ORDNANCE SURVEY GB

# GETTING STARTED WITH VECTOR TILES



#### **Copyright notice**

© Ordnance Survey Limited (2022). All rights reserved.

No part of this work may be reproduced, stored, or transmitted in any form, by electronic means or otherwise, without the written permission of Ordnance Survey Limited.

Disclaimer: Unless otherwise stated, the content in this work is provided for general information only and it is not intended to amount to advice on which the reader should rely. Ordnance Survey therefore disclaims all liability and responsibility arising from any reliance placed on such content. Professional or specialist advice should be obtained before taking, or refraining from, any action on the basis of the content herein.

#### Version history

Version	Date	Description
1.0	09/2021	Initial release.
1.1	09/2022	Amendments to Section 2.1 to remove reference to the QGIS Vector Tiles Reader plugin. New instructions and a note added to Section 2.2 on Cadcorp. Stylesheet sub-sections added to Sections 2 and 3, containing information on styling vector tiles using OS styles.

#### **Contact details**

OS website 'Contact us' page (https://www.ordnancesurvey.co.uk/contact-us).

## Contents

Ι.	Introduction	.4
1.1	What are vector tiles?	. 4
1.2	Key features and benefits of vector tiles	. 4
2.	Installing vector tiles in GIS software	.5
2.1	Installing vector tiles data in QGIS	. 5
2.1.1	Adding stylesheets to OS vector tiles products in QGIS	. 7
2.2	Installing vector tiles data in Cadcorp	. 9
2.2.I	Method I: Drag-and-drop	10
2.2.2	Method 2: Add Overlay	10
2.2.3	Adding stylesheets to OS vector tiles products in Cadcorp SIS Desktop	12
3.	Installing vector tiles in Mapbox	
3.I	Using OS styles to get started in Mapbox Studio	14
4.	Hosting and serving your own vector tiles	16
5.	Using OS styles on vector tiles you have created	17
Anne	x A: Additional resources	I 8

## I. Introduction

This guide explains what vector tiles are, lists the key features and benefits of the format, and details the applications that support vector tiles. Section 2 provides step-by-step instructions on how to install vector tiles data in QGIS and Cadcorp. Section 3 details how to install vector tiles in Mapbox. Section 4 provides information on hosting and serving your own vector tiles, while Section 5 gives step-by-step instructions on using OS styles on vector tiles you have created.

In response to customer feedback on preferred data formats, a growing number of OS products have been made available in vector tile format, including OS Open Zoomstack, OS VectorMap Local, Code-Point with Polygons, Boundary-Line, OS Terrain 50, OS Open Roads and OS MasterMap Greenspace Layer, to name a few. We also have the OS Vector Tile API on the <u>OS Data Hub</u> (<u>https://osdatahub.os.uk/</u>) if you want to connect directly to OS-hosted vector tiles.

### I.I What are vector tiles?

Vector tiles are clipped tiles, or grid squares, composed of layers of vector features which are optimised for caching, scaling, and producing map imagery quickly. They serve in a similar way to raster tiles but have the added functionality of being customisable by users.

A vector tile represents a specific area of the Earth's surface and contains geographic information about the coverage area. Each tile can contain many layers of features, such as buildings, roads, rivers, greenspaces, etc. Vector tiles are packets of geographic data which have been packaged into tiles for transfer over the web. The information they contain can be used to deliver styled vector data and web maps to the end-user.

Note: OS supplies data in the Mapbox Vector Tile Specification, packed in a single MBTiles file (which is based on the SQLite database). This is a Mapbox-specific vector tile format. Other specifications are available; however, this document will reference MBTiles only.

### I.2 Key features and benefits of vector tiles

Vector tiles offer users the following key features and benefits:

- User customisation and styling functionality customise your map with full and dynamic design control.
- Small file size lightweight tiles that are efficient and quick to render in your client application.
- Pixel perfect maps high-resolution, beautiful mapping for all devices (web and mobile devices).
- Snapping ability due to the data being vector, data can be snapped to and traced.
- Smooth zooming and scaling effect a seamless user experience when zooming in and out of maps.
- Advanced features vector tiles contain geographic data (not just images) which can be interrogated and analysed.
- Offline maps store the tiles locally to take your maps offline (for example, on mobile devices).
- Data will be supplied in Web Mercator projection (EPSG:3857).

## 2. Installing vector tiles in GIS software

The following sub-sections provide step-by-step instructions on how to install vector tiles data in QGIS and Cadcorp.

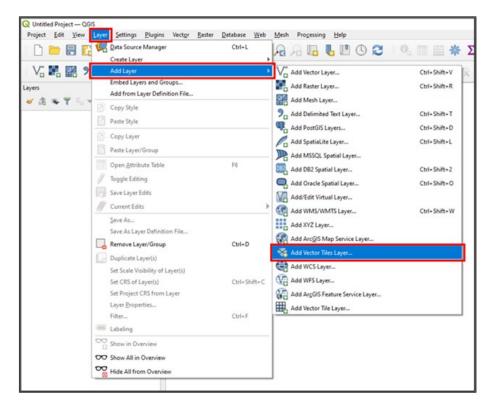
### 2.1 Installing vector tiles data in QGIS

**Requirements:** 

- QGIS (version 3.14 or later)
- Vector tiles

Note: These instructions were created using QGIS version 3.14 – a Long Term Release version.

- 1. Download your vector tiles (MBTiles) and save them in a preferred location.
- 2. Load QGIS Desktop and open a new or an existing project.
- 3. From the top ribbon of the workspace, click Layer > Add Layer > Add Vector Tiles Layer...



es Browse
Description

4. In the Add Layer(s) from a Vector Tile Source dialog box, select the *MBTiles* tab and then click *Browse*.

- 5. In the file explorer, navigate to your saved vector tiles and click Open.
- 6. In the Options section, select the Base map defaults option.
  - a. Note that the Base map defaults option sets the maximum number of loaded tiles as 32. You can decrease or increase this limit as preferred if you select the *Manual* option instead.
  - b. Note that the greater the number of tiles loaded, the greater the resulting impact on performance and the longer the loading times for the data.
- 7. Click Add.

The data will now appear in your Layers Panel and will render in your map window.

8. Click Close to return to the map window.

### 2.1.1 Adding stylesheets to OS vector tiles products in QGIS

Vector tiles can be styled in any way desired. However, if you want to style them with OS styling, stylesheets for vector tiles can be found on <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey</u>) on a product-by-product basis.

To add stylesheets to OS vector tiles products in QGIS, please use the following instructions:

1. Download the appropriate repositories from <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey</u>). The example below shows a screenshot of the GitHub repository containing OS Open Zoomstack stylesheets:

Search or jump to.	Z Pull requests Issues Marketplace	Explore		
GordnanceSurvey / OS-Open-Zoo	omstack-Stylesheets Public			() Watch 15 +
○ Code ⊙ Issues 1 12 Pull request	s 🕕 💿 Actions 🖽 Projects 🔘	Socurity 🗠 Insights		
	P master - P 1 branch S 0 tag	gs	Go to file Add file * Code -	About
	🚳 egil1978 Update railway_stations.qml		D Clone ()	Cartographic Stylesheets for OS Open Zoomstack
	Colour Values	upload stylesheets	HTTPS SSH GitHub CLI	map stylesheets zoomstack
	GeoPackage	Update railway_stations.qml	https://github.com/OrdnanceSurvey/OS-Open-	C Readme
	Vector Tiles	Merge branch 'master' of github.c	Use Git or checkout with SVN using the web URL	4∯a View license ☆ 40 stars
	gitignore	Add composer-json and package js	😭 Open with GitHub Desktop	<ul> <li>40 stars</li> <li>15 watching</li> </ul>
	D UCENSE.txt	Add OGL v3 license text		¥ 42 forks
	README.md	upload styleshoets	Open with Visual Studio	
	🗋 compaser,isan	Add composer, json and package,	Download ZIP	Releases
	D package.json	Add composer.json and package.js	on to allow composer and npm installs 5 years ago	No releases published
	README.md			Packages
	OS Open Zooms	tack Stylesheets		No packages published
	This repository contains styleshee	ts for OS Open Zoomstack		Contributors 6
	Select the directory that matches	the format of your data or choose	Colour Values	O 🗊 🔁 🖗 🕲 🗊

- 2. Store the downloaded repository in a sensible folder location.
- 3. Navigate to your QGIS project with the vector tile data loaded. Double-click on your vector tile layer and navigate to the Symbology tab on the left-hand ribbon of the Layer Properties dialog box.

4. In the bottom left of the Layer Properties dialog box, select Style > Load Style...

Cardina Propert - Card			- 0. A.
Fejert (Mt Ver Leve Delings Degre Verigt Seter Endows (Ed Ebek Property (Dep			
0 = 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	μ 🖞 🕲 😂 🔍 🐘 🛄 🎆 Σ 🛲 • 🗭 🔍	+ (X) +	
●●VIA● 図(人)時信友・単数べき目もさ		A 4 A 10 10 (Res).	<mark>0</mark> - <mark>1</mark> ,
「「副島・福島県総営営務の通信書業業をまで	- 3 K 10 1 1 1 1 X & X	N = 34	
HR Q.			
Econaria D.H. (Construction Internet Medican Internet 1992) MC and 1992 2790		Dia 200 0*	Assessing Ration ID M
GCTTO A		tean Jose Or	1 1 0 B 0 1
	Core Faceratada - Symitecholy	×	1 de teart
> C Citericeked/odures	Lated Layer Min. Zoare Man	Jam Her	1 (1) Recently and
* 📳 Igeld Budrach	V Polygers (of level)	(no 5/bel)	P Q Cetepishy
These Revenues	🖌 — Lites (effigues)	(no filter)	+ Q Database
> Liter facebracks	V O Foins tell level	(no fitw)	F Q Fire book
> (2) Human			b Q bdepolding
+ D to		1.00	+ Q Layer teach
			+ Q Meda
Sould Excitent Verige DE		10	<ul> <li>P Q Network analysis.</li> </ul>
Aloc Al Alas		the second se	+ Q Pers
New AGene		10 P.	Fight analysis
			Fig. Ranker constant.
Tal Terrets		- 2	<ul> <li>Q Parker tennis analysis</li> </ul>
Evelant Content			Q Rade tools
Passes		1.0	P Q Vector analysis
Transferen			P Q Vector continue
			Q Vector general
- VEP 20248		N 9	<ul> <li>Q Vector geometry</li> </ul>
			Q Vector overlay     Q Vector selection
Layers D.H.		s 0	<ul> <li>Q Vetertable</li> <li>Q Vetertable</li> </ul>
FARTL-ROD AND			Q Vecenter     Q Vecenter
V 📕 03. Spon. Zomotack	Land Style		> 1 CO4
	Save Style_		+ @ CRASS
	Serve as Default.		+ d Hagi
	Restary Default		+ GE SAGA
	F40_		
	Resarce Current-	Constant & Makesheats	
ALCOLUMN TO MARKED	• Mad		
	294 * (H	Carol Kosly His 10	
1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	A DESCRIPTION OF A DESC		
	Lister Build Ad Dig	A CANAL & RASSING	
AND THE REAL PROPERTY OF	A STATE OF A	a search of the France	
	A DECEMBER OF	and the second second	
Q. 7 per la made (Derro) Updated legit dels montes		Coordinate 384403.257525 🏶 Scale (225099) *	A Proprier 107% C Roston 10* C V Annier @ 05002778 Q
		and a more than the state of the second	a contract of the second

- 5. In the Database Styles Manager dialog box, select From File as your Load style option.
- 6. For the File option, you will need to navigate to the folder where you stored the downloaded stylesheet repository. The vector tiles stylesheet will be found in *Vector Tiles > Mapbox GL Styles*, and the file type will be .json.

ΩDatab	ase Styles Manager			>
Load style	From File			٣
File	eets-master/Vector Tiles/Mapbox Gl	Styles\OS Open	Zoomstack - Light.json   🗉	
	V 🧭 Symbology			
	V (abc Labels			
Categories				
		Load Style	Cancel H	elp

7. Click Load Style to load the style.

A styled vector tile dataset will now be visible in the project.

### 2.2 Installing vector tiles data in Cadcorp

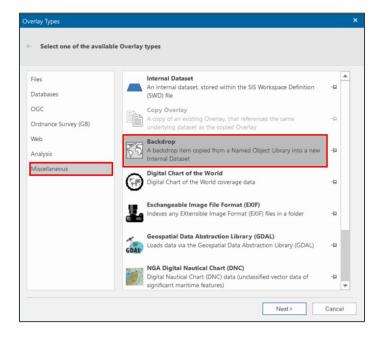
Requirements:

- Cadcorp SIS Desktop (version 9)
- Vector tiles

Note: As OS vector tiles are only available in Web Mercator projection, you will need to undertake a few extra steps to be able to use them within Cadcorp. Additionally, the tiles will not be reprojected into British National Grid (BNG), so the tiles may create some gaps within the data.

The following instructions outline how to change the projection of your basemap from British National Grid (EPSG:27700) to WGS 84 (EPSG:4326) in Cadcorp:

- 1. Open Cadcorp SIS Desktop (version 9) and navigate to Add Overlay in the upper ribbon.
- 2. In the Overlay Types dialog box, select *Miscellaneous* > *Backdrop*, then click *Next*.



- 3. Expand WGS 84 and select WGS 84 Lat/Long.
- 4. Click Finish.

A basemap projected in WGS 84 will appear in the map screen. It is now possible to follow either method I or method 2 on the following pages to add vector tiles to a Cadcorp project.

The following sub-sections outline two methods for installing vector tiles in Cadcorp.

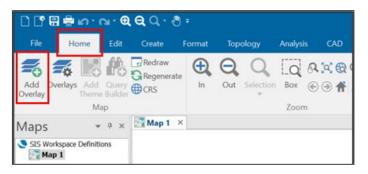
#### 2.2.1 Method I: Drag-and-drop

- I. Download the vector tiles (MBTiles) and save them in a preferred location.
- 2. Start Cadcorp SIS Desktop and open a new or an existing map window.
- 3. Navigate to your saved vector tiles in file explorer and drag-and-drop the file into the map window.

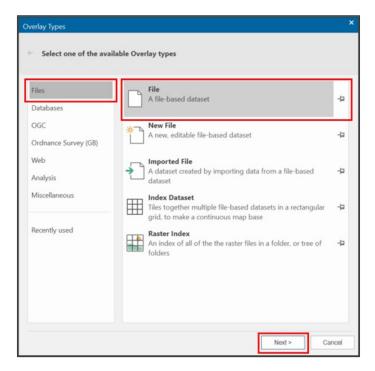
The data will appear in your Maps Control Bar and render in your map window.

### 2.2.2 Method 2: Add Overlay

- I. Download the vector tiles (MBTiles) and save them in a preferred location.
- 2. Start Cadcorp SIS Desktop and open a new or an existing map window.
- 3. In the upper ribbon, navigate to the Home tab and click Add Overlay.



4. In the Overlay Types dialog box, select Files > File as the Overlay type, then click Next.



5. In the File Browser dialog box, navigate to and select your saved vector tiles, then click Finish.

File Browser Browse for one ← dataset loads	or more data	set files	to add. Press th	e Configure.	button to con	trol how each
📜 « This PC 🕨			•	Documents	<ul> <li>GSG with Vect</li> </ul>	or Tiles 🕨
New Folder						ii v
Name		Size	Туре	Modified		
OS_Open_Greens	ace_GB 8	8,819 KB	MBTILES File	18/03/2021	10:32:14	
File name: OS_Open_0	Greenspace_G8	3.mbtiles		Al	known formats	• Configure
					Finish	Cancel

The data will now appear in your Maps Control Bar and render in your map window.

### 2.2.3 Adding stylesheets to OS vector tiles products in Cadcorp SIS Desktop

Vector tiles can be styled in any way desired. However, if you want to style them with OS styling, stylesheets for vector tiles can be found on <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey</u>) on a product-by-product basis.

Note: OS Open Zoomstack stylesheets can be automatically applied when adding this product into CadCorp SIS Desktop. While vector tile stylesheets do exist for OS VectorMap Local, they cannot currently be applied in Cadcorp SIS Desktop.

To add stylesheets to OS vector tiles products in Cadcorp SIS Desktop, please use the following instructions:

1. Download the appropriate repositories from <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey</u>). The example screenshot below shows a screenshot of the GitHub repository containing OS Open Zoomstack stylesheets.

Code O Issues 1 In Pull requ		🛈 Security 🖂 Insights		© Watch B
	P master - P 1 branch C	0 tags	Go to file Add file *	Code - About
	🚱 egilti 978 Update railway, stations.qml 📟		E Clone	Cartographic Stylesheets for OS Open     Zoomstack
	Colour Values	upload stylesheets	HTTPS SSH GitHub CLI	map stylesheets zoomstack
	GeoPackage	Update railway_stations.qml	https://github.com/OrdnanceSurvey/OS-Open-	CP (C) Readme
	Vector Tiles	Merge branch 'master' of github.or	Use Git or checkout with SVN using the web URL	A View license
	D gitignore	Add composer ison and package is	Dpen with GitHub Desktop	<ul> <li>☆ 40 stars</li> <li>◆ 15 watching</li> </ul>
		Add OGL v3 license text		¥ 42 fories
	README.md	upload stylesheets	Open with Visual Studio	
	🗅 composer,ison	Add composer, ison and package j	Download ZIP	Releases
	packagejson	Add composer ison and package is	on to allow composer and ripm installs 5 yea	As ago No releases published
	README.md			Packages
	OS Open Zoo	mstack Stylesheets		No peckages published
	This repository contains style	sheets for OS Open Zoomstack		Contributors 6
	Colorit the disease what make	ches the format of your data or choose (	alous Making	Ø T @ @ @ D

- 2. Add the stylesheets file to the folder where the MBTiles are also stored and rename the stylesheets file so that it has the same name as the MBTiles file.
- 3. Add the following file extension to the end of the newly named stylesheets file: .style.json



4. Drag and drop the style.json file into your Cadcorp SIS Desktop project.

The styling will now be applied to your layer.

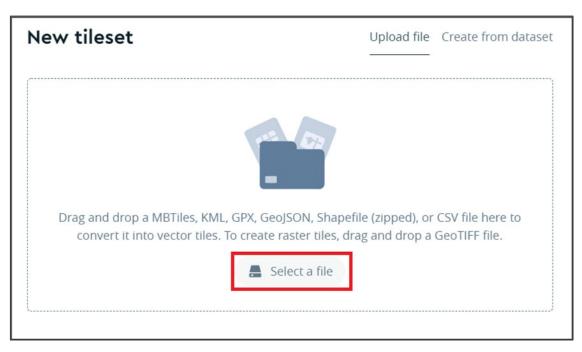
## 3. Installing vector tiles in Mapbox

**Requirements:** 

- A Mapbox account
- Vector tiles
- I. Download your vector tiles (MBTiles) and save them in a preferred location.
- 2. Navigate to Mapbox Studio (https://www.mapbox.com/mapbox-studio/) and login to your account.
- The vector tiles can be uploaded in the <u>Tilesets section of Studio (https://studio.mapbox.com/tilesets/</u>). In the Tilesets page, click New tileset.

🕑 mapbox   Studio	
Tilesets	New tileset
<b>Q</b> Search	7 of 7 tilesets

4. In the New tileset pop-up, click Select a file and navigate to the saved location of your MBTiles.



The upload will begin, and a notification will appear once it is complete.

Note: There is an upload limit within Mapbox Studio of 300mb per upload and 20 uploads per month.

### 3.1 Using OS styles to get started in Mapbox Studio

OS has supplied Mapbox GL Styles created by our cartographic designers for use in Mapbox Studio on <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey</u>). These stylesheets allow you to add colours to features contained in the vector tiles to produce a far more vivid and visually appealing map.

The following step-by-step instructions will guide you through setting up Mapbox GL Styles in Mapbox Studio:

1. Download the appropriate repositories from <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey</u>). The example screenshot below shows a screenshot of the GitHub repository containing OS Open Zoomstack stylesheets. This downloaded repository should be stored in an appropriate location.

Search or jump to	/ Pull requests Issues Marketplace	Explore		
G OrdnanceSurvey / OS-Open-Zoo	omstack-Stylesheets (Public)			③ Watch 15 +
↔ Code	s 🕕 💿 Actions 🖽 Projects 🔘	Security 🗠 Insights		
	P master - P 1 branch S 0 to	05	Go to file Add file • Code •	About
	🚱 egil1978 Update railway_stations.q	ni uk	D Clone ()	Cartographic Stylesheets for OS Open Zoomstack
	Colour Values	upload stylesheets	HTTPS SSH GeHub CLI	map stylesheets zoomstack
	GeoPackage	Update railway_stations.qml	https://github.com/OrdnanceSurvey/OS-Open-	E Readme
	Vector Tiles	Merge branch 'master' of github.o	Use Git or checkout with SVN using the web URL	<ul> <li>♣ View license</li> <li>☆ 40 stars</li> </ul>
	🗅 -gitignore	Add composer ison and package it	Dpen with GitHub Desktop	<ul> <li>15 watching</li> </ul>
	D UCENSE.txt	Add OGI, v3 license text		¥ 42 forks
	README.md	upload stylesheets	Open with Visual Studio	
	🗋 compaser,isan	Add composer json and package j	Download ZIP	Releases
	D package_ison	Add composer, son and package, is	on to allow composer and npm installs s years ago	No releases published
	README.md			Packages
	OS Open Zooms	stack Stylesheets		No packages published
	This repository contains styleshe	ets for OS Open Zoomstack		Contributors 6
	Select the directory that matches	the format of your data or choose	Colour Values	😳 🟗 🔁 🕲 🕲 🧶

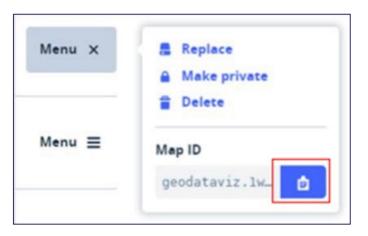
- 2. Navigate to Mapbox Studio to complete the next set of instructions.
- 3. Copy the Map ID for your new tileset by doing the following:
  - a. In Mapbox Studio, click on the *Tilesets* tab in the top right corner.



b. Scroll down until you see your new tileset and click the Menu button.



c. Click on the *clipboard icon* to copy the Map ID.



- 4. Open the folder of stylesheets that you downloaded in step I and navigate to Vector Tiles > Mapbox GL Styles, where you will find four styles (Road, Outdoor, Light, and Night).
- 5. Choose the style that you want to use, then open the .json file (for example, Outdoor.json) in a text editor.
- 6. Find the following block of code near the top of the file (line 46) and paste your Map ID where it says ADD-SOURCEURL-HERE:

```
"sources": {
    "composite": {
        "url": "mapbox://ADD-SOURCE-URL-HERE",
        "type": "vector"
    }
},
```

- 7. Save the .json file.
- 8. Go back to Mapbox Studio and click the Styles tab.



- 9. Click the Upload button.
- 10. Navigate to your newly saved style.json file and click Open.

The style will then load up in the Mapbox Studio style editor.

From this point on, you can customise the content and style of your map (for example, you can turn layers on or off, delete layers from your map, add new layers, and change any of the style elements).

11. Once you are happy with your map, click *Publish* in the top right corner and your map is ready to use.

## 4. Hosting and serving your own vector tiles

There are a couple of benefits associated with hosting and serving your own vector tiles:

- There are no thresholds when uploading your own data to create the tiles.
- You do not need external connectivity to use the tiles as the hosting can be done locally (i.e. you can work offline with the vector tiles).

There are numerous options if you want to host and serve your own vector tiles. The following GitHub repositories have comprehensive lists of the available options for vector tiles and those available specifically for MBTiles:

- <u>GitHub repository listing choices available for hosting and serving your own vector tiles</u> (<u>https://github.com/mapbox/awesome-vector-tiles/blob/master/README.md</u>).
- <u>GitHub repository listing choices available for hosting and serving your own MBTiles</u> (<u>https://github.com/mapbox/mbtiles-spec/wiki/Implementations</u>).

If you want to export an MBTiles file to a directory of files, you can use open-source tools such as <u>Tippecanoe (https://github.com/mapbox/tippecanoe/)</u> or <u>MBUtil (https://github.com/mapbox/mbutil)</u>.

## 5. Using OS styles on vector tiles you have created

It is possible to use OS styles on vector tiles you have created. The following step-by-step instructions outline how to do this:

- 1. Download and unzip the appropriate OS product folder of stylesheets from <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey</u>), for example, <u>OS's OS-Open-Zoomstack-Stylesheets repository</u> on <u>GitHub</u> (<u>https://github.com/OrdnanceSurvey/OS-Open-Zoomstack-Stylesheets</u>).
- 2. Once you have downloaded and unzipped the folder of stylesheets, navigate to Vector Tiles > Mapbox GL Styles.
- 3. If appropriate, choose the style you want to use and open the .json file (for example, OS Outdoor.json) in a text editor.
- 4. Find the following piece of code near the top of the file and enter your data source URL where it says ADD-SOURCE-URL-HERE:

```
"sources": {
    "composite": {
        "url": "mapbox://ADD-SOURCE-URL-HERE",
        "type": "vector"
    }
},
```

Note: You can find <u>more information on the different source types</u> on Mapbox's documentation site (<u>https://docs.mapbox.com/mapbox-gl-js/style-spec/sources/</u>).

5. Save the .json file.

The style is now ready to use. You can customise the style if you want to (for example, you could adapt the style of a map to match your own brand colours). <u>Maputnik (https://maputnik.github.io/</u>) is a good open-source map editor tool for creating and customising vector tile styles.

## Annex A: Additional resources

Stylesheets for OS products are available on our GitHub pages (https://github.com/OrdnanceSurvey).

#### The following OS blog posts contain useful information about vector tiles:

- OS blog post: The benefits of vector tiles (https://www.ordnancesurvey.co.uk/newsroom/blog/thebenefits-of-vector-tiles)
- OS blog post: Creating your own vector tiles
   (https://www.ordnancesurvey.co.uk/newsroom/blog/creating-your-own-vector-tiles)
- OS blog post: An interactive house prices map with OS data (https://www.ordnancesurvey.co.uk/newsroom/blog/house-prices-map-os-data)