Kent County Council's Drone trials

DEVELOPING AN UNMANNED AERIAL SYSTEM-OF-SYSTEMS FOR LOCAL AUTHORITY ASSET MANAGEMENT

Carol Valentine, Highways project manager, Kent County Council &

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ADEPT Programme - Live Labs Kent

- £23 m grant funding from Department for Transport (DfT) – Smarter Places
- 28 bids received in 2018
- 8 successful bids
- Innovation covering (Smart) Materials, Communications, Energy & Mobility, singularly and in combination
- Kent CC in partnership with Amey plc awarded £1.975m from the Department for Transport to invest in Highways innovation over 2 years
- Range of innovations, technology trials, digital customer tool
- Kent Lane Rental – additional c. £500k inc. drone trials

Kent County Council's Drone Development Programme

Kent County Council is currently investigating how aerial data acquisition technology can be used for Asset Management, to increase safety, reduce delays and drive efficiencies.

Working with amey consulting and it partners, the team are developing the capabilities to acquire data, process and deliver actionable insights.

Supporting:

- The identification and profiling of highway defects, with repeatable visits support change detection
- Detecting issues with vegetation and street furniture, highlighting health and infrastructure risks
- The evaluation of the surrounding environment, including utility interfaces and drainage runoffs.

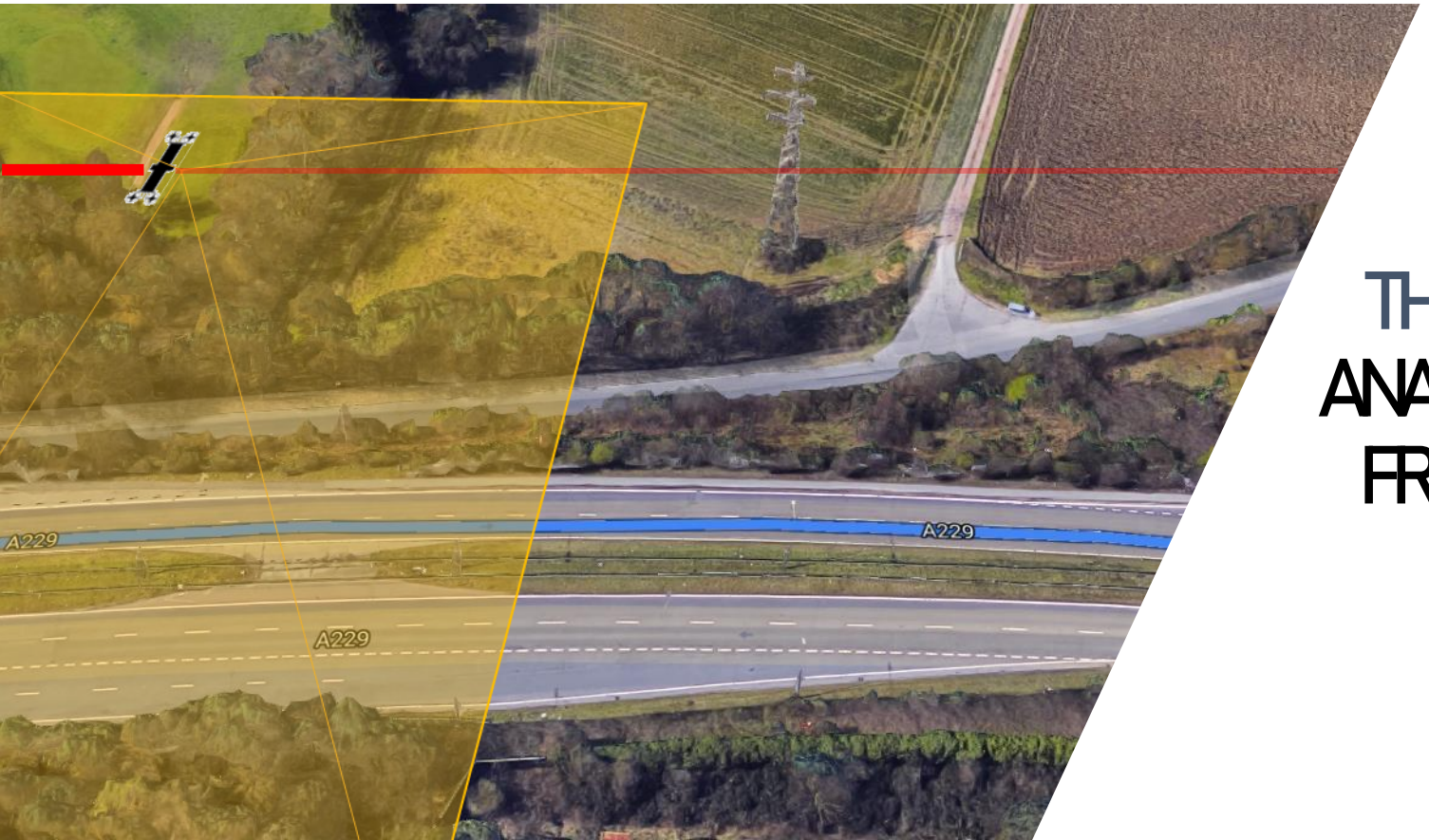
The project is part of a wider programme to develop Beyond Visual Line of Site capabilities for the use over the Kent County Region.

Background

Kent County Council and amey consulting are currently working on a programme to evaluate and asses how the development of a fully automated Beyond Visual Line of Sight (BVLOS) Unmanned Aerial Service (UAS) can be used to benefit asset management activities within the region.

KCC has taken a mature innovation strategy approach in the evaluation of UAV's for the region, breaking the programme up into smaller projects, whilst focusing on faster sprints, with a focus on faster return on investment. Using the end of each sprint to evaluate how he developments and capabilities within the sprint can be used commercially at each stage. This approach supports the continued business case development for the larger programme whilst also supporting Kent to exploit the learning at each of the stage gates.

Furthermore by progressing through an iterative process Kent County Council has been able to gain knowledge and insight into the procedural requirements for safe integration of UAS activities into the region.



THE ULTIMATE END STATE VISION: ANALYSIS OF ALL NETWORK ASSETS FROM A SINGLE SOURCE – BVLOS AERIAL DATA ACQUISITION

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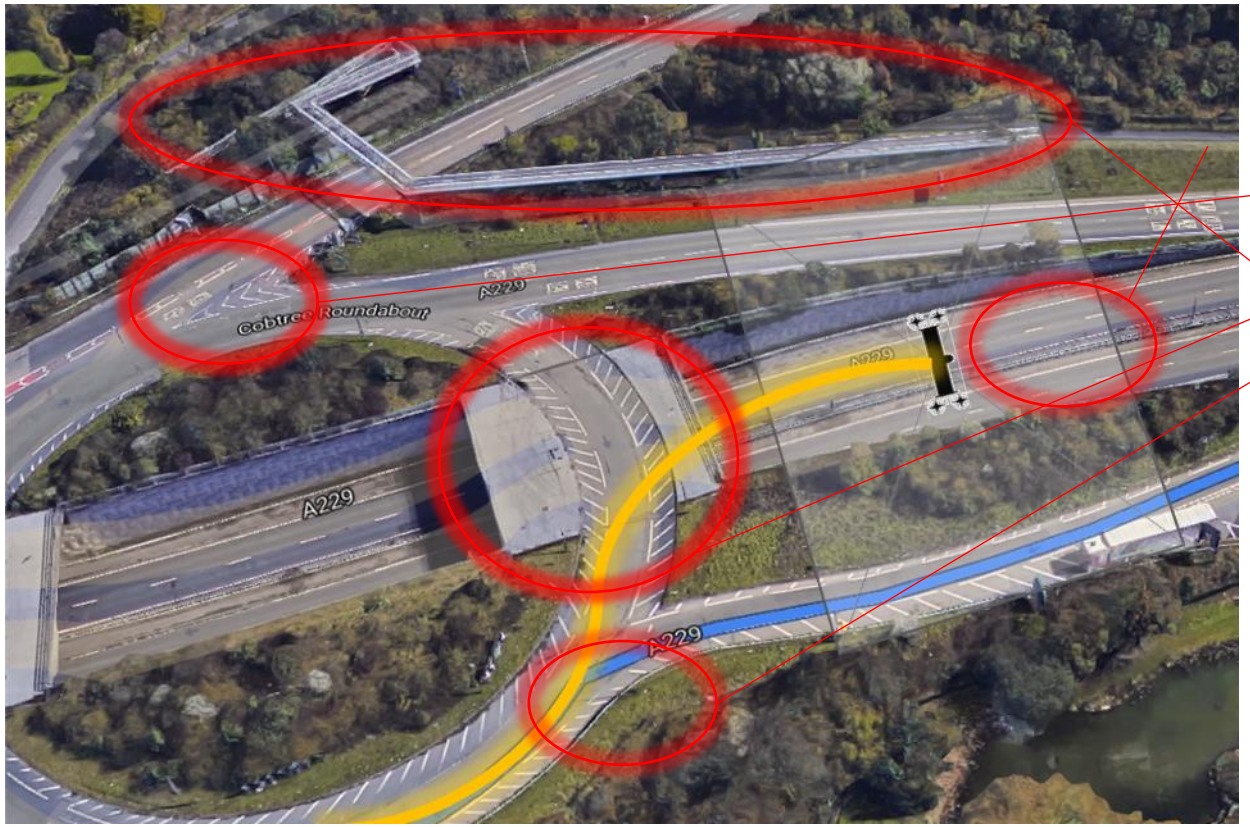
End State Vision – Aerial Data Acquisition

One flight to enable all network assets to be inspected:

- Highway surface inspection
- Road markings
- Street furniture and signs
- Structures
- Barrier condition
- Earthworks and verges
- Bodies of water or drainage
- Soft Landscape – Vegetation proximity and condition
- Environmental
- Utilities
- Network boundaries – fences etc
- Incident response
- Foot paths and adjacent assets
- … and so on

End State Vision – Aerial Data Acquisition



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End State Vision – Aerial Data Acquisition

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- Incident response
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- … and so on

Our Vision

To provide an automated asset data acquisition and processing service for infrastructure owners to enable their engineering teams to focus on their highest value capabilities

Customer benefits:

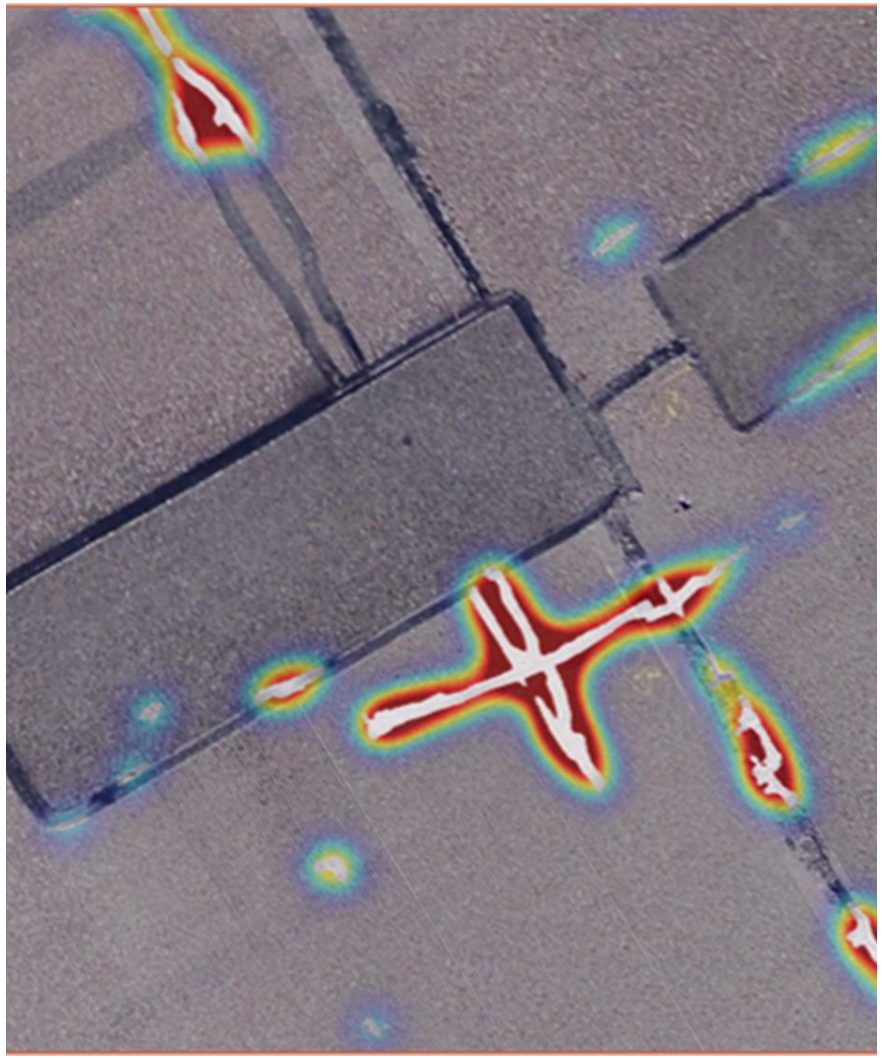
Safety – no need to send inspectors and surveyors into hazardous environments

Economy – automation results in much lower data acquisition and processing costs and avoids wasting engineer time in validation

Efficiency – minimal disruption to operations; reduces the need for expensive closures and possessions

Efficacy – accurate, repeatable, and traceable data and an absolute audit trail

Intelligence – powerful AI tools enable automation of change detection and predictive modelling



PHASE 1 – UAS TRIALS IN A REPLICATIVE ENVIRONMENT

Use case: Pavement Condition

Imagery Collection

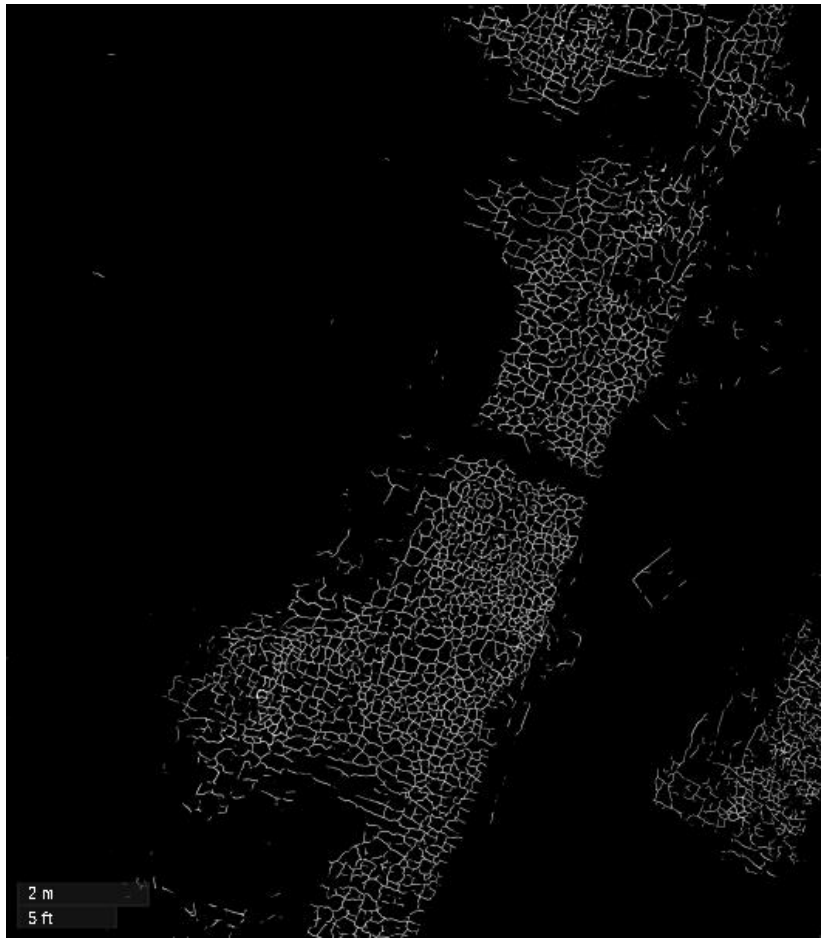
Imagery Collection took place at Detling Showground in Kent

Composite Images

With accurate matching between images, we can create composite images and composite analysis results over whole imaging collections – or even multiple data collections.

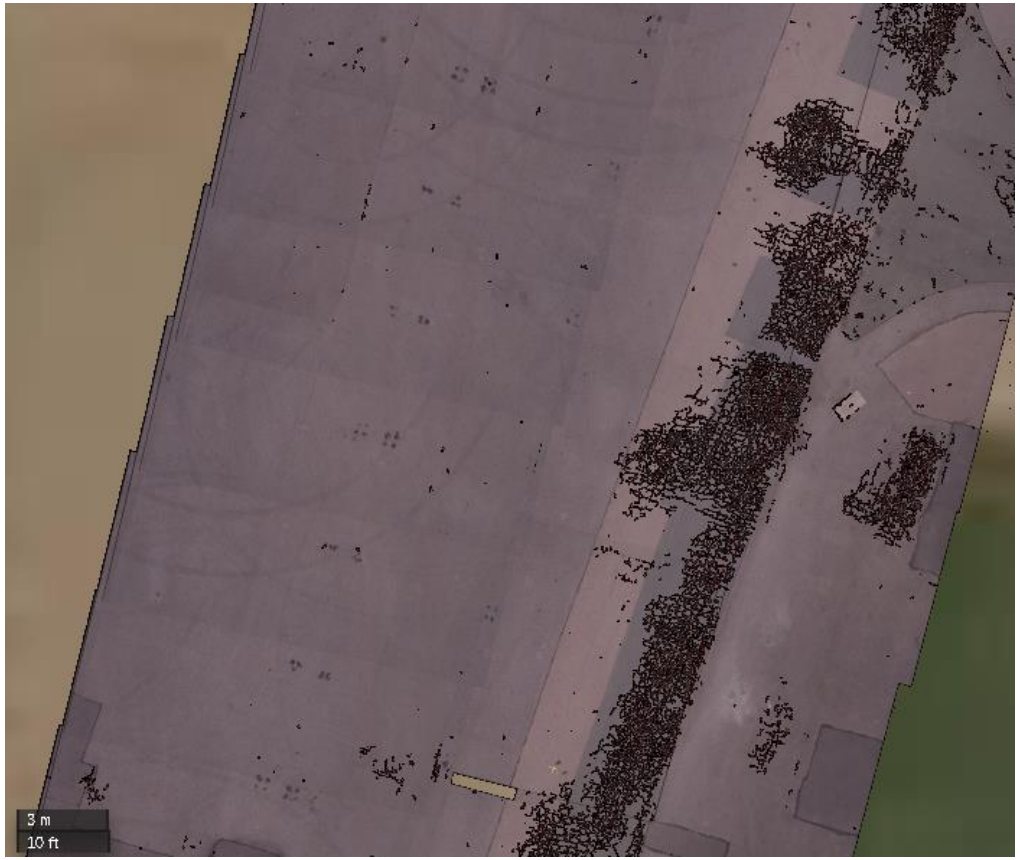
Crack Detection

Crack and crazing detection



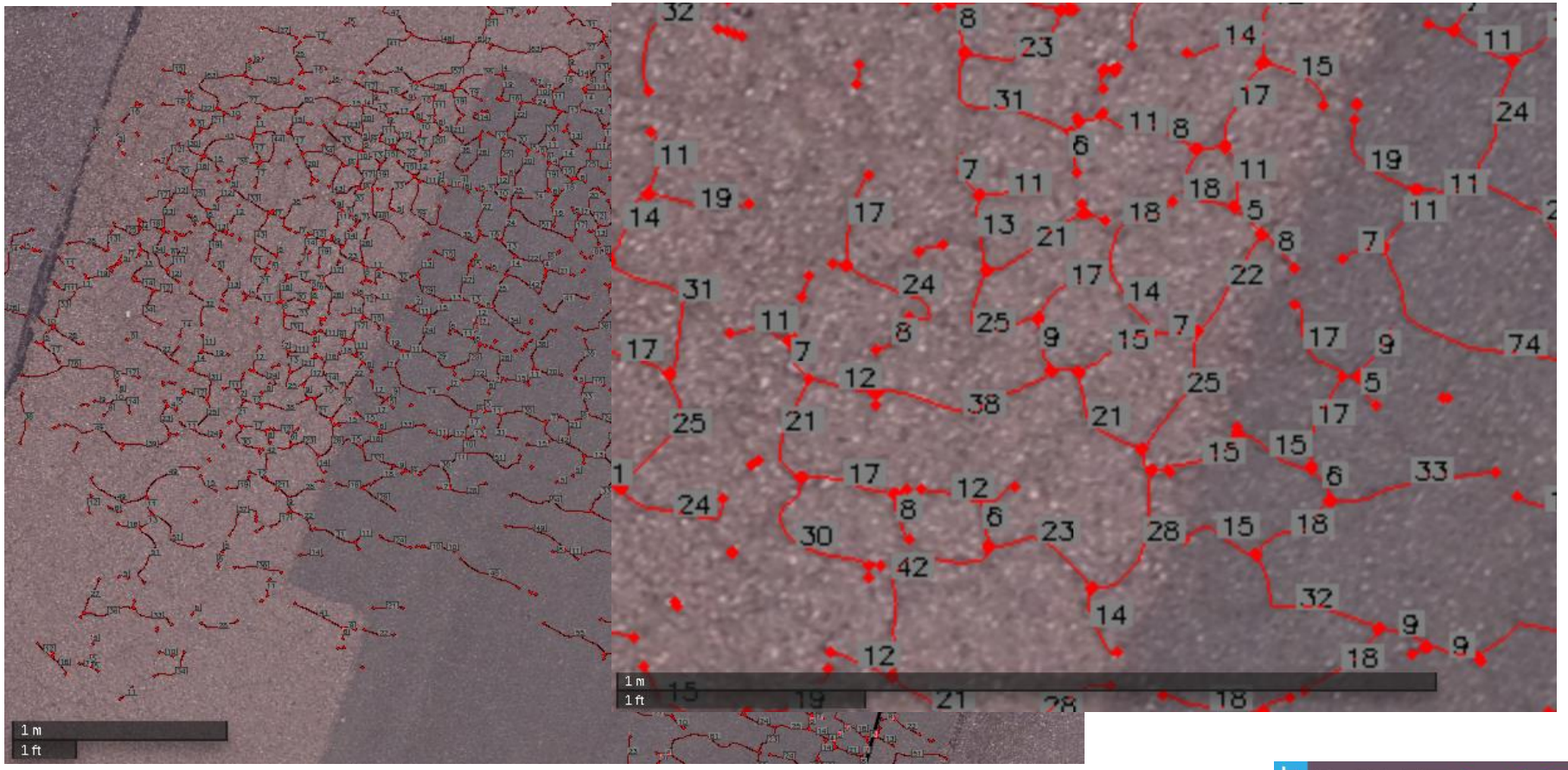
Crack Visualisation

The cracks can be viewed over the collected imagery



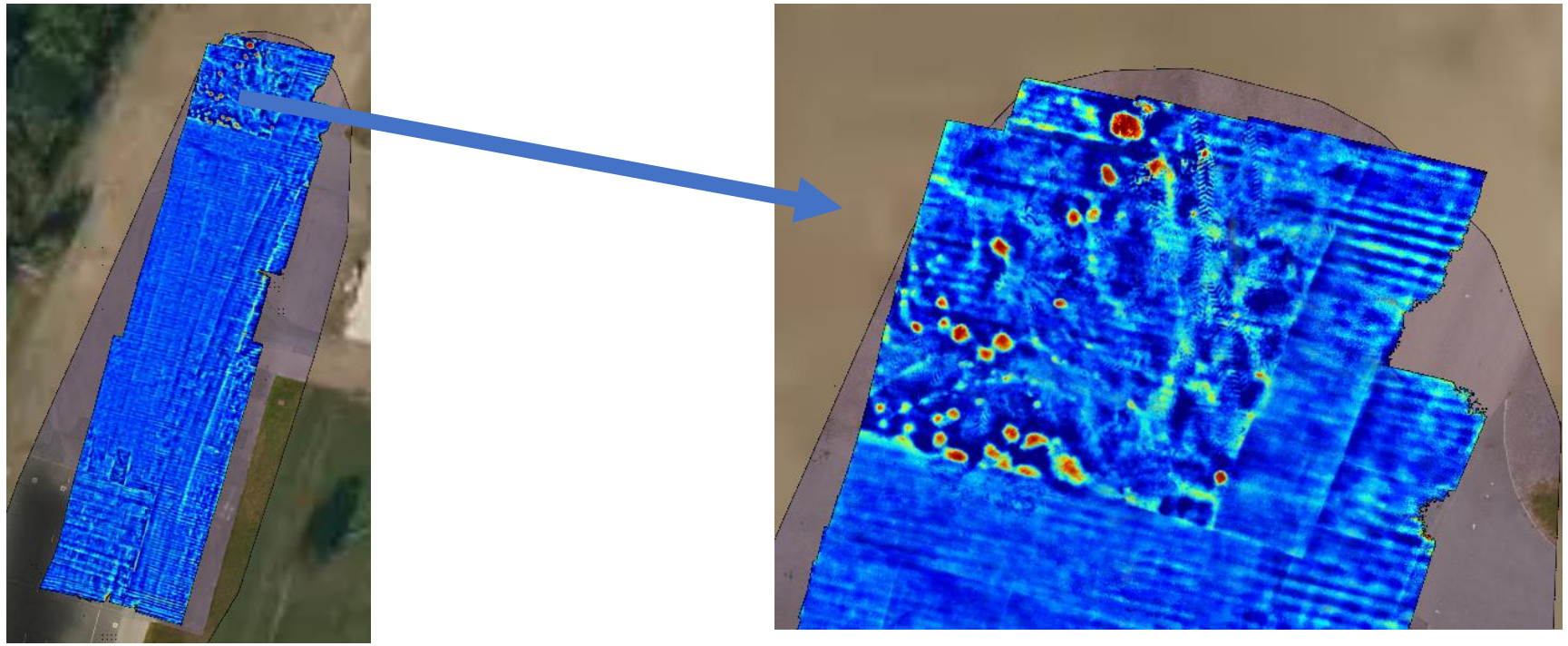
Crack Measurements

And we've measured the length of every crack (measurements below in cm)



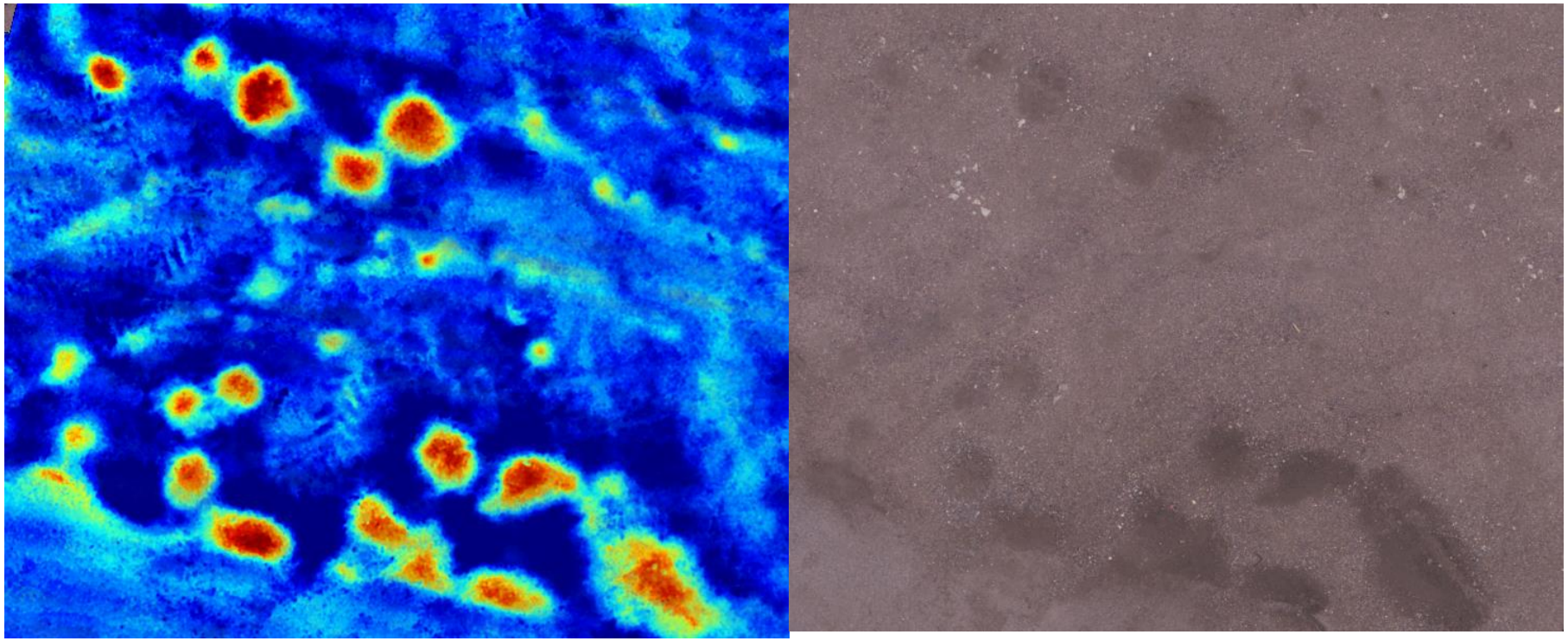
Potholes

Using a technique to generate depth from pairs of imagery, we can create a heatmap of deviations from a flat surface



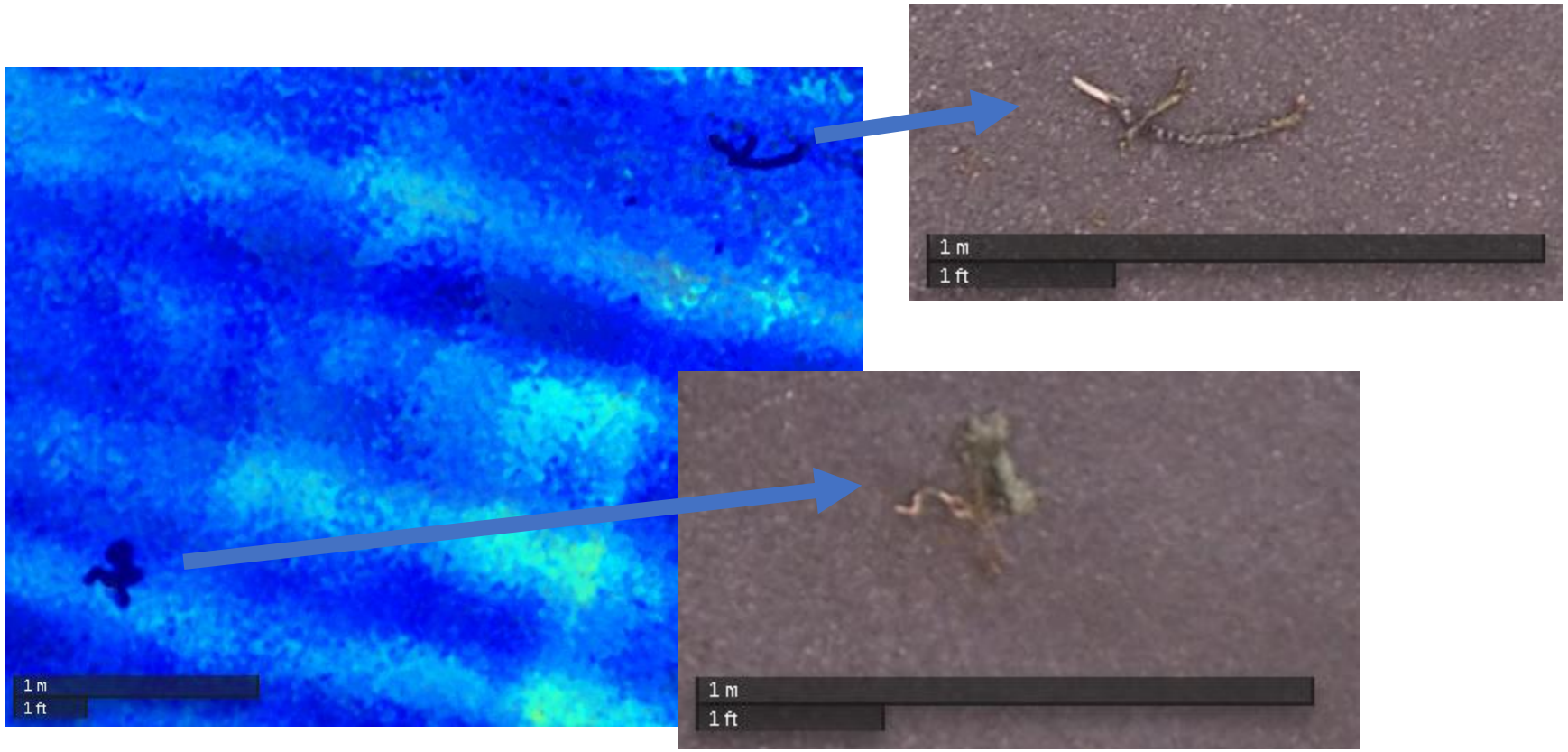
Potholes

We can see the features being identified in the imagery



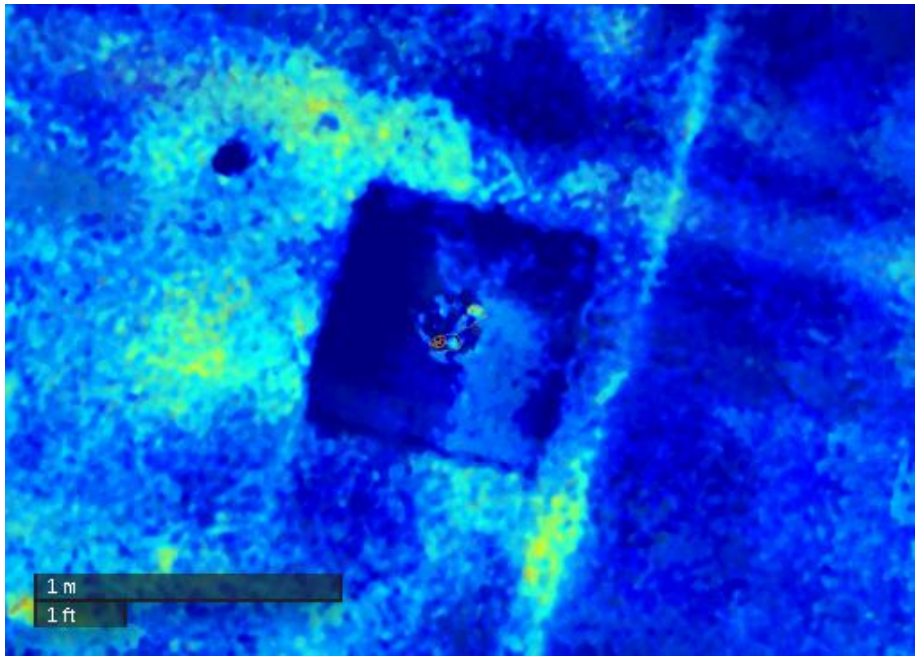
Pothole – Fine level features

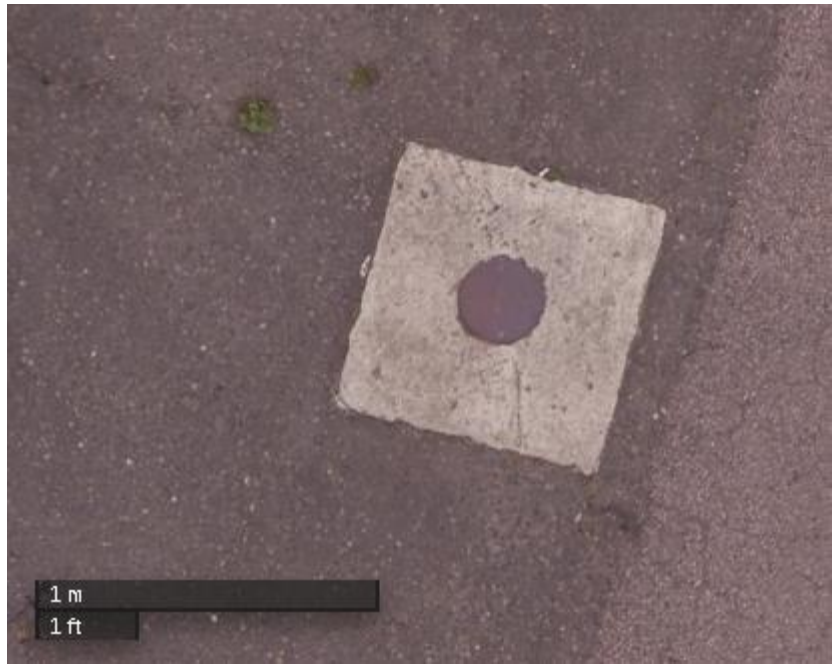
Example of identifying raised objects on the road surface



Pothole – Fine level features

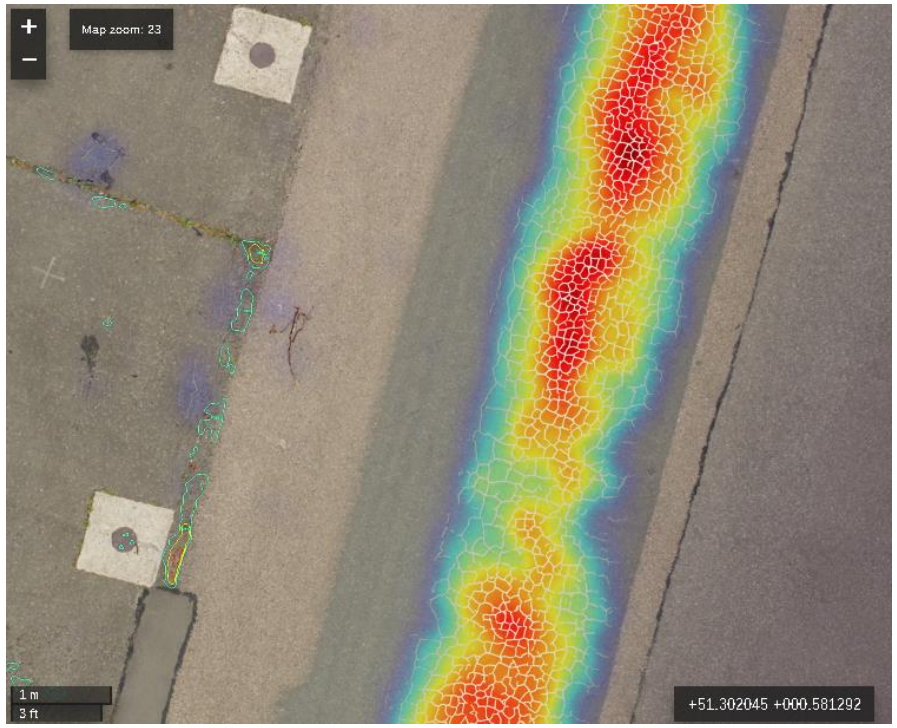
Or perhaps more pertinently, we can identify raised iron work or eroded tarmac next to concrete post footings





Cracks with no Depth

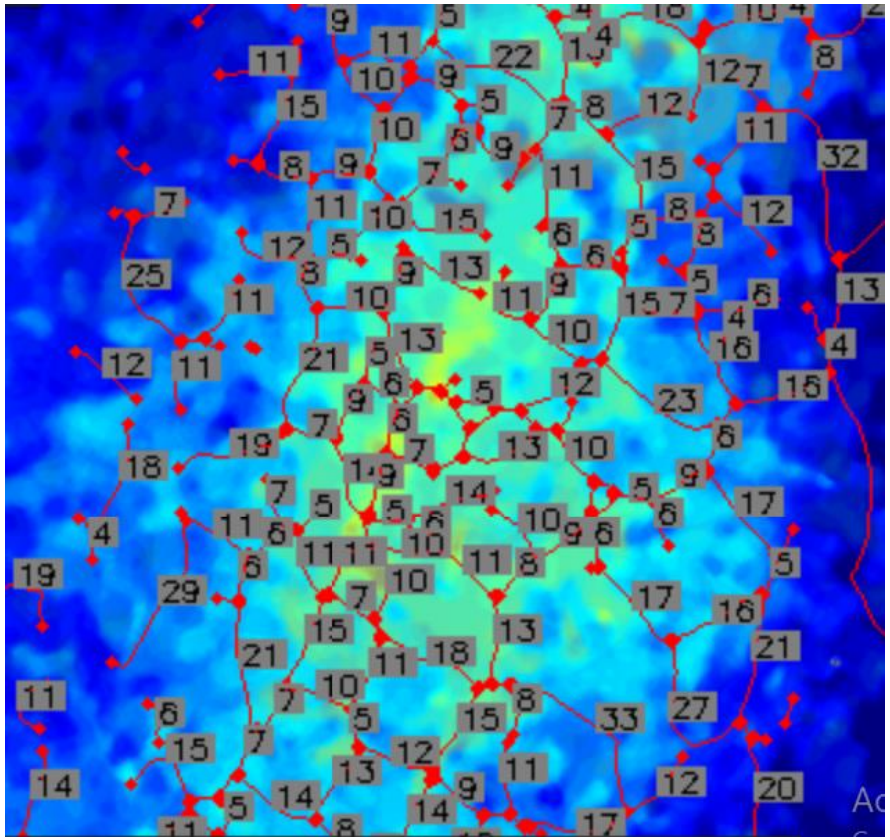
We can identify areas of road surface that have patterns of cracks across the surface but have minimal crack depth – crocodile crazing

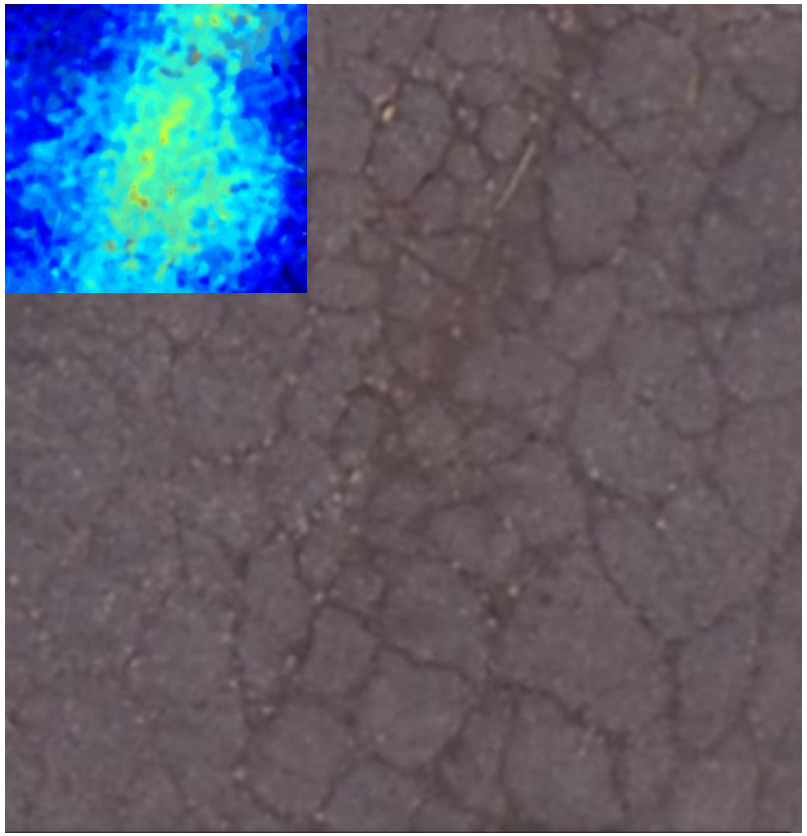


Depth contours

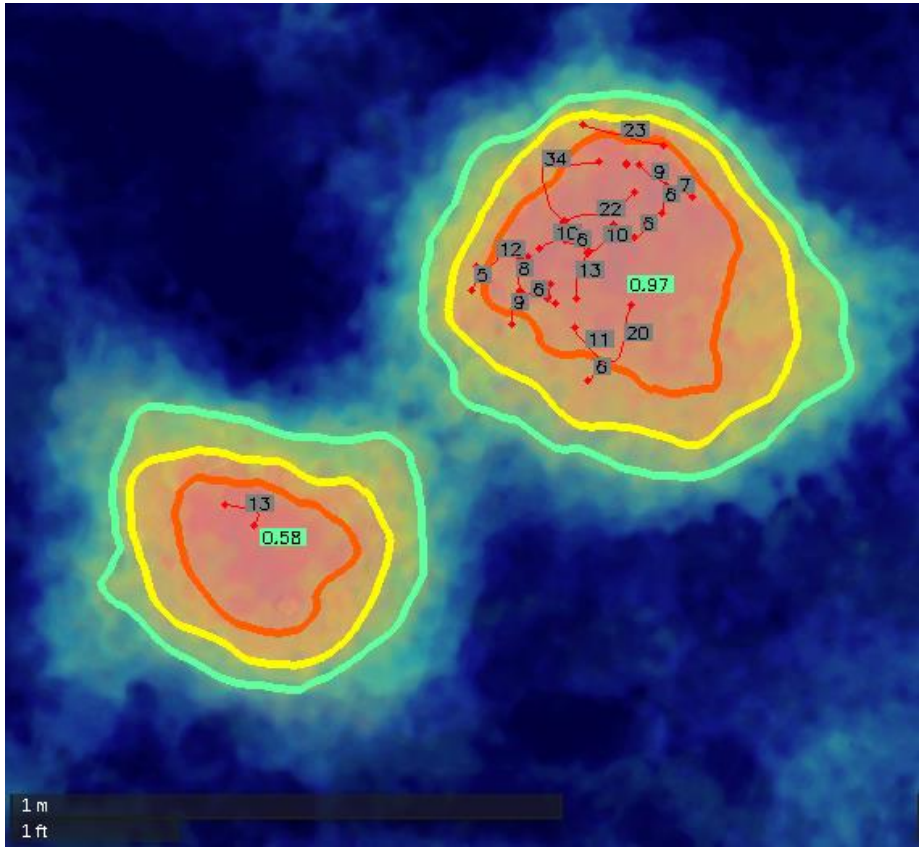
Cracks with Depth

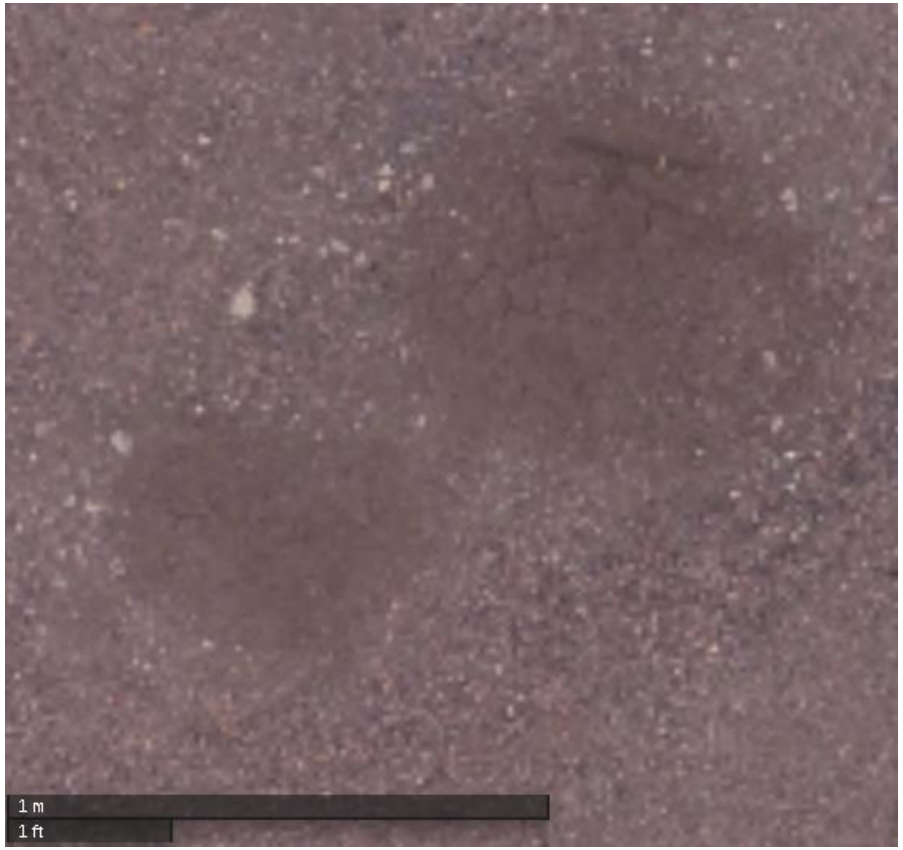
We can also identify the more severe cracks, enabling us to identifying key defects such as alligator/crocodile cracking





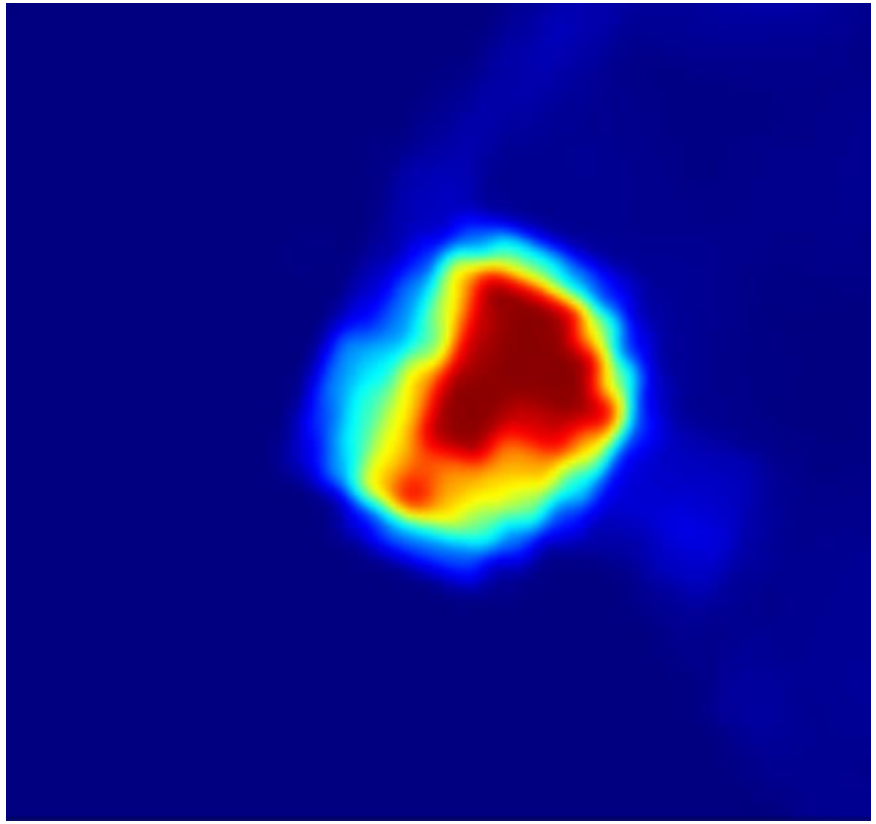
Potholes with cracks in them

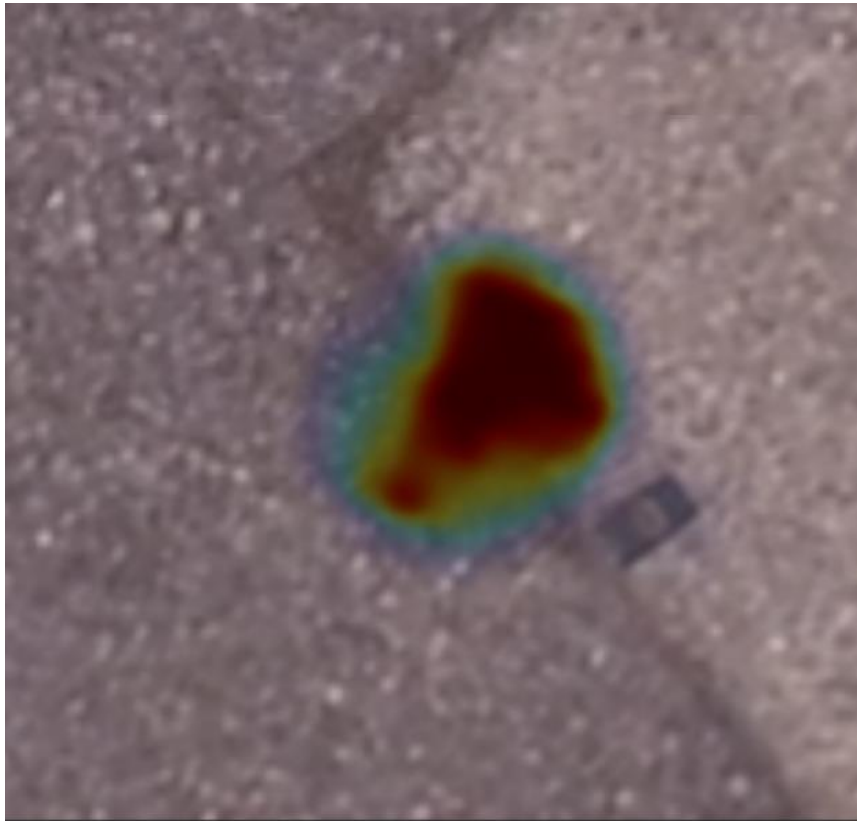




Change Detection – example results

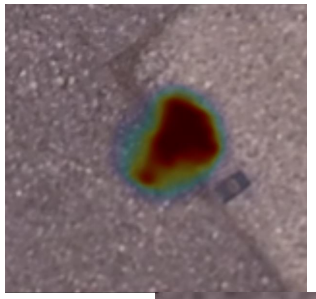
Through multiple visits we can undertake change detection, enabling us to focus on the key areas of interest. Those areas that are seeing change overtime and could be trending towards defects that can cause significant disruption.





Change detection – example results

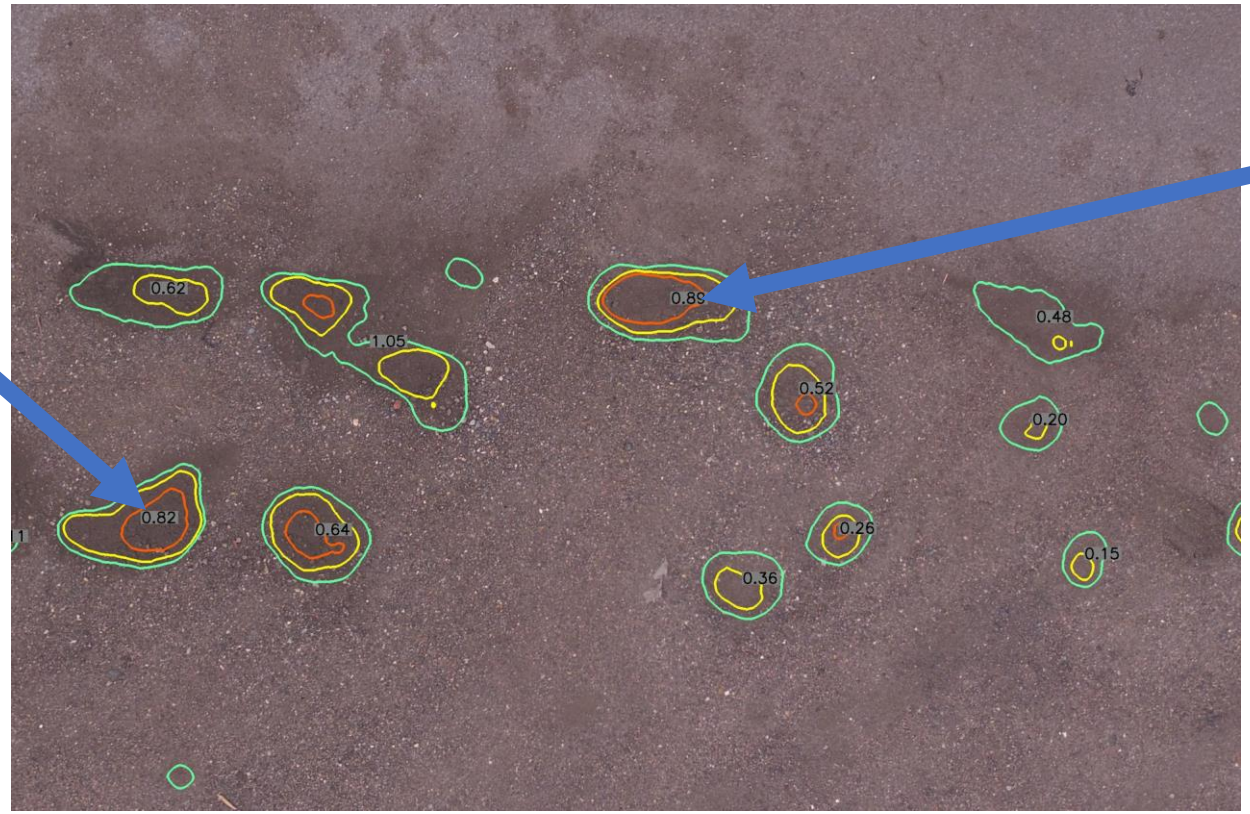
Change that triggered this detection



Pothole Depth and Areas

From the "stereo disparity" output, we can calculate the area and depth of pothole like defects. This can be presented visually …

Contours of increasing depth



Area of outer edge of pothole

Tabular Defect reports

Although they may be quite lengthy, we can generate defect reports from our analysis in formats that can either be human readable – or more suitable for downstream data processing.

	A	B	C
1	LAT	LONG	LENGTH
2	51.302520N	0.581419E	237
3	51.302520N	0.581419E	237
4	51.302520N	0.581419E	236
5	51.302530N	0.581432E	236
6	51.302530N	0.581432E	236
7	51.302530N	0.581432E	236
8	51.302664N	0.581735E	160
9	51.302657N	0.581728E	160

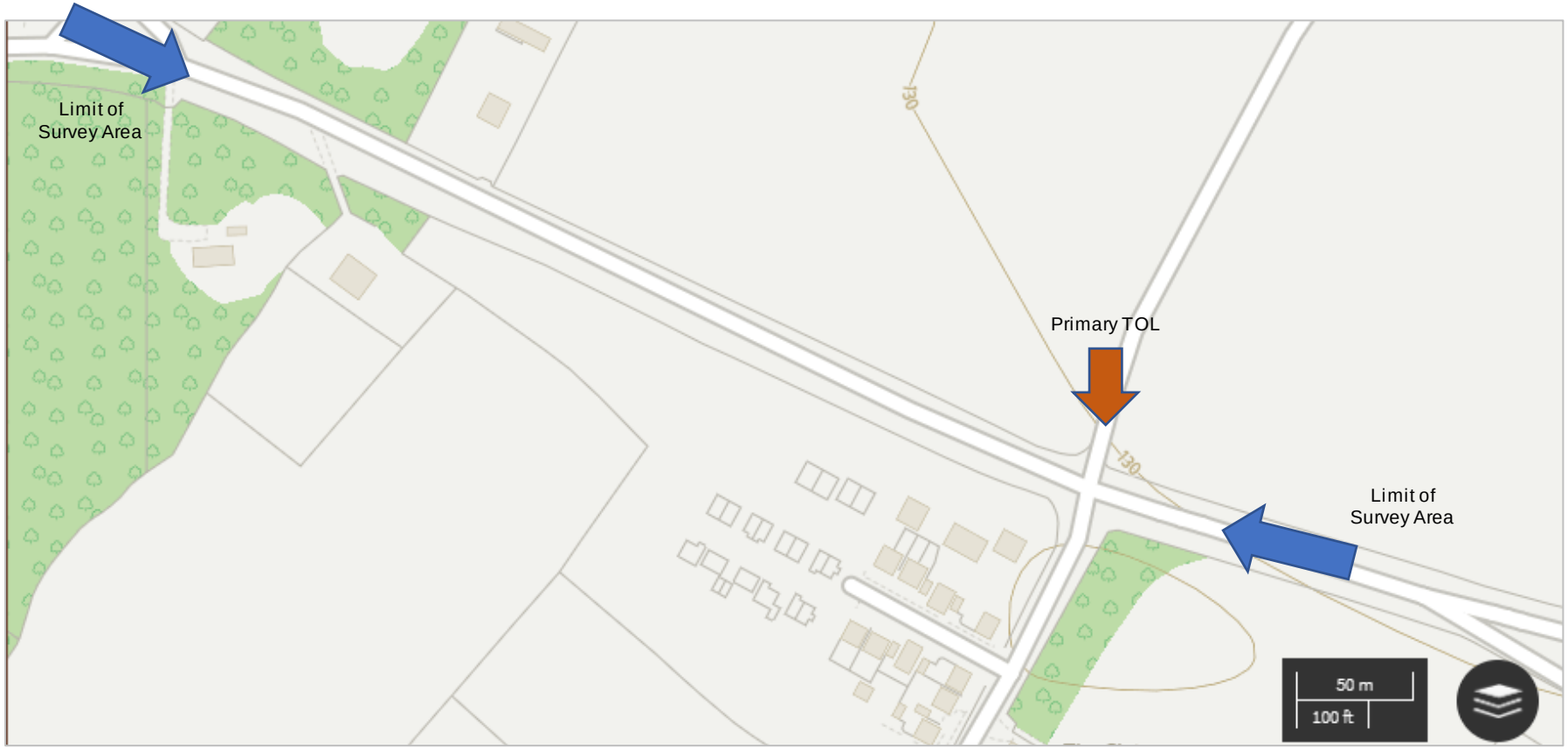
	A	B	C
1	LAT	LONG	LENGTH
2	51.302588N	0.581610E	123
3	51.302593N	0.581615E	123
4	51.302593N	0.581615E	123
5	51.302418N	0.581610E	120
6	51.302418N	0.581610E	120
7	51.302424N	0.581605E	120
8	51.302424N	0.581605E	120
9	51.302653N	0.581702E	119
10	51.302655N	0.581693E	119
11	51.302030N	0.581288E	116
12	51.302036N	0.581289E	116
13	51.301947N	0.581298E	115
14	51.301947N	0.581298E	115
15	51.301947N	0.581298E	115
16	51.301947N	0.581298E	114
17	51.301947N	0.581288E	114
18	51.302588N	0.581764E	109
19	51.302589N	0.581755E	109
20	51.302571N	0.581622E	108
21	51.302575N	0.581616E	108

Phase 2 – Live trials

Highway & Soft Landscape Asset Management

Survey area

ROUTE ALONG A20 NEAR HARRIETSHAM – EAST OF BP GARAGE



Planning & CONOPS (Concept of Operations)

To undertake aerial data acquisition activity in a safe and responsible manner, the team had to undertake specific planning for operations over the local authority region.

A review of the operations plan and scheduling was conducted in line with the regulations set out by the CAA and legislations set out by the Air Navigation Order, to ensure all activities were acting in a lawful and considered manner.

Activities were conducted in line with: CAA (Civil Aviation Authority) - CAP 722

Title: Unmanned Aircraft System Operations in UK Airspace - Guidance

Description: CAP 722 is the primary guidance document for the operation of unmanned aircraft systems within the UK. It is intended to assist those who are involved in all aspects of the development and operation of UAS..

Consideration was given to: ANO (Air Navigation Order) Article 241

Article: Endangering safety of any person or property

241. A person must not recklessly or negligently cause or permit an aircraft to endanger any person or property.

4 Drones, 4 cameras - VISIBLE

DATA COLLECTION WAS CONDUCTED WITH 4 DIFFERENT SYSTEMS

Phase One Camera

- 100 Megapixel visual spectrum camera
- 80mm lens
- Footprint at 50m – 27m x 20m
- GSD – 2.3mm

DJI FLIR

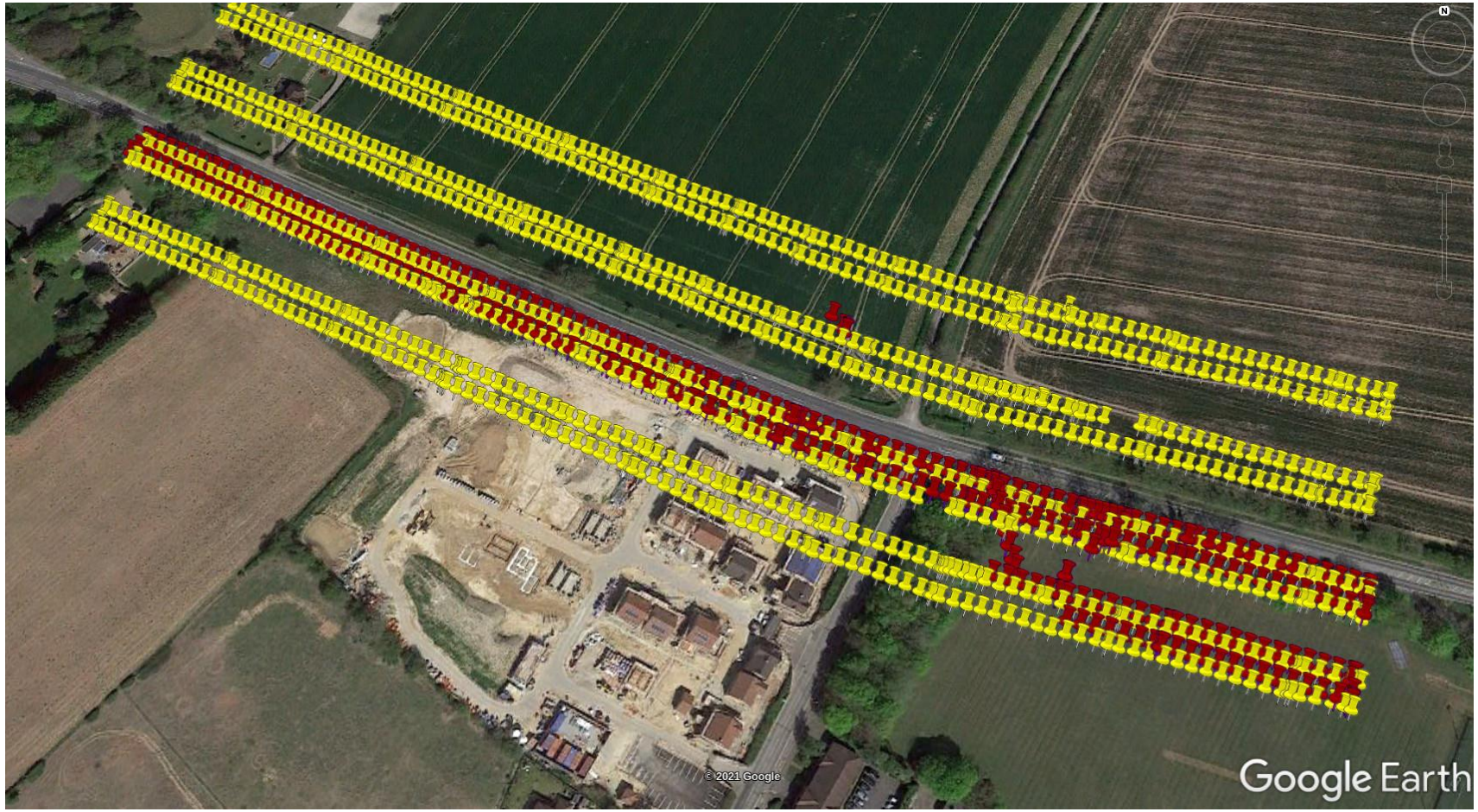
- 0.25 Megapixel visual multispectral camera
- Footprint at 50m – 37m x 31m
- GSD – 60mm

Zenmuse P1

- 45 Megapixel visual spectrum camera
- 35mm lens
- Footprint at 50m – 44m x 32m
- GSD – 6mm

- Micasense RedEdge
- 1 Megapixel visual multispectral camera
- Footprint at 50m – 40m x 30m
- GSD – 30mm

Flights & Flight Paths



OrthoPHOTOs

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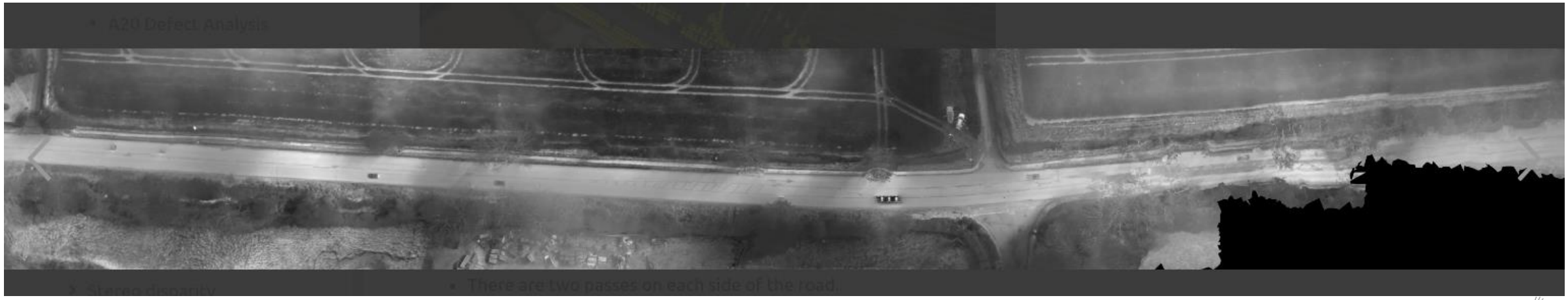
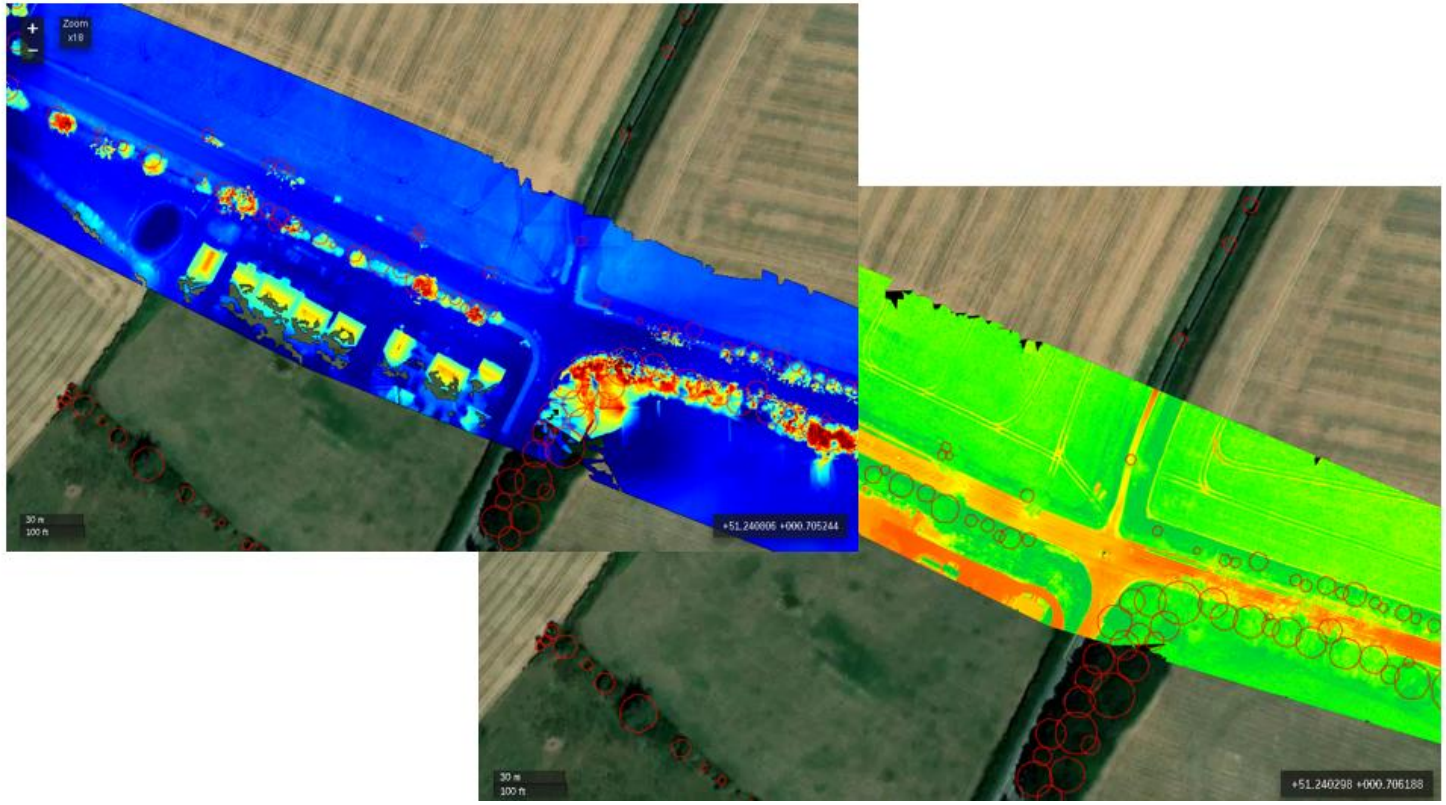


NDVI

Normalized Difference Vegetation Index (NDVI). The project is investigating how NDVI change detection can be used to identify trends in soft landscape vegetation health. NDVI quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs). Healthy vegetation (chlorophyll) reflects more near-infrared (NIR) and green light compared to other wavelengths

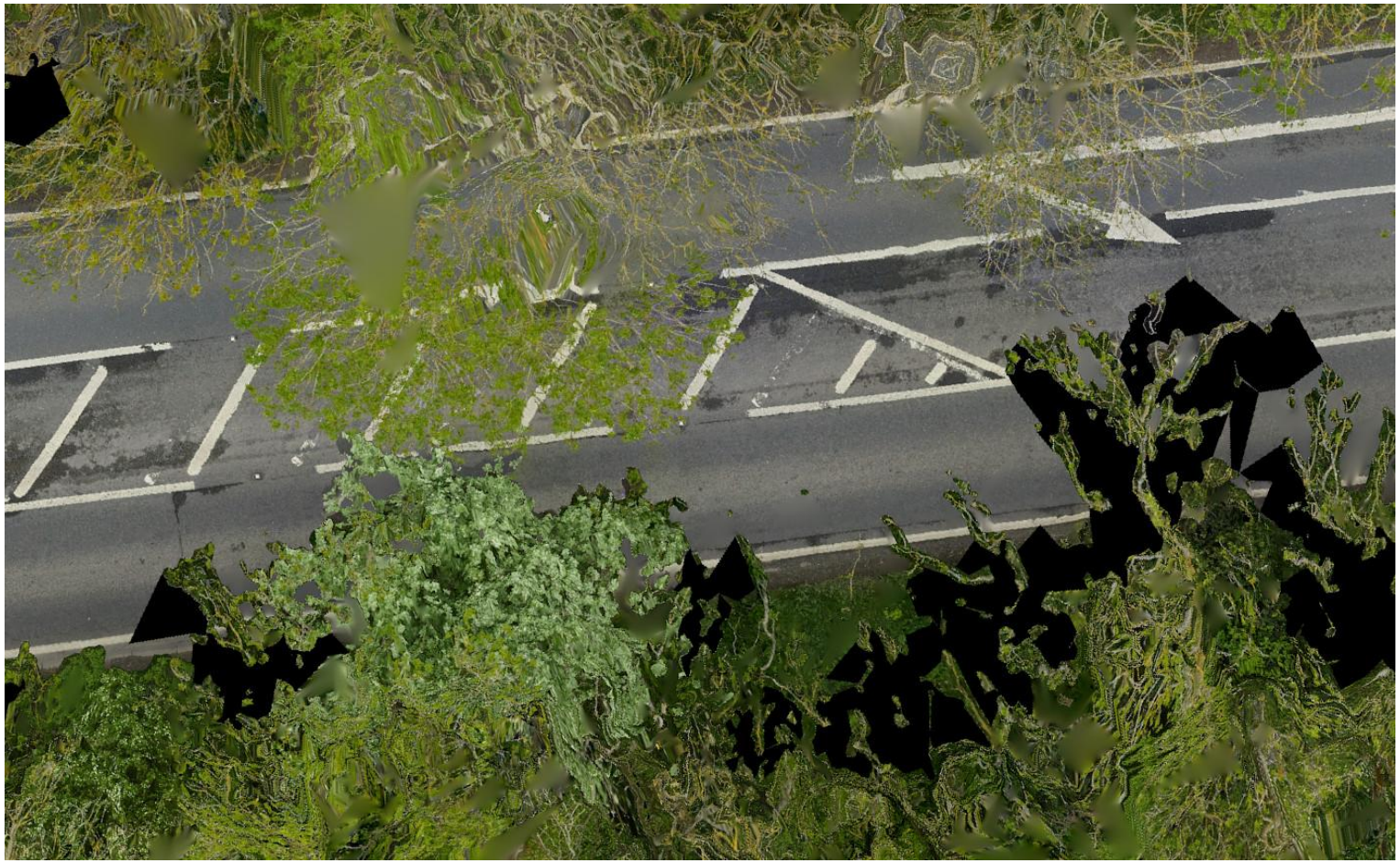


Crack Detection

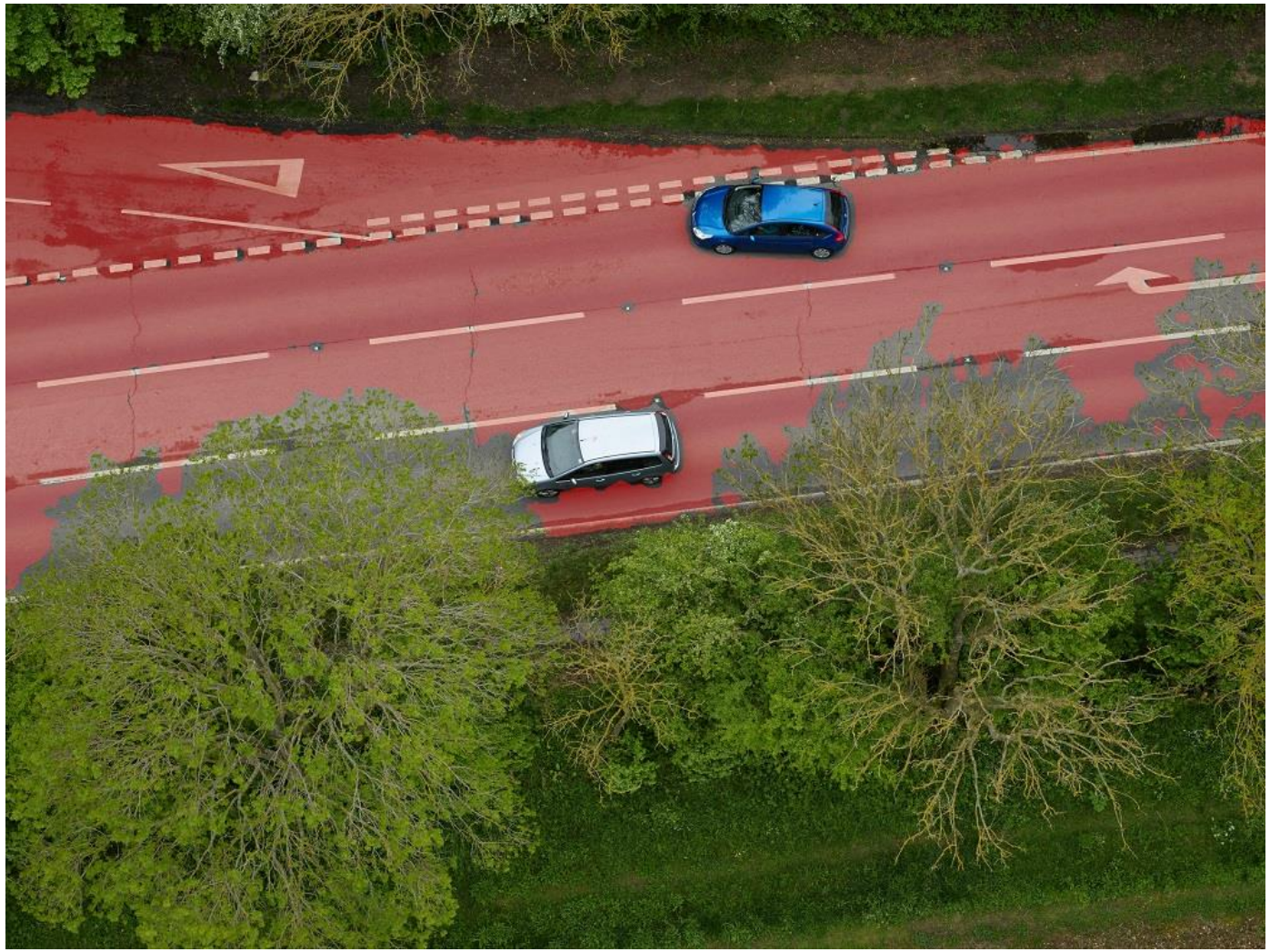
Depth Perception

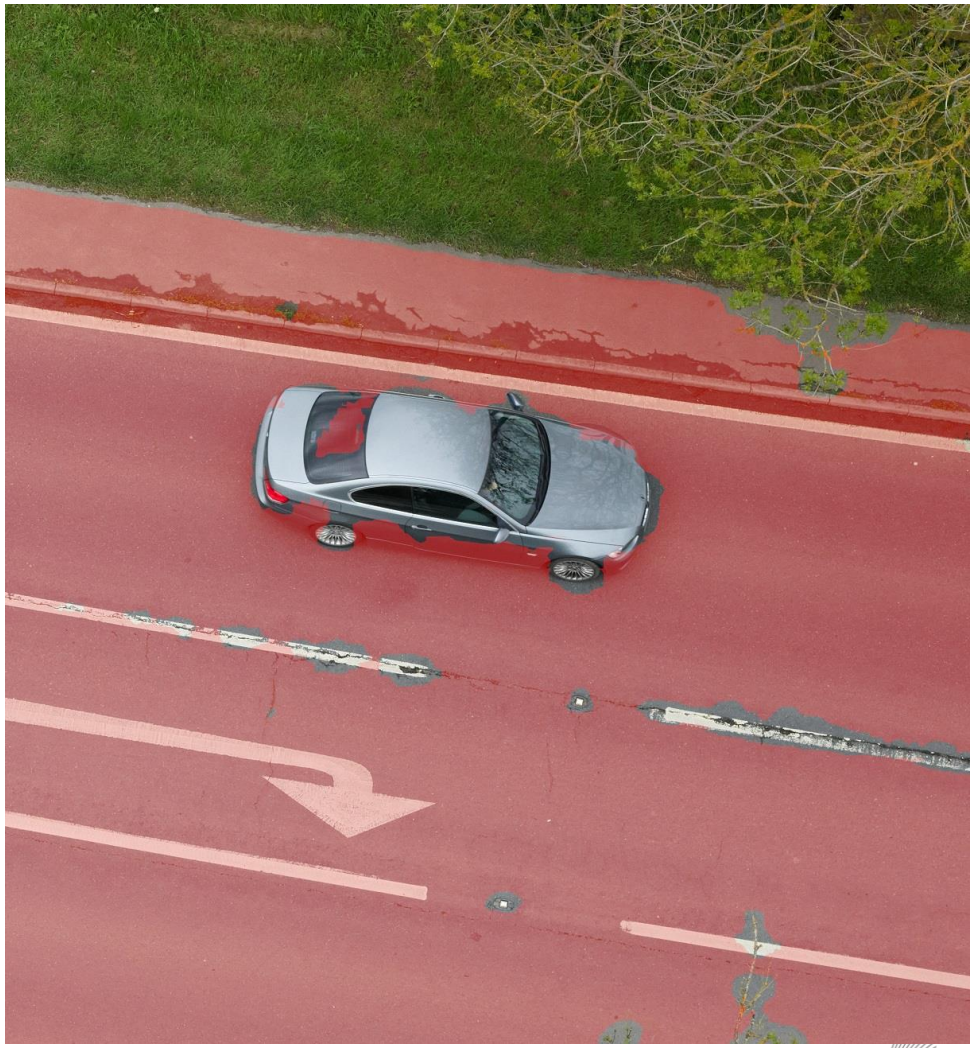
Depth Perception – Car Problem

Orthophoto – Tree Shadows

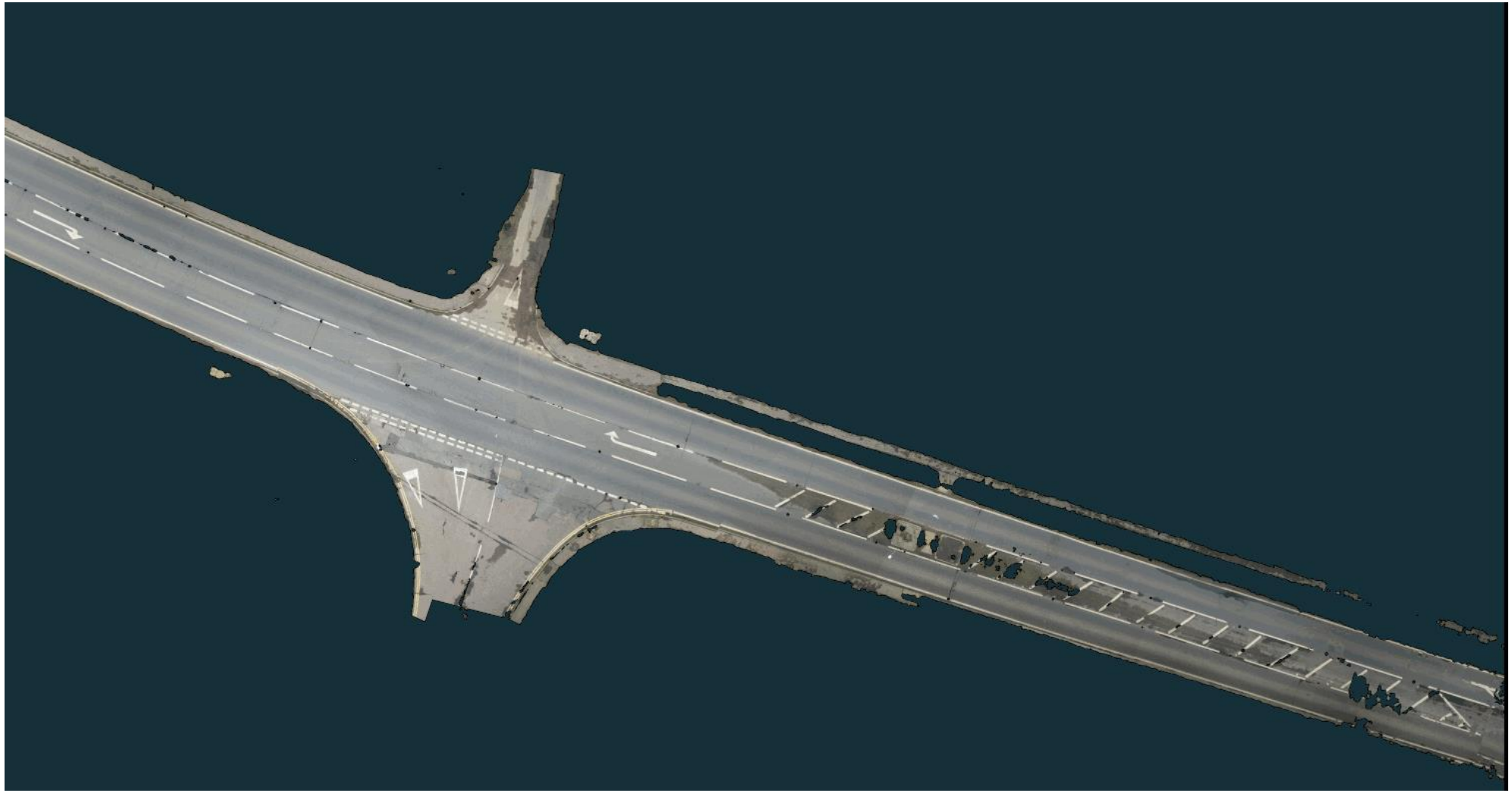


Road Filtering





Road Filtering - Used To Remove Trees

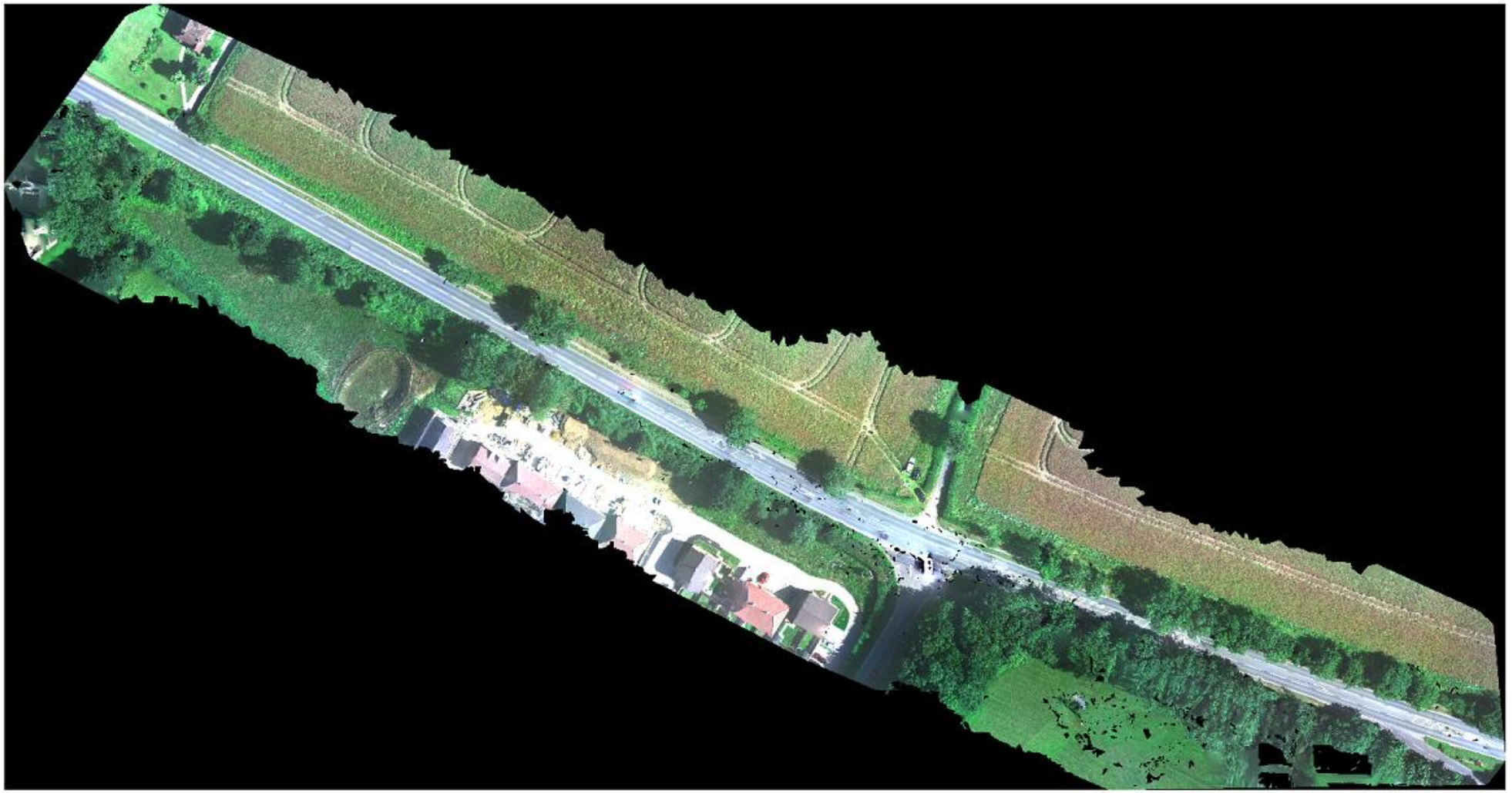


Road Filtering - Removed Trees

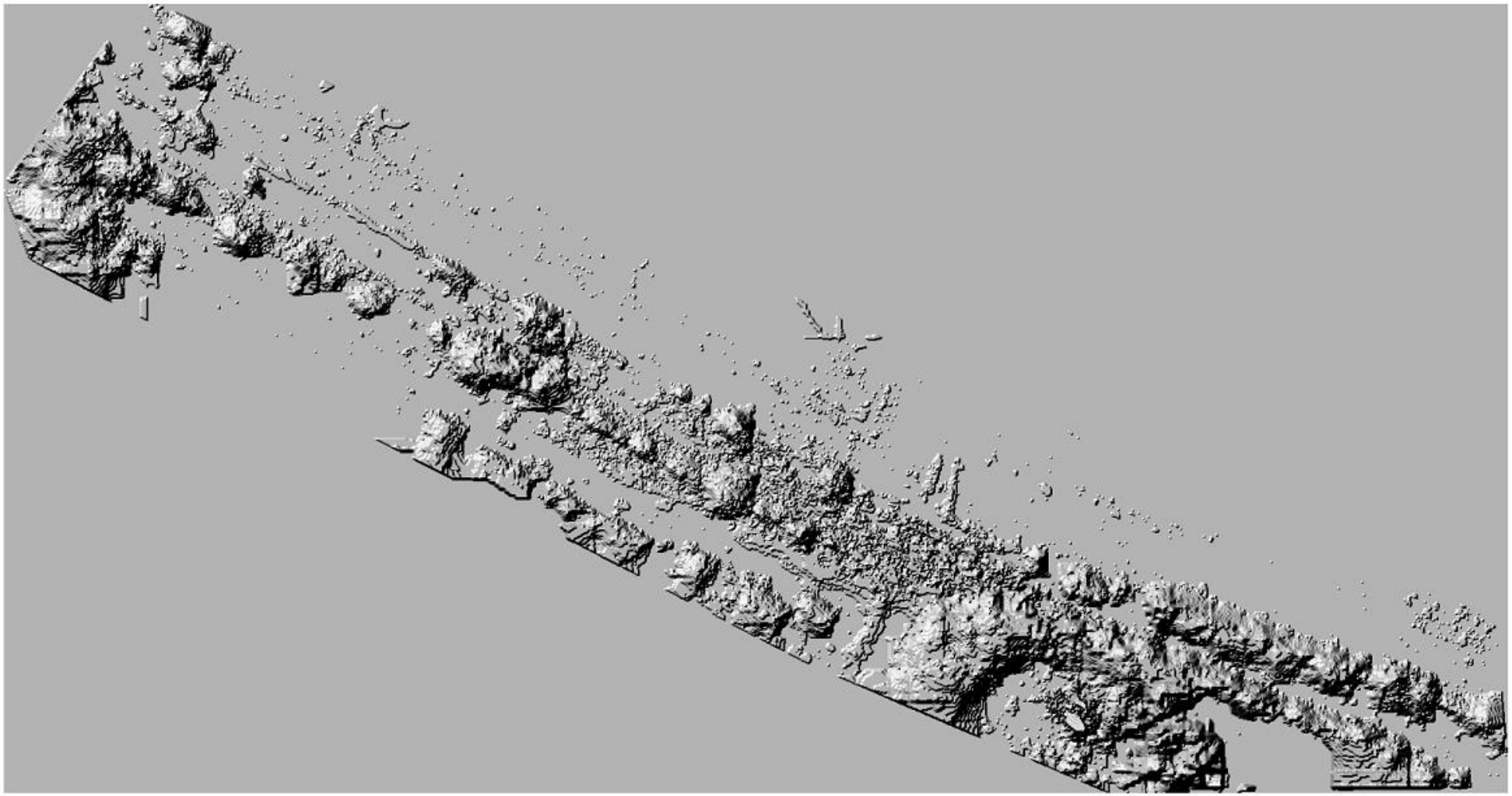
Risks From Tree Health

- Images derived from multispectral imagery from the July 2021 collection;
- Aim is to generate a 'risk' overlay for trees based on:
    1. Health
    2. Height
    3. Proximity to highway

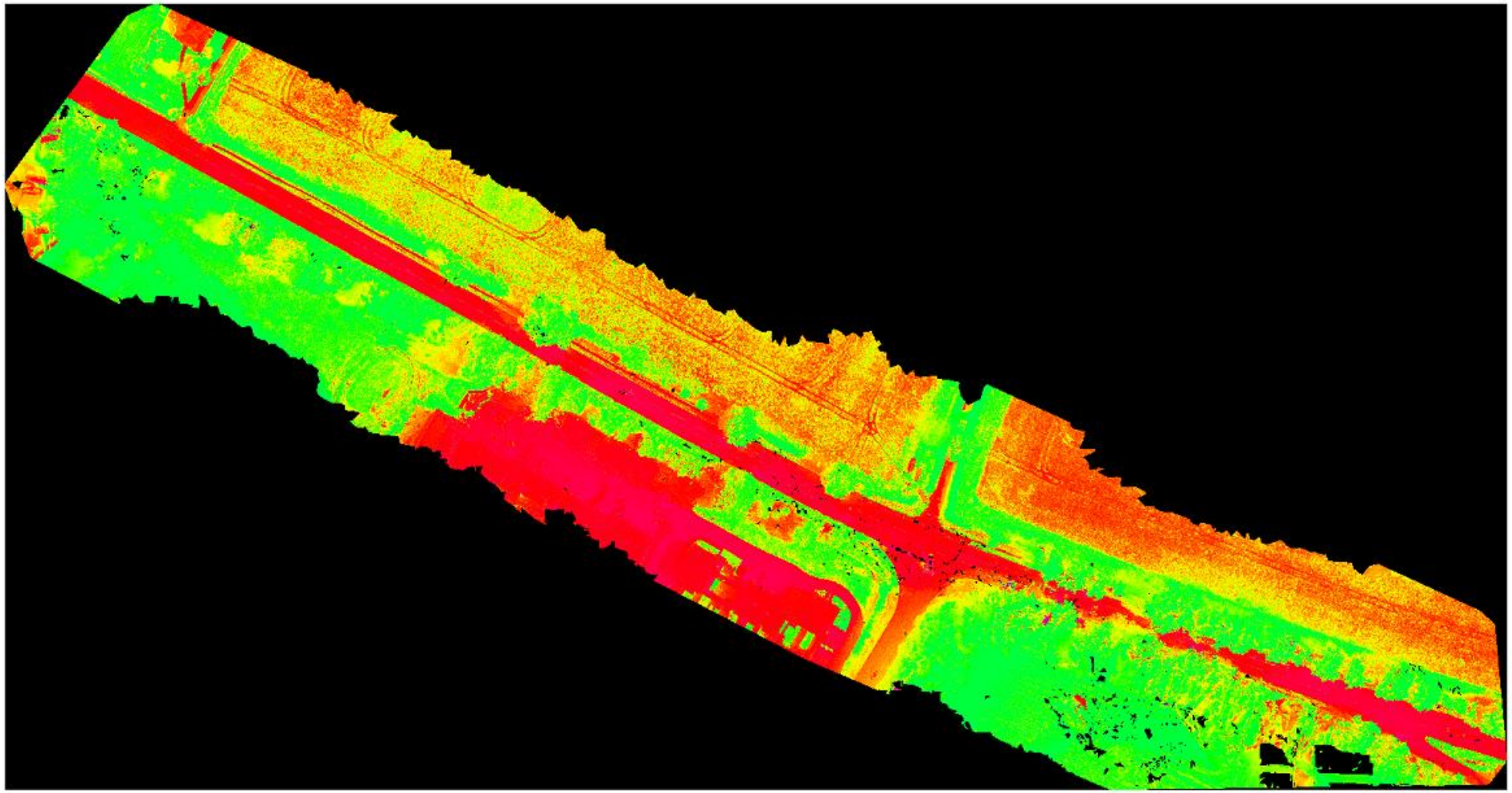
RGB Composite from Multispectral Images



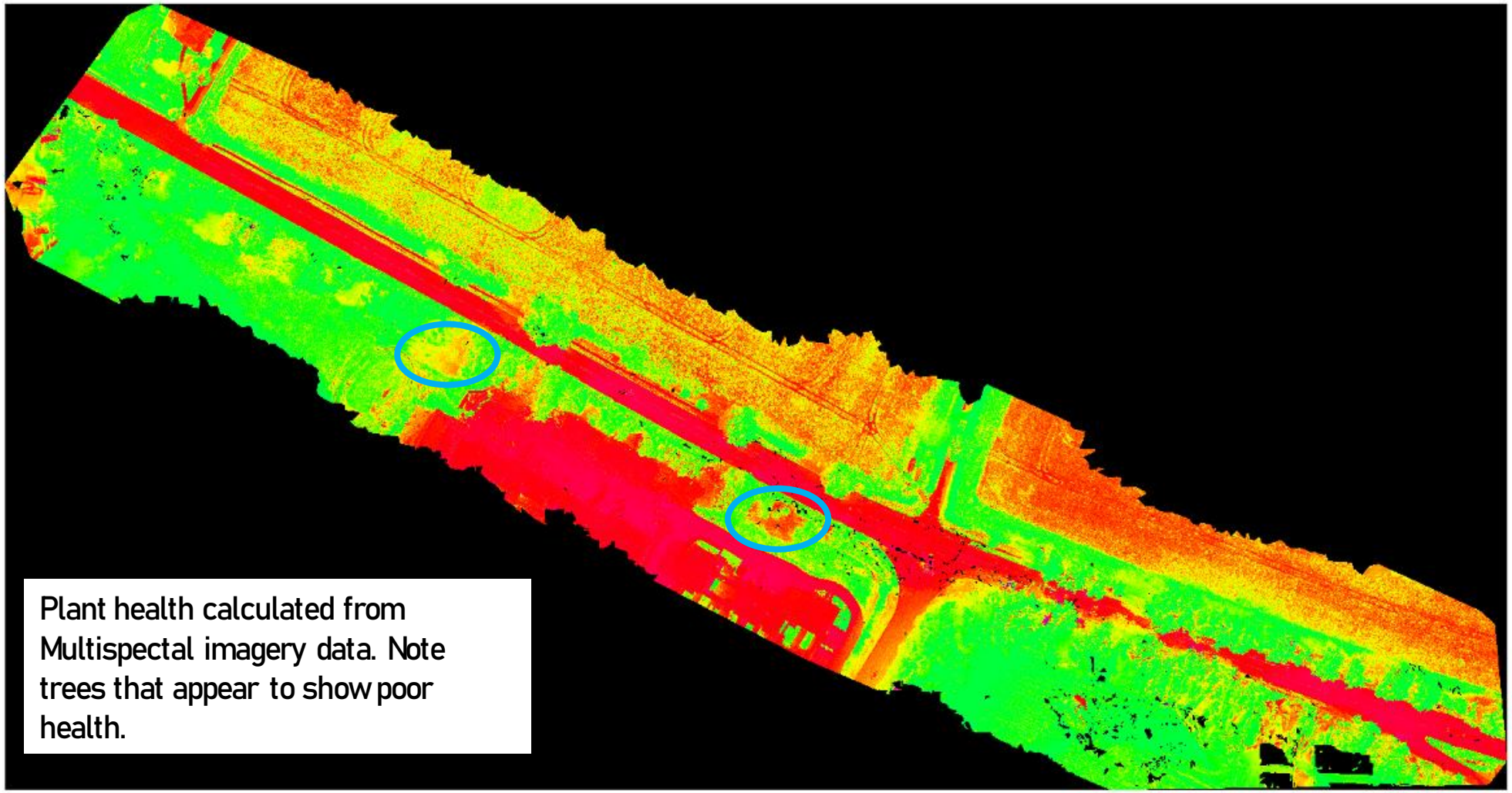
Height Image For Obtaining Tree Heights



NVDI Image From Red And Near - IR Images

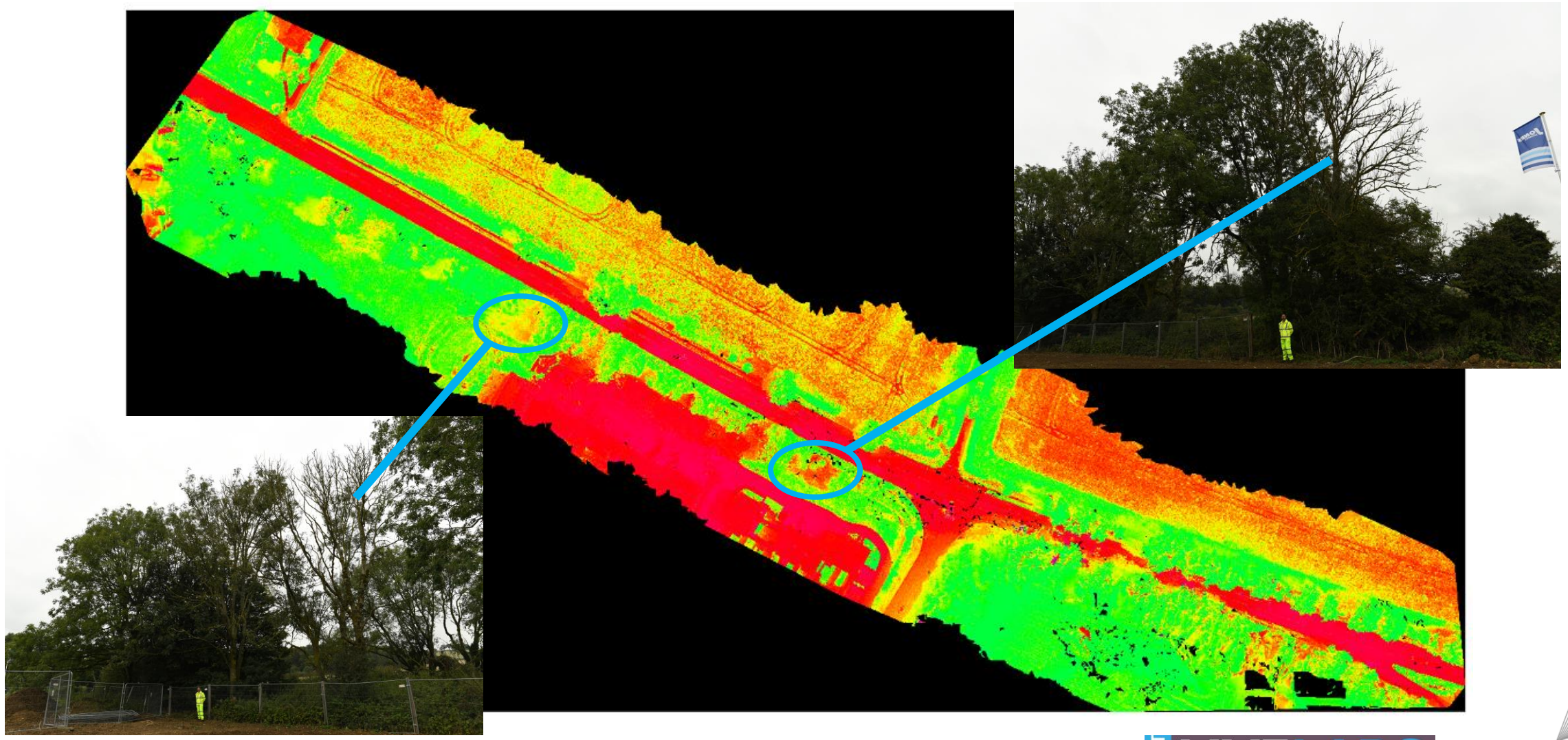


NVDI Image From Red And Near - IR Images

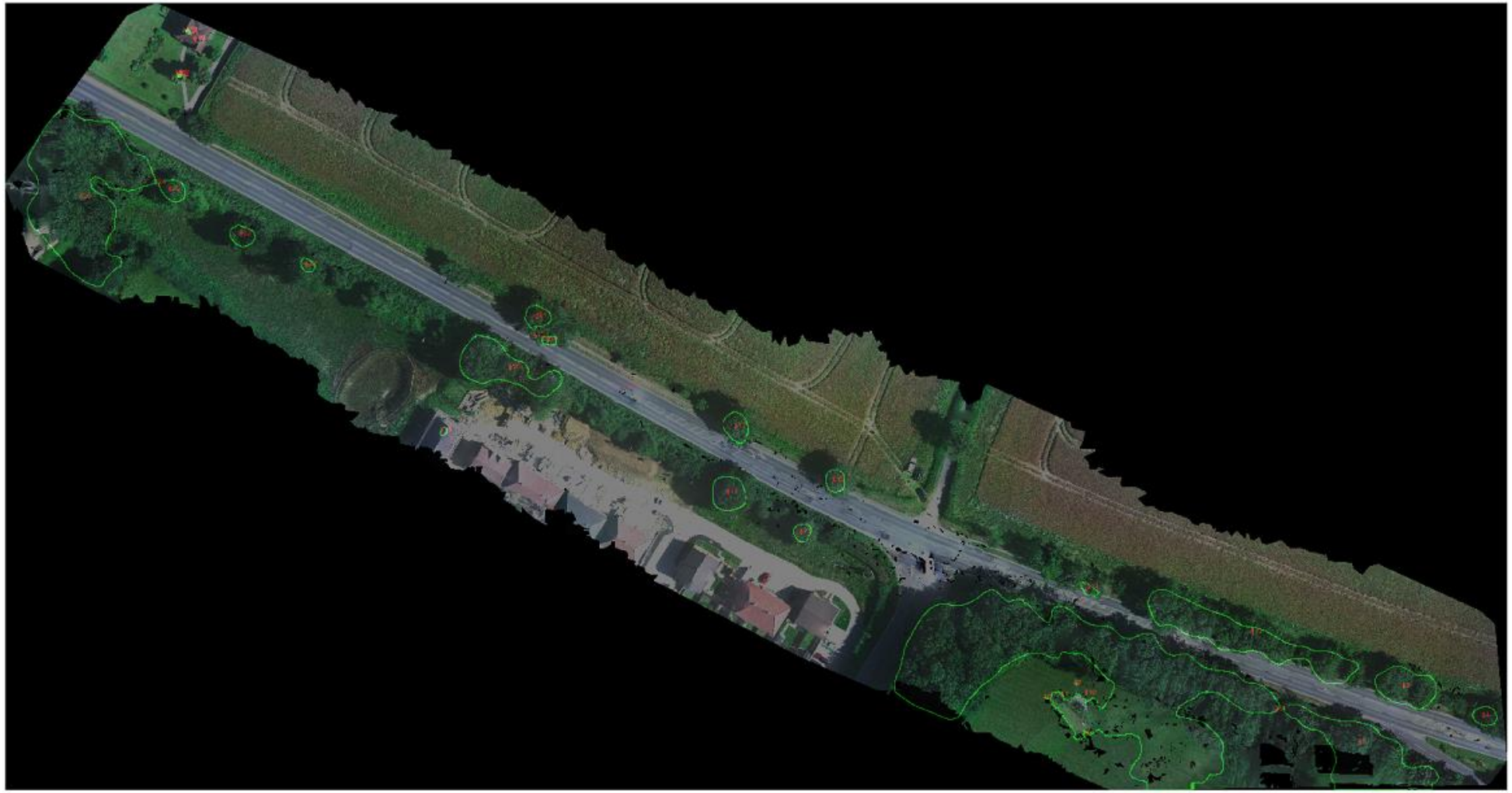


Plant health calculated from Multispectal imagery data. Note trees that appear to show poor health.

NVDI Image From Red And Near - IR Images

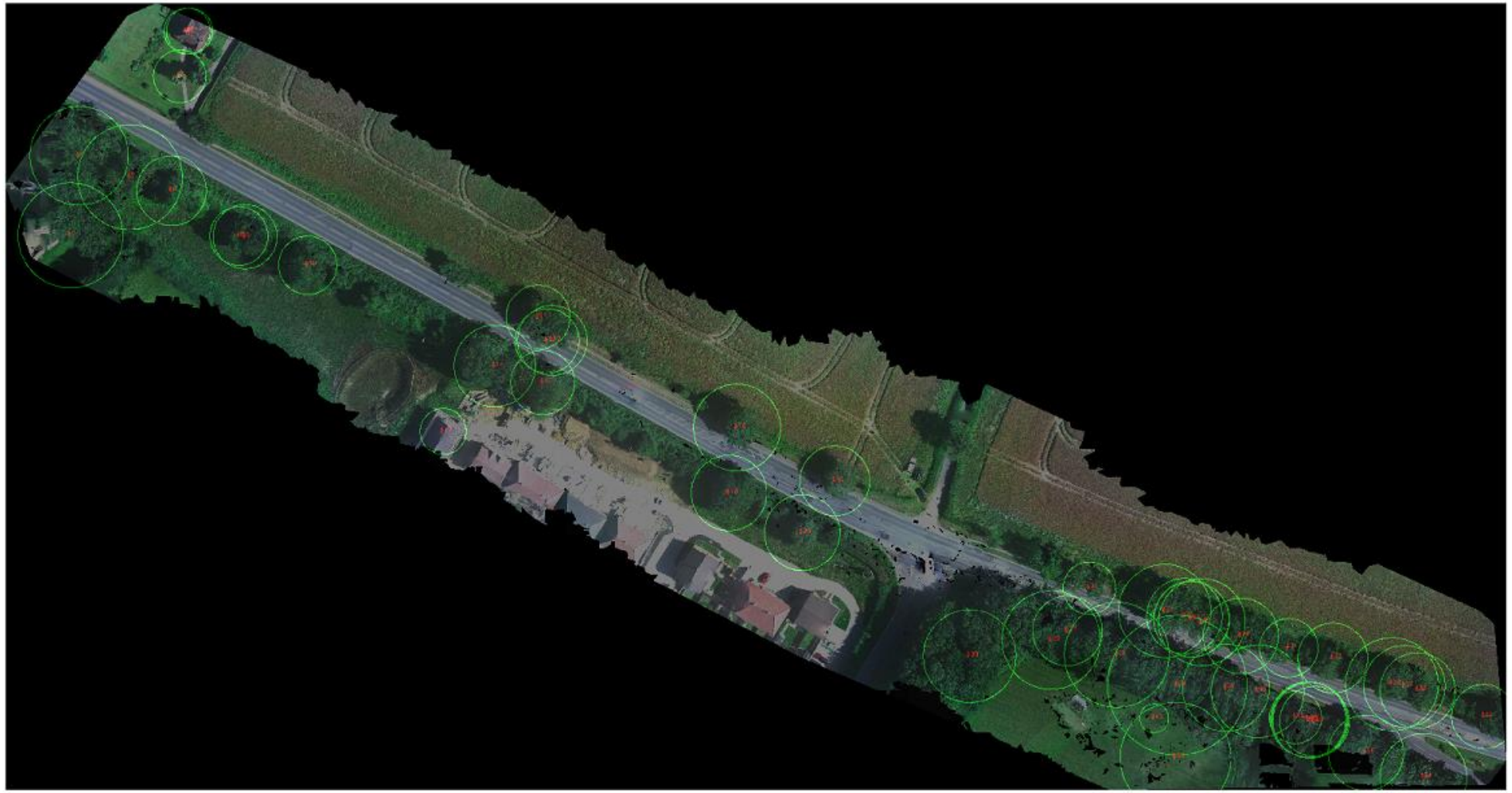


Contours Identified Using Simple Algorithm

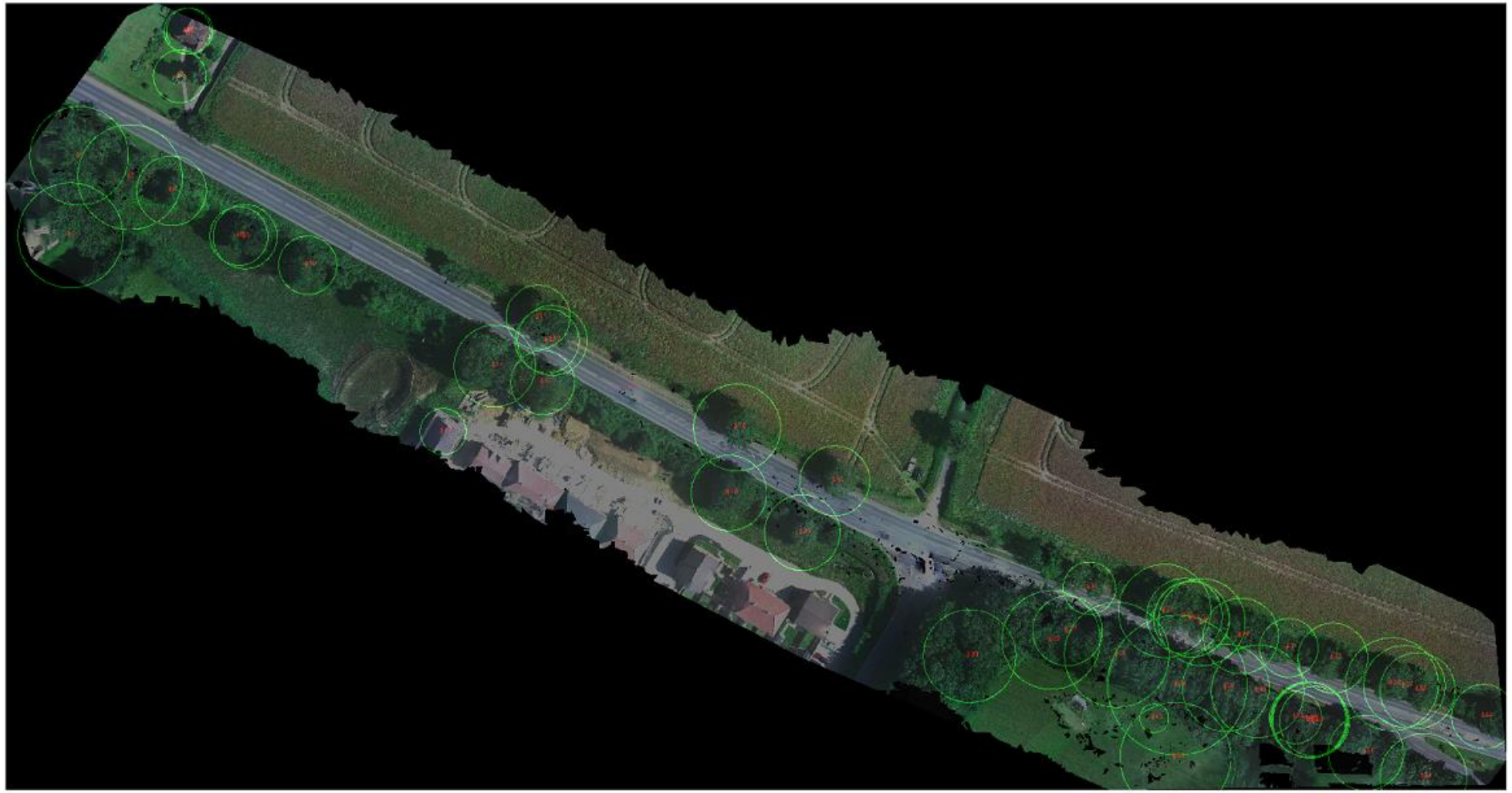


Identified Using More Sophisticated Algorithm

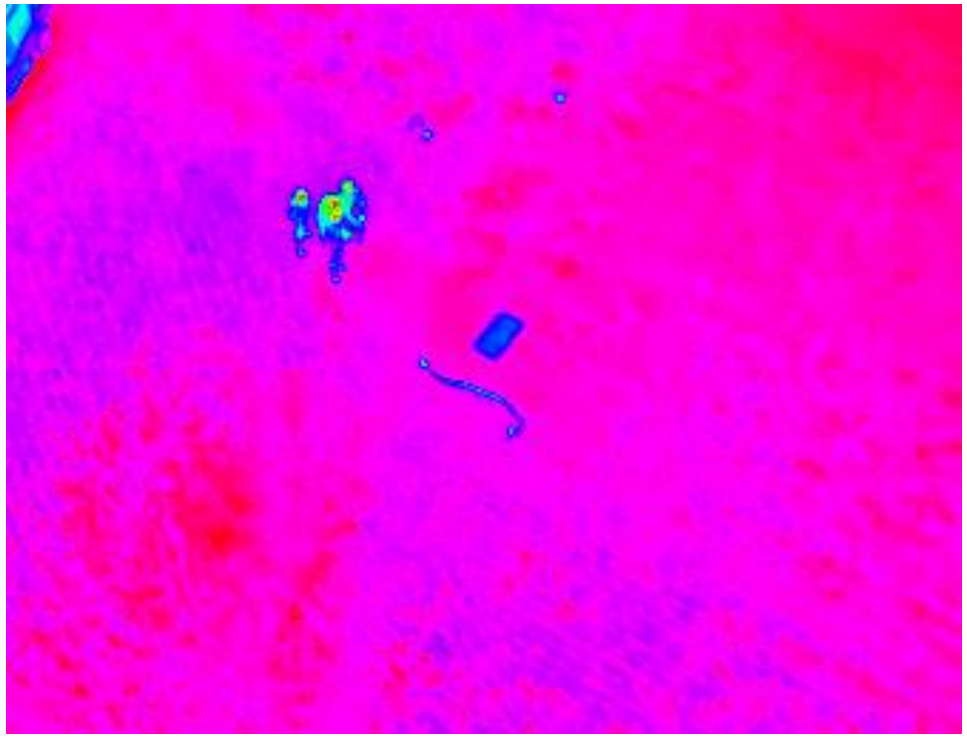
RISK ZONES



RISK ZONES



Thermal Camera – Anomaly detection



Raw camera output from Thermal camera and colorised version of image.
A section of pipework was heated using hot water to show a thermal return

Next Steps

Moving towards full automation

Next Steps

Current Project:

Build out the tool set to support

Prioritisation of defects with severity and risk profiling. For highway surface defects, soft landscape asset health and utility condition/proximity

Next Phases:

High speed dual carriage way trials, operating in environments in which the benefits can be realised with greater added value. Removing the need for operatives to be on site, whilst reducing disruption to services

Establish bespoke policies and procedures for operating drones safely over the Kent County Council region, to be used to support safe use on a wider basis

Develop the concept of operations for Beyond Visual line of sight operations, working to wards fully automated data acquisition capabilities over the network.

Questions

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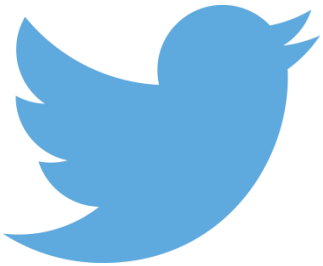

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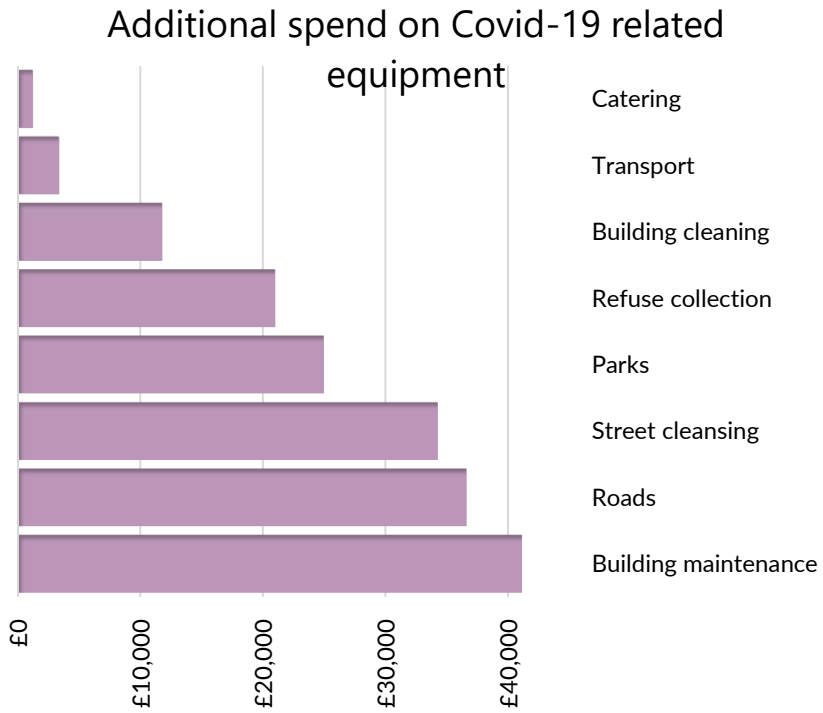
Assessing the impact of Covid-19 on your service through data collection

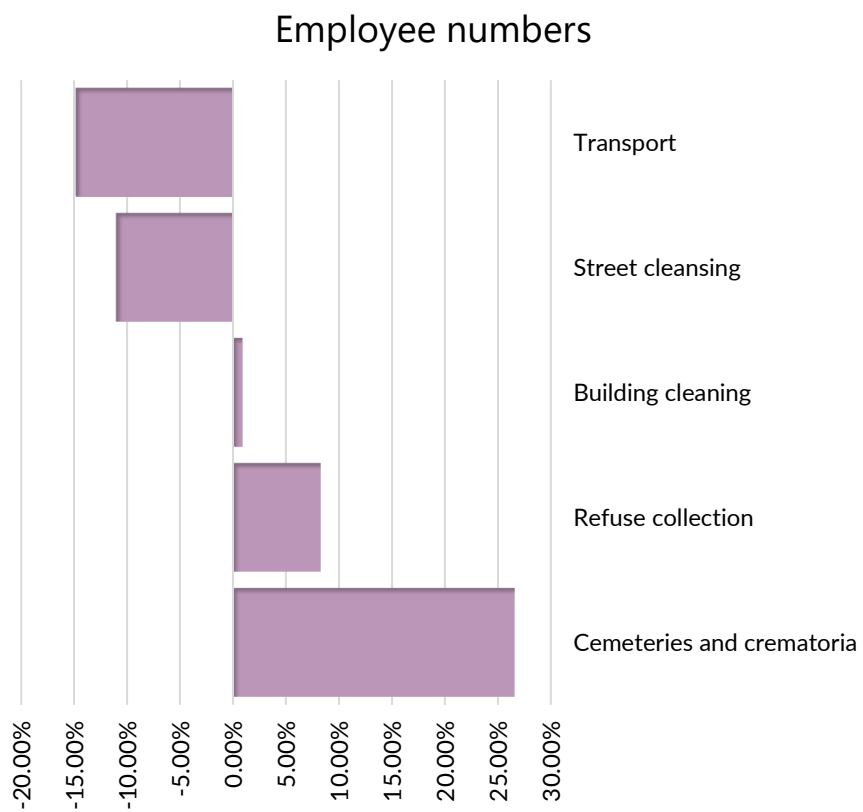
Debbie Johns, Head of Performance Networks

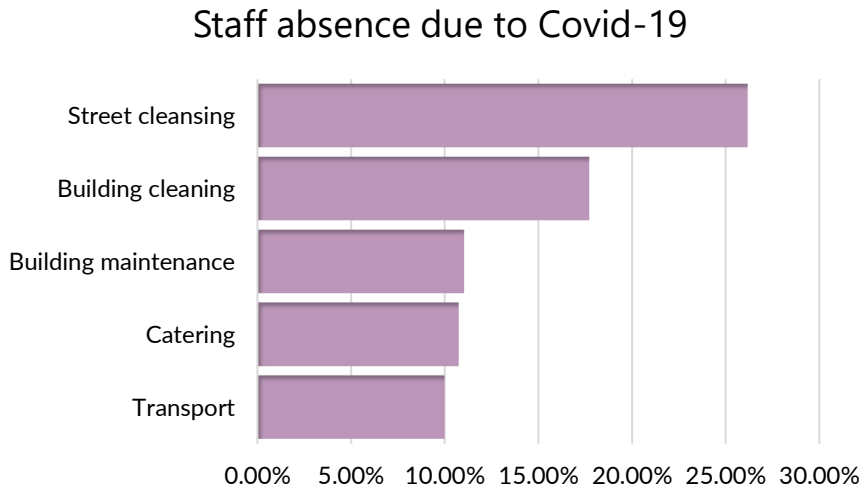
Spend



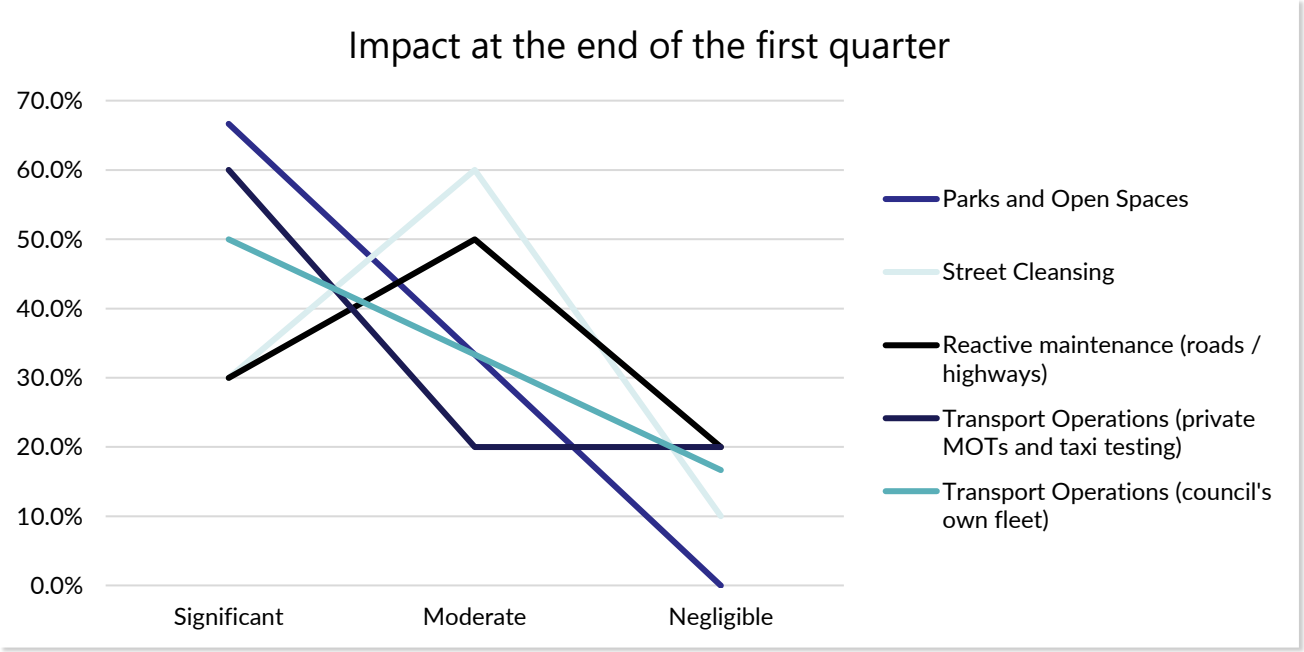
Cost of additional specification for building cleaning	£41,105
Refuse additional cost of agency/overtime to cover	£37,728
Additional vehicles hired in by the Transport section	8.50

Impact on employees

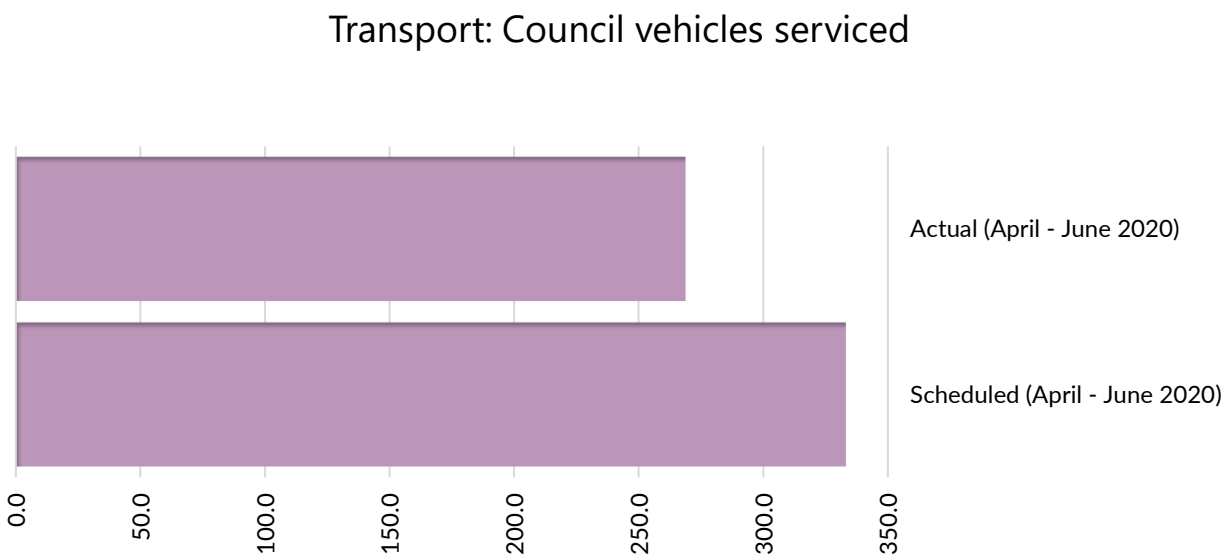




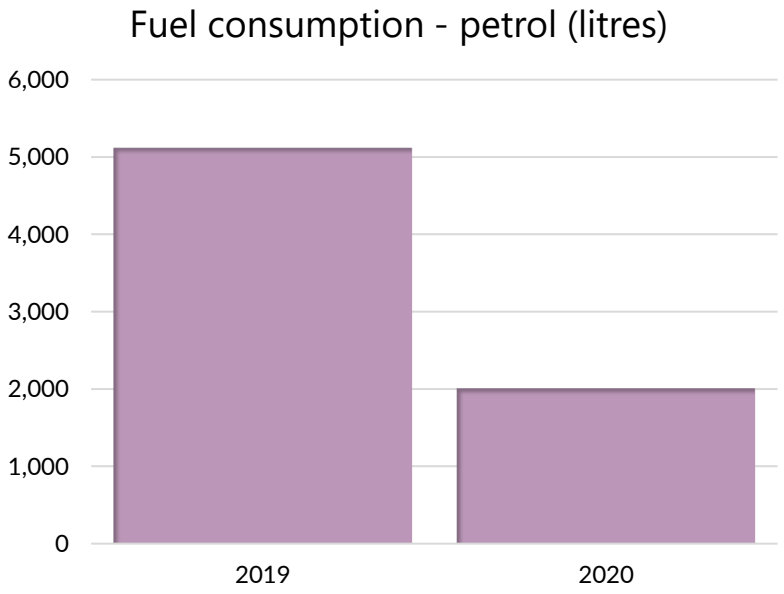
Service Standards

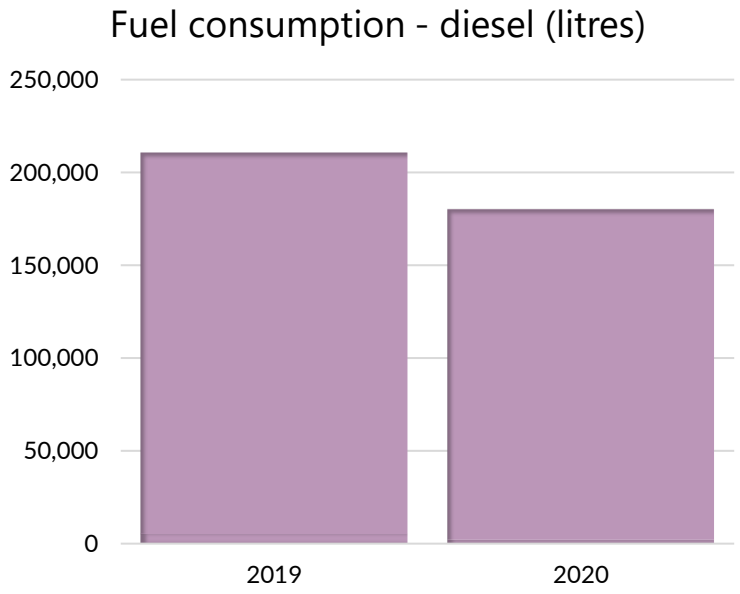


Works Data

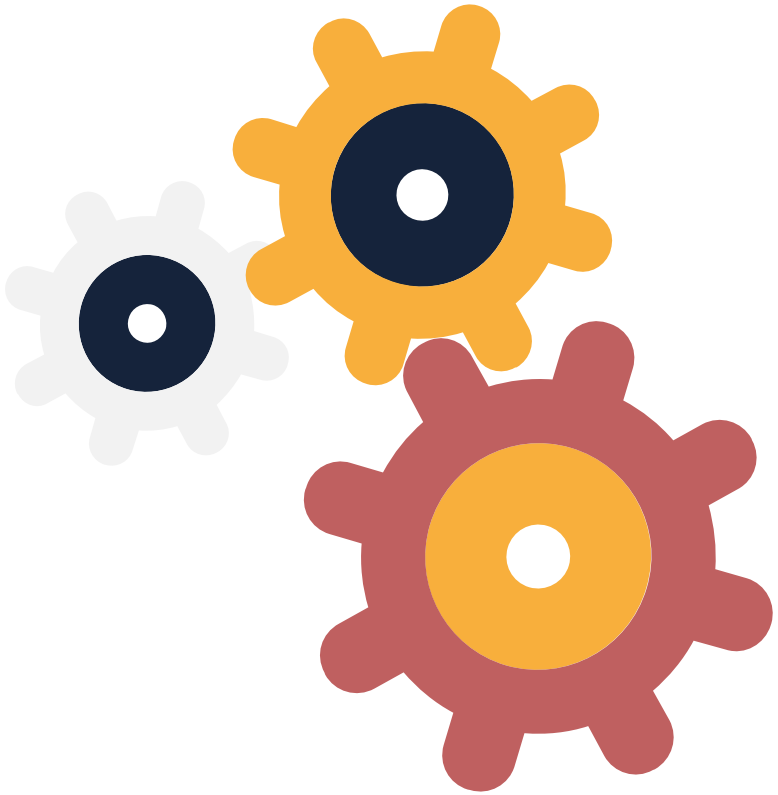

Transport: Council vehicles serviced
Actual (April - June 2020)
Scheduled (April - June 2020)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0

Fuel Consumption





Working groups 2021



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Back to Blackpool

The UK's largest local government benchmarking conference

2 – 3 December 2021

Village Hotel Blackpool, East Park Drive, Blackpool FY3 8LL

Workshop J: Transport

- **Recruitment and retention**
- **Electric fleet and greening the fleet**
- **Lessons learned from the pandemic**

Mike Cooper, Highland Council, Andy Mudd, Head of APSE solutions and Pete Johnson, APSE associate

Main changes: 2020-21

- Compressed natural gas added to the fuel list
- Productive hours section on FIS file reduced to become more easier to complete and have consistency across the authorities with data capture
- FTE automation built into the staff resources section through the introduction of capturing hours worked to work out the FTE

About the process

- One-to-one online training (free of charge)
- Final deadline for first batch: 26 October
- Prioritising data collection
- Encouraging members who didn't submit last year to do so, so they have a baseline
- Assess the impact of Covid-19
- Data more important than ever – evidence
- PI standings reports will show 19-20 against 20-21

How to... access the performance networks web portal

From January 1 2020 the old PN web portal will no longer be accessible so you need to make sure you are registered on the brand new portal

Already registered?

N

Complete the form with contact details and which service areas you need to access.

APSE will then email the service contact for authorisation to add you as a report or data contact.

Once authorisation is received, your account will be set up.

You will receive an email from **webportal@apse.org.uk** with instructions to set your account up

Y

Report contact – can access the data templates AND view the reports

Data contact – can only access the data templates, they cannot view the reports

If you have been registered but have not accessed the portal before, you may need to reset your password.

Login to the portal

pn.apse.org.uk and click on forgot your password. You will immediately be sent a reset link. If this does not arrive check your firewall settings as it may have been sent to your junk email folder.

Hurray! You can log on to the portal and access data templates and view your reports*

*if you have the correct level of access.

I don't know if I'm registered?

That's fine! Just check with the APSE staff at the registration desk today and they can tell you. Alternatively, you can email **webportal@apse.org.uk** and we can tell you.

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Transport operations and vehicle maintenance performance indicator standings: Family group report

Name of authority Sample Authority
PIN 3999
Family group T1

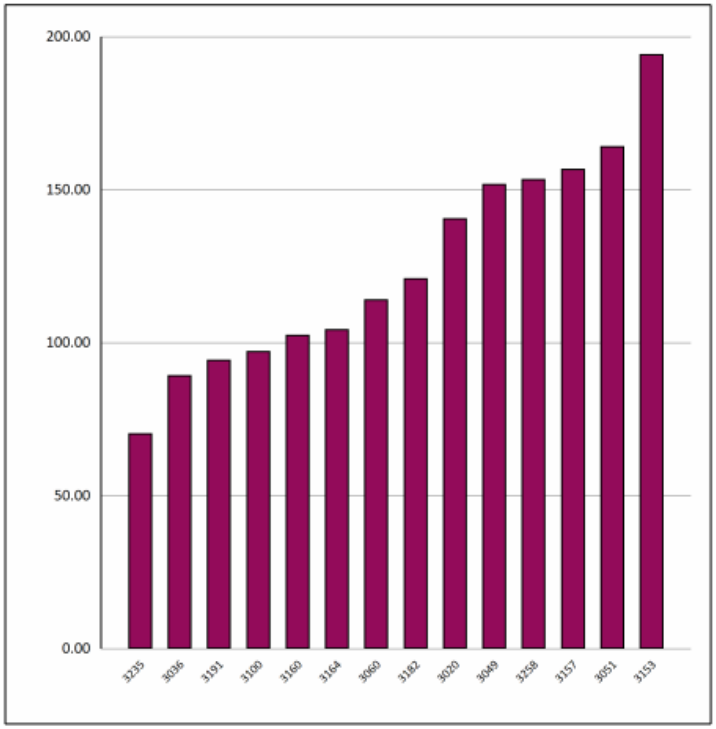
Performance indicator	Number in group	Highest in group	Average for group	Lowest in group	Your output/score	Standing in group	Top quartile mark	Quartile achieved	Ten percentile mark	High / Low / Neutral
Qualitative performance indicators										
PI 66b - No of weighted vehicle (units - adjusted for direct maintenance) maintained per fitter per annum	18	183.64	114.50	72.11	97.47	12	139.77	3	154.56	H
PI 72b - No of weighted vehicle (units - adjusted for direct maintenance) maintained per fitter per annum (excluding miscellaneous group)	14	183.84	117.79	67.89	93.97	9	149.42	3	172.91	H
PI 67a - Percentage staff absence (fitters / tradesmen)	13	11.17%	4.24%	2.10%	2.93%	5	2.80%	2	2.50%	L
PI 67b - FTE staff absence days (Scotland only)	8	13.03	6.96	0.94	7.63	5	5.00	3	3.05	L
PI 68 - Number of days hire vehicles' used (per vehicle on fleet) to cover for vehicles in workshop as a result of non fair wear & tear	10	1.63	0.34	0.00	0.02	5	0.00	2	0.00	L
PI 70 - Quality assurance and consultation	17	89	52.12	10	73	4	70	1	79	H
PI 71 - Human resources and people management	18	82	57.94	35	82	1	70	1	74	H
PI 78 - Good practice and consultation	18	100.00%	81.31%	45.45%	81.82%	12	95.45%	3	96.82%	H
Transport operations performance indicators										
PI 73b - Percentage of vehicles passing DVSA test first time (DVSA statistics)	17	98.15%	93.04%	87.70%	93.46%	8	95.00%	2	97.28%	H
PI 74 - Percentage of vehicles serviced within 7 days of schedule	18	100.00%	96.02%	68.52%	95.73%	15	100.00%	4	100.00%	H
PI 76 - Percentage of all workshop jobs completed within 24 hours	17	97.39%	66.75%	41.58%	58.24%	11	78.44%	3	87.32%	H
PI 110 - Percentage of council vehicles requiring an Operators Licence	18	34.79%	19.02%	5.14%	10.42%	-	-	-	-	N
PI 111 - Number of PG9 notices issued by DVSA per 100 council vehicles	17	0.13	0.02	0.00	0.00	1	0.00	1	0.00	L
PI 116 - Number of motor vehicle accidents/incidents reported per 100 vehicles	16	62.15	29.10	8.49	50.34	14	15.95	4	9.98	L

Notes:
a. The authority will only be ranked in family group if it has shown an output / score within the set parameters for the performance indicator.
b. Quartile / percentile marks are only shown for those performance indicators for which there is a desirable achievement.
c. Quartile marks are only shown for those performance indicators for which there are a minimum of 8 outputs / scores within the set parameters.

PI 66b Number of weighted vehicles (units - adjusted for direct maintenance) maintained per fitter per annum

Family group T1/2

	Number of Vehicles Maintained	Number of Tradesmen	Vehicles per Fitter
Average	1,500.48	13.80	125.40
Lowest	322.56	2.10	70.45
Highest	3,704.82	38.21	194.36



Source data

([[FPSOF] - [SOFG26]) x [PMTCE]) / [SRMFV]

Acceptable parameters: >65 and <200 (Direct maintenance cost percentage < 100% (Direct maintenance cost percentage =100% if PMTCEYN=N))

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Transport operations and vehicle maintenance performance at a glance

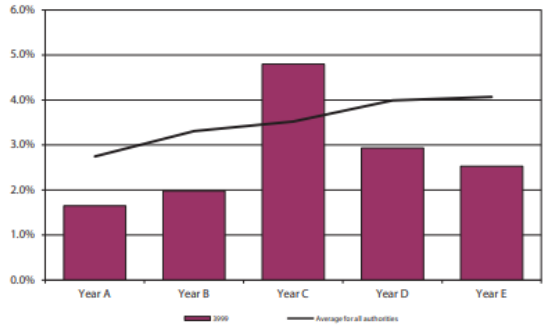
Sample Authority **3999**

These pages show your authority's performance for each performance indicator against the current year average performance of your family group. Whether your result has improved or not from previous year is also shown. Icons are used to display this information and the idea of this report is that authorities can see 'at a glance' where improvements may need to be made. Where the box is blank, this indicates that there is no authority score available for this performance indicator or that there were less than three participants in this PI, meaning we are unable to produce a meaningful average score. The key to the icons are displayed below each table.

Performance indicators	Performance in current year	Improved since previous year?^
Qualitative performance indicators		
PI 66b Number of weighted vehicle (units - adjusted for direct maintenance) maintained per fitter per annum	▲	▲
PI 72b Number of weighted vehicle (units - adjusted for direct maintenance) maintained per fitter per annum (excluding miscellaneous group)	▲	▲
PI 67a/b Staff absence (fitters / tradespeople)	▲	▲
PI 68 Number of days hire vehicles' used (per vehicle on fleet) to cover for vehicles in workshop as a result of no fair wear and tear	●	
PI 70 Quality assurance and consultation	●	▬
PI 71 Human resources and people management	●	▬
PI 78 Good practice and consultation	●	▬
Transport operations performance indicators		
PI 73b Percentage of vehicles passing DVSA test first time (DVSA statistics)	●	▬
PI 74 Percentage of vehicles serviced within 7 days of schedule	▲	▬
PI 76 Percentage of all workshop jobs completed within 24 hours	▲	▲
PI 111 Number of PG9 notices issued by DVSA per 100 council vehicles	●	▲
PI 116 Number of motor vehicle accidents/incidents reported per 100 vehicles	◆	▼
Group 1 vehicles - cars and car derived vans		
PI 14 Contract maintenance hire charge – supply and maintain	●	▼
PI 27 Annual maintenance cost per weighted vehicle unit	●	▲
PI 118 Percentage of maintenance cost attributable to non fair wear & tear	◆	▼
PI 128 Labour input hours per weighted vehicle	●	▲
Group 2 vehicles - vans up to 3,500kg GVW		
PI 15 Contract maintenance hire charge – supply and maintain	●	
PI 28 Annual maintenance cost per weighted vehicle unit	●	▼

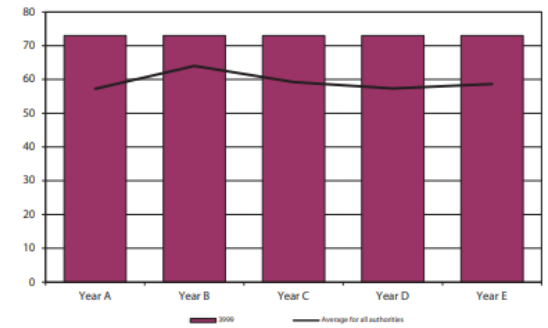
Transport operations and vehicle maintenance

PI 67a Percentage staff absence (fitters / tradespeople)



This performance indicator measures the percentage of fitter and tradespeople absence. This indicator only applies to staff who are directly involved in the maintenance of vehicles including fitters, electricians and body shop specialists. Long term, certified and self-certified sickness absence and absence for other health related or injury reasons, for all permanent employees plus all industrial injuries are included in this performance indicator. Temporary staff or those on maternity or paternity leave are excluded.

PI 70 Quality assurance and consultation process

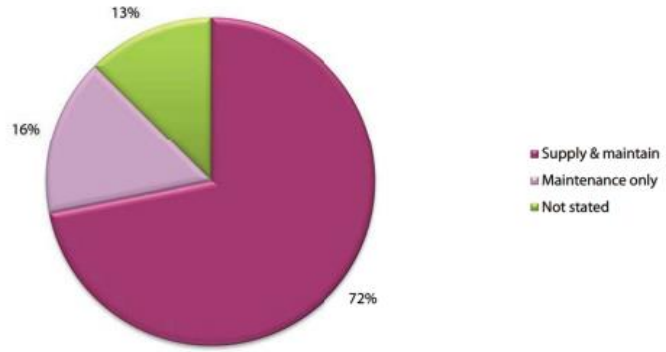


This performance indicator measures the quality assurance and consultation process. This indicator is scored according to the responses given to questions on customer consultation, quality systems, participation and awards, publication of service standards and complaints procedures.

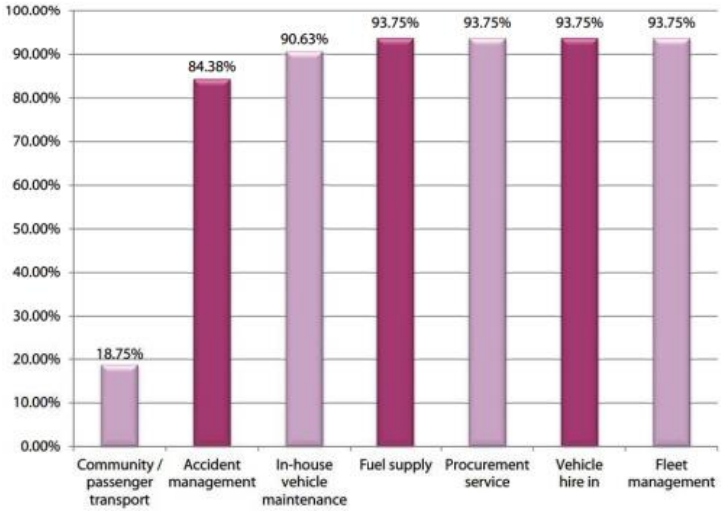
For more detailed information on the methodology and scoring for this performance indicator, please refer to your performance report or alternatively contact a member of the performance networks team who can provide you with a copy.

Authority profile

Type of operation



What services does the transport section provide?

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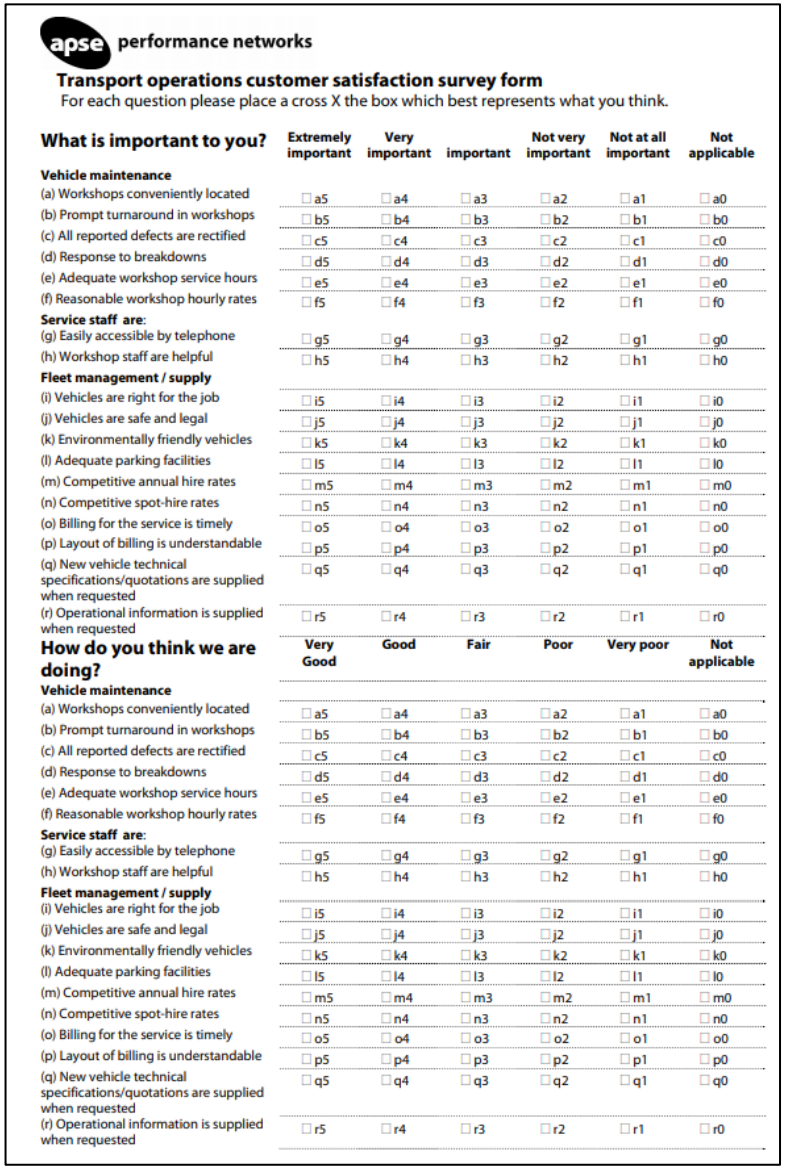
Case study report 2021
Best and most improved performer award finalists and winners

Optional extras

- Regional reports
  - Customised reports
  - Customer satisfaction surveys
- Training and development
  - Using the data training
  - Validation training



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Transport operations customer satisfaction survey form

For each question please place a cross X the box which best represents what you think.

What is important to you?	Extremely important	Very important	important	Not very important	Not at all important	Not applicable
Vehicle maintenance						
(a) Workshops conveniently located	☐ a5	☐ a4	☐ a3	☐ a2	☐ a1	☐ a0
(b) Prompt turnaround in workshops	☐ b5	☐ b4	☐ b3	☐ b2	☐ b1	☐ b0
(c) All reported defects are rectified	☐ c5	☐ c4	☐ c3	☐ c2	☐ c1	☐ c0
(d) Response to breakdowns	☐ d5	☐ d4	☐ d3	☐ d2	☐ d1	☐ d0
(e) Adequate workshop service hours	☐ e5	☐ e4	☐ e3	☐ e2	☐ e1	☐ e0
(f) Reasonable workshop hourly rates	☐ f5	☐ f4	☐ f3	☐ f2	☐ f1	☐ f0
Service staff are:						
(g) Easily accessible by telephone	☐ g5	☐ g4	☐ g3	☐ g2	☐ g1	☐ g0
(h) Workshop staff are helpful	☐ h5	☐ h4	☐ h3	☐ h2	☐ h1	☐ h0
Fleet management / supply						
(i) Vehicles are right for the job	☐ i5	☐ i4	☐ i3	☐ i2	☐ i1	☐ i0
(j) Vehicles are safe and legal	☐ j5	☐ j4	☐ j3	☐ j2	☐ j1	☐ j0
(k) Environmentally friendly vehicles	☐ k5	☐ k4	☐ k3	☐ k2	☐ k1	☐ k0
(l) Adequate parking facilities	☐ l5	☐ l4	☐ l3	☐ l2	☐ l1	☐ l0
(m) Competitive annual hire rates	☐ m5	☐ m4	☐ m3	☐ m2	☐ m1	☐ m0
(n) Competitive spot-hire rates	☐ n5	☐ n4	☐ n3	☐ n2	☐ n1	☐ n0
(o) Billing for the service is timely	☐ o5	☐ o4	☐ o3	☐ o2	☐ o1	☐ o0
(p) Layout of billing is understandable	☐ p5	☐ p4	☐ p3	☐ p2	☐ p1	☐ p0
(q) New vehicle technical specifications/quotations are supplied when requested	☐ q5	☐ q4	☐ q3	☐ q2	☐ q1	☐ q0
(r) Operational information is supplied when requested	☐ r5	☐ r4	☐ r3	☐ r2	☐ r1	☐ r0

How do you think we are doing?	Very Good	Good	Fair	Poor	Very poor	Not applicable
Vehicle maintenance						
(a) Workshops conveniently located	☐ a5	☐ a4	☐ a3	☐ a2	☐ a1	☐ a0
(b) Prompt turnaround in workshops	☐ b5	☐ b4	☐ b3	☐ b2	☐ b1	☐ b0
(c) All reported defects are rectified	☐ c5	☐ c4	☐ c3	☐ c2	☐ c1	☐ c0
(d) Response to breakdowns	☐ d5	☐ d4	☐ d3	☐ d2	☐ d1	☐ d0
(e) Adequate workshop service hours	☐ e5	☐ e4	☐ e3	☐ e2	☐ e1	☐ e0
(f) Reasonable workshop hourly rates	☐ f5	☐ f4	☐ f3	☐ f2	☐ f1	☐ f0
Service staff are:						
(g) Easily accessible by telephone	☐ g5	☐ g4	☐ g3	☐ g2	☐ g1	☐ g0
(h) Workshop staff are helpful	☐ h5	☐ h4	☐ h3	☐ h2	☐ h1	☐ h0
Fleet management / supply						
(i) Vehicles are right for the job	☐ i5	☐ i4	☐ i3	☐ i2	☐ i1	☐ i0
(j) Vehicles are safe and legal	☐ j5	☐ j4	☐ j3	☐ j2	☐ j1	☐ j0
(k) Environmentally friendly vehicles	☐ k5	☐ k4	☐ k3	☐ k2	☐ k1	☐ k0
(l) Adequate parking facilities	☐ l5	☐ l4	☐ l3	☐ l2	☐ l1	☐ l0
(m) Competitive annual hire rates	☐ m5	☐ m4	☐ m3	☐ m2	☐ m1	☐ m0
(n) Competitive spot-hire rates	☐ n5	☐ n4	☐ n3	☐ n2	☐ n1	☐ n0
(o) Billing for the service is timely	☐ o5	☐ o4	☐ o3	☐ o2	☐ o1	☐ o0
(p) Layout of billing is understandable	☐ p5	☐ p4	☐ p3	☐ p2	☐ p1	☐ p0
(q) New vehicle technical specifications/quotations are supplied when requested	☐ q5	☐ q4	☐ q3	☐ q2	☐ q1	☐ q0
(r) Operational information is supplied when requested	☐ r5	☐ r4	☐ r3	☐ r2	☐ r1	☐ r0

Useful contacts

Enquiries / training / reports

Cheryl Walker	cwalker@apse.org.uk
Jennifer Stanley	jstanley@apse.org.uk
Andy Derbyshire	aderbyshire@apse.org.uk

Data processing support / error checking help

Ryan McNally	rmcnally@apse.org.uk
Alistair Holcroft	aholcroft@apse.org.uk

General e-mail :	performance.networks@apse.org.uk
Telephone :	0161 772 1810

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