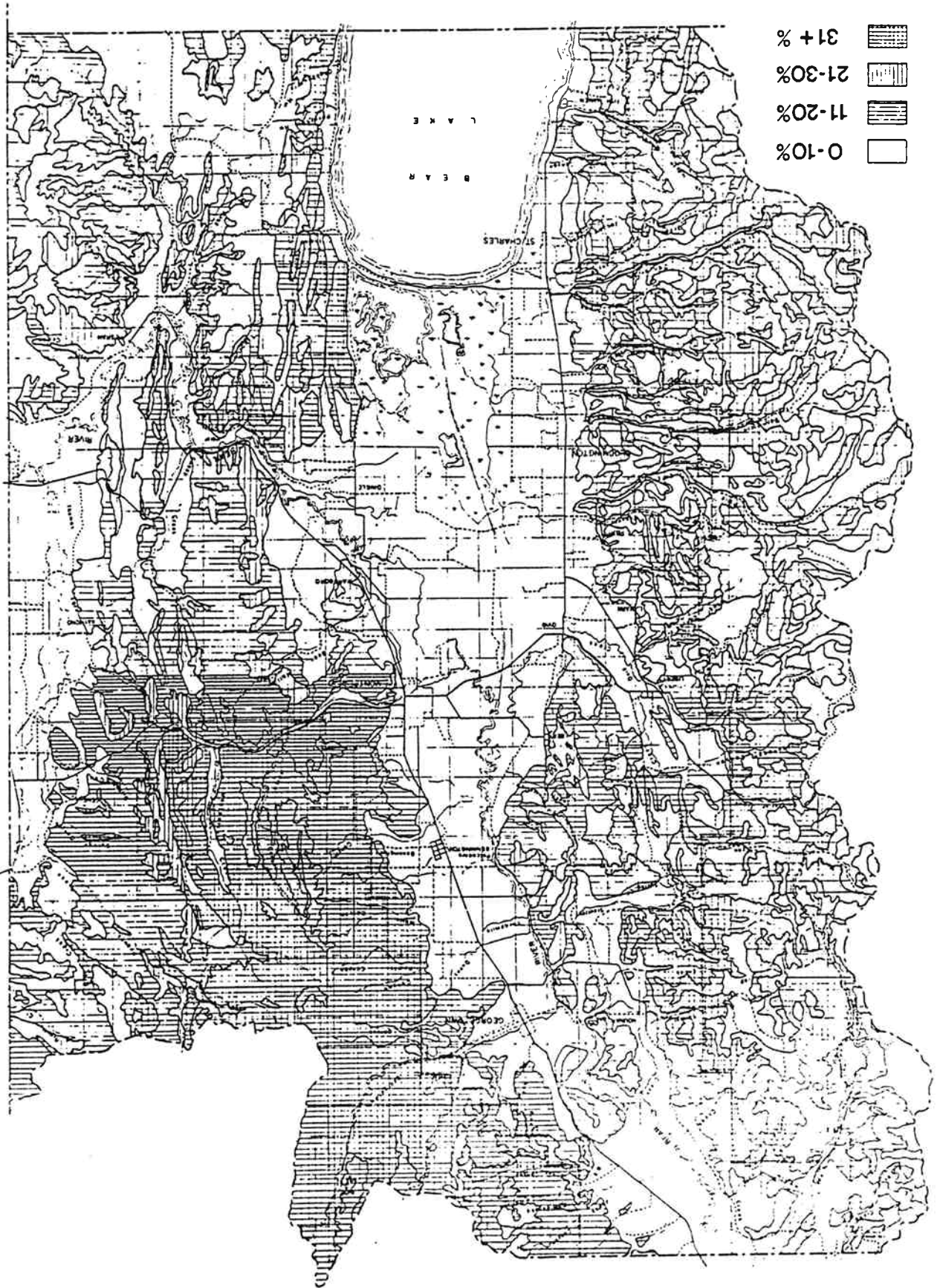


Figure 4.2.1-3. Slope percentages in the Bear Lake County portion of the Bear Lake Basin (BLRC 1979a).



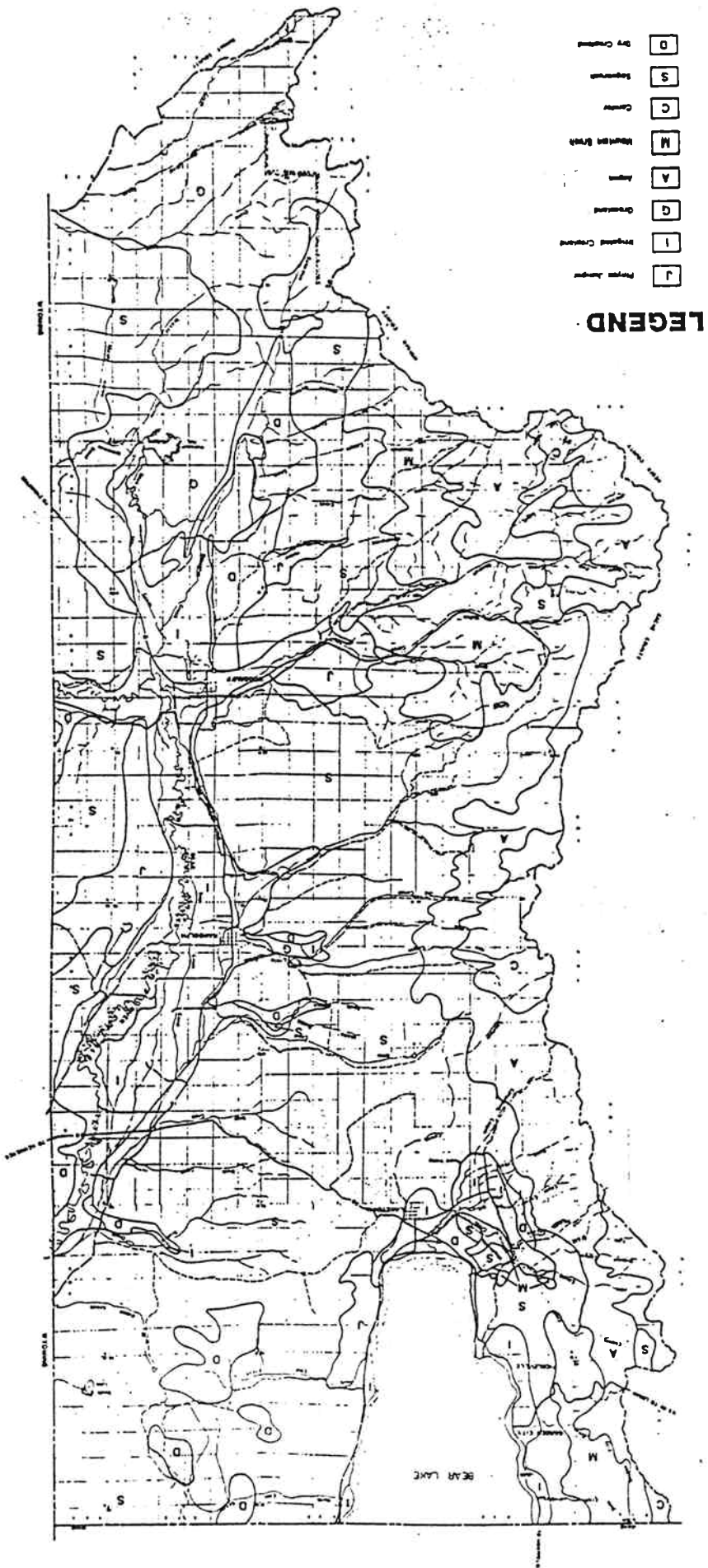


Figure 4.2.1-4. General vegetation types in the Rich County portion of the Bear Lake Basin (BLRC 1979b).

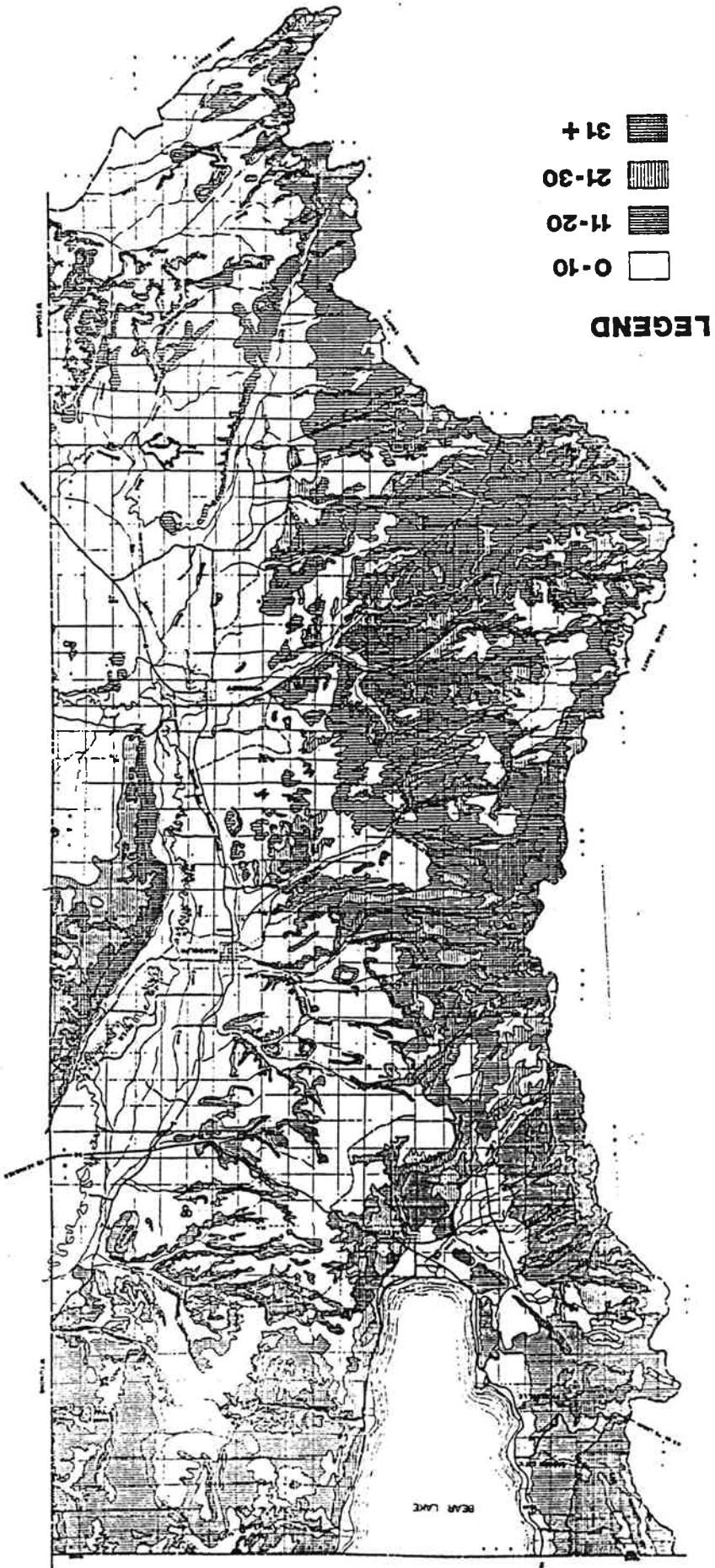


Figure 4.2.1-5. Slope percentages in the Rich County portion of the Bear Lake Basin (BLRC 1979b).

The data concerning the development has to be transferred to the computer. This is accomplished by identifying which map cells are affected by the proposed development, the nature and the magnitude of the effects on the cells. The relevant land uses and the computer codes for those land uses are shown in Table 4.2.1-9.

The percent change in land use of the cells affected by development are recorded on a data form. A sample data form is shown in Table 4.2.1-10. In

on these base maps.

The first step in using the WQMP model is to identify the watershed where the proposed development will take place (Table 4.2.1-8). The developer will come to the BLRC with preliminary plans for the development. The appropriate watershed maps will be selected. These base maps will have a grid pattern superimposed on them (see Figure 4.2.1-1 for a sample map of a hypothetical watershed). The proposed development will then be overlain

what is described herein.

The final form of the model may be different than perceived at this time. The following section discusses the use of the model as it is not been written. Those considerations precluded the development of a final WQMP model. The following section discusses the use of the model as it is have not been digitized and the software to utilize the digitized data has been written. Those considerations precluded the development of a final WQMP model. The following section discusses the use of the model as it is

Note: This is a preliminary user's guide. At this point the map data

Preliminary Model Users Guide

4.2.1.5.

adequate for most of Rich County but could be greatly improved in terms of accuracy. The lack of a recent soil survey for Bear Lake County restricts use of the model to areas for which soil information is available. Data gaps and potential sources of more detailed data are discussed in Section

Code	Land Use
LG	Lawns, Parks, Golf Courses, Good Condition
LF	Lawns, Parks, Golf Courses, Fair Condition
CB	Commercial and Business Areas
S1	Streets, Paved with Storm Sewers
S2	Streets, Paved with Open Ditches
SG	Streets, Gravel
SD	Streets, Dirt
R8	Residential 8 Units/Acre
R4	Residential 4 Units/Acre
R3	Residential 3 Units/Acre
R2	Residential 2 Units/Acre
R1	Residential 1 Unit/Acre
ME	Meadows
WG	Woods, Good Condition
WF	Woods, Fair Condition
PL	Parking Lots

Table 4.2.1-9. Codes for land uses.

Code Number	Watershed Name	Code Number	Watershed Name
1	West State Line Hollows	14	Cooley Canyon
2	Fish Haven Creek	15	East State Line
3	South Canyon		Hollows
4	Jacobs Canyon	16	North Eden
5	Green Canyon	17	South Eden
6	St. Charles Creek	18	Falula Spring
7	Dry Creek	19	Laketown Canyon
8	Worm Creek	20	Round Valley
9	Bloomington Creek	21	Jebo Canyon
10	Paris Creek	22	Pickleville
11	Wildlife Refuge	23	Hodges Canyon
12	Merkley Mountain	24	Garden City
13	Indian Creek	25	Swan Creek

Table 4.2.1-8. The code # and watershed name of each area delineated in the WQMP data file system.

CELL LOCATION		PERCENT CELL AREA CHANGED TO:																
X	H	PL	WF	WG	ME	R1	R2	R3	R4	R8	SD	SG	S2	S1	CB	LF	LG	
5	I																	
4	H						60											
							30											
																		20

Watershed ID: _____

Table 4.2.1-10. Sample Data form.

this example 60% of cell 4-H is changed from its natural cover type to 1/2 acre residential units and 20% of the cell is changed to parking lot (PL).

These data are then entered on the computer. The computer will prompt the user to enter the cell co-ordinates and the changes in land use. After all the changes have been entered, the computer will calculate runoff and soil loss for three sets of conditions: natural cover, construction phase, and final development. The increases in runoff and soil loss during the construction phase and the final development will be output, along with BMP's to mitigate the anticipated impacts. A more detailed coverage of the outputs is included in the next section.

Results of Test Runs

To test the performance of the model in the absence of any digitized data, a hypothetical data set was developed. This data set represented a one-half square mile area in Rich County, Utah, composed of the following proportions of soil types:

- 70% Yeates Hollow - Obroy complex, 6-25% slope, YBD
- 10% Agassiz - Rock outcrop complex, 25-60% slope, ACF
- 7% Foxol very stony loam, 10-40% slope, FGE
- 5% Agassiz - Richfield complex, 10-60% slope, ABF
- 5% Despain gravelly loam, 30-60% slope, DGF
- 3% Hourglass silt loam, 25-50% slope, HEF

Input data to the model for these soils are listed in Table 4.2.1-11. EI calculations are summarized in Table 4.2.1-12. The energy is summed over all the intervals to obtain total storm energy (1206.8/t-tons/acre = E). The maximum half hour intensity (I_{30}) is 1.30 in/hr (Column 4, Table 4.2.1-12). EI is the product of E (1206.8) times I_{30} (1.30) divided by 100 (since the units of EI are hundreds of foot-tons/acre). For the design storm, the EI is 15.7. This figure agrees with published data for the region (Wischmeier and Smith 1978).

Table 4.2.1-11. Input data to test model.

Soil Type	Acres	AMC II Pre-devel	AMC III Pre-devel	AMC II Constr.	AMC III Constr.	AMC II Post-devel	AMC III Post-devel	Precip (in.)
YBD	224.0	81.5	92.0	95.0	98.0	85.0	85.0	1.5
ACF	32.0	87.5	95.0	87.5	95.0	87.5	87.5	1.5
FGE	22.4	84.0	93.0	84.0	93.0	84.0	84.0	1.5
ABF	16.0	81.5	92.0	81.5	92.0	81.5	81.5	1.5
DGF	16.0	69.0	84.0	69.0	84.0	69.0	69.0	1.5
HEF	9.6	60.0	78.0	60.0	78.0	60.0	60.0	1.5

CN

Soil Type	Acres	surface	L (feet)	S (%)	C pre-devel	C constr.	C post-devel	P	EI
YBD	224.0	.24	300	15	.025	.439	.159	1.0	1206.8
ACF	32.0	.17	300	35	.186	.186	.186	1.0	1206.8
FGE	22.4	.17	300	25	.130	.130	.130	1.0	1206.8
ABF	16.0	.27	300	35	.100	.100	.100	1.0	1206.8
DGF	16.0	.24	300	45	.040	.040	.040	1.0	1206.8
HEF	9.6	.28	300	35	.130	.130	.130	1.0	1206.8

Table 4.2.1-12. Calculation of EI.

Interval	% Total Rainfall	Amount (In.)	Intensity (In/Hr)	Energy Per In.	Total
1	3	.05	.10	585	29.3
2	3	.05	.10	585	29.3
3	4	.06	.12	611	36.7
4	5	.08	.16	653	52.3
5	6	.09	.18	669	60.2
6	12	.18	.36	769	138.4
7	43	.65	1.30	954	620.1
8	8	.12	.24	711	85.3
9	6	.09	.18	669	60.2
10	4	.06	.12	611	36.7
11	3	.05	.10	585	29.3
12	3	.05	.10	585	29.3
1.50					1206.8

area remained free of vegetation but not paved or covered by buildings. The For post-development conditions, it was assumed that 10% of the surface

by the use of surface stabilizing treatments (Table 4.2.1-14). for the remaining 60%. The value of C during construction could be reduced recalculated using 1.0 for 40% of the area and the original value of 0.065 within the YBD soil type, the value of the C factor for this soil type was another 10-20% of the surface area. Assuming that all development occurred houses, etc. It was assumed that construction activities would disturb development results in 20-30% impervious area under roads, sidewalks, activities. Table 4.2.1-13 indicates that low density residential denuded of vegetation by a combination of road-building and home-building During construction, it was assumed that 40% of the surface area was

60%. The result is a value of .065 for the C factor for the YBD soil type. averaged because the understory cover percentage is midway between 40 and understory is mostly grasses. Values for C from columns 6 and 7 were was used because the canopy consists of appreciable tall brush and the averages 10-20%. Understory cover averages 45-55%. In Table 4.2.1-6, row 9 soil type YBD is Mountain Gravelly loam. In this range type, shrub cover the range sites corresponding to soil types. The range site description for using species composition and cover values from range site descriptions for Pre-development values for the C factor were obtained from Table 4.2.1-6

were assumed to be 1.0 due to the lack of erosion control practices. derivation of the LS factor equation (Wischmeier and Smith 1978). P values assumed to be 300 feet which is the maximum slope length used in the of S in the calculation of the topographic, LS, factor. Slope length, L, was 1982). Average slope percentages for each soil type were assigned as values K values were obtained from the Soil Survey of Rich County, Utah (SCS

Effects of Urbanization on Storm Runoff - Cudworth and
 Bottorf - South Pacific Division - Corps of Engineers.
 Presented to Water Management Subcommittee, PSIA, March
 1969.

Land Use	% Imperviousness ¹
Low Density Residential	20 - 30
Medium Density Residential	25 - 35
High Density Residential	30 - 40
Business - Commercial	40 - 90
Light Industrial	45 - 65
Heavy Industrial	50 - 70

Table 4.2.1-13. Imperviousness of developed areas.

Table 4.2.1-14. Average factor C-values for various surface stabilizing treatments.

TIME ELAPSED BETWEEN SEEDING AND BUILDING		TYPE OF TREATMENT
None*	6 Months**	
0.32	0.35	Seed, fertilizer and straw mulch or chemical straw tack
0.54	0.64	Seed and fertilizer
--	0.89	Chemicals (providing 3 months protection)
0.38	0.52	Seed and fertilizer with chemicals (providing 3 months protection)
--	0.56	Chemical (providing 12 months protection)
--	0.38	Seed and fertilizer with chemical (12 months protection)

*Assumes 18-month construction period.
 **Assumes 24-month construction period.

Source: U.S. Environmental Protection Agency, 1973, Comparative Costs of Erosion and Sediment Control, Construction Activities.