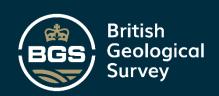


BGS INFORMATICS, DECARBONISATION AND RESOURCE MANAGEMENT

User Guide: BGS Thermal Properties V1 (Great Britain)

Open Report OR/25/014



BRITISH GEOLOGICAL SURVEY

BGS INFORMATICS, DECARBONISATION AND RESOURCE MANAGEMENT OPEN REPORT OR/25/014

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Maps and diagrams in this book use topography based on Ordnance Survey mapping.

User Guide: BGS Thermal Properties V1 (Great Britain)

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Foreword

The British Geological Survey (BGS) is a world-leading geological survey, focusing on publicgood science for Government and research to understand earth and environmental processes.

We are the UK's premier provider of objective and authoritative geoscientific data, information and knowledge to help society to:

- use its natural resources responsibly
- manage environmental change
- be resilient to environmental hazards

We provide expert services and impartial advice in all areas of geoscience. As a public sector organisation, we are responsible for advising the UK Government on all aspects of geoscience as well as providing impartial geological advice to industry, academia and the public. Our client base is drawn from the public and private sectors both in the UK and internationally.

The BGS is a component body of the Natural Environment Research Council (NERC), part of UK Research and Innovation (UKRI).

DATA PRODUCTS

BGS produces a wide range of data products that align to Government policy and stakeholder needs. These include baseline geological data, engineering properties and geohazards datasets. These products are developed using in-house scientific and digital expertise and are based on the outputs of our research programmes and substantial national data holdings.

Our products are supported by stakeholder focus groups, identification of gaps in current knowledge and policy assessments. They help to improve understanding and communication of the impact of geo-environmental properties and hazards in Great Britain, thereby improving society's resilience and enabling people, businesses, and the government to make better-informed decisions.

Acknowledgments

This report is the published product of a study by the British Geological Survey (BGS) to create a digital dataset suitable for describing thermal properties of bedrock at or near surface for Great Britain. The methods used to derive the data were determined by a team of specialists with a broad range of expertise, including geophysics, geothermal, statistical modelling and spatial analytics. A large number of individuals within BGS have contributed to the dataset over several decades, notably staff who delivered the 1970-1980s geothermal programme and most recently I. Gale, K. Rollin and J. Busby. This user guide was written by R. Lawley with editorial input from Dr. A. Monaghan and Mr D. P. Boon.

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Summary

The British Geological Survey (BGS) Thermal Properties dataset is derived from a programme of work commissioned in 2004 by the Carbon Trust to assess the suitability of BGS geological records for site characterisation when installing ground source heat pumps (GSHP). The dataset portrays a range of information relating to the thermal characteristics of bedrock – defined here by the 1:250 000 scale digital geological map (BGS DiGMapGB 250 V4). The information is presented as a vector polygon coverage for the extent of Great Britain (GB). Each record in the dataset describes the lithology, age, Thermal Conductivity, Thermal Diffusivity, Specific Heat Capacity and Density of the rock units. The information is summarised from a wider programme of work that has been developed since the late 1970's and includes published information from laboratory measurements and deep-drilling observations.

The information provided in this User Guide is intended to provide a quick start guide to using and understanding the BGS Thermal Properties dataset V1 (Great Britain).

1 Introduction

Since June 2019, the UK Government has committed to reducing the UK's net greenhouse gas emissions by at least 100% by 2050 compared with 1990 levels (BEIS,2021). This strategy coupled with the Energy Security bill (2021 and 2023) and a series of incentive schemes (RHI, BUS, PSDS) has encouraged the uptake of geothermal or ground source heat pumps for domestic and commercial heating/cooling of buildings. Ground Source Heat Pumps (GSHP) have been an established technology for many years, but until recently, have not been widely used in Great Britain with only a few thousand systems installed annually. GSHP systems extract low grade heat from the subsurface either via groundwater pumped from boreholes ("open loop"), or from the ground itself (closed loop) via conductive heat transfer where plastic pipes, or loops, are installed into vertical boreholes. Typically, GSHPs extract heat from between 10s to 400m below ground level.

Deeper geothermal boreholes from which medium grade heat can be used directly, or from which power (electricity) can be generated are also of increasing interest for decarbonisation and decentralisation of energy supply.

The design of an efficient GSHP or deeper geothermal infrastructure requires an good understanding of thermal properties of the ground, often termed 'soil' by engineers, but in the UK environment this includes loose soils and hard rocks, and everything in between; this dataset describes a model of thermal properties of bedrock for Great Britain. As more GSHP and deeper geothermal systems are installed over the next decade and as more data become available from research in the lab and field, this model can be iteratively improved in terms of spatial resolution, accuracy and precision.

The geothermal potential of the UK was initially investigated by a program funded by the UK government and the European Commission that ran from 1977-1994. It comprised three elements: an appraisal of heat flow, an investigation of the potential of hot brines in deep sedimentary aquifers that might be suitable for electricity generation or direct use applications, and an investigation of petro-thermal granites that might be exploited as Hot Dry Rock (HDR) reservoirs. The results have been summarized in Burley et al (1984), Downing and Gray (1986a, b), Rollin (1987), BGS (1988), Parker (1989, 1999) and Barker et al. (2000).

Since the initial investment in geothermal research, BGS has developed a broader ongoing research area for ground heat (in all forms) and actively supports public and private sector projects concerned with utilising the subsurface for heating, cooling, interseasonal thermal energy storage, and power (electricity generation).

The information presented here was compiled by BGS to support its GeoReports service for GSHP installers (Gale, 2004 and 2005). The model is created from a revised 1:250 000 scale digital geological map supplemented with thermal properties derived from a range of borehole and laboratory observations (including data derived from the early geothermal projects). An earlier version of the model, utilising elements of the BGS 1:625 000 scale map was first documented (in a non-spatial form) in 1984 (Burley et al, 1984) and again in 1987 (Rollin, 1987).

1.1 WHAT THE DATA SHOW

This dataset shows thermal properties relating to the bedrock beneath our feet. The information can be used to assess the energy transfer potential of the ground for geo-exchange, mainly for closed loop ground source heat pumps, energy piles, heat storage schemes, other subsurface infrastructure, and deeper geothermal assessments, across the United Kingdom. The attribution and spatial data underpinning the model are that which is described and shown by Rollin (1987) and Gale (2004, 2005).

The information is presented as either:

- a vector-based, irregular polygon coverage at 1:250 000 scale
- a vector-based, hexagonal, cellular grid (side length 1km, area c.2.6 Km²)

Each raster/vector cell is attributed with a range of geological properties including modelled values for thermal conductivity, thermal diffusivity, specific heat capacity and bulk density.

Coverage in this dataset is for the Great Britain (see Figure 1). The underpinning thermal property data used to create the estimated values is largely informed by the online geothermal catalogue data (as point data).



Figure 1 Coverage of the Thermal Properties V1 product. Coastline: Contains OS data © Crown copyright and database right 2024

1.2 WHO MIGHT REQUIRE THE DATA

The data will be of use to organisations in the public and private sectors who need to understand or model the potential to deploy ground source heat pumps or deeper geothermal for heating/cooling. The dataset is for specialist use (i.e. GSHP designers, HVAC and civil engineers, installers, geothermal experts, researchers and heat management specialists). Users requiring a more simplified assessment of the potential for GSHP, and other forms of geothermal energy can access summary information from the BGS website.

The BGS carries out updates and amendments to the underlying databases as part of its national remit to acquire, model and publish relevant geological information for public good. This model is the first published release and is based on the 2004 model described by Busby et al (2011).

2 Case study: Determining locations suitable for Ground Source Heat Pumps

In this case study we review the use of the Thermal Properties V1 model within a portfolio of data and online tools to assess suitability of closed loop GSHP to meet a net zero strategy for heating and cooling of a UK public sector property portfolio.

2.1 THE PROBLEM

Heat decarbonisation of public assets is one of the greatest challenges the public sector faces because roughly half of the carbon emissions generated by a UK organisation or homeowner in 2025 are from space heating and hot water using fossil fuel boilers. Estate managers are trying to compare alternative heat resourcing from a range of net zero options to remove a CHP plant or replace 'end of life' boilers, and deployment of GSHP technology is commonly seen as 'challenging' because of the complexity and paucity of data available in the early stages of any strategic review. Asset managers need to be able to quickly understand whether GSHP technology would be an option at their site, and how well it may compare with the counterfactual (e.g. Gas or Air Source Heat Pumps).

2.2 THE CHALLENGE

The perceived disadvantage of deploying GSHP as part of a n organisations net zero pathway, is often due to a lack of technology awareness and experience, with added uncertainty around the time frames for planning consents, levels of disruption during installation, high upfront capital costs, unclear operational running costs and pay back periods, and lack of knowledge around life expectancy of the different system components (ground loop pipes and heat pumps). Uncertainty about ground conditions and long-term sustainability and reliability of the heat source is major barrier to investment. Resolving the 'initial hurdles' of information for GSHP is critical to getting this technology more widely considered at an early stage in Decarbonisation projects. What is needed is a simple way to assess the fundamental metrics that influence availability of ground heat: principally the geothermal heat flow, thermal properties of the ground, accessibility to the heat resource (ease of drilling and loop installation), and an estimation of the costs of a 'collector array' of sufficient capacity to meet design loads, within the constraints of the land available for drilling works.

2.3 THE SOLUTION

The Thermal Properties V1 model is suitable for professionals making an initial feasibility assessment for GSHPs. It is a simple map coverage that highlights the modelled variation in thermal conductivity, specific heat capacity and thermal diffusivity of bedrock layers. GSHP designers and installers need to consider heat transfer (along with other practical and economic factors) to estimate the sustainable thermal energy extraction rate (W/m) of a borehole and optimal depth of drilling given the local ground conditions. The model is designed to be used alongside and in conjunction with a range of other national data relating to GSHP (e.g. heat demand mapping and heat network zoning).

The dataset described here has been integrated into a screening toolkit on behalf of NHS (England) by the BGS and the Energy Systems Catapult. The toolkit enables NHS Trust energy and sustainability managers to rapidly assess the theoretical heating capacity of a closed loop GSHP system utilising available parcels of land at their site.

3 Methodology

3.1 OVERVIEW

The standard BGS Geology 250K Version 4 bedrock map has been attributed with basic thermo-physical properties comprising, thermal conductivity, specific heat capacity and density. From these parameters, thermal diffusivity has been calculated and attributed using long-established equations.

3.1.1 Geological domains and thermal properties

Typically, the age and lithology of a rock or soil fundamentally controls its engineering, geochemical and geophysical properties. For most BGS geological maps, attribution is on the basis of the LEX-ROCK (or more lately LEX-RCS) code provided for each geological unit. This code combination describes the lithostratigraphic name for the rock and its lithology (based on the BGS Rock Classification Schemes, or RCS) and reflects how the rocks were identified and differentiated at time of survey and map compilations. There are 1102 unique LEX-ROCK combinations available in the BGS Geology 250 V4 bedrock map. However, we do not hold enough thermal property measurements to fully statistically represent all of those combinations across the full range of UK crustal stress and temperature conditions. However, thermal properties are more closely controlled by lithology or rock type; therefore, it has been possible to reprofile the map data to consider primarily lithology (of which there are only 85 unique Rock codes) and a much-simplified geological age, in this case the 'System' age (also known as geological period) of the rock (e.g. 'Devonian'). Using this combination of lithology and age provides 206 unique codes, and this is more appropriate to statistically resolve the thermal property data. The code combinations are presented in appendix 1.

3.1.2 Thermal conductivity

The thermal conductivity of a material is the quantity or maximum flow of thermal energy transmitted per unit area, per unit temperature gradient, in unit time under steady state conditions. It is the main mechanism for transfer of heat from the interior of the earth to the surface and for transfer of heat from solar warming downwards into the earth. Its SI units of measurement are Wm⁻¹K⁻¹ and often denoted as Watts per meter per one degree change in Kelvin.

Thermal conductivity can be derived from laboratory measurements of representative samples, it can also be derived (at a formation scale) computationally from geophysical logging datasets or mineralogy data.

Just like geology, the bulk thermal conductivity can vary significantly laterally and horizontally in the crust. The mineralogical composition of the rock or deposit, it's porosity and density, and the nature of any saturating fluids in fractures will primarily control the bulk thermal conductivity. In general, increasing porosity will decrease the thermal conductivity of a geological unit, but this effect is reduced if the rock is water saturated. Therefore, for sedimentary rocks the primary control on thermal conductivity is porosity, the mineral make-up of the sedimentary rock and the extent of saturation. For volcanic and metamorphic rocks porosity is also the main influence on thermal conductivity, but matrix porosity is often low so the porosity is generally in the form of open fluid-filled fractures. Superficial materials such as glacial till present the greatest challenge to determining thermal conductivity due to their range of lithological heterogeneity as well variable degree of saturation and thickness; for this reason, the Thermal Properties V1 model is based upon bedrock information only. Users requiring information about thermal properties for superficial materials should contact enquiries@bgs.ac.uk.

3.1.3 Specific Heat Capacity

The specific heat capacity of a material is the quantity of heat (Joules) that must be added to one unit of mass (kg) of the material in order to cause an increase of one unit in temperature (Kelvin). Its units of measurement are $J.kg^{-1}K^{-1}$.

Specific heat is affected by lithology type and porosity, especially where the porosity is occluded by water.

3.1.4 Density

The density of a material is the ratio of its mass to its volume. Its SI units of measurement are kg.m⁻³.

Rock densities are generally derived from laboratory measurements of representative samples. Relative bulk densities of rock units can also be derived from geophysical logging (Neutron Density).

3.1.5 Thermal diffusivity

The thermal diffusivity of a material is a measure of the heat transfer rate or ability of a material to conduct thermal energy relative to its ability to store thermal energy (it is the ratio between thermal conductivity of a material and its heat capacity). Its units of measurement are m²s⁻¹.

3.2 CREATING THE TESSELLATED HEXAGON COVERAGE

The 1:250 000 vector dataset has been converted to a vector cellular grid using the tessellation toolkit available in ESRI's ArcPro3.2 GIS. The vector cellular grid is supplied as a 1km-sided hexagonal cell tessellation (each cell has an area of 2.56km²), designed to provide a resampled and easier to use version of the original BGS 1:250 000 polygon-based model.

The hexagon based cellular grid offers a summary of the geology which is driven by the most spatially dominant bedrock type encountered within the area of the hexagon. A range of numerical values for each thermal property is provided – typically in the form of Minimum, Maximum and area-weighted average. The attribution of the 1:250 000 scale and hex-grid versions of the data are given in Table 1 and 2 below.

3.3 SOURCE DATASETS

The Thermal Properties V1 model is based on a compilation of the following:

- BGS Geology 250k v4 geology map (bedrock),
- BGS Geology 625k V1 geology map (superficial),
- a collection of published research papers (outlined above) and,
- the 4th edition of the UK Geothermal Catalogue (Rollin 1987).

The first digital release of the legacy UK Geothermal Catalogue has been published, see Fellgett & Monaghan (2024), and can be downloaded from the BGS website: https://webapps.bgs.ac.uk/services/ngdc/accessions/index.html#item184577 .

4 Technical Information

This section provides more detailed information on the Data Product, its content, and advice on best use as well as highlighting some important considerations for users.

4.1 SCALE

The Thermal Properties V1 dataset is intended for use at 1:250 000 scale and largely created from data cartographically captured at that scale, as such the underlying bedrock geological linework is considered accurate to +/- 250m.

4.2 COVERAGE

The Thermal properties V1 dataset has coverage for Great Britain and the Isle of Man. Coverage for the dataset is shown in Figure 1. Northern Ireland is served by the Geological Survey of Northern Ireland (GSNI).

4.3 ATTRIBUTE DESCRIPTION

BGS supplies Thermal Properties mapping in two vector formats:

- a) the higher resolution Thermal Properties V1 dataset, with a working scale of 1:250 000, with attribution shown in Table 1 below, and
- b) the summarised Thermal Properties V1 Hex dataset, based on tessellated polygons of c.2.56 km² area, with attribution shown in table 2 below.

FIELD	DESCRIPTION	EXAMPLE
OBJECTID	Unique identifier for polygon	20319
LEX	The lithostratigraphic code for the rock	SSG
ROCK	The rock code for the rock type	SDST
LEXICONDES	Descriptive lithostratigraphic name for the rock	SHERWOOD SANDSTONE GROUP
ROCKDESC	Descriptive lithology type for the rock	SANDSTONE
AGE	Generic age code for the rock (based on the system age code)	PU
MIN_AGE	Minimum geological age code for the rock	TD
PARENT	Parent lithostratigraphic unit for the rock	NRS
STAGE	Geological 'stage' name for the rock	NA
SERIES	Geological 'series' name for the rock	TRIASSIC
SUBSYSTEM	Geological 'subsystem' name for the rock	NA
SYSTEM	Geological 'system' name for the rock	PERMIAN
ERATHEM	Geological 'erathem' name for the rock	PALAEOZOIC
EONOTHEM	Geological 'eonothem' name for the rock	PHANEROZOIC
THERMC	The thermal capacity of the rock (Wm ⁻¹ K ⁻¹)	3.03
DENS	The density of the rock (g.cm ⁻³)	2.65
SHEAT	The specific heat capacity of the rock (kJ.kg ⁻¹ K ⁻¹)	0.84
TDIFF	The thermal diffusivity of the rock (m ² .day-1)	0.1176
VERSION	The version/title identifier for the dataset	THERMAL_PROPERTIES_V1_GB

Table 1 Attributes of the Thermal Properties V1 GB dataset.

FIELD	DESCRIPTION	EXAMPLE
UUID	Unique identifier of each hexagon	84032
GEOL_DESC1	A verbose description summarising the superficial geology found in the 1km sided hexagon.	Dominant superficial cover is: Glacigenic Deposits (49% coverage), along with: Alluvial Deposits (24%).
GEOL_DESC2	A verbose description summarising the dominant bedrock geology units found in the hexagon.	Dominant bedrock is: LOCHABER SUBGROUP-PSAMMITE AND SEMI- PELITE (33% coverage), along with: AILNACK PHYLLITE AND LIMESTONE FORMATION-PSAMMITE, PELITE AND METALIMESTONE (24%),
GEOL_DESC3	Continuation of the description summarising the less dominant bedrock geology found in the hexagon.	(continued): MORTLACH GRAPHITIC SCHIST FORMATION-PELITE, GRAPHITIC (23%), CORRYHABBIE QUARTZITE FORMATION-QUARTZITE (18%), additional minor bedrock units occur.
MINTC	The minimum thermal conductivity found in the hexagon ($Wm^{-1}K^{-1}$)	3.1
MAXTC	The maximum thermal conductivity found in the hexagon (Wm ⁻¹ K ⁻¹)	4
WTAV_TC	The area-weighted mean thermal conductivity found in the hexagon (Wm ⁻¹ K ⁻¹)	3.8
MINTD	The minimum thermal diffusivity found in the hexagon (m ² ·day ⁻¹)	0.1137
MAXTD	The maximum thermal diffusivity found in the hexagon (m ^{2.} day ⁻¹)	0.1629
WTAV_TD	The area-weighted thermal diffusivity found in the hexagon (m ^{2.} day ⁻¹)	0.154
MINSH	The minimum specific heat capacity found in the hexagon (kJ.kg ⁻¹ K ⁻¹)	0.78
MAXSH	The maximum specific heat capacity found in the hexagon (kJ.kg ⁻¹ K ⁻¹)	0.86
WTAV_SH	The area weighted specific heat capacity found in the hexagon (kJ.kg ⁻¹ K ⁻¹)	0.84
MIND	The minimum bulk density found in the hexagon (Mg/m ³)	2.72
MAXD	The maximum bulk density found in the hexagon (Mg/m ³)	2.79
VERSION	The version/title identifier for the dataset	THERMAL_PROPERTIES_V1(HEX)_GB

Table 2 Attributes of the Thermal Properties V1 (hex) GB dataset

4.4 DATA FORMAT

The BGS Thermal Properties V1 dataset is available as a vector GIS dataset with attribute values relating to geological description and thermal properties. The dataset comprises polygon data in (ESRI) Shapefile format (SHP). Other formats such as QGIS Geopackage and MapInfo (TAB) are available.

4.5 DATASET HISTORY

This is the first published version of the digital Thermal Properties V1 dataset.

4.6 **DISPLAYING THE DATA**

The data is alpha-numerical, providing classifications of geological materials in terms of age, lithological type and thermal properties (shown as numerical values). Typically, the geological information can be portrayed with **any** colouration. An example colour lookup table is provided with the dataset for the purpose of showing the Thermal Conductivity values as a colour ramp (and lyr/gpkg files are also supplied). The thermal properties attribution does not need any **specific** parameters for map display. Users wishing to show these values as a colour map can utilise **any** graduated colour scheme (within their GIS software) that spans the full range of the data provided.

5 Licencing the data

5.1 BGS LICENCE TERMS

The British Geological Survey does not sell its digital mapping data to external parties. Instead, BGS grants external parties a licence to use this data, subject to certain standard terms and conditions. In general, a licence fee will be payable based on the type of data, the number of users, and the duration (years) of a licence.

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5.2 DATA AVAILABILITY VIA A WEB MAP SERVICE

To encourage the use and re-use of this data we have made The hex grid variant of the dataset available under the Open Government Licence www.nationalarchives.gov.uk/doc/open-government-licence/version/3/, via a web map service and subject to the following

acknowledgement accompanying the reproduced BGS materials: "Contains British Geological Survey materials © UKRI [year]".

This dataset falls under BGS' OpenGeoscience portfolio of datasets and services. OpenGeoscience provides a wide range of freely available geoscience information allowing users to view maps, download data, access web services and browse our archive of photos, maps and memoirs. The services available under OpenGeoscience include:

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- Data collections
- Software

Please refer to OpenGeoscience, see www.bgs.ac.uk/Opengeoscience for more information and a full listing of datasets and services available under this service.

5.3 DATA ACKNOWLEDGMENTS

Please use the following acknowledgements when *using* the Thermal Properties V1 dataset:

Thermal Properties V1 dataset, licenced data: 'Derived from BGS Digital Data under Licence (*cite your licence number here*) British Geological Survey © UKRI. All rights reserved.'

The data product and user guidance may be cited in publications as follows:

British Geological Survey (2024): Thermal Properties V1 dataset. British Geological Survey. (Dataset). https://doi.org/10.5285/def961e0-3432-4af8-a09a-a489c845af54

5.4 CONTACT INFORMATION

For all data and licensing enquiries please contact: BGS Data Services **British Geological Survey** Environmental Science Centre Keyworth Nottingham NG12 5GG Direct Tel: +44(0)115 936 3143 Email: digitaldata@bgs.ac.uk

6 Limitations

6.1 DATA CONTENT

The Thermal Properties V1 dataset is a compilation of observed and modelled data derived from previously published and unpublished maps and archive information. The models are based upon the interpolation of evidence available at the time.

6.2 SCALE

The data are provided as irregular vector polygons, or as a tessellated vector grid of polygons.

The 1:250 000 scale vector polygons have been captured with a cartographic accuracy of +/-250m.

The tessellated hexagon-based dataset has polygons with a surface area of 2.56km² (each side of the hexagon is 1km in length).

The smallest resolution offered by the hex-cell layer is 2.56 km², this layer is a direct resampling of the 1:250 000 scale dataset (see also section 3 Methodology).

6.3 ACCURACY AND UNCERTAINTY

Users of this data should be aware that this is a compilation of simplified geology at 1:250 000 scale and estimated/modelled values of thermal properties (based on laboratory and downhole observations). The results of the model should be considered as indicative. The age of this dataset and its original derivation from legacy records, predates the use of modern geostatistical methods at BGS, and so no uncertainty modelling (of the inputs) is available.

Users wishing to update or modify this model for their own purposes, should consider acquiring the original point dataset from the legacy geothermal catalogue to create a new interpolation.

Future releases of this dataset will include new metrics for uncertainty and will incorporate alternative coordinate reference systems.

6.4 ARTEFACTS

The Thermal Properties V1 dataset been compiled from data of differing ages, locations, lithologies and methods. As a synthesis of data across Great Britain there may be data artefacts created by the combination of input data, the methods used to collate observed values and the limitation of the sample size, compared with the natural variance of thermal properties and geological materials across our environment.

The 1km Hexagon tessellation vector layer has been directly resampled from the original 1:250 000 scale model. The values of minimum, maximum and mean values for the thermal properties have been created using standard ESRI ArcGIS tools for spatial analysis.

6.5 **DISCLAIMER**

The use of any information provided by the British Geological Survey ('BGS') is at your own risk. Neither BGS nor the Natural Environment Research Council (NERC) or UK Research and Innovation (UKRI) gives any warranty, condition, or representation as to the quality, accuracy or completeness of the information or its suitability for any use or purpose. All implied conditions relating to the quality or suitability of the information, and all liabilities arising from the supply of the information (including any liability arising in negligence) are excluded to the fullest extent permitted by law. No advice or information given by BGS, NERC, UKRI or their respective employees or authorised agents shall create a warranty, condition or representation as to the quality, accuracy or completeness of the information or its suitability for any use or purpose.

7 Frequently asked questions

The questions and answers below have been provided to address potential issues relating to how the product can be used or how it can be interpreted. If you have any additional questions, please contact digitaldata@bgs.ac.uk

Q: What does this dataset show?

A: This dataset portrays a compilation of summary data which outlines the thermal properties of bedrock through the subsurface for Great Britain.

Q: What scale are these data provided at?

A: Data are provided as vector polygons at a 1:250 000 scale, or as tessellated vector cells 2.56km² area, and side length of 1km.

Q: How accurate is this dataset?

A: The database is based on xxx estimates of thermal properties (derived from previously published research), compiled alongside the BGS Geology 250k bedrock map. This is a relatively sparse dataset for national coverage, but new data is being acquired by BGS as part of our ongoing research into geothermal technologies.

Q: How often will this dataset be updated?

A: The background database is amended and updated over time. It is intended that the Thermal Properties V1 dataset will be updated and republished on an episodic basis (typically 2-4 years).

Q: In what formats can the dataset be provided?

A: The dataset can be provided as a coverage of vector polygons. BGS normally supplies data in ESRI *SHP format but can also supply QGIS Geopackages and MapInfo TAB format.

Q: Can I access the underlying data?

A: Many of the underlying thermal properties data can be reviewed in previously published papers (outlined above). Some data is also available in the Geothermal Catalogue here: https://www2.bgs.ac.uk/nationalgeosciencedatacentre/citedData/catalogue/05569ed5-db0e-4587-807c-58e39ee240fa.html?_ga=2.120694285.444736648.1725035139-1121370896.1725035139.

Q: Can I use this dataset as part of a commercial application?

A: Please refer to the licencing terms supplied alongside the dataset. For further queries regarding the licensing terms of our products, please contact digitaldata@bgs.ac.uk.

Appendix 1

SYSTEM	LITHOLOGY	TCOND Wm ⁻¹ K ⁻¹	DENS Mgm ⁻³	SHC kJkg ⁻¹ K ⁻¹	TDIFF m²day¹
UNDIFF	ACID ROCK, UNDIFFERENTIATED, COARSE-GRAINED	3.27	2.62	0.84	0.1284
NA	ACID ROCK, UNDIFFERENTIATED, COARSE-GRAINED, METAMORPHOSED	2.9	2.65	1	0.0946
SILURIAN	ACID ROCK, UNDIFFERENTIATED, COARSE-GRAINED, METAMORPHOSED	2.9	2.65	1	0.0946
UNDIFF	ACID ROCK, UNDIFFERENTIATED, FINE-GRAINED	3	2.65	0.84	0.1164
		3.2	2.7	0.83	0.1234
NA DEVONIAN	AMPHIBOLITE AND HORNBLENDE SCHIST AND ESITIC LAVA	2.75 2.35	<u>2.88</u> 2.75	<u>0.84</u> 1	0.0982
ORDOVICIAN	ANDESITIC LAVA	2.5	2.75	1	0.0785
SILURIAN	ANDESITIC LAVA	2.5	2.75	1	0.0785
DEVONIAN	ANDESITIC TUFF	2.35	2.75	0.9	0.082
SILURIAN	ANDESITIC TUFF	2.5	2.75	0.9	0.0873
PERMIAN	ANHYDRITE ROCK ARGILLACEOUS ROCKS AND ISUBEOUAL/SUBORDINATEI CHERT, INTERBEDDED	5.06	2.96	1	0.1477
CARBONIFEROUS CAMBRIAN	ARGILLACEOUS ROCKS AND ISUBEQUAL/SUBORDINATET CHERT, INTERBEDDED	<u>1.79</u> 2.18	2.6 2.61	0.92 0.92	0.0647
SILURIAN	ARGILLACEOUS ROCKS AND ISOBEQUAL/SUBORDINATE ONE IN INTERDEDUED	2.18	2.65	0.92	0.0773
CRETACEOUS	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED	1.67	2.2	0.9	0.0729
JURASSIC	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED	1.8	2.3	0.9	0.0751
TRIASSIC	ARGILLACEOUS ROCKS AND ISUBEOUAL/SUBORDINATE1 LIMESTONE. INTERBEDDED	2.1	2.28	0.9	0.0884
CARBONIFEROUS	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED	2.45	2.62	0.9	0.0898
TRIASSIC PERMIAN	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE AND ARGILLACEOUS ROCKS AND ISUBEOUAL/SUBORDINATE] SANDSTONE AND	2.46 2.5	2.55 2.55	0.89 0.89	0.0937
JURASSIC	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE AND	1.76	2.33	0.89	0.0712
CRETACEOUS	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	1.77	2.45	0.89	0.0701
PALAEOGENE	ARGILLACEOUS ROCKS AND ISUBEOUAL/SUBORDINATE1 SANDSTONE. INTERBEDDED	1.8	1.9	0.89	0.092
PERMIAN	ARGILLACEOUS ROCKS AND ISUBEOUAL/SUBORDINATE1 SANDSTONE. INTERBEDDED	1.9	2.6	0.89	0.0709
TRIASSIC	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	1.97	2.38	0.89	0.0804
SILURIAN ORDOVICIAN	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	2.4	2.68 2.72	0.89 0.89	0.0869 0.0857
NA	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	2.4	2.72	0.89	0.0837
CARBONIFEROUS	ARGILLACEOUS ROCKS AND ISOBEQUAL/SUBORDINATE SANDSTONE, INTERBEDDED	2.56	2.6	0.89	0.0956
CAMBRIAN	ARGILLACEOUS ROCKS AND ISUBEOUAL/SUBORDINATEI SANDSTONE. INTERBEDDED	2.6	2.65	0.89	0.0952
DEVONIAN	ARGILLACEOUS ROCKS AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	2.89	2.65	0.89	0.1059
JURASSIC	ARGILLACEOUS ROCKS, UNDIFFERENTIATED	1.3	2.4	0.92	0.0509
PERMIAN	ARGILLACEOUS ROCKS, UNDIFFERENTIATED	1.77	2.57	0.92	0.0647
PALAEOGENE CARBONIFEROUS	ARGILLACEOUS ROCKS, UNDIFFERENTIATED ARGILLACEOUS ROCKS, UNDIFFERENTIATED	<u>1.79</u> 1.79	<u>1.98</u> 2.6	0.92 0.92	0.0849
TRIASSIC	ARGILLACEOUS ROCKS, UNDIFFERENTIATED	1.87	2.52	0.92	0.0697
CRETACEOUS	ARGILLACEOUS ROCKS, UNDIFFERENTIATED	2.18	2.02	0.92	0.098
SILURIAN	ARGILLACEOUS ROCKS, UNDIFFERENTIATED	2.18	2.65	0.92	0.0773
ORDOVICIAN	ARGILLACEOUS ROCKS. UNDIFFERENTIATED	2.18	2.74	0.92	0.0747
	ARGILLACEOUS ROCKS, UNDIFFERENTIATED	2.18	2.61	0.92	0.0784
NA DEVONIAN	ARGILLACEOUS ROCKS, UNDIFFERENTIATED ARGILLACEOUS ROCKS, UNDIFFERENTIATED	2.5 2.89	2.65 2.65	0.92 0.92	0.0886
PERMIAN	BASALTIC LAVA	1.8	2.05	0.88	0.065
ORDOVICIAN	BASALTIC LAVA	2.3	2.8	0.88	0.0806
UNDIFF	BASIC ROCK, UNDIFFERENTIATED, COARSE-GRAINED	3	2.93	0.88	0.1005
NA	BASIC ROCK, UNDIFFERENTIATED, COARSE-GRAINED, METAMORPHOSED	2.5	2.88	0.9	0.0833
	BASIC ROCK, UNDIFFERENTIATED, COARSE-GRAINED, METAMORPHOSED	2.5	2.88	0.9	0.0833
	BASIC ROCK. UNDIFFERENTIATED. FINE-GRAINED	3	2.88	0.88	0.1023
<u>DEVONIAN</u> PERMIAN	BRECCIA	2	2.65	0.86	<u>0.0758</u> 0.0773
TRIASSIC	BRECCIA	2	2.6	0.86	0.0773
CARBONIFEROUS	BRECCIA	2	2.7	0.86	0.0744
NA	CALCAREOUS PELITE AND CALC-SILICATE	3.6	2.78	0.9	0.1243
NA	CATACLASITES	2	2.7	0.86	0.0744
CRETACEOUS JURASSIC	CHALK CHERT	<u>1.67</u> 2.8	<u>2.2</u> 2.65	0.88	0.0745
CARBONIFEROUS	CHERT	2.8 3.5	2.65	0.88	0.1037
NEOGENE	CONGLOMERATE	2.4	2.07	0.86	0.1287
PALAEOGENE	CONGLOMERATE	2.4	2	0.86	0.1206
TRIASSIC	CONGLOMERATE	2.4	2.3	0.86	0.1048
PERMIAN	CONGLOMERATE	2.4	2.5	0.86	0.0964
	CONGLOMERATE	2.4	2.72	0.86	0.0886
SILURIAN DEVONIAN	CONGLOMERATE CONGLOMERATE	2.6 2.7	2.7 2.55	0.86 0.86	0.0967
CARBONIFEROUS	CONGLOMERATE	2.7	2.33	0.86	0.1004
NA	CONGLOMERATE	2.7	2.7	0.86	0.1005
PERMIAN	CONGLOMERATE AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	2.4	2.43	0.86	0.0992
PALAEOGENE	CONGLOMERATE AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	2.4	2.1	0.86	0.1148
DEVONIAN	CONGLOMERATE AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED	2.5	2.7	0.86	0.093
	CONGLOMERATE AND ISUBEOUAL/SUBORDINATE! SANDSTONE, INTERBEDDED	3	2.72	0.86	0.1108
ORDOVICIAN UNDIFF	CONGLOMERATE AND [SUBEQUAL/SUBORDINATE] SANDSTONE, INTERBEDDED DIORITIC - ROCK	3.2 2.35	<u>2.73</u> 2.75	0.86 1	0.1178
CAMBRIAN	DOLOMITE - NOCK DOLOMITE. LIMESTONE AND CHERT. INTERBEDDED	3.6	2.68	0.95	0.1222
CAMBRIAN	DOLOMITIC ARGILLACEOUS ROCKS AND SUBORDINATE SANDSTONE, INTERBEDDED	2.72	2.00	0.92	0.0946
DEVONIAN	DOLOMITIC ARGILLACEOUS ROCKS AND SUBORDINATE SANDSTONE, INTERBEDDED	2.89	2.69	0.92	0.1009
PERMIAN	DOLOMITISED LIMESTONE AND DOLOMITE	3.59	2.52	0.95	0.1296
	FELSIC LAVA	2	2.7	0.95	0.0674
SILURIAN ORDOVICIAN	FELSIC LAVA	2	<u>2.7</u> 2.7	0.95 0.95	0.0674
		۷	2.1	0.90	0.0074

SILURIAN FELSE DUFF 2.0 2.7 0.9 DECOVICIAN GRESS, EN MERNORPHOSED 2.8 0.84 NA GRESS, EN MERNORPHOSED 2.9 2.75 0.84 NA GRESS, EN MERNORPHOSED 2.9 2.75 0.84 INDEF GRANITC: BLOCK 3.27 2.85 1.1 TRASSC INAL 6.6 2.24 2.9 1.4 INA INTERMONTE BOCK, INDEFERINTATED, COARSE GRANED, MERNORPHOSED 2.7 2.86 1. INA INTERMONTE BOCK, INDEFERINTATED, COARSE GRANED 2.7 2.76 0.3 INDEF INTERMONTE BOCK, INDEFERINTATED, COARSE GRANED 2.7 2.7 0.3 DEVOLVAN DAVAND DUFF, INDEFERINTATED 2.7 2.7 0.3 DEVOLVAN DAVAND DUFF, INDEFERINTATED 2.7 2.7 0.3 DEVOLVAN DAVAND DUFF, INDEFERINTATED 2.7 2.7 0.3 ALACODE L DAVAND DUFF, INDEFERINTATED 2.7 0.5 DEVONIAN LAVAND DUFF, INDEFERENTRATED <t< th=""><th>CARBONIFEROUS</th><th>FELSIC TUFF</th><th>2.8</th><th>2.7</th><th>0.9</th><th>0.0996</th></t<>	CARBONIFEROUS	FELSIC TUFF	2.8	2.7	0.9	0.0996
DPUCNAM GMESS 2.9 2.8 0.84 NA GMESS 0.14 0.4 NA GMESS 0.14 0.4 TRASSIC HALTE 6.2 2.5 2.6 0.4 TRASSIC HALTE 6.2 2.4 0.4 UNDEF INTERMEDIATE ROCK, UNDEFFERENTIATED, COARSE-GRAINED 2.7 2.67 1.0 DEVORMA LOWAND UFF, UNDEFFERENTIATED 2. 2.75 1.0 DEVORMA LOWAND UFF, UNDEFFERENTIATED 2. 2.75 1.0 DEVORMA LOWAND UFF, UNDEFFERENTIATED 2. 2.74 0.8 ORDOVIGAN LAWAND UFF, UNDEFFERENTIATED 2. 2.7 0.8 CAREONFEROUS LAWAND UFF, UNDEFFERENTIATED 3.8 2.7 0.8 DEVORMA LAWAND UFF, UNDEFFERENTIATED 3.8 2.7 0.8 DAVIDAR LAWAND UFF, UNDEFFERENTIATED 3.8 2.7 0.8 DEVORMA LAWAND UFF, UNDEFFERENTIATED 3.8 2.7 0.8						0.1031
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UNDEF INTERMISSINE ROCK. UNDEFERENTIATED. COARSE-GRAINED 2.7 2.8 2.7 2.8 0.8 NAM INTERMISSINE ROCK. UNDEFERENTIATED. FOR-GRAINED 2.7 2.8 1 UNDER INTERMISSINE ROCK. UNDEFERENTIATED. FOR-GRAINED 2.7 2.8 1.4 UNDER INTERMISSINE ROCK. UNDEFERENTIATED. 2.7 0.9 ORDOVICAN LAVA AND TLF. UNDEFERENTIATED 2. 2.7 0.9 ORDOVICAN LAVA AND TLF. UNDEFERENTIATED 2. 2.72 0.9 PLARSOCHE LAVA AND TLF. UNDEFERENTIATED 2. 2.72 0.9 ORDOVICAN LAVA AND TLF. UNDEFERENTIATED 2. 2.72 0.9 ORDOVICAN LAVA AND TLF. UNDEFERENTIATED 1.8 2.72 0.9 PLARSOCHE LAVA OR EXTRUSIVE ENCOLS NOCK UNDEFERENTIATED 1.8 2.72 0.8 DEVONNAN LAVA OR EXTRUSIVE ENCOLS NOCK UNDEFERENTIATED 2. 2.74 0.8 DEVONAN LAVA OR EXTRUSIVE ENCOLS NOCK UNDEFERENTIATED 2. 2.4 0.8 DEVONAN LAVA OR EXTRUSIVE						0.0969 0.1825
NA. INTERMEDIATE ROCK, UNDIFFERENTIATED, COASES-GRANED, METAMORPHOSED 2.9 2.7.8 1. DEVORNA LAWA AND LIFE, UNDIFFERENTIATED 2 2.7.5 0.3 DEVORNA LAWA AND LIFE, UNDIFFERENTIATED 2 2.7.6 0.3 DEVORNA LAWA AND LIFE, UNDIFFERENTIATED 2 2.7.7 0.3 CARREDOVICAN LAWA AND LIFE, UNDIFFERENTIATED 2.7 2.7.2 0.3 CARREDOVICAN LAWA AND LIFE, UNDIFFERENTIATED 2.7 2.7.2 0.3 CARREDOVICAN LAWA AND LIFE, UNDIFFERENTIATED 2.7 2.7.2 0.3 CARREDOVICAN LAWA ON DIFFERENTIATED 2.7 2.7.2 0.3 CARREDOVICAN LAWA ON DIFFERENTIATED 2.7 0.3 0.3 PLAEDOCIDE LAWA ON DIFFERENTIATED 2.7 0.8 0.3 0						0.1825
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DEVORNA LVA AND TUF, UNDEFRENTIATED 2 2.75 0.9 ORDOYCRAN LVA AND TUF, UNDEFRENTIATED 2 2.76 0.9 ORDOYCRAN LVA AND TUF, UNDEFRENTIATED 2 2.77 0.9 ALCORENCE LVA AND TUF, UNDEFRENTIATED 2 2.77 0.9 CARBONIFEROUS LVA AND TUF, UNDEFRENTIATED 1.8 2.72 0.9 CARBONIFEROUS LVA AND TUF, UNDEFRENTIATED 1.8 2.72 0.95 DEVONAN LVA OR DETRUSKE IGNOUS ROCK IUNDEFRENTIATED 1.8 2.72 0.95 DEVONAN LVA OR DETRUSKE IGNOUS ROCK IUNDEFRENTIATED 1.8 2.72 0.85 PALACOGENE LVA OR DETRUSKE IGNOUS ROCK IUNDEFRENTIATED 1.8 2.72 0.85 PALACOGENE LVA OR DETRUSKE IGNOUS ROCK IUNDEFRENTIATED 2 2.74 0.86 PALACOGENE LVA OR DETRUSKE IGNOUS ROCK IUNDEFRENTIATED 2 2.42 0.89 PALACOGENE LVA OR DETRUSKE IGNOUS ROCK IUNDEFRENTIATED 2 2.42 0.89 PALACOGENE LVA OR DETRUSKE IGNOUS ROCK RUNDEFRENTIA						0.087
NEORDERGZOL LAVA AND TUF- UNDEFERENTATED 2 2.7.4 0.9 MA CARDONCIAN LAVA AND TUF- UNDEFERENTATED 2 2.7.2 0.9 MA CARSON FEEL (NUDEFERENTATED) 2 2.7.2 0.9 CARSON FEELOW MA AND TUF- UNDEFERENTIATED 1.8 2.7.2 0.9 CARSON FEELOW MA AND RETRUSY FERONS FOR CONCINNOFFERENTIATED 1.8 2.7.2 0.95 CARSON FEELOW MA AND RETRUSY FERONS FOR CONCINNOFFERENTIATED 1.8 2.7.2 0.95 PERMAN LAVA OR ETRUSY FERONS FOR CONCINNOFFERENTIATED 1.8 2.7.2 0.95 PERMAN LAVA OR ETRUSY FERONS FOR CONCINNOFFERENTIATED 2 2.4 0.86 ORDOVCIAN LAVA OR ETRUSY FERONS FOR CONCINNOFFERENTIATED 2 2.2 0.88 PALACOSCIN LIMESTONE 2 2.4 0.86 0.82 0.82 0.83 PALACOSCIN LIMESTONE 2 2.7 0.88 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84						0.0698
NA LVA AND TUF- LUNDEFERENTIATED 2 2.7 0.9 CARBONFEROUS LAVA AND TUF- UNDEFERENTIATED 2.7 2.7 0.9 CARBONFEROUS LAVA AND TUF- UNDEFERENTIATED 1.8 2.77 0.9 CARBONFEROUS LAVA OR EXTUSAVE (INCIDENCI SACCILINOIFFERENTIATED) 1.8 2.77 0.95 PERMINN LAVA OR EXTUSAVE (INCIDENCI SACCILINOIFFERENTIATED) 1.8 2.74 0.95 SILURIAN LAVA OR EXTUSAVE (INCIDENCI SACCILINOIFFERENTIATED) 2 2.74 0.95 SILURIAN LAVA OR EXTUSAVE (INCIDENCI SACCILINOIFFERENTIATED) 2 2.72 0.85 DRODVICAN LAVA OR EXTUSAVE (INCIDENCI SACCILINOIFFERENTIATED) 2 2.72 0.85 MA CARTINAVE (INCIDENCI SACCILINOIFFERENTIATED) 2 2.77 0.85 MA	NEOPROTEROZOIC	LAVA AND TUFF. UNDIFFERENTIATED	2	2.75	0.9	0.0698
PALAEOGENE LWAAND TUF-LUNDFERENTATED 2 2.7 2.72 0.9 CARBONHEROUS LWAA OR EXTRUSYE IGNEGUS ROCK NUNDFERENTATED 1.8 2.77 0.95 CARBONHEROUS LWAA OR EXTRUSYE IGNEGUS ROCK NUNDFERENTATED 1.8 2.77 0.95 DEVONAN LWAA OR EXTRUSYE IGNEGUS ROCK NUNDFERENTATED 1.8 2.74 0.95 PALAEOGENE LWAA OR EXTRUSYE IGNEGUS ROCK NUNDFERENTIATED 2 2.74 0.95 NA LWAA OR EXTRUSYE IGNEGUS ROCK NUNDFERENTIATED 2 2.74 0.95 NA LWAA OR EXTRUSYE IGNEGUS ROCK NUNDFERENTIATED 2 2.74 0.95 PALAEOGENE LMASTONE 2 2.72 0.89 ORDOVICIAN LWAS OR EXTRUSYE IGNEGUS ROCK NUNDFERENTIATED 2 2.4 0.89 SILUBAN LIMESTONE 2 2.7 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.84 0.89 0.80 0.80 0.80 0.80 0.89 0.80 0.80 0.80 0.80 0.80 </td <td>ORDOVICIAN</td> <td>LAVA AND TUFF, UNDIFFERENTIATED</td> <td>2</td> <td>2.74</td> <td>0.9</td> <td>0.0701</td>	ORDOVICIAN	LAVA AND TUFF, UNDIFFERENTIATED	2	2.74	0.9	0.0701
CARBONIFEROUS LAVA AND TUFF. UNDIFFERENTIATED 2,7 2,7 0.95 CARBONIFEROUS LAVA OR EXTRUSY ESTROUS MOCK INDIFFERENTIATED 1.8 2,72 0.95 DEVONIAN LAVA OR EXTRUSY ESTROUS MOCK INDIFFERENTIATED 1.8 2,72 0.95 DEVONIAN LAVA OR EXTRUSY ESTROUS MOCK INDIFFERENTIATED 1.8 2,72 0.95 PALACORNE LAVA OR EXTRUSY ESTROUS MOCK INDIFFERENTIATED 1.8 2,72 0.85 PALACORNE LAVA OR EXTRUSY ESTROUS MOCK INDIFFERENTIATED 2 2,74 0.86 NA MAX OR EXTRUSY ESTROUS MOCK INDIFFERENTIATED 2 2,48 0.89 NALACORNE LIMESTONE 2 2,48 0.89 SILURAN LIMESTONE 2 2,48 0.89 SILURAN LIMESTONE 2 2,48 0.89 SILURAN LIMESTONE 2 2,4 0.89 SILURAN LIMESTONE 2 2,4 0.89 SILURAN LIMESTONE 2 2,4 0.89 DEVONIAN <						0.0711
CARBODIFEROUS LAW OR EXTRUSIVE (ENNEQUS ROCK UNDEFERENTIATED) 1.8 2.72 0.95 DEVONIAN LAW OR EXTRUSIVE (ENNEQUS ROCK UNDEFERENTIATED) 1.8 2.73 0.85 PERMAN LAW OR EXTRUSIVE (ENNEQUS ROCK UNDEFERENTIATED) 1.8 2.74 0.85 DEROMICAN LAW OR EXTRUSIVE (ENNEQUS ROCK UNDEFERENTIATED) 2 2.74 0.95 ORDOVICAN LAW OR EXTRUSIVE (ENNEQUS ROCK UNDEFERENTIATED) 2 2.76 0.95 CARBODICAN LAW OR EXTRUSIVE (ENNEQUS ROCK UNDEFERENTIATED) 2 2.72 0.89 CARBODICENE LIMESTONE 2 2.24 0.89 0.83 CARBODIFEROUS LIMESTONE 2 2.4 0.89 0.83						0.0698
DEVONIAN LAVA OR EXTRUSIVE IGNEOUS ROCK UNDIFFERENTIATED] 1.8 2.75 0.95 PRALACOCENE LAVA OR EXTRUSIVE IGNEOUS ROCK UNDIFFERENTIATED] 1.8 2.72 0.95 PALACOCENE LAVA OR EXTRUSIVE IGNEOUS ROCK UNDIFFERENTIATED] 2 2.74 0.85 ONA CARDA OR EXTRUSIVE IGNEOUS ROCK UNDIFFERENTIATED] 2 2.74 0.85 ONA CARDA OR EXTRUSIVE IGNEOUS ROCK UNDIFFERENTIATED] 2 2.24 0.89 DALACOCENE LIMESTONE 2 2.48 0.89 SILURIAN LIMESTONE 2.5 2.42 0.89 SILURIAN LIMESTONE 2.5 2.42 0.89 SILURIAN LIMESTONE 2.5 2.42 0.89 JURASSIC LIMESTONE 2.5 2.44 0.89 JURASSIC LIMESTONE 2.5 2.6 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE ARGILACCOUS ROCKS, INTERBEDDED 2.5 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE ARGILACCOUS ROCKS, INTERBEDDED 2.4 0.89						0.0953
PERMIAN LAVA OR EXTRUSIVE (ENOPOUS ROCK UNDEFERENTIATED) 1.8 2.72 0.95 SILURIAN LAVA OR EXTRUSIVE (ENOPOUS ROCK UNDEFERENTIATED) 2 2.74 0.95 SILURIAN LAVA OR EXTRUSIVE (ENOPOUS ROCK UNDEFERENTIATED) 2 2.75 0.95 SILURIAN LAVA OR EXTRUSIVE (ENCOUS ROCK UNDEFERENTIATED) 2 2.76 0.85 MA LAVA OR EXTRUSIVE (ENCOUS ROCK UNDEFERENTIATED) 2 2.76 0.85 DEVENDENCE 2 2.76 0.89 2.77 0.89 JURASSIC LIMESTONE 2.8 2.72 0.89 2.97 0.89 CARBOINFEROUS LIMESTONE 2.9 2.72 0.89 0.80 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>0.0602</td></t<>						0.0602
PALAGOSCNE LAVA OR EXTRUSIVE (GNOCUS ROCK UNDIFFERENTIATED) 1.8 2.75 0.95 ORDOVICIAN LAVA OR EXTRUSIVE (GNOCUS ROCK UNDIFFERENTIATED) 2 2.74 0.95 ORDOVICIAN LAVA OR EXTRUSIVE (GNOCUS ROCK UNDIFFERENTIATED) 2 2.75 0.95 DALAGOSTINE LIMESTONE 1.9 2.2 0.85 DEVICIAN LIMESTONE 2.4 2.40 0.85 SILURIAN LIMESTONE 2.5 2.72 0.89 SILURIAN LIMESTONE 2.5 2.72 0.89 DEVONIAN LIMESTONE 2.9 2.7 0.89 DEVONIAN LIMESTONE 2.9 2.7 0.80 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE ARGIL/ACCOUS ROCKS, INTERBEDDED 2.2 2.4 0.80 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE ARGIL/ACCOUS ROCKS, INTERBEDDED 2.7 2.4 0.80 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE ARGIL/ACCOUS ROCKS, INTERBEDDED 2.7 2.4 0.80 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE ARGIL/ACCOUS ROCKS, INTERBE						0.0595 0.0602
SILUPIAN LAVA OR EXTRUSIVE IGNEOUS ROCK UNDIFFERENTIATED 2 2.74 0.95 NA LAVA OR EXTRUSIVE GINEOUS ROCK UNDIFFERENTIATED 2 2.75 0.95 NA LAVA OR EXTRUSIVE GINEOUS ROCK UNDIFFERENTIATED 2 2.76 0.89 CHETACOUS LIMESTONE 2 2.48 0.89 CHETACOUS LIMESTONE 2 2.48 0.89 SILUPASIN LIMESTONE 2 2.48 0.89 SILUPASIN LIMESTONE 2 2.47 0.89 CARBONIFEOUS LIMESTONE 2 2.48 0.89 CARBONIFEOUS LIMESTONE 2 2.4 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGIL LACCOUS ROCKS, INTERBEDDED 2.7 2.6 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGIL LACCOUS ROCKS, INTERBEDDED 2.4 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGIL LACCOUS ROCKS, INTERBEDDED 2.5 2.46 0.89 CARBONIFEROUS LIMESTONE AND ISUBEOUAL/SUBORDINATE IARDIALACEOUS ROCKS, INTERBEDDED 2.5						0.0595
ORDOVICIAN LAVA OR EXTRUSIVE EINHOUS ROCK LUNDIFFERENTIATED] 2 2.74 0.95 PALACOREXTRUSIVE EINHOUS ROCK LUNDIFFERENTIATED] 1.9 2 2.0 0.95 FRIAZCOCINE LIMESTONE 2 2.2 0.89 JARASSIC LIMESTONE 2 2.2 0.89 JARASSIC LIMESTONE 2 2.4 0.80 ORDOVICIAN LIMESTONE 2 2.7 0.89 ORDOVICIAN LIMESTONE 2 2.7 0.89 DEVONIAN LIMESTONE 2 2.7 0.89 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.6 0.89 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.6 0.89 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.6 0.89 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.6 0.89 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED						0.0664
NA LAWA OR EXTRUSIVE IGNEOUS ROCK (UNDIFFERENTIATED] 2 2.2 0.89 CARETACEOUS IMESTONE 2 2.2 0.89 JURASSIC IMESTONE 2 2.4 0.89 SILUPANA IMESTONE 2.5 2.72 0.89 SILUPANA IMESTONE 2.54 2.24 0.89 CARONCIANUS IMESTONE 2.5 2.27 0.89 CARONCIANUS IMESTONE 2.5 2.24 0.89 TITASSIC IMESTONE AND SUBEOUAL/SUBORDINATE ARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.44 0.89 TITASSIC IMESTONE AND ISUBEOUAL/SUBORDINATE ARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.6 0.89 JURASSIC IMESTONE AND ISUBEOUAL/SUBORDINATE ARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.6 0.89 JURASSIC IMESTONE AND ISUBEOUAL/SUBORDINATE INSTICHE INTERBEDDED 2.7 2.6 0.89 JURASSIC IMESTONE AND ISUBEOUAL/SUBORDINATE INSTICHE INTERBEDDED 2.7 2.6 0.89 LIRASSIC IMESTONE AND ISUBEOUAL/SUBORDINATE INSTICHE INTERBEDDED						0.0664
PALAEOGENE LIMESTONE 1.9 2.2 0.89 CRETACEOUS LIMESTONE 2 2.49 0.89 JURASSIC LIMESTONE 2.5 2.72 0.89 RIABSIC LIMESTONE 2.5 2.72 0.89 RIABSIC LIMESTONE 2.5 2.72 0.83 ORDOVICAN LIMESTONE 2.9 2.77 0.83 DRAMIN LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTEREDDED 2.2 2.44 0.89 TRIASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTEREDDED 2.56 2.58 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTEREDDED 2.5 2.4 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELSANDISTONE. INTEREDDED 2.5 2.4 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELSANDSTONE. INTEREDDED 2.5 2.4 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELSANDSTONE. INTEREDDED 2.5 2.7 0.81 CARBONIFEROUS LIMESTONE AND ISUBEOUAL/SUBORDINATELS						0.0661
CRETACEOUS LIMESTONE 2 2.4 0.89 JURASSIC LIMESTONE 2.5 2.7.2 0.89 SILUTIAN LIMESTONE 2.5.4 2.42 0.89 CARBONIFEROUS LIMESTONE 2.5.4 2.42 0.89 CARBONIFEROUS LIMESTONE 2.9 2.7 0.89 DEVONIAN LIMESTONE 2.9 2.7 0.89 JARSSIC LIMESTONE AND ISUBCOLAL/SUBORDINATEL ARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.4 0.89 JARSSIC LIMESTONE AND ISUBCOLAL/SUBORDINATEL ARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.6 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATEL CONGLOMERATE. INTERBEDDED 2.7 2.6 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.7 2.6 0.89 NEOGENE LIMESTONE AND ISUBEOUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.7 2.7 0.89 NA MACILAVA DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.6 0.89 ORDOWICAN MARIGL						0.0838
JURASSIC UHESTONE 2 2.49 0.89 RIASSIC UHESTONE 2.5 2.72 0.89 CARBONIFERONE 2.9 2.72 0.88 CARBONIFEROUS LIMESTONE 2.9 2.72 0.88 DEVONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATEL ARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.44 0.89 TIRASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATEL ARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.4 0.89 TIRASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATEL ARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.6 0.83 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE SANDSTONE, INTERBEDDED 2.7 2.6 0.83 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE SANDSTONE, INTERBEDDED 2.7 2.6 0.83 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE SANDSTONE, INTERBEDDED 2.5 2.7 0.88 CARBONIFEOUS LIMESTONE AND ISUBEOUAL/SUBORDINATE SANDSTONE, INTERBEDDED 2.5 2.7 0.89 CARBONIFEOUS LIMESTONE AND ISUBEOUAL/SUBORDINATE SANDSTONE, INTERBEDDED 2.5 2.7 0.85						0.0883
TRIASSIC LIMESTONE 2.54 2.42 0.89 CARBONIFEROUS LIMESTONE 2.9 2.7 0.89 DEVONIAN LIMESTONE 2.9 2.7 0.89 DEVONIAN LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.48 0.89 JURASSIC LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.86 0.89 LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.86 0.89 JURASSIC LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.8 0.89 JURASSIC LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.8 0.89 JURASSIC LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.8 0.89 JURASSIC LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.5 2.4 0.89 JURASSIC LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS 2.9 2.77 0.85 ORDOVICINN LIMESTONE AND SUBECOLAL/SUBORDINATELARGILLACEOUS ROCKS 2.9 2.77 0.95 ORDOVICINN					0.89	0.0783
CARBONIFEROUS LIMESTONE 2.9 2.72 0.89 ORDOVICIAN LIMESTONE 2.9 2.7 0.89 DEVONIAN LIMESTONE 2.9 2.48 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.62 2.44 0.89 CARBONIFEROUS LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.6 2.88 0.89 DEVONIAN LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.6 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.0 2.45 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.0 2.7 0.80 CARBONIFEROUS LIMESTONE AND ISUBECUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.05 2.4 0.89 0.80 0.80 0.80 2.7 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.8						0.0892
ORDOVICIAN LIMESTONE 2.9 2.7 0.89 DVRONIAN LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 1.82 2.48 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.26 2.86 0.89 CARBONIFEROUS LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.66 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.0 2.46 0.89 JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.0 2.4 0.89 NEOGENE LIMESTONE AND ISUBEOUAL/SUBORDINATEI SANDSTONE. INTERBEDDED 2.05 2.4 0.89 ORDOVICIAN LIMESTONE. AND FUBDEOUAL/SUBORDINATE SANDSTONE. INTERBEDDED 2.45 0.89 0.89 CARBONIFEROUS LIMESTONE. AND FUDEOUAL/SUBORDINATE SANDSTONE. INTERBEDDED 2.2 2.77 0.85 CARBONIFEROUS LIMESTONE. AND FUDEOUAL/SUBORDINATE SANDSTONE. INTERBEDDED 2.4 2.8 0.89 ORDOVICIAN MARIC LAVA 2 2.77 0.85 0.80 0.77 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.1019</td>						0.1019
DEVONIAN LIMESTONE 3 2.68 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 1.62 2.44 0.89 TRIASSIC LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.26 2.46 0.89 CARBONIFERONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.66 0.89 DEVONIAN LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.05 2.4 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.05 2.4 0.89 ORDOVICIAN LIMESTONE AND ISUBECUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.05 2.4 0.89 ORDOVICIAN LIMESTONE AND ISUBECUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.45 2.65 0.89 CARBONIFEROUS LIMESTONE AND SUBECUAL/SUBORDINATELSANDSTONE. INTERBEDDED 2.45 2.65 0.89 CARBONIFEROUS MARIC LAV 2 2.77 0.85 0.81 2.77 0.85 CARBONIFEROUS MARIC LAV 2 2.77 0.85 0.81 1.83						0.1035
JURASSIC LINESTONE AND ISUBECUAL/SUBORDINATEI ARGILACEOUS ROCKS. INTERBEDDED 2.2 2.4 0.89 CARBONIFEROUS LINESTONE AND ISUBECUAL/SUBORDINATEI ARGILACEOUS ROCKS. INTERBEDDED 2.5 2.8 0.89 JURASSIC LINESTONE AND ISUBECUAL/SUBORDINATEI ARGILACEOUS ROCKS. INTERBEDDED 2.7 2.6 0.89 JURASSIC LINESTONE AND ISUBECUAL/SUBORDINATEI CONGLOMERATE, INTERBEDDED 2.7 2.6 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATEI SANDSTONE. INTERBEDDED 2.7 2.6 0.89 NEOGENE LIMESTONE AND ISUBECUAL/SUBORDINATEI SANDSTONE. INTERBEDDED 2.7 2.7 0.89 CARBONIFEROUS LIMESTONE AND ISUBECUAL/SUBORDINATEI SANDSTONE. INTERBEDDED 2.7 0.89 CARBONIFEROUS LIMESTONE AND MUDSTONE. INTERBEDDED 2.7 0.5 CARBONIFEROUS LIMESTONE AND MUDSTONE. INTERBEDDED 2.5 2.7 0.89 CARBONIFEROUS LIMESTONE AND MUDSTONE. INTERBEDDED 2.6 2.65 0.89 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80 0.80						0.1043
TRIASSIC LINESTONE AND ISUBECULAL/SUBORDINATEI ARGILACEOUS POCKS, INTERBEDDE 2.2 2.4 0.89 CARBONIFEROUS LIMESTONE AND ISUBECULAL/SUBORDINATEI ARGILACEOUS POCKS, INTERBEDDE 2.7 2.6 0.89 DEVONIAN LIMESTONE AND ISUBECULAL/SUBORDINATEI ANDILACEOUS POCKS, INTERBEDDED 2.05 2.4 0.89 JURASSIC LIMESTONE AND ISUBECULAL/SUBORDINATEI SANDSTONE, INTERBEDDED 2.05 2.4 0.89 CARDONIFEROUS LIMESTONE AND ISUBECULAL/SUBORDINATEI SANDSTONE, INTERBEDDED 2.05 2.6 0.89 CARBONIFEROUS LIMESTONE AND ISUBECULAL/SUBORDINATEI SANDSTONE, INTERBEDDED 2.05 2.68 0.89 CARBONIFEROUS LIMESTONE AND GUISOTORE, INTERBEDDED 2.5 2.67 0.85 CARBONIFEROUS MAFIC LAVA 2 2.77 0.95 CARBONIFEROUS MAFIC LAVA 2 2.77 1.83 NA MAFIC LAVA 2 2.77 1.84 CARBONIFEROUS MAFIC LAVA 2 2.77 1.83 CARBONIFEROUS MAFIC LAVA 2 2.77 0.81						0.1087
CARBONIFEROUS LIMESTONE AND ISUBECUAL/SUBORDINATEI ARGILACEOUS ROCKS. INTERBEDDED 2.6 2.58 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATEI AGGILACEOUS ROCKS. INTERBEDDED 2. 2.45 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATEI SANDSTONE. INTERBEDDED 2.05 2.4 0.89 NEOGENE LIMESTONE AND ISUBECUAL/SUBORDINATEI SANDSTONE. INTERBEDDED 2.72 2.72 0.89 CARBONIFEROUS LIMESTONE AND ISUBECUAL/SUBORDINATEI SANDSTONE. INTERBEDDED 2.75 0.89 CARBONIFEROUS LIMESTONE AND MUDSTONE. INTERBEDDED 2.6 2.6 0.89 CARBONIFEROUS LIMESTONE AND MUDSTONE. INTERBEDDED 2.5 2.77 0.95 CARBONIFEROUS MAFIC LAVA 2 2.77 0.95 CARBONIFEROUS MAFIC LAVA 2.5 2.7 0.83 CARBONIFEROUS MAFIC LAVA 2.5 2.7 0.85 CARBONIFEROUS MAFIC LAVA 2.5 2.7 0.85 NA MELANOFE 3.3 2.7 0.91 NA MELANOFE 2.5 <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.0712</td>						0.0712
DEVONIAN LIMESTONE AND ISUBECUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 2.7 2.6 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATEL SANDSTONE, INTERBEDDED 2.05 2.4 0.89 JURASSIC LIMESTONE AND ISUBECUAL/SUBORDINATE ISANDSTONE, INTERBEDDED 2.05 2.4 0.89 ORDOVICIAN LIMESTONE AND ISUBECUAL/SUBORDINATE ISANDSTONE, INTERBEDDED 2.72 2.72 0.89 CARBONIFEROUS LIMESTONE AND ISUBECUAL/SUBORDINATE SANDSTONE, INTERBEDDED 2.5 2.68 0.89 CARBONIFEROUS LIMESTONE AND GUISORTONE, INTERBEDDED 2.5 2.77 0.95 CARBONIFEROUS MAFIC LAVA 2 2.77 0.95 CARBONIFEROUS MAFIC LAVA 2 2.77 1.95 CARBONIFEROUS MAFIC LAVA 2 2.77 1.95 NA MAFIC LAVA 2 2.77 1.91 NA METABASAIT, CALCARITE AND CALC-SILCATE 2.2 2.8 0.9 ORDOVICIAN METABASAIT, CALCARETUR AND CALC-SILCATE 2.2 2.8 0.9 NA METABA						0.089
JURASSIC LIMESTONE AND ISUBEQUAL/SUBORDINATE ICONGLOMERATE, INTERBEDDED 2 2.45 0.89 JURASSIC LIMESTONE AND ISUBEQUAL/SUBORDINATE ISANDSTONE. INTERBEDDED 2.05 2.4 0.89 ORDOVICIAN LIMESTONE AND ISUBEQUAL/SUBORDINATE ISANDSTONE. INTERBEDDED 2.72 2.72 0.39 CARBONIFEROUS LIMESTONE AND MUDSTONE. INTERBEDDED 2.35 2.68 0.39 CARBONIFEROUS LIMESTONE AND MUDSTONE. INTERBEDDED 2.45 2.65 0.39 CARBONIFEROUS LIMESTONE ANGLIACCUS ROCKS AND SUBORDINATE SANDSTONE. INTERBEDDED 2.5 2.7 0.35 CARBONIFEROUS MARIC LAVA 2 2.77 0.35 CARBONIFEROUS MARIC TUFF 2.5 2.7 0.38 NA MAELAND CALC-SULCATE 2.8 2.75 0.3 NA MELANDSALT, CALGAEOUS PELITE AND CALC-SULCATE 2.8 0.9 ORDOVICIAN METAGONSIC DIGRENTE 3.8 2.7 0.9 NA MELANDORLOSED IGNE DUS ROCK 2.9 2.75 0.85 ORDOVICIAN METAMORPHOSED LAVA						0.1008
JURASSIC LIMESTONE AND ISUBEOUAL/SUBORDINATE ISANDSTONE. INTERBEDDED 2.05 2.4 0.89 NEOGENE LIMESTONE AND ISUBEOUAL/SUBORDINATE ISANDSTONE. INTERBEDDED 2.72 2.72 0.48 CARBONIFEROUS LIMESTONE AND ISUBEOUAL/SUBORDINATE ISANDSTONE. INTERBEDDED 2.35 2.68 0.48 CARBONIFEROUS LIMESTONE AND MUSICINE. INTERBEDDED 2.45 2.68 0.48 CARBONIFEROUS MARTIC LAVA 2 2.77 0.95 CARBONIFEROUS MARTIC LAVA 2 2.77 0.85 CARBONIFEROUS MARTIC TUF 2.5 2.7 1 NA MARDIE AND CALC-SILICATE 2.2 2.85 0.9 ORDOVICIAN METABASALT, FAMMITE AND PELITE 2.2 2.85 0.9 ORDOVICIAN METABASALT, FAMMITE AND PELITE 3.3 2.77 0.9 NA METAGONGLOMERATE 3.3 2.77 0.9 NA METAGONGLOMERATE 3.3 2.75 0.9 NA METAGONGLOMERATE 3.3 2.75 0.85						0.0792
NEOGENE LIMESTONE AND ISUBECUAL/SUBORDINATE ISANDSTONE. INTERBEDDED 2.05 2.08 0.89 CARBONIFERCUIS LIMESTONE AND MUDSTONE. INTERBEDDED 2.35 2.68 0.89 CARBONIFERCUIS LIMESTONE AND MUDSTONE. INTERBEDDED 2.35 2.68 0.89 CARBONIFERCUIS LIMESTONE ANGILLACEOUS ROCKS AND SUBORDINATE SANDSTONE. INTERBEDDED 2.45 2.66 0.89 CARBONIFERCUIS MAFIC LAVA 2 2.77 0.95 ORABONIFERCUIS MAFIC LAVA 2 2.77 0.85 ORABONIFERCUIS MAFIC LAVA 2 2.8 7.2 1 ORABONIFERCUIS MAFIC LAVA 2 2.8 0.9 0.9 NA METAGREANL FSAMMITE AND PELITE AND CALC-SILICATE 2 2.8 0.9 ORDOVICIAN METABASALT, CALCAREOUS PELITE AND CALC-SILICATE 3 2.7 0.9 NA METAGONGLOMERATE 3 2.7 0.9 N NA METAGONGLOMERATE 3 2.7 0.8 N ORDOVICIAN METAGONGLOMERATE<						0.0829
CABBONIFEROUS LIMESTONE, AND MUDSTONE, INTERBEDDED 2.35 2.68 0.89 CABBONIFEROUS LIMESTONE, AGRILACEOUS ROCKS AND SUBORDINATE SANDSTONE, INTERBEDDED 2.45 0.89 CABBONIFEROUS MAFIC LAVA 2 2.77 0.95 CABBONIFEROUS MAFIC LAVA 2 2.77 0.95 CABBONIFEROUS MAFIC LAVA 2 2.77 0.95 CARBONIFEROUS MAFIC LAVA 2 2.77 0.95 CARBONIFEROUS MAFIC LAVA 2 2.77 0.95 NA METABASAT, CALCAREOUS PELITE AND CALC-SILICATE 2.8 0.9 ORDOVICIAN METABASAT, PASAMMITE AND PELITE 2.2 2.8 0.9 ORDOVICIAN METABONASAT, PASAMMITE AND PELITE 3.3 2.7 0.9 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED IGNEOUS ROCK 3.9 2.75 0.86 NA METAMORPHOSED IGNEOUS ROCK 3.9 2.75 0.86 NA METAMORPHOSED IGNEOUS ROCK						0.0995
CABBONIFEROUS LIMESTONE, ARGILLACEOUS ROCKS AND SUBORDINATE SANDSTONE, INTERBEDDED 2.45 2.65 0.89 CABBONIFEROUS MAFIC LAVA 2 2.77 0.95 CABBONIFEROUS MAFIC LAVA 2 2.77 0.95 CABBONIFEROUS MAFIC LAVA 2 2.77 0.95 NA MARDLE AND CALC-SILICATE 2.5 2.7 1 NA MELANCE 2.8 2.72 1 NA MELANCE 2.8 2.72 1 NA METABASAIT, CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.8 0.9 ORDOVICIAN METABASAIT, CALCAREOUS PELITE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.7 0.9 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 <td></td> <td></td> <td></td> <td></td> <td>0.89</td> <td>0.0971</td>					0.89	0.0971
CARBONIFEROUS MAFIC LAVA 2 2.77 0.95 CORDOVICIAN MAFIC LAVA 2 2.77 0.83 CARBONIFEROUS MAFIC TUFF 2.5 2.7 1 NA MAELANCE 2.8 2.72 0.9 NA METABASALT, CALCAREOUS PELITE AND CALC-SILICATE 2.8 0.9 ORDOVICIAN METABASALT, CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.8 0.9 ORDOVICIAN METABCONGLOMERATE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.67 0.9 NA METADIAMICTITE 3.2 2.75 0.85 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.86	CARBONIFEROUS	LIMESTONE AND MUDSTONE. INTERBEDDED	2.35	2.68	0.89	0.0851
ORDOVICIAN MAFIC LAVA 2 2.77 0.95 CARBONIFEROUS MAFIC TUFF 2.5 2.7 0.88 NA MARBIE AND CALC-SILICATE 3.5 2.7 1 NA MELANGE 2.8 2.72 0.9 NA METABASALT. CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.85 0.9 ORDOVICIAN METABASALT. CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.8 0.9 ORDOVICIAN METACONGLOMERATE 3.3 2.7 0.9 NA METACONGLOMERATE 3.2 2.67 0.85 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.2 2.66 0.82	CARBONIFEROUS	LIMESTONE, ARGILLACEOUS ROCKS AND SUBORDINATE SANDSTONE, INTERBEDDED	2.45	2.65	0.89	0.0898
CABBONIFERQUS NA MAPIC TUFF 2.5 2.7 0.88 NA MELANGE 3.5 2.7 1 NA MELANGE 2.8 2.72 0.9 NA METABASALI, CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.85 0.9 ORDOVICIAN METABASALI, FSAMMITE AND PELITE 2.2 2.8 0.9 ORDOVICIAN METACONGLOMERATE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.67 0.9 NA METACONGLOMERATE 3.2 2.75 0.86 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.86 NA METAMORPHOSED IAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.2 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.2 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.2 2.75 0.86						0.0657
NA MARBLE AND CALC-SILICATE 3.5 2.7 1 NA MELANGE 2.8 2.72 0.9 NA METABASALT. CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.85 0.9 ORDOVICIAN METABASALT. PSAMMITE AND PELITE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.67 0.9 NA METACONGLOMERATE 3.3 2.7 0.9 NA METAMORPHOSED IONEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED IONEOUS ROCK 2.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUF 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUF 3.2 2.68 0.82 NA METAGOABBROIC- ROCK 2.2 2.85 0.82 NA METAGOABBROIC- ROCK 3.2 2.86 0.82 UNDIFF MICOGABRITIC - ROCK 3.2 2.86 0.82 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>0.0657</td></t<>						0.0657
NA MELANCE 2.8 2.72 0.9 NA METABASALT, CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.8 0.9 ORDOVICIAN METABASALT, CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.8 0.9 ORDOVICIAN METACONSICIMERATE 3.3 2.7 0.9 NA METACONSICIMERATE 3.3 2.7 0.9 NA METADONCIONERATE 3.2 2.67 0.9 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.2 2.68 0.82 UNDIFF MICROGRABROIC - ROCK 3.2 2.68 0.82 UNDIFF MICROGRABROIC - ROCK 3.2 2.68 0.82 NA METABORANT AND COK 3.2 2.68 0.82 NA METAMORPHOSED LAVA AND TUFF 3.4 2.68						0.0909
NA METABASALT, CALCAREOUS PELITE AND CALC-SILICATE 2.2 2.85 0.9 ORDOVICIAN METAGASALT, PSAMMITE AND PELITE 2.3 2.7 0.9 ORDOVICIAN METACONGLOMERATE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.67 0.9 NA METACONGLOMERATE 3.2 2.67 0.8 ORDOVICIAN METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.86 NA METAMORPHOSED IAVA 3.9 2.75 0.86 NA METAMORPHOSED IAVA 3.9 2.75 0.86 NA METAMORPHOSED IAVA 3.2 2.86 0.82 NA METAMORPHOSED IAVA 3.2 2.8 0.82						0.112 0.0988
ORDOVICIAN METABASALT, PSAMMITE AND PELITE 2.2 2.8 0.9 ORDOVICIAN METACONGLOMERATE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.7 0.9 NA METADIANICITTE 3.3 2.7 0.9 NA METADIANICITTE 3.2 2.67 0.8 ORDOVICIAN METAMORPHOSED INFOUS ROCK 2.9 2.75 0.8 ORDOVICIAN METAMORPHOSED INFOUS ROCK 2.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND DUFM 3.2 2.6 0.82 NA METAMORPHOSED LAVA 3.2 7.0 0.86 UNDIFF MICROGABBROIC - ROCK 3.2 2.6 0.82 NA MIGMATITES 3.4 2.68 0.82 NA MIGMATITES 3.4 2.68 0.82 NA M						0.0741
ORDOVICIAN METACONGLOMERATE 3.3 2.7 0.9 NA METACONGLOMERATE 3.3 2.7 0.9 NA METADLAMICTITE 3.2 2.75 0.8 ORDOVICIAN METAMORPHOSED IONEOUS ROCK 2.9 2.75 0.85 NA METAMORPHOSED DISNEOUS ROCK 2.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METASEDIMENTARY ROCK 3.2 2.8 0.82 UNDIFF MICROGRBBROIC- ROCK 3.2 2.68 0.82 NA MICROGRBBROIC- ROCK 3.2 2.8 0.82 NA MICROGRBBROIC- ROCK 3.2 2.68 0.82 NA MICROGRBBROIC- ROCK 3.2 2.68 0.82 NA MIDISTONE, BITU						0.0754
NA METACONGLOMERATE 3.3 2.7 0.9 NA METADIAMICTITE 3 2.67 0.9 NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.85 ORDOVICIAN METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVAND TUFF 3.9 2.75 0.86 NA METASEDIMENTARY ROCK 3.2 2.2 2.85 0.82 UNDIFF MICROGRABEROIC - ROCK 3.2 2.2 2.85 0.82 NA MEGAGBABROIC - ROCK 3.2 2.8 0.82 0.83 NA MIGMATITES 3.4 2.68 0.82 0.82 NA MIGMATITES 3.4 2.68 0.82 0.82 NA MUNDITE 2.9 2.75 0.86 NA MPLITE 3.1 2.76 0.86						0.1173
NA METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.8 ORDOVICIAN METAMORPHOSED IGNEOUS ROCK 2.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LIVA AND TUFF 3.9 2.75 0.86 NA METASEDIMENTARY ROCK 3 2.7 0.86 UNDIFF MICROGRABRIC - ROCK 3.2 2.8 0.82 NA MIGNGABBROIC - ROCK 3.4 2.68 0.82 NA MIGNGABBROIC - ROCK 3.2 2.68 0.82 NA MIGNGABRITIES 3.4 2.68 0.82 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.86 NA PELITE 2.9 2.75 0.86 ORDOVICIAN PELITE 3.1 2.76 0.86 NA PELITE 3.2 2.69 0.86 NA PELITE 3.1 <td></td> <td></td> <td></td> <td></td> <td>0.9</td> <td>0.1173</td>					0.9	0.1173
ORDOVICIAN METAMORPHOSED IAVA 2.9 2.75 0.85 NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3 2.75 0.86 NA METASEDIMENTARY ROCK 3 2.75 0.86 UNDIFF MICROGABBROIC - ROCK 3.2 2.68 0.82 NA MEGOGANITIC - ROCK 3.2 2.68 0.82 NA MICROGRANITIC - ROCK 3.2 2.68 0.82 NA MICROGRANITIC - ROCK 3.2 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.86 NA MYLONITE 2.8 2.7 0.86 ORDOVICIAN PYLITE 3.1 2.76 0.86 NA PELITE 3.2 2.69 0.86 NA PELITE 3.1 2.76 0.86 NA PELITE 3.2 <td>NA</td> <td>METADIAMICTITE</td> <td>3</td> <td>2.67</td> <td>0.9</td> <td>0.1079</td>	NA	METADIAMICTITE	3	2.67	0.9	0.1079
NA METAMORPHOSED LAVA 3.9 2.75 0.86 NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LIMESTONE AND DOLOMITE 3 2.75 0.86 NA METASEDIMENTARY ROCK 3 2.77 0.86 UNDIFF MICROGABBROIC - ROCK 2.2 2.85 0.82 UNDIFF MICROGRABROIC - ROCK 3.4 2.68 0.82 NA MIGMATITES 3.4 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.86 NA MYLONITE 2.8 2.77 0.86 ORDOVICIAN MYLONITE 2.8 2.77 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE 3.2 2.69 0.86 NA PELITE 3.2 2.69 0.86 NA PELITE 3.4 2.75 0.86 NA PELITE 3.8 2.77 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>0.1139</td></t<>						0.1139
NA METAMORPHOSED LAVA AND TUFF 3.9 2.75 0.86 NA METAMORPHOSED LIMESTONE AND DOLOMITE 3 2.7 0.9 NA METASEDINENTARY ROCK 3 2.7 0.86 UNDIFF MICROGABBROIC - ROCK 2.2 2.85 0.82 UNDIFF MICROGRANITIC - ROCK 3.2 2.68 0.82 NA MICROGRANITIC - ROCK 3.2 2.68 0.82 NA MICROGRANITIC - ROCK 3.2 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.86 ORDOVICIAN MYLONITE 2.8 2.72 0.86 ORDOVICIAN PELITE 2.9 2.75 0.86 NA PELITE 3.1 2.76 0.86 NA PELITE 3.1 2.74 0.86 NA PELITE 3.2 2.69 0.86 NA PELITE 3.5 2.74 0.86 NA PSAMMITE AND SEMI-PELITE 3.4						0.1072
NA METAMORPHOSED LIMESTONE AND DOLOMITE 3 2.75 0.9 NA METASEDIMENTARY ROCK 3 2.7 0.86 UNDIFF MICROGABBROIC - ROCK 2.2 2.85 0.82 UNDIFF MICROGRANITIC - ROCK 3.4 2.68 0.82 NA MIGMATITES 3.4 2.68 0.82 NA MIGMATITES 3.4 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.86 NA MYLONITE 2.8 2.72 0.86 ORDOVICIAN MYLONITE 3.1 2.76 0.86 NA PELITE 3.1 2.74 0.86 NA PSAMMITE 3.8 2.72 0.86						0.1425
NA METASEDIMENTARY ROCK 3 2.7 0.86 UNDIFF MICROGABBROIC - ROCK 2.2 2.85 0.82 NA MICROGRANTIC - ROCK 3.2 2.68 0.82 NA MIGROGRANTIC - ROCK 3.4 2.68 0.82 NA MICROGRANTIC - ROCK 3.4 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.86 ORDOVICIAN MYLONITE 2.8 2.72 0.86 ORDOVICIAN PELITE 2.9 2.75 0.86 NA PELITE 3.1 2.76 0.86 NA PSAMMITE AND SEM-PELITE 3.4 2.75 0.86						0.1425
UNDIFF MICROGABBROIC - ROCK 2.2 2.85 0.82 UNDIFF MICROGRANITIC - ROCK 3.2 2.68 0.82 NA MIGMATITES 3.4 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.86 NA MYLONITE 2.8 2.7 0.86 ORDOVICIAN MYLONITE 2.8 2.72 0.86 ORDOVICIAN PELITE 2.9 2.75 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE, GRAPHITIC 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.76 0.86 NA PSAMMITE AND PELITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.4 2.75 0.86 NA PSAMMITE AND PELITE 3.4 2.75 0.86 NA PSAMMITE AND PELITE 3.4 2.						0.1047
UNDIFF MICROGRANITIC - ROCK 3.2 2.68 0.82 NA MIGMATITES 3.4 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.88 NA MYLONITE 2.8 2.7 0.86 ORDOVICIAN MYLONITE 2.9 2.75 0.86 ORDOVICIAN PELITE 3.25 2.75 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE AND SEMI-PELITE 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.74 0.86 NA PELITE, GRAPHITIC 3.2 2.69 0.86 NA PSAMMITE AND SEMI-PELITE 3.2 2.69 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE AND SEMI-PELITE 3.4						0.1116 0.0813
NA MIGMATITES 3.4 2.68 0.85 JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.88 NA MYLONITE 2.8 2.7 0.86 ORDOVICIAN MYLONITE 2.8 2.72 0.86 ORDOVICIAN PELITE 2.9 2.75 0.86 NA PELITE 3.1 2.76 0.86 NA PELITE AND SEMI-PELITE 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.74 0.86 NA PELITE, GRAPHITIC 3.2 2.69 0.86 NA PSAMMITE 3.5 2.74 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.72 0.78 NA OUARTZITE 3.3 2.72 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>0.1258</td></t<>						0.1258
JURASSIC MUDSTONE, BITUMINOUS 1.3 2.25 0.88 NA MYLONITE 2.8 2.7 0.86 ORDOVICIAN MYLONITE 2.8 2.72 0.86 ORDOVICIAN PELITE 2.9 2.75 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE 3.1 2.76 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE, GRAPHITIC 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.74 0.86 NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.4 2.75 0.86 NA PSAMMITE AND PELITE 3.4 2.75 0.86 NA PSAMMITE AND PELITE 3.6 2.72 0.78 NA OLARTZITE AND 0.86 2.72 0.78 NA OUARTZITE AND PELITE 3.3 2.72 <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.1238</td>						0.1238
NA MYLONITE 2.8 2.7 0.86 ORDOVICIAN MYLONITE 2.8 2.72 0.86 ORDOVICIAN PELITE 2.9 2.75 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE 3.1 2.76 0.86 NA PELITE AND SEMI-PELITE 3.1 2.76 0.86 NA PELITE, GRAPHTIC 3.1 2.74 0.86 NA PELITE, GRAPHTIC 3.1 2.74 0.86 NA PELITE, GRAPHTIC 3.2 2.69 0.86 NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE 3.5 2.74 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND ERLITE 3.4 2.75 0.86 NA PSAMMITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN OUARTZITE SEMI-PELITE AND METALIMESTONE 3.6						0.0567
ORDOVICIAN PELITE 2.9 2.75 0.86 NA PELITE 3.25 2.75 0.86 NA PELITE AND SEMI-PELITE 3.1 2.76 0.86 NA PELITE AND SEMI-PELITE 3.1 2.76 0.86 NA PELITE GRAPHITIC 3.1 2.74 0.86 NA PELITE AND SEMI-PELITE 3.2 2.69 0.86 NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE, PELITE AND METALIMESTONE 3.4 2.75 0.86 NA PSAMMITE, PELITE AND METALIMESTONE 3.8 2.72 0.78 NA OUARTZITE 3.8 2.72 0.78 NA OUARTZITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.78 NA OUARTZITE, SEM		MYLONITE				0.1042
NA PELITE 3.25 2.75 0.86 NA PELITE AND SEMI-PELITE 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.74 0.86 UNDIFF PORPHYRY 3.2 2.69 0.86 NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND PELITE 3.4 2.75 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN OUARTZITE 3.8 2.72 0.78 NA OUARTZITE 3.6 2.72 0.78 NA OUARTZITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.1034</td>						0.1034
NA PELITE AND SEMI-PELITE 3.1 2.76 0.86 NA PELITE, GRAPHITIC 3.1 2.74 0.86 UNDIFF PORPHYRY 3.2 2.69 0.86 NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND PELITE 3.4 2.75 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE, PELITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN QUARTZITE 3.8 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.33 2.1 0.84 NEOGENE SA						0.1059
NA PELITE, GRAPHITIC 3.1 2.74 0.86 UNDIFF PORPHYRY 3.2 2.69 0.86 NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE, PELITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN OUARTZITE 3.8 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE AND PELITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.33 2.1 0.84 NEOGE						0.1187
UNDIFF PORPHYRY 3.2 2.69 0.86 NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND PELITE 3.4 2.75 0.86 NA PSAMMITE AND SEMI-PELITE 3.7 2.79 0.86 DEVONIAN OUARTZITE 3.7 2.72 0.78 NA OUARTZITE 3.6 2.72 0.78 NA OUARTZITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 0.84 NEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35						0.1128
NA PSAMMITE 3.8 2.7 0.86 NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE, PELITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN OUARTZITE 3.8 2.72 0.78 NA OUARTZITE 3.6 2.72 0.78 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.59 2.4 0.84 PERMIAN SANDSTONE 3.03 2.65						0.1137
NA PSAMMITE AND PELITE 3.5 2.74 0.86 NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE, PELITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN OUARTZITE 3.8 2.72 0.78 NA OUARTZITE 3.6 2.72 0.86 DEVONIAN OUARTZITE 3.6 2.72 0.78 NA OUARTZITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.6 2.72 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.33 2.1 0.84 NEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.03 2.4 0.84 TRIASSIC SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.1 2.5						0.1195 0.1414
NA PSAMMITE AND SEMI-PELITE 3.4 2.75 0.86 NA PSAMMITE, PELITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN OUARTZITE 3.8 2.72 0.78 NA OUARTZITE 4 2.72 0.78 NA OUARTZITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.78 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.33 2.1 0.84 NEOGENE SANDSTONE 2.35 2.25 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.35 2.4 0.84 TRIASSIC SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.1 2.55 0.84						0.1414
NA PSAMMITE, PELITE AND METALIMESTONE 3.7 2.79 0.86 DEVONIAN OUARTZITE 3.8 2.72 0.78 NA OUARTZITE 4 2.72 0.78 NA OUARTZITE 3.6 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.33 2.1 0.84 NEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.35 2.25 0.84 PERMIAN SANDSTONE 2.30 2.4 0.84 PERMIAN SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.1 2.55 0.84						0.1283
DEVONIAN OUARTZITE 3.8 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 4 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUARTRNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.33 2.1 0.84 NEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.35 2.25 0.84 PERMIAN SANDSTONE 2.30 2.4 0.84 PREMIAN SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.1 2.55 0.84						0.1332
NA OUARTZITE 4 2.72 0.78 NA OUARTZITE, SEMI-PELITE AND PELITE 3.6 2.72 0.86 ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.4 JURASSIC SANDSTONE 2.23 2.5 0.84 NEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 PERMIAN SANDSTONE 2.59 2.4 0.84 PERMIAN SANDSTONE 3.03 2.65 0.84 TRIASSIC SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.2 2.6 0.84						0.1548
ORDOVICIAN RHYOLITIC LAVA 3.3 2.75 0.86 OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.23 2.5 0.84 NEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.35 2.25 0.84 PERMIAN SANDSTONE 2.59 2.4 0.84 TRIASSIC SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.1 2.55 0.84		OUARTZITE	4	2.72		0.1629
OUATERNARY SANDSTONE 2.1 2.1 0.84 JURASSIC SANDSTONE 2.23 2.5 0.84 NEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.35 2.25 0.84 PERMIAN SANDSTONE 2.59 2.4 0.84 TRIASSIC SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.1 2.55 0.84						0.133
JURASSIC SANDSTONE 2.23 2.5 0.84 NEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.59 2.4 0.84 PERMIAN SANDSTONE 3.03 2.65 0.84 NA SANDSTONE 3.1 2.55 0.84						0.1206
NEOGENE SANDSTONE 2.33 2.1 0.84 PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.59 2.4 0.84 PERMIAN SANDSTONE 3.03 2.65 0.84 TRIASSIC SANDSTONE 3.1 2.55 0.84 NA SANDSTONE 3.2 2.6 0.84						0.1029
PALAEOGENE SANDSTONE 2.35 2.25 0.84 CRETACEOUS SANDSTONE 2.59 2.4 0.84 PERMIAN SANDSTONE 3.03 2.65 0.84 TRIASSIC SANDSTONE 3.1 2.55 0.84 NA SANDSTONE 3.2 2.6 0.84						0.0917
CRETACEOUS SANDSTONE 2.59 2.4 0.84 PERMIAN SANDSTONE 3.03 2.65 0.84 TRIASSIC SANDSTONE 3.1 2.55 0.84 NA SANDSTONE 3.2 2.6 0.84						0.1141
PERMIAN SANDSTONE 3.03 2.65 0.84 TRIASSIC SANDSTONE 3.1 2.55 0.84 NA SANDSTONE 3.2 2.6 0.84						0.1074
TRIASSIC SANDSTONE 3.1 2.55 0.84 NA SANDSTONE 3.2 2.6 0.84						0.111
NA SANDSTONE 3.2 2.6 0.84						0.1176 0.125
						0.125
	DEVONIAN	SANDSTONE	3.28	2.65	0.84	0.1200
CARBONIFEROUS SANDSTONE 3.34 2.6 0.84						0.1321

ORDOVICIAN SANDSTONE 3.4 2.7 0.84 0.1295 CAMBRIAN SANDSTONE 3.4 2.65 0.84 0.132 JURASSIC SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 1.95 2.25 0.84 0.1078 CRETIACEOUS SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.1 0.84 0.10178 CRETIACEOUS SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.71 2.88 0.84 0.1015 CAMBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1029 CAMBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1136 DEVONIAN SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.82 2.85 0.84 0.1132 TRIASSIC SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.58 0.84 0.1132 PERMIAN SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.84						
CAMBRIAN SANDSTONE 3.4 2.65 0.84 0.132 JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 1.95 2.25 0.84 0.0091 PALAEOGENE SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.32 2.36 0.84 0.1078 CRETIACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.71 2.68 0.84 0.104 SILURIAN SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.72 0.84 0.1024 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.72 0.84 0.1038 DEVONIAN SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.82 2.45 0.84 0.1184 TIRIASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.82 0.84 0.1182 PERMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.58 0.84 0.1182 PERMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATELARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.5 0.84	SILURIAN	SANDSTONE	3.4	2.68	0.84	0.1305
JJRASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 1.95 2.25 0.84 0.1078 CRETIACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.1 0.84 0.1078 CRETIACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.22 2.35 0.84 0.1018 ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1029 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1136 DEVONIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.82 2.45 0.84 0.1136 CABBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.8 0.84 0.1132 PREMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 0.54 0.1132 PREMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 0.84 0.1162 DEREMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED						
PALAEOGENE SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.2 2.1 0.84 0.1078 CRETACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.32 2.35 0.84 0.1015 ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.71 2.68 0.84 0.1029 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1036 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.74 0.84 0.1136 DEVONIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.85 2.88 0.84 0.1136 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1132 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1132 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1162 CRETACEOUS						
CRETACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGIL ACEOUS ROCKS. INTERBEDDED 2.32 2.35 0.84 0.1015 ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGILLACEOUS ROCKS. INTERBEDDED 2.71 2.68 0.84 0.1029 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGILLACEOUS ROCKS. INTERBEDDED 2.72 0.84 0.1029 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGILLACEOUS ROCKS. INTERBEDDED 2.72 2.77 0.84 0.1184 TRIASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGILLACEOUS ROCKS. INTERBEDDED 2.82 2.58 0.84 0.1184 TRIASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.59 0.84 0.1183 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.50 0.84 0.1183 NA SANDSTONE AND ISUBEOUAL/SUBORDINATE LARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.60 0.44 0.1184 JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE LIMESTONE, INTERBEDDED 2.4 2.4 0.4 0.1022 CRETACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE LIMES	JURASSIC	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	1.95	2.25	0.84	0.0891
ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE! ARGILLACEOUS ROCKS, INTERBEDDED 2.71 2.68 0.84 0.1029 SILURIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE! ARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1029 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE! ARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.74 0.84 0.1136 DEVONIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE! ARGILLACEOUS ROCKS, INTERBEDDED 2.82 2.45 0.84 0.1136 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE! ARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1132 PERMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE! ARGILLACEOUS ROCKS, INTERBEDDED 3 2.62 0.84 0.1178 JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE! IMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1082 CRETACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE! IMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1082 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE! IMESTONE, INTERBEDDED 2.8 2.65 0.84 0.1082 CAMBRIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED<	PALAEOGENE	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.2	2.1	0.84	0.1078
SILURAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1029 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.7 0.84 0.1039 DEVONIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS, INTERBEDDED 2.82 2.45 0.84 0.1184 TRIASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS, INTERBEDDED 2.85 2.58 0.84 0.1132 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1132 PERMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1132 JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE I IMESTONE, INTERBEDDED 2.4 0.22 0.84 0.1082 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I IMESTONE, INTERBEDDED 2.4 0.24 0.24 0.24 0.24 0.46 0.1087 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I IMESTONE, INTERBEDDED 2.8 2.65 0.84 0.1162	CRETACEOUS	SANDSTONE AND ISUBEOUAL/SUBORDINATE1 ARGILLACEOUS ROCKS. INTERBEDDED	2.32	2.35	0.84	0.1015
CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.72 2.72 0.84 0.1036 DEVONIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.82 2.45 0.84 0.1136 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.59 0.84 0.1136 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1132 PERMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1172 JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE ILIMESTONE, INTERBEDDED 2.1 2.45 0.84 0.1082 CRETACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE ILIMESTONE, INTERBEDDED 2.4 2.26 0.84 0.1087 ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE ILIMESTONE, INTERBEDDED 2.4 2.45 0.84 0.1087 URASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 2.8 2.7 0.84 0.1055 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.5 </td <td>ORDOVICIAN</td> <td>SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED</td> <td>2.71</td> <td>2.68</td> <td>0.84</td> <td>0.104</td>	ORDOVICIAN	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.71	2.68	0.84	0.104
DEVONIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE IARGILLACEOUS ROCKS. INTERBEDDED 2.82 2.45 0.84 0.1184 TRIASSIC SANDSTONE AND ISUBEQUAL/SUBORDINATE IARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.59 0.84 0.1136 CARBONIFEROUS SANDSTONE AND ISUBEQUAL/SUBORDINATE IARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.5 0.84 0.1132 PERMIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE IARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.5 0.84 0.1178 JURASSIC SANDSTONE AND ISUBEQUAL/SUBORDINATE ILIMESTONE. INTERBEDDED 2.1 2.45 0.84 0.1182 CARBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE ILIMESTONE. INTERBEDDED 2.4 2.2 0.84 0.1087 CAMBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE ILIMESTONE. INTERBEDDED 2.8 2.7 0.84 0.1067 ORDOVICIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE ILIMESTONE. INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE. INTERBEDDED 2.8 2.7 0.84 0.1067 SILURIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.2 2.6	SILURIAN	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.72	2.72	0.84	0.1029
TRIASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE ARGILLACEOUS ROCKS. INTERBEDDED 2.85 2.58 0.84 0.1136 CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.5 0.84 0.1152 PERMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.5 0.84 0.1193 NA SANDSTONE AND ISUBEOUAL/SUBORDINATE IARGILLACEOUS ROCKS. INTERBEDDED 3 2.62 0.84 0.1178 JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE I LIMESTONE. INTERBEDDED 2.4 2.2 0.84 0.1087 CRETACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATE I LIMESTONE. INTERBEDDED 2.8 2.65 0.84 0.1087 ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I LIMESTONE. INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE. INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.35 2.72 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.35 2.72 0.	CAMBRIAN	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.72	2.7	0.84	0.1036
CARBONIFEROUS SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.59 0.84 0.1152 PERMIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS. INTERBEDDED 2.9 2.5 0.84 0.1193 NA SANDSTONE AND ISUBEOUAL/SUBORDINATE I ARGILLACEOUS ROCKS. INTERBEDDED 2.1 2.45 0.84 0.1178 JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATE I LIMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1172 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I LIMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1087 ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I LIMESTONE. INTERBEDDED 2.8 2.7 0.84 0.1087 ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATE I LIMESTONE. INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 2.8 2.5 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.2 0.55 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 <td>DEVONIAN</td> <td>SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED</td> <td>2.82</td> <td>2.45</td> <td>0.84</td> <td>0.1184</td>	DEVONIAN	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.82	2.45	0.84	0.1184
PERMIAN SANDSTONE AND ISUBEQUAL/SUBORDINATEI ARGILLACEOUS ROCKS, INTERBEDDED 2.9 2.5 0.84 0.1193 NA SANDSTONE AND ISUBEQUAL/SUBORDINATEI LARGILLACEOUS ROCKS, INTERBEDDED 3 2.62 0.84 0.1178 JURASSIC SANDSTONE AND ISUBEQUAL/SUBORDINATEI LIMESTONE, INTERBEDDED 2.1 2.45 0.84 0.0882 CRETACEOUS SANDSTONE AND ISUBEQUAL/SUBORDINATEI LIMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1022 CAMBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATEI LIMESTONE, INTERBEDDED 2.8 2.65 0.84 0.1067 JURASSIC SANDSTONE AND CONCLOMERATE, INTERBEDDED 2.8 2.45 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.8 2.7 0.84 0.105 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1369 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1067 SILURIAN </td <td>TRIASSIC</td> <td>SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED</td> <td>2.85</td> <td>2.58</td> <td>0.84</td> <td>0.1136</td>	TRIASSIC	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.85	2.58	0.84	0.1136
NA SANDSTONE AND ISUBEQUAL/SUBORDINATELARGILLACEOUS ROCKS, INTERBEDDED 3 2.62 0.84 0.1178 JURASSIC SANDSTONE AND ISUBEQUAL/SUBORDINATELIMESTONE, INTERBEDDED 2.1 2.45 0.84 0.0122 CRETACEOUS SANDSTONE AND ISUBEQUAL/SUBORDINATELIMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1122 CAMBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATELIMESTONE, INTERBEDDED 2.8 2.65 0.84 0.1087 ORDOVICIAN SANDSTONE AND ISUBEQUAL/SUBORDINATELIMESTONE, INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 2.5 2.45 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1267 NA SANDSTONE AN	CARBONIFEROUS	SANDSTONE AND ISUBEOUAL/SUBORDINATE1 ARGILLACEOUS ROCKS. INTERBEDDED	2.9	2.59	0.84	0.1152
JURASSIC SANDSTONE AND ISUBEOUAL/SUBORDINATEI LIMESTONE, INTERBEDDED 2.1 2.4 2.2 0.84 0.0882 CRETACEOUS SANDSTONE AND ISUBEOUAL/SUBORDINATEI LIMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1122 CAMBRIAN SANDSTONE AND ISUBEOUAL/SUBORDINATEI LIMESTONE, INTERBEDDED 2.8 2.7 0.84 0.1087 ORDOVICIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 2.5 2.45 0.84 0.1067 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.65 0.84 0.1164 DEVONIAN SCHIST	PERMIAN	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.9	2.5	0.84	0.1193
CRETACEOUS SANDSTONE AND ISUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED 2.4 2.2 0.84 0.1122 CAMBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED 2.8 2.65 0.84 0.1087 ORDOVICIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED 2.5 2.45 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 2.5 2.45 0.84 0.1164 JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1167 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 PERMIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1267 PERMIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1267 PERMIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1267 SUPENNIAN SCHIST CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1048 CARBONIFEROUS TUFF	NA	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	3	2.62	0.84	0.1178
CAMBRIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE1 LIMESTONE. INTERBEDDED 2.8 2.65 0.84 0.1087 ORDOVICIAN SANDSTONE AND ISUBEQUAL/SUBORDINATE1 LIMESTONE. INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE. INTERBEDDED 2.5 2.45 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3 2.65 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.4 2.5 0.84 0.1048 SILURIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3 2.65 0.84 0.1048 CARBONIFEROUS TUFF 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.7 0.85 0.0791	JURASSIC	SANDSTONE AND [SUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED	2.1	2.45	0.84	0.0882
ORDOVICIAN SANDSTONE AND ISUBEOUAL/SUBORDINATEI LIMESTONE. INTERBEDDED 2.8 2.7 0.84 0.1067 JURASSIC SANDSTONE AND CONGLOMERATE. INTERBEDDED 2.5 2.45 0.84 0.105 SILURIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.35 2.72 0.84 0.1267 PERMIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3.4 2.5 0.84 0.1399 SILURIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3 2.65 0.84 0.1048 DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.77 0.85 0.0791 PALAEOGENE TUFF 2.1 2.77 0.85 0.085 ORDOVICIAN TUFF 2.3 2.75 0.85 0.085 ORDOVICIAN TUFF	CRETACEOUS	SANDSTONE AND [SUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED	2.4	2.2	0.84	0.1122
JURASSIC SANDSTONE AND CONGLOMERATE, INTERBEDDED 2.5 2.45 0.84 0.105 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1399 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1048 DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 NA SCHIST 2.9 2.78 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.3 2.74 0.85 0.0853 NA TUFF 2.3 2.74 0.85 0.0851 ORDOVICIAN TUFF 2.3 2.74 0.85 0.0	CAMBRIAN	SANDSTONE AND [SUBEQUAL/SUBORDINATE] LIMESTONE, INTERBEDDED	2.8	2.65	0.84	0.1087
SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 PERMIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 NA SCHIST 2.9 2.78 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF	ORDOVICIAN	SANDSTONE AND ISUBEOUAL/SUBORDINATE1 LIMESTONE. INTERBEDDED	2.8	2.7	0.84	0.1067
DEVONIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 PERMIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1267 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1164 DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 NA SCHIST 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.72 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF 2.3 2.75 0.85 0.0853 NA TUFF 2.3 2.76 0.85 0.0853 NA TUFF 2.3 2.75 0.85 0.0853 NA TUFF 2.3 2.76 0.85 0.0853 NA TUFF	JURASSIC	SANDSTONE AND CONGLOMERATE, INTERBEDDED	2.5	2.45	0.84	0.105
NA SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.35 2.72 0.84 0.1267 PERMIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1399 SILURIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 NA SCHIST 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.72 0.85 0.0785 PERMIAN TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF 2.3 2.74 0.85 0.0851 SILURIAN TUFF 2.3 2.75 0.85 0.0851 ORDOVICIAN TUFF 2.3 2.74 0.85 0.0853 NA TUFF AND LAVA, UNDIFFERENTIATED 2.3 2.75 0.85 0.0847 NEOPROTEROZOI	SILURIAN	SANDSTONE AND CONGLOMERATE, INTERBEDDED	3	2.65	0.84	0.1164
PERMIAN SANDSTONE AND CONGLOMERATE, INTERBEDDED 3.4 2.5 0.84 0.1399 SILURIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 NA SCHIST 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.72 0.85 0.0785 PERMIAN TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF 2.2 2.73 0.85 0.0819 SILURIAN TUFF 2.2 2.73 0.85 0.085 ORDOVICIAN TUFF 2.3 2.75 0.85 0.085 ORDOVICIAN TUFF 2.3 2.75 0.85 0.0847 NA TUFF 2.3 2.76 0.85 0.0847 NA TUFF AND LAVA, UNDIFFERENTIATED 2	DEVONIAN	SANDSTONE AND CONGLOMERATE, INTERBEDDED	3.35	2.72	0.84	0.1267
SILURIAN SANDSTONE AND CONGLOMERATE. INTERBEDDED 3 2.65 0.84 0.1164 DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 NA SCHIST 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.72 0.85 0.0785 PERMIAN TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF 2.1 2.7 0.85 0.0819 SILURIAN TUFF 2.2 2.73 0.85 0.0819 SILURIAN TUFF 2.3 2.75 0.85 0.0853 ORDOVICIAN TUFF 2.3 2.74 0.85 0.0847 NA TUFF 2.3 2.76 0.85 0.0847 NA TUFF AND LAVA, UNDIFFERENTIATED 2.8 2.78 0.85 0.1024 NEOPROTEROZOIC TUFF AND LAVA, UNDIFFERENTIATED 2.	NA	SANDSTONE AND CONGLOMERATE, INTERBEDDED	3.35	2.72	0.84	0.1267
DEVONIAN SCHIST 2.9 2.78 0.86 0.1048 NA SCHIST 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.72 0.85 0.0785 PERMIAN TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0819 SILURIAN TUFF 2.3 2.75 0.85 0.085 ORDOVICIAN TUFF 2.3 2.74 0.85 0.0853 NA TUFF 2.3 2.75 0.85 0.0847 ORDOVICIAN TUFF 2.3 2.76 0.85 0.0847 NA TUFF AND LAVA, UNDIFFERENTIATED 2.3 2.76 0.85 0.0847 NEOPROTEROZOIC TUFF AND LAVA, UNDIFFERENTIATED 2.8 2.78 0.85 0.1024 UNDIFF ULTRABASIC GROUP 2.4 2.95 0.85 0.0827 NA ULTRABASIC ROCK, METAMORPHOSED 2.9	PERMIAN	SANDSTONE AND CONGLOMERATE, INTERBEDDED	3.4	2.5	0.84	0.1399
NA SCHIST 2.9 2.78 0.86 0.1048 CARBONIFEROUS TUFF 2.1 2.72 0.85 0.0785 PERMIAN TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF 2.1 2.7 0.85 0.0819 SILURIAN TUFF 2.3 2.75 0.85 0.085 ORDOVICIAN TUFF 2.3 2.74 0.85 0.0853 NA TUFF 2.5 2.75 0.85 0.0847 NEOPOVICIAN TUFF AND LAVA, UNDIFFERENTIATED 2.3 2.76 0.85 0.0847 NEOPROTEROZOIC TUFF AND LAVA, UNDIFFERENTIATED 2.8 2.78 0.85 0.1024 UNDIFF ULTRABASIC GROUP 2.4 2.95 0.85 0.0827 NA ULTRABASIC ROCK, METAMORPHOSED 2.9	SILURIAN	SANDSTONE AND CONGLOMERATE. INTERBEDDED	3	2.65	0.84	0.1164
CARBONIFEROUS TUFF 2.1 2.72 0.85 0.0785 PERMIAN TUFF 2.1 2.7 0.85 0.0791 PALAEOGENE TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF 2.1 2.7 0.85 0.0791 DEVONIAN TUFF 2.2 2.73 0.85 0.0819 SILURIAN TUFF 2.3 2.75 0.85 0.0853 NA TUFF 2.3 2.74 0.85 0.0823 NA TUFF 2.3 2.75 0.85 0.0823 NA TUFF 2.3 2.76 0.85 0.0924 ORDOVICIAN TUFF AND LAVA, UNDIFFERENTIATED 2.3 2.76 0.85 0.0924 ORDOVICIAN TUFF AND LAVA, UNDIFFERENTIATED 2.8 2.78 0.85 0.1024 UNDIFF ULTRABASIC GROUP 2.4 2.95 0.85 0.0827 NA ULTRABASIC ROCK, METAMORPHOSED 2.9 2.85	DEVONIAN	SCHIST	2.9	2.78	0.86	0.1048
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DEVONIAN TUFF 2.2 2.73 0.85 0.0819 SILURIAN TUFF 2.3 2.75 0.85 0.085 ORDOVICIAN TUFF 2.3 2.74 0.85 0.0853 NA TUFF 2.5 2.75 0.85 0.0924 ORDOVICIAN TUFF AND LAVA, UNDIFFERENTIATED 2.3 2.76 0.85 0.0924 ORDOVICIAN TUFF AND LAVA, UNDIFFERENTIATED 2.3 2.76 0.85 0.0847 NEOPROTEROZOIC TUFF AND LAVA, UNDIFFERENTIATED 2.8 2.78 0.85 0.1024 UNDIFF ULTRABASIC GROUP 2.4 2.95 0.86 0.1022 CAMBRIAN ULTRABASIC ROCK, METAMORPHOSED 2.9 2.85 0.86 0.1022	PERMIAN	TUFF	2.1	2.7	0.85	0.0791
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ORDOVICIAN TUFF AND LAVA, UNDIFFERENTIATED 2.3 2.76 0.85 0.0847 NEOPROTEROZOIC TUFF AND LAVA, UNDIFFERENTIATED 2.8 2.78 0.85 0.1024 UNDIFF ULTRABASIC GROUP 2.4 2.95 0.85 0.0827 NA ULTRABASIC ROCK. METAMORPHOSED 2.9 2.85 0.86 0.1022 CAMBRIAN ULTRABASIC ROCK, METAMORPHOSED 2.9 2.85 0.86 0.1022	ORDOVICIAN	TUFF	2.3	2.74	0.85	0.0853
NEOPROTEROZOIC TUFF AND LAVA, UNDIFFERENTIATED 2.8 2.78 0.85 0.1024 UNDIFF ULTRABASIC GROUP 2.4 2.95 0.85 0.0827 NA ULTRABASIC ROCK. METAMORPHOSED 2.9 2.85 0.86 0.1022 CAMBRIAN ULTRABASIC ROCK, METAMORPHOSED 2.9 2.85 0.86 0.1022	NA	TUFF	2.5	2.75	0.85	0.0924
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UNDIFF ULTRABASIC GROUP 2.4 2.95 0.85 0.0827 NA ULTRABASIC ROCK. METAMORPHOSED 2.9 2.85 0.86 0.1022 CAMBRIAN ULTRABASIC ROCK, METAMORPHOSED 2.9 2.85 0.86 0.1022	NEOPROTEROZOIC	TUFF AND LAVA, UNDIFFERENTIATED		2.78	0.85	0.1024
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CAMBRIAN ULTRABASIC ROCK, METAMORPHOSED 2.9 2.85 0.86 0.1022	NA		2.9	2.85	0.86	0.1022
					0.8	

Glossary

Term	Explanation
ArcGIS	Geographic information system (GIS) software for working with maps and geographic information maintained by the Environmental Systems Research Institute (ESRI).
ASCII grid	American Standard Code for Information Interchange (ASCII) data format for the storage of raster data. The ASCII raster format can be used to store cell based or raster information. The basic structure of an ASCII grid has the header information at the beginning of the file followed by the cell value data.
Attribute	Named property of an entity. Descriptive information about features or elements of a database. For a database feature like census tract, attributes might include many demographic facts including total population, average income, and age. In statistical parlance, an attribute is a variable, whereas the database feature represents an observation of the variable.
Bedrock	The main mass of rocks forming the earth, laid down prior to 2.588 million years ago. Present everywhere, whether exposed at the surface in rocky outcrops or concealed beneath superficial deposits, artificial ground or water. Formerly called solid.
Conductivity	The degree to which a specified material conduct electricity or heat.
DTM (Digital Terrain Model)	Digital elevation model (DEM) that incorporates the elevation of important topographic features on the land.
Extrapolate	Process of constructing new data points outside a discrete set of known data points. It is similar to the process of interpolation, which constructs new points between known points, but the results of extrapolations are often less meaningful, and are subject to greater uncertainty.
Flow rate	Rate at which groundwater moves through rock.
Geographical Information System	Geographic Information Systems (GIS) provides accurate information, assistance, support, and maintains and creates information to aid in the development of maps and data analysis.
Geology	The study or science of the earth, its history, and its life as recorded in the rocks; includes the study of geologic features of an area, such as the geometry of rock formations, weathering and erosion, and sedimentation.
Geospatial data	Data that has a geographic component to it. This means that the records in a dataset have locational information tied to them such as geographic data in the form of coordinates, address, city, or postcode.
GeoTiff	The Geo TIFF format embeds geospatial metadata into image files such as aerial photography, satellite imagery, and digitized maps so that they can be used in GIS applications.
Lithology	Rocks maybe defined in terms of their general characteristics of appearance: colour, texture and composition. Some lithologies may require a microscope or chemical analysis for the latter to be fully determined.
Metadata	Data about data or a service. Metadata is the documentation of data. In human-readable form, it has primarily been used as information to enable the manager or user to understand, compare and interchange the content of the described data set. In the Web Services context, XML-encoded (machine-readable and human-readable) metadata stored

	in catalogues and registries enables services to use those catalogues and registries to find data and services.
Modelled	Constructing a set of parameters to form a framework, populating with data and programmatically interpolating a surface by extrapolating across areas with no usable data.
OpenGeoscience	OpenGeoscience is a free service where you can view maps, download data, scans, photos and other information. <u>https://www.bgs.ac.uk/opengeoscience/</u> Open data is data that is available to everyone to use, access and share.
Permeability	The term permeability, used in a general sense, refers to the capacity of a rock to transmit water. Such water may move through the rock matrix (intergranular permeability) or through joints, faults, cleavage or other partings (fracture or secondary permeability). A stricter definition of permeability is that it is a measure of the relative ease with which a porous medium can transmit a fluid under a potential gradient. It is the property of the medium only and is independent of the fluid. Commonly, but imprecisely, taken to be synonymous with the term Hydraulic Conductivity which implies the fluid is water.
Porosity	The ratio of the volume of the interstices to the total volume of rock expressed as a fraction. Effective porosity includes only the interconnected pore spaces available for groundwater transmission; measurements of porosity in the laboratory usually exclude any void spaces caused by cracks or joints (secondary porosity).
QGIS	A free and open-source cross-platform desktop geographic information system (GIS) application that supports viewing, editing, and analysis of geospatial data. QGIS was known until 2013 as Quantum GIS.
Radiogenic	A material effect or process created radioactive decay
Resolution	Resolution expresses the size of the smallest object in a spatial data set that can be described. It refers to the amount of detail that can be discerned. It is also known as granularity.
Rockhead	The point of contact between Bedrock and Quaternary units. The 'ground level' before the Quaternary deposits were laid down.
Scale	The relation between the dimensions of features on a map and the geographic objects they represent on the earth, commonly expressed as a fraction or a ratio. A map scale of 1/100,000 or 1:100,000 means that one unit of measure on the map equals 100,000 on the earth.
Shapefile	The shapefile format is a geospatial vector data format for geographic information system software. It is developed and regulated by Esri as a mostly open specification for data interoperability among Esri and other GIS software products.
Sedimentary	Rocks that originated from the broken up or dissolved and re-precipitated particles of other rocks. Examples include clay, mudstone, siltstone, shale, sandstone, limestone and conglomerate. Sedimentary rocks cover more than two-thirds of the Earth's surface. They are formed from the weathering and erosion products of rock material, which have been transported (usually by water or wind), redeposited and later consolidated.
Spatial data	Data describing anything with spatial extent, i.e. size, shape or position. In addition to describing things that are positioned relative to the Earth, spatial data may also describe things using other coordinate systems that are not related to position on the Earth, such as the size, shape and positions of cellular and sub-cellular Spatial Things described using the 2D or 3D Cartesian coordinate system of a specific tissue sample.
Superficial	The youngest geological deposits formed during the most recent period of geological time, the Quaternary. They date from about 2.6 million years ago to the present.

Vadose	The vadose zone is also termed the unsaturated zone and represents the shallow subsurface between the soil and the local groundwater level. This zone exhibits changing levels of saturation.
Vector	A representation of the spatial extent of geographic features using geometric elements (such as point, curve, and surface) in a coordinate space.

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The British Geological Survey holds most of the references listed below and copies may be obtained via the library service subject to copyright legislation (contact libuser@bgs.ac.uk for details). The library catalogue is available at https://envirolib.apps.nerc.ac.uk/olibcgi.

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