ORDNANCE SURVEY GB

GETTING STARTED WITH GEOPACKAGE

Ordnance Survey

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Version history

Version	Date	Description
1.0	07/2021	Initial release.

Contact details

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1. Introduction

This guide explains what GeoPackage is, lists the key features and benefits of the format, and details the applications that support GeoPackage features. Section 2 provides step-by-step instructions on how to access GeoPackage data via ArcMap, QGIS, MapInfo Professional, ArcGIS Pro and CadCorp. Section 3 details how to load GeoPackage data into PostgreSQL. Section 4 outlines how to read GeoPackage data into FME.

In response to customer feedback on preferred data formats, a growing number of OS products have been made available in GeoPackage format, including AddressBase Core, Boundary-Line, OS Open Zoomstack and OS Open Roads, to name a few.

1.1 What is GeoPackage?

GeoPackage (.gpkg) is an open, non-proprietary, platform-independent and standards-based data format for geographic information systems (GIS), as defined by the Open Geospatial Consortium (OGC). It is designed to be a lightweight format that can contain large amounts of varied and complex data in a single, easy to distribute and ready to use file. GeoPackage is natively supported by numerous software applications.

1.2 Key features and benefits of GeoPackage

GeoPackage offers users the following key features and benefits:

- The single file is easy to transfer and offers the end-user a rich experience.
- Attribute names are not limited in length, making the format user-friendly.
- The file size limit is very large at 140 TB[1], so lots of data can be easily accommodated – great for GB national coverage.
- It supports raster, vector and database formats, making it a highly versatile solution.
- It is an OGC standard.
- In most cases, it is a Plug and Play format.
- Data will be supplied in British National Grid (ESPG:27700).

[1] A file size limit might be imposed by the file system to which the file is written.

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2. Accessing GeoPackage data via GIS software

The following sub-sections provide step-by-step instructions on how to access GeoPackage data via ArcMap, QGIS, MapInfo Professional, ArcGIS Pro and CadCorp.

2.1 Accessing GeoPackage data via ArcMap

Requirements:

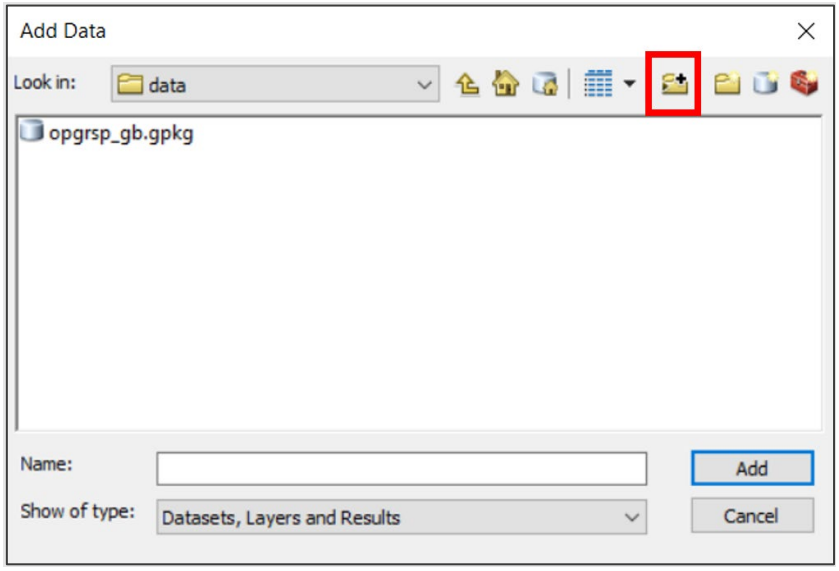
- ArcMap (version 10.2.2 or later)
- A GeoPackage dataset

These instructions were created using ArcMap version 10.7, but versions from 10.2.2 onwards will also support GeoPackage features.

1. Open ArcMap.

2. Once ArcMap loads, select the *Add Data* button. The icon is an orange-coloured diamond shape with a black plus symbol on top; it can be found in the ribbon at the top of the workspace.

If the *Add Data* button is not visible, an alternate method to add data is to select *File* > *Add Data* > *Add Data*. An Add Data dialog box will appear which will be similar to the following screenshot:



If you have not yet connected to the appropriate folder in which you are storing the GeoPackage data, you can connect to it by selecting the *Add Folder* button:

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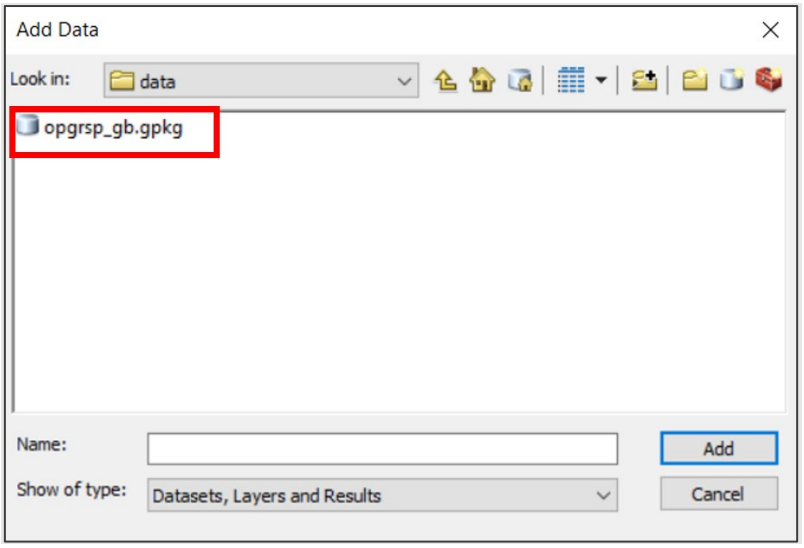
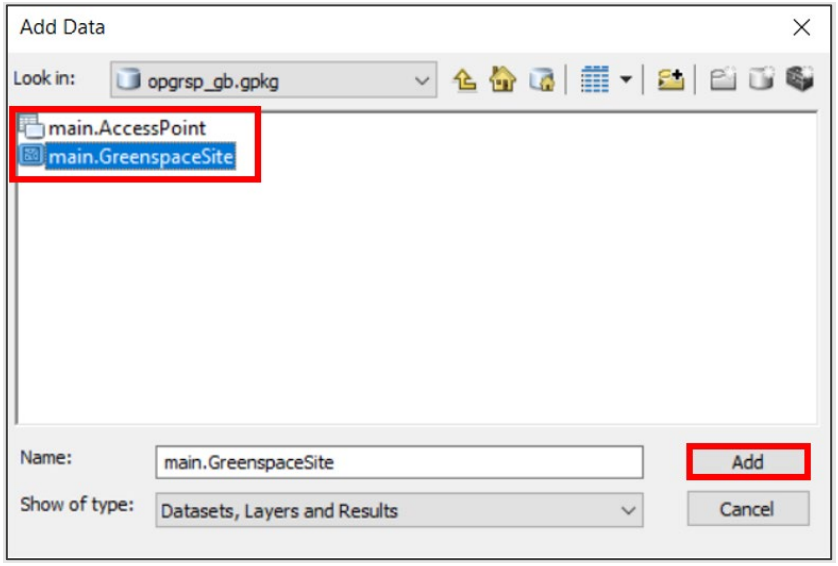
3. Once you have connected to the appropriate folder, locate the GeoPackage to upload into ArcMap. The .gpkg file will look similar to the one in the following screenshot:



4. Double-click on the GeoPackage file to reveal the layers within it. Select the layers you want to upload into ArcMap.

   Note: More than one layer can be selected at any time by holding down shift and clicking on multiple layers.



5. Add the relevant selected GeoPackage layers into the map by clicking the *Add* button.

6. The GeoPackage layers should now be viewable in the layers list in the Table Of Contents on the left-hand side of the workspace.

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2.2 Accessing GeoPackage data via QGIS

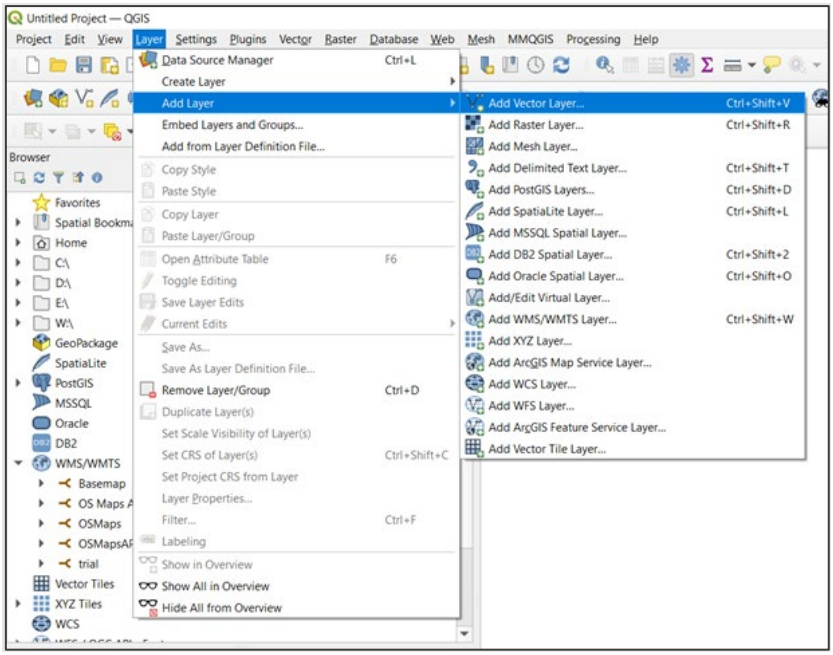
Requirements:

- QGIS (version 2.10.1 or later)
- A GeoPackage dataset

These instructions were created using QGIS version 3.14. Other versions of QGIS can be used, from version 2.10.1 onwards.

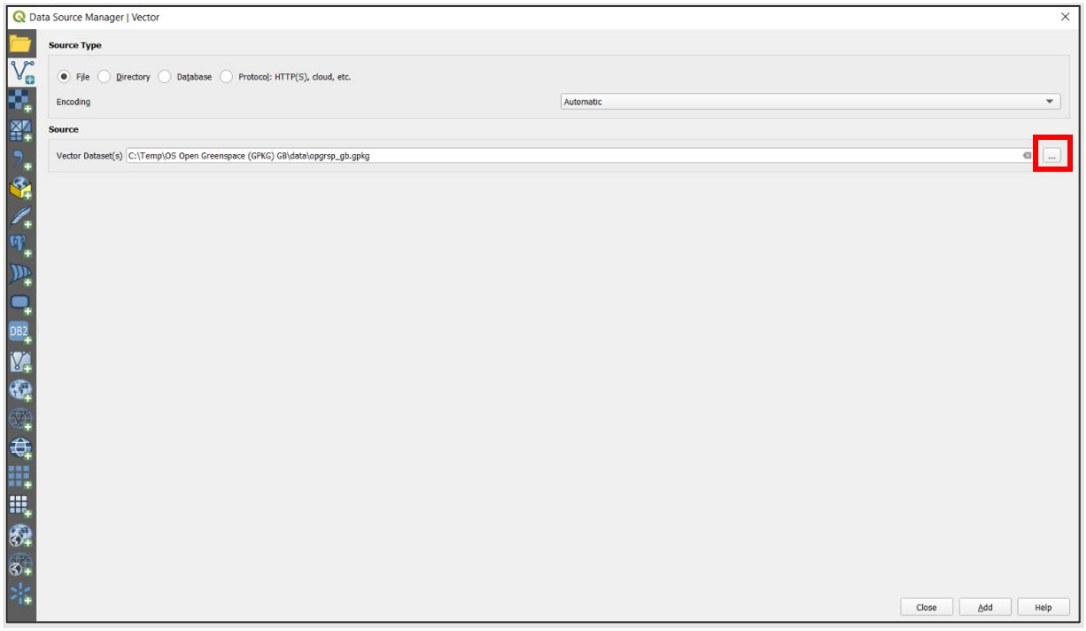
1. Open a new or existing QGIS project.

2. On the top ribbon of the workspace, add a layer by selecting *Layer* > *Add Layer* > *Add Vector Layer*.



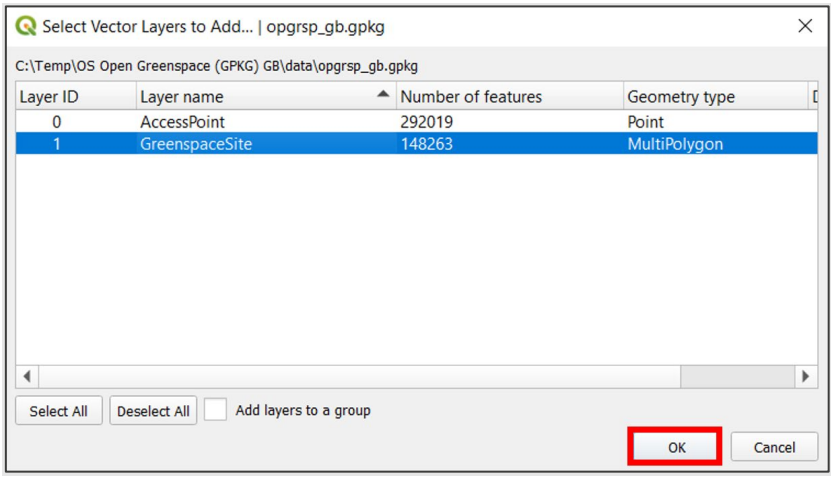
Alternatively, you can simply select the *Add Vector Layer* button:

3. A dialog box will appear. Here, it is possible to select the GeoPackage that will be loaded using the *three dots* button located next to the Vector Dataset(s) box. Click the *three dots* button.



4. Navigate to the GeoPackage. Double-click the file or select it, then click *Add*.

5. A separate dialog box will appear. Here, the layers of the GeoPackage can be selected and added to a map. It is possible to add selected layers, numerous layers or all layers.



6. Once the relevant layers have been selected, click *OK*.

7. The GeoPackage layers should now be viewable in the layers list on the left-hand side of the workspace.

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2.3 Accessing GeoPackage data via MapInfo Professional

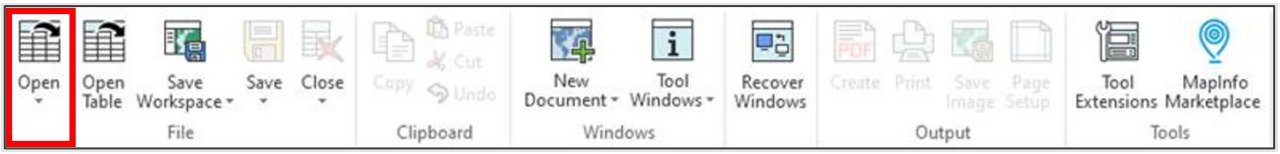
Requirements:

- MapInfo Professional (version 15.2 or later)
- A GeoPackage dataset

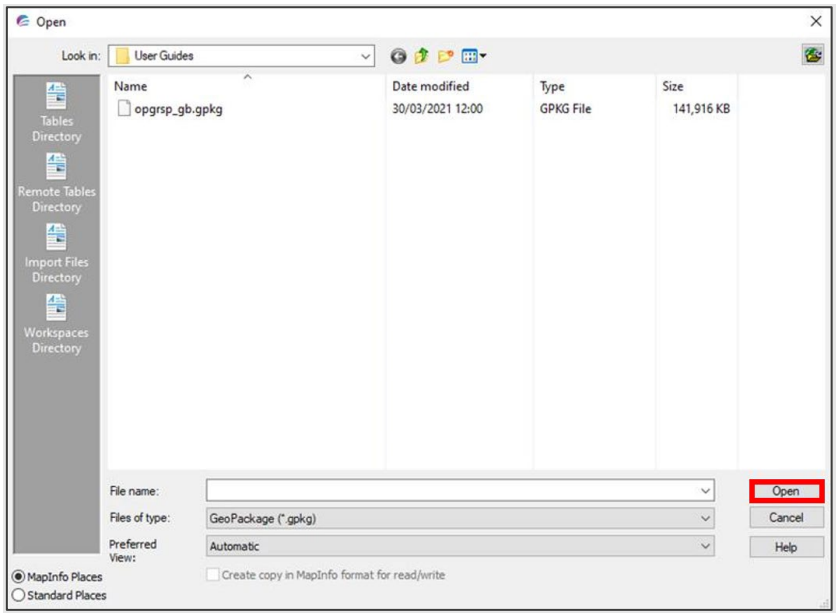
These instructions were completed using MapInfo Professional version 2019; however, any version from 15.2 onwards can be used.

1. Start MapInfo Professional.

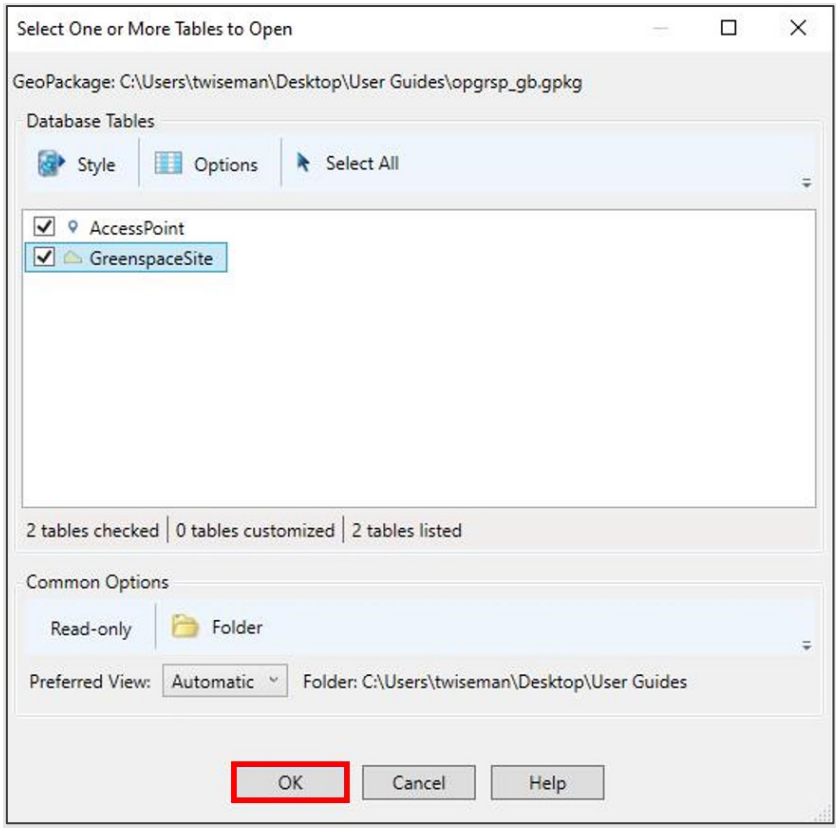
2. Select *Open* > *Table* in the top ribbon.



3. A dialog box will appear where you can search for the appropriate GeoPackage. Once located, select the GeoPackage and click *Open*.



4. Another dialog box will appear. Here, it is possible to select which layers to import into MapInfo Professional from the GeoPackage.



5. Once the layers have been selected, click *OK*.

6. The data should now be available in your workspace.

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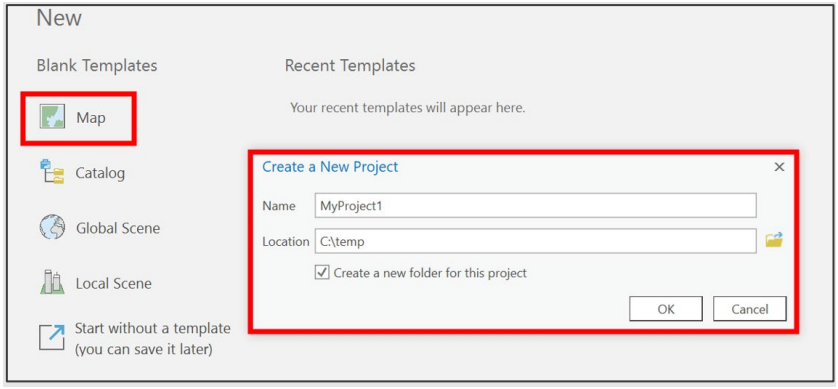
2.4 Accessing GeoPackage data via ArcGIS Pro

Requirements:

- ArcGIS Pro (version 1.1 or later)
- A GeoPackage dataset

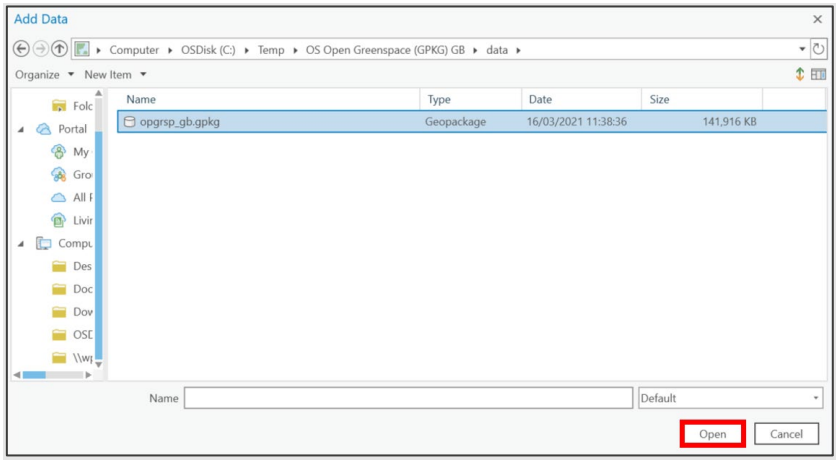
These instructions were created using ArcGIS Pro version 2.5, but versions from 1.1 onwards will support GeoPackage.

1. Start ArcGIS Pro, then open an existing project or create a new one. To create a new project, select *Map* from the Blank Templates section, then enter a *Name* and a *Location* for the project in the Create a New Project section. Click *OK*.



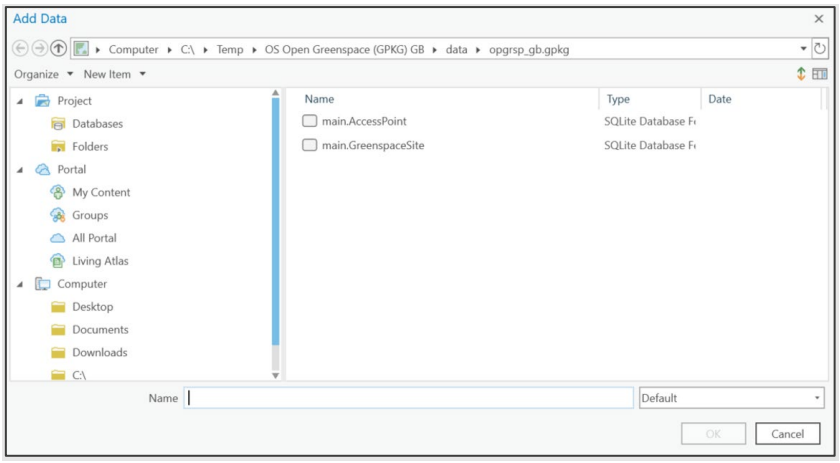
2. In the ribbon at the top of the project, select *Map* > *Add Data*.

3. A dialog box will appear. Navigate to the GeoPackage to be added into ArcGIS Pro. Select the GeoPackage and click *Open*. This will open the GeoPackage to reveal the individual layers.



4. The layers can be selected either individually or together. Once the relevant layers have been selected, click *OK*. The selected layers will then be added into ArcGIS Pro.

   Note: More than one layer can be selected at any time by holding down shift and clicking on multiple layers.



5. The layers added into ArcGIS Pro will appear in the contents pane on the left-hand side of the project.

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2.5 Accessing GeoPackage data via CadCorp

Requirements:

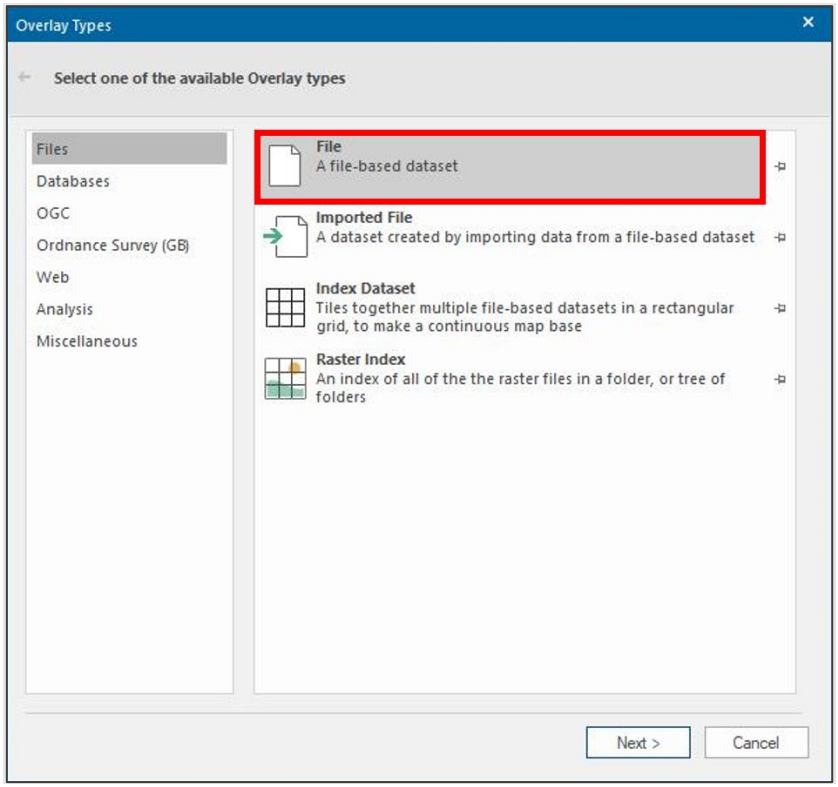
- CadCorp SIS
- A GeoPackage dataset

These instructions were created using CadCorp SIS 9 Desktop Express; however, other versions of CadCorp can support GeoPackage.

1. Start CadCorp SIS.

2. In the upper ribbon, select *Add Overlay*.

3. A dialog box will appear. Select *Files* > *File*.



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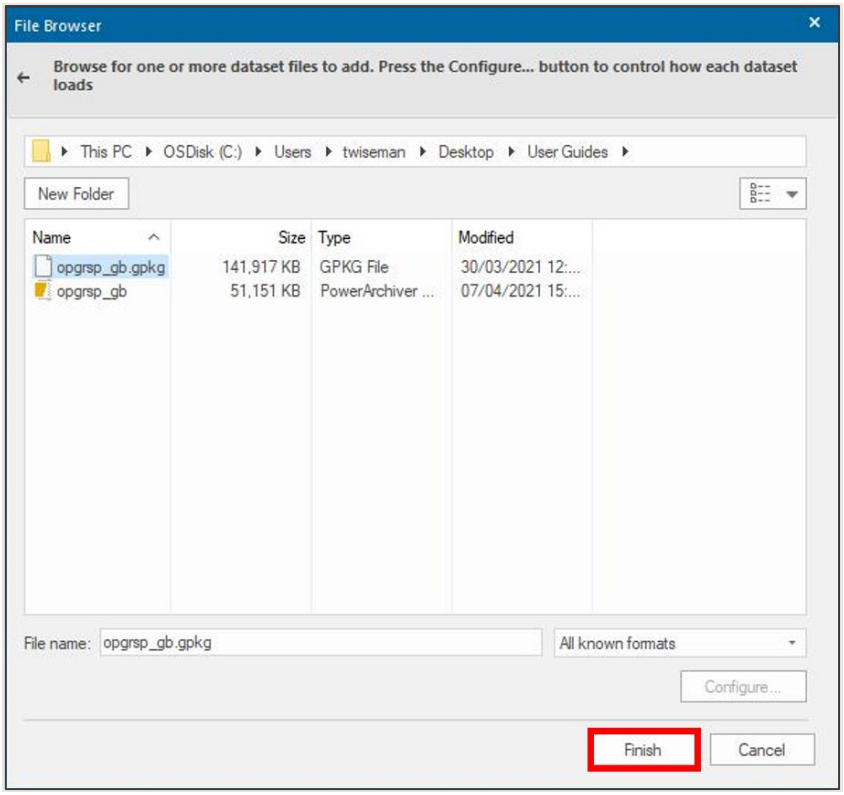
4. From here, another dialog box appears where you can map to where the GeoPackage has been stored locally.



5. Once the correct GeoPackage has been located, click *Finish*.

6. The data should now appear on the map.

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3. Loading GeoPackage into a database

The following sub-section provides instructions on how to load GeoPackage datasets into PostgreSQL.

3.1 Loading a GeoPackage into PostgreSQL (via GDAL / Command Prompt)

Requirements:

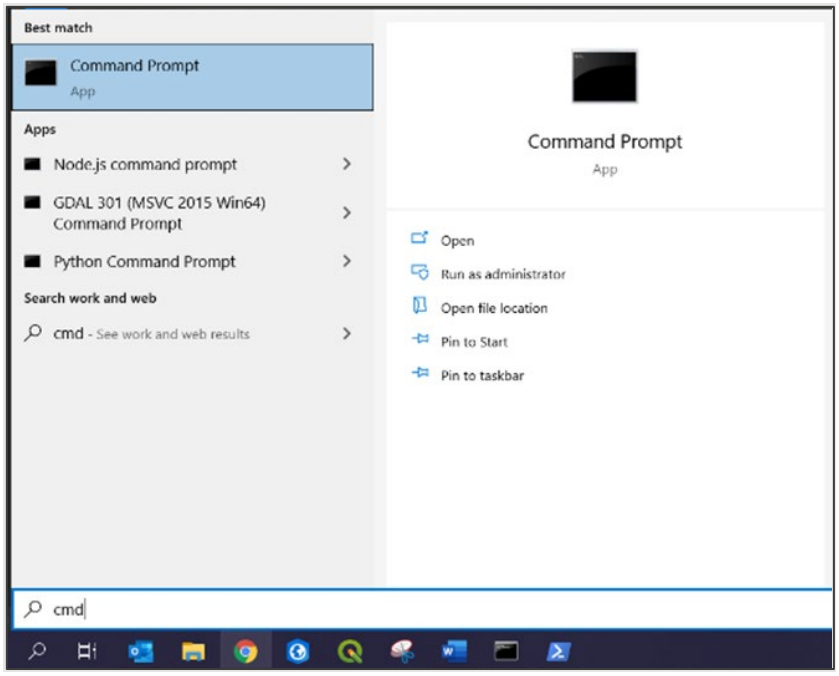
- A development platform for PostgreSQL (for example, pgAdmin or dBeaver)
- A PostgreSQL database
- PostGIS extension
- GDAL
- Access to a Command Prompt or similar
- A GeoPackage dataset

There are various ways of loading a GeoPackage into PostgreSQL. The following step-by-step instructions run through using GDAL / Command Prompt to do this.

1. Open your chosen development platform, for example, dBeaver (this can be found by going to *Windows Start Menu* > *PostGreSQL*).

2. Either connect to an existing database or create a new database. It is recommended that the encoding is set to *UTF-8*. We will return to the PostgreSQL development platform later.

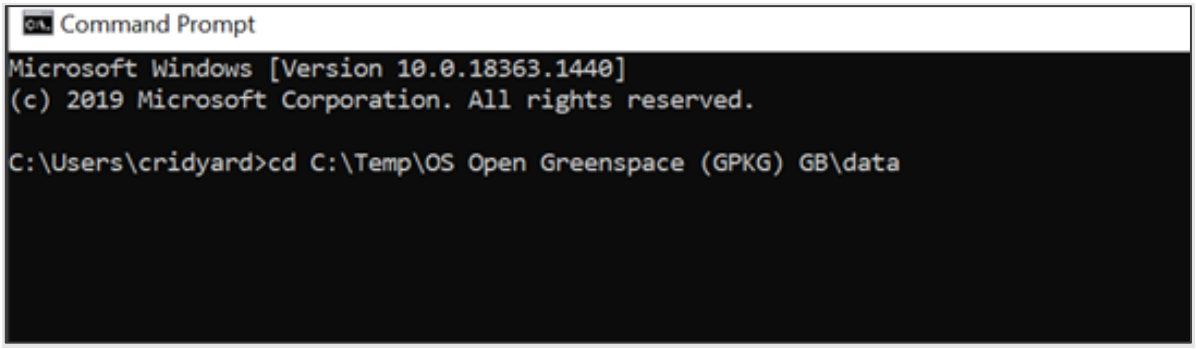
3. Open the Command Prompt by clicking the *Start* button in the bottom left-hand side of the screen and typing *cmd* into the search bar.



4. The Command Prompt will appear.

5. Change the directory of the Command Prompt app if necessary. The directory needs to point to the folder where the GeoPackage is stored. For this example, the GeoPackage to be loaded into PostgreSQL is stored in a C:\Temp folder.

6. In the Command Prompt, type *cd* followed by the directory of the location of the GeoPackage. Press *Enter* on the keyboard. This will change the directory.



7. Enter the command:

   ogr2ogr -progress -gt 65000 -f PostgreSQL "PG:user=***<username>*** password=***<password>*** dbname=***<database>***" -a_srs EPSG:***<coordinate_system>*** ***<data_name>***.gpkg

   username, ***password***, ***database*** and ***host*** can all be found within the subsequent database.

   coordinate_system is the EPSG of the data to be loaded, for example, to load into British National Grid, the EPSG is 27700.

   data_name is the name of the GeoPackage to be loaded.

   Example:

   ogr2ogr -progress -gt 65000 -f PostgreSQL "PG:user=***postgres*** password=***PG123*** dbname=***osdata*** host=***localhost***" -a_srs EPSG:***27700 Greenspace***.gpkg

8. Open your chosen development platform (for example, dBeaver) by going to *Start* > *dBeaver*.

9. Under Database Navigator, move to the database you loaded data into and expand the schema. Using the code above, the GeoPackage should be in your default schema (shown in bold).

10. The GeoPackage will now appear as new tables / a new table in the schema nominated as default. Nominate a schema by adding the following text to the command noted in step 7:

    active schema=***<schema>***

    schema can be found within the subsequent database.

11. Once loaded, you may want to add Primary and Foreign Keys to the data. These can only be added on columns where the data values are unique. Where there are no unique data values, an index may be added, which will aid searching.

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4. Reading GeoPackage data via FME

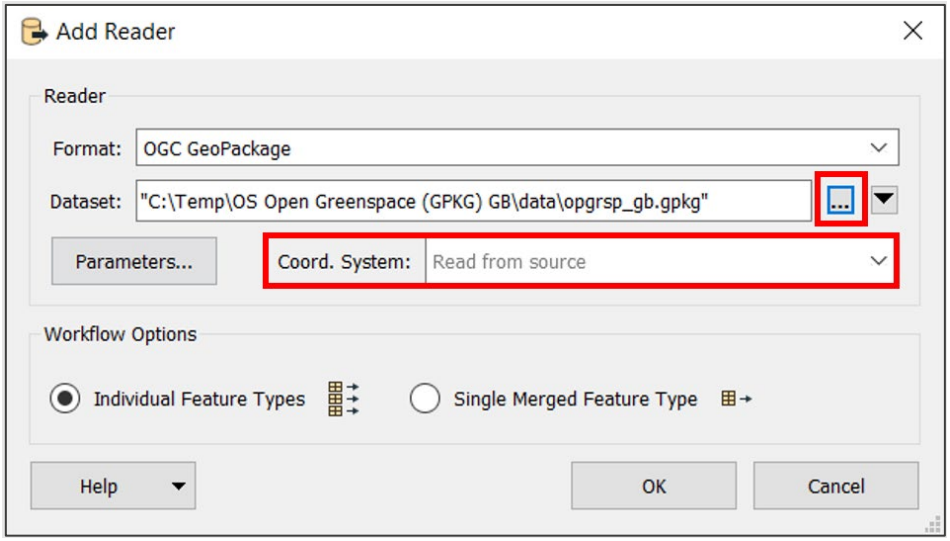
Requirements:

- An FME license
- A GeoPackage dataset

GeoPackages can also be read into and used in FME workbenches.

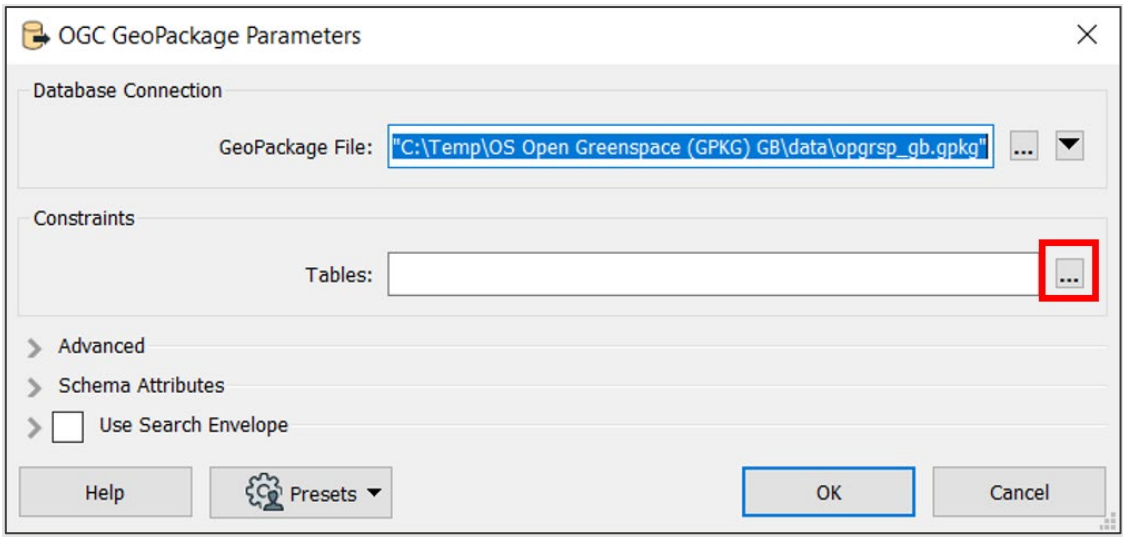
1. Start up FME. In the top ribbon, click the *Add Reader* button, which will look similar to the following image:

2. A dialog box will appear. Here, the format (GeoPackage in this instance) can be specified using the drop-down list. Select the *three dots* button next to Dataset to specify which GeoPackage you want to read. The Coordinate System should also be set appropriately.



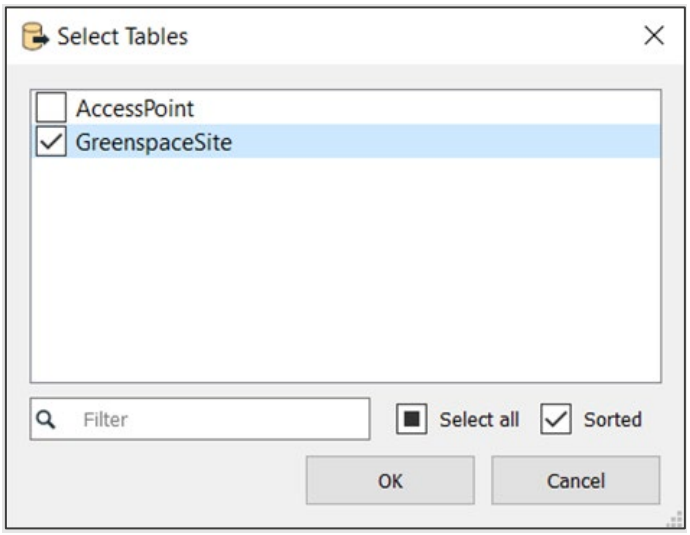
3. Click *Parameters…*

4. Another dialog box will appear. Here, specific layers within the GeoPackage can be selected, rather than importing the entire file. Additionally, the Search Envelope can be used to clip the GeoPackage to an extent.



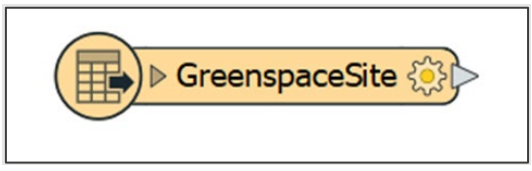
5. Click the *three dots* button next to the Tables drop-down menu.

6. The next dialog box to appear allows for the selection of specific layers. Here, it is possible to select which themes / layers should be added into the workbench.



7. Click *OK*.

8. An orange reader will appear which will display the name of the GeoPackage table that has been 'read in'.



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