

Web Service using GeoPackage (I)

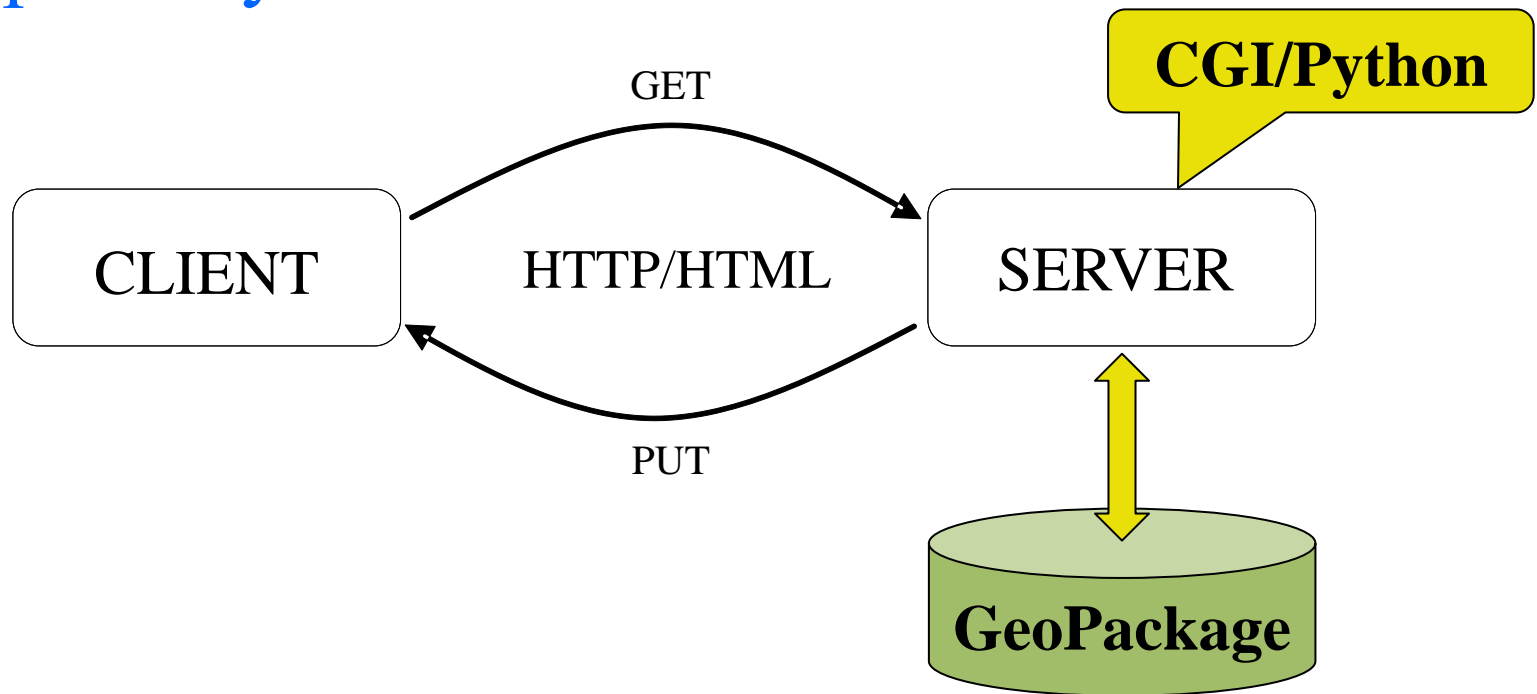
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Introduction

- This presentation is about...
 - Creation of a **GeoPackage** using the **Geospatial Data Extraction Tool** of Natural Resources Canada
 - Development of a **Web Service** using the GeoPackage as a data repository on the Server

Web Service...

- GeoPackage in the role of the data repository...



Geospatial Data Extraction Tool

<https://maps.canada.ca/czs/index-en.html>

The screenshot shows the 'Geospatial Data Extraction' tool interface. At the top, there's a header with the Government of Canada logo and a search bar. Below the header is a navigation bar with links to Jobs, Immigration, Travel, Business, Benefits, Health, Taxes, and More services. The main content area is titled 'Geospatial Data Extraction' and includes a 'Data extraction guide' section with a 'PDF version' link. The guide contains a welcome message and a list of four steps: 1. Select which data product to clip, 2. Find and select the clipping area, 3. Fill the extraction form and submit it, and 4. Receive email and download your package. A red arrow points to the 'Select data to be extracted' step in the guide. Below the guide, there are several input fields and buttons for finding a location, including a search bar for 'Name or Postal FSA (K1A) or NTS' and a 'Find' button. There is also a section for 'Instructions: Map Navigation' and a '+' button for additional options.

Geospatial Data Extraction

Government of Canada / Gouvernement du Canada

Search Canada.ca

Home

Geospatial Data Extraction

▼ Data extraction guide [PDF version](#)

Welcome to the geospatial data extraction tool!

This slide deck will guide you through all options available and hopefully help you find what you are looking for.

The purpose of this application is to provide tailored geospatial dataset based on your needs. Here are the basic steps to extract data:

1. Select which data product to clip
2. Find and select the clipping area
3. Fill the extraction form and submit it
4. Receive email and download your package

◀ Item 1 of 11 ▶

► Overlay reference layers

► **Select data to be extracted**

► Select clipping area

► Select options and submit job

► Job status

▼ Find a location

Name or Postal FSA (K1A) or NTS

► Instructions: Map Navigation

+

Geospatial Data Extraction Tool

The screenshot shows the 'Geospatial Data Extraction' web application. The browser address bar displays 'maps.canada.ca/czs/index-en.html'. The main content area features a welcome message and a list of steps for data extraction. A sidebar on the left contains several sections: 'Overlay reference layers', 'Select data to be extracted', 'Select clipping area', 'Select options and submit job', and 'Job status'. The 'Select data to be extracted' section is expanded, showing a list of data products. A red arrow points to the 'CanVec' option, which is highlighted in blue. Below 'CanVec' are links for 'Elevation' and 'Automatic Extraction Data'. The right side of the interface includes a 'Find a location' search bar, an 'Instructions: Map Navigation' section, and a map of Canada.

Geospatial Data Extraction

maps.canada.ca/czs/index-en.html

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2. Find and select the clipping area
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4. Receive email and download your package

Item 1 of 11

► Overlay reference layers

▼ [Select data to be extracted](#)

Basemap and reference overlay are not included in the extraction package.

► Want more info, click here !

CanVec

[Elevation](#)

[Automatic Extraction Data](#)

► Select clipping area

► Select options and submit job

► Job status

▼ Find a location

Name or Postal FSA (K1A) or NTS

► Instructions: Map Navigation

Map of Canada showing provinces and territories.

<https://maps.canada.ca/czs/canvec>

Geospatial Data Extraction Tool

<https://maps.canada.ca/czs/index-en.html>

The screenshot shows the 'Geospatial Data Extraction' tool interface. At the top, there's a header with the Government of Canada logo and a search bar. Below the header is a navigation bar with links to Jobs, Immigration, Travel, Business, Benefits, Health, Taxes, and More services. The main content area is titled 'Geospatial Data Extraction' and contains a 'Data extraction guide' section. This section includes a welcome message, a list of basic steps to extract data, and a progress indicator showing 'Item 1 of 11'. A red arrow points to the 'Select clipping area' step in the guide. To the right of the guide, there's a 'Find a location' section with a search bar and a 'Find' button. Below the search bar, there's an 'Instructions: Map Navigation' section with a '+' button.

Geospatial Data Extraction

Home

Geospatial Data Extraction

▼ Data extraction guide [PDF version](#)

Welcome to the geospatial data extraction tool!

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◀ Item 1 of 11 ▶

► Overlay reference layers

► Select data to be extracted

► **Select clipping area**

► Select options and submit job

► Job status

▼ Find a location

Name or Postal FSA (K1A) or NTS

► Instructions: Map Navigation

Geospatial Data Extraction Tool

Geospatial Data Extraction

maps.canada.ca/czs/index-en.html

3. Fill the extraction form and submit it
4. Receive email and download your package

Item 1 of 11

► Overlay reference layers

► Select data to be extracted

▼ Select clipping area

► Want more info, click here !

☐ Current Map Extent
☐ Predefined Clipping Area
☐ Custom Clipping Area
☐ Area from a Shapefile
☐ Remove selected area

OK

► Select options and submit job

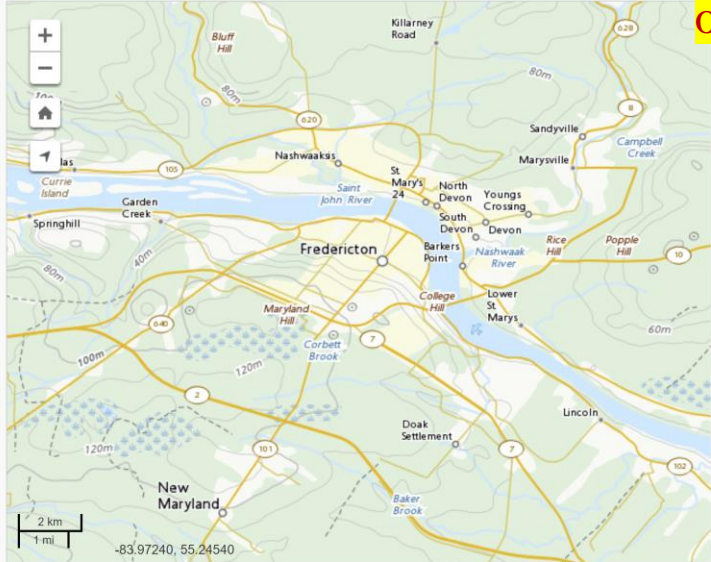
► Job status

▼ Find a location

Name or Postal FSA (K1A) or NTS Find

► Instructions: Map Navigation

zoom in the area of interest



Geospatial Data Extraction Tool

Geospatial Data Extraction

maps.canada.ca/czs/index-en.html

3. Fill the extraction form and submit it
4. Receive email and download your package

Item 1 of 11

► Overlay reference layers

► Select data to be extracted

▼ Select clipping area

► Want more info, click here !

☒ Current Map Extent

☐ Predefined Clipping Area

☐ Custom Clipping Area

☐ Area from a Shapefile

☐ Remove selected area

OK

► Select options and submit job

► Job status

▼ Find a location

Name or Postal FSA (K1A) or NTS Find

► Instructions: Map Navigation

Map showing Fredericton, New Brunswick, with various geographical features and roads. The map includes a scale bar (2 km / 1 mi) and coordinates (-83.97240, 55.24540).

Geospatial Data Extraction Tool

Geospatial Data Extraction x +

maps.canada.ca/czs/index-en.html

CanVec

Data Extraction Form

* Extraction polygon coordinates in geoJson, wkt or bbox format ? (required)

POLYGON((-66.74999388449
45.86883474347,-66.55468138449
45.86883474347,-66.55468138449

Maximum allowed area (km²) : 150000

Extraction zone area (km²) : 270.08

* Select one or more theme from the list ? (required)

☐ Select all / unselect all

☒ Lakes and rivers - Hydrographic features

☒ Transport networks - Transport features

☐ Constructions and land use - Manmade features

☐ Mines, energy and communication networks - Resources Management Features

☐ Wooded areas, saturated soils and landscape - Land Features

☐ Elevation features

☐ Map labels - Toponymic features (50K only)

* Output format choice ? (required)

OGC GeoPackage

OGC GeoPackage ? (required)

ESRI file geodatabase

ESRI Shapefile

* Select to clip or not the data ? (required)

Yes

Geospatial Data Extraction Tool

Geospatial Data Extraction

maps.canada.ca/czs/index-en.html

- ☒ Transport networks - Transport features
- ☐ Constructions and land use - Manmade features
- ☐ Mines, energy and communication networks - Resources Management Features
- ☐ Wooded areas, saturated soils and landscape - Land Features
- ☐ Elevation features
- ☐ Map labels - Toponymic features (50K only)

* Output format choice (required)

OGC GeoPackage

* Select a coordinate system (required)

NAD83 CSRS (EPSG:4617)

* Select to clip or not the data (required)

Yes

Select the scale of the data (required)

1/50 000

* Email address (yourname@domain.com) (required)

emmanuel.stefanakis@g

Email address validation

☒ Check here to confirm you have entered your email address correctly.

Submit

Job status

New Maryland

Baker Brook

2 km

1 mi

-83.97240, 55.24540

Enter your email
address here

Geospatial Data Extraction Tool

The screenshot displays the Geospatial Data Extraction Tool interface. At the top, a progress bar shows 'Item 1 of 11'. Below this, a list of steps is visible: '4. Receive email and download your package'. The main interface is divided into two columns. The left column contains a sidebar with options: 'Overlay reference layers', 'Select data to be extracted', 'Select clipping area', 'Select options and submit job', and 'Job status'. The 'Job status' section shows a table with one job entry: '258052' with status 'Processing'. A red arrow points to this entry. To the right of the table is a 'Refresh status' button. The right column features a 'Find a location' search bar with the placeholder text 'Name or Postal FSA (K1A) or NTS' and a 'Find' button. Below the search bar is a section titled 'Instructions: Map Navigation'. The map itself shows a topographic view of a region including Fredericton, New Brunswick, with various roads, rivers, and elevation contours. A scale bar at the bottom left of the map indicates 2 km and 1 mi. The coordinates -83.97240, 55.24540 are displayed at the bottom center of the map.

4. Receive email and download your package

Item 1 of 11

► Overlay reference layers

► Select data to be extracted

► Select clipping area

► Select options and submit job

▼ Job status

► Want more info, click here !

Id	Status
258052	Processing

Refresh status

▼ Find a location

Name or Postal FSA (K1A) or NTS

Find

► Instructions: Map Navigation

Map showing Fredericton, New Brunswick, with various roads, rivers, and elevation contours. A scale bar indicates 2 km and 1 mi. Coordinates: -83.97240, 55.24540.

An email will be sent to you;
with the GeoPackage file
attached.

Geospatial Data Extraction Tool

Geospatial Data Extraction

maps.canada.ca/czs/index-en.html

Item 1 of 11

- Overlay reference layers
- Select data to be extracted
- Select clipping area
- Select options and submit job

Job status

Want more info, click here !

Id	Status
258052	Processing error
258053	Success

If it fails, please retry...

Find a location

Name or Postal FSA (K1A) or NTS

Find

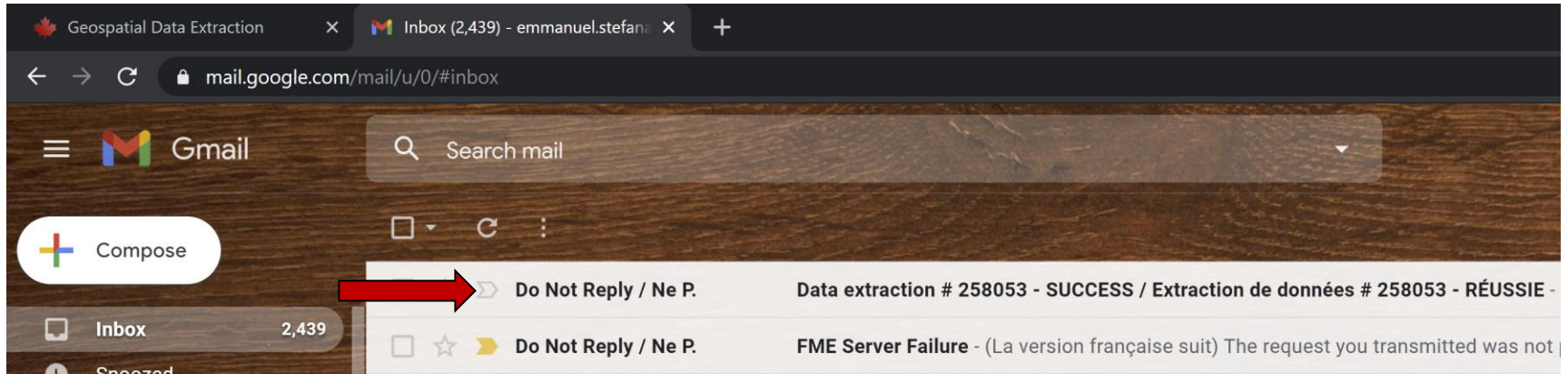
Instructions: Map Navigation

Map showing Fredericton, New Brunswick, with various geographical features and roads. Coordinates: -83.97240, 55.24540.

Share this page

Date modified: 2017-06-28

Geospatial Data Extraction Tool



Data extraction # 258053 - SUCCESS / Extraction de données # 258053 - RÉUSSIE Inbox x

Do Not Reply / Ne Pas Répondre (nrncan/rncan) <nrncan.DoNotReply-NePasRepondre.nrncan@canada.ca>
to me ▾

(La version française suit)

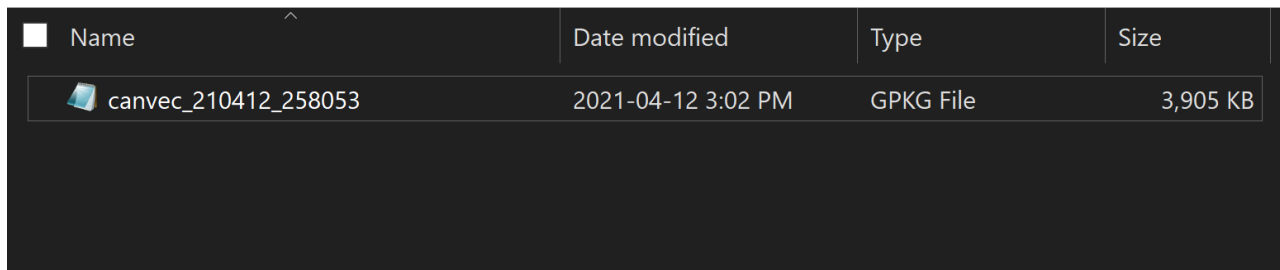
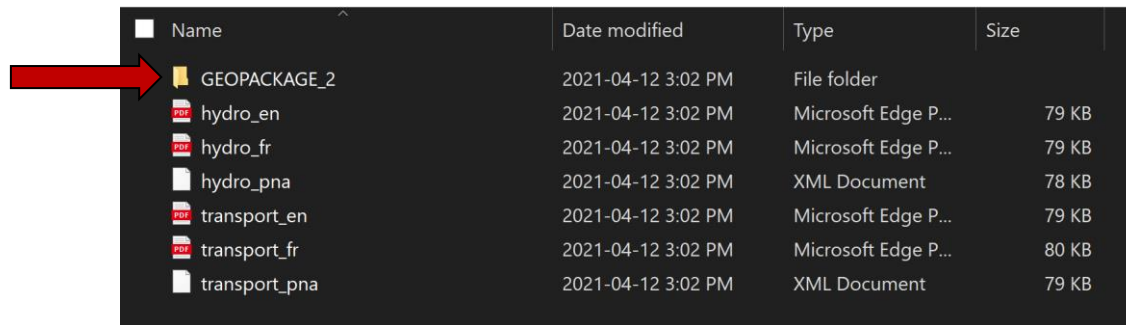
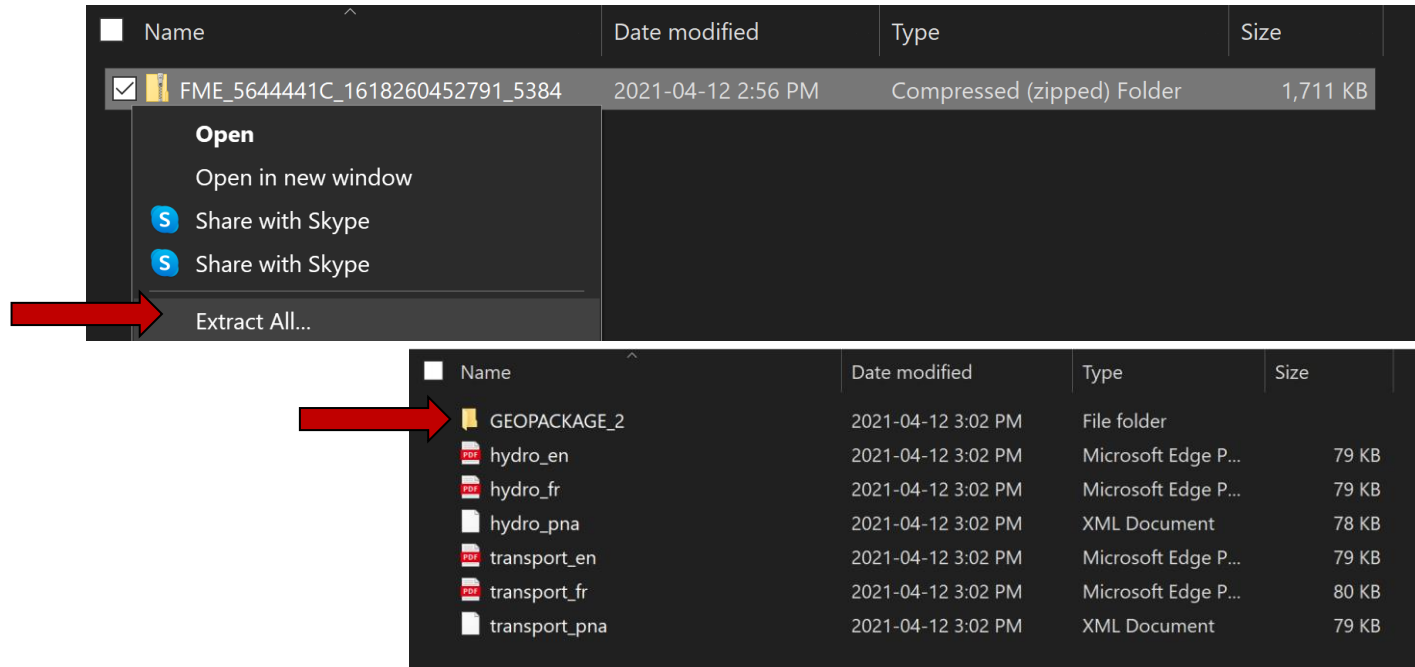
Your request has been processed successfully and you can now download your data using the following link:

https://webservices.maps.canada.ca/fmedatadownload/results/FME_5644441C_1618260452791_5384.zip

Please note that the file will remain available for the **next five days** only.

FME_5644441C_16...zip

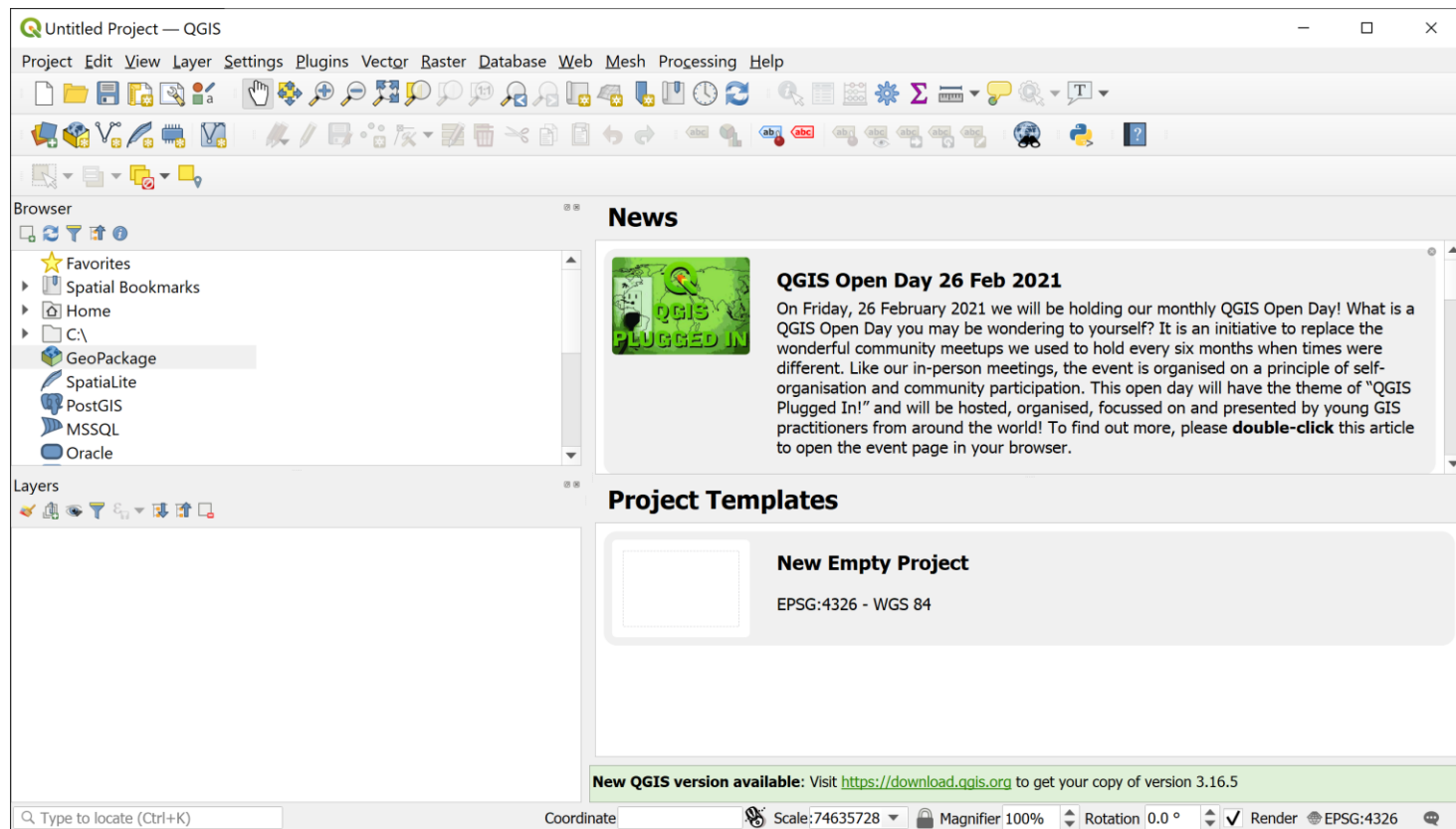
Geospatial Data Extraction Tool



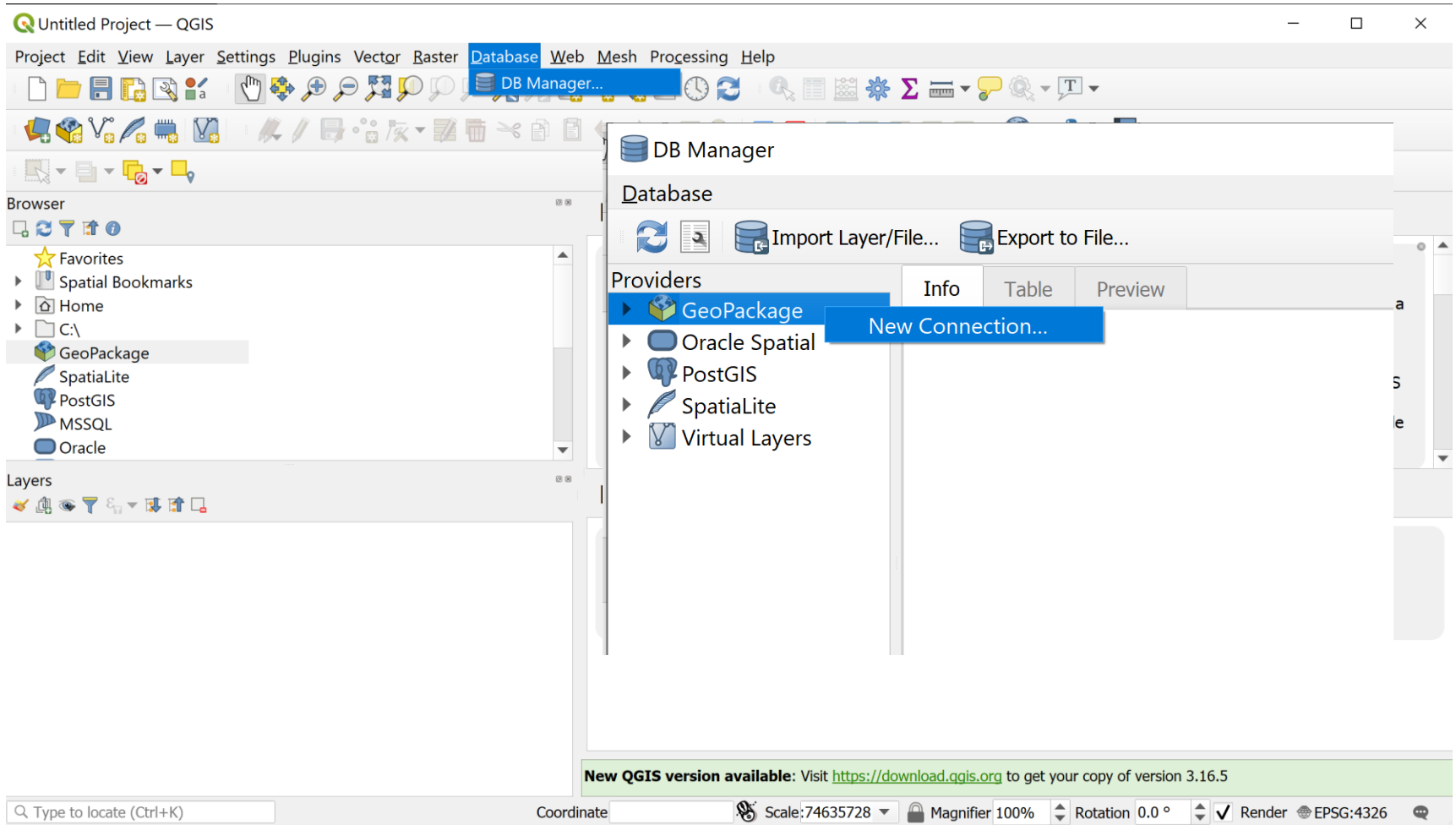
This is the
GeoPackage file
-- upload to server

Explore GeoPackage

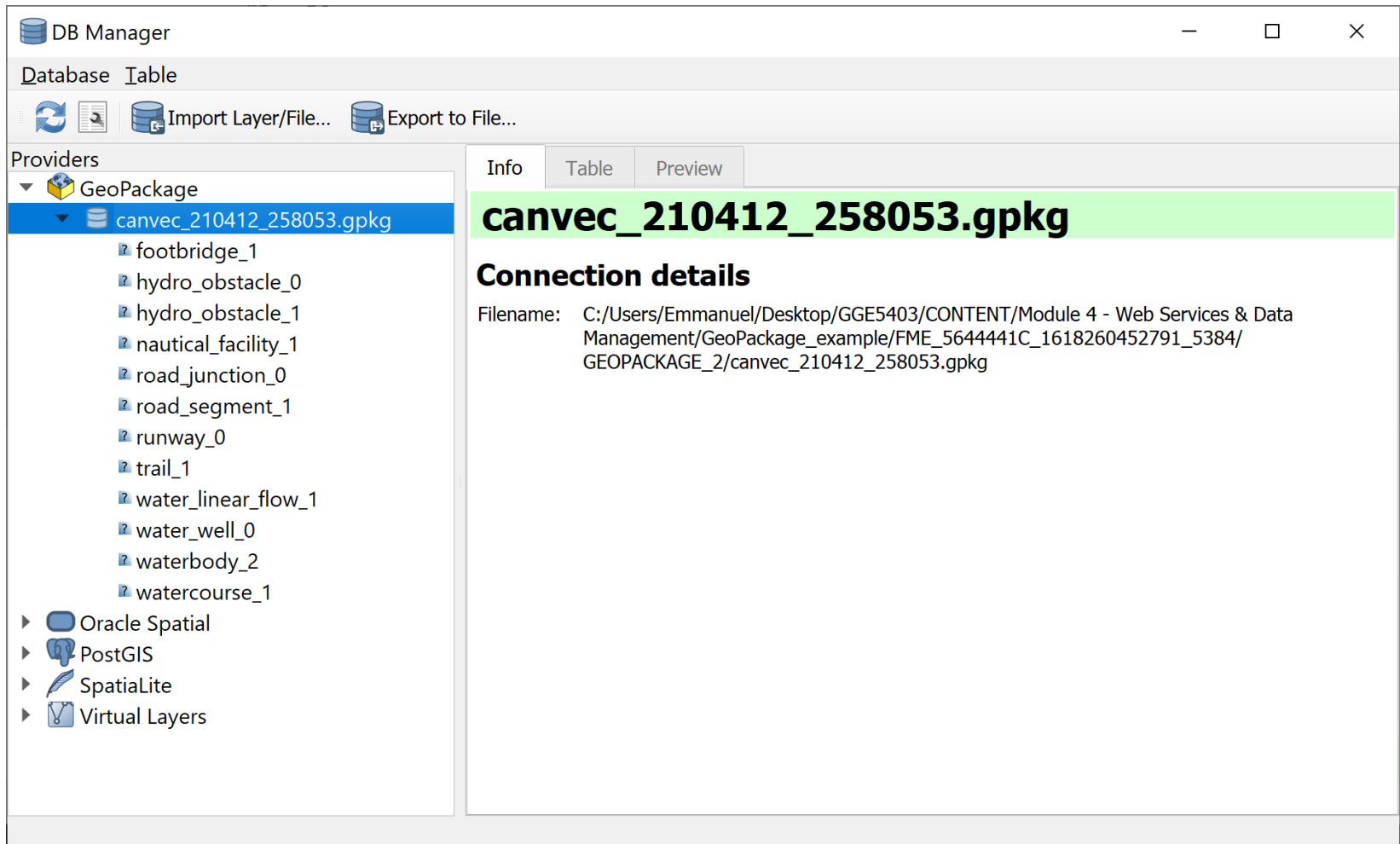
- Open GeoPackage file using QGIS



Explore GeoPackage



Explore GeoPackage



Explore GeoPackage

The screenshot shows the DB Manager application window. On the left, the 'Providers' tree is expanded to show the 'GeoPackage' provider, which contains a list of files. The file 'canvec_210412_258053.gpkg' is selected, and its contents are listed below it. The 'road_segment_1' file is highlighted. On the right, the 'Table' tab is selected, showing the 'road_segment_1' table. The 'General info' section displays the relation type as 'Table' and the number of rows as 3618. The 'GeoPackage' section shows the column 'geom' with a GEOMETRY type, XY dimension, and NAD83(CSRS) (4617) spatial reference. A warning message states: 'There is no entry in geometry_columns!'. The 'Fields' section displays a table with 14 columns: #, Name, Type, Null, and Default.

Providers

- GeoPackage
 - canvec_210412_258053.gpkg
 - footbridge_1
 - hydro_obstacle_0
 - hydro_obstacle_1
 - nautical_facility_1
 - road_junction_0
 - road_segment_1
 - runway_0
 - trail_1
 - water_linear_flow_1
 - water_well_0
 - waterbody_2
 - watercourse_1
- Oracle Spatial
- PostGIS
- Spatialite
- Virtual Layers

Table: road_segment_1

General info

Relation type: Table
Rows: 3618

GeoPackage

Column: geom
Geometry: GEOMETRY
Dimension: XY
Spatial ref: NAD83(CSRS) (4617)
Extent: -66.75000, 45.86880 - -66.55470, 46.02520

⚠ There is no entry in geometry_columns!

Fields

#	Name	Type	Null	Default
0	id	INTEGER	Y	
1	geom	GEOMETRY	Y	
2	feature_id	TEXT(64)	Y	
3	md_temporal_extent_date_min	TEXT(20)	Y	
4	md_temporal_extent_date_max	TEXT(20)	Y	
5	md_horiz_position_accuracy_min	REAL	Y	
6	md_horiz_position_accuracy_max	REAL	Y	
7	closing_period	SMALLINT	Y	
8	exit_number	TEXT(10)	Y	
9	political_division	SMALLINT	Y	
10	road_jurisdiction_en	TEXT(100)	Y	
11	road_jurisdiction_fr	TEXT(100)	Y	
12	is_national_highway_system	SMALLINT	Y	
13	is_trans_canada_highway	SMALLINT	Y	

Explore GeoPackage

DB Manager

Database Table

Import Layer/File... Export to File...

Providers

GeoPackage

canvec_210412_258053.gpkg

footbridge_1

hydro_obstacle_0

hydro_obstacle_1

nautical_facility_1

road_junction_0

road_segment_1

runway_0

trail_1

water_linear_flow_1

water_well_0

waterbody_2

watercourse_1

Oracle Spatial

PostGIS

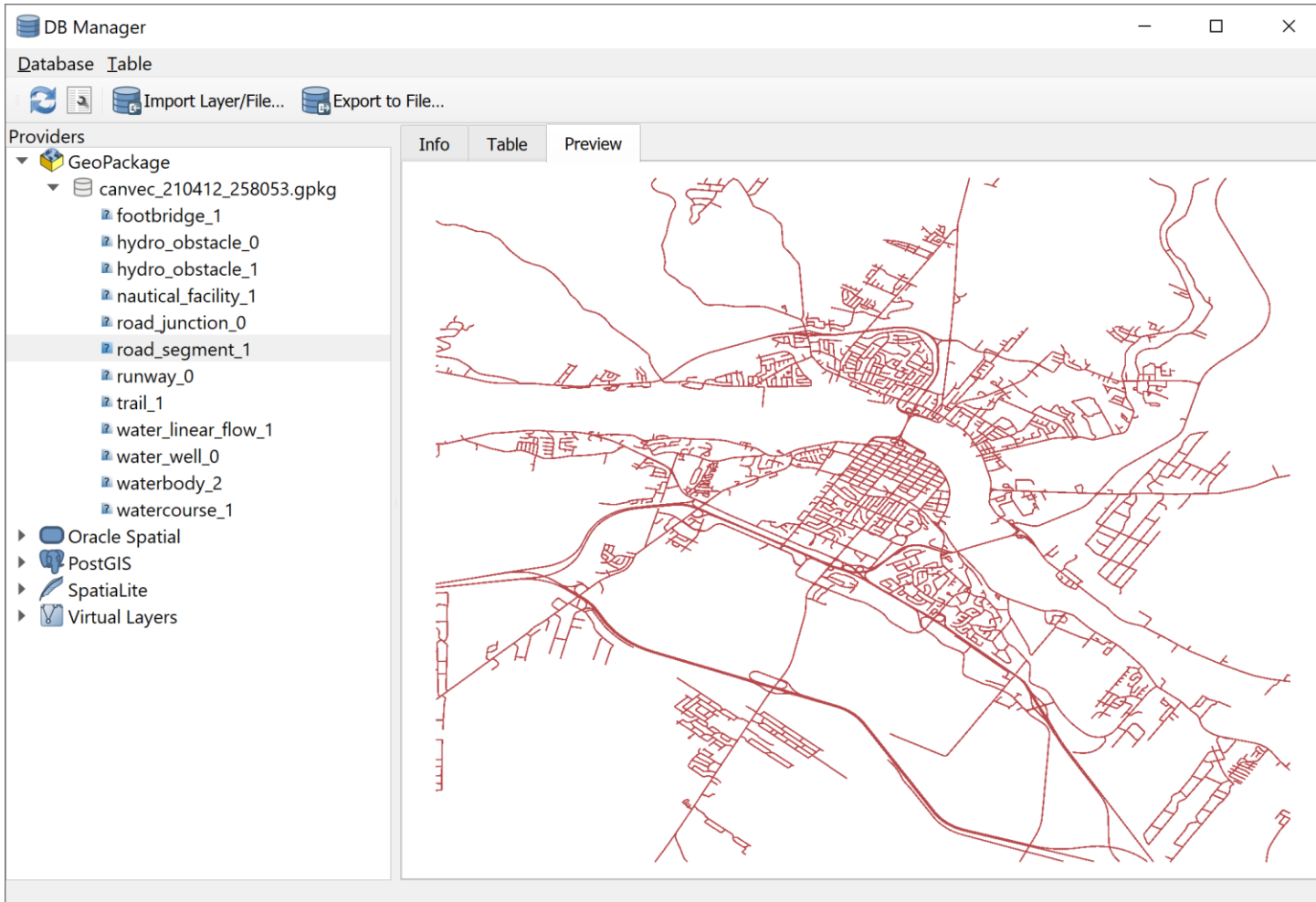
SpatialLite

Virtual Layers

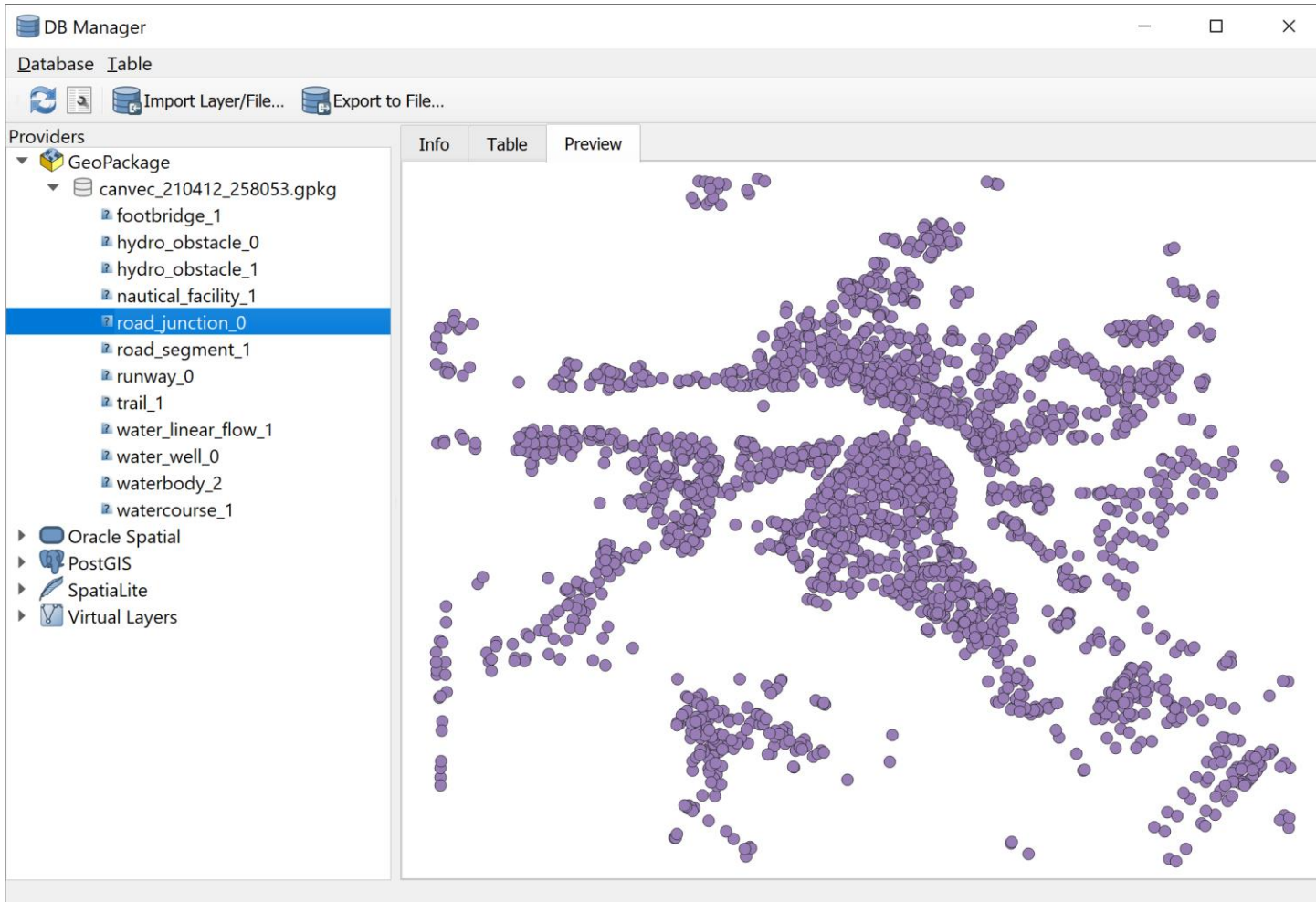
Info Table Preview

	id	geom	feature_id	mporal_extent_dat	mporal_extent_dat	riz_position_accura	riz_position_accura	closing_period	exit_number
1	1	LINESTRING (-6...	015dabe0aa764...	20170331	20170331	10.0	10.0	20	
2	2	LINESTRING (-6...	e35ff9e4119045...	20170331	20170331	10.0	10.0	20	
3	3	LINESTRING (-6...	167e13b8b2134...	20170331	20170331	10.0	10.0	20	
4	4	LINESTRING (-6...	caab879434654...	20170331	20170331	10.0	10.0	20	
5	5	LINESTRING (-6...	dd40129dd9184...	20170331	20170331	10.0	10.0	20	
6	6	LINESTRING (-6...	6126a76f77154c...	20170331	20170331	10.0	10.0	20	
7	7	LINESTRING (-6...	5021bcb702624...	20170331	20170331	10.0	10.0	20	
8	8	LINESTRING (-6...	9b40fc43b76d4c...	20170331	20170331	10.0	10.0	20	
9	9	LINESTRING (-6...	752803cda2ca4a...	20170331	20170331	10.0	10.0	20	
10	10	LINESTRING (-6...	1f66919899bf42...	20170331	20170331	10.0	10.0	20	
11	11	LINESTRING (-6...	64ca23c0959748...	20170331	20170331	10.0	10.0	20	
12	12	LINESTRING (-6...	6c76148354534c...	20170331	20170331	10.0	10.0	20	
13	13	LINESTRING (-6...	e2807c3c38cb43...	20170331	20170331	10.0	10.0	20	
14	14	LINESTRING (-6...	3904e267c5cd4...	20170331	20170331	10.0	10.0	20	

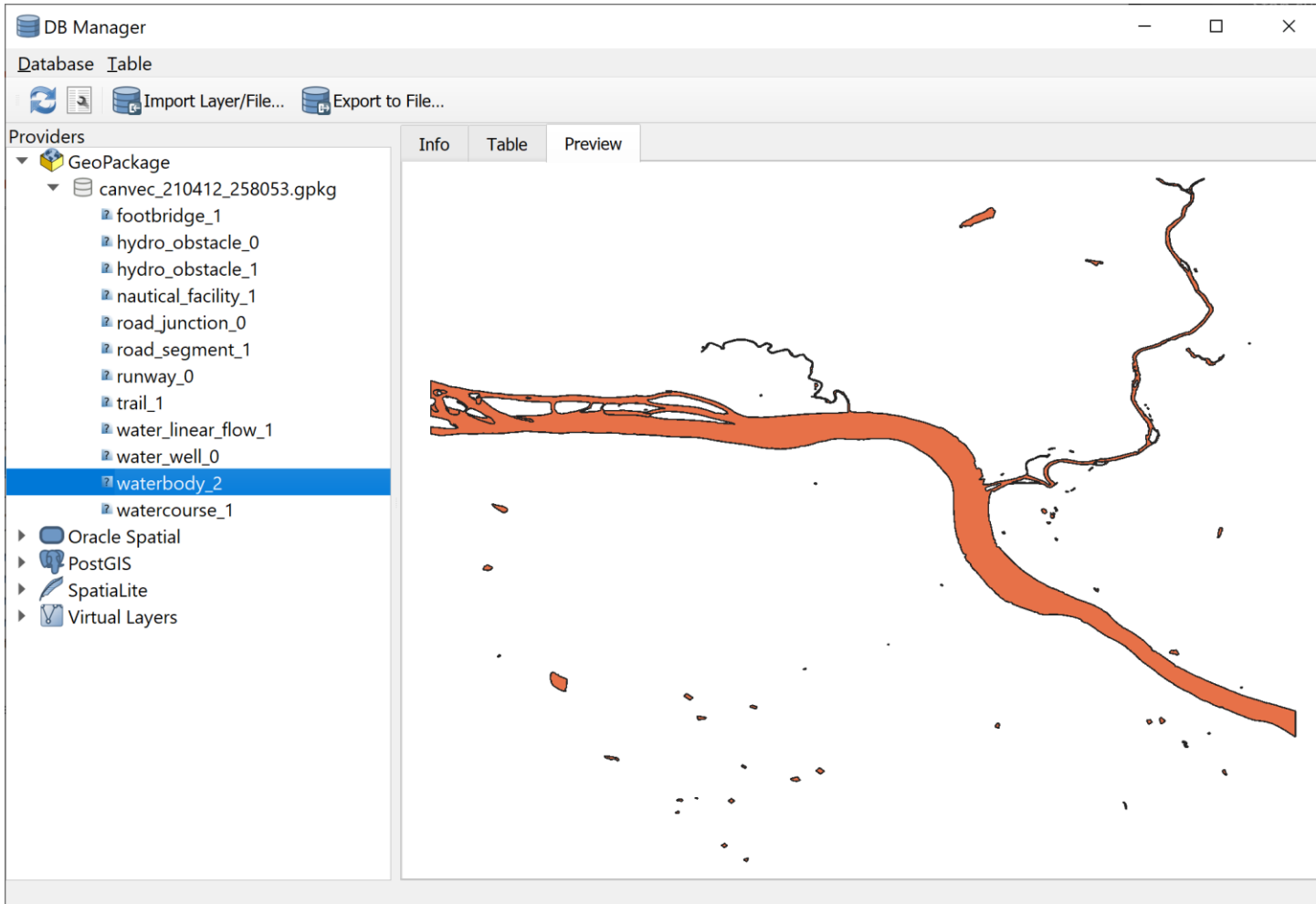
Explore GeoPackage



Explore GeoPackage



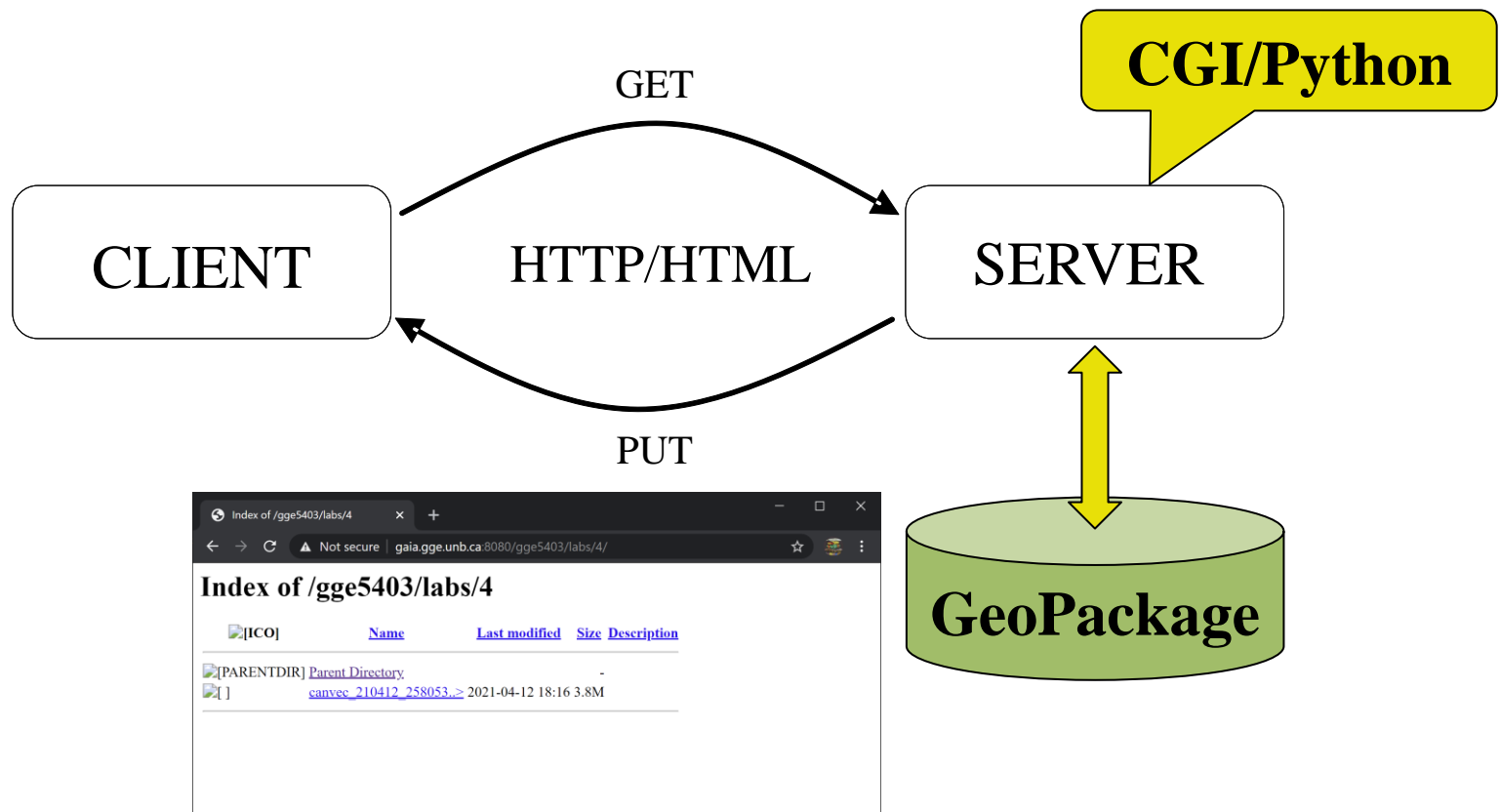
Explore GeoPackage



Development of the Web Service...

- GeoPackage uploaded to the server...

<http://gaia.gge.unb.ca:8080/gge5403/labs/4/>



Development of the Web Service...

- GeoPackage is an SQLite file



- SQLite is a self-contained, high-reliability, embedded, full-featured, public-domain, SQL database engine. SQLite is the most used database engine in the world. <https://www.sqlite.org/>
- SQLite python library is available in the course server; hence CGI/Python scripts can be called from the client

The concept of cursor

Cursors are what contain the result set of a query made against a **database**. Database queries return multiple records. The **Cursor** class has an API that allows an app to read the columns that were returned from the query as well as iterate over the rows of the result set.

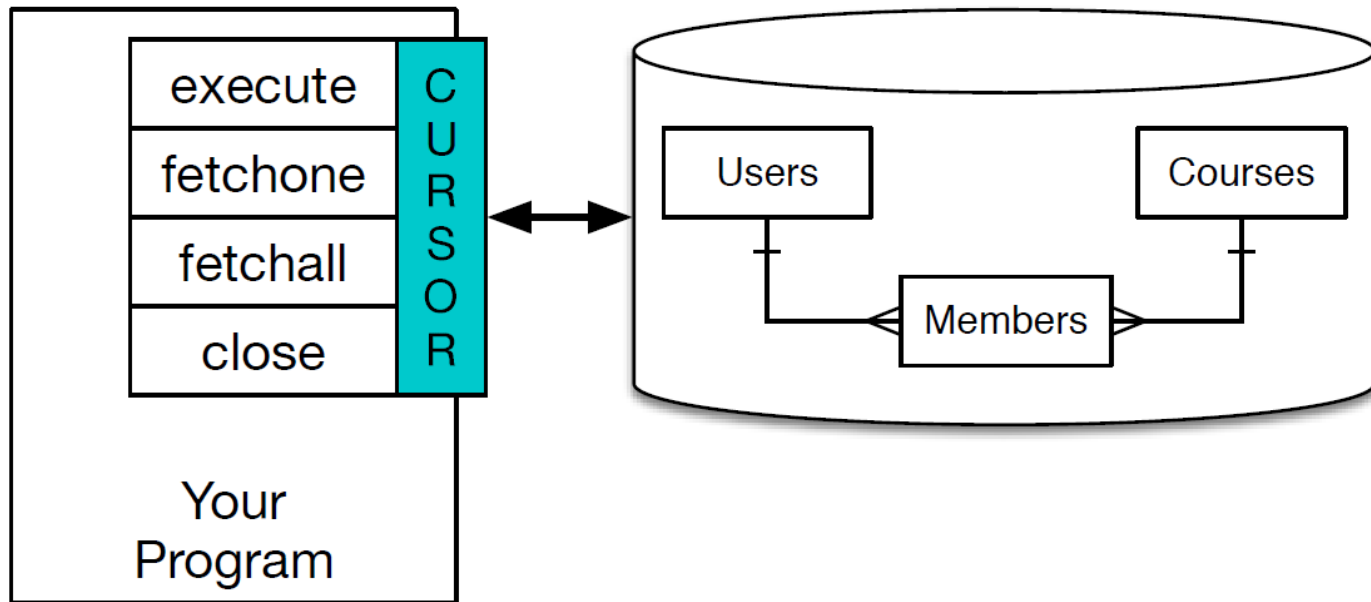
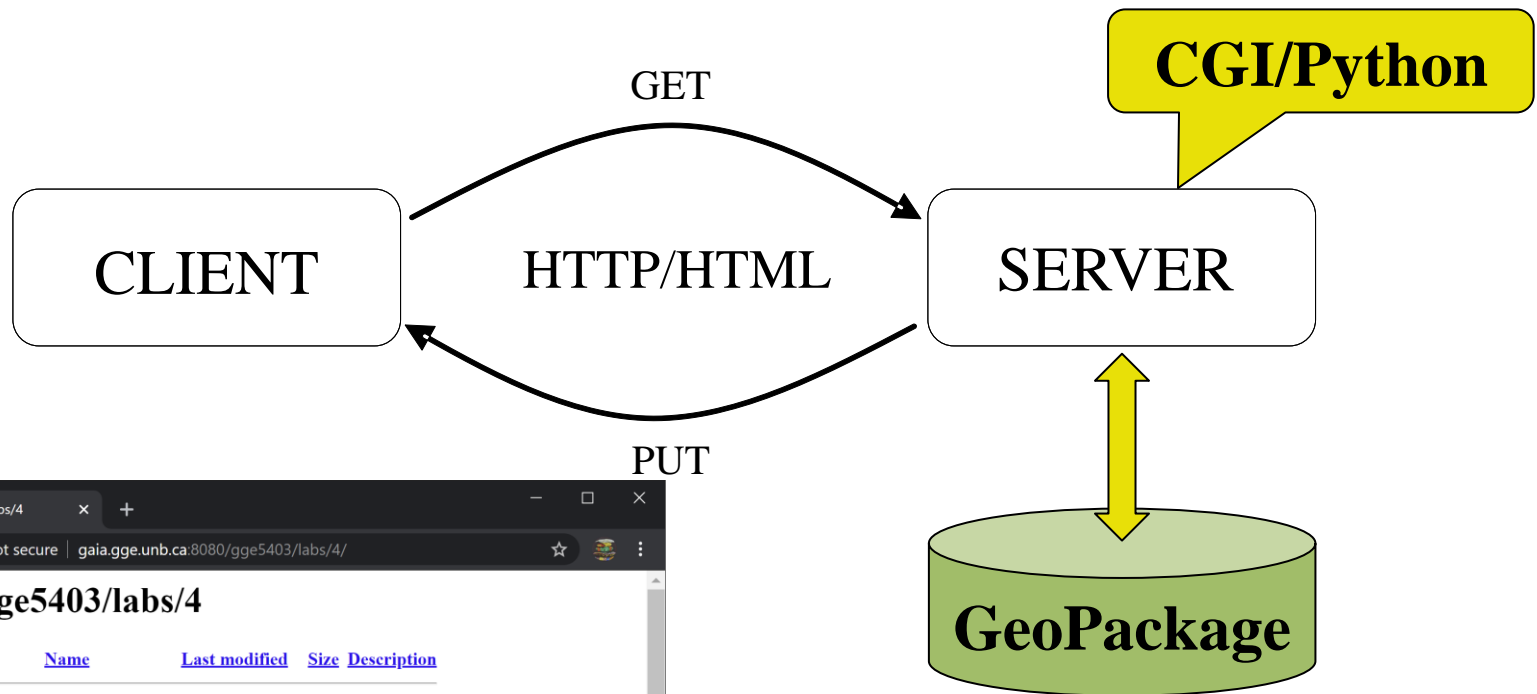


Figure 15.2: A Database Cursor

Development of the Web Service...

- Example Services...

<http://gaia.gge.unb.ca:8080/gge5403/labs/4/>



Development of the Web Service...

<http://gaia.gge.unb.ca:8080/gge5403/labs/4/Ex1.py>

```
C:\Users\Emmanuel\Desktop\GGE5403\CONTENT\Module 4 - Web ...
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
Ex1.py
1  #!C:\ms4w\Python\python
2
3  import sqlite3
4  conn = sqlite3.connect('canvec_210412_258053.gpkg')
5
6  print ("Content-Type: text/plain;charset=utf-8")
7  print() # must have a free line here
8
9  print ("Opened database successfully")
10
11  sqlq = "select count(*) from road_segment_1"
12  print("QUERY: " + sqlq)
13
14  try:
15      cursor = conn.execute(sqlq)
16      for row in cursor:
17          print(row)
18  except:
19      print("Wrong query")
20
21  conn.close()
22

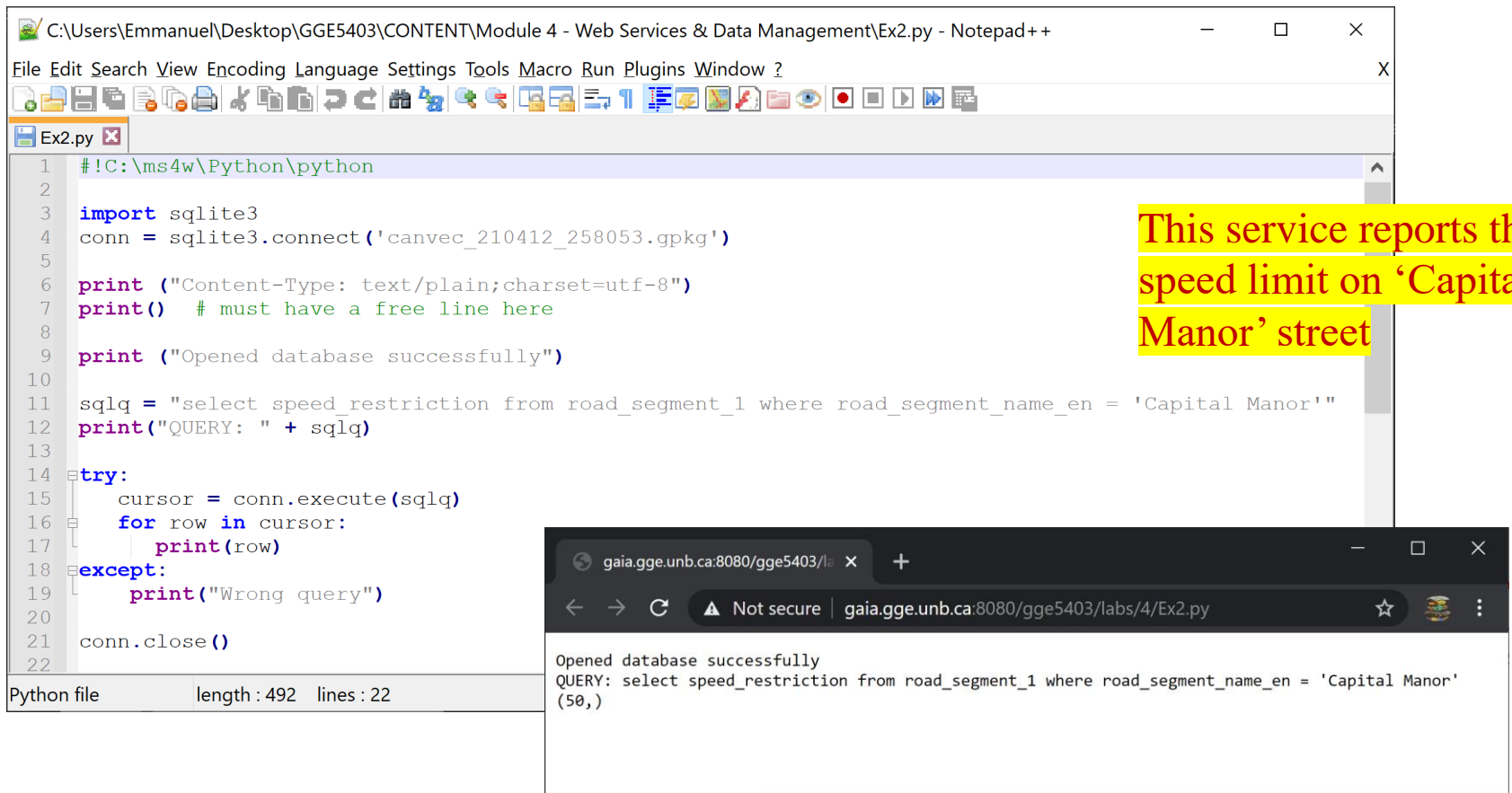
Ln : 11  Col : 23  Pos : 254  Windows (CR LF)
```

This service reports the
number of records in
'road_segment_1'



Development of the Web Service...

<http://gaia.gge.unb.ca:8080/gge5403/labs/4/Ex2.py>



The image shows a development environment with a Notepad++ editor and a web browser. The Notepad++ editor displays a Python script named `Ex2.py` located at `C:\Users\Emmanuel\Desktop\GGE5403\CONTENT\Module 4 - Web Services & Data Management\Ex2.py`. The script imports `sqlite3`, connects to a database, and executes a SQL query to retrieve speed restrictions for 'Capital Manor'. The web browser shows the output of the script, which includes the message 'Opened database successfully' and the query results: 'QUERY: select speed_restriction from road_segment_1 where road_segment_name_en = 'Capital Manor'' and '(50,)'.

```
1 #!C:\ms4w\Python\python
2
3 import sqlite3
4 conn = sqlite3.connect('canvec_210412_258053.gpkg')
5
6 print ("Content-Type: text/plain;charset=utf-8")
7 print() # must have a free line here
8
9 print ("Opened database successfully")
10
11 sqlq = "select speed_restriction from road_segment_1 where road_segment_name_en = 'Capital Manor'"
12 print("QUERY: " + sqlq)
13
14 try:
15     cursor = conn.execute(sqlq)
16     for row in cursor:
17         print(row)
18 except:
19     print("Wrong query")
20
21 conn.close()
22
```

This service reports the speed limit on 'Capital Manor' street

gaia.gge.unb.ca:8080/gge5403/labs/4/Ex2.py

Opened database successfully
QUERY: select speed_restriction from road_segment_1 where road_segment_name_en = 'Capital Manor'
(50,)

Python file length : 492 lines : 22