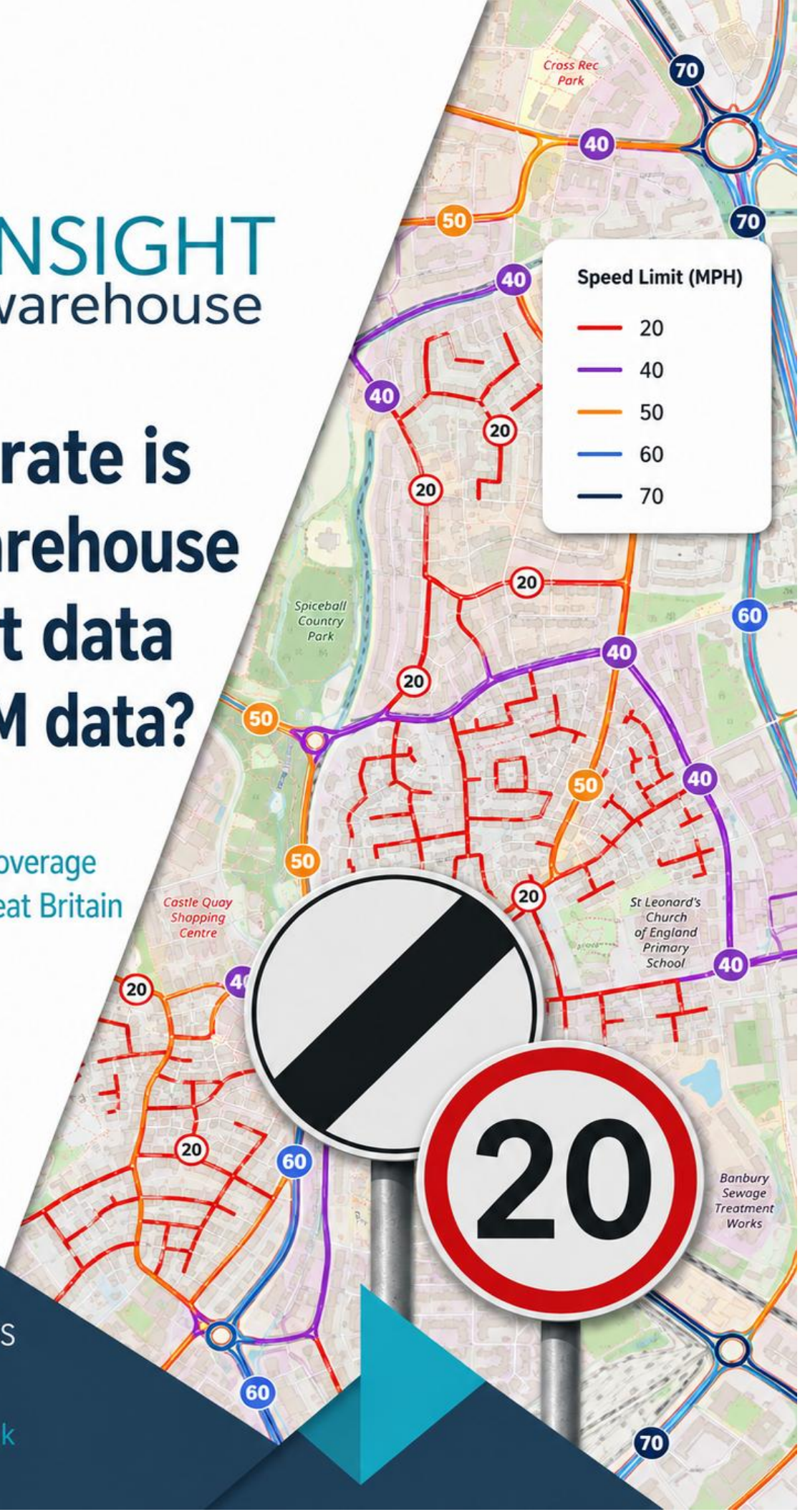
INSIGHT warehouse

How accurate is Insight Warehouse speed limit data vs free OSM data?

A national analysis of coverage and accuracy across Great Britain



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INSIGHTwarehouse

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Who are Insight Warehouse?

Insight Warehouse Limited is a UK-based data company based in Banbury, Oxfordshire. Since our foundation in 2010 we have specialised in data products and solutions and our sole focus is now on speed limit information in the UK and elsewhere.

Insight Warehouse's flagship product, SpeedMap, has been in production for over a decade and is the UK's leading database of current speed limits. The team originally created the award-winning CrashMap, a free collision-mapping tool that built Insight Warehouse's reputation for making transport data reliable and accessible.

Insight Warehouse's speed limit data is now included in the Public Sector Geospatial Agreement (PSGA), giving hundreds of UK public sector organisations access to speed limit data via Ordnance Survey through a long-term contract. This unique link with hundreds of local authorities means we have great access to the teams implementing new speed limit changes and provides unique validation of our data that other commercial providers cannot match.

We provide data to a number of private sector users and are seeing interest grow which is our focus for this year. To find out more about us and speed map in particular you can read more in the appendix.

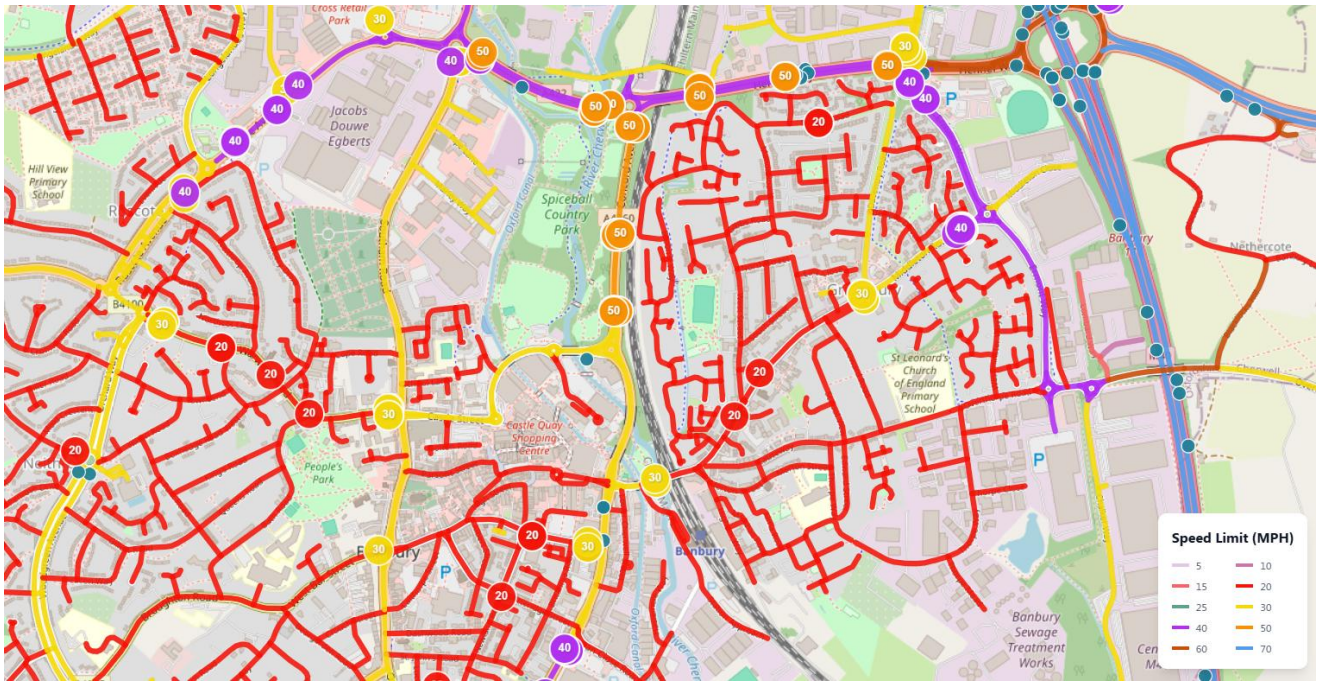

Figure 1- Screenshot from our internal mapping system showing speed limits and traffic signs

What did we analyse and why?

Open Street Map (OSM) is an amazing global resource of information relating to transport networks an a lot more. It carries a value for *maxspeed* that shows the highest speed limit on any road section and is updated by members of the OSM community. As a crowd-sourced solution it has weaknesses of course; in some areas you may have passionate individuals who are regularly updating speed limits in their area, but in others updates may be very infrequent or non-existent.

Many of our clients come to us because they are already using this as a data source and are noticing the lack of coverage and quality for essential products and solution. We have therefore embarked on this analysis to put some figure behind the problem and demonstrate how our coverage and quality can help.

Scale of the analysis and methodology

We carried out full national analysis comparing 427,659km of roads[1], totalling 2.2 million links, across Great Britain. We looked at the OSM data and matched this to our independent database. We use the stated OSM road class to split the network, with the caveat being that this may not be 100% accurate of course. We then analysed differences based on the speed limit in our data and OSM. A small number of links (997km, 0.23% of the network) carry non-standard speed values (5/10/15/25mph) that aren't legal UK limits and are used on private roads. These have been excluded from this analysis and the figures below so the report focuses on the six standard limits (20/30/40/50/60/70mph).

Headline Results

Coverage

The first thing we analysed was coverage. Where is OSM missing data on speed limits. The information in Figure 2 below shows how this breaks down by road class.

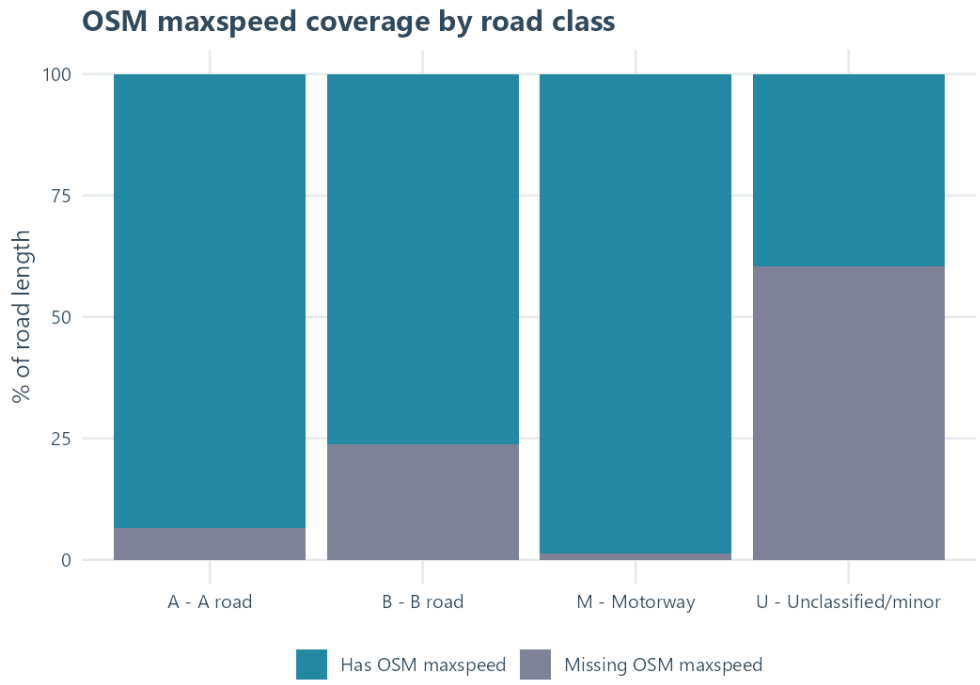

Figure 2- OSM maxspeed coverage by road class

[1] The length of public roads in Great Britian is lower than this, around 397,000km

OSM's maxspeed coverage is strong on motorways and A roads, but falls away sharply lower down the network hierarchy which is the vast majority of the network by length. The table below shows the percentage coverage in numbers.

Road class	% of length with an OSM speed limit recorded	% of total network length
M – Motorway	98.8%	2.0%
A – A road	93.4%	13.3%
B – B road	76.2%	7.2%
U – Unclassified/minor	39.5%	77.4%

As unclassified roads make up over three-quarters of the network by length, and OSM's coverage there is weakest, this is the single biggest reason why OSM has a 49.4% national coverage gap.

Across the whole network, where OSM actually records a speed limit at all:

- 87.9% of the comparable road network matches between Insight Warehouse and OSM
- 12.1% disagrees

Separately — and this is the more striking number — **OSM has no speed limit recorded at all for 49.4% of the road network by length**. Insight Warehouse has a speed limit recorded for **100%** of the network, on every road class.

Accuracy

Road Classification Analysis

We wanted to review accuracy of data in OSM but first of all we needed to review where the difference in recorded speed limit values are. Naturally we had to restrict this to the roads where OSM does have a value to check against. Figure 3 shows how this works out by road class.

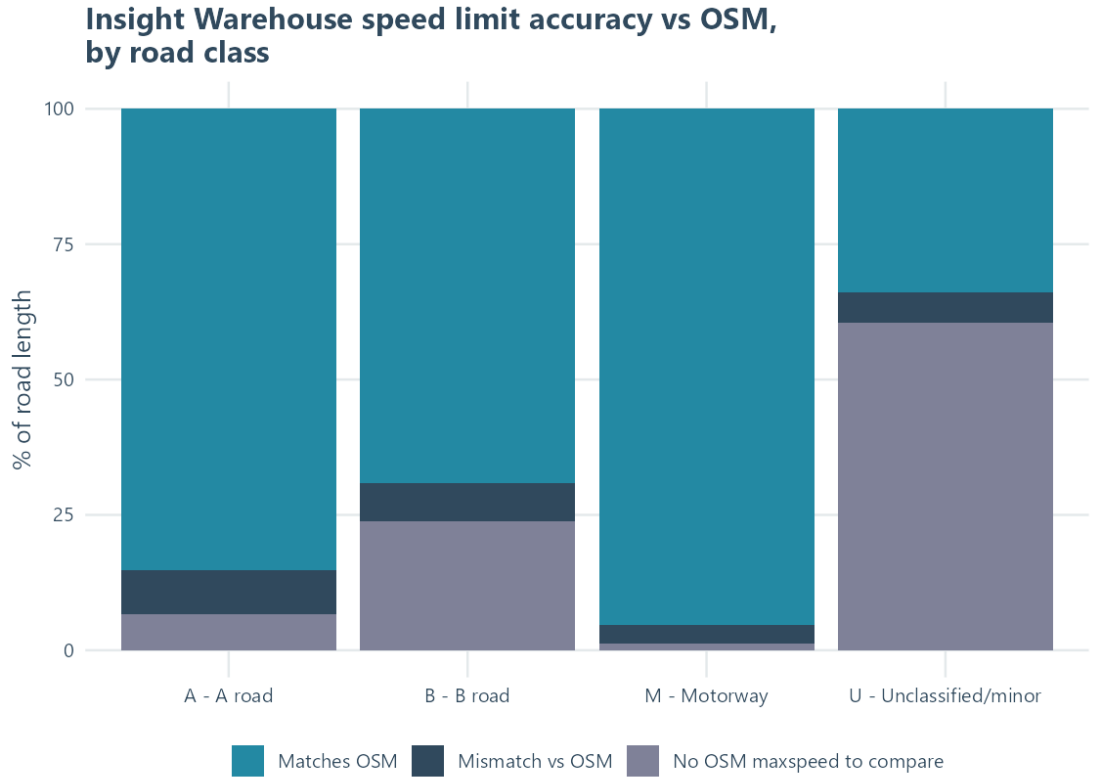

Figure 3 – OSM versus Insight Warehouse Speedmap by Road Class

At the moment we are just testing where there are differences, no assertion is made as to which value is right but it does tell a story. On Motorways we can see that there is almost universal agreement, but there are still 3.5% of roads by road length where there is disagreement. This rises to 8.8% for A roads, 9.2% for B Roads and 14.4% for all other roads. When added to the lack of coverage it means that there is significant uncertainty around the true speed limit.

Road class	Matches OSM	Mismatch vs OSM	Memo: % of class with no OSM value
M – Motorway	96.5%	3.5%	1.2%
A – A road	91.2%	8.8%	6.6%
B – B road	90.8%	9.2%	23.8%
U – Unclassified/minor	85.6%	14.4%	60.4%

Speed Limit Analysis

For this analysis we looked at our own speed limit value rather than road class as we wanted to get a sense of whether mismatches were more common on certain speed limits. We include the coverage analysis too and it demonstrates a real variance. For roads that are defined by their un-restricted status (60mph) and for motorways (which are typically 70mph) we don't find as many conflicts. For urban areas with a mix of 20mph and 30mph the differences are lager. The greatest areas of conflict are for roads with a speed limit that is

defined by a traffic regulation order (TRO) including 40 and 50mph. Figure 4 shows the chart including missing data from OSM and the table below illustrates the level of conflict.

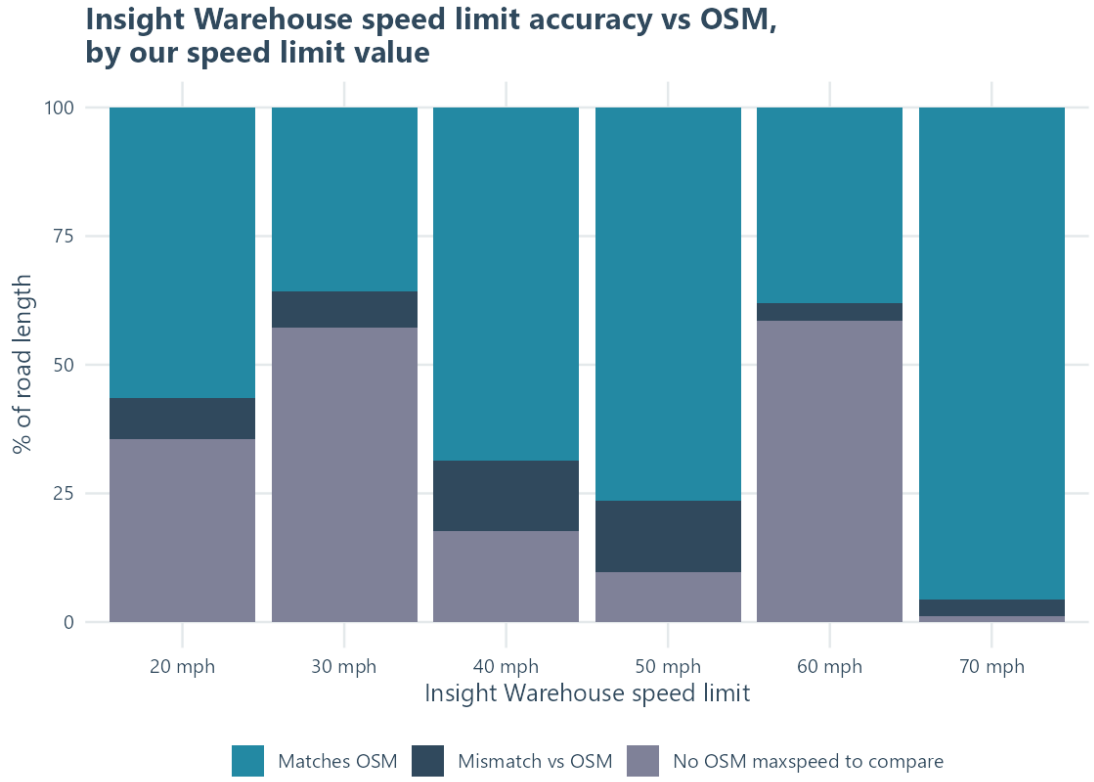

Figure 4 – OSM versus Insight Warehouse Speedmap by Speed Limit

Our speed limit	Matches OSM (of comparable)	Mismatch (of comparable)
20mph	87.4%	12.6%
30mph	83.8%	16.2%
40mph	83.3%	16.7%
50mph	84.5%	15.5%
60mph	91.8%	8.2%
70mph	96.8%	3.2%

Another way of presenting these results is to use a confusion matrix (*Figure 5*) which cross-tabs our speed limit against OSM's for every mismatched link, and it shows the disagreements aren't random. Analysing the data we find that a handful of specific mix-ups account for most of the mismatched length:

- Our 30mph vs OSM 20mph: 4,484km
- Our 20mph vs OSM 30mph: 4,839km

- Our 30mph vs OSM 60mph: 4,353km
- Our 60mph vs OSM 30mph: 2,005km
- Our 60mph vs OSM 40mph: 1,369km
- Our 40mph vs OSM 30mph: 856km

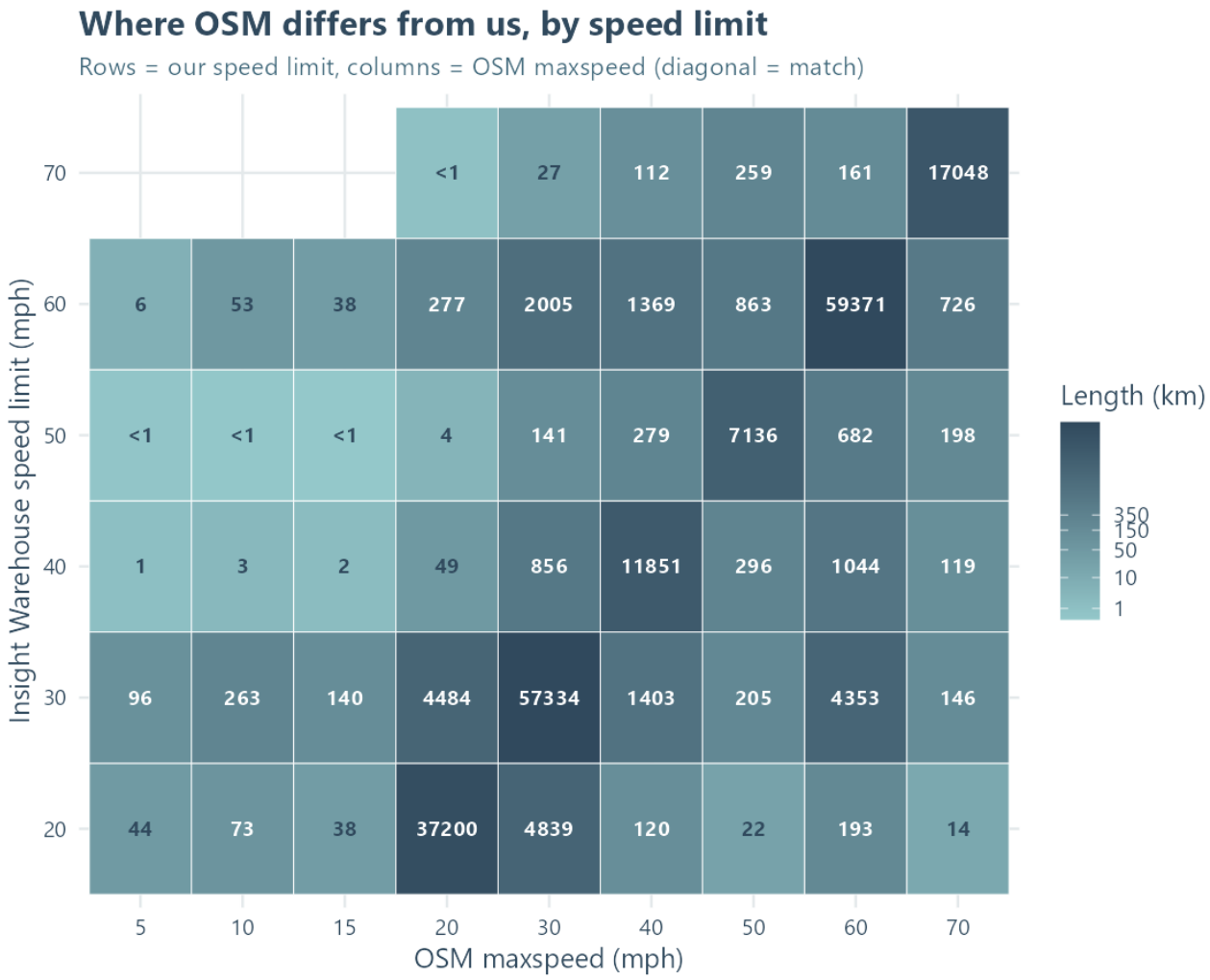

Figure 5 – Confusion matrix

How do we find out who is right on mismatches?

Naturally we are confident that our data is the highest quality but we can't prove that without carrying out an assessment against ground truth data. The problem is that there is no ground truth to speak of. We spend time every week collating data from various data sources to make sure we have the most up-to-date information possible, but there is not official map of speed limits, and there probably won't ever be one (the reason we created Speedmap in the first place.

Clearly, checking every single road section by visiting them and looking at traffic signs wouldn't be reasonable. We have therefore pulled a stratified sample of 1,337 mismatched links (capped at 50 per road class by speed-limit combination, fewer where there weren't 50 available) for independent verification. This is ready to go out for analysis in the coming weeks and once that's back, we can state with real confidence how often Insight Warehouse is right where it disagrees with OSM.

More information about our solution

Why is Speedmap the leading source of speed limit data?

- Complete network coverage — every public road and some private roads
- Frequency — the underlying database is refreshed almost daily from road authority and sign data; published updates are released quarterly to data download clients and in near-real-time with API customers.
- Close road authority relationships — used in the PSGA, trusted by Ordnance Survey and 125+ local authorities.
- Scale and trust — through a private sector clients our data finds its way into 10m+ vehicles, and ~35m mobile phones.
- Flexible delivery — We have traditional provided a download function where we match our database to the network of choice for the client (OS Open Roads, Open Street Map, Overture). We now offer the API which include a snap-to-roads function for those who don't develop their own systems.
- Track record — We have been doing this for over a decade and have a great relationship with Ordnance Survey and other mapping providers. Our data must meet rigorous quality standards to be accepted by our major clients.

Who uses it, and why:

- Fleet management / vehicle tracking and insurance telematics — accurate speed context for driver risk and pricing.
- ADAS / navigation database providers — feeding Intelligent Speed Assistance (ISA) and in-vehicle systems.
- Transport planning, roadworks and utilities — network-wide speed limit context for planning work.
- Road safety — the original use case, and still core to the public sector side of the business where it is used by police forces and local authorities.