



Vadose Zone Hydrology in Engineering Geology and Hydrogeology

Presented by the Department of Geology, University of Pretoria

1 SACNASP CPD Point | CPD Reg No: 2020-0115-001577

1 ECSA CPD Point | CPD Reg No: P002601-2020

The vadose zone stretches from the land surface to the groundwater table, where moisture in intergranular pore space and rock defects occurs at variable water saturation and at negative pore-water pressures. Theory in the occurrence and movement of water in unsaturated conditions in soil and rock media is developing, with improved understanding reducing the uncertainty in conceptualising and characterising these complex systems.

The vadose zone dictates how water exists and moves in the shallow subsurface. This, in terms of engineering geology, inevitably leads to volume change of ground, changes in the corrosiveness of the subsurface, and seepage problems (such as seasonal perched systems and waterlogging), requiring mitigation.

In terms of hydrogeology and hydrology, the vadose zone links the subsurface water cycle with the surface. This directly determines groundwater recharge (preferential through complex soil-rock systems), advection rates and attenuation of contaminants, and greater interactions with surface water through interflow and eventual surface discharge.

Applications are vast, expanding into hydrogeology, foundation design, land use planning, and so forth, with specific examples to be presented around cemeteries, ingress in karst, pressure testing, slope stability, and/ or groundwater vulnerability.

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Shifting knowledge to insight



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Course outline

09:00	Rock Cycle and Soil (JLVR; 30') <i>Earth materials; the ground profile and its description; mechanics of solids and discontinua; weathering and soil formation; pedogenesis</i>
09:30	Water Cycle and Hydrostratigraphy (RED; 30') <i>Hydrological cycle; subsurface flow; hydraulic parameters; hydrogeochemistry; hydrostratigraphy</i>
10:00	Vadose Zone Hydrology and Unsaturated Hydraulics (MAD; 45') <i>Wettability, capillarity, and unsaturated flow; unsaturated flow through interstitial pores and rock fractures; flow mechanisms, regimes and scenarios; complex vadose zone successions; soil-rock interface</i>
10:45	TEA
11:00	Geochemical and Hydrogeological Considerations (RED) <i>Recharge; vulnerability; natural attenuation; isotopes</i>
11:30	Geotechnical and Hydraulic Considerations in Rock (MM) <i>Geometrical influences on partially saturated flow through rock</i>
12:00	Applications (MAD&JLRV) <i>Cemeteries; pressure testing; shallow seepage; rock slopes</i>
12:45	Discussion
13:00	Closing

Learning outcomes

This is a workshop deliverable to showcase research output from a Water Research Commission Grant.

Course fees

R650.00 per delegate (VAT incl.)

Course fees include venue and tea. (Half-day workshop)

Course fees must be paid in full 14 days prior to course start dates. Proof of payment can be submitted to enrolments@enterprises.up.ac.za.

Admission requirements

Honours/ HQESF 8 and above.

Accreditation and certification

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Registration and enquiries

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Course leader

Dr Matthys Dippenaar
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Engineering Geology and Hydrogeology

Course presenters

1. Prof Matthys Dippenaar
 2. Prof Louis van Rooy
 3. Dr Roger Diamond
 4. Ms Mampho Maoyi
- Engineering Geology and Hydrogeology Section; Department of Geology; University of Pretoria

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