TOWN OF ACTON
472 Main Street
Acton, Massachusetts, 01720
Telephone (978) 929-6611
Fax (978) 929-6350

Board of Selectmen

LEGAL NOTICE
TOWN OF ACTON
NOTICE OF HEARING

The Acton Board of Selectmen will hold a public hearing on June 9, 2014 at 7:15 PM (continued from April 28, 2014 at 7:10 PM) in the Francis Faulkner Hearing Room at Town Hall, 472 Main Street, Acton on the application of Tom Trudeau, 852 Main Street, for a Site Plan Special Permit #2/20/14 – 448, for site improvements as required under section 10.4 of the Acton Zoning Bylaw at 848 Main Street, Acton MA 01720 The application and accompanied plans can be inspected at Town Hall during normal business hours.

Acton Board of Selectmen

RECEIVED
JUN 10 2014
TOWN CLERK
ACTON

AGREEMENT ON TIME EXTENSION

The Board of Selectmen and the Petitioner for a Special Permit

Site Plan Special Permit

(identify type of permit)

File Number: 2/20/14 - 448

Petitioner Name: Tom Trudeau - Acorn Deck House

Project Name:

Location/Address: 848 Main St - Acton, MA

Hereby agree to continue the Public Hearing to:

(date): 7/28/14

(time): 7:10 PM

And to extend the legally required time limit in which the Board of Selectmen must render a decision to 90 days following the date of the hearing continuance stated above.

Signed this date: 6/9/14

Mike Gowing
Board of Selectmen

Petitioner
STAMSKI AND McNARY, INC.
FOR: ACORN DECK HOUSE CO.

This agreement must be filed with the Office of the Acton Town Clerk.

Lisa Tomyl

From: Steve Ledoux
Sent: Wednesday, June 04, 2014 8:43 AM
To: Lisa Tomyl; Mike Gowing; Scott Mutch
Subject: FW:

FYI

Steven L Ledoux
Town Manager
472 Main Street
Acton, MA 01720
Telephone (978) 929-6611

When writing or corresponding, please be aware that the Secretary of State has determined that most email is a public record and, therefore, may not be kept confidential.

From: George Dimakarakos [mailto:gd@stamskiandmcnary.com]
Sent: Wednesday, June 04, 2014 8:39 AM
To: Steve Ledoux
Subject: RE:

Yes Steve. Please let this email serve as a request for a continuation to the next meeting of the Selectmen. This request is being made in order to respond to staff comments.

George Dimakarakos, P.E.
Vice President
Stamski and McNary, Inc.
1000 Main Street
Acton, MA 01720
ph: 978-263-8585 ext: 212
fax: 978-263-9883
email: gd@stamskiandmcnary.com

From: Steve Ledoux [mailto:sledoux@acton-ma.gov]
Sent: Wednesday, June 04, 2014 8:35 AM
To: George Dimakarakos
Subject:

George

WE are hearing that the continuance for Trudeau scheduled for 6/9 is being requested to be continued. Can you verify?

Regards,

Steve

Steven L Ledoux
Town Manager
472 Main Street

TOWN OF ACTON
472 Main Street
Acton, Massachusetts 01720
Telephone (978) 929-6631
Fax (978) 929-6340
planning@acton-ma.gov

Planning Department

MEMORANDUM

To: Steve Ledoux, Town Manager ***Date:*** April 24, 2014

July 3, 2014 Revised Plans reviewed: **July, 23, 2014**

From: Roland Bartl, AICP, Planning Director RB

Subject: **Acorn Deck House Company (Trudeau)**
– Application for Site Plan Special Permit #02/20/14-448

The Planning Department offers the following information and comments on this application:

General Information:

Public Hearing as advertised:	**April 28, 2014; 7:20 PM** **7/23/14:** **Continued to w/o hearing twice to June 9, 2014 and July 28, 2014 by agreements filed with Town Clerk.**
Location:	848 Main Street
Town Atlas Map/Parcel:	C5-39 (Lot A-2 and Parcel A as shown on the plan in the application)
Related Parcel:	C5-39-1 (Lot 2C as shown on the plan in the application), 852 Main St.
Applicant / Owners:	Tom Trudeau, Acton Realty LLC
Engineer/Surveyor:	Stamski and McNary, Inc.
Zoning:	Small Manufacturing (SM), Groundwater Protection Dist.- Zone 3
Project Type:	Site improvements; no proposed building additions
Site Area:	+/-8.34 acres **7/23/14:** **includes Lot A-2 and Parcel A as shown on plan.**
Decision Due:	No later than July 27, 2014 (unless extended by mutual agreement) **7/23/14:** **Extended by agreement to October 26, 2014.**

Background:

1. During the latter part of 2012 unauthorized paving activity was noted at the 848 Main Street site on the north and east sides of the large manufacturing building. This was done without a site plan special permit, in non-compliance with a previous site plan special permit, and in violation

of several zoning set-back and area requirements. Closer scrutiny of the site also revealed further zoning violations relative to:

a. Building floor area, FAR and Frontage that resulted, not from illegal construction of buildings, but from the deed a few years earlier into a separate ownership entity of an adjacent parcel at 852 Main Street, shown on the plan as Lot 2C.
b. A common driveway connection between the 848 and 852 Main Street parcels that was nowhere shown on any previously approved plan.
c. The apparent expansion over time of gravel surfaces beyond previously approved boundaries.

This site plan special permit application now before the Board is intended to correct the zoning violations. It succeeds only in part as outlined in the following.

7/23/14:
The applicant revised the plan and provided additional documentation – see added comments below.

Site Improvements

2. The site was the subject of seven (7) previous site plan special permits dating from 1973 through 1987. It is our recollection that these permits addressed improvements at the property which at the time comprised 848 and 852 Main Street in single ownership as one parcel for zoning purposes. All these permits predate the last major zoning revisions of 1990 that affected the site and that are for the most part still in effect today. As a result of these older permitted improvements, some aspects of the site would properly be considered pre-existing non-conforming. These include, subject to recommendations and limitations stated herein, the extent of the existing building floor area, gravel surfaces, the configuration of parking and paved surfaces, and insufficient landscaping.

3. The plan package includes an Existing Conditions Plan (sheet 2 of 5) that shows existing building footprints and delineates existing areas of pavement and gravel surfaces as found at 848 and 852 Main Street after the paving activities cited in par. 1 above. We believe it is a fair reflection of existing conditions on the ground as they currently exist.

4. The other plan sheets show proposed changes and improvements at 848 Main Street intended to return the site into compliance with zoning. I defer to others with respect to proposed grading, drainage controls, septic installation, and construction details. This review focuses on zoning-related matters. No proposed changes are shown for 852 Main Street (except for lot line boundary changes discussed later in this memo).

5. The Layout Plan (sheet 4 of 5) shows in a general manner the proposed allocations on the site for buildings (existing), paved/graveled surfaces, and areas counting as Open Space and Perimeter Landscaping, the latter two items as defined in the zoning bylaw. These delineations appear largely acceptable.

   7/23/14:
   The revised plan includes a "Planting Plan", dated June 3, 2014 (identified as an additional sheet 6 of 6). Dean Charter has reviewed this plan; see memo dated 7/18/14.

6. The land use table on sheet 3 brings the proposed amount of Open Space in at 35%, the minimum required under current zoning. It includes:
   a. A substantial area in the northwest part of the site that is rather disturbed - dirt surface that shows marks of prior use from driving on, parking on, and/or materials storage (most recently fire wood storage and processing). This is generally the vicinity of a former railroad spur into the property.

b. A 9,189 S.F. area along the north-side of the large industrial building that we recall as appearing substantially disturbed when viewing the unauthorized paving action in 2012.
c. A 7,426 S.F area on the west side of the building that we recall as current storage area.

Recommendation:
These three itemized designated Open Space areas should be restored or re-naturalized to some real resemblance of Open Space. Removal or remaining stored materials, some tilling of the surface, a bit of top soil and compost mixed in, and a hardy grass/ wildflower mix can go a long way here. A Landscape Plan sheet should be added to specify how these Open Space area will be re-naturalized.

7/23/14:
The Planting Plan sheet specifies for these Open Space areas: "Remove Materials and Equipment", "Rake", and "Loam and Seed", as appropriate.

7. The 40,719 S.F. pavement area identified in the east portion of the site (it wraps around to the north portion also) includes an area of approximately 60' X 80' closest to Main Street that was paved on a former meadow in 2012 in violation of governing zoning permits (the "rectangle" adjacent to lot 2C and the designated Open Space Area beside Main Street). The portion of the 6,090 S.F. Perimeter Landscaping separator shown between this new pavement area and the striped parking spaces at the entrance driveway is therefore insufficient for today's applicable zoning requirements.

   Recommendation:
   The Perimeter Landscaping separator between the striped parking spaces and the new pavement added on the former meadow (the "rectangle") must be widened to 30 feet in order to meet applicable parking lot design requirements (separation of parking lot cells). Another way to describe the location: The Perimeter Landscaping separator adjacent to the first 6-1/2 to 7 striped parking spaces seen when entering 848 Main Street must be widened to 30 feet. The added Landscape Plan sheet should specify landscaping of this area in compliance with the zoning bylaw's Perimeter Landscaping requirements.

   7/23/14:
   This item has been addressed. The Site Plan sheet was modified and the Planting Plan sheet specifies landscaping elements both in compliance with zoning requirements.

8. The Perimeter Landscaping and Open Space strip along the north and east side of the 848 Main Street site would remain after new pavement was added there in 2012. Just leaving it 'as is' would not meet applicable zoning standards for new parking lot/pavement areas.

   Recommendation:
   The added Landscape Plan sheet should specify landscaping details for the Perimeter Landscaping and Open Space strip along the north and east side of the 848 Main Street site in compliance with the zoning bylaw's Perimeter Landscaping requirements.

   7/23/14:
   The Planting Plan sheet specifies "Loam and Seed" for this area. This is sufficient to meet zoning requirements for this strip adjacent to the internal driveway and the property boundary.

9. The driveway on the north of the large manufacturing building on the 848 Main Street site is new, added in 2012 as part of the unauthorized paving activity. It has insufficient width for two-

way travel. The proposed driveway on the west side of the building also does not measure up to two-way traffic.

Recommendation:
These interior driveways must be specified on the plan, and posted on site for use as one-way driveways only.

7/23/14:
The revised plan shows a "Do Not Enter" sign at the SW entry of the one-way driveway around the building.

Frontage

10. 848 Main Street in separate ownership as presently configured does not meet the frontage requirement in the SM zoning district. 200 feet is the minimum requirement; the parcel has +/- 182 feet. This violation is the result of dividing the ownership of 848 and 852 Main Street into separate ownership entities a few years in the past. 852 Main Street has sufficient surplus frontage to give to 848 so as to cure the violation. This can be done with minor dimensional recalculations. The plan as presented makes provision for the transfer of an unspecified frontage triangle from 852 to 848 Main Street. However, it does not help cure the equally fundamental zoning violation of FAR.

    7/23/14:
    The applicant stated in a June 13, 2014 letter to the Planning Department that he intends to follow through with a correction to the frontage problem. This can be a condition of site plan approval.

Floor Area, Floor Area Ratio, and Divided Ownership

11. The maximum Floor Area Ratio (FAR) in the SM zoning district is 0.20. The FAR is the result of the mathematical division of the Net Floor Area in a Building or Buildings by the Developable Site Area of the property. A Building is defined as "a structure enclosed with exterior walls, built or erected with any combination of materials, ..., having a roof, ... for the shelter of persons, animals, or property".

12. The special permit application represents for the 848 Main Street site a Net Floor Area of 66,629 S.F. and a Floor Area Ratio (FAR) of 0.184. We disagree.

13. As a matter of long-standing practice, we include as part of a Building any portion that is roofed and enclosed on at least three sides. There are three building additions on the south side of the main building, which unlike the drive-through "roofed storage-area" along the north side of the main building, are fully enclosed, partially enclosed, and/or fully enclosable with ease during inclement weather. These three building sections must be added into the Net Floor Area on the site. The three building areas in question are called out separately on the plan and add in total 25,971 S.F. of Net Floor Area for a total of 92,663 S.F. on the site, and a FAR of 0.255.

14. One solution to correct this zoning violation is to remove parts of the building on the 848 Main Street site, sufficient in quantity to reduce the FAR to 0.20. The other more practical solution is a return to the pre-existing non-conforming status that the 848 and 852 Main Street parcels had before when their ownership was held in common.

    Recommendation:
    Re-combine 848 Main Street (Lot A-2 & Parcel A) with 852 Main Street (Lot 2C) to create one parcel under single ownership with +/- 9.26 acres, and combined Net Floor Area of +/- 96,242 S.F. and a FAR of 0.239.

    It is understood that the resulting FAR on the re-combine property is still not in compliance with current zoning limits. However, the combining of the parcels restores

the pre-existing non-conforming status of the combined properties as it existed before their ownership was separated. Pre-existing non-conforming is a legal status that can continue forward. The current situation is illegal under zoning. It is further note that the proposed cure for frontage violation will then become unnecessary.

7/23/14:
In the June 13, 2014 letter to the Planning Department, including attachments, the applicant has provided documentation dating to year 2001 on relevant proposed land dispositions and zoning determinations and recommendations that led to zoning and special permit amendments, and ultimately to project developments relying on such determinations and permit amendments. These documents show that a previous zoning administration found the property at 848 Main Street consisting of Lot A-2 & Parcel A, including the buildings thereon, in compliance with zoning without 852 Main Street (Lot 2C).

Today, we would have decided this differently. But, I am not inclined to seek reversal of a previous zoning determination that many people relied on since then; it should stand. Furthermore, the Zoning Act (M.G.L Ch. 40A) includes in Section 7 a six-year statute of limitation that applies here.

Common Driveway connection to lot 2C

15. The common driveway shown between parcels A-2 and 2C can become a non-issue with the granting of this requested site plan special permit. Zoning Bylaw, section 10.4.3.3 provides in part: "If a common driveway is authorized under a Site Plan Special Permit to lead onto an adjacent LOT which is not subject to such Site Plan Special Permit, no separate Site Plan Special Permit shall be required for the adjacent LOT in order to permit the construction of the common driveway." Of course, this matter would also be resolved under a granted permit where the two properties must be recombined to restore zoning compliance for FAR.

School Bus Parking

16. During the hearing the current school bus parking may be raised as a concern. About two years ago, or so, the owner, Mr. Trudeau, and representatives from the Concord – Carlisle Regional Schools met with us to inquire about this. At the time we determined that the proposed temporary parking/storage on the property as it then existed of active school buses owned and operated by a public school system in the Commonwealth is an Educational Use under section 3.4.2 of the zoning bylaw. Section 3.4.2 aims to be consistent with section 3 of the State zoning statute's Dover Amendment (exemptions from zoning for educational and religious uses). This determination was made before the unauthorized paving activity took place.

Firewood Storage and Processing

17. The Site Plan on sheets 3 and 4 shows a proposed 30' X 100' Wood Processing Area in the rear, i.e. west of the large manufacturing building. Axe Brothers, who we believe is the prospective operator of the wood processing activity has a separate special permit application pending before the Board for this specific proposed outdoor use. All matters, related to the Axe Bros. application should be deferred to that hearing and permit consideration. Likewise, it should be clear to all that simply showing the area on a proposed site plan, if approved, would not in any way indicate approval of the use, which requires a separate use special permit. That use special permit has been applied for; it is on a separate track and schedule. If the Board were to grant that other permit, it can impose separate conditions related to it, including specific site improvements and mitigation measures related to that use.

7/23/14:
The previously "Proposed Wood Processing Area" has been relabeled to "Proposed Wood Storage Area".

Existing Model Home

18. We remain puzzled why the owner continues to hang on to the decrepit old model home in the northwest corner of the property. Last we saw it, it was crammed full with stuff and appeared to sort of crumble away slowly. A small effort would remove this eyesore.

    7/23/14:
    The applicant stated that he intends to continue use of this building for storage purposes.

Enforcement

Typically, site plan special permit compliance is a pre-condition to the granting of building and occupancy permits. Neither applies here. We look forward to working with the applicant towards zoning compliance and compliance with any conditions of the site plan special permit that the Board may grant, provided that the applicant makes a diligent effort towards compliance going forward and further that the a reasonable completion/compliance date is on the horizon – say within 6 months for the parcel re-merger in to combined ownership, and 12 months for all site improvement/modification work (or such other time period that the Board may determine). The Board could also require that the owner post a bond as surety. But, I cannot see how that would add anything to enhance achievement of compliance, unless the Town is prepared to take the highly unusual step of following through on the purpose of a bond, i.e. taking matters in its own hands should the applicant/owner fail to comply. In the end, with or without a bond, we are left appealing to the applicant to do the right thing; or, if that fails, applying standard zoning enforcement procedures using fines and court system.

7/23/14:
Other Departmental Comments and Reviews, Interim Plan

Interim plan:
Between the originally scheduled April 28 hearing date (see docushare collection http://doc.acton-ma.gov/dsweb/View/Collection-6164) and before the latest revised plan set now provided for the July 28 hearing, an interim collection of plan and documents was provided to staff for discussion purposes. The documents, where still relevant, are provided to the Board; the interim plan is omitted since it is superseded by the most recent submittal.

Engineering review:
The Engineering Dept. review of 6/26/14 is based on the interim plan. The one remaining comment (reference to the 1929 NGVD) is addressed with Note 5 on the latest plan.

Fire and Health Dept.'s reviews:
These items should be made conditions of site plan approval.

Tree Warden:
Reviewed and commended landscape plan.

Cc: George Dimakarakos, Stamski and McNary, Inc. (for the applicant)
Planning Department
Manager Department

p:\roland open files\site plan\448, acorn deck house, 852 main - review of revised plan.docx

Lisa Tomyl

From: Robert Hart
Sent: Wednesday, July 23, 2014 9:47 AM
To: Roland Bartl; Scott Mutch; Building Department
Cc: Patrick Futterer
Subject: 848 Main Street

Hello Roland,

There is little concern with the two 1000 gallon fuel storage tanks at the rear of the building/lot. They have been properly licensed and inspected as well as registered with the town clerk. However, I do have concerns with the sprinkler system in the building. A permit was obtained last year to repair the system, so it would function properly and be code compliant. The sprinkler contractor who procured the permit for repair has written me stating that he is no longer working for the building owner and the system is not operating properly. I have had no further correspondence with the owner. I would ask that the owner be required to bring the sprinkler system into compliance prior to granting him any additional permits for any reason. If you have any questions or concerns please feel free to contact me.

Respectfully,

Robert Hart
Deputy Fire Chief

Lisa Tomyl

From: Doug Halley
Sent: Wednesday, July 23, 2014 1:55 PM
To: Roland Bartl; Health Department
Subject: RE: Trudeau - Deck House

Roland,

Soil tests have been completed in support of a proposed replacement wastewater system. At this point in time the design for the proposed wastewater system has not been submitted to the Health Department. We would appreciate it if approval of the site plan contains a condition that states "The applicant shall submit a design for the proposed on-site wastewater to the Health Department and the on-site wastewater system shall be constructed in accordance with the permit issued by the Health Department". We would also note that this project triggers the requirements of the Board of Health Article 16 – Minimum Requirements for Activities within the Aquifer Zones. We would appreciate an additional condition that states "The applicant shall submit an application for a Special Permit to the Board of Health in accordance with the conditions of Article 16 of the Board's rules and regulations".

Doug

From: Roland Bartl
Sent: Wednesday, July 23, 2014 1:00 PM
To: Health Department
Subject: Trudeau - Deck House

Hi,
As discussed, here attached is the latest plan submission for site plan #448 (Trudeau – Acorn/Deck House) at 848 Main Street.
For first submission and other materials see -
http://doc.acton-ma.gov/dsweb/View/Collection-6164

Thank you for your review and comments.

Roland Bartl, AICP
Planning Director
Town of Acton
472 Main Street
Acton, MA 01720
978-929-6631

ACTON MUNICIPAL PROPERTIES DEPARTMENT

INTERDEPARTMENTAL COMMUNICATION

To: **Planning Department** ***Date:*** July 18, 2014

From: **Dean A. Charter, Municipal Properties Director**

Subject: Review of Landscape Plan for Acorn/Deck House 852 Main Street

---

Stamski and McNary Inc. has dropped off a landscape plan with a revised date of June 3, 2014 for the site at 852 Main Street, as noted above. I had met with the Landscape Architect on site several weeks ago and have since conferred with her. The planting area already hosted a number of mature trees, and the plan submitted proposes to add a sufficient number of trees and shrubs to bring the site into zoning compliance, at least in regards to landscaping.

I find the plan to be adequate and appropriate for the site. I will commend the landscape Architect for finding an unusual assortment of native plant material to install in the challenging site.

I will be away for the next three weeks, so I have reviewed this plan in anticipation of you sending it over for formal review.

TOWN OF ACTON
472 Main Street
Acton, Massachusetts, 01720
Telephone (978) 264-9628
Fax (978) 264-9630

Engineering Department

INTERDEPARTMENTAL COMMUNICATION

To: **Board of Selectmen** ***Date:*** June 26, 2014

From: **Engineering Department**

Subject: 848 Main Street – Acorn Deck House Company – SPSP #448 – 2nd Submission

We have reviewed the plans titled "Site Plan for Acorn Deck House CO, 848-852 Main Street, Acton MA 01720" dated February 18th, 2014 with a revision date of June 3, 2014 for the above mentioned site plan special permit. The applicant has satisfactorily addressed our comments in a memo dated April 11, 2014 with the following comments left outstanding:

2. The post-development runoff rate increases from pre-development for all storm events according to the calculations provided by the applicant. The site is divided between four subcatchment areas. Subcatchments 1 and 3 have increased the amount of impervious surfaces while providing no additional detention. Subcatchment 2 remains unchanged from pre to post-development. The runoff in Subcatchment 4 is reduced post-development by infiltrating the roof runoff into the infiltration trench and directing the remaining runoff to Subcatchment 3. Combined, the overall runoff increases from pre- to post-development. Overall the increase is negligible, however considering the other issues with the drainage design the applicant may want to address runoff totals.

10-year Storm, Runoff Totals

Subcatchment Area	Pre-Development Rate (cfs)	Post-Development Rate (cfs)	Net
1	2.479	3.648	+ 1.169
2	4.532	4.532	0
3	2.025	2.806	+ 0.781
4	5.046	3.110	- 1.936
		Total =	+ 0.014

Applicant's response (June 4, 2014): Runoff from Subcatchments 3 and 4 flows to the Fire Pond on site. Therefore, there is no offsite runoff increase from these Subcatchments. The reduction of impervious area near the site entrance and adjustment of the existing infiltration basin outlet structure are proposed and will mitigate Runoff from Subcatchment 1.

Our response: We accept the explanation that subcatchments 3 and 4 flow to the Fire Pond on site and do not contribute to offsite runoff increase. The rate of runoff from subcatchment 3 increases by 0.754 cfs for the 10-year storm which is being infiltrated by the Fire Pond as it exists today. As long as the fire pond contains and infiltrates the increased runoff from subcatchment 3, the overall offsite runoff will be decreased for the 10-year storm. We see no problem approving the drainage design proposed using the fire pond as a detention basin.

6. There is no note stating to which datum the existing and proposed elevations are referenced to.

Applicant's response (June 4, 2014): A note indentifying the datum used has been added to the plan.

Our response: The datum used is an assumed datum. The Site Plan Special Permit regulations require plans to be on the 1929 NGVD datum.

STAMSKI AND MCNARY, INC.
1000 Main Street
Acton, Massachusetts 01720
(978) 263-8585
FAX (978) 263-9883

JOSEPH MARCH, P.E., P.L.S.
GEORGE DIMAKARAKOS, P.E.

July 3, 2014

Acton Planning Department
Attn: Roland Bartl and Scott Mutch
472 Main Street
Acton, MA 01720

RE: 848-852 Main Street
Site Plan Special Permit

Dear Mr. Bartl,

On behalf of our client, Acorn Deck House Company, we have revised the Site Plan for the referenced project to address concerns raised in our meeting on June 27, 2014, as follows:

1. A Planting Plan has been prepared by Kim Ahern Landscape Architects.

2. The Perimeter landscaping has been clarified to distinguish between existing and proposed.

3. The wood processing area has been relabeled as "wood storage area". There will be no processing of wood. Also, the perimeter landscaping designation has been removed, though screening is proposed.

4. One way signs have been changed to "Do Not Enter" signs.

5. A note has been added to refer to the 1929 NGVD datum.

Please do not hesitate to contact our office if you have any further questions.

Respectfully,

Stamski and McNary, Inc.

Joseph March, P.E., P.L.S.

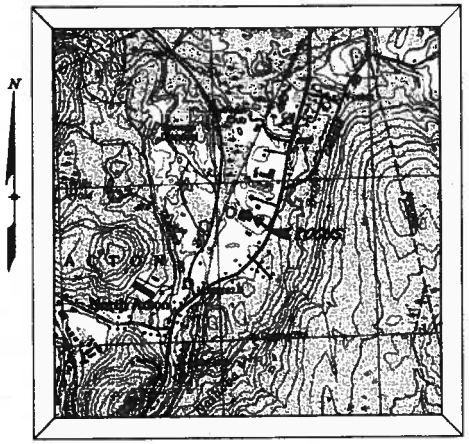
cc: Tom Trudeau, Acron Deck House Co.
Louis Levine, D'Agostine, Levine, Parra & Netburn, P.C.

SITE PLAN
FOR
ACORN DECK HOUSE CO.
848-852 MAIN STREET
ACTON, MASSACHUSETTS

DATE: FEBRUARY 18, 2014
REVISED: JUNE 3, 2014
REVISED: JULY 3, 2014

INDEX

SHEET 1	TITLE SHEET
SHEET 2	EXISTING CONDITIONS PLAN
SHEET 3	GRADING & DRAINAGE PLAN
SHEET 4	LAYOUT PLAN
SHEET 5	CONSTRUCTION DETAILS
SHEET 6	LANDSCAPE RESTORATION PLAN



LOCUS PLAN
SCALE: 1"=1200'

0 600 1200 2400 4800

RECORD OWNER:

PARCEL 39 — 848 MAIN STREET NOMINEE TRUST
852 MAIN STREET
ACTON, MA 01720

PARCEL 39-1 — 852 MAIN STREET NOMINEE TRUST
852 MAIN STREET
ACTON, MA 01720

APPLICANT:

ACORN DECK HOUSE CO.
852 MAIN STREET
ACTON, MA

ZONING DISTRICT:

SMALL MANUFACTURING (SM)
GROUNDWATER PROTECTION DISTRICT ZONE 3

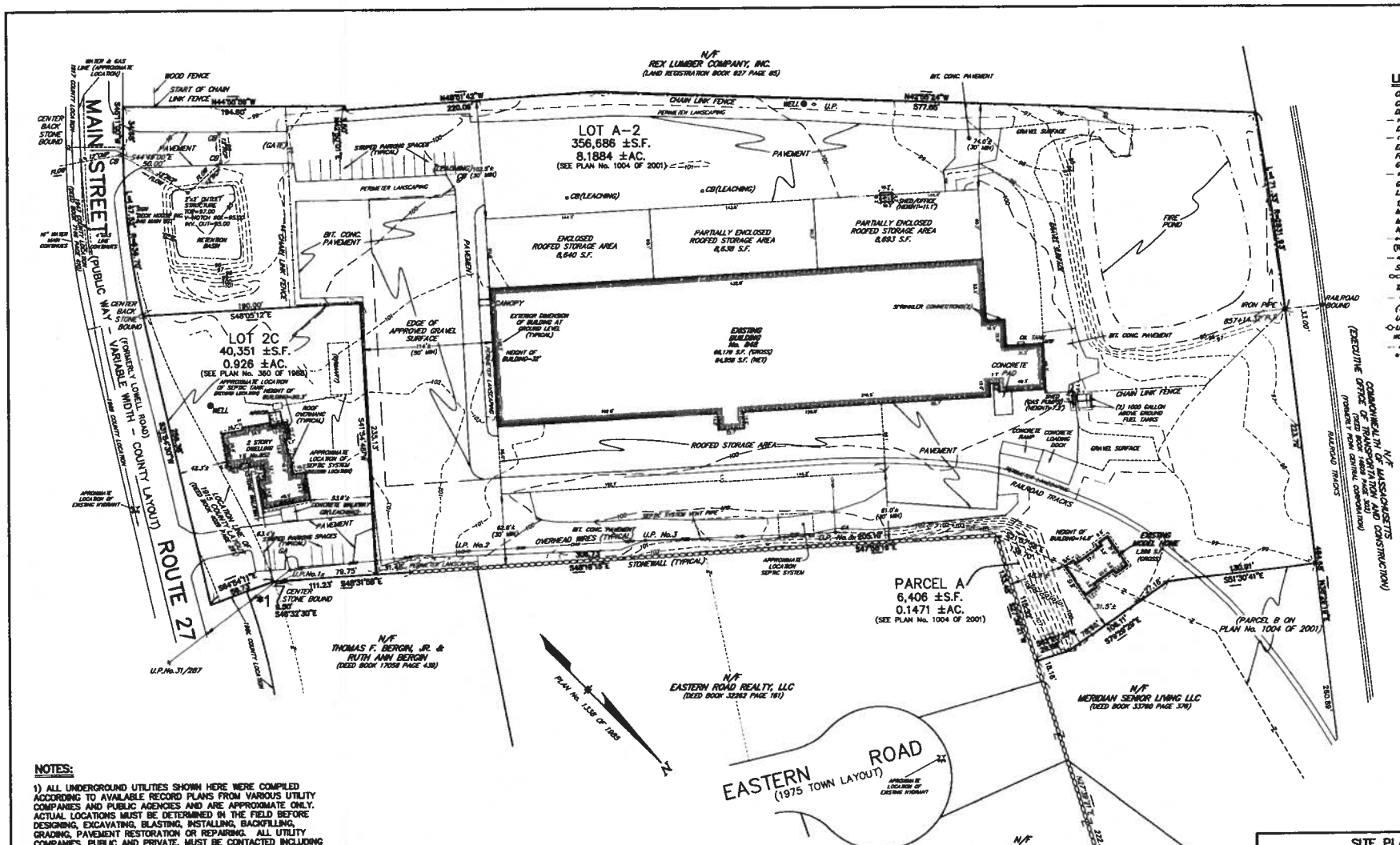
REFERENCE:

MIDDLESEX REGISTRY OF DEEDS
SOUTH DISTRICT
PARCEL 39 DEED BOOK 53416 PAGE 128
PARCEL 39-1 DEED BOOK 53416 PAGE 125
PLAN No. 1004 OF 2001
PLAN No. 360 OF 1988

TOWN OF ACTON ASSESSORS MAPS
MAP C-5, PARCELS 39 & 39-1

ENGINEER/SURVEYOR

STAMSKI AND MCNARY, INC
1000 MAIN STREET
ACTON, MASSACHUSETTS 01720
(978) 263-8585



LEGEND:

CB	CATCH BASIN
CP	CONCRETE PAD
DMH	DRAIN MANHOLE
SD	SUBSURFACE DRAINAGE
D.H.	DRILL HOLE
E	ELECTRIC SERVICE (BURIED)
EMH	ELECTRIC MANHOLE
FND.	FOUND
GG	GAS GATE
G	GAS SERVICE (BURIED)
GA	GUY WIRE ANCHOR
I.P.	IRON PIPE
LP	LIGHTPOST
MH	MANHOLE
MW	MONITORING WELL
N/F	NOW OR FORMERLY
OH	OVERHEAD WIRES
(REC.)	RECORD
RD	ROOF DRAIN (BURIED)
SMH	SEWER MANHOLE
	STONE WALL
TMH	TELEPHONE MANHOLE
T	TELEPHONE SERVICE (BURIED)
(TYP.)	TYPICAL
UG	UNDERGROUND WIRES
U.P.	UTILITY POLE
WG	WATER GATE
W	WATER SERVICE (BURIED)
*1	POSSIBLE ENCROACHMENTS

NOTES:

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2) THE SU-30 FIRE TRUCK MAY MANEUVER ON THE SITE.

3) AN AS-BUILT PLAN CERTIFIED BY A PE/PLS DEMONSTRATING COMPLIANCE WITH THE APPROVED PLAN AND DESIGN WILL BE REQUIRED.

4) NO FILL SHALL CONTAIN ANY HAZARDOUS MATERIALS. HAULING OF EARTH TO AND FROM THE SITE SHALL BE DONE BETWEEN THE HOURS OF 9 AM AND 4 PM.

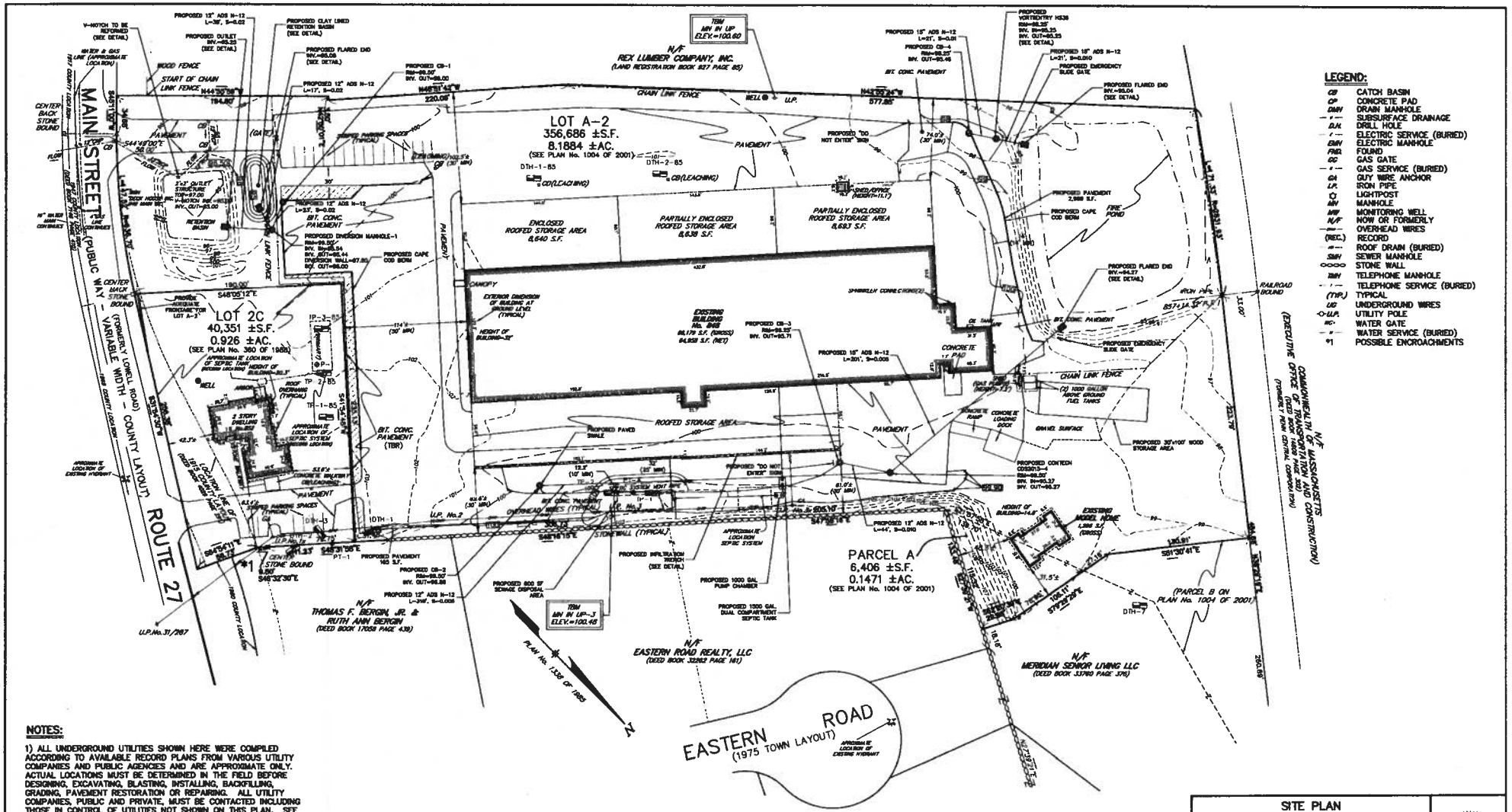
5) CONVERSION FACTOR TO NGVD OF 1929: ADD 80.34'.

SITE PLAN
IN
ACTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

EXISTING CONDITIONS PLAN
FOR: ACORN DECK HOUSE CO.
SCALE: 1"=40' FEBRUARY 18, 2014
REVISED: JUNE 3, 2014
REVISED: JULY 3, 2014

STAMSKI AND MCNARY, INC.
1000 MAIN STREET ACTON, MASSACHUSETTS
ENGINEERING - PLANNING - SURVEYING
0 20 40 80 120 160 FT

(72B-SITE-7.dwg) Main Street SM-72B Sheet 2 of 6



LEGEND:

CB	CATCH BASIN
CP	CONCRETE PAD
DMH	DRAIN MANHOLE
— s —	SUBSURFACE DRAINAGE
D.H.	DRILL HOLE
— e —	ELECTRIC SERVICE (BURIED)
EMH	ELECTRIC MANHOLE
FND	FOUND
GG	GAS GATE
— g —	GAS SERVICE (BURIED)
GA	GUY WIRE ANCHOR
I.P.	IRON PIPE
LP	LIGHTPOST
MH	MANHOLE
MW	MONITORING WELL
N/F	NOW OR FORMERLY
—ohw—	OVERHEAD WIRES
(REC.)	RECORD
— rd —	ROOF DRAIN (BURIED)
SMH	SEWER MANHOLE
○○○○	STONE WALL
TMH	TELEPHONE MANHOLE
— t —	TELEPHONE SERVICE (BURIED)
(TYP.)	TYPICAL
UG	UNDERGROUND WIRES
U.P.	UTILITY POLE
— w —	WATER GATE
— w —	WATER SERVICE (BURIED)
*1	POSSIBLE ENCROACHMENTS

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SITE PLAN
IN
ACTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

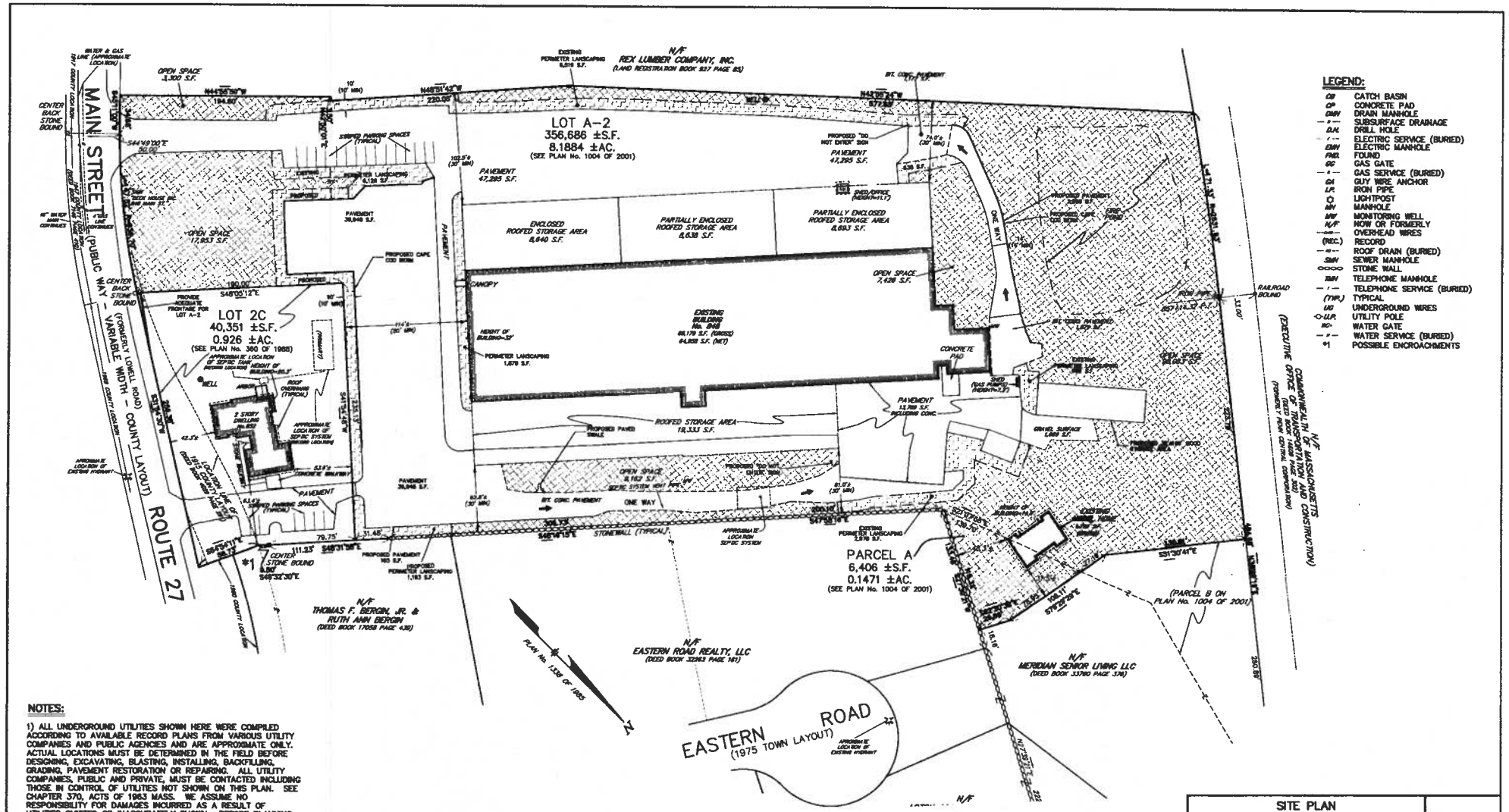
GRADING AND DRAINAGE PLAN
FOR: ACORN DECK HOUSE CO.
SCALE: 1"=40' FEBRUARY 18, 2014
REVISED: JUNE 1, 2014
REVISED: JULY 3, 2014

STAMSKI AND MCNARY, INC.
1000 MAIN STREET ACTON, MASSACHUSETTS
ENGINEERING - PLANNING - SURVEYING
0 20 40 80 120 160 FT

(728-SITE-7.dwg) Main Street SM-728 Sheet 3 of 6

COMMONWEALTH OF MASSACHUSETTS JOSEPH MARCH CIVIL #40478 REGISTERED PROFESSIONAL ENGINEER

COMMONWEALTH OF MASSACHUSETTS JOSEPH MARCH #34314 REGISTERED LAND SURVEYOR



LEGEND:

- CB CATCH BASIN
- CP CONCRETE PAD
- DMH DRAIN MANHOLE
- SUBSURFACE DRAINAGE
- D.H. DRILL HOLE
- ELECTRIC SERVICE (BURIED)
- EMH ELECTRIC MANHOLE
- FND. FOUND
- GG GAS GATE
- GAS SERVICE (BURIED)
- GA GUY WIRE ANCHOR
- I.P. IRON PIPE
- LP LIGHTPOST
- MH MANHOLE
- MW MONITORING WELL
- N/F NOW OR FORMERLY
- OVERHEAD WIRES
- (REC.) RECORD
- ROOF DRAIN (BURIED)
- SMH SEWER MANHOLE
- STONE WALL
- TMH TELEPHONE MANHOLE
- TELEPHONE SERVICE (BURIED)
- (TYP.) TYPICAL
- UG UNDERGROUND WIRES
- U.P. UTILITY POLE
- WG WATER GATE
- WATER SERVICE (BURIED)
- *1 POSSIBLE ENCROACHMENTS

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LAND USE TABLE

(NOT ADJUSTED FOR FRONTAGE SWAP)

	REQUIRED	LOT A-2/PARCEL A	LOT 2C
LOT AREA	40,000 S.F.	363,091 S.F.	40,351 S.F.
GROSS FLOOR AREA	N/A	67,475 S.F.	4,000 S.F.*
NET FLOOR AREA	N/A	66,629 S.F	3,579 S.F.*
FLOOR AREA RATIO	0.2	0.184	0.089
PERIMETER LANDSCAPING	N/A	23,109 S.F.	2,637 S.F.
TOTAL IMPERVIOUS	N/A	214,078 S.F.	8,778 S.F.
% IMPERVIOUS	N/A	59.0%	37.2%
OPEN SPACE	35%	131,574 S.F. (36.2%)	25,357 S.F. (62.8%)

* ESTIMATED

SITE PLAN
IN
ACTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

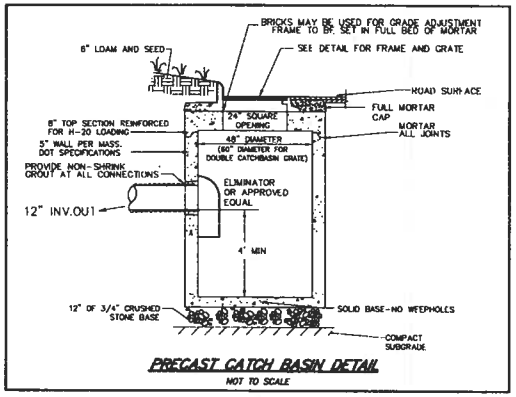
LAYOUT PLAN
FOR: ACORN DECK HOUSE CO.
SCALE: 1"=40' FEBRUARY 18, 2014
REVISED: JUNE 3, 2014
REVISED: JULY 3, 2014

STAMSKI AND MCNARY, INC.
1000 MAIN STREET ACTON, MASSACHUSETTS
ENGINEERING - PLANNING - SURVEYING
0 20 40 80 120 160 FT

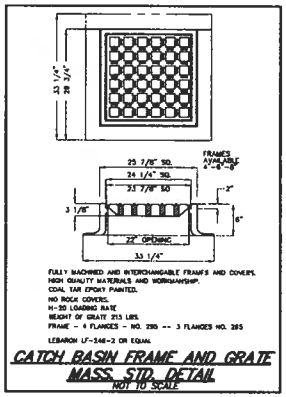
(728-SITE-7.dwg) Main Street SM-728 Sheet 4 of 6

COMMONWEALTH OF MASSACHUSETTS JOSEPH MARCH CIVIL 34012

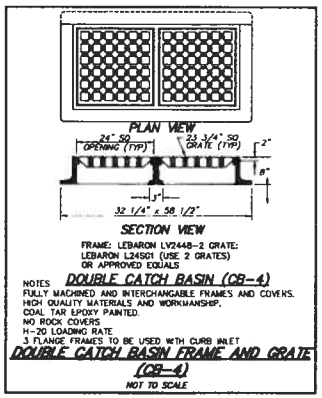
COMMONWEALTH OF MASSACHUSETTS JOSEPH MARCH # 35294 SURVEYOR



PRECAST CATCH BASIN DETAIL
NOT TO SCALE

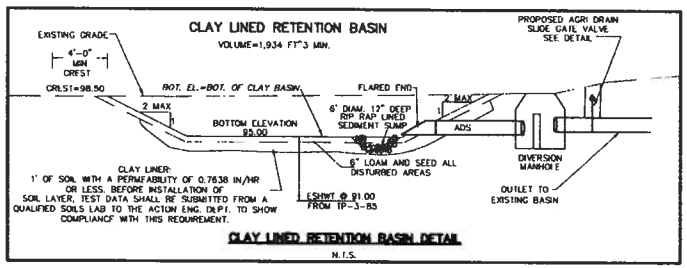


CATCH BASIN FRAME AND GRATE MASS. STD. DETAIL
NOT TO SCALE

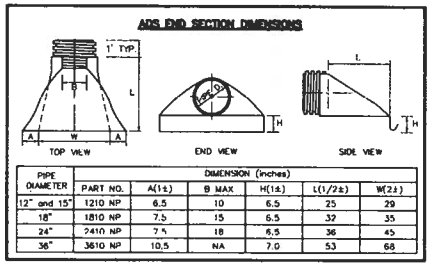


NOTES **DOUBLE CATCH BASIN (CB-4)**
FULLY MACHINED AND INTERCHANGABLE FRAMES AND COVERS.
HIGH QUALITY MATERIALS AND WORKMANSHIP.
COAL TAR EPOXY PAINTED.
NO ROCK COVERS
H-20 LOADING RATE
3 FLANGE FRAMES TO BE USED WITH CURB INLET

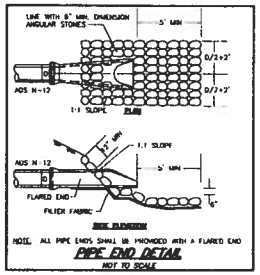
DOUBLE CATCH BASIN FRAME AND GRATE (CB-4)
NOT TO SCALE



CLAY LINED RETENTION BASIN DETAIL
N.T.S.

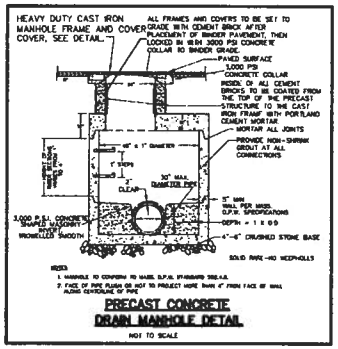


PIPE DIAMETER	DIMENSION (inches)					
	PART NO.	A(1±)	B MAX.	H(1±)	L(1/2±)	W(2±)
12" and 15"	1210 NP	6.5	10	6.5	25	29
18"	1810 NP	7.5	15	6.5	32	35
24"	2410 NP	7.5	18	6.5	36	45
36"	3610 NP	10.5	NA	7.0	53	68

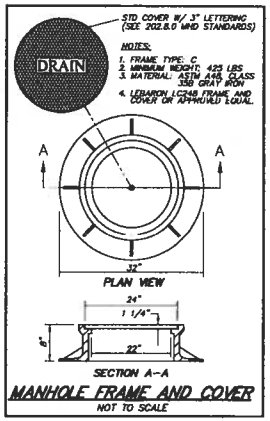


NOTE: ALL PIPE ENDS SHALL BE PROVIDED WITH A FLARED END

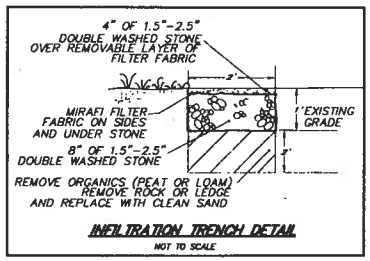
PIPE END DETAIL
NOT TO SCALE



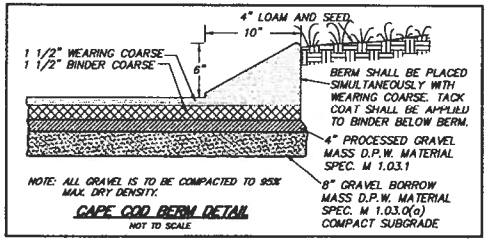
PRECAST CONCRETE DRAIN MANHOLE DETAIL
NOT TO SCALE



MANHOLE FRAME AND COVER
NOT TO SCALE

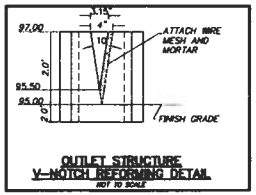


INFILTRATION TRENCH DETAIL
NOT TO SCALE

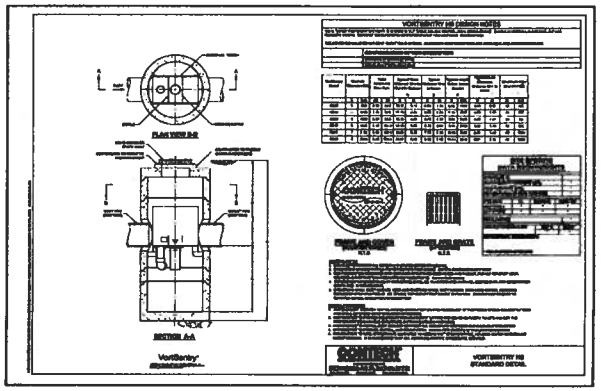


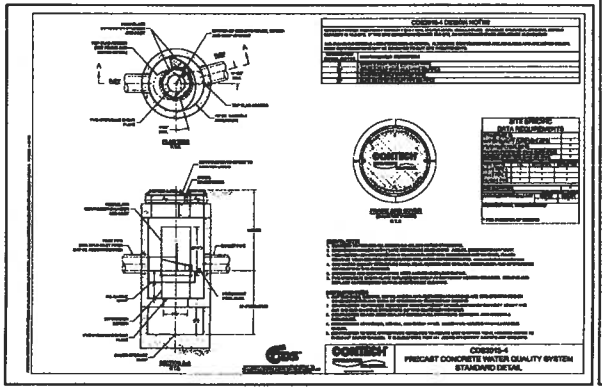
NOTE: ALL GRAVEL IS TO BE COMPACTED TO 95% MAX. DRY DENSITY.

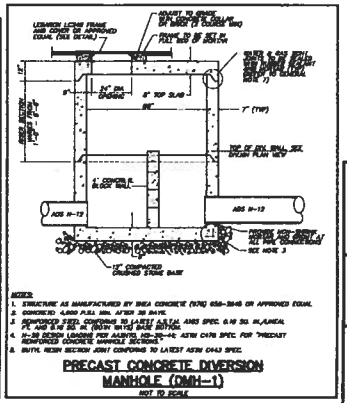
CAPE COD BERM DETAIL
NOT TO SCALE



OUTLET STRUCTURE V-NOTCH REFORMING DETAIL
NOT TO SCALE







PRECAST CONCRETE DIVERSION MANHOLE (DMH-1)
NOT TO SCALE

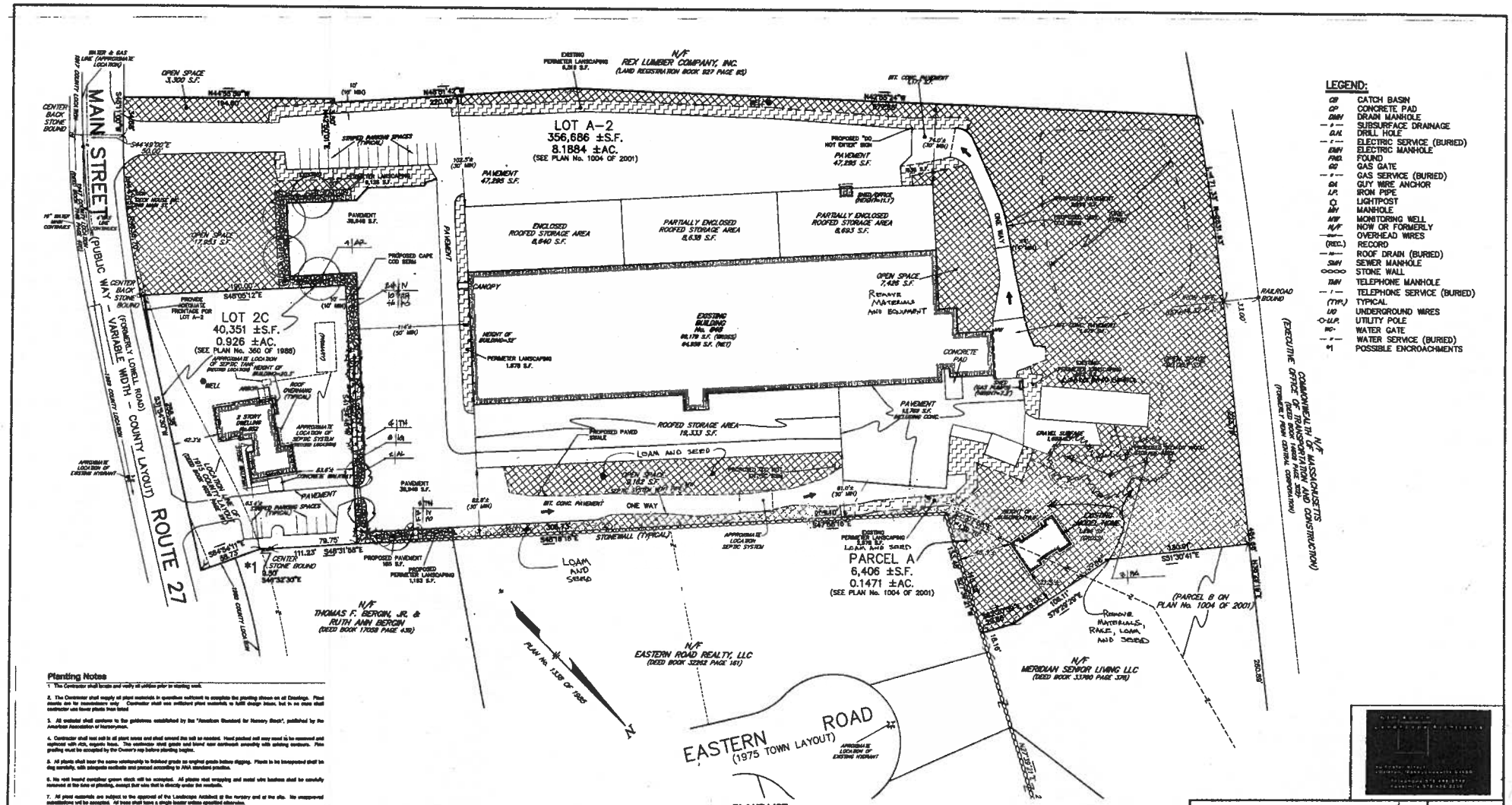
SITE PLAN
IN
ACTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

CONSTRUCTION DETAILS
FOR: ACORN DECK HOUSE CO.
SCALE: 1"=40' FEBRUARY 18, 2014
REVISED: JUNE 3, 2014
REVISED: JULY 3, 2014

STAMSKI AND MCNARY, INC.
1000 MAIN STREET ACTON, MASSACHUSETTS
ENGINEERING - PLANNING - SURVEYING

0 20 40 80 120 160 FT

(728-SITE-7.dwg) Main Street SM-728 Sheet 5 of 6



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N/F	NOW OR FORMERLY
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(REC.)	RECORD
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(TYP.)	TYPICAL
UG	UNDERGROUND WIRES
O-U.P.	UTILITY POLE
WG	WATER GATE
— w —	WATER SERVICE (BURIED)
*1	POSSIBLE ENCROACHMENTS

Planting Notes

1. The Contractor shall locate and verify all utilities prior to planting work.

2. The Contractor shall supply all plant materials in quantities sufficient to complete the planting shown on all Drawings. Plant counts are for reminiscence only. Contractor shall use sufficient plant materials to fulfill design intent, but in no case shall contractor use fewer plants than listed.

3. All material shall conform to the guidelines established by the "American Standard for Nursery Stock", published by the American Association of Nurseryman.

4. Contractor shall test soil in all plant areas and shall amend the soil as needed. Hard packed soil may need to be removed and replaced with rich, organic loam. The contractor shall grade and blend new earthwork smoothly with existing contours. Fine grading must be accepted by the Owner's rep before planting begins.

5. All plants shall bear the same relationship to finished grade as original grade before digging. Plants to be transported shall be dug carefully, with adequate rootballs and pressed according to ANA standard practice.

6. No root bound container grown stock will be accepted. All plants shall wrapping and metal wire baskets shall be carefully removed at the time of planting, except that wire that is directly under the rootballs.

7. All plant materials are subject to the approval of the Landscape Architect at the nursery and at the site. No unapproved substitutions will be accepted. All trees shall have a single leader unless specified otherwise.

8. Trees, shrubs and perennials shall be laid out on site according to the Planting Plan for the approval of the project Landscape Architect. Layout shall be completed prior to arrival of the Landscape Architect. Notify Landscape Architect at least 4 days prior to anticipated date of layout. Coordinate layout and planting deadlines with Landscape Architect. Plants location may change as directed on site by Landscape Architect. No additional compensation shall be paid to the contractor for this service.

9. Set plants and shrubs plumb. The Contractor is responsible for providing planting soil for backfilling of all plants. Submit soil/plant content analysis to Connecticut for approval.

10. Plant plants thoroughly once immediately after planting and water during the first twenty-four hour period after planting. The Contractor shall maintain the plants for a minimum of 30 days following installation, or longer if instructed by the Owner. Before the end of the 30day period, the contractor shall provide a written maintenance outline to the Owner and the Contractor shall be available to answer questions or concerns at that time.

11. Mulch: Contractor shall place 3" - 5" of shredded bark mulch throughout the plant bed areas and around the base of each new tree (20" diameter mulch bed, approximately). DO NOT PLACE MULCH AGAINST TREE TRUNKS. Submit sample of mulch for approval.

12. All trees and shrubs shall be sprayed with anti-desiccant within twenty-four hours after planting. All plants to be sprayed with an anti-desiccant the first week of November the first winter following planting.

13. For lawn areas—contractor shall submit seed mix for approval and shall discuss installation methods and procedures with Landscape Architect and/or Owner's rep. prior to construction.

14. Irrigation (temporary or permanent) layout and materials shall be discussed with Landscape Architect and must be approved prior to installation. Discuss system operation with Owner's maintenance personnel.

15. All plants shall be guaranteed for a minimum of one year from the date of final acceptance of planting by the Landscape Architect. Contractor shall replace, at his/her own expense, any dead or diseased plants, or any plant material damaged by the Landscape Architect to be in poor condition.

General Notes

1. All site information represented on this plan is illustrative, and must be verified by the contractor. Written specifications shall take precedence over representations on drawings.

2. It is contractor's responsibility to become apprised of existing conditions, underground utilities, and overhead utilities. Coordination with all relevant companies and agencies, including performing A Dig Safe, affected by this construction is contractor's responsibility. The contractor is required to obtain any necessary permits required from local authorities for all work in this contract.

3. Contractor shall be responsible for on-site safety of construction crew, and particularly of safety of pedestrians during period of construction project. Do not place or leave any materials on public sidewalks during construction.

4. Extreme care shall be taken not to disturb existing plant materials, except those specifically noted to be transplanted or removed. Any plant injured or destroyed shall be replaced with a plant of equal or greater size and species at the contractor's expense. The contractor shall make improvements to the existing planting areas, as needed. Make new plantings with respect to existing plants to remain. Planting Plan is for general locations only.

5. All unused materials that are reparable shall be removed from site daily, or stored in such a way as to preclude loss or vandalism.

6. All debris shall be removed, made free of obstructions, and site left in a neat, clean condition at the close of each workday.

PLANT LIST

Note: Do not disturb existing plant materials to remain. Locate new plantings to minimize injury to existing root systems.

Symbol/Botanical Name	Common Name	No.	Size	Remarks
Deciduous Trees (All trees shall have a straight leader, unless noted otherwise)				
AA/Amelanchier grandiflora 'Autumn Brilliance'	Autumn Brilliance Serviceberry	5	2-2½" CT	Multistemg, LA may pick 'Cumulus'
AR/Acer rubrum 'October Glory'	October Glory Red Maple	4	2-2½" CT	
Evergreen Trees				
TH/Thuja 'Hetz'	Dark American Arborvitae	9	6-8'HT	Matching ball to base
PA/Picea abies	Norway Spruce	3	6-8'HT	
Shrubs (min. shrubs shall be 18" height, substitute container grown equivalents)				
SC/Syr siebig 'Compacta'	Compact lilacery	6	18-24" CT	Full, matching
RS/Rhu aromatica 'Grow Mound'	Grow Mound Sumacbery	35	18-24" CT	
PW/Pennisetum setaceum 'Little Devil'	Little Devil Fountain	10	18-24" CT	
PV/Pennisetum alopecuroides 'Hameln'	Hameln Dwarf White Fountain	50	18-24" CT	

SITE PLAN
IN
ACTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

PLANTING PLAN
FOR: ACORN DECK HOUSE CO.
SCALE: 1"=40' FEBRUARY 18, 2014
REVISED JULY 23, 2014 REVISED: JUNE 3, 2014

STAMSKI AND MCNARY, INC.
1000 MAIN STREET ACTON, MASSACHUSETTS
ENGINEERING – PLANNING – SURVEYING
0 20 40 80 120 160 FT

(72B-SITE-6.dwg) Main Street SM-72B Sheet 6 of 6

MASSACHUSETTS REGISTERED LANDSCAPE ARCHITECT NO. 743

STAMSKI AND MCNARY, INC.
1000 Main Street
Acton, Massachusetts 01720
(978) 263-8585
FAX (978) 263-9883

JOSEPH MARCH, P.E., P.L.S.
GEORGE DIMAKARAKOS, P.E.

RECEIVED
JUN 19 2014
Town of Acton
Planning Department

June 13, 2014

Acton Planning Department
Attn: Roland Bartl and Scott Mutch
472 Main Street
Acton, MA 01720

RE: 848-852 Main Street
Site Plan Special Permit

Dear Mr. Bartl,

On behalf of our client, Acorn Deck House Company, we have revised the Site Plan for the referenced project to address concerns raised in Interdepartmental Communications, as follows:

Roland Bartl, Planning Director Memorandum **Dated April 24, 2014**

1.,2., 3., 4., 5. No response needed.

6. Open Spaces:
   a. Materials will be removed from the Open Space area in the northwest part of the site and the area will be raked out, loamed and seeded. This has been indicated on plan sheet 6.
   b. The 9,189 square foot area along the north side of the large building will be loamed and seeded. This has been indicated on plan sheet 6.
   c. The 7,426 square foot area on the west side of the building will have materials removed and left as open space.

7. The landscaping strip between the striped parking spaces and the newly paved area on the former meadow is shown to be widened to 30 feet in the easterly portion of the site near Main Street, as recommended. Specify landscaping elements.

8. As discussed at a meeting with the Planning Department staff, the perimeter landscaping and Open Space along the northerly and easterly boundaries of the property have been shown to be loamed and seeded on sheet 6 of 6. Specify landscaping elements.

9. The narrow driveways on the north and west of the large building have been indicated as "One-Way" on plan sheet 4, along with signage.
   Do not enter?

10. The applicant still intends to correct the frontage requirement. Refer to 11. Below regarding FAR.

11.,12.,13.,14., Attached is an Interdepartmental Communication from Garry Rhodes, Building Commissioner, to the Board of Selectmen dated November 8, 2001. This memo, when sent to the Selectmen, was accompanied by a letter from our office, an ANR plan showing a portion of the Deck House property being conveyed to the Robbins Brook Community and the then current site plan for the Deck House property. At that time, Deck House requested that the Board allow a land conveyance to facilitate the next phase of the Robbins Brook development. Mr. Rhodes made a determination that he did "not have any concerns" for the Board granting permission for the conveyance and he had drafted a decision for the Board's consideration. Ultimately the approvals were granted for the next phase of Robbins Brook. The approval of these plans fundamentally establishes several interpretations:

1. The Deck House lot was reduced to 363,092 square feet. This did not include Lot 2C.
2. The Site Plan clearly showed the "Existing Partially Enclosed Roofed Storage Areas and did not include them in the Net Floor Area or FAR calculations.
3. The plan demonstrates that the FAR limitation was not exceeded.

Therefore, we respectfully submit that to change the interpretation of the previous Zoning Enforcement Officer is not warranted. We respectfully submit that the lots can be re-divided by an ANR plan without placing the property into non-compliance. The present calculations take into account the complete enclosure of one of the previously "Existing Partially Enclosed Roofed Storage Areas" without exceeding the FAR limit of 0.2.

15., 16., 17. No response needed.

18. The existing model home is used for storage of windows and doors. The applicant intends to continue to use it as a storage place in the near future and intends to renovate it in the future.

Engineering Department Interdepartmental Communication **Dated April 11, 2014**

1. a. The plan has been revised to included one clay lined basin and two proprietary stormwater BMP's to treat runoff. The groundwater elevation precludes the use of clay lined basins to the rear of the site, therefore Contech VortSentry HS-36 and Contech CDS 2015-4 treatment units have been proposed for an equivalent level of treatment. Literature describing the products and their performance is included.

   b. Three emergency slide gates have been added to the plan.

   c. The location of field soil tests have been added to the plan and soil logs have been attached.

   d. A note forbidding the use of fill containing hazardous material and requiring the hauling of earth to and from the site to the hours between 9 a.m. and 4 p.m. has been added to the plan.

2. Runoff from Subcatchments 3 and 4 flows to the Fire Pond on site. Therefore, there is no offsite runoff increase from these Subcatchments. The reduction of impervious area near the site entrance and adjustment of the existing infiltration basin outlet structure are proposed and will mitigate Runoff from Subcatment 1.

3. The CN number for Gravel has been changed to 76.

4. Fire hydrant locations have been shown on the plan.

5. A note stating that a SU-30 truck can maneuver on the site has been added to the plan.

6. A note identifying the datum used has been added to the plan.

7. Shaped inverts have been added to the manhole detail.

8. A Stormwater Operation and Maintenance Plan has been prepared and is attached.

9. Two benchmarks have been shown on the plan.

10. No response needed.

We would like to meet with you by the end of June in order to move the process along. Please do not hesitate to contact our office if you have any further questions.

Respectfully,

Stamski and McNary, Inc.

George Dimakarakos, P.E.

cc: Tom Trudeau, Acron Deck House Co.
Louis Levine, D'Agostine, Levine, Parra & Netburn, P.C.

848 main st

TOWN OF ACTON

Building Department

***INTERDEPARTMENTAL** COMMUNICATION*

To: **Board of Selectmen** ***Date:*** November 8, 2001

From: Garry A. Rhodes, Building Commissioner

Subject: Site Plan Special Permit # 10/15/85-267 amendment

On August 15, 2001, Acton Assisted Living, L.L.C and Deck House requested that the Board allow them to do a land swap. The land swap would allow for the second phase of the Acton Assisted Living to proceed. They subsequently requested that I delay forwarding it to the Board for action until after they decided if they would proceed with phase II. Even though they withdrew phase II they have now elected to proceed with the land swap. They have not given any indication that they propose to continue with phase II.

The Site Plan Special Permit for Deck House Condition 2.7 and Limitation 3.2 (attached) require the applicant to obtain Board approval prior to any change. As shown on the attached plan Parcel B which is currently part of Deck House will be joined with Lot C. Parcel A which is currently part of Lot C will be joined to the Deck House lot.

With the exception of the land swap no other changes are proposed. There will not be any additions, new buildings or impervious surfaces added. The Deck House decision provides that the Board may amend its' decision if it finds that the amendment is not significant to the public interest and that such amendment is not inconsistent with the purpose and intent of the Bylaw. I do not have any concerns if the Board grants the request. I have taken the liberty of drafting a decision for your consideration.

STAMSKI AND MCNARY, INC.
80 Harris Street
Acton, Massachusetts 01720
(978) 263-8585
FAX (978) 263-9883

WILLIAM F. MCNARY, P.L.S.
JOSEPH MARCH, P.E., P.L.S.

August 15, 2001

Acton Board of Selectmen
472 Main Street
Acton, MA 01720

Re: 848 Main Street
Map C5 Parcel 39
Site Plan Special Permit Amendment

Members of the Board,

On behalf of our client, Acton Assisted Living, L.L.C., and Deck House, Inc., we hereby request an amendment to Site Plan Special Permit #10/15/85-267, pursuant to the Board of Selectmen's "Rules and Regulations for Site Plan Special Permits", for the referenced site.

The amendment is being sought in order to reconfigure of the northeasterly end of the lot. As a result of this reconfiguration, the overall site area will be reduced by 61,558 square feet. The following table outlines the existing and proposed zoning parameters.

	Existing	Proposed
Lot Area	424,650 sf	363,092 sf
Wetland Area	22,680 sf	22,680 sf
Developable Site Area	401,970 sf	340,412 sf
Net Floor Area		
1st Floor*	54,550 sf	54,550 sf
2nd Floor**	3,000 sf	3,000 sf
Total	58,550 sf	58,550 sf → 66629?
FAR	0.146	0.172
Open Space***	232,587 sf (54.8%)	171,029 sf (47.1%)

*Actual Gross Floor Area (conservative estimate)
**Per Deck House, Inc.
***Per ref. Site Plan in Permit #10/15/85-267

included b+ 2008

The site plan, showing the lot change in red, is attached. The A.N.R. plan, which is to be submitted to the Planning Board for endorsement is also attached. Thank you for your time in consideration of this matter. Please call our office if you have any further questions.

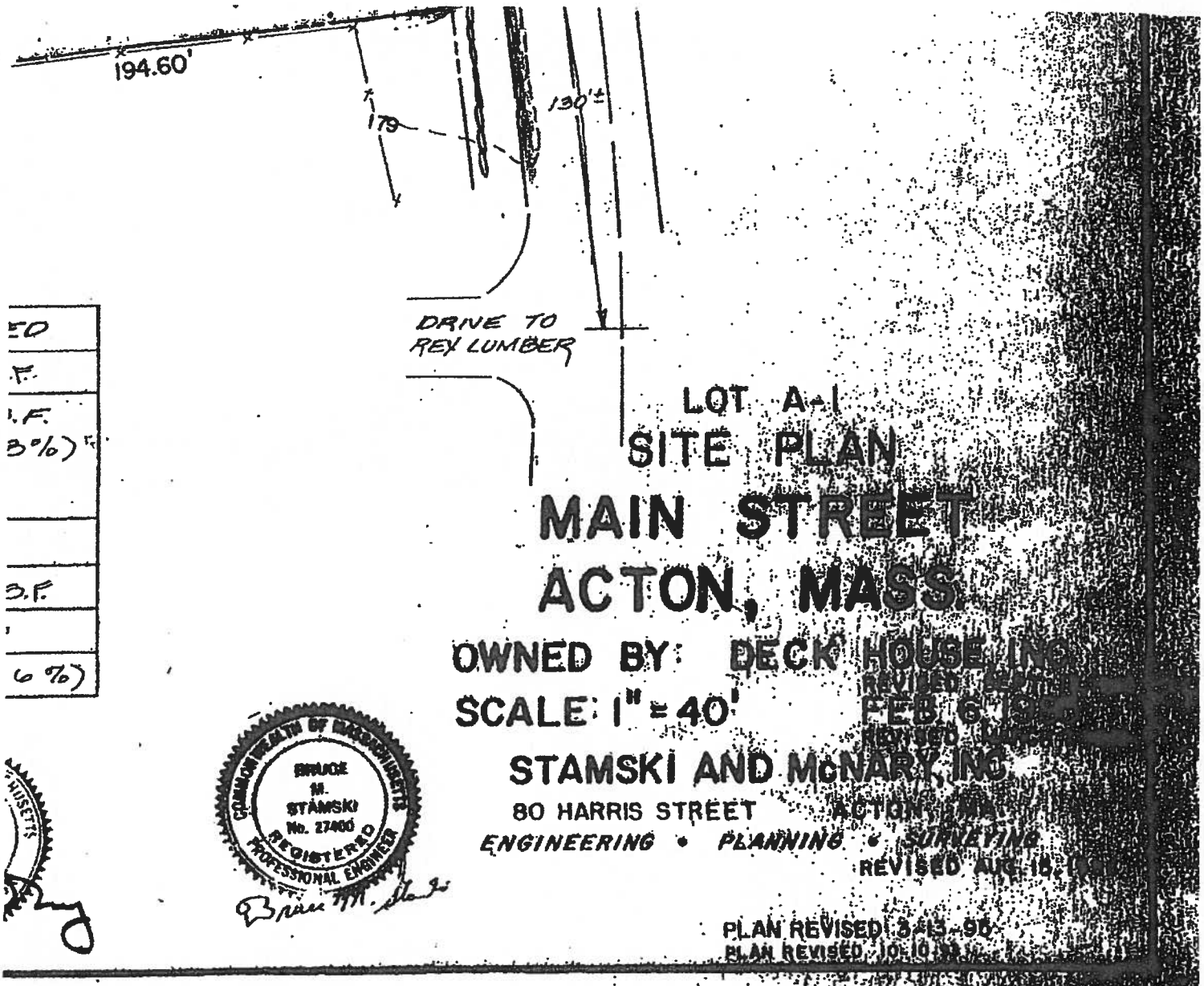
Very truly yours,

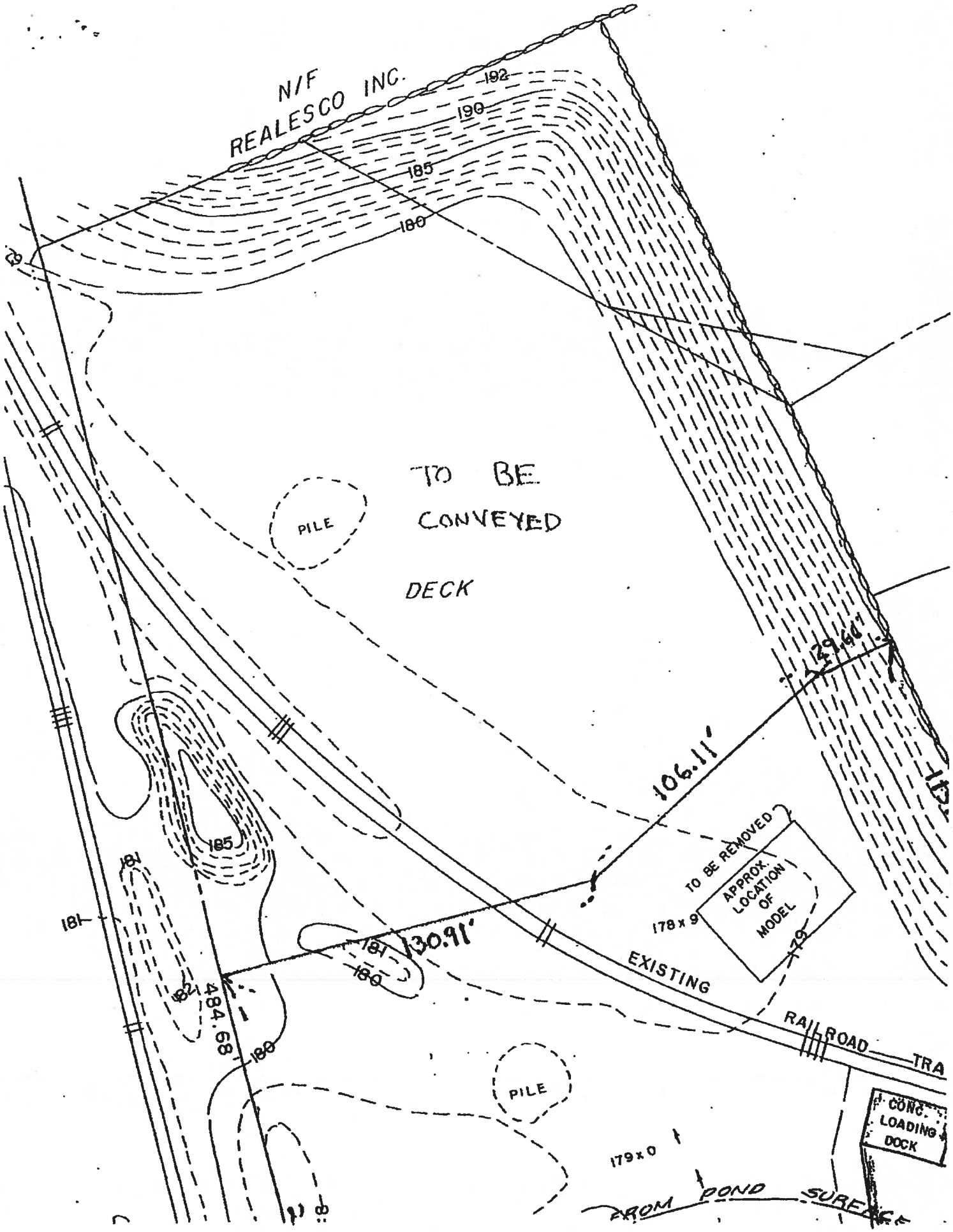
Stamski and McNary, Inc.

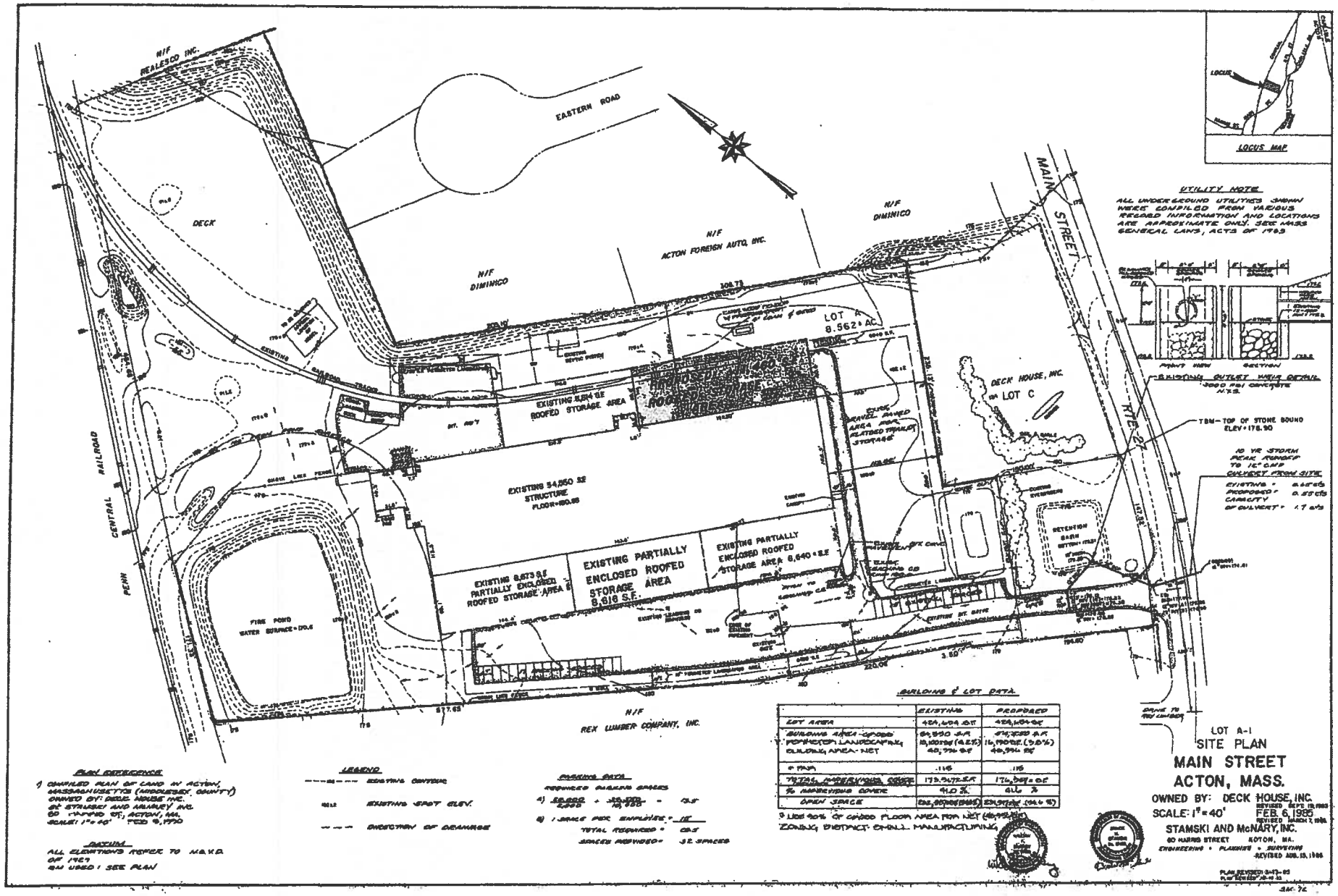
George Dimakarakos, P.E.

Joseph March, P.E., P.L.S.

cc: Don Cameron, Deck House, Inc.
Stephen Vazza, Acton Assisted Living, L.L.C.


194.60'
179
130'±
DRIVE TO
REX LUMBER
LOT A-1
SITE PLAN
MAIN STREET
ACTON, MASS.
OWNED BY: DECK HOUSE INC
SCALE: 1" = 40'
FEB 6
STAMSKI AND McNARY, INC
80 HARRIS STREET
ACTON, MA
ENGINEERING • PLANNING • SURVEYING
REVISED AUG 18
PLAN REVISED 3-13-90
PLAN REVISED 10-10
COMMONWEALTH OF MASSACHUSETTS
BRUCE M. STAMSKI
No. 27460
REGISTERED
PROFESSIONAL ENGINEER


N/F
REALESCO INC.
192
190
185
180
TO BE
CONVEYED
DECK
PILE
106.11'
29.66'
TO BE REMOVED
APPROX.
LOCATION
OF
MODEL
178 x 9
79
185
181
181
130.91'
181
180
484.68
180
182
EXISTING
RAILROAD
TRA
PILE
CONC.
LOADING
DOCK
179 x 0
FROM POND SURFACE


N/F REALESCO INC.
EASTERN ROAD
N/F DIMINICO
N/F ACTON FOREIGN AUTO, INC.
N/F DIMINICO
DECK
LOT A 8.562± AC.
EXISTING 8,894 SF ROOFED STORAGE AREA
EXISTING 54,550 SF STRUCTURE FLOOR=180.85
EXISTING 8,873 SF PARTIALLY ENCLOSED ROOFED STORAGE AREA
EXISTING PARTIALLY ENCLOSED ROOFED STORAGE AREA 8,616 S.F.
EXISTING PARTIALLY ENCLOSED ROOFED STORAGE AREA 8,640 ± S.F.
DECK HOUSE, INC.
LOT C
RETENTION BASIN
FIRE POND WATER SURFACE = 170.5
CENTRAL RAILROAD
PENN
MAIN STREET
RTE. 27
N/F REX LUMBER COMPANY, INC.
LOCUS MAP
UTILITY NOTE
ALL UNDERGROUND UTILITIES SHOWN WERE COMPILED FROM VARIOUS RECORD INFORMATION AND LOCATIONS ARE APPROXIMATE ONLY. SEE MASS GENERAL LAWS, ACTS OF 1963
EXISTING OUTLET WEIR DETAIL
3000 PSI CONCRETE
N.T.S.
TBM – TOP OF STONE BOUND ELEV = 176.90
10 YR STORM PEAK RUNOFF TO 12" CMP CULVERT FROM SITE
EXISTING = 0.45 CFS
PROPOSED = 0.55 CFS
CAPACITY OF CULVERT = 1.7 CFS
DRIVE TO REX LUMBER
LOT A-1
SITE PLAN
MAIN STREET
ACTON, MASS.
OWNED BY: DECK HOUSE, INC.
SCALE: 1" = 40'
FEB. 6, 1985
STAMSKI AND McNARY, INC.
80 HARRIS STREET ACTON, MA.
ENGINEERING • PLANNING • SURVEYING
REVISED AUG. 15, 1986
PLAN REFERENCE
1) COMPILED PLAN OF LAND IN ACTON, MASSACHUSETTS (MIDDLESEX COUNTY) OWNED BY: DECK HOUSE INC. & STAMSKI AND McNARY INC. 80 HARRIS ST., ACTON, MA. SCALE: 1" = 40' FEB 6, 1990
DATUM
ALL ELEVATIONS REFER TO N.G.V.D. OF 1929
BM USED: SEE PLAN
LEGEND
EXISTING CONTOURS
EXISTING SPOT ELEV.
DIRECTION OF DRAINAGE
PARKING DATA
REQUIRED PARKING SPACES
1) 52,000 / 2,000 + 20,000 / 10,000 = 43.5
2) 1 SPACE PER EMPLOYEE = 18
TOTAL REQUIRED = 61.5
SPACES PROVIDED = 52 SPACES
BUILDING & LOT DATA
	EXISTING	PROPOSED
LOT AREA	424,404 S.F.	424,404 S.F.
BUILDING AREA - GROSS	54,550 S.F.	54,550 S.F.
FOOTPRINT LANDSCAPING	13,100 SF (4.8%)	16,190 SF (3.8%)
BUILDING AREA - NET	40,750 S.F.	38,360 S.F.
F.A.R.	.115	.115
TOTAL IMPERVIOUS COVER	173,347 S.F.	176,287 S.F.
% IMPERVIOUS COVER	41.0 %	41.5 %
OPEN SPACE	251,057 S.F. (59.2 %)	248,117 S.F. (58.4 %)

RECORD OWNER:
DECK HOUSE, INC.
830 MAIN STREET
ACTON, MASSACHUSETTS

ZONING DISTRICT:
SMALL MANUFACTURING (SM)
GROUNDWATER PROTECTION DISTRICT
ZONE 3

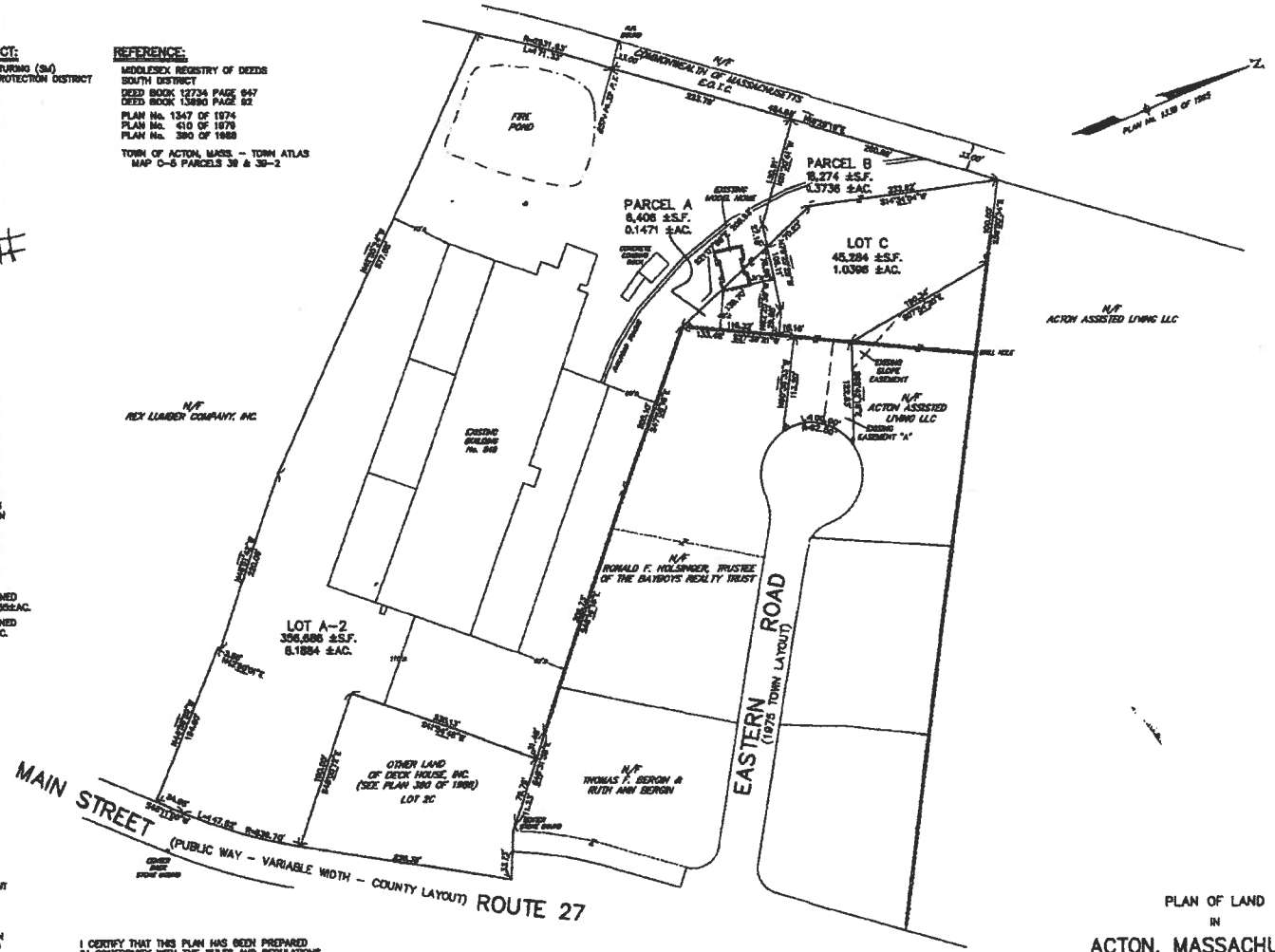
REFERENCE:
MIDDLESEX REGISTRY OF DEEDS
SOUTH DISTRICT
DEED BOOK 12734 PAGE 647
DEED BOOK 13890 PAGE 92
PLAN No. 1347 OF 1974
PLAN No. 410 OF 1979
PLAN No. 380 OF 1988
TOWN OF ACTON, MASS. – TOWN ATLAS
MAP C–5 PARCELS 39 & 39–2

NOTES:

1.) THIS PLAN IS BASED ON THE REFERENCED PLANS AND DEEDS AND AN ON THE GROUND SURVEY. THE CERTIFICATION HEREON IS INTENDED TO MEET THE REQUIREMENTS OF THE REGISTRY OF DEEDS ONLY, AND IS NOT CERTIFICATION TO THE TITLE OR OWNERSHIP OF THE PROPERTY SHOWN, OR AS TO THE EXISTENCE OF UNRECORDED EASEMENTS. OWNERSHIP OF ABUTTING PROPERTIES ARE FROM CURRENT ASSESSOR'S RECORDS.

2.) PARCEL A IS NOT A LEGAL BUILDING LOT, IT IS TO BE COMBINED WITH LOT A–2 FOR A TOTAL AREA OF 363,092±S.F. OR 8.3395±AC.

3.) PARCEL B IS NOT A LEGAL BUILDING LOT, IT IS TO BE COMBINED WITH LOT C FOR A TOTAL AREA OF 61,658±S.F. OR 1.4152±AC.



PLANNING BOARD ENDORSEMENT IS NOT A DETERMINATION AS TO CONFORMANCE WITH ZONING REQUIREMENTS

APPROVAL UNDER SUBDIVISION CONTROL LAW NOT REQUIRED
ACTON PLANNING BOARD

September 17, 2001
DATE

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

17 AUG 01
DATE

REGISTERED PROFESSIONAL LAND SURVEYOR

Middlesex Registry of Deeds,
Southern District
Cambridge, Massachusetts
Plan No. 1004 of 2001
Rec'd 10-5-2001
at 2:00 P.M. Bk 875 Pg 54
Rec'd 859760 Fee $75
Attest
Register

PLAN OF LAND
IN
ACTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

FOR: DECK HOUSE, INC.
SCALE: 1"=60' JUNE 19, 2001

STAMSKI AND MCNARY, INC.
80 HARRIS STREET ACTON, MASSACHUSETTS
ENGINEERING – PLANNING – SURVEYING

0 30 60 120 180 240 FT

(2294DHANR.dwg) 848 MAIN STREET SM–72

1004

Stormwater Management Report

For

848 Main Street
Acton, MA

RECEIVED
JUN 19 2014
Town of Acton
Planning Department

January 22, 2014
Revised – June 3, 2014

Applicant: Acorn Deck House Company
852 Main Street
Acton, MA 01720

Stamski And McNary, Inc.
Engineering - Planning – Surveying
1000 Main Street; Acton, MA 01720 (978) 263-8585
www.stamskiandmcnary.com

SM-72B File: 72B-StormwaterReportCover.doc

Table of Contents

Narrative

Pre-Development Hydrology

Post-Development Hydrology

First Flush Volume Calculation

Pipe Sizing Calculations

Soil Evaluations

Stormwater Operation and Maintenance Manual

Narrative

Stormwater Management

The proposed project is to add a paved surface to the site as well as stormwater BMP's to treat and infiltrate runoff from impervious surfaces on the site.

Pre Development-

The existing site is approximately 8.33 ac and contains an existing building, roofed storage areas, a fire pond, and associated bituminous concrete pavement and gravel. The building is currently being used to manufacture modular homes. Approximately 45,626 sf of pavement and 7,758 sf of gravel have been added to the site without providing treatment for the added runoff. The site has been divided into 4 subcatchments as shown on the attached drainage map.

Subcatchment 1 is located to the south and drains in to an existing detention basin which overflows to a catch basin in Main Street. Subcatchment 2 is the southern portion of the building roof and a portion of pavement. This subcatchment drains to 3 existing leaching catch basins on site. Subcatchment 3 is the northwest area of the site that drains to the fire pond on site. Therefore, subcatchments 2 and 3 are not contributing to the total off-site runoff and volume tables shown below. Subcatchment 4 is the area of roof and pavement on the eastern portion of the site. This area drains off the site towards Eastern Road.

Post Development-

The proposed work is to bring the site into compliance with the Town of Acton Zoning Bylaws and the Rules and Regulations for Site Plan Special Permits. This requires the removal of pavement on the southern portion of the site and the addition of pavement in the western portion of the site. Stormwater controls are proposed to treat and infiltrate the runoff created by the added impervious areas on site as well as the impervious areas that were added without providing treatment. The proposed subcatchments are shown on the attached drainage map.

The pavement parking area in Subcatchment 1 will drain to a deep sump hooded catch basin and manhole with a diversion wall to direct the first inch of runoff from the impervious area to a clay lined retention basin prior to discharging into the existing basin. This will provide pre-treatment for stormwater before infiltrating in the existing basin. The existing outlet structure will have the v-notch mortared closed and re-cut 6" higher to reduce the discharge off-site. Subcatchment 2 will not be adjusted and will continue to drain to the 3 leaching catch basins. Impervious areas in subcatchment 3 will drain to a catch basin and VortSentry HS36 unit before discharging to the fire pond. The VortSentry unit will provide pretreatment of the runoff. Subcatchment 4 will no longer be draining off site. An infiltration trench will be installed to capture and infiltrate the roof runoff and all other impervious in the subcatchment will be sent to deep sump hooded catch basins and manholes and a Contech CDS 2015-4 unit for pre-treatment

prior to discharging to the fire pond. Therefore, subcatchments 2, 3 and 4 are not contributing to the total off-site runoff and volume tables shown below.

In accordance with the Town of Acton Zoning Bylaw, Section 10.4.3.1, the peak rate of stormwater runoff will not exceed the existing rate based on a 10-year storm event. The peak off site runoff was decreased due to infiltrating roof runoff and redirecting the impervious area of Subcatchment 4 to the existing fire pond on site. The peak runoff rates have been summarized in the following tables.

Discharge Summary Tables

Total Runoff

2-year Storm		10-year Storm	
Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
2.439	0.000	5.015	0.032

Total Volume

2-year Storm		10-year Storm	
Pre (cf)	Post (cf)	Pre (cf)	Post (cf)
7,642	0	15,495	69

In accordance with the Rules and Regulations for Site Plan Special Permits, water balance calculations have also been performed. Detailed calculations for water balance, infiltration trench sizing, inlet grate capacity, and pipe sizing are attached.

Design Basis

1. The United States Department of Agriculture Natural Resource Conservation Service (N.R.C.S.) TR55 methodology was used to determine offsite rates of runoff.
2. The twenty-four hour rainfall, taken from N.R.C.S. publications, is 4.5 inches for the 10-year storm, and 3.1 inches for the 2-year storm event.
3. The hydrologic calculations were performed using the computer program: "Hydraflow Hydrographs 2007" by Intelisolve.
4. The soil types of the site were taken from the N.R.C.S. Soil Survey Map for Acton.
5. Soil conditions and observed seasonal high groundwater table were based on on-site soil evaluations.
6. The Natural Resources Conservation Service (N.R.C.S.) soil survey indicated the presences of Merrimac-Urban land complex. This soil group rates as Hydrologic Group A.

Pre-Development Hydrology

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.697	2	726	2,943	—	—	—	E1
2	SCS Runoff	3.098	2	724	10,402	—	—	—	E2
3	SCS Runoff	0.262	2	740	2,502	—	—	—	E3
4	SCS Runoff	2.439	2	724	7,585	—	—	—	E4
5	Reservoir	0.224	2	752	2,940	1	95.28	601	Existing Basin
6	Diversion1	0.215	2	752	2,883	5	—	—	Exfiltration
7	Diversion2	0.009	2	752	57	5	—	—	Overflow
8	Combine	2.439	2	724	7,642	4, 7	—	—	Total Runoff

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	2.238	2	724	7,348	—	—	—	E1
2	SCS Runoff	4.532	2	724	15,485	—	—	—	E2
3	SCS Runoff	2.025	2	726	8,484	—	—	—	E3
4	SCS Runoff	4.987	2	724	14,963	—	—	—	E4
5	Reservoir	0.773	2	746	7,345	1	95.83	1,784	Existing Basin
6	Diversion1	0.637	2	746	6,812	5	—	—	Exfiltration
7	Diversion2	0.136	2	746	532	5	—	—	Overflow
8	Combine	5.015	2	724	15,495	4, 7	—	—	Total Runoff

Worksheet 2: Runoff curve number and runoff SM-0072B

Project: 848 Main Street By WJH Date 06/04/14

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 1

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
A	Woods- Good Condition	30			0.00	
A	Open Space- Good Condition	39			0.89	34.83
A	Pavement	98			0.50	49.29
A	Roof	98			0.00	
A	Gravel	78			0.36	26.98
					Totals =	1.75	111.10

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{111.10}{1.75} = 63.45$; Use CN = 63.5

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.1	4.6	6.4
Runoff, Q..... in (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	0.49	1.23	2.50
Runoff, Q..... cf	3129	7822	15902

D-2

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

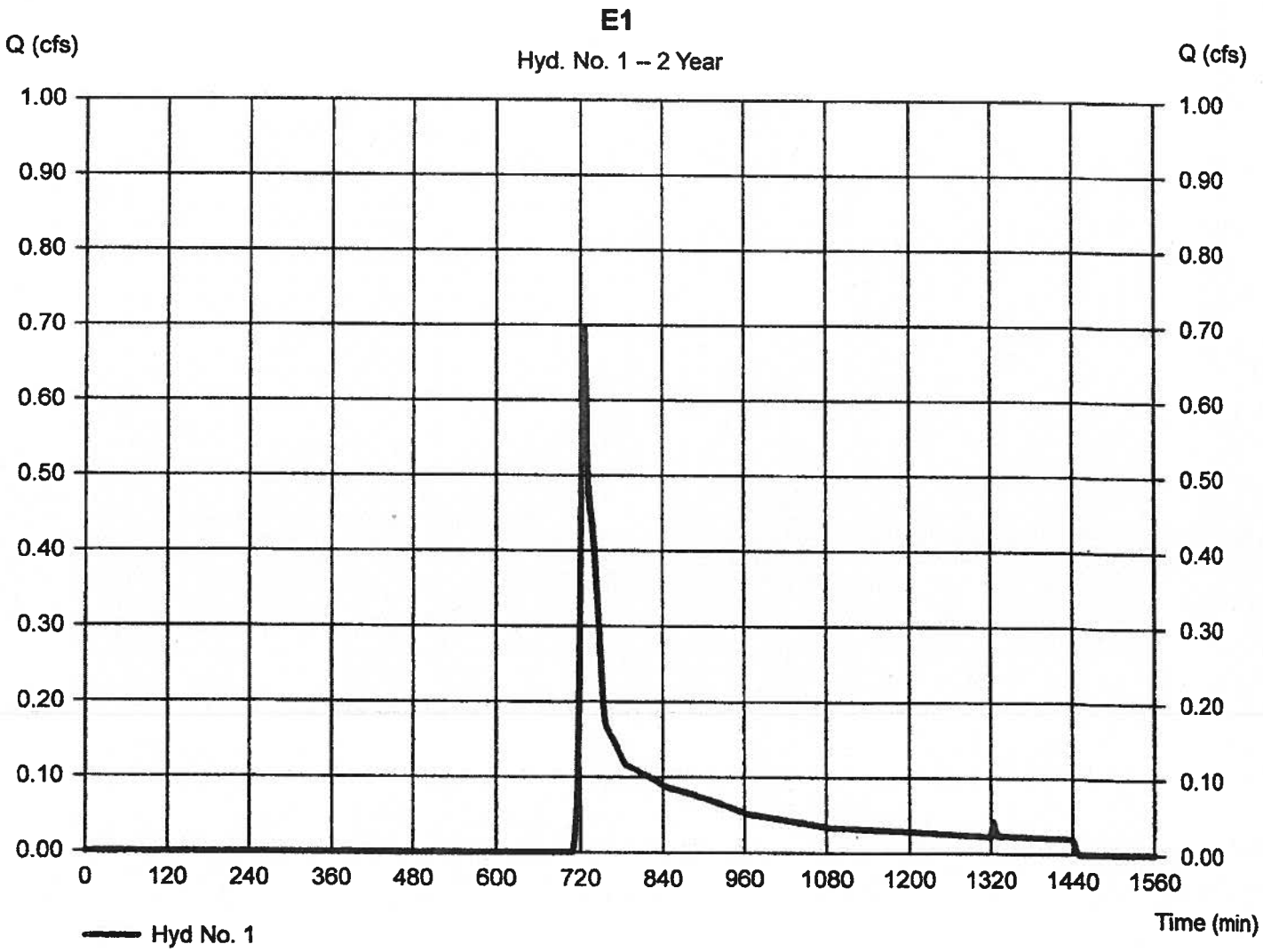
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, Jun 4, 2014

Hyd. No. 1

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.697 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 2,943 cuft
Drainage area	= 1.750 ac	Curve number	= 63.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

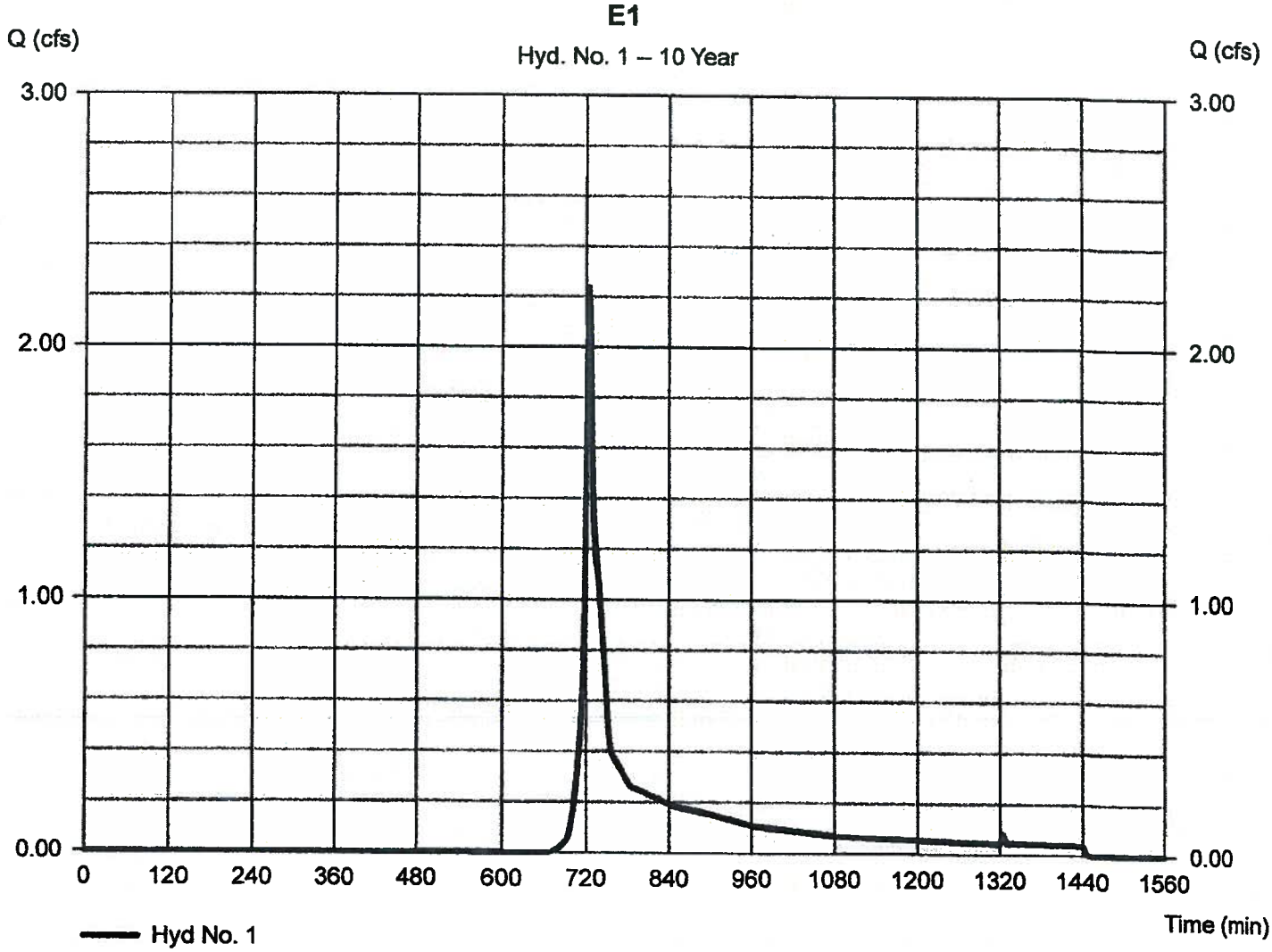
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 1

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.238 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 7,348 cuft
Drainage area	= 1.750 ac	Curve number	= 63.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

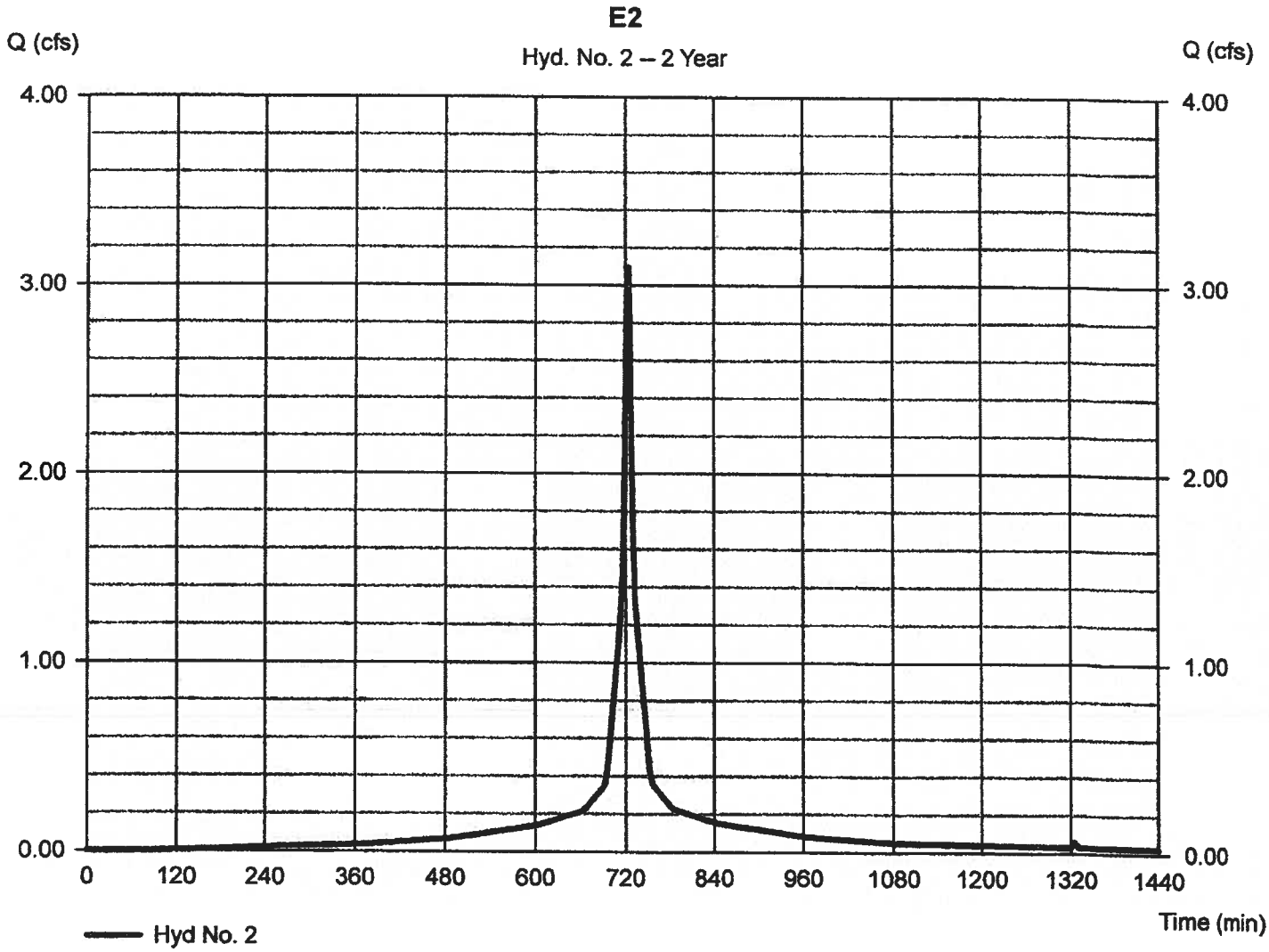
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 2

E2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.098 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 10,402 cuft
Drainage area	= 1.070 ac	Curve number	= 97.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

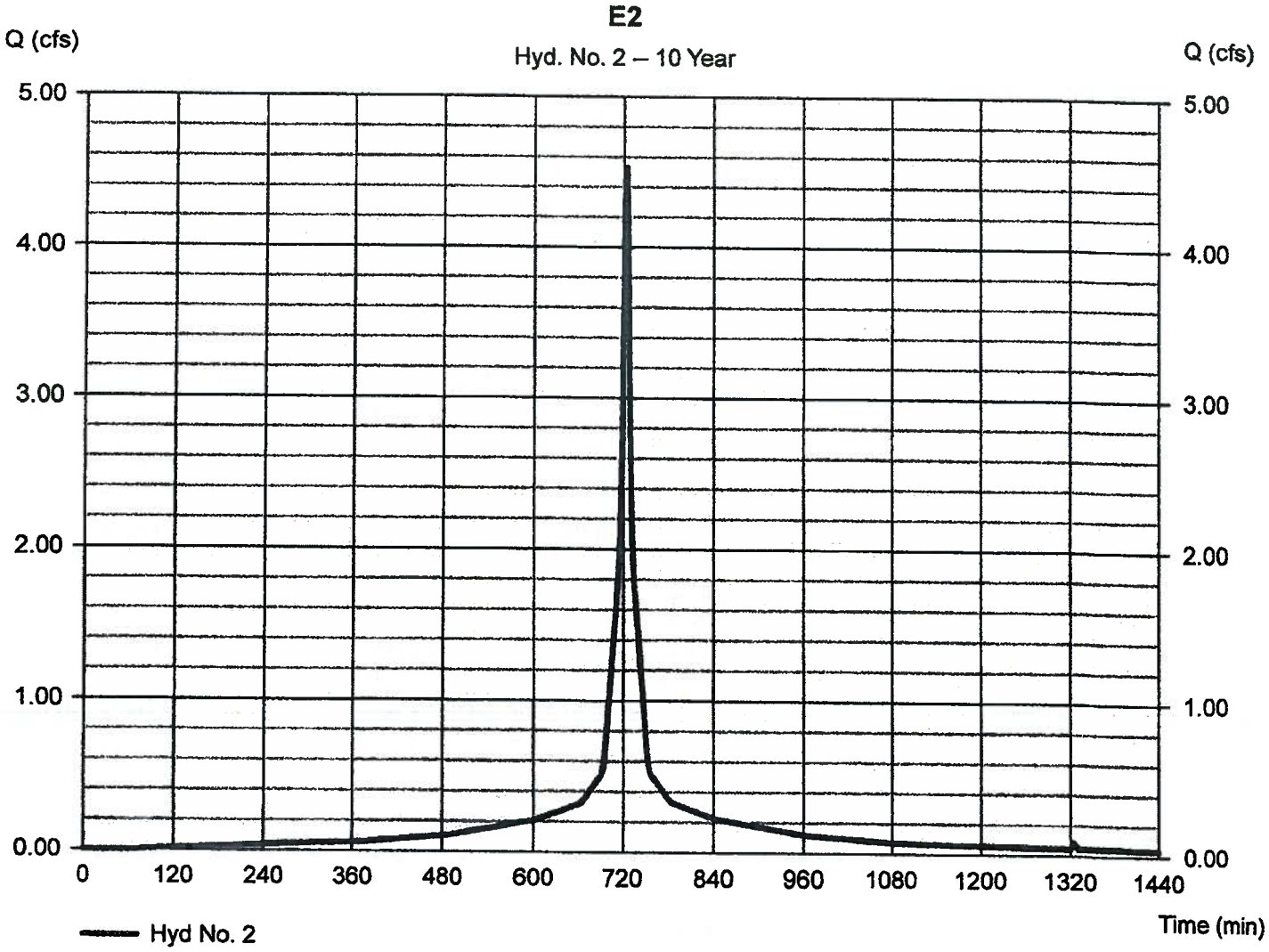
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 2

E2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.532 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 15,485 cuft
Drainage area	= 1.070 ac	Curve number	= 97.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

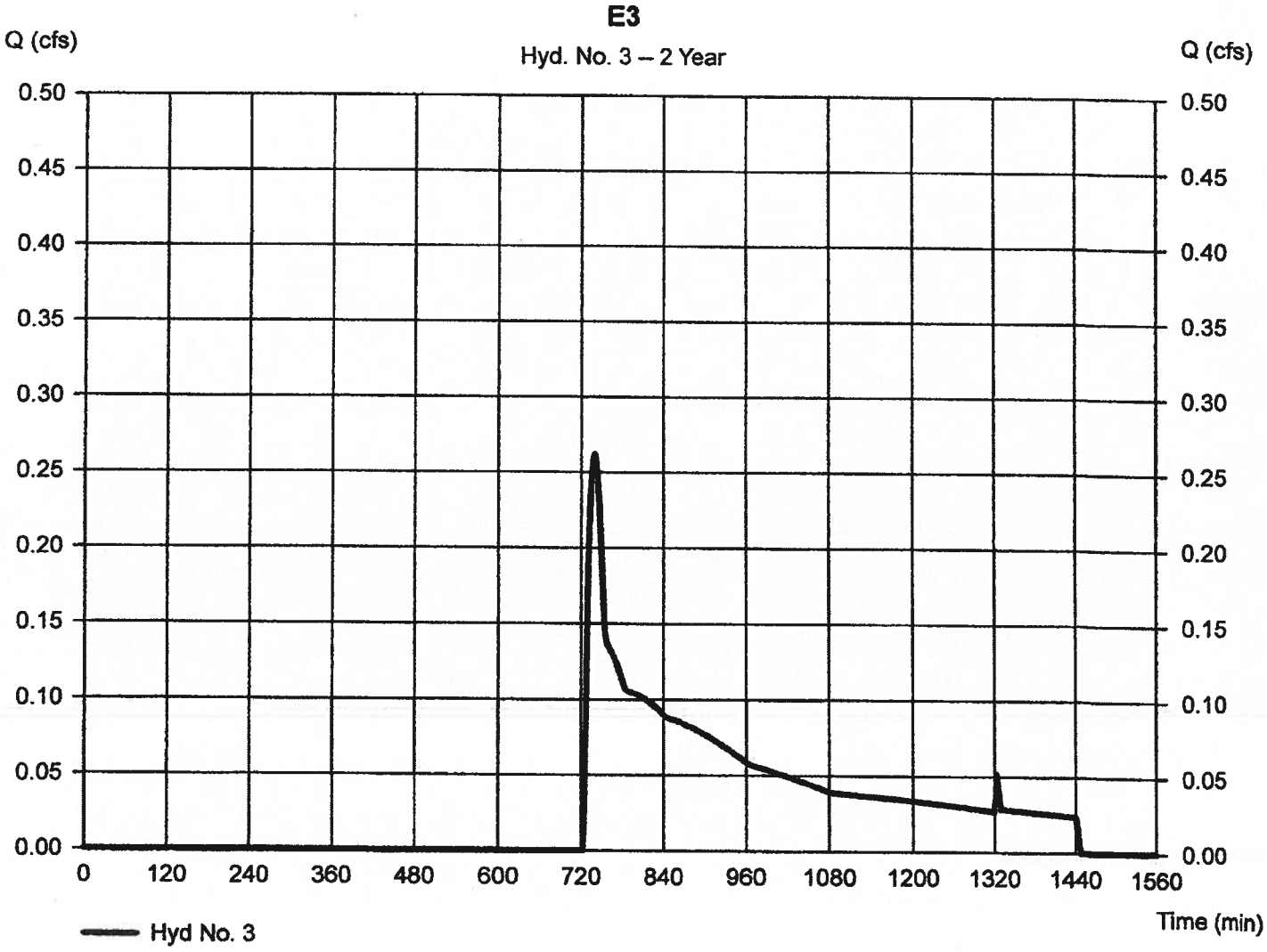
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 3

E3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.262 cfs
Storm frequency	= 2 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 2,502 cuft
Drainage area	= 3.430 ac	Curve number	= 54.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

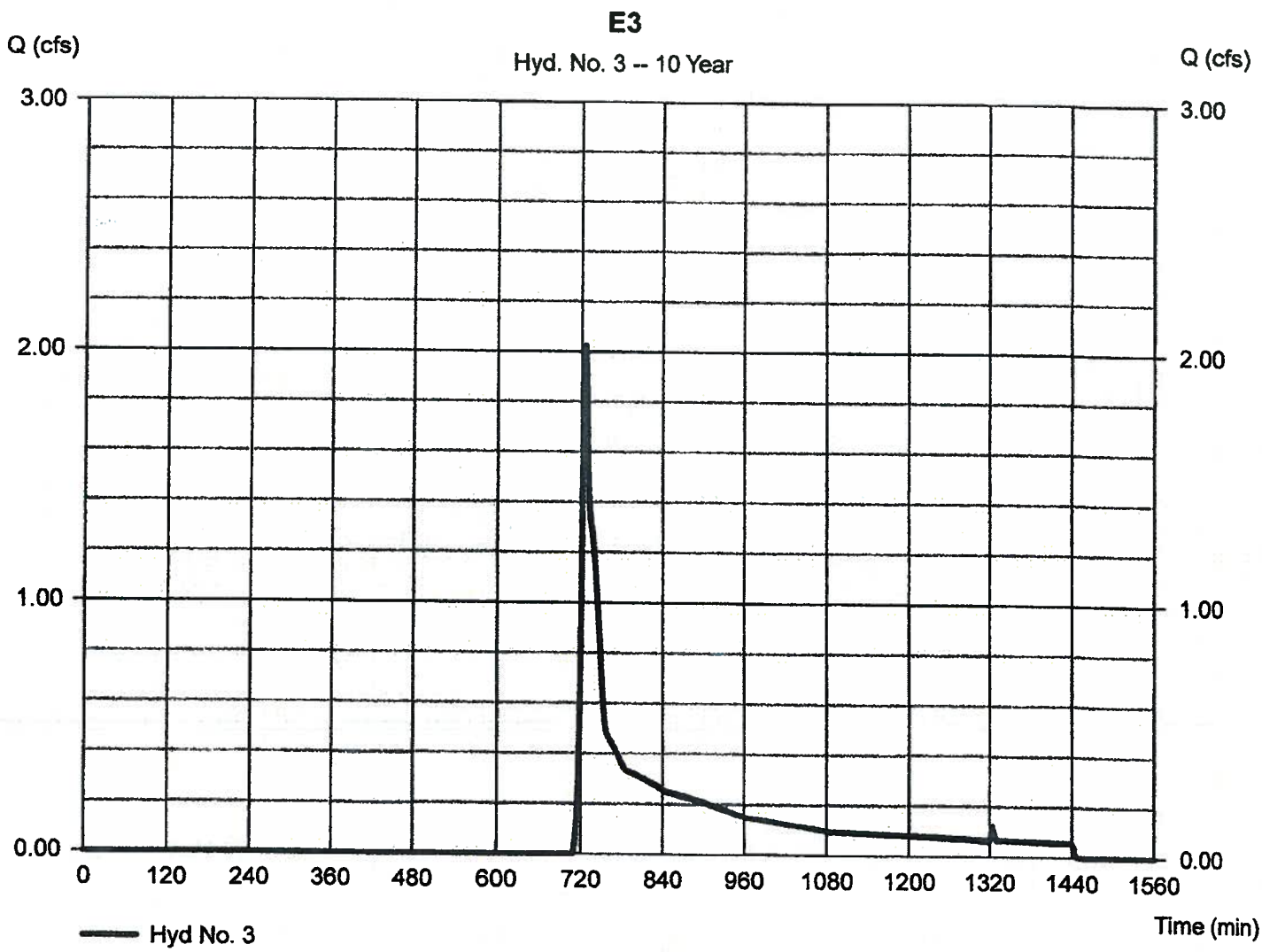
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 3

E3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.025 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 8,484 cuft
Drainage area	= 3.430 ac	Curve number	= 54.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Worksheet 2: Runoff curve number and runoff SM-0072B

Project: 848 Main Street By WJH Date 06/04/14

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 4

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
A	Woods- Good Condition	30			0.00	
A	Open Space- Good Condition	39			0.76	29.48
A	Pavement	98			0.23	22.25
A	Roof	98			1.03	100.45
A	Gravel	76			0.07	5.55
					Totals =	2.08	157.73

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{157.73}{2.08} = 75.79$; Use CN = 75.8

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.1	4.3	6.4
Runoff, Q..... in (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	1.07	2.11	3.71
Runoff, Q..... cf	8092	15964	28000

D-2 (210-VI-TR-55, Second Ed., June 1986)

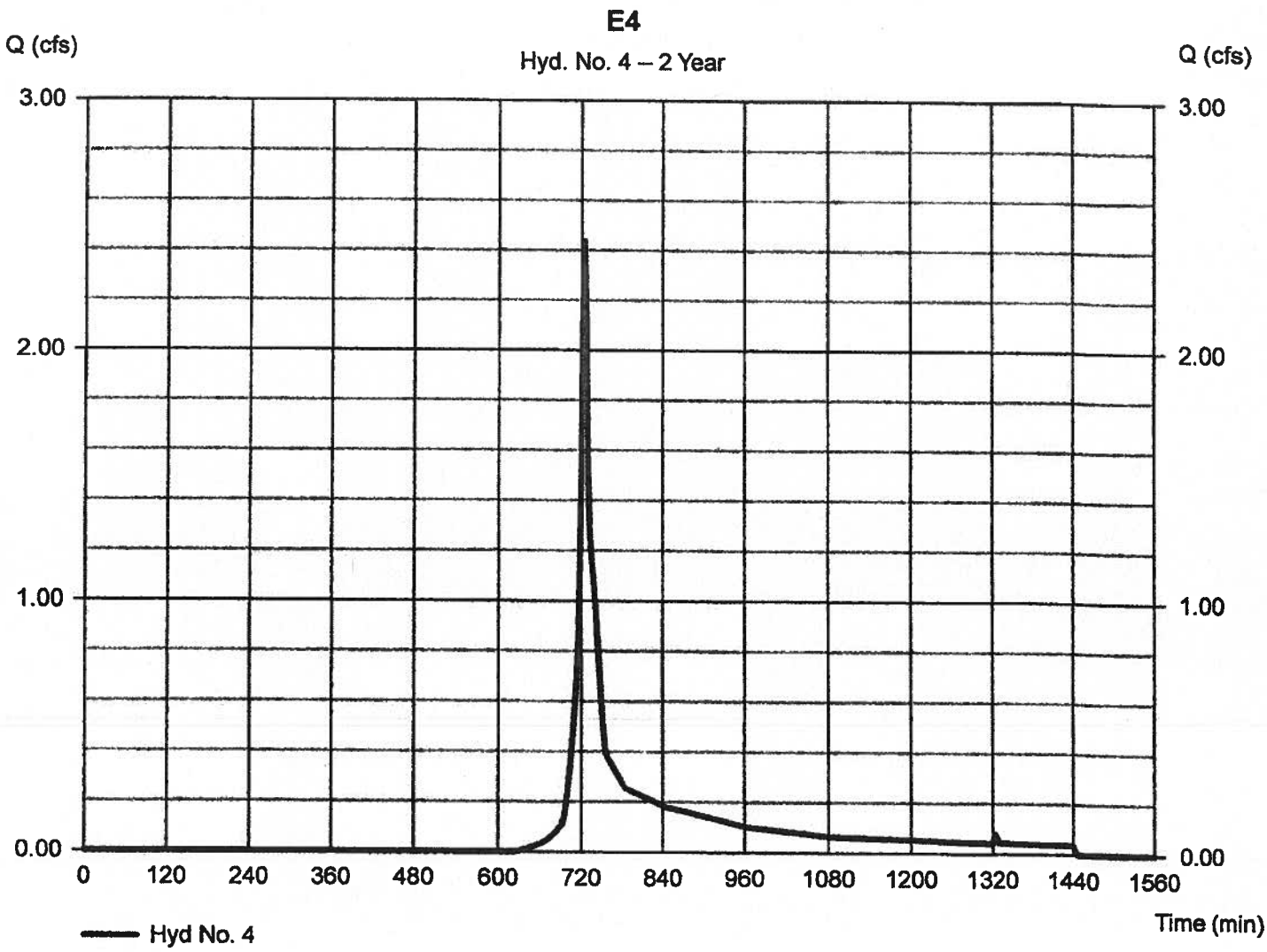
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, Jun 4, 2014

Hyd. No. 4

E4

Hydrograph type	= SCS Runoff	Peak discharge	= 2.439 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 7,585 cuft
Drainage area	= 2.080 ac	Curve number	= 75.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



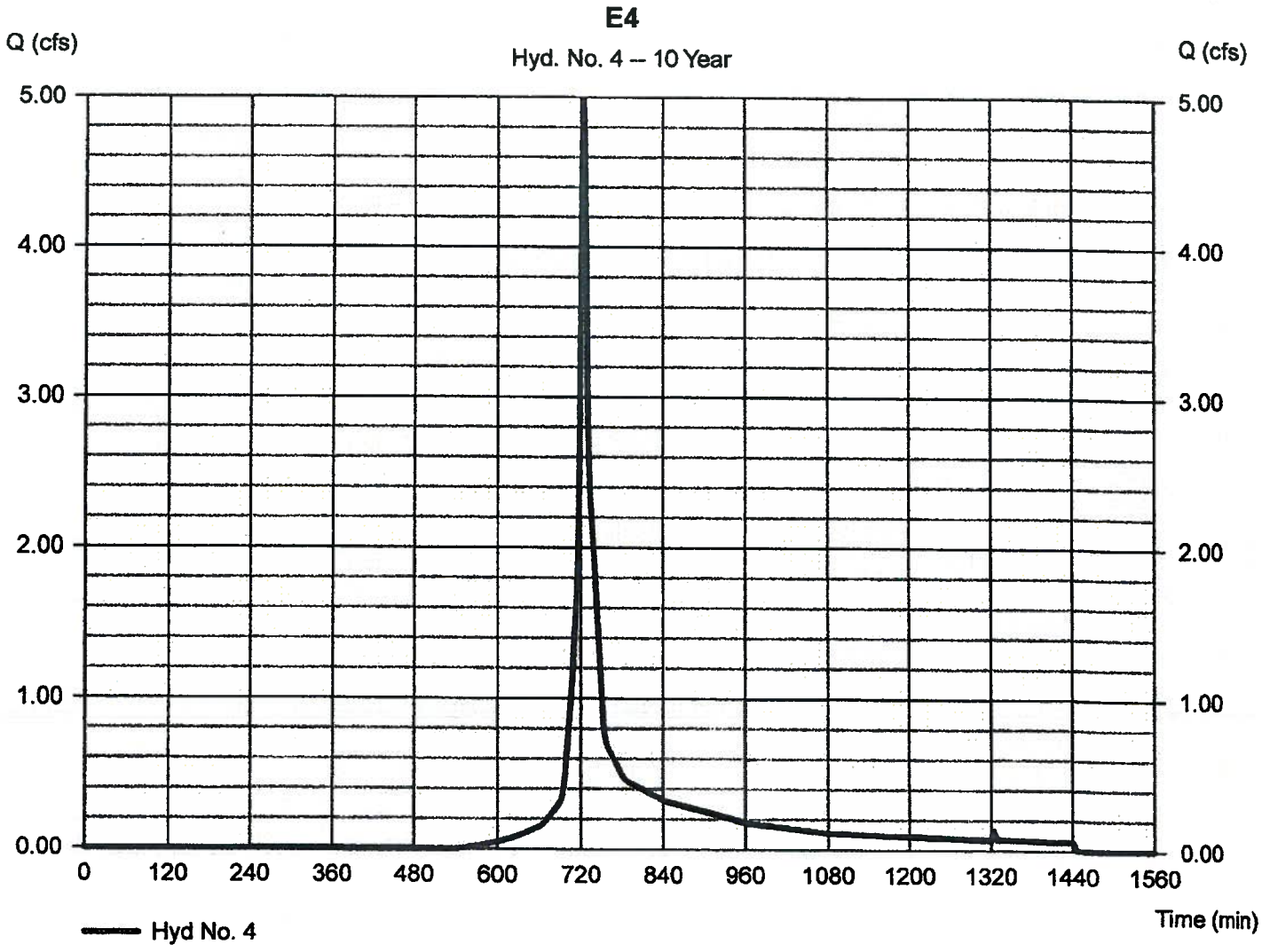
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, Jun 4, 2014

Hyd. No. 4

E4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.987 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 14,963 cuft
Drainage area	= 2.080 ac	Curve number	= 75.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

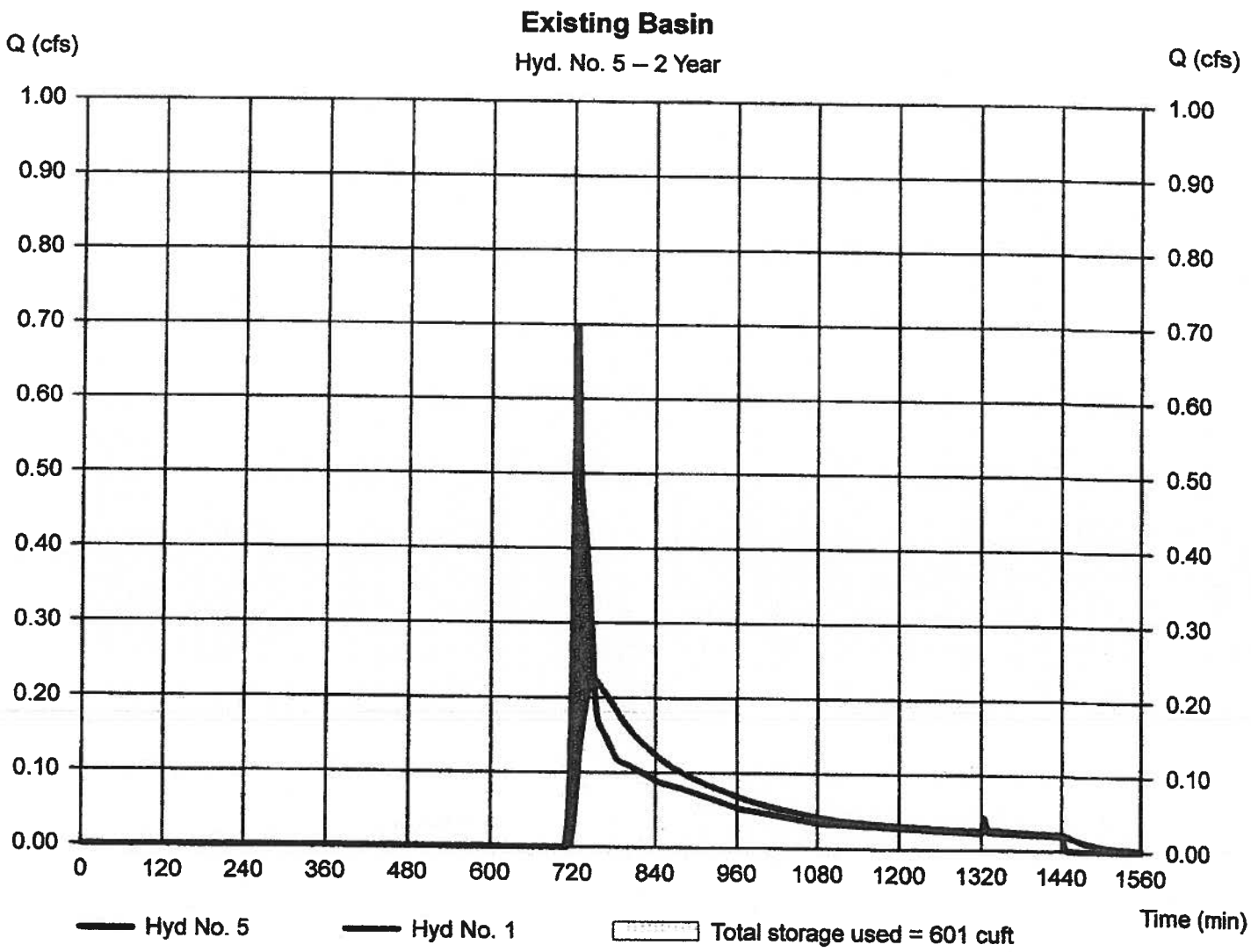
Wednesday, Jun 4, 2014

Hyd. No. 5

Existing Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.224 cfs
Storm frequency	= 2 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 2,940 cuft
Inflow hyd. No.	= 1 - E1	Max. Elevation	= 95.28 ft
Reservoir name	= Existing Basin	Max. Storage	= 601 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

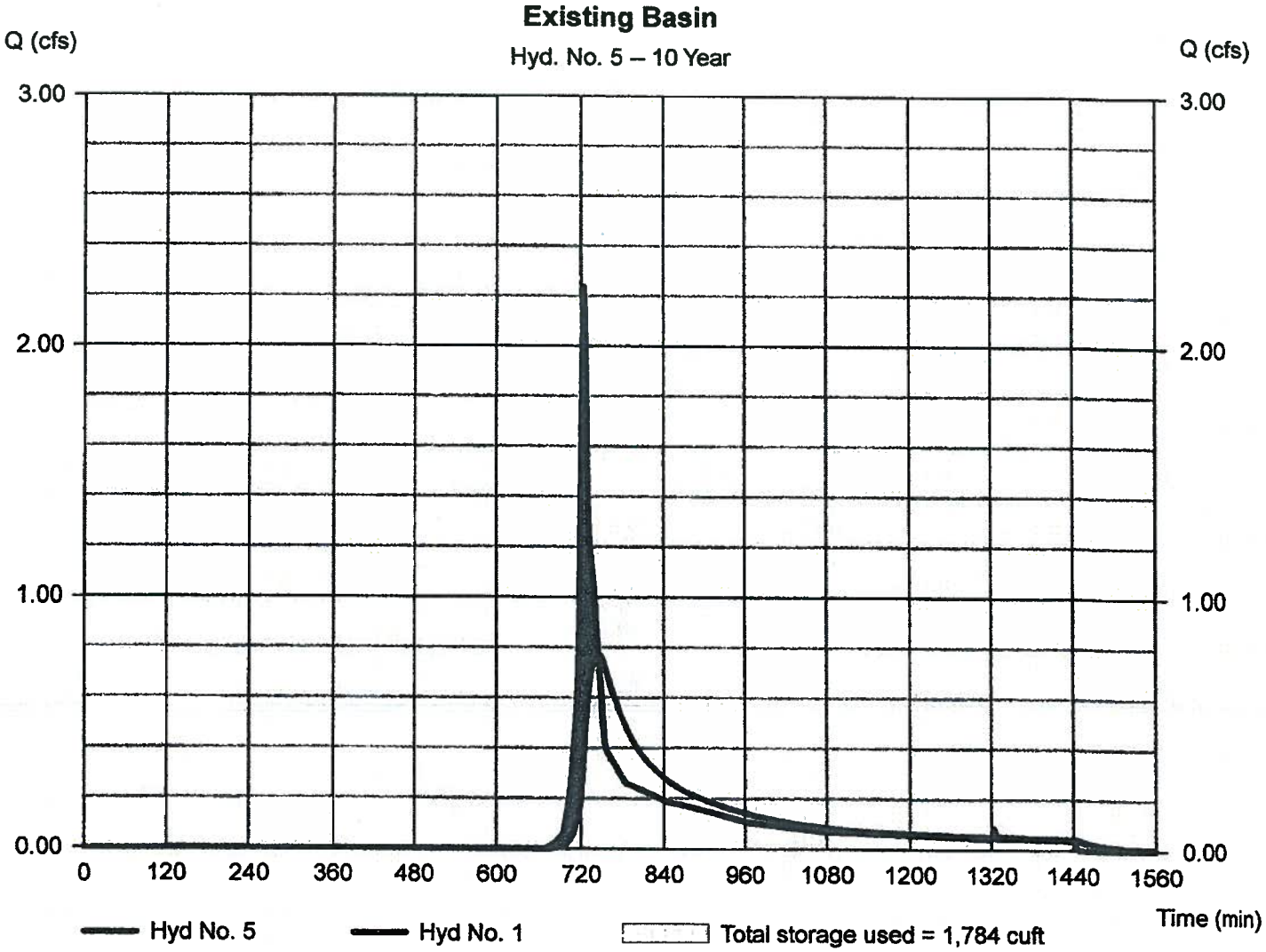
Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, Jun 4, 2014

Hyd. No. 5

Existing Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.773 cfs
Storm frequency	= 10 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 7,345 cuft
Inflow hyd. No.	= 1 - E1	Max. Elevation	= 95.83 ft
Reservoir name	= Existing Basin	Max. Storage	= 1,784 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

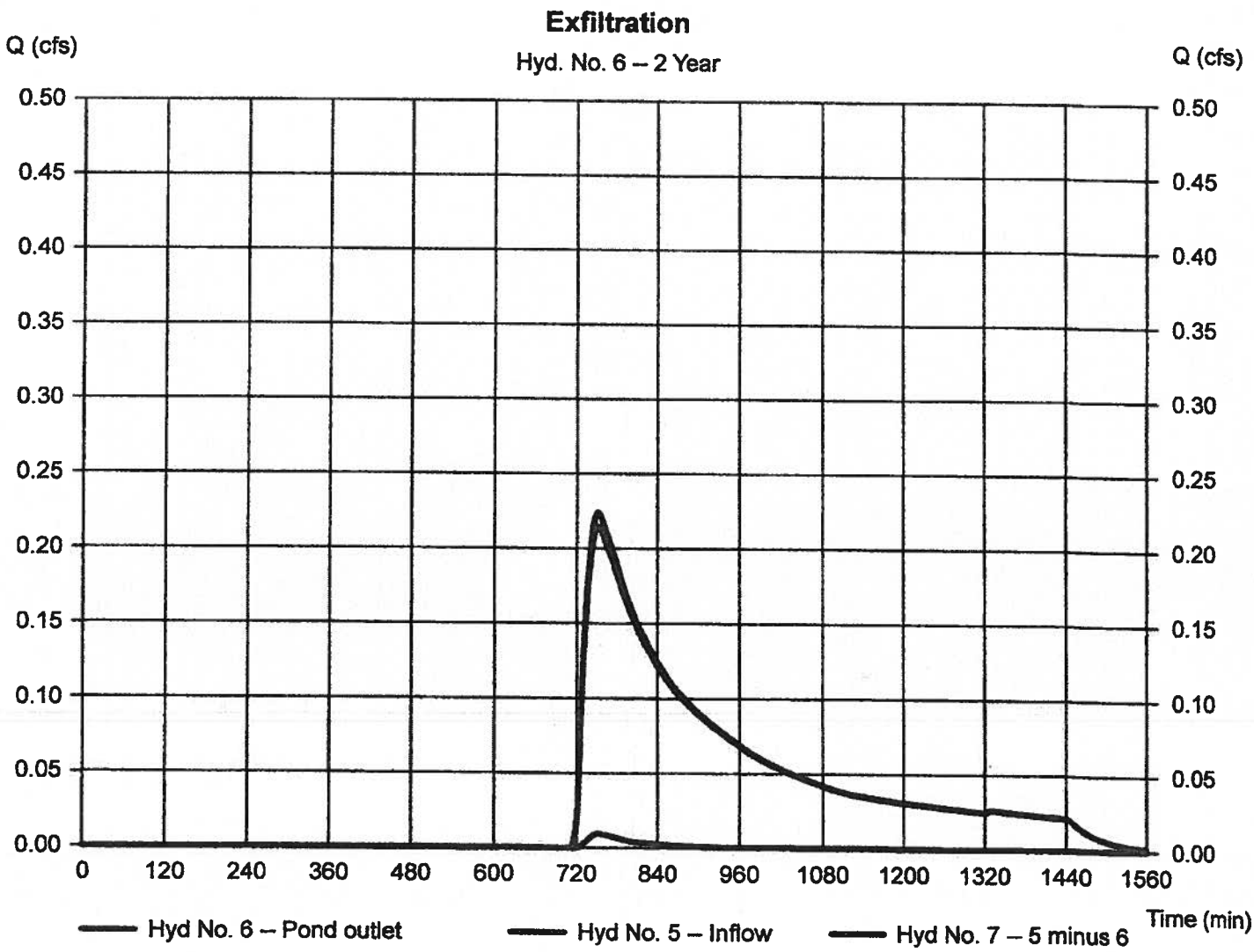
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 6

Exfiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.215 cfs
Storm frequency	= 2 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 2,883 cuft
Inflow hydrograph	= 5 - Existing Basin	2nd diverted hyd.	= 7
Diversion method	= Pond - Existing Basin	Pond structure	= Exfiltration



Hydrograph Report

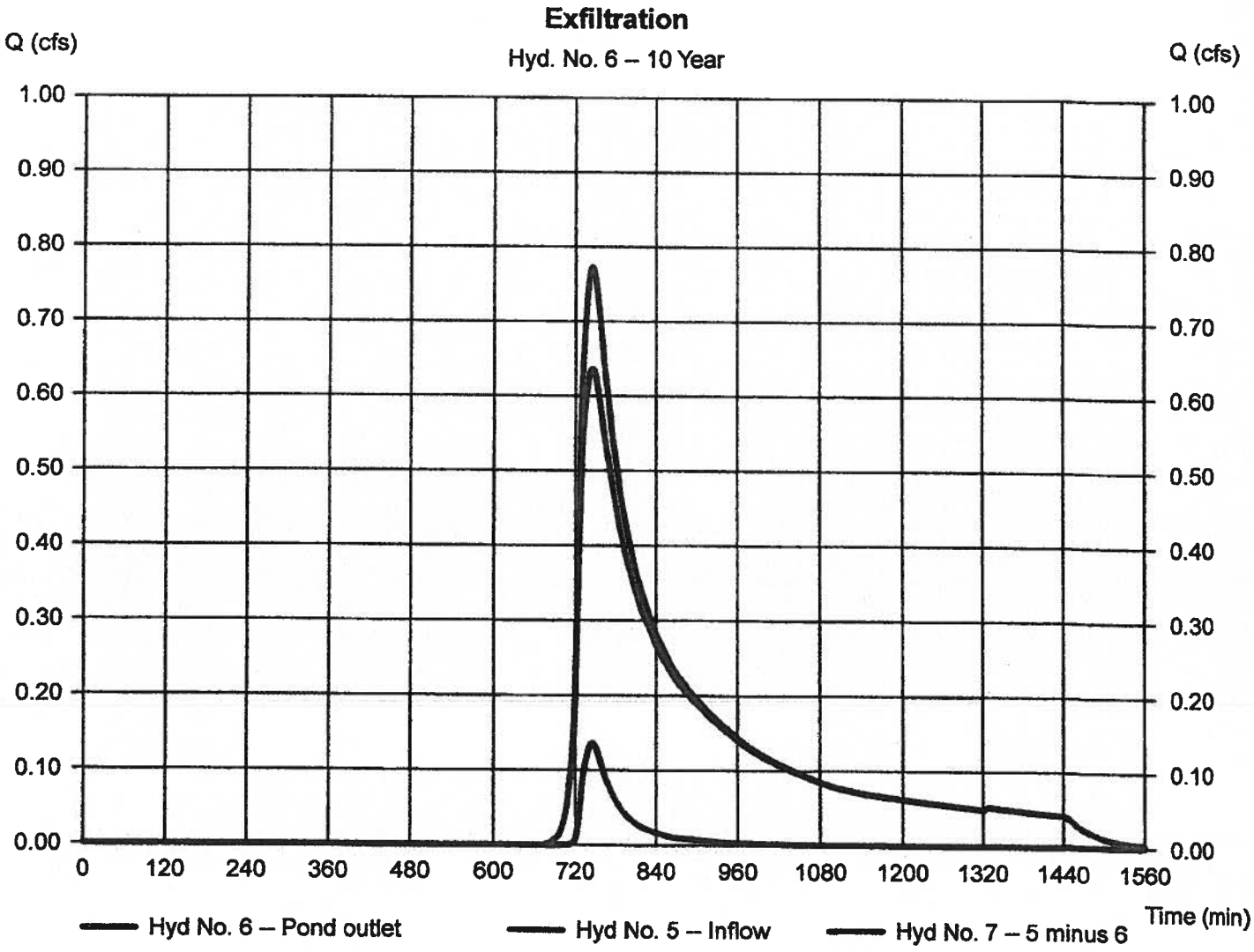
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 6

Exfiltration

Hydrograph type	=	Diversion1	Peak discharge	=	0.637 cfs
Storm frequency	=	10 yrs	Time to peak	=	746 min
Time interval	=	2 min	Hyd. volume	=	6,812 cuft
Inflow hydrograph	=	5 - Existing Basin	2nd diverted hyd.	=	7
Diversion method	=	Pond - Existing Basin	Pond structure	=	Exfiltration



Hydrograph Report

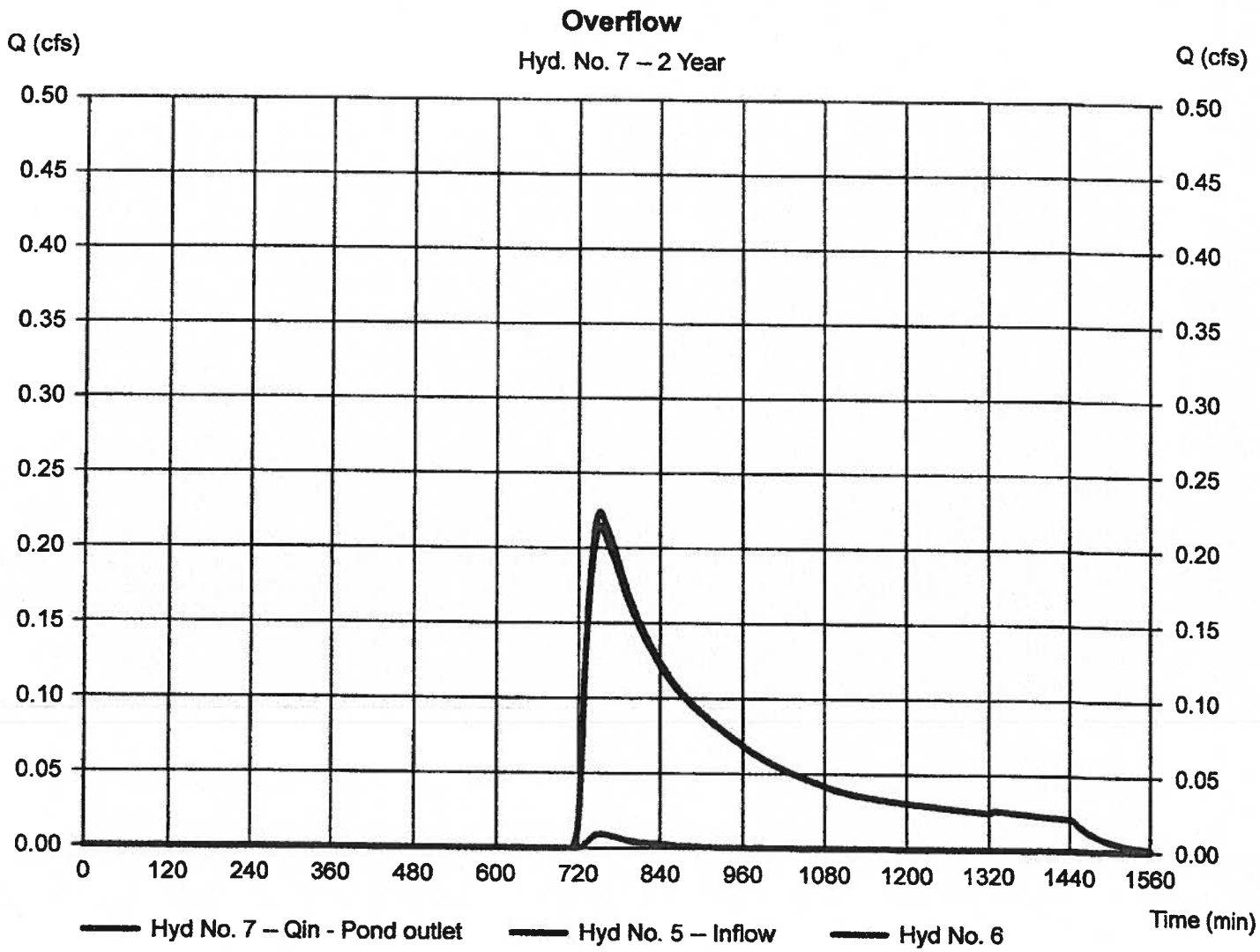
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 7

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.009 cfs
Storm frequency	= 2 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 57 cuft
Inflow hydrograph	= 5 - Existing Basin	2nd diverted hyd.	= 6
Diversion method	= Pond - Existing Basin	Pond structure	= Exfiltration



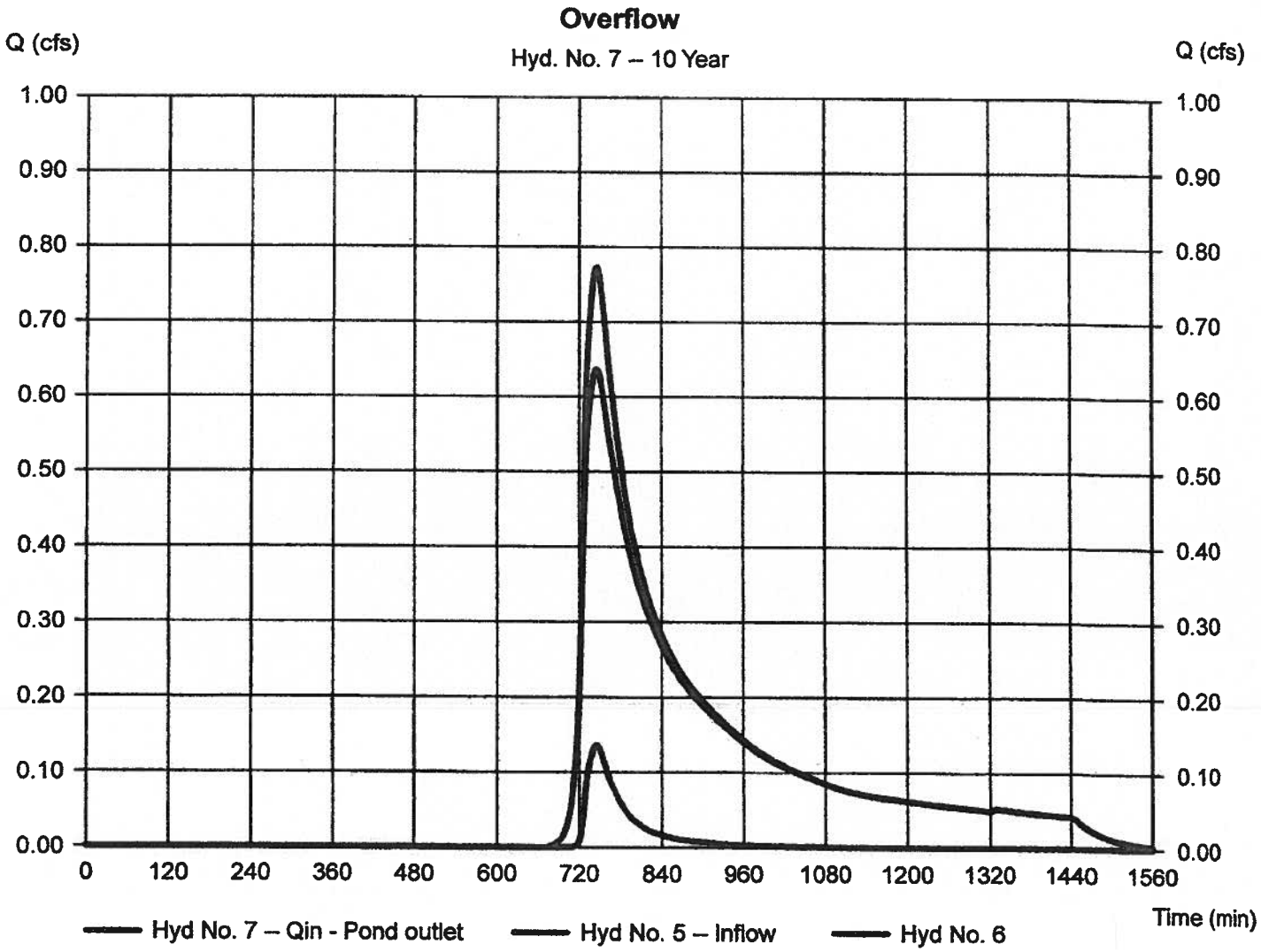
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, Jun 4, 2014

Hyd. No. 7

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.136 cfs
Storm frequency	= 10 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 532 cuft
Inflow hydrograph	= 5 - Existing Basin	2nd diverted hyd.	= 6
Diversion method	= Pond - Existing Basin	Pond structure	= Exfiltration



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Pond No. 1 - Existing Basin

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 95.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	95.00	728	0	0
1.00	96.00	3,990	2,140	2,140
2.00	97.00	4,847	4,411	6,552
3.00	98.00	8,291	6,492	13,044

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 95.00	0.00	0.00	0.00
Length (ft)	= 68.00	0.00	0.00	0.00
Slope (%)	= 0.44	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

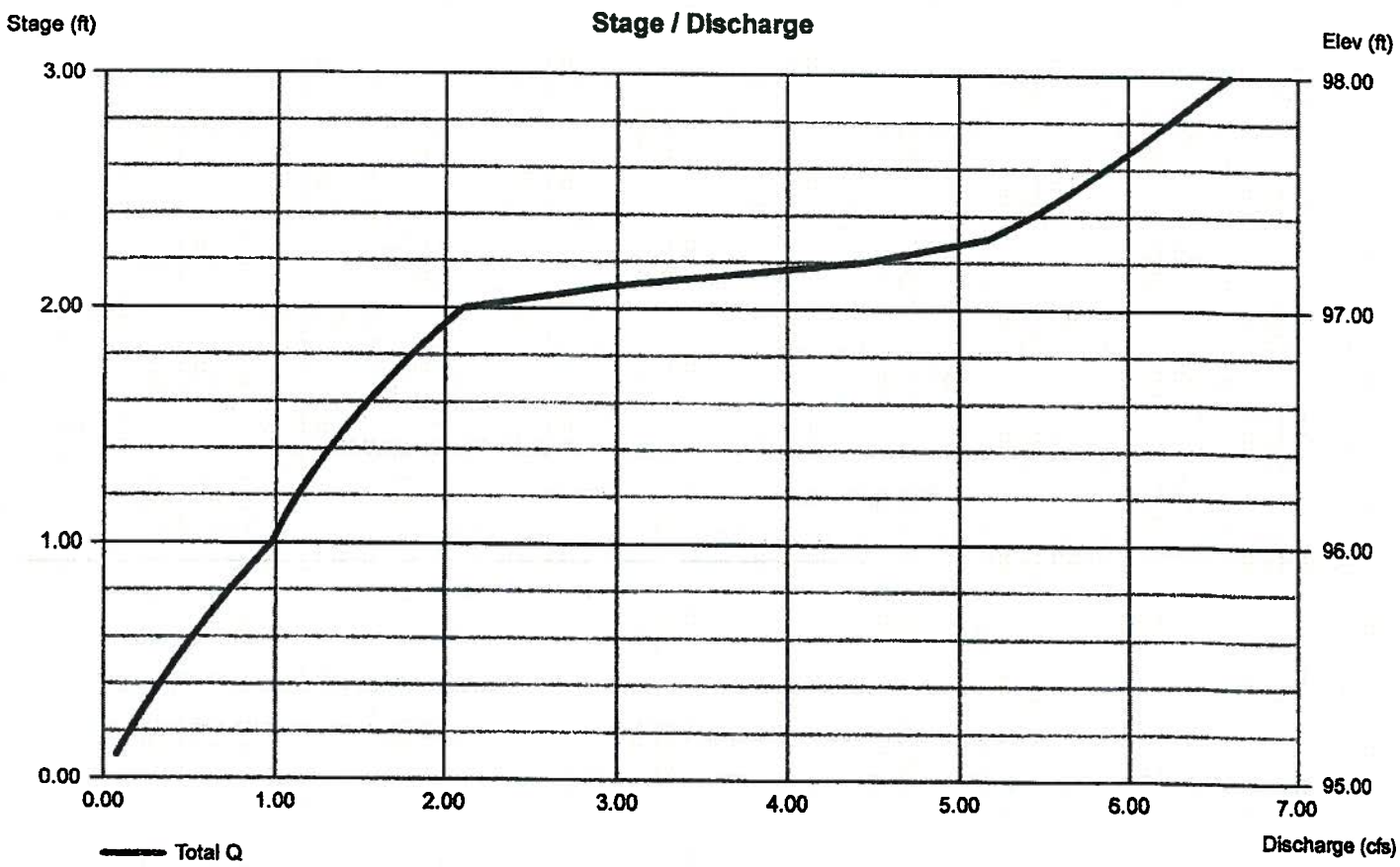
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 97.00	95.00	0.00	0.00
Weir Coeff.	= 3.33	0.22	3.33	3.33
Weir Type	= Riser	10 degV	—	—
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 8.270 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



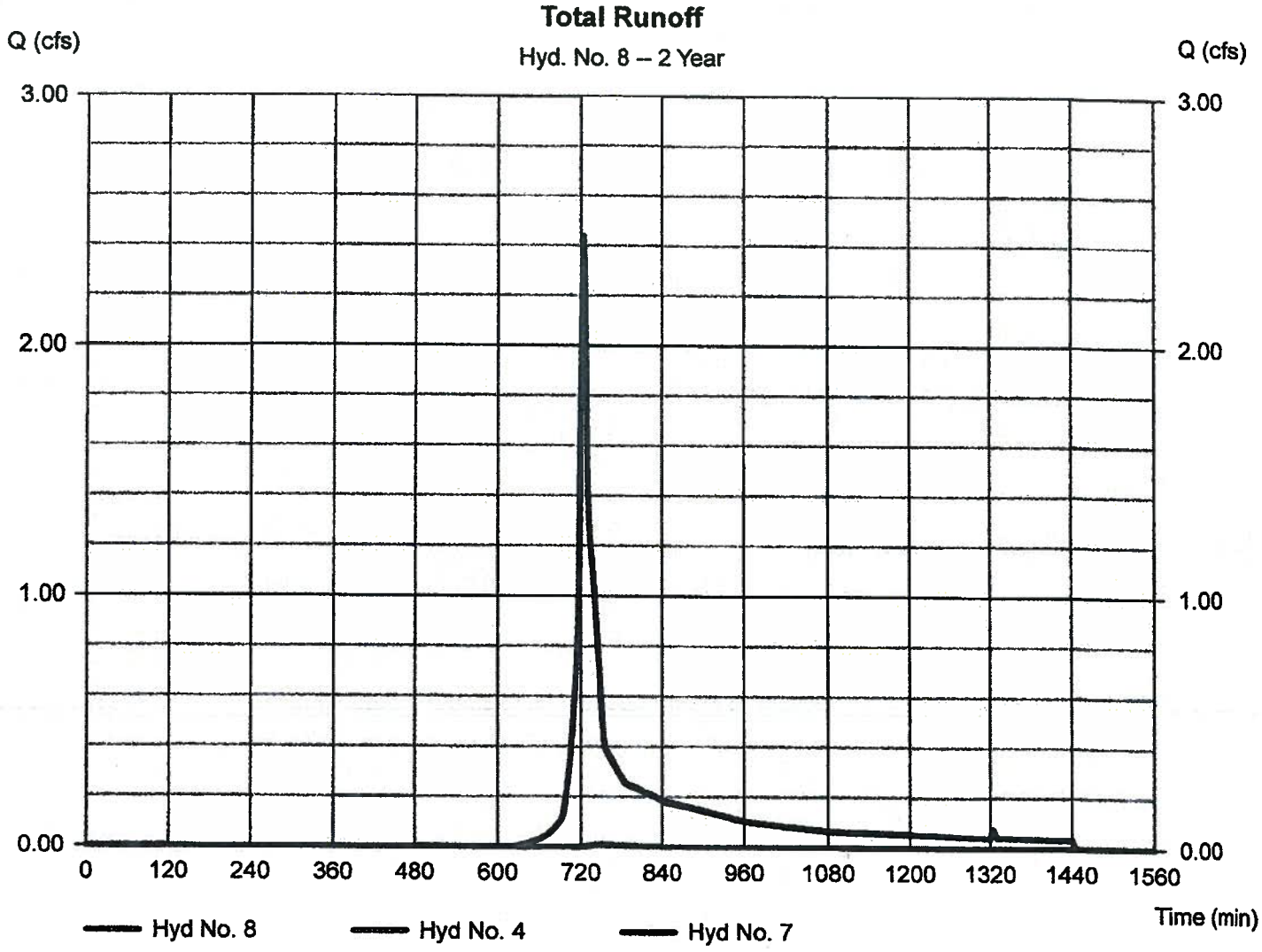
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, Jun 4, 2014

Hyd. No. 8

Total Runoff

Hydrograph type	= Combine	Peak discharge	= 2.439 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 7,642 cuft
Inflow hyds.	= 4, 7	Contrib. drain. area	= 2.080 ac



Hydrograph Report

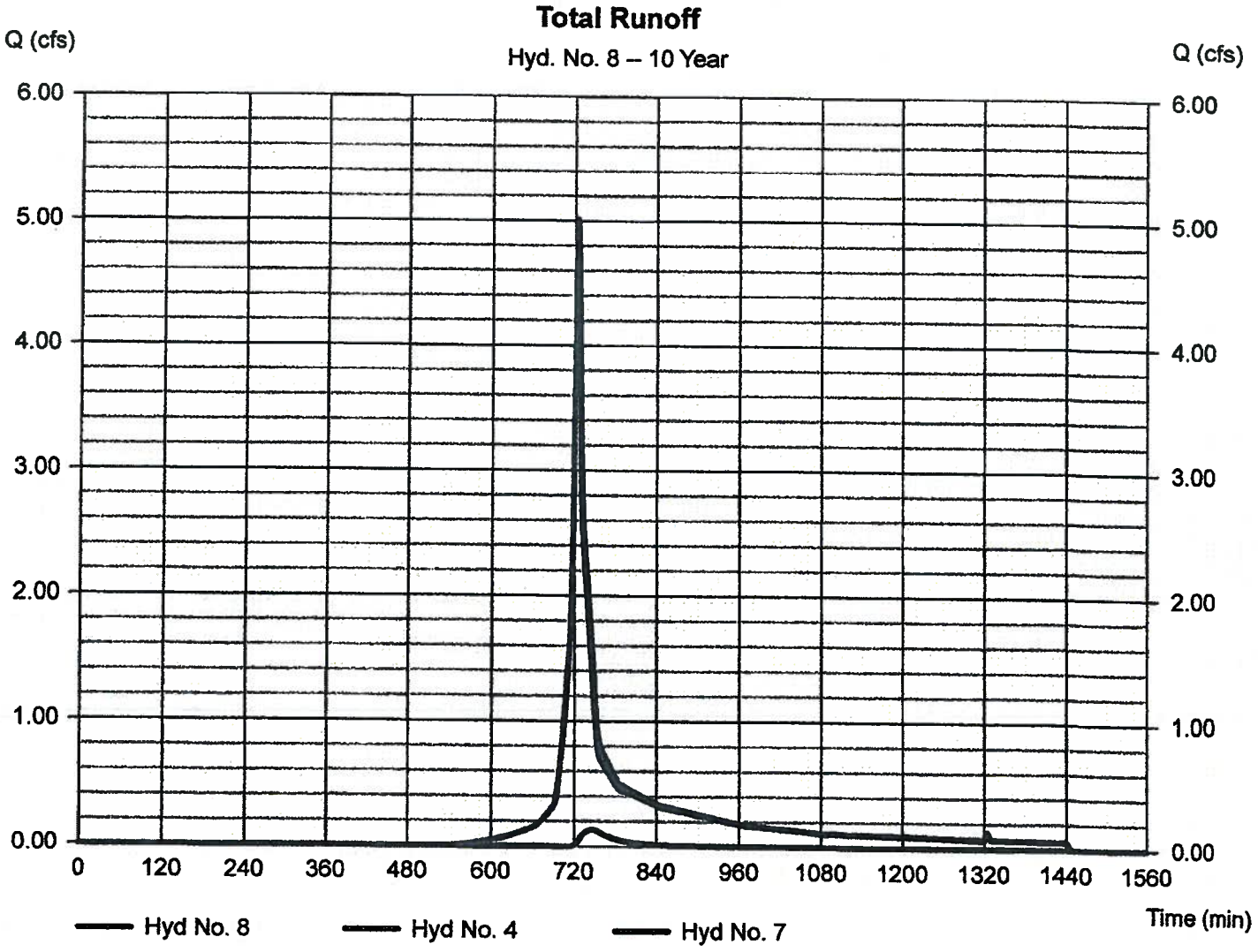
Hydraflow Hydrographs by Intelisolve v9.2

Wednesday, Jun 4, 2014

Hyd. No. 8

Total Runoff

Hydrograph type	= Combine	Peak discharge	= 5.015 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 15,495 cuft
Inflow hyds.	= 4, 7	Contrib. drain. area	= 2.080 ac



Post-Development Hydrology

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	1.573	2	724	5,141	---	----	----	P1
2	Reservoir	0.231	2	770	3,004	1	97.58	2,249	First Flush Basin
3	SCS Runoff	3.098	2	724	10,402	---	----	----	P2
4	SCS Runoff	0.484	2	728	3,510	---	----	----	P3
5	SCS Runoff	1.609	2	724	4,902	---	----	----	P4
6	Reservoir	0.141	2	838	3,001	2	95.19	396	Existing Basin
7	Diversion1	0.141	2	838	3,001	6	----	----	Exfiltration
8	Diversion2	0.000	2	830	0	6	----	----	Overflow
9	Combine	1.934	2	726	8,412	4, 5,	----	----	To Fire Pond

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	3.550	2	724	10,797	---	---	---	P1
2	Reservoir	2.630	2	728	8,660	1	97.90	2,721	First Flush Basin
3	SCS Runoff	4.532	2	724	15,485	---	---	---	P2
4	SCS Runoff	2.779	2	724	10,430	---	---	---	P3
5	SCS Runoff	3.110	2	724	9,295	---	---	---	P4
6	Reservoir	0.762	2	754	8,657	2	95.96	2,046	Existing Basin
7	Diversion1	0.730	2	754	8,588	6	---	---	Exfiltration
8	Diversion2	0.032	2	754	69	6	---	---	Overflow
9	Combine	5.889	2	724	19,725	4, 5,	---	---	To Fire Pond

Hydrograph Report

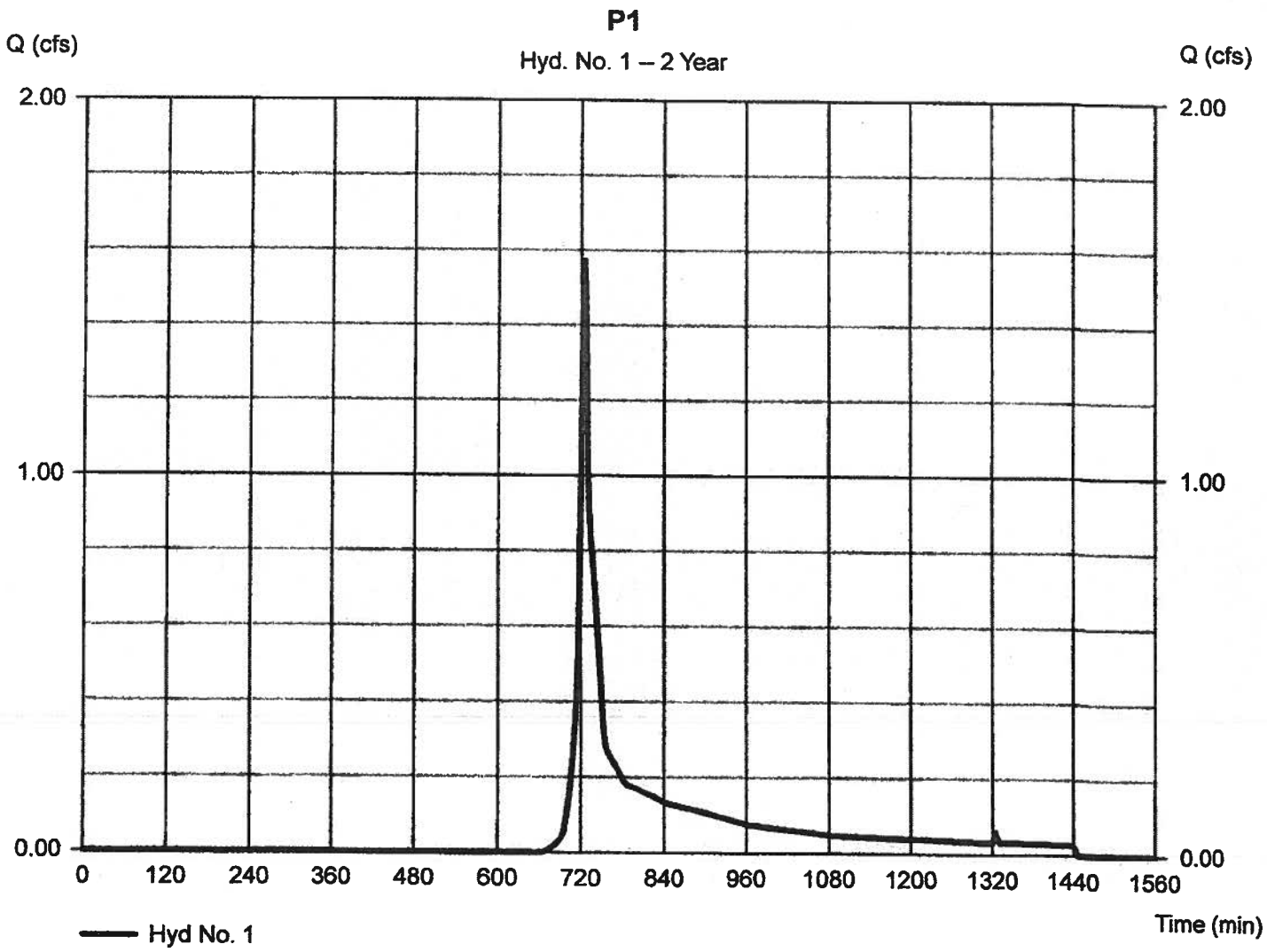
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 1

P1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.573 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 5,141 cuft
Drainage area	= 1.750 ac	Curve number	= 71.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

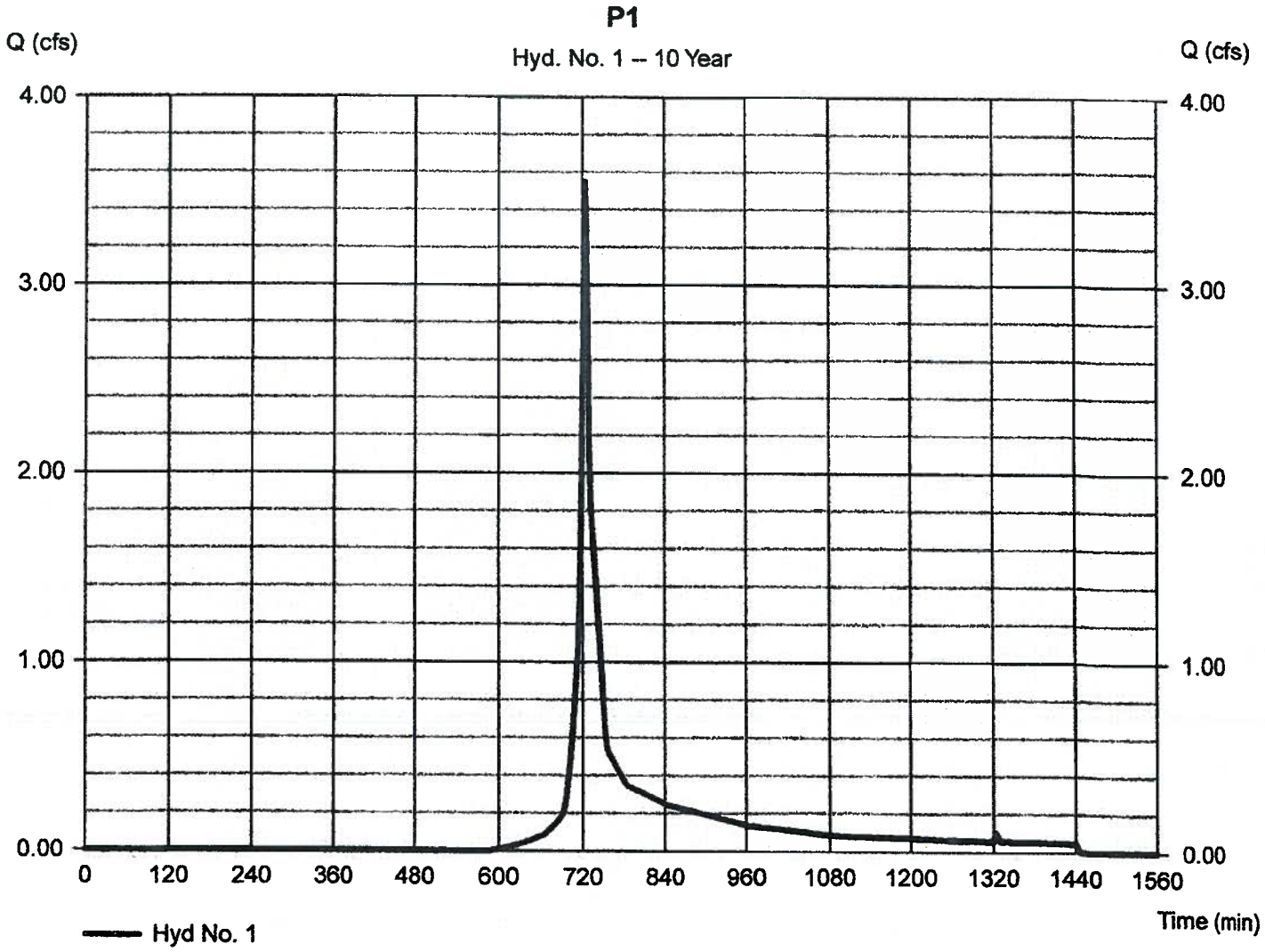
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 1

P1

Hydrograph type	= SCS Runoff	Peak discharge	= 3.550 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 10,797 cuft
Drainage area	= 1.750 ac	Curve number	= 71.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

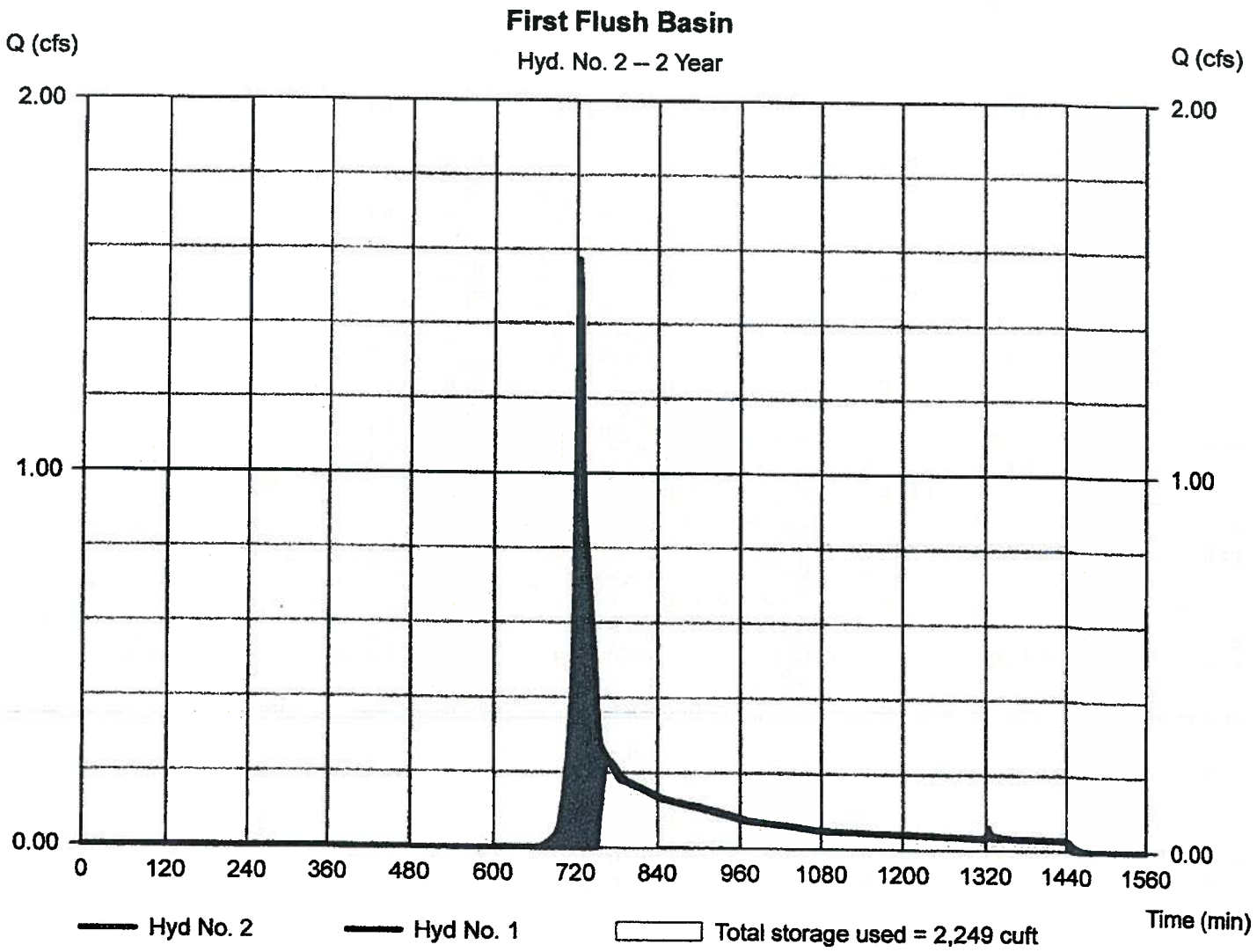
Thursday, Jun 5, 2014

Hyd. No. 2

First Flush Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.231 cfs
Storm frequency	= 2 yrs	Time to peak	= 770 min
Time interval	= 2 min	Hyd. volume	= 3,004 cuft
Inflow hyd. No.	= 1 - P1	Max. Elevation	= 97.58 ft
Reservoir name	= Sub 1 First Flush Basin	Max. Storage	= 2,249 cuft

Storage Indication method used.



Hydrograph Report

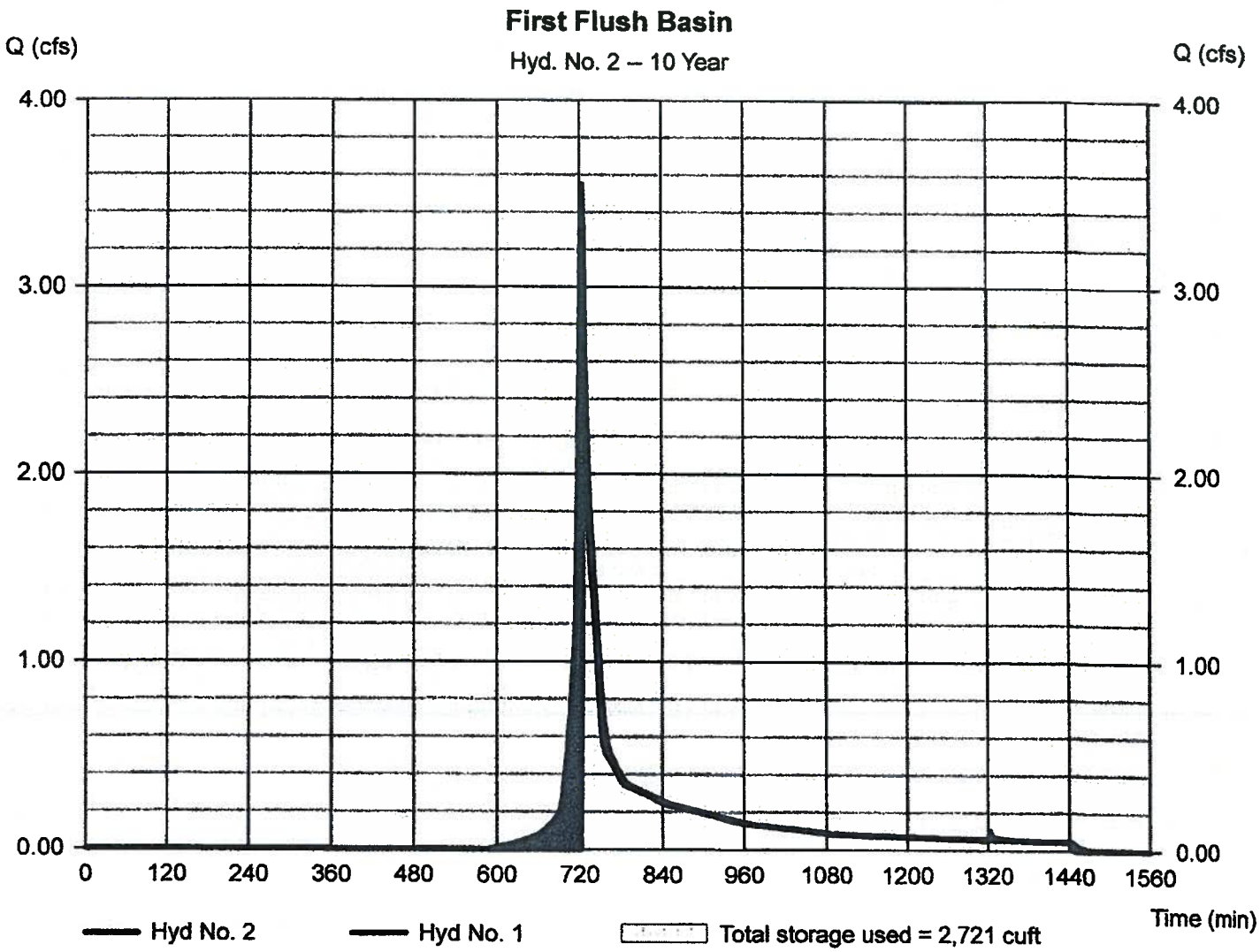
Hydraflow Hydrographs by Intelisolve v9.2 — Thursday, Jun 5, 2014

Hyd. No. 2

First Flush Basin

Hydrograph type	= Reservoir	Peak discharge	= 2.630 cfs
Storm frequency	= 10 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 8,660 cuft
Inflow hyd. No.	= 1 - P1	Max. Elevation	= 97.90 ft
Reservoir name	= Sub 1 First Flush Basin	Max. Storage	= 2,721 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 — Thursday, Jun 5, 2014

Pond No. 2 - Sub 1 First Flush Basin

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 95.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	95.00	422	0	0
1.00	96.00	751	579	579
2.00	97.00	1,136	937	1,515
2.50	97.50	1,350	621	2,136
3.00	98.00	1,578	731	2,867

Culvert / Orifice Structures

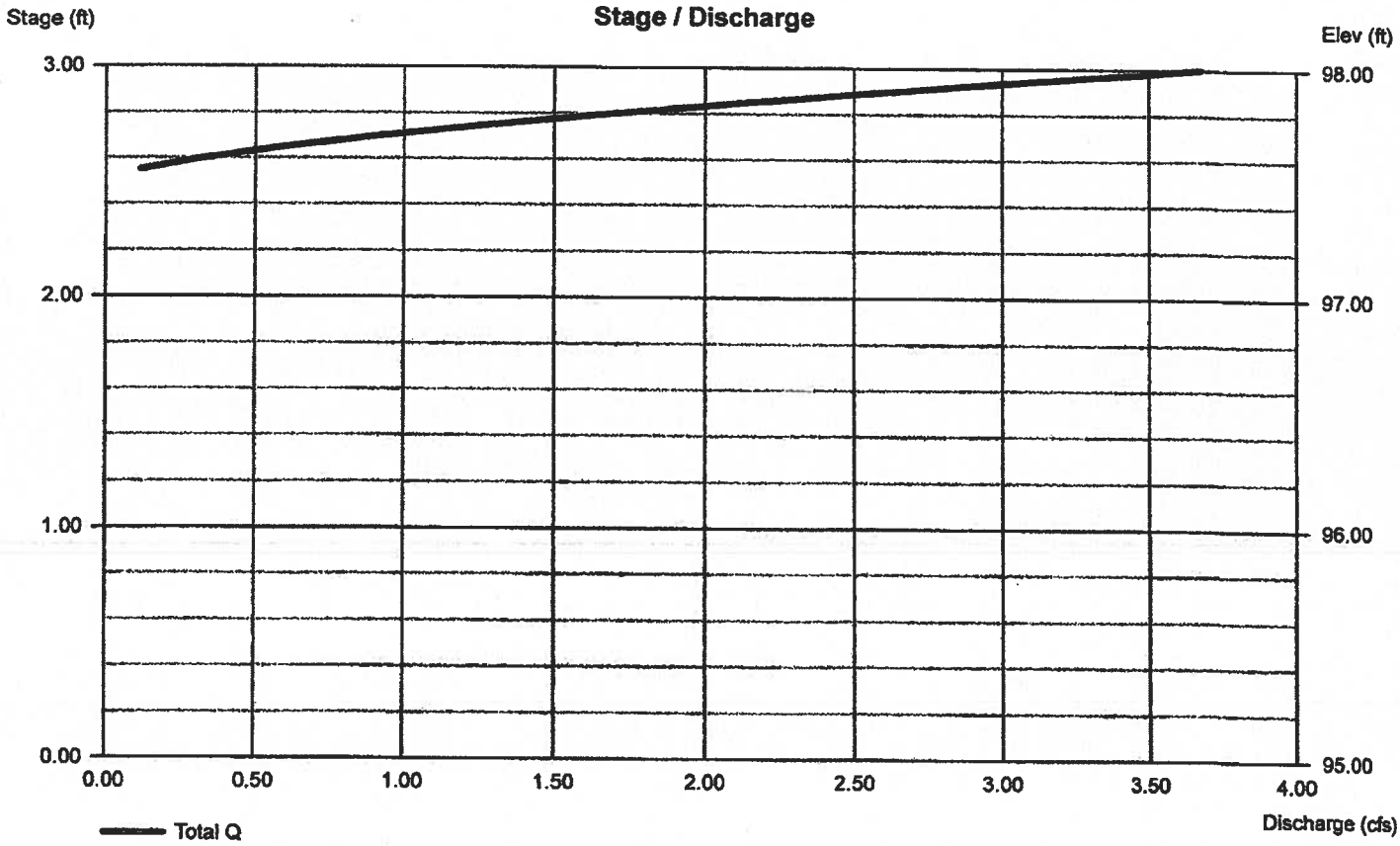
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 96.00	0.00	0.00	0.00
Length (ft)	= 38.00	0.00	0.00	0.00
Slope (%)	= 2.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 97.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	—	—	—
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

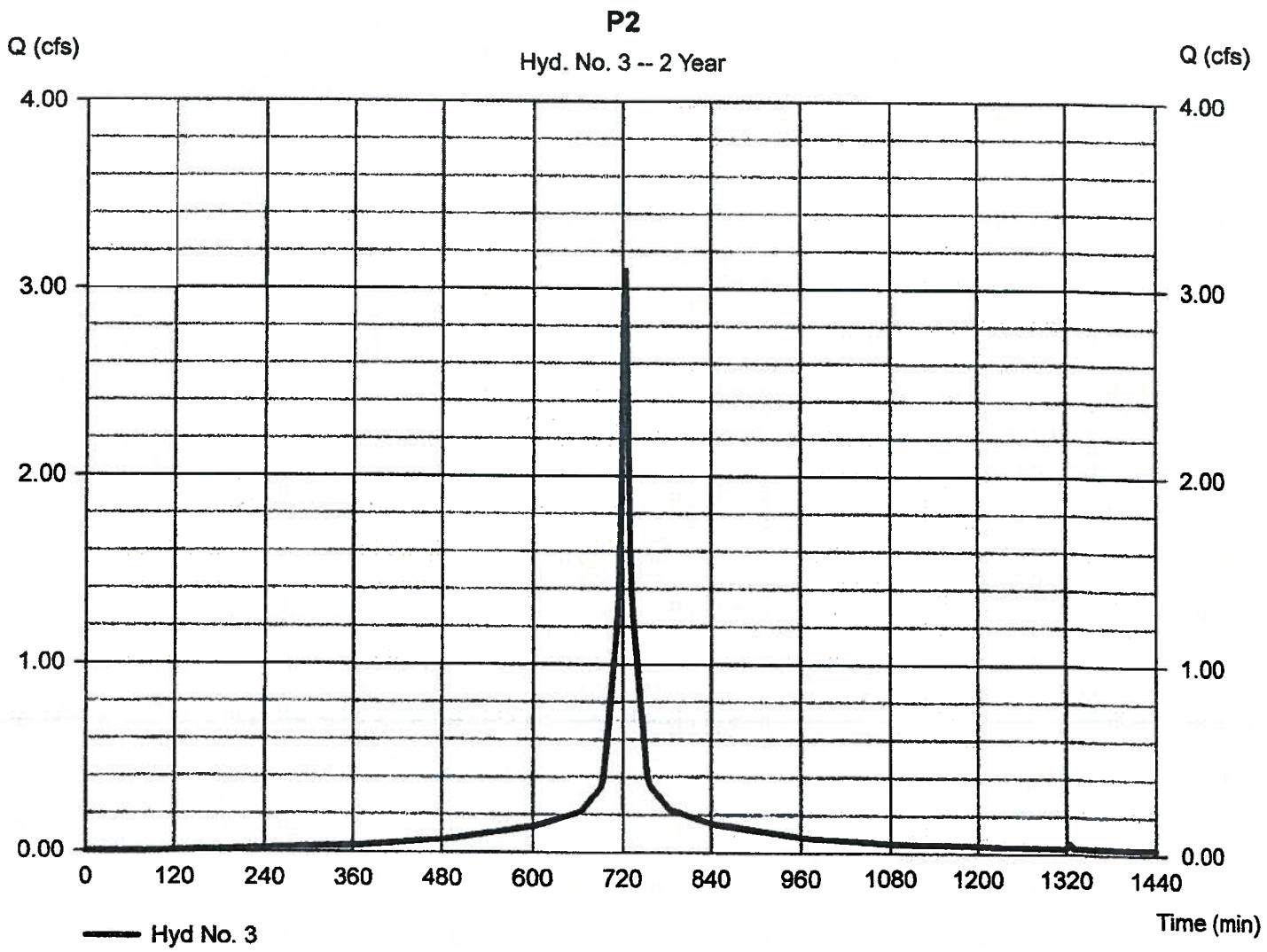
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 3

P2

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.098 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	10,402 cuft
Drainage area	=	1.070 ac	Curve number	=	97.9
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.10 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

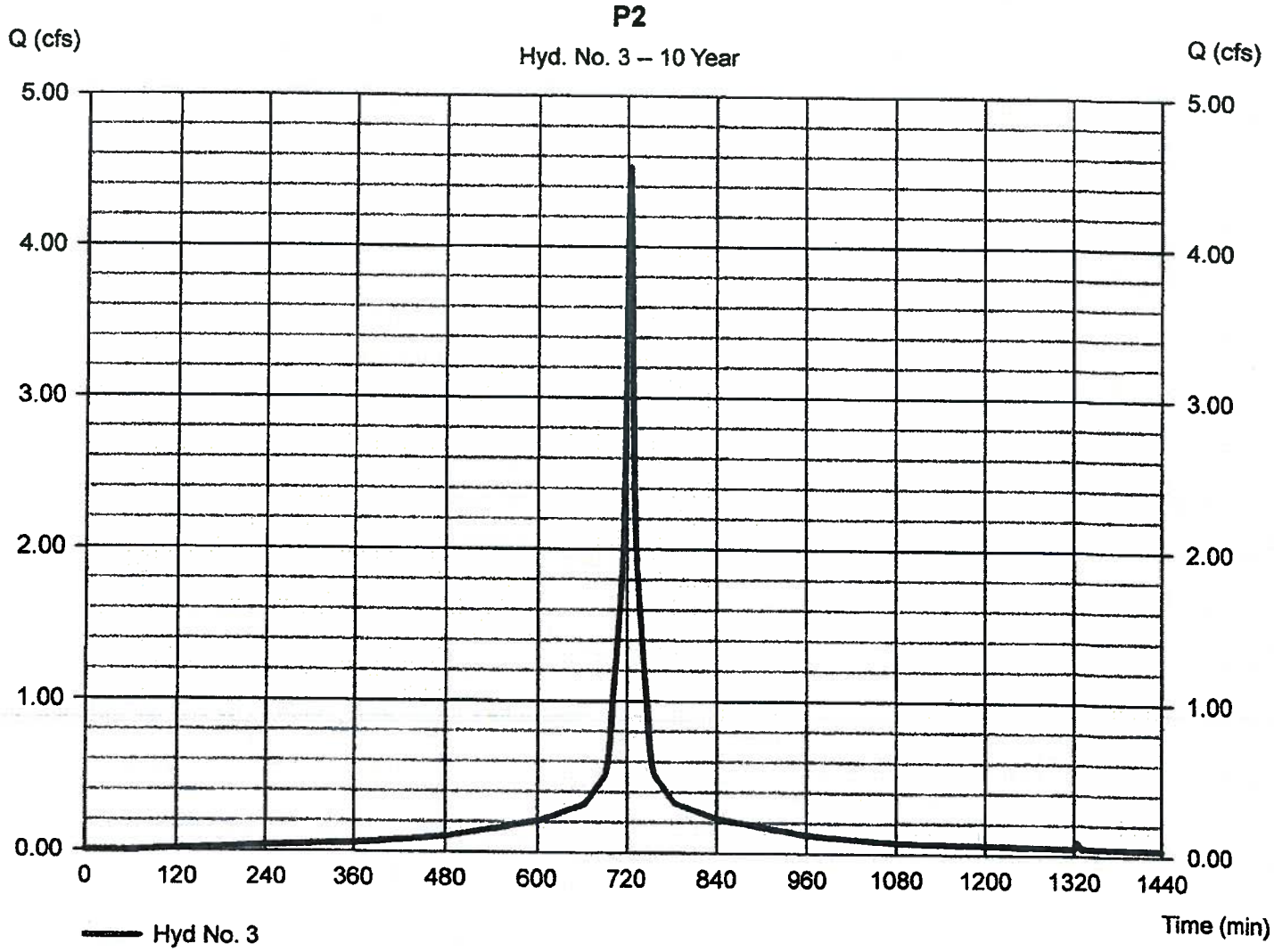
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 3

P2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.532 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 15,485 cuft
Drainage area	= 1.070 ac	Curve number	= 97.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

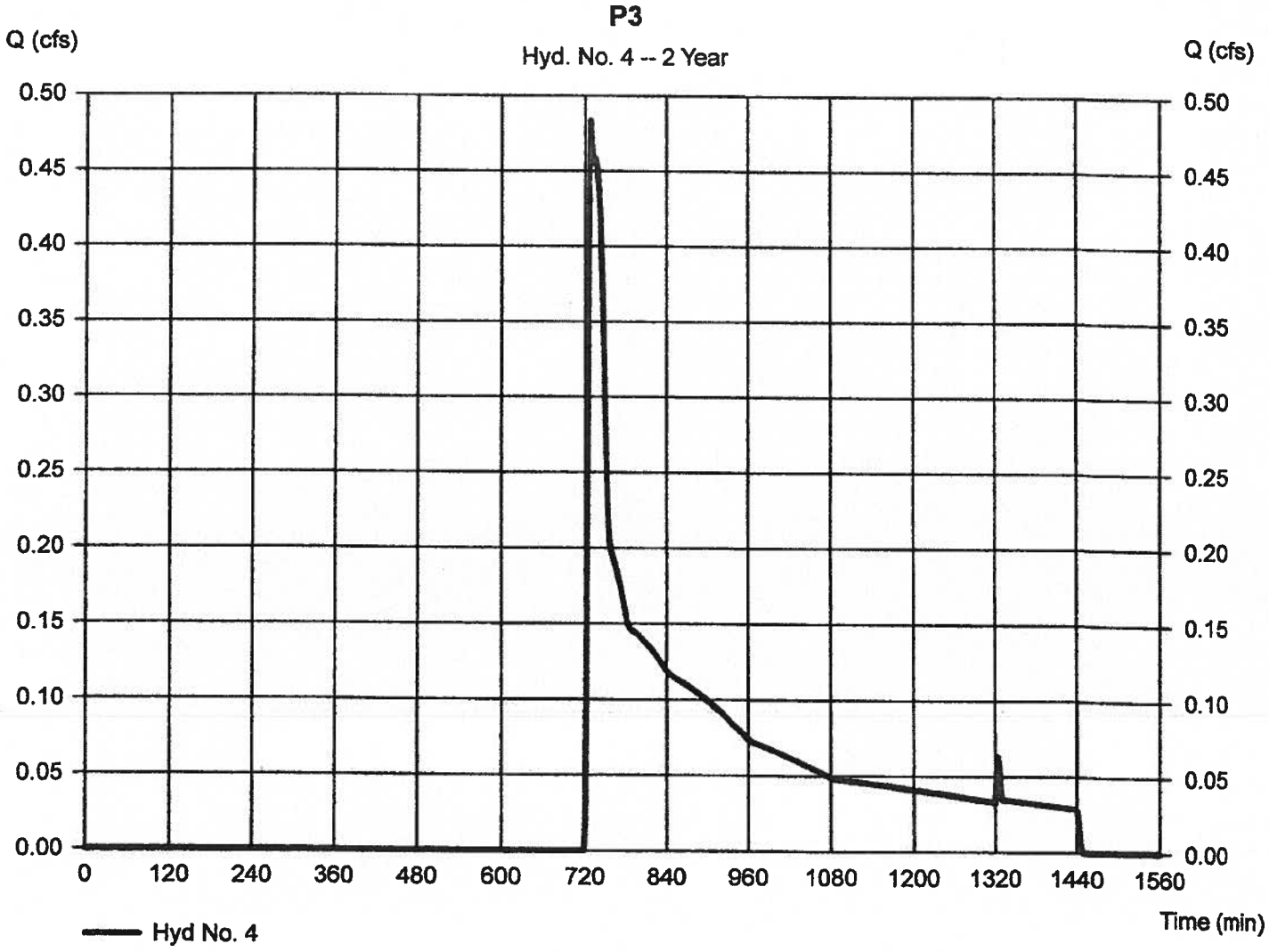
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 4

P3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.484 cfs
Storm frequency	= 2 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 3,510 cuft
Drainage area	= 3.430 ac	Curve number	= 57.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

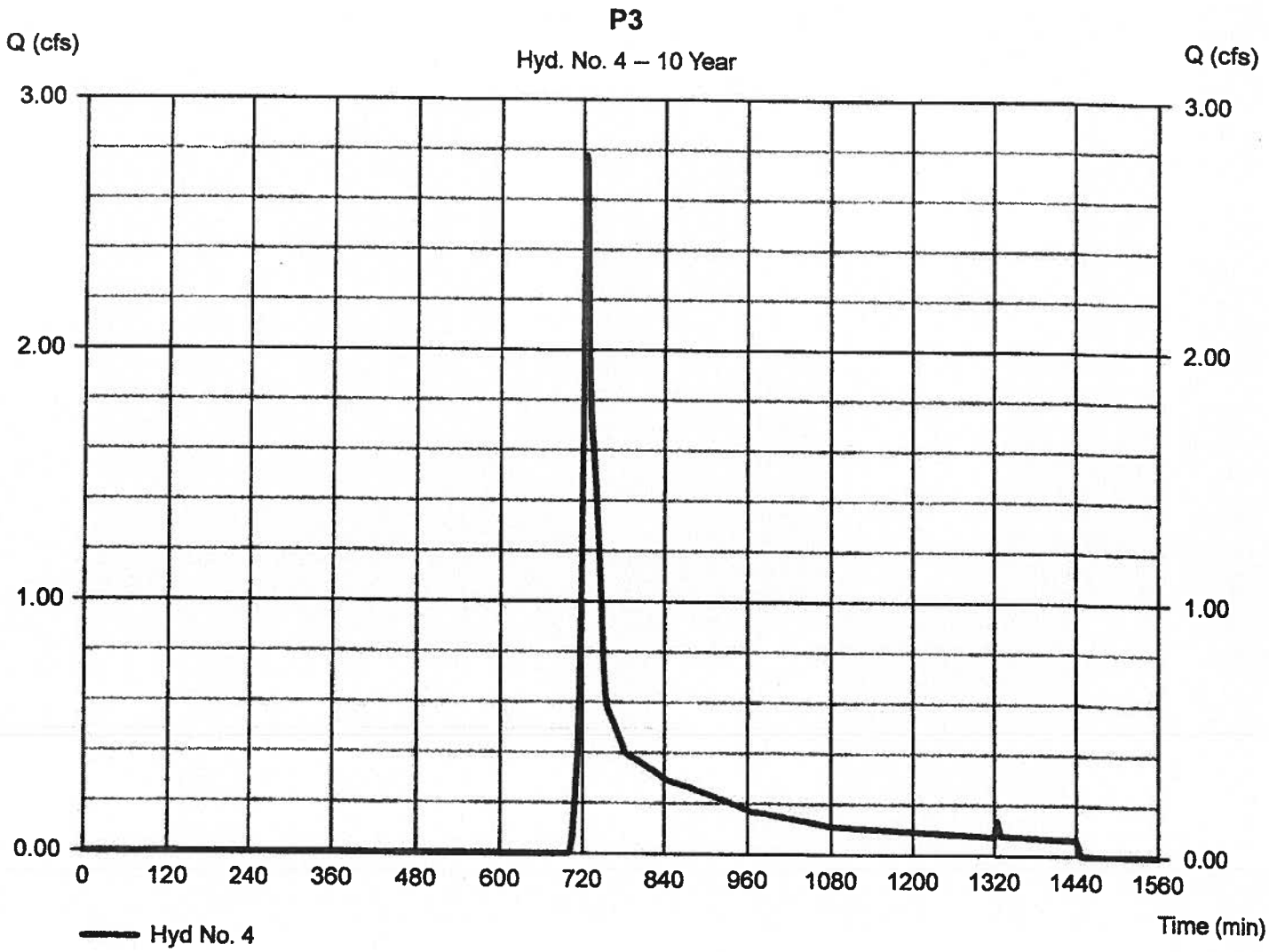
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 4

P3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.779 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 10,430 cuft
Drainage area	= 3.430 ac	Curve number	= 57.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

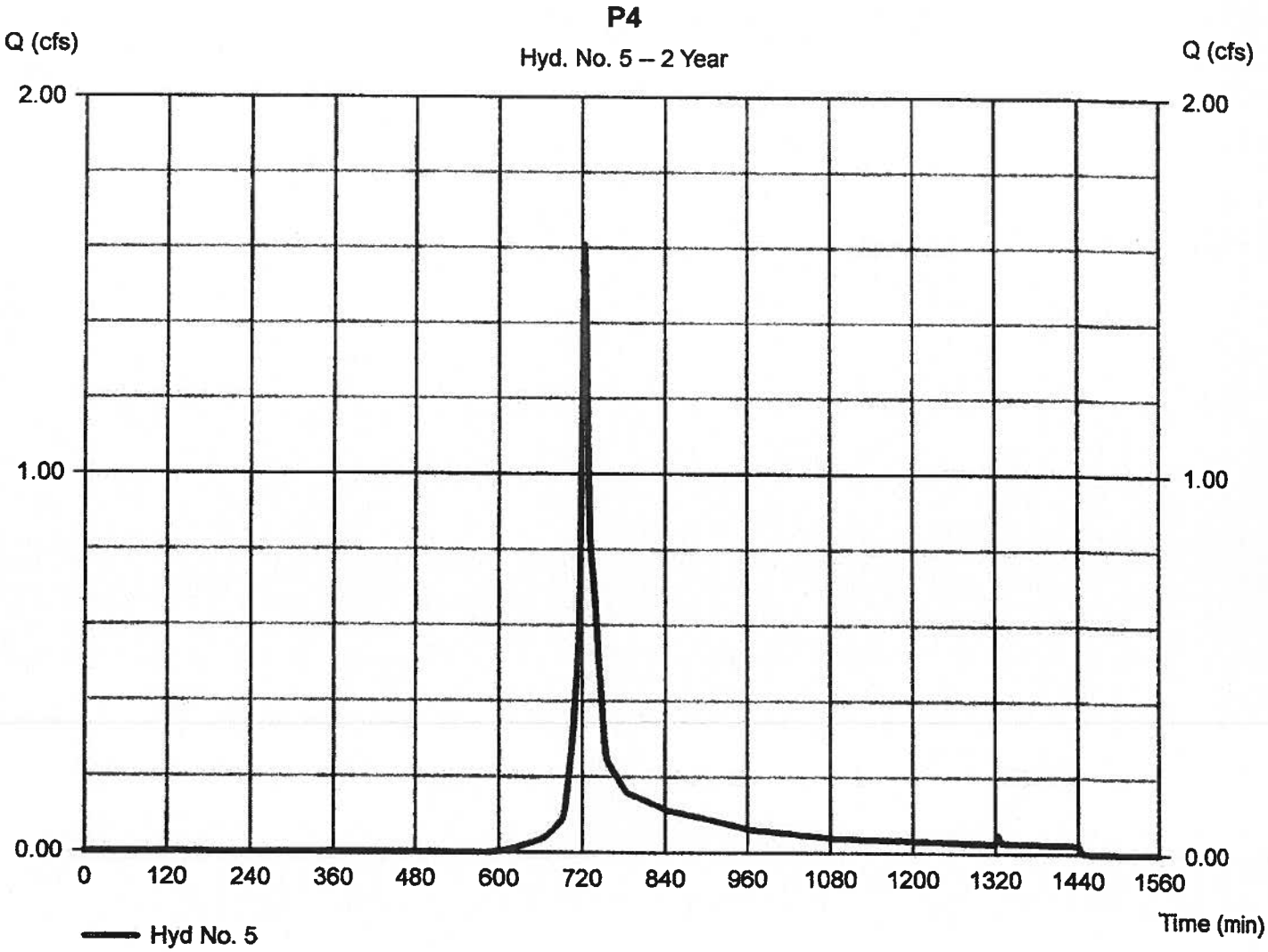
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 5

P4

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.609 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	4,902 cuft
Drainage area	=	1.170 ac	Curve number	=	78.5
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.10 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

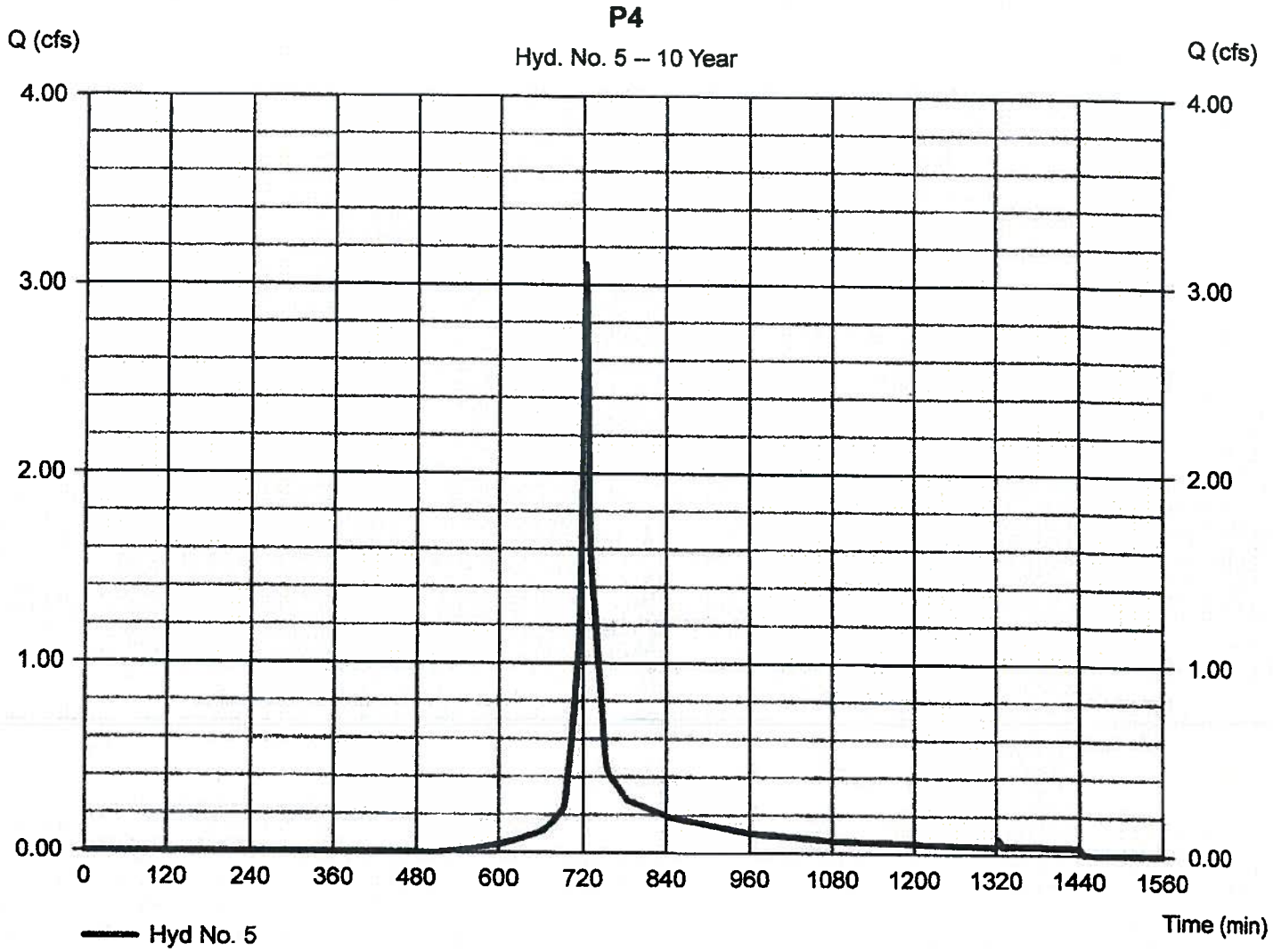
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 5

P4

Hydrograph type	= SCS Runoff	Peak discharge	= 3.110 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 9,295 cuft
Drainage area	= 1.170 ac	Curve number	= 78.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

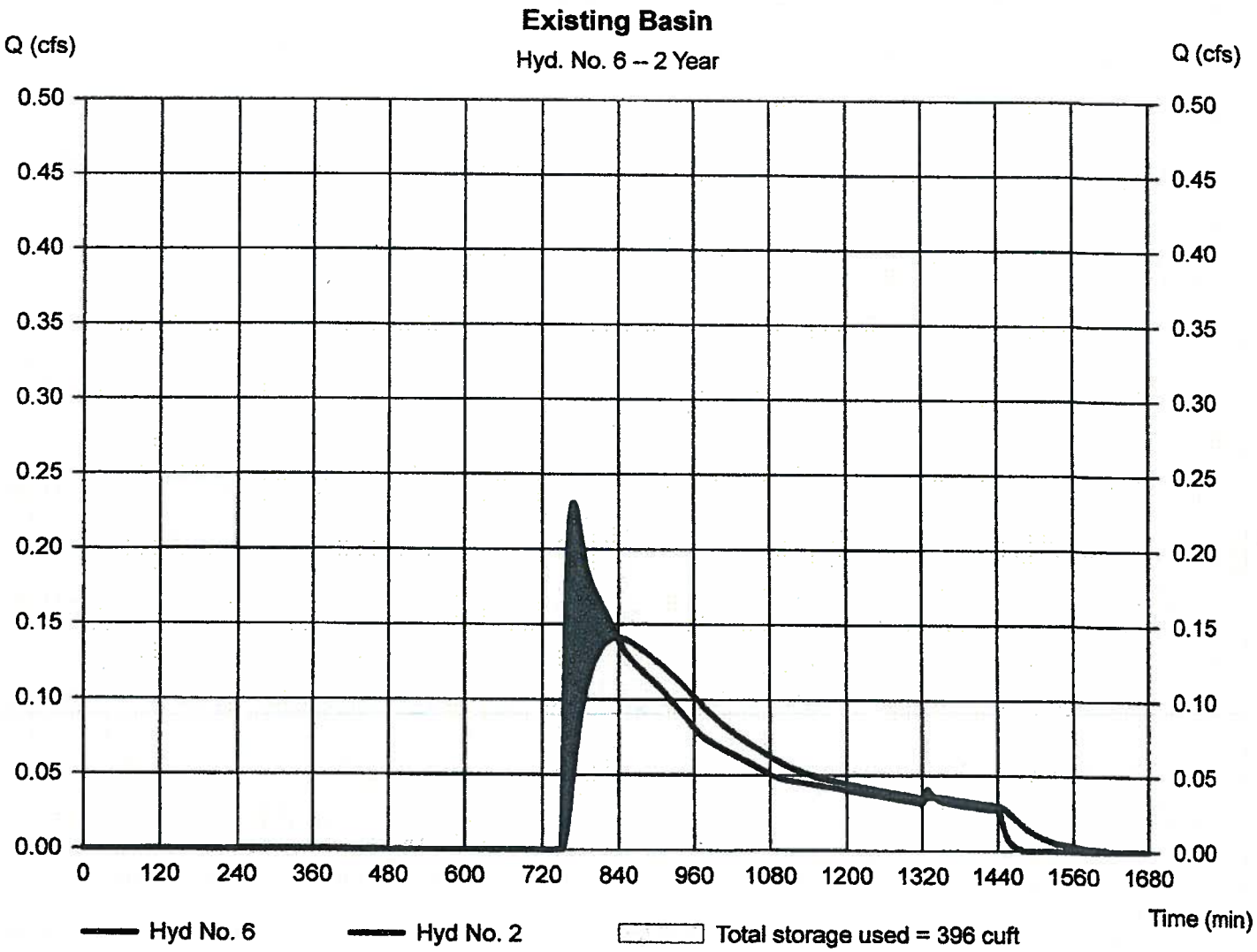
Thursday, Jun 5, 2014

Hyd. No. 6

Existing Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.141 cfs
Storm frequency	= 2 yrs	Time to peak	= 838 min
Time interval	= 2 min	Hyd. volume	= 3,001 cuft
Inflow hyd. No.	= 2 - First Flush Basin	Max. Elevation	= 95.19 ft
Reservoir name	= Existing Basin	Max. Storage	= 396 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

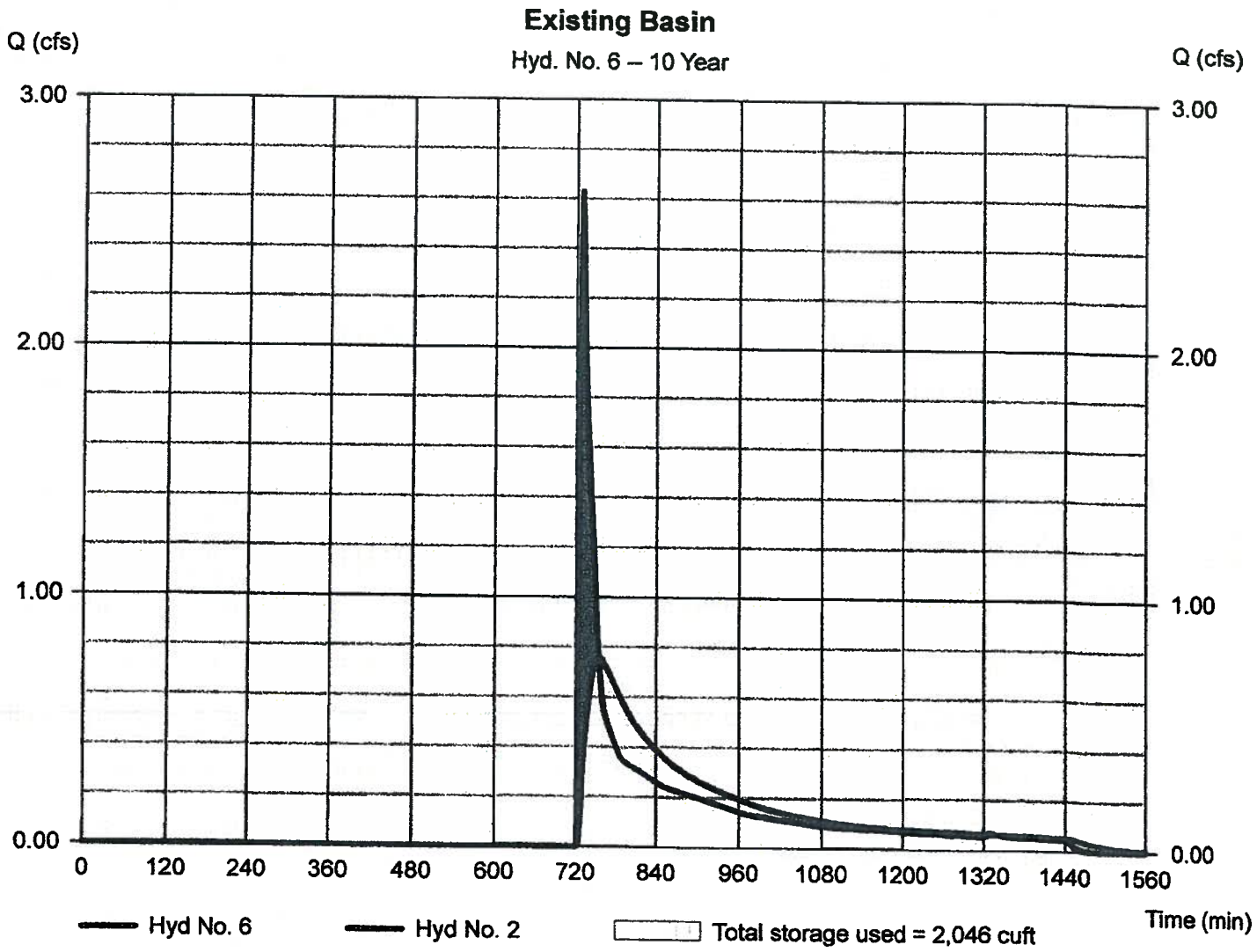
Thursday, Jun 5, 2014

Hyd. No. 6

Existing Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.762 cfs
Storm frequency	= 10 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 8,657 cuft
Inflow hyd. No.	= 2 - First Flush Basin	Max. Elevation	= 95.96 ft
Reservoir name	= Existing Basin	Max. Storage	= 2,046 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

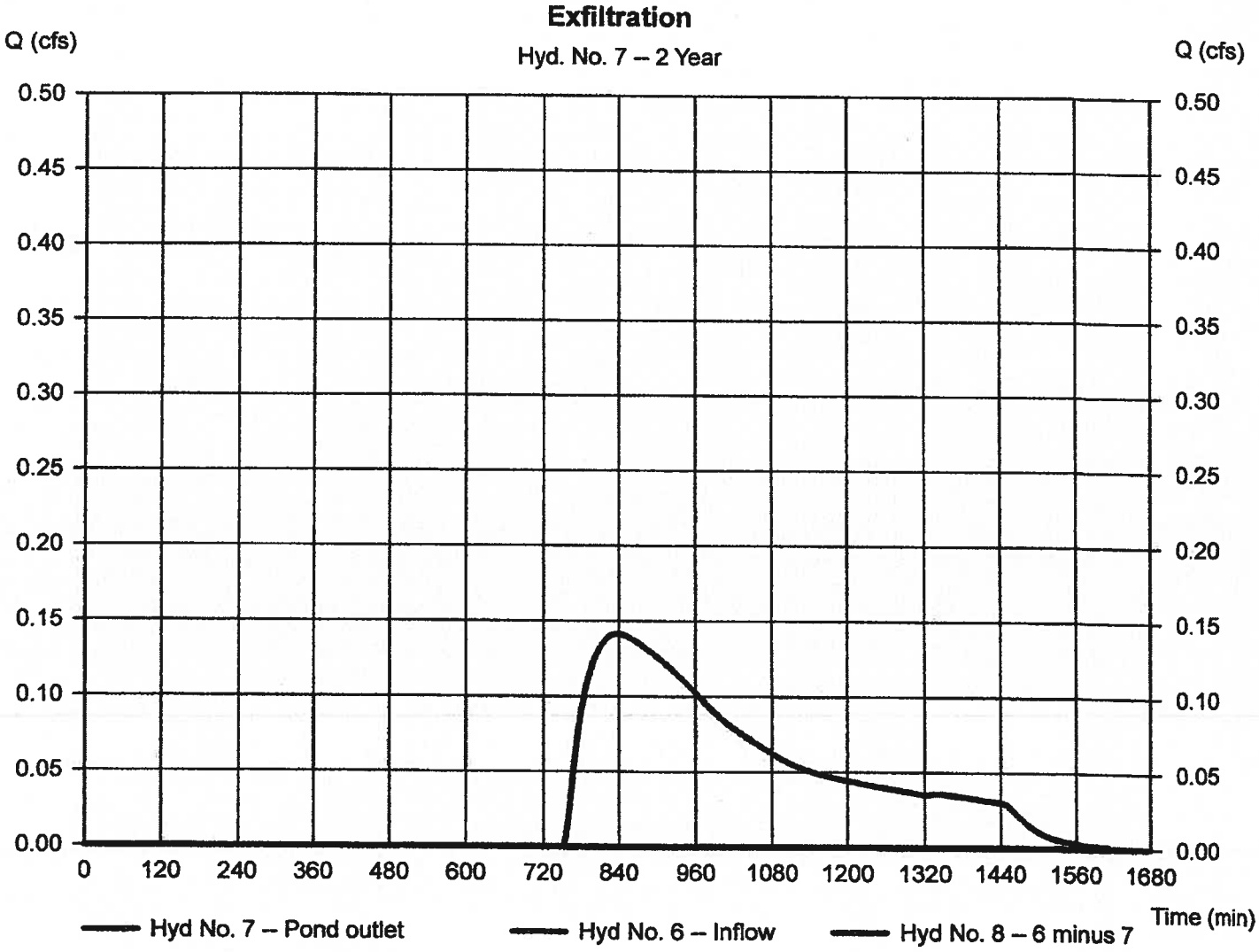
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 7

Exfiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.141 cfs
Storm frequency	= 2 yrs	Time to peak	= 838 min
Time interval	= 2 min	Hyd. volume	= 3,001 cuft
Inflow hydrograph	= 6 - Existing Basin	2nd diverted hyd.	= 8
Diversion method	= Pond - Existing Basin	Pond structure	= Exfiltration



Hydrograph Report

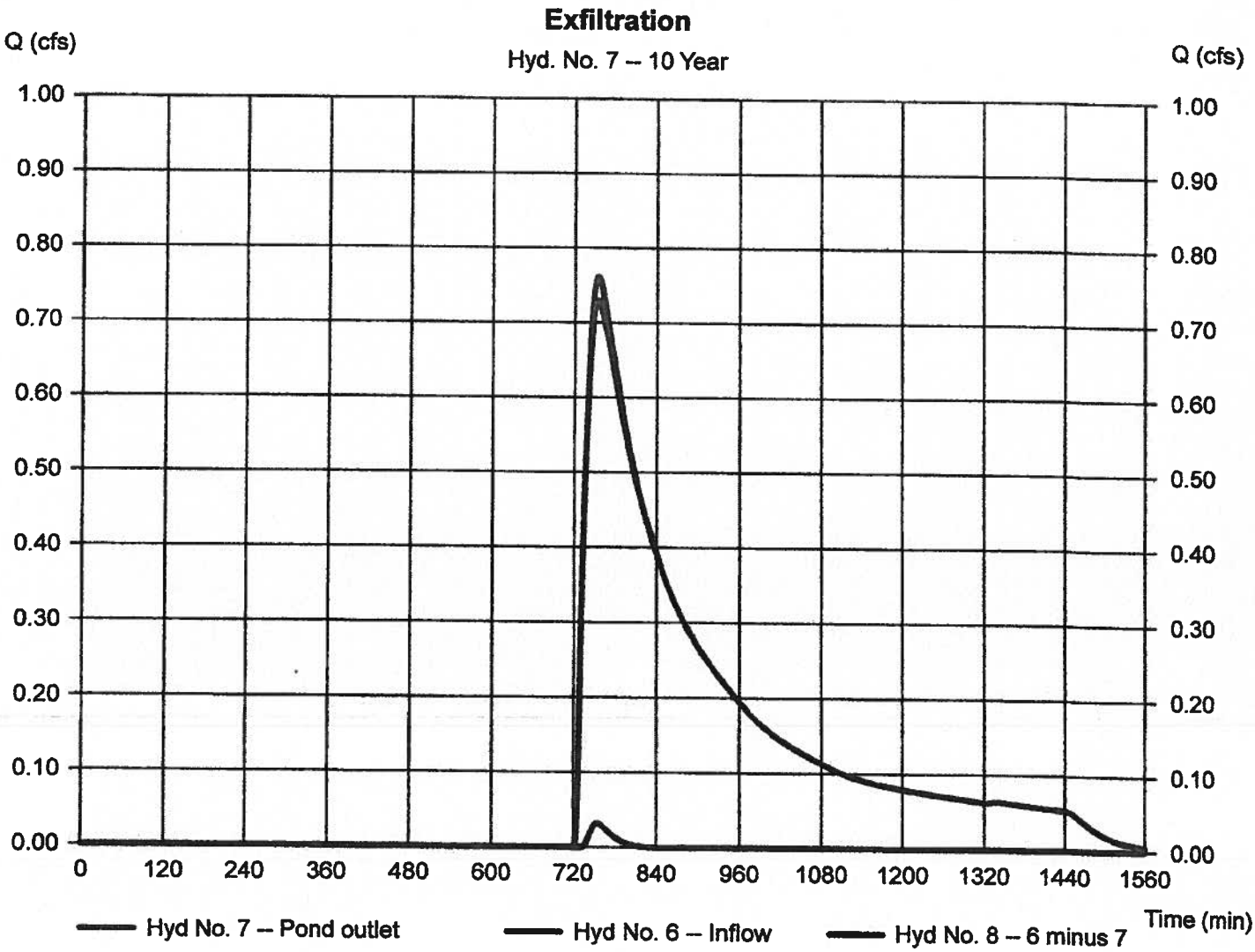
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 7

Exfiltration

Hydrograph type	=	Diversion1	Peak discharge	=	0.730 cfs
Storm frequency	=	10 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	8,588 cuft
Inflow hydrograph	=	6 - Existing Basin	2nd diverted hyd.	=	8
Diversion method	=	Pond - Existing Basin	Pond structure	=	Exfiltration



Hydrograph Report

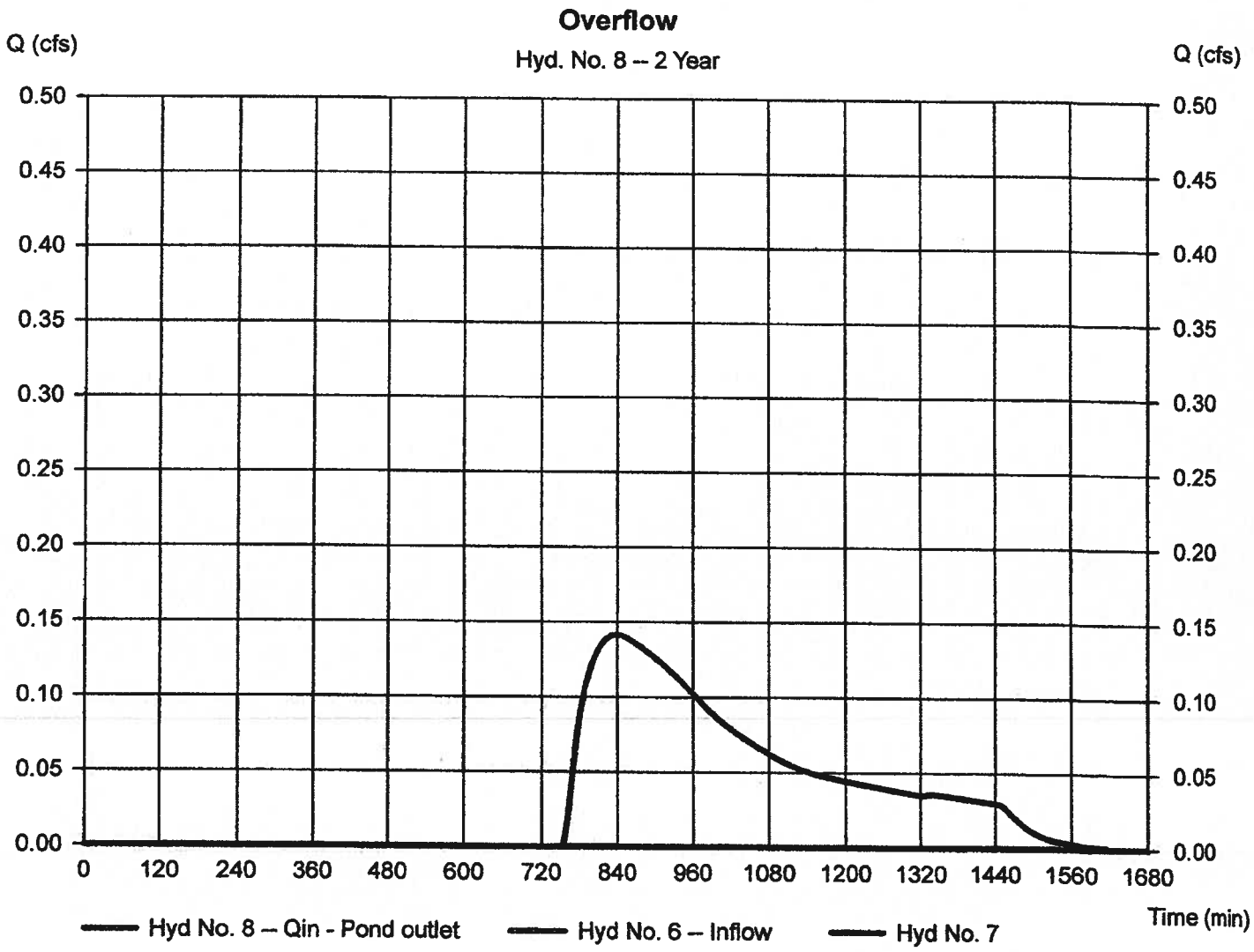
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 8

Overflow

Hydrograph type	=	Diversion2	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	830 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hydrograph	=	6 - Existing Basin	2nd diverted hyd.	=	7
Diversion method	=	Pond - Existing Basin	Pond structure	=	Exfiltration



Hydrograph Report

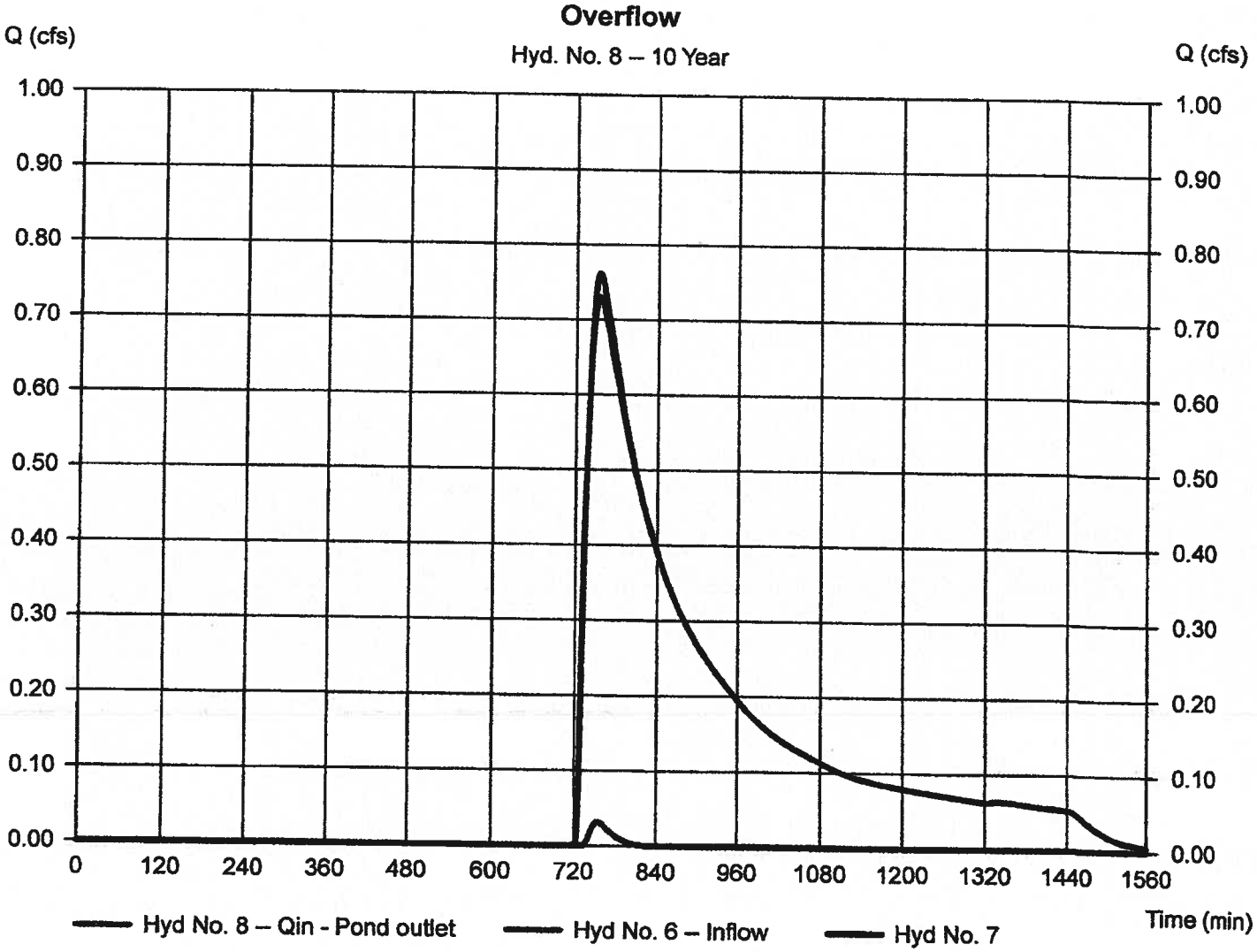
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 8

Overflow

Hydrograph type	=	Diversion2	Peak discharge	=	0.032 cfs
Storm frequency	=	10 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	69 cuft
Inflow hydrograph	=	6 - Existing Basin	2nd diverted hyd.	=	7
Diversion method	=	Pond - Existing Basin	Pond structure	=	Exfiltration



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Pond No. 1 - Existing Basin

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 95.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	95.00	728	0	0
1.00	96.00	3,990	2,140	2,140
2.00	97.00	4,847	4,411	6,552
3.00	98.00	8,291	6,492	13,044

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 95.00	0.00	0.00	0.00
Length (ft)	= 68.00	0.00	0.00	0.00
Slope (%)	= 0.44	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

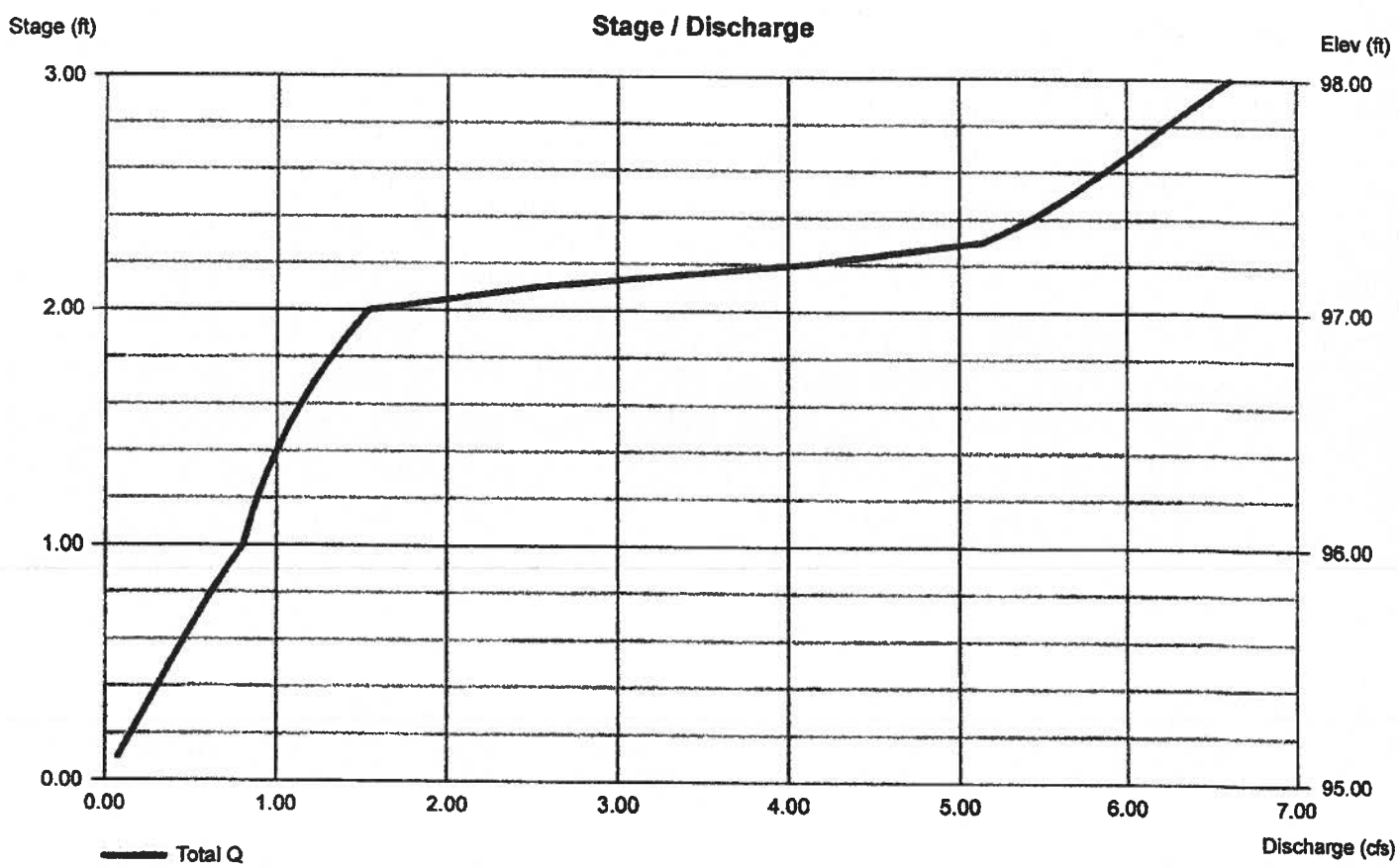
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 97.00	95.50	0.00	0.00
Weir Coeff.	= 3.33	0.22	3.33	3.33
Weir Type	= Riser	10 degV	—	—
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 8.270 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



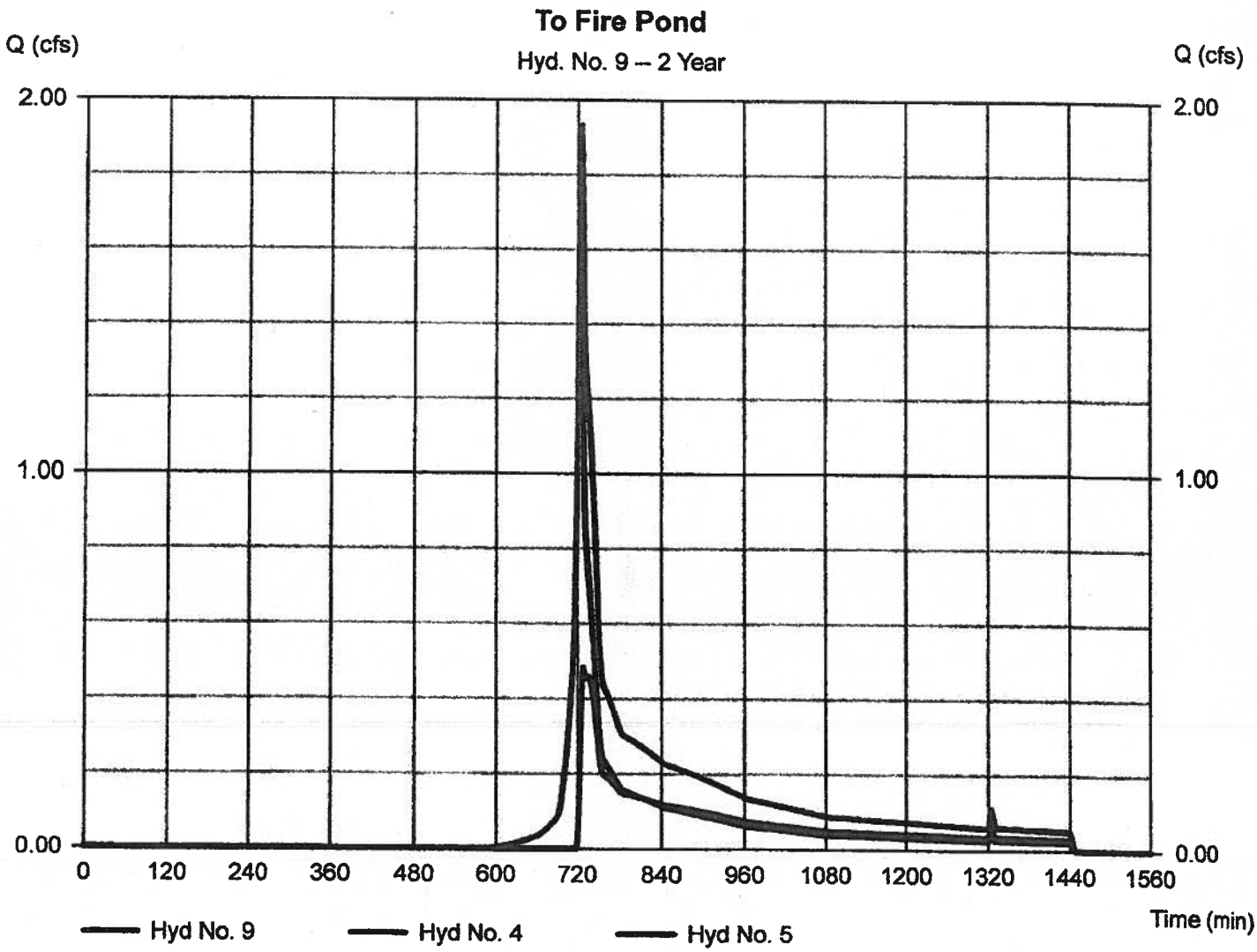
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Thursday, Jun 5, 2014

Hyd. No. 9

To Fire Pond

Hydrograph type	= Combine	Peak discharge	= 1.934 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 8,412 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 4.600 ac



Hydrograph Report

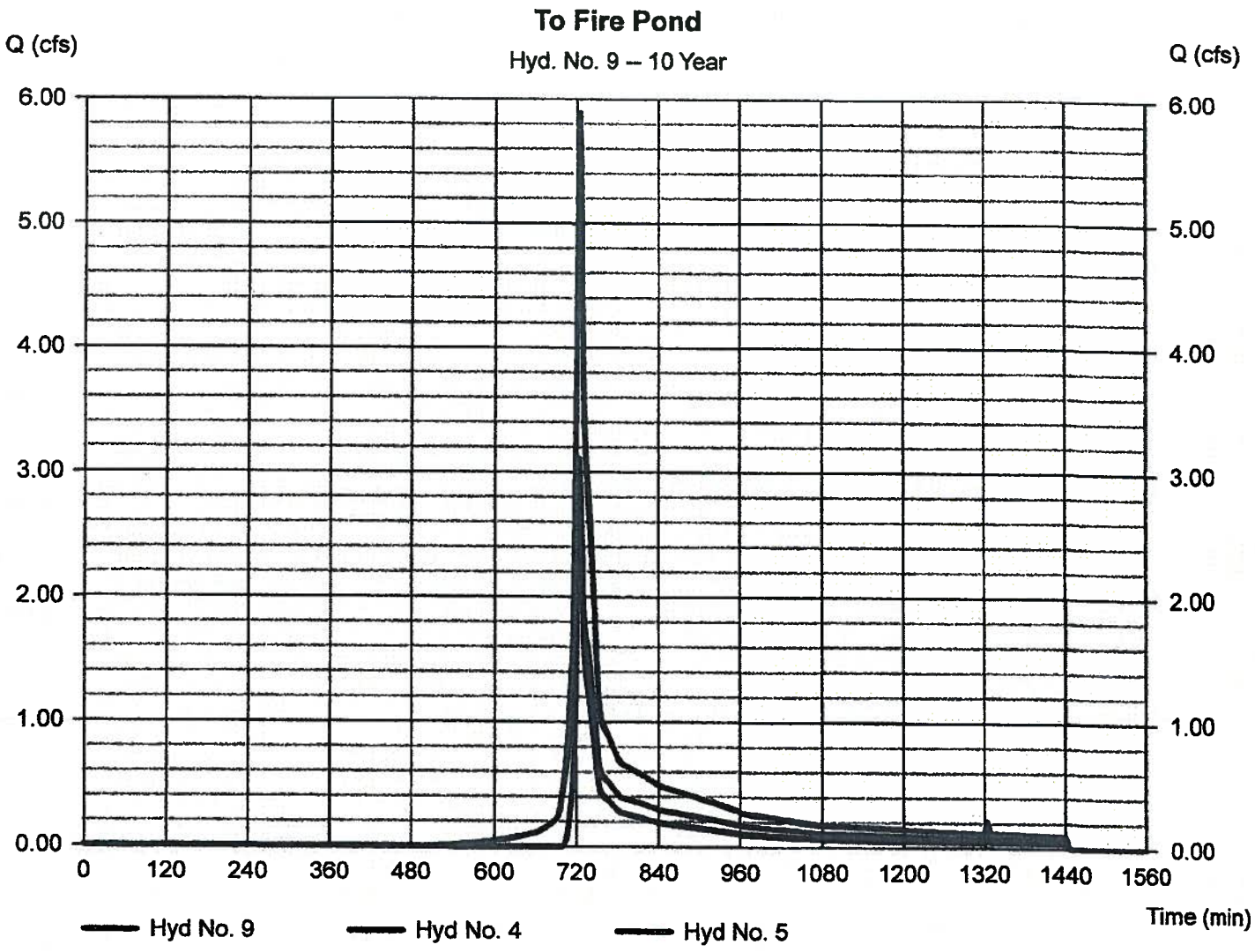
Hydraflow Hydrographs by Intelisolve v9.2

Thursday, Jun 5, 2014

Hyd. No. 9

To Fire Pond

Hydrograph type	= Combine	Peak discharge	= 5.889 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 19,725 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 4.600 ac



First Flush Volume Calculation

STAMSKI AND McNARY, INC.
1000 Main Street
ACTON, MASSACHUSETTS 01720
TEL (978) 263-8585
FAX (978) 263-9883

JOB Acton Beerhouse
SHEET NO. ____ OF ____
CALCULATED BY WJH DATE ____
CHECKED BY ____ DATE ____
SCALE ____

FIRST FLUSH CALCULATIONS

SUBCATCHMENT 1

IMPERVIOUS AREA = 23,210 SF

BASIN VOLUME REQUIRED = $\frac{1}{12}$ × 23,210 SF

V_{REQ} = 1,934 CF

DRAWDOWN CALCULATION:

MUST DRAIN WITHIN 72 HOURS

BOTTOM AREA = 422 SF
V = 1,934 CF

$$T = \frac{V}{K \times \text{BOT. AREA}}$$

$$72 = \frac{1{,}934 \text{ CF}}{K \times 422 \text{ SF}}$$

3.0384 K HRS/FT = 1,934 CF

K = 0.06365 FT/HR

$\boxed{K = 0.7638 \text{ IN/HR MIN PERMEABILITY}}$

Pipe Sizing Calculations

DESIGN STORM: 10 YEAR
DATE: 06/05/14
DONE BY: WJH
FILE: 72B-RATIONAL METHOD.wb3

STORM SEWER DESIGN

(PVC)"n"= 0.010
(Cast Iron)"n"= 0.011
(ADS)"n"= 0.012

PROJECT: SM-72B
LOCATION: ACTON, MA

FROM	TO	LENGTH (FT)	TRIBUTARY AREA INCR. (ACRES)	TRIBUTARY AREA TOTAL (ACRES)	TIME OF FLOW TO UPPER END (MIN)	TIME OF FLOW TIME IN SECTION (MIN)	RUNOFF COEFF. "C"	RAINFALL INTENSITY (IN/HR)	"Q" TOTAL RUNOFF (CFS)	SLOPE of PIPE (FT/FT)	DIAM (IN)	MANN. "n"	CAPACITY FULL (CFS)	VELOCITY FULL (FPS)	DESIGN FLOW VELOCITY (FPS)	DESIGN FLOW VELOCITY HEAD (FT)	DESIGN FLOW DEPTH OF FLOW (FT)	DESIGN FLOW TOTAL ENERGY HEAD (FT)	MANHOLE INVERT DROP (FT)	FALL IN PIPE (FT)	DRAIN INV. ELEVATION UPPER END	DRAIN INV. ELEVATION LOWER END
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.06	[illegible]	[illegible]	2.29	0.020	12	0.012	5.45	6.94	6.64	0.68	0.45	1.14		0.46	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.04	[illegible]	[illegible]	2.29	0.021	[illegible]	0.012	5.61	7.14	6.78	0.71	0.45	1.16		0.36	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.10	[illegible]	[illegible]	2.29	0.020	[illegible]	0.012	5.41	6.89	6.61	0.68	0.45	1.13		0.75	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.26	[illegible]	[illegible]	1.62	0.005	[illegible]	[illegible]	2.72	3.46	3.62	0.20	0.56	0.76		1.36	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.02	[illegible]	[illegible]	1.45	0.010	[illegible]	[illegible]	3.85	4.91	4.56	0.32	0.43	0.75		0.06	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.70	[illegible]	[illegible]	3.07	0.005	[illegible]	[illegible]	4.94	4.03	4.25	0.28	0.71	0.99		0.89	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.50	[illegible]	[illegible]	3.07	0.005	[illegible]	[illegible]	4.94	4.03	4.25	0.28	0.71	0.99		0.64	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.06	[illegible]	[illegible]	3.74	0.010	[illegible]	[illegible]	6.99	5.70	5.79	0.52	0.65	1.17		0.21	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.06	[illegible]	[illegible]	3.74	0.010	[illegible]	[illegible]	6.99	5.70	5.79	0.52	0.65	1.17		0.21	[illegible]	[illegible]

Closed Drainage System

SM-72B

Project: 848 Main Street By WJH Date 06/05/14

Location: Acton, MA Checked _____ Date _____

Rational Method

Q = peak flow rate, (cfs)
C = runoff coefficient,
C = 0.90 impervious
C = 0.20 landscaped / grass
C = 0.15 woods

i = rainfall intensity inches/hour
A = area (ac)

CB-1

Surface Cover	A (ac)	C	Product A x C
impervious	0.559	0.90	0.503
lands/grass	0.034	0.20	0.007
woods	0.000	0.15	0.000
sum =	0.593	sum =	0.510

C = 0.86 = total product / total area

CB-2

Surface Cover	A (ac)	C	Product A x C
impervious	0.364	0.90	0.328
lands/grass	0.163	0.20	0.033
woods	0.000	0.15	0.000
sum =	0.527	sum =	0.360

C = 0.68 = total product / total area

CB-3

Surface Cover	A (ac)	C	Product A x C
impervious	0.313	0.90	0.282
lands/grass	0.207	0.20	0.041
woods	0.000	0.15	0.000
sum =	0.520	sum =	0.323

C = 0.62 = total product / total area

DMH-2

Surface Cover	A (ac)	C	Product A x C
CB-2	0.527	0.68	0.360
CB-3	0.520	0.62	0.323
sum =	1.047	sum =	0.683

C = 0.65 = total product / total area

CB-4

Surface Cover	A (ac)	C	Product A x C
impervious	0.883	0.90	0.795
lands/grass	0.185	0.20	0.037
woods	0.000	0.15	0.000
sum =	1.067	sum =	0.832

C = 0.78 = total product / total area

Soil Evaluations

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Owner Name: TOM TRUDEAU

Street Address: 848 MAIN STREET

City: ALTON

State: MA

Map/Lot #

Zip Code: 01720

B. Site Information

1. (Check one) ☐ New Construction ☐ Upgrade ☑ Repair

2. Published Soil Survey Available? ☑ Yes ☐ No
   If yes: NE SOIL (Year Published) 1:25000 (Publication Scale) 626B (Soil Map Unit)
   Soil Name: MERRIMAC-URBAN LAND COMPLEX
   Soil Limitations

3. Surficial Geological Report Available? ☑ Yes ☐ No
   If yes: OLIVER (Year Published) 1:25000 (Publication Scale) Map Unit
   Geologic Material: SAND + GRAVEL
   Landform

4. Flood Rate Insurance Map
   Above the 500-year flood boundary? ☑ Yes ☐ No
   Within the 500-year flood boundary? ☐ Yes ☑ No
   Within the 100-year flood boundary? ☐ Yes ☑ No
   Within a velocity zone? ☐ Yes ☑ No

5. Wetland Area:
   National Wetland Inventory Map — Map Unit: — Name: —
   Wetlands Conservancy Program Map — Map Unit: — Name: —

6. Current Water Resource Conditions (USGS): 1/14 (Month/Year) Range: ☐ Above Normal ☐ Normal ☑ Below Normal

7. Other references reviewed:

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

848 MAIN
Site Address or Map/Lot Number

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 1/7/14 (Date) 8:00 (Time) 10° WINDY (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-1 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: COMMERCIAL USE (e.g. woodland, agricultural field, vacant lot, etc.) FEW Surface Stones 0-5 Slope (%)

   Vegetation _____ Landform _____ Position on landscape (attach sheet) _____

3. Distances from: Open Water Body — feet Drainage Way — feet Possible Wet Area >100 feet

   Property Line >60 feet Drinking Water Well — feet Other _____

4. Parent Material: Outwash Unsuitable Materials Present: Yes ☐ No ☑

   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☑

   If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —

   Estimated Depth to High Groundwater: 78 inches _____ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

848 MAIN
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-18	FILL	—	—	—	—	—	—	—	—	—	
18-120	C	10YR5/4	78"	LGCH LOW	2	SAND	2	—	SG	LOOSE	

Additional Notes STRATIFIED LAYERS

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

848 MAIN
Site Address or Map/Lot Number

C. On-Site Review (minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 1/7/14 (Date) 8:30 (Time) 10° WINDY (Weather)

1. Deep Observation Hole Logs

Deep Hole Number TP-2 Ground Elevation at Surface of Hole _____

Location (Identify on Plan) _____

2. Land Use: COMMERCIAL USE (e.g. woodland, agricultural field, vacant lot, etc.) FEW Surface Stones D-5 Slope (%)

Vegetation _____ Landform _____ Position on landscape (attach sheet) _____

3. Distances from: Open Water Body — feet Drainage Way — feet Possible Wet Area >100 feet

Property Line >10 feet Drinking Water Well — feet Other _____

4. Parent Material: OUTWASH Unsuitable Materials Present: Yes ☐ No ☑

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☑

If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —

Estimated Depth to High Groundwater: 78 inches _____ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

848 MAIN
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-18	FILL	—	—	—	—	—	—	—	—	—	—
18-78	C	10YR5/4	—	—	—	SAND	2	—	SG	LOOSE	

Additional Notes STRATIFIED LAYERS

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A. Site Information

Owner Name: TOM TAUDEAU

Street Address or Lot #: 848 MAIN ST

City/Town: ACTON | State: MA | Zip Code: 01720

Contact Person (if different from Owner): | Telephone Number:

B. Test Results

	Date / Time	Date / Time
	1/7/14 8:45	
Observation Hole #	PT-A	
Depth of Perc	44"	
Start Pre-Soak	8:45	
End Pre-Soak	24 GAL	
Time at 12"	COULD NOT SATURATE	
Time at 9"		
Time at 6"		
Time (9"-6")		
Rate (Min./Inch)	<2 MPI	
	Test Passed: ☑ Test Failed: ☐	Test Passed: ☐ Test Failed: ☐

Test Performed By: STANSKE AND MURRAY INC - BILL HALL

Witnessed By: ACTON BOH - EVAN CARLONI

Comments:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

☐ Depth observed standing water in observation hole	A. SEE inches	B. SEE inches
☐ Depth weeping from side of observation hole	A. SOIL inches	B. SOIL inches
☐ Depth to soil redoximorphic features (mottles)	A. LOGS inches	B. LOGS inches
☐ Groundwater adjustment (USGS methodology)	A. inches	B. inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____

Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☑ Yes ☐ No

b. If yes, at what depth was it observed? Upper boundary: SEE SOIL LOGS inches Lower boundary: SEE SOIL LOGS inches

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Bill Hall — Signature of Soil Evaluator — Date: 1/7/14

WILLIAM HALL SE 13592 — Typed or Printed Name of Soil Evaluator / License # — Date of Soil Evaluator Exam: 7/2012

EVAN CHALONE — Name of Board of Health Witness — Board of Health: ALTON

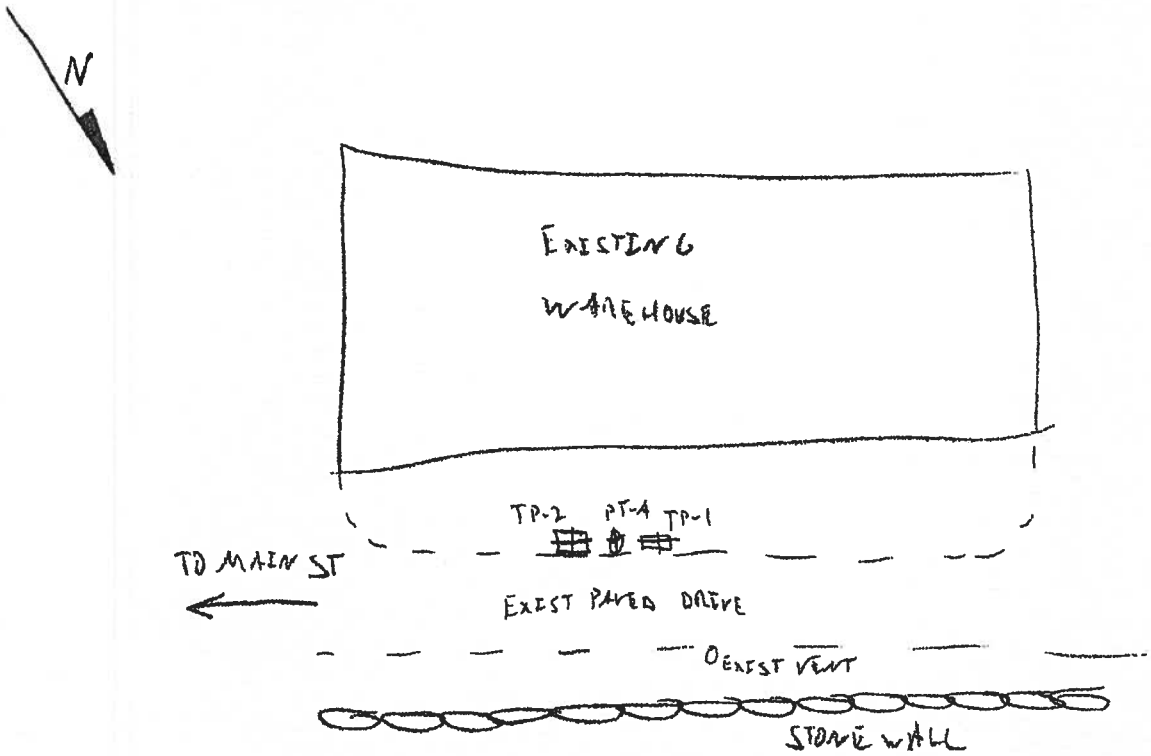
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:



SOIL TEST INFORMATION

Client : Dick Hoover	Inspector : Edw	STAMSKI AND MCNARY INC	
Lot No. : Lot C	Weather : Ocast. Drizzle	229 CENTRAL ST.	
Street : Main St	Date : 9/9/86	ACTON, MA. 01720	
Town : Acton			
Party : CV Petterson			
Job No. : SM-72			

Any fill encountered during excavation of surface w/clean fill accord. to Title 5 Sect. 15.17 conditions to be removed

Monitor Pipe

Depth in Feet	Test Pit 1 Elev.=	Test Pit 2 Elev.=	Test Pit 3 Elev.=	Test Pit Elev.=
1	old Leaching Bed	Fill		
2			Fill	
3				
4	Coarse			
5	Sand			
6	Gravel			
7			Coarse Sand, Gravel	
8				
9				
10	(No Water)	(No Water)	(No Water)	

	Perc. 1	Perc.	Perc.	Perc.
Start Presoak	2:47			
Start Test	2:51			
1st 3" Drop	2:52			
2nd 3" Drop				
Elapsed Time				
Rate : Min./Inch	< 2min/in.			

Structure size :
No. of Bedrooms :
Preferred System Location :
Water Supply :
Garbage Disposal :
Washing Machine Pit :
Sketch :

NOTE: Indicate Watertable

Field Sheet of Sheets

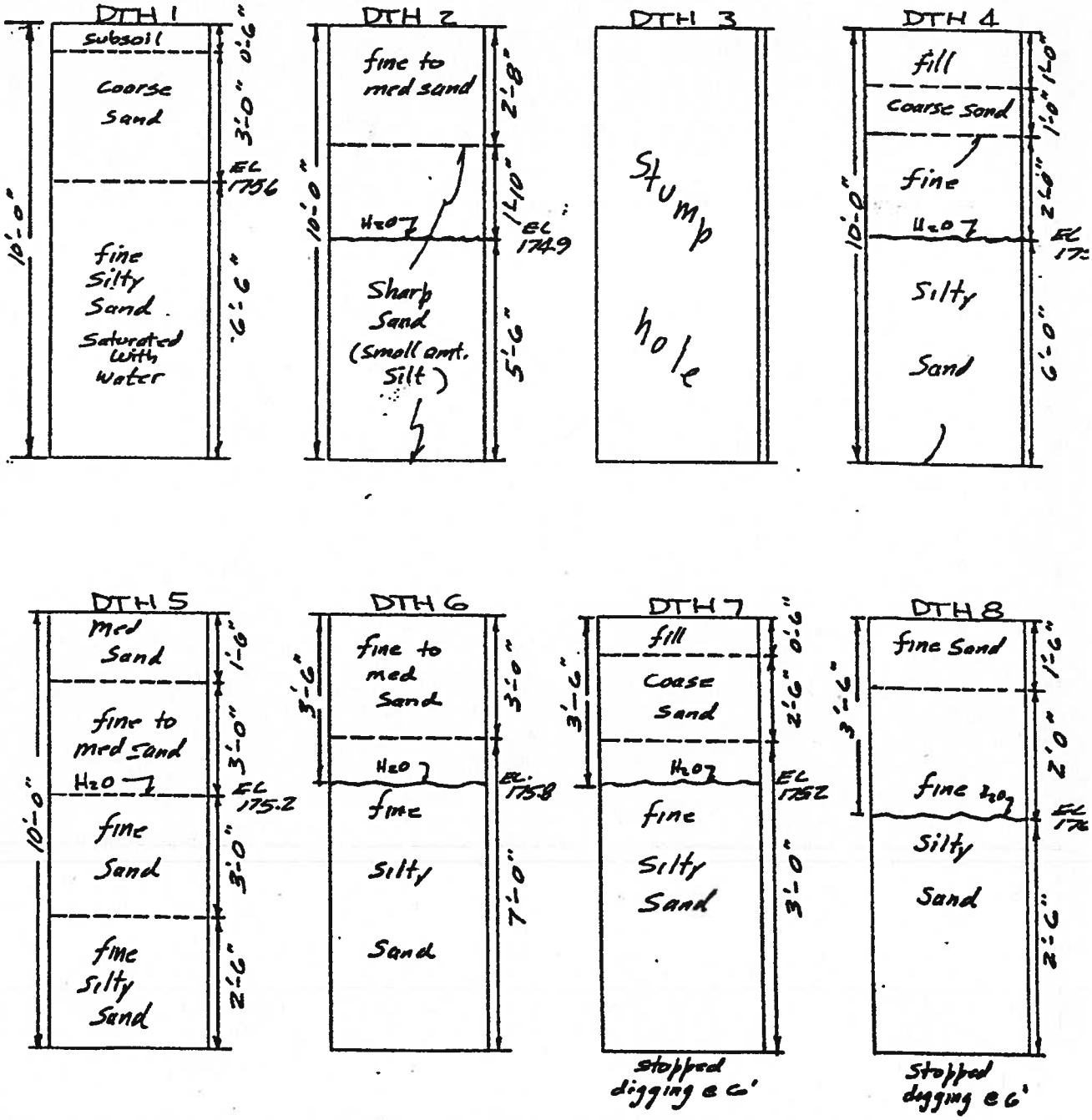
ACTON SURVEY & ENGINEERING, INC.

JOHN E. DUNPHY, JR., President

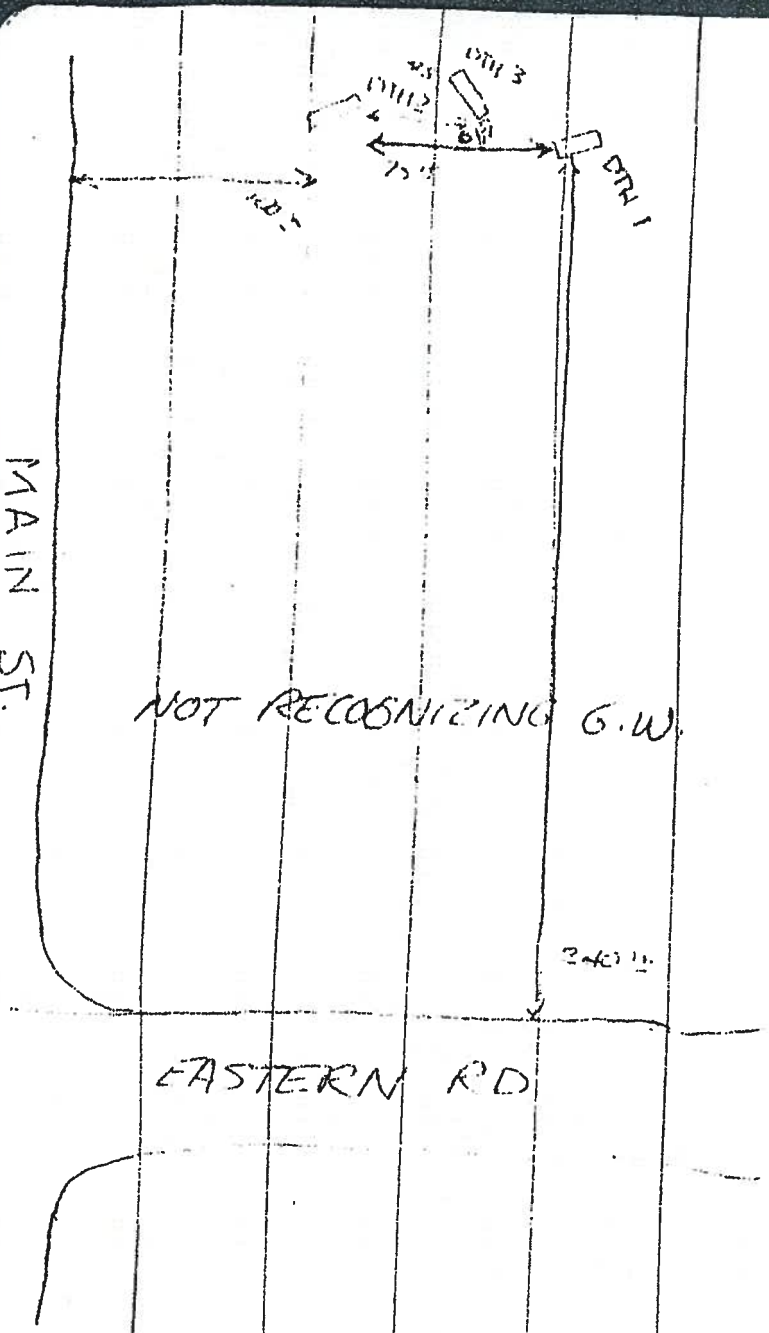
P.O. BOX 666 • ACTON, MASS. 01720

DEEP TEST HOLE SECTIONS
LOT X EASTERN RD.
ACTON, MASS

DEC. 2, 1982



Office: 277 Central Street, West Acton (617) 263-3666



LOT 6 EASTERN RD (54) 2/12/85

OWNER ACTON FOREIGN AUTO. INC. EW

ENGINEER ACTON SURVEY RUSS SCOTT LEN

DTH 1

246'± FROM EASTERN RD.

1' TOP & SUBSOIL

9' SAND & GRAVEL

H_2O @ 5'

DTH 2

75'± FROM DTH 1

1' TOP & SUBSOIL

9' SAND & GRAVEL

H_2O @ 9'

DTH 3

45'± FROM DTH 2

1' TOP & SUBSOIL

9' SAND & GRAVEL

H_2O @

PT 1 66'

5'± FROM DTH 3

START SOAK 12:44 AM

24 GALLONS IN AT

12:47 AM

HOLE DRY @ 12:44 AM

L2MPI

Stormwater Operation and Maintenance Manual

Schedule for Inspection and Maintenance:

Deep Sump and Hooded Catch Basins and Manholes:
The deep sump for the catch basins shall be inspected and cleaned annually. The catch basins shall have a four foot deep sump and the water level is maintained by the discharged pipe at four feet. The discharge pipe is hidden from view by a hooded outlet. The depth of the sediment in a basin shall not exceed a depth of 18 inches as determined by probing with a stick. If the stick hits the bottom within 30 inches of the water level, more than 18 inches of sediment has accumulated and must be removed. Licensed persons should remove and dispose of the contents of the sump in accordance with applicable regulations.

Contech CDS and VortSentry Units:
See attached Contech Stormwater Solutions Operation, Design, Performance and Maintenance Guides.

Drainage Basins:
In each of the first three years after construction, two inspections are required in both the growing and non-growing seasons. After successful establishment of all required vegetation and surfaces withstand erosion, inspection and maintenance should continue on a yearly basis. The following observations and corrective measures should be made during each inspection:

-Side slopes of the channel shall be inspected for erosion. All eroded areas shall receive 6" of loam and be reseeded per original design plan. Areas of continued erosion shall be stabilized with 3" minus riprap.

-Remove all sediment from the channel once the sediment reaches 10% of channel volume or 3-inch depth.

Infiltration Trench
Inspect the infiltration trench after the first several rainfall events, after all major storms, and on regularly scheduled dates every six months. If the top of the trench is grassed, it must be mowed on a seasonal basis. Grass height must be no more than four inches. Routinely remove debris from the top of the trench.

Emergency Contacts:
In the event of a hazardous materials spill on the site the following parties shall be contacted:
Fire Department: ph: 978-264-9645

Records:
The Owner shall maintain an inspection log of all elements of the storm water management plan. The owner shall maintain a maintenance log documenting the inspection and maintenance of the drainage structures under his control. A copy of the erosion control and storm water maintenance plan and inspection logs shall be kept onsite at all times.

Responsibility Party:
The Owner shall be responsible for all inspection and maintenance of the items included in the Manual.

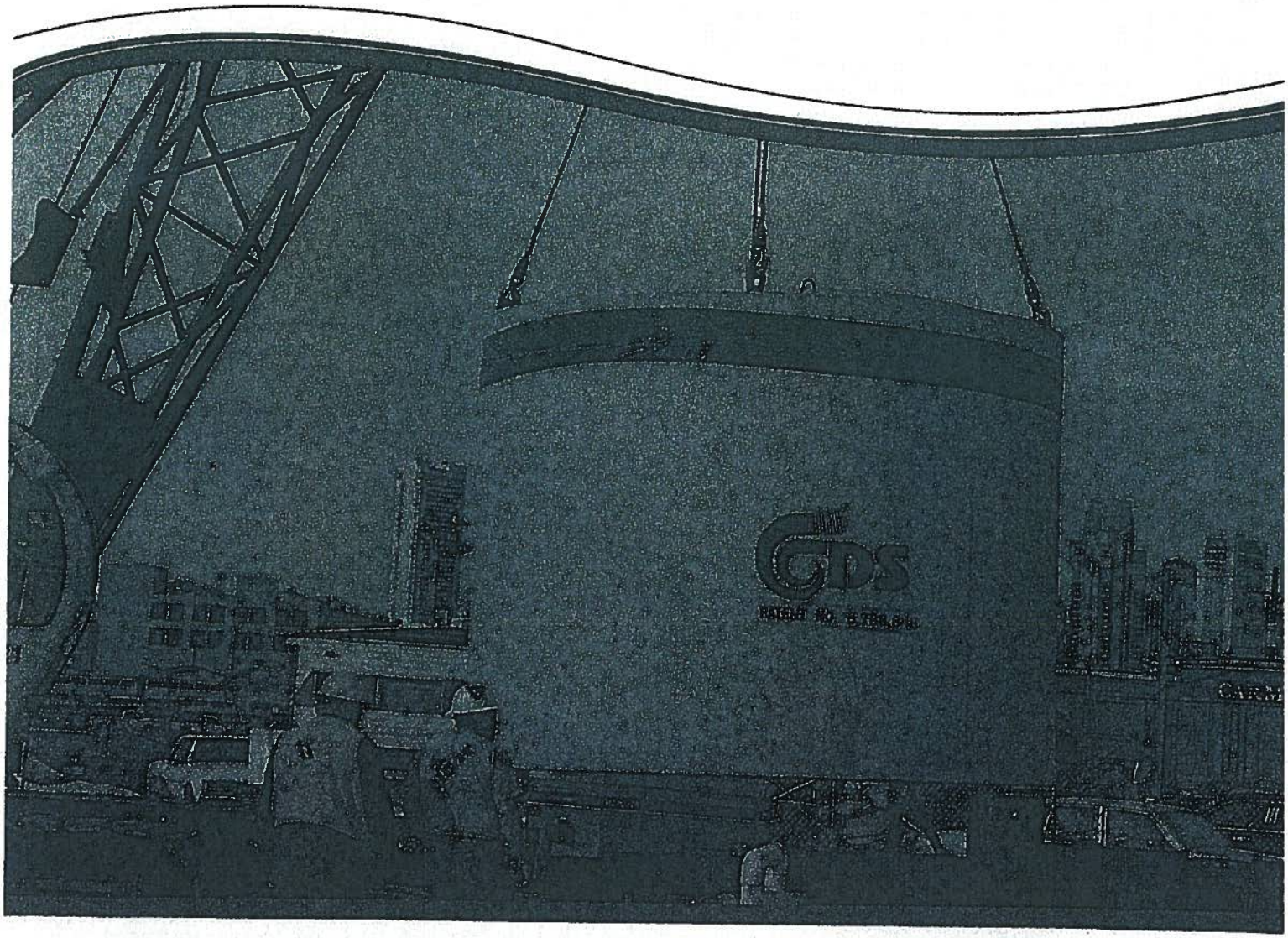
Name: _____

Signature: _____

Date: _____

CONTECH®
ENGINEERED SOLUTIONS

CDS Guide
Operation, Design, Performance and Maintenance



CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

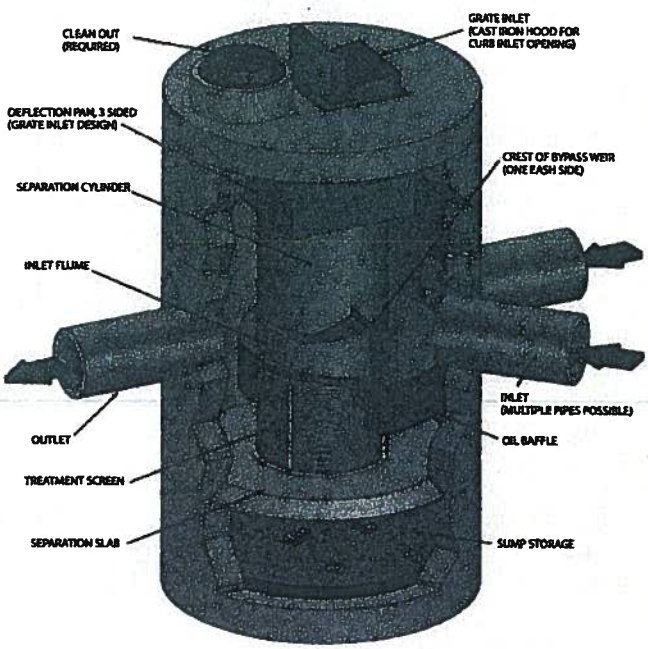
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are

determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

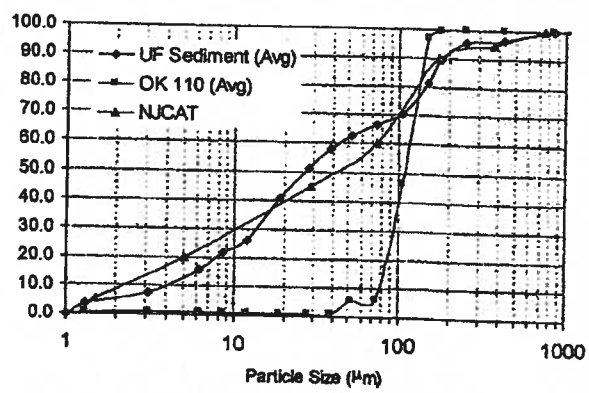


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect

to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

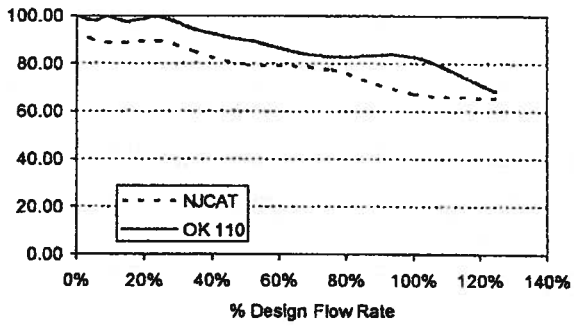


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

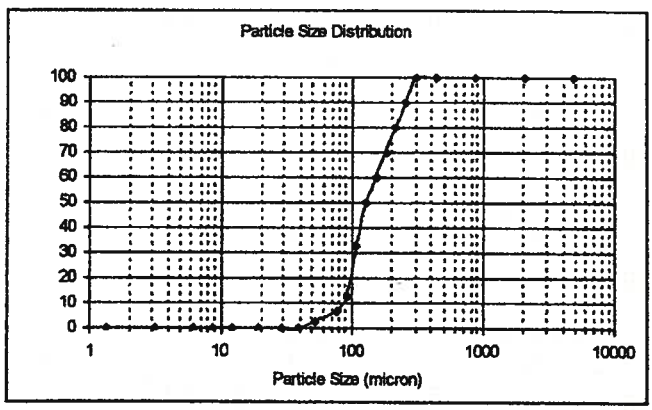


Figure 3. WASDOE PSD

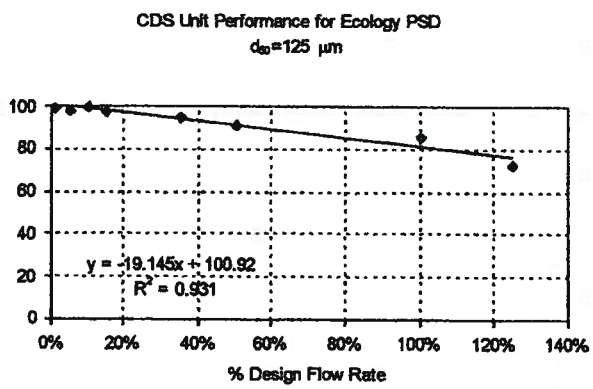


Figure 4. Modeled performance for WASDOE PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified

during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

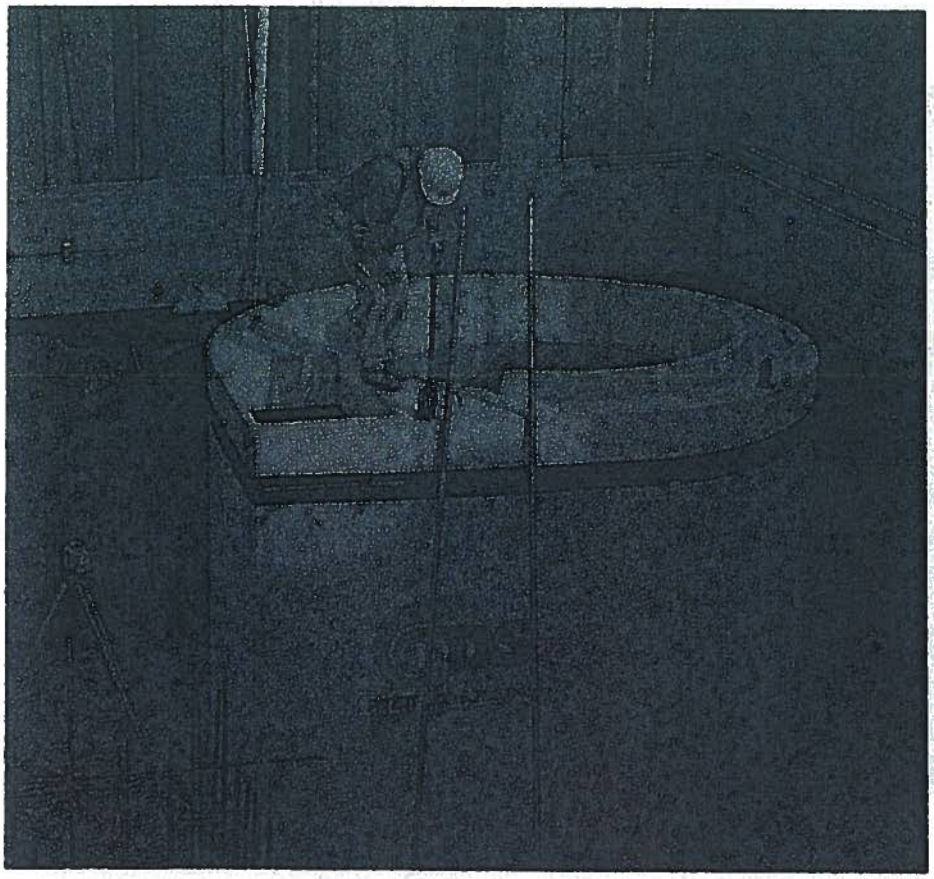
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be cleaned to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.3	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

Support

- Drawings and specifications are available at www.ContechES.com/urbangreen.
- Site-specific design support is available from our engineers.

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The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

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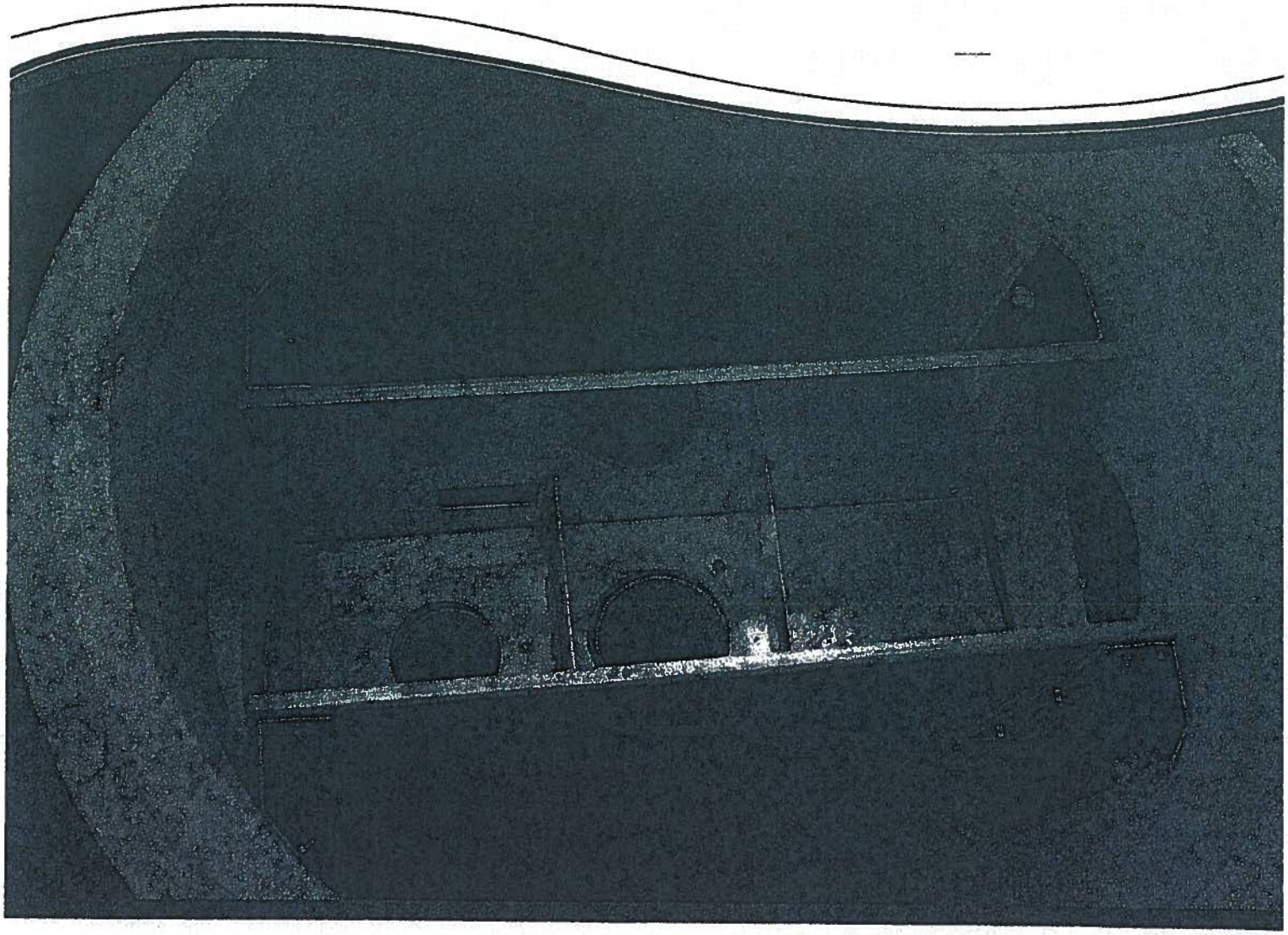
RECYCLED PAPER

CONTECH®
STORMWATER SOLUTIONS™

VortSentry® HS Guide
Operation, Design, Performance and Maintenance



VortSentry® HS

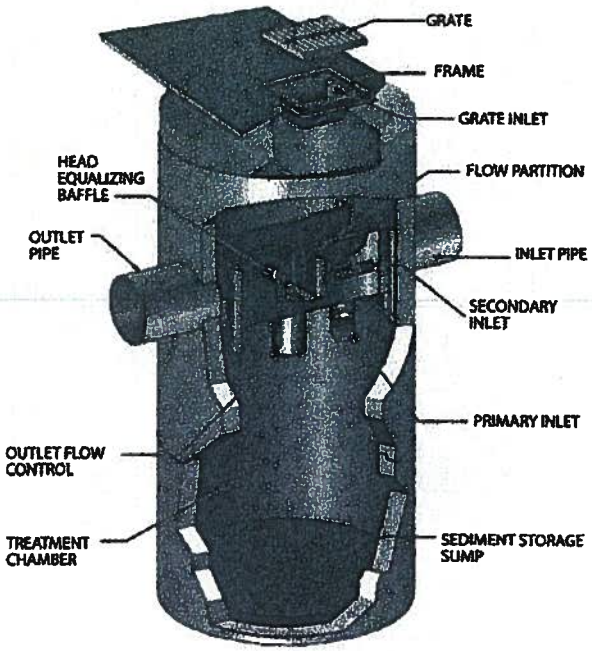
The VortSentry HS is a compact, below grade stormwater treatment system that employs helical flow technology to enhance gravitational separation of floating and settling pollutants from stormwater flows. With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofit installations.

Operation Overview

Low, frequently occurring storm flows are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settleable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition. Internal diversion of high flows eliminates the need for external bypass structures. During bypass, the head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.



Design Basics

There are two primary methods of sizing a VortSentry HS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow for a defined particle size. The summation process of the Rational Rainfall Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically, VortSentry HS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a particle gradation with an average particle size (d_{50}) of 240-microns (μm).

Water Quality Flow Rate Method

In many cases, regulations require that a specific flow rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval (i.e. the six-month storm) or a water quality depth (i.e. 1/2-inch of rainfall).

The VortSentry HS is designed to treat all flows up to the WQQ. Due to its internal bypass weir configuration, flow rates in the treatment chamber only increase minimally once the WQQ is surpassed. At influent rates higher than the WQQ, the flow partition will allow most flow exceeding the treatment flow rate to bypass the treatment chamber. This allows removal efficiency to remain relatively constant in the treatment chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the VortSentry HS will remove a specific gradation of sediment at a specific removal efficiency. Therefore they are variable based on the gradation and removal efficiency specified by the design engineer and the unit size is scaled according to the project goal.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. The Rational Rainfall Method is a sizing program CONTECH developed to estimate a net annual sediment load reduction for a particular VortSentry HS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics. For more information on the Rational Rainfall Method, see *Vortechs Technical Bulletin 4: Modeling Long Term Load Reduction: The Rational Rainfall Method*, available at www.contechstormwater.com.

Treatment Flow Rate

The outlet flow control is sized to allow the WQQ to pass entirely through the treatment chamber at a water surface elevation equal to the crest of the flow partition. The head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber when bypass occurs, thus helping to prevent re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The VortSentry HS is available in three standard configurations: inline (with inlet and outlet pipes at 180° to each other), grated inlet, and a combination of grate and pipe inlets. All three configurations are available in 36-inch (900-mm) through 96-inch (2400-mm) diameter manholes.

The configuration of the system is determined by the suffix of the model name:

- A model name without a suffix denotes a standard pipe inlet (Example HS48).
- A "G" at the end of the model designation denotes a grate inlet (Example HS48G).
- A "GP" at the end of the model designation denotes a combination of grate and pipe inlets (Example HS48GP).

Performance

Full-Scale Laboratory Test Results

Laboratory testing of the VortSentry HS was conducted using F-55 Silica, a commercially available sand product with an average particle size of 240-μm (Table 1). This material was metered into a model HS48 VortSentry HS at an average concentration of between 250-mg/L and 300-mg/L at flow rates ranging from 0.50-cfs to 1.5-cfs (14-L/s to 56-L/s).

US Standard Sieve Size	Particle Size Micron (μm)	Cumulative Passing %
30	600	99.7%
40	425	95.7%
50	300	74.7%
70	212	35.7%
100	150	6.7%
140	106	0.7%

Table 1 : US Silica F-55 Particle Size Distribution

Removal efficiencies at each flow rate were calculated based on net sediment loads passing the influent and effluent sampling points. Results are illustrated in Figure 1.

Assuming that sediment in the inlet chamber is ideally mixed, removal rates through the system will decay according to the percentage of flow bypassed. This effect has been observed in the laboratory where the test system is designed to produce a

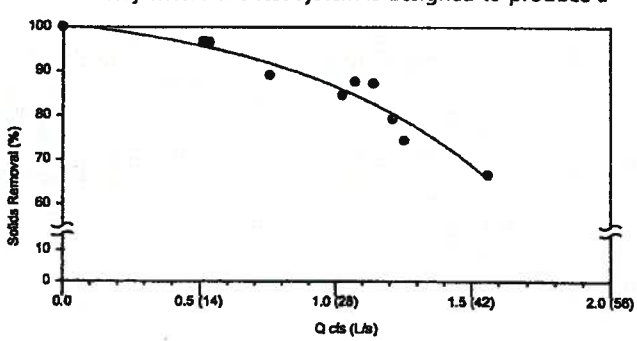


Figure 1: VortSentry HS Removal Efficiencies for 240-μm Particle Gradation

thoroughly mixed inlet stream. All VortSentry HS models have the same aspect ratio regardless of system diameter (i.e. an increase in diameter results in a corresponding increase in depth). Operating rates are expressed volumetrically.

Removal efficiency at each operating rate is calculated according to the average of volumetric and Froude scaling methods and is described by Equation 1.

Equation 1: $$\left(\frac{\text{Diameter Prototype}}{\text{Diameter Model}}\right)^{2.75} = \left(\frac{\text{Flow Rate Prototype}}{\text{Flow Rate Model}}\right)$$

Equation 1 and actual laboratory test results were used to determine the flow rate which would be required for the various VortSentry HS models to remove 80% of solids.

View full report at www.contechstormwater.com

Maintenance

The VortSentry HS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, i.e., unstable soils or heavy winter sanding will cause the treatment chamber to fill more quickly, but regular sweeping will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in equipment washdown areas and in climates where winter sanding operations may lead to rapid accumulations of a large volume of sediment. It is useful and often required as part of a permit to keep a record of each inspection. A simple inspection and maintenance log form for doing so is available for download at www.contechstormwater.com.

The VortSentry HS should be cleaned when the sediment has accumulated to a depth of two feet in the treatment chamber. This determination can be made by taking two measurements with a stadia rod or similar measuring device; one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the distance given in Table 2, the VortSentry HS should be maintained to ensure effective treatment.

Cleaning

Cleaning of the VortSentry HS should be done during dry weather conditions when no flow is entering the system. Cleanout of the VortSentry HS with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. Simply remove the manhole cover and insert the vacuum hose into the sump. All pollutants can be removed from this one access point from the surface with no requirements for Confined Space Entry.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads, which solidify the oils. These are usually much easier to remove from the unit individually, and less expensive to dispose than the oil/water emulsion that may be

created by vacuuming the oily layer. Floating trash can be netted out if you wish to separate it from the other pollutants.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. If anyone physically enters the unit, Confined Space Entry procedures need to be followed.

Disposal of all material removed from the VortSentry HS should be done is accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

VortSentry HS Model	Diameter		Distance Between Water Surface and Top of Storage Sump		Sediment Storage		Oil Spill Storage	
	in.	m	ft.	m	yd^3	m^3	gal.	liter
HS36	36	0.9	3.6	1.1	0.5	0.4	83	314
HS48	48	1.2	4.7	1.4	0.9	0.7	158	598
HS60	60	1.5	6.0	1.8	1.5	1.1	258	978
HS72	72	1.8	7.1	2.2	2.1	1.6	372	1409
HS84	84	2.1	8.4	2.6	2.9	2.2	649	2458
HS96	96	2.4	9.5	2.9	3.7	2.8	845	3199

Table 2: VortSentry HS Maintenance Indicators and Sediment Storage Capacities.

Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Finer, silty particles at the top of the pile may be more difficult to feel with the measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

Logon to www.contechstormwater.com to download the VortSentry HS Inspection and Maintenance Log.

For assistance with maintaining your VortSentry HS, contact us regarding the CONTECH Maintenance compliance certification program.

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

CONTECH STORMWATER SOLUTIONS
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6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

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848 Main Street

Operation and Maintenance Inspection Log

Year: _____

Inspection Items:	Frequency:
Contech Units	Two times per year
Catch Basins	Four times per year
Drainage Basin	Once per year
Infiltration Trench	Twice per year

Contech Units

Previous Inspection Date: _____
Inspection Date: _____
Inspector Name: _____
Comments:

Action Required:

Catch Basins:

Previous Inspection Date: _____
Inspection Date: _____
Inspector Name: _____
Sediment Depth: _____ (Remove if depth greater than 18")
Comments:

Action Required:

Drainage Basin:

Previous Inspection Date: _____
Inspection Date: _____
Inspector Name: _____
Sediment Forebay: _____
Erosion in Basin: _____
Outlet Structure: _____
Comments:

Action Required:

Infiltration Trench:

Previous Inspection Date: _____

Inspection Date: _____

Inspector Name: _____

Comments:

Action Required: