CONSTRUCTION OF A DEEP TUBE WELL- A CASE STUDY.

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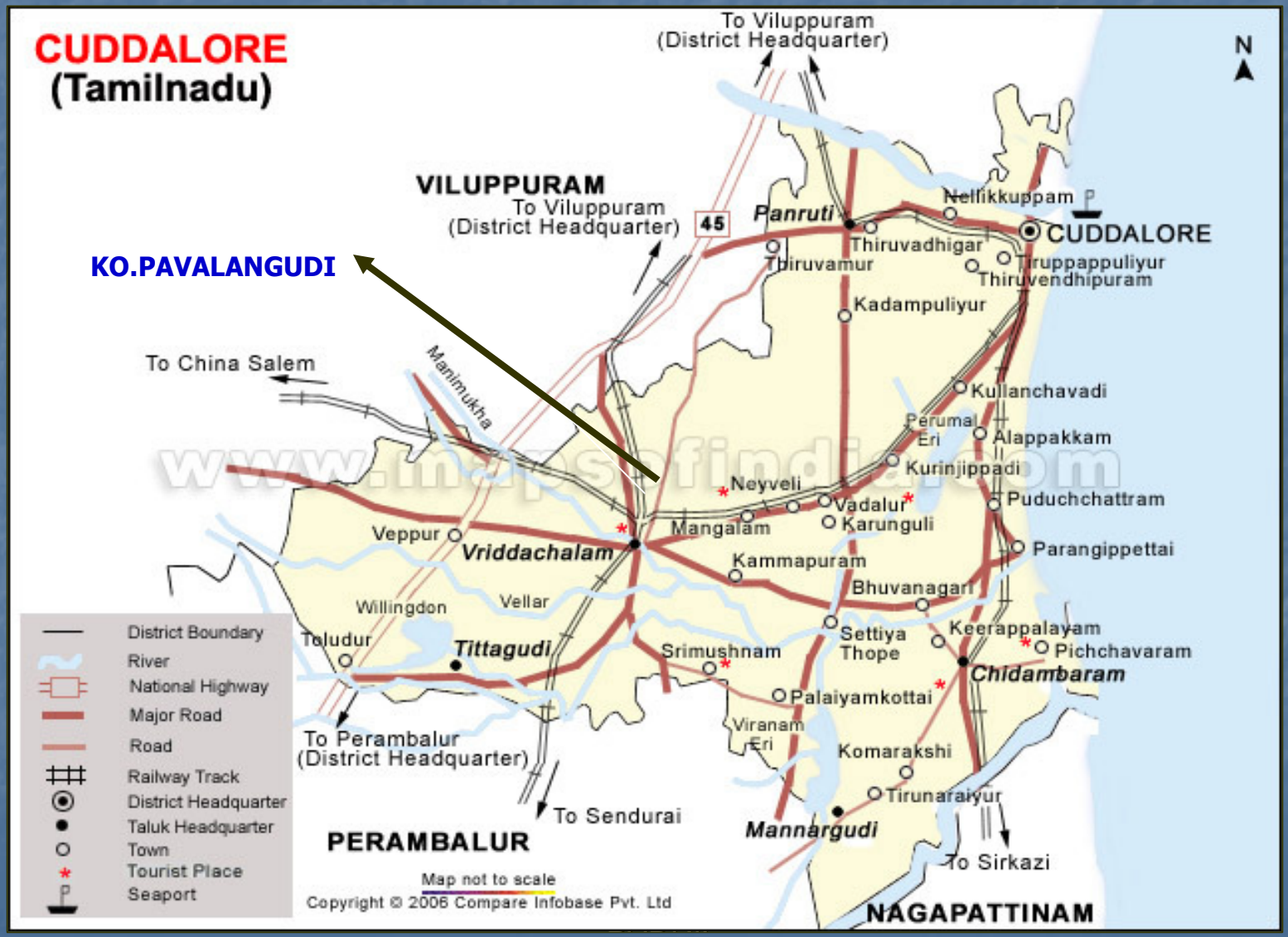
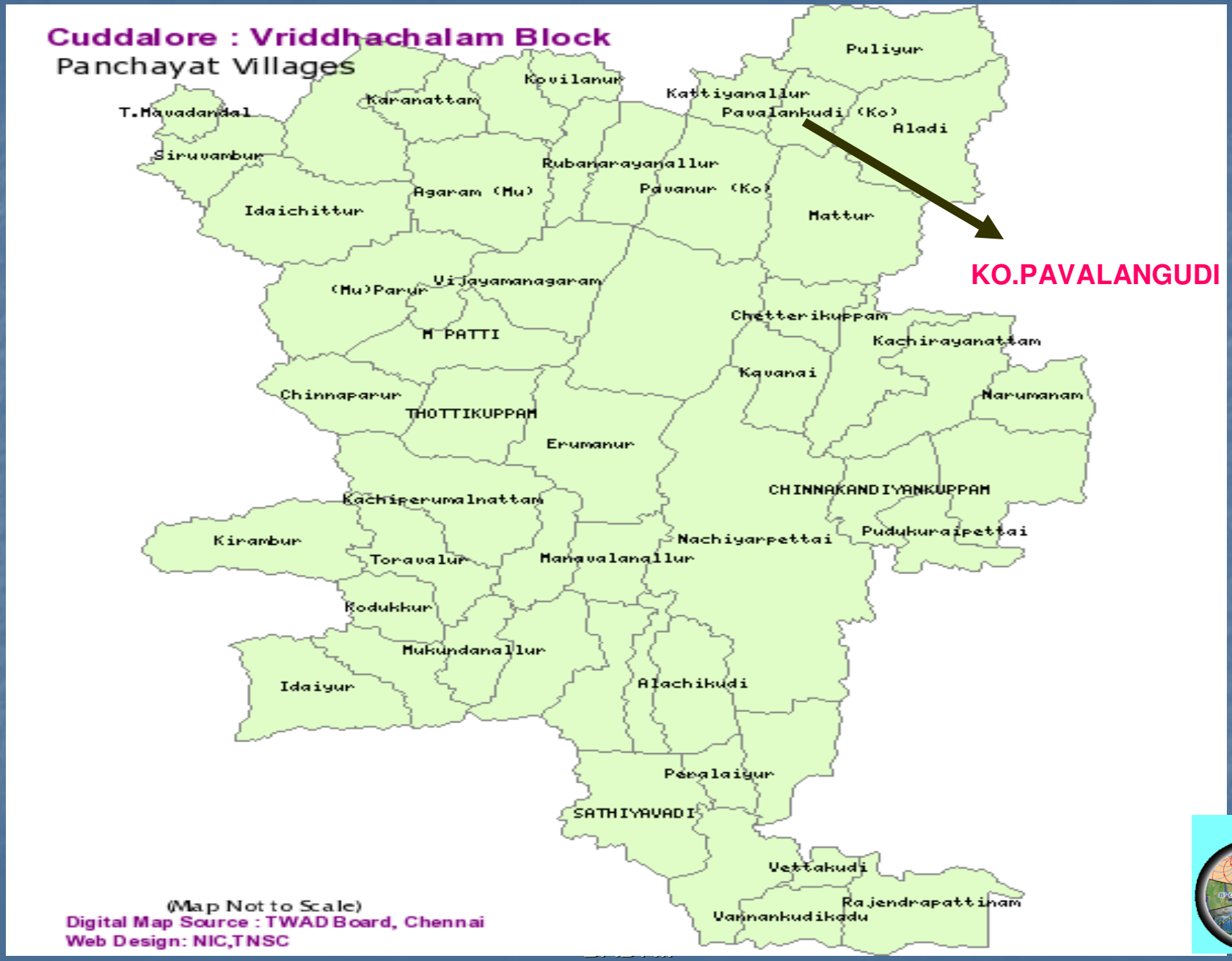
AREA & PURPOSE OF INVESTIGATION.

Name of the village	: Ko.Pavalangudi.
Panchayat Union	: Vridhachalam.
Taluk	: Vridhachalam.
District	: Cuddalore.
State	: Tamilnadu.
Area of extent	: 100 acres.
Purpose of investigation	: To construct a very deep tube well for agricultural purpose.

CUDDALORE DISTICT MAP SHOWING THE AREA OF INVESTIGATION.



VRIDHACHALAM UNION MAP



PROBLEMS.

- The hydrogeological condition is such that, potential confined aquifers occurs @ a very deep depth of > 200 meters below ground level.
- A very huge thick layer of aquiclude.
- Exploring the very deep aquifer & construction of well are problematic.
- A huge investment has to be made for construction.

STAGES OF GW EXPLORATION IN SEDIMENTARY TERRAIN.

SURFACE METHODS.
WELL SITE SELECTON BY INTEGRATED HYDROGEOLOGICAL & GEOPHYSICAL METHODS.

SUB SURFACE METHODS.
DRILLING PILOT BORE HOLE
LITHOLOG
ELECTRICAL WELL LOGGING

WELL DEVELOPMENT
BY AIR COMPRESSOR
YIELD ASSESSMENT
WELL COMPLETION
PUMPING TEST-
HYDROGEO CHEMICAL ANALYSIS OF WATER SAMPLE.

METHODOLOGY.

- Three stages of ground water exploration –surface, subsurface methods & well development.
- Surface method- hydrogeological investigation to select a bore hole point.
- Sub surface method-drilling pilot bore well- litholog preparation- electrical well logging.
- Well designing & construction-
- Well development by compressor- yield assessment-well completion.

GROUND WATER EXPLORATION METHODOLOGY ADAPTED.

FIRST STAGE.

- SURFACE METHOD.
- HYDROGEOLOGICAL
- SELECTING FEASIBLE POINT.

SECOND STAGE.

- SUB SURFACE METHOD.
- PILOT BORE HOLE DRILLING.
- GEOLOGICAL-LITHOLOG.
- HYDROGEOLOGICAL
- GEOPHYSICAL-ELECTRICAL LOGGING.

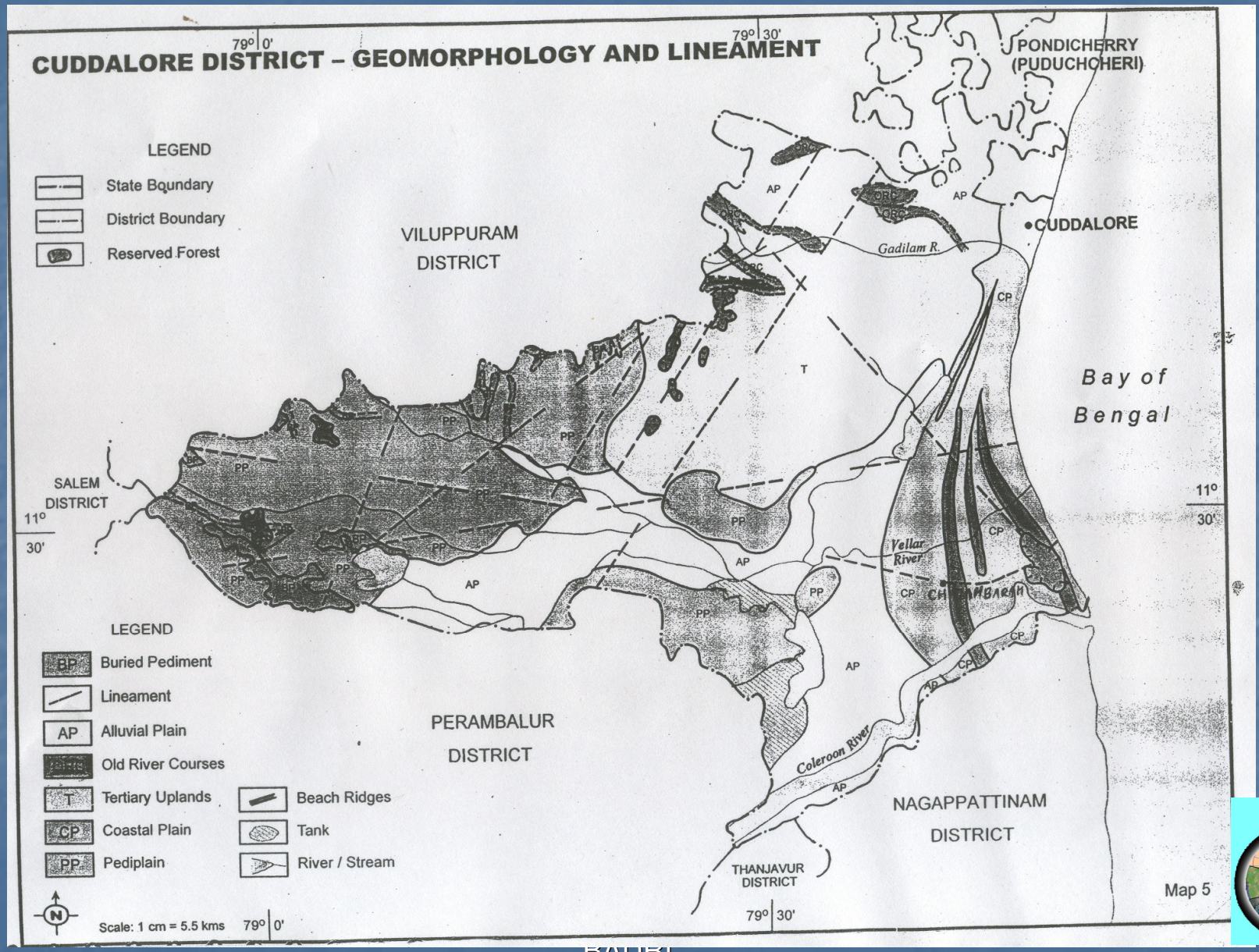
THIRD STAGE.

- WELL DESIGNING & CONSTRUCTION.
- WELL DEVELOPMENT
- WELL COMPLETION

1.1.FIRST STAGE- SURFACE METHOD.

- Geological and Hydrogeological investigations to select a feasible point to drill a pilot bore hole.

GEOMORPHOLOGY MAP OF CUDDALORE DISTRICT.



GEOLOGY OF THE AREA.

- Terrain- Sedimentary terrain.
- The area is covered by various geological formations ranging in age from Cretaceous to Recent represented by black clay, calcareous sandstones & marls [Upper Cretaceous] overlain by Gopurapuram formations of Eocene age, essentially argillaceous, comprising silts, claystones, calcareous sandstones, shales, black clay & soils.
- The area is about 60 to 65 kms away from sea shore.

[SOURCE- CGWB].

HYDROGEOLOGY.

- Ground water occurs in all geological formations both under confined & unconfined conditions.
- The area receives maximum rain fall during northeast monsoon period which is the main source for ground water recharge.
- The shallow unconfined aquifers may not be potential to tap for irrigation purposes.
- The deep confined aquifer occurs below 200 meters below ground level.
- The principal & potential aquifers are sand stones, fine to medium grained sands, pebbles & gravels.
- The depth to water level ranges from 20 to 60 m bgl.

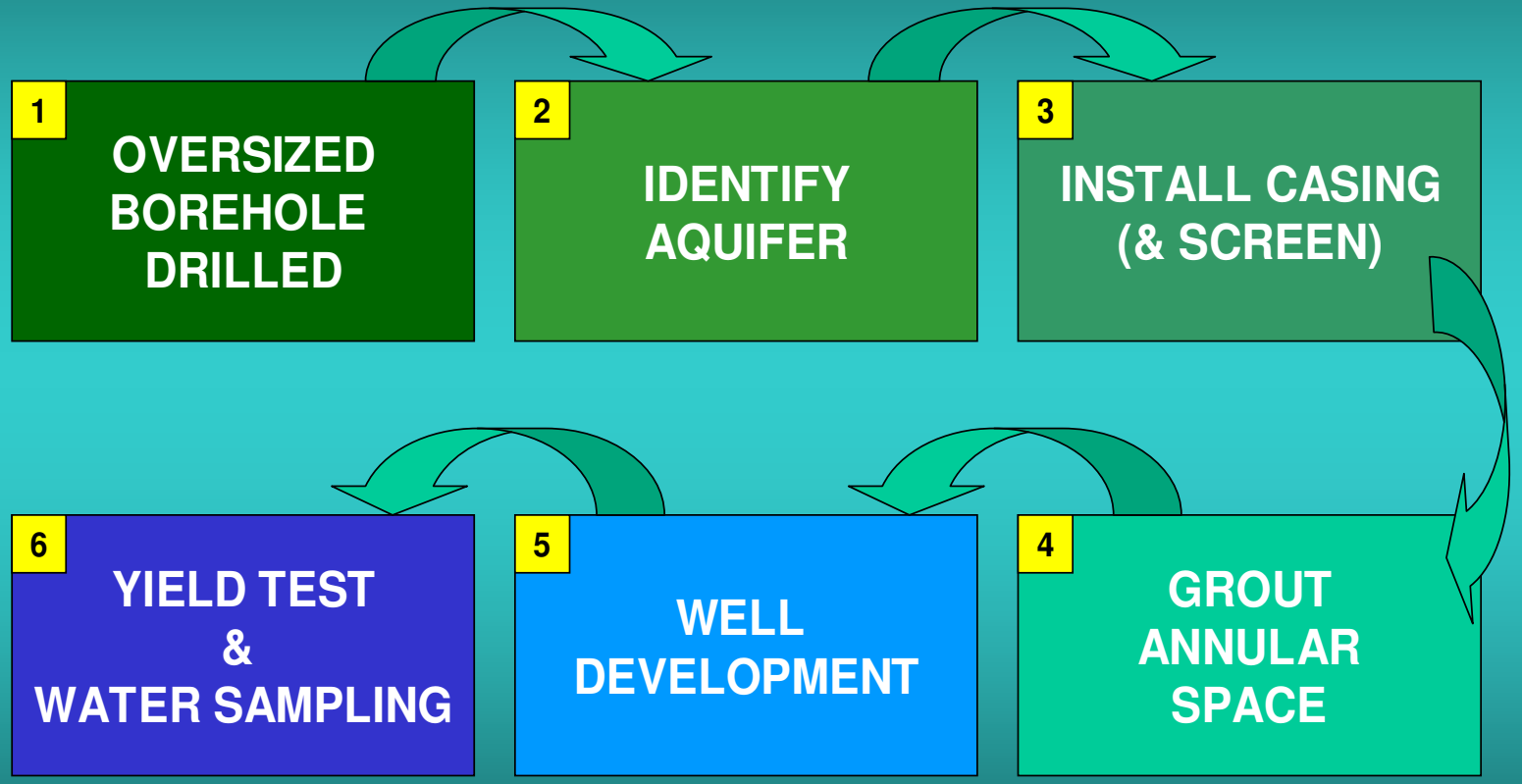
2.1. SECOND STAGE- SUBSURFACE METHOD

- Drilling of pilot bore hole-
- Rig engaged- Rotary rig.
- Dia & depth of pilot bore hole- 300 mm- depth- 312 m.
- Soil samples collected for every 6 m- litholog prepared- soil samples analyzed in depth.

ROTARY RIG.

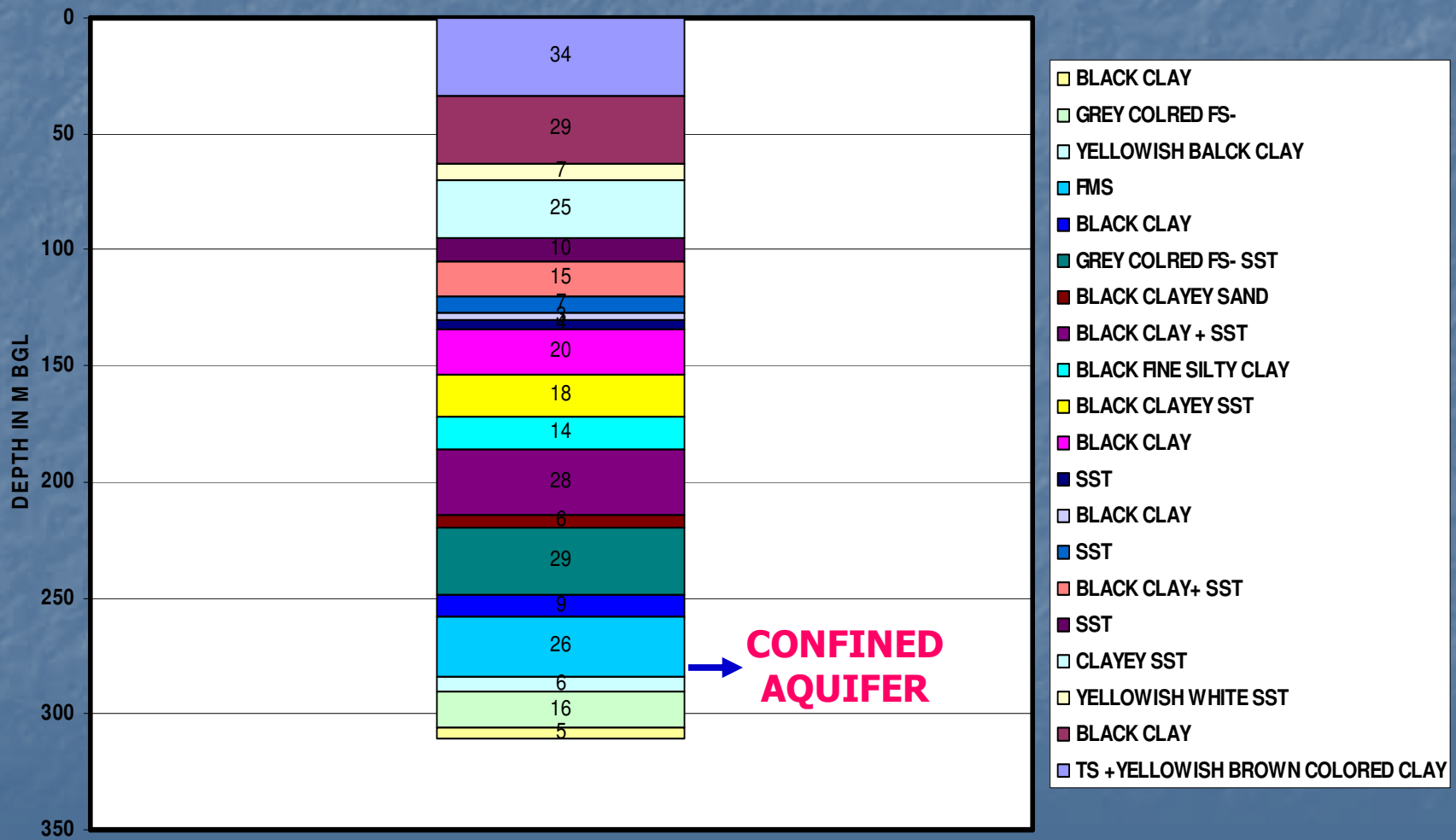
ROTARY RIG.

TYPICAL ROTARY WELL CONSTRUCTION SEQUENCE



2.2. LITHOLOG.

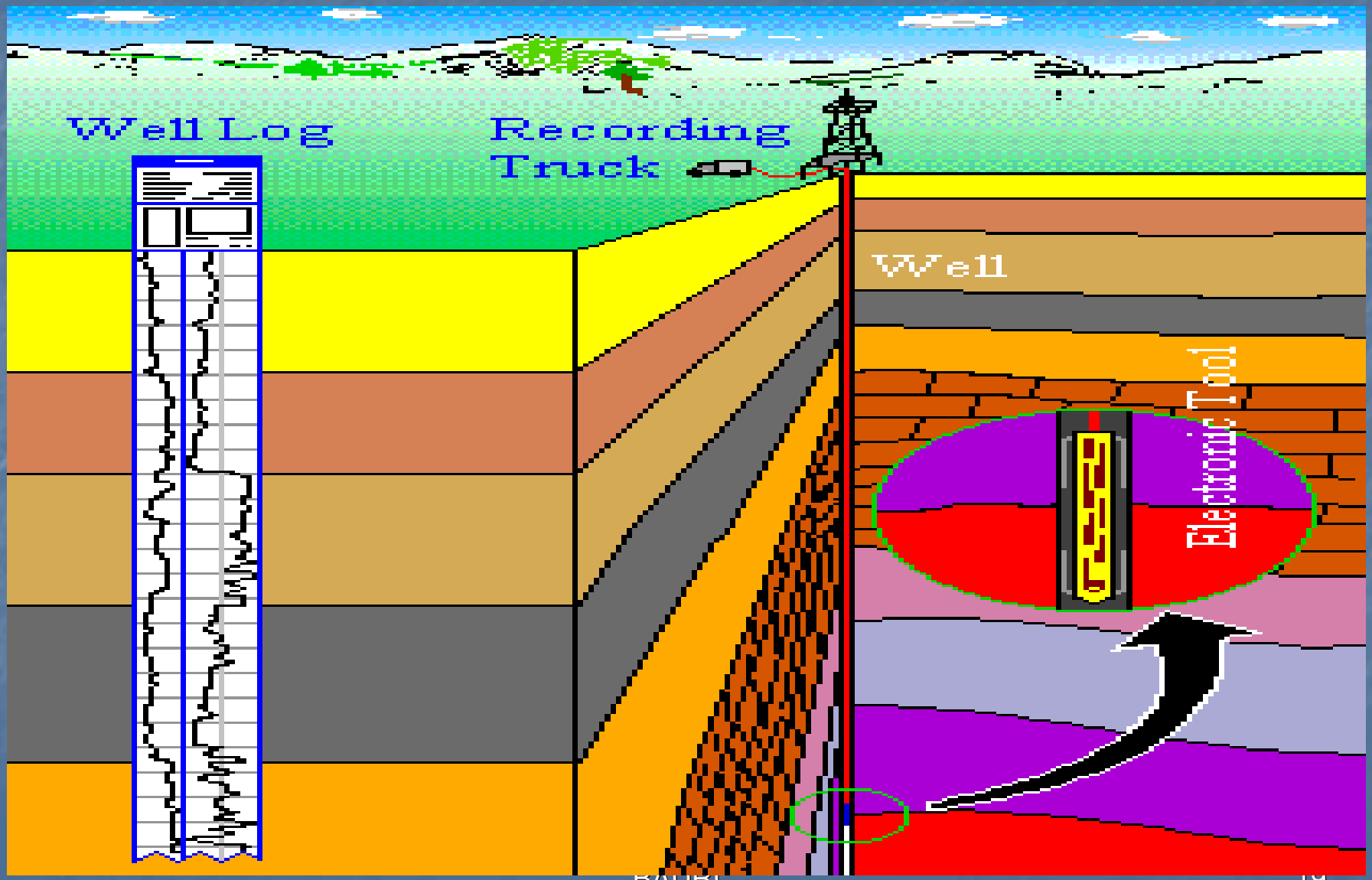
JEYARAMAN, KO.PAVALANGUDI, LITHO LOG.



2.3. GEOPHYSICAL-ELECTRICAL WELL LOGGING

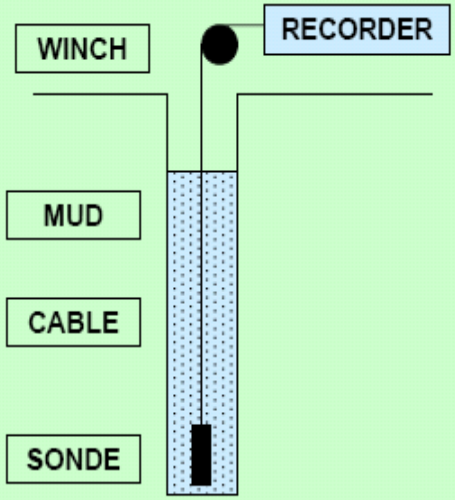
- One of the subsurface methods of ground water exploration namely the electrical well logging facilitates continuous recording of electrical response verses depth by a sensor when it moves inside the bore hole. Among the several methods of well logging the common method used for ground water exploration is electrical well logging which includes SP log and resistivity logs.

WELL LOGGING.



LOGGING CONFIGURATION.

Logging Configuration



Logging Components

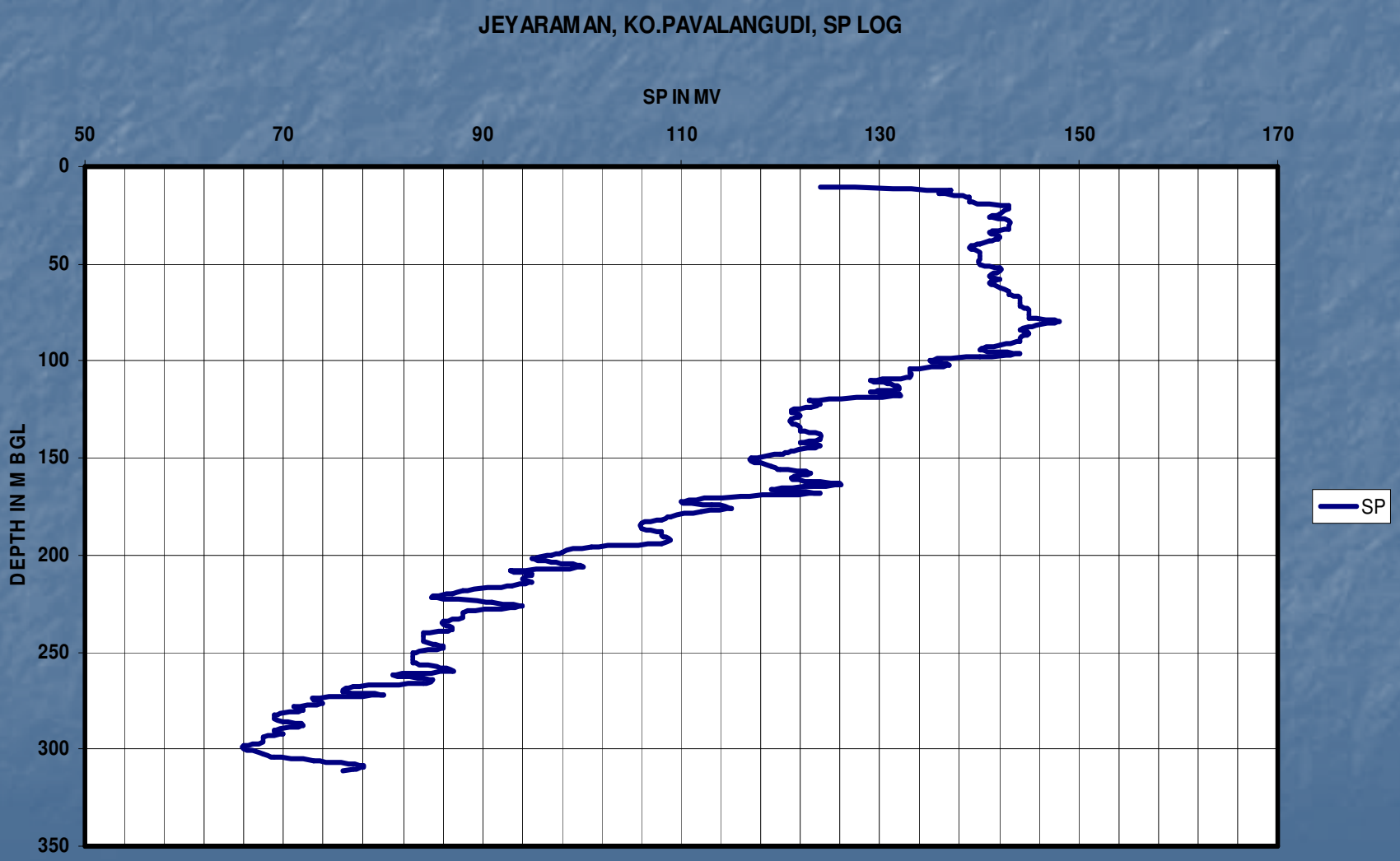
- mud column
- sonde (tool)
- cable (wireline)
- winch
- recorder

Tool records as it is raised from the bottom of the hole.

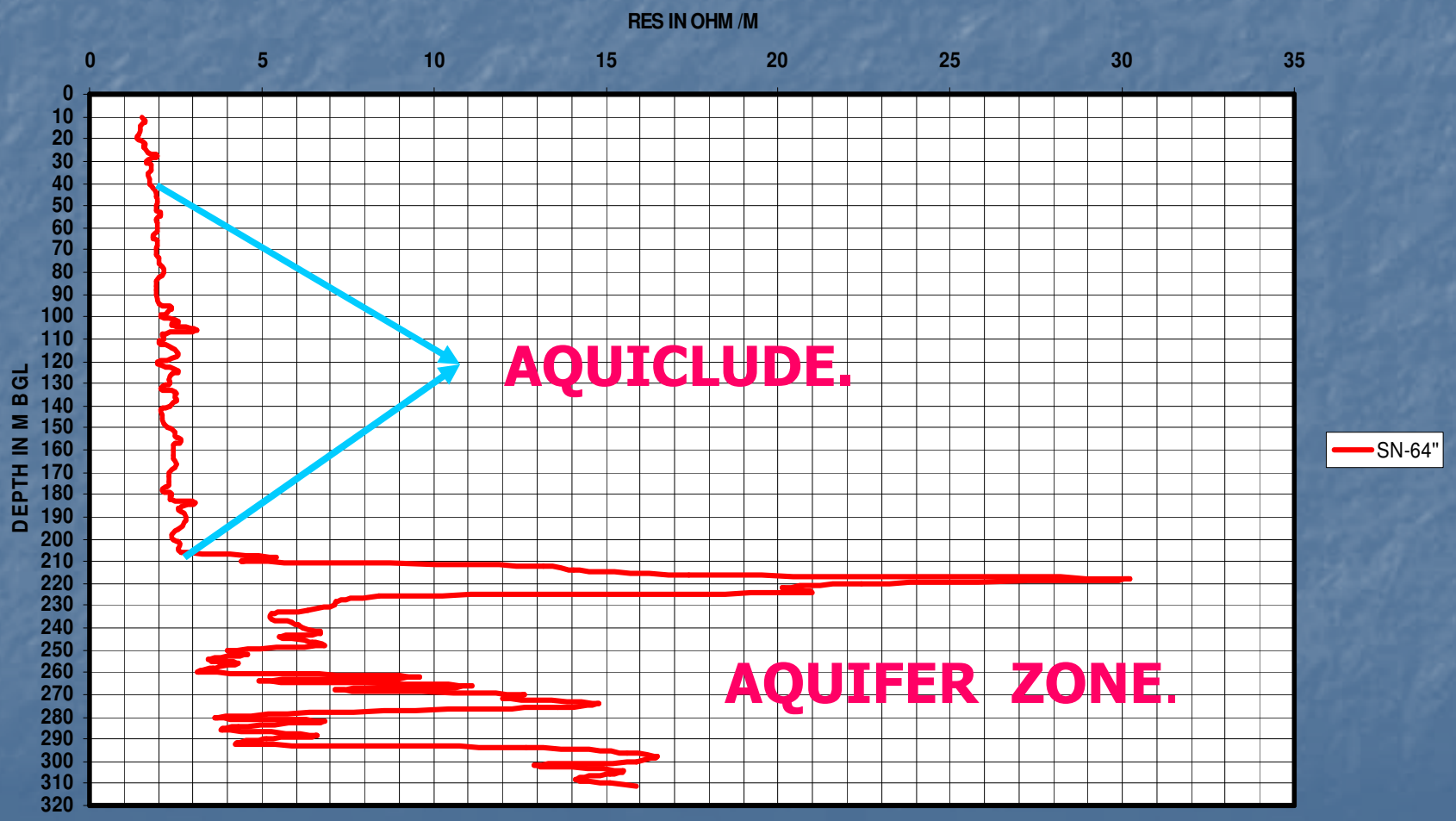
ELECTRICAL WELL LOGGING

- Logging equipment- Portable spot logger.
- Resistivity meter used- Microprocessor based signal stacking digital meter- model- SSR- MP- AT- S 0f IGIS, Hyderabad make.
- Logging modes- SP & Normal resistivity log- LN-64".

SP LOG.


JEYARAMAN, KO.PAVALANGUDI, SP LOG
SP IN MV
50
70
90
110
130
150
170
0
50
100
150
200
250
300
350
DEPTH IN M BGL
SP

NORMAL RESISTIVITY LOG- LN 64”



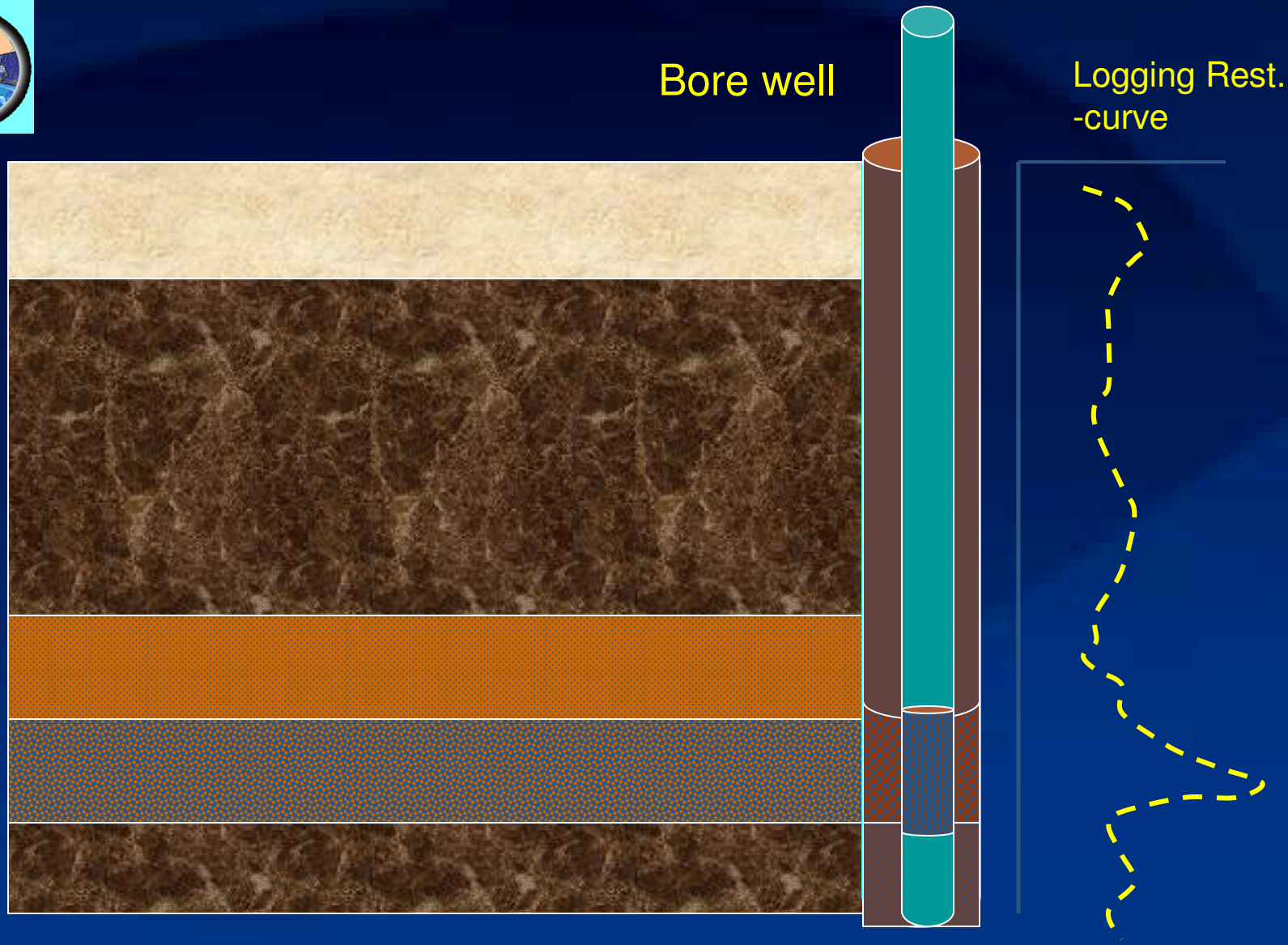
3.THIRD STAGE- WELL DESIGN & CONSTRUCTION.

- The success of well depends on the well design and construction. The tube well design shall ensure an efficient and economical well with a service life of more than a decade.
- Well design- The assembly of plain and slotted pipes. The aim of screened & gravel packed well is to draw clear water from the aquifer without excessive head loss and to keep the aquifer material cut.

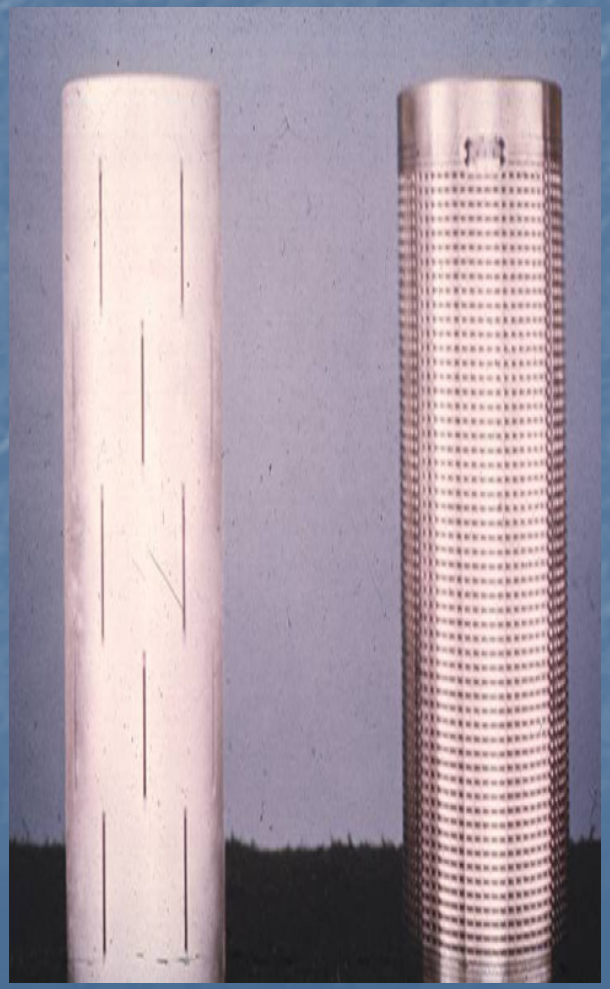
WHY CARE ABOUT WELL CONSTRUCTION ?

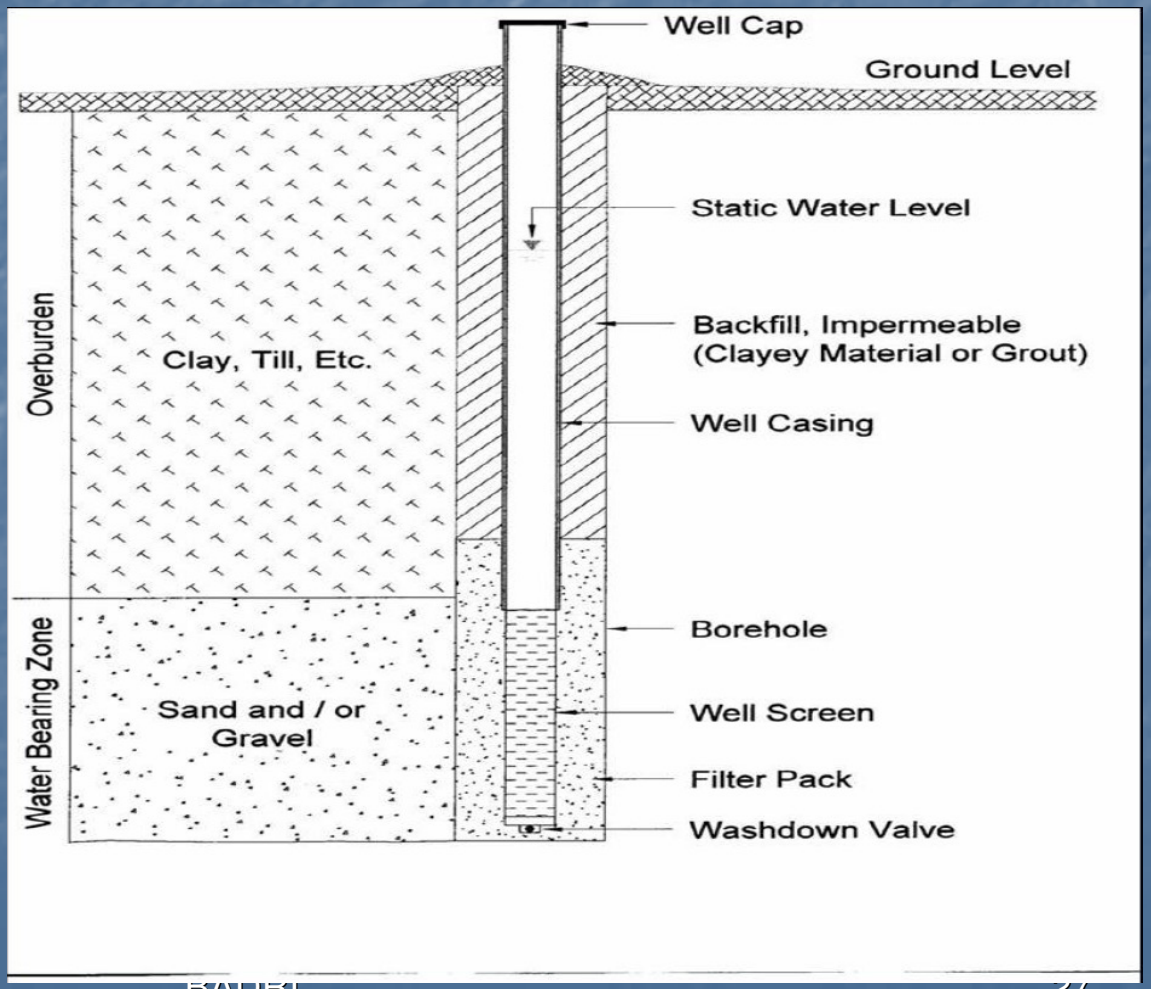
- Poor construction can affect drinking water quality.
- Poor construction can contribute, promote, and facilitate pollution and contamination of the groundwater aquifer.
- Proper construction can prolong the life and yield of the well.

CONSTRUCTION OF BORE WELL IN SEDIMENTARY TERRAIN



TYPICAL DRILLED WELL CONSTRUCTION WITH SCREEN WELL

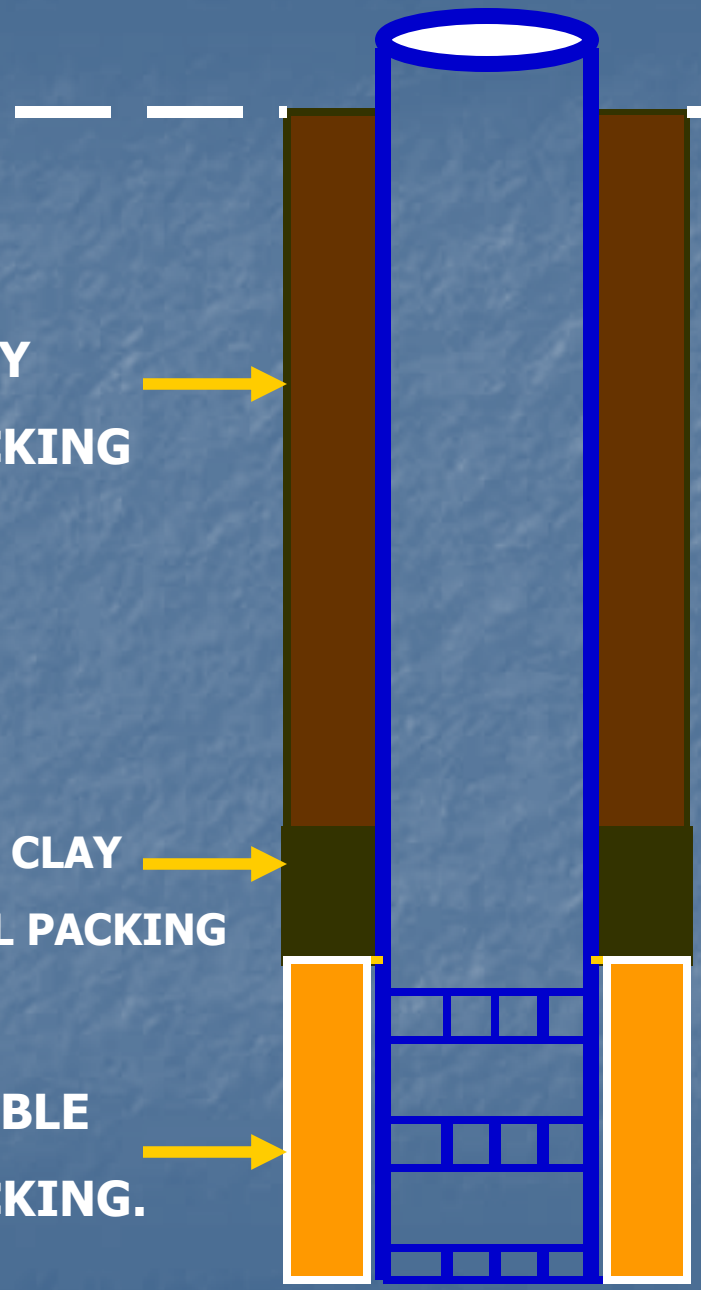




3.1. KO.PAVALANGUDI TUBE WELL DESIGN.

JEYARAMAN, KO.PAVALANGUDI, PD.

3.3. KO. PAVALANGUDI TUBE WELL CONSTRUCTION



TUBE WELL DEPTH – 312 M.

0 TO 213 M PLAIN PIPE.

213 TO 231 M SLOTTED PIPE.

231 TO 267 M PLAIN PIPE.

267 TO 285 M SLOTTED PIPE.

285 TO 294 M PLAIN PIPE.

294 TO 312 M SLOTTED PIPE + BOTTAM DUMMY.

PVC PLAIN PIPE

SLOTTED PIPE.

3.4. DEVELOPMENT AND COMPLETION OF WELL

- Development of well is essential to obtain an efficient and long lasting well. The fundamental purpose of development is to cause reversal of flow through the screen openings. A permeable zone is created around the well screen.
- The tube well constructed was developed after 10 days by an air compressor. 90° V- notch yield was ascertained while developing. The yield of the well is 760 liters per minute. The water is very clear and the quality is very good to drink. Finally the well was completed by grouting and sealing the casing.

WELL DEVELOPEPMENT BY COMPRESSOR

RESULT AND CONCLUSION.

- The depth of tube well [TW] constructed- 312 m & dia of TW- 150 mm.
- The principal & potential aquifers- sandstone, fine to medium grained sand [FMS] & fine sand.
- The thickness of FMS- 26 m.
- Number of slotted pipes provided- 18 pipes- 54 m.
- Yield of the TW, by 90° V-notch- 6”- 760 LPM.
- The quality of water is good.
- Thus by integrated geological, hydrogeological & geoelectrical investigations the deep potential confined aquifer could be explored & exploited successfully.

THANK YOU.