



Day 1 Webinar 1 - Bringing Groundwater to the Surface

Question 1 Does drilling boreholes help improve water quality in rivers?

Answer Not directly but it helps us understand if groundwater quality is improving or not which can then impact on river water quality

Question 2 You mentioned that these groundwater monitoring stations could be used for future research. Have you any ideas of what that might be?

Answer We are looking to new partners to develop future uses of them

Question 3 Do you intend to give the land owners a description of profile found when drilling the ground water monitoring bore hole? and do you think it would be possible to have "live" access to water table data?

Answer We hope to do this

Question 4 Are the sulphur and potassium detected from natural or chemical fertilisers?

Answer I showed a Durov diagram where two wells showed a different signature from the rest. These were the only two wells not found on karst limestone. One is found up the shale and sandstones up on Thur Mountain to the west of the Catchment and one is found in the Bundoran Shale Formation to the East. Sulphur and potassium can occur naturally in soils, rock and minerals. Sulphur is especially common if the dissolved oxygen content is low as the aquifer contains organic matter, such as a shale. The Sulphur well, in particular, is highly mineralised with an electrical conductivity value 1,140 uS/cm and contains very high levels of dissolved compounds such as sodium (219 mg/l). Again, these compounds can be naturally occurring in the shales or may indicate pollution. In both of these well ammonia as N, was also very high suggesting there may be some evidence of human influence,

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such as forestry or fertilisers. More sampling results will help determine the source of such parameters.

Question 5 What are the reasons for elevated ammonium in the upland catchments and is there a statistically associated more with the limestone areas/ neutral pH.

Answer Again, this answer is a little bit similar the answer above. The highest levels of ammonia (as N) were found on the two wells not on the karst limestone aquifer, though there were some low exceedances of ammonia found in some of the karst springs. The two wells are found on shale and sandstones and shales. Ammonia can be present in groundwater naturally as a result of anaerobic breakdown of organic matter, such as that found in shales. However, it may also indicate some influence from organic waste and agricultural processes, such as forestry. The relatively high levels of ammonia found in these two wells suggest a contamination of the water supply but again more results will help provide a clearer picture of this.

Question 6 You mentioned 50+ monitoring stations - what was the rationale for this number??

Answer The original project proposal was to drill and install 50 groundwater boreholes to be used as monitoring stations. However, as the Arney catchment has large amount of groundwater naturally coming to the surface as springs, groundwater monitoring stations have been established at these sites. We are still aiming for the 50 boreholes and so the spring monitoring stations will be additional.

Question 7 You said groundwater moves really fast in karst - at what speed does it flow in other aquifers and why is this significant?

Answer In non-karst aquifers groundwater flow velocities are usually in the order of a fraction of a meter per day and flow is usually relatively dispersed throughout the aquifer. In karst aquifers the flow is localised and can be much faster. Tracing work in the Arney has shown speeds of over a kilometre per day. This is significant because it has huge implications on water quality and the area that can be affected by a pollution incident.

Question 8 Do you see a wider take up of presenting outputs this way?

Answer We would hope so as it's an excellent communication tool and enables complex science to be communicated visually in an understandable way

Question 9 Will some animations from the VR modules be available on the CatchmentCARE website to view even without VR goggles?

Answer Yes they will and we will have as much of the output on the website.

Question 10 Do any of the panel have concerns around fracking, gas or mining activities? Can you monitor for contamination from these activities?

Answer The effects of all pressures on groundwater will be better understood

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Question 11 Are unlicensed activities an issue that anyone on the panel have detected e.g. unlicensed quarries, landfills, washing diesel etc. etc.?

Answer As above we aim to better understand the effects of all pressures on groundwater

Question 12 In all your lovely conceptual models there seems to be a good understanding of the depth of the bedrock layers, is this data widely available throughout the country or are these areas where there are enough boreholes to make informed assumptions about depth of bedrock layers?

Answer There is information on the depths of the bedrock layers widely available from both geological surveys (GSI and GSNI). However, site specific data is always welcome and will enhance our knowledge of these depths.

Question 13 What legal protections are in place and how well are these implemented in reality?? What protections can be put in place for ground water? Is ground water ever taken into consideration with construction/planning applications??

Answer Yes, groundwater is one of the key aspects in any planning proposal or Environmental Impact Study (EIS). Groundwater and groundwater vulnerability are incorporated into guidelines for national policy and planning. Certain groundwater features, such as a groundwater fed wetland or turlough, are protected by being designated or included in Special Areas of Conservation while many are also listed as National or County Geological Heritage Sites.

Question 14 Is soil erosion into ground water an issue especially with more extreme weather events?

Answer In extreme weather events runoff into swallow holes or bare rock can cause some issues with turbidity and microbiological pollution at springs and but this is only really a problem if the water is used for as a drinking water supply

Question 15 What is the most exciting and unexpected thing that you've found so far in your study, and is it changing your view of groundwater in these systems

Answer The level of engagement from the local community, the high flow rates in the karst and the areas of locally good supply from poor aquifers.

Question 16 Are there benefits from the monitoring in terms of flood prediction? I.e. water table data to warn of high levels therefore the risk of surface flooding is greater?

Answer Yes there is as we monitor groundwater levels we can better understand the relationship between surface flooding and groundwater