

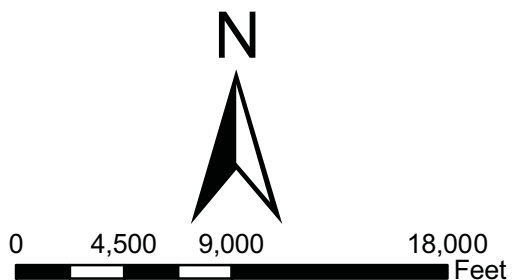
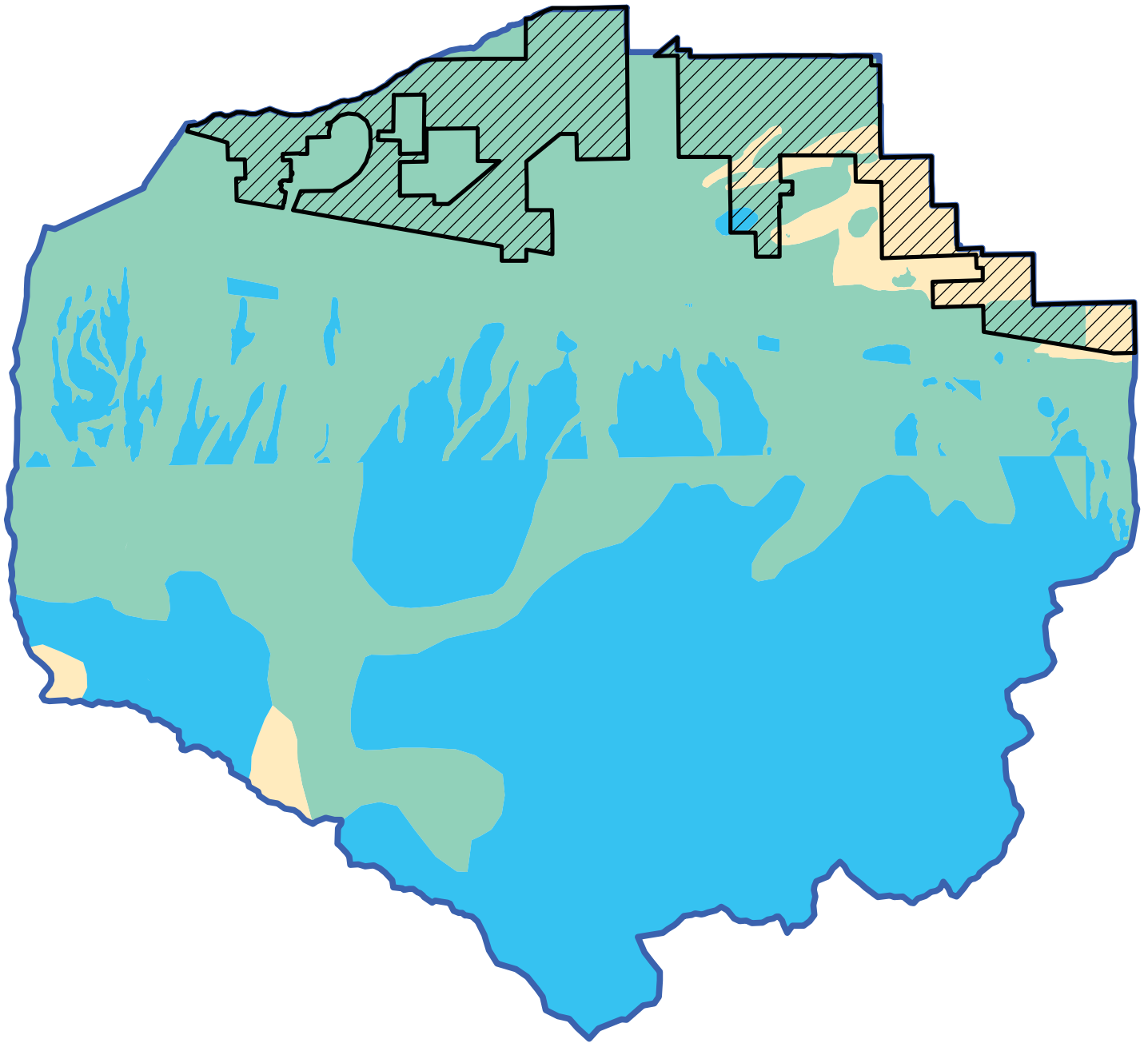
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EXHIBIT “D.3”

Watershed Hydrologic Soils Groups Composite

EXHIBIT D.3

COMPOSITE SOILS GROUPS








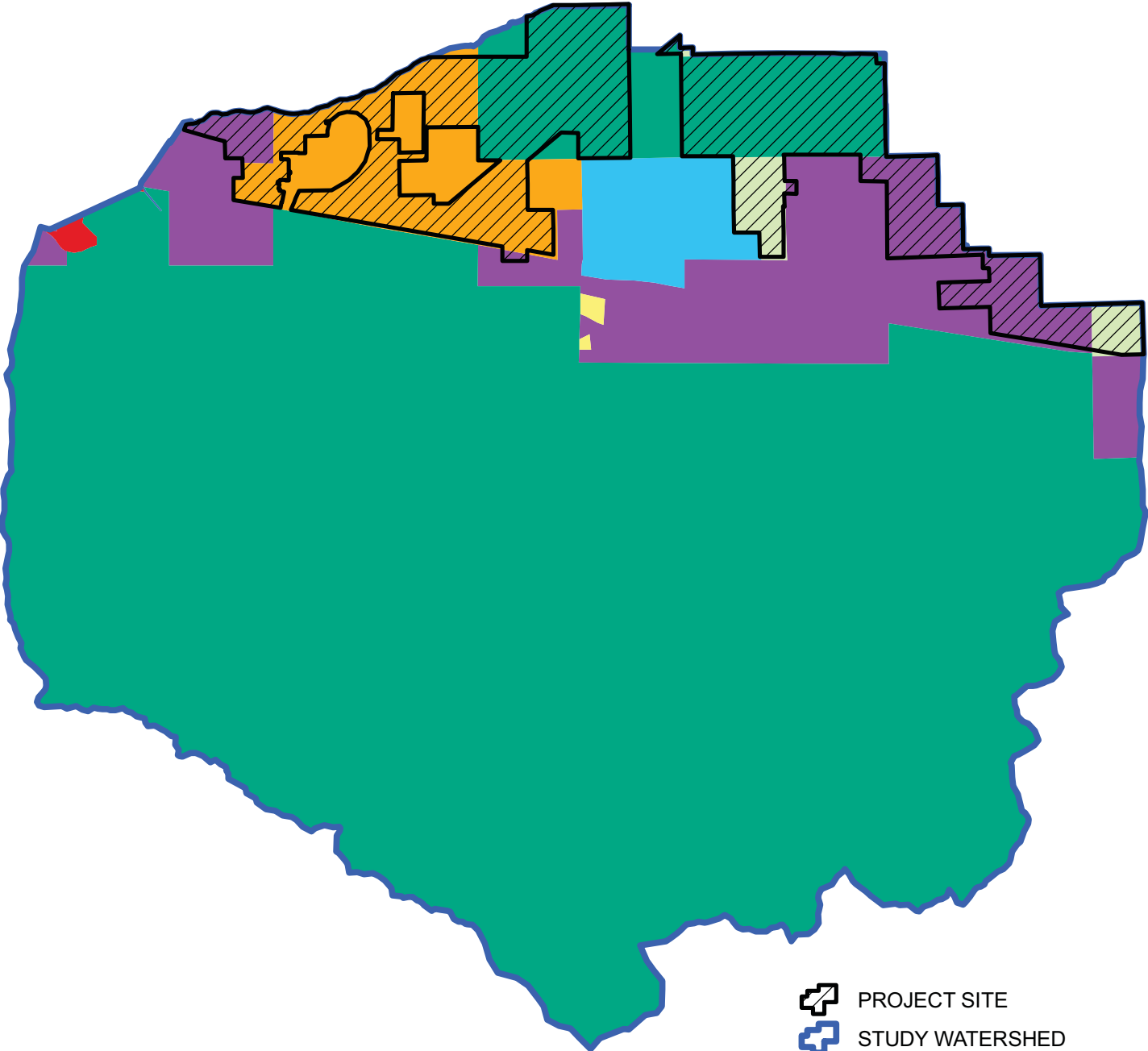
-  PROJECT SITE
-  STUDY WATERSHED
- HYDROLOGIC SOILS GROUP:**
 -  A
 -  C
 -  D

EXHIBIT “D.4”

Watershed Land Use
SBC General Plan

EXHIBIT D.4

GENERAL PLAN LAND USE



- PROJECT SITE
- STUDY WATERSHED

LAND USE:

- AGRICULTURE
- GENERAL COMMERCIAL
- GENERAL INDUSTRIAL
- INSTITUTIONS/GOVERNMENT
- OPEN SPACE
- REGIONAL COMMERCIAL
- RESIDENTIAL
- UTILITIES

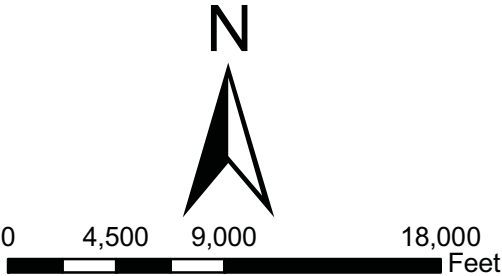


EXHIBIT “D.5”

SBC Hydrology Manual - Figure C-4
Actual Impervious Cover

ACTUAL IMPERVIOUS COVER		
Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.
2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.
3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

**ACTUAL IMPERVIOUS COVER
FOR
DEVELOPED AREAS**

EXHIBIT “D.6”

Watershed Pervious %
Existing Conditions

EXHIBIT D.6

EXISTING CONDITIONS PERVIOUS %

TYP. ALL AREAS NORTH OF A.T.S.F. RAILROAD:
USE ACTUAL IMPERVIOUS COVER PER AERIAL &
SATELLITE IMAGERY ANALYSIS (EXCLUDES AREAS
ZONED RURAL RESIDENTIAL LOCATED OUTSIDE THE
PROJECT BOUNDARY, AS NOTED)

TYP. AREAS ZONED INDUSTRIAL OR COMMERCIAL
SOUTH OF A.T.S.F. RAILROAD: USE HYDROLOGY
MANUAL PERVIOUS COVER RECOMMENDATION OF 10%

TYP. AREAS ZONED RURAL RESIDENTIAL LOCATED OUTSIDE
PROJECT BOUNDARY: USE HYDROLOGY MANUAL PERVIOUS COVER
RECOMMENDATION OF 90%

A.T.S.F. R.R.



PROJECT SITE



STUDY WATERSHED

% PERVIOUS:



0%



10%



90%



100%

N

0 4,500 9,000 18,000 Feet

EXHIBIT “D.7”

Watershed Pervious %
Developed Conditions

EXHIBIT D.7

DEVELOPED CONDITIONS PERVIOUS %

TYP. ALL AREAS NORTH OF A.T.S.F. RAILROAD:
USE ACTUAL IMPERVIOUS COVER PER AERIAL &
SATELLITE IMAGERY ANALYSIS (EXCLUDES ALL AREAS
LOCATED WITHIN PROJECT BOUNDARY)

FOR DEVELOPED CONDITIONS, ASSUME 90% PERVIOUS
FOR ALL AREAS WITHIN PROJECT BOUNDARY

TYP. AREAS ZONED INDUSTRIAL OR COMMERCIAL
SOUTH OF A.T.S.F. RAILROAD: USE HYDROLOGY
MANUAL PERVIOUS COVER RECOMMENDATION OF 10%

TYP. AREAS ZONED RURAL RESIDENTIAL LOCATED OUTSIDE
PROJECT BOUNDARY: USE HYDROLOGY MANUAL PERVIOUS COVER
RECOMMENDATION OF 90%

A.T.S.F. R.R.



PROJECT SITE



STUDY WATERSHED

% PERVIOUS:



0%



10%



90%



100%

N

0 4,500 9,000 18,000 Feet

EXHIBIT “D.8”

Watershed Pervious Cover
Existing Conditions

EXHIBIT D.8

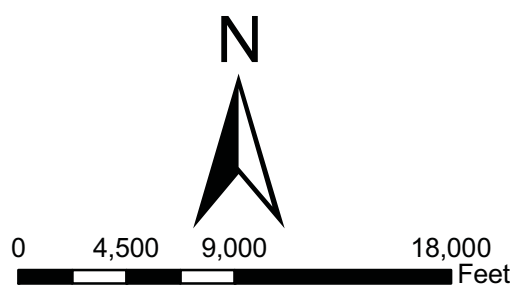
EXISTING CONDITIONS PERVIOUS COVER

TYP. AREAS NORTH OF A.T.S.F. R.R.
IDENTIFIED AS SUBSTANTIALLY BARREN
PER AERIAL & SATELLITE IMAGERY ANALYSIS :
ASSUME BARREN COVER

TYP. ALL AREAS NORTH OF A.T.S.F. R.R.
IDENTIFIED AS AGRICULTURAL PER AERIAL
& SATELLITE IMAGERY ANALYSIS:
ASSUME LEGUMES (ALFALFA), GOOD COVER

A.T.S.F. R.R.

TYP. ALL OTHER AREAS NOT SPECIFIED ON THIS MAP:
ASSUME OPEN BRUSH, POOR COVER



-  PROJECT SITE
-  STUDY WATERSHED
- PERVIOUS COVER:**
 -  AG-LEGUMES-GOOD
 -  BARREN
 -  OPEN BRUSH - POOR

EXHIBIT “D.9”

Watershed Pervious Cover
Developed Conditions

EXHIBIT D.9

DEVELOPED CONDITIONS Pervious Cover

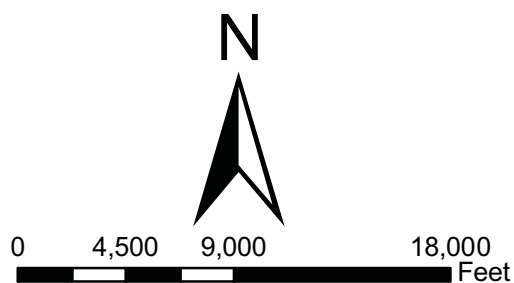
TYP. AREAS NORTH OF A.T.S.F. R.R. OUTSIDE OF PROJECT BOUNDARY IDENTIFIED AS SUBSTANTIALLY BARREN PER AERIAL & SATELLITE IMAGERY ANALYSIS: ASSUME BARREN COVER

TYP. ALL AREAS OUTSIDE PROJECT BOUNDARY IDENTIFIED AS AGRICULTURAL PER AERIAL & SATELLITE IMAGERY ANALYSIS: ASSUME LEGUMES (ALFALFA), GOOD COVER

FOR DEVELOPED CONDITIONS, ASSUME BARREN COVER FOR ALL AREAS WITHIN PROJECT BOUNDARY

A.T.S.F. R.R.

FOR ALL OTHER AREAS NOT SPECIFIED ON THIS MAP: ASSUME BARREN COVER




-  PROJECT SITE
-  STUDY WATERSHED
- PERVIOUS COVER:**
 -  AG-LEGUMES-GOOD
 -  BARREN
 -  OPEN BRUSH - POOR

EXHIBIT “D.10”

SBC Hydrology Manual - Figures C-2 & C-3
SCS Curve Numbers (AMC II)

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Residential Landscaping (Lawn, Shrubs, etc.) - The pervious portions of commercial establishments, single and multiple family dwellings, trailer parks and schools where the predominant land cover is lawn, shrubbery and trees.

Row Crops - Lettuce, tomatoes, beets, tulips or any field crop planted in rows far enough apart that most of the soil surface is exposed to rainfall impact throughout the growing season. At plowing, planting and harvest times it is equivalent to fallow.

Small Grain - Wheat, oats, barley, flax, etc. planted in rows close enough that the soil surface is not exposed except during planting and shortly thereafter.

Legumes - Alfalfa, sweetclover, timothy, etc. and combinations are either planted in close rows or broadcast.

Fallow - Fallow land is land plowed but not yet seeded or tilled.

Woodland - grass - Areas with an open cover of broadleaf or coniferous trees usually live oak and pines, with the intervening ground space occupied by annual grasses or weeds. The trees may occur singly or in small clumps. Canopy density, the amount of ground surface shaded at high noon, is from 20 to 50 percent.

Woodland - Areas on which coniferous or broadleaf trees predominate. The canopy density is at least 50 percent. Open areas may have a cover of annual or perennial grasses or of brush. Herbaceous plant cover under the trees is usually sparse because of leaf or needle litter accumulation.

Chaparral - Land on which the principal vegetation consists of evergreen shrubs with broad, hard, stiff leaves such as manzanita, ceanothus and scrub oak. The brush cover is usually dense or moderately dense. Diffusely branched evergreen shrubs with fine needle-like leaves, such as chamise and redchank, with dense high growth are also included in this soil cover.

Annual Grass - Land on which the principal vegetation consists of annual grasses and weeds such as annual bromes, wild barley, soft chess, ryegrass and filaree.

Irrigated Pasture - Irrigated land planted to perennial grasses and legumes for production of forage and which is cultivated only to establish or renew the stand of plants. Dry land pasture is considered as annual grass.

Meadow - Land areas with seasonally high water table, locally called cienegas. Principal vegetation consists of sod-forming grasses interspersed with other plants.

Orchard (Deciduous) - Land planted to such deciduous trees as apples, apricots, pears, walnuts, and almonds.

Orchard (Evergreen) - Land planted to evergreen trees which include citrus and avocados and coniferous plantings.

Turf - Golf courses, parks and similar lands where the predominant cover is irrigated mowed close-grown turf grass. Parks in which trees are dense may be classified as woodland.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

SCS
COVER TYPE
DESCRIPTIONS

POOR: Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

FAIR: Moderate cover with 50 percent to 75 percent of the ground surface protected by vegetation.

GOOD: Heavy or dense cover with more than 75 percent of the ground surface protected by vegetation.

In most cases, watershed existing conditions cover type and quality can be readily determined by a field review of a watershed. In ultimate planned open spaces, the soil cover condition shall be considered as "good." Figure C-3 provides the CN values for various types and quality of ground cover. Impervious areas shall be assigned a CN of 98. It is noted that for ultimately developed conditions, the CN for urban landscaping (turf) is provided in Figure C-3.

C.4. WATERSHED DEVELOPMENT CONDITIONS

Ultimate development of the watershed should normally be assumed since watershed urbanization is reasonably likely within the expected life of most hydraulic facilities. Long range master plans for the County and incorporated cities should be reviewed to insure that reasonable land use assumptions are made for the ultimate development of the watershed. A field review shall also be made to confirm existing use and drainage patterns. Particular attention shall be paid to existing and proposed landscape practices, as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. Appropriate actual impervious percentages can then be selected from Figure C-4. It should be noted that the recommended values from these figures are for average conditions and, therefore, some adjustment for particular applications may be required.

Runoff Index Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>NATURAL COVERS -</u>					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
<u>URBAN COVERS -</u>					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
<u>AGRICULTURAL COVERS -</u>					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

CURVE

NUMBERS
FOR
PERVIOUS AREAS

Runoff Index Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>AGRICULTURAL COVERS</u> (Continued)					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.
2. Quality of cover definitions:
 Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
 Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
 Good-Heavy or dense cover with more than 75 percent of the ground surface protected.
3. See Figure C-2 for definition of cover types.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

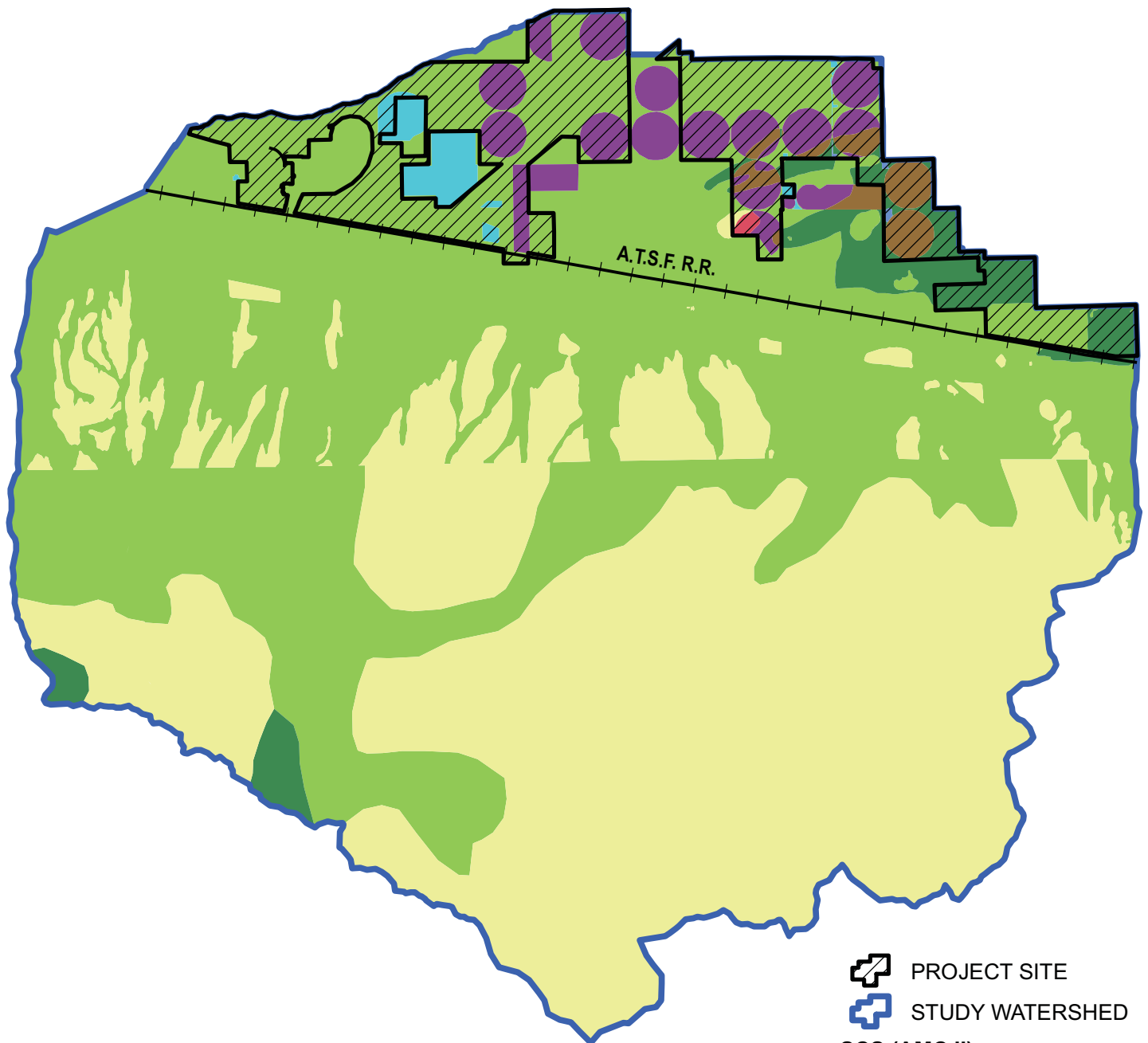
NUMBERS
FOR
PERVIOUS AREAS



EXHIBIT “D.11”

Watershed SCS Curve Numbers (AMC II)
Existing Conditions









EXHIBIT D.11

EXISTING CONDITIONS SCS VALUES



-  PROJECT SITE
-  STUDY WATERSHED

SCS (AMC II):

-  58
-  62
-  78
-  81
-  84
-  85
-  88
-  91

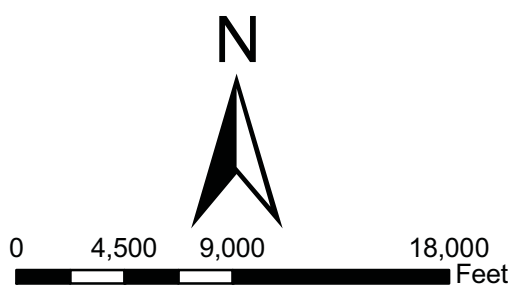
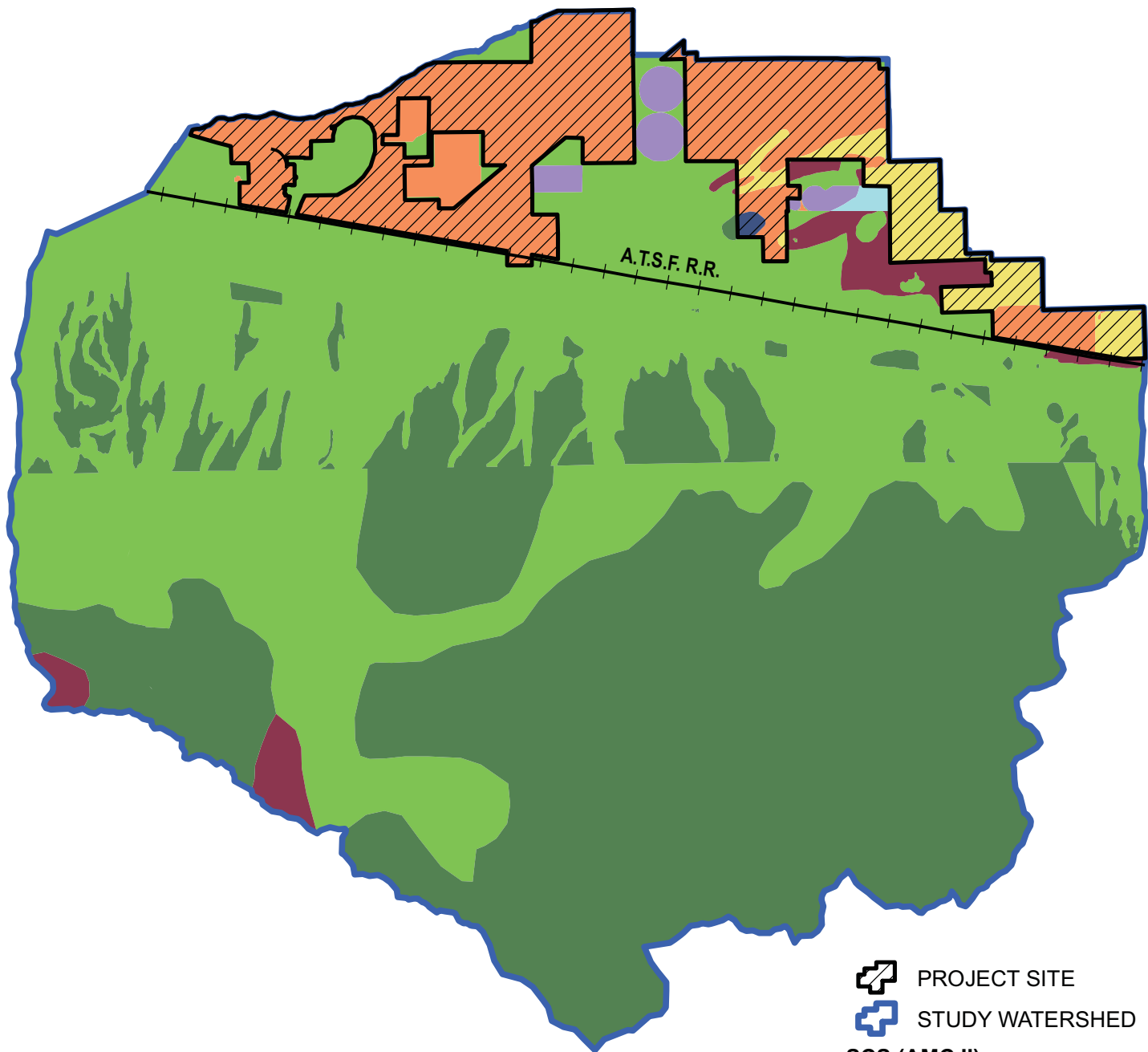




EXHIBIT “D.12”

Watershed SCS Curve Numbers (AMC II)
Developed Conditions









EXHIBIT D.12

DEVELOPED CONDITIONS SCS VALUES



-  PROJECT SITE
-  STUDY WATERSHED

SCS (AMC II):

-  58
-  62
-  78
-  81
-  84
-  88
-  91
-  93

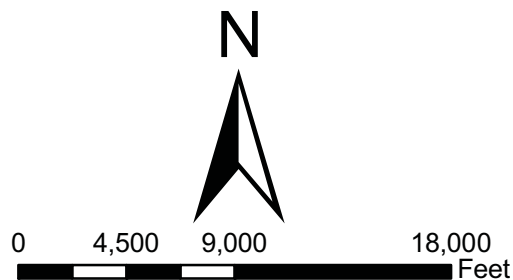


EXHIBIT “E”

Offsite (Tributary) Hydrology Study Map



EXHIBIT “F”

Existing Conditions Hydrology Study Map

EXHIBIT “G”

Developed Conditions
Hydrology Study Map