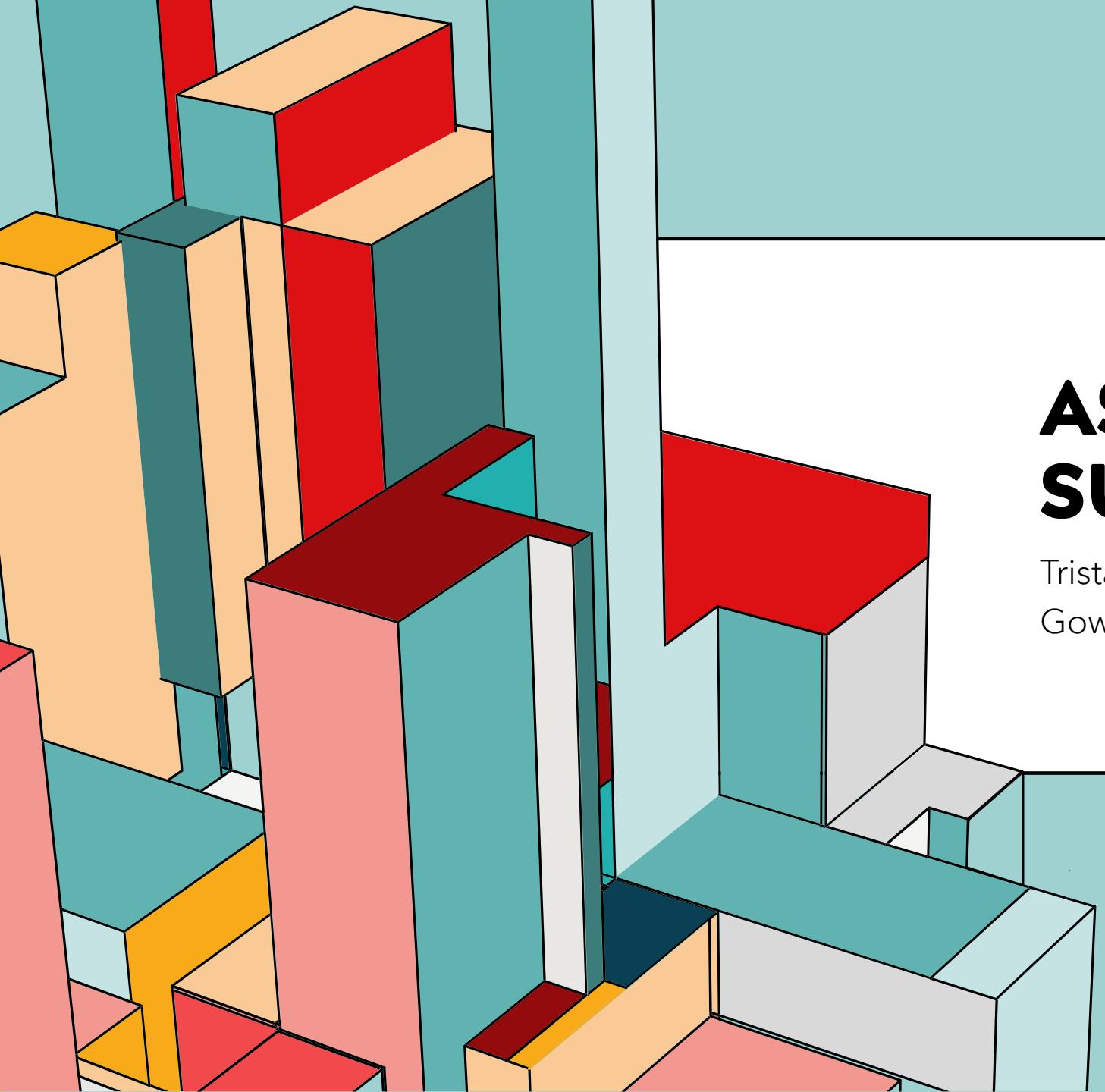
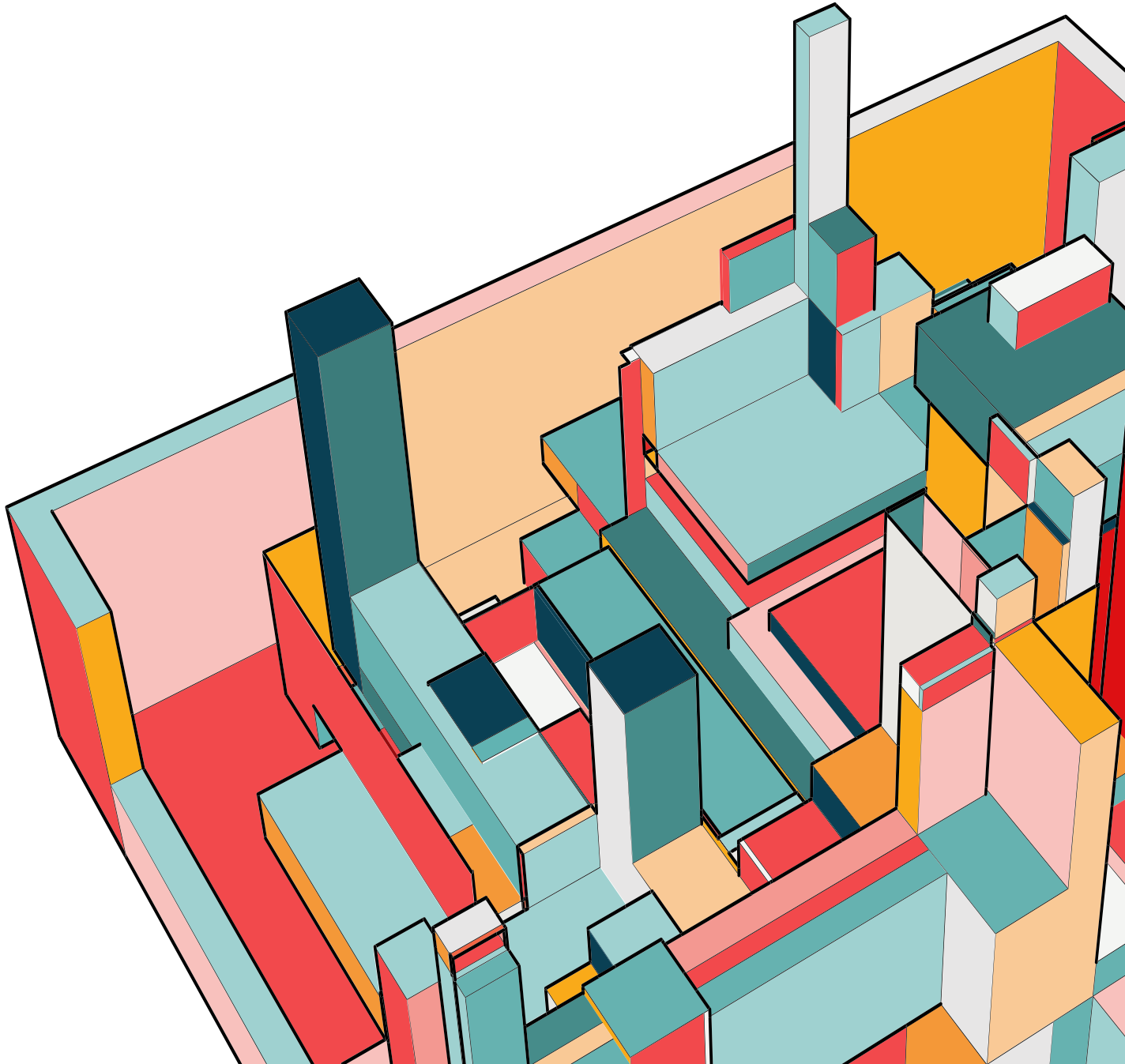


ASSET SURVEILLANCE

Tristan Campbell-Reynolds
Gower Consultants

ABOUT US

The Data Analytics Division of Gower Consultants is developing a system that integrates remote sensing technologies with machine learning to support carbon auditing and cemetery management. We use LiDAR, hyperspectral, and optical data collection to create practical solutions tailored to the needs of our clients.



THE SOLUTION

Up to date Maps

High-resolution mapping ensures accurate and current representations of your site. Features such as roads, pathways, and infrastructure are clearly documented, supporting efficient management and decision-making.

Carbon Storage

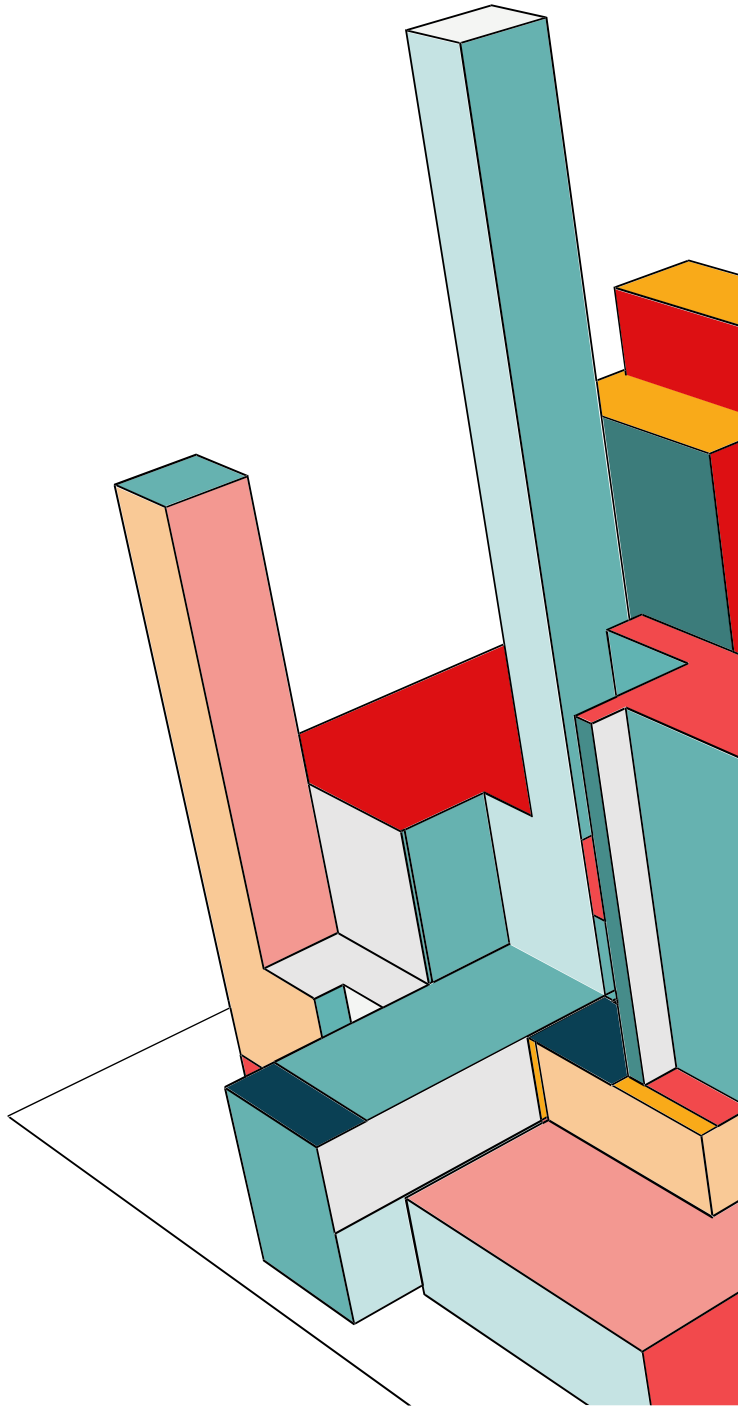
Our system estimates carbon storage at the individual tree level using species-specific data and advanced modelling. This provides reliable insights into the carbon sequestration potential of your site.

Monument health and safety

Using LiDAR and machine learning, we assess the stability and movement of monuments over time. This information helps identify potential risks and supports proactive health and safety measures.

Access to your data on the go

With cloud-based solutions, your data is available wherever you need it. This enables seamless access and management from any device, ensuring flexibility and convenience.



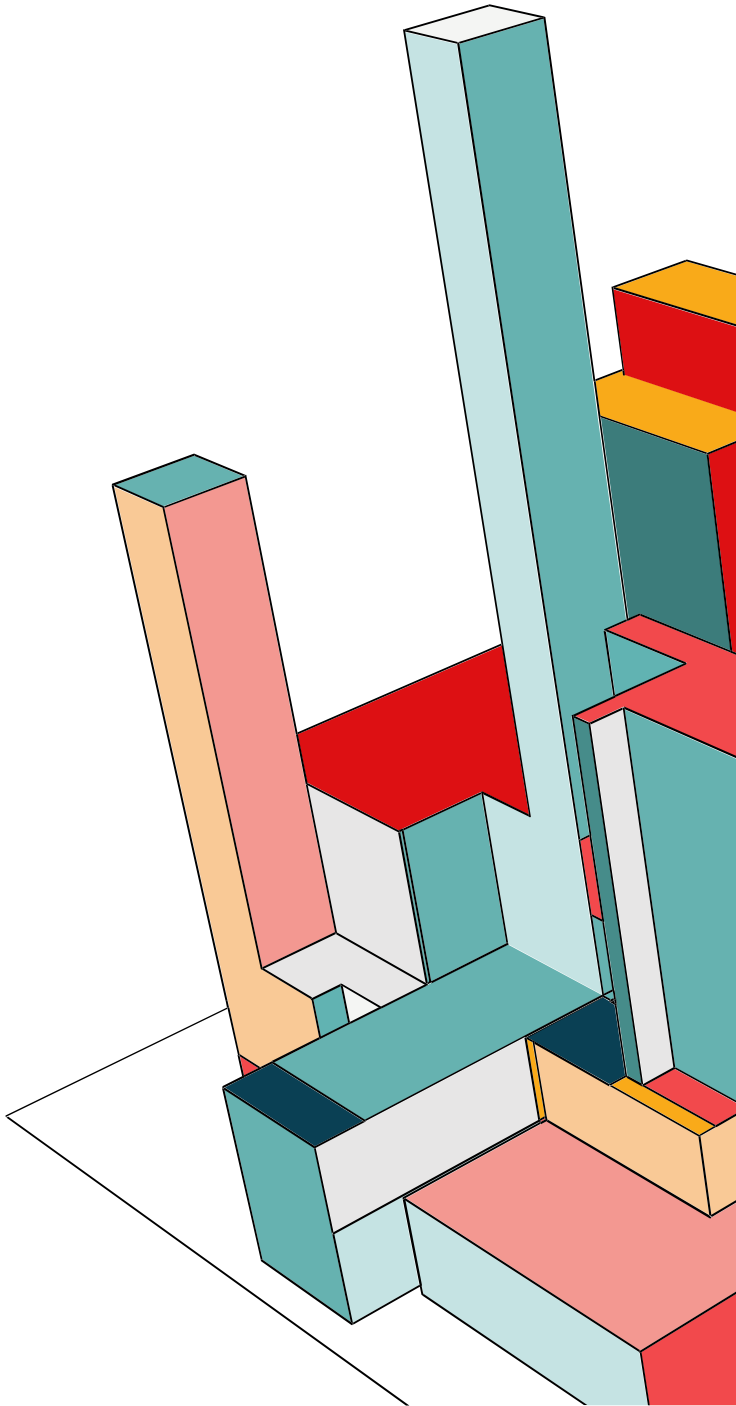
EQUIPMENT

LiDAR Sensors

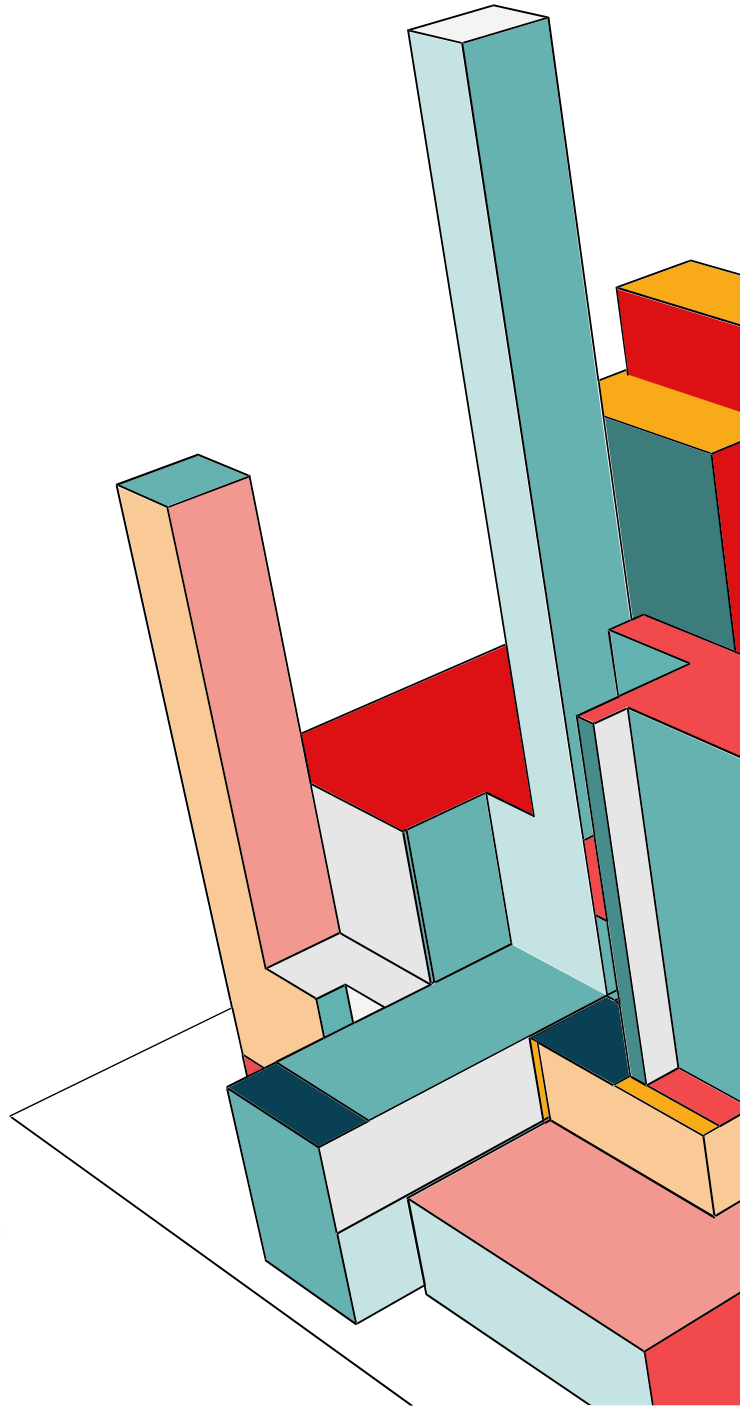
Hyperspectral Sensors

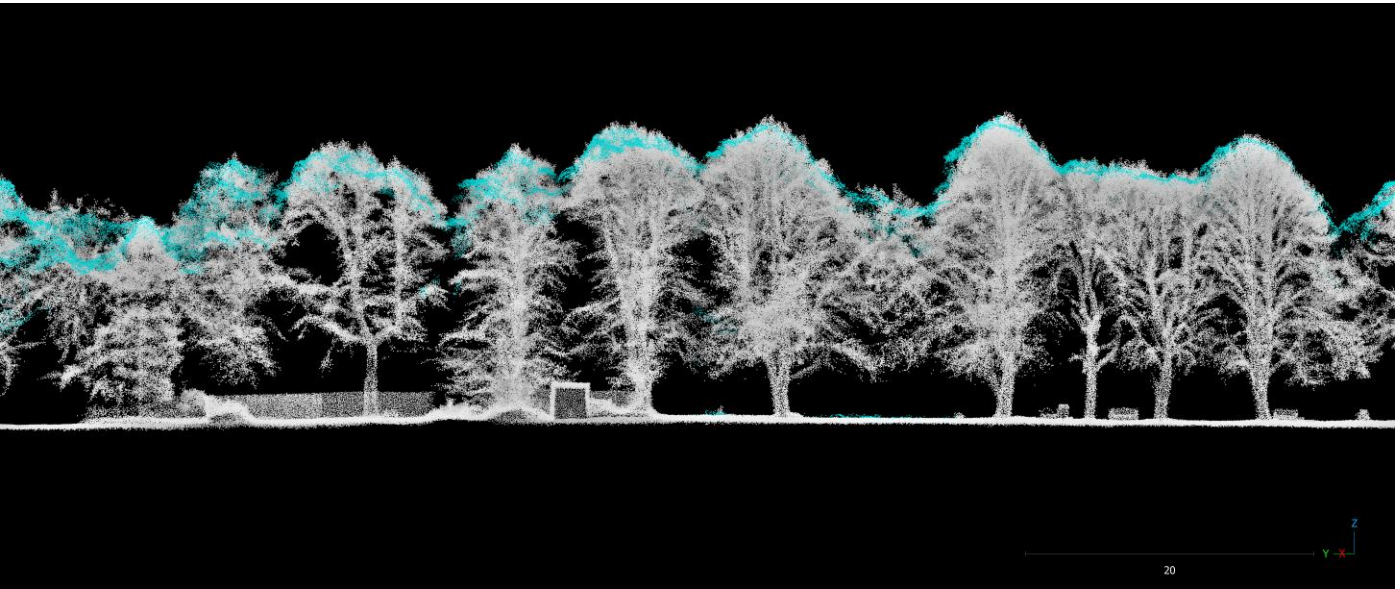
Optical Cameras

Ground Truth Data



LIDAR DATA





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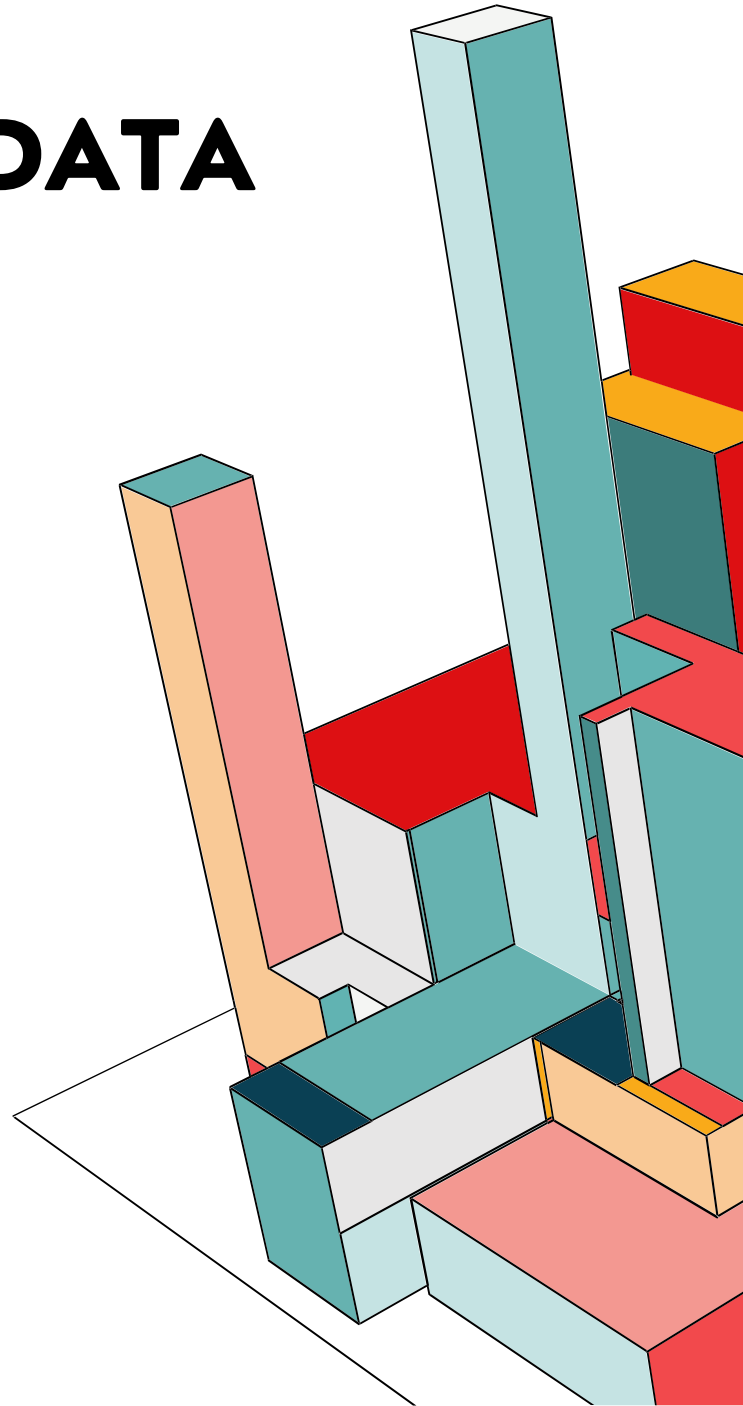
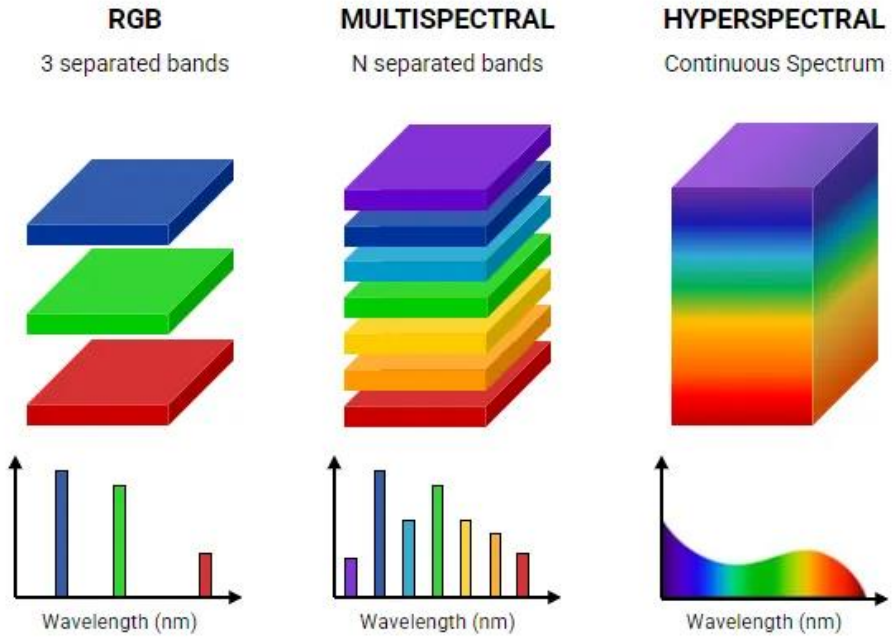
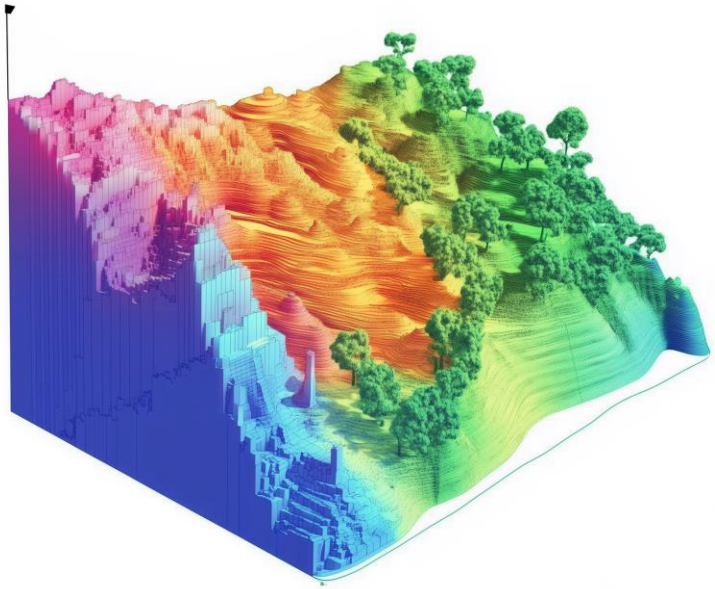
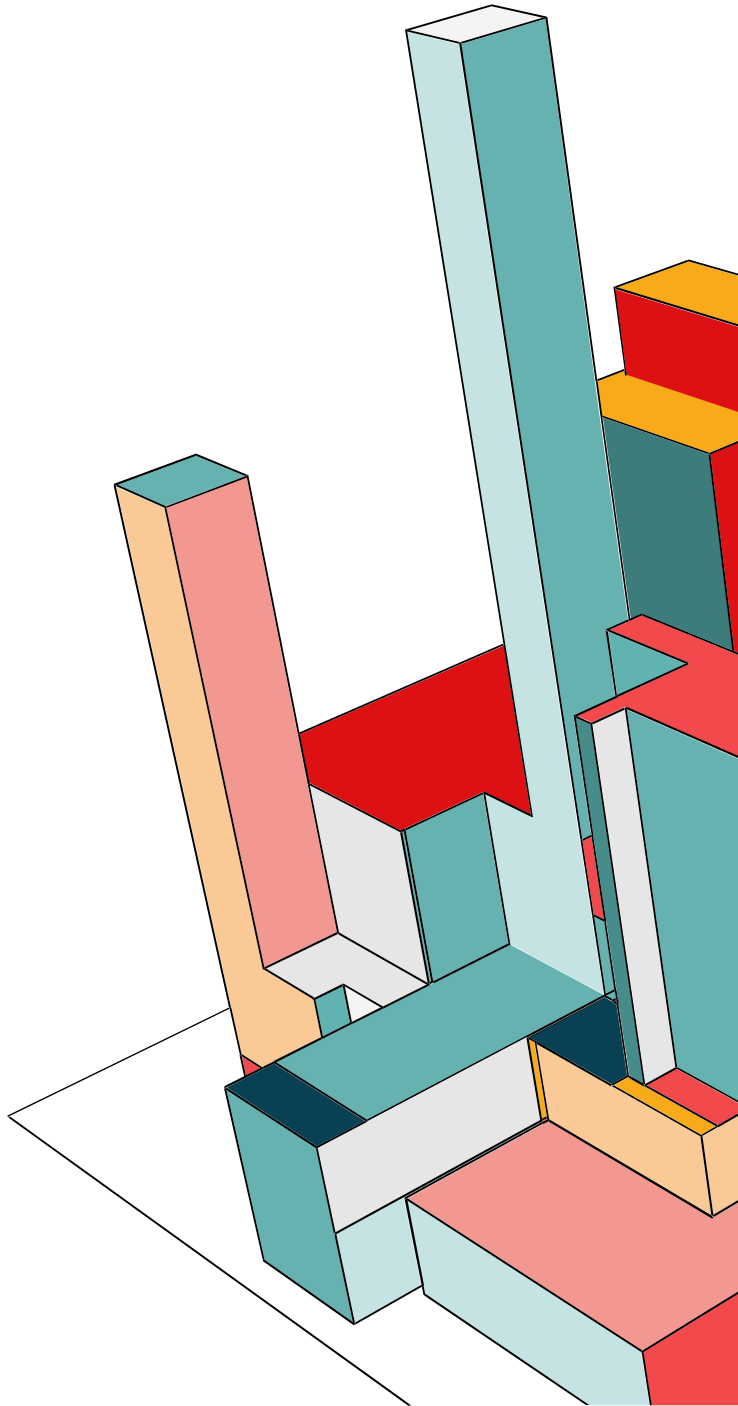


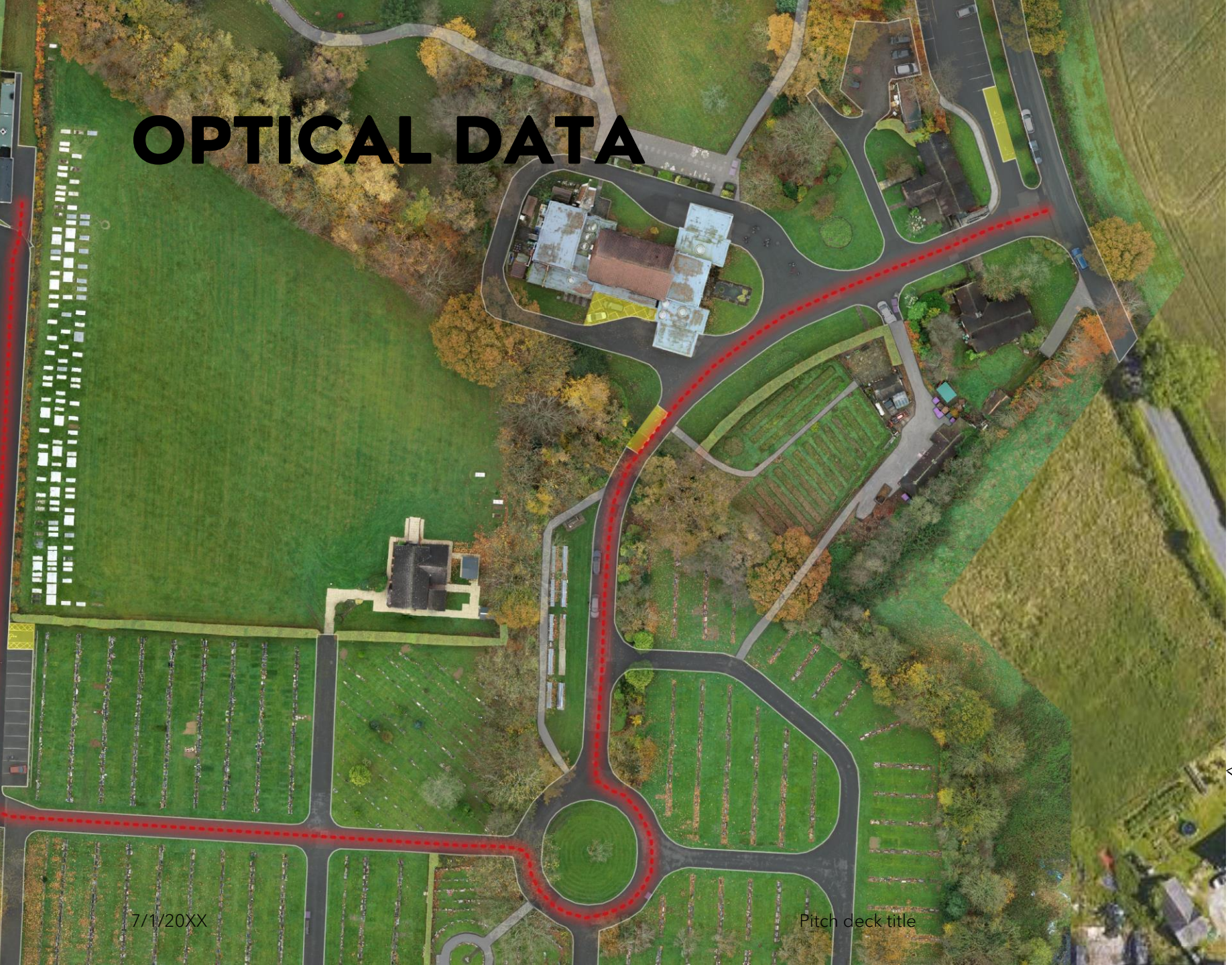
HYPERSPECTRAL DATA

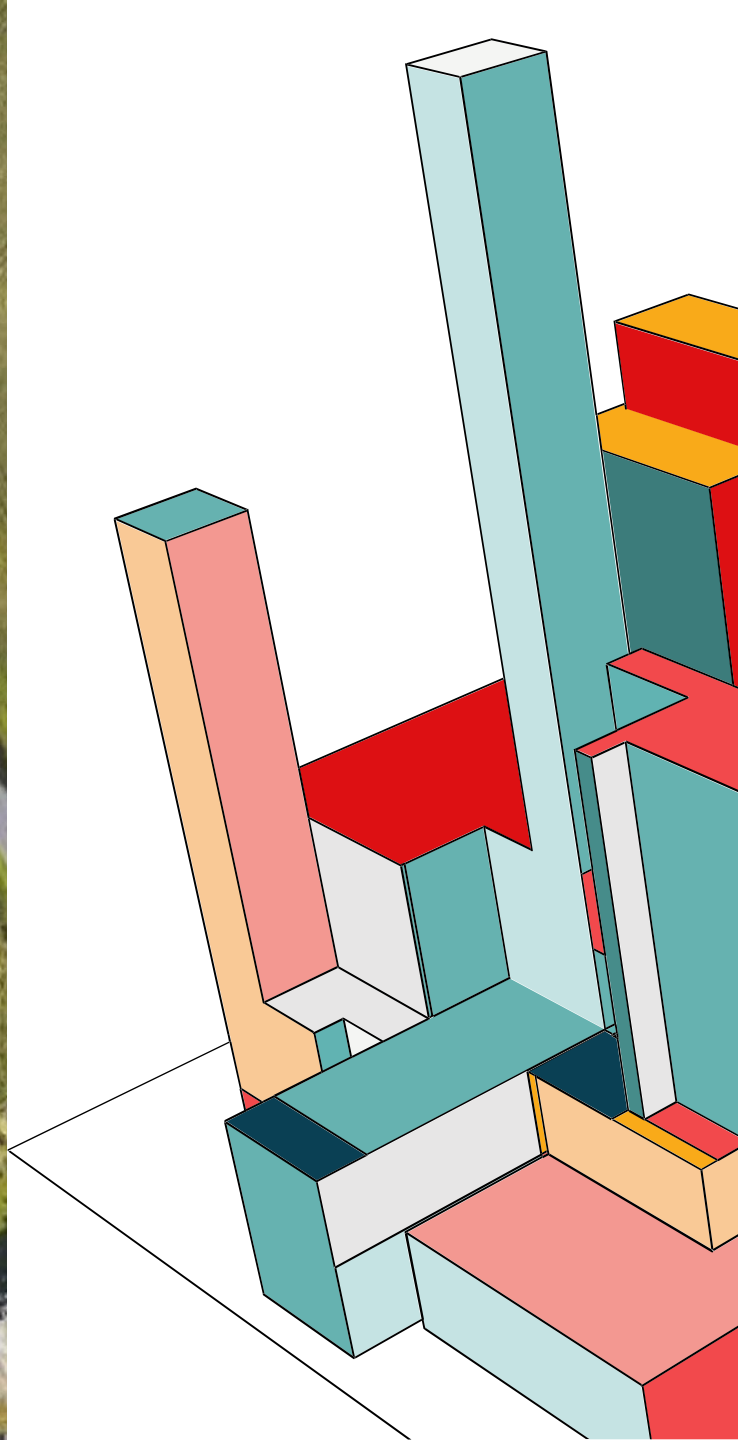


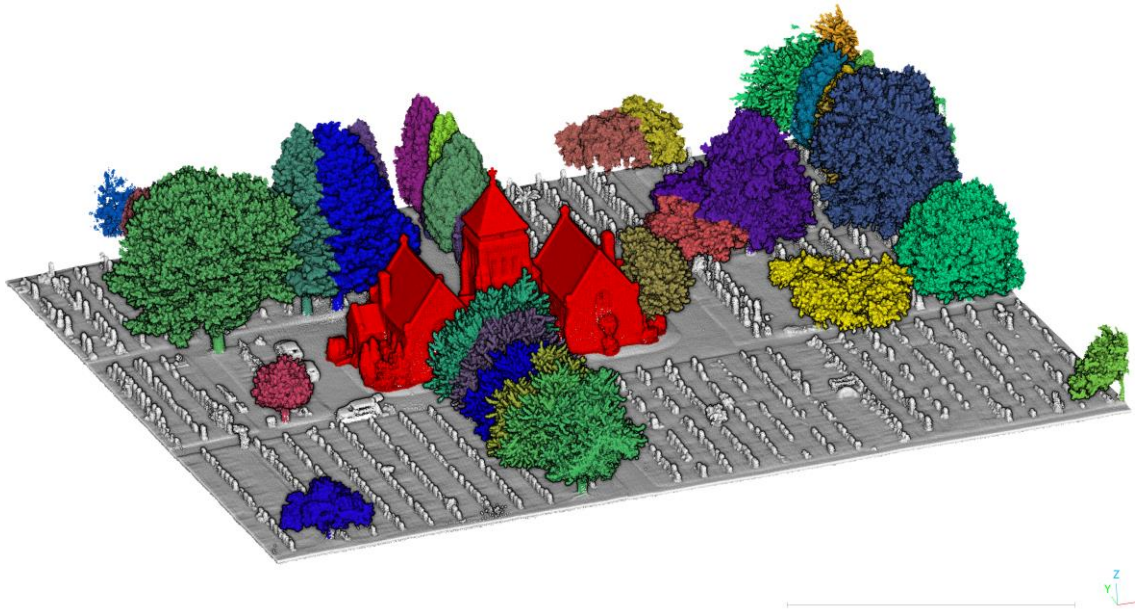


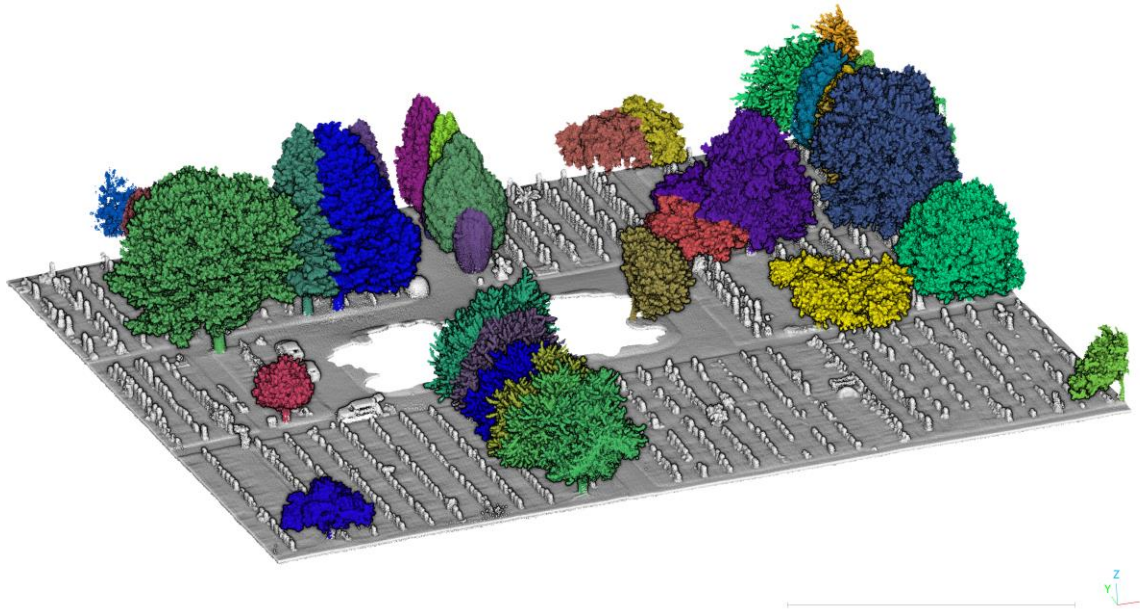


OPTICAL DATA

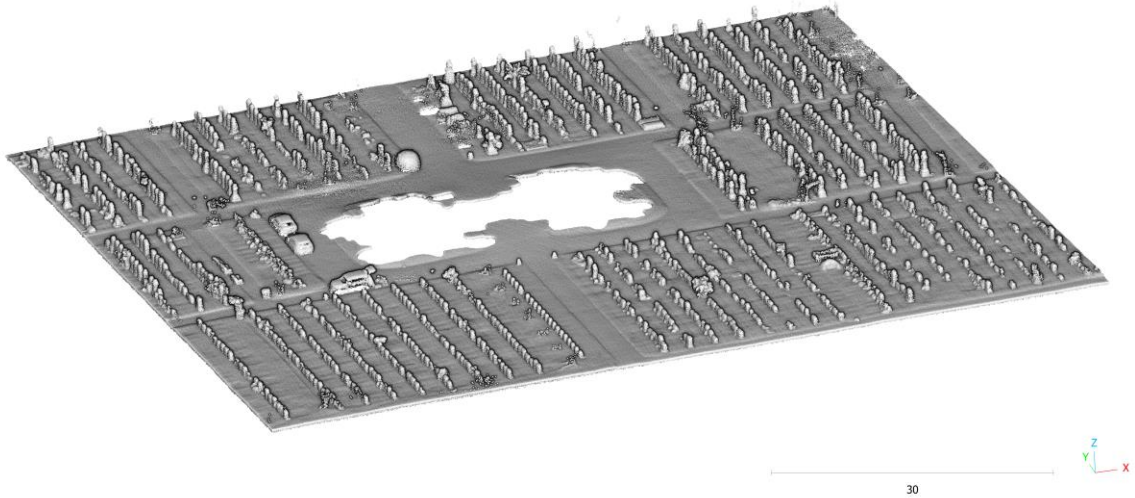


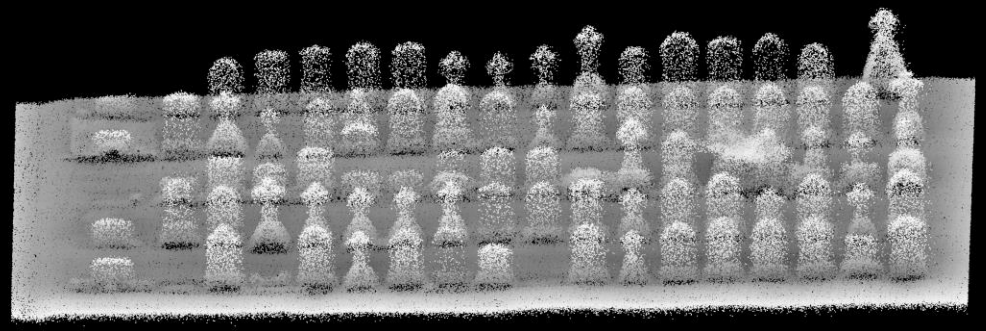


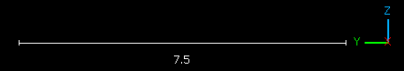




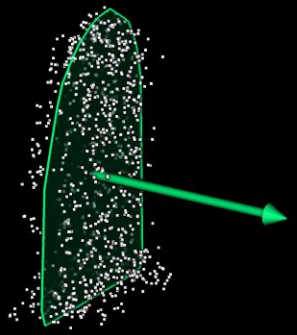
CLASSIFICATION



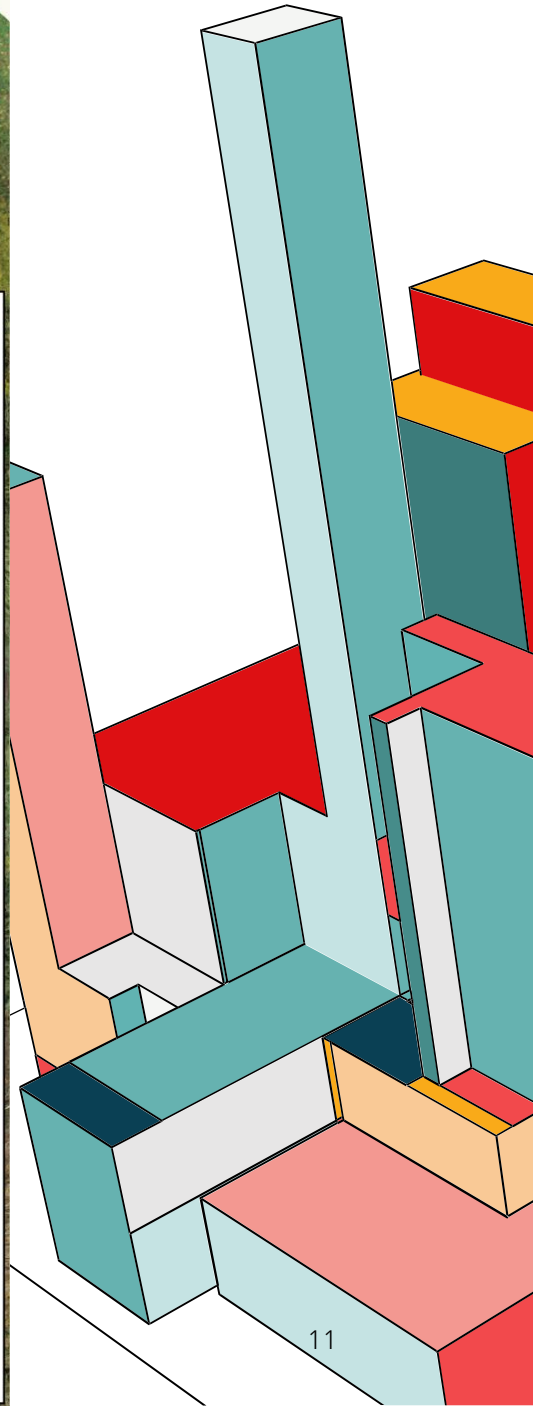




MONUMENTS TILT

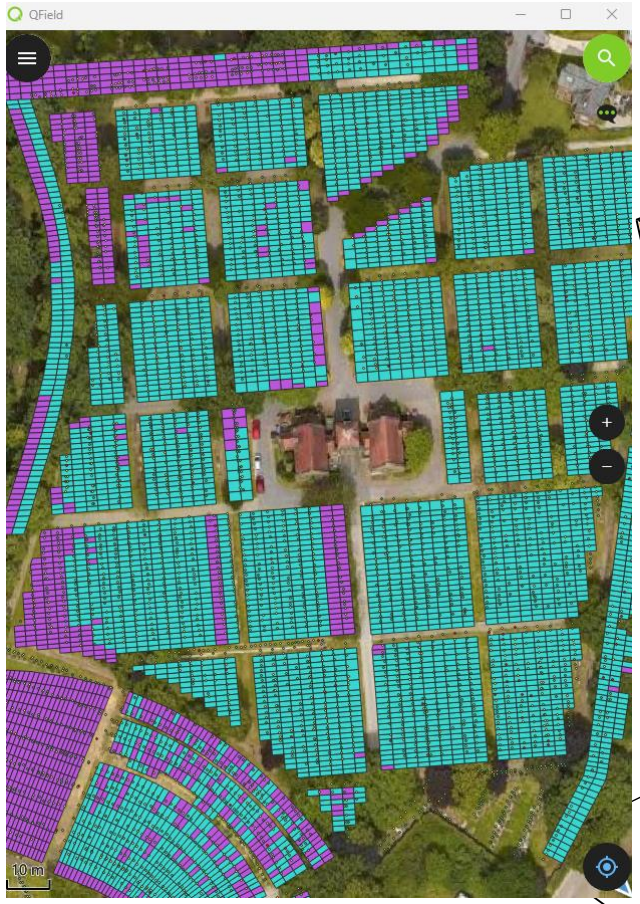


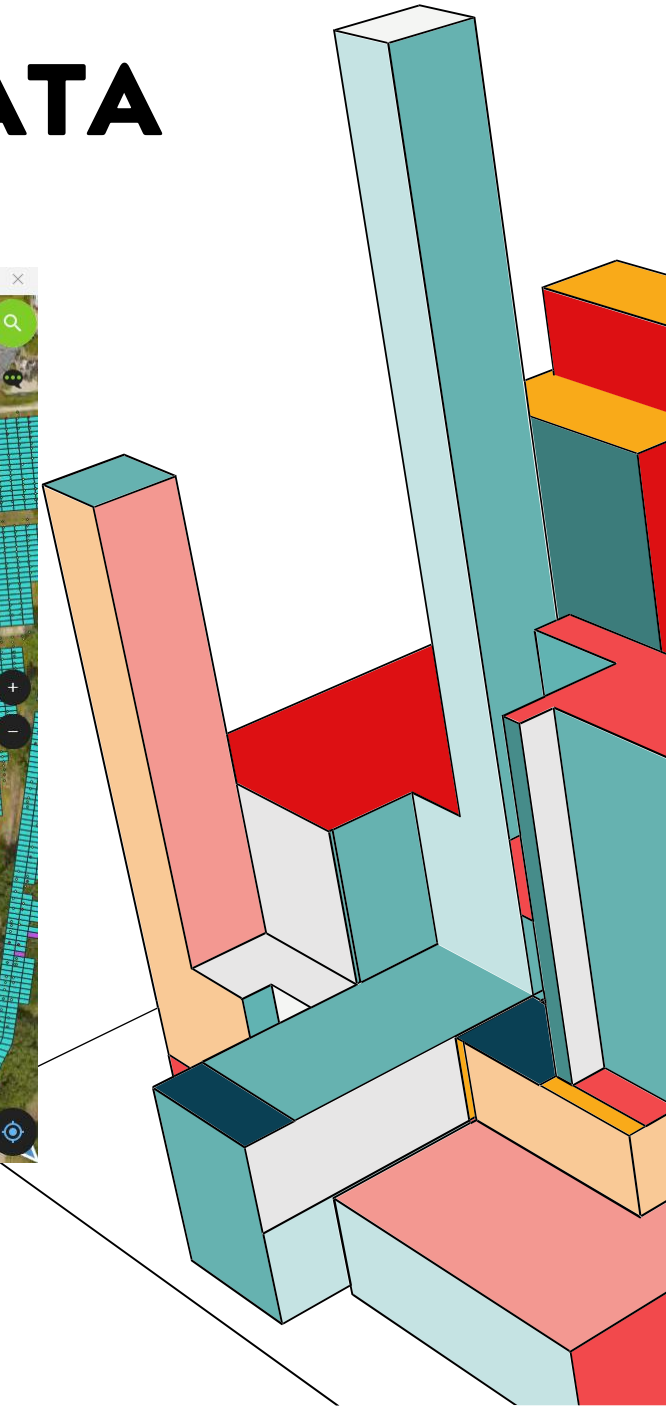
VISUALISATION

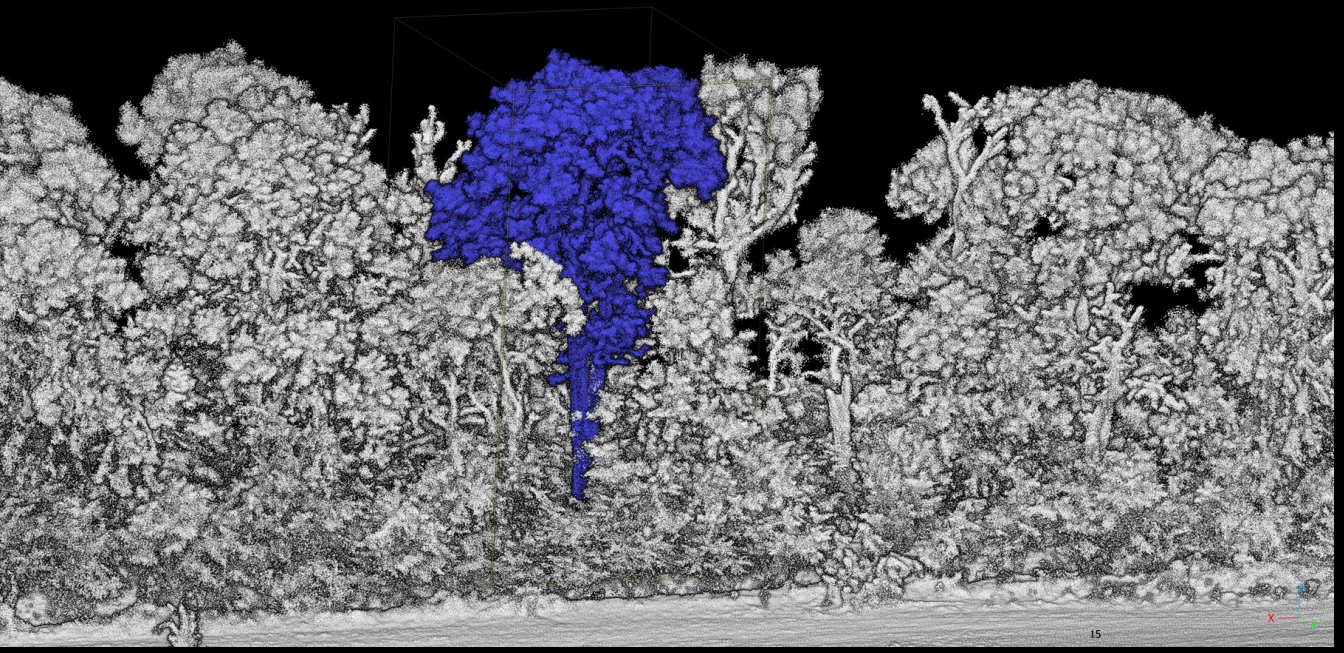


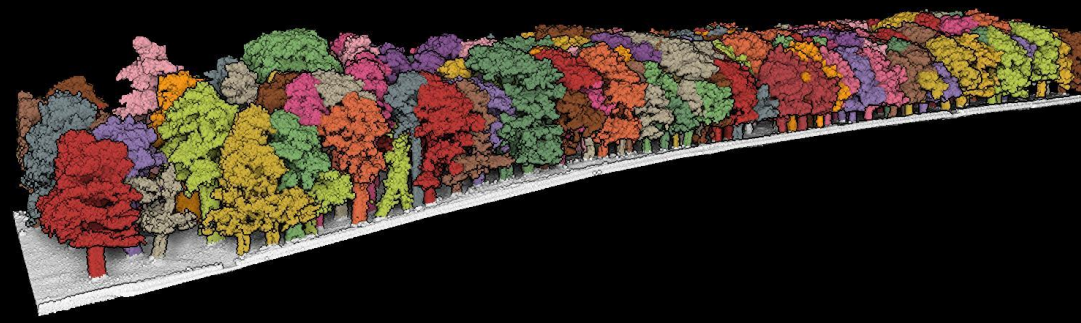
GRAVE SIDE ACCESS TO YOUR DATA

- Access and edit all your data seamlessly using the QField app, available on both mobile and PC.
- Changes are instantly synced to the cloud, keeping your team's data up to date across all devices.
- More complex updates can be handled remotely by our team in the Gower data analytics department, ensuring accuracy and efficiency.
- GPS integration guides you directly to graves or other locations needing attention.
- Automatically generate PDF maps for streamlined site management.
- Offline functionality

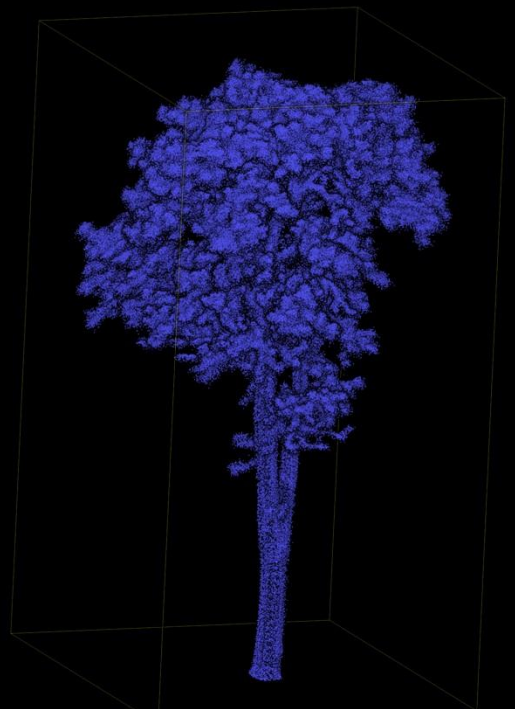


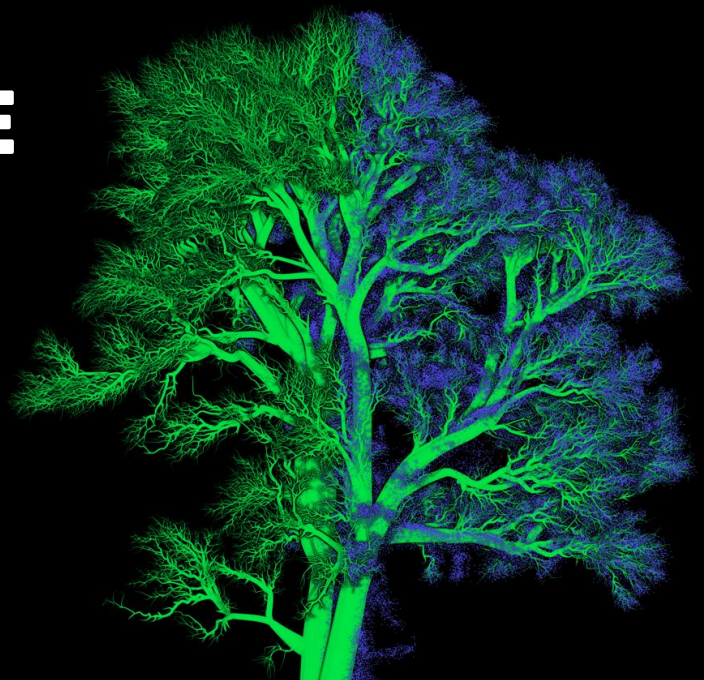


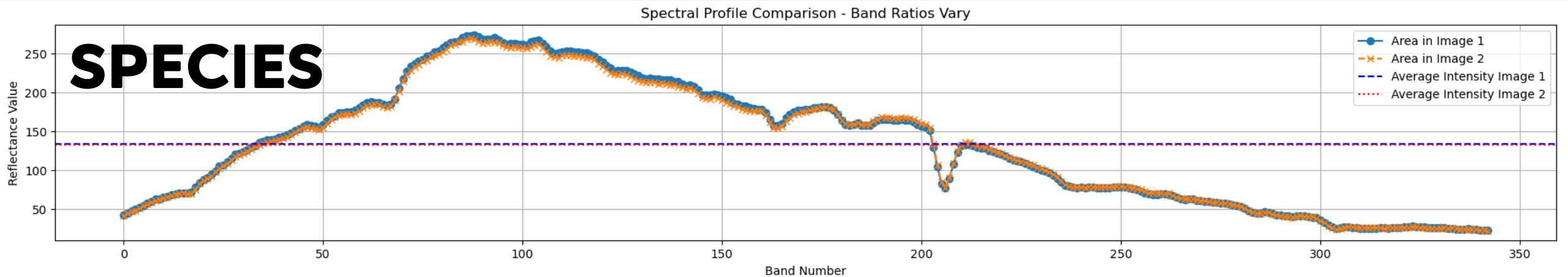


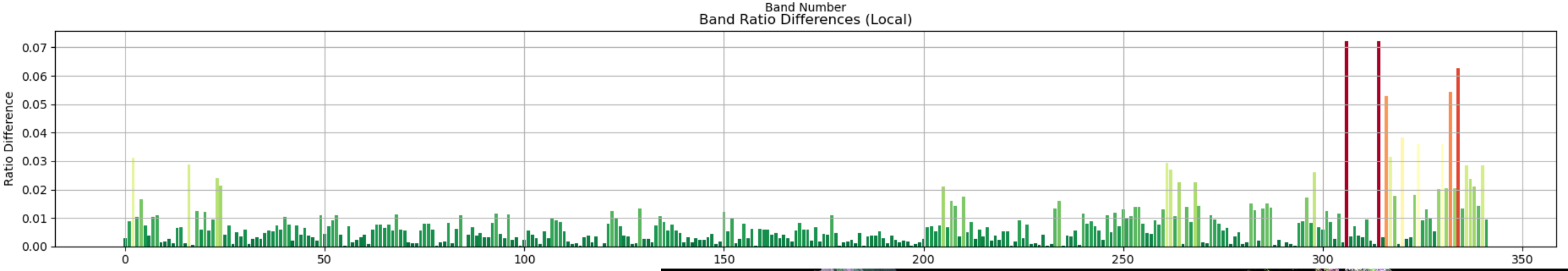


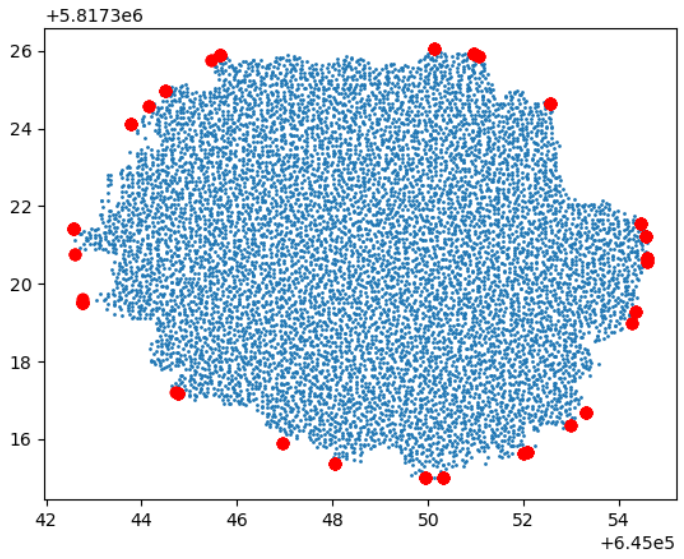
TREE VOLUME

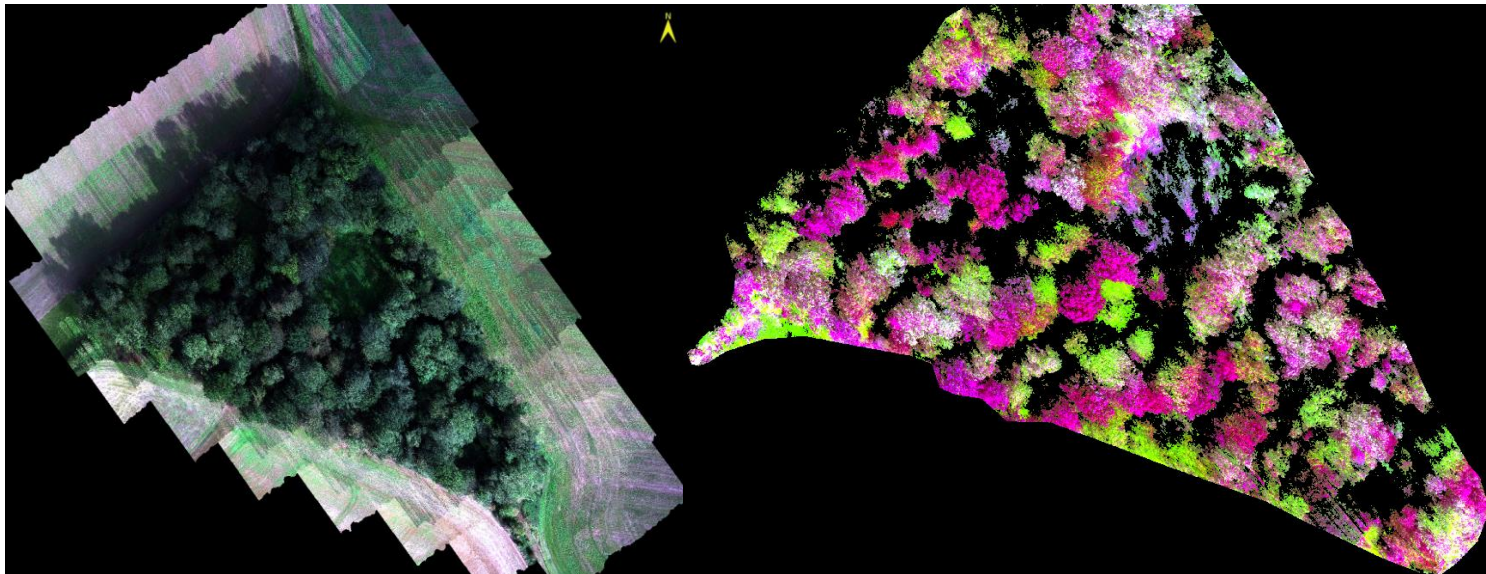





Spectral Profile Comparison - Band Ratios Vary
SPECIES
Area in Image 1
Area in Image 2
Average Intensity Image 1
Average Intensity Image 2
Reflectance Value
Band Number


Band Ratio Differences (Local)
Ratio Difference


+5.8173e6
+6.45e5

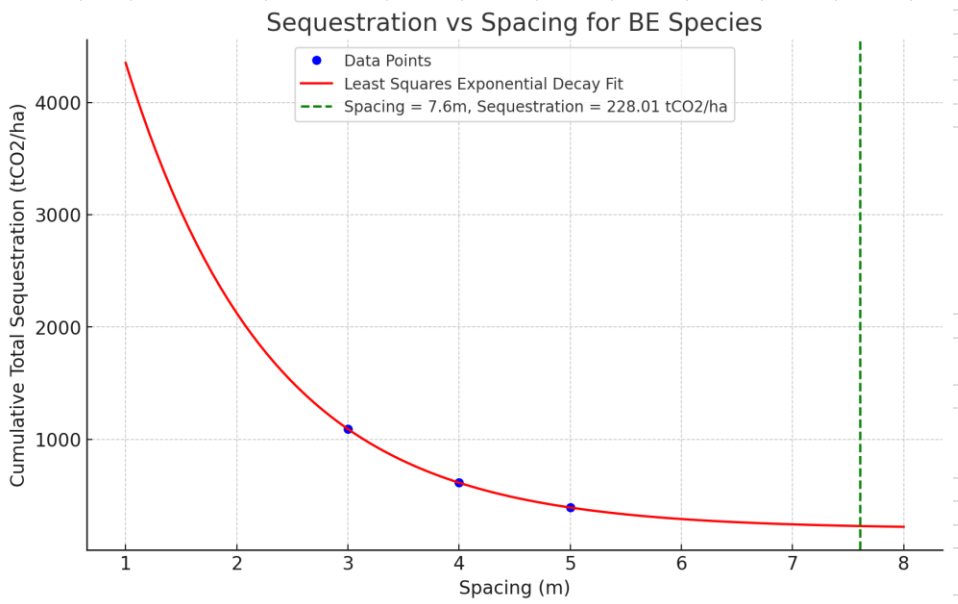


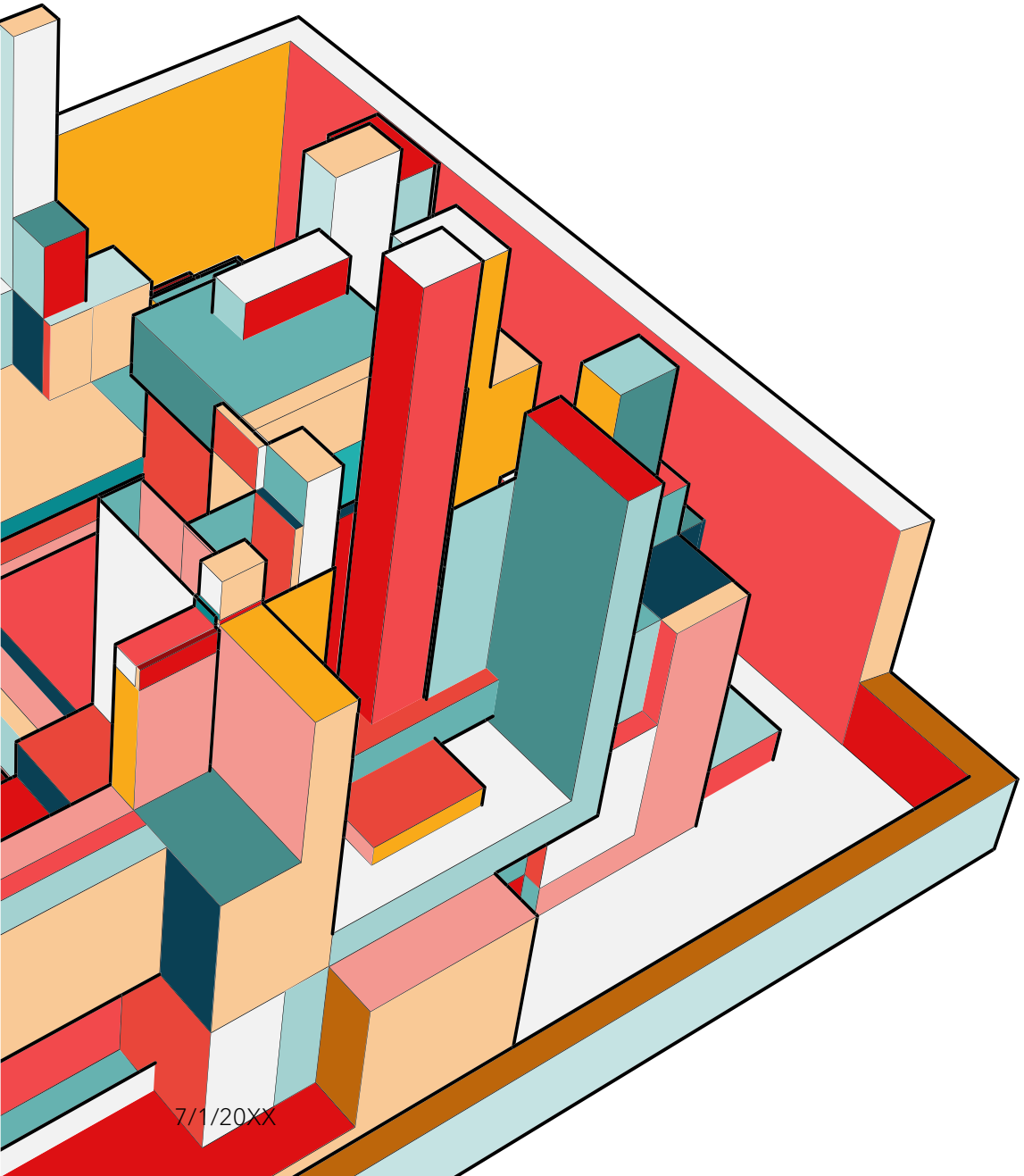
INDIVIDUAL TREE DATA

ID	TreeHeight(m)	DBH(cm)	TrunkVolume(m3)	BranchVolume(m3)	TotalVolume(m3)	TrunkLength(m)	BranchLength(m)	BranchesNum	CBH(m)	TrunkSurfaceArea(m2)	BranchesSurfaceArea(m2)	TotalArea(m3)	CrownWidth(m)	Species (Common Name)	what3words
_000000	20.073	148.673996	14.2732	124.268	**138.541**	16048.4	16048.4	42665	5.38422	74.0941	2547.97	2622.06	14.7969	**Quercus spp. (Oak spp)**	///money.icon.mimic
_000001	17.499	60.270401	1.99892	8.71658	**10.7155**	5773.99	5773.99	15613	3.082	6.08033	429.328	435.408	10.7328	**Acer platanoides 'Crimson King' (Purple Norway**	///saves.slows.quiz
_000002	20.244	112.717003	7.68464	77.963	**85.6477**	16708.5	16708.5	44590	3.93301	20.2603	2051.11	2071.38	16.8104	**Acer cappadocicum (Cappadocian Maple)**	///hedge.vest.gravy
_000003	14.194	137.048004	9.39826	88.0641	**97.4624**	8888.09	8888.09	23182	2.83678	59.8456	1775.9	1835.75	15.086	**Prunus avium (Wild Cherry)**	///blur.harder.kept
_000004	7.488	77.805801	1.79767	11.7488	**13.5465**	2344.71	2344.71	6388	1.61548	3.95032	392.294	396.244	6.1666	**Ilex aquifolium (Common Holly)**	///urgent.tuck.sudden
_000005	9.1	58.4492	1.35144	16.1633	**17.5147**	7673.68	7673.68	20467	2.69913	10.4545	753.099	763.554	10.662	**Ilex aquifolium (Common Holly)**	///trucks.birds.types
_000006	13.852	89.180099	3.58694	34.7245	**38.3115**	8810.89	8810.89	23627	1.62906	4.87887	1141.07	1145.95	10.8134	**Ailanthus altissima (Tree of Heaven)**	///chase.hands.error
_000007	7.93999	102.008003	3.04651	32.5798	**35.6263**	4119.1	4119.1	10809	1.41943	5.71759	824.918	830.636	9.89045	**Prunus 'Kanzan' (Pink Japanese Cherry)**	///backup.shady.drama
_000008	13.003	73.968597	2.48526	19.8147	**22.3**	8359.86	8359.86	23088	8.19009	415.693	418.059	833.752	13.6685	**Acer pseudoplatanus (Sycamore)**	///sings.think.whips
_000009	19.016	93.813301	6.17102	29.6995	**35.8705**	11071.1	11071.1	29151	4.72808	102.812	1016.98	1119.79	12.2819	**Tilia x euchlora (Caucasian Lime)**	///monday.faded.saves
_000010	13.95	137.856003	9.94789	69.8573	**79.8052**	9389.78	9389.78	25797	2.97672	18.379	1638.15	1656.53	13.6588	**Acer pseudoplatanus (Sycamore)**	///festivity.master.sentences
_000011	8.29401	84.787598	2.50412	27.6281	**30.1322**	6353.13	6353.13	16682	1.69805	6.32881	922.138	928.466	13.4283	**Prunus 'Kanzan' (Pink Japanese Cherry)**	///silly.reds.carry
_000012	14.088	155.082001	12.0941	98.9452	**111.039**	12274.6	12274.6	34440	1.55507	8.31776	2168.8	2177.12	14.3404	**Acer pseudoplatanus (Sycamore)**	///leader.also.gender
_000013	9.595	89.209999	2.71161	23.9717	**26.6833**	4225.87	4225.87	11316	1.31615	3.91128	713.532	717.443	9.35042	**Malus spp. (Apple spp**	///zeal.tracks.wallet
_000014	8.3	79.838501	2.0176	21.9596	**23.9772**	4183.5	4183.5	11187	1.45657	3.91514	703.437	707.352	9.32025	**Malus spp. (Apple spp**	///poem.delay.voice
_000015	15.58	98.013298	5.63231	60.2931	**65.9254**	13307.6	13307.6	35003	2.23462	14.9792	1780.1	1795.08	13.2874	**Acer platanoides (Norway Maple)**	///dragon.haven.salsa
_000016	16.763	110.712997	6.30308	45.8548	**52.1579**	6328.79	6328.79	16481	2.22041	8.62282	1006.19	1014.82	10.9803	**Acer platanoides (Norway Maple)**	///jaws.item.leads
_000017	11.935	98.147202	3.91418	54.7582	**58.6724**	7506.07	7506.07	20238	2.12004	13.6581	1307.04	1320.69	11.8883	**Acer platanoides 'Crimson King' (Purple Norway**	///event.finishing.lived
_000018	14.823	107.008003	7.57231	68.9939	**76.5662**	10913	10913	28501	2.13917	11.7873	1683.89	1695.68	14.1619	**Prunus spp. (Cherry spp)**	///stones.tiger.clots
_000019	15.714	415.623993	4.94885	92.5598	**97.5087**	18482.3	18482.3	49088	2.53053	95.2574	2312.31	2407.57	20.348	**Robinia pseudoacacia (False Acacia)**	///cool.flank.slice
_000020	16.381	100.232002	1.4819	13.9715	**15.4534**	11279.2	11279.2	29505	3.25731	12.0349	697.285	709.32	18.0587	**Carpinus betulus (Hornbeam)**	///lists.sorry.flight
_000021	13.443	79.734398	2.64406	14.7597	**17.4037**	4753.88	4753.88	13074	3.50802	16.4438	521.003	537.447	9.44059	**()**	///speak.evenly.else
_000022	12.768	126.231003	8.50605	74.8636	**83.3697**	7582.08	7582.08	20423	2.45152	15.344	1548.04	1563.38	13.2467	**Acer platanoides (Norway Maple)**	///brief.dent.fine
_000023	12.69	68.046501	2.01411	12.0005	**14.0146**	3819.78	3819.78	10260	2.93703	6.61325	445.55	452.163	8.04224	**Acer platanoides 'Crimson King' (Purple Norway**	///wasp.social.dish
_000024	15.254	109.136002	5.46728	58.5337	**64.001**	10033.5	10033.5	26617	1.69745	5.82066	1499.67	1505.49	13.4426	**Acer pseudoplatanus (Sycamore)**	///wiping.cabin.worm
_000025	12.521	57.905602	1.44183	14.7063	**16.1481**	6614.28	6614.28	17902	3.15396	18.2531	621.229	639.482	10.454	**Acer platanoides 'Crimson King' (Purple Norway**	///member.cakes.clock
_000026	9.663	66.202301	1.50873	19.0365	**20.5453**	4602.28	4602.28	12326	1.25629	4.91849	634.888	639.807	9.08181	**Acer davidii 'davidii' (Pere David's Snake-bark m**	///bubble.guises.hill
_000027	6.028	111.502998	5.63683	32.055	**37.6919**	6753.97	6753.97	18387	3.3744	518.124	423.993	942.117	17.2038	**Prunus spp. (Cherry spp)**	///blocks.ranch.coach
_000028	13.068	120.696999	5.58862	87.9233	**93.5119**	11509.9	11509.9	30942	1.64353	6.49487	2067.37	2073.87	14.0489	**Acer pseudoplatanus (Sycamore)**	///sunk.obey.things
_000029	16.052	124.709999	7.93131	91.0026	**98.9339**	12601.4	12601.4	33558	2.58574	14.6473	2115.07	2129.72	12.3134	**Tilia x euchlora (Caucasian Lime)**	///owners.torch.puzzle
_000030	8.841	107.869003	4.74073	35.4254	**40.1661**	5144.81	5144.81	14053	1.60415	8.79922	949.553	958.352	11.821	**Prunus spp. (Cherry spp)**	///gifted.ends.lease
_000031	8.428	123.154999	5.13855	42.6246	**47.7631**	3839.92	3839.92	10248	1.67309	13.7077	872.052	885.76	10.4313	**Prunus subhirtella'Autumnalis' (Autumn cherry)**	///clock.drift.aware
_000032	18.196	127.328003	9.77105	92.0178	**101.789**	16884.7	16884.7	44745	3.01426	12.1715	2488.72	2500.89	14.4023	**Platanus x hispanica (London Plane)**	///detect.books.liability
_000033	17.619	87.105797	4.58418	28.1196	**32.7038**	9883.29	9883.29	26413	3.10692	14.1035	972.845	986.949	13.5688	**Acer platanoides 'Crimson King' (Purple Norway**	///dome.diary.lungs
_000034	17.588	86.986	4.37543	19.6298	**24.0052**	8335.99	8335.99	22399	6.97583	167.225	623.915	791.14	10.4625	**Prunus avium (Wild Cherry)**	///types.system.alive
_000035	12.503	78.030502	3.20896	9.24631	**12.4553**	2390.01	2390.01	6371	4.091	35.2533	295.711	330.964	6.82035	**Prunus avium (Wild Cherry)**	///daring.bricks.void
_000036	12.913	57.4533	1.63439	6.7078	**8.34219**	4658.1	4658.1	12281	3.13898	5.80641	382.644	388.45	8.3425	**Prunus avium (Wild Cherry)**	///aware.atoms.noise
_000037	12.36	74.594803	2.59503	10.7129	**13.308**	3612.36	3612.36	9530	1.6979	4.48033	401.558	406.038	7.59246	**Prunus avium (Wild Cherry)**	///recent.panic.fleet
_000038	12.506	102.619003	4.75292	15.3222	**20.0752**	2766.23	2766.23	7477	3.43666	22.3842	443.57	465.954	6.35553	**Cupressus spp. (Cypress spp)**	///broken.showed.awake
_000039	11.93	76.111702	3.08021	9.13356	**12.2138**	2657.54	2657.54	7182	4.17914	52.5717	300.776	353.348	6.21997	**Cupressus spp. (Cypress spp)**	///spine.ground.worm
_000040	14.213	99.411499	5.37179	15.9031	**21.2749**	3940.77	3940.77	10514	1.47147	5.57555	491.788	497.364	9.1929	**Cupressus spp. (Cypress spp)**	///handy.steep.less
_000041	12.761	100.557999	4.14447	39.9082	**44.0526**	6906.14	6906.14	17953	3.15046	24.8869	1084.26	1109.15	11.1382	**Prunus avium (Wild Cherry)**	///nature.tools.drum
_000042	14.368	98.820297	4.89341	44.9808	**49.8742**	10445.7	10445.7	27481	2.32905	11.7235	1394.12	1405.85	13.0186	**Prunus avium (Wild Cherry)**	///ships.formal.reveal
_000043	15.674	72.6175	2.71864	13.718	**16.4366**	7109.5	7109.5	18643	5.02727	76.6112	565.042	641.653	9.70039	**Stump (Stump)**	///rigid.labels.change
_000044	16.4483	139.227997	5.05924	40.4918	**45.551**	10784.4	10784.4	28094	2.64892	17.2278	1285.94	1303.16	11.5473	**Cupressus spp. (Cypress spp)**	///lakes.spoken.bounty
_000045	13.184	87.750603	3.33211	16.4737	**19.8058**	4115.89	4115.89	10903	2.38717	8.32316	558.204	566.527	7.54156	**Cupressus spp. (Cypress spp)**	///ropes.chest.push
_000046	13.081	62.551998	1.81513	9.2732	**11.0883**	4755.84	4755.84	12586	5.496	79.9691	382.521	462.49	8.50144	**Prunus 'Kanzan' (Pink Japanese Cherry)**	///couches.doors.middle
_000047	12.417	63.792801	1.72538	9.28898	**11.0144**	4085.11	4085.11	10839	2.44089	5.45097	414.068	419.519	8.92527	**Prunus 'Kanzan' (Pink Japanese Cherry)**	///soup.goes.impose
_000048	12.708	57.5396	1.61656	5.39238	**7.00894**	2980.61	2980.61	7944	5.607	65.1431	216.231	281.374	7.09695	**Cupressus spp. (Cypress spp)**	///latter.tend.view

CONVERSION FROM VOLUME TO CARBON

Calculations		
Area of study (ha)	1.44126	Mesured from Lidar
Age estimate	37.2 years - 62 Years	Age basied on heightBeech trees typically grow about 30 to 50 cm (0.3 to 0.5 m) per year in height under average conditions. For trees with an average height of 18.6 meters, we can estimate the age range by dividing the height by the average annual growth rate.
Assumed Age (years)	65	Average 37.2 - 62
Total trees	249	Number of trees
Total Volume	4340.846228	Uncorrected
Total Volume Corrected	520.9319856	Corrected using Multiple regression on an idividual tree basis to account for LiDAR noise
Estimated Dencity of Fagus Sylvatica	1000-1200kg/m3 (Fresh cut)	Gatherd from Litriture
Assumed Dencity	1100	Average 1000-1200kg/m3
Estimated Water content	60-80%	Gatherd from Litriture
Total Biomass	573025.1841	Total Volume Corrected * Assumed Dencity
Assumed Water content	70%	Average 60%-80%
Calcualted Water content	401117.6289	70% of total Volume Corrected
Calcualted Dry Biomass	171907.5552	Total Biomass-Water Content
Assumed carbon %	50%	Standard Value Used Globaly
Carbon Stock	85953.77762	Dry Biomass * Assumed carbon %
Equivalent mass of CO2 Method	Mass of CO_2 = Carbon Stock × 3.67	The molecular weight of carbon (C) is approximately 12 atomic mass units (amu), and the molecular weight of carbon dioxide (CO_2) is 44 amu (12 for carbon + 32 for the two oxygen atoms). Therefore, the mass of CO_2 is 44/12 (or approximately 3.67) times the mass of carbon.
Equivalent mass of CO2	315450.3639	Carbon stock * 3.67
Carbon Credit Stock Method	Number of Carbon Credits= 1000kg per credit / Mass of CO_2	Since one carbon credit represents 1 metric tonne (1,000 kg) of CO_2
Carbon Credit Stock	315.4503639	Equivalent mass of CO2 / 1000
Carbon Sequestration Estimate Method	Carbon Credit Stock / Assumed age	Anualised over lifespan, single data point will not alow for the estimates to take growth phases into account.
Calculated Carbon Sequestration (Per Year)	4.853082521	Carbon Credit Stock / Assumed age
Calculated Carbon Sequestration (Per Year/Ha)	3.367249851	Carbon sequesration / Area (Ha)
Stocking dencity (Trees/Ha)	172.7654969	Total Trees / Area of Study
Tree Spacing Method	Area per tree= 10,000(m2/ha)/stocking dencity(trees/ha) Spacing=√ Area per tree	To Calculate the spacing for comparison with WCC data
Area per Tree	57.88192771	
Average Tree Spacing	7.608017331	





CONTINUAL DEVELOPMENT

- Automatic species classification
- Tree disease early warning
- Hedge and soil Carbon
- Wood density database

THANK YOU

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