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Government of Ireland

TIONSCADAL GEOPHÁIRC
Dhúiche Sheoigheach & Lochanna an Iarthair
JOYCE COUNTRY & WESTERN LAKES GEOPARK PROJECT

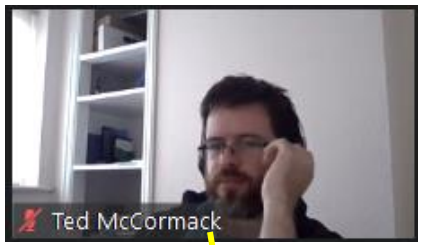
Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann
175 years | bliain 1845-2020

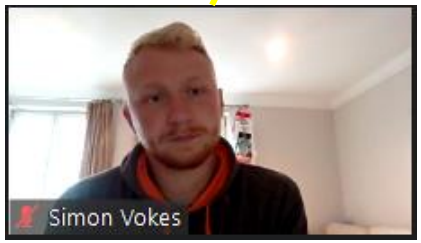
GSI's groundwater investigations around Lough Carra

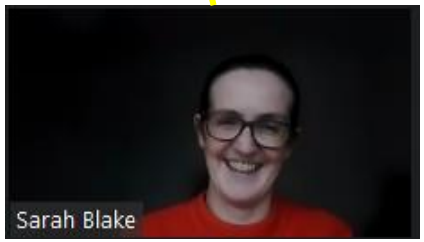
Sarah Blake, Natalie Duncan & Alasdair Pilmer
GSI, Groundwater and Geothermal Unit

Lough Carra Catchment Association meeting,
5th October 2021

GSI Lough Carra project team!







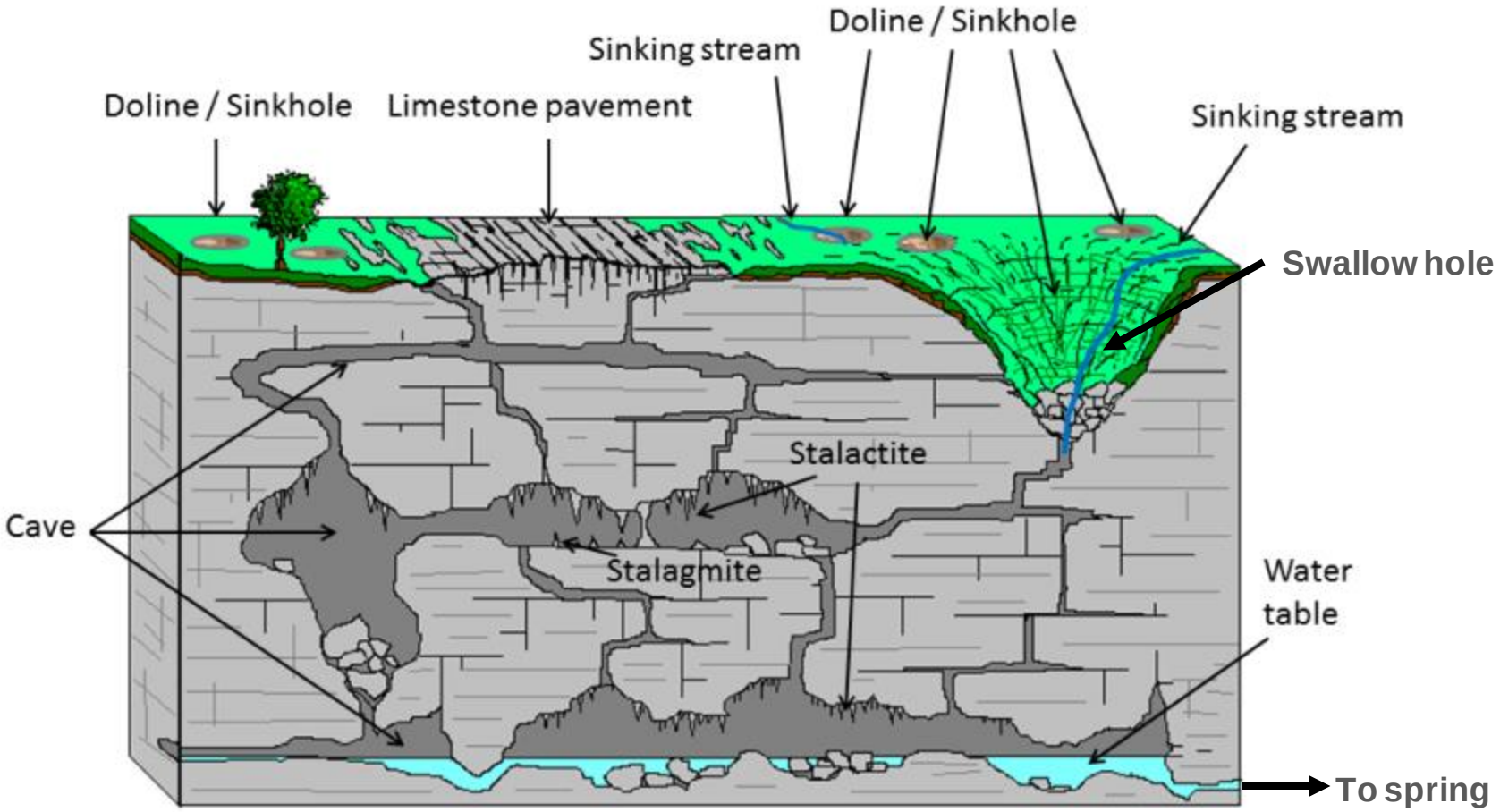
Outline:

1. Lough Carra catchment from a groundwater perspective

2. Previous work (karst feature mapping, 2019)

3. Next steps in the (near) future

Lough Carra catchment: groundwater perspective



Examples of features seen in karst limestone areas

Lough Carra catchment: groundwater perspective

Examples of features seen in karst limestone areas

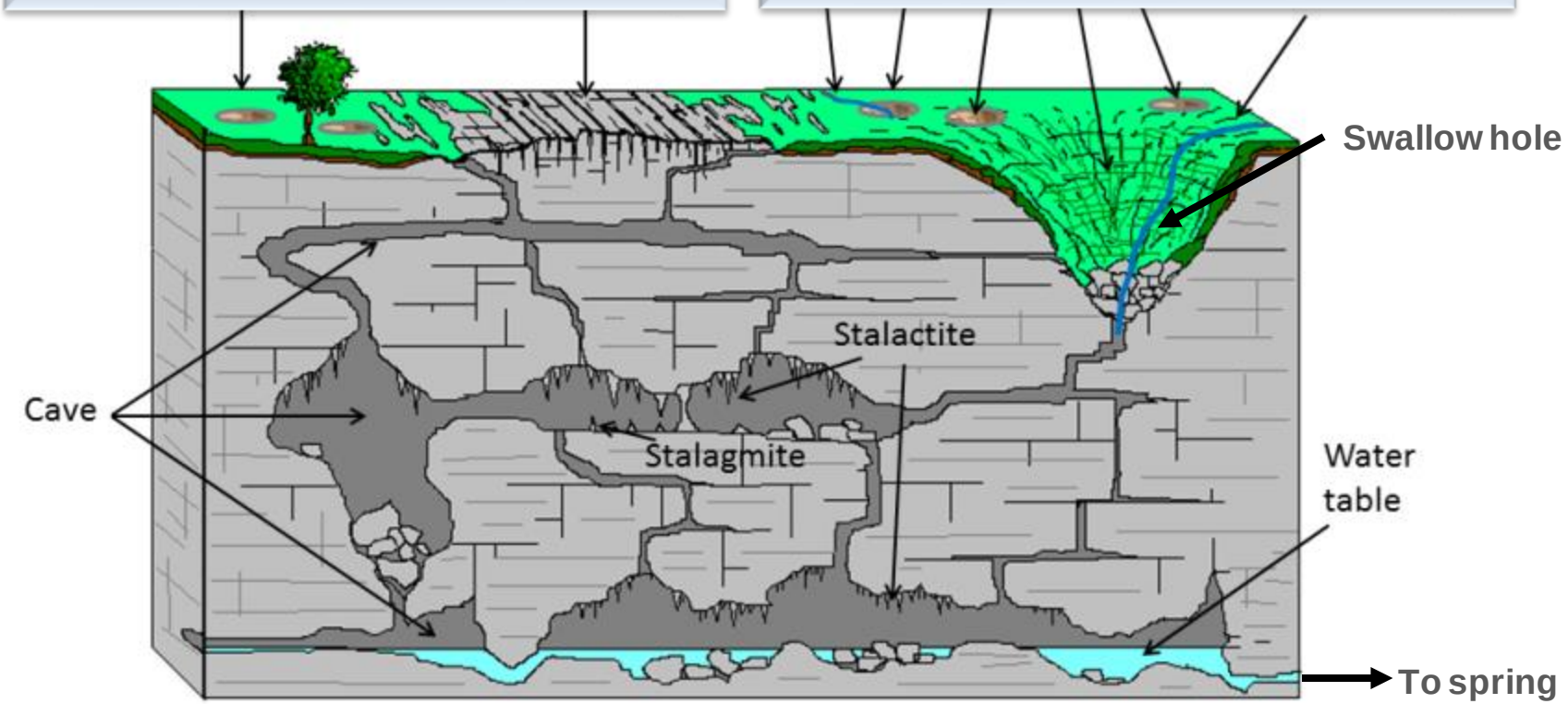
Lough Carra catchment: groundwater perspective

Diffuse GW recharge

Through infiltration and percolation over large areas

Localised GW recharge

Through movement of SWs into the GW system at discrete entry points



Fissure/diffuse flow

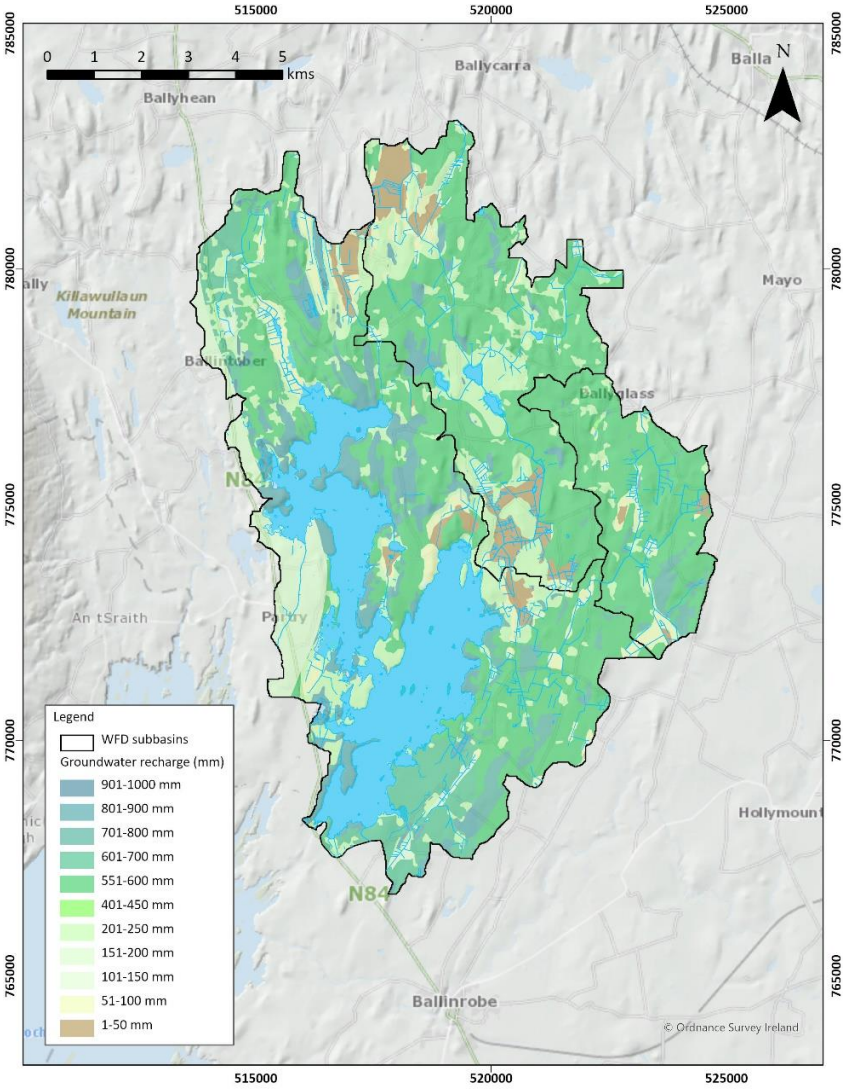
GW flows through cracks and fissures (slower)

Conduit flow

GW flows through larger channels (faster)

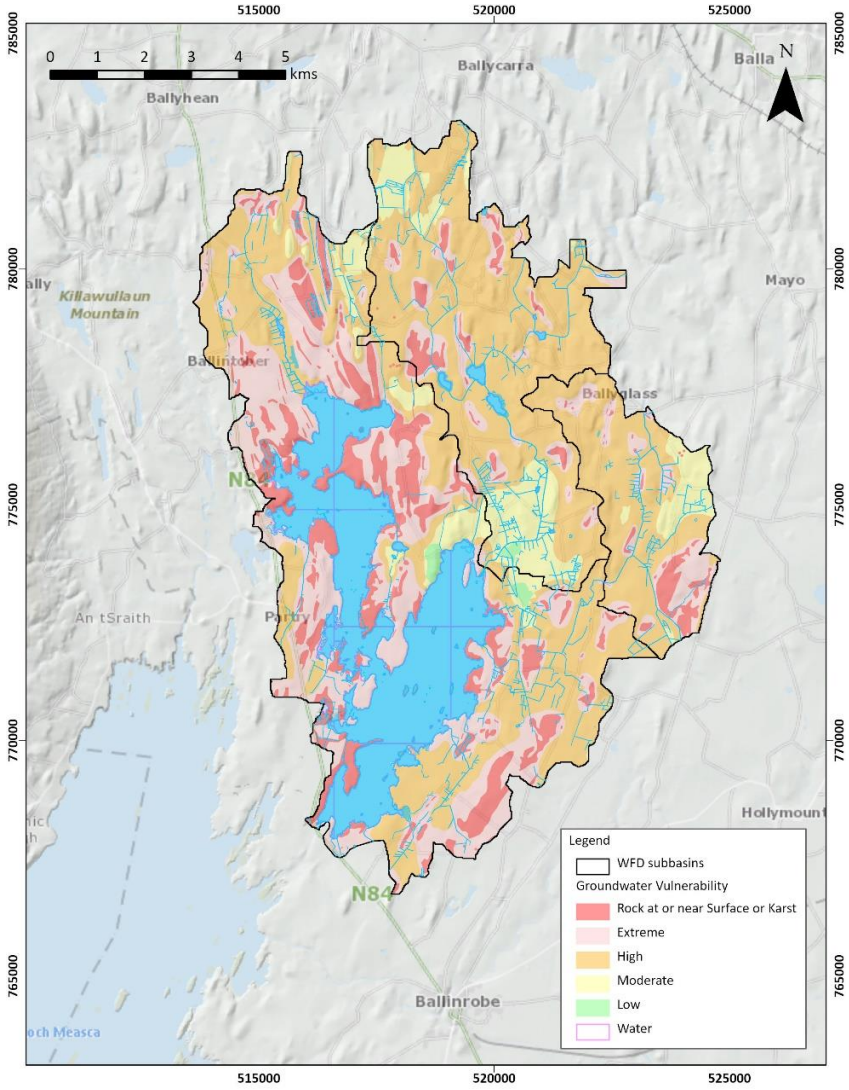
Groundwater in karst limestone areas

Lough Carra catchment: groundwater perspective



Groundwater recharge

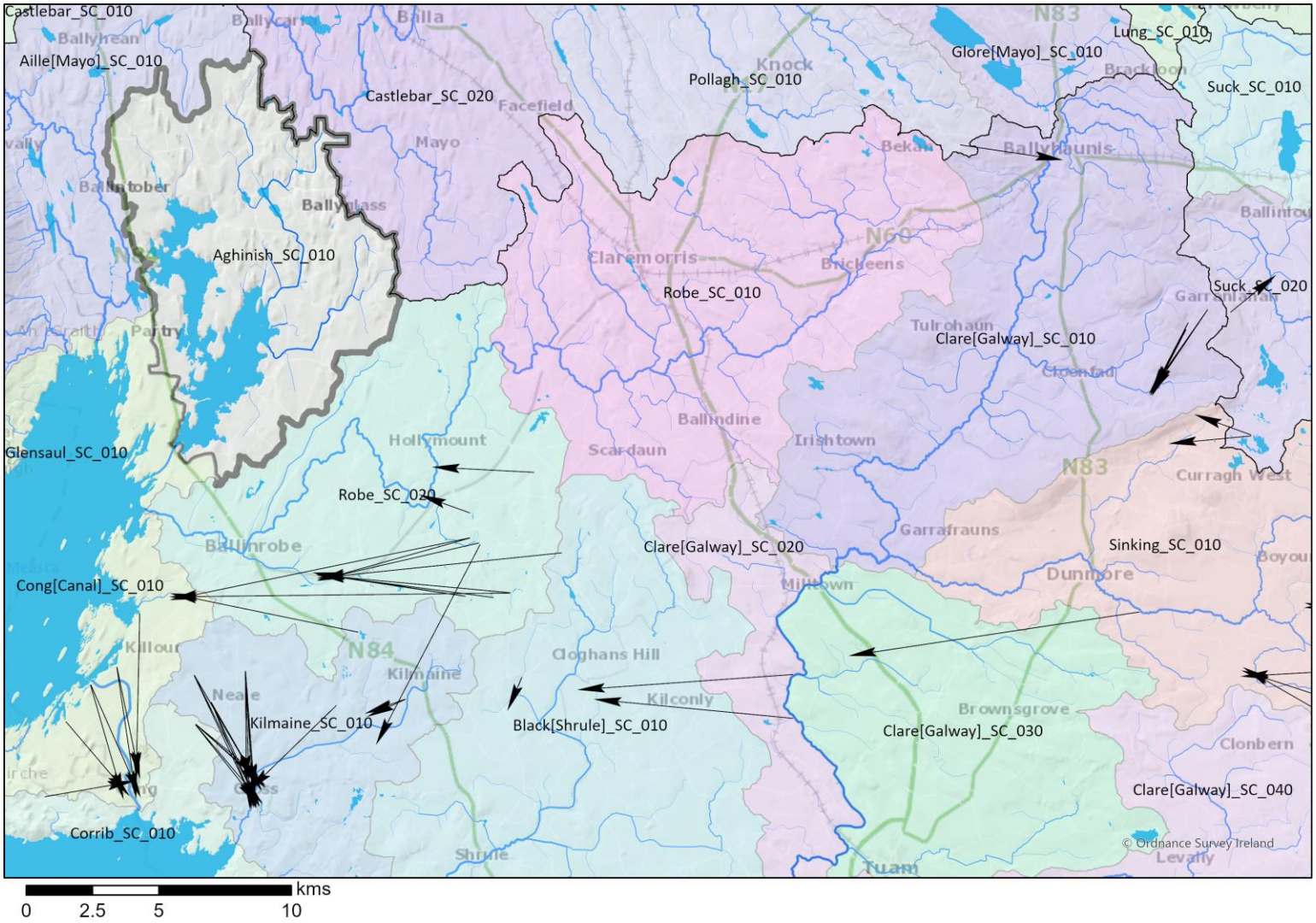
Ca. 50% of rainfall goes to groundwater recharge
BUT relative contribution to SW flow is seasonal



Groundwater vulnerability

High to extreme vulnerability to pollution

Lough Carra Catchment ??



Traced groundwater connections (arrows) – groundwater can travel long distances in a short time – groundwater can flow through surface water catchment boundaries (coloured areas) - catchments can be bigger or smaller than represented.

Previous work

To develop a conceptual understanding of groundwater movement within the Lough Carra catchment'

Karst feature mapping 2019

Mapping of karst features within and around the surface water catchments around Lough Carra consisted of four elements:

1. **Desk study** of maps, databases and literature for the area

2. **Field mapping**, ground-truthing features identified in the desk study, physically walking fields and engaging with landowners/local knowledge

3. **Remote sensing**, testing the capability of thermal imaging, to identify karst features such as turloughs and subaqueous springs

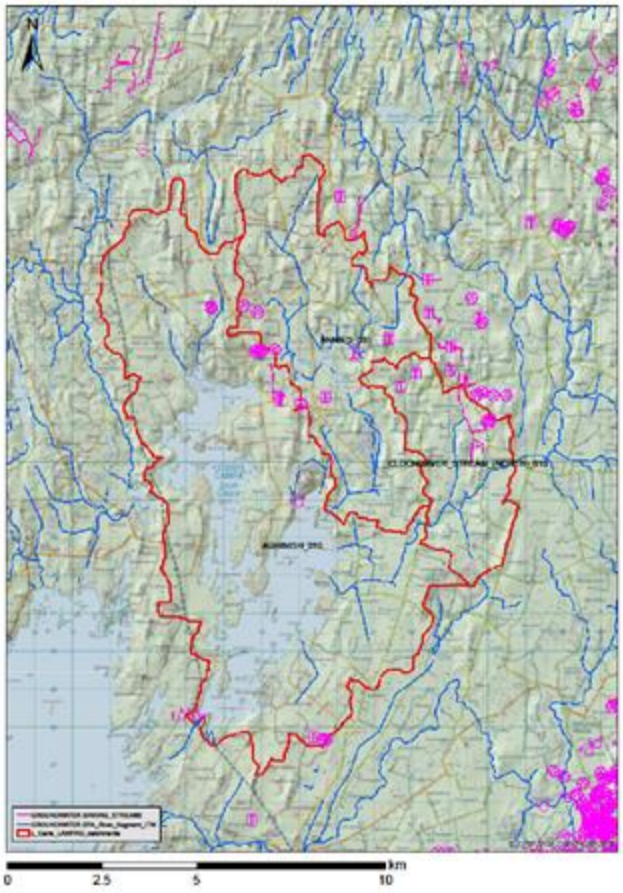
4. **Uploading** features onto the GSI public viewer.

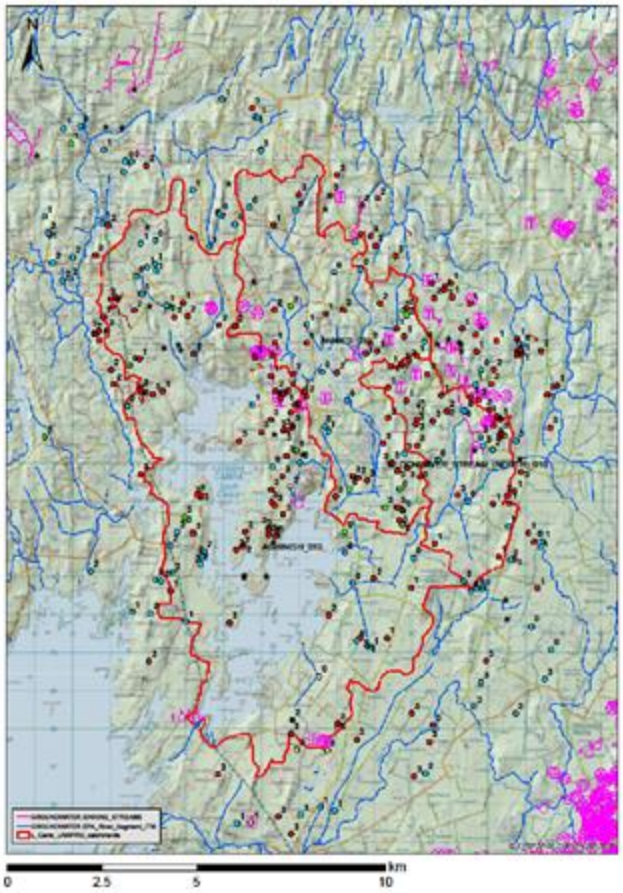
Karst feature mapping 2019

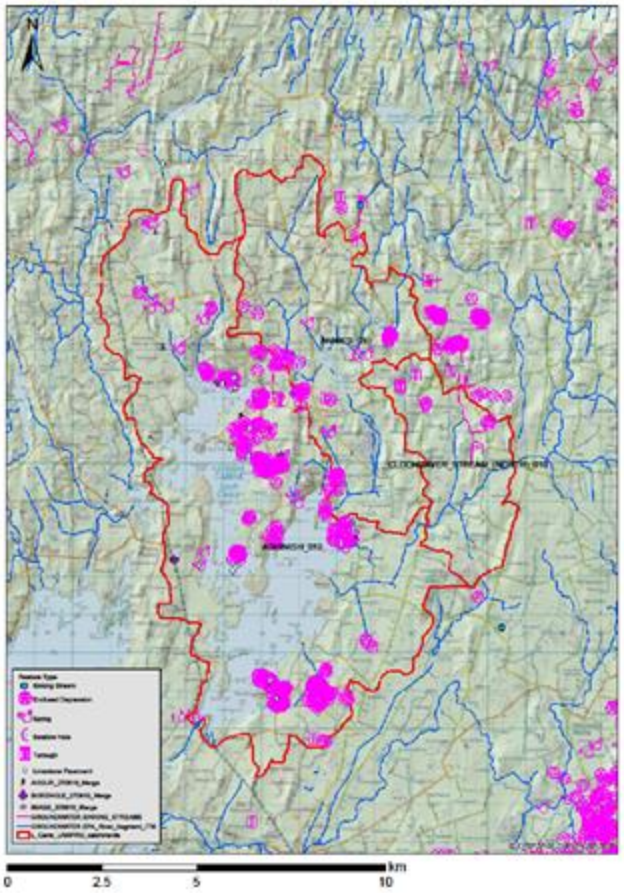
MAP 1: Previous karst features on the GSI database (Note the lack of coverage)

MAP 2: Desk study and potential features for field checking

MAP 3: New karst features identified after field checking







Karst feature mapping 2019: Results

- In total, **693** karst features were identified within and around the Lough Carra surface water catchments, **119** excluding enclosed depressions.

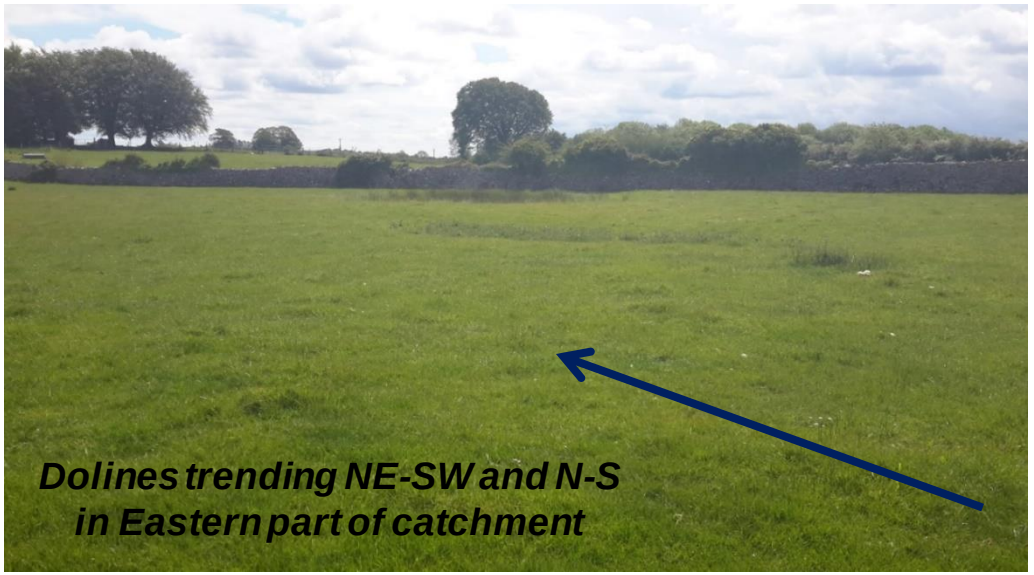
- Karst features uploaded to GSI map viewer included :
  - 574 dolines/enclosed depressions
  - 66 springs/holy wells
  - 15 swallow holes
  - 3 sinking streams
  - 8 potential turloughs
  - 21 limestone pavement exposures
  - 17 augured features
  - 9 boreholes
  - 33 images of quarries, karst windows, potential dry springs, etc.

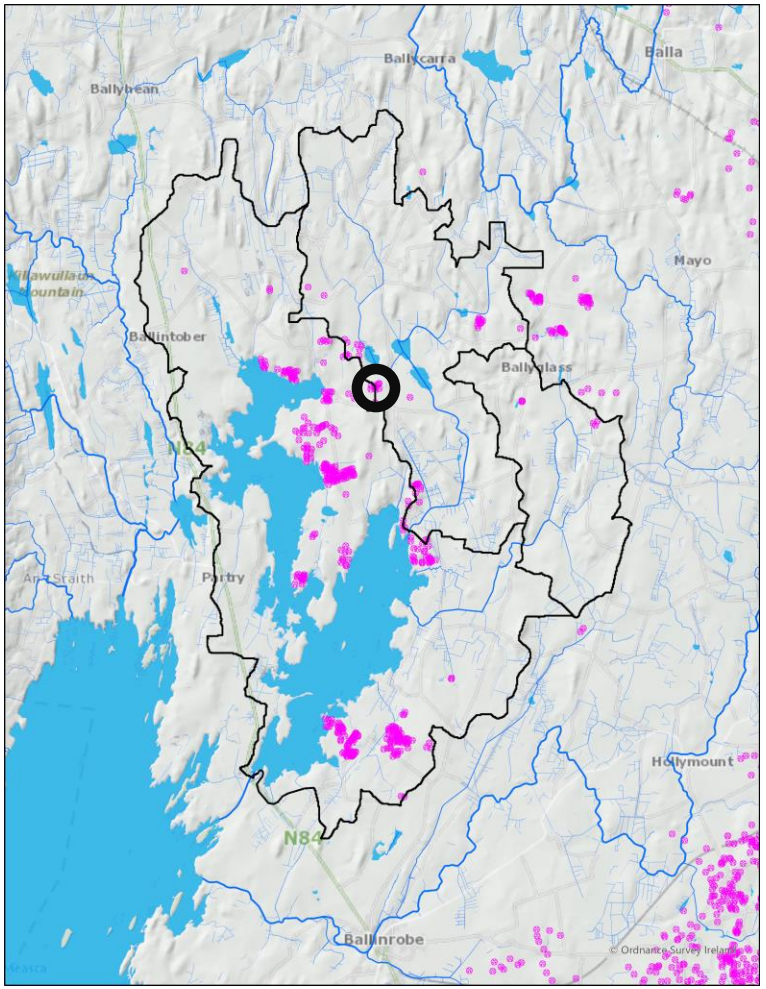
- Covered an area of *c.* **200 km^2** (the area of the surface water catchment is *c.* 110 km^2).

Examples of Karst Features in the Lough Carra Catchment

Dolines (Enclosed depressions)

Carrownacon

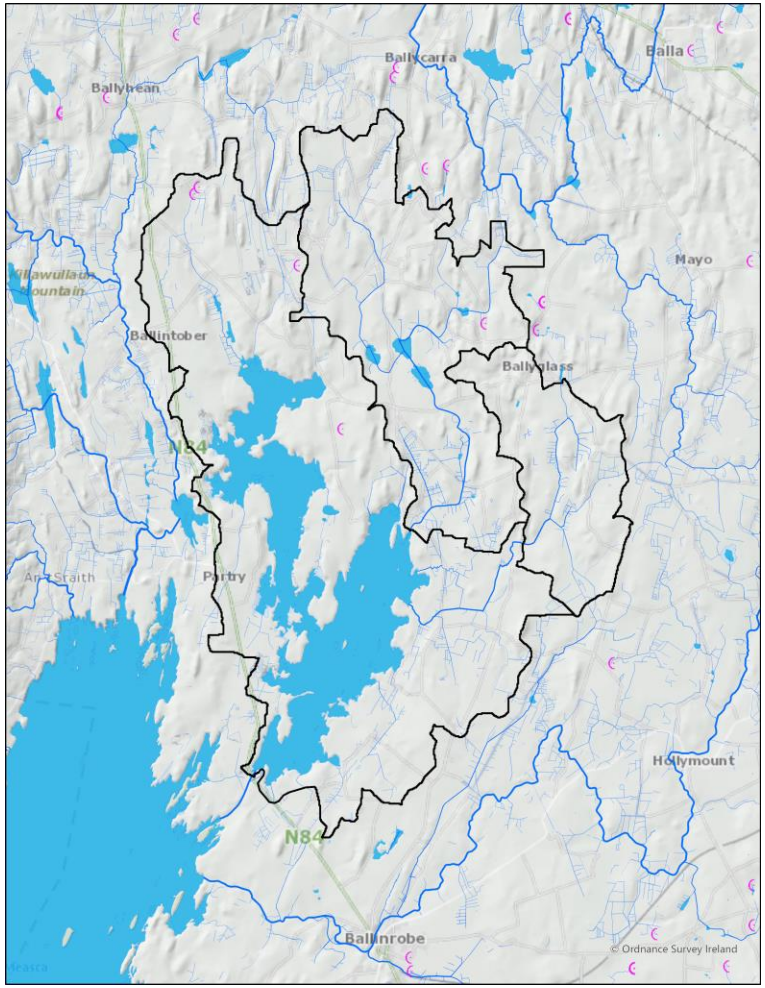




Swallow holes

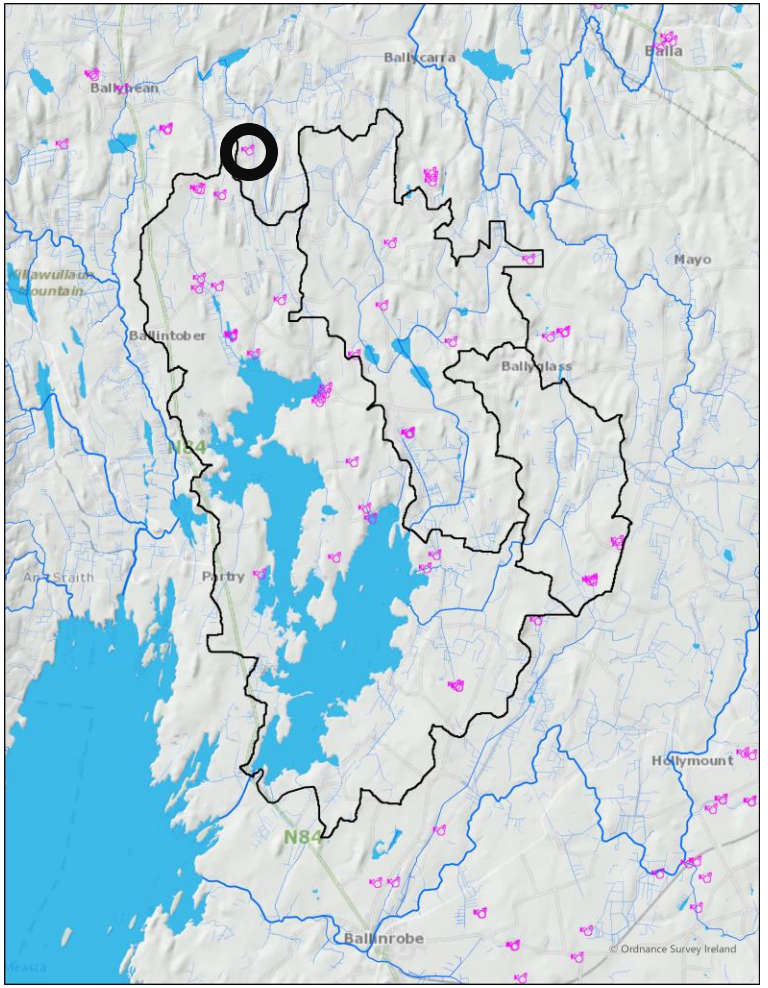
Drumcorrabaun

Ballyhean



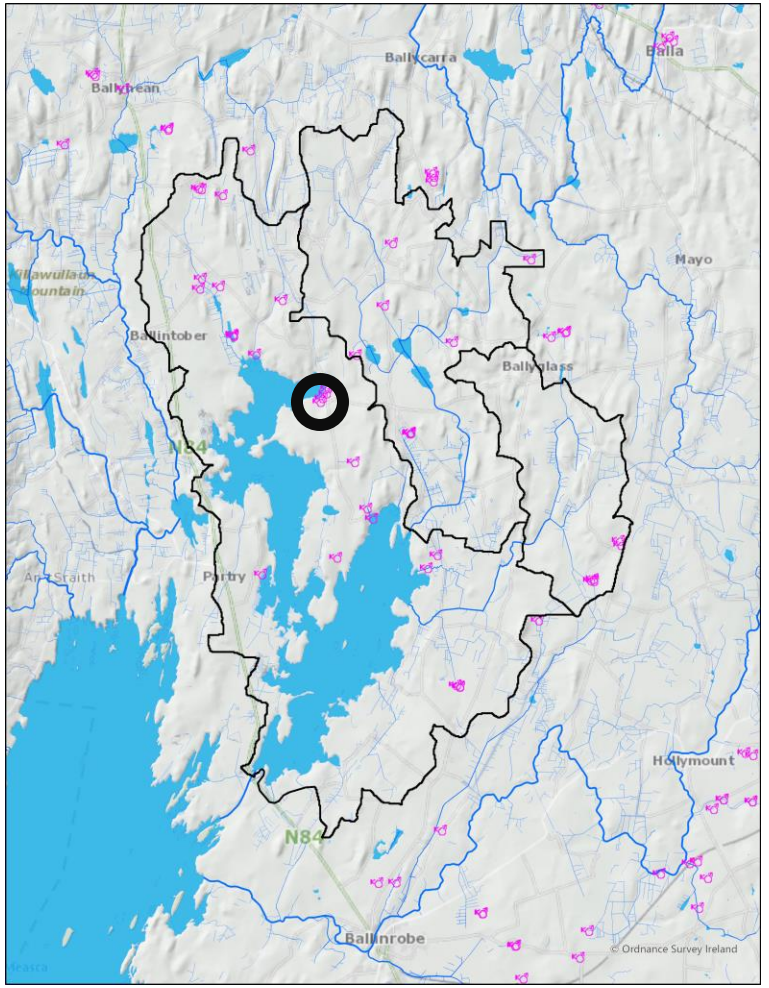
Point-entry contamination of agri-materials

Springs & Holy Wells



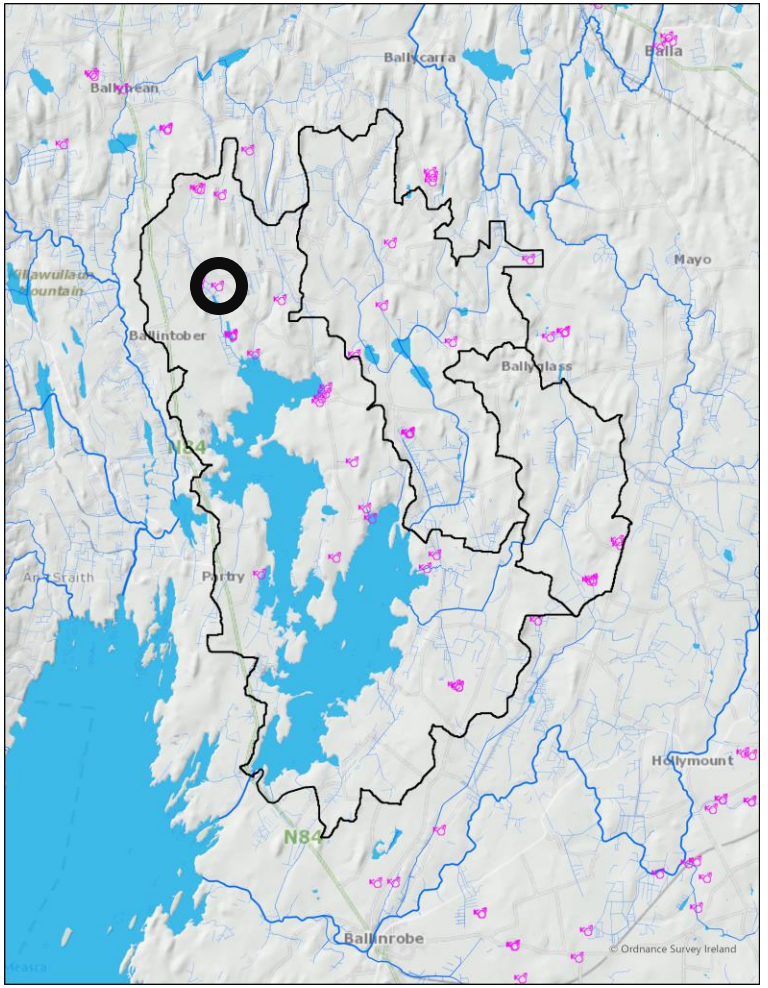
Liscunnell: Spring flowing from limestone pavement (ca. 0.25 l/s)

Springs & Holy Wells



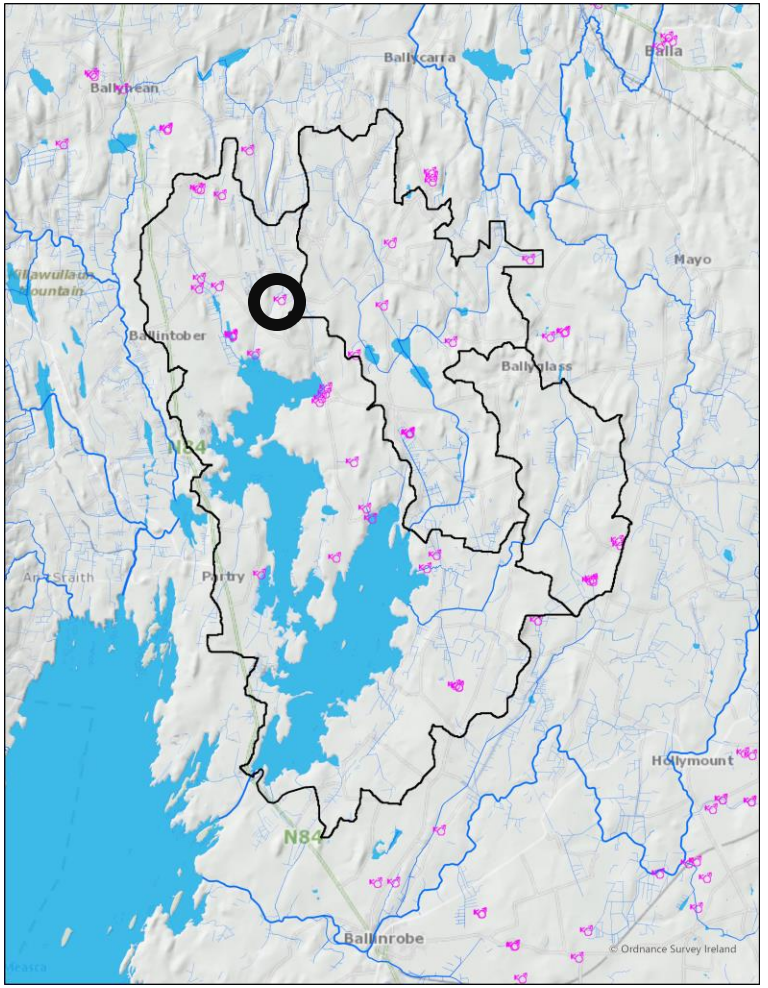
'Bull's Well', Burriscarra Abbey

Springs & Holy Wells



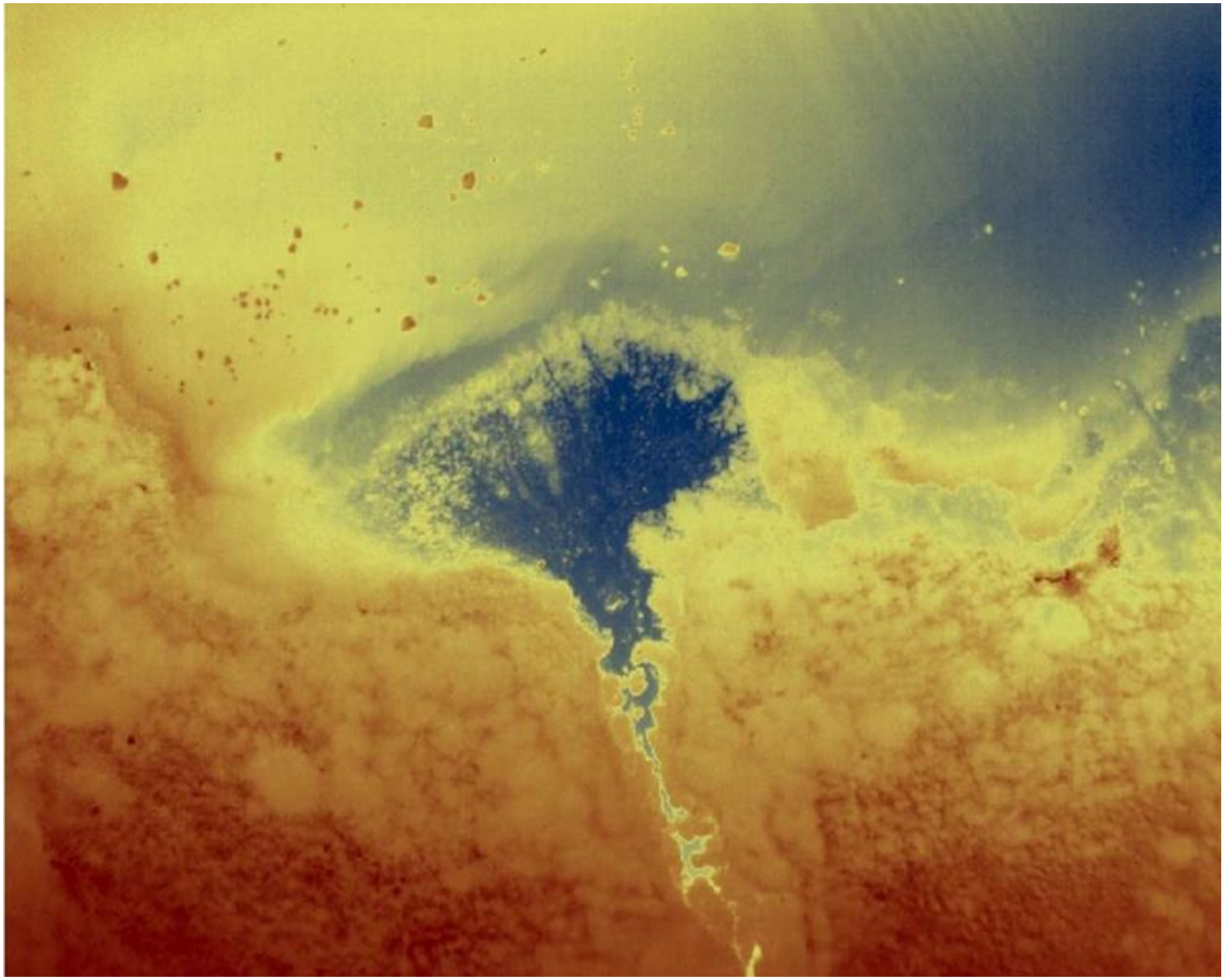
Tobar Padraig, Ballintober

Springs & Holy Wells



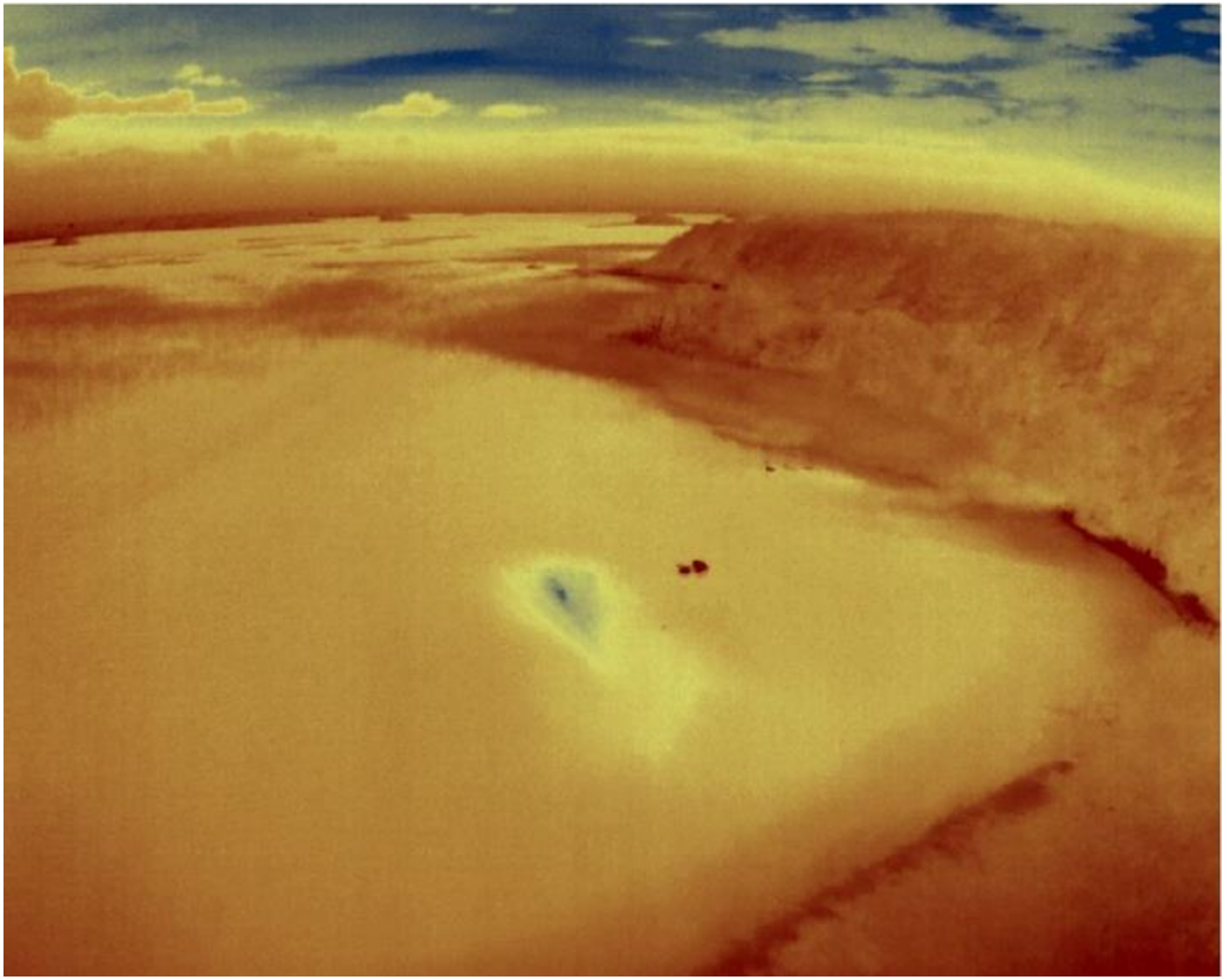
Old Cattle Wells, Glasgort

Thermal image of Bull's Well Spring (Burriscarra)

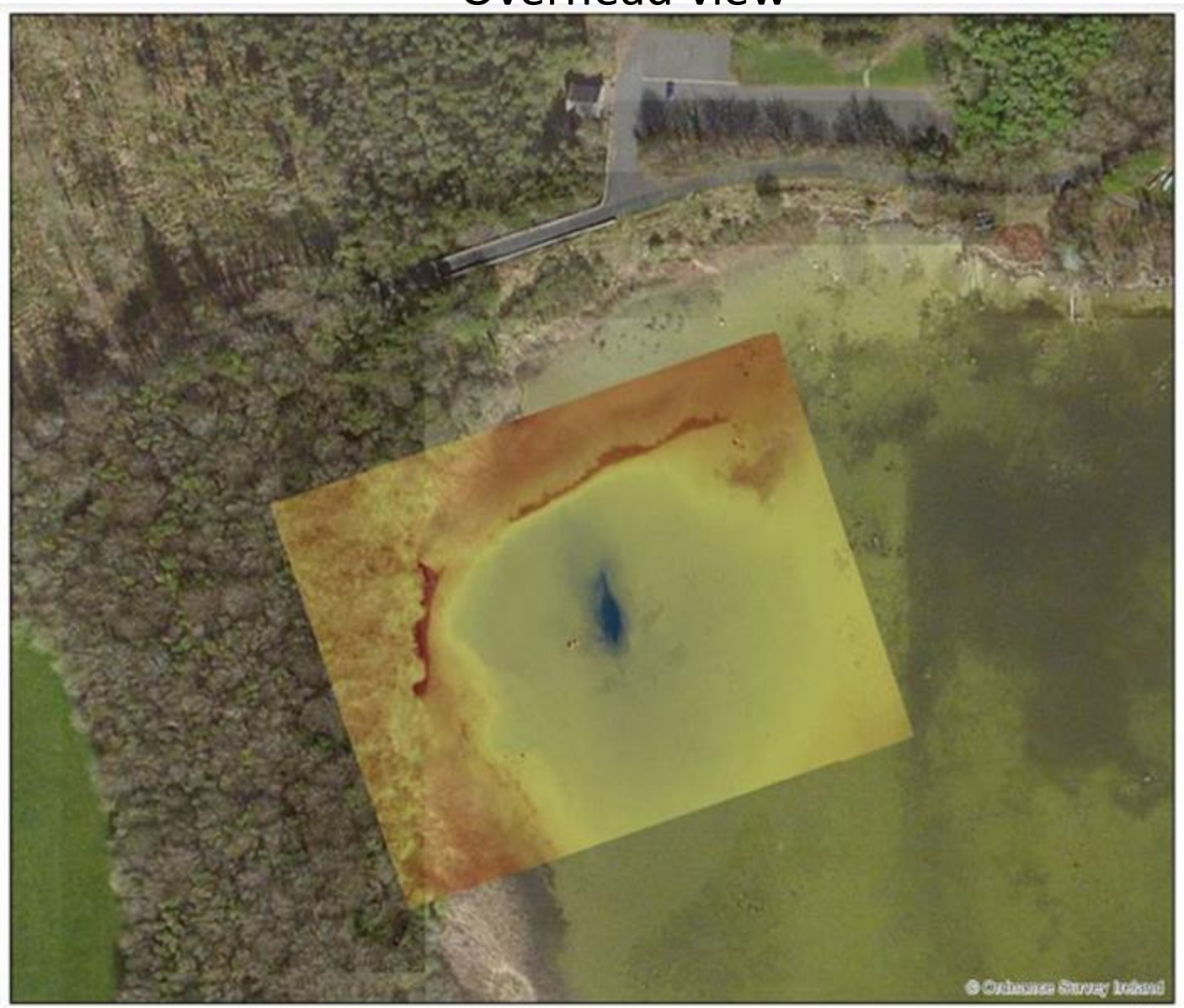


Flow

Thermal image of Moore Hall Subaqueous Spring oblique view

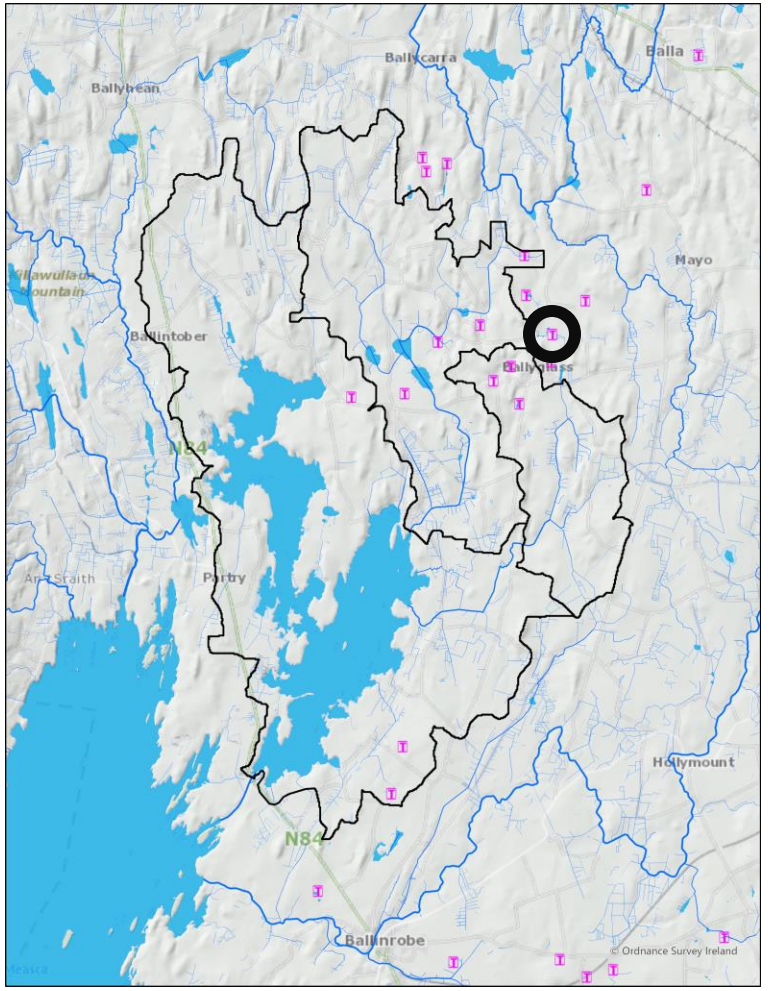


Thermal image of Moore Hall Subaqueous Spring Overhead view



Turloughs

Spring actively feeding a turlough in Ballyglass



Limestone Pavements & Other Lakeside Features

Limestone Pavement, Kilkeeran

Tubular, lake-shore karren (Simms, 2002), Castleburke

Limestone Pavements & Other Lakeside Features

Next steps

(Near) Future work:

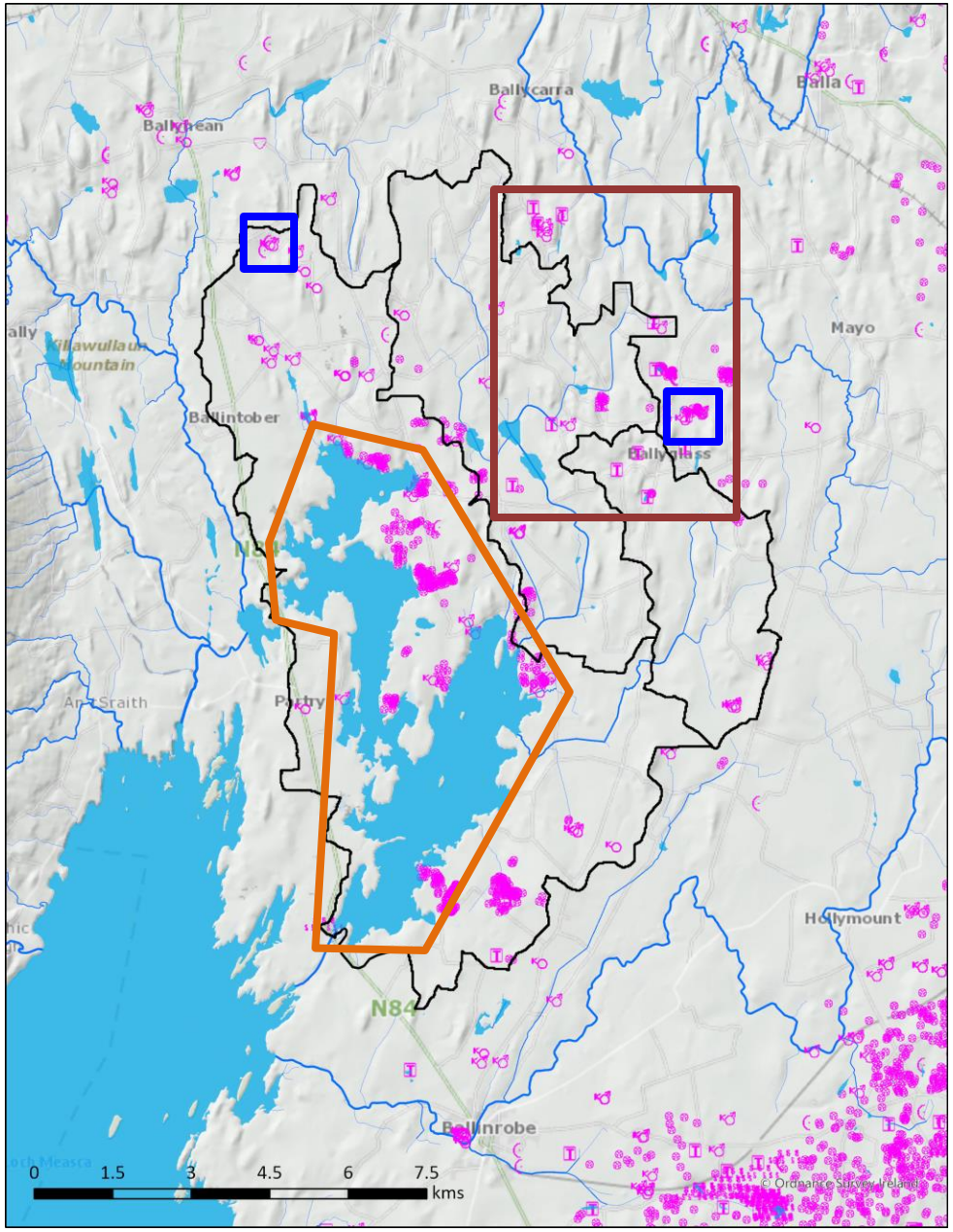
1. Turlough walkover survey

2. Lakeshore walkover survey

3. LiDAR survey

4. Private well survey

5. Dye tracing



Dye tracing: What's involved?

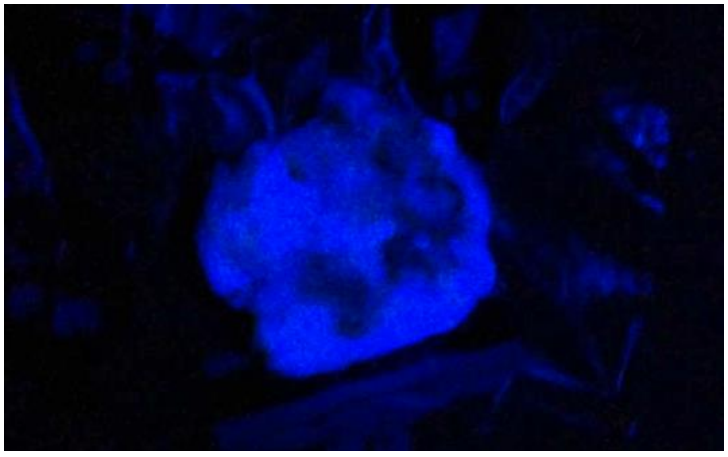
- Dye is injected into swallow holes and flows under ground
- The dye can be red (Rhodamine), green (Fluorescein) or colourless (optical brightener)
- The dye mixes and flows with groundwater

Dye tracing: What's involved?

- Springs, streams and rivers are monitored frequently for presence of dye

- Water samples are taken by:

- Automatic loggers
- Manually, using bottles, small bags of charcoal and/or cotton wool



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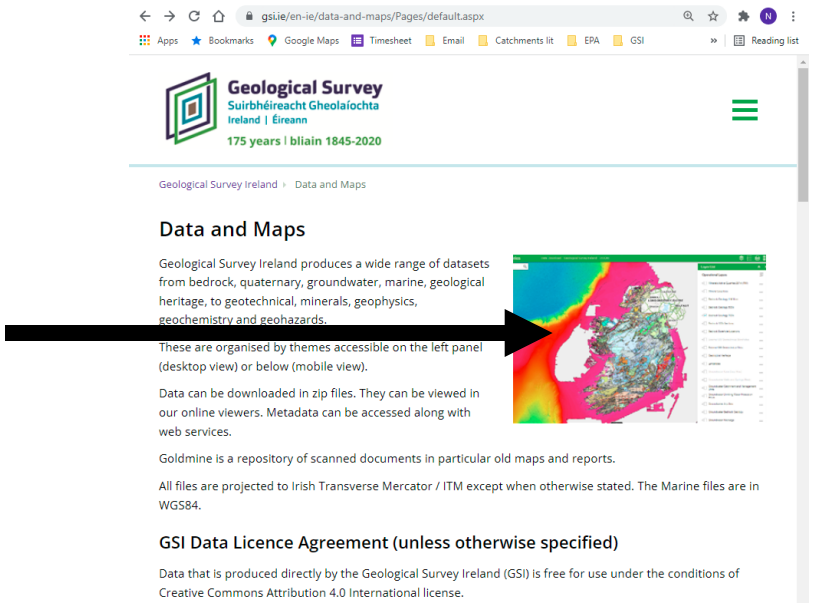
www.gsi.ie

www.gsi.ie/mapping

Click on the map!



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