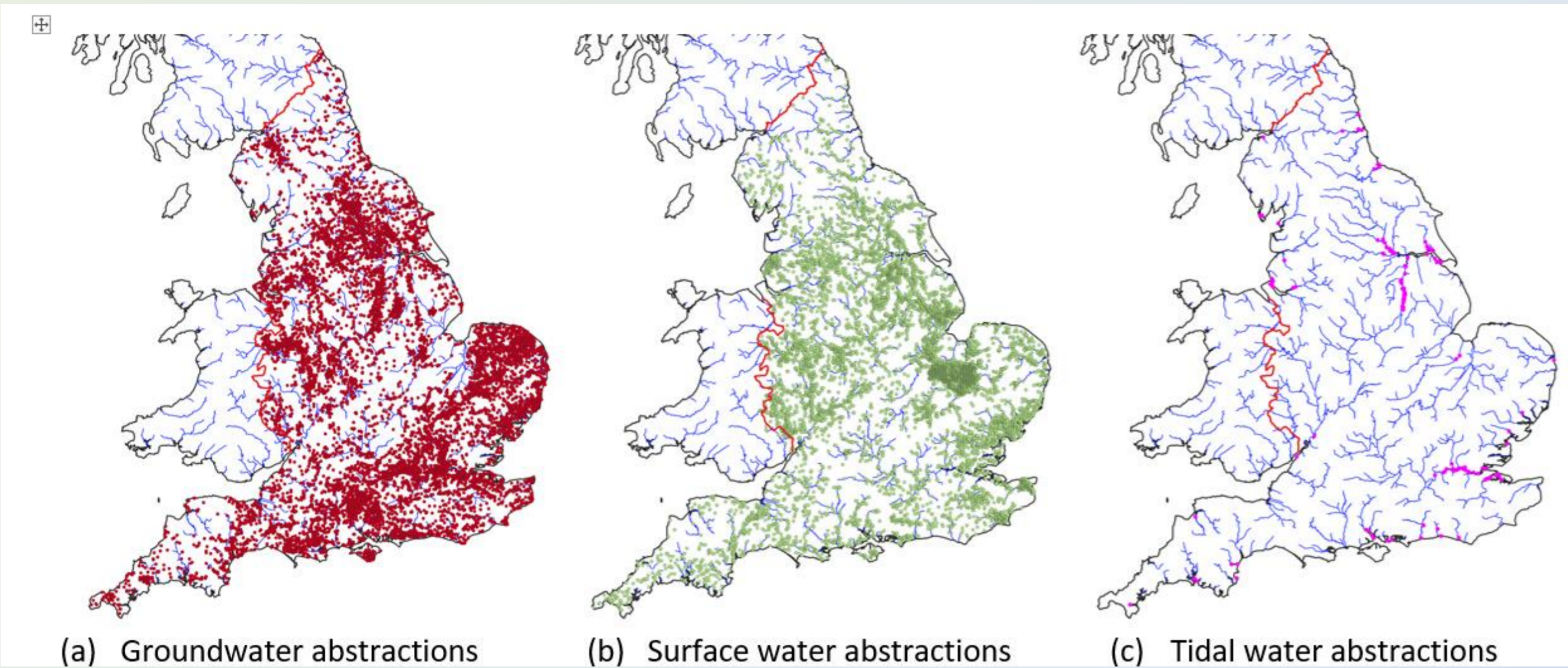




Rameshwaran P, Bell VA, Davies HN, Sadler P, Beverton A, Thornton R

1km resolution abstractions

The data provided consist of water abstraction licences operational from January 1999 to December 2014, associated monthly returns, and abstraction purposes (Primary, Secondary and Use purpose)

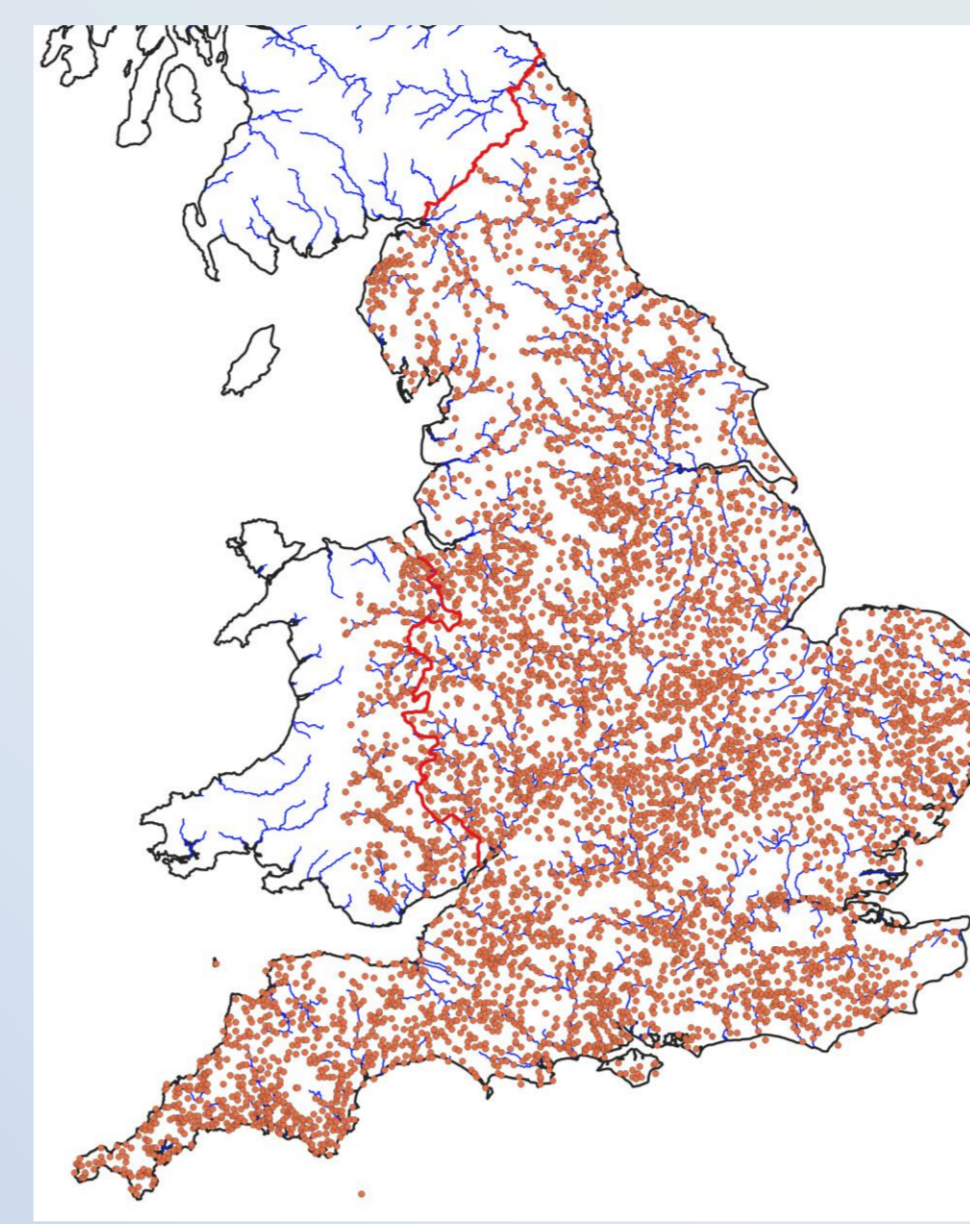


Locations of 1 km x 1 km resolution groundwater, surface water and tidal water abstractions. Regional boundaries with Scotland and Wales are shown in red

- Abstractions ($m^3 \text{ month}^{-1}$) have been converted to a 1km x 1km monthly resolution and are provided for three sources: Groundwater, Surface Water & Tidal Water
- Note that the abstraction data do not take account of water immediately returned to the source by the licence holder.
- Many abstractions are limited by a Hands-off Flow (HoF) threshold (for surface water abstractions, [see below](#)) or a Hands-off-Level threshold (used for groundwater abstractions).

1km resolution discharges

The anthropogenic discharge data used alongside the abstraction data consists of **discharge consent information** for England and were obtained from the Environment Agency's WRGIS (2017 version).



1 km resolution discharges

- These data represent effluents from sewage treatment works (STW) and other 'significant' direct discharges to the water sources (generally those $> 20 m^3 \text{ day}^{-1}$), such as from industry.
- This discharge daily rate is based on either an estimate of recent actual summer discharge (Q_{95} of the previous 6 years of discharge data where available), or it is based on the consented dry weather flow discharge (if 6 years of discharge data are unavailable).
- The relationship between discharge consent data and water returned from abstractions that are not consumptive can be complex. Generally, the discharge consents provided here include most of the water that is not consumed (permanently removed from the landscape, e.g., by evaporation) by the abstractor.

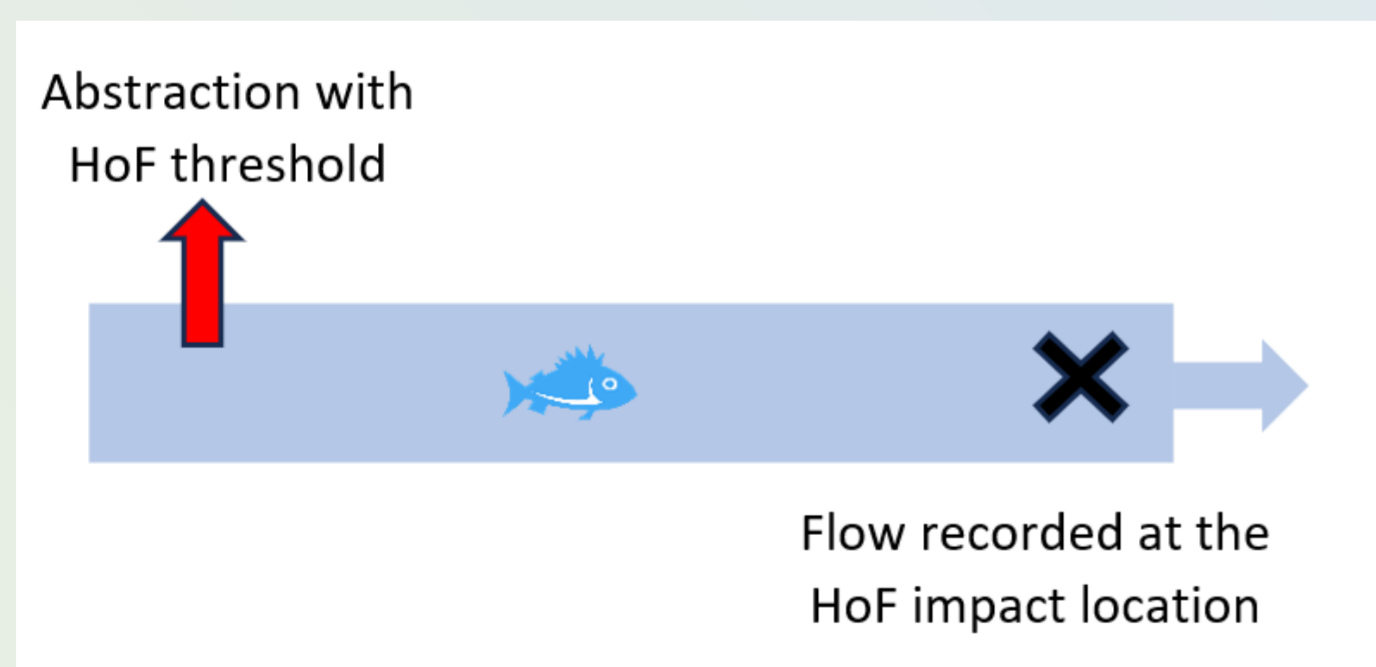
The final 1 km x 1 km resolution discharge dataset provides total discharges for actively discharging locations during the data period and combines discharges for consented dry weather flow ($m^3 \text{ day}^{-1}$) and recent actual discharge rate ($m^3 \text{ day}^{-1}$) for England (with some cross-border NRW data).

Overview

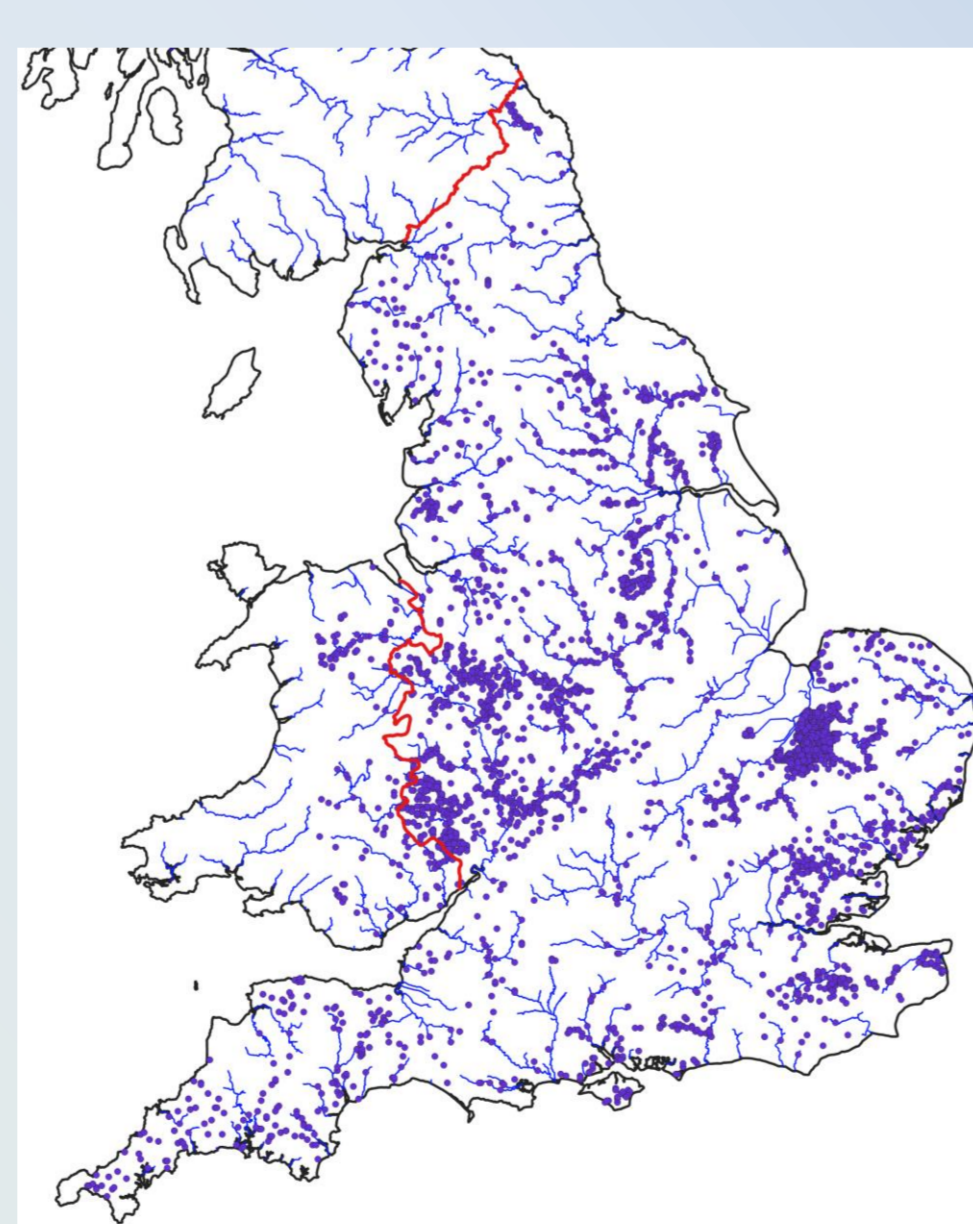
- UKCEH and the Environment Agency (EA) are publishing 15 years of 1km gridded monthly historical abstraction data (1999-2014) and a discharge dataset (annual mean) for England (Rameshwaran et al., 2024).
- Anthropogenic abstractions and discharges can have a significant impact on flows and freshwater ecosystems, and until now spatiotemporal data on these influences have been **unavailable for research without a licence**.
- Here, recorded or 'actual' abstraction and discharge data for sites across England have been transformed into 1 km x 1 km resolution gridded data along with surface water Hands-off Flow (HoF) conditions, and will soon be available in CSV and/or NetCDF formats on BADC (a NERC data centre):
 - Monthly abstractions ($m^3 \text{ month}^{-1}$) from 1999 to 2014 for Groundwater, Surface Water & Tidal Water
 - Daily rate of Consented Dry Weather flow (CDWF) and Recent Actual (RACT) discharges ($m^3 \text{ day}^{-1}$) based on information from a 6-year period ending in 2017
 - Hands-off Flow (HoF) conditions ($m^3 \text{ day}^{-1}$) for 2022
- Recently, the CS-NOW project (Climate services for a Net Zero resilient world - GOV.UK (www.gov.uk)) used the dataset to develop **future scenarios of abstractions and discharges**.

Hands off flow (HoF) conditions

- Many surface water abstractions are limited by a Hands-off Flow (HoF) threshold.
- Surface water abstractions constrained by a HoF flow value ($m^3 \text{ day}^{-1}$), are required to cease if the river flow falls below this threshold.
- This requirement is designed to prevent the detrimental impact of excessive abstraction on the environment and protect river ecosystems during periods of low flows particularly during drier years.
- The HoF condition is often applied with reference to river flows at a different location.



Abstraction can take place if the flow at the impact location (X) is above the HoF flow threshold



Surface water Hands-off Flow locations

The 1 km x 1 km resolution HoF dataset provides HoF flow threshold ($m^3 \text{ day}^{-1}$) and impact locations (Impact_Easting, Impact_Northing) for some but not all surface water abstractions, across England

Format/Availability

- These 1km gridded data will be published on NERC-CEDA in October 2024. <https://catalogue.ceda.ac.uk/uuid/18886f95ba84447f997efac96df456ad>
- The original datasets were sourced from the Environment Agency (EA: Environment Agency - GOV.UK (www.gov.uk)).
- Datasets are provided for England

Due to national security data restrictions regarding the location of public water supply abstractions, publication of the dataset is limited to a 1 km x 1 km resolution. Information at a higher resolution has been removed or converted to a 1 km x 1 km resolution as appropriate, and any personal or identifying data has been removed.

- Note that these 1km resolution abstraction and discharge data are a greatly-simplified representation of true historical water influences.
- A data description document provides further details: Rameshwaran et al. (2024).

Type	Format	Name of files (1 km x 1 km gridded)
Abstraction:		
1 km x 1 km abstractions for multiple purposes	CSV	England_Monthly_Abstactions_1km_GW_SW_TW_199901_201412.csv
1 km x 1 km abstractions for multiple purposes	CSV	England_Monthly_5YRMEAN_Abstactions_1km_GW_SW_TW_2010_2014.csv
Total CS-NOW (weighted)	NetCDF	England_Monthly_Weighted_Abstactions_1km_Grid_GW_199901_201412.nc England_Monthly_Weighted_Abstactions_1km_Grid_SW_199901_201412.nc
Discharge:		
1 km x 1 km discharges for multiple purposes	CSV	England_Daily_Rate_Discharges_1km_CDWF_RACT_2017.csv
CS-NOW	NetCDF	England_Daily_Rate_Discharges_1km_Grid_RACT_2017.nc
Hands-off Flow (HoF):		
1 km x 1 km HoF values	CSV	England_HoF_1km_2022.csv
	NetCDF	England_HoF_Threshold_1km_Grid_2022.nc England_HoF_Impact_Easting_1km_Grid_2022.nc England_HoF_Impact_Northing_1km_Grid_2022.nc

Table: Available data and filenames/types

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Reference: Rameshwaran, P., Bell, V. A., Davies, H. N., Sadler, P., Beverton, A., & Thornton, R. (2024). Data Documentation: Gridded Actual Abstraction, Discharge and Hands-off Flow Datasets for England. Zenodo. <https://doi.org/10.5281/zenodo.13746897>