

Active Travel Scheme Prioritisation: An automated model

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The challenge: too many schemes, not enough clarity



WITHOUT A COMMON FRAMEWORK

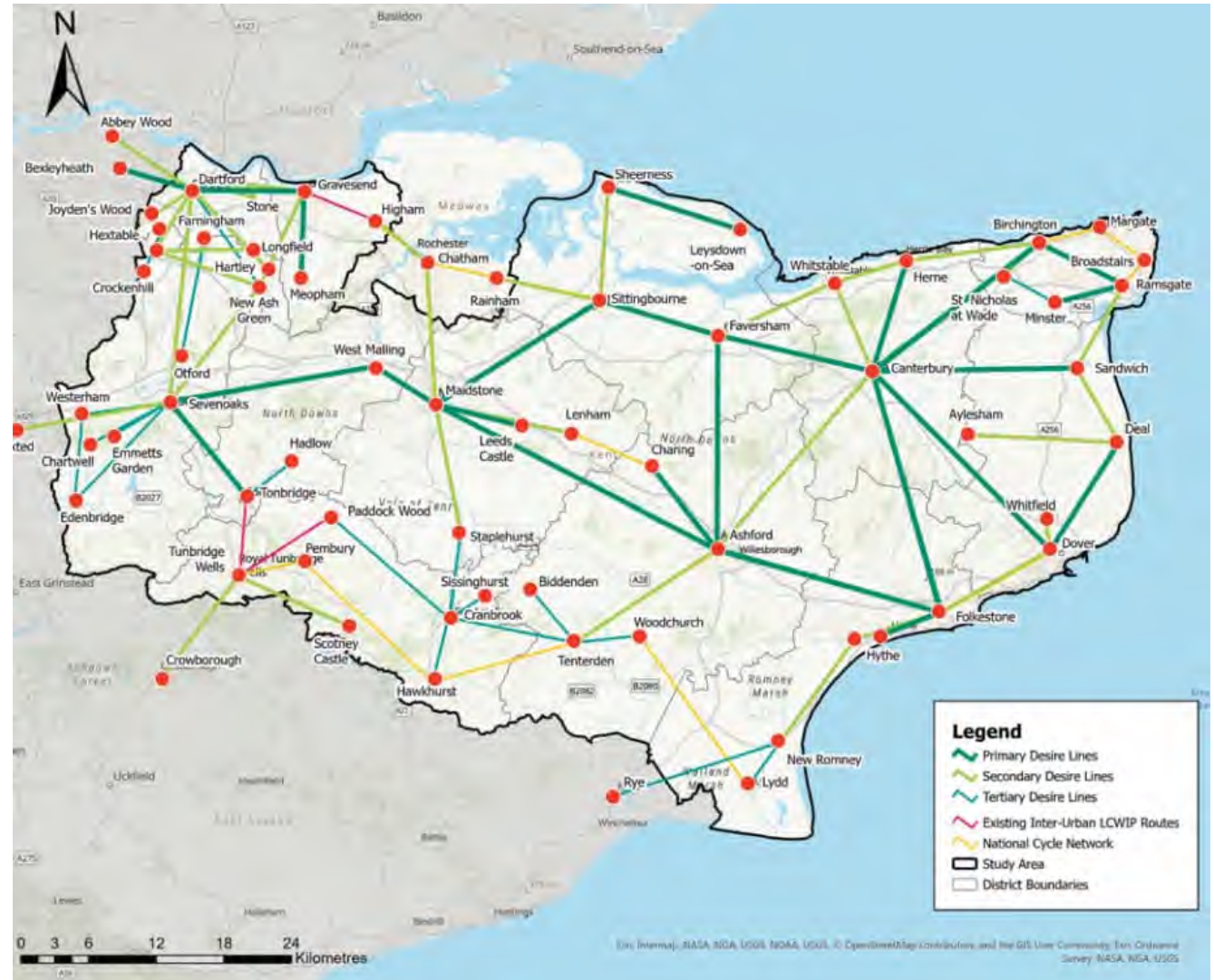
- 01 Duplicated schemes**
The same opportunity can appear in multiple sources.
- 02 Inconsistent information**
Different levels of detail, evidence and assumptions.
- 03 Hard to compare**
Urban and rural interventions are difficult to assess consistently.
- 04 No clear investment strategy**
A long list of ideas does not show what to deliver first.

Case Study: KCC Active Travel 10-year Plan

- ~3,000 potential active travel schemes
- ~30 assessment criteria
- **Multiple** data sources and scheme types

Output:

- county-wide evidence base
- automated prioritisation model
- interactive WebGIS dashboard



Building a common evidence base

Gathering latest
information from
local authorities

Filling the gaps

Updating
outdated
information

Data cleaning
and formatting



Prioritisation Model Overview

Objective

- Score and rank routes based on multi-dimensional criteria

Tool

- Interactive GIS map with scalable scoring system

Adaptability

- Criteria weights can be adjusted over time

Criteria Categories



► Demand



► Network Connectivity



► Safety & Environmental Impact



► Economic & Social Value



► Policy Alignment



► Environmental Constraints



► Deliverability

Criteria Breakdown



Demand

- Propensity to Cycle Tool and Population Density



Network Connectivity

- Network Connections / Network Gaps / Public Transport / Active Travel Corridors



Safety & Environmental Impact

- Road Safety Improvements and Air Quality



Economic & Social Value

- Trip Attractors / Tourist Value / Green Spaces / Access to Employment / Primary Education / Secondary & Further Education



Policy Alignment

- Indices of Multiple Deprivation (IMDs) – Income, Employment, Education, Health, Crime, Housing, Living Environment, Transport



Environmental Constraints

- Ecologically Sensitive Areas, Flooding Areas, Sea Level Rise, Topography



Deliverability

- Highway Boundary, LCWIP Deliverability Assessment, LCWIP Status, LCWIP Priority Scoring

Prioritisation Model Scoring

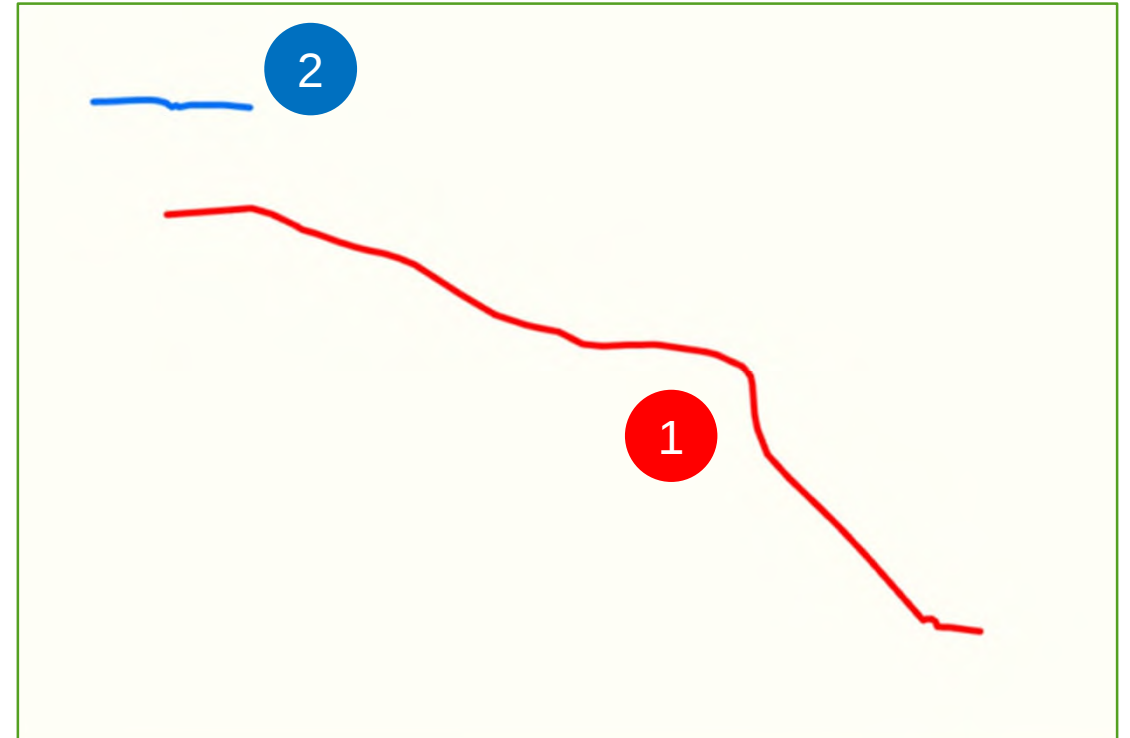
- ▶ Each criteria is split into individual topics
- ▶ Each topic is scored on a scale from 0 – 5
- ▶ The prioritisation model will be scalable, allowing for higher priority to be given to different topics
- ▶ A higher overall score gives the route a higher priority

Providing Access to Employment	Automated	0/5	The route is scored depending on the employment density along the route based on the average employment density across a route from LSOAs in which the route passes through for more than 100 metres: 0: There is no employment density across the route 1: The average employment density of the LSOAs across the route is within the bottom quintile in relation to the average employment densities for all routes 2: The average employment density of the LSOAs across the route is within the second lowest quintile in relation to the average employment densities for all routes 3: The average employment density of the LSOAs across the route is within the middle quintile in relation to the average employment densities for all routes 4: The average employment density of the LSOAs across the route is within the second highest quintile in relation to the average employment densities for all routes 5: The average employment density of the LSOAs across the route is within the top quintile in relation to the average employment densities for all routes
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Example of a criterion scoring within the prioritisation process

Example of Prioritisation Model – Walking Routes

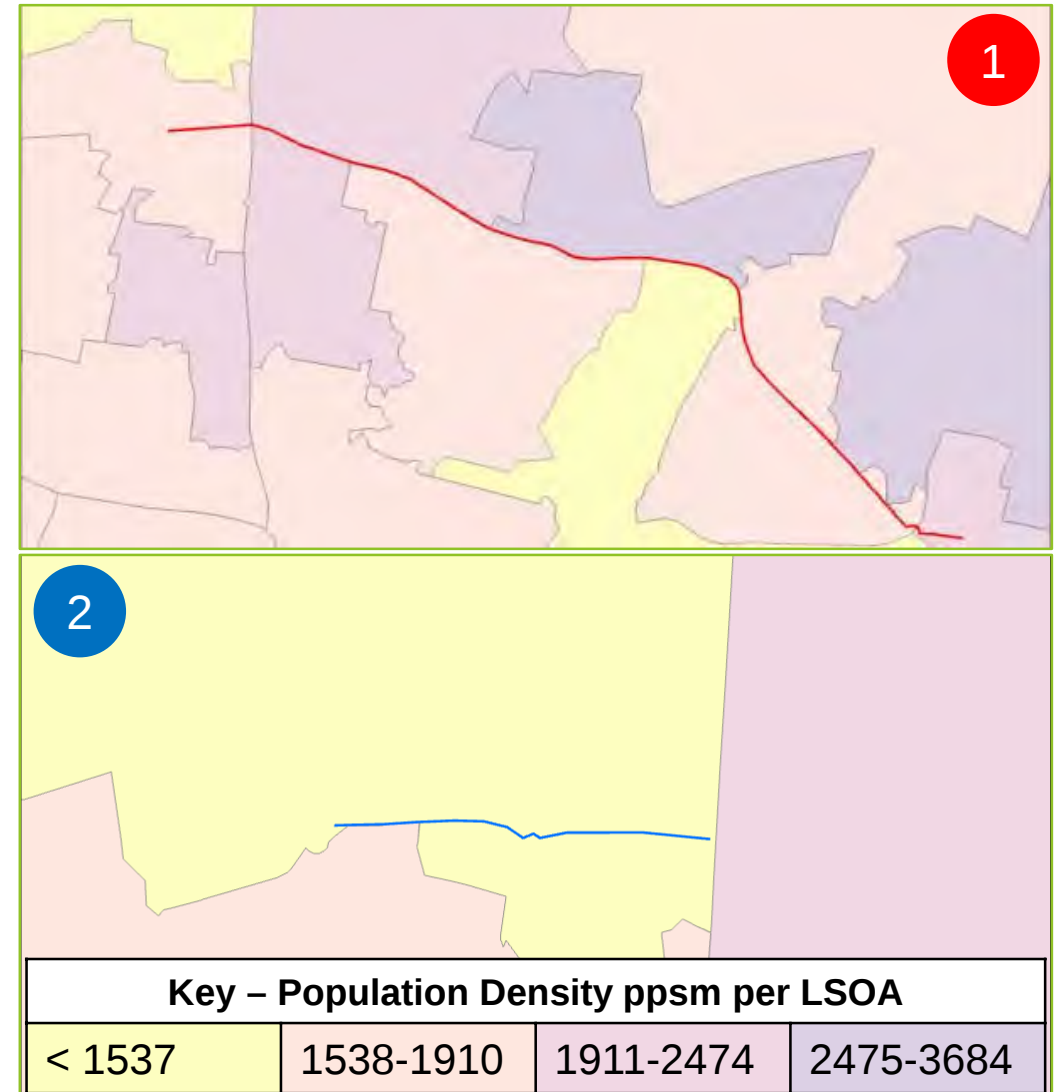
- ▶ Here are two anonymised examples of walking routes within Kent
- ▶ **Route 1**, in red, is 2.53km long, whereas **Route 2**, in blue, is only 0.41km long
- ▶ **Route 1** scored an overall prioritisation score of 82
- ▶ **Route 2** scored 50 overall for prioritisation
- ▶ The total possible prioritisation score is 150



Example – Demand – Population Density

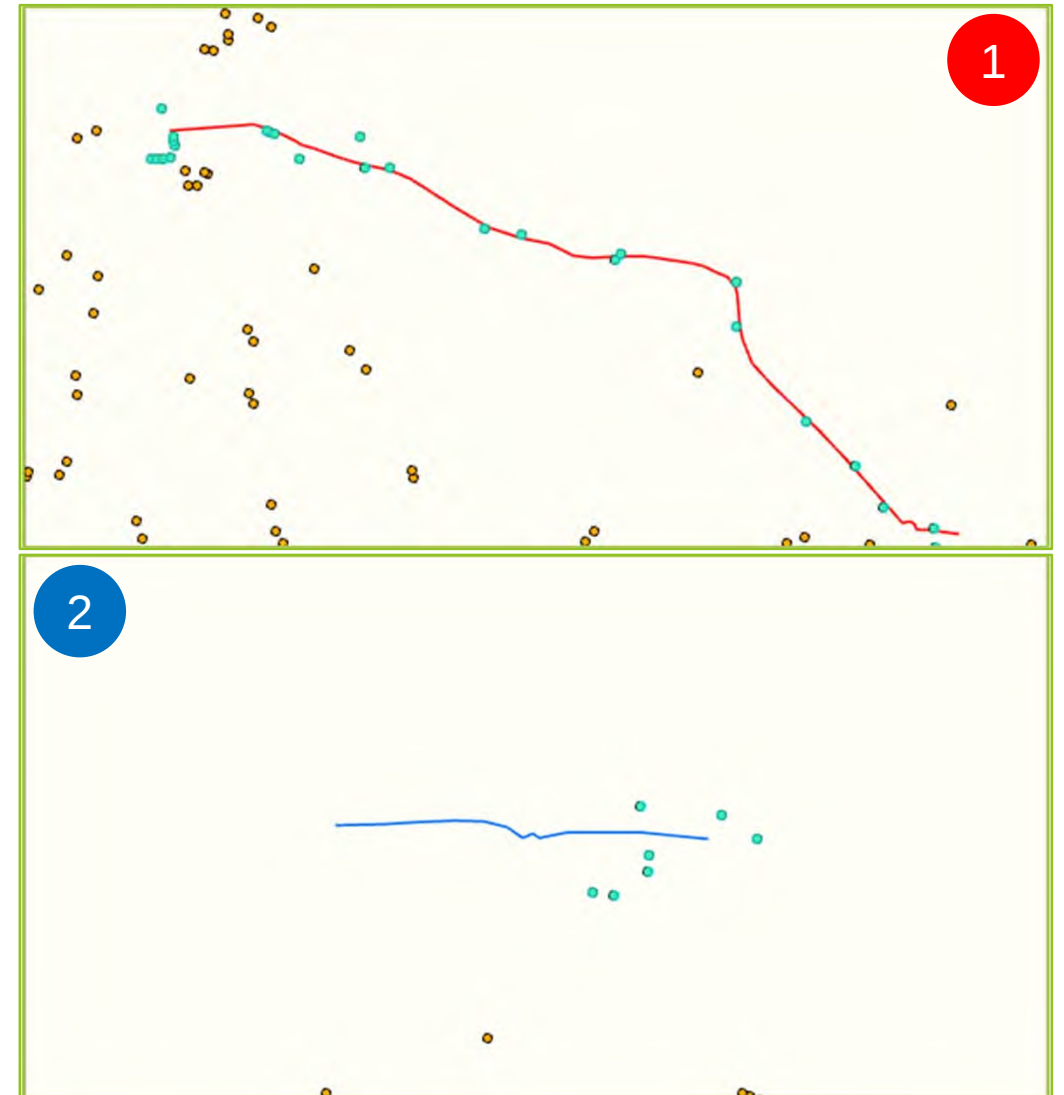
- ▶ Population densities measured as people per square metre, ppsm
- ▶ Each route is assessed based on the average population density of all the LSOAs the route passes through for more than 100 metres
- ▶ **Route 1** passes through **8 LSOAs** for more than 100 metres, with an average population density of **2039 ppsm**
- ▶ **Route 2** only passes through **1 LSOA** for more than 100 metres, with a population density of **1323 ppsm**
- ▶ **Route 1** is scored a 4 due to more population dense LSOAs throughout Kent

Route	PD Criteria Score	Overall Priority Score	Priority Ranking
1	4	4	1
2	1	1	2



Example – Network Connectivity – Bus Stops

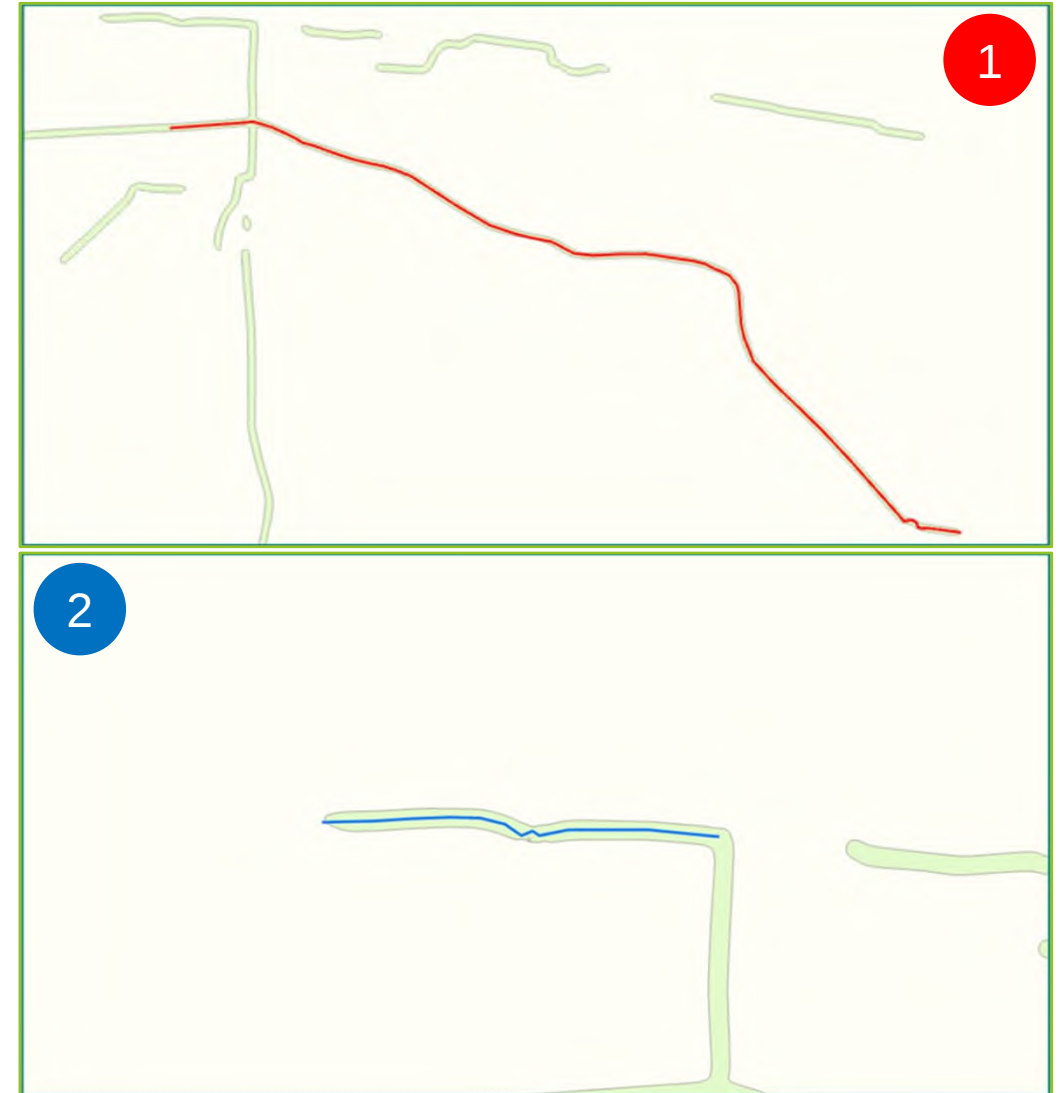
- ▶ These two figures show the number of bus stops, in green, the two routes pass. The bus stops in blue are within 100 metres (1-minute walk) of the route selected
- ▶ **Route 1** passes within 100 metres of 26 bus stops
- ▶ **Route 2** passes within 100 metres of 7 bus stops
- ▶ Each route is assessed based on the average number of bus stops per 100 metres, with a 100-metre buffer
- ▶ **Route 1** has a more even spread of stops across its route, whereas **Route 2** has a larger cluster at one side of the route



Route	Bus Stops Criteria Score	Overall Priority Score	Priority Ranking
1	4	8	1
2	3	4	2

Example – Network Connectivity – Active Travel Corridors

- ▶ These two figures show the areas covered by active travel corridors, shown in green
- ▶ Active travel corridors are where a course is covered by both cycling and walking/wheeling routes, in this case using both the existing and proposed network
- ▶ More priority is given to routes which would help add to active travel corridors
- ▶ Both **Route 1** & **Route 2** are within active travel corridors entirely across their routes, and therefore are given the highest priority score

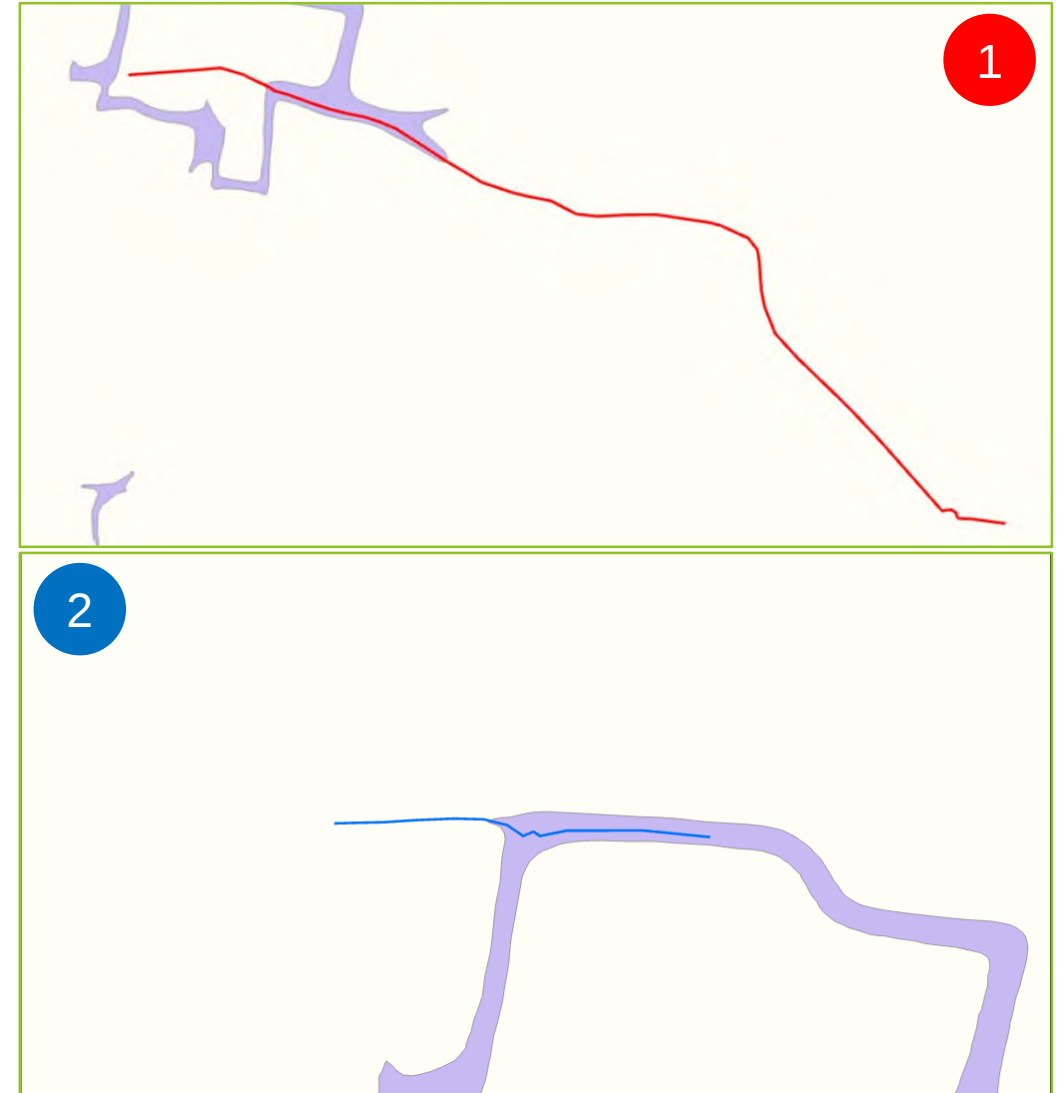


Route	AT Corridor Criteria Score	Overall Priority Score	Priority Ranking
1	5	13	1
2	5	9	2

Example – Safety & Environmental Impact – Air Quality

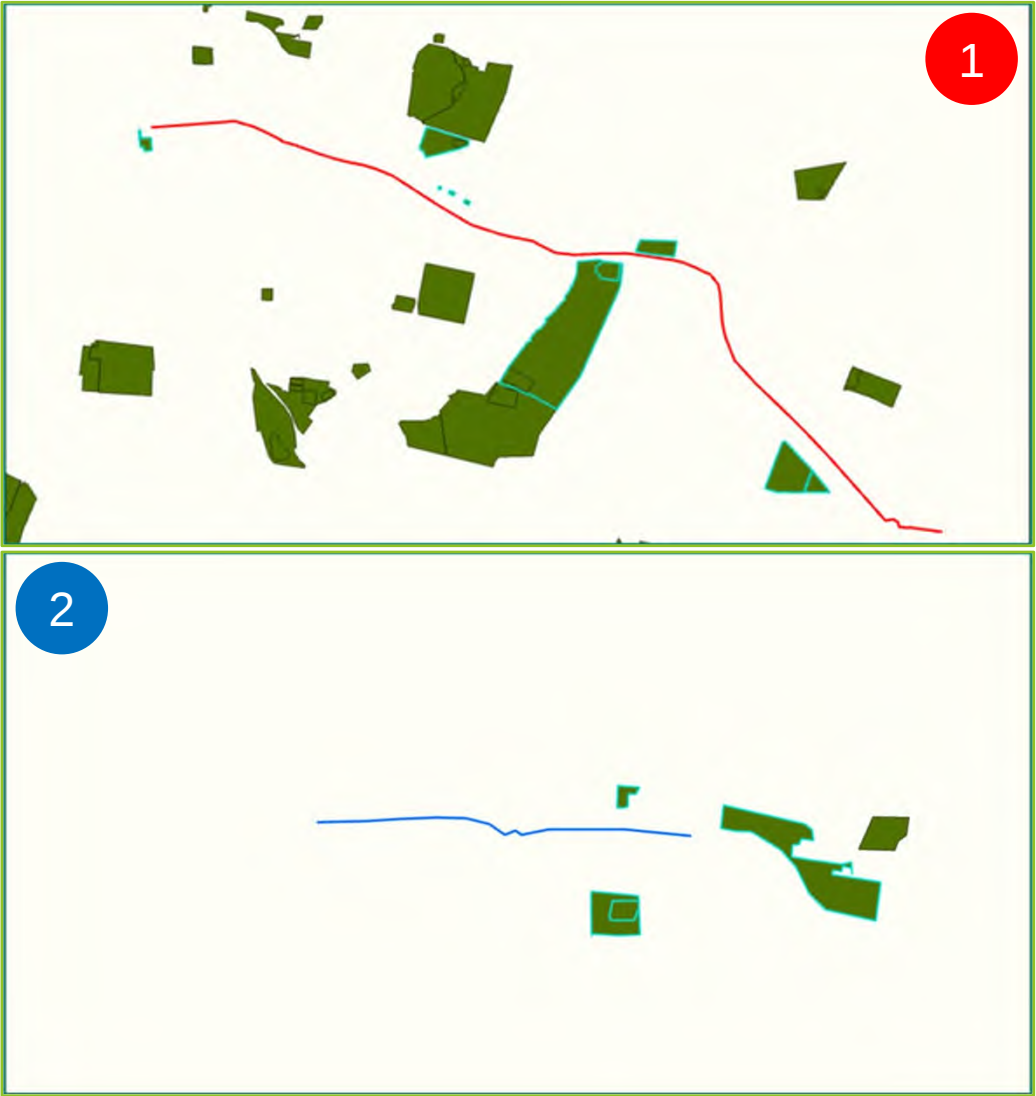
- ▶ These two figures show the Air Quality Management Areas (AQMAs), **in purple**, surrounding the two routes
- ▶ Routes are assessed based on the number of metres a route passes through an AQMA, with the highest ranking given to routes passing over 200 metres through an AQMA
- ▶ **Route 1** passes **470.72 metres** through an AQMA
- ▶ **Route 2** passes **242.28 metres** through an AQMA
- ▶ **Both routes** are classified at the highest rank

Route	Air Quality Criteria Score	Overall Priority Score	Priority Ranking
1	5	18	1
2	5	14	2



Example – Economic & Social Value – Green Spaces

- ▶ These two figures show the number of green spaces, **in green**, the routes passes within 100 metres of, highlighted **in blue**
- ▶ **Route 1** passes within 100 metres of **10 green spaces** with a combined area of **83,430 square metres**
- ▶ **Route 2** passes within 100 metres of **4 green spaces** with a combined area of **10,590 square metres**
- ▶ Each route is assessed based on the combined area of the green spaces per 100 metres, with a 100-metre buffer



Route	Green Spaces Criteria Score	Overall Priority Score	Priority Ranking
1	4	22	1
2	2	16	2

Example – Economic & Social Value – Access to Primary Schools

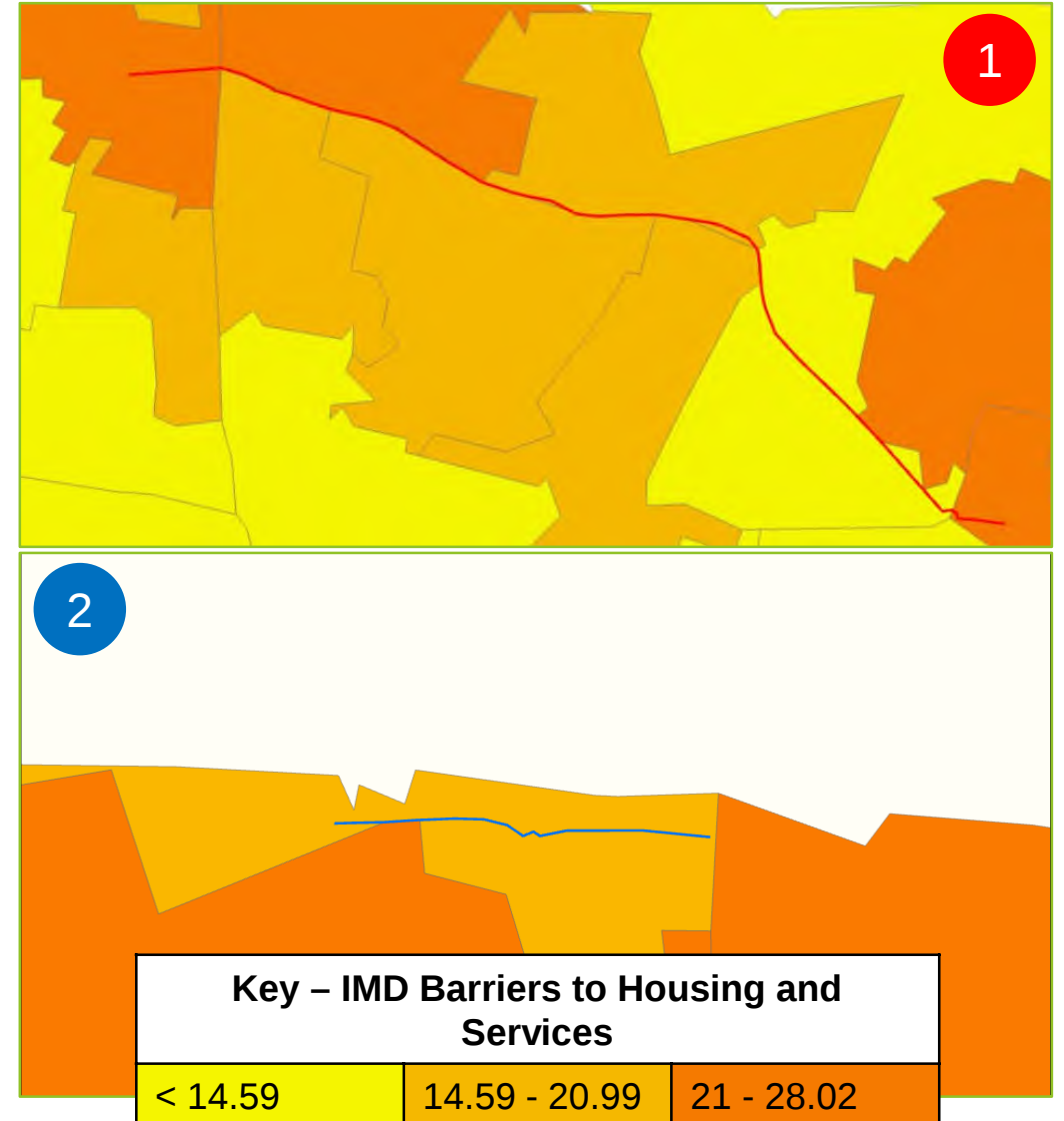
- ▶ These two figures show the number of primary schools, **in pink**, the routes passes within 100 metres of, highlighted **in blue**
- ▶ Each route is prioritised higher if they connect to a higher number of primary school pupils per 100 metres of the route
- ▶ **Route 1** passes within 100 metres of **1 primary school** with **453 pupils** (average of **0.18 pupils** per 100 metres)
- ▶ **Route 2** passes within 100 metres of **0 primary schools** (average **0 pupils** per 100 metres)



Route	Schools Criteria Score	Overall Priority Score	Priority Ranking
1	1	23	1
2	0	16	2

Example – Policy Alignment – IMD Barriers to Housing and Services

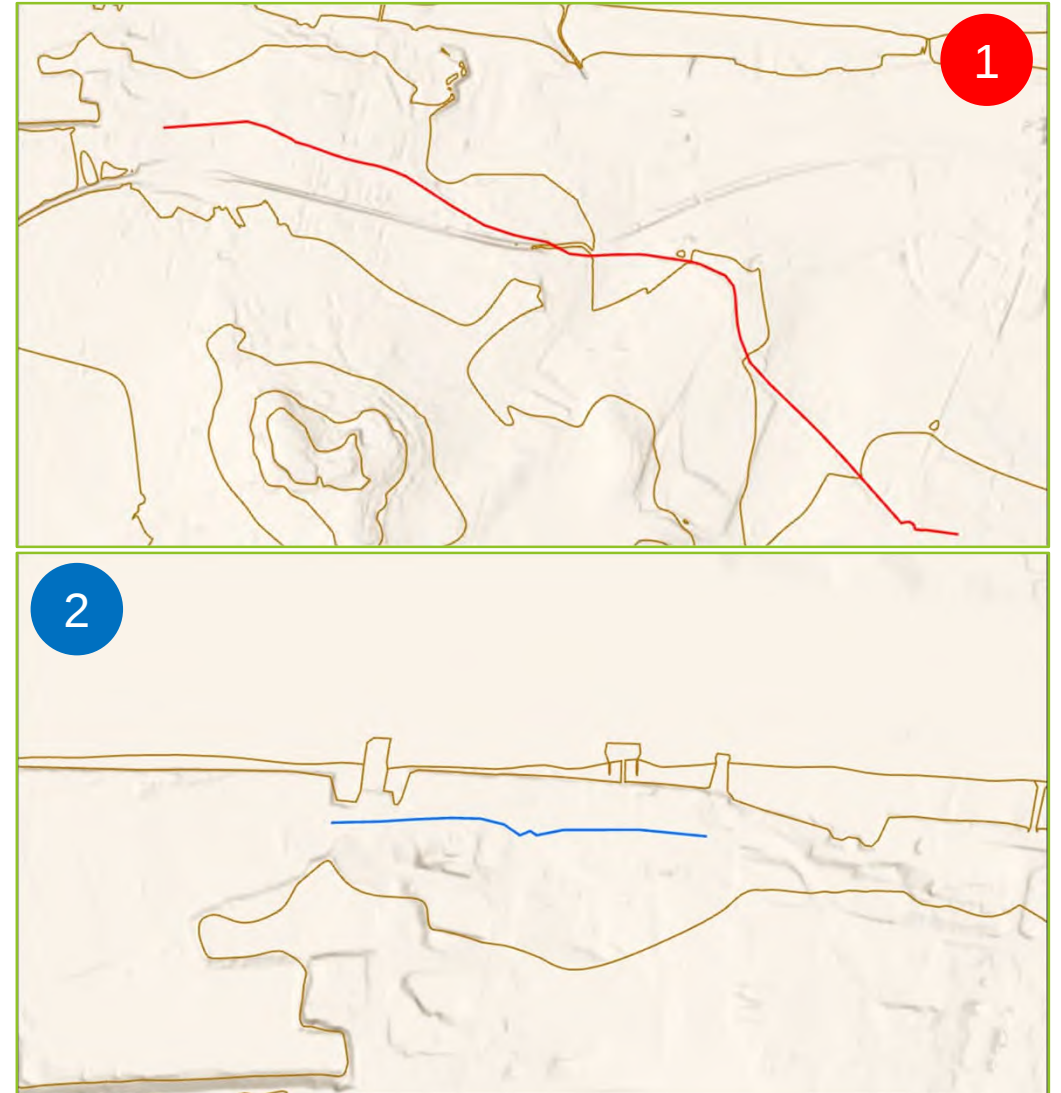
- ▶ These two figures show the IMD score assigned to the LSOAs surrounding the routes
- ▶ Each route is prioritised higher if it passes through LSOAs with a higher IMD
- ▶ **Route 1** passes through 8 LSOAs, with its highest IMD Barriers to Housing and Services score of **23.6**
- ▶ **Route 2** passes through 1 LSOA, with its IMD Barriers to Housing and Services score of **15.8**



Route	IMD Criteria Score	Overall Priority Score	Priority Ranking
1	5	28	1
2	1	17	2

Example – Environmental Constraints - Topography

- ▶ These two figures show the topography lines, **in brown**, which each route passes through
- ▶ Each route is prioritised higher if the difference between its highest and lowest topography level is smaller (i.e. route is relatively flat)
- ▶ **Route 1** passes through one topography line on 6 occasions, meaning the route is relatively flat as it does not raise higher than a singular topography layer change
- ▶ **Route 2** does not pass through any topography lines, therefore making the route flat



Route	Topography Criteria Score	Overall Priority Score	Priority Ranking
1	5	33	1
2	5	22	2

Example – Deliverability – LCWIP Priority Scoring

- ▶ **Route 1** and **Route 2** were each assessed within in their own LCWIP reporting and assigned separate prioritisation scores
- ▶ The prioritisation model takes into consideration those **initial priority rankings** as part of the Deliverability criteria category
- ▶ If a route wasn't part of a separate scheme, it automatically receives a **score of 0** for this criterion
- ▶ **Route 1** had **low priority** within its own scheme → it scores **1** in the prioritisation model
- ▶ **Route 2** had **high priority** within its own scheme → it scores **5** in the prioritisation model

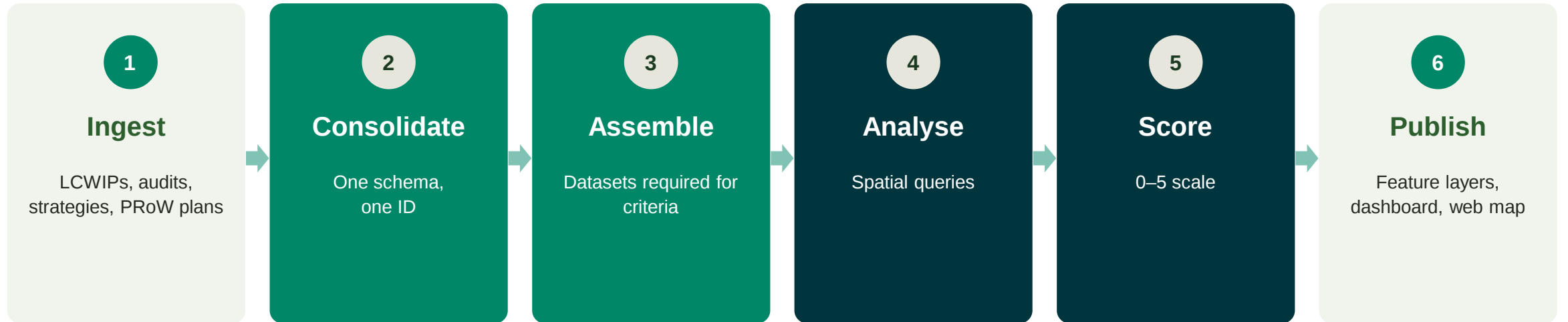
Route	LCWIP Priority Criteria Score	Overall Priority Score	Priority Ranking
1	1	34	1
2	5	27	2

Summary of Walking Routes Prioritisation

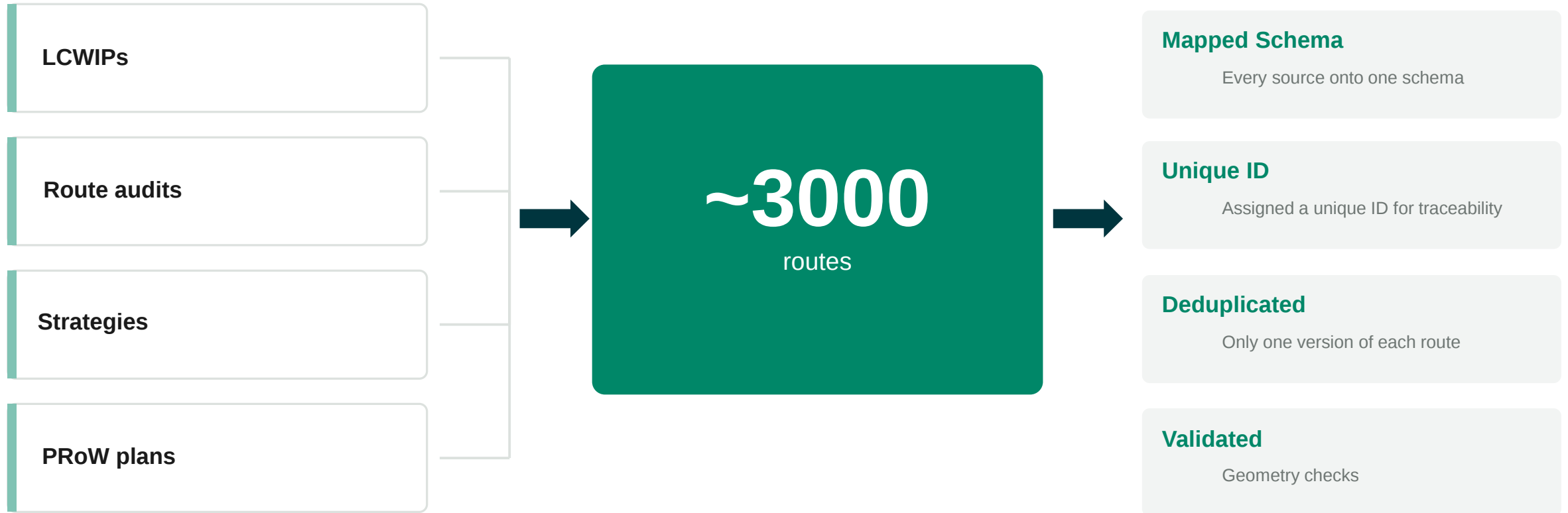
- ▶ **Route 1** has a higher scoring overall to **Route 2** through the selected prioritisation criteria
- ▶ Each route undergoes similar automated process and receives a priority score relative to all other Kent active travel routes
- ▶ Routes with the highest scores are expected to deliver the greatest social and economic benefits and to face fewer potential deliverability constraints

Criteria	Route 1 Score	Route 2 Score
Population Density	4	1
Bus Stops	4	3
AT Corridor	5	5
Air Quality	5	5
Green Spaces	4	2
Schools	1	0
IMD	5	1
Topography	5	5
LCWIP Priority Scoring	1	5
Overall Priority Score	34	27
Priority Ranking	1	2

Automated model: Workflow



Ingest & Consolidate



Assemble & Analyse



Demand

- Propensity to Cycle Tool and Population Density



Network Connectivity

- Network Connections / Network Gaps / Public Transport / Active Travel Corridors



Safety & Environmental Impact

- Road Safety Improvements and Air Quality



Economic & Social Value

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Policy Alignment

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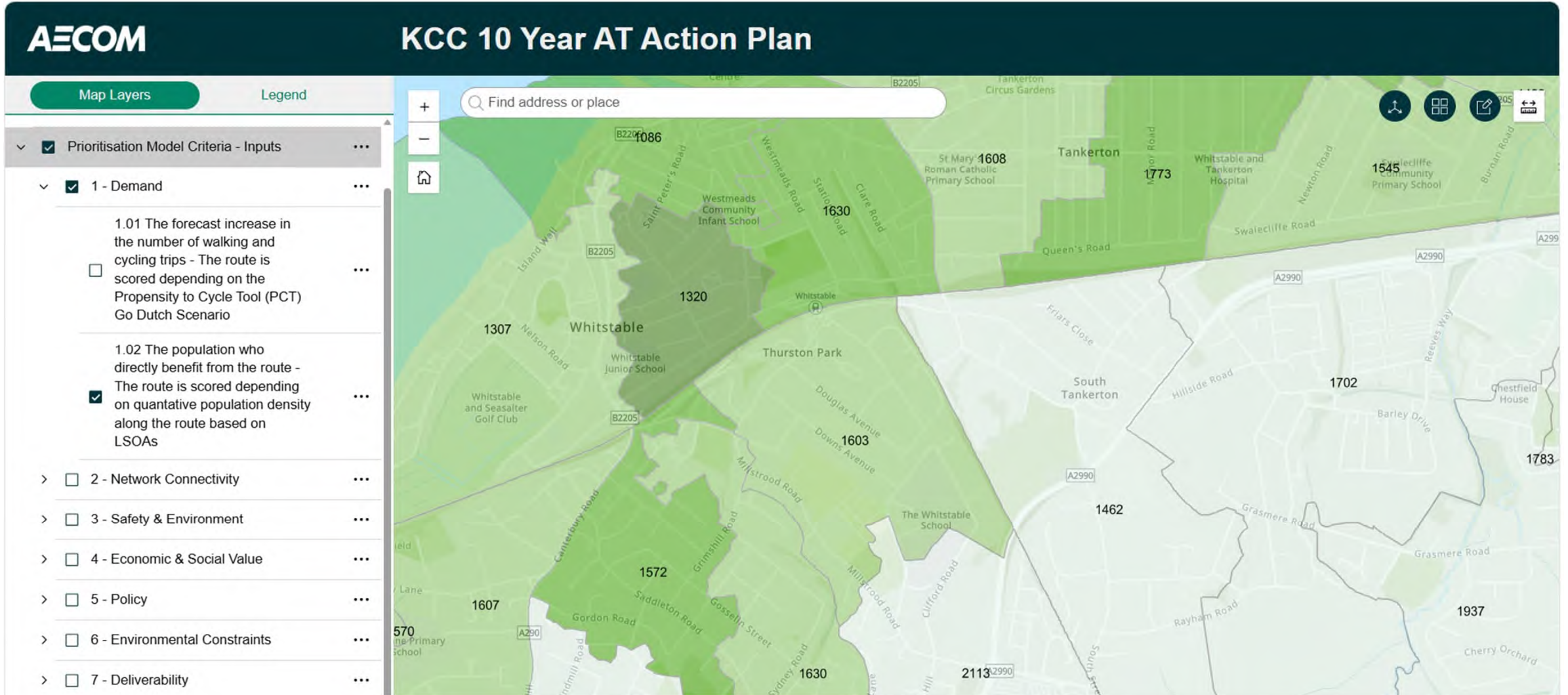
Environmental Constraints

- Ecologically Sensitive Areas, Flooding Areas, Sea Level Rise, Topography



Deliverability

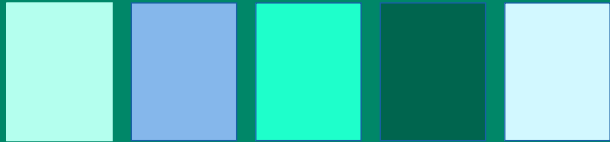
- Highway Boundary, LCWIP Deliverability Assessment, LCWIP Status, LCWIP Priority Scoring



Scoring

Quintile ranking

MOST CRITERIA

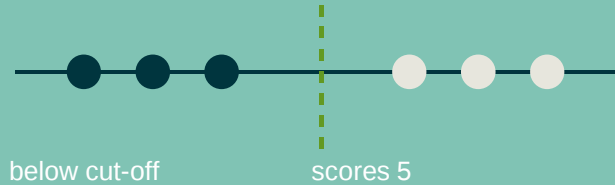


Each route placed against the distribution of all routes.

3.01 Collisions 1.01 PCT Go Dutch flow

Absolute bands

WHERE A THRESHOLD EXISTS



below cut-off

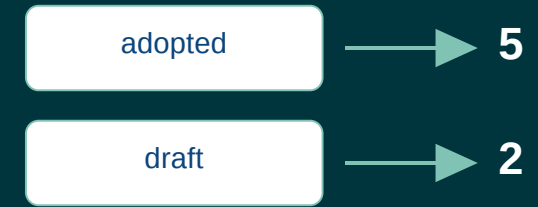
scores 5

Fixed cut-offs, independent of other routes.

2.05 >200 m corridor = 5 5.08 No car = 5

Categorical lookup

WHERE THE SOURCE IS USED



no ranking involved

A label maps straight to a value.

7.03 Adopted = 5, draft = 2 7.04 Primary = 5



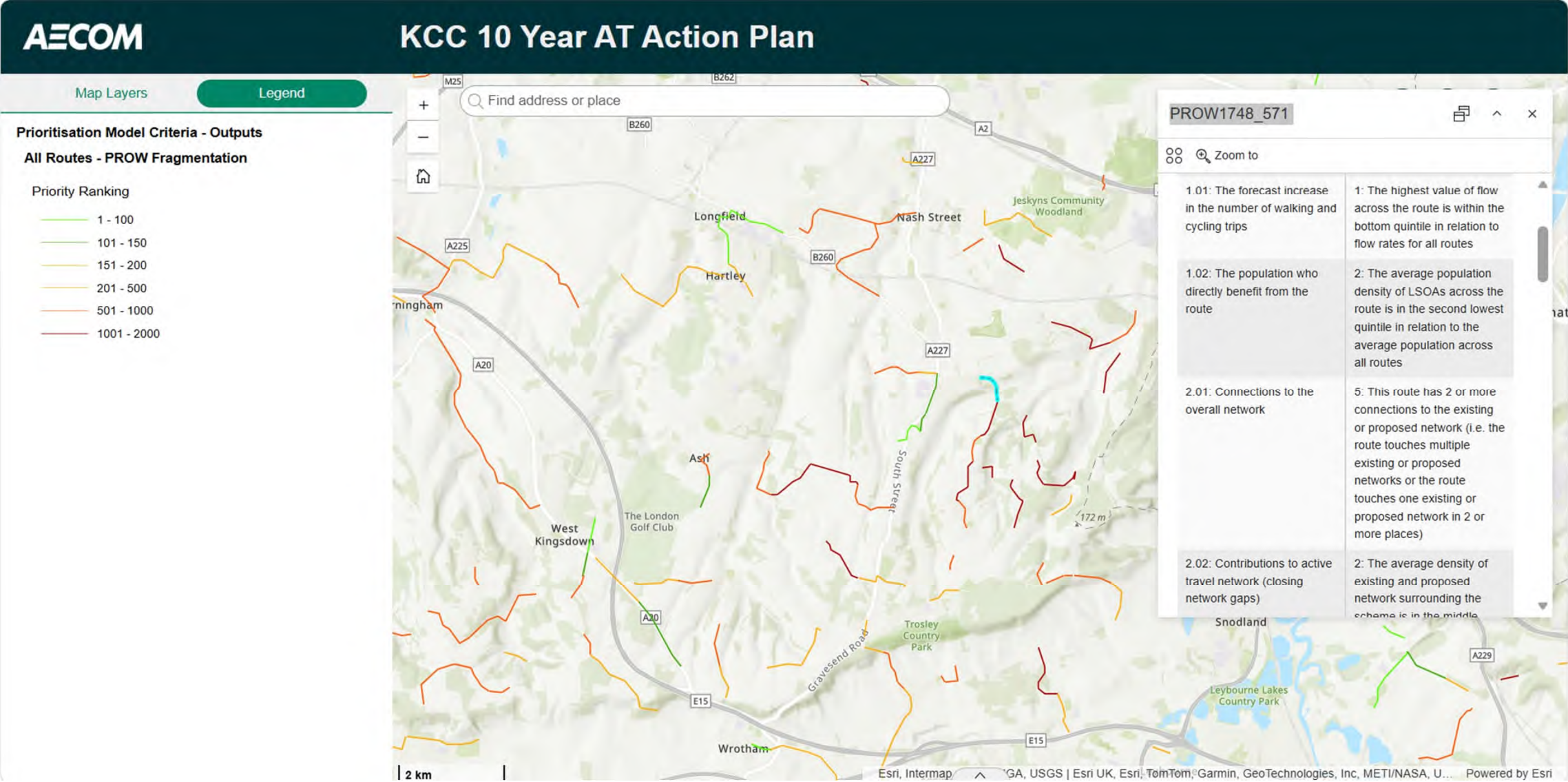
Quintiles are relative

A route's score depends on the population it sits in. Add schemes and existing scores can move.

Model Configuration

Criteria ID	Criteria Name	Data Source	Analysis Type	Parameters	Attribute Field	Score 0	Score 1	Score 2	Score 3	Score 4	Score 5	Score Method	Custom Thresholds	Active
1.01	PCT Flow Analysis	PCT_Fastest_Routes_LN	Proximity and Intersect	line_buffer_distance=5; proximity_distance=50; min_intersect_length=10;	dutch_slc	0	1	2	3	4	5	quintile		TRUE
1.02	Population Density	Population_Density_Mid2020_LSOA_PG	Attribute Join	target_field=Mid_2020_p;operation=average;min_length=100	Mid_2020_p	0	1	2	3	4	5	quintile		TRUE
2.01	Network Connections	OverallNetwork_Existing_Proposed_Merge_LN	Spatial Join	operation=count;join_operation=JOIN_ONE_TO_MANY		0	3	5	5	5	5	custom	0;1	TRUE
2.02	Network Gap Analysis	KentCC_Grid_500m_AllRoutes_pg	Network Gap Analysis	network_field=Total_Length;min_intersection_length=0		5	4	3	2	1	0	quintile		TRUE

Output



Making the results understandable

KCC 10 Year AT Action Plan - Dashboard



Keeping it alive

Consistent

The same measurements on every route

Traceable

Every score back to a dataset

Re-runnable

New data, new schemes - can be re-run

- Potential connection to live sources
- Decide whether to re-run the model

Using prioritisation outputs for funding



**Matching latest
funding criteria**



**Funding applications
support**



**Clarity and consistency
across geographies**



**Accelerated
implementation**

Lessons Learnt



Lots of data with poor formatting, missing descriptions and odd data. A guidance on the format of the data for the LA to accept from third parties.



Minor data discrepancies may only be noticed with time.



Testing required to understand the best dashboard functionality for a specific user.

Importance of network

The model can support a wider conversation about:

- geographic balance
- strategic corridors
- network continuity
- connections between communities
- links to existing infrastructure
- packages of schemes



Q&A

AECOM Delivering a
better world