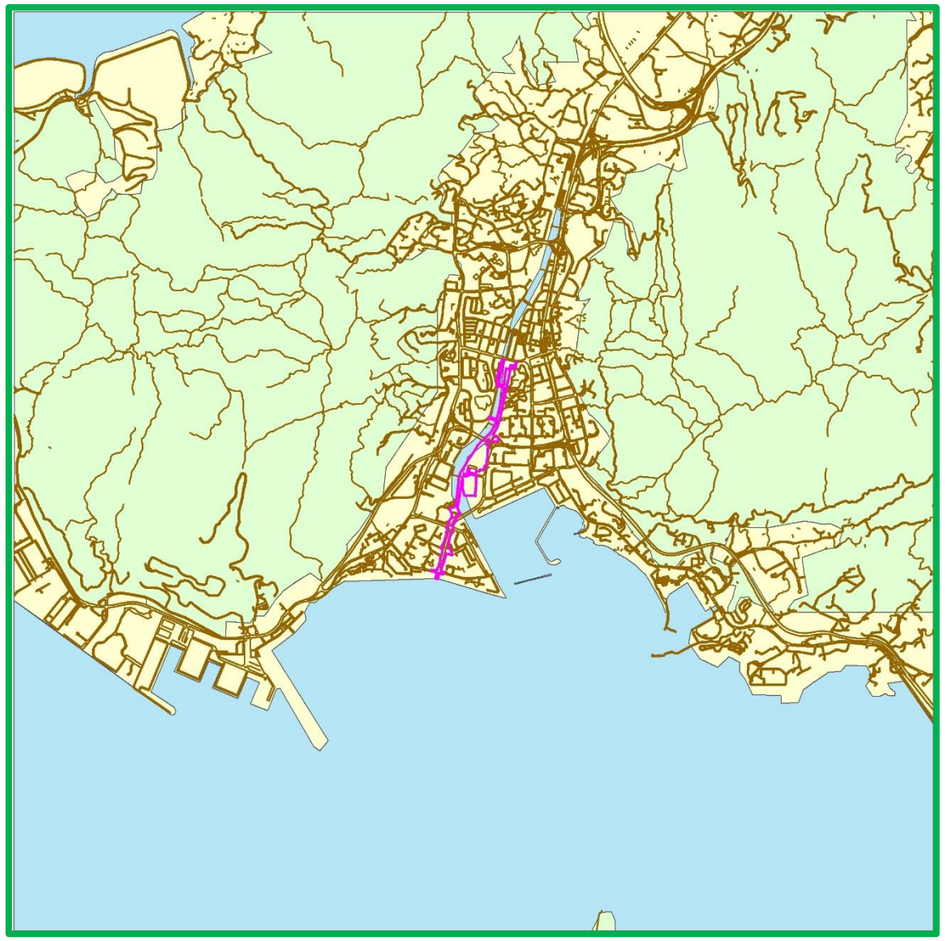
Appendix 3.9 Determination of Surface Characteristics

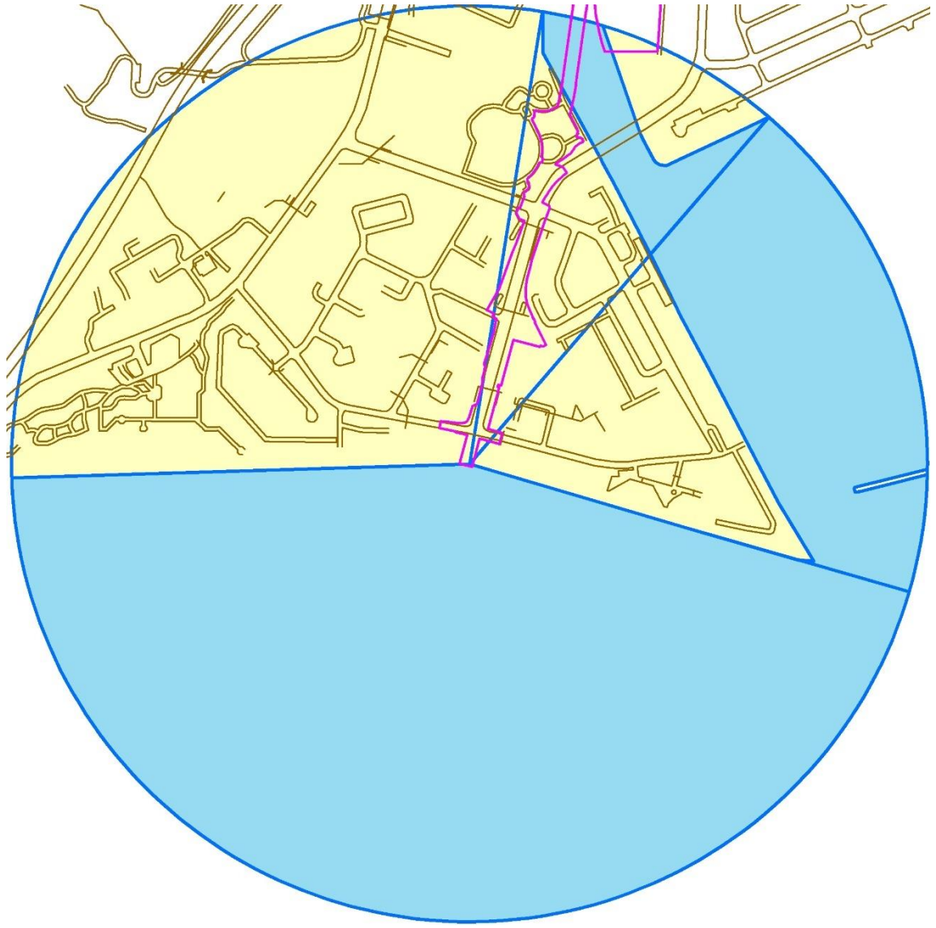
10km by 10km Region Centred on the Project Site



Legend

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

1km Boundary from Grid 1939



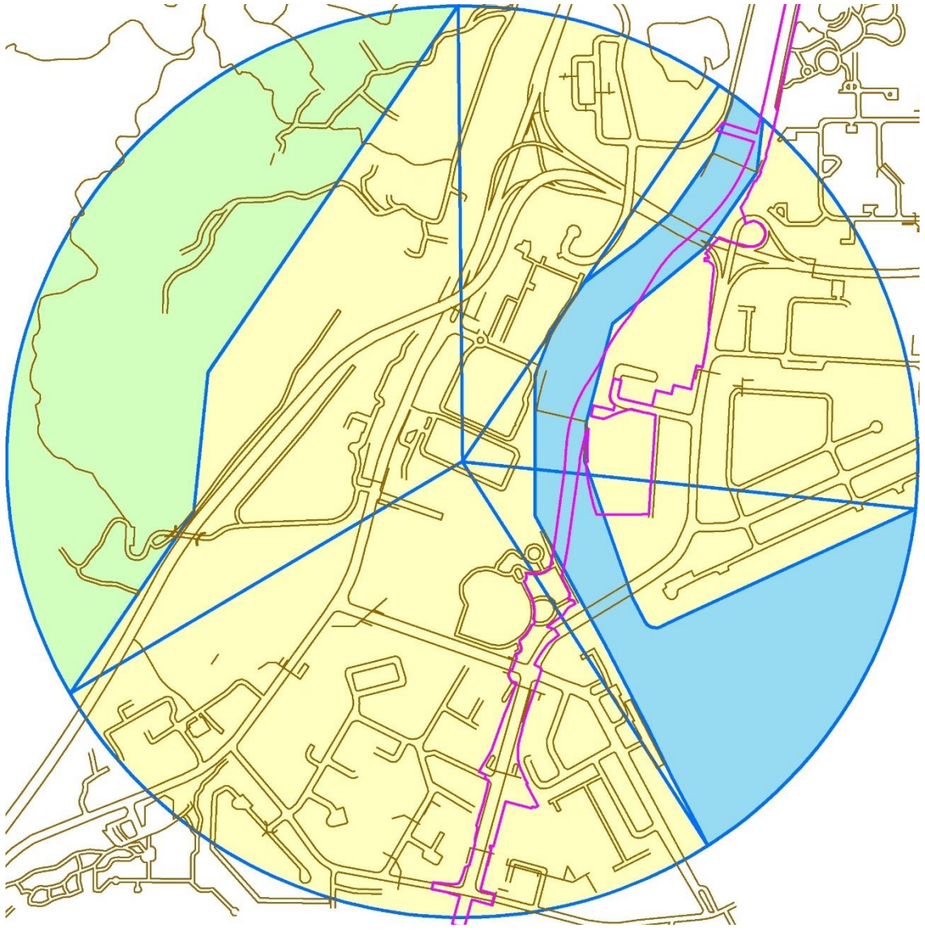
Legend

- Project Site
- 1km boundary from Grid 1939

Note: Grey area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

Appendix 3.9 Determination of Surface Characteristics

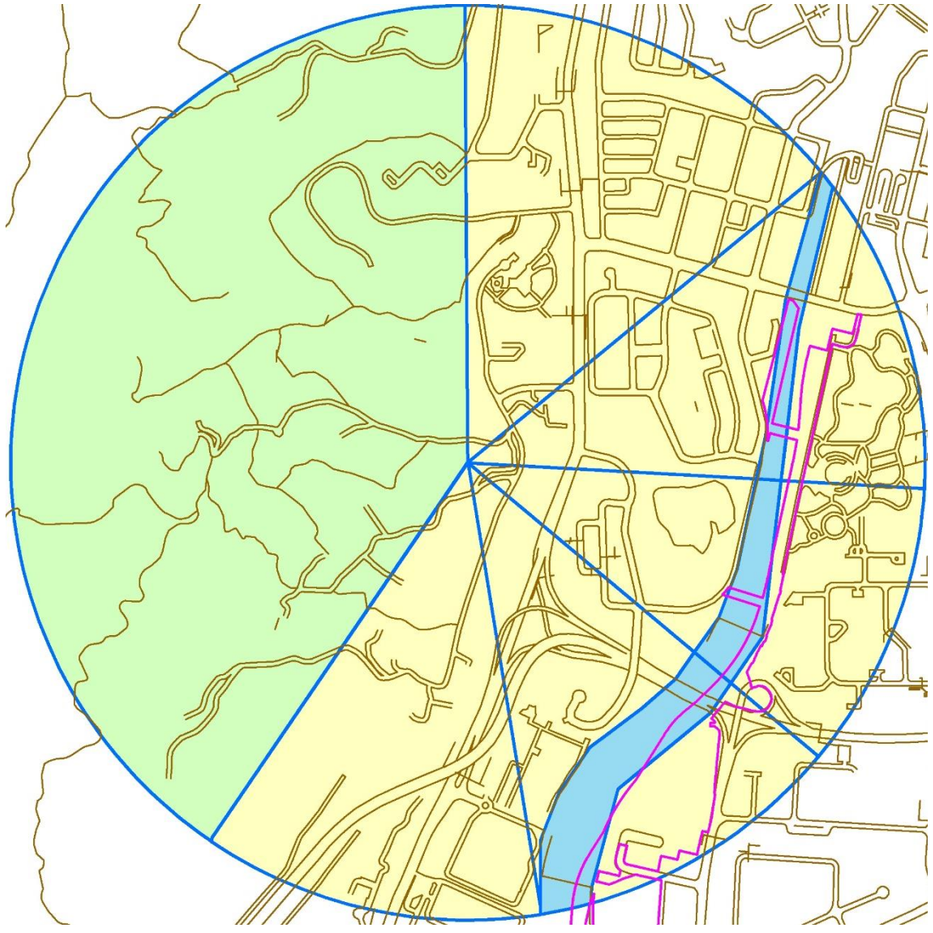
1km Boundary from Grid 1940



Legend

- Project Site
- 1km boundary from Grid 1940

1km Boundary from Grid 1941



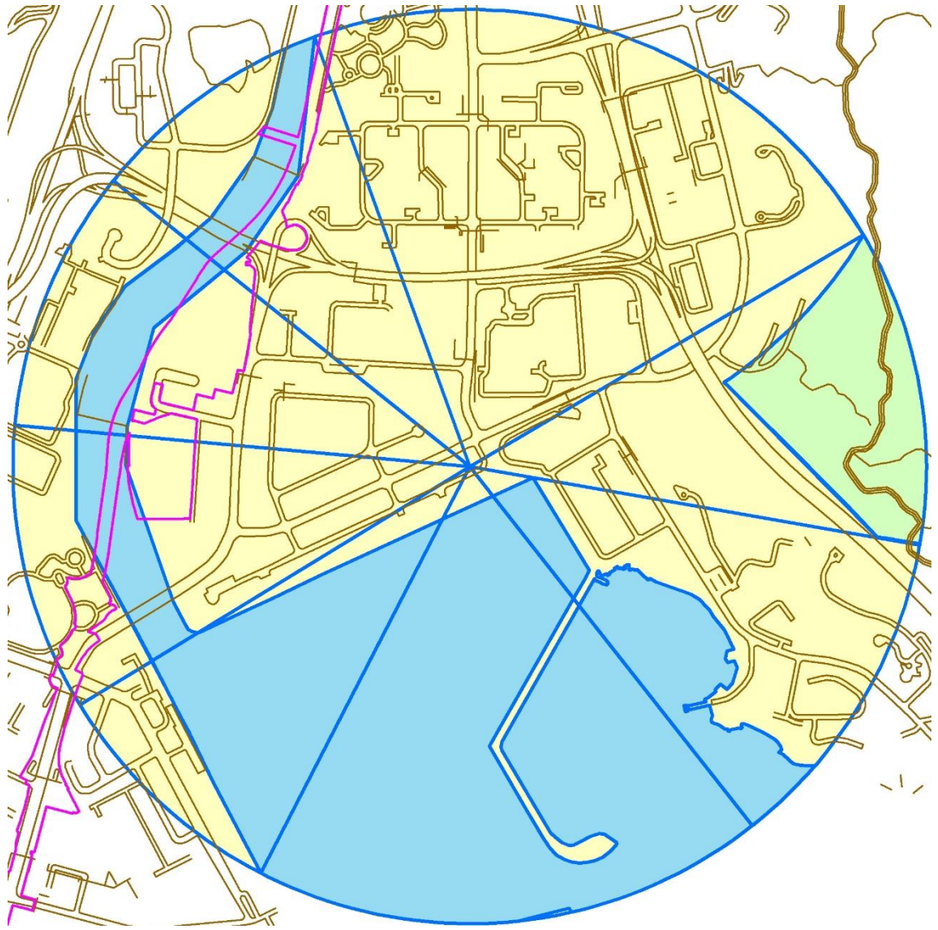
Legend

- Project Site
- 1km boundary from Grid 1941

Note: Grey area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

Appendix 3.9 Determination of Surface Characteristics

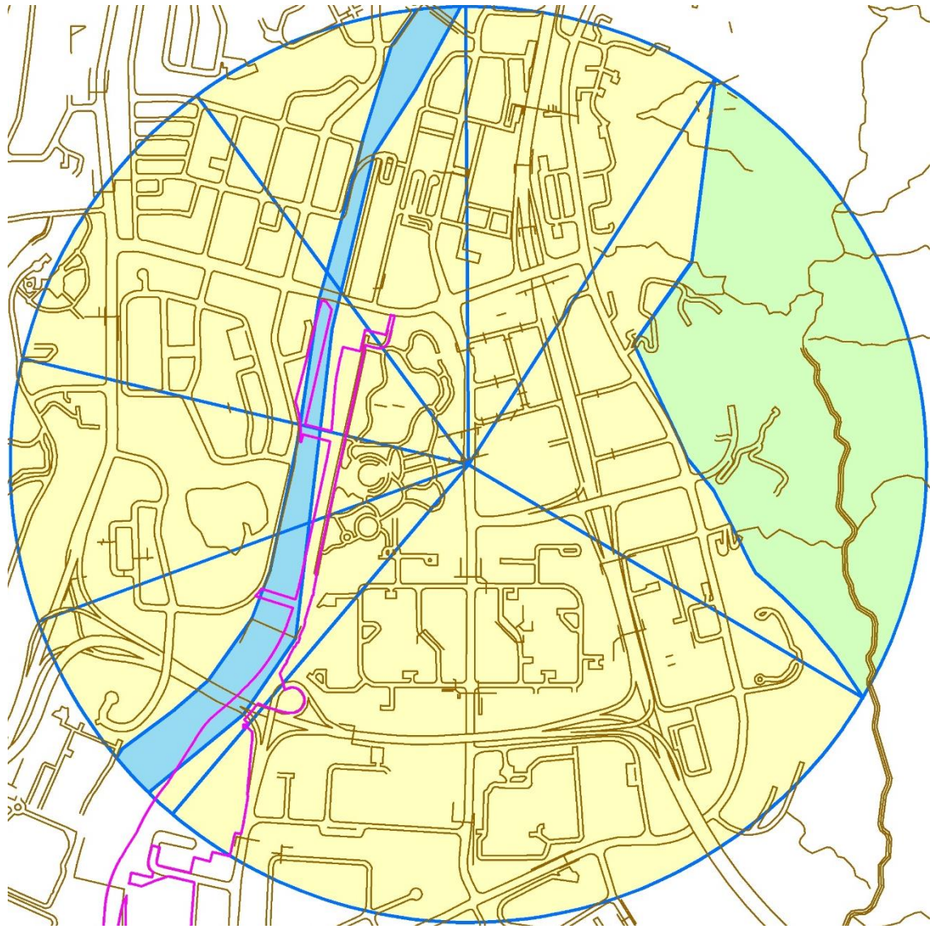
1km Boundary from Grid 2040



Legend

- Project Site
- 1km boundary from Grid 2040

1km Boundary from Grid 2041



Legend

- Project Site
- 1km boundary from Grid 2041

Note: Grey area is classified as urban area. Blue area is classified as water area. Green area is classified as grassland area.

Land Type	Season	Default Albedo from AERMET	Default Bowen Ratio of Average Moisture Conditions from AERMET	Default Surface Roughness(m) from AERMET
Urban	Spring	0.14	1.00	1.0000
	Summer	0.16	2.00	1.0000
	Autumn	0.18	2.00	1.0000
	Average	0.160	1.667	1.0000
Grassland	Spring	0.18	0.40	0.0500
	Summer	0.18	0.80	0.1000
	Autumn	0.20	1.00	0.0100
	Average	0.187	0.733	0.0533
Water	Spring	0.12	0.10	0.0001
	Summer	0.10	0.10	0.0001
	Autumn	0.14	0.10	0.0001
	Average	0.120	0.100	0.0001

Appendix 3.9 Determination of Surface Characteristics

Grid 1939

Sector (degrees in Clockwise)	Land type	Area (m^2)	Distance	Weighting (Area Fraction/Distance)	Weighting Sum	Albedo	Bowen Ratio	Surface Roughness	Remarks
9-40	Urban	149077	514.07	0.0010496	0.001586	0.1583	0.4373	0.14496	Water and urban development at northeast
	Water	75107	817.15	0.0003327					
	Urban	52118	923.58	0.0002042					
	Total	276303	-	-					
40-106	Urban	213470	391.23	0.0009544	0.001782			0.01414	Water and urban development from northeast to East
	Water	356350	756.55	0.0008239					
	Urban	1859	921.07	0.0000035					
	Total	571679	-	-					
106-268	Water	1411982	-	-	-			0.00010	Water from east to west
268-9	Urban	881310	-	-	-			1.00000	Urban development from west to north

Grid 1940

Sector (degrees in Clockwise)	Land type	Area (m^2)	Distance	Weighting (Area Fraction/Distance)	Weighting Sum	Albedo	Bowen Ratio	Surface Roughness	Remarks
0-31	Urban	303593	-	-	-	0.1583	0.4373	1.00000	Urban development from north to northeast
31-92	Urban	20737	149.46	0.000257901	0.00169835			0.15014	Water and urban development from northeast to east
	Water	102553	545.20	0.000349653					
	Urban	387121	703.09	0.001023484					
	Urban	27556	760.94	6.73151E-05					
92-144	Urban	45013	422.88	0.000236659	0.00153803			0.00526	Water and urban development from east to southeast
	Urban	119366	624.54	0.000424942					
	Water	285393	723.99	0.000876432					
144-239	Urban	803414	-	-	-			1.00000	Urban development from southeast to southwest
239-0	Urban	471305	423.63	0.001061434	0.00192209			0.26915	Urban development and grassland from southwest to north
	Grassland	576838	639.45	0.000860654					

Appendix 3.9 Determination of Surface Characteristics

Grid 1941

Sector (degrees in Clockwise)	Land type	Area (m^2)	Distance	Weighting (Area Fraction/Distance)	Weighting Sum	Albedo	Bowen Ratio	Surface Roughness	Remarks
0-50	Urban	444671	-	-	-	0.1583	0.4373	1.00000	Urban development from north to northeast
50-93	Urban	208750	490.84	0.001142463	0.00165652			0.58417	Water and urban development from northeast to east
	Water	27593	766.65	9.668260E-05					
	Urban	135919	874.80	0.000417373					
93-129	Urban	128512	394.26	0.00101814	0.0017584			0.41551	Water and urban development from east to southeast
	Water	35220	656.11	0.000167671					
	Urban	156415	853.27	0.000572591					
129-169	Urban	172186	501.52	0.000964724	0.00157896			0.21423	Water and urban development from southeast to south
	Water	73363	780.49	0.000264126					
	Urban	110330	885.51	0.000350106					
169-213	Urban	380330	-	-	-			1.00000	Urban development from south to southwest
213-0	Grassland	1271011	-	-	-			0.05333	Grassland from southwest to north

Grid 2040

Sector (degrees in Clockwise)	Land type	Area (m^2)	Distance	Weighting (Area Fraction/Distance)	Weighting Sum	Albedo	Bowen Ratio	Surface Roughness	Remarks
59-99	Urban	195244	508.01	0.001093065	0.00162807	0.1583	0.4373	0.38166	Urban development and grassland at east
	Grassland	156365	831.24	0.000535					
99-141	Water	20684	220.02	0.000257064	0.00170119			0.02855	Water and urban development from east to southeast
	Urban	244120	639.16	0.001044382					
	Water	100905	690.24	0.000399739					
141-206	Urban	4828	58.76	0.000143906	0.00183038			0.00026	Water and urban development at south
	Water	548006	586.09	0.001637792					
	Urban	17391	641.59	4.74787E-05					
	Urban	682	994.95	1.20016E-06					
206-238	Urban	23333	309.46	0.000275623	0.00162324			0.00188	Water and urban development from south to southwest
	Water	189167	625.06	0.001106303					
	Urban	61059	924.96	0.000241312					
238-275	Urban	167479	438.33	0.00119641	0.00176565			0.28098	Water and urban development from southwest to west
	Water	59151	761.08	0.000243361					
	Urban	92730	891.01	0.000325879					
275-309	Urban	158285	457.23	0.001183691	0.0017292			0.27373	Water and urban development from west to northwest
	Water	54843	770.92	0.000243243					
	Urban	79332	897.43	0.000302262					
309-340	Urban	156919	524.79	0.001090662	0.00158104			0.29362	Water and urban development at northwest
	Water	47100	816.67	0.000210364					
	Urban	70139	913.64	0.000280016					
340-59	Urban	692577	-	-	-			1.00000	Urban development from northwest to east

Appendix 3.9 Determination of Surface Characteristics

Grid 2041

Sector (degrees in Clockwise)	Land type	Area (m^2)	Distance	Weighting (Area Fraction/Distance)	Weighting Sum	Albedo	Bowen Ratio	Surface Roughness	Remarks
0-33	Urban	287472	-	-	-	0.1583	0.4373	1.00000	Urban development at north
33-121	Urban	285944	419.61	0.000888471	0.0017616			0.23391	Grassland and urban development from northeast to east
	Grassland	481047	718.32	0.000873131					
121-221	Urban	869477	-	-	-			1.00000	Urban development froms east to southwest
221-251	Urban	72131	474.08	0.000587163	0.00154808			0.11722	Water and urban development at southwest
	Water	65006	696.25	0.000360311					
	Urban	121988	783.82	0.000600608					
251-284	Urban	33752	199.51	0.000580192	0.00188204			0.57718	Water and urban development at west
	Water	12076	368.76	0.000112305					
	Urban	245754	708.54	0.001189539					
284-324	Urban	51396	249.78	0.000585437	0.00175458			0.61147	Water and urban development at northwest
	Water	13325	404.59	9.37066E-05					
	Urban	286748	758.63	0.001075432					
324-0	Urban	156674	508.15	0.000980428	0.00161168			0.41870	Water and urban development at north
	Water	35745	746.11	0.000152343					
	Urban	122056	810.45	0.000478905					

Note:

1. 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. 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 a default upwind distance of 1 kilometer relative to the grid.
4. Land use within 10km by 10km region centered on the measurement site included 20.379652% urban (20379652 km^2), 34.348708% water (34348708 km^2), and 45.271640% grassland (45271640 km^2).
5. For the parameters including albedo, Bowen Ratio and surface roughness, the default value for "Winter" is excluded from calculating the representative values.