ISSN(O): 2320-5407 | ISSN(P): 3107-4928

ISSN NO. 2320-5407

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

REVIEWER'S REPORT

Manuscript No.: IJAR-54488

Title: HARD ROCKS AQUIFER PROPERTIES ESTIMATION AND MAPPING THE OPTIMAL DEPTH OF WELLS TO DRILL IN DIVO-GUITRY AREA, SOUTHERN CÃƒÂ”TE DÃ‚Â'IVOIRE

Recommendation:
Accept as it is

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality		√		
Clarity		√		
Significance		√		

Reviewer Name:Dr. Manju M

Date: 25-10-2025

Detailed Reviewer's Report

1. Importance of Hard Rock Aquifers

Hard or crystalline rocks (plutonic and metamorphic) act as aquifers only when fractured or weathered, providing vital groundwater resources in areas with limited surface water.

2. Hydrogeological Complexity

Hard rock aquifers are spatially heterogeneous in weathering, fracturing, permeability, and recharge, resulting in unpredictable well yields and high borehole failure rates (>40%).

3. Economic Implications

High drilling costs (~25,000 CFA/m) and frequent borehole failures can cause major financial losses in rural water projects, e.g., up to 100 million CFA for 100 wells at 40% failure.

4. Weathering-Controlled Aquifers

Weathering, rather than tectonics, governs aquifer formation in hard rocks, creating a weathered profile with distinct hydrodynamic properties.

5. Aquifer Layers and Properties

The weathering profile includes a saprolite (weathered layer) and an underlying fissured layer. Groundwater flow and storage are controlled by lithology and geometry of these layers.

6. Statistical Analysis of Borehole Data

Statistical analysis of existing borehole records is an effective, low-cost method to evaluate aquifer properties and guide drilling decisions.

ISSN(O): 2320-5407 | ISSN(P): 3107-4928
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

7. Study Area

The Divo–Guitry region (~144 km², southern Côte d'Ivoire) features a humid tropical climate and intensive agriculture and mining, increasing groundwater demand.

8. Geological Context

The area is dominated by Paleoproterozoic intrusive rocks:

- Biotite Metagranite (MGR)
- Biotite/Hornblende Metagranodiorite (MGDR)
- Metatonalite (MTR) Minor volcano–sedimentary units are also present.

9. Data Sources

275 boreholes analyzed:

- MTR: 150
- MGR: 92
- MGDR: 33

Parameters recorded: depth, saprolite thickness, inflow depths, and discharge.

10. Key Analytical Parameters

Four parameters statistically analyzed:

- Total depth (Td)
- Saprolite thickness (St)
- Length below saprolite (Lbs)
- Instantaneous discharge (Qi)

11. Borehole Depth Distribution

Most boreholes are 50–75 m deep. Deeper wells (>100 m) are rare, with MGR generally showing the greatest depths and thicker saprolites.

12. Saprolite Thickness Trends

- MGR: thickest (up to 72 m)
- MGDR: ≤48 m
- MTR: ≤49 m Thicker saprolites correspond to less fractured but highly weathered rocks.

13. Length Below Saprolite

Most boreholes penetrate 35–65 m into the fissured layer. MTR shows slightly longer fissured sections, indicating better hydraulic potential.

14. Instantaneous Discharge Patterns

Low discharges (<5 m³/h) dominate. Higher yields (>10 m³/h) are more frequent in MTR and MGDR than MGR.

15. Vertical Distribution of Inflows

Water inflows decrease with depth:

- MTR: 10–68 m below saprolite
- MGR: 10–46 m

ISSN(O): 2320-5407 | ISSN(P): 3107-4928
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

- MGDR: mainly 10–40 m

16. Useful Aquifer Thickness (Lu)

Transmissive zones determined from cumulative discharge curves:

- MTR: 53.99 m
- MGR: 50.58 m
- MGDR: 36.93 m

17. Average Aquifer Productivity

Average discharges within Lu:

- MTR: 7.0 m^3/h
- MGR: 5.14 m^3/h
- MGDR: 8.3 m^3/h Despite thinner layers, MGDR shows higher productivity.

18. Optimal Drilling Depth (Pop)

Pop = Lu + saprolite thickness. Kriging interpolation shows optimal depths:

- Range: 45–124 m
- Deepest: ≥89 m in MGR zones
- Shallowest: 45–55 m near Guitry and Divo (MGDR/MTR)

19. Hydrodynamic Interpretation

Fissure density decreases with depth; highest permeability occurs just below saprolite, supporting the weathering-controlled aquifer model.

20. Practical Implications and Recommendations

- Target drilling ~50–55 m below saprolite for best yield.
- Statistical borehole analysis is reliable for groundwater exploration.
- Results support sustainable groundwater management, reducing failures and improving rural water planning.