CITY OF PORTLAND, MAINE
SITE PLAN REVIEW
Processing Form

Applicant: C & A Associates

Date: January 13, 1987

Mailing Address: 20 Atlantic Place, S.P. 04106

Address of Proposed Site: 2326-2340 Congress Street

Proposed Use of Site: office building

Site Identifier(s) from Assessors Maps: 237-A-10

Acreage of Site / Ground Floor Coverage: 1.9 acres / 9600 sq. ft.

Zoning of Proposed Site:

Site Location Review (DEP) Required: ( ) Yes ( ) No

Board of Appeals Action Required: ( ) Yes ( ) No

Planning Board Action Required: ( ) Yes ( ) No

Proposed Number of Floors: 1

Total Floor Area: 9600 sq. ft.

Other Comments:

Date Dept. Review Due:

PLANNING DEPARTMENT REVIEW

(Date Received)

☐ Major Development — Requires Planning Board Approval: Review Initiated

☒ Minor Development — Staff Review Below

	LOADING AREA	PARKING	CIRCULATION PATTERN	ACCESS	PEDESTRIAN WALKWAYS	SCREENING	LANDSCAPING	SPACE & BULK OF STRUCTURES	LIGHTING	CONFLICT WITH CITY PROJECTS	FINANCIAL CAPACITY	CHANGE IN SITE PLAN	
APPROVED	—	—	—	—		—		—	—	—	—	—	
APPROVED CONDITIONALLY					X		X						CONDITIONS SPECIFIED BELOW
DISAPPROVED													REASONS SPECIFIED BELOW

REASONS: 1. Sidewalks to extend the length of the property on Congress unless waived by the board.
2. Zumi CrabApple to be 2-2½".
3. Sea Green Juniper to be 2-2½'.

(Attach Separate Sheet if Necessary)

Caroline Woodwell 2/10/87

SIGNATURE OF REVIEWING STAFF/DATE

PLANNING DEPARTMENT COPY

2326-2340 Congress opp Hutchins Drive

CITY OF PORTLAND, MAINE
M E M O R A N D U M

TO: Chairman and Members of the Planning Board

FROM: Caroline Woodwell, Planner

DATE: May 12, 1987

SUBJECT: C&A Associates Sidewalk Waiver

waived by the board 5/26/87

C&A Associates of South Portland is requesting a sidewalk waiver for an office building for Excess Insurance Underwriters, Inc. on outer Congress Street. C&A Associates went through an administrative site plan review in February. The plan is attached.

The building is on 1.9 acres in the I-1 zone, across from Hutchins Drive. Building area is 9,600 square feet and there is parking for 32 cars. Drainage flows into two detention areas before being piped to a swale along Congress Street. The sewer connection is made to an existing line on the eastern side of the property.

The applicant and other developers are widening Congress Street in that area to match improvements being made by the City. Because of the uncertainty about the City's plan for improving Congress Street, Mr. William Bray, the City's Traffic Engineer, has no objection to the sidewalk waiver. His memo is attached.

Attachments
eg

CITY OF PORTLAND, MAINE
M E M O R A N D U M

TO: Caroline Woodwell, Planner

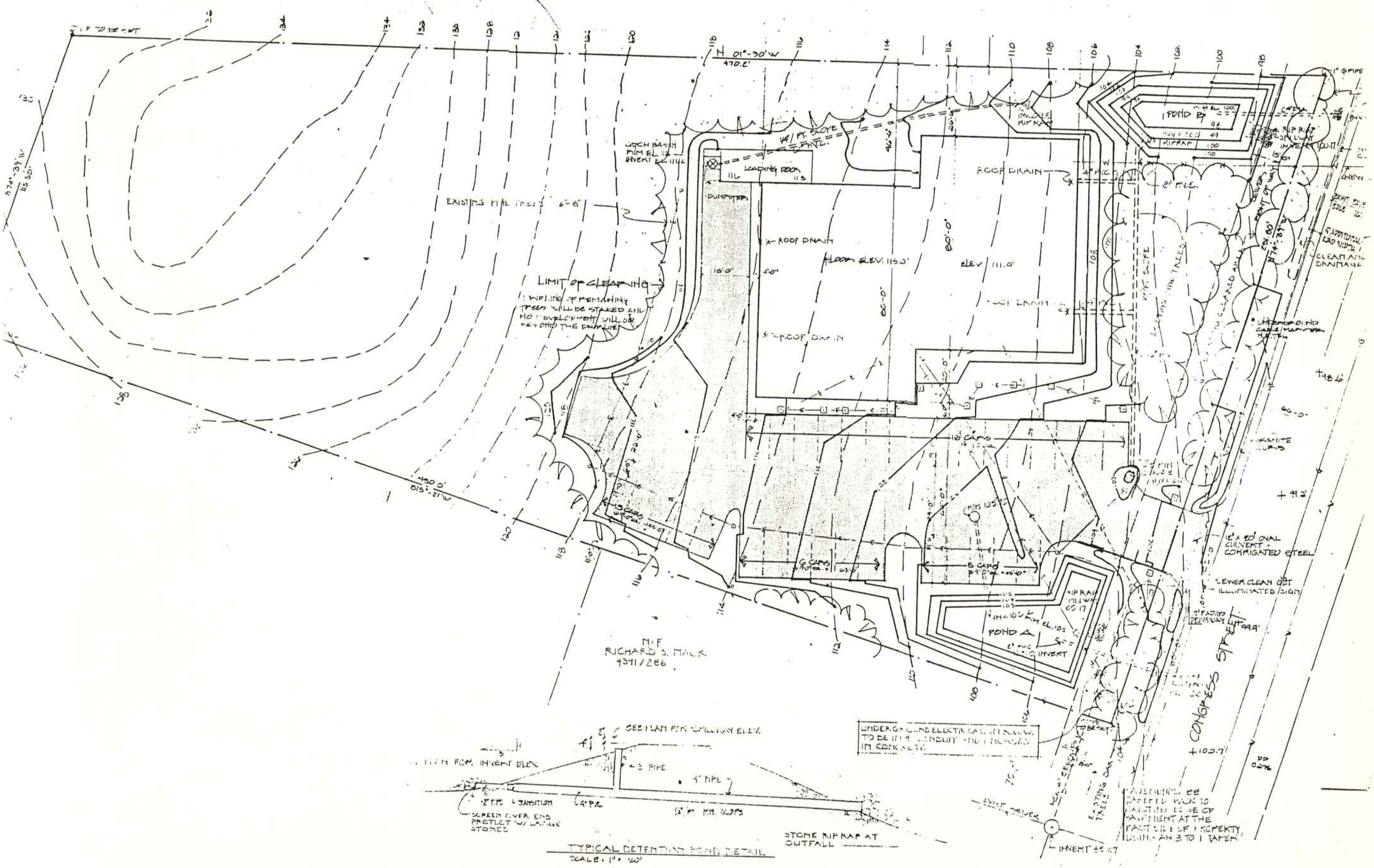
FROM: William Bray, Traffic Engineer

DATE: May 4, 1987

SUBJECT: C&A Sidewalk Waiver

I do not oppose a sidewalk waiver for C&A Associates on outer Congress Street. This is an industrial area and there is not much pedestrian traffic.

Due to uncertainties of future improvements it would be foolhearted to construct a sidewalk here.


CONGRESS STREET
POND A
POND B
ROOF DRAIN
FLOOR ELEV. 115.0'
ELEV 111.0'
80'-0"
LOADING DOCK
DUMPSTER
LIMIT OF CLEARING
EXISTING PINE TREES 6"-8"
CATCH BASIN
16 CARS
5 CARS
6 CARS
N/F
RICHARD S. MACK
4341/286
N 01°-30'W
470.0'
12"x 20" OVAL CULVERT - CORRIGATED STEEL
SEWER CLEAN OUT
ILLUMINATED SIGN
GRANITE CURB
UNDERGROUND ELECTRICAL LINES TO BE IN A CONDUIT AND ENCASED IN CONCRETE
TYPICAL DETENTION POND DETAIL
SCALE: 1" = 20'
STONE RIP RAP AT OUTFALL
SCREEN OVER END PROTECT W/ LARGE STONES
4" PIPE
INVERT 95.67
EXISTING OAK TREES

CITY OF PORTLAND

JOSEPH E. GRAY, JR.
DIRECTOR OF PLANNING
AND URBAN DEVELOPMENT

November 6, 1987

Dean Barbalias
Excess Insurance Company
2326 Congress Street
Portland, Maine 04103

Dear Mr. Barbalias:

This letter is to confirm the revision to the approved site plan of the Excess Insurance Company project located at 2326-2340 Congress Street. The approved revision includes the relocation of the driveway approximately 70 feet westerly of the existing drive, which will be closed off. The revised plan has been reviewed and approved by the project review staff including representatives of the Planning, Public Works, Building Inspections, Fire and Parks Departments, with the condition that four (4) oak trees (2 1/2" - 3" caliper) be located along the landscaped buffer strip in the area of the closed off driveway in order to screen the parking lot.

If you have any questions regarding the conditinal approval please contact the planning staff at 775-5451, extension 266.

Sincerely,

Joseph E. Gray, Jr. /eg

Joseph E. Gray, Jr.
Director of Planning and Urban Development

KC/eg

cc: Alexander Jaegerman, Chief Planner
Kathleen A. Conner, Senior Planner
David Klenk, Planner
Robert Roy, Planning Engineer
P. Samuel Hoffses, Chief Building Inspector
Carmela Barton, City Arborist
Lt. James Collins, Fire Department
Natalie Burns, Associate Corporation Counsel

CITY OF PORTLAND

DEPARTMENT OF PLANNING & URBAN DEVELOPMENT
INSPECTION SERVICES DIVISION

February 18, 1987

RE: 2326-2340 Congress Street

C&A Associates
20 Atlantic Place
South Portland, Maine 04106

Dear Sir:

Your application to construct a 9600 square foot building has been reviewed and a building permit is herewith issued subject to the following requirements:

Site Plan Review Requirements

Inspection Services   Approved with condition:
One loading bay 14´ X 50´ is required for this building. The bay shown on the plot plan is 12´ X 34´ in size. Section 14-352 of the Zoning Ordinance. W. J. Turner 2/17/87

Fire Department   Approved   F. F. John Dobkowski   2/17/87
Planning   Approved with conditions:

1. Sidewalk to extend the length of the property on Congress unless waived by the Board;
2. Zuni Crab Apple to be 2-2 1/2"; and,
4. Sea Green Juniper to be 2-2 1/2". Ms. Caroline Woodwell

Public Works   Approved with Conditions

1. Street widening along Congress Street shall be done in accordance with City specifications on road construction;
2. Curb and sidewalk shall be installed as per City standards; and,
3. A sewer connection permit shall be obtained prior to connection into the existing sewer manhole. Mr. Robert J. Roy 2/10/87

Building and Fire Code Requirements

1. All lot lines shall be clearly marked before calling for a foundation inspection;
2. All concrete and the earth below the foundation shall be protected from freezing;
3. Vertical opening to be protected as per N.F.P.A. 101 26-31;
4. Manual fire alarm to be provided as per N.F.P.A. 101-7-6.2.1;

CITY OF PORTLAND, MAINE
MEMORANDUM

ext. 493

TO: Rick Knowland, Planning

DATE: 10/27/87

FROM: Patrick Welch, Engineering PW

SUBJECT: Entrance - Executone Building

Attached is a copy of the plan for the proposed new entrance to the Executone Building on outer Congress Street.

It is necessary to relocate this entrance because of a grade problem created by the widening of Congress Street at the existing entrance.

PW/na
pc: Thomas H. Eaton, City Engineer
William J. Bray, Traffic Engineer
William S. Boothby, Principal Engineer

CITY OF PORTLAND, MAINE
M E M O R A N D U M

TO: Patrick Welch, Engineering

FROM: Kathleen A. Conner, Senior Planner KC

DATE: October 29, 1987

SUBJECT: Excess Insurance Underwriters Building--Site Plan Revision

Staff has reviewed the proposed driveway relocation for the Excess Insurance Building located at 2326-2340 Congress Street and finds the new driveway location acceptable. The lower proposed grade of approximately 6% is preferable to the 20% grade of the existing drive now that Congress Street is being widened. Please note that the approved site plan indicated a 8%-9% grade for the driveway and it is likely, given the 15%-20% grade, that it was not built as approved.

Excess Insurance must provide four (4) infill oak trees (2 1/2" - 3" caliper) at the old driveway location to screen the parking lot and fill in the new gap in the screening along the frontage of the property.

As we discussed, the City removed many of the trees along the Congress Street right-of-way for the street widening for the slip lane. If possible, the City should replace trees along the Excess Insurance Company frontage if there are any gaps in addition to the one that Excess Insurance is responsible for as noted above.

/eg

cc: Alexander Jaegerman, Chief Planner
Thomas Eaton, City Engineer
William Bray, Traffic Engineer
William Boothby, Principal Engineer

Alex
Let's Discuss
Joe

Caroline

EIU
Excess Insurance Underwriters, Inc.
P.O. Box 1518, Portland, Maine 04104-1518
SPECIAL RISK SPECIALISTS

Michael S. Adams
President

March 23, 1987

Mr. Joseph E. Gray
Portland City Hall
389 Congress Street
Room 211
Portland, Maine 04101

Reference: C & A PROPERTIES

waived by the board 5/26/87

Dear Sir:

We hereby request a form for the waiver of sidewalks on the C & A Office Porperty at 2326 through 2340 Congress Street, Portland, Maine.

We wish to have this waiver presented on the Planning Board's agenda no later than May 1, 1987 as occupancy is anticipated for June 1, 1987.

Please advise if you have any questions regarding this matter.

Very truly yours,

Michael S. Adams
C & A PROPERTIES

Dennis O'Connell
Dennis O'Connell
O'CONNELL CONSTRUCTION
774-1210

cc: Alex Jaegerman
Portland City Hall

ATP/pac

HUTCHINS

1000 CONGRESS STREET
P.O. BOX 8358
PORTLAND, MAINE 04104-8358
Telephone: 774-2621

January 26, 1987

To Whom it May Concern:

Being the present owner of an existing private sewer line which crosses Congress Street and connects to the public sewer line at Stroudwater Estates, C & A Properties has my permission to connect to the sewer for their building to be constructed on the property designated as 237-A-10 , Congress Street 2326-2340 on the City of Portland Tax Map.

George M. Hutchins per P.O.A dated 9/28/84

George M. Hutchins
Stroudwater Estates

February 5, 1987

Hill-Nemmers and Associates
424 Fore Street
Portland, ME 04101

Dear Bill,

I am writing to pass along some staff concerns about the Excess Insurance site on outer Congress Street. The plan has been reviewed by Bill Bray, City Traffic Engineer, and Bob Roy in Public Works.

Mr. Bray has several comments:

- Pavement along Congress Street should be widened to match the width of Congress at the Hutchins Street intersection. Minor tree trimming and removal may be required after the driveway is graded.

- Pavement to be tapered back to existing edge of pavement at the east side of property, using an 8 to 1 taper. Transition not to be curbed.

- Congress Street to be overlaid to centerline of street with a minimum of 1 1/2" overlay.

Mr. Roy's comments:

X
- contours and site grading elevations must be referenced to mean sea level ~~to mean sea level~~ datum.

- Detention basins shall be designed in accordance with city standards and also include

    a) invert elevation of outlet pipes.

    b) elevation of spillways

- Indicate size, invert elevation and type of material for driveway culvert.

- Need additional catch basin in ~~driveway~~ parking lot.

- Drainlines from catch basins shall be adequately sized. 4" is unacceptable.

    a) Show catch basin invert elevations, pipe sizes and slopes.

- Size and location of water service.

- Documentation of right to connect into private sewer.

- Invert elevations at existing sewer manhole. Note sewer service size and slope. Need clean out at angle in line.

- Radius of curb at driveway?

- Erosion control measures are inadequate.

~~I~~ He suggests ~~applicant~~ that you refer to Maine Environmental Quality Handbook and Greater Portland Council of Governments Stormwater Management Manual to outline use of 1) haybales or silt fencing 2)construction and stabilization of detention basins 3) stock piling of topsoil 4) schedule of revegetation and/or seeding of site after construction.

There are quite a few comments here. If you have questions or would like to schedule another meeting, please give me a call.

Sincerely,

Caroline Woodwell
Planner

CW/sc

Hill Nemmers and Associates Architects · Planners

January 13, 1987

APPLICATION TO THE PORTLAND PLANNING BOARD

FOR: MINOR DEVELOPMENT, SITE PLAN APPROVAL

PROJECT: EXCESS INSURANCE UNDERWRITERS, INC. BUILDING
OUTER CONGRESS STREET
PORTLAND, MAINE

APPLICANT: EXCESS INSURANCE UNDERWRITERS, INC.
20 ATLANTIC PLACE
SOUTH PORTLAND, MAINE
ATTN: MIKE ADAMS, PRES. 775-0136

AGENT FOR APPLICANT: HILL-NEMMERS AND ASSOCIATES, ARCHITECTS & PLANNERS
424 FORE STREET
PORTLAND, MAINE
ATTN: WILLIAM E. NEMMERS, AIA

REFERENCE SECTION 14-526, FINAL SITE PLAN

ITEM (c.1) Enclosed with this application please find six copies of the Site Plan (dated 12-8-86) and the Planting Plan (dated 12-18-86) These plans contain all information required on items "a" through "f" under item "c.1"

Enclosed also find three copies of the stamped topographic survey of "George Hutchins Property" dated June 1985 prepared by Earl Stewart Engineering.

ITEM (c.2) WRITTEN STATEMENT

2.a. Description of proposed uses: The site will be used to construct a one story office building. The building will be about 75% office and 25% dead storage areas. There will be 32 parking spaces and a loading dock.

2.b. Area Descriptions: The area of the site is approximately 1.9 acres
The floor area of the building is 9,600 S.F.
Ground coverage of building is 9,600 S.F.
Paved surfaces are approximately 13,300 S.F.

COMMENTS WITH RESPECT TO SECTION 14.527 - STANDARDS

1. All parking will have easy access to Congress Street through a single driveway. There is good visibilaty in both directions, and the drive is not opposite another drive or road.

2. The building is one story as are most of its existing neighbors and the building and parking areas are comparable to the neighboring sites. The function of the building is similar to its neighbors. Only toilet room wastes will be generated by the project and should have no impact on the city sewer system.

3. A large portion of the existing tree growth at the front of the site has been retained. In areas where clearing was necessary trees and landscaping have been used to ease the transition between building and site.

4. The drainage aspects of the project have been addressed in the <u>rain water runoff analysis</u> submitted earlier to the Planning Board.

dimensions
text

5. Since the parking and the building are protected from the street by the buffer of existing trees, no lighting of these structures will be a hazard to traffic. A LIGHTED SIGN, LOCATED UNDER THE trees to the left of the driveway and two low lights will mark the entry.

$25 + .20¢

6. The applicant is an insurance business currently in business and in good standing in the community. The proposed building will not be a speculative venture but will house the existing insurance business.

7. The building is accessable to emergency equipment on three sides by virtue of paved parking on the East and South, and Congress Street within 80 feet to the North. The cleared right-of-way for the Portland Water District is on the West and can also be utilized as an access.

8. No changes in essential items

9 Not applicable.

William E. Nemmers, AIA
Partner: Hill-Nemmers and Associates Architects and Planners

DRAINAGE MAINTENANCE AGREEMENT

IN CONSIDERATION OF Site plan approval granted by the City of Portland to a plan entitled C&A Properties - Revised Site Plan, dated December 8, 1986, 198 and filed with the City of Portland, Department of Planning and Urban Development, 389 Congress Street, Portland, Maine, * and pursuant to a condition thereof, C&A Properties, A Partnership with a place of business at 20 Atlantic Place, So.Portland, Maine, the owner of the subject premises, does hereby agree, for itself, its successors and assigns (the "Owner"), as follows:

That it will, at its own cost and expense and at all times in perpetuity, maintain in good repair and in proper working order the surface water drainage system as shown on said plan, including but not limited to the detention basin or basins and the outlet or outlets therefrom, for the benefit of the said City of Portland, all persons in lawful possession of said premises and abutters thereto; further, that the said City of Portland, said persons in lawful possession and said abutters, or any of them, may enforce this Agreement by an action at law or in equity in any court of competent jurisdiction; further, that after giving the Owner written notice and a reasonable time to perform, the said City of Portland may, by its authorized agents or representatives, enter upon said premises or any portion thereof for the purpose of performing the aforementioned maintenance of said surface water drainage system in the event of any failure or neglect thereof, the cost and expense thereof to be reimbursed in full to the said City of Portland by the Owner upon demand.

This Agreement shall not confer upon the said City of Portland or any other person the right to utilize said surface water drainage system for public use or for the development of any other property, and the Owner shall bear no financial responsibility by virtue of this Agreement for enlarging the capacity of said service water drainage system for any reason whatsoever.

This Agreement shall bind the undersigned only so long as it retains any interest in said premises, and shall run with the land and be binding upon its successors and assigns as their interests may from time to time appear.

Dated at Portland, Maine this 13th day of January, 1987.

MICHAEL S. ADAMS

By [signature]
Its PARTNER

STATE OF MAINE
CUMBERLAND, ss.

Jan 13, 1987

Personally appeared the above-named Michael S. Adams of C&A Properties, and acknowledged the foregoing instrument to be his free act and deed in his said capacity, and the free act and deed of said partner.

Before me,

[signature]
Notary Public/Attorney at Law

Print name: LOIS A. PRATT NOTARY

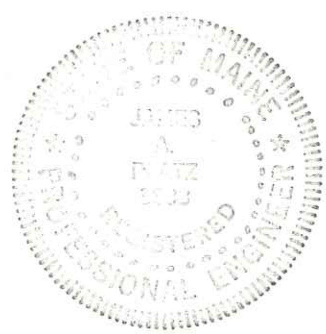
COMMISSION EXPIRES 2/5/89

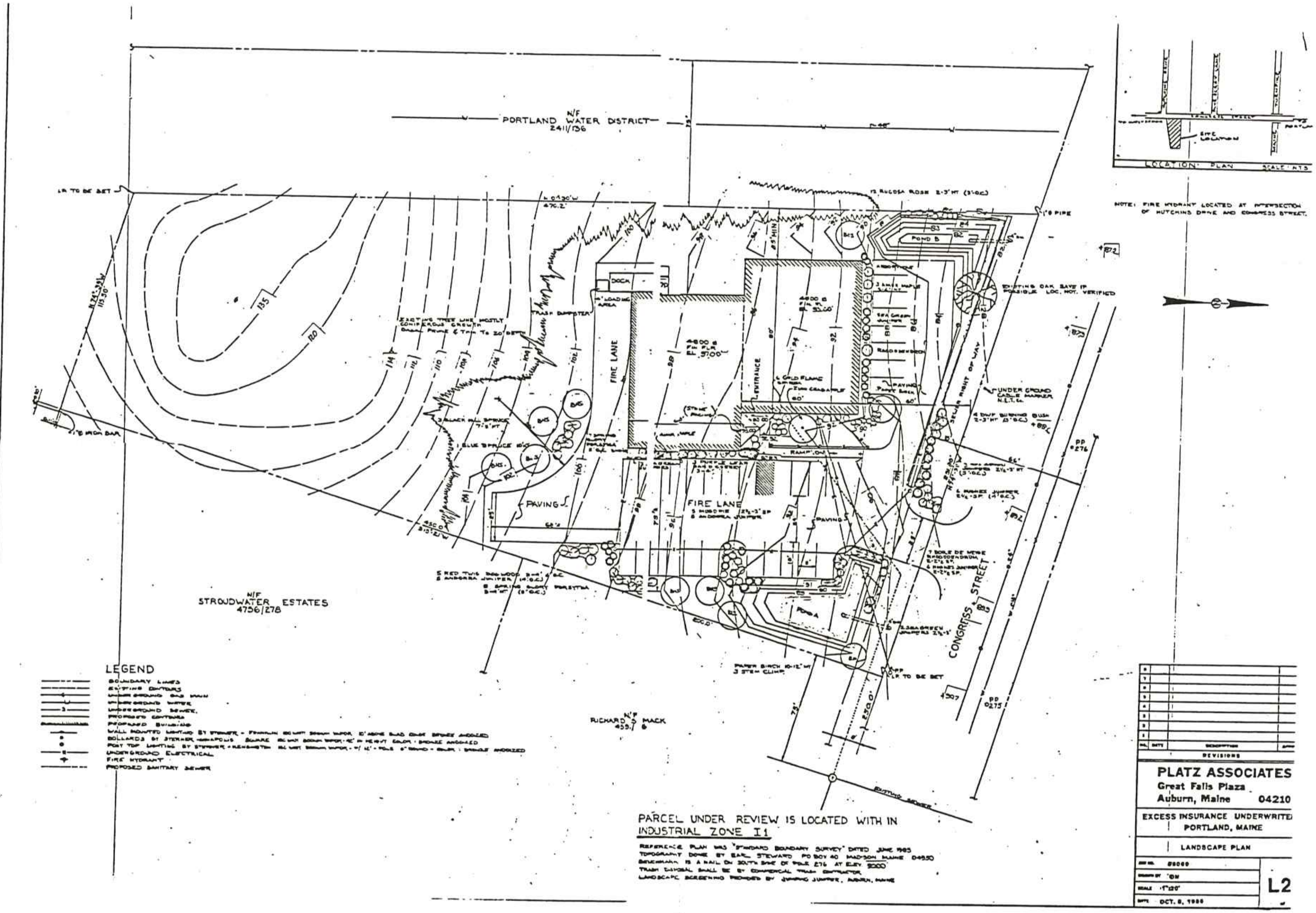
Excess Insurance Underwriters

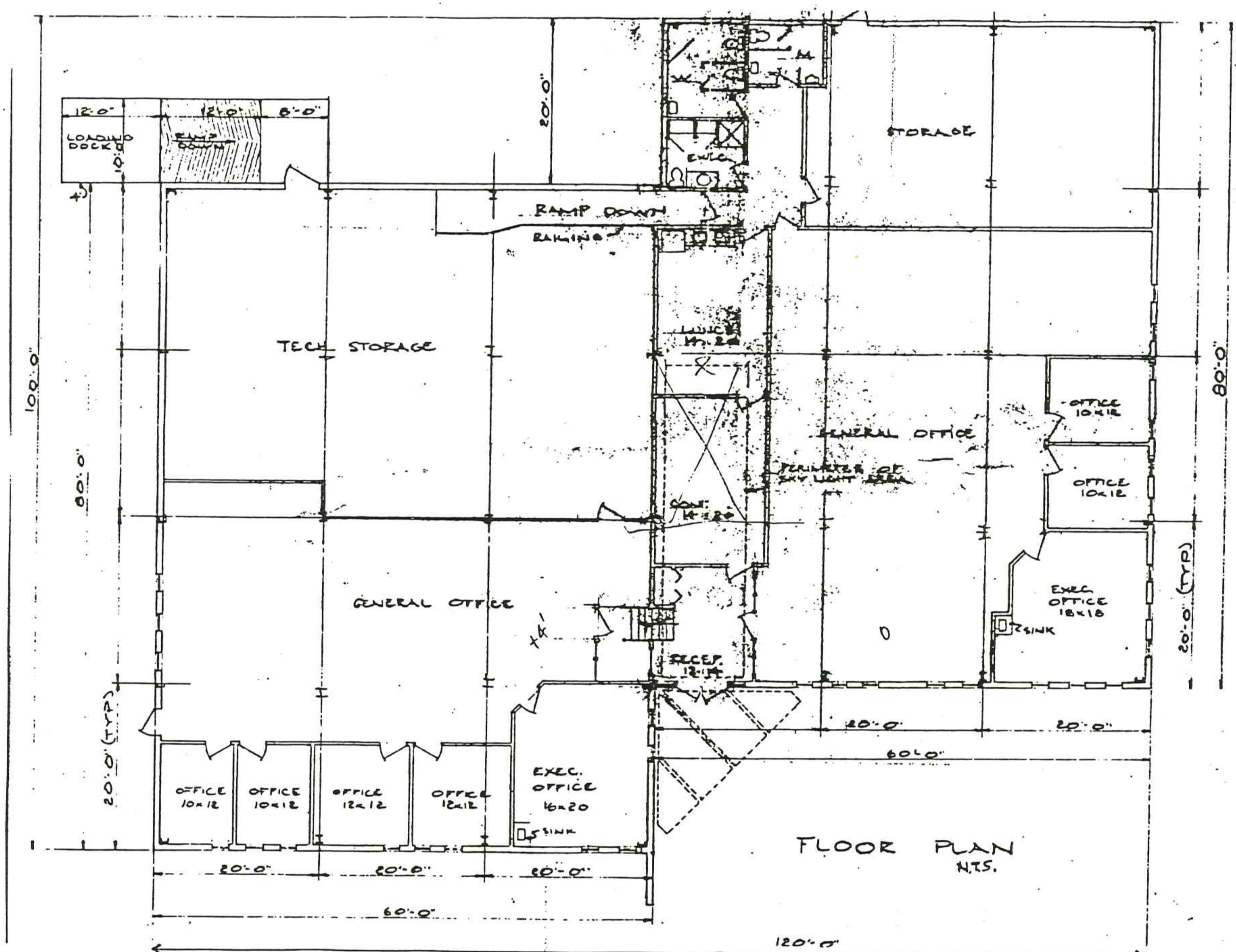
Portland, Maine

Run Off Calculations

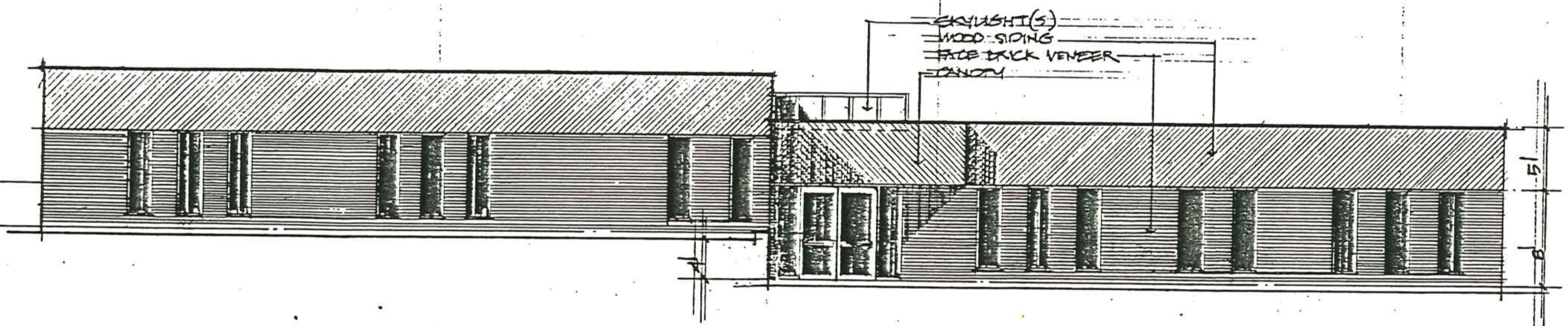
11-26-86




N/F PORTLAND WATER DISTRICT 2411/156
N/F STROUDWATER ESTATES 4756/278
N/F RICHARD O. MACK
FIRE LANE
FIRE LANE
ENTRANCE
PAVING
POND A
POND B
DOCK
CONGRESS STREET
SEWER RIGHT OF WAY
EXISTING OAK SAVE IF POSSIBLE LOC. NOT VERIFIED
LOCATION PLAN
SCALE: NTS
NOTE: FIRE HYDRANT LOCATED AT INTERSECTION OF HUTCHINS DRIVE AND CONGRESS STREET.
LEGEND
BOUNDARY LINES
EXISTING CONTOURS
UNDERGROUND GAS MAIN
UNDERGROUND WATER
UNDERGROUND SEWER.
PROPOSED CONTOURS
PROPOSED BUILDING
WALL MOUNTED LIGHTING
BOLLARDS
POST TOP LIGHTING
UNDERGROUND ELECTRICAL
FIRE HYDRANT
PROPOSED SANITARY SEWER
PARCEL UNDER REVIEW IS LOCATED WITH IN INDUSTRIAL ZONE I1
REFERENCE PLAN WAS "STANDARD BOUNDARY SURVEY" DATED JUNE 1985
TOPOGRAPHY DONE BY EARL STEWARD PO BOX 40 MADISON MAINE 04950
TRASH DISPOSAL SHALL BE BY COMMERCIAL TRASH CONTRACTOR
REVISIONS
PLATZ ASSOCIATES
Great Falls Plaza
Auburn, Maine 04210
EXCESS INSURANCE UNDERWRITE
PORTLAND, MAINE
LANDSCAPE PLAN
OCT. 8, 1986
L2



FLOOR PLAN
N.T.S.



EAST ELEVATION 1/8" = 1'-0"

Worksheet 2: Runoff curve number and runoff

Project EXCESS INS. & EXECUTONE BLDG By DM. Date 10-24-86

Location CONGRESS ST. PORTLAND ME. Checked JP Date 11-26-86

Circle one: (Present) Developed 1.87 ACRE COMMERCIAL OFFICE BLDG

1. Runoff curve number (CN)

Soil name and hydrologic group SEE SKETCH (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area ☒ acres ☐ mi^2 ☐ %	Product of CN x area
ELMWOOD EMB (C)	POOR CONDITION LIGHTLY WOODED & GRASSED	86			.01	.86
BELGRADE BgB (B)	HEAVILY WOODED LIGHTLY GRASSED FAIR	60			1.00	60.00
HOLLIS HrB (C/D)	HEAVILY WOODED LIGHTLY GRASSED FAIR	76			.35	26.60
HOLLIS HrC (C/D)	HEAVILY WOODED LIGHTLY GRASSED FAIR	76			.51	38.76
				Totals =	1.87	126.22

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{126.22}{1.87} = 67.5$; Use CN = 68

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	2	25	
Rainfall, P (24-hour) FIG. B3, B6	in	3	5	
Runoff, Q (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)	in	.63	1.88	

D

Worksheet 2: Runoff curve number and runoff

Project EXCESS INS. AND EXECUTONE BLDG. By DM Date 10-24-86

Location CUMBERLAND COUNTY. Checked JP Date 11-26-86

Circle one: Present (Developed) 1.87 ACRE LOT COMM. BUSI. BLDG.

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area ☒acres ☐mi² ☐%	Product of CN x area
ELMWOOD (C)	POOR CONDITION LIGHTLY. WOODED & GRASSED.	86			.01	.86
BELGRADE (B)	PAVING PARKING LOT 39% AREA. IMPERVIOUS CONNECTED.	98			.39	38.22
	BLDG ROOF 22% AREA IMPERVIOUS CONNECTED.	98			.22	21.56
	LAWN GOOD CONDITION	61			.39	23.79
HOLLIS (C/D) HrB	PAVING PARKING LOT. CONNECTED 11%.	98			.04	3.92.
	HEAVILY WOODED LIGHTLY GRASSED FAIR	76			.31	23.56
HOLLIS HrC (C/D)	HEAVILY WOODED. LIGHTLY GRASSED FAIR	76			.51	38.76
				Totals =	1.87	150.67

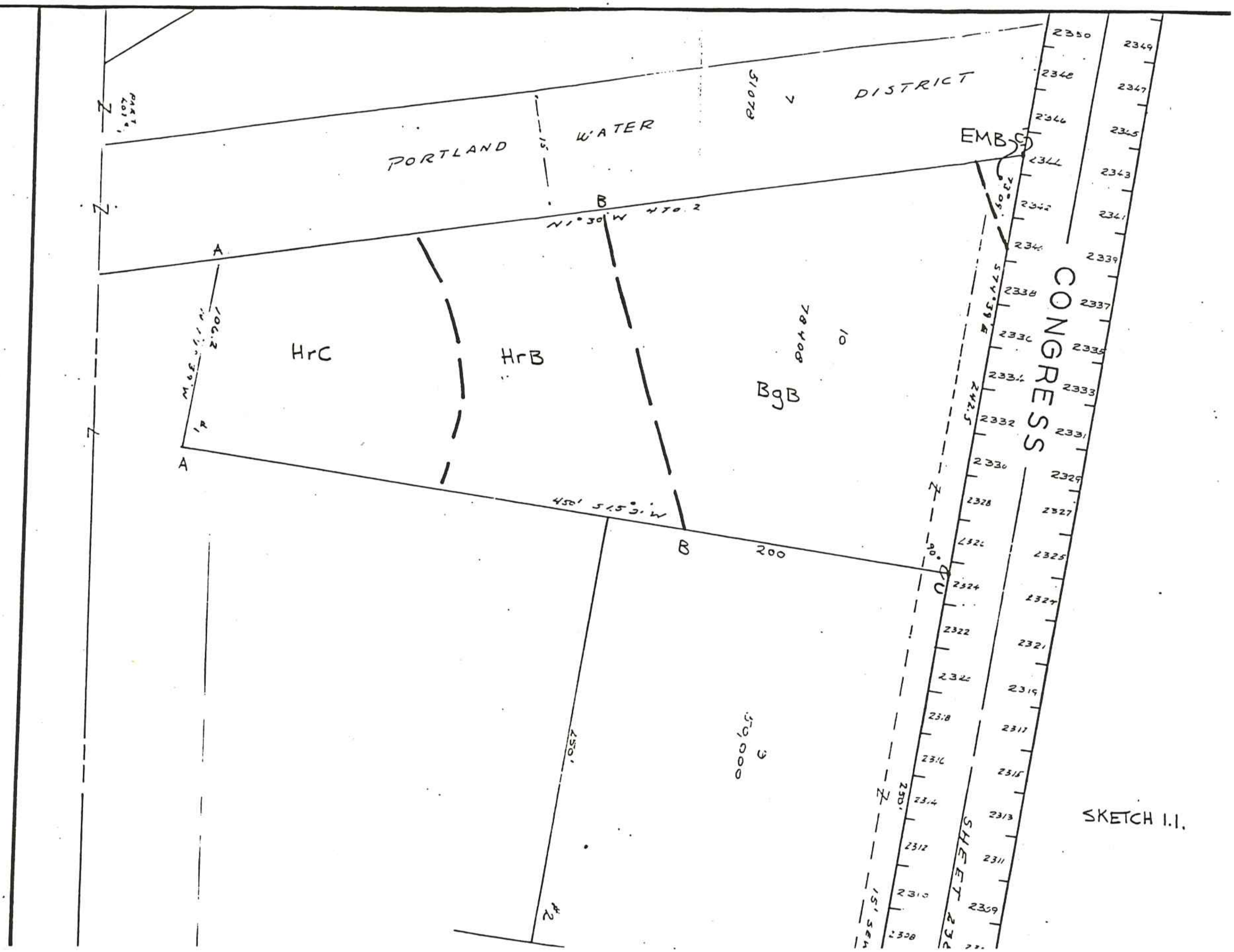
1/ Use only one CN source per line.

CN (weighted) = total product / total area = 150.67 / 1.87 = 80.57; Use CN = 81

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	2	25	
Rainfall, P (24-hour) FIG B3, B6	in	3	5	
Runoff, Q (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)	in	1.31	3.00	

(210-VI-TR-55, Second Ed., June 1986)


CONGRESS
PORTLAND WATER DISTRICT
EMB
HrC
HrB
BgB
N 1°30' W 470.2
S 74°39' E
242.5
450' S 15°3' W
200
250'
106.2
78408
51078
50,000
SHEET

SKETCH I.I.


81
N
(Joins sheet 75)
(Joins sheet 82)
(Joins sheet 85)
(Joins sheet 80)
313 000 FEET
297 000 FEET
465 000 FEET
1 Mile
5 000 Feet
Scale 1:20 000
WESTBROOK
Cumberland Mills
Sagamore Village
Nasons Corner
Deering
Rosemont
Deer Hill
Post Office
Bridge St School
Brown St School
Saccarappa School
Beaver Pond
Radio towers
Hospital
Substation
Thompson Hill
Clark
Willard School
Bradleys Corner
PRESUMPSCOT
RIVER
FORE RIVER
PORTLAND INTERNATIONAL JETPORT
SCARBOROUGH

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the series to which the mapping unit belongs. The suitability of the soils for use as cropland is described in the soil descriptions. An explanation of the capability classification system begins on page 38. Other information is given in tables, as follows:

Acreage and extent, table 1, page 9.
Estimated yields, table 2, page 42.
Woodland management, table 3, page 44.
Suitability for wildlife habitat, table 4, page 51.
Engineering uses of the soils, tables 5, 6, and 7, pages 54 through 67.
Limitations for uses related to town and country planning, table 8, page 68.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Woodland group Symbol	Wildlife group Number
Au	Au Gres loamy sand	10	IVw-5	4w1	3
BgB	Belgrade very fine sandy loam, 0 to 8 percent slopes	11	IIw-7	3o1	2
BgC2	Belgrade very fine sandy loam, 8 to 15 percent slopes, eroded	11	IIIew-7	3r1	1
Bo	Biddeford silt loam	12	VIw-7	Unsuited	4
BuB	Buxton silt loam, 3 to 8 percent slopes	12	IIw-7	4o1	2
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded	12	IIIew-7	5c1	1
CaB	Canaan sandy loam, 3 to 8 percent slopes	13	IIIe-1	4d1	6
CaC	Canaan sandy loam, 8 to 15 percent slopes	13	IVe-1	4d1	6
CeB	Canaan very rocky sandy loam, 3 to 8 percent slopes	13	VIs-1	4x1	8
CeC	Canaan very rocky sandy loam, 8 to 20 percent slopes	13	VIs-1	4x1	8
CeE	Canaan very rocky sandy loam, 20 to 60 percent slopes	14	VIIs-1	4x2	8
Ck	Coastal beaches	14	VIIIs-5	Unsuited	13
Cu	Cut and fill land	14	Unclassified	---	--
DeA	Deerfield loamy sand, 0 to 3 percent slopes	15	IIIw-5	4o1	2
DeB	Deerfield loamy sand, 3 to 8 percent slopes	15	IIIw-5	4o1	2
Du	Dune land	15	VIIIs-5	6s1	13
EmB	Elmwood fine sandy loam, 0 to 8 percent slopes	16	IIw-8	3o1	2
Gp	Gravel pits	16	Unclassified	---	13
HfB	Hartland very fine sandy loam, 3 to 8 percent slopes	16	IIe-7	3o1	1
HfC2	Hartland very fine sandy loam, 8 to 15 percent slopes, eroded	16	IIIe-7	3r1	1
HfD2	Hartland very fine sandy loam, 15 to 25 percent slopes, eroded	16	IVe-7	3r2	10
HgB	Hermon sandy loam, 3 to 8 percent slopes	17	IIs-3	4s1	1
HgC	Hermon sandy loam, 8 to 15 percent slopes	17	IIIes-3	4s1	1
HgD	Hermon sandy loam, 15 to 25 percent slopes	17	IVes-3	4s2	10
HhB	Hermon very stony sandy loam, 3 to 8 percent slopes	18	VIs-3	4s1	7
HhC	Hermon very stony sandy loam, 8 to 15 percent slopes	18	VIs-3	4s1	7
HhD	Hermon very stony sandy loam, 15 to 30 percent slopes	18	VIs-3	4s2	8
HkC	Hermon extremely stony sandy loam, 8 to 20 percent slopes	18	VIIs-3	4x3	8
HkE	Hermon extremely stony sandy loam, 20 to 60 percent slopes	18	VIIs-3	4x4	8
HlB	Hinckley gravelly sandy loam, 3 to 8 percent slopes	19	IIIs-5	5s1	5
HlC	Hinckley gravelly sandy loam, 8 to 15 percent slopes	19	IVs-5	5s1	5
HlD	Hinckley gravelly sandy loam, 15 to 25 percent slopes	19	VIs-5	5s2	8
HnB	Hinckley-Suffield complex, 3 to 8 percent slopes	19	IIIes-57	5s1	5
HnC	Hinckley-Suffield complex, 8 to 15 percent slopes	19	IVs-57	5s1	5
HnD	Hinckley-Suffield complex, 15 to 25 percent slopes	19	VIs-57	5s2	8
HrB	Hollis fine sandy loam, 3 to 8 percent slopes	20	IIIe-1	5d1	6
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	20	IVe-1	5d1	6
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	20	VIe-1	5d2	8
HsB	Hollis very rocky fine sandy loam, 3 to 8 percent slopes	20	VIs-1	5x1	8
HsC	Hollis very rocky fine sandy loam, 8 to 20 percent slopes	20	VIs-1	5x1	8
HsE	Hollis very rocky fine sandy loam, 20 to 35 percent slopes	21	VIIs-1	5x2	8
Ls	Limerick-Saco silt loams	21			
	Limerick soil	--	VIw-6	4w1	9
	Saco soil	--	VIw-6	Unsuited	9
LyB	Lyman fine sandy loam, 3 to 8 percent slopes	22	IIIe-1	4d1	6
LyC	Lyman fine sandy loam, 8 to 15 percent slopes	22	IVe-1	4d1	6
LzB	Lyman very rocky fine sandy loam, 3 to 8 percent slopes	22	VIs-1	4x1	8
LzC	Lyman very rocky fine sandy loam, 8 to 20 percent slopes	22	VIs-1	4x1	8
LzE	Lyman very rocky fine sandy loam, 20 to 45 percent slopes	22	VIIs-1	4x2	8
Md	Made land	23	Unclassified	---	---
MeC	Melrose fine sandy loam, 8 to 15 percent slopes	23	IIIe-8	4o1	1
MkB	Merrimac fine sandy loam, 3 to 8 percent slopes	24	IIs-5	4s1	1
MkC	Merrimac fine sandy loam, 8 to 15 percent slopes	24	IIIes-5	4s1	1
On	Ondawa fine sandy loam	24	I-6	4o1	1
PbB	Paxton fine sandy loam, 3 to 8 percent slopes	25	IIe-4	3o1	1
PbC	Paxton fine sandy loam, 8 to 15 percent slopes	25	IIIe-4	3o1	1
PbD	Paxton fine sandy loam, 15 to 25 percent slopes	25	IVe-4	3r3	10
PfB	Paxton very stony fine sandy loam, 3 to 8 percent slopes	25	VIs-4	3o1	7
PfC	Paxton very stony fine sandy loam, 8 to 15 percent slopes	25	VIs-4	3o1	7
PfD	Paxton very stony fine sandy loam, 15 to 25 percent slopes	26	VIs-4	3r3	8
PkB	Peru fine sandy loam, 0 to 8 percent slopes	26	IIw-4	3o1	2
PkC	Peru fine sandy loam, 8 to 15 percent slopes	26	IIIew-4	3o1	1
PlB	Peru very stony fine sandy loam, 0 to 8 percent slopes	27	VIs-4	3o1	12
PlC	Peru very stony fine sandy loam, 8 to 15 percent slopes	27	VIs-4	3o1	12
Py	Podunk fine sandy loam	27	IIw-6	3o1	2
RbA	Ridgebury fine sandy loam, 0 to 3 percent slopes	28	IIIw-4	4w1	3
RgA	Ridgebury very stony fine sandy loam, 0 to 3 percent slopes	28	VIIsw-4	4w1	11
Ro	Rock land	29	VIIIs-1	6x1	13
Ru	Rumney fine sandy loam	29	IIIw-6	4w1	9
Sd	Saugatuck loamy sand	30	Vw-5	4w1	3
Sn	Scantic silt loam	31	IVw-7	5w1	3
So	Scarboro sandy loam	31	Vw-5	5w1	4
Sp	Sebago mucky peat	32	VIIw-9	Unsuited	14
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	33	IIIe-7	5c1	1
SuD2	Suffield silt loam, 15 to 25 percent slopes, eroded	33	IVe-7	5c2	10
SuE2	Suffield silt loam, 25 to 45 percent slopes, eroded	33	VIe-7	5c2	10
Sz	Swanton fine sandy loam	34	IIIw-8	5w1	3
Tm	Tidal marsh	34	VIIIw-99	Unsuited	14
Wa	Walpole fine sandy loam	35	IIIw-5	4w1	3
Wg	Whately fine sandy loam	35	Vw-8	Unsuited	4
Wh	Whitman fine sandy loam	36	Vw-4	5w1	4
WmB	Windsor loamy sand, 0 to 8 percent slopes	37	IIIs-5	5s1	5
WmC	Windsor loamy sand, 8 to 15 percent slopes	37	IVs-5	5s1	5
WmD	Windsor loamy sand, 15 to 30 percent slopes	37	VIs-5	5s2	8
WrB	Woodbridge fine sandy loam, 0 to 8 percent slopes	38	IIw-4	3o1	2
WrC	Woodbridge fine sandy loam, 8 to 15 percent slopes	38	IIIew-4	3o1	1
WsB	Woodbridge very stony fine sandy loam, 0 to 8 percent slopes	38	VIs-4	3o1	12
WsC	Woodbridge very stony fine sandy loam, 8 to 15 percent slopes	38	VIs-4	3o1	12

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. A final number, 2, in the symbol shows that the soil is eroded.

SYMBOL	NAME
Au	Au Gres loamy sand
BgB	Belgrade very fine sandy loam, 0 to 8 percent slopes
BgC2	Belgrade very fine sandy loam, 8 to 15 percent slopes, eroded
Bo	Biddeford silt loam
BuB	Buxton silt loam, 3 to 8 percent slopes
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded
CaB	Canaan sandy loam, 3 to 8 percent slopes
CaC	Canaan sandy loam, 8 to 15 percent slopes
CeB	Canaan very rocky sandy loam, 3 to 8 percent slopes
CeC	Canaan very rocky sandy loam, 8 to 20 percent slopes
CeE	Canaan very rocky sandy loam, 20 to 60 percent slopes
Ck	Coastal beaches
Cu	Cut and fill land
DeA	Deerfield loamy sand, 0 to 3 percent slopes
DeB	Deerfield loamy sand, 3 to 8 percent slopes
Du	Dune land
EmB	Elmwood fine sandy loam, 0 to 8 percent slopes
Gp	Gravel pits
HfB	Hartland very fine sandy loam, 3 to 8 percent slopes
HfC2	Hartland very fine sandy loam, 8 to 15 percent slopes, eroded
HfD2	Hartland very fine sandy loam, 15 to 25 percent slopes, eroded
HgB	Hermon sandy loam, 3 to 8 percent slopes
HgC	Hermon sandy loam, 8 to 15 percent slopes
HgD	Hermon sandy loam, 15 to 25 percent slopes
HhB	Hermon very stony sandy loam, 3 to 8 percent slopes
HhC	Hermon very stony sandy loam, 8 to 15 percent slopes
HhD	Hermon very stony sandy loam, 15 to 30 percent slopes
HkC	Hermon extremely stony sandy loam, 8 to 20 percent slopes
HkE	Hermon extremely stony sandy loam, 20 to 60 percent slopes
HlB	Hinckley gravelly sandy loam, 3 to 8 percent slopes
HlC	Hinckley gravelly sandy loam, 8 to 15 percent slopes
HlD	Hinckley gravelly sandy loam, 15 to 25 percent slopes
HnB	Hinckley-Suffield complex, 3 to 8 percent slopes
HnC	Hinckley-Suffield complex, 8 to 15 percent slopes
HnD	Hinckley-Suffield complex, 15 to 25 percent slopes
HrB	Hollis fine sandy loam, 3 to 8 percent slopes
HrC	Hollis fine sandy loam, 8 to 15 percent slopes
HrD	Hollis fine sandy loam, 15 to 25 percent slopes
HsB	Hollis very rocky fine sandy loam, 3 to 8 percent slopes
HsC	Hollis very rocky fine sandy loam, 8 to 20 percent slopes
HsE	Hollis very rocky fine sandy loam, 20 to 35 percent slopes
Ls	Limerick-Saco silt loams
LyB	Lyman fine sandy loam, 3 to 8 percent slopes
LyC	Lyman fine sandy loam, 8 to 15 percent slopes
LzB	Lyman very rocky fine sandy loam, 3 to 8 percent slopes
LzC	Lyman very rocky fine sandy loam, 8 to 20 percent slopes
LzE	Lyman very rocky fine sandy loam, 20 to 45 percent slopes
Md	Made land
MeC	Melrose fine sandy loam, 8 to 15 percent slopes
MkB	Merrimac fine sandy loam, 3 to 8 percent slopes
MkC	Merrimac fine sandy loam, 8 to 15 percent slopes
On	Ondawa fine sandy loam
PbB	Paxton fine sandy loam, 3 to 8 percent slopes
PbC	Paxton fine sandy loam, 8 to 15 percent slopes
PbD	Paxton fine sandy loam, 15 to 25 percent slopes
PfB	Paxton very stony fine sandy loam, 3 to 8 percent slopes
PfC	Paxton very stony fine sandy loam, 8 to 15 percent slopes
PfD	Paxton very stony fine sandy loam, 15 to 25 percent slopes
PkB	Peru fine sandy loam, 0 to 8 percent slopes
PkC	Peru fine sandy loam, 8 to 15 percent slopes
PlB	Peru very stony fine sandy loam, 0 to 8 percent slopes
PlC	Peru very stony fine sandy loam, 8 to 15 percent slopes
Py	Podunk fine sandy loam
RbA	Ridgebury fine sandy loam, 0 to 3 percent slopes
RgA	Ridgebury very stony fine sandy loam, 0 to 3 percent slopes
Ro	Rock land
Ru	Rumney fine sandy loam
Sd	Saugatuck loamy sand
Sn	Scantic silt loam
So	Scarboro sandy loam
Sp	Sebago mucky peat
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded
SuD2	Suffield silt loam, 15 to 25 percent slopes, eroded
SuE2	Suffield silt loam, 25 to 45 percent slopes, eroded
Sz	Swanton fine sandy loam
Tm	Tidal marsh
Wa	Walpole fine sandy loam
Wg	Whately fine sandy loam
Wh	Whitman fine sandy loam
WmB	Windsor loamy sand, 0 to 8 percent slopes
WmC	Windsor loamy sand, 8 to 15 percent slopes
WmD	Windsor loamy sand, 15 to 30 percent slopes
WrB	Woodbridge fine sandy loam, 0 to 8 percent slopes
WrC	Woodbridge fine sandy loam, 8 to 15 percent slopes
WsB	Woodbridge very stony fine sandy loam, 0 to 8 percent slopes
WsC	Woodbridge very stony fine sandy loam, 8 to 15 percent slopes

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Grade
- R. R. over
- R. R. under

Buildings

School

Church

Mine and quarry

Gravel pit

Power line

Breakwater, Jetty

Airway beacon

Cemetery

Dams

Levee

Tanks

Lighthouse

Forest fire or lookout station

Fort

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Limit of soil survey
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Short steep slope

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Ds)
- Gravel
- Stoniness: Stony; Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Top soil removed
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

Appendix A: Hydrologic soil groups

Soils are classified into hydrologic soil groups (HSG's) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSG's, which are A, B, C, and D, are one element used in determining runoff curve numbers (see chapter 2). For the convenience of TR-55 users, exhibit A-1 lists the HSG classification of United States soils.

The infiltration rate is the rate at which water enters the soil at the soil surface. It is controlled by surface conditions. HSG also indicates the transmission rate—the rate at which the water moves within the soil. This rate is controlled by the soil profile. Approximate numerical ranges for transmission rates shown in the HSG definitions were first published by Musgrave (USDA 1955). The four groups are defined by SCS soil scientists as follows:

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

In exhibit A-1, some of the listed soils have an added modifier; for example, "Abrazo, gravelly." This refers to a gravelly phase of the Abrazo series that is found in SCS soil map legends.

Disturbed soil profiles

As a result of urbanization, the soil profile may be considerably altered and the listed group classification may no longer apply. In these circumstances, use the following to determine HSG according to the texture of the new surface soil, provided that significant compaction has not occurred (Brakensiek and Rawls 1983):

HSG	*Soil textures*
A	Sand, loamy sand, or sandy loam
B	Silt loam or loam
C	Sandy clay loam
D	Clay loam, silty clay loam, sandy clay, silty clay, or clay

Drainage and group D soils

Some soils in the list are in group D because of a high water table that creates a drainage problem. Once these soils are effectively drained, they are placed in a different group. For example, Ackerman soil is classified as A/D. This indicates that the drained Ackerman soil is in group A and the undrained soil is in group D.

Exhibit A-1, continued: Hydrologic soil groups for United States soils

AVON	C	BALDFIELD	C	BARDLEY	C	BATESON	B	BEAVERTON	B
AVONBURG	D	BALDHILL	B	BARELA	C	BATESVILLE	C	BECKER	B
AVONDA	B	BALDMOUNTAIN	B	BARFIELD	D	BATH	C	BECKET	C
AVONDALE	B	BALDOCK	D	BARFUSS	B	BATTERSON	D	BECKLEY	B
AVONVILLE	B	BALDOCK, GRAVELLY	C	BARGE	C	BATTLE CREEK	C	BECKMAN	D
AVTABLE	D	SUBSTRATUM,		BARGER	C	BATTLEMENT	B	BECKS	C
AWBRIG	D	DRAINED		BARIO	B	BATZA	D	BECKTON	D
AXIS	D	BALDOCK, SALINE	C	BARISHMAN	C	BAUDETTE	B	BECKTON, WELL	C
AXTELL	D	BALDOCK, SALINE	C	BARKCAMP	B	BAUER	C	DRAINED	
AYAR	D	BALDOCK, DRAINED	C	BARKELEW	B	BAUMAN	C	BECKVILLE	B
AYCOCK	B	BALDWIN	D	BARKERVILLE	C	BAUMGARD	B	BECKWITH	D
AYDELOTTE	D	BALDY	B	BARKLEY	C	BAUSCHER	B	BECKWOURTH	C
AYERSVILLE	B	BALE	B	BARKOF	D	BAUX	B	BECRAFT	B
AYLMER	A	BALE, WET	D	BARLEYFIELD	B	BAUXSON	B	BECREEK	B
AYNOR	B/D	BALLAHACK	D	BARLING	C	BAXENDALE	B	BEDELL	B
AYON	B	BALLARD	B	BARLOW	B	BAXTER	B	BEDEN	D
AYOUB	C	BALLER	D	BARNABE	C	BAXTERVILLE	C	BEDFORD	C
AYR	B	BALLINGER	D	BARNARD	C	BAYAMON	B	BEDINGTON	B
AYRES	D	BALLTOWN	D	BARNELLCREEK	B	BAYARD	B	BEDKE	B
AYRSHIRE	C	BALLVAR	B	BARNES	B	BAYBORO	D	BEDNER	C
AYSEES	B	BALLY	C	BARNESTON	B	BAYERTON	C	BEDSTEAD	C
AZAAR	C	BALM	D	BARNESTON,	A	BAYFIELD	C	BEDWYR	D
AZELTINE	B	BALMAN	B	NONGRAVELLY		BAYFIELD, WET	D	BEE	B
AZTALAN	C	BALMAN, SALINE,	C	BARNEY	D	BAYHORSE	D	BEEBE	A
AZTEC	B	FLOODED		BARNHARDT	B	BAYLIS	B	BEECHER	C
AZTEC, HIGH	C	BALMLAKE	B	BARNMOT	D	BAYMEADE	A	BEECHGROVE	B
RAINFALL		BALMORHEA	C	BARNSDALL	B	BAYOU	D	BEECHWOOD	C
AZULE	C	BALON	B	BARNSTABLE	B	BAYOUDAN	D	BEEK	C
AZWELL	C	BALSORA	B	BARNUM	B	BAYSHORE	D	BEEKMAN	C
BAAHISH	B	BALTIC	D	BARODA	D	BAYSHORE,	B	BEELEM	D
BABB	B	BALTIMORE	B	BAROID	A	MODERATELY WET		BEELINE	D
BABBINGTON	B	BAMA	B	BAROID, WET	D	BAYSIDE	D	BEEMONT	C
BABELTHUAP	B	BAMAC	A	BARRADA	D	BAYTOWN	B	BEENOM	D
BACA	B	BAMBER	B	BARRE	D	BAYUCOS	D	BEESKOVE	B
BACA, FLOODED	C	BAMOS	C	BARRETT	D	BAYVI	D	BEETVILLE	B
BACH	B/D	BAMTUSH	B	BARRIER	D	BAYVIEW	D	BEEZEE	B
BACHELOR	B	BANADERU	D	BARRINGTON	B	BAYWOOD	A	BEFAR	D
BACHO	D	BANAT	B	BARRON	B	BAZETTE	C	BEGAY	B
BACHUS	C	BANBURY	D	BARRONETT	B/D	BAZILE	B	BEHANIN	B
BACKBAY	D	BANCAS	C	BARRY	B/D	BEACH	D	BEHEMOTOSH	C
BACKBONE	B	BANCKER	D	BARSAC	C	BEAD	C	BEHRING	D
BACLIFF	D	BANCROFT	B	BARSHAAD	D	BEADLE	C	BEIGLE	B
BACOBI	C	BANCY	D	BART	B	BEALAND	B	BEIRMAN	D
BACONA	B	BANDAG	B	BARTINE	C	BEALES	B	BEISIGL	A
BADAXE	B	BANDERA	B	BARTLE	D	BEAM	D	BEJE	D
BADENA	B	BANDID	B	BARTLEY	C	BEAMTON	C	BEJUCOS	B
BADENAUGH	B	BANDON	C	BARTO	D	BEANBLOSSOM	B	BELAIN	C
BADGE	B	BANE	A	BARTOME	D	BEANFLAT	C	BELATE	B
BADGERTON	B	BANGO	B	BARTON	B	BEANLAKE	B	BELCHER	D
BADIN	C	BANGOR	B	BARTONFLAT	B	BEANO	D	BELDEN	C
BADITO	C	BANGSTON	A	BARVON	B	BEAR BASIN	B	BELDING	B
BADO	D	BANIDA	D	BARX	B	BEAR CREEK	B	BELEN	D
BADUS	C/D	BANKARD	A	BASCAL	B	BEAR LAKE	D	BELFAST	B
BADWATER	B	BANKHEAD	B	BASCO	C	BEAR PRAIRIE	B	BELFIELD	C
BAGARD	B	BANKS	A	BASCOM	B	BEARDALL	C	BELFORE	B
BAGDAD	B	BANLIC	C	BASCOVY	D	BEARDEN	C	BELGARRA	C
BAGGOTT	D	BANNEL	B	BASEHOR	D	BEARDSLEY	C	BELGRADE	B
BAGLEY	B	BANNER	C	BASH	C	BEARDSTOWN	C	BELHAVEN	D
BAHEM	B	BANNING	C	BASHAW	D	BEARGULCH	B	BELINDA	D
BAHIA	A	BANNION	C	BASHER	B	BEARMOUTH	B	BELJICA	B
BAHL	C	BANNOCK	B	BASILE	D	BEARPAW	C	BELK	D
BAILE	D	BANTRY	A/D	BASIN	C	BEARSKIN	D	BELKNAP	C
BAILEGAP	B	BAPOS	D	BASINGER	B/D	BEARSPRING	B	BELLAVISTA	C
BAILEYCREEK	C	BARABOO	B	BASINGER,	D	BEARTRAP	B	BELLE	B
BAILING	C	BARAGA	C	DEPRESSIONAL		BEARVILLE	C	BELLECHESTER	A
BAINVILLE	C	BARANA	B	BASINGER, FLOODED	D	BEARWALLOW	C	BELLEHELEN	D
BAIRD HOLLOW	C	BARATARI	A/D	BASKET	B	BEASLEY	C	BELLENMINE	D
BAIRD HOLLOW,	D	BARBAROSA	D	BASSEL	B	BEASON	C	BELLEVILLE	B/D
EXTREMELY COBBLY		BARBARY	D	BASSETT	B	BEATRICE	D	BELLEVILLE, PONDED	D
BAIRD HOLLOW,	B	BARBERT	D	BASSFIELD	B	BEAUCOUP	B/D	BELLEVUE	B
GRAVELLY		BARBOUR	B	BASTIAN	C	BEAUFORD	D	BELLICUM	B
BAJURA	D	BARBOURVILLE	B	BASTON	C	BEAUGHTON	D	BELLINGHAM	D
BAKEOVEN	D	BARCAVE	B	BASTROP	B	BEAUMONT	D	BELLINGHAM,	C
BAKER	C	BARCE	B	BASTSIL	B	BEAUREGARD	C	DRAINED	
BAKERSVILLE	D	BARCLAY	C	BATA	B	BEAUSITE	C	BELLPASS	D
BALAAM	B	BARCO	B	BATAN	B	BEAUVAIS	B	BELLPINE	C
BALCOM	B	BARCUS	A	BATAVIA	B	BEAVERCREEK	B	BELLWOOD	D
BALD	C	BARD	D	BATEMAN	B	BEAVERDAM	C	BELMEAR	D
BALDER	D	BARDEN	C	BATES	B	BEAVERELL	B	BELMILL	B

NOTES: TWO HYDROLOGIC SOIL GROUPS SUCH AS B/C INDICATES THE DRAINED/UNDRAINED SITUATION.
MODIFIERS SHOWN, E.G., BEDROCK SUBSTRATUM, REFER TO A SPECIFIC SOIL SERIES PHASE FOUND IN SOIL MAP LEGEND.

Exhibit A-1, continued: Hydrologic soil groups for United States soils

Soil	Group
ECONFINA	A
ECTOR	D
EDALGO	C
EDDINGS	B
EDDS	B
EDDY	C
EDEN	C
EDENBOWER	D
EDENTON	C
EDFRO	D
EDGAR	B
EDGE	D
EDGEHILL	C
EDGELEY	C
EDGEMONT	B
EDGEWATER	C
EDGEWICK	C
EDGINGTON	C/D
EDINA	D
EDINBURG	C
EDISTO	C
EDLIN	B
EDLOE	B
EDMINSTER	D
EDMONDS	D
EDMORE	D
EDMUND	D
EDMUNDSTON	B
EDNA	D
EDNEYTOWN	B
EDNEYVILLE	B
EDOM	C
EDROY	D
EDSON	C
EDWARDS	B/D
[illegible]	B
EECOVE	D
EELPOINT	D
EEP	C
EFFIE	C
EFFINGTON	D
EGAM	C
EGAN	B
EGAS	D
EGBERT	D
EGBERT, STRATIFIED SUBSTRATUM	C
EGBERT, MODERATELY WET	C
EGBERT, DRAINED	C
EGBERT, SANDY SUBSTRATUM	C
EGBERT, SLOPING	C
EGELAND	B
EGINBENCH	C
EGLIN	A
EGYPT	D
EICKS	C
EIGHTLAR	D
EIGHTMILE	D
EILERTSEN	B
EITZEN	B
EKAH	C
EKALAKA	B
EKIM	C
EKRUB	D
EL DARA	B
EL PECO	C
EL RANCHO	B
EL SOLYO	C
ELAM	A
ELAM, HARDPAN SUBSTRATUM	B
ELANDCO	B
ELBA	C
ELBAVILLE	B
ELBERT	D
ELBETH	B
ELBON	B
ELBOWLAKE	B
ELBURN	B
ELBUTTE	C
ELCO	B
ELD	D
ELDEAN	B
ELDER	B
ELDER HOLLOW	D
ELDERON	B
ELDERON, STONY	A
ELDGIN	B
ELDON	B
ELDORADO	B
ELDRIDGE	C
ELECTRA	C
ELEROY	B
ELEVA	B
ELFCREEK	C
ELFRIDA	B
ELGEE	A
ELHINA	C
ELIJAH	C
ELINDIO	C
ELIOAK	C
ELIZA	D
ELK	B
ELK HOLLOW	B
ELK MOUNTAIN	B
ELKA	C
ELKADER	B
ELKCREEK	C
ELKHART	B
ELKHILLS	B
ELKHORN	B
ELKINS	D
ELKINSVILLE	B
ELKMOUND	D
ELKNER	B
ELKOL	D
ELKRIDGE	B
ELKSEL	C
ELKTON	C/D
ELLABELLE	D
ELLEDGE	C
ELLEN	B
ELLETT	D
ELLIBER	A
ELLICOTT	A
ELLINGTON	B
ELLINOR	C
ELLIOTT	C
ELLIOTTSVILLE	B
ELLIS	D
ELLISFORDE	B
ELLISVILLE	B
ELLOAM	D
ELLOREE	D
ELLSWORTH	C
ELLUM	C
ELLZEY	B/D
ELM LAKE	A/D
ELMDALE	B
ELMENDORF	D
ELMINA	C
ELMIRA	A
ELMONT	B
ELMORE	B
ELMRIDGE	C
ELMVILLE	B
ELMWOOD	C
ELNIDO	C
ELNORA	B
ELOCHOMAN	B
ELOCIN	D
ELOIKA	B
ELOMA	C
ELPAM	D
ELPEDRO	B
ELRED	B/D
ELRICK	B
ELRIN	B
ELROSE	B
ELS	A
ELSAH	B
ELSIE	B
ELSINBORO	B
ELSMERE	A
ELSTON	B
ELTREE	B
ELTSAC	D
ELVE	B
ELVEDERE	C
ELVERS	B/D
ELVIRA	B/D
ELWELL	C
ELWHA	C
ELWOOD	C
ELY	B
ELYSIAN	B
ELZINGA	B
EMBAL	B
EMBARGO	C
EMBDEN	B
EMBERTON	C
EMBLEM	B
EMBRY	B
EMBUDO	C
EMDENT	D
EMDENT, BEDROCK SUBSTRATUM, DRAINED	C
EMDENT, DRAINED	C
EMERALD	B
EMERALDA	D
EMERSON	B
EMIGRANT	C
EMIGRATION	C
EMILY	B
EMLIN	C
EMMA	C
EMMERT	A
EMMET	B
EMMONS	B
EMORY	B
EMOT	B
EMPEDRADO	B
EMPEYVILLE	C
EMPIRE	B
EMPORIA	C
EMRICK	B
EMRO	C
ENBAR	B
ENBAR, WET	D
ENCAMPMENT	B
ENCHANTED	B
ENCIERRO	D
ENCINA	B
ENDCAV	C
ENDERS	C
ENDERSBY	B
ENDICOTT	C
ENDLICH	B
ENDSAW	C
ENERGY	B
ENET	B
ENFIELD	B
ENGELHARD	B/D
ENGETT	A
ENGLE	B
ENGLEWOOD	C
ENKO	C
ENKO, OVERBLOWN	B
ENLOE	D
ENNING	D
ENNIS	B
ENOCH	C
ENOCHVILLE	D
ENOCHVILLE, DRAINED	C
ENOLA	B
ENON	C
ENOREE	D
ENOS	C
ENOSBURG	C
ENSENADA	B
ENSIGN	D
ENSLEY	B/D
ENSTROM	B
ENTENTE	B
ENTERO	D
ENTERPRISE	B
ENTIAT	D
ENTMOOT	C
ENVILLE	C
ENVOL	D
ENZIAN	D
EOJ	C
EOLA	D
EPHRAIM	C
EPHRATA	B
EPIKOM	D
EPLEY	C
EPOKE	B
EPOT	B
EPOUFETTE	B/D
EPPING	D
EPSIE	D
EPVIP	D
EQUIS	D
ERA	B
ERAKATAK	C
ERAM	C
ERAMOSH	D
ERBER	C
ERCAN	B
ERD	D
ERICSON	B
ERIE	C
ERIN	B
ERNEM	D
ERNEST	C
ERNO	B
ERRAMOUSPE	C
ERVIDE	C
ESCABOSA	C
ESCALANTE	B
ESCAMBIA	C
ESCANABA	A
ESCANO	C
ESCARLO	B
ESCONDIDO	C
ESHAMY	B
ESLENDO	D
ESMERALDA	B
ESMOND	B
ESPARTO	B
ESPELIE	B/D
ESPIL	D
ESPINAL	A
ESPINOSA	B
ESPINT	D
ESPLIN	D
ESPY	C
ESQUATZEL	B
ESRO	D
ESRO, MODERATELY WET	C
ESS	B
ESSAL	B
ESSEN	C
ESSEX	C
ESSEXVILLE	A/D
ESTACADO	B
ESTACION	B
ESTATE	C
ESTELLINE	B
ESTER	D
ESTER, THAWED	C
ESTERO	D
ESTES	D
ESTESLAKE	C
ESTHERVILLE	B
ESTO	B
ESTRELLA	B
ETACH	C
ETCHEN	C
ETELKA	C
ETHAN	B
ETHANIA	B
ETHELMAN	B
ETHETE	B
ETHETE, SALINE	C
ETHRIDGE	C
ETIL	A
ETOE	B
ETOILE	D
ETOWAH	B
ETOWN	B
ETSEL	D
ETTA	B
ETTER	B
ETTERSBURG	B
ETTPICK	B/D
EUBANKS	B
EUCLID	C
EUDORA	B
EUER	B
EUFAULA	A
EUHARLEE	C
EULONIA	C
EUNOLA	C
EUREKA	D
EUSEBIO	C
EUSTIS	A
EUTAW	D
EVADALE	D
EVANGELINE	C
EVANS	B
EVANSHAM	D
EVANSTON	B
EVANSVILLE	B/D
EVANT	D
EVARD	B
EVARO	B
EVART	D
EVENDALE	C
EVERETT	A
EVERETT, HARD SUBSTRATUM	B
EVERGLADES	B/D
EVERLY	B
EVERMAN	C
EVERSON	D
EVERWHITE	C
EVESBORO	A
EVRIDGE	B
EWA	B
EWA, BEDROCK SUBSTRATUM	C
EWALL	A
EXCELSIOR	B
EXCHEQUER	D
EXCLOSE	B
EXEL	C
EXETER	C
EXETER, THICK SOLUM	B
EXETTE	B
EXIRA	B
EXLINE	D
EXRAY	D
EXUM	C
EYAK	C
EYERBOW	C
EYLAU	C

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Exhibit A-1, continued: Hydrologic soil groups for United States soils

HESCH	B
HESPER	B
HESPERIA	B
HESPERUS	B
HESSEL	B/D
HESSELBERG	D
HESSELTINE	B
HESSING	B
HESSLAN	C
HESSON	C
HETERWA	C
HETTINGER	C/D
HEUSSER	C
HEUVELTON	C
HEWITT	D
HEXT	B
HEYDER	B
HEYDLAUFF	B
HEYTOU	B
HEZEL	B
HI VISTA	C
HIARC	C
HIBAR	C
HIBBARD	C
HIBBING	C
HIBERNIA	C
HIBRITEN	B
HICKMAN	B
HICKORY	C
HICKS	B
HICKSVILLE	B
HICKSVILLE, BEDROCK SUBSTRATUM	C
HICOTA	B
HIDALGO	B
HIDATSA	B
HIDEAWAY	D
HIDEWOOD	B/D
HIERRO	B
HIGGINS	D
HIGGINSVILLE	C
HIGH GAP	C
HIGHAMS	D
HIGHBANK	C
HIGHCAMP	B
HIGHFIELD	B
HIGHHORN	B
HIGHMORE	B
HIGHPOINT	D
HIGHROCK	D
HIGHTOWER	C
HIGHWOOD	C
HIHIMANU	B
HIIBNER	C
HIKO PEAK	B
HIKO SPRINGS	B
HILAIRE	B
HILAND	B
HILDEBRECHT	C
HILDRETH	D
HILEA	D
HILES	B
HILGER	B
HILGRAVE	B
HILIGHT	D
HILINE	D
HILLBRICK	D
HILLCO	B
HILLEMANN	C
HILLERY	C
HILLET	B/D
HILLFIELD	B
HILLGATE	D
HILLIARD	B
HILLIARD, MODERATELY WELL DRAINED	C
HILLON	C
HILLSBORO	B
HILLSDALE	B
HILLTO	B
HILLWOOD	B
HILMAR	D
HILMAR, DRAINED	B
HILMOE	C
HILO	A
HILOLO	D
HILT	B
HILTON	B
HINCKLEY	A
HINDES	C
HINESBURG	C
HINKER	C
HINKLE	D
HINMAN	C
HINSDALE	D
HIRAMSBURG	C
HIRIDGE	D
HIRSCHDALE	C
HISEGA	C
HISKEY	B
HISLE	D
HITCHCOCK	B
HITILO	A
HITT	B
HIVAL	D
HIWAN	D
HIWASSEE	B
HIWOOD	A
HIXTON	B
HOADLY	C
HOBACKER	B
HOBAN	B
HOBBS	B
HOBCAW	D
HOBE	A
HOBERG	C
HOBIT	C
HOBO	D
HOBOG	D
HOBONNY	D
HOBSON	C
HOBUCKEN	D
HOCAR	D
HOCHHEIM	B
HOCKINSON	D
HOCKINSON, MODERATELY WET	C
HOCKINSON, DRAINED	B
HOCKLEY	C
HOCKLEY, GRADED	D
HODA	C
HODEDO	C
HODENPYL	B
HODGE	A
HODGINS	B
HODGSON	C
HOEHNE	A
HOFFLAND	D
HOFFMANVILLE	C
HOFFSTADT	B
HOFLY	C
HOGADERO	B
HOGANSBURG	B
HOGBACK	C
HOGG	C
HOGMALAT	D
HOGRIS	B
HOH	B
HOHMANN	C
HOKO	C
HOLBORN	C
HOLBROOK	B
HOLCOMB	D
HOLDAWAY	D
HOLDEN	B
HOLDER	B
HOLDERMAN	C
HOLDERNESS	C
HOLDINGFORD	C
HOLDREGE	B
HOLILLIPAH	A
HOLLAND	B
HOLLANDLAKE	B
HOLLINGER	B
HOLLIS	C/D
HOLLISTER	D
HOLLOMAN	D
HOLLOMEX	B
HOLLOW	C
HOLLOWAY	B
HOLLOWTREE	C
HOLLY	B/D
HOLLY, PONDED	D
HOLLY SPRINGS	D
HOLLYWELL	B
HOLLYWOOD	D
HOLMAN	A
HOLMDEL	C
HOLMES	B
HOLOHAN	B
HOLOMUA	B
HOLOPAW	B/D
HOLOPAW, DEPRESSIONAL	C
HOLOPAW, FREQUENTLY FLOODED	D
HOLSINE	B
HOLSTEIN	B
HOLSTON	B
HOLT	B
HOLTER	B
HOLTLE	B
HOLTON	C
HOLTVILLE	C
HOLYOKE	C/D
HOMA	C
HOME CAMP	C
HOMELAKE	B
HOMELAND	C
HOMER	B
HOMESTAKE	C
HOMESTEAD	B
HOMEWOOD	C
HOMME	C
HOMME, MODERATELY WET	B
HOMOSASSA	D
HONAUNAU	C
HONCUT	B
HONDALE	D
HONDOHO	B
HONEOYE	B
HONEYDEW	C
HONEYGROVE	B
HONEYJONES	B
HONEYVILLE	C
HONKER	D
HONLAK	C
HONLAK, DRAINED	B
HONLU	B
HONN	B
HONOBIA	C
HONOKAA	A
HONOLUA	B
HONOMANU	A
HONONEGAH	A
HONOULIULI	B
HONTAS	B
HONTOON	B/D
HONUAULU	A
HOOD	B
HOODLE	B
HOODOO	D
HOODSPORT	C
HOODVIEW	D
HOOGDAL	C
HOOKS	B
HOOKSAN	A
HOOKTON	C
HOOLEHUA	B
HOOLY	C
HOOPAL	D
HOOPER	D
HOOPESTON	B
HOOPLITE	D
HOOSAN	B
HOOSEGOW	B
HOOSIC	A
HOOSIERVILLE	C
HOOSIMBIM	B
HOOT	D
HOOTEN	D
HOPCO	C
HOPDRAW	A
HOPEKA	D
HOPKINS	B
HOPLAND	B
HOPLEY	B
HOPSONVILLE	C
HOQUIAM	B
HORD	B
HOREB	C
HOREB, GRAVELLY SUBSTRATUM	B
HORNELL	D
HORNING	B
HORNITOS	D
HORNSBY	C
HORNSVILLE	C
HORROCKS	B
HORSECAMP	D
HORSERIDGE	B
HORSESHOE	B
HORSETHIEF	B
HORSLEY	D
HORST	B
HORTONVILLE	B
HOSKIN	C
HOSKINNINI	D
HOSLEY	D
HOSMER	C
HOSSICK	B
HOSTAGE	B
HOT LAKE	C
HOTAW	C
HOTCHEEK	D
HOTEL	C
HOTSPRINGS	B
HOUDEK	B
HOUGH	B
HOUGHTON	A/D
HOUGHTON, PONDED	D
HOUGHTONVILLE	C
HOUK	C
HOULA	B
HOULKA	D
HOURGLASS	B
HOUSE MOUNTAIN	D
HOUSER	D
HOUSEROCK	D
HOUSTAKE	C
HOUSTON	D
HOUSTON BLACK	D
HOVDE	D
HOVEN	D
HOVENWEEP	C
HOVERT	D
HOVEY	C
HOWARD	A
HOWARDSVILLE	A
HOWCAN	B
HOWCREE	C
HOWE	C
HOWELL	C
HOWLAND	C
HOWSON	C
HOYE	B
HOYLETON	C
HOYPUS	A
HOYTVILLE	C/D
HUACHUCA	D
HUALAPAI	C
HUB	B
HUBBARD	A
HUBBARDTON	D
HUBBELL	B
HUBERLY	D
HUBERT	B
HUBLERSBURG	B
HUCKLEBERRY	C
HUCKLEBERRY, HIGH RAINFALL	B
HUDNUT	B
HUDSON	C
HUECO	C
HUEL	A
HUENEME	C
HUENEME, MODERATELY WET	B
HUENEME, DRAINED	B
HUERFANO	D
HUEY	D
HUFFINE	B
HUFFMAN	B
HUFFTON	B
HUGGINS	C
HUGHES	B
HUGHESVILLE	C
HUGO	B
HUGUS	B
HUGUSTON	D
HUICHICA	C
HUICHICA, PONDED	D
HUIKAU	A
HUKILL	B
HULETT	B
HULLS	C
HULLT	B
HULUA	D
HUM	B
HUMACAO	B
HUMATAS	C
HUMBARGER	B
HUMBIG	C
HUMBIRD	B
HUMBOLDT	D
HUMBOLDT, MODERATELY WET, SALINE-ALKALI	B
HUMBOLDT, MODERATELY WET, SALINE	B
HUMBOLDT, DRAINED, STRONGLY SALINE	B
HUMBOLDT, DRAINED, NONSALINE	B
HUMBOLDT, MODERATELY WET	B
HUMBOLDT, DRAINED	B
HUMDUN	B
HUME	C
HUMESTON	C/D
HUMKER	C
HUMMINGTON	C
HUMPHREYS	B
HUMPTULIPS	B
HUMSKEL	C
HUN	B
HUNCHBACK	D
HUNDRAW	D
HUNEWILL	B
HUNGRY	C

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Table 2-2a.—Runoff curve numbers for urban areas[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2c.—Runoff curve numbers for other agricultural lands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing.[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element.[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	[4]30	48	65	73
Woods—grass combination (orchard or tree farm).[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods.[6]	Poor	45	66	77	83
	Fair	36	60	73 (76)	79
	Good	[4]30	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

[1]Average runoff condition, and $I_a = 0.2S$.

[2]*Poor:* <50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only occasionally grazed.

[3]*Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

[4]Actual curve number is less than 30; use CN = 30 for runoff computations.

[5]CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[6]*Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

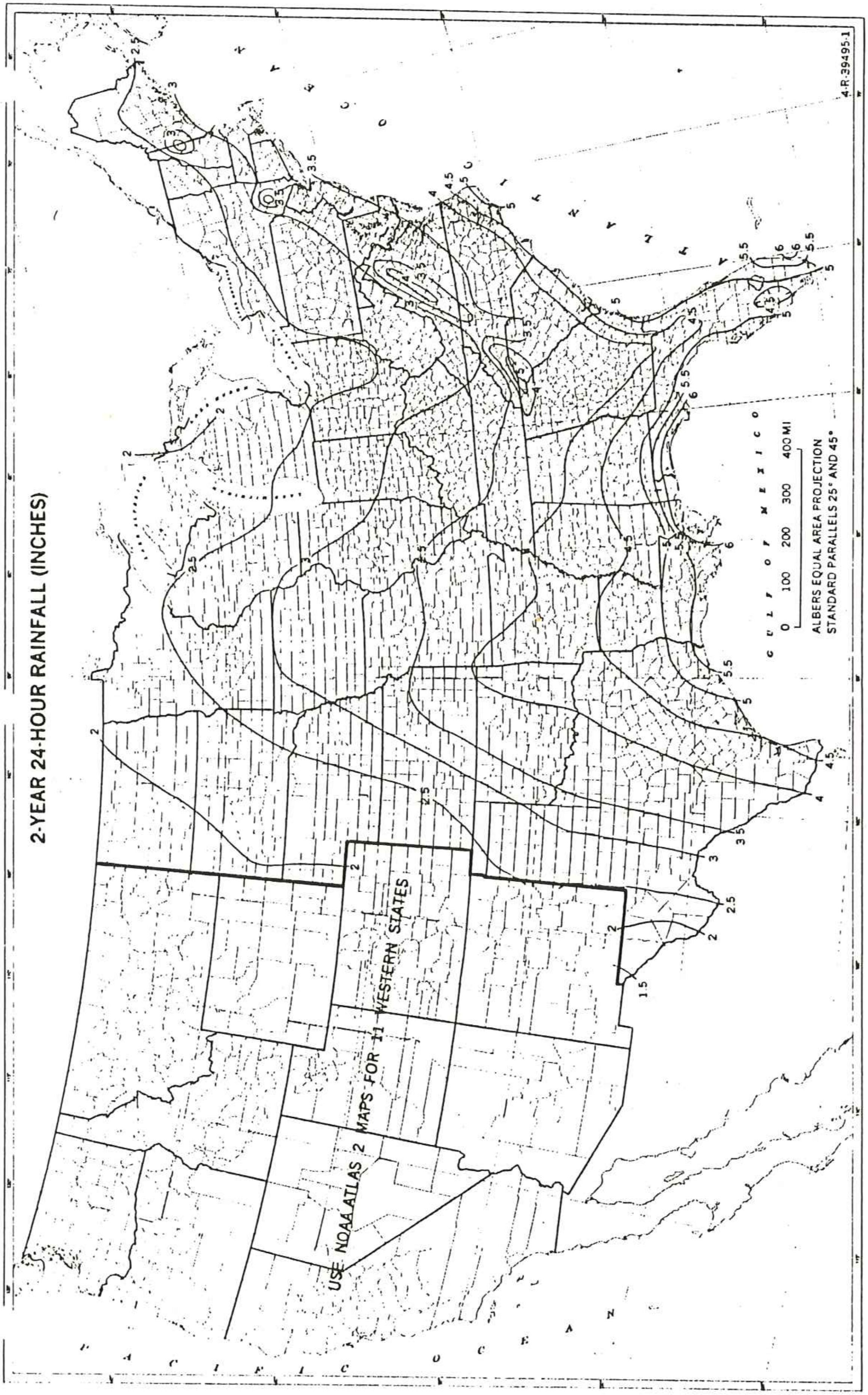


Figure B-3.—Two-year, 24-hour rainfall.

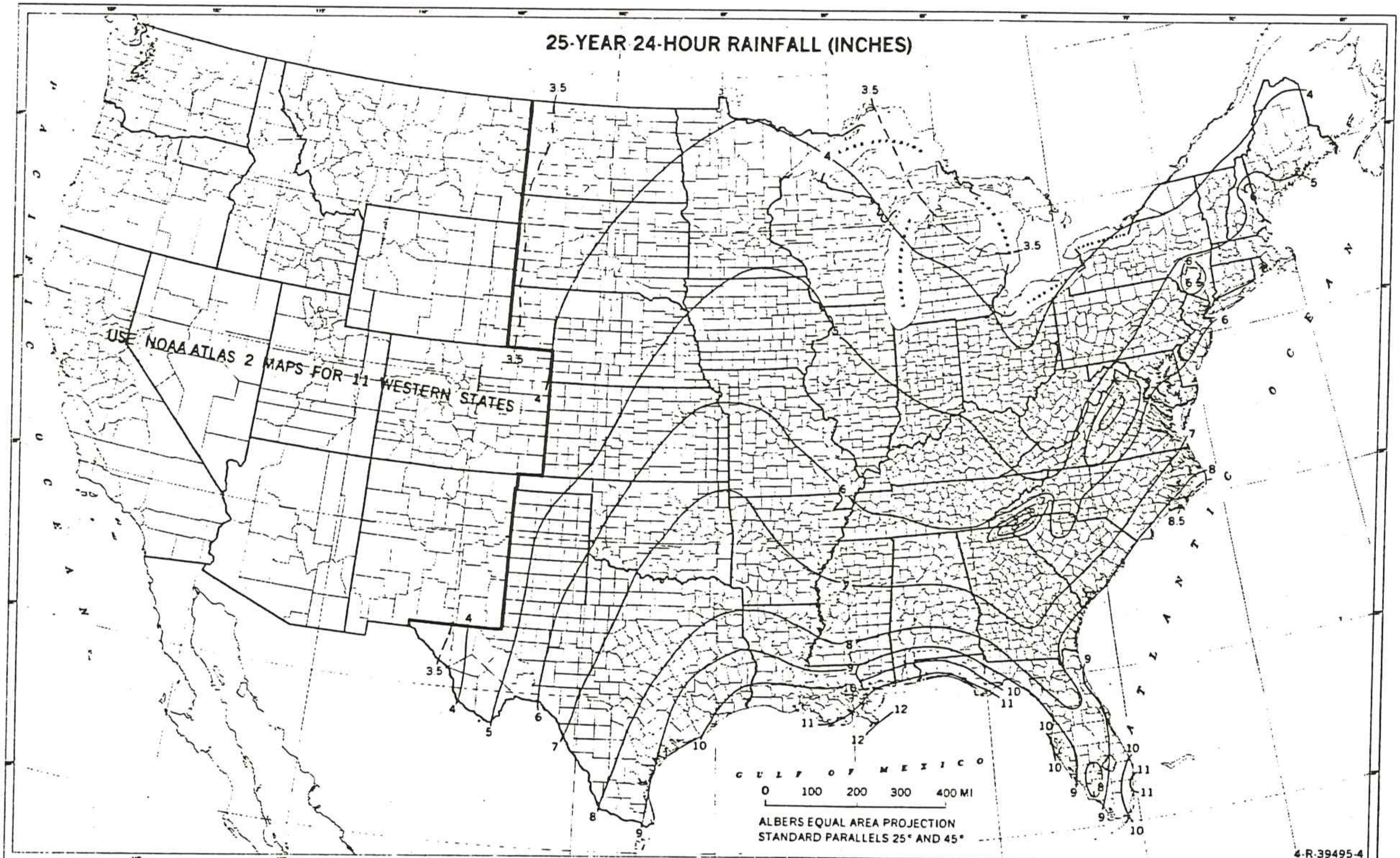


Figure B-6.—Twenty-five-year, 24-hour rainfall.

texture is given in appendix A for determining the HSG classification for disturbed soils.

Cover type

Table 2-2 addresses most cover types, such as vegetation, bare soil, and impervious surfaces. There are a number of methods for determining cover type. The most common are field reconnaissance, aerial photographs, and land use maps.

Treatment

Treatment is a cover type modifier (used only in table 2-2b) to describe the management of cultivated agricultural lands. It includes mechanical practices, such as contouring and terracing, and management practices, such as crop rotations and reduced or no tillage.

Hydrologic condition

Hydrologic condition indicates the effects of cover type and treatment on infiltration and runoff and is generally estimated from density of plant and residue cover on sample areas. *Good* hydrologic condition indicates that the soil usually has a low runoff potential for that specific hydrologic soil group, cover type, and treatment. Some factors to consider in estimating the effect of cover on infiltration and runoff are (a) canopy or density of lawns, crops, or other vegetative areas; (b) amount of year-round cover; (c) amount of grass or close-seeded legumes in rotations; (d) percent of residue cover; and (e) degree of surface roughness.

Table 2-1.—Runoff depth for selected CN's and rainfall amounts[1]

Rainfall	Runoff depth for curve number of—												
	40	45	50	55	60	65	70	75	80	85	90	95	98
	inches												
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56	0.79
1.2	.00	.00	.00	.00	.00	.00	.03	.07	.15	.27	.46	.74	.99
1.4	.00	.00	.00	.00	.00	.02	.06	.13	.24	.39	.61	.92	1.18
1.6	.00	.00	.00	.00	.01	.05	.11	.20	.34	.52	.76	1.11	1.38
1.8	.00	.00	.00	.00	.03	.09	.17	.29	.44	.65	.93	1.29	1.58
2.0	.00	.00	.00	.02	.06	.14	.24	.38	.56	.80	1.09	1.48	1.77
2.5	.00	.00	.02	.08	.17	.30	.46	.65	.89	1.18	1.53	1.96	2.27
3.0	.00	.02	.09	.19	.33	.51	.71	.96	1.25	1.59	1.98	2.45	2.77
3.5	.02	.08	.20	.35	.53	.75	1.01	1.30	1.64	2.02	2.45	2.94	3.27
4.0	.06	.18	.33	.53	.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
4.5	.14	.30	.50	.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92	4.26
5.0	.24	.44	.69	.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	.50	.80	1.14	1.52	1.92	2.35	2.81	3.28	3.78	4.30	4.85	5.41	5.76
7.0	.84	1.24	1.68	2.12	2.60	3.10	3.62	4.15	4.69	5.25	5.82	6.41	6.76
8.0	1.25	1.74	2.25	2.78	3.33	3.89	4.46	5.04	5.63	6.21	6.81	7.40	7.76
9.0	1.71	2.29	2.88	3.49	4.10	4.72	5.33	5.95	6.57	7.18	7.79	8.40	8.76
10.0	2.23	2.89	3.56	4.23	4.90	5.56	6.22	6.88	7.52	8.16	8.78	9.40	9.76
11.0	2.78	3.52	4.26	5.00	5.72	6.43	7.13	7.81	8.48	9.13	9.77	10.39	10.76
12.0	3.38	4.19	5.00	5.79	6.56	7.32	8.05	8.76	9.45	10.11	10.76	11.39	11.76
13.0	4.00	4.89	5.76	6.61	7.42	8.21	8.98	9.71	10.42	11.10	11.76	12.39	12.76
14.0	4.65	5.62	6.55	7.44	8.30	9.12	9.91	10.67	11.39	12.08	12.75	13.39	13.76
15.0	5.33	6.36	7.35	8.29	9.19	10.04	10.85	11.63	12.37	13.07	13.74	14.39	14.76

[1]Interpolate the values shown to obtain runoff depths for CN's or rainfall amounts not shown.

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project EXCESS INS UND. By DM. Date 11-10-86

Location CUMBERLAND COUNTY. Checked JP Date 11-26-86

Circle one: (Present) Developed

Circle one: (T_c) T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

	Segment ID	AB.	SKETCH 1.1 (FOR WRKSHT 2	
1. Surface description (table 3-1)		WOODED BRUSH		
2. Manning's roughness coeff., n (table 3-1) ..		.40		
3. Flow length, L (total L ≤ 300 ft)	ft	300		
4. Two-yr 24-hr rainfall, P_2 ...WRKSHT 2......	in	3.0		
5. Land slope, s	ft/ft	.08		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr	.51	+	= .51

Shallow concentrated flow

	Segment ID	BC	SKETCH 1.1	
7. Surface description (paved or unpaved)		UNPAVED		
8. Flow length, L	ft	100		
9. Watercourse slope, s	ft/ft	.07		
10. Average velocity, V (figure 3-1)	ft/s	4.2		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	.01	+	= .01

Channel flow

	Segment ID			
12. Cross sectional flow area, a	ft^2			
13. Wetted perimeter, p_w	ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft			
15. Channel slope, s	ft/ft			
16. Manning's roughness coeff., n				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s			
18. Flow length, L	ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+	=

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) .... hr .52

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project EXCESS INS. UNDW. By DM Date 11-10-86

Location CUMBERLAND COUNTY Checked JP Date 11-26-86

Circle one: Present (Developed)

Circle one: (T_c) T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)	Segment ID		AB	SKETCH 1.1 (WRKSHT 2)	
1. Surface description (table 3-1)			WOODED L. GRASSED		
2. Manning's roughness coeff., n (table 3-1) ..			.40		
3. Flow length, L (total L ≤ 300 ft)		ft	200		
4. Two-yr 24-hr rainfall, P_2 ....WRKSHT 2....		in	3		
5. Land slope, s		ft/ft	.08		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$	Compute T_t	hr	.37	+	= .37
Shallow concentrated flow	Segment ID		BC		
7. Surface description (paved or unpaved)			PAVED		
8. Flow length, L		ft	200		
9. Watercourse slope, s		ft/ft	.07		
10. Average velocity, V (figure 3-1)		ft/s	5.5		
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	.01	+	= .01
Channel flow	Segment ID				
12. Cross sectional flow area, a		ft^2			
13. Wetted perimeter, p_w		ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$	Compute r	ft			
15. Channel slope, s		ft/ft			
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s			
18. Flow length, L		ft			
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr		+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)		hr			.38

Sheet flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. These n values are for very shallow flow depths of about 0.1 foot or so. Table 3-1 gives Manning's n values for sheet flow for various surface conditions.

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overton and Meadows 1976) to compute T_t:

$$T_t = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,s^{0.4}} \qquad \text{[Eq. 3-3]}$$

where

T_t = travel time (hr),
n = Manning's roughness coefficient (table 3-1),
L = flow length (ft),
P_2 = 2-year, 24-hour rainfall (in), and
s = slope of hydraulic grade line (land slope, ft/ft).

This simplified form of the Manning's kinematic solution is based on the following: (1) shallow steady uniform flow, (2) constant intensity of rainfall excess (that part of a rain available for runoff), (3) rainfall duration of 24 hours, and (4) minor effect of infiltration on travel time. Rainfall depth can be obtained from appendix B.

Table 3-1.—Roughness coefficients (Manning's n) for sheet flow

Surface description	n[1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses[2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1]The n values are a composite of information compiled by Engman (1986).
[2]Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
[3]When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

Shallow concentrated flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from figure 3-1, in which average velocity is a function of watercourse slope and type of channel. For slopes less than 0.005 ft/ft, use equations given in appendix F for figure 3-1. Tillage can affect the direction of shallow concentrated flow. Flow may not always be directly down the watershed slope if tillage runs across the slope.

After determining average velocity in figure 3-1, use equation 3-1 to estimate travel time for the shallow concentrated flow segment.

Open channels

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bank-full elevation.

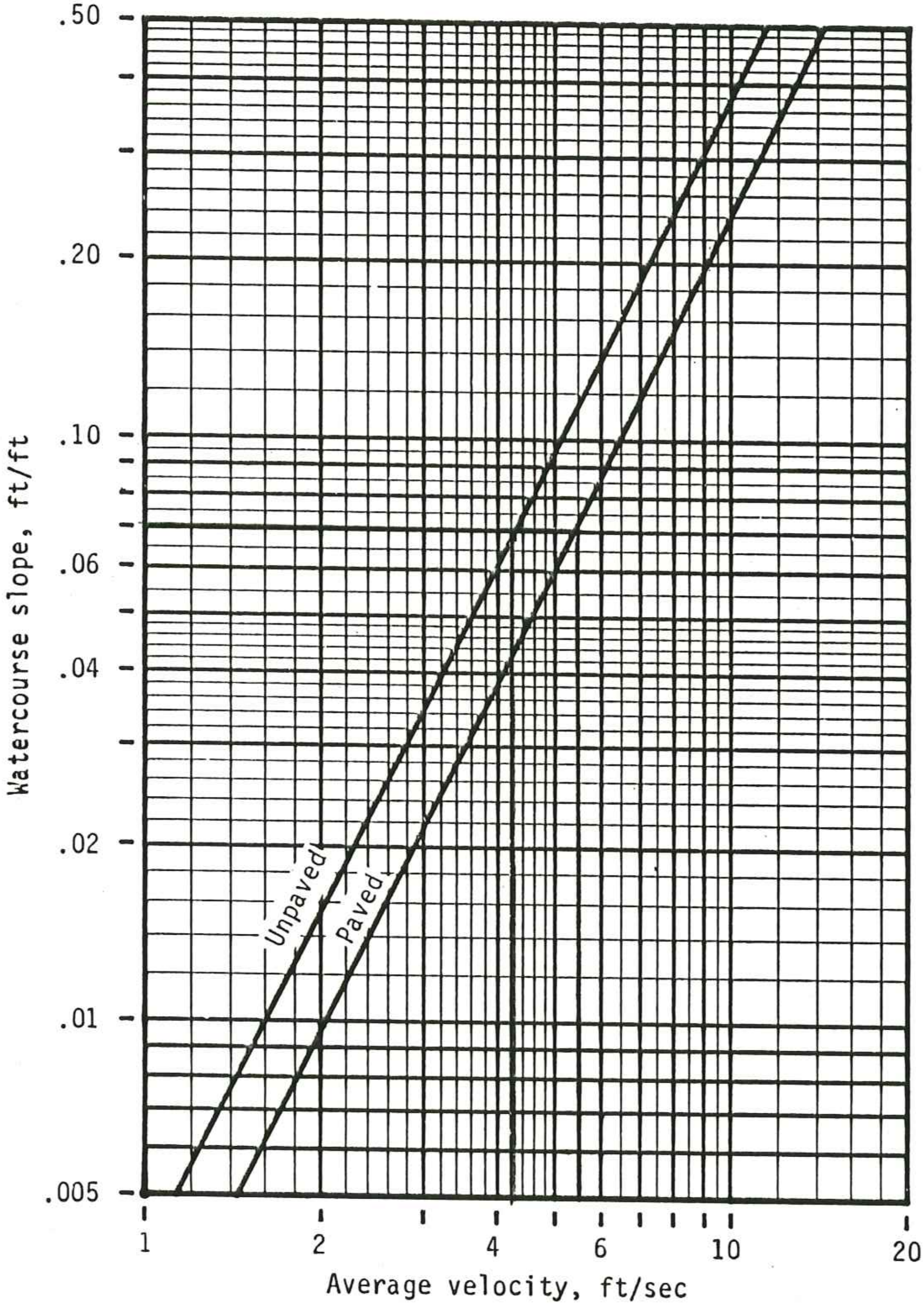


Figure 3-1.—Average velocities for estimating travel time for shallow concentrated flow.

Worksheet 4: Graphical Peak Discharge method

Project EXCESS INS UNDW. By DM. Date 11-10-86

Location CUMBERLAND COUNTY Checked JP Date 11-26-86

Circle one: (Present) Developed

1. Data:

Drainage area .... A_m = .003 mi^2 (acres/640)

Runoff curve number .... CN = 68 (From worksheet 2)

Time of concentration .. T_c = .52 hr (From worksheet 3)

Rainfall distribution type = III (I, IA, II, III)

Pond and swamp areas spread throughout watershed ...... = – percent of A_m (– acres or mi^2 covered)

			Storm #1	Storm #2	Storm #3
2.	Frequency	yr	2	25	
3.	Rainfall, P (24-hour)	in	3	5	
4.	Initial abstraction, I_a .... (Use CN with table 4-1.)	in	.941	.941	
5.	Compute I_a/P		.314	.188	
6.	Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-III)	csm/in	330	380	
7.	Runoff, Q .... (From worksheet 2).	in	.63	1.88	
8.	Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.0	1.0	
9.	Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	cfs	.624	2.14	

Worksheet 4: Graphical Peak Discharge method

Project EXCESS INS UNDERWRITERS By DM. Date 11-10-86

Location CUMBERLAND COUNTY Checked JP Date 11-26-86

Circle one: Present (Developed)

1. Data:

Drainage area .... A_m = .003 mi^2 (acres/640) 1.87 ACRES

Runoff curve number .... CN = 81 (From worksheet 2)

Time of concentration .. T_c = .38 hr (From worksheet 3)

Rainfall distribution type = III (I, IA, II, III).

Pond and swamp areas spread throughout watershed ...... = — percent of A_m (— acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	2	25	
3. Rainfall, P (24-hour)	in	3	5	
4. Initial abstraction, I_a .... (Use CN with table 4-1.)	in	.469	.469	
5. Compute I_a/P		.156	.094	
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-III)	csm/in	440	480	
7. Runoff, Q .... (From worksheet 2).	in	1.31	3.00	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.0	1.0	
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	cfs	1.73	4.32	

(210-VI-TR-55, Second Ed., June 1986)

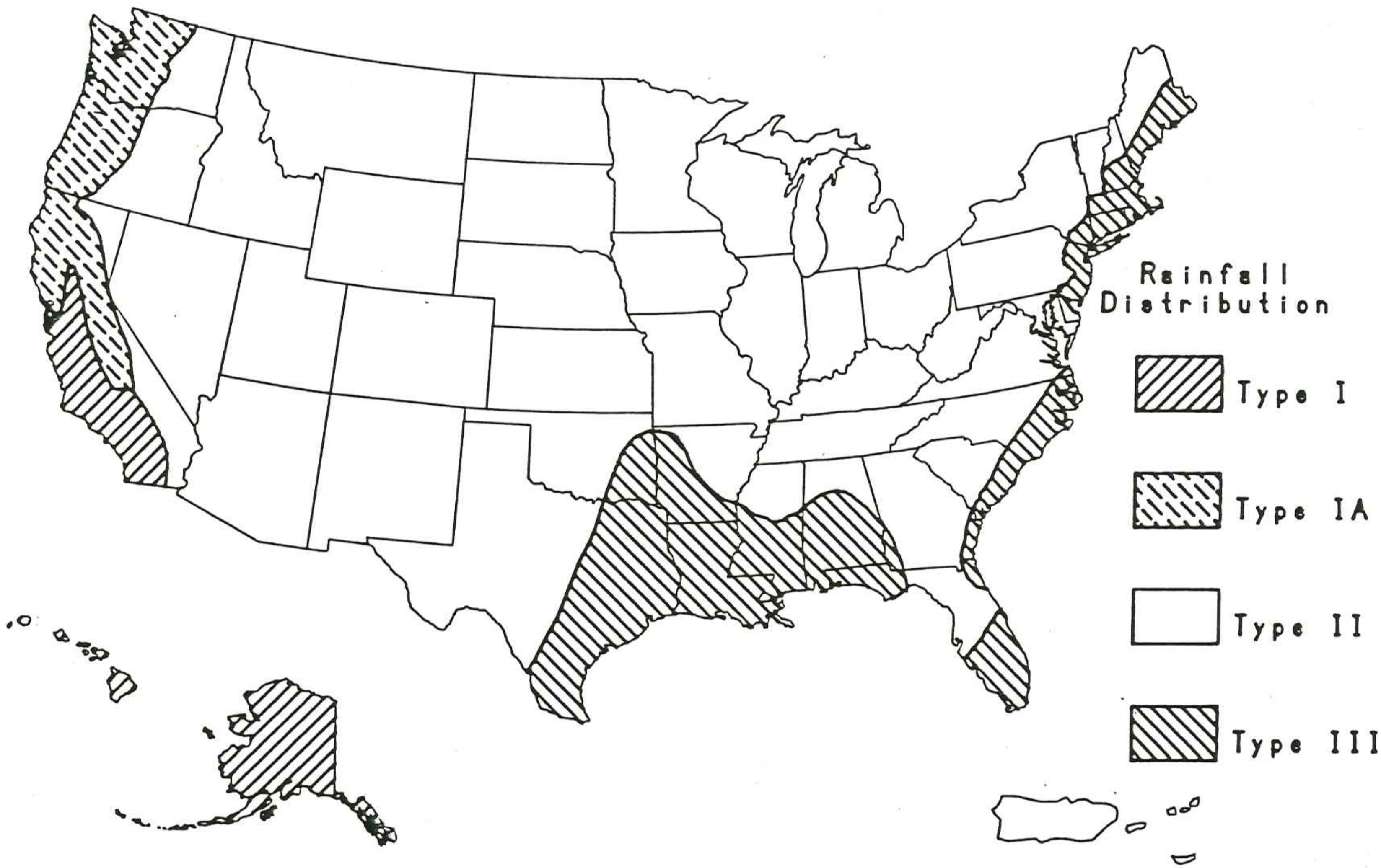


Figure B-2.—Approximate geographic boundaries for SCS rainfall distributions.

Chapter 4: Graphical Peak Discharge method

This chapter presents the Graphical Peak Discharge method for computing peak discharge from rural and urban areas. The Graphical method was developed from hydrograph analyses using TR-20, "Computer Program for Project Formulation—Hydrology" (SCS 1983). The peak discharge equation used is

$$q_p = q_u A_m Q F_p \qquad \text{[Eq. 4-1]}$$

where

q_p = peak discharge (cfs);
q_u = unit peak discharge (csm/in);
A_m = drainage area (mi^2);
Q = runoff (in); and
F_p = pond and swamp adjustment factor.

The input requirements for the Graphical method are as follows: (1) T_c (hr), (2) drainage area (mi^2), (3) appropriate rainfall distribution (I, IA, II, or III), (4) 24-hour rainfall (in), and (5) CN. If pond and swamp areas are spread throughout the watershed and are not considered in the T_c computation, an adjustment for pond and swamp areas is also needed.

Peak discharge computation

For a selected rainfall frequency, the 24-hour rainfall (P) is obtained from appendix B or more detailed local precipitation maps. CN and total runoff (Q) for the watershed are computed according to the methods outlined in chapter 2. The CN is used to determine the initial abstraction (I_a) from table 4-1. I_a/P is then computed.

If the computed I_a/P ratio is outside the range shown in exhibit 4 (4-I, 4-IA, 4-II, and 4-III) for the rainfall distribution of interest, then the limiting value should be used. If the ratio falls between the limiting values, use linear interpolation. Figure 4-1 illustrates the sensitivity of I_a/P to CN and P.

Peak discharge per square mile per inch of runoff (q_u) is obtained from exhibit 4-I, 4-IA, 4-II, or 4-III by using T_c (chapter 3), rainfall distribution type, and I_a/P ratio. The pond and swamp adjustment factor is obtained from table 4-2 (rounded to the nearest table value). Use worksheet 4 in appendix D to aid in computing the peak discharge using the Graphical method.

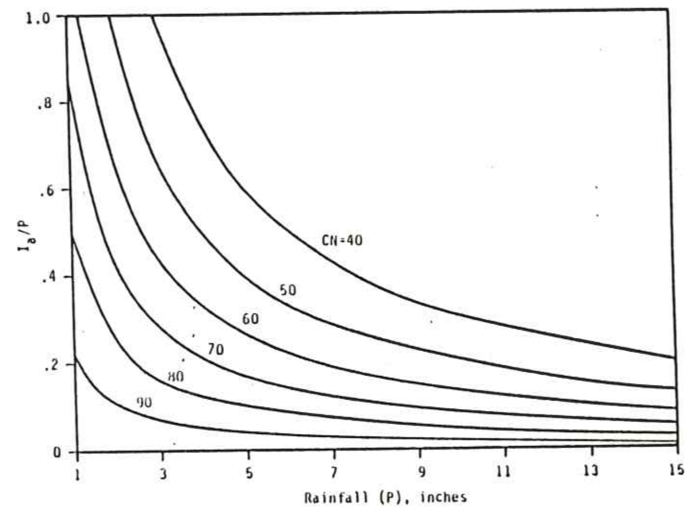
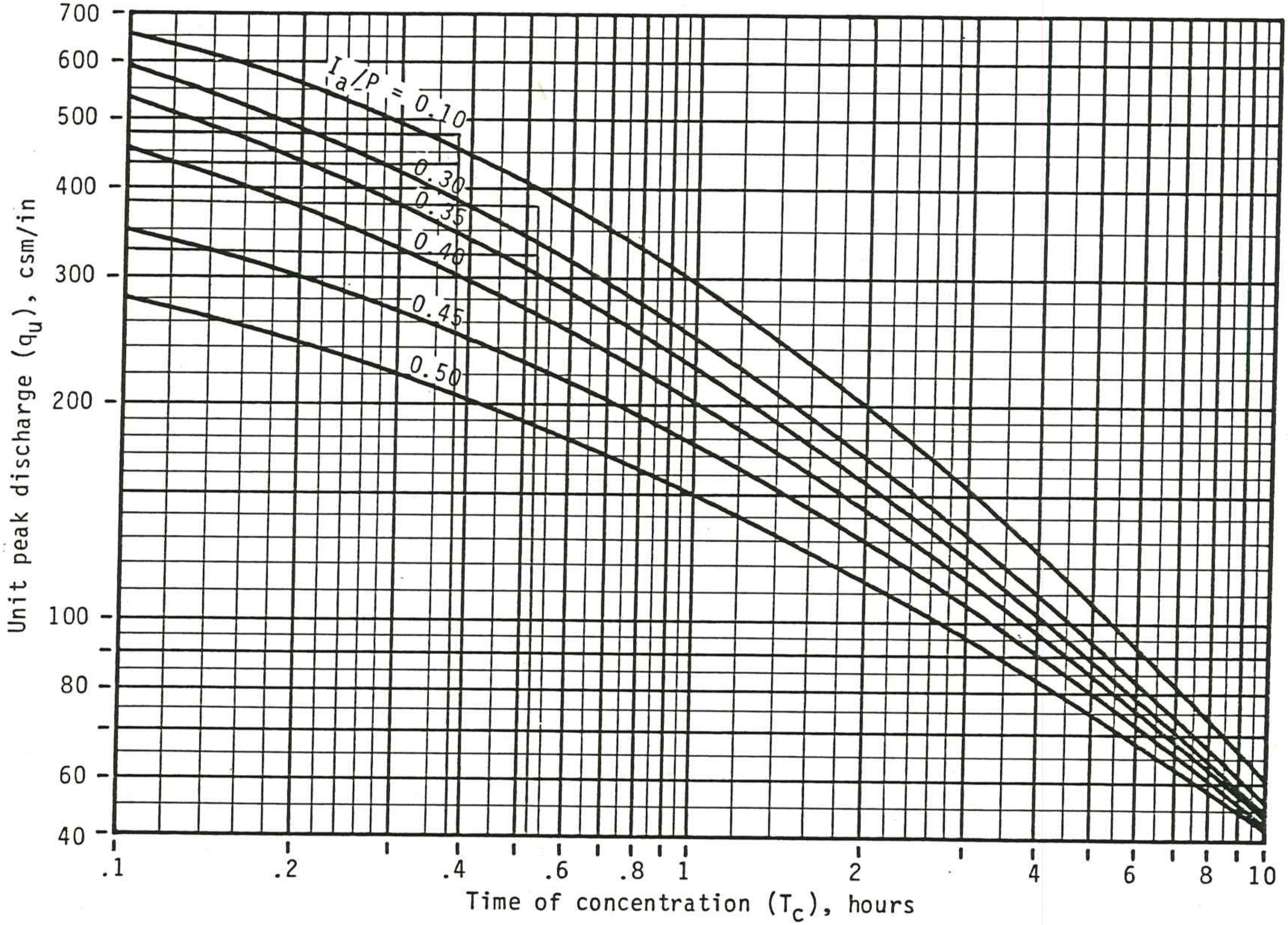


Figure 4-1.—Variation of I_a/P for P and CN.

Table 4-1.—I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Exhibit 4-III: Unit peak discharge (q_u) for SCS type III rainfall distribution

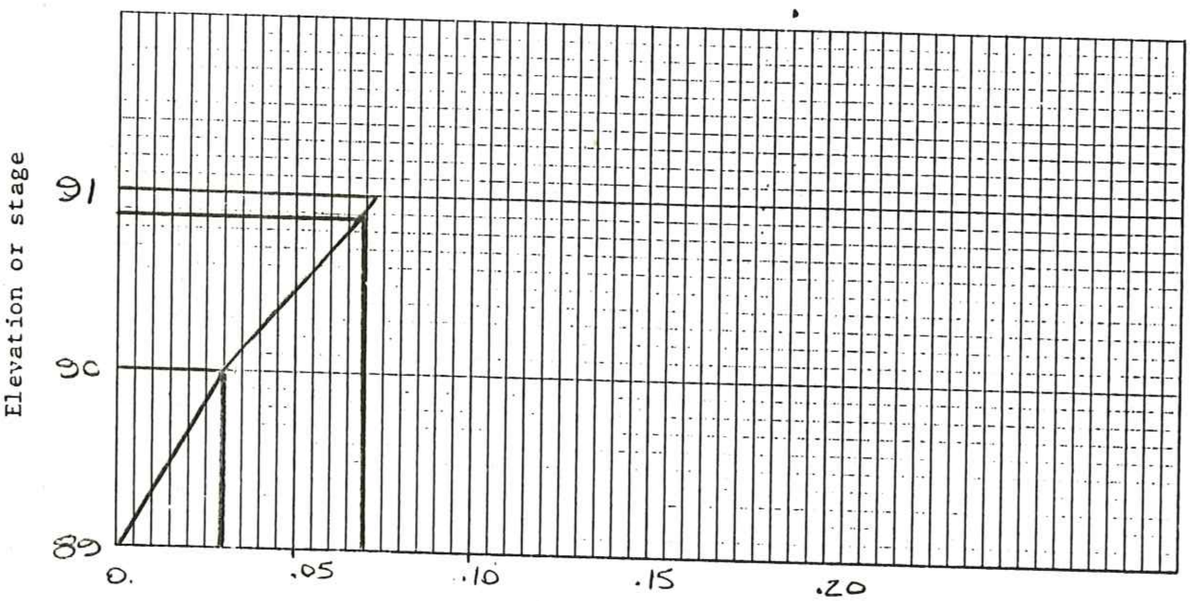


Worksheet 6a: Detention basin storage, peak outflow discharge (q_o) known

Project EXCESS INS UNDERW. By DM. Date 11-10-86

Location CUMBERLAND COUNTY Checked JP Date 11-26-86

Circle one: Present (Developed) THIS GRAPH REPRESENTS POND A.



1. Data:
   Drainage area .... A_m = .0015 mi^2
   Rainfall distribution type (I, IA, II, III) = III

	1st stage	2nd stage
2. Frequency ...... yr	2	25
3. Peak inflow discharge, q_i .... cfs * (From worksheet 4 or 5b) - DEVELOPED	.865	2.16
4. Peak outflow discharge, q_o .... cfs * (WRKSHT 4 - PRESENT)	.312	1.07 1/
5. Compute $\frac{q_o}{q_i}$	.36	.49
6. $\frac{V_s}{V_r}$ .... (Use $\frac{q_o}{q_i}$ with figure 6-1)	.34	.28
7. Runoff, Q ...... in (From worksheet 2)	1.31	3.00
8. Runoff volume, V_r .... ac-ft ($V_r = QA_m 53.33$)	.10	.24
9. Storage volume, V_s .... ac-ft ($V_s = V_r(\frac{V_s}{V_r})$)	.03	.07
10. Maximum stage, E_{max} (From plot)	90.00	90.88

1/ 2nd stage q_o includes 1st stage q_o.

* $\frac{1.73}{2} = .865$ $\frac{4.32}{2} = 2.16$

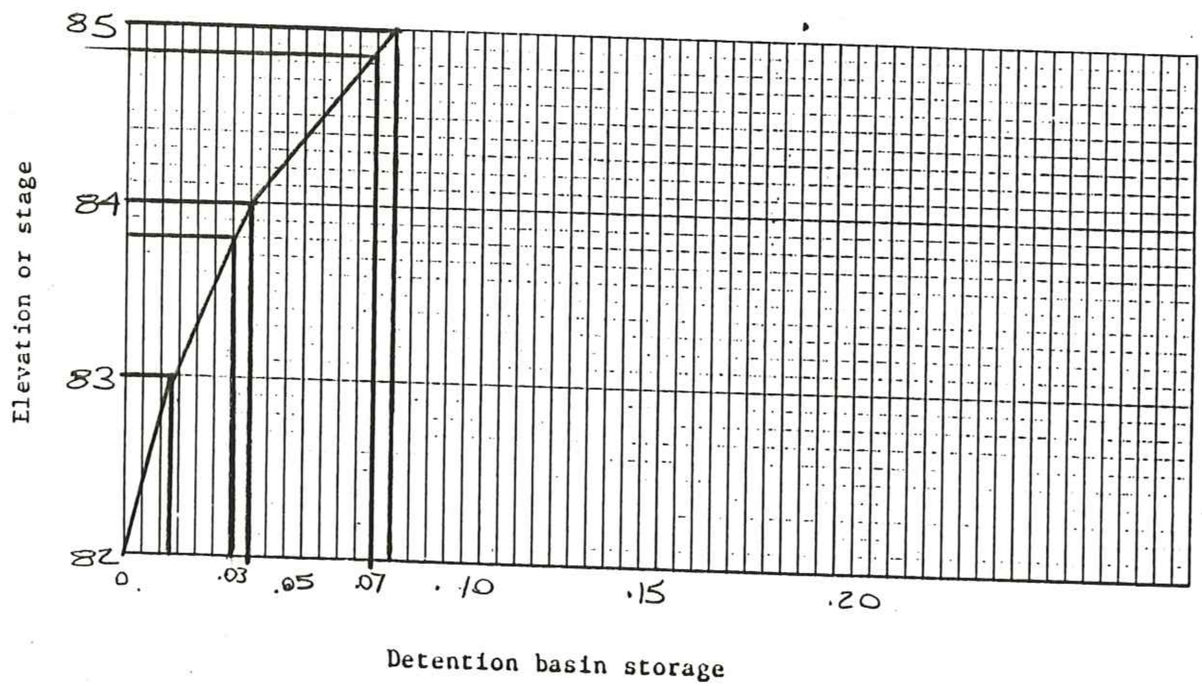
$\frac{.624}{2} = .312$ $\frac{2.14}{2} = 1.07$

Worksheet 6a: Detention basin storage, peak outflow discharge (q_o) known

Project EXCESS INS. UNDERW. By DM. Date 11-20-86

Location CUMBERLAND COUNTY Checked JP Date 11-26-86

Circle one: Present (Developed) THIS GRAPH REPRESENTS POND B



1. Data:
   Drainage area .... A_m = .0015 mi^2
   Rainfall distribution type (I, IA, II, III) = I

	1st stage	2nd stage
2. Frequency ...... yr	2	25
3. Peak inflow discharge, q_i .... cfs (From worksheet 4 or 5b)	.865	2.16
4. Peak outflow discharge, q_o .... cfs [1/]	.312	1.07
5. Compute $\frac{q_o}{q_i}$	.36	.49
6. $\frac{V_s}{V_r}$ .... (Use $\frac{q_o}{q_i}$ with figure 6-1)	.34	.28
7. Runoff, Q ...... in (From worksheet 2)	1.31	3.00
8. Runoff volume, V_r .... ac-ft ($V_r = QA_m 53.33$)	.10	.24
9. Storage volume, V_s .... ac-ft ($V_s = V_r(\frac{V_s}{V_r})$)	.03	.07
10. Maximum stage, E_{max} (From plot)	83.80	84.85

1/ 2nd stage q_o includes 1st stage q_o.

Input requirements and procedures

Use figure 6-1 to estimate storage volume (V_s) required or peak outflow discharge (q_o). The most frequent application is to estimate V_s, for which the required inputs are runoff volume (V_r), q_o, and peak inflow discharge (q_i). To estimate q_o, the required inputs are V_r, V_s, and q_i.

Estimating V_s

Use worksheet 6a to estimate V_s, storage volume required, by the following procedure.

1. Determine q_o. Many factors may dictate the selection of peak outflow discharge. The most common is to limit downstream discharges to a desired level, such as predevelopment discharge. Another factor may be that the outflow device has already been selected.
2. Estimate q_i by procedures in chapters 4 or 5. Do not use peak discharges developed by any other procedure. When using the Tabular Hydrograph method to estimate q_i for a subarea, only use

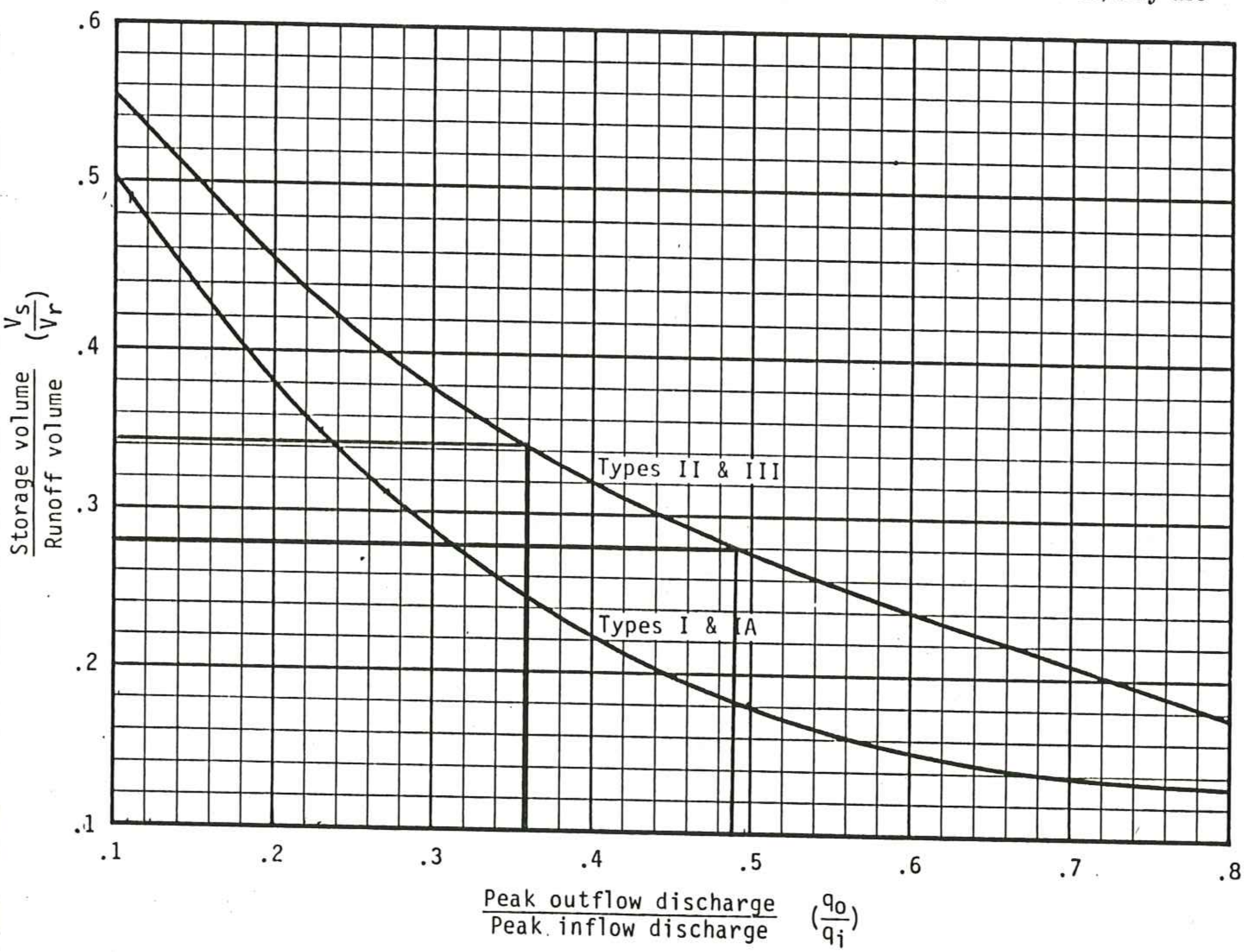


Figure 6-1.—Approximate detention basin routing for rainfall types I, IA, II, and III.

PLATZ ASSOCIATES Great Falls Plaza Auburn, ME 04210 (207)784-2941

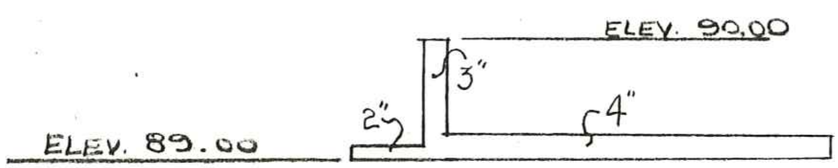
File No.: 86069 By: DM Checked: JP Revised: _____
Description: POND A PIPE SIZE Date: 11-24-86 Date: 11-26-86 Date: _____

POND A.	2 yr. 1ST STAGE	25 yr. 1ST STAGE	25 yr. 2ND STAGE*
q_o WORK SHEET 6A.	.312	☐	+ ☐ = 1.07
E_{MAX}	90.00	90.88	90.88
INV. EL.	89.00	89.00	89.00
H.	1.00	1.88	1.88
PIPE ϕ	2"	2"	3"
q	.144 < .312 ✓	.197	+ .443 =
		.640 < 1.07 ✓	

* TOP OF VERTICAL @ EL. 90.00

$q = .0438\ K\ D^2 \sqrt{H}$

$K = .82$



PLATZ ASSOCIATES Great Falls Plaza Auburn, ME 04210 (207)784-2941

File No.: 86069
Description: POND B PIPE SIZE
By: DM. Date: 11-24-86
Checked: JP Date: 11-26-86
Revised: Date:

POND B.

	2yr.	25yr.	
	1ST STAGE	1ST STAGE	2ND STAGE.*
qo WORKSHEET 6A.	.312	☐ +	☐ = 1.07
EMAX	83.80	84.85	84.85
INV. EL.	82.00	82.00	82.00
H.	1.80	2.85	2.85
PIPE φ = D	2"	2"	3"
q.	.193 < .312	.242 +	.546 = .788

.788 < 1.07

TOP OF VERTICAL @ EL. 84.00

$q = .0438\ K\ D^2 \sqrt{H}$

$K = .82$