

OSM Geo-Processing

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Will automated rules based processes improve quality?


Some Research Questions



Will formal QA increase confidence/authority?



Will improved QA & confidence & ease of access increase contribution?



Can “professional” contributors be “motivated” to fill in gaps?



What benefits arise from conflating OSM with national map data?

3 Phases



Set up infrastructure and web services



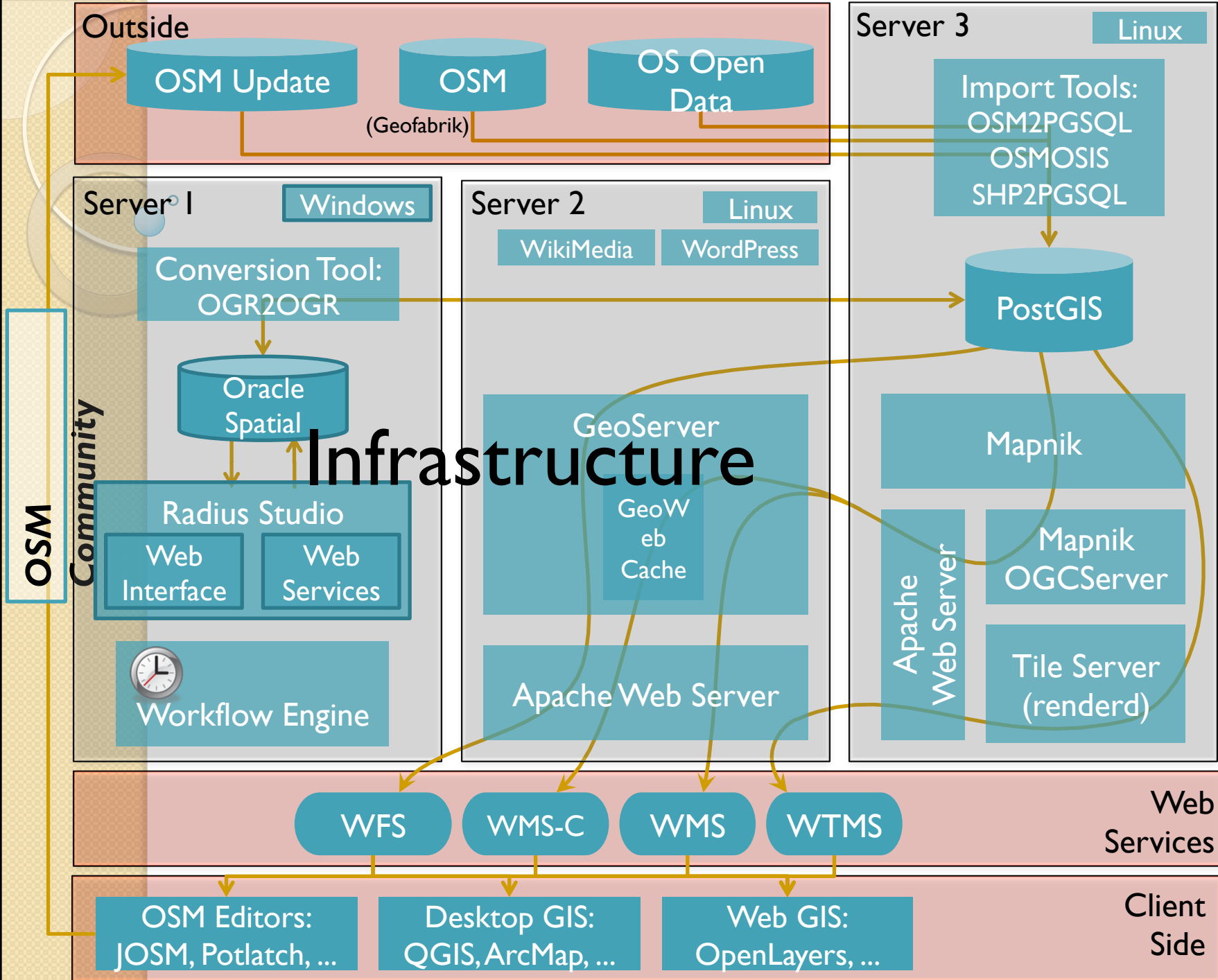
Develop rules based improvements
& Public sector use cases



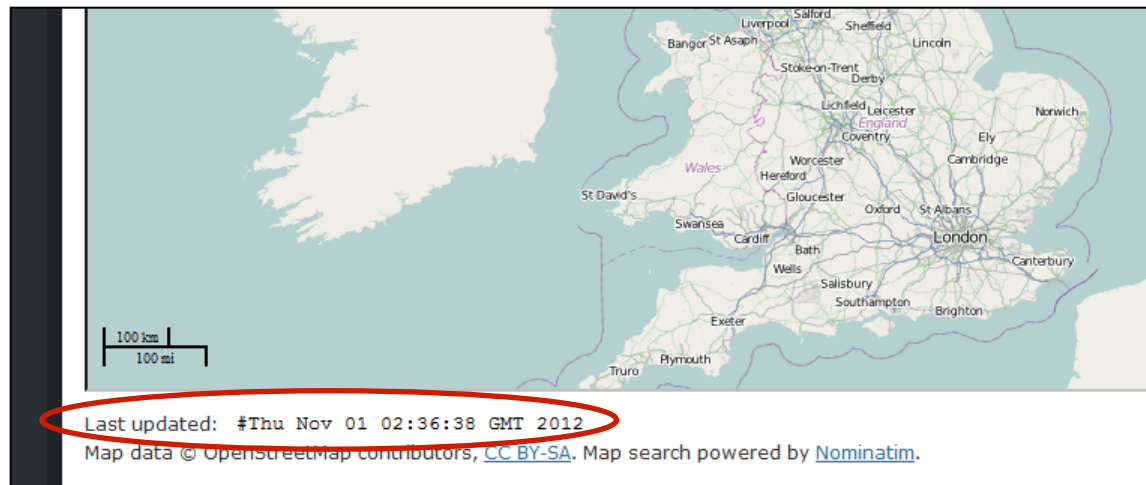
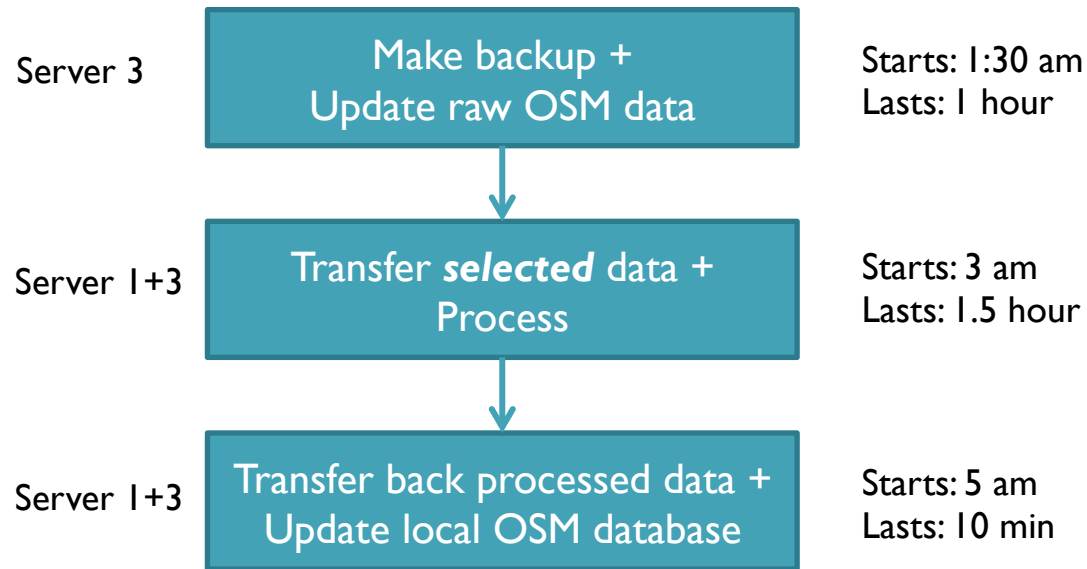
Explore conflation with National Maps

System Design

- Setting: OSM in Great Britain
- National Maps from Ordnance Survey (OS) Open Data
 - VMD (Vector Map Data) + Meridian-2
- Initial user group meeting + user discussions
- Professional Users' Requirements
 - Raster and Vector Maps
 - Coordinate Reference System
 - OGC Compliance
 - Consistent Access to National Open Maps
 - Multiplicity of Layers
 - Frequent Updates
 - Quality Check and Fix
- Orchestration between the available resources
 - OSM ingestion
 - Radius Studio
 - Databases
 - Open-source tools
 - Web resources and open data



Daily (or Nightly) Update



Optimized Update

- Apply changes-only updates from OSM Replication [Website](#) (daily)
 - Saves about 2hours daily
- Apply rules/fixes on “selected” features instead of processing all OSM.
 - All the buggy features from yesterday
 - And all features in their proximity (currently 20m)
 - Newly added/changed features
 - And all features in their proximity (currently 20m)
 - Saved time depends on rule-base (currently saving 2 days for each processing round)

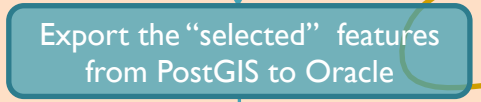
Data Update Workflow



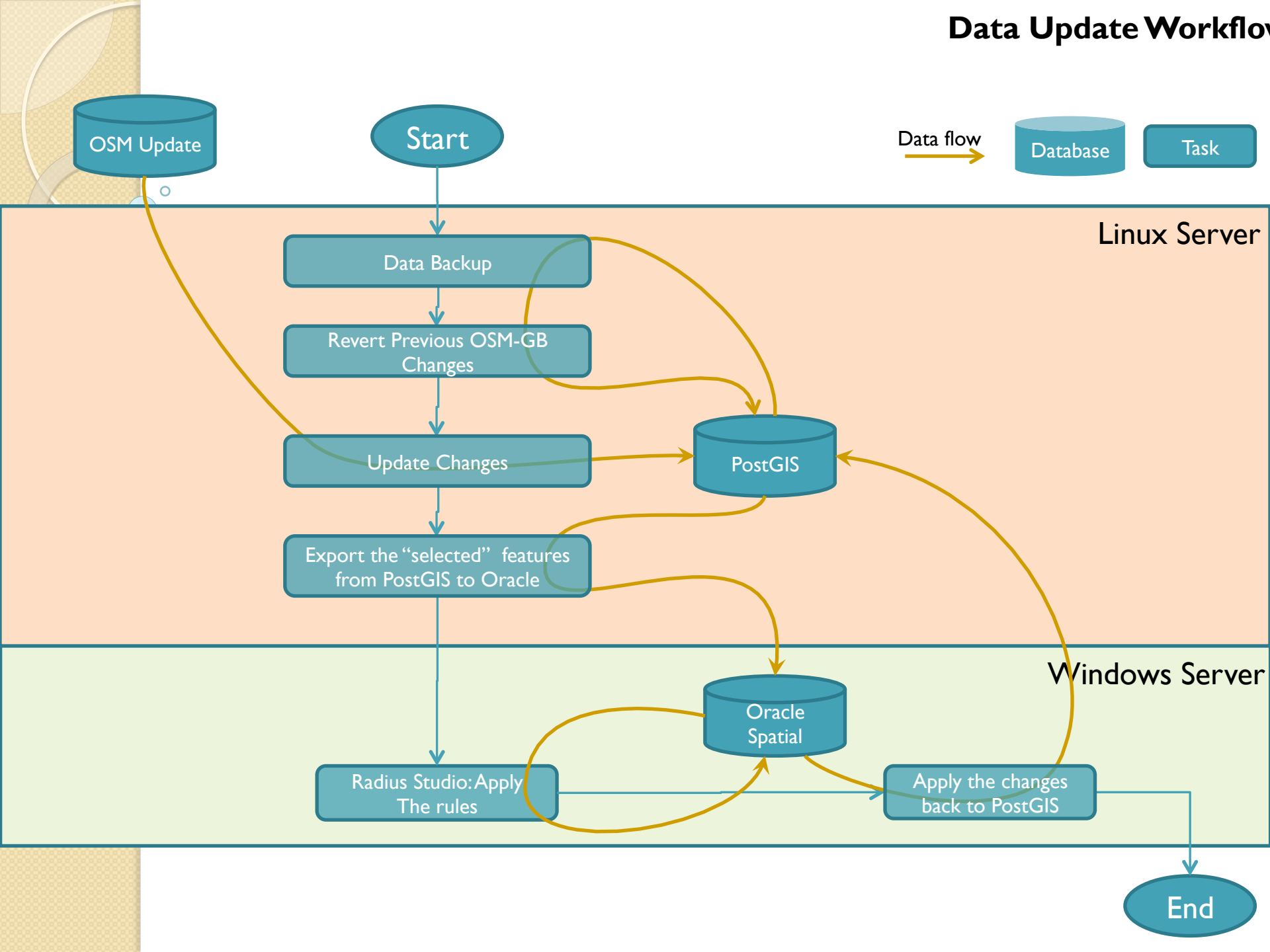
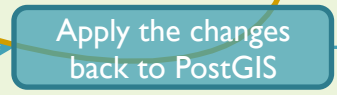
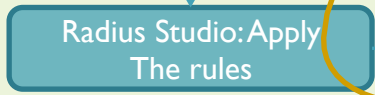
Data flow →



Linux Server



Windows Server



OGC Web Services

- WMS

- Layers

- Land (5 sub-layers)
 - Water (12 sub-layers)
 - Buildings (7 sub-layers)
 - Power (3 sub-layers)
 - Boundaries (4 sub-layers)
 - Transportation (38 sub-layers)
 - Places (11 sub-layers)
 - Amenities (6 sub-layers)

- WMTS

- 256x256 flatten tiles in png

- WFS

- Separated by Points, Lines and Polygons
 - Serving geometry + attributes

- WMSC

- Quick WMS service (single layer)

- WMS/WFS for Bugs

- Serving the detected bugs (Points, Lines and Polygons)

- WFS for OS OpenData

- VMD (20 layers)
 - Meridian-2 (19 layers)
-

- CRS

- British National Grid (EPSG:27700)
 - Lat/long (EPSG:4326)
 - Google Mercator (EPSG:900913)

- Vector Formats:

- GML 2, GML 3.1, GML 3.2, GeoJSON, ShapeFile and CSV

- Raster Formats:

- png, pdf, kml, kmz, geotiff8, gif, jpeg, png8, svg, tiff, tiff

- Tested on

- OpenLayers
 - QGIS
 - ArcMap
 - Mapinfo
 - Cadcorp

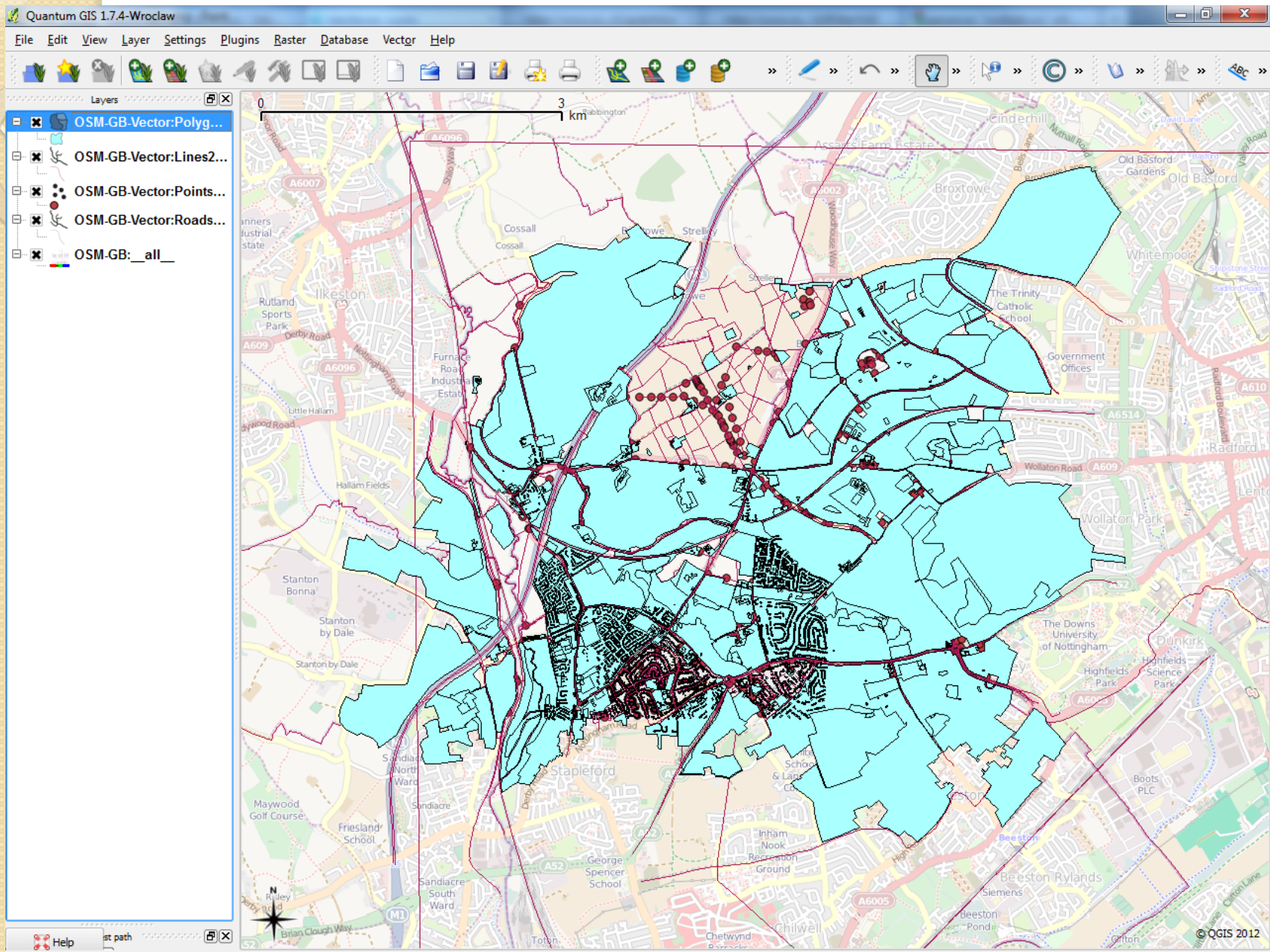
Multi-layered WMS in Desktop GIS - ArcMap

The screenshot shows the ArcMap interface with the following components:

- Table Of Contents (Layers):**
 - All layers - flat
 - Amenities
 - Places
 - Transportation
 - Boundaries
 - Power
 - Buildings
 - OSM-GB:Buildings
 - House numbers
 - House names
 - citywalls
 - castle_walls
 - builtup - medium zoom
 - Buildings - medium zoom
 - Buildings - high zoom
 - Water
 - Land
 - OSM-GB:Land
 - World Boundaries
 - landuse_overlay
 - landcover_line
 - Land cover - high zoom
 - Coastline polygons - high zoom

- Map View:** A map of the Midlands region in the UK, showing major cities like Nottingham, Derby, Leicester, and Lichfield. The map is overlaid with various layers, including buildings (orange and grey polygons), water (blue lines and areas), and land cover (green and brown areas). A scale of 1:319,704 is displayed at the top.
- Bottom Status Bar:** Shows the coordinates -1.867 52.536 Decimal Degrees.

Using WMS/WFS in QGIS



Using WMS/WFS in QGIS

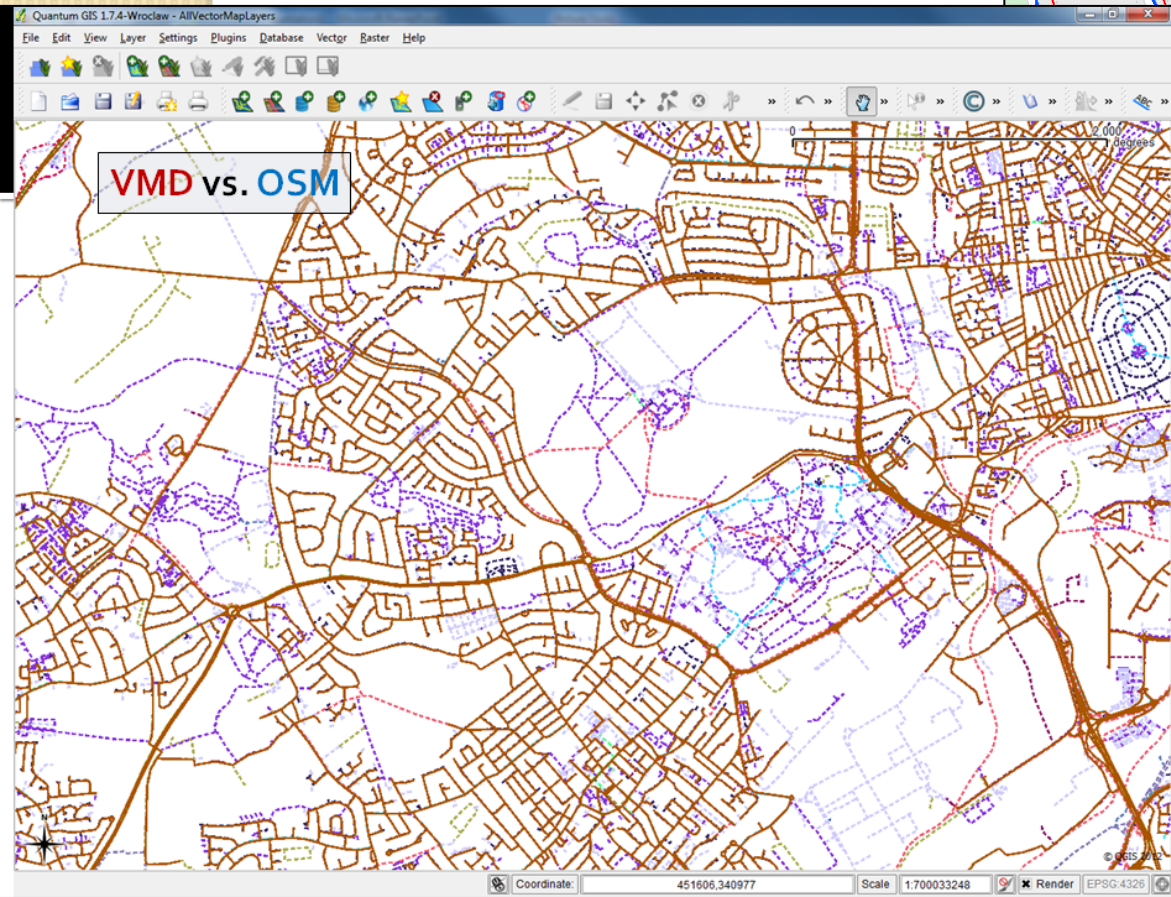
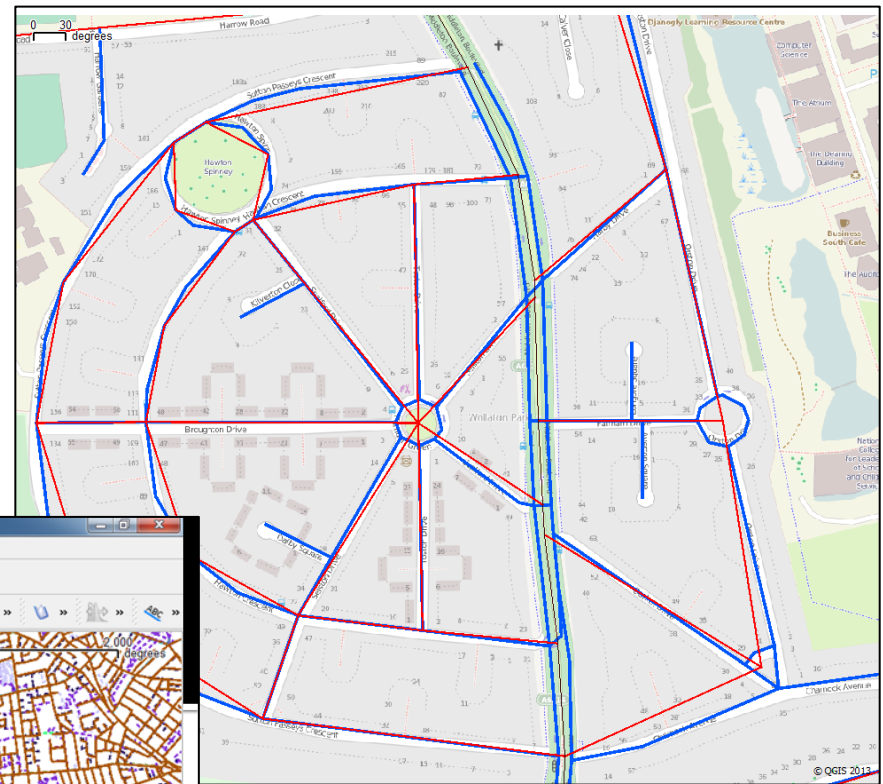
The screenshot shows the QGIS 1.7.4-Wroclaw interface. The main map area displays a vector map with green buildings and pink roads. A scale bar at the top left indicates 0 to 30 meters. The 'Layers' panel on the left lists several layers: OSM-GB-Vector:Polyg..., OSM-GB-Vector:Lines2..., OSM-GB-Vector:Points..., OSM-GB-Vector:Roads..., and OSM-GB: _all_. An 'Identify Results' dialog box is open in the center, showing a table of features and their values. The table has two columns: 'Feature' and 'Value'. The 'Feature' column lists various OSM tags, and the 'Value' column shows the corresponding values for those tags. The 'house' feature has a value of 'house', and the 'housenumber' feature has a value of '5'. The dialog box also has 'Close' and 'Help' buttons.

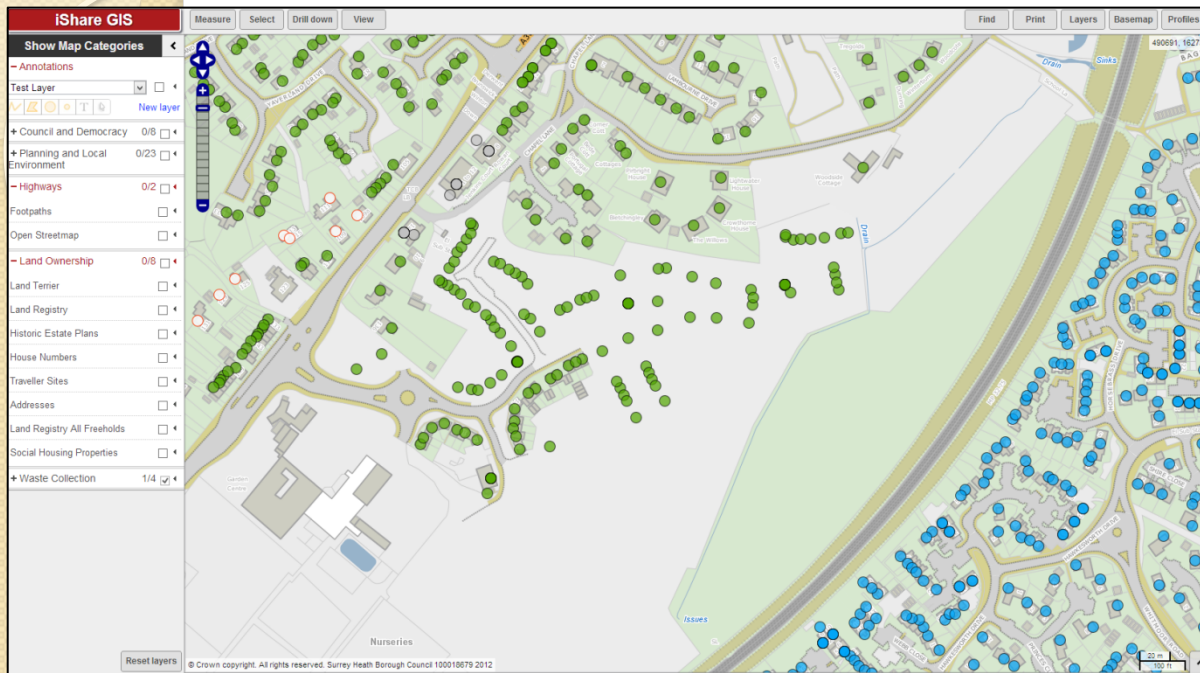
Feature	Value
bicycle	
boundary	
bridge	
building	house
construction	
cutting	
disused	
embankment	
flataddress	
foot	
highway	
historic	
horse	
housenumber	5
junction	

WFS for VMD

WFS for Meridian-2

WMS (OpenStreetMap)

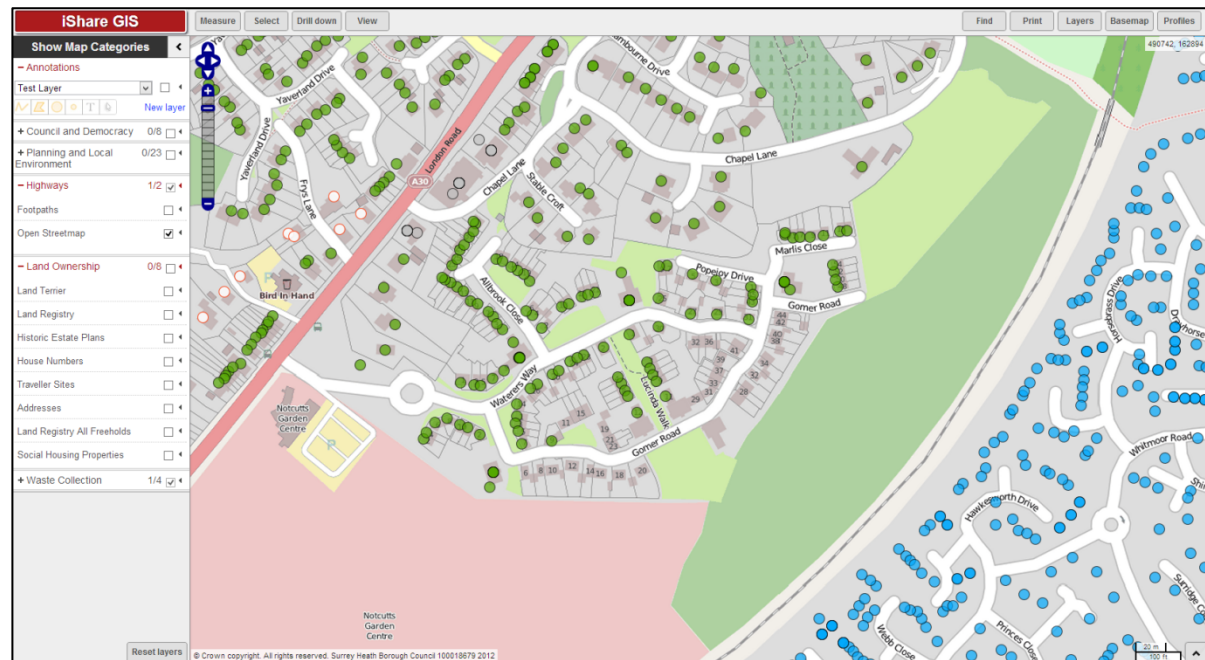




**Web Services;
Professional
Uptake**
(thanks to James Rutter)

Waste collection
points on top of
MasterMap

Waste collection
points on top of
OSMGB WMS





RULES AND BUG DETECTION

Rules

- Self Detection
 - Geometry bugs - Topological inconsistencies
 - Attribute bugs - Conceptual inconsistencies
 - Geometry/Attribution bugs
- OSM Community
 - Non-standard attributes (taken from taginfo)
- Differences with reference maps (OS VMD)
 - Mismatched features
 - Missing features

Rule-base

Lines

Dead-ended one-way	301	
Different-layer joint	1466	
Geometry/Kickback	404	being fixed
Geometry/Spike	1413	being fixed
Intersection without junction	36940	
Invalid motorway connection	41	
Mismatched road name	2427	fixes - currently suspended
Mismatched road ref	366	fixes - currently suspended
Non-standard amenity tag	419	
Non-standard building tag	733	
Non-standard highway tag	987	
Null road name	1876	being fixed
Null road ref	1059	being fixed
Overlapping roads	637	
Self-intersected line	22178	
Un-tagged bridge	343	
Unclosed Area	2651	
Wrong-level bridge	646	
Wrong-level tunnel	200	
Sum (19)	75087	

Rule-base – cont.

Polygons

Doubled place	3317	
Geometry/Kickback	34	being fixed
Geometry/Spike	1581	being fixed
Non-standard amenity tag	1931	
Non-standard building tag	20510	
Non-standard highway tag	5249	
Overlapping Buildings	9736	
Ways intersecting Buildings	6876	
Sum (8)	49234	

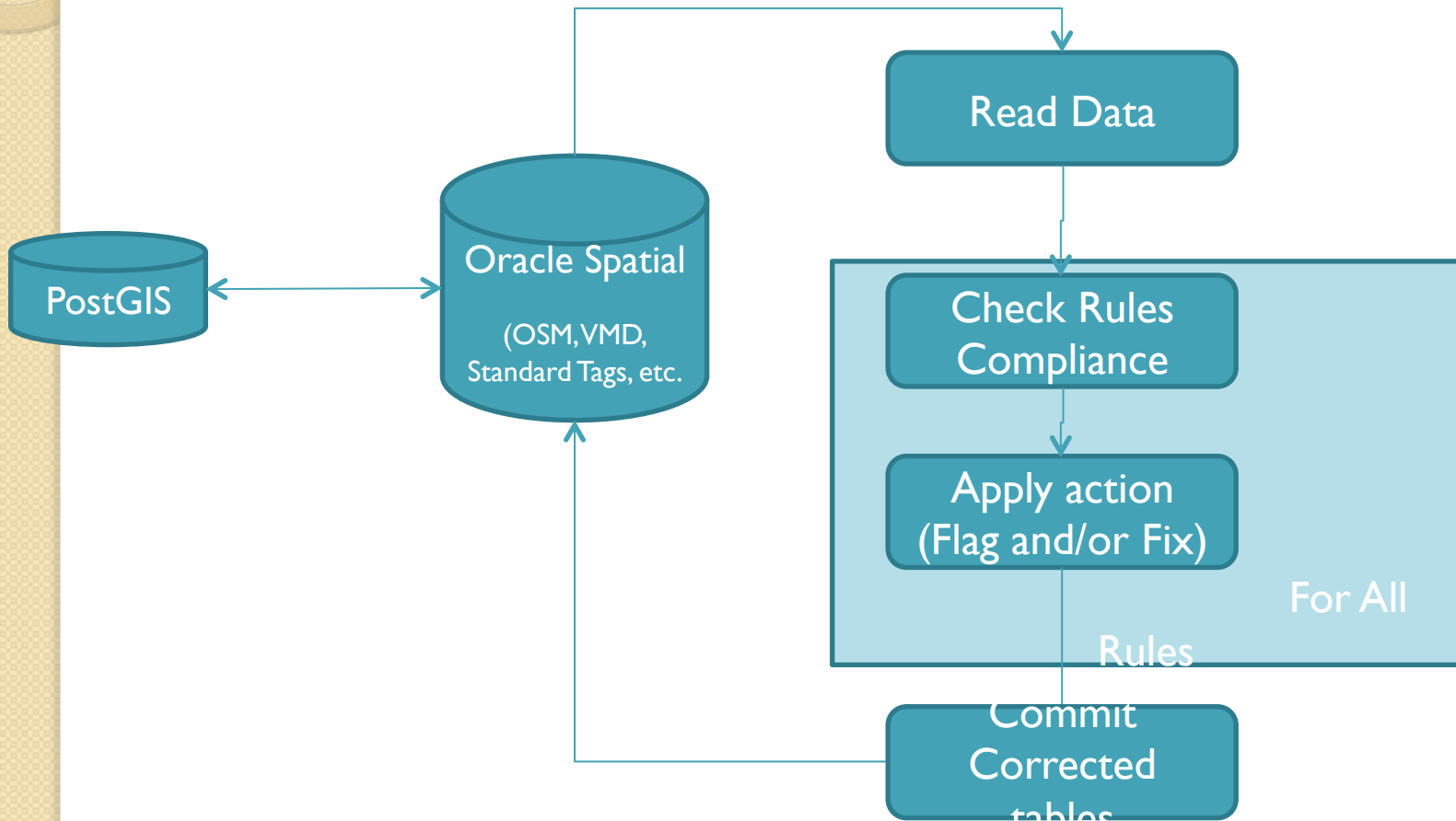
Points

Non-standard amenity tag	3706	
Non-standard building tag	14865	
Non-standard highway tag	3480	
Sum (3)	22051	

Summary

OS Missing/Mismatches	5728	
Geometry autocorrections	3432	
Invalid geometry detection	22178	
Overlapping roads/buildings	17249	
Attribution issues	7458	
Road connection issues	38447	
Non-standard tags	51880	
Sum (30)	146372	

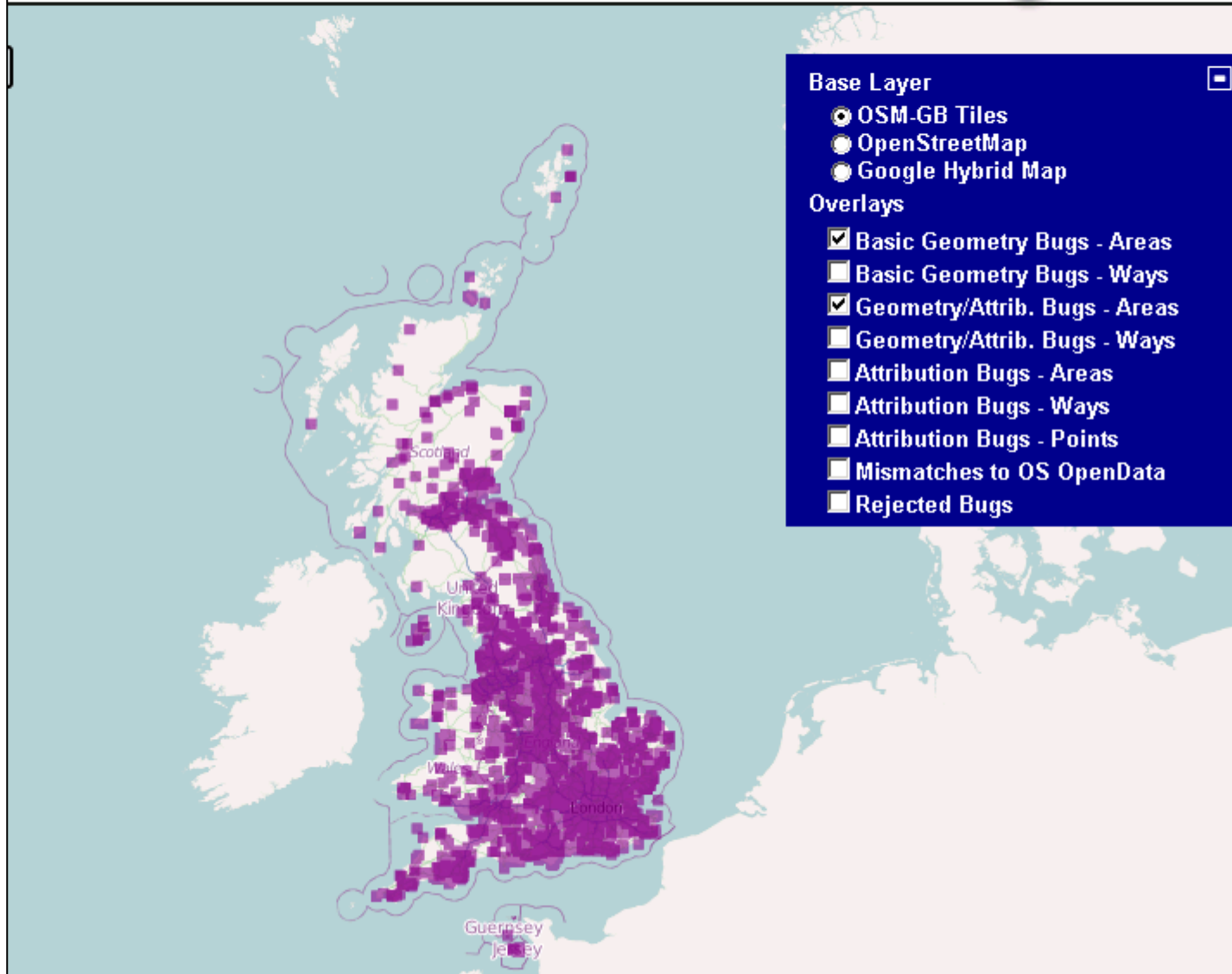
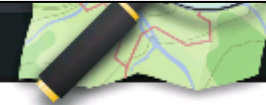
Radius Studio Implementation



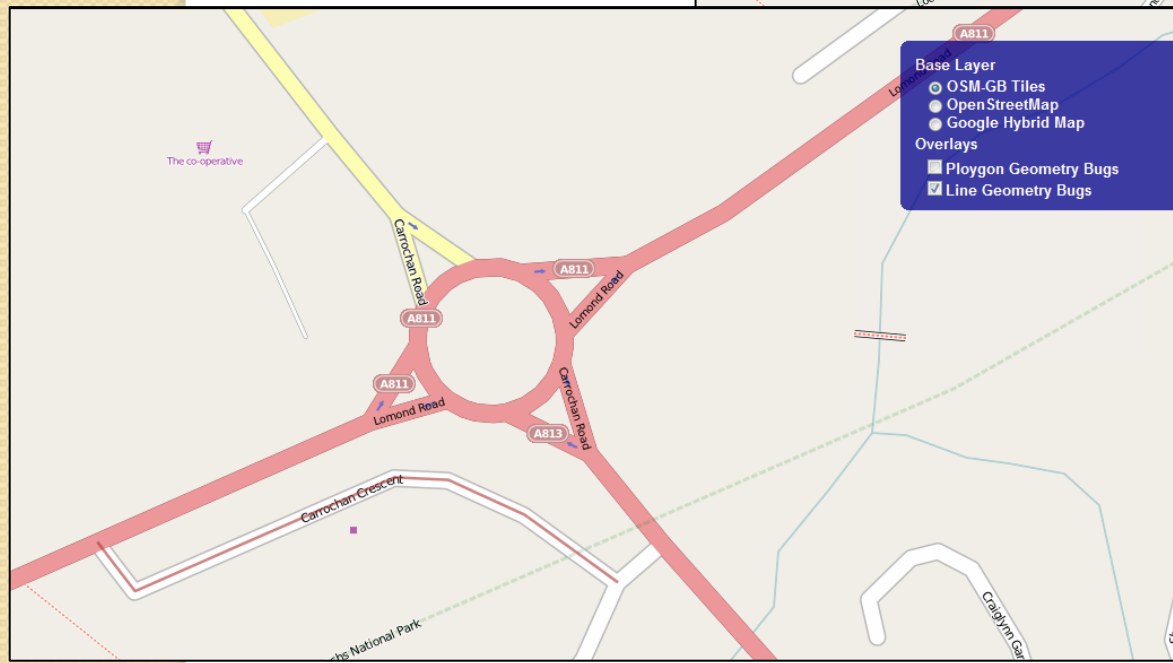
Bug Layers

Web Services

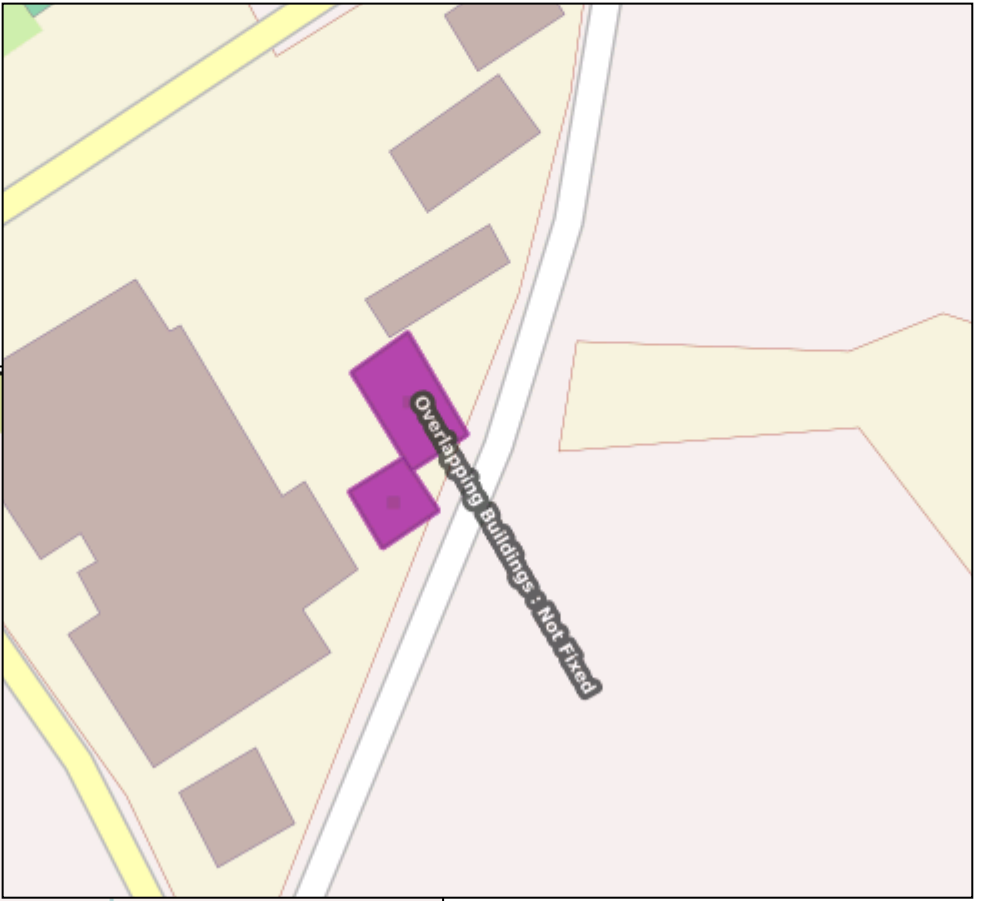
Search



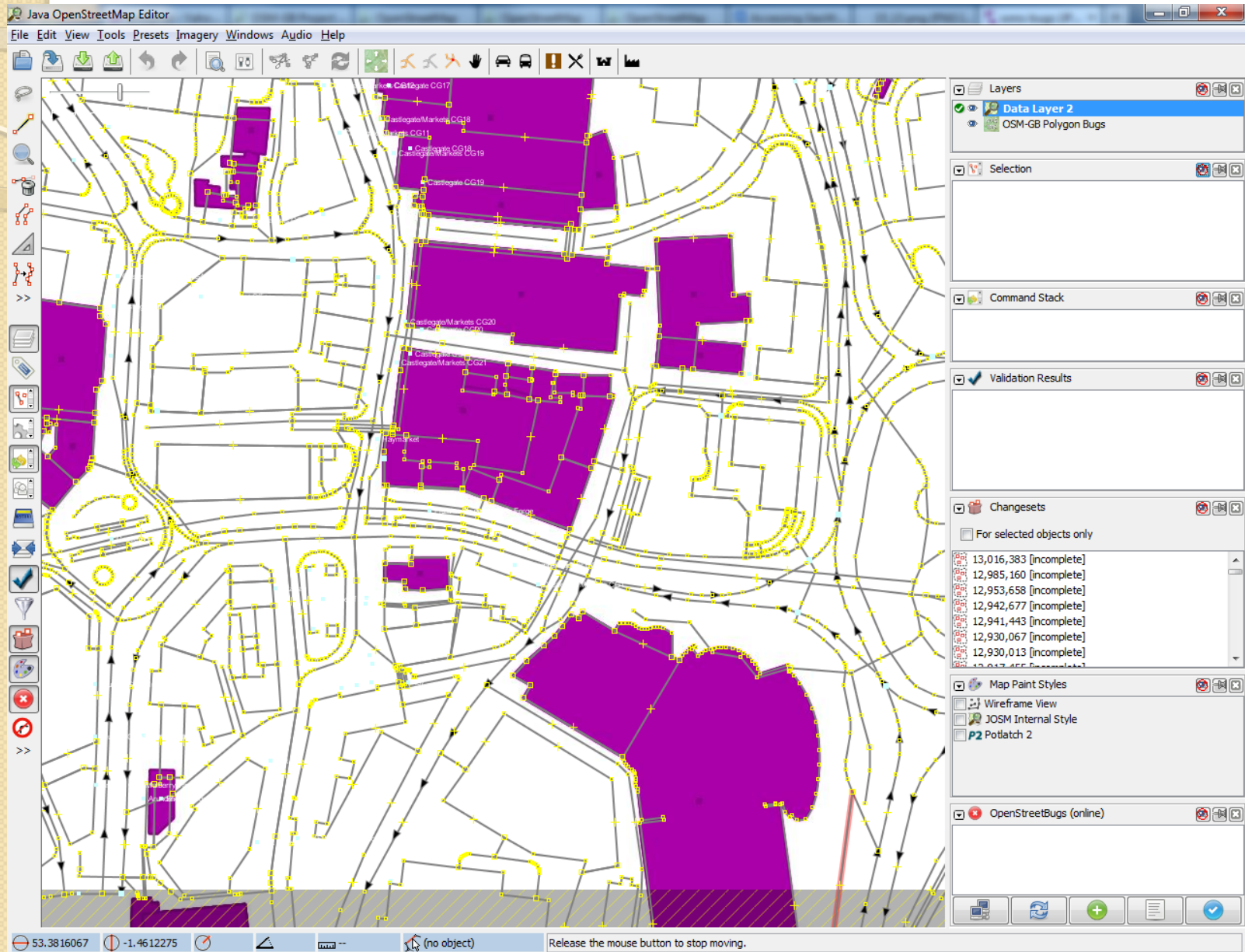
Bug Layers (Fixed)



Bug Layers (Not Fixed)



In JOSM: Bug layers for instant corrections



Non-Standard tagging (?)

The screenshot shows a map of Nottingham with several tagging errors highlighted in black boxes. The errors include:

- (building=yes) Not fixed.
- (building=entrance) Not fixed.
- (amenity=well) Not fixed.
- (building=entrance) Not fixed.
- (amenity=medical_centre) Not fixed.
- (building=office) Not fixed.
- (amenity=crossing) Not fixed.
- (l(building=entrance) Not fixed.
- (highway=steps) Not fixed.
- (nignway=steps) Not fixed.
- (building=yes) Not fixed.

Other map features include Nottingham University, Theatre Royal, Old Market Square, Lace Market, AMF Bowling, and various streets like Station Street and Lower Pavement Street. A 'View in OSM' button is visible in the top left corner.

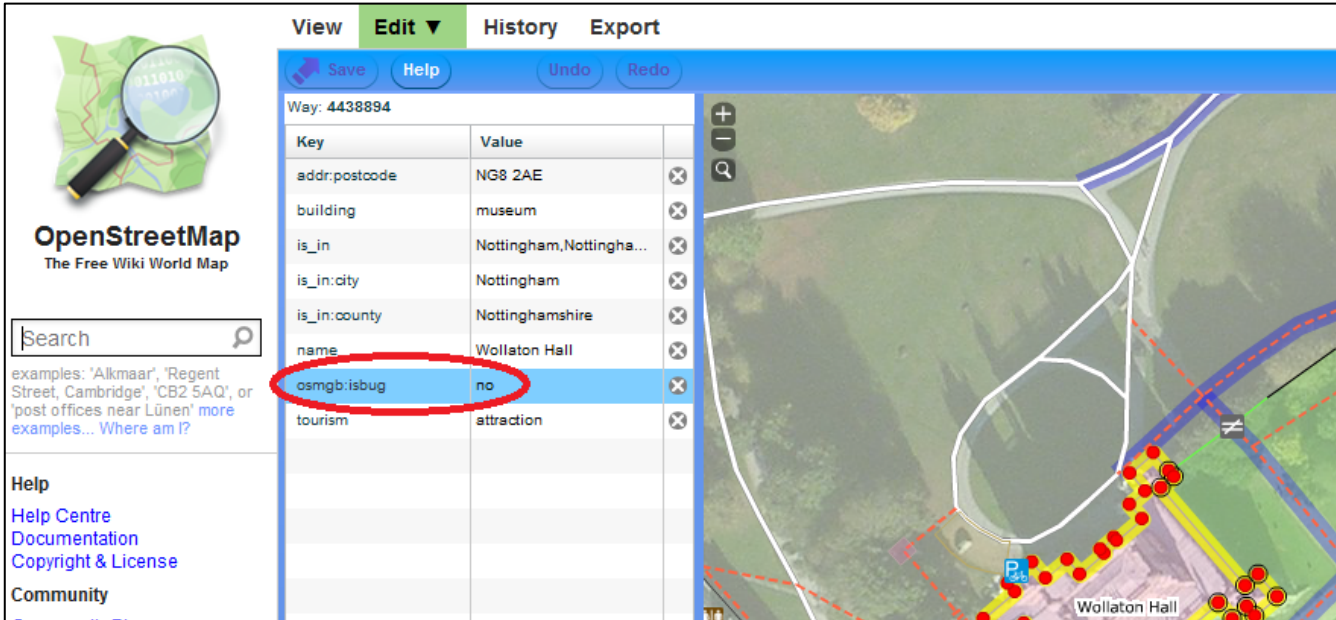
- Base Layer**
 - OSM-GB Tiles
 - OpenStreetMap
 - Google Hybrid Map
- Overlays**
 - Basic Geometry Bugs - Areas
 - Basic Geometry Bugs - Ways
 - Geometry/Attrib. Bugs - Areas
 - Geometry/Attrib. Bugs - Ways
 - Attribution Bugs - Areas
 - Attribution Bugs - Ways
 - Attribution Bugs - Points
 - Mismatches to OS OpenData

The inset map shows Wollaton Hall, a large purple building. Two tagging errors are highlighted in black boxes:

- (building=museum) Not fixed.
- (building=museum) Not fixed.

<http://taginfo.openstreetmap.org/>

OSMGB:isbug tag



OpenStreetMap
The Free Wiki World Map

Search

examples: 'Alkmaar', 'Regent Street, Cambridge', 'CB2 5AQ', or 'post offices near Lünen' more examples... Where am I?

Help
[Help Centre](#)
[Documentation](#)
[Copyright & License](#)

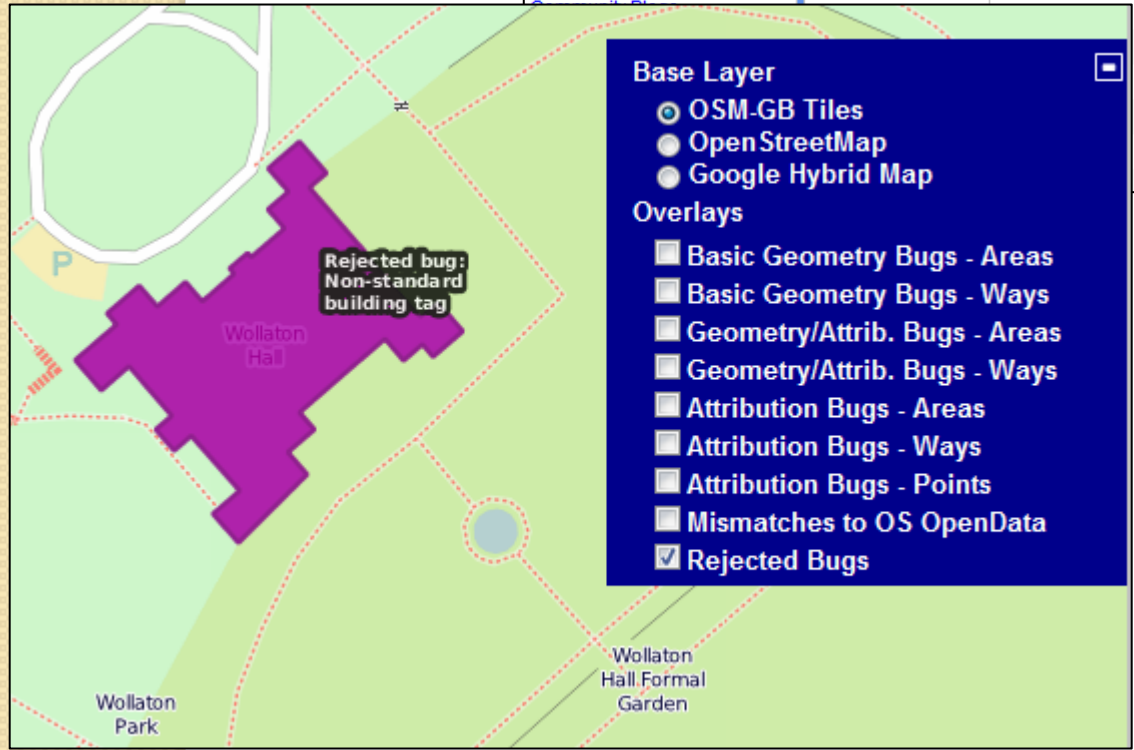
Community

View Edit History Export

Save Help Undo Redo

Way: 4438894

Key	Value	
addr:postcode	NG8 2AE	✕
building	museum	✕
is_in	Nottingham,Nottingha...	✕
is_in:city	Nottingham	✕
is_in:county	Nottinghamshire	✕
name	Wollaton Hall	✕
osmgb:isbug	no	✕
tourism	attraction	✕



Rejected bug:
Non-standard
building tag

Wollaton Hall

Wollaton Park

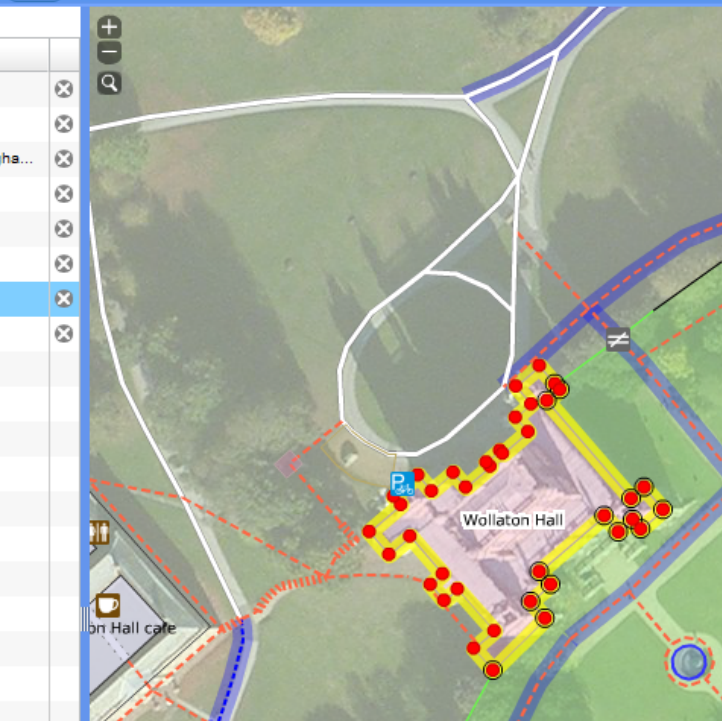
Wollaton Hall Formal Garden

Base Layer

- OSM-GB Tiles
- OpenStreetMap
- Google Hybrid Map

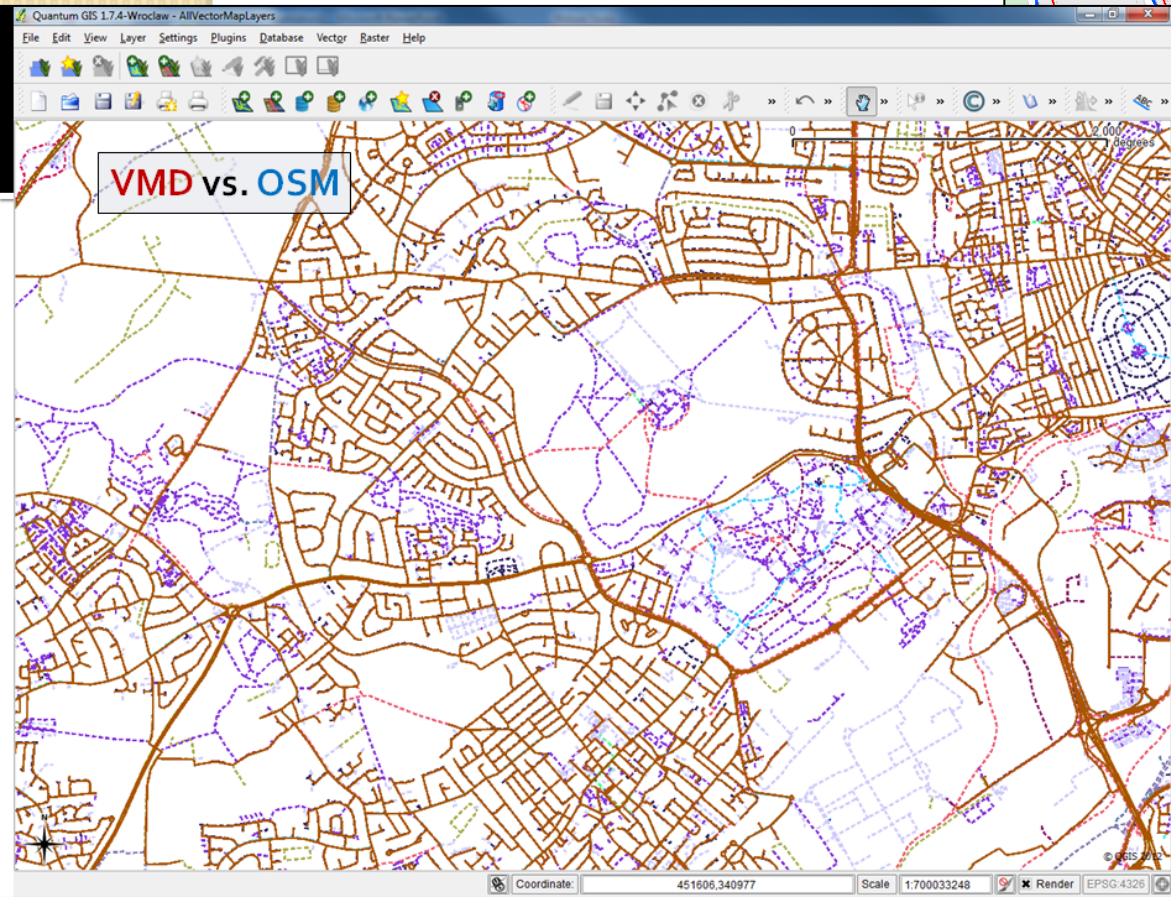
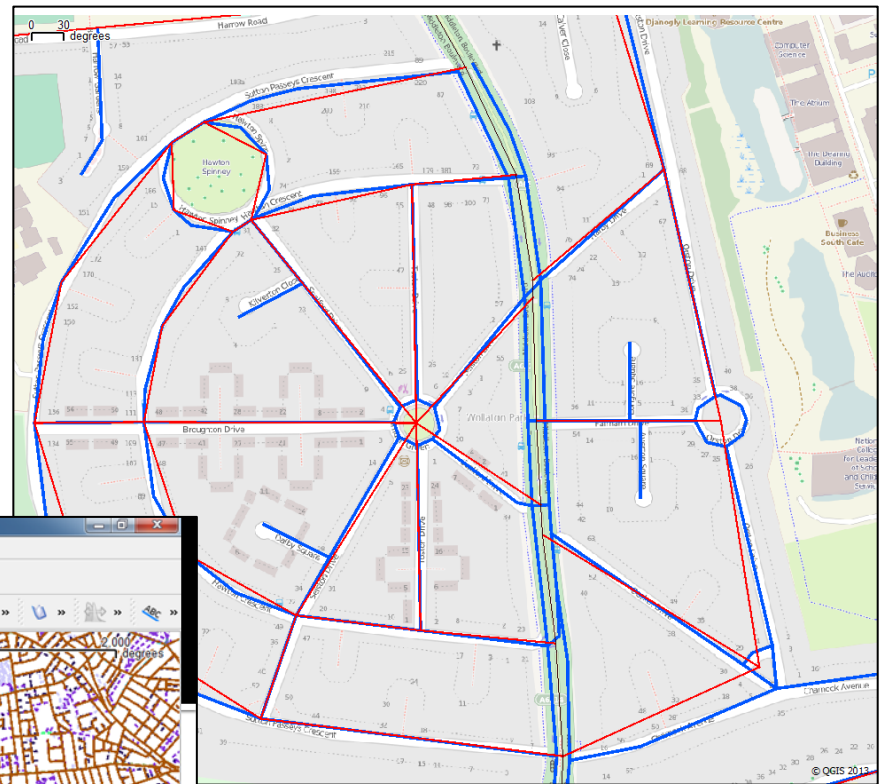
Overlays

- Basic Geometry Bugs - Areas
- Basic Geometry Bugs - Ways
- Geometry/Attrib. Bugs - Areas
- Geometry/Attrib. Bugs - Ways
- Attribution Bugs - Areas
- Attribution Bugs - Ways
- Attribution Bugs - Points
- Mismatches to OS OpenData
- Rejected Bugs

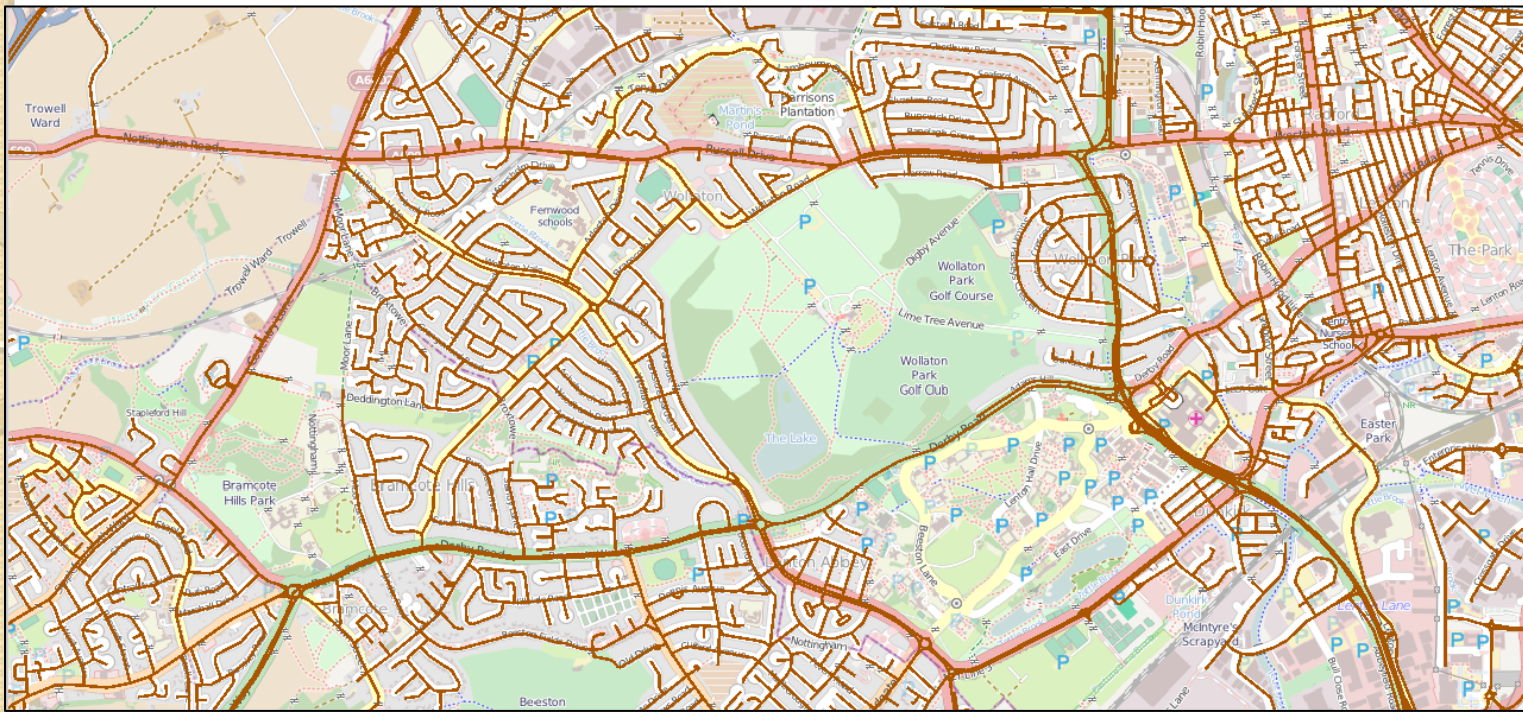


OSM vs. National Maps - Conflation

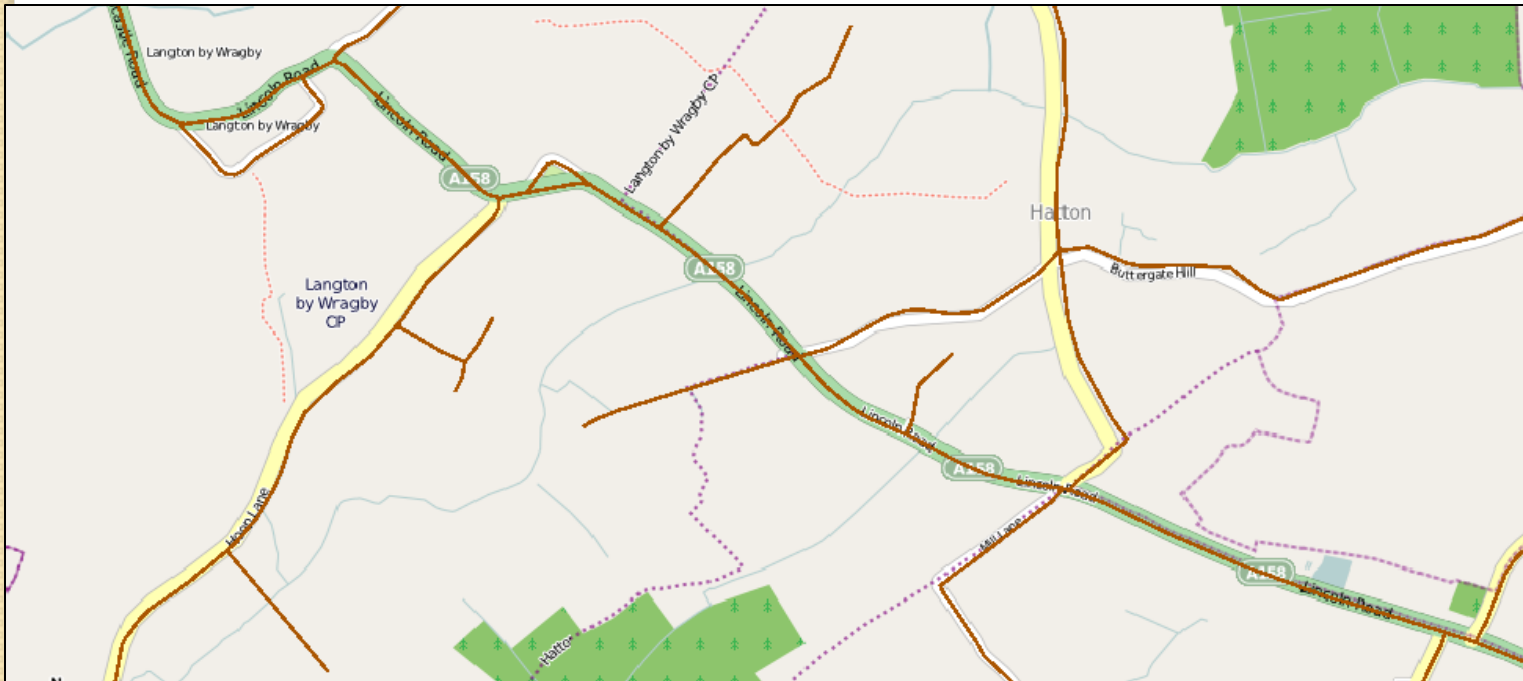
VectorMap District vs. Meridian-2 vs. OpenStreetMap



VMD vs. OSM

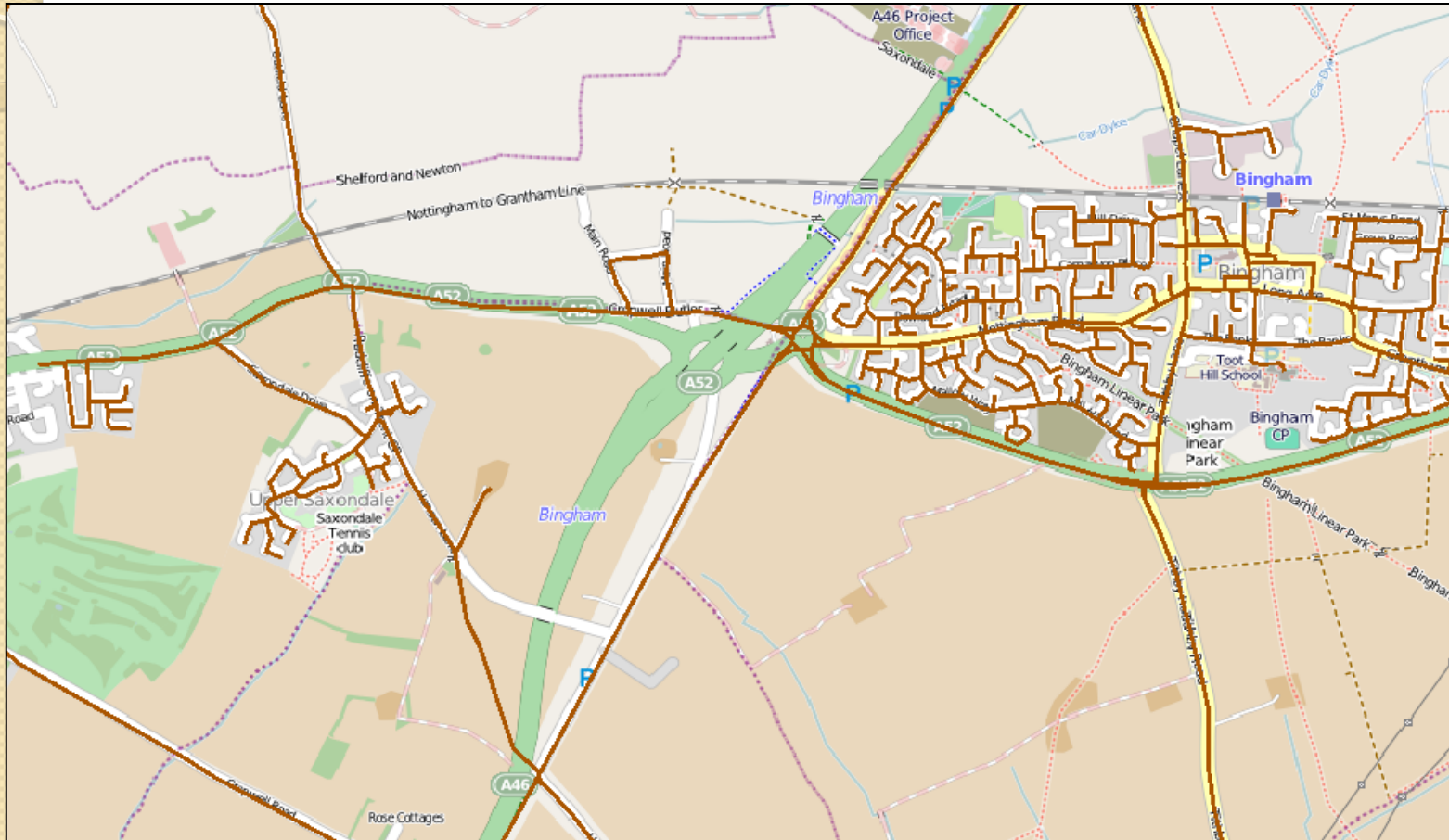


Urban

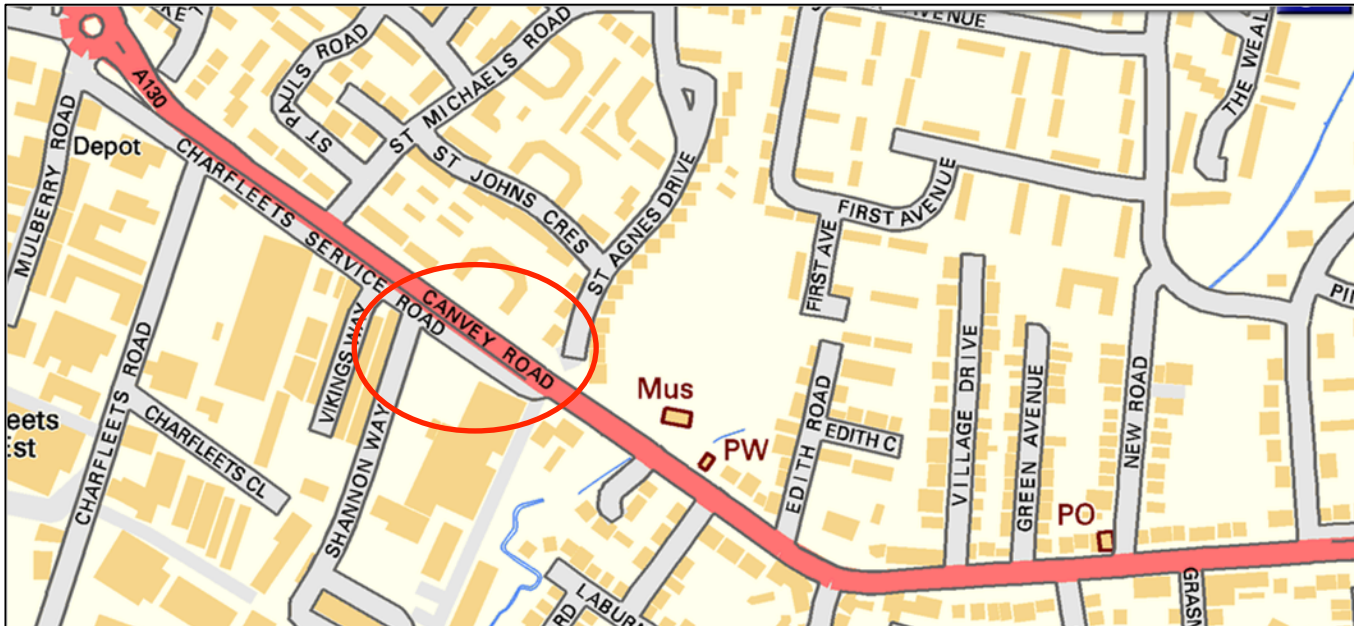
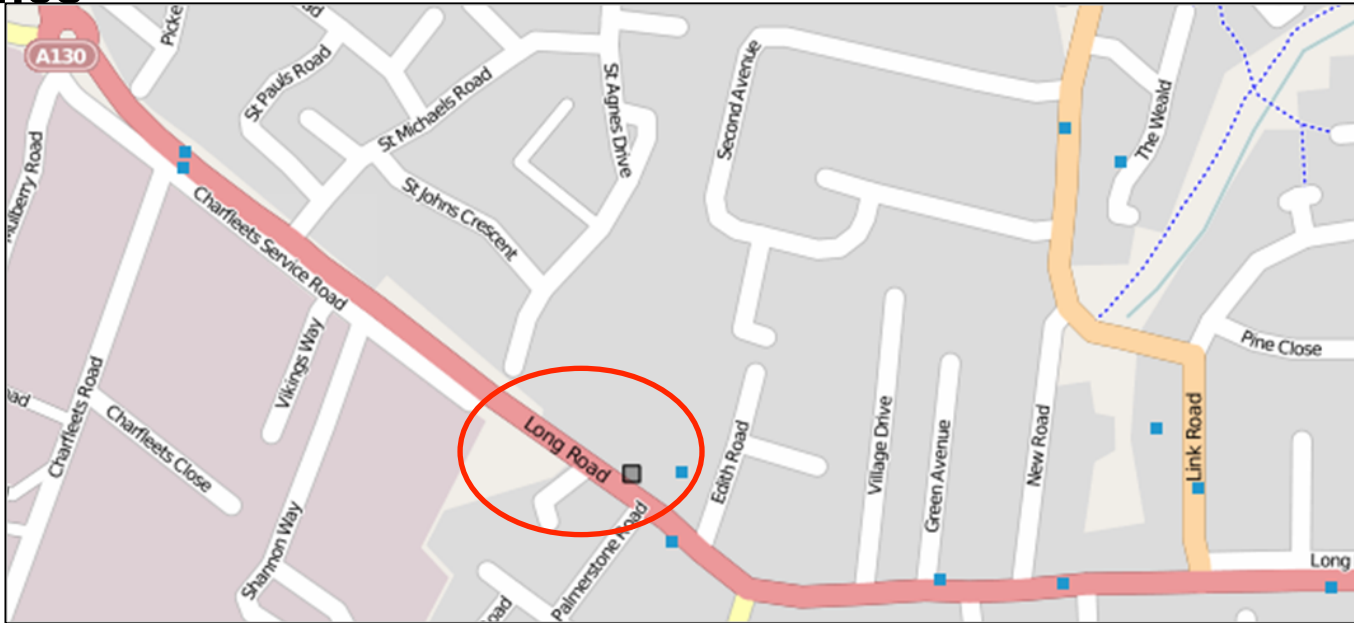


Rural

VMD vs. OSM: Update Delays



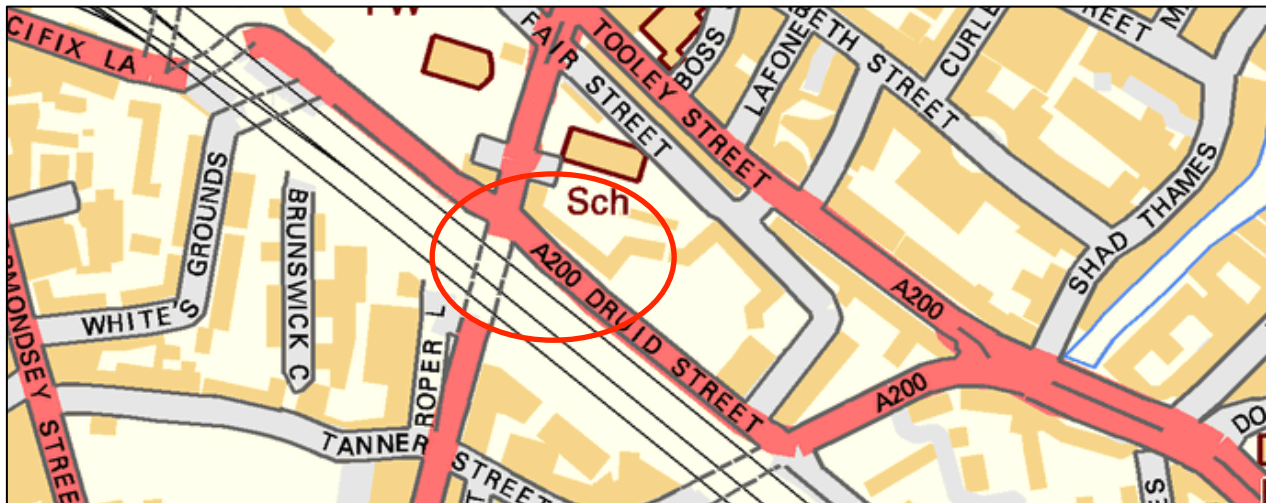
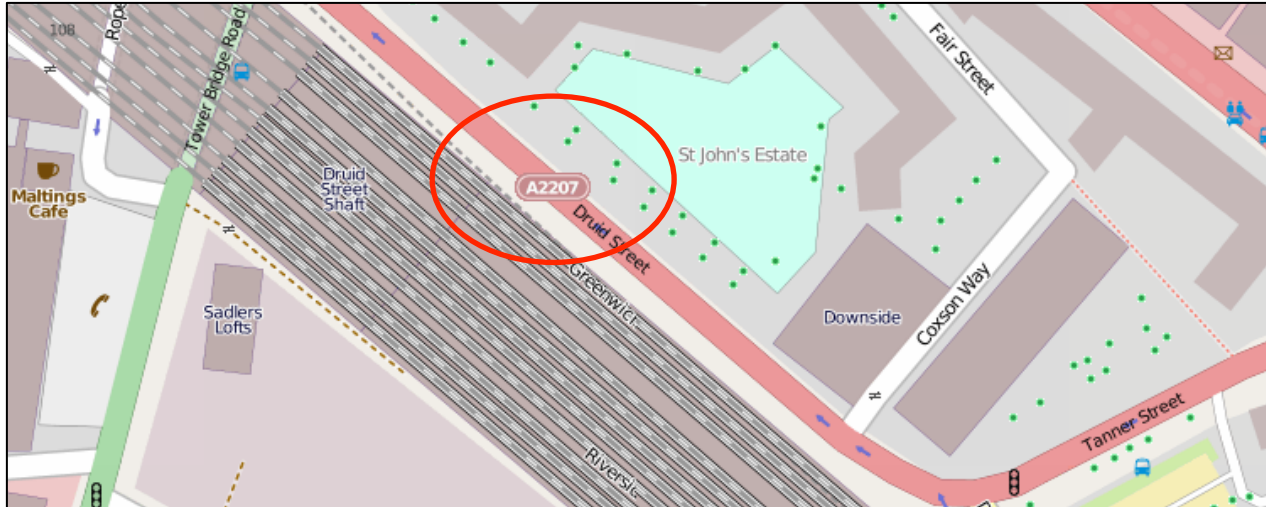
VMD vs. OSM: Road Names



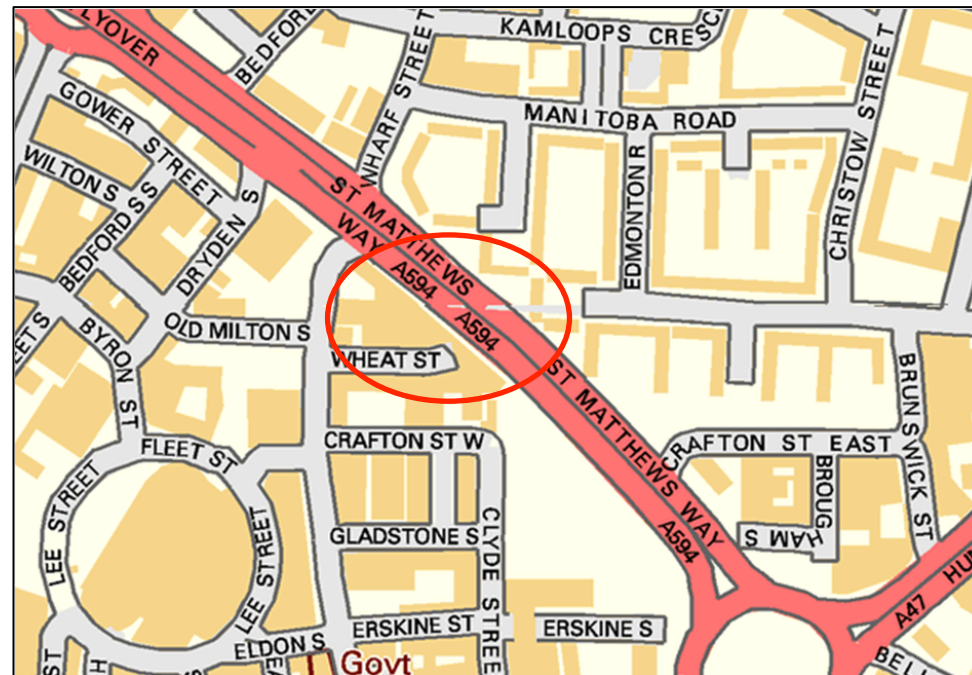
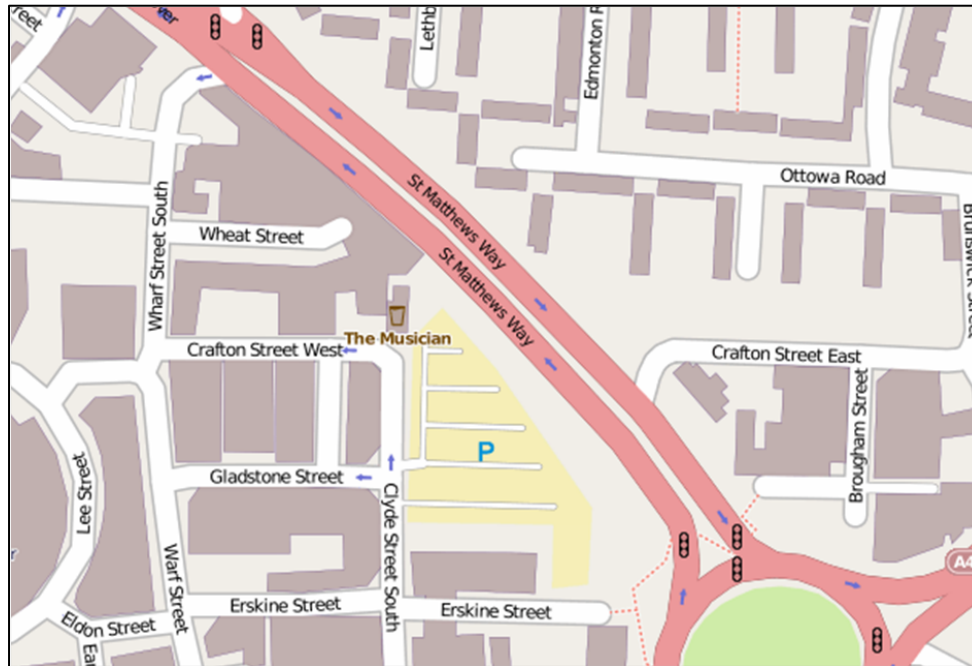
VMD vs. OSM: Road Names



VMD vs. OSM: Road Codes



VMD vs. OSM: Road Codes




VMD vs. OSM: Road Names/Code Differences

OSM-GB Project

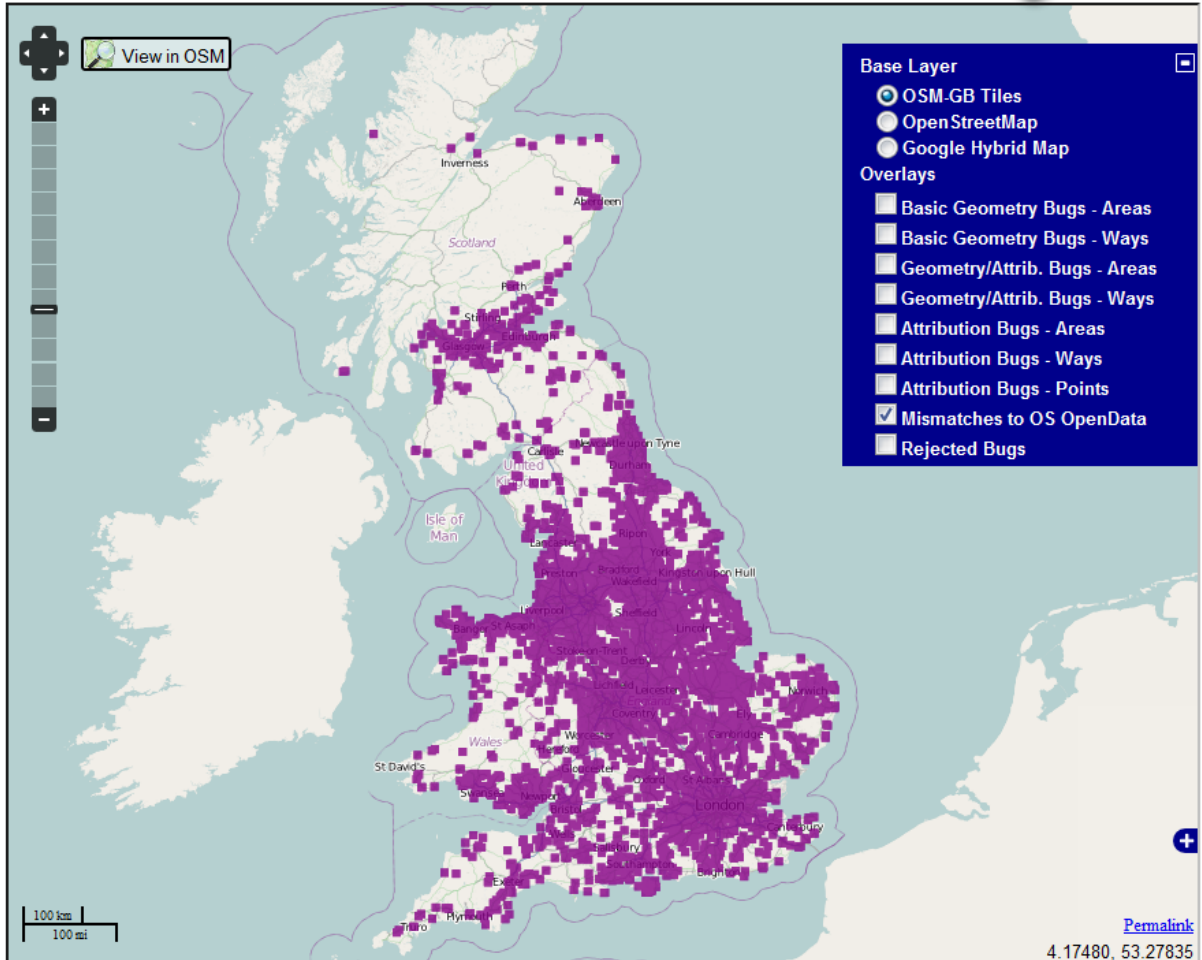
Measuring and Improving the Quality of OpenStreetMap for Great Britain

About Blog Wiki Web Services

Search



View in OSM



Base Layer

- OSM-GB Tiles
- OpenStreetMap
- Google Hybrid Map

Overlays

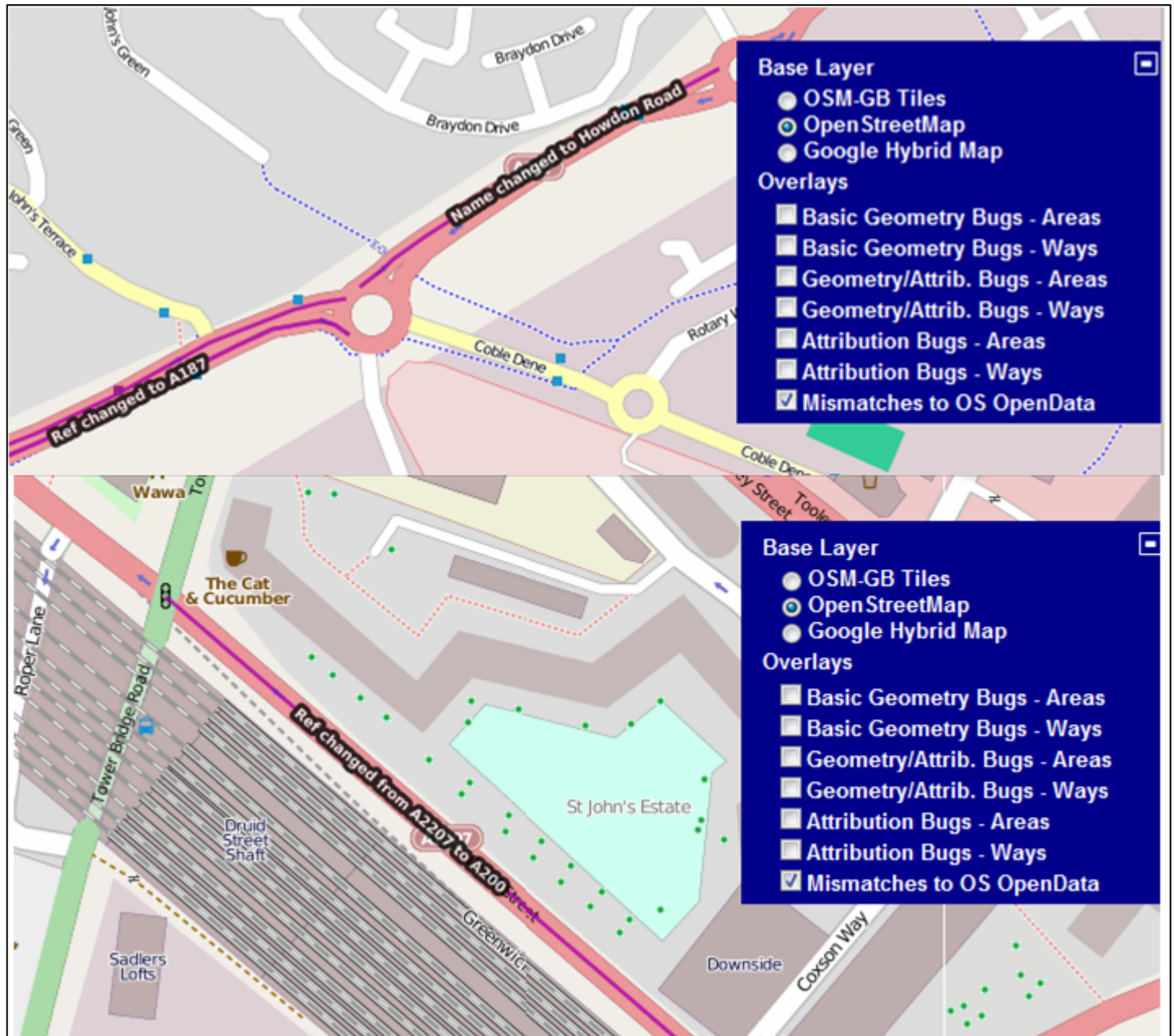
- Basic Geometry Bugs - Areas
- Basic Geometry Bugs - Ways
- Geometry/Attrib. Bugs - Areas
- Geometry/Attrib. Bugs - Ways
- Attribution Bugs - Areas
- Attribution Bugs - Ways
- Attribution Bugs - Points
- Mismatches to OS OpenData
- Rejected Bugs

Permalink
4.17480, 53.27835

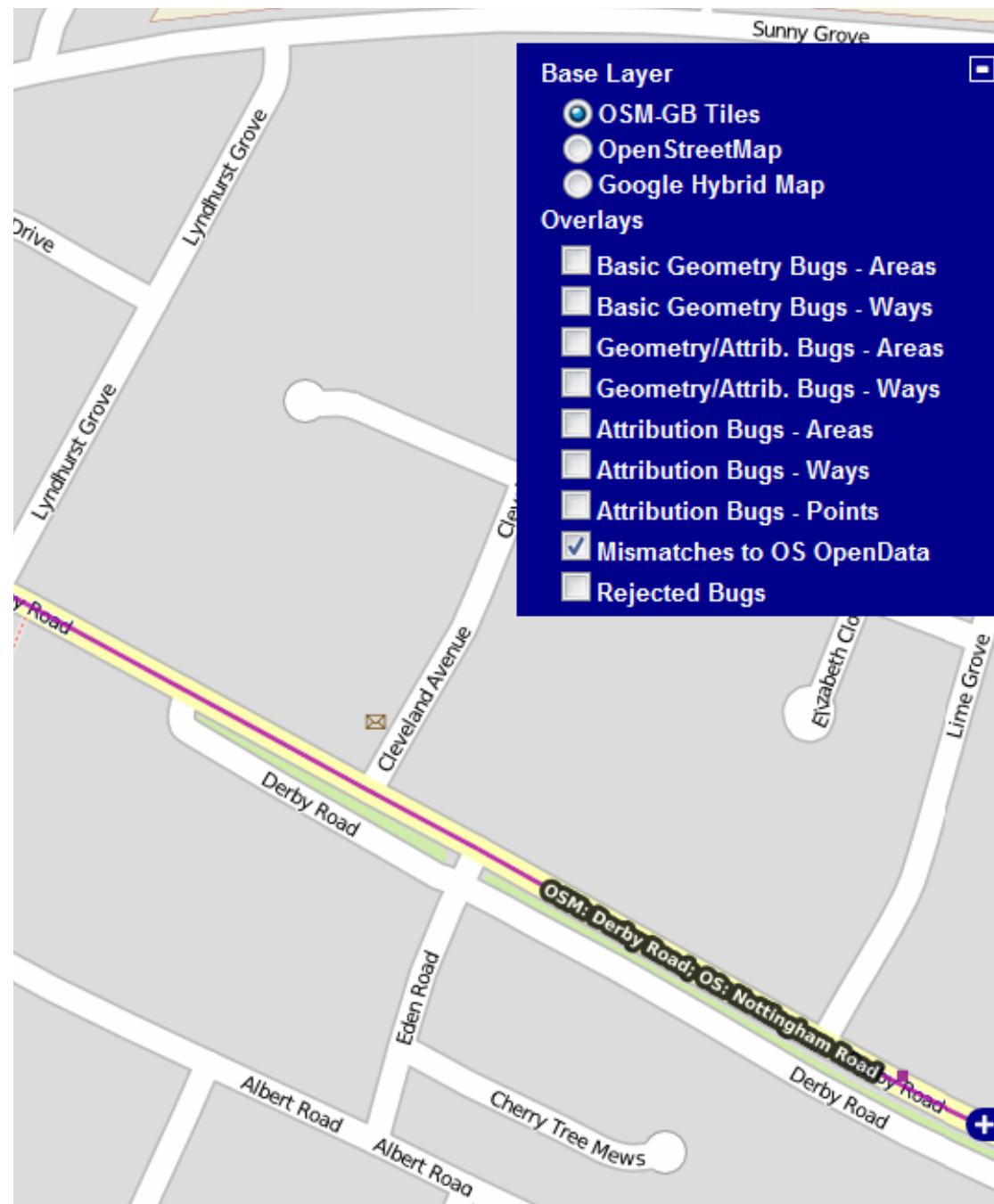
Last updated: #Thu May 16 01:38:07 BST 2013

Map data © OpenStreetMap contributors, [CC BY-SA](#). Map search powered by [Nominatim](#).

VMD vs. OSM: Automatic Addition



VMD vs. OSM: Flagging the Road Names Mismatches



Mismatched
road names
2471

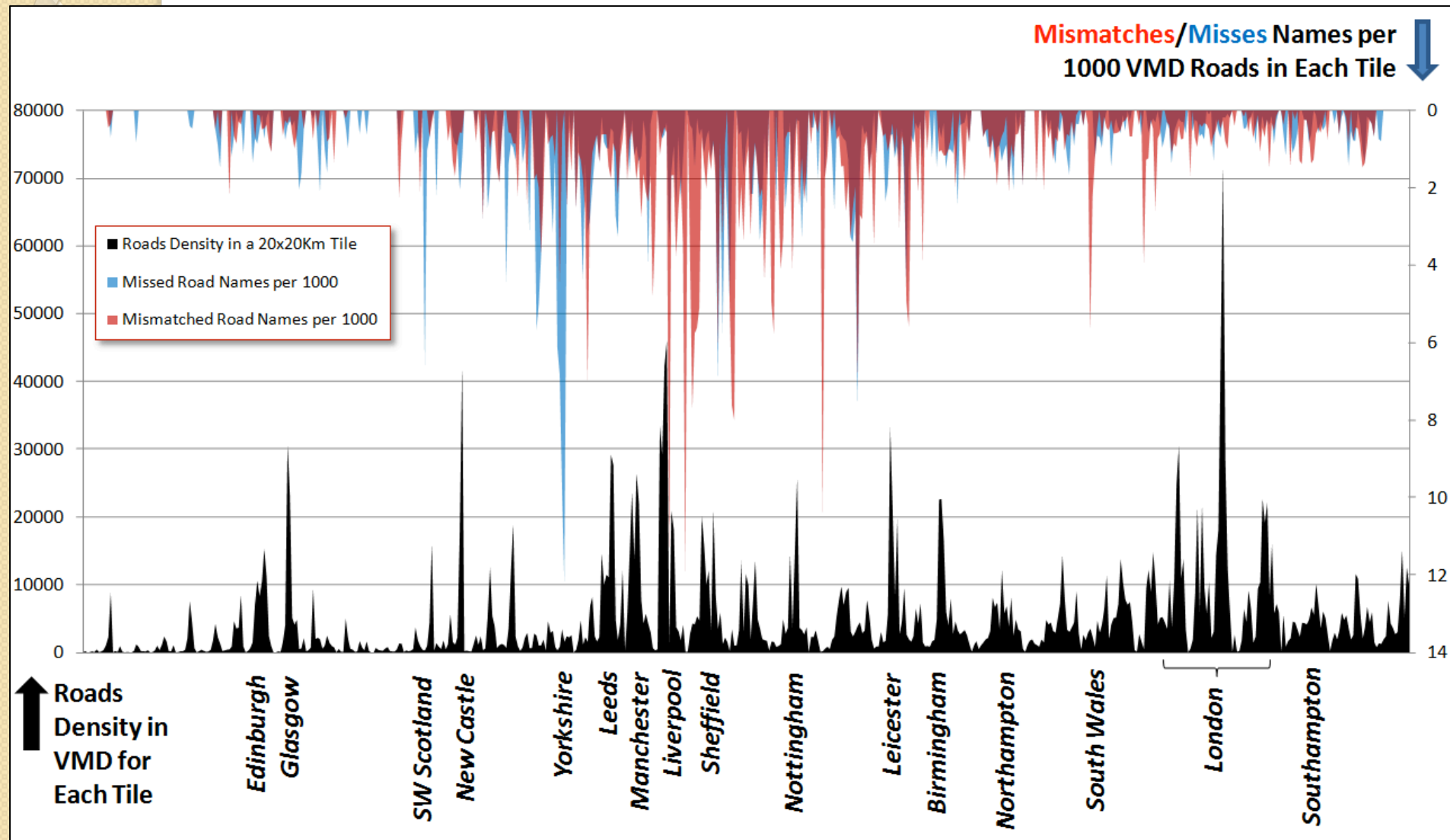
MD Comparison

Missing road
names
2026

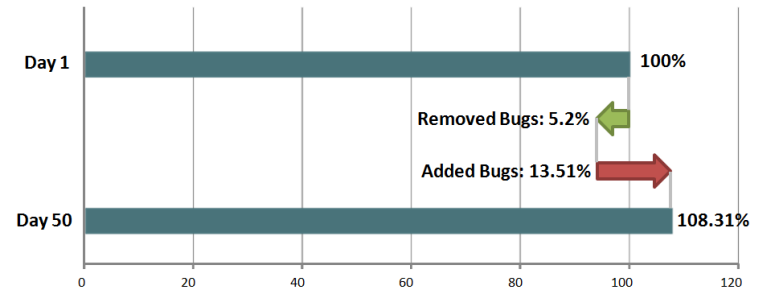
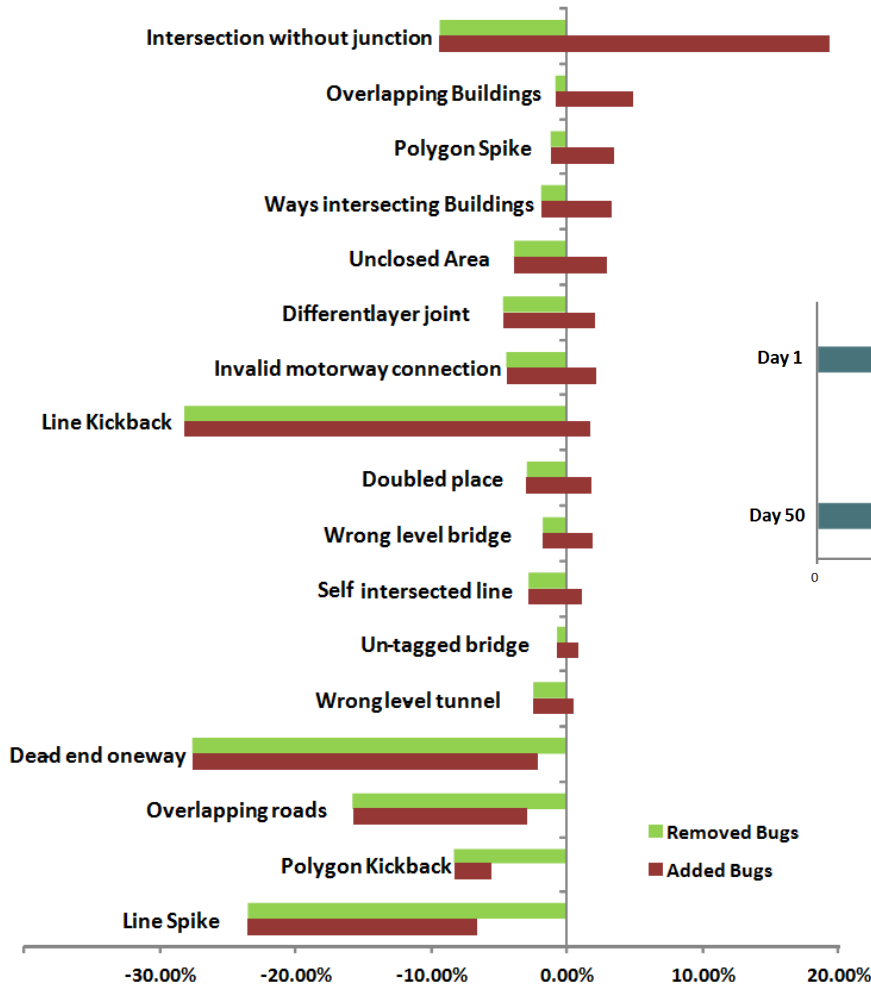
Mismatched
road refs.
377

Missing road
refs.
1121

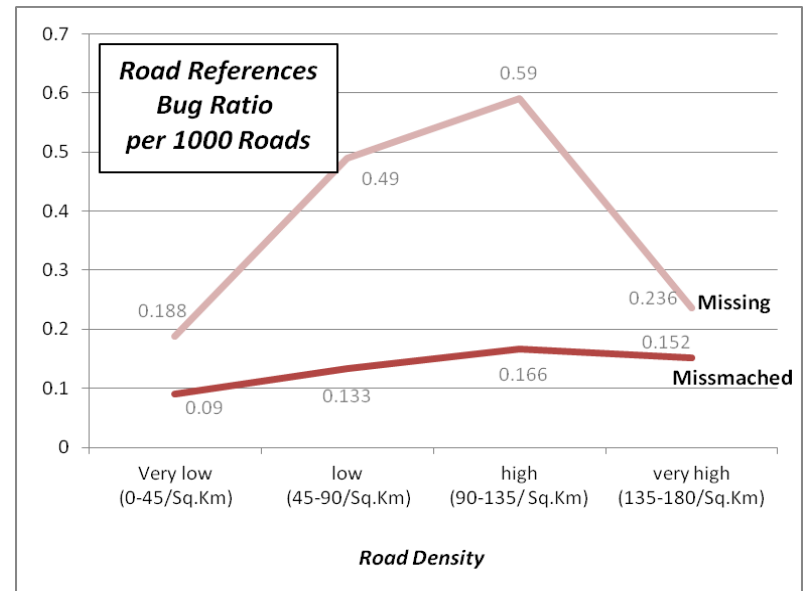
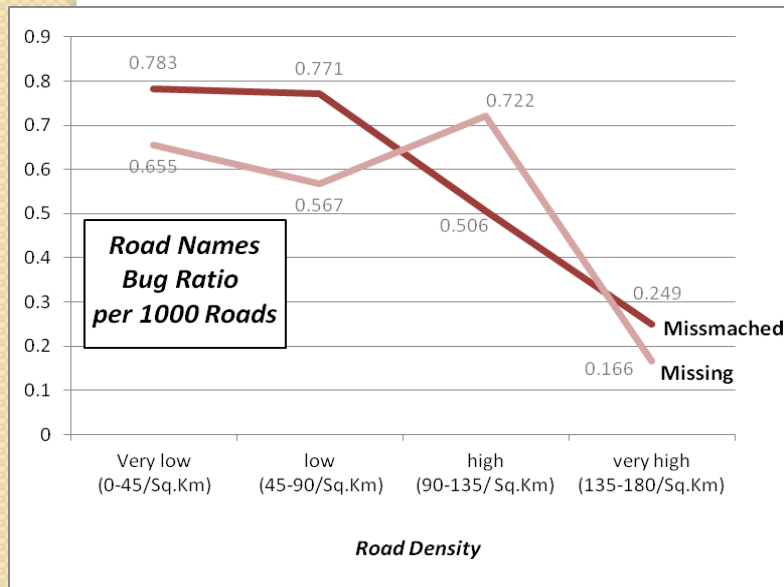
Patterns of road name bug ratios vs. road densities (20 x 20 km²)



OSM Self-assessed Quality Researches



OSM/OS Reference-based Quality Researches



OSM Dynamicity Research

[video link](#)

Next steps

- Longer term monitoring & detailed research
- Recently incorporated new rules to examine tag consistency: are features tagged with recommended combinations
 - Some argument from the OSM community about appropriateness of this check
- Closing the feedback loop: tag “IsBug=no” to indicate a feature that is not in error
- More community engagement for bug report checking & rules feedback