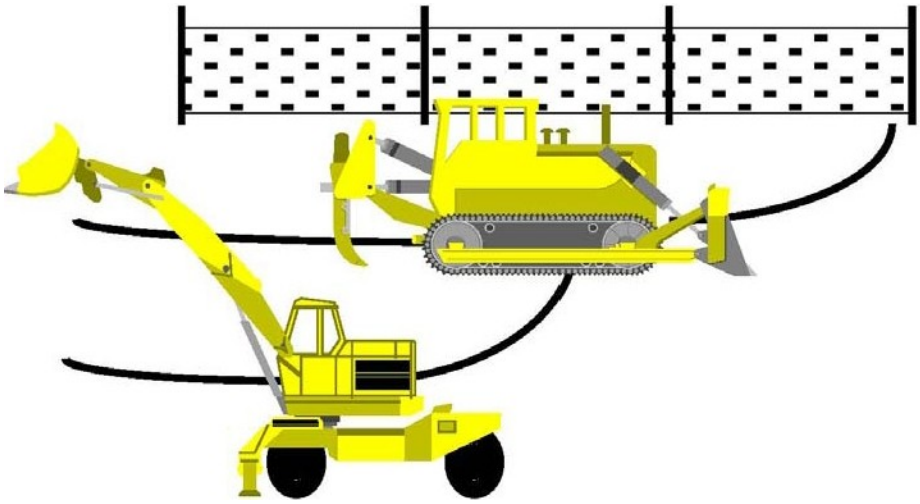
STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREA U OF' MATERIALS MANAGEMENT & COMI'L ANCE
ASSURANCE
WATER PERMITTING & ENFORCEMENT DIVISION
860-424-3018

General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities



Issuance Date: April 9, 2010
Expiration Date: October 1, 2011

General Perm it for Discharge of Stormwater and Dewatering Wastewaters from Construction Activities

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General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities

Section 1. Authority

ll1is general permit is issued under the authority of Section 22a-430b of Connecticut General Statutes.

Section 2. Definitions

Tthe definitions of terms used in this general permit shall be the same as the definitions contained in Section 22a-423 of the Connecticut General Statutes and Section 22a-430-3(a) of the Regulations of Connecticut State Agencies. As used in this general permit, the following definitions shall apply:

"Authorized activity" means any activity authorized under this general permit.

"Coastal area" means coastal area as defined il Section 22a-93(5) of the Connecticut General Statutes.

"Coastal waters" means coastal waters as defined in Section 22a-29 of the Connecticut General Statutes.

"Commissioner" means commissioner as defined in Section 22a-2(b) of the Connecticut General Statutes.

"Construction activities" means activities including but not limited to clearing and grubbing, grading, excavation, and dewatering.

"Department" means the department of environmental protection.

"Developer" means a person who or municipality which is responsible, either solely or through contract, for the design and construction of a project site.

"Dewatering wastewater" means wastewater generated from the lowering of the groundwater table, the pumping of accumulated stormwater from an excavation, or the pumping of surface water from a cofferdam, or pumping of other surface water that has been diverted into a construction site.

"Disturbance" means the execution of any of the construction activities defined above.

"Erosion" means the detachment and movement of soil or rock fragments by water, wind, ice and gravity.

"Fresh-tidal wetland" means a tidal wetland with an average salinity level of less than 0.5 parts per thousand.

"Guidelines" means the Com1ecticut Guidelines for Soil Erosion and Sediment Control, as amended, or as may be amended, established pursuant to Section 22a-328 of the Connecticut General Statutes.

"High tide line" means high tide line as defined in Section 22a-359(c) of the Connecticut General Statutes.

"Individual permit" means a permit issued to a named permittee under Section 22a-430 of the Connecticut General Statutes.

"Inland wetland" means wetlands as defined in Section 22a-38 of the Connecticut General Statutes.

"Municipal separate storm sewer" means conveyances for stormwater (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) owned or operated by any municipality and discharging directly to surface waters of the state.

"Municipality" means a city, town or borough of the state.

"Permittee" means any person who or municipality which initiates, creates or maintains a discharge in accordance with Section 3 of this general pem1iL

"Person" means person as defined in Section22a-4i23 of the Connecticut General Statutes.

"Point Source'· means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, Concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged.

"Registrant" means a person who or municipality which files a registration.

"Registration·· means a registration form filed with the commissioner pursuant to Section 4 of this general permit.

"Retain" means to permanently hold on-site with no subsequent point-source release as in a detention system where there is a temporary holding or delaying of the delivery of stormwater downstream.

"Sediment" means solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin by erosion.

"Site" means geographically contiguous land or water on which a authorized activity takes place or on which an activity for which authorization is sought under this general permit is proposed to take place. Non-contiguous land or water owned by the same person and connected by a right-of-way, which such person contorls, and to which the public does not have access shall be deemed the same site.

"Soil" means any unconsolidated mineral and organic material of any origin.

"Stabilize" means the use of pavement, establishment of vegetation, use of geotextile materials, use or organic of inorganic mulching materials, or retention of existing vegetation to prevent erosion.

"Stormwater" mean'> waters consisting of precipitation runoff.

"Tidal wetland" means a wetland as that tem1 is defined in Section 22a-29(2) of the Connecticut General Statutes.

"Total disturbance" means the total area on a site that will be exposed or susceptible to erosion during the course of a project.

"Total sediment load" means the total amount of sediment carried by sto1mwater runoff on annualized basis.

"Upland soils" means soils which are not designated as poorly drained, very poorly drained, alluvial, or flood plain by the National Cooperative Soils Survey, as may be amended from time to time, of the Soil Conservation Service of the United States Department of Agriculture at1d/or the Inland Wetlands Commission of the community in which the project will take place.

"Water company" meruls water compru1y as defined in Section 25-32a of the Connecticut General Statutes.

Section 3. Authorization Under This General Permit

(a) Eligible Activities

11te following activity is authorized by this general permit, provided the requirements of subsection (b) of this section are satisfied:

The discharge of stormwater and dewatering wastewater from construction activities which result in the disturbance of one or more total acres of land area on a site regardless of project phasing. In the case of a larger plan of development (such as a subdivision), the estin1ate of total acres of site disturbance shall include, but is not limited to, road and utility construction, individual lot construction (i.e. house, Drive way, septic system, etc.), and all other construction associated with the overall plan, regard less of the individual pa11ies responsible for construction of these various elements.

(b) Requirements for Authorization

11tis general permit authorizes the activity listed in subsection (a) of this section provided:

(1) Coastal Management Act

Such activity must be consistent with all applicable goals and policies in Section 22a-92 of the Connecticut General Statutes, and must not cause adverse impacts to coastal resources as defined in Section 22a-93(15) of the Connecticut General Statutes.

(2) Endangered and 1l1reatened Species

Such activity must not threaten the continued existence of any species listed pursuant to Section 26-306 of the Connecticut General Statutes as endangered or threatened and must not result in the destruction or adverse modification of habitat designated as essential to such species.

(3) Historic Places

Such activity must at all times be in compliance with State and Federal Historic Preservation statutes, regulations and policies including identification of any potential impacts on property listed or eligible for listing on the State and/or National Registers of Historic Places and a description of measures necessary to avoid or minimize those impacts.

(4) The stom1water is *not* discharged to a Publicly Owned Treatment Work> or to ground water;

(5) The discharge shall *not* cause pollution due to acute or chronic toxicity to aquatic and marine life, impair the biological integrity of aquatic or marine ecosystems, or result in an unacceptable risk to human health.

(6) Any construction site that is registered under the General Permit for the Discharge ofStom1water and Dewatering Wastewaters from Construction Activities, issued October 1, 1997, is authorized by this general permit provided that the site continues to meet the conditions listed in Section 6 of this general permit.

(c) Registration

Pursuant to Section 4 oftl1is general permit, a completed registration with respect to the construction activity shall be filed with the commissioner 30 days prior to the commencement of the activity unless exempted by Section 3(d) of this general permit.

(tl) Small Construction

For construction projects with a total disturbed area (regardless of phasing) of between one and five acres, the permittee sham agree to adhere to the erosion and sediment control land use regulations of the town in which the construction activity is conducted. No registration pursuant to Section 4 of this general pem1it shall be required for such construction activity as long as it receives town review and written approval of its erosion and sediment control measures and follows the Guidelines. If no review is conducted by the town, the permittee must register and comply with Section 6.

(e) Geographic Area

111is general pem1it applies throughout the State of Connecticut.

(f) Effective Date and Expiration Date of this General Permit

T11e modification of this general permit is effective on April9, 2010, and expires on October **1,** 2011.

(g) Effective Date of Authorization

Any activity is authorized by this general permit on the date the general permit becomes effective or on the date the activity is initiated, whichever is later.

(h) Re1•ocatum of an Individual Permit

If an activity is eligible for authorization under this general permit and such activity is personally authorized by an individual permit, the existing individual permit may be revoked by the commissioner upon a written request by the permittee. **If** the commissioner revokes such individual permit in writing, such revocation shall take effect on the effective date of authorization of such activity under this general pem1it.

(i) Issuance of an Individual Permit

If the commissioner issues ru1individual pem1it under Section 22a-430 of the Connecticut General Statutes, authorizing an activity authorized by this general permit, this general permit shall cease to authorize that activity beginning on the date such individual permit is issued.

Section **4.** Registration Requirements

(a) Who Must File a Registration

With the exception noted below or in Section 3(d) of this general permit, my person who or municipality which initiates, creates, originates or maintains a discharge described in Section 3(a) of this general permit shall file with the commissioner a registration fom1 that meets the requirements of Section 4 of this general permit it along with the applicable .fee at least thirty (30) days before the initiation of constrction activities**.**

If a site has been previously registered under the General Pem1it for the Discharge of Stormwater ru1d Dewatering Wastewaters form Construction Activities issued October I, 1997 or October 1, 2002 and modified April 8, 2004, the pem1ittee does *not* need to submit a new registration under this general permit, unless the ownership ofthe site has been transfelTed.

If the site for which a registration is submitted under this permit is owned by one person or municipality but is leased or, in some other way, the legal responsibility of ru1other person or municipality (the developer), the developer is responsible for submitting the registration required by this permit. T11e registrant is responsible for compliru1ce with all conditions of this permit.

(b) Scope of Registration

A registrant shall register on one registration form only those discharges that are operated by such permittee on one site.

(c) Contents of Registration

(1) Fees

(A) 11w registration fee of$625.00 shall be submitted with a registration form, provided that the registration fee for a municipality shall be $312.50. A registration shall not be deemed complete and no activity shall be authorized by this general permit it (with the exception of activities previously registered under the general permit issued October 1, 1997 or October 1, 2002 and modified April 8, 2004), unless the registration fee has been paid in full.

(B) Registrants required to submit a stormwater pollution control plan (Plan) in accordance with Section 6(b)(3)(C) of this permit shall pay an additional plan review fee of $625.00 with the submittal of the Plan, the registration form and registration fee, provided that the plan review fee for a municipality shall be $312.50.

(C) Title registration fee and plan review fee shall be paid by check or money order payable to the Department of Environmental Protection.

(D) The registration fee and plan review fee are non-refundable.

(2) Registration Fom1

A registration shall be filed on forms prescribed and provided by the commissioner and shall include the following:

(A) Legal name, address, and telephone number of the registrant. If the registrant is a person (as defined in Section 2) transacting business in Connecticut and is registered with the Connecticut Secretary of the State, provide the exact name as registered with the Connecticut Secretary of the State.

(B) Legal name, address and telephone number of the owner of the property on which the activity will take place.

(C) Legal name, address and telephone number of the primary contact for departmental correspondence and inquiries, if different from the registrant.

(D) Legal name, address and telephone number of the developer of the property on which the subject activity is to take place.

(E) Legal name, address and daytime and off-hours telephone numbers of the general contractor or other representative, if different from the developer.

(F) Legal name, address and telephone number of any consultant(s) or engineer(s) retained by the permittee to prepare the registration and Stormwater Pollution Control Pla11.

(G) Location address or description of the site with respect to which the registration is submitted.

(H) TI1e estimated duration of the construction activity.

(I) A brief description of the construction activity, including, but not limited to:

(i) Number of acres disturbed.

(ii) Assurance that construction is in accordance with the Guidelines and local erosion and sediment control ordinances.

(iii) A detem1ination of whether or not a coastal consistency review is necessary for the activity.

(iv) Assurance that there are no endangered or threatened species suspected or known to be impacted by the activity.

(J) A brief description of the stormwater discharge, including:

(i) The name of the municipal separate storm sewer system or immediate surface water body or wetland to which the stormwater runoff discharges, and whether or not the site discharges within 500 feet of a tidal wetland.

(ii) The name of the watershed or nearest waterbody to which the site discharges.

(K) An 8 \12" by II" copy of the relevant portion or a full-sized original of a United States Geological Survey (USGS) quadrangle map, with a scale of 1:24,000, showing the exact location of the site and the area within a one mile radius of the site. Identity the quadrangle name on such copy.

(L) For all sites that will disturb 10 acres or more (regardless of phasing), a copy of the Stormwater Pollution Control Plan shall be submitted (with the $625.00 plan review fee) in accordance with Section 6(b)(3)(C) of this general permit.

(M) TI1e signature of the registrru1t and of the individual or individuals responsible for actually preparing the registration, each of whom shall certify in writing as follows:

"I have personally examined ru1d am familiar with the information submitted in this document and all at1achments thereto, and 1 ce1tify that, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the infom1ation, the submitted information is true, accurate ru1d complete to the best of my knowledge and belief. I certify that this permit registration is on complete and accurate forms as prescribed by the commissioner without alteration of the text. I understand that a false statement made in the submitted information may be punishable as a criminal offense, in accordance with Section 22a-6 of the Connecticut General Statutes, pursuant to Section 53a-157b of the

Connecticut General Statutes, and in accordance with any other applicable statute.

I also certify under penalty of law that I have read and understand all conditions of the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities issued on October 1, 2002 (or as reissued or modified), that all conditions for eligibility for authorization under the general permit are met, all terms and conditions of the general permit it are being met for all discharges which have been initiated and are the subject of this registration, and that a system is in place to ensure that all terms and conditions of this general permit will continue to be met for all discharges authorized by this general permit at the site. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowingly making false statements."

(N) The following certification must be signed by a professional engineer, licensed to practice in Connecticut:

"I certify that I have thoroughly and completely reviewed the Stormwater Pollution Control Plan for the site. I further certify, based on such review and on my professional judgment, that the Stormwater Pollution Control Plan has been prepared in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, and the conditions for the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities issued on October 1, 2002 (or as reissued or modified), and the controls required for such Plan are appropriate for the site. I am aware that there are significant penalties for false statements in this certification, including the possibility of fine and imprisonment for knowingly making false statements."

(d) Where to File a Registration

A registration shall be filed with the commissioner at the following address:

CENTRAL PERMIT PROCESSING UNIT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
79 ELM STREET
HARTFORD, CT 06106-5127

(e) Additional Information

The commissioner may require a registrant to submit additional information that the commissioner reasonably deems necessary to evaluate the consistency of the subject activity with the requirements for authorization under this general permit.

(f) Additional Notification

For discharges through a municipal separate storm sewer system authorized by this general permit, a copy of the registration shall also be submitted to the owner and operator of that system.

For discharges within a public drinking water supply watershed or aquifer area, a copy of the registration and the Plan described in Section 6(b) of this general pem1it shall be submitted to the water company.

In addition, a copy of this registration and the Plan shall be available upon request to the local wetlands agency or its equivalent, or its duly authorized agent

(g) Action by Commissioner

(1) The commissioner may reject without prejudice a registration if he detem1ines that it does not satisfy the requirements of Section 4(c) of this general permitor more than 30 days have elapsed since the commissioner requested that the registrant submit additional infom1ation or the required fee and the registrant has not submitted such information or fee. Any registration refiled after such a rejection shall be accompanied by the fee specified in Section 4(c)(l) of this general pem1it.

(2) The commissioner may disapprove a registration if he finds that the subject activity is inconsistent with the requirements for authorization under Section 3(b) of this general permit it, or for any other reason provided by Jaw.

(3) Disapproval of a registration under this subsection shall constitute notice to the registrant that the subject activity must be authorized under an individual permit.

(4) Rejection or disapproval of a registratim1 shall be in writing.

Section 5. Termination Requirements

(a) Notice oj'Termi11atio11

At the completion of a construction project registered pursuant to Section 4 of this general permit it, a Notice ofTem1ination must be filed with the commissioner. A project shall be considered complete after the site has been stabilized for at least three months following the cessation of construction activities. A site is not considered stabilized until there is no active erosion or sedimentation present and no disturbed areas remain exposed.

(b) Termination Form

A termination notice shall be filed on forms prescribed and provided by the commissioner and shall include the following:

(1) TI1e permit number as provided to the permittee on the permit certificate.

(2) TI1e name of the registrant as reported on the genera l permit registration fom1 (DEP-PED-REG-015).

(3) TI1e address of the completed construction site.

(4) 111e date all stom1 drainage structures were cleaned of construction debris pursuant to Section 6(b)(6)(C)(i v) of this general pem1it, the date of completion of construction, and the date of the final inspections pursuant to Section 6(b)(6)(D) of this general permit it.

(5) A description of the post-construction activities at the site.

(6) Signature of the permittee.

(c) Where to File a Termi11atio11 Form

A tem1ination fom1 shall be filed with the commissioner at the following address:

WATER PERMITTING & ENFORCEMENT DIVISION
BUREAU OF MATERIALS MANAGEMENT & COMPLIANCE ASSURANCE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
79 ELM STREET
HARTFORD, CT 06106-5127

Section 6. Conditions of this General Permit

The permittee shall at all times continue to meet the requirements for authorization set forth in Section 3 of this general permit. In addition, a pem1ittee shall assure that authorized activities are conducted in accordance with the following conditions:

(a) Conditions Applicable to Certain Discharges

(1) Any person who or municipality that discharges stormwater into coastal tidal waters for which a pem1it is required under eiU1er the Structures and Dredging Act in accordance with Section 22a-361 of the Connecticut General Statutes or the Tidal Wetlands Act in accordance with Section 22a-32 of the Connecticut General Statutes, shall obtain such permit(s) from the commissioner. A tidal wetland permit is required for the placement of any sediment upon tidal wetland, whether it is deposited directly or indirectly.

(2) Any site which has a post-construction stormwater discharge that is located less than 500 feet from a tidal wetlands which is not a fresh-tidal wetland, shall discharge such stormwater through a system designed to retain the volume of stom1water runoff generated by 1 inch of rainfall on the site.

(b) Stormwater Polh1tion Control .Plan

A registrant shall develop a Stormwater Pollution Control Plan ("Plan") for each site authorized by this general pem1it. Once the construction activity begins, the permittee shall perform all actions required by such Plan and shall maintain compliance with the Plan thereafter. n1e Plan shall be designed to address two components of stormwater pollution: (1) pollution caused by soil erosion and sedimentation during and after construction; and (2) stormwater pollution caused by use of the site after construction is completed, including, but not limited to, parking lots, roadways and the maintenance of grassed areas.

(l) Development of Plan

(A) TI1e registrant shall develop a Plan for the site. Plans shall be prepared in accordance with sound engineering practices. The Plan shall ensure and demonstrate compliance with the Guidelines.

(B) For any stormwater discharges that were permitted under the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities issued October 1, 1997 or October 1, 2002 and modified April 8, 2004, the existing Plan shall be updated in accordance with subsection (b)(6) of this section. The permittee shall maintain compliance with such Plan tl1ereafter.

(2) Deadlines for Plan Preparation and Compliance

For construction activities authorized by this general permit that are initiated after the date of issuance of this general permit, the registrant shall prepare the Plan no later than thirty days before the date of initiation of the construction activity.

(3) Signature and Plan Review

(A) TI1e Plan shall be signed by the registrant in accordance with Section 6(h) of this general pem1it. 111e Plan shall be certified by all contractors and subcontractors in accordance with subsection (b)6(E) of this section.

(B) The registrant shall provide a copy oftl1e Plan, and the registration fom1 required in Section 4 of this general permit to the following persons inm1ediately upon request:

(i) the commissioner;

(ii) the local agency approving sediment and erosion plans, grading plans, or stormwater management plans, and the local official responsible for enforcement of such plans;

(iii) in the case of a stormwater discharge through a municipal separate stom1 sewer system, the municipal operator of the system;

(iv) in the case of a st0m1water discharge located within a public drinking water supply watershed or aquifer area, the water company.

111e registrant shall also provide a copy of the Plan to all contractors or developers conducting construction activities on individual lots or buildings within the overall plan of development, regardless of ownership. 111ese additional contractors or developers shall sign the certification in Section 6(b)(6)(E)(ii).

For all registrants or permittees submitting a Plan in accordance with subsection (b)(3)(B)(i) of this section, a plan review fee of$625.00 shall be submitted wiU1 the Plan.

(C) For construction activities that result in the disturbance of ten or more total acres of land area on a site (regardless of phaing), the Plan shall be submitted to the commissioner no later than thi11y days before the initiation of construction activities_ Plans shall be submitted in conjunction with the registration submitted in compliance with Section 4 of this general permit.

(D) T11e conm1issioner may notify the registrant at m1y time that the Plan and/or the site do not meet one or more ofU1e minimum requirements of this permit. Within 7 days of such notice, or such other time as the conm1issioner may allow, the permittee shall make the required changes to the Plan and perform all actions required by such revised Plan. Within 15 days of such notice, or such other time as the commissioner may allow, the permittee shall submit to the commissioner a written certification that the requested changes have been made and implemented and such other information as the commissioner requires, in accordance with Sections 6(g) and 6(h) of this general permit.

(4) Keeping Plans Current

T11e permittee shall amend the Plan whenever there is a change in contractors or subcontractors at the site, or a change in design, construction, operation, or maintenance at the site which has the poential for the discharge of pollutants to the waters of the state m1d which has not otherwise been addressed in the Plan or if the actions required by the Plan fail to prevent pollution.

(5) Failure to Prepare, Maintain or Amend Plan

In no event shall failure to complete, maintain or update a Plan in accordance with subsections (b)(l) and (b)(4) of this section relieve a permittee of responsibility to implement any actions required to protect the waters of the state and to comply with all conditions of the permit, including but not limited to installation and maintenance of all controls and management measures described in subsection (b)(6)(C) of this section and in the Guidelines.

(6) Contents of the Plan

T11e Plan shall include, at a minimum the following items:

(A) Site Description

(i) A description of the nature of the construction activity,

(ii) Estimates of the total area of U1e site and the total area of the site that is expected to be disturbed by construction activities

(iii) An estimate, including calculations if any, of the average runoff coefficient of the site after construction activities are completed and existing data describing the soil or U1e quality of any discharge:from the site;

(iv) A site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, the location of major structural and non-structural controls identified in the Plan, the location of areas where stabilization practices are expected to occur, areas which will be vegetated following construction, surface waters (including inland wetlands, tidal wetlands, and fresh-tidal wetlands), and locations where stom1water is discharged to a surface water (both during and post-construction); and

(v) The name of the immediate receiving water(s) and the ultimate receiving water(s) of the discharges authorized by this general permit and areal e11.1.ent of wetland acreage on the site.

(B) Construction Sequencing

Each Plan shall clearly identify the expected sequence of major construction activities on the site, including but not limited to installation of erosion and sediment control measures, clearing, grubbing, grading, cut and fill operations, drainage and utility installation, and paving and stabilization operation;. TI1is section shall include an estimated timetable for all activities, which shall be revised in accordance with subsection (4) above as necessary. Wherever possible, the site shall be phased to avoid the disturbance of over five acres at one time. The Plan shall clearly show the limits of disturbance for the entire activity and for each phase. Any Plan that shows a site disturbance of over ten acres total (regardless of phasing) requires submittal of the Plan to the commissioner, in accordance with subsection (b)(3)(C) of this section.

(C) Controls

Each Plan shall include a description of appropriate controls and measures that will be perfom1ed at the site to prevent pollution of the waters of the state. The Plan shall clearly describe for each major activity identified in subsection (b)(6)(B) of this section, the appropriate control measures and th e timing during the construction process that the measures would be implemented. (For example, perimeter controls for one portion of the site will be installed after the clearing and grubbing necessary for installation of the measure, but before the clearing and grubbing for the remaining portions of the site. Perimeter controls will be actively maintained until final stabilization of those portions of the site upgradient of the perimeter control. Temporary perimeter controls will be removed after final stabilization.) Controls shall be designed in accordance with the Guidelines. Use of controls to comply with subsection (b)(6)(C)(i) of this section that are not included in the Guidelines must be approved by the commissioner or his designated agent. The description of controls shall address the following minimum components:

(i) Erosion and Sediment Controls

1) Stabilization Practices

111e Plan shall include a description of interim and permitanent stabilizat1on practices, including a schedule for implementing the practices. Site plans shall ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include but not be limited to: silt fences, temporary seeding, permitanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other vegetative and non-structural measures as may be identified by the Guidelines. Where construction activities have pem1anently ceased or have temporarily been suspended for more than seven days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within three days. Areas that will remain disturbed but inactive for at least thirty days shall receive temporary seeding it1 accordance with the Guidelines. Areas that will remain disturbed beyond the planting season, shall receive long-term, non-vegetative stabilization sufficient to protect the site through the winter. In all cases, stabilization measures shall be implemented as soon as possible in accordance with the Guidelines. Areas to be graded with slopes steeper than 3:1 (horizont1ll:vertical) and higher than 15 feet shall be graded with appropriate slope benches in accordance with the Guidelines.

2) Structural Practices

The Plan shall include a description of structural practices to divert flows away from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from the site. Such practices include but may not be limited to earth dikes (diversions), dmit1age swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, stom1 drain inlet protection, outlet protection, reit1forced soil retait1ed systems, gabions, and temporary or pemuu1ent sediment basins and chambers. Unless otherwise specifically approved in writit1g, structural measures shall be installed on upland soils.

At a minimum, for discharge points that serve an area with between 2 and 5 disturbed acres at one time, a sediment basit1, sediment trap, or other control as may be defined in the Guidelines for such drainage area, designed in accordance with the Guidelines, shall be designed and installed. All sediment traps or basins shall provide a minimum of 134 cubic yards of water storage per acre drained and shall be maintait1ed until final stabilization of the contributing area. 111is requirement shall not apply to flows from off-site areas and flows thorugh the

site that are either undisturbed or have undergone final stabilization where such flows are diverted around the sediment trap or basin. Any exceptions must be approved in writing by the commissioner.

For discharge points that serve an area with more than five (5) disturbed acres at one time, a sediment basin designed in accordance with the Guidelines, shall be designed and installed, which basin shall provide a minimum of 134 cubic yards of water storage per acre drained and which basin shall be maintained until final stabilization of the contributing area. This requirement shall not apply to flows from off-site areas and flows from the site that are either undisturbed or have undergone final stabilization where such flows are dive1ted around the sediment basin. Outlet structures from sedimentation basins shall not encroach upon a wetland. Any exceptions must be approved in writing by the commissioner.

3) Maintenance

Maintenance shall be performed in accordance with the Guidelines, provided that, if additional maintenance is required to protect the waters of the state from pollution, the Plan shall include a description of the procedures to maintain in good and effective operating conditions all erosion and sediment control measures, including vegetation, and all other protective measures identified in the site plan.

(ii) Dewatering Wastewaters

Where feasible and appropriate, dewatering wastewaters shall be infiltrated into the ground. Dewatering watewaters discharged to surface waters shall be discharged in a manner that minimizes the discoloration of the receiving waters. Each plan shall include a description of the operational and practices that will be used to ensure U1at all dewatering wastewaters will not cause scouring or erosion or contain suspended solids in amounts that could reasonably be expected to cause pollution of waters of the State.

(iii) Post Construction Stom1water Mru1agement

Each plan must include a description of measures that will be installed during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Unless otherwise specifically provided by U1e commissioner in writing, structural measures shall be placed on upland soils. 'l11is general pem1il only addresses U1e installation of stormwater management measures, and not the ultimate operation and maintenance of such structures included in such measures after the construction activities have been completed and the site has

undergone final stabilization. The following measures must be implemented:

1) For construction activities initiated after October 1, 1992, the permittee shall install post-construction stormwater management measures designed to remove suspended solids and floatables (i.e. oil and grease, other floatable liquids, floatable solids, trash, etc.) from stormwater. A goal of 80 percent removal of total sediment load from the stormwater discharge shall be used in designing and installing stormwater management measures. Such measures many include but are not limited to: stom1water detention structures (including wet ponds); stormwater retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff off-site; vegetated buffer strips; sediment removal chambers or structures; and sequential systems (which combine several practices). Provisions shall be included to address the maintenance of any system installed.

2) Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., maintenance of hydrologic conditions, such as the hydrodynamics present prior to the initiation of construction activities).

3) Any site which has a post-construction stormwater discharge located less than 500 feet from a tidal wetlands which is not a fresh-tidal wetland, shall discharge such stormwater through a system designed to retain the volume of st01mwater runoff generated by 1 inch of rainfall on the site.

(iv) Other Controls

A description of other controls used at the site. The following controls must be implemented:

I) Waste Disposal

A description of best management practices to be perfom1ed at the site, which practices shall ensure that no litter, debris, building materials, or similar materials are discharged to waters of the State.

2) Off-site vehicle tracking of sediments and the generation of dust shall be minimized.

3) All post-construction stormwater structures shall be cleaned of construction sediment and any remaining silt fence shall be removed prior to filing of a termination notice pursuant to Section 5 of this general permit.

(O) Inspection

A description of the inspection procedures that must be addressed and implemented in the following manner:

Qualified personnel (provided by the permittee) shall inspect disturbed areas of the construction activity that have not been finally stabilized, structural control measures, and locations where vehicles enter or exit the site at least once every seven calendar days and within 24 hours of the end of a storm that is 0.1 inches or greater. Where sites have been temporarily or finally stabilized, such inspection shall be conducted at least once every month for three months.

(i) Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures shall be observed to ensure that they are operating correctly. Where discharge locations or points are assessable, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

(ii) Based on the results of the inspection, the description of potential sources and pollution prevention measures identified in the Plan shall be revised as appropriate as soon as practicable after such inspection. Such modifications shall provide for timely implementation of any changes to the site within 24 hours and implementation of any changes to the Plan within 3 calendar days following the inspection. Tile Plan shall be revised and the site controls updated in accordance with sound engineering practices, the Guidelines, and subsections (4) and (6)(C)(i) 3) of this section.

(iii) A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Plan, and actions taken shall be made and retained as part of the Plan for at least three years after the date of inspection. The report shall be signed by the permittee or his/11er authorized representative in accordance with the requirements of Section 6(h) of this general permit.

(E) Contractors

(i) The Plan shall clearly identify each contractor and subcontractor that will perform actions on the site which may reasonably be expected

to cause or have the potential to cause pollution of the waters of the State, and shall include a copy of the certification statement shown below signed by each such contractor and subcontractor. All certifications shall be included in the Plan.

(ii) Subdivisions

Where individual lots in a subdivision or other common plan of development are conveyed or otherwise the responsibility of another contractor, those individual lot contractors shall be required to comply with the provisions of this general permit and shall sign the certification statement below regardless of lot size or disturbed area. The permittee shall provide a copy of the Plan to each of these contractors.

(iii) Cet1itication Statement

The Plan shall include the following cet1ification signed by each contractor and subcontractor identified in the Plan as described above:

"I certify under penalty of the law that I have read and understand the tem1s and conditions of the General Permit it for the Discharge of Stom1water and Dewatering Wastewaters from Construction Activities. I understand that as a contractor or subcontractor at the site, I am authorized by this general permit, and must comply with the tem1s and conditions of this permit it, including but not limited to the requirements of the Stormwater Pollution Control Plan prepared for the site."

The certification shall include the nan1e and title of the person providing the signature; the name, address and telephone number of the contracting time; the address (or other identifying description) of the site; and the date the certification is made.

(c) Reporting and Record Keeping Requirements

(1) 1l1e permittee shall retain copies of the J>Jan and all reports required by this general permit, and records of all data used to complete the registration to be authorized by this general permit, for a period of at least three years from the date that construction at the site is completed unless the commissioner specifies another time period in writing.

(2) 1l1e permittee shall retain an updated copy of the Plan required by this general permit at the construction site from the date construction is initiated at tl1e site until the date construction at the site is completed.

(3) Upon completion of construction, for sites authorized by the General Permit it for tl1e Discharge of Stormwater Associated with Commercial Activity or the General Pem1it for the Discharge of Stormwater Associated with Industrial Activity, the Plan shall be kept as an appendix to the Stormwater Management

Plan or Stormwater Pollution Prevention Plan (as applicable) for a period of at least three years from the date of completion of construction.

(d) Regulations of Co1111ecticut State Age11cies l11corporated into this General Permit

The permittee shall comply with the following Regulations of Connecticut State Agencies which are hereby incorporated into tl1is general permit, as fully set forth herein:

(1) Section 22a-430-3:

Subsection (b) General - subparagraph (l)(D) and subdivisions (2),(3),(4) and (5)
Subsection (c) Inspection and Entry
Subsection (d) Effect of a Permit- subdivisions (1) and (4)
Subsection (e) Duty to Comply
Subsection (f) Proper Operation and Maintenance
Subsection (g) Sludge Disposal
Subsection (h) Duty to Mitigate
Subsection (I) Facility Modifications, Notification -subdivisions (I) and (4)
Subsection (j) Monitoring, Records and Report Requirements - subdivisions (I), (6), (7), (8), (9) and (11) (except subparagraphs (9) (A) (2) and (9) (c)
Subsection (k) Bypass
Subsection (m) Effluent Limitation Violations
Subsection (n) Enforcement
Subsection (p) Spill Prevention and Co11trol
Subsection (q) Instrumentation, Alarms, Flow Recorders
Subsection (r) Equalization

(2) Section 22a-430-4

Subsection (t) Prohibitions
Subsection (p) Revocation, Denial, Modification
Appendices

(e) Reliance on Registration

In evaluating the registrant's registration, the commissioner has relied on information provided by the registrant. If such information proves to be false or incomplete, the registrant's authorization may be suspended or revoked in accordance with law, and the commissioner may take any other legal action provided by law.

(f) Duty to Correct and Report Violations

Upon teaming of a violation of a condition of this general permit, a permittee shall immediately take all reasonable action to determine the cause of such violation, co1rect and mitigate the results of such violation, prevent further such violation, and report in writing such violation and such corrective action to the commissioner within five (5) days of the permittee's teaming of such violation. Such information shall be filed in accordance with the certification requirements prescribed in Section 6(h) of this general permit.

(g) Duty to Pro11ide Information

If the commissioner requests any infom1ation pertinent to the authorized activity or to compliance with this general permit it or with the permittee's authorization under this general permit, the permittee shall provide such information within fifteen (15) days of such request. Such information shall be filed in accordance with the certification requirements prescribed in Section 6(h) of this general permit.

(II) Certijicatio11 of Documents

Any document, including but not limited to any notice, infom1ation or report, which is submitted to the commissioner under this general permit shall be signed by the permittee, or a duly auU10rized representative of the permittee, and by the individual or individuals responsible for actually preparing such document, each of whom shall certify in writing as follows:

"l have personally examined and am familiar with the infom1ation submitted in this document and all attachments thereto, and I certify that, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that a .false statement made in this document or its attachments may be punishable as a criminal offense, in accordance with Section 22a-6 of the Connecticut General Statutes, pursuant to Section 53a-157b of Ule Connecticut General Statutes, and in accordance with any other applicable statute.''

(i) Date of Filing

For purposes of this general permit, the date of filing with the commissioner of any document is the date such document is received by the commissioner. The word "day" as used in this general permit means the calendar day; if any date specified in the general permit it falls on a Saturday, Sunday, or legal holiday, such deadline shall be the next business day thereafter.

OJ False Statements

Any false statement in any information submitted pursuant to this general permit may be punishable as a criminal offense, in accordance with Section 22a-6 of the Cotu1ecticut General Statutes, pursuant to Section 53a-157b of the Cotu1ecticut General Statutes.

(k) Corree1io11 of Inaccuracies

Within fifteen (15) days after the date a pem1i11ee becomes aware of a change in any information in any material submitted pursuant to this general pem1il, or becomes aware that any such inf01mation is inaccurate or misleading or that any relevant infom1ation has been omitted, such permittee shall correct the inaccurate or misleading information or supply the omitted information in writing to the commissioner. Such information shall be filed in accordance with the certification requirements prescribed in Section 6(h) of this general permit.

(1) Transfer of Authorization

Authorizations under this general permit are non-transferable. However, any person or municipality registering a discharge that has previously been registered under this permit may adopt by reference the Plan developed by the previous permittee. l11e new permittee shall amend the Plan as required by Section 6(b)(4) prior to submitting a new registration.

(m) Other Applicable Law

Nothing in this general permit shall relieve the permittee of the obligation to comply with any other applicable federal, state and local law, including but not limited to the obligation to obtain any other authorizations required by such law.

(n) Other Rights

111is general permit is subject to and does not derogate any present or future rights or powers of the State of Connecticut and conveys no rights in real or personal property nor any exclusive privileges, and is subject to all public and private rights and to any federal, state, and local laws pertinent to the property or activity affected by such general permit it. In conducting any activity authorized hereunder, the permittee may not cause pollution, impaim1ent, or destruction of the air, water, or other natural resources of this state. The issuance of this general permit shall not create any presumption that this general permit it should or will be renewed.

Section 7. Commissioner's Powers

(a) Abateme11t of Violations

the commissioner may take any action provided by law to abate a violation of this general permit it, including but not limited to penalties of up to $25,000 per violation per day under Chapter 446k of the Connecticut General Statutes, for such violation. Tl1e commissioner may, by summary proceedings or otherwise and for any reason provided by law, including violation of this general permit, revoke a permittee's authorization hereunder in accordance with Sections 22a-3a-2 through 22a-3a-6, inclusive, of the Regulations of Connecticut State Agencies. Nothing herein shall be coustn1ed to affect any remedy available to the Commissioner by law.

(b) Ge11eral Permit Revocation, Suspension, or Modification

l11e commissioner may, for any reason provided by law, by summary proceedings or otherwise, revoke or suspend this general permit it or modify to establish any appropriate conditions, schedules of complial1!ce, or other provisions which may be necessary to protect human health or the environment.

(c) Filing of of Individual Application

If the commissioner notifies a permittee in writing that such permittee must obtain an individual permit if he wishes to continue lawfully conducting the authorized activity, the Permittee must file an application for an individual permit within thirty (30) days of receiving the commissioner's notice. While such application is pending before the commissioner, the permittee shall comply with the terms and conditions of this

general permit and the subject approval of registration. Nothing herein shall affect the commissioner 's power to revoke a permittee's authorization under this general permit al any lime.

Issued Date: April9, 2010

AI\IIEY W. MARRELLA

Commissioner

This is a true and accurate copy of the general pem1it executed o April 9, 2010 by the Commissioner of the Department of Environmental Protection.

APPENDIX K
SUPPORTING CALCULATIONS

Water Quality Volume Calculations

WATER QUALITY VOLUME CALCULATIONS FOR ACCESS ROAD STATION 0+50 TO STATION 12+50 (PER DEP 2004 STORMWATER QUALITY MANUAL)

6-28-12

Water Quality Volume (WQV) = 1" x R x A/ 12

Where R = Volumetric Runoff Coefficient = 0.05 + 0.009 x I
I = Percent impervious cover
A = Site area in acres

A = 1.40 acres
I = 0.43 ac = 30.7%
R = 0.05 + 0.009 x 30.7 = 0.326
WQV (Drainage Area) = 1" x 0.326 x 1.40 / 12 = .038 ac-ft = 1,657 CF

Total WQV Required = 1,657 CF

Pre-treatment provided in Forebay area of Pond #1 = 1,298 CF (78.3% of WQV-min. of 25% recommended)

Volume provided in Stormwater Pond #1 (in 2'deep forebay and micro-pool below outlet invert) = 3,782 CF

Total WQV provided = 3,782 CF

WATER QUALITY VOLUME CALCULATIONS FOR ACCESS ROAD STATION 12+50 TO STATION 15+30 (PER DEP 2004 STORMWATER QUALITY MANUAL)

6-28-12

Water Quality Volume (WQV) = 1" x R x A/ 12

Where R = Volumetric Runoff Coefficient = 0.05 + 0.009 x I
I = Percent impervious cover
A = Site area in acres

A = 3.13 acres
I = 0.11 ac = 3.5%
R = 0.05 + 0.009 x 3.5 = .0815
WQV (Drainage Area) = 1" x 0.0815 x 3.13 / 12 = .021 ac-ft = 925 CF

Total WQV Required = 1,361 CF

Volume provided in Dry Water Quality Swale B below Basin #2 = 340 LF x 5.3 SF = 1,802 CF

Total WQV provided = 1,802 CF

WATER QUALITY VOLUME CALCULATIONS FOR ACCESS ROAD STATION 15+30 TO 21+55 AND TOWER 1 ACCESS ROAD (PER DEP 2004 STORMWATER QUALITY MANUAL)

6-28-12

Water Quality Volume (WQV) = 1" x R x A/ 12

Where R = Volumetric Runoff Coefficient = 0.05 + 0.009 x I
I = Percent impervious cover
A = Site area in acres

A = 2.38 acres
I = 0.60 ac = 25.2%
R = 0.05 + 0.009 x 25.2 = 0.277
WQV (Drainage Area) = 1" x 0.277 x 2.38 / 12 = .055 ac-ft = 2,398 CF

Total WQV Required = 2,610 CF

Pre-treatment provided in Forebay area above Basin #2 = 660 CF (27.5% of WQV-min. of 25% recommended)

Volume provided in Dry Water Quality Swales = 170 LF x 5.3 SF + 270 LF x 4.7 SF = 2,170 CF

Volume provided in Bottom of Infiltration Basin #3 = 1,195 CF

Total WQV provided = 3,365 CF

WATER QUALITY VOLUME CALCULATIONS FOR ACCESS ROAD STATION 21+55 TO STATION 30+65 (PER DEP 2004 STORMWATER QUALITY MANUAL)

6-28-12

Water Quality Volume (WQV) = 1" x R x A/ 12

Where R = Volumetric Runoff Coefficient = 0.05 + 0.009 x I
I = Percent impervious cover
A = Site area in acres

A = 2.31 acres
I = 0.55 ac = 23.8%
R = 0.05 + 0.009 x 23.8 = 0.264
WQV (Drainage Area) = 1" x 0.264 x 2.31 / 12 = .051 ac-ft = 2,215 CF

Total WQV Required = 2,218 CF

Pre-treatment provided in Forebay area above Water Quality Swale = 660 CF (29.8% of WQV-min. of 25% recommended)

Volume provided in Dry Water Quality Swales = 255 LF x 4.7 SF + 275 LF x 7.5= 3,261 CF

Total WQV provided = 3,261 CF

WATER QUALITY VOLUME CALCULATIONS FOR ACCESS ROAD STATION 34+80 TO TOWER #3 LOCATION (PER DEP 2004 STORMWATER QUALITY MANUAL)

6-28-12

Water Quality Volume (WQV) = 1" x R x A/ 12

Where R = Volumetric Runoff Coefficient = 0.05 + 0.009 x I
I = Percent impervious cover
A = Site area in acres

A = 1.77 acres
I = 0.35 ac = 19.8%
R = 0.05 + 0.009 x 19.8 = 0.228
WQV (Drainage Area) = 1" x 0.228 x 1.77 / 12 = .034 ac-ft = 1,465 CF

Total WQV Required = 1,465 CF

Volume provided in Dry Water Quality Swale = 510 LF x 5.3 SF = 2,703 CF

Total WQV provided = 2,703 CF

WATER QUALITY VOLUME CALCULATIONS FOR ROADSIDE INFILTRATION TRENCH NEAR WETLANDS CROSSING (PER DEP 2004 STORMWATER QUALITY MANUAL)

6-28-12

Water Quality Volume (WQV) = 1" x R x A/ 12

Where R = Volumetric Runoff Coefficient = 0.05 + 0.009 x I
I = Percent impervious cover
A = Site area in acres

TYPICAL SIZING FOR 100 LF ROAD TO 100 LF OF INFILTRATION TRENCH AT TOE OF SLOPE ON BOTH SIDES OF ROAD (STATION 35+50 TO STATION 36+50 ACCESS ROAD)

A = 0.06 acres
I = 0.06 ac = 83.3%
R = 0.05 + 0.009 x 83.3 = 0.800
WQV (Drainage Area) = 1" x 0.800 x .06 / 12 = .004 ac-ft = 174 CF
WQV Required = 174 CF

Total Volume provided in 200 LF of 2' x 2' stone trench = 280 CF (assumes 35% void ratio in stone trench comprised of 2" crushed stone).
Total Volume provided by Infiltration Trench = 280 CF

Specify 2'w x 2'd stone infiltration trench at toe of slope below roadway where appropriate on Site Plans.

Storm Sewer Pipe and Swale Sizing Calculations

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR FLOWS TO CATCH BASIN 2+50 R TO STORMWATER POND #1

10-YEAR DESIGN STORM
6-28-12

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to pipe: 1.11 ac.
Proposed Land Cover
Grass = 0.08ac.
Wooded = .60 ac.
Impervious = 0.43

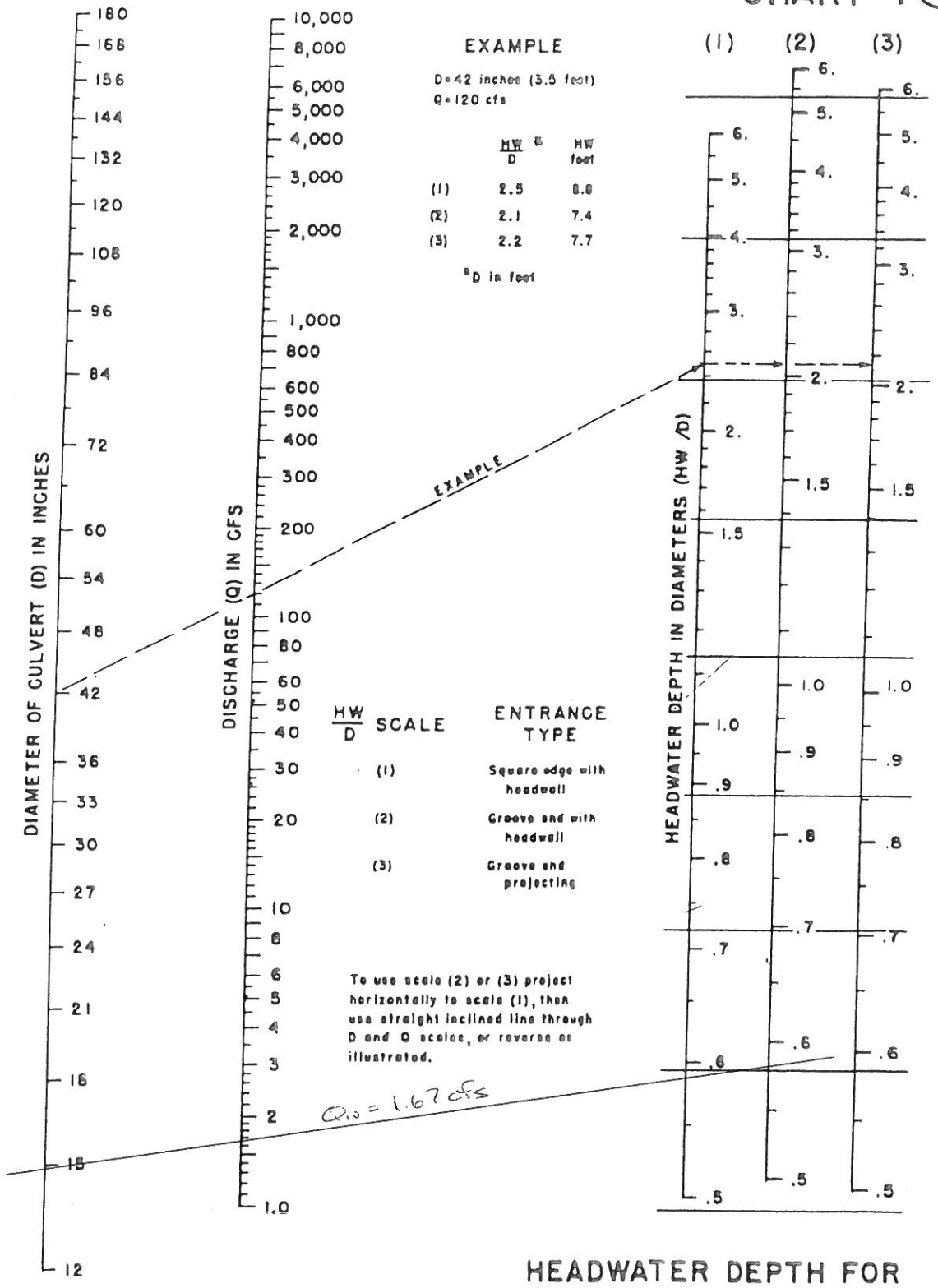
C = [(.9*0.43) + (.3*.08) + (.2*0.60)]/1.11 = 0.47
Time of Concentration = 25 minutes ∴ I = 3.2 in/hr

Q = C*I*A = .47 * 3.2 * 1.11 = 1.67 cfs

HW/D for 15" RCP = 0.6

CB 2+50R TO STORMWATER POND #1

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Worksheet
Worksheet for Circular Channel

CB 2+50R to OUTLET

Project Description	
Worksheet	CB 2+50R
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	050000	ft/ft
Diameter	15.0	in
Discharge	1.67	cfs

Results		
Depth	0.29	ft
Flow Area	0.2	ft²
Wetted Perime	1.25	ft
Top Width	0.00	ft
Critical Depth	0.51	ft
Percent Full	23.0	%
Critical Slope	0.005369	ft/ft
Velocity	7.85	ft/s
Velocity Head	0.96	ft
Specific Energ	1.24	ft
Froude Numbe	3.08	
Maximum Disc	15.54	cfs
Discharge Full	14.44	cfs
Slope Full	0.000668	ft/ft
Flow Type	Supercritical	

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR PERMANENT DIVERSION SWALE #1 (PDS 1) AND CROSS CULVERTS FROM STATION 3+50 TO 11+00 SIZE FOR LARGEST CONTRIBUTING DRAINAGE AREA TO SWALE (STATION 7+00)

10-YEAR DESIGN STORM

6-28-12

Rational Method:

Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 2.53 ac.
Proposed Land Cover
Grass = 0.23 ac.
Wooded = 2.26 ac.
Impervious = 0.04

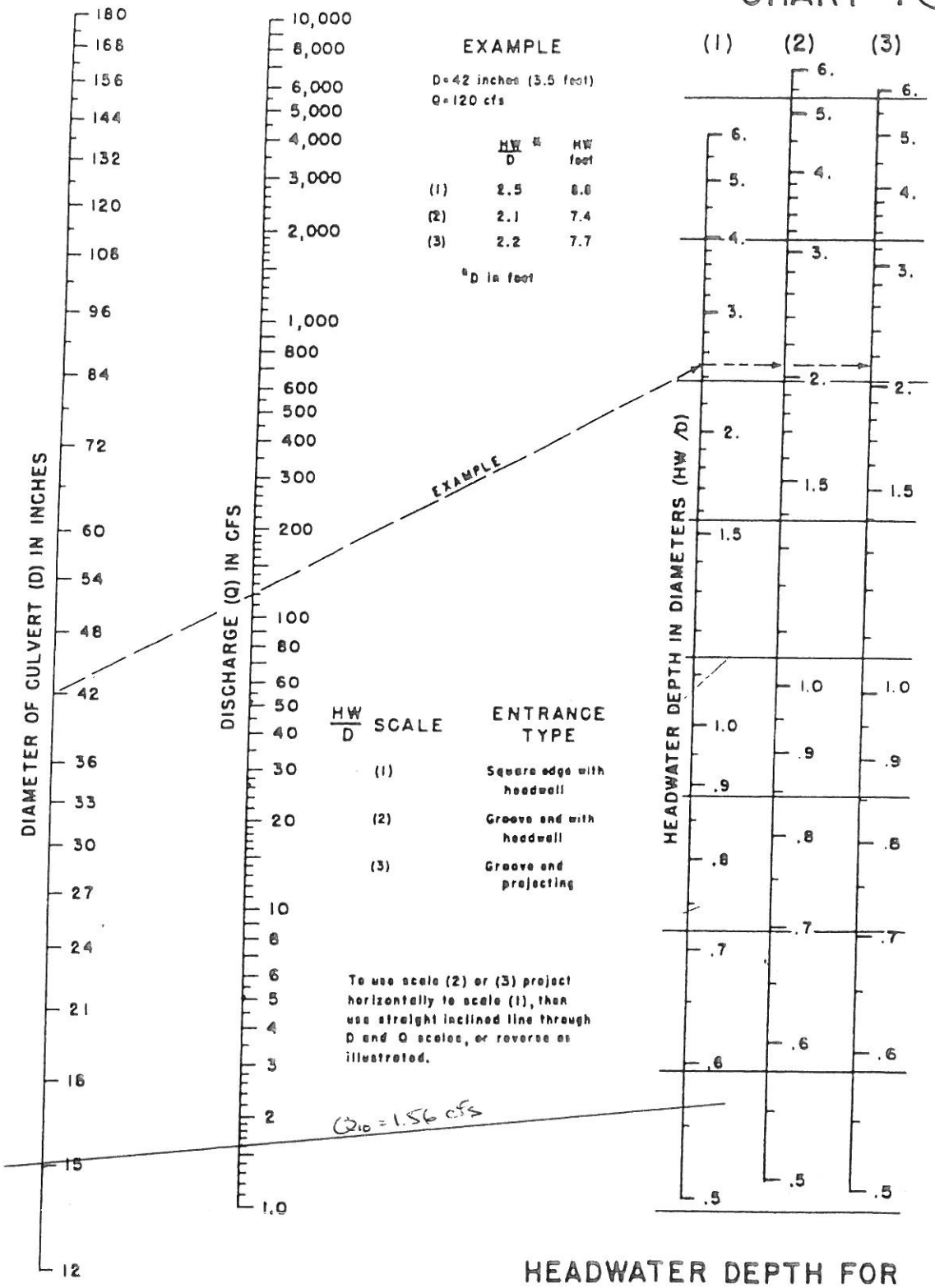
C = [(.9*0.04) + (.3*.23) + (.2*2.26)]/2.53 = 0.22
Time of Concentration = 30 minutes $\therefore$ I = 2.8 in/hr

Q = C*I*A = .22 * 2.8 * 2.53 = 1.56 cfs

HW/D for 15" RCP = 0.55

Velocity in riprap-lined swale at 12.50% slope (steepest portion of swale) = 3.71 fps.

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 283
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

CROSS CULVERT STA 7+00

Worksheet
Worksheet for Trapezoidal Channel

PDS #1

to Cross Culvert Sta. 7+00

Project Description	
Worksheet	PDS 1
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	125000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	1.56	cfs

Results		
Depth	0.18	ft
Flow Area	0.4	ft²
Wetted Perim	2.80	ft
Top Width	2.71	ft
Critical Depth	0.24	ft
Critical Slope	0.041610	ft/ft
Velocity	3.71	ft/s
Velocity Head	0.21	ft
Specific Energ	0.39	ft
Froude Numb	1.66	
Flow Type	Supercritical	

← use Modified Riprap

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR PERMANENT CONVEYANCE SWALE #1 (PCS#1)

10-YEAR DESIGN STORM
6-28-12

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 4.62 ac.
Proposed Land Cover
Grass = 1.36 ac.
Wooded = 3.15 ac.
Impervious = 0.11

C = [(.9*0.11) + (.3*1.36) + (.2*3.15)]/4.62 = 0.25
Time of Concentration = 18 minutes ∴ I = 3.8 in/hr

Q = C*I*A = .25 * 3.8 * 4.62 = 4.39 cfs

Velocity in grass-lined swale at 5.0 % slope (steepest portion of swale) = 3.86 fps.

Worksheet
Worksheet for Trapezoidal Channel

PCS #1

Project Description	
Worksheet	PCS 1-Grass WC
Flow Element	Trapezoidal Char
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.030	
Channel Slope	050000	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	4.00	ft
Discharge	4.39	cfs

Results		
Depth	0.24	ft
Flow Area	1.1	ft²
Wetted Perim	5.52	ft
Top Width	5.44	ft
Critical Depth	0.31	ft
Critical Slope	0.021031	ft/ft
Velocity	3.86	ft/s
Velocity Head	0.23	ft
Specific Energ	0.47	ft
Froude Numb	1.49	
Flow Type	Supercritical	

← Grass lined swale OK. V < 5.0 fps.

Curtis Jones & Associates
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666
Project Engineer: Emily Jones

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR CB 18+50R TO PERMANENT CONVEYANCE SWALE #2 (PCS#2) TO CB 1+00R (TOWER ACCESS ROAD)

10-YEAR DESIGN STORM
6-28-12

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale & pipe: 1.06 ac.
Proposed Land Cover
Grass = 0.73 ac.
Impervious = 0.33

C = [(.9*0.33) + (.3*0.73)]/1.06 = 0.49
Time of Concentration = 10 minutes ∴ I = 4.8 in/hr

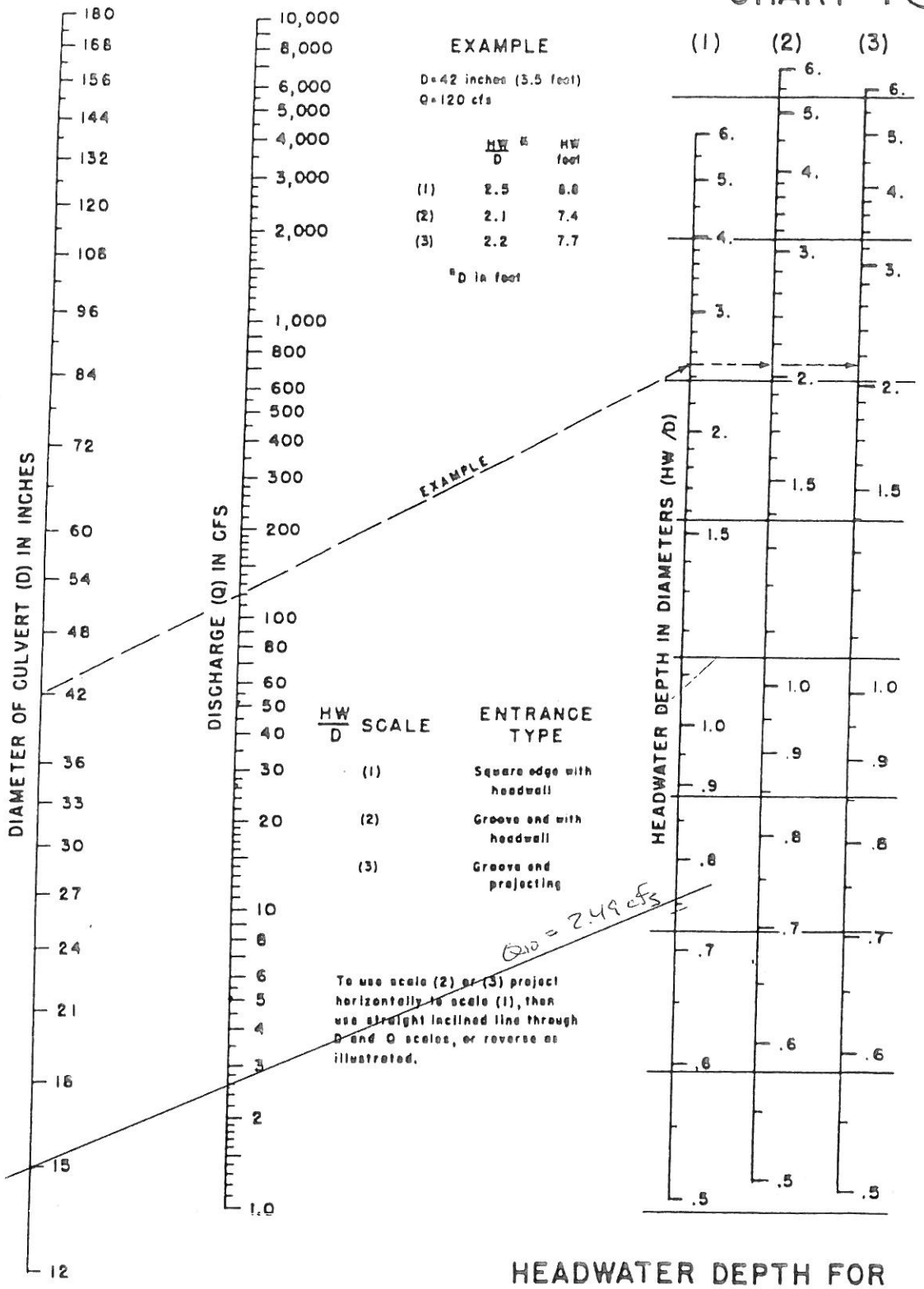
Q = C*I*A = .49 * 4.8 * 1.06 = 2.49 cfs

Velocity in riprap-lined swale at 9.7 % slope (steepest portion of swale) = 3.97 fps.

HW/D for 15" RCP = 0.75

CB STA 1+00R - TOWER 1 ACCESS ROAD

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 283
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Worksheet
Worksheet for Circular Channel

CB 1+00R - TOWER 1 ACCESS ROAD

Project Description	
Worksheet	CB 1+00R Tower 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	050000	ft/ft
Diameter	15.0	in
Discharge	2.49	cfs

Results		
Depth	0.35	ft
Flow Area	0.3	ft²
Wetted Perime	1.40	ft
Top Width	0.00	ft
Critical Depth	0.63	ft
Percent Full	28.1	%
Critical Slope	0.005728	ft/ft
Velocity	8.81	ft/s
Velocity Head	1.21	ft
Specific Energ	1.56	ft
Froude Numbe	3.10	
Maximum Disc	15.54	cfs
Discharge Full	14.44	cfs
Slope Full	0.001486	ft/ft
Flow Type	Supercritical	

Curtis Jones & Associates
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Worksheet
Worksheet for Trapezoidal Channel

PCS #2

Project Description	
Worksheet	PCS 2-Riprap
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	097000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	2.49	cfs

Results		
Depth	0.25	ft
Flow Area	0.6	ft²
Wetted Perim	3.12	ft
Top Width	3.00	ft
Critical Depth	0.32	ft
Critical Slope	0.038785	ft/ft
Velocity	3.97	ft/s
Velocity Head	0.25	ft
Specific Ener	0.50	ft
Froude Numb	1.53	
Flow Type	Supercritical	

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR PERMANENT DIVERSION SWALE #2 (PDS#2) TO CB 15+95L

10-YEAR DESIGN STORM
6-28-12

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale & pipe: .76 ac.
Proposed Land Cover
Grass = 0.08 ac.
Wooded = 0.68 ac.

C = [(.3*0.08) + (.2*0.68)]/0.76 = 0.21
Time of Concentration = 10 minutes ∴ I = 4.8 in/hr

Q = C*I*A = .21 * 4.8 * 0.76 = 0.77 cfs

Velocity in riprap-lined swale at 7.8 % slope (steepest portion of swale) = 2.50 fps.

HW/D for 15" RCP = <0.5

Worksheet
Worksheet for Trapezoidal Channel

PDS #2

Project Description	
Worksheet	PDS 2
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	078000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	0.77	cfs

Results		
Depth	0.14	ft
Flow Area	0.3	ft²
Wetted Perim	2.61	ft
Top Width	2.54	ft
Critical Depth	0.16	ft
Critical Slope	0.046779	ft/ft
Velocity	2.50	ft/s
Velocity Head	0.10	ft
Specific Ener	0.23	ft
Froude Numb	1.27	
Flow Type	Supercritical	

Worksheet
Worksheet for Circular Channel

CB 15+95L

Project Description	
Worksheet	CB 15+95L
Flow Element	Circular Chann
Method	Manning's For
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	050000	ft/ft
Diameter	15.0	in
Discharge	0.77	cfs

Results		
Depth	0.20	ft
Flow Area	0.1	ft²
Wetted Perime	1.02	ft
Top Width	0.00	ft
Critical Depth	0.34	ft
Percent Full	15.7	%
Critical Slope	0.005221	ft/ft
Velocity	6.25	ft/s
Velocity Head	0.61	ft
Specific Energ	0.80	ft
Froude Numbe	2.99	
Maximum Disc	15.54	cfs
Discharge Full	14.44	cfs
Slope Full	0.000142	ft/ft
Flow Type	Supercritical	

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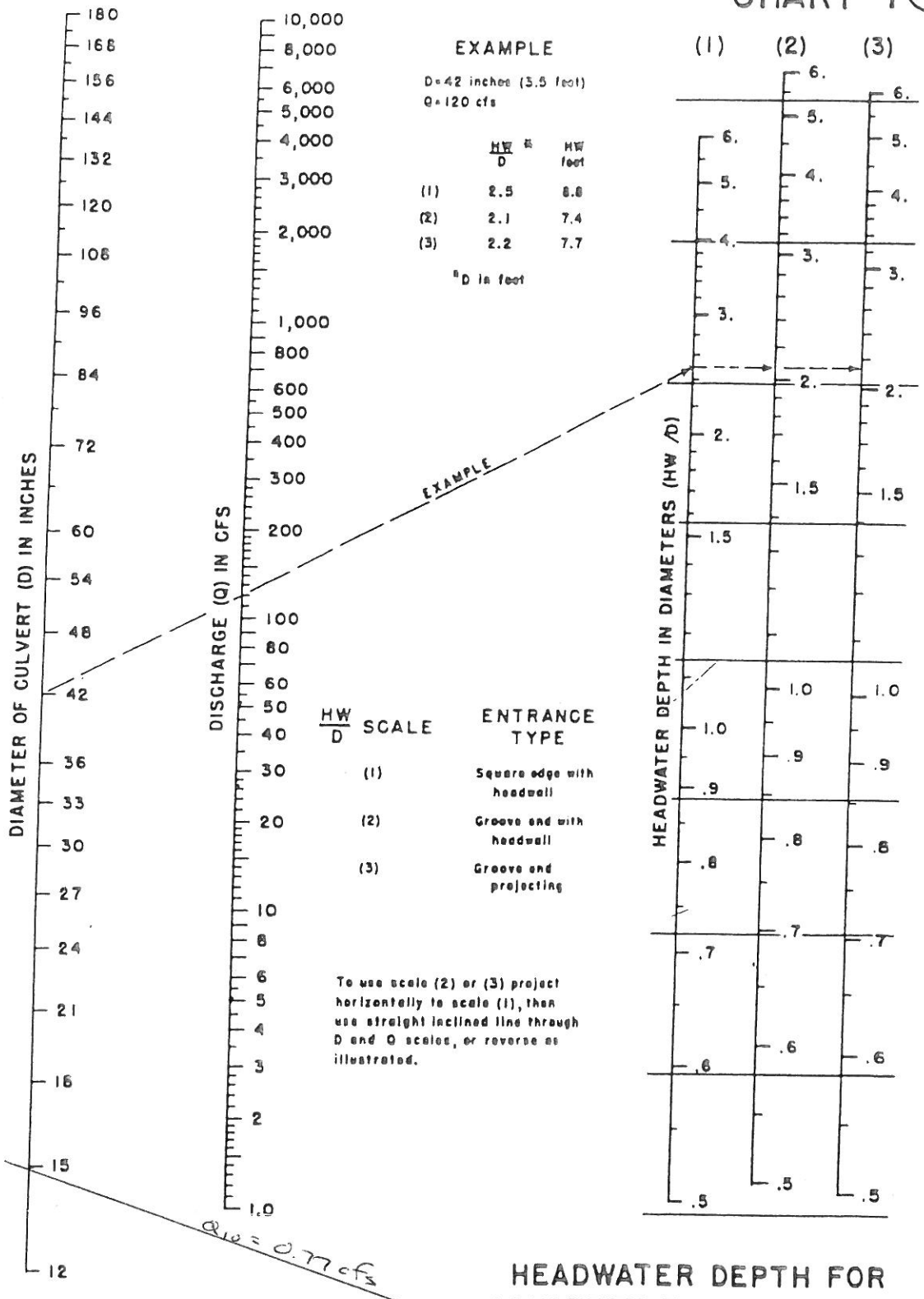
CB 15+95L

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 283
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR PERMANENT CONVEYANCE SWALE #3 (PCS 3) AND CB 30+65 R

10-YEAR DESIGN STORM
6-28-12

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 2.31 ac.
Proposed Land Cover
Grass = 1.17 ac.
Wooded = 0.59 ac.
Impervious = 0.55 ac.

C = [(.9*0.55) + (.3*1.17) + (.2*0.59)]/2.31 = 0.42
Time of Concentration = 17 minutes ∴ I = 3.8 in/hr

Q = C*I*A = .42 * 3.8 * 2.31 = 3.68 cfs

Velocity in riprap-lined swale at 9.7% slope = 4.49 fps.

Velocity in grass-lined swale at 5.0% slope = 3.64 fps.

HW/D for 15" RCP = 0.95

Worksheet
Worksheet for Trapezoidal Channel

PCS-#3 · Grass

Project Description	
Worksheet	PCS 3-Grass WC
Flow Element	Trapezoidal Char
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.030	
Channel Slope	050000	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	4.00	ft
Discharge	3.68	cfs

Results		
Depth	0.22	ft
Flow Area	1.0	ft²
Wetted Perim	5.38	ft
Top Width	5.30	ft
Critical Depth	0.28	ft
Critical Slope	0.021674	ft/ft
Velocity	3.64	ft/s
Velocity Head	0.21	ft
Specific Energ	0.42	ft
Froude Numb	1.47	
Flow Type	Supercritical	

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Worksheet
Worksheet for Trapezoidal Channel

PCS #3 - Riprap

Project Description	
Worksheet	PCS 3-Riprap S\
Flow Element	Trapezoidal Cha
Method	Manning's Form\
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	097000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	3.68	cfs

Results		
Depth	0.31	ft
Flow Area	0.8	ft²
Wetted Perim\	3.40	ft
Top Width	3.25	ft
Critical Depth	0.41	ft
Critical Slope	0.036653	ft/ft
Velocity	4.49	ft/s
Velocity Head	0.31	ft
Specific Ener\	0.63	ft
Froude Numb\	1.57	
Flow Type	Supercritical	

Worksheet
Worksheet for Circular Channel

CB 30+65R

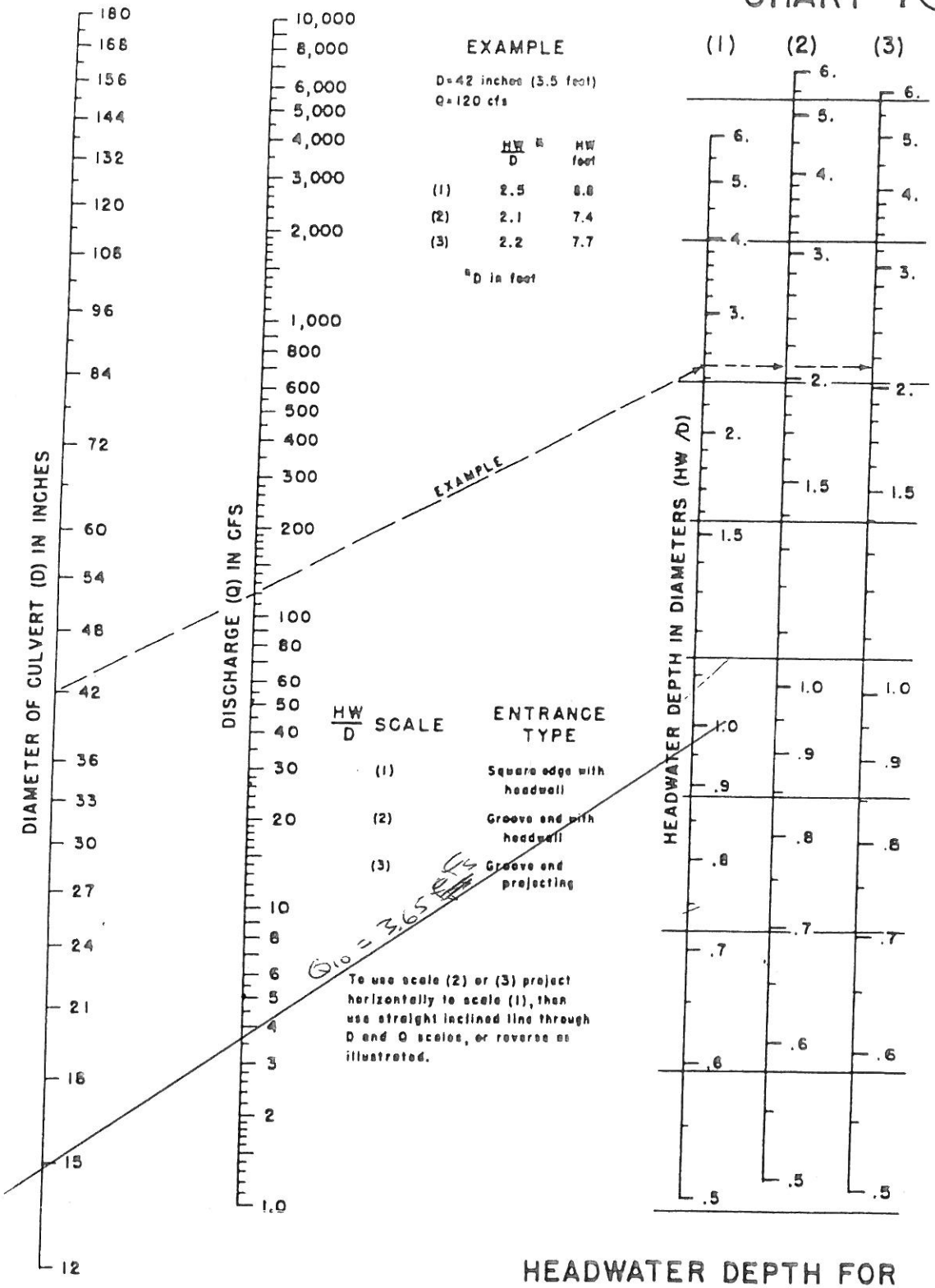
Project Description	
Worksheet	CB 30+65R
Flow Element	Circular Chann
Method	Manning's For
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	010000	ft/ft
Diameter	15.0	in
Discharge	3.68	cfs

Results		
Depth	0.68	ft
Flow Area	0.7	ft²
Wetted Perime	2.07	ft
Top Width	0.00	ft
Critical Depth	0.77	ft
Percent Full	54.1	%
Critical Slope	0.006515	ft/ft
Velocity	5.43	ft/s
Velocity Head	0.46	ft
Specific Energ	1.13	ft
Froude Numbe	1.30	
Maximum Disc	6.95	cfs
Discharge Full	6.46	cfs
Slope Full	0.003246	ft/ft
Flow Type	Supercritical	

CB 30+65 R

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 283
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR PERMANENT DIVERSION SWALE #3 (PDS 3) AND CB 29+35 L

10-YEAR DESIGN STORM
6-28-12

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 0.85 ac.
Proposed Land Cover
Grass = 0.05 ac.
Wooded = 0.75 ac.
Impervious = 0.05 ac.

C = [(.9*0.05) + (.3*0.75) + (.2*0.05)]/0.85 = 0.33
Time of Concentration = 15 minutes $\therefore$ I = 4.0 in/hr

Q = C*I*A = .33 * 4.0 * 0.85 = 1.12 cfs

Velocity in riprap-lined swale at 9.7% slope = 3.06 fps.

HW/D for 15" RCP < 0.5

Worksheet
Worksheet for Trapezoidal Channel

PDS #3

Project Description	
Worksheet	PDS 3
Flow Element	Trapezoidal Cha
Method	Manning's Formı
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	097000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	1.12	cfs

Results		
Depth	0.16	ft
Flow Area	0.4	ft²
Wetted Perim	2.71	ft
Top Width	2.63	ft
Critical Depth	0.20	ft
Critical Slope	0.043991	ft/ft
Velocity	3.06	ft/s
Velocity Head	0.15	ft
Specific Ener	0.30	ft
Froude Numb	1.44	
Flow Type	Supercritical	

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Worksheet
Worksheet for Circular Channel

CB 29+35L

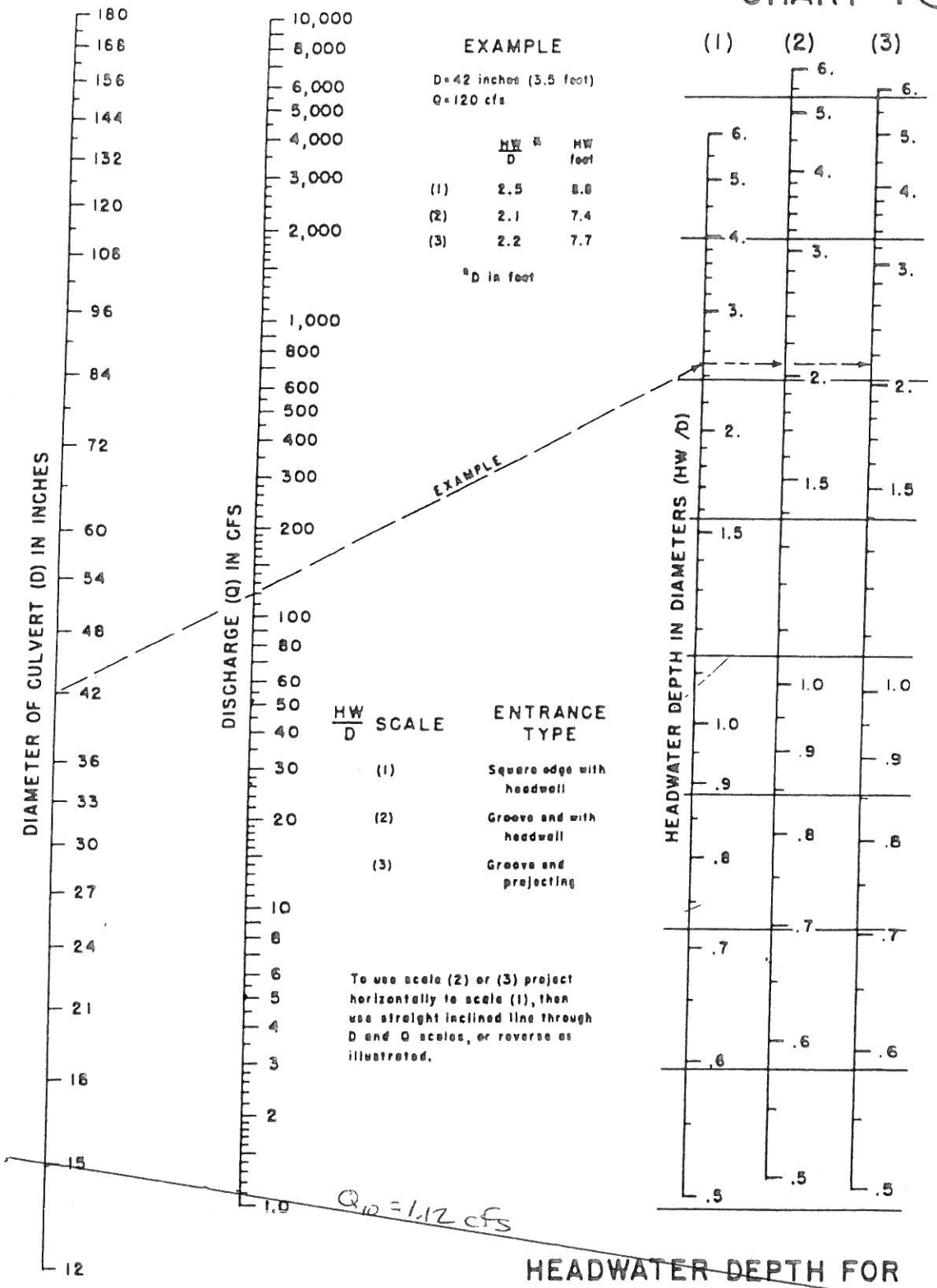
Project Description	
Worksheet	CB 29+35L
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	007500	ft/ft
Diameter	15.0	in
Discharge	1.12	cfs

Results		
Depth	0.38	ft
Flow Area	0.3	ft²
Wetted Perime	1.46	ft
Top Width	0.00	ft
Critical Depth	0.42	ft
Percent Full	30.3	%
Critical Slope	0.005228	ft/ft
Velocity	3.56	ft/s
Velocity Head	0.20	ft
Specific Energ	0.58	ft
Froude Numbe	1.20	
Maximum Disc	6.02	cfs
Discharge Full	5.59	cfs
Slope Full	0.000301	ft/ft
Flow Type	Supercritical	

CB 29+35L

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 283
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Wind Colebrook South
Flagg Hill Road
Colebrook, CT

DRAINAGE CALCULATIONS FOR PERMANENT CONVEYANCE SWALE #4 (PCS 4) AND CB 34+80 L

10-YEAR DESIGN STORM
6-28-12

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 1.77 ac.
Proposed Land Cover
Grass = 1.32 ac
Impervious = 0.45

C = [(.9*0.45) + (.3*1.32)]/1.77 = 0.45
Time of Concentration = 15 minutes ∴ I = 4.0 in/hr

Q = C*I*A = .45 * 4.0 * 1.77 = 3.19 cfs

HW/D for 15" RCP = 0.90

Velocity in dry grass-lined swale at 1.0% slope = 2.74 fps.

Worksheet
Worksheet for Trapezoidal Channel

PCS#4

Project Description	
Worksheet	PCS 4-Grass WC
Flow Element	Trapezoidal Char
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.030	
Channel Slope	010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	4.00	ft
Discharge	3.19	cfs

Results		
Depth	0.33	ft
Flow Area	1.5	ft²
Wetted Perim	5.46	ft
Top Width	5.30	ft
Critical Depth	0.26	ft
Critical Slope	0.022072	ft/ft
Velocity	2.11	ft/s
Velocity Head	0.07	ft
Specific Energ	0.39	ft
Froude Numb	0.69	
Flow Type	Subcritical	

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Worksheet
Worksheet for Circular Channel

CB 34+80L

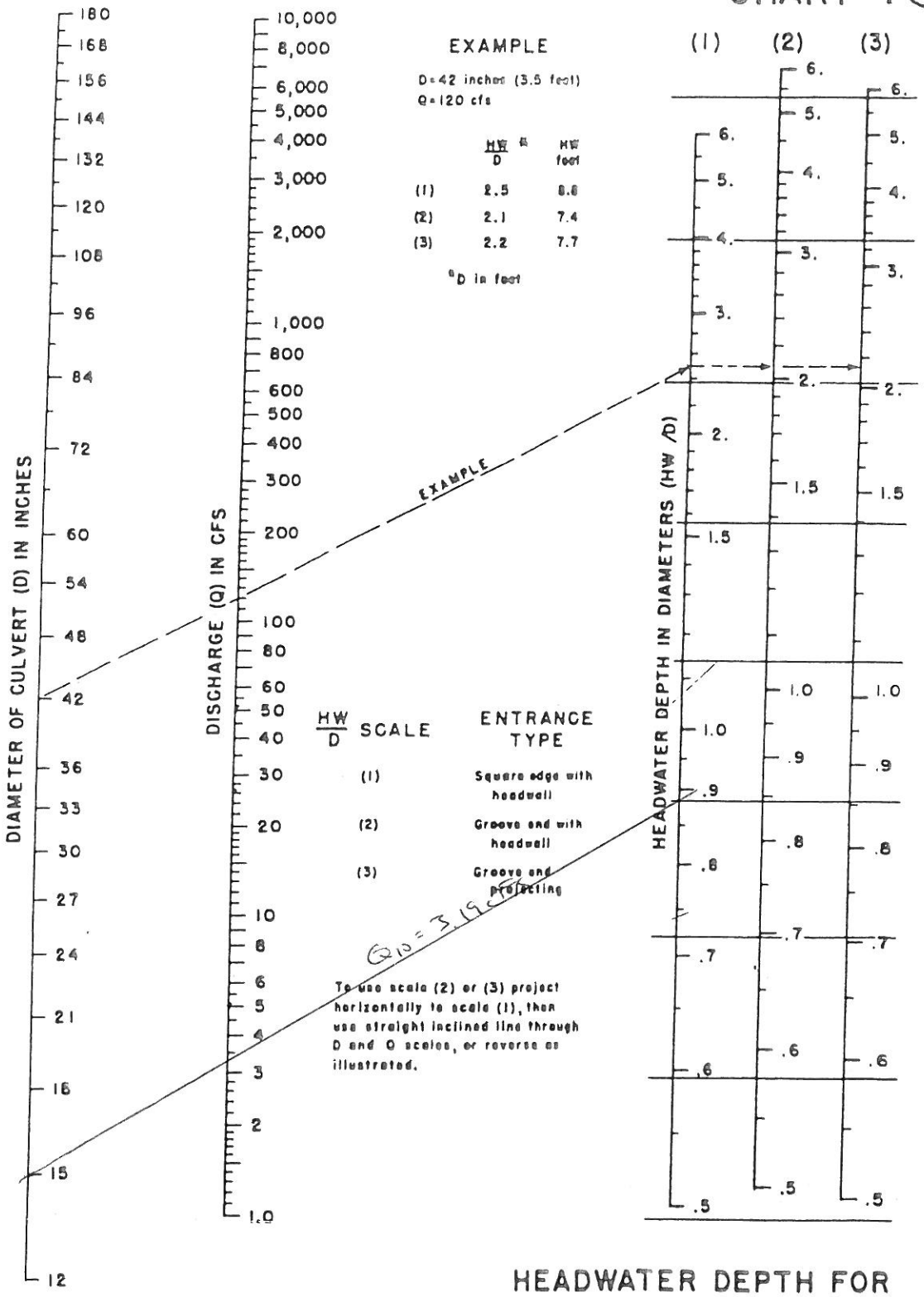
Project Description	
Worksheet	CB 34+80 L
Flow Element	Circular Chann
Method	Manning's For
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	010000	ft/ft
Diameter	15.0	in
Discharge	3.19	cfs

Results		
Depth	0.62	ft
Flow Area	0.6	ft²
Wetted Perime	1.95	ft
Top Width	0.00	ft
Critical Depth	0.72	ft
Percent Full	49.6	%
Critical Slope	0.006153	ft/ft
Velocity	5.25	ft/s
Velocity Head	0.43	ft
Specific Energ	1.05	ft
Froude Numbe	1.33	
Maximum Disc	6.95	cfs
Discharge Full	6.46	cfs
Slope Full	0.002439	ft/ft
Flow Type	Supercritical	

CB 341+80L

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Existing Flows – DP1

Table of Contents

Table of Contents (continued)

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Litchfield Co.

Return Event	Total Depth in	Rainfall Type	RNF ID
2 YR	3.2000	Synthetic Curve	TypeIII 24hr
10 YR	4.7000	Synthetic Curve	TypeIII 24hr
25 YR	5.5000	Synthetic Curve	TypeIII 24hr
50 YR	6.2000	Synthetic Curve	TypeIII 24hr
100 YR	7.0000	Synthetic Curve	TypeIII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*DP 1	JCT	2	.361		12.5500	1.83		
*DP 1	JCT	10	.999		12.4500	6.75		
*DP 1	JCT	25	1.417		12.4000	10.13		
*DP 1	JCT	50	1.816		12.4000	13.35		
*DP 1	JCT	100	2.302		12.4000	17.25		
EXDA 1	AREA	2	.361		12.5500	1.83		
EXDA 1	AREA	10	.999		12.4500	6.75		
EXDA 1	AREA	25	1.417		12.4000	10.13		
EXDA 1	AREA	50	1.816		12.4000	13.35		
EXDA 1	AREA	100	2.302		12.4000	17.25		

File.... C:\Program Files\Haestad\PPKW\PPW\
Title... Project Date: 4/16/2009
Project Engineer: Curtis Jones
Project Title: Watershed
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = Litchfield Co.

Storm Tag Name = 2 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 3.2000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 4.7000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 6.2000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = Litchfield Co.

Storm Tag Name = 2 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 3.2000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 4.7000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 6.2000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100 YR

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... C:\Program Files\Haestad\PPKW\PPW\3092 EXDA 1.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000	
Hydraulic Length	250.00	ft
2yr, 24hr P	3.2000	in
Slope	.064000	ft/ft
Avg.Velocity	.15	ft/sec

Segment #1 Time: .4678 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	1030.00	ft
Slope	.184000	ft/ft
Unpaved		
Avg.Velocity	6.92	ft/sec

Segment #2 Time: .0413 hrs

Segment #3: Tc: TR-55 Channel

Flow Area	2.5000	sq.ft
Wetted Perimeter	5.50	ft
Hydraulic Radius	.45	ft
Slope	.028000	ft/ft
Mannings n	.0400	
Hydraulic Length	140.00	ft
Avg.Velocity	3.68	ft/sec

Segment #3 Time: .0106 hrs

Total Tc: .5197 hrs

File.... C:\Program Files\Haestad\PPKW\PPW\3092 EXDA 1.PPW

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... C:\Program Files\Haestad\PPKW\PPW\3092 EXDA 1.PPW

==== SCS Channel Flow ==========

R = Aq / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... C:\Program Files\Haestad\PPKW\PPW\3092 EXDA 1.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Soil Type B - Wooded	55	6.740			55.00
Soil Type B - Grass/Meadow	60	1.160			60.00
Soil Type C - Wooded	70	2.120			70.00
Soil Type C - Grass/Meadow	72	.390			72.00
Impervious	98	.200			98.00
COMPOSITE AREA & WEIGHTED CN --->		10.610			59.98 (60)

SCS UNIT HYDROGRAPH METHOD
(Computational Notes)

DEFINITION OF TERMS: ----------

```
  At    = Total area (acres):  At = Ai+Ap
  Ai    = Impervious area (acres)
  Ap    = Pervious area (acres)
  CNi   = Runoff curve number for impervious area
  CNp   = Runoff curve number for pervious area
  fLoss = f loss constant infiltration (depth/time)
  gKs   = Saturated Hydraulic Conductivity (depth/time)
  Md    = Volumetric Moisture Deficit
  Psi   = Capillary Suction (length)
  hK    = Horton Infiltration Decay Rate (time^-1)
  fo    = Initial Infiltration Rate (depth/time)
  fc    = Ultimate(capacity)Infiltration Rate (depth/time)
  Ia    = Initial Abstraction (length)
  dt    = Computational increment (duration of unit excess rainfall)
          Default dt is smallest value of 0.1333Tc, rtm, and th
          (Smallest dt is then adjusted to match up with Tp)
UDdt    = User specified override computational main time increment
          (only used if UDdt is => .1333Tc)
  D(t)  = Point on distribution curve (fraction of P) for time step t

  K     = 2 / (1 + (Tr/Tp)):  default K = 0.75: (for Tr/Tp = 1.67)
  Ks    = Hydrograph shape factor
        = Unit Conversions * K:
        = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K
          Default Ks = 645.333 * 0.75 = 484

  Lag   = Lag time from center of excess runoff (dt) to Tp:  Lag = 0.6Tc
  P     = Total precipitation depth, inches
  Pa(t) = Accumulated rainfall at time step t
  Pi(t) = Incremental rainfall at time step t
  qp    = Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi.
        = (Ks * A * Q) / Tp   (where Q = 1in. runoff, A=sq.mi.)
  Qu(t) = Unit hydrograph ordinate (cfs) at time step t
  Q(t)  = Final hydrograph ordinate (cfs) at time step t
  Rai(t)= Accumulated runoff (inches) at time step t for impervious area
  Rap(t)= Accumulated runoff (inches) at time step t for pervious area
  Rii(t)= Incremental runoff (inches) at time step t for impervious area
  Rip(t)= Incremental runoff (inches) at time step t for pervious area
  R(t)  = Incremental weighted total runoff (inches)
  Rtm   = Time increment for rainfall table
  Si    = S for impervious area:  Si = (1000/CNi) - 10
  Sp    = S for pervious area:    Sp = (1000/CNp) - 10
  t     = Time step (row) number
  Tc    = Time of concentration
  Tb    = Time (hrs) of entire unit hydrograph:  Tb = Tp + Tr
  Tp    = Time (hrs) to peak of a unit hydrograph:  Tp = (dt/2) + Lag
  Tr    = Time (hrs) of receding limb of unit hydrograph:  Tr = ratio of Tp
```

SCS UNIT HYDROGRAPH METHOD
(Computational Notes)

PRECIPITATION: ----------
Column (1): Time for time step t
Column (2): D(t) = Point on distribution curve for time step t
Column (3): Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4): Pa(t) = D(t) x P: Col.(2) x P

PERVIOUS AREA RUNOFF (using SCS Runoff CN Method) ----------
Column (5): Rap(t) = Accumulated pervious runoff for time step t
If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
If (Pa(t) is > 0.2Sp) then use:

Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)

Column (6): Rip(t) = Incremental pervious runoff for time step t
Rip(t) = Rap(t) - Rap(t-1)
Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

IMPERVIOUS AREA RUNOFF ----------
Column (7 & 8)... Did not specify to use impervious areas.

INCREMENTAL WEIGHTED RUNOFF: ----------
Column (9): R(t) = (Ap/At) x Rip(t) + (Ai/At) x Rii(t)
R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS UNIT HYDROGRAPH METHOD: ----------
Column (10): Q(t) is computed with the SCS unit hydrograph method
using R() and Qu().

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.2000 in
Rain Dir = C:\Program Files\Haestad\PPKW\PPW\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\Program Files\Haestad\PPKW\PPW\
HYG File - ID = - EXDA 1 2 YR
Tc = .5197 hrs
Drainage Area = 10.610 acres Runoff CN= 60

==========
Computational Time Increment = .06929 hrs
Computed Peak Time = 12.5417 hrs
Computed Peak Flow = 1.84 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.5500 hrs
Peak Flow, Interpolated Output = 1.83 cfs
==========

DRAINAGE AREA

ID:EXDA 1
CN = 60
Area = 10.610 acres
S = 6.6667 in
0.2S = 1.3333 in

Cumulative Runoff

.4083 in
.361 ac-ft

HYG Volume... .361 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .51968 hrs (ID: EXDA 1)
Computational Incr, Tm = .06929 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 23.13 cfs
Unit peak time Tp = .34646 hrs
Unit receding limb, Tr = 1.38582 hrs
Total unit time, Tb = 1.73228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 4.7000 in
Rain Dir = C:\Program Files\Haestad\PPKW\PPW\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\Program Files\Haestad\PPKW\PPW\
HYG File - ID = - EXDA 1 10 YR
Tc = .5197 hrs
Drainage Area = 10.610 acres Runoff CN= 60

==========
Computational Time Increment = .06929 hrs
Computed Peak Time = 12.4031 hrs
Computed Peak Flow = 6.76 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4500 hrs
Peak Flow, Interpolated Output = 6.75 cfs
==========

DRAINAGE AREA

ID:EXDA 1
CN = 60
Area = 10.610 acres
S = 6.6667 in
0.2S = 1.3333 in

Cumulative Runoff

1.1297 in
.999 ac-ft

HYG Volume... .999 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .51968 hrs (ID: EXDA 1)
Computational Incr, Tm = .06929 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 23.13 cfs
Unit peak time Tp = .34646 hrs
Unit receding limb, Tr = 1.38582 hrs
Total unit time, Tb = 1.73228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = C:\Program Files\Haestad\PPKW\PPW\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\Program Files\Haestad\PPKW\PPW\
HYG File - ID = - EXDA 1 25 YR
Tc = .5197 hrs
Drainage Area = 10.610 acres Runoff CN= 60

==========
Computational Time Increment = .06929 hrs
Computed Peak Time = 12.4031 hrs
Computed Peak Flow = 10.15 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4000 hrs
Peak Flow, Interpolated Output = 10.13 cfs
==========

DRAINAGE AREA

ID:EXDA 1
CN = 60
Area = 10.610 acres
S = 6.6667 in
0.2S = 1.3333 in

Cumulative Runoff

1.6026 in
1.417 ac-ft

HYG Volume... 1.417 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .51968 hrs (ID: EXDA 1)
Computational Incr, Tm = .06929 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 23.13 cfs
Unit peak time Tp = .34646 hrs
Unit receding limb, Tr = 1.38582 hrs
Total unit time, Tb = 1.73228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 50 year storm
Duration = 24.0000 hrs Rain Depth = 6.2000 in
Rain Dir = C:\Program Files\Haestad\PPKW\PPW\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\Program Files\Haestad\PPKW\PPW\
HYG File - ID = - EXDA 1 50 YR
Tc = .5197 hrs
Drainage Area = 10.610 acres Runoff CN= 60

==========
Computational Time Increment = .06929 hrs
Computed Peak Time = 12.4031 hrs
Computed Peak Flow = 13.37 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4000 hrs
Peak Flow, Interpolated Output = 13.35 cfs
==========

DRAINAGE AREA

ID:EXDA 1
CN = 60
Area = 10.610 acres
S = 6.6667 in
0.2S = 1.3333 in

Cumulative Runoff

2.0536 in
1.816 ac-ft

HYG Volume... 1.816 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .51968 hrs (ID: EXDA 1)
Computational Incr, Tm = .06929 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 23.13 cfs
Unit peak time Tp = .34646 hrs
Unit receding limb, Tr = 1.38582 hrs
Total unit time, Tb = 1.73228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.0000 in
Rain Dir = C:\Program Files\Haestad\PPKW\PPW\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\Program Files\Haestad\PPKW\PPW\
HYG File - ID = - EXDA 1 100 YR
Tc = .5197 hrs
Drainage Area = 10.610 acres Runoff CN= 60

==========
Computational Time Increment = .06929 hrs
Computed Peak Time = 12.4031 hrs
Computed Peak Flow = 17.27 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4000 hrs
Peak Flow, Interpolated Output = 17.25 cfs
==========

DRAINAGE AREA

ID:EXDA 1
CN = 60
Area = 10.610 acres
S = 6.6667 in
0.2S = 1.3333 in

Cumulative Runoff

2.6036 in
2.302 ac-ft

HYG Volume... 2.302 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .51968 hrs (ID: EXDA 1)
Computational Incr, Tm = .06929 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 23.13 cfs
Unit peak time Tp = .34646 hrs
Unit receding limb, Tr = 1.38582 hrs
Total unit time, Tb = 1.73228 hrs

SUMMARY FOR HYDROGRAPH ADDITION
at Node: DP 1

HYG Directory: C:\Program Files\Haestad\PPKW\PPW\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
TO DP 1	EXDA 1		EXDA 1	2 YR

INFLOWS TO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	EXDA 1	2 YR	.361	12.5500	1.83

TOTAL FLOW INTO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	DP 1	2 YR	.361	12.5500	1.83

TOTAL NODE INFLOW...
HYG file =
HYG ID = DP 1
HYG Tag = 2 YR

Peak Discharge =	1.83 cfs
Time to Peak =	12.5500 hrs
HYG Volume =	.361 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
11.9000	.00	.01	.03	.09	.22
12.1500	.40	.64	.92	1.18	1.43
12.4000	1.62	1.75	1.81	1.83	1.78
12.6500	1.71	1.61	1.51	1.40	1.30
12.9000	1.21	1.12	1.05	.99	.93
13.1500	.89	.84	.80	.77	.74
13.4000	.72	.70	.68	.66	.65
13.6500	.64	.62	.61	.60	.59
13.9000	.58	.57	.57	.56	.55
14.1500	.54	.53	.52	.52	.51
14.4000	.50	.50	.49	.49	.48
14.6500	.48	.47	.47	.46	.46
14.9000	.45	.45	.45	.44	.44
15.1500	.43	.43	.42	.42	.41
15.4000	.41	.40	.40	.39	.39
15.6500	.38	.38	.37	.37	.36
15.9000	.36	.35	.34	.34	.33
16.1500	.33	.32	.32	.31	.31
16.4000	.30	.30	.30	.29	.29
16.6500	.29	.29	.28	.28	.28
16.9000	.27	.27	.27	.27	.26
17.1500	.26	.26	.26	.25	.25
17.4000	.25	.25	.24	.24	.24
17.6500	.24	.23	.23	.23	.23
17.9000	.22	.22	.22	.21	.21
18.1500	.21	.21	.20	.20	.20
18.4000	.20	.20	.20	.19	.19
18.6500	.19	.19	.19	.19	.19
18.9000	.19	.19	.19	.19	.18
19.1500	.18	.18	.18	.18	.18
19.4000	.18	.18	.18	.18	.18

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
19.6500	.18	.18	.17	.17	.17
19.9000	.17	.17	.17	.17	.17
20.1500	.17	.17	.17	.17	.17
20.4000	.17	.16	.16	.16	.16
20.6500	.16	.16	.16	.16	.16
20.9000	.16	.16	.16	.16	.16
21.1500	.16	.16	.15	.15	.15
21.4000	.15	.15	.15	.15	.15
21.6500	.15	.15	.15	.15	.15
21.9000	.15	.15	.15	.14	.14
22.1500	.14	.14	.14	.14	.14
22.4000	.14	.14	.14	.14	.14
22.6500	.14	.14	.14	.14	.13
22.9000	.13	.13	.13	.13	.13
23.1500	.13	.13	.13	.13	.13
23.4000	.13	.13	.13	.13	.12
23.6500	.12	.12	.12	.12	.12
23.9000	.12	.12	.12	.12	.11
24.1500	.11	.10	.09	.08	.06
24.4000	.05	.04	.03	.03	.02
24.6500	.02	.01	.01	.01	.01
24.9000	.00	.00	.00	.00	.00
25.1500	.00	.00	.00		

SUMMARY FOR HYDROGRAPH ADDITION
at Node: DP 1

HYG Directory: C:\Program Files\Haestad\PPKW\PPW\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
TO DP 1	EXDA 1		EXDA 1	10 YR

INFLOWS TO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	EXDA 1	10 YR	.999	12.4500	6.75

TOTAL FLOW INTO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	DP 1	10 YR	.999	12.4500	6.75

TOTAL NODE INFLOW...
HYG file =
HYG ID = DP 1
HYG Tag = 10 YR

Peak Discharge =	6.75 cfs
Time to Peak =	12.4500 hrs
HYG Volume =	.999 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
11.4500	.00	.00	.01	.02	.04
11.7000	.07	.12	.21	.32	.51
11.9500	.79	1.17	1.72	2.49	3.37
12.2000	4.31	5.21	5.91	6.44	6.74
12.4500	6.75	6.61	6.34	5.94	5.50
12.7000	5.05	4.60	4.19	3.81	3.46
12.9500	3.17	2.93	2.71	2.52	2.36
13.2000	2.22	2.10	1.99	1.90	1.82
13.4500	1.76	1.70	1.65	1.60	1.56
13.7000	1.53	1.49	1.46	1.43	1.41
13.9500	1.38	1.36	1.33	1.31	1.28
14.2000	1.26	1.24	1.22	1.20	1.18
14.4500	1.17	1.15	1.14	1.12	1.11
14.7000	1.10	1.09	1.07	1.06	1.05
14.9500	1.04	1.03	1.01	1.00	.99
15.2000	.98	.97	.95	.94	.93
15.4500	.92	.90	.89	.88	.87
15.7000	.85	.84	.83	.81	.80
15.9500	.79	.77	.76	.75	.74
16.2000	.72	.71	.70	.69	.68
16.4500	.67	.66	.66	.65	.64
16.7000	.63	.63	.62	.62	.61
16.9500	.60	.60	.59	.58	.58
17.2000	.57	.57	.56	.55	.55
17.4500	.54	.54	.53	.52	.52
17.7000	.51	.51	.50	.49	.49
17.9500	.48	.48	.47	.46	.46
18.2000	.45	.45	.44	.44	.43
18.4500	.43	.43	.42	.42	.42
18.7000	.42	.41	.41	.41	.41
18.9500	.41	.40	.40	.40	.40

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
19.2000	.40	.40	.39	.39	.39
19.4500	.39	.39	.38	.38	.38
19.7000	.38	.38	.38	.37	.37
19.9500	.37	.37	.37	.36	.36
20.2000	.36	.36	.36	.36	.35
20.4500	.35	.35	.35	.35	.35
20.7000	.35	.34	.34	.34	.34
20.9500	.34	.34	.34	.33	.33
21.2000	.33	.33	.33	.33	.33
21.4500	.32	.32	.32	.32	.32
21.7000	.32	.32	.31	.31	.31
21.9500	.31	.31	.31	.31	.31
22.2000	.30	.30	.30	.30	.30
22.4500	.30	.29	.29	.29	.29
22.7000	.29	.29	.29	.29	.28
22.9500	.28	.28	.28	.28	.28
23.2000	.27	.27	.27	.27	.27
23.4500	.27	.27	.26	.26	.26
23.7000	.26	.26	.26	.26	.25
23.9500	.25	.25	.25	.24	.23
24.2000	.21	.19	.16	.13	.11
24.4500	.09	.07	.05	.04	.03
24.7000	.03	.02	.02	.01	.01
24.9500	.01	.01	.00	.00	.00
25.2000	.00	.00	.00	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: DP 1

HYG Directory: C:\Program Files\Haestad\PPKW\PPW\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
TO DP 1	EXDA 1		EXDA 1	25 YR

INFLOWS TO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	EXDA 1	25 YR	1.417	12.4000	10.13

TOTAL FLOW INTO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	DP 1	25 YR	1.417	12.4000	10.13

TOTAL NODE INFLOW...
HYG file =
HYG ID = DP 1
HYG Tag = 25 YR

Peak Discharge =	10.13 cfs
Time to Peak =	12.4000 hrs
HYG Volume =	1.417 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
11.0000	.00	.00	.01	.01	.02
11.2500	.03	.05	.07	.10	.13
11.5000	.16	.21	.26	.33	.42
11.7500	.56	.73	.96	1.30	1.77
12.0000	2.39	3.23	4.38	5.66	7.01
12.2500	8.24	9.17	9.82	10.13	10.03
12.5000	9.73	9.24	8.60	7.91	7.23
12.7500	6.55	5.93	5.37	4.87	4.44
13.0000	4.08	3.77	3.50	3.27	3.07
13.2500	2.89	2.73	2.60	2.49	2.40
13.5000	2.31	2.24	2.18	2.12	2.07
13.7500	2.02	1.98	1.94	1.90	1.86
14.0000	1.83	1.79	1.76	1.73	1.69
14.2500	1.66	1.64	1.61	1.59	1.56
14.5000	1.54	1.52	1.50	1.49	1.47
14.7500	1.45	1.43	1.42	1.40	1.38
15.0000	1.37	1.35	1.34	1.32	1.30
15.2500	1.29	1.27	1.25	1.24	1.22
15.5000	1.20	1.18	1.17	1.15	1.13
15.7500	1.11	1.10	1.08	1.06	1.04
16.0000	1.03	1.01	.99	.97	.96
16.2500	.94	.93	.91	.90	.89
16.5000	.88	.87	.86	.85	.84
16.7500	.83	.82	.81	.80	.80
17.0000	.79	.78	.77	.76	.76
17.2500	.75	.74	.73	.72	.72
17.5000	.71	.70	.69	.68	.67
17.7500	.67	.66	.65	.64	.63
18.0000	.63	.62	.61	.60	.59
18.2500	.59	.58	.57	.57	.56
18.5000	.56	.56	.55	.55	.55

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
18.7500	.54	.54	.54	.54	.53
19.0000	.53	.53	.53	.52	.52
19.2500	.52	.52	.51	.51	.51
19.5000	.51	.50	.50	.50	.50
19.7500	.49	.49	.49	.49	.48
20.0000	.48	.48	.48	.48	.47
20.2500	.47	.47	.47	.46	.46
20.5000	.46	.46	.46	.45	.45
20.7500	.45	.45	.45	.44	.44
21.0000	.44	.44	.44	.44	.43
21.2500	.43	.43	.43	.43	.42
21.5000	.42	.42	.42	.42	.41
21.7500	.41	.41	.41	.41	.41
22.0000	.40	.40	.40	.40	.40
22.2500	.39	.39	.39	.39	.39
22.5000	.38	.38	.38	.38	.38
22.7500	.38	.37	.37	.37	.37
23.0000	.37	.36	.36	.36	.36
23.2500	.36	.35	.35	.35	.35
23.5000	.35	.34	.34	.34	.34
23.7500	.34	.33	.33	.33	.33
24.0000	.33	.32	.31	.29	.27
24.2500	.24	.21	.17	.14	.11
24.5000	.09	.07	.05	.04	.03
24.7500	.03	.02	.02	.01	.01
25.0000	.01	.01	.00	.00	.00
25.2500	.00	.00	.00	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: DP 1

HYG Directory: C:\Program Files\Haestad\PPKW\PPW\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
TO DP 1	EXDA 1		EXDA 1	50 YR

INFLOWS TO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	EXDA 1	50 YR	1.816	12.4000	13.35

TOTAL FLOW INTO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	DP 1	50 YR	1.816	12.4000	13.35

TOTAL NODE INFLOW...
HYG file =
HYG ID = DP 1
HYG Tag = 50 YR

Peak Discharge =	13.35 cfs
Time to Peak =	12.4000 hrs
HYG Volume =	1.816 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
10.5500	.00	.00	.00	.01	.01
10.8000	.02	.03	.05	.06	.08
11.0500	.11	.13	.16	.19	.22
11.3000	.26	.30	.35	.40	.45
11.5500	.52	.61	.71	.85	1.05
11.8000	1.31	1.63	2.11	2.76	3.60
12.0500	4.73	6.23	7.89	9.62	11.15
12.3000	12.28	13.03	13.35	13.14	12.66
12.5500	11.97	11.09	10.17	9.26	8.36
12.8000	7.56	6.82	6.17	5.61	5.15
13.0500	4.75	4.39	4.10	3.84	3.61
13.3000	3.41	3.25	3.11	2.98	2.88
13.5500	2.79	2.70	2.63	2.56	2.50
13.8000	2.45	2.39	2.35	2.30	2.25
14.0500	2.21	2.17	2.13	2.09	2.05
14.3000	2.02	1.98	1.95	1.92	1.90
14.5500	1.87	1.85	1.83	1.81	1.78
14.8000	1.76	1.74	1.72	1.70	1.68
15.0500	1.66	1.64	1.62	1.60	1.58
15.3000	1.56	1.53	1.51	1.49	1.47
15.5500	1.45	1.43	1.41	1.39	1.36
15.8000	1.34	1.32	1.30	1.28	1.25
16.0500	1.23	1.21	1.19	1.17	1.15
16.3000	1.13	1.11	1.10	1.08	1.07
16.5500	1.06	1.04	1.03	1.02	1.01
16.8000	1.00	.99	.98	.97	.96
17.0500	.95	.94	.93	.92	.91
17.3000	.90	.89	.88	.87	.86
17.5500	.85	.84	.83	.82	.81
17.8000	.80	.79	.78	.77	.76
18.0500	.75	.74	.73	.72	.71

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
18.3000	.71	.70	.69	.69	.68
18.5500	.68	.67	.67	.66	.66
18.8000	.66	.65	.65	.65	.64
19.0500	.64	.64	.64	.63	.63
19.3000	.63	.62	.62	.62	.61
19.5500	.61	.61	.61	.60	.60
19.8000	.60	.59	.59	.59	.59
20.0500	.58	.58	.58	.57	.57
20.3000	.57	.57	.56	.56	.56
20.5500	.56	.55	.55	.55	.55
20.8000	.54	.54	.54	.54	.53
21.0500	.53	.53	.53	.53	.52
21.3000	.52	.52	.52	.51	.51
21.5500	.51	.51	.50	.50	.50
21.8000	.50	.50	.49	.49	.49
22.0500	.49	.48	.48	.48	.48
22.3000	.48	.47	.47	.47	.47
22.5500	.46	.46	.46	.46	.45
22.8000	.45	.45	.45	.44	.44
23.0500	.44	.44	.44	.43	.43
23.3000	.43	.43	.42	.42	.42
23.5500	.42	.41	.41	.41	.41
23.8000	.40	.40	.40	.40	.39
24.0500	.39	.38	.36	.33	.29
24.3000	.25	.21	.17	.14	.11
24.5500	.08	.07	.05	.04	.03
24.8000	.03	.02	.02	.01	.01
25.0500	.01	.01	.00	.00	.00
25.3000	.00	.00	.00	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: DP 1

HYG Directory: C:\Program Files\Haestad\PPKW\PPW\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
TO DP 1	EXDA 1		EXDA 1	100 YR

INFLOWS TO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	EXDA 1	100 YR	2.302	12.4000	17.25

TOTAL FLOW INTO: DP 1

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	DP 1	100 YR	2.302	12.4000	17.25

TOTAL NODE INFLOW...
HYG file =
HYG ID = DP 1
HYG Tag = 100 YR

Peak Discharge =	17.25 cfs
Time to Peak =	12.4000 hrs
HYG Volume =	2.302 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
10.1000	.00	.00	.00	.01	.01
10.3500	.02	.03	.04	.06	.07
10.6000	.09	.12	.14	.16	.19
10.8500	.22	.25	.28	.31	.35
11.1000	.39	.42	.47	.52	.57
11.3500	.63	.69	.77	.85	.94
11.6000	1.06	1.20	1.40	1.68	2.04
11.8500	2.49	3.14	4.01	5.12	6.60
12.1000	8.53	10.63	12.81	14.70	16.06
12.3500	16.94	17.25	16.89	16.20	15.25
12.6000	14.08	12.88	11.69	10.53	9.50
12.8500	8.56	7.72	7.01	6.42	5.91
13.1000	5.46	5.08	4.76	4.47	4.22
13.3500	4.01	3.83	3.67	3.54	3.43
13.6000	3.32	3.23	3.14	3.07	3.00
13.8500	2.93	2.87	2.82	2.76	2.70
14.1000	2.65	2.60	2.55	2.51	2.46
14.3500	2.42	2.38	2.35	2.32	2.28
14.6000	2.26	2.23	2.20	2.17	2.15
14.8500	2.12	2.09	2.07	2.04	2.02
15.1000	1.99	1.97	1.94	1.92	1.89
15.3500	1.86	1.84	1.81	1.79	1.76
15.6000	1.73	1.71	1.68	1.66	1.63
15.8500	1.60	1.58	1.55	1.52	1.49
16.1000	1.47	1.44	1.42	1.39	1.37
16.3500	1.35	1.33	1.31	1.30	1.28
16.6000	1.27	1.25	1.24	1.22	1.21
16.8500	1.20	1.19	1.17	1.16	1.15
17.1000	1.14	1.13	1.11	1.10	1.09
17.3500	1.08	1.06	1.05	1.04	1.03
17.6000	1.02	1.00	.99	.98	.97

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
17.8500	.96	.94	.93	.92	.91
18.1000	.89	.88	.87	.86	.85
18.3500	.84	.84	.83	.82	.82
18.6000	.81	.81	.80	.80	.79
18.8500	.79	.78	.78	.78	.77
19.1000	.77	.77	.76	.76	.76
19.3500	.75	.75	.74	.74	.74
19.6000	.73	.73	.73	.72	.72
19.8500	.72	.71	.71	.70	.70
20.1000	.70	.69	.69	.69	.68
20.3500	.68	.68	.67	.67	.67
20.6000	.67	.66	.66	.66	.65
20.8500	.65	.65	.65	.64	.64
21.1000	.64	.63	.63	.63	.63
21.3500	.62	.62	.62	.62	.61
21.6000	.61	.61	.60	.60	.60
21.8500	.60	.59	.59	.59	.59
22.1000	.58	.58	.58	.57	.57
22.3500	.57	.57	.56	.56	.56
22.6000	.55	.55	.55	.55	.54
22.8500	.54	.54	.53	.53	.53
23.1000	.53	.52	.52	.52	.51
23.3500	.51	.51	.51	.50	.50
23.6000	.50	.49	.49	.49	.49
23.8500	.48	.48	.48	.47	.47
24.1000	.45	.43	.39	.35	.30
24.3500	.25	.21	.16	.13	.10
24.6000	.08	.06	.05	.04	.03
24.8500	.02	.02	.01	.01	.01
25.1000	.01	.01	.00	.00	.00
25.3500	.00	.00	.00		

Index of Starting Page Numbers for ID Names

Proposed Flows DP-1

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MASTER DESIGN STORM SUMMARY

Network Storm Collection: Litchfield Co.

Return Event	Total Depth in	Rainfall Type	RNF ID
2 YR	3.2000	Synthetic Curve	TypeIII 24hr
10 YR	4.7000	Synthetic Curve	TypeIII 24hr
25 YR	5.5000	Synthetic Curve	TypeIII 24hr
50 YR	6.2000	Synthetic Curve	TypeIII 24hr
100 YR	7.0000	Synthetic Curve	TypeIII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*DP 1	JCT	2	.326		12.5000	1.73		
*DP 1	JCT	10	.903		12.4000	6.45		
*DP 1	JCT	25	1.281		12.3500	9.66		
*DP 1	JCT	50	1.641		12.3500	12.74		
*DP 1	JCT	100	2.081		12.3500	16.47		
PRDA 1	AREA	2	.326		12.5000	1.73		
PRDA 1	AREA	10	.903		12.4000	6.45		
PRDA 1	AREA	25	1.281		12.3500	9.66		
PRDA 1	AREA	50	1.641		12.3500	12.74		
PRDA 1	AREA	100	2.081		12.3500	16.47		