



EDWARD LEWIS & MARTIN NAYEMBIL

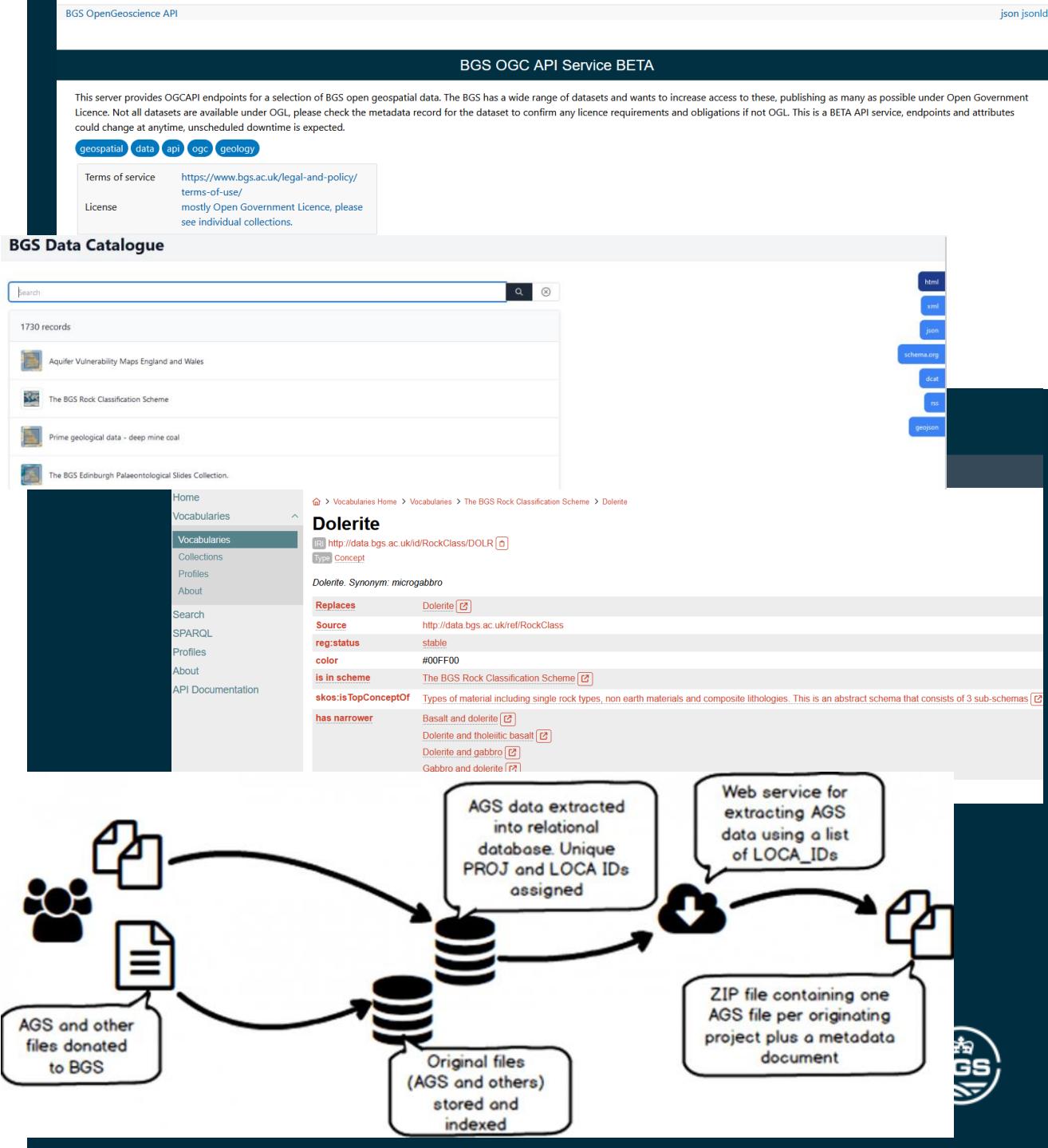
Making Subsurface Data FAIR



British
Geological
Survey

Conclusions First!

- The subsurface impacts and supports the surface.
- The data value increased dramatically by commitment of those who submit it as open data allowing it to be reused with interoperable data models/formats (.ags).
- The re-launch of the Construction Playbook means it is now a requirement for public sector projects that any ground investigation data collected must be shared as soon as reasonably practical with the British Geological Survey (BGS).
- Standards Matter:
 - Metadata (SEO)
 - Data Models – Ontologies/Vocabularies
 - Data Services (Web Services/API's)
 - Encodings (File Formats)
- New BGS data access options
 - BGS OGC API – Features
 - BGS OGC API – Tiles
 - BGS OGC API – Records
 - Linked Data Server Vocabularies & PIDs



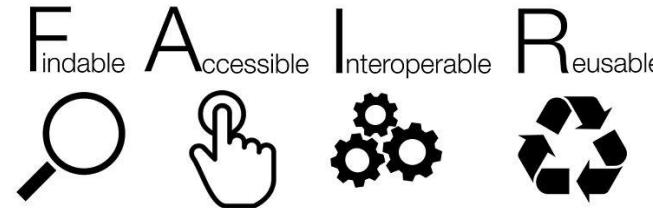


BGS



British Geological Survey

- National geological survey founded in 1835
- UK custodian of geoscientific information
- Independent
- 600 staff
- Part of UKRI, a not-for-profit public sector research establishment
- Funded by Government & external income
- Offices at Keyworth, Wallingford, Edinburgh & Cardiff
- Includes the NERC Environmental Data Service for Geoscience.



National Geoscience Data Centre (NGDC)

- The National Geoscience Data Centre (NGDC) collects and preserves geoscientific data and information, making them available for the long-term to a wide range of users and communities.
 - The NGDC is recognised as the NERC Environmental Data Centre for geoscience data.
 - Includes
 - All data funded by NERC research grants
 - Voluntary data deposits - Geotech drilling, Aggregates Production
 - Statutory data deposits – Minerals, Water and Petroleum drilling

Deposited data search

This search allows you to discover data that has been ingested by the National Geoscience Data Centre (NGDC) and the National Geological Data layers on the [Geoidex](#).

To deposit data with the NGDC please visit our [Deposit Portal](#).

[Simple search](#) [Advanced search](#)

Text search 

[Search](#) [Clear All Tabs](#)

Filter results by location

Some results do not contain spatial data and so will not appear on the map.
Remember to clear any limitations on map before starting new search.

+ -

Enter location to centre map

The National Geoscience Data Centre (NGDC) collects and preserves geoscientific data and information, making them available for the long-term to a wide range of users and communities. The NGDC is recognised as the NERC Environmental Data Centre for geoscience data.

The NGDC is responsible for managing geoscientifically valuable information and datasets. The data it holds covers many geological disciplines dealing with the physical structure of the Earth and the processes that act on it, as measured from geological time to near-real-time sensor and data streams. It is the NGDC policy to preserve this data, which underpins the existing scientific record, and make it accessible for future re-use to a wide range of user communities.

Remit and scope of NGDC

Notification to drill information

Useful links

FAQs

Depositing data and records with NGDC

Searching and retrieving data

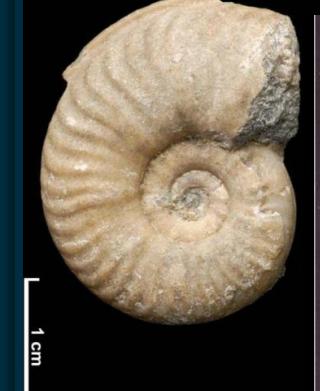
Old wells, boreholes and datasets

Drilling new boreholes

Grants

Using the Deposited Data

centre map

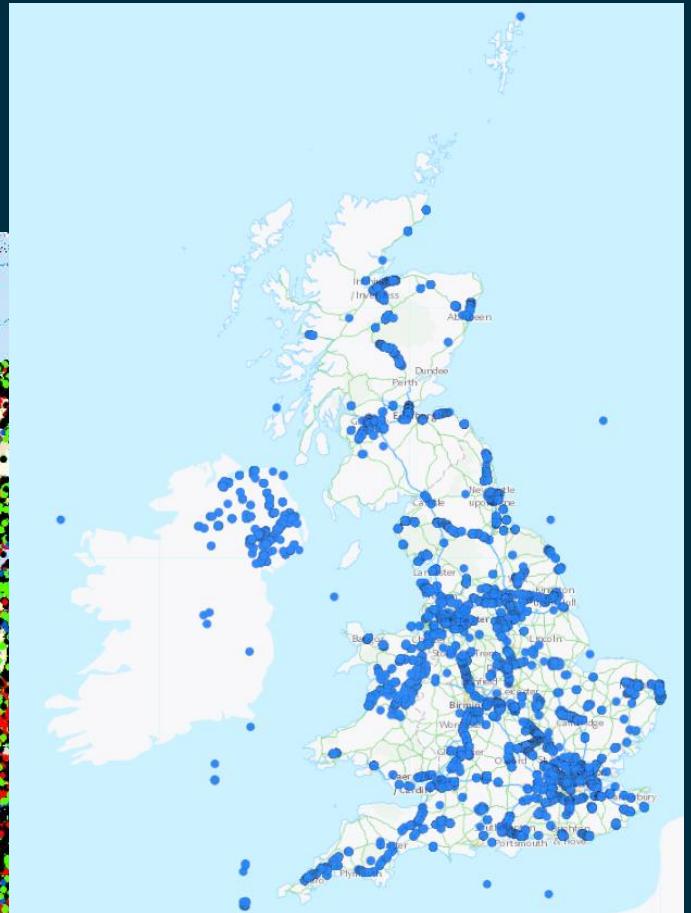
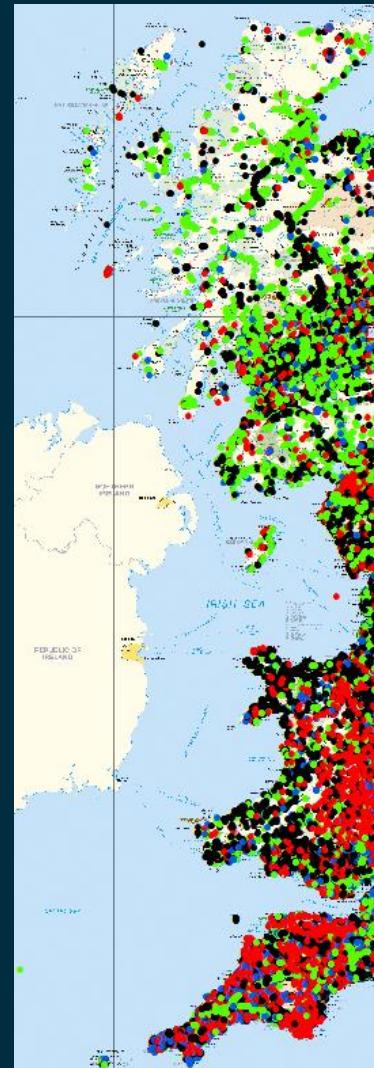
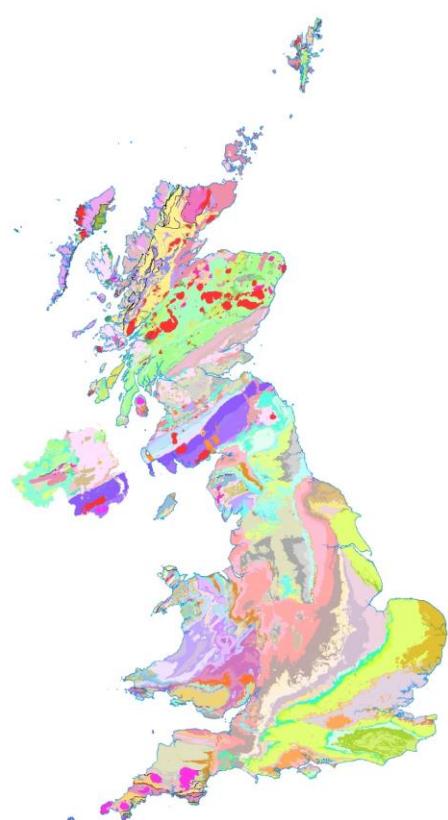




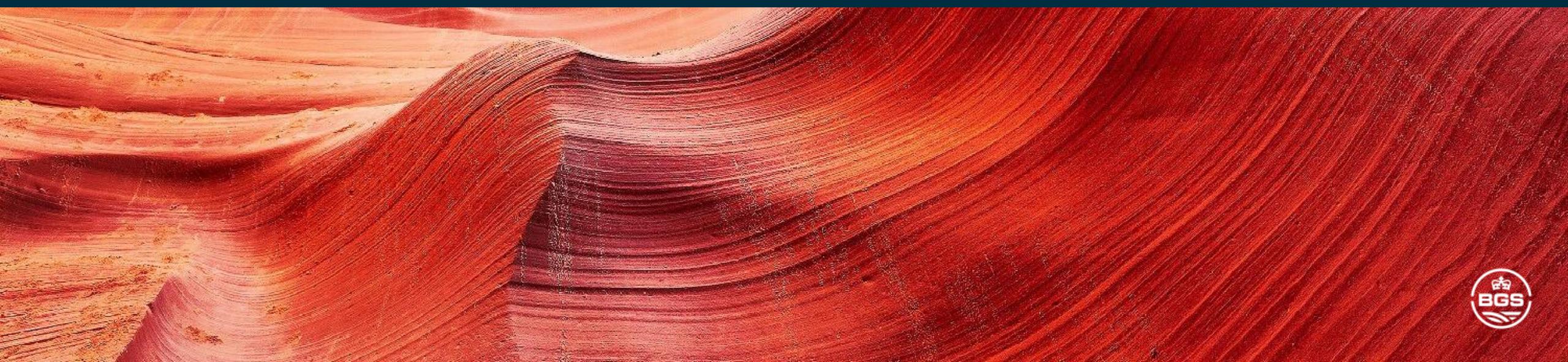



BGS data and public good

- BGS has a remit to curate, store and disseminate geospatial data
- The new BGS Strategy contains science priority – “Maps and Models for the 21st century”
- Part of the BGS role is to provide access to open data
- Examples - geological maps, boreholes, groundwater, minerals, geohazards.



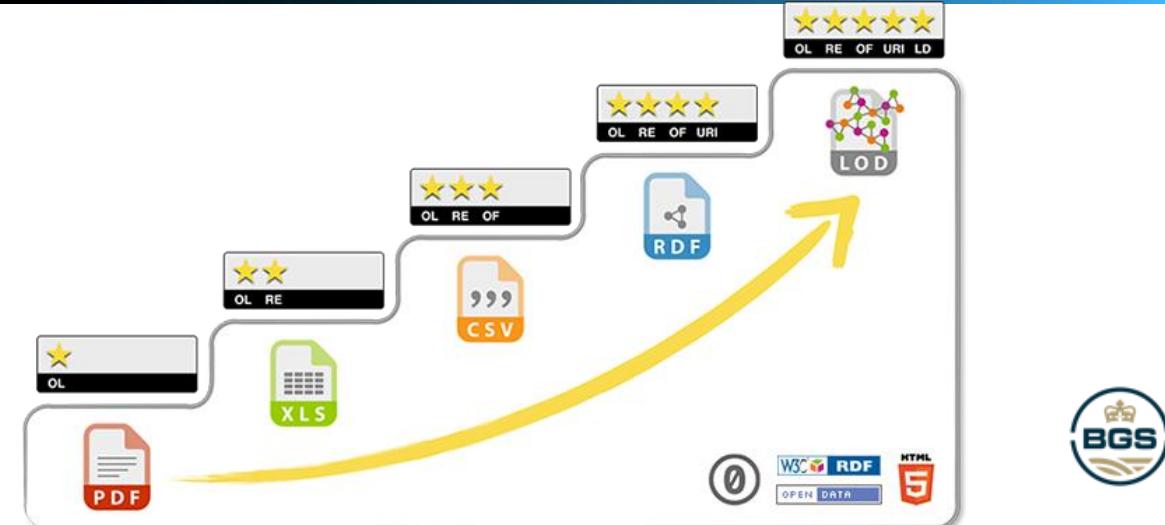
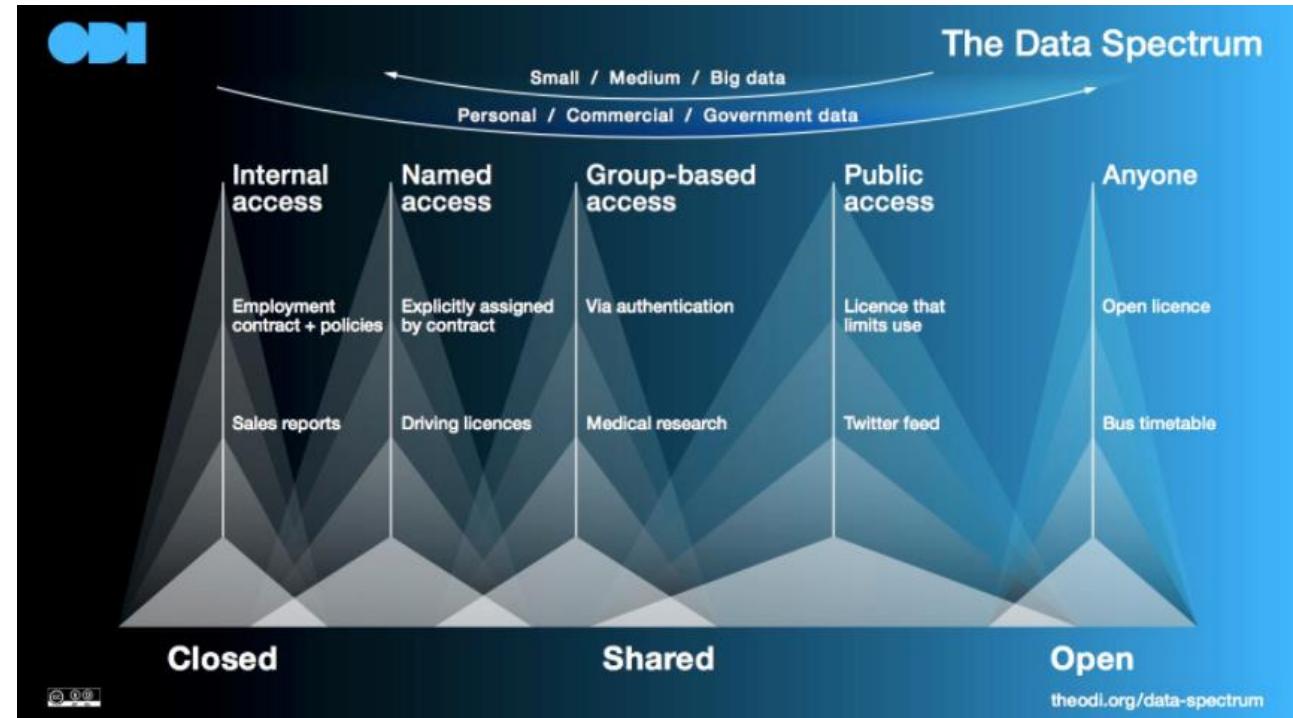
FAIR Data



FAIR vs Open Data

FAIR data and open data are different, although there are similarities.

- The key difference is that open data should be available to everyone to access, use, and share, without licences, copyright, or patents. It is expected that open data at most should be subject to attribution/share-alike licenses.
- FAIR data, however, uses the term “Accessible” to mean accessible by appropriate people, at an appropriate time, in an appropriate way. This means that data can be FAIR when it is private, when it is accessible by a defined group of people, or when it is accessible by everyone (open data).



Interoperability Challenges

“We can't share maps on the Web.”

“We can't deliver data to different systems.”

“We don't have a common language to speak about our geospatial data or our services.”

“We can't find and pull together data from our automated sensors.”

“We have security issues relating to geospatial data exchange.”



Key Guidance - Covers Semantics / Transfer (formats/API's) / Metadata

- **UK Geospatial Data Standards Register**
- Spatial Data on the Web Best Practices
- 'Geospatial Standards for UK data providers' (Ordnance Survey/Geospatial Commission)
- UK Government Digital Service Standards
- Open Geospatial Commission Standards
- INSPIRE
- Data.gov.uk requirements
- UN-GGIM Standards Guide



UK Geospatial Data Standards Register

- Ensure UK geospatial data is more FAIR

What's in it?

- Geospatial identifiers, metadata, data formats, data content, coordinate reference systems, coordinate reference system transformation and data services
- [UK GEMINI v2.3](#) -> [MEDIN Discovery](#) metadata standard v3.1.2 (Marine Profile)
- CRS & CRS Transformations



The screenshot shows the official website for the UK Geospatial Data Standards Register. At the top, the GOV.UK logo is visible along with navigation links for 'Menu' and 'Search'. Below the header, the Cabinet Office and Geospatial Commission logos are displayed. The main title 'UK Geospatial Data Standards Register' is prominently featured in a large blue banner, with the subtitle 'Updated 15 April 2024' underneath. To the left, a 'Contents' sidebar lists various topics such as 'Purpose of the register and use of standards', 'Geospatial identifiers and metadata', and 'Coordinate reference systems'. A 'Print this page' button is located at the bottom of this sidebar. The main content area to the right is titled 'Purpose of the register and use of standards' and explains the register's role in ensuring data consistency and accessibility across systems. It also highlights the empowerment of the geospatial community and advocacy for standards in other sectors. A note states that the register currently contains standards for identifiers, metadata, data format, data content, coordinate reference systems, coordinate reference system transformation, and data services.



Summary

- Geodata should be easily findable and accessible in a digital format that is easily used
- Quality (19157) assured to ensure that geodata release is reliable. Should be interoperable and reuseable
- Seamless geodata/Value Added Geodata is less important than findability and accessibility of geodata – get the basics right first
- Reusable – “everything” has a licence/copyright, try and ensure reusability.
- Good infrastructure (including a well-functioning org that is responsive and services the needs of investors) e.g. functioning 24/7 portals/downloads/API’s





CASE STUDY

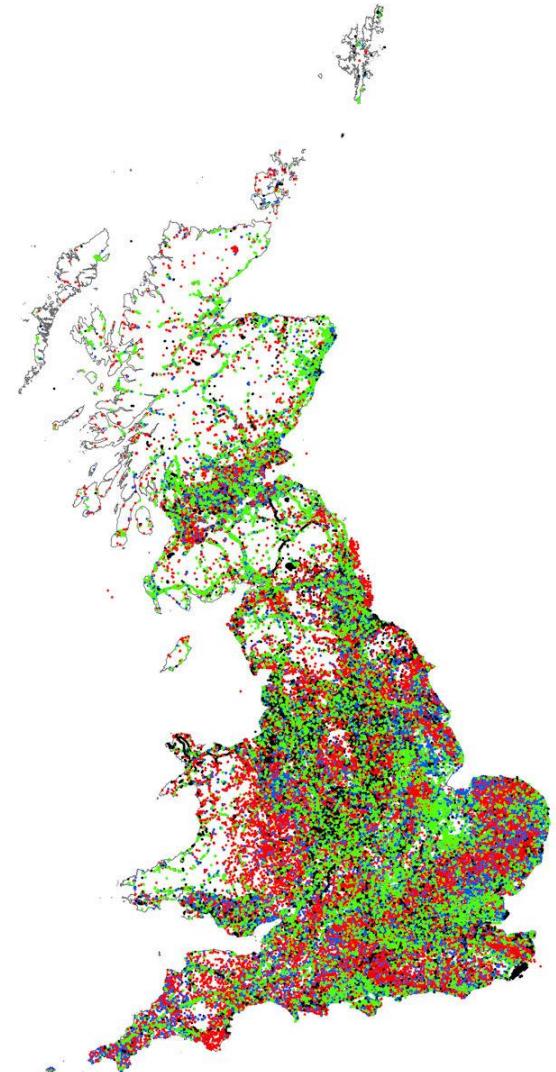
Geotechnical Data



Context

Did you know that currently when a borehole is drilled the information gained is often only used once?

- ~500,000 boreholes are sunk in the UK every year, mainly for construction and infrastructure projects.
- The NGDC holds over **1.4 million** UK borehole records.
- Thousands of new ground investigation records are added each year.
- This data provides vital geological, geotechnical and geoenvironmental information that is essential for construction, infrastructure and academic research.
- 50% of project delays are caused by not understanding ground conditions
(Source: NCE, Tim Chapman, Director, Arup)
- Government encourages 'open data' approach
- **The BGS estimates that 80% of borehole data is not reported to them, resulting in an estimated loss of data and knowledge to the UK economy valued in the region of £150-200 million per year.**



Context

- Farringdon Station - Elizabeth Line
 - Robust ground-truthed 3D geological model created by the BGS and taken forward by the project partners (Dr Sauer Group and BAM Ferrovial Kier Joint Venture).
 - Utilised a wealth of historical borehole data both held by the different project partners and augment this with newly acquired ground investigation data, to better predict the ground conditions.
- This led to a 70% reduction of in-tunnel probing from original plans and delivered a cycle of risk reduction thereby saving significant amounts of time and costs.
 - <https://learninglegacy.crossrail.co.uk/documents/3d-geological-model-completed-farringdon-underground-railway-station/>



Geotechnical Data Standards

- Two Data Formats Globally
 - DIGGS – North America
 - AGS Data Format – UK, Australia, NZ, Hong Kong, growing use across Europe & Asia
 - V1 – 1992! Currently v4.1.1
 - Text file format based
 - Standard way to transfer ground investigation, laboratory testing and monitoring data
 - Strong Support Across Industry and Software Vendors

- Associated Standards

- AGS Piling
- AGSi – Ground Models



Code Blame 100 lines (93 loc) · 6.6 KB

```
1 "GROUP", "PROJ"
2 "HEADING", "PROJ_ID", "PROJ_AGS", "PROJ_CLNT", "PROJ_LOC", "PROJ_CONT", "PROJ_ENG", "PROJ_NAME"
3 "UNIT", "", "", "", "", "", ""
4 "TYPE", "X", "X", "X", "X", "X", "X"
5 "DATA", "4284", "4.0", "ROCHDALE M.B.C", "GALE STREET", "STRATA SURVEYS LTD.", "N/A", "Gale Street Rochdale"
6
7 "GROUP", "LOCA"
8 "HEADING", "LOCA_FDEP", "LOCA_GL", "LOCA_ID", "LOCA_NATE", "LOCA_NATN", "LOCA_REM"
9 "UNIT", "", "", "", "", ""
10 "TYPE", "X", "X", "X", "X", "X", "X"
11 "DATA", "6.5", "Null", "GALE STREET ROCHDALE 3", "389640.00", "415030.00", "29656"
12 "DATA", "8", "Null", "GALE STREET ROCHDALE 5", "389570.00", "415020.00", "29658"
13 "DATA", "6.5", "Null", "GALE STREET ROCHDALE 4", "389600.00", "415030.00", "29657"
14 "DATA", "6.5", "Null", "GALE STREET ROCHDALE 2", "389660.00", "415060.00", "29655"
15
16 "GROUP", "GEOL"
17 "HEADING", "LOCA_ID", "GEOL_BASE", "GEOL_DESC", "GEOL_GEO2", "GEOL_LEG", "GEOL_TOP"
18 "UNIT", "", "", "", "", ""
19 "TYPE", "X", "X", "X", "X", "X", "X"
20 "DATA", "GALE STREET ROCHDALE 2", "0.30", "MADE GROUND: Ash", "MADE GROUND", "102", "0.00"
21 "DATA", "GALE STREET ROCHDALE 2", "2.50", "Firm becoming stiff brown silty sandy fine to medium gravelly CLAY.", "CLAY", "211", "0.30"
22 "DATA", "GALE STREET ROCHDALE 2", "3.50", "Medium dense to dense moist brown silty gravelly SAND.", "SAND", "412", "2.50"
23 "DATA", "GALE STREET ROCHDALE 2", "4.50", "Medium dense moist brown slightly clayey silty gravelly SAND.", "SAND", "408", "3.50"
24 "DATA", "GALE STREET ROCHDALE 2", "6.10", "Soft grey clayey SILT with occasional mudstone gravel. ", "CLAY", "301", "4.50"
25 "DATA", "GALE STREET ROCHDALE 2", "6.50", "Medium dense black highly weathered MUDSTONE.", "MUDSTONE", "801", "6.10"
26 "DATA", "GALE STREET ROCHDALE 3", "0.40", "MADE GROUND: Ash", "MADE GROUND", "102", "0.00"
27 "DATA", "GALE STREET ROCHDALE 3", "3.20", "Firm brown silty slightly sandy CLAY with occasional gravel.", "CLAY", "207", "0.40"
28 "DATA", "GALE STREET ROCHDALE 3", "4.30", "Loose brown clayey silty gravelly SAND.", "SAND", "408", "3.20"
29 "DATA", "GALE STREET ROCHDALE 3", "5.00", "Loose brown fine sandy SILT.", "SILT", "301", "4.30"
```



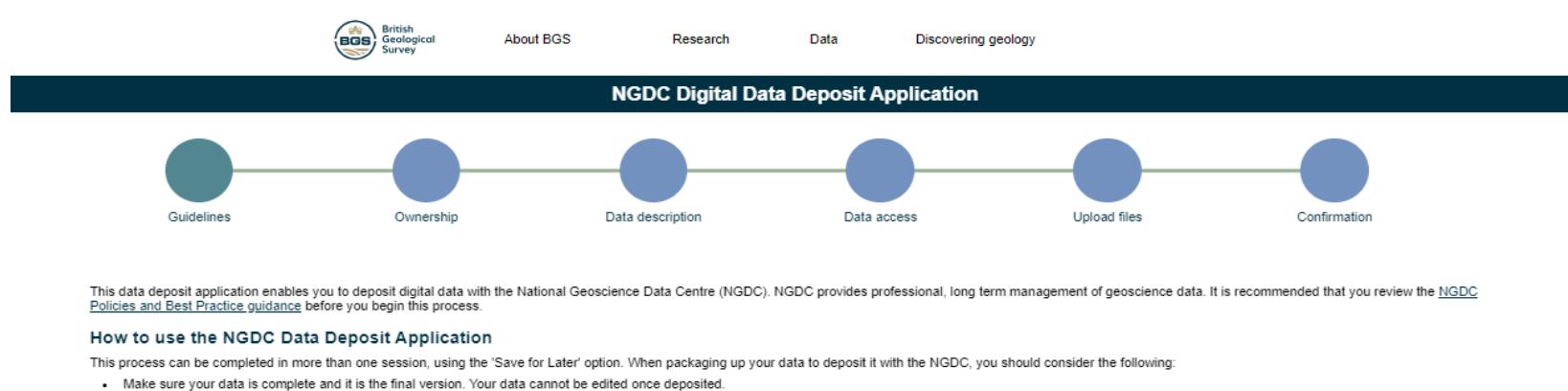
The background of the slide is a high-angle aerial photograph of a winding, reddish-brown dirt or paved road cutting through a vast, rugged terrain. The landscape is characterized by distinct geological layers and colors, ranging from deep blues and greens to warm browns and yellows. The road follows the contours of the land, creating a sense of movement across the frame.

IMPROVEMENTS

AGS Ingestion, Storage & Delivery

Ingestion

- File are deposited using with the NGDC Data Deposit Application <http://transfer.bgs.ac.uk/ingestion>
- **Users are recommended to validate their .ags prior to submitting using AGS4 File Utilities Tool (<https://agsapi.bgs.ac.uk/>).**
 - The legacy AGS Validator (<https://webapps.bgs.ac.uk/data/ags/validation/index.cfm>) is still available for AGS3 data.



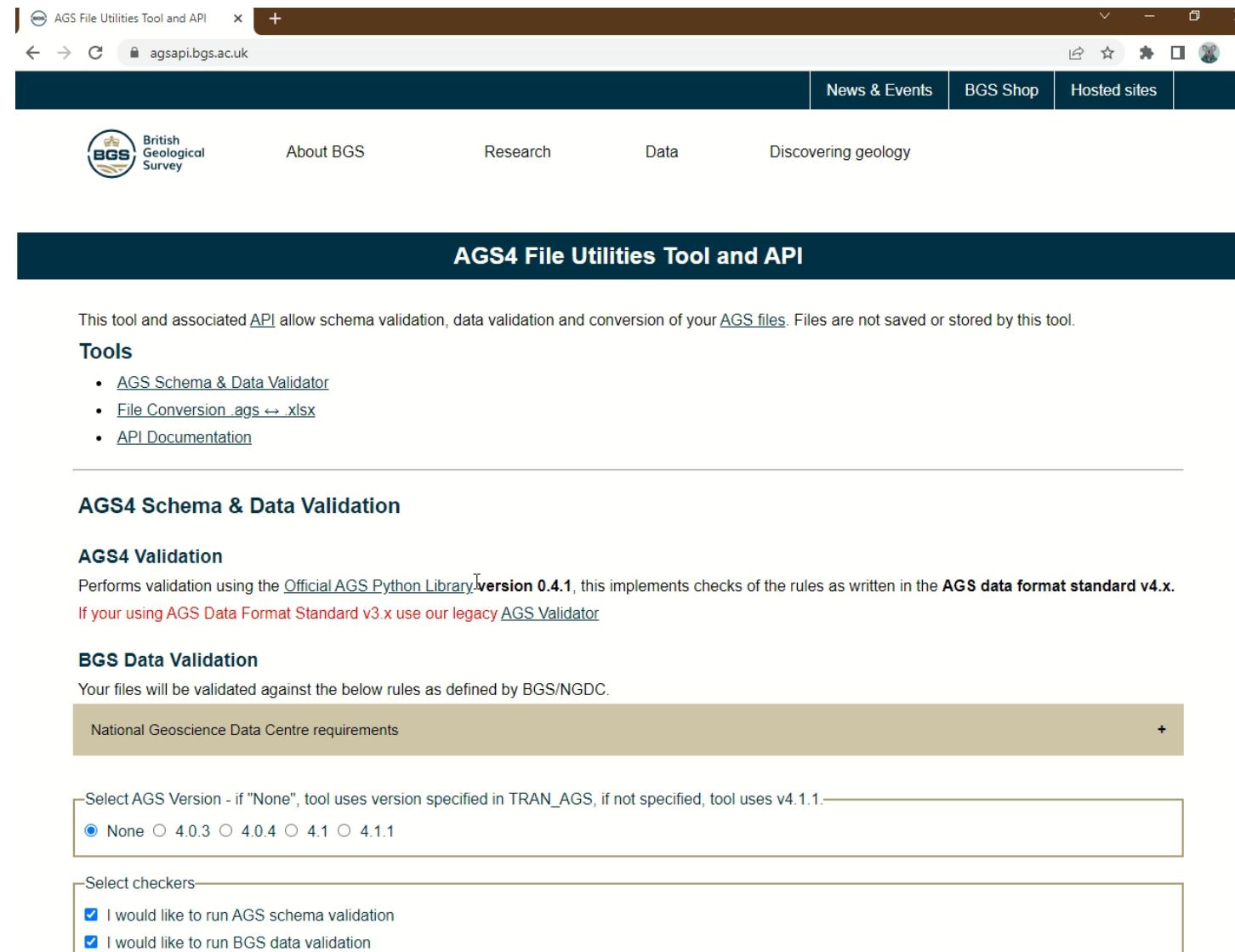
- It is a very simple process to describe the data you are depositing and ensure that you stick to the default option of OPEN data.
- **The data should then be available to view on various delivery platforms in ~ 5 days!!!**



[HTTPS://AGSAPI.BGS.AC.UK/](https://agsapi.bgs.ac.uk/)

Validation - AGS4 File Utilities Tool

- Users are recommended to validate their .ags prior to submitting using AGS4 File Utilities Tool (<https://agsapi.bgs.ac.uk/>).
- **UPDATED! Uses same python library as AGS Official Validator == Same Results!**
- Validates against AGS Rules & BGS submission requirements.
- Also offers conversion between .ags & .xlsx
- If you find an AGS3 file you can use the legacy validator
<https://webapps.bgs.ac.uk/data/ags/validation/index.cfm>



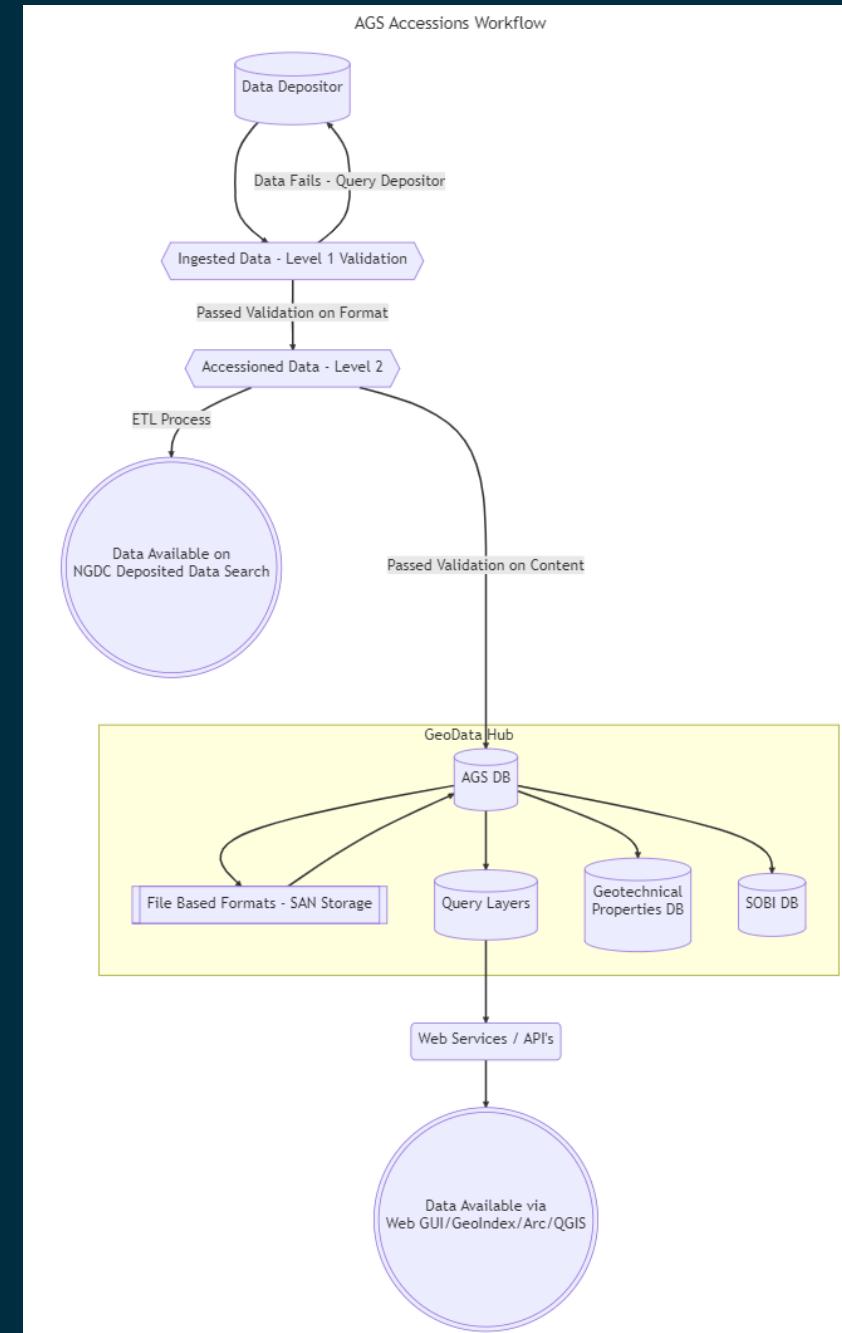
The screenshot shows a web browser window for the AGS4 File Utilities Tool and API at agsapi.bgs.ac.uk. The page has a dark header with the BGS logo and navigation links for News & Events, BGS Shop, and Hosted sites. A sub-header "AGS4 File Utilities Tool and API" is displayed above the main content area. The content area includes a brief description of the tool's purpose, a "Tools" section with links to AGS Schema & Data Validator, File Conversion .ags ↔ .xlsx, and API Documentation. Below this is a "AGS4 Schema & Data Validation" section with "AGS4 Validation" and "BGS Data Validation" subsections. The "AGS4 Validation" section notes the use of the Official AGS Python Library Version 0.4.1 and mentions a legacy AGS Validator for AGS Data Format Standard v3.x. The "BGS Data Validation" section states that files will be validated against BGS/NGDC rules. A "National Geoscience Data Centre requirements" section is shown with a dropdown menu for selecting AGS Version (None, 4.0.3, 4.0.4, 4.1, 4.1.1, or 4.1.1) and checkboxes for selecting checkers (AGS schema validation and BGS data validation). The background of the page features a geological image of layered rock.

Digital Workflow for AGS Borehole Data

- AGS Data Submitted (manually or via API)
- Ingested & Stage 1 validation
- Available on Deposited Data Search (~ 3 days)
- Stage 2 Validation
- Added to DB
- Available via GeoIndex/API's (< 10 day)

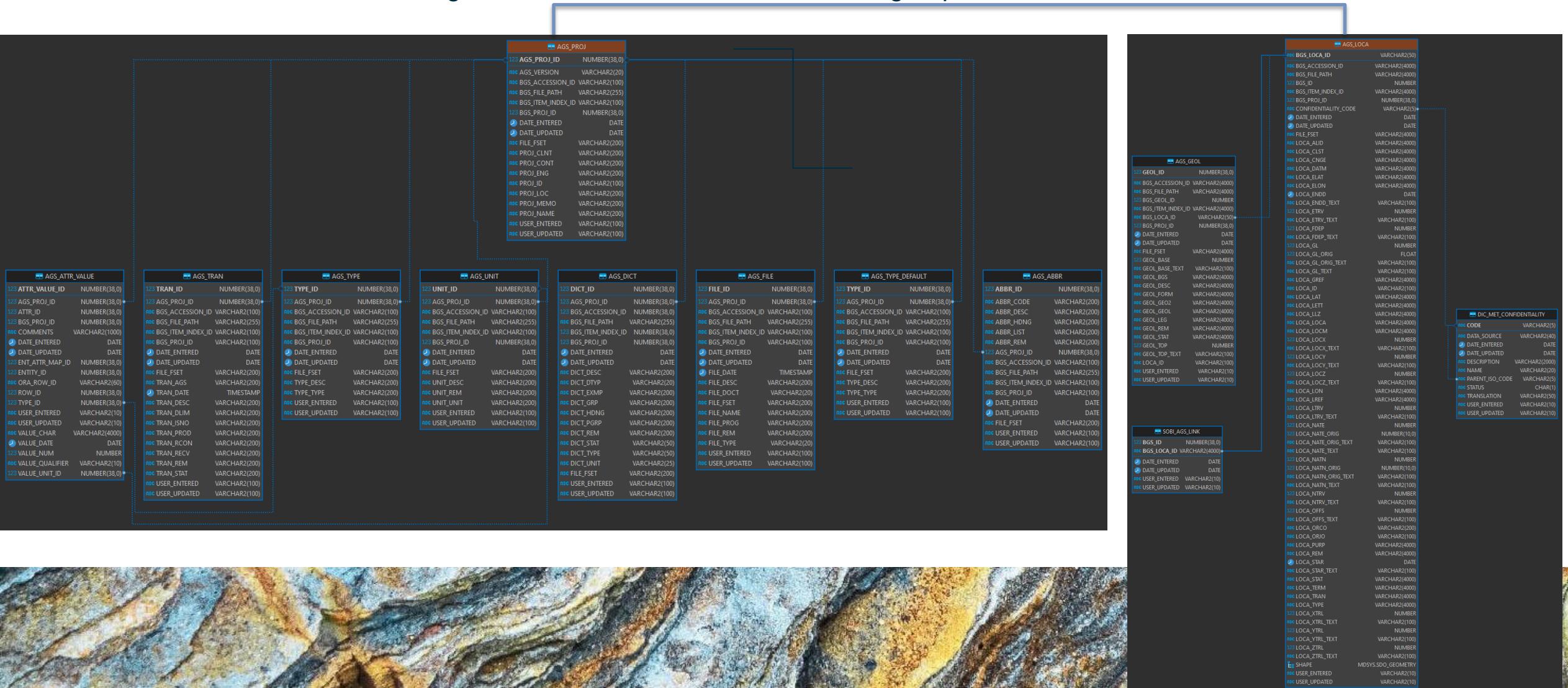
```
File Edit Format View Help
Project "PROJ"
"HEADING", "PROJ_ID", "PROJ_NAME", "PROJ_LOC", "PROJ_CLNT", "PROJ_CONT", "PROJ_ENG", "PROJ_MEMO", "FILE_FSEI"
"UNIT", "UNIT", "UNIT", "UNIT", "UNIT", "UNIT", "UNIT", "UNIT"
"TYPE", "X", "X", "X", "X", "X", "X", "X"
"DATA", "m", "metre"
"DATA", "mm", "millimetre"
"DATA", "yyyy-mm-ddThh:mm", "year-month-day hour:minute"
"DATA", "mm:ss", "seconds"
"DATA", "yyyy-mm-dd", "year-month-day"
"DATA", "mm", "millimetre"
"DATA", "%", "percentage"
"DATA", "deg", "degree (angle)"
"DATA", "hh:mm", "hour:minute"
"DATA", "ppm", "parts per million"
"DATA", "kg/m³", "kilogram per cubic metre"
"DATA", "m³/v", "kilogramme volume by volume"
"DATA", "l/s", "litres per second"
"DATA", "Mg/m³", "megagrams per cubic metre"
"DATA", "kg/m³", "kilogramme per litre"
"DATA", "mm/min", "millimetres per minute"
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"DATA", "N/m²", "newton per square metre per year"
"DATA", "mg/l", "milligrams per litre"
"DATA", "pH Units", "pH Unit"
"DATA", "mg/l", "microgram per litre"
"DATA", "ug/cm³", "micrograms per kilogram"
"DATA", "ug/cm³", "micrograms per centimetre"
"DATA", "g/l", "grams per litre"
"DATA", "ug/l", "micrograms per litre per kilogram"
"DATA", "ug/l", "micrograms per litre"

"GROUP", "TYPE"
"HEADING", "TYPE_TYPE", "TYPE_DESC"
"UNIT", "UNIT"
"TYPE", "X", "X"
"DATA", "X", "Unique identifier"
"DATA", "X", "Text"
"DATA", "2DP", "Value; required number of decimal places, 2"
"DATA", "DT", "Date Time (ISO 8601:2004)"
"DATA", "0DP", "Value; required number of decimal places, 0"
"DATA", "PA", "ABRR pick list"
"DATA", "MC", "Moisture content (BS1377:Part 2)"
"DATA", "2SF", "Value; required number of significant figures, 2"
"DATA", "DN", "Value; required number of decimal places, 1"
"DATA", "XNM", "Text/Numeric"
"DATA", "3DP", "Value; required number of decimal places, 3"
"DATA", "U", "Variable"
"DATA", "YN", "Yes/No"
"DATA", "3SF", "Value; required number of significant figures, 3"
"DATA", "PT", "Elapsed time"
"DATA", "PT", "Text listed in TYPE Group"
```



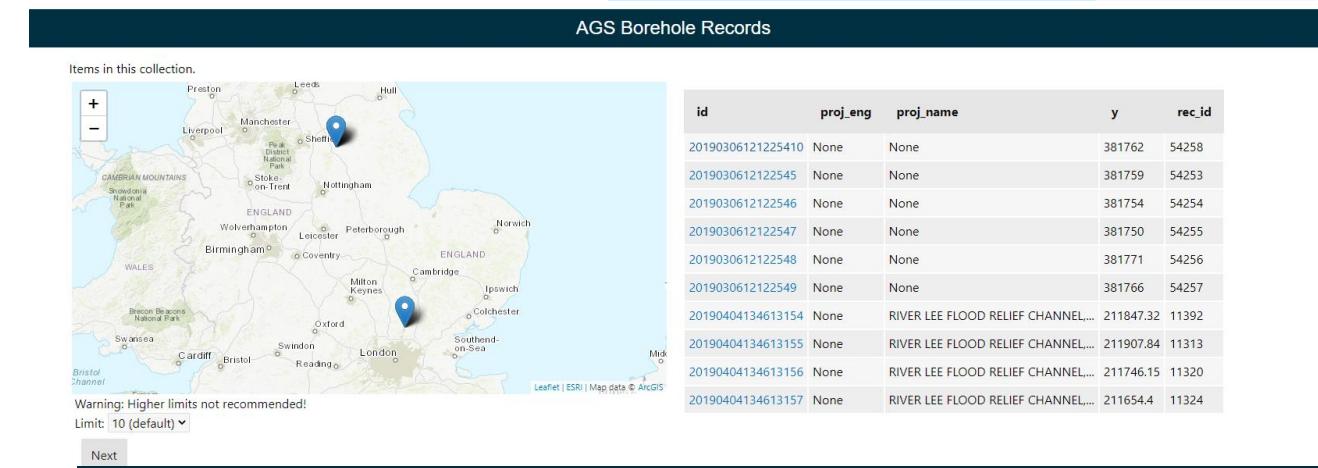
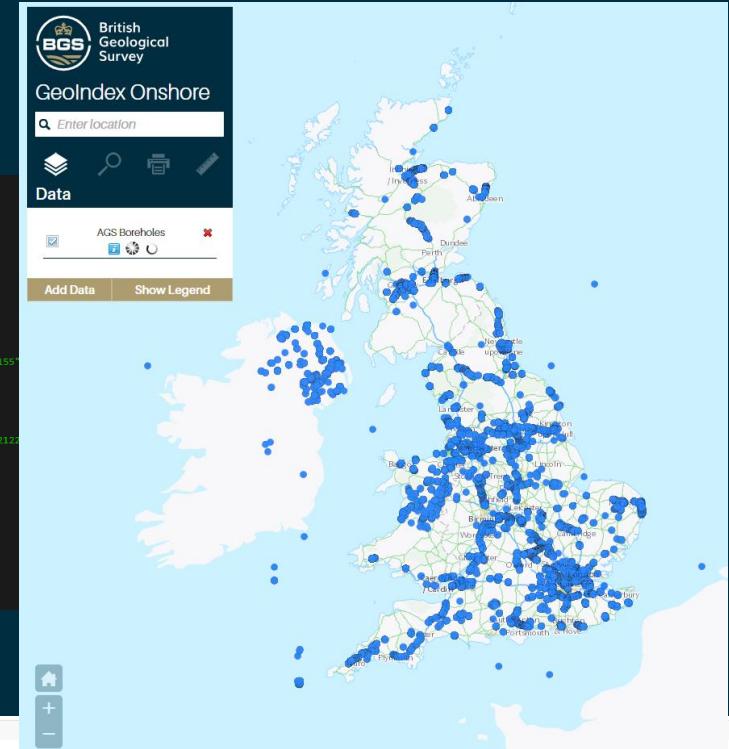
Storage

- Data is held in a version agnostic database with tables for each group



Data Delivery

- Online Portals (GeoIndex)
- Geospatial Data Download (.shp/.gpkg + others on request)
- AGS Data Download API - Query by borehole ID or polygon area (WKT)
- Web Services/APIs – WMS, WFS OGC API-Features
- Original Submitted AGS files are available from the NGDC Deposited Data Search -
<https://webapps.bgs.ac.uk/services/ngdc/acquisitions/index.html>



The screenshot shows the British Geological Survey's GeoIndex Onshore portal. At the top right is the BGS logo and the text "British Geological Survey". Below it is the "GeoIndex Onshore" heading. A search bar says "Enter location". Underneath are "Data" and "Add Data" buttons. A "Show Legend" button is also present. The main area is a map of the United Kingdom with numerous blue dots representing borehole locations. To the left of the map is a JSON representation of a borehole record:

```
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "properties": {
        "proj_eng": null,
        "proj_name": null,
        "y": 381762,
        "rec_id": 54258,
        "loc_id": "TPE",
        "dad_item_url": "http://www.bgs.ac.uk/services/ngdc/acquisitions/index.html#item125155",
        "proj_cont": null,
        "x": 468699,
        "local_fdep": 1.3,
        "item_index_id": 125155,
        "ags_log_url": "https://webservices.bgs.ac.uk/GMW/viewborehole?loc_id=20190306121225410&id=20190306121225410"
      },
      "id": "20190306121225410",
      "geometry": {
        "type": "Point",
        "coordinates": [
          -0.969627172925076,
          55.328325207728085
        ]
      }
    }
  ]
}
```

Below the map is a navigation bar with icons for home, zoom in, and zoom out. The URL "BGS OGC API Server / Collections / AGS Borehole Records / Items" is visible at the bottom of the map area.

The bottom section is titled "AGS Borehole Records" and contains a table of borehole records:

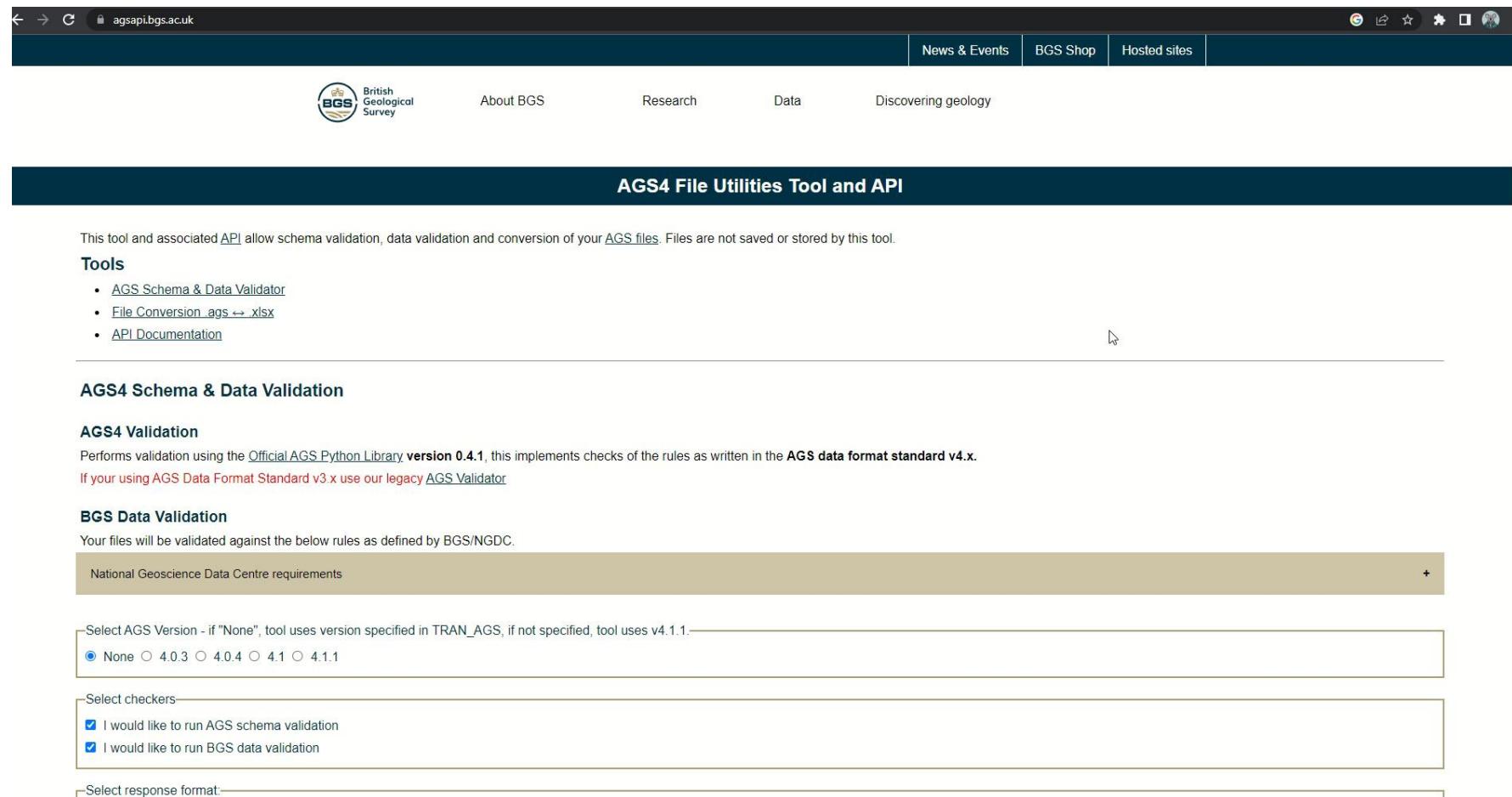
id	proj_eng	proj_name	y	rec_id
20190306121225410	None	None	381762	54258
2019030612122545	None	None	381759	54253
2019030612122546	None	None	381754	54254
2019030612122547	None	None	381750	54255
2019030612122548	None	None	381771	54256
2019030612122549	None	None	381766	54257
20190404134613154	None	RIVER LEE FLOOD RELIEF CHANNEL...	211847.32	11392
20190404134613155	None	RIVER LEE FLOOD RELIEF CHANNEL...	211907.84	11313
20190404134613156	None	RIVER LEE FLOOD RELIEF CHANNEL...	211746.15	11320
20190404134613157	None	RIVER LEE FLOOD RELIEF CHANNEL...	211654.4	11324

Below the table is a map of the UK with borehole locations marked as blue dots. A warning message says "Warning: Higher limits not recommended! Limit: 10 (default)". There are buttons for "Next" and "Previous".

[HTTPS://AGSAPI.BGS.AC.UK/](https://agsapi.bgs.ac.uk/)

AGS4 File Utilities Tool and API

- **Recently Updated and production ready!**
- Uses the same python library as the Official AGS Validator – AGS Rules validation will give consistent results
- Performs checks for NGDC/BGS data submission guidelines
- Allows conversion between .ags and .xlsx
- API available for programmatic access

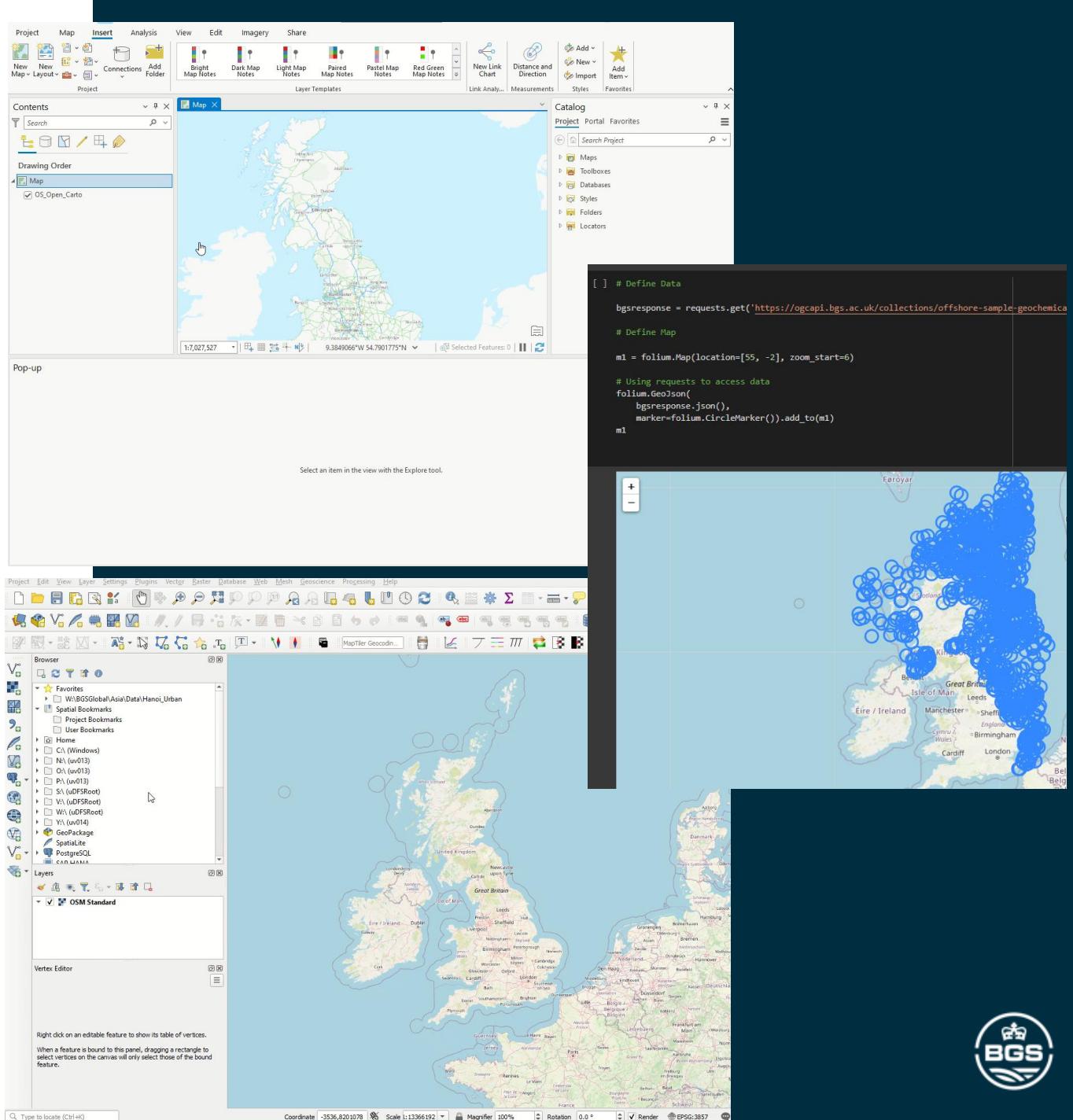


The screenshot shows a web browser displaying the AGS4 File Utilities Tool and API. The URL in the address bar is `agsapi.bgs.ac.uk`. The page header includes the British Geological Survey logo and links for News & Events, BGS Shop, and Hosted sites. The main content area has a dark blue header bar with the text "AGS4 File Utilities Tool and API". Below this, a sub-header states: "This tool and associated API allow schema validation, data validation and conversion of your AGS files. Files are not saved or stored by this tool." A section titled "Tools" lists three items: "AGS Schema & Data Validator", "File Conversion ags ↔ xlsx", and "API Documentation". A mouse cursor is hovering over the "API Documentation" link. The next section, "AGS4 Schema & Data Validation", contains a sub-section titled "AGS4 Validation" which explains the validation process using the "Official AGS Python Library version 0.4.1" and mentions the "AGS data format standard v4.x". It also notes that users of the "AGS Data Format Standard v3.x" should use the legacy AGS Validator. Another sub-section, "BGS Data Validation", states that files will be validated against rules defined by BGS/NGDC. A yellow callout box highlights the "National Geoscience Data Centre requirements" section. At the bottom of the form, there are fields for selecting AGS Version (radio buttons for "None", "4.0.3", "4.0.4", "4.1", and "4.1.1", with "None" selected), checkboxes for "I would like to run AGS schema validation" and "I would like to run BGS data validation" (both checked), and a field for "Select response format".



BGS OGC API - Features

- Uses OGCAPI – Features Standard
- Fully Queryable
- Supported by ESRI ArcPro & QGIS
- “Live” link to BGS Database
- Useful for dynamic/frequently updated datasets
 - Saves repeat downloading
 - Always using the most current data
- Data collections include:
 - Single Onshore Borehole Index (Weekly Updates)
 - AGS Borehole Index (Weekly Updates)
 - Landslide Database Index (Weekly Updates)
 - Earthquakes (Daily Updates)



IMPROVEMENTS

BGS SOBI PDF API



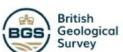
Version 2.0.6.7

BGS ID: 223839 : BGS Reference: SK45SW67
British National Grid (27700) : 442990,351412

<< <Prev Page 1 of 1 >Next> >>

Image Unavailable

The image is too large to display, as it is greater than 1MB.
Please email enquiries@bgs.ac.uk for further information about this record that is not accessible online.



Version 2.0.6.7
BGS ID: 339164 : BGS Reference: SP58NW20
British National Grid (27700) : 451250,289620

<< <Prev Page 1 of 5 >Next> >>

SP 58 NW 180 5125 6962 RECORD OF WELL (SHAFT OR BORE)

XACT SITE
OF WELL

At Frolesworth Lodge, Frolesworth, No. 2.

British Geological Survey

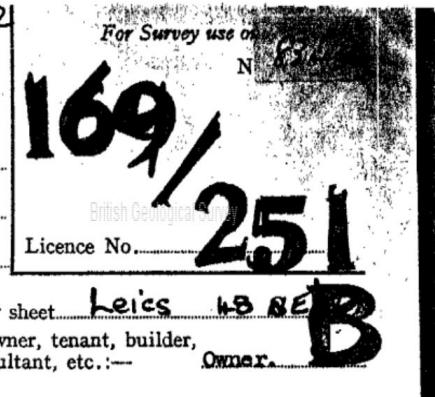
Town or Village Frolesworth.

County Warwickshire.

Six-inch quarter sheet Leics 48 SE

State whether owner, tenant, builder,
contractor, consultant, etc.:— Owner.

For R.T. Sale.



Legacy Service – Couldn't display large scans (>1 MB), paged results.

The screenshot shows a web browser displaying a geological record. At the top, it says "https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/223839" and "BGS ID: 223839 : BGS Reference: SK45SW67". Below this is a header with the BGS logo and "British Geological Survey". The main content area contains a "RECORD OF WELL (SHAFT OR BORE)" form with handwritten entries. Handwritten text includes "SP 58 NW 180 5125 6962", "At Frolesworth Lodge, Frolesworth, No. 2.", "Frolesworth", "Warwickshire", "Leics 48 SE B", "169/251", and "Owner". The form has sections for address, shaft details, pumping equipment, and analysis. To the right of the form is a large, detailed geological map of the area.

Updated Service (Improved Layout & ability to export large images. No paging – One PDF returned)



IMPROVEMENTS

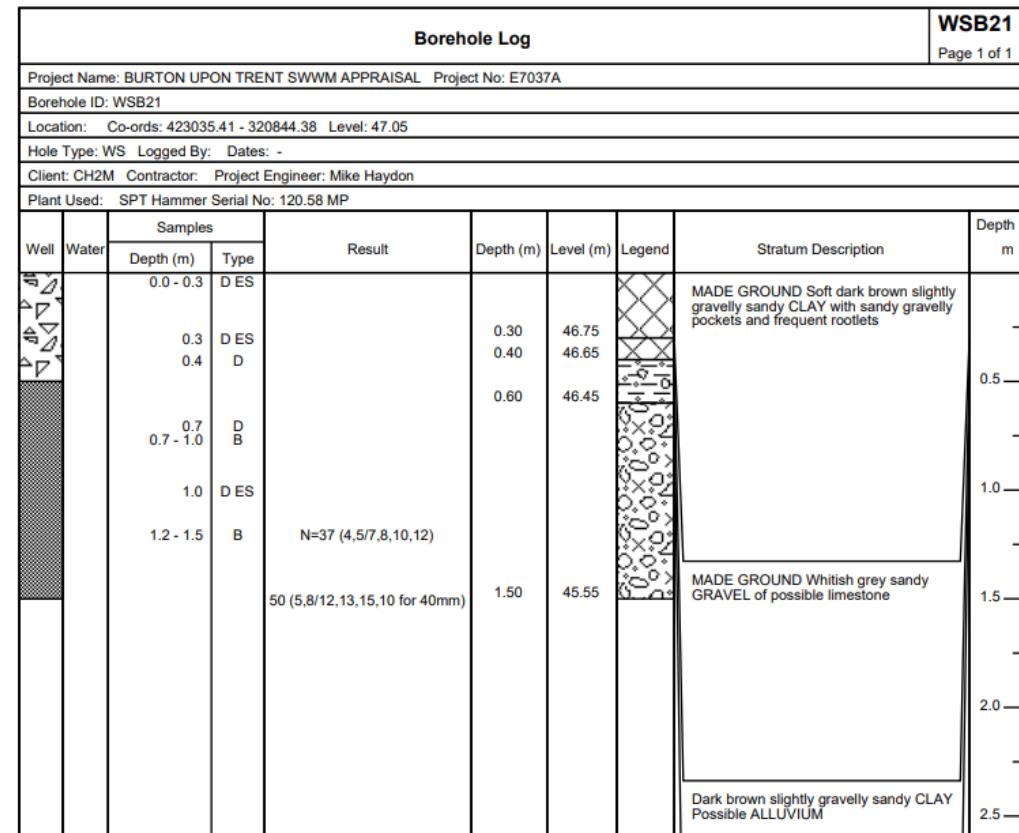
BGS AGS Logs API

Available via:

- AGS Boreholes Layer in GeoIndex Web Portal- <https://mapapps2.bgs.ac.uk/geoindex/home.html?layer=AGSBoreholes>
- AGS Utilities Tool - <https://agsapi.bgs.ac.uk/>

BURTON UPON TRENT SWWM APPRAISAL WSB21 WS				
X: 423035.41 Y: 320844.38 Level: 47.05				
Start: End:				
Client: CH2M				
Contractor:				
Engineer: Mike Haydon				
Page 1				
DEPTH METRES	Depth	Level	Log	Description
	0.30	46.75		MADE GROUND Soft dark brown slightly gravelly sandy CLAY with sandy gravelly pockets and frequent rootlets
	0.40	46.65		
	0.60	46.45		
1.0	1.50	45.55		MADE GROUND Whitish grey sandy GRAVEL of possible limestone
2.0				Dark brown slightly gravelly sandy CLAY Possible ALLUVIUM

Legacy Service – Limited attributes available



Updated Service (Legend, Well Construction, Water, Samples & Results)



Data Delivery – The Detail!

- Original Submitted AGS files & Other Data are available from the NGDC Deposited Data Search -
<https://webapps.bgs.ac.uk/services/ngdc/acquisitions/index.html>
- BGS OpenGeoscience API – Features
 - Add to ArcPro / QGIS to get the current data directly in your GIS platform.
 - Query the Single Onshore Borehole Index (SOBI) to find boreholes
 - <https://ogcapi.bgs.ac.uk/collections/onshoreboreholeindex>
- BGS AGS Exporter API
 - Used by Holebase & Groundhog Web Borehole Viewer
 - Creates v4 .ags file from our version agnostic ags database
 - Spatial Query or by Borehole ID
- BGS SOBI PDF API
 - Creates pdf (or a zip of multiple pdfs) of BGS held borehole scans
 - This improves issues with large images that prevented users accessing the scan
 - <https://api.bgs.ac.uk/sobi-scans/v1/api>
- BGS AGS Logs API
 - Creates much improved graphical logs from the BGS AGS Exporter API containing more data fields
 - https://agsapi.bgs.ac.uk/ags_log/?bgs_loca_id=20190405103004521588



AGS Data - Future

AGS Data Management Working Group

- AGS Validator v1 released
- Advanced lab data transfer, inconsistent csv type files
→ AGS format.
- AGS API ‘standard’ for cloud-to-cloud data transfers
- First steps to AGS 5
- Integration with BIM, buildingSmartInternational (bSI) and the Open Geospatial Consortium (OGC) standards
 - <https://www.ogc.org/initiatives/geotech-ie/>
- AGS Data forms a key to the BGS hosting the National Geoscience Data Centre (NGDC) which collects, stores and preserves digital geoscientific data and information
 - We've built our ingestion and geotechnical data delivery around this standard.
 - Committed to its further development, working on the AGS Data Management WG & Directly contributing to AGS Validation tooling



Association of Geotechnical &
Geoenvironmental Specialists

AGS4 File Utilities Tool and API

This tool and associated [API](#) allow schema validation, data validation and conversion of your **AGS files**. Files are not saved or stored by this tool. Also included are links to our other AGS data

Data Discovery	Schema & Data Validator	Data Submission	File Conversion
----------------	-------------------------	-----------------	-----------------

AGS4 Validation
Performs validation using the [Official AGS Python Library version 0.5.0](#), this implements checks of the rules as written in the **AGS data format standard v4.x**.
If you're using AGS Data Format Standard v3.x use our legacy [AGS Validator](#)

BGS Data Validation
Your files will be validated against the below rules as defined by BGS/NGDC.
National Geoscience Data Centre requirements

Select AGS Version - if "None", tool uses version specified in TRAN_AGS, if not specified, tool uses v4.1.1.
 None 4.0.3 4.0.4 4.1 4.1.1

Select checkers:
 I would like to run AGS schema validation
 I would like to run BGS data validation

Select response format:
 HTML JSON Plain Text

If HTML show LOCA features on a map / If JSON include GeoJSON
 Yes No





UPDATES

The Construction Playbook



The Construction Playbook

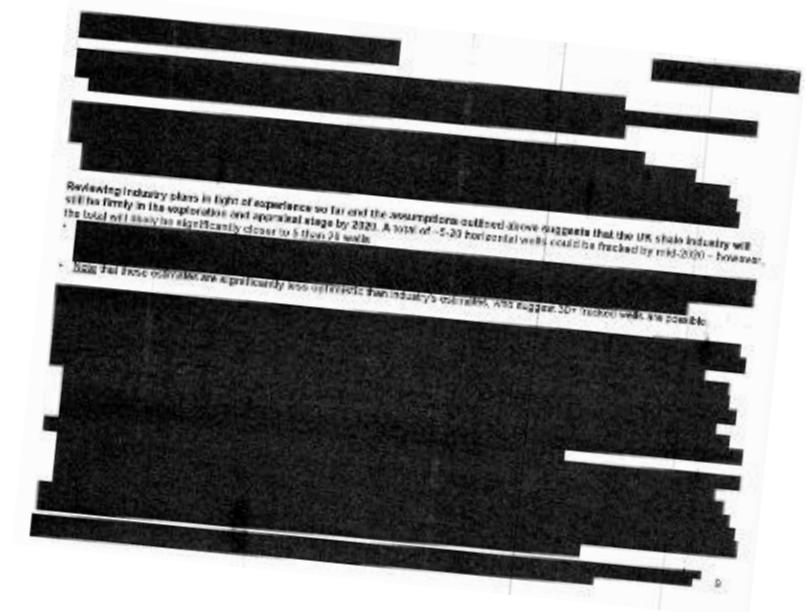
- Sets out key policies and guidance for how public works projects and programmes are assessed, procured and delivered.
- Version 1.1 released September 2022
- Included template “HMG Model Clause - Subsurface Data Sharing”
- It is now a requirement for public sector projects that any ground investigation data collected must be shared as soon as reasonably practical with the British Geological Survey (BGS) in AGS format for re-access and longevity.
- Data should be marked as open and not as confidential.

“ A critical success factor is the sharing of high quality and robust data between parties during the project lifecycle and into operation.”



Legacy Confidential Boreholes

- The construction playbook and other initiatives like individual data sharing agreements are significant steps in ensuring that more open data is available and that it is deposited under an open licence, in AGS format for interoperability and reusability
- However, of the over 1.4 million boreholes in the BGS Borehole Database - 278,000 are confidential (~ 20%)
- We continue to engage with a number of organisations (some here today) about releasing legacy confidential boreholes for the benefit of UK PLC



The background of the slide is a high-angle aerial photograph of ocean waves. The water is a deep teal color, and the white foam from the breaking waves creates a textured, patterned surface across the frame.

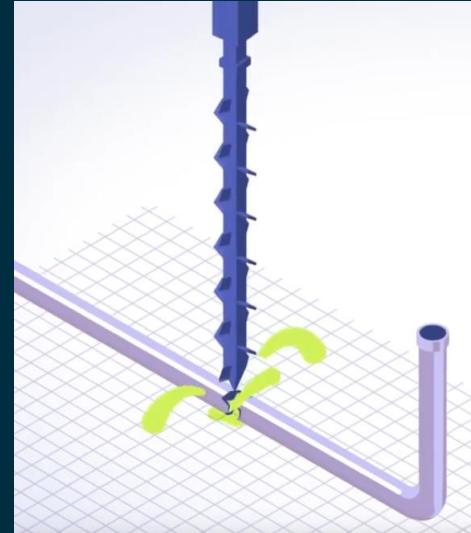
CASE STUDY

National Underground Asset Register

NUAR

Background

- > 4 000 000 km of underground pipe & cables
- Nearly 60 000 accidental strikes annually
 - Outdated / difficult to access data
 - Unexpected Danger
- Cost to UK economy £2.4 Billion Annually
 - Delays & Repairs



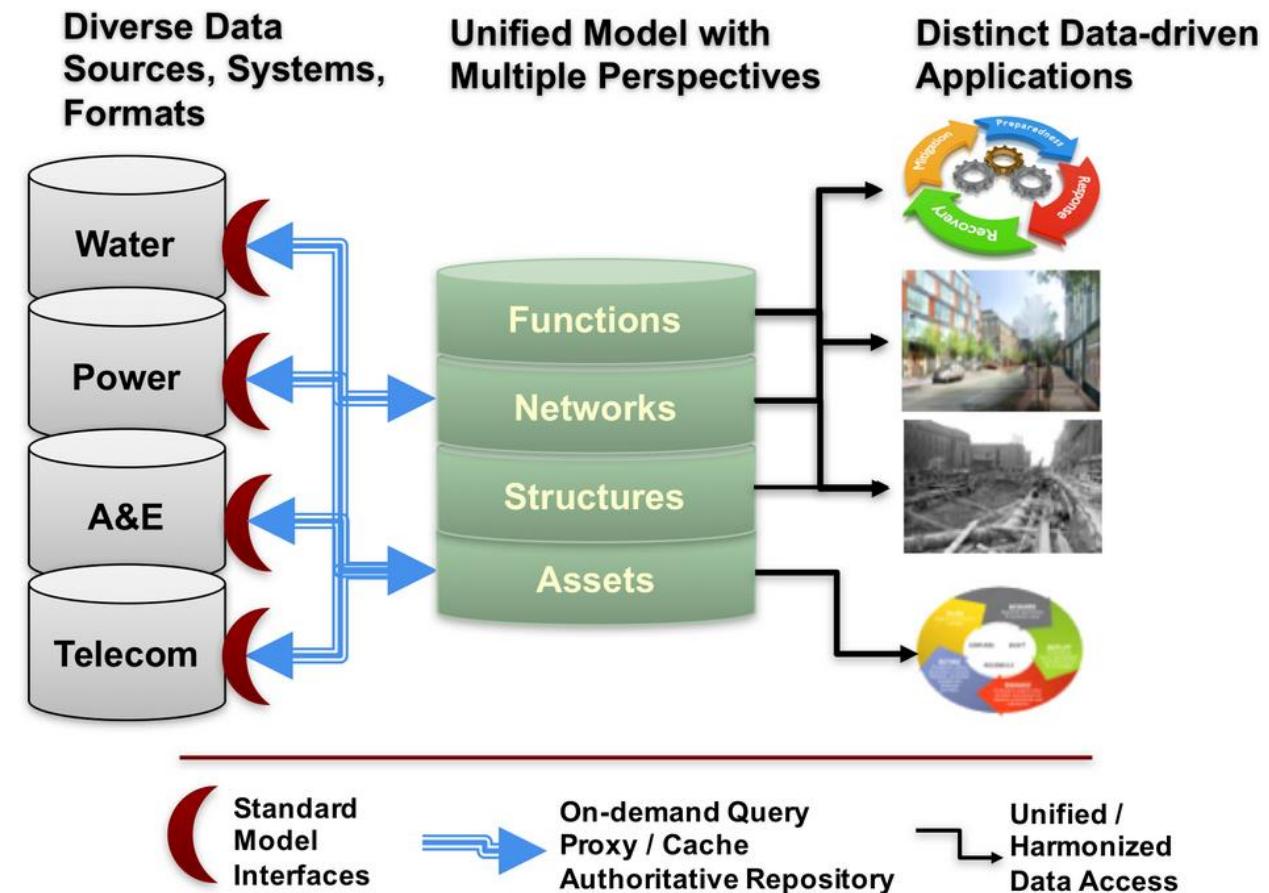
Solution

- Standardised Digital Map of Buried Assets
- Combining >650 data sources



NUAR -Standardistion

- NUAR Data Model = OGC Model for Underground Data Definition and Integration (MUDDI)
- OGC API
- GeoPackage
- JSON-FG (Allows other CRS such as BNG/27700)
- GEOINT Imagery Media for ISR” (GIMI) profile of the ISO Base Media File Format (ISOBMFF)
- High-Efficiency Image Format (HEIF).



NUAR – Coming Soon

- Search provides data on AOI
 - Postcodes
 - UPRN/USRN
 - Address
 - Polygon
- User submitted updates

Data shown is generated sample data for illustrative purposes only.

Map Create and edit polygon

The screenshot shows a map interface with a polygon drawn on it. The map includes street names like 'Albert Street, Durham' and 'Quarrygate'. A legend on the left shows layers for Drainage, Links, Nodes, and Other Network Objects. To the right is a detailed data panel.

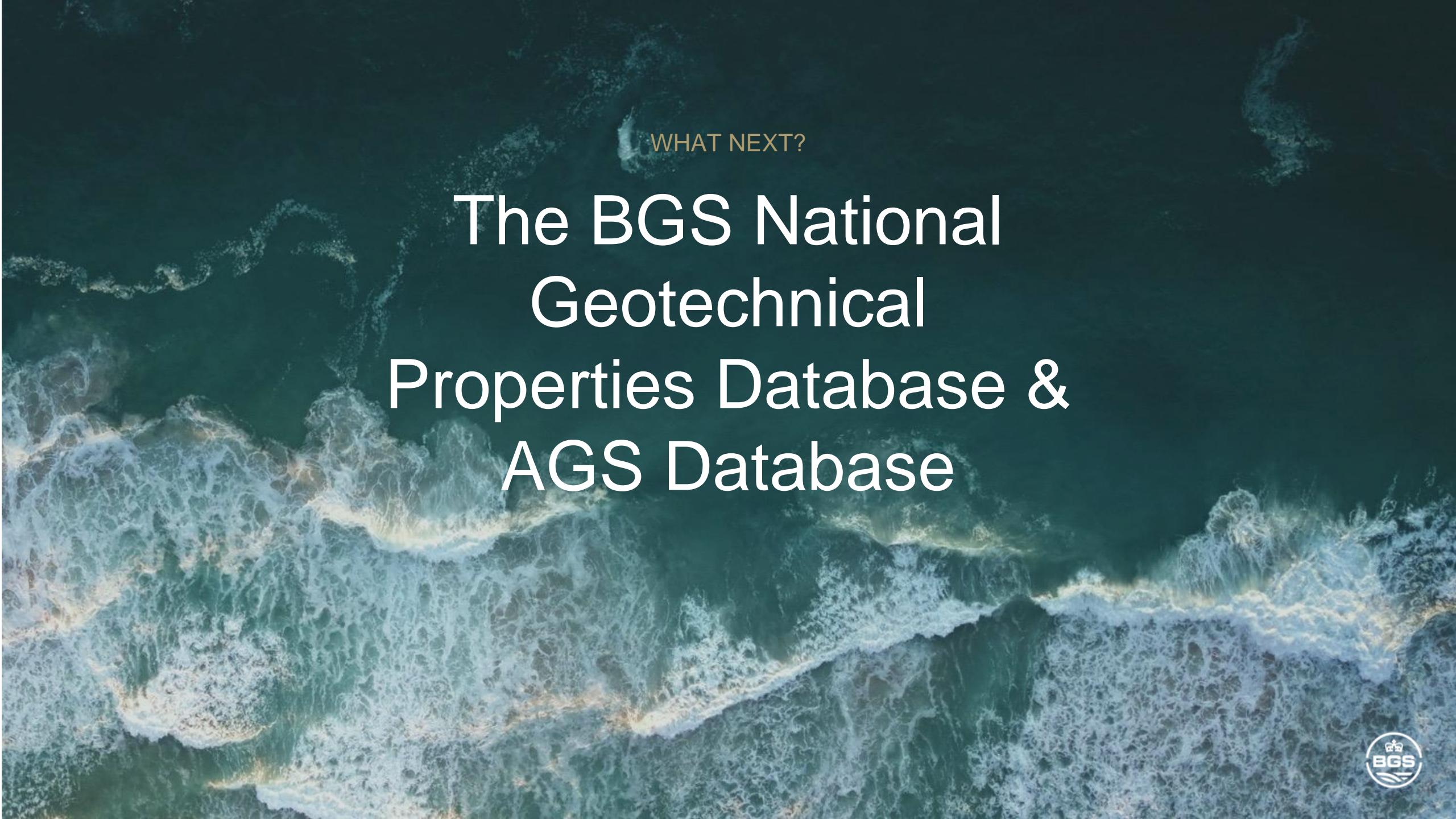
GENERAL INFORMATION	
Property	Value
Data Owner	Unknown
Emergency Contact	emergency@acme-water.co.uk
Business Contact	business@acme-water.co.uk
Last refreshed in NUAR	18/03/2022 - 12:43:53 PM

ASSETS	
Property	SUPPLEMENTARY DATA
Asset Owner	Unknown
Asset Type	Cleaning Device
Operational Status	Commissioned
Position	Underground

CLOSE

These images are taken from an early version of the NUAR service, which is currently still in development.



The background of the slide is a high-angle aerial photograph of ocean waves. The water is a deep teal or green color, with white and light blue foam where the waves break. The waves are somewhat choppy but not extremely large, creating a textured pattern across the frame.

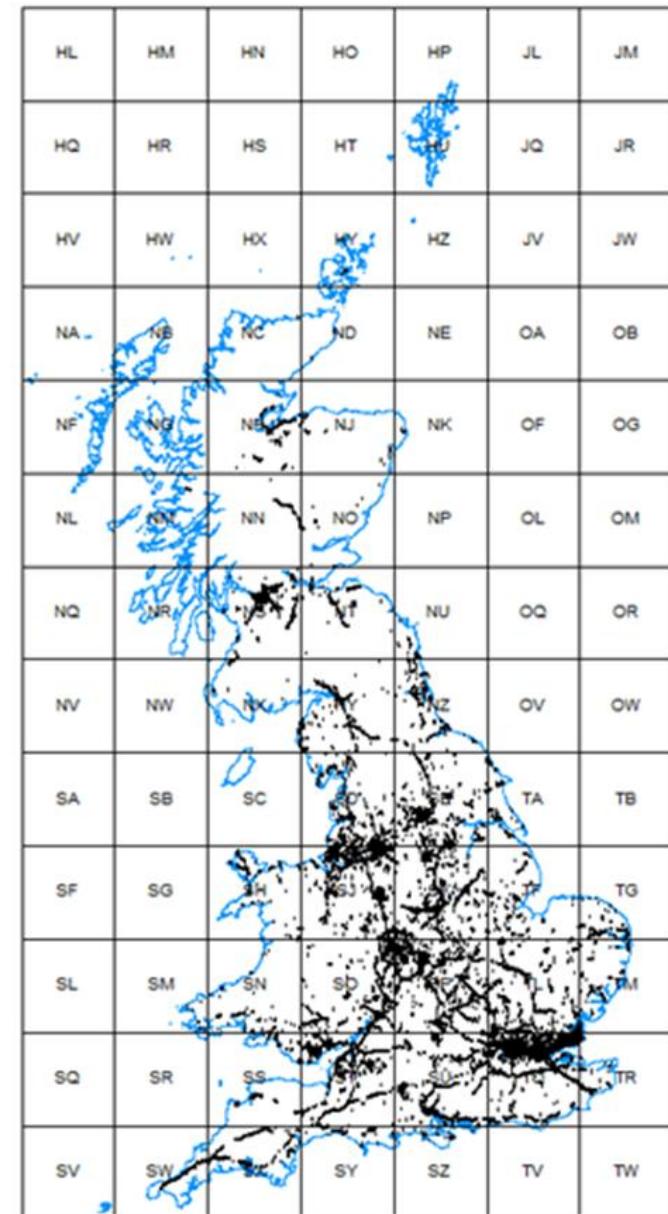
WHAT NEXT?

The BGS National Geotechnical Properties Database & AGS Database



BGS National Geotechnical Properties Database (NGPD)

- Emerged in early 1990s, included datasets from previous BGS urban mapping programme and new programme to characterise UK rocks and soils.
- NGPD made use of a new data interchange format established by AGS.
- For decades data were manually input from paper or PDF ground investigation reports; more recently AGS data ingestion systems developed as the format was increasingly adopted by the industry.
- Now data ingestion is semi-automated, which has improved efficiency and reduced transcription errors.



*Distribution of exploratory holes
in BGS NGPD*



BGS National Geotechnical Properties Database (NGPD)

- Contains data from >200,000 exploratory hole records across the whole of GB; 80% from AGS data.
- Broadly based on AGS 3.1 data structure, currently being upgraded to (broadly) AGS 4.0 data structure.
- Several checks performed on data added to NGPD: duplicates, orphan records, values outside sensible range, gaps and overlaps in geological log intervals.
- Importantly lithology and stratigraphy are validated, or added where absent.

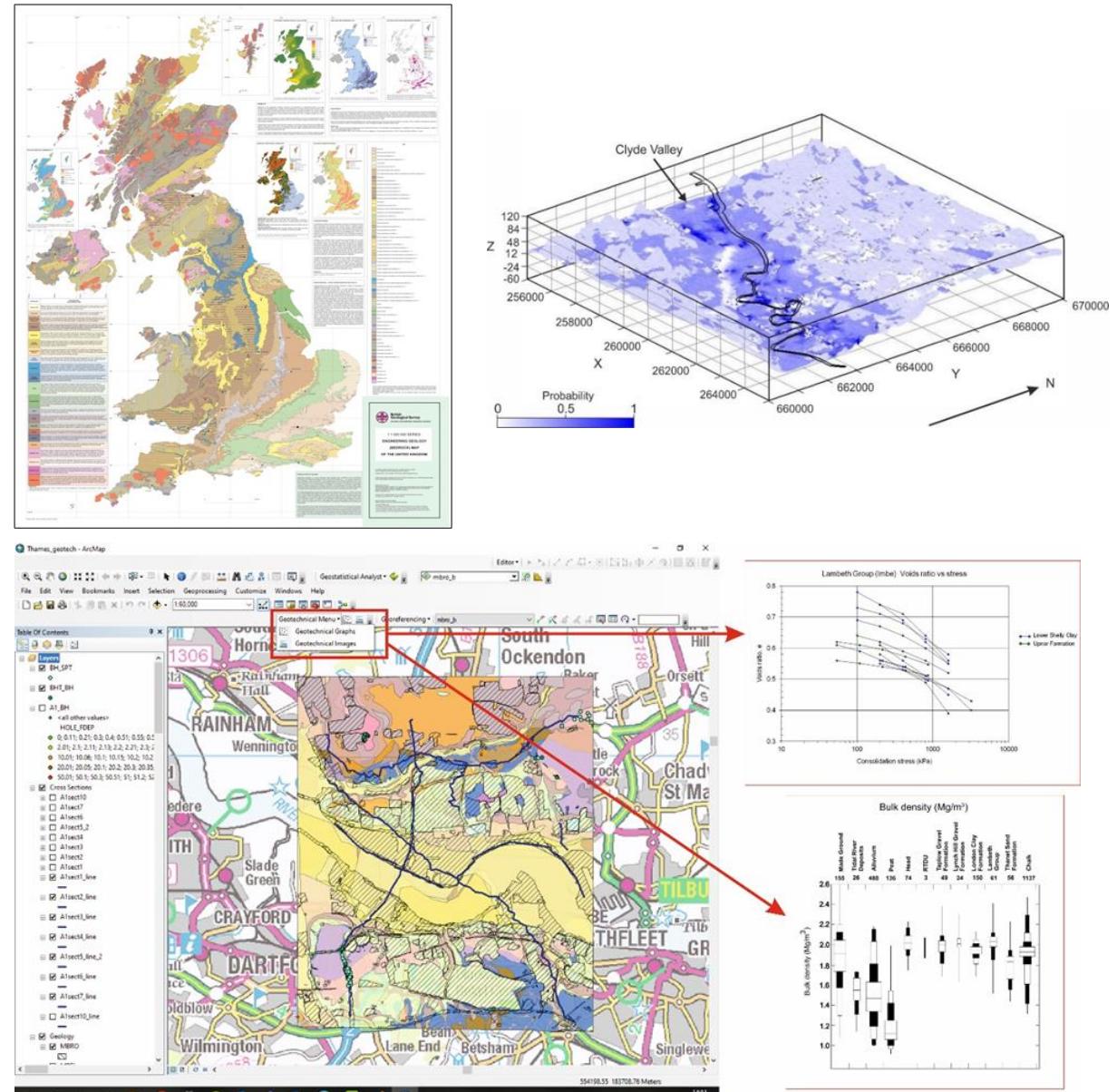
Database Table	No. of records
Contaminant and chemical testing	5112810
Static cone penetration test	2106811
Stratum descriptions	1011057
Standard penetration test results	415382
Classification tests	381637
Particle size distribution analysis data	118922
Fracture spacing	104057
Point load tests	81704
In situ vane test	80655
Triaxial tests	80360
Water strike details	58756
Weathering grades	36052
Piezometer readings	34751
Rock testing	26358
Consolidation test – general results	20853
Chalk engineering properties	14069
Compaction tests – general	13529
Chalk tests	11382
In situ permeability test	9302
Shear box testing – general	5651
Pressure meter test results, general	1467
Pumping test	1091
Shrinkage Tests	1032
Laboratory permeability tests	931
(Rock testing – Modulus related test results)	855
Suction tests	720
In situ resistivity test	186
Frost susceptibility	45
In situ UCS test	38

Examples of the number of records held in different tables within the NGPD



Applications of NGPD

- NGPD is extensive curated dataset with potential for application on commercial and academic research projects.
- BGS Formation Studies Reports (Gault, Mercia, Lias and Lambeth)
- BGS 1:1 000 000-scale engineering geology maps of the UK
- BGS Civils and GeoSure datasets
- 3D property models, geotechnical GIS and ESRI story maps (London, Birmingham and Glasgow)
- Ongoing research on how regional geotechnical data can inform site-specific data for geotechnical design



Examples of BGS outputs using NGPD data: UK Engineering Geology Map, Glasgow stochastic probability model showing high permeability deposits, and the Glasgow Geotechnical GIS).





Next?

Future Work

- Improvements to data discoverability & user journey
 - Integrate Metadata with Web Pages/Visualisation tools
- Improved standards documentation & examples – eg MUDDI, OGC API
- Further geotechnical characterisation of key rock formations and development areas
 - How to best deliver 3D volume data (coverageJSON/GeoPackage?)
- Add further dictionaries to vocab server
 - More mappings between BGS and external vocabularies (AGS)
- Permanent Identifiers for more things – boreholes, sensors etc.

