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Appendix A

Physical Environmental Database Preparation

Soil map

The soil classification and soil characteristic Information of Sukhothai were inventoried from the Department of Land Development in 1974. The map has scale 1:100,000. There are 83 soil associations classified for this province in order to emphasize only the major groups and the majority includes the slope complex of granite rock. As indicated in figure A-1, that illustrates the landform of the province.

A soil association map does not provide significant information for the analysis therefore interpolation is necessary. When the soil association map combined with the soil characteristic, the specific data that important for analysis created and established the new map. The ARC/Info system was selected to store and process data in this study. The original data of the soil association map digitized into the computer and a soil association map in digital form is created. With the attribute tables developed in the ARC/Info system, a soil association map is created. By manipulating these tables with the soil characteristic data, new maps necessary for further analysis can be establish.

Rainfall Map

Rainfall data was obtained from Department of Meteorology Department and Royal Thai Irrigation. The data was collected from 21 weather stations in Sukhothai and Neighbor provinces. Appendix B shows the rainfall data recorded from both stations during the past 53 years. Then interpolate to contour lines with kriging interpolation. Figure A-2 shows the annual rainfall of Sukhothai Province.

Kriging is a geostatistical gridding method, which has proven useful and popular in many fields. This procedures visually appearing contour and surface plots from irregularly spaced data, attempts the express trends that are suggested.

Topographic map

Topographic map of Sukhothai was produce since 1971 by the Royal Thai Survey Department in Scale 1:50,000 and 1:250,000. Although in this study not used the same year of map creation: it is assumed that the topography of this area has not change significantly. The type of development that has taken place during the past decade has not required major changes in landform. However, the same assumption cannot be applied to the land cover of the study area, which has changed dramatically due to the growth of development.

The topographic map is needed to create a slope map. In this study used the Digital Elevated Model procedure. Each contour line is digitized and stored into the GIS coverage with PC/ARC INFO then export to SURFER program to generate DEM by using Triangulate Irregular Network (TIN) with linear interpolation procedure to generate the DEM data.

The TIN with linear interpolation method in SURFER uses the optimal Delaunary triangulation. The algorithm creates triangles by drawing lines between data points. The original data points connected in such a way that no triangle edges are intersected by other triangles. The result is a patchwork of triangular faces over the extent of the grid. This method is an extract interpolator.

Each triangle defines a plane over the grid nodes lying within the triangle, with the tilt and elevation of the triangle determined by the tree original data points defining the triangular surface. Because the original data points are used to define the triangle, data is honored very closely.

- **Hydrologic Soil map**

The soil association map is used to create a hydrological soil group map. Within this model, soils are classified into four hydrological soil groups with respect to their infiltration rate. Therefore, the soil information that must be entered into this TR-55 model is soil permeability. Inputting the soil permeability quality into the attribute table of the soil association map can create the soil permeability map.

- **Geology Map**

An available source of information about the earth materials was the geological map of Sukhothai that was prepared and published by the Geological Survey Division, Department of Mineral Resource in 1976. The map has a scale of 1:100,000 and shows boundaries of rock types and location of geological faults. With limited information, the spatial variability of earth material was assumed to have a direct relationship with the bedrock. The geological map was used to characterize the distribution of earth materials.

Since the hydrological soil group is classified by infiltration characteristics, which not only refer to the permeability of soil but also to the permeability of geology, the available source of information about the earth materials was the geological map of Sukhothai that was prepared and published by the Geological Survey Division, Department of Mineral Resource in 1976. The map has a scale of 1:100,000 and shows boundaries of rock types and location of geological faults. With limited information, the spatial variability of earth material was assumed to have a direct relationship with the bedrock. The geological map was used to characterize the distribution of earth materials. The enlargement perhaps increases the accuracy of the map, but since the analysis to indicate the potential not actual calculation of runoff, a deviation in some data is acceptable. The geology map is digitized into the ARC/Info system and attribute information tables are created. The permeability quality is interpreted from that type of that particular geology, and added into the attribute tables, and then a geology permeability map is created.

- **Watershed map**

The watershed map is created from the DEM data from PCI Easi watershed delineating procedure and topographic map by visual interpretation; the area of watershed is used in the TR-55 method to indicate the total area for infiltration potential. In order to estimate this, the type of landuse and land cover must also be identified.

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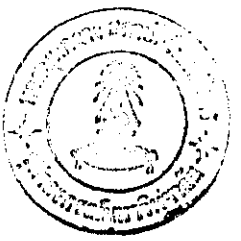
Appendix B

Rainfall data of Sukhothai Province

Station No	Lontitude	Latitude	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average	Rainy Day
59012	99 49 36	17 00 21	41.9	162.2	150	130.2	179.9	242.9	141.4	26.4	3.2	5.1	7.5	17.2	1107.8	61.3
59022	99 45 52	17 30 55	39.4	136.2	115.1	102.6	171.9	213.8	102.6	15	3.1	5.2	8.4	15.6	929	60
59032	99 50 08	17 18 55	44.2	155.8	133.9	122	162.2	224.9	135.2	20.7	4.1	4.1	8.2	20.2	1035.6	59.2
59042	99 58 46	16 57 04	49.8	175.3	155.1	150.4	220.9	251.7	152	26.1	3.9	6.3	16.8	21.4	1229.8	81.9
59062	99 34 38	17 00 16	50	185.7	128.4	116.2	130.7	232.5	153.5	28.5	4.1	6.1	4.5	15.5	1055.8	65.2
59072	99 52 00	17 10 00	48.2	195.1	146.6	139	202.3	259.1	147.3	24	11.5	4.3	5.2	25.6	1208.2	106.3
59082	99 48 20	16 49 55	55	186.8	158.8	137.5	198.4	252.8	142	29	6.6	8.2	12.4	22.9	1210.5	86.1
59092	99 33 50	17 19 12	52.6	177	125.6	116.5	162.7	240.6	120.7	28.2	1.7	5.2	6.7	23.3	1060.8	62.7
59104	99 52 01	17 09 52	74.9	175.5	127.4	176	187.5	249.2	173	15.5	2.7	5.3	15.7	29.7	1232.1	92.6
59110	99 57 18	17 15 22	42.6	200.9	141.8	148.2	206.8	268.1	170.4	25.3	17.4	4.2	4.2	12.2	1242.2	61.8
59121	99 47 32	17 26 03	42.8	184.7	139.2	139.1	180.9	244.4	137.9	31	6.8	3.8	8.1	20.8	1139.5	97.1
59131	99 43 08	17 35 42	45	206.5	155.5	153.2	232.9	303.4	139.7	28.7	7.1	4.8	5	17	1298.9	94.3
59140	99 49 08	17 34 52	38.3	211.4	175.3	201.7	282.6	289.2	165.2	34.1	4.9	8.2	5.8	10.2	1426.9	77.4
59154	99 34 00	16 57 00	49.4	185.6	139.9	113.5	125	192.8	170.7	35.7	9	3.6	6.1	17.1	1048.4	74.6
59162	99 58 00	17 27 00	23.6	161.9	138.4	150.9	131.1	191.7	80.5	12.2	9.7	1.3	2.1	7.8	911.1	55.8
59170	99 45 41	17 29 31	8.4	102.1	118.2	103.5	131.4	200.1	110.7	21	0	1.2	0	0	796.6	63
59182	99 50 00	17 04 00	45.5	209.1	180.3	123.1	210.2	262.7	160.2	28.5	5.1	5	11.3	3.3	1244.5	66.1
48378	100 16 00	16 47 00	6.6	11.9	29.1	51	118.5	183.3	189.8	257.1	241.4	157	30.7	5.5	1351.9	120.7
48310	99 54 00	19 08 00	2.5	6.2	11.5	104.9	179.1	99.1	137.8	163.6	189.3	116.5	59.4	4.3	1074.2	117.5
48330	100 10 00	18 10 00	7	5.4	20.8	71.6	179.2	121.8	144.2	232.6	191.3	97.3	21.1	3.2	1095.5	111.6
48400	100 10 00	15 48 00	9.8	14.9	30	60.9	138.7	117.1	134.1	194.9	231.6	144.4	35.3	7.3	1119	107.7

Source: Department of Irrigation, Department of Meteorology



BIOGRAPHY

Narumitr Sawangphol was born on August 15, 1974. He received a Bechelor of Science (Fisheries) in 1995 from Faculty of Agriculture, Khon Kean University. After that, he entered a Master degree program at the Inter-department of Environmental Science, Graduated School of Chulalongkorn University.