

CM3104: Large Scale Databases

Coursework – 1

Coursework Part B: Spatial Databases

Task1: Name the populated places in the district of CAERDYDD - CARDIFF that are within 100 metres of a motorway (within the region of the provided datasets).

Note: the motorway is represented by a sequence of short segments, so be careful that each populated place is only counted once.

```
SQL> select DISTINCT t.DISTNAME
  2  from CARDIFFPOPULATEDPLACES t, CARDIFFDISTRICTS t1, MOTORWAYSSOUTHWALES t2
  3  where
  4  SDO_INSIDE(t.GEOMETRY, t1.GEOMETRY) = 'TRUE'
  5  and
  6  t1.NAME = 'CAERDYDD - CARDIFF'
  7  and
  8  SDO_WITHIN_DISTANCE(t.GEOMETRY, t2.GEOMETRY, 'distance = 100') = 'TRUE';
```

DISTNAME

```
-----  
Ty-Yn-Y Berllan  
Tylamorris Lodge
```

```
SQL> select DISTINCT t.DISTNAME
  2  from CARDIFFPOPULATEDPLACES t, CARDIFFDISTRICTS t1, MOTORWAYSSOUTHWALES t2
  3  where
  4  SDO_INSIDE(t.GEOMETRY, t1.GEOMETRY) = 'TRUE'
  5  and
  6  t1.NAME = 'CAERDYDD - CARDIFF'
  7  and
  8  SDO_WITHIN_DISTANCE(t.GEOMETRY, t2.GEOMETRY, 'distance = 100') = 'TRUE';
```

DISTNAME

```
-----  
Ty-Yn-Y Berllan  
Tylamorris Lodge
```

Task2: Name the districts that share a boundary with CAERDYDD - CARDIFF and give their areas, in square kilometres, for each of them.

```
SQL> select t1.NAME, SDO_GEOM.SDO_AREA(t1.GEOMETRY, 0.005, 'unit = SQ_KM') AS "Area in
sq_km"
  2  from CARDIFFDISTRICTS t, CARDIFFDISTRICTS t1
  3  where
  4  t.NAME = 'CAERDYDD - CARDIFF'
  5  and
  6  SDO_TOUCH(t.GEOMETRY, t1.GEOMETRY) = 'TRUE';
```

| Name of Districts | Area in sq_km |
|------------------------|---------------|
| RHONDDA CYNON TAF - RH | 424.135125 |
| ONDDA CYNON TAF | |

BRO MORGANNWG - THE VA
LE OF GLAMORGAN 331.688841

CAERFFILI - CAERPHILLY 277.45317
CASNEWYDD - NEWPORT 90.7896965

```
SQL> select t1.NAME, SDO_GEOGRAPHICAL_AREA(t1.GEOMETRY, 0.005, 'unit = SQ_KM') AS "Area in sq_km"
  2  from CARDIFFDISTRICTS t, CARDIFFDISTRICTS t1
  3  where
  4  t.NAME = 'CAERDYDD - CARDIFF'
  5  and
  6  SDO_TOUCH(t.GEOMETRY, t1.GEOMETRY) = 'TRUE';

Name of Districts          Area in sq_km
-----
RHONDDA CYNON TAF - RH    424.135125
ONDDA CYNON TAF

BRO MORGANNWG - THE VA    331.688841
LE OF GLAMORGAN

CAERFFILI - CAERPHILLY   277.45317
CASNEWYDD - NEWPORT        90.7896965
```

Task3: Count the number of segments of railway line that cross the M4 motorway within the region of the provided dataset.

```
SQL> select COUNT(SDO_GEOGRAPHICAL_INTERSECTION(t.GEOMETRY, t1.GEOMETRY, 0.005)) AS
  "Number_of_Segments"
  2  from RAILWAYSSOUTHWALES t, MOTORWAYSSOUTHWALES t1
  3  where
  4  t1.NUMBER_MB = 'M4';
```

Number_of_Segments

13

```
SQL> select COUNT(SDO_GEOGRAPHICAL_INTERSECTION(t.GEOMETRY, t1.GEOMETRY, 0.005)) AS "Number_of_Segments"
  2  from RAILWAYSSOUTHWALES t, MOTORWAYSSOUTHWALES t1
  3  where
  4  t1.NUMBER_MB = 'M4';

Number_of_Segments
-----
13
```

Task4: Name the districts that have a coastal boundary and contain at least 5 railway stations, giving the numbers of railway stations for each of the districts

```
SQL> select t1.NAME as "District Names", count(t2.NAME) as "Count"
  2  from CARDIFFDISTRICTS t, COASTLINESOUTHWALES t1, STATIONSSOUTHWALES t2
  3  where
  4  SDO_TOUCH(t.GEOMETRY, t1.GEOMETRY) = 'TRUE'
  5  and
  6  SDO_CONTAINS(t.GEOMETRY, t2.GEOMETRY) = 'TRUE'
  7  group by t1.NAME
  8  having count(t2.NAME) >= 5;
```

| District Names | Count |
|---------------------------------------|-------|
| BRO MORGANNWG - THE VALE OF GLAMORGAN | 264 |
| CASNEWYDD - NEWPORT | 32 |
| PEN-Y-BONT AR OGWR - BRIDGEND | 126 |
| CAERDYDD - CARDIFF | 220 |

```
SQL> select t.NAME as "District Names", count(t2.NAME) as "Count"
  2  from CARDIFFDISTRICTS t, COASTLINESOUTHWALES t1, STATIONSSOUTHWALES t2
  3  where
  4    SDO_TOUCH(t.GEOMETRY, t1.GEOMETRY) = 'TRUE'
  5  and
  6    SDO_CONTAINS(t.GEOMETRY, t2.GEOMETRY) = 'TRUE'
  7  group by t.NAME
  8  having count(t2.NAME) >= 5;
```

| District Names | Count |
|---------------------------------------|-------|
| BRO MORGANNWG - THE VALE OF GLAMORGAN | 264 |
| CASNEWYDD - NEWPORT | 32 |
| PEN-Y-BONT AR OGWR - BRIDGEND | 126 |
| CAERDYDD - CARDIFF | 220 |

Task5: What is the total area of land, in square kilometres, that is within 5 metres of the M4 Motorway and is inside the district of CAERDYDD - CARDIFF.

```
SQL> select SUM(SDO_GEOG.SDO_AREA(SDO_GEOG.SDO_BUFFER(t1.GEOMETRY, '5', 0.05 , 'unit = M'), 0.005, 'unit = SQ_KM')) AS "Total Area in sq_km"
  2  from CARDIFFDISTRICTS t, MOTORWAYSSOUTHWALES t1
  3  where
  4    t1.NUMBER_MB = 'M4'
  5  and
  6    SDO_INSIDE(t1.GEOMETRY, t.GEOMETRY) = 'TRUE'
  7  and
  8    t.NAME = 'CAERDYDD - CARDIFF';
```

Total Area in sq_km

.151580976

```
SQL> select SUM(SDO_GEOG.SDO_AREA(SDO_GEOG.SDO_BUFFER(t1.GEOMETRY, '5', 0.05 , 'unit = M'), 0.005, 'unit = SQ_KM')) AS "Total Area in sq_km"
  2  from CARDIFFDISTRICTS t, MOTORWAYSSOUTHWALES t1
  3  where
  4    t1.NUMBER_MB = 'M4'
  5  and
  6    SDO_INSIDE(t1.GEOMETRY, t.GEOMETRY) = 'TRUE'
  7  and
  8    t.NAME = 'CAERDYDD - CARDIFF';

Total Area in sq_km
.151580976
```

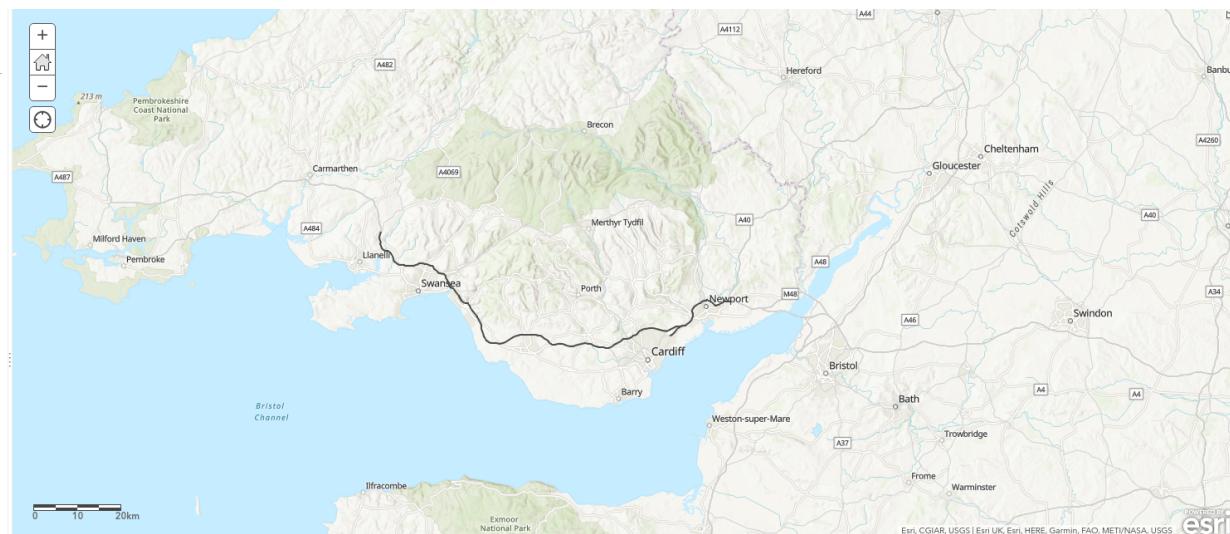
Task6: Using either QGIS or ArcGIS attempt to verify the answer that you have obtained from Question 5. Discuss the likely origin of any discrepancy between the answer that you obtain here and that from Question 5. In your answer you should also list the sequence of operations that you performed to get the solution and for each operation provide screenshots of the QGIS or ArcGIS interaction dialog. Also provide screenshots of the maps of 1) the initial two layers; 2) the layers after selection of the M4 and Cardiff District; 3) the area that is within 5 metres of the M4 motorway and that coincides with the district of Cardiff.

1. The initial two layers

Districts of Cardiff



Motorways South Wales



2. The layers after selection of the M4 and Cardiff District

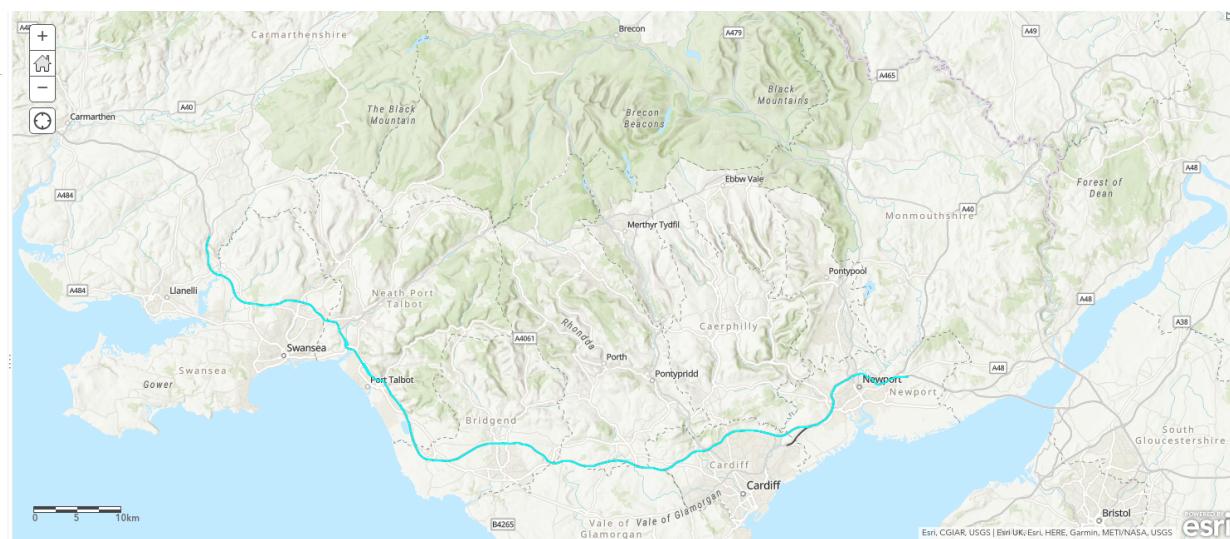
Cardiff District

Inside the blue boundary represents ‘CAERDYDD - CARDIFF’



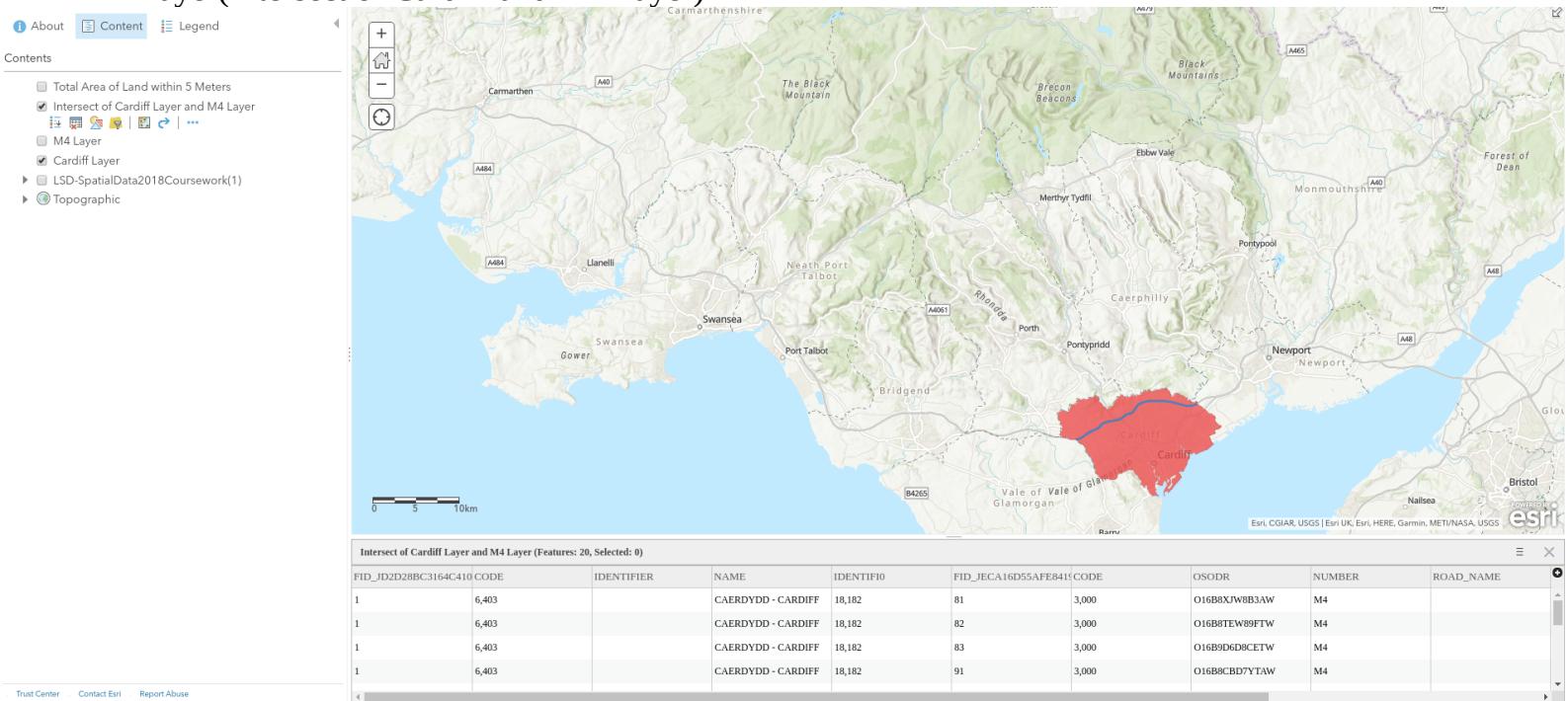
MotorwaysSouthWales – M4

Blue Lines represents ‘M4’

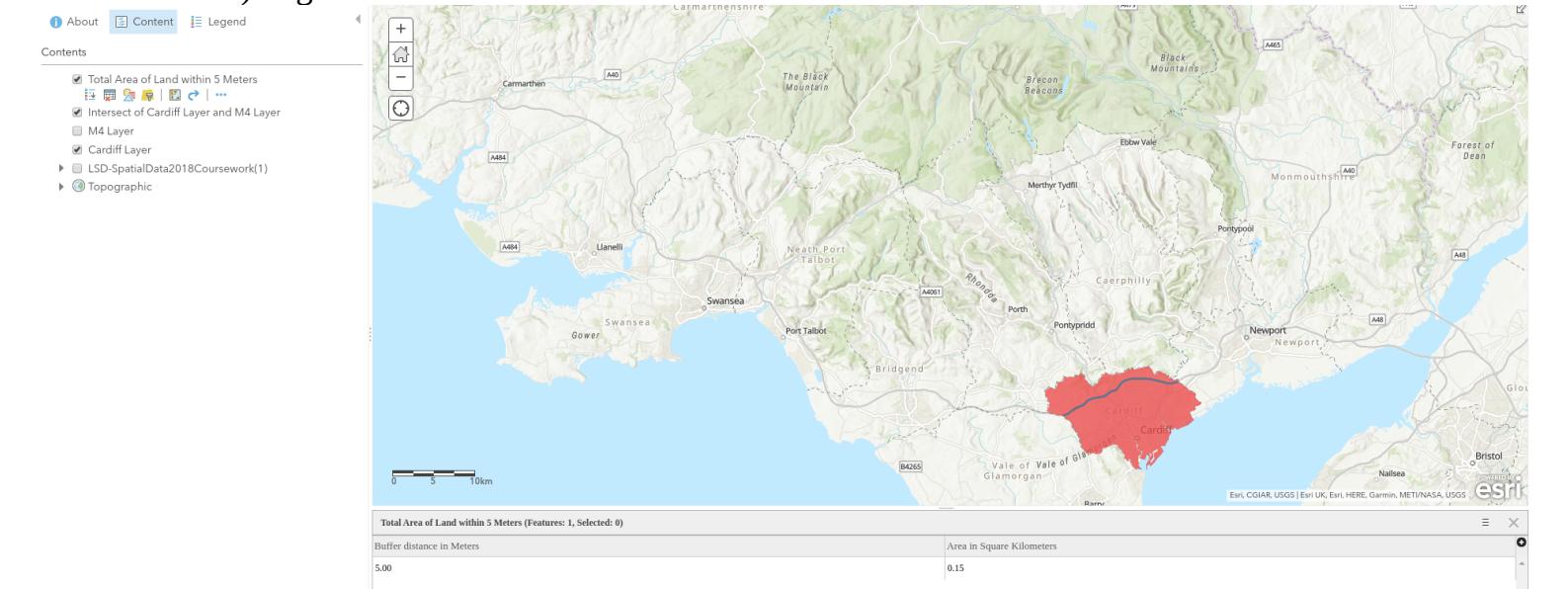


3. The area that is within 5 metres of the M4 motorway and that coincides with the district of Cardiff

Combined two layers - Cardiff & M4 layers by using overlay method (Intersect) into one layer(Intersect of Cardiff and M4 Layer)



Created buffer on new layer(Intersect of Cardiff and M4 Layer) with condition (i.e within 5 metres) to get the Total Area of Land within 5 metres.



Total Area of Land within 5 metres of the M4 motorway and inside the Cardiff = **0.15 km²** .

In the Question 5, I obtained **0.151580976 km²** as the total area of the land, that is within 5 metres of the M4 Motorway and is inside the district of CAERDYDD – CARDIFF but In the ArcGIS, I obtained **0.15 km² (rounded to nearest 2 decimal places)**.

In the Question 5, I used SUM, SDO_AREA, SDO_BUFFER together as a statement and SDO_INSIDE as a condition to get the result whereas In ArcGIS, I used two layers – Cardiff & M4 layers and combined those layers by using overlay method (Intersect) into one layer(Intersect of Cardiff and M4 Layer) and then I created buffer on new layer with condition (i.e within 5 metres) to retrieve the result.
