

In May 2017, I wrote a White Paper which started to explore using the **Ogr2Ogr** Command Line tool (within **GDAL**) to undertake attribute, geographic queries and some geoprocessing routines using flat GIS file formats such as ESRI Shapefiles. That paper can be accessed via this link:

<https://www.cadlinecommunity.co.uk/hc/en-us/articles/115003496349-Utilising-Ogr2Ogr-Part-One>

In this second paper, I will start to explore more advanced spatial processing options and also how to use Ogr2Ogr tools in conjunction with your **PostGIS database**.

The data used within this White paper is freely available from the Ordnance Survey and is used within all our DynamicMaps Open Source GIS training courses: <http://www.dynamicmaps.co.uk/training/>

- Introduction to QGIS - <http://www.dynamicmaps.co.uk/introduction-to-qgis-desktop-gis/>
- Introduction to GeoServer - <http://www.dynamicmaps.co.uk/introduction-to-geoserver/>
- Integrated Open Source GIS - <http://www.dynamicmaps.co.uk/open-source-gis-integration/>

This White Paper has been compiled using several online examples from the following resources:

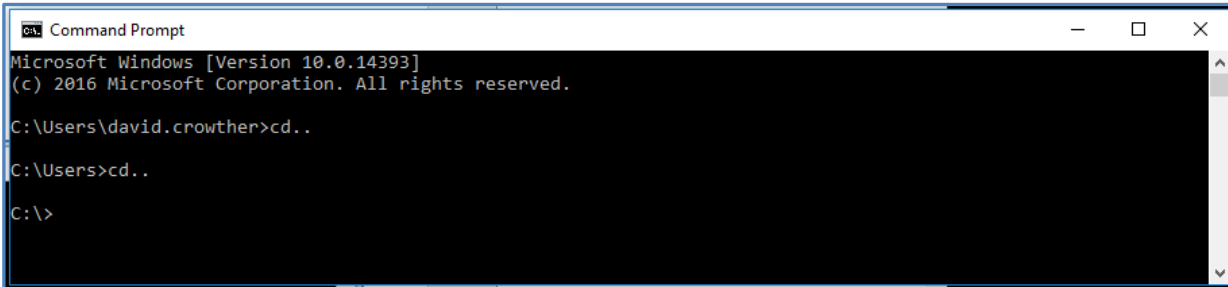
- GIS Stack Exchange
- <http://www.postgresonline.com/journal/archives/31-GDAL-OGR2OGR-for-Data-Loading.html>
- <https://github.com/dwtkns/gdal-cheat-sheet>

To access the Ogr2Ogr command tools, you need to navigate to the location where GDAL has been installed. In my case, I have used the installer provided by the OSGeo project which contains the GDAL tools:

https://live.osgeo.org/en/win_installers.html

and my installation is located at: **C:\OSGeo4W64\bin**

Using the command `cd..` (change directory) navigate to the root of your local drive, for example `C:\`



```

Command Prompt
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\David.Crowther>cd..

C:\Users>cd..

C:\>
  
```

1 – Create an Index on an ESRI Shapefile

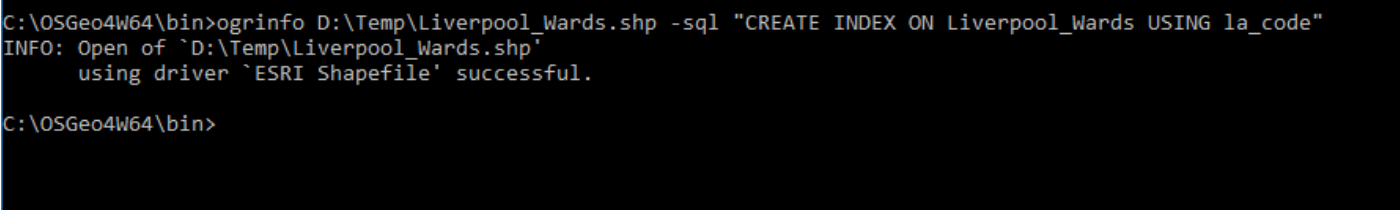
Using the Ogrinfo options we can create an index on any field within a GIS file, such as a Shapefile. Indexes will increase the performance of your files, specifically when undertaking queries and updating columns.

Command:

```
ogrinfo example.shp -sql "CREATE INDEX ON example USING fieldname"
```

Example:

```
ogrinfo D:\Temp\Liverpool_Wards.shp -sql "CREATE INDEX ON Liverpool_Wards USING la_code"
```



```

C:\OSGeo4W64\bin>ogrinfo D:\Temp\Liverpool_Wards.shp -sql "CREATE INDEX ON Liverpool_Wards USING la_code"
INFO: Open of `D:\Temp\Liverpool_Wards.shp'
      using driver `ESRI Shapefile' successful.

C:\OSGeo4W64\bin>
  
```

The result will state that the index was successfully created.

2 – DISSOLVE features in an ESRI Shapefile

Using the Ogr2Ogr tools we can undertake several geoprocessing tasks on GIS files. In this example we will dissolve the boundaries between polygons with a unique value in common.

Command:

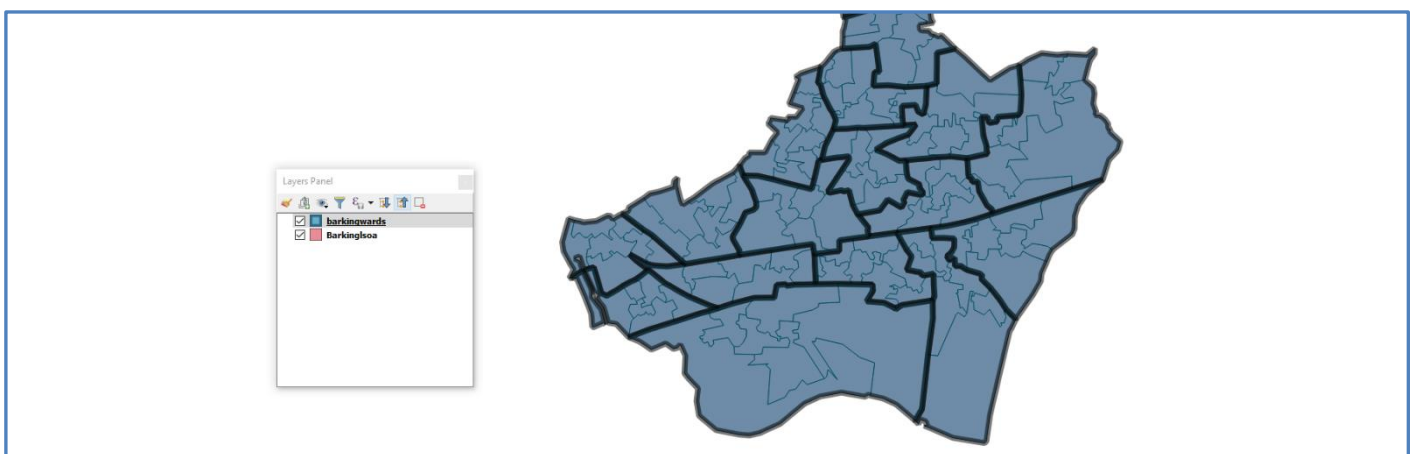
```
ogr2ogr -f "ESRI Shapefile" InputShapefileLocation\Name.shp OutputShapefileLocation\Name.shp -dialect
sqlite -sql "select ST_union(Geometry),fieldname from inputshapefile GROUP BY fieldname"
```

Example:

```
ogr2ogr -f "ESRI Shapefile" D:\Temp\barkingwards.shp D:\Temp\Barkinglsoa.shp -dialect sqlite -sql "select
ST_union(Geometry),STWARD_NAM from barkinglsoa GROUP BY STWARD_NAM"
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "ESRI Shapefile" D:\Temp\barkingwards.shp D:\Temp\Barkinglsoa.shp -dialect sqlite -sql
"select ST_union(Geometry),STWARD_NAM from barkinglsoa GROUP BY STWARD_NAM"
C:\OSGeo4W64\bin>
```

The result will be a new shapefile called barkingwards, and the LSOA polygons will have been dissolved using the Ward Name field (STWARD_NAM) to generate ward polygons.



Using the Ogr2Ogr tools we will now explore working with **PostGIS**, looking at options to; list tables, extract data, append datasets, import new tables and edit the schema of existing database tables.

To access your PostGIS database via Ogr2Ogr the most important thing is to correctly specify the database connection parameters to your PostGIS Instance. Below is an example of the ogr2ogr syntax for connecting to PostGIS.

```
PG:"host=servername port=5432 user='username' password='password' dbname='PGDatabaseName'"
```

3 – Connect to PostGIS and List Tables

Ogr2Ogr provides the capability to very quickly list the spatial tables within your PostGIS database.

Command:

```
ogrinfo PG:"host=172.17.2.176 port=5432 user='user' password='password' dbname='dbname'"
```

Example:

```
ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'"
```

The result will be a list of the tables within the specified PostGIS database.

```
C:\OSGeo4W64\bin>ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'"
INFO: Open of `PG:host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'`
      using driver `PostgreSQL` successful.
1: lsoa_extra (Multi Polygon)
2: b_roads (Multi Line String)
3: mways (Multi Line String)
4: Leicester_ITN (Multi Line String)
5: 1_lsoa_select (Polygon)
6: land_parcel (Multi Line String)
7: postgisshrewapps (Polygon)
8: shrew4326 (Polygon)
9: shrewbng (Polygon)
10: papps4326 (Polygon)
11: apps4326 (Polygon)
12: planningapps27700 (Polygon)
13: hospitals (Point)
14: topographicarea (Polygon)
```

4 – Extract data from PostGIS to a GeoJSON file

Ogr2Ogr allows you to extract/export spatial database tables from PostGIS to many GIS file formats. Using the syntax below you can extract a PostGIS table to a GeoJSON file.

Command:

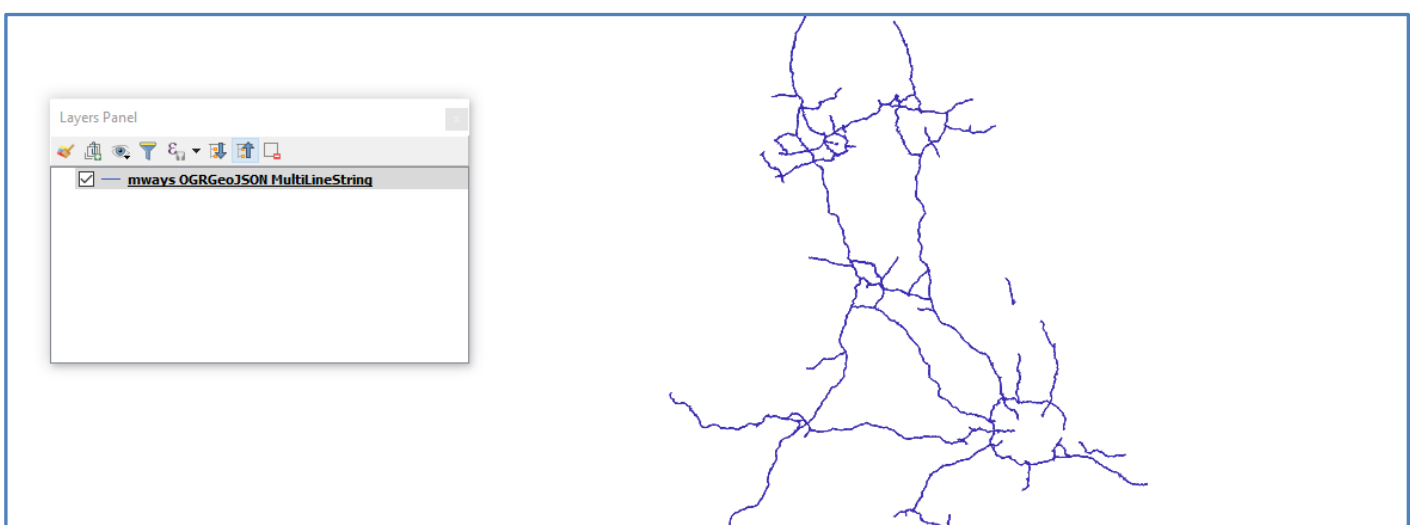
```
ogr2ogr -f "GeoJSON" outputlocation\outputfile.geojson PG:"host=server port=5432 user='username' password='password' dbname='PostgisDBName'" -sql "SELECT * from PGtablename"
```

Example:

```
ogr2ogr -f "GeoJSON" D:\Temp\mways.geojson PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "GeoJSON" D:\Temp\mways.geojson PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
C:\OSGeo4W64\bin>
```

The result will be a new GeoJSON file of Motorways.



5 – Extract data from PostGIS to an ESRI Shapefile

Ogr2Ogr allows you to extract/export spatial database tables from PostGIS to many GIS file formats. Using the syntax below you can extract a PostGIS table to an ESRI Shapefile.

Command:

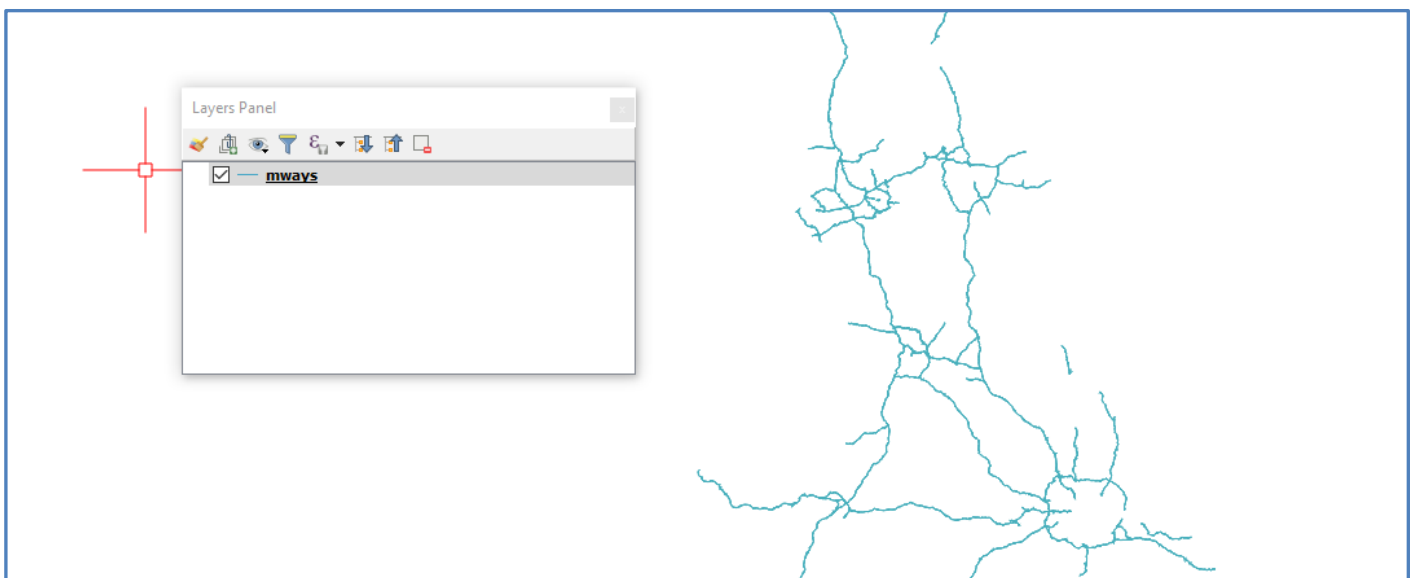
```
ogr2ogr -f "ESRI Shapefile" outputlocation\outputfile.shp PG:"host=server port=5432 user='username' password='password' dbname='PostgisDBName'" -sql "SELECT * from PGtablename"
```

Example:

```
ogr2ogr -f "ESRI Shapefile" D:\Temp\mways.shp PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "ESRI Shapefile" D:\Temp\mways.shp PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
C:\OSGeo4W64\bin>
```

The result will be a new ESRI Shapefile file of Motorways.



6 – Extract data from PostGIS to an ESRI Shapefile and Re-project to 4326

Using the syntax below you can extract a PostGIS table to an ESRI Shapefile and reproject the extracted data to another projection.

Command:

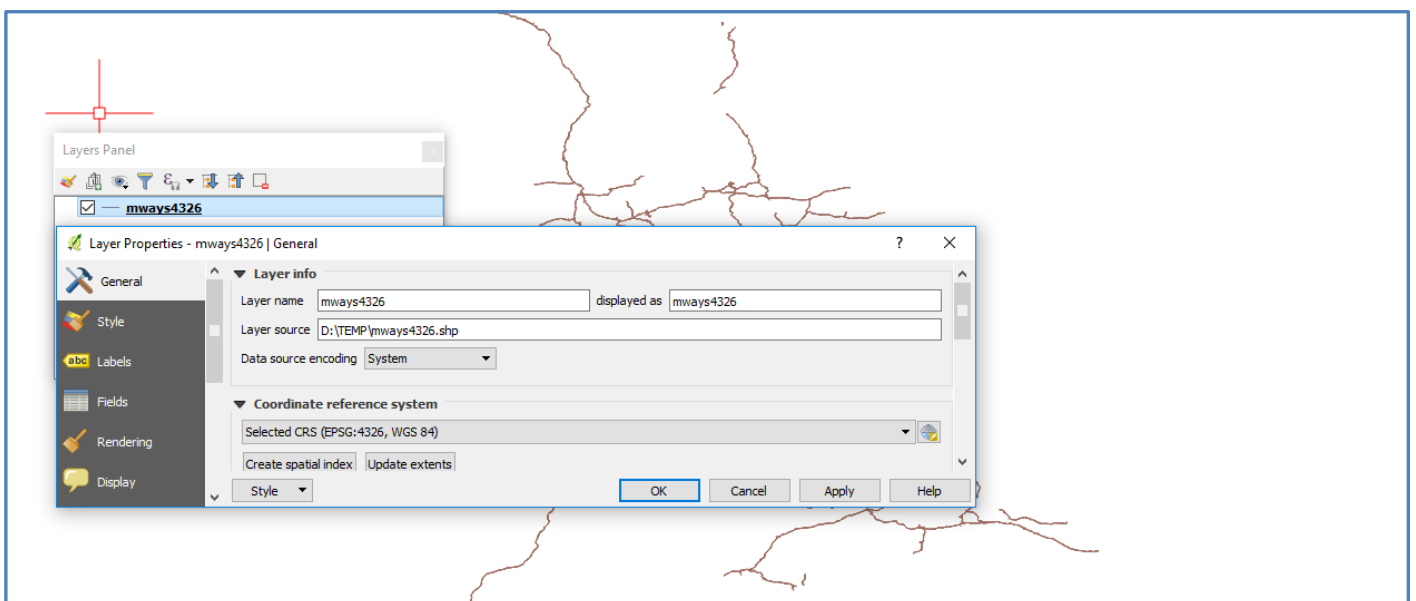
```
ogr2ogr -f "ESRI Shapefile" outputlocation\outputfile.shp -t_srs "EPSG:4326" PG:"host=server port=5432 user='username' password='password' dbname='PostgisDBName'" -sql "SELECT * from PGtablename"
```

Example:

```
ogr2ogr -f "ESRI Shapefile" D:\Temp\mways4326.shp -t_srs "EPSG:4326" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "ESRI Shapefile" D:\Temp\mways4326.shp -t_srs "EPSG:4326" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
C:\OSGeo4W64\bin>
```

The result will be a new ESRI Shapefile file of Motorways now projected to 4326.



7 – Extract data from PostGIS to an ESRI Shapefile – Selecting Specific Fields

Using the syntax below you can extract a PostGIS table to an ESRI Shapefile and choose only to export specific fields. Here when we export the Mways table we will only export the 'number' field.

Command:

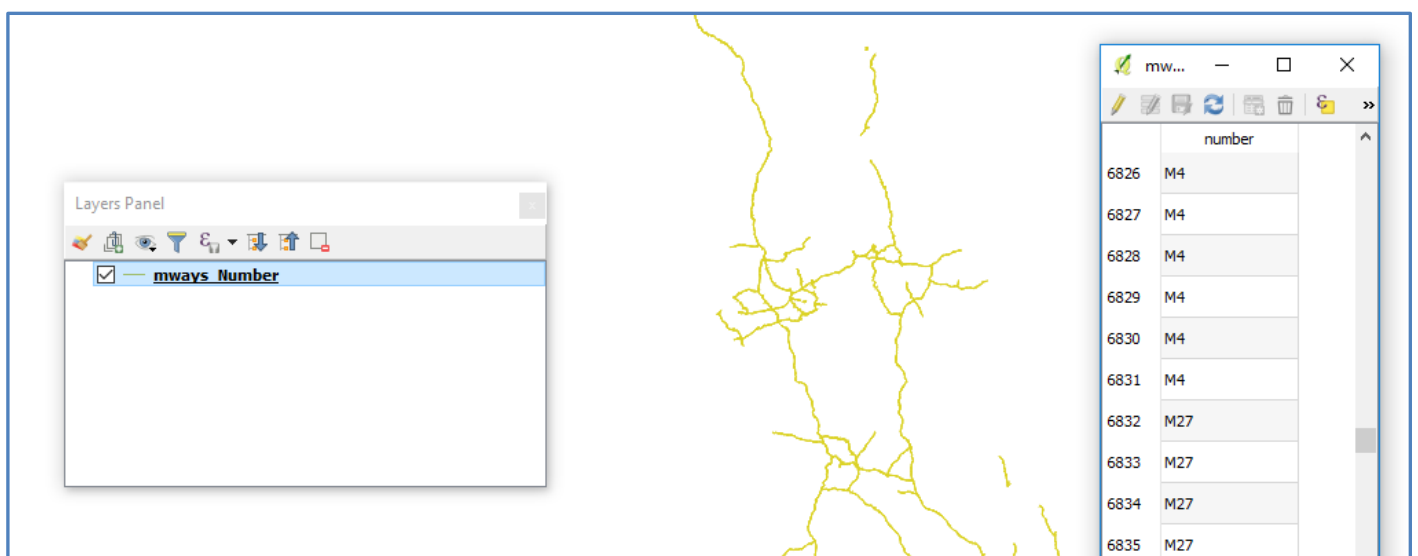
```
ogr2ogr -f "ESRI Shapefile" outputlocation\outputfile.shp -select "fieldname" PG:"host=server port=5432 user='username' password='password' dbname='PostgisDBName'" -sql "SELECT * from PGtablename"
```

Example:

```
ogr2ogr -f "ESRI Shapefile" D:\Temp\mways_Number.shp -select "number" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "ESRI Shapefile" D:\Temp\mways_Number.shp -select "number" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways"
C:\OSGeo4W64\bin>
```

The result will be a new ESRI Shapefile file of Motorways with only the 'Number' field exported.



8 – Extract data from PostGIS to an ESRI Shapefile – Selecting Specific Records

Using the syntax below you can extract a PostGIS table to an ESRI Shapefile and using SQL you can choose to export specific records. Here when we export the Mways table we will export just the 'M90'.

Command:

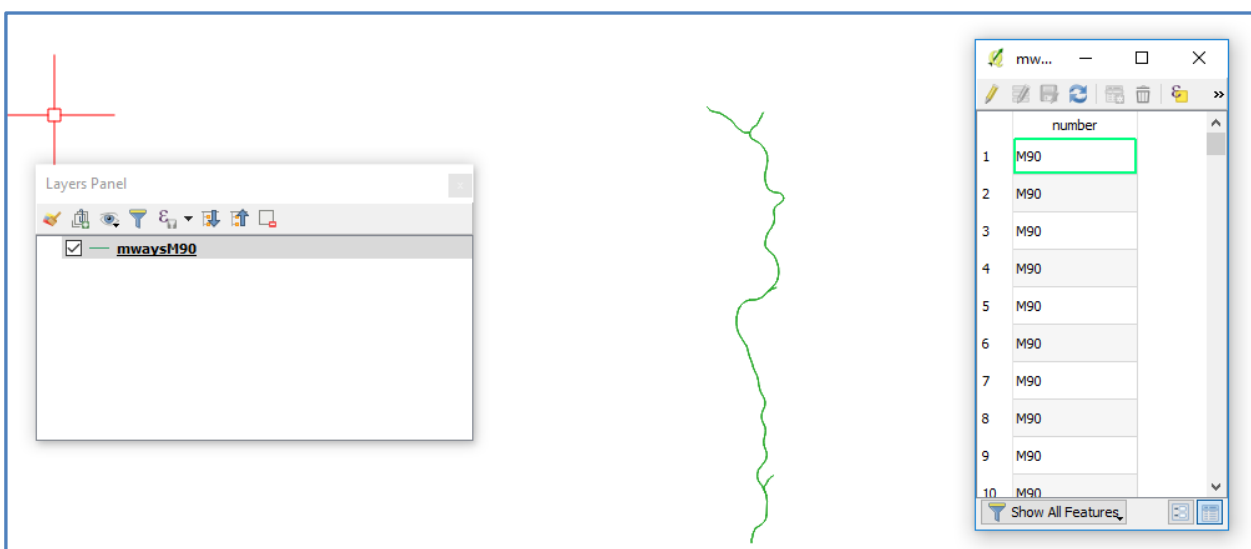
```
ogr2ogr -f "ESRI Shapefile" outputlocation\outputfile.shp -select "fieldname" PG:"host=server port=5432 user='username' password='password' dbname='PostgisDBName'" -sql "SELECT * from PGtablename" where fieldname = 'value'
```

Example:

```
ogr2ogr -f "ESRI Shapefile" D:\Temp\mwaysM90.shp -select "number" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways where number = 'M90'
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "ESRI Shapefile" D:\Temp\mwaysM90.shp -select "number" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql "SELECT * from mways where number = 'M90'
C:\OSGeo4W64\bin>
```

The result will be a new ESRI Shapefile file of Motorways with only the records where 'Number' value = 'M90'.



9 – Append Records to an existing PostGIS Table – Point Data

Using the syntax below you can upload and append the records from one GIS file into an existing table in your PostGIS database. Here we will append School Point objects to a PostGIS table.

Command:

```
ogr2ogr -append -f "PostgreSQL" PG:"dbname=db" shapefile.shp -nln mytable
```

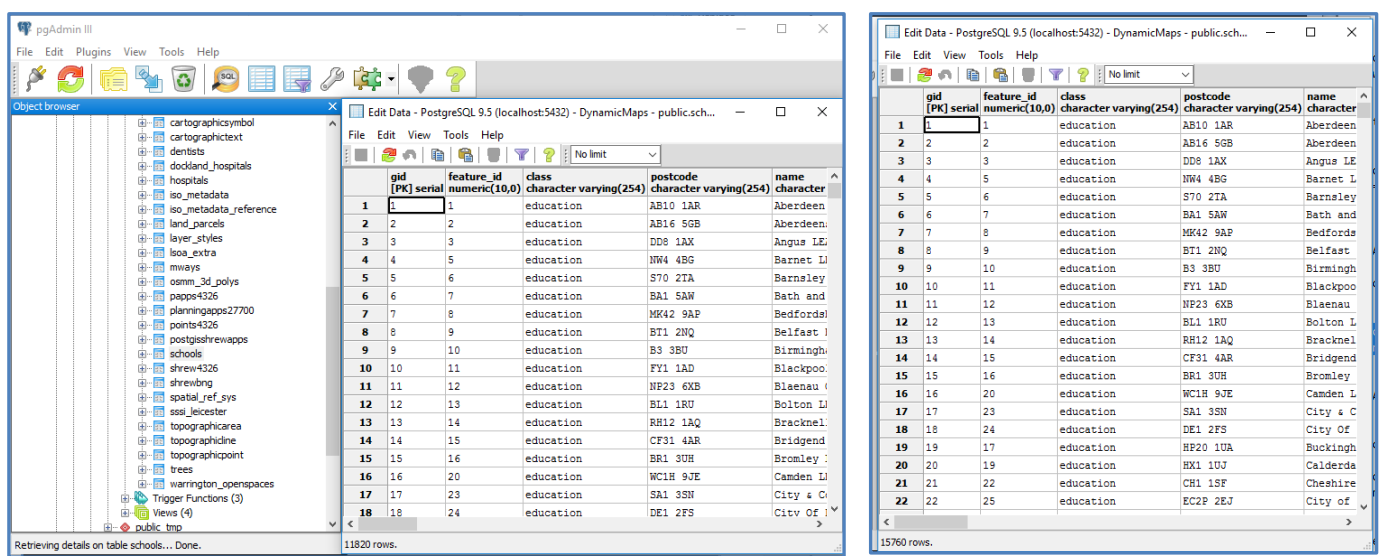
Example:

```
ogr2ogr -append -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\schools.shp -nln schools
```

```
C:\OSGeo4W64\bin>ogr2ogr -append -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\schools.shp -nln schools

C:\OSGeo4W64\bin>
```

The result will append the records from the Schools Shapefile into the existing records in the Schools PostGIS table. Using PGAdmin we can see how the 3940 records from the Schools Shapefile have now been appended to the existing 11820 records, to create a new record count of **15760**.



10 – Append Records to an existing PostGIS Table – Line Data

Using the syntax below you can upload and append the records from one GIS file into an existing table in your PostGIS database. Here we will append motorway line objects to a PostGIS table.

Command:

```
ogr2ogr -append -f "PostgreSQL" PG:"dbname=db" shapefile.shp -nln mytable
```

Example:

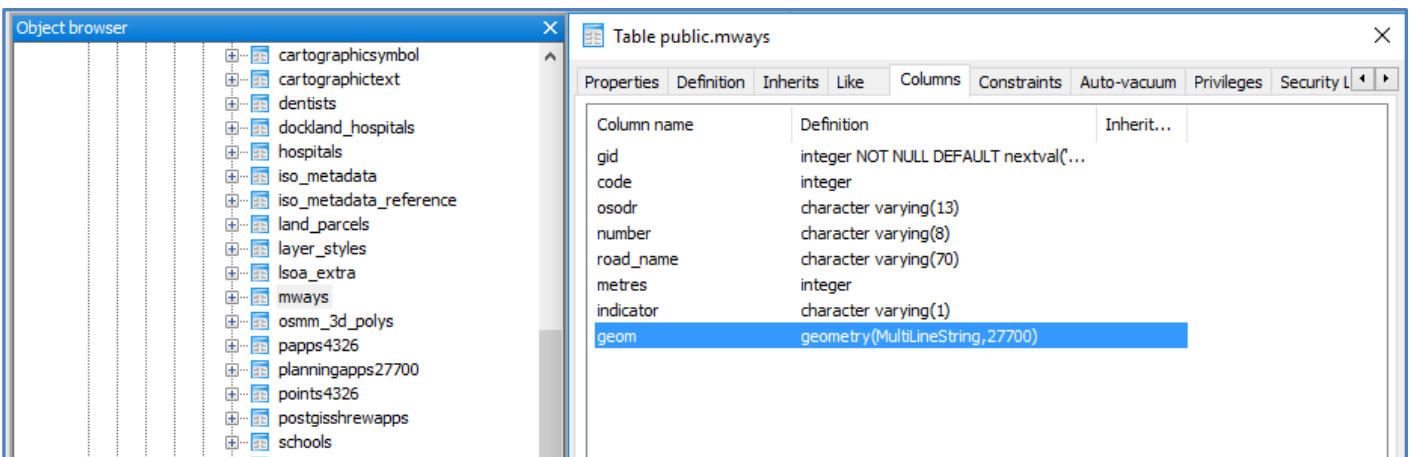
```
ogr2ogr -append -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\mways.shp -nln mways
```

```
C:\OSGeo4W64\bin>ogr2ogr -append -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\mways.shp -nln mways
Warning 1: Geometry to be inserted is of type Line String, whereas the layer geometry type is Multi Line String.
Insertion is likely to fail
ERROR 1: ERROR: Geometry type (LineString) does not match column type (MultiLineString)

ERROR 1: INSERT command for new feature failed.
ERROR: Geometry type (LineString) does not match column type (MultiLineString)

Command: INSERT INTO "mways" ("geom", "code", "osodr", "number", "metres") VALUES ('0102000020346C00000200000000000000000030E31241000000009E0A264100000000C0EB124100000000D0072641':GEOMETRY, 3000, '013U7WC504CAV', 'M90', 655) RETURNING "gid"
ERROR 1: Unable to write feature 0 from layer mways.
ERROR 1: Terminating translation prematurely after failed translation of layer mways (use -skipfailures to skip errors)
```

If however, there is a mismatch between the input files geometry format and the PostGIS database geometry format an error will be returned. In this instance the Shapefile contains **LineString** objects and the PostGIS database table has **MultiLineString** geometry.



Column name	Definition	Inherit...
gid	integer NOT NULL DEFAULT nextval(...	
code	integer	
osodr	character varying(13)	
number	character varying(8)	
road_name	character varying(70)	
metres	integer	
indicator	character varying(1)	
geom	geometry(MultiLineString,27700)	

To overcome this issue we can use the following options for either importing into a Line or Polygon table:

-nlt MULTIPOLYGON

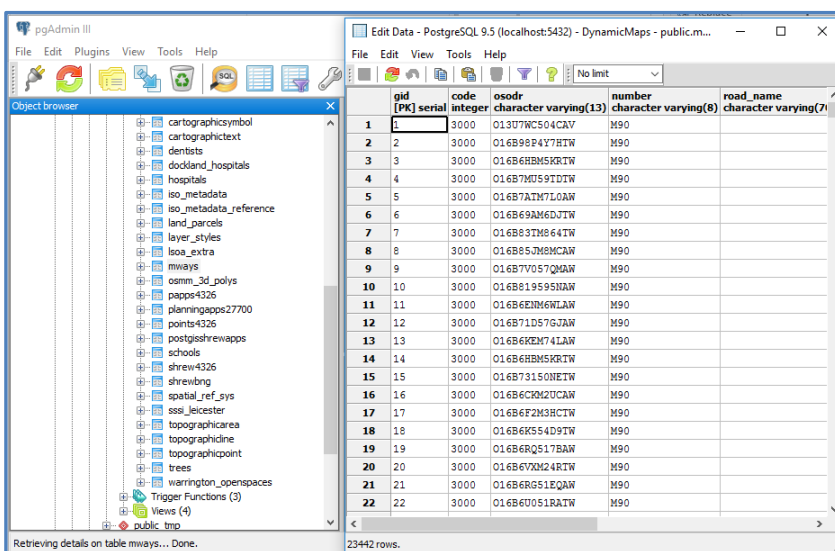
-nlt MULTILINESTRING

Example:

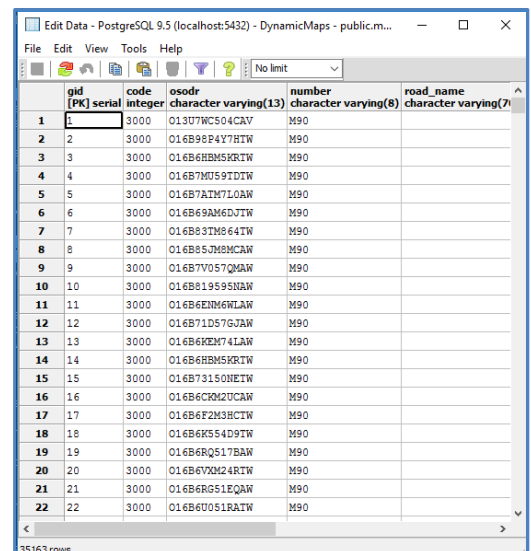
```
ogr2ogr -append -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\mways.shp -nlt MULTILINESTRING mways
```

```
C:\OSGeo4W64\bin>ogr2ogr -append -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\mways.shp -nlt MULTILINESTRING mways
C:\OSGeo4W64\bin>
```

The result will append the records from the Mways Shapefile into the existing records in the Mways PostGIS table. Using PGAdmin we can see how the 11721 records from the Mways Shapefile have now been appended to the existing 23442 records, to create a new record count of **35163**.



gid	serial	code	osodr	number	road_name
[PK]		integer	character varying(13)	character varying(8)	character varying(7)
1	1	3000	01307WC504CAV	M90	
2	2	3000	016B99P4V7HTW	M90	
3	3	3000	016B6HBM5KRITW	M90	
4	4	3000	016B7M059TDTW	M90	
5	5	3000	016B7ATM7L0AW	M90	
6	6	3000	016B69AM6DJTW	M90	
7	7	3000	016B83TM864TW	M90	
8	8	3000	016B85JM8MCAW	M90	
9	9	3000	016B7V057QMNAW	M90	
10	10	3000	016B819595NAW	M90	
11	11	3000	016B6ENM6WLAW	M90	
12	12	3000	016B71D57GJAW	M90	
13	13	3000	016B6KEM74LAW	M90	
14	14	3000	016B6HBM5KRITW	M90	
15	15	3000	016B73150NETW	M90	
16	16	3000	016B6CRM2UCAW	M90	
17	17	3000	016B6F2M3HCTW	M90	
18	18	3000	016B6K554D9TW	M90	
19	19	3000	016B6RQ517BAW	M90	
20	20	3000	016B6VXM24RTW	M90	
21	21	3000	016B6RG51EQAW	M90	
22	22	3000	016B6U051RATW	M90	



gid	serial	code	osodr	number	road_name
[PK]		integer	character varying(13)	character varying(8)	character varying(7)
1	1	3000	01307WC504CAV	M90	
2	2	3000	016B99P4V7HTW	M90	
3	3	3000	016B6HBM5KRITW	M90	
4	4	3000	016B7M059TDTW	M90	
5	5	3000	016B7ATM7L0AW	M90	
6	6	3000	016B69AM6DJTW	M90	
7	7	3000	016B83TM864TW	M90	
8	8	3000	016B85JM8MCAW	M90	
9	9	3000	016B7V057QMNAW	M90	
10	10	3000	016B819595NAW	M90	
11	11	3000	016B6ENM6WLAW	M90	
12	12	3000	016B71D57GJAW	M90	
13	13	3000	016B6KEM74LAW	M90	
14	14	3000	016B6HBM5KRITW	M90	
15	15	3000	016B73150NETW	M90	
16	16	3000	016B6CRM2UCAW	M90	
17	17	3000	016B6F2M3HCTW	M90	
18	18	3000	016B6K554D9TW	M90	
19	19	3000	016B6RQ517BAW	M90	
20	20	3000	016B6VXM24RTW	M90	
21	21	3000	016B6RG51EQAW	M90	
22	22	3000	016B6U051RATW	M90	

11 – INSERT records to a new PostGIS Table

Using the syntax below you can upload records from one GIS file and create a new PostGIS database table, as well as re-projecting the source data during import. Here we will upload a Trees Shapefile into PostGIS.

Command:

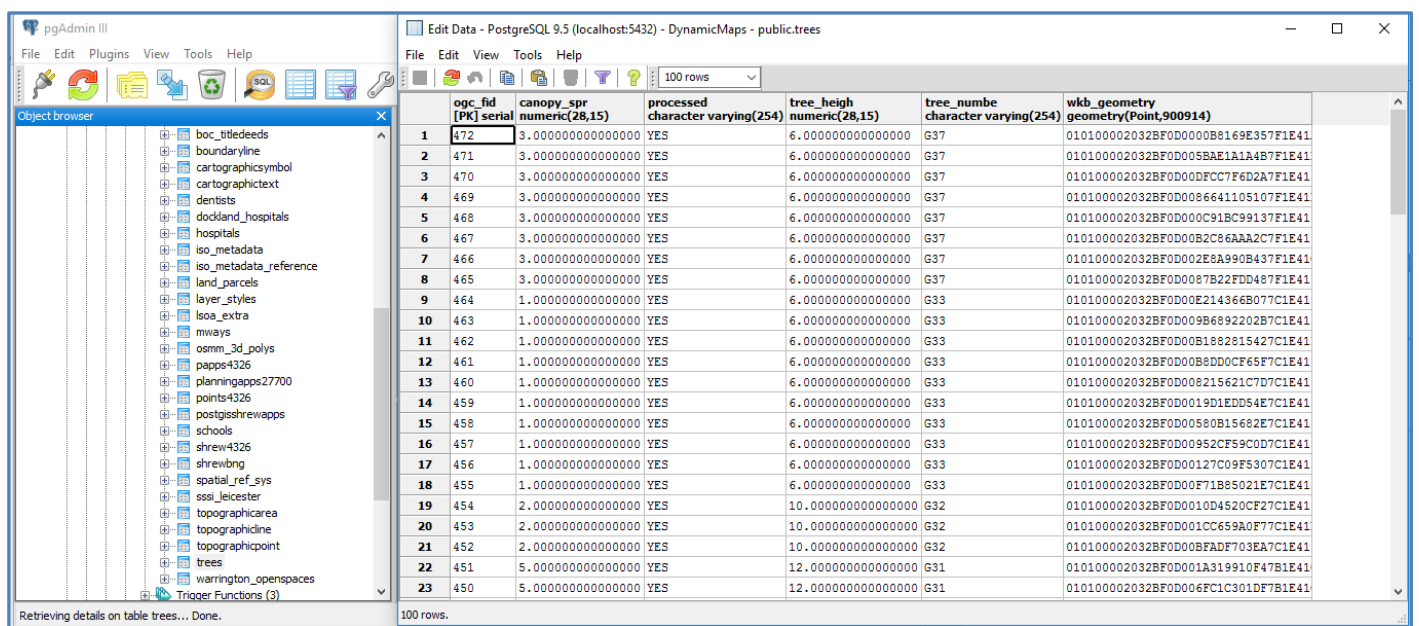
```
ogr2ogr -f PostgreSQL PG: ne_10m_admin_0_map_subunits.shp
```

Example:

```
ogr2ogr -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\Trees.shp
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\Trees.shp
C:\OSGeo4W64\bin>
```

The result will create a new table called Trees within the PostGIS database.



12 – INSERT records to a new PostGIS Table and Re-project to 4326

Using the syntax below you can upload records from one GIS file and create a new PostGIS database table. Here we will upload a Trees Shapefile into PostGIS and re-project that on import to 4326.

Command:

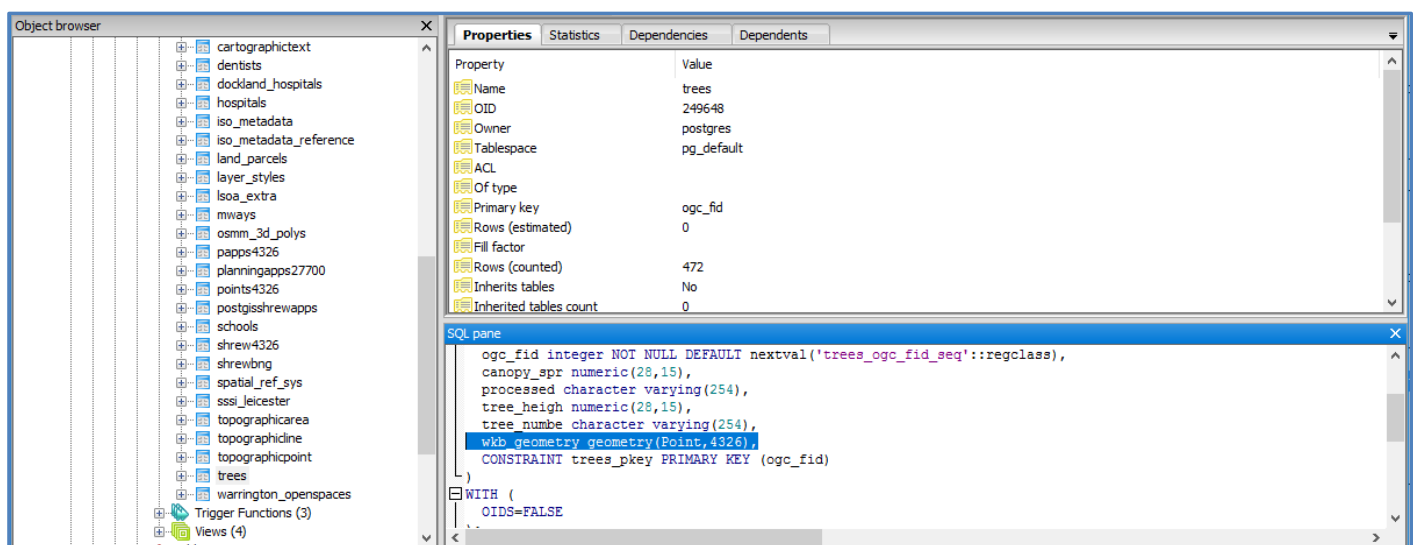
```
ogr2ogr -f PostgreSQL PG:"host=server port=5432 user='username' password='password' dbname='PostgisDBName'" shapefilename.shp -t_srs "EPSG:4326"
```

Example:

```
ogr2ogr -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\Trees.shp -t_srs "EPSG:4326"
```

```
C:\OSGeo4W64\bin>ogr2ogr -f "PostgreSQL" PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" D:\Temp\Trees.shp -t_srs "EPSG:4326"
C:\OSGeo4W64\bin>
```

The result will create a new table called Trees within the PostGIS database, which has the projection of 4326.



13 – Update a PostGIS Database Table with a new Field

Before we can update values into a field in PostGIS, you may need to create that new field first. We can use ogrinfo to edit the Schema of a PostGIS database table. Here we will use the Trees table that we imported earlier and create a new field called ‘Surveyor’.

Command:

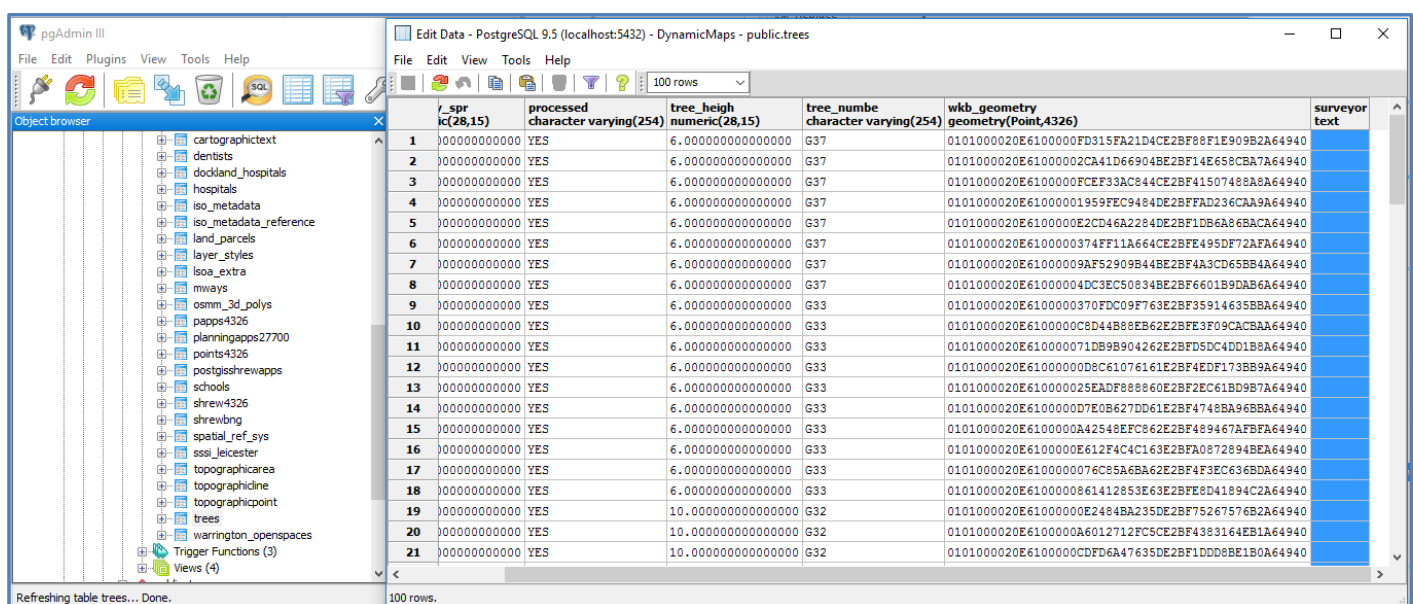
```
ogrinfo PG:"host=server port=5432 user='username' password='password' dbname='PostgisDBName'" -sql
"ALTER TABLE test ADD COLUMN newfield TEXT"
```

Example:

```
ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -sql
"ALTER TABLE trees ADD COLUMN Surveyor TEXT"
```

```
C:\OSGeo4W64\bin>ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -
sql "ALTER TABLE trees ADD COLUMN Surveyor TEXT"
INFO: Open of `PG:host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'`
using driver `PostgreSQL` successful.
```

The result will alter the structure of the Trees table by adding a new Text/String field called Surveyor.



14 – Update a PostGIS Database Table with values in a Field

Now that we have a new field called ‘Surveyor’ we will use ogrinfo to update that field with new values for all records.

Command:

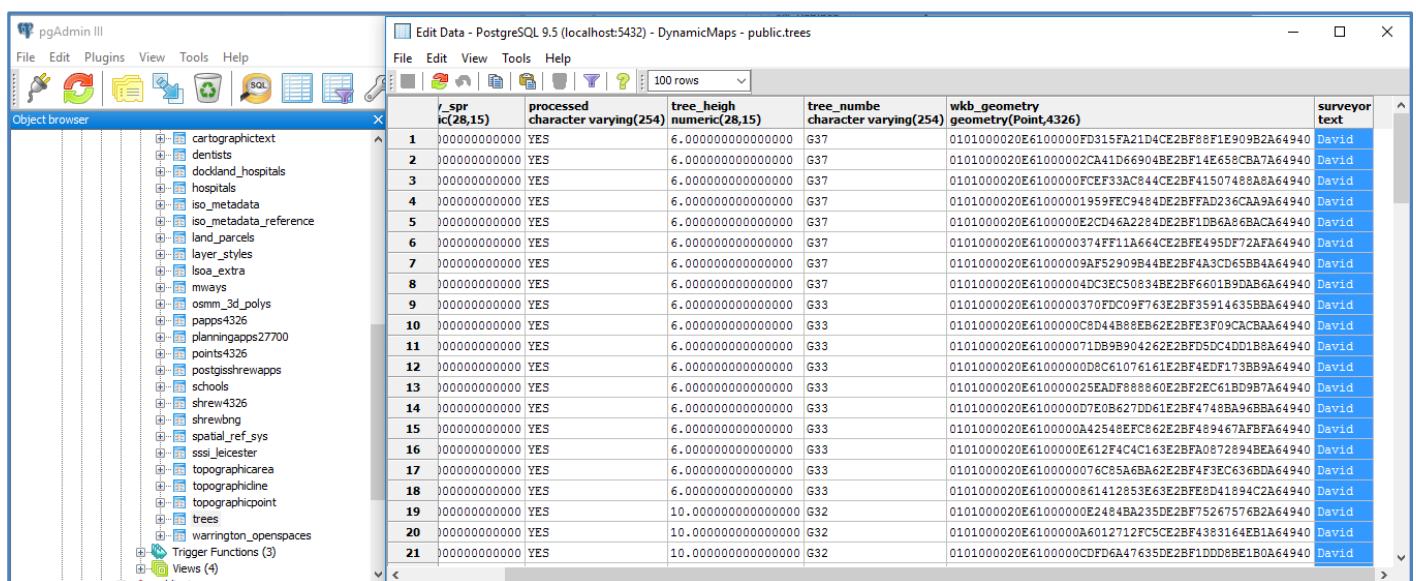
```
ogrinfo PG:"host=server port=5432 user='username' password='password' dbname='pgdatabase'" -dialect SQLite -sql "UPDATE table SET field = 'Value'"
```

Example:

```
ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -dialect SQLite -sql "UPDATE trees SET Surveyor = 'David'"
```

```
C:\OSGeo4W64\bin>ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -dialect SQLite -sql "UPDATE trees SET Surveyor = 'David'"
INFO: Open of `PG:host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'` using driver `PostgreSQL` successful.
```

The result will update the ‘Surveyor’ field with the value of ‘David’ for all records.



15 – Update a PostGIS Database Table with values in a Field – Using a Where Clause

We can then expand on the SQL statement to only update those records which meet specific criteria. For example, only updating the records in the Trees table where the 'Processed' field = 'No'.

Command:

```
ogrinfo PG:"host=server port=5432 user='username' password='password' dbname='pgdatabase'" -dialect SQLite -sql "UPDATE table SET field = 'Value' where Processed = 'NO'"
```

Example:

```
ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -dialect SQLite -sql "UPDATE trees SET Surveyor = 'Paul' where Processed = 'NO'"
```

```
C:\OSGeo4W64\bin>ogrinfo PG:"host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'" -dialect SQLite -sql "UPDATE trees SET Surveyor = 'Paul' where Processed = 'NO'"
INFO: Open of `PG:host=localhost port=5432 user='postgres' password='postgres' dbname='DynamicMaps'` using driver `PostgreSQL` successful.
```

The result will update the 'Surveyor' field with the value of 'Paul' for the selected records.

