Department for
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Data deposit, sharing and possible future sharing obligations for UK geothermal data

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Introduction

This report written by the British Geological Survey summarises existing data deposit workflows for geothermal data and information through the National Geoscience Data Centre. It explores mechanisms to optimise data deposits, dissemination and data sharing obligations in the future.

Availability of and access to geothermal data and information is globally recognised as a barrier to widespread deployment of geothermal technologies [1, 2, 3]. This is because data and information that allows the geological characterisation of the subsurface environment are fundamental for identifying the most suitable locations for geothermal projects, helping to de-risk the cost of investment.

This report was written as Output 8 during development of the UK Geothermal Platform in 2024-2025. The platform aims to make available a range of UK geothermal and geoscientific digital information from several organisations, accessible in a single place. Much of what is currently included is classed as legacy (historical) data and/or information.

Whilst legacy data is useful, it does not provide current measurements to modern standards to enable cost and risk reduction. New data and information are needed to grow the geothermal sector. Types of new geothermal data and information include:

- Boreholes, wells, water level, pumping tests, temperature measurements, thermal properties from core or cuttings
- Seismic and other geophysical data
- Design and as-built info for geothermal schemes (pumps, heat exchangers etc.)
- Summarised operational information for geothermal schemes (flow rates, thermal outputs etc.) as well as depth, reservoir, owner.

This report firstly describes the existing processes for deposit in the National Geoscience Data Centre. Secondly, we examine mechanisms for future data deposits and dissemination. Finally, we discuss points around future geothermal data sharing obligations, should these come into force.

Existing process for deposit of geothermal data and information

The National Geoscience Data Centre [4] (NGDC) is hosted by the British Geological Survey (BGS) and one of five environmental data centres that forms the NERC Environmental Data Service (NERC-EDS). NGDC's remit is to manage and make accessible geoscience data of value for Great Britain, for the long-term. The NGDC receives a wide range of geological data and information. Examples include borehole drilling records, core sample analyses (e.g

geochemical, mineralogical, rock mechanics), seismic records and other research datasets from UKRI-NERC research grants relating to the subsurface. Geothermal data and information are a small subset of what is currently deposited, for example, in 2024 there were 24 borehole logs related to ground source heat pump drilling, 2 BGS deposits for open data release and 1 deposit associated with a NERC grant that related to deep geothermal.

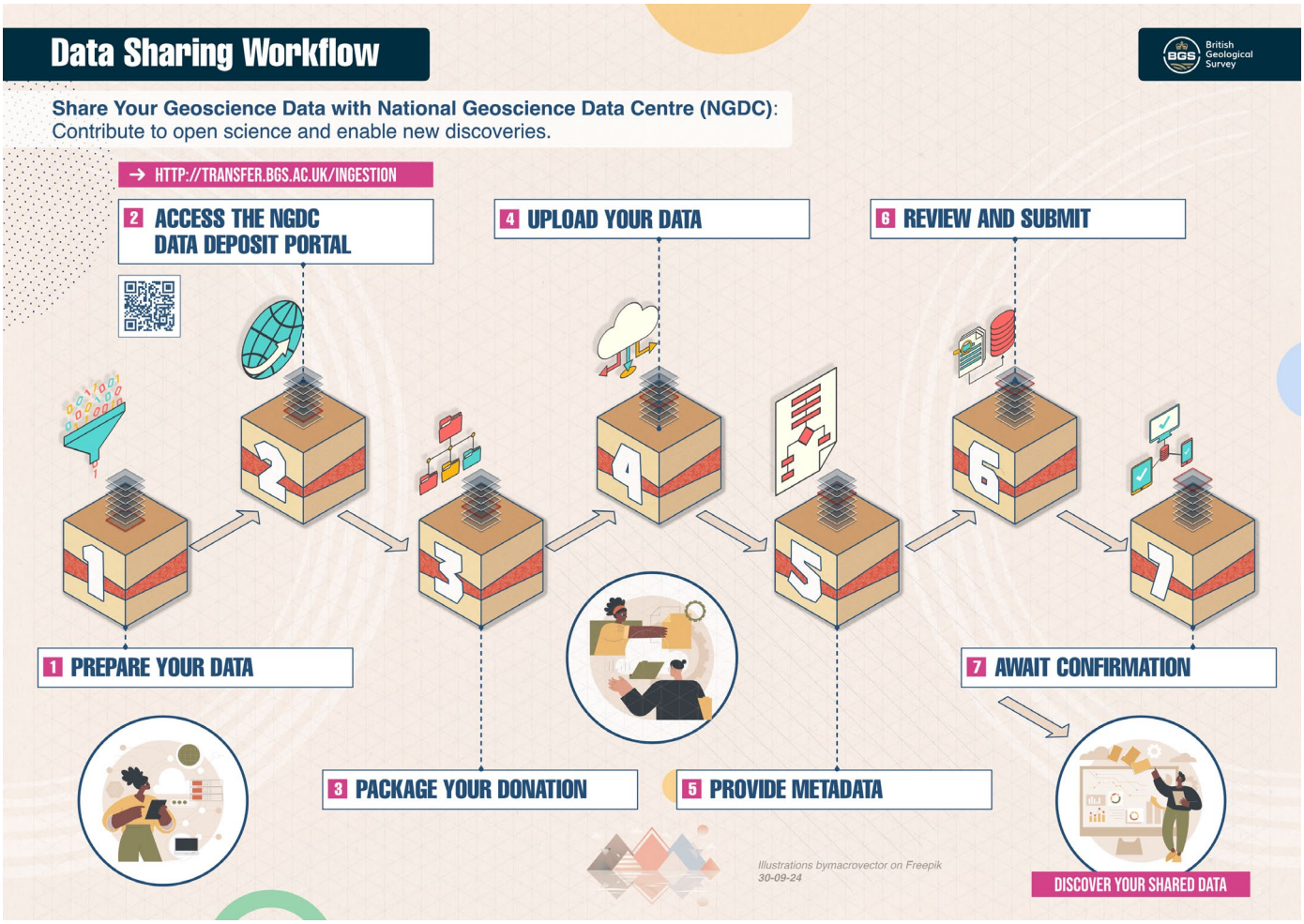

Figure 1. Summary of the workflow for data deposit within NGDC BGS © UKRI.

The NGDC uses a Data Deposit Portal [5] to receive deposits of data, these include statutory[1] and voluntary deposits which meet the criteria of the NGDC data value checklist [6] . The portal captures:

- Ownership – the ownership of the data remains with the owner, but the NGDC is granted a non-exclusive, in-perpetuity licence to use and disseminate the data for all uses and re-uses, which may include commercial use as per the NGDC Terms and Conditions [7].
- Permissions – NGDC prefer to hold data as “open” with no access or use constraints and available via an appropriate Open Government Licence (OGL). If data requires a

[1] Statutory deposits are data received to comply with legislative requirements to deposit data with BGS/NGDC/UKRI.

restriction, an embargo period can be set but this must be justified and an end date provided. Freedom of Information (FOI) and Environmental Information Regulations (EIR) will supersede embargo restrictions if challenged.

- Metadata – the data has to be appropriately described so that it can be re-used in an appropriate way. This includes, for example, lineage and geographic locations. BGS uses the UK standard Gemini [8] for geospatial data.

Metadata and data are processed by a data ingestion team who check that the formats meet the requirements of the preferred formats list [9] and data value checklist [3], as well as checking that the metadata adequately describes the data. Deposited data is then discoverable through both the BGS [10] and NERC metadata catalogue services [11].

The NGDC uses funding BGS receives from UKRI-NERC to:

- process borehole data as received and make available via the Deposited Data Search[12]
- process statutory deposits and AGS borehole data into the National Borehole Data Register [13].

Currently, NGDC have no funding to:

- process voluntary deposits of borehole data in non-standard formats
- extract the values of data such as geotechnical, geothermal, chemistry, hydrogeology, etc.
- quality assure (QA) the data, including the scientific accuracy of data values, or the associated metadata.

Current legislation and licensing obligations

Summary of existing legislation

The only legislation relating to data deposits of geothermal data that currently exists is when boreholes are classified as water wells (shallow open loop systems) or extraction for mineral boreholes (e.g. lithium brine extraction). In such cases, one of the following legislative acts applies:

- The Mining Industry Act 1926 [14], Section 23 of the Mining Industry Act 1926 (as amended by the Science and Technology Act 1965) requires notice in writing to UKRI of anyone proposing to sink a well, or drill a borehole to a depth greater than 100 feet (30 metres) for the purpose of searching for or extracting minerals. It also mandates the retention of information and samples such as journals of shafts or boreholes as well as samples – core or fragments - for a period of at least six months, and grants the right to UKRI to have free access (if requested) to shaft, borehole or core, to inspect and take copies of the journals as well as to inspect and take representative subsamples. The

Act applies to England, Wales and Scotland. It gives powers to impose a fine (not exceeding £50) if there is failure to inform UKRI or grant access to data and samples.

- The Water Resources Act 1991 [15], Section 198 of the Water Resources Act 1991 requires notification in writing to UKRI of anyone proposing to sink a well, or drill a borehole to a depth greater than 50 feet (15 metres) for the purpose of searching for or abstracting water. The legislation also requires the creation of a journal, including details of any test made before completion or abandonment, specifying the flow of water and, where practicable, the water levels during the test and thereafter until the water returned to its natural level. The act explicitly states the requirement to send a complete copy of the journal to UKRI and to right of UKRI – or an authorised person – to access to the well and samples, and to take subsamples if required. The act describes failure to comply with these obligations as an offence and defines a maximum penalty of £1,000 on conviction, and daily fines of £20 if the offence continues afterwards. The act applies to England and Wales.
- The Water (Scotland) Act 1980 [16] gives similar provisions to the Water Resources Act above – although it references NERC instead of UKRI. As WRA 1991, it includes provision for fines for non- compliance.

Summary of geothermal regulatory guidance

- The Scottish Government recently changed their geothermal regulatory guidance [17] to point to the obligations regarding borehole records under the Water (Scotland) Act 1980 to deposit data to the BGS' National Geoscience Data Centre. Similar information has been fed into the geothermal regulation guidance for England and Wales (not yet published).
- The Environment Agency (EA) requires consent, abstraction licence or an environmental permit for deep geothermal abstraction [18], depending on the scheme. The requirements around closed loop systems [19] are less restrictive with a number of exemptions preventing the requirement for a permit or a licence.
- The Scottish Environmental Protection Agency (SEPA) guidance "requirements for activities related to Geothermal Energy v 1.3 [20]" require boreholes drilled greater than 200 m to be authorised via a CAR (The Water Environment (Controlled Activities (Scotland) Regulations 2011).
- A Mining Remediation Authority [21] (MRA) permit is required for any works that drill boreholes through a coal seam and an MRA license for activity on MRA property, including for deep energy boreholes.
- The above guidance and permits used by the EA, SEPA and the MRA do not inform the permit holder of any other obligations to retain or share information about the borehole.

Other relevant guidance

The construction playbook [22] provides exemplar clauses that can be inserted into the new public works contracts that mandate that subsurface data is deposited as open Association of Geotechnical & Geoenvironmental Specialists (AGS) format [23] with the NGDC. AGS is a text file format used to transfer data reliably in a standard format.

The Microgeneration Certification Scheme (MCS) is a mark of quality assurance in the renewable energy sector. The MCS have published a Specification for Ground Source Closed-Loop Drilling [24] which requires a drilling log to be completed for each borehole with a minimum set of information and that the log should be deposited by with BGS, preferably in AGS format.

Lack of data sharing obligations for other types of geothermal-related data

As summarised above, the geothermal-related data currently deposited with the NGDC mainly relates to drilling activity. This is likely due to the existence of the national borehole register where many drillers and consultants already deposit data. BGS is aware of seismic data, geophysical surveys, temperature datasets across commercial and research projects being collected in Great Britain (GB); however, there is currently no guidance or legislation for such data to be deposited (e.g. with NGDC) to enable future data sharing and re-use.

Improved processes for future data deposits and dissemination

Although the International Association of Drilling Contractors (IADC) have recently published a deep geothermal well classification [25], the MCS have published a Specification for Ground Source Closed Loop Drilling [24 and the Ground Source Heat Pump Association (GSHPA) have a Vertical Borehole Standard [26], as far as the authors are aware at the time of publication, there are no standard formats for geothermal data which would make extraction of data and parameters more efficient. Looking at borehole data more generally, there has been a move in the ground investigation sector to use AGS format. The NGDC has a semi-automated workflow to process AGS files (see Figure 2 in Appendix 1). Non-AGS format deposits tend to be received as PDF documents in non-standard layouts. This makes the automated extraction of the data difficult.

Agreeing standard formats, minimum requirements and consistent values for the parameters required will facilitate automatic extraction of data into geo-scientific property specific datasets.

The preferred model for NGDC to receive data is:

- in a standard format, such as AGS, so that it can be processed in a semi- automated way. This would also allow the values contained within the borehole record to be extracted into geo-scientific property specific databases i.e. geotechnical, chemistry, geothermal properties, and then made available.

- With agreed embargo periods for particular types of data that may be commercially sensitive

The NGDC would recommend:

- support for the extraction of the geo-scientific values (e.g. geotechnical, geophysical, geothermal, geochemical, hydrogeological, etc) into corporate data-systems for onward open delivery.
- a funding vehicle to develop an implement a “tell us once” approach to notifications and data sharing i.e. explore the opportunities to streamline the notifications systems for drilling with the notification to the Health and Safety Executive (HSE) under the Borehole Sites and Operations Regulations 1995 [27] and work with other organisations who consent or licence drilling activities.

Dissemination of information is currently being investigated in the ‘Common Ground Project [28] for geotechnical information, based on user needs and market research on delivery methods and formats.

Future data sharing obligations

Data sharing obligations are commonly part of licensing and regulation. The recent National Underground Asset Register (NUAR) government-led project [29] provides an example of a pilot data sharing initiative culminating in a view that legislative reform was required to continue the work of the project, and the need for a funding vehicle. The NUAR project is an example of a successful project which considers the factors considered necessary to lead to a successful open data programme, namely, a clear strategy, considering the barriers to access to ensure the data is open in every sense and continued investment in the project [30].

Benefits and challenges of data sharing

The benefits of data sharing and re-use are recognised in the UK Geospatial Strategy 2030 [31] which aims to unlock the opportunities of location data. The re-use of borehole data for construction and infrastructure sector has been addressed by changes to the Construction Playbook, recognising that access to this data and then its subsequent re-use could reduce the number of boreholes drilled and better target locations for new drilling [32].

The challenges of data sharing include how to incentivise the sharing of data, legislative reform takes a significant amount of time and alternative options vary in their uptake. The consultation required to create a common format and minimum parameters required to ensure that data can be re-used and matches FAIR (Findable, Accessible, Interoperable and Re-useable) data principles is also significant. Finally, without legislative reform, issues around ownership and IPR would need to be addressed.

Possible options for sharing data

The value of BGS as a provider of factual and contextual subsurface data is evidenced in a report [32] focusing on infrastructure projects. Ensuring geothermal data is available for re-use could create similar benefits, providing primary data, enhancing efficiency, reducing risk and supporting decision making.

Four possible approaches for improving the pathway for geothermal data sharing are:

Approach	**Pros**	**Cons**
Legislation • Mandatory requirements to share data including powers to enforce. • Including agreed embargo periods or enforced open data	Higher chance of compliance with legislation and powers in place to enforce. Could ensure all data related to geothermal is captured (not just drilling information)	Challenging to allocate parliamentary time, low priority for new bills.
Update data sharing agreements • Such as the construction playbook or data sharing agreements in place with other public sector organisations. • Encourage the use of standard clauses in all contracts to say that data will be deposited with BGS as open.	Quicker to deploy than legislative reform. Could ensure all data related to geothermal is captured (not just drilling information)	Difficult to enforce without a funding vehicle to ensure compliance. Uptake has mainly been public authorities.
Rely on the support of industry to understand the value of sharing data • Work with groups to develop industry standards and processes • Setting up a paid for repository in the absence of regulation, that industry would pay into to maintain and donate to. This model has been tested by NUAR and resulted in the recognition that legislation is required to sustain this model.	Led from industry which may increase buy-in	Outstanding issues of client confidentiality

Tell Us Once Work with other regulatory organisations to create a “Tell us Once” portal where users requiring permits and licences could provide all the required information once to all parties.	Does not need legislative reform. Create efficiencies and improve data sharing across the public sector. Licenses and permit notifications could trigger a workflow to follow up for the data created from drilling activities.	Requires funding to develop a portal. Requires agreement across a number of organisations. Does not capture data which do not specifically relate to drilling unless a mechanism followed that obligated the deposit of data assets.

Summary

Geothermal data is created and handled by a number of organisations for purposes including licensing, regulation and health and safety. Although some drillers, developers and researchers deposit geothermal data with the National Geoscience Data Centre (NGDC) in its remit as a repository for subsurface data, there is no legal requirement to deposit this data with the NGDC. There is no agreed format for the types of data created which would enable efficient re-use of the data.

There is scope to improve various aspects of data sharing, including agreeing standard formats for sharing information provided across organisations. For example, creating a “Tell us Once” portal where users requiring permits and licences could provide all the required information once, would create efficiencies and improve data sharing across the public sector. Such a portal could be a catalyst to ensure that once licenses and permits are in place, data created from activities should be captured.

Four possible approaches for improving future geothermal data sharing have been summarised: legislation, updated data sharing agreements, relying on industry, and investment in a ‘tell us once’ portal. Funding to support user research to fully explore wider views on these approaches and wider geothermal data sharing options in order to develop recommendations for policy development and guidance is required.

References

[1] Abesser, C.; Gonzalez Quiros, A.; Boddy, J. 2023a. A deep geothermal energy white paper: The case for deep geothermal energy - unlocking investment at scale in the UK . British Geological Survey, North East Local Enterprise Partnership, Department for Energy Security and Net Zero, North East and Yorkshire Net Zero Hub, Arup.

[2] Abesser, C.; Gonzalez Quiros, A.; Boddy, J. 2023b. Evidence report supporting the deep geothermal energy white paper: the case for deep geothermal energy - unlocking investment at scale in the UK. Nottingham. UK, British Geological Survey, 134pp, OR/23/032.

[3] IEA 2024. The Future of Geothermal Energy.

[4] British Geological Survey, National Geoscience Data Centre, https://www.bgs.ac.uk/geological-data/national-geoscience-data-centre/ (accessed 3 March 2025)

[5] British Geological Survey,NGDC Digital Data Deposit Application, http://transfer.bgs.ac.uk/ingestion (accessed 3 March 2025)

[6] British Geological Survey, NGDC Data value checklist, https://www.bgs.ac.uk/download/ngdc-data-value-checklist/ (accessed 3 March 2025)

[7] British Geological Survey, NGDC Terms and Conditions, https://www.bgs.ac.uk/download/ngdc-terms-and-conditions/ (accessed 3 March 2025)

[8] Gov.UK, GEMINI and ISO 19139 metadata, https://guidance.data.gov.uk/publish_and_manage_data/harvest_or_add_data/harvest_data/gemini/#gemini-and-iso-19139-metadata (accessed 3 March 2025)

[9] British Geological Survey, NGDC Depositing Data – Preferred Digital Formats, https://www.bgs.ac.uk/download/ngdc-depositing-data-preferred-digital-formats/ (accessed 3 March 2025)

[10] British Geological Survey, BGS Metadata Catalogue, https://metadata.bgs.ac.uk/geonetwork/srv/eng/catalog.search#/home (accessed 3 March 2025)

[11] UKRI Natural Environment Research Council, Data Catalogue Service, https://data-search.nerc.ac.uk/geonetwork/srv/eng/catalog.search#/home (accessed 3 March 2025)

[12] British Geological Survey, Deposited Data Search, https://webapps.bgs.ac.uk/services/ngdc/accessions/index.html (accessed 3 March 2025)

[13] British Geological Survey, Single Onshore Borehole Index (SOBI), https://www.bgs.ac.uk/datasets/boreholes-index/ (accessed 3 March 2025)

[14] The National Archives, legislation.gov.uk, Mining Industry Act 1926, https://www.legislation.gov.uk/ukpga/Geo5/16-17/28/enacted (accessed 3 March 2025)

[15] The National Archives, legislation.gov.uk, Water Resources Act 1991, https://www.legislation.gov.uk/ukpga/1991/57/contents (accessed 3 March 2025)

[16] The National Archives, legislation.gov.uk, Water (Scotland) Act 1980, https://www.legislation.gov.uk/ukpga/1980/45/contents (accessed 3 March 2025)

[17] Scottish Government, Accessing Scotland's geothermal resource: regulatory guidance, https://www.gov.scot/publications/accessing-scotlands-geothermal-resource-regulatory-guidance/pages/1/ (accessed 3 March 2025)

[18] GOV.UK, Guidance, Deep geothermal energy regulation, https://www.gov.uk/guidance/deep-geothermal-energy-regulation (accessed 3 March 2025)

[19] GOV.UK, Guidance, Closed loop ground source heating and cooling systems: when you need a permit, https://www.gov.uk/guidance/closed-loop-ground-source-heating-and-cooling-systems-when-you-need-a-permit (accessed 3 March 2025)

[20] Scottish Environment Protection Agency, SEPA's Requirements for Activities Related to Geothermal Energy v 1.3, https://www.sepa.org.uk/media/594535/geothermal-october-2022.pdf (accessed 3 March 2025)

[21] GOV.UK, Collection, Coal mining permits and licenses, https://www.gov.uk/government/collections/coal-mining-permits-and-licences (accessed 3 March 2025)

[22] GOV.UK, Guidance, The Construction Playbook, https://www.gov.uk/government/publications/the-construction-playbook (accessed 3 March 2025)

[23] Association of Geotechnical and Geoenvironmental Specialists, AGS Data Format, https://www.ags.org.uk/data-format/ (accessed 3 March 2025)

[24] MCS, The MCS Specification for Ground Source Closed-Loop Drilling Issue 1.0, 25/02/2022, https://mcscertified.com/wp-content/uploads/2022/02/The-MCS-Specification-for-Ground-Source-Closed-loop-Drilling-1.0.pdf (accessed 3 March 2025)

[25] IADC, IADC Geothermal Well Classification, Issue 1.0, 17/02/2025, https://iadc.org/wp-content/uploads/2025/02/IADC-Geothermal-Well-Classification-v1.pdf (accessed 3 March 2025)

[26] Ground Source Heat Pump Association, Vertical Borehole Standard, https://mail.gshp.org.uk/GSHPA_Vertical_Borehole_Standard.html (accessed 3 March 2025)

[27] Legislation.gov.uk, The Borehole Sites and Operations Regulations 1995, https://www.legislation.gov.uk/uksi/1995/2038 (accessed 3 March 2025)

[28] British Geological Survey, The Common Ground Project, BGS Research, https://www.bgs.ac.uk/geology-projects/the-common-ground-project/ (accessed 3 March 2025)

[29] GOV.UK, Policy Paper, NUAR project update – November 2024, https://www.gov.uk/government/publications/national-underground-asset-register-project-update-november-2023/nuar-project-update-november-2023 (accessed 3 March 2025)

[30] Wildman, G; Lewis, E, 2021, Value of open data: A geoscience perspective, Wiley Geoscience Data Journal, https://rmets.onlinelibrary.wiley.com/doi/pdfdirect/10.1002/gdj3.138 (accessed 10 March 2025)

[31] GOV.UK, Policy Paper, UK Geospatial Strategy 2030, https://www.gov.uk/government/publications/uk-geospatial-strategy-2030/uk-geospatial-strategy-2030 (accessed 10 March 2025)

[32] Bricker, S; Terrington R; Burke H; Dobbs M; Arnhardt R; Kearsey T; Thorpe S, 2021, Urban Geoscience Report - The value of geoscience data, information and knowledge for transport and linear infrastructure projects, British Geological Survey.

[32] Terrington, R; West, H https://gdsgeospatial.blog.gov.uk/2022/09/05/construction-playbook-why-the-relaunch-will-improve-re-use-of-ground-investigation-data/

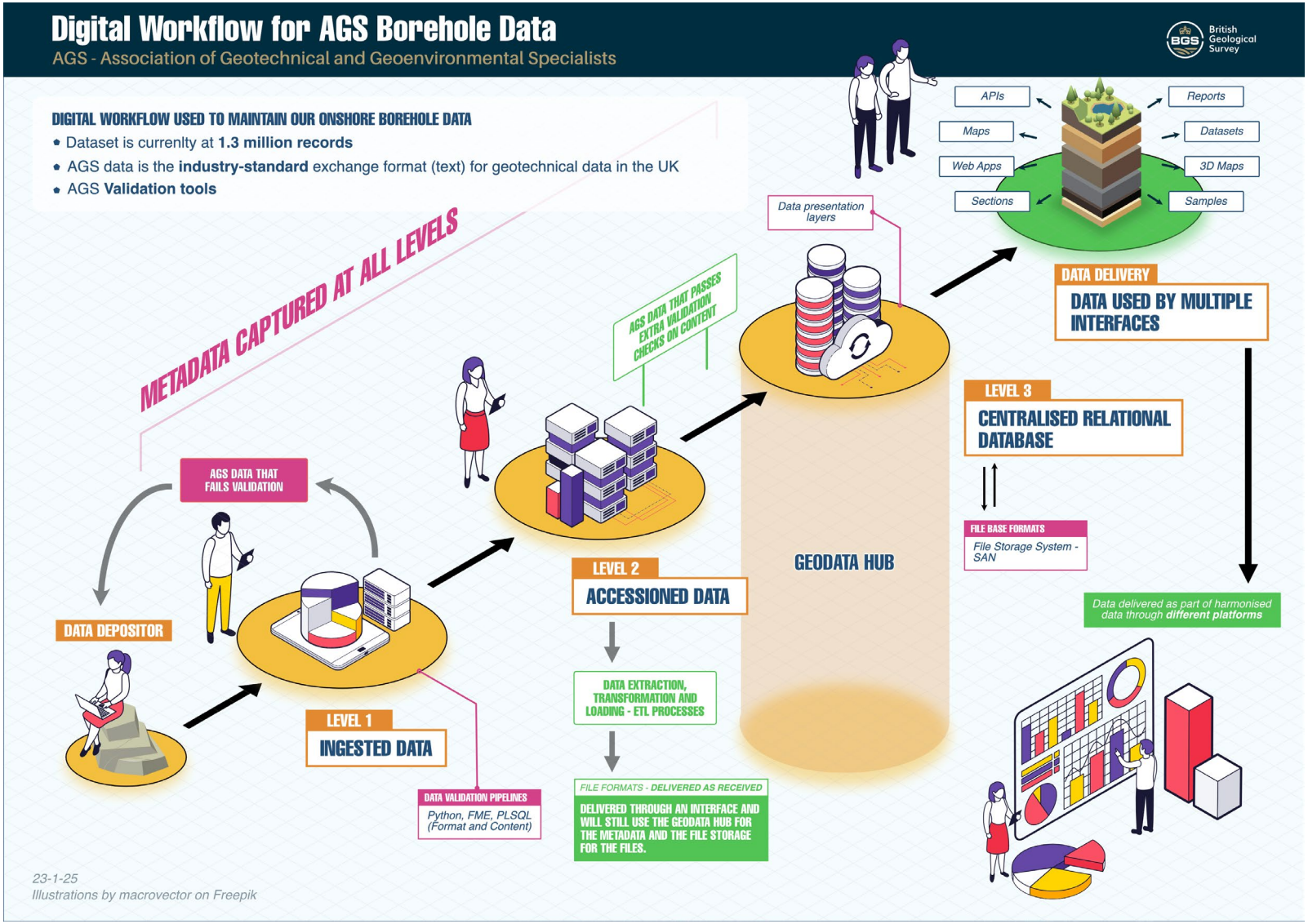

Figure 2 Digital workflow for AGS borehole data; a similar standard could be used for geothermal data.

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