality and analysis of complex spatial data.

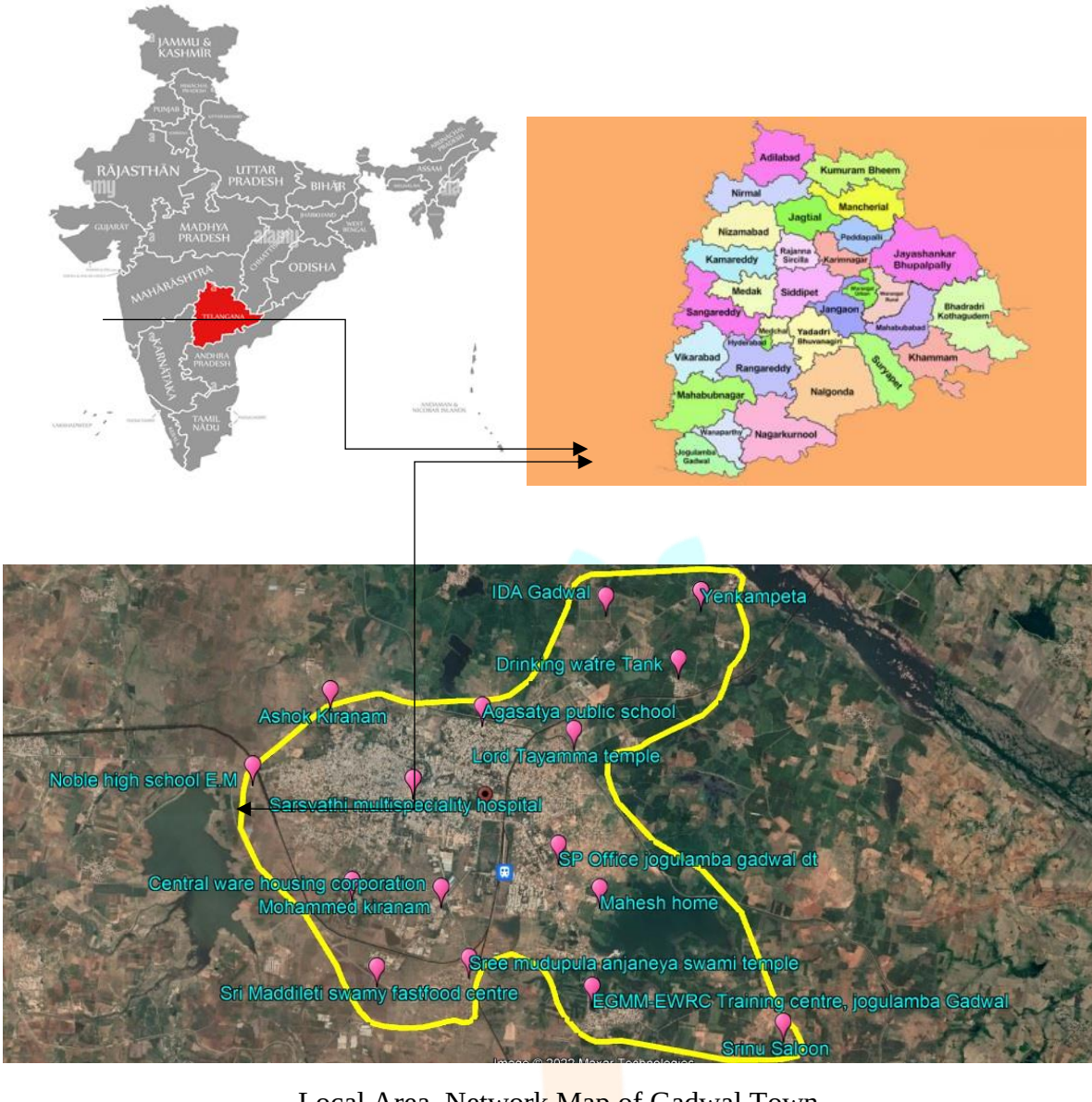
In developing countries like India around 80% no excellence of drinking water quality. The purity of water supplies has always been paramount in the field of environmental quality management, always should follow the guideline, means the safety of ground water from contamination.

STUDY AREA

Gadwal is a town and the District Headquarters of Jogulamba Gadwal District in the Indian State of Telangana it is located 188KM from the State capital Hyderabad and 59KM from Kurnool and is a state assembly Constituency.

Gadwal historically served as the Capital of Gadwal historically served as the Capital of Gadwal Samsthanam a varsal of the Nizam of Hyderabad .Gadwal Fort is an imposing structure around which the old temples .the most important of which is Sri Chennakesava Swamy, another well known temple, Jammu Lamma ,is located west to the city .The Priyadarshini Jural Project is a large dam under construction (as of 2017) near Gadwal, Gadwal is known for its handloom jarichiralu (Gadwal sarees).I t was registered as one of

the geographical inductions from Telangana by Geo graphical indication of Goods (Registration and protection) ,Act 1999.The study lies b/w longitude and latitudes are 77.80E-16.230N .Tropical climate in this area causes variation in temperature ,ranging from 420C to 520 C as the do solute maximum with very hot dry and dry summer.



Local Area Network Map of Gadwal Town

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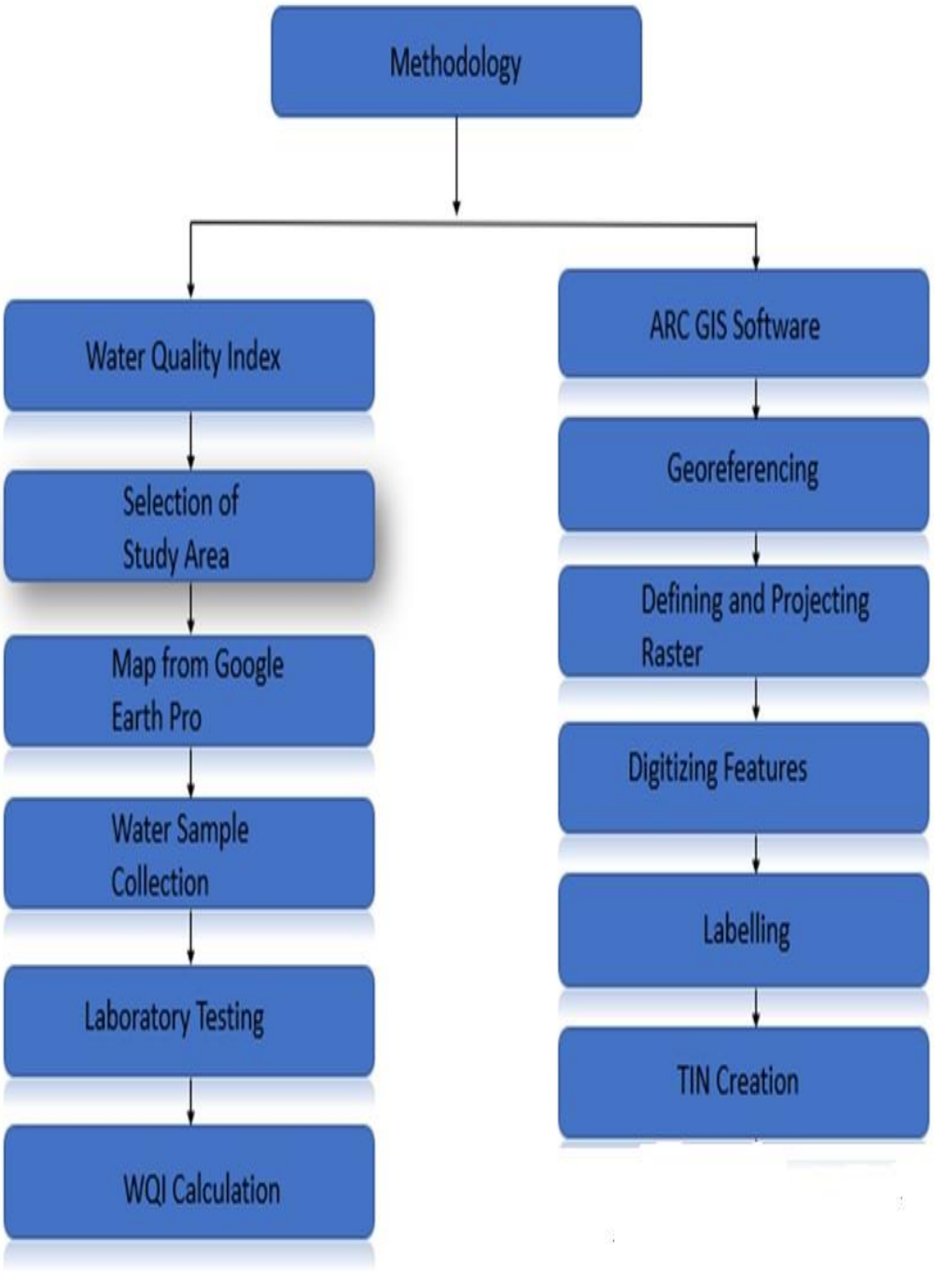
Methodology



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Sample Calculations 1:

Parameters:	TDS	Chlorides	Hardness	PH	Fluorides	Ca	Mg
Values :	916 ppm	300 ppm	562 ppm	8.1	0.62 ppm	88 ppm	83ppm

Formula :

Wn K/Sn

K= 1/(1/Sn1-1/Sn2+……1/Sn) 1/SUM(1/Sn)

Where

Sn= Standard desirable value of nth parameters

Sum(Wn)=1

Qn= ((Vn-Vo)/(Sn-So))*100

Where

Vn= Mean Concentration of nth parameter

Vo = Actual Value of Parameters in water

Q_{PH} = ((Vph-7)/(8.5-7))*100

OVERALL WQI= Sum (Wn*Qn)/(Sum(Wn))

Calculations:

K =	1.1909
W1	0.1401
W2	0.0048
W3	0.0024
W4	0.004
W5	0.0159
W6	0.0397
W7	0.7940

Q1	9.808043
Q2	0.571669
Q3	0.45764
Q4	0.743121
Q5	1.863217
Q6	10.98345
	32.81802

Overall WQI=	57.24516

Parameters	Standard Values
TDS	500 ppm
Chlorides	250 ppm
Hardness	300 ppm
Alkalinity	200 ppm
PH	8.5
Fluorides	1.5 ppm
Ca	75 ppm
Mg	30 ppm

Based on the below WQI values, the ground water quality is rated as excellent, good, poor, very poor and unfit for human consumption.

We performed water quality parameters(pH,Total Dissolved Solids, Hardness, Chlorides, Alkalinity and Fluorides, Calcium, Magnesium) tests in Environmental Engineering Laboratory to find out Water Quality Index.

Table-1

Parameters	Test	Units	Drinking water standard
P^H	Potentiometer	-	6.5-8.5
Total Dissolved solids (TDS)	TDS meter	ppm	500-1000
Turbidity	Nephelometer	NTU	5-10
Colour	Tintometer	TCU	5-20
Test & Odour	Osmoscope	TON	1-3
Alkalinity	Titrometry	ppm	200-600
Hardness	EDTA Test	ppm	75-115
Chlorides	Titrometry	ppm	250
Fluorides	Colorometry	ppm	1-1.5
Calcium	EDTA Titrometry Test	ppm	75-200
Magnesium	EDTA Titrometry Test	ppm	30-100

Results and Discussion:-

Based on the standard Values for WQI as shown in the table following conclusions were made:

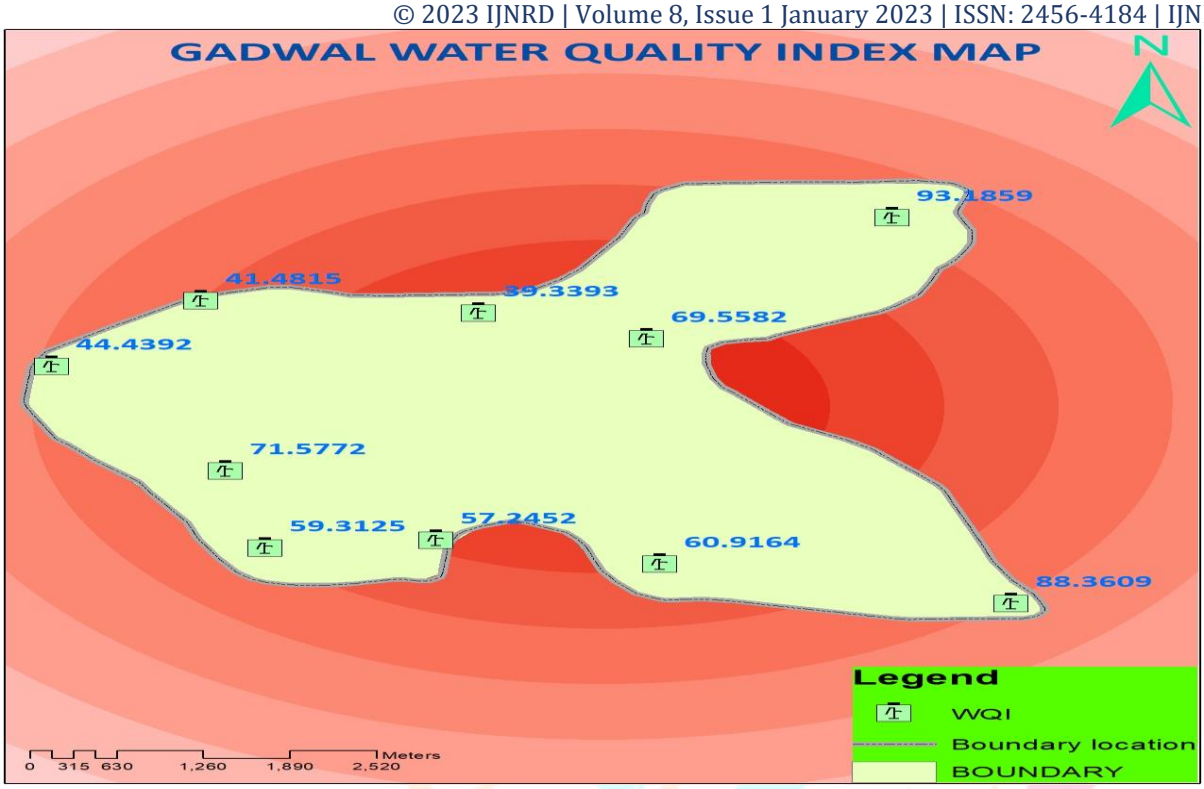
1. Water Samples 1,2 and 9,14 were found of good quality.
2. Water Samples 3,6,7,8,12 and 13 were found of poor quality.
3. Water Samples 4,5 and 11 and were found of very poor quality.

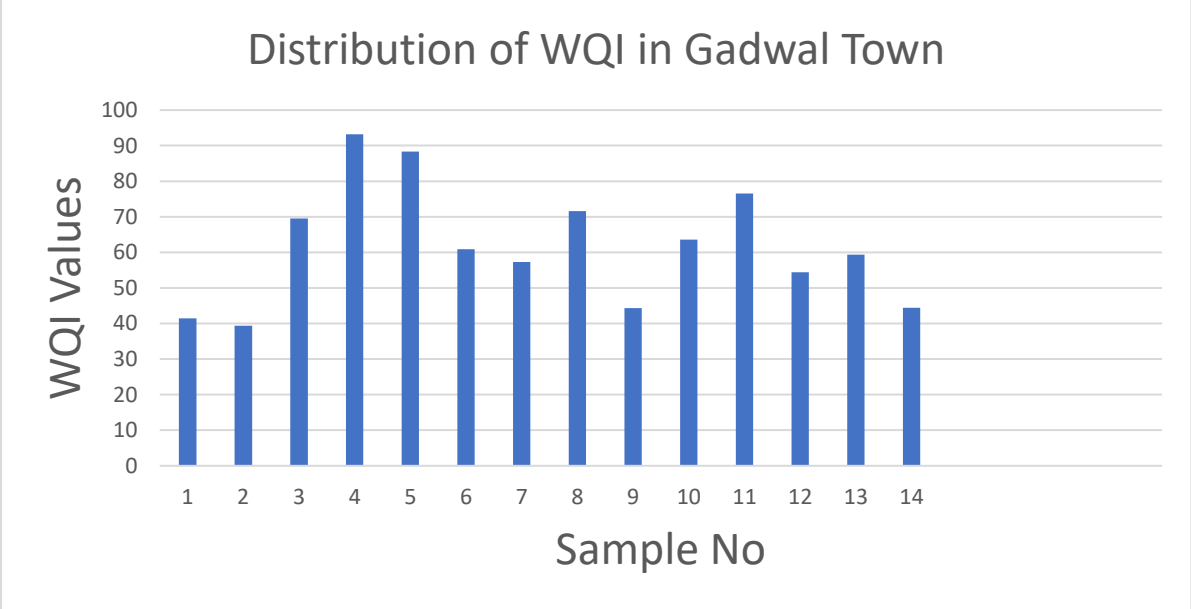
Gadwal Town shows water is suitable for Drinking purpose and need to take the required precautions for consumption and domestic purpose. Treat meant is required to make it more use full Ex: RO water plant. Analysis was done according to Table I above.

Table-2

Laboratory Results of Gadwal Town								
Sample No.	**Location Name**	**PH**	**TDS (ppm)**	**MG (ppm)**	**Total Hardness (ppm)**	**Cloride (ppm)**	**Fluoride (ppm)**	**WQI**
1	**Ashok Kiranam**	8	1216	39	400	96	0.43	41.4814
2	**Agastya Public School**	7.8	1184	39	280	48	0.47	39.3393
3	**Lord Tayamma Temple**	8.1	787	97	599	80	0.82	69.5582
4	**Yenkampeta**	7.8	1165	34	280	56	1.5	93.1859
5	**Srinu Saloon**	8	998	83	622	112	1.2	88.3608
6	**EGMM-EWRC Training center**	7.9	1129	53	318	40	0.82	60.9164
7	**Sree Mudupula Anjeneya Swamy Temple**	8.1	961	83	562	88	0.62	57.2451
8	**Mohammed Kiranam**	8	692	97	559	64	0.87	71.5771
9	**nallakunta**	7.6	1051	97	619	88	0.42	44.3127
10	**momin mohalla**	7.6	896	83	462	48	0.84	63.6005
11	**bheem nagar**	8.2	932	78	501	72	0.98	76.5504
12	**h.b.colony**	8.6	630	58	359	48	0.42	54.4209
13	TPM Church	7.4	638	248	550	202.45	1.3	59.3125
14	Residential House 1	7.48	640	247	548	201.55	0.94	44.4392

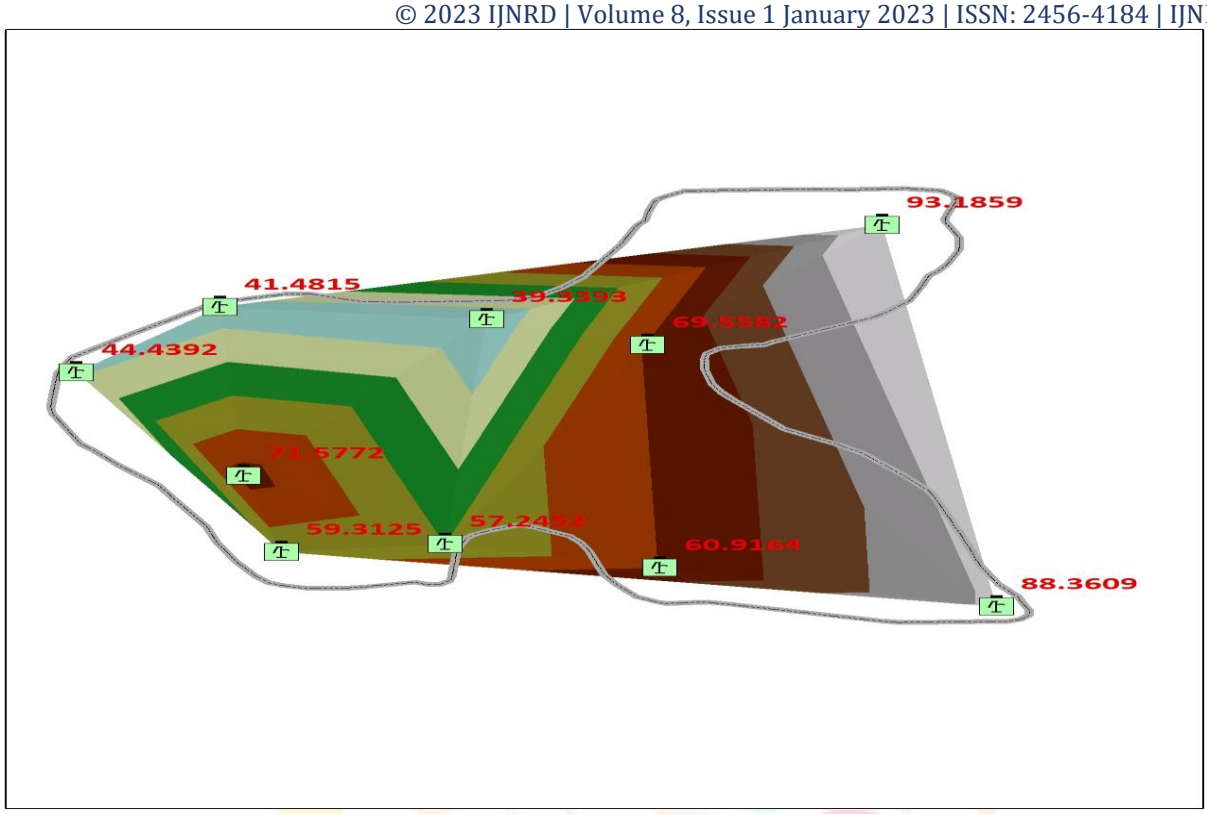
A WQI map was generated by using ArcGIS, to better understand the water potability over space.





CREATION OF TIN SURFACE:

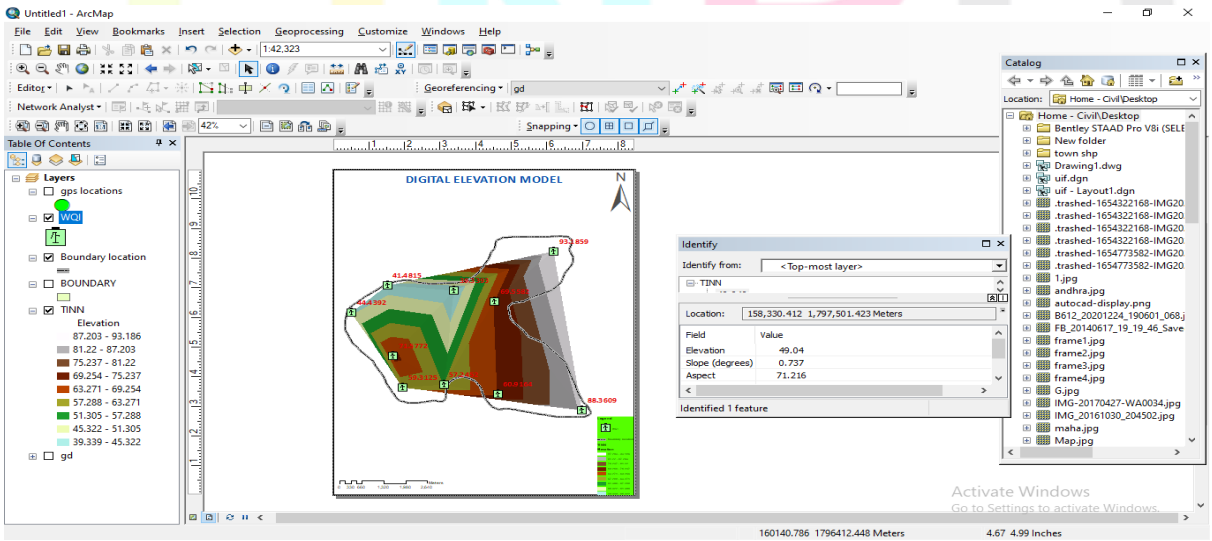
A triangulated irregular network (TIN) surface can be generated from surface source measurements or by converting another functional surface to a TIN surface. You can create a TIN surface from features, such as points, lines, and polygons, that contain elevation information.



In Google Earth Pro, you get a few other options to find information about an area, primarily the Measurement tool. In the standard release of Google Earth, only linear measurements are allowed. In Pro, you can find out the area by drawing a polygon, either a square or free After generation of TIN map, we can find water quality index(WQI) at any point on the selected study area.

Steps to identify WQI at any point

1. Right click at any point on generated TIN map, a dialog box appears.
2. Select Identify.



Conclusions:

- This study demonstrates that the use of GIS and WQI methods could provide useful information for water quality assessment. Spatial distribution of water quality parameters was carried out through GIS technique. These techniques have successfully demonstrated its capability in water quality mapping of Gadwal town. A total of eighteen water samples were collected and analyzed for various physico-chemical parameters.
- A WQI map was generated by using ArcGIS, to better understand the water potability over space.
- The categories of water quality evaluated based on major part of the study area fall under poor category.
- A TIN was created based on the calculated Water Quality Index values using ArcGIS software. We are concluding that from the TIN we created the WQI values of unknown locations in that particular area were found closer to that of known values.

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