

# CS621 Week 4

## Working with Spatial Data in PostgreSQL PostGIS. SELF STUDY ASSIGNMENT.

On Moodle you will find an SQL file called **GreaterManchesterCrime.sql** which is a geolocated listing of ALL crimes detected and investigated by the Greater Manchester Police Force in the United Kingdom, **during August 2018 only**. The data has been downloaded from here [<https://data.police.uk/data/>] and prepared for you. By using the SQL and associated techniques presented in CS621 Week 4 you should attempt to answer the following questions based on this dataset.

In the first instance you will need to execute the entire SQL (**GreaterManchesterCrime.sql**) in order to create the corresponding database table. There are 6 columns. The fields/columns are as follows

**CrimeID** – this is a randomly generated text string to uniquely indentify each crime record, This is composed of 6 blocks of two alpha numeric characters with each bloc separated by a period character. For example, one such CrimeID value would be 32:8B:E8:6A:48:37

**CrimeTS** – this is the timestamp of the recorded crime or activity

**Location** – this is the text description of the area in Greater Manchester where the crime occurred,

**LSOA** – this is text. Lower Layer Super Output Area (LSOA) is a GEOGRAPHIC AREA. Lower Layer Super Output Areas are a geographic hierarchy designed to improve the reporting of small area statistics in England and Wales,

**Type** – this is text. It is the type or class of crime,

**Outcome** – this is text. It is an indication of the outcome of the police investigation.

**TheGeom** – this is the geographical location in WGS 84 (EPSG:4326) Longitude Latitude of where the crime was committed.

You are STRONGLY ADVISED to attempt is Self Assessed Exercise. To help students become familiar with Moodle Quizes you can insert your answers into the Moodle Quiz on Week 4 on the CS621 Moodle Section. While there are marks allocated on Moodle in the Quiz **please note that there are NO C/A MARKS attached to this assignment**. The provision of a Moodle Quiz is for your benefit in order to practice before CS621 Lab Exam 1. It is necessary to allocate marks within a Moodle Quiz in order for the quiz to function correctly.

SQL Solutions will be available BEFORE Lab Exam 1 next week.

**QUESTION 1:** Write an SQL Query to find all of the crimes recorded in Greater Manchester in an LSOA containing the name Manchester and where the crime occurred in the final hour of the 2<sup>nd</sup> last day of August 2018. The Moodle quiz will ask you to provide the number of rows returned by this query.

**QUESTION 2:** Look at the structure of the **crimeid** field in the database table. Write an SQL query to extract the following rows from the table where the first 3 blocks of the **crimeid** contain only alphabetical characters and the **outcome** field contains the text 'no suspect identified'. The Moodle Quiz requires you to type in the **crimeid** (no quotes) of the most recent (by **crimets**) of these crimes.

**QUESTION 2a:** Look at the structure of the **crimeid** field in the database table. Write an SQL query to extract all rows in the table where the crimeid has the following structure: The first block of characters and the last block of characters are composed of PRIME NUMBER digits (but the two digits together do not need to make a PRIME NUMBER). The Moodle Quiz requires you to provide the number of rows returned by this query.

**QUESTION 2b:** Look at the structure of the **crimeid** field in the database table. Write an SQL query to extract all rows in the table where the crimeid has the following structure: The second and third block of characters are composed of EVEN digits only (0 is considered even). We do not care what is in the other blocks (despite the fact these might also be even digits). The Moodle Quiz requires you to provide the number of rows returned by this query.

**QUESTION 3:** The Old Trafford Football Stadium in Manchester has **latitude,longitude** (53.463056, -2.291389). Write an SQL query to return all of the rows (**crimes**) which are recorded less than or equal to 2000 meters of this exact coordinate position. Moodle will ask you to specify the number of rows returned. You are encouraged to use **UTM ESPG:32630** for the UK in your calculations.

**QUESTION 4:** Manchester Picadilly is the largest railway station in Manchester. Coordinates (**lat, lon**): 53.477013, -2.229452. Unfortunately the area around the station is a particularly frequent location of crime. Write an SQL query which returns all of the rows (crimes) recorded within 2000 meters of this precise location. Only return rows which have the word 'theft' (case insensitive) in the **crime type** column. Moodle will require you to specify the number of rows returned.

**QUESTION 5:** On the 19th of August 2018 at 13:30 Manchester City played Huddersfield Town in a football game at the City of Manchester Stadium (coordinates (**lat, long**): 53.483056, -2.200278). Write an SQL query to extract all crimes which occurred between noon and 6pm (inclusive) on the day of this game. Any crime which occurred within 5KM of the exact stadium location should be returned. Moodle will require the number of rows returned.

**QUESTION 5A:** A researcher is investigating a specific area in Manchester. They have provided you with the following pieces of geo data: `St_GeomFromText('POINT(-2.255501 53.482794)',4326)` and `St_GeomFromText('POINT(-2.242498 53.488106)',4326)` which represent the coordinates of Salford and Manchester Victoria train stations. Write a query which returns all crimes recorded within 800m of both of these locations on or after the 20<sup>th</sup> of August 2018. The Moodle quiz will require you to specify the number of rows returned.

**QUESTION 6:** Write an SQL query to return any crime which was recorded as occurring in LSOA with this exact name "Rochdale 012D". Moodle will require the number of rows affected.

**QUESTION 7:** Write an SQL query which returns of all crimes where the crimeid field only contains digits in all of the blocks. Moodle will require the number of rows affected.

**QUESTION 8:** Write a query which return all crime records in LSOA Bolton 022E where the location contains 'Cyril Street' and the type is Shoplifting. Moodle will require the number of rows affected.

**QUESTION 9:** Write a Select statement to rreturn all of the rows in the database which have the following criteria. The theGeom location is within 5KM of `St_GeomFromText('POINT(-2.234566 53.47924)',4326)` and the numerical total of the hour, minute and second of the crimeTS field is equal to 100. Moodle will require you to specify how many rows are affected or returned.

**QUESTION 10:** Write a select statement which returns all crimes which happened at one minute to five in the morning (ignoring the seconds) on any day of August and the crime type was Burglary. Moodle will require the number of rows affected.

**QUESTION 11:** Write a query which returns all rows in the database table which have **Isoa** and **location** with the following pattern. The **Isoa** field ends with 3 even digits followed by an upper case letter A to C (inclusive). The **location** field ends with the word 'Street'. Moodle will require the number of rows affected.