

## Determination of Surface Characteristics Parameters

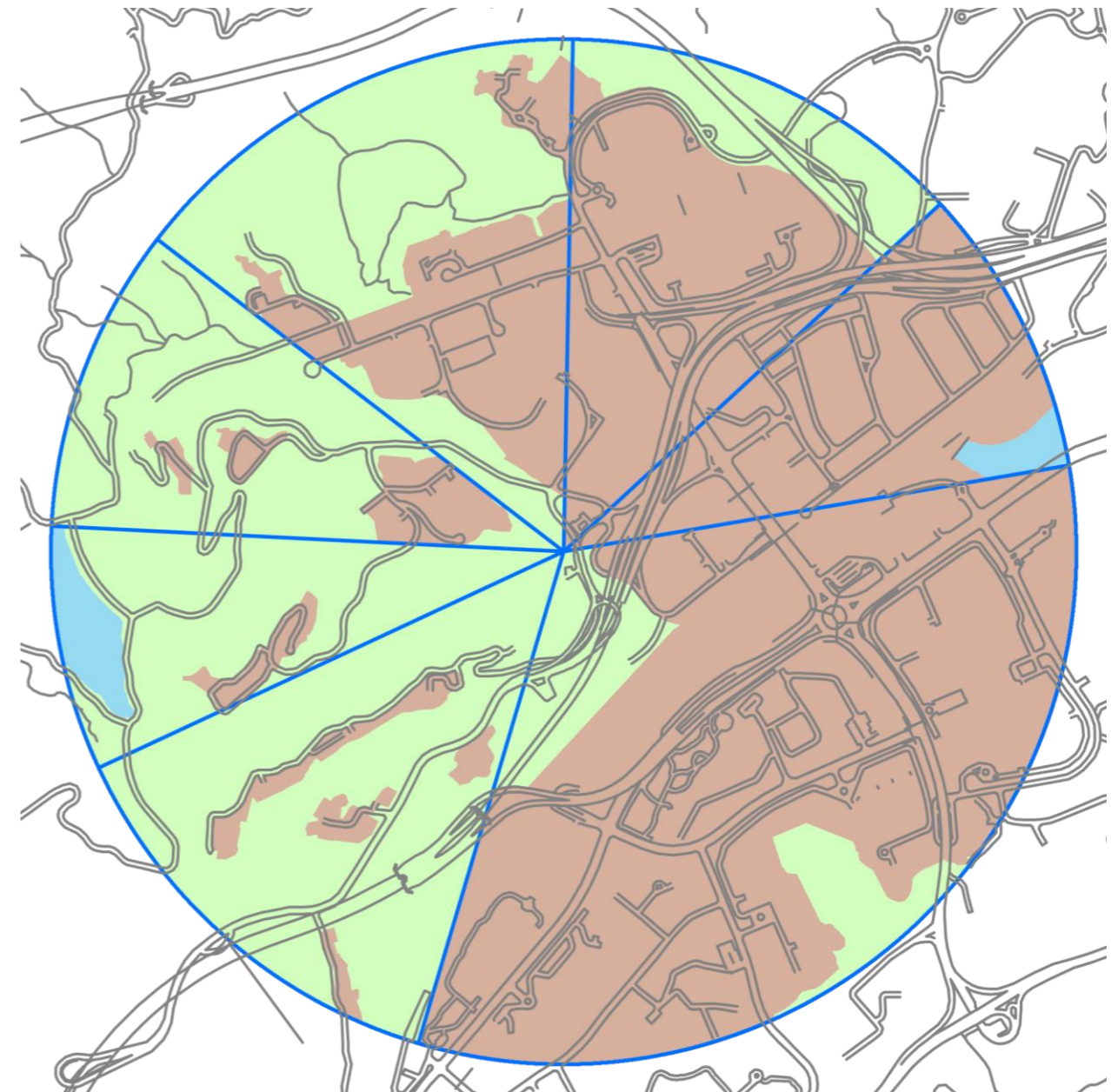
### 10km by 10km Region Centered on the Project Site



#### Legend

— 10km by 10km Region Centered on the Project Site

### 1km Boundary from Grid 4039



#### Legend

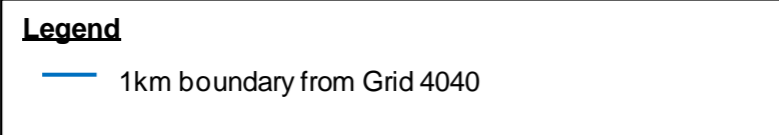
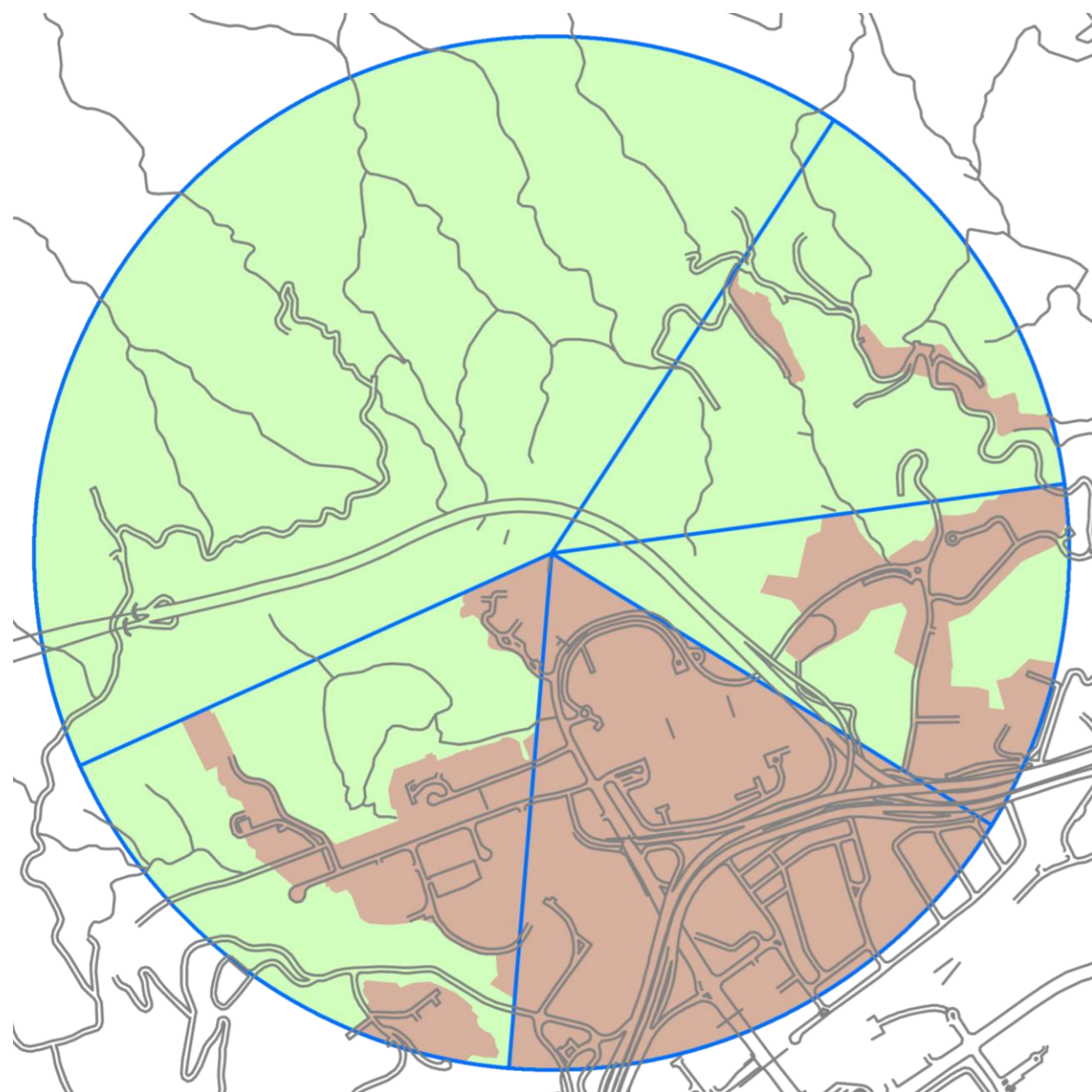
— 1km boundary from Grid 4039

Note:

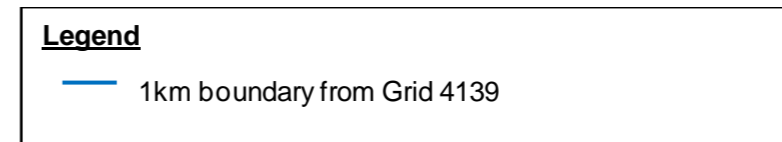
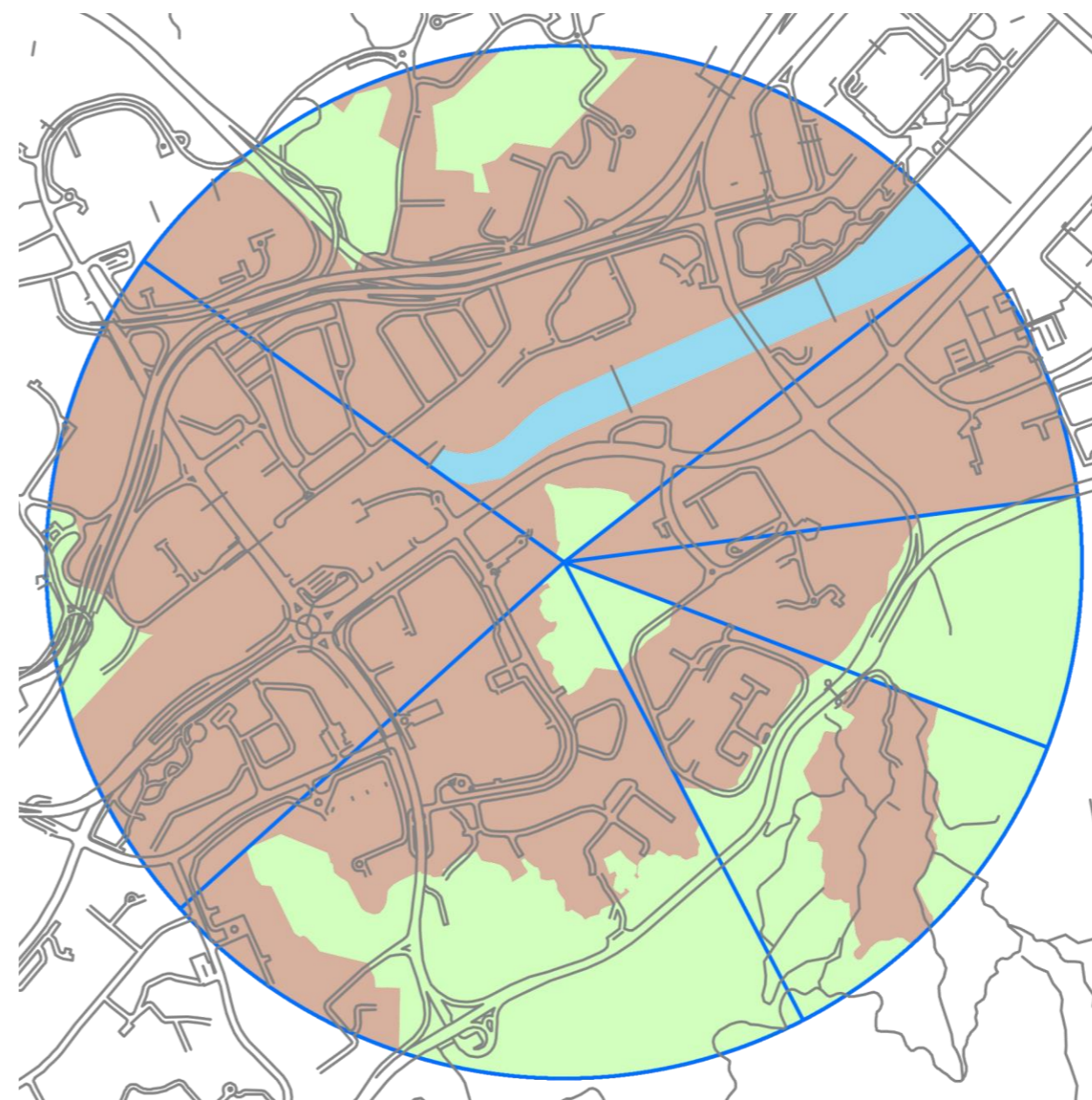
Brown area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

# Determination of Surface Characteristics Parameters

## 1km Boundary from Grid 4040



## 1km Boundary from Grid 4139

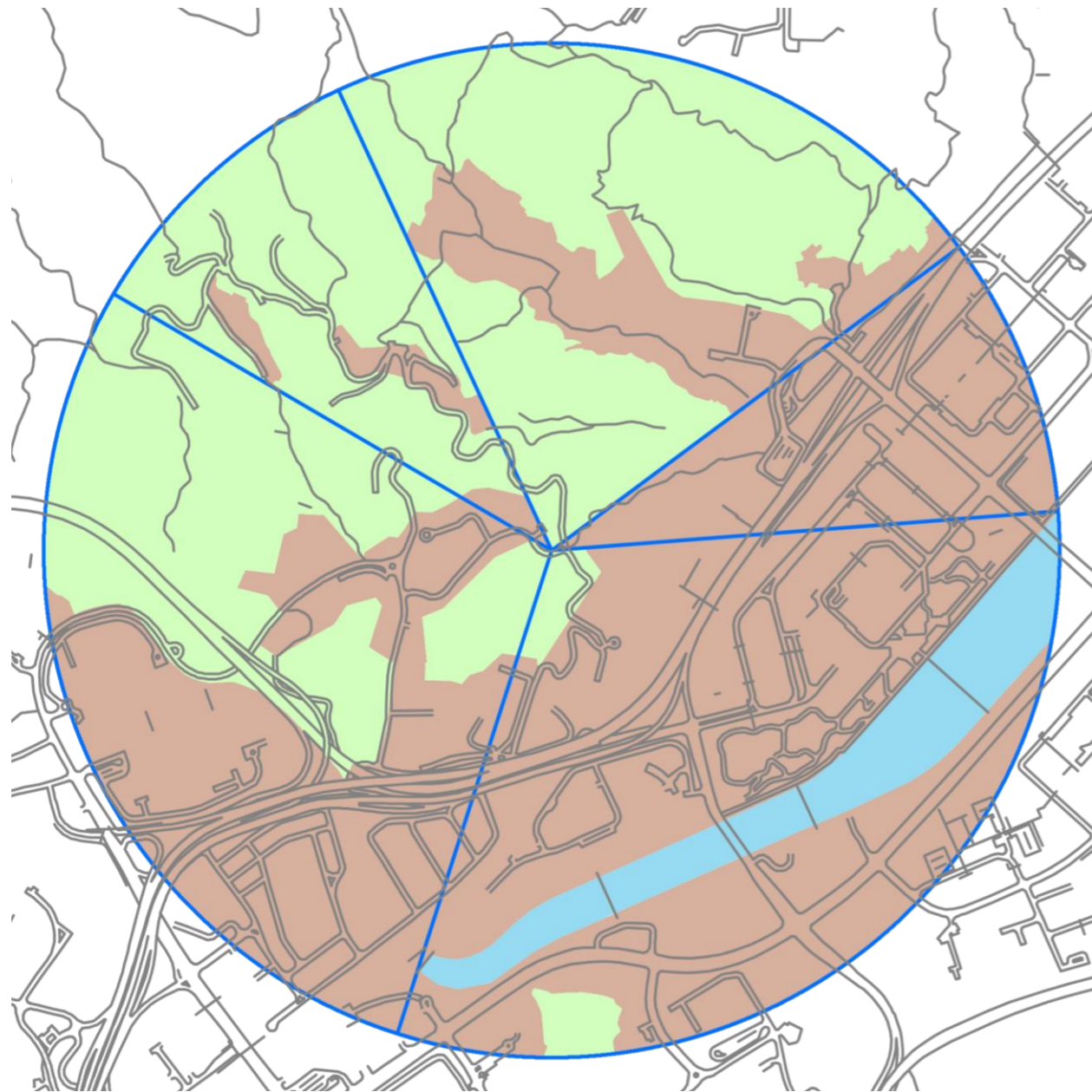


Note:

Brown area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

## Determination of Surface Characteristics Parameters

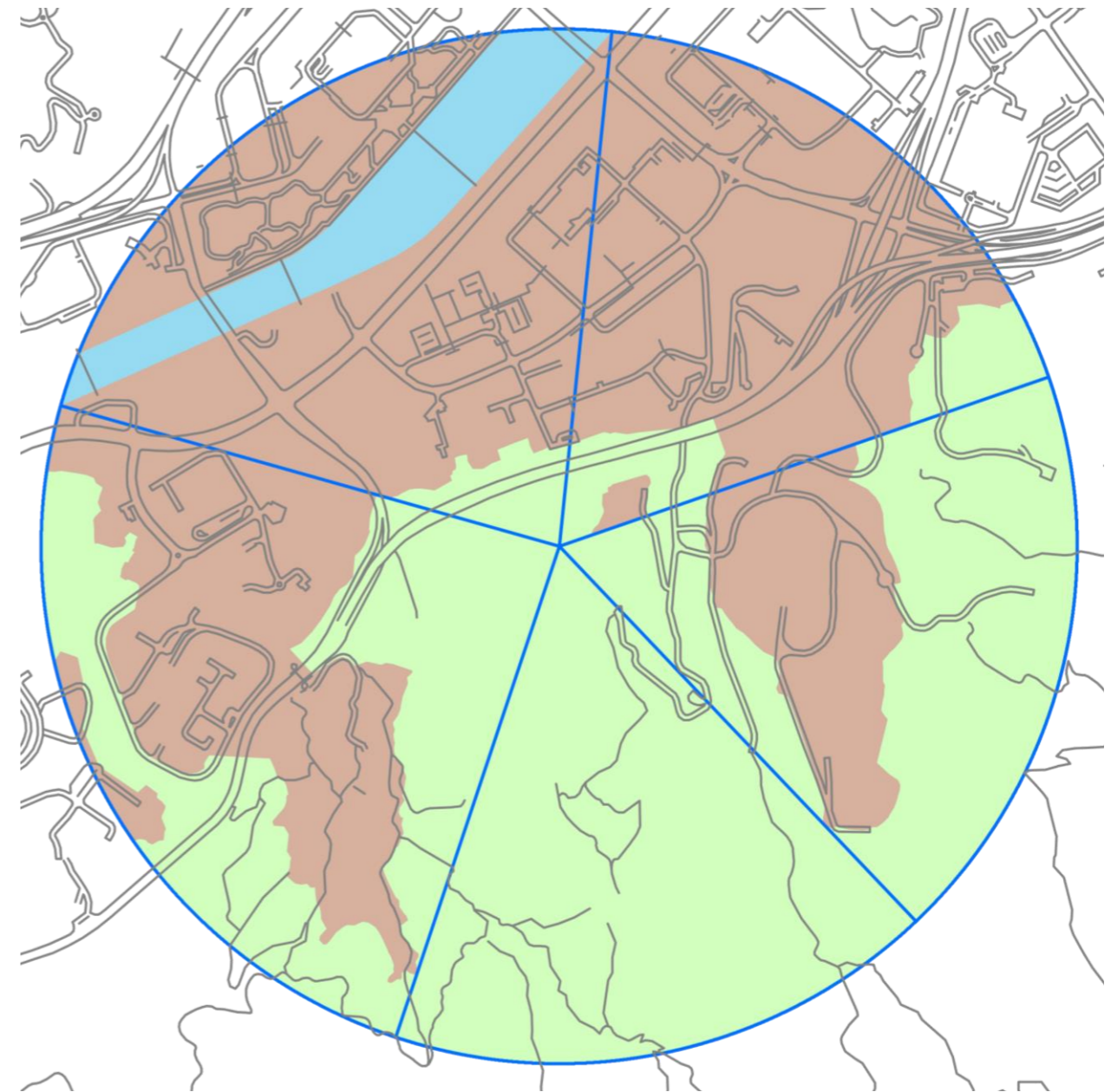
### 1km Boundary from Grid 4140



#### **Legend**

— 1km boundary from Grid 4140

### 1km Boundary from Grid 4239



#### **Legend**

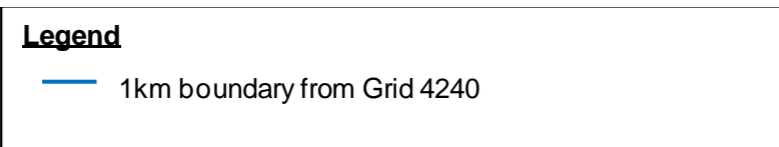
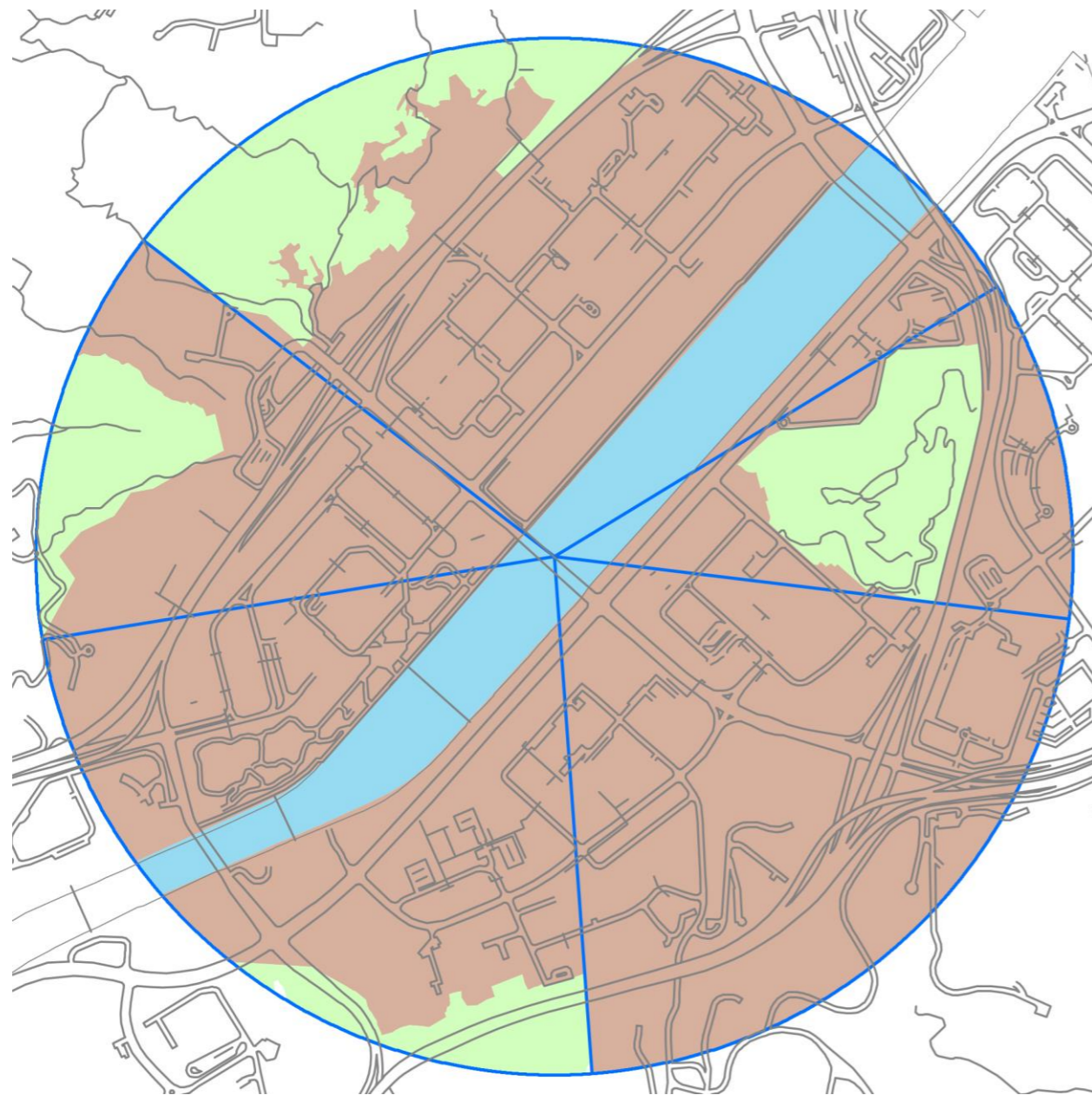
— 1km boundary from Grid 4239

Note:

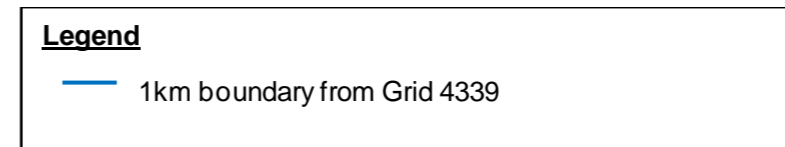
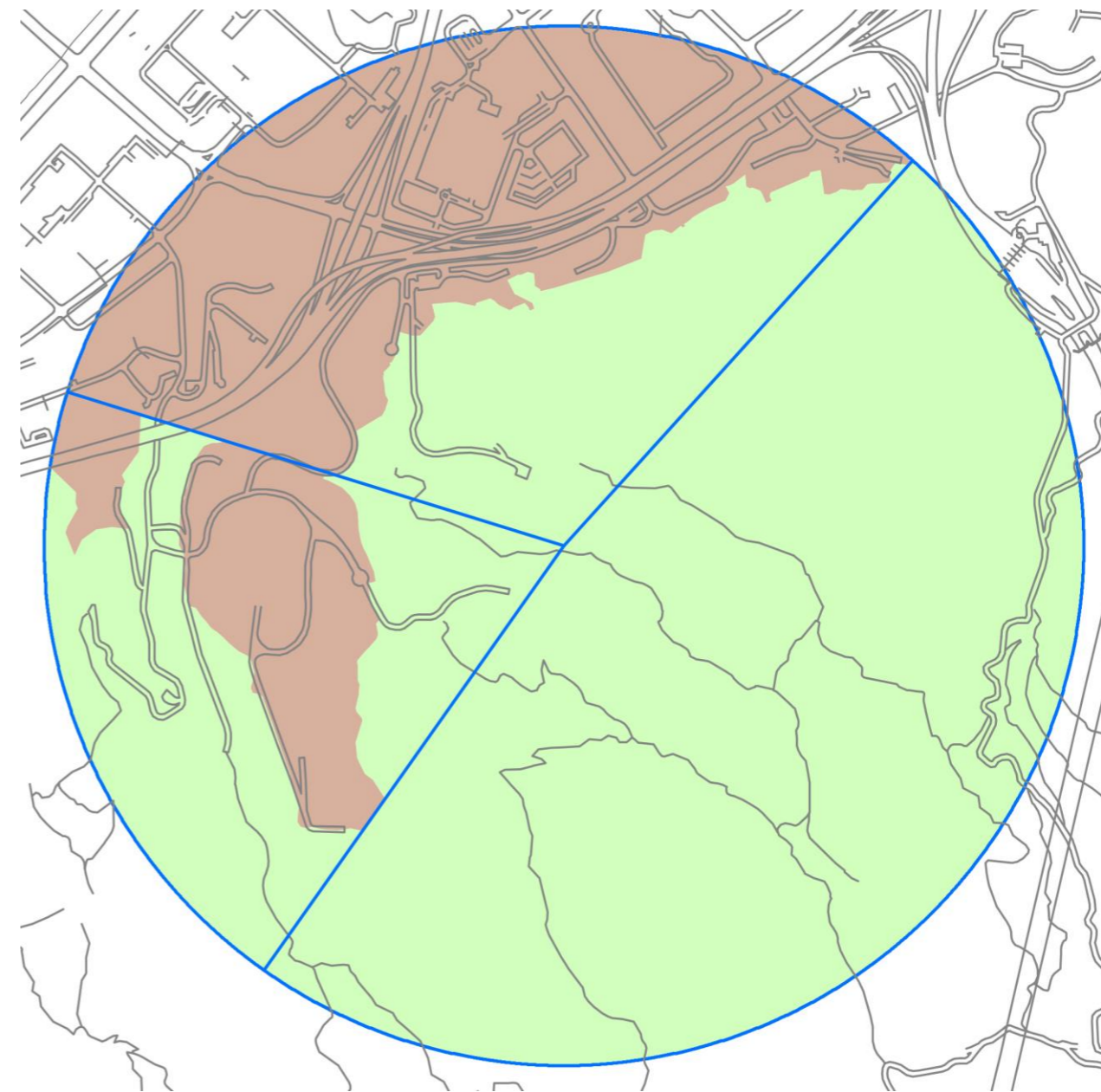
Brown area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

# Determination of Surface Characteristics Parameters

## 1km Boundary from Grid 4240



## 1km Boundary from Grid 4339



Note:

Brown area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

## Determination of Surface Characteristics Parameters

### 1km Boundary from Grid 4340



#### Legend

— 1km boundary from Grid 4340

Note:

Brown area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

## Determination of Surface Characteristics Parameters

Summary of Default Albedo and Bowen Ratio from AERMET

Land Type	Season	Default Albedo from AERMET	Default Bowen Ratio from AERMET
Urban	Spring	0.14	1.00
	Summer	0.16	2.00
	Autumn	0.18	2.00
	<b>Average</b>	<b>0.16</b>	<b>1.67</b>
Grassland	Spring	0.18	0.40
	Summer	0.18	0.80
	Autumn	0.20	1.00
	<b>Average</b>	<b>0.19</b>	<b>0.73</b>
Water	Spring	0.12	0.10
	Summer	0.10	0.10
	Autumn	0.14	0.10
	<b>Average</b>	<b>0.12</b>	<b>0.10</b>

Summary of Surface Roughness(m) from AERMET

		Default Surface Roughness(m) from AERMET
Urban	Spring	1.0000
	Summer	1.0000
	Autumn	1.0000
	<b>Average</b>	<b>1.0000</b>
Grassland	Spring	0.0500
	Summer	0.1000
	Autumn	0.0100
	<b>Average</b>	<b>0.0533</b>
Water	Spring	0.0001
	Summer	0.0001
	Autumn	0.0001
	<b>Average</b>	<b>0.0001</b>

Summary of Surface Characteristics for the Study Area

Grid 4039

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
0-50	Urban	303446.64	565	0.00133	0.6083	0.18	0.83	Urban development and grassland from north to northeast
	Grassland	99801.18	910	0.00027				
50 - 80	Urban	272961.99	645	0.00147	0.6999	0.18	0.83	Urban development and water from northeast to east
	Water	15519.49	910	0.00006				
80 - 195	Urban	891897.08	570	0.00154	0.5587	0.18	0.83	Urban development and grassland from east to south
	Grassland I	73254.39	220	0.00033				
	Grassland II	48461.97	885	0.00005				
195 - 245	Urban I	21730.18	610	0.00008	0.0727	0.18	0.83	Urban development and grassland from south to southwest
	Urban II	5857.06	440	0.00003				
	Urban III	9740.54	670	0.00003				
	Urban IV	5542.84	940	0.00001				
	Grassland	381462.06	650	0.00138				
245 - 275	Urban	15216.63	625	0.00010	0.0382	0.18	0.83	Urban development, grassland and water from southwest to west
	Grassland	197660.69	620	0.00132				
	Water	29446.79	940	0.00013				
275 - 310	Urban I	35595.87	275	0.00043	0.1160	0.18	0.83	Urban development and grassland from west to northwest
	Urban II	7442.00	650	0.00004				
	Urban III	4568.41	780	0.00002				
	Grassland I	248437.56	725	0.00113				
	Grassland II	6426.18	100	0.00021				
310 - 360	Urban	189916.35	515	0.00079	0.2044	0.18	0.83	Urban development and grassland from northwest to north
	Grassland I	39126.02	275	0.00030				
	Grassland II	237649.85	810	0.00063				

## Determination of Surface Characteristics Parameters

### Grid 4040

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
245 - 30	Grassland	1285828.95	495	0.00202	0.0533	0.18	0.83	Grassland from southwest to northeast
30 - 80	Urban I	10141.44	600	0.00004	0.0645	0.18	0.83	Urban development and grassland from northeast to east
	Urban II	21718.19	835	0.00006				
	Grassland	397579.40	640	0.00145				
80 - 120	Urban	157518.16	760	0.00060	0.1550	0.18	0.83	Urban development and grassland from east to southeast
	Grassland I	129299.87	440	0.00085				
	Grassland II	14492.24	695	0.00006				
	Grassland III	42908.86	905	0.00014				
120 - 185	Urban	549714.62	635	0.00157	1.0000	0.18	0.83	Urban development from southeast to south
185 - 245	Urban I	23030.56	135	0.00032	0.1972	0.18	0.83	Urban development and grassland from south to southwest
	Urban II	149925.99	625	0.00045				
	Urban III	28885.20	940	0.00006				
	Grassland I	169952.78	855	0.00037				
	Grassland II	160467.60	460	0.00066				

### Grid 4139

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
305 - 50	Urban I	95783.76	330	0.00031	0.2464	0.18	0.83	Urban development, grassland and water from northwest to northeast
	Urban II	602337.95	610	0.00107				
	Grassland I	14378.31	100	0.00016				
	Grassland II	62136.97	870	0.00008				
	Grassland III	57405.74	890	0.00007				
	Water	95007.84	545	0.00019				
50 - 80	Urban	267712.44	660	0.00152	1.0000	0.18	0.83	Urban development from northeast to east
80 - 110	Urban	93980.55	410	0.00092	0.2657	0.18	0.83	Urban development and grassland from east to southeast
	Grassland	154202.24	815	0.00076				
110 - 150	Urban I	79642.46	385	0.00057	0.2277	0.18	0.83	Urban development and grassland in southeast
	Urban II	98218.63	775	0.00035				
	Grassland I	18756.68	150	0.00035				
	Grassland II	110952.62	715	0.00043				
	Grassland III	54470.04	910	0.00017				
150 - 225	Urban I	266765.96	440	0.00092	0.2672	0.18	0.83	Urban development and grassland from southeast to southwest
	Urban II	59161.53	925	0.00010				
	Grassland I	20826.75	140	0.00023				
	Grassland II	310199.36	775	0.00061				
225 - 305	Urban	643917.85	600	0.00158	0.9056	0.18	0.83	Urban development and grassland from southwest to northwest
	Grassland	35322.08	940	0.00006				

## Determination of Surface Characteristics Parameters

### Grid 4140

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
335 - 55	Urban	171239.74	545	0.00046	0.1094	0.18	0.83	Urban development and grassland from northwest to northeast
	Grassland I	144639.32	290	0.00073				
	Grassland II	366228.80	780	0.00069				
55 - 85	Urban	281560.84	660	0.00152	1.0000	0.18	0.83	Urban development from northeast to east
85 - 195	Urban I	500941.35	415	0.00123	0.2549	0.18	0.83	Urban development, grassland and water from east to south
	Urban II	283500.58	815	0.00036				
	Grassland I	18091.91	100	0.00018				
	Grassland II	18369.15	935	0.00002				
195 - 300	Urban	483093.42	645	0.00084	0.2227	0.18	0.83	Urban development and grassland from southwest to northwest
	Grassland I	40497.29	185	0.00024				
	Grassland II	372271.18	655	0.00063				
300 - 335	Urban I	8344.05	115	0.00024	0.1113	0.18	0.83	Urban development and grassland in northwest
	Urban II	19333.52	440	0.00014				
	Urban III	10141.44	750	0.00004				
	Grassland	265936.36	685	0.00128				

### Grid 4239

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
5 - 70	Urban I	7232.06	150	0.00008	0.4903	0.18	0.83	Urban development and grassland from north to northeast
	Urban II	479002.60	665	0.00127				
	Grassland I	42506.64	210	0.00036				
	Grassland II	39139.18	880	0.00008				
70 - 135	Urban	172555.14	515	0.00059	0.1399	0.18	0.83	Urban development and grassland from northeast to southeast
	Grassland I	96986.21	315	0.00054				
	Grassland II	302249.30	805	0.00066				
135 - 195	Grassland	540430.25	635	0.00157	0.0533	0.18	0.83	Grassland from southeast to south
195 - 280	Urban I	363105.92	625	0.00076	0.1875	0.18	0.83	Urban development and grassland from south to west
	Urban II	17250.60	965	0.00002				
	Grassland I	189794.44	335	0.00074				
	Grassland II	192543.80	835	0.00030				
280 - 5	Urban I	369559.82	500	0.00106	0.1652	0.18	0.83	Urban development, grassland and water from west to north
	Urban II	154023.16	880	0.00025				
	Grassland	36936.15	145	0.00036				
	Water	138350.14	755	0.00026				



## Determination of Surface Characteristics Parameters

### Grid 4240

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
60 - 100	Urban I	110286.93	890	0.00037	0.1095	0.18	0.83	Urban development, grassland and water from northeast to east
	Urban II	73403.79	385	0.00057				
	Grassland	140250.38	650	0.00065				
	Water	10422.64	135	0.00023				
100 - 180	Urban	681750.58	620	0.00160	0.4361	0.18	0.83	Urban development and water from east to south
	Water	6532.89	60	0.00016				
180 - 260	Urban I	301787.18	655	0.00062	0.1035	0.18	0.83	Urban development, grassland and water from south to west
	Urban II	249328.04	675	0.00050				
	Grassland	69146.00	915	0.00010				
	Water	120095.03	455	0.00036				
260 - 310	Urban	320605.11	590	0.00134	0.6419	0.18	0.83	Urban development and grassland from west to northwest
	Grassland	85215.96	880	0.00024				
310 - 60	Urban I	557077.23	565	0.00102	0.1291	0.18	0.83	Urban development, grassland and water from northwest to northeast
	Urban II	69852.62	770	0.00009				
	Grassland	190774.65	840	0.00023				
	Water	151072.81	540	0.00029				

### Grid 4339

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
40 - 215	Grassland	1510380.00	440	0.00227	0.0533	0.18	0.83	Grassland from northeast to southwest
215 - 285	Urban I	180406.00	545	0.00053	0.1345	0.18	0.83	Urban development and grassland from southwest to northwest
	Urban II	32701.10	915	0.00006				
	Grassland I	287542.00	805	0.00057				
	Grassland II	127202.00	290	0.00070				
285 - 40	Urban	674240.00	680	0.00099	0.2430	0.18	0.83	Urban development and grassland from northwest to northeast
	Grassland	328348.00	355	0.00092				

## Determination of Surface Characteristics Parameters

### Grid 4340

Sector (degrees in clockwise)	Land Use	Area (m <sup>2</sup> )	Distance (m)	Weighting (Fraction/Distance)	Surface Roughness (m) <sup>3,5</sup>	Albedo <sup>2,4,5</sup>	Bowen Ratio <sup>1,4,5</sup>	Remark
0 - 80	Urban I	364147.32	435	0.00118	0.4666	0.18	0.83	Urban development and water from north to east Grassland from northeast to east
	Urban II	233733.98	830	0.00040				
	Water	59700.96	690	0.00012				
	Grassland	51670.21	920	0.00008				
80 - 205	Grassland	558900.64	710	0.00073	0.2967	0.18	0.83	Urban development and grassland from east to southwest
	Urban	522618.50	470	0.00103				
205 - 260	Urban	451360.32	645	0.00155	1.0000	0.18	0.83	Urban development from southwest to west
260 - 360	Urban I	423141.99	460	0.00169	0.0321	0.18	0.83	Urban development water from west to north Grassland in northwest
	Urban II	119840.07	905	0.00024				
	Water	216086.26	750	0.00053				
	Grassland	140010.46	425	0.00061				

#### Notes:

1. With reference to AERMOD Implementation Guide, the determination of the Bowen ratio should be based on a simple unweighted geometric mean (i.e., no direction or distance dependency) for a representative domain, with a default domain defined by a 10km by 10km region centered on the measurement site.
2. With reference to AERMOD Implementation Guide, the determination of the albedo should be based on a simple unweighted arithmetic mean (i.e., no direction or distance dependency) for the same representative domain as defined for Bowen ratio, with a default domain defined by a 10km by 10km region centered on the measurement site.
3. Surface roughness length is based on an inverse-distance weighted geometric mean for an upwind distance of 1 km relative to the concerned site.
4. Land use within 10km by 10km region centered on the measurement site included 23.35% urban (23347842.42 m<sup>2</sup>), 73.17% grassland (73170008.10 m<sup>2</sup>), and 3.48% water (3482149.48 m<sup>2</sup>).
5. For the parameters including albedo, Bowen Ratio and surface roughness, the default value for "Winter" is excluded from calculating the representative values.