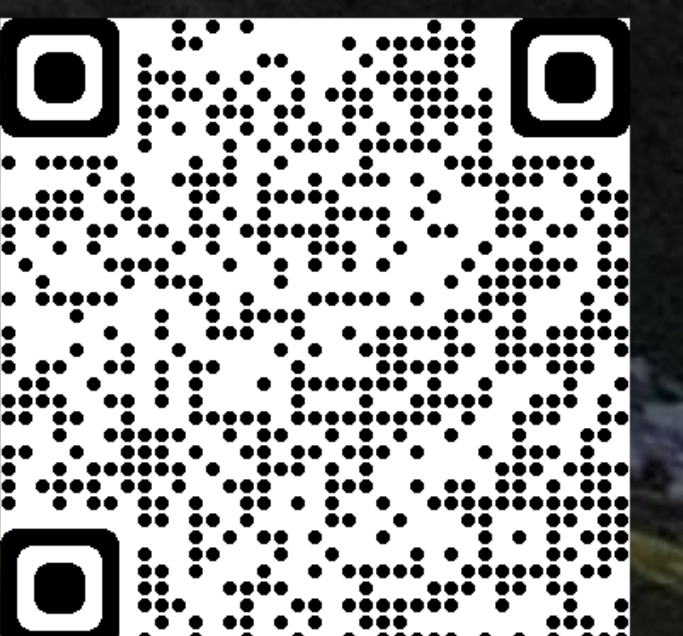
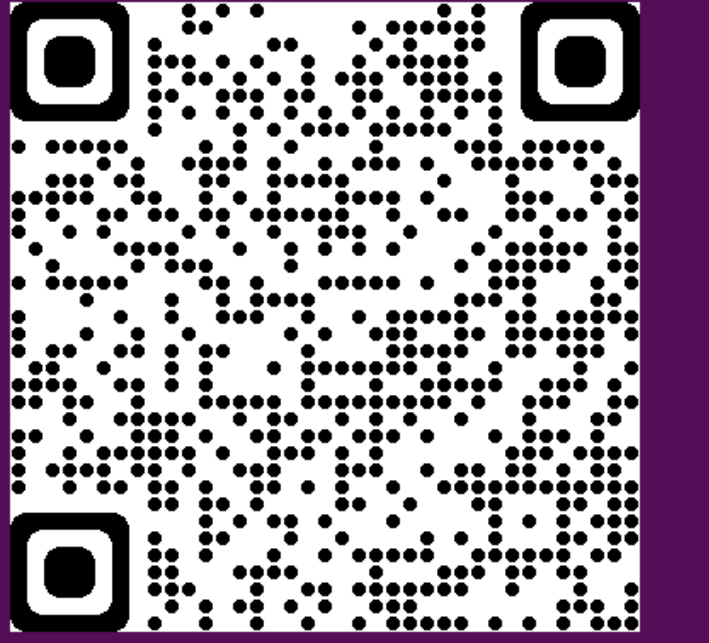


Durham
University

Assessing the use of earth bunds as natural flood management features

Jeremy S. Teale, Dr. Julia Knapp, Dr. Fred Worrall





Study Site

Middlehope Burn, Weardale North East England



Figure 1. Location map of the site.



Figure 2. Middlehope burn overview (above) and NFM bund installations (below).

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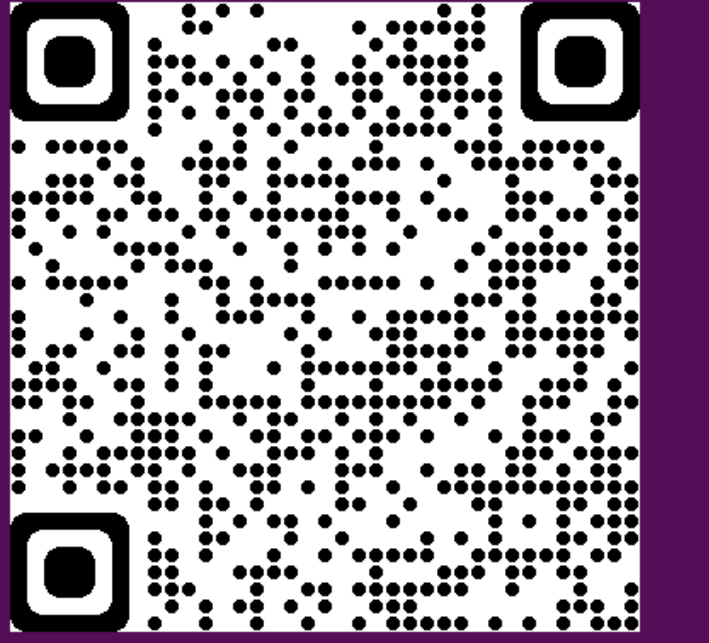


Figure 3. Bunds M11 and M14

Outflow pipe releases
stored water at a
controlled rate

Out of bank flows
enter the bund via an
overflow channel

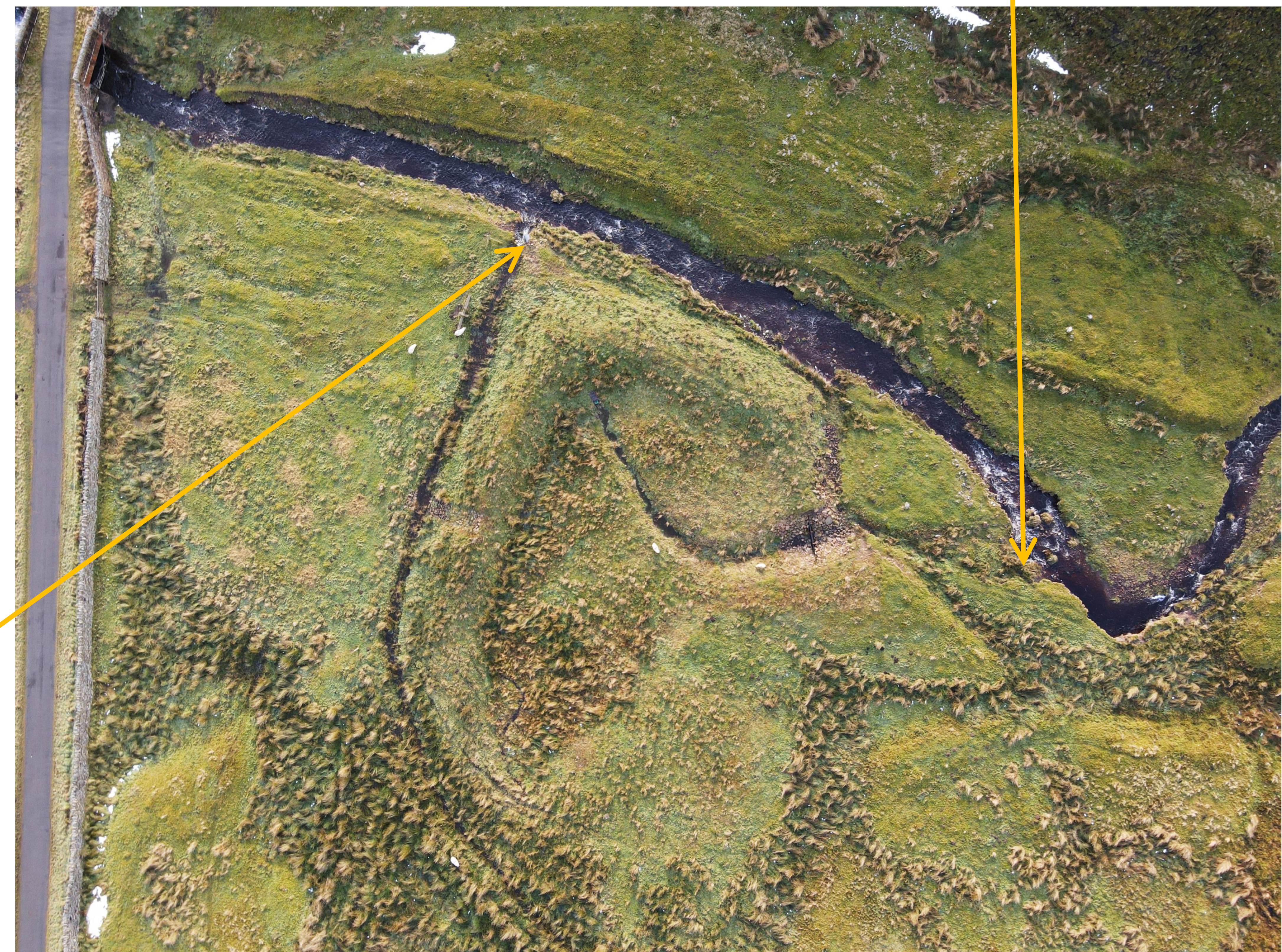
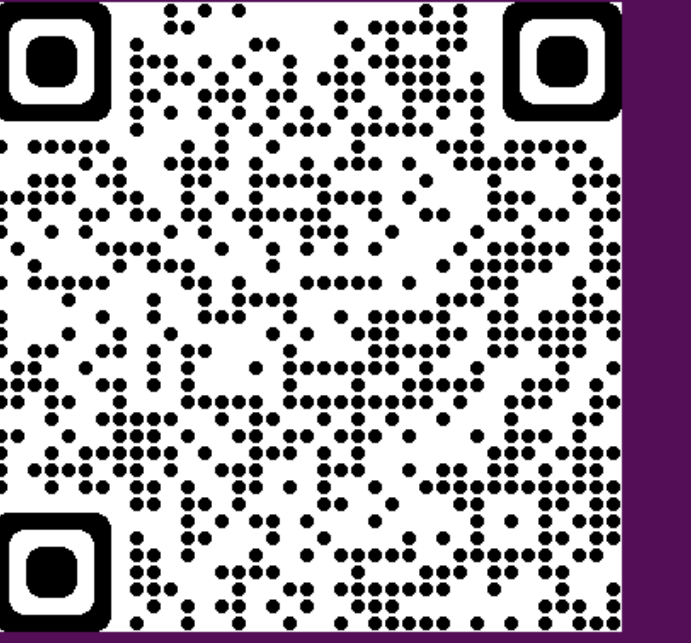


Figure 4. Demonstrator site

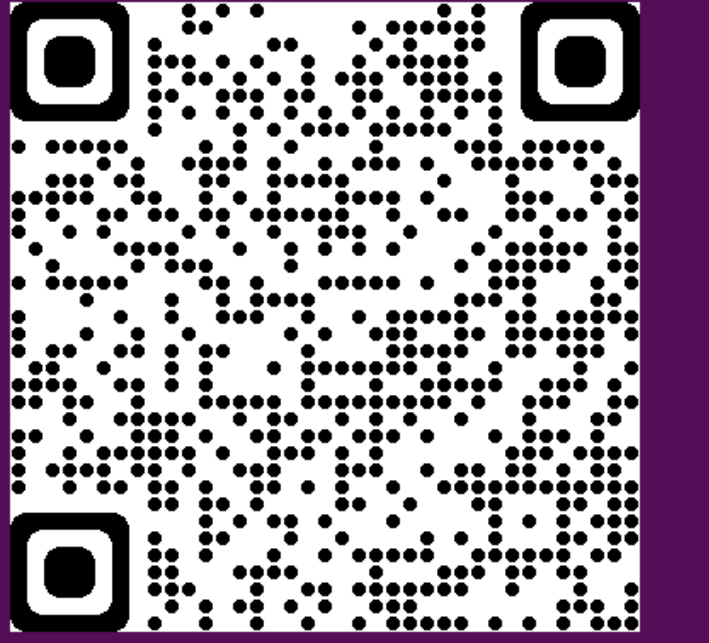
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Research Questions

How regularly are the bunds acting as storage features for the catchment?

- How does build quality affect the effectiveness of the bunds?

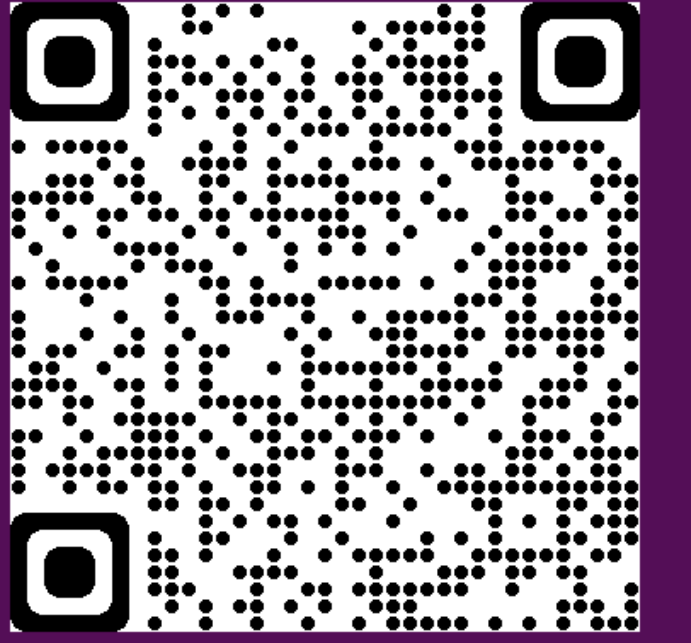
How is bund stability affected through time?

- Is this affected by build quality?
- How long does it take for the bunds to recover as grazing ground?

Are there any further benefits to using earth bunds as NFM features?

- Water quality?





Methods

How regularly are the bunds acting as storage features for the catchment?

- Arduino based water sensors recording presence and absence of water.

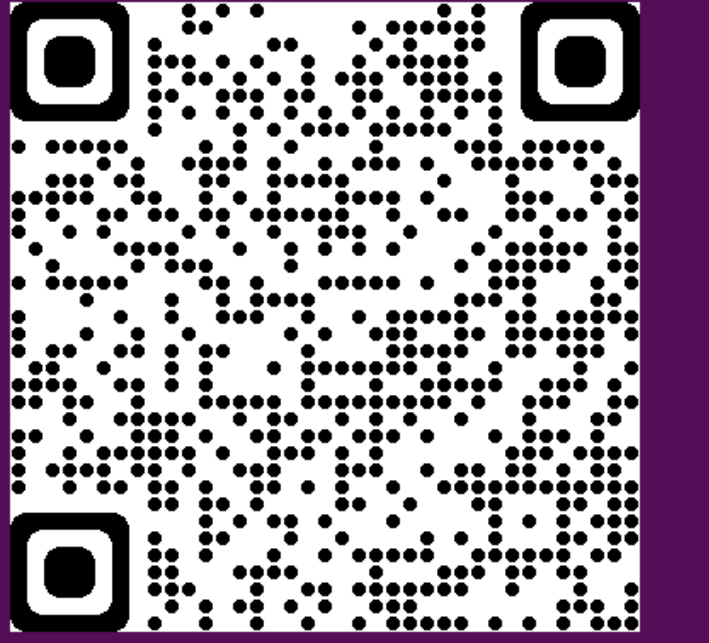
How is bund stability affected through time?

- Hydraulic conductivity measurements using Minidisk infiltrometers.

Are there any further benefits to using earth bunds as NFM features?

- Lysimeters installed at 30cm and 60cm depths to assess soil chemistry.

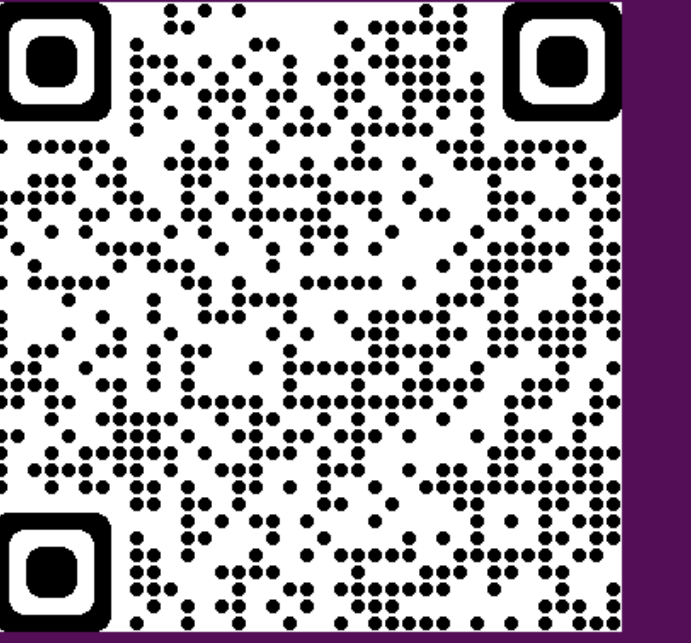




Methods

How regularly are the bunds acting as storage features for the catchment?





Methods

How is bund stability affected through time?



Figure 5. Installed mini-disk infiltrometer

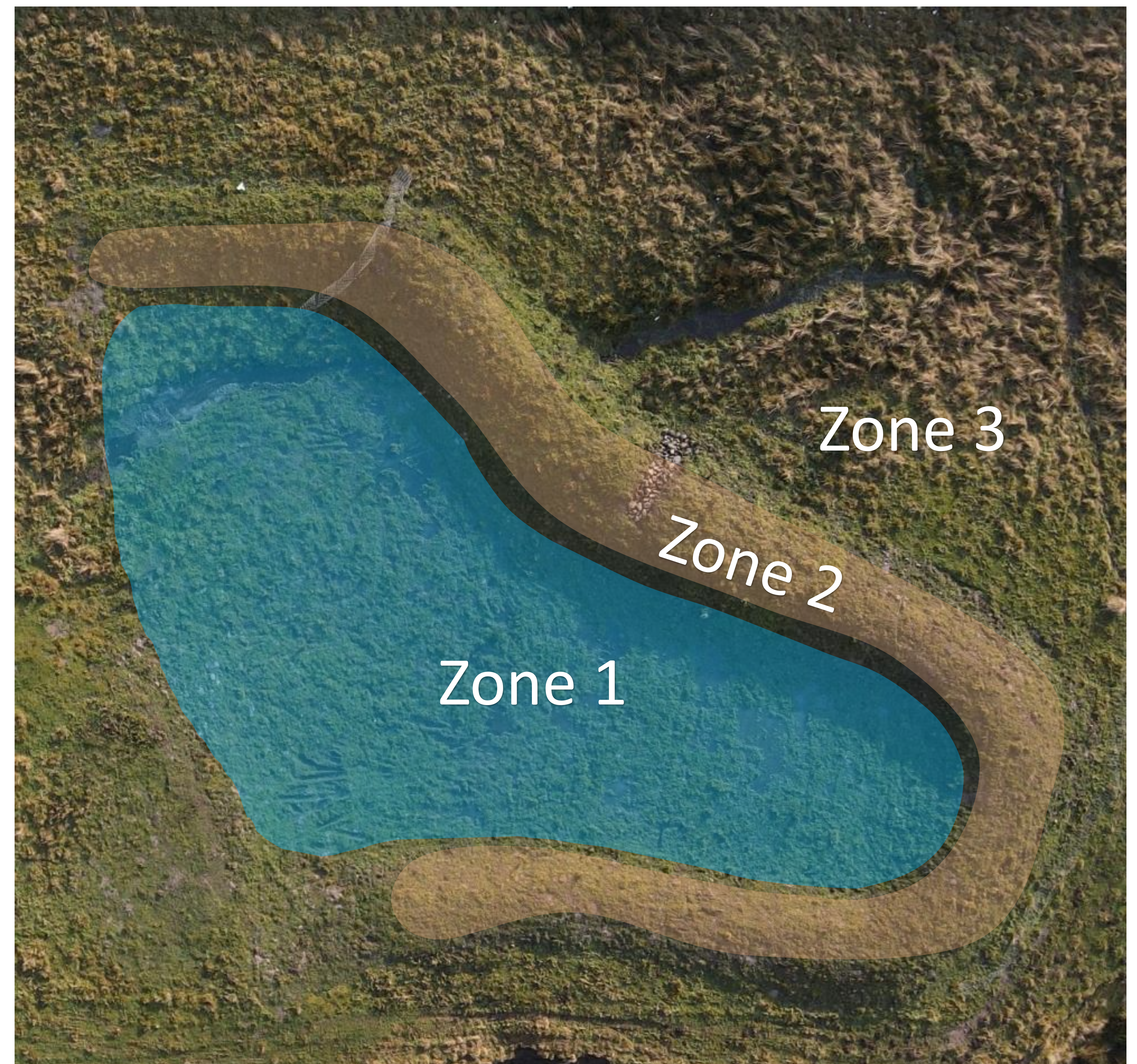
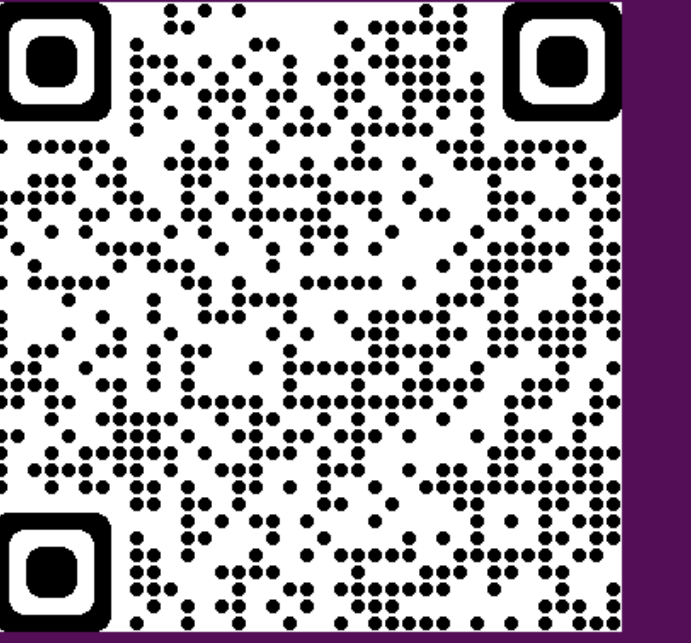


Figure 6. Bund zone divisions

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Methods

Are there any further benefits to using earth bunds as NFM features?

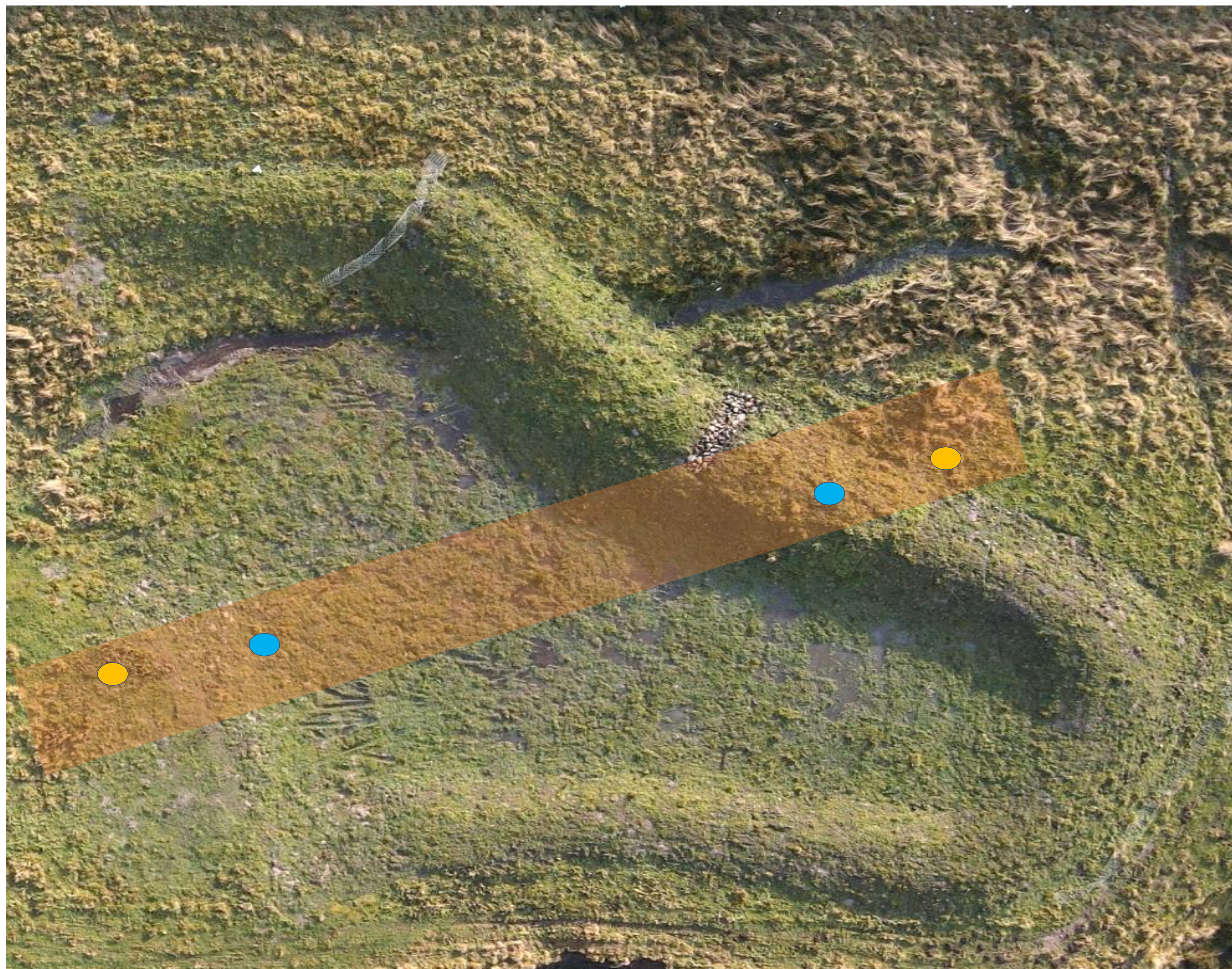
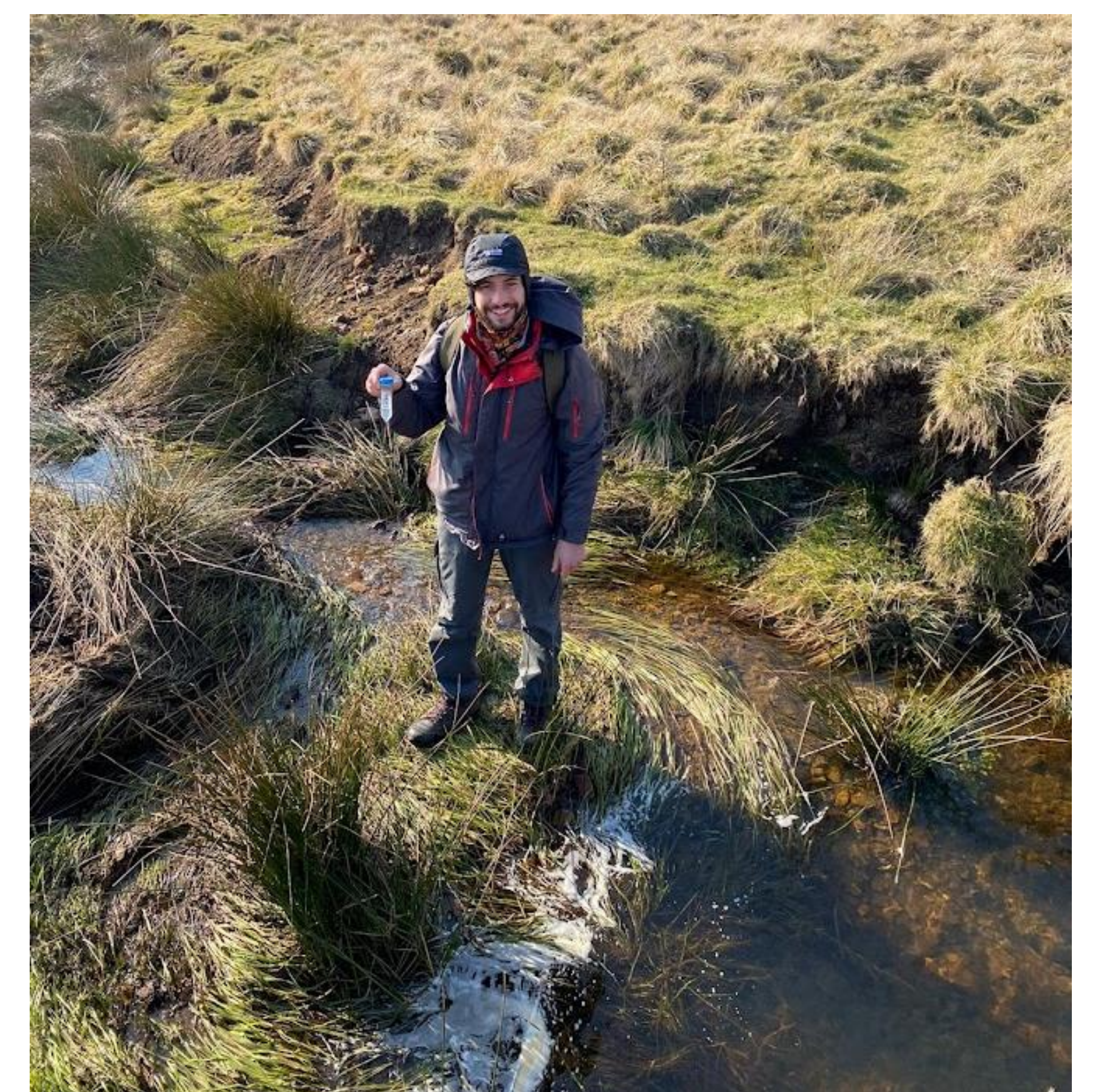
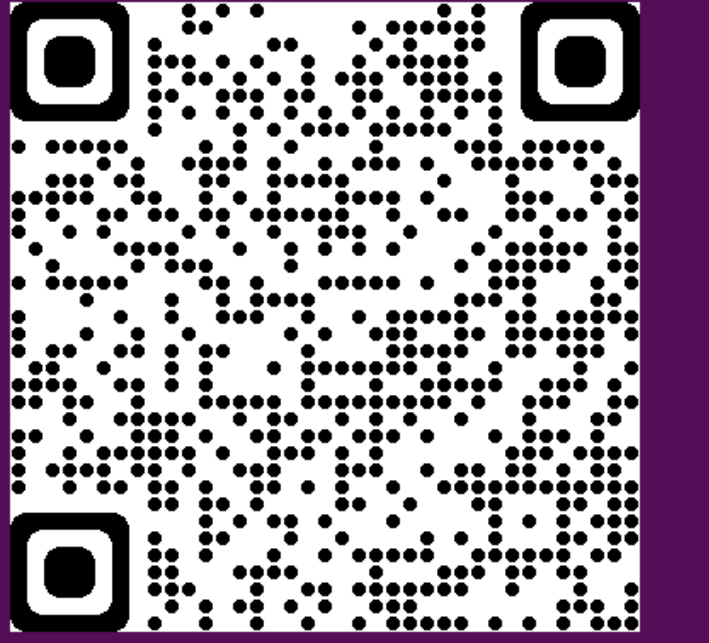


Figure 7. Lysimeter transect across bund M11.





Preliminary Results

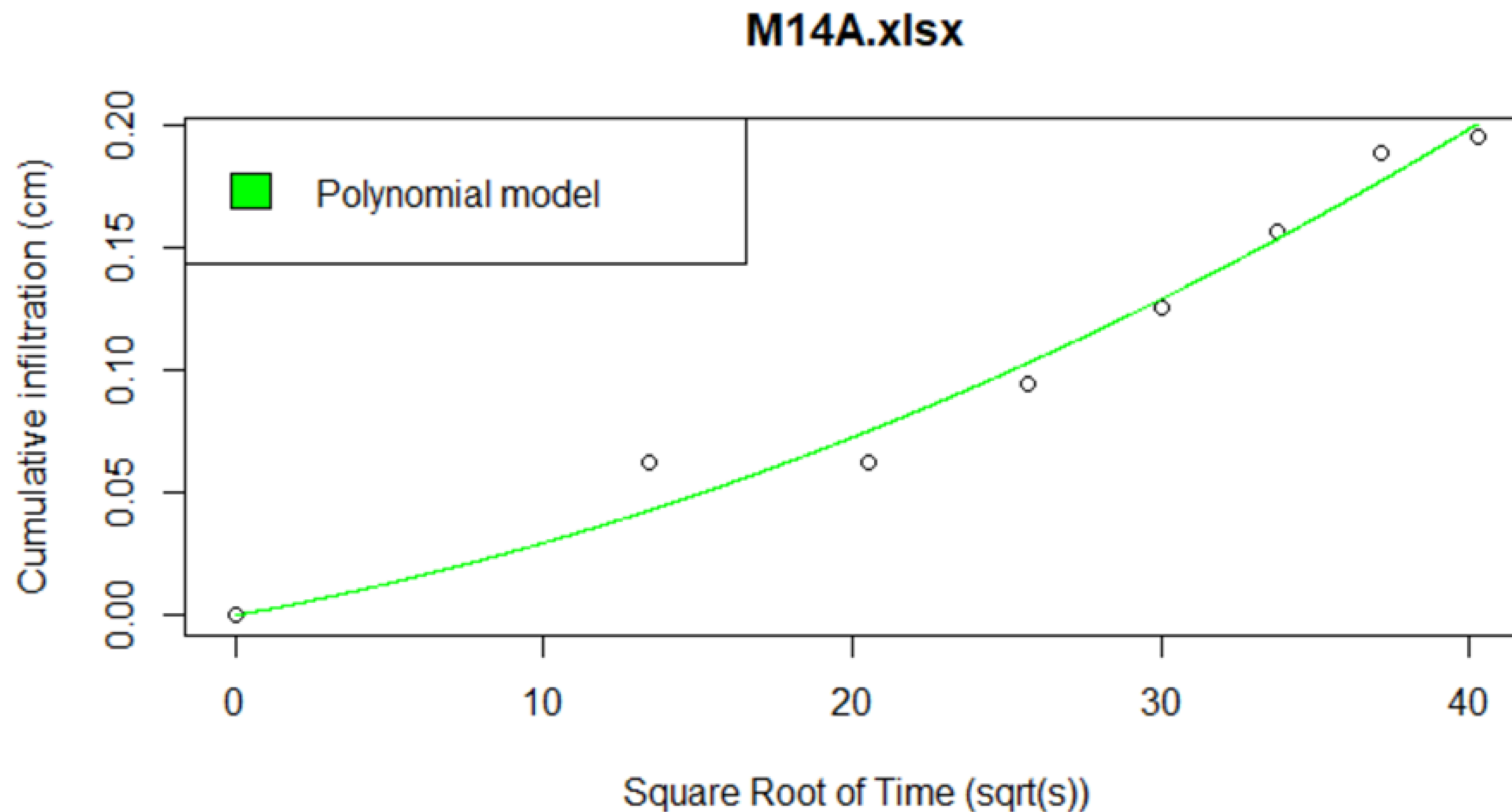
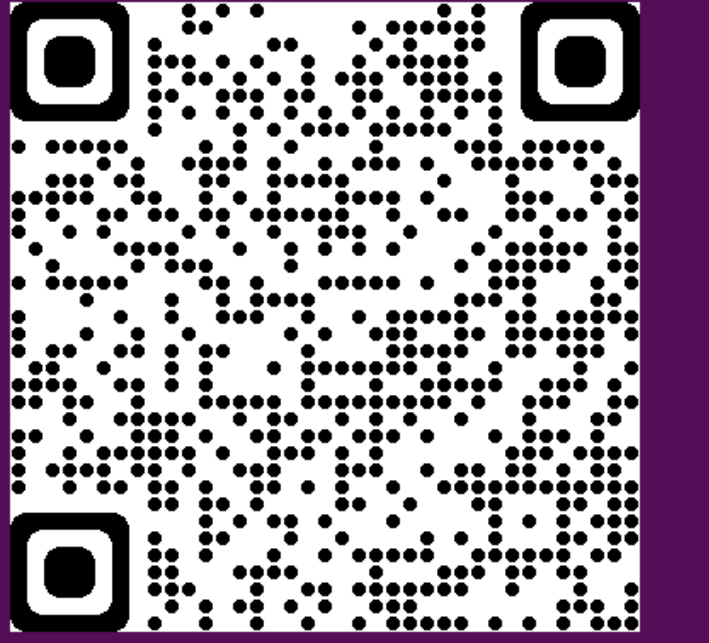


Figure 8. Sample graph of plotted cumulative infiltration of Minidisk infiltrometers versus the square root of time.



Preliminary Results

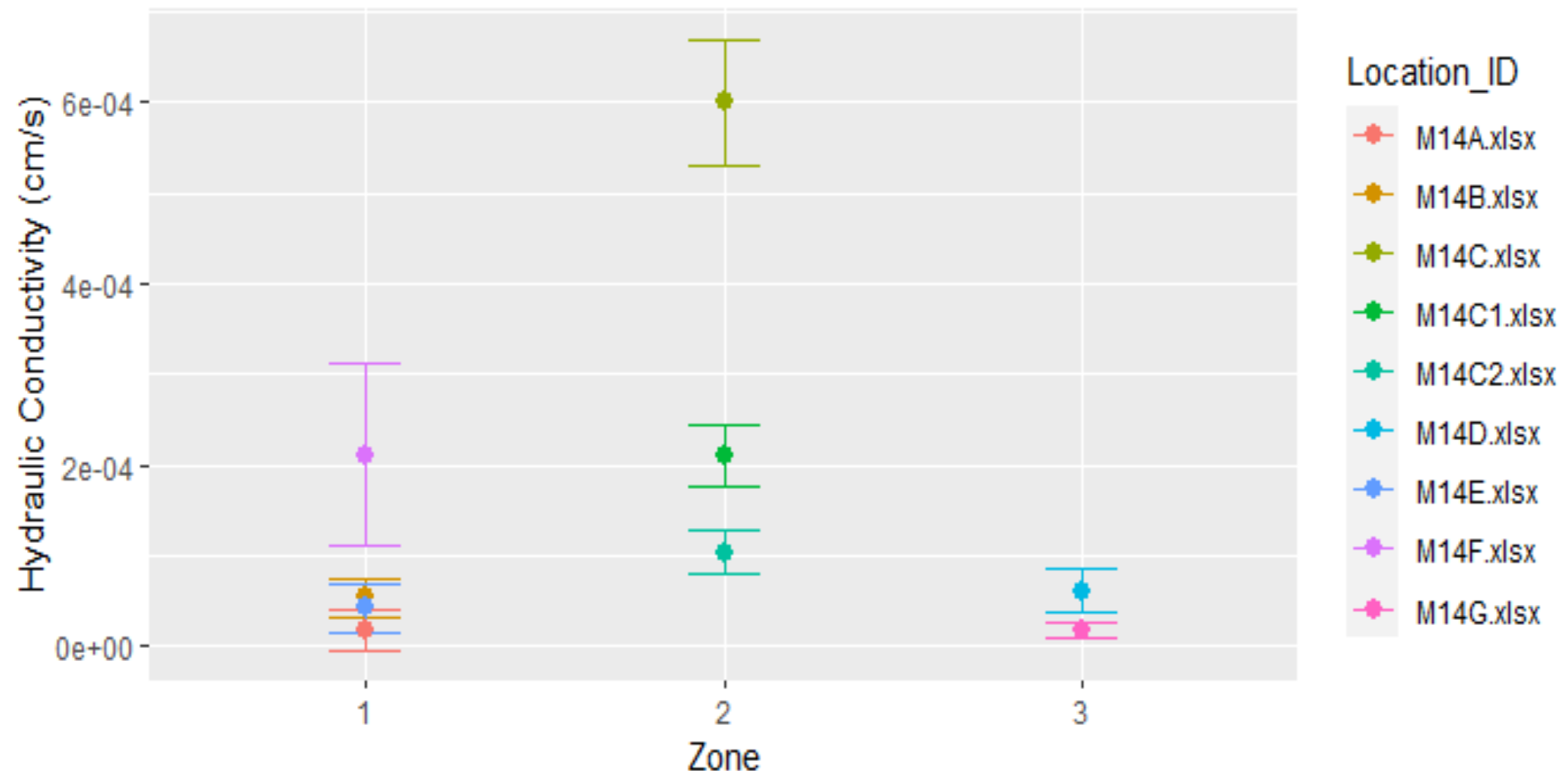


Figure 9. Cross-zone analysis of hydraulic conductivity within bund M11.

An aerial photograph of a wide, winding river flowing through a lush green valley. The river meanders from the upper center towards the bottom right. The surrounding landscape is a patchwork of green fields, some with small white patches of snow or frost, particularly on the higher slopes. A small, dark structure is visible on the left side of the valley. The sky is filled with large, white, fluffy clouds, and the overall lighting suggests a bright but slightly overcast day. The word "Questions?" is superimposed in a large, white, sans-serif font in the center of the image.

Questions?