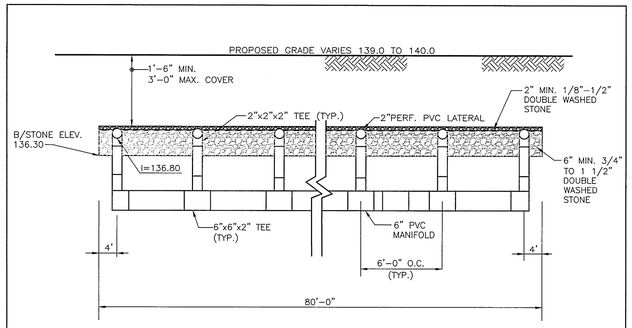
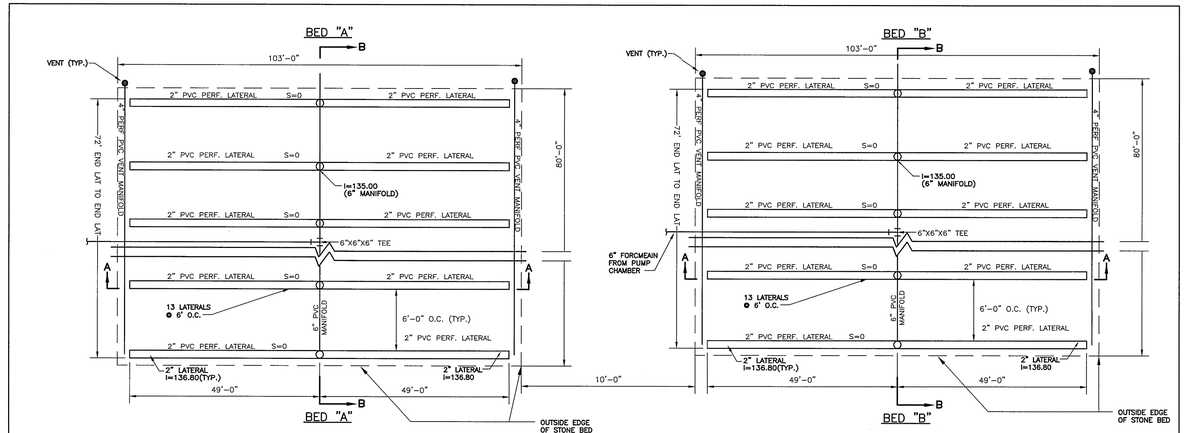


GROUNDWATER ELEVATION = 130.00
DETERMINED FROM MOTTLING IN DEEPHOLE OBSERVATION LOG. (TP-HA103)
2.3 FT. MOUNDING TO ELEVATION 132.30

SECTION B-B 6" PVC MANIFOLD

SCALE: N.T.S.



PRESSURE DISTRIBUTION SEPTIC FIELD LAYOUT

SCALE: N.T.S.

NOTES:

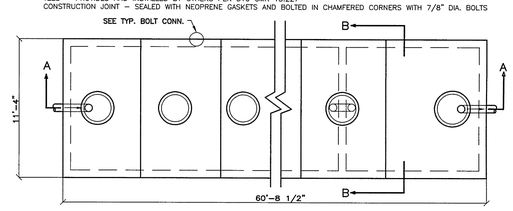
1. VENTS SHALL TERMINATE FOUR (4) FEET ABOVE GROUND WITH A GOOSENECK.
2. INSERT PVC GRATE ON OPEN END OF GOOSENECK.
3. ALL PIPING IN SEPTIC FIELD SHALL BE SCHEDULE 40 PVC.

NOTES:

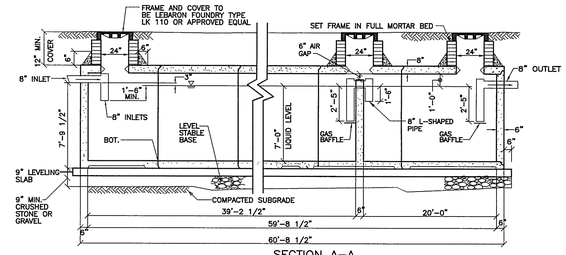
1. SEPTIC TANK SHALL BE REINFORCED CONCRETE.
2. SEPTIC TANK TO WITHSTAND HS-20 LOADING.
3. ALL PIPE CONNECTIONS AND CONCRETE CONSTRUCTION TO BE WATERTIGHT.
4. INLET AND OUTLET TEES TO BE SCHEDULE 40 PVC AND TO BE CENTERED UNDER COVER.
5. RECOMMENDED MANUFACTURER – ROTONDO OR APPROVED EQUAL, LWT 810-31 WITH BAFFLES.
6. COVERS IN THE STRUCTURE TO BE REMOVED PRIOR TO PLACEMENT OF THE MANHOLE RISERS.
7. TOPS OF INLET & OUTLET TEES ARE TO BE LEFT OPEN.

SPECIFICATIONS

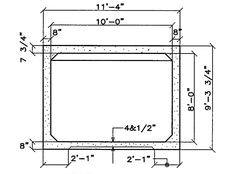
CONCRETE MINIMUM STRENGTH – 5,000 P.S.I. @ 28 DAYS
STEEL REINFORCEMENT – ASTM A-615 GRADE 60, 1" MINIMUM COVER
DESIGN LOADING – AASHTO HS20-44
TEES – PROVIDED AND INSTALLED BY OTHERS PER 310 CMR 15.227
CONSTRUCTION JOINT – SEALED WITH NEOPRENE GASKETS AND BOLTED IN CHAMFERED CORNERS WITH 7/8" DIA. BOLTS



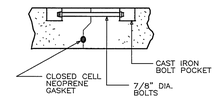
PLAN VIEW



SECTION A-A



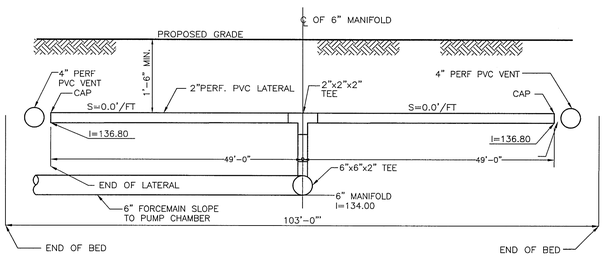
SECTION B-B



TYP. BOLT CONNECTION FOR VERTICAL JOINTS

31,000 GAL. 2-COMPARTMENT SEPTIC TANK

SCALE: N.T.S.



- TWENTY FOUR (24) 1/4" DIA. HOLES TO BE DRILLED @ 4' O.C. LOCATED AT BOTTOM OF EACH 2" PVC LATERAL PIPE.
- GROUNDWATER ELEVATION = 130.00 DETERMINED FROM MOTTLING IN DEEPHOLE OBSERVATION LOG.(TP-HA103)
- 2.3 FT. MOUNDING TO ELEVATION 132.30

SECTION A-A THRU 2" PVC LATERALS

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
BRIAN P. DUNDON
CIVIL
No. 41605
REGISTERED PROFESSIONAL ENGINEER
9-29-08

ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHESKEY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

Proponent:

Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	CJD/BPD
Issue Date:	2 JUNE 2008
Revision:	Date:
REISSUED FOR SITE PLAN APPROVAL	9/29/08

Project:

Wayland Town Center

400 Boston Post Road
Wayland, Massachusetts

Site Plan II
Phase I Site Plan Application

Drawing Title:

SUBSURFACE SEWAGE DISPOSAL SYSTEM DETAILS

Drawing Number

SCALE N.T.S. **C-10**

Drawing name: G:\AA\Wayland\Current Issues\Town Center\Main\Details\06032_C-10.dwg
Mar 29, 2008 - 12:29pm

Copyright Arrowstreet Inc.

DETAILS GENERAL

1. FINAL SYSTEM DESIGN SHALL BE COORDINATED WITH THE SYSTEM MANUFACTURER CONTRACTOR SHALL SUBMIT DESIGN DRAWINGS FROM THE MANUFACTURER/INSTALLER INCLUDING THE CONCRETE CHAMBER PREPARED AND SEALED BY A PROFESSIONAL ENGINEER HOUSING THE SYSTEM FOR ENGINEER'S APPROVAL. DESIGN DRAWINGS SHALL INCLUDE BUOYANCY CALCULATIONS.
2. EXCAVATION SHALL BE KEPT DEWATERED UNTIL ALL BACKFILL HAS BEEN PLACED AND COMPACTED.
3. CONTRACTOR SHALL COORDINATE MANUFACTURER/INSTALLER'S SCOPE OF WORK WITH CONTRACTOR'S SCOPE OF WORK.
4. ALL MACHINERY, EQUIPMENT, PIPING AND WIRING SHALL BE SECURED IN PLACE.

MEDIA TANK VENT

1. IF THE MEDIA TANK IS COVERED, VENT TO ATMOSPHERE THROUGH THE TANK COVER. DO NOT VENT THROUGH THE SIDE OF THE TANK.
2. DO NOT COMBINE THE MEDIA TANK VENT WITH ANY OTHER VENT. (EXCEPT RECYCLE AIRLIFT VENT)
3. MANWAYS, HATCHES AND OTHER PENETRATIONS ABOVE THE WATERLINE SHALL BE DESIGNED TO SEAL AGAINST A MAXIMUM VENT BACKPRESSURE OF 3" IWG.
4. VENTED AIR IS WARMER THAN SURROUNDING AIR AND WILL TEND TO RISE. LOCATE VENT TERMINATION HIGH RATHER THAN LOW.
5. VENT TERMINATION SHALL BE NOT LESS THAN 10' FROM ANY WALKWAY, DOOR, WINDOW, VENTILATION AIR INLET OR POTENTIAL SOURCE OF IGNITION.
6. DO NOT EMPLOY A FLAME SCREEN AT THE VENT TERMINATION. IT WILL PLUG WITH LINT AND REQUIRE REGULAR MAINTENANCE.
7. HORIZONTAL OFFSETS IN THE VENT PIPE SHALL SLOPE UP AND AWAY FROM THE MEDIA TANK AT NOT LESS THAN ¼" PER FOOT, SO THAT CONDENSED MOISTURE WILL DRAIN BACK TO THE MEDIA TANK.

INLET TRAP

1. IF SEWAGE FLOWS TO THE MEDIA TANK BY GRAVITY, THE GRAVITY DRAIN LEADING TO THE MEDIA TANK SHALL PASS THROUGH A TRAP BEFORE ENTERING THE MEDIA TANK. IF TWO OR MORE DRAINS ARE EMPLOYED, THEY SHALL BE COMBINED BEFORE ENTERING THE TRAP.
2. TRAP WATER SEAL SHALL BE NOT LESS THAN 3". THE TRAP PIPING SHALL BE CAPPED AT GROUND LEVEL.
3. THE CLEANOUT SHALL BE ON THE INLET SIDE OF THE TRAP. MAXIMUM TRAP ARM LENGTH SHALL NOT EXCEED 10'.
4. IF SEWAGE IS PUMPED TO THE MEDIA TANK, A TRAP IS NOT REQUIRED. BUT, EACH PUMP SHALL BE FITTED WITH A DISCHARGE CHECK VALVE AND THE DISCHARGE PIPING SHALL PROVIDE NOT LESS THAN 3" IWG WATER SEAL WHEN THE PUMP IS OFF.

AIRLIFT SHELLS

INSTALL AIRLIFT SHELLS DIRECTLY UNDER AIRLIFTS AS SHOWN TO PREVENT DAMAGE ON INSTALLATION. CONNECT SHELL TO TANK FLOOR USING (3) ½" SS ANCHORS.

MEDIA TANK CONSTRUCTION

1. INTERIOR SURFACES OF BOTTOM AND SIDE WALLS SHALL BE PLUMB, SQUARE AND FLAT WITHIN ± 1".
2. FOR COVERED MEDIA TANKS, PROVIDE ACCESS THROUGH THE TANK COVER FOR EACH AIRLIFT AND FOR EACH SLUDGE REMOVAL PIPE. TANK SEAMS AND PENETRATIONS ABOVE WATER LEVEL MUST SEAL AGAINST AIR LEAKAGE WITH 3" IWG INTERNAL PRESSURE.
3. MEDIA TANK WATER LEVELS ARE CRITICAL. HOLD INLET AND OUTLET INVERT HEIGHTS AS SHOWN ON INSTALLATION DRAWINGS.

MEDIA MODULE

1. LIFT THE MODULE AND INSTALL THE MODULE PEDESTALS (LEGS).
DANGER: SECURE THE MODULE IN PLACE WITH BLOCKS OR OTHER SUITABLE MEANS BEFORE INSTALLING PEDESTALS (LEGS) OR WORKING UNDERNEATH THE MODULE FOR ANY REASON.
2. INSTALL THE MODULE IN THE BASIN WITH A GAP OF APPROXIMATELY 1–1/4"ALL AROUND.
3. VERIFY THAT THE MODULE IS LEVEL.
4. THE MODULE IS PROVIDED WITH NEOPRENE SEALING STRIPS (1/4" X 6–1/2") ALONG ALL 4 SIDES.
5. INSTALL THE BAFFLE ASSEMBLY AND THE AIRLIFT DROP PIPE / SPLASH PLATE ASSEMBLIES.
6. COAT THE OUTSIDE SURFACE OF EACH SLUDGE REMOVAL / WATER DECANTING PIPE (BELOW THE STOP PLATE) WITH SCHEDULE 40 PVC PIPE SOLVENT CEMENT. ALLOW THE CEMENT TO BECOME TACKY BEFORE INSTALLING.

PRESS EACH PIPE INTO THE HOLE PROVIDED IN THE MEDIA UNTIL THE STOP PLATE RESTS FIRMLY ON TOP OF THE MEDIA.

AIR PIPING

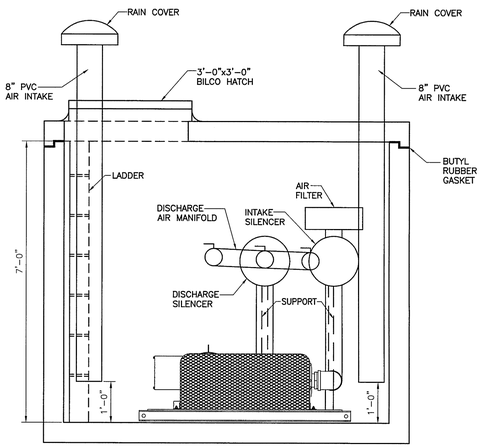
1. FIELD CUT EACH HOSE TO THE REQUIRED LENGTH FOR EACH RUN. DO NOT CUT HOSE TOO SHORT.
2. SECURE EACH HOSE END TO ITS FITTING WITH 2 HOSE CLAMPS.
3. SECURE HOSES TO STRUCTURE SO THAT HOSE END FITTINGS DO NOT CARRY THE WEIGHT OF THE HOSES.

FINAL CHECK

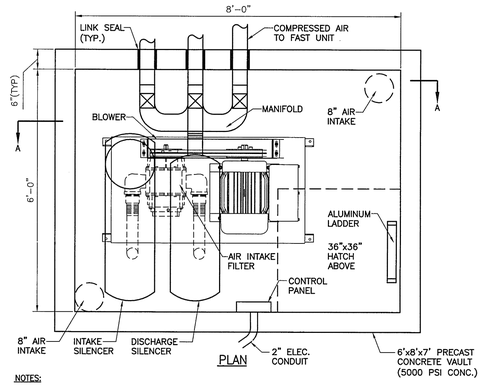
BEFORE INSTALLING THE TANK COVER:

1. VERIFY THAT THE MODULE IS LEVEL.
2. FILL THE BASIN WITH WATER UP TO OR SLIGHTLY ABOVE THE LEVEL OF THE EFFLUENT PIPE INVERT. WHEN THE WATER LEVEL STABILIZES, VERIFY THAT THE WATER LEVEL IS CORRECT.
3. OPERATE THE AIRLIFTS. THEY SHOULD BE PUMPING EQUALLY AND AT A HIGH RATE. ALL OF THE AIR SHOULD BE COMING UP THE AIRLIFT DRAFT TUBES AND NO AIR SHOULD BE BUBBLING UP ANYWHERE ELSE.
4. OPERATE THE AIR SCOURS. VERIFY A UNIFORM PATTERN OF BUBBLES ACROSS THE ENTIRE SURFACE OF THE BASIN.
5. CHECK THAT ALL PIPING AND HOSE CONNECTIONS ARE TIGHT AND SECURE AND THAT ALL HOSES ARE PROPERLY SUPPORTED.
6. NO HOSE END FITTING SHOULD BE IN TENSION BECAUSE THE HOSE WAS CUT TOO SHORT OR BECAUSE THE HOSE IS NOT PROPERLY SUPPORTED.

MODULAR FAST® SYSTEM CONSTRUCTION NOTES



SECTION A–A



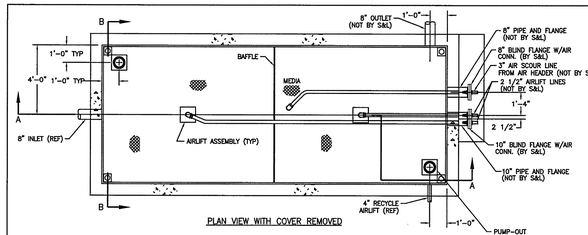
PLAN

NOTES:

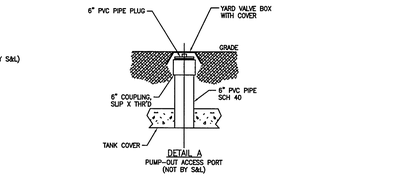
1. FINAL SYSTEM DESIGN SHALL BE COORDINATED WITH THE SYSTEM MANUFACTURER. CONTRACTOR SHALL SUBMIT DESIGN DRAWINGS FROM THE MANUFACTURER/INSTALLER INCLUDING THE CONCRETE CHAMBER PREPARED AND SEALED BY A PROFESSIONAL ENGINEER HOUSING THE SYSTEM FOR ENGINEER'S APPROVAL. DESIGN DRAWINGS SHALL INCLUDE BUOYANCY CALCULATIONS.

BLOWER VAULT

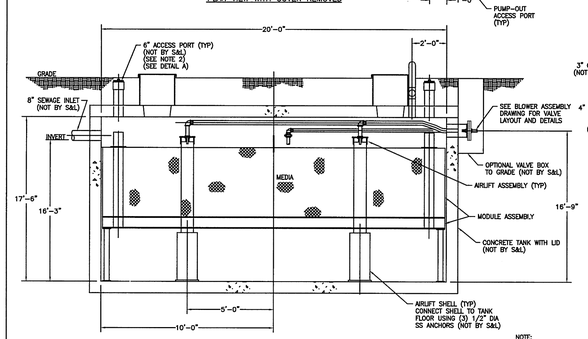
SCALE: N.T.S.



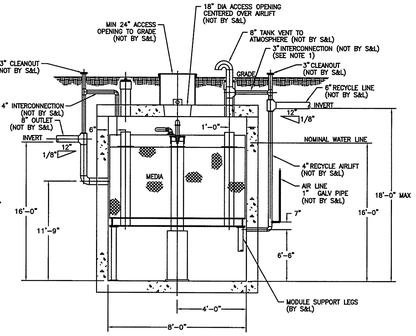
PLAN VIEW WITH COVER REMOVED



DETAIL A
PUMP–OUT ACCESS PORT (NOT BY S&L)



SECTION A–A



SECTION B–B

NOTE:
1. THE TANK VENT PIPE IS SIZED TO LIMIT VENT PRESSURE TO 12 IWC WITH A MAXIMUM LENGTH OF 100 FEET, 6 ELBOWS AND A 180° BEND. VENT SHALL BE INDEPENDENT OF BUILDING VENT SYSTEM, AND MUST SLOPE UP AWAY FROM TANK NOT LESS THAN 1/4" PER FOOT (2%).
2. ACCESS OPENINGS THROUGH TOP OF TANK MUST LINE UP WITH ACCESS PORTS IN MEDIA AND AIRLIFTS.
3. ALL PIPES PENETRATING THE TANK WALLS SHALL BE GROUTED IN PLACE AND ALL ANNULAR SPACES SEALED.
4. STANDARD MODULE SUPPORT LEGS PROVIDED ARE SHIPPED DISASSEMBLED FROM THE MODULE ASSEMBLY AND MUST BE BOLTED TO MODULE FRAME PRIOR TO INSTALLATION IN THE TANK.
5. COPYRIGHT (C) 2000 SMITH & LOVELESS INC.

MANUFACTURER NOTES:
1. TANK BASIN, BLOWER CHAMBER, VALVE BOX, TANK PENETRATIONS AND EXTERNAL PIPING BY CONTRACTOR.
2. PIPE SIZES SHOWN ARE SYSTEM MINIMUM REQUIREMENTS PER SMITH & LOVELESS. CONSULT APPLICABLE REGULATIONS AND CODES.
3. MAXIMUM DISTANCE BETWEEN BLOWER & TREATMENT TANK IS 100 FEET.
4. SEE DETAIL 5 FOR INSTALLATION NOTES AND DETAILS.
5. INSTALL PRIOR TO MODULE INSTALLATION, SHIM AS NEEDED TO OBTAIN MEDIA HEIGHT LEVEL ACROSS ENTIRE TANK AT 14'–9".

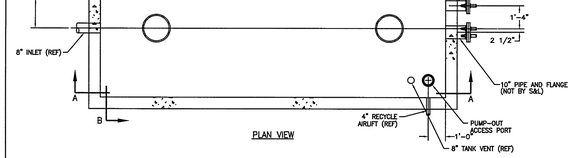
35B370

					DRAWN BY: ALEX	DATE: 1/25/2000	ALLOWABLE TOLERANCES	FOR	
					CHECKED BY: F.T.	DATE: 1/25/2000	FRACTIONS –	FAST® SEWAGE TREATMENT PLANT MODULAR FAST MODEL K1208XT WITH RECYCLE	
					APPROVED BY: C.G.M.	DATE: 1/25/2000	DECIMALS –		
					SCALE: NTS	CODE: 9	ANGLES –	SIZE	U/M EA WT.
LET	ECN NO	DATE	BY APPVD					FILE NAME \SALES\35B370_	PLOT SCALE 1=48.000
ORIGINAL ISSUE	N2000–4			© Smith & Loveless, Inc. 2000				SERIAL NO	DWG NO 35B370 REV

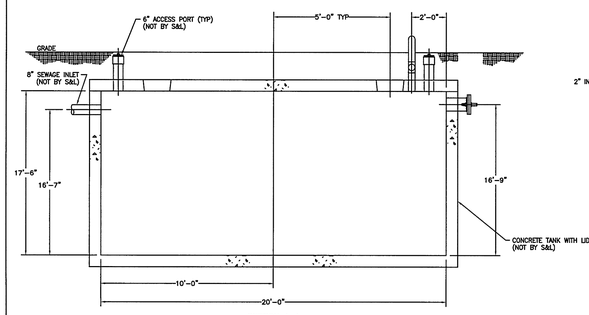
THE DESIGN AND DETAIL OF THIS DRAWING IS THE PROPERTY OF SMITH & LOVELESS, INC. AND IS NOT TO BE USED EXCEPT IN CONNECTION WITH OUR WORK. DESIGN AND INVENTION RIGHTS ARE RESERVED. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Smith & Loveless, Inc.

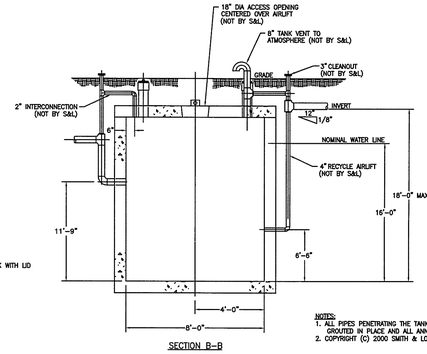
SHEET 1 OF 1



PLAN VIEW



SECTION A–A



SECTION B–B

NOTES:
1. ALL PIPES PENETRATING THE TANK WALLS SHALL BE GROUTED IN PLACE AND ALL ANNULAR SPACES SEALED.
2. COPYRIGHT (C) 2000 SMITH & LOVELESS INC.

NOTES:

1. FINAL SYSTEM DESIGN SHALL BE COORDINATED WITH THE SYSTEM MANUFACTURER. CONTRACTOR SHALL SUBMIT DESIGN DRAWINGS FROM THE MANUFACTURER/INSTALLER INCLUDING THE CONCRETE CHAMBER HOUSING THE SYSTEM FOR ENGINEER'S APPROVAL.
2. EXCAVATION SHALL BE KEPT DEWATERED UNTIL ALL BACKFILL HAS BEEN PLACED AND COMPACTED.
3. PRECAST CONCRETE CHAMBER MANUFACTURED BY ROTONDO & SONS OR APPROVED EQUAL.
4. CONCRETE MIMIMUM STRENGTH: 5000 PSI AT 28 DAYS
   STEEL REINFORCEMENT: ASTM A–615–79, GRADE 60, 1" MIN. COVER
   DESIGN LOADING–ASTM HS20–44
5. CONSTRUCTION JOINTS: SEALED WITH A 1" DIA. BUTYL RUBBER OR EQUIVALENT
6. SEE SMITH AND LOVELESS DRAWINGS FOR MECHANICAL EQUIPMENT DETAIL.
7. CONTRACTOR SHALL COORDINATE MANUFACTURER/INSTALLER'S SCOPE OF WORK WITH CONTRACTOR'S SCOPE OF WORK.

35B372

					DRAWN BY: ALEX	DATE: 1/25/2000	ALLOWABLE TOLERANCES	FOR	
					CHECKED BY: F.T.	DATE: 1/25/2000	FRACTIONS –	FAST® SEWAGE TREATMENT PLANT MODULAR FAST CONCRETE TANK MODEL K1208XT WITH RECYCLE	
					APPROVED BY: C.G.M.	DATE: 1/25/2000	DECIMALS –		
					SCALE: NTS	CODE: 9	ANGLES –	SIZE	U/M EA WT.
LET	ECN NO	DATE	BY APPVD					FILE NAME \SALES\35B372_	PLOT SCALE 1=48.000
ORIGINAL ISSUE	N2000–4			© Smith & Loveless, Inc. 2000				SERIAL NO	DWG NO 35B372 REV

THE DESIGN AND DETAIL OF THIS DRAWING IS THE PROPERTY OF SMITH & LOVELESS, INC. AND IS NOT TO BE USED EXCEPT IN CONNECTION WITH OUR WORK. DESIGN AND INVENTION RIGHTS ARE RESERVED. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Smith & Loveless, Inc.

SHEET 1 OF 1

ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHESKEY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

Proponent:
Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	C/D/BPD
Issue Date:	2 JUNE 2008
Revision:	Date:
REISSUED FOR SITE PLAN APPROVAL	9/29/08

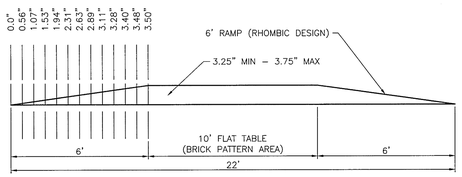
Project:
Wayland Town Center
400 Boston Post Road
Wayland, Massachusetts

Site Plan II
Phase I Site Plan Application

Drawing Title:
FAST SYSTEM DETAILS

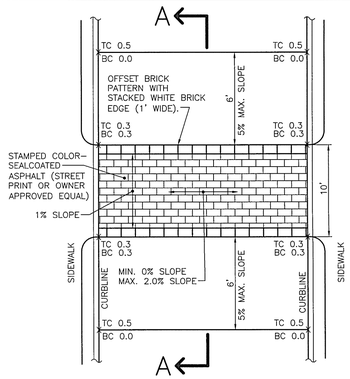
Drawing Number
SCALE N.T.S. C-11

Drawing name: G:\AR\Wayland\Great Island\Town Center\Mech\Details\06032_C-11.dwg
Apr 29, 2008 - 2:19pm



TYPICAL RAISED CROSSWALK SECTION A-A

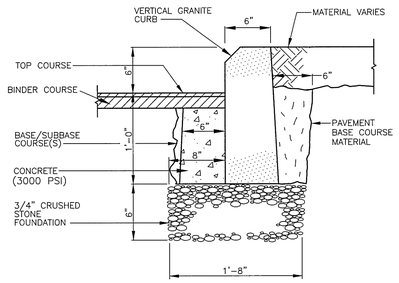
SCALE: N.T.S.



NOTES:
1. THE CONTRACTOR MUST BE A MANUFACTURER AUTHORIZED APPLICATOR, EXPERIENCED WITH THIS SPECIALIZED SYSTEM SATISFACTORY TO THE OWNER.
2. WHEN FULL DEPTH EXCAVATION IS NOT REQUIRED, THE EXISTING PAVEMENT SURFACE SHALL BE REMOVED TO AN APPROXIMATE UNIFORM DEPTH OF 0.75 INCHES.
3. THE CONTRACTOR SHALL STAMPED COLOR PATTERN IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
4. THE CONTRACTOR SHALL THEN APPLY THE HEATED, MIXED MATERIAL IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS TO THE SURFACE OF A HARDENED, STRUCTURALLY SOUND BITUMINOUS CONCRETE SURFACE.
5. THE COLOR AND SURFACE PATTERN SHALL BE IN ACCORDANCE WITH THE DESIGN APPROVED BY THE OWNER.
6. ONCE THE FINISHED SURFACE HAS COOLED SUFFICIENTLY, THE APPLICATION AREA MAY BE OPENED TO VEHICULAR AND/OR PEDESTRIAN TRAFFIC.

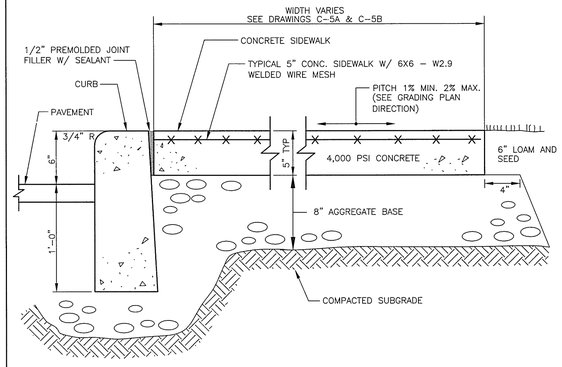
TYPICAL RAISED CROSSWALK

SCALE: N.T.S.



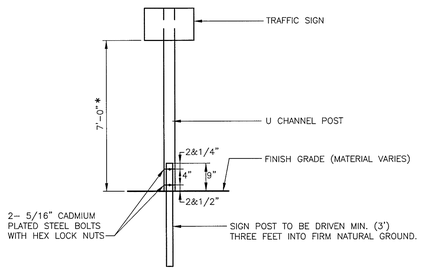
VERTICAL GRANITE CURB DETAIL (TYPE 1 CURB)

SCALE: N.T.S.



TYPICAL CONCRETE SIDEWALK DETAIL

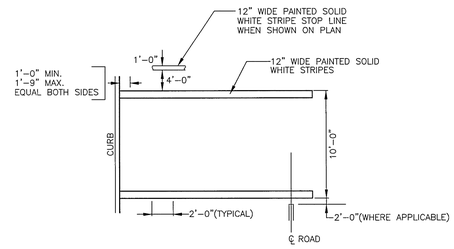
SCALE: N.T.S.



NOTE:
7' TYPICAL. REFER TO TRAFFIC CONTROL SCHEDULE FOR EXACT MOUNTING HEIGHT

TYPICAL BREAKAWAY SIGN POST DETAIL

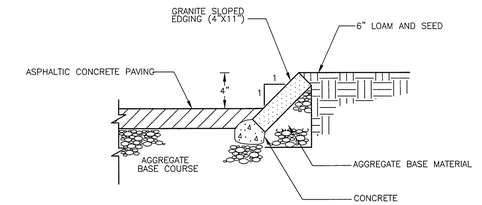
SCALE: N.T.S.



NOTE:
ROAD CENTERLINE (STRIPE) TO ALIGN WITH STRIPE OR SPACE CENTERLINE (SPACE SHOWN)

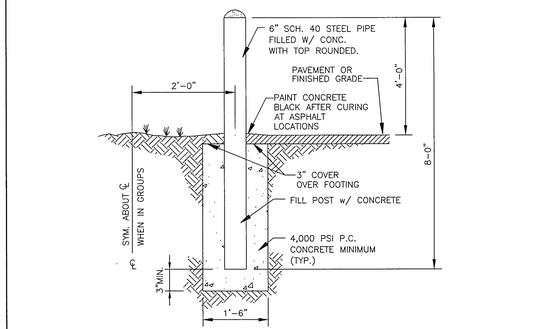
TYPICAL 12" WIDE 90° PAINTED CROSSWALK DETAIL

SCALE: N.T.S.



TYPICAL TYPE 2 CURB (SLOPED GRANITE) DETAIL

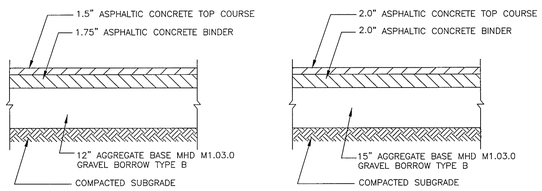
SCALE: N.T.S. CU-006.DWG



NOTE:
ALL PIPE BOLLARDS SHALL BE PAINTED WITH REFLECTIVE YELLOW TRAFFIC PAINT (SEE SPECS)

PIPE BOLLARD

SCALE: N.T.S.



TYPICAL PAVEMENT SECTION

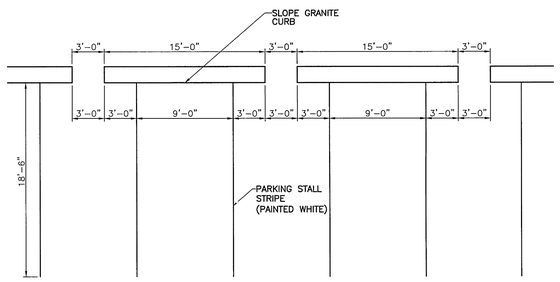
HEAVY DUTY PAVEMENT SECTION

DEPTH	TYPICAL PAVEMENT SECTION	HEAVY DUTY PAVEMENT SECTION
ASPHALTIC CONCRETE TOP COURSE	1.5 INCHES	2.0 INCHES
ASPHALTIC CONCRETE BINDER COURSE	1.75 INCHES	2.0 INCHES
AGGREGATE BASE MHD M1.03.0 GRAVEL BORROW TYPE B	12.0 INCHES	15.0 INCHES

PAVEMENT SECTION TABLE

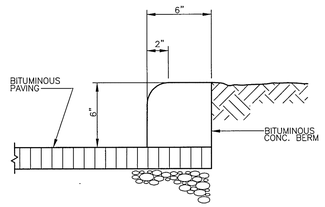
TYPICAL PAVEMENT DETAIL

SCALE: N.T.S. PVMT-001PT.DWG



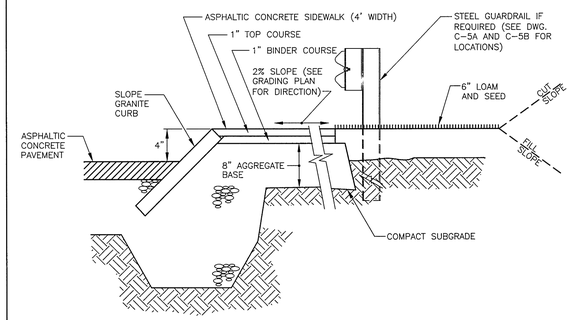
TYPICAL CURB BREAKS AT SWALES & RAIN GARDENS

SCALE: N.T.S.



TYPICAL TYPE 2 CURB (BITUMINOUS BERM) DETAIL

SCALE: N.T.S. CU-005.DWG



TYPICAL ASPHALTIC CONCRETE SIDEWALK @ CURB DETAIL

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
BRIAN P. CURDON
CIVIL
No. 41603
REGISTERED PROFESSIONAL ENGINEER
9-29-08

ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHESKEY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

Proponent:

Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	CAD/BPD
Issue Date:	2 JUNE 2008
Revision:	Date:
REISSUED FOR SITE PLAN APPROVAL	9/29/08

Project:

Wayland Town Center

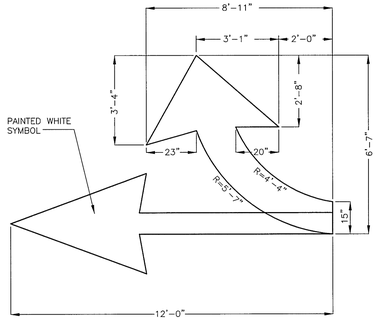
400 Boston Post Road
Wayland, Massachusetts

Site Plan II
Phase I Site Plan Application

Drawing Title:
LAYOUT AND MATERIALS DETAILS I

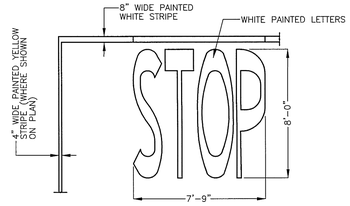
Drawing Number
SCALE N.T.S. C-12

Drawing name: G:\MA\Wayland\Great Island\Town Center\Work\Details\C-12.dwg
Sep 29, 2008 - 2:28pm



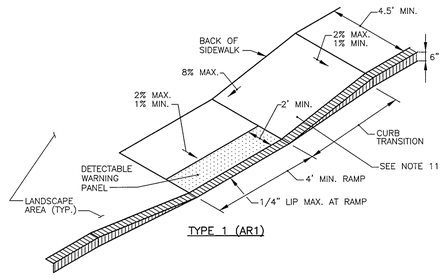
TYPICAL PAINTED ARROWS DETAIL

SCALE: N.T.S.

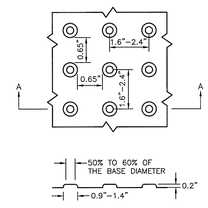


TYPICAL PAINTED 'STOP' DETAIL

SCALE: N.T.S.



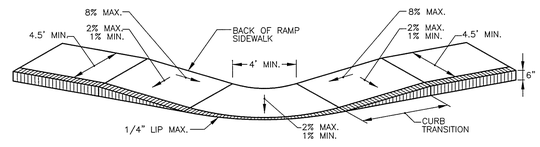
TYPE 1 (AR1)



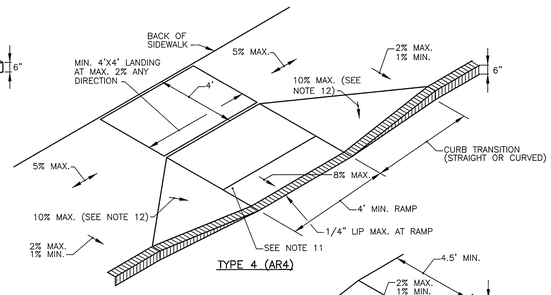
SECTION A–A

DETECTABLE WARNING PANEL

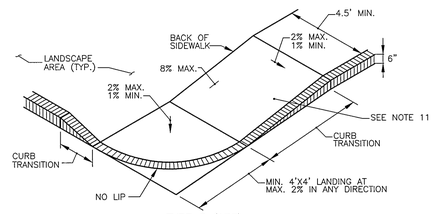
NOTE:
1. SEE PLANS FOR CURB TYPE.
2. CURBS AND WALKS ALONG ACCESSIBLE ROUTES SHALL MEET OR EXCEED THE APPLICABLE REGULATIONS OF THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD, FAIR HOUSING ACT AND ADA.
3. THE MAXIMUM ALLOWABLE SIDEWALK AND CURB RAMP CROSS SLOPES SHALL BE 2%(1% MIN.).
4. THE MAXIMUM ALLOWABLE SLOPE OF ACCESSIBLE ROUTE EXCLUDING CURB RAMPS SHALL BE 5%.
5. THE MAXIMUM ALLOWABLE SLOPE OF ACCESSIBLE ROUTE CURB RAMPS SHALL BE 8%.
6. MAINTAIN A MINIMUM OF 3 FEET CLEAR AT ANY PERMANENT OBSTACLE IN ACCESSIBLE ROUTE (I.E., HYDRANTS, UTILITY POLES, TREE WELLS, SIGNS ETC.)
7. GRADE BASE OF RAMP TO PREVENT PONDING.
8. RAMP CONSTRUCTION SHALL CONFORM TO TYPICAL SIDEWALK SECTION.
9. WHERE ACCESSIBLE ROUTES ARE LESS THAN 5' IN WIDTH (EXCLUDING CURBING) A 5'X5' PASSING AREA SHALL BE PROVIDED AT INTERVALS NOT TO EXCEED 200 FEET.
10. ALL CURBING AT RAMPS SHALL BE VERTICAL CURBING SET FLUSH WHERE IT ABUTS ROADWAY.
11. IF LANDING AREA IS LESS THAN 4' DEEP, FLARED SIDE RAMPS SHALL NOT EXCEED 8% MAX.



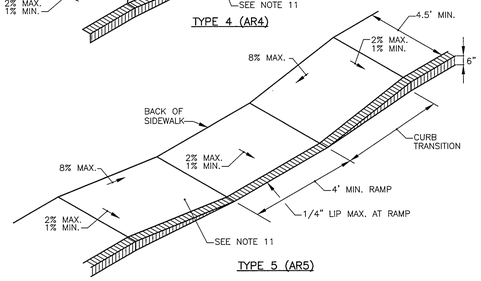
TYPE 2 (AR2)



TYPE 4 (AR4)



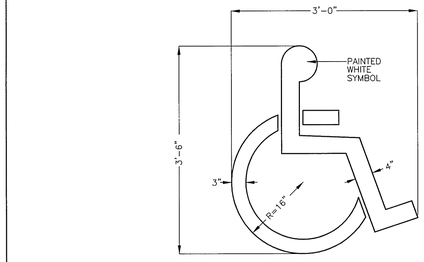
TYPE 3 (AR3)



TYPE 5 (AR5)

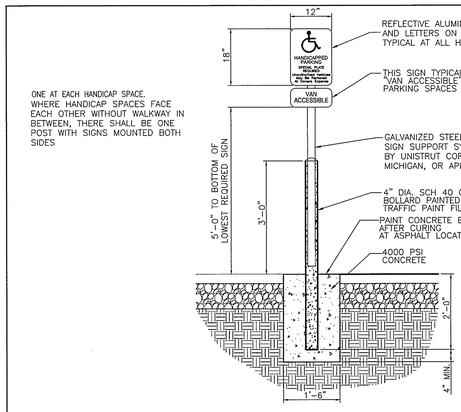
ACCESSIBLE CURB RAMPS (AR)

SCALE: N.T.S. CP-001.DWG



TYPICAL PAINTED HANDICAP SYMBOL DETAIL

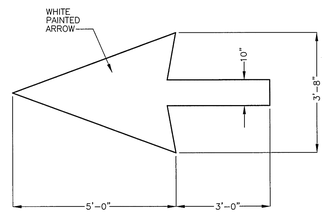
SCALE: N.T.S.



ONE AT EACH HANDICAP SPACE. WHERE HANDICAP SPACES FACE EACH OTHER WITHOUT WALKWAY IN BETWEEN, THERE SHALL BE ONE POST WITH SIGNS MOUNTED BOTH SIDES

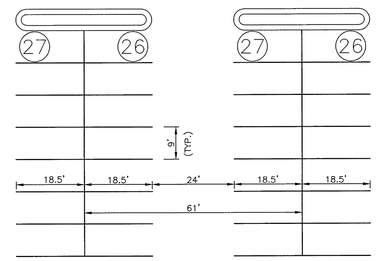
HANDICAP PARKING SIGN

SCALE: N.T.S.



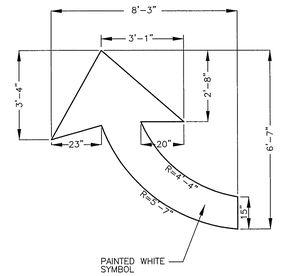
TYPICAL PAINTED ARROW DETAIL

SCALE: N.T.S.



TYPICAL PARKING LOT STRIPING DETAIL

SCALE: N.T.S.



TYPICAL PAINTED ARROWS DETAIL

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
BRIAN P. DUNDON
CIVIL
No. 41605
REGISTERED PROFESSIONAL ENGINEER
9-29-08

ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHESKEY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

Proponent:

Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	CAD/BPD
Issue Date:	2 JUNE 2008
Revision:	Date:
REISSUED FOR SITE PLAN APPROVAL	9/29/08

Project:

Wayland Town Center

400 Boston Post Road
Wayland, Massachusetts

Site Plan II
Phase I Site Plan Application

Drawing Title:
LAYOUT AND MATERIALS DETAILS II

Drawing Number
SCALE N.T.S. C-13

Drawing name: G:\MA\Wayland\Great Island\Town Center\Main\Details\06032_C-13.dwg
Sep 29, 2008 - 2:30pm

SEWER PUMP STATION DESIGN CALCULATIONS

GRAVITY FLOW INTO PUMP STATION = 9,990 GPD

PEAK INFLOW RATE W/6.0 PEAK FACTOR

$$\frac{6 \times 9{,}990\ GPD}{24\ HR/DAY \times 60\ MIN/\ HR} = 42\ GPM$$

FLOW DESIGN FOR 4" SCH 80 PVC FORCE MAIN @ 3 FPS = 109 GPM (USE 110 GPM PUMP RATE)

PUMP CHAMBER AT 6' DIAMETER @ 211 GAL/FT

PUMP CYCLE VOLUME

3.5 TO 4 MIN PUMP RUN = 385 TO 550 GAL

USE 2.5' PUMP VOLUME @ 527 GAL = 3.84 MIN RUN

LOWEST INVERT @ 122.50

LAG PUMP/ALARM @ 122.50
LEAD PUMP ON @ 122.00
DESIGN STATIC @ 121.00
PUMP OFF @ 119.50
LOW WATER ALARM @ 119.00
BOTTOM OF CHAMBER @ 118.50

DISCHARGE @ 133.65
STATIC = 12.7' 133.65–121.00
20'–4" PIPE LOSS @ 110 GPM = .2' (USE 1')
MINOR STATION LOSS = 2.5'
TDH = 16 FT
PUMP RATE = 160 GPM @ 16 FT TDH

½" DRAIN HOLE FLOW @ 16' HEAD = ±20 GPM
NET PUMP RATE = 160–20 = 140 GPM
REVISED PUMP TIME = 527/140 = 3.75 MIN

WEIL 4-Inch Discharge Submersible Pump 2519

Commercial and industrial applications.
Pump clear water, gray water, effluent and wastewater.
Handles 3-inch solids from commercial and institutional wastewater wet wells, etc.

Disch. Size	4 Inch
Disch. Type	ANSI
Solids Max.	3 Inch

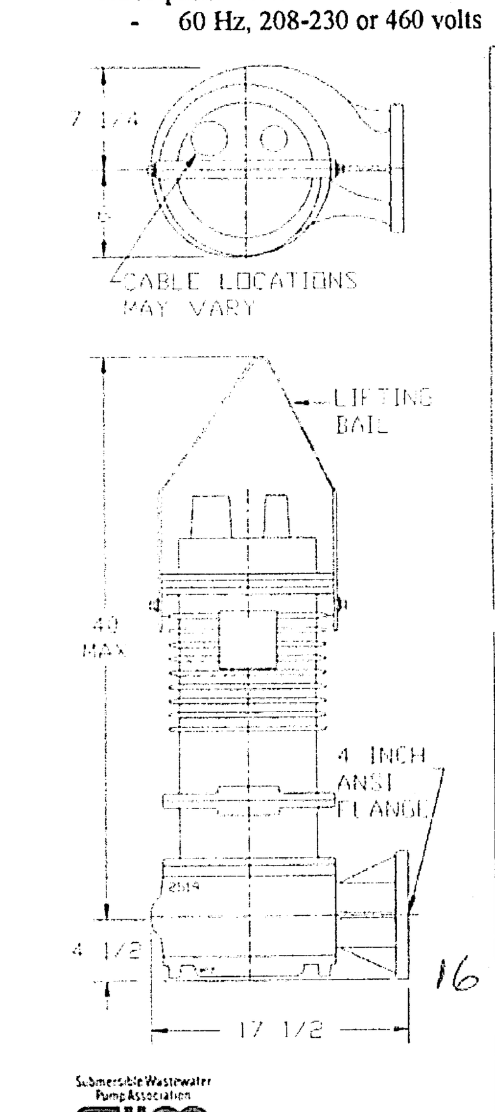
Mounting Style 2613 Removal

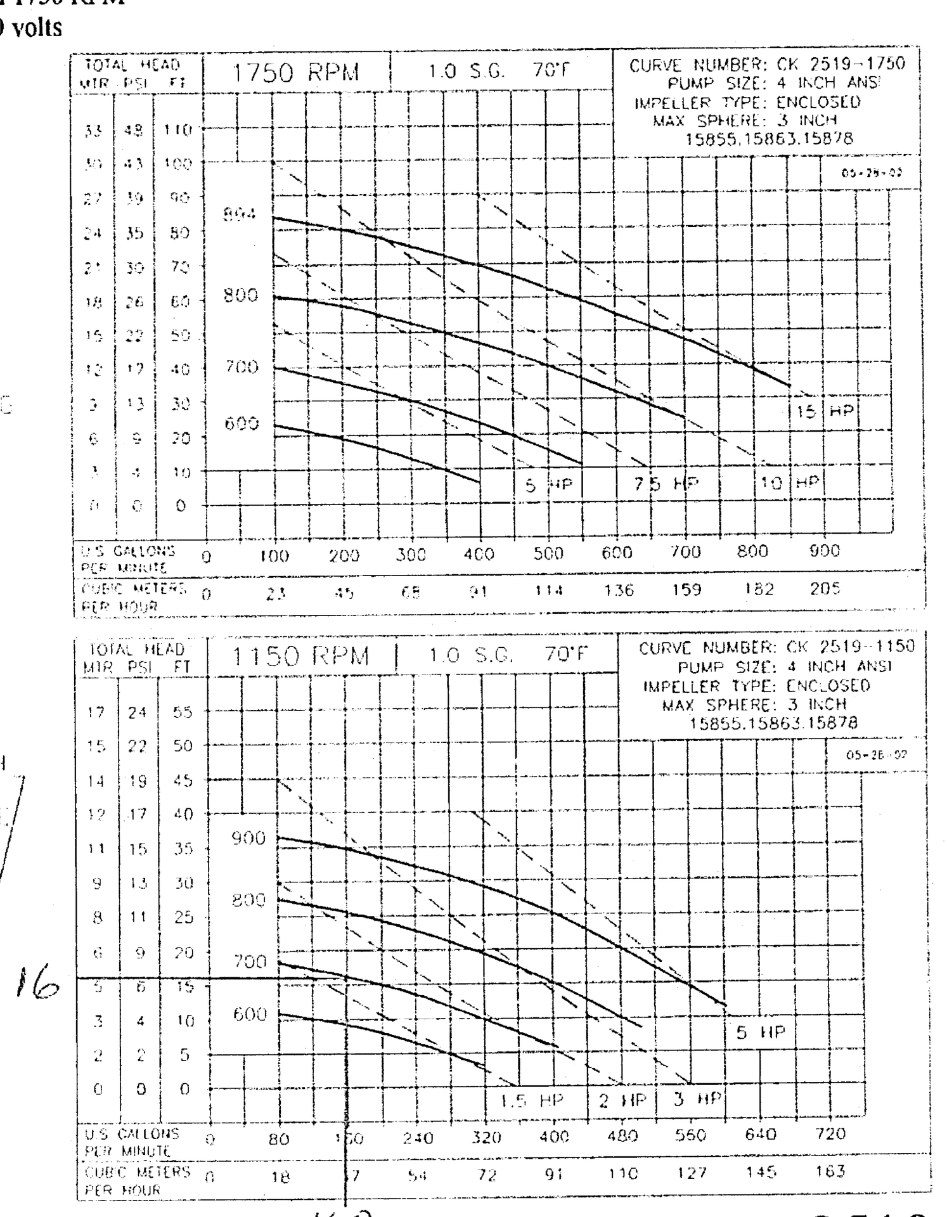
Pump
- Case – Cast Iron
- Impeller – Cast Iron
- Stainless Steel Hardware
- Stainless steel lifting cable – 20 feet

Motor
- **Double Seal – Tandem**
  - Upper – Carbon against Ceramic
  - Lower – Silicon Carbide against Silicon Carbide
- **Air-Filled, Hermetically Sealed**
- **Shaft – Stainless Steel Series 300**
- Motor Shell – Cast Iron
- Insulation – Class F
- Ball Bearings – 2 – Double Sealed
- Power Cord Length – 25 ft.
- Three-phase motor – 1150 and 1750 RPM
  - 60 Hz, 208-230 or 460 volts

Options
- Bronze impeller
- UL Explosion-Proof motor
- Moisture Sensor and Temperature Limiter
- Additional power cable lengths

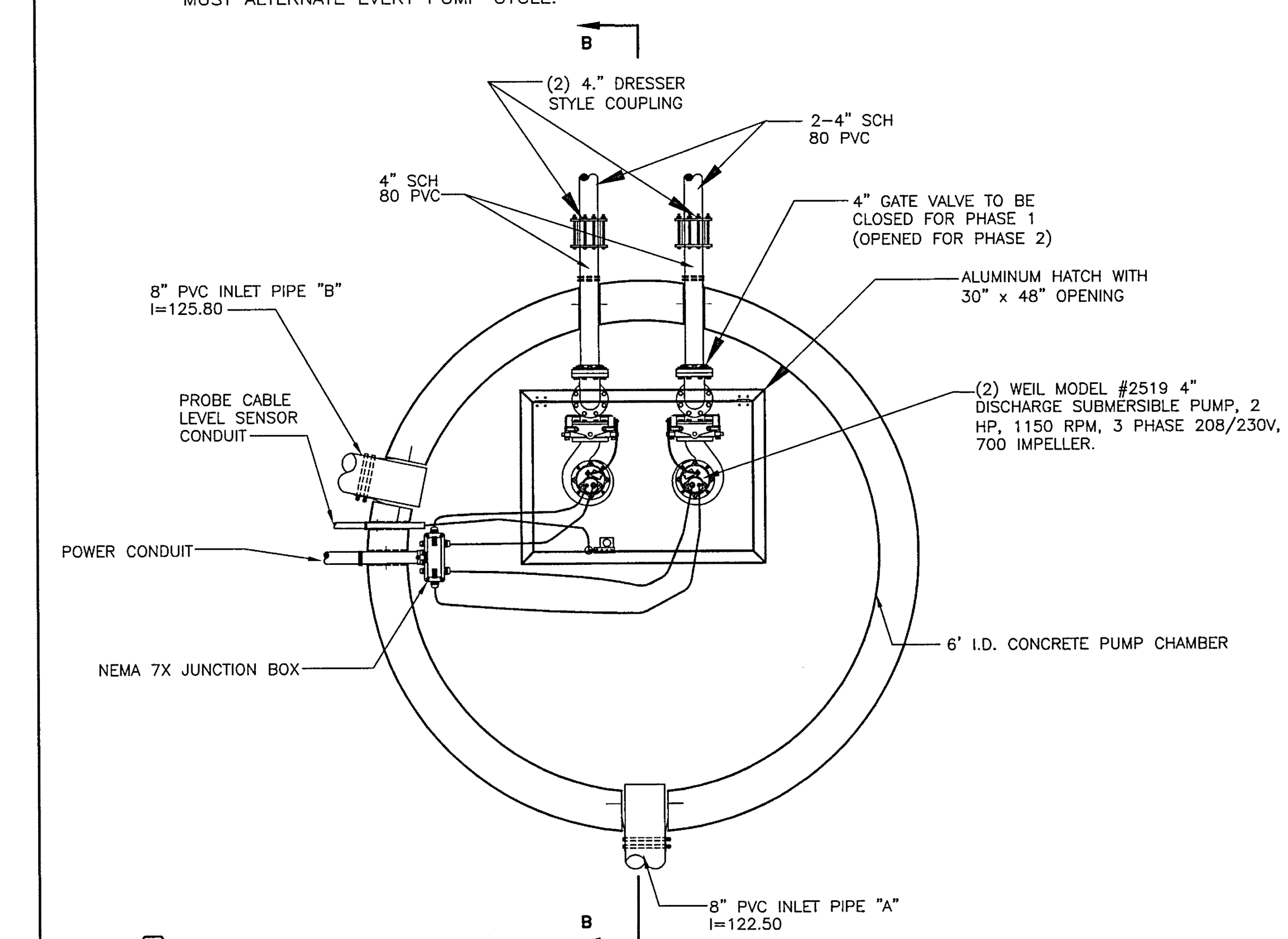
Disch. Location	Minimum Basin Dia. Simplex	Duplex
Above Grade	42 Inches	54 Inches
Below Grade	42 Inches	60 Inches



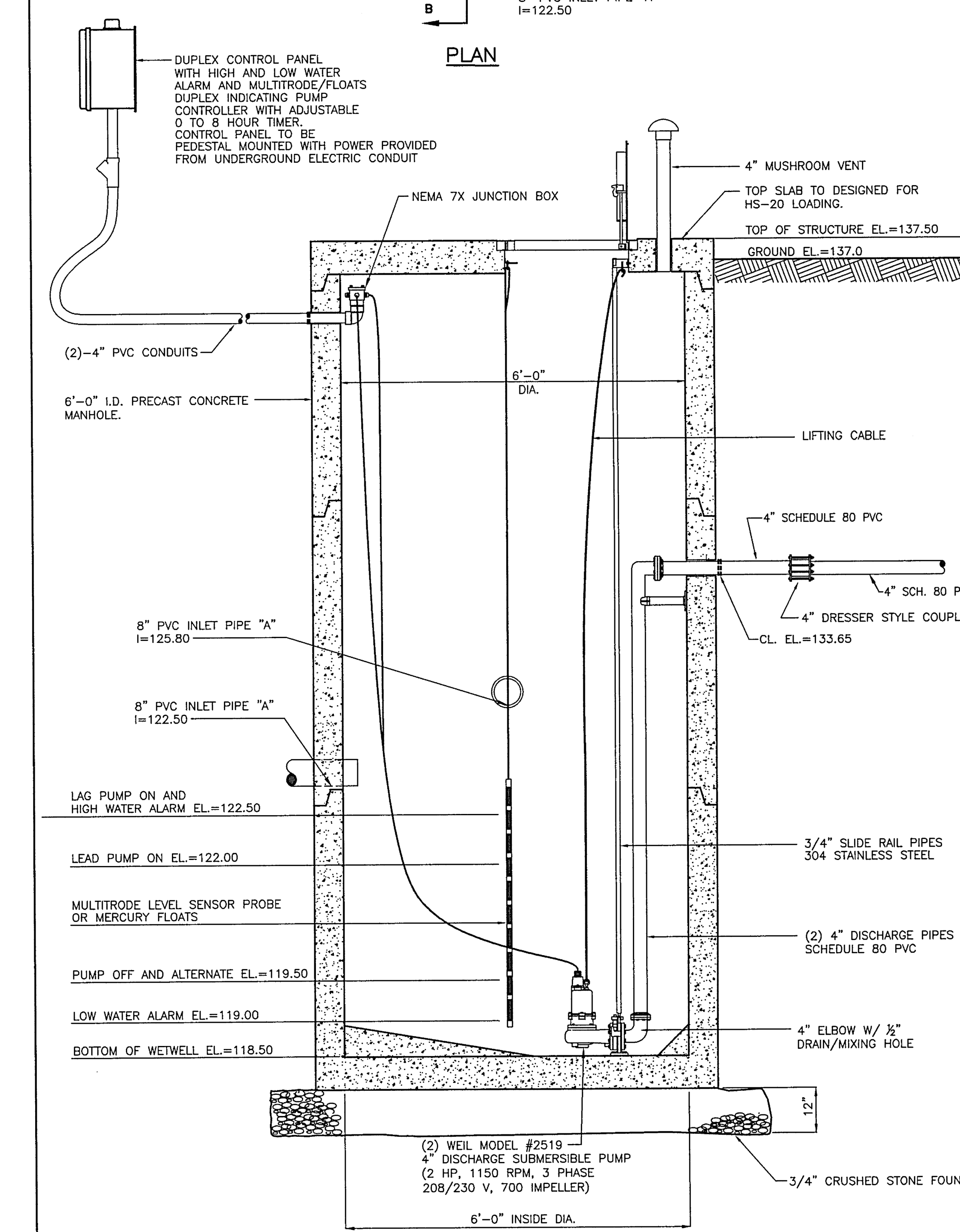


X Replaces SN-2519, July 1, 2001 — SN-2519 (160) — FEBRUARY 2, 2004 — 2519

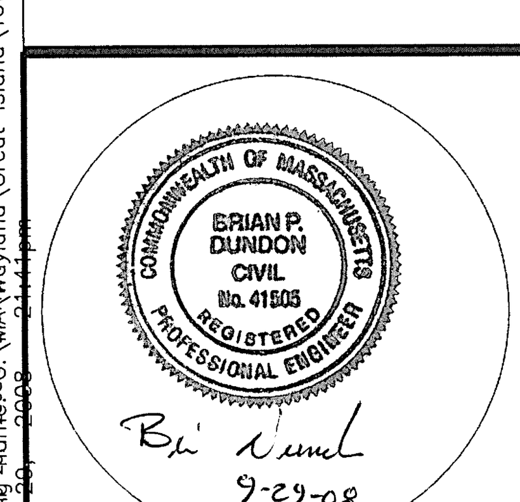
NOTES:
1. IF GROUNDWATER IS ENCOUNTERED, THE EXCAVATION SHALL BE KEPT IN A "DEWATERED" STATE UNTIL ALL BACKFILL HAS BEEN PLACED AND COMPACTED.
2. ALL ELECTRICAL SYSTEMS AND COMPONENTS INSIDE THE PUMP CHAMBER SHALL COMPLY WITH THE NEC REQUIREMENTS FOR CLASS 1, GROUP D, DIVISION1 ENVIRONMENTS AND SHALL BE SUITABLE FOR USE UNDER CORROSIVE CONDITIONS.
3. PUMP CHAMBER AND HATCH TO BE DESIGNED TO HANDLE HS–20 LOADING.
4. THE PUMP CONTROLLER SHALL INCLUDE SEPARATE PUMP RUN TIME METERS FOR EACH PUMP.
5. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL, ALL PUMP SPECIFICATIONS INCLUDING PUMP PERFORMANCE CURVES. THE PUMPS SHALL HAVE A CAPACITY OF 160 GPM AT 16 FEET TOTAL DYNAMIC HEAD. THE CONTRACTOR SHALL VERIFY THE TOTAL DYNAMIC HEAD REQUIRED FOR 160 GPM AND SUBMIT CALCULATIONS TO THE ENGINEER FOR REVIEW AND APPROVAL.
6. THE CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF THE OPERATION AND MAINTENANCE MANUALS FOR THE PUMP STATION TO THE OWNER BEFORE FINAL ACCEPTANCE AND OPERATION.
7. THE CONTRACTOR SHALL SUBMIT BUOYANCY CALCULATIONS FOR THE PUMP STATION TO THE ENGINEER FOR APPROVAL, AND SHALL INCLUDE THE SIZE OF CONCRETE ANCHOR SLAB TO PREVENT FLOTATION IF REQUIRED. THE CONTRACTOR SHALL DESIGN THE STRUCTURAL CONNECTIONS BETWEEN THE PUMP CHAMBER AND CONCRETE ANCHOR SLAB. SHOP DRAWINGS SHALL BE STAMPED BY A REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED TO THE ENGINEER FOR APPROVAL.
8. AS REQUIRED BY MA TITLE 5, THE PUMP AND ALARMS MUST BE ON SEPARATE ELECTRICAL CIRCUITS.
9. LEVEL CONTROL SHALL INCLUDE PUMP OFF/LEAD PUMP ON/LAG PUMP ON SWITCHES. LEAD AND LAG PUMP MUST ALTERNATE EVERY PUMP CYCLE.



PLAN



1 SEWER PUMP STATION SECTION B–B
SCALE: N.T.S.



ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHESKEY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

Proponent:
Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	CAD/BPD
Issue Date:	2 JUNE 2008
Revision:	Date:
REISSUED FOR SITE PLAN APPROVAL	9/29/08

Project:
Wayland Town Center
400 Boston Post Road
Wayland, Massachusetts

Site Plan II
Phase I Site Plan Application

Drawing Title:
SEWER PUMP STATION #1 DESIGN

Drawing Number
SCALE N.T.S. C-14

Drawing name: G:\MA\Wayland\Great Island\Town Center\Main\Details\06032_C-14.dwg

SEWAGE DISPOSAL SYSTEM CALCULATIONS

DESIGN FLOW

45,000 S.F. SUPERMARKET @ 97 GPD/1,000 S.F. = 4,365 GPD
112,500 S.F. (MAX) RETAIL @ 50 GPD/1,000 S.F. = 5,625 GPD
TOTAL (MAXIMUM) DESIGN FLOW: 4,365 + 5,634 = 9,990 GPD

LEACHING FIELD SIZING
SLOWEST PERCOLATION RATE IN LEACHING FIELD AREA = 15 MINUTES/INCH; FIELDS ARE DESIGNED FOR 15 MINUTES/INCH
EFFLUENT LOADING RATE FOR PRESSURE DISTRIBUTION = 0.61 GPD/S.F.

REQUIRED LEACHING AREA: $\frac{9{,}990\ \text{GPD}}{0.61\ \text{GPD/SF}} = 16{,}378$ SF

PROVIDED LEACHING AREA: 16,480 SF (2 BEDS @ 8,240 SF EACH)

DISTRIBUTION SYSTEM FOR 80 FT x 103 FT BEDS

13 LATERALS @ 6 FT O.C. 12 SPACES @ 6 FT PLUS 2 SIDES @ 4 FT

24 – ¼" HOLES @ 4 FT O.C. EACH LATERAL

312 TOTAL HOLES

1.17 GPM/HOLE @ 2.5 FT HEAD = 365 GPM
PUMPS TO BE SIZED TO PUMP 365 GPM (MIN)

DESIGN VOLUME

MAXIMUM DOSE = 8,240 SF x 1IN/FT x .5 VOID RATIO x 7.48 G/CF = 2568 GAL

FOUR DOSES/DAY = 9,990 GAL/2 BEDS/4 = 1,249 GAL (4 DOSES EACH BED)

RUN TIME 1249 GAL/365 GPM = 3.43 MIN

DOSING PUMP CHAMBER SIZING:
USE 8' DIAMETER ROUND CHAMBER
VOLUME = 376 GALLONS / VERTICAL FOOT
DOSE VOLUME: (1249/376) = 3.33 FT

RESERVE VOLUME PROVIDED BETWEEN ELEV. 132.60 – 130.80 = 1.8 FT (1.8 FT x 376 G/FT = 677 GAL*)
*BACKUP GENERATOR POWER TO BE PROVIDED

INVERT INTO CHAMBER:	132.60
LAG PUMP & ALARM:	130.80
LEAD PUMP ON:	130.30
PUMP OFF:	127.00
LOW WATER ALARM:	126.50
BOTTOM OF CHAMBER:	126.00

FRICTION LOSSES:

$$F=0.002083L\left(\frac{140}{C}\right) \times \frac{Q^{1.85}}{D^{4.8655}}$$

WHERE:
L = LENGTH
C = FRICTION FACTOR (140)
D = FORCE MAIN OR LATERAL DIAMETER
Q = PUMP DISCHARGE RATE (365 GPM)

6" FORCE MAIN (L=235') = 4.4'
6" MANIFOLD = 0.1'
2" LATERALS = 0.1'
2" RISER = 0.2'
CHECK VALVE = 4'
GATE VALVES = 2'
MINOR PUMP STATION LOSSES = 2'
TOTAL FRICTION LOSSES = 12.8 ≈ 13'
TOTAL DYNAMIC HEAD (TDH):
2' LATERAL INVERT: 136.80
PUMP OFF ELEVATION: 127.00
PUMP ON ELEVATION: 130.30
ELEVATION HEAD: 136.8 – 127.00 = 10'

TOTAL DYNAMIC HEAD (TDH):

STATIC HEAD = 10'
HEAD LOSS DUE TO FRICTION = 13'
RESIDUAL = 2.5'
TDH = 25.5' ≈ 26'

PUMP MUST PROVIDE DISCHARGE RATE OF 365 GPM @ 26 FT. TDH

USE WEIL MODEL #1620 3-INCH SUBMERSIBLE PUMP (5 HP, 1150 RPM, 3 PHASE, 208/230V, 1050 IMPELLER)

SEPTIC SYSTEM NOTES

1. ALL COMPONENTS OF THE SEPTIC SYSTEM, INCLUDING BUT NOT LIMITED TO PIPING, TANKS, PUMPS AND SOIL ABSORPTION SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH MASSACHUSETTS ENVIRONMENTAL CODE 310 CMR 15.00 (TITLE 5).

2. CONTRACTOR SHALL EXCAVATE ALL UNSUITABLE MATERIAL WITHIN THE LIMITS OF FILL BENEATH THE SOIL ABSORPTION (LEACHING) SYSTEMS. UNSUITABLE MATERIAL SHALL INCLUDE BUT NOT BE LIMITED TO VEGETATION, TOPSOIL, SUBSOIL, ORGANIC MATTER, OR ANY MATERIAL DEEMED UNSUITABLE BY THE SOILS ENGINEER. UNSUITABLE MATERIAL SHALL BE EXCAVATED A MINIMUM OF 5 FEET LATERALLY IN ALL DIRECTIONS BEYOND THE OUTER PERIMETER OF THE LEACHING AREA TO THE DEPTH OF NATURALLY OCCURRING PERVIOUS SOIL LAYER IN WHICH THE PERCOLATION TEST WAS PERFORMED AS REQUIRED BY 310 CMR 15.240.

3. CONTRACTOR SHALL TAKE PRECAUTIONS NOT TO COMPACT THE SUBGRADE OF THE LEACHING AREAS THAT ARE LOCATED OUTSIDE OF PAVED AREAS. VEHICULAR TRAFFIC AND PARKING OF VEHICLES OR EQUIPMENT IN OR ON THE AREA OF THE LEACHING SYSTEM SHALL BE AVOIDED DURING AND AFTER CONSTRUCTION OF THE SYSTEM. UNTIL RECEIPT OF A CERTIFICATE OF COMPLIANCE, THE LEACHING AREA SHALL BE STAKED AND FLAGGED TO PREVENT THE USE OF THE AREA FOR ACTIVITIES WHICH MIGHT DAMAGE THE SYSTEM. STOCKPILING OF MATERIALS OR EQUIPMENT WITHIN THE AREA IS PROHIBITED.

4. IN ACCORDANCE WITH 310 CMR 15.255 (3) AND EXCEPT WHERE OTHER MATERIALS ARE SPECIFIED, FILL MATERIAL WITHIN THE LEACHING AREA AND UP TO THE TOP OF THE PEA STONE SHALL CONSIST OF SELECT ON-SITE OR IMPORTED SOIL MATERIAL. THE FILL SHALL BE COMPRISED OF CLEAN GRANULAR SAND, FREE FROM ORGANIC MATTER AND DELETERIOUS SUBSTANCES. THE FILL SHALL NOT CONTAIN ANY FILL MATERIAL LARGER THAN 2-INCHES. A SIEVE ANALYSIS, USING A #4 SIEVE, SHALL BE PERFORMED ON A REPRESENTATIVE SAMPLE OF THE FILL. UP TO 45% BY WEIGHT OF THE FILL SAMPLE MAY BE RETAINED ON THE #4 SIEVE. SIEVE ANALYSIS ALSO SHALL BE PERFORMED ON THE FRACTION OF THE FILL SAMPLE PASSING THE #4 SIEVE, SUCH ANALYSIS MUST DEMONSTRATE THAT THE MATERIAL MEETS EACH OF THE FOLLOWING SPECIFICATIONS:

SIEVE SIZE	EFFECTIVE PARTICLE SIZE	% THAT MUST PASS SIEVE
#4	4.75 mm	100%
#50	0.30 mm	10% – 100%
#100	0.15 mm	0% – 20%
#200	0.075 mm	0% – 5%

5. PRIOR TO PLACEMENT OF THE FILL, THE BOTTOM SURFACE OF THE EXCAVATION SHALL BE SCARIFIED AND RELATIVELY DRY. FILL SHALL NOT BE PLACED DURING RAIN OR SNOW STORMS. IF THE WATER TABLE ELEVATION IS ABOVE THE EXCAVATION ELEVATION, THE EXCAVATION SHALL BE DEWATERED AS NECESSARY.

6. FILL SHALL BE SUFFICIENTLY COMPACTED TO PREVENT DEPRESSIONS DUE TO SETTLING (85% MODIFIED PROCTOR) EXCEPT IN PAVED AREAS WHERE COMPACTION SHALL BE AS SPECIFIED FOR THOSE AREAS.

7. EXCEPT IN PAVED AREAS, FILL OVER THE LEACHING AREAS SHALL BE ORDINARY FILL , CLEAN AND FREE OF BOULDERS AND STONES GREATER THAN SIX INCHES.

8. FINAL COVER OF TOPSOIL SHALL BE GRADED TO A MINIMUM SLOPE OF 2%.

9. INSPECTIONS SHALL BE COORDINATED WITH RJ O'CONNELL & ASSOCIATES AND THE BOARD OF HEALTH AGENT. ALL INSTALLATION, INSPECTIONS, AND AS-BUILT PLANS SHALL BE DONE IN ACCORDANCE WITH FOXBORO BOARD OF HEALTH ON-SITE SEWAGE DISPOSAL SYSTEM REGULATIONS.

10. CONTRACTOR SHALL INSTALL ONE PERMANENT BENCHMARK WITHIN 50 TO 75 FEET OF THE SEWAGE DISPOSAL SYSTEM. LOCATION AND ELEVATION OF BENCHMARK SHALL BE SHOWN ON AS-BUILT PLAN.

11. PUMPS , ALARMS AND OTHER EQUIPMENT REQUIRING PERIODIC OR ROUTINE INSPECTION AND MAINTENANCE SHALL BE OPERATED, INSPECTED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURER'S AND DESIGNER'S SPECIFICATIONS AND DEPARTMENT GUIDANCE. IN NO INSTANCE SHALL INSPECTION BE PERFORMED LESS FREQUENTLY THAN ONCE EVERY THREE MONTHS FOR A SYSTEM SERVING A FACILITY WITH A DESIGN FLOW OF 2,000 GALLONS PER DAY OR GREATER...THE SYSTEM OWNER SHALL SUBMIT THE RESULTS OF SUCH INSPECTIONS TO THE LOCAL APPROVING AUTHORITY ANNUALLY BY JANUARY 31 OF EACH YEAR FOR THE PREVIOUS CALENDAR YEAR. (310 CMR 15.254, 2.d.)

WEIL 3-Inch Discharge Submersible Pump 1620

Commercial and industrial applications.
Pump clear water, gray water and effluent.
Handles 1-inch solids from below ground utility vaults, sump pits, loading docks, etc.

Disch. Size	3 Inch
Disch. Type	Weil
Solids Max.	1 Inch
Mounting Style	Floor

Pump
Case – Cast Iron
Impeller – Cast Iron
Stainless Steel Hardware

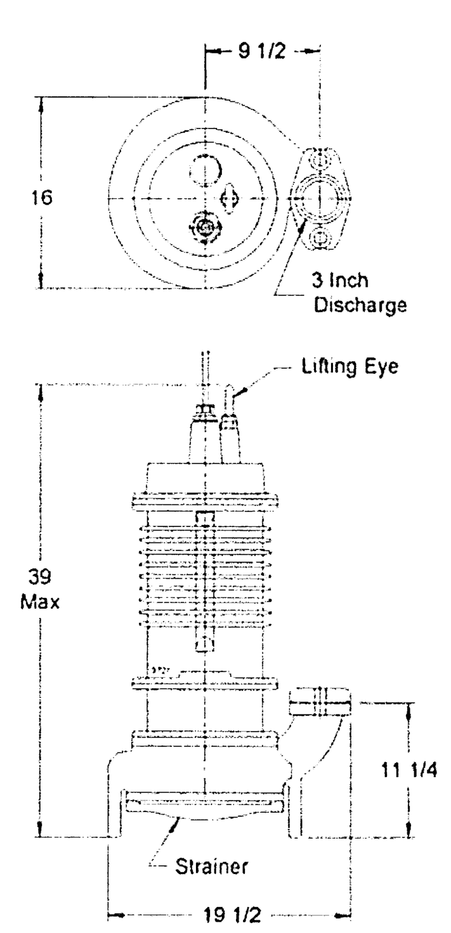
Strainer – Cast Iron

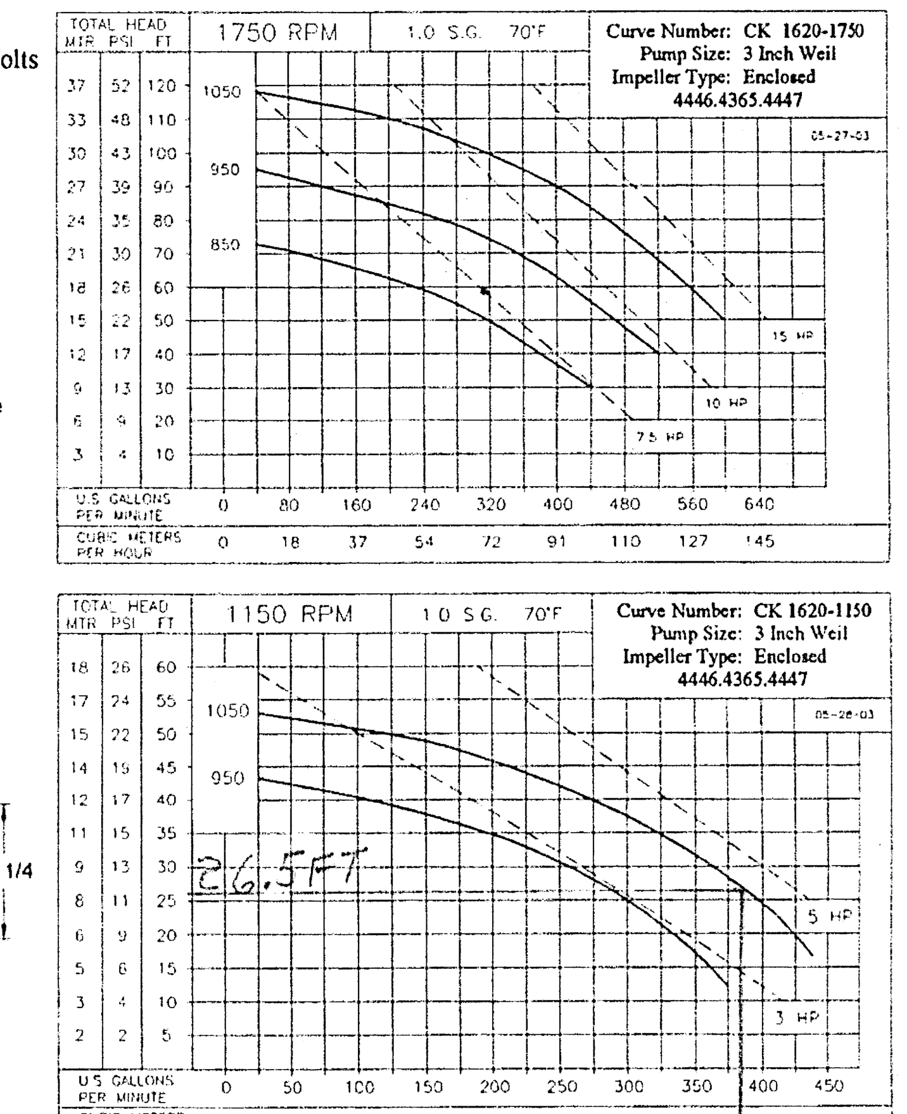
Options
- Bronze impeller
- UL Explosion-Proof Motor
- Moisture Sensor and Temperature Limiter
- Additional Power Cable Lengths
- Stainless Steel Lifting Cable

Motor
Double Seal – Tandem
- Upper – Carbon against Ceramic
- Lower – Silicon Carbide against Silicon Carbide

Air-Filled Hermetically Sealed
Shaft – Stainless Steel Series 300
Motor Shell – Cast Iron
Insulation – Class F
Ball Bearings – 2 Double Sealed
Power Cord Length – 25 ft.
Three phase motor
- 1150 and 1750 RPM
- 60 Hz, 208-230 or 460 volts

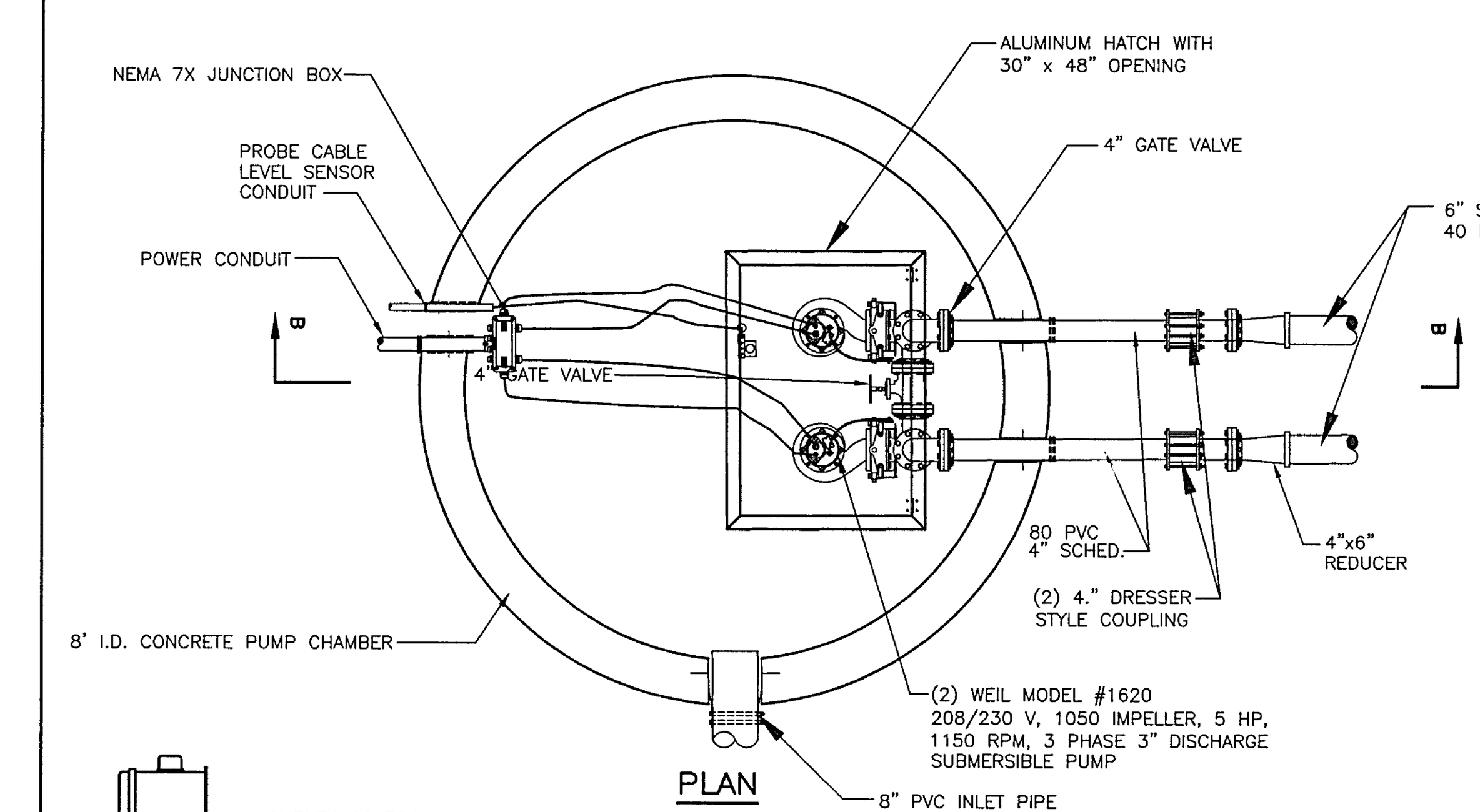
Disch. Location	Minimum Basin Dia. Simplex	Duplex
Above Grade	30 Inches	42 Inches
Below Grade	30 Inches	42 Inches

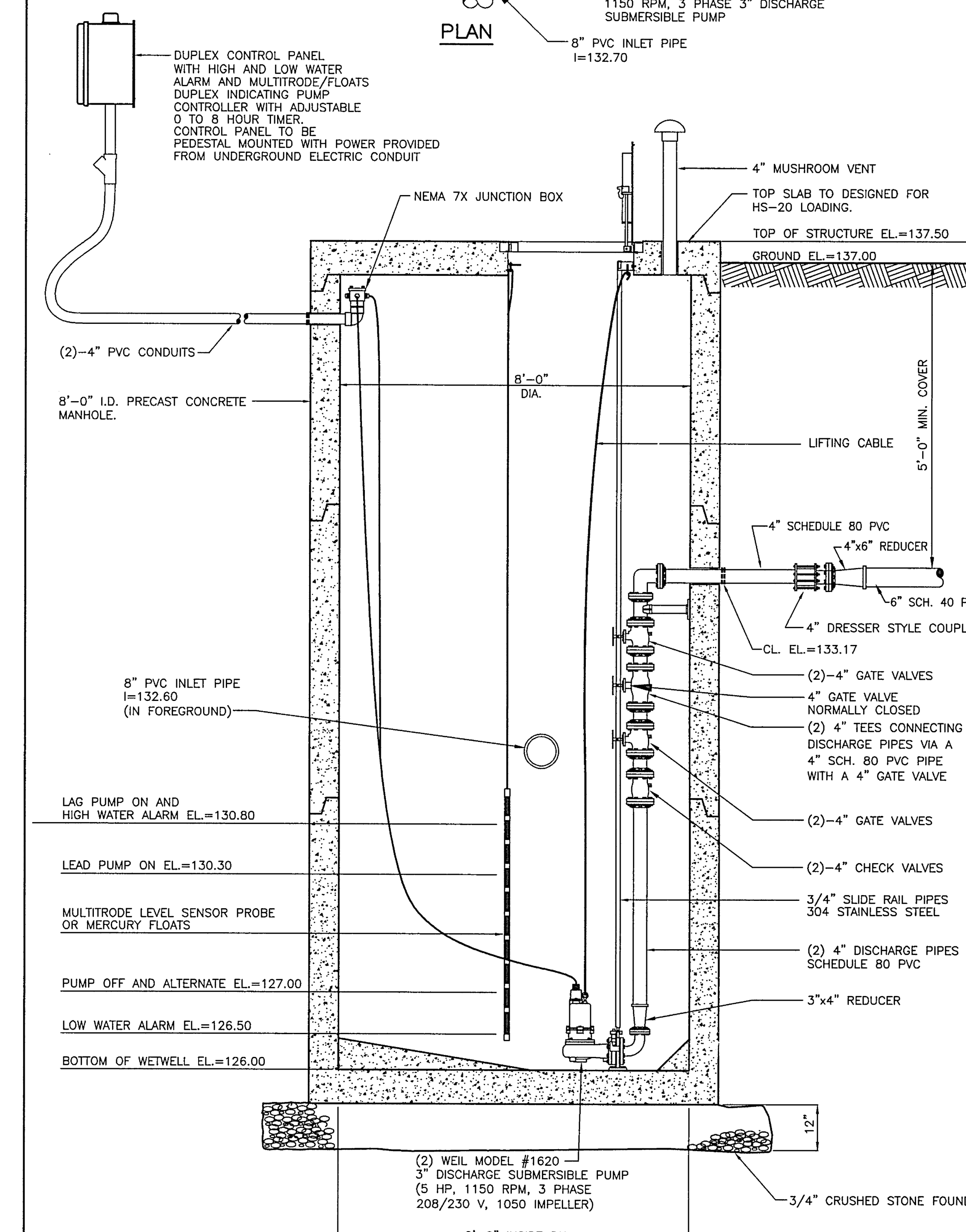




Replaces SN-1620, April 1, 2003 SN-1620 FEBRUARY 2, 2004 1620

NOTES:
1. IF GROUNDWATER IS ENCOUNTERED, THE EXCAVATION SHALL BE KEPT IN A "DEWATERED" STATE UNTIL ALL BACKFILL HAS BEEN PLACED AND COMPACTED.
2. ALL ELECTRICAL SYSTEMS AND COMPONENTS INSIDE THE PUMP CHAMBER SHALL COMPLY WITH THE NEC REQUIREMENTS FOR CLASS 1, GROUP D, DIVISION1 ENVIRONMENTS AND SHALL BE SUITABLE FOR USE UNDER CORROSIVE CONDITIONS.
3. PUMP CHAMBER AND HATCH TO BE DESIGNED TO HANDLE HS-20 LOADING.
4. THE PUMP CONTROLLER SHALL INCLUDE SEPARATE PUMP RUN TIME METERS FOR EACH PUMP.
5. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL, ALL PUMP SPECIFICATIONS INCLUDING PUMP PERFORMANCE CURVES. THE PUMPS SHALL HAVE A CAPACITY OF 365 GPM AT 26 FEET TOTAL DYNAMIC HEAD. THE CONTRACTOR SHALL VERIFY THE TOTAL DYNAMIC HEAD REQUIRED FOR 365 GPM AND SUBMIT CALCULATIONS TO THE ENGINEER FOR REVIEW AND APPROVAL.
6. THE CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF THE OPERATION AND MAINTENANCE MANUALS FOR THE PUMP STATION TO THE OWNER BEFORE FINAL ACCEPTANCE AND OPERATION.
7. THE CONTRACTOR SHALL SUBMIT BUOYANCY CALCULATIONS FOR THE PUMP STATION TO THE ENGINEER FOR APPROVAL, AND SHALL INCLUDE THE SIZE OF CONCRETE ANCHOR SLAB TO PREVENT FLOTATION IF REQUIRED. THE CONTRACTOR SHALL DESIGN THE STRUCTURAL CONNECTIONS BETWEEN THE PUMP CHAMBER AND CONCRETE ANCHOR SLAB. SHOP DRAWINGS SHALL BE STAMPED BY A REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED TO THE ENGINEER FOR APPROVAL.
8. AS REQUIRED BY MA TITLE 5, THE PUMP AND ALARMS MUST BE ON SEPARATE ELECTRICAL CIRCUITS.
9. LEVEL CONTROL SHALL INCLUDE PUMP OFF/LEAD PUMP ON/LAG PUMP ON SWITCHES. LEAD AND LAG PUMP MUST ALTERNATE EVERY PUMP CYCLE.





SECTION A–A

(1) SEPTIC SYSTEM PUMP STATION
SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
BRIAN P. DUNDON
CIVIL
No. 41505
REGISTERED PROFESSIONAL ENGINEER
9-29-08

ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHESKEY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

Proponent:
Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

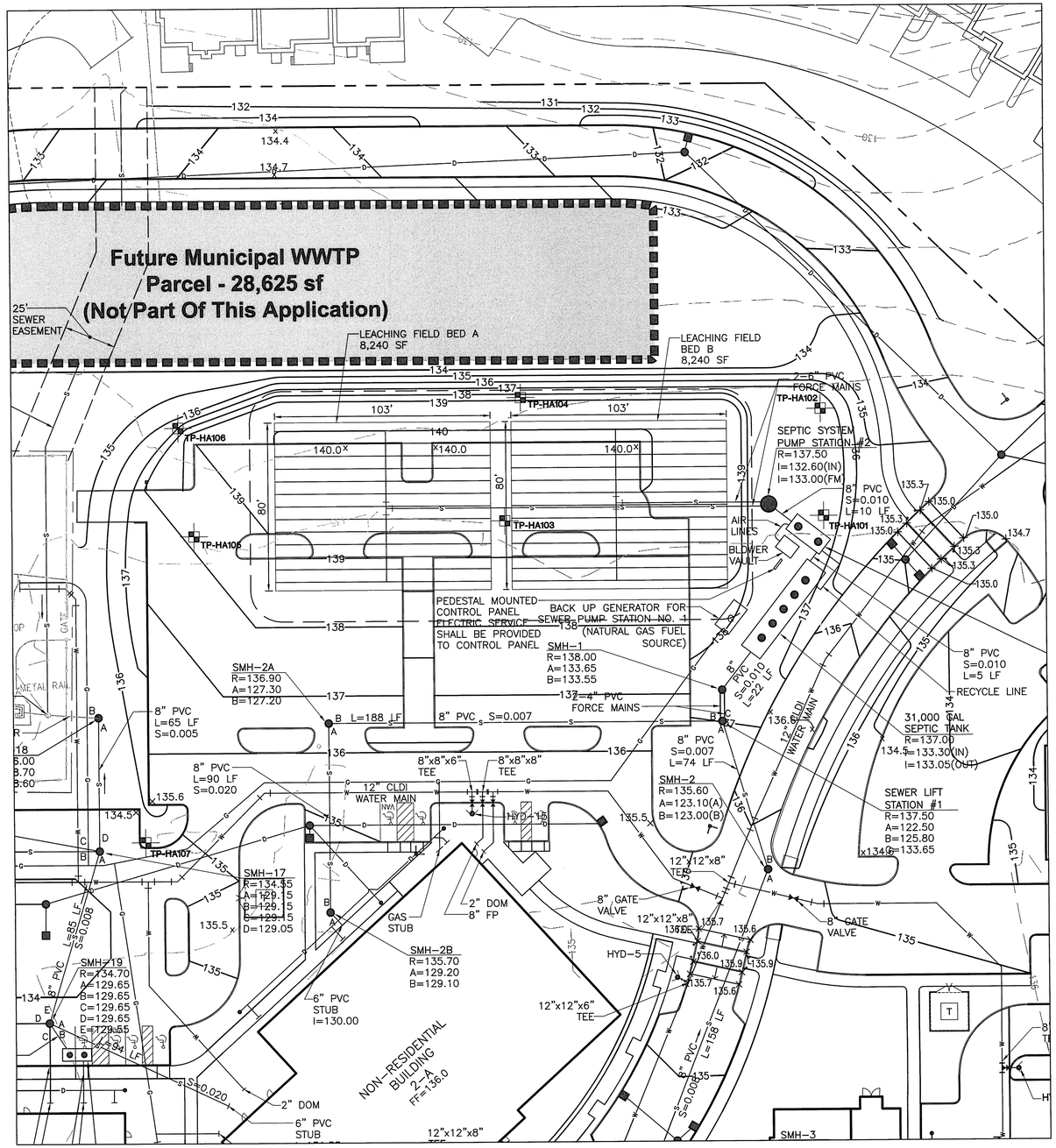
Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	CAD/BPD
Issue Date:	2 JUNE 2008
Revision:	Date:
REISSUED FOR SITE PLAN APPROVAL	9/29/08

Project:
Wayland Town Center
400 Boston Post Road
Wayland, Massachusetts

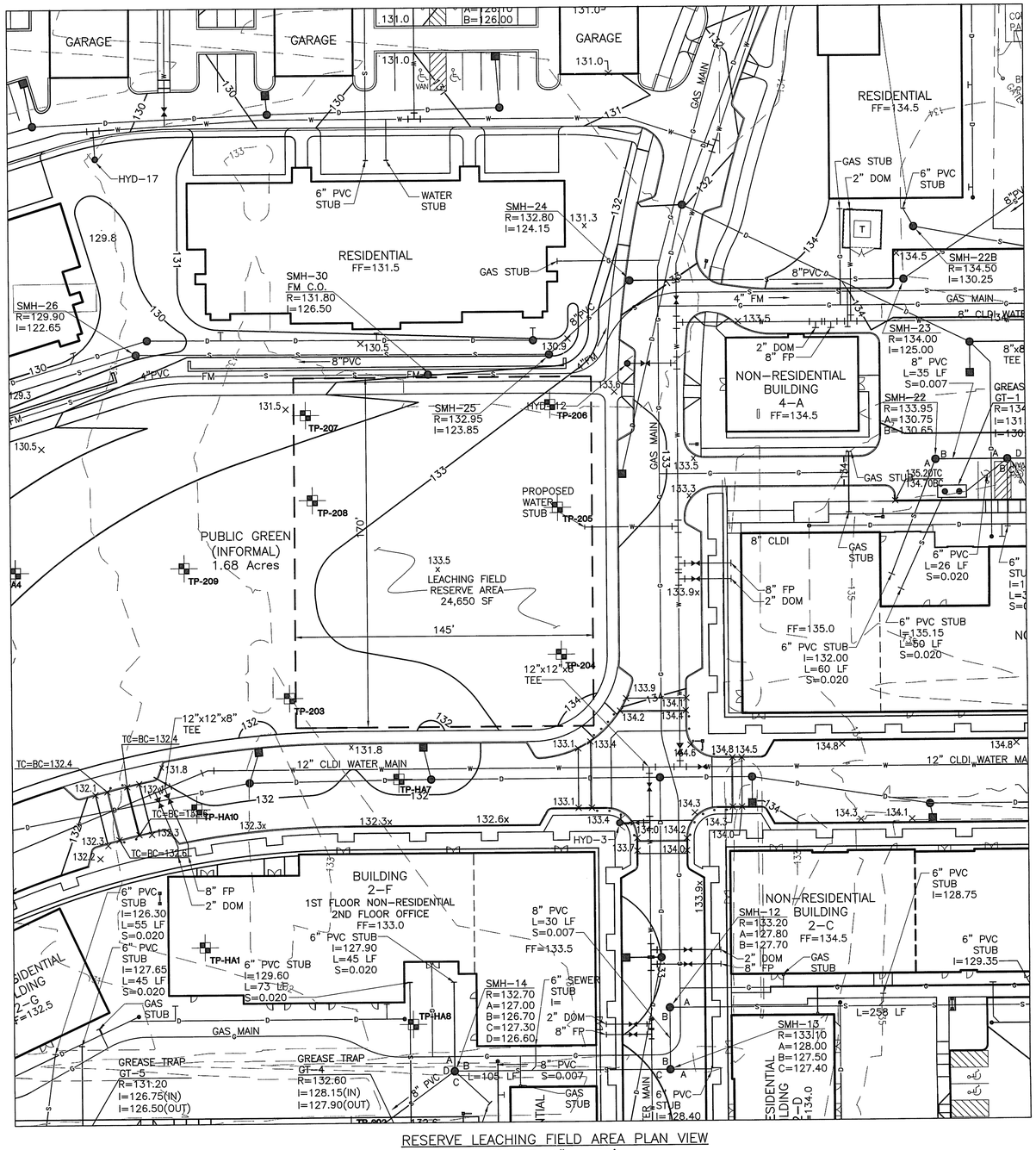
Site Plan II
Phase I Site Plan Application

Drawing Title:
SEPTIC SYSTEM PUMP STATION #2 DESIGN

Drawing Number
SCALE N.T.S.
C-15



PRIMARY LEACHING FIELD PLAN VIEW
SCALE: 1" = 30'



RESERVE LEACHING FIELD AREA PLAN VIEW
SCALE: 1" = 30'

ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHELSKY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

COMMONWEALTH OF MASSACHUSETTS
BRIAN P. DUNDON
CIVIL
No. 41505
REGISTERED PROFESSIONAL ENGINEER
9-29-08

Proponent:
Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	CAD/BPD
Issue Date:	2 JUNE 2008
Revision:	Date:
REISSUED FOR SITE PLAN APPROVAL	9/29/08

Project:
Wayland Town Center
400 Boston Post Road
Wayland, Massachusetts

Site Plan II
Phase I Site Plan Application

Drawing Title:
SEPTIC SYSTEM PLAN VIEW

Drawing Number
SCALE N.T.S. C-16

Drawing name: G:\MA\Wayland\Great Island\Town Center\Main\Details\G6032_C-16.dwg
Drawing Number: MA\Wayland\Great Island\Town Center\Main\Details\G6032_C-16.dwg

SEWER PUMP STATION NO.3 DESIGN CALCULATIONS

GRAVITY FLOW INTO PUMP STATION = 60,000 GPD

PEAK INFLOW RATE W/3.2 PEAK FACTOR

$$\frac{3.2 \times 60{,}000 \text{ GPD}}{24 \text{ HR/DAY} \times 60 \text{ MIN/ HR}} = 134 \text{ GPM}$$

FLOW DESIGN FOR 4" SDR-21 PVC FORCE MAIN @ 3 FPS = 122 GPM (USE 135 GPM PUMP RATE)

PUMP CHAMBER AT 6' DIAMETER @ 211 GAL/FT

PUMP CYCLE VOLUME

3.5 TO 4 MIN PUMP RUN = 473 TO 540 GAL

USE 2.5' PUMP VOLUME @ 527 GAL = 3.91 MIN RUN

LOWEST INVERT @ 122.00

LAG PUMP/ALARM @ 121.50
LEAD PUMP ON @ 121.00
DESIGN STATIC @ 118.50
PUMP OFF @ 118.50
LOW WATER ALARM @ 118.00
BOTTOM OF CHAMBER @ 117.50

DISCHARGE @ 129.15
STATIC = 11' 129.15-118.50
850'-4" PIPE LOSS @ 135 GPM = 9.72' (USE 10')
MINOR STATION LOSS = 3'
TDH = 24 FT
PUMP RATE = 135 GPM @ 24 FT TDH

WEIL 4-Inch Discharge Submersible Pump 2519

Commercial and industrial applications.
Pump clear water, gray water, effluent and wastewater.
Handles 3-inch solids from commercial and institutional wastewater wet wells, etc.

Disch. Size	4 Inch
Disch. Type	ANSI
Solids Max.	3 Inch

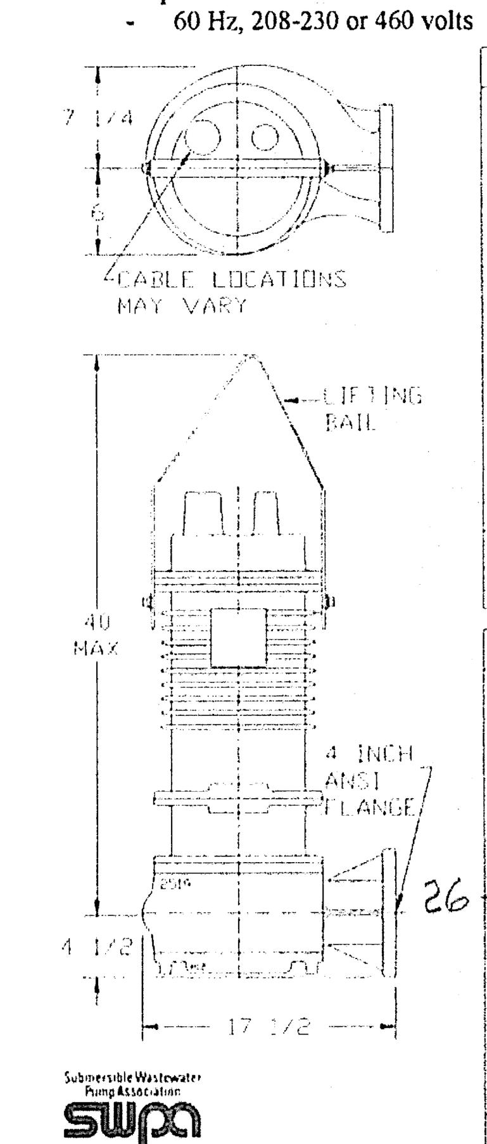
Mounting Style 2613 Removal

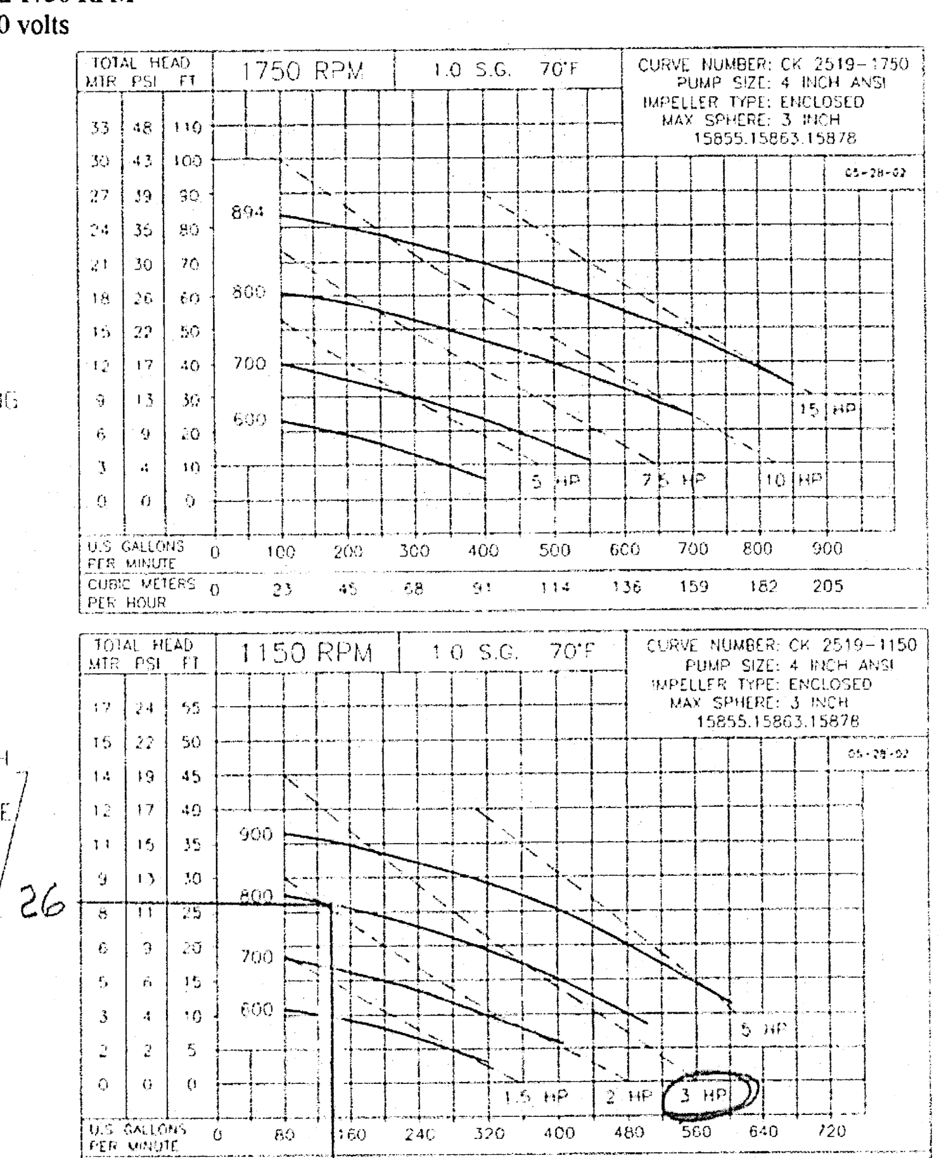
Pump
- Case – Cast Iron
- Impeller – Cast Iron
- Stainless Steel Hardware
- Stainless steel lifting cable – 20 feet

Motor
- **Double Seal – Tandem**
  - Upper – Carbon against Ceramic
  - Lower – Silicon Carbide against Silicon Carbide
- **Air-Filled, Hermetically Sealed**
- **Shaft – Stainless Steel Series 300**
- Motor Shell – Cast Iron
- Insulation – Class F
- Ball Bearings – 2 – Double Sealed
- Power Cord Length – 25 ft.
- Three-phase motor – 1150 and 1750 RPM
  - 60 Hz, 208-230 or 460 volts

Options
- Bronze impeller
- UL Explosion-Proof motor
- Moisture Sensor and Temperature Limiter
- Additional power cable lengths

Disch. Location	Minimum Basin Dia.	
	Simplex	Duplex
Above Grade	42 Inches	54 Inches
Below Grade	42 Inches	60 Inches

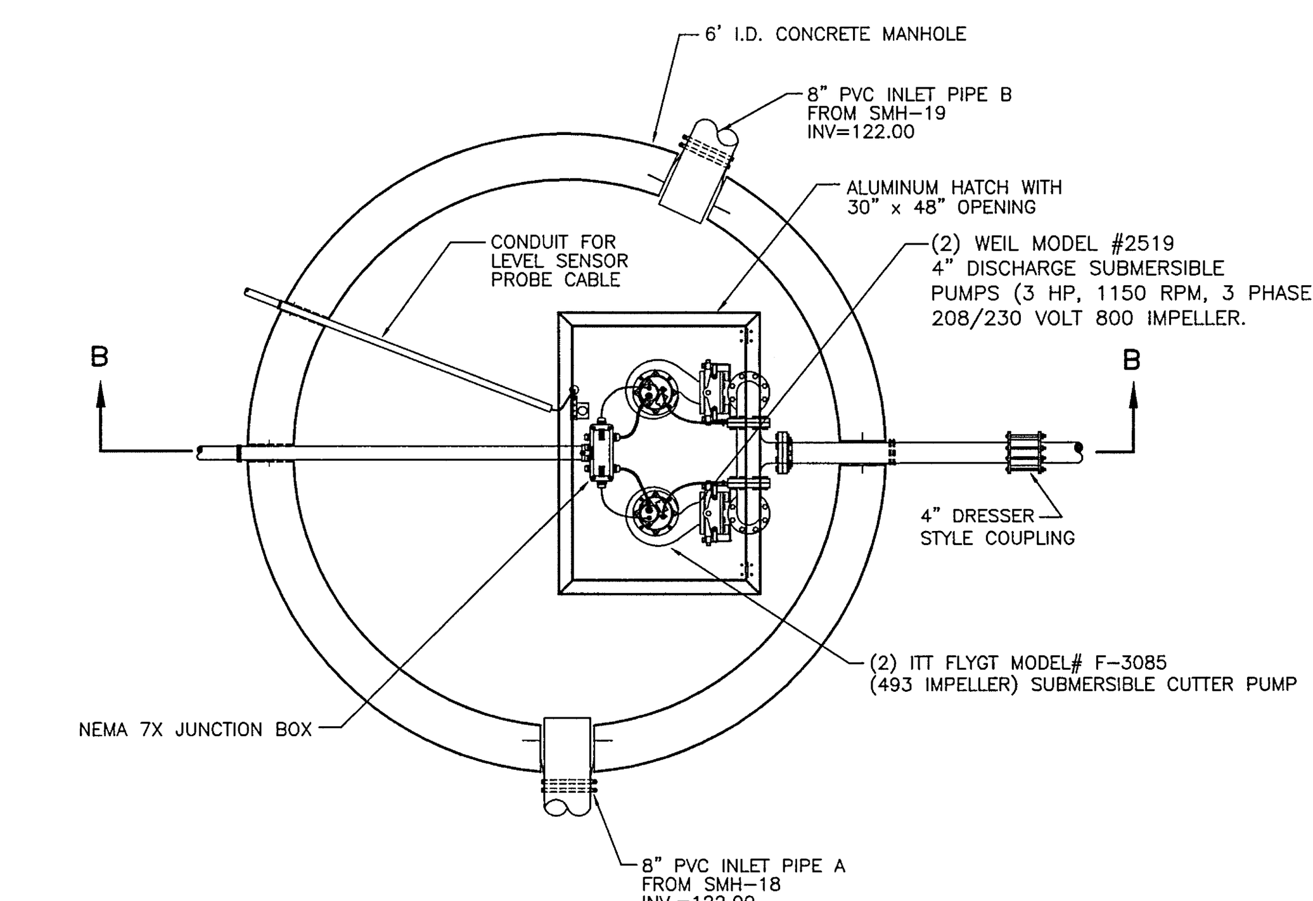




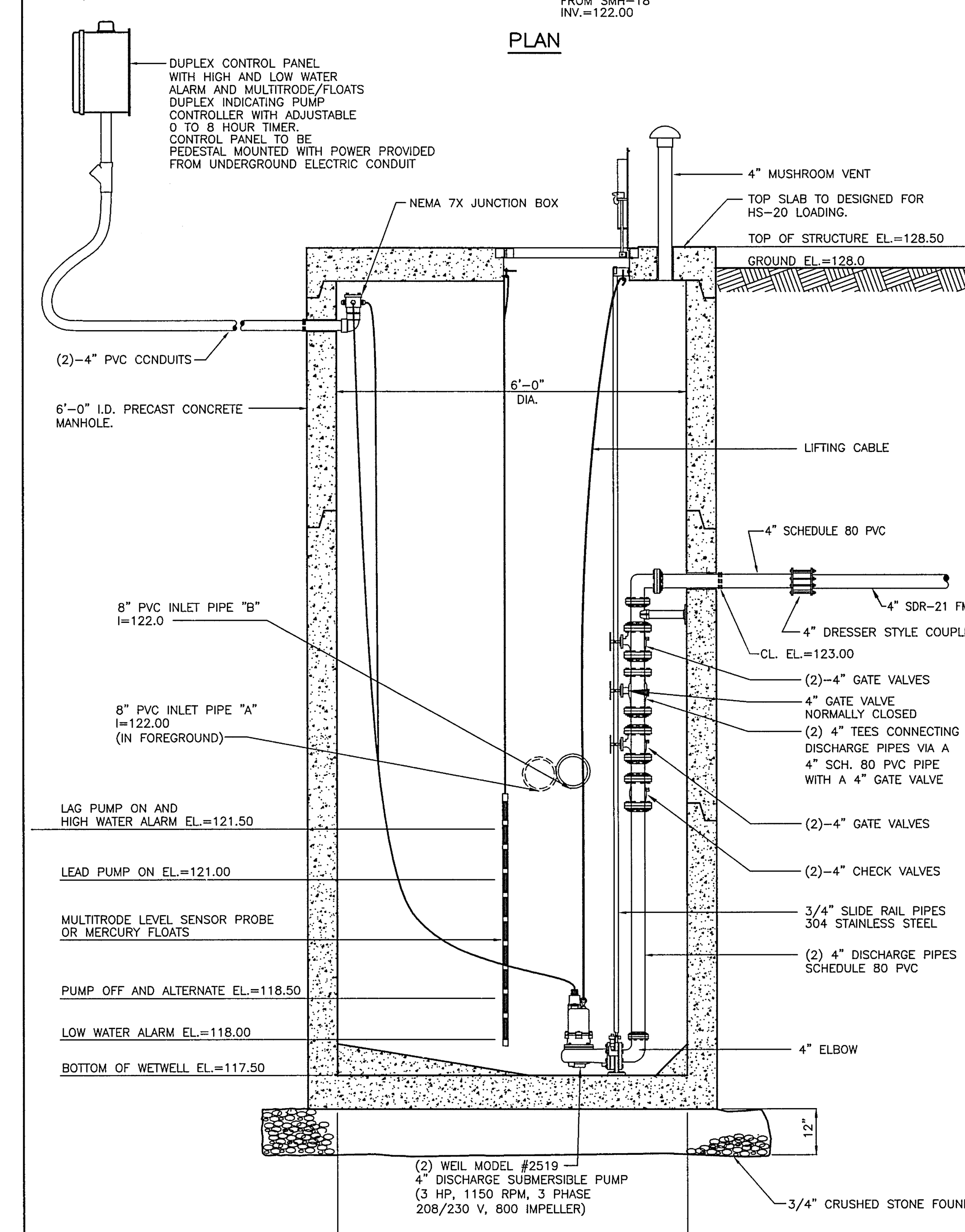
X Replaces SN-2519, July 1, 2001 SN-2519 FEBRUARY 2, 2004 2519

NOTES:

1. IF GROUNDWATER IS ENCOUNTERED, THE EXCAVATION SHALL BE KEPT IN A "DEWATERED" STATE UNTIL ALL BACKFILL HAS BEEN PLACED AND COMPACTED.
2. ALL ELECTRICAL SYSTEMS AND COMPONENTS INSIDE THE PUMP CHAMBER SHALL COMPLY WITH THE NEC REQUIREMENTS FOR CLASS 1, GROUP D, DIVISION1 ENVIRONMENTS AND SHALL BE SUITABLE FOR USE UNDER CORROSIVE CONDITIONS.
3. PUMP CHAMBER AND HATCH TO BE DESIGNED TO HANDLE HS-20 LOADING.
4. THE PUMP CONTROLLER SHALL INCLUDE SEPARATE PUMP RUN TIME METERS FOR EACH PUMP.
5. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL, ALL PUMP SPECIFICATIONS INCLUDING PUMP PERFORMANCE CURVES. THE PUMPS SHALL HAVE A CAPACITY OF 135 GPM AT 25 FEET TOTAL DYNAMIC HEAD. THE CONTRACTOR SHALL VERIFY THE TOTAL DYNAMIC HEAD REQUIRED FOR 135 GPM AND SUBMIT CALCULATIONS TO THE ENGINEER FOR REVIEW AND APPROVAL.
6. THE CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF THE OPERATION AND MAINTENANCE MANUALS FOR THE PUMP STATION TO THE OWNER BEFORE FINAL ACCEPTANCE AND OPERATION.
7. THE CONTRACTOR SHALL SUBMIT BUOYANCY CALCULATIONS FOR THE PUMP STATION TO THE ENGINEER FOR APPROVAL, AND SHALL INCLUDE THE SIZE OF CONCRETE ANCHOR SLAB TO PREVENT FLOTATION IF REQUIRED. THE CONTRACTOR SHALL DESIGN THE STRUCTURAL CONNECTIONS BETWEEN THE PUMP CHAMBER AND CONCRETE ANCHOR SLAB. SHOP DRAWINGS SHALL BE STAMPED BY A REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED TO THE ENGINEER FOR APPROVAL.
8. AS REQUIRED BY MA TITLE 5, THE PUMP AND ALARMS MUST BE ON SEPARATE ELECTRICAL CIRCUITS.
9. LEVEL CONTROL SHALL INCLUDE PUMP OFF/LEAD PUMP ON/LAG PUMP ON SWITCHES. LEAD AND LAG PUMP MUST ALTERNATE EVERY PUMP CYCLE.

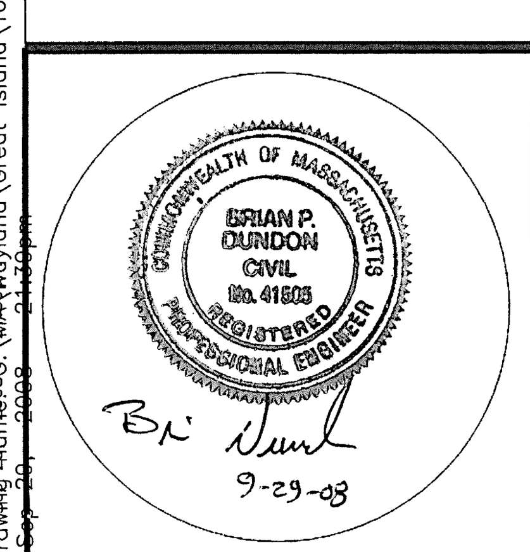


PLAN



SECTION B-B

(1) SEWER PUMP STATION #3
SCALE: N.T.S.



ARROWSTREET
Architecture
Urban Design
Planning
Graphics and Interiors
212 Elm Street Somerville MA 02144
617.623.5555 fax:617.625.4646
www.arrowstreet.com

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE. STONEHAM, MA 02180
PHONE: 781 279 0180 FAX: 781 279 0173

SHESKEY ARCHITECTS
14 Franklin Street
Quincy, MA 02169

Proponent:
Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

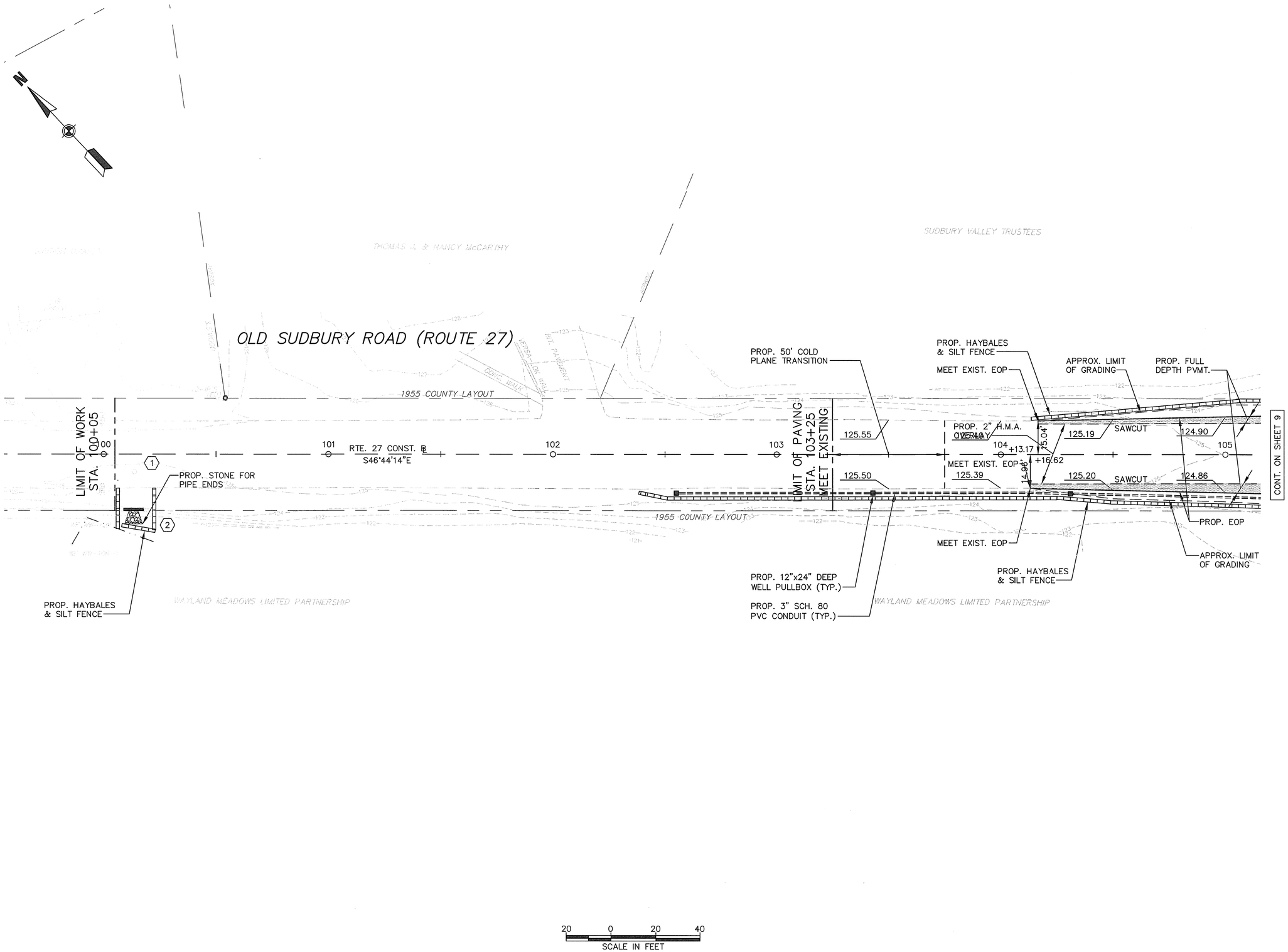
Project No:	RJOC 06032
Drawn By:	WJH
Checked By:	CAD/BPD
Issue Date:	2 JUNE 2008
Revision:	Date
REISSUED FOR SITE PLAN APPROVAL	3/29/08

Project:
Wayland Town Center
400 Boston Post Road
Wayland, Massachusetts

Site Plan II
Phase I Site Plan Application

Drawing Title:
SEWER PUMP STATION # 3 DESIGN

Drawing Number
SCALE N.T.S.
C-17



Copyright © 2008 by VAI. All Rights Reserved.

T:\5139\R+27\v3-PS&E\5139CTv3.dwg 8/26/2008 4:16:49 PM EDT

PROJECT TITLE

Wayland Town Center Off-Site Improvements

Wayland,
Massachusetts

PREPARED FOR

Twenty Wayland, LLC

Boston,
Massachusetts

Vanasse & Associates, Inc.
Transportation Engineers & Planners

ANDOVER, MASSACHUSETTS
10 N.E. BUSINESS CENTER DRIVE
ANDOVER, MA 01810-1066
TEL: (978) 474-8800
FAX: (978) 688-6508

FORT MYERS, FLORIDA
12730 NEW BRITTANY BLVD., SUITE 600
FORT MYERS, FL 33907
TEL: (239) 437-4601
FAX: (239) 437-4636

DESIGNED BY	JAR
DRAWN BY	JAR
CHECKED BY	FLD
DATE	OCTOBER 2008
SCALE	1" = 20'
STAMP	

REVISIONS

NO.	DESCRIPTION	DATE

DRAWING TITLE

Curb Tie & Grading Plan

SHEET 8 OF 19	DRAWING NUMBER
JOB NO. 5139	8
CAD 5139CTv3	

Stormwater Management Study

Wayland Town Center
Wayland, MA

Applicant:
Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Prepared by:
R.J. O'Connell & Associates, Inc.
80 Montvale Avenue
Stoneham, MA 02180

Date: **June 2, 2008**

TABLE OF CONTENTS **Page**

I. STORMWATER MANAGEMENT NARRATIVE

II. FIGURES

III. APPENDICES

I. STORMWATER MANAGEMENT NARRATIVE

1.0 Project Location and Description

The project site has an area of approximately 56.9 acres and is located at 400 Boston Post Road, in Wayland, MA (See Figure 1 - Locus Map). The site is bound by Route 20 (Boston Post Road) to the south, the Wayland Business Center property to the North, Sudbury River to the west and the Wayland meadows property and Route 27 (Old Sudbury Road) to the East. There are wetland areas on the site. The larger wetland is located at the western portion of the site adjacent to Sudbury River, two smaller wetland areas are at the north east portion of the site adjacent to the Wayland Business Center property, and on the south east portion of site adjacent to Route 20.

Approximately 25 acres of the site is currently developed. The existing development contains a building formerly occupied by Raytheon with a footprint area of ±272,700 square feet and a ±10,500 square foot building formerly utilized as a daycare center and associated parking. There is a Wastewater Treatment facility on site which is owned and operated by the Town of Wayland. The existing topography of the project site generally slopes east to west and ranges from elevation ±146 at the eastern property line adjacent to the Wayland Meadows Property to elevation ±116 at the western side of the site in the large wetland area adjacent to Sudbury River.

The proposed development program consists of demolishing the existing ±272,700 square foot building and constructing a mixed use development consisting of residential, municipal and retail use buildings, with associated parking facilities, utilities, and stormwater collection system (See Figure 2 - Site Plan). The stormwater management system for the proposed project has been designed in accordance with the MADEP's Stormwater Management Policy and Standards and the Town of Wayland's Wetlands and Water Resources Bylaw Chapter 194 Rules and Regulations.

Stormwater quality control will be achieved through a program of Best Management Practices (BMP's). The proposed stormwater management system will significantly improve the quality of the stormwater runoff. The existing pavement runoff drains to catch basins which direct runoff to wetland resource areas without additional water quality treatment. The proposed stormwater management system for the project will include new catch basins with deep sumps and hoods, and the use of innovative low impact development (LID) techniques.

Low Impact Development is a stormwater management approach with the goal to mimic the site's pre-development hydrology. This is done by using design techniques that infiltrate, filter, store, and detain water throughout the site using decentralized micro-scale controls. LID includes structural and non-structural strategies such as retention areas, reduction of impervious surfaces, lengthening of flow paths, and the preservation of existing vegetation and landscape features. Redevelopment and improving stormwater quality of existing sites, and energy and water conservation are also examples of LID techniques.

LID techniques proposed for the project include the use of water quality swales, rain gardens, and bio-retention basins to increase times of concentration, promote groundwater recharge, and enhance water quality. The water quality swales will be planted with grass on the bottom and sides to slow the runoff velocity and filter pollutants. The rain gardens and bio-retention basins will be planted with a combination of grasses, perennials, shrubs, and small trees. The clean stormwater runoff from the building rooftops will be directed to the water quality swales and bio-retention basins to provide additional groundwater recharge.

Based on a review of The National Flood Hazard Insurance Rate Map for the Town of Wayland, Massachusetts, Community Panel No 250224 0002 C, Dated (Revised) February 19,1986, the project site is located within the following zones:

Zone A - Area of 100 year flood
Zone B – Area between 100 year and 500 year floods
Zone C - Area of Minimal Flooding

2.0 Design Objectives and Methodologies

The stormwater management system was designed to control post-development peak runoff from the site by keeping it at or below the levels of pre-development. This was done by analyzing the 2-year, 10-year, and 100-year 24-hour storm events using the Hydraflow Hydrographs 2004 computer program. Hydraflow uses TR-20, the SCS Unit Hydrograph method (an industry accepted method) capable of developing runoff hydrographs for both simple and complex drainage basins. Hydraflow computes SCS Method Runoff Hydrographs by convoluting a rainfall hyetograph through a unit hydrograph.

Utilizing the TR-20 method in Hydraflow, the following data is necessary for input:

Watershed Area: Areas of each watershed are calculated and expressed in acres for these calculations.
SCS Curve Number (CN): Based on the cover type and hydrologic soil group, a weighted curve number (CN) was determined for each of the existing watersheds utilizing Table 2-2a- *Runoff Curve Numbers For Urban Areas* and *Worksheet 2, Runoff Curve Number and Runoff* from the Soil Conservation Service Technical Release 55 – Urban Hydrology for Small Watersheds
Time Interval (Minutes): For the most compatible results with the existing conditions, this value is defined at 2 minutes.
Time of Concentration, Tc (Minutes): The time of concentration for each watershed was determined by finding the time necessary for runoff to travel from the hydraulically most distant point in the watershed to the point of concentration. Time of concentrations were calculated using TR-55 worksheets with a minimum recommended time of concentration of 6 minutes.
SCS 24-Hour Storm Type: For the greater New England region, a Type III storm is recommended for drainage calculations.
Rainfall Precipitation: Rainfall precipitations for the 2, 10, and 25 year, 24-hour storm events were obtained using Figure B-1 from Technical Paper No. 40 (TP-40) Rainfall Frequency Atlas of the United States and are as follows for Wayland, MA:

2-year storm event: 3.1 inches
10-year storm event: 4.5 inches

As per Town of Wayland Wetland regulations, a 24 hour storm event with a depth of 1 inch will be required as part of the analysis. The minimum depth for a 24 hour 100 year storm depth will be 7 inches as per the Town of Wayland Wetland Regulations.

An on-site subsurface storm drainage collection system was designed to carry a minimum 25-year storm event through the site using the Hydraflow Storm Sewers Program. This program uses the Rational Method for estimating runoff and storm drainage pipes are sized based on calculated flows using Manning's Equation (See Appendix C for Pipe Sizing Calculations).

The site was divided into sub-areas, each contributing runoff to an individual catch basin inlet or roof drain. A value for area, time of concentration, and a runoff coefficient were calculated for each contributing sub-area. Rainfall intensities are calculated based on regional precipitation values provided in Technical Memorandum Hydro-35.

3.0 Existing Soils

The Soil Survey of Middlesex County, Massachusetts, completed by the National Resource Conservation Service (NRCS, formerly the Soil Conservation Service), was reviewed for general information on the soils within the site area (See Figure 3 - Soil Map). The mapped soils shown within the site limits are identified as follows:

Soil Number	Soil Type	Hydrologic Group
255A	Windsor Loamy Sand, 0 to 3 percent slopes	A
256A	Deerfield Loamy Sand, 0 to 3 percent slopes	B
602	Urban Land	Null
36A	Saco Mucky Silt Loam, 0 to 1 percent slopes	D

The soils surrounding the mapped urban land consists primarily of consist primarilyof Windsor Loamy Sand (hydrologic group A). Borings done on site in the areas mapped as urban land indicate that the soils consist of loamy sands which are consistent with hydrologic group A soils. For hydrology calculations, the soils mapped as urban land was assumed to be hydrologic group A soil.

4.0 Existing Conditions Runoff

The existing topography and land cover has been analyzed and 6 watershed areas were delineated with a combined area of ±43 acres for stormwater runoff. The watershed areas consist of the project site as well as any contributing off-site areas that direct runoff onto the project site. Six analysis points corresponding to the watersheds were used for determining the existing runoff leaving the site. The same points were used for the proposed runoff leaving the site to ensure that there will be no increase in peak runoff rates for the 2, 10, 25, and 100 year, 24 hour design storms (see Figure 4 – Pre-development watershed).

Watershed EW-1 is 17.05 acres and is predominantly impervious, consisting of the 6.26 acres of roof area of the existing Raytheon building, sidewalks and landscaped islands, a small area of runoff from offsite and a large portion of the existing parking lot. Runoff currently travels east to west and is captured by a number of catch basins and piped to a 36"combined sewer and storm pipe which discharges into the large wetland.

Watershed EW-2 has an area of 4.11 acres and consists mainly of paved areas with a small portion of a landscaped island and the roof runoff from the existing 10,500 square foot building. Runoff sheet flows northwest and is collected by catch basins and discharges directly into the wetland through an existing 18" storm pipe.

Watershed EW-3 is 12.31 acres in size and groundcover is predominantly previous consisting of grass, brush, woods and a small portion of the existing paved area. Runoff from this watershed is overland flow,

which travels east to west directly into the existing wetland without any stormwater collection system capturing the runoff.

Watershed EW-4 has an area of 1.58 acres and is made up of the existing paved area and grass lawn area. Runoff currently sheet flows southwest into two ponds which are separated by the existing driveway entrance from Route 20 (Boston Post Road). These two ponds are connected by a culvert under the driveway and have no outlet, therefore during a large storm event, the ponds will overflow into Route 20.

Watershed EW-5 (EW-5A and EW-5B) is 8.08 acres in size and is consists of pavement, lawn, and brush areas. The existing Wayland Wastewater treatment plant is part of this watershed and a portion of runoff from off-site areas contributes to this watershed. Runoff from Watershed EW-5A is sheet flow which eventually flows north to the Wayland Commons property. Runoff from EW-5B consists of the Route 27 driveway and off-site areas. This runoff is collected in swales and a drainage culvert and flows to the wetland system north of the site.

Watershed EW-6 has an area of 2.83 acres, and is made up of the existing access driveway at the south east corner of the Raytheon Building and thick brush along the south east corner of the property. Runoff sheet flows south directly into the existing wetland located at the south-east corner of the property.

Table 4.1: The existing peak rates of stormwater runoff leaving the site are summarized as follows:

Analysis Point	Contributing Watersheds	1-inch (CFS)	2-YEAR (CFS	10-YEAR (CFS)	100-YEAR (CFS)	Receiving Watershed
Analysis Point 1 Existing 36" CMP combined storm/sewer culvert at Wetland	EW-1	3.3	31.7	53.1	91.5	Wetland system west of site
Analysis Point 2 Existing Culvert at Wetland	EW-2	<1.0	8.3	13.8	23.8	
Analysis Point 3	EW-1, EW2, EW-3	4.1	39.4	66.8	120.3	
Analysis Point 4 Overland flow southeast to Boston Post Road	EW-4	0	0	0	0	Boston Post Road
Analysis Point 5 Overland flow to wetland system north of site	EW-5	0	<1.0	1.4	8.6	Wetland system north of site
Analysis Point 6 Overland flow southeast to existing wetland	EW-6	0	1.1	4.0	10.7	Wetland system south of site

5.0 Proposed Conditions Runoff

The proposed site was also broken up into five watersheds with a combined area of ±43 acres (See Figure 5 – Proposed Watershed Plan). Proposed watershed 4 was removed as there is no proposed runoff to Route 20. Catch basins and water quality swales and rain gardens have been designed to collect runoff and discharge into bio-retention basins which will discharge the runoff at a controlled rate. Six analysis points corresponding to the watersheds were used for determining the proposed runoff that will leave the site. The same points were used for the existing runoff leaving the site to ensure that there will be no increase in runoff rates for the 2, 10, 25, and 100 year, 24 hour design storms. A curve number and time of concentration were calculated for each watershed using Soil Conservation Service TR-55 methods (See Appendix C for Proposed Conditions Hydrology Calculations). The recommended minimum time of concentration of 6 minutes was used for watersheds PW-1, PW-2B, PW-5B, and PW-6B.

Watershed PW-1 (PW-1A and PW-1B) is made up of the proposed paved areas, sidewalks, landscaped islands, roof areas and the proposed town green area. The runoff from this watershed is collected in catch basins rain gardens and water quality swales and directed to Basin 2. Runoff from Basin 2 is discharged into the large wetland located at the western portion of the site (Analysis Point 1).

Watershed PW-2 is made up of paved areas, sidewalks, one roof area and landscaped areas located at the southern portion of the site. The total area of the watershed is 1.31 acres. The majority of the runoff from PW-2 is collected in the existing basins located at the southern portion of the site adjacent to Rte 20. Runoff is discharged into an existing drain pipe which discharges into the large wetland located at the western portion of the site (Analysis Point 2).

Watershed PW-3 is made up of undisturbed area consisting of grass, brush, and woods. The total area of the watershed is 7.25 acres and is located in the western portion of the site. Runoff from this watershed will continue to runoff as it does presently, which is overland flow into the large wetland (Analysis Point 3).

Watershed PW-5 (PW-5A and 5B) is made up of paved areas and grass. The total area of all watersheds in PW-5 is 10.46 acres and is located at the north-eastern portion of the site. Runoff from PW-5A is predominately sheet flow into catch basins and a water quality swale which outlets into Bio-retention Basin 3.Infiltration is the primary outlet for both basins, however overflow from these basins is discharged into the large wetland area located at the western part of the site. Runoff from PW-5B is collected in swales and catch basins and is discharged to the wetland system via overland flow and a drainage culvert.

Watershed PW-6 (PW-6A and PW-6B) is made up of paved areas, landscaped islands, rooftop, sidewalks and a small undisturbed area consisting of grass, and brush. The total area of all watersheds in PW-6 is 1.95 acres and it is located at the south eastern portion of the site. Runoff from the developed area (PW-6A) is collected in roof drains and catch basins, which outlet into Bio-retention basin 4. Runoff from the undisturbed area (PW-6B) will continue to runoff as it does presently, which is overland flow into the small wetland located at the south eastern corner of the property.

Table 5.1: The peak rates of stormwater runoff leaving the site from the proposed development are summarized as follows:

Analysis Point	Contributing Watersheds	1 inch (CFS)	2-YEAR (CFS)	10-YEAR (CFS)	100-YEAR (CFS)	Receiving Watershed
Analysis Point 1 Existing CMP combined storm/sewer culvert at Wetland	PW-1	0	16.0	33.4	64.8	Wetland system west of site
Analysis Point 2 Existing Culvert at Wetland	PW-2	0	0	0	<1.0	
Analysis Point 3 Wetlands West of Site	PW-1, PW2, PW-3	0	16.6	39.3	80.6	
Analysis Point 4 Overland flow southeast to Boston Post Road	PW-4	0	0	0	0	Boston Post Road
Analysis Point 5 Overland flow north to Wayland Meadows	PW-5	0	<1.0	1.0	2.0	Wetland system north of site
Analysis Point 6 Overland flow southeast to existing wetland	PW-6	0	1.1	2.7	5.2	Wetland system south of site

6.0 Water Quality

Stormwater quality control will be achieved through a program of Best Management Practices (BMP's). The proposed development is designed to achieve a minimum 80% total suspended solids (TSS) removal in accordance with the MA DEP Stormwater Management Standards. The development includes high-intensity use parking lots, which classify the development as a land use with higher potential pollutant loads, and the water quality volume required to be treated is equal to 1-inch times the total impervious area. The total impervious area of the site is 22.2 acres, and the water quality volume is as follows:

$$WQV = (22.2\,acres)\left(\frac{43{,}560\,sf}{1\,acre}\right)(1\,inch)\left(\frac{1\,ft}{12\,inches}\right) = 80{,}586\,cf$$

The stormwater management system has been designed to treat the entire water quality volume. This is indicated in Table 5.1, which shows that the entire 1-inch storm is treated and there is no discharge to any of the analysis points for the 1-inch storm.

Effective stormwater management practices include the use of curbing along all pavement edges, catch basins with deep sumps and hoods, and detention/infiltration devices, which will treat stormwater runoff from the proposed development and minimize potential indirect, long term impacts to down gradient resources. In addition, a sediment and erosion control plan will be implemented to protect these areas during and after construction of the proposed development.

Catch Basins:

The proposed catch basins will be equipped with deep sumps and hoods. The sumps capture sediments and coarse particles, and the hoods prevent hydrocarbons and other floatable debris from entering the drainage system, which will improve the performance of subsequent BMP's. The sump will be no less than 4' in depth and a regular maintenance schedule will be followed. A regular inspection and cleaning will ensure optimal effectiveness.

Water Quality Swales:

Water quality swales are used to provide peak runoff control as well as enhanced water quality. The swales will be planted with grass on the bottom and sides to slow the runoff velocity and filter pollutants. Runoff volume is controlled by reducing runoff velocity and promoting infiltration. Pollutant removal is achieved through sedimentation, filtration, nutrient uptake, and infiltration.

Rain Gardens:

Rain gardens are low impact development techniques that serve to promote groundwater recharge and enhance water quality. The proposed rain gardens will be located within parking lot areas and will be planted with a combination of grasses, perennials, shrubs, and wetland plantings. Rain gardens are designed to maximize the removal of pollutants from stormwater runoff through vegetation uptake, retention, and settling.

Bioretention Basins:

Bioretention basins are low impact development techniques that serve to promote groundwater recharge and enhance water quality, but at a larger scale and are designed to handle larger runoff volumes than rain

gardens. The proposed bioretention basins are essentially extended detention basins that are planted with a combination of grasses, perennials, shrubs, and wetland plantings, and are designed to maximize the removal of pollutants from stormwater runoff through vegetation uptake, retention, and settling.

TSS Removal:

There are three different treatment paths that stormwater runoff can take before being discharged off-site. The first two paths include runoff that is collected in water quality swales and rain gardens. All runoff collected in water quality swales and rain gardens will then be routed to a bioretention basin. The third path is runoff that is collected in catch basins. This runoff will then be routed to either a water quality swale or forebay for pretreatment and then to a bioretention basin. Parking lot sweeping will also be provided, but no credit for sweeping was included in TSS removal calculations.

The following tables provide the design TSS removal rates as set forth in the Massachusetts Stormwater Management Policy for the various BMP's utilized in this project:

Runoff collected in rain gardens:

BMP	Design Rate	Cumulative TSS Removal
Rain Garden	80%	80%
Bio-retention Basin	80%	96%

Runoff collected in water quality swales:

BMP	Design Rate	Cumulative TSS Removal
Water Quality Swale	70%	70%
Bio-retention Basin	80%	94%

Runoff collected in catch basins:

BMP	Design Rate	Cumulative TSS Removal
Catch Basin w/ Deep Sumps (off-line only)	25%	25%
Forebay (pretreatment calculation only)	25%	44%
Bio-retention Basin (including forebay)	80%	89%

As shown above, the proposed development will provide water quality treatment that exceeds 80% TSS removal required by the DEP Stormwater Management Standards. In addition, 44% TSS removal will be achieved prior to stormwater entering the bio-retention basins.

7.0 Groundwater Recharge

Groundwater recharge for the proposed development will be provided in accordance with the MA DEP Stormwater Management Standards. These standards require that the annual recharge from the post-development site shall approximate the annual recharge from pre-development site conditions based on soil types. For hydrologic group A soil types, the volume that is required to be recharged is equal to 0.60 inches multiplied by the increase in impervious area. The proposed development is located within hydrologic group A soils, therefore the volume required to be recharged is as follows:

Existing impervious area: ±21.8 acres
Proposed impervious area: ±22.2 acres
Increase in impervious area: ±0.4 acres

$$V = 0.4\ acres\ x\ 0.60\ inches\ x\ \frac{43{,}560\ s.f.}{1\ acre}\ x\ \frac{1\ ft.}{12\ inches} = 871\ cubic\ ft.$$

The stormwater management system will provide groundwater recharge through the use of water quality swales, rain gardens, and bio-retention basins. The static method was used to calculate recharge volumes for the bio-retention basins by determining the volume of water stored in each basin that is located below the system outlet. The recharge volumes provided in each BMP are as follows:

BMP	**Recharge Volume (cubic ft.)**
Basin 1	3,750
Basin 2	8,540
Basin 3	4,230
Basin 4	1,660
Total	18,180

As shown above, the proposed development provides a recharge volume of 18,180 cubic ft. which exceeds the 871 cubic feet required by DEP Stormwater Management Standards.

72-hour Drawdown Analysis:

As per the Massachusetts Stormwater Handbook, the recharge volume should infiltrate within 72 hours. The drawdown analysis for the static method is performed by selecting a Rawls infiltration rate (provided by the Handbook) for the existing site soils in the areas where recharge is proposed. Based on the site soils and review of the Rawls table, an infiltration rate of 2.41 inches per hour was used to determine the drawdown time for the infiltration BMP's. The drawdown time is calculated as follows:

$$DrawdownTime = \frac{Recharge\ Volume}{(Infiltration\ Rate)(1\ ft/12\ inches)(Bottom\ Area)}$$

The following table shows the calculated drawdown rate for the infiltration BMP's:

BMP	**Recharge Volume (c.f.)**	**Bottom Area (s.f.)**	**Drawdown Time (hrs)**
Basin 1	3,750	1,828	10.2
Basin 2	8,540	1,690	25.2
Basin 3	4,230	2,172	9.7
Basin 4	1,660	458	18.0

As indicated above, the recharge volume will infiltrate within 72 hours for the proposed infiltration BMP's.

8.0 Summary

The stormwater collection and management system for the proposed development will provide mitigation of post-development stormwater runoff conditions utilizing a combination of detention basins and Low Impact Development techniques and "Best Management Practices" to reduce pollutant loadings within the stormwater prior to discharging it off site.

As shown in the following summary, the proposed stormwater management system has been designed to match or reduce post development peak discharges to less than the existing rates for all modeled storms.

Analysis Point 1 - Existing 36" CMP

Summary Existing vs. Proposed Peak Discharge Rates

Storm Event:	Existing Flow (CFS)	Proposed Flow (CFS)
1-inch	3.3	0
2-year	31.7	16.0
10-year	53.1	33.4
100-year	91.5	64.8

Analysis Point 2 – Existing Culvert (Behind Daycare Building)

Summary Existing vs. Proposed Peak Discharge Rates

Storm Event:	Existing Flow (CFS)	Proposed Flow (CFS)
1-inch	<1.0	0
2-year	8.3	0
10-year	13.8	0
100-year	23.8	<1.0

Analysis Point 3 –Wetlands West of Site (Sudbury River)

Summary Existing vs. Proposed Peak Discharge Rates

Storm Event:	Existing Flow (CFS)	Proposed Flow (CFS)
1-inch	4.1	0
2-year	39.4	16.6
10-year	66.8	39.3
100-year	120.3	80.6

Analysis Point 4 - Boston Post Road

Summary Existing vs. Proposed Peak Discharge Rates

Storm Event:	Existing Flow (CFS)	Proposed Flow (CFS)
1-inch	0	0
2-year	0	0
10-year	0	0
100-year	0	0

Analysis Point 5 – Wetlands North of Site (Adjacent to Wayland Meadows)

Summary Existing vs. Proposed Peak Discharge Rates

Storm Event:	Existing Flow (CFS)	Proposed Flow (CFS)
1-inch	0	0
2-year	<1.0	<1.0
10-year	1.4	1.0
100-year	8.6	2.0

Analysis Point 6 – Wetlands South of Site

Summary Existing vs. Proposed Peak Discharge Rates

Storm Event:	Existing Flow (CFS)	Proposed Flow (CFS)
1-inch	0	0
2-year	1.1	1.1
10-year	4.0	2.7
100-year	10.7	5.2

9.0 Compliance with Stormwater Management Standards

Standard 1: *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The stormwater management system has been designed such that no new stormwater conveyances will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Refer to section 6.0 Water Quality for more information about stormwater treatment.

Standard 2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

The stormwater management system has been designed to mitigate peak rates of runoff for the 1-inch, 2-year, 10-year, 25-year, and 100-year 24 hour storm event. Please refer to the tables in Section 9 Summary and the Hydrology Calculations for more information.

Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance.*

Groundwater recharge will be provided through the use of low-impact development techniques such as rain gardens, water quality swales, and bioretention basins. Please refer to section 7.0 Groundwater Recharge for supporting calculations.

Standard 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).*

The stormwater management system has been designed to remove 80% of the average annual post-construction load of TSS. BMP's have been sized to handle the water quality volume, and pretreatment is provided prior to infiltration in accordance with the Stormwater Management Handbook. Please refer to section 6.0 Water Quality for additional information and supporting calculations. A long term pollution prevention plan identifying suitable practices for source control and pollution prevention is included in Appendix E.

Standard 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.*

The project is considered a land use with higher potential pollutant loads due to the parking lots with high-intensity useand is subject to the requirement of Standard 5. BMP's selected for the project are consistent with the stormwater BMP's determined by DEP to be suitable for land uses with higher potential pollutant loads (i.e. deep sump catch basins, forebays, water quality swales, rain gardens, and bioretention areas).

Standard 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific*

source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

The project will be discharging treated stormwater to a Zone II and is subject to the requirements of Standard 6. BMP's selected for the project are consistent with the stormwater BMP's determined by DEP to be suitable for discharge to a Zone II (i.e. deep sump catch basins, forebays, water quality swales, rain gardens, and bioretention areas) and 44% TSS removal will be achieved prior to any infiltration BMP.

***Standard 7**: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

Although the project is a redevelopment and only required to meet the Stormwater Management Standards to the maximum extent practicable, the stormwater management system has been designed to meet all of the Stormwater Management Standards.

***Standard 8:** A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

A plan to control construction-related impacts including erosion, sedimentation, and other pollutant sources during construction has been included in Appendix F.

***Standard 9**: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

A long term operation and maintenance plan is included in Appendix G.

***Standard 10:** All illicit discharges to the stormwater management system are prohibited.*

There will not be any illicit discharges to the stormwater management system.

II. FIGURES

Designed by:	
Drawn by:	LTT
Checked by:	
Scale:	1"=1,200'
Date:	5/08/2007

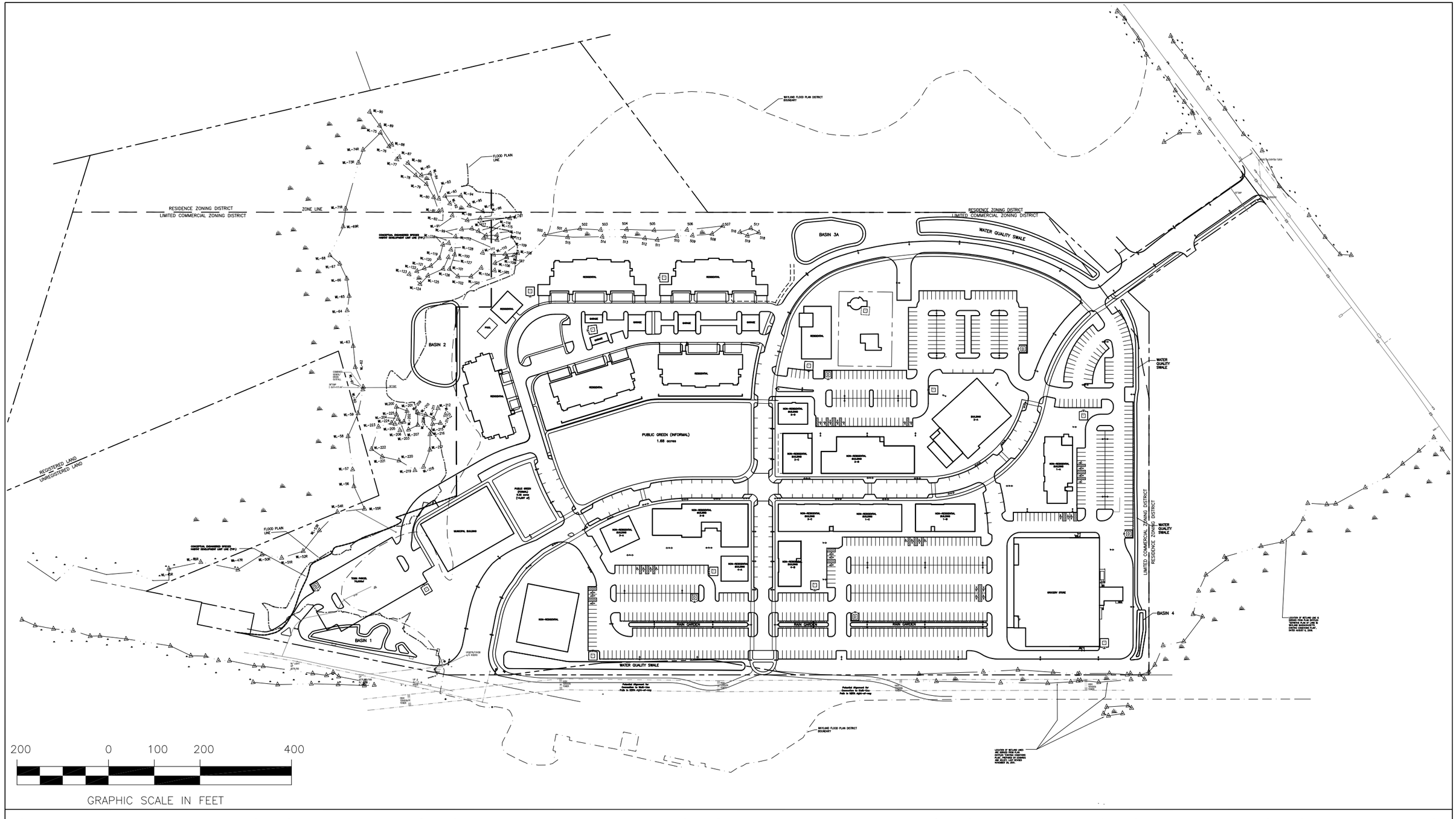
Prepared by:
RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
600 UNICORN PARK DRIVE
WOBURN, MA 01801
781-938-0570 / FAX: 781-938-0031

Project Name:
WAYLAND TOWN CENTER
WAYLAND, MA

Drawing Name:
SITE LOCUS MAP
WAYLAND, MA
QUADRANGLE
MAP DATE: 1977

Drawing No.:
FIG. 1

Project No.: 06032



No.	Revision	Date

Designed by:	SS
Drawn by:	LT/WJH
Checked by:	SS
Scale:	1"=200'
Date:	06/02/2008

Prepared for:

TWENTY WAYLAND, LLC
45 BROAD STREET, 4TH FLOOR
BOSTON, MA 02109

Prepared by:
RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
600 UNICORN PARK DRIVE
WOBURN, MA 01801
781-938-0570 / FAX: 781-938-0031

Project Name:
WAYLAND TOWN CENTER
WAYLAND, MA

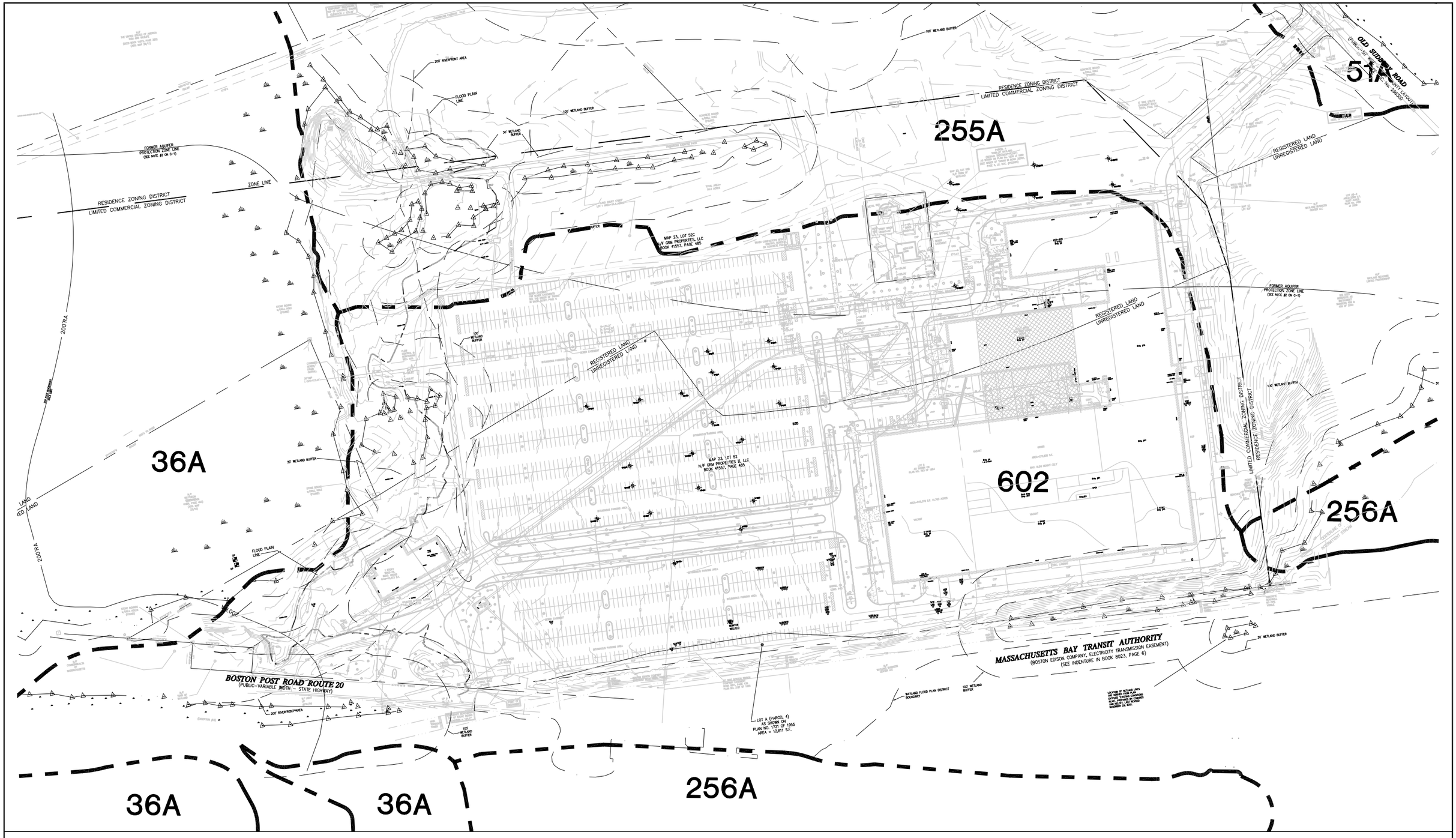
Drawing Name:
SITE PLAN

Drawing No.:
FIG.-2

Project No.: 06032

Copyright © 2005 by R.J. O'Connell & Associates, Inc.

Drawing name: G:\MA\Wayland\Great Island\Town Center\Engineer\Stormwater\Site Plan Review 5-29-08\Fig-2 Site Plan.dwg
May 27, 2008 - 14:02pm



No.	Revision	Date	No.	Revision	Date

Seal:

Designed by:	SS
Drawn by:	RBM
Checked by:	SS
Scale:	NTS
Date:	06/02/2008

Prepared for:

TWENTY WAYLAND, LLC
45 BROAD STREET, 4TH FLOOR
BOSTON, MA 02109

Prepared by:
RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
600 UNICORN PARK DRIVE
WOBURN, MA 01801
781-938-0570 / FAX: 781-938-0031

Project Name:

WAYLAND TOWN CENTER
WAYLAND, MA

Drawing Name:

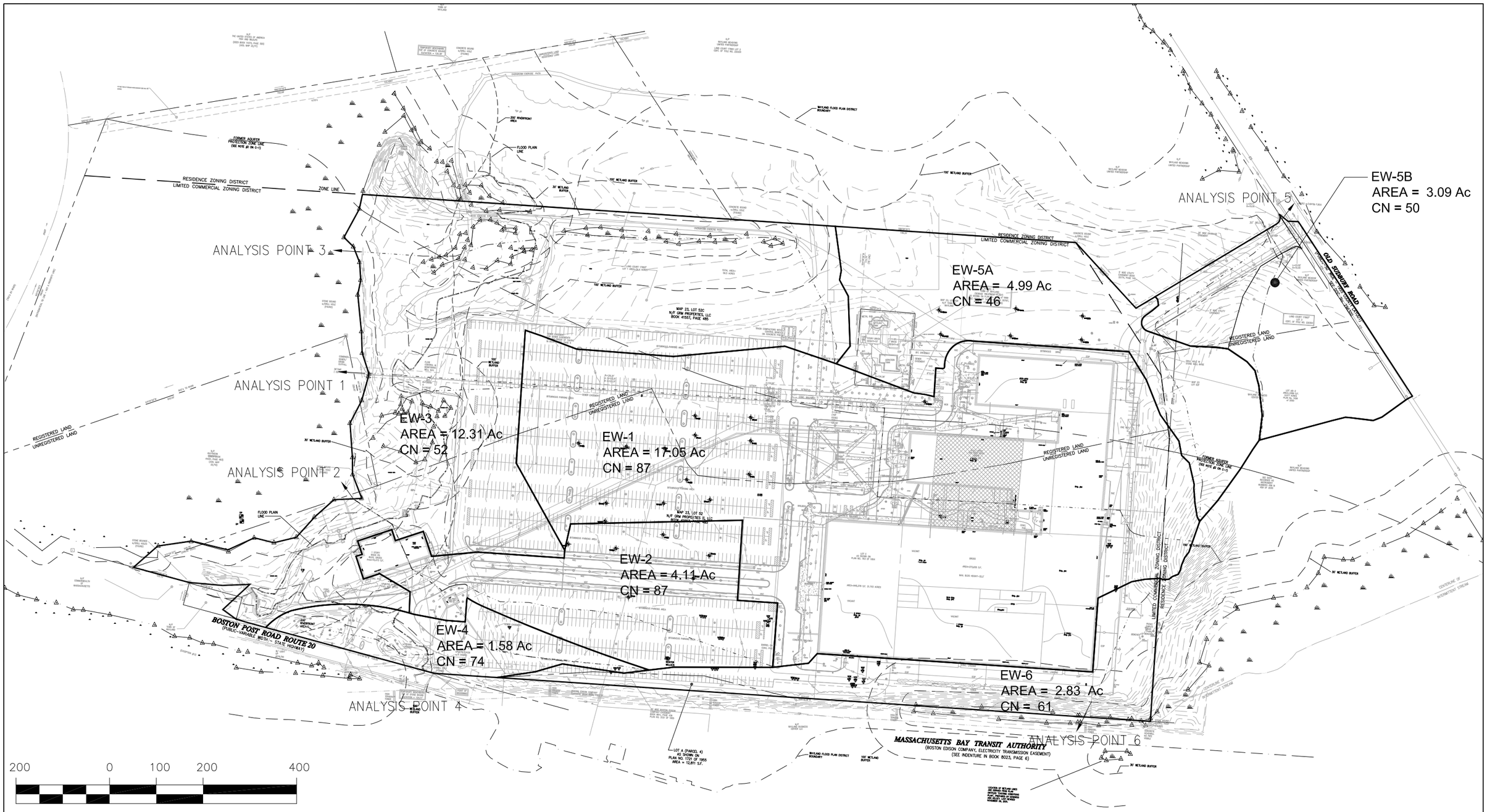
SOIL MAP PLAN

Drawing No.:

FIG-3

Project No.: 06032

Copyright © 2005 by R.J. O'Connell & Associates, Inc.



No.	Revision	Date

Designed by:	SS
Drawn by:	LT/WJH
Checked by:	SS
Scale:	1"=200'
Date:	06/02/2008

Prepared for:

TWENTY WAYLAND, LLC
45 BROAD STREET, 4TH FLOOR
BOSTON, MA 02109

Prepared by:

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
600 UNICORN PARK DRIVE
WOBURN, MA 01801
781-938-0570 / FAX: 781-938-0031

Project Name:

WAYLAND TOWN CENTER
WAYLAND, MA

Drawing Name:

PRE-DEVELOPMENT WATERSHED PLAN

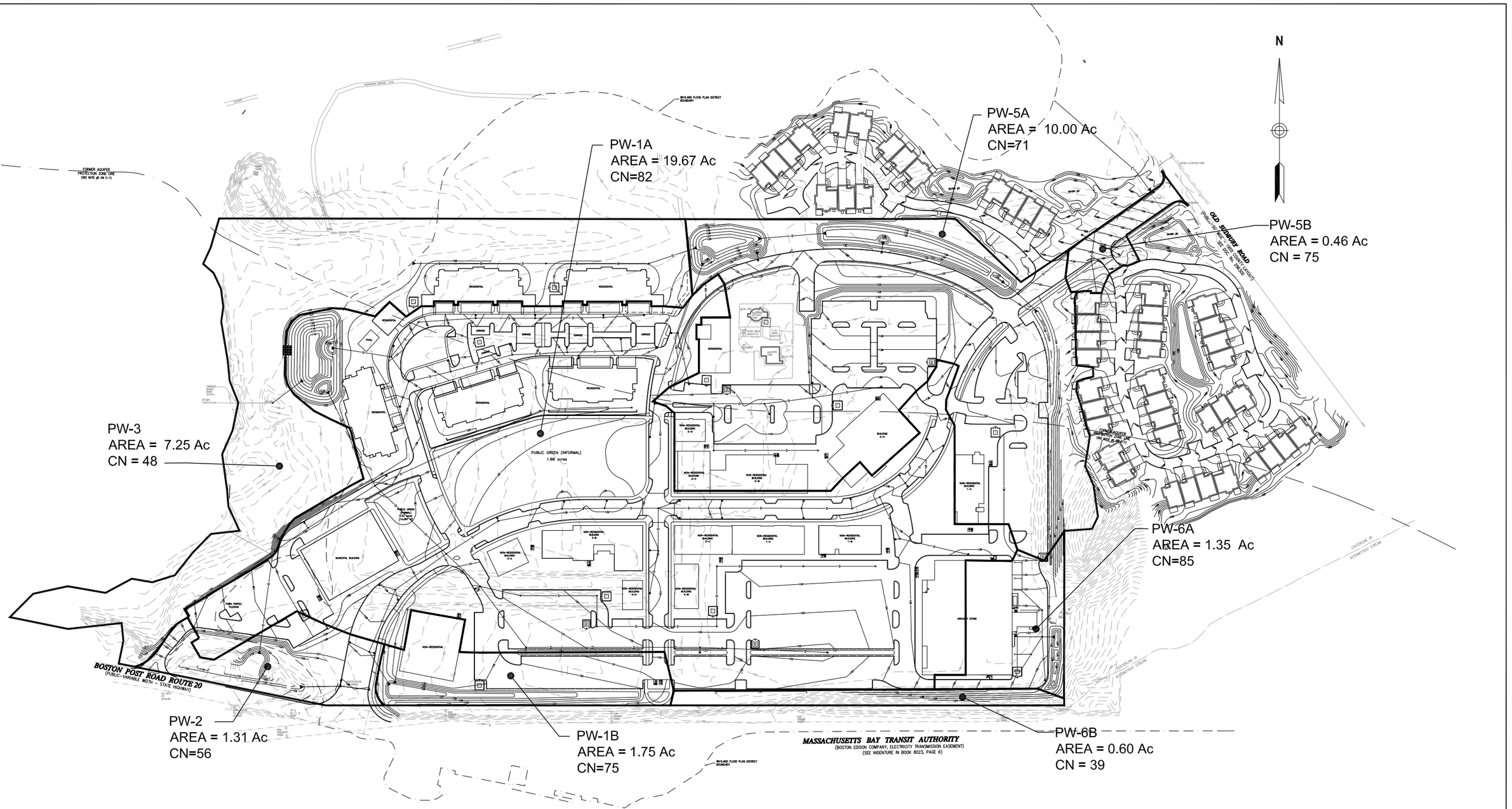
Drawing No.:

FIG.-4

Project No.: 06032

Copyright © 2005 by R.J. O'Connell & Associates, Inc.

Drawing name: G:\MA\Wayland\Great Island\Town Center\Engineer\Stormwater\Site Plan Review 6-02-08\Fig-4 Pre-Dev Watershed Plan.dwg
Jun 03, 2008 - 18:10pm



No.	Revision	Date

Designed by:	SS
Drawn by:	LT/WJH
Checked by:	SS
Scale:	N.T.S.
Date:	06/02/08

Prepared for:

TWENTY WAYLAND, LLC
45 BROAD STREET, 4TH FLOOR
BOSTON, MA 02109

Prepared by:

RJ O'CONNELL & ASSOCIATES, INC.
Civil Engineers & Land Planners
80 MONTVALE AVE
STONEHAM, MA 02180
781-938-0570 / FAX: 781-938-0031

Project Name:

WAYLAND TOWN CENTER
WAYLAND, MA

Drawing Name:

POST-DEVELOPMENT WATERSHED PLAN

Drawing No.:

FIG.-5

Project No.: 06032

Copyright © 2005 by R.J. O'Connell & Associates, Inc.

Drawing name: G:\MA\Wayland\Great Island\Town Center\Engineer\Stormwater\Site Plan Review 6-02-08\Fig-5 Post-Dev Watershed Plan.dwg
Jun 03, 2008 - 18:11pm

III. APPENDICES

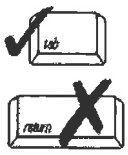
APPENDIX A: CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

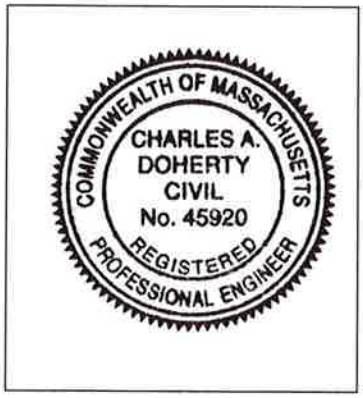
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Charles A. Doherty 6/02/08

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☒ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☒ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☒ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☒ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☒ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX B: EXISTING CONDITIONS HYDROLOGY CALCULATIONS

Runoff Curve Numbers and Runoff
Time of Concentration
Pond Reports
Hydrograph Plots (2, 10, 25, 100 year storm events)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **Existing Watershed 1 (EW-1)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			3.24	126.36
A	Impervious (pavement, roof)	98			13.81	1353.38
A						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**17.05**	**1479.74**

CN (weighted) = total product / total area **86.7883** Use CN= **87**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	2.00	3.29	5.38	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **Existing Watershed 2 (EW-2)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			0.80	31.20
A	Impervious (pavement, roof)	98			3.31	324.38
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**4.11**	**355.58**

CN (weighted) = total product / total area **86.5158** Use CN= **87**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	2.00	3.29	5.38	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **Existing Watershed 3 (EW-3)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			9.42	367.38
A	Impervious (pavement, roof)	98			2.32	227.36
A	Gravel	76			0.44	33.44
A	Wetland	83			0.13	10.79
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**12.31**	**638.97**

CN (weighted) = total product / total area **51.9066** Use CN= **52**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.20	0.67	1.79	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **Existing Watershed 4 (EW-4)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			0.63	24.57
A	Impervious (pavement, roof)	98			0.95	93.10
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**1.58**	**117.67**

CN (weighted) = total product / total area **74.4747** Use CN= **74**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	1.10	2.13	3.96	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **Existing Watershed 5A (EW-5A)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			4.43	172.77
A	Impervious (pavement, roof)	98			0.56	54.88
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**4.99**	**227.65**

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ **45.6212** Use CN= **46**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.07	0.39	1.27	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **Existing Watershed 5B (EW-5B)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			2.53	98.67
A	Impervious (pavement, roof)	98			0.56	54.88
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**3.09**	**153.55**

CN (weighted) = total product / total area **49.6926** Use CN= **50**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.15	0.57	1.61	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **Existing Watershed 6 (EW-6)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			1.79	69.81
A	Impervious (pavement, roof)	98			1.04	101.92
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**2.83**	**171.73**

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ **60.6820** Use CN= **61**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.49	1.19	2.63	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

TR55 Tc Worksheet

Hyd. No. 1

EW-1 (PT. 1)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.200		0.011		0.011		
Flow length (ft)	= 136.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 14.70		0.00		0.00		
Travel Time (min)	**= 7.22**	**+**	**0.00**	**+**	**0.00**	**=**	**7.22**
Shallow Concentrated Flow							
Flow length (ft)	= 60.00		0.00		0.00		
Watercourse slope (%)	= 0.50		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 1.44		0.00		0.00		
Travel Time (min)	**= 0.70**	**+**	**0.00**	**+**	**0.00**	**=**	**0.70**
Channel Flow							
X sectional flow area (sqft)	= 7.00		0.00		0.00		
Wetted perimeter (ft)	= 4.71		0.00		0.00		
Channel slope (%)	= 1.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	= 12.95		0.00		0.00		
Flow length (ft)	= 1800.0		0.0		0.0		
Travel Time (min)	**= 2.32**	**+**	**0.00**	**+**	**0.00**	**=**	**2.32**

Total Travel Time, Tc ..... 10.23 min

TR55 Tc Worksheet

Hyd. No. 2

EW-2 (PT. 2)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 0.50		0.00		0.00		
Travel Time (min)	**= 2.14**	**+**	**0.00**	**+**	**0.00**	**=**	**2.14**
Shallow Concentrated Flow							
Flow length (ft)	= 673.00		0.00		0.00		
Watercourse slope (%)	= 1.20		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 2.23		0.00		0.00		
Travel Time (min)	**= 5.04**	**+**	**0.00**	**+**	**0.00**	**=**	**5.04**
Channel Flow							
X sectional flow area (sqft)	= 1.22		0.00		0.00		
Wetted perimeter (ft)	= 1.96		0.00		0.00		
Channel slope (%)	= 1.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	= 7.23		0.00		0.00		
Flow length (ft)	= 275.0		0.0		0.0		
Travel Time (min)	**= 0.63**	**+**	**0.00**	**+**	**0.00**	**=**	**0.63**

Total Travel Time, Tc ..... 7.81 min

TR55 Tc Worksheet

Hyd. No. 3

EW-3

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.200		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.10		0.00		0.00		
Land slope (%)	=	0.50		0.00		0.00		
Travel Time (min)	**=**	**21.82**	**+**	**0.00**	**+**	**0.00**	**=**	**21.82**
Shallow Concentrated Flow								
Flow length (ft)	=	972.00		148.00		0.00		
Watercourse slope (%)	=	1.30		2.70		0.00		
Surface description	=	Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=	1.84		2.65		0.00		
Travel Time (min)	**=**	**8.81**	**+**	**0.93**	**+**	**0.00**	**=**	**9.74**
Channel Flow								
X sectional flow area (sqft)	=	0.00		0.00		0.00		
Wetted perimeter (ft)	=	0.00		0.00		0.00		
Channel slope (%)	=	0.00		0.00		0.00		
Manning's n-value	=	0.015		0.015		0.015		
Velocity (ft/s)	=	0.00		0.00		0.00		
Flow length (ft)	=	0.0		0.0		0.0		
Travel Time (min)	**=**	**0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 31.55 min

TR55 Tc Worksheet

Hyd. No. 5

EW-4

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 2.50	0.00	0.00	
Travel Time (min)	**= 11.46**	**+ 0.00**	**+ 0.00**	**= 11.46**
Shallow Concentrated Flow				
Flow length (ft)	= 100.00	0.00	0.00	
Watercourse slope (%)	= 3.50	0.00	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 3.02	0.00	0.00	
Travel Time (min)	**= 0.55**	**+ 0.00**	**+ 0.00**	**= 0.55**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 12.01 min

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 7

EW-5A

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 1.50	0.00	0.00	
Travel Time (min)	**= 14.06**	**+ 0.00**	**+ 0.00**	**= 14.06**
Shallow Concentrated Flow				
Flow length (ft)	= 130.00	0.00	0.00	
Watercourse slope (%)	= 2.50	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 2.55	0.00	0.00	
Travel Time (min)	**= 0.85**	**+ 0.00**	**+ 0.00**	**= 0.85**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 14.91 min

TR55 Tc Worksheet

Hyd. No. 8

E-5B

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	**= 16.53**	**+ 0.00**	**+ 0.00**	**= 16.53**
Shallow Concentrated Flow				
Flow length (ft)	= 370.00	0.00	0.00	
Watercourse slope (%)	= 5.40	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 3.75	0.00	0.00	
Travel Time (min)	**= 1.64**	**+ 0.00**	**+ 0.00**	**= 1.64**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 18.18 min

TR55 Tc Worksheet

Hyd. No. 10

EW-6 (PT. 6)

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 6.00	0.00	0.00	
Travel Time (min)	**= 9.34** +	**0.00** +	**0.00** =	**9.34**
Shallow Concentrated Flow				
Flow length (ft)	= 240.00	0.00	0.00	
Watercourse slope (%)	= 0.85	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 1.49	0.00	0.00	
Travel Time (min)	**= 2.69** +	**0.00** +	**0.00** =	**2.69**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00** +	**0.00** +	**0.00** =	**0.00**

Total Travel Time, Tc ..... **12.03 min**

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Pond No. 7 - EX. BASIN

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 118.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	118.00	1,828	0	0
1.00	119.00	5,668	3,748	3,748
2.00	120.00	8,193	6,931	10,679
3.00	121.00	20,000	14,097	24,775

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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

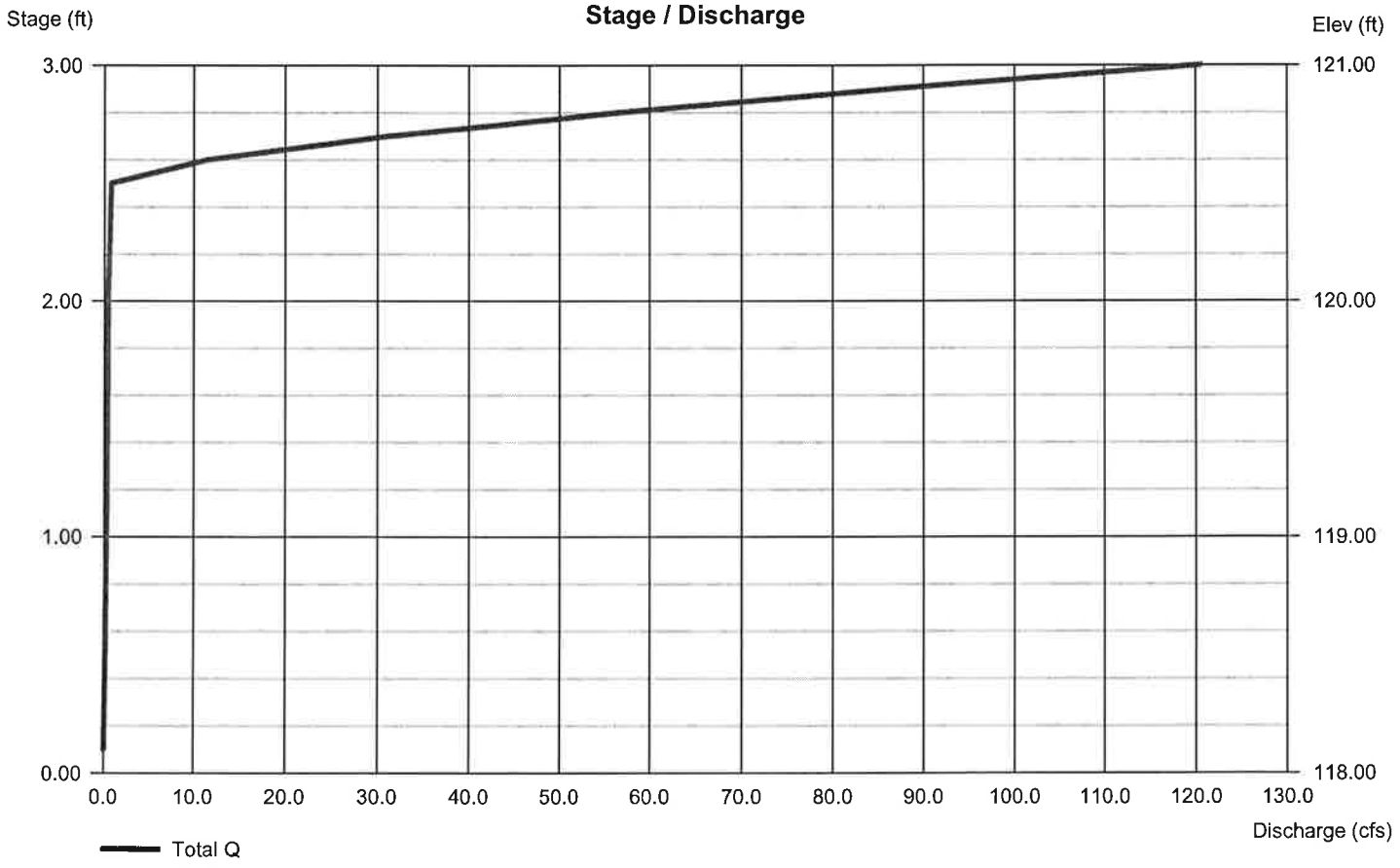
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 130.00	0.00	0.00	0.00
Crest El. (ft)	= 120.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 2.400 (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 Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	3.300	1	730	14,107	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	0.864	1	727	3,257	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	0.000	1	n/a	0	------	------	------	EW-3
4	Combine	4.099	1	729	17,364	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	0.005	1	890	131	------	------	------	EW-4
6	Reservoir	0.000	1	960	0	5	118.01	37.2	EXIST. BASIN (PT. 4)
7	SCS Runoff	0.000	1	n/a	0	------	------	------	EW-5A
8	SCS Runoff	0.000	1	n/a	0	------	------	------	E-5B
9	Combine	0.000	1	n/a	0	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	0.000	1	n/a	0	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	1.436	1	741	9,324	------	------	------	PW-1A
12	SCS Runoff	0.007	1	825	199	------	------	------	PW-1B
13	Reservoir	0.000	1	893	0	12	126.02	61.1	WATER QUALITY SWALE
14	Combine	1.436	1	741	9,324	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	0.000	1	1477	0	14	117.41	3,803	BASIN 2
16	Diversion1	0.289	1	1477	1,526	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	0.000	1	n/a	-1,526	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-2
19	Reservoir	0.000	1	n/a	0	18	118.00	0.000	BASIN 1 (PT.2)
20	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-3
21	SCS Runoff	0.009	1	1337	283	------	------	------	PW-5A
22	Reservoir	0.000	1	1254	0	21	126.03	104	BASIN 3
23	Combine	0.000	1	1484	0	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	0.002	1	827	51	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	0.136	1	745	851	------	------	------	PW-6A
26	Reservoir	0.000	1	930	0	25	128.02	235	BASIN 4
27	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-6B
28	Combine	0.000	1	930	0	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

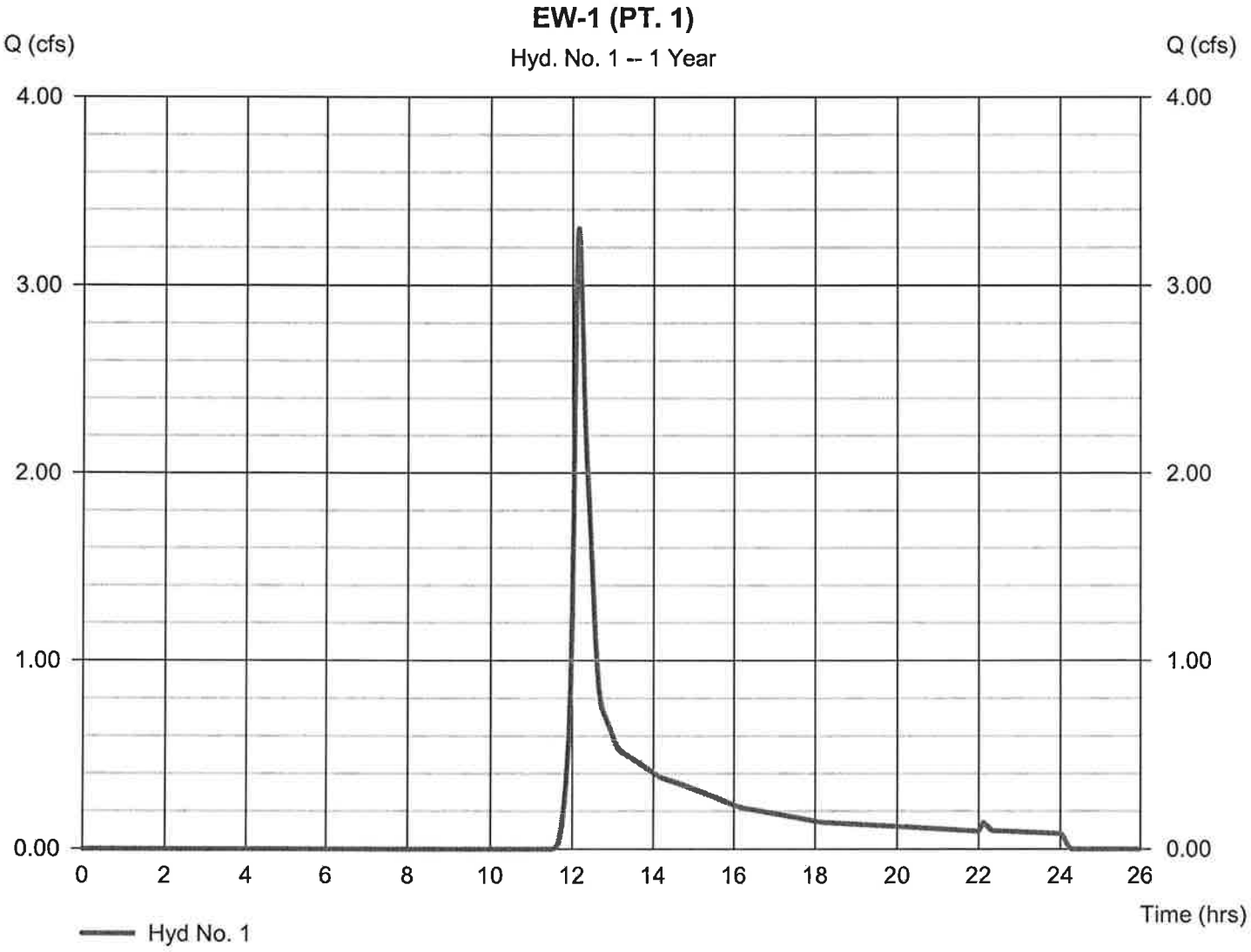
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 1

EW-1 (PT. 1)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.300 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 1 min	Hyd. volume	= 14,107 cuft
Drainage area	= 17.050 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.23 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.240 x 39) + (14.180 x 98)] / 17.050



Hydrograph Report

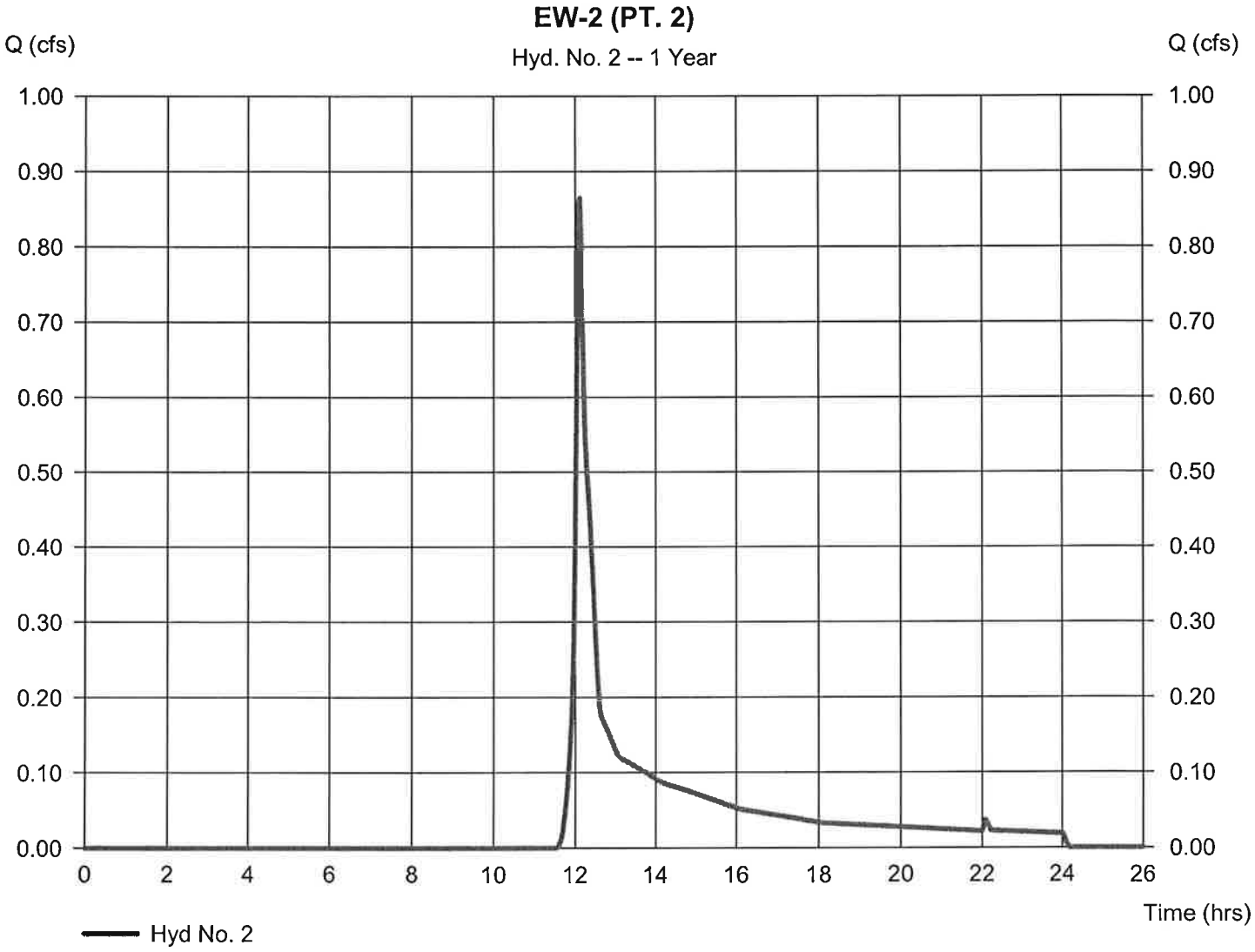
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 2

EW-2 (PT. 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.864 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 3,257 cuft
Drainage area	= 4.110 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.81 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.310 x 98) + (0.800 x 39)] / 4.110



Hydrograph Report

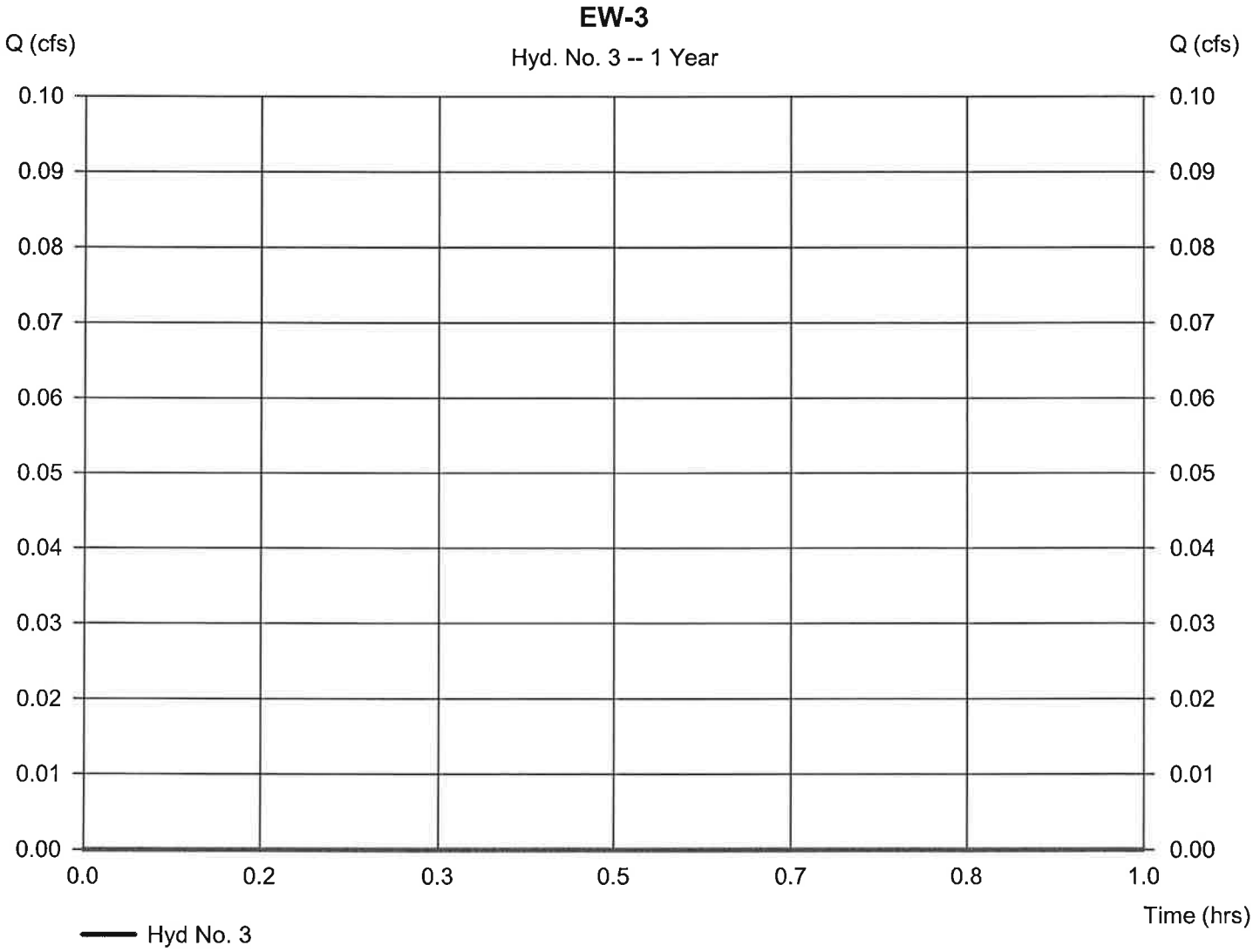
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 3

EW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 12.310 ac	Curve number	= 52*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.55 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.280 x 98) + (0.440 x 76) + (0.130 x 83) + (14.090 x 39)] / 12.310



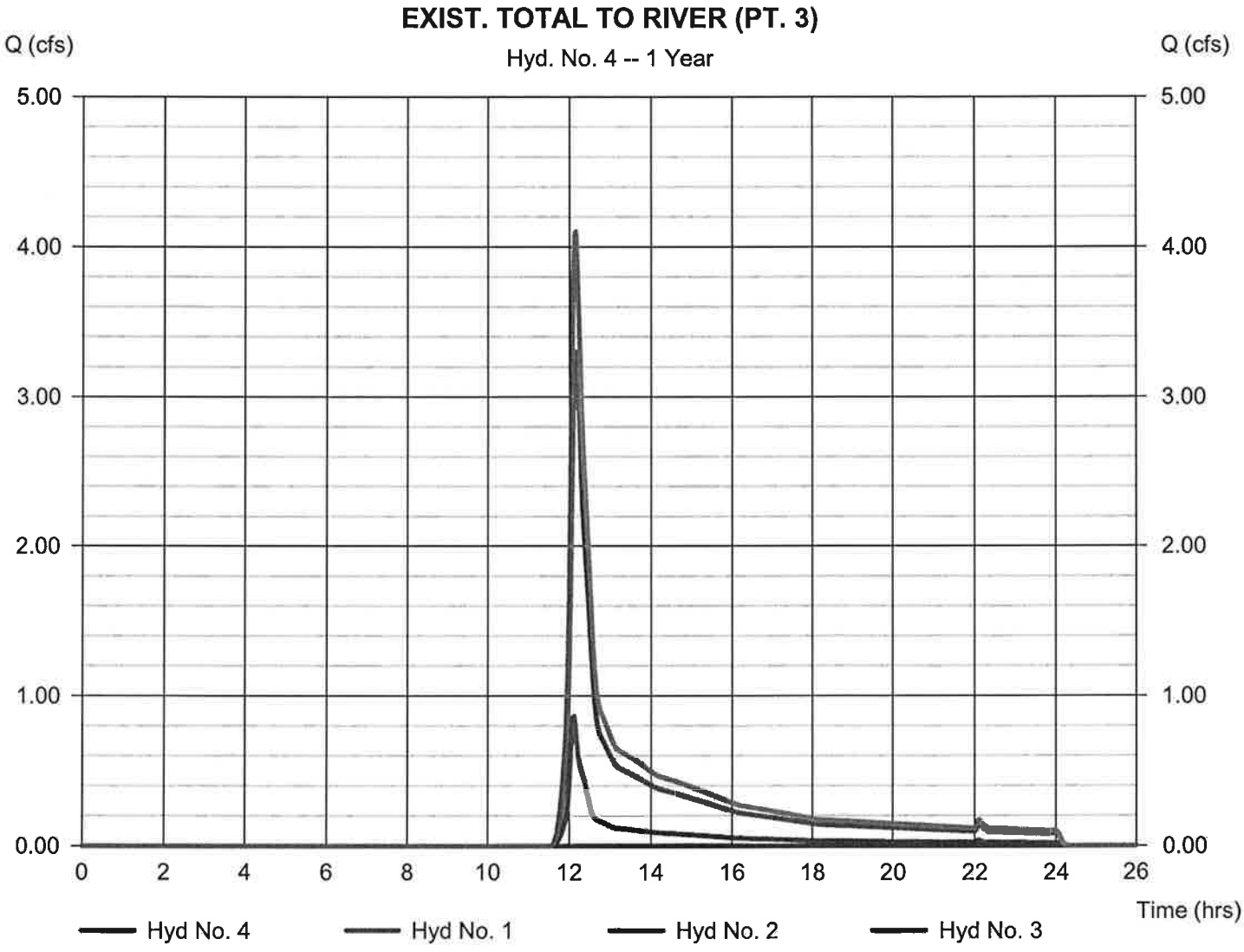
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 4

EXIST. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 4.099 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 17,364 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 33.470 ac



Hydrograph Report

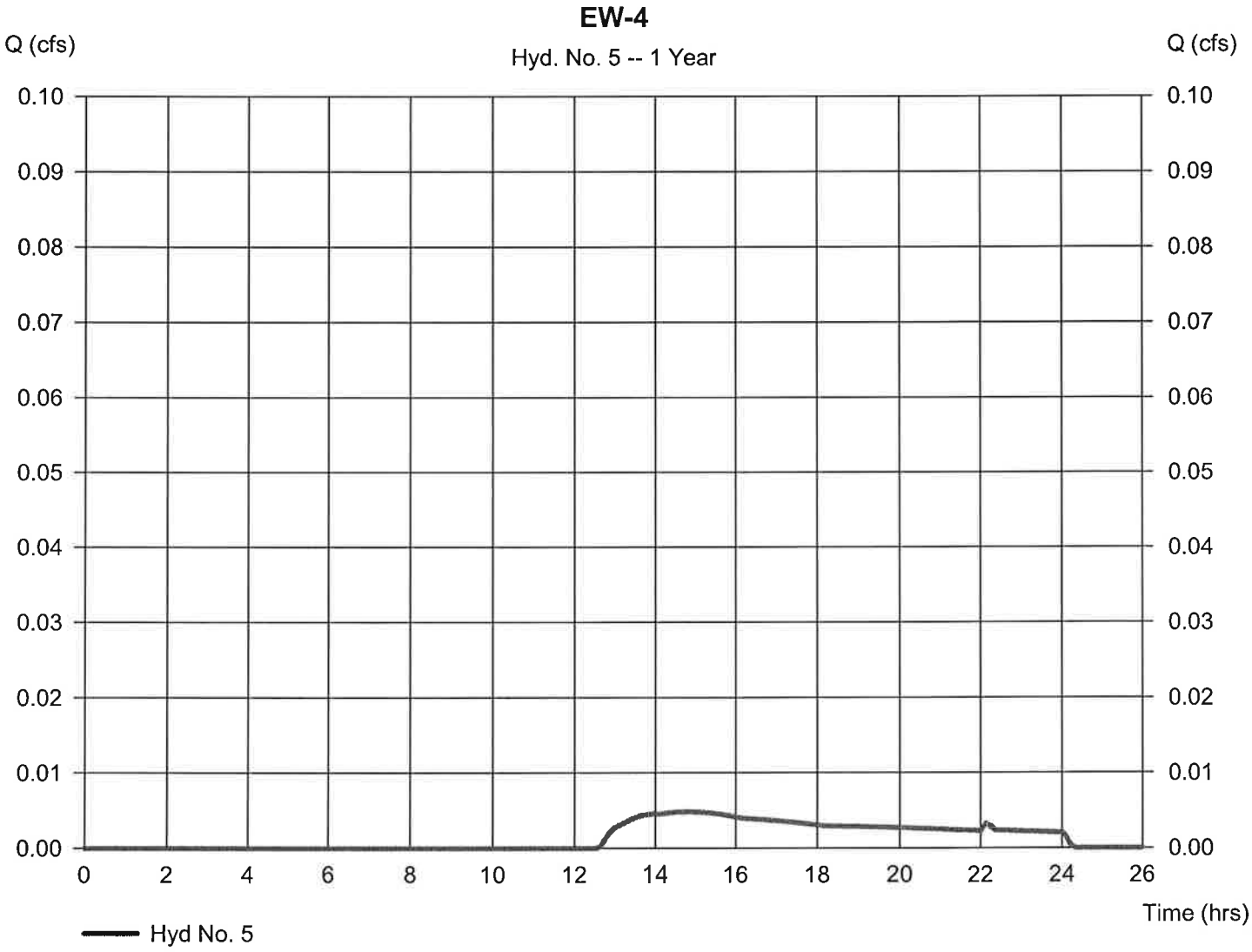
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 5

EW-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.005 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.83 hrs
Time interval	= 1 min	Hyd. volume	= 131 cuft
Drainage area	= 1.580 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.01 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.950 x 98) + (0.630 x 39)] / 1.580



Hydrograph Report

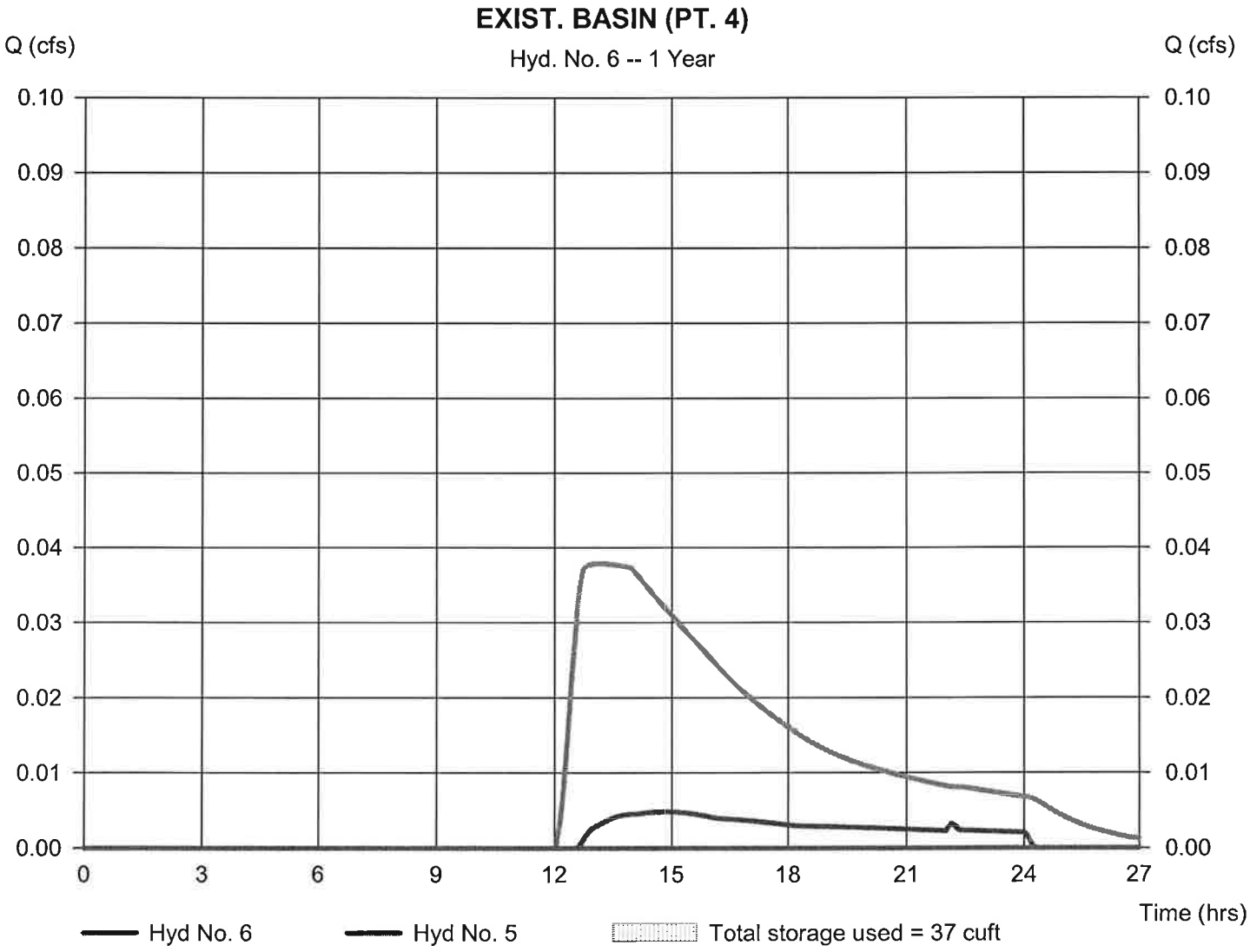
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 6

EXIST. BASIN (PT. 4)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 16.00 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 5 - EW-4	Max. Elevation	= 118.01 ft
Reservoir name	= EX. BASIN	Max. Storage	= 37 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

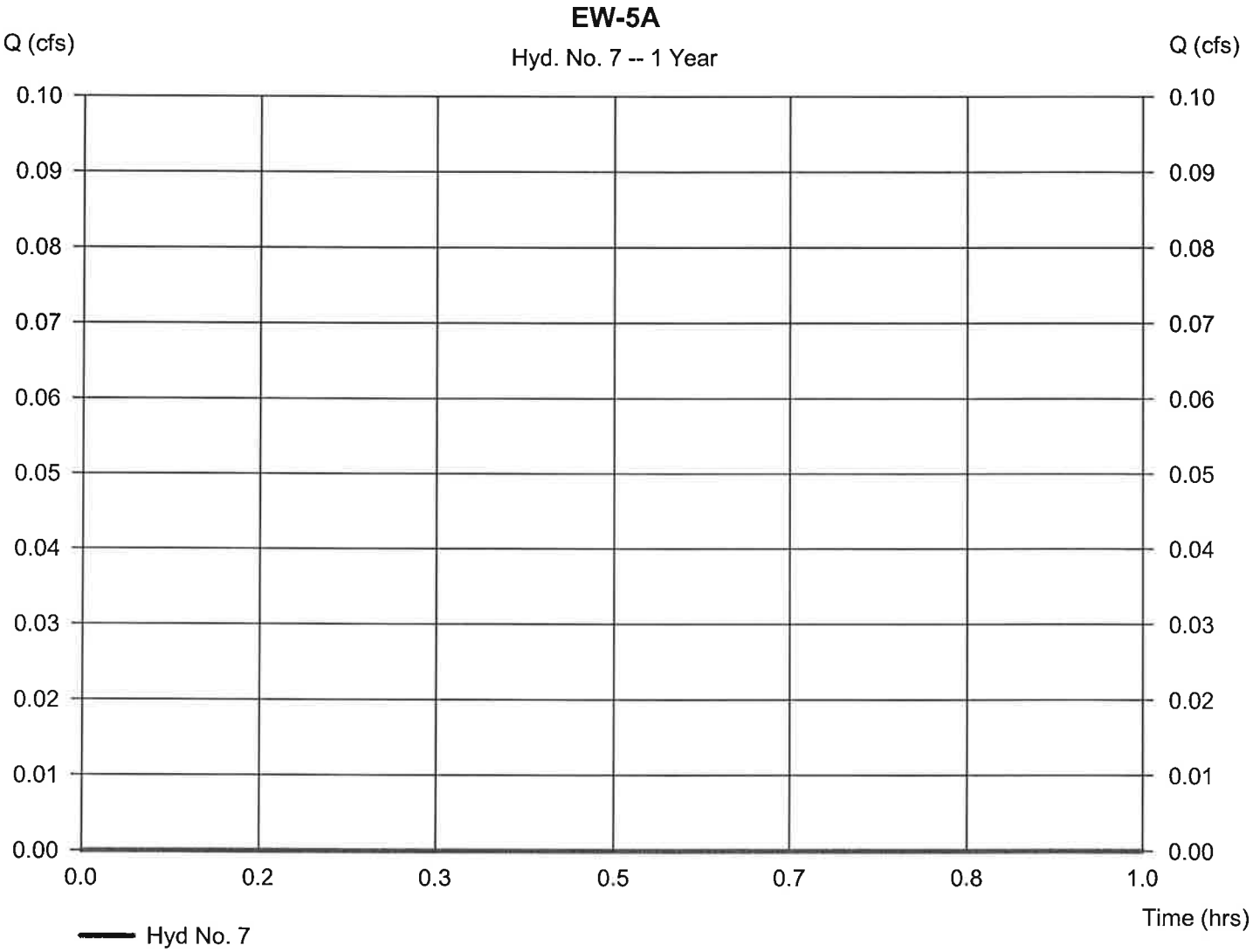
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 7

EW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 4.990 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.91 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.400 x 98) + (4.750 x 39)] / 4.990



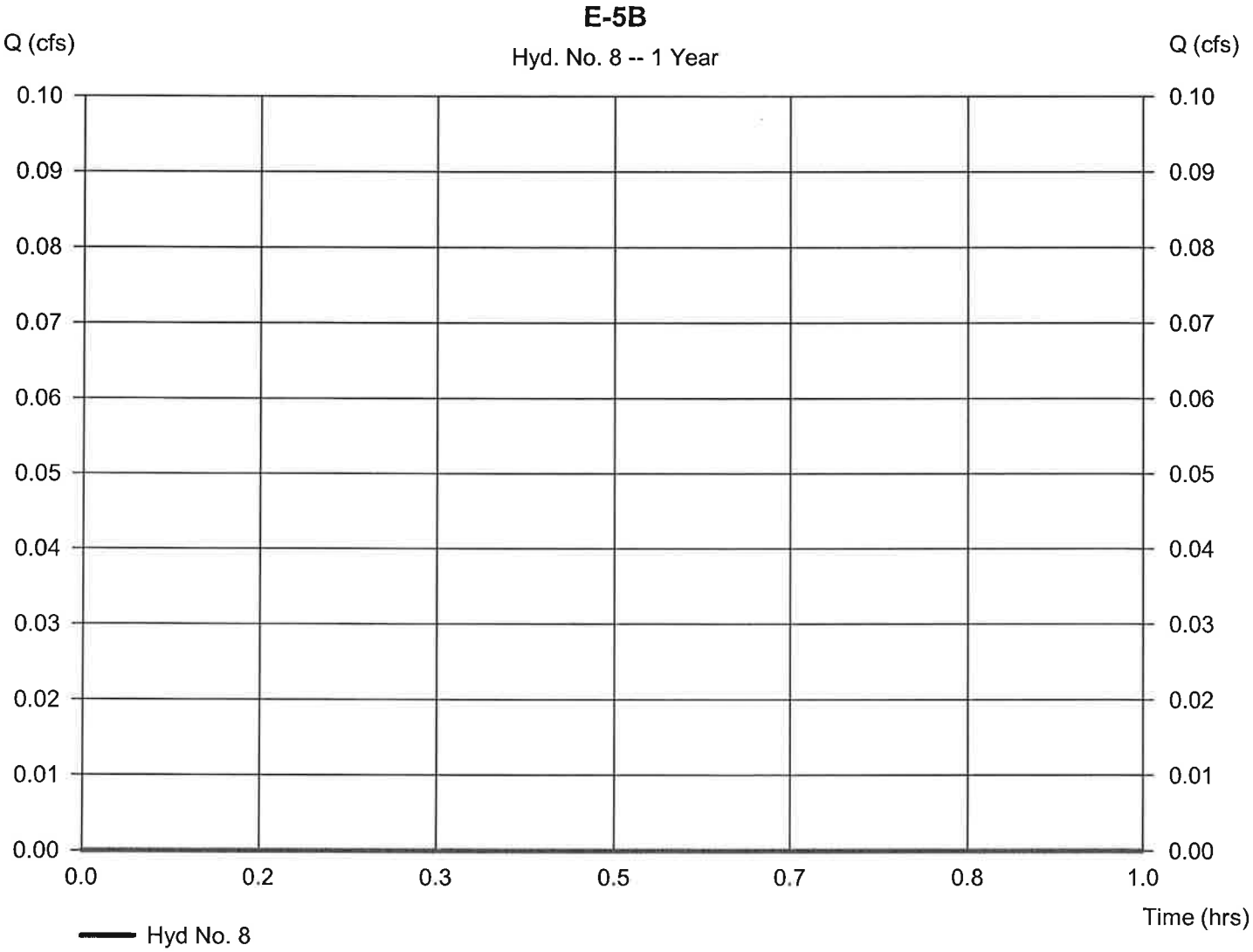
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 8

E-5B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 3.090 ac	Curve number	= 50
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.18 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



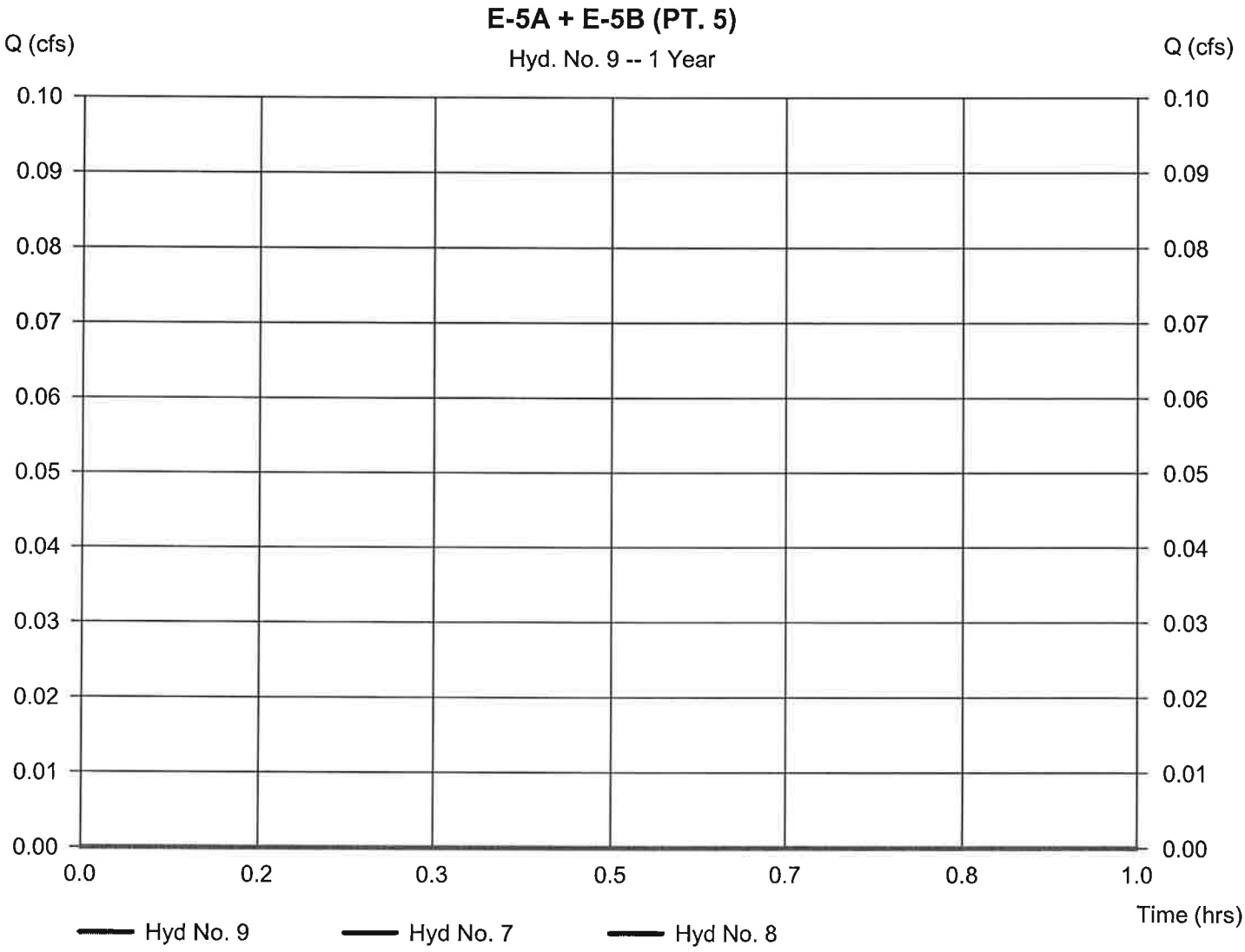
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 9

E-5A + E-5B (PT. 5)

Hydrograph type	= Combine	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 8.080 ac



Hydrograph Report

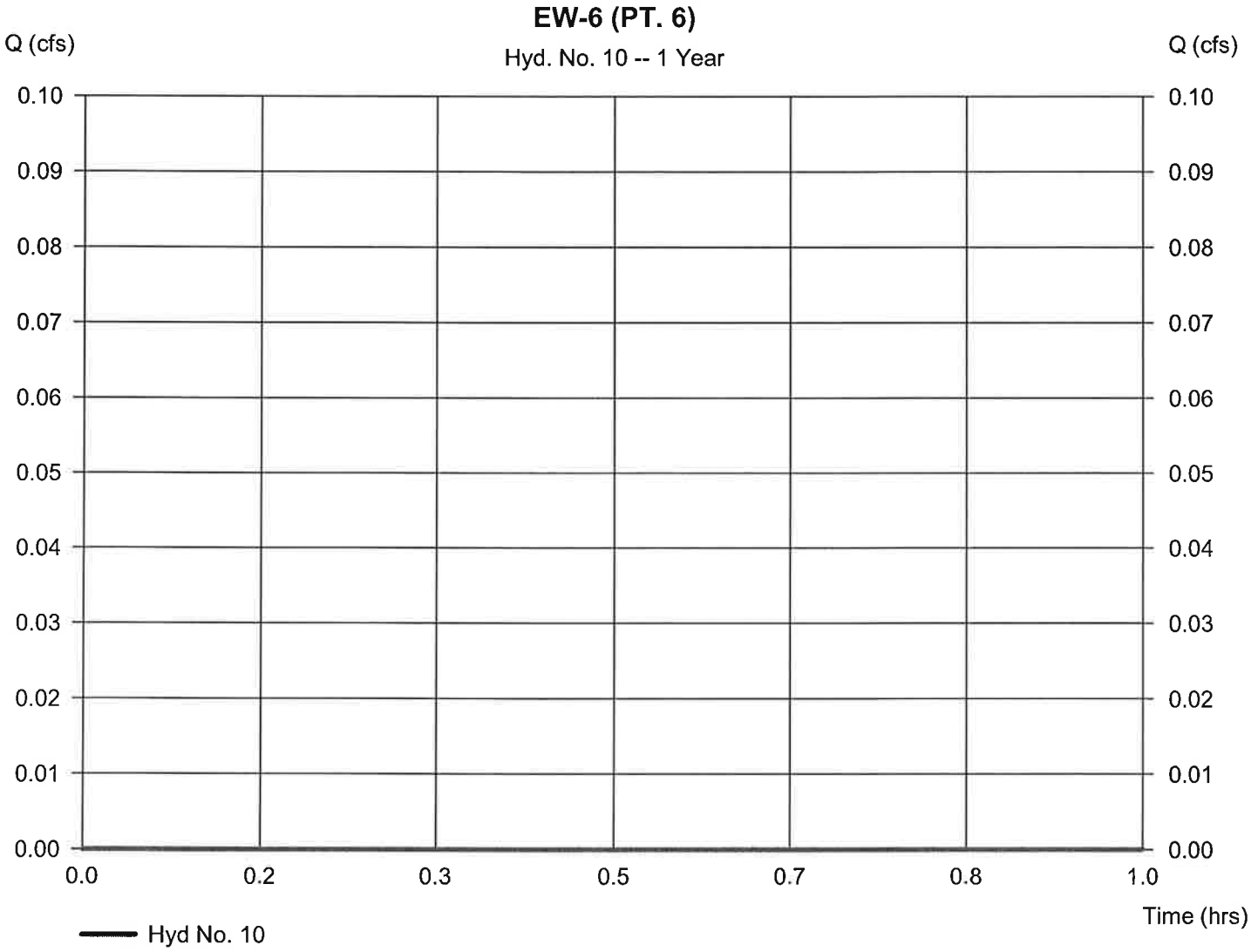
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 10

EW-6 (PT. 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 2.830 ac	Curve number	= 61*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.03 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.660 x 98) + (1.790 x 39)] / 2.830



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	31.68	1	728	115,076	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	8.251	1	726	26,572	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	0.352	1	773	6,744	------	------	------	EW-3
4	Combine	39.44	1	727	148,392	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	1.373	1	730	5,489	------	------	------	EW-4
6	Reservoir	0.000	1	785	0	5	118.60	2,248	EXIST. BASIN (PT. 4)
7	SCS Runoff	0.029	1	922	820	------	------	------	EW-5A
8	SCS Runoff	0.047	1	825	1,209	------	------	------	E-5B
9	Combine	0.072	1	897	2,029	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	1.095	1	724	4,083	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	25.32	1	733	107,826	------	------	------	PW-1A
12	SCS Runoff	2.087	1	725	6,726	------	------	------	PW-1B
13	Reservoir	0.000	1	734	0	12	126.99	2,879	WATER QUALITY SWALE
14	Combine	25.32	1	733	107,826	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	16.64	1	745	82,763	14	120.76	25,670	BASIN 2
16	Diversion1	0.601	1	745	16,824	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	16.04	1	745	65,940	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	0.095	1	765	1,177	------	------	------	PW-2
19	Reservoir	0.000	1	798	0	18	118.10	368	BASIN 1 (PT.2)
20	SCS Runoff	0.072	1	893	1,948	------	------	------	PW-3
21	SCS Runoff	5.236	1	743	29,497	------	------	------	PW-5A
22	Reservoir	1.175	1	781	8,948	21	128.44	10,868	BASIN 3
23	Combine	16.64	1	745	91,712	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	0.476	1	727	1,715	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	1.697	1	737	8,197	------	------	------	PW-6A
26	Reservoir	1.083	1	752	2,070	25	129.94	2,955	BASIN 4
27	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-6B
28	Combine	1.083	1	752	2,070	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

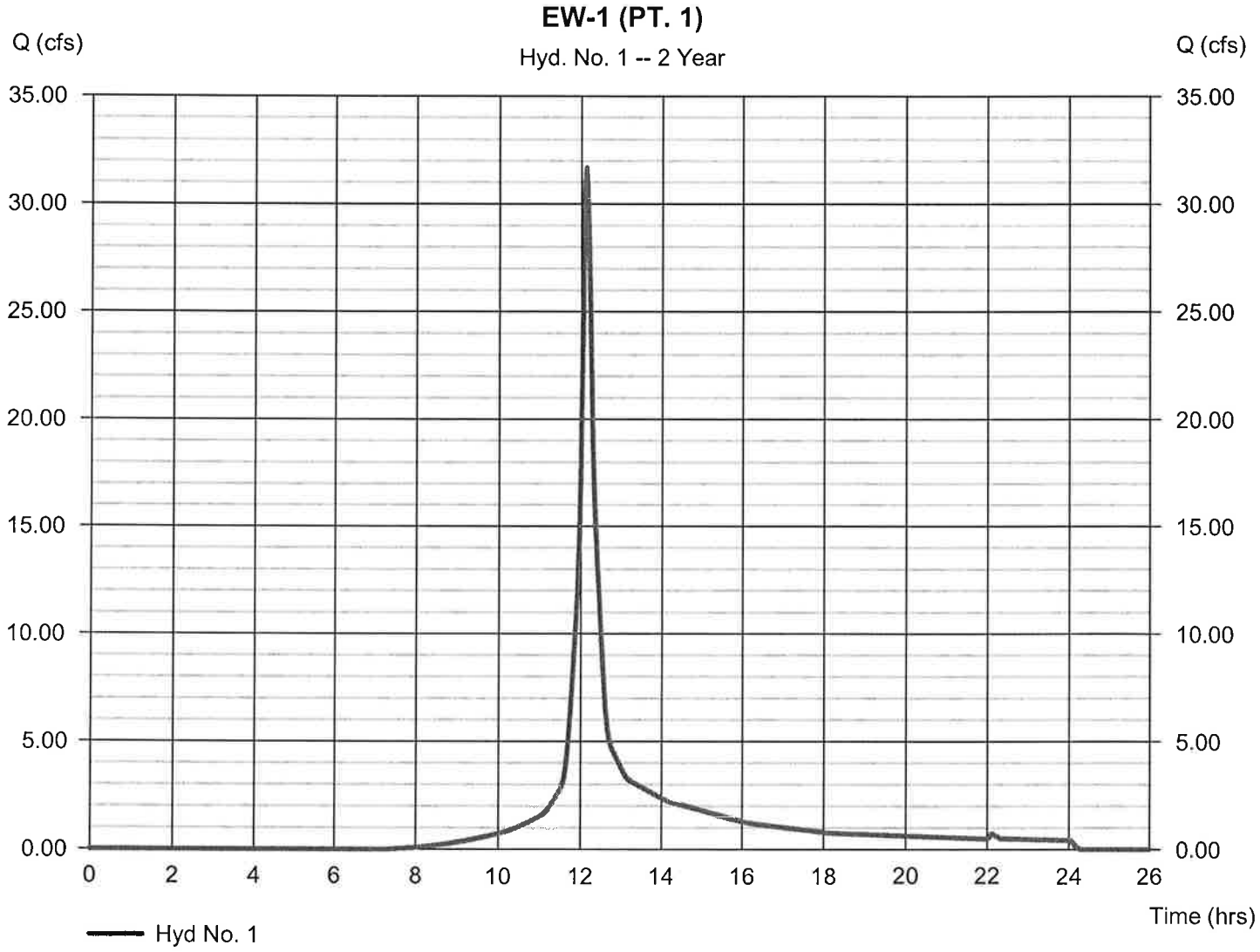
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 1

EW-1 (PT. 1)

Hydrograph type	= SCS Runoff	Peak discharge	= 31.68 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 1 min	Hyd. volume	= 115,076 cuft
Drainage area	= 17.050 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.23 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.240 x 39) + (14.180 x 98)] / 17.050



Hydrograph Report

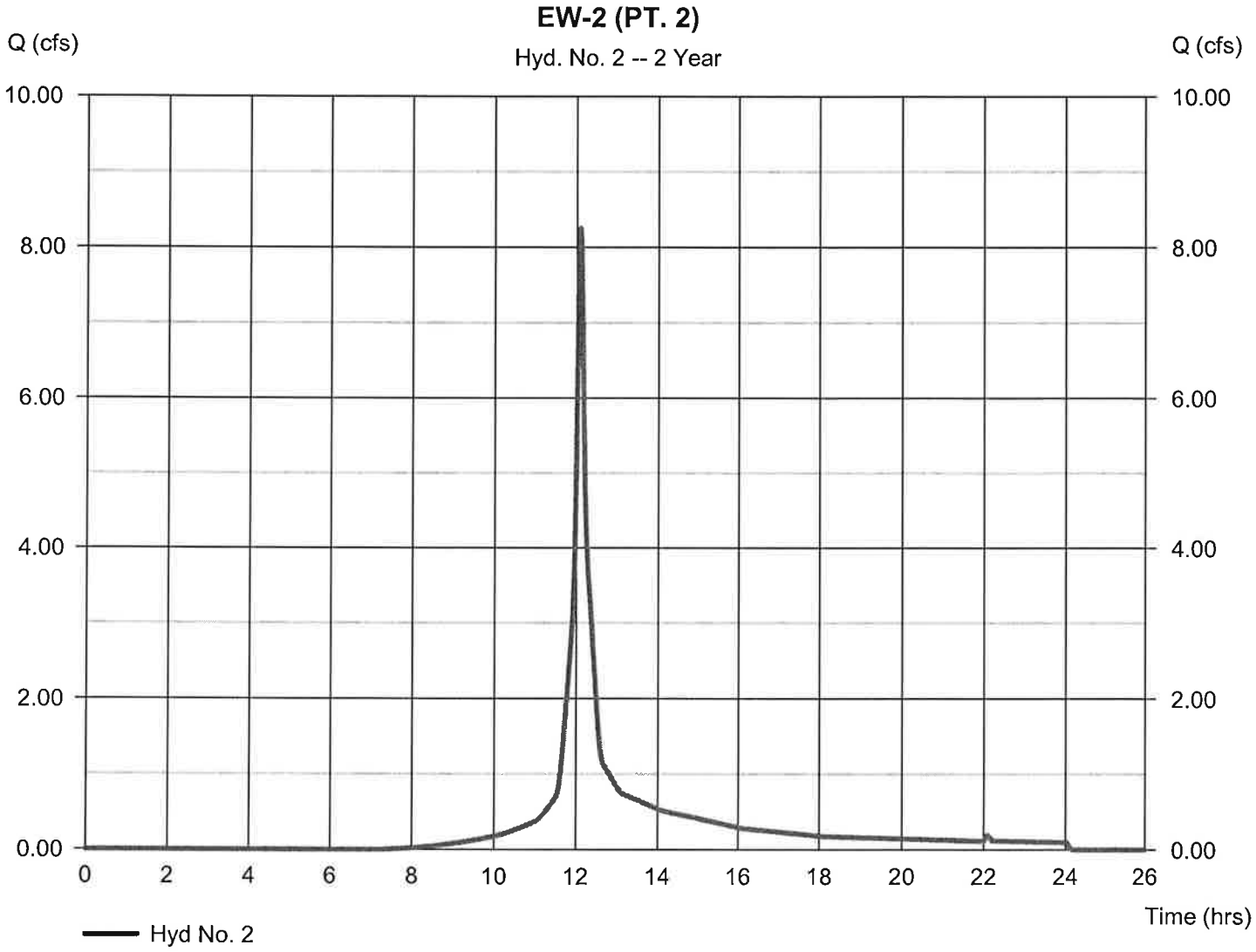
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 2

EW-2 (PT. 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 8.251 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 1 min	Hyd. volume	= 26,572 cuft
Drainage area	= 4.110 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.81 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.310 x 98) + (0.800 x 39)] / 4.110



Hydrograph Report

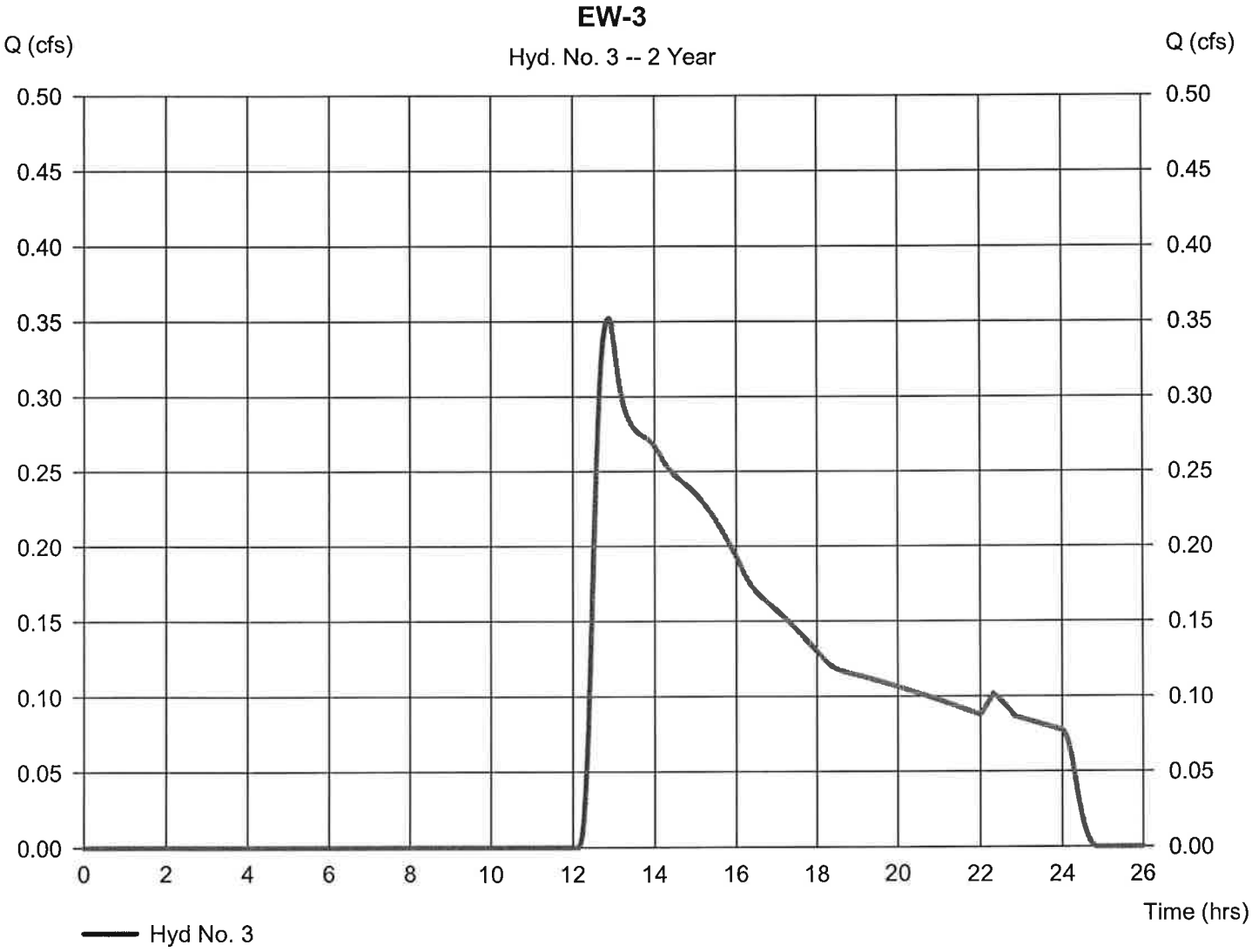
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 3

EW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.352 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.88 hrs
Time interval	= 1 min	Hyd. volume	= 6,744 cuft
Drainage area	= 12.310 ac	Curve number	= 52*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.55 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.280 x 98) + (0.440 x 76) + (0.130 x 83) + (14.090 x 39)] / 12.310



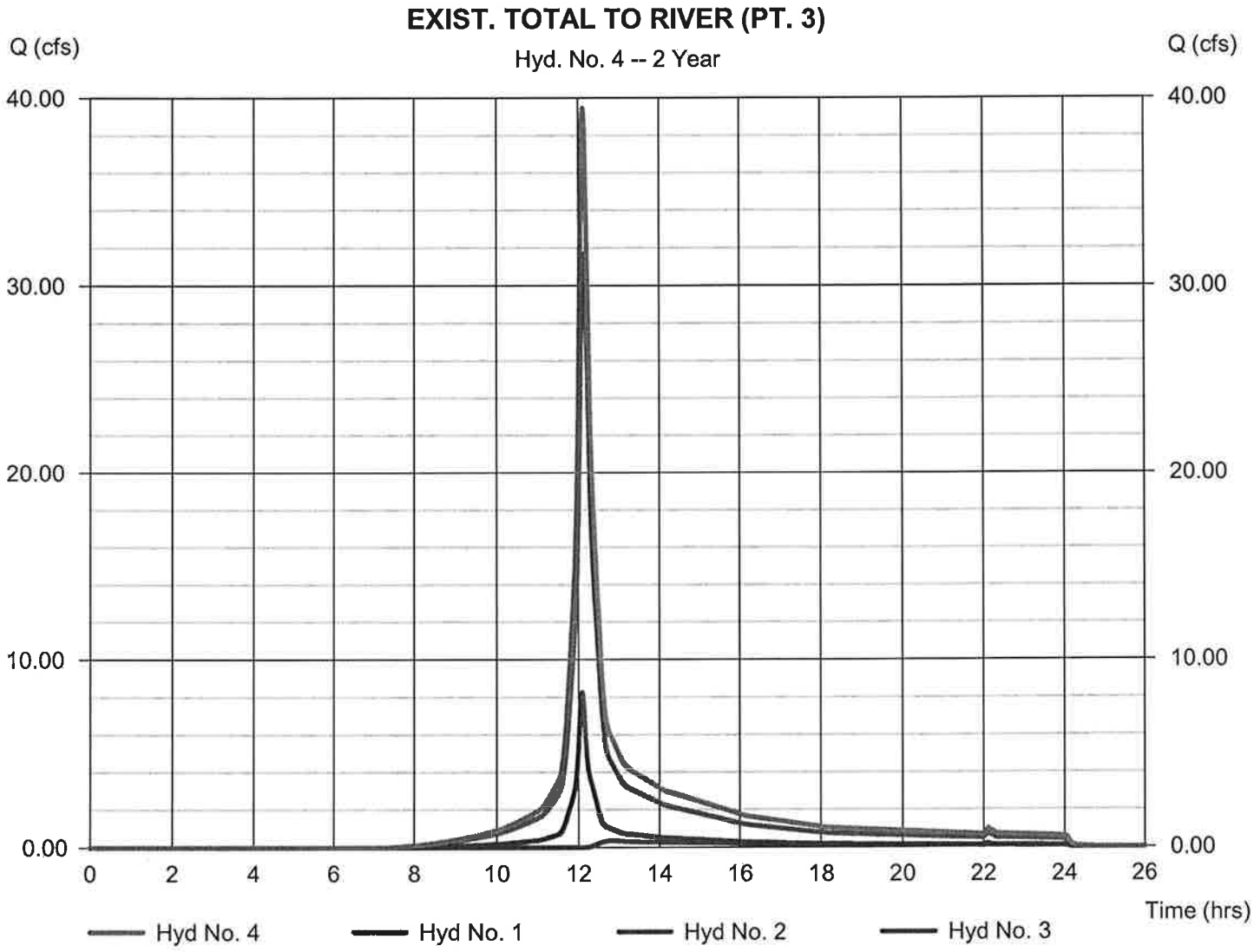
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 4

EXIST. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 39.44 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 148,392 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 33.470 ac



Hydrograph Report

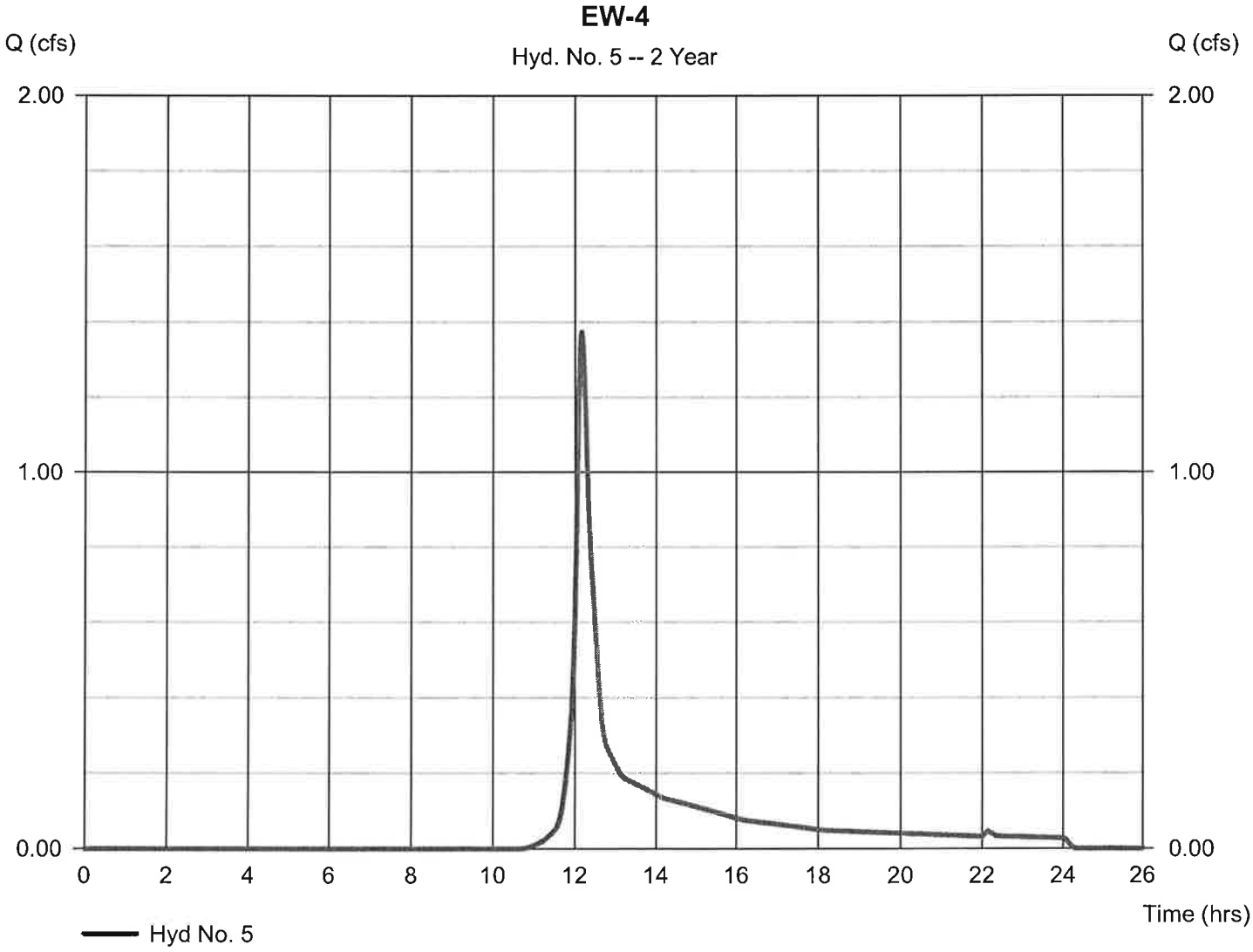
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 5

EW-4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.373 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 1 min	Hyd. volume	= 5,489 cuft
Drainage area	= 1.580 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.01 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.950 x 98) + (0.630 x 39)] / 1.580



Hydrograph Report

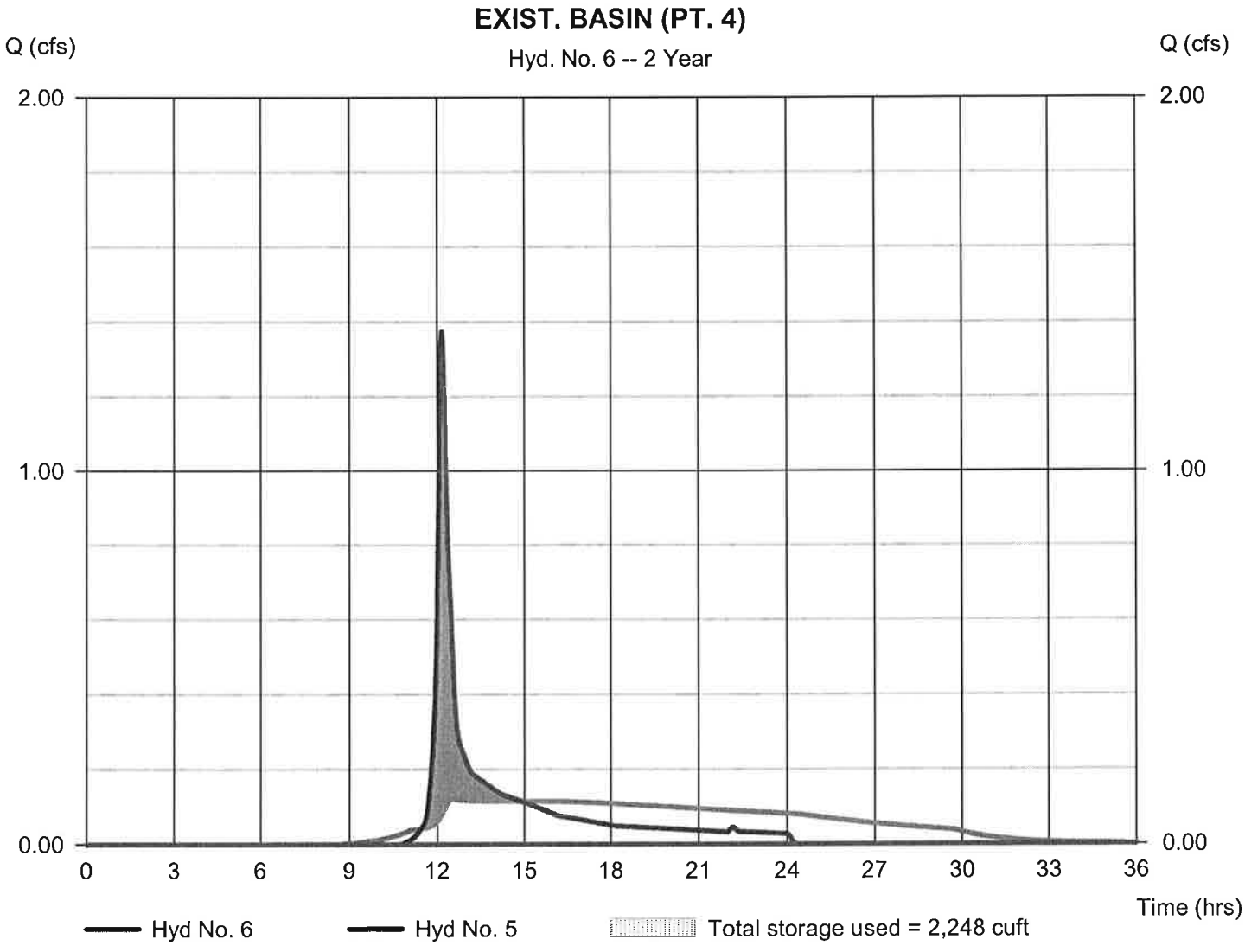
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 6

EXIST. BASIN (PT. 4)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.08 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 5 - EW-4	Max. Elevation	= 118.60 ft
Reservoir name	= EX. BASIN	Max. Storage	= 2,248 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

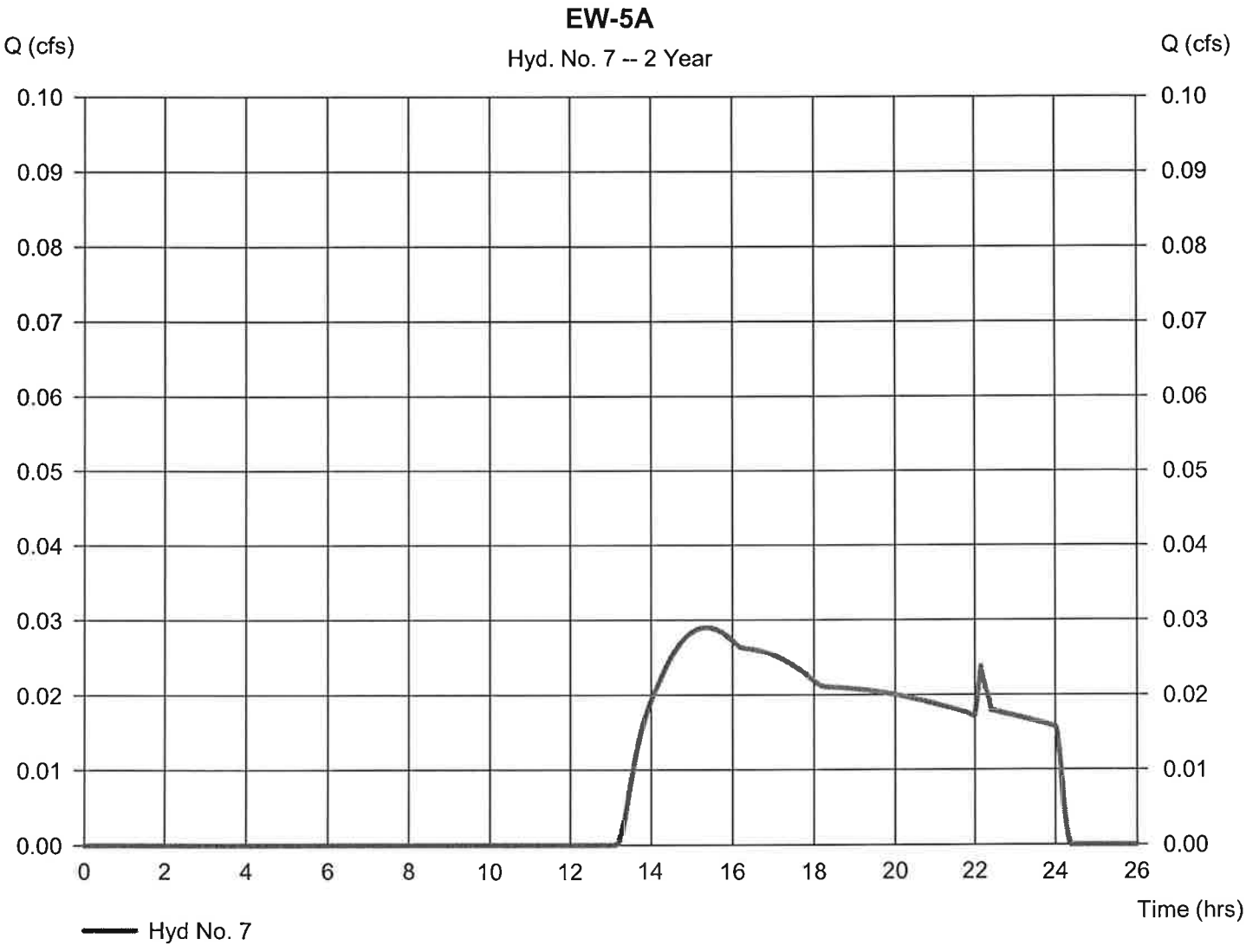
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 7

EW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.029 cfs
Storm frequency	= 2 yrs	Time to peak	= 15.37 hrs
Time interval	= 1 min	Hyd. volume	= 820 cuft
Drainage area	= 4.990 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.91 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.400 x 98) + (4.750 x 39)] / 4.990



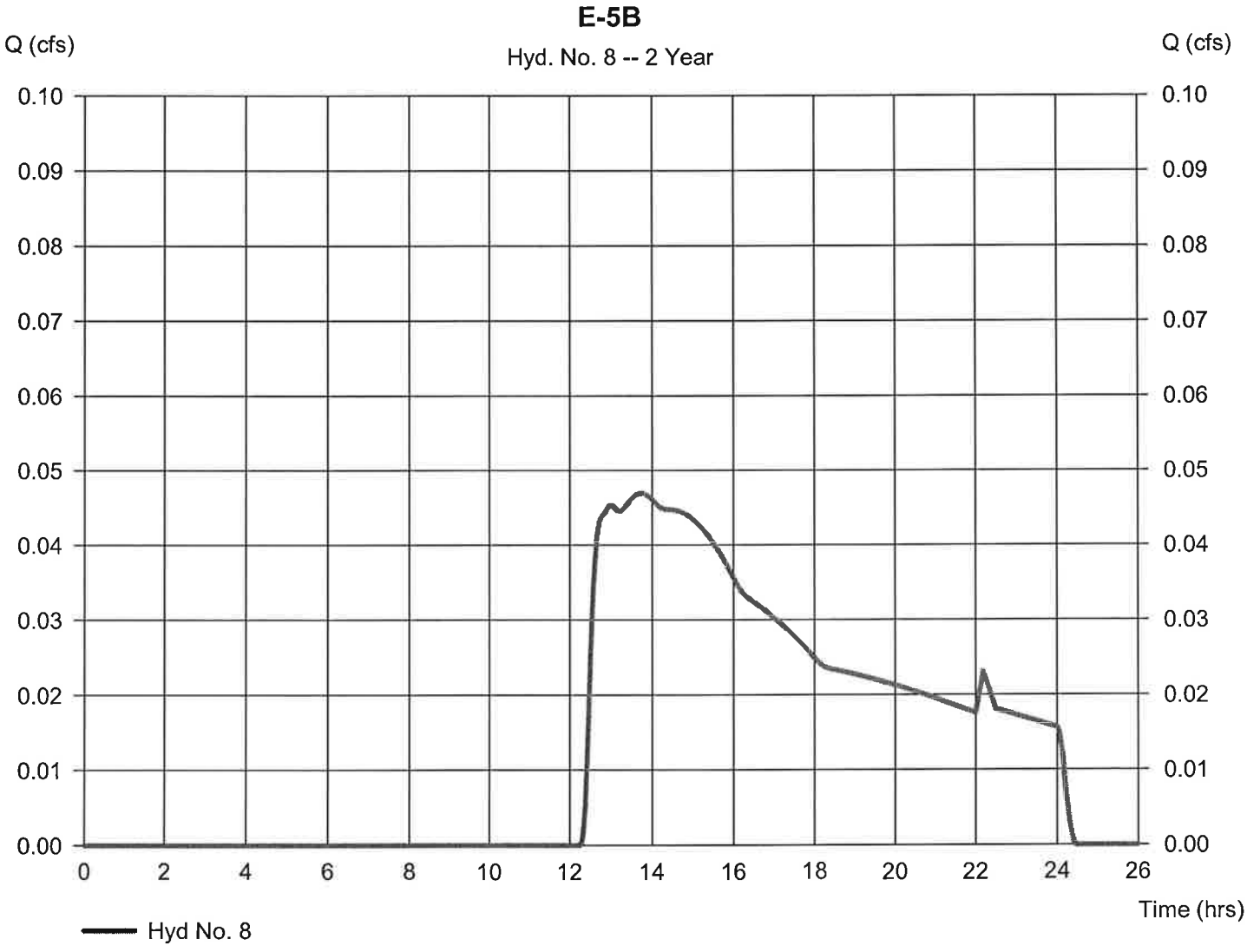
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 8

E-5B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.047 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.75 hrs
Time interval	= 1 min	Hyd. volume	= 1,209 cuft
Drainage area	= 3.090 ac	Curve number	= 50
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.18 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



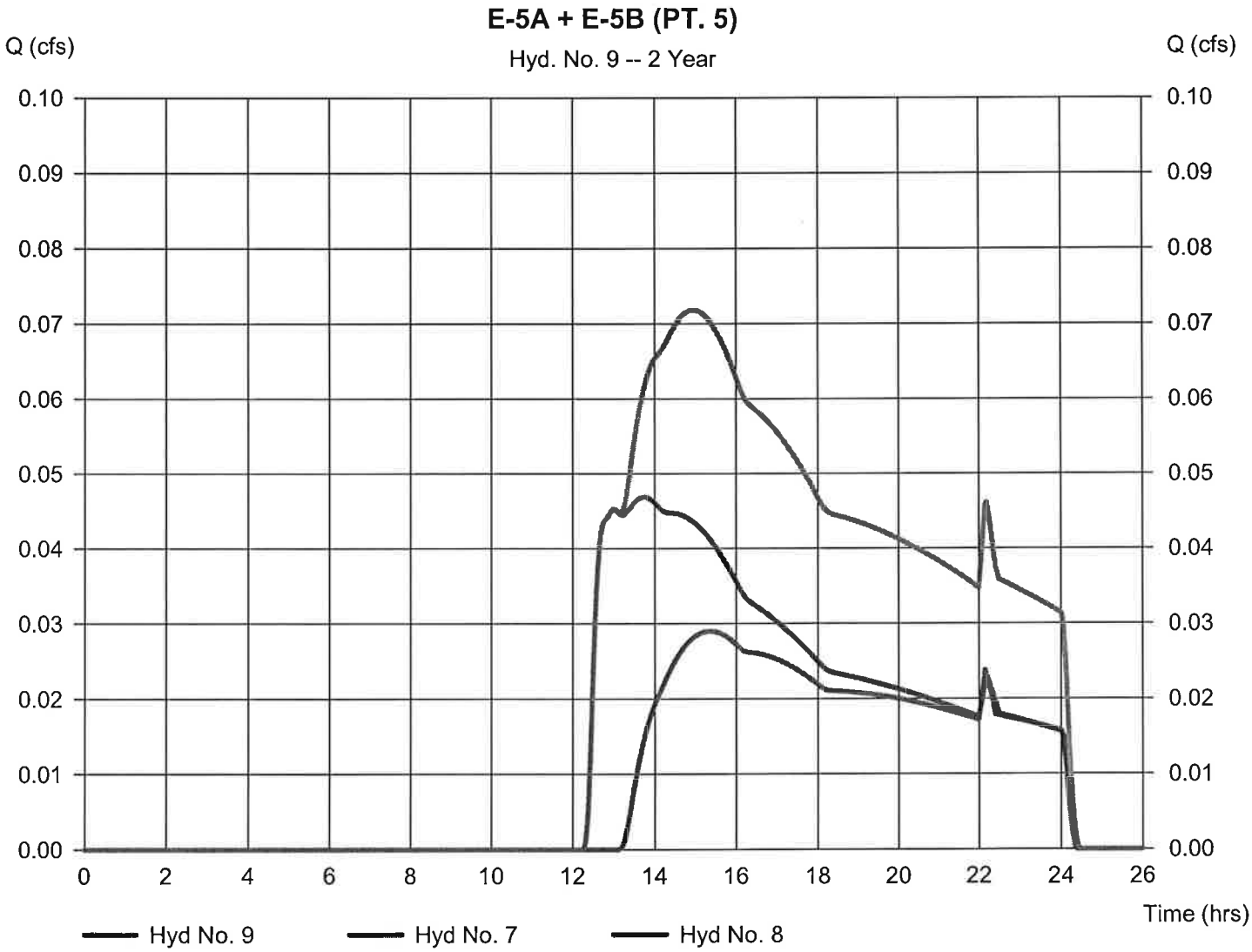
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 9

E-5A + E-5B (PT. 5)

Hydrograph type	= Combine	Peak discharge	= 0.072 cfs
Storm frequency	= 2 yrs	Time to peak	= 14.95 hrs
Time interval	= 1 min	Hyd. volume	= 2,029 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 8.080 ac



Hydrograph Report

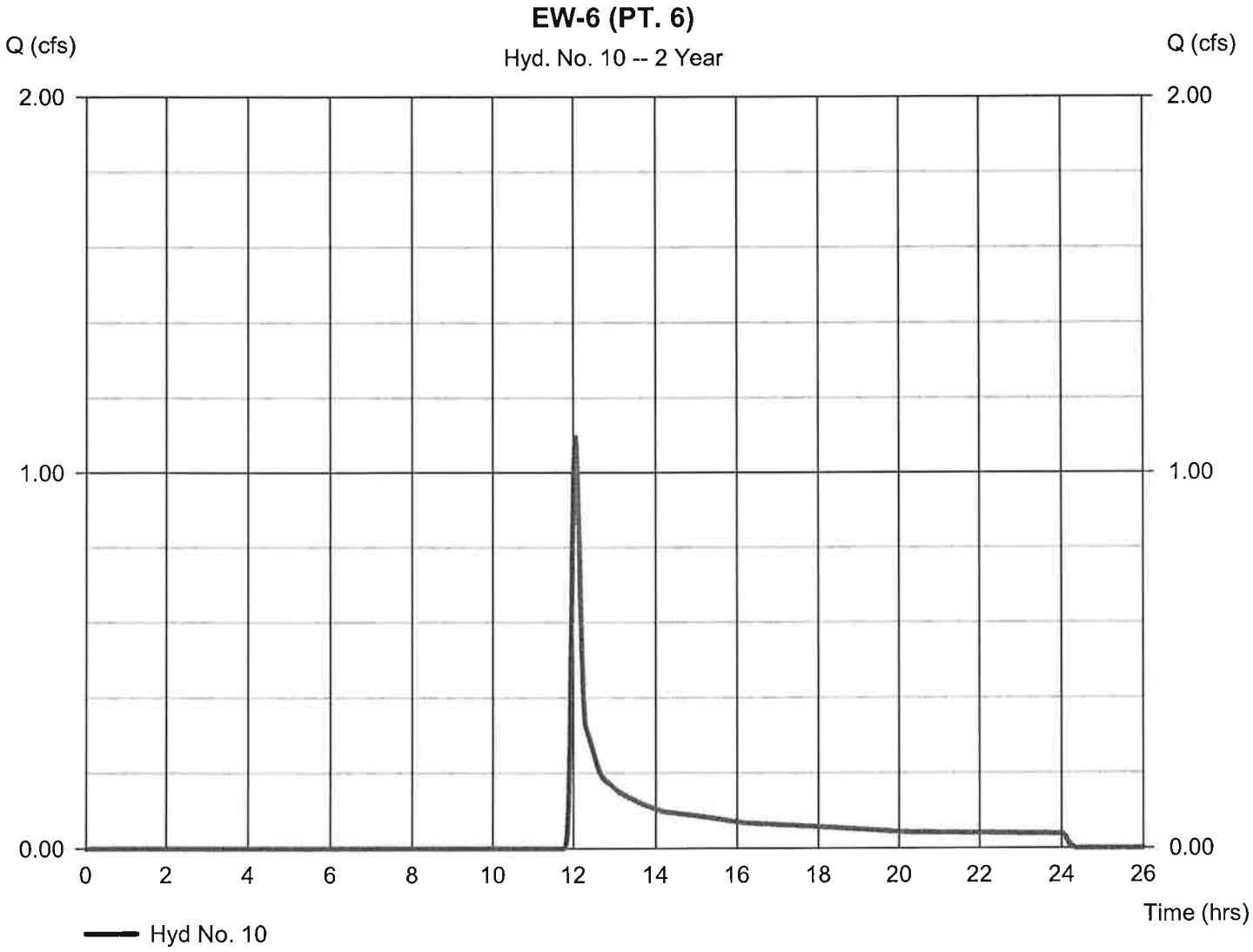
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 10

EW-6 (PT. 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.095 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 4,083 cuft
Drainage area	= 2.830 ac	Curve number	= 61*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.03 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.660 x 98) + (1.790 x 39)] / 2.830



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	53.09	1	728	195,223	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	13.82	1	725	45,078	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	3.324	1	753	26,655	------	------	------	EW-3
4	Combine	66.75	1	727	266,955	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	2.927	1	729	11,135	------	------	------	EW-4
6	Reservoir	0.000	1	732	0	5	119.19	5,096	EXIST. BASIN (PT. 4)
7	SCS Runoff	0.630	1	746	6,040	------	------	------	EW-5A
8	SCS Runoff	0.762	1	743	5,544	------	------	------	E-5B
9	Combine	1.385	1	745	11,584	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	3.951	1	722	10,914	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	45.30	1	732	192,400	------	------	------	PW-1A
12	SCS Runoff	4.338	1	725	13,432	------	------	------	PW-1B
13	Reservoir	0.842	1	748	3,749	12	127.41	5,189	WATER QUALITY SWALE
14	Combine	45.70	1	732	196,149	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	34.19	1	742	167,881	14	121.92	40,295	BASIN 2
16	Diversion1	0.820	1	742	19,625	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	33.37	1	742	148,255	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	0.499	1	755	3,761	------	------	------	PW-2
19	Reservoir	0.000	1	774	0	18	118.36	1,341	BASIN 1 (PT.2)
20	SCS Runoff	1.274	1	748	10,882	------	------	------	PW-3
21	SCS Runoff	12.06	1	741	62,928	------	------	------	PW-5A
22	Reservoir	7.915	1	757	38,755	21	129.25	17,002	BASIN 3
23	Combine	39.25	1	744	206,636	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	0.993	1	727	3,424	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	2.941	1	737	14,256	------	------	------	PW-6A
26	Reservoir	2.731	1	740	6,961	25	130.06	3,214	BASIN 4
27	SCS Runoff	0.009	1	881	248	------	------	------	PW-6B
28	Combine	2.731	1	740	7,210	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

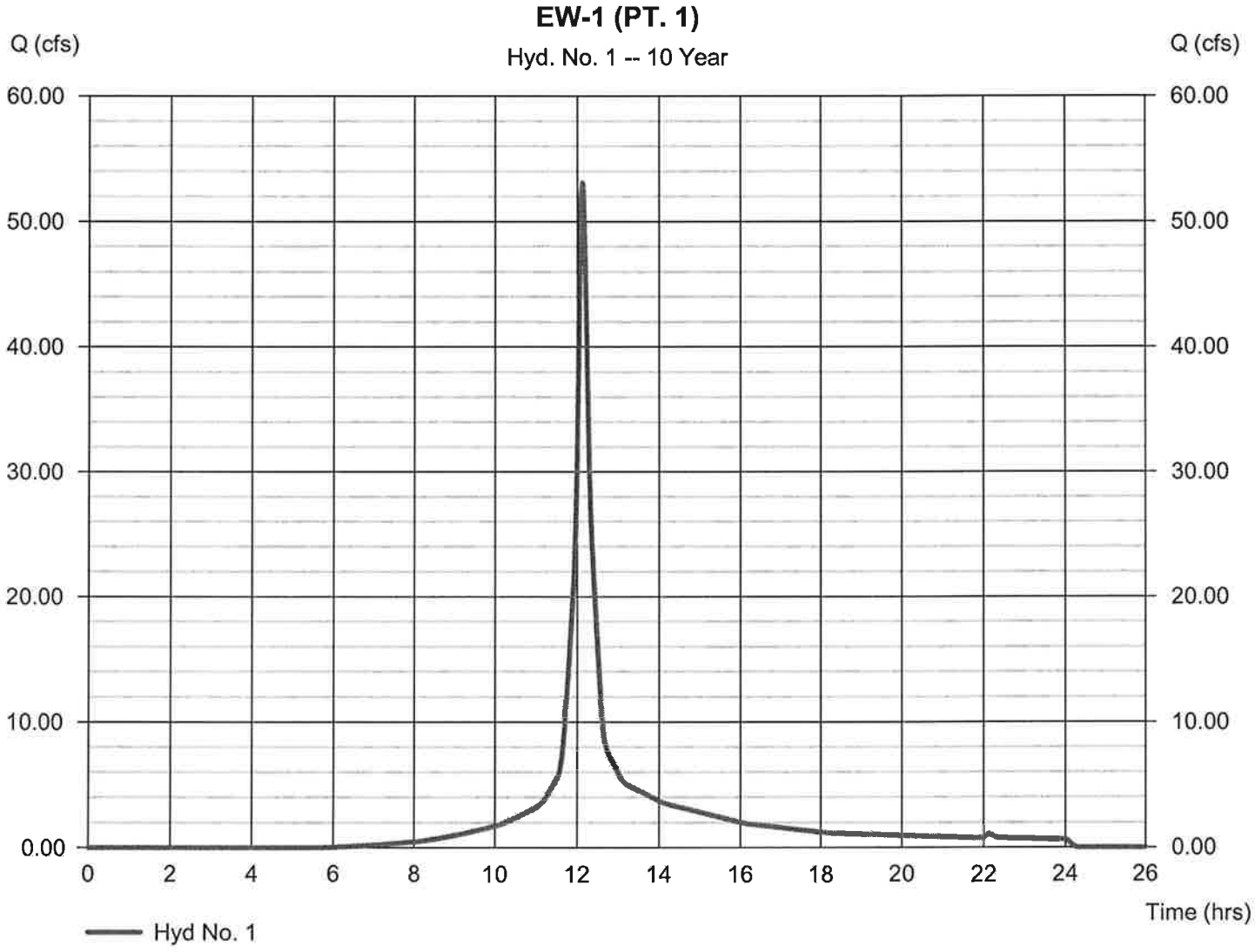
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 1

EW-1 (PT. 1)

Hydrograph type	= SCS Runoff	Peak discharge	= 53.09 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 1 min	Hyd. volume	= 195,223 cuft
Drainage area	= 17.050 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.23 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.240 x 39) + (14.180 x 98)] / 17.050



Hydrograph Report

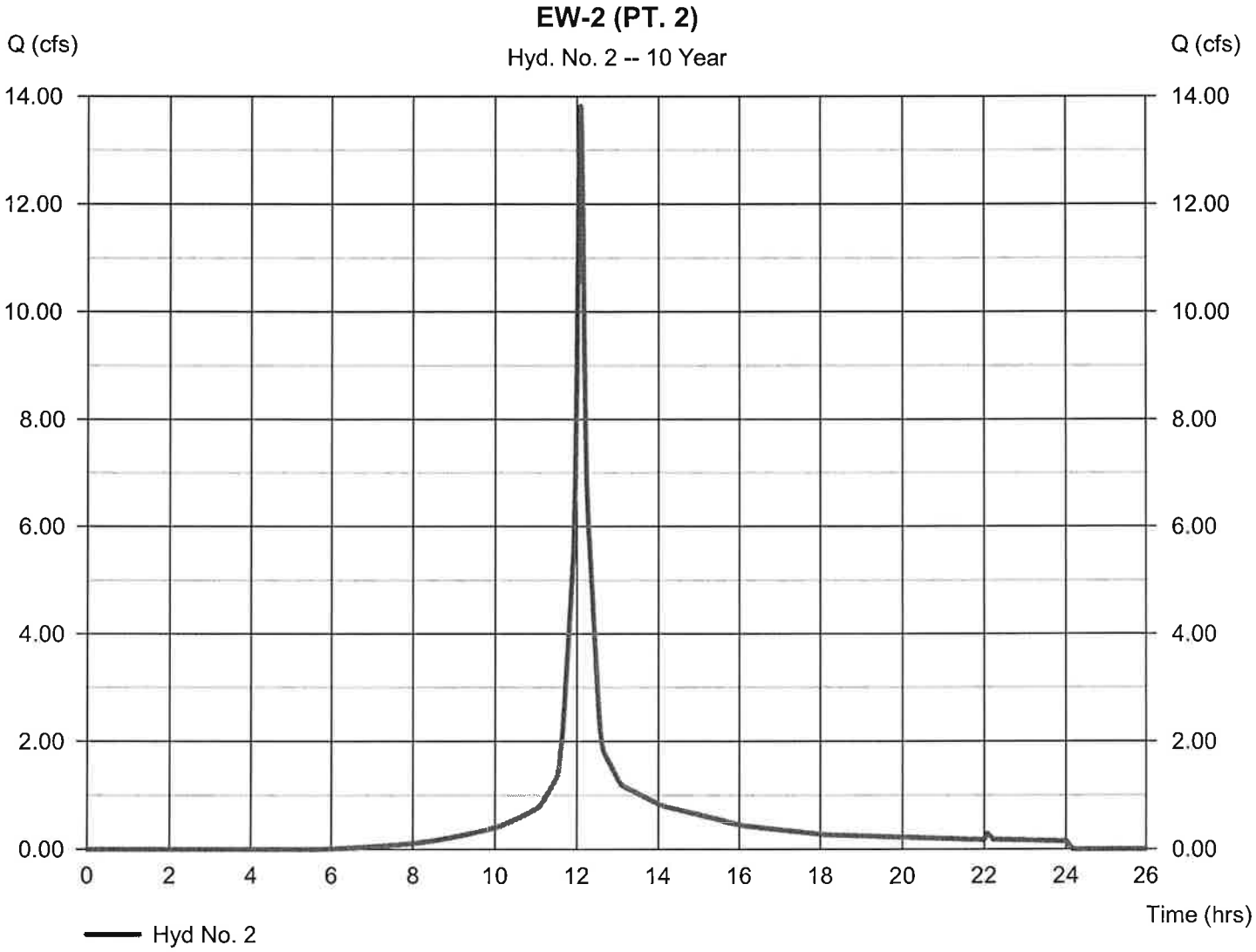
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 2

EW-2 (PT. 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 13.82 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 45,078 cuft
Drainage area	= 4.110 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.81 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.310 x 98) + (0.800 x 39)] / 4.110



Hydrograph Report

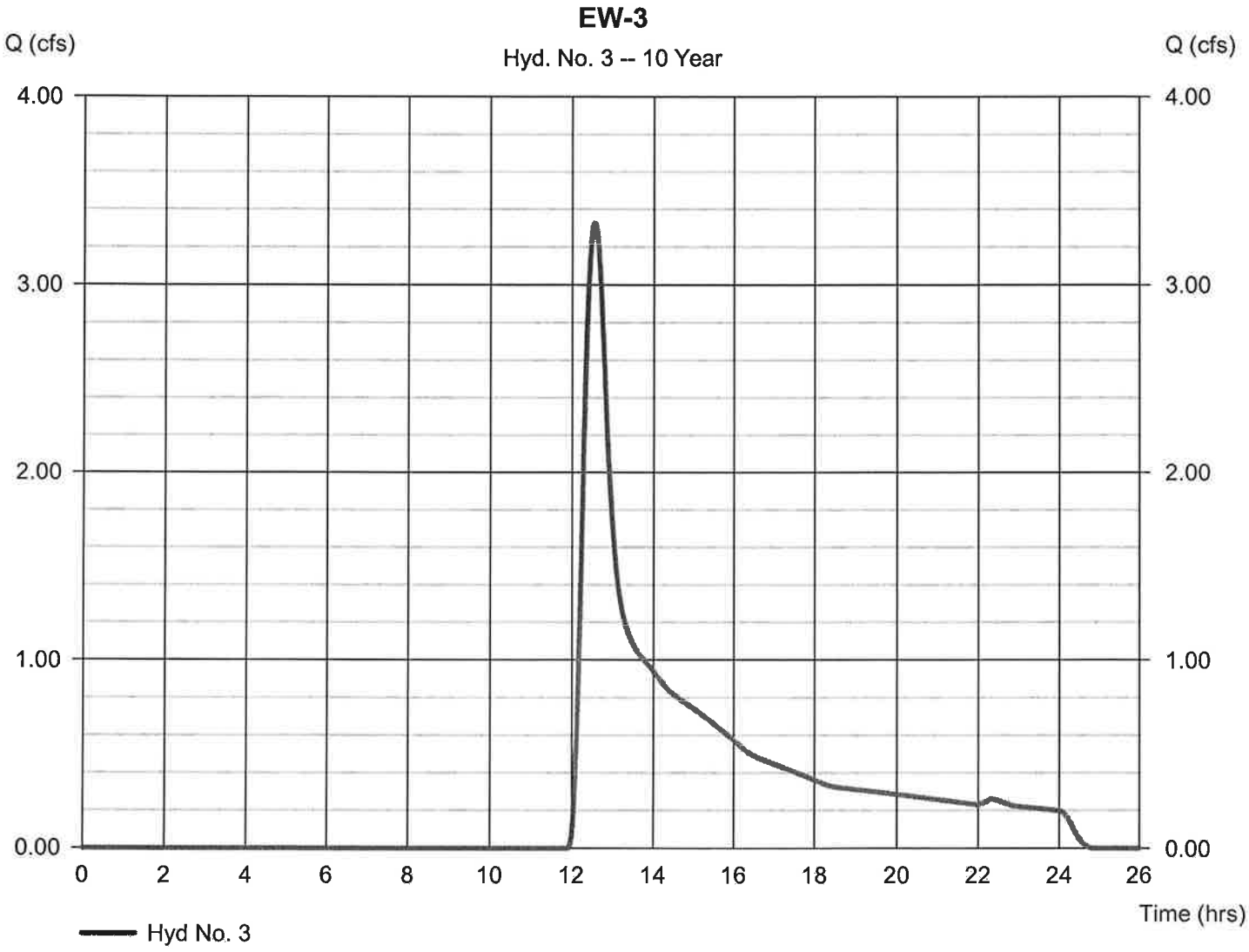
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 3

EW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.324 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.55 hrs
Time interval	= 1 min	Hyd. volume	= 26,655 cuft
Drainage area	= 12.310 ac	Curve number	= 52*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.55 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.280 x 98) + (0.440 x 76) + (0.130 x 83) + (14.090 x 39)] / 12.310



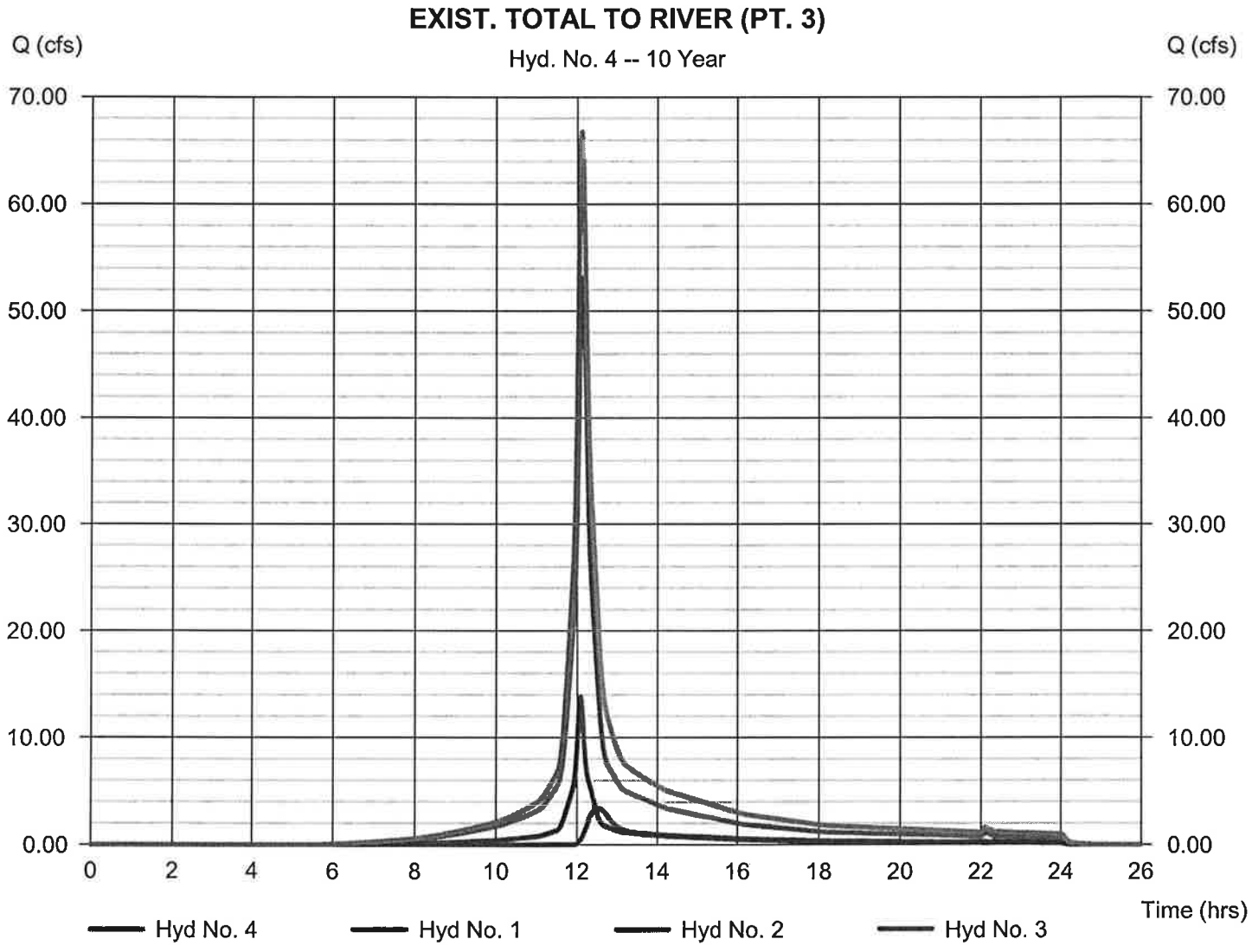
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 4

EXIST. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 66.75 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 266,955 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 33.470 ac



Hydrograph Report

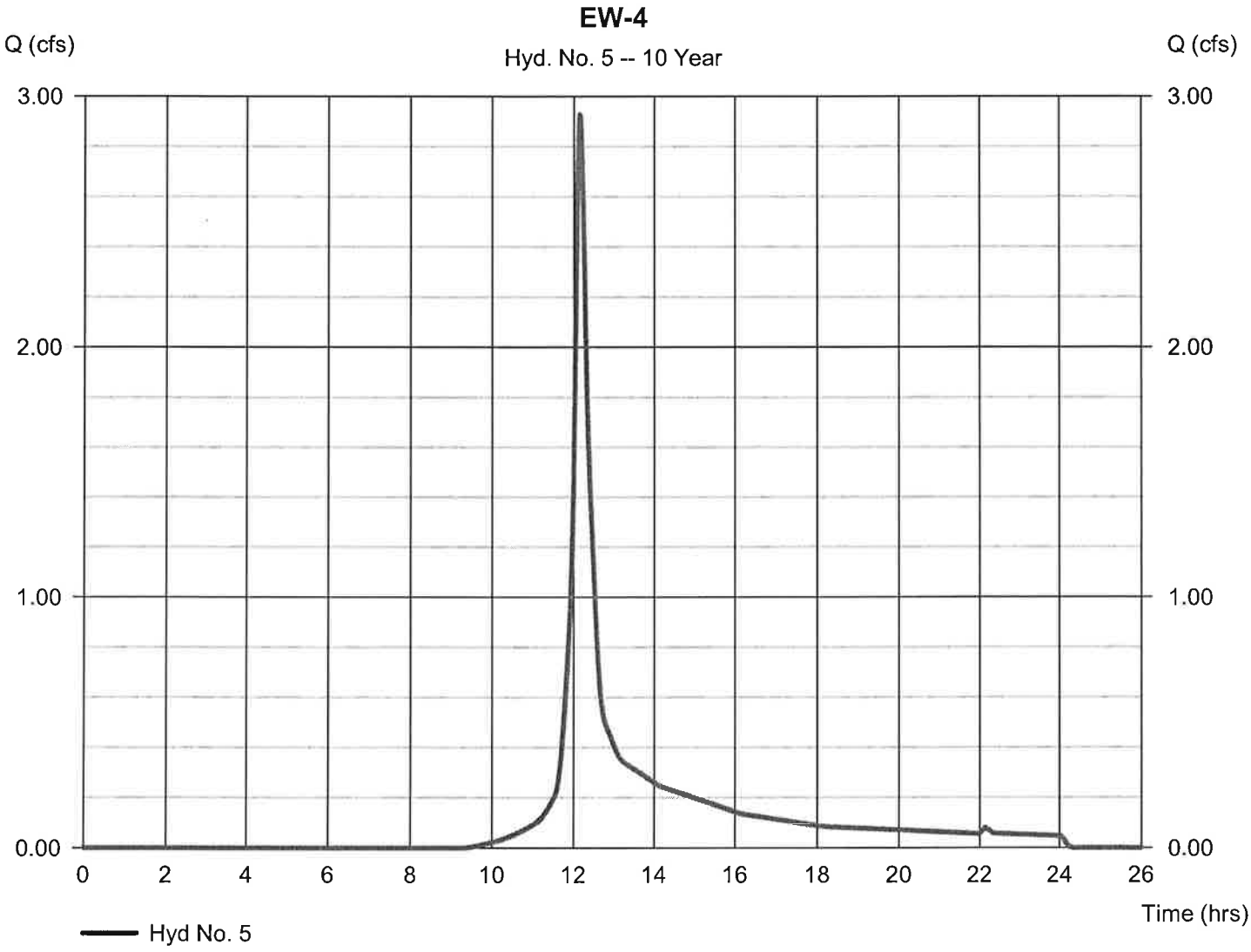
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 5

EW-4

Hydrograph type	= SCS Runoff	Peak discharge	= 2.927 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 11,135 cuft
Drainage area	= 1.580 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.01 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.950 x 98) + (0.630 x 39)] / 1.580



Hydrograph Report

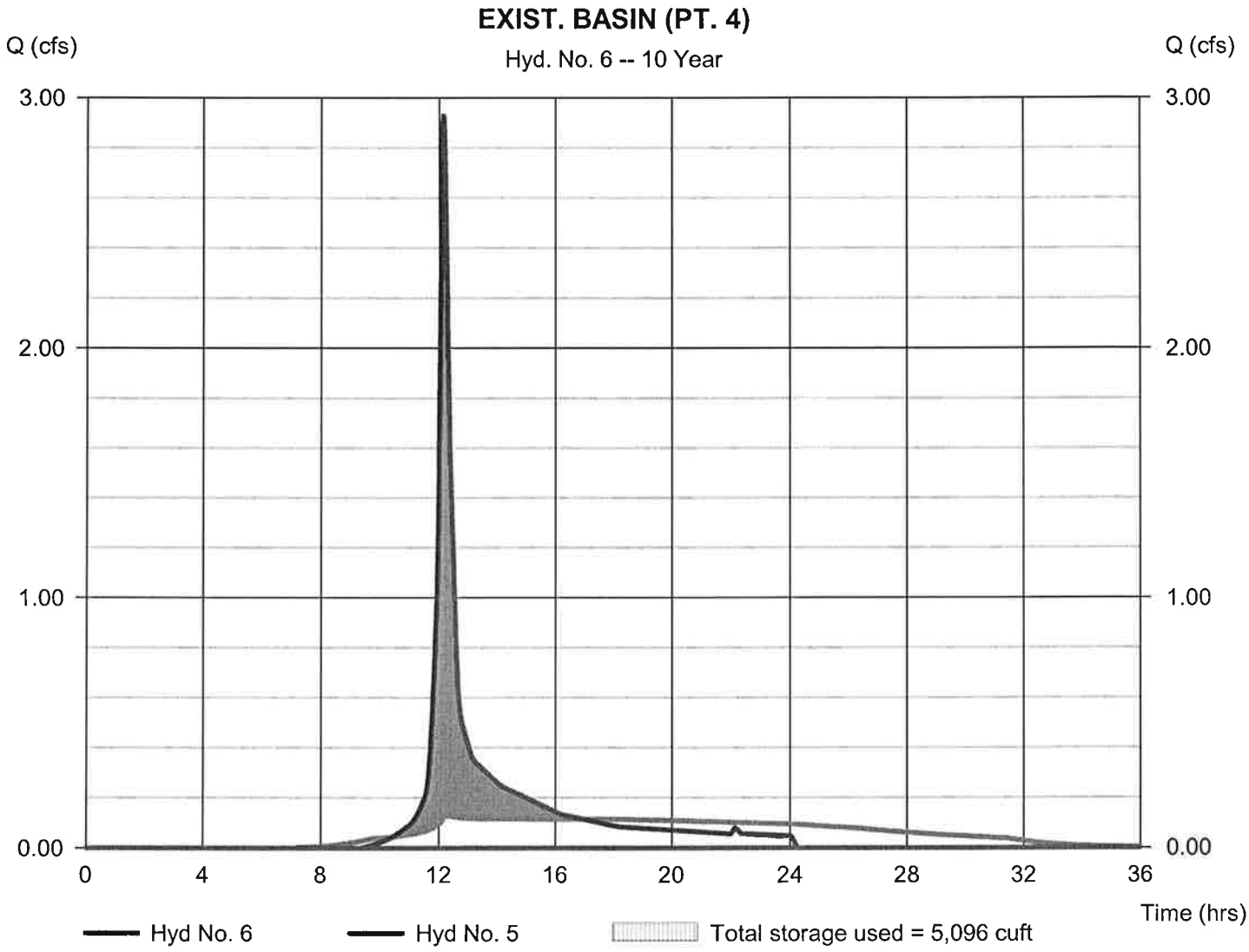
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 6

EXIST. BASIN (PT. 4)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 5 - EW-4	Max. Elevation	= 119.19 ft
Reservoir name	= EX. BASIN	Max. Storage	= 5,096 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

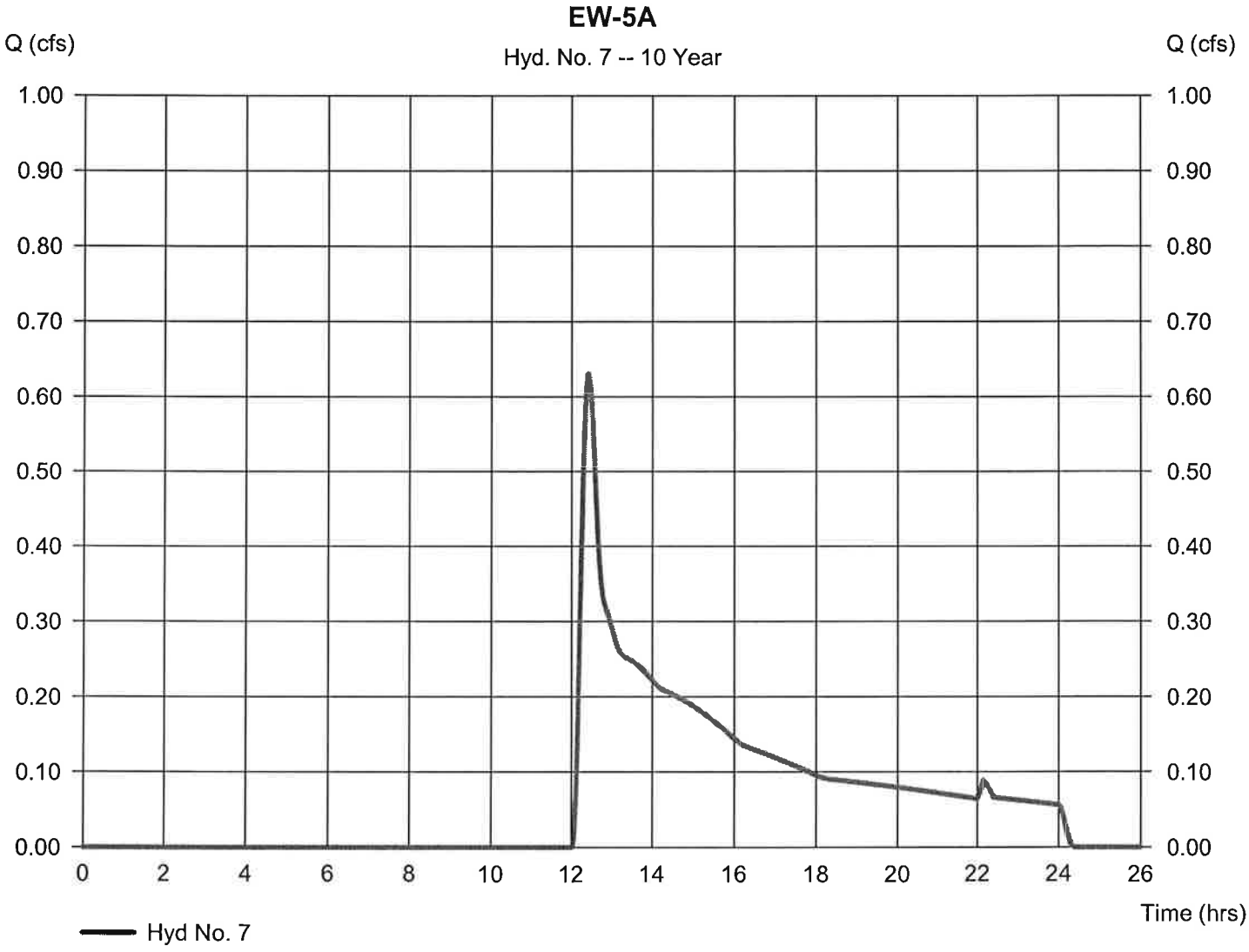
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 7

EW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.630 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.43 hrs
Time interval	= 1 min	Hyd. volume	= 6,040 cuft
Drainage area	= 4.990 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.91 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.400 x 98) + (4.750 x 39)] / 4.990



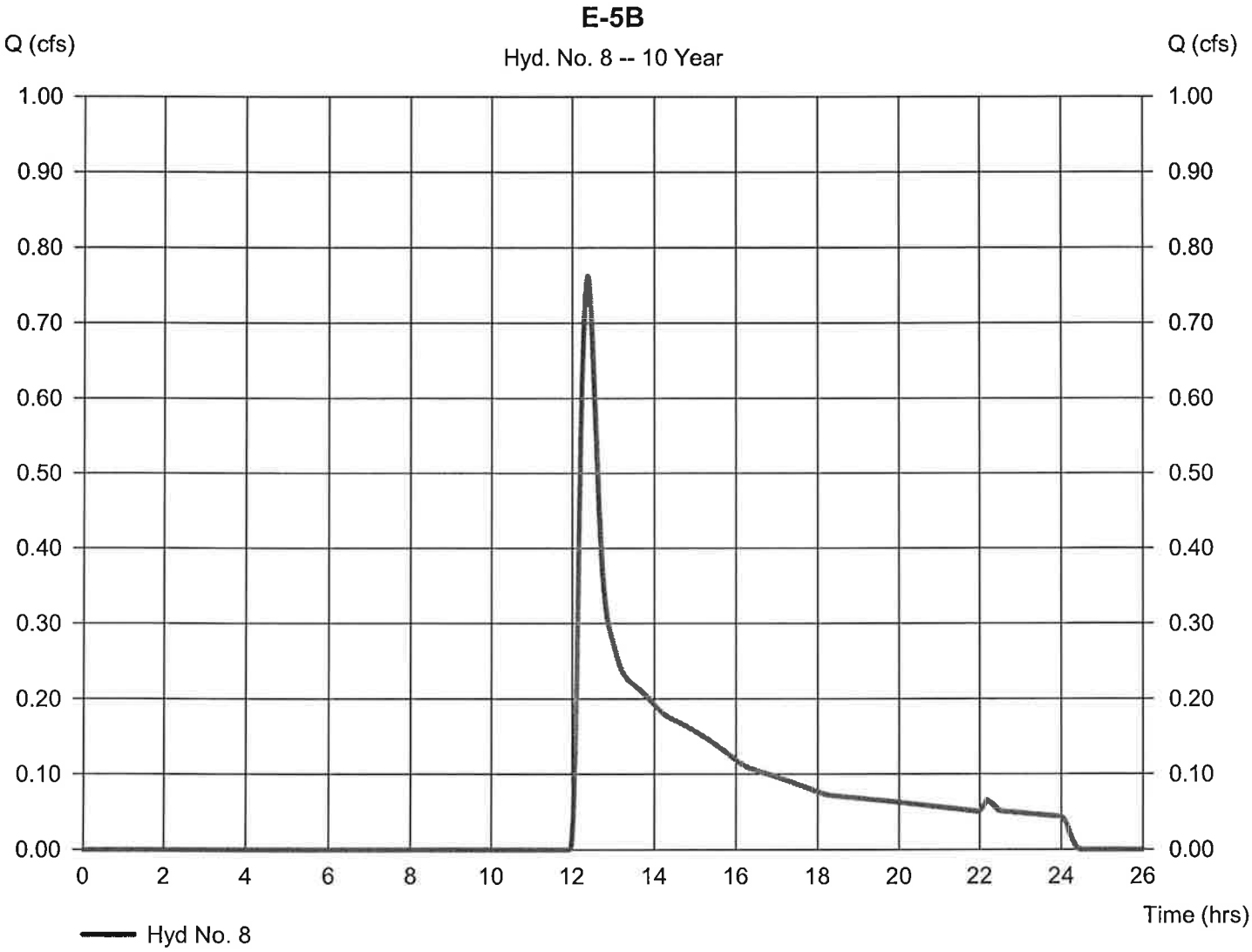
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 8

E-5B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.762 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.38 hrs
Time interval	= 1 min	Hyd. volume	= 5,544 cuft
Drainage area	= 3.090 ac	Curve number	= 50
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.18 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



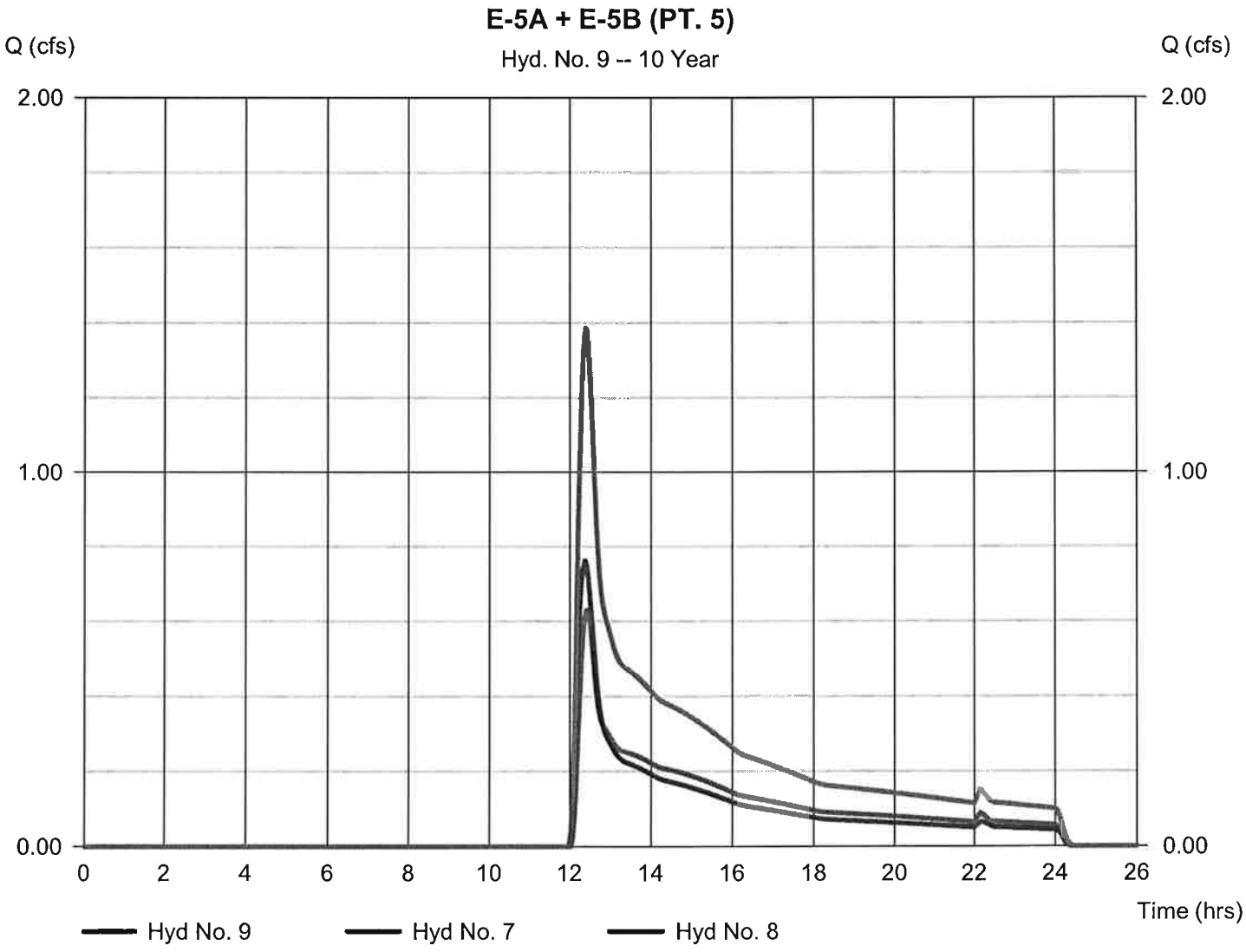
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 9

E-5A + E-5B (PT. 5)

Hydrograph type	= Combine	Peak discharge	= 1.385 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.42 hrs
Time interval	= 1 min	Hyd. volume	= 11,584 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 8.080 ac



Hydrograph Report

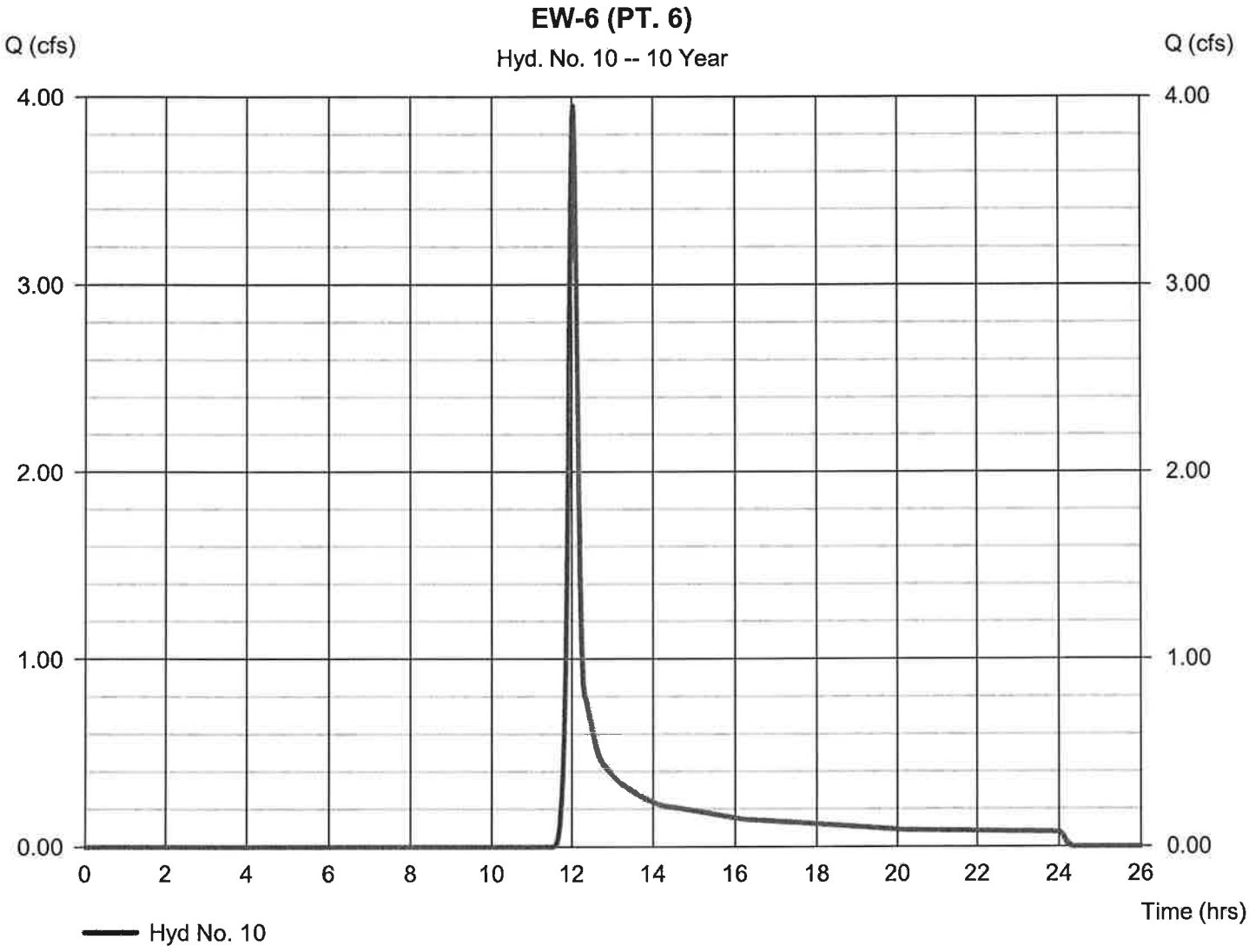
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 10

EW-6 (PT. 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.951 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 1 min	Hyd. volume	= 10,914 cuft
Drainage area	= 2.830 ac	Curve number	= 61*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.03 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.660 x 98) + (1.790 x 39)] / 2.830



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	91.48	1	728	345,180	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	23.83	1	725	79,704	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	13.92	1	746	83,057	------	------	------	EW-3
4	Combine	120.33	1	727	507,942	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	6.070	1	729	22,821	------	------	------	EW-4
6	Reservoir	0.000	1	768	0	5	120.10	12,018	EXIST. BASIN (PT. 4)
7	SCS Runoff	4.778	1	733	23,917	------	------	------	EW-5A
8	SCS Runoff	3.796	1	735	18,482	------	------	------	E-5B
9	Combine	8.554	1	734	42,399	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	10.68	1	721	27,323	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	82.29	1	732	354,916	------	------	------	PW-1A
12	SCS Runoff	8.803	1	725	27,183	------	------	------	PW-1B
13	Reservoir	4.011	1	733	14,267	12	127.96	8,308	WATER QUALITY SWALE
14	Combine	86.29	1	732	369,183	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	65.82	1	741	336,563	14	123.29	63,332	BASIN 2
16	Diversion1	1.025	1	741	23,696	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	64.79	1	741	312,865	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	1.683	1	749	10,491	------	------	------	PW-2
19	Reservoir	0.035	1	815	215	18	119.08	4,292	BASIN 1 (PT.2)
20	SCS Runoff	7.448	1	737	39,243	------	------	------	PW-3
21	SCS Runoff	26.40	1	740	134,167	------	------	------	PW-5A
22	Reservoir	17.27	1	757	106,346	21	130.69	31,280	BASIN 3
23	Combine	80.60	1	743	443,123	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	2.021	1	727	6,929	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	5.210	1	736	25,740	------	------	------	PW-6A
26	Reservoir	5.006	1	739	16,969	25	130.19	3,527	BASIN 4
27	SCS Runoff	0.275	1	728	1,726	------	------	------	PW-6B
28	Combine	5.237	1	739	18,695	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

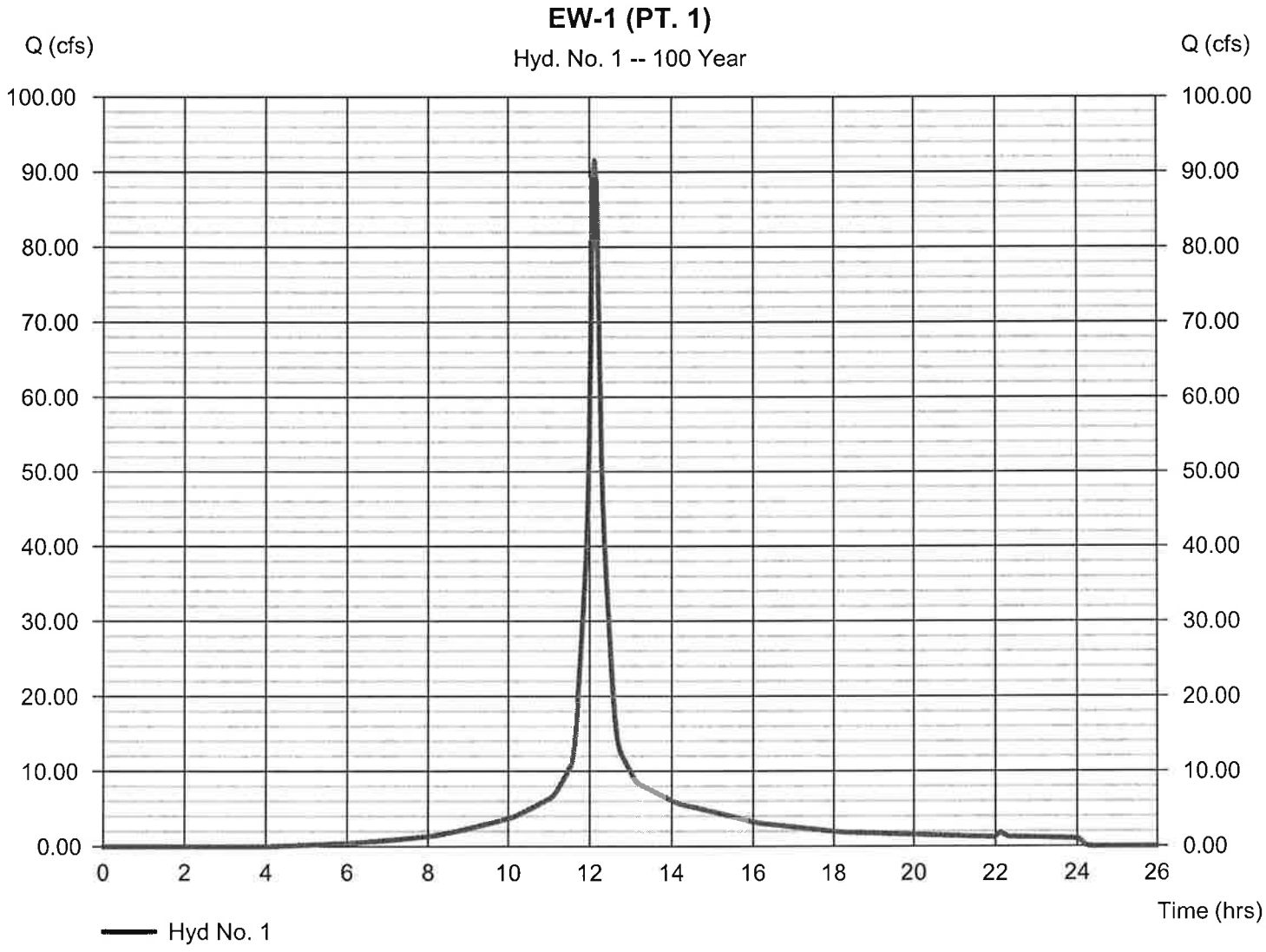
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 1

EW-1 (PT. 1)

Hydrograph type	= SCS Runoff	Peak discharge	= 91.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 1 min	Hyd. volume	= 345,180 cuft
Drainage area	= 17.050 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.23 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.240 x 39) + (14.180 x 98)] / 17.050



Hydrograph Report

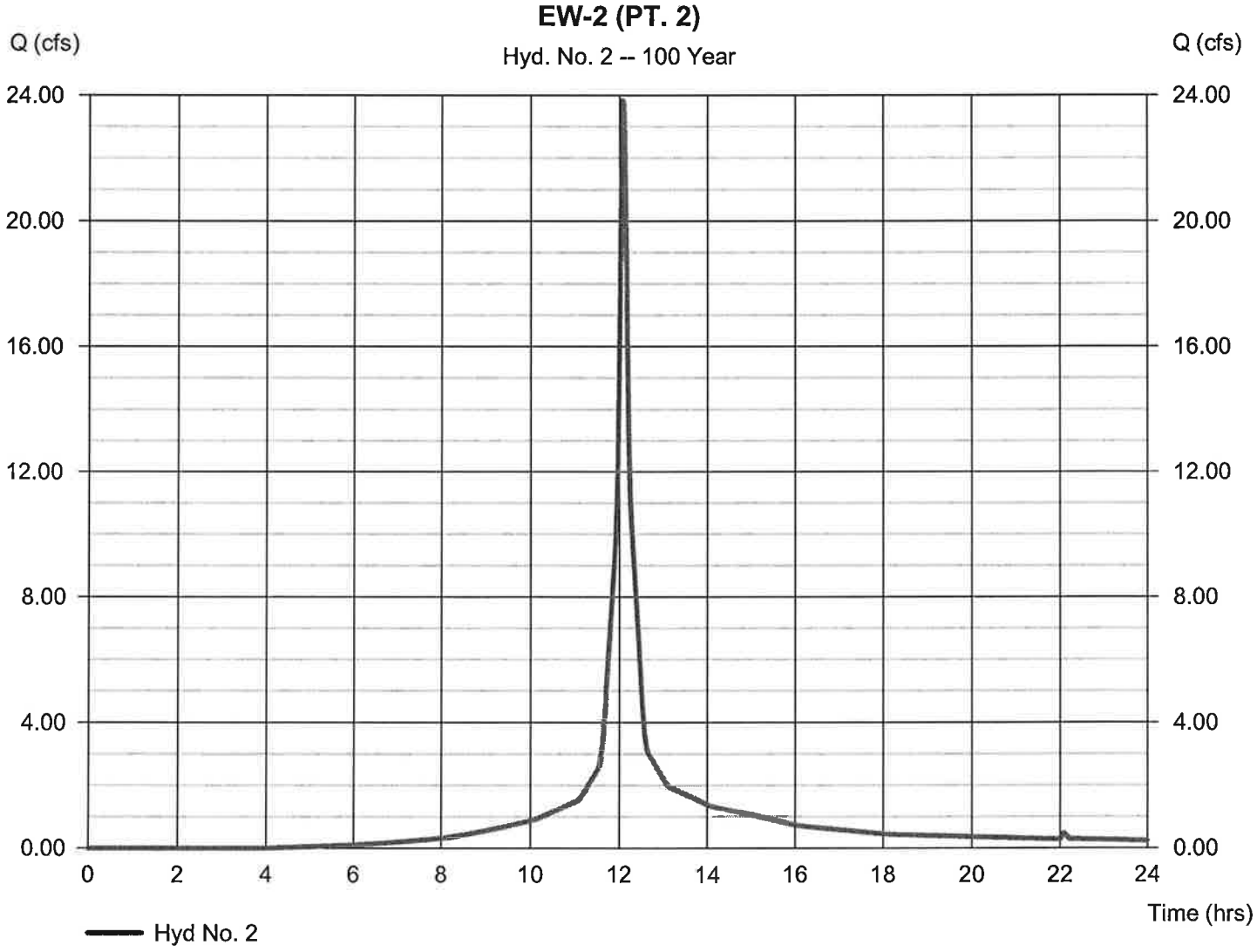
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 2

EW-2 (PT. 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 23.83 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 79,704 cuft
Drainage area	= 4.110 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.81 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(3.310 x 98) + (0.800 x 39)] / 4.110



Hydrograph Report

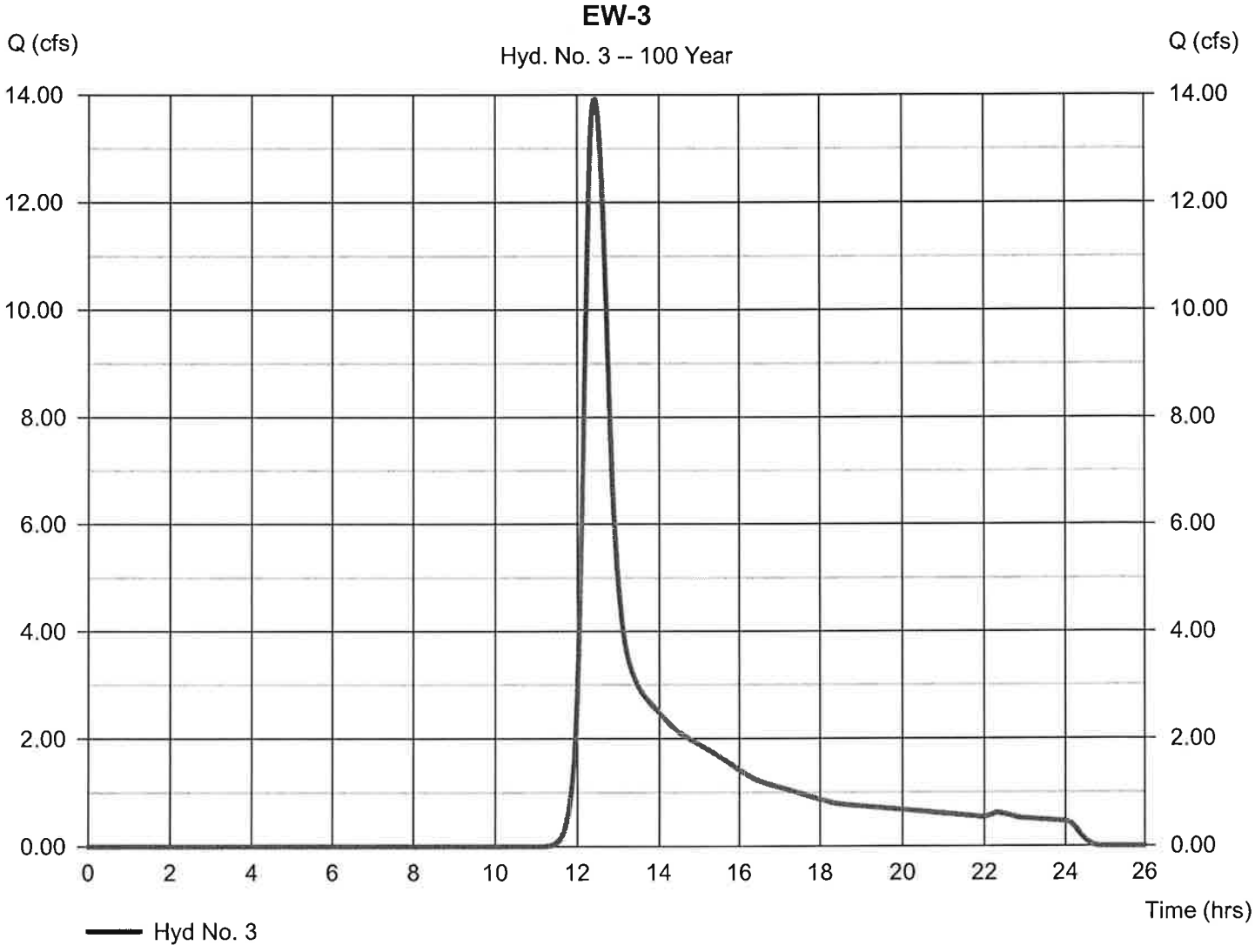
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 3

EW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 13.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.43 hrs
Time interval	= 1 min	Hyd. volume	= 83,057 cuft
Drainage area	= 12.310 ac	Curve number	= 52*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.55 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.280 x 98) + (0.440 x 76) + (0.130 x 83) + (14.090 x 39)] / 12.310



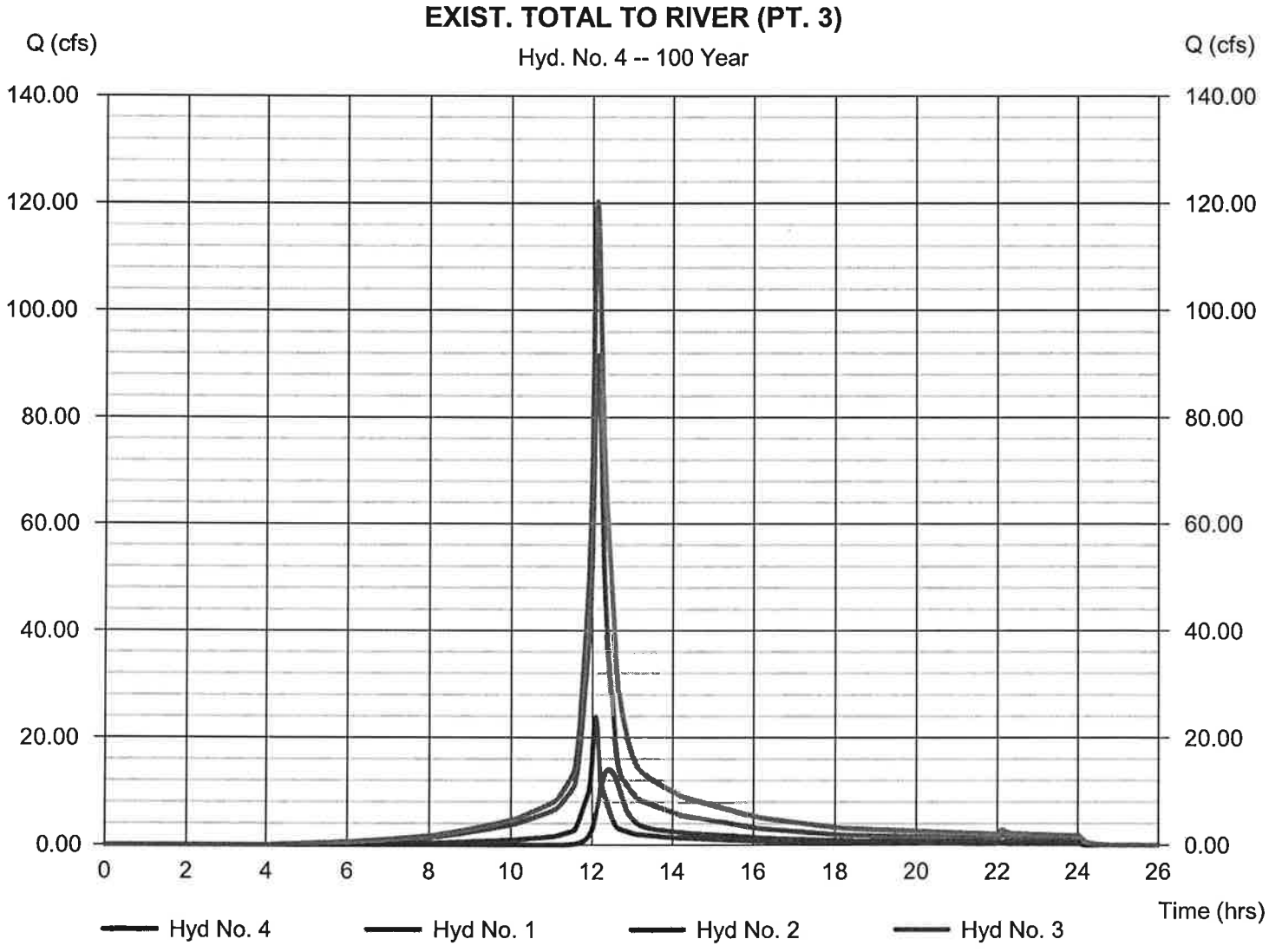
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 4

EXIST. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 120.33 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 507,942 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 33.470 ac



Hydrograph Report

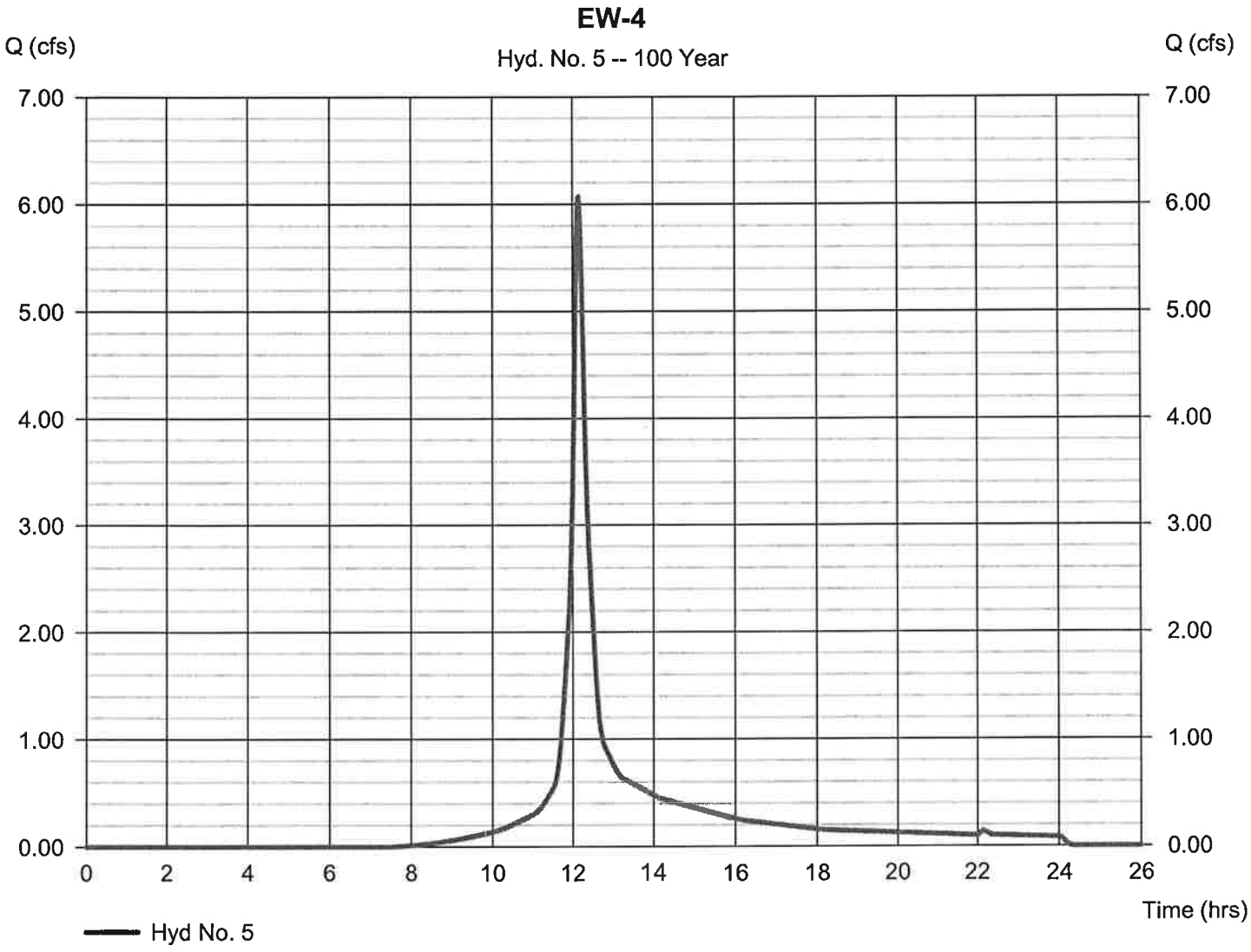
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 5

EW-4

Hydrograph type	= SCS Runoff	Peak discharge	= 6.070 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 22,821 cuft
Drainage area	= 1.580 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.01 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.950 x 98) + (0.630 x 39)] / 1.580



Hydrograph Report

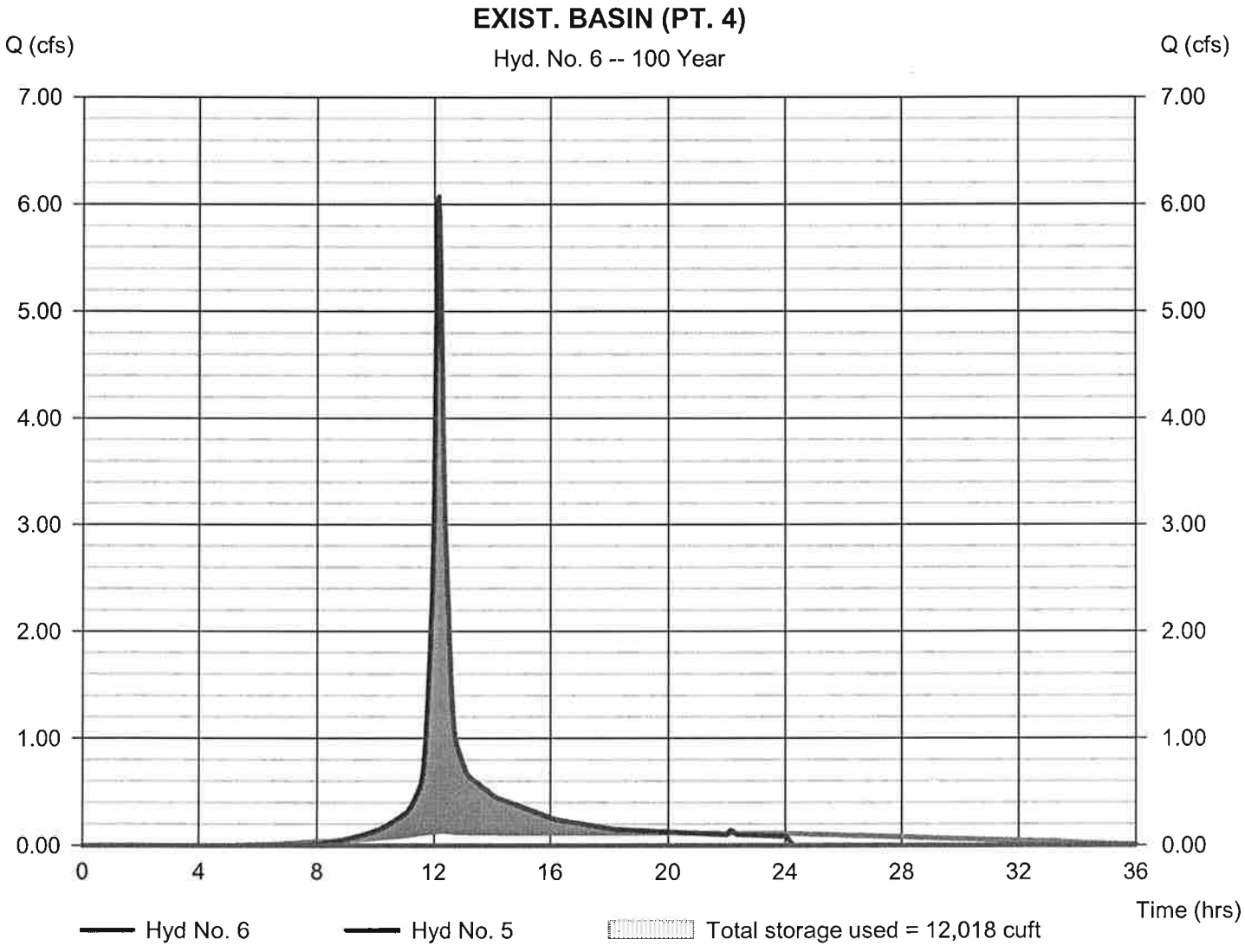
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 6

EXIST. BASIN (PT. 4)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.80 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 5 - EW-4	Max. Elevation	= 120.10 ft
Reservoir name	= EX. BASIN	Max. Storage	= 12,018 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

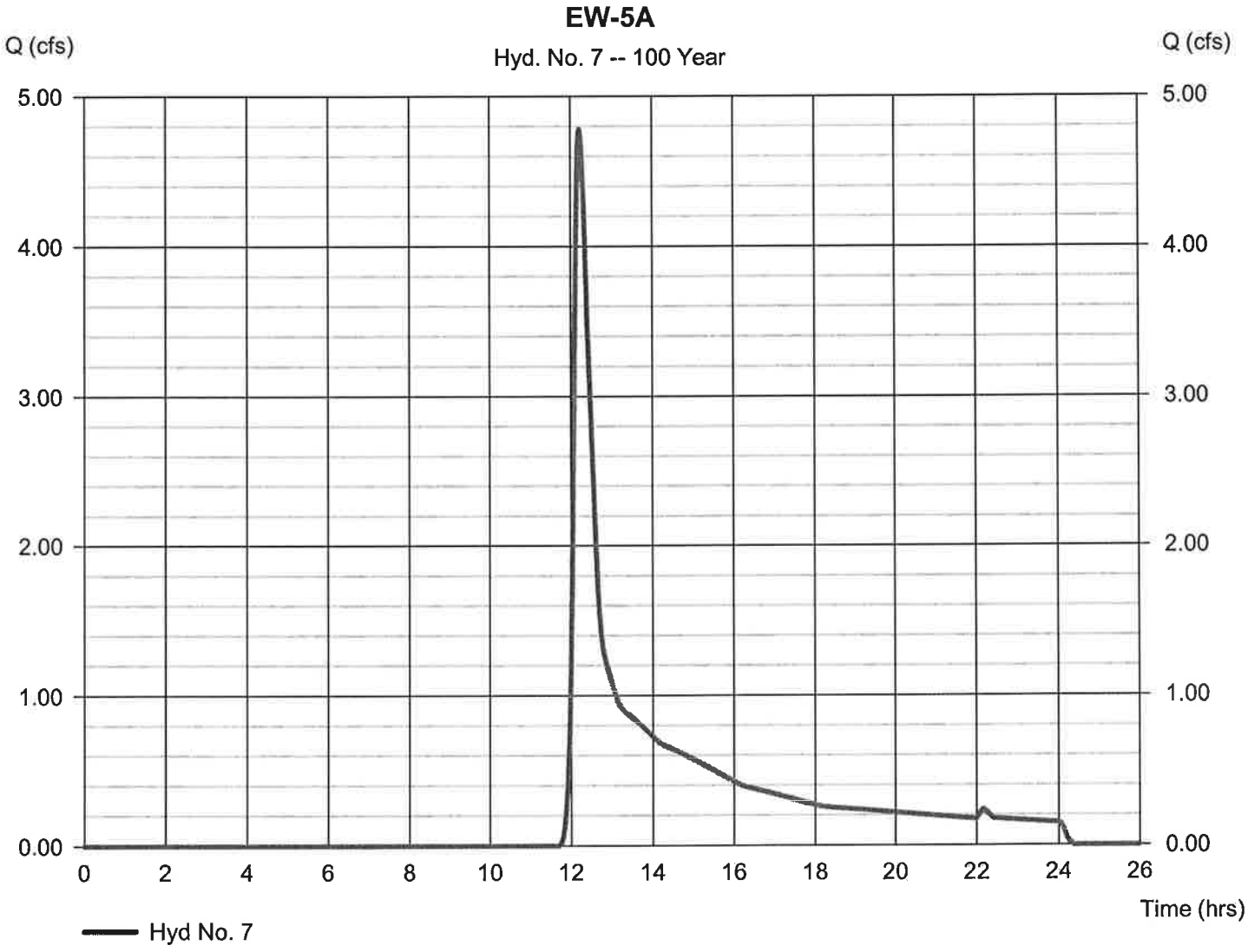
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 7

EW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 4.778 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.22 hrs
Time interval	= 1 min	Hyd. volume	= 23,917 cuft
Drainage area	= 4.990 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.91 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.400 x 98) + (4.750 x 39)] / 4.990



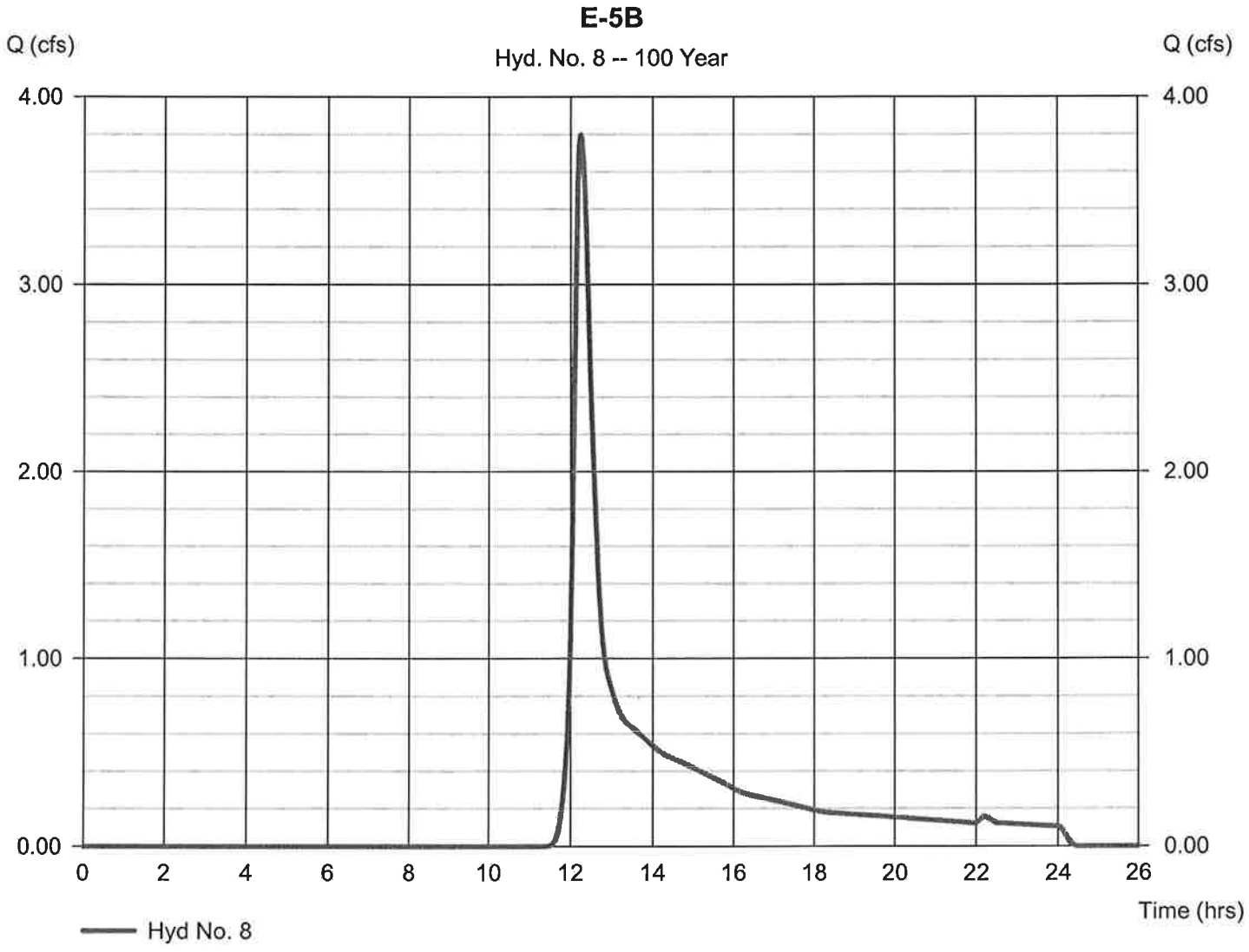
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 8

E-5B

Hydrograph type	= SCS Runoff	Peak discharge	= 3.796 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.25 hrs
Time interval	= 1 min	Hyd. volume	= 18,482 cuft
Drainage area	= 3.090 ac	Curve number	= 50
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.18 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



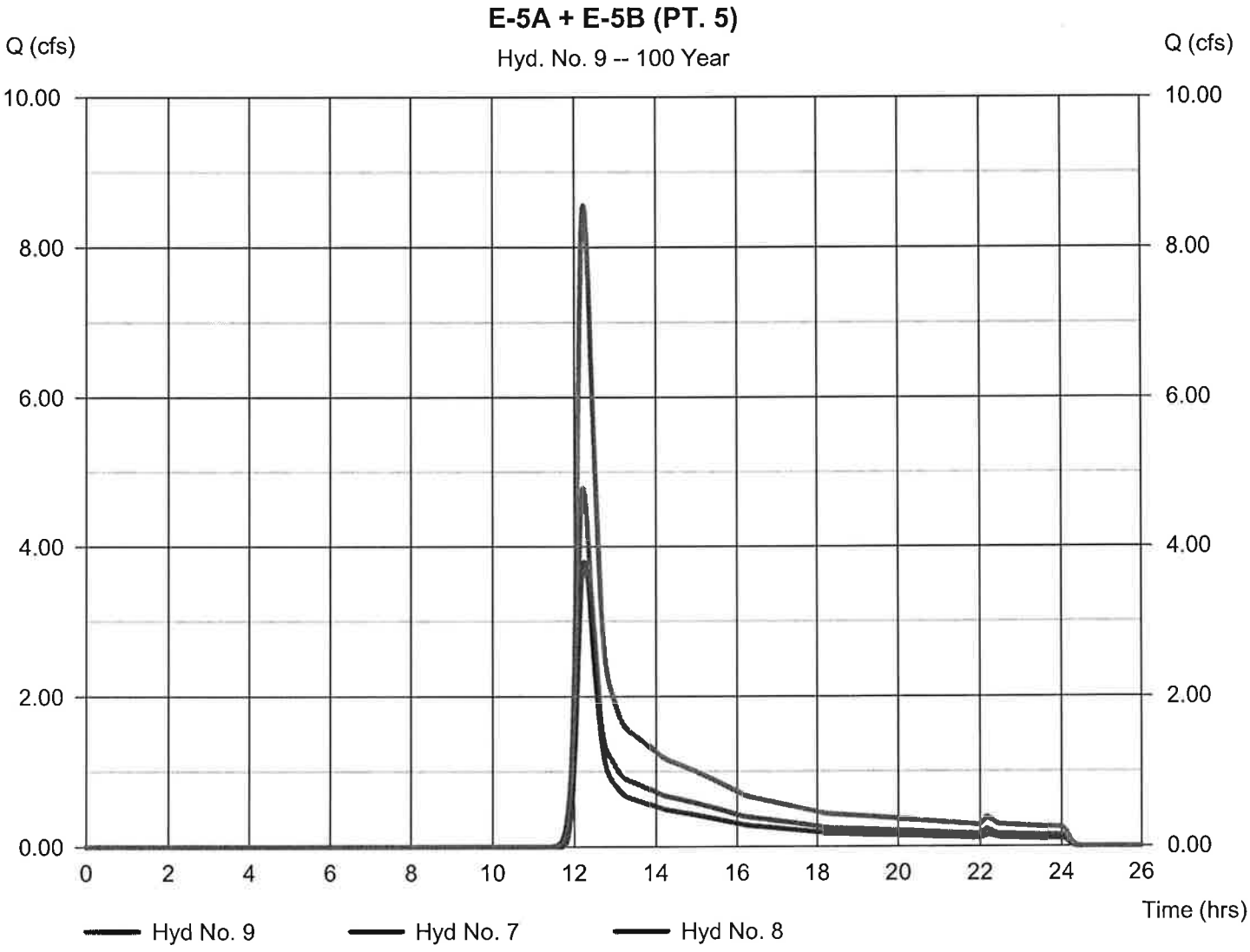
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 9

E-5A + E-5B (PT. 5)

Hydrograph type	= Combine	Peak discharge	= 8.554 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.23 hrs
Time interval	= 1 min	Hyd. volume	= 42,399 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 8.080 ac



Hydrograph Report

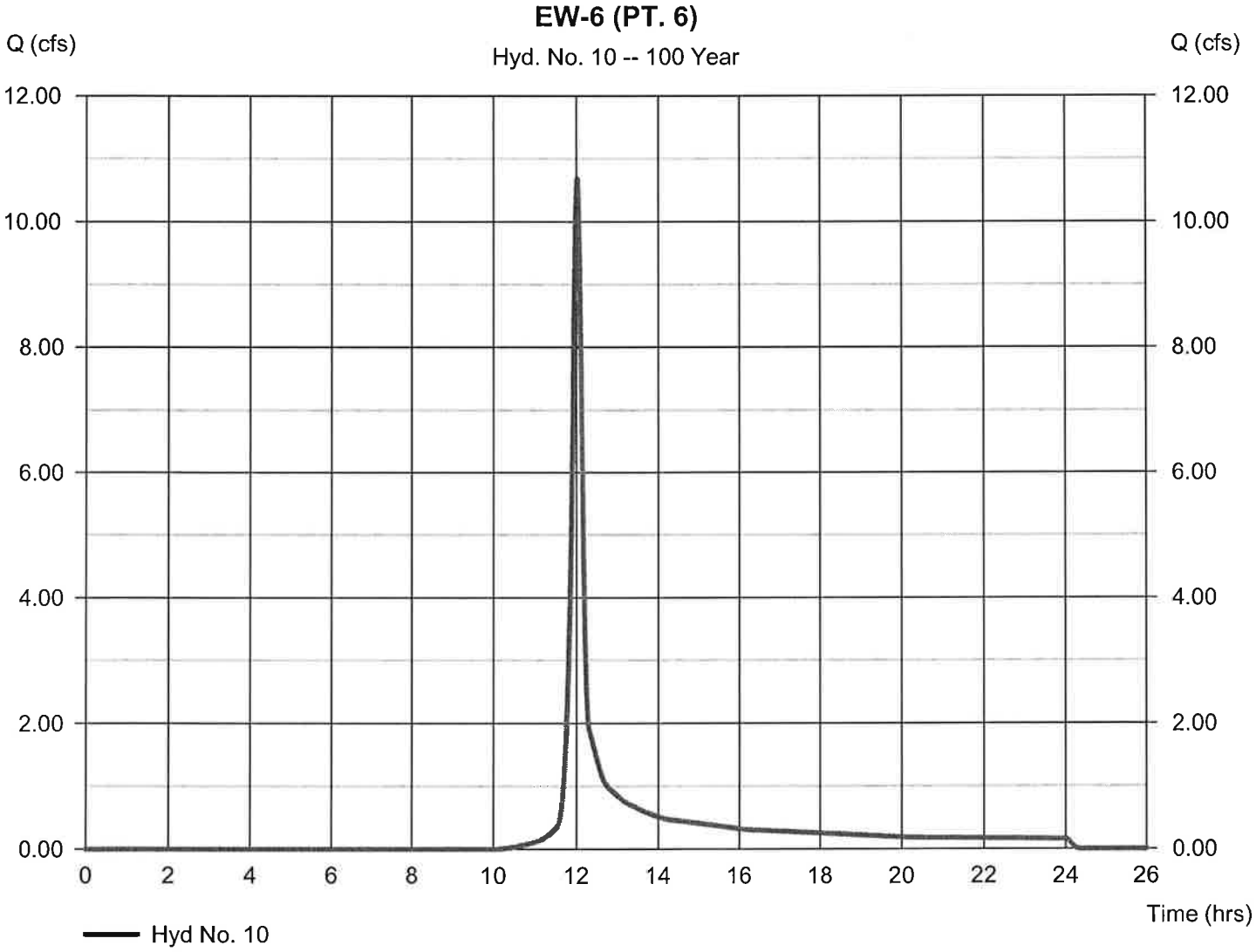
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 10

EW-6 (PT. 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 10.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.02 hrs
Time interval	= 1 min	Hyd. volume	= 27,323 cuft
Drainage area	= 2.830 ac	Curve number	= 61*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.03 min
Total precip.	= 7.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.660 x 98) + (1.790 x 39)] / 2.830



APPENDIX C: PROPOSED CONDITIONS HYDROLOGY CALCULATIONS

Runoff Curve Numbers and Runoff
Time of Concentration
Pond Reports
Hydrograph Plots (2, 10, 25, 100 year storm events)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** Developed **PROPOSED WATERSHED 1A (PW-1A)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			5.23	203.97
A	Impervious (pavement, roof)	98			14.44	1415.12
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**19.67**	**1619.09**

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ **82.3127** Use CN= **82**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	1.62	2.81	4.82	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** Developed **PROPOSED WATERSHED 1B (PW-1B)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			0.68	26.52
A	Impervious (pavement, roof)	98			1.07	104.86
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**1.75**	**131.38**

CN (weighted) = total product / total area **75.0743** Use CN= **75**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	1.16	2.21	4.06	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** Developed **PROPOSED WATERSHED 2 (PW-2)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			0.94	36.66
A	Impervious (pavement, roof)	98			0.37	36.26
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**1.31**	**72.92**

CN (weighted) = total product / total area **55.6641** Use CN= **56**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.31	0.89	2.15	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** **PROPOSED WATERSHED 3 (PW-3)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			5.95	232.05
A	Wetland	83			0.63	52.29
A	Impervious (pavement, roof)	98			0.67	65.66
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**7.25**	**350**

CN (weighted) = total product / total area **48.2759** Use CN= **48**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.11	0.48	1.44	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** Developed **PROPOSED WATERSHED 5A (PW-5A)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			4.65	181.35
A	Impervious (pavement, roof)	98			5.35	524.30
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**10**	**705.65**

CN (weighted) = total product / total area **70.5650** Use CN= **71**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.94	1.89	3.64	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** Developed **PROPOSED WATERSHED 5B (PW-5B)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			0.18	7.02
A	Impervious (pavement, roof)	98			0.28	27.44
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**0.46**	**34.46**

CN (weighted) = total product / total area **74.9130** Use CN= **75**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	1.16	2.21	4.06	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** Developed **PROPOSED WATERSHED 6A (PW-6A)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			0.30	11.70
A	Impervious (pavement, roof)	98			1.06	103.88
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**1.36**	**115.58**

CN (weighted) = total product / total area **84.9853** Use CN= **85**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	1.84	3.09	5.16	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 2: Runoff curve number and runoff

Project: **Wayland Town Center** By: **CAD** Date **06/02/08**

Location: **Wayland, MA** Checked: Date

Check One: **Present** Developed **PROPOSED WATERSHED 6B (PW-6B)**

1. Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic conditions percent impervious unconnected/connected impervious area ratio)	CN Table 2-2	CN Figure 2-3	CN Figure 2-4	Area X acres / mi² / %	Product of CN x Area
A	Grass - good	39			0.60	23.40
A	Impervious (pavement, roof)	98			0.00	0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
Use only one CN source per line.				Totals =	**0.6**	**23.4**

CN (weighted) = total product / total area **39.0000** Use CN= **39**

2. Runoff

		Storm #1	Storm #2	Storm #3	
Frequency	yr.	2	10	100	
Rainfall, P (24 hour)	in.	3.30	4.70	6.90	
Runoff, Q	in.	0.00	0.14	0.73	

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

TR55 Tc Worksheet

Hyd. No. 11

PW-1A

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.200		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 16.53**	**+**	**0.00**	**+**	**0.00**	**=**	**16.53**
Shallow Concentrated Flow							
Flow length (ft)	= 70.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 1.61		0.00		0.00		
Travel Time (min)	**= 0.72**	**+**	**0.00**	**+**	**0.00**	**=**	**0.72**
Channel Flow							
X sectional flow area (sqft)	= 1.77		0.00		0.00		
Wetted perimeter (ft)	= 2.36		0.00		0.00		
Channel slope (%)	= 0.50		0.00		0.00		
Manning's n-value	= 0.012		0.015		0.015		
Velocity (ft/s)	= 7.24		0.00		0.00		
Flow length (ft)	= 540.0		0.0		0.0		
Travel Time (min)	**= 1.24**	**+**	**0.00**	**+**	**0.00**	**=**	**1.24**

Total Travel Time, Tc ..... 18.50 min

TR55 Tc Worksheet

Hyd. No. 18

PW-2

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 0.25	0.00	0.00	
Travel Time (min)	**= 28.79**	**+ 0.00**	**+ 0.00**	**= 28.79**
Shallow Concentrated Flow				
Flow length (ft)	= 400.00	0.00	0.00	
Watercourse slope (%)	= 0.25	0.00	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 0.81	0.00	0.00	
Travel Time (min)	**= 8.26**	**+ 0.00**	**+ 0.00**	**= 8.26**
Channel Flow				
X sectional flow area (sqft)	= 1.76	0.00	0.00	
Wetted perimeter (ft)	= 2.35	0.00	0.00	
Channel slope (%)	= 0.50	0.00	0.00	
Manning's n-value	= 0.012	0.015	0.015	
Velocity (ft/s)	= 7.23	0.00	0.00	
Flow length (ft)	= 205.0	0.0	0.0	
Travel Time (min)	**= 0.47**	**+ 0.00**	**+ 0.00**	**= 0.47**

Total Travel Time, Tc ..... **37.52 min**

TR55 Tc Worksheet

Hyd. No. 20

PW-3

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
Travel Time (min)	**= 12.53**	**+ 0.00**	**+ 0.00**	**= 12.53**
Shallow Concentrated Flow				
Flow length (ft)	= 430.00	0.00	0.00	
Watercourse slope (%)	= 0.50	0.00	0.00	
Surface description	= Unpaved	Unpaved	Unpaved	
Average velocity (ft/s)	= 1.14	0.00	0.00	
Travel Time (min)	**= 6.28**	**+ 0.00**	**+ 0.00**	**= 6.28**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 18.81 min

TR55 Tc Worksheet

Hyd. No. 21

PW-5A

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 0.50	0.00	0.00	
Travel Time (min)	**= 21.82**	**+ 0.00**	**+ 0.00**	**= 21.82**
Shallow Concentrated Flow				
Flow length (ft)	= 360.00	0.00	0.00	
Watercourse slope (%)	= 0.50	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 1.14	0.00	0.00	
Travel Time (min)	**= 5.26**	**+ 0.00**	**+ 0.00**	**= 5.26**
Channel Flow				
X sectional flow area (sqft)	= 1.76	0.00	0.00	
Wetted perimeter (ft)	= 2.36	0.00	0.00	
Channel slope (%)	= 0.50	0.00	0.00	
Manning's n-value	= 0.012	0.015	0.015	
Velocity (ft/s)	= 7.21	0.00	0.00	
Flow length (ft)	= 80.0	0.0	0.0	
Travel Time (min)	**= 0.18**	**+ 0.00**	**+ 0.00**	**= 0.18**

Total Travel Time, Tc ..... 27.26 min

TR55 Tc Worksheet

Hyd. No. 24

PW-5B (PT. 5)

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 70.0	30.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	3.10	0.00	
Land slope (%)	= 7.00	5.00	0.00	
Travel Time (min)	**= 5.71 +**	**0.33 +**	**0.00 =**	**6.03**
Shallow Concentrated Flow				
Flow length (ft)	= 170.00	280.00	0.00	
Watercourse slope (%)	= 3.50	0.80	0.00	
Surface description	= Paved	Unpaved	Paved	
Average velocity (ft/s)	= 3.80	1.44	0.00	
Travel Time (min)	**= 0.75 +**	**3.23 +**	**0.00 =**	**3.98**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00 +**	**0.00 +**	**0.00 =**	**0.00**

Total Travel Time, Tc ..... 10.01 min

TR55 Tc Worksheet

Hyd. No. 25

PW-6A

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.10	0.00	0.00	
Land slope (%)	= 0.50	0.00	0.00	
Travel Time (min)	**= 21.82**	**+ 0.00**	**+ 0.00**	**= 21.82**
Shallow Concentrated Flow				
Flow length (ft)	= 200.00	0.00	0.00	
Watercourse slope (%)	= 0.50	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 1.14	0.00	0.00	
Travel Time (min)	**= 2.92**	**+ 0.00**	**+ 0.00**	**= 2.92**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 24.74 min

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Pond No. 1 - BASIN 2

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 116.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	116.00	1,690	0	0
1.00	117.00	2,915	2,303	2,303
2.00	118.00	4,360	3,638	5,940
3.00	119.00	6,043	5,202	11,142
4.00	120.00	7,985	7,014	18,156
5.00	121.00	11,696	9,841	27,996
6.00	122.00	15,017	13,357	41,353
7.00	123.00	17,997	16,507	57,860
8.00	124.00	19,572	18,785	76,644

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 118.50	0.00	0.00	0.00
Length (ft)	= 45.00	0.00	0.00	0.00
Slope (%)	= 0.50	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

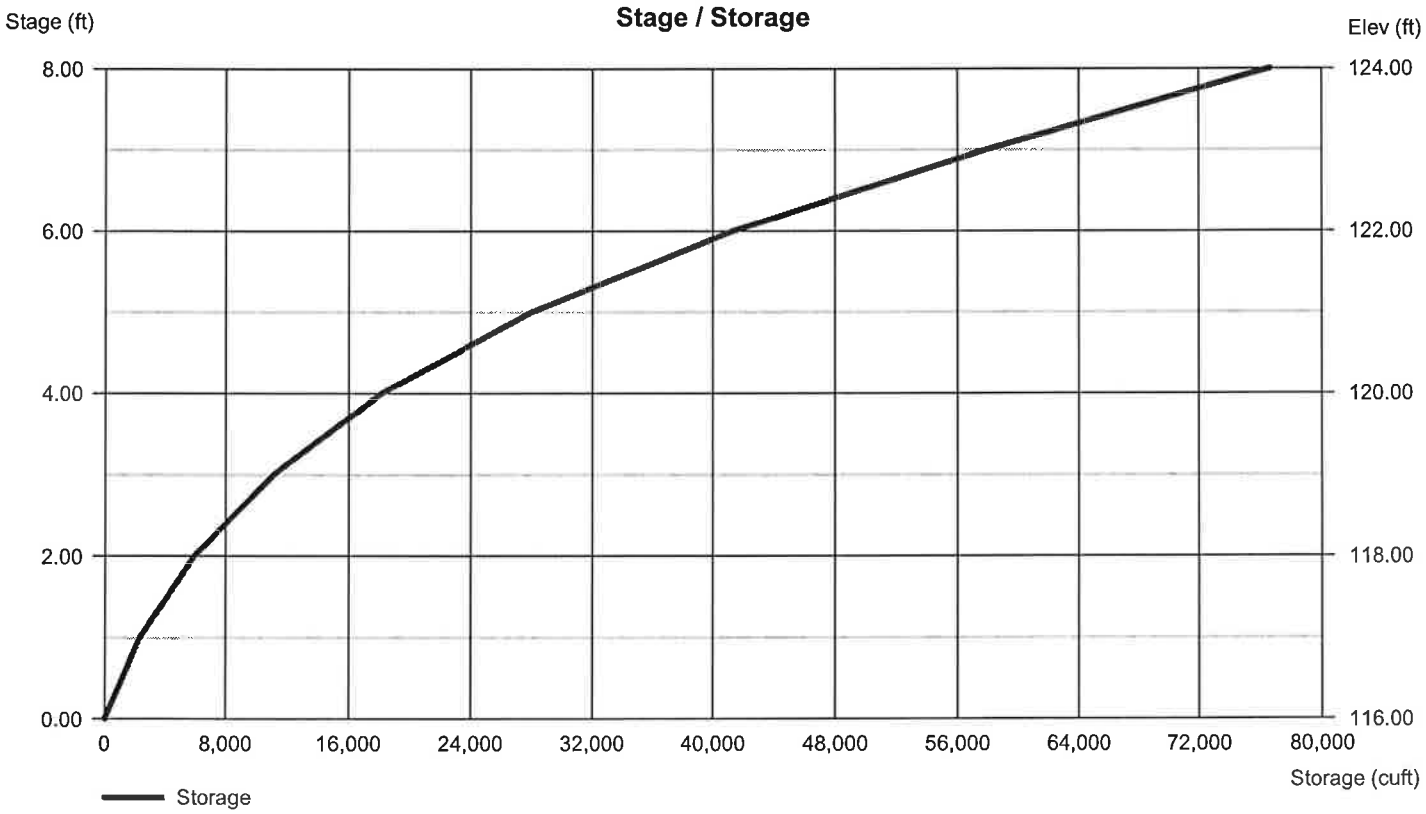
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 122.80	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 2.400 (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).



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Pond No. 2 - BASIN 3

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 126.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	126.00	2,172	0	0
1.00	127.00	3,880	3,026	3,026
2.00	128.00	5,778	4,829	7,855
3.00	129.00	7,901	6,840	14,695
4.00	130.00	10,251	9,076	23,771
5.00	131.00	11,511	10,881	34,652

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 128.00	0.00	0.00	0.00
Length (ft)	= 200.00	0.00	0.00	0.00
Slope (%)	= 0.50	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

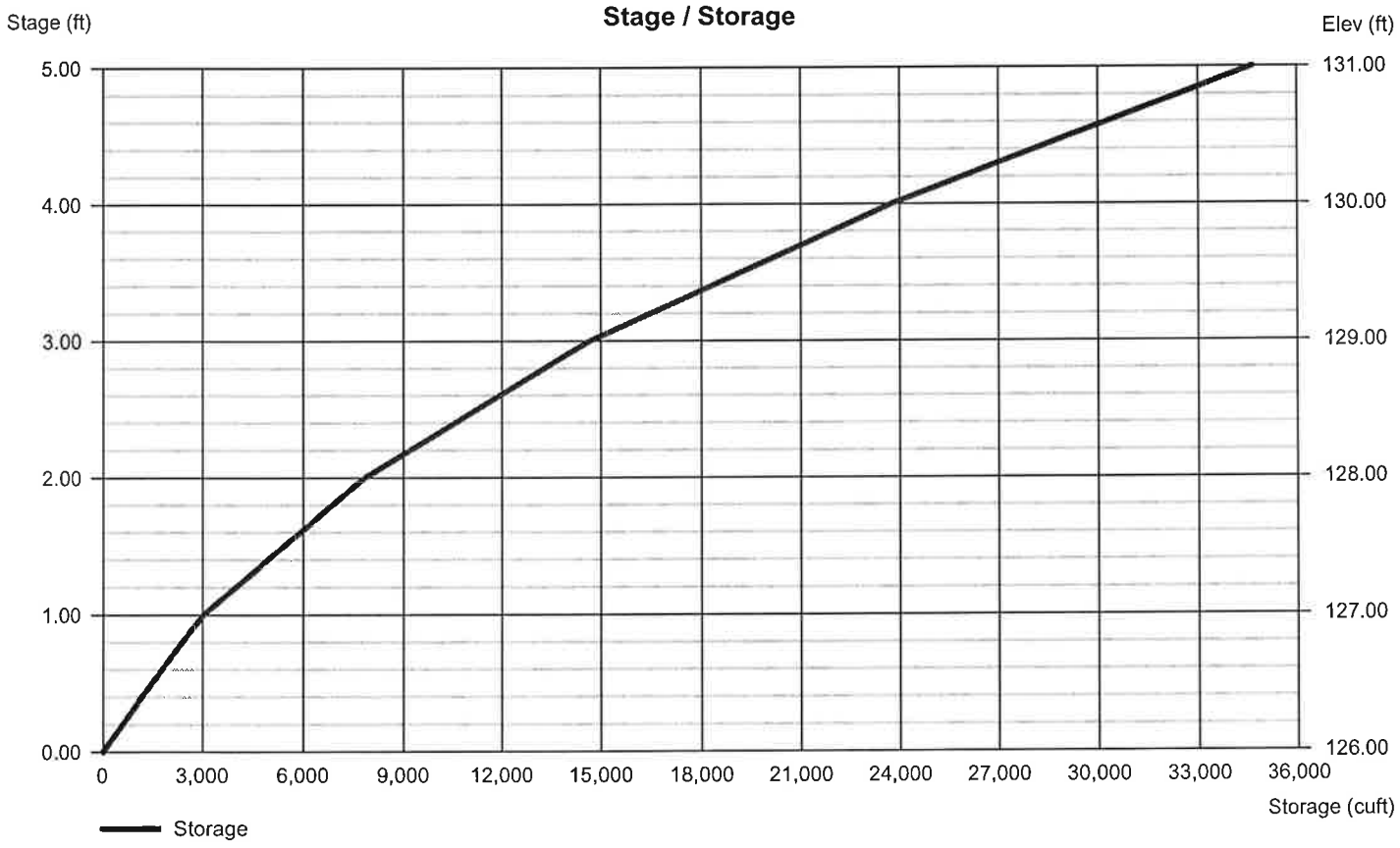
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 2.400 (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).



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Pond No. 4 - BASIN 4

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 127.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	127.50	200	0	0
0.50	128.00	670	218	218
1.50	129.00	1,407	1,039	1,256
2.50	130.00	2,225	1,816	3,072
3.00	130.50	2,657	1,221	4,293

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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

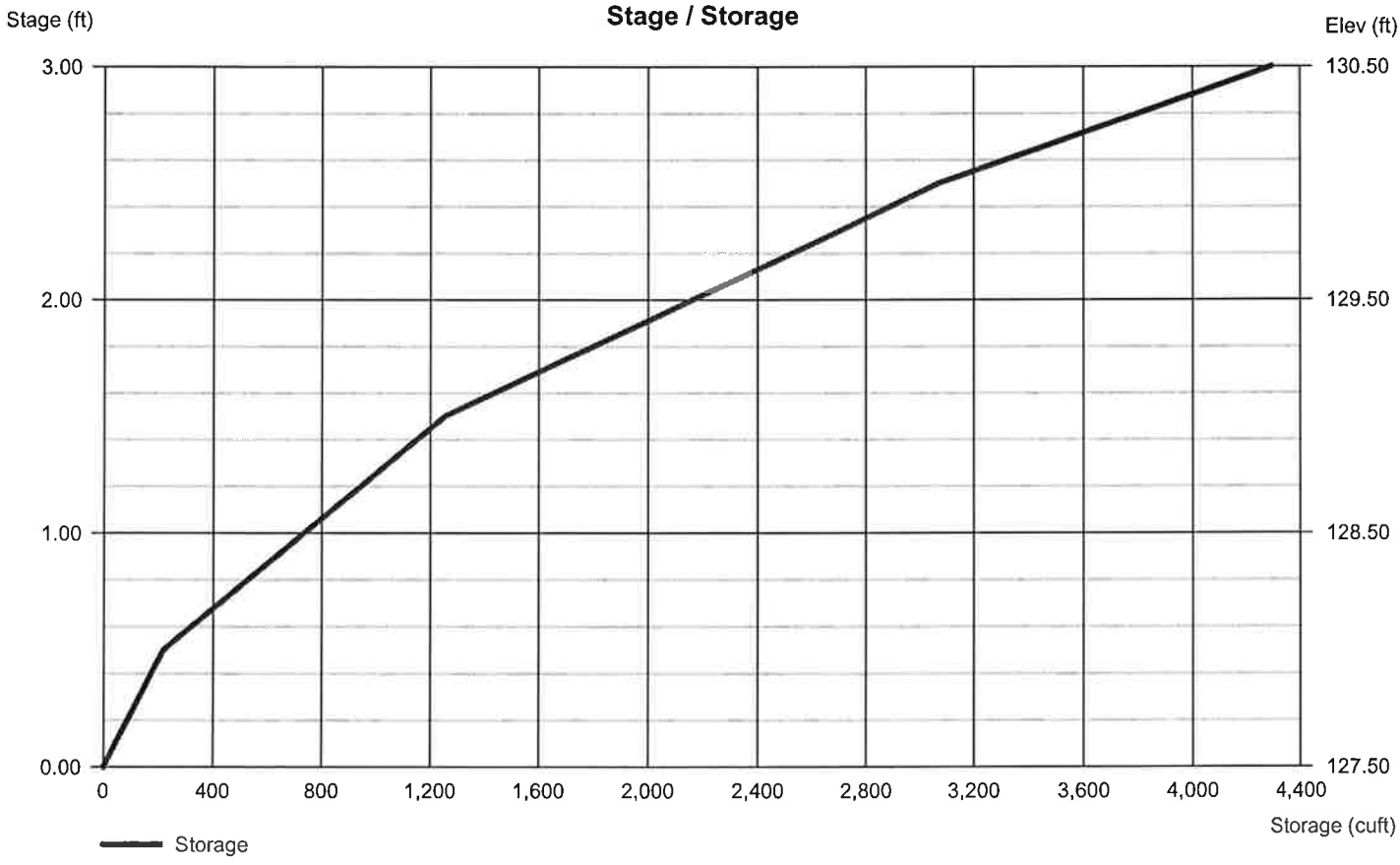
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 129.80	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 2.400 (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).



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Pond No. 5 - WATER QUALITY SWALE

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 126.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	126.00	1,916	0	0
1.00	127.00	3,905	2,911	2,911
2.00	128.00	7,305	5,605	8,516

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 127.00	0.00	0.00	0.00
Length (ft)	= 140.00	0.00	0.00	0.00
Slope (%)	= 0.50	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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 2.400 (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).

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Pond No. 8 - UPGRADED BASIN

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 118.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	118.00	1,828	0	0
1.00	119.00	5,668	3,748	3,748
2.00	120.00	8,193	6,931	10,679
3.00	121.00	20,000	14,097	24,775

Culvert / Orifice Structures

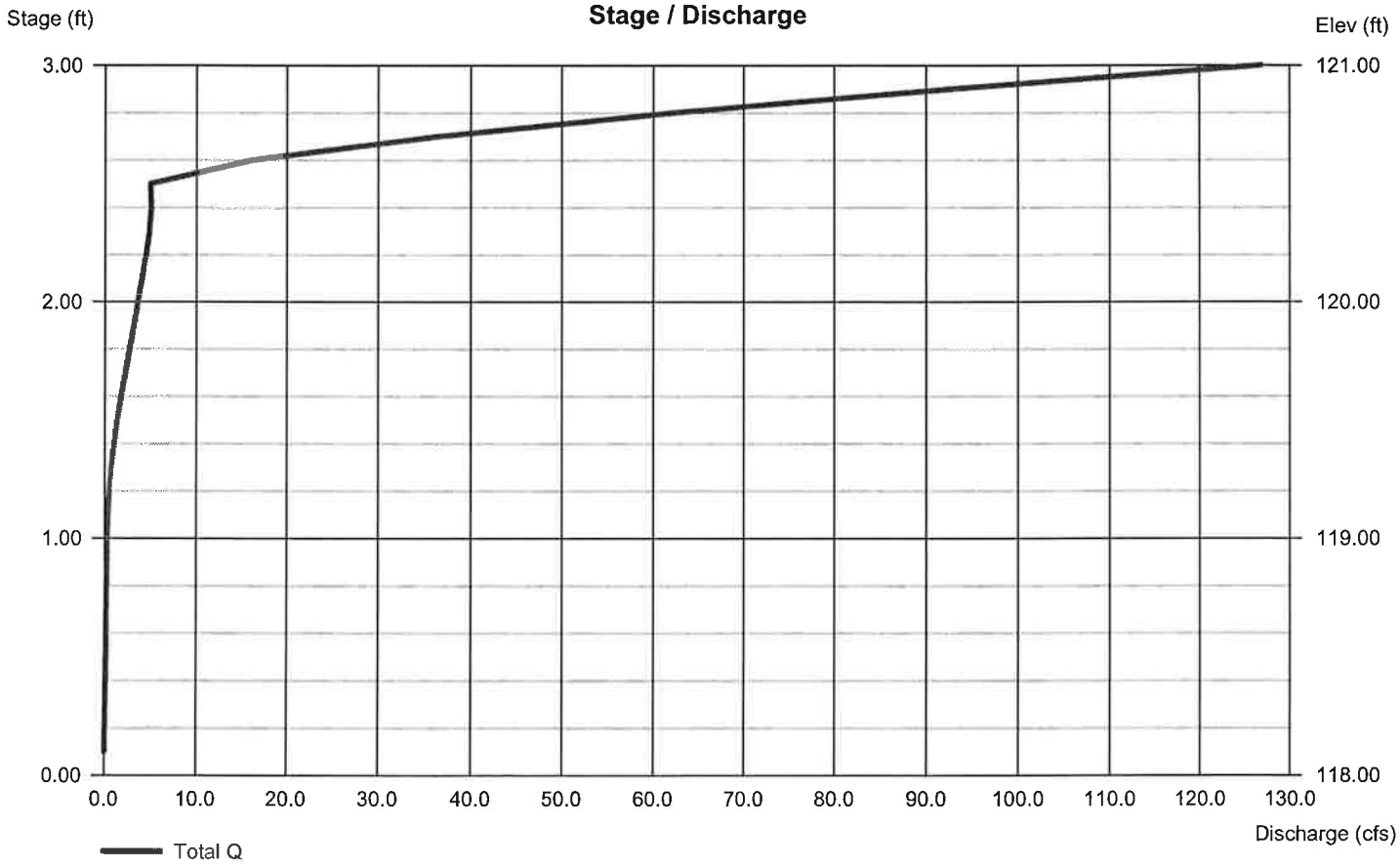
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 119.00	0.00	0.00	0.00
Length (ft)	= 200.00	0.00	0.00	0.00
Slope (%)	= 0.20	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 130.00	0.00	0.00	0.00
Crest El. (ft)	= 120.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 2.400 (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 Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	3.300	1	730	14,107	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	0.864	1	727	3,257	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	0.000	1	n/a	0	------	------	------	EW-3
4	Combine	4.099	1	729	17,364	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	0.005	1	890	131	------	------	------	EW-4
6	Reservoir	0.000	1	960	0	5	118.01	37.2	EXIST. BASIN (PT. 4)
7	SCS Runoff	0.000	1	n/a	0	------	------	------	EW-5A
8	SCS Runoff	0.000	1	n/a	0	------	------	------	E-5B
9	Combine	0.000	1	n/a	0	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	0.000	1	n/a	0	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	1.436	1	741	9,324	------	------	------	PW-1A
12	SCS Runoff	0.007	1	825	199	------	------	------	PW-1B
13	Reservoir	0.000	1	893	0	12	126.02	61.1	WATER QUALITY SWALE
14	Combine	1.436	1	741	9,324	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	0.000	1	1477	0	14	117.41	3,803	BASIN 2
16	Diversion1	0.289	1	1477	1,526	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	0.000	1	n/a	-1,526	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-2
19	Reservoir	0.000	1	n/a	0	18	118.00	0.000	BASIN 1 (PT.2)
20	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-3
21	SCS Runoff	0.009	1	1337	283	------	------	------	PW-5A
22	Reservoir	0.000	1	1254	0	21	126.03	104	BASIN 3
23	Combine	0.000	1	1484	0	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	0.002	1	827	51	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	0.136	1	745	851	------	------	------	PW-6A
26	Reservoir	0.000	1	930	0	25	128.02	235	BASIN 4
27	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-6B
28	Combine	0.000	1	930	0	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

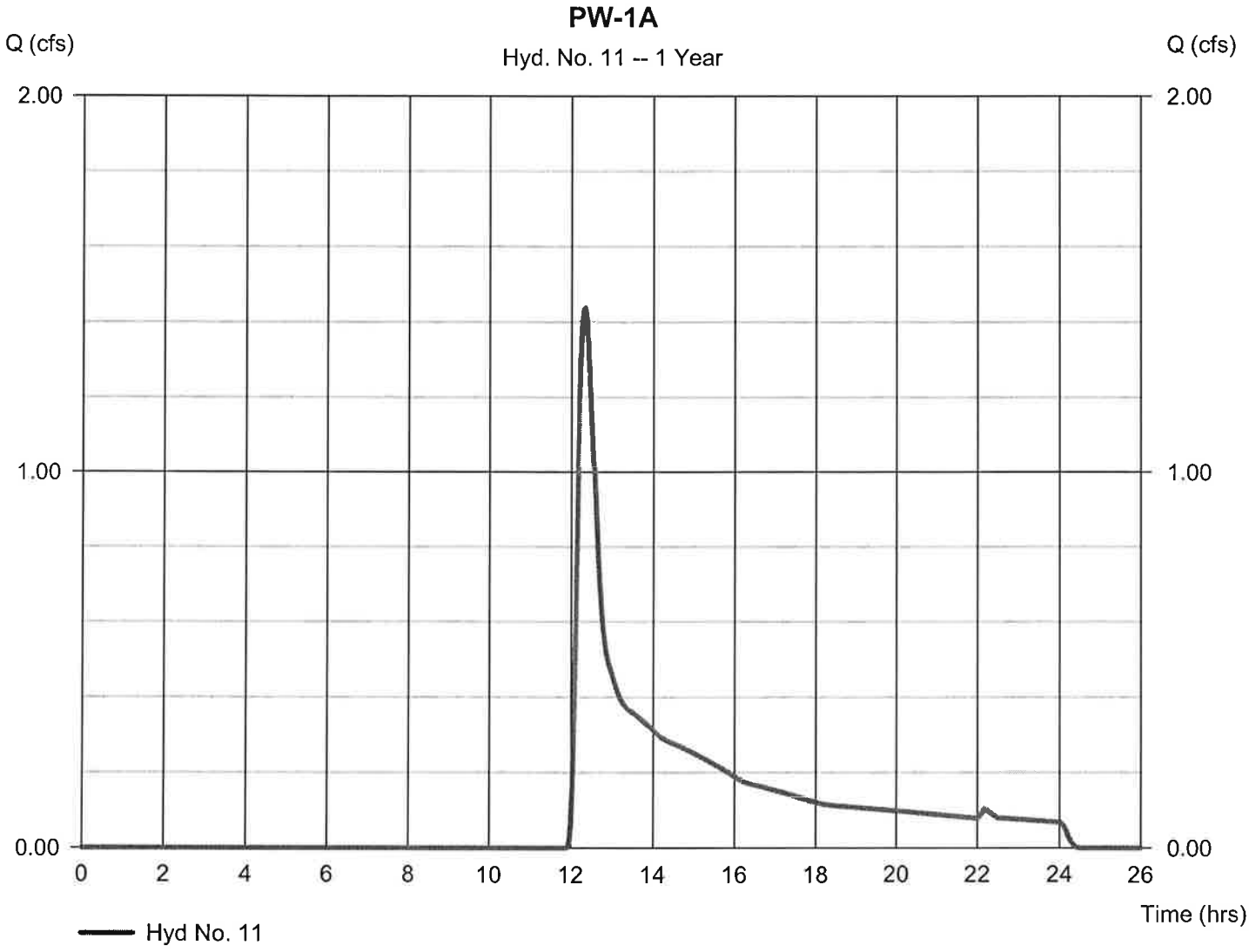
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 11

PW-1A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.436 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.35 hrs
Time interval	= 1 min	Hyd. volume	= 9,324 cuft
Drainage area	= 19.670 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.50 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(13.300 x 98) + (5.150 x 39)] / 19.670



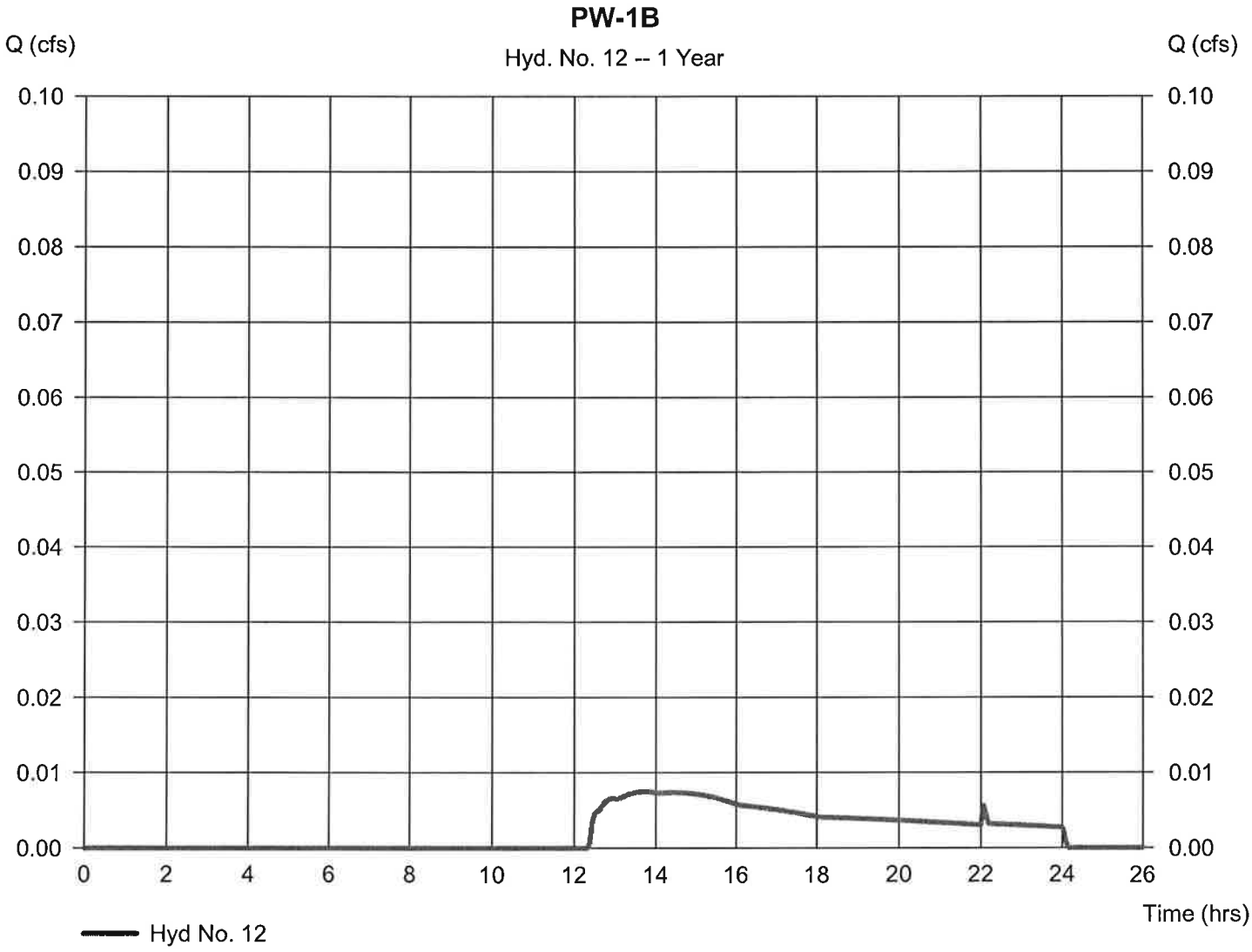
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 12

PW-1B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.007 cfs
Storm frequency	= 1 yrs	Time to peak	= 13.75 hrs
Time interval	= 1 min	Hyd. volume	= 199 cuft
Drainage area	= 1.750 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

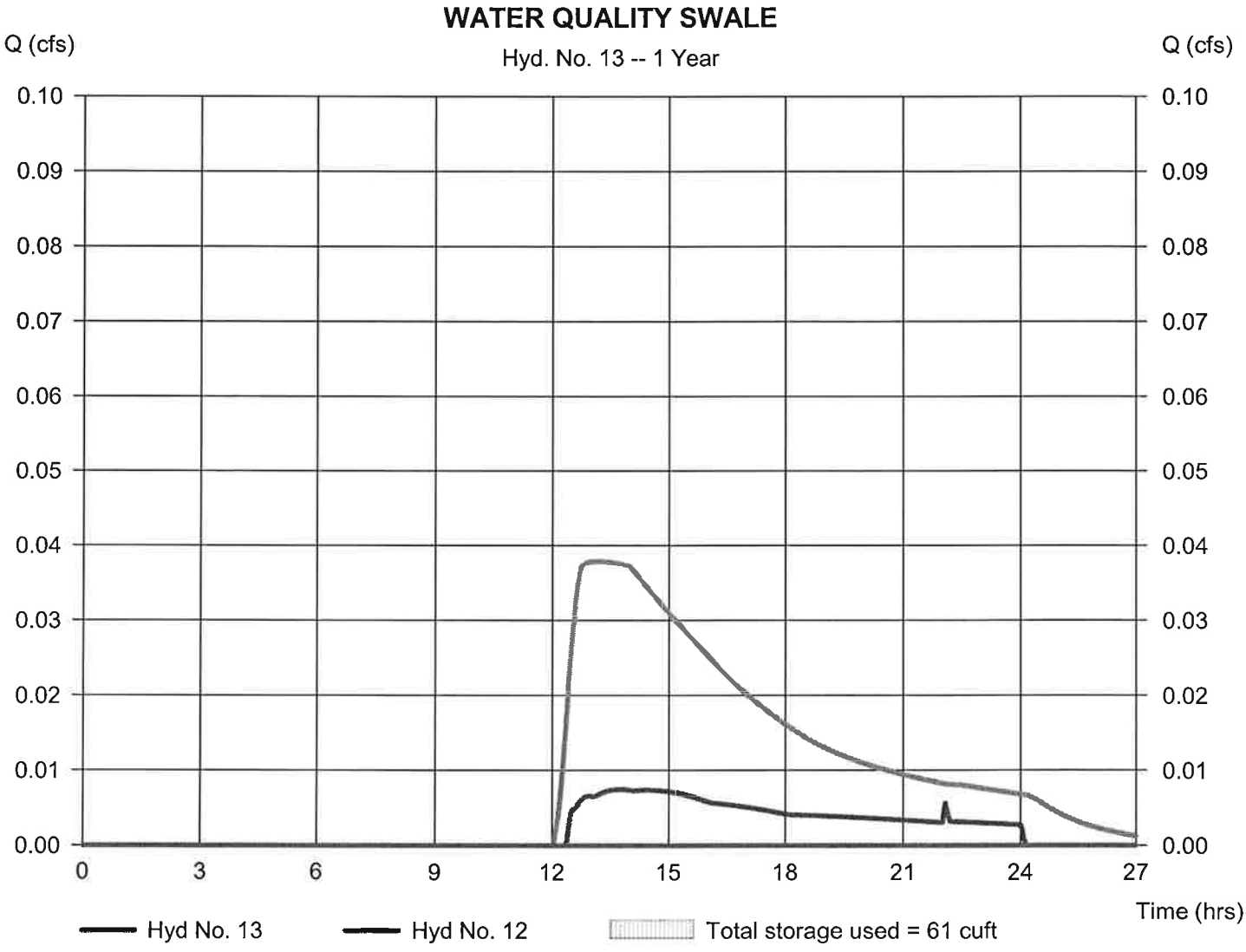
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 13

WATER QUALITY SWALE

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.88 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 12 - PW-1B	Max. Elevation	= 126.02 ft
Reservoir name	= WATER QUALITY SWALE	Max. Storage	= 61 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



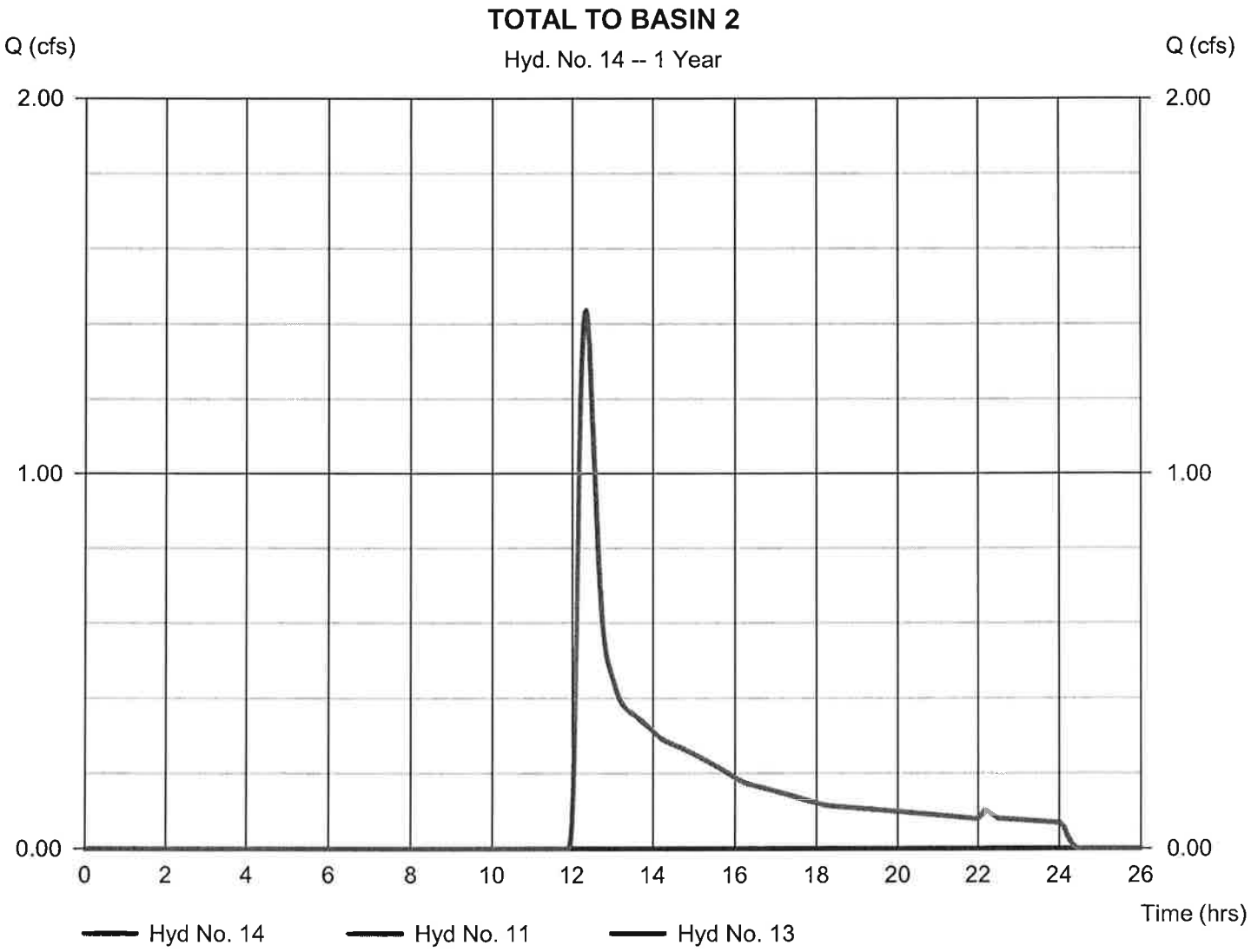
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 14

TOTAL TO BASIN 2

Hydrograph type	= Combine	Peak discharge	= 1.436 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.35 hrs
Time interval	= 1 min	Hyd. volume	= 9,324 cuft
Inflow hyds.	= 11, 13	Contrib. drain. area	= 19.670 ac



Hydrograph Report

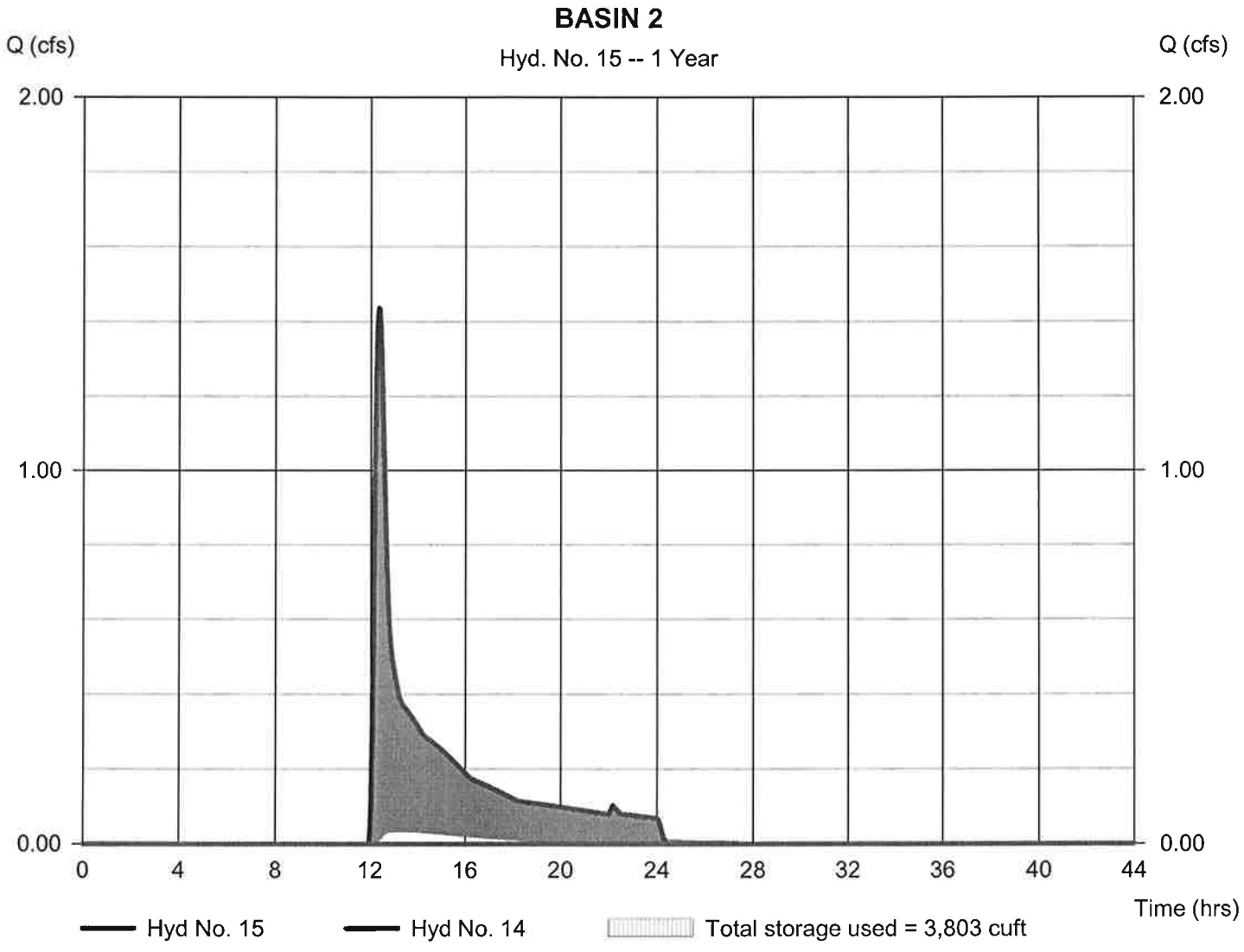
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 15

BASIN 2

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.62 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 14 - TOTAL TO BASIN 2	Max. Elevation	= 117.41 ft
Reservoir name	= BASIN 2	Max. Storage	= 3,803 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



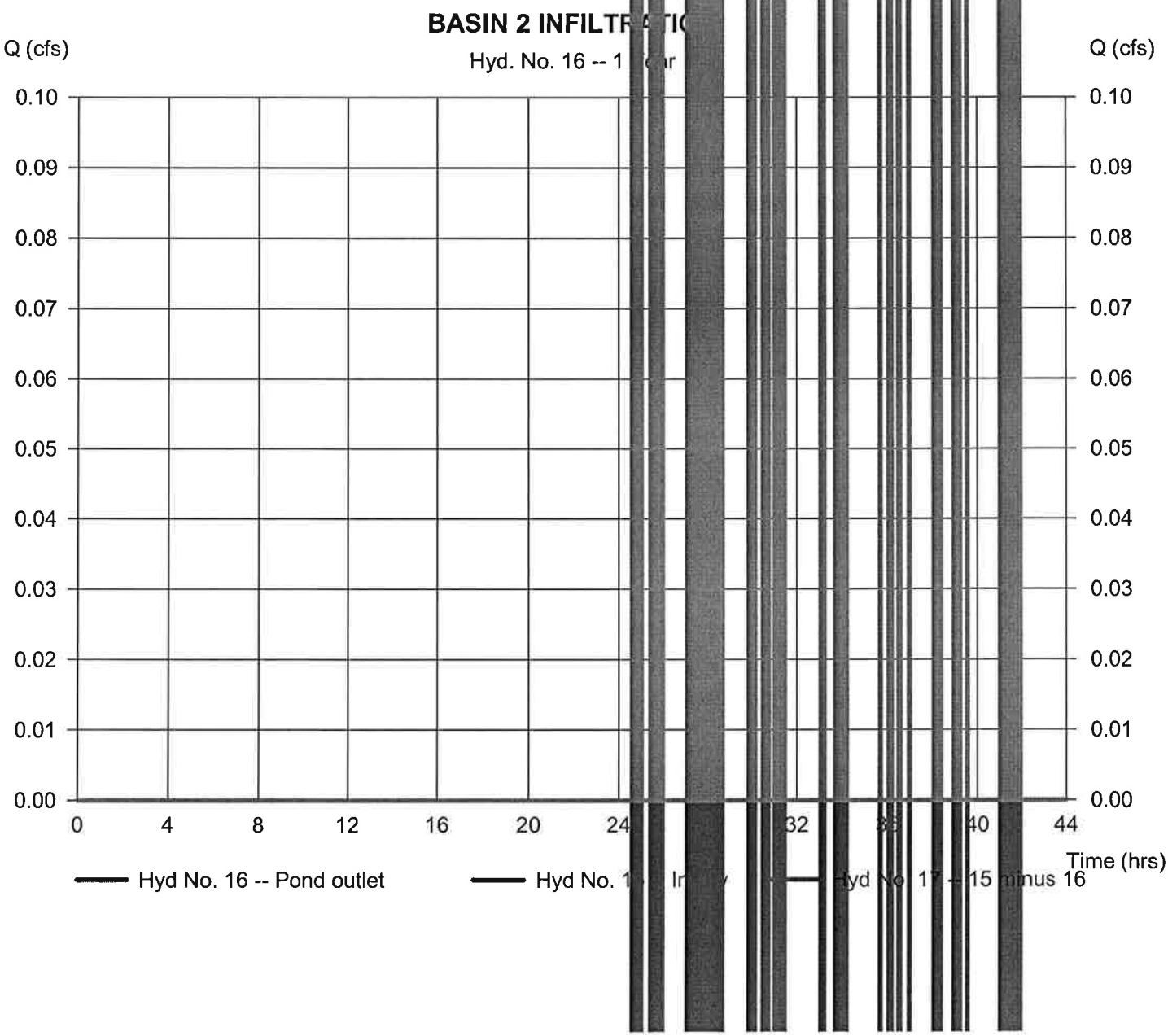
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v7.05 — Tuesday, Jun 3, 2008

Hyd. No. 16

BASIN 2 INFILTRATION

Hydrograph type	= Diversion1	Peak discharge	= 0.09 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.02 hrs
Time interval	= 1 min	Hyd. volume	= 1,016 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd overtop hyd.	= 17
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



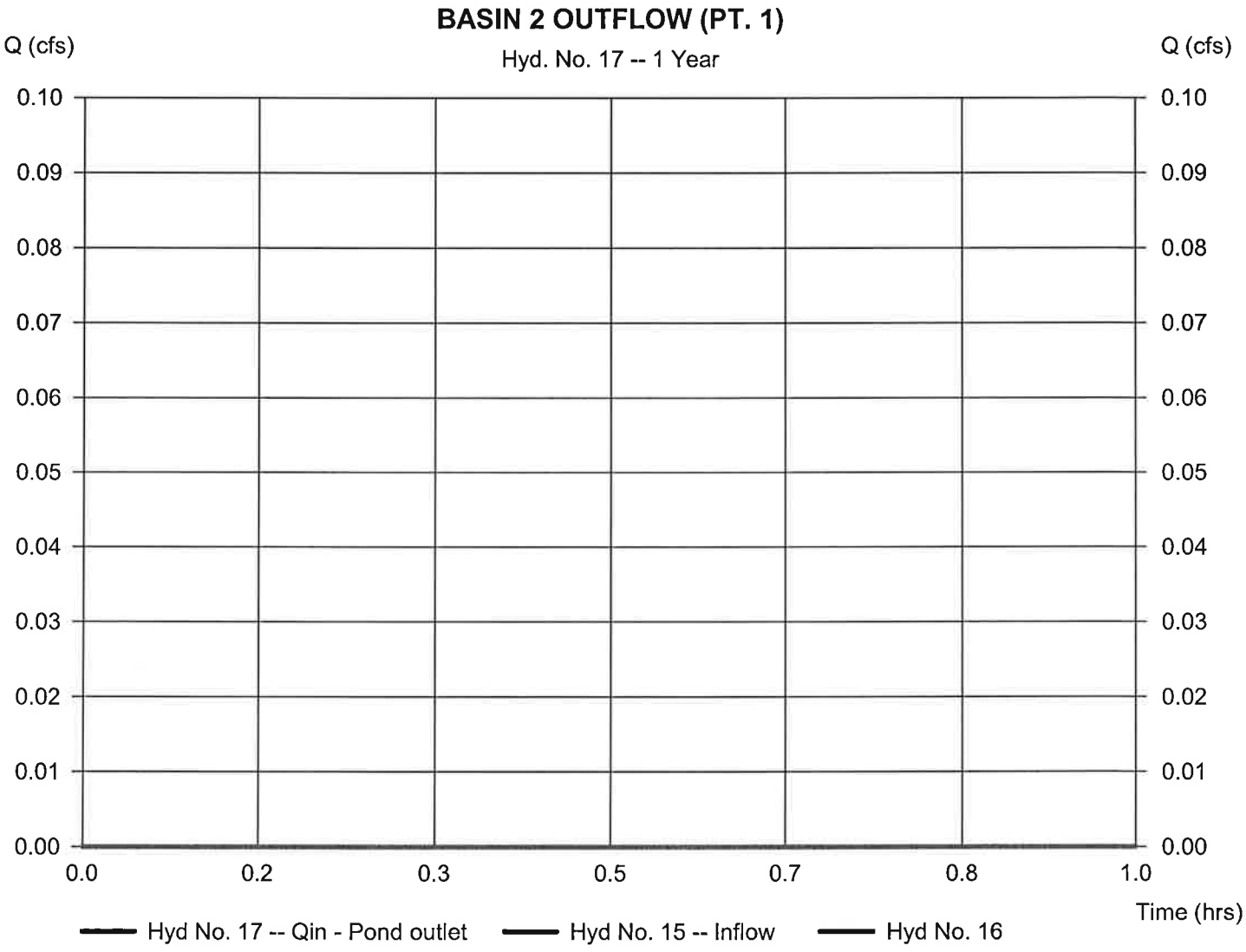
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 17

BASIN 2 OUTFLOW (PT. 1)

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= -1,526 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd diverted hyd.	= 16
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



Hydrograph Report

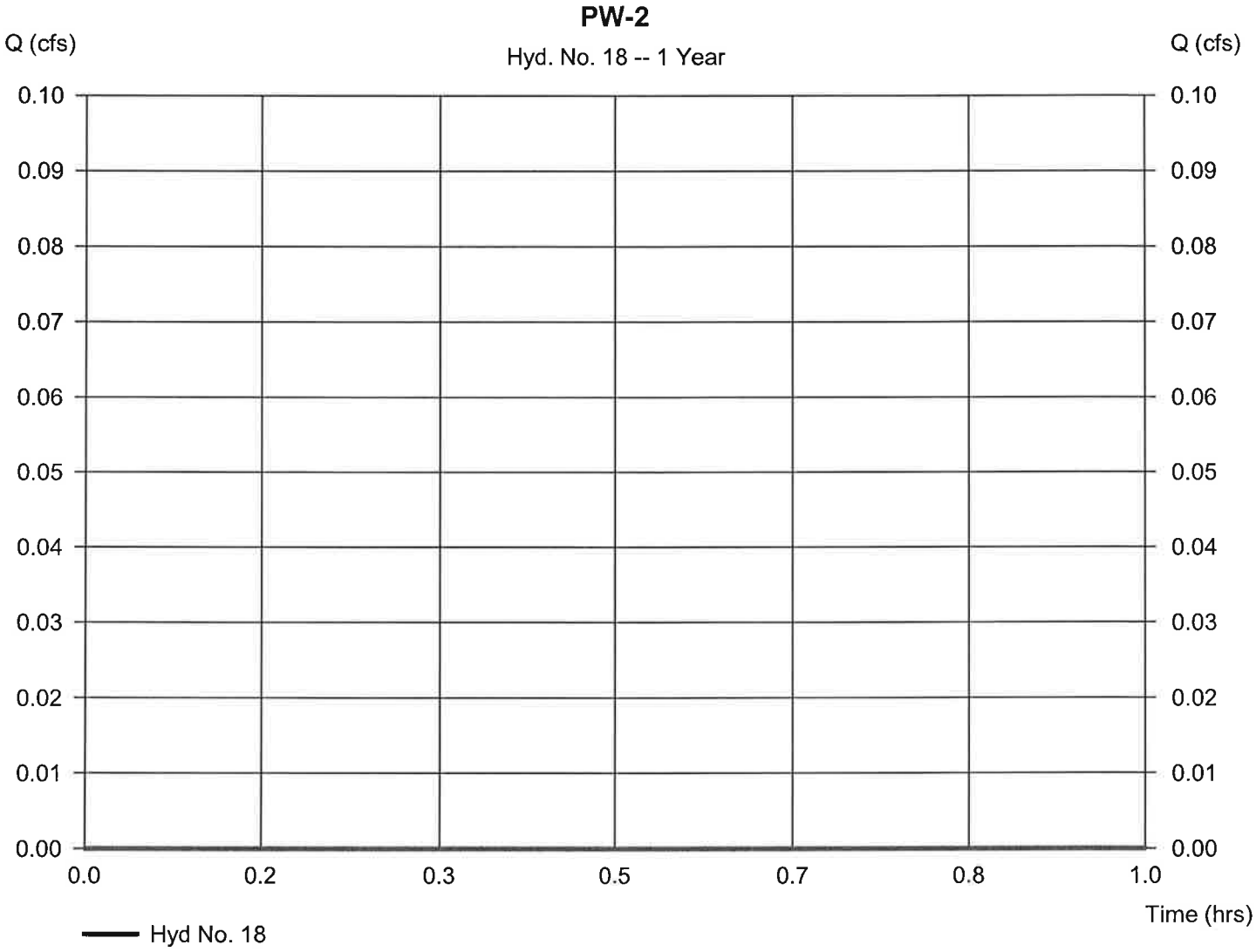
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 18

PW-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 1.310 ac	Curve number	= 56*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 37.52 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.230 x 98) + (0.300 x 39)] / 1.310



Hydrograph Report

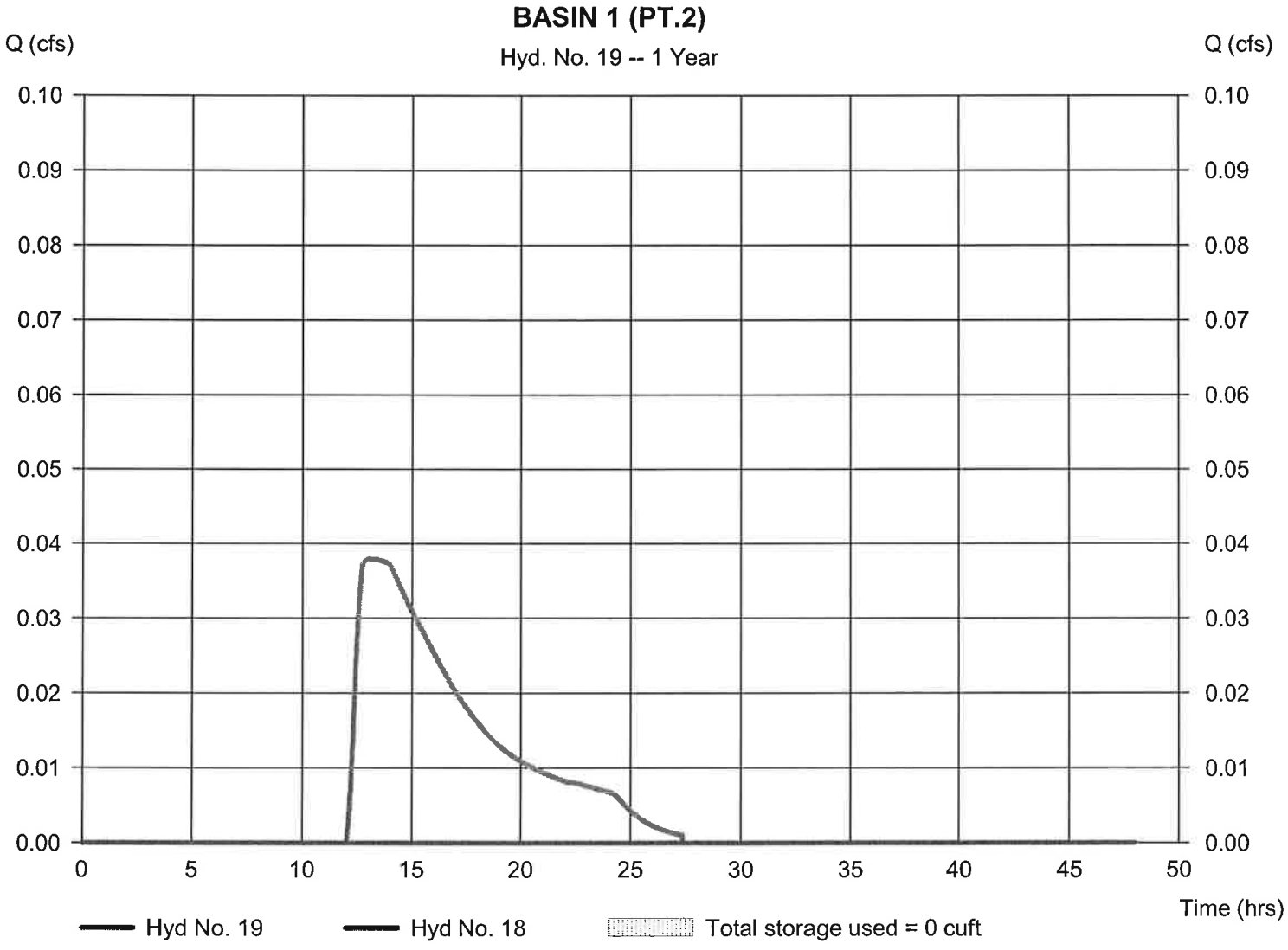
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 19

BASIN 1 (PT.2)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 18 - PW-2	Max. Elevation	= 118.00 ft
Reservoir name	= UPGRADED BASIN	Max. Storage	= 0 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

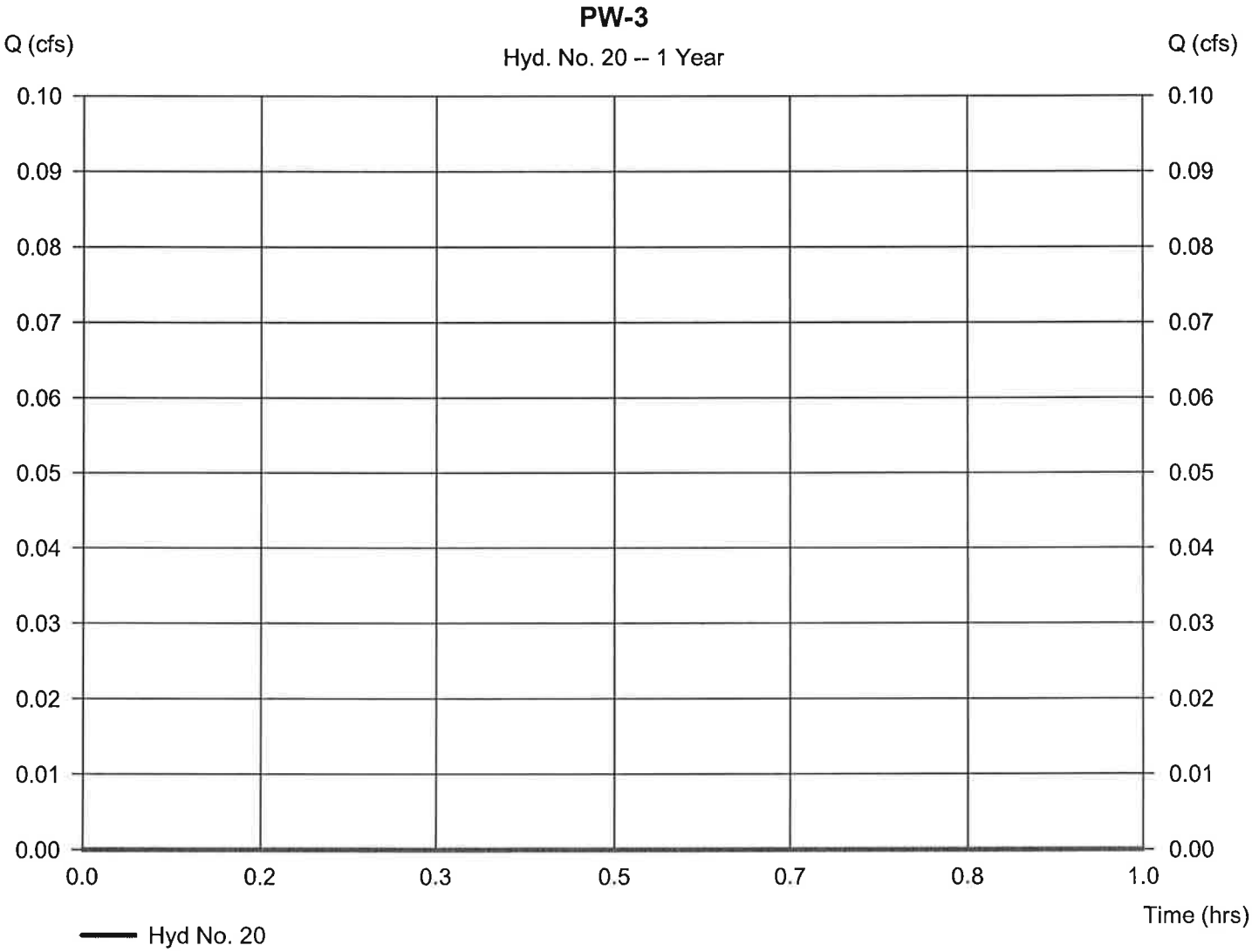
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 20

PW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 7.250 ac	Curve number	= 48*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.81 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.240 x 39)] / 7.250



Hydrograph Report

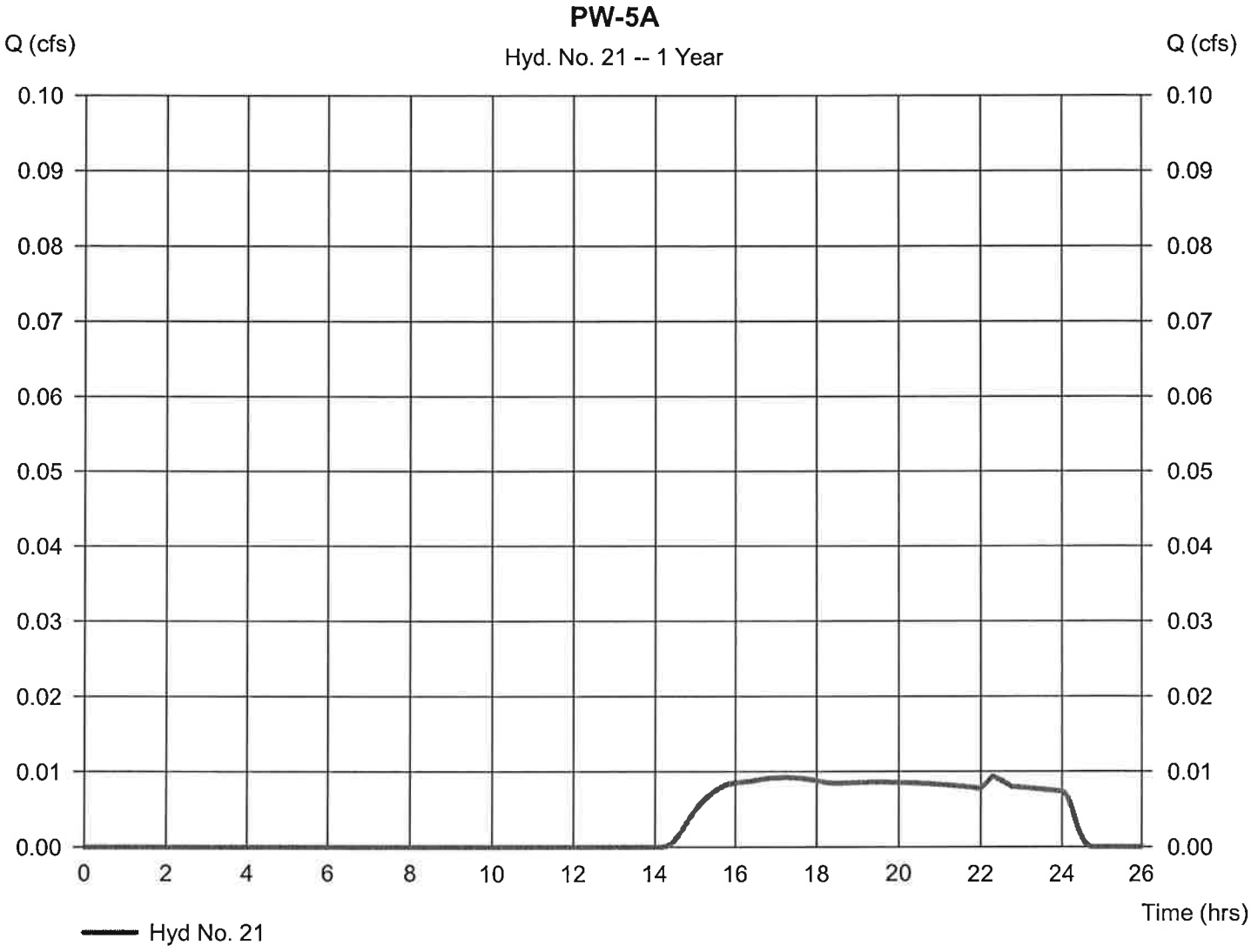
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 21

PW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.009 cfs
Storm frequency	= 1 yrs	Time to peak	= 22.28 hrs
Time interval	= 1 min	Hyd. volume	= 283 cuft
Drainage area	= 10.000 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.26 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.880 x 98) + (3.950 x 39)] / 10.000



Hydrograph Report

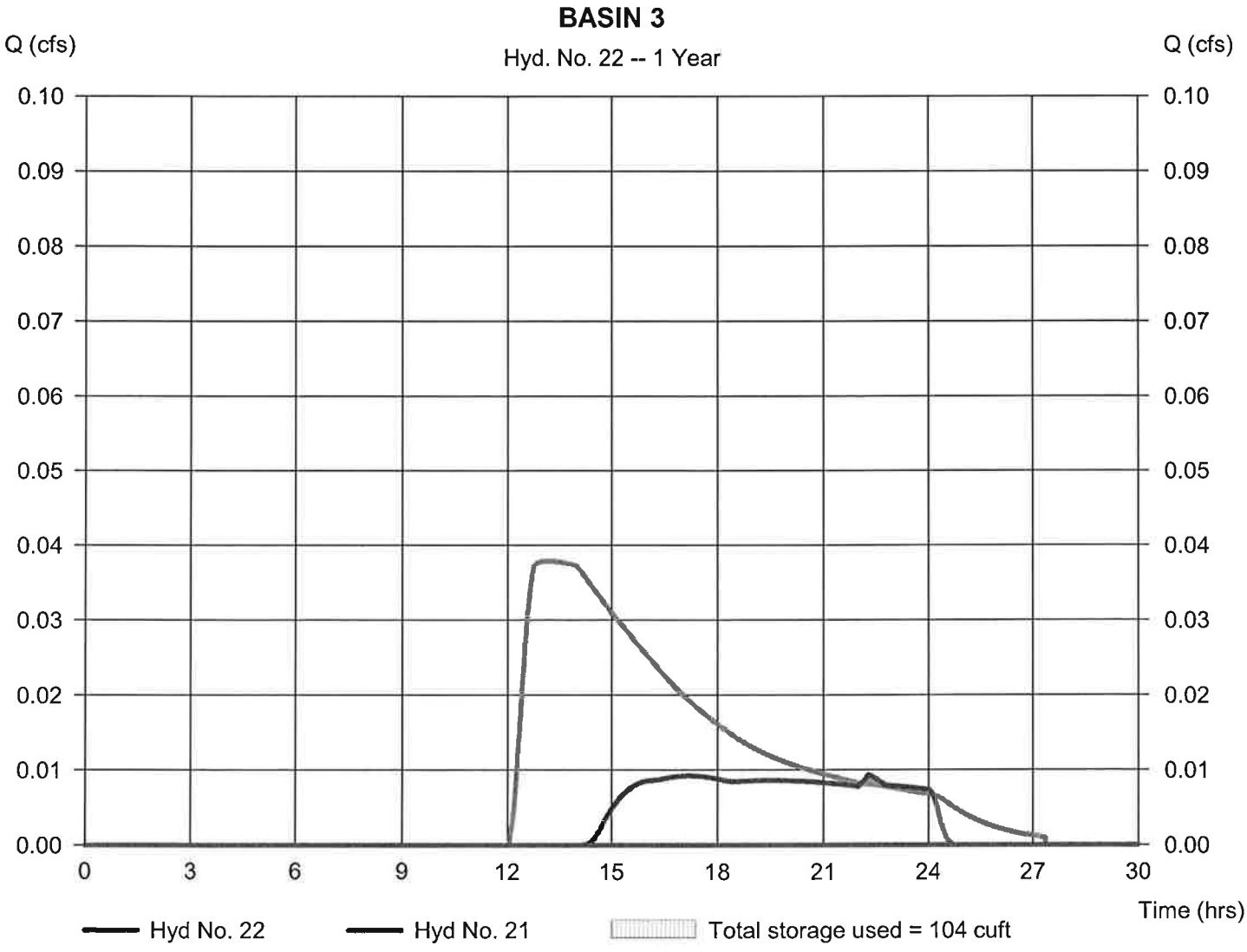
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 22

BASIN 3

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 20.90 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 21 - PW-5A	Max. Elevation	= 126.03 ft
Reservoir name	= BASIN 3	Max. Storage	= 104 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



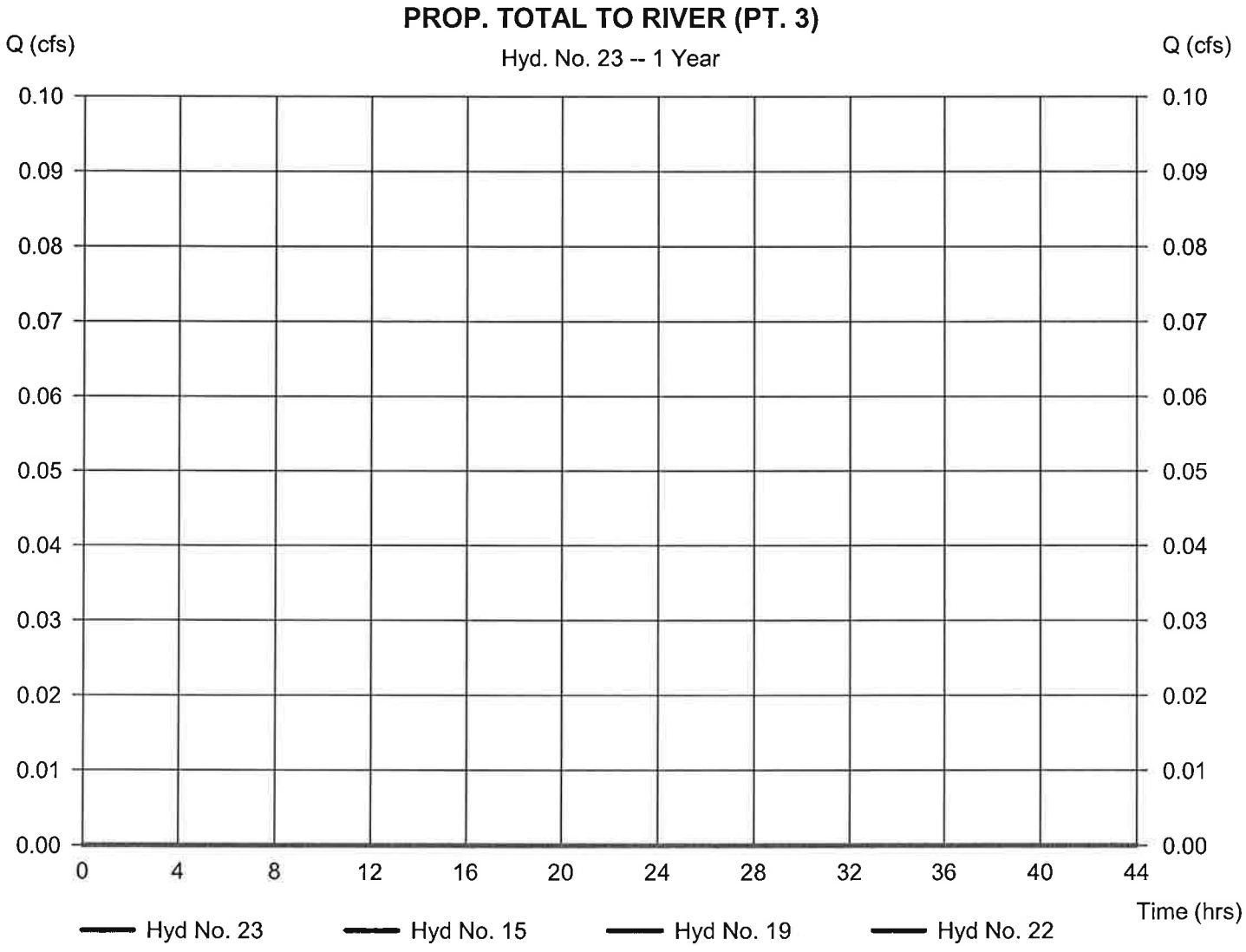
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 23

PROP. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.73 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyds.	= 15, 19, 22	Contrib. drain. area	= 0.000 ac



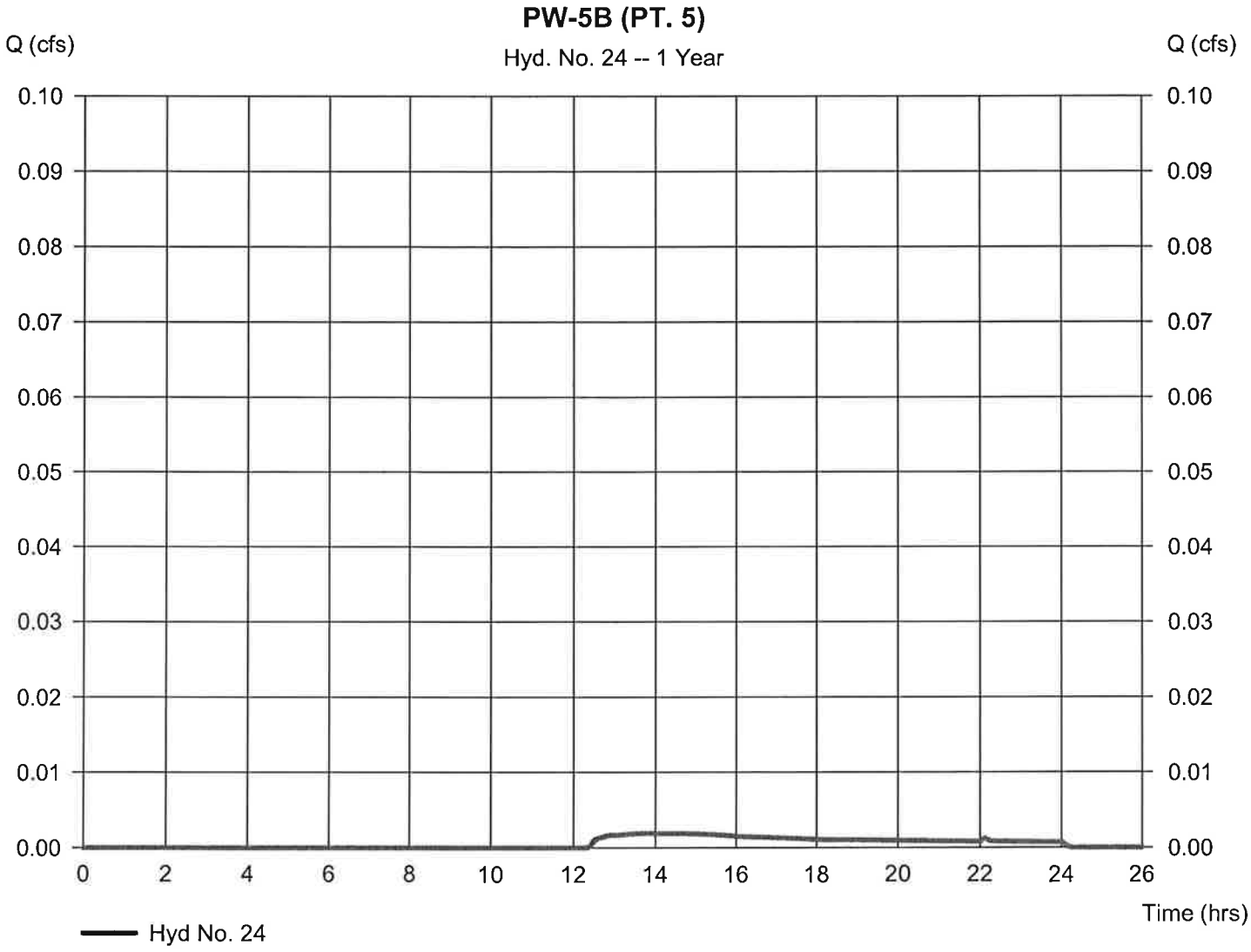
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 24

PW-5B (PT. 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 1 yrs	Time to peak	= 13.78 hrs
Time interval	= 1 min	Hyd. volume	= 51 cuft
Drainage area	= 0.460 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.01 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

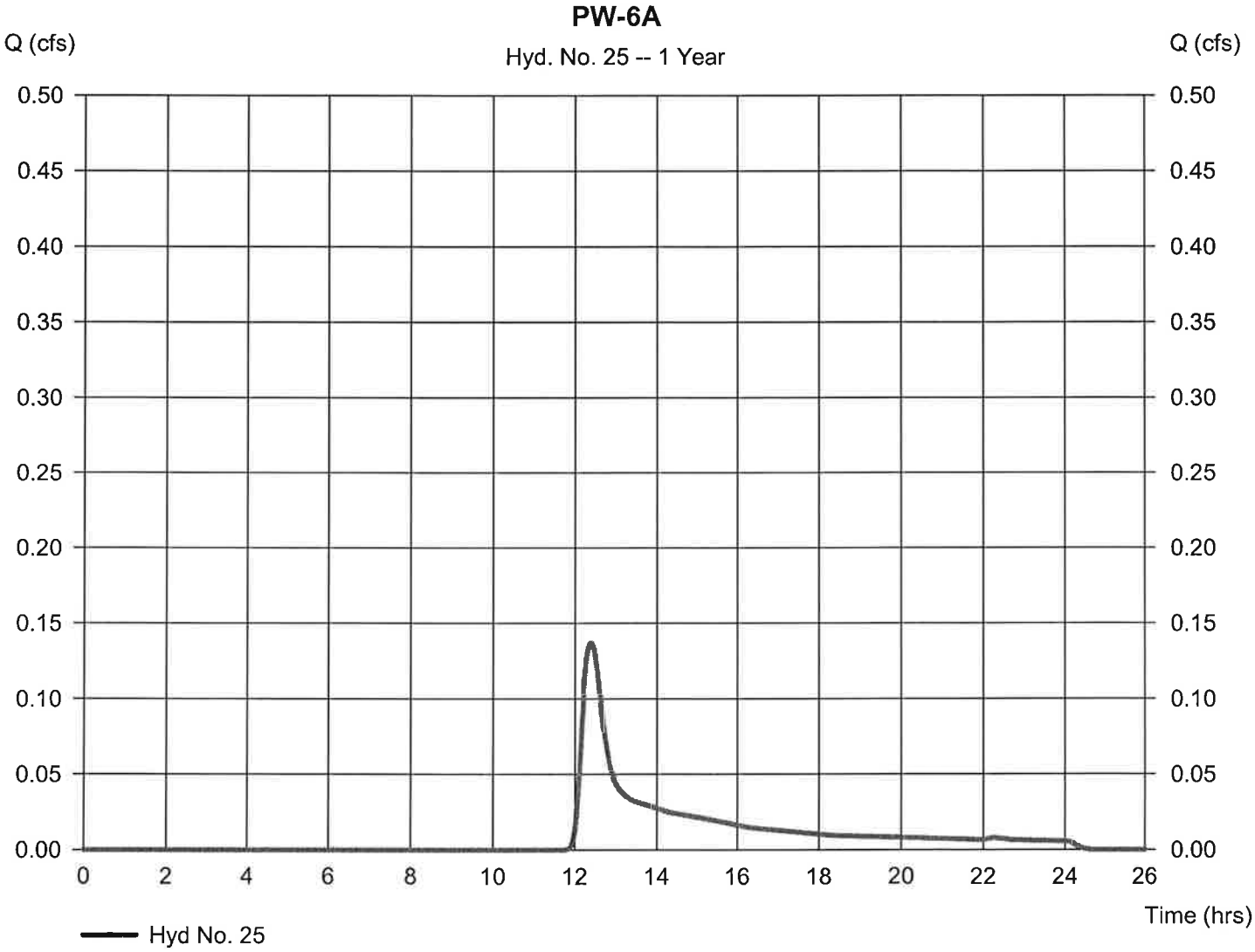
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 25

PW-6A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.136 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.42 hrs
Time interval	= 1 min	Hyd. volume	= 851 cuft
Drainage area	= 1.350 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.74 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.380 x 39) + (0.650 x 98)] / 1.350



Hydrograph Report

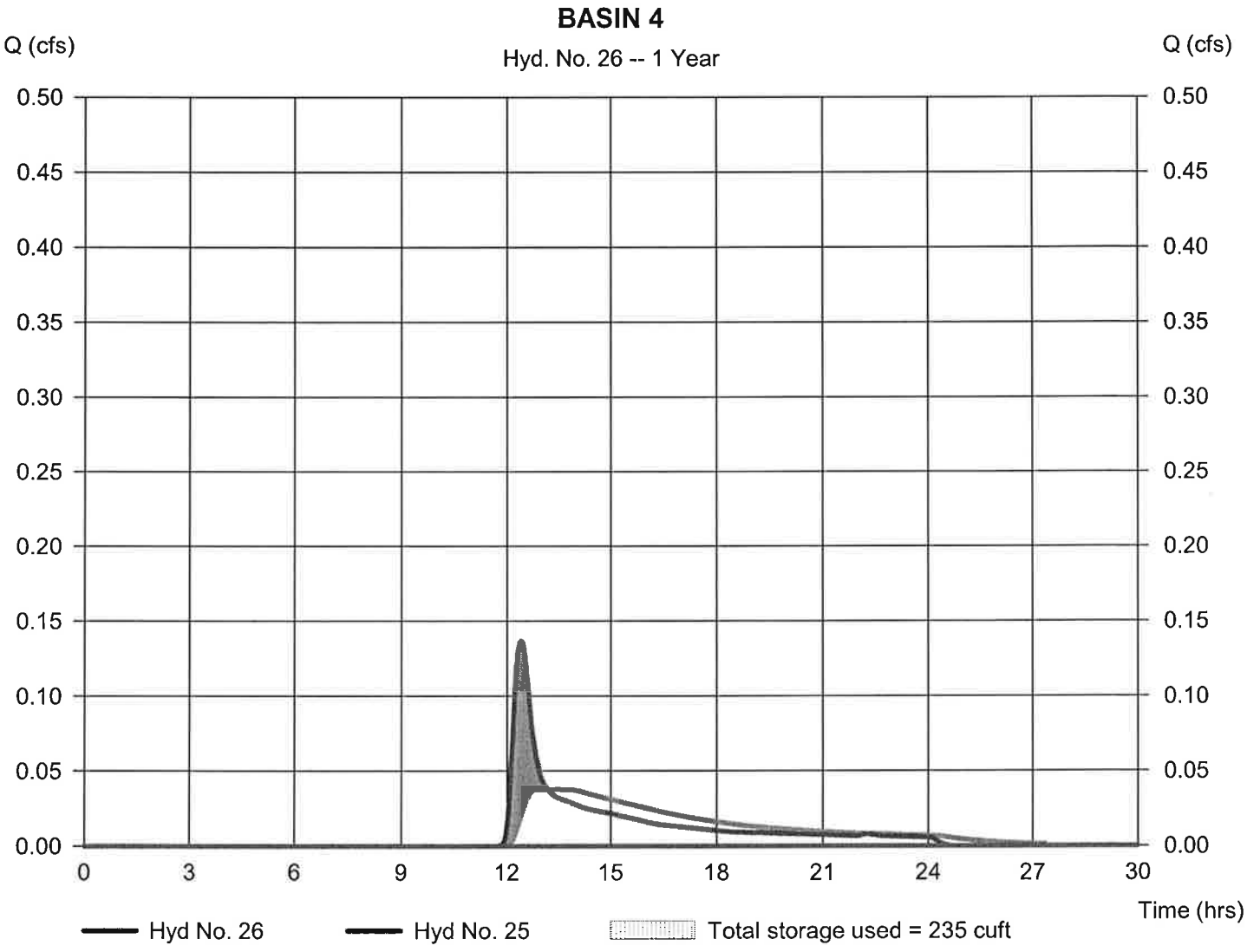
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 26

BASIN 4

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 15.50 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 25 - PW-6A	Max. Elevation	= 128.02 ft
Reservoir name	= BASIN 4	Max. Storage	= 235 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

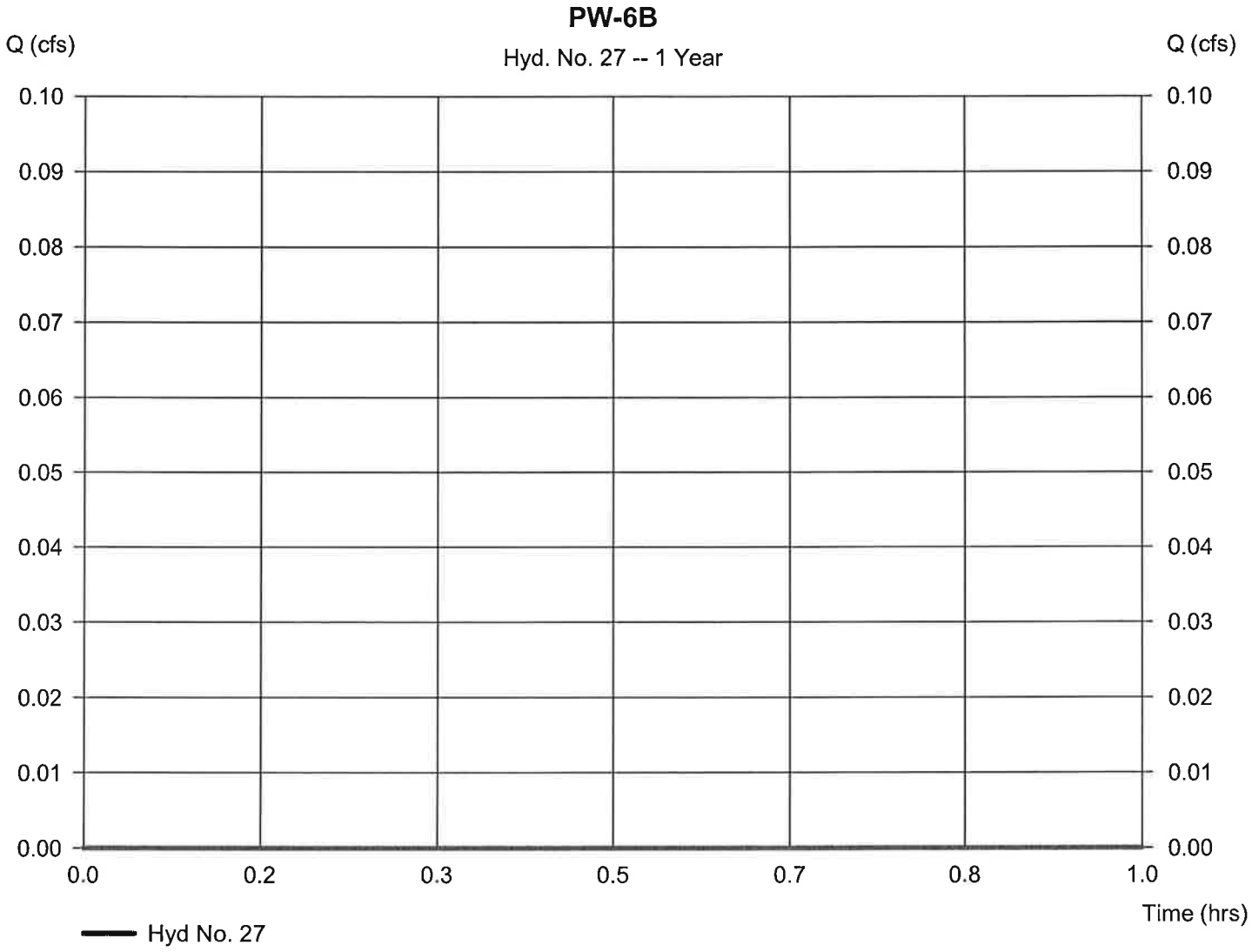
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 27

PW-6B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 0.600 ac	Curve number	= 39*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.610 x 39)] / 0.600



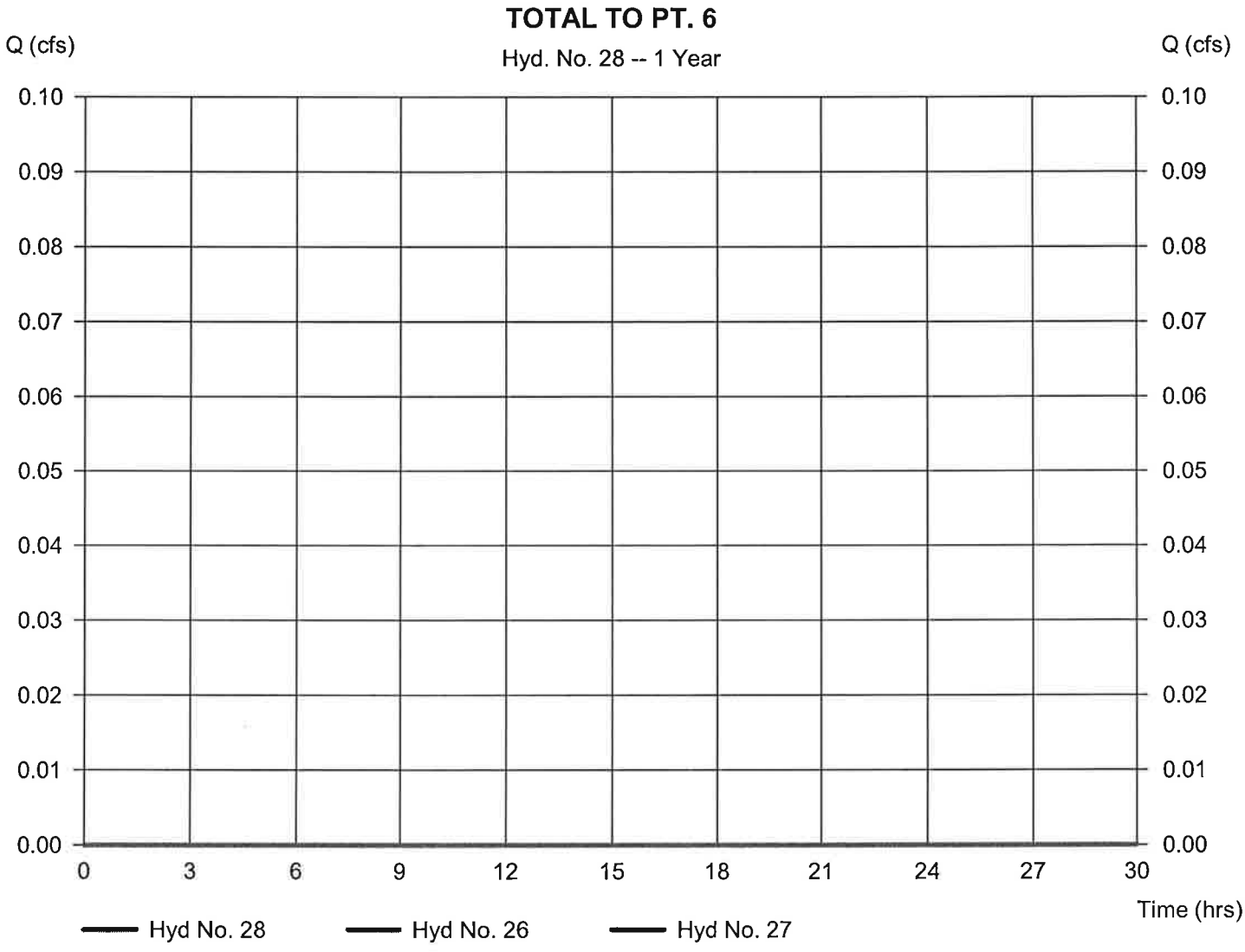
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 28

TOTAL TO PT. 6

Hydrograph type	= Combine	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 15.50 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyds.	= 26, 27	Contrib. drain. area	= 0.600 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	31.68	1	728	115,076	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	8.251	1	726	26,572	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	0.352	1	773	6,744	------	------	------	EW-3
4	Combine	39.44	1	727	148,392	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	1.373	1	730	5,489	------	------	------	EW-4
6	Reservoir	0.000	1	785	0	5	118.60	2,248	EXIST. BASIN (PT. 4)
7	SCS Runoff	0.029	1	922	820	------	------	------	EW-5A
8	SCS Runoff	0.047	1	825	1,209	------	------	------	E-5B
9	Combine	0.072	1	897	2,029	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	1.095	1	724	4,083	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	25.32	1	733	107,826	------	------	------	PW-1A
12	SCS Runoff	2.087	1	725	6,726	------	------	------	PW-1B
13	Reservoir	0.000	1	734	0	12	126.99	2,879	WATER QUALITY SWALE
14	Combine	25.32	1	733	107,826	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	16.64	1	745	82,763	14	120.76	25,670	BASIN 2
16	Diversion1	0.601	1	745	16,824	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	16.04	1	745	65,940	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	0.095	1	765	1,177	------	------	------	PW-2
19	Reservoir	0.000	1	798	0	18	118.10	368	BASIN 1 (PT.2)
20	SCS Runoff	0.072	1	893	1,948	------	------	------	PW-3
21	SCS Runoff	5.236	1	743	29,497	------	------	------	PW-5A
22	Reservoir	1.175	1	781	8,948	21	128.44	10,868	BASIN 3
23	Combine	16.64	1	745	91,712	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	0.476	1	727	1,715	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	1.697	1	737	8,197	------	------	------	PW-6A
26	Reservoir	1.083	1	752	2,070	25	129.94	2,955	BASIN 4
27	SCS Runoff	0.000	1	n/a	0	------	------	------	PW-6B
28	Combine	1.083	1	752	2,070	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

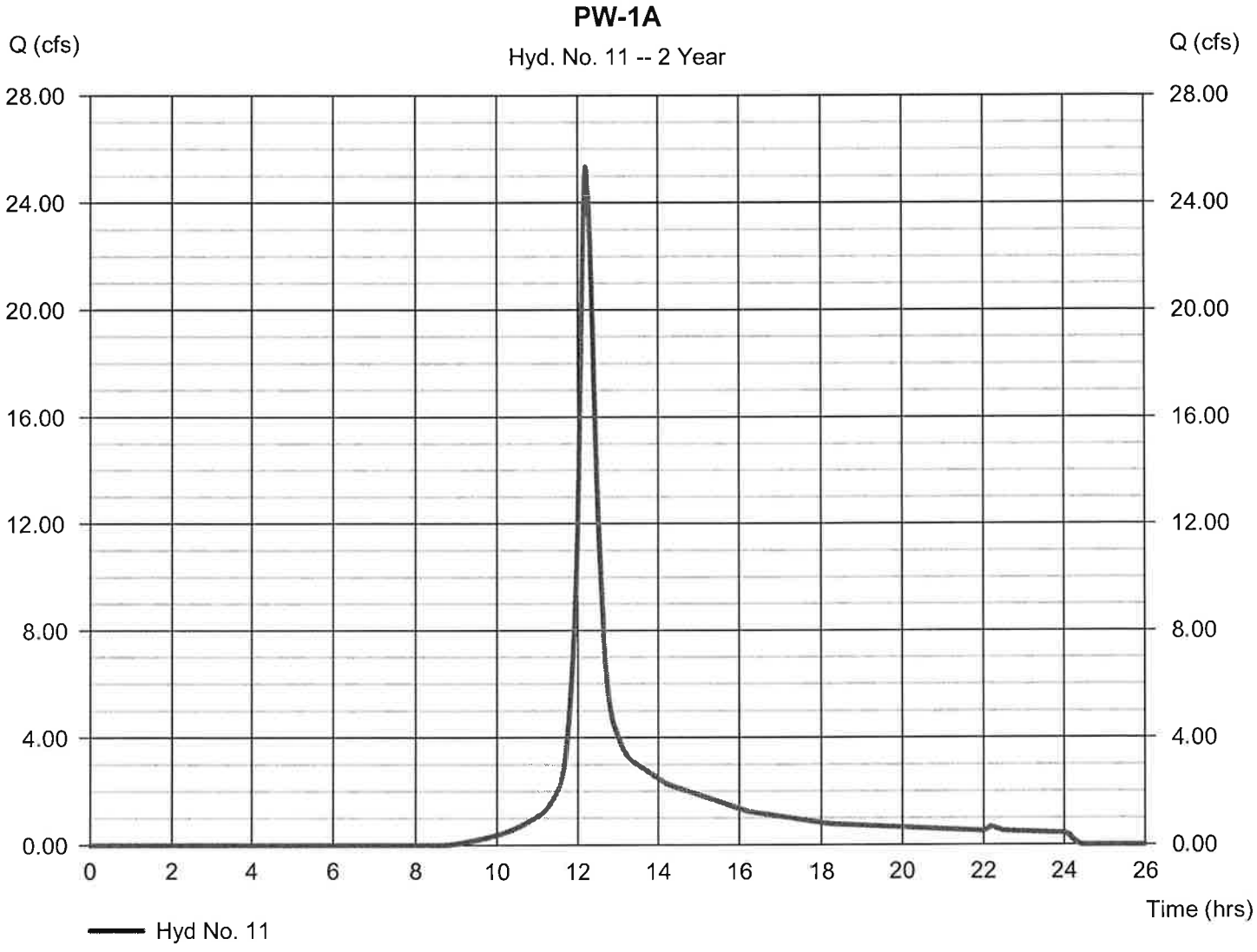
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 11

PW-1A

Hydrograph type	= SCS Runoff	Peak discharge	= 25.32 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.22 hrs
Time interval	= 1 min	Hyd. volume	= 107,826 cuft
Drainage area	= 19.670 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.50 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(13.300 x 98) + (5.150 x 39)] / 19.670



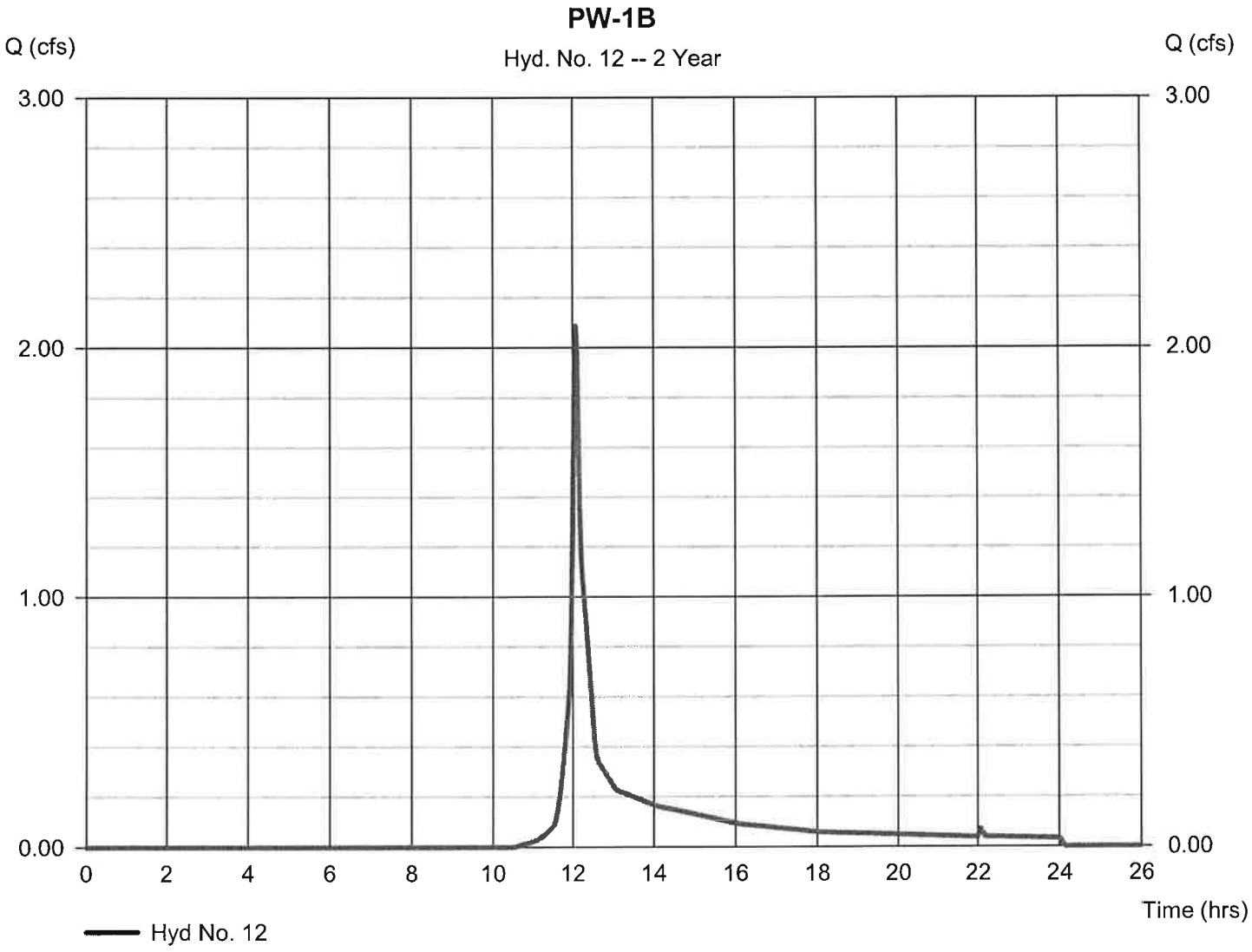
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 12

PW-1B

Hydrograph type	= SCS Runoff	Peak discharge	= 2.087 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 6,726 cuft
Drainage area	= 1.750 ac	Curve number	= 75
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

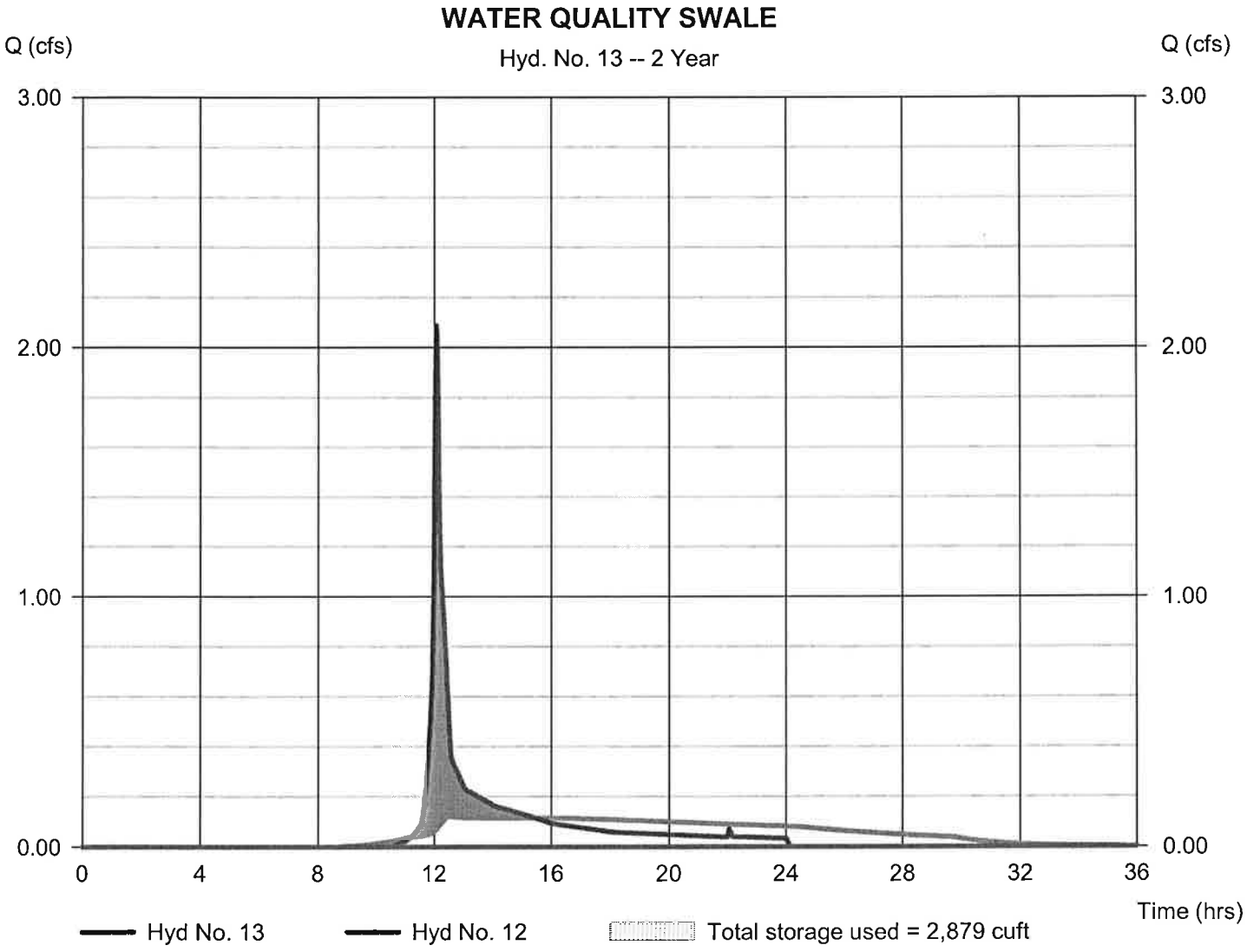
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 13

WATER QUALITY SWALE

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.23 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 12 - PW-1B	Max. Elevation	= 126.99 ft
Reservoir name	= WATER QUALITY SWALE	Max. Storage	= 2,879 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



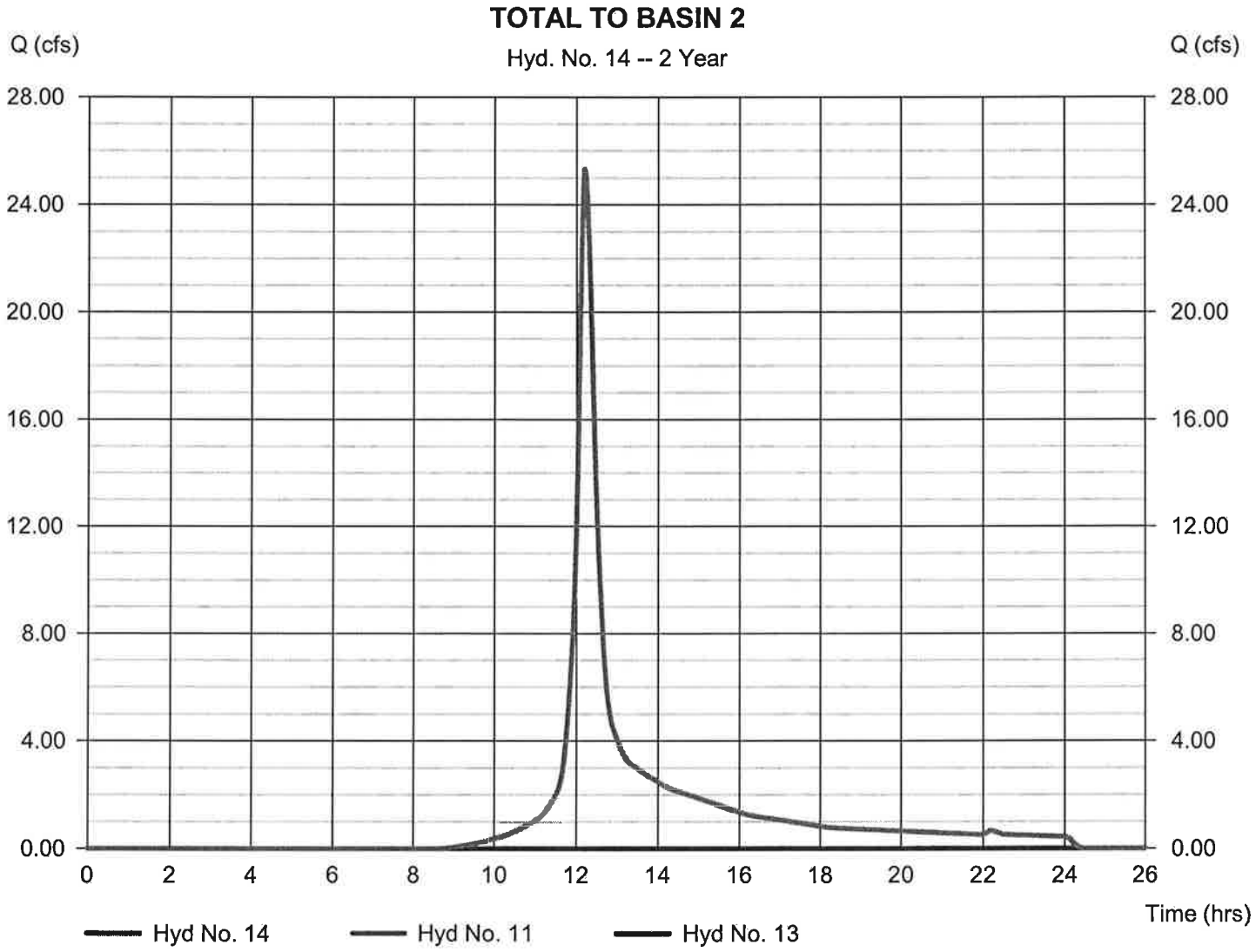
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 14

TOTAL TO BASIN 2

Hydrograph type	= Combine	Peak discharge	= 25.32 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.22 hrs
Time interval	= 1 min	Hyd. volume	= 107,826 cuft
Inflow hyds.	= 11, 13	Contrib. drain. area	= 19.670 ac



Hydrograph Report

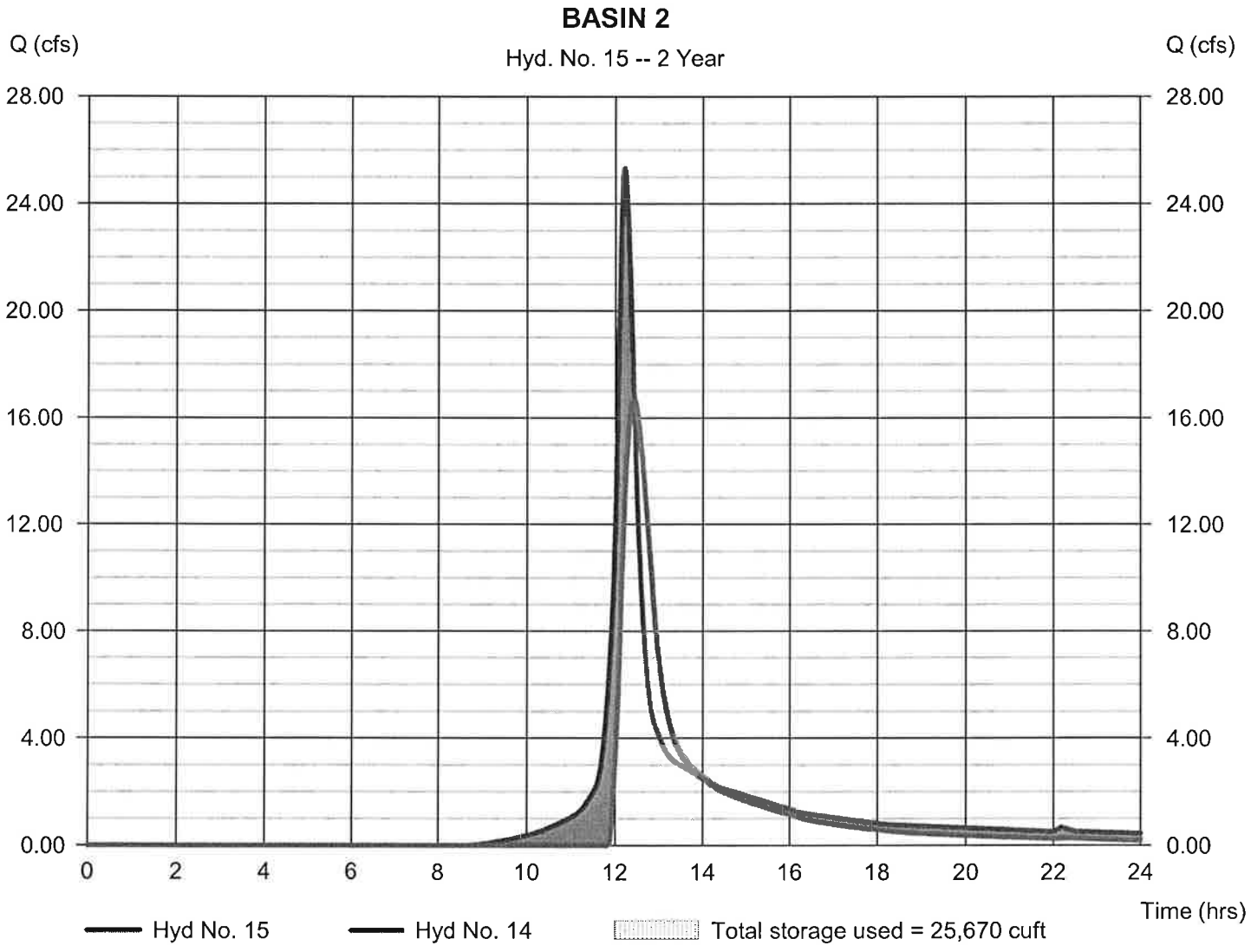
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 15

BASIN 2

Hydrograph type	= Reservoir	Peak discharge	= 16.64 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.42 hrs
Time interval	= 1 min	Hyd. volume	= 82,763 cuft
Inflow hyd. No.	= 14 - TOTAL TO BASIN 2	Max. Elevation	= 120.76 ft
Reservoir name	= BASIN 2	Max. Storage	= 25,670 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



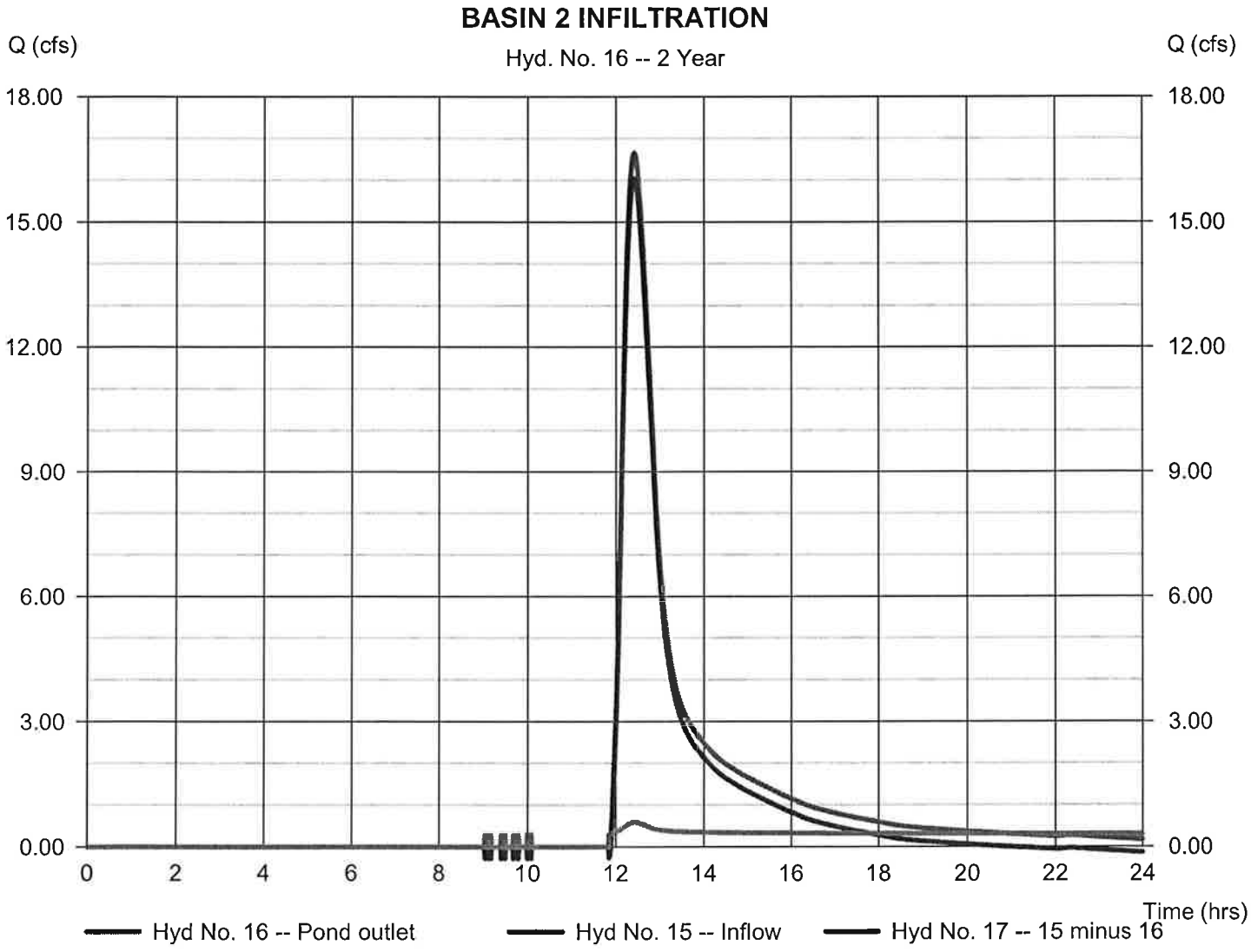
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 16

BASIN 2 INFILTRATION

Hydrograph type	= Diversion1	Peak discharge	= 0.601 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.42 hrs
Time interval	= 1 min	Hyd. volume	= 16,824 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd diverted hyd.	= 17
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



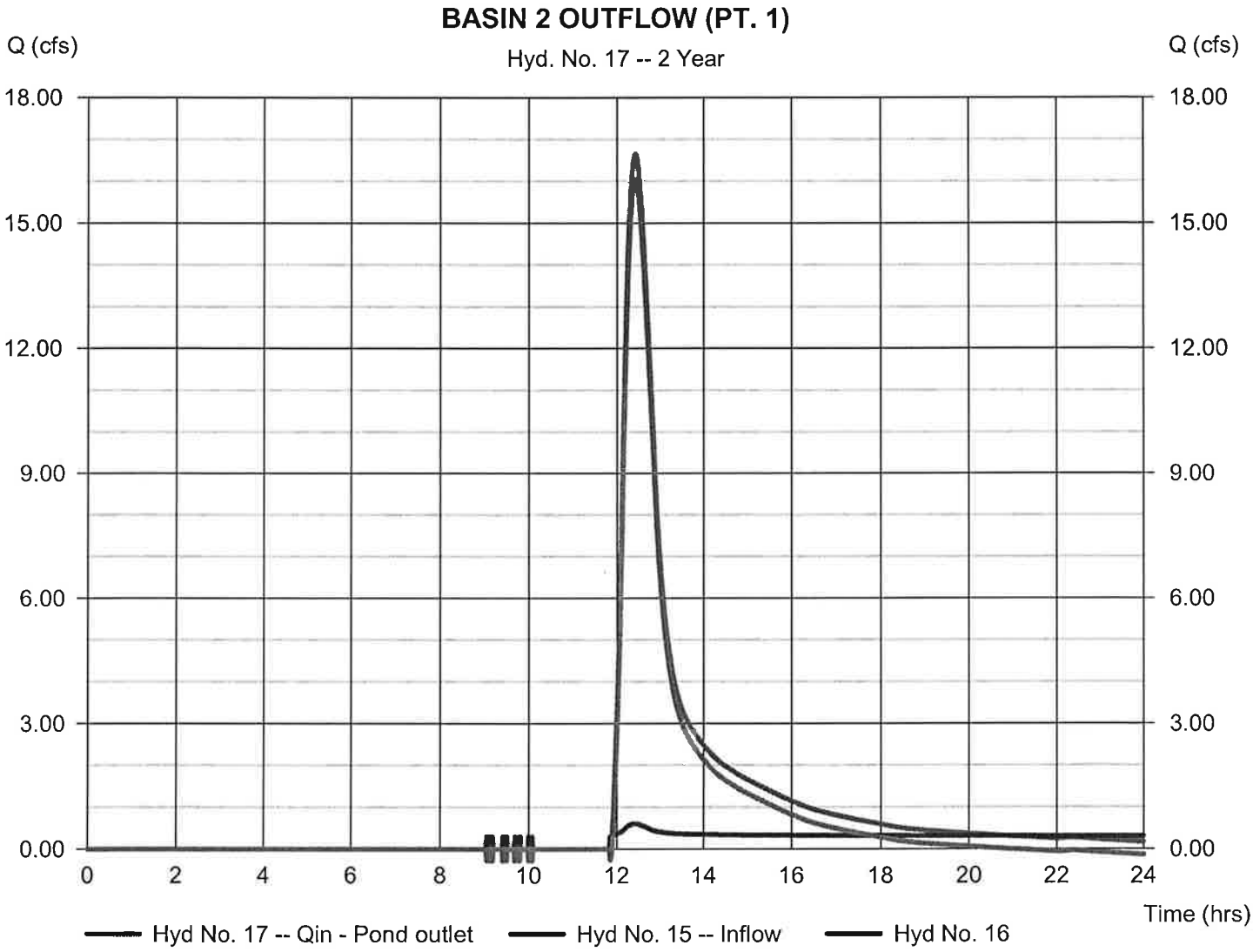
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 17

BASIN 2 OUTFLOW (PT. 1)

Hydrograph type	= Diversion2	Peak discharge	= 16.04 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.42 hrs
Time interval	= 1 min	Hyd. volume	= 65,940 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd diverted hyd.	= 16
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



Hydrograph Report

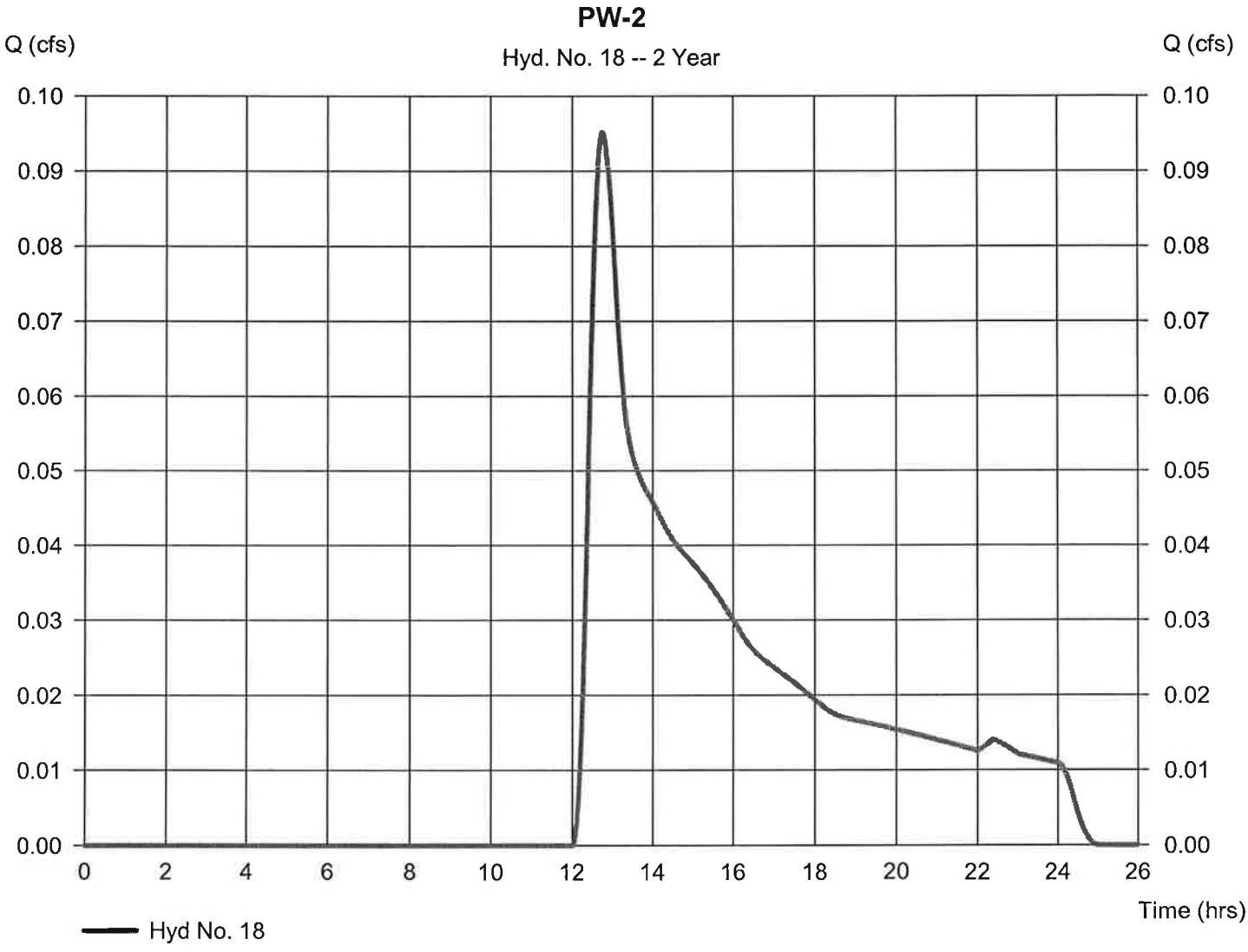
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 18

PW-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.095 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.75 hrs
Time interval	= 1 min	Hyd. volume	= 1,177 cuft
Drainage area	= 1.310 ac	Curve number	= 56*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 37.52 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.230 x 98) + (0.300 x 39)] / 1.310



Hydrograph Report

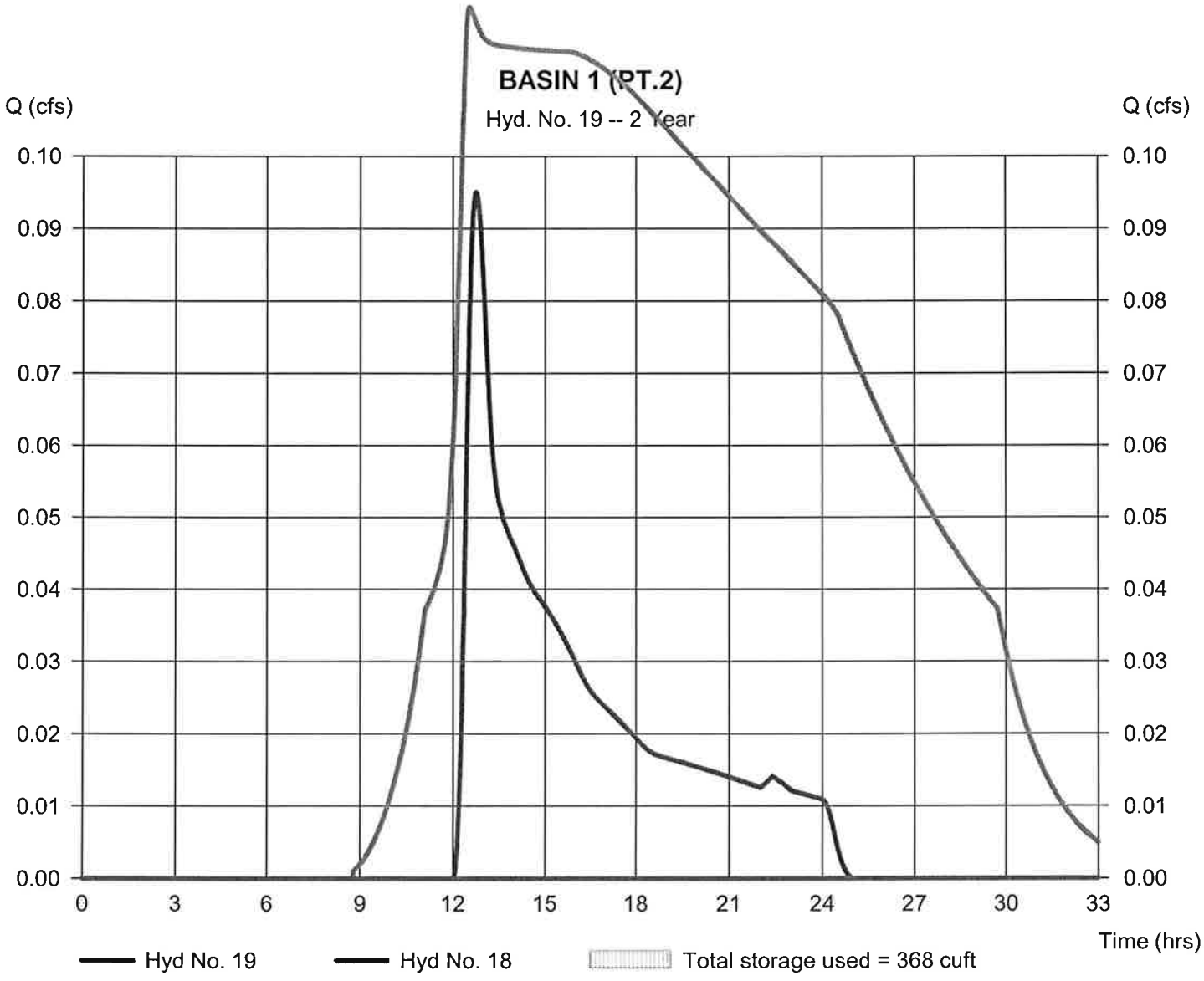
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 19

BASIN 1 (PT.2)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.30 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 18 - PW-2	Max. Elevation	= 118.10 ft
Reservoir name	= UPGRADED BASIN	Max. Storage	= 368 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

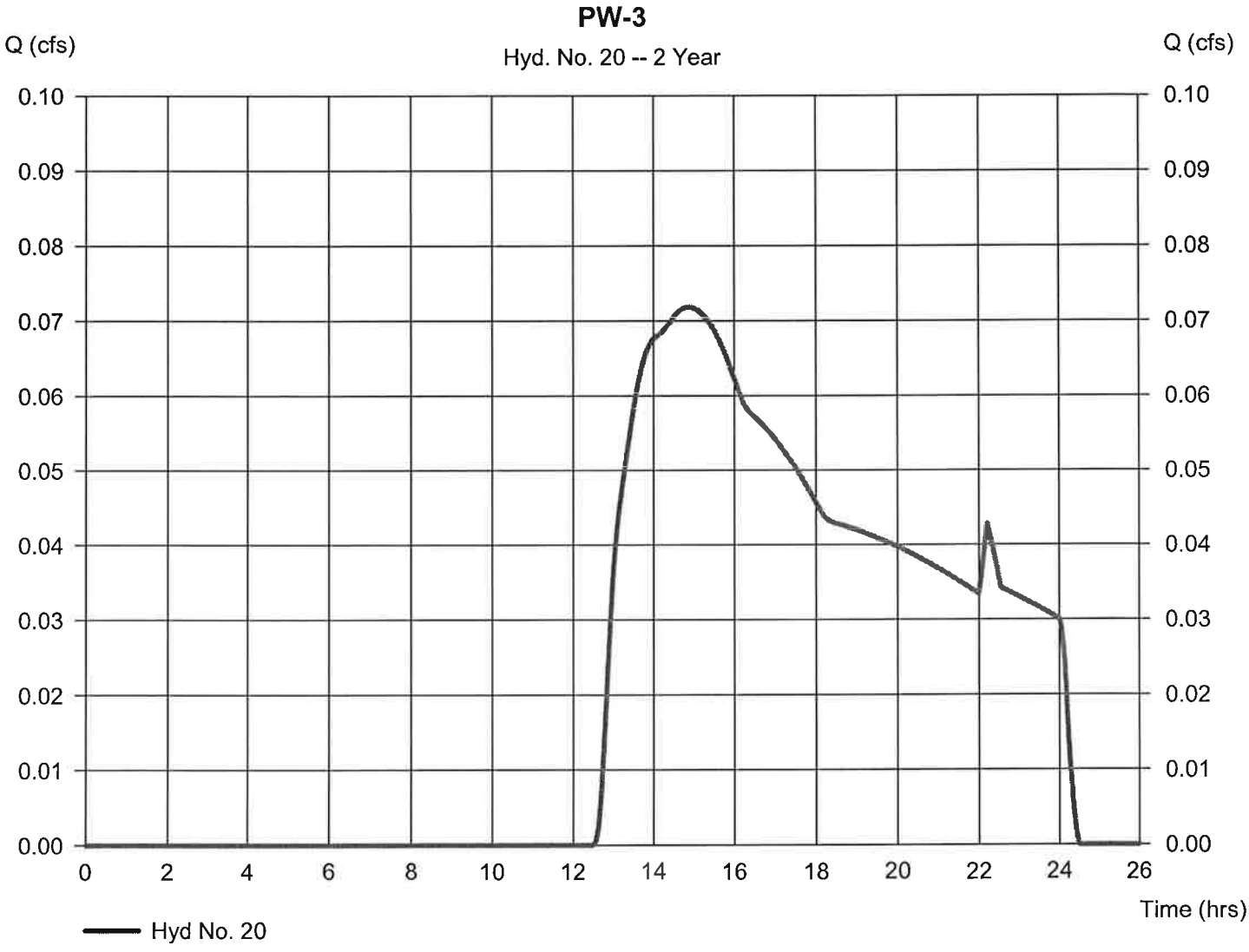
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 20

PW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.072 cfs
Storm frequency	= 2 yrs	Time to peak	= 14.88 hrs
Time interval	= 1 min	Hyd. volume	= 1,948 cuft
Drainage area	= 7.250 ac	Curve number	= 48*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.81 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.240 x 39)] / 7.250



Hydrograph Report

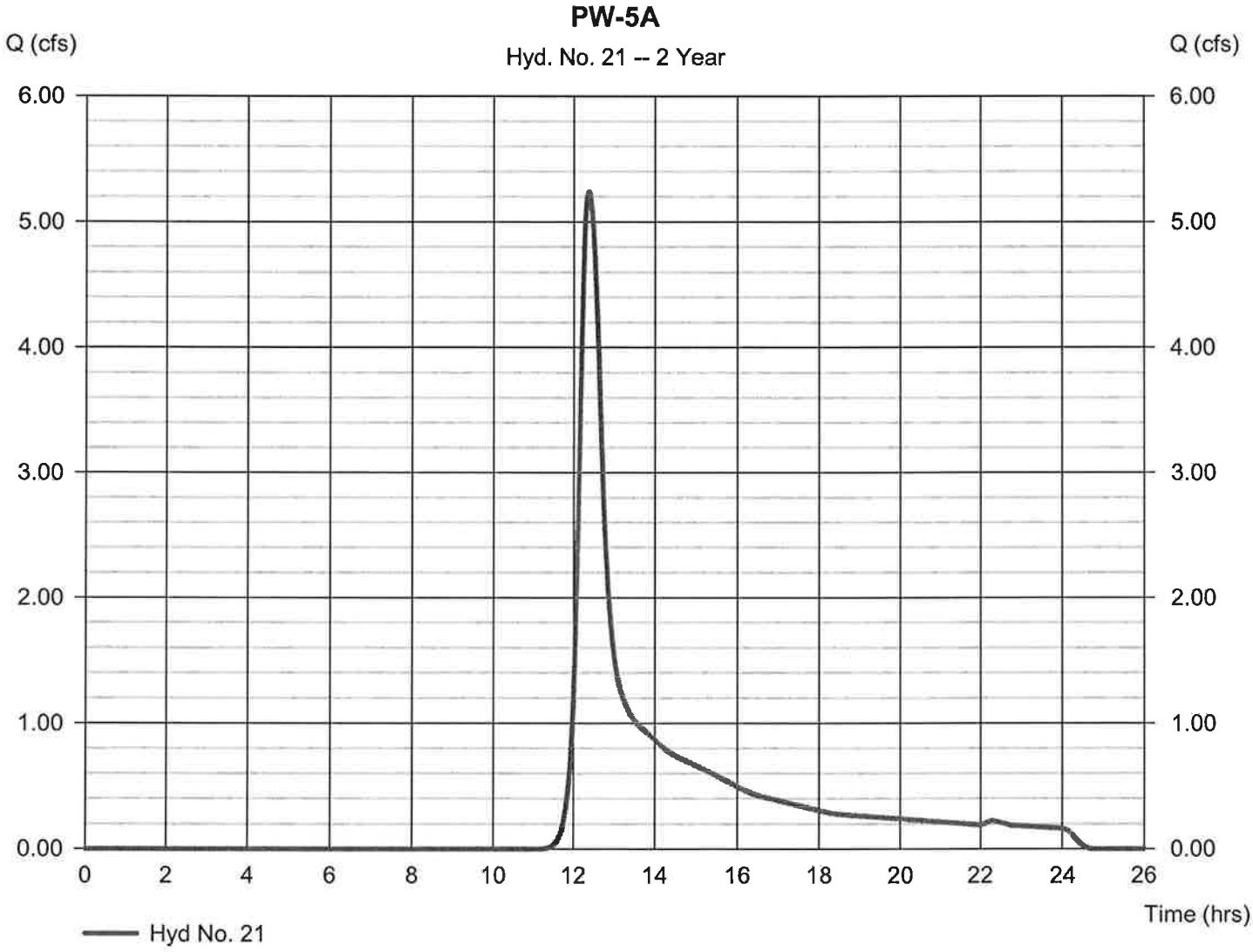
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 21

PW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 5.236 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.38 hrs
Time interval	= 1 min	Hyd. volume	= 29,497 cuft
Drainage area	= 10.000 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.26 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.880 x 98) + (3.950 x 39)] / 10.000



Hydrograph Report

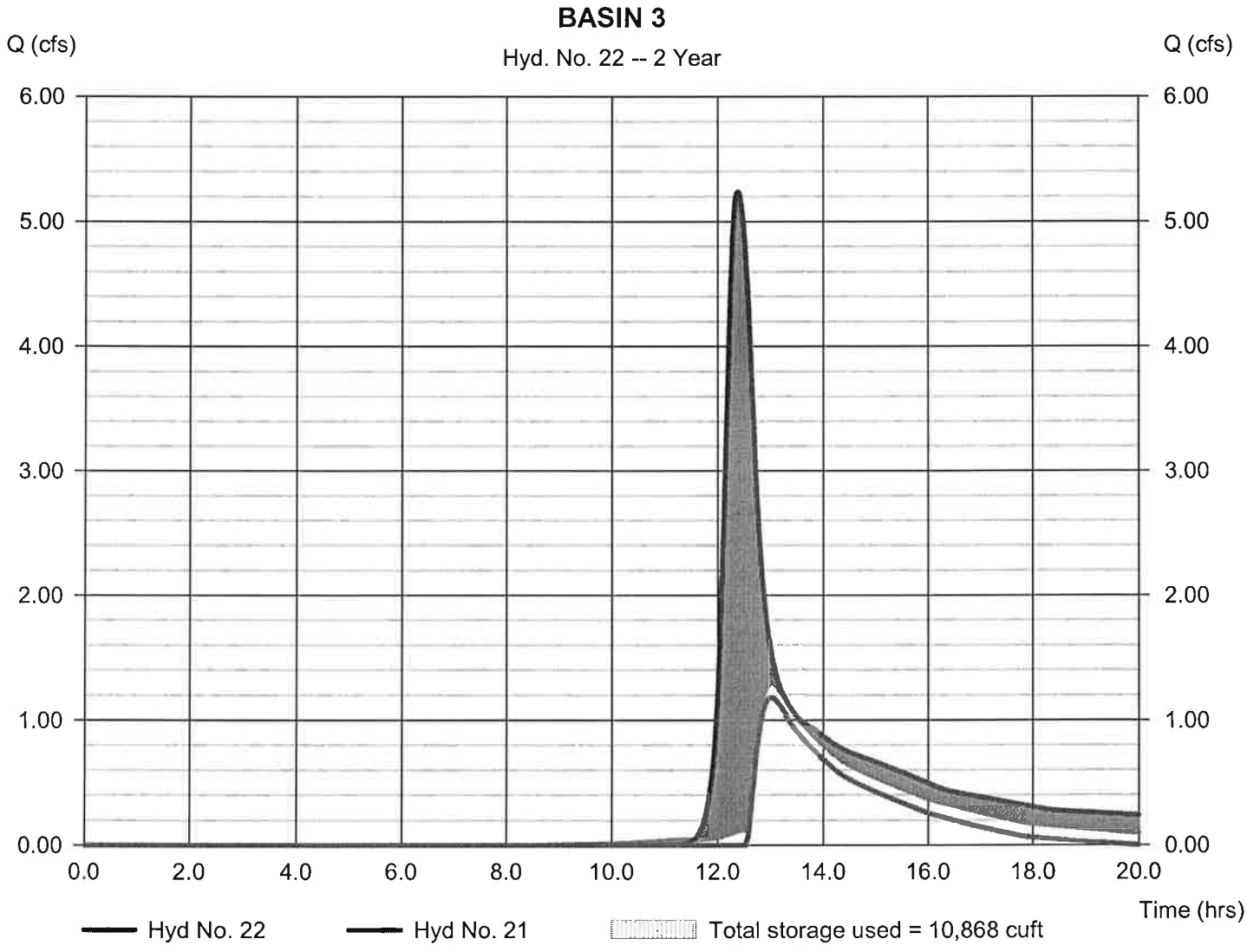
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 22

BASIN 3

Hydrograph type	= Reservoir	Peak discharge	= 1.175 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.02 hrs
Time interval	= 1 min	Hyd. volume	= 8,948 cuft
Inflow hyd. No.	= 21 - PW-5A	Max. Elevation	= 128.44 ft
Reservoir name	= BASIN 3	Max. Storage	= 10,868 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



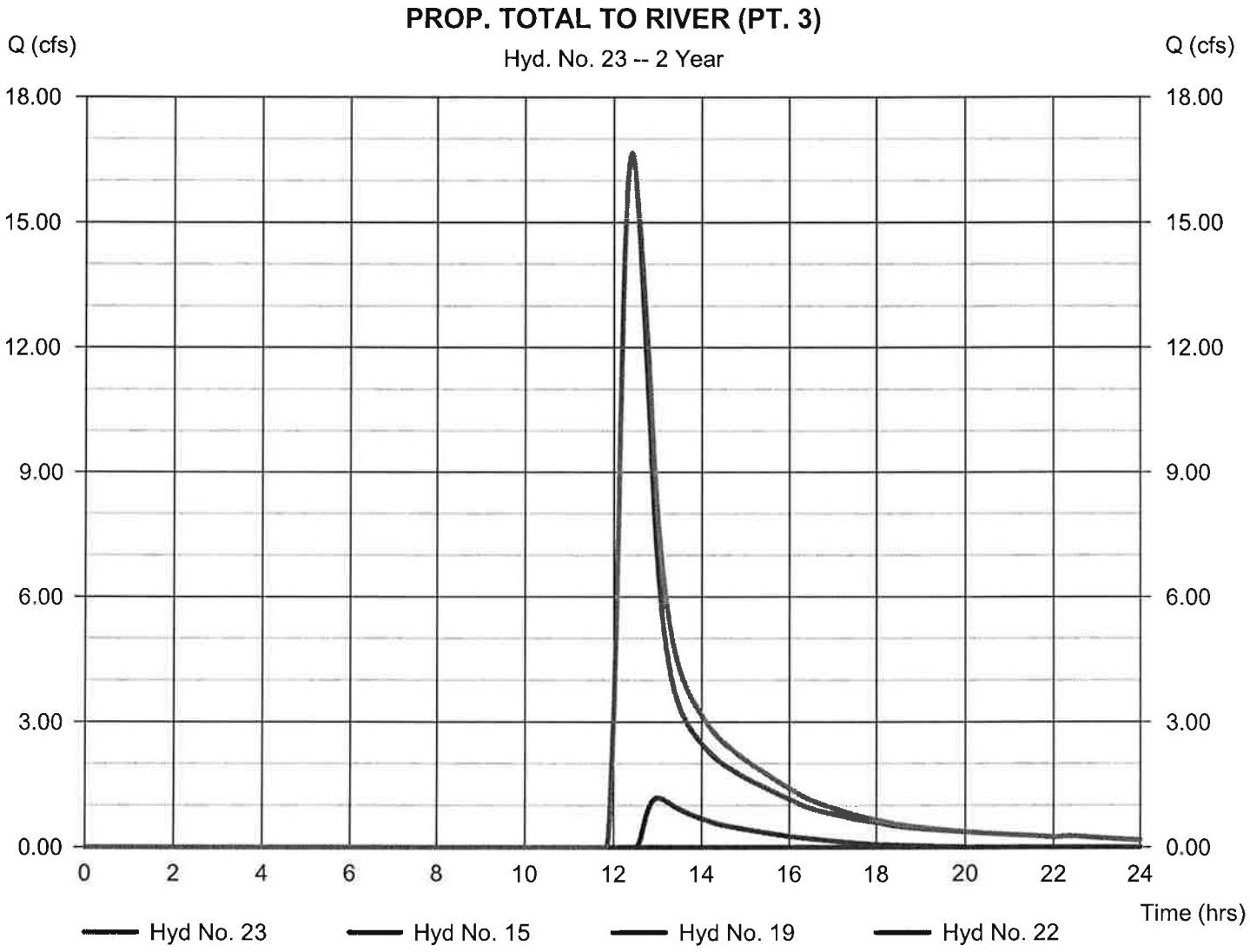
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 23

PROP. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 16.64 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.42 hrs
Time interval	= 1 min	Hyd. volume	= 91,712 cuft
Inflow hyds.	= 15, 19, 22	Contrib. drain. area	= 0.000 ac



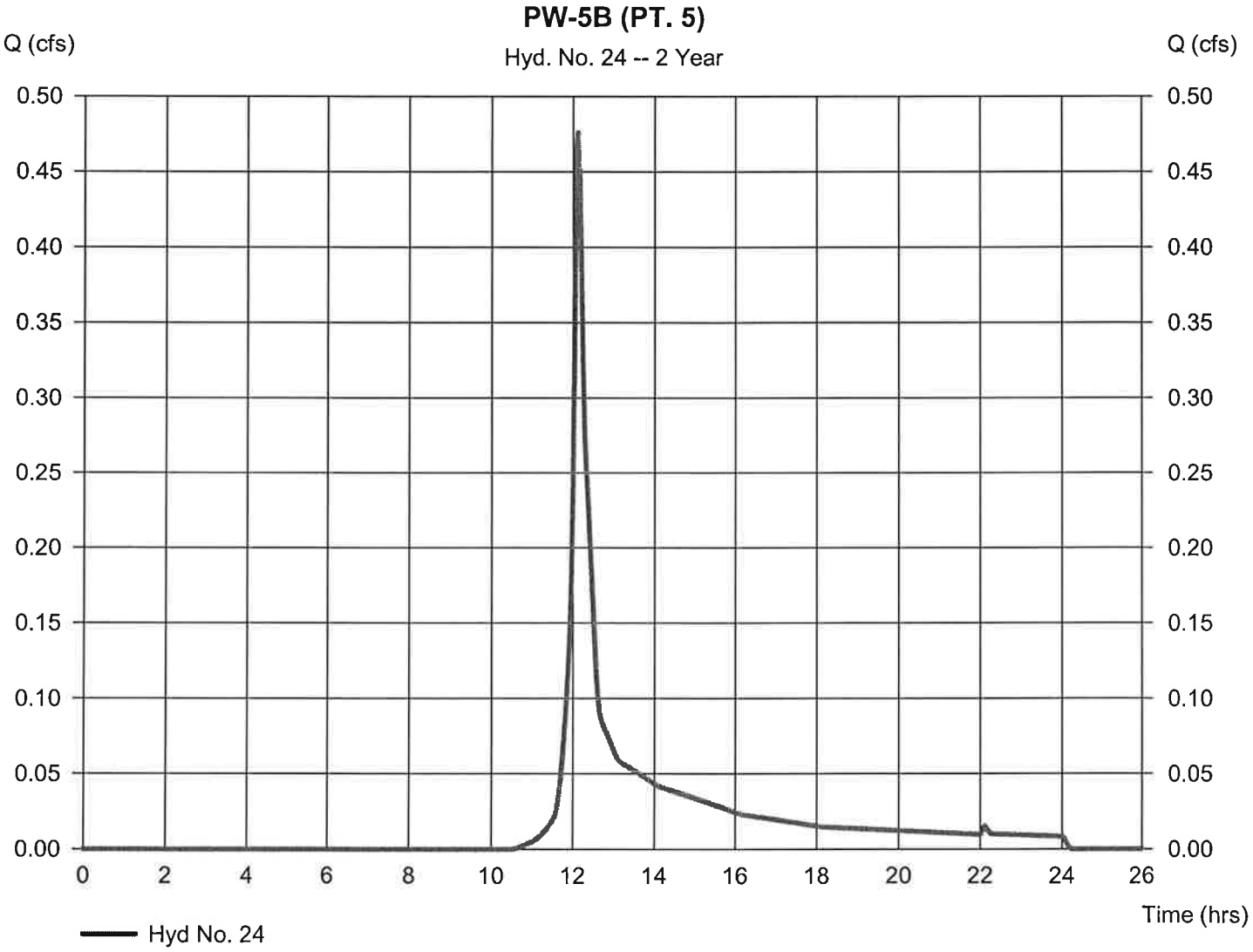
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 24

PW-5B (PT. 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.476 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 1,715 cuft
Drainage area	= 0.460 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.01 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

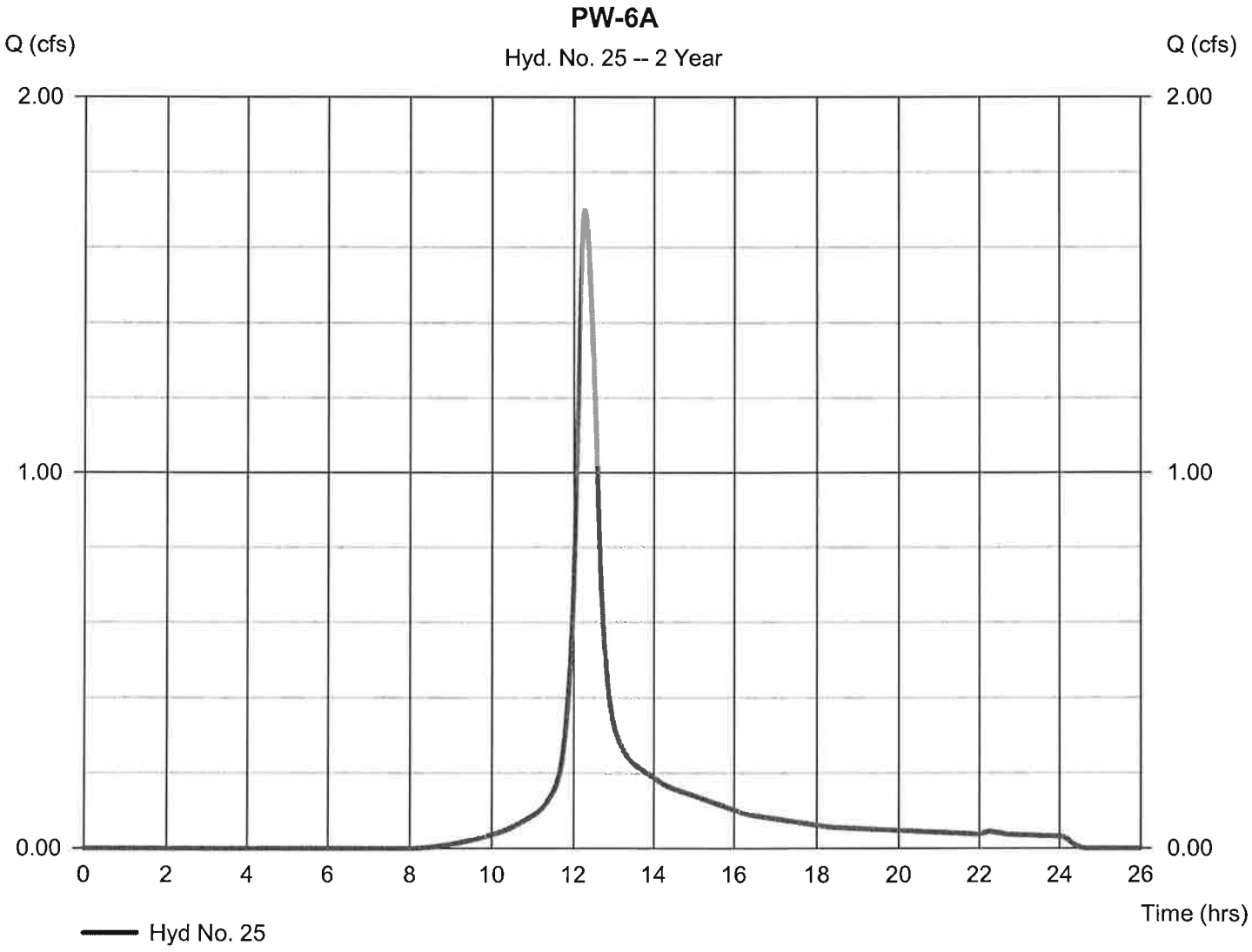
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 25

PW-6A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.697 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.28 hrs
Time interval	= 1 min	Hyd. volume	= 8,197 cuft
Drainage area	= 1.350 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.74 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.380 x 39) + (0.650 x 98)] / 1.350



Hydrograph Report

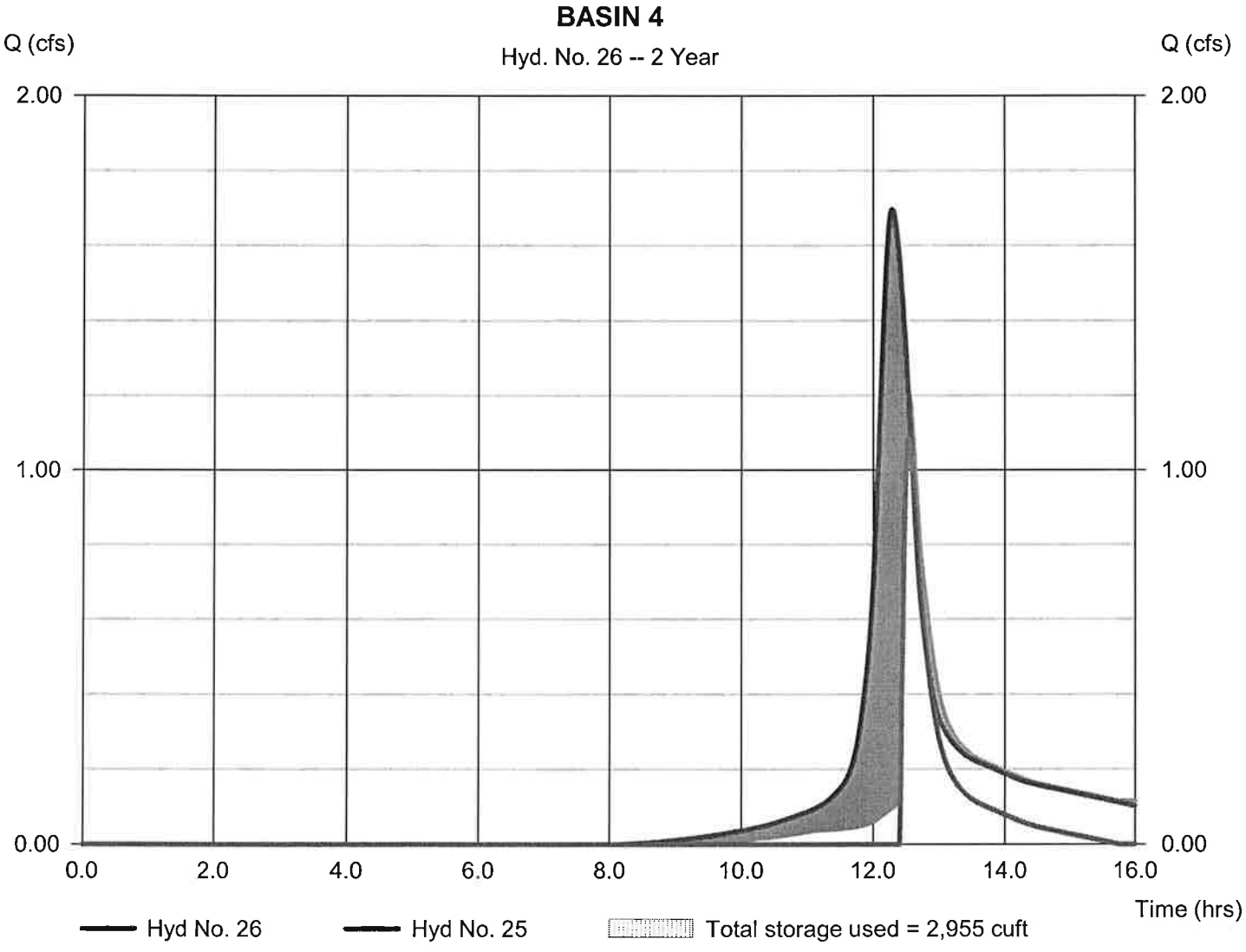
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 26

BASIN 4

Hydrograph type	= Reservoir	Peak discharge	= 1.083 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.53 hrs
Time interval	= 1 min	Hyd. volume	= 2,070 cuft
Inflow hyd. No.	= 25 - PW-6A	Max. Elevation	= 129.94 ft
Reservoir name	= BASIN 4	Max. Storage	= 2,955 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

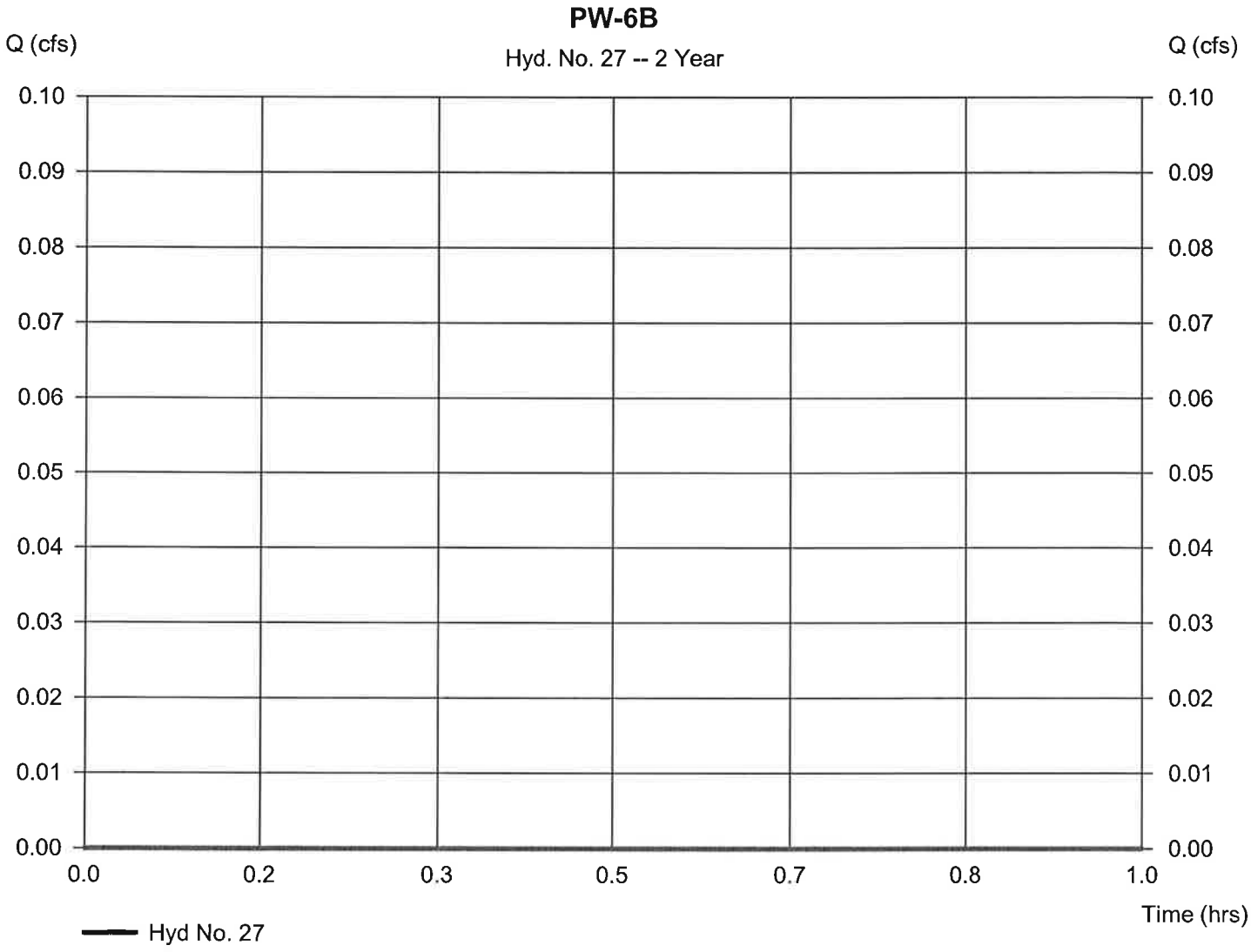
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 27

PW-6B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 0.600 ac	Curve number	= 39*
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

* Composite (Area/CN) = [(1.610 x 39)] / 0.600



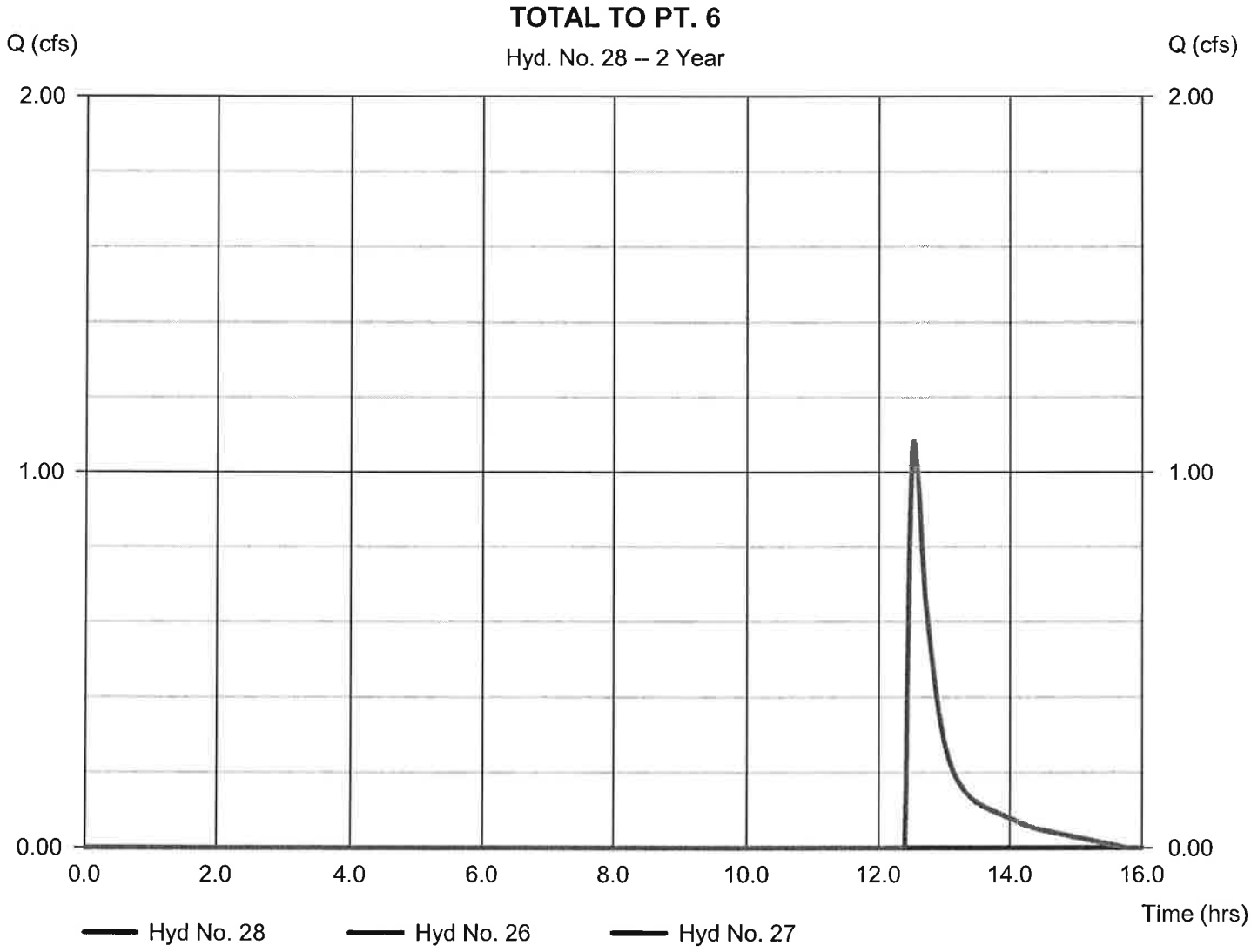
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 28

TOTAL TO PT. 6

Hydrograph type	= Combine	Peak discharge	= 1.083 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.53 hrs
Time interval	= 1 min	Hyd. volume	= 2,070 cuft
Inflow hyds.	= 26, 27	Contrib. drain. area	= 0.600 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	53.09	1	728	195,223	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	13.82	1	725	45,078	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	3.324	1	753	26,655	------	------	------	EW-3
4	Combine	66.75	1	727	266,955	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	2.927	1	729	11,135	------	------	------	EW-4
6	Reservoir	0.000	1	732	0	5	119.19	5,096	EXIST. BASIN (PT. 4)
7	SCS Runoff	0.630	1	746	6,040	------	------	------	EW-5A
8	SCS Runoff	0.762	1	743	5,544	------	------	------	E-5B
9	Combine	1.385	1	745	11,584	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	3.951	1	722	10,914	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	45.30	1	732	192,400	------	------	------	PW-1A
12	SCS Runoff	4.338	1	725	13,432	------	------	------	PW-1B
13	Reservoir	0.842	1	748	3,749	12	127.41	5,189	WATER QUALITY SWALE
14	Combine	45.70	1	732	196,149	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	34.19	1	742	167,881	14	121.92	40,295	BASIN 2
16	Diversion1	0.820	1	742	19,625	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	33.37	1	742	148,255	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	0.499	1	755	3,761	------	------	------	PW-2
19	Reservoir	0.000	1	774	0	18	118.36	1,341	BASIN 1 (PT.2)
20	SCS Runoff	1.274	1	748	10,882	------	------	------	PW-3
21	SCS Runoff	12.06	1	741	62,928	------	------	------	PW-5A
22	Reservoir	7.915	1	757	38,755	21	129.25	17,002	BASIN 3
23	Combine	39.25	1	744	206,636	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	0.993	1	727	3,424	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	2.941	1	737	14,256	------	------	------	PW-6A
26	Reservoir	2.731	1	740	6,961	25	130.06	3,214	BASIN 4
27	SCS Runoff	0.009	1	881	248	------	------	------	PW-6B
28	Combine	2.731	1	740	7,210	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

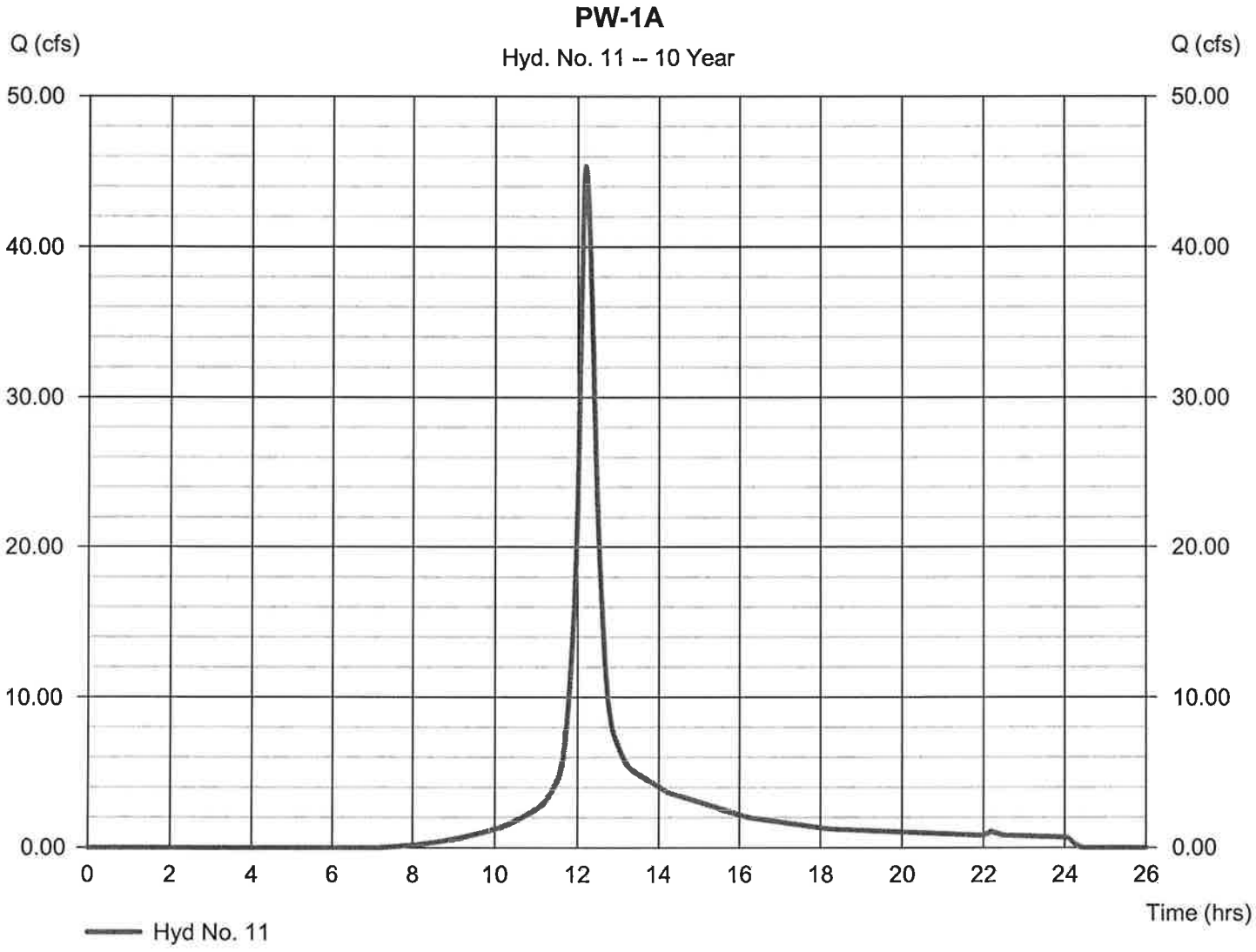
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 11

PW-1A

Hydrograph type	= SCS Runoff	Peak discharge	= 45.30 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 1 min	Hyd. volume	= 192,400 cuft
Drainage area	= 19.670 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.50 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(13.300 x 98) + (5.150 x 39)] / 19.670



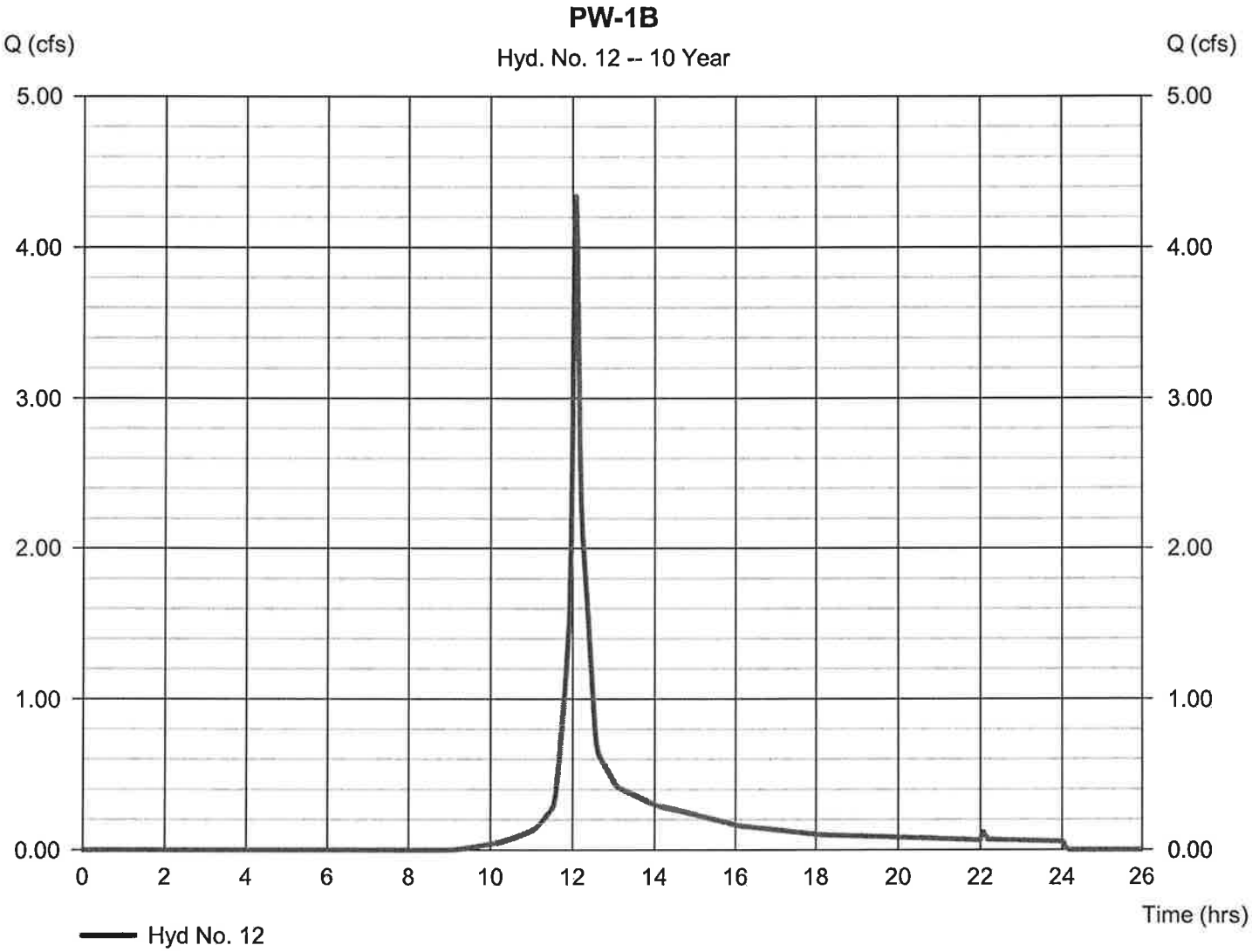
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 12

PW-1B

Hydrograph type	= SCS Runoff	Peak discharge	= 4.338 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 13,432 cuft
Drainage area	= 1.750 ac	Curve number	= 75
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

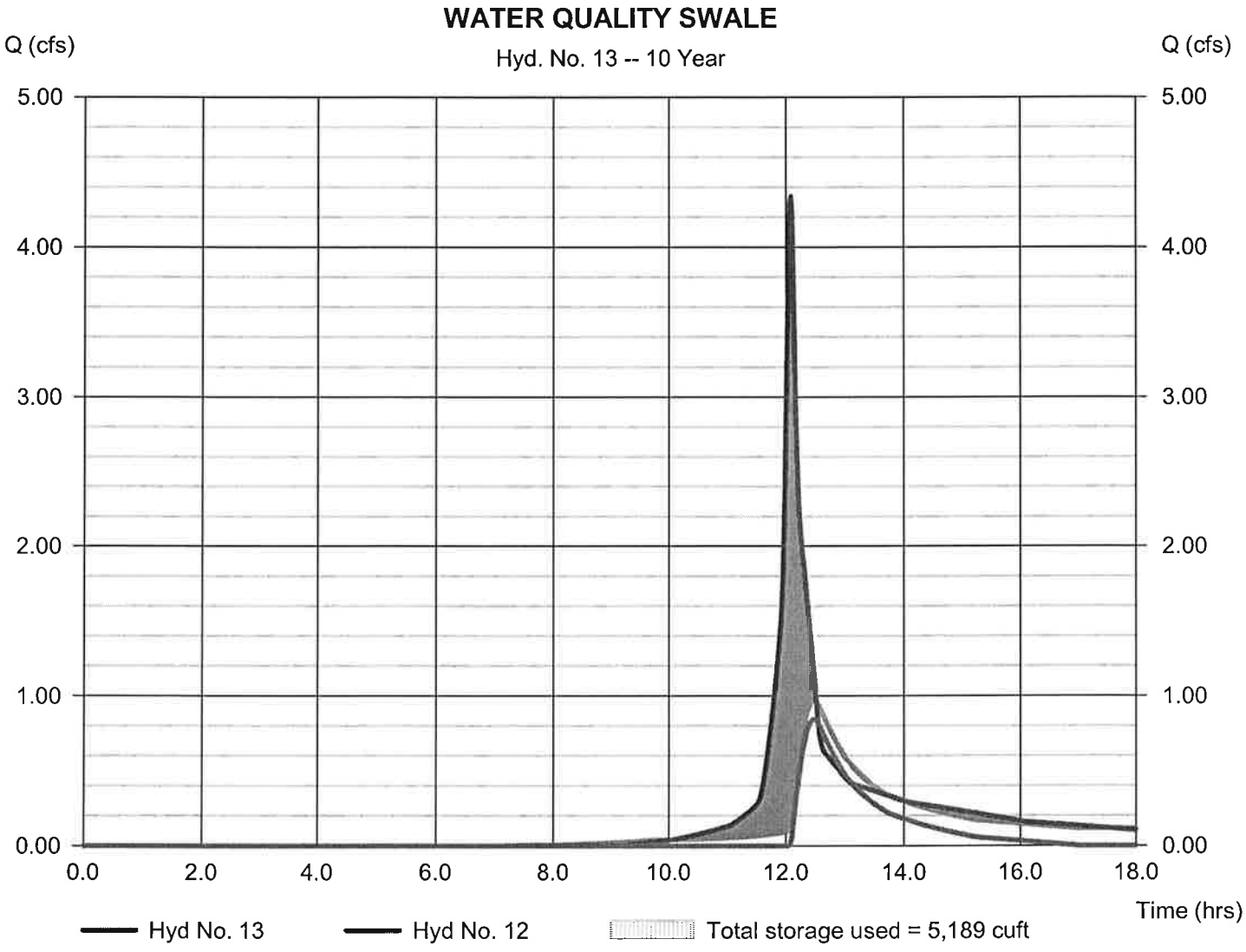
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 13

WATER QUALITY SWALE

Hydrograph type	= Reservoir	Peak discharge	= 0.842 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.47 hrs
Time interval	= 1 min	Hyd. volume	= 3,749 cuft
Inflow hyd. No.	= 12 - PW-1B	Max. Elevation	= 127.41 ft
Reservoir name	= WATER QUALITY SWALE	Max. Storage	= 5,189 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



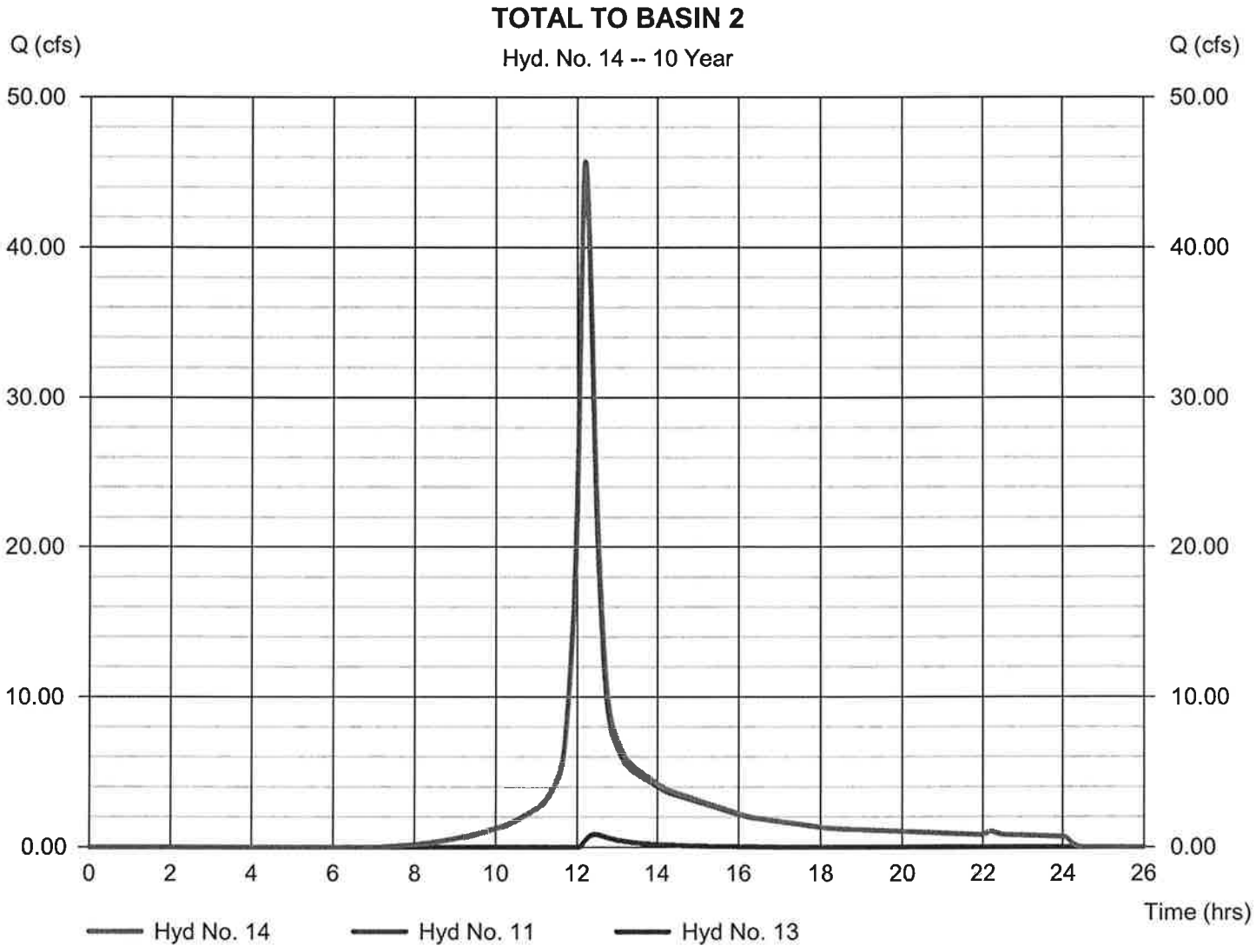
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 14

TOTAL TO BASIN 2

Hydrograph type	= Combine	Peak discharge	= 45.70 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 1 min	Hyd. volume	= 196,149 cuft
Inflow hyds.	= 11, 13	Contrib. drain. area	= 19.670 ac



Hydrograph Report

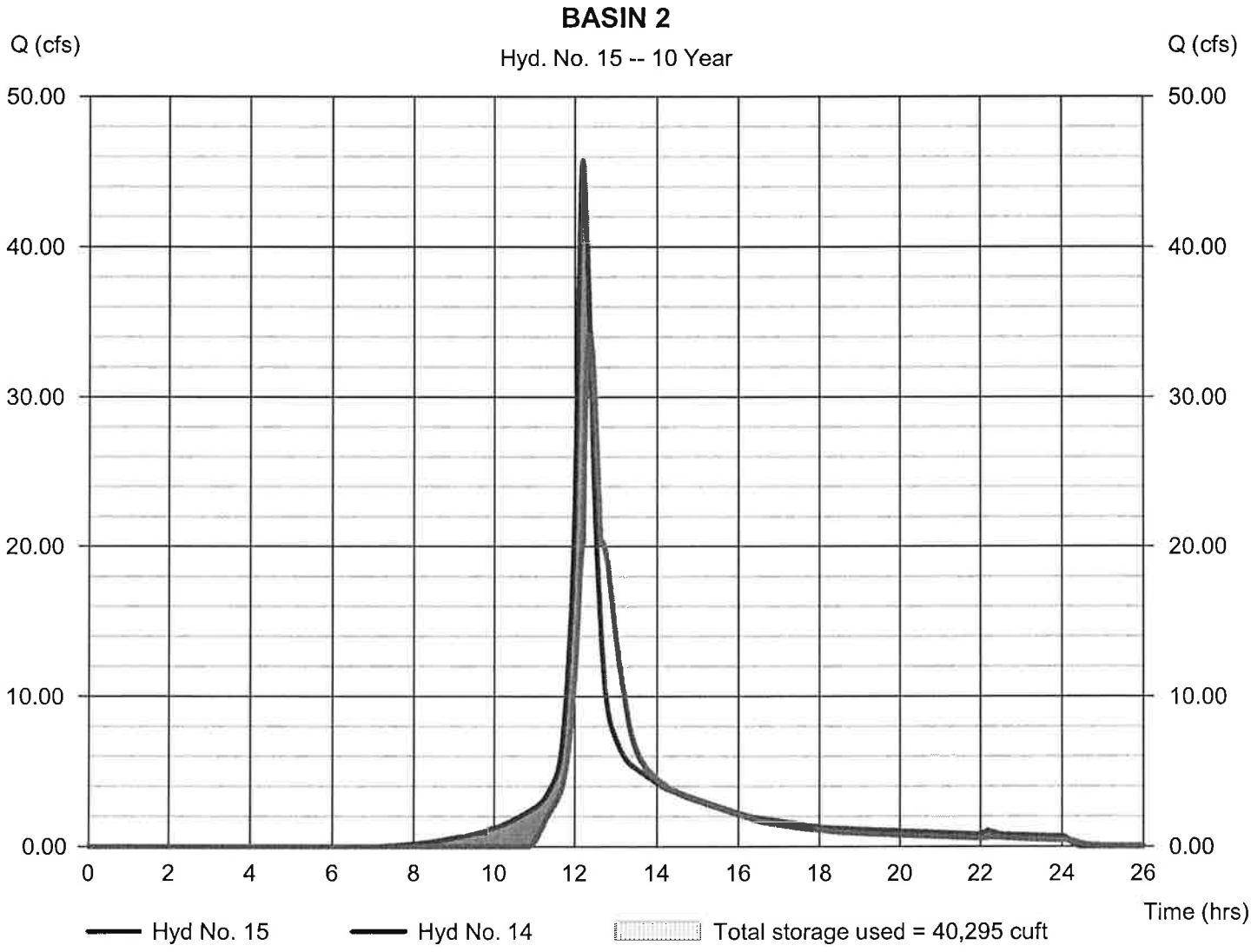
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 15

BASIN 2

Hydrograph type	= Reservoir	Peak discharge	= 34.19 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 1 min	Hyd. volume	= 167,881 cuft
Inflow hyd. No.	= 14 - TOTAL TO BASIN 2	Max. Elevation	= 121.92 ft
Reservoir name	= BASIN 2	Max. Storage	= 40,295 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



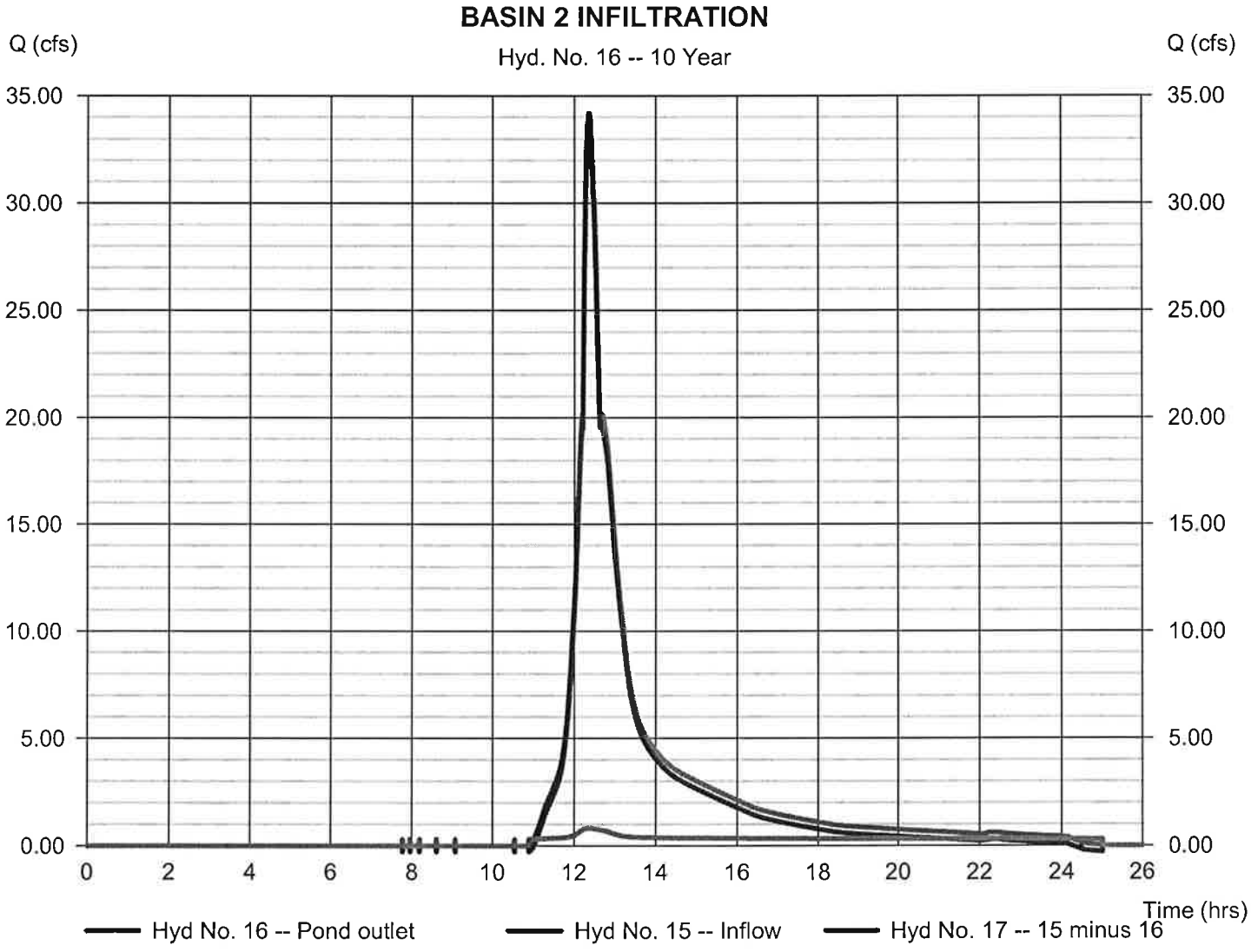
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 16

BASIN 2 INFILTRATION

Hydrograph type	= Diversion1	Peak discharge	= 0.820 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 1 min	Hyd. volume	= 19,625 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd diverted hyd.	= 17
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



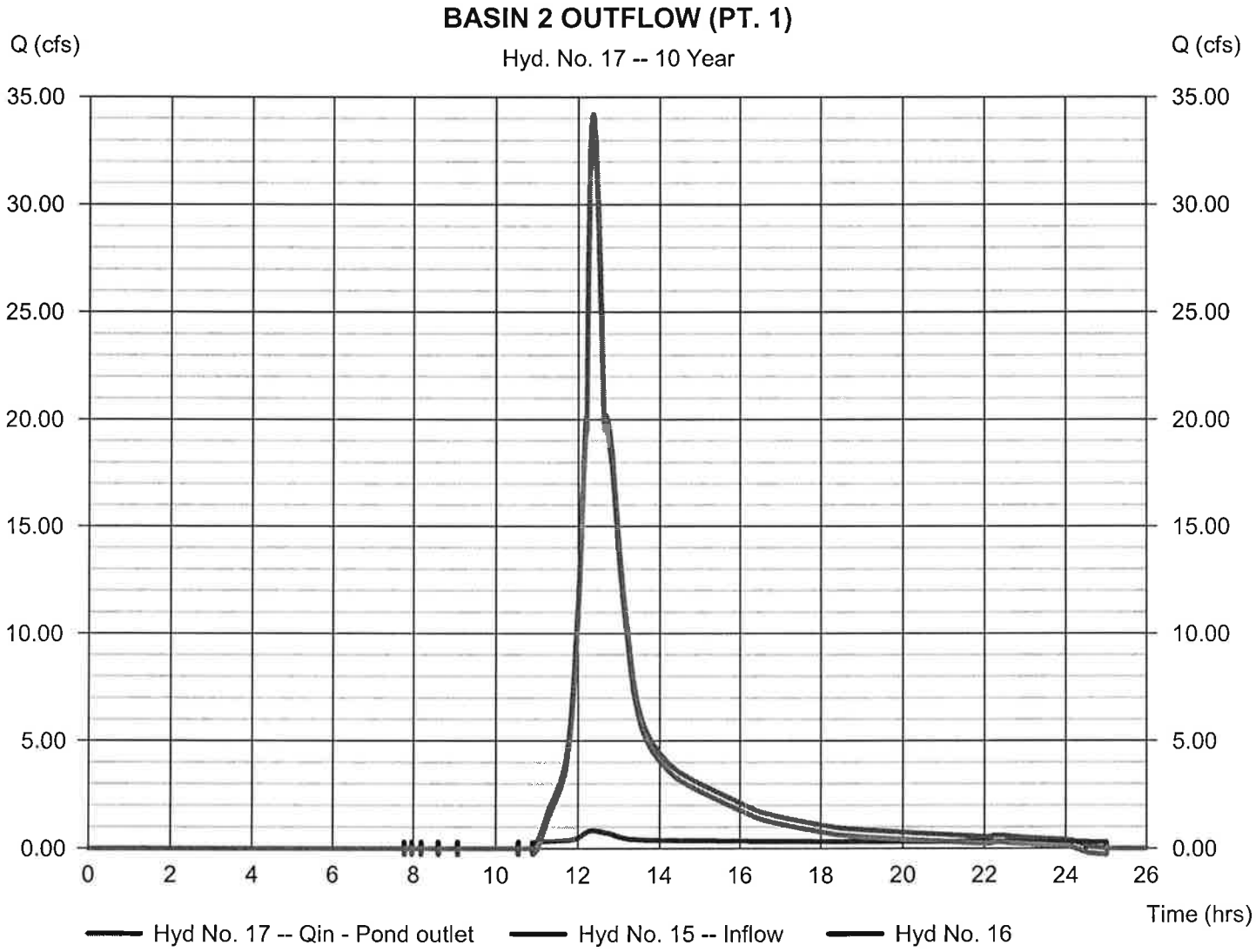
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 17

BASIN 2 OUTFLOW (PT. 1)

Hydrograph type	= Diversion2	Peak discharge	= 33.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 1 min	Hyd. volume	= 148,255 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd diverted hyd.	= 16
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



Hydrograph Report

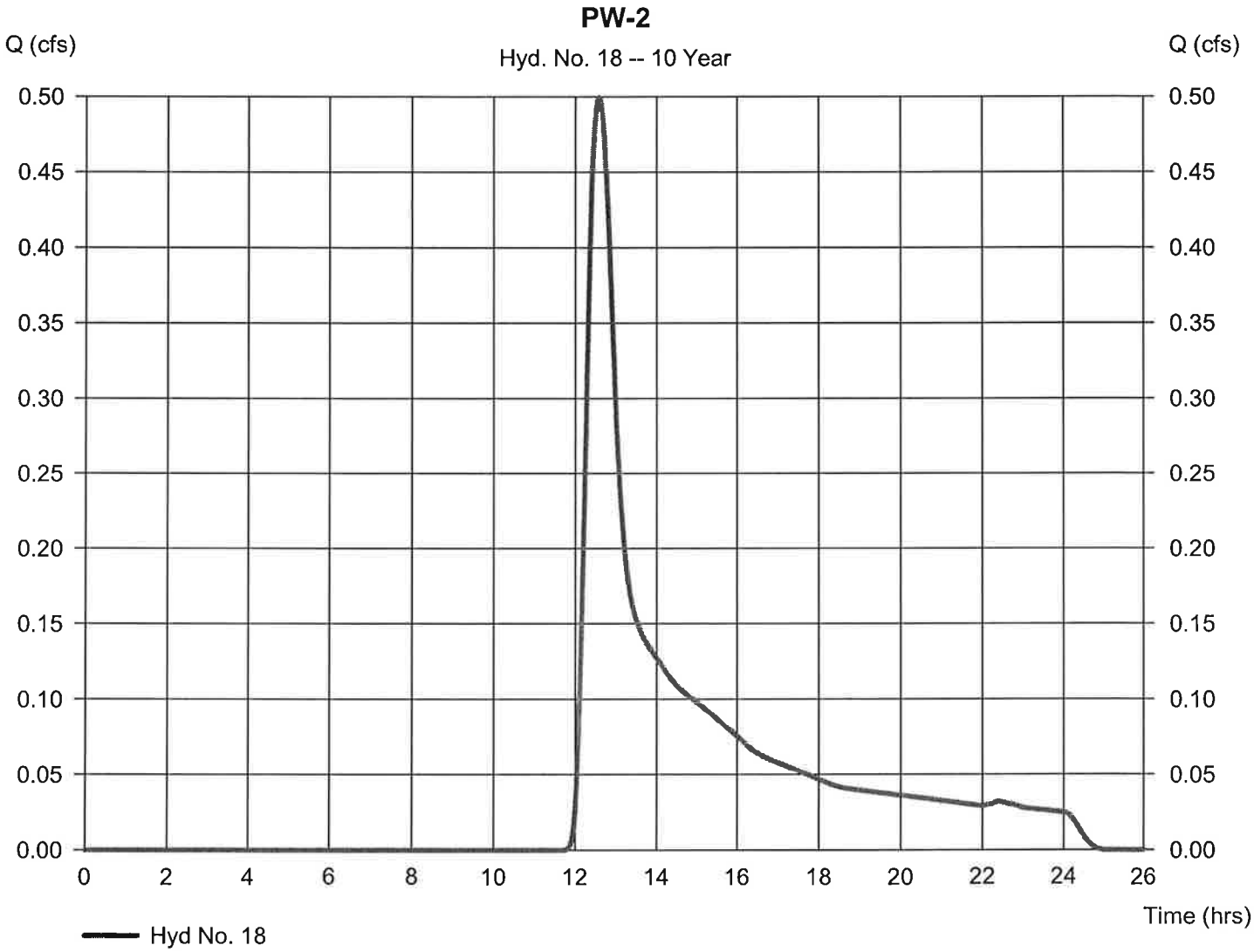
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 18

PW-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.499 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.58 hrs
Time interval	= 1 min	Hyd. volume	= 3,761 cuft
Drainage area	= 1.310 ac	Curve number	= 56*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 37.52 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.230 x 98) + (0.300 x 39)] / 1.310



Hydrograph Report

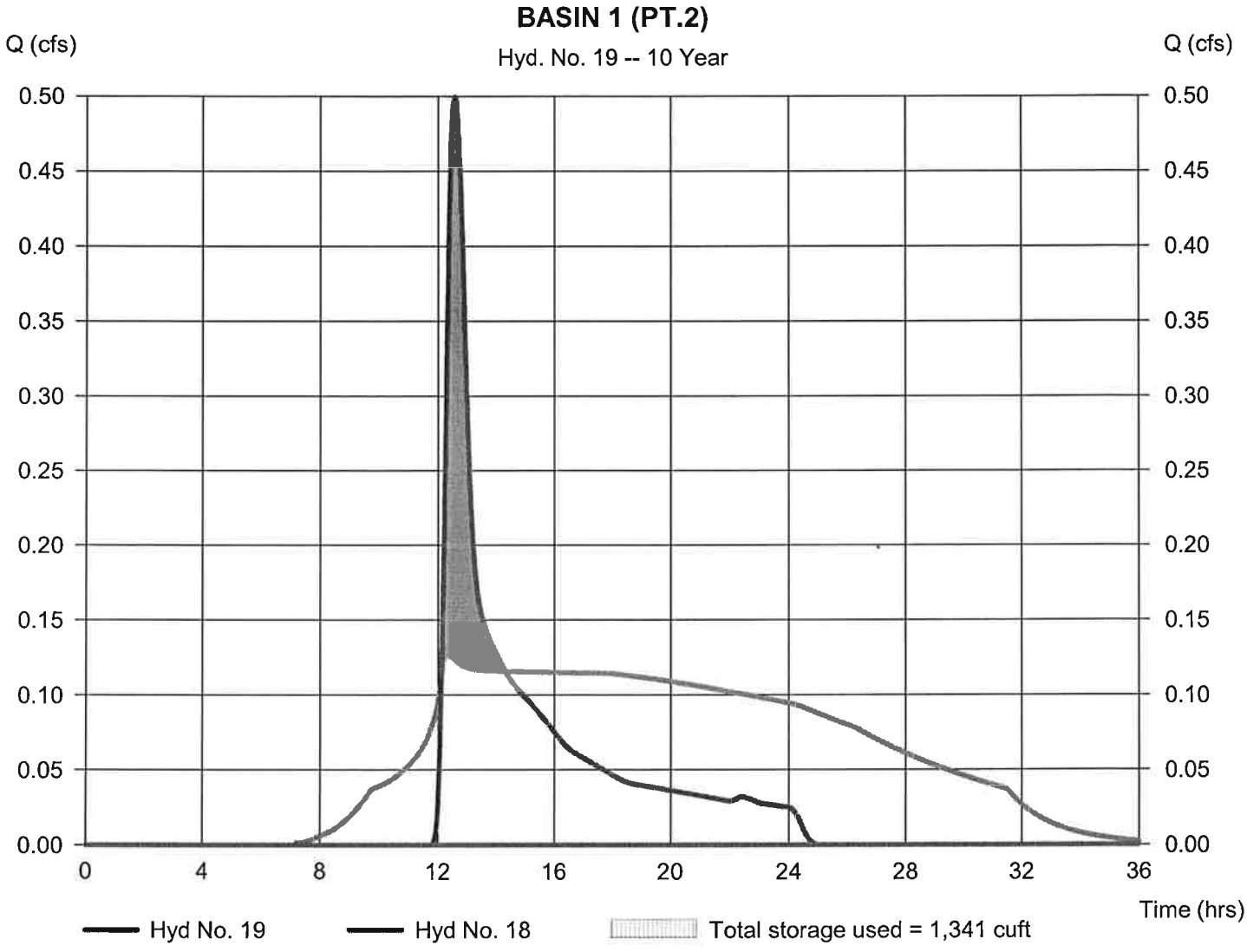
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 19

BASIN 1 (PT.2)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.90 hrs
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 18 - PW-2	Max. Elevation	= 118.36 ft
Reservoir name	= UPGRADED BASIN	Max. Storage	= 1,341 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

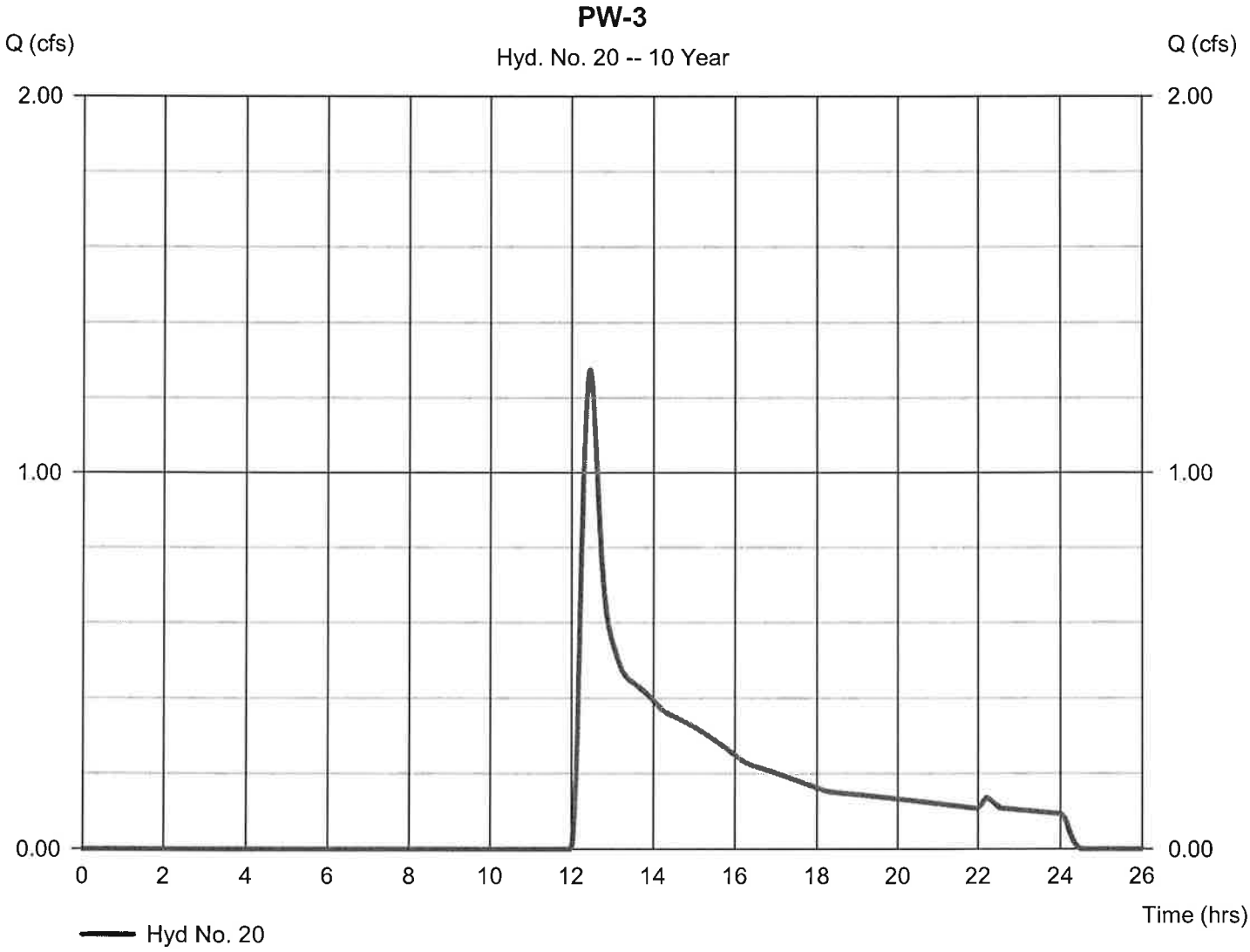
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 20

PW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.274 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.47 hrs
Time interval	= 1 min	Hyd. volume	= 10,882 cuft
Drainage area	= 7.250 ac	Curve number	= 48*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.81 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.240 x 39)] / 7.250



Hydrograph Report

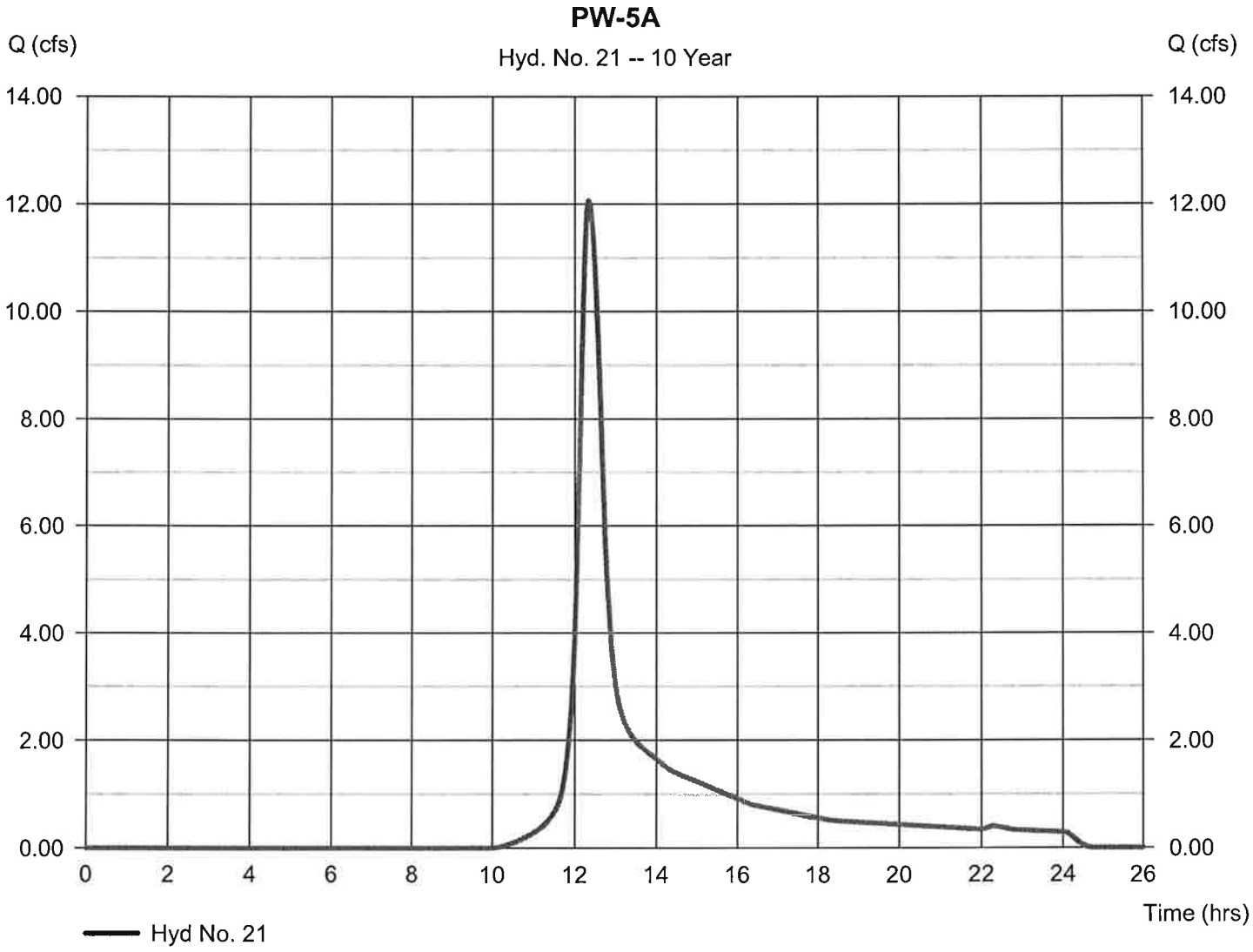
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 21

PW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 12.06 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.35 hrs
Time interval	= 1 min	Hyd. volume	= 62,928 cuft
Drainage area	= 10.000 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.26 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.880 x 98) + (3.950 x 39)] / 10.000



Hydrograph Report

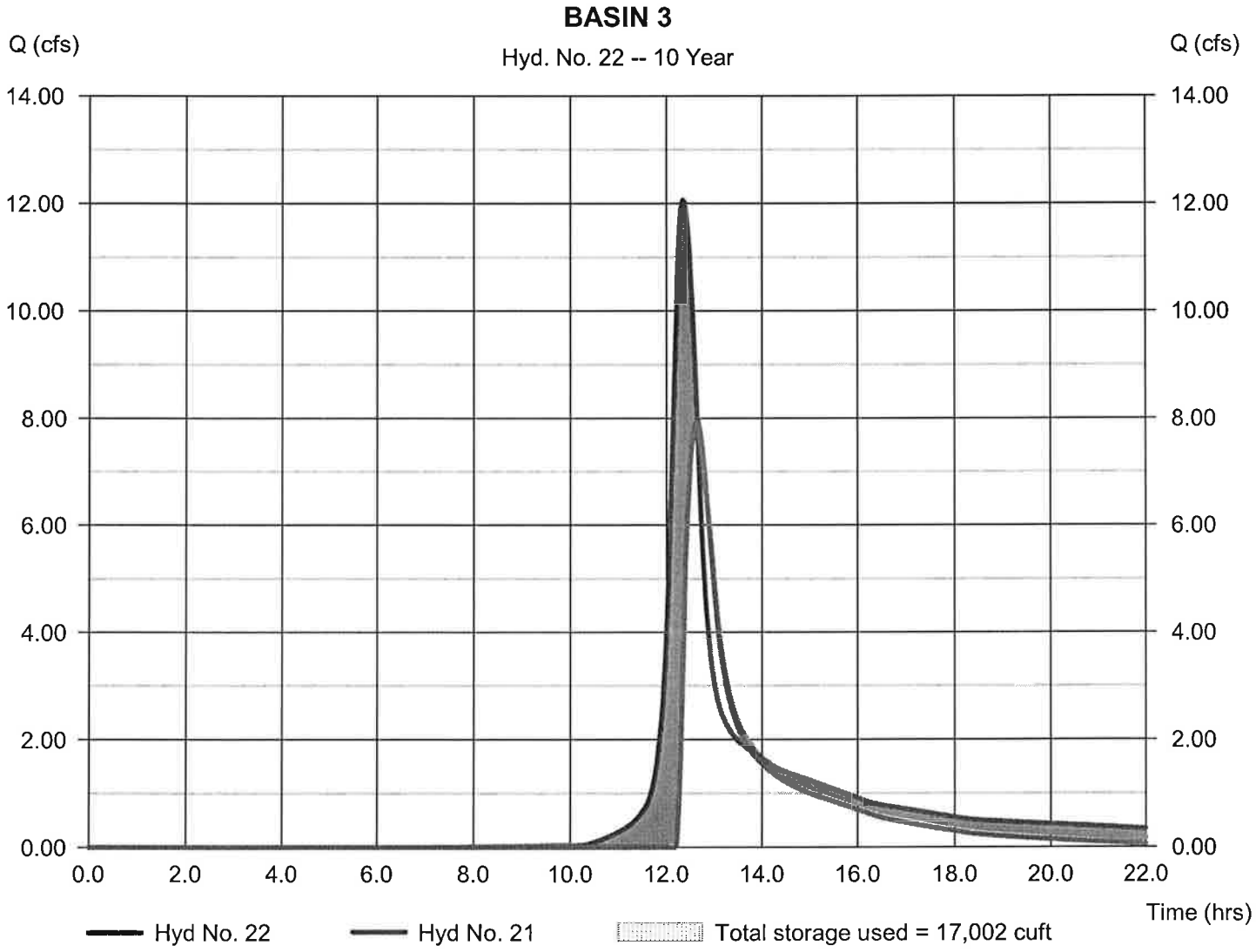
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 22

BASIN 3

Hydrograph type	= Reservoir	Peak discharge	= 7.915 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.62 hrs
Time interval	= 1 min	Hyd. volume	= 38,755 cuft
Inflow hyd. No.	= 21 - PW-5A	Max. Elevation	= 129.25 ft
Reservoir name	= BASIN 3	Max. Storage	= 17,002 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



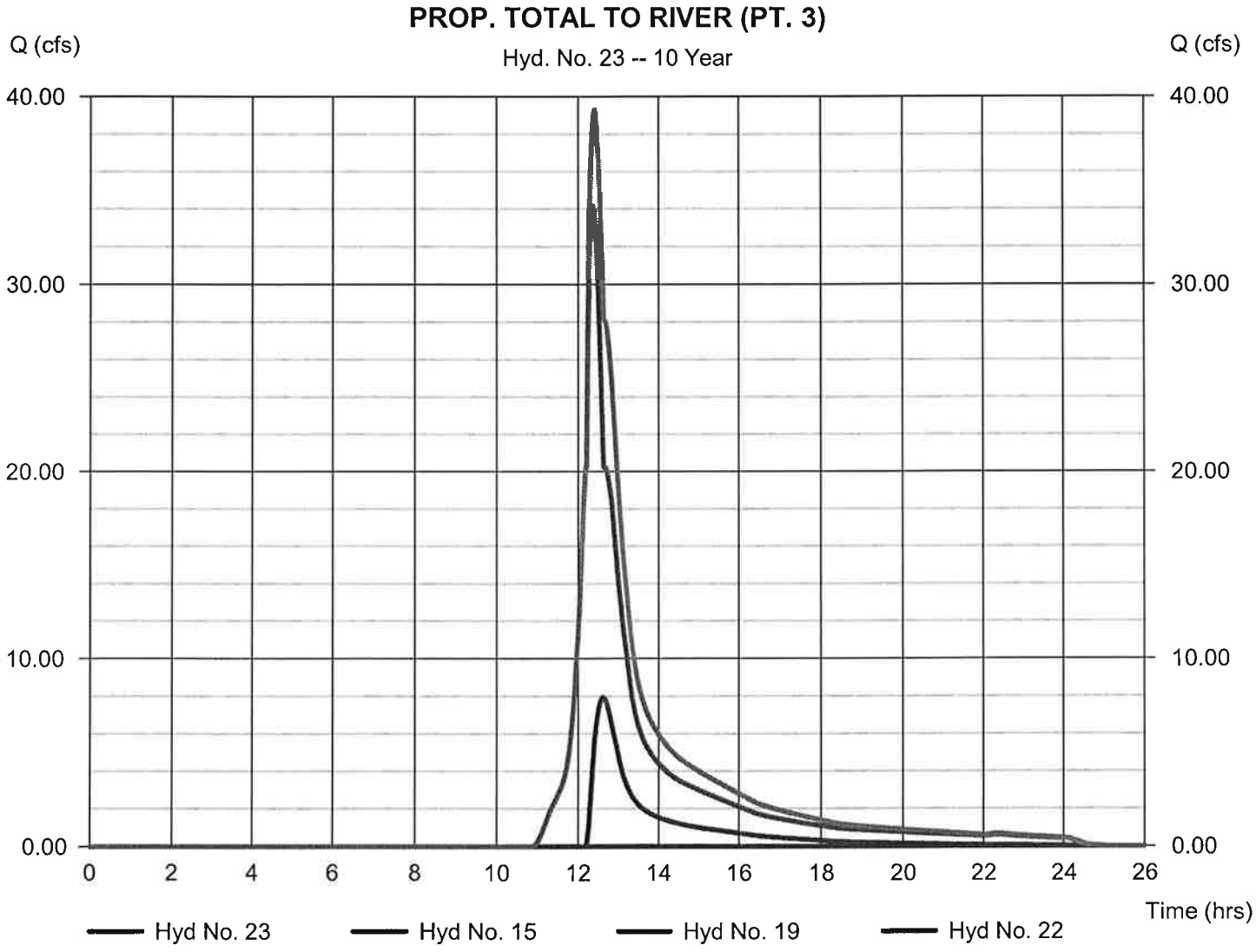
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 23

PROP. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 39.25 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.40 hrs
Time interval	= 1 min	Hyd. volume	= 206,636 cuft
Inflow hyds.	= 15, 19, 22	Contrib. drain. area	= 0.000 ac



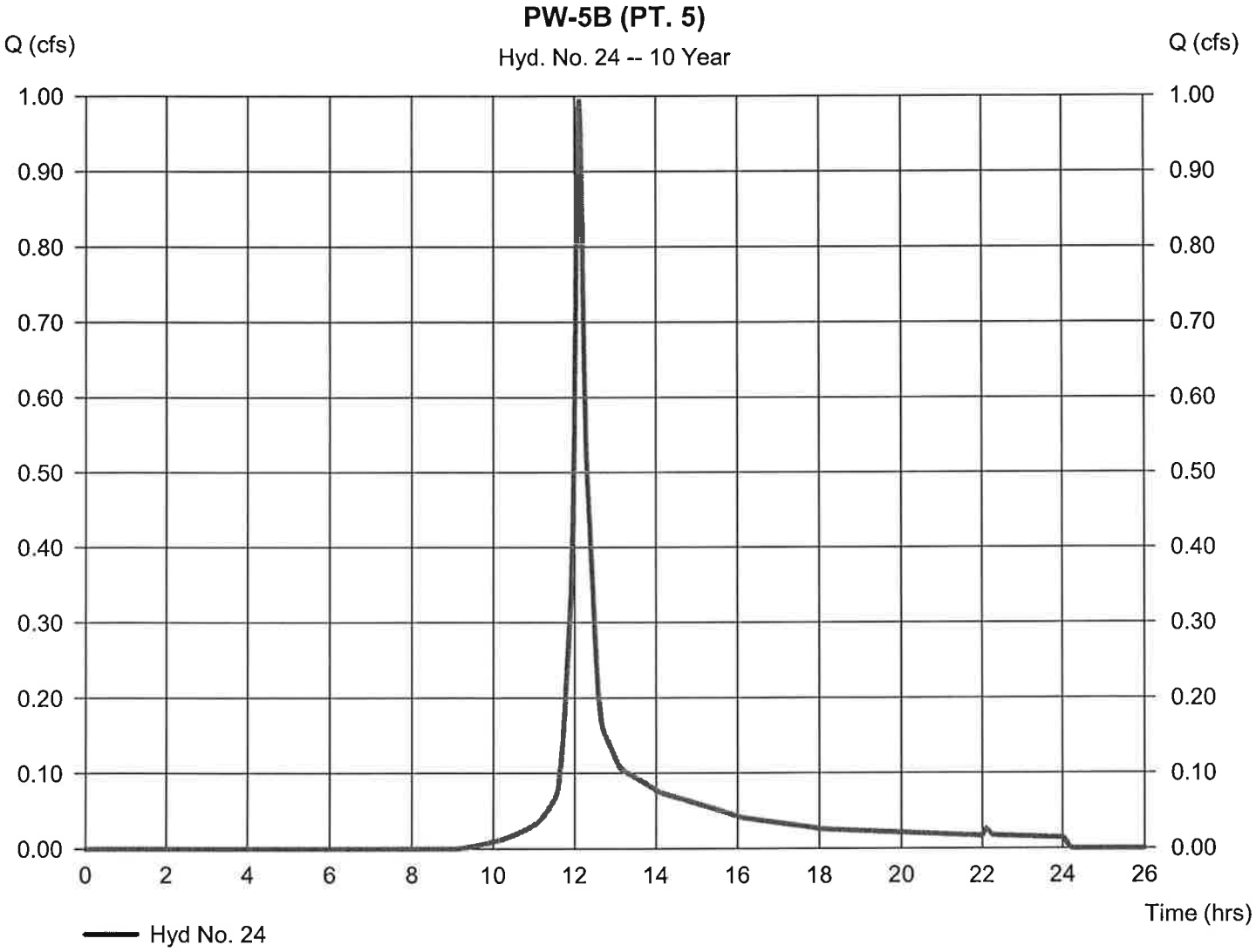
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 24

PW-5B (PT. 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.993 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 3,424 cuft
Drainage area	= 0.460 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.01 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

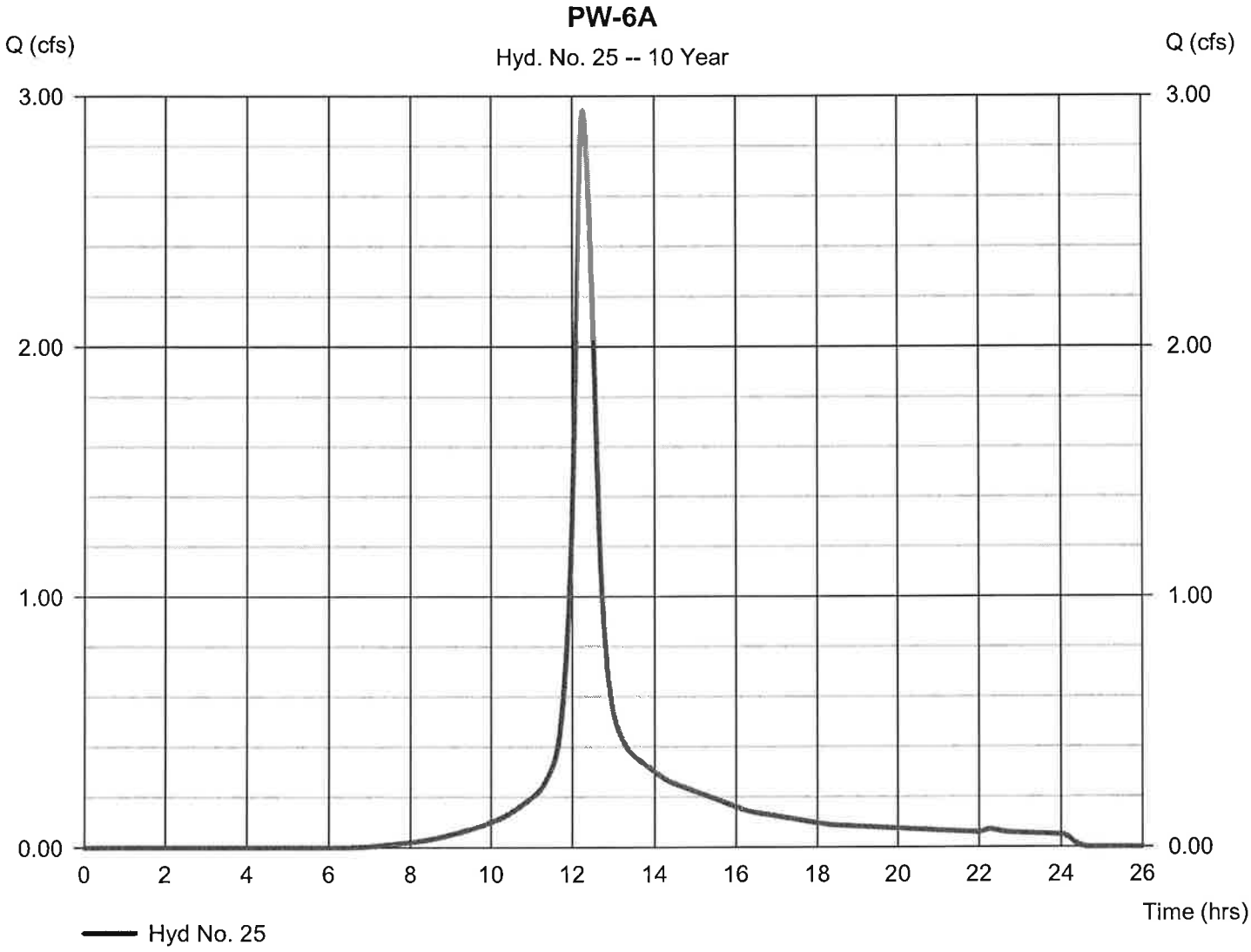
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 25

PW-6A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.941 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.28 hrs
Time interval	= 1 min	Hyd. volume	= 14,256 cuft
Drainage area	= 1.350 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.74 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.380 x 39) + (0.650 x 98)] / 1.350



Hydrograph Report

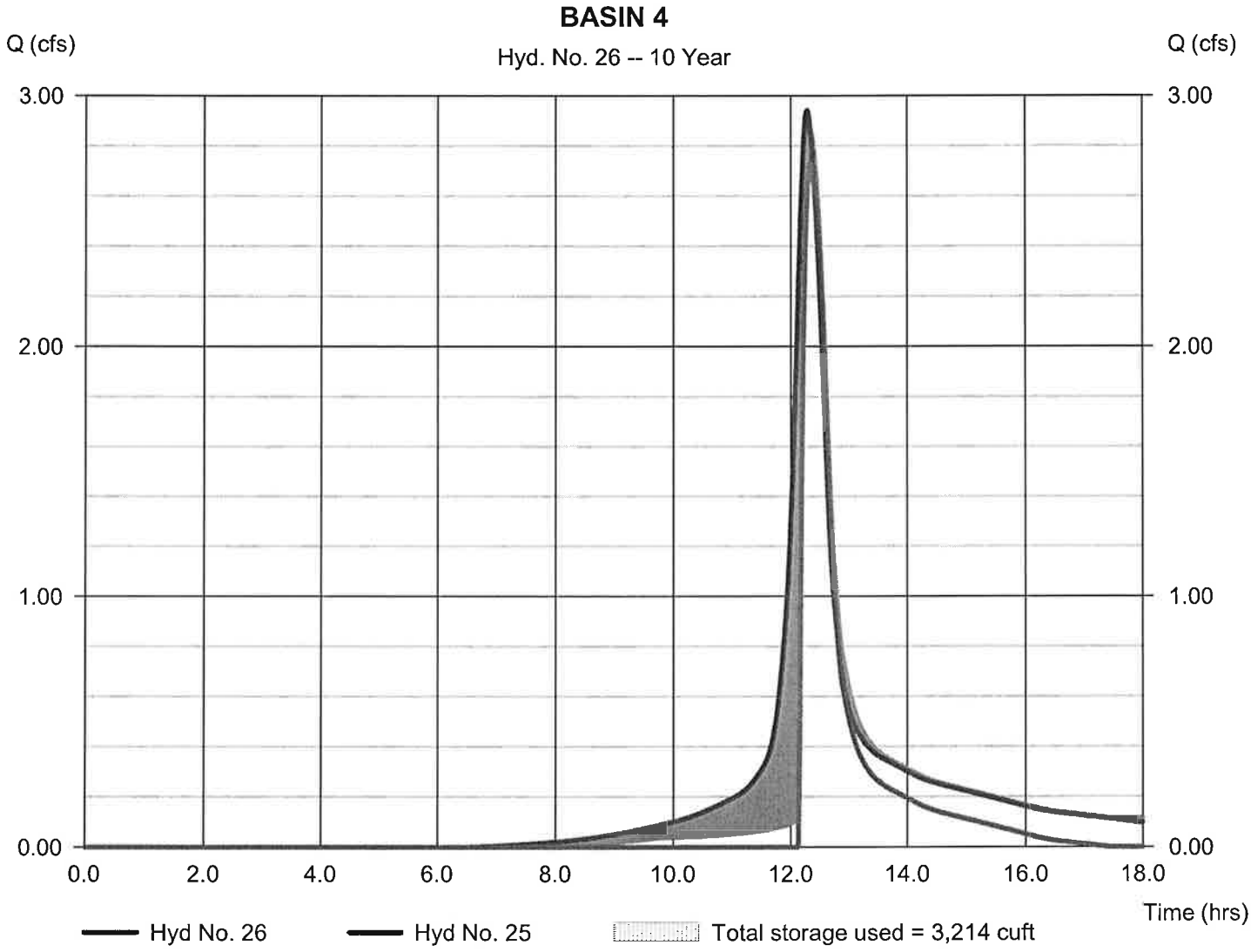
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 26

BASIN 4

Hydrograph type	= Reservoir	Peak discharge	= 2.731 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.33 hrs
Time interval	= 1 min	Hyd. volume	= 6,961 cuft
Inflow hyd. No.	= 25 - PW-6A	Max. Elevation	= 130.06 ft
Reservoir name	= BASIN 4	Max. Storage	= 3,214 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

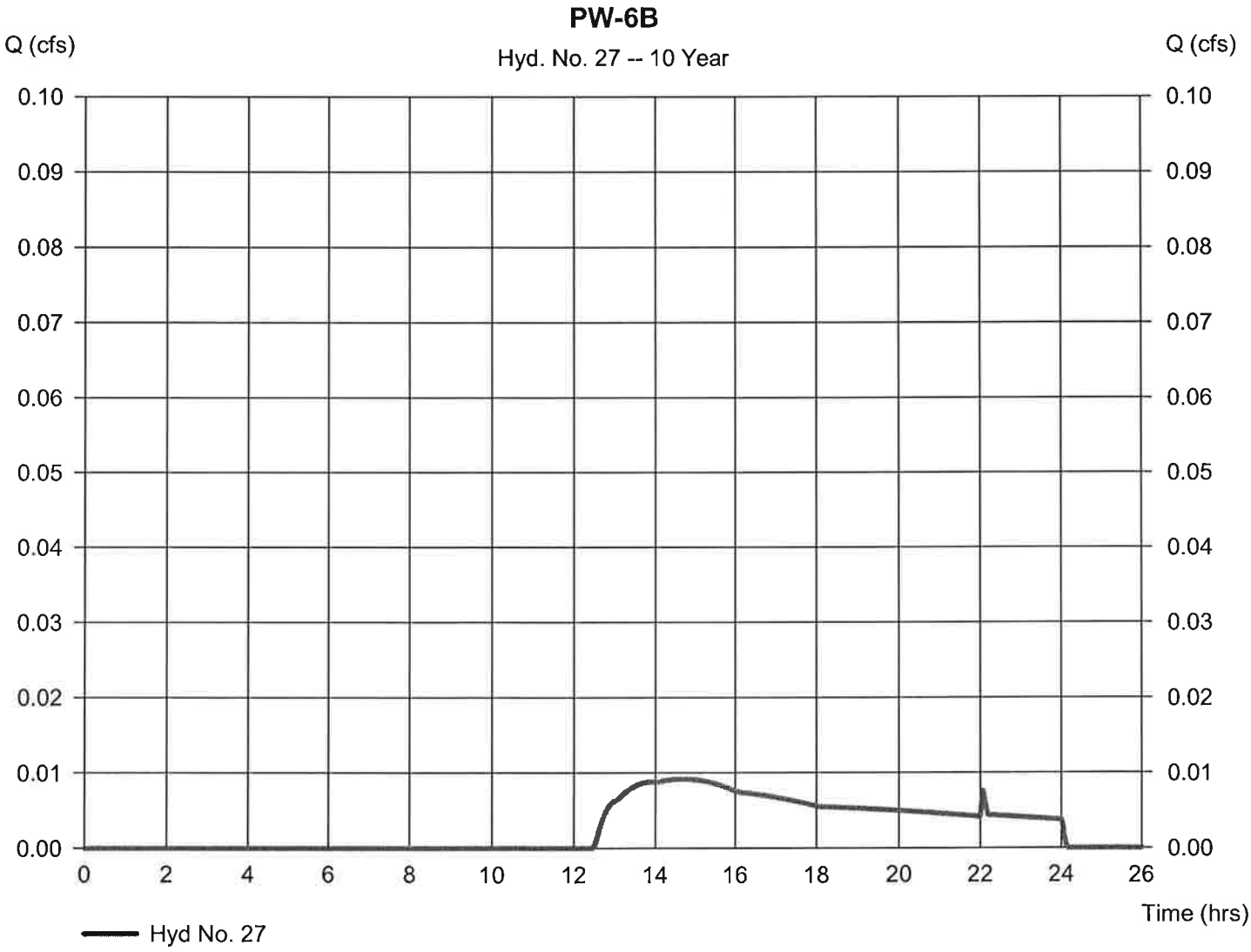
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 27

PW-6B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.009 cfs
Storm frequency	= 10 yrs	Time to peak	= 14.68 hrs
Time interval	= 1 min	Hyd. volume	= 248 cuft
Drainage area	= 0.600 ac	Curve number	= 39*
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

* Composite (Area/CN) = [(1.610 x 39)] / 0.600



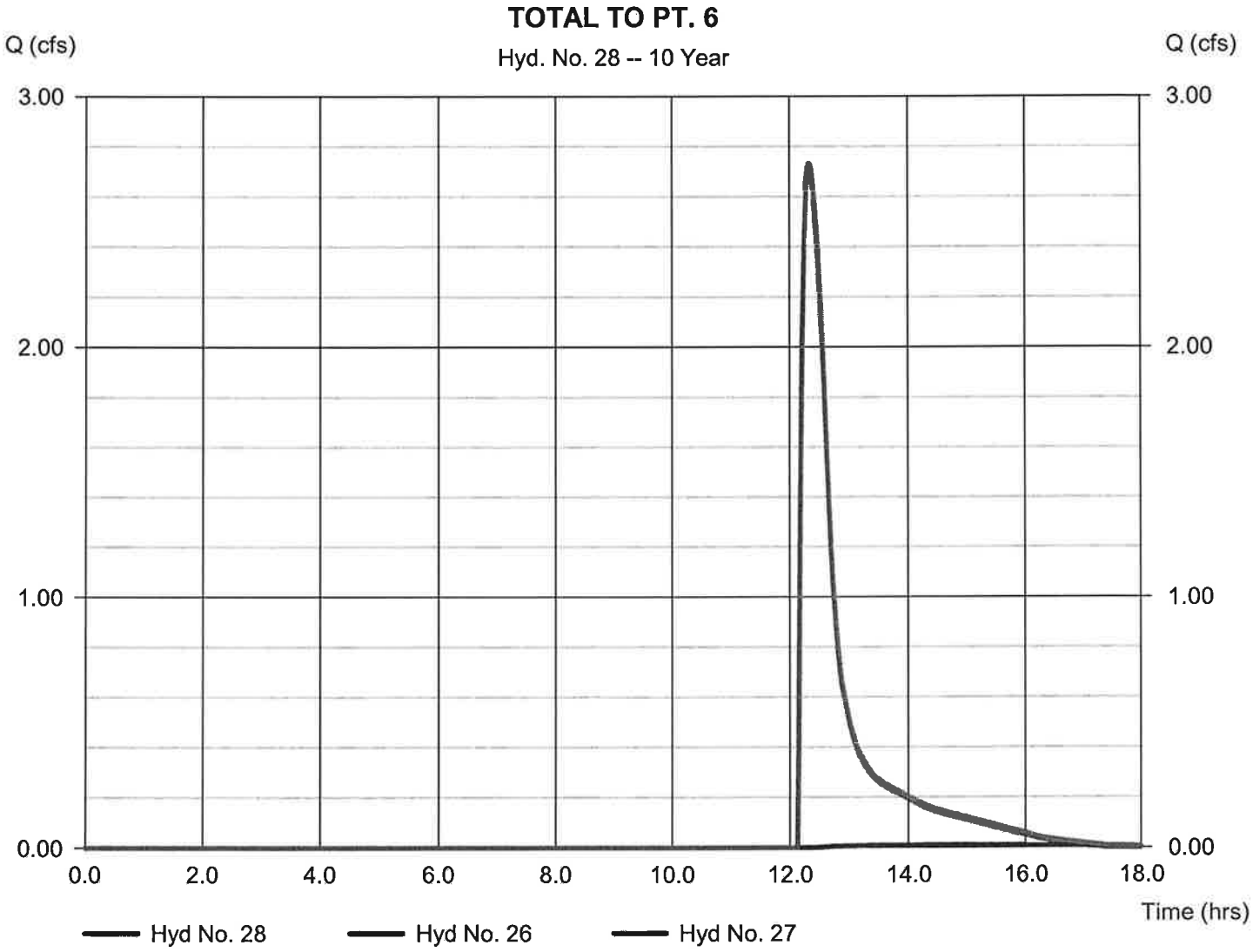
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 28

TOTAL TO PT. 6

Hydrograph type	= Combine	Peak discharge	= 2.731 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.33 hrs
Time interval	= 1 min	Hyd. volume	= 7,210 cuft
Inflow hyds.	= 26, 27	Contrib. drain. area	= 0.600 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	91.48	1	728	345,180	------	------	------	EW-1 (PT. 1)
2	SCS Runoff	23.83	1	725	79,704	------	------	------	EW-2 (PT. 2)
3	SCS Runoff	13.92	1	746	83,057	------	------	------	EW-3
4	Combine	120.33	1	727	507,942	1, 2, 3	------	------	EXIST. TOTAL TO RIVER (PT. 3)
5	SCS Runoff	6.070	1	729	22,821	------	------	------	EW-4
6	Reservoir	0.000	1	768	0	5	120.10	12,018	EXIST. BASIN (PT. 4)
7	SCS Runoff	4.778	1	733	23,917	------	------	------	EW-5A
8	SCS Runoff	3.796	1	735	18,482	------	------	------	E-5B
9	Combine	8.554	1	734	42,399	7, 8	------	------	E-5A + E-5B (PT. 5)
10	SCS Runoff	10.68	1	721	27,323	------	------	------	EW-6 (PT. 6)
11	SCS Runoff	82.29	1	732	354,916	------	------	------	PW-1A
12	SCS Runoff	8.803	1	725	27,183	------	------	------	PW-1B
13	Reservoir	4.011	1	733	14,267	12	127.96	8,308	WATER QUALITY SWALE
14	Combine	86.29	1	732	369,183	11, 13	------	------	TOTAL TO BASIN 2
15	Reservoir	65.82	1	741	336,563	14	123.29	63,332	BASIN 2
16	Diversion1	1.025	1	741	23,696	15	------	------	BASIN 2 INFILTRATION
17	Diversion2	64.79	1	741	312,865	15	------	------	BASIN 2 OUTFLOW (PT. 1)
18	SCS Runoff	1.683	1	749	10,491	------	------	------	PW-2
19	Reservoir	0.035	1	815	215	18	119.08	4,292	BASIN 1 (PT.2)
20	SCS Runoff	7.448	1	737	39,243	------	------	------	PW-3
21	SCS Runoff	26.40	1	740	134,167	------	------	------	PW-5A
22	Reservoir	17.27	1	757	106,346	21	130.69	31,280	BASIN 3
23	Combine	80.60	1	743	443,123	15, 19, 22	------	------	PROP. TOTAL TO RIVER (PT. 3)
24	SCS Runoff	2.021	1	727	6,929	------	------	------	PW-5B (PT. 5)
25	SCS Runoff	5.210	1	736	25,740	------	------	------	PW-6A
26	Reservoir	5.006	1	739	16,969	25	130.19	3,527	BASIN 4
27	SCS Runoff	0.275	1	728	1,726	------	------	------	PW-6B
28	Combine	5.237	1	739	18,695	26, 27	------	------	TOTAL TO PT. 6

Hydrograph Report

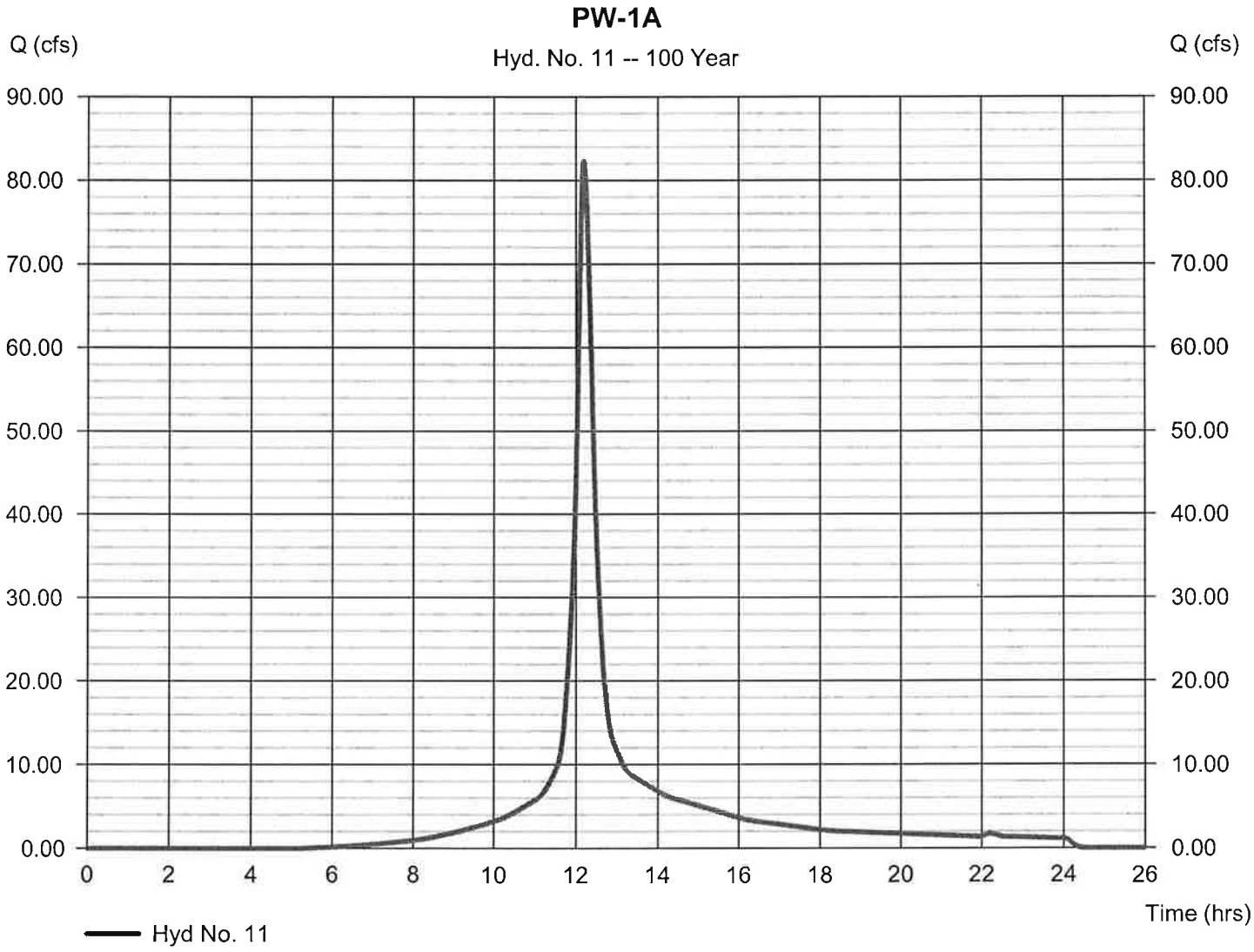
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 11

PW-1A

Hydrograph type	= SCS Runoff	Peak discharge	= 82.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 1 min	Hyd. volume	= 354,916 cuft
Drainage area	= 19.670 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.50 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(13.300 x 98) + (5.150 x 39)] / 19.670



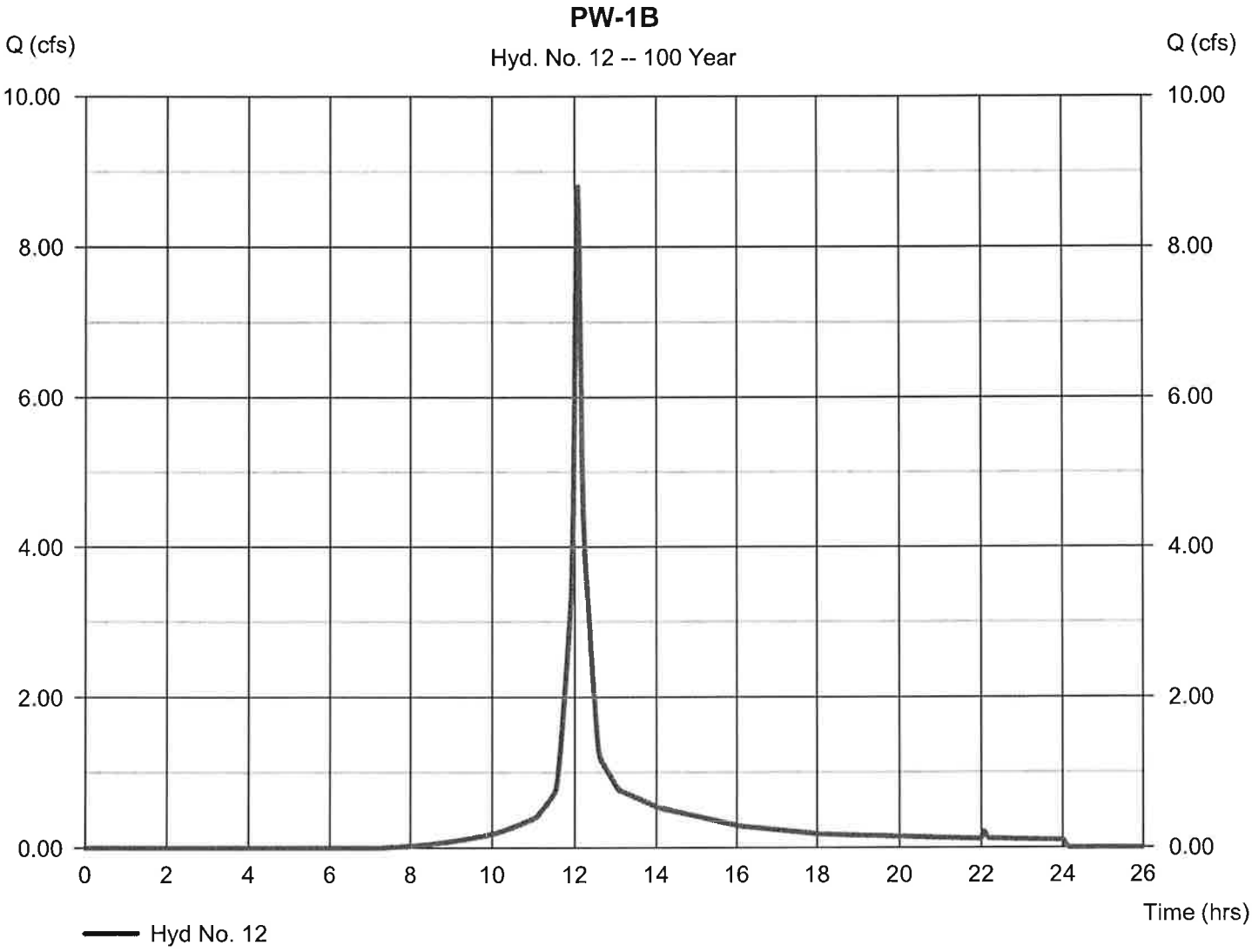
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 12

PW-1B

Hydrograph type	= SCS Runoff	Peak discharge	= 8.803 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 27,183 cuft
Drainage area	= 1.750 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

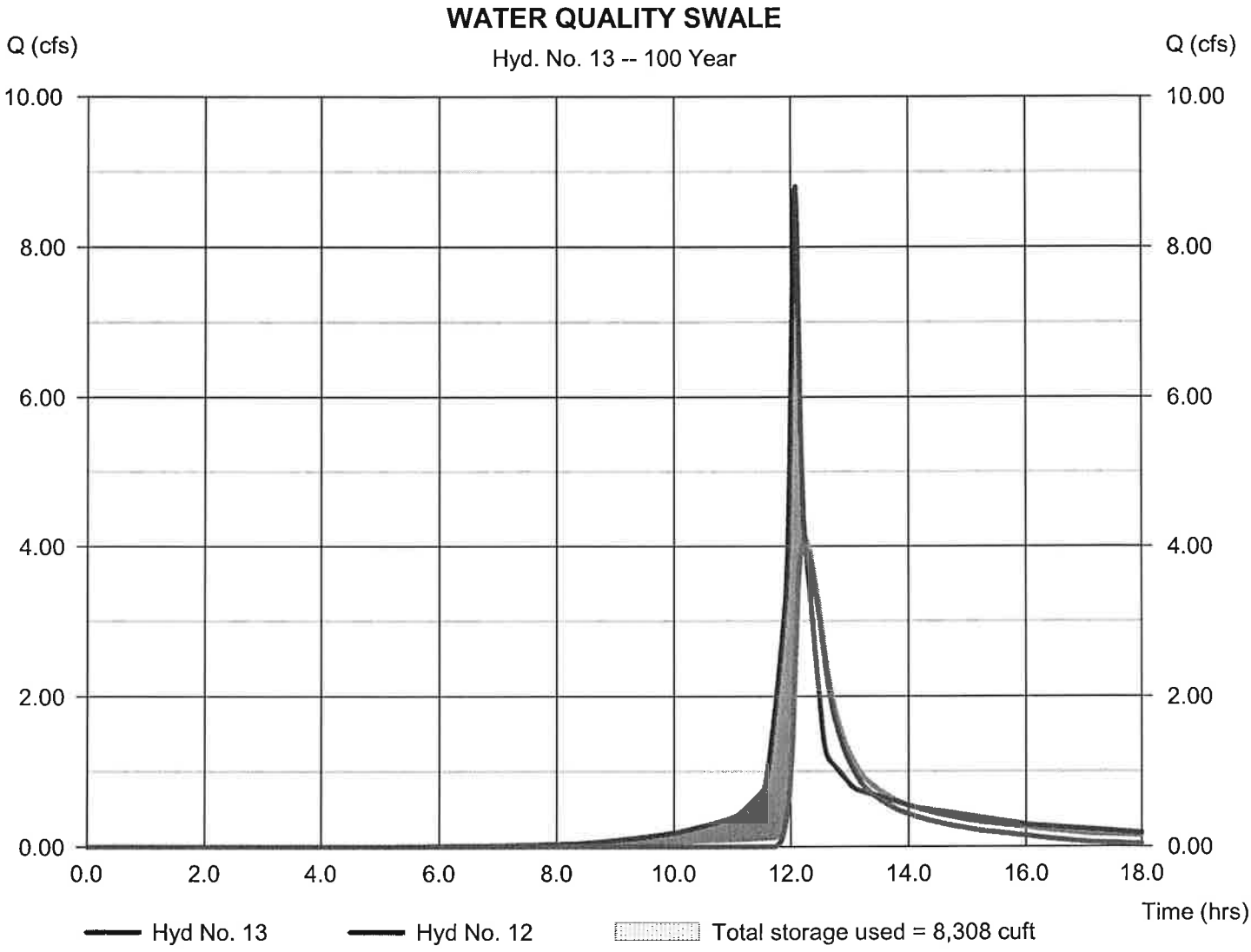
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 13

WATER QUALITY SWALE

Hydrograph type	= Reservoir	Peak discharge	= 4.011 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.22 hrs
Time interval	= 1 min	Hyd. volume	= 14,267 cuft
Inflow hyd. No.	= 12 - PW-1B	Max. Elevation	= 127.96 ft
Reservoir name	= WATER QUALITY SWALE	Max. Storage	= 8,308 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



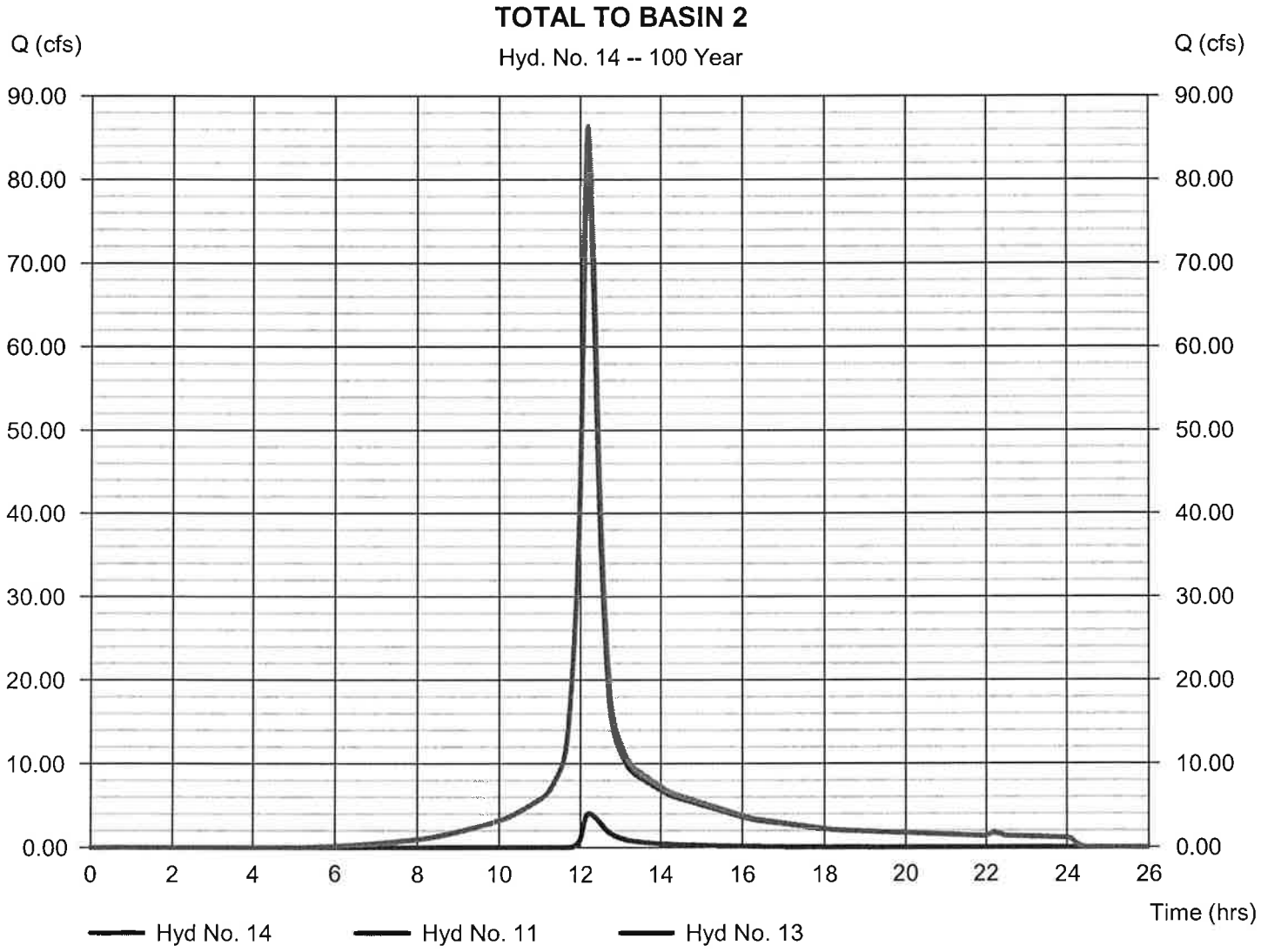
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 14

TOTAL TO BASIN 2

Hydrograph type	= Combine	Peak discharge	= 86.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 1 min	Hyd. volume	= 369,183 cuft
Inflow hyds.	= 11, 13	Contrib. drain. area	= 19.670 ac



Hydrograph Report

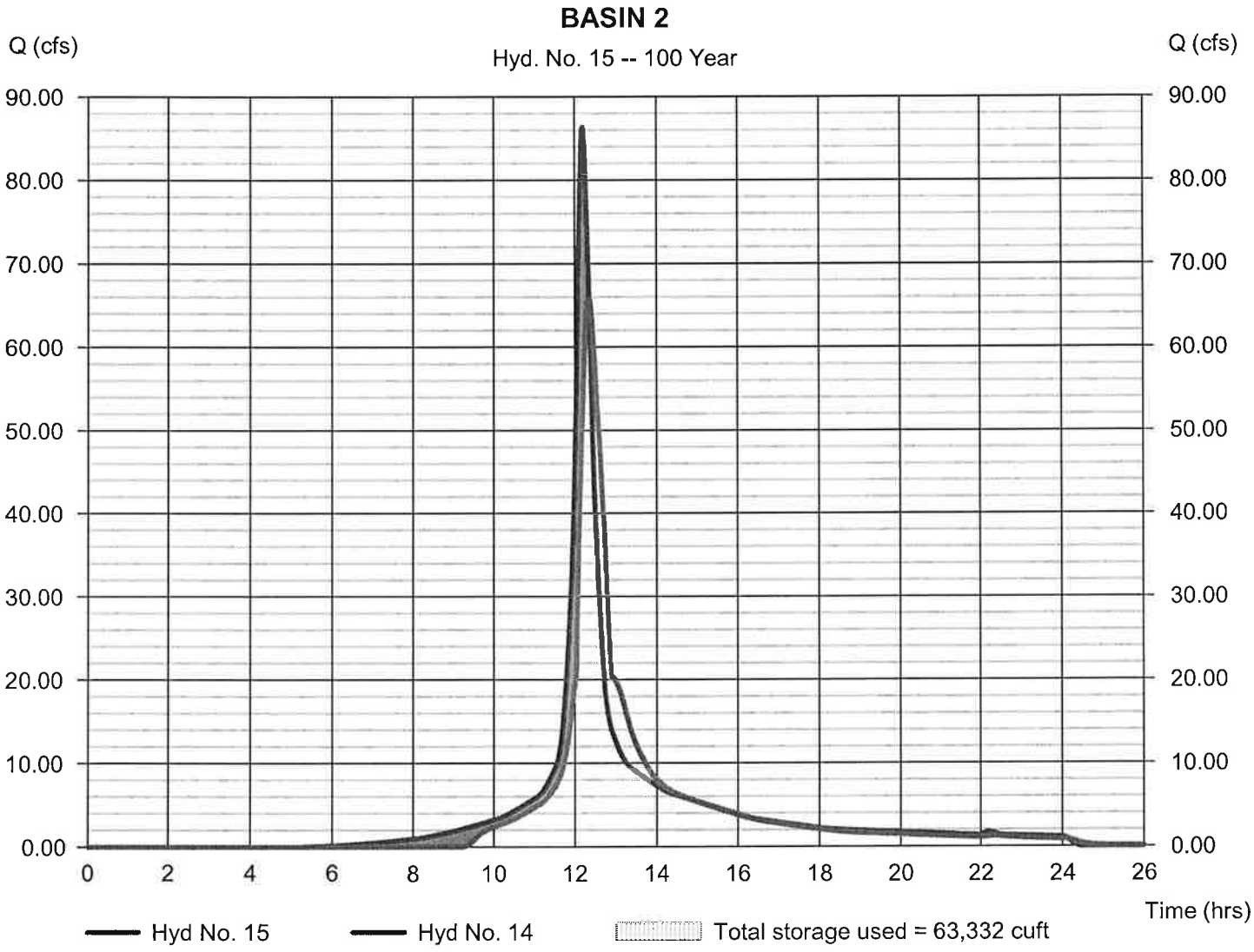
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 15

BASIN 2

Hydrograph type	= Reservoir	Peak discharge	= 65.82 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.35 hrs
Time interval	= 1 min	Hyd. volume	= 336,563 cuft
Inflow hyd. No.	= 14 - TOTAL TO BASIN 2	Max. Elevation	= 123.29 ft
Reservoir name	= BASIN 2	Max. Storage	= 63,332 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



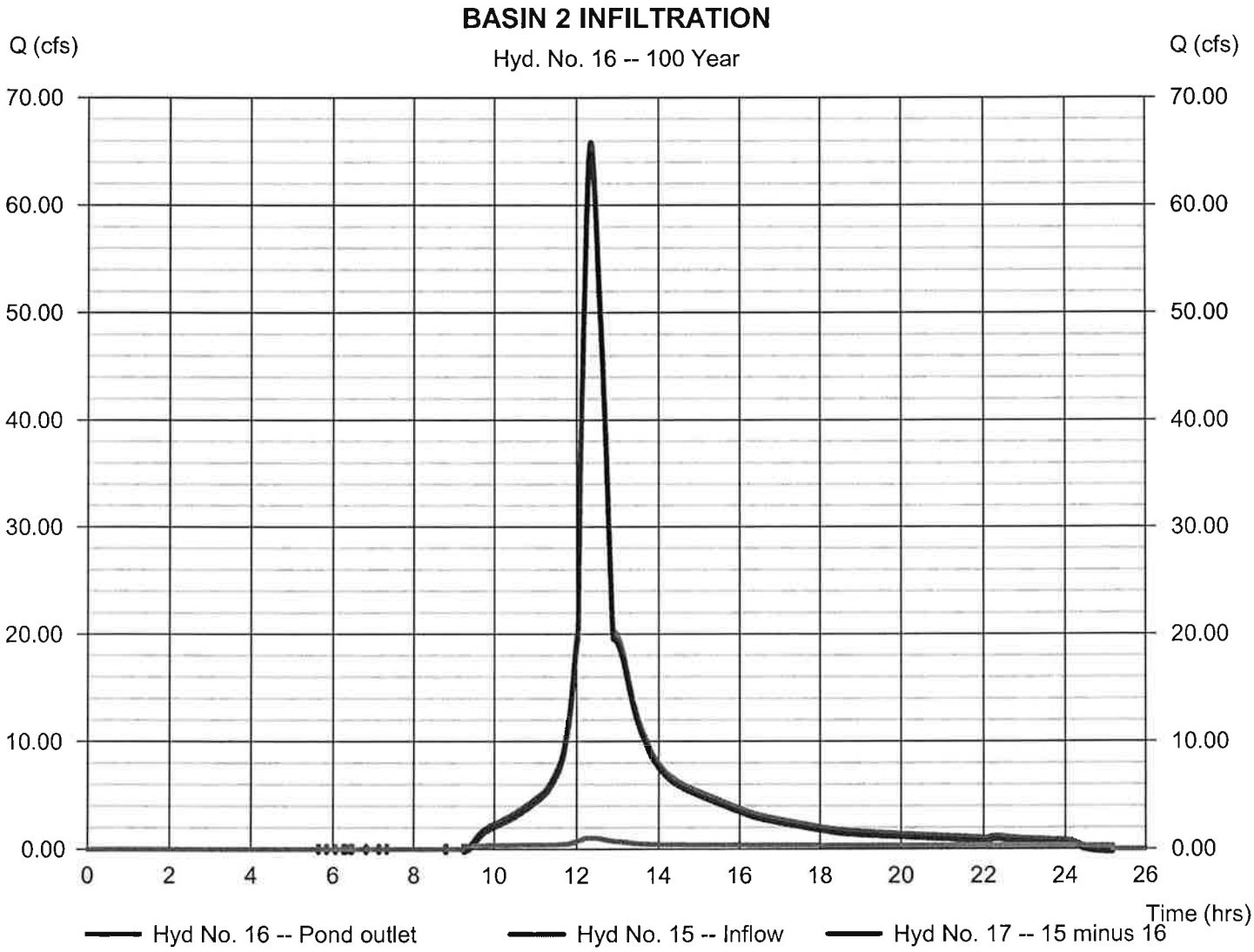
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 16

BASIN 2 INFILTRATION

Hydrograph type	= Diversion1	Peak discharge	= 1.025 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.35 hrs
Time interval	= 1 min	Hyd. volume	= 23,696 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd diverted hyd.	= 17
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



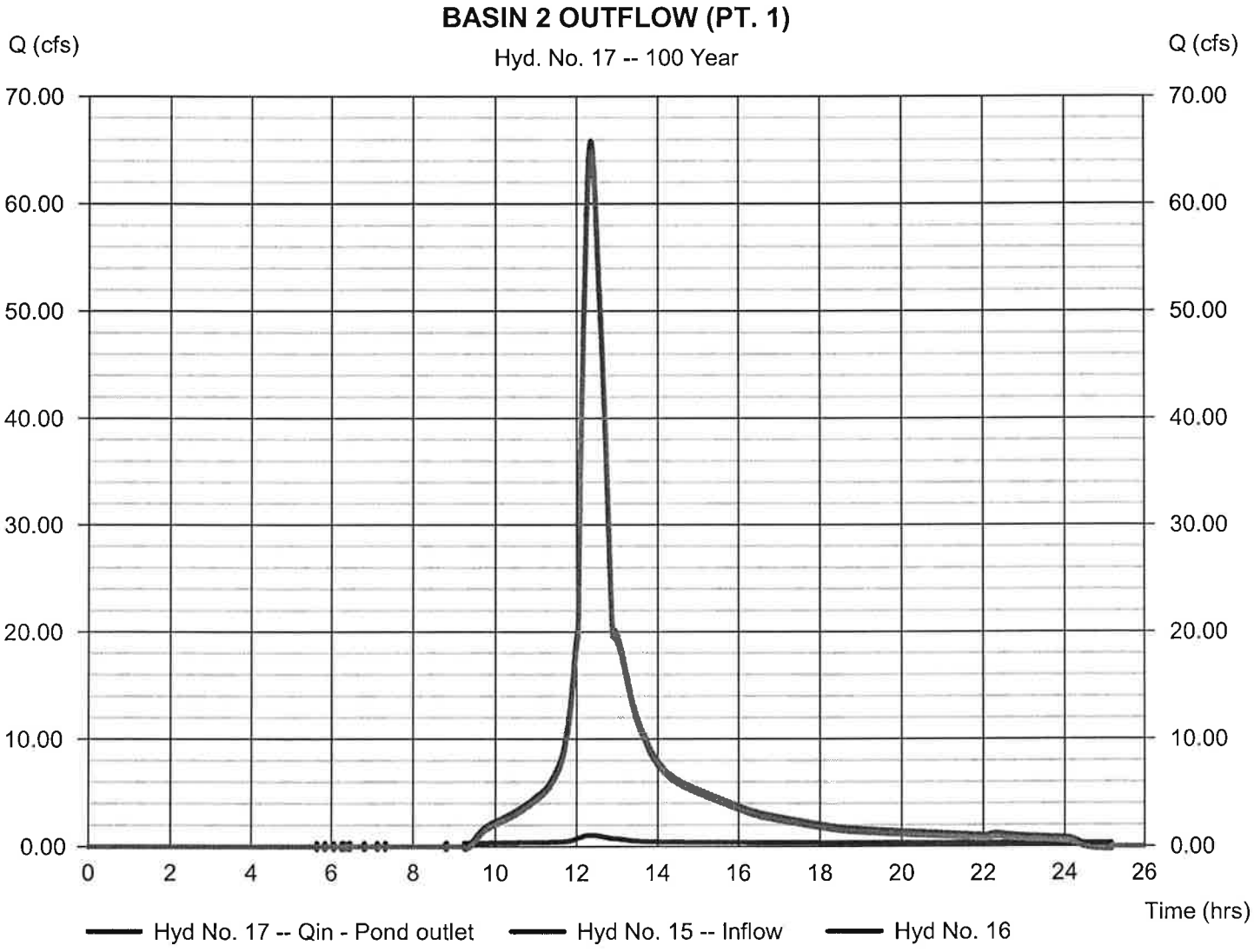
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 17

BASIN 2 OUTFLOW (PT. 1)

Hydrograph type	= Diversion2	Peak discharge	= 64.79 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.35 hrs
Time interval	= 1 min	Hyd. volume	= 312,865 cuft
Inflow hydrograph	= 15 - BASIN 2	2nd diverted hyd.	= 16
Diversion method	= Pond - BASIN 2	Pond structure	= Exfiltration



Hydrograph Report

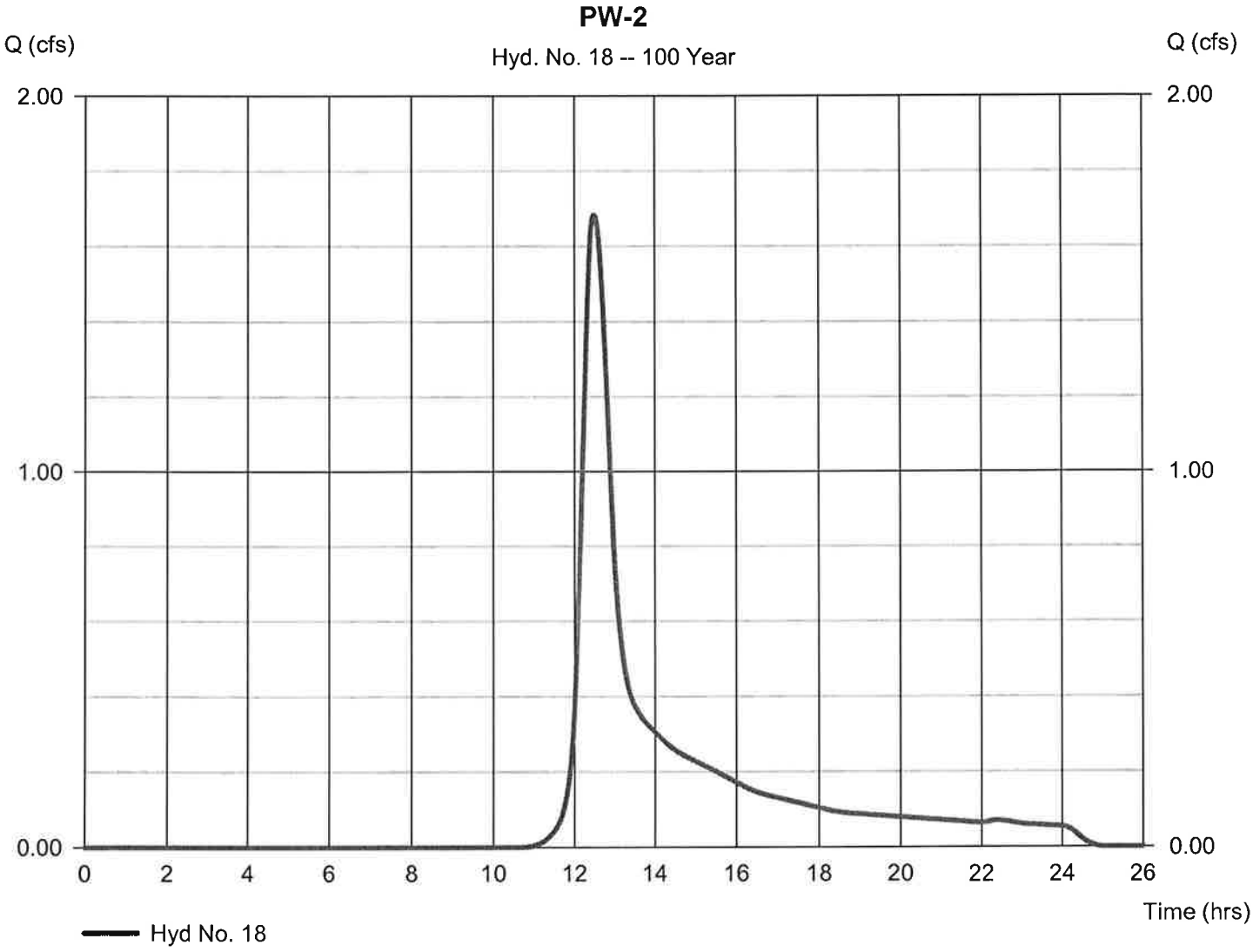
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 18

PW-2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.683 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.48 hrs
Time interval	= 1 min	Hyd. volume	= 10,491 cuft
Drainage area	= 1.310 ac	Curve number	= 56*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 37.52 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.230 x 98) + (0.300 x 39)] / 1.310



Hydrograph Report

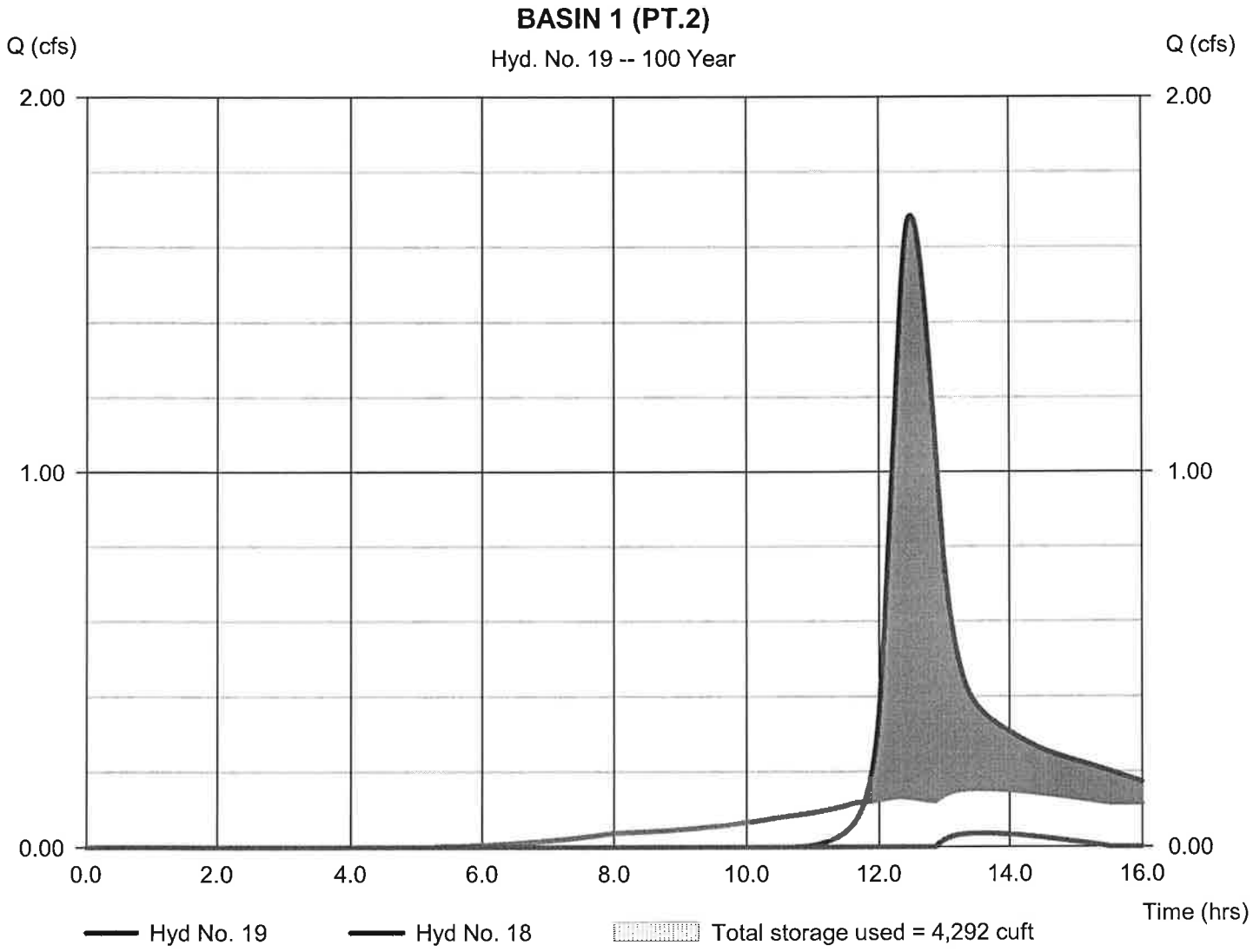
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 19

BASIN 1 (PT.2)

Hydrograph type	= Reservoir	Peak discharge	= 0.035 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.58 hrs
Time interval	= 1 min	Hyd. volume	= 215 cuft
Inflow hyd. No.	= 18 - PW-2	Max. Elevation	= 119.08 ft
Reservoir name	= UPGRADED BASIN	Max. Storage	= 4,292 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

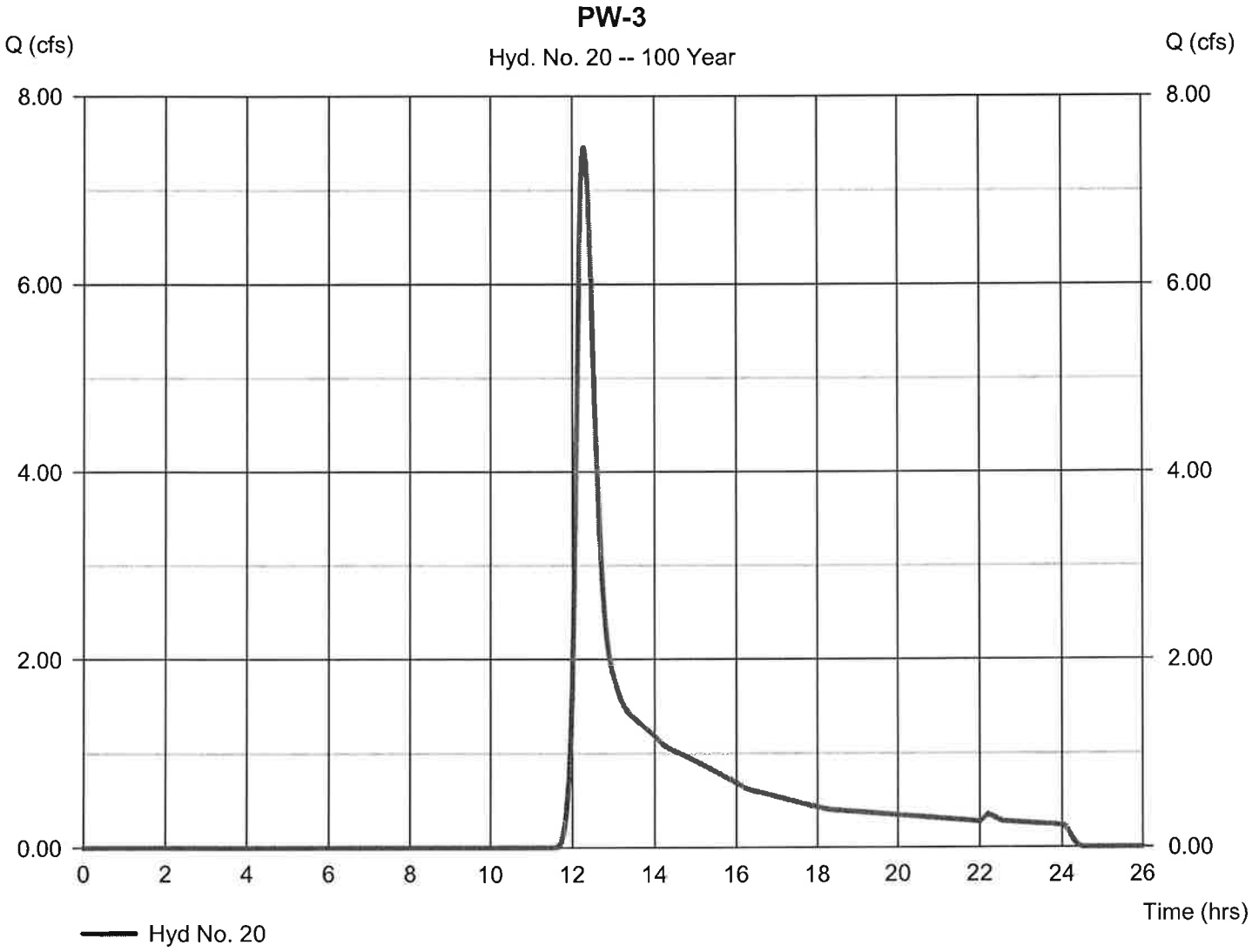
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 20

PW-3

Hydrograph type	= SCS Runoff	Peak discharge	= 7.448 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.28 hrs
Time interval	= 1 min	Hyd. volume	= 39,243 cuft
Drainage area	= 7.250 ac	Curve number	= 48*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.81 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(7.240 x 39)] / 7.250



Hydrograph Report

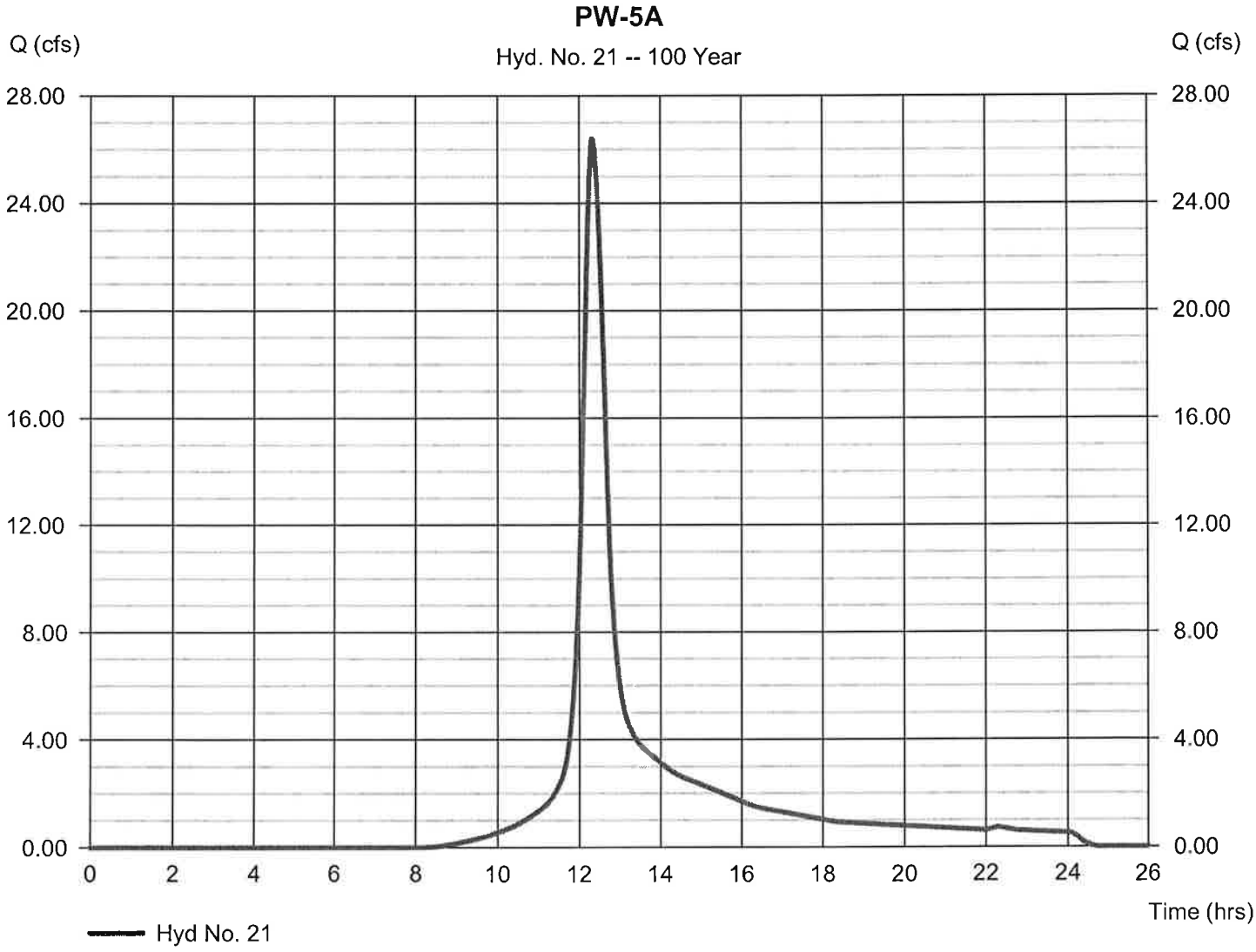
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 21

PW-5A

Hydrograph type	= SCS Runoff	Peak discharge	= 26.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.33 hrs
Time interval	= 1 min	Hyd. volume	= 134,167 cuft
Drainage area	= 10.000 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.26 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.880 x 98) + (3.950 x 39)] / 10.000



Hydrograph Report

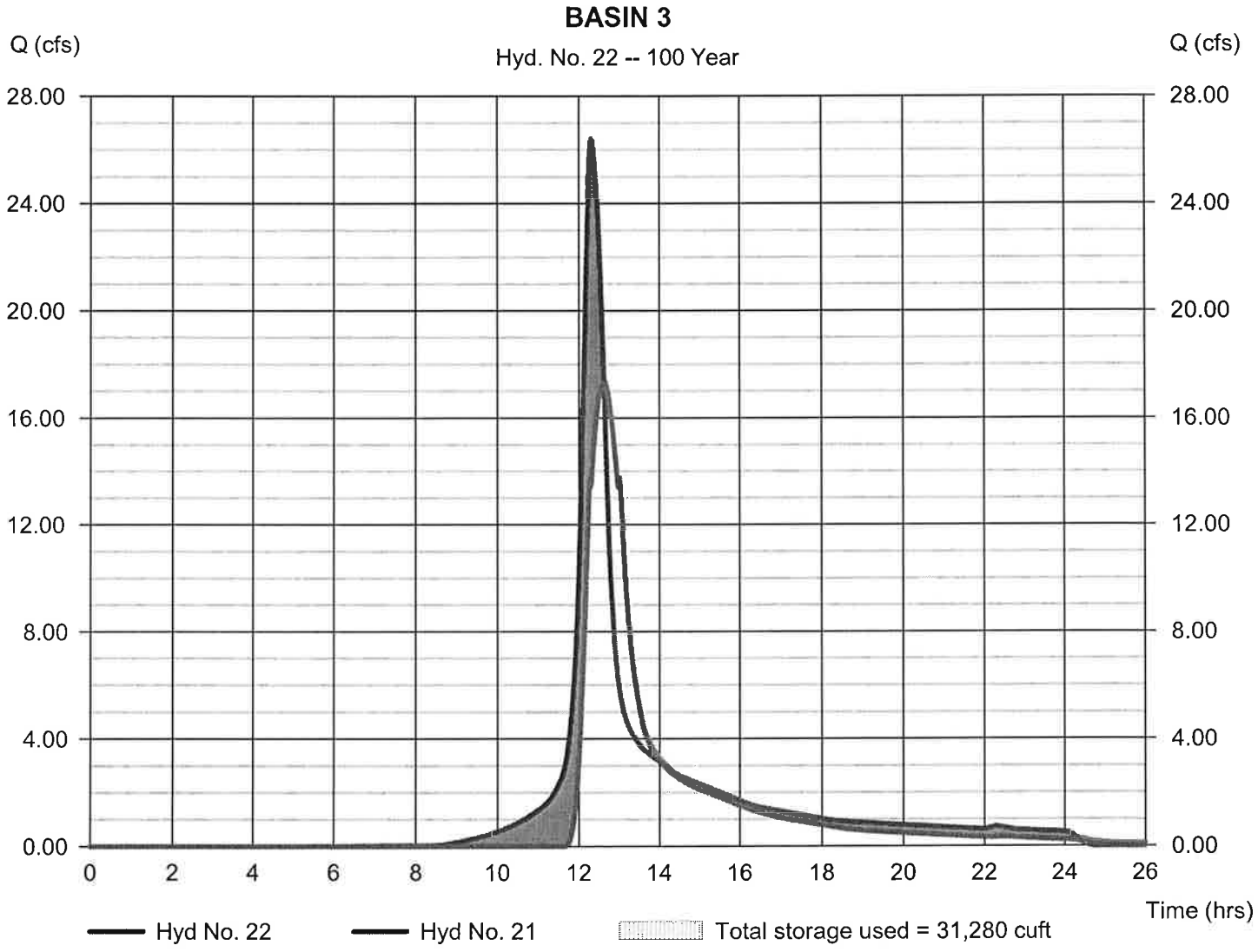
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 22

BASIN 3

Hydrograph type	= Reservoir	Peak discharge	= 17.27 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.62 hrs
Time interval	= 1 min	Hyd. volume	= 106,346 cuft
Inflow hyd. No.	= 21 - PW-5A	Max. Elevation	= 130.69 ft
Reservoir name	= BASIN 3	Max. Storage	= 31,280 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



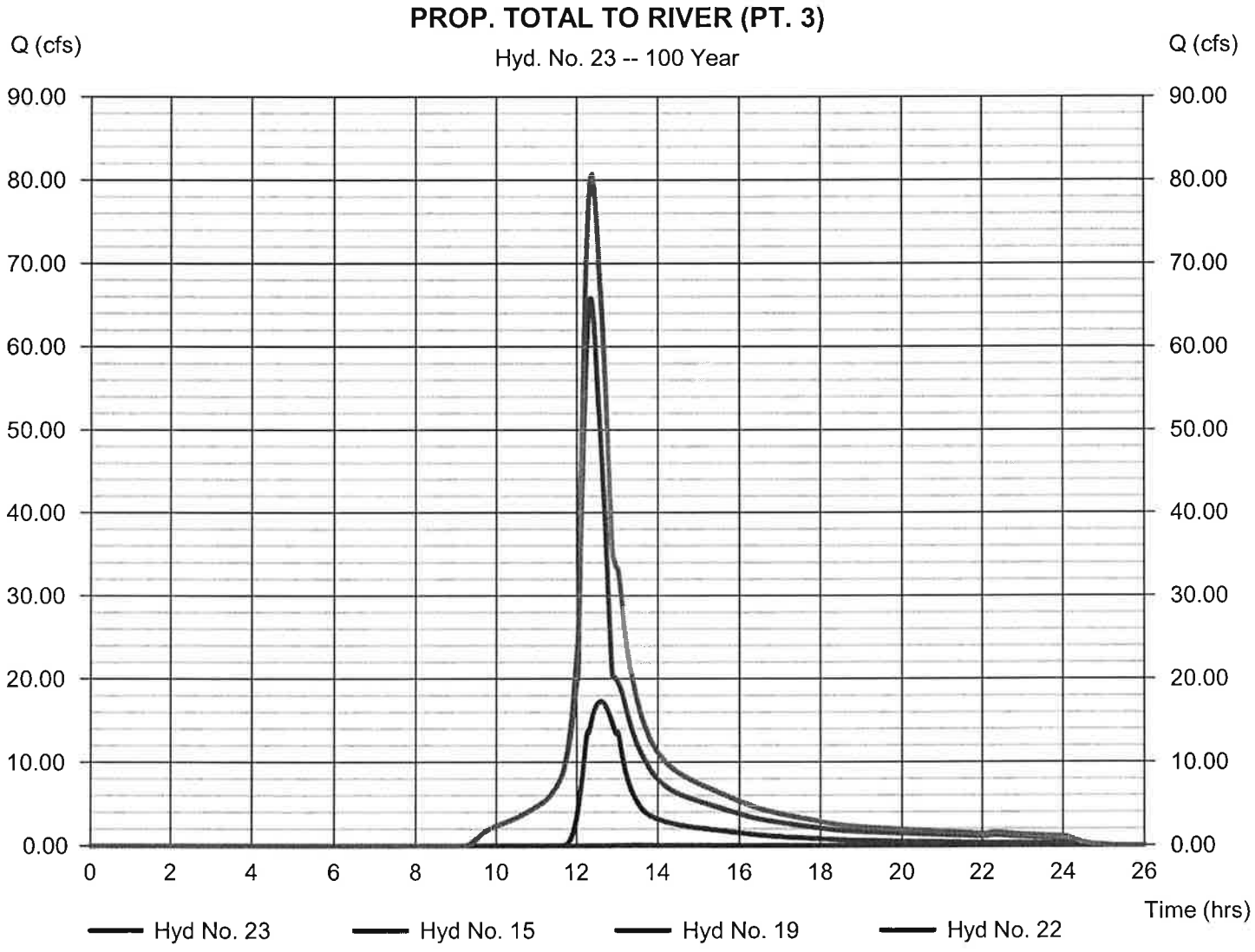
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 23

PROP. TOTAL TO RIVER (PT. 3)

Hydrograph type	= Combine	Peak discharge	= 80.60 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.38 hrs
Time interval	= 1 min	Hyd. volume	= 443,123 cuft
Inflow hyds.	= 15, 19, 22	Contrib. drain. area	= 0.000 ac



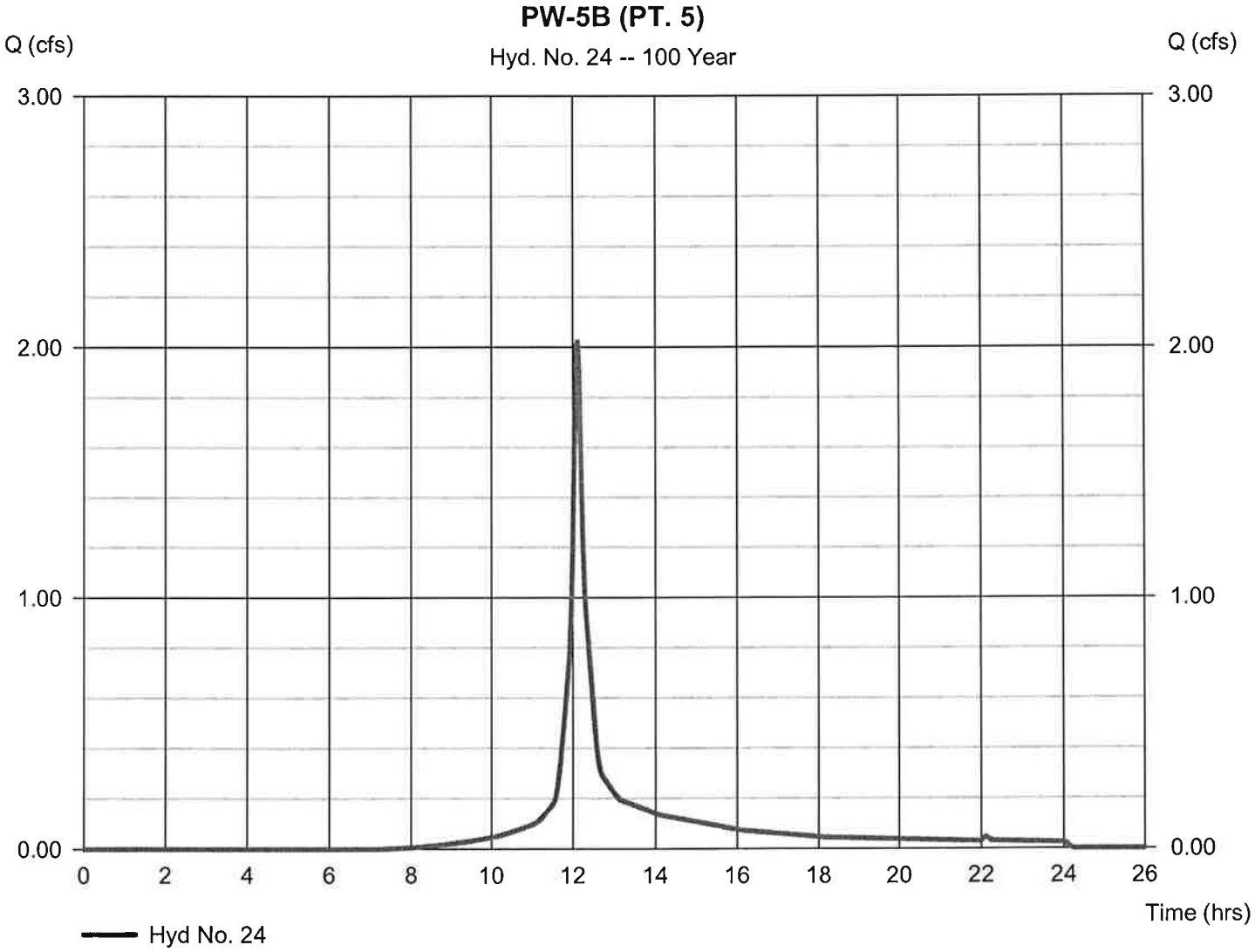
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 24

PW-5B (PT. 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.021 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 6,929 cuft
Drainage area	= 0.460 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.01 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

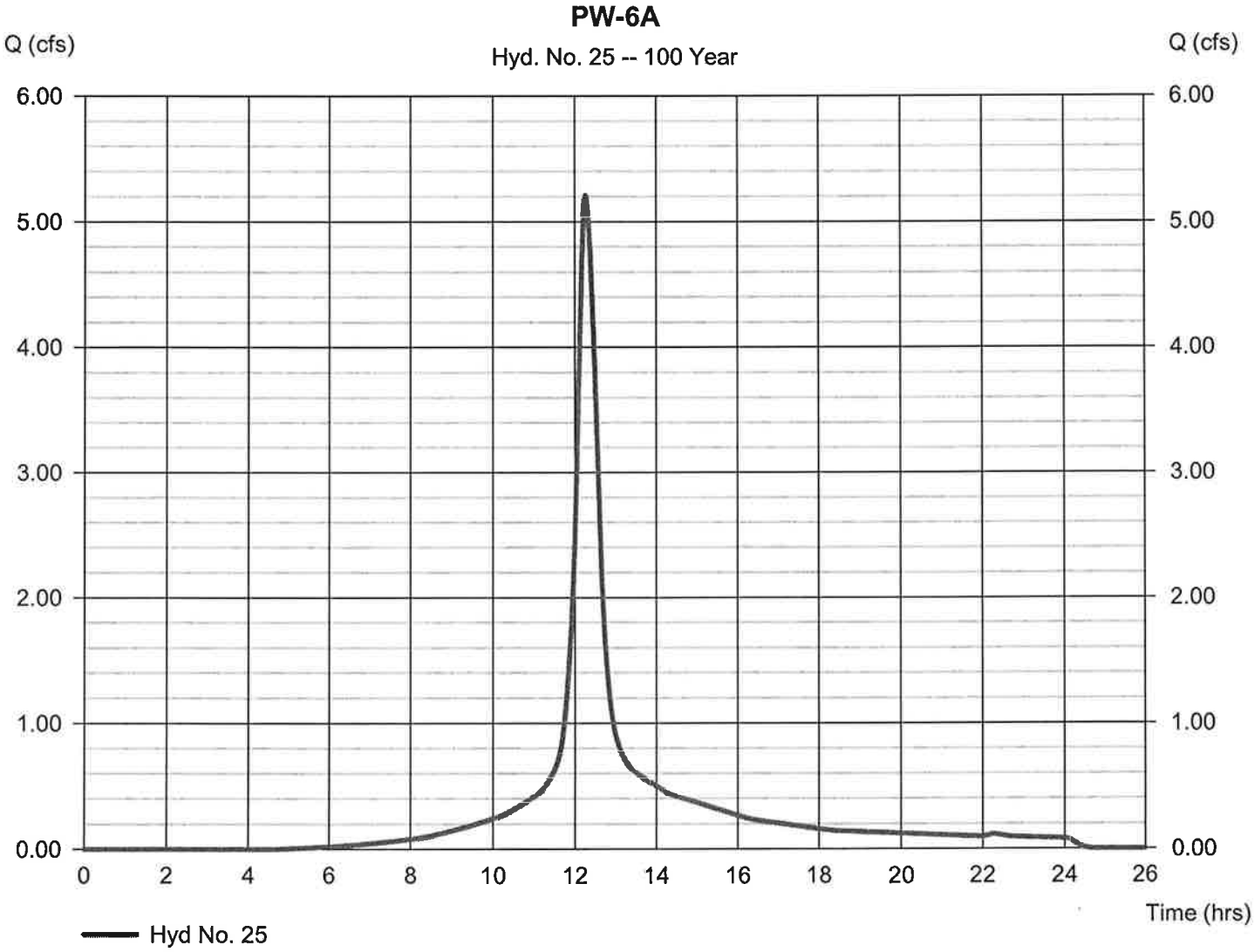
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 25

PW-6A

Hydrograph type	= SCS Runoff	Peak discharge	= 5.210 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.27 hrs
Time interval	= 1 min	Hyd. volume	= 25,740 cuft
Drainage area	= 1.350 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.74 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.380 x 39) + (0.650 x 98)] / 1.350



Hydrograph Report

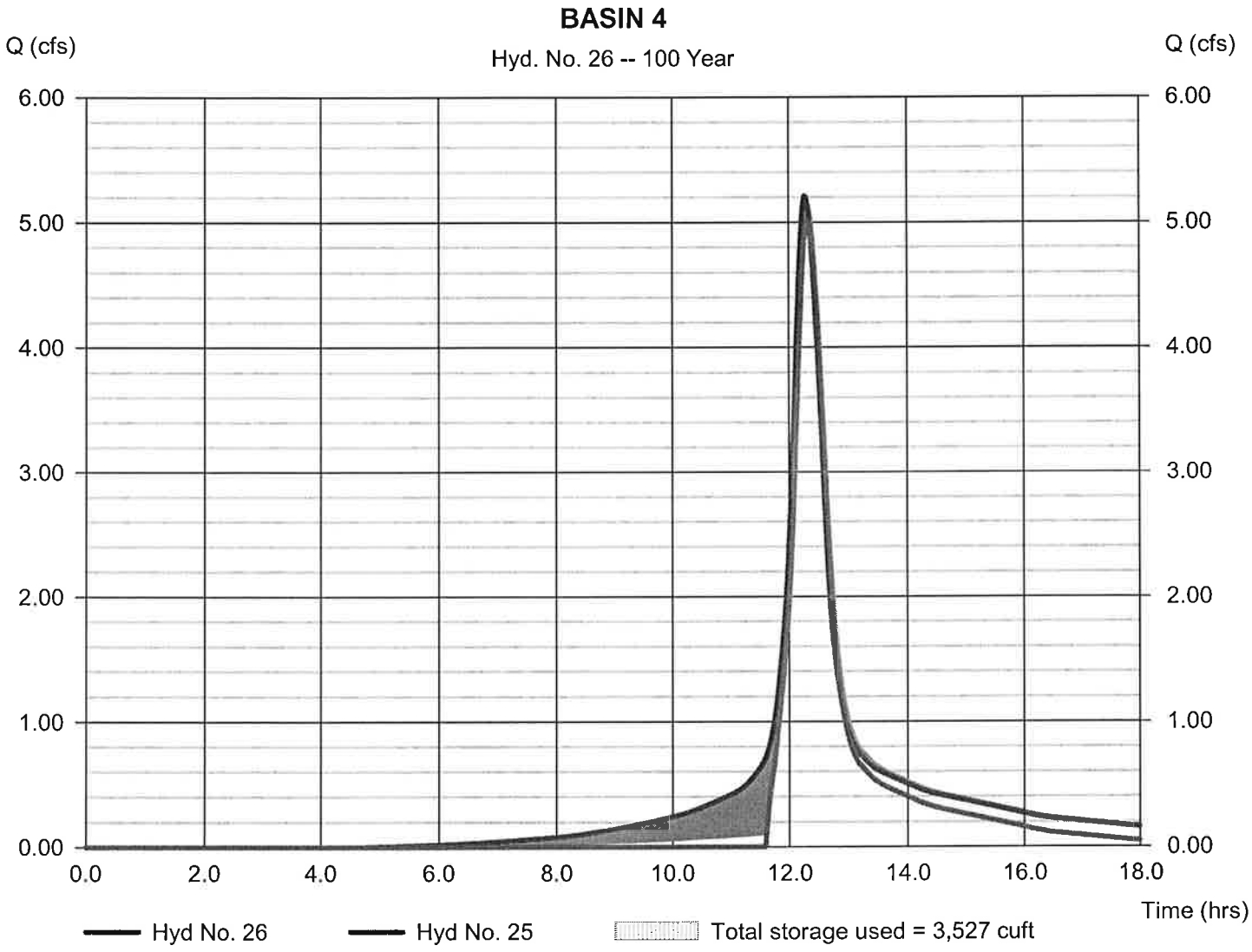
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Tuesday, Jun 3, 2008

Hyd. No. 26

BASIN 4

Hydrograph type	= Reservoir	Peak discharge	= 5.006 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.32 hrs
Time interval	= 1 min	Hyd. volume	= 16,969 cuft
Inflow hyd. No.	= 25 - PW-6A	Max. Elevation	= 130.19 ft
Reservoir name	= BASIN 4	Max. Storage	= 3,527 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

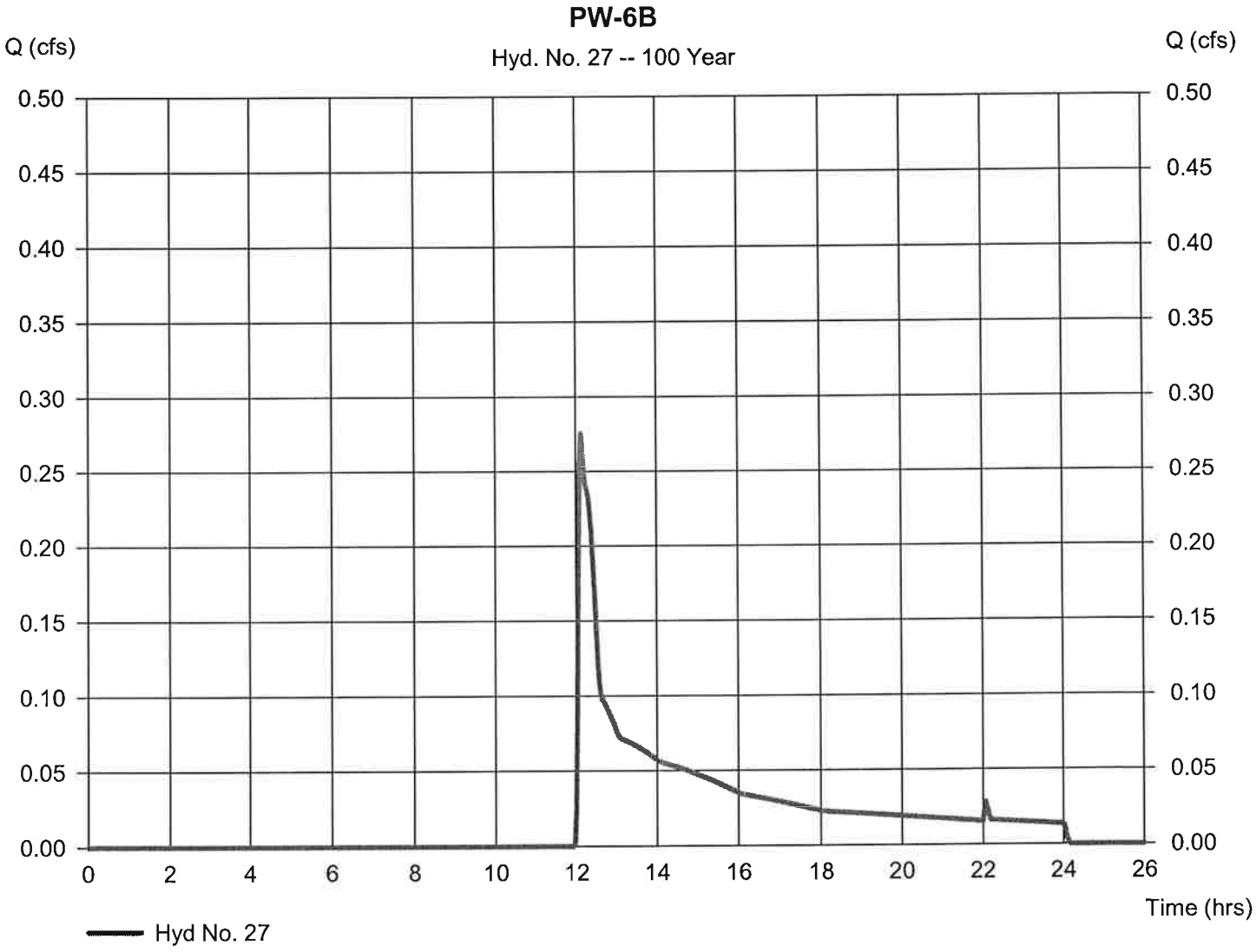
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 27

PW-6B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.275 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 1 min	Hyd. volume	= 1,726 cuft
Drainage area	= 0.600 ac	Curve number	= 39*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 7.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.610 x 39)] / 0.600



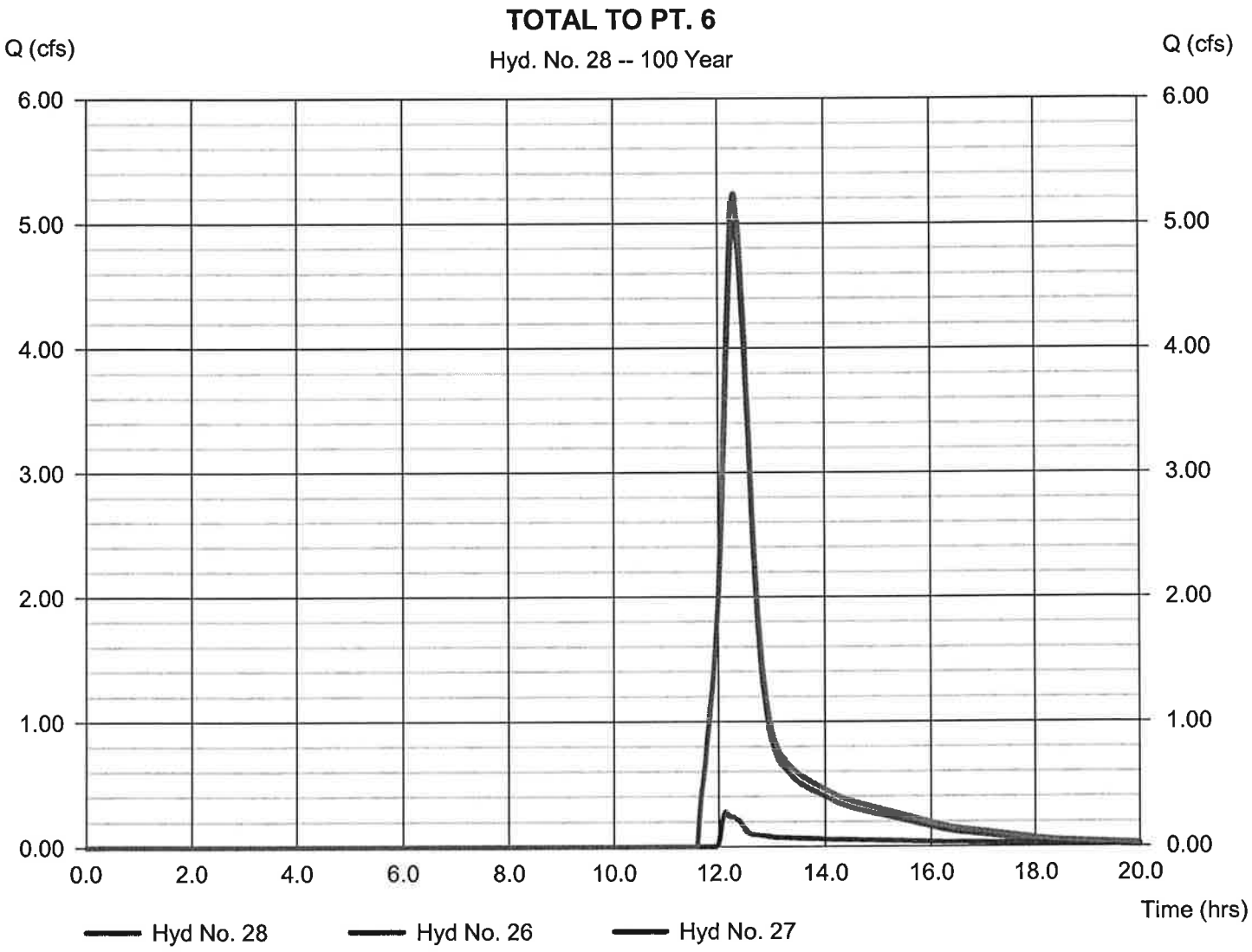
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Tuesday, Jun 3, 2008

Hyd. No. 28

TOTAL TO PT. 6

Hydrograph type	= Combine	Peak discharge	= 5.237 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.32 hrs
Time interval	= 1 min	Hyd. volume	= 18,695 cuft
Inflow hyds.	= 26, 27	Contrib. drain. area	= 0.600 ac



APPENDIX D: HYDRAULIC CALCULATIONS

RJO_HGL

Line No.	Line ID	DnStm Ln No	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	Gnd/Rim El Dn (ft)	HGL Dn (ft)
1	DMH-12	Outfall	195.900	0.00	16.59	0.00	0.00	12.16	0.0	23.8	42.41	51.62	7.86	36	0.51	121.00	120.00	127.15	123.08	121.50	122.21
2	DMH-25	1	157.480	0.00	0.93	0.00	0.00	0.80	0.0	7.6	4.49	7.85	2.54	18	0.48	121.25	120.50	128.30	123.32	127.15	123.08
3	DMH-23	2	298.520	0.00	0.68	0.00	0.00	0.58	0.0	5.6	3.57	4.88	2.91	15	0.49	122.70	121.25	125.30	124.20	128.30	123.42
4	CB-28	3	92.140	0.34	0.34	0.86	0.29	0.29	5.0	5.0	1.84	2.84	2.34	12	0.54	123.20	122.70	125.70	124.52	125.30	124.31
5	CB-27	1	12.690	0.30	0.30	0.58	0.17	0.17	5.0	5.0	1.09	5.42	3.92	12	1.97	123.75	123.50	127.00	124.30	127.15	123.80
6	CB-30	2	7.210	0.25	0.25	0.86	0.22	0.22	5.0	5.0	1.35	7.18	4.42	12	3.47	124.25	124.00	128.25	125.13	128.30	124.29
7	CB-29	3	8.280	0.34	0.34	0.86	0.29	0.29	5.0	5.0	1.84	4.24	2.34	12	1.21	122.80	122.70	125.60	124.33	125.30	124.31
8	DMH-28	1	124.580	0.00	2.06	0.00	0.00	1.25	0.0	15.1	5.42	5.18	6.90	12	1.81	122.75	120.50	127.25	125.53	127.15	123.08
9	DMH-27	8	254.990	0.27	0.54	0.90	0.24	0.49	5.0	6.3	2.88	4.71	3.69	12	1.49	126.55	122.75	130.50	127.52	127.25	126.21
10	DMH-26	9	190.960	0.27	0.27	0.90	0.24	0.24	5.0	5.0	1.53	2.72	2.70	12	0.50	127.50	126.55	130.50	128.05	130.50	127.59
11	DMH-11	1	218.000	0.00	12.84	0.00	0.00	9.53	0.0	22.3	34.34	31.56	7.00	30	0.50	121.60	120.50	131.05	124.38	127.15	123.08
12	CB-31	8	16.960	1.52	1.52	0.50	0.76	0.76	15.0	15.0	3.31	4.68	4.22	12	1.47	123.00	122.75	127.00	126.34	127.25	126.21
13	DMH-22	11	129.520	0.00	2.83	0.00	0.00	1.83	0.0	21.5	6.74	8.06	3.81	18	0.50	122.25	121.60	129.20	125.59	131.05	125.14
14	DMH-21	13	140.160	0.00	2.23	0.00	0.00	1.45	0.0	20.5	5.46	8.04	3.09	18	0.50	122.95	122.25	127.10	126.13	129.20	125.81
15	CB-23	14	44.000	0.43	0.43	0.55	0.24	0.24	5.0	5.0	1.49	3.68	1.89	12	0.91	123.35	122.95	127.05	126.35	127.10	126.28
16	DMH-20	11	97.680	0.10	6.20	0.90	0.09	4.96	5.0	20.2	18.79	39.20	6.62	24	2.56	124.10	121.60	130.00	125.64	131.05	125.14
17	CB-25	13	35.580	0.40	0.40	0.56	0.22	0.22	5.0	5.0	1.41	4.09	1.81	12	1.12	124.90	124.50	128.90	125.85	129.20	125.81
18	CB-24	14	10.470	0.31	0.31	0.56	0.17	0.17	5.0	5.0	1.09	3.77	1.39	12	0.96	123.05	122.95	127.05	126.29	127.10	126.28
19	DMH-19	16	84.710	0.00	1.04	0.00	0.00	0.94	0.0	11.1	4.62	4.09	5.88	12	1.12	125.05	124.10	131.20	126.85	130.00	125.64
20	DMH-18	19	158.000	0.35	1.04	0.90	0.32	0.94	5.0	10.1	4.79	4.98	3.90	15	0.51	125.85	125.05	132.60	127.69	131.20	126.95
21	DMH-17	20	73.640	0.05	0.69	0.90	0.05	0.62	5.0	9.6	3.23	2.66	4.12	12	0.48	126.20	125.85	132.10	128.43	132.60	127.92
22	DMH-16	21	230.000	0.16	0.64	0.90	0.14	0.58	5.0	8.0	3.18	2.79	4.05	12	0.52	127.40	126.20	133.20	130.25	132.10	128.69

Project File: Wayland TC.stm | Number of lines: 112 | Date: 05-27-2008

NOTES: ** Critical depth

RJO_HGL

Line No.	Line ID	DnStm Ln No	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	Gnd/Rim El Dn (ft)	HGL Dn (ft)
23	DMH-15	22	125.000	0.11	0.48	0.90	0.10	0.43	5.0	7.2	2.47	2.78	3.14	12	0.52	128.05	127.40	133.90	131.02	133.20	130.51
24	DMH-14	23	180.000	0.22	0.37	0.90	0.20	0.33	5.0	6.0	2.00	2.73	2.55	12	0.50	128.95	128.05	134.60	131.66	133.90	131.17
25	DMH-13	24	150.000	0.15	0.15	0.90	0.14	0.14	5.0	5.0	0.85	3.98	1.08	12	1.07	130.55	128.95	134.55	131.74	134.60	131.67
26	DMH-10	11	129.460	0.00	3.81	0.00	0.00	2.74	0.0	11.9	13.14	39.71	5.18	24	2.63	125.00	121.60	131.05	126.28 j	131.05	125.14
27	CB-26	13	25.640	0.20	0.20	0.78	0.16	0.16	5.0	5.0	0.98	6.81	1.25	12	3.12	124.80	124.00	128.80	125.83	129.20	125.81
28	DMH-54	16	158.350	0.00	4.70	0.00	0.00	3.69	0.0	19.2	14.35	17.42	5.96	24	0.51	124.90	124.10	130.00	126.25 j	130.00	125.64
29	DMH-9	26	134.970	0.00	3.30	0.00	0.00	2.44	0.0	11.0	12.08	17.65	5.81	24	0.52	125.70	125.00	131.80	126.93 j	131.05	126.28
30	DMH-53	28	361.870	0.00	3.20	0.00	0.00	2.59	0.0	16.8	10.75	17.28	4.60	24	0.50	126.70	124.90	132.00	127.86 j	130.00	126.77
31	DMH-8	29	88.540	0.00	2.96	0.00	0.00	2.26	0.0	10.4	11.39	17.47	5.70	24	0.51	126.15	125.70	131.80	127.35	131.80	126.93
32	CB-19	30	265.180	2.64	2.64	0.81	2.14	2.14	15.0	15.0	9.33	7.97	5.28	18	0.49	128.00	126.70	131.00	129.98	132.00	128.20
33	DMH-7	31	109.350	0.00	2.50	0.00	0.00	2.00	0.0	9.7	10.36	17.38	4.32	24	0.50	126.70	126.15	133.50	127.95	131.80	127.86
34	DMH-7A	33	87.500	0.00	0.33	0.00	0.00	0.29	0.0	5.6	1.78	3.45	4.16	12	0.80	128.70	128.00	132.20	129.27	133.50	128.51
35	CB-18	34	89.670	0.15	0.15	0.90	0.14	0.14	5.0	5.0	0.85	2.88	2.42	12	0.56	129.20	128.70	132.20	129.59 j	132.20	129.27
36	CB-22	16	10.190	0.36	0.36	0.68	0.24	0.24	5.0	5.0	1.54	7.64	4.80	12	3.93	126.90	126.50	129.90	127.85	130.00	126.80
37	CB-14	26	6.640	0.51	0.51	0.58	0.30	0.30	10.0	10.0	1.52	10.59	5.75	12	7.53	127.50	127.00	131.00	128.88	131.05	127.26
38	CB-21	28	11.260	1.50	1.50	0.73	1.10	1.10	15.0	15.0	4.78	8.13	6.08	12	4.44	125.50	125.00	129.50	126.94	130.00	126.77
39	CB-13	29	20.310	0.34	0.34	0.55	0.19	0.19	10.0	10.0	0.96	7.66	3.03	12	3.94	127.30	126.50	131.30	127.72 j	131.80	126.93
40	CB-20	30	10.610	0.56	0.56	0.81	0.45	0.45	15.0	15.0	1.98	8.38	5.23	12	4.71	128.00	127.50	131.00	128.87	132.00	127.86
41	CB-12	31	21.440	0.46	0.46	0.56	0.26	0.26	10.0	10.0	1.32	4.56	2.65	12	1.40	127.30	127.00	131.30	127.79	131.80	127.86
42	DMH-6	33	130.560	0.00	1.96	0.00	0.00	1.53	0.0	8.8	8.18	10.91	5.80	18	0.92	128.40	127.20	134.50	129.49 j	133.50	128.34
43	CB-15	34	8.280	0.18	0.18	0.87	0.16	0.16	5.0	5.0	0.98	4.24	2.63	12	1.21	128.80	128.70	132.20	129.22 j	132.20	129.27
44	DMH-5	42	169.460	0.00	1.76	0.00	0.00	1.36	0.0	7.7	7.59	8.29	5.32	18	0.53	129.30	128.40	134.60	130.43	134.50	129.53

Project File: Wayland TC.stm | Number of lines: 112 | Date: 05-27-2008

NOTES: ** Critical depth

RJO_HGL

Line No.	Line ID	DnStm Ln No	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	Gnd/Rim El Dn (ft)	HGL Dn (ft)
45	DMH-4	44	84.140	0.00	1.43	0.00	0.00	1.07	0.0	7.2	6.14	7.84	3.55	18	0.48	129.70	129.30	134.80	131.07	134.60	130.86
46	DMH-3	45	81.710	0.00	1.27	0.00	0.00	0.95	0.0	6.6	5.54	4.89	4.51	15	0.49	130.10	129.70	135.20	131.79	134.80	131.28
47	DMH-2	46	60.670	0.00	0.69	0.00	0.00	0.49	0.0	5.7	2.98	2.71	3.80	12	0.49	130.40	130.10	134.80	132.46	135.20	132.10
48	DMH-1	47	60.000	0.00	0.38	0.00	0.00	0.27	0.0	5.3	1.64	3.52	2.09	12	0.83	130.90	130.40	135.05	132.80	134.80	132.69
49	CB-2	48	50.700	0.16	0.16	0.79	0.13	0.13	5.0	5.0	0.79	3.43	1.01	12	0.79	131.30	130.90	134.30	132.86	135.05	132.84
50	CB-10	33	51.140	0.11	0.11	0.85	0.09	0.09	5.0	5.0	0.59	2.95	2.78	12	0.59	129.00	128.70	133.00	129.33	133.50	129.00
51	CB-8	42	20.790	0.10	0.10	0.85	0.09	0.09	5.0	5.0	0.53	3.78	2.98	12	0.96	130.00	129.80	134.00	130.31	134.50	130.05
52	CB-6	44	21.040	0.13	0.13	0.90	0.12	0.12	5.0	5.0	0.73	7.04	0.98	12	3.33	130.00	129.30	134.30	130.87	134.60	130.86
53	CB-5	45	22.340	0.16	0.16	0.79	0.13	0.13	5.0	5.0	0.79	4.47	1.01	12	1.34	130.00	129.70	134.00	131.29	134.80	131.28
54	DMH-52	46	96.280	0.00	0.58	0.00	0.00	0.46	0.0	6.0	2.74	3.05	3.49	12	0.62	130.70	130.10	135.90	132.59	135.20	132.10
55	CB-3	47	27.340	0.10	0.10	0.85	0.09	0.09	5.0	5.0	0.53	4.04	0.68	12	1.10	130.70	130.40	134.50	132.69	134.80	132.69
56	CB-1	48	47.960	0.22	0.22	0.63	0.14	0.14	5.0	5.0	0.87	3.52	1.11	12	0.83	131.30	130.90	134.30	132.87	135.05	132.84
57	CB-17	54	145.680	0.32	0.32	0.71	0.23	0.23	5.0	5.0	1.43	2.67	1.82	12	0.48	131.40	130.70	134.70	132.98	135.90	132.78
58	CB-11	33	51.140	0.10	0.10	0.85	0.09	0.09	5.0	5.0	0.53	2.95	2.70	12	0.59	129.00	128.70	133.00	129.31	133.50	128.99
59	CB-9	42	20.560	0.10	0.10	0.86	0.09	0.09	5.0	5.0	0.54	3.81	2.99	12	0.97	130.00	129.80	134.00	130.31	134.50	130.05
60	CB-7	44	20.820	0.20	0.20	0.84	0.17	0.17	5.0	5.0	1.06	7.07	1.40	12	3.36	130.00	129.30	134.30	130.87	134.60	130.86
61	CB-4	47	7.620	0.21	0.21	0.67	0.14	0.14	5.0	5.0	0.88	6.25	1.13	12	2.62	130.60	130.40	134.50	132.69	134.80	132.69
62	CB-16	54	9.770	0.26	0.26	0.88	0.23	0.23	5.0	5.0	1.44	6.76	1.83	12	3.07	131.00	130.70	134.50	132.79	135.90	132.78
63	FES-16	14	82.240	1.49	1.49	0.70	1.04	1.04	20.0	20.0	3.98	7.43	5.06	12	3.71	126.00	122.95	0.00	127.16	127.10	126.28
64	DMH-55	1	76.133	0.46	0.46	0.90	0.41	0.41	5.0	5.0	2.60	5.14	5.55	12	1.77	124.50	123.15	130.50	125.18	127.15	123.65
65	DMH-34	Outfall	123.910	0.00	2.91	0.00	0.00	1.89	0.0	9.0	10.02	9.70	6.29	18	0.73	122.40	121.50	126.90	123.74	0.00	122.71
66	DMH-33	65	80.790	0.00	1.45	0.00	0.00	0.98	0.0	8.5	5.32	5.50	4.33	15	0.62	122.90	122.40	127.50	124.76	126.90	124.29

Project File: Wayland TC.stm | Number of lines: 112 | Date: 05-27-2008

NOTES: ** Critical depth

RJO_HGL

Line No.	Line ID	DnStm Ln No	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	Gnd/Rim El Dn (ft)	HGL Dn (ft)
67	DMH-32	66	128.490	0.00	1.07	0.00	0.00	0.73	0.0	7.7	4.12	7.17	3.37	15	1.05	124.25	122.90	129.05	125.47	127.50	125.05
68	DMH-31	67	116.930	0.00	0.89	0.00	0.00	0.62	0.0	6.9	3.59	4.80	3.01	15	0.47	124.80	124.25	129.05	125.92	129.05	125.64
69	DMH-30	68	100.600	0.00	0.66	0.00	0.00	0.43	0.0	6.2	2.53	2.85	3.22	12	0.55	125.35	124.80	130.05	126.50	129.05	126.07
70	DMH-29	69	103.790	0.00	0.50	0.00	0.00	0.32	0.0	5.5	1.94	2.81	2.47	12	0.53	125.90	125.35	130.05	126.90	130.05	126.66
71	CB-32	70	76.360	0.37	0.37	0.62	0.23	0.23	5.0	5.0	1.44	3.42	2.43	12	0.79	126.50	125.90	130.50	127.08	130.05	126.99
72	CB-42	65	27.220	0.35	0.35	0.61	0.21	0.21	5.0	5.0	1.34	5.73	1.71	12	2.20	123.00	122.40	126.50	124.32	126.90	124.29
73	CB-37	66	13.920	0.38	0.38	0.65	0.25	0.25	5.0	5.0	1.55	3.27	1.98	12	0.72	123.00	122.90	126.50	125.07	127.50	125.05
74	CB-36	67	7.110	0.18	0.18	0.63	0.11	0.11	5.0	5.0	0.71	10.23	4.28	12	7.03	126.00	125.50	129.00	126.78	129.05	125.68
75	CB-35	68	6.070	0.23	0.23	0.85	0.20	0.20	5.0	5.0	1.23	7.00	1.56	12	3.29	125.00	124.80	129.00	126.07	129.05	126.07
76	CB-34	69	5.850	0.16	0.16	0.68	0.11	0.11	5.0	5.0	0.68	7.13	1.10	12	3.42	126.00	125.80	130.00	126.66	130.05	126.66
77	CB-33	70	6.770	0.13	0.13	0.67	0.09	0.09	5.0	5.0	0.55	4.69	0.70	12	1.48	126.00	125.90	130.00	126.99	130.05	126.99
78	DMH-38	65	61.040	0.00	1.11	0.00	0.00	0.69	0.0	8.5	3.76	5.95	4.80	12	2.38	123.85	122.40	127.50	124.84	126.90	124.29
79	DMH-37	78	124.040	0.00	1.11	0.00	0.00	0.69	0.0	7.6	3.89	5.06	3.57	15	0.52	124.50	123.85	129.05	125.43	127.50	125.10
80	DMH-36	79	138.400	0.00	0.82	0.00	0.00	0.50	0.0	6.7	2.94	2.74	3.74	12	0.51	125.20	124.50	129.55	126.48	129.05	125.68
81	DMH-35	80	127.250	0.00	0.60	0.00	0.00	0.36	0.0	5.9	2.18	2.76	2.78	12	0.51	125.85	125.20	130.05	127.10	129.55	126.70
82	CB-38	81	130.000	0.39	0.39	0.55	0.21	0.21	5.0	5.0	1.35	2.73	1.79	12	0.50	126.50	125.85	130.50	127.37	130.05	127.22
83	CB-41	79	6.460	0.29	0.29	0.65	0.19	0.19	5.0	5.0	1.18	10.73	1.87	12	7.74	125.00	124.50	129.00	125.64	129.05	125.68
84	CB-40	80	6.460	0.22	0.22	0.65	0.14	0.14	5.0	5.0	0.90	8.31	1.14	12	4.64	125.50	125.20	129.50	126.70	129.55	126.70
85	CB-39	81	5.350	0.21	0.21	0.70	0.15	0.15	5.0	5.0	0.92	6.46	1.18	12	2.80	126.00	125.85	130.00	127.23	130.05	127.22
86	DMH-50	Outfall	67.160	0.00	0.75	0.00	0.00	0.43	0.0	5.4	2.64	3.80	4.58	12	0.97	121.65	121.00	125.75	122.34	123.50	121.69
87	CB-53	86	11.130	0.43	0.43	0.55	0.24	0.24	5.0	5.0	1.49	6.33	3.10	12	2.70	121.95	121.65	125.95	122.47 j	125.75	122.34
88	CB-52	86	57.410	0.32	0.32	0.60	0.19	0.19	5.0	5.0	1.21	2.79	2.71	12	0.52	121.95	121.65	125.95	122.42	125.75	122.34

Project File: Wayland TC.stm | Number of lines: 112 | Date: 05-27-2008

NOTES: ** Critical depth

Line No.	Line ID	DnStm Ln No	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	Gnd/Rim El Dn (ft)	HGL Dn (ft)
89	DMH-45	Outfall	137.320	0.00	3.34	0.00	0.00	2.65	0.0	9.3	13.92	17.49	6.18	24	0.51	127.60	126.90	131.25	128.98	128.90	128.22
90	DMH-44	89	155.480	0.00	3.22	0.00	0.00	2.57	0.0	8.3	14.05	17.58	5.64	24	0.51	128.40	127.60	133.50	129.73 j	131.25	129.29
91	DMH-43	90	96.530	0.00	2.77	0.00	0.00	2.28	0.0	7.6	12.77	10.36	7.23	18	0.83	129.20	128.40	133.40	131.57	133.50	130.35
92	DMH-43A	91	142.390	0.00	1.94	0.00	0.00	1.53	0.0	6.7	8.92	15.91	2.84	24	0.42	129.80	129.20	133.80	132.57	133.40	132.38
93	CB-43	92	108.000	0.00	1.07	0.00	0.00	0.90	0.0	6.0	5.38	11.99	3.05	18	1.11	131.00	129.80	134.50	132.93	133.80	132.69
94	CB-44A	93	145.150	0.95	0.95	0.86	0.82	0.82	5.0	5.0	5.13	11.37	3.25	18	1.00	132.20	130.75	134.50	133.33	134.50	133.08
95	CB-54	89	108.680	0.12	0.12	0.65	0.08	0.08	5.0	5.0	0.49	2.98	0.62	12	0.60	128.25	127.60	132.25	129.31	131.25	129.29
96	CB-46	90	69.590	0.45	0.45	0.65	0.29	0.29	5.0	5.0	1.84	2.74	2.34	12	0.50	128.75	128.40	132.25	130.51	133.50	130.35
97	CB-43	92	21.710	0.87	0.87	0.73	0.64	0.64	5.0	5.0	3.99	4.75	3.25	15	0.46	129.90	129.80	133.40	132.76	133.80	132.69
98	CB-45	91	35.992	0.20	0.83	0.90	0.18	0.75	5.0	7.3	4.25	7.34	2.41	18	0.42	129.35	129.20	133.55	132.43	133.40	132.38
99	DMH-42	98	61.058	0.19	0.63	0.90	0.17	0.57	5.0	6.9	3.28	8.61	1.86	18	0.57	129.70	129.35	133.80	132.53	133.55	132.48
100	DMH-41	99	278.000	0.44	0.44	0.90	0.40	0.40	5.0	5.0	2.49	5.63	2.03	15	0.65	131.50	129.70	135.50	132.93	133.80	132.58
101	CB-44	93	30.312	0.12	0.12	0.65	0.08	0.08	5.0	5.0	0.49	13.02	0.40	15	3.46	131.80	130.75	0.00	133.08	134.50	133.08
102	DMH-47	Outfall	29.170	0.00	3.00	0.00	0.00	1.80	0.0	20.3	6.82	11.54	3.86	18	1.03	128.50	128.20	133.55	130.34	130.20	130.23
103	DMH-46	102	112.150	0.00	0.59	0.00	0.00	0.45	0.0	5.3	2.82	2.82	3.59	12	0.54	129.10	128.50	132.05	131.15	133.55	130.56
104	CB-50	103	6.890	0.27	0.27	0.90	0.24	0.24	5.0	5.0	1.53	4.65	1.94	12	1.45	129.20	129.10	132.00	131.36	132.05	131.34
105	FES-13	102	46.210	2.41	2.41	0.56	1.35	1.35	20.0	20.0	5.14	7.28	4.19	15	1.08	129.00	128.50	131.00	130.81	133.55	130.56
106	CB-49	103	42.330	0.32	0.32	0.66	0.21	0.21	5.0	5.0	1.33	2.65	1.69	12	0.47	129.30	129.10	132.00	131.40	132.05	131.34
107	CB-47	Outfall	18.000	0.53	0.53	0.13	0.07	0.07	10.0	10.0	0.35	7.04	0.45	12	3.33	127.60	127.00	130.60	128.84	129.00	128.84
108	FES-12	Outfall	54.680	1.58	1.58	0.64	1.01	1.01	15.0	15.0	4.41	4.67	6.01	12	1.46	129.00	128.20	131.00	129.88	130.50	129.08
109	CB-48	Outfall	6.000	0.62	0.62	0.58	0.36	0.36	5.0	5.0	2.26	4.98	4.27	12	1.67	128.30	128.20	131.30	128.94	130.50	128.84
110	DMH-49	Outfall	17.390	0.00	0.49	0.00	0.00	0.42	0.0	5.4	2.59	5.07	3.92	12	1.73	127.70	127.40	132.25	128.38 j	129.00	128.38

Project File: Wayland TC.stm | Number of lines: 112 | Date: 05-27-2008

NOTES: ** Critical depth

RJO_HGL

Line No.	Line ID	DnStm Ln No	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	Gnd/Rim El Dn (ft)	HGL Dn (ft)
111	CB-51	110	61.500	0.34	0.34	0.86	0.29	0.29	5.0	5.0	1.84	2.69	3.52	12	0.49	128.00	127.70	131.20	128.59	132.25	128.38
112	TR-DR	110	15.000	0.15	0.15	0.85	0.13	0.13	5.0	5.0	0.80	5.46	2.17	12	2.00	128.00	127.70	131.90	128.38 j	132.25	128.38

Project File: Wayland TC.stm | Number of lines: 112 | Date: 05-27-2008

NOTES: ** Critical depth

APPENDIX E: LONG TERM POLLUTION PREVENTION PLAN

LONG TERM POLLUTION PREVENTION PLAN (LTPPP)
MATERIALS MANAGEMENT PLAN

Applicant: Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Prepared by: R.J. O'Connell & Associates, Inc.
80 Montvale Avenue
Stoneham, MA

A. PROGRESS DRAWING

The Civil Construction plan set includes an Erosion and Sediment Control Plans which shall be posted inside the job trailer wall. This plan will be used to record the locations of the Job Trailer, Sanitary Waste Facilities, Solid Waste Facilities, Fuel Storage Area, Equipment Service Area, and Concrete Washout Pit. Any time any of these facilities are relocated on the site, a new location will be noted on the drawing.

B. MATERIALS COVERED

The following materials or substances are expected to be present onsite during construction:

Concrete/Additives/Wastes
Detergents
Paints/Solvents
Acids
Solid and construction wastes
Soil stabilization additives
Cleaning solvents
Petroleum based products
Pesticides
Fertilizers
Sanitary wastes

C. MATERIALS MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. The Contractor's Superintendent will be responsible for ensuring that these procedures are followed:

1. Good Housekeeping
   The following good housekeeping practices will be followed onsite during construction:
   a) An effort will be made to store only enough products required to do the job.
   b) All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers will be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
   c) Products will be kept in their original containers with the original manufacturer's label in legible condition.
   d) Substances will not be mixed with one another unless recommended by the manufacturer.
   e) Whenever possible, all of a product will be used up before disposing of the container.
   f) Manufacturer's recommendations for proper use and disposal will be followed.

g) The Contractor’s Superintendent will be responsible for daily inspections to ensure proper use and disposal of materials.

2. Hazardous Substances

These practices will be used to reduce the risks associated with Hazardous Substances. Material Safety Data Sheets (MSDS's) for each product with hazardous properties that is used at the Project will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the job trailer at the Project. Each employee who must handle a Hazardous Substance will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

a) Products will be kept in original containers with the original labels in legible condition.
b) Original labels and MSDS's will be procured and used for each product.
c) If surplus product must be disposed manufacturer's and local/state/federal required methods for proper disposal must be followed.

3. Hazardous Waste

It is imperative that all Hazardous Waste be properly identified and handled in accordance with all applicable Hazardous Waste Standards, including the storage, transport and disposal of the Hazardous Wastes. There are significant penalties for the improper handling of Hazardous Wastes. It is important that the Site Superintendent seeks appropriate assistance in making the determination of whether a substance or material is a Hazardous Waste. For example, Hazardous Waste may include certain Hazardous Substances, as well as pesticides, paints, paint solvents, cleaning solvents, pesticides, contaminated soils, and other materials, substances or chemicals that have been discarded (or are to be discarded) as being out-of-date, contaminated, or otherwise unusable, and can include the containers for those substances; other materials and substances can also be or become Hazardous Wastes, however. The Contractor's Superintendent is also responsible for ensuring that all site personnel are instructed as to these Hazardous Waste requirements and also that the requirements are being followed.

4. Product Specific Practices

The following product specific practices will be followed on the job site:

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Petroleum storage tanks shall be located at minimum 100 linear feet from drainage ways, inlets and surface waters. Any petroleum storage tanks stored onsite will be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank. Any mobile petroleum tank shall be parked in a vehicular service area surrounded by a berm that provides a containment volume that is equal to 110% of the volume of the largest tank. Containment must provide sufficient volume to contain expected precipitation and 110% volume of the largest tank.

Accumulated rainwater or spills from containment areas are to be promptly pumped into a containment device and disposed of properly by a licensed Hazardous Waste transporter. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations. The location of any fuel tanks and/or equipment storage areas must be identified on the Erosion Control Plan by the Contractor once the locations have been determined.

Fertilizers

Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints, Paint Solvents, and Cleaning Solvents

All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and federal regulations.

Concrete Wastes

Concrete trucks will be allowed to wash out or discharge surplus concrete or drum wash water on the site, but only in specifically designated diked and impervious washouts which have been prepared to prevent contact between the concrete wash and storm water. Waste generated from concrete wash water shall not be allowed to flow into drainage ways, inlets, receiving waters or highway right of ways, or any location other than the designated concrete washout. Waste concrete may be poured into forms to make riprap or other useful concrete products. Proper signage designating the “Concrete Washout” shall be placed near the facility. Concrete Washouts shall be located at minimum 100 linear feet from drainage ways, inlets and surface waters.

The hardened residue from the concrete wash out diked areas will be disposed of in the same manner as other non-hazardous construction waste materials or may be broken up and used on site as deemed appropriate by the Contractor. Maintenance of the washout is to include removal of hardened concrete. Facility shall have sufficient volume to contain all the concrete waste resulting from washout and a minimum freeboard of 12 inches. Facility shall not be filled beyond 95% capacity and shall be cleaned out once 75% full unless a new facility is constructed. The Contractor’s Superintendent will be responsible for seeing that these procedures are followed.

Saw-cut Portland Cement Concrete (PCC) slurry shall not be allowed to enter storm drains or Watercourses. Saw-cut residue should not be left on the surface of pavement or be allowed to flow over and off pavement. Residue from saw-cutting and grinding shall be collected by vacuum and disposed of in the concrete washout facility.

The Project may require the use of multiple concrete wash out areas. These concrete wash out areas are to be made available to all trades and subcontractors working on the Project. The Contractor may designate certain wash out areas for particular trades or subcontractors, but the Contractor is responsible for the management of all concrete washout

areas on the Project. All concrete wash out areas will be located in an area where the likelihood of the area contributing to storm water discharges is negligible. If required, additional BMPs must be implemented to prevent concrete wastes from contributing to storm water discharges. The location of concrete wash out area(s) must be identified on the Civil plans by the Contractor once the locations have been determined. In addition, a standard detail on the construction of the concrete wash out is included in the Civil detail sheets.

5. Solid and Construction Wastes

All waste materials will be collected and stored in an appropriately covered container and/or securely contained metal dumpster rented from a local waste management company which must be a licensed solid waste management company. The dumpster will comply with all local and state solid waste management regulations.

All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of once per week or more often if necessary. Once building construction has commenced, the dumpster will be emptied a minimum of once per week or when 95% full, or more often if necessary to prevent over-flow and the trash will be hauled to a landfill. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers will be located in an area where the likelihood of the containers contributing to storm water discharges is negligible. Solid waste containers shall be located no less than 50 feet from any storm inlet, drainage way, or surface water. If required, additional BMPs must be implemented, such as gravel bags, wattles, Dikes, berms, and fences around the base, to prevent wastes from contributing to storm water discharges. The location of waste dumpsters and roll-off containers must be identified on the Civil plans by the Contractor once the locations have been determined.

6. Sanitary Wastes

A minimum of one portable sanitary unit will be provided for every ten (10) workers on the site. All sanitary waste will be collected from the portable units a minimum of one time per week by a licensed portable facility provider in complete compliance with local and state regulations.

All sanitary waste units will be located in an area where the likelihood of the unit contributing to storm water discharges is negligible. Additional containment BMPs must be implemented, such as gravel bags or specially designed plastic skid containers around the base, to prevent wastes from contributing to storm water discharges. The location of sanitary waste units must be identified on the Civil plans by the contractor once the locations have been determined

7. Contaminated Soils

Any contaminated soils (resulting from spills of Hazardous Substances or Oil or discovered during the course of construction) which may result from Construction Activities will be contained and cleaned up immediately in accordance with the procedures given in the Materials Management Plan and in accordance with applicable state and federal regulations. Contaminated soils not resulting from Construction Activities, or which pre-existed Construction Activities, but which are discovered by virtue of Construction Activities, should be reported in the same manner as spills, but with sufficient information to indicate that the discovery of an existing condition is being

reported. If there is a release that occurs by virtue of the discovery of existing contamination, this should be reported as a spill, if it otherwise meets the requirements for a reportable spill.

D. SPILL PREVENTION AND RESPONSE PROCEEDURES

The Contractor will train all personnel in the proper handling and cleanup of spilled Hazardous Substances or Oil. No spilled Hazardous Substances or Oil will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the Contractor's Superintendent to be properly trained, and to train all personnel in spill prevention and clean up procedures.

1. In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil to come into contact with storm water, the following steps will be implemented:

   a) All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
   b) The minimum practical quantity of all such materials will be kept at the Project.
   c) A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.
   d) Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.
   e) It is the Contractors responsibility to ensure that all Hazardous Waste discovered or generated at the Project site is disposed of properly by a licensed hazardous material disposal company. The Contractor is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authority.

2. In the event of a spill of Hazardous Substances or Oil, the following procedures must be followed:

   a) All measures must be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to storm water or off-site. (The spill area must be kept well ventilated and personnel must wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)
   b) For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.
   c) For spills greater than five (5) gallons of material immediately contact the MA DEP Hazardous Waste Incident Response Group at (617) 792-7653 and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired.
   d) If there is a Reportable Quantity (RQ) release during the construction period, then the National Response Center will be notified immediately at (800) 424-8802; within 14 days a report will be submitted to the EPA regional office describing the release, the date and circumstances of the

release and the steps taken to prevent another release. This Stormwater Pollution Prevention Plan must be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

3. The Contractor's Superintendent will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the office trailer onsite.

E. ILLICIT DISCHARGE STATEMENT- CONTROL OF NON-STORMWATER DISCHARGES

Certain types of discharges are allowable under the U.S. Environmental Protection Agency Construction General Permit, and it is the intent of this LTPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place.

APPENDIX F: CONSTRUCTION PERIOD POLLUTION PREVENTION AND SEDIMENTATION PLAN

CONSTRUCTION PERIOD POLLUTION PREVENTION AND SEDIMENTATION PLAN

CONTACT INFORMATION/ RESPONSABLE PARTIES

Operators:

Owner
Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Contractor
Not selected at this time

Plan Prepared by
R.J. O'Connell & Associates, Inc.
80 Montvale Avenue
Stoneham, MA 02180

I. PROJECT DESCRIPTION

The project site has an area of approximately 56.9 acres and is located at 400 Boston Post Road, in Wayland, MA (See Figure 1 - Locus Map). The site is bound by Route 20 (Boston Post Road) to the south, the Wayland Business Center property to the North, Sudbury River to the west and the Wayland meadows property and Route 27 (Old Sudbury Road) to the East. There are wetland areas on the site. The larger wetland is located at the western portion of the site adjacent to Sudbury River, two smaller wetland areas are at the north east portion of the site adjacent to the Wayland Business Center property, and on the south east portion of site adjacent to Route 20.

Approximately 25 acres of the site is currently developed. The existing development contains a building formerly occupied by Raytheon with a footprint area of ±272,700 square feet and a ±10,500 square foot building formerly utilized as a daycare center and associated parking. There is a Wastewater Treatment facility on site which is owned and operated by the Town of Wayland. The existing topography of the project site generally slopes east to west and ranges from elevation ±146 at the eastern property line adjacent to the Wayland Meadows Property to elevation ±116 at the western side of the site in the large wetland area adjacent to Sudbury River.

The proposed development program consists of demolishing the existing ±272,700 square foot building and constructing a mixed use development consisting of residential, municipal and retail use buildings, with associated parking facilities, utilities, and stormwater collection system (See Figure 2 - Site Plan). The stormwater management system for the proposed project has been designed in accordance with the MADEP's Stormwater Management Policy and Standards and the Town of Wayland's Wetlands and Water Resources Bylaw Chapter 194 Rules and Regulations.

Stormwater quality control will be achieved through a program of Best Management Practices (BMP's). The proposed stormwater management system will significantly improve the quality of the stormwater runoff. The existing pavement runoff drains to catch basins which direct runoff to wetland resource areas without additional

water quality treatment. The proposed stormwater management system for the project will include new catch basins with deep sumps and hoods, and the use of innovative low impact development (LID) techniques.

Low Impact Development is a stormwater management approach with the goal to mimic the site's pre-development hydrology. This is done by using design techniques that infiltrate, filter, store, and detain water throughout the site using decentralized micro-scale controls. LID includes structural and non-structural strategies such as retention areas, reduction of impervious surfaces, lengthening of flow paths, and the preservation of existing vegetation and landscape features. Redevelopment and improving stormwater quality of existing sites, and energy and water conservation are also examples of LID techniques.

LID techniques proposed for the project include the use of water quality swales, rain gardens, and bio-retention basins to increase times of concentration, promote groundwater recharge, and enhance water quality. The water quality swales will be planted with grass on the bottom and sides to slow the runoff velocity and filter pollutants. The rain gardens and bio-retention basins will be planted with a combination of grasses, perennials, shrubs, and small trees. The clean stormwater runoff from the building rooftops will be directed to the water quality swales and bio-retention basins to provide additional groundwater recharge.

II. EROSION AND SEDIMENT CONTROL BMPS

A. MINIMIZE DISTURBED AREA AND PROTECT NATURAL FEATURES AND SOIL

Prior to any construction activity, silt fence shall installed at the limits of the work area and filter bags installed in existing catch basins within the construction site area as shown on the plans. All construction activities shall occur within the limits of the silt fence as shown on the attached Erosion Control Plans. See Appendix B Drawings C-2A and C-2B for Erosion Control Plans.

B. PHASE CONSTRUCTION ACTIVITY

The following phasing is one possible sequence of construction. The contractor, upon approval from the owner's on-site erosion control monitor, may divert from this sequence in order to accommodate specific situations that may occur once construction has commenced. Any changes shall be approved by the owner's on site erosion control monitor and conform to the DEQE's (D.E.P.) Erosion and Sedimentation Control Guidelines, August 1983 and USDA S.C.S. Erosion and Sediment Control in Site Development, Massachusetts Conservation Guide, September 1983 and all local municipal regulations.

Phase I

Phase 1 erosion controls will be installed prior to initiating the major earthwork activity at the site. The following measures will be installed and maintained:

- Prior to any construction activity, silt fencing shall be installed at the limits of the work area as shown on the plans. The silt fence may be installed in stages, but must be in place prior to disturbance of soils within the area draining to the silt fence.

- Stabilized construction entrances shall be installed at the pavement limits as shown on the drawings. The construction entrance locations shall be adjusted as necessary as construction proceeds.

- Install filter bags on all existing catch basins within the construction area until the site is stabilzed.

- Phase 1 erosion controls must remain in place during clearing and grubbing activities and the preliminary cut and fill operation. Cuts and fills shall be performed in a manner such that runoff will continue to be directed toward erosion and sediment controls. Fill shall be placed in lifts sloping towards the control measures until it becomes practical and necessary to relocate them. As the excavated and filled surfaces reach subgrade, Phase 2 erosion control measures will be installed.

Phase II

Phase 2 erosion controls shall consist of similar controls to Phase 1, but with new locations. The following measures shall be applied:

- All silt fence shall remain in place until the final stabilization of the site.

- As side slopes reach final subgrade, and where these slopes are outside the limits of paving or other structural surfacing, the slopes shall be topsoiled, seeded for permanent vegetative cover and mulched. All proposed slopes steeper than 3:1 shall be stabilized with erosion control matting and protected from erosion. Topsoil placement and seeding shall take place within 30 days of completion of subgrade at these locations, unless the time of year prevents application of permanent seed. In that case, the exposed slopes shall be mulched for winter protection, and if seasonal conditions permit, a temporary seed mix applied.

Phase III

Phase 3 erosion controls comprise measures required to control erosion from surfaces that are near to final grade and are waiting final stabilization by pavement, permanent landscaping, or other surfacing. These measures shall include the following:

- Silt fence shall remain until the tributary drainage areas are stabilized.

General Measures During All Phases:

In addition to the erosion controls listed for in Phases 1, 2, and 3, the following measures shall be employed throughout all phases:

- The contractor shall minimize the area of disturbed soil and efforts shall be made to limit the time of exposure of disturbed areas.

- Erosion control measures shall be routinely inspected and cleaned, repaired or replaced as necessary. The proponent will monitor the measures for proper maintenance and operation throughout the construction period will retain a professional environmental scientist or other qualified professional.

- Where construction activities have permanently ceased or have temporarily been suspended for more than seven days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within three days. Areas which remain disturbed but inactive for at least thirty days shall receive temporary seeding in accordance with the DEP Erosion and Sedimentation Control Guidelines, August 1983 and USDA S.C.S. Erosion and Sediment Control in Site Development, Massachusetts Conservation Guide, September 1983 and all local municipal regulations.

- Stockpiled soil materials shall be contained within staked haybales and/or silt fence.

- Any dewatering activities in which water will be released to a resource area or to a storm drain shall use a settling pond or similar device to remove sediment before water is released.

Structural Practices:

Structural practices which will be used on this site to divert stormwater flows away from exposed soils, store stormwater runoff, and discharge stormwater from the site include but are not limited to; silt fences, stacked haybales, drainage swales, sediment traps, check dams, catch basins, drainage pipe, manholes, temporary sediment basins, outlet control structure, permanent seeding and landscaping treatments (including permanent mulches, as applicable), and structural surfaces such as pavements. The site work drawings detail and show locations of these structural practices.

C. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT

BMP Description: Sedimentation filter bag	
Installation Schedule:	At commencement of construction activities
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

D. ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

BMP Description: Silt fence	
Installation Schedule:	Prior to any construction activity
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

E. STABILIZE SOILS

BMP Description: Mulch, hay or seeding for temporary vegetation of disturbed or exposed areas	
☐ ***Permanent***	☒ ***Temporary***
Installation Schedule:	As needed. No areas shall be left disturbed for longer than necessary to complete the work associated with that area.
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

F. PROTECT SLOPES

BMP Description: Erosion control matting for slopes steeper than 3:1	
Installation Schedule:	During construction activities associated with the slope
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

G. PROTECT STORM DRAIN INLETS

BMP Description: Sedimentation filter bag	
Installation Schedule:	At commencement of construction activities
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

H. RETAIN SEDIMENT ON-SITE

BMP Description: Sedimentation filter bag	
Installation Schedule:	At commencement of construction activities
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

I. ESTABLISH STABILIZED CONSTRUCTION EXITS

BMP Description: Construction entrance vehicle tracking pads	
Installation Schedule:	Prior to the commencement of any earthwork operations
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

III. GOOD HOUSEKEEPING BMPS

A. MATERIAL HANDLING AND WASTE MANAGEMENT

BMP Description: Solid waste containers / dumpsters	
Installation Schedule:	At commencement of construction activities
Maintenance and Inspection:	As required

B. ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

BMP Description: Silt fences and haybales at all stockpile areas of construction and excavated material	
Installation Schedule:	At the commencement of construction activities
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

C. DESIGNATE WASHOUT AREAS

BMP Description: Equipment washing shall occur only within drainage areas with temporary sedimentation basins.	
Installation Schedule:	At the commencement of construction activities
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

D. ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

BMP Description: Fueling operations, including the service and storage of equipment associated with fueling, shall occur a minimum of 100 feet from the edge of a resource area and within a drainage areas with temporary sedimentation basins.	
Installation Schedule:	At the commencement of construction activities
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

E. CONTROL EQUIPMENT/VEHICLE WASHING

BMP Description: Vehicle washing shall occur only within drainage areas with temporary sedimentation basins.	
Installation Schedule:	At the commencement of construction activities
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

F. SPILL PREVENTION AND CONTROL PLAN

A spill contingency plan will be implemented during construction, including the following provisions:

- Equipment necessary to quickly attend to inadvertent spills or will be stored on-site in a secure but accessible location. Such equipment will include:

    1. safety goggles
    2. chemically resistant gloves and overshoe boots
    3. water and chemical fire extinguishers
    4. sand and shovels
    5. suitable absorbent materials
    6. storage containers
    7. first aid equipment

- Spills or leaks will be treated properly in accordance with material type, volume of spillage and location of the spill. Mitigation will include:

    1. preventing further spillage

2. containing the spilled material in the smallest practical area
3. removing spilled material immediately in a safe and environmentally sound manner
4. mitigating any damage to the environment

- For spills of less than 5 gallons of material, proceed with source control and containment and clean up with absorbent materials or other applicable means, unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional response contractor.

- Spills of toxic or hazardous materials will be reported to the appropriate federal, state and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed reportable quantities of certain substances specifically mentioned in federal regulations 40 CFR 110, 40 CFR 117 and 40 CFR 302 must be immediately reported to the EPA National Response Center, telephone 1-800-424-8802.

G. ANY ADDITIONAL BMPS

BMP Description: Adequate sanitation facilities for on-site construction crews	
Installation Schedule:	At the commencement of construction activities
Maintenance and Inspection:	As required

BMP Description: Dust control through watering	
Installation Schedule:	As required throughout earthwork operations
Maintenance and Inspection:	As required

H. ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

BMP Description: All measures used to mitigate sedimentation shall be used to control water associated with dust control activities	
Installation Schedule:	As outlined in above measures
Maintenance and Inspection:	Once weekly and within 24 hours of the end of a rainfall event that is 0.5 inches or greater

APPENDIX G: STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

STORMWATER MANAGEMENT SYSTEM (SMS)
OPERATION AND MAINTENANCE PLAN

Applicant: Twenty Wayland, LLC
260 Boston Post Road, Suite 9
Wayland, MA 02109

Prepared by: R.J. O'Connell & Associates
80 Montvale Avenue
Stoneham, MA

A. SMS DESCRIPTION

The on-site drainage system, which collects and conveys storm water runoff from the parking lot consists of deep sump catch basins with oil/grease hoods on the outlets, drain manholes, closed drainage piping, water quality swales, rain gardens, bioretention basins and curbing along pavement edges.

B. OPERATION AND MAINTENANCE RESPONSIBILITY

During construction:
Site Contractor (Not Selected at this time)

Post construction**:**
Twenty Wayland, LLC

C. INSPECTION AND MAINTENANCE SCHEDULE

Schedule During Construction:

See Erosion Control Notes (below). These notes are also included on the site design plans. The NPDES general permit which is prepared prior to construction will also include schedule information for the inspection and maintenance of erosion controls during and immediately following construction.

EROSION CONTROL NOTES:

1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH D.E.Q.E.'S (DEP) EROSION AND SEDIMENTATION CONTROL GUIDELINES, AUGUST 1983, THE U.S.D.A. S.C.S. EROSION AND SEDIMENT CONTROL IN SITE DEVELOPMENT, MASSACHUSETTS CONSERVATION GUIDE, SEPTEMBER 1983 AND ALL LOCAL MUNICIPAL REGULATIONS.

2. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO THE COMMENCEMENT OF ANY SITE WORK OR EARTHWORK OPERATIONS,

SHALL BE MAINTAINED DURING CONSTRUCTION, AND SHALL REMAIN IN PLACE UNTIL ALL SITE WORK IS COMPLETE AND GROUND COVER IS ESTABLISHED.

3. STOCKPILES SHALL BE SURROUNDED ON THEIR PERIMETERS WITH STAKED HAY BALES AND/OR SILTATION FENCES TO PREVENT AND/OR CONTROL SILTATION AND EROSION.

4. TOPS OF STOCKPILES SHALL BE COVERED IN SUCH A MANNER THAT STORMWATER DOES NOT INFILTRATE THE MATERIALS AND THEREBY RENDER THE SAME UNSUITABLE FOR FILL USE.

5. ALL DISTURBED OR EXPOSED AREAS SUBJECT TO EROSION SHALL BE STABILIZED WITH MULCH OR SEEDED FOR TEMPORARY VEGETATIVE COVER. WHERE CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED OR HAVE TEMPORARILY BEEN SUSPENDED FOR MORE THAN FOURTEEN DAYS, OR WHEN FINAL GRADES ARE REACHED IN ANY PORTION OF THE SITE, STABILIZATION PRACTICES SHALL BE IMPLEMENTED WITHIN THREE DAYS. AREAS WHICH REMAIN DISTURBED BUT INACTIVE FOR AT LEAST FOURTEEN DAYS SHALL RECEIVE TEMPORARILY SEEDING IN ACCORDANCE WITH MASSACHUSETTS DEP EROSION AND SEDIMENT CONTROL GUIDELINES. IN ALL CASES, STABILIZATION MEASURES SHALL BE IMPLEMENTED AS SOON AS POSSIBLE.

6. EARTHWORK ACTIVITY ON THE SITE SHALL BE DONE IN A MANNER SUCH THAT RUNOFF IS DIRECTED TO THE TEMPORARY DRAINAGE SWALES & SEDIMENT BASINS.

7. THE LOCATION OF TEMPORARY DRAINAGE SWALES AND SEDIMENTATION TRAPS SHALL BE REVISED AS REQUIRED AS CONSTRUCTION PROGRESSES

8. HAYBALES AND/OR FILTER BAGS SHALL BE PLACED AROUND CATCH BASINS AS REQUIRED DURING CONSTRUCTION.

9. ALL EROSION CONTROL MEASURES SHALL BE ROUTINELY INSPECTED OR A WEEKLY BASIS (ONCE EVERY SEVEN DAYS), CLEANED AND REPAIRED OR REPLACED AS NECESSARY THROUGHOUT ALL PHASES OF CONSTRUCTION. IN ADDITION, INSPECTION SHALL TAKE PLACE AFTER EACH RAINFALL EVENT. THE CONTRACTOR SHALL STRICTLY ADHERE TO THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) DURING CONSTRUCTION OPERATIONS.

10. ALL PROPOSED SLOPES (EXCLUDING RIP RAP SLOPES) STEEPER THAN 3H:1V SHALL BE STABILIZED WITH A CURLEX EROSION CONTROL MATTING BY AMERICAN EXCELSIOR COMPANY (OR EGINEER APPROVED EQUAL) PRIOR TO HYDROSEEDING AND PROTECTED FROM EROSION.

11. THE CONTRACTOR SHALL KEEP ON SITE AT ALL TIMES ADDITIONAL HAYBALES AND EXTRA SILTATION FENCING FOR INSTALLATION AT THE DIRECTION OF THE ENGINEER AND/OR CONSERVATION COMMISSION AGENT TO MITIGATE ANY EMERGENCY CONDITION.

12. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND PAYING FOR ANY PERMITS AND/OR CONNECTION FEES REQUIRED TO CARRY OUT THE WORK INCLUDING BUT NOT LIMITED TO DEMOLITION.

13. THE LIMIT OF WORK LINE FOR THE AREA TO BE CLEARED AND GRUBBED SHALL BE THE SAME AS THE LIMIT OF WORK LINE NECESSARY FOR GRADING PURPOSES, (I.E.., THE GRADING LIMITS AROUND THE PERIMETER OF THE PROJECT AREA).

14. THE AREA OR AREAS OF ENTRANCE AND EXIT TO AND FROM THE SITE SHALL BE CLEARED OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL AS DETERMINED BY THE ENGINEER OR OWNER'S REPRESENTATIVE.

15. THE AREA OR AREAS OF ENTRANCE AND EXIT TO AND FROM THE SITE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.

16. CATCH BASINS WHICH SERVE AS TEMPORARY SEDIMENT TRAPS MUST BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH RAINFALL EVENT. SEDIMENT WILL BE REMOVED FROM EACH BASIN WHEN SEDIMENT HAS ACCUMULATED TO WITHIN 1' BELOW THE INVERT ELEVATION OF THE OUTFALL PIPE.

17. UPON COMPLETION OF ALL SITE WORK CONSTRUCTION SITE CONTRACTOR SHALL INSPECT ALL ON-SITE CATCH BASINS, DRAINAGE SWALES, FOREBAYS, & THE DETENTION POND AND REMOVE ALL SEDIMENT AND TRASH DEBRIS THAT HAS ACCUMULATED WITHIN EACH STRUCTURE DURING THE COURSE OF CONSTRUCTION.

18. ALL CONSTRUCTION SHALL MEET OR EXCEED THE TOWN OF WAYLAND'S ENGINEERING DEPARTMENT SPECIFICATIONS.

19. ALL SLOPES EXCEEDING FIFTEEN (15) PERCENT RESULTING FROM THE SITE GRADING SHALL BE EITHER COVERED WITH SIX (6) INCHES OF TOPSOIL AND PLANTED WITH A VEGETATIVE COVER SUFFICIENT TO PREVENT EROSION OR BE STABILIZED BY A RETAINING WALL.

20. DUST CONTROL SHALL BE USED DURING GRADING OPERATIONS. DUST CONTROL METHODS SHALL CONSIST OF DAMPENING THE GROUND WITH WATER. IF WATER DOES NOT PROVIDE ADEQUATE DUST CONTROL, AN EMULSION SOIL STABLIZER SHALL BE APPLIED TO SUSCEPTIBLE SOILS.

21. THE CONTRACTOR SHALL BE AWARE THAT SOIL, GRADES AND WETLANDS PROXIMITY AT THIS SITE MAKE IT PARTICULARLY SUSCEPTIBLE TO SOIL EROSION AND SENSITIVE TO IT'S CONSEQUENCES. IT SHOULD BE NOTED THAT THE EROSION CONTROL MEASURES AS SHOWN ON THE DRAWINGS DEPICT THE MINIMUM REQUIRED CONTROL AND ARE REPRESENTATIVE OF A SINGLE STAGE OF CONSTRUCTION FOR EACH PHASE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SITING, RELOCATION AND AUGMENTATION OF EROSION CONTROL DEVICES AS THE PROJECT PROGRESSES AND SITE DRAINAGE CONDITIONS CHANGE.

22. THE CONTRACTOR SHALL ANTICIPATE AND MODIFY EROSION CONTROL MEASURES BASED ON PAST AND CURRENT WEATHER CONDITIONS, SEASON AND EXPECTED FUTURE CONSTRUCTION ACTIVITIES.

23. THE CONTRACTOR SHALL MINIMIZE THE AREA OF DISTURBED SOIL. EFFORTS SHALL BE MADE TO LIMIT THE TIME OF EXPOSURE OF DISTURBED AREAS.

24. THE CONTRACTOR SHALL AT HIS EXPENSE SURVEY AND MARK OUT IN THE FIELD THE LIMITS OF CLEARING (I.E. HAYBALE/SILTFENCE LINE) AND THE WETLAND BUFFER BOUNDARY FOR APPROVAL BY THE TOWN PRIOR TO COMMENCEMENT OF CLEARING AND GRUBBING ACTIVITIES.

25. THE CONTRACTOR SHALL NOTIFY THE TOWN'S PLANNING STAFF AND CONSERVATION AGENT AT LEAST 48 HOURS PRIOR TO COMMENCEMENT OF SITEWORK.

26. PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES AT THE SITE, THE CONTRACTOR SHALL ENGAGE AN INDIVIDUAL WITH SPECIFIC PROFESSIONAL TRAINING AND EXPERTISE IN EROSION AND SEDIMENT CONTROL. THE EROSION CONTROL MONITOR SHALL PREPARE A WEEKLY REPORT WHICH SHALL BE KEPT ON SITE AT ALL TIMES AND SHALL BE SHOWN TO LOCAL, STATE AND FEDERAL AGENTS UPON REQUEST. THIS REPORT SHALL INDICATE THE STATUS OF THE EROSION CONTROLS AND ANY MAINTENANCE REQUIRED AND PERFORMED. THIS REPORT SHALL CONFORM TO THE REQUIREMENTS OF THE EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT.

27. HAYBALE DIKES SHALL BE CONSTRUCTED AT ALL EXISTING & PROPOSED CATCH BASINS LOCATED IN FILL AREAS & SUBJECT TO STORMWATER RUN-OFF FROM PROPOSED FILL AREAS DURING CONSTRUCTION, OR AS DIRECTED BY THE OWNER/ENGINEER. NO SEDIMENTS SHALL ENTER THE ON-SITE DRAINAGE SYSTEM AT ANY TIME.

28. THE FOREBAY BASINS SHALL BE USED AS SEDIMENTATION BASINS THROUGHOUT CONSTRUCTION AND SHALL BE PERIODICALLY CLEANED DURING CONSTRUCTION, AND AT THE COMPLETION OF CONSTRUCTION. ALL TEMPORARY SWALES SHALL BE DIRECTED TO THE FOREBAY LOCATION WHEN POSSIBLE.

29. THE LOCATION OF HAYBALE CHECK DAMS SHALL BE FIELD VERIFIED DURING SITE PREPARATION OPERATIONS BY THE CONTRACTOR.

30. UPON COMPLETION OF ALL SITE WORK CONSTRUCTION SITE CONTRACTOR SHALL INSPECT ALL ON-SITE CATCH BASINS, DRAINAGE SWALES, FOREBAYS, & THE DETENTION POND AND REMOVE ALL SEDIMENT AND TRASH DEBRIS THAT HAS ACCUMULATED WITHIN EACH STRUCTURE DURING THE COURSE OF CONSTRUCTION.

Post Construction Schedule

1. A checklist of all maintenance items will be developed and used for each stormwater treatment component. Each time an inspection is completed or a maintenance procedure is performed, it will be documented on the checklist. The checklist will be kept on the project site.

2. The property owner will be financially responsible for the implementation of this plan and for future system repairs as needed.

3. Sweep parking lot and driveway areas to remove sediments before they can enter the stormwater management system, twice annually, in the early spring and late fall, and on an as needed basis at other times.

4. Inspect and clean deep sump catch basins including the oil/grease traps to prevent blockage and to remove accumulated sediments on an annual basis in the spring and in general if the depth of accumulated sediment is greater than one-half the depth of the sump.

5. Inspect and clean water quality swales and rain gardens an annual basis in the spring and on an as needed basis at other times.

6. Inspect and clean bioretention basins an annual basis in the spring and on an as needed basis at other times.

7. Inspect dumpster and compactor areas for spillage and clean as necessary.

8. Inspect landscape areas and edges of paved areas for any signs of erosion. Perform any necessary curb replacement, earth repair, reseeding or mulching upon identification.

9. Routinely pick up and remove litter from the parking areas and perimeter landscape areas. Clean leaves or trash from catch basin grates when observed.