Appendix A

CORRESPONDENCE

4 Deer Trail
Cornwall, New York 12518
845 534 3816 [tel]
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info@groundwatergeology.com

SSEC Inc.

Memo

To: Fred Wells / Tim Miller Associates, Inc.

From: Sergio Smiriglio

Date: November 11, 2005

Re: Fairgrounds Wetlands/Well Interconnection

You requested that I respond to the concerns that have been raised about the possible interconnection between the bedrock aquifer that is tapped by the two project wells and the site and offsite wetlands. Towards that end I requested that the four wetlands points (WP) and the two production wells be surveyed using a common datum so that the water levels taken from all points could be compared. If the water levels are found to be "similar" between the wells and the wetlands points, a possibility can exist that the two systems are interconnected. However, if the water levels for the wells and the wetlands are significantly different, it is very unlikely that the two systems are directly interconnected.

The table below shows the results of the water level survey. It is clear from the data that the water table elevation at each of these points is directly related to the land surface elevation and is not part of a regional water table aquifer. The bedrock aquifer water level differs in elevation from the surface water level by as much as 14 feet. Such a difference indicates that there is limited, if any, connection between the bedrock [artesian] aquifer and the surface water monitored by the wetland points. If a direct connection existed we would expect to see that the water level readings from all of the points to be similar.

Point	Ground Elevation	*Top of Casing*	*Depth to Water*	*Water Level*
Well 1	**599**	600.7	32.3	568.4
Well 2	**599.8**	601.4	33.1	568.3
WP 1	**554.3**	555.9	1.2	554.7
WP 2	**561.7**	562.4	0.6	561.8
WP 3	**564**	564.8	0.95	563.85
WP 4	**562**	563.4	1.24	562.16

ERS CONSULTANTS, INC.
ENVIRONMENTAL RESOURCE SPECIALISTS

February 23, 2006

Ms. Robyn Niver
United States Department of the Interior
US Fish and Wildlife Service
3817 Luker Road
Cortland, NY 13045

RE: Fairgrounds Project – Bog Turtle Issues

Dear Ms. Niver:

We are writing to summarize the latest revisions made to the development plans for the Fairgrounds project (the "Project") in Warwick, New York (the "Site"). The Site is bound by wetlands on the east and west – a New York State Department of Environmental Conservation ("NYSDEC") regulated wetland on the east ("Wetland A"), and a U.S. Army Corp of Engineers ("ACOE") regulated wetland to the west ("Wetland D"). As you are aware, the U.S. Fish and Wildlife Services ("USFWS") submitted initial comments on the Project's potential impacts to bog turtles in the area to the Town in the summer of 2005. The project developer, Fairgrounds, LLC (the "Developer"), in response to these comments, amended the Project to include a 100' buffer area around each of the on-site wetlands in which no development would occur. (See November 28, 2005 letter from Tim Miller Associates and enclosures thereto.) We now write to respond to certain concerns you raised based on your review of those revisions and your October 18, 2005 visit to the Site.

Landscape Plan

Consistent with your request, the landscape plan has been re-designed to provide for plantings of certain native species within the buffer areas to be established around Wetlands A and D, which would further reduce and/or prevent potential indirect impacts of adjacent development on wetland resources. Two copies of the revised Landscape Plan are enclosed for your review.

11 Forester Avenue, Warwick, New York 10990 • info@ersconsultants.com
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Currently, the adjacent areas are in various stages of succession and differing categories of land use. The buffer area to be created around Wetland D consists mostly of agriculture field with annual tillage, planting and harvest. The buffer area to be created in the vicinity of Wetland A is covered with naturalized old-field type vegetation and used primarily as a hay field with an annual to biennial harvest period. The Developer proposes to establish plantings of the species listed below to enhance the effectiveness of the buffer areas' function as an ecological barrier from development impacts for the wetlands as well as downstream resources.

Ten species of native tree and shrub will be planted adjacent to and within the wetland adjacent areas (see Table 1). Native species were selected to prevent unwanted invasion of invasive and/or exotic species into the wetlands.

Planting arrangements were designed to form a permeable barrier between the developed portion of the property and the adjacent areas and wetlands. This barrier is meant to prevent human encroachment upon the adjacent area during facility maintenance and to deter wildlife from moving into the developed portion of the property and/or the road during annual migrations and episodic dispersal. However, barrier permeability will allow fauna to pass through without restraint. Additionally, trees planted along the stream running through Wetland D will provide cooling shade and bank stability to the stream. Plantings will also provide protection from sedimentation of the stream and associated wetlands during construction and prior to the establishment of a natural vegetation community.

Table 1. Native trees and shrub species incorporated in the transition area plantings

Common name	Scientific name
shadblow serviceberry	Amelanchier canadensis
silky dogwood	Cornus amomum
gray dogwood	C. racemosa
redtwig dogwood	C. sericea
American sycamore	Platanus occidentalis
swamp white oak	Quercus bicolor
staghorn sumac	Rhus typhina
common elderberry	Sambucus canadiensis
witherod viburnum	V. cassinoides
arrowood viburnum	Viburnum dentatum

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Snow Removal

In order to prevent snowmelt from entering the wetlands systems, the Grading & Utility Plan (Sheet 4) for the Project, prepared by Lehman & Getz, P.C., was revised to include designated snow storage areas and several requirements related to snow storage and removal. (Two copies of this Plan are enclosed herewith.) These requirements were added to the site plan to provide additional mitigation for water quality impacts during the long-term operation of the commercial facility.

As indicated on the plan in Note #1B, all of the proposed pavement areas will drain to a piped drainage system that leads to a dry swale, organic filter, bioretention area, or pocket pond. Each of these stormwater management measures will provide for removal of particulates and other pollutants from snowmelt by settling and/or filtration. The proposed perimeter curbing will prevent any runoff or snowmelt from the paved surfaces from flowing into the vegetated areas beyond the pavement. In addition, Note #3 was added to specify that once the designated stockpile areas are full, additional snow collected on-site must be removed.

The Developer will require the snow removal contractor to sign a contract that includes the specific requirements specified on the Grading & Utility Plan.

Water Quality

In order to assess potential impacts to the wetlands systems, surface water sampling will be conducted as follows: once prior to any site construction; annually during site construction; and tri-annually (once every three (3) years for a period of nine years) after construction has been completed.

Water sampling will be conducted within the intermittent stream flowing along the western property boundary and through Wetland D. As depicted in the map attached hereto as Exhibit 1, sampling along the stream will occur where the stream enters the site (WQ1) to determine the quality of water entering the project area. To assess the quality of water leaving the site, a sample will be collected at a point along the northwest edge of the property (WQ2). Sampling will also be conducted along the eastern property boundary within the center (WQ3) of Wetland A to assess the quality of water leaving the site. Samples would be collected from both wetlands on the same day. All water sampling would occur during the later half of June. Samples will be collected under normal weather conditions when possible, before any large rain events or a significant time after a large rain event, so as to be representative of normal stream conditions.

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Quality assurance measures will be implemented, including laboratory Standard Operating Procedures (SOPs), sample bottle preparation, equipment decontamination, sample preservation and handling, and chain of custody forms.

The following analyses will be performed by a New York State Certified Laboratory: US Environmental Protection Agency (USEPA) Method 418 for Total Petroleum Hydrocarbons (TPH); USEPA Method 8151 for Herbicides; USEPA Method 8081 for Organochlorine Pesticides; USEPA Method 8082 for PCB's; USEPA Method 200 for Heavy Metals; USEPA Method 8270 for Semi-Volatile Organic Contaminants; and USEPA Method 8260 for Volatile Organic Contaminants.

Plant Monitoring

As discussed, plant monitoring is proposed both on- and off-site to monitor wetland vegetation, associated water table, and the plantings to be implemented by the Developer. The two main objectives of such monitoring are to:

1. Monitor water table and wetland vegetation community (richness, composition and structure) before site construction, during construction and for a period of ten years after construction and generate data to better ensure the function and integrity of on-site wetlands; and
2. Monitor wetland buffer plantings for a period of five years to determine whether the plantings successfully are established.

Such monitoring will include the following:

- Vegetation and groundwater will be sampled annually in the month of July. The success of wetland buffer plantings will be determined by annual survey of plant mortality/survival.

- Four 3 x 3 meter permanent plots will be placed in Wetlands A and D within the Fairgrounds property, for a total of eight sample plots. Outside of the Fairgrounds property, six plots will be established in areas identified as potential or actual bog turtle habitats – three in the wetland northeast of the northeastern property corner and at least three within the bog turtle habitat located west of the Fairgrounds property.

- Species richness, height and percent cover will be sampled to determine the community richness, composition and structure of vegetation within the plots. To sample species richness, Fairgrounds will census and enumerate plant species present within each plot. Graminoids will be identified to genus. Structure of the vegetation community will be sampled by measuring the

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maximum height of the herbaceous, shrub and tree layers. Dominance within the different vegetation layers will be sampled by estimating the percent area covered by vegetation within each of these layers to the nearest 25 percent (i.e., 100, 75, 50, 25 and 0).

- The depth to water table will be sampled concurrently with the vegetation and opportunistically during other scheduled sampling. Lysimeters will be installed in the center of the study plots to measure depth to the water table within the wetlands. Lysimeters will be 3.5 m lengths of ~5.75 cm (2.5 in) PVC piping with capped and drilled bottoms sunk at least 0.60 m below the surface.

Bog Turtle Monitoring

The objective of the bog turtle monitoring would be to monitor the population status of bog turtles and potential bog turtle habitat in the vicinity of the Fairgrounds property and to generate data for bog turtle habitat management and restoration. Monitoring will occur during construction and for a period of ten years after construction has been completed.

On-site Wetlands A and D will be surveyed for bog turtles annually as per the methodology specified in the USFWS Bog Turtle Northern Population Recovery Plan (USFWS, 2001). The survey protocol will consist of actively searching (muddling) potentially suitable areas of Wetlands A and D between April 15 and June 15. Surveys will be conducted when air and water temperatures are at least 55° F and between 9:00 and 17:00 hours. Surveys will not be conducted when cloud cover is greater than 50 percent or immediately following significant rain events. One to three surveyors will conduct each survey. There will be at least four surveys per annum with two or more surveys occurring in May. Surveys will be separated by three or more days during the first half of the survey period and six or more days during the second half. Survey effort will consist of a minimum of three person-hours per acre per wetland visit. Weather, date, time and duration of survey and the names of surveyors will be recorded for each survey visit.

Additional trapping surveys will be conducted in off-site potential bog turtle habitat to the northeast of the site and in documented bog turtle habitat northwest of the Fairgrounds site. Permits will be obtained from the NYSDEC prior to trapping. Trapping surveys will be conducted every three years between April 15 and June 15. Trapping effort will be 100 trap days (20 traps x 5 days) in the northwestern bog turtle habitat and 50 trap days (10 traps x 5 days) in potential habitat northeast of the Fairgrounds property. Traps will be set daily by 9:00 hours and checked and closed daily between 16:00 and 17:00 hours. Traps will

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be concealed and shaded by vegetation and placed so that they are not submerged.

If turtles are located, they will be photographed, weighed and measured (plastron length and width). Additionally, habitat data, location, and the presence of distinguishing marks will be recorded. Following data collection all turtles will be returned to the exact point of capture. All data will be shared with both NYSDEC and USFWS.

Conclusion

These latest revisions to the Project and the enhancements to the Developers' commitments to protect bog turtles and their habitat off-site in addition to the previously submitted modifications to the Project, will protect both on-site wetlands and downstream resources. As the current proposal complies with both USFWS and NYSDEC requirements for the protection of bog turtles and their habitat, we respectfully request a determination that the Project will not have any significant adverse impacts to bog turtles or their habitat and that all practicable mitigation measures have been implemented. We look forward to finalizing this matter so that the Project may move forward in the planning process.

Very truly yours,
ERS Consultants, Inc.

David Griggs
Senior Wildlife Biologist

cc: A. Goddard, Fairgrounds, LLC (w/o attach)
M. Chertok, Sive, Paget & Riesel (w/o attach)

Mar. 1. 2006 5:02PM GODDARD DEVELOPMENT 845-534-0101 No.4668 P. 7/7

Faxed 04/18/06

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

April 18, 2006

Mr. David Griggs
Senior Wildlife Biologist
ERS Consultants, Inc.
11 Forester Avenue
Warwick, NY 10990

Dear Mr. Griggs:

This is in regards to the proposed 47.5-acre Fairgrounds project located along NYS Route 94 in the Town of Warwick, Orange County, New York. The proposed project includes an automobile dealership, grocery store, bank or other commercial building, associated parking facilities, and a wastewater treatment plant. The U.S. Fish and Wildlife Service (Service) previously provided comments regarding potential impacts to Federally-listed species from the proposed project in our July 7, 2005, letter to Mr. Benjamin Astorino, Chairman of the Town of Warwick Planning Board. In addition, Ms. Robyn Niver of this office attended a visit of the site on October 18, 2005. Our comments and the purpose of the site visit were focused on determining whether the project has the potential to impact the Federally-listed threatened bog turtle (*Clemmys muhlenbergii*). We also provided comments regarding the potential for the project to impact the Federally-listed endangered Indiana bat (*Myotis sodalis*). We understand the proposed project has been modified, partially as a result of the concerns stated in our letter and at the site visit. We received written confirmation of these changes in a package dated November 28, 2005, from Mr. Frederick Wells, of Tim Miller Associates, Inc. to the Service, and in your letter to the Service dated February 23, 2006.

Based on our current understanding of the proposed project, we offer the following comments as technical assistance pursuant to the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) for your consideration.

Federally-listed Species

Except for the bog turtle, the potential for Indiana bats, and occasional transient individuals, no other Federally-listed or proposed endangered or threatened species under our jurisdiction are known to exist in the vicinity of the project area. In addition, no habitat in the project area is currently designated or proposed "critical habitat" in accordance with provisions of the ESA. The most recent compilation of Federally-listed and proposed endangered and threatened species in New York* is available for your information. If the proposed project is not completed within 90 days from the date of this letter, we recommend that you check our website* to ensure that listed species presence/absence information for the proposed project is current.

Indiana bat

As mentioned in our July 7, 2005, letter, there is potential for the Indiana bat to occur within the proposed project area, which is less than 5 miles from a known capture site and approximately 46 miles from known hibernacula in Ulster County. However, it appears that most of the proposed disturbance will occur within open field habitats and impacts to Indiana bats are unlikely.

Bog turtle

In addition to the potential for the Indiana bat, the Federally-listed threatened bog turtle is known to occur off-site within a wetland contiguous with the proposed project area and at other sites within the Wawayanda Creek system. The Bog Turtle Assessment (ERS Consultants, Inc. 2005) describes potential habitat off-site in both larger wetlands to the northwest and northeast (wetlands A and D in the Bog Turtle Assessment), but no potential habitat in any of the project area wetlands where direct impacts could occur from project construction. Our July 7, 2005, letter described potential adverse impacts to bog turtles that could be associated with the proposed project such as, but not limited to, fragmentation of habitat and alterations to bog turtle dispersal routes; introduction of contaminated surface water runoff into the wetland (from pesticides, herbicides, fertilizers, road deicers, etc.); reductions in groundwater recharge; and death/injury of bog turtles that wander onto lawns and roads.

We have reviewed the information provided to our office and offer the following comments by category of potential impact.

Potential Direct Effects

Wetland degradation

Construction activities could result in temporary wetland degradation. However, the applicant is implementing best management practices (*e.g.*, stabilizing topsoil stockpiles and directing runoff into water quality basins to trap sediment during construction) as described in the project's Draft Stormwater Pollution Prevention Plan (Tim Miller Associates, Inc. 2005). Therefore, we do not anticipate adverse impacts to bog turtles in the form of harm through temporary degradation of wetland habitat.

Turtle injury or death

Construction activities within potential bog turtle habitat could result in direct take of bog turtles in the form of killing, wounding, or injuring. Wetland disturbances are proposed in areas that are not considered "classic bog turtle habitat" (wetlands B and C), however, these areas are in fairly close proximity to wetlands that have been identified as providing suitable habitat for bog turtles. Therefore, we offer the following recommendations for the project sponsor to consider:

1. A qualified bog turtle monitor should be present during all construction activities within wetlands B and C to ensure that there are no bog turtles within the work area;

2. A silt fence should be installed to exclude turtles from the work area; and

3. Any turtles found in the work area should be moved by a qualified monitor to suitable habitat outside the work area. Please contact the New York State Department of Environmental Conservation (NYSDEC) for necessary permits (contact information below).

Potential Indirect Effects

Turtle injury or death

The applicant has proposed the following conservation measures: 100-foot vegetated buffer around wetlands A and D to deter human encroachment during maintenance activities at the site; use of a wildlife underpass located between the wooded upland knoll and wetland D; and use of double-sided high curbs to prevent turtle access to paved areas and to funnel them to the wildlife underpass. In addition, as several years of Phase 2 surveys did not result in any observations of bog turtles using wetlands A or D on-site, it appears that while there is potential for bog turtle presence within the disturbance footprint, the likelihood appears low.

Altered wetland hydrology from wells and stormwater management

The proposed project includes two deep bedrock wells. The November 11, 2005, memo from Mr. Sergio Smiriglio, of PPEC Inc., to Mr. Frederick Wells, of Tim Miller Associates, Inc., describes no hydrologic connection between the well and wetlands within the project area. Therefore, we do not anticipate adverse impacts to bog turtles in the form of harm through long-term alteration of wetland hydrology by use of the proposed well.

We understand that existing (pre-project) stormwater drainage patterns have been maintained but concentrated into swales and basins for treatment. In addition, the Drainage Report (Lehman & Getz 2005) explains that post-development peak discharge has generally been modeled as slightly less than pre-development, while groundwater recharge volumes are preserved. Therefore, it appears that adverse impacts to bog turtles due to altered wetland hydrology are unlikely.

Wetland degradation due to stormwater runoff

We understand the proposed project includes the following conservation measures: use of dry swales, pocket ponds, bioretention areas, and organic filters, associated with five stormwater basins, and pipe to convey stormwater; reduction of parking areas from 195,000 square feet to 166,300 square feet; removal of an existing driveway within the 100-foot wetland buffer; planting native vegetation within the 100-foot buffers; storage of snow in designated areas where meltwater will go through stormwater treatment; removal of snow from the site once the designated stockpile areas are full; relocation of the sewage treatment plant to discharge through a vegetated swale into the eastern wetland buffer area; and monitoring of water quality, wetland vegetation, and bog turtles to ensure effectiveness of conservation measures.

It appears that adverse impacts to bog turtles due to wetland degradation from changes in surface water quality are unlikely. In addition, the proposed project includes monitoring of water quality, wetland vegetation, and bog turtle population information to further evaluate effectiveness of the proposed project's conservation measures. We request that you provide annual monitoring reports to both the Service and the NYSDEC. We recommend that you submit the proposed monitoring plans to the NYSDEC for their review and comment.

Dispersal impediments from roads and structures

See our discussion of conservation measures proposed to avoid turtle injury or death.

Endangered Species Act Prohibitions

Adverse effects that reach the level of "take" are prohibited under Section 9 of the ESA, unless exempted by a permit. The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Harm is defined as an act which actually kills or injures wildlife; harm may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR Part 17.3). It can be difficult to link development in adjacent upland habitats to impacts to a long-lived, cryptic wetland species, such as the bog turtle. However, based on our current understanding of the project's potential impacts, as well as bog turtle use of wetlands in the area, the likelihood of take appears minimal. In addition, the proposed project includes wetland water quality monitoring (pre- and post-construction), as well as monitoring of wetland vegetation and the bog turtle population to ensure effectiveness of conservation measures, and assist the Service with better understanding how to avoid impacts to bog turtles from future developments. Please note that this technical assistance does not constitute authorization to take bog turtles by any party including project contractors or property owners.

As you are aware, the Indiana bat and bog turtle are listed as endangered by the State of New York. Any additional information regarding the proposed project and the potential for impacts to these species should be coordinated with both this office and with the NYSDEC. The NYSDEC contact for the Endangered Species Program is Mr. Peter Nye, Endangered Species Unit, 625 Broadway, Albany, NY 12233 (telephone: [518] 402-8859).

Finally, should project plans change, or if new information reveals effects of project construction and/or commercial area operation that may impact bog turtles in a manner or to an extent not previously considered, you should contact us for further technical assistance.

Thank you for your time. We appreciate the cooperative spirit and patience of the project sponsor throughout the past several months while working with the Service, NYSDEC, and others to develop conservation measures designed to avoid impacts to the bog turtle. If you require additional information please contact Robyn Niver at (607) 753-9334. Future correspondence with us on this project should reference project file 51550.

Sincerely,

David A. Stilwell
Field Supervisor

*Additional information referred to above may be found on our website at:
http://www.fws.gov/northeast/nyfo/es/section7.htm

References:

ERS Consultants, Inc. March 2005. Bog Turtle Assessment on a 47.5 +/- acre site in the Town of Warwick, County of Orange, State of New York. ERS Consultants, Inc., Warwick, New York.

Lehman & Getz, P.C. November 28, 2005. Drainage Report - The Fairgrounds, Town of Warwick, Orange County, New York. Lehman & Getz, P.C., Warwick, New York.

Tim Miller Associates, Inc. November 2005. Draft Storm Water Pollution Prevention Plan. Tim Miller Associates, Inc., Cold Spring, New York.

cc: Goddard Development Partners, LLC, Mountainville, NY (Attn: A. Goddard)
Town of Warwick, NY (Planning Board; Attn: B. Astorino)
Tim Miller Associates, Inc., Cold Spring, NY (Attn: F. Wells)
NYSDEC, New Paltz, NY (Attn: S. Joule/S. Sheeley)
NYSDEC, Albany, NY (Endangered Species; Attn: P. Nye)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

July 7, 2005

Mr. Benjamin Astorino
Chairman
Town of Warwick Planning Board
132 Kings Highway
Warwick, NY 10990

Dear Mr. Astorino:

This is in regards to the proposed Fairgrounds supermarket and auto dealership off of New Milford Road in the Town of Warwick, Orange County, New York. The following comments are provided as technical assistance pursuant to the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). This does not preclude additional U.S. Fish and Wildlife Service (Service) comments under other legislation.

We received a copy of your May 4, 2005, letter to Mr. Alexander Ciesluk, Jr., of the New York State Department of Environmental Conservation (NYSDEC) regarding the potential for the proposed project to impact the Federally-listed threatened bog turtle (*Clemmys muhlenbergii*). Based on this letter, Ms. Robyn Niver, of this office, contacted Tim Miller Associates, Inc., to request a copy of the Bog Turtle Assessment (ERS Consultants, Inc. 2005) and the Final Environmental Impact Statement (FEIS) (Tim Miller Associates, Inc. 2005).

After reviewing the Bog Turtle Assessment and FEIS, we realized that staff from this office were coordinated with in 1999 and 2000; however, we are unable to locate any records regarding the proposed project. Therefore, our comments are based on our current understanding of the proposed project area using information from the Bog Turtle Assessment and FEIS. We understand that the bog turtle is known to occur off-site within one of the same contiguous wetlands found within the proposed project area. The Bog Turtle Assessment describes potential habitat off-site in both larger wetlands to the northwest and northeast but no potential habitat within the proposed project area. However, Phase 2 surveys were conducted within the wetlands in 2000, 2002, and 2004. In general, we do not recommend Phase 2 surveys for habitat that does not appear suitable for bog turtles, as we would not expect to find them in completely unsuitable habitat. In addition, we do not recommend Phase 2 surveys for wetlands with <u>known</u> records of bog turtles, as the surveys are an attempt to determine presence or probable absence of the species. When we already have documented presence, Phase 2 surveys are unnecessary. We understand that the applicant chose to do the Phase 2 surveys for their own information due to a high level of interest in the proposed project.

We understand that no bog turtles were located within the proposed project area in any year of surveys. However, we consider the northwestern wetland an occupied bog turtle site. Therefore,

the negative results from the Phase 2 surveys do not lessen our concerns about potential indirect effects (*e.g.*, changes in water quality or quantity) to this wetland and the bog turtles known to occur within it. In addition, while no bog turtles were captured in the northeastern wetland, it is in close proximity to known bog turtle sites and does have the potential to be used by bog turtles based on its habitat characteristics. Proper implementation of the Phase 2 survey protocol is usually adequate to determine species presence or probable absence. However, if the quality and quantity of habitat are good and are in a watershed of known occurrence, additional surveys may be necessary to determine bog turtle use of a particular wetland. We understand that 3 years of surveys were completed within this wetland, and, therefore, the likelihood of bog turtle use appears to be low. However, as stated above, based on the location and characteristics of the wetland, the site could be used by bog turtles and we would recommend treating the wetland as occupied. Changes in any part of the wetland system could have impacts on the suitable habitat for bog turtles found off-site.

Adverse impacts associated with this project could include, but are not limited to, fragmentation of habitat and alterations to bog turtle dispersal routes; introduction of contaminated surface water runoff into the wetland; reductions in groundwater recharge; and death/injury of bog turtles that wander onto lawns and roads. The Bog Turtle (*Clemmys muhlenbergii*) Northern Population Recovery Plan (U.S. Fish and Wildlife Service 2001) (Appendix A - Bog Turtle Conservation Zones) includes recommendations for minimum buffers for various activities. You can find this document at http://nyfo.fws.gov/es/btconszone.pdf; we have enclosed a copy for your convenience. Generally, the larger the upland buffer, the lower the risk of many of these potential adverse affects. However, some of the effects may not be adequately addressed by buffers. We recommend a minimum of a 300-foot buffer around both the western and eastern wetlands within the proposed project area to address potential water quality impacts.

In addition to the bog turtle, there is potential for the Federally- and State-listed endangered Indiana bat (*Myotis sodalis*) to occur within the proposed project area. However, based on the limited amount of forested habitat disturbance (~0.2 acres), we do not anticipate any adverse impacts to Indiana bats, should suitable habitat and the species be present.

Except for the bog turtle, the potential for the Indiana bat, and occasional transient individuals, no other Federally-listed or proposed endangered or threatened species under our jurisdiction are known to exist in the project area. In addition, no habitat in the project area is currently designated or proposed "critical habitat" in accordance with provisions of the ESA. Should project plans change, or if additional information on listed or proposed species or critical habitat becomes available, this determination may be reconsidered. The most recent compilation of Federally-listed and proposed endangered and threatened species in New York* is available for your information. If the proposed project is not completed within one year from the date of this letter, we recommend that the project proponent contact us to ensure that the listed species presence/absence information for the proposed project is current.

The bog turtle and Indiana bat are listed as endangered by the State of New York. Any additional project information should be coordinated with both this office and with the NYSDEC. The NYSDEC contact for the Endangered Species Program is Mr. Peter Nye, Endangered Species Unit, NYSDEC, 625 Broadway, Albany, NY 12233 (telephone: 518-402-8859) or Mr. Steven Joule, NYSDEC, 21 South Putt Corners Road, New Paltz, NY 12561 (telephone: 845-256-3089).

We understand that the current site plan does not include direct impacts to wetlands under Federal or State jurisdiction within the project area. Should project plans change, work in certain waters of the United States, including wetlands, may require a permit from the U.S. Army Corps of Engineers (Corps). If a permit is required, in reviewing the application pursuant to the Fish and Wildlife Coordination Act, the Service may concur, with or without recommending additional permit conditions, or recommend denial of the permit depending upon potential adverse impacts on fish and wildlife resources associated with project construction or implementation. The need for a Corps permit may be determined by contacting the appropriate Corps office(s).* In addition, should any part of the proposed project be authorized, funded, or carried out, in whole or in part, by a Federal agency, such as the Corps, further consultation between the Service and that Federal agency pursuant to the ESA may be necessary.

In summary, we have concerns about potential impacts to the bog turtle and wetlands. We recommend that the Town Planning Board require additional coordination among the appropriate consulting firms, involved Federal agencies (if any), the applicant, NYSDEC, and the Service regarding these potential impacts. Thank you for your time. If you require additional information please contact Robyn Niver at 607-753-9334. Future correspondence with us on this project should reference project file 51550.

Sincerely,

David A. Stilwell
Field Supervisor

Enclosure

*Additional information referred to above may be found on our website at:
http://nyfo.fws.gov/es/section7.htm

References:

ERS Consultants, Inc. March 2005. Bog Turtle Assessment on a 47.5 +/- acre site in the Town of Warwick, County of Orange, State of New York. ERS Consultants, Inc., Warwick, New York.

Tim Miller Associates. January 19, 2005. Final Environmental Impact Statement The Fairgrounds. Town of Warwick, Orange County, New York. Tim Miller Associates, Inc., Cold Spring, New York.

U.S. Fish and Wildlife Service. 2001. Bog Turtle (*Clemmys muhlenbergii*), Northern Population, Recovery Plan. Hadley, Massachusetts. 103 pp.

cc: Tim Miller Associates, Inc., Cold Spring, NY (Attn. F. Wells)
NYSDEC, New Paltz, NY (Attn: S. Joule/A. Ciesluck)
NYSDEC, Albany, NY (Endangered Species; Attn: P. Nye)
COE, New York, NY

TOWN OF WARWICK

132 KINGS HIGHWAY
WARWICK, NEW YORK 10990

TOWN HALL TELEPHONE (845) 986-1124
POLICE DEPT. TELEPHONE (845) 986-3423
PUBLIC WORKS TELEPHONE (845) 986-3358
TOWN HALL FAX (845) 986-9908
SUPERVISOR supervi@warwick.net
TOWN CLERK townclk@warwick.net

5/4/2005

Alexander F. Ciesluk, Jr., Deputy Permit Administrator
New York State Department of Environmental Conservation
21 South Putt Corners Road
New Paltz, NY 12561

Re.: *The Fairgrounds Proposed Supermarket & Auto Dealership*
DEC No. 3-3354-00433/00003
Town of Warwick, Orange County

Dear Mr. Ciesluk:

The Town of Warwick Planning Board has been acting as the State Environmental Quality Review Act Lead Agency for the review of the above proposed development. The action consists of development of 17.4 acres of land with approximately 82,750 square feet of new retail development, paved parking for 834 vehicles and a sewage treatment plant on a 47.5 acre site. State and Federal wetlands are found on and surrounding the site; on-site wetland areas consist of approximately 20.29 acres of the site. We are writing to the Department as a SEQR Involved Agency and are specifically seeking the input of the Department with regard to Bog turtles, which have been identified in such wetland areas.

The SEQR public comment period on the Draft Environmental Impact Statement (DEIS) was held from January 19, 2005 until February 28, 2005. While the comment period has closed, the Planning Board required the applicant to provide a full copy of their Bog Turtle Assessment report for the Board and Department's review. This report was summarized in the DEIS but was not provided for public review. Our consultants have now completed their review of the report and have asked for clarifications and additional information. I enclose their comments. The Planning Board would like to know whether the Department has any comments or concerns with the Bog Turtle Assessment report before proceeding with adoption of a Final Environmental Impact Statement. We would appreciate that any comments your Department may have to be forwarded to my attention as soon as possible. Thank you for your attention to this matter.

For the Town of Warwick Planning Board,

Benjamin Astorino

Benjamin Astorino, Chairman

Cc: New York Field Office, US Fish & Wildlife Service
Fairgrounds LLC
J. Theodore Fink, AICP
Zenon Wojcik, P.E.
John Bollenbach, Esq.

Enclosure: Hickory Creek Bog Turtle Assessment Review

Hickory Creek Consulting LLC

Karen Schneller-McDonald
25 Carriage Drive
Red Hook, New York 12571

845 758-2369
katykill@frontiernet.net

Bog Turtle Assessment Review
Fairgrounds Site, Town of Warwick
April, 2005

These comments are based on review of the Bog Turtle Assessment report (March 2005) provided by ERS Consultants. The review was conducted using the Bog Turtle Northern Population Recovery Plan (USFWS, May 2001) as the standard for evaluation.

1. On p.ii the Assessment discusses Natural Heritage Program/DEC record of bog turtles found adjacent to the project site, to the northwest and northeast, and within the same watershed and wetland complex as found on the project site. The assessment states that habitat onsite is not suitable, but doesn't clarify for which part of the turtles' life cycle. The Recovery Plan notes that a habitat mosaic is used by bog turtles; certain habitats are used for different purposes. This was not specifically described in the Assessment as it pertains to the project site. Because turtles are present in other portions of the Wawayanda Creek watershed, what is the potential for turtle use of the project site, even if only at certain times of the year or on an occasional basis?

2. Regarding the Phase 2 surveys described in the Recovery Plan; the information provided in the Assessment does not include dates/hours spent in the field at each of the potential sites identified on pages 23 and 24. The Recovery Plan (page B-4) specifies that "Survey time should be three (3) to six (6) person-hours per acre of wetland per visit. Both random opportunistic searching and transect surveys should be used at each wetland." This information is not documented in the Assessment. Also, the Recovery Plan specifies that four surveys per wetland should be conducted, and that two of these must occur in May. The first Phase 2 assessment was conducted before the Recovery Plan was published (May, 2001), which might account for these differences. However, surveys subsequent to 2001 should meet these field survey criteria, and this should be clearly described in the Assessment.

The Assessment did not describe these surveys in sufficient detail to ascertain either the number of person-hours spent searching each wetland area, or the areal extent of any transect surveys, or even the approximate locations (on a map) of the turtle traps. Without the inclusion of this information in the Assessment, the completeness of the

Phase 2 surveys on this site is still in question, even though these surveys were conducted over the course of several years.

3. The Assessment does not include a description of the potential use of the project site by turtles within the Wawayanda Creek watershed- including use of habitat on the project site even though that habitat may not be optimal. This broader use of a habitat matrix is documented in the Recovery Plan, which states on page 20:
" Protected areas are usually relatively small and, although encompassing the turtle's primary habitat, leave the drainage basin largely unprotected. Therefore, although the core habitat may be protected, these wetland drainage basins are vulnerable to a host of external factors, including subdivisions, wells, and road construction activities. These activities ma alter both the supply and quality of the water entering the turtle's habitat and impede the dispersal of turtles within a drainage basin. Ultimately, external activities at the landscape level can greatly diminish the suitability of any one wetland to support bog turtles."
Since this would have the potential to affect the configuration of development on the project site, it should be discussed in the Assessment. The potential presence of bog turtles on the Fairgrounds property, or, as noted in the Recovery Plan, the presence of turtles in any portion of the watershed, will affect other issues including stormwater management practices, water supply and quality issues, and wetland buffers.

TIM
MILLER
ASSOCIATES, INC.

10 North Street, Cold Spring, New York 10516 *Phone (845) 265-4400* *Fax (845) 265-4418*

November 28, 2005

Ms. Robyn Niver
US Fish & Wildlife Service
3817 Luker Road
Cortland, NY 13045

RE: The Fairgrounds Project, Town of Warwick NY
USFWS File #51550

Dear Ms. Niver:

As a follow up to the discussions with the Project Sponsor during the October 18, 2005 site walk at the Fairgrounds site, we enclose a revised project plan and accompanying materials for your information and review. Your comments on that day were very helpful to the project team in formulating measures to provide significant protections for the bog turtle and the local wetland environment.

Enclosed are the following materials:

- Summary of Plan Conformance with Bog Turtle *Recovery Plan*
- Site Plans, as revised November 2005
- Stormwater Drainage Report, as revised November 2005
- Draft Storm Water Pollution Prevention Plan, as revised November 2005
- Memo re. Wetlands/Well Interconnection by S. Smiriglio, Hydrogeologist, dated Nov. 11, 2005
- Bog Turtle Assessment by ERS Consultants Inc., March 2005

The Project Sponsor acknowledges its duty and desire to develop this project responsibly, and to mitigate the project's effects on environmental resources to the greatest extent practicable. It feels that these objectives will be met by implementing the proposed project changes detailed in the attachments, through which it has been revised including a 100' absolute buffer from wetlands and extensive water quality improvements that leave water quality and quantity virtually unaffected as compared with the existing conditions.

The Project Sponsor believes the improvements made to the project plan eliminate any potential impacts from the project on any potential off-site bog turtle habitat and the plan now accomplishes the objectives of the bog turtle *Recovery Plan*. As such, the Sponsor feels the plan meets all Federal, State, and local environmental criteria applicable to protection of potential NY State endangered species habitat and asks for your concurrence. Accordingly, we respectfully request that USFWS review the accompanying materials.

I will take the liberty of contacting you next week to discuss these revisions in further detail. In addition, the Project Sponsor would be pleased to meet with you again to discuss this material or the project plans if that would be helpful.

Yours truly,

Frederick Wells
Senior Planner
TIM MILLER ASSOCIATES, INC.

cc w/ encl.: Adrian Goddard / Fairgrounds LLC

cc w/out encl.: Alexander F. Ciesluk, Jr., NYSDEC Reg. 3
Steven Joule / NYSDEC Region 3
Michael Klemens, Ph.D.
Frank Petrucci / Fairgrounds LLC
David Griggs / ERS Consultants
David Getz, PE / Lehman & Getz

TIM
MILLER
ASSOCIATES, INC.

10 North Street, Cold Spring, New York 10516 *Phone (845) 265-4400* *Fax (845) 265-4418*

November 28, 2005

Mr. Alexander F. Ciesluk, Jr.
Deputy Regional Permit Administrator
NYS DEC Region 3
21 South Putt Corners Road
New Paltz, NY 12561-1696

RE: The Fairgrounds Project, Town of Warwick NY

Dear Mr. Ciesluk:

As you know, upon receipt of the letter from the U.S. Fish & Wildlife (USFWS) to the Town of Warwick Planning Board, dated July 7, 2005, in which the USFWS expressed certain concerns regarding the potential for bog turtle habitat on the Fairgrounds project site, the Applicant retained Dr. Michael Klemens to evaluate the project plans and develop revisions thereto that would address any potential bog turtle issues. We also conducted a site walk with Ms. Robyn Niver of USFWS on October 18, 2005, to present and discuss revisions to the project plan relative to the protection of bog turtles and wetland habitat.

Enclosed please find a revised project plan and accompanying materials prepared in response to Ms. Niver's comments:

- Summary of Plan Conformance with Bog Turtle *Recovery Plan*
- Site Plans, as revised November 2005
- Stormwater Drainage Report, as revised November 2005
- Draft Storm Water Pollution Prevention Plan, as revised November 2005
- Memo re. Wetlands/Well Interconnection by S. Smiriglio, Hydrogeologist, dated Nov. 11, 2005
- Bog Turtle Assessment by ERS Consultants Inc., March 2005

The Applicant for this project acknowledges its duty and desire to develop this project responsibly, and to mitigate the project's effects on environmental resources to the greatest extent practicable. It feels that these objectives have been met as a result of an inclusive and exhaustive process by which the project has been revised to include a 100' absolute buffer from wetlands and extensive water quality improvements that leave water quality and quantity virtually unaffected as compared with the existing conditions.

In its May 4, 2005, letter to you, the Town of Warwick Planning Board requested NYSDEC comments or concerns on the *Bog Turtle Assessment* prepared by ERS Consultants before proceeding with the project review. We respectfully request that NYSDEC review the accompanying materials.

I will take the liberty of contacting you or Steve Joule next week to discuss these revisions in further detail. In addition, the Applicant would be pleased to meet with NYSDEC staff to discuss this material or the project plans if that would be helpful.

Yours truly,

Frederick Wells
Senior Planner
TIM MILLER ASSOCIATES, INC.

cc w/out encl.: Robyn Niver, USFWS
Steven Joule / NYSDEC Region 3
Michael Klemens, Ph.D.
Adrian Goddard / Fairgrounds LLC
Frank Petrucci / Fairgrounds LLC
David Griggs / ERS Consultants
David Getz, PE / Lehman & Getz

Summary of Plan Conformance with Bog Turtle *Recovery Plan*
The Fairgrounds, Warwick NY

November 28, 2005

This submission addresses concerns raised in the US Fish & Wildlife Service letter addressed to Mr. Benjamin Astorino, Chairman, Town of Warwick Planning Board, dated July 7, 2005, about the protection of bog turtles in the context of the bog turtle *Recovery Plan* and about overall biodiversity.

Immediately upon receipt of that US Fish & Wildlife Service (USFWS) letter, the project sponsor retained the services of Dr. Michael Klemens, author of the *Recovery Plan*[1], to help it meet the objectives of the Plan. Most of the recent site plan changes were made at the suggestion of Dr. Klemens. Project activities were assessed in relation to maintaining local wetland hydrology, runoff water quality and habitat quality consistent with those pre-development conditions that are supportive of currently occupied bog turtle habitat within the greater Wawayanda Creek watershed. That assessment included an on-site visit by Robyn Niver of USFWS, and her preliminary review of the proposed mitigation measures. After extensive further consultations with scientists, engineers, and regulators, the project plans contain a comprehensive array of enhancements for the protection of wildlife, and of water quality.

The applicant believes these changes offer sufficient basis upon which the USFWS, NYSDEC, and the Town Planning Board can determine that the project will avoid or minimize any possible impacts to the bog turtle meta-population within the Wawayanda River drainage system.

The following summary provides an overview of the current condition of the site and the studies that have been conducted to date with respect to bog turtles as well as a description of the measures that have been incorporated into the site plan design to mitigate the project's potential to affect potential and actual habitat off-site.

Current Status:

1. Bog turtle surveys were conducted on-site over a six year period (including three April-May-June trapping surveys during 3 years) by ERS Consultants Inc. (under direction of biologist David Griggs) and documented in a *Bog Turtle Assessment* dated March 2005 (attached).

2. The multiple surveys concluded that no bog turtles are present on site. The on-site wetlands do contain marginal bog turtle habitat, however, these wetlands are dominated by invasive plant species. This conclusion, reached by David Griggs, was informally confirmed by Dr. Michael Klemens, and Karen Schneller-Macdonald of Hickory Creek Consulting for GreenPlan, Inc. (on behalf of the Town of Warwick) during separate visits to the site. The small ACOE wetlands on the eastern side of the project have been confirmed by the same experts as low value wetland habitats and are not vernal pools.

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[1] Bog Turtle (*Clemmys muhlenbergii*) Northern Population Recovery Plan. Michael Klemens, Ph.D. for US Fish and Wildlife Service, Region 5, Hadley, Massachusetts. 103 pp. 2001.

3. The closest known bog turtle colony is off-site in a different location, over 1,000 feet northwest of any proposed site disturbance.

Project Enhancements:

4. Project modifications and design commitments have been made which treat the adjacent wetlands as "occupied" by bog turtles, as recommended by Dr. Klemens and confirmed by USFWS in its July 7, 2005, letter to the Town Planning Board. They are:

i. Modify the project to provide a 100' no disturbance buffer around the entire perimeter of the area to be developed. This means there will be no development within 100' from the ACOE wetland boundary to the west and the NYSDEC wetland boundary to the east. Temporary disturbance within the absolute 100' buffer is limited to the southwest corner of the site (ACOE wetland) for removal of the existing paved driveway and restoration with buffer wetland vegetation and installation of a subsurface drain pipe from a stormwater basin. There will be no permanent disturbance within this buffer.

ii. Reduce parking area pavement. Proposed impervious surface in Lot 1 is reduced some 15% from 195,000 square feet, as shown on the previous site plan, to 166,300 square feet.

iii. Create a wildlife underpass for amphibians, including blue-spotted salamanders and box turtles, between the wooded upland knoll and the western wetland through an underpass between the dealership's vehicle storage areas at the rear of the property. An open steel grate design is proposed to provide light spillage into the underpass thereby facilitating wildlife movement.

iv. Restore an area within 100' of the wetland in the southwest corner of the site that is currently impervious pavement and land in agricultural use. This area will be restored as a vegetated buffer and planted with appropriate herbaceous and woody vegetation, thus removing a significant, unregulated agricultural use at the project's closest approach to the most sensitive potential wetland habitat on the site. Additional plantings of native plant species are proposed along the length of the wetland buffer on the western side of the project to improve water quality, reduce soil erosion and provide wildlife habitat.

v. Double-sided high curbs are proposed around the perimeter of pavement areas to exclude any small animals from entering the paved portions of the site and funnel them through the wildlife underpass.

vi. Stormwater management practices have been redesigned for the revised plan to improve stormwater treatment. The proposed system will provide greater reductions in peak flow than would have been achieved under the original site plan, and will match the existing surface runoff volume for the 1-year storm. The current plan includes the following designs, all of which will be located outside the wetland buffer:

- Dry vegetated swales, an organic filter system, and a bioretention basin will serve as filtration devices proposed to treat the stormwater collected on the site. These devices

will have underdrain pipes with valved outlets that will be closed under normal conditions, causing all of the treated and filtered water to percolate into the soil. The valves can be opened for maintenance or to sample the discharge.[2]

- An infiltration swale is added to receive treated discharge from the pocket pond in the southeast corner of the site, with a design based on perc rates measured in the field.

- A bioretention system using filter soil media to filter runoff will serve an area at the project entrance.

- The size of the organic filter system, including provisions for pretreatment and a dry detention basin designed with filter media, located in the northwest corner behind the car storage area will be increased. The system will be able to store and treat all anticipated runoff from a 1-year storm (and all more frequent rainfalls) from that part of the site without discharging.

- Dry swales will be located from peripheral pavement areas along the western side and northeast corner of the project to treat stormwater before release to the wetland buffers.

- The stormwater analysis was revised to more accurately account for the existing conditions of row crops on the west side of the site.

- Snow stockpile areas have been identified in areas where meltwater will be received by the treatment measures.

vii. The sewage treatment plant has been relocated so it will discharge (after receiving tertiary treatment) through a vegetated swale to the eastern wetland buffer, which is removed from known off-site bog turtle habitat. Discharge is approximately 5,000 gallons per day (gpd) -- 3.5 gallons per minute on average, comparable to moderate flow from a garden hose.

5. Stormwater management practices in this project are based on NYSDEC standard methods of design for compliance with Clean Water Act Phase II regulations for water quality and quantity.[3] The proposed stormwater management systems are designed to treat the entire 1-year storm, accounting for over 90% of average annual runoff volume from the site. The proposed measures will promote the removal of pollutants to the maximum extent practicable prior to discharge at least 100' from the wetlands, thereby allowing further filtration and infiltration through the natural wetland buffers. These added functions of the natural system, however, are not factors in the design calculations for the project. Treated stormwater at the design discharge points will

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[2] Discharge water from the filtration devices will be treated water, thus complying with the Town's aquifer regulations and the NYSDEC Design Manual for accepted filtration methods, which are different than the NYSDEC's designs for infiltration methods which are not allowed in the Town aquifer protection area.

[3] All proposed treatment practices are selected from the New York State Stormwater Management Design Manual, 2001, which specifies measures that meet State water quality objectives.

meet or exceed the most stringent standards of the NYSDEC Design Manual and Federal Clean Water standards.

6. Measures to ameliorate any increase in temperature of collected stormwater include the use of detention devices and vegetated swales that store and release water over extended periods of time, and release of treated runoff at least 100' from any wetland. In no instance is there discharge from a developed area without treatment.

7. Discharge from the proposed sewer treatment plant will conform with NYSDEC intermittent stream effluent limits (ISELs), which are based on the assumption that the receiving stream possesses the least favorable physical characteristics with regard to self-purification potential, that no dilution is available, and thus the stream standards should be met in the effluent itself. ISELs represent the highest degree of treatment required by NYSDEC[4] and will be specified in the discharge permit issued by NYSDEC for this facility to protect surface water quality and therefore the downstream ecological conditions. The further treatment afforded by the vegetated swale as well as the added function of natural filtration and infiltration within the wetland buffer, however, are not factors in the design calculations for the treatment plant.

8. Well testing and stormwater runoff calculations for this site demonstrate that the project will not cause drawdown of the surface water levels in the wetlands.

i. Well pump testing at a rate of 30 gpm (approximately 4 times the need of the project) for 24 hours reached well water level equilibrium after 7.5 hours. Monitoring of 4 wetland points was conducted over a 4 day period, commencing 2 days prior to the pump test. Water level cycles recorded in the wetlands showed no correlation with the pumping of the well (although they did reflect local rain events and effects of evapotranspiration).[5] Further comparison of the actual water levels in the 2 wells and 4 wetland points shows the bedrock aquifer water level differs in elevation from the surface water level by as much as 14 feet.[6] If a direct connection existed, the water levels at all points would be similar, however, the difference indicates that there is limited, if any, connection between the bedrock aquifer and the surface water. The "cone of depression" around the well clearly does not effect surface waters.

ii. Stormwater calculations demonstrate that in the 2-year storm event and all smaller, more frequent rainfalls (accounting for over 90% of average annual runoff volume from the site), infiltration of runoff in the post-development condition will meet or exceed pre-development site conditions.

iii. Car washing at the dealership will be contained within the building with a self-contained water recycling system and no discharge to the environment.

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[4] NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.3.1.B.), June 1989.

[5] Well Test Report, DEIS Appendix G.

[6] Memo from S. Smiriglio, Hydrogeologist, to F. Wells/TMA dated November 11, 2005.

9. As discussed above, the applicant retained Dr. Michael Klemens to provide technical assistance in reviewing and revising the project, including site visits, review of the project plans and design recommendations. Dr. Klemens was asked to ensure that the project meets the goals of the bog turtle *Recovery Plan*. In his letter to David Getz, PE, the project engineer, dated September 29, 2005, Dr. Klemens outlines the various strategies employed for improving the site plans. Further design details for implementation of these measures, as mentioned in the letter, will be developed for inclusion in the final project plans to be submitted to the Town for approval.

In the opinion of Dr. Klemens, with the various mitigation and avoidance modifications made to the plan it is consistent with the goals of the *Recovery Plan* and overall biodiversity protection.

The applicant believes the improvements to the project plan eliminate any potential impacts from the project on any potential off-site bog turtle habitat. As such, the applicant feels the plan meets all Federal, State, and local environmental criteria applicable to protection of potential NY State endangered species habitat.

Documentation:

Enclosed documents relative to water quality concerns of this project:
Site Plans, as revised November 2005
Stormwater Drainage Report, as revised November 2005
Draft Storm Water Pollution Prevention Plan, as revised November 2005
Memo re. Wetlands/Well Interconnection by S. Smiriglio, Hydrogeologist, dated Nov. 11, 2005
Bog Turtle Assessment by ERS Consultants Inc., March 2005

Previously submitted documents relative to water quality concerns are listed below:
Letter from Dr. Michael Klemens to David Getz, PE, dated September 29, 2005
Well Test Report, DEIS Appendix G
Utilities Report (WWTP Design), DEIS Appendix H

W:\Fairgrounds Warwick\FEIS\Summary of plan revisions for turtles5.doc

Michael W. Klemens, LLC
47 Florida Hill Road
Ridgefield, CT 06877

September 29, 2005

Mr. David Getz
Lehman and Getz, P.C.
17 River Street
Warwick, NY 10990

RE: Fairgrounds LLC-Warwick, NY

Dear Mr. Getz:

I have reviewed your concept plan (dated 22 September 2005) and offer the following comments in regard to my recommendations concerning bog turtle conservation and overall biodiversity protection that I made to you and the project team during my field visit on August 16th 2005.

The southernmost wetland drains directly into an active off-site bog turtle colony located near Sanfordville Road, therefore protection of that wetland is essential. You have responded to my recommendations to protect this wetland by removing all development from no less than 100 feet from the edge of that wetland and relocating the sewage treatment plant to discharge tertiary treated water into the northern wetland. The northern wetland is a preferable location for the sewage treatment plant because the discharge will have a long run through bio-filtration swales before percolating into the northern wetland. The previous plan, which I found to be inadequate in terms of biodiversity protection, directly discharged treated water (ca. 5000 gallons per day) into a feeder stream of the southern wetland. In addition, you have committed to re-vegetating the 100-foot buffer of the southern wetland which will enhance ground water recharge proximal to the wetland. Currently portions of that buffer are in agricultural production and paved with black top. Finally, the current plan has reduced the amount of impervious surface from 195,000 square feet (4.5 acres) to 166,300 square feet (3.8 acres).

I was also concerned about the ability of wildlife, including the blue-spotted salamander and eastern box turtle, to migrate from the central hill on the site into the southern wetland. The original plan had a large, continuous obstruction of pavement associated with the car dealership, effectively fragmenting the upland portion of the site from the wetland. Upon my recommendations, you have

greatly improved this situation by reducing the amount of paved parking area associated with the car dealership, dividing the large lot into two portions, with a wildlife corridor/underpass between the two lots. You have also agreed to provide excluding curbing to keep wildlife off of the parking lots and to funnel wildlife into the corridor/underpass.

In conclusion, the concept plan is a major improvement to your original plan in its goals to conserve not only the active bog turtle habitat in the southern wetland, but to also conserve other important elements of biodiversity on the site. The next steps are to refine the plan and provide details of the various mitigation structures and plans, including a sample re-vegetation plan, and design details for the wildlife excluding curbs, wildlife underpass, and stormwater management. At this juncture, with the various mitigation and avoidance modifications that you have made to your plan, I consider it in compliance with the goals of bog turtle and overall biodiversity protection.

Sincerely,

Michael W. Klemens, PhD

CC: Sive, Paget, and Riesel, PC
Goddard Development Partners

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

11 August 2006

Janelle Herring
Tim Miller Associates
10 North Street
Cold Spring, NY 10516

Dear Ms. Herring

Re: DEC
Proposed Fairgrounds Development
Town of Warwick, Orange County, NY
05PR00382

Thank your for requesting the comments of the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) with regard to the potential for this project to affect significant historical/cultural resources. OPRHP has reviewed the several archaeological and architectural reports prepared by Columbia Heritage for this project between 1997 and 2004. Based on this review OPRHP offers the following comments.

1. Although the 1998 report investigated areas not previously examined there still appear to be portions of the Area of Potential Effect that will be disturbed that should have been examined. Specifically, the northwestern extension of the project area falls outside of the initial study area and was not considered in the later investigations. Also, the area around the farm buildings has not been tested. While the area immediately adjacent to the farm house was examined in later testing, it still appears that the area within and around the farm buildings has not been examined. Portions of this area may be disturbed, however it does not appear that the entire area has been. OPRHP recommends that additional testing be carried out in these areas.

2. OPRHP concurs with archaeological finding in other portions of the project area that have been sufficiently examined and has no concerns for those areas.

3. William Krattinger of OPRHP's National Register of Historic Places unit has evaluated above-ground resources to determine whether or not they are eligible for listing on the State and National Registers. After careful consideration, it has been determined that the Blain-Raynor-Miller House and associated buildings and structures do not qualify as a National Register-eligible farmstead. The gambrel roof suggests that section of the house dates from c. 1770-1810, and the primary entrance retains vestiges of a c. 1840s Greek Revival-style updating, intimating another phase of work; most conspicuous, both on the interior and exterior based on the photography included in the 1999 Oberon Report ("Assessment of Potential Cultural Resource Significance, Blain-Raynor-Miller House"), is a considerable early 20th century updating in the Colonial Revival taste. Though this dwelling was not considered National Register eligible, it would nevertheless be prudent—in the event of a demolition scenario—to allow for some level of recordation of the building's salient features, as well as potential salvage of important elements, by a local historical organization or interested group. This information might one day prove valuable to a historian, and could be put on file in the

local library. Similar consideration might be given to the small timber frame barn or granary, which could easily be relocated to a new site.

Please contact me at extension 3291, or by e-mail at douglas.mackey@oprhp.state.ny.us, if you have any questions regarding these comments.

Sincerely

Douglas P. Mackey

Douglas P. Mackey
Historic Preservation Program Analyst
Archaeology

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
REGION EIGHT
4 BURNETT BOULEVARD
POUGHKEEPSIE, NEW YORK 12603
www.dot.state.ny.us

ROBERT A. DENNISON III, P.E.
REGIONAL DIRECTOR

THOMAS J. MADISON, JR.
COMMISSIONER

August 30, 2006

Mr. P. Grealy, Ph.D., P.E.
John Collins Engineers, P.C.
11 Bradhurst Ave.
Hawthorne, NY 10532

RE: PROPOSED FAIRGROUNDS DEVELOPMENT ROUTE 94; TOWN OF WARWICK

Dear Mr. Grealy:

The Department has completed a preliminary review of the subject project. The Department conceptually agrees with the proposed mitigation which includes the installation of separate left and right turn lanes on Route 94 into the project.

A traffic signal is also proposed at the site access drive. We will require a signal warrant analysis for this intersection for review before a determination regarding signalization can be made.

If you have any questions, please contact me at (845) 575-6054.

Very truly yours,

Glenn T. Boucher, P.E.
Regional Highway Work Permit Coordinator

GTB:kmb

cc: K. Henken, Permit Inspector, Residency 8-5
Town of Warwick Planning Board

Appendix B

PUBLIC HEARING TRANSCRIPT

ORIGINAL

COUNTY OF ORANGE
TOWN OF WARWICK
----------X

IN THE MATTER OF THE APPLICATION OF:

COUNTRY FAIRGROUNDS, L.L.C.

----------X

DATED: February 16, 2005
Warwick, New York
7:14 p.m. - 8:18 p.m.

Claudia Miller, Reporter

HEARING MINUTES

of

PLANNING BOARD MEETING

MARY T. BABIARZ COURT REPORTING SERVICE, INC.

845-471-2511

APPEARANCES:

BOARD MEMBERS:

Benjamin Astorino, Chairman
Zen Wojcik, Engineer
Ted Fink, Planning Consultant
John Bollenbach, Board Attorney
Connie Sardo, Secretary
Al Buckbee
Karl Roecker
Russel Kowal
Carl Singer

TIM MILLER ASSOCIATES, INC.
Environmental Consultants for Applicant
10 North Street
Cold Spring, New York 10516
BY: FRED WELLS, CONSULTANT

PROCEEDINGS

BY CHAIRMAN ASTORINO:

"Application for preliminary site plan approval, preliminary special use permit approval, and preliminary 2-lot subdivision approval for the construction and use of 82,750 feet of commercial/retail facilities, situated on tax parcel S 51 B 1 L 40; property located on the northern side of New York State Route 94 approximately 1000 feet east of Orange County Route 21, in the DS/OI zones, of the Town of Warwick, County of Orange, State of New York. A Draft EIS has been completed and accepted for the proposed action by the Town of Warwick Planning Board, the SEQR Lead Agency for the action. Comments on the DRAFT EIS are requested and will be accepted by the Town of Warwick Planning Board Secretary, Connie Sardo until 4:00 p.m. on February 28, 2005. The DRAFT EIS is available for examination at the Town of Warwick Town Hall." Representing the Applicant?

BY MR. PETRUCCI:

Frank Petrucci.

BY CHAIRMAN ASTORINO:

(Inaudible)

BY MR. WELLS:

PROCEEDINGS

Fred Wells, Tim Miller Associates.

BY CHAIRMAN ASTORINO:

Comment number one, Board to discuss SEQR.

BY MR. FINK:

Yes, on the SEQR, this is really the second of four milestones that occurred in the SEQR review process, the first one being adopted by the planning board of a scoping document that was done some time ago when the application was first presented to the planning board. The applicant prepared a draft of that statement in accordance with the scoping document. They reviewed it, they made some modifications to that document to bring that document into compliance with the scoping. We've got the scoping document. This is the public comment phase of the process. After this closes on February 28th, the next step or the third step is the preparation of a final environmental impact statement, and that document will consist of responses to any comments that we receive tonight or in the written period of the public comment phase and any changes or modifications that are requested to the draft environmental impact statement will also be addressed in the final EIS.

PROCEEDINGS

The fourth and final milestone in the SEQR process would be the adoption of a written finding statement and that would conclude the SEQR process, and so this just moves along the process, but there are still other steps that have to be done.

BY CHAIRMAN ASTORINO:

Thank you. Number two. Applicant to discuss project.

BY MR. WELLS:

If the Board would like, I'd like to make a pre-presentation to both the Board and the public on what some of my associates here tonight have proposed.

Again, my name is Fred Wells, with Tim Miller Associates. We're the environmental consultant for the applicant.

BY MS. SARDO:

Fred, just try to speak over this way, if you could.

BY MR. WELLS:

I've brought several graphics here. One is the site plan, which is here (Indicating), and I have some other photographics. This is a general area site plan. This is Route 94 on the bottom of

PROCEEDINGS

the site. North is this way, I believe -- I'm sorry. North is up.

Right now, this property, which is 40-some-odd acres, is now partially farmed and partially wooded. There's wetlands on this side, which is attached, and wetlands that come on and off the site on the west side as well. There's a wooded knoll up in back here, a prominent knoll, and this area is kind of ridge, a ridge through the middle of the site, and what's proposed here are three buildings. One is a supermarket building, which is the largest one set furthest back, and the other building is an automobile dealership building, and this is a bank building, what we refer to as a pad building in the EIS. Right now, a tenant has not been designated for that, but it's presumed and planned that a bank possibly, or some other similar use, non fast food type use, to use that pad building.

Right now, I'd like to introduce Frank Petrucci, who is the owner of the Country Chevy-Olds. Where the dealership is, it would be relocated from the Village of Warwick (Inaudible) would be Country Chevy. Hannaford's supermarkets

are the main -- has indicated they are interested in this parcel for development of a Hannaford supermarket here, so those are the two primary tenants that are proposed here.

The access, as you see, is one single access to the center of the site, which comes directly through the center, and that splits off into internal roadways for circulation around the parking buildings. This intersection is proposed to be multi-lanes, multi-lanes coming out of the project, left turn, right turn, and also signalized. Based on the traffic studies that were done along here, there will be a traffic signal installed.

The project includes its own storm water management facilities, its own well water supply, water supply tank and its own sewer treatment plant. Right now, the plan shows the sewer treatment plant set far back on the site, a water tank back here behind the supermarket building, and there are scattered -- around the site, are storm water facilities to accommodate runoff from the drains and so forth.

As I indicated, this is 47.5 acre site. What

is proposed for development is approximately 17 and a half acres. The remainder of the site would stay as is, wooded and wetlands. This use is as of right -- zoning wise, it's a designed shopping center and office, industrial park zone. Actually, the second zone I mentioned, the office and industrial, is back this way in the site, so most of the development is in the designed shopping district.

BY ~~UNIDENTIFIED SPEAKER:~~ DAVE GETZ:

Fred, if I could just add a comment. The project also includes a two-lot subdivision to roughly split the property in half. Both lots will be over 20 acres in size and the proposed dividing line would run between the two major buildings, so that the Hannaford's would be on its own lot and Country Chevy-Olds on a separate lot.

BY MR. WELLS:

I'll present briefly a couple of graphics that are in the EIS. These are graphics generated by computer based on actual topography and mapping of the trees on the site and so forth. This is a bird's-eye view of the project.

Again, looking down towards the front of the

site towards the rear, using a typical Hannaford style building and bank building and a prototype for the car dealership. This is a view taken from Route 94 in the southwest corner looking northwest. This is the dealership building. The Hannaford's supermarket here. These are existing trees that would remain on the site. This area is now meadow, a farm, dairy, and it would remain as meadow with storm water basins and so forth. On the back is the hillside. This is the view looking northwest. The Hannaford building is here, the bank building in front, and a little piece of the dealership would go through the existing trees. Again, these are actual -- taken from a photograph of actual existing trees with a building set into the landscape. This is the building back, which would remain as a wooded knoll.

Briefly, I'll just run through the approvals required of this planning board. I'm going to ask for site plan approval, subdivision approval, special use permit. It's possible, although at this time not required and not needed, it's possible that through the process, that the zoning board approval may be needed for a signed -- a

PROCEEDINGS

signed EIS. The State Department of Health, Orange County Department of Health, will review the project. The State Environmental Preservation will review portions of the project and a DOT permit will be required for the traffic signal on the intersection for construction, and Orange County Planning will review the plans and have a copy of the EIS written.

Also, I'd like to introduce ~~Earl~~ Irv Zuckerman, who is one of the partners with us on the project that's here tonight and (Inaudible) Allan Zuckerman, also a partner in the project who is here tonight. We are here to -- primarily to listen to comments. As Ted mentioned, all of the comments that are given tonight, we will respond to in writing in a final EIS which then this Board will review and accept prior to any executing any further action. That EIS will be subject to public review as well. So we're not planning to respond to things unless something comes up here that we need to respond to. We're here to listen.

BY CHAIRMAN ASTORINO:

Thank you. Moving onto the comments.

BY UNIDENTIFIED SPEAKER:

PROCEEDINGS

(Inaudible)

BY UNIDENTIFIED SPEAKER:

(Inaudible)

BY UNIDENTIFIED SPEAKER:

Does the stenographer have a copy of that so she can incorporate that into the transcript?

BY MR. WELLS:

We will include a copy of this, not in the transcript, but there's a copy of your letter right in the EIS, the final EIS.

BY MR. WELLS:

Can I ask the stenographer to move up here? She's having trouble hearing.

(OFF THE RECORD DISCUSSION)

BY CHAIRMAN ASTORINO:

Mr. Singer, you have a couple of comments?

BY MR. SINGER:

The town zoning regulations include the provision requiring consideration of a ~~model~~ marginal access road in the design shopping district on Route 94. I don't see that reflected in your EIS or in your maps. You have a comment that a waiver from the

2-23

regulations will be sought from the planning board, but I haven't received that request up to this point, so I think it should be addressed in the EIS and it should be on the plans, and when that happens -- you point out that on page 1-19 of your EIS that, as a result of this development, two small wetland pockets will be impacted, but you're saying that will be less than a tenth of an acre so that wetland mitigation would not be required by the US Army Corps of Engineers. I think that's a choice you might change once you put the marginal access road in. The wetlands may require to be filled in, you'll have an impervious surface, and possibly you may have to change the size of the footprint of the building. So I think that definitely the marginal access road should be shown and explored in the EIS and in your plans. Another point I have is -- I'd like to ask Mr. Petrucci a question.

BY MR. PETRUCCI:

Sure.

BY MR. SINGER:

On pages 1-19 of the associated economics part of your EIS, you state that the proposed auto

PROCEEDINGS

dealership will replace the dealership in the Village of Warwick. That site would likely be reused in the long term with no significant impact to the area. Question.

BY MR. PETRUCCI:

Yes.

BY MR. SINGER:

Have you made a deal with Hannaford's to not sell or rent that property to a supermarket?

BY MR. PETRUCCI:

No.

BY MR. SINGER:

All right. I'd like to talk to Mr. Grates (Proper noun subject to correction). Mr. Grates, you're the environmentalist on this project. Maybe educate me, tell me what qualifies you to be a bog turtle expert?

BY MR. ~~GRATES:~~ GRIGGS:

I have -- I have over 20 years professional experience. I have a bachelor's degree in wildlife biology management from (Inaudible) Science and Forestry and another degree from Syracuse University in biology. I've conducted over one thousand wildlife inventories in the United States,

PROCEEDINGS

the majority of which have occurred in New York and New Jersey. I've conducted herpetology studies, threatened endangered species studies. I'm certified as a wildlife biologist. I'm recognized by the DEC.

BY MR. SINGER:

Is there a certain time of year when the search for bog turtles should take place?

BY MR. ~~GRATES:~~ GRIGGS:

Yes, and you can look for potential habitat basically year round, but you can't start looking for -- for bog turtle species until they're pretty much active, which is, in this area, around early April through -- sometimes through to the end of June.

BY MR. SINGER:

And that's when you did your studies?

BY MR. ~~GRATE:~~ GRIGGS:

Correct.

BY MR. SINGER:

You indicated in the EIS that you set traps?

BY MR. ~~GRATES:~~ GRIGGS:

That's correct.

BY MR. SINGER:

PROCEEDINGS

Did you have a permit to set the traps?

BY MR. ~~GRATES:~~ GRIGGS:

Yes. We coordinated first with the DEC and the Fish and Wildlife Service. They reviewed all of our work prior to conducting any of the work. They include (Inaudible) study plans and they were aware of the work that was conducted there.

BY MR. SINGER:

How many people were involved when you were searching for the bog turtles?

BY MR. ~~GRATES:~~ GRIGGS:

Two biologists.

BY MR. SINGER:

Plus yourself?

BY MR. ~~GRATES:~~ GRIGGS:

No. Usually myself and another biologist, or sometimes two of us and a technician.

BY MR. SINGER:

It's my understanding that the protocol is that three people have to be on the site.

BY MR. ~~GRATES:~~ GRIGGS:

Usually it's two people, two biologists.

BY CHAIRMAN ASTORINO:

Any other Board member's comments at this

PROCEEDINGS

time? I open this up to the public on the sign up sheet. Michael Newhard?

BY MR. NEWHARD:

I don't really have any verbal comments. I just have a written comment I'd like to submit.

BY CHAIRMAN ASTORINO:

Can that be read out loud?

BY MR. NEWHARD:

It's too long.

BY MR. McCARSKY:

Can I have a copy of that?

BY CHAIRMAN ASTORINO:

Who are you?

BY MR. McCARSKY:

Steven McCarsky (Proper noun subject to correction).

BY CHAIRMAN ASTORINO:

We'll have one at the planning office.

BY MR. McCARSKY:

Okay.

BY CHAIRMAN ASTORINO:

Sue Gardner?

BY MS. GARDNER:

PROCEEDINGS

"I think I speak for many of our citizens in being happy at the prospect that there will soon be more than one grocery store in our town. And as a ten-year employee of a public facility that doesn't meet current needs, I can completely understand and sympathize with the urgency that Mr. Petrucci and his associates must feel in needing an expanded physical plant for their business. It's unfortunate that the way the planning board structure is set up, public commentary is brought in at the eleventh hour of an expensive and complex approval process, instead of in early stages when adjustments are more easily done, but I feel that if the Board approves the destruction of the Miller farmhouse on the property, that we as a community will have pursued the letter of the law but will have completely lost its spirit.

The question is not really about how old this house is, or what parts of it are old and what parts of it are not. It was the farmstead of one of our leading citizens, Fred Cary Raynor, whose memoirs are preserved, as well as containing parts of the colonial era Blain homestead. By the applicant's own assessment on the Environmental

5-6

PROCEEDINGS

Impact statement, Section 19, page 11, the project will have a large impact on existing structures of historic importance to the community, and which impact can be mitigated by project change. 5.6

In every planning document that the Town now has, paragraph after paragraph speaks of the need to accommodate the preserving of rural agricultural heritage of the community. From the Warwick Village limit to the corner of Shop Rite is a stretch of 1.5 miles. On this 1.5 miles, there are only 8 rural structures and complexes surviving. 5.1 By their very scarcity, every single one of them assumes an important role in preserving the rural fell of this stretch of what was the King's Highway in colonial days. Much of this corridor is zoned commercial. I ask you to look forward to the future when buildings on a medium to large scale are erected on this land. The board is striving to have new structures evoke our agricultural past, but it is the few currently standing farm buildings that will become anchors for this gateway that tells everyone arriving, "Warwick is a community that can find ways to allow growth without discarding its heritage."

PROCEEDINGS

The structure in particular plays a key role of keeping this corridor from looking like every other commercial strip in the northeast. It is large in scale, appears structurally solid and well, is near to the knoll, and is on a road that gives it a dominance on the landscape. It is one of the few older structures in this area that has the kind of mass to be able to hold its own among commercial structures that will surround it. To approve its removal without exploring every extraordinary and creative means at our disposal is to act in direct opposition to the stated goals in the community in its planning documents. Isn't there any way to find an adaptive reuse of the building that will still accommodate the project needs? That kind of forward thinking community based heritage based planning is what can earn our businesses and planners the position of leadership in the region for which we are increasingly noted, and the support of our citizens and their customers. I urge the Planning Board and the applicant take those small steps back even at this late hour and challenge them to put this one element of the plan back on the table and find a

5-1

way to save this historic homestead."

BY CHAIRMAN ASTORINO:

Pass me that letter.

BY MR. WELLS:

I just want to point out one thing. In reference to the eleventh hour, by no means we're at the eleventh hour. It is not set in stone. We're just in the beginning stages of reviewing this. Thank you.

BY CHAIRMAN ASTORINO:

Okay. Matthew Rudikoff.

BY MR. RUDIKOFF:

Good evening, members of the Board. I'm Matthew Rudikoff. I'm a professional planner and environmental consultant. I've been retained by Shop Rite, and the purpose of my being retained is really to participate in this review process, hopefully in a constructive way, to see that the application gets the kind of scrutiny that Warwick really deserves, the citizens deserve, the natural resources deserve and of course, the existing businesses deserve, all with the idea of making the common better and richer and more suitable for everyone.

PROCEEDINGS

Our comments are made this evening in conjunction with -- or rather that was received by the planning office today by rider (Inaudible). They are also retained by Shop Rite, and we are working together on making these comments.

In that letter, it makes reference to a January 20 -- 10th letter that my office submitted to the planning board and in that letter, we have identified a number of issues that we expressed our opinion on that were really suitable relative to your completeness determination, meaning that there were some things that we felt weren't in the EIS that really related to the appropriateness of determining the action complete for the purposes of public review, and of course, you made your decision about property and that will remain to be seen.

I think the point is really -- and of course, some of those comments we've made we still hold are appropriate for completeness. What we are really urging the Board to do is, during the course of this comments period, if, looking back at our comments and future comments and the comments received by the public, there are any issues that

the Board feels are significant enough to warrant that -- the responses to those comments, really should have an opportunity to be reviewed by the public, because that's the idea of it being a draft EIS, so that it's subject to scrutiny during this comment period, that if any of the comments we've made are completeness issues are now raised by the public, are appropriately in need for further public review, we urge the Board to consider the option of suggesting that those comments be made in the context of a supplemental draft EIS so that those important issues and the answers to them would have an opportunity for further public review.

I'm not going to go through the items that are identified in that January 10th letter, however, they were sort of put into two categories. One category were those items that we felt dealt with completeness, and one of them was the marginal access road issue being very important relative to the exploration of alternatives to determine whether that waiver really is an appropriate action by the Board, and another one has to do with some of the natural resource investigations, some of

PROCEEDINGS

which were not identified as well as some others. And in addition, there are substantive issues which were more appropriate for a comment period (Inaudible), in that they're not suggesting that they need to have a supplemental draft EIS done and those are the ones, such as the water tank. There is very little definition of the water tank. There's some ambiguity regarding the future still water relationship between the two parcels and there are a number of other issues.

8.5

2.3

It is our intention to make a fuller and written submission by the close of the comment period, which provides information which will acclimate all of these points and hopefully provide information which will enable the Board to consider those issues and make appropriate decisions. Thank you very much. Go ahead.

BY CHAIRMAN ASTORINO:

Okay. That's all we have on our comment sheet. Is there anyone else wishing to address the Fairgrounds project? You, sir.

BY UNIDENTIFIED SPEAKER:

Come up and state your name for the record.

BY MR. ARENA:

PROCEEDINGS

Sure. If it's possible. I don't know if it's the right thing to do. My name is Ben Arena.

BY MS. SARDO:

Ben, spell me your last name, please?

BY MR. ARENA:

A-r-e-n-a.

BY MS. SARDO:

Thank you.

BY MR. ARENA:

And I live in Warwick. I just have a couple of questions on the picture here. You say that they're going to install a traffic light for traffic control on 94. My questions is, is this area large enough? They have trucks going in and out of here for Hannaford, but what about trucks for the dealership? Is there enough area for a truck to unload cars here or is the car -- the truck going to have to stop here to unload cars? I see that constantly a lot.

2-30

BY MR. PETRUCCI:

It will be.

BY MR. ARENA:

Okay. My next question is what about automotive fluids and protection of the water

PROCEEDINGS

areas? In other words, you're going to have your own wastewater treatment. The dealership has taken safeguards for any automotive fluids going into the water, the groundwater, and also going into the wastewater treatment plant? Is there something done for that?

4-9 & 4-10

BY MR. PETRUCCI:

There will be, yes.

BY MR. ARENA:

That's what I just wondered. That's all my questions. Thank you.

BY CHAIRMAN ASTORINO:

Thank you. Sir, in the back?

BY MR. FERRUGGIA:

I'm having a problem with my voice. Can you hear me, Miss?

BY THE COURT REPORTER:

Yes.

BY MR. FERRUGGIA:

I'm Donald Ferruggia. I live across the street from -- (Interrupted)

BY MS. SARDO:

Could you spell your last name, please?

BY MR. FERRUGGIA:

PROCEEDINGS

F-e-r-r-u-g-g-i-a. I wrote my comments down in case I can't finish them. First, I'm mourning the loss of the most beautiful farm in Warwick. For over twenty years, I've driven down that hill and turned right at Shop Rite. As soon as I caught a glimpse of that picturesque -- (Interrupted)

BY CHAIRMAN ASTORINO:

Just stand back, just stand back. The microphone is just echoing on the recorder.

BY MR. FERRUGGIA:

I'm sorry -- of that farm, I knew I was home. Now, I won't know where I am. With this loss, Warwick is little less Warwick and little more nondescript shopping. Can you still hear me?

BY CHAIRMAN ASTORINO:

Yes.

BY MR. FERRUGGIA:

In more practical terms, a new supermarket in town would not be a bad thing. Our corner of the town is already fairly well served. We have an A&P in Vernon and an A&P in West Milford, both only 15 minutes from Shop Rite and both open 24 hours a day, but many other areas of town have fewer choices.

PROCEEDINGS

If Hannaford wants to compete in Warwick, let them do so. That is the American way. But allowing them to open up right across the road from Shop Rite would be the worst kind of planning. It's easy to predict what will happen. A price war will drive prices down, but we'll only be able to enjoy them for a short time. Soon one party will realize that they can't afford the battle and will close. We'll be left not only with high prices again, but with an empty shell of a building.

The grocery industry runs on very thin margins, as we know, from bitter experience. We've already seen Grand Union go bankrupt and Big V go bankrupt. How long has the Big V supermarket in Florida been empty? I don't know if it's still empty, actually.

Hannaford's executives must know this. They are no amateurs. They have run a huge grocery empire throughout New England for many years. If they want to build next door to Shop Rite, they must believe they'll win the war, and they probably will. They are a very large company and have the resources to wait Shop Rite out. Wakefern, which owns our Shop Rite, is not a small company, but as

2-8

PROCEEDINGS

far as I know, it's only got a few retail stores.

It is a benefit to the town to have more than one supermarket. It is to no one's benefit if Shop Rite closes. So let Hannaford come to Warwick, but not to this site.

BY CHAIRMAN ASTORINO:

Thank you. Is there anyone else wishing to address the Fairgrounds project? Marie?

BY MS. PENNING:

My name is Marie -- (Interrupted)

BY MS. SARDO:

You don't have to hold onto that.

BY MS. PENNING:

Okay. My name is Marie Penning. I have been waiting for about ten years for another grocery store to come to Warwick. Hannaford's knows what they're doing. These people have done their research and it's absolutely the correct place to be.

The only thing that I object to is the loss of the Miller farmhouse. We do not need to put that driveway coming out to save that tree that's standing there and lose the home. The driveway should really come out where the darn old hot dog

5-1

PROCEEDINGS

stand is every day, and then the red light would be right there and you got plenty of site distance on either way and then if -- I don't think St. Anthony's is going to be across the street, but if they are, all -- everything is parallel or however you call it, you know, this way (Indicating), an X, right.

BY UNIDENTIFIED SPEAKER:

Perpendicular.

BY MS. PENNING:

Perpendicular, yeah, you got it. But I really hate to see that house go down, and I know Frank does too, and it's just because the plan was set up the way it is, and the house has a lot of value. Somebody would love to have their business in that house and then we save one more building in Warwick and we keep that look of the farm. So that's what I came to tell you. Thank you.

5-1

BY CHAIRMAN ASTORINO:

Thank you. Anyone else wishing to address the Fairgrounds project? Let the record indicate there is no further public comment.

So the applicant will address these concerns and get back to the Board?

PROCEEDINGS

BY MR. WELLS:

Yes. We will address all of these comments in writing and present them to the Board in a preliminary final EIS.

BY CHAIRMAN ASTORINO:

Thank you.

BY UNIDENTIFIED SPEAKER:

I just want to note for everyone's benefit that the public comment period will remain open until February 28, 2005, at four o'clock p.m. Additional written comments will be forwarded to Connie Sardo, the planning board secretary. Thank you.

BY CHAIRMAN ASTORINO:

I ask for a motion to close the public hearing. Would somebody care to move on that?

BY MR. SINGER:

I make the motion to close the public hearing.

BY UNIDENTIFIED SPEAKER:

I'll second.

BY CHAIRMAN ASTORINO:

You second? All those in favor?

BY UNIDENTIFIED SPEAKERS:

Aye, Aye.

1 PROCEEDINGS

2 BY CHAIRMAN ASTORINO:

3 Closed. Motion carried out.

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5 (Whereupon the proceedings

6 ended at 8:18 p.m.)

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STATE OF NEW YORK)
) ss.
COUNTY OF ORANGE)

I, CLAUDIA MILLER, a Stenotype Reporter and Notary Public within and for the State of New York, do hereby certify that the foregoing is a true and correct transcript of the minutes having been stenographically recorded and transcribed by me, to the best of my knowledge and belief.

X Claudia Miller
CLAUDIA MILLER

Dated: March 15, 2005

Appendix C

WRITTEN COMMENTS RECEIVED ON DEIS

Index of Written Comments Received on The Fairgrounds DEIS

Letter #	Author	Date
1	John P. Minerly	02/01/05
2	Tectonic	02/16/05
3	Don Ferruggia	02/16/05
4	Michael J. Newhard, Mayor, Village of Warwick	02/16/05
5	Sue Ann Gardner	02/16/05
6	David E. Church, Commissioner, Orange County Dept. of Planning	02/16/05
7	Florence P. Tate, Town Historian, Town of Warwick	02/21/05
8	Penny Steyer	02/21/05
9	Bill Raynor	02/22/05
10	Stephen L. Pascal, Village of Warwick Trustee	02/22/05
11	Marlene Falot Stabin	02/23/05
12	Patrick Gallagher	02/24/05
13	Matthew D. Rudikoff, Matthew D. Rudikoff Associates	02/25/05
14	Lynn Miller	02/27/05
15	Joan T. Nagrod, Fran and Neil Sinclair	02/28/05
16	Robert Sachnin (email)	02/28/05
17	Judith Rae Davis (email)	02/28/05
18	Mark and Alena Sweet Insetta (email)	02/28/05
19	J. Theodore Fink, AICP, Greenplan	02/28/05
20	Tula Tsalis (email)	03/16/05

FS: Index of comment ltrs Fairgrounds.lwp

RECEIVED
FEB 0 2 2005
TOWN OF WARWICK

John P. Minerly
30 Cedar Hill Drive
Warwick, N.Y. 10990

LETTER # 1

February 01, 2005

Mr. Benjamin Astorino, Chairman
Warwick Town Planning Board
132 Kings Highway
Warwick, N.Y. 10990

Re: The Fairgrounds

Dear Mr. Astorino:

It is my understanding that the shopping mall project on Route 94, across from Leo Kaytes Ford and involving the relocation to new facilities for Country Chevrolet, is once again a possibility. I would like to take this opportunity to encourage support for this endeavor both as a local shopper and taxpayer. I believe it will give the community both an excellent ratable and a needed additional supermarket alternative. 2-1

I would greatly appreciate having my letter read at the Public Hearing if I am unable to attend in person. Thank you.

Very truly yours,

John P. Minerly

on 2/2/05 - el faxed to Dave Metz + Ted Fink.

on 2/2/05 - Copies to Pl. Bd. + Consultants. + Mike Sweeton.

TECTONIC

TOWN OF WARWICK

532.0304FRG

FOR THE PLANNING BOARD MEETING OF FEBRUARY 16, 2005

REVIEW OF THE FAIRGROUNDS- SUBDIVISION, SITE PLAN & SPECIAL USE PERMIT FOR COMMERCIAL DEVELOPMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT BY TIM MILLER ASSOCIATES
PLANS BY LEHMAN & GETZ, P.C. DATED 5/5/1999, LAST REVISED 8/2/2004
C 1/19/2005

COMMENTS:

LETTER # 2

1. Board to discuss SEQR.
2. Applicant to discuss project.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (Last Revised 1/19/2005)

3. Clearly label and identify the water, sewer, and stormwater drain lines on the grading and utility plan. 2-2
4. The project lies entirely in the Town's Aquifer Overlay District. Per §164-47.2(D) of the Town Code, applicant to prepare and submit an Aquifer Impact Assessment as part of the site plan approval. 4-1
5. Page 2-10 – Water Supply:
   a. What financial assurance will be provided by the applicant to maintain and repair the water system if Fairgrounds, LLC is unable to meet their responsibilities for the water system?
   b. Who will be responsible for the maintenance and repair of the water lines and hydrants on the site? 2-3
6. Page 2-11 - Wastewater Treatment:
   a. The Wastewater Treatment Plant (WWTP) is discussed as definitely serving the supermarket building but the DEIS indicates that the auto dealership and pad building might be serviced by conventional subsurface on-site wastewater system (i.e. a septic field). The wastewater from the auto dealership will contain elevated levels of petroleum due to the nature of automobile servicing operations. If the auto service discharge is to be to a septic field at the dealership, the applicant should discuss how the project would meet the Federal Safe Drinking Water Act – Underground Injection Control program regulations. 4-2
   b. The retail facility for the pad building has not been identified but could include a restaurant which might also be better served by the WWTP. Explain why all the project buildings would not be connected to the WWTP. 2-4
   c. What is the lifespan of the proposed WWTP and how would its replacement be financed? 2-5

TECTONIC

d. What financial assurance will be provided by the applicant to maintain and repair the wastewater treatment system if Fairgrounds, LLC is unable to meet their responsibilities for the wastewater system? 2-6

e. Who will be responsible for the maintenance and repair of the wastewater lines? 2-7

7. Page 3.1-3 - Soil Tests: This section indicates that no groundwater was encountered in the test pits. However, a review of the test pit logs in Appendix K indicates that groundwater was encountered in test pits 7, 8, and 9. Due to the proximity of the wetlands, a shallow groundwater table would not be unexpected in some areas of the property. Revise the estimate of depth to groundwater and comment on potential impacts that construction may have on surface water quality if a shallow groundwater table is encountered with respect to the SWPPP. Also comment on whether the soils found in the test pits confirm the soil survey findings 3-1

8. Page 3.1-4 – Hydrogeology: As per Comment 4 above, the entire project site is located in the Town's Aquifer Overlay District. Applicant to explain how the proposed project is in compliance with the Town's regulations.

9. Page 3.4-2 – Existing Groundwater & Well Test Results:

   a. Set the datum used in the hydrogeologic report to a fixed site elevation. The water levels for the pumping phase and recovery phase of the pump test for the pumping well and nearby monitoring well should be referenced to an on-site benchmark and the existing ground surface elevation at the well head. 4-3

   b. In the hydrogeologic report, include the pre-pump test groundwater levels in the wells. This information is important to understanding the existing groundwater condition. 4-4

   c. Include a copy of the pump test measurements and original field notes in a tabular form as part of the pump test report. 4-5

   d. One of the primary purposes of the pump test was to evaluate the impact of pumping on the on-site wetlands per the request of the NYSDEC. However, rainfall at the site not monitored during the pump test period. Provide a discussion in this section explaining the test rationale. 4-6

   e. Why was the Town not asked to review the pump test procedures prior to performance of the pump test when the purpose of the pump test was not only to meet OCDOH requirements, but to meet requirements of the DEIS and the aquifer overlay district? 4-7

   f. Provide a commentary regarding the acceptability of only a 24-hour pump test to determine if the wetlands were impacted by pumping the wells. 4-8

10. Section3.4.2 – Potential Impacts: The potential impacts to the water resources do not address the potential for release of hydrocarbons from the vehicle maintenance operations at the car dealership.

    a. Address what the potential impacts would be from vehicle maintenance operations including storage of new vehicle fluids and storage and disposal of waste vehicle fluids. 4-9

    b. Address the mitigation measures to be taken in the design of the dealership to minimize such potential impacts to the aquifer and Aquifer Overlay District. 4-10

TECTONIC

c. Address how wastewater from car washing operations would be treated so that the aquifer and surface water are not impacted. 4-11

11. Page 3.4-5 – Proposed Stormwater Runoff Quality: Please comment on potential petroleum contamination to the stormwater quality from leaking vehicles. 4-12

12. Page 3.4-6 – Sewage Disposal Discharge Impacts:

    a. Sewage from the site may meet standards if all the site sewage was treated at the WWTP. Please address possible impacts from conventional subsurface septic fields if the entire site is not connected to the WWTP. 4-13

    b. What measures are to be taken to prevent or minimize impacts to downstream water resources if the WWTP fails due to mechanical problems, including piping and tank failures, as well as pump failures and/or power failures? 4-14

13. Page 3.4-7 – First complete paragraph:

    a. The DEIS states that vehicle servicing will occur in the interior of the building therefore there will be no impacts to the stormwater. Please address impacts from vehicles leaking fluids while temporarily stored in the parking area waiting for servicing. 4-15

    b. The DEIS states that no floor drains will be connected to the stormwater drainage system. What would floor drains be connected to and what would the floor drains be used for? 4-16

    c. Please address what measures the dealership would utilize to collect, store and dispose of waste fluids from vehicles and what measures would be implemented to control and cleanup an uncontrolled release. 4-17

    d. In the Wastewater Treatment Section in the Project Description, the DEIS states "Throughout the site, no wastewater from industrial uses or car washing will be discharged to the wastewater collection system." Cars at the dealership, particularly used vehicles, require cleaning to increase their retail value. If the car wash water, containing surfactants, salts, particulates, and petroleum, does not get treated at the WWTP then it must be discharged to the stormwater system. Please address whether the stormwater facilities are designed to handle this type of contaminant loading or what alternative methods of car washing are planned. 4-18

14. Page 3.4-10 – Mitigation of Water Quality Impacts: Address whether the proposed wastewater and stormwater systems are capable of providing adequate protection from petroleum releases. 4-19

Fairgrounds

LETTER # 3

Don Ferruggia
119 So. Route 94
Warwick, NY 10990

February 16, 2005

Town of Warwick Planning Board

Re: the Hannaford development on Route 94

Dear Planning Board:

I mourn the loss of the most beautiful farm in Warwick. For over 20 years I have come down that hill and turned right at ShopRite. As soon as I caught a glimpse of that picturesque historic farm, always neat and trim, I knew I was home. Now I won't know where I am. With this loss Warwick is a little less "Warwick" and a little more "Nondescript Shopping". 5-1

In more practical terms, a new supermarket in Town would not be a bad thing. Our corner of Town is already well served, with an A&P in Vernon and an A&P in West Milford, both only 10 - 15 minutes from ShopRite and both open 24 hours. Many other areas of Town have fewer choices.

If Hannaford wants to compete in Warwick, let them do so. That is the American way. But allowing them to open up right across the road from ShopRite would be the worst kind of planning. It's easy to predict what will happen: a price war will drive prices down but we will only be able to enjoy them for a short time. Soon one party will realize they can't afford the battle and will close. We'll be left not only with high prices again, but with an empty shell of a building. 2-8

The grocery industry runs on very thin margins, as we know from bitter experience. We've already seen Grand Union go backrupt and Big V go bankrupt. How long was the Big V supermarket in Florida empty?

Hannaford's executives must know this. They are no amateurs: they have run a huge grocery empire throughout New England for many years. If they want to build next door to ShopRite, they must believe they'll win the war. And they probably will: they are a very large company and have the resources to wait ShopRite out. Wakefern (which owns our ShopRite) is not a small company, but has only a few retail stores as far as I know.

It is a benefit to the Town to have more than one supermarket. It is to no one's benefit if ShopRite closes. So let Hannaford come to Warwick, but not on this site.

Sincerely,

Don F.

Received at the 2/16/05 Pl. Bd. meeting. (CS)

m 2/17/05 - ee

Office of the Mayor
Board of Trustees
Village Clerk
Treasurer
Telephone: 845-986-2031
Fax: 845-986-6884

Public Works Supervisor
Telephone: 845-986-2061
Fax: 845-987-1215

OFFICE OF THE CORPORATION
MEETINGS HELD 1ST & 3RD MONDAY OF EACH MONTH

Village of Warwick

77 MAIN STREET
P.O. BOX 369
ORANGE COUNTY
Warwick, NY 10990

Village Justice
Telephone: 845-986-7044
Fax: 845-986-2870

Building, Planning, Zoning and Historical District Review Board
Telephone: 845-986-9888
Fax: 845-987-1215

LETTER # 4

RECEIVED
FEB 16 2005
TOWN OF WARWICK @ P.B. Bd Meeting

Warwick Town Planning Board
Public Hearing: Fairgrounds Project
February 16, 2005

Dear Members of the Planning Board:

After careful reading of the DEIS for the Fairgrounds Project I would like to make a few comments:

We do need a competitive grocer – though I believe Hanaford is considered "high end".

Country Chevy obviously needs more room. The loss of its presence in the Village will free up parking and the Main Street site has potential for mixed retail, multi shops, etc. Please be aware although our tenancy rate is high the independent business market is extremely fragile. 2-9

The overall project will benefit the needs and convenience of our growing community but our very same community may not be fully aware of what will be lost (at least not now!). This includes the loss of prime agricultural land – which will become 17 acres of impermeable surface. We will lose open space, the rural landscape that has been known for generations of Warwickians, the wooded knoll, the gentle roll of farmland into wetland, the vistas articulated by stone walls, stands of trees and flocks of birds. This will no longer remain a wildlife corridor – natural pathways will be obliterated and habitat removed and wildlife pushed to a smaller square. 5-2

The effect of this development on the Village is varied. The positive as mentioned, will be the opening up of retail potential in the former Chevy site on Main Street. The negatives include that a new mega grocery store will greatly diminish the possibility of any grocery operation in the Village. This may also include independent, specialty stores such as bakers, fish stores, etc. who will not be able to compete with a chain store that can sell at greatly reduced prices. 2-9 CONT.

Page Two

The level of planned development for this site will create a threshold for like-kind highway commercial development which will surely become a drain on the Village. Interestingly, someone said to me recently, "You know Pennings Market is beginning to look out of place. So goes the neighborhood!"

Senior citizens constitute nearly 22% of the Village population. Many are in subsidized housing and are on fixed incomes. A 58,000 square foot store is not senior friendly. An "upscale" food store does not satisfy their needs as well. Nothing is being addressed to satisfy this segment of our community. 2-10

The project is large in scale and much of the landscape will be changed – flattened. We will be losing some real agricultural structures and homestead. The replacement structures – at least the County Chevy building emulates agrarian architecture. Hanafords does not and although not all together unpleasing, it remains a very big box in a field. 5-3

Because so much of the terrain will be changed very little of the natural vegetation will remain. I am grateful that an ancestral beech tree is being saved but the planting plan for this project remains lack luster if not "shopping center generic". The handling of the front parking lots are merely adequate, the "meadow" along the roadway is a weak echo of the rural context. The large 400 car holding lot behind County Chevy lacks any vestige of integrated green space – it will be a sea of shiny Chevys and remains visually exposed to viewers arriving from South Route 94. 5-4

In the Environmental review it notes that this property is prime agricultural land and that 17 acres will be covered by building and parking lot. As a matter of perspective, the Village Business District is approximately 25 acres of mixed use property.

The State of New York is very careful in regulating and protecting its wetlands and for good reason. I cannot help to wonder if we should treat prime agricultural land with as much respect. If a developer eliminates or diminishes wetlands, they are required to create new wetlands to mitigate the loss. Why not do the same with prime farm land – if a developer cannot create new farmland, to then monetarily support the preservation of farmland through donations to the PDR fund. 5-5

Finally, I am concerned that the site plan offers very few amenities and lacks a human scale. At this time it is not enough to give the community convenient shopping and cheaper peas. This will never, ever compensate for what pre-existed here.

There must be a way of integrating a more park like quality to this environment. I suggest the Board look at the possibility of internal walk and bike paths that may interconnect to neighboring properties that may be developed in the future. This possibly could connect to the Village creating a tangible relationship. 2-11

Page Three

The feature of this beautiful land is the wetland. It would be an enlightened developer who could create a meaningful connection to this asset. Otherwise I believe the inclusion of community or human spaces such as playgrounds, outdoor theatre space or other recreational amenities would greatly enhance the project and its reason to be there.

I do not know the fee structure in the town but I hope a project of this magnitude will generate serious contributions to the Town Parkland monies.

12-12

I hope you, as a Board, exercise all your legal power to define from this application a just return for the loss of rural character, open space, prime land and the negative addition of traffic, human pollution, infrastructure challenges and taxpayer cost.

The mark it will leave will be long reaching and its finality deafening. It will be the difference between the soft earth beneath our feet and the crazy clutter of shopping carts rolling aimlessly on the acres of what will become prime macadam.

Thank you for your ear and thank you for your hard work as a Board.

Respectfully submitted,

Michael J. Newhard
Mayor

cc: Michael Sweeton
David Church

MJN:jr

Fairgrounds

Sue Ann Gardner
30 Wickham Drive
Warwick, NY 10990
(845)987-8917
sgardner@rcls.org

LETTER # 5

Planning Board
Town of Warwick

February 16, 2005

"FAIRGROUNDS" PROJECT PUBLIC HEARING COMMENTARY

I think I speak for many of our citizens in being happy at the prospect that there will soon be more than one grocery store in our town. And as a 10 year employee of a public facility that doesn't meet current needs, I can completely understand and sympathize with the urgency that Mr. Petrucci and his associates must feel in needing an expanded physical plant for their business. It's unfortunate that the way the planning structure is set up, public commentary is brought in at the eleventh hour of an expensive and complex approval process, instead of in early stages when adjustments are more easily done, but I feel that if the board approves the destruction of the Miller farmhouse on the property, that we as a community will have pursued the letter of the law but will have completely lost its spirit.

The question here is not really how old this house is, or what parts of it are old and what parts of it are not. It was the farmstead of one of our leading citizens, Fred Cary Raynor, whose memoirs are preserved, as well as containing parts of the colonial era Blain homestead. By the applicant's own assessment on the Environmental Impact Statement, Section 19 page 11, the project will have a large impact on existing structures of historic importance to the community, and which impact can be mitigated by project change. 5-6

In every planning document that the Town now has, paragraph after paragraph speaks of the need to accommodate growth while preserving the rural agricultural heritage of the community. From the Warwick Village limit to the corner at Shop Rite is a stretch of 1.5 miles. On this 1.5 miles there are only 8 rural structuresand complexes surviving. By their very scarcity, every single one of them assumes an important role in preserving the rural feel of this stretch of what was the King's Highway in colonial days. Much of this corridor is zoned commercial. I ask you to look forward to the future when new buildings on a medium to large scale are erected on this land. The board is striving to have new structures evoke our agricultural past, but it is the few currently standing farm buildings that will become anchors for this gateway that tell everyone arriving, "Warwick is a community that can find ways to allow growth without discarding its heritage".

This structure in particular plays a key role of keeping this corridor from looking like every other commercial strip in the northeast. It is large in scale, appears structurally solid and well kept, is near to the road, and is on a knoll that gives it a dominance on the landscape. It is one of the few older structures in this area that has the kind of mass to be able to hold its own among commercial structures that will surround it. To approve its removal without exploring every extraordinary and creative means at our disposal is to act in direct opposition to the stated goals of the community in its planning documents. Isn't there any way to find an adaptive reuse of the building that will still accomodate something the project needs? That kind of forward thinking community heritage based planning is what can earn our businesses and planners the position of leadership in the region for which we are increasingly noted, and the support our citizens and their customers. I urge the Planning Board and the applicant take this small step back even at this late hour, and challenge them put this one element of the plan back on the table and find a way to save this historic homestead. 5-1

Sue Gardner

LETTER # 6

COUNTY OF ORANGE DEPARTMENT OF PLANNING
EDWARD A. DIANA
COUNTY EXECUTIVE
124 MAIN STREET
GOSHEN, NEW YORK 10924-2124
TEL: (845)291-2318 FAX: (845)291-2533
DAVID CHURCH, AICP
COMMISSIONER

RECEIVED
FEB 22 2005
TOWN OF WARWICK

ORANGE COUNTY DEPARTMENT OF PLANNING
239 L, M, & N NON-MANDATORY REPORT

To bring important inter-community, county-wide and regional considerations to the referring Agency, the proposed action is reviewed to aid the coordination among governmental agencies.

Referred by: Town of Warwick
Planning Board

Reference No.: WRT4-05N)
County Tax No. S51 B1 L40

Applicant: Goddard Dev. Partners, LLC,(Fairgrounds)
Proposed Action: SEQR on a commercial development
Reason for Review: Within 500 feet of State Route 94
Date: February 16, 2005

Review Comments: The Department has received a draft Environmental Impact Statement on a commercial site plan application, which is presently before the Town Planning Board. We have reviewed the DEIS and offer the following comments.

1. The DEIS has covered a variety of potential impacts outlined initially through a scoping session. We have reviewed the scoping document and the DEIS and find that the applicant has adequately addressed the issues and has developed mitigation measures to minimize any of the impacts identified in the document.
2. There is no doubt that the project will increase traffic on Route 94 and nearby feeder roads but the highways have adequate capacity and will handle the flow with the suggested additional improvements. 9-1
3. Although the project will convert existing and once existing farmland to a commercial use, it appears from the DEIS that there was no intention by the land owner to protect or continue farming on this parcel. The Town has an aggressive plan to protect farmland in other areas where farming will continue with PDR protection. 8-1
4. The applicants have taken steps to minimize impacts upon the wetlands and the scenic qualities of the area. They have also followed the zoning requirements of the Town's Zoning Law, the Town's Comprehensive Plan and the County Comprehensive Plan. 14-20
5. The Department will have another opportunity to comment when the FEIS and the site plan application are submitted for our review. 18-1
6. Having no further comments on the DEIS, the Department finds, from our perspective, the document to be complete.

Reviewed by: Richard J. Jones, Senior Planner

David E. Church
Commissioner

TOWN OF WARWICK

HISTORIAN
FLORENCE P. TATE

RECEIVED
FEB 23 2005
TOWN OF WARWICK

~~60 MAIN STREET, P.O. BOX 369~~
WARWICK, NEW YORK 10990
TELEPHONE (914) 986-1126

To: The Planning Board
Town of Warwick

LETTER # 7

February 21, 2005

The property recently called the Fairgrounds Project has always been a welcome sight to anyone traveling that main route through the Town of Warwick.

Leveling the land and demolishing the structures, as proposed by the project, would result in a very weak spot in the framework surrounding the village of Warwick. Preserving the property as it is offers an unique welcome to both the town and the village of Warwick. Talking about the historic rural background of the Town of Warwick and then allowing such important evidence of it to be wiped out are inconsistent. S-1

Warwick's assets should be protected, not lost forever.

Florence P. Tate
Town Historian

LETTER # 8

RECEIVED
FEB 28 2005
TOWN OF WARWICK

February 21, 2005

Mr.Benjamin Astorino, Chairman
Town of Warwick Planning Board
132 Kings Highway
Warwick, New York 10990

Subject: Comments on the DEIS for Country Chevy Fairgrounds development , Route 94 South.

Mr. Astorino and Planning Board Members:

While the Fairgrounds DEIS addresses many issues concerning natural resources, it fails to address the most significant issues which were part of the 1999 scoping document. Bearing in mind that these issues could have been just as easily addressed at any time in the intervening 5-1/2 years (since September, 1999), it is nearly impossible to respond to them now and reconcile the application with new Town Master Plan and the Inter-municipal Agreement with the Village of Warwick. The Master Plan, while acknowledging a Designed Shopping district along the Route 94 corridor also encourages the Town to direct commercial development back toward the Village of Warwick in order to maintain traditional land use patterns. The IMA, which has been the supporting document behind several grants and awards under the Quality Communities initiative, specifically directs commercial development back toward the Village in order to maintain traditional land use- specifically maintaining a traditional downtown commercial center. 8-2

The loss of 17 acres of current agricultural land is no longer in sync with the new Town of Warwick Master Plan, Town Zoning, and agricultural land preservation policies.

The loss of the Miller farmhouse, the third oldest house in Warwick and home of another Revolutionary War hero, is a local cultural feature that contributes to the historic landscape of the Town, is not appropriate. Every effort should be made to retain, restore and adapt this vernacular building for use in the complex. 5-6

Nowhere is the DEC's concern about bog turtles truly addressed in the DEIS, and the suggestions concerning traffic, including a stop sign at the entrance to the project site may only make traffic along the Route 94 corridor worse – not better. An additional outside independent opinion should be sought. 2-28

All this being said, I am fully well aware that Country Chevy received an approval in 1999 to move its dealership from the Village of Warwick to this site. Country Chevy would be well within their rights to act upon the existing approval, and given the size of the dealership, support services needed, inventory requirements, it makes perfect sense for this auto dealership to move to this a already approved site.

There is one effect of the application currently under review that absolutely must be remedied prior to approval being granted by the Town Planning Board to this present development: the adverse affects of the addition of a supermarket to this location. 7-1

Most members of the Warwick community would indeed welcome competition between ShopRite and another major supermarket. However, the loss of village supermarkets in Greenwood Lake, Warwick, and subsequently in Florida has wrought significant negative impacts upon the community. Remedying these losses before adding a new Hannafords (or other major supermarket) on the Fairgrounds property would not only offer an essential service within the traditional village land use pattern, it would also offer a significant amount of real competition within the Town. 7.1

The very existence of the supermarket lease (first assigned to Stop and Shop and on file as such with the County, and now reportedly assigned to Hannafords) has seriously damaged the residents of this community. Not only residents of the Village of Warwick, but also the residents of the Villages of Greenwood Lake and Florida. The existing lease has been used in an extremely predatory manner to effectively block out competition (a practice identified by the FTC as "Competitive Entry Foreclosure" and currently under investigation as a wholesale tactic of Chapter 11 reorganizations by the State Attorney Generals' office). It has also been used to disenfranchise the Village Board of their rights under the eminent domain laws of the State of New York, as well as to effectively nullify an FTC filing and ruling under Hart-Scott Rodino, and to flaunt sections 363 and 365 of Federal Title 11. 7.1

A bit of history will clarify:

When Grand Union was confronted by popular opposition to the development of the Welling Property within the Village for a supermarket, Grand Union signed a lease in May of 1999 with Fairgrounds LLC to develop a 60,000 sq. ft. supermarket on the property currently under consideration. It was not publicly known at that time that Grand Union was ready to enter into bankruptcy for a third time. The existence of 12 developmental leases, all signed between May and December 1999, effectively created huge financial assets of great interest to major international supermarkets wanting to significantly increase their market share in the United State. They inflated the value of the corporation when it would be sold under bankruptcy. Stop and Shop (a division of the Dutch company Royal Ahold) and Hannafords (a division of the Belgian company DelHaize) were two such entities. Both needed just such a vehicle to gain SEC and FTC approval of their market expansions in the US.

The lease was and remains clearly predatory.

1) The lease not only contains a non-compete agreement limiting the leaseholders to not lease within the development to any other retail operation which would sell food for off-premise consumption (not counting fast food), which is totally reasonable and understandable.

2) The same paragraph in the binding lease, page #10, section # 3.02 also clearly excludes the operation of a food market on **any** property directly or indirectly owned or controlled by the Owner (of the Fairgrounds property and lease) for a store where the principal business is the sale of food intended to be eaten off premises or as a drug store or pharmacy. Excluded from the restriction are fast-food type restaurants, take-out , gourmet coffee shops, or a deli with seating for no more than 12.

3) More importantly and clearly indicative of the nature and intent of the lease is the paragraph in the same section: **"In the event Owner [Fairgrounds} comes into possession or ownership of the existing Grand Union store in the Village of Warwick,** the above restriction with reference to a drug and or pharmacy store shall not be applicable thereto nor shall the incidental sale of food items in conjunction with the operation of a non-food business by any tenant at any location be deemed a violation of the restriction set forth above as to the sale of food."

   Why is this paragraph even included in a lease where the landowner was not at that time (and presumably is not today) in control of or ownership of the Main Street location where Grand Union formerly operated - unless restraint of competition were not an express purpose of this lease?

4) There is no guarantee that Hannafords intends a long-term occupancy of the premises for which the Town is considering an approval. Section 3.03 of the lease indicates that the lessee shall open a food market (with sale of other incidental merchandise as deemed appropriate) for a guaranteed period of one (1) year. **After 1 year, the lessee shall have the right to close its doors, may lease or sublease at will, but "shall not thereafter be required to operate any business in its building or occupy its building and nothing in this Lease Agreement is intended to require ... [them] to occupy the premises or operate any business in the premises, continuously or otherwise."**

   Before the Town destroys open space in order to facilitate Hannafords coming to the property, it is imperative to have a long-term guarantee of occupancy and operation of the food market on it as well as proof of the removal of any clauses restricting trade. There should also be a contingency requiring that the property shall not "go dark" for more than a set period of time and a contingency that should the property "go dark," it must be restored to the condition it was in when the approval was granted (open green space). 7.2

Lest anyone contend that this lease is no longer binding, page #30, Section 8.06 provides for the lease in its entirety with all restrictions and obligations to transfer to any entity resulting from merger, reorganization or consolidation or sale. This lease was expressly designed to be transferred, and as one of the members of the "stalking horse" consortium that won the bid, Hannafords becomes after Stop and Shop (now in serious financial problems) the logical next recipient of the lease. Given the worldwide financial impacts of judgments against Ahold both

in the US and in Europe (an accounting scandal that is considered larger than Enron), Ahold has sold off many of its subsidiary chains and locations worldwide in order to finance those judgments. The consortium held the right to transfer leases at will for a period of 180 days after resolution and closing of the bankruptcy in July of 2004.

In fairness to the Fairgrounds applicants, they did on 12/8/2000 file for injunctive relief from this lease on the basis that without the stipulated tenant, development financing could not be obtained. The judge ruled immediately to enforce this lease as written. Of all the leases for which injunctive relief was sought, this was the only lease which was enforced exactly as written, without any provision for negotiation. In fact, the judge was so intent upon enforcing the terms of the lease that she appended the lease in its entirety to the judgment so that its terms would be clear.

It is now obvious why this lease is of such importance in the greater scheme of things.

1) It was used, first, to undermine the ability of the Village Board to exercise its powers of eminent domain – the specter of Hannaford's alone was intended to keep any grocer from seeking the necessary guarantees from his wholesaler, even if the Main Street property had been condemned.

2) It was used to support the CVS suit against the Village in which CVS claimed to have won the lease at auction on 12/8/2000. CVS did not participate in the auction for the estate of Grand Union. The auction transcript declares that all the members of the "stalking horse" consortium that won the award were grocery stores. The specter of Hannaford's coming to Warwick was touted as effectively making a smaller grocery store not viable – therefore detracting attention from the fact that CVS was taking the location in violation of the FTC filings.

3) It was also used, as with the Village Board, to get around the filing made with the FTC that all 195 Grand Union locations would continue to operate as grocery stores. It is important to note that under Title 11, review of the transfer of any property or lease must be approved by the FTC and section 365 specifically protects shopping districts and business centers from adverse impacts to other businesses, to the property and to the community that would be caused by a change in the business mix or loss of an anchor. The Fairgrounds lease is being used to shift the business centers of the town and to change the mix in existing business centers in direct conflict with sections 363 and 365, US Title 11. 7-1

The results have been damaging throughout the entire town. Please refer to the Advertiser, dated February 18, 2005. In it, representatives of the Ecumenical Food Pantry note that there were 180+ local families, dependent upon its services, who received food baskets at Christmas. This

is a record number, and the number began to escalate with the loss of a local grocery in our village center. It has had a similar effect in the villages of Greenwood Lake and Florida.

In fact, the market study provided by Hannfords for the DEIS, amazingly, includes Greenwood Lake, Tuxedo and Chester as part of the market area. If that is true, then Florida which lies as close and without the impediment of Mt. Peter is also part of the market mix and impact upon that village has been as deliberate as upon Greenwood Lake and Warwick.

For the first time, in 2002, senior citizens comprised a significant percentage of people dependent upon our food pantries. This number, for the Ecumenical Food Pantry, had risen to 56 as of December, 2004. The financial damage is most felt by senior citizens, people on fixed incomes, and single parents. The increased cost of simply getting to and from the grocery has significantly depleted the amount of available funds for groceries, not to mention other essentials. While it is possible to take the Dial-A-Bus at a reasonable cost, the Town was placed in a position of having to fund an additional bus in order to meet the increased demand caused by the loss of easily accessible food markets.

The cost has been greater for the average family, as many have elected to leave the town completely for their weekly shopping. This means at least an 18 mile round trip to a grocery, or as much as 40 miles (to Middletown/ Wallkill) – not to mention the cost of extra goods purchased, waste, etc. The cost of discretionary income lost has had an impact on nearly every household. A financial impact analysis was done in March of 2003 and presented to the Warwick Village Board and made part of the public record. It should be available for your review. In the interim, with rising costs for gasoline, rising costs of incidentals in our convenience stores, etc., the impact has increased.

I am sure that you will hear comments about "letting the free market prevail." Unfortunately, given the circumstances, this is not a free market issue, but if allowed to proceed without remedy, it is a market contrived by a consortium of international conglomerates serving their needs and those of the two remaining major food wholesalers in the US. Like a movie set that is supposed to reflect a real market, it is a smoke and mirrors facade..

It is unfortunate that "free market" is being defended vocally by local residents who were part of the unsecured creditors of Grand Union. Unsecured creditors (non financial institutions) draft the plan of liquidation and approve it. They have a vested interest, usually financial, in making sure it is enacted exactly as written. Unsecured creditors may be refrigeration companies, wholesalers such as C&S Distributors, or local companies such as SEM Security Systems in our own area. Locally opposition to any other grocery or market coming into the community to fill the void – a real free market response – has been led by just such unsecured creditors, effectively disenfranchising their neighbors.

If Hannafords is to come to Warwick, it should be incumbent upon them to remedy the damage of the loss of smaller, local groceries in Greenwood Lake, Warwick Village and Florida. Since Hannafords was party to the FTC filing and their award of the local leases was predicated upon sworn testimony that they would retain these stores as "grocery stores" (and that no other bidder could do so), we should expect them to stand behind this promise, and restore grocery stores with long-term guarantees to our villages before receiving approval to develop this store in a currently undeveloped location. 71

As a division of the multi-national DelHaize (now the second largest purveyor of food in the world), Hannafords has access to many models. They have a smaller Trade Winds division, as well as a new model that is attempting to inroad Whole Foods and opened last year in the State of Florida. They also have access to urban and European models which would be of a suitable scale and adaptable to our villages. As a member of the C&S "Stalking Horse" Consortium awarded these properties, they have corporate relationships with several supermarkets and independents who could also be brought into the community to retain many levels of competition.

While prevailing market wisdom says that the "big box" model is the most effective, those touting it most loudly have been suffering from a downturn in profits (Pathmark, A&P, Winn-Dixie, and obviously Stop and Shop once the real figures were revealed). Hannafords has the ability to restore grocery stores to our villages, remedy the current situation and benefit from a series of stores that would attract more customers more frequently.

As members of the Planning Board you are not only charged with helping to promote the appropriate development in line with local codes, but also with protecting the health and welfare of the greater community. This is not an easy issue to understand, but it is one that affects the health and wellbeing of every resident of the Town. It is also the type of issue which will surface under many different guises as the Town grapples with increased demand for development. Thoroughly understanding the situation and requiring the appropriate remedy by Hannafords (or any other entity to whom they assign this lease) is the first step in protecting the community while facilitating growth.

Penny Steyer
76 Pine Island Turnpike
Warwick, NY 10990

Cc: Senator Charles Schumer, Senator Thomas Morahan, Attorney General Elliott Spitzer, Supervisor Michael Sweeton, Mayor Michael Newhard, Mayor Bill Morris, Mayor James Pawlicek, Mayor Scott Wohl

LETTER # 9

RECEIVED
FEB 22 2005
TOWN OF WARWICK

Planning Board
Town of Warwick

Feb/22/05 Re: The Fairgrounds

On Sunday Feb/13/05, I went with the Historical Soc. Committee to take a look at our old homestead on the Miller Farm that used tobelong to my Grandfather Fred C Raynor.

It has been many decades since I've been inside the house, but I can say that this house is still in good shape, and has certainly been well taken care of over the years. It would be a shame to have it taken down.

There is certainly alot of history here with the house, it seems to me that we should be looking at in that way, and not too much from the physical appearance of the house. The house is one of the oldest in this area and represents a strong sense of history of Warwick (from the Blain family on down). If it goes down it will be lost forever, and our loss.

We are fast burying history around heremnder developments and blacktop.

I hope that the Planning Board and Frank Petrucci will come up with a way to save this Historical Farmhouse.

Sincerely
Bill Raynor

Bill Raynor
126 Main St
Warwick, NY
10990

9-5

cc
PL. BD
TBD

Michael Sweeton

From: "Chief Stephen L. Pascal" <wpdchief@hvc.rr.com>
To: <supervi@warwick.net>
Sent: Tuesday, February 22, 2005 12:32 PM
Subject: FAIRGROUNDS PROJECT

RECEIVED
FEB 25 2005
TOWN OF WARWIC

To: Michael Sweeton, Supervisor Town of Warwick
Warwick Town Planning Board Members

Subject: Fairgrounds Project Rt 94 South

LETTER # 10

Dear Michael Sweeton, and Planning Board Members:

This correspondence is to acknowledge your hard work on creating and improving a greatly needed Grocery Shopping store "Hanafords" with close proximity for all residents especially the senior citizens. This will create much needed competition with the Shoprite Grocery Store and in the end benefit everyone. This is what business is all about, choice for the people they serve and competitive pricing to allow it to be affordable for all incomes. Not to mention opening up the job market for our local residents.

This is in lieu of what was originally proposed in the Village of Warwick not so long ago to allow an "upscale" high priced store such as "Emanuels" which would have served only the interests of a political few, and not the residents at all.

The Country Chevy Dealer will also be able to grow and compete with the rest of the car sales and manufacturing businesses in the same locale. All in such close proximity to the Village, which will also benefit in the long run to draw more people to the area of retail etc. A "Win" "Win" situation for all residents, merchants and retailers in the Town and the Village.

Please convey my feelings that I am very glad to see such progression in the interests of all concerned.

Stephen L. Pascal

Stephen L. Pascal
Village of Warwick Trustee

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LETTER # 11

RECEIVED

FEB 25 2005

TOWN OF WARWICK

February 23, 2005
30 North Lynn St.
Warwick, New York 10990

Town of Warwick Planning Board
132 Kings Highway
Warwick, NY 10990

Re: Country Fairgrounds on Rt. 94

Dear Planning Board:

I have been a longtime supporter of this Development on Route 94 for the Country Chevy Olds and a grocery store. Mr. Petrucci must be very frustrated at having to wait so long for approval.

I have lived here for 17 years. Warwick supported 2 grocery stores in the past and there are certainly enough people now to support 2 grocery stores with all the growth that has come to this town.

Just as the Dodge Dealership had the opportunity to expand and move out of the village so should this dealership. As far as the grocery store, I think it is a GREAT idea. Why shouldn't there be some competition? Competition is a good thing and keeps businesses on their toes. I myself shop at Shoprite and other grocery stores including Hannafords, which is a very good grocery store. It would complement Shoprite in that each store has some unique brands or items and people would use both. 7-3

Warwick must continue to progress into the 21h century. As people move in, taxes go up. We need ways to create more job opportunities and help with the tax structure by having more businesses. We can't live in a closed society. We have been very careful as to what is allowed in Warwick but people need to get over the arguing of expansion. As far as the historic house on the property, find a way to move it. Now residents are worried? Where have they been for the past 6 years? They could have commented about it in all the years that have past. It is ridiculous. I love historic homes but this cannot stop progress. Those that want to save this farmhouse should find a solution, but it should not prevent the progress of building on this property. 5-7

I speak for several residents of the area who would welcome another grocery store and larger Chevy/Olds Dealership.

Sincerely,

Marlene Falot Stabin

Attn: Dave Getz
+ Fred Wells (File)

RECEIVED
FEB 24 2005
TOWN OF WARWICK

02/24/2005

LETTER # 12

Connie Sardo
Planning Board Secretary
Town of Warwick, NY.
Re: Country Chevy/Fairgrounds

I've owned the home at 57 West St for 13 years and have been blessed with wonderful neighbors.
The lower lot for Country Chevy is right in my backyard.
The lot is fenced and ringed by a wide border of trees.
We have not been blighted by noise and light pollution.
While other businesses close by have excessive and obnoxious lights on at all hours the lighting on the car lot is limited to a single unobtrusive lamp.
The noise level is nominal.
I garden on the green space surrounding the lot.
Another grocery in the village is not necessarily precluded by the addition of a Hannaford's.
The corridor in question is bound to be developed like it or not.
An owner from the community with a record of thoughtfulness in the community will build the right kind of facility.
No doubt the proposed Fairgrounds will benefit from the same level of neighborly consideration extended to the residents of West St.
The Petrucci's have been terrific neighbors and will take the community into consideration wherever they go.

8-3

Sincerely,

Patrick Gallagher

MDRA

MATTHEW D. RUDIKOFF ASSOCIATES, INC.
Planning • Environment • Development
Beacon Building
427 Main Street • Suite 201 • Beacon, New York 12508
Phone: 845.831.1182 • Fax: 845.831.2696
www.rudikoff.com

RECEIVED
FEB 28 2005
TOWN OF WARWICK

February 25, 2005

LETTER # 13

Ben Astorino, Chairman and Members of the Board
Town of Warwick Planning Board
Warwick Town Hall
132 Kings Highway
Warwick, NY 10990

RE: DEIS REVIEW
FAIRGROUNDS, LLC
Our File WK04520

Dear Chairman Astorino:

At the request of Shop-Rite Supermarkets, Inc., Matthew D. Rudikoff Associates, Inc. ***(MDRA)*** has reviewed the DEIS for "The Fairgrounds" project, submitted by Fairgrounds, LLC, which was recently accepted as complete by the Town of Warwick Town Planning Board, as Lead Agency. Upon review, ***MDRA*** finds that the DEIS does not provide the public with adequate information from which the public can determine the impact of the project, and therefore a supplemental DEIS should be provided. In support of our findings, ***MDRA*** has prepared the following comments on the accepted DEIS as submitted by Fairgrounds, LLC.

As indicated in our prior letter dated January 19, 2005, the DEIS does not provide enough information regarding the presence of bog turtles, the project's impacts on bog turtle habitat, or if the investigations were done properly. ***MDRA*** respects the request of the NYSDEC that the findings of the bog turtle search be kept confidential. However, it is our understanding that the NYSDEC request is selective and does not include information regarding the methodology used the qualifications of the researchers that conducted the search, and the compliance of the search results in order for the Lead Agency to determine the impacts and mitigation measures to occur. As indicated to ***MDRA*** via an email conversation with the DEC, in the absence of any conclusive evidence, the Town should assume that the bog turtle is present and plan accordingly.

In addition, some of the following comments also address information necessary to determine compliance with the Town's ordinance, while other comments are needed to support the discretionary decisions or waivers requested by the applicant. For example the marginal access road, which was previously mentioned in a January 10, 2005 memo from ***MDRA***, and the 60,000 gallon water tank are both issues in the DEIS lacking sufficient details regarding their compliance to the Town ordinance, and therefore are insufficient for your decision making.

On behalf of our client, ***MDRA*** respectfully requests that our attached substantive comments be taken into consideration.

3.2 Terrestrial and Aquatic Ecology

A review of the DEIS indicates a number of inadequacies which brings into question whether or not an adequate evaluation of site natural resources was undertaken consistent with the requirements of SEQRA.

Site Flora

1. Given the size of the site, diversity of natural communities, and predominance of old field vegetation, the identification of only about 50 herbaceous plant species on the site appears quite sparse. It is likely that a thorough review of the site would reveal a substantially greater number of herbaceous species, including protected and possibly rare species.

2. Despite the extent of herb-dominated wetlands on the site, not a single species of sedge is listed in the DEIS (the DEIS merely states that sedges are present. It is likely that several species of sedges occur in site wetlands and uplands, some of which could be rare. For example, false hop sedge (*Carex lupuliformis;* NYSDEC listed rare) and cattail sedge (*Carex typhina;* NYSDEC listed threatened) are known to occur in wetlands of Orange County and could be present in site wetlands. There is no evidence in the DEIS that sedges and other general plant groups; e.g., asters and goldenrods were properly identified. 6-2

Bog Turtle Search

3. As indicated in our prior letter dated January 19, 2005, and upon additional review of the issue and consultation with experts, in ***MDRA's*** opinion, due to the lack of information regarding the presence of bog turtles and the project's impacts on bog turtle habitat, a supplemental DEIS should be required to allow for additional public review of pertinent information. A supplemental EIS is clearly warranted here, based upon the important and relevant new information provided by Dr. Michael Klemens, discussed below. 6-3

   In regards to the project impacts on bog turtles, a State-listed endangered species; the NYSDEC expressed substantial concerns in their Response to Lead Agency Letter dated June 18, 1999. The NYSDEC required the Town of Warwick, as Lead Agency to provide a DEIS, which is to specifically include a "thorough study related to the presence of bog turtles and project impacts".

4. Looking further at the bog turtle issue, we have reviewed the NYSDEC letter to Ms. Sally McGovern of the Town of Warwick Planning Board, dated August 5, 1999, which informed the Planning Board of its concern about the potential for bog turtles to occur on and in the vicinity of the site and advises that the findings results be kept confidential. However, since the NYSDEC requested that the findings of bog turtle assessment be kept confidential, little detailed information regarding results of the study were included in the DEIS. Consequently, it is not possible for ***MDRA*** to determine if the surveys for bog turtles were done pursuant to the requirements of the 2001 Bog Turtle Northern Population Recovery Plan. The confidentiality of the search is not meant to withhold the methodology used or the results if the search resulted in negative findings. 6-3

According to the ERS consultant, the information regarding the Bog Turtle searches has been submitted to the DEC. However, the information has not been submitted to the Town, as Lead Agency. Without knowing the status of the NYSDEC submission, the Town is unable to make an informed decision of whether or not to accept the DEIS as complete. It has been established that the project site is located within a watershed known to support bog turtles and that the USFWS and NYSDEC require that a Phase 1 search be conducted in such areas. Therefore, in the absence of any conclusive evidence, the Town should assume that the bog turtle is present and plan accordingly regarding the potential impacts and mitigation measures involving the bog turtle and bog turtle habitat on the site. 6-4

5. In order to determine if the appropriate bog turtle search protocol was conducted, ***MDRA's***, Senior Biologist contacted Dr. Michael Klemens, the author of the 2001 Bog Turtle Northern Population Recovery Plan, to discuss bog turtle records in the Town of Warwick. Dr. Klemens reported that he has found several bog turtles in the regional watershed, which encompasses the project site and that the site is extremely sensitive because of its possible use by bog turtles. Based on ***MDRA's*** conversation with Dr. Klemens, it became evident that:

- The DEIS does not include a description of the bog turtle search protocol explicitly required by NYSDEC and Fish and Wildlife Service; nor is there any indication in the DEIS that the required protocol was followed during bog turtle searches by the applicant's consultant after 2001;
- The search protocol referred to, which is described in the 2001 Bog Turtle Northern Population Recovery Plan, should have at least been cited in the DEIS (It was not); and
- The bog turtle analysis in the DEIS fails to evaluate the significance of the entire watershed in which bog turtles have been found ant the relationship of that watershed to the sensitivity of the site as suitable or potential bog turtle habitat. 6-5

- There is no analysis of the potential for bog turtles to use the site on an interim basis; nor is there a description of distinctive bog turtle habitat requirements with respect to indicative flora, hydrologic requirements, substrate conditions and food requirements. The DEIS also fails to provide an assessment of the suitability of site wetlands to support bog turtles. Further, the DEIS has not established if site wetlands afford marginal, moderate or optimal habitat. Suitable or optimal bog turtle habitat can be quite small (minimum size about 2,500 square feet; less than the 0.1 acre of wetlands proposed for filling by the applicant), provided such areas are connected to other wetlands. Consequently, optimal habitats can be readily overlooked or the suitability of the wetlands can be "underevaluated" by focusing on the larger wetland condition and ignoring the interconnected optimal and suboptimal bog turtle habitats that encompass the watershed in which the site and bog turtles coexist. 6-10
- Equally important, there is no analysis in the DEIS of project impacts that could adversely alter bog turtle habitat or the surrounding watershed, including the potential for nutrient enrichment, hydrologic alteration, loss of habitat, impacts of pesticides and fertilizers on wetland water quality and the facilitation of an increase in the spread in nonnative invasive species. 6-11

Other Wildlife Concerns

10. The Wildlife List (Table 3.2-2) in the DEIS makes no distinction between wildlife actually observed on site and that which has the potential to occur on the site. Moreover, there is no analysis of project impacts on the following rare species, several of which frequently use oldfields, meadows and agricultural areas that are proposed for removal: 6-12

Upland sandpiper (*Bartramia longicauda*; NYSDEC-listed threatened) 6-13
This species relies on old pastures and agricultural areas for nesting and other activities. It is a ground nesting species which, if present on the site, would be seriously imperiled by construction during its breeding season. There is no analysis in the DEIS of potential impacts of the project to this species and other agricultural area-old pasture ground nesting species that have been listed but not discussed or assessed in the DEIS. Nor is mitigation to offset potential impacts to these or other state listed species indicated below discussed in the DEIS. Failure to assess potential project impacts on this threatened species is considered a significant shortcoming of the DEIS. Emphatically, confirmed breeding of upland sandpiper has been recorded for only seven survey areas in southeastern New York, six of which are located in Orange County. No confirmed breeding of this species has been recorded in any of the surrounding 10 counties. Consequently, all of Orange County particularly sites with open fields meadows and abandoned agricultural lands provide critical habitat for this threatened species.

Potential impacts to the following NYSDEC-listed special concern species which utilize agricultural areas and old pastures or oldfields for nesting and other activities, and which are said to occur on the site or have the potential to occur on the site, have not been assessed in the DEIS:

Grasshopper sparrow (*Ammodramus savannarum*) 6-13 CONT.
Wood turtle (*Clemmys insculpta*)
Eastern box turtle (*Terrapene carolina*)

Spotted turtle (*Clemmys guttata*)

Additionally, there is no analysis of regionally rare species; e.g., horned lark (*Eremophila gramineus*), which is an uncommon field nesting species in the Hudson Valley Region. Nor is there an assessment of potential project impacts on other NYSDEC-listed special concern species that occur on site or have the potential to occur on site, namely: Cooper's hawk (*Accipiter cooperii*) and Jefferson salamander (*Ambystoma jeffersonianum*). 6-13 CONT.

3.4 Water Resources

Stormwater Management and Controls

11. Section 3.4.3 on page 3.4-10 discusses maintenance of stormwater controls but contains no reference to the distribution of the responsibility between the owners of the two lots and easements that may be necessary to ensure rights and responsiveness to Town code enforcement in the event of a failure by the responsible party to maintain. 4-21

3.5 Land Use and Zoning

Marginal Access Road

12. In Sections 1.2.4 and 3.5.2 of the DEIS, the applicant discusses its request for a waiver from the Town Zoning requirement to provide a marginal access road. According to the Town Zoning Code, "The Planning Board may waive any and all of the requirements for a marginal access road in § 164-42F if future interconnection with adjoining parcels is provided and offered for dedication to the Town of Warwick. Marginal access roads are encouraged in high traffic areas and are attainable pursuant to New York State Town Law § 200." As previously discussed in ***MDRA's*** letter to the Planning Board dated January 10, 2005, the applicant is not proposing such an interconnection with adjoining parcels. In addition, the previously granted variance for Country Chevrolet applied to a radically different site plan proposal for the property. Therefore, the Planning Board likely lacks authority to grant a waiver and the applicant should be required to apply to the Zoning Board of Appeals for a variance. 8-4

60,000 Gallon Water Tank

13. Pages 2-6 and 2-10 contain an identical one-sentence reference to the proposed 60,000-gallon water tank. The DEIS contains no discussion of the size, height and paint color of the water tank, nor does it discuss any required lighting or potential use for mobile telephone or similar transmission facilities. The Executive Summary Section 1.2.10 on page 1-23 asserts the proposed water tank "will be hidden from view from off-site viewpoints" but there is not further explanation of how this is accomplished. The illustrative aerial view at Figure 2-6 and the Post-Development Views from Route 94 at Figures 3.10-10 and 3-10-11 omit the water tank. 8-5

14. The failure to explain the assertion contained in the executive summary may be a serious omission from the DEIS. The DEIS should mention any and all compliance (i.e.: dimensions of the tank) to the Town zoning ordinances regarding the water tower. 8-6

MDRA will be available to discuss the attached comments with the lead agency to clarify or address any questions about them.

Sincerely,

MATTHEW D. RUDIKOFF ASSOCIATES, INC.

Matthew D. Rudikoff
President

RECEIVED
MAR 04 2005
TOWN OF WARWICK

LETTER # 14

Mr Benjamin Astorino, Chariman
Town of Warwick Planning Board
132 Kings Highway
Warwick, New York 10990

February 27, 2005

Dear Chairman Astorino and Planning Board Members,

I am writing you regarding concerns I would like considered as you review the Country Chevy Fairground development.

One major issue is having a Supermarket put into this location. As our Town Planning Board, have you not wondered why this is the only location a Supermarket is looking at when we have three Villages with no grocery stores at all? The negative impact on all of our residents, of which a large number are seniors on limited incomes, has been huge. We have more residents dependent on the services of the Ecumenical Food Pantry than ever before. Transportation availability, distances, time and cost just to get food for many of our residents is a large concern.

Between the Town of Warwick Master Plan, The Village of Warwick.. Master Plan and the Intermunicipal Agreement, the idea of having commercial development and services centered in the downtown center is a major goal. It is understandable that Country Chevy needs a larger location,, but why must a huge grocery store be part of this arrangement? For a downtown to survive, every day services must be available. Moving a food store to this location will continue to drive local dollars away from our downtown merchants. 7-4

What assurances do we have that Hannafords will stay at this location for 2, 5, or any amount of years at all? If they do not survive there, will another grocery store be able to, or want to,move into this 58,000 square foot building? Will we end up with an empty big box on this agriculture land? 7-5

This development will have an irreversible impact on this land and our Town. Have adequate studies been done on the traffic impact for the Village of Warwick, Route 94 and Warwick Turnpike? Are 800 plus parking spaces in this location what Warwick residents really want? 9-2

Each member of the Planning Board has a huge responsibility in how they look at each development that comes before the Board. You have laws and Master Plans and input from many to contend with. You have the ability to grant variances, approve or disapprove projects, and in doing so, shape the landscape of our Town forever.

Your responsibility is to ensure that the needs and interest of the residents of Warwick are what determines our future path, not the greed of major corporations or small business and individuals.

Thank you.

Sincerely,

Lynn Miller
5 The Knolls
Warwick, NY 10990

February 28, 2005

RECEIVED
FEB 28 2005
TOWN OF WARWICK

LETTER # 15

Warwick Town Planning Board
Warwick, New York 10990

Dear Sirs:

This letter is in regard to the site plan approval regarding the two-lot subdivision to allow the use of 82,750 square feet of commercial retail facilities across from Leo Kaytes Ford and adjacent to the Frontier Bowling Lanes.

Our home is at the junction of 17A and 94 in Warwick..across from Dawson Motors. About a mile up from my home is Kaytes Ford and Shoprite. A little further up 94 is the Chrysler Dodge dealership. What was once farmland, trees or fields are now cars, cars, cars, with no green buffer between them and 94. Now another dealership is planned for this area, right across from Kaytes Ford. Is this in keeping with Warwick Town plans for this area? Are we to have one car dealership after another on 94, similar to those on Route 23 in New Jersey? Is this what the Warwick Town Planning Board has in store for us who live at this entrance to the Village of Warwick? 8-7

And why is a food store planned directly across from Shop Rite? If we have to drive to Shop Right anyway (because you may be sure no one is walking to it from the Village), we may just as well drive to Chester or Middletown or Vernon if we want an alternative. 8-13

No one ever bought a home in a town or a village because it was near a car dealership. In fact, it is just the reverse. People who live near them move on to ~~greener pastures~~. Do you get the picture? By the way, do you have a "For Sale" sign available?

Sincerely,

Joan T. Nagrod
Fran Sinclair
Neil Sinclair

Joan T. Nagrod
Fran and Neil Sinclair
40 Oakland Avenue
Warwick, New York 10990

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Date: Mon, 28 Feb 2005 14:02:20 -0500

From: rsachnin@optonline.net Add to Address Book

Subject: question about board meeting 2/16/05

To: towplanning@yahoo.com

To whom it may concern,
My name is Robert Sachnin and I had attended your planning board meeting on 2/16. My question pertains to the country fairgrounds, I hearing. I was just curious what the name and exact spelling of the that was to be destroyed and the name of the person that had lived there.
Thankyou for your time, I look forward to hearing from you.
Best Reguards,
Robert Sachnin

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FEB 28 2005
TOWN OF WARWICK

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LETTER # 17

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Date: Mon, 28 Feb 2005 12:31:22 -0800 (PST)
From: "Judith Rae Davis" <judithraedavis@yahoo.com> Add to Address Book
Subject: Route 94 Property for Hannafords/Chevy Olds
To: towplanning@yahoo.com

Connie: Attached please find a letter of inquiry regarding the proposed developme
Ford. Please bring it to the attention of Planning Board Members. Thanks for your

Judith Rae Davis
222 Homestead Village Drive
Warwick, NY 10990

Plain Text Attachment [Download File | Save to my Yahoo! Briefcase]

Judith Rae Davis
222 Homestead Village Dr.
Warwick, NY, 10990

RECEIVED
FEB 28 2005
TOWN OF WARWICK

9-5

To the Planning Board of Warwick, N.Y. ;
2/24/05

I am writing in regards to the development of the property on Rou
94 by Country Olds and Hannaford.

I understand that with this development the third oldest house in t
town of Warwick (est. 1723) will be lost in this development.
Interestingly, mention of the fate of this historic house has been
any newspaper commentary and photos, even quotations from people
present at your meeting are modified to exclude concerns about the
mentioning the barn area instead

A second loss will be wetlands that the development will encroach u

A second loss will be wetlands that the development will encroach u
I have not heard which portion of wetlands is being pinpointed and
would like to know specifically which wetlands on the property it w
eliminated. There is an ephemeral wetland that with the thaw and ra
throughout the summer is home to some pretty incredible wildlife. O
summers eve one can just pull over on 94 and hear all the life in t
wetlands. I understand there was an environmental impact study and
attempt to see if there were bog turtles with no avail. I would li
know how many times and how many years this research was taken and
there were any concerns toward the wildlife in these ephemeral wetl
I am aware there will be an service entrance and I fear it will
encroach on this very area.

My final question is about the location of the main entrance. I rea
that it runs pretty much right through where the historic farmhouse
now standing. There is a knoll and I am concerned that the removal
this knoll and surrounding trees will disrupt the environment of a
year old copper beech tree to the right of the house. I believe the
beech tree is among the chosen trees to remain, but I am afraid if
of its environment is destroyed it will perish.

I appreciate the time you will invest in answering my questions and
thank you in advance for your response.

4-19

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LETTER # 18

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Date: Mon, 28 Feb 2005 11:12:49 -0800 (PST)

From: "Mark Insetta" <classicarts2@yahoo.com> Add to Address Book

Subject: Open letter to Town of Warwick

To: "Town of Warwick Planning" <towplanning@yahoo.com>, "News GL, WM" <glnews@greenwoodlakenews.com>, "Lisa Wolfe" <babbleon@warwick.net>

To Whom It May Concern:
History value of small farm house on rt. 94 in Warwick

In this day and age people travel to Mars and Moon and will traven farther, but can not save the third oldest house in this area, because a parking lot has to replace it.

S-6

It is just amazing, that no one in town can see the value in preserving a small piece of Warwick history.

It appears, that a value of a parking lot and or convenial store outweighs the value of this precious architectural jewel. I could only imagine, if this building was centrally located, where people could see it cestroyed, that would be different!
But since it is located where no one could see on rt. 94, which is fast becoming Strip mall-chain store-/aluminum, vinyl siding, fake stone facades poluted buildings/ Capital of the county, it seems to be putting business over historic value.

There is no way to move and preserve endangered architectural treasures in to one location to create functional "scansen village" or "Museum village" which could serve as an historical living example, providing the shows of old crafts, cooking, furniture making,

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TOWN OF WARWICK

american country art exhibitions, etc, generating money by having thematic theatre shows, traditional music concerts and so on?????????????
That is the way other countries care for their legacy.

Our chidlren and grandchildren will know these only from the photos in the books!

I can see in near future the Statue of Liberty being replaced by parking lot.
And that's very sad. We have always money for War, for helping other Countries in need, bud don't see ourselves in context of the history.

Mark and Alena Sweet Insetta
Greenwood Lake, Warwick

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GREENPLAN

LETTER # 19

MEMORANDUM

GREENPLAN INC.
Environmental Planners
302 Pells Road
Rhinebeck, NY 12572-3354
845.876.5775
Fax 876.3188
www.greenplan.org

To: Ben Astorino, Chairman
Town of Warwick Planning Board

From: J. Theodore Fink, AICP

Date: 2/28/05

Subject: The Fairgrounds DEIS

Applicant: Fairgrounds, LLC.

We have completed our technical review of the Draft Environmental Impact Statement (DEIS) for above captioned application, which was accepted as complete on January 19, 2005. We offer the following comments for the Planning Board's consideration. These comments, together with all oral and written comments will need a response, and where necessary, revisions to the DEIS, in the form of a Final Environmental Impact Statement.

CHAPTER 1.0 EXECUTIVE SUMMARY

1. The applicant states the wastewater treatment plant will only service Lot 1, but not Lot 2. There are no details on the Site Plan identifying the location of subsurface wastewater treatment system for the auto dealership. 2-13
2. The design of the proposed project has the potential to impact the character of the area. We disagree with the applicant's assessment on page 1-16 that separating the buildings will minimize the scale of the project. Spreading the buildings out on the site increases the scale, coverage and magnitude of the project. 2-14

CHAPTER 2.0 DESCRIPTION OF PROPOSED ACTION

3. Section 2.4.2, subheading of *Access* describes the site access from Route 94. In this description, the text states "Turn lanes are being considered, pending further design review by the project engineers". This is inconsistent with the *Mitigation Measures* described in the Executive Summary, page 1-17. 2-15
4. In our opinion, the applicant has not justified the proposed 136 off-street parking spaces for the auto dealership as described on page 2-7. The number of spaces proposed is nearly double the number required by zoning (72). Further, this number exceeds the Urban Land Institute (ULI) standards for shopping centers where ULI recommends 4 spaces per 1,000 square feet of gross floor area (gfa). If you were to base the parking on ULI standards, the dealership would require 91 spaces. Finally, 2-16

the applicant claims that the number of spaces proposed is based upon experienced need at the present Country Chevy location. There are no facts to support this claim presented in the DEIS and no discussion of the possibility of customers utilizing shared parking spaces provided for the grocery store. If the applicant can justify the proposed number of spaces, the Planning Board should consider requiring the number of spaces, that exceed the Zoning requirements, be banked until demand for those spaces has been demonstrated. Alternatively, we suggest modifying the plan to facilitate shared parking areas. 2-16 CONT.

5. In the discussion of parking for Lot 2 (page 2-9), which includes the grocery store and the pad building, the applicant again does not justify parking in excess of the zoning requirements. In fact, the applicant provides evidence supporting the requirements in the Zoning Law. The applicant notes average parking space use for a supermarket and bank from an Institute of Transportation Engineers survey of a representative sampling of parking facilities. The weekday and Saturday averages for the supermarket are **below** the Zoning requirement. In the case of the bank, the weekday average (0.63 spaces per 1,000 square feet of gfa) is well below the zoning requirement (3.6 spaces per 1,000 square feet of gfa) and the Saturday average (4.23 spaces per 1,000 feet of gfa) is more. However, we believe customers will find adequate parking within the requirements of the Zoning Law. 2-17

   We question why the applicant did not choose to use the same ULI standard for the supermarket and bank as they suggested in the discussion for the auto dealership. We fail to see why the applicant makes no mention of the ULI shopping center standard of 4 spaces per 1,000 square feet of gfa and its application for these uses, especially since it matches the Town's Zoning requirements for a supermarket. 2-18

6. The applicant offers no explanation about why the wastewater treatment plant will only be connected with the supermarket and not the auto dealership or the pad building. The applicant needs to disclose what event will cause the dealership or the pad building the ability to secure connection to the treatment plant. 2-19

   The Town Board is considering changes to the Zoning that would permit traditional neighborhood development in this area of the Town. The should discuss whether the proposed wastewater treatment plant can be designed so that expansion is possible to accommodate other potential users. If this project is approved, this wastewater treatment plant is the only one in this rapidly expanding area. 2-20

7. The applicant is proposing pole lighting at 25 feet high with spacing ranging from 100 to 140 feet. § 164-43.4(5) states the maximum height for a freestanding luminare shall be 16 feet above finished grade. The height can be increased to 25 feet as the applicant is proposing; however, we recommend the height of pole lighting for parking lot areas not to exceed 15 to 20 feet. § 164-43.4(6) states spacing between fixtures should be approximately four times the height. The applicant has indicated spacing up to 140 feet. 2-21

8. The discussion of signage on page 2-13 does little to inform the reader about any proposed signage. Figure 2-6 only provides a sense of the location of the entrance sign. Signage has direct impacts on community character and details about type, size, lighting, and materials are critical issues for consideration. 2-22

9. The applicant is requesting a waiver from constructing a marginal access road on the site. Reasons cited include less site disturbance such as removal of buffering trees, wetland filling and excavation of the entire site frontage. However, the waiver can only be granted if future connection to adjoining parcels is attainable. The applicant claims the connection is possible, but does not provide plans for how and where a marginal access road could happen on the site. The road should be depicted on the plan with appropriate notation regarding dedication to the Town. 2-23

CHAPTER 3.0 EXISTING SETTING, POTENTIAL IMPACTS AND MITIGATION

10. Bog turtles. On February 14, Karen Schneller-McDonald spoke with Alexander Ciesluk, DEC Deputy Regional Permit Administrator, regarding his August 5, 1999 letter commenting on the Fairgrounds scoping document. In that letter, Mr. Ciesluk asks for a detailed assessment of "the potential use of this site by bog turtles and potential impacts to this species, both on the site and on adjoining properties as a result of the project." In addition he requested that this assessment be kept as a confidential document not distributed with the EIS for public review. However, based upon Ms. Schneller-McDonald's recent conversation with Mr. Ciesluk, it was his intention that this special assessment be available for lead agency review only. The assessment was to be summarized for inclusion in the main body of the DEIS. In addition, the assessment should provide information on the qualifications of the consultant who conducted the bog turtle surveys, and on the survey methodology, using the US Fish and Wildlife Service's *Bog Turtle Northern Population Recovery Plan* (Recovery Plan) protocol. 6-15

Field surveys for bog turtles conducted after 2001 must conform to Recovery Plan standards; this was not documented in the DEIS. How does the Recovery Plan describe bog turtle habitat, and is this present on the Fairgrounds site? What condition is it in? Have bog turtles been found within the same watershed, or on adjacent sites, or in other portions of wetlands connected to those on the project site? These are only a few of the questions that must be answered in the DEIS. 6-16

Review of the bog turtle assessment is essential for completion of the technical evaluation of the DEIS and comment on potential impacts to this species and its habitat. The potential presence of bog turtles on the Fairgrounds property, or, as noted in the Recovery Plan, the presence of turtles in any portion of the watershed, will affect other issues including stormwater management practices, water supply and quality issues, and wetland buffers. It will also be a factor in assessing impacts to wetlands B and C. Therefore, review of the bog turtle report prepared as part of the DEIS will be necessary before comments regarding impacts and mitigation can be completed. 6-17

We believe that it is necessary for there to be an additional 30 day period, for the Town's consultant's to review the Bog Turtle Study called for in the Scoping Document and DEC letter. We also believe that this study should only be made available to the Town's consultants to conform to the DEC request for confidentiality. Once GREENPLAN and Tectonic are in receipt

of the Study, we can then begin our 30 day technical review of this document.

Additional comments from Mr. Ciesluk's letter were not addressed adequately in the DEIS. These include:

a. "...assessment of potential impacts to onsite and adjoining wetlands due to stormwater and treated wastewater effluent. Of concern are changes to vegetation (short and long term) due to nutrient loadings etc., associated with these discharges." 6-18

b. "Include description and assessment of surface water bodies including stream proposed to receive treated wastewater effluent." (see comments below for more details) 4-22

11. Geology, soils and topography. Placement of high curbs to deter passage of turtles is mentioned in this section; will this measure in fact be used? If so, a detailed description of these curbs is required. 2-24

12. Page 3.1-7. The statement "Deconcentrate and distribute stormwater runoff through natural vegetation or structural means before discharge to streams or wetlands" needs further explanation. What is meant by "deconcentrate" and "structural means", and what type of vegetation would be used for this purpose? 3-2

13. "... no parking areas are proposed to be constructed with alternative pavement surfacing..." These alternatives are included in the scoping document and must be addressed in the DEIS. 2-25

14. Stormwater impacts and management. Impacts, (short term, long term and cumulative) incurred by stormwater runoff from adjacent properties, impervious surfaces, lawns, etc onsite must be adequately evaluated in the DEIS. This includes separate evaluation for each of the common constituents of stormwater as listed on page 2-3 of the "NYS Stormwater Design Manual". These pollutants include, but are not limited to total phosphorus, total nitrogen, chloride, and oil and grease. This evaluation will include an examination of the effectiveness of the Stormwater Pollution Prevention Plan in removing these pollutants (including total phosphorus and total nitrogen) before they flow into any of the wetlands onsite. The proximity of the proposed commercial uses on this property – especially an auto dealership- to high quality wetlands requires a rigorous evaluation of the fate of specific stormwater constituents. 4-23

15. Terrestrial and Aquatic Ecology, and Wetlands. This section, along with the Wetlands section, did not provide sufficient information for an assessment and evaluation of impacts on habitats, wetlands, and protected species. The following comments identify the specific information required.

    Assessment of onsite habitats and their condition. A brief summary of the information necessary to make an informed decision regarding project impacts on habitat and species is provided below. It is included here as an example; the habitat descriptions in the DEIS do not provide this level of information. 6-19

    - A habitat assessment typically identifies the various habitat types (e.g., shrubby oldfield, mature mesophytic forest, intermittent woodland pool)

found on the property and estimates their extent, condition, and ecological sensitivity. It analyzes the presence or potential presence of plant and animal species of conservation concern on the property and estimates the impact the development will have on all plants and wildlife found in the area.

- Assessment of habitats includes two perspectives: site specific and the context, or surrounding landscape. The habitat assessment must first describe existing conditions onsite, and observable habitats on adjacent and nearby properties. Though decisions are made on a site-by-site basis, some of the ecological information that informs those decisions is on the landscape scale. Many species utilize a complex of habitats within the course of their life cycles; development that attempts to avoid disturbance of breeding habitat, for example, may unintentionally destroy foraging, roosting or winter habitat. 6-19 CONT.
- Description of probable plant and animal species present should be based on field and existing information such as breeding bird surveys. The possible presence of local, state, or federal threatened, endangered, special concern or rare species is identified based on these lists. Invasive species and their extent onsite must also be identified.
- Many of the species of conservation concern are restricted to specialized habitats with particular physical or biological features. If the appropriate habitat is present onsite, it is generally assumed that species known to use that habitat may be present now or in the future.
- The assessment includes the value of the habitats for non-protected as well as protected species. This includes habitat for breeding, nursery habitat, foraging, seasonal movements, nesting, overwintering, and population dispersal. 6-19 CONT.

16. Upland habitats. From the brief descriptions provided in the DEIS it is not clear whether species listed were actually observed onsite. For species found onsite, the date of the observation and method used must also be provided. Many species are readily found only at certain times of the year. Additional species that were not observed, but that are usually associated with a particular habitat found on site (or that may use it at some stage of their life cycle) should also be listed. Did field investigations target species or groups of species? Did they follow accepted scientific protocol? 6-20

17. Wetland habitats. These descriptions are not sufficient for impact evaluation; an accurate assessment of impacts depends on specific information regarding existing conditions. Wetlands A and D extend beyond property boundaries, and they must be described in their entirety. Wetlands are described in two different sections and this makes it more difficult for the reader to evaluate the information provided. 6-21 The NWI wetland map in the DEIS indicates that the two main types of wetlands onsite are palustrine emergent- persistent, and scrub/shrub broad-leaved deciduous. The text mentions palustrine aquatic bed- but this type is not found onsite according to the map. NWI wetland codes are based on "Classification of Wetlands and Deepwater Habitats of the United States " (Cowardin et al., 1979. USFWS/OBS- 6-22

79/31). If this nomenclature is to be used in the DEIS, the wetlands should be described accurately, according to the information provided in this document. 6-22 CONT.

18. Filling a portion of wetlands B and C will destroy habitat and impact water quality. What species use these ponds? The DEIS must provide more detailed information before impacts can be assessed accurately. 6-23

19. Fish and Wildlife. This information is insufficient for impact evaluation. For example, the DEIS mentions a few of the most common birds observed in a particular habitat, and notes several 'characteristic' species. However, it does not describe the rare or protected species that may occur on the site. Nor does it describe the presence of invasive species.

20. The scoping document calls for discussion of downstream impacts on fish, including cumulative impacts to fishery resources of Wawayanda creek. This information is not found in the DEIS. 6-24

21. Several vernal pool breeding amphibians were found onsite, yet no mention was made of vernal pools or areas where these species were found onsite. Are wetlands B and C used by these species? The text did not provide sufficient information on this topic. Vernal pool breeders require implementation of specific management practices, described in Calhoun and Klemens, 2002, *Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States.* 6-25

22. In the DEIS, the section labeled <u>Potential for Use by Rare, Endangered, Or Protected Species including Bog Turtle</u> on page 3.2-9 discusses bog turtles, but no other species. The possible presence of threatened, endangered, special concern species of animals, and threatened, endangered or rare species of plants was not discussed in sufficient detail in this DEIS to support a determination of impacts. Given the extent of wetlands onsite, and the potential for the presence of sensitive species, additional species information must be provided. 6-26

23. Unsubstantiated statements serve no purpose in impact evaluation, and may lead to erroneous conclusions regarding impacts. For example, on page 3.2-9 the statement that "... during all field investigations no state or federal endangered or threatened wildlife species was observed" is not substantiated by facts. On page 3.2-11, discussions of impacts on wildlife populations are so general that they do not document the conclusion that ..."it is not anticipated that there would be a loss of species from the area." The reader needs to know which species and which habitats are being assessed here. Page 3.2-12, the conclusion that "no protected wildlife species have been identified or observed on the project site. Thus no impacts are projected to occur" is again, speculation. Given the habitats found onsite, which protected species might be present? Were these species field surveyed at the appropriate time of year to maximize the probability of observation? Additional information must be provided in the DEIS so the reader can evaluate these issues. 6-26

24. Page 3.2-12, is the stormwater management plan referred to in the text the same as the required Stormwater Pollution Prevention Plan (SWPPP)? The features of this plan must be described in terms of specific stormwater pollutants, their potential impacts, and specific descriptions of how they will be effectively treated by 4-24

implementation of the plan. Refer to previous comment above, under Stormwater Impacts and Management.

25. Page 3.2-13 Mitigation measures. Statements regarding stormwater management should refer specifically to elements of the Stormwater Pollution Prevention Plan (SWPPP). The statement that 'stormwater facilities have been engineered to prevent impacts to onsite wetlands' is not sufficient to support the conclusion that all stormwater pollution impacts will effectively be mitigated. Specific elements of the SWPPP should be described in narrative form as they apply to wetlands and the stream onsite. 4-25

26. Mitigation for loss of a portion of wetlands B and C cannot be accomplished by the construction of water quality basins. On page 3.2-13 the DEIS states "several water quality basins will include a permanent pool. These will create some wetland functions and values, including wildlife habitat that should compensate for the minimal impacts to wetlands B and C." This is not supported by recent research. Basins constructed for stormwater quality management do not duplicate wetland functions. The DEIS must provide specific, factual statements regarding impact mitigation. The impacts to wetlands B and C have not yet been fully described; until more information is provided, mitigation cannot be evaluated. 6-27

Note: there is a difference between wetland disturbance regulated by the U.S. Army Corps of Engineers and impacts on wetland habitat-, which is not necessarily protected by either federal or state wetland regulations. 6-28

27. Page 3.2-14. Landscape plantings are not necessarily mitigation for habitat loss and may in fact contribute to proliferation of invasive species. If vegetation is to be used as mitigation, a detailed planting plan and plant species list should be provided in the DEIS along with the wildlife species expected to use the plantings. Vegetation in all buffers adjacent to wetlands should also be described in the DEIS; again, species lists should be provided. 6-29

28. Wetlands. On page 3.3-3, errors in wetland descriptions in the DEIS reflect inaccuracies in the information presented. For example, a palustrine emergent wetland does not contain components of palustrine scrub/shrub and forested wetlands. Also, the 'small size' and 'lack of hydrology' of wetlands B and C are not meaningful statements; size does not determine wetland value and wetlands do not exhibit a 'lack' of hydrology. 6-30

29. The Wetland Benefits table on page 3.3-4 cannot be completed accurately until additional information on species that use these wetlands is provided. 6-31

30. The discussion regarding wetland impacts and mitigation does not address indirect impacts. The increase in stormwater pollutant levels as a result of this project (i.e. a dramatic increase in impervious surface) is not addressed specifically. Evaluation of existing stormwater quality (for each pollutant) as compared to the post-construction stormwater quality has not been included in the DEIS, but this information is essential to mitigation planning and the development of an effective SWPPP. Potential thermal effects of stormwater runoff are not discussed in the DEIS. 6-32

31. Water resources. The area of recharge for the wetlands on this site is not described in the DEIS, along with impacts to that recharge area and percent impervious surfaces within that area. 4-26

32. Other items listed in the scoping document but not adequately addressed in the DEIS include: all of item D.1.b., c, and f. Refer to the scoping document for this information. All of these issues must be addressed in the DEIS. 4-27

33. Page 3.4-7. What are the specific 'provisions for spill containment' for the car dealership? 4-28

34. Where are the discharge points for the wastewater treatment facility? Will there be any chemical (e.g. chlorine) storage at this facility? 4-29

35. Appendix G mentions water quality test results that will be presented under separate cover. Where is this information? 4-30

36. The applicant indicates that 7.9 acres of active prime and statewide agricultural soils will be converted to other uses. These soils will no longer be available for agricultural use and although it may seem insignificant in the context of this project, contributes to a continuing trend of farmland loss in the Town. 8-8

37. On page 3.5-10, the applicant refers to the *Orange County Comprehensive Plan* and states the project falls within a "mixed use corridor", however, the applicant does not provide the full description of how Orange County describes a mixed use corridor. The *Orange County Comprehensive Plan* (p. 36) defines a mixed use corridor as "currently identified by a mix and range of land uses, these corridors have the potential for an additional mix of development as well as in-fill development. While additional development is anticipated, quality of design is important in addressing road access, corridor transportation capacity, and roadside appearance as well as in avoiding conflict with current land uses." The Planning Board is encouraged to emphasize the quality of design in this project in furtherance of the County Plan. 8-9

38. The applicant notes (pg. 3.5-13) the proposed total square footage of the auto dealership and the supermarket is less than the limit of 80,000 square feet noted in § 164-46(J), number 49. The provision in the code notes the limit is per lot, however, these two lots are under unified ownership by the Fairgrounds, LLC. The total square footage for both lots is 82,750 when you include the pad building and exceeds the stated limited in § 164-46(J), number 49. 8-10

39. In the discussion of compliance with the design guidelines, we believe the Planning Board should examine the location of the parking for both the supermarket and the dealership. A basic tenet of the design guidelines calls for parking to the rear or side of the building. The supermarket locates the parking directly in front and dealership surrounds the building with parking. This is in clear opposition to the guidelines. There is great potential here to break up the parking lots and relocate them to adhere to the standards the Town is seeking for new development. 8-11

40. The Planning Board should consider whether the proposed architecture fits in with the surrounding landscape. The site is surrounded by agricultural uses, further there are existing structures on the site, which should be considered for their style and potential reuse. 5-9

41. The applicant states (pg 3.5-17) that this project "is not a strip commercial type center, which typically provides convenience retail services to a relatively small surrounding area." We believe it is not necessarily the services provided in a commercial center that makes it a strip, but rather it's the location, how the buildings are sited and the auto dependent nature of the setting. In this case, one could make an argument that this is closely related, if not in fact a strip commercial development. Consider the following factors: this project involves stringing buildings along a major thoroughfare, it is outside an identified "center" and it requires the use of a vehicle to get to it. 8-12

42. The applicant has presented a traffic study that indicates the following intersections all experience a decrease in their level of service to an "E" or "F" for at least one lane group under the No Build conditions:
    - NYS Route 94 and Warwick Turnpike CR21 (NB-L, Weekday Peak)
    - NYS Route 94 and Shoprite (NB-L, Weekday & Saturday Peak)
    - NYS Route 94 and Pelton Rd CR1A (SB-L,R, Saturday Peak).

    Under the Build Conditions, these intersections all experience an increase in Delay, with NYS Route 94 and Warwick Turnpike CR21 (NB-L, Saturday Peak) and NYS Route 94 and Shoprite (NB-L, Saturday Peak) decreasing to Level of Service "F". The intersection at NYS Route 94 and Pelton Rd CR1A (SB-L,R) shows the greatest increase in Delay time. 9-3

    Mitigation measures for this chapter only discuss the installation of a traffic signal at NYS Route 94 and Pelton Rd CR1A and improvement at the site access. Further on in the DEIS, the applicant states these improvements will improve conditions for all other studied intersections. However, there is no evidence presented in support of this claim. The applicant needs to substantiate this claim.

43. The applicant, in several places in the DEIS, makes reference to the *Orange County Comprehensive Plan* and notes this project lies within an area designated as a "mixed use corridor." If this is to become such an area, accommodations must be made for pedestrian and bicycle traffic. In this context, the project cannot be perceived only in the present moment. The Planning Board is encouraged to envision the long-term possibilities of this site, its relationship to surrounding uses and the potential for it to become a "mixed use corridor" where incorporating alternative modes of transportation should not be ignored. 9-4

44. In the subsection on *Community Services and Socioeconomics*, the applicant notes the Fire Department indicated a radio repeater in one of the buildings would be beneficial to the community. The applicant should more fully discuss its willingness to cooperate with the Fire Department to address this concern. 7-6

45. In the discussion of Solid Waste, the applicant explains used oils and lubricants, antifreeze and other solvents will be stored on-site. The applicant needs to provide additional details about the quantity to be stored, the specifics of the containers and how spills are handled. 4-31

46. The Town Historian has indicated the Blain/Raynor homestead is "one of the most important historical structures in the Valley" and clearly one of local importance. 5-10

Further, the applicant has not provided the response from the New York State Office of Parks, Recreation and Historic Preservation regarding their potential issues related to the Blain/Raynor house. The applicant should provide additional information regarding the preservation of the site and how it can be effectively incorporated into the Site Plan. S-11

47. We disagree with applicant's assessment of visual impact on the local roads from this project. The applicant states (pg. 3.10-7) "no significant change to visual character will be evident from local roads or other publicly accessible land as a result of this project." The photo simulations represent the altering of a natural, rural landscape into one dominated by massive buildings and extensive parking. S-12

48. Given the proximity to the Warwick Drive-In and residential uses, the Planning Board should ensure the proposed lighting fixtures are fully shielded. S-13

CHAPTER 4.0 ALTERNATIVES

49. The Planning Board should carefully weigh the alternative proposed taking into consideration the Town Board's review of the area for potential as a mixed use area. The Planning Board should discuss this possibility with the applicant to work towards a solution that respects the rural character of the Town and complements future development of the area in perhaps a more traditional neighborhood concept. 2-29

CHAPTER 5.0 ADVERSE ENVIRONMENTAL IMPACTS THAT CANNOT BE AVOIDED IF THE PROPOSED ACTION IS IMPLEMENTED

50. No comment.

CHAPTER 6.0: IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

51. No comment.

CHAPTER 7.0: EFFECTS ON THE USE AND CONSERVATION OF ENERGY RESOURCES

52. No comment.

CHAPTER 8.0: GROWTH INDUCING ASPECTS

53. No comment.

SITE PLANS

54. The site plans show paved areas and a portion of the supermarket building within the 200 foot boundary around the proposed wells. To ensure adequate protection of 2-26

this source, we recommend reducing the parking and altering the location of the building to beyond the 200 foot boundary. 2-26 CONT.

Cc: Zen Wojcik
John Bollenbach

281Memo4_DEIS_Tech_Review

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Date: Wed, 16 Mar 2005 15:12:12 -0500

To: towplanning@yahoo.com

From: "Tula Tsalis" <ttsalis@warwick.net> Add to Address Book

Subject: New Supermarket on Rt. 94

2-23

March 14, 2005

To Ben Astorino, Planning Board Chairman and members of the Warwick Planning Board, Warwick NY.

Dear Members of the Planning Board

As it seems that there will be another large food market on Rt. 94, across from the Shoprite, I would like to bring some concerns to your attention.

As you know, we continue to lose local farms to development in the , while global agribusiness, unhappily, continues to control more an more of the food supply. This situation is detrimental in ways too numer to mention here.

Local farmers in Warwick, and in the region generally, would more happily remain farmers, if they had secure enhanced local markets for the products, including value-added products with ingredients that the grow themselves, or are grown at nearby farms.

I think you will agree that we should support local farmers by ma
it
easier for them to sell their products locally. Everyone would
benefit,
including consumers, who will be able to purchase more nutritious
food
while also supporting local farmers and farms.

Buying the products of local/regional farmers will also benefit t
community the most as money exchanges will be more greatly
re-circulated in
the local economy, instead of leaving for distant corporate
headquarters. The environment will also be better protected as
less petroleum will be used over all.

I respectfully request that you, the Planning Board, consider t
the
important steps of finding ways to encourage the new food market
Rt.
94 to purchase a reasonable percentage of its food from local and
regional farmers on a regular basis. The new market will also ben
from
this as people want both more healthful local foods and to suppor
local
farms, farmers and the community.

Sincerely,

Tula Tsalis
293 Cascade Road
Warwick, New York

2-22 cont.

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Appendix D

AQUIFER IMPACT ASSESSMENT

AQUIFER IMPACT ASSESSMENT
The Fairgrounds

Revised September 11, 2006
Prepared under direction of Sergio Smiriglio, Hydrogeologist

An Aquifer Protection Overlay District (designated the "AQ-O" District) is established in portions of the Town of Warwick to protect, preserve, and maintain the quality and quantity of the Town's irreplaceable groundwater resources. The Town has defined this District as including the aquifers and aquifer recharge areas identified on the zoning map for the town. Protection of this aquifer is managed by the development of project specific Aquifer Impact Assessments for site plan, subdivision and special use permit applications within the district. The Fairgrounds project, to be developed within the town alongside NYS Route 94 (New Milford Road), is subject to this zoning amendment as the entire site of the project is located within the Aquifer Protection Overlay District.

OVERVIEW

The Warwick Planning Board, as the designated Lead Agency for the project, has previously filed New York State Environmental Quality Review (SEQR) documentation, and a Draft Environmental Impact Statement (EIS) has been circulated for public review. Public comments have been received on the DEIS for incorporation by the applicant into the project Final Environmental Impact Statement. This document supplements the EIS by presenting an Aquifer Impact Assessment which addresses the requirement for assessment relative to aquifer protection in conformance with *Town of Warwick Code §*164-47.2(D). The aquifer can potentially be affected by permitted activities of the project. This can include modification from existing conditions of the quality and quantity of either stormwater or wastewater flows from the site. Mitigation of the affects of these flows may be achieved by establishing or maintaining vegetated buffer zones for flows into riparian and recharge areas, the treatment and minimization of stormwater discharge, and the protection of existing wetlands. Provided are summaries of stormwater management measures, treatment of project wastewater prior to discharge, water supply well installations, other factors proposed to minimize aquifer impacts, and conclusions with regard to specific items concerning sources of water contamination that are specified in the Town Code.

In addition to provisions of this document, the project has been designed in conformance with the general use restrictions of Warwick zoning law specified for most development within the AQ-O District. These restrictions (*§*164-47.2-E of Article IV of the zoning code) are enforceable for development projects occurring within the AQ-O District. Their incorporation into the planning and final design for the project provides for significant protections of local water resources, including aquifers. In conformance with these restrictions, the project will operate within permitted guidelines for the use, storage, and disposal of substances of regulatory concern. This list will include, but not be limited to, wastewater, stormwater, hazardous substances, pesticides and herbicides, petroleum products, and salt and snow removal stockpiles. Incidental to the development of the project, the existing use of residential septic drainfields on the property will cease.

WATER RESOURCES BACKGROUND

The project site is located within the watershed of the Wawayanda Creek, which flows southwest through Warwick toward a confluence with the Pochuck Creek in New Jersey and then into the Wallkill River. The wetland systems present on the Fairgrounds site are associated with small unnamed tributaries that flow north toward the Wawayanda Creek.

The topography of the site creates a natural drainage divide between the eastern and western portions of the property. The divide runs from the high point on Route 94 in a northwesterly direction to the highest elevations found in the wooded area at the rear part of the property.

Stormwater runoff from the western half of the property enters a watercourse to the west, runoff from the eastern half drains to a watercourse to the east.

No data are available on existing runoff water quality from the project site. It is expected that runoff water quality characteristics vary somewhat throughout the site, being a function of the various land covers, including woods, meadow, residential, and agricultural uses.

Water supply is presently provided to the site from a well on the south side of Route 94 via a water main under the road. The main serves the farmhouse and other buildings located on the site. This main will be properly capped and abandoned during construction of the proposed project. Although water use data is not available for this well, it is estimated that average daily use is several hundred gallons per day. There are no municipal water supply systems located adjacent to or near the project site; nearby residential and commercial facilities are served by privately owned water supply wells.

The existing buildings on the project site are also serviced by one or more subsurface sewage disposal systems on the property. The locations of these systems are not known. These will be abandoned during the construction phase of the project.

STORMWATER MANAGEMENT

Construction of the project will require regrading of much of the central portion of the site, but existing drainage patterns will generally be maintained; there will not be any significant diversion of runoff from one side of the site to the other. A hydrologic analysis was prepared for the DEIS and updated in the FEIS to estimate the potential increases in runoff from the development areas and to develop mitigation measures so that peak rates of runoff would not increase significantly on either the east and west sides of the site. The ACOE HEC-1 program was used to develop runoff hydrographs from the proposed development areas. Hydrographs for both existing and proposed conditions on the site were generated using Soil Conservation Service TR55 methodology. Calculations and backup data are included in the stormwater management report in FEIS Appendix F.

Without corrective measures, the proposed project would increase pollutant loadings found in stormwater runoff from the proposed development areas. During construction, the regrading and stockpiling of soil materials will create the potential for erosion and as a result, potential sedimentation of downstream areas. Operation of the project could also potentially create long-term impacts on runoff water quality. An increase in the levels of pollutants commonly associated with developed land uses is typically most evident in the “first flush,”

the initial runoff from the ground surface during a storm event. To minimize these effects, stormwater quality mitigation is proposed as an integral part of the project, including both structural measures and operational practices which are outlined in detail in the FEIS. The applicant will be required to comply with NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities, GP-02-01. The permit conditions require preparation of a Stormwater Pollution Prevention Plan that specifies measures for minimizing adverse effects of the stormwater discharges.

Without the provision of a proper stormwater management plan, the project would increase the quantity of runoff and decrease the quality of the runoff entering the wetland areas on and adjoining the site. Unmanaged runoff would have the potential to adversely impact the groundwater resources of the unconsolidated aquifer at the site.

Inclusion of a stormwater management plan conforming to NYSDEC SPDES requirements to minimize the potential for adverse stormwater-related impacts is an integral part of this project. The stormwater management facilities specified are designed to mitigate potential water quality impacts to the groundwater resources within the unconsolidated aquifer, in conformance with State regulations. The project will not involve the creation of large lawn or landscaped areas that would require use of fertilizers and herbicides. Therefore, nutrient loads (including nitrates and phosphates) in the stormwater runoff are likely to decrease as compared to the current agricultural use of the site. The design of the automobile dealership building, which incorporates an interior vehicle service area, will have provisions for spill containment as well as accommodations for small amounts of regulated HAZMAT storage and will not have any floor drains connected to the stormwater system, thereby avoiding any potential for unintentional discharges to surface or groundwater resources. No vehicle service will be conducted on areas outside of the building. Parking and driveway areas of the supermarket site will be regularly swept by mechanical sweepers to reduce the rinsing of sand, dust, and other incidental waste into the stormwater outflow from the vehicle access areas.

With the implementation of the stormwater management plan, no short-term or long-term adverse stormwater related impacts to the AQ-O District are anticipated. A draft description of the proposed stormwater pollution prevention plan is provided in FEIS Appendix E.

WASTEWATER TREATMENT

The treated effluent from the proposed sewage plant will discharge into a vegetated swale BMP before discharging into Wetland A on the east side of the site. The proposed wastewater treatment plant (WWTP) is designed to have an average flow design capacity of 5,000 gallons per day of treated effluent (tertiary treatment). All flow to the WWTP will be from commercial sources, but not domestic or industrial sources. Treatment capacity calculations were conservatively developed by using “strong” concentrations for 20 typical constituents of domestic and commercial waste streams.

The WWTP design assures tertiary treatment for flows at or below design capacity and can exceed an average 3.47 gallons per minute for short periods of time (up to two hours). The system is designed with an inline flow equalization unit that stores small flows (less than 25% of the design flow) and flows in excess of the design flow and meters the internal flow so it is treated at a constant process flow rate. The system is designed to accept a peak influent flow of 420% the average flow rate over a 2-hour sustained period. Flows less than

25% of the design flow are switched to a batch mode where incoming flow is stored and treated in batches as the stored volume reaches a designated level. There is no minimum flow at which no tertiary treatment would occur. The process flow in the system remains constant to prevent the incoming flow rate from affecting the process treatment efficiency and effluent quality.

Outflow from the WWTP is designed to average 3.47 gallons per minute. This small rate of flow is comparable to the flow of water from a garden hose, and would minimally increment the average daily flow through Wetland A. As described in the DEIS, the WWTP is designed to provide tertiary treatment to meet the NYSDEC's water quality standards for intermittent streams. The intermittent stream standards are the NYSDEC's highest and most stringent water quality standards. As described in the NYSDEC's Technical and Operational Guidance Memo (TOGS 1.3.1.B), "since the intermittent stream effluent levels are considered to represent the highest degree of treatment that can be reasonably achieved by practical technology, it has traditionally been the maximum level of treatment that has been required regardless of the class of the receiving stream." NYSDEC intermittent stream standards were designed to ensure that the downstream water quality would not be impaired even within streams where the discharge may not have the added benefit of dilution at times throughout the year.

As described in DEIS Appendix H, the proposed treatment plant includes both nitrification and secondary clarifer processes which are designed to reduce effluent nutrients to levels that would not result in adverse impacts in compliance with the discharge permit for the facility.

Given the high level of proposed treatment, the low flow rate at the discharge and the added measure of treatment of its effluent through a vegetated swale, no short term or long term adverse impacts to the Wetland A flow characteristics, or downstream aquatic resources would result from the project. The design of the vegetated swale is such that there would be no significant groundwater recharge associated with the vegetated swale and virtually all of the WWTP discharge would flow to surface water resources.

WELL PUMP TESTS

The project site is located in an area underlain by various limestone and dolostone bedrock formations with varying degrees of resistance to erosion and susceptibility to the formation of solution cavities, the source of water for supply wells. The project site appears to be covered by various thicknesses of glacial outwash deposits, ranging in depth from 85 to 90 feet in the central portion of the property to and estimated 40 to 50 feet in the surrounding wetlands. Although there appear to be substantial water-producing unconsolidated deposits below major portions of the property, associated with the wetlands, to avoid disturbance to the wetlands the water supply for this project was developed from the bedrock aquifer.

Two future use water supply wells were drilled at the rear of the property and a well pump test was conducted to establish three specific goals: (1) Assess potential impacts to on-site and adjoining wetlands (particularly related to Bog turtle habitat) due to well water drawdown, including changes to the water table; (2) Obtain baseline groundwater quality data by sampling the proposed production wells and analyzing for Part 5 Drinking Water Parameters; and, (3) Analyze potential impacts of well water drawdown to the subject aquifer and to downstream surface waters. These goals were established in the scope of the DEIS adopted

by the Town Planning Board, which included input on same from New York State Department of Environmental Conservation.

The water supply wells were drilled at the project site and tested in May 2004. The wells were drilled to a depth sufficient to tap bedrock water resources outside the unconsolidated sand and gravel deposits of the predominant aquifers in the town. The locations of the wells and criteria for testing were determined through consultations between the project engineer, project hydrogeologist, and Orange County Department of Health (OCDOH). A 24-hour pumping test was authorized by the OCDOH and conducted while monitoring the ground water level in the wells and surface water levels at four locations in the on-site wetlands using electronic monitoring/recording devices (data loggers). Details of the pump test are described in a technical memorandum prepared by the project hydrogeologist in DEIS Appendix G.

The two wells are located in the central portion of the site, and reach depths of approximately 155 feet below land surface. Both wells produced approximately 60 gallons per minute (gpm) during drilling from a limestone aquifer. Due to the similar geology and the proximity of the two wells to each other (approximately 50 feet apart), it was determined that the two wells were interconnected and derived their water from the same source. Thus, the pumping test was conducted in one well while monitoring both wells. To evaluate whether the wells were also interconnected to existing surface water resources located within the wetlands on either side of the property, four well points with data loggers were installed on the wetland edges. During a 24-hour pumping test conducted in one test well, it was determined that the drawdown was limited to about 7.5 feet, with stabilization occurring within 460 minutes of the start of the test with a steady withdrawal of 30 gpm. The data loggers in the wetlands did not show any interconnection of surface water to the aquifer from the pumping of the well.

Water Level Data

Survey information was collected to demonstrate whether or not the operation of these wells would affect the surface water levels in the nearby wetlands. The elevations of the four wetland monitoring points and the two production wells were surveyed using a common datum so that the water levels taken at all points could be compared. If the static water table elevations in the bedrock wells were found to be similar to the water levels in the wetlands, the two systems (surface and ground water) could possibly be interconnected. Table 1 below shows the results of the water level survey.

Table 1
Water Level Survey

Well Point	Ground Elev.	Top of Casing	Depth to Water	Water Level
Well 1	599	600.7	32.3	568.4
Well 2	599.8	601.4	33.1	568.3
WP-1	554.3	555.9	1.2	554.7
WP-2	561.7	562.4	0.6	561.8
WP-3	564	564.8	0.95	563.85
WP-4	562	563.4	1.24	562.16

The data show that the bedrock aquifer water level in the wells differs in elevation from the surface water elevation by as much as 13.7 feet. The static water levels in the two bedrock

wells were essentially the same (568.4 and 568.3), demonstrating that the two bedrock wells are hydraulically connected. It should be noted that the elevations in the limestone bedrock wells were higher than the static water levels in the shallow wetland monitoring wells. These water levels indicate an artesian condition in the bedrock aquifer; or that the groundwater in the limestone aquifer is under sufficient hydrostatic pressure to rise above the confining layers which lie above the aquifer. As shown in the Table above, water levels in the wetland monitoring points vary in elevation and closely reflect the surrounding topography and land surface grades. The variable static water levels in the wetlands indicate that there is no substantial hydraulic connection between the wetlands in different areas of the site.

The artesian condition in the limestone bedrock aquifer and the 5 to 14 foot difference in static water levels between the bedrock aquifer and the wetlands indicates that there is limited, if any, connection between the bedrock aquifer and the surface water. Therefore, the operation of the on-site wells would not affect the surface water levels in the nearby wetlands, either on- or off-site.

In addition to the pump test, ground water samples from the well were taken before the conclusion of the pump test and submitted to a NYS certified laboratory for comprehensive analysis. Laboratory testing encompassed typical analyses for drinking water contaminants including coliform, pesticides, volatile substances, and metals. The water quality testing concluded that the groundwater sampled from the project site meets all parameters for a safe drinking water supply. Technical results of the laboratory testing are provided in DEIS Appendix G.

In summary, well tests revealed no significant impacts to wetlands from well water drawdown, no significant change to the water table, and baseline groundwater quality data was obtained from lab testing. Drawdown, stabilization, and recharge characterization of the well test results indicated that the project needs could easily be met on a sustainable basis. The well test also showed that the operation of these wells will not significantly affect the water level in the on-site wetlands. Therefore, no adverse impacts to the natural water resources are anticipated as a result of the project water supply system.

GROUNDWATER RECHARGE

Existing Conditions

A groundwater recharge analysis was completed for the site and was described in Section 3.4 Water of the DEIS. The recharge analysis has been updated for the current plan. For purposes of the analysis, recharge has been calculated assuming the only source of water is the rainfall that falls on the site itself. The primary source of groundwater is precipitation which infiltrates through the surface of the ground and percolates into the water table. The majority of rainfall, however, is “lost” to surface water runoff, shallow subsurface flow and evapotranspiration. Depending on the physical characteristics of the recharge area, between 15 and 40 percent of the annual precipitation typically recharges the local aquifer.

Evaluation of groundwater recharge with respect to a specific project or land use is usually done by a comparison of projected water demand and the ability of the local watershed to recharge the aquifer. Generally, the groundwater table in an unconfined aquifer will loosely follow the surface topography of the land. Groundwater would be expected to flow from drainage boundaries, such as ridges, toward points topographically lower in the watershed.

Groundwater in storage and recharge "collected" within the natural drainage basin area would be available to replenish or recharge the aquifer. Due in part to the anisotropic (irregular) nature of the bedrock aquifer, however, only a portion of total basin recharge could transmit water to any given pumping area. The rate of aquifer recharge would also depend on other specific hydrogeological conditions present at each location. For example, heavily faulted and fractured bedrock zones are capable of transmitting larger quantities of water to recharge the bedrock aquifer than are less fractured zones.

The major fractures, if tapped successfully, will potentially pick up recharge from a large area. The faults and fractures can extend for miles and intercept additional fractures well beyond the property. Since precipitation falling anywhere within this area naturally drains towards the valleys from the highlands, the typical 40 percent of precipitation that becomes groundwater through recharge is potentially available to wells tapping these interconnected fractures. Table 2 below provides an estimate of the amount of water available for recharge accounting for only precipitation falling on the subject property.

Table 2
Aquifer Recharge Calculations

Acres	47.5
Square Feet	2,069,100
Rainfall (inches)	48.0
Rainfall (feet)	4.0
Cubic feet of precipitation per year	8,276,400
Gallons of precipitation per year	61,907,470
Amount lost to evapotranspiration and runoff (60%)	37,144,482
Amount, in gallons, available for recharge per year	24,762,988
Amount, in gallons, available for recharge per day	67,843
Amount, in gallons, available for recharge per minute	47.11

Using a typical recharge rate of 40 percent (the percentage of precipitation available to recharge groundwater) results in approximately one gallon of recharge per minute per acre available at the site. The existing few buildings and impervious surfaces cover a very small portion of the site (0.6 acres) and do not significantly affect the recharge calculations. Again, the 47.11 gallons per minute of recharge is a conservative estimate of the recharge available to on-site wells from the site itself and does not include the potential contribution of groundwater from off-site, through fractures in the bedrock.

Potential Impacts on Aquifer Recharge and Off-site Wells

With the proposed development, 7.75 acres of the site would be covered by impervious surfaces. As no credit is taken for 1.35 acres of proposed semi-pervious gravel surface, this would leave 38.4 acres of non-impervious landscape capable of providing recharge to the aquifer. A post-construction aquifer recharge analysis based on this proposed change in land coverage is provided in Table 3 below.

Table 3 Post-Construction Aquifer Recharge Calculations	
Acres (total pervious surfaces)	38.4
Square Feet	1,672,704
Rainfall (inches)	48.0
Rainfall (feet)	4.0
Cubic feet of precipitation per year	6,690,816
Gallons of precipitation per year	50,050,613
Amount lost to evapotranspiration (60%)	30,030,368
Amount, in gallons, available for recharge per year	20,020,245
Amount, in gallons, available for recharge per day	54,812
Amount, in gallons, available for recharge per minute	38.1

The project will result in the conversion of 7.75 acres of the site to impervious surface and 1.35 acres of gravel surface (counted here as impervious). Therefore, the amount of area in which rainfall will fall directly on pervious (unpaved) surfaces and potentially recharge the aquifer will be reduced by approximately 19.2 percent. It should be noted that all stormwater from impervious surfaces will be directed to stormwater treatment facilities, such as vegetated swales and detention ponds, thereby allowing much of the precipitation falling on impervious surfaces to potentially contribute to aquifer recharge. Also, most of the groundwater utilized at the Fairgrounds site will be returned to surface water via the proposed sanitary sewage treatment system.

The above estimate of groundwater recharge demonstrates that more than adequate groundwater recharge area and volume will remain at the subject property following construction to balance the volume of groundwater utilized by the project. If the potential recharge area on the property was reduced by 19.2 percent as the result of paving and buildings, and none of this water was returned to the aquifer as a result of stormwater facility infiltration and the sewage treatment outflow, then 54,812 gallons per day or 38.1 gallons per minute would be available to recharge the aquifer within the project boundaries. This conservative estimate is substantially greater than the project water demand of 5,000 gallons per day (gpd) or 3.47 gallons per minute (gpm).

Therefore, based upon conservative analysis, the project is not anticipated to have an adverse affect upon local groundwater recharge or groundwater availability to on-site or off-site wells.

Aquifer Impact Summary

The proposed project is not expected to have an adverse impact on groundwater availability or to wetlands based upon the following:

1) The bedrock wells are installed into a limestone aquifer to a depth of 155 feet below ground surface. The top of the bedrock was encountered at depths of 85 and 90 feet, in the two production wells. Above the bedrock, the unconsolidated material was described as clay and boulders (to 30 feet) and gravel glacial till to 85 to 90 feet. While the glacial till may have lenses of sand and gravel, these are separated by poorly transmissive silt

and clay. The bedrock wells were constructed with 90 to 110 feet of steel casing, cemented into the limestone. Therefore, the bedrock wells were constructed to specifically isolate the bedrock aquifer from the shallow sand and gravel aquifer as well as from surface water.

2) The static water levels in the bedrock wells compared to monitoring points in the wetlands indicate that the bedrock aquifer is not connected to the surface water. The water levels in the wetlands varied between 5 and 13.7 feet below the levels of the bedrock aquifer. The water levels in the bedrock wells indicate an artesian condition in the limestone bedrock aquifer and that hydrostatic pressure in the limestone aquifer is sufficient to raise the water levels above the glacial till confining layers which lie above the limestone.

3) The 24 hour pumping test showed no clear impact upon the shallow monitoring wells located in the wetlands. The production well was pumped at 30 gallons per minute which is eight times project water demand.

4) The estimated water demand for the project is relatively low at 5,000 gallons per day (gpd) or 3.47 gallons per minute (gpm). The initial estimated well yields were 60 gallons per minute for each well. Therefore, the limestone aquifer has significantly greater capacity than is being proposed for use by the project.

5) The estimated groundwater recharge for the project is substantially greater than the proposed water demand. Accounting for the reduction in available recharge area as the result of paving and buildings, 54,812 gpd or 38.1 gpm would be available to recharge the aquifer within the project boundaries. This conservative estimate is substantially greater than the project water demands of 5,000 gpd or 3.47 gpm.

GROUNDWATER PROTECTION

In §164-47.2 of the Town of Warwick Code regulations are presented for the designated Aquifer Protection Overlay District. The following statement is taken from the regulation:

> A. Findings and purpose. The Town of Warwick finds that protection of groundwater is essential to promoting the health, safety, and welfare of the Town. The purpose of this Aquifer Protection Overlay District (hereafter the AQ-O District) is to protect, preserve, and maintain the quality and quantity of the groundwater resources, which the Town depends upon for its present and future public water supply, for its existing public water supplies that depend on groundwater, and for numerous private wells in the Town of Warwick.

The AQ-O District consists of aquifers and aquifer recharge areas shown on the Zoning Map of the Town of Warwick. The Aquifer Map shows an approximate delineation of the boundaries of the unconsolidated sand and gravel deposits, recharge areas with sand and gravel at the surface, and probable high-yield bedrock well locations as identified in Figure 8 of the Town of Warwick Comprehensive Plan.

Applicability

The applicant for this proposed action is subject to the use restrictions set forth in §164-47.2E, and additionally shall submit an aquifer impact assessment prepared by a qualified professional. The entire project site is located within the AQ-O District as identified on the Town of Warwick Aquifer Overlay District Map.

The regulations (§164-47.2E) include use restrictions and requirements that apply to all land in the AQ-O District. The following 13 restricted or prohibited uses listed in the regulation are NOT proposed at the project site, but are itemized below with project-specific notations:

(1) No disposal wells are proposed in this project.

(2) The installation or use of stormwater runoff infiltration basins are not proposed. Any stormwater basin used for pretreatment of runoff will be lined with an impermeable barrier layer.

(3) No snow will be transported to the site from any other location for the purpose of stockpiling or disposal.

4) No animal wastes will be deposited or stockpiled on the site.

(5) No toxic or hazardous substances, defined as such by the United States Environmental Protection Agency or the New York Department of Environmental Conservation, will be stored at the site.

(6) Wastewater lagoons and pits are not proposed at this site.

(7) There will be no disposal of toxic chemicals, industrial sludge, or radioactive materials at this site.

(8) There will be no bulk storage of fertilizers at this site.

(9) No pesticides or herbicides will be stored at this site, however during the normal operation of the supermarket, retail quantities of such chemicals, in packaging appropriate to domestic consumption, will be present. No outside storage of any quantity of pesticides and/or herbicides is permitted in the AQ-O District. On site application of pesticides or herbicides would be incidental to the proposed commercial uses and only as needed for pest control in the course of normal operations as required and permitted by Orange County Department of Health (OCDOH) regulations, and would be conducted by licensed contractors experienced in their proper use. All such application will be in accordance with the requirements of the New York State Environmental Conservation Law and its implementing regulations.

(10) No storage tanks of 1,100 gallons or greater are proposed at the site. All aboveground storage tanks will be less than 1,100 gallons in size and will be installed inside the building. All aboveground storage tanks for petroleum products and transfer areas will be designed to minimize the risk of groundwater contamination by incorporating backup containment features, impervious surface catchment areas, and other features consistent with the requirements of the New York State Petroleum Bulk Storage Code found in 6 NYCRR 612, 613, and 614.

(11) There will be no outside storage of salts or coal at the site.

(12) The water supply wells at the site will be constructed in accordance with the requirements of the Orange County Department of Health.

(13) Regarding abandoned wells, there are no existing wells on the property.

STORMWATER POLLUTION PREVENTION PLAN

The applicant's engineer has prepared a draft Stormwater Pollution Prevention Plan (SWPPP) to document the structural and procedural management devices which will be instituted both during the construction and the operational phases of the project. This plan is included in the FEIS as Appendix E. The plan emphasizes specific responsibilities of all parties associated with the development to ensure that good housekeeping practices (also often referred to as standard operating procedures) are established and will be adhered to at all times in order to avoid runoff impacts on surrounding streams, wetlands, and aquifers.

This storm water pollution prevention plan reflects New York State Department of Environmental Conservation requirements for stormwater management and erosion and sediment control, as established in Article 17, Titles 7, 8 and Article 70 of the Environmental Conservation Law. To ensure compliance, this plan was prepared in accordance with the SPDES General Permit for Storm Water Discharges From Construction Activities That Are Classified as "Associated With Construction Activity", published by the NYSDEC.

Appendix E

DRAFT STORM WATER POLLUTION PREVENTION PLAN

DRAFT STORMWATER POLLUTION PREVENTION PLAN

SITE DESCRIPTION

Project Name & Location: The Fairgrounds
Route 94
Town of Warwick
Orange County, New York

The project site includes 47.5 acres, and is located on the north side of NYS Route 94 in the Town of Warwick, Orange County, New York.

Project Sponsor:

Country Fairgrounds, L.L.C.
c/o Goddard Development Partners, LLC
PO Box 55
Mountainville, NY 10953
tel. 845-534-0100

Description:

This project will consist of construction of a new supermarket, automobile dealership, and a small building for a bank or other service-oriented commercial use. The proposal also includes the construction of a new access drive from Route 94, paved parking areas, and various utilities to serve the new facilities. There are several existing buildings on the site, and they will be removed.

The site includes approximately 14 acres of federally regulated wetlands and 6 acres of NYS regulated wetlands.

Water supply will be provided by a wells recently drilled on the site. Sewage will be discharged to a sewage treatment plant to be constructed on the site.

Soil disturbing activities will include:

1. Clearing and grubbing
2. Construction of sediment and erosion controls
3. Grading of building areas, parking lots, access drives, etc.
4. Excavation for utilities, building foundations, etc.
5. Construction of permanent stormwater measures
6. Fine grading, preparation for final planting and seeding

Site Runoff:

The Draft Environmental Impact Statement (DEIS) prepared for the project includes an analysis of runoff rates from the project site under existing and proposed conditions. Stormwater detention will be provided on the project site to prevent potential increases in peak rates of runoff due to the construction of additional impervious surfaces. The analysis

indicates that peak runoff rates will be reduced for the 2-year, 10-year, and 100-year design storms.

Site Area:

The site includes a total of 47.5 acres. Approximately 16.4 acres will be disturbed during construction of the proposed facilities. The current land cover includes 0.4 acre of impervious surfaces. The proposed project includes a total of 7.85 acres of impervious surfaces.

Sequence of Major Activities:

The order of construction activities will be as follows:

1. Notify regulatory agencies of proposed schedule in accordance with permit requirements.

2. Erect snow fencing around trees, structures, and other features to be protected.

3. Construct stabilized construction entrance(s).

4. Install silt fence barriers along wetland buffers and downslope of areas to be disturbed.

5. Construct water quality basins, including berms and swales as needed to direct runoff to the basins. The basins shall be utilized as temporary sediment traps during construction.

6. Clear and grub vegetation in areas to be regraded.

7. Stockpile topsoil in approved locations.

8. Perform grading, excavation, construction of utilities, foundations, paving, etc. During construction, grates of curb and field inlets shall be set at an elevation which permits proper collection of surface runoff.

9. Maintain silt fence barriers, sediment traps, and other measures in proper condition throughout the construction period. Sediment shall be removed from sediment traps once it has accumulated to one-half the design depth of the basin. Removed sediment shall be deposited in a suitable area in a manner that it will not erode.

10. As construction proceeds, all disturbed areas shall be seeded, sodded, planted, or paved as specified on the plans, in a timely manner to prevent unnecessary erosion. Once disturbed areas have been properly stabilized, silt fence, temporary berms, and temporary swales shall be removed.

11. Once the contributing areas have been stabilized, convert sediment traps to permanent water quality structures.

Name of Receiving Waters:

Runoff from disturbed areas of the western part of the project site will be discharged, following water quality mitigation measures, to an unnamed tributary to the Wawayanda Creek. Runoff from the eastern part of the site will also be directed to water quality measures, and then discharged to the buffer of NYSDEC regulated wetland WW-3.

EROSION AND SEDIMENT CONTROLS
STABILIZATION PRACTICES

Temporary Stabilization:

Topsoil stockpiles and disturbed portions of the site where construction activity temporarily ceases for at least 30 days will be stabilized with temporary seed and mulch no later than 14 days from the last construction activity in that area. The temporary seed shall be Rye (grain) applied at the rate of 20 pounds per acre. Prior to seeding, 400 pounds of 10-10-10 fertilizer shall be applied to each acre to be stabilized. After seeding each area shall be mulched with straw. The straw mulch is to be tacked into place by a disk with blades set nearly straight. Areas of the site which are to be paved, will be temporarily stabilized by applying stone sub-base until bituminous pavement can be applied.

Permanent Stabilization:

Disturbed portions of the site where construction activities permanently cease shall be stabilized with permanent seed no later than 7 days after the last construction activity. Permanent stabilization shall be performed in accordance with the requirements of the approved site plans.

STRUCTURAL PRACTICES

Temporary Sediment Traps:

Temporary sediment traps will be provided during construction as needed to collect runoff from disturbed areas.

Silt Fence Barriers, Berms, and Swales:

During construction, these measures will be used to provide a continuous barrier to protect downstream wetlands or watercourses.

Water Quality Basins:

Permanent water quality basins will be constructed at various locations throughout the site. These include pocket ponds, dry swales, and an organic filter. Piped and open channel drainage systems will collect runoff from developed areas and discharge to the basins. The basins will promote the removal of pollutants prior to discharge to wetlands, buffers, or watercourses. The basins will also be utilized as sediment traps during the construction phases.

OTHER CONTROLS

Waste Materials:

All waste materials will be collected and stored in securely lidded metal dumpsters. The dumpsters will meet all Town of Warwick, Orange County and New York 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 twice per week or more often if

necessary, and the trash will be hauled off-site to a transfer station. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer and the Site Superintendent, _____, the individual who manages the day- to- day site operations, will be responsible for seeing that these procedures are followed:

Hazardous Waste:

All hazardous waste materials will be disposed of in the manner specified by local or State regulation or by the manufacturer. Site personnel will be instructed in these practices and the Site Superintendent, the individual who manages day-to day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste:

Portable toilet facilities will be provided by the contractor for the use of his personnel during the construction phase of the project. All sanitary waste will be collected from the portable units a minimum of three times per week by a licensed sanitary waste management contractor.

Offsite Vehicle Tracking:

Stabilized construction entrances will be provided to reduce vehicle tracking of sediments. The paved streets adjacent to the site entrances will be swept if necessary to remove any excess mud, dirt or rock tracked from the site.

TIMING OF CONTROLS / MEASURES

As indicated in the Sequence of Major Activities, erosion and sediment control devices will be constructed prior to grading activities. Areas where construction activity temporarily ceases for more than 30 days will be stabilized with temporary seed and mulch within 14 days of the last disturbance. Once construction activity ceases permanently in a lawn area, that area will be stabilized with sod or permanent seed and mulch.

CERTIFICATION OF COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS

This storm water pollution prevention plan reflects New York State Department of Environmental Conservation requirements for stormwater management and erosion and sediment control, as established in Article 17, Titles 7, 8 and Article 70 of the Environmental Conservation Law. To ensure compliance, this plan was prepared in accordance with the SPDES General Permit for Storm Water Discharges From Construction Activities That Are Classified as "Associated With Construction Activity", published by the NYSDEC.

MAINTENANCE / INSPECTION PROCEDURES
EROSION AND SEDIMENT CONTROL INSPECTION AND MAINTENANCE PRACTICES

The following inspection and maintenance practices will be used to maintain erosion and sediment controls:

1. All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater. The inspections shall be conducted by a NYS licensed professional engineer, a certified professional in erosion or sediment control engineer, or by a soil scientist.

2. All measures will be maintained in good working order. If a repair is necessary, it will be initiated within 24 hours of report.

3. Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.

4. Silt fence will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.

5. Water quality basins will be inspected for depth of sediment and built up sediment will be removed when it reaches a depth equal to one half of the basin's design depth, and at the end of construction.

6. Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.

7. A maintenance inspection report will be made after each inspection.

NON-STORMWATER DISCHARGES

During construction: It is expected that the following non-storm water discharges will occur from the site during the construction period:

1. Water from water system flushings.

2. Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).

3. Uncontaminated groundwater (from dewatering excavation).

4. All non-storm water discharges will be directed to sediment control devices prior to discharge to waterways or wetlands.

During long-term operation: The showroom / service facility and other facilities to be constructed on the site will be operated in a manner that prevents the release of non-stormwater discharges to either surface waters or groundwater. Equipment will be provided to collect all accidental spills of petroleum products, wash waters, and other wastes within the facility, and dispose of them by evaporation or transport by licensed haulers off the project site.

INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction:

Concrete	Fertilizers
Detergents	Petroleum Based Products
Paints (enamel and latex)	Cleaning Solvents
Metal Studs	Wood
Concrete	Masonry Block
Tar	Roofing Shingles

SPILL PREVENTION

MATERIAL 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:

Good Housekeeping:

The following good housekeeping practices will be followed onsite during the construction project:

1. An effort will be made to store only enough product required to do the job.
2. All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
3. Products will be kept in their original containers with the original manufacturer's label.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturers' recommendations for proper use and disposal will be followed.
7. The Site Superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Products:

1. These practices are used to reduce the risks associated with hazardous materials.
2. Products will be kept in their original containers unless they are not resealable.
3. Original labels and material safety data will be retained; they contain important product information.
4. If surplus product must be disposed of, manufacturers' or local and State recommended methods for proper disposal will be followed.

PRODUCT SPECIFIC PRACTICES

The following product specific practices will be followed on site:

Petroleum Products:

All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturers' recommendations.

Fertilizers:

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed or trailer. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system, but will be properly disposed of according to manufacturer's instructions or State and local regulations.

Concrete Trucks:

Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

SPILL CONTROL PRACTICES

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

1. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

2. Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, activated charcoal, sawdust, and plastic and metal trash containers specifically provided for this purpose.

3. All spills will be cleaned up immediately after discovery.

4. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

5. Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.

6. The spill prevention plan will be adjusted to include measures to prevent this type of spill from re-occurring and how to clean up the spill if there is another one.

7. A description of the spill, what caused it, and the cleanup measures will also be included .

The Site Superintendent responsible for the day-to-day site operations will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.

MAINTENANACE OF PERMANENT FACILITIES

The property owners shall be responsible for the operation and maintenance of the permanent stormwater facilities, including structures, piping, ponds, filters, and swales. A legally binding maintenance agreement shall be developed, indicating that the following minimum requirements shall be met:

1. Visual inspections shall be conducted on a monthly basis. A written record shall be kept of all inspections and work performed. If a repair is necessary, it shall be initiated within one week of detection. Copies of the monthly inspection reports shall be forwarded to the Town Engineer. The record repository shall be Warwick Town Hall.

2. Permanent seeding and plantings shall be inspected semi-annually for bare spots, washouts, and healthy growth. Repairs, if necessary, shall be made immediately (dependent upon weather conditions).

3. Wet pond (NYSDEC designation (P-2) requirements:

   a. Sediment shall be removed from the forebays every five years or when 50% full.
   b. Trash and debris shall be removed immediately.
   c. Inflow pipe shall be inspected regularly, and cleaned as necessary.

4. Organic filter (F-4) and bioretention area (F-3) requirements:

   a. Sediment shall be removed from the pretreatment basin when it reaches a depth of six inches.
   b. Trash and debris shall be removed immediately.
   c. Outlet device shall be cleaned or repaired when drawdown times exceed 36 hours.
   d. Inflow pipe shall be inspected regularly, and cleaned as necessary.
   e. Sediment shall be removed from the filter bed when accumulations exceed one inch in depth.
   f. When the filtering capacity diminishes such that the water ponds on the surface for more than 48 hours, the top few inches of discolored material shall be removed and replaced with fresh material.

5. Dry swale requirements (O-1):

   a. Sediment shall be removed from the pretreatment sump when it reaches a depth of six inches.
   b. Trash and debris shall be removed immediately.
   c. Inflow pipe shall be inspected regularly, and cleaned as necessary.
   d. Grass within the dry swale shall be maintained to a height of four to six inches.
   e. Sediment shall be removed from the pretreatment sump when it reaches a depth of six inches.

6. Pavement sweeping:

All parking areas and driveways will be swept or vacuumed on a regular basis (at least three times per week) as a standard operating procedure for the supermarket and dealership. The vehicle storage areas located behind the dealership building are not included in the sweeping program.

7. Perimeter curb requirements:

   A perimeter curb will be provided to prevent small animals from reaching paved areas. The low (natural) side of the curb shall be swept or raked out once a year, in early December, to remove litter and debris.

8. Snow storage areas::

   Snow shall be piled only in approved areas, where snowmelt will be directed to a permanent stormwater management facility.

SUPPORTING DOCUMENTS

The following documents, prepared by the project team's professional consultants and by the Town of Warwick, are included as part of the pollution prevention plan:

- *Draft and Final Environmental Impact Statements*
- *Drainage Report*
- *Subdivision and site plans*

POLLUTION PREVENTION PLAN CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____

Owner's representative Date

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

Signed: _____

Contractor's signature Date

Appendix F

STORMWATER
DRAINAGE REPORT

DRAINAGE REPORT

THE FAIRGROUNDS

Town of Warwick

Orange County

New York

LEHMAN & GETZ, P.C.

CONSULTING ENGINEERS
17 River Street, Warwick, NY 10990
(845) 986-7737 phone (845) 986-0245 fax

Date: 11-28-05

L&G #1018

Introduction

The Fairgrounds site is located within the watershed of the Wawayanda Creek, which flows southwest through Warwick toward its confluence with the Wallkill River in New Jersey. Figure A shows the site's location on the USGS quadrangle, and Figure B indicates the mapped soil types on the property according to the USDA Soil Survey of Orange County.

The topography of the site creates a natural drainage divide between the eastern and western portions of the property. The divide runs from the high point on Route 94 in a northwesterly direction to the site's highest elevations, found in the wooded area at the rear part of the property. Stormwater runoff from the western part of the property enters the western (ACOE) wetland system. Runoff from the eastern part drains to the eastern (NYSDEC & ACOE) wetlands. Both wetland systems connect to environmentally sensitive offsite habitat.

Stormwater runoff from the project site will be directed by piped systems to various basins located along the periphery of the developed areas. The proposed measures are located outside existing streams, regulated wetlands, and regulated wetland buffers. Upon the completion of construction, the property owners will be responsible for maintenance of the stormwater management measures.

This study has been conducted to evaluate potential impacts of development of the project and to design physical and operational measures to mitigate those impacts.

Hydrologic Impacts: Stormwater management basins are proposed on each side of the property to attenuate peak discharges and promote groundwater recharge to avoid potential adverse impacts to on-site and downstream areas that could be caused by increased peak flows and runoff volumes.

Water Quality Impacts: The stormwater management measures proposed throughout the site have been designed in accordance with the guidelines of the New York State Department of Environmental Conservation's Stormwater Management Design Manual.

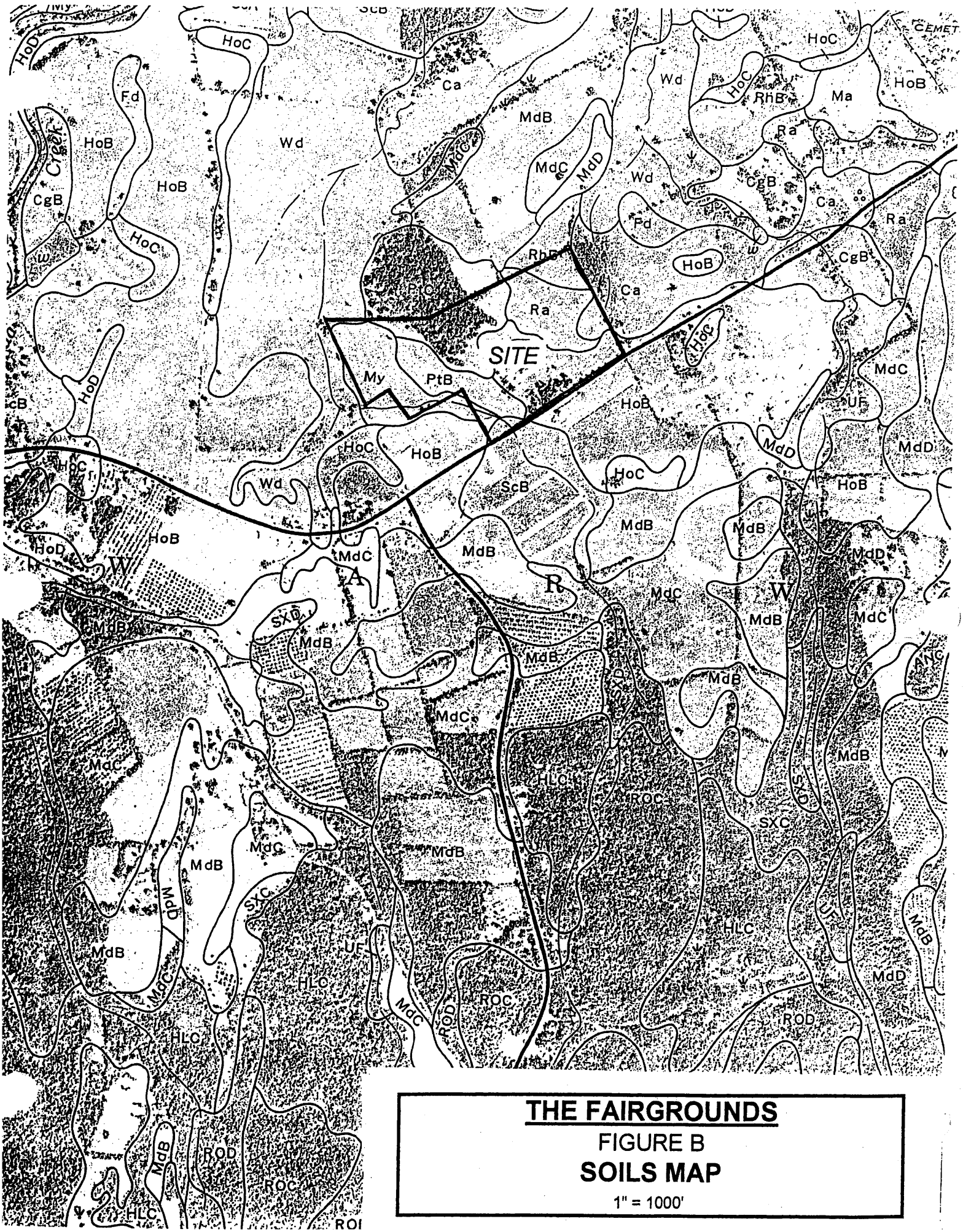
This report includes a discussion of each of mitigation measure, including design calculations and background data. It is an update of the Stormwater Drainage Report presented in Appendix C of the DEIS prepared for the Fairgrounds project.

THE FAIRGROUNDS

FIGURE A

USGS TOPOGRAPHIC MAP

1" = 2000'



THE FAIRGROUNDS

FIGURE B

SOILS MAP

1" = 1000'

Hydrologic Impacts

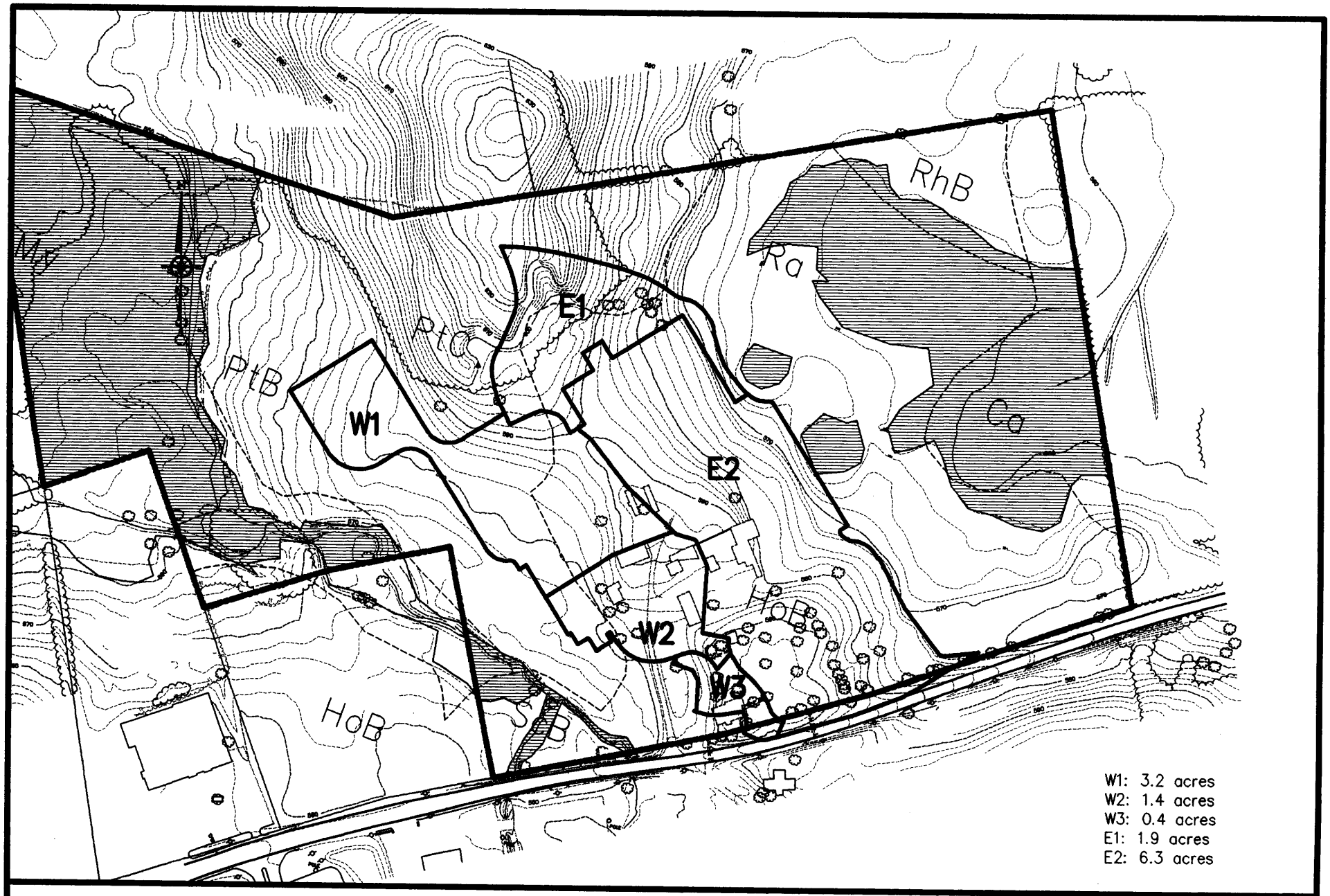
The drainage analysis prepared for the project includes calculations of runoff rates from the proposed development areas. The study area was divided into five subbasins; two on the eastern side of the site and three on the west. These drainage areas are shown in Figures C and D.. The study area includes the 13.3 acres of the 47.5-acre site that will drain to stormwater management basins. Runoff from the remaining portions of the site (outside the study area) will not be adversely affected by the proposed project.

The SCS unit hydrograph method was used within the Hydraflow computer program to develop runoff hydrographs from the study area for existing and proposed conditions. The program was also used to model the benefits of the proposed stormwater basins in attenuating peak flows from the site. The calculated peak flows are summarized in Table S-1:

Table S-1
Peak Discharges from Development Areas, Existing and Proposed Conditions

Storm Event	Existing Conditions	Proposed Conditions	Change
East Subbasins (E1+E2)			
2 year	0.05 cfs	0.31 cfs	+0.26 cfs
10 year	1.51 cfs	1.51 cfs	0 cfs
100 year	5.87 cfs	4.94 cfs	-0.93 cfs
West Subbasins (W1+W2+W3)			
2 year	1.61 cfs	0.07 cfs	-1.54 cfs
10 year	6.14 cfs	1.93 cfs	-4.21 cfs
100 year	12.04 cfs	8.64 cfs	-3.4 cfs
Study Area Total			
2 year	1.61 cfs	0.34 cfs	-1.27 cfs
10 year	6.69 cfs	2.76 cfs	-3.93 cfs
100 year	15.98 cfs	13.49 cfs	-2.49 cfs

The facilities are designed to reduce post-development peak flows to levels equal to or lower than existing peak flow rates. This is accomplished in all instances with the exception of the 2-year discharge from the eastern side of the site. The minor increase there (0.26 cfs) will not create any adverse flooding or erosion impacts, due to the very small flow rates involved. It is possible that the SCS methodology underestimates the actual 2-year flow rate for existing conditions. In addition, as a conservative measure for design, the above analyses of the 2-, 10-, and 100-year events do not include the effects of the infiltration swale proposed adjacent to Pocket Pond E2. The swale will reduce peak runoff rates for all storm events, and will therefore bring the 2-year eastern peak rate down to a level even closer to the computed existing conditions peak.

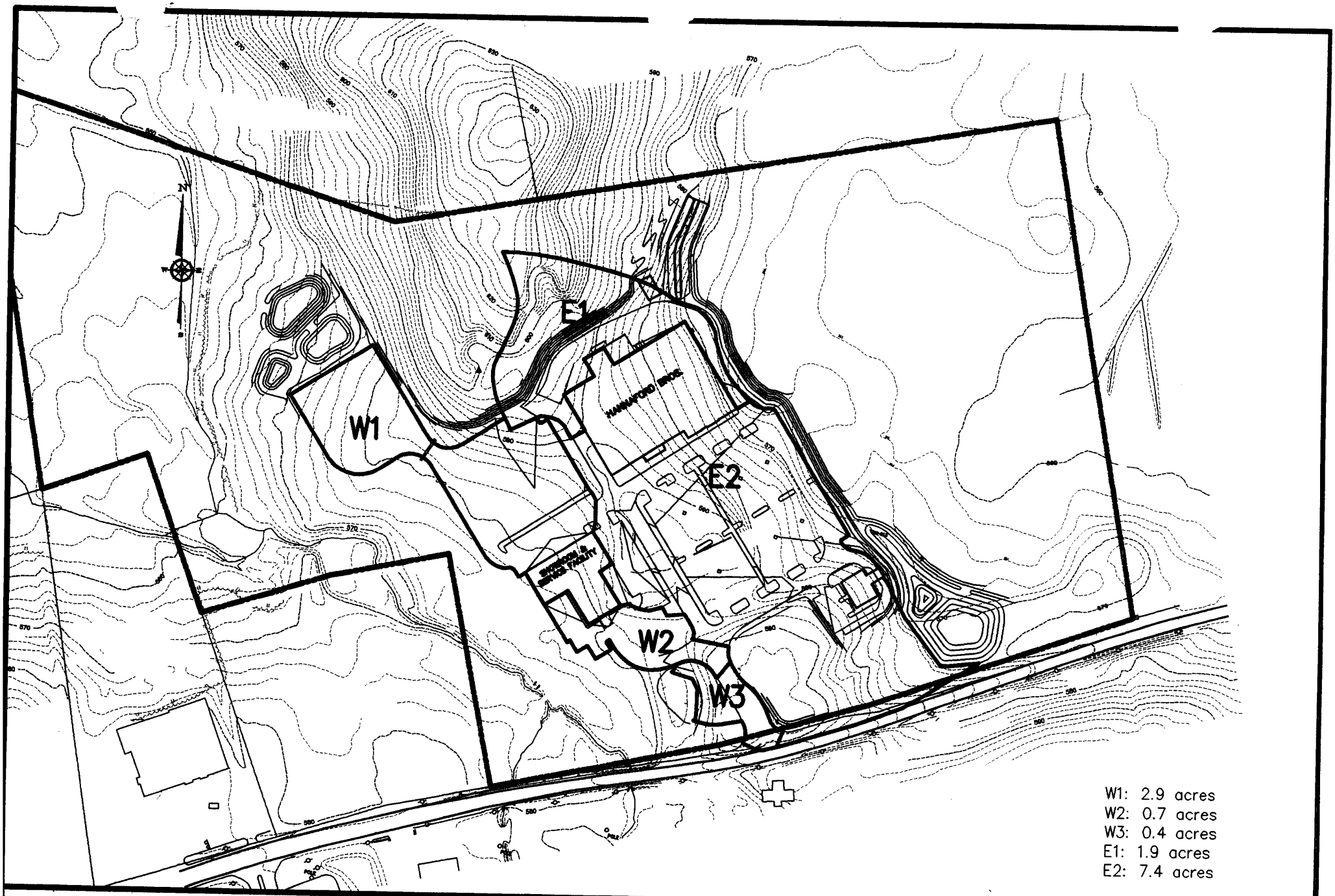


125 0 125 250

SCALE IN FEET

FIGURE C

DRAINAGE AREAS – EXISTING CONDITIONS



125 0 125 250

SCALE IN FEET

FIGURE D

DRAINAGE AREAS – PROPOSED CONDITIONS

Input data for the analyses were generated using SCS TR55 methodology. Calculations, backup data, and printouts from the Hydraflow program are included in the following appendices:

Appendix S-1:	TR-55 Data
Appendix S-2	Stormwater Basin Design Calculations
Appendix S-3	Hydraflow Model – Existing Conditions 2, 10, and 100 Year Storms
Appendix S-4	Hydraflow Model – Proposed Conditions 2, 10, and 100 Year Storms

Runoff Volumes

The Hydraflow model was used also to analyze runoff volumes produced under existing and proposed conditions. The construction of impervious surfaces will decrease the amount of groundwater recharge occurring beneath buildings, parking lots, and sidewalks. To mitigate this effect, the proposed stormwater facilities have been designed to promote infiltration, following the treatment of stormwater runoff, as described below.

The underdrain outlet pipes from the proposed dry swales, bioretention facility, and organic filter will be equipped with valves. At each facility, the valve will be closed under normal conditions, causing all of the treated and filtered water to percolate into the soil. The valve can be opened for maintenance or to sample the discharge.

In the southeast corner of the development area, adjacent to Pocket Pond E2, a 250–foot long infiltration swale will receive discharges from the pond. Percolation tests were performed at three locations along the swale on November 8, 2005, with stabilized rates determined of approximately 3, 7, and 1.3 minutes per inch. These rates confirm the soil mapping for the site, which indicates that the soils in the vicinity are well drained. For design purposes, a percolation rate of 12 minutes per inch was utilized.

At the northwest corner of the development area, a dry detention basin is proposed for the reduction of runoff rates and volumes. Water quality will be provided for low flows in this subbasin by the proposed organic filter system. In conjunction with organic filter, the detention basin has been sized to store the runoff for the 2-year event without surface discharge.

A detailed Hydraflow model was used to analyze runoff volumes and recharge volumes for the 1-year storm. It includes the effects of infiltration at the swale in Subbasin E2 and at the organic filter in Subbasin W1. The results are summarized in Table S-2.

Table S-2
Runoff Volumes from Development Areas, Existing and Proposed Conditions
1-Year Design Storm

	Existing Conditions Volume	**Proposed Conditions Volume**	**Change**
East Subbasins (E1+E2)	411 cubic feet	3,825 cf	+ 3,414 cf
West Subbasins (W1+W2+W3)	5,767 cubic feet	154 cf	- 5,613 cf
Study Area Total	6,178 cubic feet	3,979 cf	- 2,199 cf

The results indicate that the proposed measures will be effective in preventing an increase in runoff volumes, thereby preserving existing groundwater recharge volumes, for the 1-year storm. This effect will also hold true for all smaller, more frequent runoff events.

Relevant Hydraflow data is included in the following appendices:

Appendix S-5 Hydraflow Model – Existing Conditions
1 Year Storm

Appendix S-6 Hydraflow Model – Proposed Conditions
1 Year Storm (for Volume Analysis)

Water Quality Measures

The same five subbasins used for the hydrologic analysis were utilized to design water quality measures in accordance with the NYSDEC's Stormwater Management Design Manual. Chapter 5 of the manual includes a list of acceptable practices for water quality treatment. The DEC states that these practices are selected based on the following criteria:

- Can capture and treat the full water quality volume,
- Are capable of 80% total suspended solids removal and 40% total phosphorus removal,
- Have acceptable longevity in the field, and
- Have a pretreatment mechanism.

The proposed practices on the Fairgrounds site have been selected from the approved list and shall be installed in accordance with the manual's recommendations.

Stormwater Management Basins

Pocket Ponds: To be utilized at Basin E2. The pond includes a forebay and permanent pool, and provides a combination of water quality storage, channel protection storage, and extreme flood protection. Chapter 6.1, Stormwater Ponds, was used as a basis for sizing the proposed measures. Due to the site's location within the Town's Aquifer Protection Zone, the forebay has been oversized, and will be lined.

Dry swales: To be utilized at Basins E1 and W2, dry swales will provide mitigation by settling and filtration of stormwater runoff. Impermeable sumps will be provided for pretreatment, and small check dams at the far end of the swales will temporarily impound runoff. Section 6.5 of the Design Manual was used to size the facilities. As indicated in the hydrologic analysis, the maximum water depth during the water quality design storm will be 12 inches.

Bioretention: To be utilized at Basin W3, serving a small area at the entrance to the site. Similar to a dry swale, the bioretention uses soil media to filter runoff.

Organic Filter: To be utilized at Basin W1. The sizes of the pretreatment basin and the filter itself have been increased from the previous design. A diversion structure will divert the peak flow from the 1.2-inch water quality design storm (2.3 cfs) to the filter system. Larger flows will bypass the filter and be directed to the dry detention basin proposed downhill of the filter. A sand / peat filter media is proposed. Section 6.4 of the Design Manual was used as a guideline for design. The bottom of the dry detention basin will also be lined with sand / peat filter media to enhance the water quality system.

The project plans include construction details, landscaping, and other requirements. As discussed in the DEIS and FEIS for the project, the property owners will be responsible for maintenance of all stormwater facilities. Access will be available from paved areas to each of the stormwater basins.

Additional Stormwater Mitigation Measures

Regular Pavement Sweeping: All parking areas and driveways will be swept or vacuumed on a weekly (or more frequent) basis as a standard operating procedure for the supermarket and dealership. Although the NYSDEC design manual does not include sweeping as a standard mitigation measure, this is a practical and effective pretreatment measure to remove a significant amount of litter, particulates, and organics before they enter the stormwater drainage and treatment systems. All materials collected will be transported offsite for disposal.

Maintenance of Permanent Facilities: The property owner will be responsible for periodic monitoring and maintenance of stormwater facilities at the site. Once per month inspections of stormwater inlets and basins would be conducted to identify sediment accumulation or other obstruction of drainage performance in the permanent stormwater facilities, including structures, piping, ponds, filters and swales. Cleaning of drainage facilities will be contracted by the property owner on an as-needed basis and according to the site specific maintenance requirements specified in the Stormwater Pollution Prevention Plan for the Fairgrounds project. A written record of inspections and maintenance will be kept at the site.

Buffer Enhancement: The layout of the project has been modified so that all driveways, parking areas, structures, and areas to be regraded are located more than 100 feet from wetland areas. Much of this 100-foot buffer is presently used for row crops. This use will cease as a result of the proposed project. In the southwestern corner of the site, an existing driveway within the buffer will be removed and replaced with vegetation. Extensive plantings of trees and shrubs are proposed within the buffer areas, designed to improve the habitat for native species. The program to reestablish and improve the wetland buffer on the west side of the site will benefit surface water quality in downstream areas in several ways. First, it will eliminate agricultural uses at the edge of the wetlands and their potential to introduce sediments, organics, and other pollutants to the receiving system. Second, it will provide new permanent vegetated filters over which surface runoff will flow before reaching the existing watercourses and wetlands, thereby attenuating possible thermal increases and catching sediments in the runoff. Additionally, new wildlife habitat will be established at the site, particularly for small animals, that will expand the capability of natural ecological systems to treat runoff.

APPENDIX S-1

TR-55 DATA

LAND USE DATA

EXISTING CONDITIONS

New Name	A	A	A	A	B	B	B	B	Weighted	
	Pasture	Impervious	Row Crops	Woods	Pasture	Impervious	Row Crops	Woods	CN	Area
	39	*98*	*67*	*30*	*61*	*98*	*78*	*55*		
E1	0.976				0.29			0.67	**47.8**	1.93944
E2	6.21	0.12							**40.7**	6.32852
W1	0.90	0.01	0.09		0.57		1.66		**63.9**	3.22833
W2	0.95	0.14	0.05		0.13	0.10			**52.4**	1.37401
W3	0.37	0.03							**44.0**	0.40154
Total:	9.4	0.3		0.0	1.0	0.1		0.7		13.27184

Row Crops	1.7 ac.
Pasture	10.4
Impervious:	0.4
Woods	0.7

DEVELOPED CONDITIONS

New Name	A	A	A	A	B	B	B	B	Weighted		
	Lawns	Impervious	Brush	Woods	Lawns	Impervious	Brush	Woods	CN	Area	TC
	39	*98*	*30*	*30*	*61*	*98*	*48*	*55*			(min)
E1	0.005	0.70		0.28	0.19	0.10		0.67	**69.6**	1.94327	13.7
E2	0.65	4.85	1.89						**75.4**	7.39281	15.0
W1		0.78			0.02	2.07			**97.7**	2.87785	1.7
W2	0.17	0.31				0.20			**83.0**	0.68577	1.5
W3	0.19	0.21							**69.6**	0.40335	2.0
Total:	1.0	6.9	1.9	0.3	0.2	2.4	0.0	0.7		13.30305	

Lawn:	1.2 ac.
Impervious:	9.2
Woods	1.0
brush	1.9

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

East #1 - Existing Conditions

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.800		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.50		0.00		0.00		
Land slope (%)	=	14.00		0.00		0.00		
Travel Time (min)	=	**16.41**	+	**0.00**	+	**0.00**	=	**16.41**
Shallow Concentrated Flow								
Flow length (ft)	=	280.00		0.00		0.00		
Watercourse slope (%)	=	13.20		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	5.86		0.00		0.00		
Travel Time (min)	=	**0.80**	+	**0.00**	+	**0.00**	=	**0.80**
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 ..... 17.21 min

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

East #2 - Existing Conditions

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.400		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.50		0.00		0.00		
Land slope (%)	=	4.00		0.00		0.00		
Travel Time (min)	=	**15.56**	+	**0.00**	+	**0.00**	=	**15.56**
Shallow Concentrated Flow								
Flow length (ft)	=	260.00		0.00		0.00		
Watercourse slope (%)	=	8.80		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	4.79		0.00		0.00		
Travel Time (min)	=	**0.91**	+	**0.00**	+	**0.00**	=	**0.91**
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 ..... 16.47 min

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

West #1 - Existing Conditions

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.170		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.50		0.00		0.00		
Land slope (%)	=	3.00		0.00		0.00		
Travel Time (min)	=	**8.80**	+	**0.00**	+	**0.00**	=	**8.80**
Shallow Concentrated Flow								
Flow length (ft)	=	160.00		0.00		0.00		
Watercourse slope (%)	=	0.06		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	0.40		0.00		0.00		
Travel Time (min)	=	**6.61**	+	**0.00**	+	**0.00**	=	**6.61**
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 ..... 15.42 min

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

West #2 - Existing Conditions

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.150		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.50		0.00		0.00		
Land slope (%)	=	5.00		0.00		0.00		
Travel Time (min)	=	**6.49**	+	**0.00**	+	**0.00**	=	**6.49**
Shallow Concentrated Flow								
Flow length (ft)	=	150.00		0.00		0.00		
Watercourse slope (%)	=	4.70		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	3.50		0.00		0.00		
Travel Time (min)	=	**0.71**	+	**0.00**	+	**0.00**	=	**0.71**
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 ..... 7.21 min

(10 minutes used for analysis)

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

West #3 - Existing Conditions

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.150		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.50		0.00		0.00		
Land slope (%)	=	5.00		0.00		0.00		
Travel Time (min)	=	**6.49**	+	**0.00**	+	**0.00**	=	**6.49**
Shallow Concentrated Flow								
Flow length (ft)	=	35.00		0.00		0.00		
Watercourse slope (%)	=	14.20		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	6.08		0.00		0.00		
Travel Time (min)	=	**0.10**	+	**0.00**	+	**0.00**	=	**0.10**
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 ..... 6.59 min

(10 minutes used for analysis)

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

East #1 – Proposed Conditions

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.800		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.50		0.00		0.00		
Land slope (%)	=	24.00		0.00		0.00		
Travel Time (min)	=	**13.23**	+	**0.00**	+	**0.00**	=	**13.23**
Shallow Concentrated Flow								
Flow length (ft)	=	110.00		40.00		0.00		
Watercourse slope (%)	=	16.70		2.50		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	6.59		3.21		0.00		
Travel Time (min)	=	**0.28**	+	**0.21**	+	**0.00**	=	**0.49**
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 ..... 13.72 min

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

E2 - Proposed Conditions

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.400		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.50		0.00		0.00		
Land slope (%)	=	6.00		0.00		0.00		
Travel Time (min)	=	**13.23**	+	**0.00**	+	**0.00**	=	**13.23**
Shallow Concentrated Flow								
Flow length (ft)	=	20.00		240.00		0.00		
Watercourse slope (%)	=	20.00		1.25		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	7.22		2.27		0.00		
Travel Time (min)	=	**0.05**	+	**1.76**	+	**0.00**	=	**1.81**
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 ..... 15.04 min

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

W1 - Proposed Conditions

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)	=	3.50		0.00		0.00		
Land slope (%)	=	3.00		0.00		0.00		
Travel Time (min)	=	**0.99**	+	**0.00**	+	**0.00**	=	**0.99**
Shallow Concentrated Flow								
Flow length (ft)	=	160.00		0.00		0.00		
Watercourse slope (%)	=	3.75		0.00		0.00		
Surface description	=	Paved		Paved		Paved		
Average velocity (ft/s)	=	3.94		0.00		0.00		
Travel Time (min)	=	**0.68**	+	**0.00**	+	**0.00**	=	**0.68**
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 ..... 1.66 min

(10 minutes used for analysis)

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

West #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)	=	3.50		0.00		0.00		
Land slope (%)	=	2.00		0.00		0.00		
Travel Time (min)	=	**1.16**	+	**0.00**	+	**0.00**	=	**1.16**
Shallow Concentrated Flow								
Flow length (ft)	=	35.00		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)	=	**0.36**	+	**0.00**	+	**0.00**	=	**0.36**
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 ..... **1.52 min**

(10 minutes used for analysis)

TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

West #3

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)	=	3.50		0.00		0.00		
Land slope (%)	=	1.00		0.00		0.00		
Travel Time (min)	=	**1.53**	+	**0.00**	+	**0.00**	=	**1.53**
Shallow Concentrated Flow								
Flow length (ft)	=	60.00		0.00		0.00		
Watercourse slope (%)	=	1.00		0.00		0.00		
Surface description	=	Paved		Paved		Paved		
Average velocity (ft/s)	=	2.03		0.00		0.00		
Travel Time (min)	=	**0.49**	+	**0.00**	+	**0.00**	=	**0.49**
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 ..... 2.02 min

(10 minutes used for analysis)

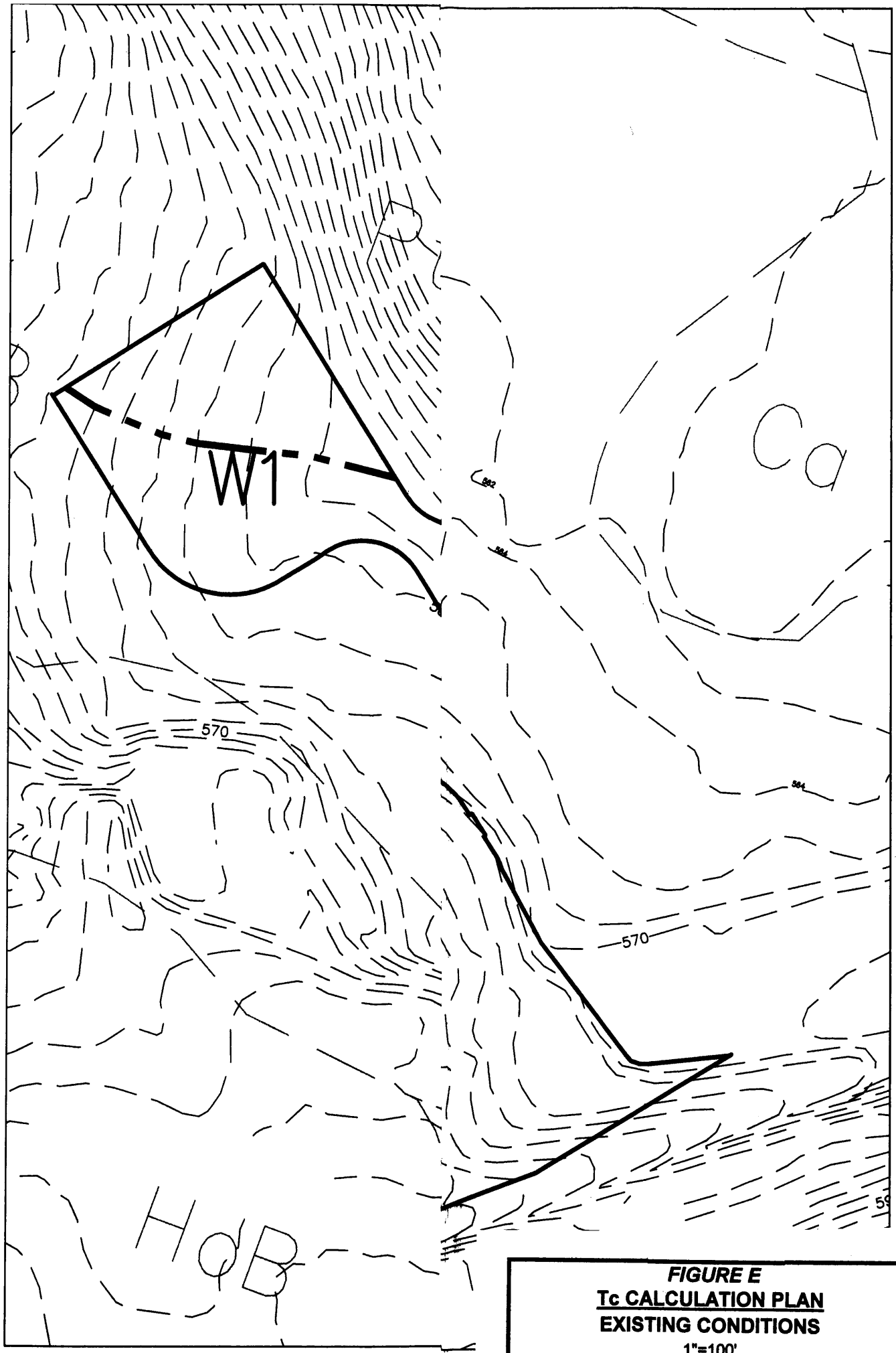


FIGURE E

Tc CALCULATION PLAN

EXISTING CONDITIONS

1"=100'

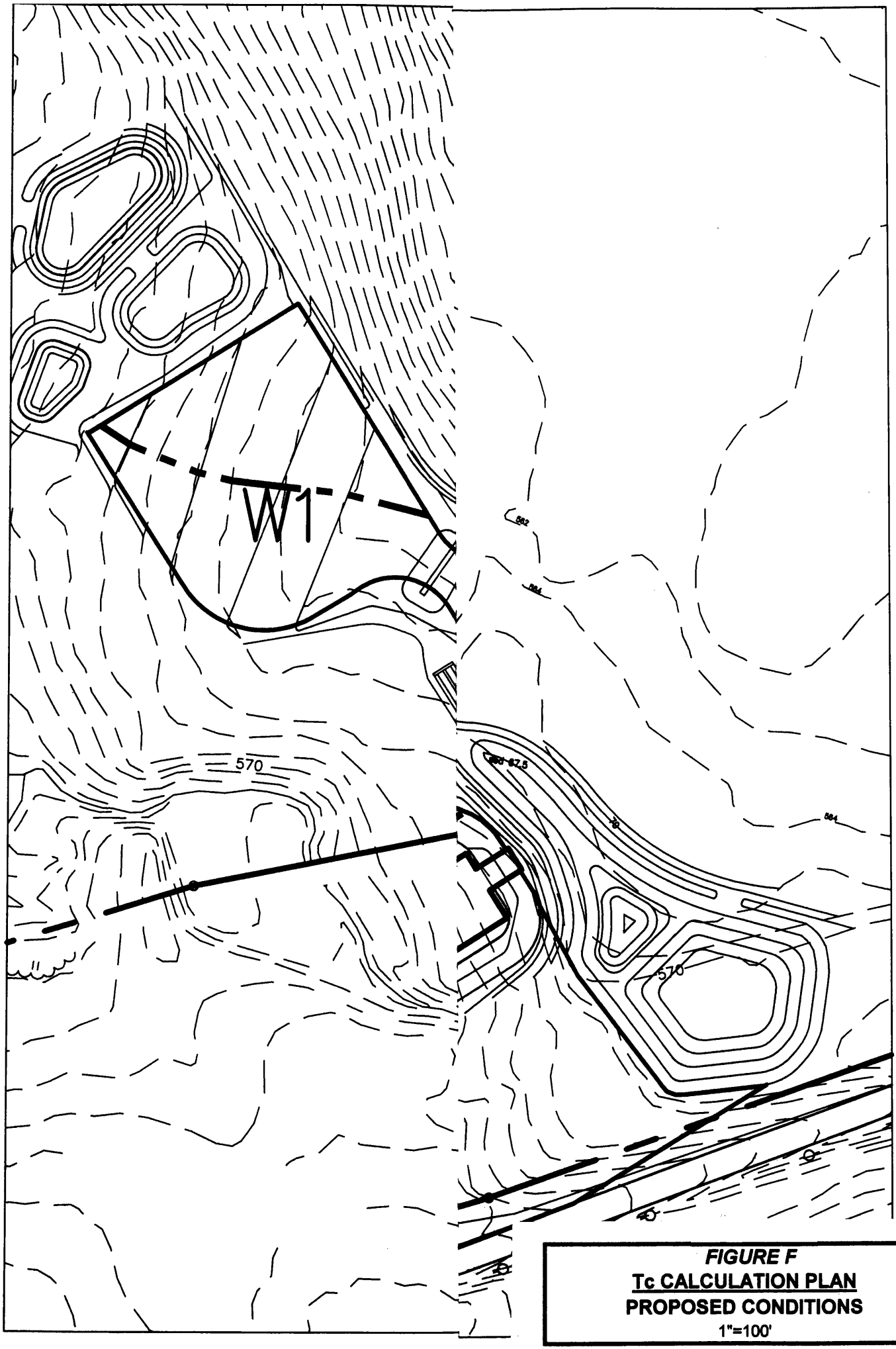


FIGURE F

Tc CALCULATION PLAN

PROPOSED CONDITIONS

1"=100'

APPENDIX S-2
STORMWATER BASIN DESIGN CALCULATIONS

FAIRGROUNDS

STORMWATER QUALITY BASIN E1

DRY SWALE

WATER QUALITY VOLUME CALCULATION

90% Precipitation (P) (in.)	**1.2**
Drainage Area (ac)	**1.9**
Imperviousness (%)	**41**
R_v	**0.42**
Water Quality Depth (in.)	**0.51**
WQv = Water Quality Volume (cf)	**3,559**

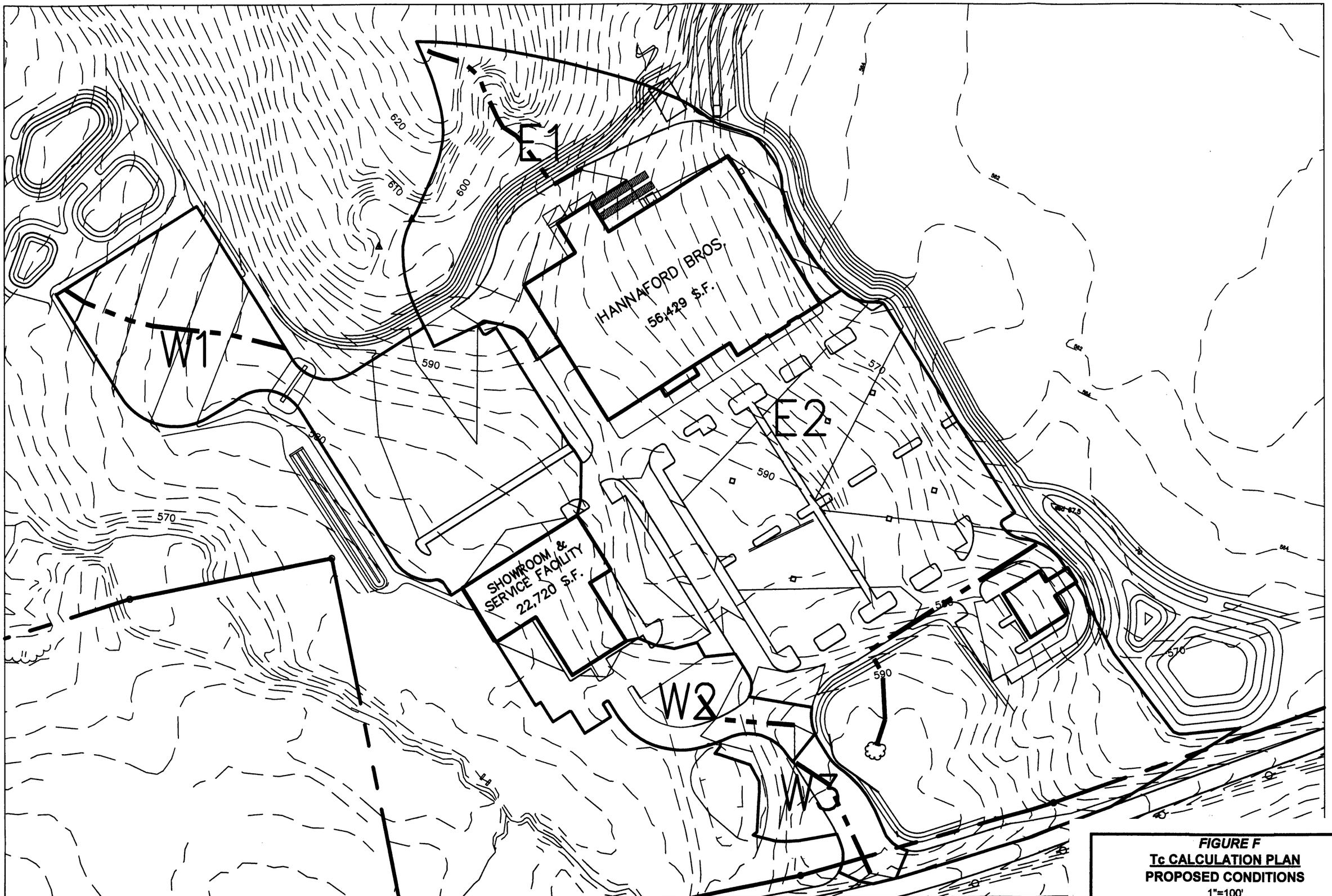


FIGURE F
Tc CALCULATION PLAN
PROPOSED CONDITIONS
1"=100'

APPENDIX S-2
STORMWATER BASIN DESIGN CALCULATIONS

FAIRGROUNDS

STORMWATER QUALITY BASIN E1

DRY SWALE

WATER QUALITY VOLUME CALCULATION

90% Precipitation (P) (in.)	**1.2**
Drainage Area (ac)	**1.9**
Imperviousness (%)	**41**
R_v	**0.42**
Water Quality Depth (in.)	**0.51**
WQv = Water Quality Volume (cf)	**3,559**

FAIRGROUNDS

11/18/05

STORMWATER QUALITY BASIN E2

POCKET POND

WATER QUALITY VOLUME CALCULATION

90% Precipitation (P) (in.)	1.2
Drainage Area (ac)	7.4
Imperviousness (%)	65.6
R_v	0.64
Water Quality Depth (in.)	0.77
WQv = Water Quality Volume (cf)	20,623

CHANNEL PROTECTION VOLUME CALCULATION

1-year precipitation (in.)	3.0
Curve Number	75
Initial abstraction (Ia)	0.653
Ia / P	0.22
S (equals 5xIa)	3.26
Tc	0.25
qu from Exhibit 4-III, TR-55	550
qu / qo from Figure 8.5, NYSDEC Manual	0.04
Vs / Vr	0.63
Q (runoff depth) (in.)	0.98
Vs = Channel Protection Volume = Cpv (cf)	16,558

OUTLET DESIGN ELEVATIONS

Outlet elevation (ft.)	565
Discharge pipe length (ft.)	50
Outlet structure invert (ft.)	566.0
Discharge pipe slope	0.020

POND DESIGN

Permanent pool invert (ft.)	562.00
Forebay invert (ft.)	562.00
Permanent pool elevation (ft.)	566.00
Berm elevation (ft.)	570.00
Spillway elevation (ft.)	569.50

	SEDIMENT FOREBAY DESIGN				PERMANENT POOL DESIGN			
Elevation vs. Area Data:	Elevation	Area	Incr. Volume	Cumulative Volume	Elevation	Area	Incr. Volume	Cumulative Volume
invert	562.00	58		0	562.00	4,991		0
			220				6,067	
	563	382		220	563	7,142		6,067
			697				7,591	
	564	1,012		917	564	8,039		13,657
			2,988				14,071	
water surface	566	1,976		3,905	566	6,032		27,728
Proposed volume (cf)	3,905				27,728			
Required pretreatment volume (cf)	2,062	*(10% of WQv)*						
Total volume of permanent pool (cf)	31,633							
Fraction of WQv	1.53	*(minimum 0.20)*						

FAIRGROUNDS

11/18/05

STORMWATER QUALITY BASIN E2

POCKET POND

STORAGE ABOVE THE PERMANENT POOL

Elevation vs. Area Data:		Elevation	Surface Area (sf)	Incr. Volume	Cumulative Volume	Surface Area (ac.)
	water surface	566	8,008		0	0.184
				0		
		566	9,284		0	0.213
				10,992		
		567	12,700		10,992	0.292
				14,138		
		568	15,576		25,130	0.358
				26,821		
	spillway	569.5	20,185		51,951	0.463

WATER QUALITY DESIGN

Required WQv storage above permanent pool (cf): **0 cf**
Required elevation to provide WQv storage (ft.): **566.0 ft.**

Surface area at WQv elevation (sf) **8,008 sf**
Percent of total drainage area: **2.49** *(minimum 1%)*

Average 24-hour release rate (cfs)	**0.00**
WQv orifice invert (ft.)	**n/a**
WQv orifice coefficient	**0.6**
Average head (ft.)	**n/a**
WQv orifice area for 24-hour detention (ft.)	**0.000**
WQv orifice diameter for 24-hour detention (in.)	**0.00**

Entire water quality volume is provided within the permanent pool

CHANNEL PROTECTION DESIGN

Required channel protection storage (cf):	**16,558**
Total volume (Wqv +Cpv above pool) (cf):	**16,558**
Required elevation above WQv storage (ft.):	**566.30**

Average 24-hour release rate (cfs)	**0.19**
Cpv orifice invert (ft.)	**566.00**
Cpv orifice coefficient	**0.6**
Average head (ft.)	**0.1**
Cpv orifice area for 24-hour detention (ft.)	**0.103**
Cpv orifice diameter for 24-hour detention (in.)	**4.34**

Use 3" diameter

FAIRGROUNDS

11/15/05

STORMWATER QUALITY BASIN W1

ORGANIC FILTER

WATER QUALITY VOLUME CALCULATION

90% Precipitation (P) (in.)	1.2
Total Drainage Area (sf)	**125,322**
Impervious Area (sf)	**124,146**
Imperviousness (%)	**99.1**
Design Imperviousness	**99.1**
R_v	0.94
Water Quality Depth (in.)	1.13028
WQv = Water Quality Volume (cf)	**11,804**

DESIGN ELEVATIONS

Outlet elevation (ft.)	**562.00**
Discharge pipe length (ft.)	**140**
Underdrain invert elev. (ft.)	**562.75**
Discharge pipe slope	0.005
Top of cleanout elevation (ft.)	566.20
Filter surface elevation (ft.)	**566.00**

PRETREATMENT BASIN DATA

Invert elev., inflow (ft.)	**568.00**
Outlet weir elevation (ft.)	**570.00**
Pretreatment berm elevation (ft.)	**571.00**
Basin invert (ft.)	**566.00**
Invert elev., upstream end of connector pipe (ft.)	**566.75**
Required pretreatment area (sf)	779
Proposed pretreatment area (sf)	**875**

Elevation vs. Area Data:		Elevation	Area	Incr. Volume	Cumulative Volume
	invert	**566.0**	**875**		0
				2,440	
		568.0	**1,565**		2,440
				3,965	
	weir	**570.0**	**2,400**		6,405

Required pretreatment volume (cf)	4,722	*(40% of WQv for cold weather considerations)*
Proposed pretreatment volume (cf)	**6,405**	
Fraction of WQv	0.54	

FILTER CALCULATIONS

Invert elev., downstream end of connector pipe (ft.)	**566.50**
Spillway elevation (ft.)	**570.00**
Filter berm elevation (ft.)	**571.00**
Filter surface elevation (ft.)	**566.00**
Available filter head (ft.)	4.00
Depth of topsoil (ft.)	**0.25**
Depth of filter media (ft.)	**2.00**
Filter Media "k"	**2.94**
Tf = Time to drain (days)	**2**
Af = Required filter area (sf)	1,004
Proposed filter area (sf)	**3,530**

Elevation vs. Area Data:		Elevation	Area	Incr. Volume	Cumulative Volume
	Surface	**566.00**	**3,530**		0
				8,580	
		568	**5,050**		8,580
				11,850	
	Spillway	**570.00**	**6,800**		20,430

Required storage volume above filter (cf)	5,902	*(0.5*WQv)*
Proposed filter storage volume (cf)	**20,430**	
Required underdrain length (ft.)	**118**	
Proposed underdrain length (ft.)	**120**	

SUMMARY

	cubic feet	% of WQv
WATER QUALITY VOLUME	**11,804**	
PROPOSED STORAGE VOLUMES:		
Pretreatment:	**6,405**	
Filter:	**20,430**	
Total:	**26,835**	**227**

FAIRGROUNDS

STORMWATER QUALITY BASIN W2

DRY SWALE

WATER QUALITY VOLUME CALCULATION

90% Precipitation (P) (in.)	**1.2**
Drainage Area (ac)	**0.7**
Imperviousness (%)	**74**
R_v	**0.72**
Water Quality Depth (in.)	**0.86**
WQv = Water Quality Volume (cf)	**2,149**

FAIRGROUNDS

STORMWATER QUALITY BASIN W3

BIO-RETENTION

WATER QUALITY VOLUME CALCULATION

90% Precipitation (P) (in.)	**1.2**
Drainage Area (ac)	**0.4**
Imperviousness (%)	**52.5**
R_v	**0.52**
Water Quality Depth (in.)	**0.63**
WQv = Water Quality Volume (cf)	**910**

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JOB THE FAIRGROUNDS
SHEET NO. _____ OF _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

INFILTRATION RATE CALCULATIONS (USED IN 1-YEAR VOLUME ANALYSIS)

① **Infiltration Swale near Pocket Pond E2**
(rate based upon soil tests)

$$\text{Rate} = \frac{250' \text{ long} \times 5' \text{ wide} \times 5 \text{ inches/hr}}{12 \text{ in/ft} \times 3600 \text{ minutes/hour}} = 0.14 \text{ cfs}$$

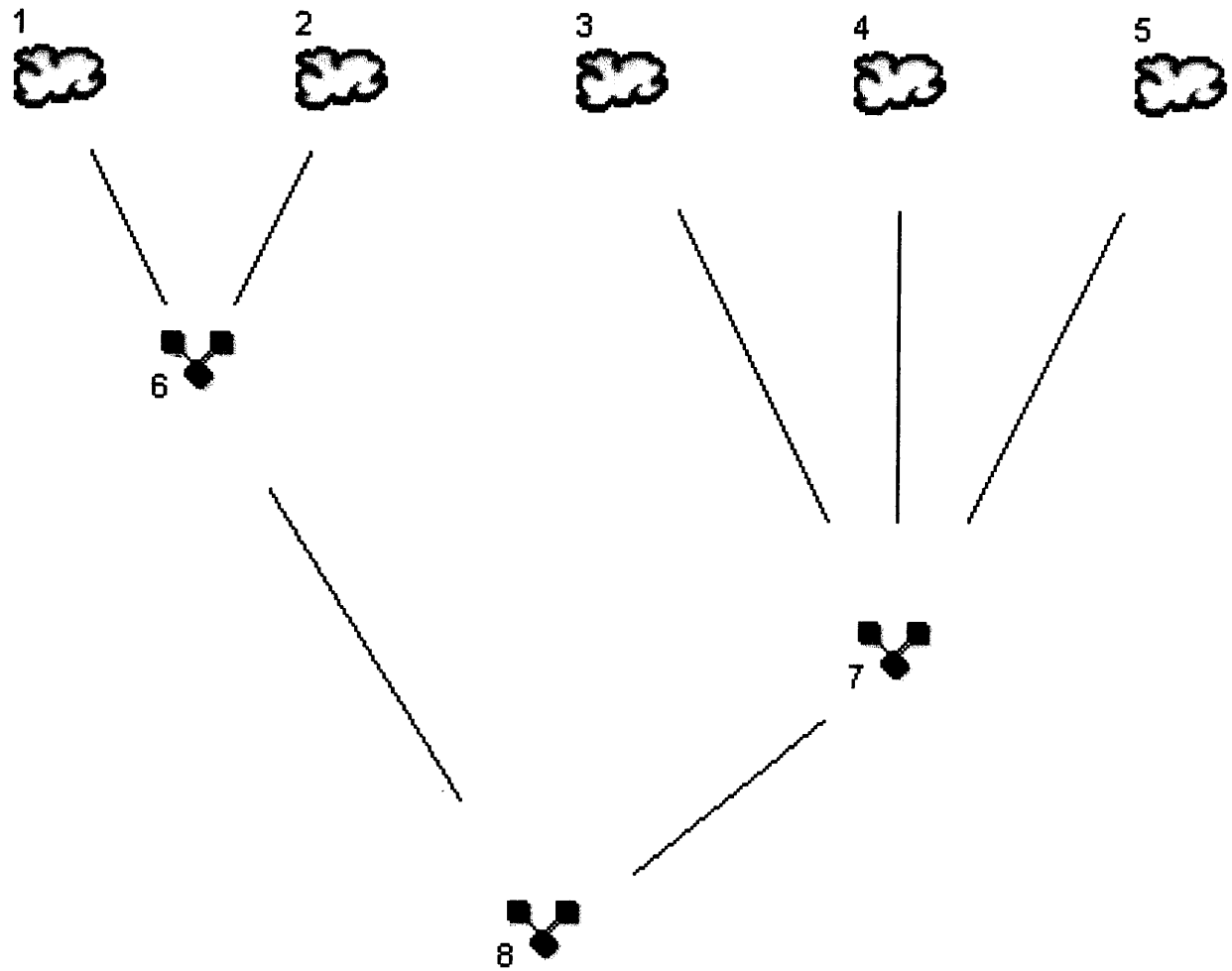
② **Organic Filter W2**
(rate based upon 2-day filter drain time;

$$\frac{48 \text{ inch depth}}{48 \text{ hours}} = 1.0 \text{ inch/hr}$$

$$\text{Rate} = \frac{3{,}530 \text{ sq. ft.} \times 1.0 \text{ inch/hr}}{12 \text{ in/ft} \times 3600 \text{ min/hr}} = 0.08 \text{ cfs}$$

APPENDIX S-3

HYDRAFLOW MODEL -- EXISTING CONDITIONS
2, 10, & 100 YEAR STORMS



Legend

Hyd.	Origin	Description
1	SCS Runoff	East #1
2	SCS Runoff	East #2
3	SCS Runoff	West #1
4	SCS Runoff	West #2
5	SCS Runoff	West #3
6	Combine	East Total
7	Combine	West Total
8	Combine	Existing Total

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Hydrograph Return Period Recap

Hyd.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	——	0.02	0.05	——	——	0.80	——	——	2.24	East #1
2	SCS Runoff	——	0.00	0.02	——	——	0.77	——	——	3.73	East #2
3	SCS Runoff	——	0.91	1.57	——	——	5.09	——	——	9.29	West #1
4	SCS Runoff	——	0.04	0.13	——	——	0.99	——	——	2.39	West #2
5	SCS Runoff	——	0.00	0.00	——	——	0.10	——	——	0.37	West #3
6	Combine	1, 2,	0.02	0.05	——	——	1.51	——	——	5.87	East Total
7	Combine	3, 4, 5,	0.91	1.61	——	——	6.14	——	——	12.04	West Total
8	Combine	6, 7	0.91	1.61	——	——	6.69	——	——	15.98	Existing Total

Proj. file: Existing 1,2,10,100.gpw

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Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.05	5	770	1,029	---	-----	-----	East #1
2	SCS Runoff	0.02	5	1335	521	---	-----	-----	East #2
3	SCS Runoff	1.57	5	730	7,698	---	-----	-----	West #1
4	SCS Runoff	0.13	5	745	1,224	---	-----	-----	West #2
5	SCS Runoff	0.00	5	905	91	---	-----	-----	West #3
6	Combine	0.05	5	770	1,549	1, 2,	-----	-----	East Total
7	Combine	1.61	5	730	9,013	3, 4, 5,	-----	-----	West Total
8	Combine	1.61	5	735	10,563	6, 7	-----	-----	Existing Total

Existing 1,2,10,100.gpw	Return Period: 2 Year	Tuesday, Nov 15 2005, 3:49 PM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

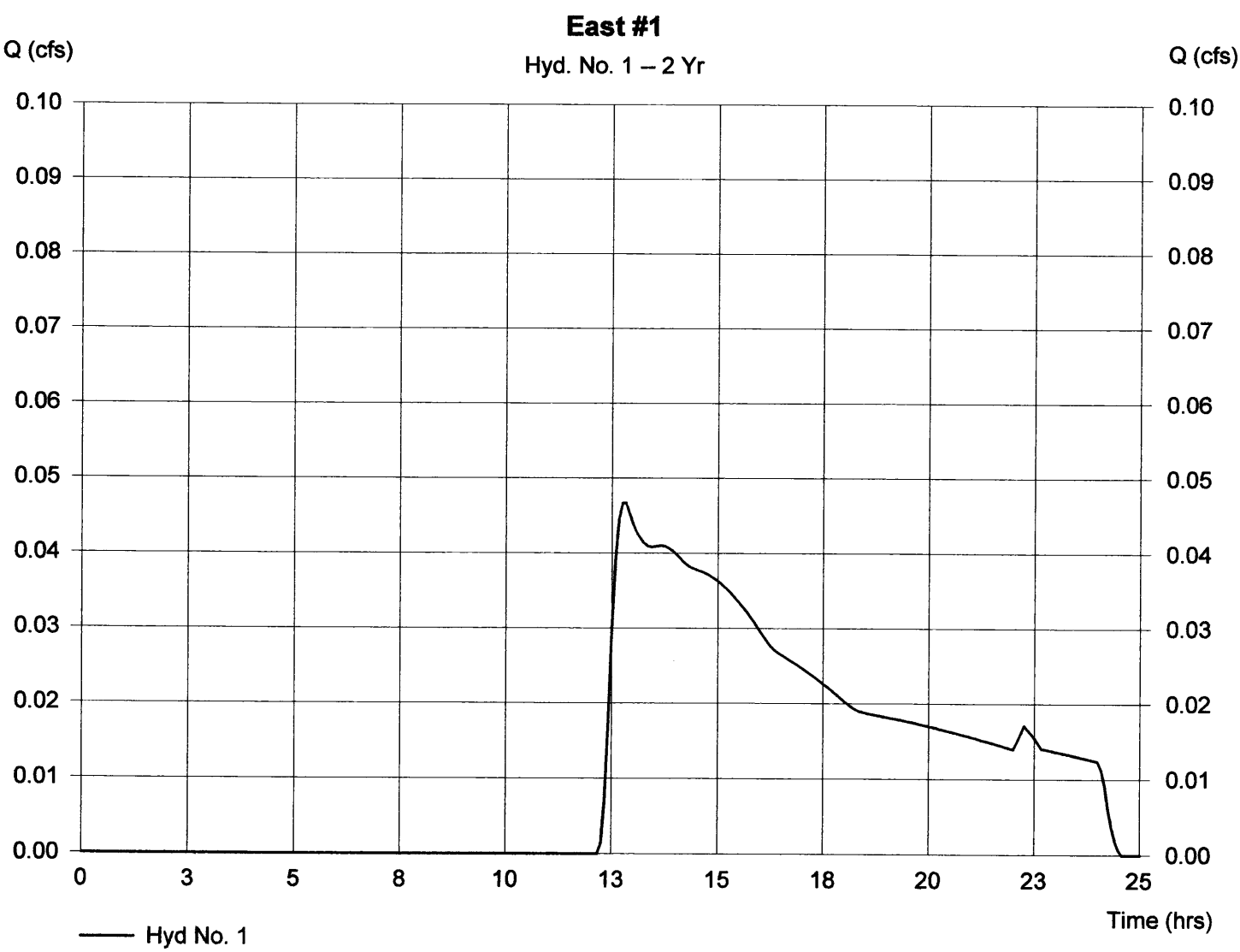
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 1

East #1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.05 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 1.940 ac	Curve number	= 48
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17.20 min
Total precip.	= 3.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,029 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

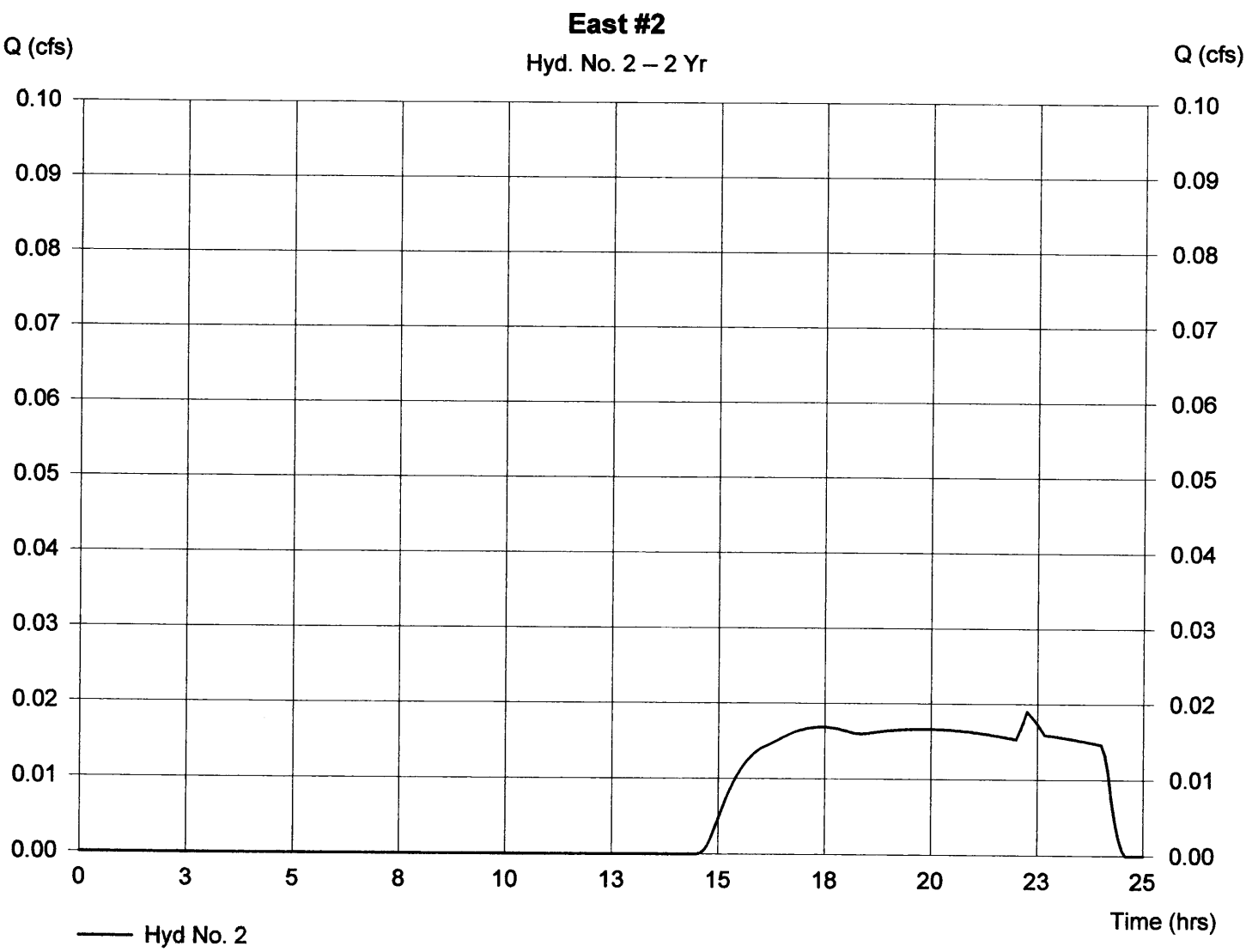
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 2

East #2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.02 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 6.330 ac	Curve number	= 40.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 16.50 min
Total precip.	= 3.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 521 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

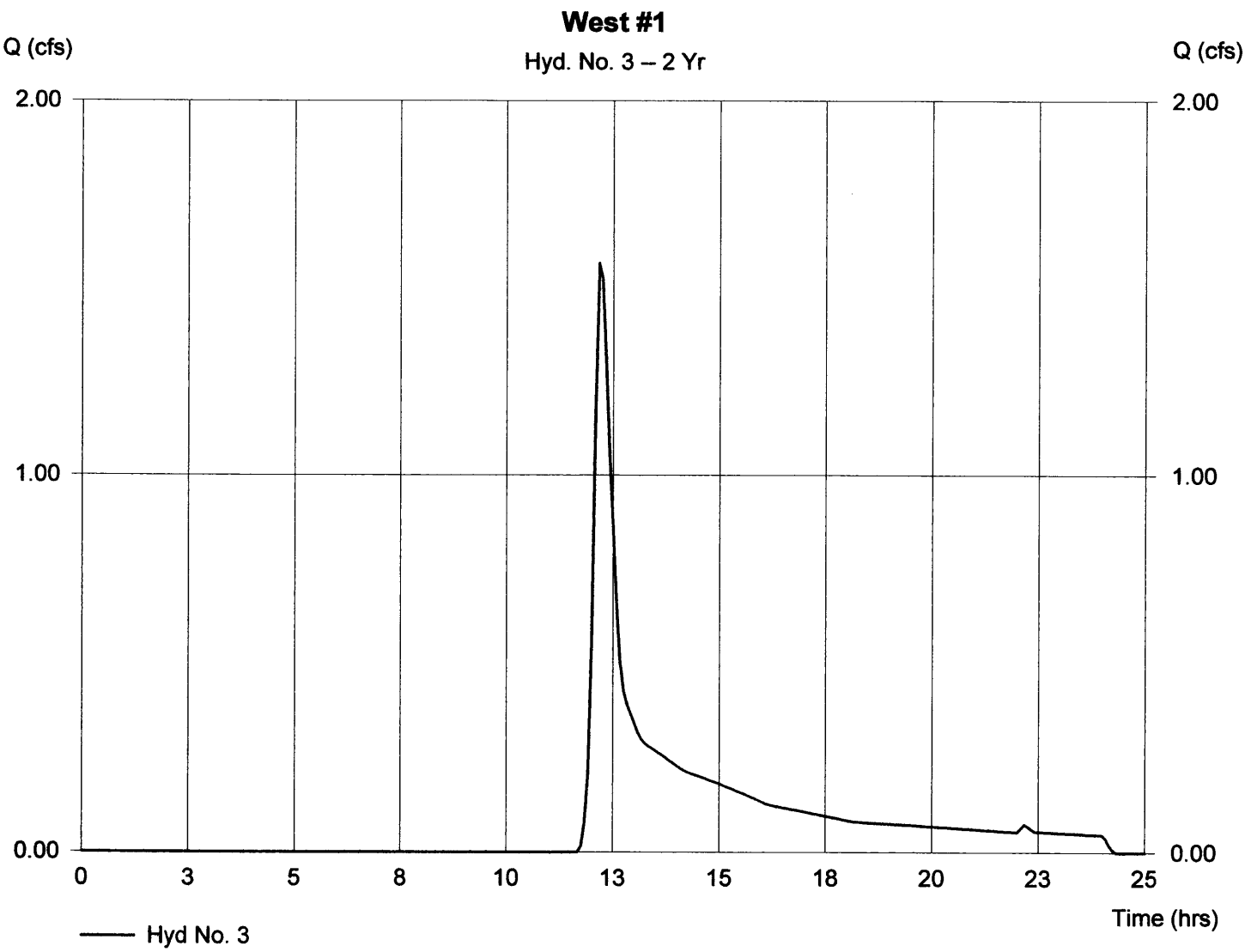
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 3

West #1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.57 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 3.230 ac	Curve number	= 63.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 15.40 min
Total precip.	= 3.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 7,698 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

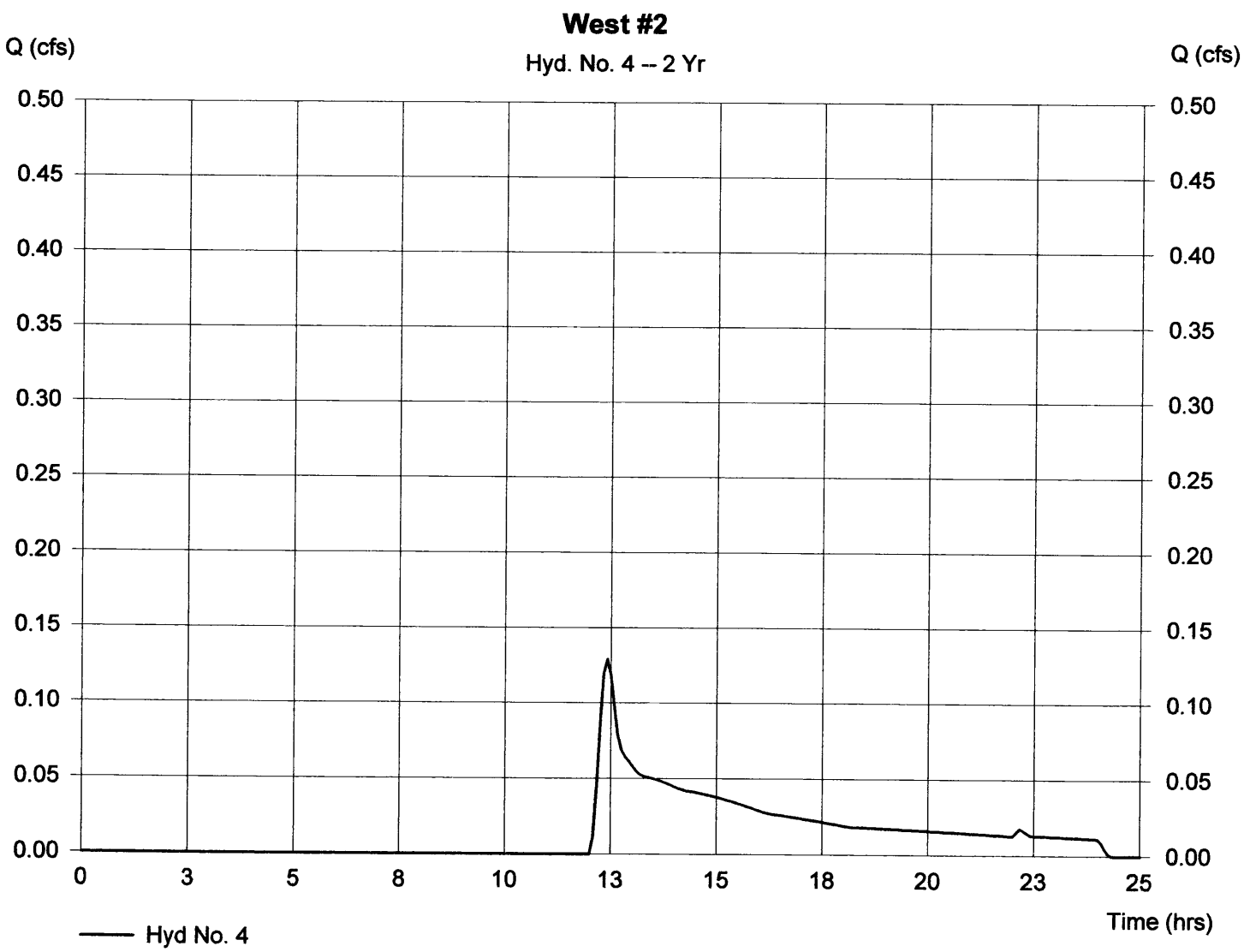
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 4

West #2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.13 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 1.370 ac	Curve number	= 52.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,224 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

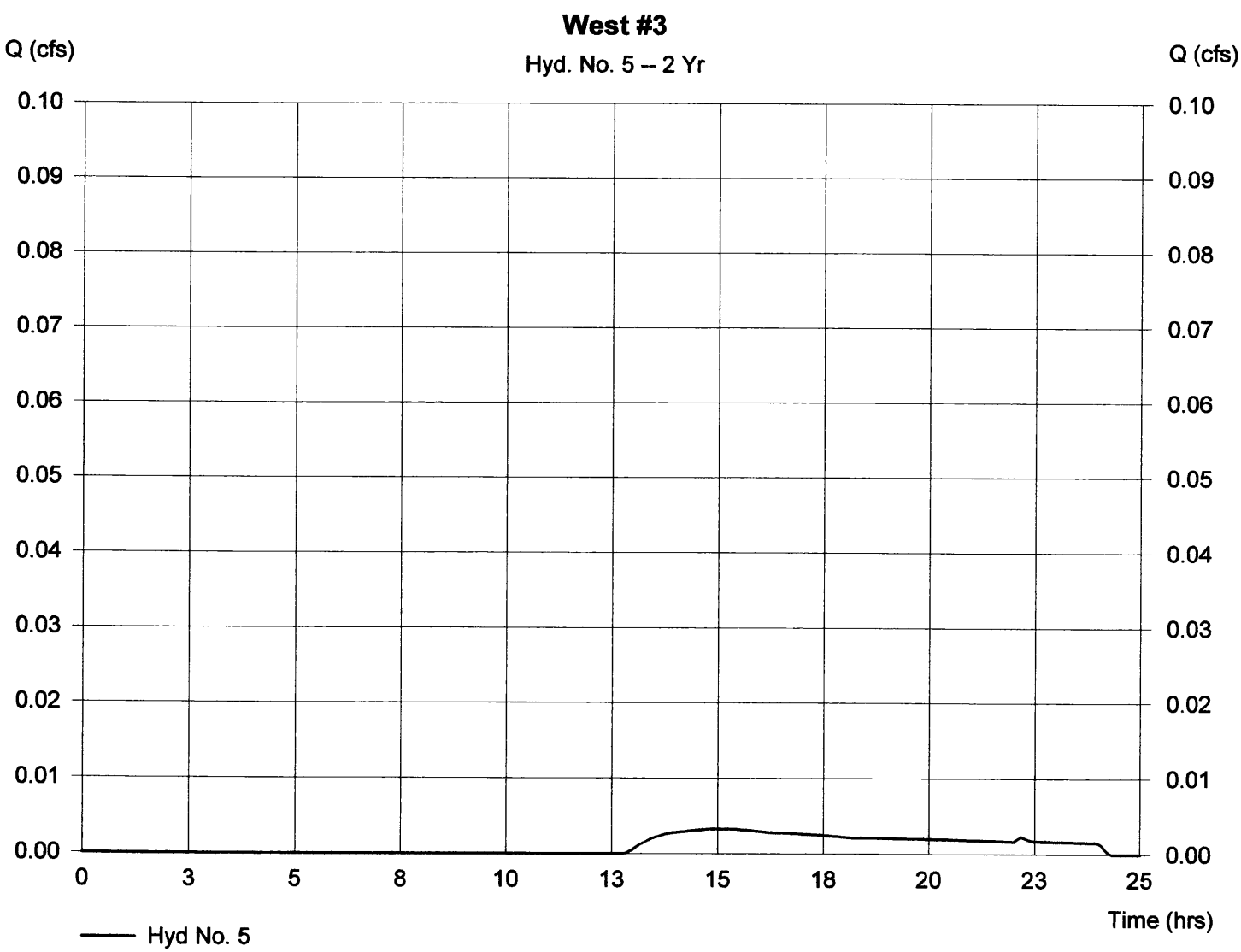
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 5

West #3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.00 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 0.400 ac	Curve number	= 44
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 91 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

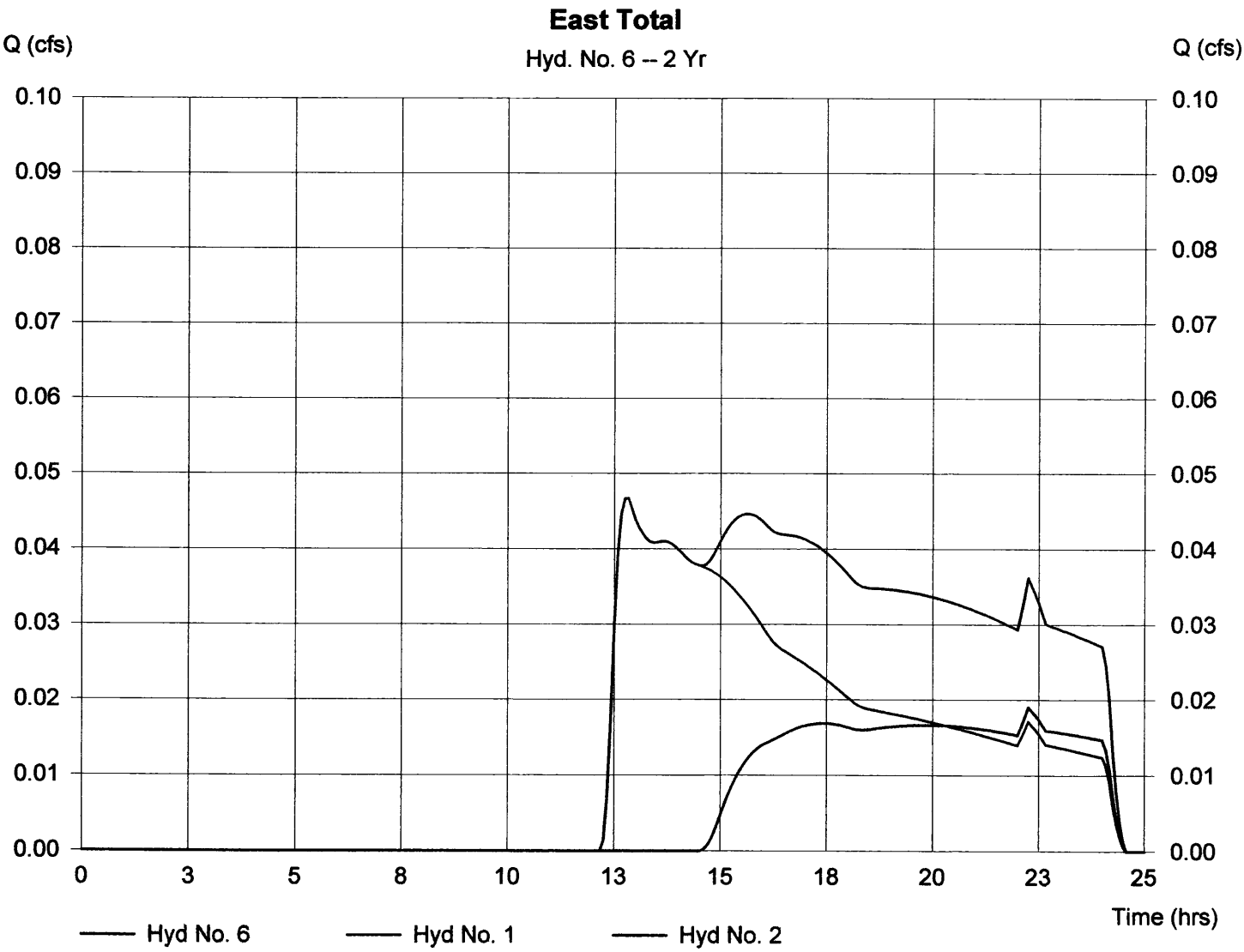
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 6

East Total

Hydrograph type	= Combine	Peak discharge	= 0.05 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 1, 2		

Hydrograph Volume = 1,549 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

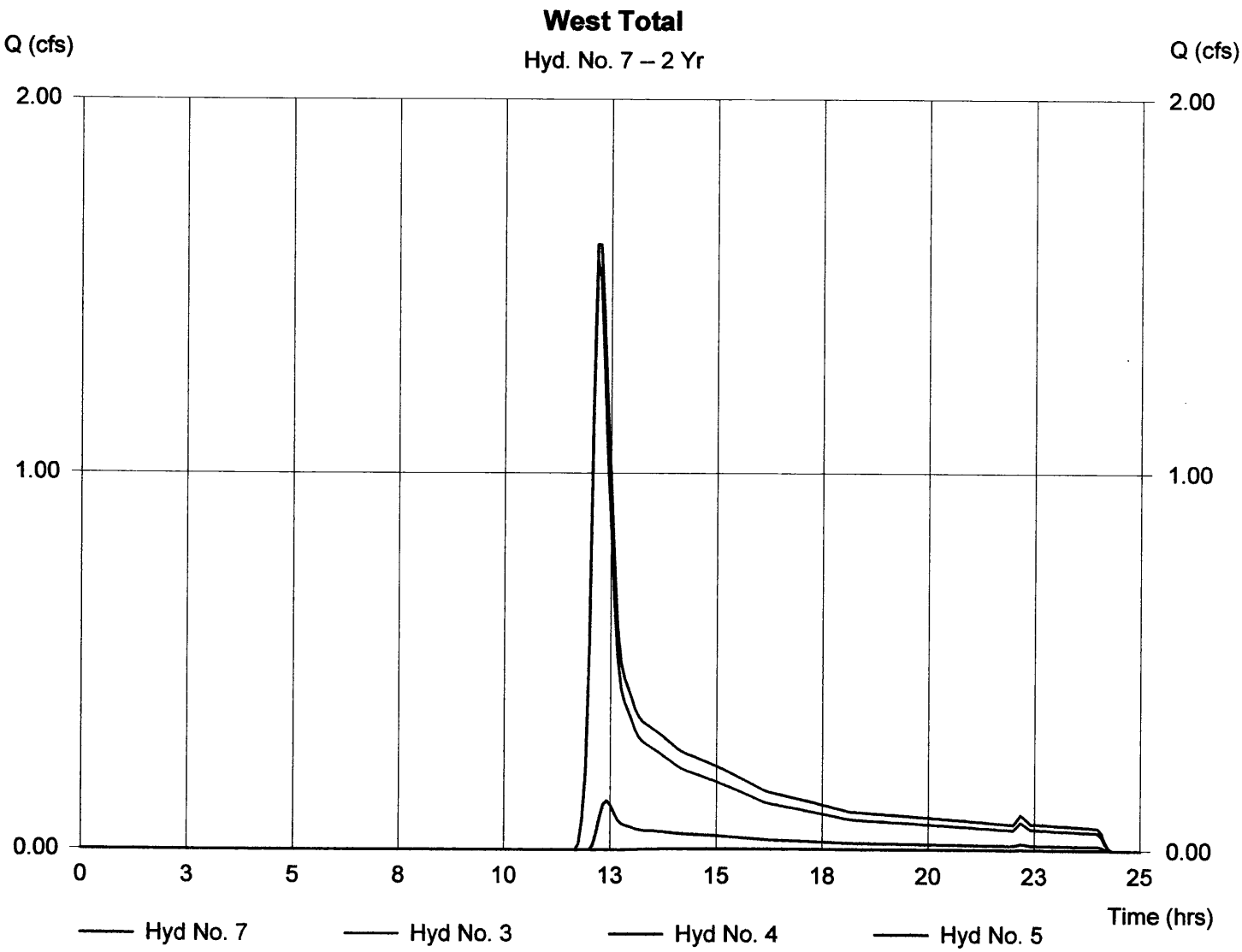
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 7

West Total

Hydrograph type	= Combine	Peak discharge	= 1.61 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4, 5		

Hydrograph Volume = 9,013 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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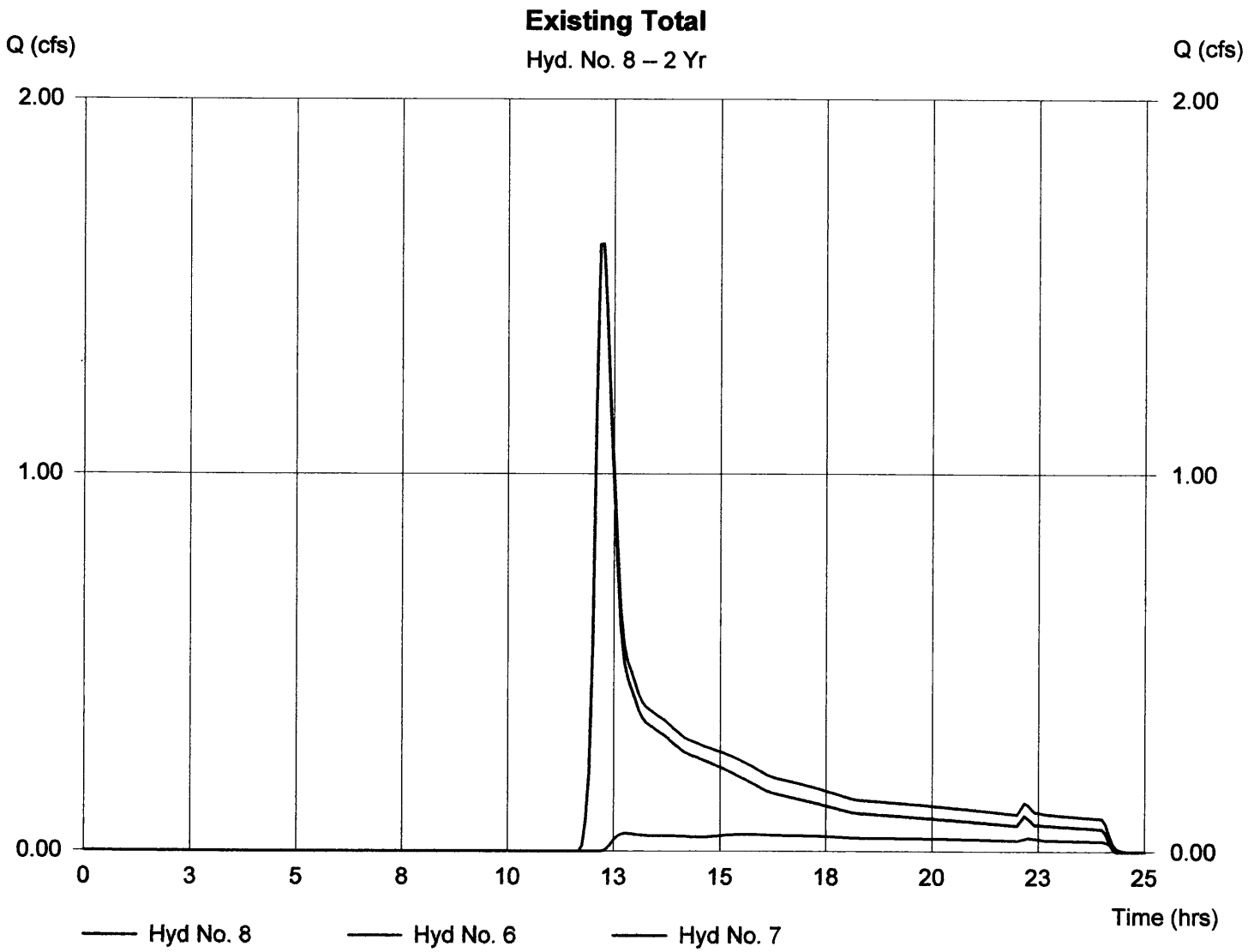
Hyd. No. 8

Existing Total

Hydrograph type	= Combine	Peak discharge	= 1.61 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 6, 7		

Hydrograph Volume = 10,563 cuft



Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.80	5	745	5,522	—	—	—	East #1
2	SCS Runoff	0.77	5	755	8,914	—	—	—	East #2
3	SCS Runoff	5.09	5	730	20,951	—	—	—	West #1
4	SCS Runoff	0.99	5	730	4,954	—	—	—	West #2
5	SCS Runoff	0.10	5	740	753	—	—	—	West #3
6	Combine	1.51	5	750	14,436	1, 2,	—	—	East Total
7	Combine	6.14	5	730	26,659	3, 4, 5,	—	—	West Total
8	Combine	6.69	5	730	41,095	6, 7	—	—	Existing Total

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

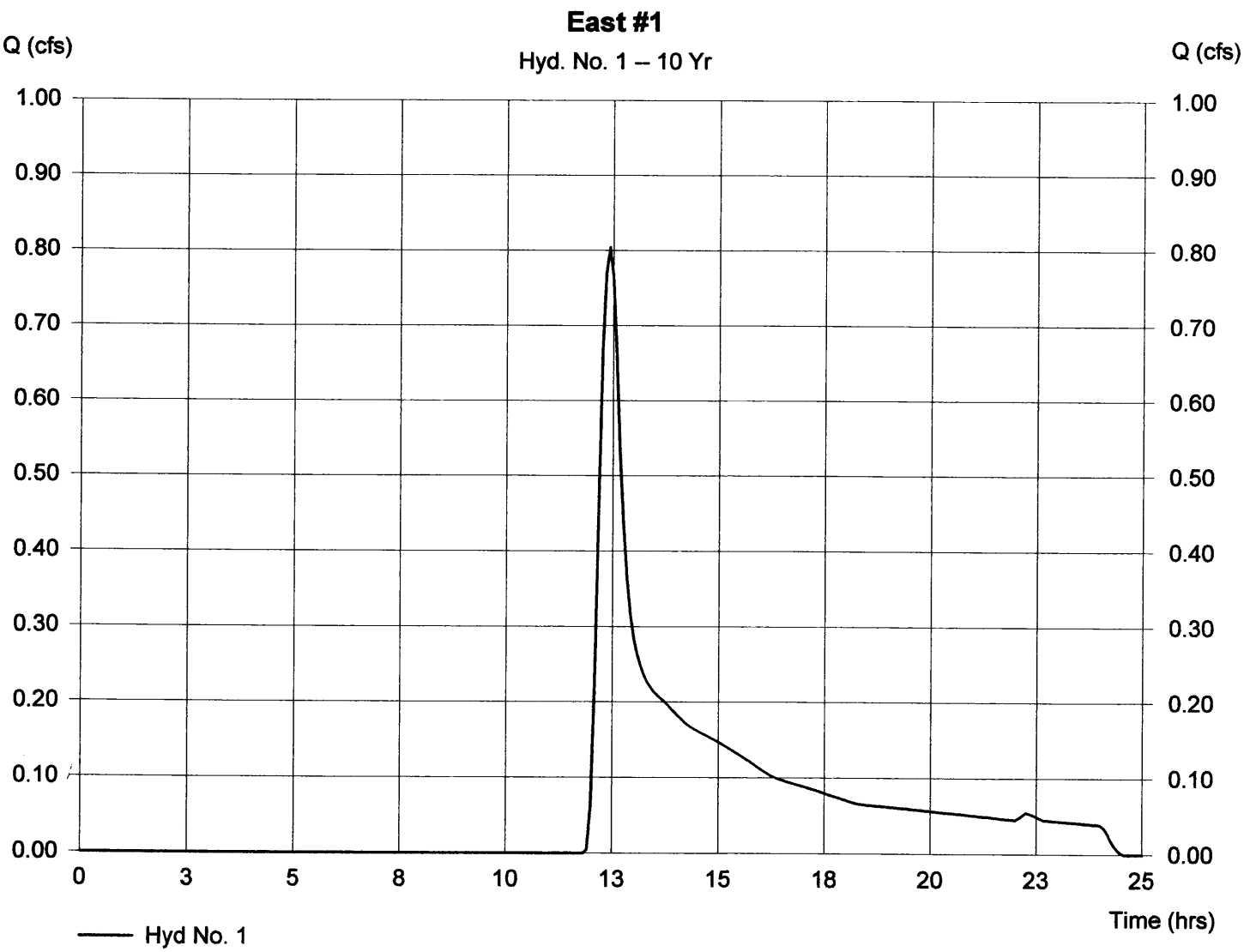
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 1

East #1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.80 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 1.940 ac	Curve number	= 48
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17.20 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,522 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

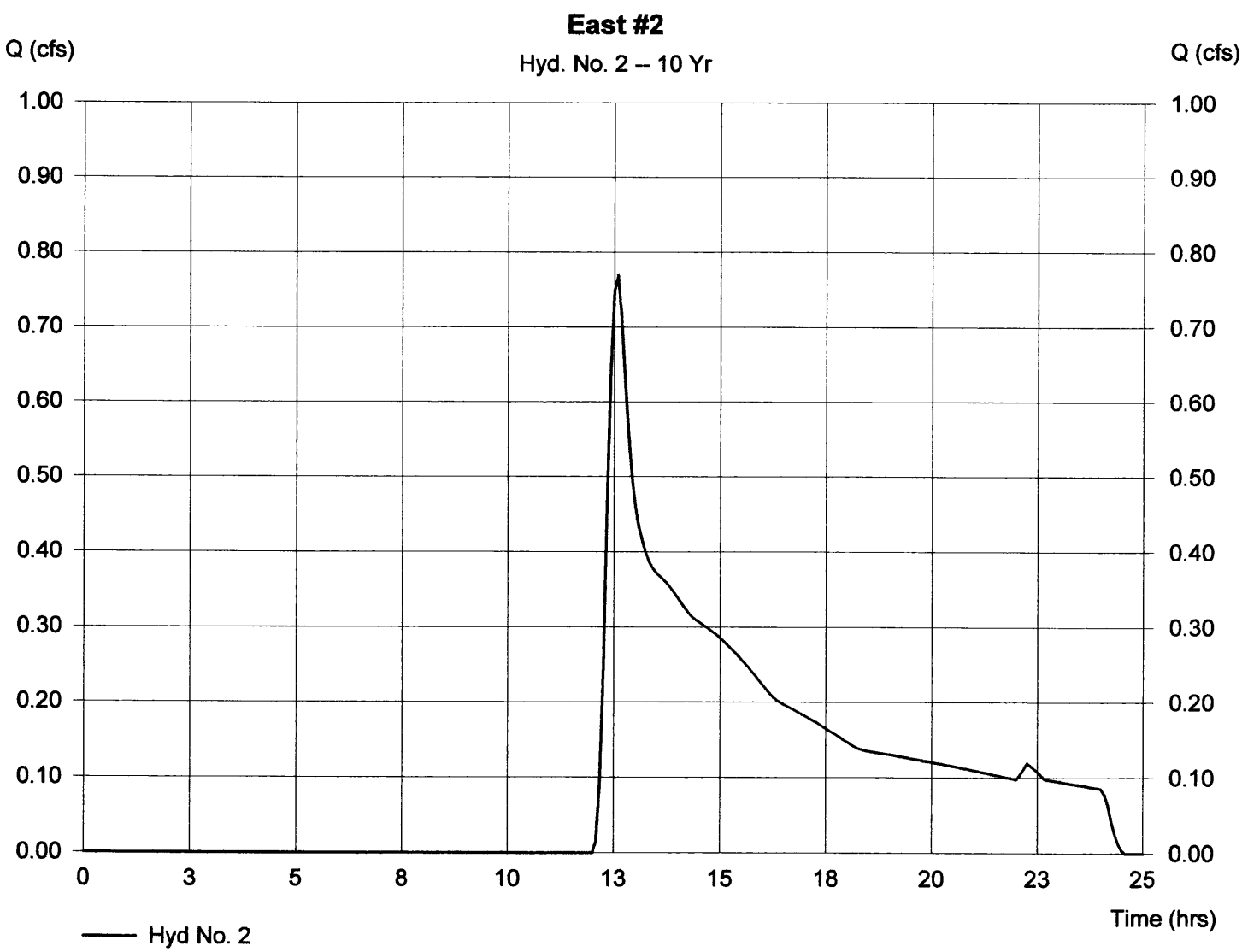
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 2

East #2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.77 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 6.330 ac	Curve number	= 40.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 16.50 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8,914 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

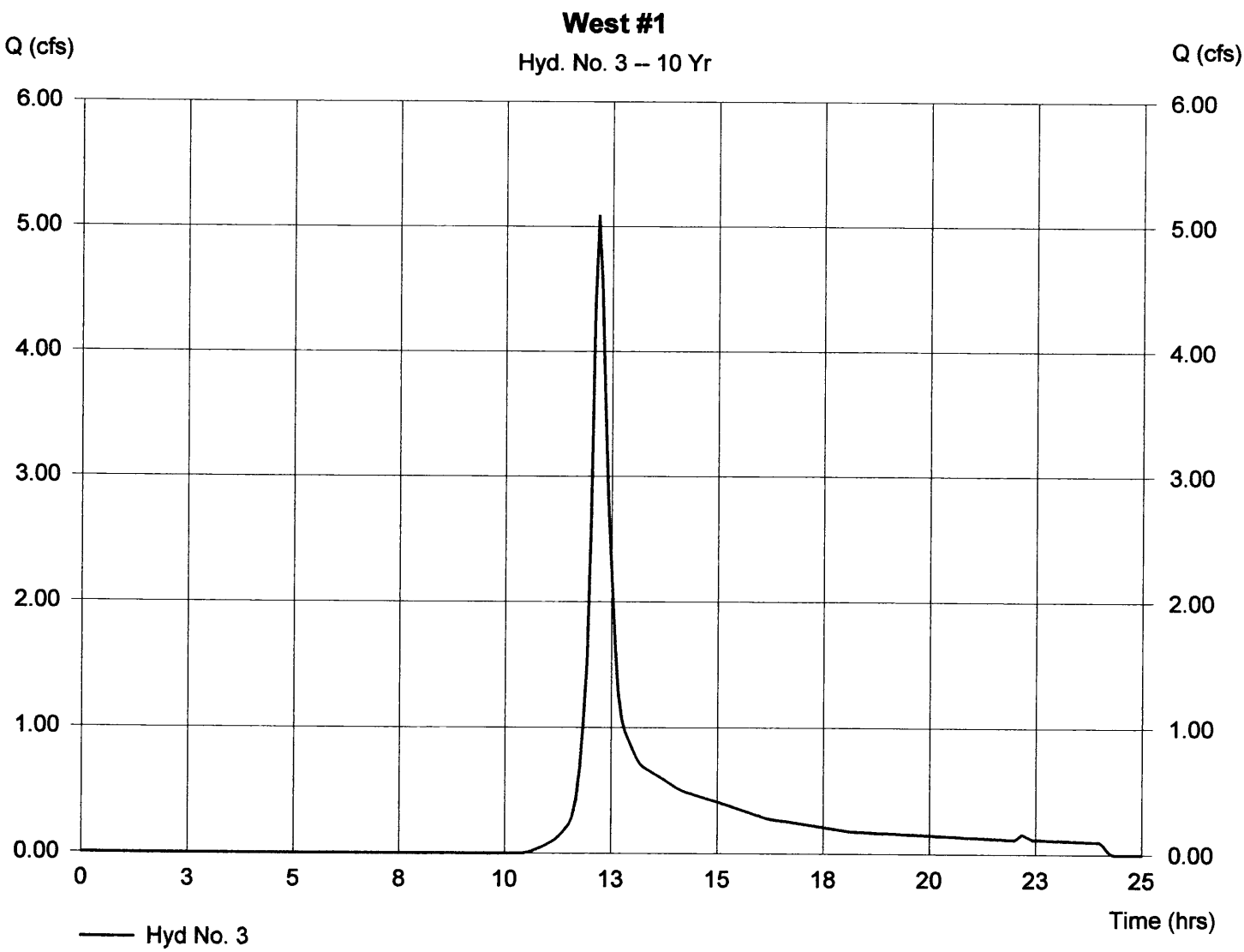
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 3

West #1

Hydrograph type	= SCS Runoff	Peak discharge	= 5.09 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 3.230 ac	Curve number	= 63.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 15.40 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 20,951 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

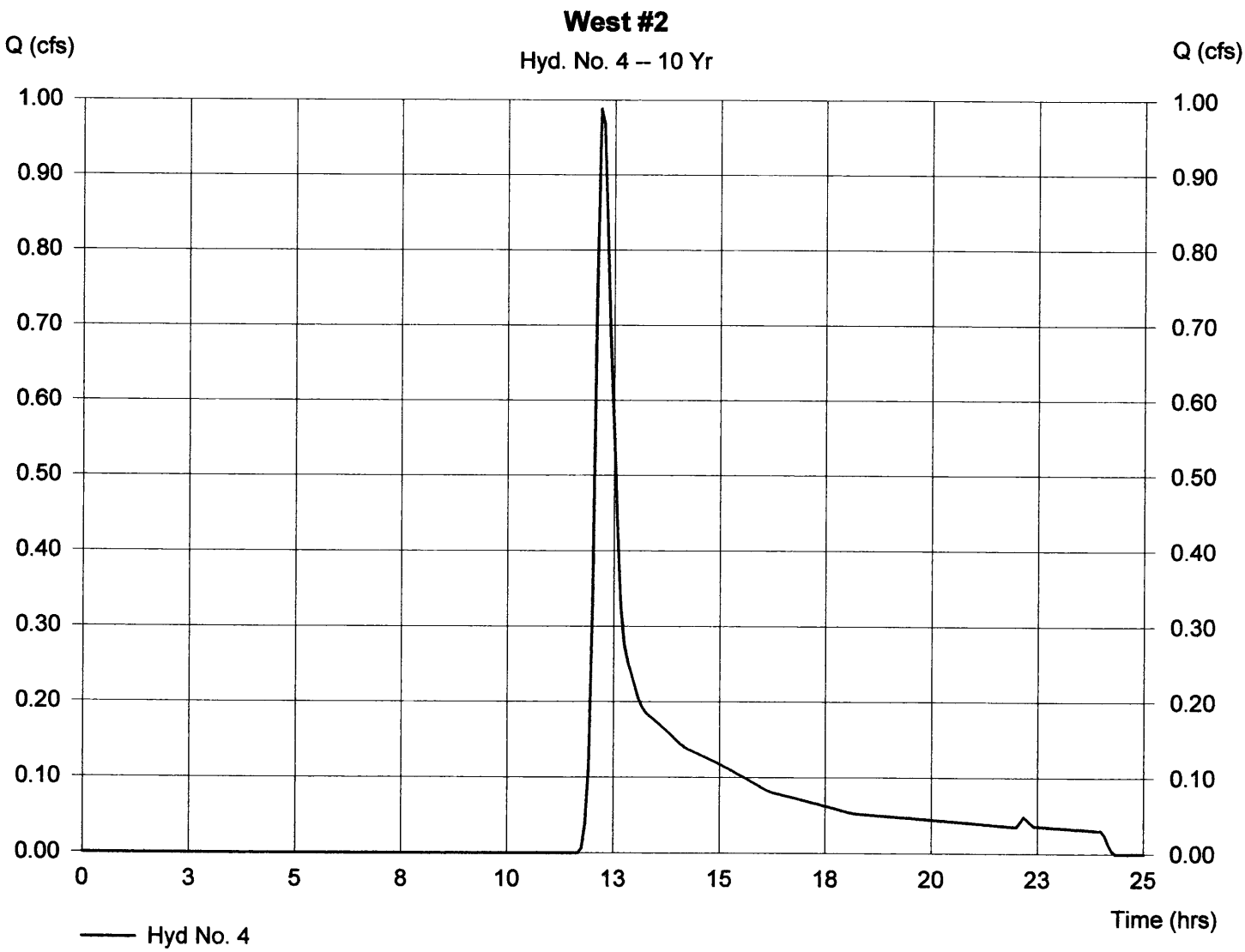
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 4

West #2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.99 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 1.370 ac	Curve number	= 52.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,954 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

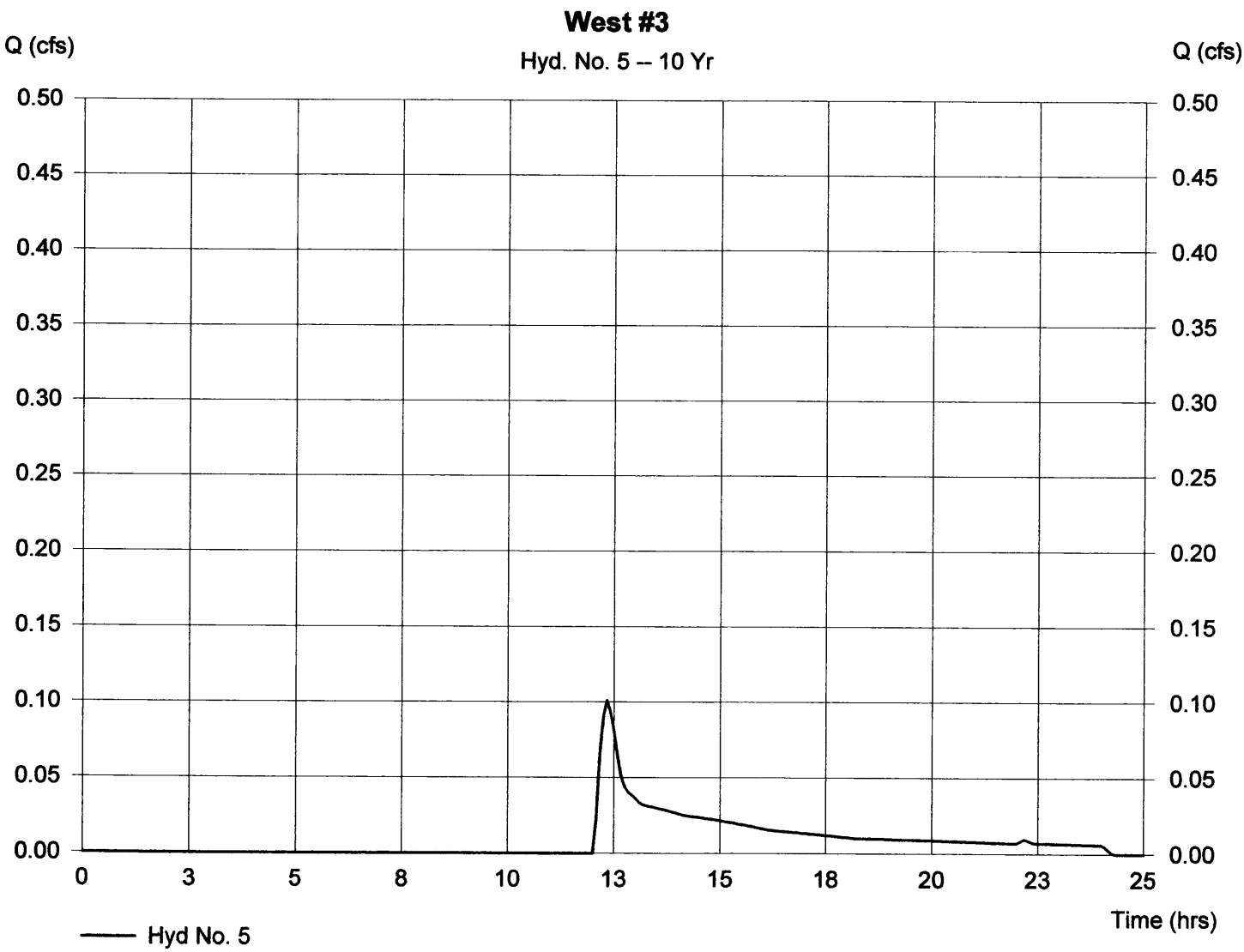
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 5

West #3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.10 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 0.400 ac	Curve number	= 44
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 753 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

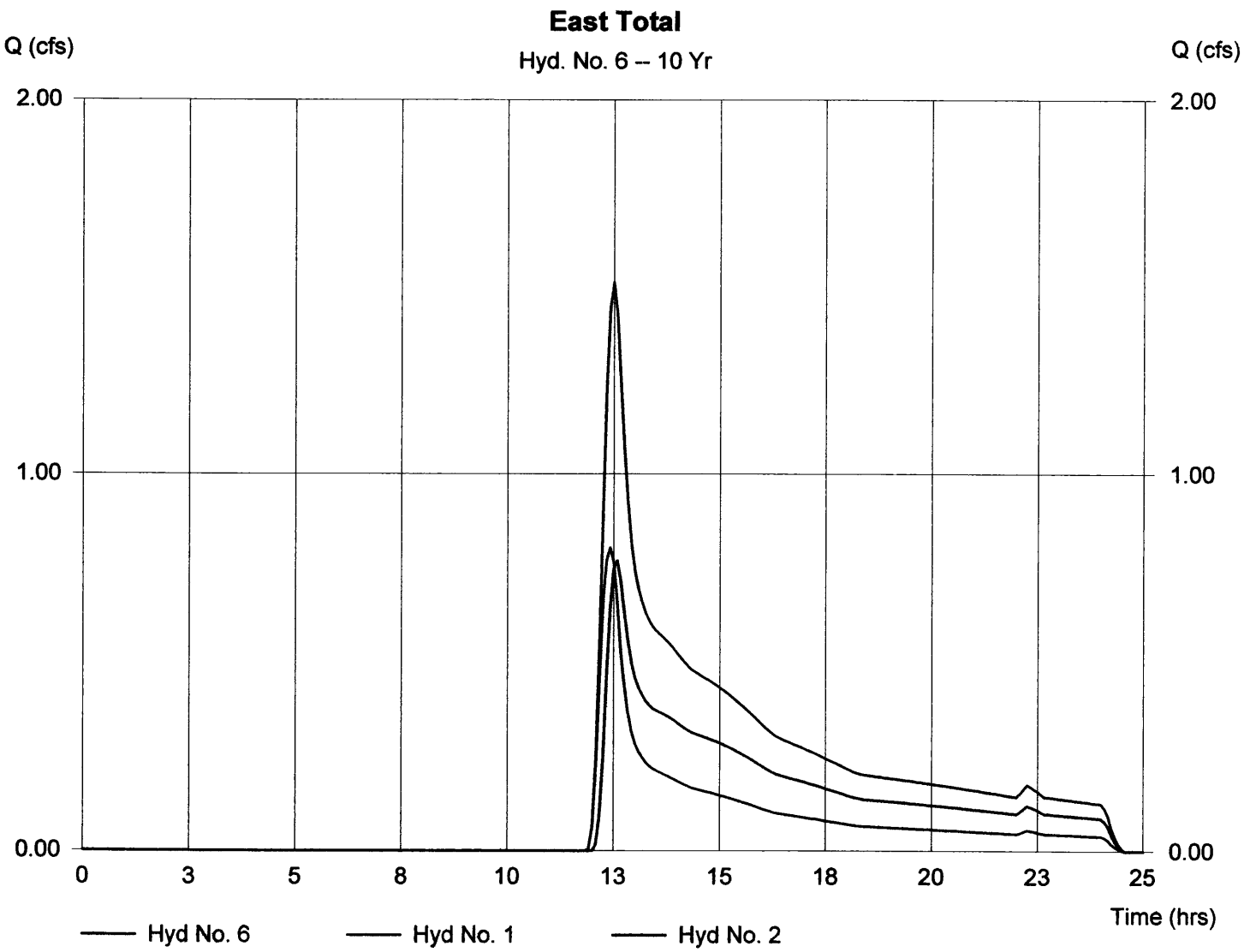
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 6

East Total

Hydrograph type	= Combine	Peak discharge	= 1.51 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 1, 2		

Hydrograph Volume = 14,436 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

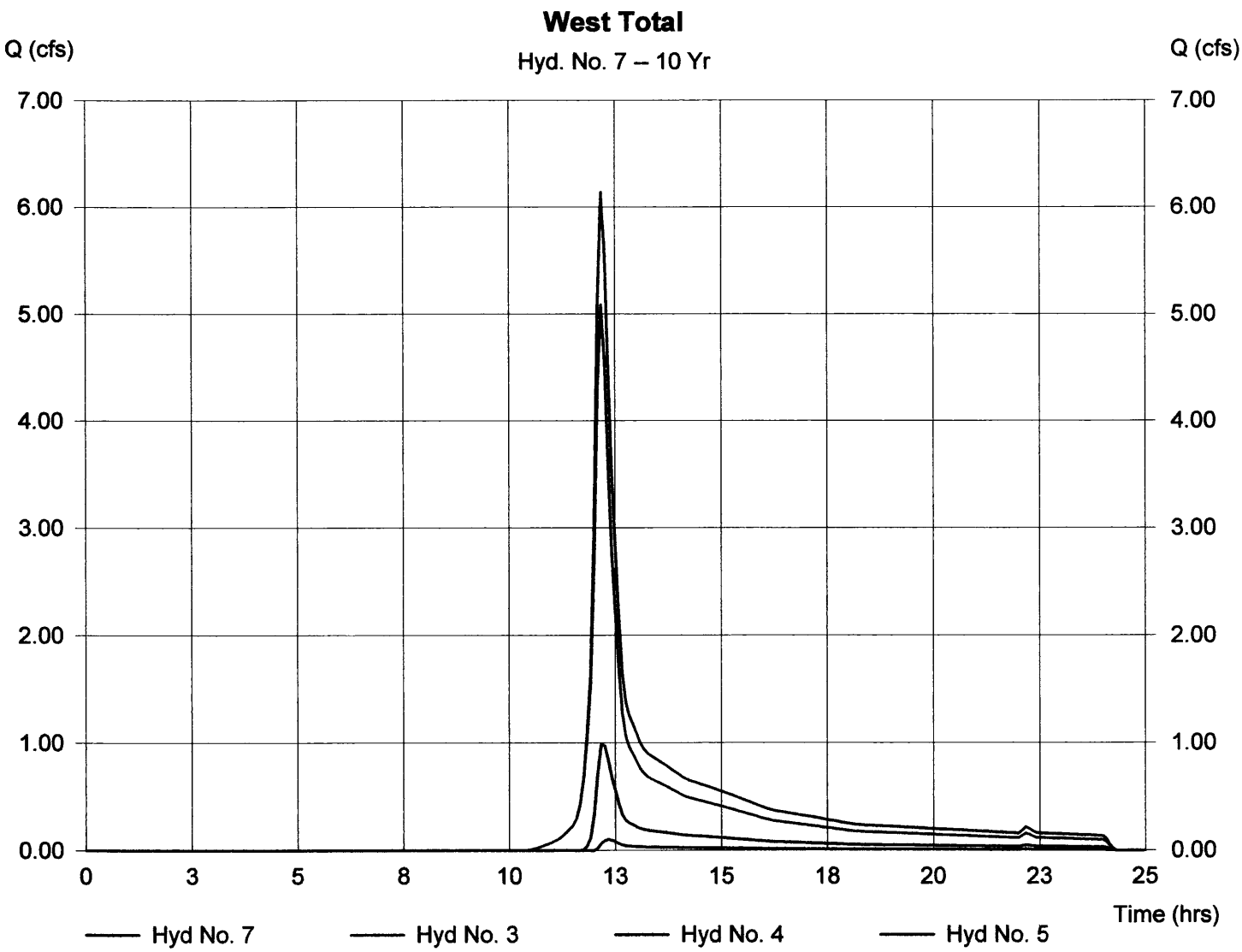
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 7

West Total

Hydrograph type	= Combine	Peak discharge	= 6.14 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4, 5		

Hydrograph Volume = 26,659 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

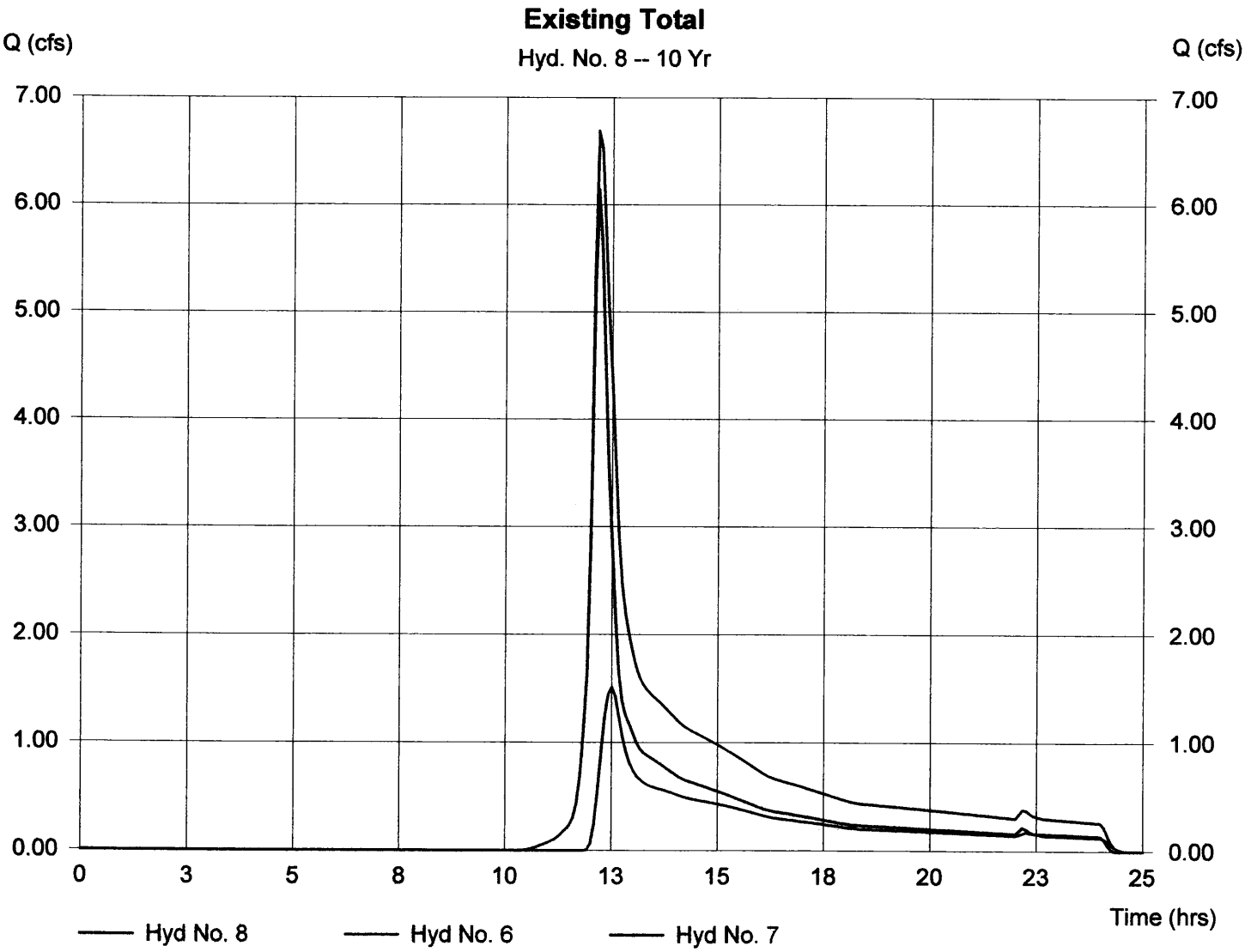
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 8

Existing Total

Hydrograph type	= Combine	Peak discharge	= 6.69 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 6, 7		

Hydrograph Volume = 41,095 cuft



Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	2.24	5	740	12,390	—	—	—	East #1
2	SCS Runoff	3.73	5	745	25,227	—	—	—	East #2
3	SCS Runoff	9.29	5	730	37,109	—	—	—	West #1
4	SCS Runoff	2.39	5	730	10,197	—	—	—	West #2
5	SCS Runoff	0.37	5	730	1,889	—	—	—	West #3
6	Combine	5.87	5	745	37,617	1, 2,	—	—	East Total
7	Combine	12.04	5	730	49,196	3, 4, 5,	—	—	West Total
8	Combine	15.98	5	730	86,813	6, 7	—	—	Existing Total

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

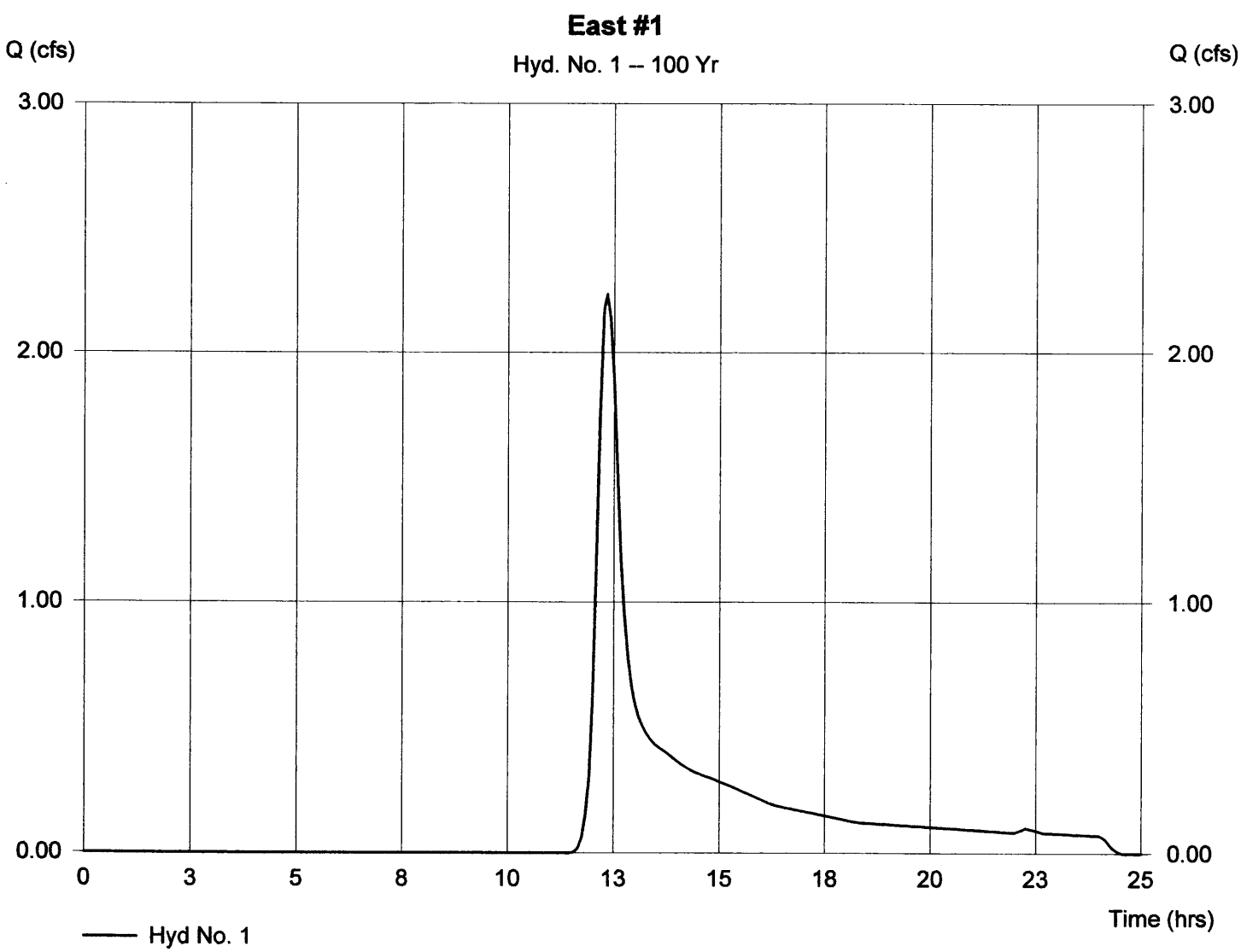
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 1

East #1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.24 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 1.940 ac	Curve number	= 48
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17.20 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 12,390 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

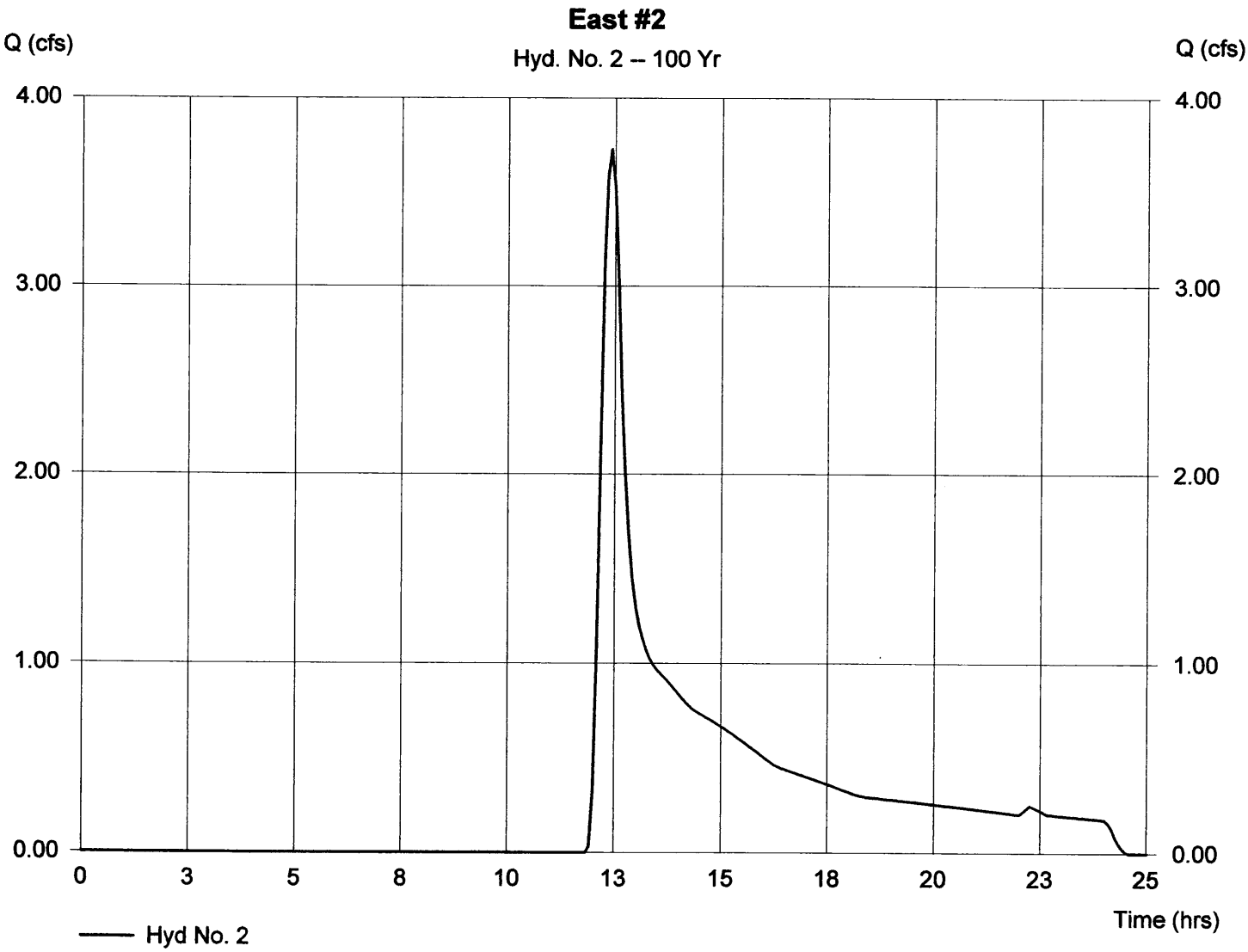
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 2

East #2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.73 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 6.330 ac	Curve number	= 40.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 16.50 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 25,227 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

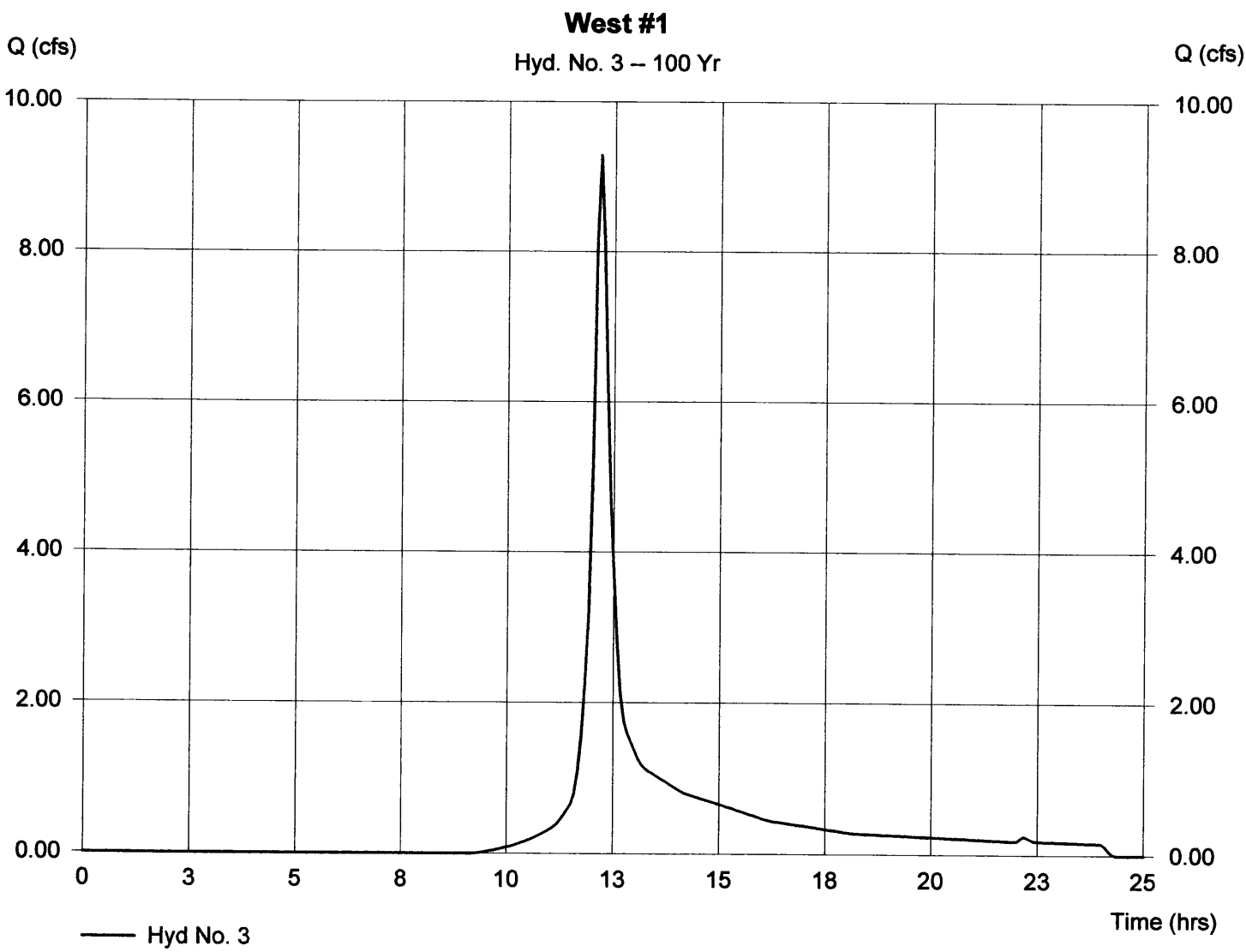
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 3

West #1

Hydrograph type	= SCS Runoff	Peak discharge	= 9.29 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 3.230 ac	Curve number	= 63.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 15.40 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 37,109 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

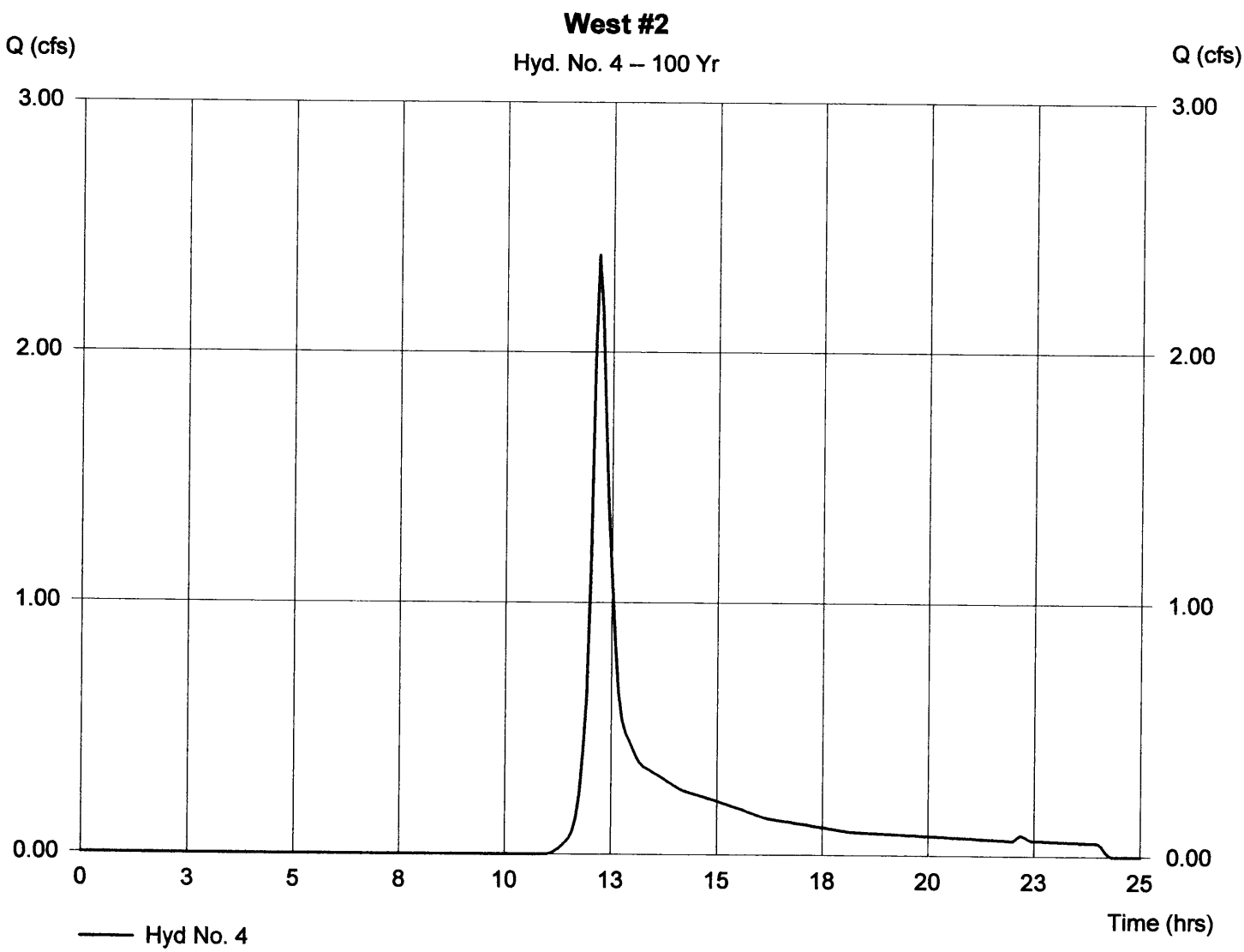
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 4

West #2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.39 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 1.370 ac	Curve number	= 52.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 10,197 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

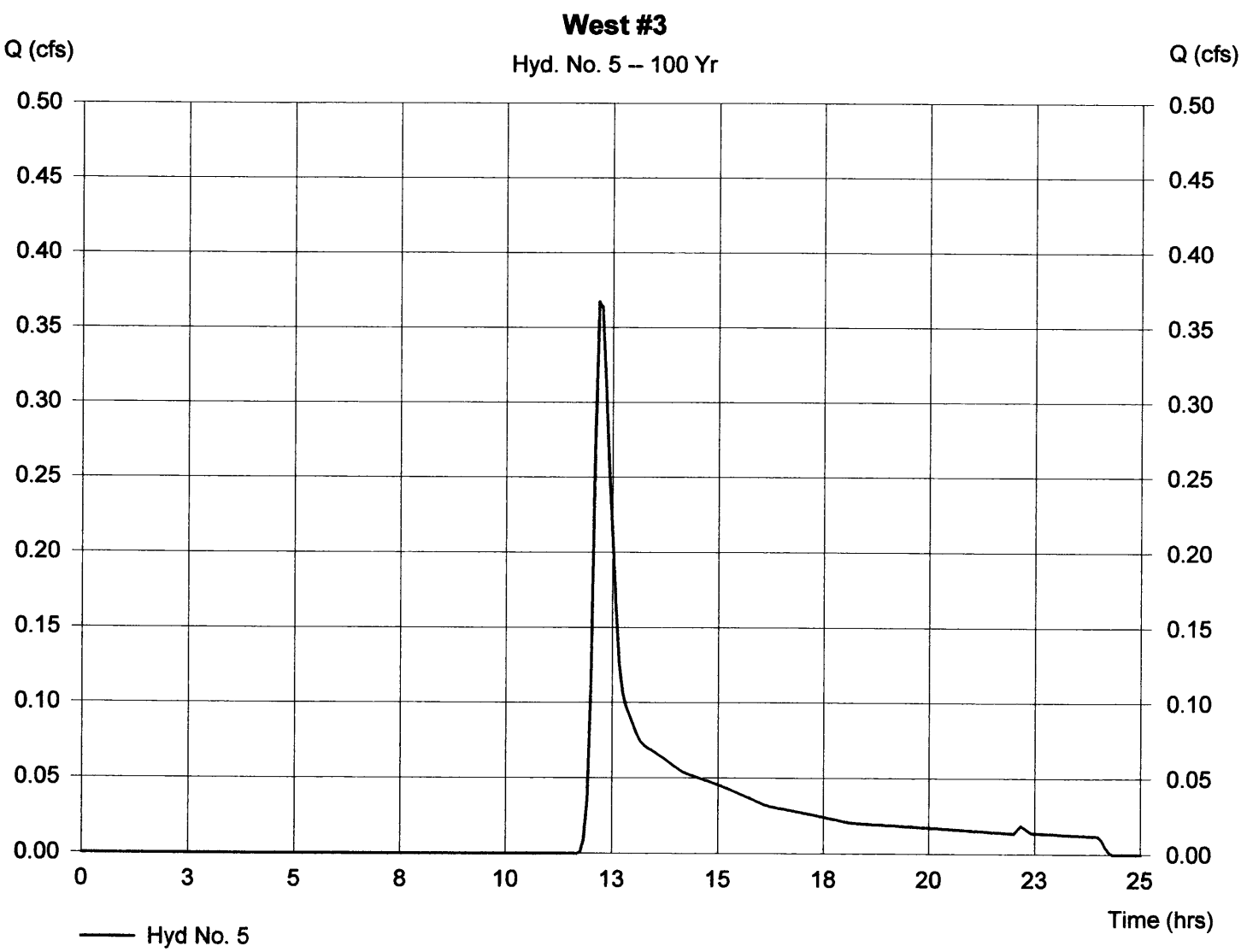
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 5

West #3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.37 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 0.400 ac	Curve number	= 44
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,889 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

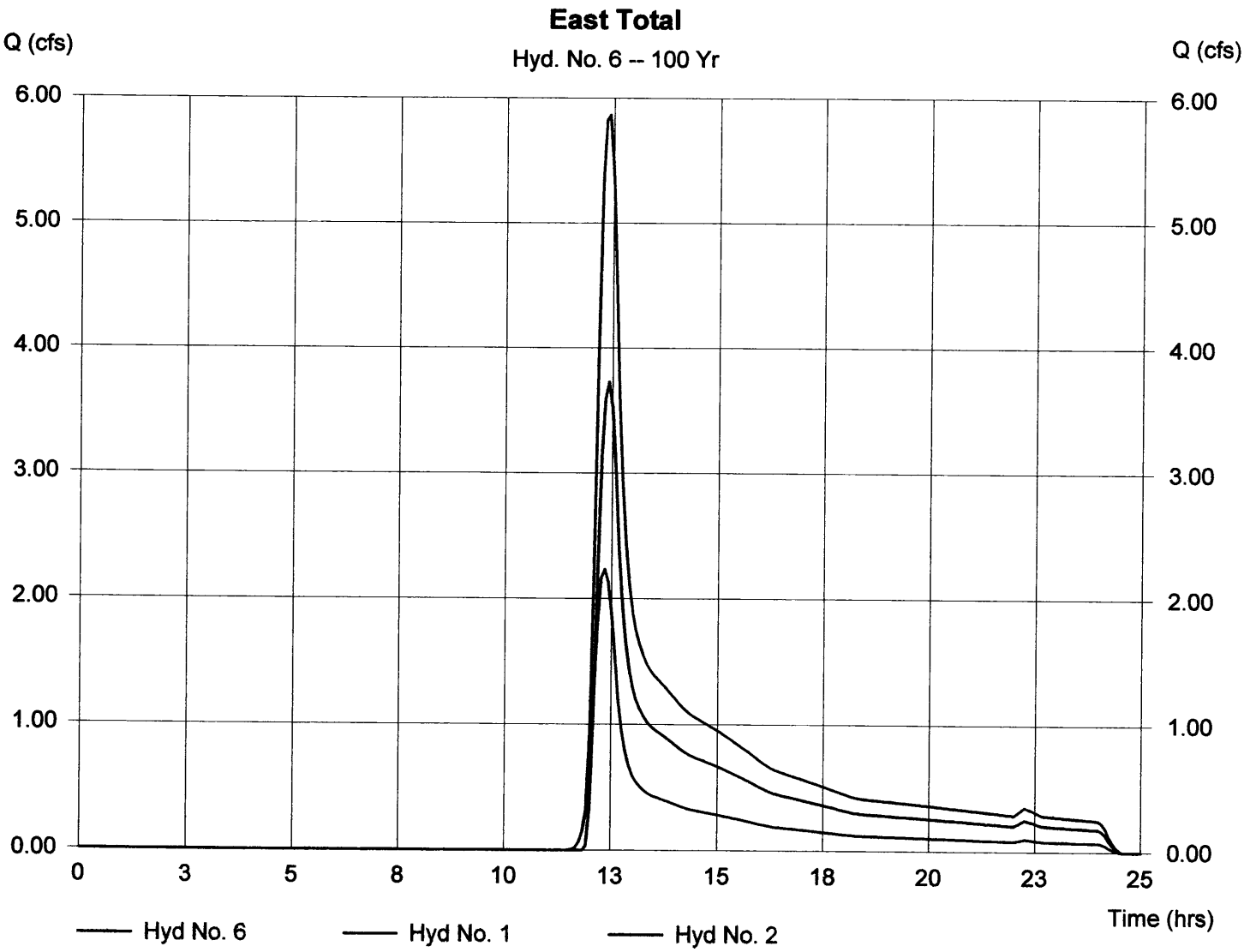
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 6

East Total

Hydrograph type	= Combine	Peak discharge	= 5.87 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 1, 2		

Hydrograph Volume = 37,617 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

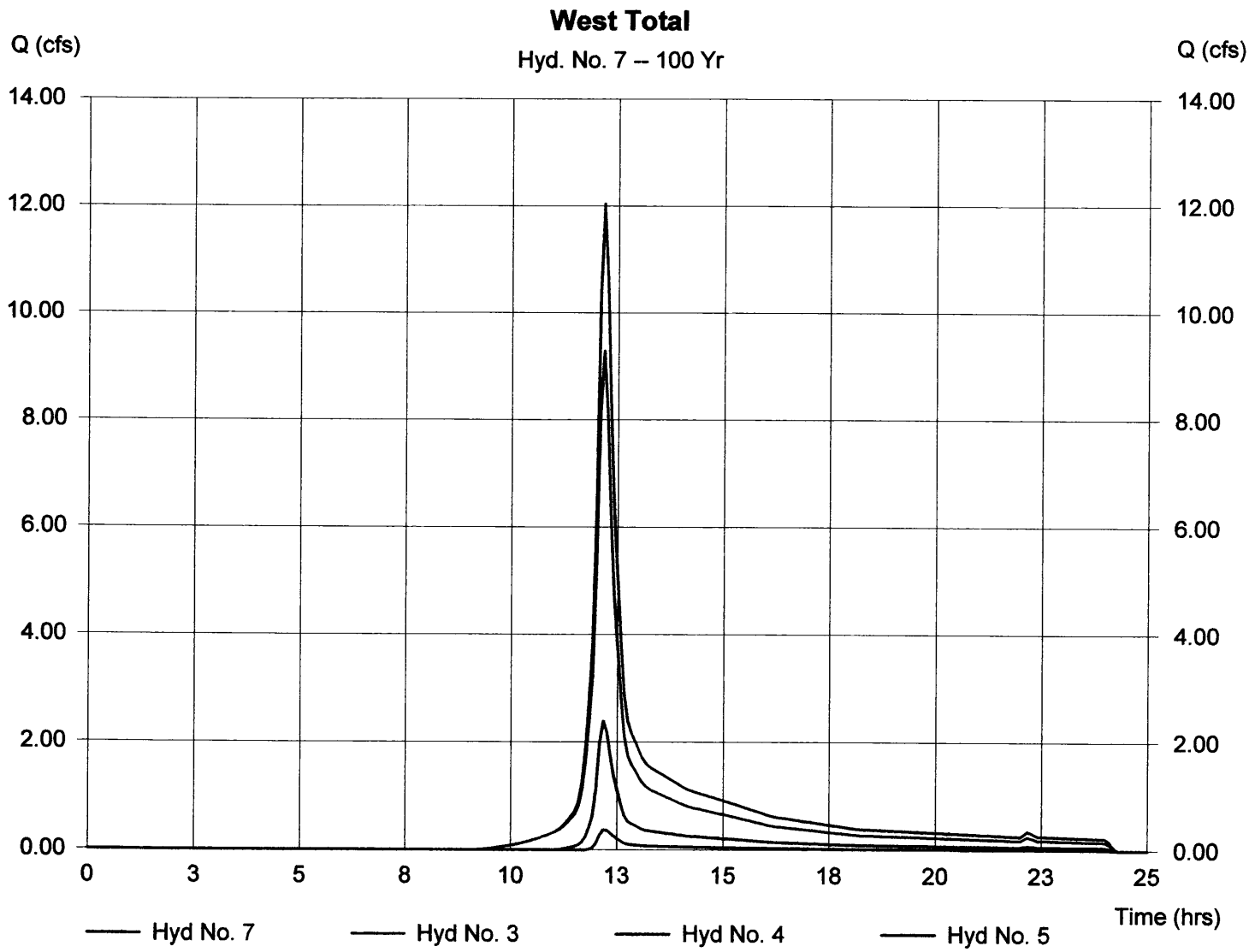
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 7

West Total

Hydrograph type	= Combine	Peak discharge	= 12.04 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4, 5		

Hydrograph Volume = 49,196 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

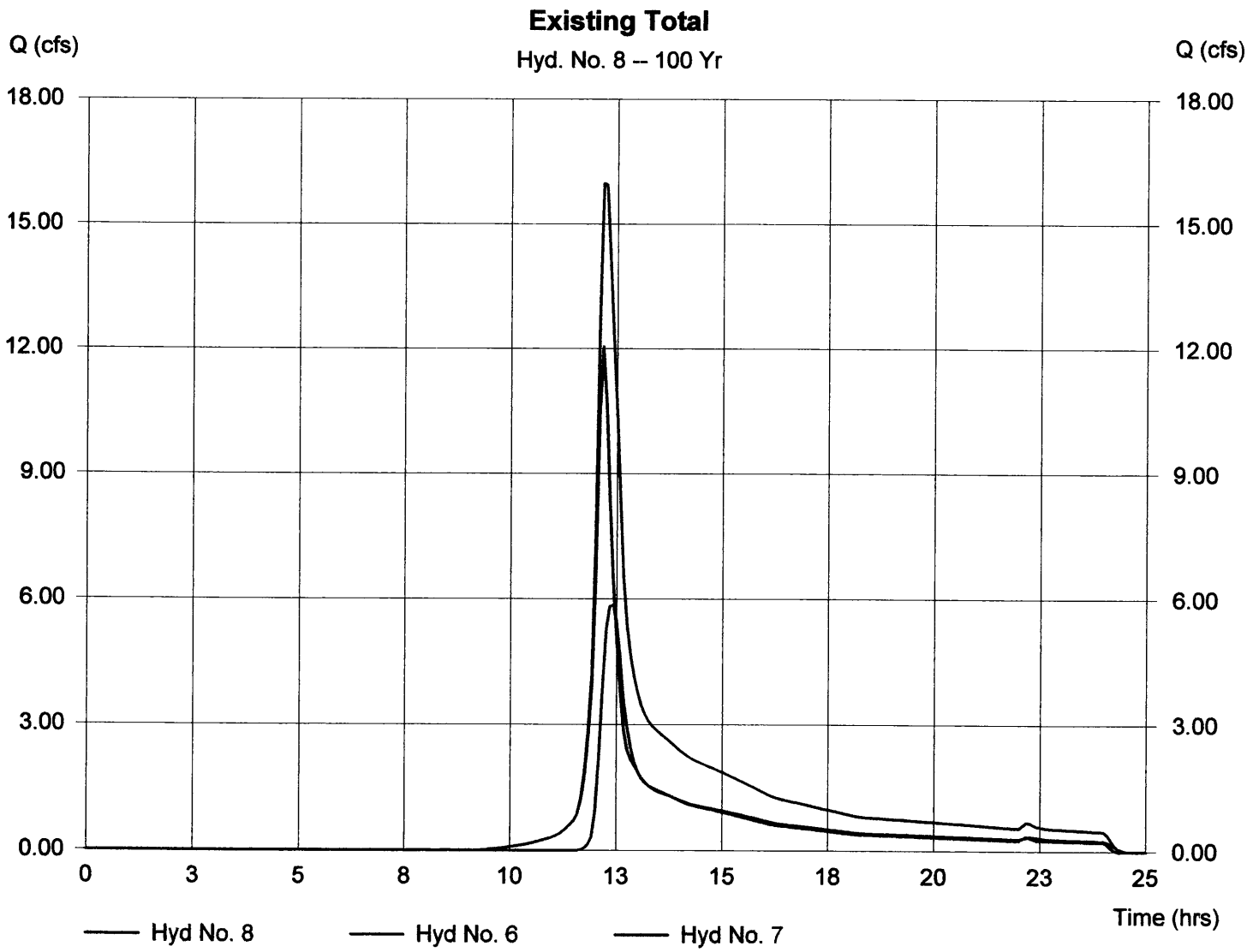
Tuesday, Nov 15 2005, 3:49 PM

Hyd. No. 8

Existing Total

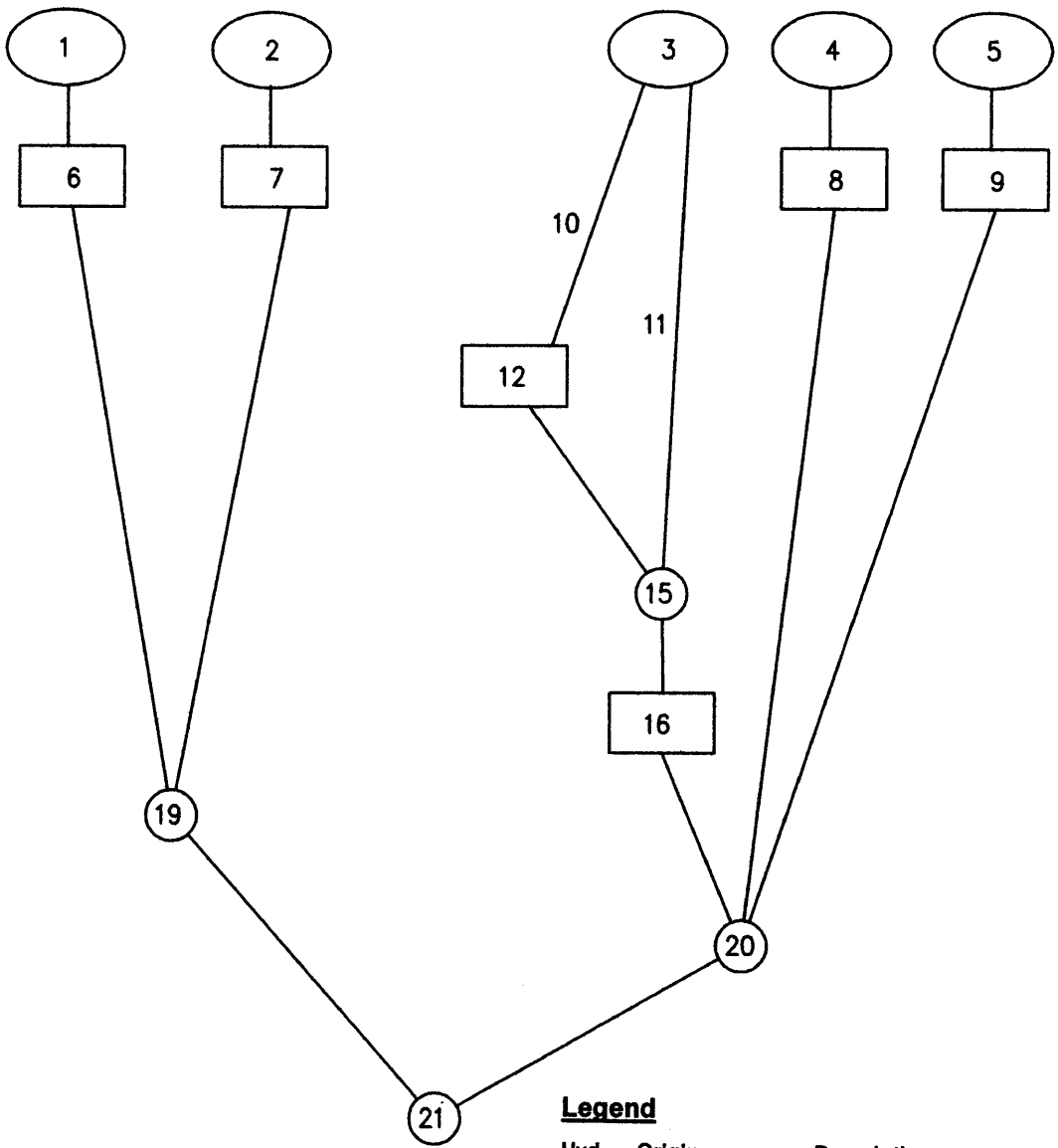
Hydrograph type	= Combine	Peak discharge	= 15.98 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 6, 7		

Hydrograph Volume = 86,813 cuft



APPENDIX S-4
HYDRAFLOW MODEL -- PROPOSED CONDITIONS
2, 10, & 100 YEAR STORMS

HYDRAFLOW MODEL – PROPOSED CONDITIONS
2–. 10–, AND 100–YEAR STORMS



Legend

Hyd.	Origin	Description
1	SCS Runoff	East #1
2	SCS Runoff	East #2
3	SCS Runoff	West #1
4	SCS Runoff	West #2
5	SCS Runoff	West #3
6	Reservoir	Dry Swale East #1
7	Reservoir	Pocket Pond East #2
8	Reservoir	Dry Swale W2
9	Reservoir	Bio-Retention Pond W3
10	Diversion1	low flow to organic filter
11	Diversion2	bypass to dry detention
12	Reservoir	Organic Filter W1
15	Combine	Total hydrograph to Dry Detention Basin
16	Reservoir	Dry Detention Basin W1
19	Combine	East Total
20	Combine	West Total
21	Combine	Study Area Total

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Hydrograph Return Period Recap

Hyd.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	——	——	1.51	——	——	3.92	——	——	6.64	East #1
2	SCS Runoff	——	——	8.21	——	——	18.35	——	——	29.21	East #2
3	SCS Runoff	——	——	7.08	——	——	11.22	——	——	15.34	West #1
4	SCS Runoff	——	——	1.10	——	——	2.12	——	——	3.16	West #2
5	SCS Runoff	——	——	0.31	——	——	0.81	——	——	1.37	West #3
6	Reservoir	1	——	0.05	——	——	1.19	——	——	4.53	Dry Swale East #1
7	Reservoir	2	——	0.25	——	——	0.52	——	——	2.13	Pocket Pond East #2
8	Reservoir	4	——	0.07	——	——	1.57	——	——	3.17	Dry Swale W2
9	Reservoir	5	——	0.01	——	——	0.47	——	——	1.27	Bio-Retention Pond W3
10	Diversion1	3	——	2.30	——	——	2.30	——	——	2.30	low flow to organic filter
11	Diversion2	3	——	4.78	——	——	8.92	——	——	13.04	bypass to dry detention
12	Reservoir	10	——	0.37	——	——	2.15	——	——	2.30	Organic Filter W1
15	Combine	11, 12,	——	4.78	——	——	8.92	——	——	15.34	Total hydrograph to Dry Detention Bas
16	Reservoir	15	——	0.00	——	——	0.77	——	——	6.12	Dry Detention Basin W1
	Combine	6, 7,	——	0.31	——	——	1.51	——	——	4.94	East Total
20	Combine	8, 9, 16,	——	0.07	——	——	1.93	——	——	8.64	West Total
21	Combine	19, 20	——	0.34	——	——	2.76	——	——	13.49	Study Area Total

Proj. file: Proposed 2,10, 100.gpw

Tuesday, Nov 15 2005, 3:01 PM

Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.51	5	730	6,511	—	—	—	East #1
2	SCS Runoff	8.21	5	730	33,373	—	—	—	East #2
3	SCS Runoff	7.08	5	730	31,682	—	—	—	West #1
4	SCS Runoff	1.10	5	730	4,364	—	—	—	West #2
5	SCS Runoff	0.31	5	730	1,343	—	—	—	West #3
6	Reservoir	0.05	5	1165	1,169	1	574.54	5,480	Dry Swale East #1
7	Reservoir	0.25	5	1135	33,314	2	567.27	23,796	Pocket Pond East #2
8	Reservoir	0.07	5	910	1,121	4	577.72	3,285	Dry Swale W2
9	Reservoir	0.01	5	1085	217	5	582.50	1,127	Bio-Retention Pond W3
10	Diversion1	2.30	5	725	25,916	3	—	—	low flow to organic filter
11	Diversion2	4.78	5	730	5,766	3	—	—	bypass to dry detention
12	Reservoir	0.37	5	900	5,516	10	570.01	20,485	Organic Filter W1
15	Combine	4.78	5	730	11,282	11, 12,	—	—	Total hydrograph to Dry Detention Bas
16	Reservoir	0.00	5	0	0	15	562.80	11,282	Dry Detention Basin W1
19	Combine	0.31	5	1165	34,483	6, 7,	—	—	East Total
20	Combine	0.07	5	910	1,339	8, 9, 16,	—	—	West Total
21	Combine	0.34	5	1140	35,822	19, 20	—	—	Study Area Total

Proposed 2,10, 100.gpw	Return Period: 2 Year	Tuesday, Nov 15 2005, 3:01 PM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

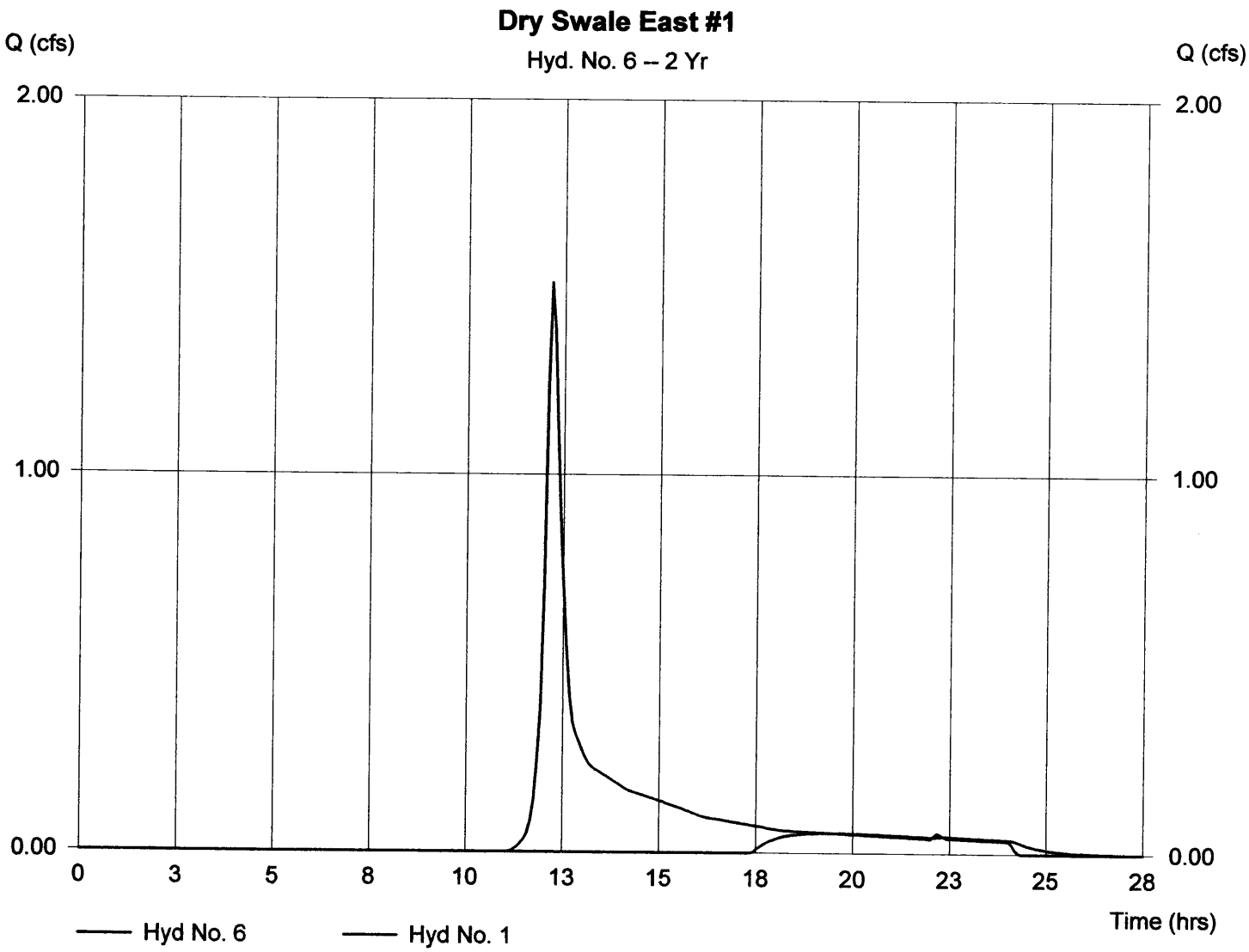
Hyd. No. 6

Dry Swale East #1

Hydrograph type	= Reservoir	Peak discharge	= 0.05 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 1	Max. Elevation	= 574.54 ft
Reservoir name	= Dry Swale East #1	Max. Storage	= 5,480 cuft

Storage Indication method used.

Hydrograph Volume = 1,169 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

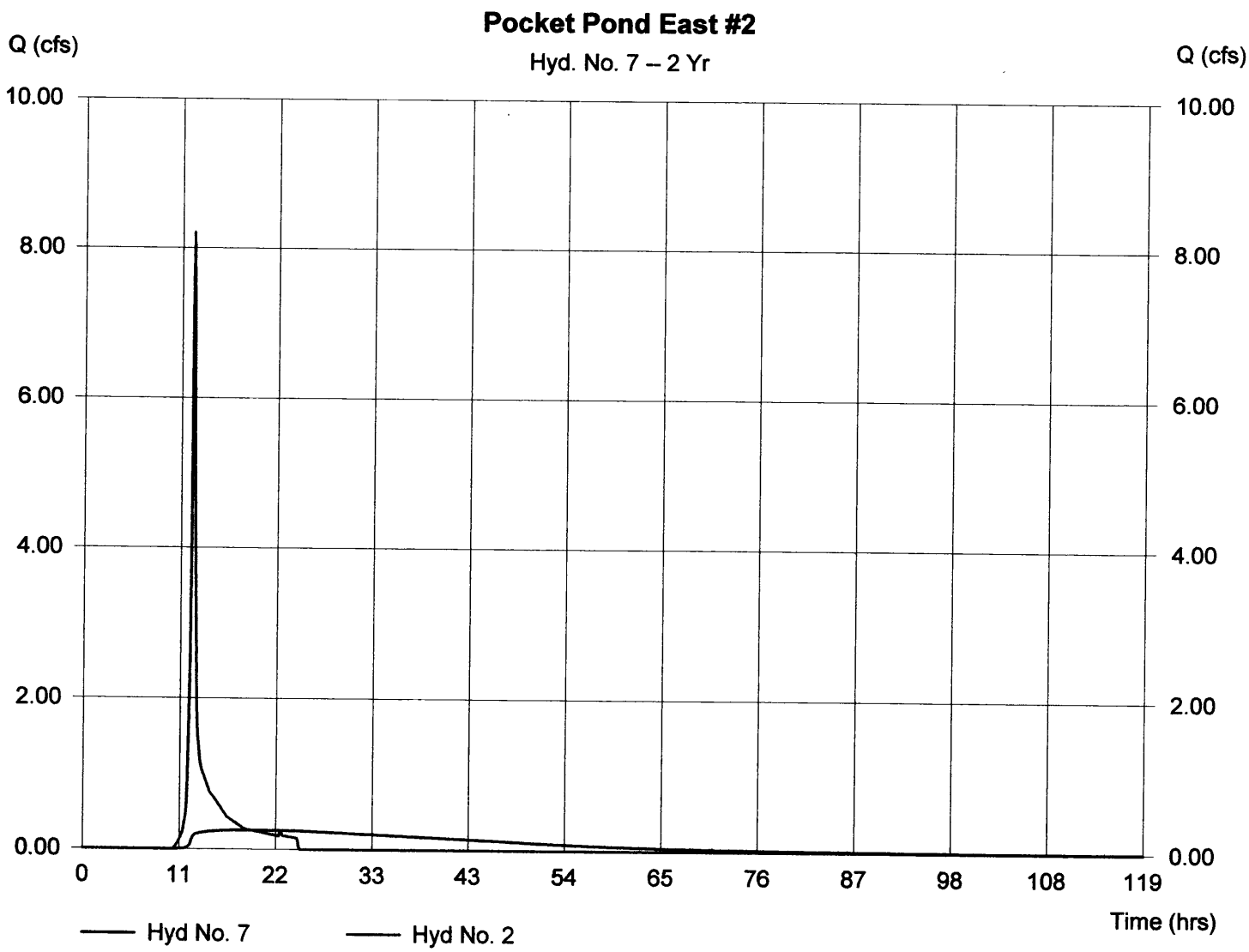
Hyd. No. 7

Pocket Pond East #2

Hydrograph type	= Reservoir	Peak discharge	= 0.25 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Max. Elevation	= 567.27 ft
Reservoir name	= Pocket Pond East #2	Max. Storage	= 23,796 cuft

Storage Indication method used.

Hydrograph Volume = 33,314 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

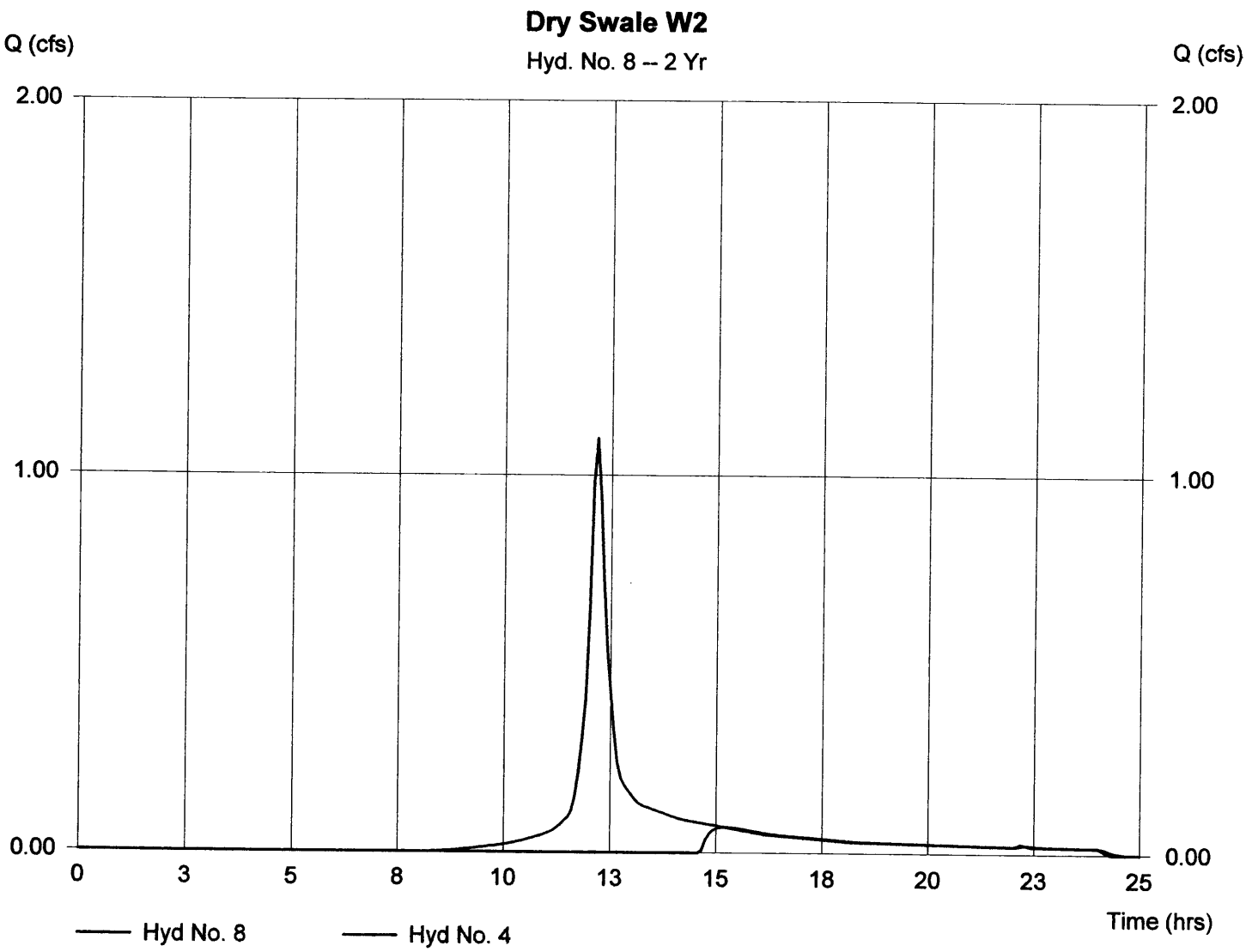
Hyd. No. 8

Dry Swale W2

Hydrograph type	= Reservoir	Peak discharge	= 0.07 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 4	Max. Elevation	= 577.72 ft
Reservoir name	= Dry Swale W2	Max. Storage	= 3,285 cuft

Storage Indication method used.

Hydrograph Volume = 1,121 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

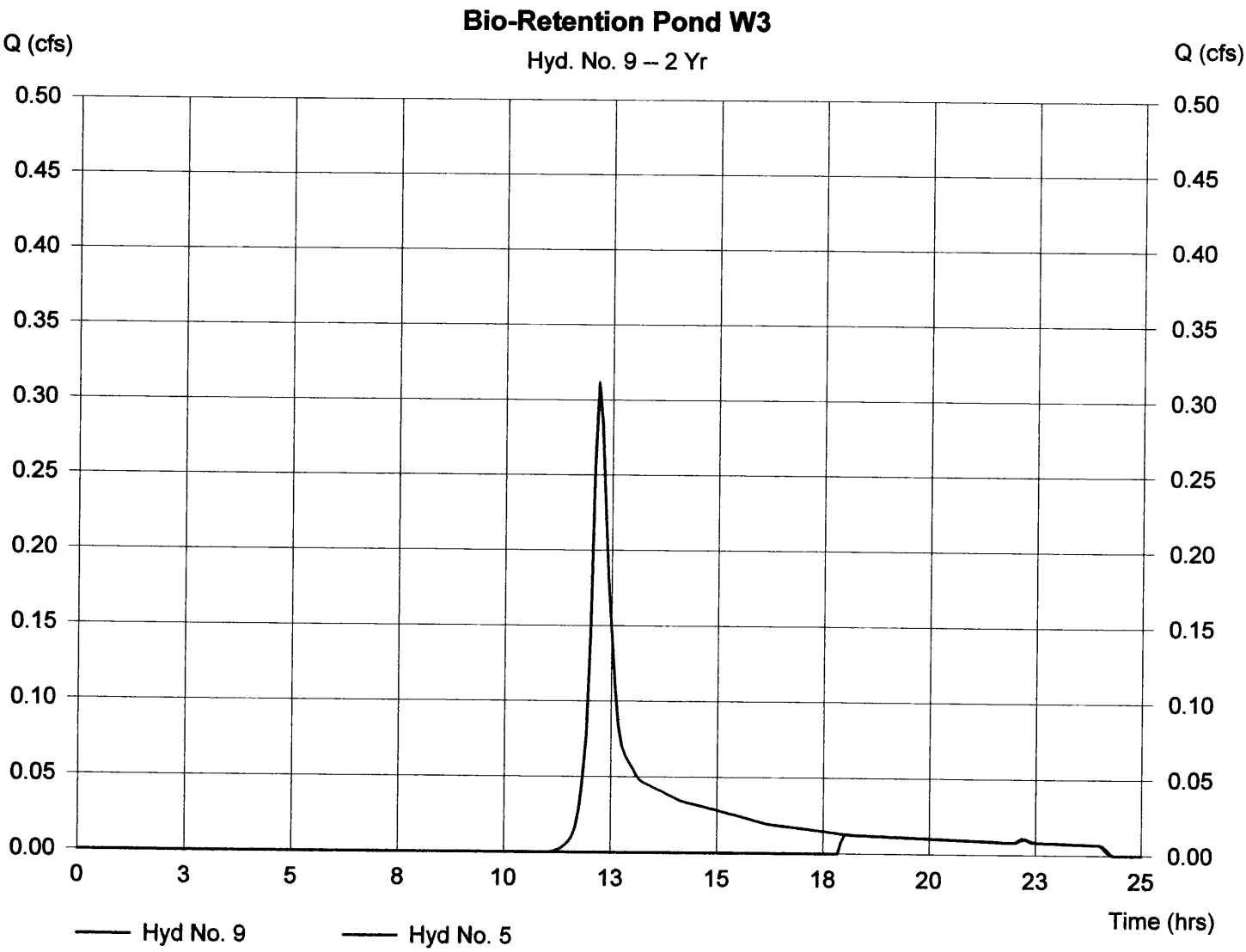
Hyd. No. 9

Bio-Retention Pond W3

Hydrograph type	= Reservoir	Peak discharge	= 0.01 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 5	Max. Elevation	= 582.50 ft
Reservoir name	= Bio-Retention Pond W3	Max. Storage	= 1,127 cuft

Storage Indication method used.

Hydrograph Volume = 217 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

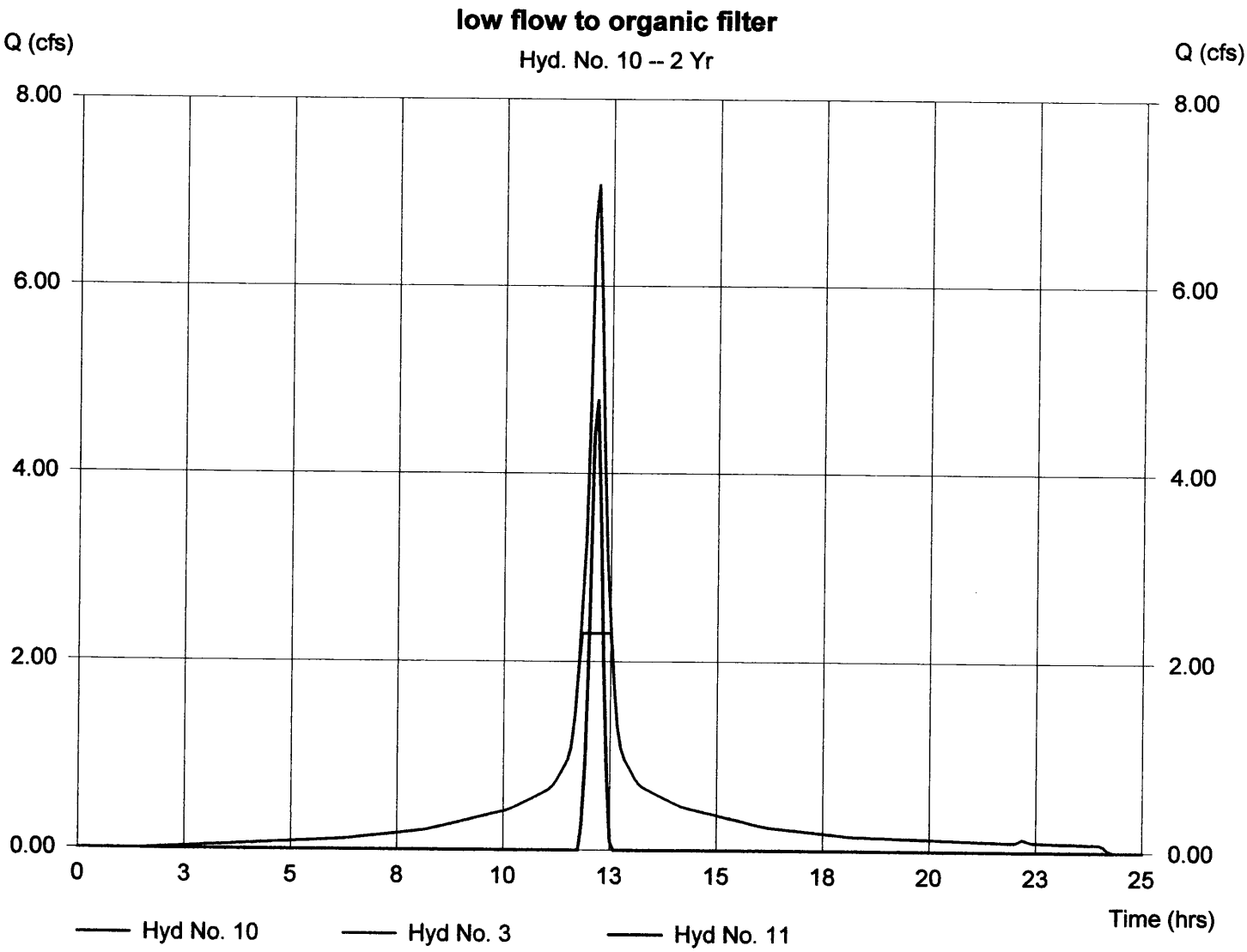
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 10

low flow to organic filter

Hydrograph type	= Diversion1	Peak discharge	= 2.30 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 25,916 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

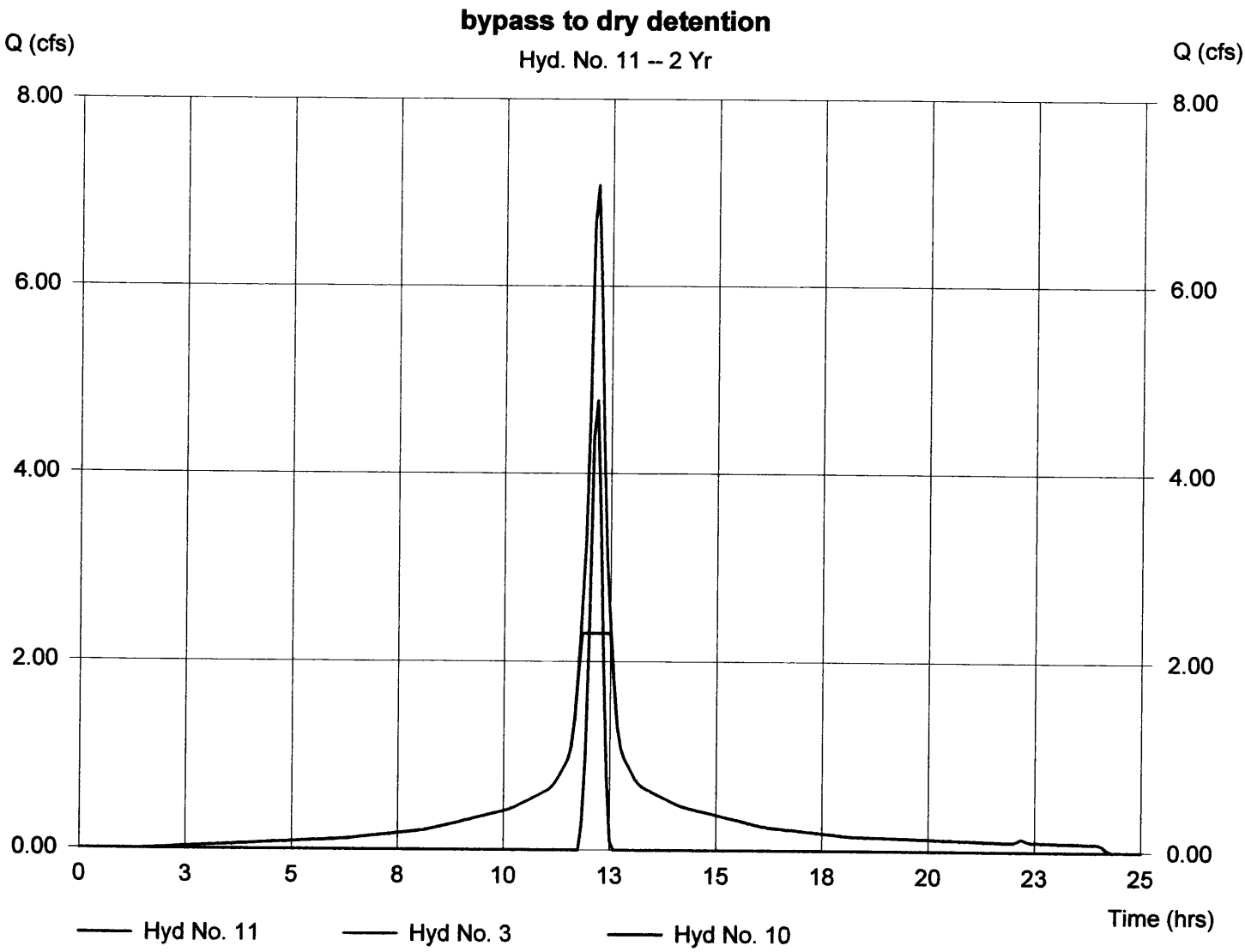
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 11

bypass to dry detention

Hydrograph type	= Diversion2	Peak discharge	= 4.78 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 5,766 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

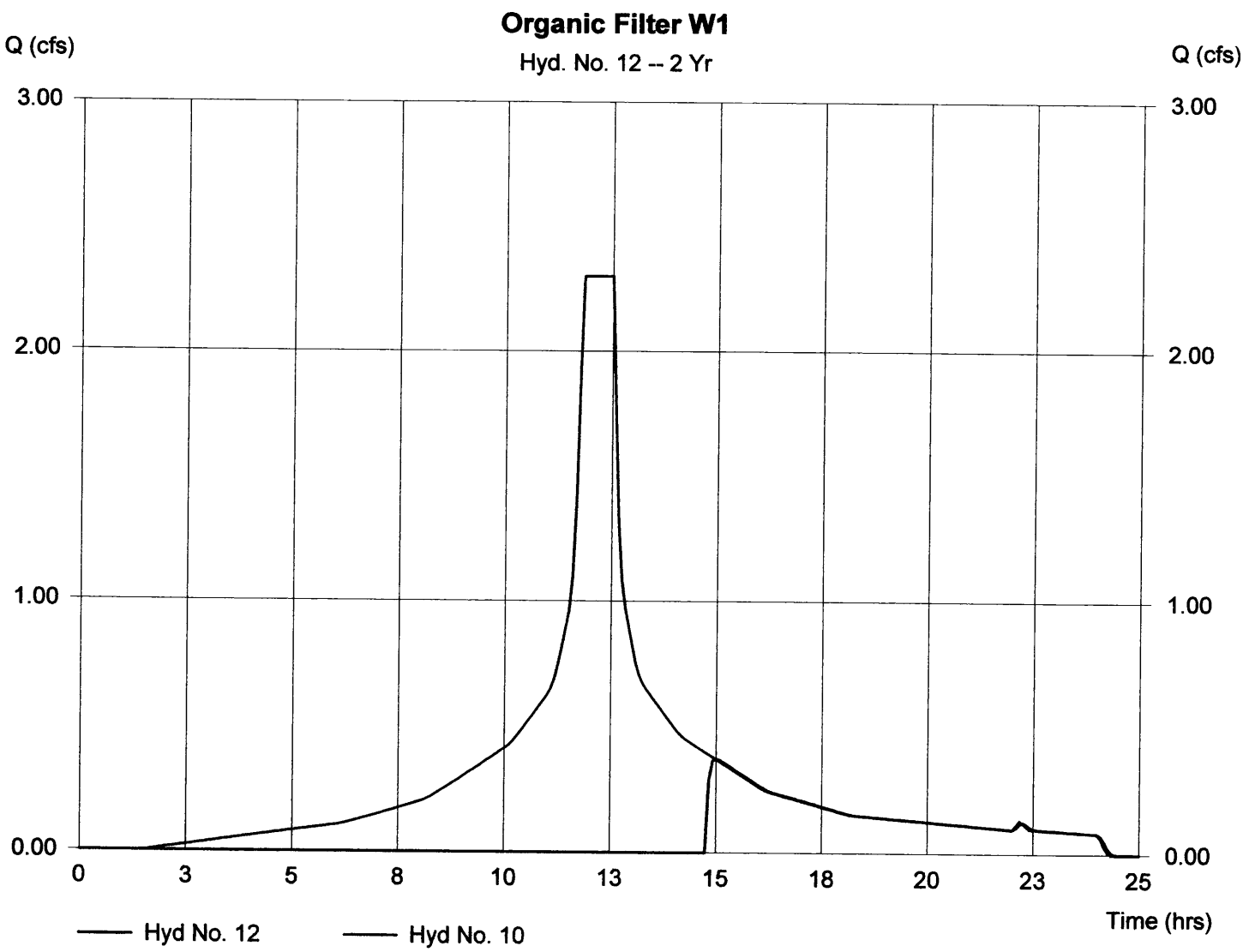
Hyd. No. 12

Organic Filter W1

Hydrograph type	= Reservoir	Peak discharge	= 0.37 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 10	Max. Elevation	= 570.01 ft
Reservoir name	= Organic Filter W1	Max. Storage	= 20,485 cuft

Storage Indication method used.

Hydrograph Volume = 5,516 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

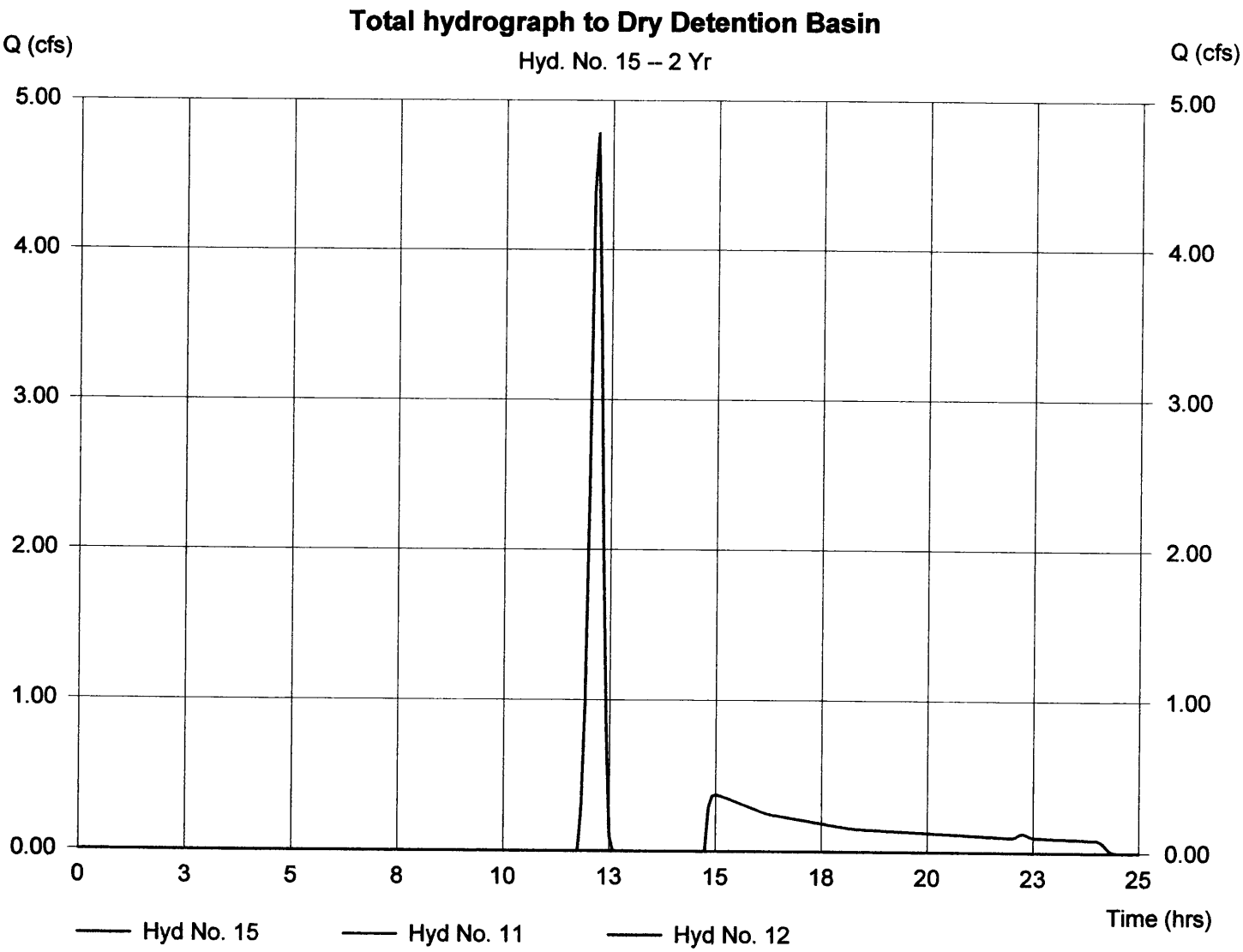
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 15

Total hydrograph to Dry Detention Basin

Hydrograph type	= Combine	Peak discharge	= 4.78 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 11, 12		

Hydrograph Volume = 11,282 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

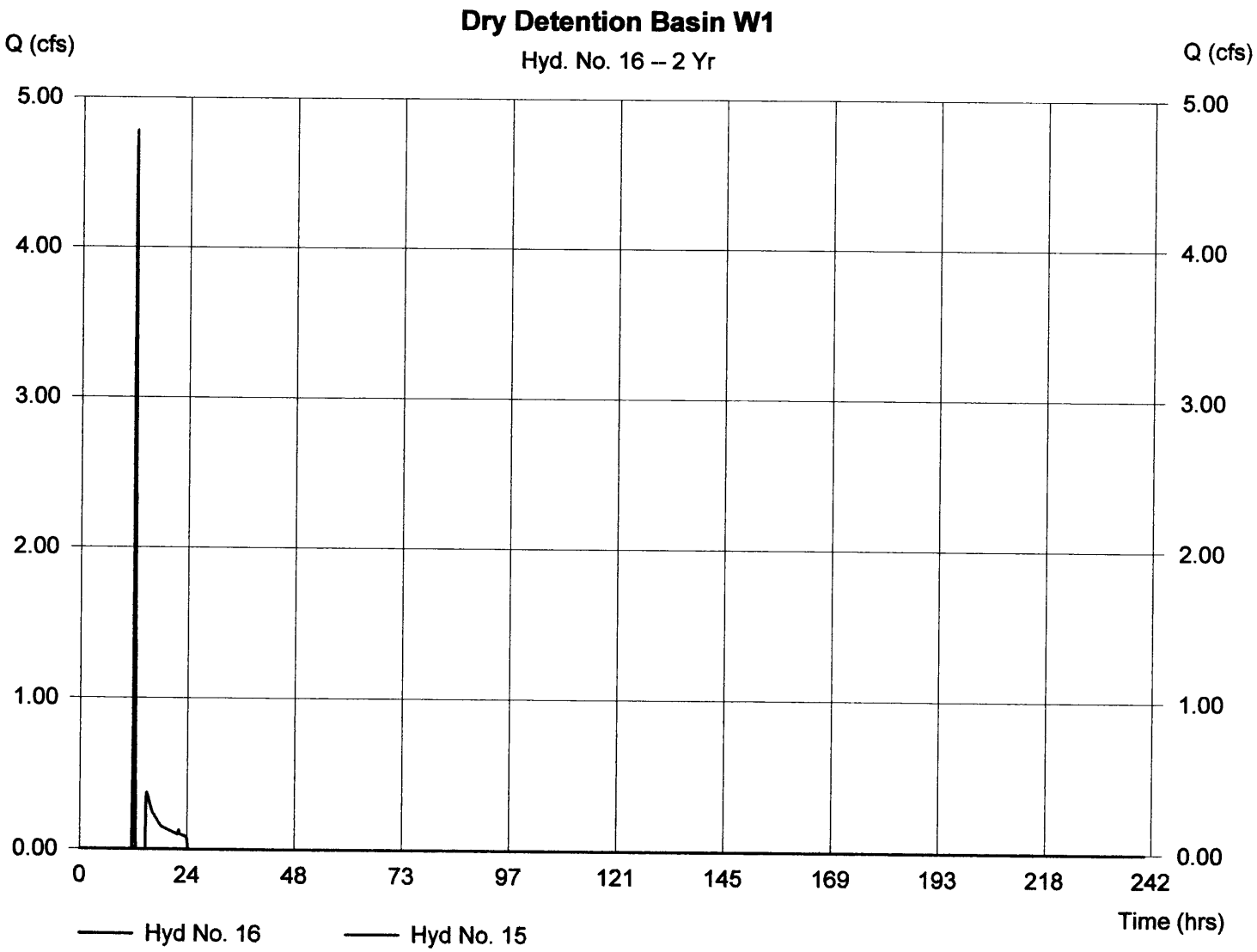
Hyd. No. 16

Dry Detention Basin W1

Hydrograph type	= Reservoir	Peak discharge	= 0.00 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 15	Max. Elevation	= 562.80 ft
Reservoir name	= Dry Detention Basin W1	Max. Storage	= 11,282 cuft

Storage Indication method used.

Hydrograph Volume = 0 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

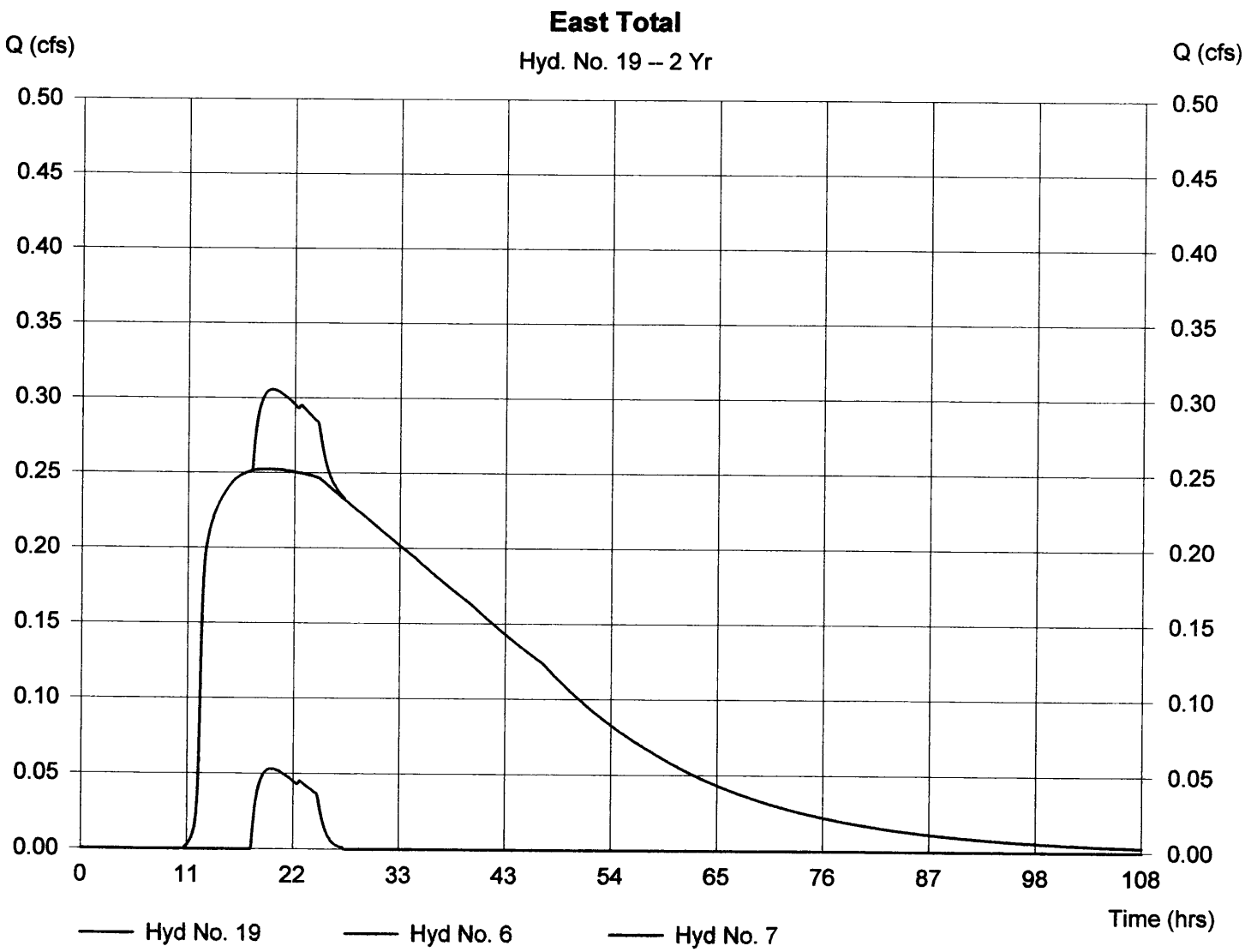
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 19

East Total

Hydrograph type	= Combine	Peak discharge	= 0.31 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 6, 7		

Hydrograph Volume = 34,483 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

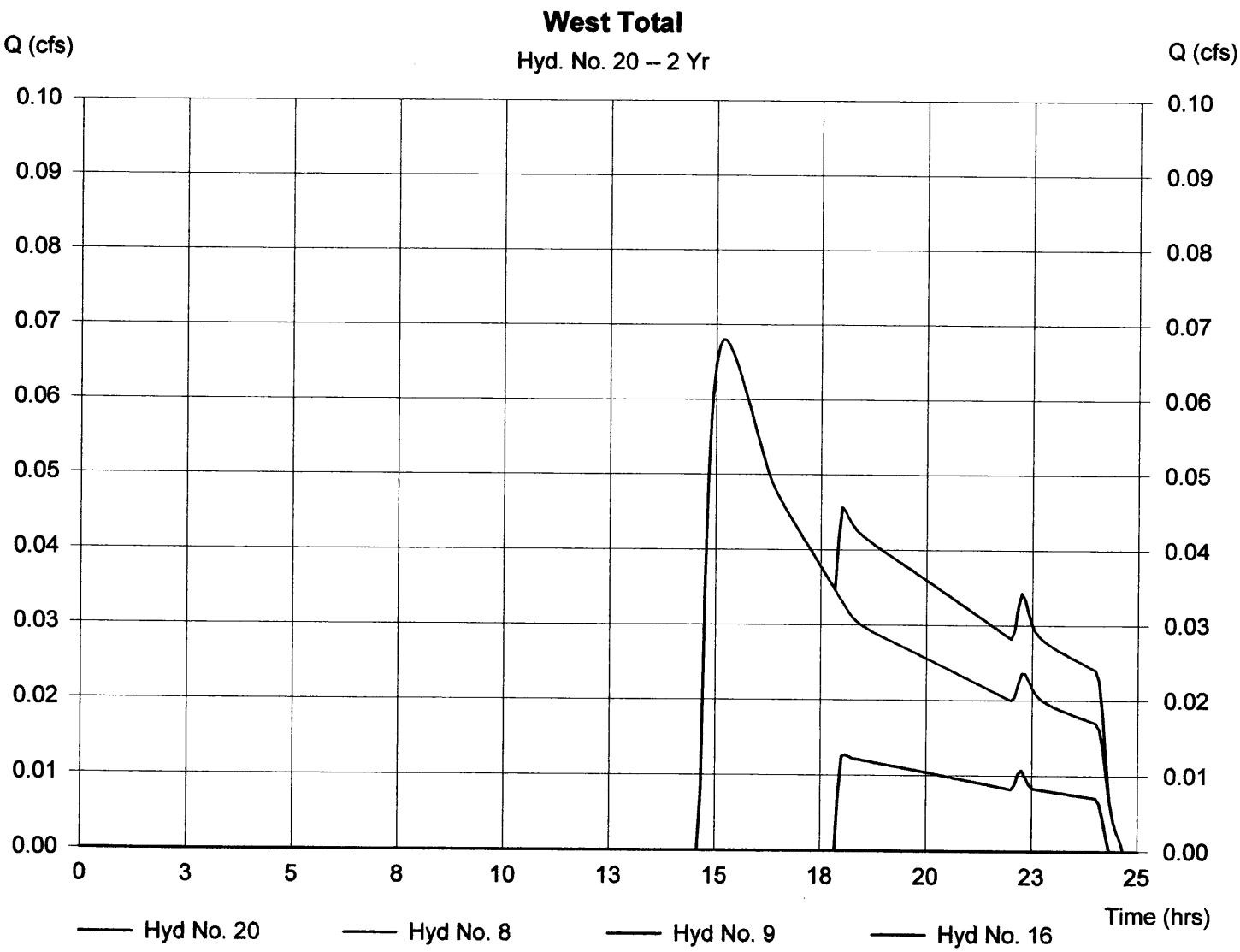
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 20

West Total

Hydrograph type	= Combine	Peak discharge	= 0.07 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 9, 16		

Hydrograph Volume = 1,339 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

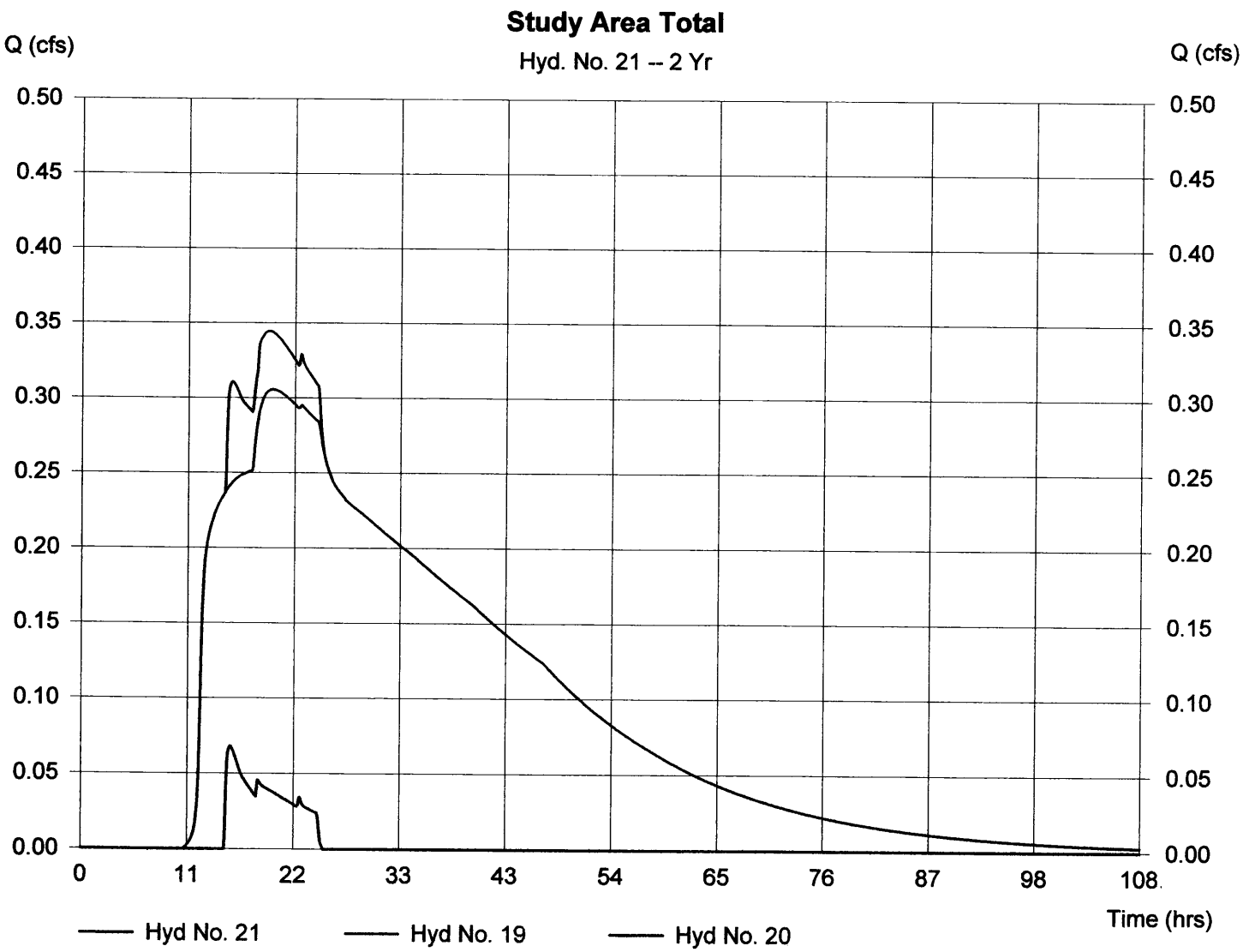
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 21

Study Area Total

Hydrograph type	= Combine	Peak discharge	= 0.34 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 19, 20		

Hydrograph Volume = 35,822 cuft



Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.92	5	730	15,711	—	—	—	East #1
2	SCS Runoff	18.35	5	730	72,867	—	—	—	East #2
3	SCS Runoff	11.22	5	730	51,232	—	—	—	West #1
4	SCS Runoff	2.12	5	730	8,523	—	—	—	West #2
5	SCS Runoff	0.81	5	730	3,239	—	—	—	West #3
6	Reservoir	1.19	5	755	10,369	1	574.94	6,895	Dry Swale East #1
7	Reservoir	0.52	5	1085	72,808	2	568.68	55,156	Pocket Pond East #2
8	Reservoir	1.57	5	740	5,281	4	577.86	3,690	Dry Swale W2
9	Reservoir	0.47	5	745	2,114	5	582.54	1,210	Bio-Retention Pond W3
10	Diversion1	2.30	5	725	38,067	3	—	—	low flow to organic filter
11	Diversion2	8.92	5	730	13,165	3	—	—	bypass to dry detention
12	Reservoir	2.15	5	760	17,667	10	570.07	20,888	Organic Filter W1
15	Combine	8.92	5	730	30,832	11, 12,	—	—	Total hydrograph to Dry Detention Bas
16	Reservoir	0.77	5	845	18,753	15	563.92	16,616	Dry Detention Basin W1
	Combine	1.51	5	755	83,177	6, 7,	—	—	East Total
20	Combine	1.93	5	740	26,149	8, 9, 16,	—	—	West Total
21	Combine	2.76	5	750	109,325	19, 20	—	—	Study Area Total

Proposed 2,10, 100.gpw	Return Period: 10 Year	Tuesday, Nov 15 2005, 3:01 PM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

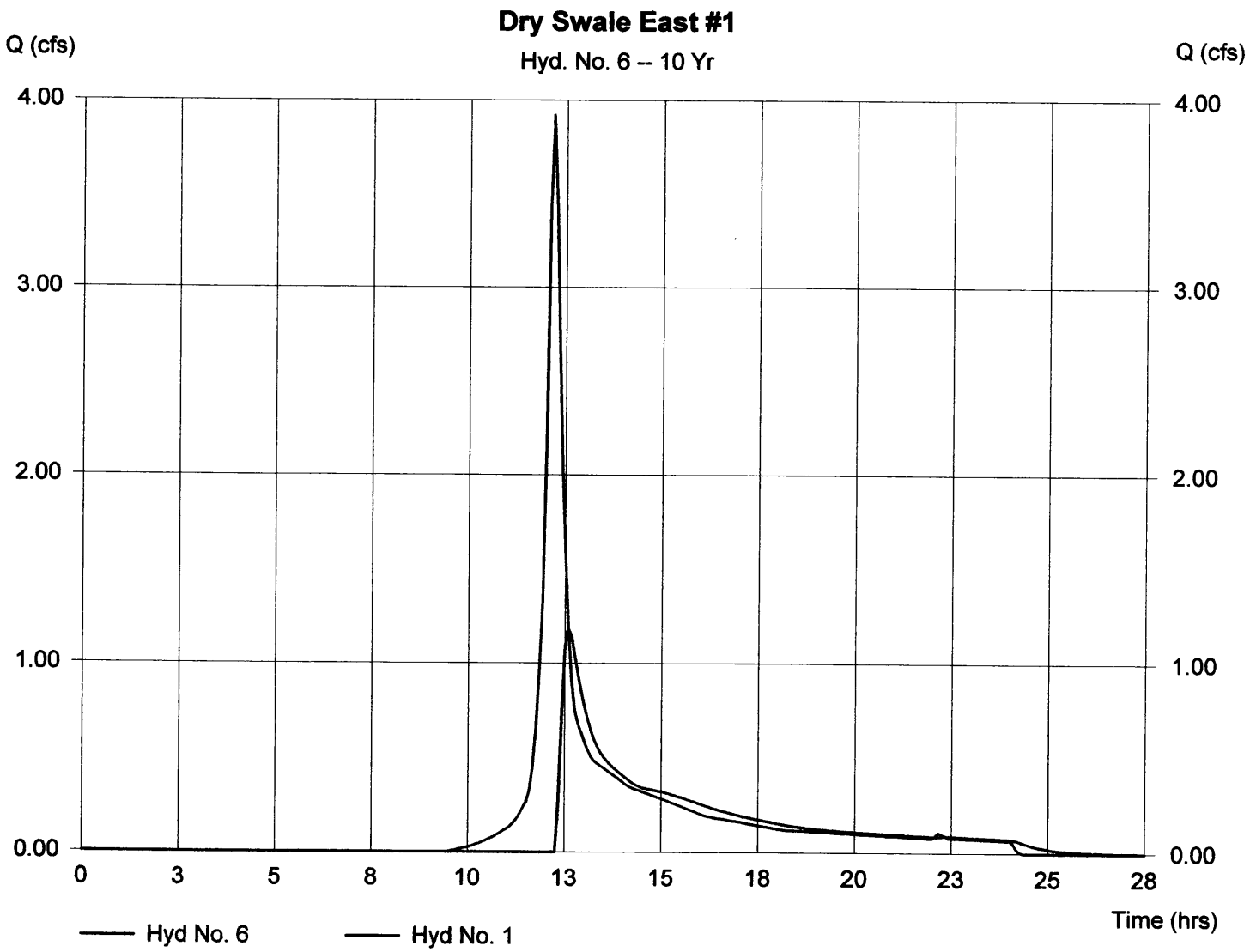
Hyd. No. 6

Dry Swale East #1

Hydrograph type	= Reservoir	Peak discharge	= 1.19 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 1	Max. Elevation	= 574.94 ft
Reservoir name	= Dry Swale East #1	Max. Storage	= 6,895 cuft

Storage Indication method used.

Hydrograph Volume = 10,369 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

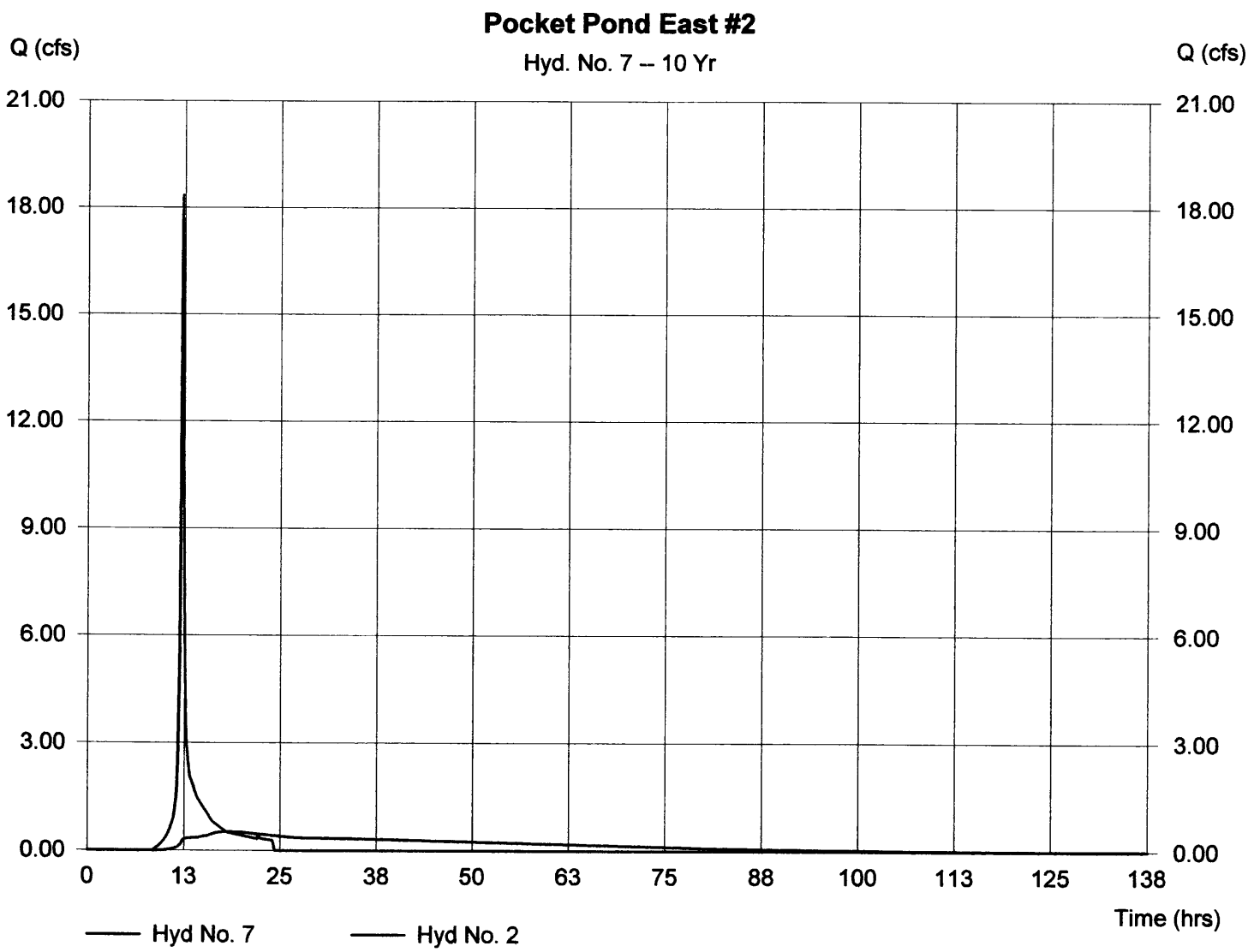
Hyd. No. 7

Pocket Pond East #2

Hydrograph type	= Reservoir	Peak discharge	= 0.52 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Max. Elevation	= 568.68 ft
Reservoir name	= Pocket Pond East #2	Max. Storage	= 55,156 cuft

Storage Indication method used.

Hydrograph Volume = 72,808 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

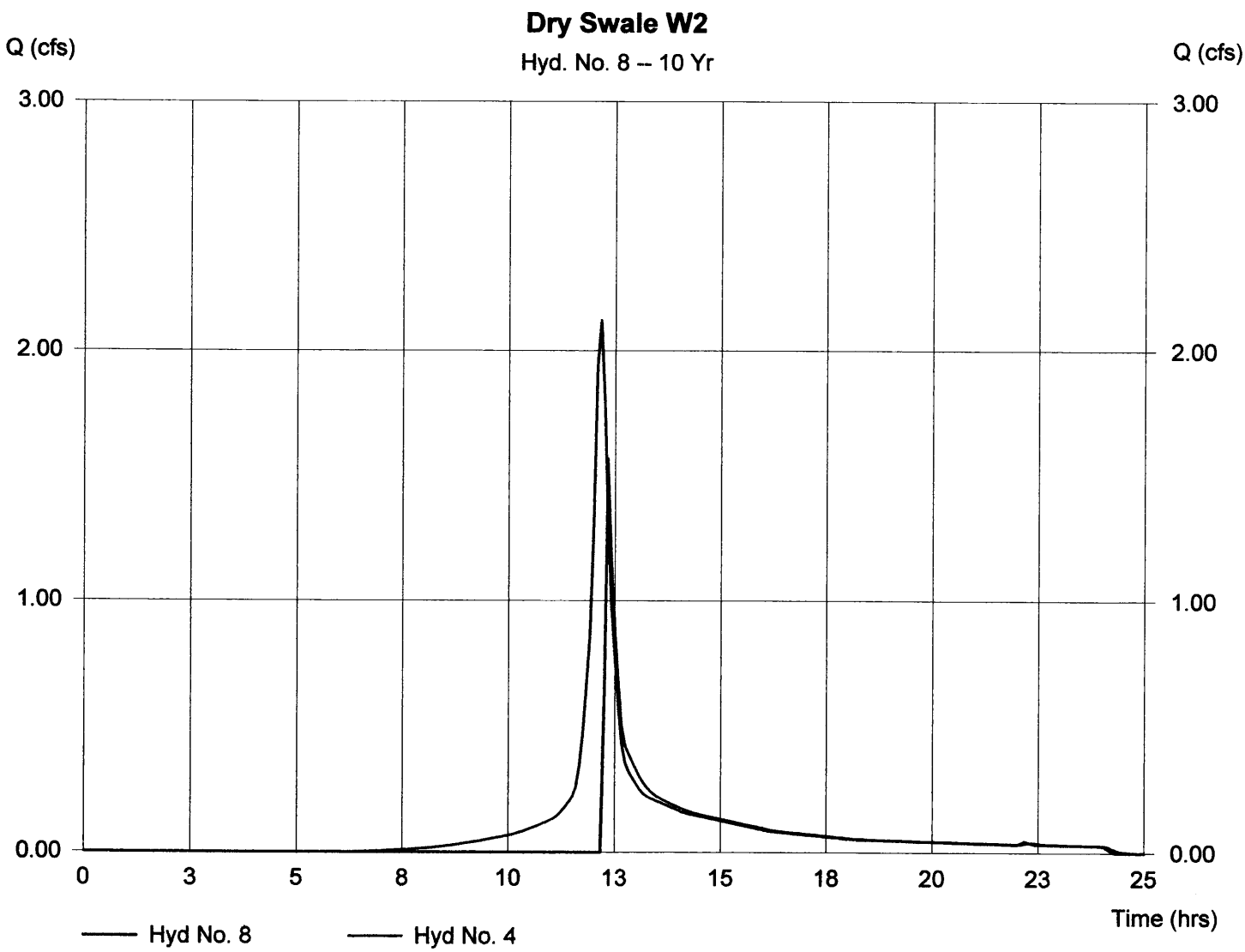
Hyd. No. 8

Dry Swale W2

Hydrograph type	= Reservoir	Peak discharge	= 1.57 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 4	Max. Elevation	= 577.86 ft
Reservoir name	= Dry Swale W2	Max. Storage	= 3,690 cuft

Storage Indication method used.

Hydrograph Volume = 5,281 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

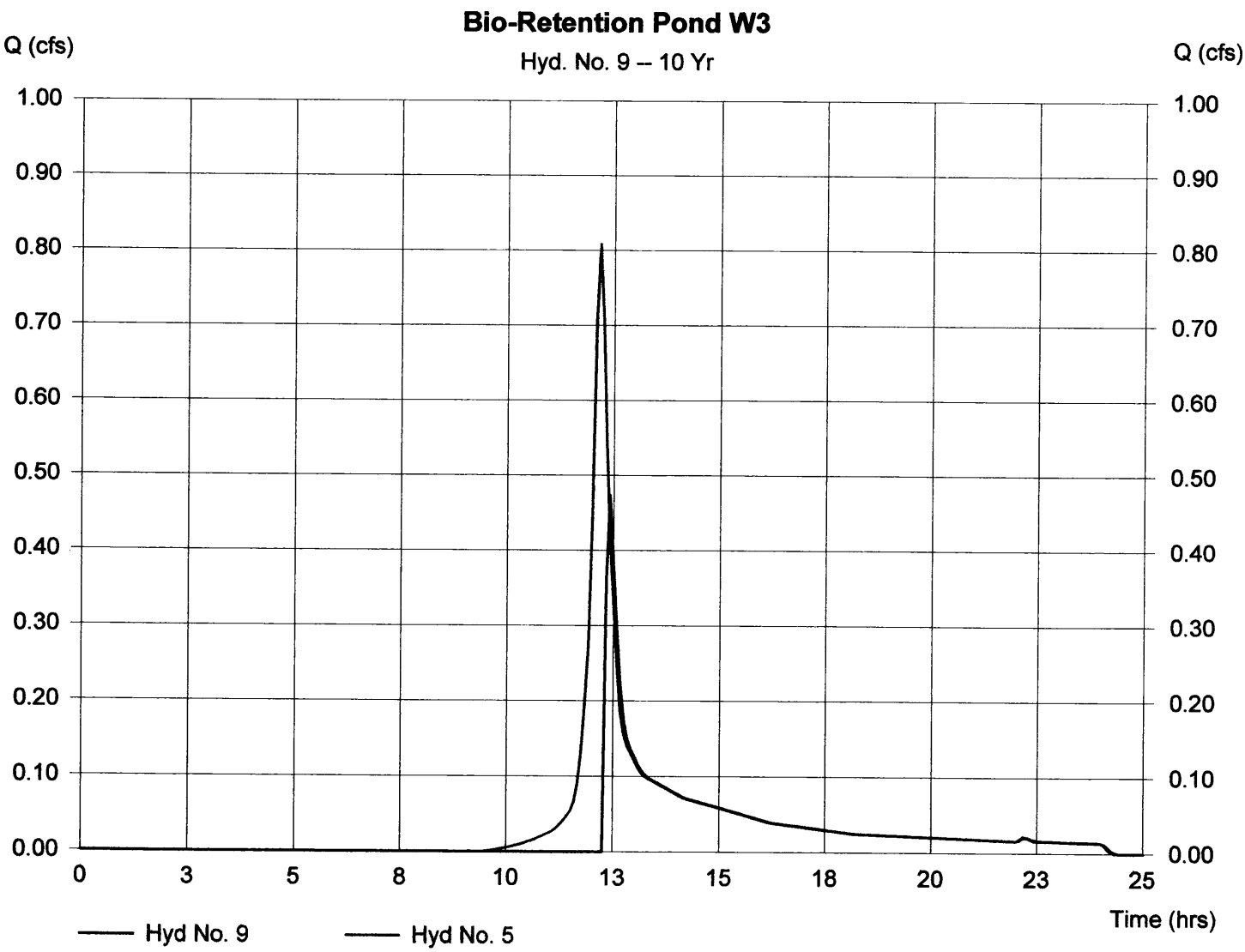
Hyd. No. 9

Bio-Retention Pond W3

Hydrograph type	= Reservoir	Peak discharge	= 0.47 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 5	Max. Elevation	= 582.54 ft
Reservoir name	= Bio-Retention Pond W3	Max. Storage	= 1,210 cuft

Storage Indication method used.

Hydrograph Volume = 2,114 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

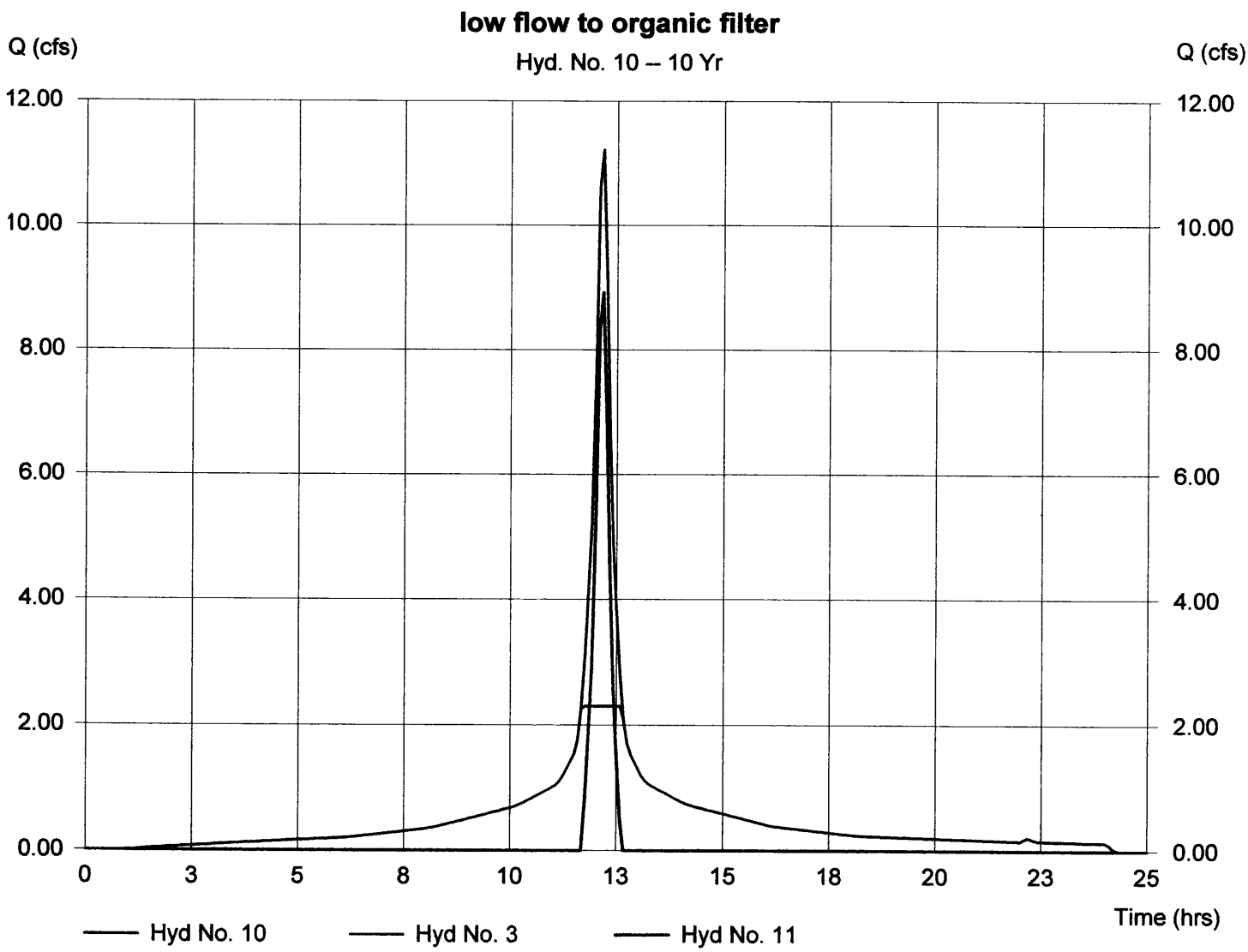
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 10

low flow to organic filter

Hydrograph type	= Diversion1	Peak discharge	= 2.30 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 38,067 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

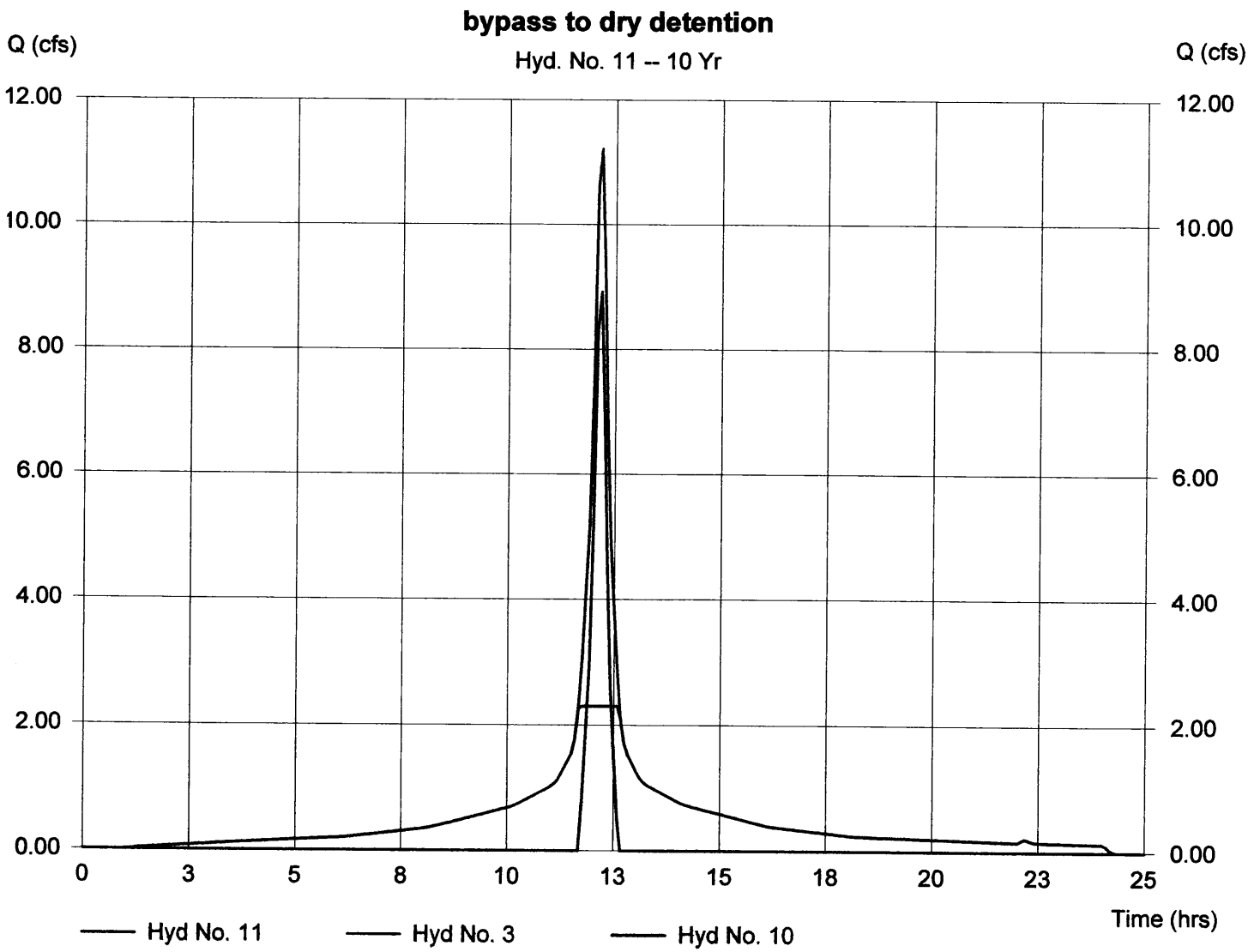
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 11

bypass to dry detention

Hydrograph type	= Diversion2	Peak discharge	= 8.92 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 13,165 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

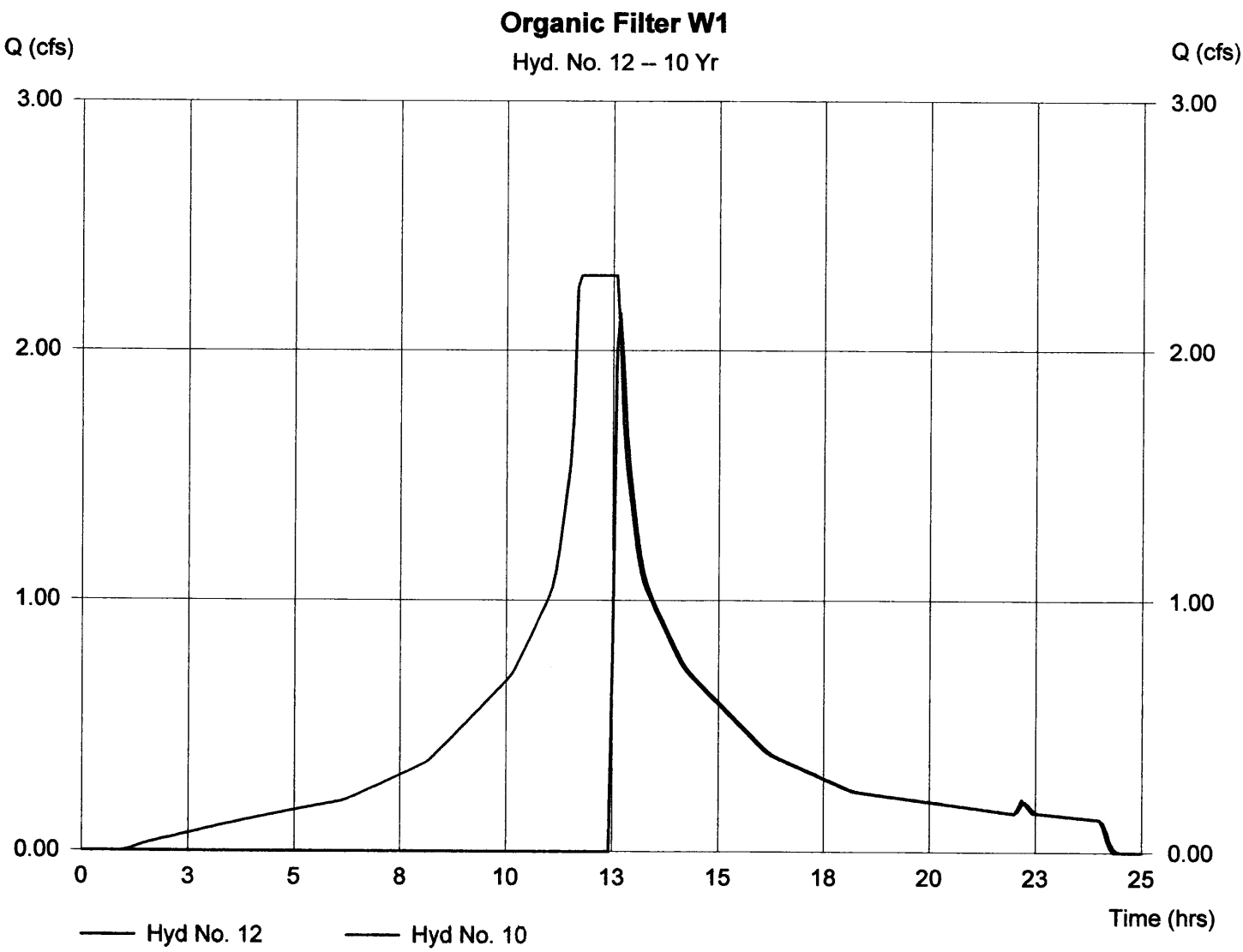
Hyd. No. 12

Organic Filter W1

Hydrograph type	= Reservoir	Peak discharge	= 2.15 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 10	Max. Elevation	= 570.07 ft
Reservoir name	= Organic Filter W1	Max. Storage	= 20,888 cuft

Storage Indication method used.

Hydrograph Volume = 17,667 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

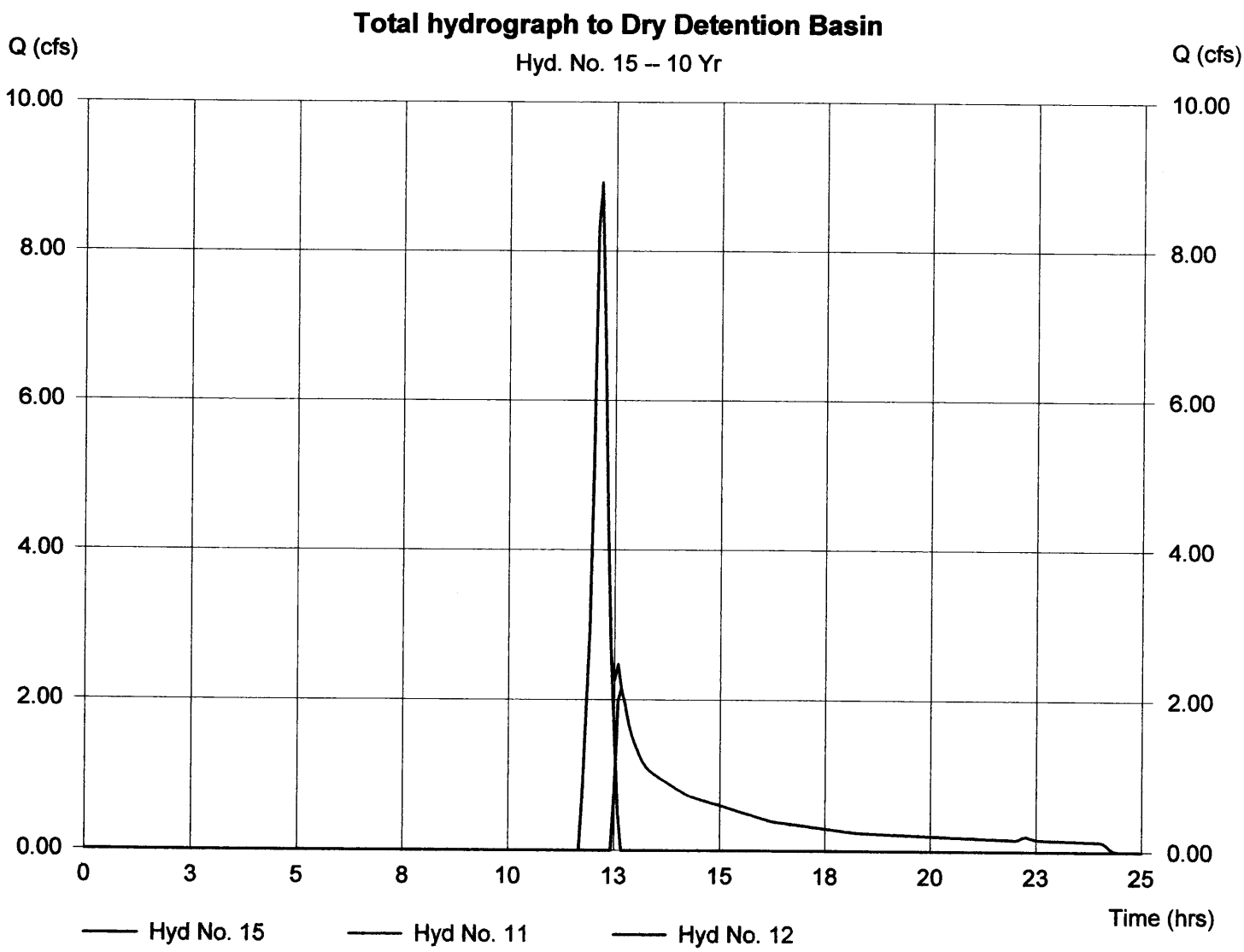
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 15

Total hydrograph to Dry Detention Basin

Hydrograph type	= Combine	Peak discharge	= 8.92 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 11, 12		

Hydrograph Volume = 30,832 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

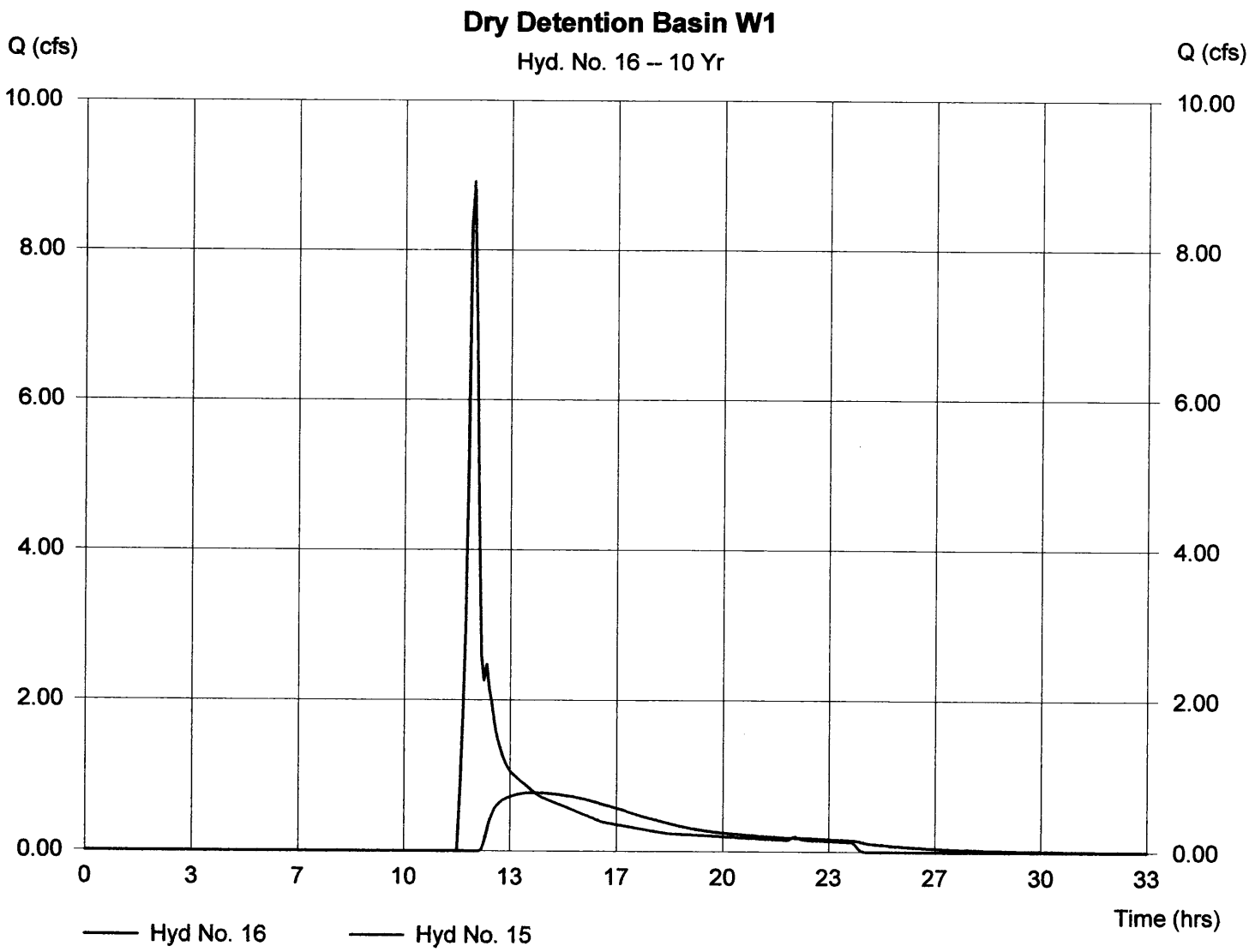
Hyd. No. 16

Dry Detention Basin W1

Hydrograph type	= Reservoir	Peak discharge	= 0.77 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 15	Max. Elevation	= 563.92 ft
Reservoir name	= Dry Detention Basin W1	Max. Storage	= 16,616 cuft

Storage Indication method used.

Hydrograph Volume = 18,753 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

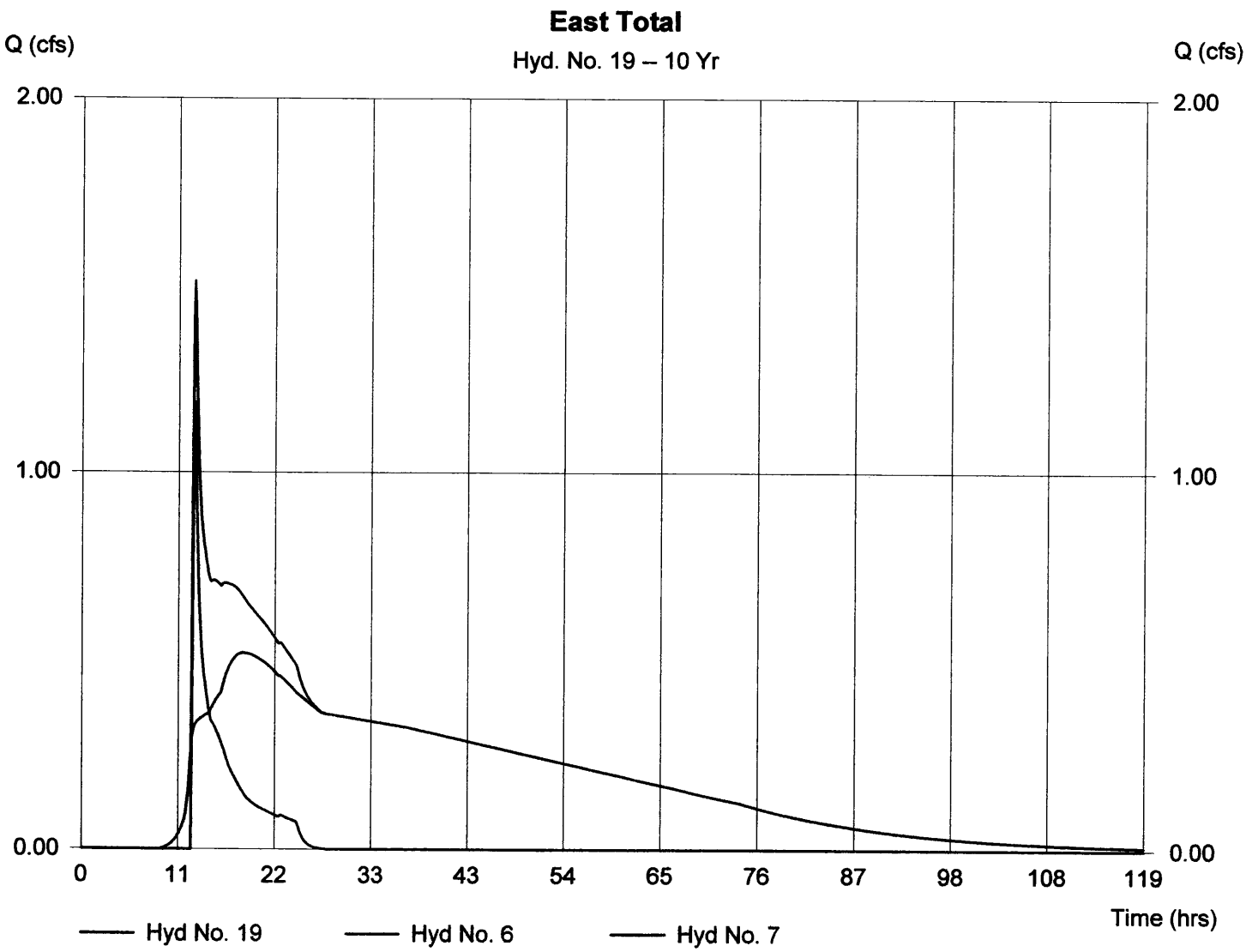
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 19

East Total

Hydrograph type	= Combine	Peak discharge	= 1.51 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 6, 7		

Hydrograph Volume = 83,177 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

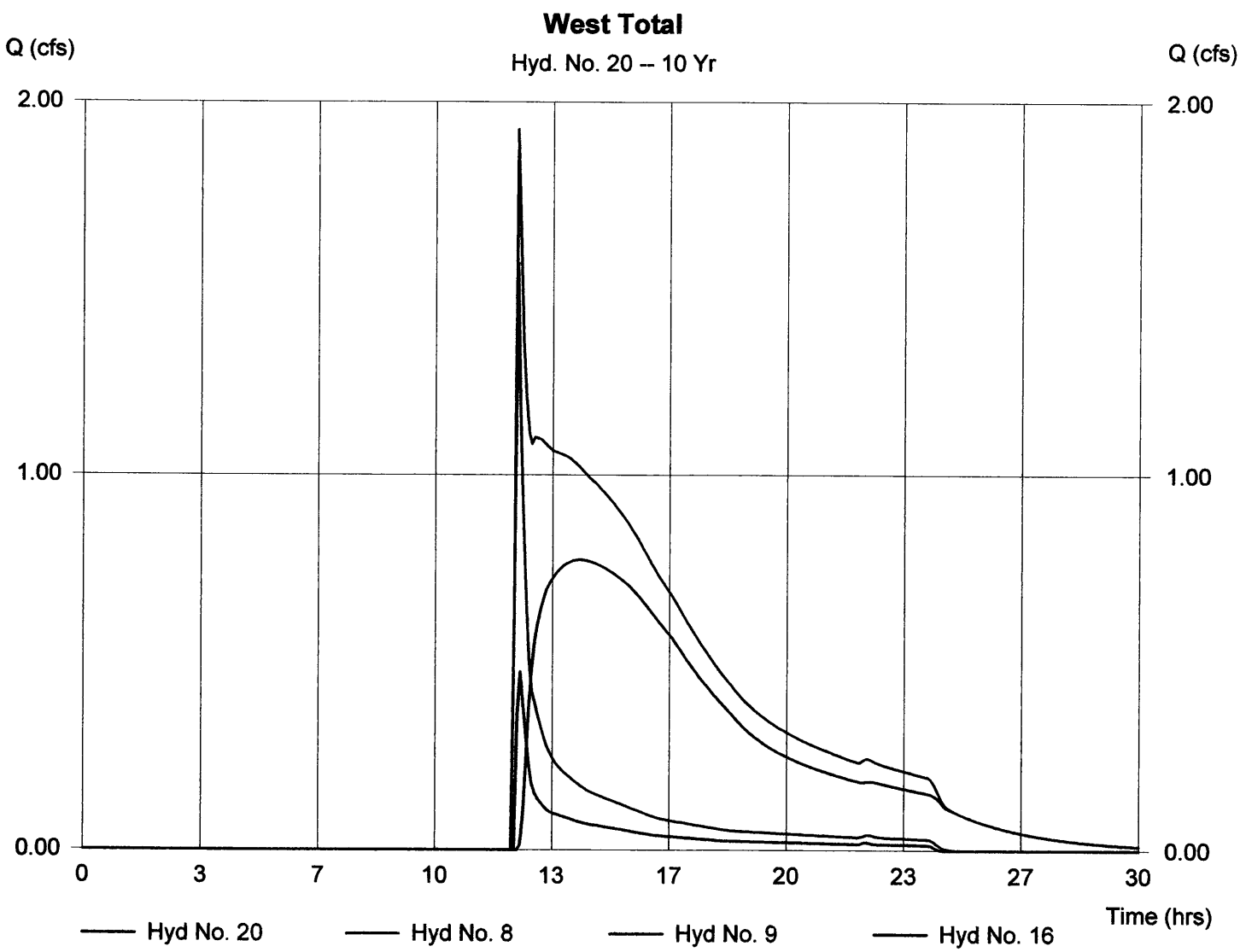
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 20

West Total

Hydrograph type	= Combine	Peak discharge	= 1.93 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 9, 16		

Hydrograph Volume = 26,149 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

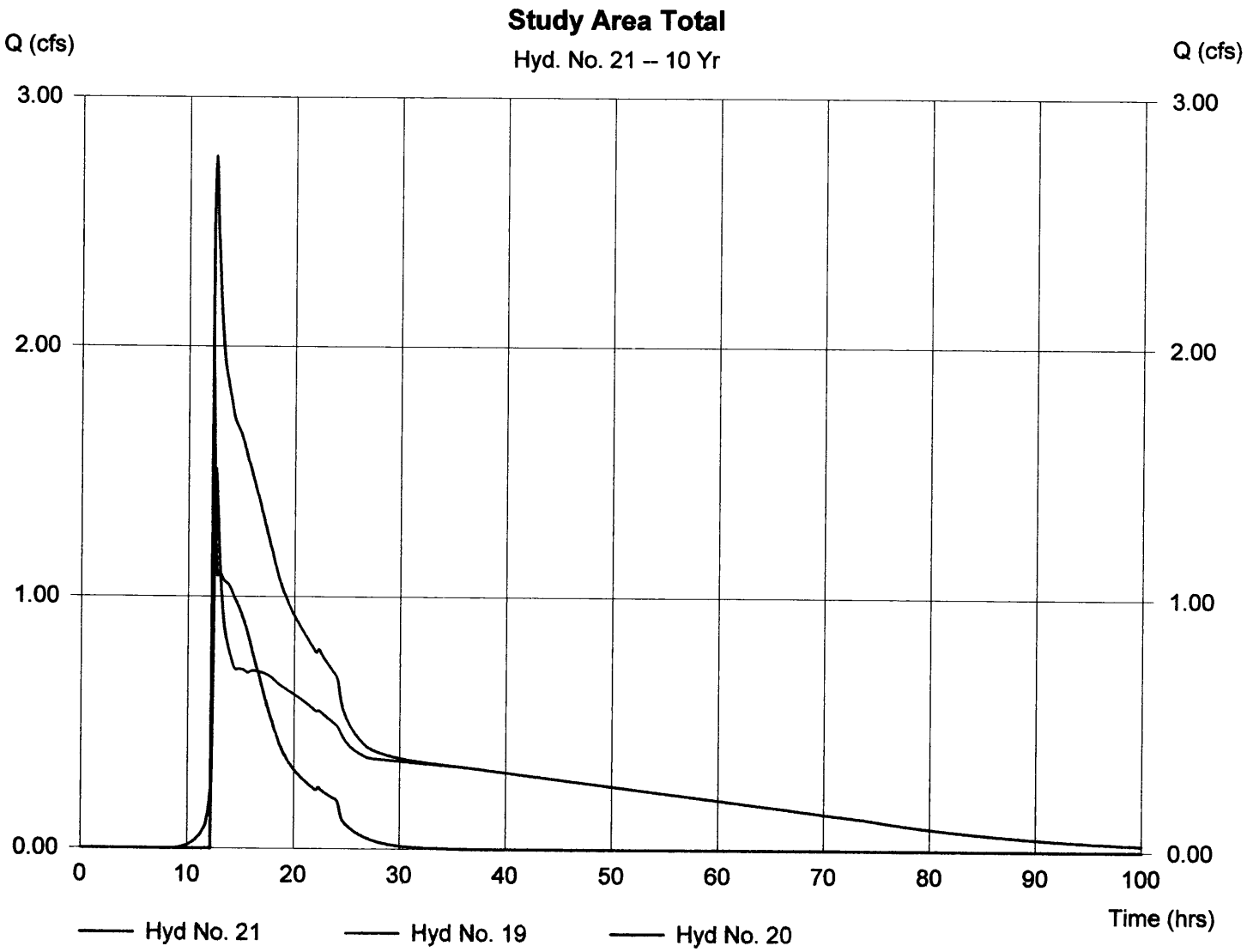
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 21

Study Area Total

Hydrograph type	= Combine	Peak discharge	= 2.76 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 19, 20		

Hydrograph Volume = 109,325 cuft



Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	6.64	5	730	26,368	---	-----	-----	East #1
2	SCS Runoff	29.21	5	730	116,635	---	-----	-----	East #2
3	SCS Runoff	15.34	5	730	70,809	---	-----	-----	West #1
4	SCS Runoff	3.16	5	730	12,918	---	-----	-----	West #2
5	SCS Runoff	1.37	5	730	5,437	---	-----	-----	West #3
6	Reservoir	4.53	5	740	21,025	1	575.44	8,693	Dry Swale East #1
7	Reservoir	2.13	5	860	116,577	2	569.34	72,340	Pocket Pond East #2
8	Reservoir	3.17	5	730	9,675	4	577.93	3,892	Dry Swale W2
9	Reservoir	1.27	5	735	4,312	5	582.60	1,351	Bio-Retention Pond W3
10	Diversion1	2.30	5	720	49,559	3	-----	-----	low flow to organic filter
11	Diversion2	13.04	5	730	21,250	3	-----	-----	bypass to dry detention
12	Reservoir	2.30	5	755	29,159	10	570.08	20,921	Organic Filter W1
15	Combine	15.34	5	730	50,409	11, 12,	-----	-----	Total hydrograph to Dry Detention Bas
16	Reservoir	6.12	5	745	38,330	15	564.77	21,940	Dry Detention Basin W1
	Combine	4.94	5	740	137,601	6, 7,	-----	-----	East Total
20	Combine	8.64	5	745	52,317	8, 9, 16,	-----	-----	West Total
21	Combine	13.49	5	745	189,918	19, 20	-----	-----	Study Area Total

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

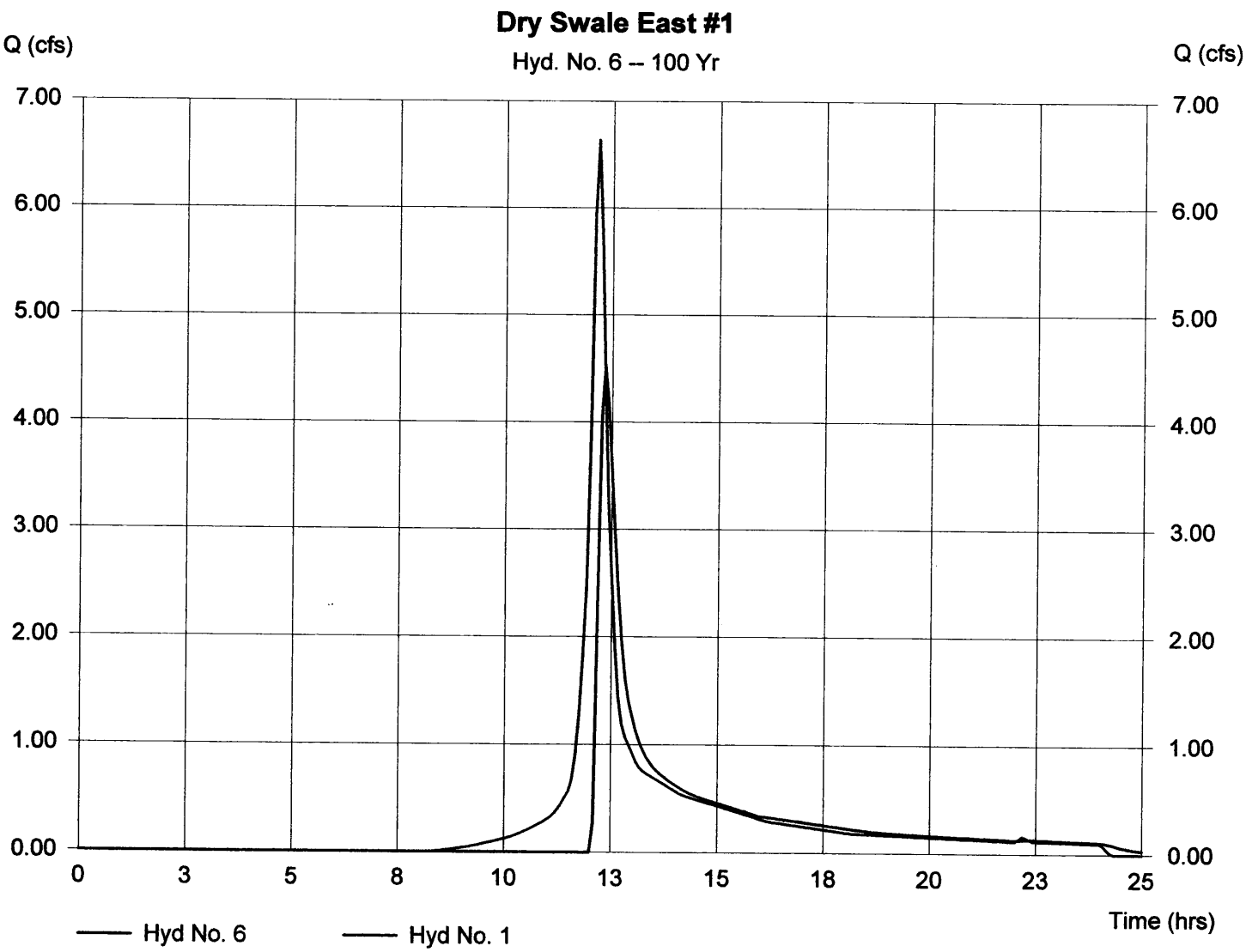
Hyd. No. 6

Dry Swale East #1

Hydrograph type	= Reservoir	Peak discharge	= 4.53 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 1	Max. Elevation	= 575.44 ft
Reservoir name	= Dry Swale East #1	Max. Storage	= 8,693 cuft

Storage Indication method used.

Hydrograph Volume = 21,025 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

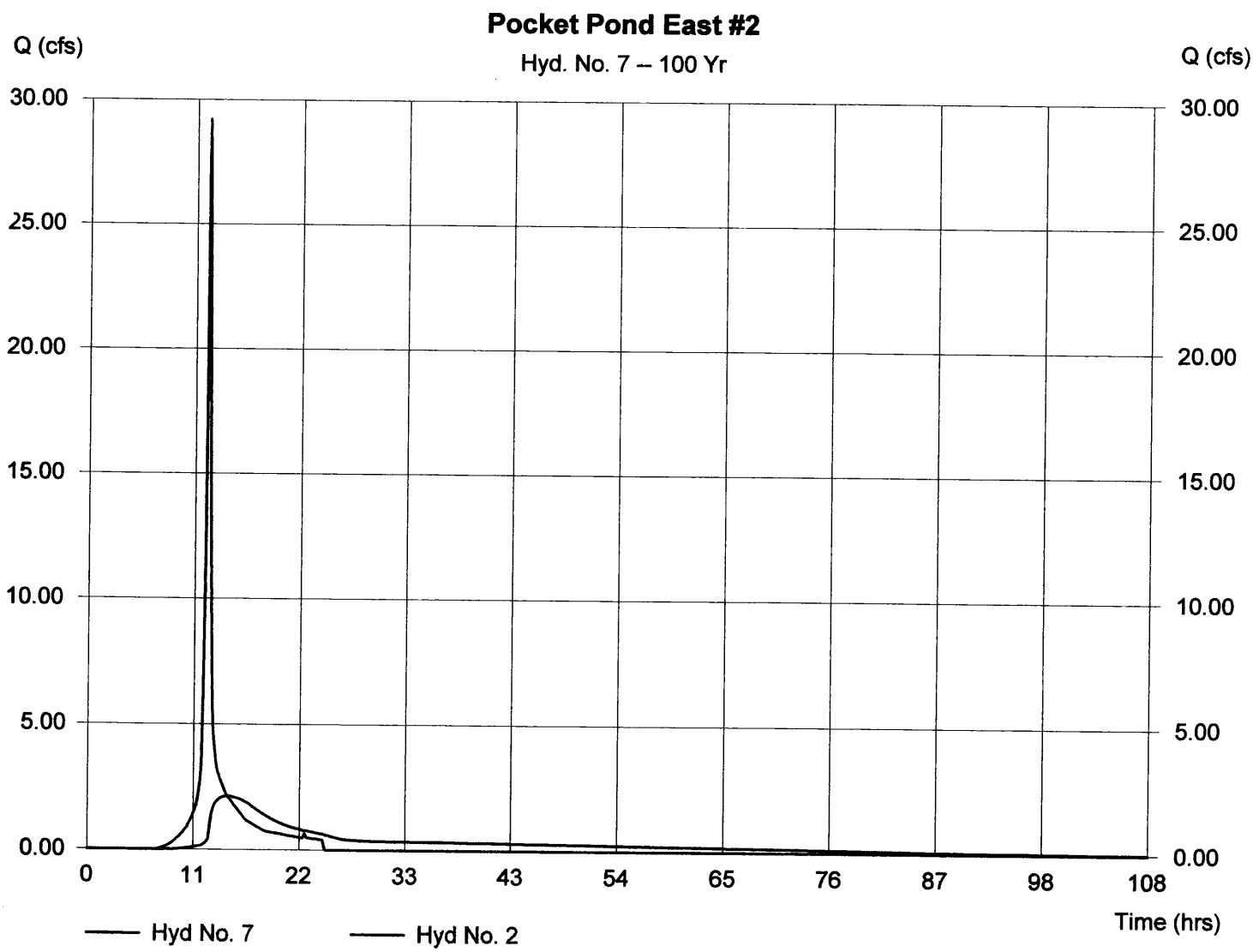
Hyd. No. 7

Pocket Pond East #2

Hydrograph type	= Reservoir	Peak discharge	= 2.13 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Max. Elevation	= 569.34 ft
Reservoir name	= Pocket Pond East #2	Max. Storage	= 72,340 cuft

Storage Indication method used.

Hydrograph Volume = 116,577 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

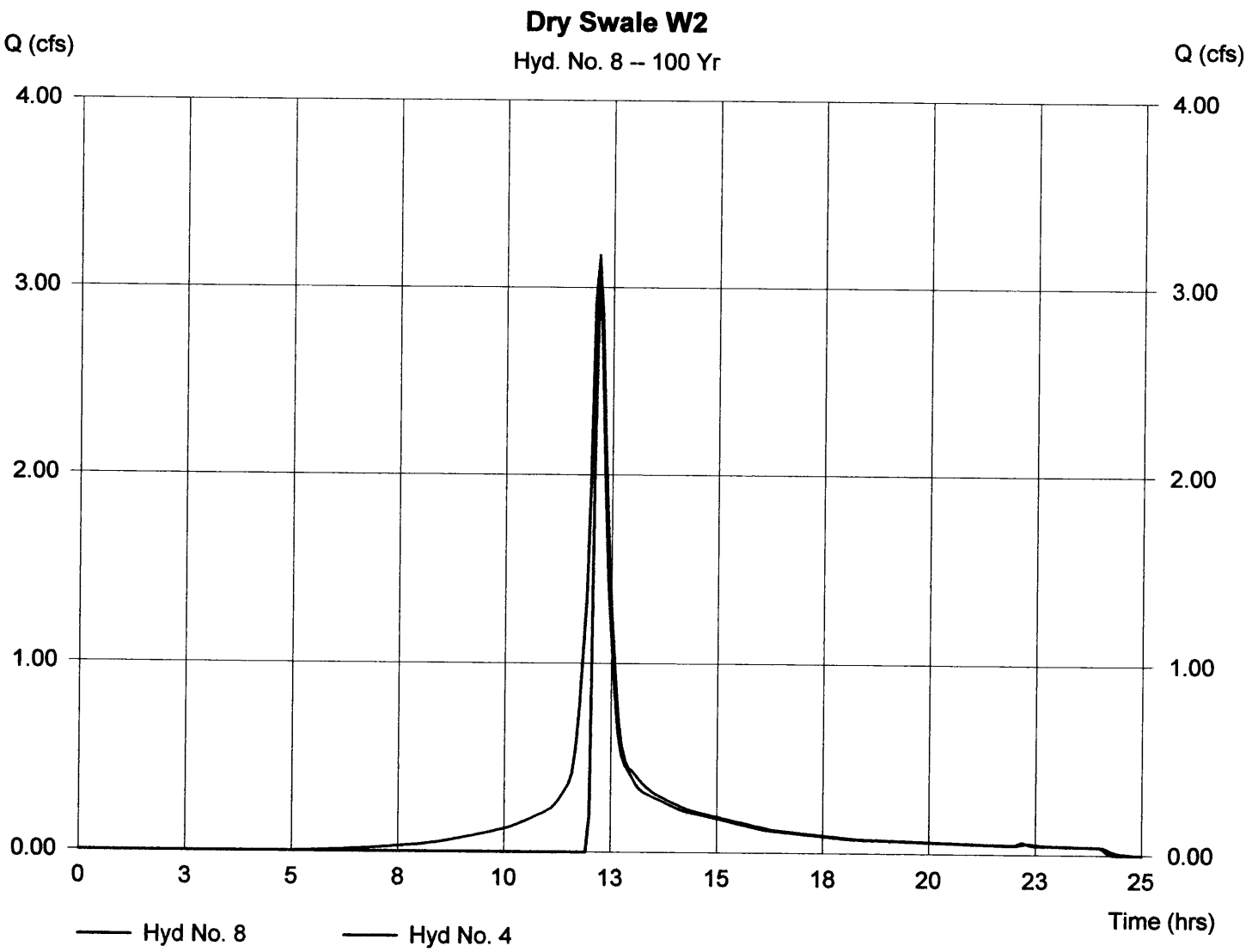
Hyd. No. 8

Dry Swale W2

Hydrograph type	= Reservoir	Peak discharge	= 3.17 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 4	Max. Elevation	= 577.93 ft
Reservoir name	= Dry Swale W2	Max. Storage	= 3,892 cuft

Storage Indication method used.

Hydrograph Volume = 9,675 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

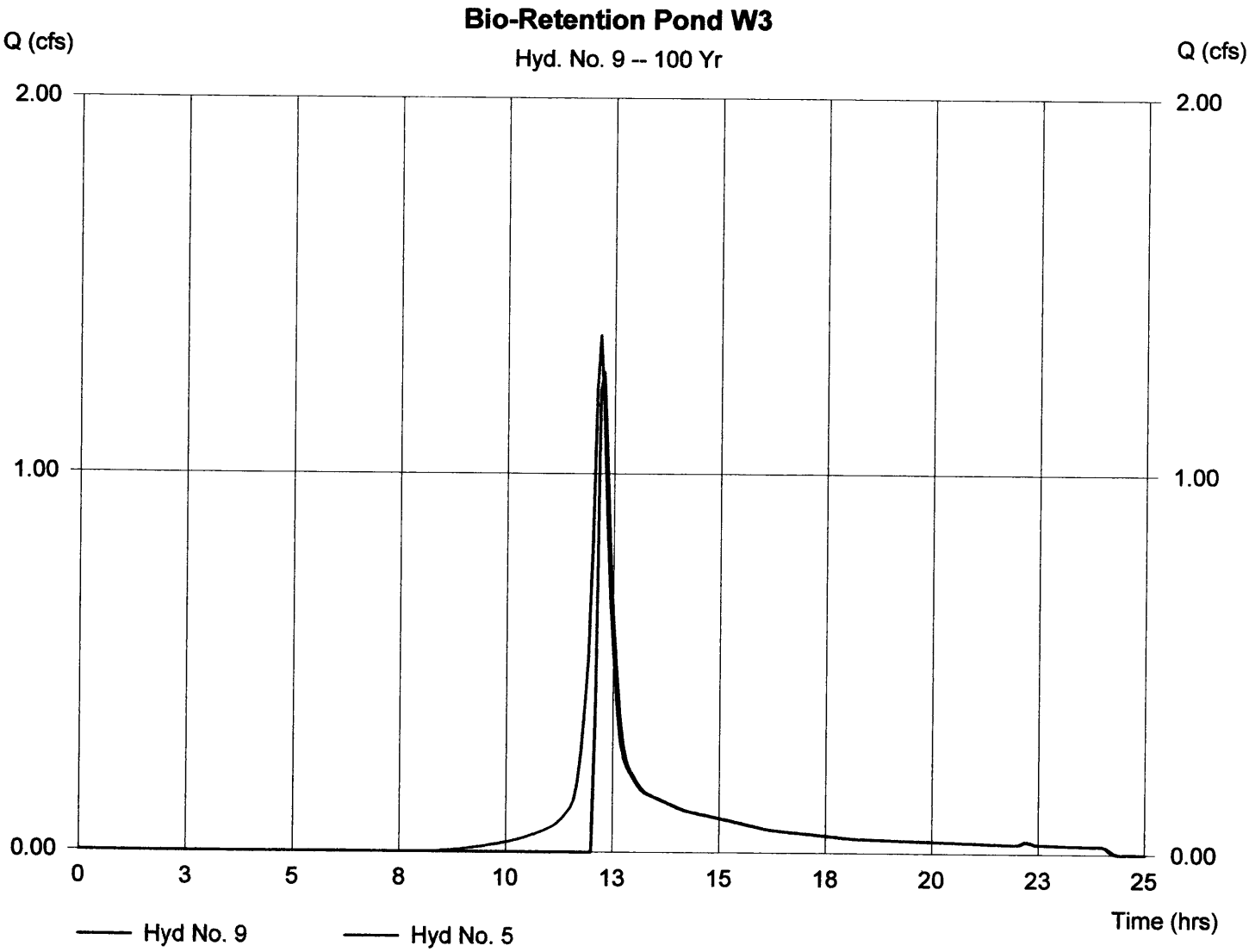
Hyd. No. 9

Bio-Retention Pond W3

Hydrograph type	= Reservoir	Peak discharge	= 1.27 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 5	Max. Elevation	= 582.60 ft
Reservoir name	= Bio-Retention Pond W3	Max. Storage	= 1,351 cuft

Storage Indication method used.

Hydrograph Volume = 4,312 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

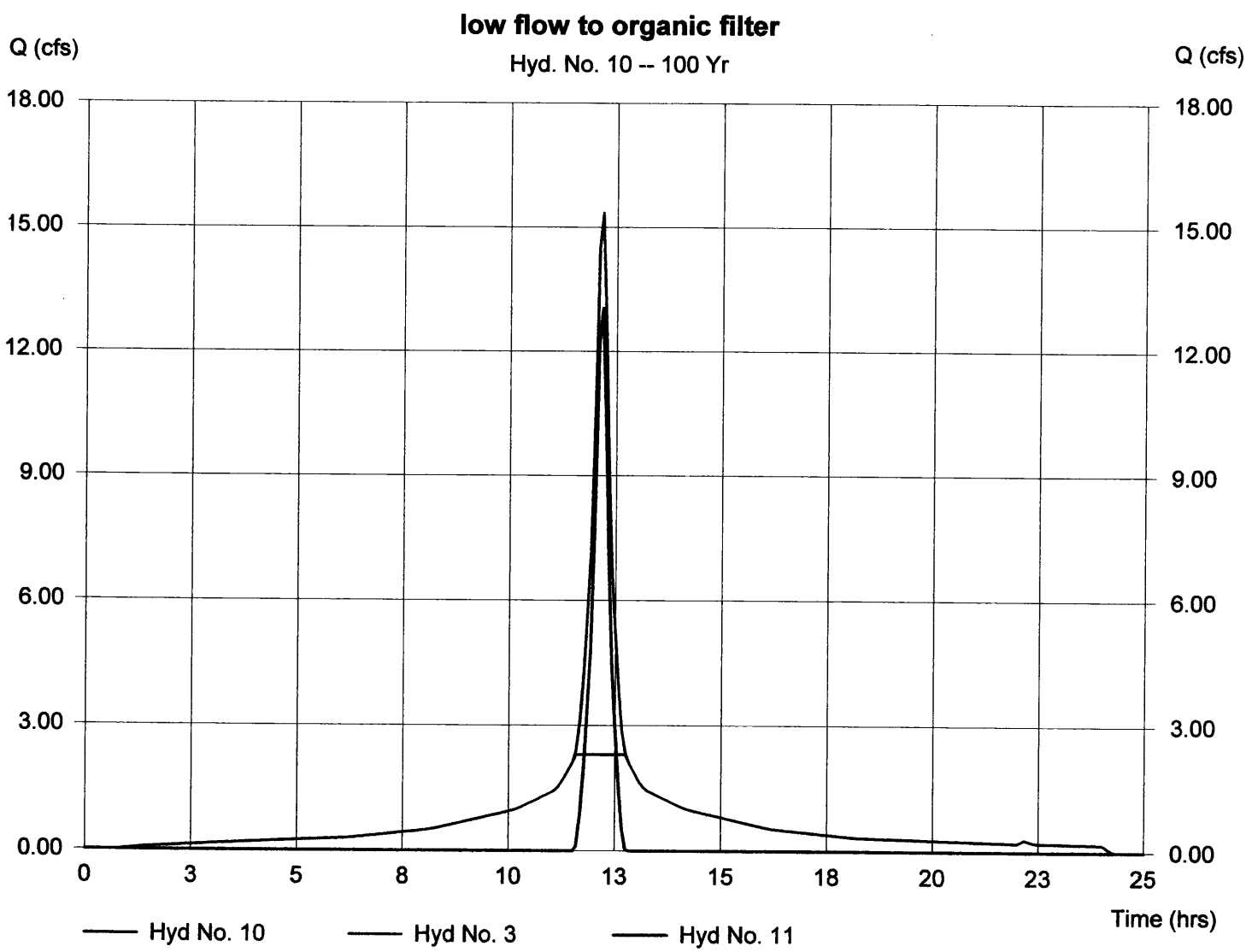
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 10

low flow to organic filter

Hydrograph type	= Diversion1	Peak discharge	= 2.30 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 49,559 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

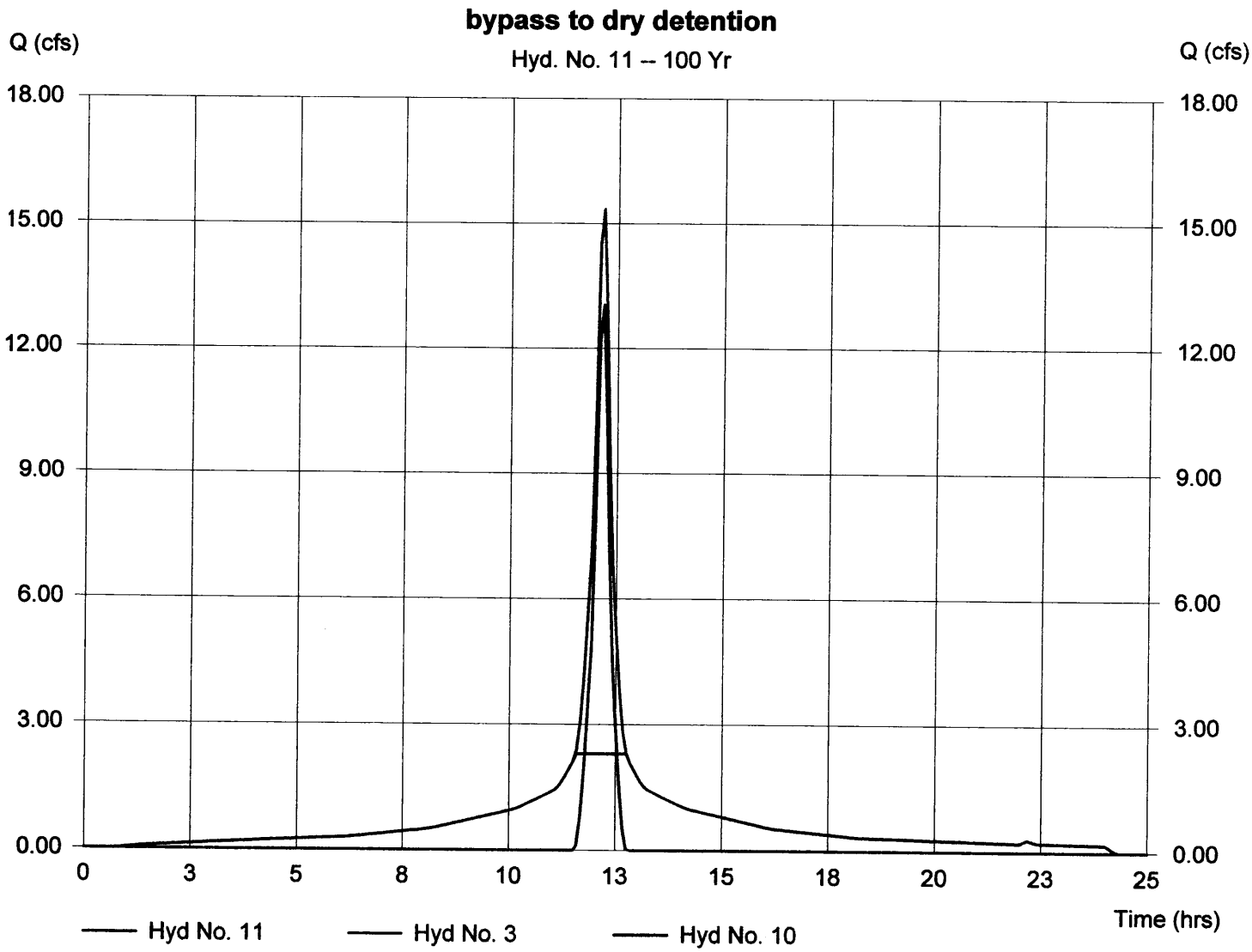
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 11

bypass to dry detention

Hydrograph type	= Diversion2	Peak discharge	= 13.04 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 21,250 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

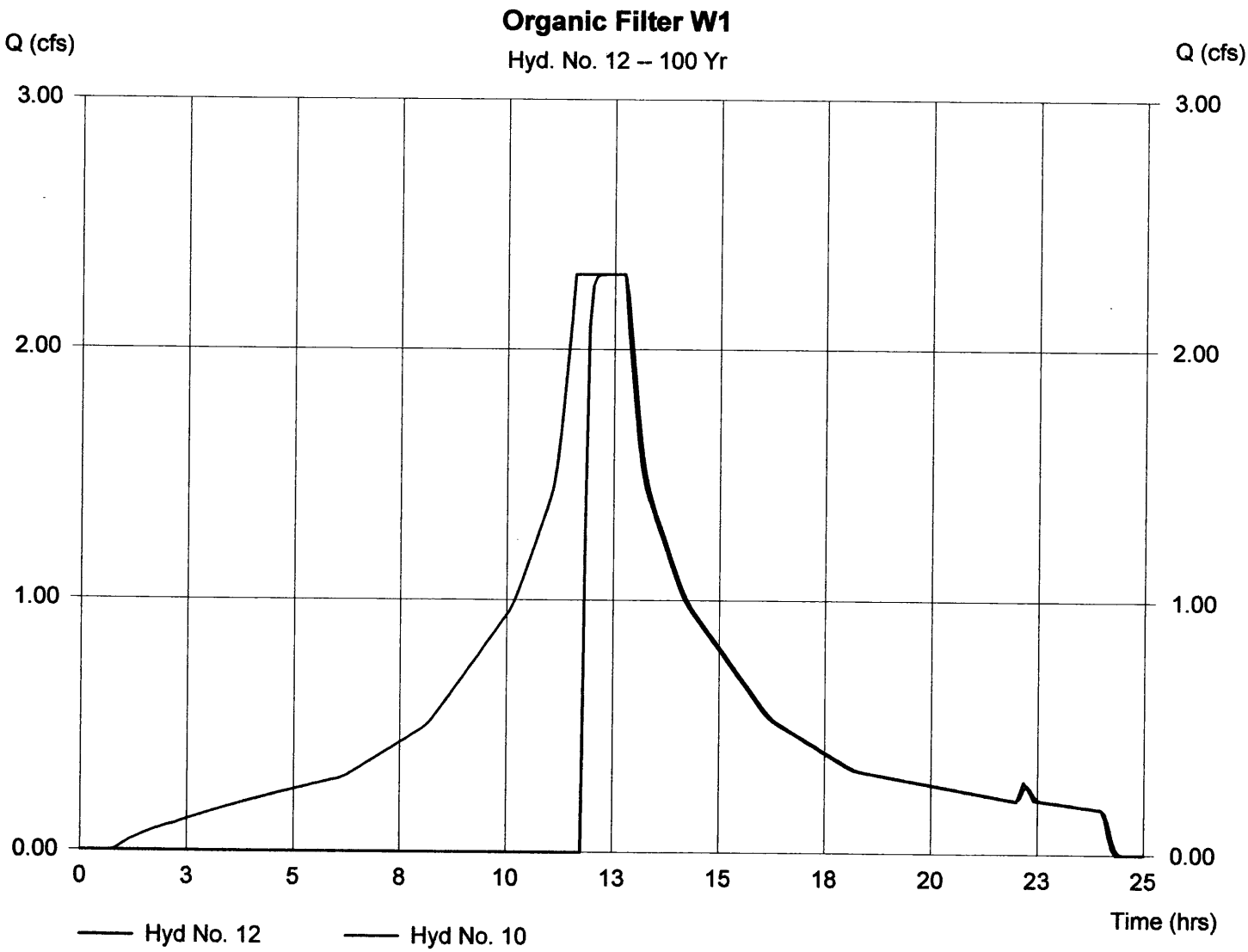
Hyd. No. 12

Organic Filter W1

Hydrograph type	= Reservoir	Peak discharge	= 2.30 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 10	Max. Elevation	= 570.08 ft
Reservoir name	= Organic Filter W1	Max. Storage	= 20,921 cuft

Storage Indication method used.

Hydrograph Volume = 29,159 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

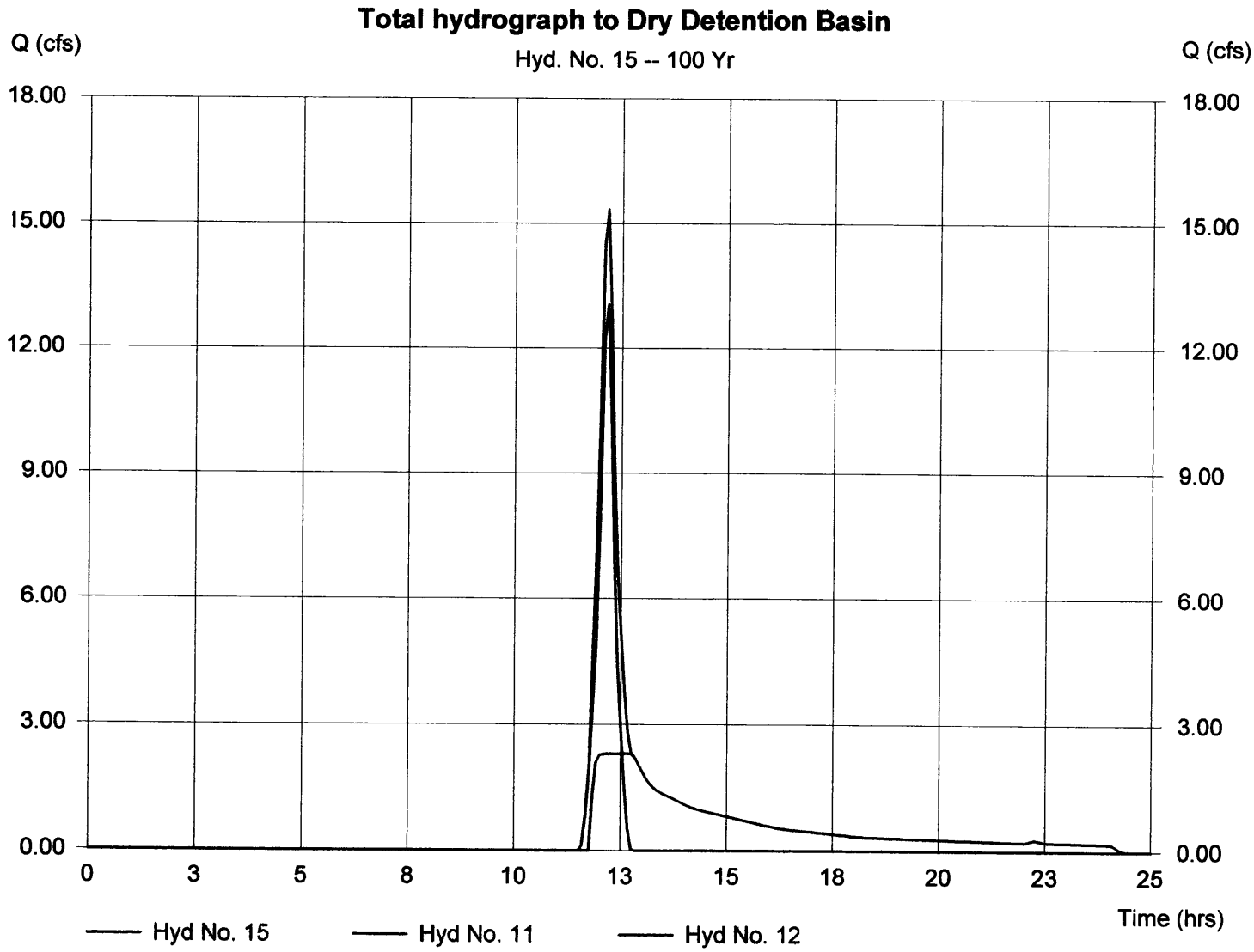
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 15

Total hydrograph to Dry Detention Basin

Hydrograph type	= Combine	Peak discharge	= 15.34 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 11, 12		

Hydrograph Volume = 50,409 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 3:1 PM

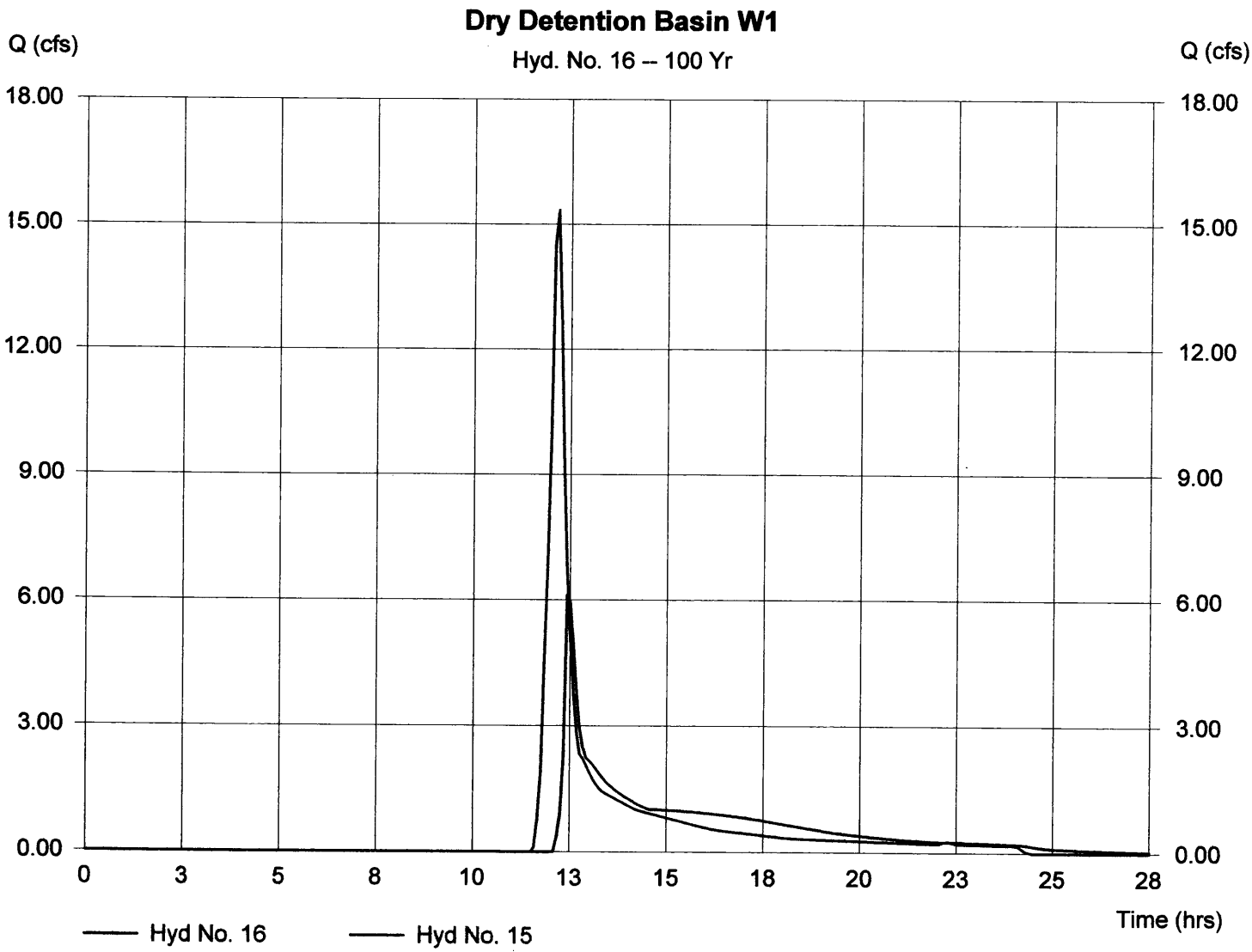
Hyd. No. 16

Dry Detention Basin W1

Hydrograph type	= Reservoir	Peak discharge	= 6.12 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 15	Max. Elevation	= 564.77 ft
Reservoir name	= Dry Detention Basin W1	Max. Storage	= 21,940 cuft

Storage Indication method used.

Hydrograph Volume = 38,330 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

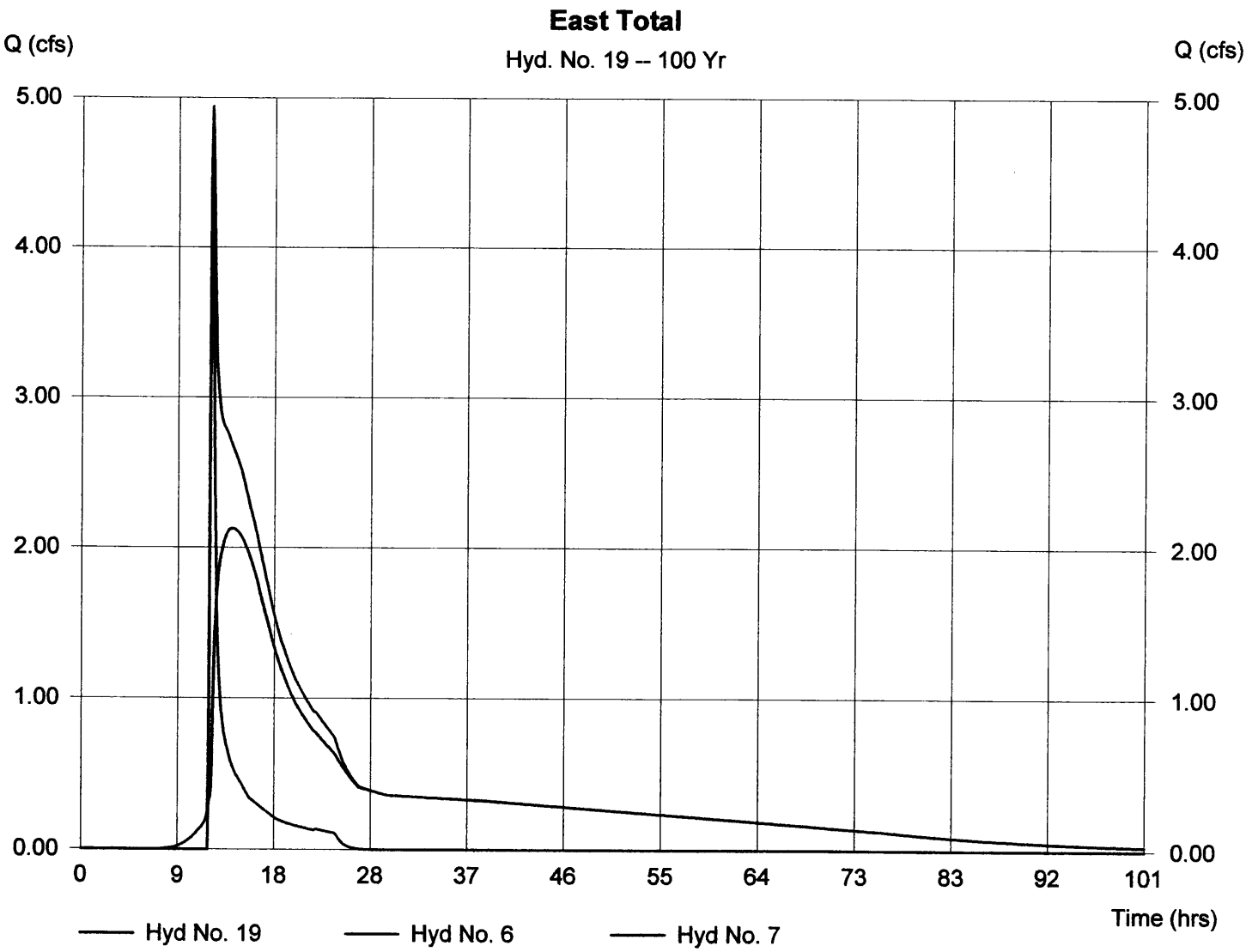
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 19

East Total

Hydrograph type	= Combine	Peak discharge	= 4.94 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 6, 7		

Hydrograph Volume = 137,601 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

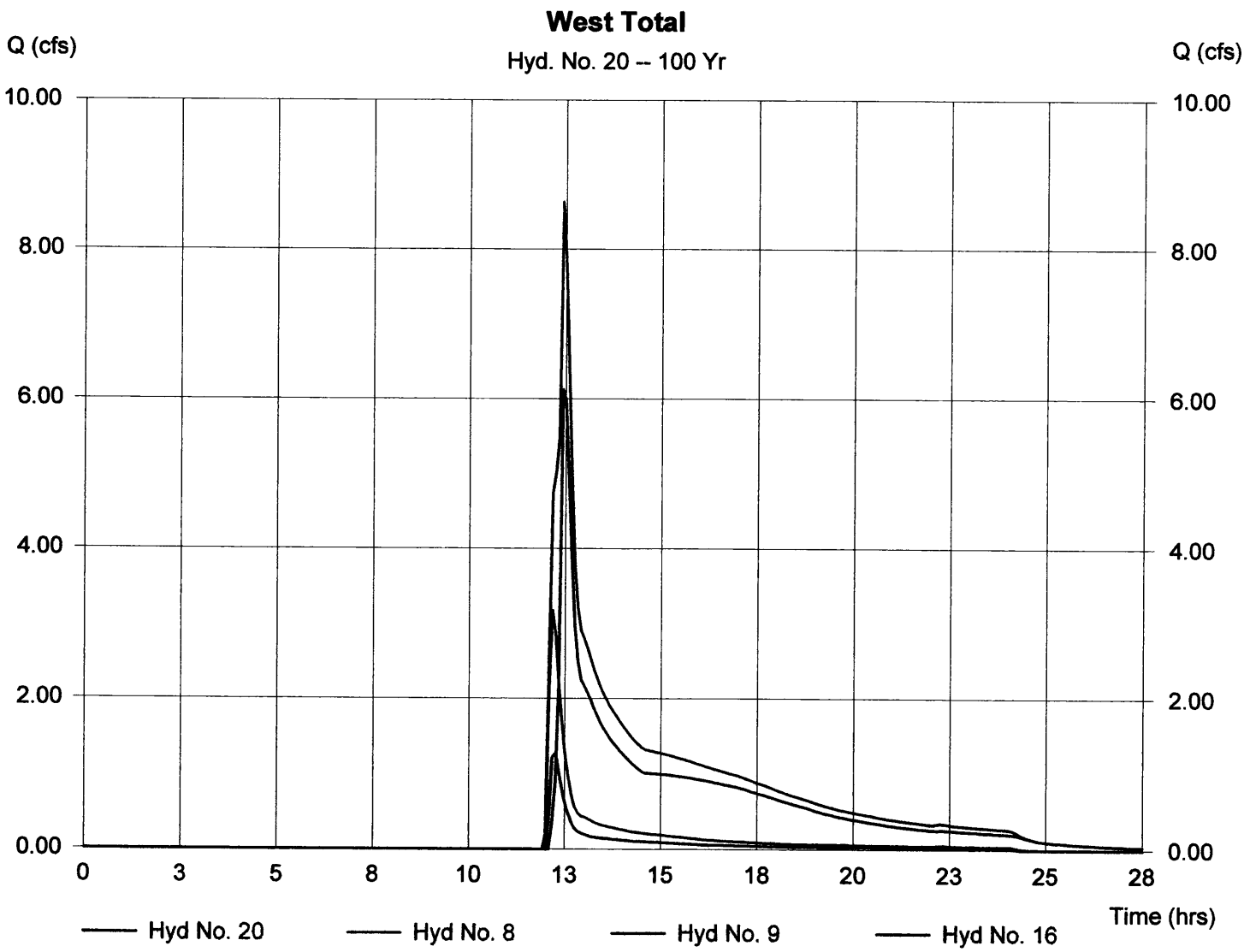
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 20

West Total

Hydrograph type	= Combine	Peak discharge	= 8.64 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 9, 16		

Hydrograph Volume = 52,317 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

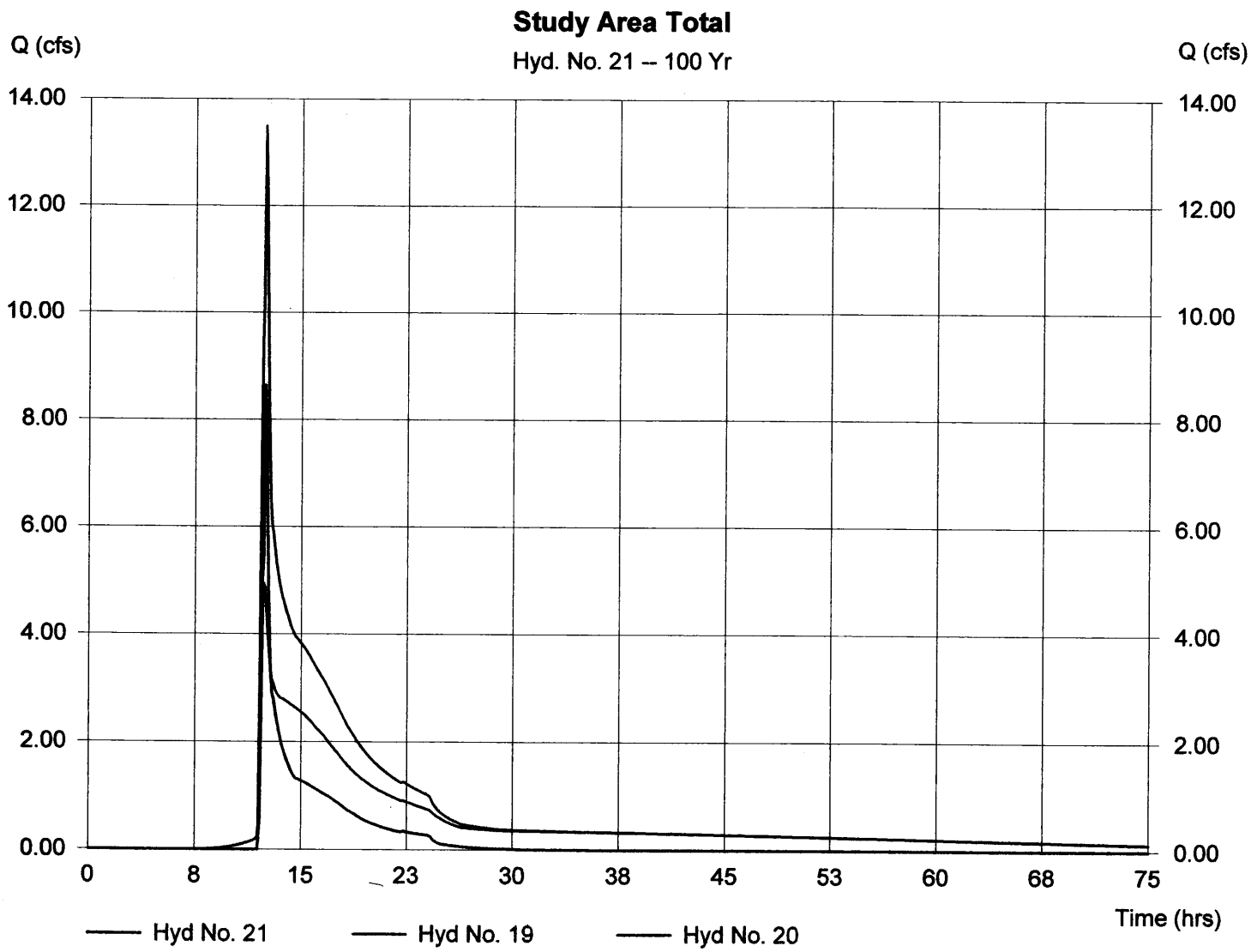
Tuesday, Nov 15 2005, 3:1 PM

Hyd. No. 21

Study Area Total

Hydrograph type	= Combine	Peak discharge	= 13.49 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 19, 20		

Hydrograph Volume = 189,918 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Monday, Nov 28 2005, 7:23 PM

Pond No. 1 - Dry Swale East #1

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	573.00	1,520	0	0
2.50	575.50	5,600	8,900	8,900

Culvert / Orifice Structures

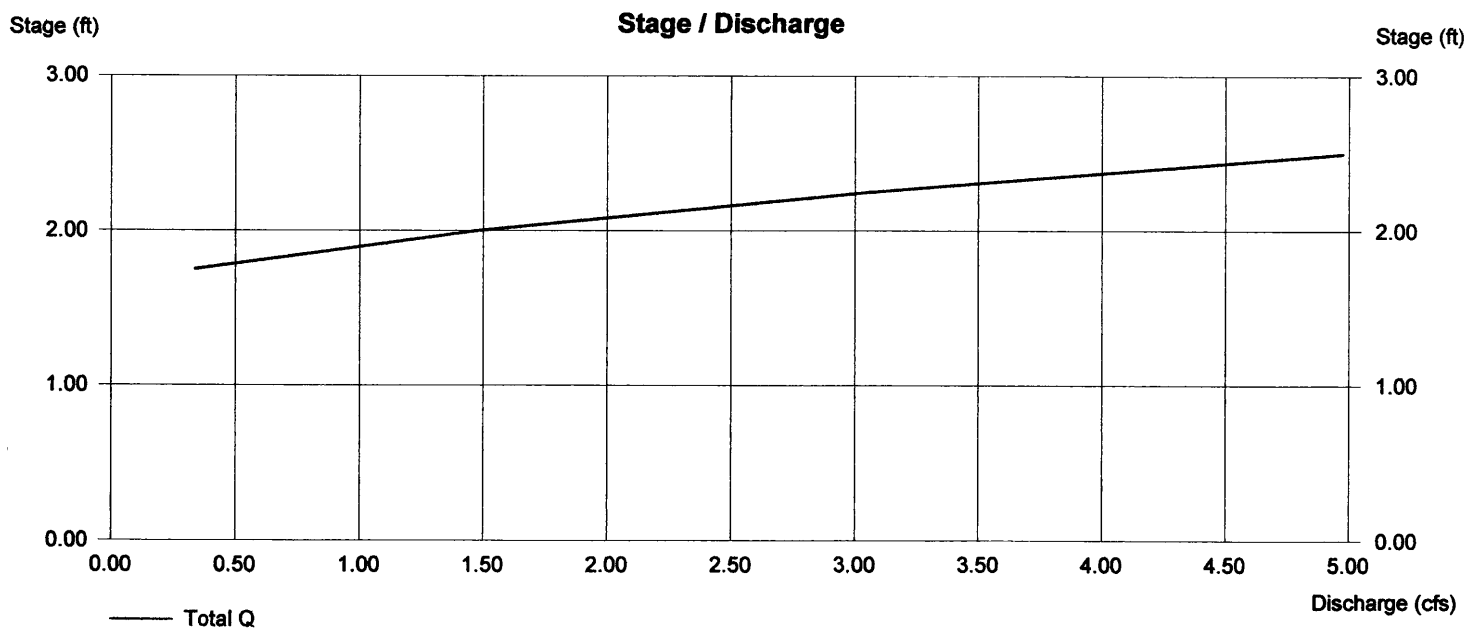
	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 572.00	0.00	0.00	0.00
Length (ft)	= 60.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	1.75	0.00	0.00
Crest El. (ft)	= 575.50	574.60	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	Rect	—	—
Multi-Stage	= Yes	Yes	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, Nov 28 2005, 7:23 PM

Pond No. 2 - Pocket Pond East #2

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	566.00	14,860	0	0
2.00	568.00	22,681	37,541	37,541
3.50	569.50	29,312	38,995	76,536

Culvert / Orifice Structures

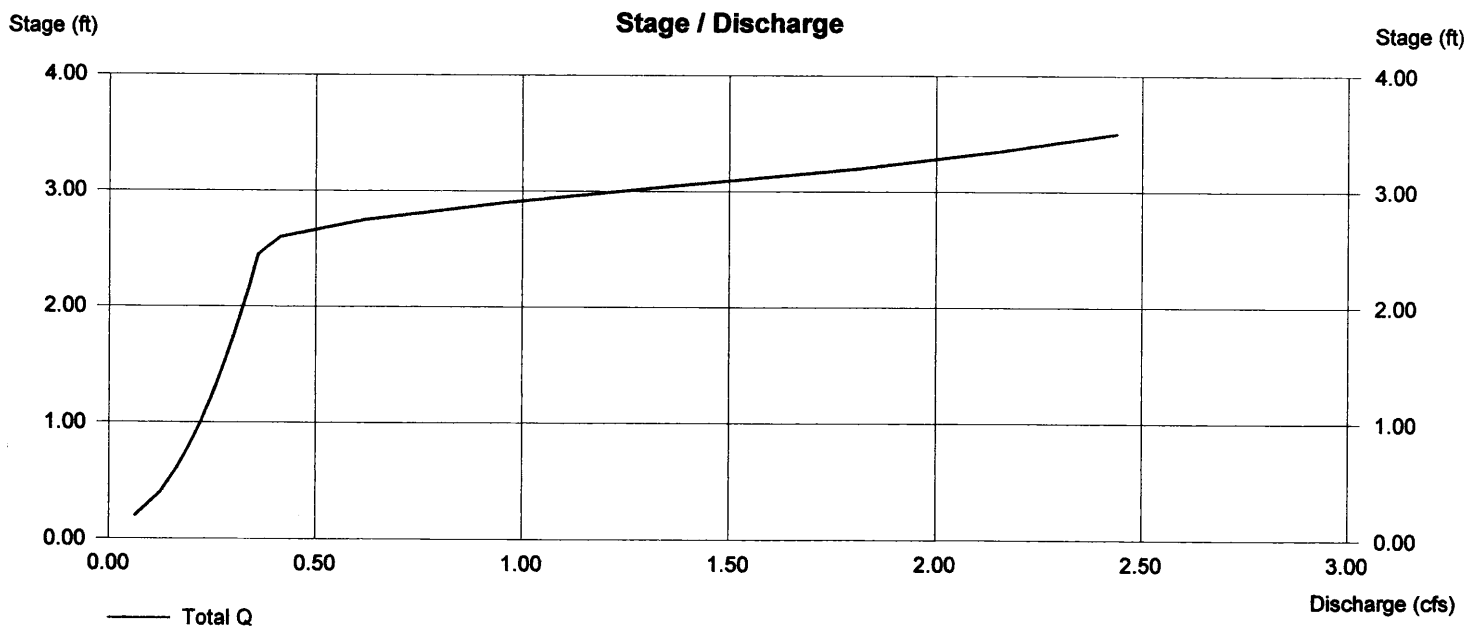
	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	3.00	10.00	0.00
Span (in)	= 24.00	3.00	10.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 565.50	566.00	568.50	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 569.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	—	—	—
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, Nov 28 2005, 7:23 PM

Pond No. 3 - Organic Filter W1

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	566.00	3,500	0	0
2.00	568.00	5,050	8,550	8,550
4.00	570.00	6,800	11,850	20,400
5.00	571.00	6,800	6,800	27,200

Culvert / Orifice Structures

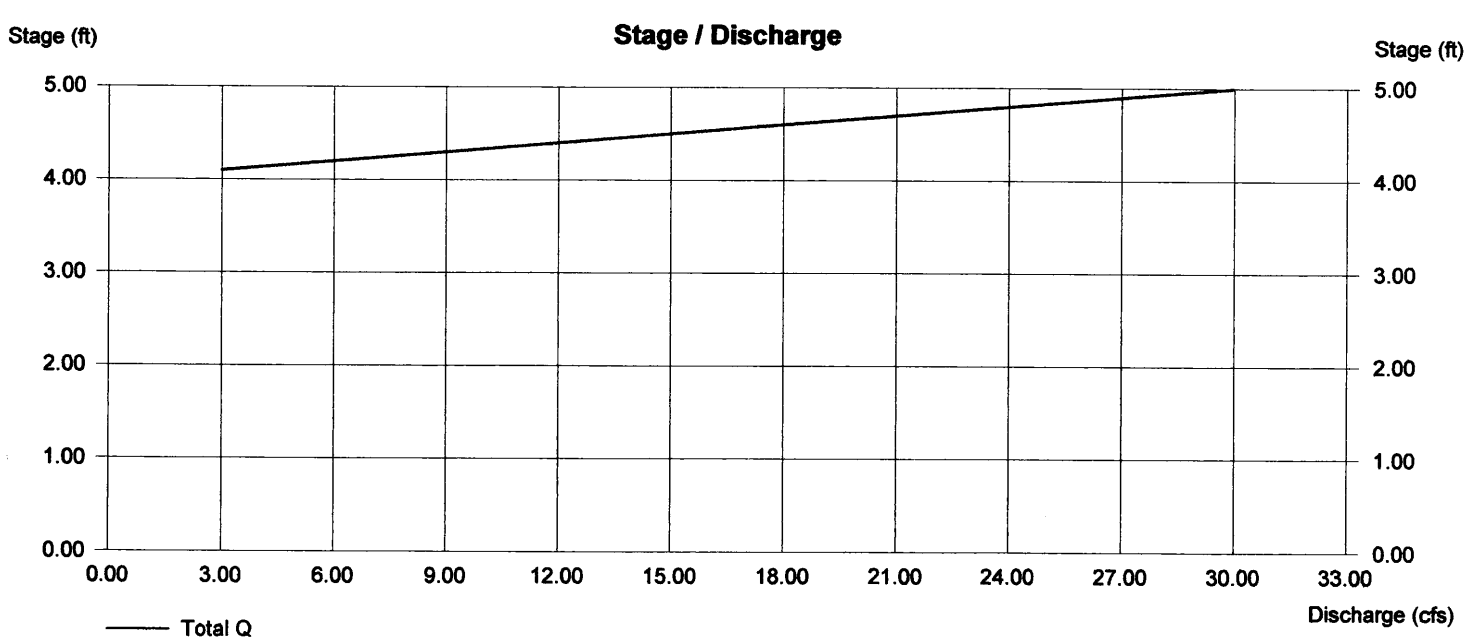
	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

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.	= 3.00	3.33	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, Nov 28 2005, 7:23 PM

Pond No. 4 - Dry Swale W2

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	576.00	359	0	0
1.00	577.00	2,203	1,281	1,281
2.00	578.00	3,400	2,802	4,083

Culvert / Orifice Structures

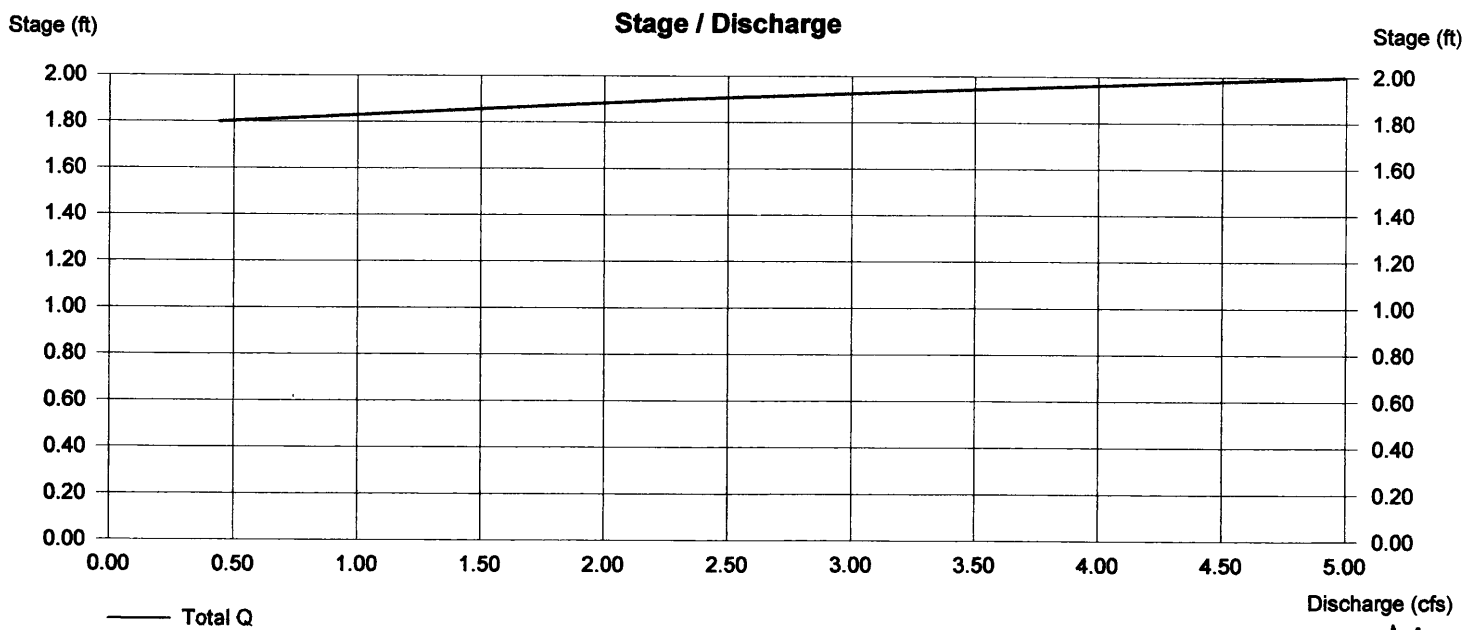
	[A]	[B]	[C]	[D]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 574.00	0.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 577.75	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	—	—	—
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Pond Report

Hydraflow Hydrographs by Intelisolve — Monday, Nov 28 2005, 7:23 PM

Pond No. 5 - Bio-Retention Pond W3

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	582.00	2,000	0	0
1.00	583.00	2,500	2,250	2,250

Culvert / Orifice Structures

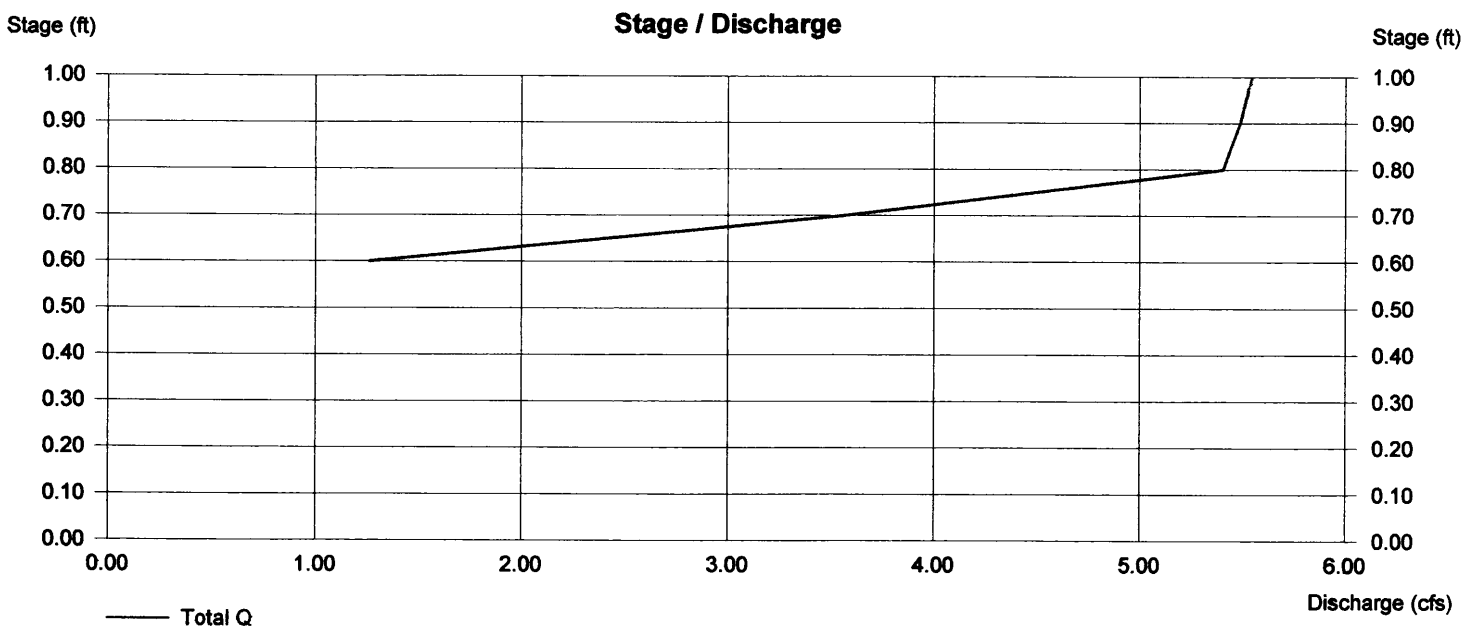
	[A]	[B]	[C]	[D]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 577.00	0.00	0.00	0.00
Length (ft)	= 200.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 582.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	—	—	—
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



APPENDIX S-5

HYDRAFLOW MODEL -- EXISTING CONDITIONS
1 YEAR STORM (FOR VOLUME ANALYSIS)

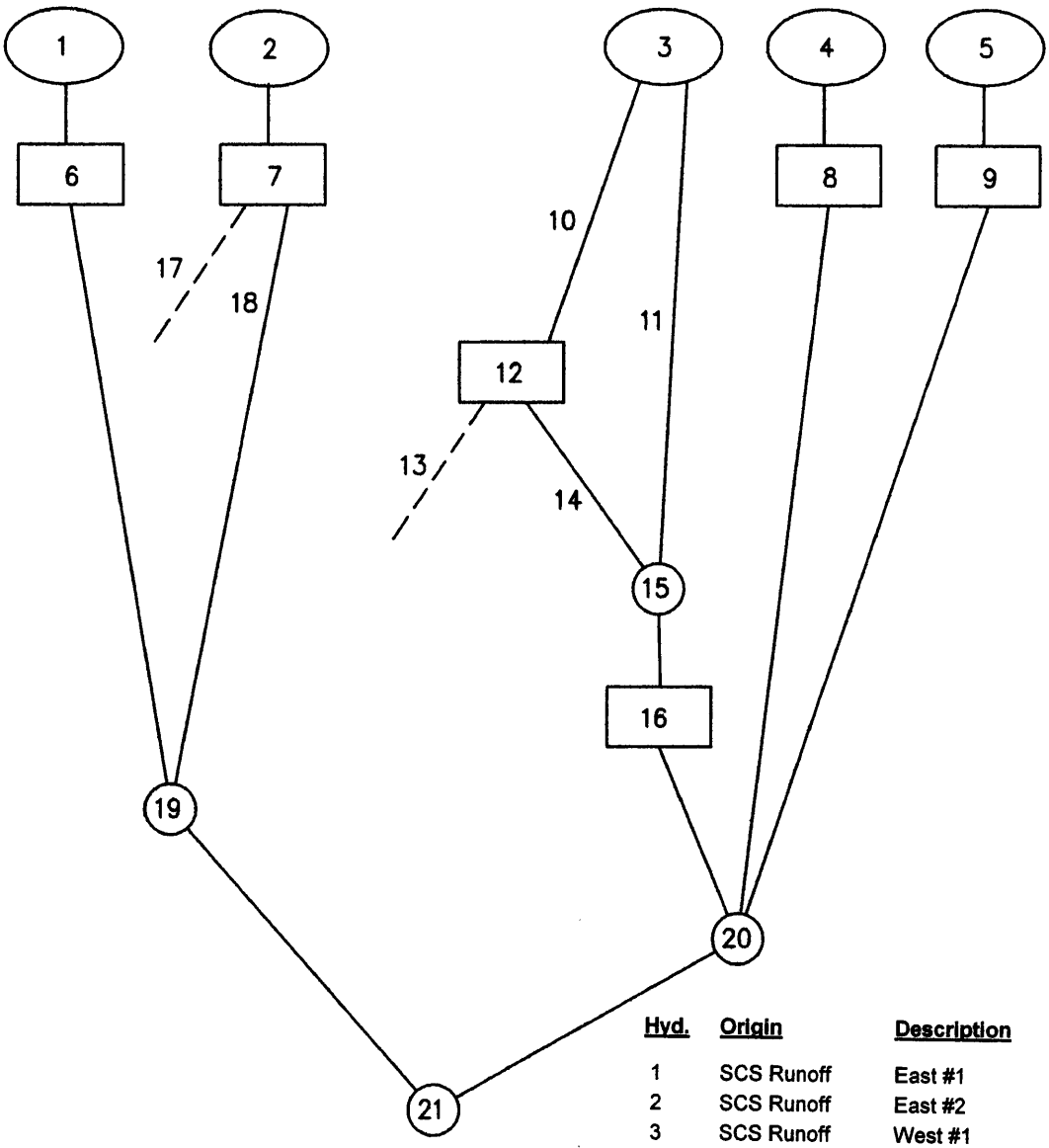
Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.01	5	910	399	—	—	—	East #1
2	SCS Runoff	0.00	5	1440	12	—	—	—	East #2
3	SCS Runoff	0.91	5	735	5,111	—	—	—	West #1
4	SCS Runoff	0.04	5	750	635	—	—	—	West #2
5	SCS Runoff	0.00	5	1330	21	—	—	—	West #3
6	Combine	0.01	5	910	411	1, 2,	—	—	East Total
7	Combine	0.91	5	735	5,767	3, 4, 5,	—	—	West Total
8	Combine	0.91	5	735	6,178	6, 7	—	—	Existing Total

Existing 1,2,10,100.gpw	Return Period: 1 Year	Tuesday, Nov 15 2005, 11:02 AM

APPENDIX S-6
HYDRAFLOW MODEL -- PROPOSED CONDITIONS
1 YEAR STORM (FOR VOLUME ANALYSIS)

HYDRAFLOW MODEL – PROPOSED CONDITIONS
1–YEAR STORM (FOR VOLUME ANALYSIS)



Hyd.	Origin	Description
1	SCS Runoff	East #1
2	SCS Runoff	East #2
3	SCS Runoff	West #1
4	SCS Runoff	West #2
5	SCS Runoff	West #3
6	Reservoir	Dry Swale East #1
7	Reservoir	Pocket Pond East #2
8	Reservoir	Dry Swale W2
9	Reservoir	Bio-Retention Pond W3
10	Diversion1	low flow to organic filter
11	Diversion2	bypass to dry detention
12	Reservoir	Organic Filter W1
13	Diversion1	infiltration from organic filter
14	Diversion2	discharge from organic filter
15	Combine	Total hydrograph to Dry Detention Basin
16	Reservoir	Dry Detention Basin W2
17	Diversion1	infiltration from E2
18	Diversion2	surface discharge from E2
19	Combine	East Total
20	Combine	West Total
21	Combine	Study Area Total

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Hydrograph Summary Report

Hyd.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.00	5	730	4,597	—	—	—	East #1
2	SCS Runoff	5.94	5	730	24,703	—	—	—	East #2
3	SCS Runoff	6.04	5	730	26,805	—	—	—	West #1
4	SCS Runoff	0.85	5	730	3,397	—	—	—	West #2
5	SCS Runoff	0.21	5	730	948	—	—	—	West #3
6	Reservoir	0.00	5	0	0	1	574.29	4,597	Dry Swale East #1
7	Reservoir	0.21	5	1105	24,645	2	566.91	17,005	Pocket Pond East #2
8	Reservoir	0.02	5	1340	154	4	577.70	3,254	Dry Swale W2
9	Reservoir	0.00	5	0	0	5	582.42	948	Bio-Retention Pond W3
10	Diversion1	2.30	5	715	22,691	3	—	—	low flow to organic filter
11	Diversion2	3.74	5	730	4,113	3	—	—	bypass to dry detention
12	Reservoir	0.14	5	1080	2,291	10	570.00	20,431	Organic Filter W1
13	Diversion1	0.08	5	1075	1,826	12	—	—	infiltration from organic filter
14	Diversion2	0.06	5	1080	465	12	—	—	discharge from organic filter
15	Combine	3.74	5	730	4,578	11, 14	—	—	Total hydrograph to Dry Detention Bas
	Reservoir	0.00	5	0	0	15	561.28	4,578	Dry Detention Basin W1
17	Diversion1	0.14	5	750	20,820	7	—	—	infiltration from E2
18	Diversion2	0.07	5	1105	3,825	7	—	—	surface discharge from E2
19	Combine	0.07	5	1105	3,825	6, 18	—	—	East Total
20	Combine	0.02	5	1340	154	8, 9, 16,	—	—	West Total
21	Combine	0.08	5	1335	3,979	19, 20	—	—	Study Area Total

Proposed 1 year volumes.gpw	Return Period: 1 Year	Tuesday, Nov 15 2005, 11:13 AM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

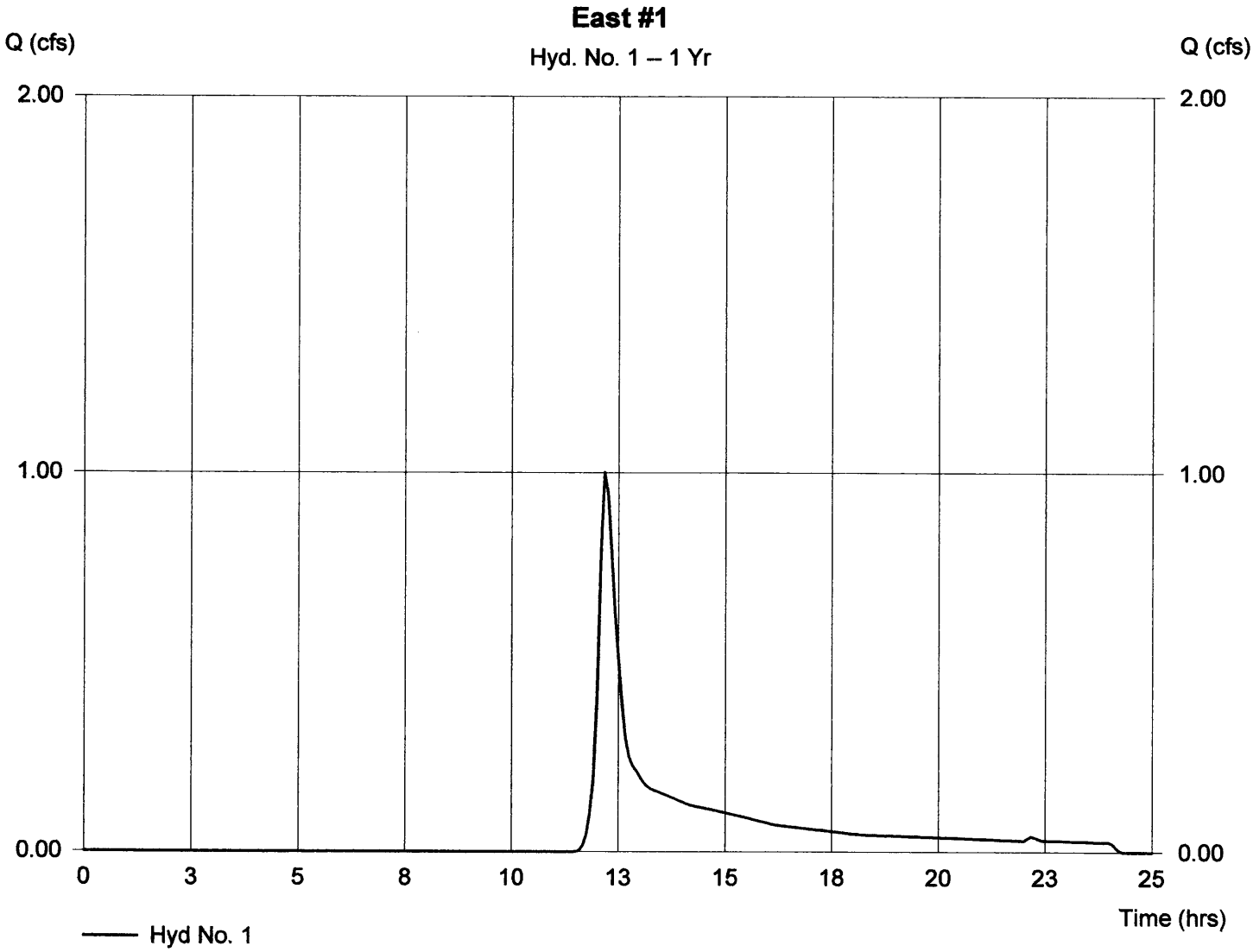
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 1

East #1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.00 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 1.940 ac	Curve number	= 69.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 13.70 min
Total precip.	= 3.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,597 cuft



Hydrograph Plot

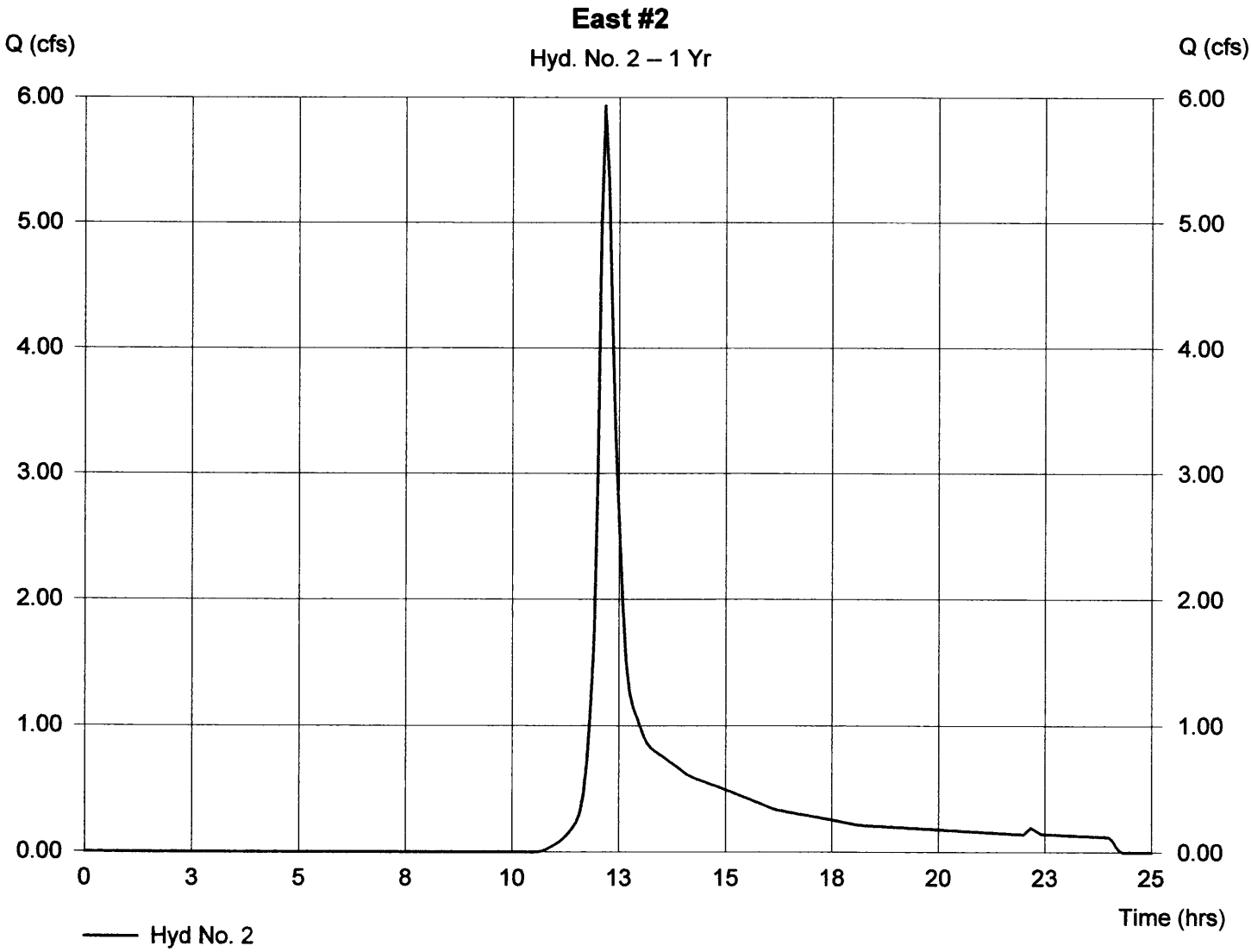
Hydraflow Hydrographs by Intelisolve | Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 2

East #2

Hydrograph type	= SCS Runoff	Peak discharge	= 5.94 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 7.390 ac	Curve number	= 75.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 24,703 cuft



Hydrograph Plot

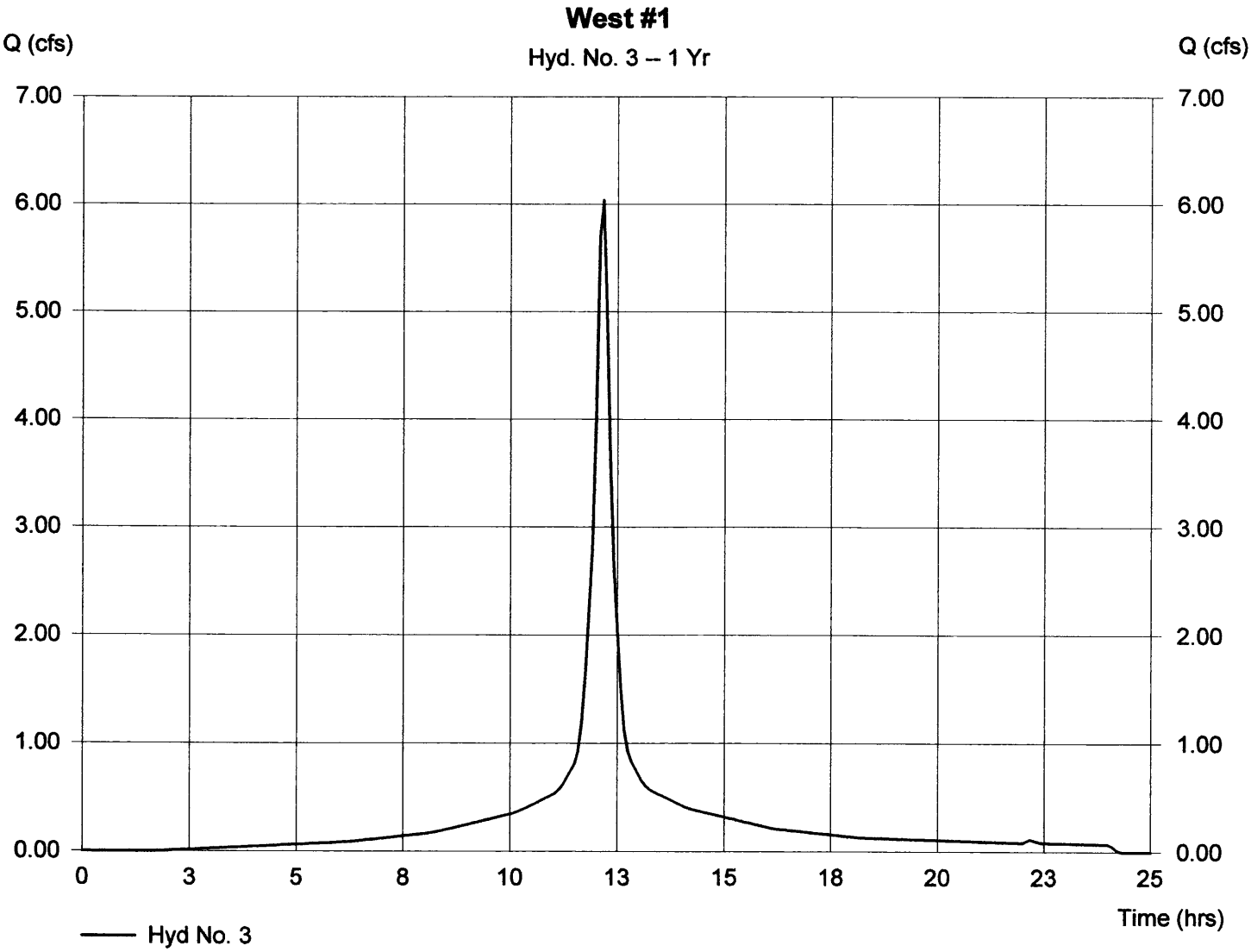
Hydraflow Hydrographs by Intelisolve | Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 3

West #1

Hydrograph type	= SCS Runoff	Peak discharge	= 6.04 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 2.880 ac	Curve number	= 97.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 26,805 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

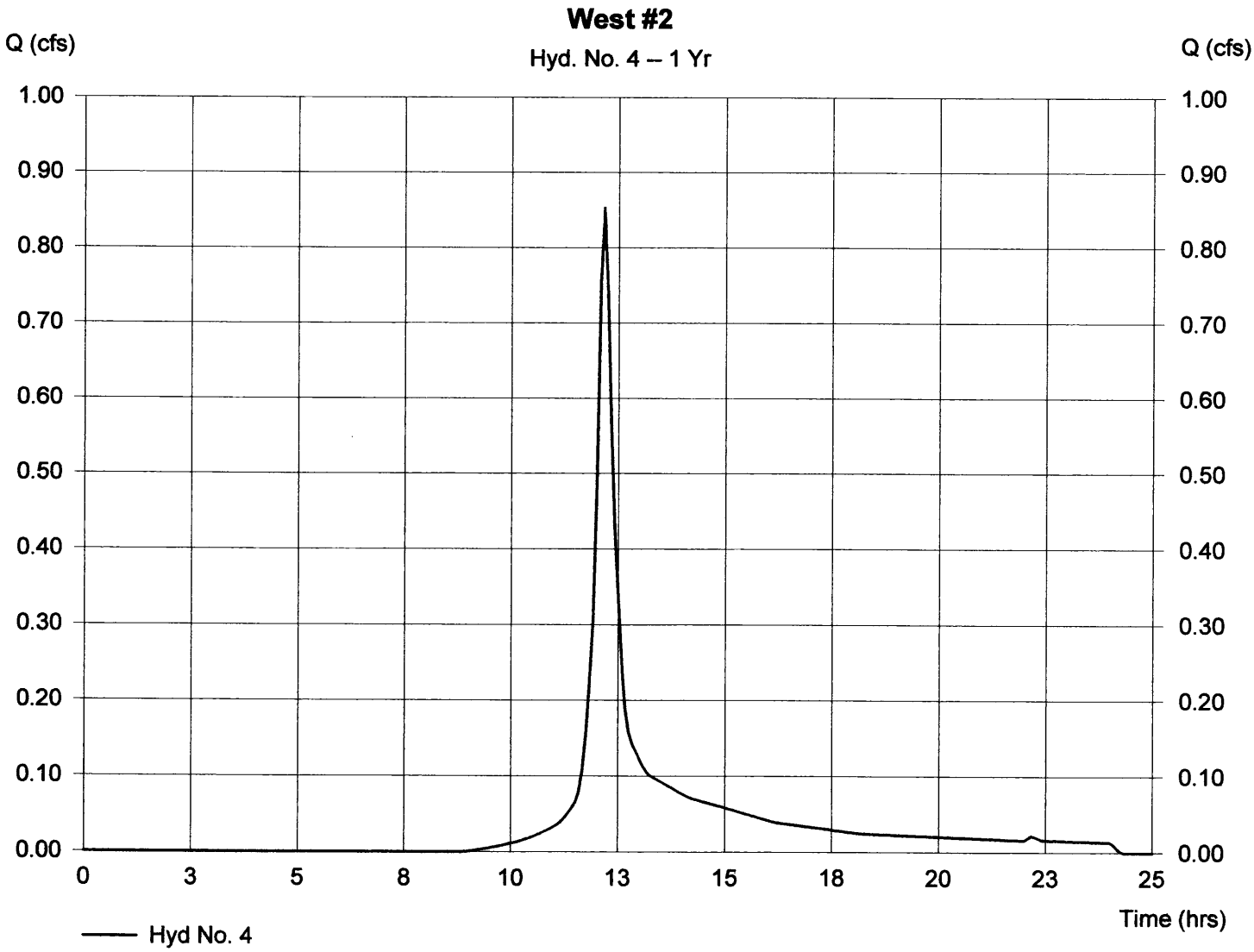
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 4

West #2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.85 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 0.690 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,397 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

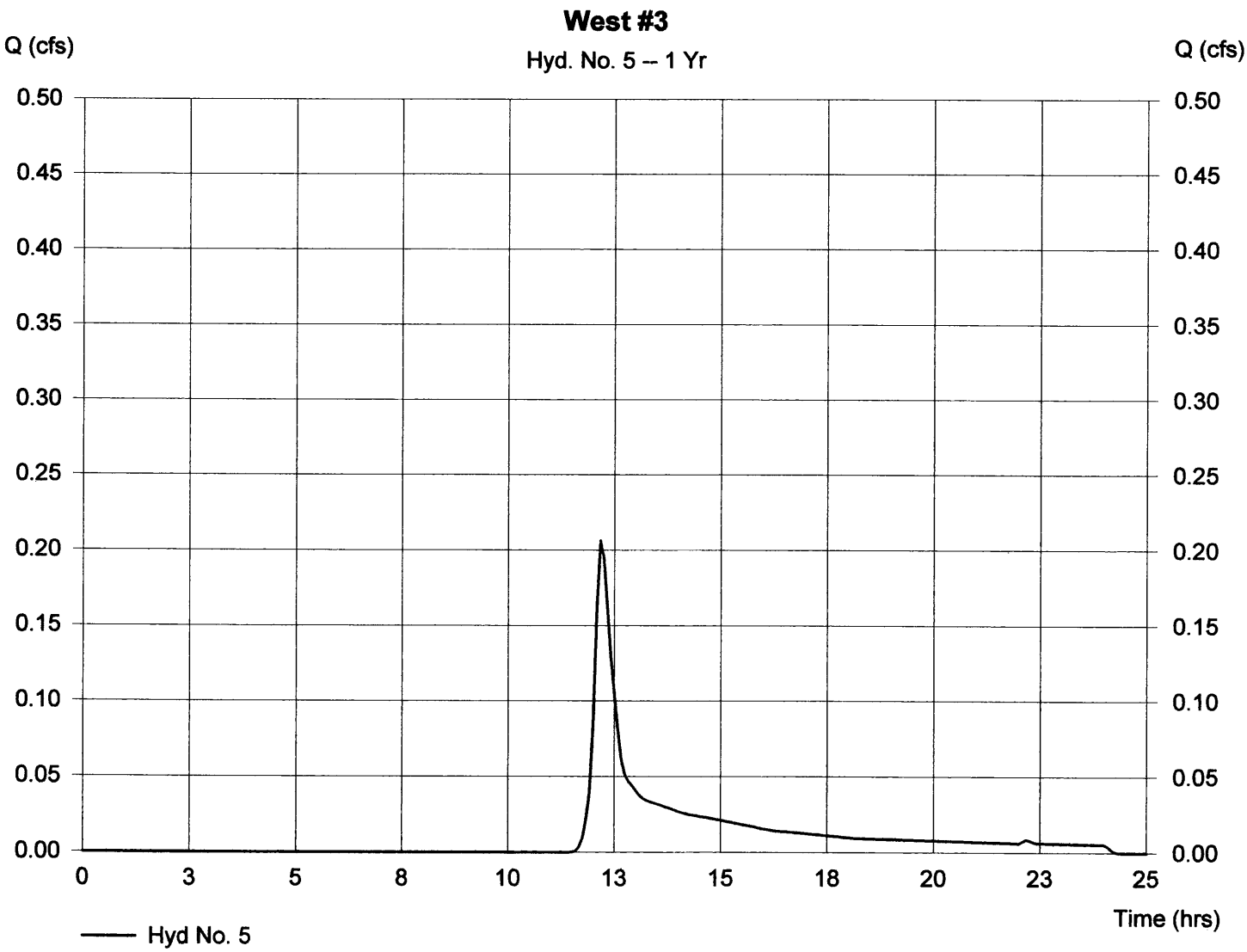
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 5

West #3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.21 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 0.400 ac	Curve number	= 69.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 948 cuft



Hydrograph Plot

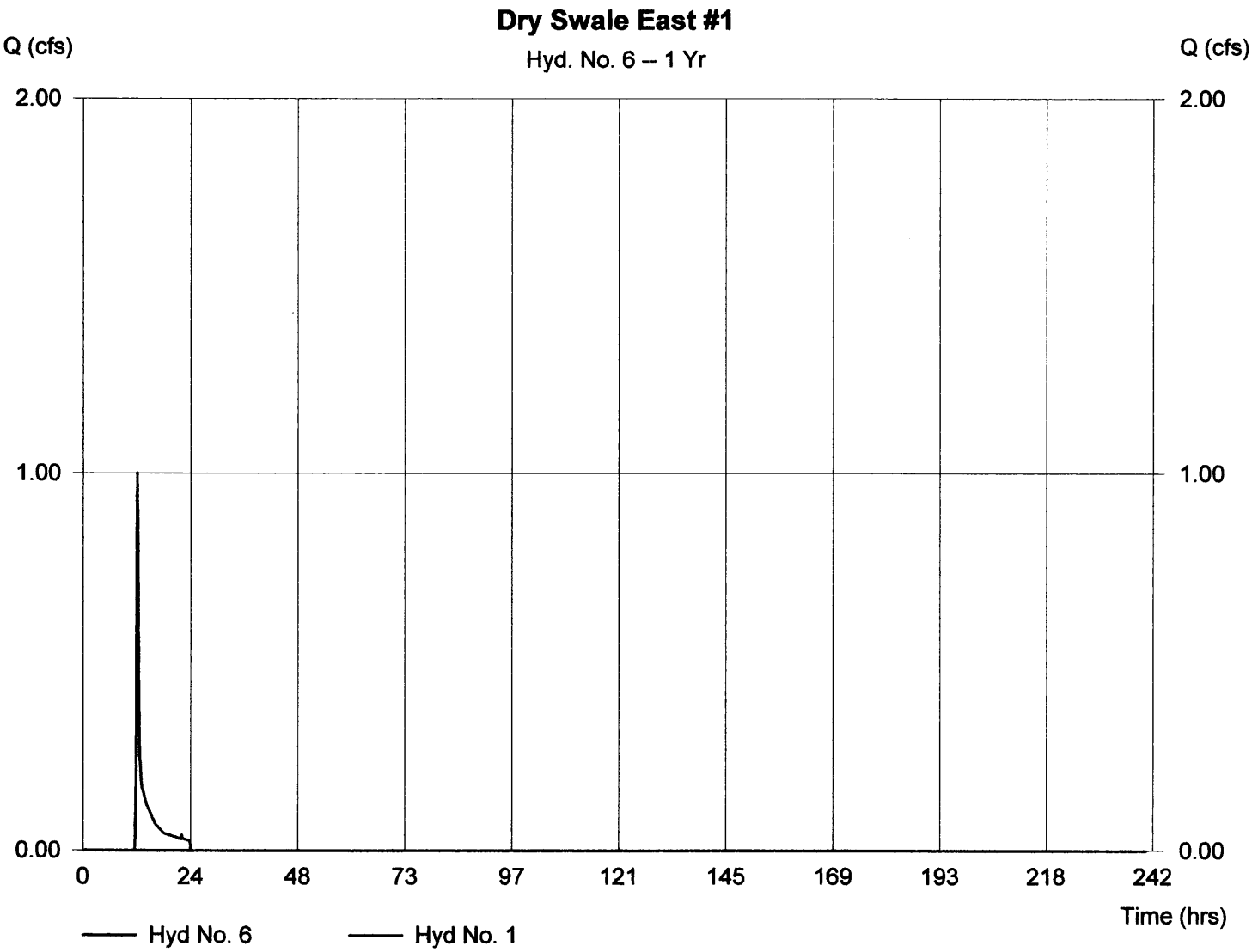
Hydraflow Hydrographs by Intelisolve | Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 6

Dry Swale East #1

Hydrograph type	= Reservoir	Peak discharge	= 0.00 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 1	Max. Elevation	= 574.29 ft
Reservoir name	= Dry Swale East #1	Max. Storage	= 4,597 cuft

Storage Indication method used. | Hydrograph Volume = 0 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 11:13 AM

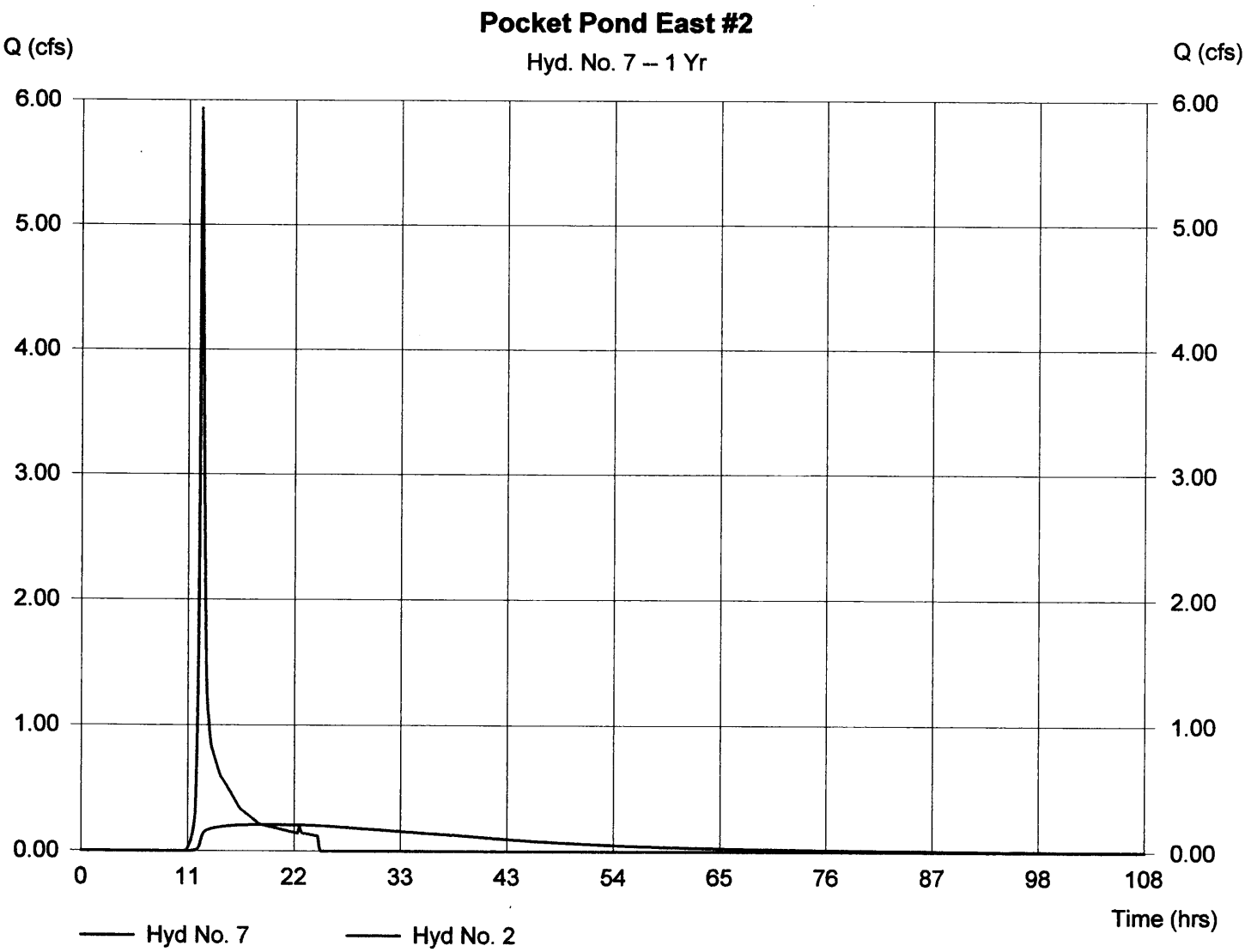
Hyd. No. 7

Pocket Pond East #2

Hydrograph type	= Reservoir	Peak discharge	= 0.21 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Max. Elevation	= 566.91 ft
Reservoir name	= Pocket Pond East #2	Max. Storage	= 17,005 cuft

Storage Indication method used.

Hydrograph Volume = 24,645 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 11:13 AM

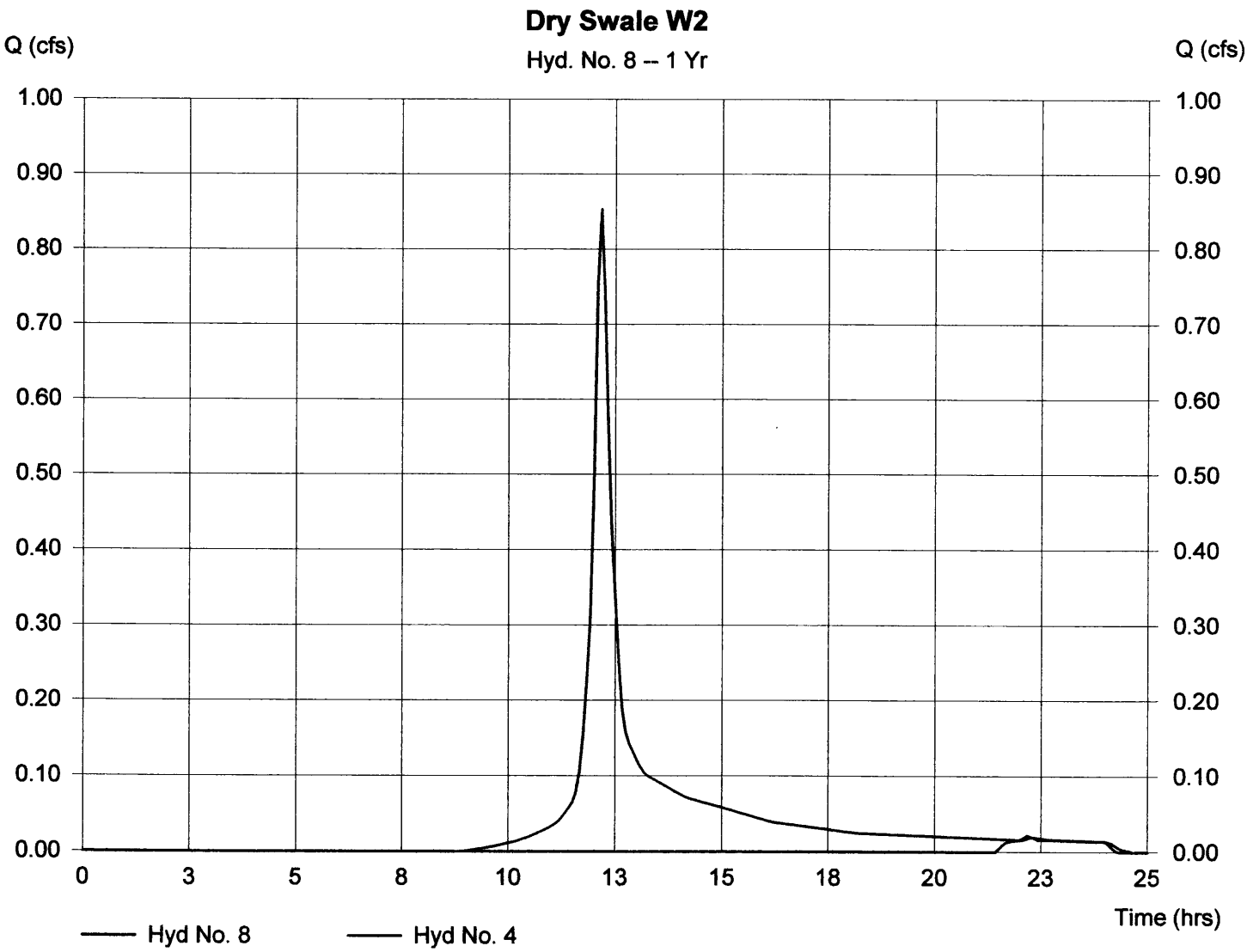
Hyd. No. 8

Dry Swale W2

Hydrograph type	= Reservoir	Peak discharge	= 0.02 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 4	Max. Elevation	= 577.70 ft
Reservoir name	= Dry Swale	Max. Storage	= 3,254 cuft

Storage Indication method used.

Hydrograph Volume = 154 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 11:13 AM

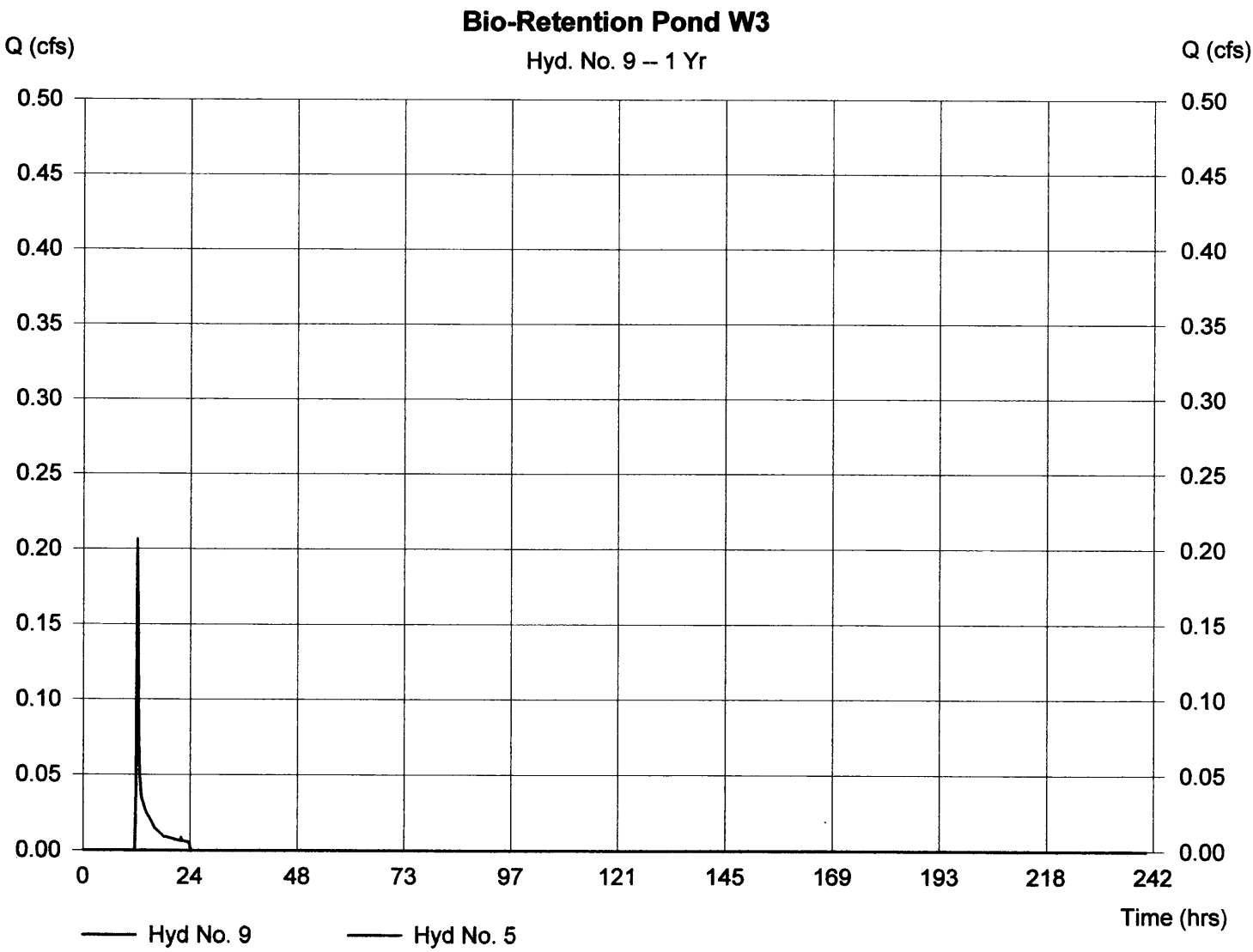
Hyd. No. 9

Bio-Retention Pond W3

Hydrograph type	= Reservoir	Peak discharge	= 0.00 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 5	Max. Elevation	= 582.42 ft
Reservoir name	= Bio-Retention Pond W3	Max. Storage	= 948 cuft

Storage Indication method used.

Hydrograph Volume = 0 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

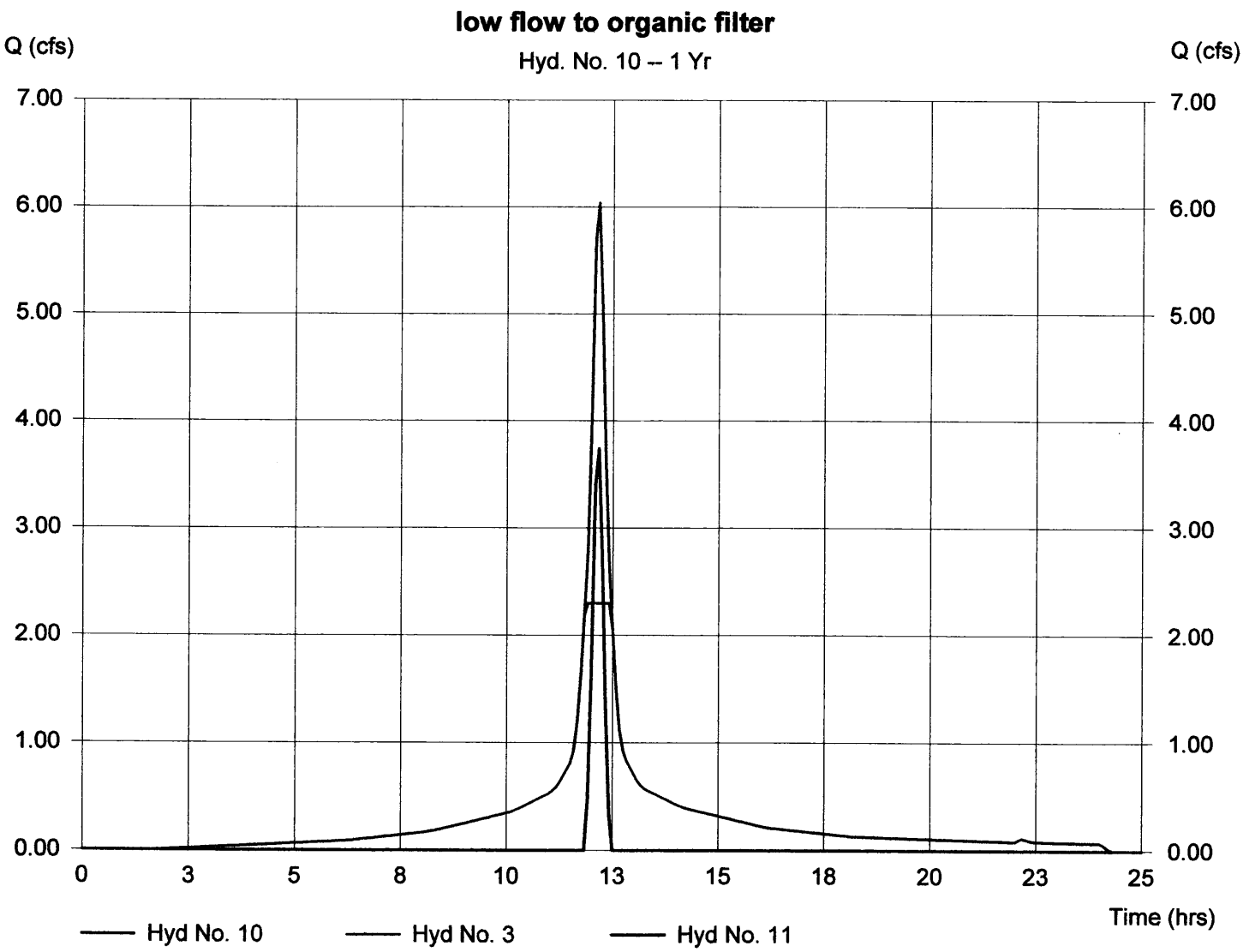
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 10

low flow to organic filter

Hydrograph type	= Diversion1	Peak discharge	= 2.30 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 22,691 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

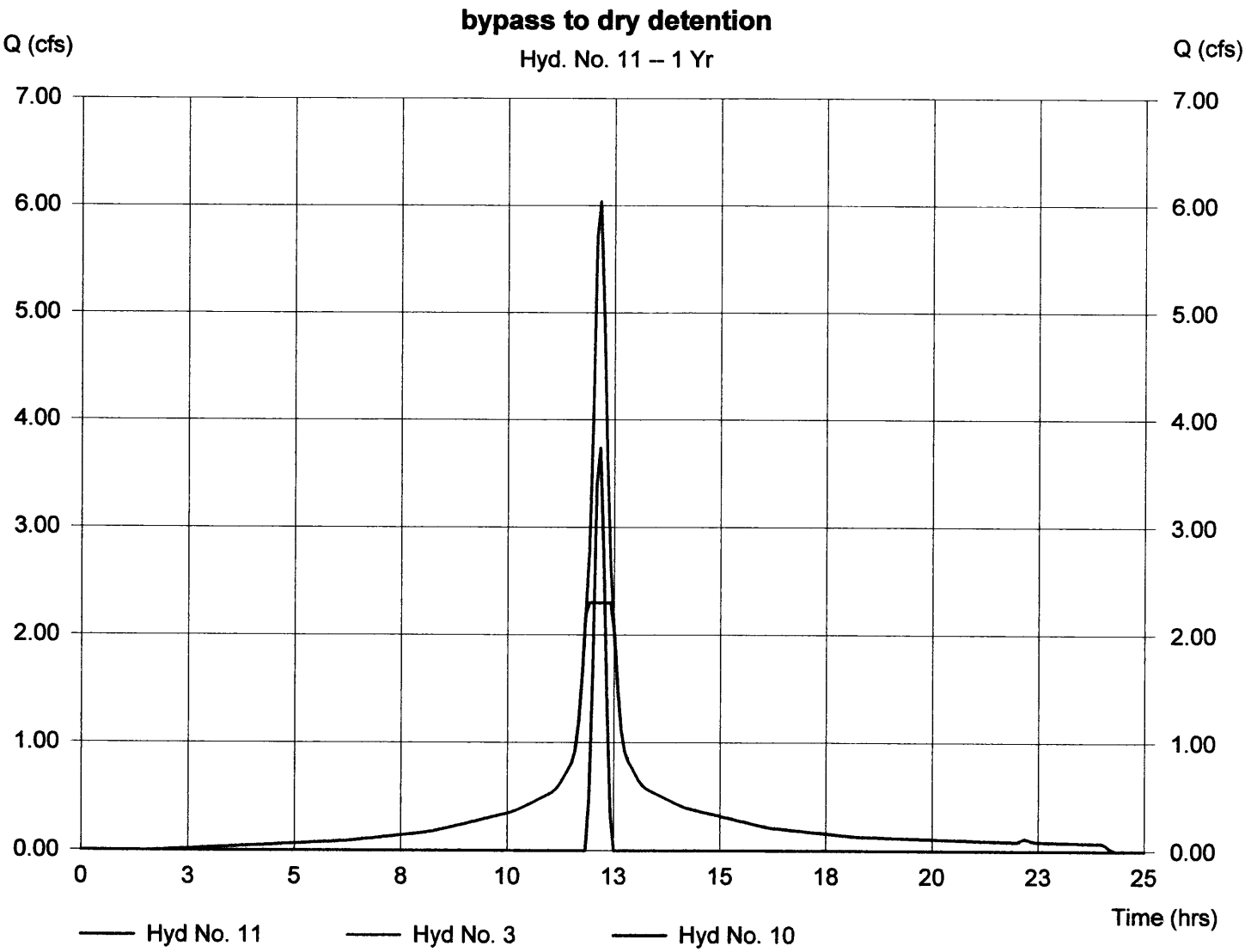
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 11

bypass to dry detention

Hydrograph type	= Diversion2	Peak discharge	= 3.74 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hydrograph	= 3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 2.30 cfs

Hydrograph Volume = 4,113 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 11:13 AM

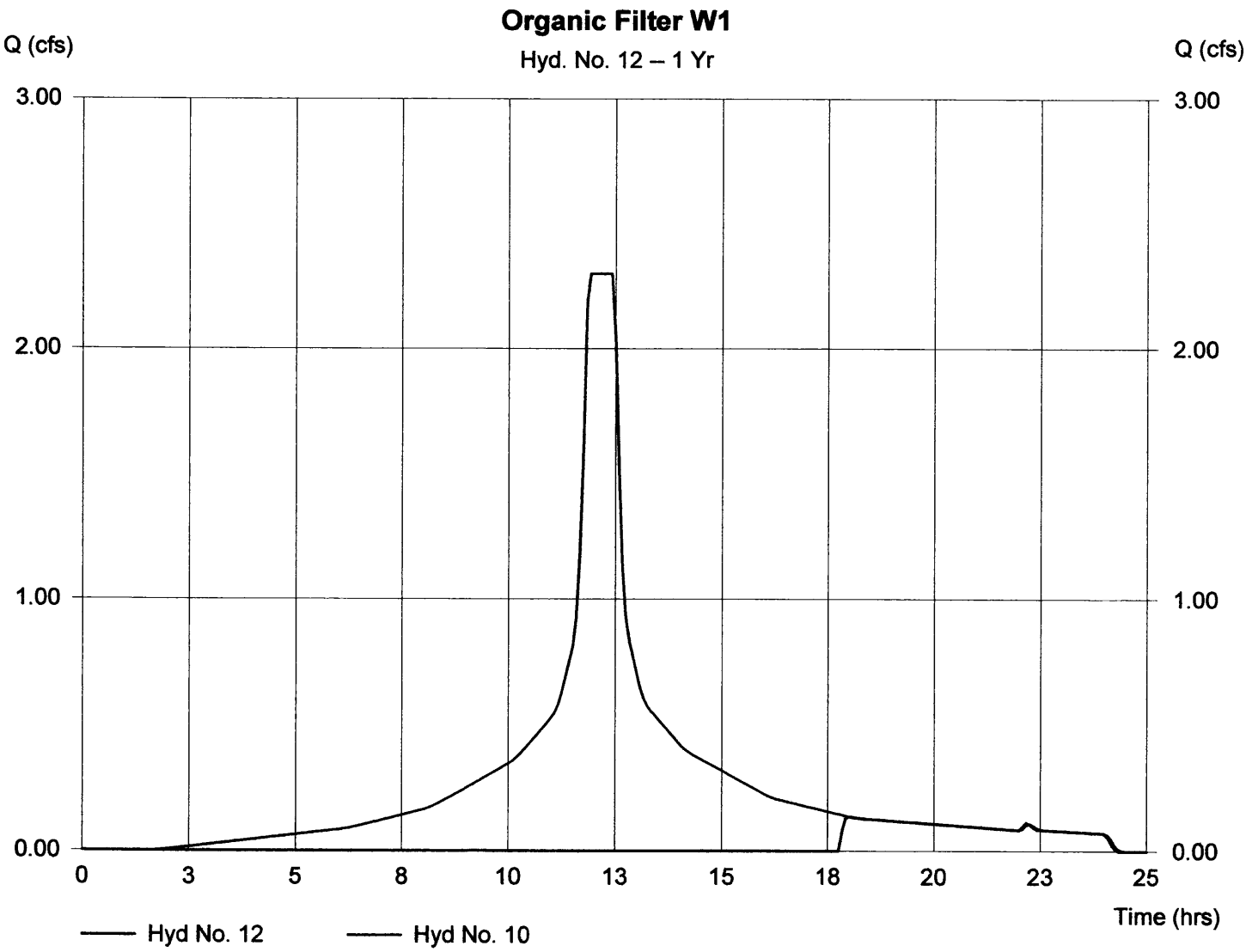
Hyd. No. 12

Organic Filter W1

Hydrograph type	= Reservoir	Peak discharge	= 0.14 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 10	Max. Elevation	= 570.00 ft
Reservoir name	= Organic Filter	Max. Storage	= 20,431 cuft

Storage Indication method used.

Hydrograph Volume = 2,291 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

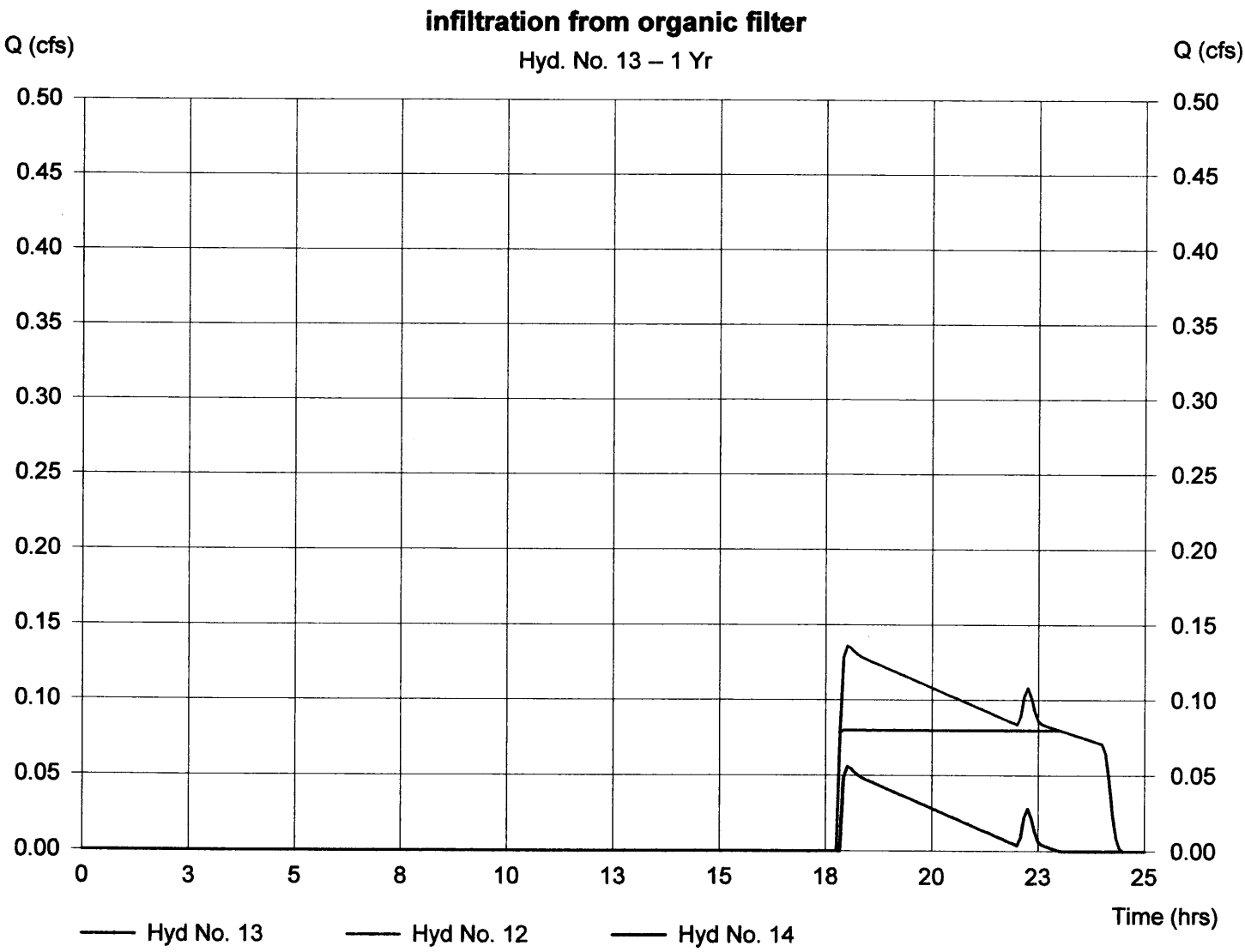
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 13

infiltration from organic filter

Hydrograph type	= Diversion1	Peak discharge	= 0.08 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hydrograph	= 12	2nd diverted hyd.	= 14
Diversion method	= Constant Q	Constant Q	= 0.08 cfs

Hydrograph Volume = 1,826 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

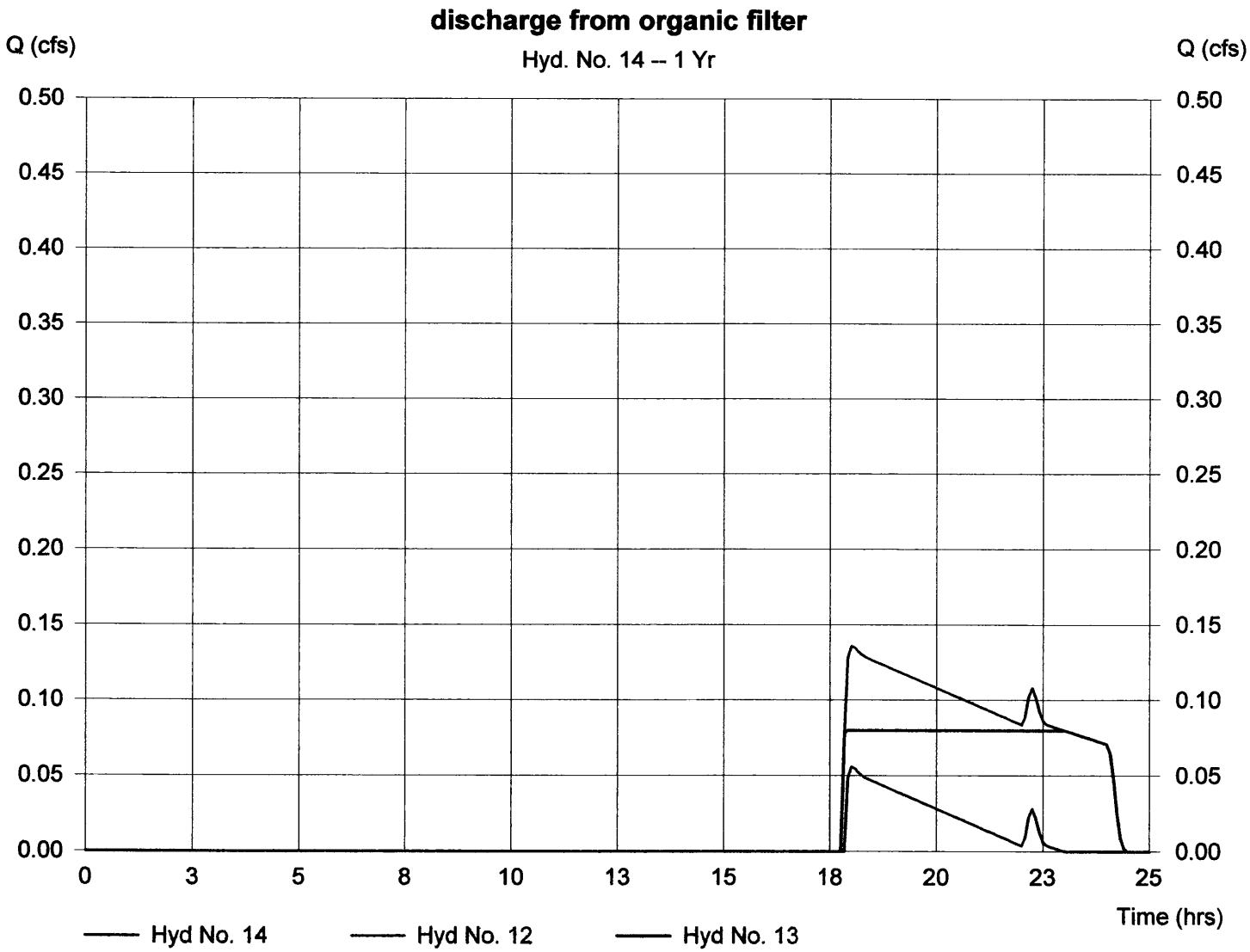
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 14

discharge from organic filter

Hydrograph type	= Diversion2	Peak discharge	= 0.06 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hydrograph	= 12	2nd diverted hyd.	= 13
Diversion method	= Constant Q	Constant Q	= 0.08 cfs

Hydrograph Volume = 465 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

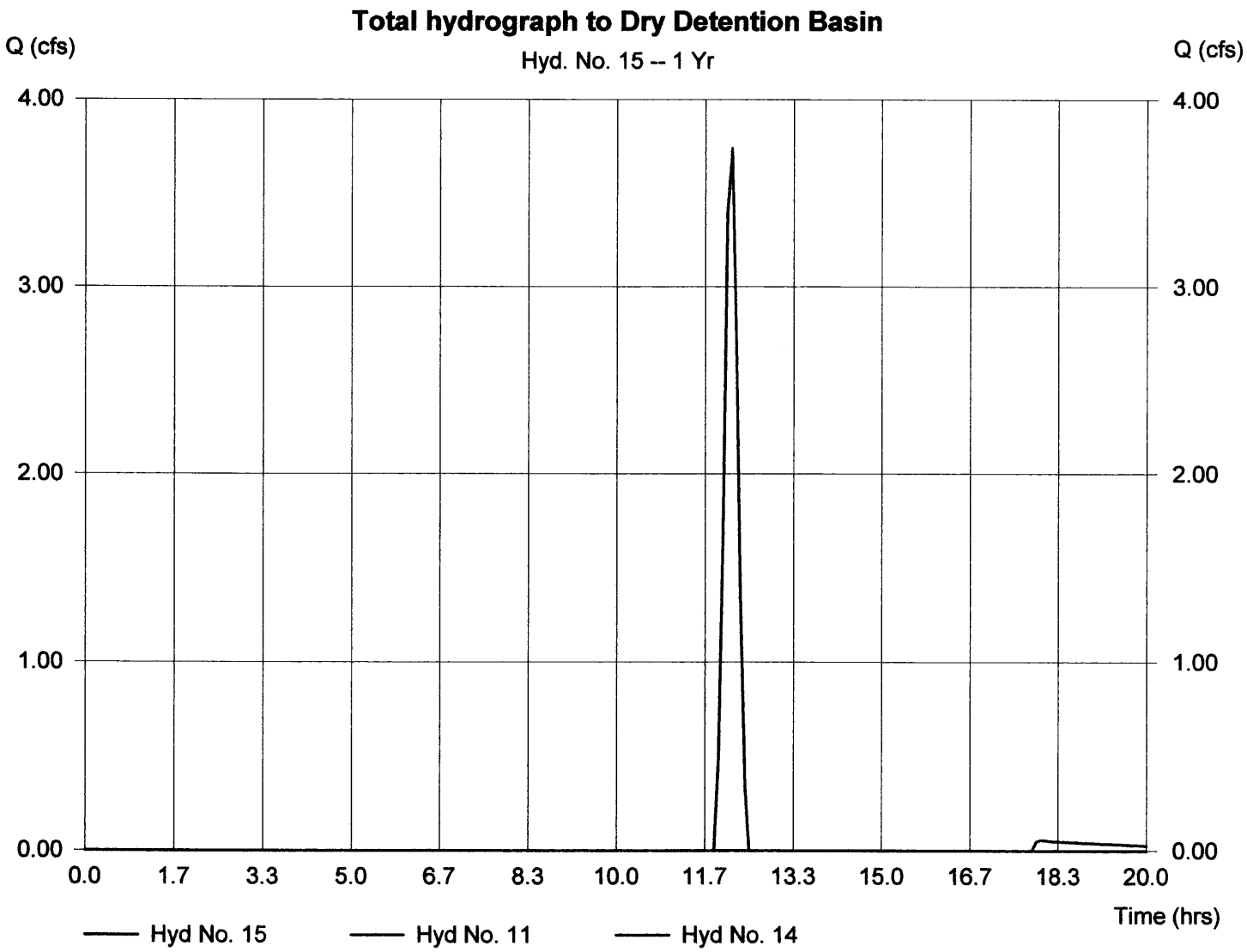
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 15

Total hydrograph to Dry Detention Basin

Hydrograph type	= Combine	Peak discharge	= 3.74 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 11, 14		

Hydrograph Volume = 4,578 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Nov 15 2005, 11:13 AM

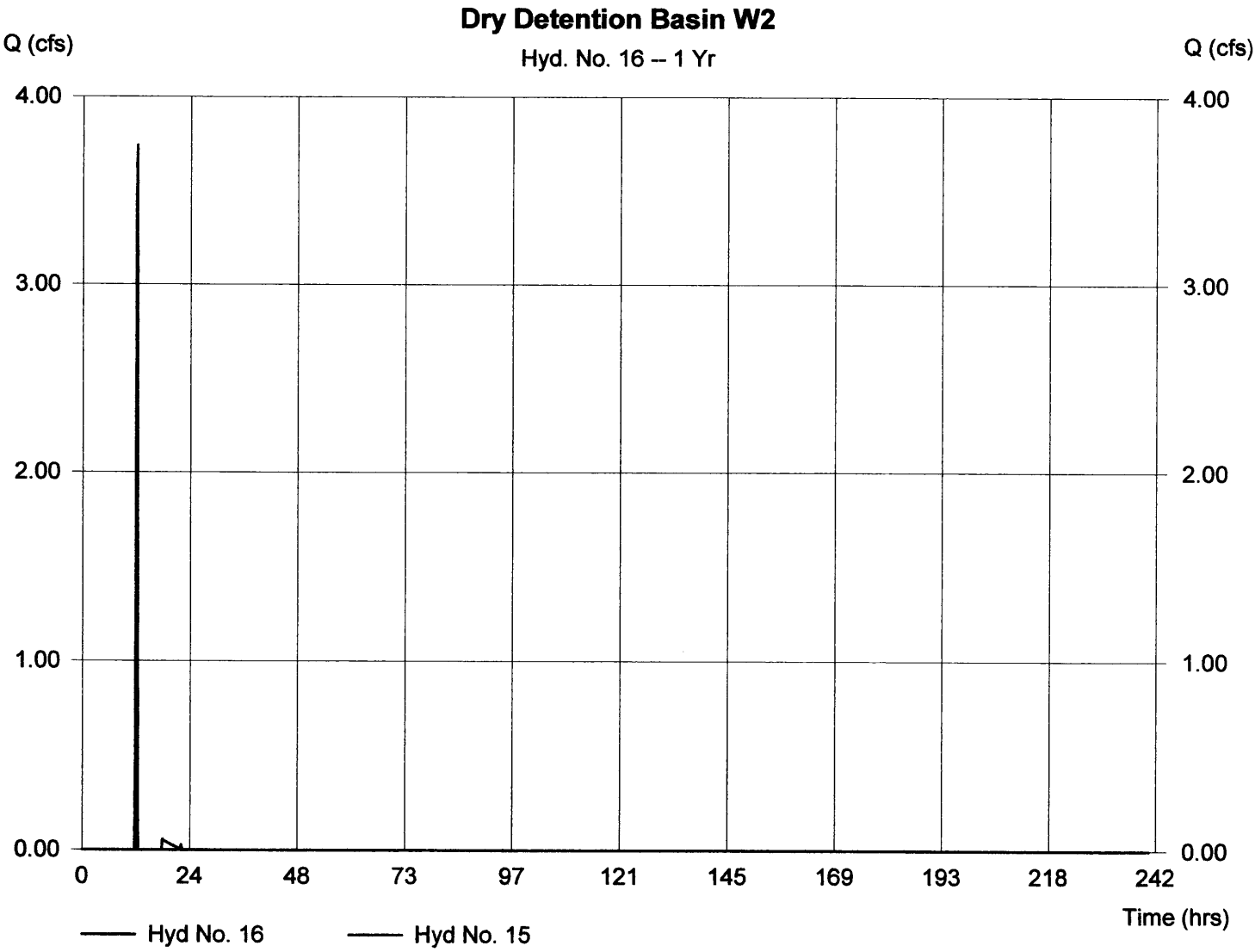
Hyd. No. 16

Dry Detention Basin W2

Hydrograph type	= Reservoir	Peak discharge	= 0.00 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 15	Max. Elevation	= 561.28 ft
Reservoir name	= Dry Detention Basin W1	Max. Storage	= 4,578 cuft

Storage Indication method used.

Hydrograph Volume = 0 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

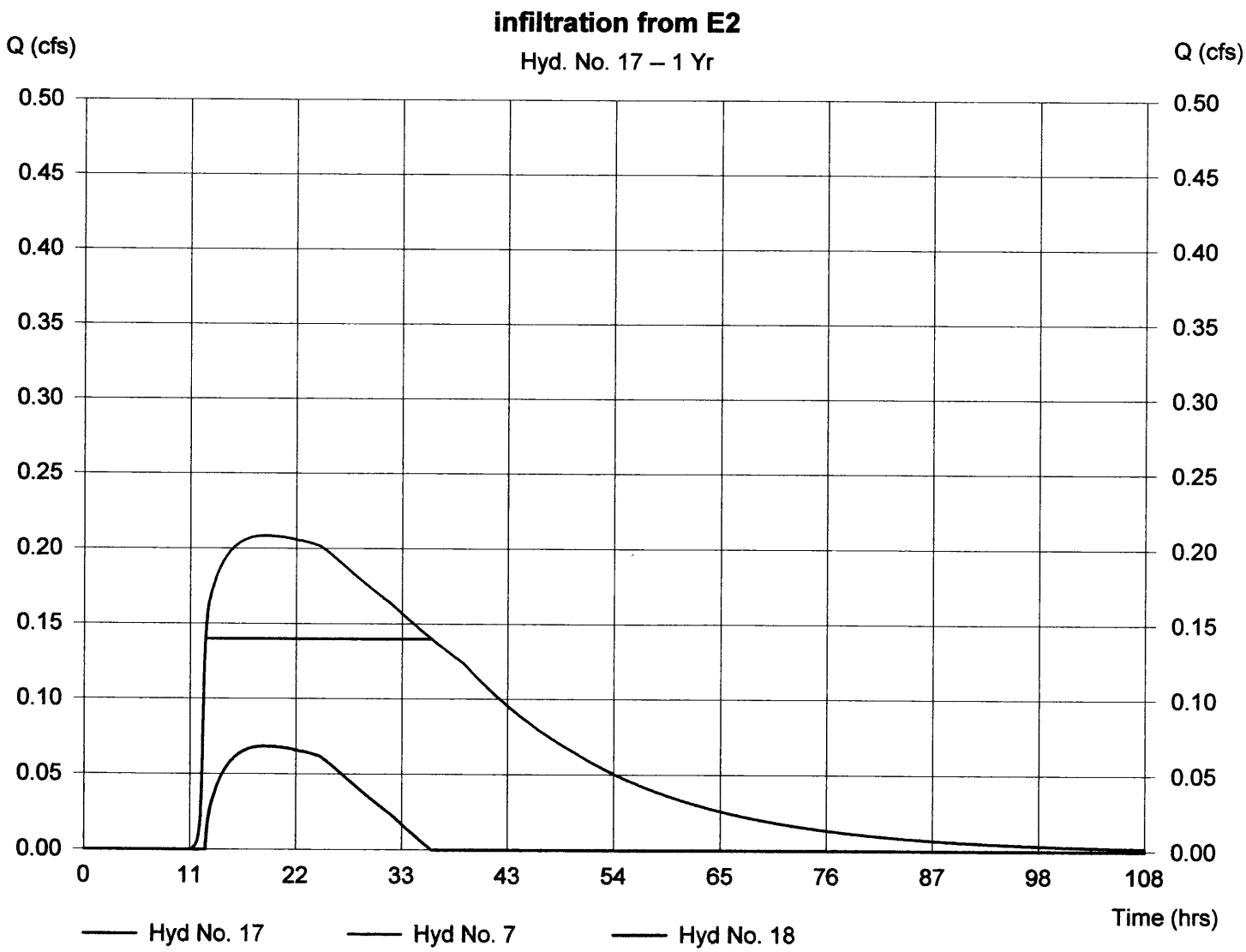
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 17

infiltration from E2

Hydrograph type	= Diversion1	Peak discharge	= 0.14 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hydrograph	= 7	2nd diverted hyd.	= 18
Diversion method	= Constant Q	Constant Q	= 0.14 cfs

Hydrograph Volume = 20,820 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

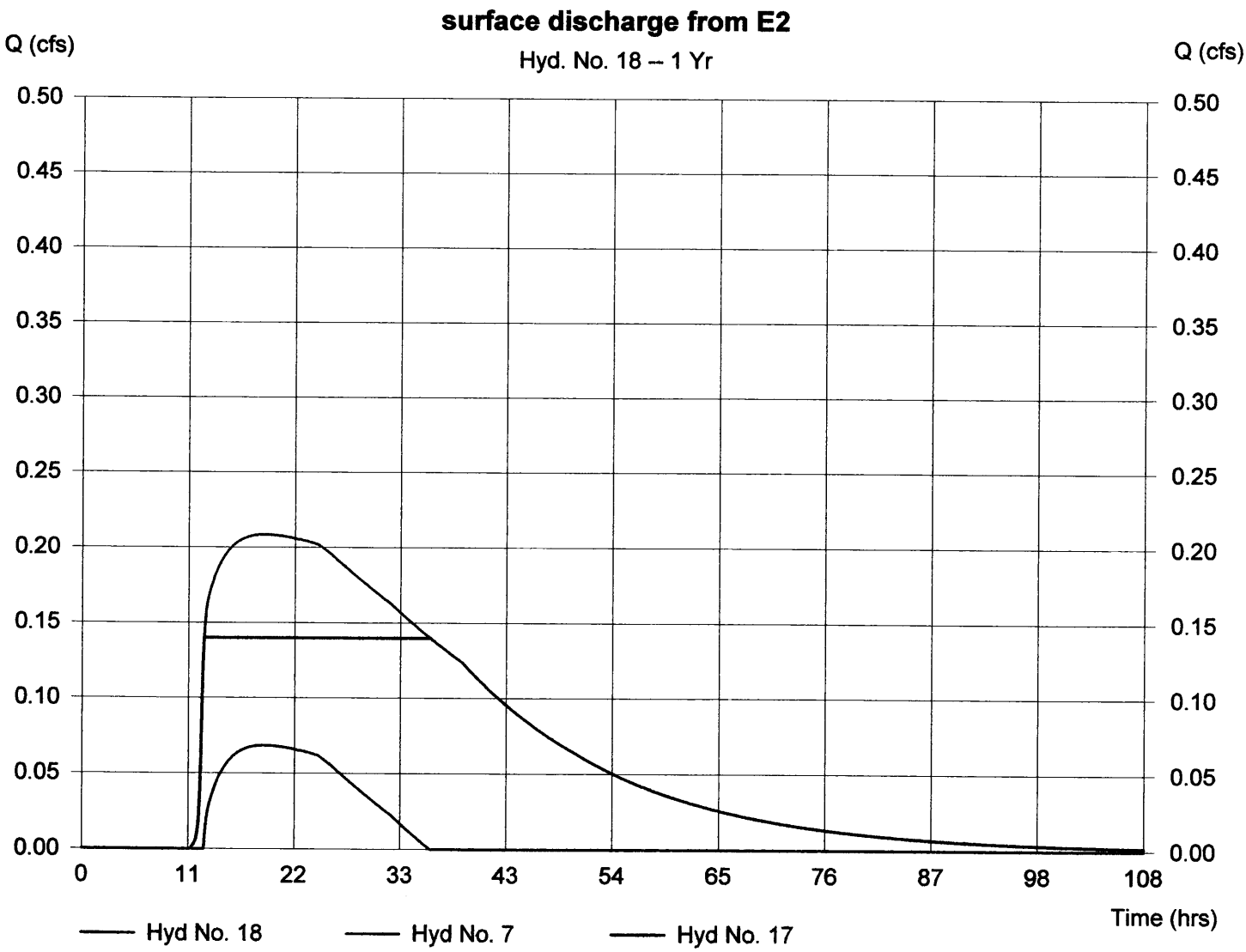
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 18

surface discharge from E2

Hydrograph type	= Diversion2	Peak discharge	= 0.07 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hydrograph	= 7	2nd diverted hyd.	= 17
Diversion method	= Constant Q	Constant Q	= 0.14 cfs

Hydrograph Volume = 3,825 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

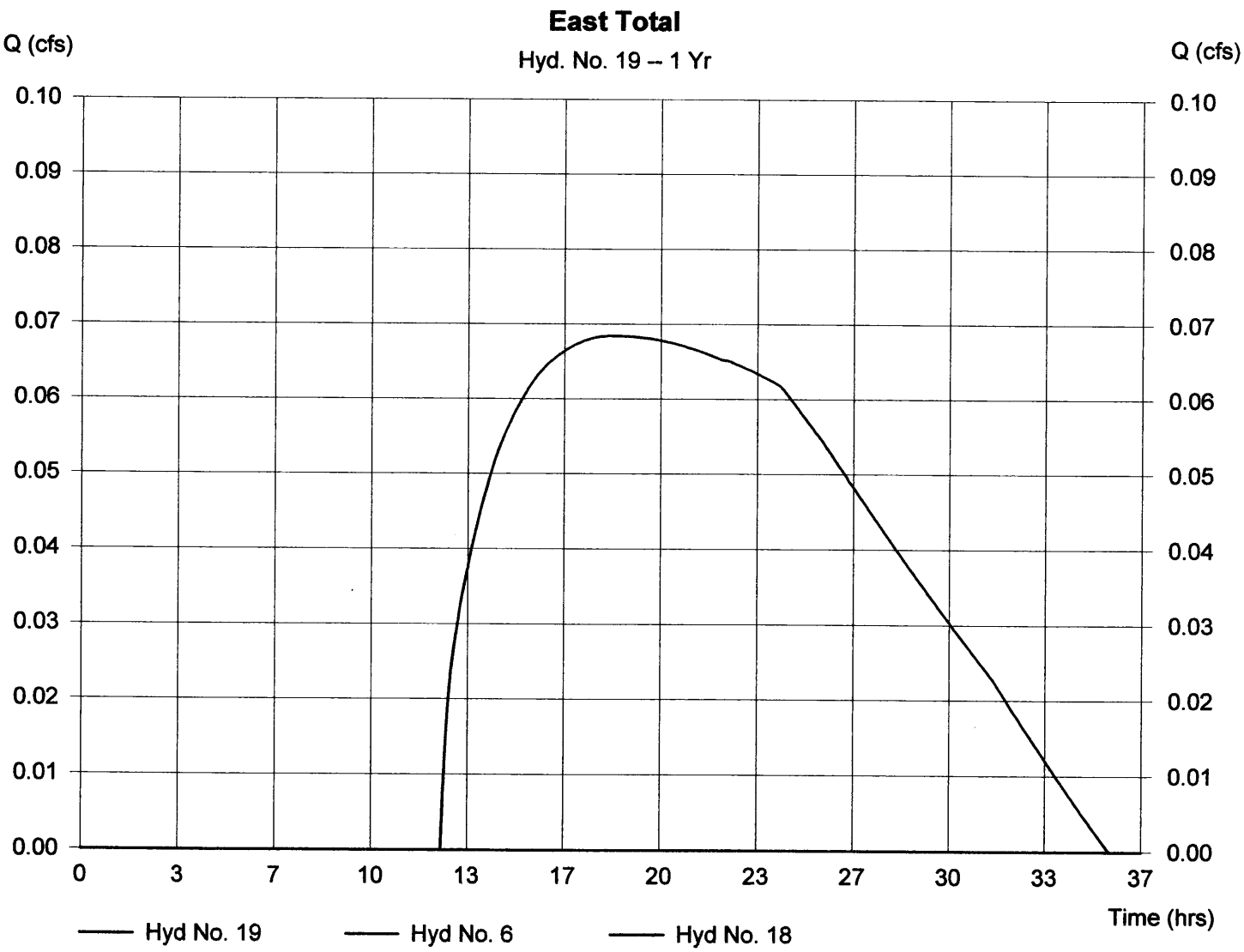
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 19

East Total

Hydrograph type	= Combine	Peak discharge	= 0.07 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 6, 18		

Hydrograph Volume = 3,825 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

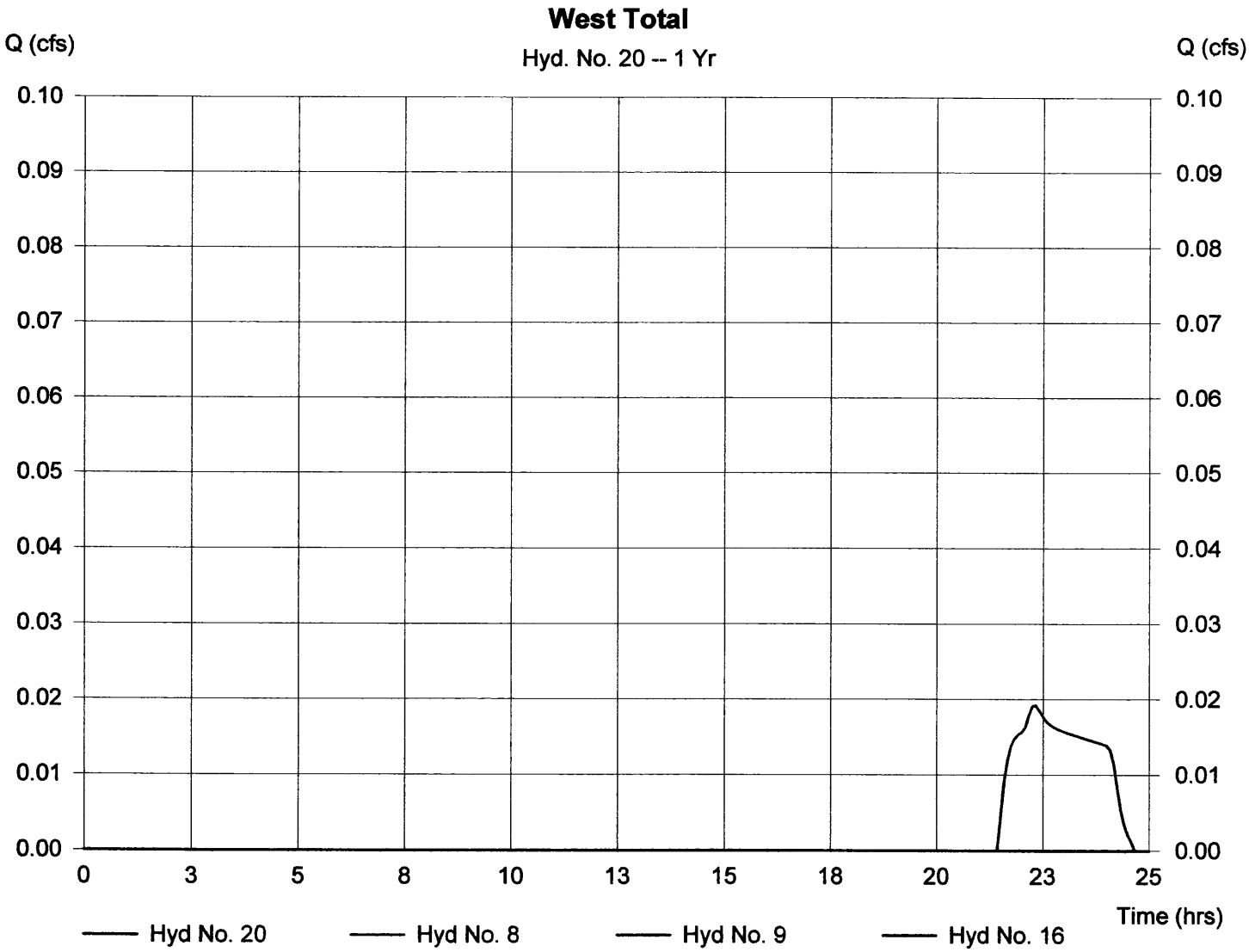
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 20

West Total

Hydrograph type	= Combine	Peak discharge	= 0.02 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 9, 16		

Hydrograph Volume = 154 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

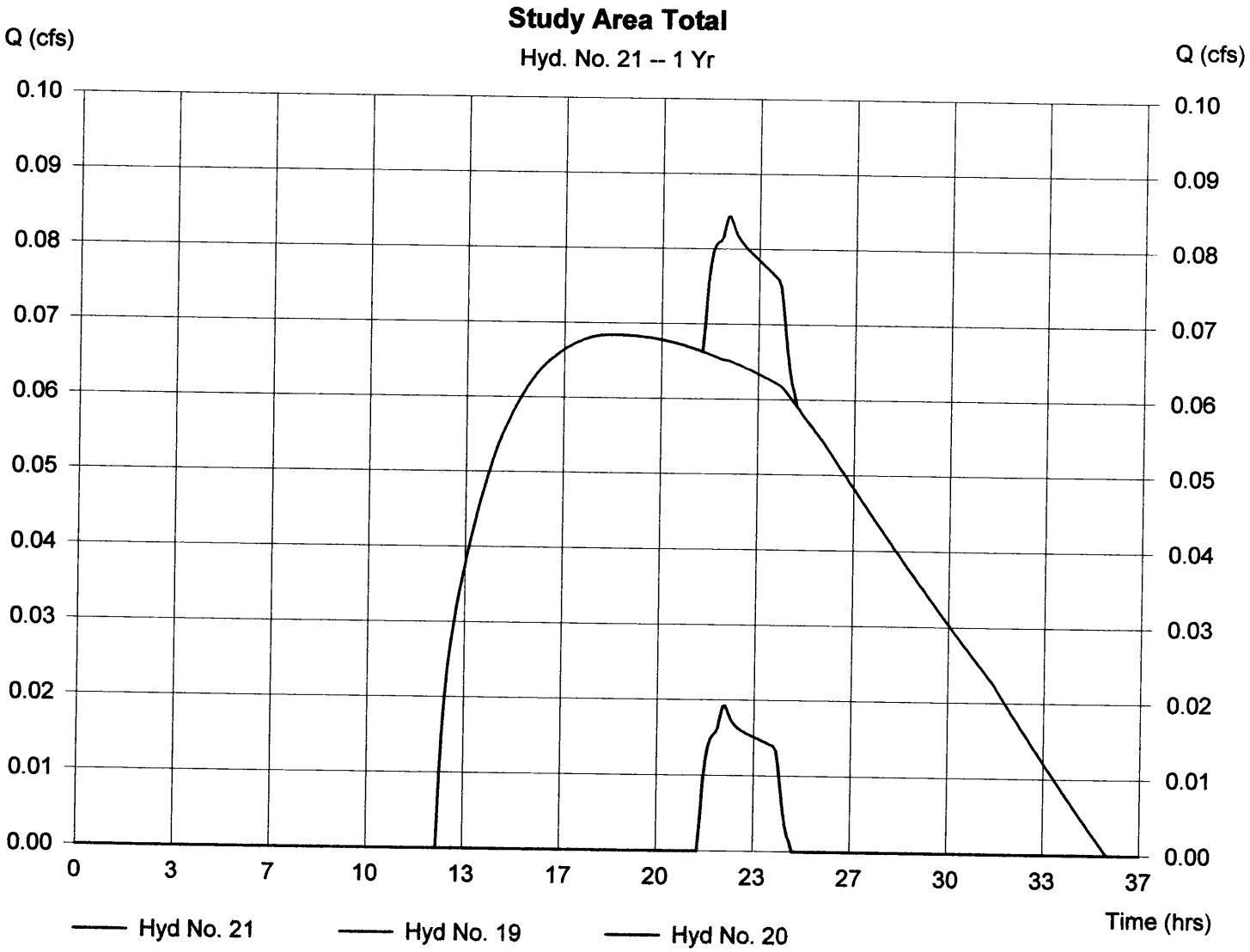
Tuesday, Nov 15 2005, 11:13 AM

Hyd. No. 21

Study Area Total

Hydrograph type	= Combine	Peak discharge	= 0.08 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 19, 20		

Hydrograph Volume = 3,979 cuft



Appendix G

STORMWATER POLLUTANT LOADINGS

STORMWATER POLLUTANT LOADINGS

THE FAIRGROUNDS

Town of Warwick

Orange County

New York

LEHMAN & GETZ, P.C.

CONSULTING ENGINEERS
17 River Street, Warwick, NY 10990
(845) 986-7737 phone (845) 986-0245 fax

Date: 7-25-06

L&G #1018

Introduction

This report is provided to supplement the Drainage Report previously submitted for the Fairgrounds, a proposed commercial project located on the north side of NYS Route 94 in the Town of Warwick. The project site is located within the watershed of the Wawayanda Creek, which flows southwest through Warwick toward its confluence with the Wallkill River in New Jersey. As discussed in the Drainage Report, runoff from the developed portions of the site will enter, following mitigation measures, on-site regulated wetlands. The wetland systems connect to environmentally sensitive offsite habitats that are located downstream of the project site.

The proposed stormwater mitigation measures will provide both hydrologic and water quality benefits. The hydrologic impacts and design considerations associated with the proposed development are covered in detail in the Drainage Report.

This report focuses on the water quality aspects of the Fairgrounds project. It provides estimates of annual stormwater pollutant loads for the following scenarios:

- Existing conditions
- Developed conditions, without mitigation
- Proposed conditions, with the proposed mitigation measures ("July 2006" plan)
- The development plan as shown in the 2005 DEIS report
- The development plan as shown in February 2006, reviewed by the US Fish & Wildlife Service (F&W)

The pollutant loading calculations have been developed using the Simple Method as described in Appendix A of the 2001 NYS Stormwater Management Design Manual.

Study Area & Mitigation Measures

The study area used for the analysis is similar to the area used in the Drainage Report. It includes five subbasins that drain to the proposed stormwater mitigation measures (a total of 13.3 acres), plus an additional 2.5 acres of existing cropland that will be removed from agricultural use and planted as a buffer to the nearby wetlands. This 2.5-acre area is designated as Area W1B under proposed conditions.

The subbasins are illustrated in Figures 1 and 2.

The following mitigation measures are proposed:

Subbasin E1:	pavement sweeping dry swale (NYSDEC Stormwater Manual designation O-1)
Subbasin E2:	pavement sweeping wet pond (P-2) Infiltration swale following the pond
Subbasin W1:	organic filter (F-4) dry detention / storage / infiltration
Subbasin W2:	pavement sweeping dry swale (O-1)
Subbasin W3:	pavement sweeping bioretention (F-3)

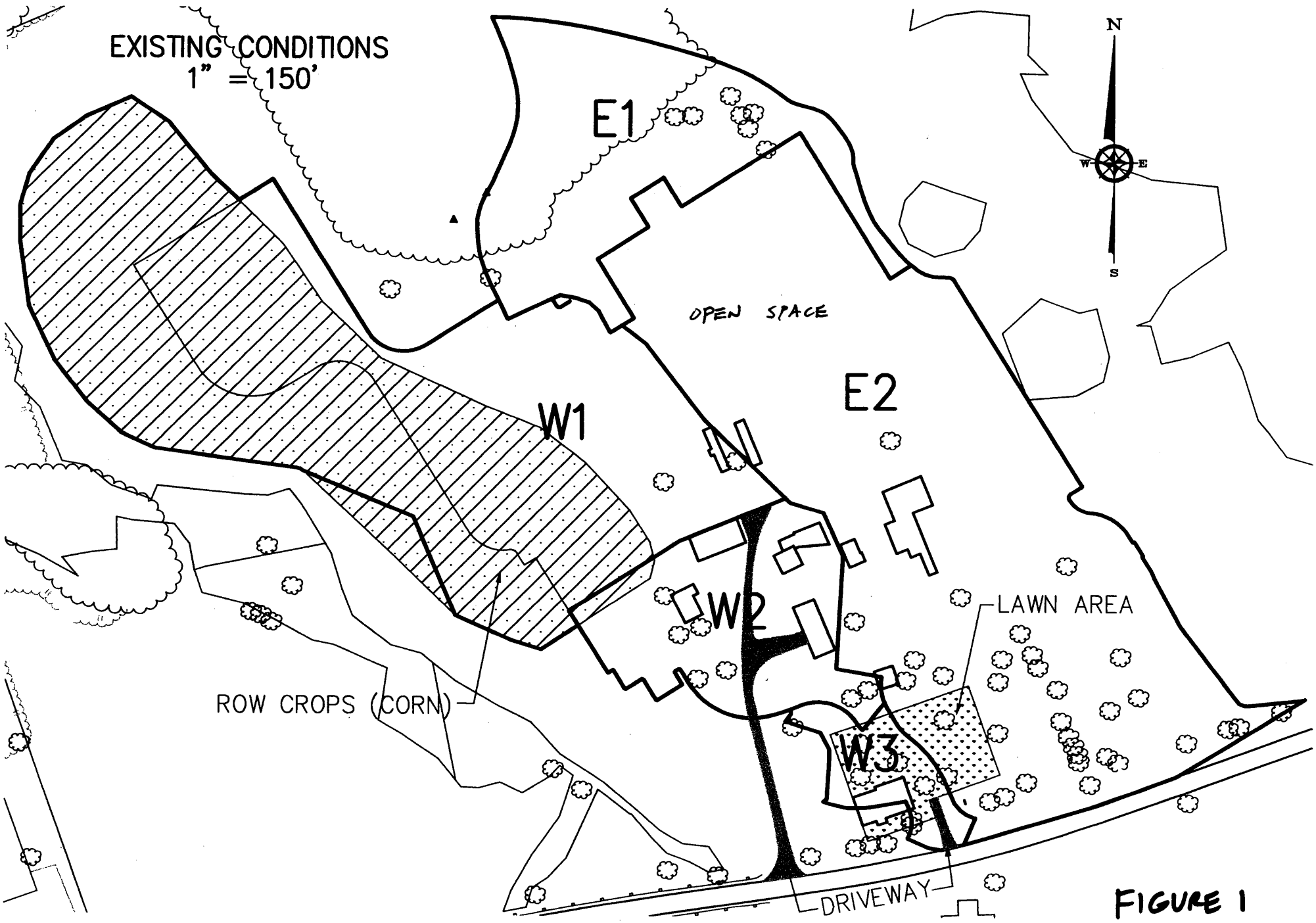

EXISTING CONDITIONS
1" = 150'
E1
OPEN SPACE
E2
W1
W2
W3
LAWN AREA
ROW CROPS (CORN)
DRIVEWAY
N
W
E
S

FIGURE 1

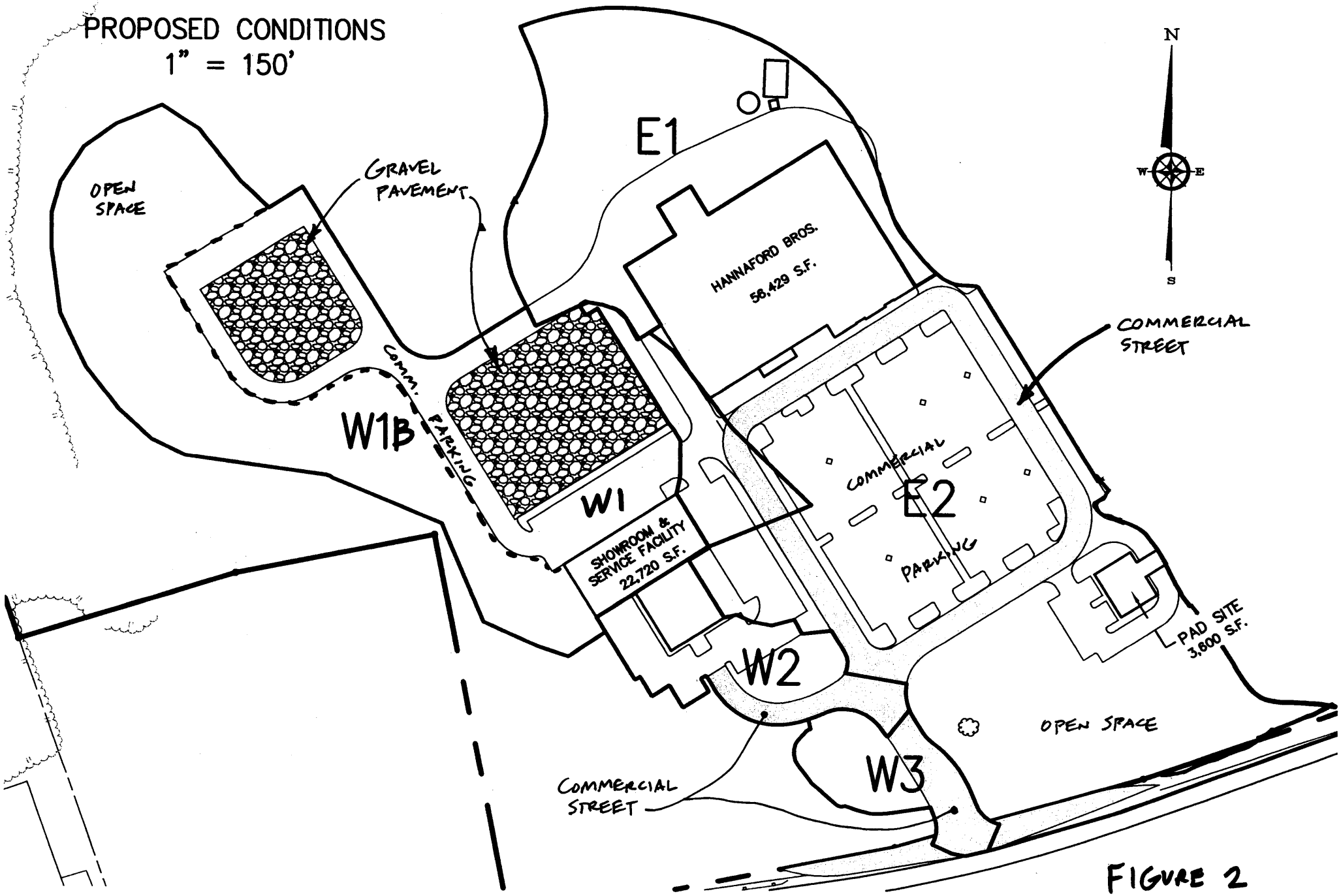

PROPOSED CONDITIONS
1" = 150'
N
W
E
S
OPEN SPACE
GRAVEL PAVEMENT
E1
HANNAFORD BROS.
56,429 S.F.
COMMERCIAL STREET
COMM. PARKING
W1B
W1
SHOWROOM & SERVICE FACILITY
22,720 S.F.
COMMERCIAL
E2
PARKING
PAD SITE
3,600 S.F.
W2
OPEN SPACE
W3
COMMERCIAL STREET

FIGURE 2

Stormwater Pollutant Concentrations

The expected mean concentrations (EMC's) input to the Simple Method were determined after consideration of various sources of information. The data available on some parameters, such as Total Suspended Solids and Total Phosphorus is abundant, although not necessarily consistent. For other pollutants, little data was found, so broader assumptions were needed.

The following hierarchy of data sources was used to input the data into the spreadsheets calculations included in Appendix 1:

1) 2001 NYS Stormwater Design Manual, Appendix A, Table A.2 (shown in red)

2) Findings from the National Stormwater Quality Database, Table 3, 2004 (shown in blue)

3) Nitrogen and Phosphorus Losses in Surface Water from the Indian Pine Watershed, Purdue University, 2000 (used for agricultural EMC data, shown in brown)

4) NYSDEC Stormwater Management Design Manual, Table 2.1, August 2003 (shown in green).

Chloride concentrations within paved areas to be treated with deicing materials in the cold weather were calculated using a weighted average of:

8 months at background levels: 10 mg/l
4 months at "snowmelt" levels: 116 mg/l

Weighted average = 45 mg/l

Removal Efficiencies of Mitigation Measures

Like the expected mean concentration data discussed previously, the available data on removal efficiencies is scattered and sometimes inconsistent. The efficiencies assigned to the spreadsheets in Appendix 1 are felt to be conservative, and were determined after searching for data from many sources.

Data from the stormwatercenter.net fact sheets was often used to estimate the removal rates.

A key parameter in the analysis is the estimated efficiency of the sweeping of paved surfaces. Recent research indicates that new technologies using vacuum trucks rather than mechanical sweepers can remove over 90 percent of total solids, and well over 50 percent of many other pollutants (Federal Highway Administration). Other sources predict lesser efficiencies, often in the range of 50 percent for solids and 15 to 55 percent for other pollutants. For this study, a value of 60 percent was utilized for TSS removal, and 40 percent for other non-soluble pollutants. The applicant is committed to regular sweeping (three times a week) using vacuum trucks on the driveways and paved parking areas at the Fairgrounds.

In Subbasin W1, all stormwater runoff, whether treated first by the organic filter or bypassing the organic filter, will be discharged to a dry detention basin. This basin has sufficient volume to store the entire water quality storm volume. As a result, pollutants will be discharged to surface waters only during the rare extreme runoff events. A removal rate of 90 percent was assigned to the dry detention basin.

In Subbasin E2, discharges from the wet pond will be treated by an infiltration swale. The volume of the swale is less than the water quality storm. An estimated removal rate of 20 percent was assigned to the infiltration swale.

Thermal Impacts

Due to the complex nature of the system, calculations for thermal impacts have not been prepared. However, the following mitigation measures and design changes are included in the current plan:

1. No runoff from impervious surfaces will be discharged directly to the ground surface. The proposed organic filter, dry swales, bioretention facility, and infiltration facilities will provide for moderation of temperatures by passing runoff through soils prior to discharge to the ground surface.

2. Approximately 1.35 acres of pervious gravel pavement will be constructed in the vehicle storage area in lieu of impervious pavement. This will significantly reduce runoff from a part of the site that is subject to direct sun without the benefit of shade trees.

3. With the exception of the bioretention facility, the discharge point from all basins is at least 100 feet from a wetland area. The vegetated buffer will promote cooling of warm runoff prior to its entering the wetlands. The proposed buffer plantings will increase the amount of shade provided.

Summary & Conclusions

The summary table on the following page provides a comparison of the computed annual pollutant loadings for existing conditions and for the three plans described in the Introduction. The results for the July 2006 plan indicate that the project will reduce the estimated Total Suspended Solids, Total Phosphorus, and fecal coliform loadings, have a minor effect on metals loadings, and create an increase in BOD, chlorides, and other pollutants released from the study area.

The results also indicate that the evolution of the development plan from the original DEIS plan to the present has reduced the potential for adverse water quality impacts. The impervious coverage has been reduced by approximately 26 percent, and the mitigation measures have been substantially increased.

A word of disclaimer is appropriate. Due to the number of generalizations and assumptions made in applying the Simple Method, it must be understood that all results are approximate. The results are useful for generating comparisons and general statements, but not exact predictions. In Appendix A to the 2001 Stormwater Manual, the DEC states that the Simple Method is meant for planning purposes only, not for design.

THE FAIRGROUNDS

	Existing Conditions	2005 DEIS Plan	FEB. 2006 F&W Plan	JULY 2006 PLAN
Area of Disturbance:		17.4 ac.	16.4 ac.	16.4 ac.
Impervious Area:	0.4 ac.	9.9 ac.	9.2 ac.	7.85 ac.

ESTIMATED POLLUTANT LOAD

PARAMETER	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
Total Suspended Solids	1,179	695	560	575
Total Phosphorus	8.4	4.4	3.2	3.1
Soluble Phosphorus	2.5	4.1	3.1	3.0
Total Nitrogen	41.2	66.3	58.9	57.8
Total Kjeldhal Nitrogen	23.5	52.1	46.0	45.1
Nitrite & Nitrate	12.8	20.4	17.0	16.4
Copper	1.1	1.1	1.0	1.0
Lead	0.4	1.1	1.0	1.0
Zinc	3.9	4.0	3.5	3.5
BOD5	99	422	345	338
COD	556	2234	1824	1788
Organic Carbon	195	435	358	351
Hydrocarbons	57	128	105	103
Oil & Grease	49	141	123	122
Chloride	502	1963	1487	1478
BACTERIA	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)
Fecal Coliform	463,320	148,479	94,432	95,302
Fecal Strep	282,226	562,850	342,011	327,012

lbs/yr = pounds per year
BC/yr = Billion colonies per year

APPENDIX 1

Simple Method Calculations

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

PARAMETER	SUBBASIN E1 (lbs/yr)	E2 (lbs/yr)	W1 (lbs/yr)	W2 (lbs/yr)	W3 (lbs/yr)	STUDY AREA TOTALS Existing Conditions (lbs/yr)	Developed Conditions Without Mitigation (lbs/yr)	Proposed Conditions With Mitigation (lbs/yr)
Total Suspended Solids								
- Existing conditions	**50**	**636**	**165**	**219**	**110**	**1,179**		
- Developed conditions without mitigation	229	4796	446	992	954		7,417	
- Proposed conditions with mitigation	22	325	53	80	96			575
Total Phosphorus								
- Existing conditions	**0.3**	**2.7**	**4.1**	**0.9**	**0.4**	**8.4**		
- Developed conditions without mitigation	1.3	7.9	2.9	0.9	0.5		13.6	
- Proposed conditions with mitigation	0.2	2.3	0.4	0.1	0.2			3.1
Soluble Phosphorus								
- Existing conditions	**0.2**	**1.1**	**0.7**	**0.3**	**0.1**	**2.5**		
- Developed conditions without mitigation	1.0	5.4	2.2	0.6	0.2		9.4	
- Proposed conditions with mitigation	0.2	2.3	0.3	0.1	0.2			3.0
Total Nitrogen								
- Existing conditions	**2.7**	**15.7**	**15.3**	**5.4**	**2.1**	**41.2**		
- Developed conditions without mitigation	16.2	96.0	38.7	10.0	4.3		165.2	
- Proposed conditions with mitigation	7.5	39.3	5.4	4.3	1.3			57.8
Total Kjeldhal Nitrogen								
- Existing conditions	**0.8**	**7.1**	**11.2**	**3.6**	**0.8**	**23.5**		
- Developed conditions without mitigation	12.7	76.0	31.7	8.1	3.3		131.8	
- Proposed conditions with mitigation	5.6	30.6	4.5	3.4	1.0			45.1
Nitrite & Nitrate								
- Existing conditions	**0.8**	**4.4**	**5.4**	**1.8**	**0.4**	**12.8**		
- Developed conditions without mitigation	5.1	29.2	11.9	3.1	1.3		50.5	
- Proposed conditions with mitigation	2.3	10.1	2.1	1.3	0.5			16.4
Copper								
- Existing conditions	**0.1**	**0.4**	**0.4**	**0.1**	**0.0**	**1.1**		
- Developed conditions without mitigation	0.4	2.2	0.8	0.3	0.2		3.9	
- Proposed conditions with mitigation	0.1	0.6	0.1	0.1	0.0			1.0
Lead								
- Existing conditions	**0.0**	**0.2**	**0.1**	**0.0**	**0.0**	**0.4**		
- Developed conditions without mitigation	0.4	2.4	0.5	0.4	0.3		4.1	
- Proposed conditions with mitigation	0.1	0.6	0.1	0.1	0.1			1.0
Zinc								
- Existing conditions	**0.4**	**1.6**	**1.1**	**0.7**	**0.1**	**3.9**		
- Developed conditions without mitigation	1.3	7.7	3.3	0.5	0.1		13.1	
- Proposed conditions with mitigation	0.5	2.5	0.3	0.2	0.0			3.5
BOD5								
- Existing conditions	**6**	**47**	**18**	**22**	**5**	**99**		
- Developed conditions without mitigation	94	565	236	60	25		980	
- Proposed conditions with mitigation	42	227	33	25	11			338
COD								
- Existing conditions	**28**	**269**	**94**	**134**	**31**	**556**		
- Developed conditions without mitigation	498	2989	1248	319	131		5,184	
- Proposed conditions with mitigation	220	1200	177	135	56			1,788
Organic Carbon								
- Existing conditions	**16**	**87**	**49**	**35**	**8**	**195**		
- Developed conditions without mitigation	100	578	236	61	26		1,002	
- Proposed conditions with mitigation	46	234	34	26	11			351

7/25/06

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

PARAMETER	SUBBASIN E1 (lbs/yr)	E2 (lbs/yr)	W1 (lbs/yr)	W2 (lbs/yr)	W3 (lbs/yr)	STUDY AREA TOTALS Existing Conditions (lbs/yr)	Developed Conditions Without Mitigation (lbs/yr)	Proposed Conditions With Mitigation (lbs/yr)
Hydrocarbons								
- Existing conditions	**5**	**26**	**14**	**10**	**2**	**57**		
- Developed conditions without mitigation	29	170	69	18	8		295	
- Proposed conditions with mitigation	14	69	10	8	3			103
Oil & Grease								
- Existing conditions	**4**	**22**	**12**	**9**	**2**	**49**		
- Developed conditions without mitigation	25	146	69	15	6		262	
- Proposed conditions with mitigation	17	84	8	9	3			122
Chloride								
- Existing conditions	**13**	**288**	**52**	**131**	**17**	**502**		
- Developed conditions without mitigation	396	1,928	198	267	109		2,898	
- Proposed conditions with mitigation	242	973	35	161	66			1,478
BACTERIA	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)
Fecal Coliform								
- Existing conditions	**57,476**	**187,441**	**169,673**	**41,694**	**7,036**	**463,320**		
- Developed conditions without mitigation	40,209	147,625	32,278	18,141	16,725		254,978	
- Proposed conditions with mitigation	37,831	29,039	3,247	12,899	12,287			95,302
Fecal Strep								
- Existing conditions	**21,645**	**133,964**	**66,797**	**47,123**	**12,696**	**282,226**		
- Developed conditions without mitigation	135,972	783,999	292,228	82,952	34,854		1,330,005	
- Proposed conditions with mitigation	89,210	136,235	29,278	50,530	21,760			327,012

BC/yr = Billion colonies per year

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN E1
EXISTING CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	Buidling	Driveway	Lawn	Row Crops	Open Space / Landscaping	Total
Area (ac):	0.00	0.00	0.00	0.00	1.94	**1.94**
Imperviousness (%):					2	
Runoff Coefficient, Rv:					0.068	
Annual Runoff, R (in.):					3.06	

BACTERIA	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	**L (lbs/yr)**
Total Suspended Solids									37	50	**50**
Total Phosphorus									0.25	0.3	**0.3**
Soluble Phosphorus									0.17	0.2	**0.2**
Total Nitrogen									2.0	2.7	**2.7**
Total Kjeldhal Nitrogen									0.6	0.8	**0.8**
Nitrite & Nitrate									0.6	0.8	**0.8**
Copper									0.094	0.1	**0.1**
Lead									0.029	0.0	**0.0**
Zinc									0.263	0.4	**0.4**
BOD5									4.2	5.6	**6**
COD									21	28.2	**28**
Organic Carbon									11.9	16.0	**16**
Hydrocarbons									3.5	4.7	**5**
Oil & Grease									3.0	4.0	**4**
Chloride									10	13.4	**13**

BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	**L (BC/yr)**
Fecal Coliform									94	57,476	**57476**
Fecal Strep									35.4	21,645	**21645**

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN E2
EXISTING CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	Buidling		Driveway		Lawn		Row Crops		Open Space / Landscaping		Study Area Total
Area (ac):	0.12		0.21		0.28		0.00		5.72		**6.33**
Imperviousness (%):	100		100		2				2		
Runoff Coefficient, Rv:	0.95		0.95		0.068				0.068		
Annual Runoff, R (in.):	42.75		42.75		3.06				3.06		
BACTERIA	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	**L (lbs/yr)**
Total Suspended Solids	19	22	173	351	602	117			37	146	**636**
Total Phosphorus	0.11	0.1	0.56	1.1	2.1	0.4			0.25	1.0	**2.7**
Soluble Phosphorus	0.13	0.2	0.13	0.3	0.13	0.0			0.17	0.7	**1.1**
Total Nitrogen	1.5	1.7	2.1	4.3	9.1	1.8			2.0	7.9	**15.7**
Total Kjeldhal Nitrogen	1.4	1.6	1.4	2.8	1.4	0.3			0.6	2.4	**7.1**
Nitrite & Nitrate	0.6	0.7	0.6	1.2	0.6	0.1			0.6	2.4	**4.4**
Copper	0.02	0.0	0.017	0.0	0.017	0.0			0.094	0.4	**0.4**
Lead	0.012	0.0	0.012	0.0	0.012	0.0			0.029	0.1	**0.2**
Zinc	0.312	0.4	0.107	0.2	0.05	0.0			0.263	1.0	**1.6**
BOD5	9	10	9	18	9	2			4.2	17	**47**
COD	55	64	55	112	55	11			21	83	**269**
Organic Carbon	11.9	14	11.9	24	11.9	2			11.9	47	**87**
Hydrocarbons	3.5	4	3.5	7	3.5	1			3.5	14	**26**
Oil & Grease	3.0	3	3.0	6	3.0	1			3.0	12	**22**
Chloride	10	12	116	235	10	2			10	40	**288**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	**L (BC/yr)**
Fecal Coliform	0.26	137	17	15,720	24	2,118			94	169,466	**187,441**
Fecal Strep	35.4	18,705	35.4	32,734	35.4	18,705			35.4	63,820	**133,964**

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN W1
EXISTING CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	Buidling		Driveway		Lawn		Row Crops		Open Space / Landscaping		Study Area Total
Area (ac):	0.01		0.02		0.00		4.25		1.45		**5.73**
Imperviousness (%):	100		50		2		2		2		
Runoff Coefficient, Rv:	0.95		0.5		0.068		0.068		0.068		
Annual Runoff, R (in.):	42.75		22.50		3.06		3.06		3.06		
BACTERIA	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	**L (lbs/yr)**
Total Suspended Solids	19	2	173	18			37	109	37	37	**165**
Total Phosphorus	0.11	0.0	0.56	0.1			1.3	4	0.25	0.3	**4.1**
Soluble Phosphorus	0.1	0.0	0.1	0.0			0.17	0	0.17	0.2	**0.7**
Total Nitrogen	1.5	0.1	2.1	0.2			4.4	13	2.0	2.0	**15.3**
Total Kjeldhal Nitrogen	1.4	0.1	1.4	0.1			3.5	10	0.6	0.6	**11.2**
Nitrite & Nitrate	0.6	0.1	0.6	0.1			1.6	5	0.6	0.6	**5.4**
Copper	0.02	0.0	0.017	0.0			0.094	0.3	0.094	0.1	**0.4**
Lead	0.012	0.0	0.012	0.0			0.029	0.1	0.029	0.0	**0.1**
Zinc	0.312	0.0	0.107	0.0			0.263	0.8	0.263	0.3	**1.1**
BOD5	9	1	9	1			4.2	12	4.2	4	**18**
COD	55	5	55	6			21	62	21	21	**94**
Organic Carbon	11.9	1	11.9	1			11.9	35	11.9	12	**49**
Hydrocarbons	3.5	0	3.5	0			3.5	10	3.5	4	**14**
Oil & Grease	3.0	0	3.0	0			3.0	9	3.0	3	**12**
Chloride	10	1	116	12			10	29	10	10	**52**

BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	**L (BC/yr)**
Fecal Coliform	0.26	11	17	788			94	125,914	94	42,959	**169,673**
Fecal Strep	35.4	1,559	35.4	1,641			35.4	47,419	35.4	16,178	**66,797**

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN W2
EXISTING CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	Buidling		Driveway		Lawn		Row Crops		Open Space / Landscaping		Study Area Total
Area (ac):	0.12		0.10		0.00		0.05		1.10		**1.37**
Imperviousness (%):	100		100		2		2		2		
Runoff Coefficient, Rv:	0.95		0.95		0.068		0.068		0.068		
Annual Runoff, R (in.):	42.75		42.75		3.06		3.06		3.06		
BACTERIA	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	**L (lbs/yr)**
Total Suspended Solids	19	22	173	167			37	1	37	28	**219**
Total Phosphorus	0.11	0.1	0.56	0.5			1.3	0.0	0.25	0.2	**0.9**
Soluble Phosphorus	0.1	0.1	0.1	0.1			0.17	0.0	0.17	0.1	**0.3**
Total Nitrogen	1.5	1.7	2.1	2.0			4.4	0	2.0	1.5	**5.4**
Total Kjeldhal Nitrogen	1.4	1.6	1.4	1.4			3.5	0	0.6	0.5	**3.6**
Nitrite & Nitrate	0.6	0.7	0.6	0.6			1.6	0	0.6	0.5	**1.8**
Copper	0.02	0.0	0.017	0.0			0.094	0.0	0.094	0.1	**0.1**
Lead	0.012	0.0	0.012	0.0			0.029	0.0	0.029	0.0	**0.0**
Zinc	0.312	0.4	0.107	0.1			0.263	0.0	0.263	0.2	**0.7**
BOD5	9	10	9	9			4.2	0	4.2	3	**22**
COD	55	64	55	53			21	1	21	16	**134**
Organic Carbon	11.9	14	11.9	11			11.9	0	11.9	9	**35**
Hydrocarbons	3.5	4	3.5	3			3.5	0	3.5	3	**10**
Oil & Grease	3.0	3	3.0	3			3.0	0	3.0	2	**9**
Chloride	10	12	116	112			0	0	10	8	**131**

BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	**L (BC/yr)**
Fecal Coliform	0.26	137	17	7,486			94	1,481	94	32,590	**41,694**
Fecal Strep	35.4	18,705	35.4	15,588			35.4	558	35.4	12,273	**47,123**

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN W3
EXISTING CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	Buidling		Driveway		Lawn		Row Crops		Open Space / Landscaping		Study Area Total
Area (ac):	0.03		0.01		0.20				0.16		**0.40**
Imperviousness (%):	100		100		2		2		2		
Runoff Coefficient, Rv:	0.95		0.95		0.068		0.068		0.068		
Annual Runoff, R (in.):	42.75		42.75		3.06		3.06		3.06		
BACTERIA	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	**L (lbs/yr)**
Total Suspended Solids	19	6	173	17	602	83			37	4	**110**
Total Phosphorus	0.11	0.0	0.56	0.1	2.1	0.3			0.25	0.0	**0.4**
Soluble Phosphorus	0.11	0.0	0.11	0.0	0.11	0.0			0.17	0.0	**0.1**
Total Nitrogen	1.5	0.4	2.1	0.2	9.1	1.3			2.0	0.2	**2.1**
Total Kjeldhal Nitrogen	1.4	0.4	1.4	0.1	1.4	0.2			0.6	0.1	**0.8**
Nitrite & Nitrate	0.6	0.2	0.6	0.1	0.6	0.1			0.6	0.1	**0.4**
Copper	0.02	0.0	0.017	0.0	0.017	0.0			0.094	0.0	**0.0**
Lead	0.012	0.0	0.012	0.0	0.012	0.0			0.029	0.0	**0.0**
Zinc	0.312	0.1	0.107	0.0	0.05	0.0			0.263	0.0	**0.1**
BOD5	9	3	9	1	9	1			4.2	0	**5**
COD	55	16	55	5	55	8			21	2	**31**
Organic Carbon	11.9	3	11.9	1	11.9	2			11.9	1	**8**
Hydrocarbons	3.5	1	3.5	0	3.5	0			3.5	0	**2**
Oil & Grease	3.0	1	3.0	0	3.0	0			3.0	0	**2**
Chloride	10	3	116	11	10	1			10	1	**17**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	**L (BC/yr)**
Fecal Coliform	0.26	34	17	749	24	1,513			94	4,740	**7,036**
Fecal Strep	35.4	4,676	35.4	1,559	35.4	4,676			35.4	1,785	**12,696**

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN E1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.00		0.75		0.04		1.15		1.94						
Imperviousness (%):			100		100		2								
Runoff Coefficient, Rv:			0.95		0.95		0.068								
Annual Runoff, R (in.):			42.75		42.75		3.06								
										Pavement Sweeping			Dry Swale		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids			27	196	9	3	37	29	**229**	196	60	78	111	80	**22**
Total Phosphorus			0.15	1.1	0.14	0.1	0.25	0.2	**1.3**	1.1	40	0.7	0.9	80	**0.2**
Soluble Phosphorus			0.11	0.8	0.11	0.0	0.17	0.1	**1.0**	0.8	40	0.5	0.7	{*}	**0.2**
Total Nitrogen			1.9	13.8	2.1	0.8	2.0	1.6	**16.2**	13.8	40	8.3	10.7	30	**7.5**
Total Kjeldhal Nitrogen			1.6	11.6	1.6	0.6	0.6	0.5	**12.7**	11.6	40	7.0	8.1	30	**5.6**
Nitrite & Nitrate			0.6	4.3	0.6	0.2	0.6	0.5	**5.1**	4.3	40	2.6	3.3	30	**2.3**
Copper			0.051	0.4	0.007	0.0	0.094	0.1	**0.4**	0.4	40	0.2	0.3	50	**0.1**
Lead			0.028	0.2	0.017	0.0	0.029	0.0	**0.2**	0.2	40	0.1	0.2	50	**0.1**
Zinc			0.139	1.0	0.256	0.1	0.263	0.2	**1.3**	1.0	40	0.6	0.9	50	**0.5**
BOD5			11.9	86	11.9	5	4.2	3	**94**	86	40	52	60	30	**42**
COD			63	457	63	24	21	17	**498**	457	40	274	315	30	**220**
Organic Carbon			11.9	86	11.9	5	11.9	9	**100**	86	40	52	66	30	**46**
Hydrocarbons			3.5	25	3.5	1	3.5	3	**29**	25	40	15	19	30	**14**
Oil & Grease			3.0	22	3.0	1	3.0	2	**25**	22	40	13	17		**17**
Chloride			53	384	10	4	10	8	**396**	384	40	230	242		**242**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform			1.8	5,944	1.1	194	94	34,071	**40,209**	5,944	40	3,567	37,831		**37,831**
Fecal Strep			35.4	116,906	35.4	6,235	35.4	12,831	**135,972**	116,906	40	70,144	89,210		**89,210**

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN E2
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total
Area (ac):	0.87		2.60		1.38		2.51		7.36
Imperviousness (%):	100		100		100		2		
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068		
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)
Total Suspended Solids	468	3934	27	678	9	120	37	64	4,796
Total Phosphorus	0.22	1.8	0.15	3.8	0.14	1.9	0.25	0.4	7.9
Soluble Phosphorus	0.11	0.9	0.11	2.8	0.11	1.5	0.17	0.3	5.4
Total Nitrogen	2.0	16.8	1.9	47.7	2.1	28.0	2.0	3.5	96.0
Total Kjeldhal Nitrogen	1.6	13.4	1.6	40.2	1.6	21.3	0.6	1.0	76.0
Nitrite & Nitrate	0.6	5.0	0.6	15.1	0.6	8.0	0.6	1.0	29.2
Copper	0.073	0.6	0.051	1.3	0.007	0.1	0.094	0.2	2.2
Lead	0.17	1.4	0.028	0.7	0.017	0.2	0.029	0.1	2.4
Zinc	0.045	0.4	0.139	3.5	0.256	3.4	0.263	0.5	7.7
BOD5	11.9	100	11.9	299	11.9	159	4.2	7	565
COD	63	530	63	1583	63	840	21	36	2989
Organic Carbon	11.9	100	11.9	299	11.9	159	11.9	21	578
Hydrocarbons	3.5	29	3.5	88	3.5	47	3.5	6	170
Oil & Grease	3.0	25	3.0	75	3.0	40	3.0	5	146
Chloride	53	445	53	1331	10	133	10	17	1928
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)
Fecal Coliform	12	45,970	1.8	20,607	1.1	6,684	94	74,364	147,625
Fecal Strep	35.4	135,611	35.4	405,275	35.4	215,108	35.4	28,005	783,999

	MITIGATION: Pavement Sweeping			Wet Pond			Infiltration		DISCHARGE
PARAMETER	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	4612	60	1,845	2,029	80	406	406	20	325
Total Phosphorus	5.6	40	3.4	5.7	50	2.8	2.8	20	2.3
Soluble Phosphorus	3.7	40	2.2	4.0		4.0	4.0	{*}	2.3
Total Nitrogen	64.5	40	38.7	70.2	30	49.1	49.1	20	39.3
Total Kjeldhal Nitrogen	53.6	40	32.2	54.6	30	38.2	38.2	20	30.6
Nitrite & Nitrate	20.1	40	12.1	21.1	40	12.7	12.7	20	10.1
Copper	1.9	40	1.1	1.4	50	0.7	0.7	20	0.6
Lead	2.1	40	1.3	1.6	50	0.8	0.8	20	0.6
Zinc	3.9	40	2.3	6.2	50	3.1	3.1	20	2.5
BOD5	399	40	239	405	30	284	284	20	227
COD	2112	40	1,267	2,144	30	1,501	1,501	20	1,200
Organic Carbon	399	40	239	419	30	293	293	20	234
Hydrocarbons	117	40	70	123	30	86	86	20	69
Oil & Grease	101	40	60	106		106	106	20	84
Chloride	1777	40	1,066	1,217		1,217	1,217	20	973
BACTERIA									(BC/yr)
Fecal Coliform	66,577	40	39,946	120,994	70	36,298	36,298	20	29,039
Fecal Strep	540,886	40	324,532	567,644	70	170,293	170,293	20	136,235

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN W1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION									DISCHARGE
	Gravel Pavement		Commercial Parking		Commercial Roof		Open Space / Landscaping									Subarea W1B Open Space / Landscaping		Total
Area (ac):	1.35		0.96		0.52		0.05									2.50		5.38
Imperviousness (%):	25		100		100		2									2		
Runoff Coefficient, Rv:	0.275		0.95		0.95		0.068									0.068		Resultant Surface Water Discharge (lbs/yr)
Annual Runoff, R (in.):	12.38		42.75		42.75		3.06									3.06		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Incoming L (lbs/yr)	Organic Filter removal (%)	remainder (lbs/yr)	Storage / Infiltration Incoming L (lbs/yr)	removal (%)	remainder (lbs/yr)	C (mg/l)	L (lbs/yr)	
Total Suspended Solids	27	102	27	250	9	45	37	1	399	399	85	60	60	90	6	27	47	53
Total Phosphorus	0.15	0.6	0.15	1.4	0.14	0.7	0.25	0.0	2.7	2.7	60	1.1	1.1	90	0.1	0.15	0.3	0.4
Soluble Phosphorus	0.11	0.4	0.11	1.0	0.11	0.6	0.17	0.0	2.0	2.0		2.0	2.0	{*}	0.1	0.11	0.2	0.3
Total Nitrogen	1.9	7.2	1.9	17.6	2.1	10.6	2.0	0.1	35.4	35.4	40	21.2	21.2	90	2.1	1.9	3.3	5.4
Total Kjeldhal Nitrogen	1.6	6.0	1.6	14.8	1.6	8.0	0.6	0.0	28.9	28.9	40	17.4	17.4	90	1.7	1.6	2.8	4.5
Nitrite & Nitrate	0.6	2.3	0.6	5.6	0.6	3.0	0.6	0.0	10.9	10.9		10.9	10.9	90	1.1	0.6	1.0	2.1
Copper	0.051	0.2	0.051	0.5	0.007	0.0	0.094	0.0	0.7	0.7	70	0.2	0.2	90	0.0	0.051	0.1	0.1
Lead	0.028	0.1	0.028	0.3	0.017	0.1	0.029	0.0	0.5	0.5	70	0.1	0.1	90	0.0	0.028	0.0	0.1
Zinc	0.139	0.5	0.139	1.3	0.256	1.3	0.263	0.0	3.1	3.1	70	0.9	0.9	90	0.1	0.139	0.2	0.3
BOD5	11.9	45	11.9	110	11.9	60	4.2	0	215	215	40	129	129	90	13	11.9	21	33
COD	63	238	63	584	63	317	21	1	1139	1139	40	684	684	90	68	63	109	177
Organic Carbon	11.9	45	11.9	110	11.9	60	11.9	0	215	215	40	129	129	90	13	11.9	21	34
Hydrocarbons	3.5	13	3.5	32	3.5	18	3.5	0	63	63	40	38	38	90	4	3.5	6	10
Oil & Grease	3.0	11	3.0	28	3.0	15	3.0	0	54	54	40	33	33	90	3	3.0	5	8
Chloride	10	38	10	93	10	50	10	0	181	181		181	181	90	18	10	17	35
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)	C (1000/ml)	L (BC/yr)	(BC/yr)
Fecal Coliform	12	20,649	1.8	7,609	1.1	2,519	94	1,481	32,258	32,258		32,258	32,258	90	3,226	12	21	3,247
Fecal Strep	35.4	60,914	35.4	149,640	35.4	81,055	35.4	558	292,167	292,167		292,167	292,167	90	29,217	35.4	61	29,278

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN W2
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.20		0.32		0.00		0.17		0.69						
Imperviousness (%):	100		100		100		2								
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068								
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06								
										Pavement Sweeping			Dry Swale		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	468	904	27	83	9	0	37	4	**992**	988	60	395	399	80	**80**
Total Phosphorus	0.22	0.4	0.15	0.5	0.14	0.0	0.25	0.0	**0.9**	0.9	40	0.5	0.6	80	**0.1**
Soluble Phosphorus	0.11	0.2	0.11	0.3	0.11	0.0	0.17	0.0	**0.6**	0.6	40	0.3	0.4	{*}	**0.1**
Total Nitrogen	2.0	3.9	1.9	5.9	2.1	0.0	2.0	0.2	**10.0**	9.7	40	5.8	6.1	30	**4.3**
Total Kjeldhal Nitrogen	1.6	3.1	1.6	4.9	1.6	0.0	0.6	0.1	**8.1**	8.0	40	4.8	4.9	30	**3.4**
Nitrite & Nitrate	0.6	1.2	0.6	1.9	0.6	0.0	0.6	0.1	**3.1**	3.0	40	1.8	1.9	30	**1.3**
Copper	0.073	0.1	0.051	0.2	0.007	0.0	0.094	0.0	**0.3**	0.3	40	0.2	0.2	50	**0.1**
Lead	0.17	0.3	0.028	0.1	0.017	0.0	0.029	0.0	**0.4**	0.4	40	0.2	0.3	50	**0.1**
Zinc	0.045	0.1	0.139	0.4	0.256	0.0	0.263	0.0	**0.5**	0.5	40	0.3	0.3	50	**0.2**
BOD5	11.9	23	11.9	37	11.9	0	4.2	0	**60**	60	40	36	36	30	**25**
COD	63	122	63	195	63	0	21	2	**319**	317	40	190	192	30	**135**
Organic Carbon	11.9	23	11.9	37	11.9	0	11.9	1	**61**	60	40	36	37	30	**26**
Hydrocarbons	3.5	7	3.5	11	3.5	0	3.5	0	**18**	18	40	11	11	30	**8**
Oil & Grease	3.0	6	3.0	9	3.0	0	3.0	0	**15**	15	40	9	9		**9**
Chloride	53	102	53	164	10	0	10	1	**267**	266	40	160	161		**161**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform	12	10,568	1.8	2,536	1.1	0	94	5,037	**18,141**	13,104	40	7,862	12,899		**12,899**
Fecal Strep	35.4	31,175	35.4	49,880	35.4	0	35.4	1,897	**82,952**	81,055	40	48,633	50,530		**50,530**

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - JULY 2006 PLAN

Date: 7/25/06

SUBBASIN W3
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.21		0.00		0.00		0.19		0.40						
Imperviousness (%):	100		100		100		2								
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068								
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06								
										Pavement Sweeping			Bioretention		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	468	950	27	0	9	0	37	5	**954**	950	50	475	480	80	**96**
Total Phosphorus	0.22	0.4	0.15	0.0	0.14	0.0	0.25	0.0	**0.5**	0.4	40	0.3	0.3	30	**0.2**
Soluble Phosphorus	0.11	0.2	0.11	0.0	0.11	0.0	0.17	0.0	**0.2**	0.2	40	0.1	0.2		**0.2**
Total Nitrogen	2.0	4.1	1.9	0.0	2.1	0.0	2.0	0.3	**4.3**	4.1	40	2.4	2.7	50	**1.3**
Total Kjeldhal Nitrogen	1.6	3.2	1.6	0.0	1.6	0.0	0.6	0.1	**3.3**	3.2	40	1.9	2.0	50	**1.0**
Nitrite & Nitrate	0.6	1.2	0.6	0.0	0.6	0.0	0.6	0.1	**1.3**	1.2	40	0.7	0.8	35	**0.5**
Copper	0.073	0.1	0.051	0.0	0.007	0.0	0.094	0.0	**0.2**	0.1	40	0.1	0.1	60	**0.0**
Lead	0.17	0.3	0.028	0.0	0.017	0.0	0.029	0.0	**0.3**	0.3	40	0.2	0.2	60	**0.1**
Zinc	0.045	0.1	0.139	0.0	0.256	0.0	0.263	0.0	**0.1**	0.1	40	0.1	0.1	60	**0.0**
BOD5	11.9	24	11.9	0	11.9	0	4.2	1	**25**	24	40	14	15	30	**11**
COD	63	128	63	0	63	0	21	3	**131**	128	40	77	79	30	**56**
Organic Carbon	11.9	24	11.9	0	11.9	0	11.9	2	**26**	24	40	14	16	30	**11**
Hydrocarbons	3.5	7	3.5	0	3.5	0	3.5	0	**8**	7	40	4	5	30	**3**
Oil & Grease	3.0	6	3.0	0	3.0	0	3.0	0	**6**	6	40	4	4	30	**3**
Chloride	53	108	53	0	10	0	10	1	**109**	108	40	65	66		**66**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform	12	11,096	1.8	0	1.1	0	94	5,629	**16,725**	11,096	40	6,658	12,287		**12,287**
Fecal Strep	35.4	32,734	35.4	0	35.4	0	35.4	2,120	**34,854**	32,734	40	19,640	21,760		**21,760**

(*): Soluble phosphorus cannot exceed total phosphorus

Proposed Conditions

Fish & Wildlife Plan (February 2006)

7/25/06

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - FISH & WILDLIFE PLAN

PARAMETER	SUBBASIN E1 (lbs/yr)	E2 (lbs/yr)	W1 (lbs/yr)	W2 (lbs/yr)	W3 (lbs/yr)	STUDY AREA TOTALS Existing Conditions (lbs/yr)	Developed Conditions Without Mitigation (lbs/yr)	Proposed Conditions With Mitigation (lbs/yr)
Total Suspended Solids								
- Existing conditions	**50**	**636**	**165**	**219**	**110**	**1,179**		
- Developed conditions without mitigation	229	4797	695	992	954		7,667	
- Proposed conditions with mitigation	22	325	56	80	77			560
Total Phosphorus								
- Existing conditions	**0.3**	**2.7**	**4.1**	**0.9**	**0.4**	**8.4**		
- Developed conditions without mitigation	1.3	7.9	4.3	0.9	0.5		15.0	
- Proposed conditions with mitigation	0.2	2.3	0.4	0.1	0.2			3.2
Soluble Phosphorus								
- Existing conditions	**0.2**	**1.1**	**0.7**	**0.3**	**0.1**	**2.5**		
- Developed conditions without mitigation	1.0	5.5	3.2	0.6	0.2		10.4	
- Proposed conditions with mitigation	0.2	2.3	0.4	0.1	0.2			3.1
Total Nitrogen								
- Existing conditions	**2.7**	**15.7**	**15.3**	**5.4**	**2.1**	**41.2**		
- Developed conditions without mitigation	16.2	96.1	56.3	10.0	4.3		182.8	
- Proposed conditions with mitigation	7.5	39.3	6.5	4.3	1.3			58.9
Total Kjeldhal Nitrogen								
- Existing conditions	**0.8**	**7.1**	**11.2**	**3.6**	**0.8**	**23.5**		
- Developed conditions without mitigation	12.7	76.0	46.5	8.1	3.3		146.7	
- Proposed conditions with mitigation	5.6	30.6	5.4	3.4	1.0			46.0
Nitrite & Nitrate								
- Existing conditions	**0.8**	**4.4**	**5.4**	**1.8**	**0.4**	**12.8**		
- Developed conditions without mitigation	5.1	29.2	17.5	3.1	1.3		56.1	
- Proposed conditions with mitigation	2.3	10.1	2.7	1.3	0.5			17.0
Copper								
- Existing conditions	**0.1**	**0.4**	**0.4**	**0.1**	**0.0**	**1.1**		
- Developed conditions without mitigation	0.4	2.2	1.3	0.3	0.2		4.3	
- Proposed conditions with mitigation	0.1	0.6	0.1	0.1	0.0			1.0
Lead								
- Existing conditions	**0.0**	**0.2**	**0.1**	**0.0**	**0.0**	**0.4**		
- Developed conditions without mitigation	0.4	2.4	0.8	0.4	0.3		4.4	
- Proposed conditions with mitigation	0.1	0.6	0.1	0.1	0.1			1.0
Zinc								
- Existing conditions	**0.4**	**1.6**	**1.1**	**0.7**	**0.1**	**3.9**		
- Developed conditions without mitigation	1.3	7.7	4.6	0.5	0.1		14.4	
- Proposed conditions with mitigation	0.5	2.5	0.4	0.2	0.0			3.5
BOD5								
- Existing conditions	**6**	**47**	**18**	**22**	**5**	**99**		
- Developed conditions without mitigation	94	565	346	60	25		1,090	
- Proposed conditions with mitigation	42	227	40	25	11			345
COD								
- Existing conditions	**28**	**269**	**94**	**134**	**31**	**556**		
- Developed conditions without mitigation	498	2989	1832	319	131		5,768	
- Proposed conditions with mitigation	220	1201	212	135	56			1824
Organic Carbon								
- Existing conditions	**16**	**87**	**49**	**35**	**8**	**195**		
- Developed conditions without mitigation	100	579	346	61	26		1,112	
- Proposed conditions with mitigation	46	235	40	26	11			358

7/25/06

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - FISH & WILDLIFE PLAN

PARAMETER	SUBBASIN E1 (lbs/yr)	E2 (lbs/yr)	W1 (lbs/yr)	W2 (lbs/yr)	W3 (lbs/yr)	STUDY AREA TOTALS Existing Conditions (lbs/yr)	Developed Conditions Without Mitigation (lbs/yr)	Proposed Conditions With Mitigation (lbs/yr)
Hydrocarbons								
- Existing conditions	**5**	**26**	**14**	**10**	**2**	**57**		
- Developed conditions without mitigation	29	170	102	18	8		327	
- Proposed conditions with mitigation	14	69	12	8	3			105
Oil & Grease								
- Existing conditions	**4**	**22**	**12**	**9**	**2**	**49**		
- Developed conditions without mitigation	25	146	101	15	6		294	
- Proposed conditions with mitigation	17	84	10	9	3			123
Chloride								
- Existing conditions	**13**	**288**	**52**	**131**	**17**	**502**		
- Developed conditions without mitigation	396	1,928	291	267	109		2,991	
- Proposed conditions with mitigation	242	974	45	161	66			1,487
BACTERIA	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)
Fecal Coliform								
- Existing conditions	**57,476**	**187,441**	**169,673**	**41,694**	**7,036**	**463,320**		
- Developed conditions without mitigation	40,209	148,514	21,441	18,141	16,725		245,029	
- Proposed conditions with mitigation	37,831	29,252	2,163	12,899	12,287			94,432
Fecal Strep								
- Existing conditions	**21,645**	**133,964**	**66,797**	**47,123**	**12,696**	**282,226**		
- Developed conditions without mitigation	135,972	784,334	441,411	82,952	34,854		1,479,522	
- Proposed conditions with mitigation	89,210	136,315	44,196	50,530	21,760			342,011

BC/yr = Billion colonies per year

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - FISH & WILDLIFE PLAN

Date: 7/25/06

SUBBASIN E1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.00		0.75		0.04		1.15		1.94						
Imperviousness (%):			100		100		2								
Runoff Coefficient, Rv:			0.95		0.95		0.068								
Annual Runoff, R (in.):			42.75		42.75		3.06								
										Pavement Sweeping			Dry Swale		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids			27	196	9	3	37	29	**229**	196	60	78	111	80	**22**
Total Phosphorus			0.15	1.1	0.14	0.1	0.25	0.2	**1.3**	1.1	40	0.7	0.9	80	**0.2**
Soluble Phosphorus			0.11	0.8	0.11	0.0	0.17	0.1	**1.0**	0.8	40	0.5	0.7	{*}	**0.2**
Total Nitrogen			1.9	13.8	2.1	0.8	2.0	1.6	**16.2**	13.8	40	8.3	10.7	30	**7.5**
Total Kjeldhal Nitrogen			1.6	11.6	1.6	0.6	0.6	0.5	**12.7**	11.6	40	7.0	8.1	30	**5.6**
Nitrite & Nitrate			0.6	4.3	0.6	0.2	0.6	0.5	**5.1**	4.3	40	2.6	3.3	30	**2.3**
Copper			0.051	0.4	0.007	0.0	0.094	0.1	**0.4**	0.4	40	0.2	0.3	50	**0.1**
Lead			0.028	0.2	0.017	0.0	0.029	0.0	**0.2**	0.2	40	0.1	0.2	50	**0.1**
Zinc			0.139	1.0	0.256	0.1	0.263	0.2	**1.3**	1.0	40	0.6	0.9	50	**0.5**
BOD5			11.9	86	11.9	5	4.2	3	**94**	86	40	52	60	30	**42**
COD			63	457	63	24	21	17	**498**	457	40	274	315	30	**220**
Organic Carbon			11.9	86	11.9	5	11.9	9	**100**	86	40	52	66	30	**46**
Hydrocarbons			3.5	25	3.5	1	3.5	3	**29**	25	40	15	19	30	**14**
Oil & Grease			3.0	22	3.0	1	3.0	2	**25**	22	40	13	17		**17**
Chloride			53	384	10	4	10	8	**396**	384	40	230	242		**242**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform			1.8	5,944	1.1	194	94	34,071	**40,209**	5,944	40	3,567	37,831		**37,831**
Fecal Strep			35.4	116,906	35.4	6,235	35.4	12,831	**135,972**	116,906	40	70,144	89,210		**89,210**

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - FISH & WILDLIFE PLAN

Date: 7/25/06

SUBBASIN E2
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total
Area (ac):	0.87		2.60		1.38		2.54		7.39
Imperviousness (%):	100		100		100		2		
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068		
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)
Total Suspended Solids	468	3934	27	678	9	120	37	65	4,797
Total Phosphorus	0.22	1.8	0.15	3.8	0.14	1.9	0.25	0.4	7.9
Soluble Phosphorus	0.11	0.9	0.11	2.8	0.11	1.5	0.17	0.3	5.5
Total Nitrogen	2.0	16.8	1.9	47.7	2.1	28.0	2.0	3.5	96.1
Total Kjeldhal Nitrogen	1.6	13.4	1.6	40.2	1.6	21.3	0.6	1.1	76.0
Nitrite & Nitrate	0.6	5.0	0.6	15.1	0.6	8.0	0.6	1.1	29.2
Copper	0.073	0.6	0.051	1.3	0.007	0.1	0.094	0.2	2.2
Lead	0.17	1.4	0.028	0.7	0.017	0.2	0.029	0.1	2.4
Zinc	0.045	0.4	0.139	3.5	0.256	3.4	0.263	0.5	7.7
BOD5	11.9	100	11.9	299	11.9	159	4.2	7	565
COD	63	530	63	1583	63	840	21	37	2989
Organic Carbon	11.9	100	11.9	299	11.9	159	11.9	21	579
Hydrocarbons	3.5	29	3.5	88	3.5	47	3.5	6	170
Oil & Grease	3.0	25	3.0	75	3.0	40	3.0	5	146
Chloride	53	445	53	1331	10	133	10	18	1928
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)
Fecal Coliform	12	45,970	1.8	20,607	1.1	6,684	94	75,252	148,514
Fecal Strep	35.4	135,611	35.4	405,275	35.4	215,108	35.4	28,340	784,334

	MITIGATION: Pavement Sweeping			MITIGATION: Wet Pond			MITIGATION: Infiltration		DISCHARGE
PARAMETER	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	4612	60	1,845	2,030	80	406	406	20	325
Total Phosphorus	5.6	40	3.4	5.7	50	2.8	2.8	20	2.3
Soluble Phosphorus	3.7	40	2.2	4.0		4.0	4.0	(*)	2.3
Total Nitrogen	64.5	40	38.7	70.2	30	49.2	49.2	20	39.3
Total Kjeldhal Nitrogen	53.6	40	32.2	54.6	30	38.2	38.2	20	30.6
Nitrite & Nitrate	20.1	40	12.1	21.1	40	12.7	12.7	20	10.1
Copper	1.9	40	1.1	1.4	50	0.7	0.7	20	0.6
Lead	2.1	40	1.3	1.6	50	0.8	0.8	20	0.6
Zinc	3.9	40	2.3	6.2	50	3.1	3.1	20	2.5
BOD5	399	40	239	405	30	284	284	20	227
COD	2112	40	1,267	2,144	30	1,501	1,501	20	1,201
Organic Carbon	399	40	239	419	30	293	293	20	235
Hydrocarbons	117	40	70	123	30	86	86	20	69
Oil & Grease	101	40	60	106		106	106	20	84
Chloride	1777	40	1,066	1,217		1,217	1,217	20	974
BACTERIA									(BC/yr)
Fecal Coliform	66,577	40	39,946	121,883	70	36,565	36,565	20	29,252
Fecal Strep	540,886	40	324,532	567,979	70	170,394	170,394	20	136,315

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - FISH & WILDLIFE PLAN

Date: 7/25/06

SUBBASIN W1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION								DISCHARGE
	Gravel Pavement		Commercial Parking		Commercial Roof		Open Space / Landscaping									Subarea W1B Open Space / Landscaping		Total
Area (ac):	0.00		2.31		0.52		0.02									2.50		5.35
Imperviousness (%):	25		100		100		2									2		
Runoff Coefficient, Rv:	0.275		0.95		0.95		0.068									0.068		Resultant Surface Water Discharge (lbs/yr)
Annual Runoff, R (in.):	12.38		42.75		42.75		3.06									3.06		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Incoming L (lbs/yr)	Organic Filter removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	Storage / Infiltration removal (%)	remainder (lbs/yr)	C (mg/l)	L (lbs/yr)	
Total Suspended Solids	27	0	27	603	9	45	37	1	648	648	85	97	97	90	10	27	47	56
Total Phosphorus	0.15	0.0	0.15	3.3	0.14	0.7	0.25	0.0	4.1	4.1	60	1.6	1.6	90	0.2	0.15	0.3	0.4
Soluble Phosphorus	0.11	0.0	0.11	2.5	0.11	0.6	0.17	0.0	3.0	3.0		3.0	3.0	{*}	0.2	0.11	0.2	0.4
Total Nitrogen	1.9	0.0	1.9	42.4	2.1	10.6	2.0	0.0	53.0	53.0	40	31.8	31.8	90	3.2	1.9	3.3	6.5
Total Kjeldhal Nitrogen	1.6	0.0	1.6	35.7	1.6	8.0	0.6	0.0	43.8	43.8	40	26.3	26.3	90	2.6	1.6	2.8	5.4
Nitrite & Nitrate	0.6	0.0	0.6	13.4	0.6	3.0	0.6	0.0	16.4	16.4		16.4	16.4	90	1.6	0.6	1.0	2.7
Copper	0.051	0.0	0.051	1.1	0.007	0.0	0.094	0.0	1.2	1.2	70	0.4	0.4	90	0.0	0.051	0.1	0.1
Lead	0.028	0.0	0.028	0.6	0.017	0.1	0.029	0.0	0.7	0.7	70	0.2	0.2	90	0.0	0.028	0.0	0.1
Zinc	0.139	0.0	0.139	3.1	0.256	1.3	0.263	0.0	4.4	4.4	70	1.3	1.3	90	0.1	0.139	0.2	0.4
BOD5	11.9	0	11.9	266	11.9	60	4.2	0	325	325	40	195	195	90	20	11.9	21	40
COD	63	0	63	1406	63	317	21	0	1723	1723	40	1,034	1,034	90	103	63	109	212
Organic Carbon	11.9	0	11.9	266	11.9	60	11.9	0	326	326	40	195	195	90	20	11.9	21	40
Hydrocarbons	3.5	0	3.5	78	3.5	18	3.5	0	96	96	40	57	57	90	6	3.5	6	12
Oil & Grease	3.0	0	3.0	67	3.0	15	3.0	0	82	82	40	49	49	90	5	3.0	5	10
Chloride	10	0	10	223	10	50	10	0	274	274		274	274	90	27	10	17	45
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)	C (1000/ml)	L (BC/yr)	(BC/yr)
Fecal Coliform	12	0	1.8	18,309	1.1	2,519	94	593	21,420	21,420		21,420	21,420	90	2,142	12	21	2,163
Fecal Strep	35.4	0	35.4	360,071	35.4	81,055	35.4	223	441,350	441,350		441,350	441,350	90	44,135	35.4	61	44,196

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - FISH & WILDLIFE PLAN

Date: 7/25/06

SUBBASIN W2
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.20		0.32		0.00		0.17		0.69						
Imperviousness (%):	100		100		100		2								
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068								
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06								
										Pavement Sweeping			Dry Swale		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	468	904	27	83	9	0	37	4	992	988	60	395	399	80	80
Total Phosphorus	0.22	0.4	0.15	0.5	0.14	0.0	0.25	0.0	0.9	0.9	40	0.5	0.6	80	0.1
Soluble Phosphorus	0.11	0.2	0.11	0.3	0.11	0.0	0.17	0.0	0.6	0.6	40	0.3	0.4	{*}	0.1
Total Nitrogen	2.0	3.9	1.9	5.9	2.1	0.0	2.0	0.2	10.0	9.7	40	5.8	6.1	30	4.3
Total Kjeldhal Nitrogen	1.6	3.1	1.6	4.9	1.6	0.0	0.6	0.1	8.1	8.0	40	4.8	4.9	30	3.4
Nitrite & Nitrate	0.6	1.2	0.6	1.9	0.6	0.0	0.6	0.1	3.1	3.0	40	1.8	1.9	30	1.3
Copper	0.073	0.1	0.051	0.2	0.007	0.0	0.094	0.0	0.3	0.3	40	0.2	0.2	50	0.1
Lead	0.17	0.3	0.028	0.1	0.017	0.0	0.029	0.0	0.4	0.4	40	0.2	0.3	50	0.1
Zinc	0.045	0.1	0.139	0.4	0.256	0.0	0.263	0.0	0.5	0.5	40	0.3	0.3	50	0.2
BOD5	11.9	23	11.9	37	11.9	0	4.2	0	60	60	40	36	36	30	25
COD	63	122	63	195	63	0	21	2	319	317	40	190	192	30	135
Organic Carbon	11.9	23	11.9	37	11.9	0	11.9	1	61	60	40	36	37	30	26
Hydrocarbons	3.5	7	3.5	11	3.5	0	3.5	0	18	18	40	11	11	30	8
Oil & Grease	3.0	6	3.0	9	3.0	0	3.0	0	15	15	40	9	9		9
Chloride	53	102	53	164	10	0	10	1	267	266	40	160	161		161
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform	12	10,568	1.8	2,536	1.1	0	94	5,037	18,141	13,104	40	7,862	12,899		12,899
Fecal Strep	35.4	31,175	35.4	49,880	35.4	0	35.4	1,897	82,952	81,055	40	48,633	50,530		50,530

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - FISH & WILDLIFE PLAN

Date: 7/25/06

SUBBASIN W3
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.21		0.00		0.00		0.19		0.40						
Imperviousness (%):	100		100		100		2								
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068								
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06								
										Pavement Sweeping			Bioretention		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	468	950	27	0	9	0	37	5	**954**	950	60	380	385	80	**77**
Total Phosphorus	0.22	0.4	0.15	0.0	0.14	0.0	0.25	0.0	**0.5**	0.4	40	0.3	0.3	30	**0.2**
Soluble Phosphorus	0.11	0.2	0.11	0.0	0.11	0.0	0.17	0.0	**0.2**	0.2	40	0.1	0.2		**0.2**
Total Nitrogen	2.0	4.1	1.9	0.0	2.1	0.0	2.0	0.3	**4.3**	4.1	40	2.4	2.7	50	**1.3**
Total Kjeldhal Nitrogen	1.6	3.2	1.6	0.0	1.6	0.0	0.6	0.1	**3.3**	3.2	40	1.9	2.0	50	**1.0**
Nitrite & Nitrate	0.6	1.2	0.6	0.0	0.6	0.0	0.6	0.1	**1.3**	1.2	40	0.7	0.8	35	**0.5**
Copper	0.073	0.1	0.051	0.0	0.007	0.0	0.094	0.0	**0.2**	0.1	40	0.1	0.1	60	**0.0**
Lead	0.17	0.3	0.028	0.0	0.017	0.0	0.029	0.0	**0.3**	0.3	40	0.2	0.2	60	**0.1**
Zinc	0.045	0.1	0.139	0.0	0.256	0.0	0.263	0.0	**0.1**	0.1	40	0.1	0.1	60	**0.0**
BOD5	11.9	24	11.9	0	11.9	0	4.2	1	**25**	24	40	14	15	30	**11**
COD	63	128	63	0	63	0	21	3	**131**	128	40	77	79	30	**56**
Organic Carbon	11.9	24	11.9	0	11.9	0	11.9	2	**26**	24	40	14	16	30	**11**
Hydrocarbons	3.5	7	3.5	0	3.5	0	3.5	0	**8**	7	40	4	5	30	**3**
Oil & Grease	3.0	6	3.0	0	3.0	0	3.0	0	**6**	6	40	4	4	30	**3**
Chloride	53	108	53	0	10	0	10	1	**109**	108	40	65	66		**66**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform	12	11,096	1.8	0	1.1	0	94	5,629	**16,725**	11,096	40	6,658	12,287		**12,287**
Fecal Strep	35.4	32,734	35.4	0	35.4	0	35.4	2,120	**34,854**	32,734	40	19,640	21,760		**21,760**

(*): Soluble phosphorus cannot exceed total phosphorus

Proposed Conditions

DEIS Plan (2005)

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

PARAMETER	SUBBASIN E1 (lbs/yr)	E2 (lbs/yr)	W1 (lbs/yr)	W2 (lbs/yr)	W3 (lbs/yr)	STUDY AREA TOTALS Existing Conditions (lbs/yr)	Developed Conditions Without Mitigation (lbs/yr)	Proposed Conditions With Mitigation (lbs/yr)
Total Suspended Solids								
- Existing conditions	50	635	165	219	110	1,179		
- Developed conditions without mitigation	205	2722	504	151	5735		9,317	
- Proposed conditions with mitigation	20	188	8	15	465			695
Total Phosphorus								
- Existing conditions	0.3	2.7	4.1	0.9	0.4	8.4		
- Developed conditions without mitigation	1.2	6.7	2.9	1.0	4.5		16.3	
- Proposed conditions with mitigation	0.2	1.9	0.1	0.1	2.0			4.4
Soluble Phosphorus								
- Existing conditions	0.2	1.1	0.7	0.3	0.1	2.5		
- Developed conditions without mitigation	0.9	4.8	2.1	0.8	2.7		11.2	
- Proposed conditions with mitigation	0.2	1.9	0.1	0.1	1.8			4.1
Total Nitrogen								
- Existing conditions	2.7	15.6	15.3	5.4	2.1	41.2		
- Developed conditions without mitigation	14.5	85.2	34.5	13.5	47.3		195.0	
- Proposed conditions with mitigation	6.8	35.2	2.1	6.9	15.3			66.3
Total Kjeldhal Nitrogen								
- Existing conditions	0.8	7.1	11.2	3.6	0.8	23.5		
- Developed conditions without mitigation	11.3	68.4	27.3	10.9	37.6		155.5	
- Proposed conditions with mitigation	5.1	27.9	1.6	5.5	12.0			52.1
Nitrite & Nitrate								
- Existing conditions	0.8	4.4	5.4	1.8	0.4	12.8		
- Developed conditions without mitigation	4.5	25.9	10.8	4.1	14.4		59.8	
- Proposed conditions with mitigation	2.1	9.1	1.1	2.1	6.1			20.4
Copper								
- Existing conditions	0.1	0.4	0.4	0.1	0.0	1.1		
- Developed conditions without mitigation	0.4	1.7	1.0	0.3	1.4		4.8	
- Proposed conditions with mitigation	0.1	0.4	0.0	0.1	0.4			1.1
Lead								
- Existing conditions	0.0	0.2	0.1	0.0	0.0	0.4		
- Developed conditions without mitigation	0.4	1.6	0.5	0.2	2.3		5.0	
- Proposed conditions with mitigation	0.1	0.4	0.0	0.1	0.6			1.1
Zinc								
- Existing conditions	0.4	1.6	1.1	0.7	0.1	3.9		
- Developed conditions without mitigation	1.2	7.3	2.7	1.2	2.6		15.0	
- Proposed conditions with mitigation	0.4	2.3	0.1	0.5	0.7			4.0
BOD5								
- Existing conditions	6	47	18	22	5	99		
- Developed conditions without mitigation	84	509	202	81	279		1,155	
- Proposed conditions with mitigation	37	207	12	41	125			422
COD								
- Existing conditions	28	269	94	134	31	555		
- Developed conditions without mitigation	443	2692	1069	429	1478		6,111	
- Proposed conditions with mitigation	197	1096	64	217	660			2234
Organic Carbon								
- Existing conditions	16	87	49	35	8	195		
- Developed conditions without mitigation	90	514	215	82	286		1,187	
- Proposed conditions with mitigation	42	210	13	42	129			435

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

PARAMETER	SUBBASIN E1 (lbs/yr)	E2 (lbs/yr)	W1 (lbs/yr)	W2 (lbs/yr)	W3 (lbs/yr)	STUDY AREA TOTALS Existing Conditions (lbs/yr)	Developed Conditions Without Mitigation (lbs/yr)	Proposed Conditions With Mitigation (lbs/yr)
Hydrocarbons								
- Existing conditions	**5**	**26**	**14**	**10**	**2**	**57**		
- Developed conditions without mitigation	26	151	63	24	84		349	
- Proposed conditions with mitigation	12	62	4	12	38			128
Oil & Grease								
- Existing conditions	**4**	**22**	**12**	**9**	**2**	**49**		
- Developed conditions without mitigation	23	130	63	21	72		308	
- Proposed conditions with mitigation	15	76	3	15	33			141
Chloride								
- Existing conditions	**13**	**288**	**52**	**131**	**17**	**502**		
- Developed conditions without mitigation	350	1,687	181	272	1154		3,643	
- Proposed conditions with mitigation	215	854	18	172	704			1,963
BACTERIA	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)	(BC/yr)
Fecal Coliform								
- Existing conditions	**57,476**	**186,848**	**169,673**	**41,694**	**7,036**	**462,727**		
- Developed conditions without mitigation	39,496	78,518	83,393	10,234	107,854		319,495	
- Proposed conditions with mitigation	37,403	14,736	8,339	8,680	79,321			148,479
Fecal Strep								
- Existing conditions	**21,645**	**133,741**	**66,797**	**47,123**	**12,696**	**282,003**		
- Developed conditions without mitigation	121,944	696,784	291,319	111,121	387,489		1,608,657	
- Proposed conditions with mitigation	80,792	122,037	29,132	80,569	250,319			562,850

BC/yr = Billion colonies per year

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

Date: 7/25/06

SUBBASIN E1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.00		0.66		0.04		1.15		1.85						
Imperviousness (%):			100		100		2								
Runoff Coefficient, Rv:			0.95		0.95		0.068								
Annual Runoff, R (in.):			42.75		42.75		3.06								
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Pavement Sweeping: Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Dry Swale: Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids			27	172	9	3	37	29	**205**	172	60	69	102	80	**20**
Total Phosphorus			0.15	1.0	0.14	0.1	0.25	0.2	**1.2**	1.0	40	0.6	0.8	80	**0.2**
Soluble Phosphorus			0.11	0.7	0.11	0.0	0.17	0.1	**0.9**	0.7	40	0.4	0.6	{*}	**0.2**
Total Nitrogen			1.9	12.1	2.1	0.8	2.0	1.6	**14.5**	12.1	40	7.3	9.7	30	**6.8**
Total Kjeldhal Nitrogen			1.6	10.2	1.6	0.6	0.6	0.5	**11.3**	10.2	40	6.1	7.2	30	**5.1**
Nitrite & Nitrate			0.6	3.8	0.6	0.2	0.6	0.5	**4.5**	3.8	40	2.3	3.0	30	**2.1**
Copper			0.051	0.3	0.007	0.0	0.094	0.1	**0.4**	0.3	40	0.2	0.3	50	**0.1**
Lead			0.028	0.2	0.017	0.0	0.029	0.0	**0.2**	0.2	40	0.1	0.1	50	**0.1**
Zinc			0.139	0.9	0.256	0.1	0.263	0.2	**1.2**	0.9	40	0.5	0.8	50	**0.4**
BOD5			11.9	76	11.9	5	4.2	3	**84**	76	40	46	53	30	**37**
COD			63	402	63	24	21	17	**443**	402	40	241	282	30	**197**
Organic Carbon			11.9	76	11.9	5	11.9	9	**90**	76	40	46	60	30	**42**
Hydrocarbons			3.5	22	3.5	1	3.5	3	**26**	22	40	13	18	30	**12**
Oil & Grease			3.0	19	3.0	1	3.0	2	**23**	19	40	11	15		**15**
Chloride			53	338	10	4	10	8	**350**	338	40	203	215		**215**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform			1.8	5,231	1.1	194	94	34,071	**39,496**	5,231	40	3,139	37,403		**37,403**
Fecal Strep			35.4	102,878	35.4	6,235	35.4	12,831	**121,944**	102,878	40	61,727	80,792		**80,792**

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

Date: 7/25/06

SUBBASIN E1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.00		0.66		0.04		1.15		1.85						
Imperviousness (%):			100		100		2								
Runoff Coefficient, Rv:			0.95		0.95		0.068								
Annual Runoff, R (in.):			42.75		42.75		3.06								
										Pavement Sweeping			Dry Swale		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids			27	172	9	3	37	29	**205**	172	60	69	102	80	**20**
Total Phosphorus			0.15	1.0	0.14	0.1	0.25	0.2	**1.2**	1.0	40	0.6	0.8	80	**0.2**
Soluble Phosphorus			0.11	0.7	0.11	0.0	0.17	0.1	**0.9**	0.7	40	0.4	0.6	{*}	**0.2**
Total Nitrogen			1.9	12.1	2.1	0.8	2.0	1.6	**14.5**	12.1	40	7.3	9.7	30	**6.8**
Total Kjeldhal Nitrogen			1.6	10.2	1.6	0.6	0.6	0.5	**11.3**	10.2	40	6.1	7.2	30	**5.1**
Nitrite & Nitrate			0.6	3.8	0.6	0.2	0.6	0.5	**4.5**	3.8	40	2.3	3.0	30	**2.1**
Copper			0.051	0.3	0.007	0.0	0.094	0.1	**0.4**	0.3	40	0.2	0.3	50	**0.1**
Lead			0.028	0.2	0.017	0.0	0.029	0.0	**0.2**	0.2	40	0.1	0.1	50	**0.1**
Zinc			0.139	0.9	0.256	0.1	0.263	0.2	**1.2**	0.9	40	0.5	0.8	50	**0.4**
BOD5			11.9	76	11.9	5	4.2	3	**84**	76	40	46	53	30	**37**
COD			63	402	63	24	21	17	**443**	402	40	241	282	30	**197**
Organic Carbon			11.9	76	11.9	5	11.9	9	**90**	76	40	46	60	30	**42**
Hydrocarbons			3.5	22	3.5	1	3.5	3	**26**	22	40	13	18	30	**12**
Oil & Grease			3.0	19	3.0	1	3.0	2	**23**	19	40	11	15		**15**
Chloride			53	338	10	4	10	8	**350**	338	40	203	215		**215**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform			1.8	5,231	1.1	194	94	34,071	**39,496**	5,231	40	3,139	37,403		**37,403**
Fecal Strep			35.4	102,878	35.4	6,235	35.4	12,831	**121,944**	102,878	40	61,727	80,792		**80,792**

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

Date: 7/25/06

SUBBASIN E1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.00		0.66		0.04		1.15		1.85						
Imperviousness (%):			100		100		2								
Runoff Coefficient, Rv:			0.95		0.95		0.068								
Annual Runoff, R (in.):			42.75		42.75		3.06								
										Pavement Sweeping			Dry Swale		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids			27	172	9	3	37	29	**205**	172	60	69	102	80	**20**
Total Phosphorus			0.15	1.0	0.14	0.1	0.25	0.2	**1.2**	1.0	40	0.6	0.8	80	**0.2**
Soluble Phosphorus			0.11	0.7	0.11	0.0	0.17	0.1	**0.9**	0.7	40	0.4	0.6	{*}	**0.2**
Total Nitrogen			1.9	12.1	2.1	0.8	2.0	1.6	**14.5**	12.1	40	7.3	9.7	30	**6.8**
Total Kjeldhal Nitrogen			1.6	10.2	1.6	0.6	0.6	0.5	**11.3**	10.2	40	6.1	7.2	30	**5.1**
Nitrite & Nitrate			0.6	3.8	0.6	0.2	0.6	0.5	**4.5**	3.8	40	2.3	3.0	30	**2.1**
Copper			0.051	0.3	0.007	0.0	0.094	0.1	**0.4**	0.3	40	0.2	0.3	50	**0.1**
Lead			0.028	0.2	0.017	0.0	0.029	0.0	**0.2**	0.2	40	0.1	0.1	50	**0.1**
Zinc			0.139	0.9	0.256	0.1	0.263	0.2	**1.2**	0.9	40	0.5	0.8	50	**0.4**
BOD5			11.9	76	11.9	5	4.2	3	**84**	76	40	46	53	30	**37**
COD			63	402	63	24	21	17	**443**	402	40	241	282	30	**197**
Organic Carbon			11.9	76	11.9	5	11.9	9	**90**	76	40	46	60	30	**42**
Hydrocarbons			3.5	22	3.5	1	3.5	3	**26**	22	40	13	18	30	**12**
Oil & Grease			3.0	19	3.0	1	3.0	2	**23**	19	40	11	15		**15**
Chloride			53	338	10	4	10	8	**350**	338	40	203	215		**215**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform			1.8	5,231	1.1	194	94	34,071	**39,496**	5,231	40	3,139	37,403		**37,403**
Fecal Strep			35.4	102,878	35.4	6,235	35.4	12,831	**121,944**	102,878	40	61,727	80,792		**80,792**

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

Date: 7/25/06

SUBBASIN E2
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION								DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total									
Area (ac):	0.42		2.60		1.38		0.98		5.38									
Imperviousness (%):	100		100		100		2											
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068											
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06											
										Pavement Sweeping			Wet Pond			Infiltration		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	468	1899	27	678	9	120	37	25	2,722	2577	60	1,031	1,176	80	235	235	20	188
Total Phosphorus	0.22	0.9	0.15	3.8	0.14	1.9	0.25	0.2	6.7	4.7	40	2.8	4.8	50	2.4	2.4	20	1.9
Soluble Phosphorus	0.11	0.4	0.11	2.8	0.11	1.5	0.17	0.1	4.8	3.2	40	1.9	3.5		3.5	3.5	{*}	1.9
Total Nitrogen	2.0	8.1	1.9	47.7	2.1	28.0	2.0	1.4	85.2	55.8	40	33.5	62.9	30	44.0	44.0	20	35.2
Total Kjeldhal Nitrogen	1.6	6.5	1.6	40.2	1.6	21.3	0.6	0.4	68.4	46.7	40	28.0	49.7	30	34.8	34.8	20	27.9
Nitrite & Nitrate	0.6	2.4	0.6	15.1	0.6	8.0	0.6	0.4	25.9	17.5	40	10.5	18.9	40	11.3	11.3	20	9.1
Copper	0.073	0.3	0.051	1.3	0.007	0.1	0.094	0.1	1.7	1.6	40	0.9	1.1	50	0.6	0.6	20	0.4
Lead	0.17	0.7	0.028	0.7	0.017	0.2	0.029	0.0	1.6	1.4	40	0.8	1.1	50	0.5	0.5	20	0.4
Zinc	0.045	0.2	0.139	3.5	0.256	3.4	0.263	0.2	7.3	3.7	40	2.2	5.8	50	2.9	2.9	20	2.3
BOD5	11.9	48	11.9	299	11.9	159	4.2	3	509	347	40	208	370	30	259	259	20	207
COD	63	256	63	1583	63	840	21	14	2692	1838	40	1,103	1,957	30	1,370	1,370	20	1,096
Organic Carbon	11.9	48	11.9	299	11.9	159	11.9	8	514	347	40	208	375	30	263	263	20	210
Hydrocarbons	3.5	14	3.5	88	3.5	47	3.5	2	151	102	40	61	110	30	77	77	20	62
Oil & Grease	3.0	12	3.0	75	3.0	40	3.0	2	130	88	40	53	95		95	95	20	76
Chloride	53	215	53	1331	10	133	10	7	1687	1546	40	928	1,068		1,068	1,068	20	854
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)									(BC/yr)
Fecal Coliform	12	22,192	1.8	20,607	1.1	6,684	94	29,034	78,518	42,800	40	25,680	61,398	70	18,419	18,419	20	14,736
Fecal Strep	35.4	65,468	35.4	405,275	35.4	215,108	35.4	10,934	696,784	470,743	40	282,446	508,487	70	152,546	152,546	20	122,037

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

Date: 7/25/06

SUBBASIN W1
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION						DISCHARGE		
	Gravel Pavement		Commercial Parking		Commercial Roof		Open Space / Landscaping									Subarea W1B Open Space / Landscaping		Total
Area (ac):	0.00		1.70		0.00		2.36									0.00		4.06
Imperviousness (%):	25		100		100		2									2		
Runoff Coefficient, Rv:	0.275		0.95		0.95		0.068									0.068		Resultant
Annual Runoff, R (in.):	12.38		42.75		42.75		3.06									3.06		Surface
										Organic Filter			Storage / Infiltration					Water
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Incoming L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	remainder (lbs/yr)	C (mg/l)	L (lbs/yr)	Discharge (lbs/yr)
Total Suspended Solids	27	0	27	443	9	0	37	60	**504**	504	85	76	76	90	8	27	0	**8**
Total Phosphorus	0.15	0.0	0.15	2.5	0.14	0.0	0.25	0.4	**2.9**	2.9	60	1.1	1.1	90	0.1	0.15	0.0	**0.1**
Soluble Phosphorus	0.11	0.0	0.11	1.8	0.11	0.0	0.17	0.3	**2.1**	2.1		2.1	2.1	{*}	0.1	0.11	0.0	**0.1**
Total Nitrogen	1.9	0.0	1.9	31.2	2.1	0.0	2.0	3.3	**34.5**	34.5	40	20.7	20.7	90	2.1	1.9	0.0	**2.1**
Total Kjeldhal Nitrogen	1.6	0.0	1.6	26.3	1.6	0.0	0.6	1.0	**27.3**	27.3	40	16.4	16.4	90	1.6	1.6	0.0	**1.6**
Nitrite & Nitrate	0.6	0.0	0.6	9.9	0.6	0.0	0.6	1.0	**10.8**	10.8		10.8	10.8	90	1.1	0.6	0.0	**1.1**
Copper	0.051	0.0	0.051	0.8	0.007	0.0	0.094	0.2	**1.0**	1.0	70	0.3	0.3	90	0.0	0.051	0.0	**0.0**
Lead	0.028	0.0	0.028	0.5	0.017	0.0	0.029	0.0	**0.5**	0.5	70	0.2	0.2	90	0.0	0.028	0.0	**0.0**
Zinc	0.139	0.0	0.139	2.3	0.256	0.0	0.263	0.4	**2.7**	2.7	70	0.8	0.8	90	0.1	0.139	0.0	**0.1**
BOD5	11.9	0	11.9	195	11.9	0	4.2	7	**202**	202	40	121	121	90	12	11.9	0	**12**
COD	63	0	63	1035	63	0	21	34	**1069**	1069	40	641	641	90	64	63	0	**64**
Organic Carbon	11.9	0	11.9	195	11.9	0	11.9	19	**215**	215	40	129	129	90	13	11.9	0	**13**
Hydrocarbons	3.5	0	3.5	57	3.5	0	3.5	6	**63**	63	40	38	38	90	4	3.5	0	**4**
Oil & Grease	3.0	0	3.0	49	3.0	0	3.0	5	**54**	54	40	33	33	90	3	3.0	0	**3**
Chloride	10	0	10	164	10	0	10	16	**181**	181		181	181	90	18	10	0	**18**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)	C (1000/ml)	L (BC/yr)	(BC/yr)
Fecal Coliform	12	0	1.8	13,474	1.1	0	94	69,920	**83,393**	83,393		83,393	83,393	90	8,339	12	0	**8,339**
Fecal Strep	35.4	0	35.4	264,988	35.4	0	35.4	26,331	**291,319**	291,319		291,319	291,319	90	29,132	35.4	0	**29,132**

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

Date: 7/25/06

SUBBASIN W2
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	0.00		0.49		0.21		0.18		0.88						
Imperviousness (%):	100		100		100		2								
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068								
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06								
										Pavement Sweeping			Dry Swale		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	468	0	27	128	9	18	37	5	**151**	128	60	51	74	80	**15**
Total Phosphorus	0.22	0.0	0.15	0.7	0.14	0.3	0.25	0.0	**1.0**	0.7	40	0.4	0.7	80	**0.1**
Soluble Phosphorus	0.11	0.0	0.11	0.5	0.11	0.2	0.17	0.0	**0.8**	0.5	40	0.3	0.6	{*}	**0.1**
Total Nitrogen	2.0	0.0	1.9	9.0	2.1	4.3	2.0	0.2	**13.5**	9.0	40	5.4	9.9	30	**6.9**
Total Kjeldhal Nitrogen	1.6	0.0	1.6	7.6	1.6	3.2	0.6	0.1	**10.9**	7.6	40	4.5	7.9	30	**5.5**
Nitrite & Nitrate	0.6	0.0	0.6	2.8	0.6	1.2	0.6	0.1	**4.1**	2.8	40	1.7	3.0	30	**2.1**
Copper	0.073	0.0	0.051	0.2	0.007	0.0	0.094	0.0	**0.3**	0.2	40	0.1	0.2	50	**0.1**
Lead	0.17	0.0	0.028	0.1	0.017	0.0	0.029	0.0	**0.2**	0.1	40	0.1	0.1	50	**0.1**
Zinc	0.045	0.0	0.139	0.7	0.256	0.5	0.263	0.0	**1.2**	0.7	40	0.4	0.9	50	**0.5**
BOD5	11.9	0	11.9	56	11.9	24	4.2	1	**81**	56	40	34	58	30	**41**
COD	63	0	63	298	63	128	21	3	**429**	298	40	179	309	30	**217**
Organic Carbon	11.9	0	11.9	56	11.9	24	11.9	1	**82**	56	40	34	59	30	**42**
Hydrocarbons	3.5	0	3.5	17	3.5	7	3.5	0	**24**	17	40	10	17	30	**12**
Oil & Grease	3.0	0	3.0	14	3.0	6	3.0	0	**21**	14	40	9	15		**15**
Chloride	53	0	53	251	10	20	10	1	**272**	251	40	151	172		**172**
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform	12	0	1.8	3,884	1.1	1,017	94	5,333	**10,234**	3,884	40	2,330	8,680		**8,680**
Fecal Strep	35.4	0	35.4	76,379	35.4	32,734	35.4	2,008	**111,121**	76,379	40	45,827	80,569		**80,569**

(*): Soluble phosphorus cannot exceed total phosphorus

THE FAIRGROUNDS
ESTIMATED POLLUTANT LOAD - DEIS PLAN

Date: 7/25/06

SUBBASIN W3
PROPOSED CONDITIONS

Annual Precip., P (in.): 50 inches
Correction Factor, Pj: 0.9

	POLLUTANT GENERATION									MITIGATION					DISCHARGE
	Commercial Street		Commercial Parking		Commercial Roof		Open Space / Landscaping		Total						
Area (ac):	1.20		1.00		0.20		1.20		3.60						
Imperviousness (%):	100		100		100		2								
Runoff Coefficient, Rv:	0.95		0.95		0.95		0.068								
Annual Runoff, R (in.):	42.75		42.75		42.75		3.06								
										Pavement Sweeping			Bioretention		
PARAMETER	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	C (mg/l)	L (lbs/yr)	L (lbs/yr)	Paved L (lbs/yr)	removal (%)	remainder (lbs/yr)	Incoming L (lbs/yr)	removal (%)	Resultant Surface Water Discharge (lbs/yr)
Total Suspended Solids	468	5426	27	261	9	17	37	31	5,735	5687	60	2,275	2,323	80	465
Total Phosphorus	0.22	2.6	0.15	1.4	0.14	0.3	0.25	0.2	4.5	4.0	40	2.4	2.9	30	2.0
Soluble Phosphorus	0.11	1.3	0.11	1.1	0.11	0.2	0.17	0.1	2.7	2.3	40	1.4	1.8		1.8
Total Nitrogen	2.0	23.2	1.9	18.4	2.1	4.1	2.0	1.7	47.3	41.5	40	24.9	30.6	50	15.3
Total Kjeldhal Nitrogen	1.6	18.6	1.6	15.5	1.6	3.1	0.6	0.5	37.6	34.0	40	20.4	24.0	50	12.0
Nitrite & Nitrate	0.6	7.0	0.6	5.8	0.6	1.2	0.6	0.5	14.4	12.8	40	7.7	9.3	35	6.1
Copper	0.073	0.8	0.051	0.5	0.007	0.0	0.094	0.1	1.4	1.3	40	0.8	0.9	60	0.4
Lead	0.17	2.0	0.028	0.3	0.017	0.0	0.029	0.0	2.3	2.2	40	1.3	1.4	60	0.6
Zinc	0.045	0.5	0.139	1.3	0.256	0.5	0.263	0.2	2.6	1.9	40	1.1	1.8	60	0.7
BOD5	11.9	138	11.9	115	11.9	23	4.2	3	279	253	40	152	178	30	125
COD	63	730	63	609	63	122	21	17	1478	1339	40	803	943	30	660
Organic Carbon	11.9	138	11.9	115	11.9	23	11.9	10	286	253	40	152	185	30	129
Hydrocarbons	3.5	41	3.5	34	3.5	7	3.5	3	84	74	40	45	54	30	38
Oil & Grease	3.0	35	3.0	29	3.0	6	3.0	2	72	64	40	38	47	30	33
Chloride	53	614	53	512	10	19	10	8	1154	1127	40	676	704		704
BACTERIA	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	C (1000/ml)	L (BC/yr)	L (BC/yr)						(BC/yr)
Fecal Coliform	12	63,407	1.8	7,926	1.1	969	94	35,552	107,854	71,333	40	42,800	79,321		79,321
Fecal Strep	35.4	187,050	35.4	155,875	35.4	31,175	35.4	13,389	387,489	342,925	40	205,755	250,319		250,319

(*): Soluble phosphorus cannot exceed total phosphorus

APPENDIX 2

References

Center for Watershed Protection

Prepared for NYSDEC

New York State Stormwater Management Design Manual

2001, 2003
Elicott City, MD

Table 2.1 National Median Concentrations for Chemical Constituents in Stormwater

Constituent	Units	Concentration
Total Suspended Solids[1]	mg/l	54.5
Total Phosphorus[1]	mg/l	0.26
Soluble Phosphorus[1]	mg/l	0.10
Total Nitrogen[1]	mg/l	2.00
Total Kjeldhal Nitrogen[1]	mg/l	1.47
Nitrite and Nitrate[1]	mg/l	0.53
Copper[1]	ug/l	11.1
Lead[1]	ug/l	50.7
Zinc[1]	ug/l	129
BOD[1]	mg/l	11.5
COD[1]	mg/l	44.7
Organic Carbon[2]	mg/l	11.9
PAH[3]	mg/l	3.5*
Oil and Grease[4]	mg/l	3.0*
Fecal Coliform[5]	col/100 ml	15,000*
Fecal Strep[5]	col/ 100 ml	35,400*
Chloride (snowmelt)[6]	mg/l	116

* Represents a Mean Value
Source:
1: Pooled NURP/USGS (Smullen and Cave, 1998)
2: Derived from the National Pollutant Removal Database (Winer, 2000)
3: Rabanal and Grizzard 1995
4: Crunkilton *et al.* (1996)
5: Schueler (1999)
6: Oberts 1994

The Simple Method to Calculate Urban Stormwater Loads

This appendix presents data and methodologies for using the Simple Method (Schueler, 1987) to estimate pollutant load from a site or drainage area. This appendix is meant for planning purposes only, and should not be used for SMP design.

The Simple Method estimates stormwater runoff pollutant loads for urban areas. The technique requires a modest amount of information, including the subwatershed drainage area and impervious cover, stormwater runoff pollutant concentrations, and annual precipitation. With the Simple Method, the investigator can either break up land use into specific areas, such as residential, commercial, industrial, and roadway and calculate annual pollutant loads for each type of land, or utilize more generalized pollutant values for urban runoff. It is also important to note that these values may vary depending on other variables such as the age of development.

The Simple Method estimates pollutant loads for chemical constituents as a product of annual runoff volume and pollutant concentration, as:

$$\mathbf{L = 0.226 * R * C * A}$$

Where:	L	=	Annual load (lbs)
	R	=	Annual runoff (inches)
	C	=	Pollutant concentration (mg/l)
	A	=	Area (acres)
	0.226	=	Unit conversion factor

For bacteria, the equation is slightly different, to account for the differences in units. The modified equation for bacteria is:

$$\mathbf{L = 103 * R * C * A}$$

Where:	L	=	Annual load (Billion Colonies)
	R	=	Annual runoff (inches)
	C	=	Bacteria concentration (1,000/ ml)
	A	=	Area (acres)
	103	=	Unit conversion factor

A.1 Pollutant Concentrations

Stormwater pollutant concentrations can be estimated from local or regional data, or from national data sources. Table A.1 presents typical concentration data for pollutants in urban stormwater.

Table A.1 National Median Concentrations for Chemical Constituents in Stormwater

Constituent	Units	Urban Runoff
TSS	mg/l	54.5[1]
TP	mg/l	0.26[1]
TN	mg/l	2.00[1]
Cu	ug/l	11.1[1]
Pb	ug/l	50.7[1]
Zn	ug/l	129[1]
F Coli	1,000 col/ ml	1.5[2]

Source:
1: Pooled NURP/USGS (Smullen and Cave, 1998)
2: Schueler (1999)

In addition, some source areas appear to be particularly important for some pollutants. Table A.2 summarizes these data for several key source areas. It is important to note that, because the Simple Method computes runoff based on an impervious area fraction, it cannot be easily used to isolate pervious sources, such as lawns. However, a user can evaluate particular hotspots, such as auto recyclers, separately. In addition, a composite runoff concentration can be developed based on the fraction of lawn, driveway, and roof on a residential site, for example.

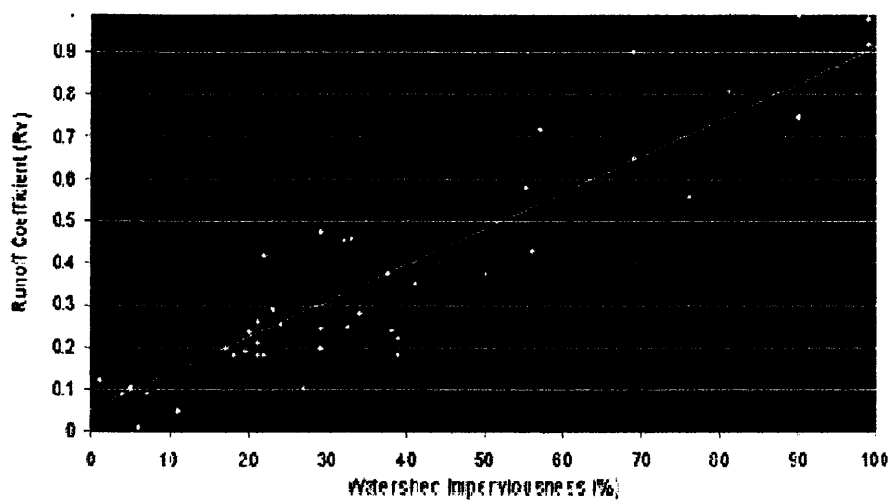
Table A.2 Pollutant Concentrations from Source Areas							
Constituent	**TSS[1]**	**TP[2]**	**TN[3]**	**F Coli[1]**	**Cu[1]**	**Pb[1]**	**Zn[1]**
	mg/l	mg/L	mg/l	1,000 col/ ml	ug/l	ug/l	ug/l
Resid Roof	19	0.11	1.5	0.26	20	21	312
Comm Roof	9	0.14	2.1	1.1	7	17	256
Indust Roof	17	-	-	5.8	62	43	1,390
C/R Parking	27	0.15	1.9	1.8	51	28	139
Indust Parking	228	-	-	2.7	34	85	224
Res Street	172	0.55	1.4	37	25	51	173
Comm Street	468	-	-	12	73	170	450
Rural Highway	51	-	22	-	22	80	80
Urban Highway	142	0.32	3.0	-	54	400	329
Lawns	602	2.1	9.1	24	17	17	50
Landscaping	37	-	-	94	94	29	263
Driveway	173	0.56	2.1	17	17	-	107
Gas Station	31	-	-	-	88	80	290
Auto Recycler	335	-	-	-	103	182	520
Heavy Industrial	124	-	-	-	148	290	1600

1: Claytor and Schueler (1996)

2: Average of Steuer et al. (1997),Bannerman (1993) and Waschbusch (2000)

3: Steuer et al. (1997)

Figure A.1 Relationship Between Watershed Imperviousness and the Stormwater Runoff Coefficient



A.2 Annual Runoff

The Simple Method calculates annual runoff as a product of annual runoff volume, and a runoff coefficient (Rv). Runoff volume is calculated as:

$$\mathbf{R = P * P_j * Rv}$$

Where:
- R = Annual runoff (inches)
- P = Annual rainfall (inches)
- P_j = Fraction of annual rainfall events that produce runoff (usually 0.9)
- Rv = Runoff coefficient

In the Simple Method, the runoff coefficient is calculated based on impervious cover in the subwatershed. This relationship is shown in Figure A.1. Although there is some scatter in the data, watershed imperviousness does appear to be a reasonable predictor of Rv.

The following equation represents the best fit line the dataset (N=47, R^2=0.71).

$$\mathbf{Rv=0.05+0.9Ia}$$

Where: Ia = Impervious fraction

A.3 Impervious Cover Data

The Simple Method uses different impervious cover values for separate land uses within a subwatershed. Representative impervious cover data, are presented in Table A.3. These numbers are derived from a recent study conducted by the Center for Watershed Protection under a grant from the U.S. Environmental Protection Agency to update impervious cover estimates for a variety of land uses. (Cappiella and Brown, 2001). In addition, some jurisdictions may have detailed impervious cover information if they maintain a detailed land use/land cover GIS database.

Table A.3 Land Use and Impervious Cover Estimates

Land Use Category	Mean Impervious Cover
Agriculture	**2**
Open Urban Land*	**9**
2 Acre Lot Residential	**11**
1 Acre Lot Residential	**14**
1/2 Acre Lot Residential	**21**
1/4Acre Lot Residential	**28**
1/8 Acre Lot Residential	**33**
Townhome Residential	**41**
Multifamily Residential	**44**
Institutional**	**31-38%**
Light Industrial	**50-56%**
Commercial	**70-74%**

* Open urban land includes developed park land, recreation areas, golf courses, and cemeteries.

** Institutional is defined as places of worship, schools, hospitals, government offices, and police and fire stations

A.4 Limitations of the Simple Method

The Simple Method should provide reasonable estimates of changes in pollutant export resulting from urban development activities. However, several caveats should be kept in mind when applying this method.

The Simple Method is most appropriate for assessing and comparing the relative stormflow pollutant load changes of different land use and stormwater management scenarios. The Simple Method provides estimates of storm pollutant export that are probably close to the "true" but unknown value for a development site, catchment, or subwatershed. However, it is very important not to over emphasis the precision of the results obtained. For example, it would be inappropriate to use the Simple Method to evaluate relatively similar development scenarios (e.g., 34.3% versus 36.9% Impervious cover). The simple method provides a general planning estimate of likely storm pollutant export from areas at the scale of a development site, catchment or subwatershed. More sophisticated modeling may be needed to analyze larger and more complex drainages.

In addition, the Simple Method only estimates pollutant loads generated during storm events. It does not consider pollutants associated with baseflow volume. Typically, baseflow is negligible or non-existent at the scale of a single development site, and can be safely neglected, unless wastewater sources such as illicit connections and wastewater treatment plans are significant. However, catchments and subwatersheds do generate baseflow volume. Pollutant loads in baseflow are generally low and can seldom be distinguished from natural background levels (NVPDC, 1980). Consequently, baseflow pollutant loads normally constitute only a small fraction of the total pollutant load delivered from an urban area. Nevertheless, it is important to remember that the load estimates refer only to storm event derived loads and should not be confused with the total pollutant load from an area. This is particularly important when the development density of an area is low. For example, in a large low density residential subwatershed (Imp. Cover < 5%), as much as 75% of the annual runoff volume may occur as baseflow. In such a case, the annual baseflow nutrient load may be equivalent to the annual stormflow nutrient load.

A.5 SMP Pollutant Removal

The removal efficiencies of various SMP practices also help determine final annual pollutant loads. Table A.4 provides estimates of the average pollutant removal efficiency of the five SMP categories.

Table A.4. Suggested Removal Rates for SMPs

	TSS	TP	TN	Metals[1]	Bacteria
Wet Ponds	80	50 (51)	35 (33)	60 (62)	70
Stormwater Wetlands	80[2] (76)	50 (49)	30	40 (42)	80 (78)
Filtering Practices	85 (86)	60 (59)	40 (38)	70 (69)	35 (37)
Infiltration Practices [4]	90[3] (95)	70	50 (51)	90[3] (99)	90[4]
Water Quality Swales	85 (84)	40 (39)	50[5] (84)	70	0 (-25)[6]

1. Average of zinc and copper. Only zinc for infiltration
2. Many wetland practices in the database were poorly designed, and we consequently adjusted sediment removal upward.
3. It is assumed that no practice is greater than 90% efficient.
4. Data inferred from sediment removal.
5. Actual data is based on only two highly performing practices.
6. Assume 0 rather than a negative removal.

Note: Data in parentheses represent median pollutant removal data reported in the *National Pollutant Removal Database - Revised Edition* (Winer, 2000). These data were adjusted for convenience and to reflect biases in the data.

These efficiencies represent ideal pollutant removal rates that cannot be achieved at all sites, or at a watershed level. Typically, they need to be "discounted" to account for site constraints, and other factors that reduce practice efficiency. For example, the removal rate should be adjusted to reflect the fraction of runoff captured by a practice on an annual basis (90% if this guidance is followed). For more detail on how to apply these discounts, consult Caraco (2001).

One particularly important consideration is how to account for practices applied in series (e.g., two ponds applied in sequence). If the volume within the practices adds up to the total water quality volume, they are assumed to act as a single practice with that volume. Otherwise, total pollutant removal should be determined by the following equation:

$$R = L\,[(E_1)+(1-E_1)E_2+(1-((E_1)+(1-E_1)E_2)E_3+\ldots]$$

Where:

R = Pollutant Removal (lbs)

L = Annual Load from Simple Method (lbs.)

E_i = Efficiency of the ith practice in a series

Another adjustment can be made to these removals to account for loss of effectiveness and "irreducible concentrations." Evidence suggests that, at low concentrations, SMPs can no longer remove pollutants.

Table A.5 depicts typical outflow concentrations for various SMPs. Another simplified way to account for this phenomenon is to reduce the efficiency of a second or third practice in a series. For example, the removal efficiency could be cut in half to reflect inability to remove fine particles.

Table A.5. Typical SMP Effluent Concentrations

	TSS	TP	TN	Cu	Zn
Wet Ponds	17	0.11	1.3	5.0	30
Wetlands	22	0.20	1.7	7.0	31
Filtering Practices	11	0.10	1.12	10	21
Infiltration Practices	17[2]	0.05[2]	3.8[2]	4.8[2]	39[2]
Open Channel Practices	14	0.19	1.12	10	53

1. Units for Zn and Cu are micrograms per liter
2. Data based on fewer than five data points

References

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➢University of Alabama Department of Civil and Environmental Engineering
➢Center for Watershed Protection

Findings from the National Stormwater Quality Database

Research Progress Report

Tuscaloosa, AL
Elicott City, MD
2004

http://www.cwp.org/npdes_research_report.pdf

Table 1. Numbers of Events for Different Seasons and Land Uses					
	Residential	Industrial	Commercial	Freeways	Open Space
Winter	280	142	122	103	28
Spring	277	135	125	45	15
Summer	223	113	109	2	15
Fall	295	134	147	35	16
Total	1075	524	503	185	74

Table 2. Numbers of Events for Different Geographic Regions and Land Uses					
EPA Rain Zone	Residential	Industrial	Commercial	Freeways	Open Space
1	25	13	3	0	1
2	686	239	304	3	36
3	58	46	24	0	0
4	91	63	58	0	13
5	98	47	22	0	22
6	45	74	37	154	2
7	58	33	46	28	0
8	7	0	0	0	0
9	7	9	9	0	0
	1075	524	503	185	74

Table 3. Median Values and EMCs for Selected Parameters in the NSDQ, Version 1.0						
Parameter	Overall	Residential	Commercial	Industrial	Freeways	Open Space
Area (acres)	56	57.3	38.8	39	1.6	73.5
% Imperv.	54.3	37	83	75	80	2
Precip. Depth (in)	0.47	0.46	0.39	0.49	0.54	0.48
TSS (mg/L)	58	48	43	77	99	51
BOD5 (mg/L)	8.6	9	11.9	9	8	4.2
COD (mg/L)	53	55	63	60	100	21
Fecal Coliform (mpn/100 mL)	5081	7750	4500	2500	1700	3100
NH3 (mg/L)	0.44	0.31	0.5	0.5	1.07	0.3
N02+NO3 (mg/L)	0.6	0.6	0.6	0.7	0.3	0.6
Nitrogen, Total Kjeldahl (mg/L)	1.4	1.4	1.6	1.4	2	0.6
Phos., filtered (mg/L)	0.12	0.17	0.11	0.11	0.2	0.08
Phos., total (mg/L)	0.27	0.3	0.22	0.26	0.25	0.25
Cd, total (ug/L)	1	0.5	0.9	2	1	0.5
Cd, filtered (ug/L)	0.5	ND	0.3	0.6	0.68	ND
Cu, total (ug/L)	16	12	17	22	35	5.3
Cu, filtered (ug/L)	8	7	7.6	8	10.9	ND
Pb, total (ug/L)	16	12	18	25	25	5
Pb, filtered (ug/L)	3	3	5	5	1.8	ND
Ni, total (ug/l)	8	5.4	7	16	9	ND
Ni, filtered (ug/L)	4	2	3	5	4	ND
Zn, total (ug/L)	116	73	150	210	200	39
Zn, filtered (ug/L)	52	33	59	112	51	ND
ND = not detected, or insufficient data to present as a median value.						

1. Notable observations for different major land use categories include the following:

   - Preliminary statistical analyses found significant differences among land use categories for all pollutants (Figure 2). This is notable because National Urban Runoff Program (NURP) findings showed no significant differences in urban runoff concentrations as a function of common urban land uses (EPA, 1983).

   - Freeway locations generally had the highest median values, except for phosphorus, nitrates, fecal coliforms, and zinc.

   - The industrial sites had the highest reported zinc concentrations.

   - The Total Kjeldahl Nitrogen (TKN), copper, lead, and zinc observations are lowest for open space areas.

2. Comparison of select NURP (1983) and NSQD data (Table 4) reveals the following interesting observations:

   - Lead concentrations, as expected, have dropped by an order of magnitude over the last 20 years, largely assumed to be the result of instituting unleaded gasoline regulations.

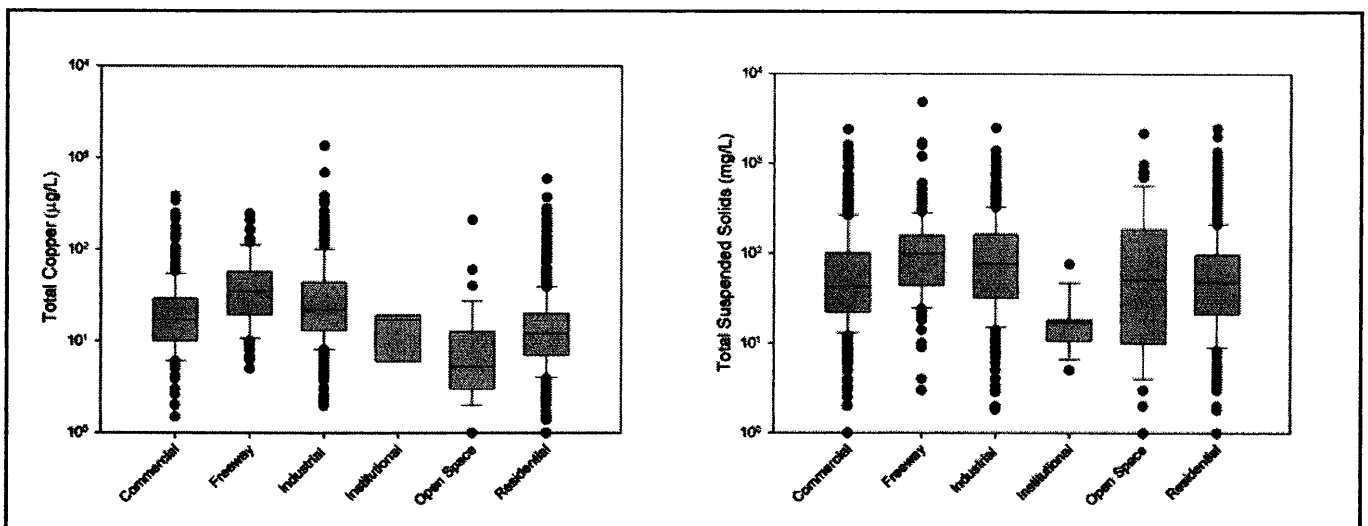


Figure 2. Example plots showing variations in pollutant concentrations between land uses.

Table 4. Comparison of NURP and NSQD Data

	Overall		Residential		Commercial		Open Space	
Parameter	**NSQD Median**	**NURP Median**	**NSQD Median**	**NURP Median**	**NSQD Median**	**NURP Median**	**NSQD Median**	**NURP Median**
Area (Acres)	56	68.5	57.3	57.5	38.8	27.5	73.5	3,775
BOD5 (mg/L)	8.6	9	9	10	11.9	9.3	NA	NA
COD (mg/L)	53	65	55	73	63	57	21	40
TSS (mg/L)	58	100	48	101	43	69	51	70
Pb, total (ug/L)	16	144	12	144	18	104	5	30
Cu, total (ug/L)	16	34	12	33	17	29	NA	NA
Zn, total (ug/L)	116	160	73	135	150	226	39	195
Nitrogen, Total Kjeldahl (mg/L)	1.4	1.5	1.4	1.9	1.6	1.18	0.6	0.97
N02+NO3 (mg/L)	0.6	0.68	0.6	0.74	0.6	0.57	0.6	0.54
Phos., total (mg/L)	0.27	0.33	0.3	0.38	0.22	0.20	0.25	0.12
Phos., filtered (mg/L)	0.12	0.12	0.17	0.14	0.11	0.08	0.08	0.03

Purdue University
Nerilde Favaretto

"Nitrogen and Phosphorus Losses in Surface Water from the Indian Pine Watershed"

Watershed System Design

2000
West Lafayette, IN

http://pasture.ecn.purdue.edu/~engelb/agen526/projects00/favarett/LTHIAproject.htm

The expected mean concentration (EMC) of nitrogen and phosphorus depend on the each land use. High values are expected in agricultural systems, followed by residential, commercial, grass/pasture, and forest. Table 1 shows the EMC for total nitrogen (N), nitrate and total phosphorus (P) used for the calculations in this study.

Nutrients (mg/l)	Residential	Commercial	Agricultural	Pasture/Grass	Forest
Total N	1.82	1.34	4.40	0.70	0.70
Nitrate	0.23	0.26	1.60	0.40	0.40
Total P	0.57	0.32	1.30	0.01	0.01

Table 1. Expected mean concentration (EMC) of nutrients in each land use class.

The amount of nutrients lost by the surface water depends on the expected mean concentration and the runoff volume. Agricultural land use has the highest EMC, but the highest runoff rates are present in the commercial and residential area. This will generate high loss of nutrients per area in commercial and residential land use classes. Table 2 shows the weighted average for the loss of nutrients in kg/ha/year. In spite of commercial and residential land use to have low EMC (Table 1), they have the highest average for nutrients loss (Table 2). However, the land use of Indian Pine Watershed is basically agricultural, consequently, the amount of nutrients that are lost in the entire watershed is basically originated from the agriculture practice.

Weighted average (kg/ha/year)	Residential	Commercial	Agricultural	Pasture/Grass	Forest
Total N	1.210	2.210	1.050	0.060	0.033
Nitrate	0.153	0.429	0.381	0.036	0.019
Total P	0.381	0.528	0.309	0.002	0.001

Table 2. Weighted average of nutrient losses (kg/ha/year) in each land use class from the Indian Pine Watershed.

Comparing land use (Figure 1) with losses of total nitrogen and nitrate (Figure 5 and 6, respectively), we can observe that the highest values of nutrient losses are related to the commercial, residential and agricultural land use. Forest and pasture have a small contribution on water pollution for these nutrients. If we look the values of the hydrological soil type (Figure 2) and comparing with the nutrient losses, we verify that soil type C has the higher value in the same land use. This soil has low infiltration rate and, consequently high runoff and nutrient losses.

The same tendency is observed for total P (Figure 7), but for dissolved P (Figure 8) this is not so evident. The behavior of P in the soil is different from N. Phosphorus is strongly adsorbed on the soil

➢U.S. Department of Commerce
➢National Oceanic and Atmospheric Administration
➢National Climatic Data Center

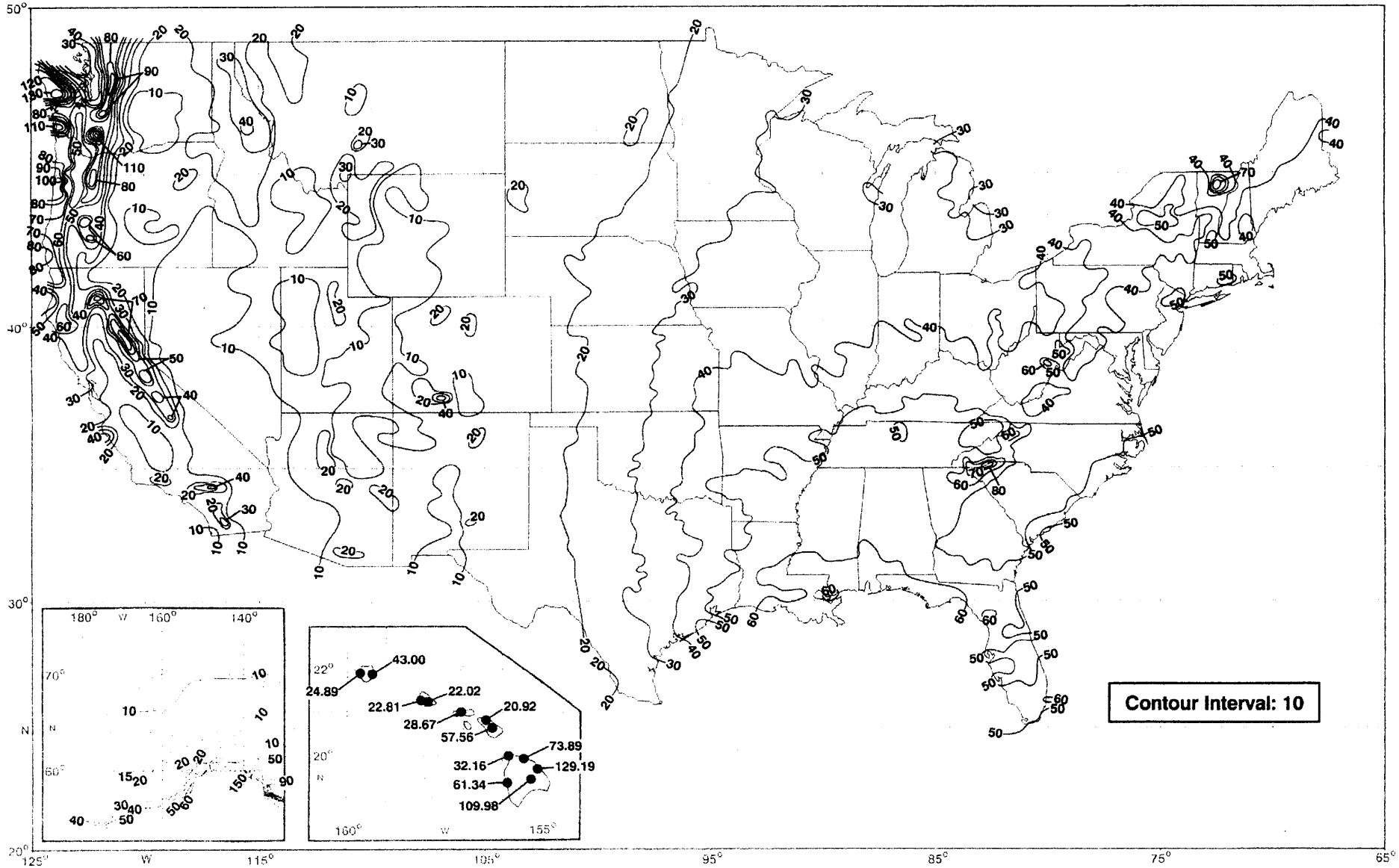
"Maps of Annual 1961-1990 Normal Temperature, Precipitation and Degree Days"

Last updated July 15, 2005

http://www.ncdc.noaa.gov/img/documentlibrary/clim81supp3/precipnormal_lowres.jpg

MEAN ANNUAL PRECIPITATION (INCHES)

BASED ON NORMAL PERIOD 1961-1990



Stormwater Manager's Resource Center

"Stormwater Management Fact Sheet: Wet Pond"

http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool6_Stormwater_Practices/Pond/Wet%20Pond.htm

Pollutant Removal

Wet ponds are among the most effective stormwater treatment practices at removing stormwater pollutants. A wide range of research is available to estimate the effectiveness of wet ponds. Table 2 provides pollutant removal estimates derived from CWP's National Pollutant Removal Performance Database for Stormwater Treatment Practices:

Table 2. Pollutant Removal Efficiency of Stormwater Wet Ponds (Winer, 2000)	
Pollutant	**Removal Efficiency (%)**
TSS	80±27[1]
TP	51±21
TN	33±20
NOx	43±38
Metals	29-73
Bacteria	70±32
1: ± values represent one standard deviation	

There is considerable variability in the effectiveness of wet ponds, and it is believed that properly designing and maintaining ponds may help to improve their performance. The locational and design criteria presented in this sheet reflect the best current information and experience to improve the performance of wet ponds. A recent joint project between the American Society of Civil Engineers (ASCE) and the US EPA Office of Water may help to isolate specific design features that can improve performance. **The National Stormwater Best Management Practice (BMP)** database is a compilation of stormwater practices which includes both design information and performance data for various practices. As the database expands, inferences about the extent to which specific design criteria influence pollutant removal may be made. For more information on this database, access the ASCE web page at http://www.asce.org.

Stormwater Manager's Resource Center

"Stormwater Management Fact Sheet: Sand and Organic Filters"

http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool6_Stormwater_Practices/Filtering%20Practice/Sand%20and%20Organic%20Filter%20Strip.htm

Effectiveness

Structural stormwater management practices can be used to achieve four broad resource protection goals. These include: *Flood Control, Channel Protection, Groundwater Recharge,* and *Pollutant Removal* (see the Manual Builder Category for more information). Filtering practices are for the most part only adapted to provide pollutant removal.

Groundwater Recharge
In exfilter designs, some groundwater recharge can be provided. None of the other sand filter designs can provide recharge, however.

Pollutant Removal
Sand filters are effective stormwater treatment practices for pollutant removal. Removal rates for all sand filters and organic filters are presented below. With the exception of nitrate nitrogen, which appears to be exported from filtering systems, they perform reasonably well at removing pollutants. The export of nitrate from filters may be caused by mineralization of organic nitrogen in the filter bed.

Table 2. Sand Filter Removal Efficiencies (%) (Winer, 2000)

Pollutant	Stormwater Treatment Practice		
	Sand Filters[1]	Organic Filter	Multi-Chamber Treatment Train[2]
TSS	86±23	88±18	85
TP	59±38	61±61	84
TN	38±16	41[2]	NA
NOx	-14±47	-15±49	14
Metals	49 - 88	53 - 85	65-98
Bacteria	37±61	NA	NA

1:Excludes vertical sand filters
2:Data based on fewer than five data points

From the few studies available, it is difficult to determine if organic filters necessarily have higher removal efficiencies than sand filters. The Multi-Chamber Treatment Train appears to have high pollutant removal for some constituents, although these data are also based only on a handful of studies. The siting and design criteria presented in this sheet reflect the best current information and experience to improve the performance of sand filters.

Stormwater Manager's Resource Center

"Stormwater Management Fact Sheet: Grass Channel"

http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool6_Stormwater_Practices/Open%20Channel%20Practice/Grassed%20Channel.htm

Pollutant Removal

Few studies are available regarding the effectiveness of grassed channels. In fact, only nine studies have been conducted on water quality swales. The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and modest removal capability for phosphorous. Table 2 provides pollutant removal data derived from CWP's National Pollutant Removal Database for Stormwater Treatment Practices:

Table 2. Pollutant Removal of Water Quality Swales (Winer, 2000)

Pollutant	Pollutant Removal (%)
TSS	81±14[1]
TP	34±33
NOx	31±49
Metals	42 - 71
Bacteria	-25[2]

1:± values represent 1 standard deviation
2: Data based on fewer than five data points

Stormwater Manager's Resource Center

"Stormwater Management Fact Sheet: Bioretention"

http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool6_Stormwater_Practices/Filtering%20Practice/Bioretention.htm

Pollutant Removal

Little pollutant removal data has been collected on the pollutant removal effectiveness of bioretention areas. In fact only one study has been conducted (Davis *et al.*, 1998). The data from this study is presented in Table 2.

Table 2. Typical Pollutant Removal Rates of Bioretention Systems

Pollutant	Pollutant Removal (%)
TSS	81
TP	29
TN	49
NOx	38
Metals	51-71
Bacteria	-58

U.S. Department of Transportation
Federal Highway Administration

"Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring"

http://www.fhwa.dot.gov/environment/ultraurb/uubmp2.htm
http://www.fhwa.dot.gov/environment/ultraurb/uubmp2.htm #t1

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring

Fact Sheet - Street Sweepers

Streetsweeping is an effective ultra-urban best management practice for reducing total suspended solids and associated pollutant washoff from urban streets. Recent studies have found that streetsweeping programs using equipment based on new technologies can significantly reduce pollutant washoff from urban streets, with potential reductions of up to 80 percent in annual total suspended solids and associated pollutants (Sutherland and Jelen, 1996).

Applicability

Streetsweeping is well suited to ultra-urban environments where little land is available for installation of structural controls. It should be considered in commercial business districts, industrial sites, and intensely developed areas in close proximity to receiving waters. For highway applications, streetsweeping may be considered for road shoulders, where safety permits, rest stop parking areas, or maintenance yards. The benefits of streetsweeping will be best realized by using the most sophisticated sweepers at a weekly to bimonthly frequency depending on local conditions, with a careful assessment of whether certain rules such as restricted street parking prior to and during sweeping can be enforced. Streetsweeping is not effective in removing oil and grease, and older conventional mechanical sweepers are limited in their ability to remove fine sediment.

Types of Street Sweepers

Mechanical sweepers employ a rotating gutter broom to remove particles from the street gutter area, with a water spray used to control dust. The particles removed are placed in the path of a cylindrical broom that rotates to carry the material onto a conveyor belt and into a storage hopper. This is the most widely used equipment for street cleaning in the United States.

Vacuum-assisted sweepers also use gutter brooms to remove particles from the street. However, the refuse is then placed in the path of a vacuum intake that transports the dirt to the hopper. The transported dirt is usually saturated with water. The overall efficiency of vacuum-assisted cleaners is generally higher than that of mechanical cleaners, especially for particles larger than the dust and dirt range (larger than about 3 mm).

Tandem sweeping operations involve two successive cleaning passes, first by a mechanical (broom and conveyor belt) sweeper, followed immediately by a vacuum-assisted sweeper.

Regenerative air sweepers blow air onto the pavement and immediately vacuum it back to entrain and capture accumulated sediments. Air is regenerated for blowing through a dust separation system. If the accumulated loading is not too great, regenerative air sweepers are generally considered effective for removing fine sediment (Sutherland and Jelen, 1996).

Vacuum-assisted dry sweepers combine the important elements of tandem sweeping into a single unit. These sweepers apply technology originally developed to remove spilled coal and coal dust from railroad tracks. The technology has also been applied to industrial sites where complete removal without leakage of particulate matter is important. The mechanical sweeping component in these sweepers is completely dry. A specialized rotating brush is used to scratch and loosen dirt and dust from impervious surfaces, allowing the vacuum system to recover practically all particulate matter. A continuous filtration system prevents very fine particulate matter from leaving the hopper, which prevents the formation of the dust trails typically seen with conventional mechanical sweepers.

Effectiveness

The effectiveness of streetsweeping programs depends on several factors, including:

Type and operation of equipment used: Vacuum-assisted and regenerative air sweepers are generally more efficient than mechanical sweepers at removing finer sediments, which often bind a higher proportion of heavy metals (Table 18). The performance of sweepers can be enhanced by operating them at optimal speeds (6 to 8 mi/h), ensuring that brushes are properly adjusted, and ensuring that appropriate rotation rates and sweeping patterns are used. Tests conducted on the newer vacuum-assisted dry sweepers have shown they have significantly enhanced capabilities to remove sediment compared to conventional sweepers, with projected reductions of up to 79 percent in total suspended solids loadings from urban streets. In addition, these sweepers are extremely effective at removing respirable (PM-10) particulate matter (particles with an aerodynamic diameter less than or equal to 10 microns) compared to conventional sweepers (Table 19) and are designed to help meet National Ambient Air Quality standards.

Table 18. Efficiencies of mechanical (broom) and vacuum-assisted sweepers

Constituent	Mechanical sweeper efficiency (%)	Vacuum-assisted sweeper efficiency (%)
Total Solids	55	93
Total Phosphorus	40	74
Total Nitrogen	42	77
COD	31	63
BOD	43	77
Lead	35	76
Zinc	47	85
Source: NVPDC (1992), as cited in Young et al. (1996).		

Table 19. PM-10 Particulate removal efficiencies for various sweepers

Sweeper type	Removal Efficiency (%)
Mechanical - Model 1	-6.7
Mechanical - Model 2	8.6
Regenerative Air	31.4
Vacuum-assisted wet - Model 1	40.0
Vacuum-assisted wet - Model 2	82.0
Vacuum-assisted dry	99.6

Sweeping frequency and number of passes: To achieve a 30 percent removal of street dirt, the sweeping interval should be less than two times the average interval between storms. To achieve 50 percent removal, sweeping must occur at least at least once between storms. Generally two passes per run should be conducted, which will result in the removal of up to 75 percent of total solids present before sweeping. Certain conditions may warrant increased sweeping frequencies. These include streets with high traffic volumes in industrial areas and streets with high litter or erosion zones. In addition, the sweeping frequency should be increased just before the wet season to remove sediments accumulated during the summer.

Climate: Sweeping appears most effective in areas with distinct wet and dry seasons (CDM et al., 1993).

Factors that limit the overall effectiveness of streetsweeping programs include:

- Presence of parked cars and traffic congestion during sweeping.
- Poor road surface and curb conditions.
- Presence of construction projects nearby.

Considerations for Equipment Selection

The selection of the type of sweeper will depend on specific conditions prevailing at sites targeted for sweeping. In general, mechanical sweepers are more effective at picking up large debris and cleaning wet streets and have lower capital and operating costs. However, mechanical sweepers can create large amounts of airborne dust. Vacuum-assisted and regenerative air sweepers are more effective at removing fine particles and associated heavy metals but tend to be ineffective at cleaning wet streets. They may also be noisier than mechanical sweepers, which can restrict the hours of operation in some areas. It may also be necessary to deploy a mechanical sweeper ahead of vacuum-assisted sweepers to remove large debris.

The somewhat larger capital costs associated with the newer vacuum-assisted dry sweepers may be warranted for areas where worker and public safety from respirable particulate matter is of concern. Vacuum-assisted sweepers are capable of providing close to 100 percent removal of PM-10 particulates and also provide better overall removal of sediment.

Maintenance and Operational Requirements

The overall maintenance requirements for mechanical sweepers are greater than those for vacuum-assisted and regenerative air sweepers since mechanical sweepers contain more moving parts that require periodic replacement. Vacuum-assisted dry sweepers have significantly less down time than water-based sweepers (less than 10 percent of total operating time compared to about 50 percent for water-based sweepers) because they require no water loading. In addition, clean-up and dumping times are shorter.

For an effective streetsweeping program, consideration should be given to the following operational requirements:

- Ensure there are adequately trained sweeper operators and maintenance personnel.
- Provide traffic control officers to enforce parking restrictions.
- Choose sweeping frequencies and cleaning routes to optimize overall sweeping efficiencies.
- Make appropriate arrangements for disposal of collected waste.
- Reduce source loadings through various measures such as public awareness of proper disposal procedures for used oil and yard waste, and enforcement of erosion control and stormwater pollution prevention practices at urban construction sites.

Cost Considerations

Conventional sweeper costs range from $69,000 to $127,000 (1995 dollars), with the higher end of this range associated with vacuum-assisted and regenerative air sweepers (CDM, 1993). The useful life span of these sweepers is generally four to seven years, and the operating cost associated with these sweepers about $70 per hour (1996 dollars; Finley, 1996). The capital cost of vacuum-assisted dry sweepers is on the order of $170,000 (1996 dollars; Enviro Whirl Technologies, personal communication, 1996) with a projected useful life span of about eight years and operating costs of approximately $35 per hour (Satterfield, 1996 dollars).

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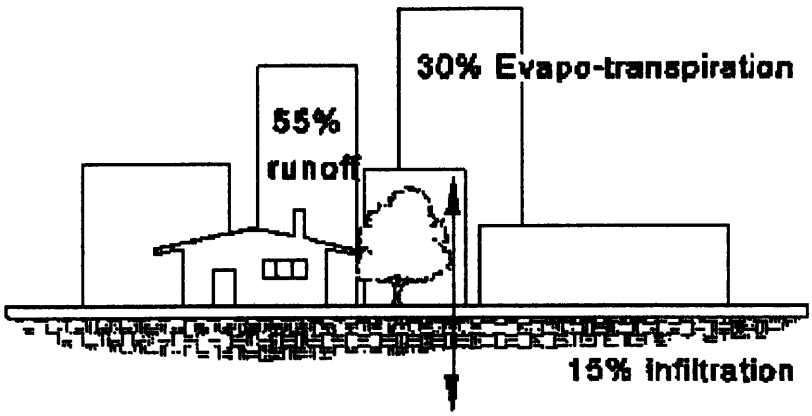

75-100% Impervious Surface

Traffic characteristics are another major influence on constituent loadings in stormwater runoff. Though mass transit methods such as subways are frequently implemented in ultra-urban areas, automobile usage is typically very high. Traffic densities are highest in urban areas, due to commuter traffic and people traveling to commercial/business areas for personal business. Increased automobile usage contributes to the constituent loadings deposited in the urban environment.

Identifying these constituent sources aids in characterizing the runoff from ultra-urban areas. This information helps to determine the most effective technologies for removing constituents from stormwater runoff, one key element in determining the type of BMP necessary to achieve water quality benefits. Fish and aquatic life concerns may also be relevant to BMP selection in some areas. Lack of oxygen and high temperatures are inter-related and very important for aquatic life. For fish and other aquatic life, temperature can be one of the most significant pollutants and presents difficult challenges in ultra-urban areas.

Table 1. Constituents and Sources in Highway Runoff

Constituent	Source
Particulates	Pavement wear, vehicles, atmospheric deposition, maintenance activities
Nitrogen, Phosphorus	Atmospheric deposition and fertilizer application
Lead	Leaded gasoline from auto exhausts and tire wear
Zinc	Tire wear, motor oil, and grease
Iron	Auto body rust, steel highway structures such as bridges and guardrails, and moving engine parts
Copper	Metal plating, bearing and brushing wear, moving engine parts, brake lining wear, fungicides and insecticides
Cadmium	Tire wear and insecticide application
Chromium	Metal plating, moving engine parts, and brake lining wear
Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, bushing wear, brake lining wear, and asphalt paving
Manganese	Moving engine parts
Cyanide	Anti-caking compounds used to keep deicing salts granular
Sodium, Calcium, Chloride	Deicing salts
Sulphates	Roadway beds, fuel, and deicing salts

Petroleum	Spill, leaks, antifreeze and hydraulic fluids, and asphalt surface leachate

2.2.1 Target Water Quality Parameters

The characteristics of highway runoff have been the focus of several studies (Barrett et al., 1995). Stormwater runoff from roadways and impervious surfaces in heavily developed areas has been shown to contain significant levels of constituents such as street litter, animal and bird waste, atmospheric deposition, and inputs from urban road runoff (Shaver, 1994). Among the constituents found in highway runoff are particulates, chromium, copper, cadmium, lead, nickel, nitrogen and phosphorus, zinc, manganese, petroleum hydrocarbons, and rubber. A list of these constituents and their primary sources is included in Table 1.

Major sources of constituents on highways are vehicles and atmospheric deposition. Vehicles generate water quality constituents on highways both directly and indirectly. Vehicles contribute constituents directly from normal operation and wear of frictional parts. Cars and other vehicles were suggested as the source of over 50 percent of the total load to the Lower San Francisco Bay of three metals—copper, cadmium, and zinc (Woodward Clyde, 1992). Reportedly, tire wear could account for at least half of the total cadmium and zinc loads deposited in the bay each year, with the copper load being linked to brake pad wear. Metals that are strongly linked to cars, such as cadmium and copper, are found to have higher concentrations in runoff from streets and parking lots and minimal concentrations in roof and lawn runoff. Fish are very sensitive to metals such as copper. Vehicles can also pick up and carry solids from parking lots, urban roadways, construction sites, farms, and dirt roads and deposit them onto urban streets (Barrett et al., 1995). Through this indirect mechanism, vehicles can contribute solids and associated water quality constituents to highway surfaces. The results of several studies characterizing highway runoff constituent concentrations are presented in Table 2.

Several factors affect overall constituent loadings in street runoff. Street runoff is strongly influenced by emissions and leaks from vehicular traffic. Streets are usually directly connected to stormwater drainage systems by curb and gutter. Curb and gutter systems are not very effective at trapping and retaining fine particles that are deposited in them. Often these particles are washed into storm drains.

Disconnecting impervious surfaces and directing runoff from impervious surfaces to pervious surfaces can provide the opportunity for infiltration of stormwater runoff, reducing both stormwater quantity and constituent loading to the receiving stream. Unfortunately, there are limited opportunities for directing stormwater runoff to pervious surfaces in the ultra-urban environment since most of the land area is already covered with impervious surfaces.

Table 2. Constituents of Highway Runoff

Parameter	Concentration[1]
Total Suspended Solids (TSS)	45-798
Volatile Suspended Solids (VSS)	4.3-79
Total Organic Carbon (TOC)	24-77
Chemical Oxygen Demand (COD)	14.7-272
Biochemical Oxygen Demand (BOD)	12.7-37
Nitrate+Nitrite (NO_3+NO_2)	0.15-1.636
Total Kjeldahl Nitrogen (TKN)	0.335-55.0
Total Phosphorus as P	0.113-0.998
Copper (Cu)	0.022-7.033
Lead (Pb)	0.073-1.78
Zinc (Zn)	0.056-0.929
Fecal coliform (organisms/100 ml)	50-590

Ranges of average values reported in the literature (Barrett et al., 1995).
[1] mg/L unless otherwise indicated.

In one study, Bannerman et al. (1993), streets were identified as a significant source of urban constituents in residential, commercial, and industrial areas. The study collected over 300 runoff samples from 46 micro-sites in two watersheds, sampling runoff from lawns, driveways, rooftops (residential and flat industrial), commercial and industrial parking lots, and a series of street surfaces (feeder, collector, and arterial). Streets produced some of the highest concentrations of phosphorus, suspended solids, bacteria, and several metals. In addition, streets generated a disproportionate amount of the total runoff volume from the watershed. Parking lot areas had moderately high concentrations of all constituents.

Other studies have found the concentrations of some of the metals and nutrients significantly correlated with that of total suspended solids (TSS). These results suggest that controlling TSS may result in reducing other constituents with the same particle sizes. The City of Austin (1990) found the event mean concentration (EMC) values of total phosphorus (TP), total Kjeldahl nitrogen (TKN), total organic carbon (TOC), lead (Pb), and zinc (Zn) are related to the values of TSS EMC. This correlation indicates that these constituents may be removed along with the particulates by filtration technologies such as sand filters.

The impact on the environment from the use of road salt or other deicing agents is another issue to address when characterizing runoff from streets and highways. Although sodium chloride, typically used as the primary chemical deicer in northern states, is an inexpensive and effective choice, concerns have been raised about the potential negative impacts (from chloride) on the environment, human health, roadway infrastructure, and vehicles. The Michigan Department of Transportation identified some of these impacts in a recent study (Public Sector Consultants, 1993), and those potential impacts of road salt are listed in the adjacent box.

Potential Impact of Road Salt

- Contamination of drinking water supplies.
- Corrosion of automobiles.
- Corrosion of bridges and other infrastructure.
- Damage to vegetation within 15.2m (50 ft) of roadside.
- Temporary reduction in soil microbes, followed by summer recovery.
- Sensitivity of various deciduous trees.
- Attraction of deer to salts on roadways, increasing the risk of accidents.
- Stratification of small lakes, hindering seasonal turnover.
- Secondary components (3 to 5 percent of road salt composition) include nitrogen, phosphorus, and metals in concentrations exceeding those in natural waters. (Public Sector Consultants, 1993)

Stormwater "hotspots" are another issue affecting ultra-urban runoff characterization. Land uses or activities that generate higher-than-normal concentrations of hydrocarbons, trace metals, or toxicants have been defined as "hotspot" areas. Increased constituent loadings from these areas may generate concerns about sediment toxicity, groundwater contamination, or toxicity in receiving surface waters. More effective stormwater treatment may be required in these areas. A preliminary list of potential stormwater hotspots is included below (Claytor and Schueler, 1996):

- Airport deicing facilities.
- Auto recycler facilities.
- Commercial nurseries.
- Commercial parking lots.
- Fueling stations.
- Fleet storage areas (bus, truck).
- Industrial rooftops (depending on the roof surface).
- Marinas.
- Outdoor container storage of liquids.
- Outdoor loading/unloading facilities.
- Public works storage areas.
- Vehicle service and maintenance areas.
- Vehicle and equipment washing/steam cleaning facilities.

Identifying "hotspot" areas will aid in determining the most effective BMP, in terms of constituent removal capability, in addition to determining the most appropriate location for the BMP. While the physical characteristics of ultra-

Schwarze Industries, Inc.
Gary Minton

"How Do We Judge the Equivalency of New Treatment BMPs?"

Newsletter

http://www.schwarze.com/sweepers/ev/mintonvol4No4.html

David Getz

From: getz [getzit@optonline.net]
Sent: Monday, November 07, 2005 10:44 PM
To: Dave Getz
Subject: HOW DO WE JUDGE THE EQUIVALENCY OF NEW TREATMENT BMPs?

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How Do We Judge the Equivalency of New Treatment BMPs?

This article was initially published in a newsletter called *Stormwater Treatment Northwest* □. You may reach Gary Minton, the producer of this newsletter, via email sent to themintons@compuserve.com.

HIGH EFFICIENCY SWEEPING or *CLEAN A STREET, SAVE A SALMON*!

Could the answer to the ultimate survival of our northwest salmon be *high-efficiency sweeping?* Could it be this simple? Of course not, since the solution to this complicated problem involves more than just water quality. However, for our urban waterways that receive a large dose of pollutant runoff, this may be the most effective pollution reduction technique ever conceived. And it could become an extremely important element of any successful salmon recovery plan. Stop and consider the following reality. So much discussion and regulatory effort is devoted to controlling pollution from new developments. But, even in a rapidly growing area, new development represents only a small portion of the area that drains to our streams. What do we do about improving the situation in areas already extensively developed? High-efficiency sweeping may be one important part of the solution. Hence, this issue is devoted to new developments in sweeping, which professionals who are involved in this subject are calling high-efficiency sweeping. This issue has been written by Roger Sutherland, who is very active in, and considered a national expert on, the subject. Any comments or questions you have about this edition you may direct to Roger at rogers@kurahashi.com.

DID YOU SAY SWEEP A STREET? OR WAS THERE A REASON YOU USED THE WORD "CLEAN"?

Using a street sweeper to clean a street is preferred over flushing. However, from the perspective of the salmon, only one type of street sweeper will actually get the street clean. That type of sweeper has been

referred to as a "high efficiency sweeper," since by definition it is highly efficient in picking up a large portion of the very fine particulate material found accumulated on street surfaces.

This material, commonly referred to as "street dirt," is highly contaminated with all of the pollutants found in stormwater runoff. As such, the street dirt that accumulates on impervious areas, such as the streets, driveways and parking lots that are directly connected to the urban waterways via a storm sewer system, have been identified over and over again as the primary source of urban nonpoint pollutants entering the waterways of the nation.

WHAT ARE THE CHARACTERISTICS OF A HIGH EFFICIENCY SWEEPER?

High efficiency street sweepers utilize strong vacuums and the mechanical action of uniquely-designed main and gutter brooms, combined with an air filtration system that only returns clean air to the atmosphere (i.e., filters particulates to 2.9 microns). These machines sweep dry, and no water is used, since they do not emit dust. Schwarze Industries, Inc.'s EV series machines, which include the EV1 and the EV2 models, are currently the only documented high-efficiency sweepers. The Tennant Company also offers its model 830-II power sweeper . This is actually a mechanical machine that has a slight vacuum and an air filtration system. However, the machine has not been properly tested using the long-established dry testing protocol, so it cannot be identified as a high efficiency sweeper at this time.

HOW DOES THE PICKUP PERFORMANCE OF A HIGH EFFICIENCY SWEEPER COMPARE TO A TRADITIONAL SWEEPER?

The pick-up performance testing of street sweepers dates back to Dr Robert Pitt's street sweeping study conducted for USEPA in San Jose, California (Pitt, 1979). Similar studies were conducted in Alameda County, California (Pitt and Shawley, 1982) and in Washoe County, Nevada (Pitt and Sutherland, 1982). In each of these efforts, the pickup testing involved a sampling of the accumulated street dirt at a site immediately adjacent to the site of the test. This was done to establish the initial conditions. The sweeper then sweeps the test site at a specified speed of 4 or 5 miles per hour. Then, the sweeping test site is sampled to establish the residual condition. The difference between initial and residual loadings by specific particle size defines the pickup performance of a street sweeping operation.

The studies noted above found that sweeping removes little, if any, material below a certain base residual which was found to vary by particle size range. Above that base residual, the street sweeper's pickup effectiveness was described as a straight-line percentage that also varied by particle size range. Dr. Robert Pitt developed a series of mathematical equations that describe the pickup performance of a street sweeper (i.e. Pitt, 1979). Sutherland and Jelen (1997) used those equations to evaluate the pickup performance of numerous street sweepers and street sweeping operations on average accumulation conditions.

The Schwarze EV1 (formerly the Enviro Whirl I) was tested, along with the Elgin Crosswind regenerative air sweeper, a Mobile mechanical sweeper, and a tandem sweeping operation that involved a single pass by a Mobil mechanical followed immediately by a single pass of a TYMCO vacuum sweeper. These test results were then compared to those obtained for the NURP-era mechanical sweepers used in Bellevue, Washington.

The EV1 clearly outperformed the field with average total pickup efficiencies of 70% for the less than 63-micron range, to 96% for the greater than 6370-micron particle size range. In fact, the base residuals discussed earlier were all zero, so there was no base residual load below which the EV1 would not remove some material. The regenerative air sweeper was a distant second with overall pickup efficiencies that ranged from 32% for the less than 63-micron range to 94% for the greater than 6370 micron range with times when pickup in the 250 to 2000 micron range could actually be zero. That will occur because base residual loads were found to exist for the regenerative air sweeper throughout the 250 to 2000 micron range.

The tandem sweeping operation finished third. Although the straight line percentages above the base residual loading varied by particle size from 84% to 98%, the base residual loadings for all particle sizes less than 6370 microns totaled to 8.2 lbs. per paved acre. This means that during lower accumulation periods, when accumulations are less than 8.2 lbs. per paved acre, the tandem sweeping operation would essentially pick up nothing.

and no change occurred in the remaining 4 cases. Nine of these EMC increases occurred in the two North Carolina sites where the intensity of rainfall was greater than any of the other three cities involved. Ten of the reported thirty EMC reductions occurred in the two Bellevue, Washington, sites where the intensity of rainfall was less than any of the other three cities studied. Once again, the phenomena of exposed particle washoff can explain why EMC increases occurred in the North Carolina sites and other sites as well.

CAN YOU ESTIMATE THE POLLUTANT REDUCTION BY HIGH EFFICIENCY SWEEPING?

The ability of a street sweeping operation to reduce the overall pollutant washoff loads depends on several things. First is the street sweeper's innate ability, when operated properly, to remove accumulated sediment. Another is the environmental dynamics of sediment accumulation and resuspension, and of sediment washoff during storm events plus suspended sediment removal by downstream water quality controls.

The Simplified Particulate Transport Model (SIMPTM) can accurately simulate this complicated interaction of accumulation, washoff, catch basin trapping and street sweeper pickup that occurs over a period of time (Sutherland, and Jelen, 1993). Working with a calibrated version of the SIMPTM program, the average annual expected reduction in total suspended solids (TSS) washoff from two of Portland's NPDES stormwater sites were projected for varying sweeping operations. The sweepers used in these simulations were the same as those described earlier: the NURP era sweepers, the Mobil mechanical sweeper, the tandem operation, the Elgin regenerative air sweeper and the Enviro Whirl I (Schwarze Industries EV1). (For a more detailed description of the SIMPTM program and its calibration to the City of Portland's NPDES monitoring sites, the reader is referred to Sutherland and Jelen, 1996).

Table 1 shows the simulated results of the expected annual washoff reductions for varied intensity of street sweeping in residential areas by each of the alternative technologies. It clearly shows that all of the newer street sweeping technologies would be significantly more effective than the NURP era sweepers in reducing TSS washoff from single family residential areas with curb and gutter drainage in Portland, Oregon. Note that the Schwarze EV1 is the best, followed by the Elgin regenerative air and the tandem operation. Even the 1988 Mobil mechanical sweeper will provide reductions in the 20% to 30 % range. Also note that weekly or twice monthly sweeping appears to be optimum for this type of land use in Portland, Oregon.

Table 1. Simulated Annual TSS Washoff Reduction (%) Single Family Residential

Sweeping Operation	Frequency of Sweeping			
	Monthly	Twice Monthly	Sweeping Weekly	Twice Weekly
Schwarze EV	51	63	79	87
Elgin Regenerative	43	53	65	71
Tandem (M+V)	33	41	49	53
Mobil Mechanical	17	23	29	33
NURP Era	0	0	0	0

Table 2 shows how the results change significantly when sweeping a highly loaded major arterials instead. It even more clearly demonstrates the superiority of the Schwarze EV1 sweeper in reducing TSS washoff from highly impervious, ultra urban drainages in Portland, Oregon. The Elgin regenerative air provides some TSS reduction, whereas the other technologies appear to be largely ineffective on this type of land use. This same land use was found to provide the highest pollutant washoffs, on a pound per paved acre basis, of the six Portland area homogenous land uses studied (Sutherland and Jelen, 1996).

Table 2. Simulated Annual TSS Washoff Reduction (%) Major Arterial

Sweeping Operation	Frequency of Sweeping			
	Monthly	Twice	Sweeping	Twice

		Monthly	Weekly	Weekly
Schwarze EV	49	62	76	85
Elgin Regenerative	15	17	22	24
Tandem (M+V)	4	5	6	8
Mobil Mechanical	3	4	5	7
NURP Era	0	0	0	0

Clearly, though, both tables show that the NURP era sweepers were totally ineffective in their ability to reduce TSS washoffs from either of the basins simulated. So this confirms the earlier conclusions of the NURP in regard to sweeper performance, while suggesting that significant benefits could now be expected from high-efficiency sweeping.

WHAT ABOUT OTHER POLLUTANTS?

SIMPTM has also been used to simulate the potential reductions in other pollutant loadings by high efficiency sweeping. These simulations have primarily dealt with the particulate phases of the pollutants. For example, if the TSS annual reduction was estimated by the model to be 60%; total metals annual reductions are estimated to vary from 45 to 55%; nutrient reductions such as total phosphorus would vary from 25 to 35% annually; and oxygen demand annual reductions are projected to vary from 35 to 45 %.

There is one final aspect of high-efficiency street sweeping that makes its potential even more promising. It appears that both the concentration and mass of dissolved pollutants such as metals and phosphorus that are associated with the 63 to 250 micron range of street dirt is much greater than that found in the very fine <63 micron faction (Sutherland and Jelen, 1998). The Schwarze EV sweepers can easily pick up 80 to 90% of the particulates in this range. Therefore, high efficiency sweeping may have the ability to remove dissolved pollutants before they become dissolved from rainwater! No other control technology with the exception of filtration systems can remove dissolved pollutants such as dissolved metals and phosphorus.

IF HIGH EFICIENCY STREET SWEEPING IS THIS GOOD, WHY ISN'T ANYONE USING IT IN THE PACIFIC NORTHWEST?

This is a good question and I believe there are several different answers to it. First, not everyone is aware of this technology. The original Enviro Whirl I was only invented in late 1993. Enviro Whirl Technologies was sold to Schwarze Industries in May 1997 and Schwarze has not invested much effort in marketing the machines, especially in the Northwest. Second, the Schwarze EV's are considerably more expensive than traditional sweepers with prices ranging from $190,000 to $250,000 depending on the machine. However, it should be noted that this higher capital cost is offset by the ability of the machine to sweep a greater percentage of its operating hours. This is because there is no time wasted on dumping dirty water and picking up clean water, since this machine sweeps dry. Third, the maximum forward speed of approximately 20 to 25 mph has been viewed as a problem by many large cities and counties. Schwarze needs to be encouraged to mount its technology onto a truck chassis. Fourth, the technology does not appear to have a competitor. Based on pickup performance, the Schwarze EV series is essentially superior in fine sediment removal and containment. Unfortunately, lack of market competition is a concern to public works officials , and they are generally reluctant to act as a result.

Perhaps most importantly, the projected water quality benefits of this technology are based on modeling and many people feel that models cannot accurately simulate this behavior. The modeling results are so unbelievably positive that many professionals have chosen not to believe them! The nay-sayers will point out that this technology has not been field-verified, and that there is no end-of-the-pipe water quality data that can currently verify the modeling results.

ARE THERE ANY PROJECTS ENVISIONED FOR THE NORTHWEST?

There is a NURP-like project starting in Wisconsin that will monitor the pollutant-reduction benefits of EV sweeping of interstate highways in Milwaukee. Unfortunately, as of this date, no field verification project has been proposed or funded for any urban area in Oregon or Washington. Given the actual results of the NURP that implied the old sweepers may have been doing some good here in the Pacific Northwest, how can we

continue to ignore the potential pollutant reduction benefits of this high efficiency technology? Especially since it could simply be the most practical and cost-effective management practice ever conceived for the ultra-urban environment.

While this argument continues amongst those that should care about water quality, street dirt continues to accumulate and rainfall continues to transport it to the urban waterways. Salmon and other aquatic life continue to be affected with declining numbers. So, until further notice, this researcher will continue to believe that salmon can be saved if we simply find the resources needed to keep our streets clean!

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Pollution Prevention Fact Sheet: Parking Lot and Street Cleaning

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Description

This management measure involves employing pavement cleaning practices, such as street sweeping on a regular basis, to minimize pollutant export to receiving waters. These cleaning practices are designed to remove sediment, debris, and other pollutants from road and parking lot surfaces that are a potential source of pollution impacting urban waterways (Bannerman, 1999). Although performance monitoring for the Nationwide Urban Runoff Program (NURP) indicted that street sweeping was not very effective in reducing pollutant loads (US EPA, 1983), recent improvements in street sweeper technology have enhanced the ability of present day machines to pick up the fine grained sediment particles that carry a substantial portion of the stormwater pollutant load. Many of today's sweepers can now significantly reduce the amount of street dirt entering streams and rivers, some by significant amounts (*Runoff Report,* 1998). A debate as to whether this ability to pick up finer particles will improve the overall pollutant removal effectiveness of street sweepers is ongoing, and further research is required to establish the optimal sweeping frequency for pollutant removal and what streets are most appropriate for a sweeping program.

Applicability

Street sweeping is practiced in most urban areas, often as an aesthetic practice to remove sediment buildup and large debris from curb gutters. In colder climates, street sweeping is used during the spring snowmelt to reduce pollutant loads from road salt and to reduce sand export to receiving waters. Seventy percent of cold climate stormwater experts recommend street sweeping during the spring snowmelt as a pollution prevention measure (Caraco and Claytor, 1997). The frequency and intensity of rainfall for a region are key variables in determining how streets need to be swept to obtain a desired removal efficiency. Other factors that affect a street sweeper's ability to reduce nonpoint pollution include the condition of the street, its geographical location, the operator's skill, the presence of parked cars, and the amount of impervious area devoted to rooftop.

Design Considerations

Arguably the most essential factor in using street sweeping as a pollutant removal practice is to be sure to use the most sophisticated sweepers available. Innovations in sweeper technology have improved the performance of these machines at removing finer sediment particles, especially for machines that use vacuum assisted dry sweeping to remove particulate matter. By using the most sophisticated sweepers in areas with the highest pollutant loads, greater reductions in sediment and accompanied pollutants can be realized. For more information see *New Developments in Street Sweeper Technology*, Article 121 in The Practice of Watershed Protection.

Another important aspect of street sweeping programs is the ability to regulate parking. The ability to impose parking regulations in densely populated areas and on heavily traveled roads is essential.

The frequency of and location of street sweeping is another consideration for any program. How often and what roads to sweep are determined by the program budget and the level of pollutant removal the program wishes to achieve. Computer modeling in the Pacific Northwest suggest that from the standpoint of pollutant removal, the optimum sweeping frequency appears to be once every week or two (Claytor, 1999). More frequent sweeping operations yielded only a small increment in additional removal. The model also suggests that somewhat higher removal could be obtained on residential streets as opposed to more heavily traveled arterial roads.

Sweeping of parking lots may also be employed at industrial sites. This sweeping involves using brooms to remove small quantities of dry chemicals and solids from areas that are exposed to rainfall or stormwater runoff. While the effectiveness of this practice at pollutant removal is unknown, the sweeping and proper disposal of materials is a reasonably inexpensive method of pollution prevention that requires no special training or equipment.

Limitations

For street sweeping, the high cost of current sweeper technologies is a large limitation to using this management practice. With costs approaching $200,000 for some of the newer sweeper technologies, stormwater managers with limited budgets must consider the high equipment cost together with the uncertainty about pollutant removal efficiency to decide whether a sweeping program is an attractive management option. The potential inability to restrict parking in urban areas may present another limitation. Additional possible limitations include the need for training for sweeper operators; the inability of current sweeper technology to remove oil and grease; and the lack of solid evidence regarding the level of pollutant removal that can be expected. Proper disposal of swept materials may also be a limitation in some instances.

Maintenance Considerations

Street cleaning programs require a significant investment of capital and a yearly operation and maintenance budget. Sweepers have a useful life of about four years, and proper maintenance can greatly improve sweeping efficiency. Arrangements for disposal of the swept material collected must also be made, as well as accurate tracking of the streets swept and the frequency of sweeping. The operation and maintenance costs for two types of sweepers are included in Table 1.

Effectiveness

Street sweeping programs had largely fallen out of favor as a pollutant removal practice following the 1983 NURP report, but improvements in sweeper technology have caused a recent reevaluation of their effectiveness. New studies show that conventional mechanical broom and vacuum-assisted wet sweepers reduce nonpoint pollution by 5 to 30%; and nutrient content by 0 to 15%, but that newer dry vacuum sweepers can reduce nonpoint pollution by 35 to 80%; and nutrients by 15 to 40% for those areas that can be swept (Runoff Report, 1998). While actual reductions in stormwater pollutants have not yet been established, information on the reductions in finer sediment particles that carry a significant portion of the stormwater pollutant load is available. Recent estimates are that the new vacuum assisted dry sweeper might achieve a 50-88% overall reduction in the annual sediment loading for a residential street, depending on sweeping frequency (Bannerman, 1999).

A benefit of high-efficiency street sweeping is that by capturing pollutants *before* they are made soluble by rainwater, the need for stormwater treatment practices may be reduced. Stormwater treatment practices, such as filtering systems, can be very costly when compared to collecting pollutants before they become soluble. Street sweepers that can show a significant level of sediment removal efficiency may prove to be more cost-effective than certain stormwater treatment practices, especially in more urbanized areas with higher areas of paving.

Cost

The largest expenditures for street sweeping programs are in staffing and equipment. The capital cost for a conventional street sweeper is between $60,000 and $120,000. Newer technologies are higher than that, with prices approaching $180,000. The average useful life of a conventional sweeper is about four years, and programs must budget for equipment replacement. Sweeping frequencies will determine equipment life, so programs that sweep more often should expect to have a higher cost of replacement.

If investing in newer technologies, training for operators must be included in operation and maintenance budgets. Costs for public education are small, and mostly deal with the need to obey parking restrictions and litter control. Parking tickets are an effective reminder to obey parking rules, as well as a source of revenue.

Table 1 gives sweeper cost data for two types of sweepers: mechanical and vacuum-assisted. The table shows that while the purchase price of vacuum-assisted sweepers is significantly higher, the operation and maintenance costs are lower.

Table 1. Estimated Costs for Two Types of Street Sweepers

Sweeper Type	Life (Years)	Purchase Price ($)	O&M Cost ($/curb mile)	Sources
Mechanical	5	75,000	30	Finley, 1996 SWRPC, 1991
Vacuum-assisted	8	150,000	15	Finley, 1996 Satterfield, 1991

Cost data for two cities in Michigan provides some guidance on the overall cost of a street cleaning program. Table 2 contains a review of the labor, equipment, and material costs for street cleaning for the year 1995 (Ferguson *et al.*, 1997). The average cost for street cleaning was $68 per curb mile and approximately 11 curb miles per day were swept.

Table 2. The Cost of Street Cleaning for Two Cities in Michigan

City	Labor	Equipment	Material and Services	Total
Livonia	$23,840	$85,630	$5,210	$114,680
Plymouth Township	$18,050	$14,550	$280	$32,880

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- New Jersey Department of Environmental Protection
- Division of Watershed Management

New Jersey Stormwater Best Practices Manual

2004
Trenton, NJ

New Jersey Stormwater Best Management Practices Manual

April 2004

State of New Jersey

James E. McGreevey, Governor

Department of Environmental Protection

Bradley M. Campbell, Commissioner

Land Use Management

Ernest P. Hahn, Assistant Commissioner

Division of Watershed Management

Larry Baier, Director

In cooperation with

New Jersey Department of Agriculture
New Jersey Department of Community Affairs
New Jersey Department of Transportation

New Jersey Department of Environmental Protection

Division of Watershed Management
PO Box 418
Trenton, NJ 08625-0418

Table 4.2 – Typical Phosphorous and Nitrogen Removal Rates for BMPs

Best Management Practice (BMP)	Total Phosphorous Removal Rate (%)	Total Nitrogen Removal Rate (%)
Bioretention Basin	60	30
Constructed Stormwater Wetland	50	30
Extended Detention Basin	20	20
Infiltration Basin	60	50
Manufactured Treatment Devices	See N.J.A.C. 7:8-5.7(d)	See N.J.A.C. 7:8-5.7(d)
Pervious Paving[2]	60	50
Sand Filter	50	35
Vegetative Filter	30	30
Wet Pond	50	30

The nutrient removal rates presented in Table 4-2 should be considered typical values based upon data from a range of research studies. Due to the multiple forms and complex behavior of nutrients in stormwater runoff and the similarly complex processes by which nutrient loading is altered by BMPs, actual removal rates for specific BMPs and development sites may vary.

The nutrient removal data in Table 4-2 is intended to assist designers in the selection of appropriate BMPs to meet both the 80 percent TSS and maximum feasible nutrient removal requirements in the NJDEP Stormwater Management Rules. During this selection process, primary consideration should be given to achieving the Rules' 80 percent TSS removal requirement with one or more BMPs that are compatible with and responsive to site conditions and constraints, maintenance needs, and safety concerns. The selection process should then be further refined to achieve the Rules' maximum feasible nutrient requirement utilizing the structural BMP data in Figure 4.2 and, as necessary, other appropriate resources. In doing so, it should be remembered that many nonstructural BMPs can also help achieve the nutrient removal requirement, and must be considered prior to the use of structural BMPs.

The nutrient removal data in Table 4-2 can also be used to optimize existing BMP retrofits.

Additional Considerations

From the information presented in this chapter, it should be evident that BMPs are intended to reduce the pollutants in stormwater runoff. However, sometimes an unintended consequence of stormwater management facilities is their attractiveness to waterfowl, such as Canada geese. Canada geese are attracted to lawn areas adjacent to water bodies. As such, wet ponds and other stormwater management structures can appeal to these waterfowl, whose resulting fecal input can result in an increase in nutrient loading to systems that are intended to reduce such pollutants. As a result, adjustments to a BMP's design and/or maintenance plan may be necessary to discourage waterfowl from contributing pollutants to the stormwater measure. Additional guidance on Canada geese is available in Management of Canada Geese in Suburban Areas: A Guide to the Basics, available at http://www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/Goosedraft.pdf.

TSS Removal Rates for Individual BMPs

As noted above, the Stormwater Management Rules require an 80 percent TSS reduction in the post-construction runoff from a land development site that increases impervious surface by 0.25 acres or more. This reduction is to be achieved by conveying the site's runoff through one or more onsite BMPs that have the ability to remove a portion of the TSS load. To demonstrate compliance with this requirement, the NJDEP has adopted official TSS removal rates for each of the BMPs described in detail in Chapter 9. These BMPs and their adopted TSS removal rates are presented below in Table 4-1. Different removal rates and BMPs may be utilized if supporting information is provided and accepted by the applicable review agencies.

It is important to note that the TSS removal rates shown in Table 4-1 have been based upon several sources of BMP research and monitoring data as well as consultation with numerous stormwater management experts. As demonstrated by that research, actual TSS removals at specific BMPs during specific storm events will depend upon a number of site factors and can be highly variable. As such, the TSS removal rates presented in Table 4-1 are considered representative values that are based upon a recognition of this variability and the state's need to develop and implement a statewide stormwater management program. Furthermore, the TSS removal rates are also considered to accurately represent the relative TSS removal efficiencies of the various BMPs listed in the table.

Table 4-1: TSS Removal Rates for BMPs

Best Management Practice (BMP)	Adopted TSS Removal Rate (%)
Bioretention System	90
Constructed Stormwater Wetland	90
Dry Well	Volume Reduction Only[1]
Extended Detention Basin	40 to 60[2]
Infiltration Structure	80
Manufactured Treatment Device	See N.J.A.C. 7:8-5.7(d)[3]
Pervious Paving System	Volume Reduction Or 80[4]
Sand Filter	80
Vegetative Filter	60-80
Wet Pond	50-90[5]

[1] See text below.
[2] Final rate based upon detention time. See Chapter 9.
[3] To be determined through testing on a case-by-case basis. See text below.
[4] If system includes a runoff storage bed that functions as an infiltration basin. See Chapter 9.
[5] Final rate based upon pool volume and detention time. See Chapter 9.

▪ New York State Department of
Environmental Conservation
▪ Division of Watershed Management

Reducing the Impacts of Stormwater Runoff from New Development

1992
Syracuse, NY

Figure 15: Comparative Pollutant Removal of Urban BMP Designs

BMP/design	SUSPENDED SEDIMENT	TOTAL PHOSPHORUS	TOTAL NITROGEN	OXYGEN DEMAND	TRACE METALS	BACTERIA	OVERALL REMOVAL CAPABILITY
EXTENDED DETENTION POND							
DESIGN 1	◕	◔	◔	◔	◑	⊗	MODERATE
DESIGN 2	●	◑	◔	◑	◕	⊗	MODERATE
DESIGN 3	●	◕	◑	◑	◕	⊗	HIGH
WET POND							
DESIGN 4	◕	◑	◔	◔	◔	⊗	MODERATE
DESIGN 5	◕	◑	◔	◔	◕	⊗	MODERATE
DESIGN 6	●	◕	◑	◑	◕	⊗	HIGH
INFILTRATION TRENCH							
DESIGN 7	◕	◑	◑	◕	◕	◕	MODERATE
DESIGN 8	●	◑	◑	◕	●	◕	HIGH
DESIGN 9	●	◕	◕	●	●	●	HIGH
INFILTRATION BASIN							
DESIGN 7	◕	◑	◑	◕	◑	◕	MODERATE
DESIGN 8	●	◑	◑	◕	●	◕	HIGH
DESIGN 9	●	◕	◕	●	●	●	HIGH
POROUS PAVEMENT							
DESIGN 7	◑	◕	◑	◕	◑	◕	MODERATE
DESIGN 8	●	◕	◕	◕	●	●	HIGH
DESIGN 9	●	◕	◕	●	●	●	HIGH
WATER QUALITY INLET							
DESIGN 10	○	⊗	⊗	⊗	⊗	⊗	LOW
FILTER STRIP							
DESIGN 11	◔	○	○	○	◔	⊗	LOW
DESIGN 12	●	◑	◑	◕	●	⊗	MODERATE
GRASSED SWALE							
DESIGN 13	○	○	○	○	○	⊗	LOW
DESIGN 14	◔	◔	◔	◔	○	⊗	LOW

KEY:

- ○ 0 TO 20% REMOVAL
- ◔ 20 TO 40% REMOVAL
- ◑ 40 TO 60% REMOVAL
- ◕ 60 TO 80% REMOVAL
- ● 80 TO 100% REMOVAL
- ⊗ INSUFFICIENT KNOWLEDGE

Design 1: First-flush runoff volume detained for 6-12 hours.
Design 2: Runoff volume produced by 1.0 inch, detained 24 hours.
Design 3: As in Design 2, but with shallow marsh in bottom stage.
Design 4: Permanent pool equal to 0.5 inch storage per impervious acre.
Design 5: Permanent pool equal to 2.5 (Vr); where Vr=mean storm runoff.
Design 6: Permanent pool equal to 4.0 (Vr); approx. 2 weeks retention.
Design 7: Facility exfiltrates first-flush; 0.5 inch runoff/imper. acre.
Design 8: Facility exfiltrates one inch runoff volume per imper. acre.
Design 9: Facility exfiltrates all runoff, up to the 2 year design storm.
Design 10: 400 cubic feet wet storage per impervious acre.
Design 11: 20 foot wide turf strip.
Design 12: 100 foot wide forested strip, with level spreader.
Design 13: High slope swales, with no check dams.
Design 14: Low gradient swales with check dams.

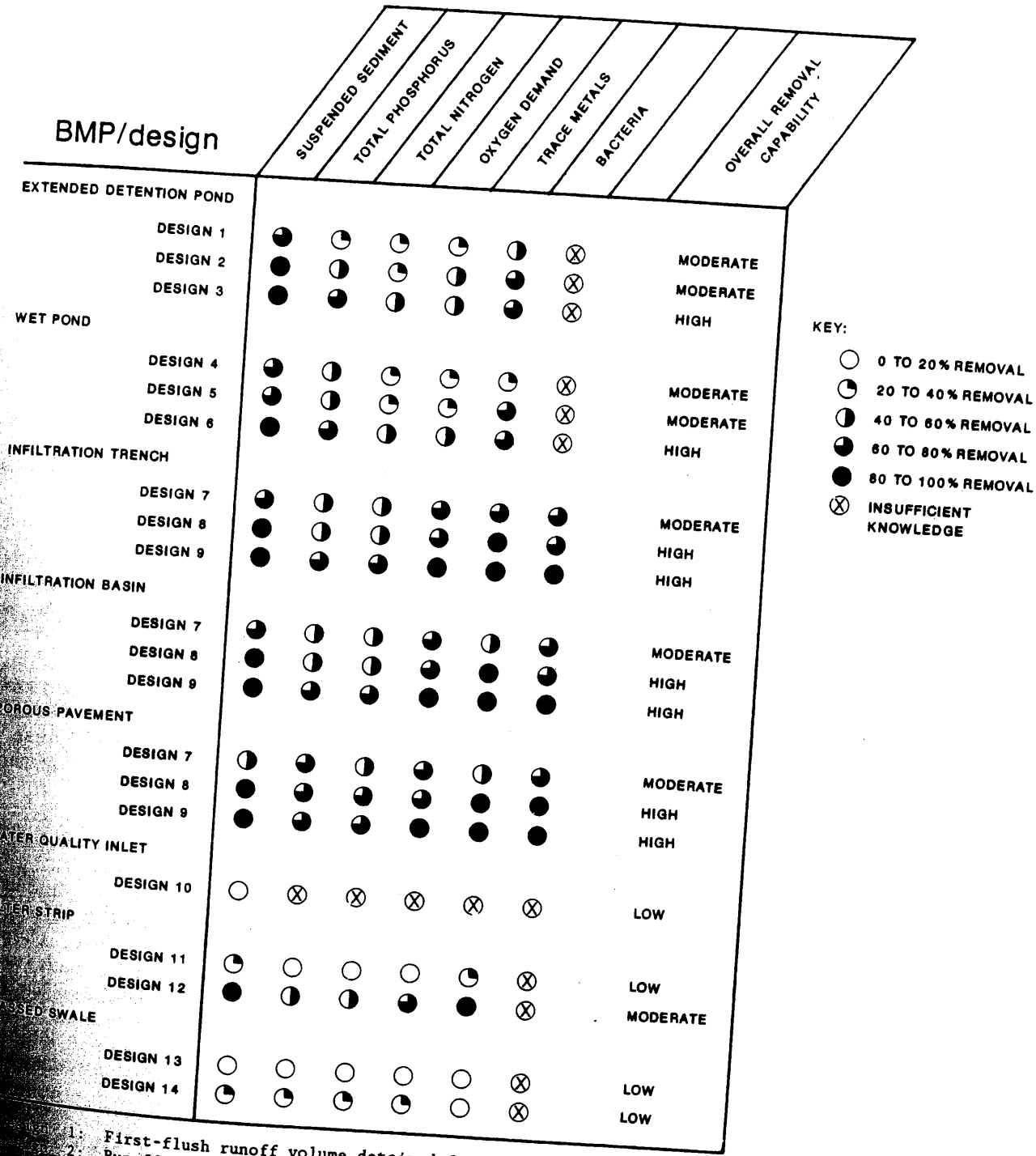
(Source: MWCG, 1987)

Thomas R. Scheuler
Department of Environmental Programs
Metropolitan Washington Council of Governments

Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMP's

1987
Washington, D.C.

Figure 2.4: Comparative Pollutant Removal Of Urban BMP Designs



1: First-flush runoff volume detained for 6-12 hours.
2: Runoff volume produced by 1.0 inch, detained 24 hours.
3: As in Design 2, but with shallow marsh in bottom stage.
4: Permanent pool equal to 0.5 inch storage per impervious acre.
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7: Facility exfiltrates first-flush; 0.5 inch runoff/imper. acre.
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9: Facility exfiltrates all runoff, up to the 2 year design storm.
10: 400 cubic feet wet storage per impervious acre.
11: 20 foot wide turf strip.
12: 100 foot wide forested strip, with level spreader.
13: High slope swales, with no check dams.
14: Low gradient swales with check dams.

Appendix H

BOG TURTLE ASSESSMENT

BOG TURTLE ASSESSMENT ON A 47.5 +/- ACRE SITE IN THE TOWN OF WARWICK COUNTY OF ORANGE STATE OF NEW YORK

MARCH 2005

Prepared for:

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APPENDICES

Appendix A Photo Plates
Appendix B Qualifications

SUMMARY

Fairgrounds, LLC is proposing to develop commercial/retail uses on a 47.5+/- acre site along New York State Route 94 (New Milford Road), east of Wawayanda Turnpike in the Town of Warwick, Orange County, New York. The Town of Warwick Planning Board conducted a coordinated review pursuant to the State Environmental Quality Review Act or SEQRA and established itself as Lead Agency in July 1999. The applicant voluntarily offered to prepare and submit a Draft Environmental Impact Statement. This bog turtle assessment report has been prepared on behalf of Fairgrounds, LLC for submission to the New York State Department of Environmental Conservation (NYSDEC). Please note all information in this document is confidential and sensitive and may not be released to the public without written authorization from the NYSDEC.

The NYSDEC – New York Natural Heritage Program database indicated that a record of a known occurrence of a state-listed animal exists on or in the immediate vicinity of the project site. The animal species identified is the bog turtle (*Clemmys muhlenbergii*) and is listed in New York State as an endangered species. The northern allopatric population of the bog turtle is federally listed as a threatened species.

The subject site is irregular in shape, consisting of 47.5+/- acres, and known as tax lot Section 51, Block 1, Lot 40. The site contains agricultural lands along with freshwater wetlands and wooded uplands. Two residences, several barns, and vacant buildings of the former farm operation are grouped

in the center of the site. Land use in the vicinity of the site includes agricultural, commercial, and residential uses and vacant land.

There are several different vegetative community types on the site, the majority of which consist of agricultural fields. The second largest vegetative cover type is wetlands. A total of four wetland areas are located on site. Two small, isolated wetlands (Wetlands B and C) along with a NYSDEC regulated wetland (Wetland A) exists on the eastern portion of the site. The NYSDEC regulated wetland extends off site to the east and northeast. A federally regulated wetland (Wetland D) is located in the western portion of the site and extends off site to the west and northwest. All wetlands have been historically disturbed by agricultural land uses and thus, are mainly dominated by invasive plant species. These plant species include common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), and cattail (*Typha latifolia*). Hydric soils within these wetland areas consist of silty loams.

ERS Consultants, Inc. conducted an assessment (Phase 1 Survey) for potential bog turtle habitat on the subject site. Based upon altered hydrology, invasive dominant plant species, and hydric soils lacking peaty or mucky substrate, little to no potential bog turtle habitat exists within the subject site. However, bog turtle habitat has been identified northwest of the site, within the same contiguous wetland and watershed found off site. This watershed drains into the Wawayanda Creek. Additionally, potential habitat was located off site, adjacent to the subject property to the northeast. Wetland A is the headwater of this watershed that also flows into the Wawayanda Creek.

Based upon the fact that the bog turtle is present within the Wawayanda Creek watershed, ERS Consultants, Inc. invited both federal (United States Fish and Wildlife Service) and state (NYSDEC) biologists to conduct an on site assessment. Both agencies confirmed our findings and

ERS Consultants, Inc. prepared a Phase 2 Survey for the bog turtle on the subject site. This plan was approved by the NYSDEC and implemented in 2000.

The initial Phase 2 Survey started in mid-April 2000, ending in mid-June 2000 and far exceeded the level of effort set forth in the Bog Turtle Northern Population Recovery Plan, prepared by the USFWS. Additionally, trapping was also conducted, again, exceeding guidelines set forth in the Bog Turtle Northern Population Recovery Plan. No bog turtles were located or trapped in the initial study conducted in 2000. The only turtles observed were the spotted turtle (*Clemmys guttata*) and the snapping turtle (*Chelydra serpentina*). Though no bog turtles were found in the initial study, a second survey was conducted, starting in mid-April 2002 and ending in mid-June 2002. No bog turtles were observed in 2002, which is consistent with the results of the initial study. Due to project delays a third and final survey was conducted, starting in mid-May 2004 and extending to mid-June 2004. No bog turtles were observed, again, consistent with the previous studies.

In conclusion, based upon a Phase 1 Survey and three Phase 2 Surveys conducted over a four year period, no bog turtles were present within the subject site. Bog turtle habitat remains off site to the northwest, and potential bog turtle habitat exists off site to the northeast. Historic agricultural activities have altered hydrology and allowed invasive plant species to dominate wetland areas located on the subject site. Little to no potential bog turtle habitat could be found within the subject site.

1 INTRODUCTION

1.1 Purpose of Study

Fairgrounds, LLC. is proposing to develop commercial/retail uses on a 47.5+/- acre site along New York State Route 94 (New Milford Road), east of Wawayanda Turnpike in the Town of Warwick, Orange County, New York. The Town of Warwick Planning Board conducted a coordinated review pursuant to the State Environmental Quality Review Act (SEQRA) and established itself as Lead Agency in July 1999. The applicant voluntarily offered to prepare and submit a Draft Environmental Impact Statement (DEIS). This bog turtle assessment report has been prepared on behalf of Fairgrounds, LLC for submission to the New York State Department of Environmental Conservation (NYSDEC. All information in this document is confidential and sensitive and may not be released to the public without written authorization from the NYSDEC.

The NYSDEC, Division of Fish, Wildlife and Marine Resources, Wildlife Resource Center – New York Natural Heritage Program database indicated that a record of a known occurrence of a state-listed animal exists on or in the immediate vicinity of the project site. The animal identified is the bog turtle (*Clemmys muhlenbergii*). This reptile species is listed in New York State as an endangered species. The northern allopatric population of the bog turtle, which ranges through seven states from Massachusetts to Maryland, was

listed as a federally threatened species on November 4, 1997, under the provisions of the Endangered Species Act of 1973, as amended (62 FR 59605623).

ERS Consultants, Inc. conducted a Phase 1 Survey assessment for potential bog turtle habitat on the subject site. Based upon coordination with both state (NYSDEC) and federal (United States Fish and Wildlife Service (USFWS)) agencies, ERS Consultants, Inc. prepared and implemented Phase 2 Surveys on the subject site in 2000, again in 2002, and a final survey in 2004.

1.2 Study Area

The subject site is irregular in shape, consisting of 47.5+/- acres, and is known as tax lot Section 51, Block 1, Lot 40. The site is currently comprised of agricultural lands with freshwater wetlands and wooded uplands. Two wood frame residences, several barns and vacant buildings of the former farm operation are grouped in the center of the site. The site topography is mostly gently sloping from a central gentle ridge rising more steeply toward the rear or northern portion of the property, and generally draining toward a wetland/watercourse to the west and toward a wetland to the east. Land use in the vicinity of the site includes agricultural, commercial, and residential uses and vacant land. The property is located on the northeast section of the US Geological Survey Wawayanda, NY Quadrangle map (Figure 1).

There are several different vegetative community types on the project site. Approximately 60 percent of the site (28.2 acres) consists of meadows or agricultural fields. This community type includes an area in the western portion of the site currently used to grow corn (*Zea Mays*). Other crops include alfalfa (*Medicago sp.*) as well as various grasses including wheat (*Triticum aestivum*), oats (*Avena sativa*) and timothy (*Phleum pratense*). The remainder of this community type, which is primarily located on the eastern side of the site, consists of hay fields. The dominant vegetation within the meadow areas consist of a variety of upland herbaceous species including buttercup (*Ranunculus spp.*), nightshade (*Solanum sp.*), bedstraw (*Galium spp.*), milkweed (*Asclepias syriaca*), plantain (*Plantago spp.*), clover (*Trifolium spp.*), campion bladder (*Silene cucubalus*), bird foot trefoil (*Lotus corniculatus*), spotted knapweed (*Centaurea maculosa*), horse nettle (*Solanum carolinense*), and bramble (*Rubus spp.*).

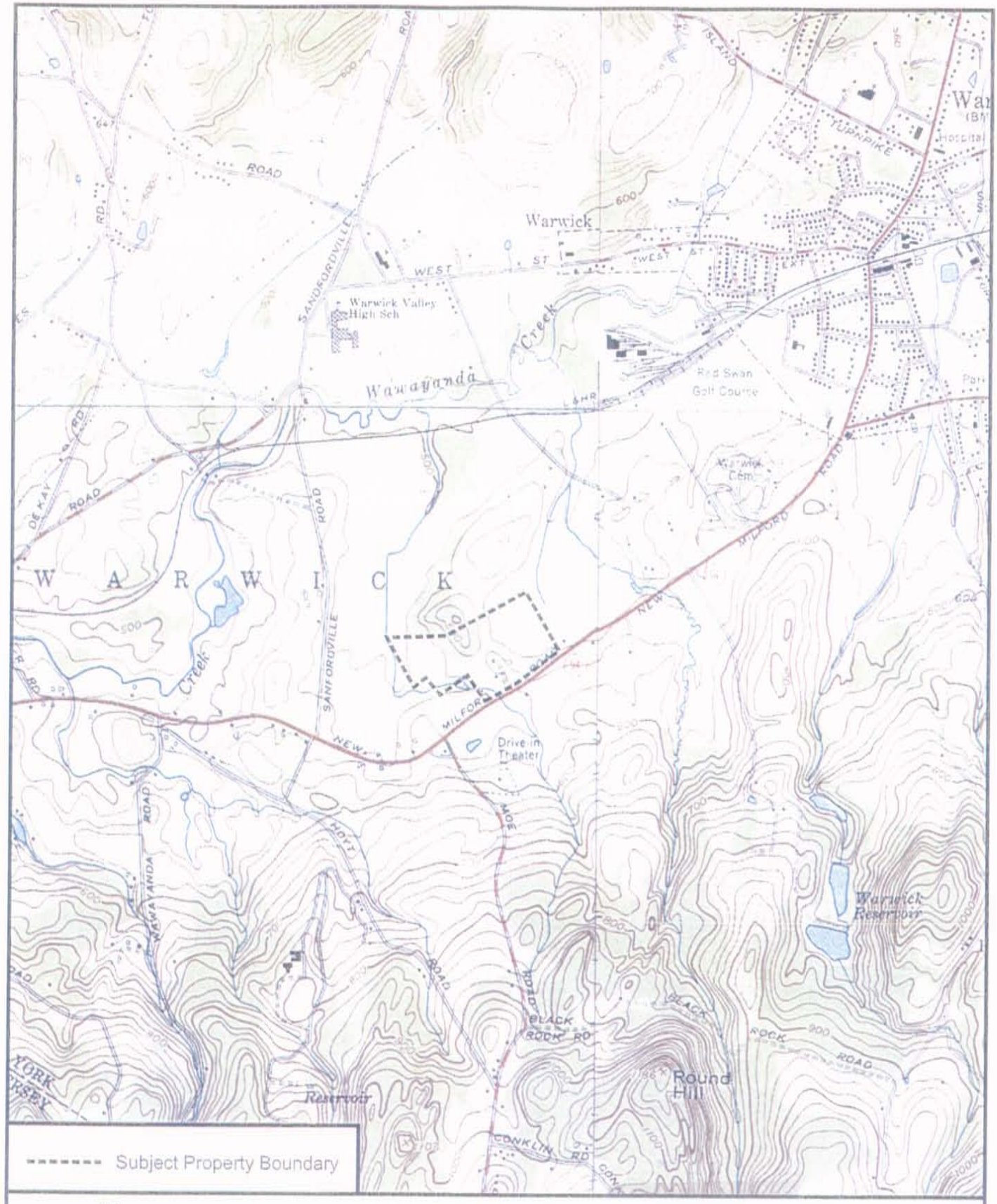

Figure 1 : Location Map
Fairgrounds Site
Town of Warwick, Orange County, New York
Base Map: USGS Topographics Map, Wawayanda Quad
Scale: 1 inch = 2,000 feet

Wetlands are the second largest vegetative cover type found on the subject site. Wetland systems represent approximately 14.4 acres or 30 percent of the project area. Figure 2 shows an aerial view of the subject site.

The project site also includes approximately 3.9 acres with second growth mixed upland forest vegetation. This community type occupies a wooded hillside located in the north-central portion of the project site.

As stated above, wetlands are the second largest vegetative cover type found on site. A total of four wetlands are identified on the subject property as shown on Figure 3. Wetland A is located in the eastern portion of the site, and is also mapped as New York State wetlands by the NYSDEC. NYSDEC wetlands have a 100-foot buffer or "Adjacent Area" extending from the wetland/upland boundary. Wetland A consists of approximately 5.92 acres on site and extends off site to the east. The Adjacent Area contains fallow fields and is approximately 4.84 acres in size. Wetland A is the headwaters of an unnamed tributary to the Wawayanda Creek. The tributary flows over one and one-half miles to the creek. This wetland is dominated by purple loosestrife (*Lythrum salicaria*), cattail (*Typha latifolia*), and skunk cabbage (*Symplocarpus foetidus*) in the herbaceous layer. This wetland can be classified as a Palustrine Emergent (PEM) Wetland System containing a small Palustrine Scrub/Shrub Broad-leaved Deciduous (PSS1) Wetland System.

Wetland B is a small Palustrine Emergent (PEM) Wetland System, consisting of 0.25 acres. Wetland C is also a small Palustrine Emergent (PEM) Wetland System, containing 0.14 acres. These wetlands are located close to Wetland A, in the eastern portion of the site. Both Wetlands B and C are dominated by canary reed grass (*Phalaris arundinacea*) and smartweed (*Polygonum sp.*) in the herbaceous layer

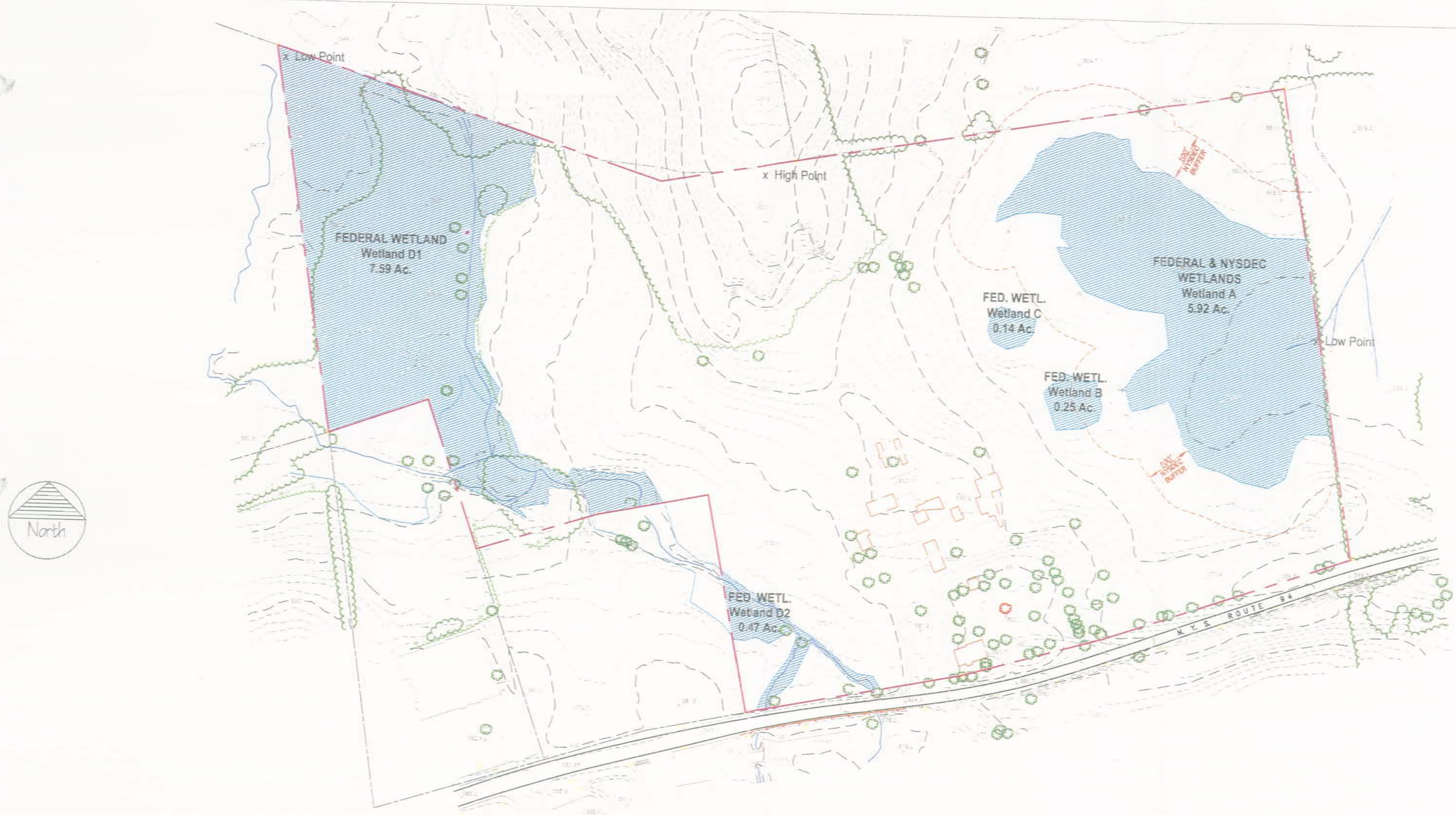

Figure 3 Existing On-Site Wetlands

The Fairgrounds

Town of Warwick, Orange County, New York

Source: Lehman & Getz, PC

Scale: 1" = 200'

N
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Figure 2 : Aerial View of Site Area
Fairgrounds Site
Town of Warwick, Orange County, New York
Base Map: NYS GIS Clearinghouse, 2001 Aerial

with minimal vegetative diversity in the herbaceous strata and totally lacking shrubs or woody plants. Wetlands B and C were man-made wetlands created for farming practices. Given their small size and lack of hydrology most of the time, these wetland pockets appear to provide little function or value.

The largest wetland system is Wetland D, located in the western portion of the site. This wetland is approximately 8.06 acres in size, extending from New York State Route 94, along an unnamed tributary to the Wawayanda Creek, to the northern property boundary. The tributary flows over two miles before entering the Wawayand Creek. This wetland extends off site to the north and west. Common reed (*Phragmites australis*) dominates the herbaceous layer within the central portion of the wetland. Along the unnamed tributary, dominant shrub species include dogwood (*Cornus spp.*) and arrowwood (*Viburnum recognitum*). Dominant herbaceous species along the tributary include New York aster (*Aster novi-belgii*), jewelweed (*Impatiens capensis*), and tearthumb (*Polygonum sagittatum*). Wetland D can be classified as a Palustrine Emergent Wetland System (PEM) with Palustrine Scrub/Shrub Broad-leaved Deciduous (PSS1) and Palustrine Forested Broad-leaved Deciduous (PF01) components.

The Orange County Soil Survey (Sheet #93) indicates the general types of soils to be encountered within the project area. The soil survey for the project site lists seven primary mapping units (see Figure 4), including: Canandaigua silt loam (Ca); Hoosic gravelly sandy loam, 3 to 8% slopes (HoB); Middlebury silt loam (My); Pittsfield gravelly loam, 3 to 8% slopes and 8 to 15% slopes (PtB & PtC); Raynham silt loam (Ra); Riverhead sandy loam with 3 to 8% slopes (RhB); and Scio silt loam, 3 to 8% slopes (ScB). Pittsfield and Hoosic soils are found in the central portion of the site and consist of well-drained soils.

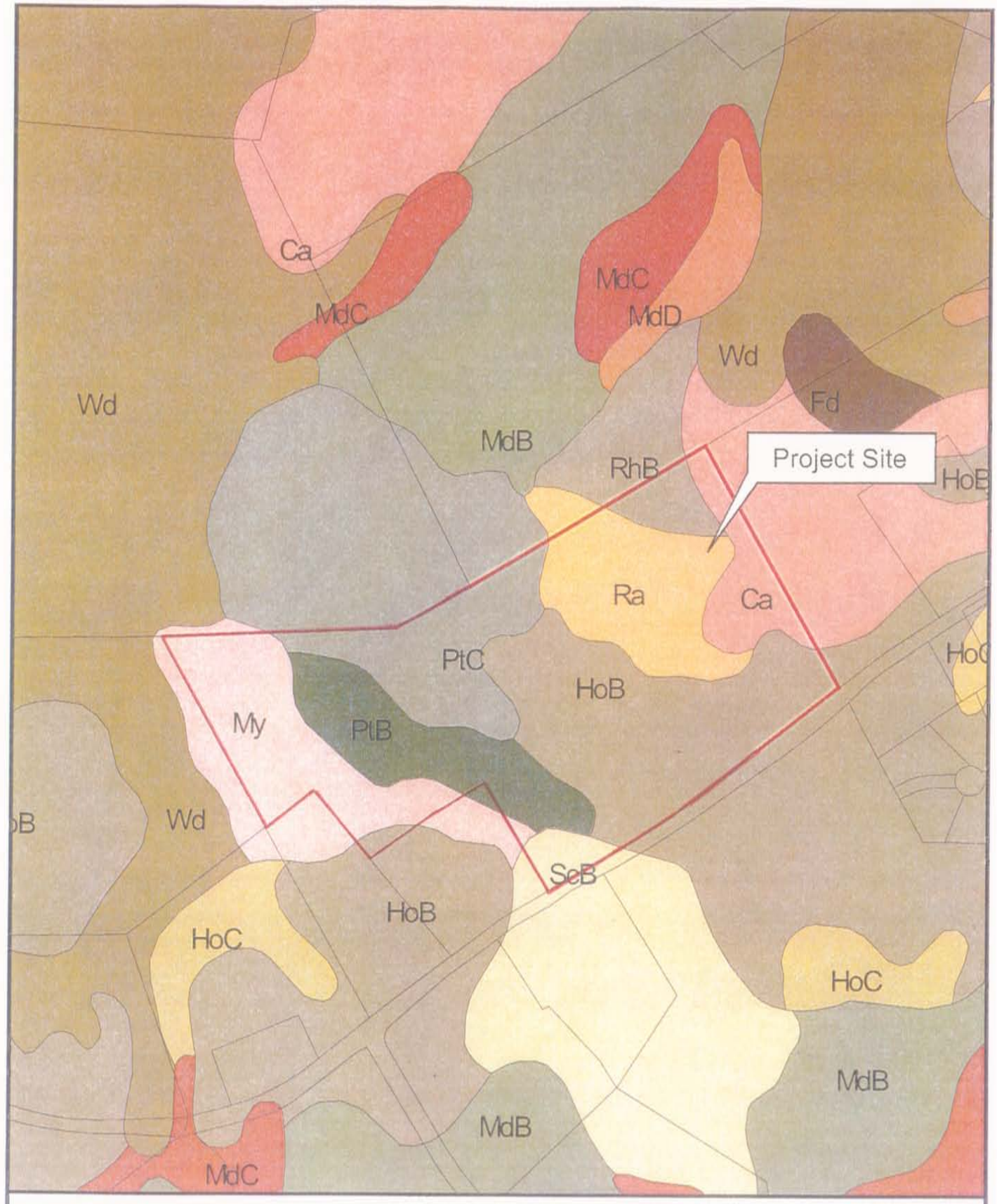

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Figure 4 : Existing Soils Map
Fairgrounds Site
Town of Warwick, Orange County, New York
Source: Orange County Water Authority
1 inch = 6,000 feet

The soil mapping units found on the site using the soil classifications of the USDA Soil Conservation Service (SCS) are briefly summarized below:

- Canandaigua silt loam (Ca) This unit consists of deep, nearly level, poorly drained and very poorly drained soil formed in glacial lake deposits, dominated by clay, silt and very fine sand. This soil is found in poorly drained areas of wetland located on the northeastern portion of the site.

- Hoosic gravely sandy loam (HoB) This is a deep, somewhat excessively drained gently sloping soil formed in glacial outwash that has a high sand and gravel content. This soil forms the gentle topographic ridge located in the central portion of the site.

- Middlebury silt loam (My) This unit consists of deep, moderately well drained to somewhat poorly drained soil found in nearly level areas formed in recent deposits and on flood plains adjacent to streams that flood periodically. This soil is found in wetland areas at the west side of the site.

- Pittsford gravelly sandy loam (PtB and PtC) This is a deep, well-drained, gently to moderately sloping soil formed in glacial till deposits derived from limestone and schists. These soils are found in upland ridge areas in the north-central portion of the site.

- Raynham silt loam (Ra) This is a deep somewhat poorly drained, nearly level soil formed in glacial lake deposits of silt and very fine sand. This soil comprises much of the wetland area on the eastern side of the site.

- Riverhead sandy loam (RhB) This is a deep well drained, gently sloping soil formed in glacial outwash deposits that are dominantly sand and gravel. This soil forms an upland area in the northeast corner of the property.

- Scio silt loam (ScB) This is a deep moderately drained, gently sloping soil formed in glacial lake deposits that are dominantly silt and very fine sand. The soil is typically found in alluvial fans and terraces in valleys. A small area of this soil type occurs in the streambed in the southwest corner of the property, adjacent to Route 94.

The soils on this site are common in this area of Orange County. As described above, on site soils were formed from glacial till and glacial lake deposits and have been directly influenced by historic agricultural activities. Soils which form the broad upland area at the center of the site are generally well drained and consist of Pittsford gravelly sandy loam and Hoosic gravelly sandy loam. Based on the soils description and local topography, the broad hillside found at the northern edge of the site is a glacial moraine. Soils on the eastern and western edges of the site are more poorly drained and form wetland areas. Soils which comprise these wetland areas include Raynham silt loam, in the northeast corner and Middlebury silt loam on the western side of the property.

1.3 Bog Turtle Ecology

The main range of the bog turtle extends from western Massachusetts, Connecticut, and eastern New York southward through eastern Pennsylvania and New Jersey to northern Delaware and northern Maryland. Isolated populations exist in northwestern New York, northwestern Pennsylvania, southern Virginia, western North Carolina, northwestern South Carolina, northern Georgia, and eastern Tennessee.

The bog turtle's range in New York is concentrated primarily in the southeastern corner of the state, where they have been reported from both sides of the Hudson River as far north as Albany. Disjunct populations occur in the Lake George (northeastern New York) and Finger Lakes (western New York) regions and south-central New York. The Lake George, Albany, and Rensselaer counties and south-central populations have been extirpated, and only one extant Seneca County site remains in the Finger Lakes region. Bog turtles are considered extirpated from Rockland County.

Bog turtles usually occur in small, discrete populations, generally occupying open-canopy, herbaceous sedge meadows and fens bordered by wooded areas. These wetlands are a mosaic of micro-habitats that include dry pockets, saturated areas, and areas that are periodically flooded. Unfragmented riparian systems that are sufficiently dynamic to allow the natural creation of open habitat are needed to compensate for ecological succession. Beaver, deer, and cattle may be instrumental in maintaining the open-canopy wetlands essential for this species' survival.

Bog turtles are usually found in small, discrete populations occupying suitable wetland habitat dispersed along a watershed. The turtles depend upon diversity of micro-habitats for foraging, nesting, basking, hibernation, shelter, and other needs. Unless disrupted by fire, beaver activity, grazing, or periodic wet years, open-canopy wetlands are slowly invaded by woody vegetation and undergo a transition into closed-canopy, wooded swamplands that are unsuitable for habitation by bog turtles. Bog turtles can live to be 40 years old. Historically, bog turtles probably moved from one open-canopy wetland patch to another, as succession closed wetland canopies in some areas and natural processes (e.g., beaver activity or fire) opened canopies in other areas.

Bog turtles inhabit a variety of wetland system types throughout their range, but generally these are small, open-canopy, herbaceous sedge meadows and fens bordered by more thickly vegetated and wooded areas. Throughout the bog turtle's northern range, seepage or spring-fed emergent wetlands associated with streams are the primary habitat. These are often at or near the headwaters of streams or small tributaries. The habitats are often elongate or strip-like transitional zones between drier upland areas and more thickly vegetated, wetter, wooded swamps or marshes. Although bog turtles are dependent upon suitable open-canopy sedge meadows and fens for many of their ecological requirements such as foraging, reproduction, and thermoregulation, they also utilize more densely vegetated areas for hibernation and may be incidentally found in a wide variety of habitats when making relatively long-distance movements. The continued existence of these habitat mosaics, as well as the ecological connections between these areas, is required to maintain bog turtle populations.

Bog turtles inhabit sub-climax seral wetland stages and are dependent on riparian systems that are unfragmented and sufficiently dynamic to allow the natural creation of meadows and open habitat. This is to compensate for

the closing-over of habitats caused by ecological succession. It has been reported that bog turtles were able to disperse between habitat patches of changing vegetation within a long-term, stable, wetland complex. It is believed that beaver, deer, and cattle may be instrumental in maintaining the open-canopy wetlands essential for this species' survival. Muskrat (*Ondatra zibethicus*) and meadow vole (*Microtus pennsylvanicus*) also play an important role in maintaining bog turtle habitat and providing travel pathways. Invasion of purple loosestrife into wetlands, altering plant species composition, as well as succession of many wetlands from open-canopy fens to closed-canopy red maple swamps negatively impact habitat and may account for the bog turtle's irregular and shrinking distribution. The "trapping out" of beaver in many areas during colonial and early post-colonial times undoubtedly accelerated successional changes in wetland vegetation by fostering the unimpeded growth of wooded swamps, with an associated decline of bog turtles.

Currently, many wetlands occupied by bog turtles in agricultural areas are subject to livestock grazing. Research has found that light to moderate grazing at certain prescribed times of the year (to avoid impacts to bog turtle individuals) may function to impede succession by preventing or minimizing the encroachment of invasive native and exotic plant species, thereby maintaining an intermediate stage of succession. It has been suggested that in pre-colonial times the grazing activities of large herbivores such as bison (*Bison bison*) and elk (*Cervus canadensis*) may have been important in maintaining bog turtle habitat.

The occurrence of bog turtles in wetlands that are actively or recently grazed by livestock is probably an instance where grazing by livestock has either replaced grazing by native herbivores or replaced one of the other historical factors that would have acted to maintain the wetlands in an early successional stage. In some areas, fire may have played an important role in maintaining the open nature of bog turtle wetlands. Evidence suggests that

fire also occurred in these wetlands during pre-settlement times. These fires may also have been set by humans to maintain open habitat.

Bog turtles become active in late March to late April, depending upon latitude, elevation, and seasonal weather conditions. At the northern limit of their range, bog turtles in New England are active from late April through late September, with 85 percent of all observations occurring in May and June. In southeastern New York, aberrant surface activity has been noted both in late February and March as well as in early October, but activity typically commences in the first or second week of April and ends in mid-September. In Pennsylvania, biologists reported that bog turtles were active from late March through late September. In Maryland, biologists reported that bog turtles are hard to find before late April, although in 1998 and 1999 following exceedingly warm winters they emerged in early April; further, about 80 percent of the bog turtle captures in Maryland from 1976 to1995 occurred in May, June, or July. Most bog turtle captures in North Carolina occurred between April and July.

At seasons end, bog turtles generally retreat back into more densely vegetated areas to hibernate. A report from Massachusetts indicated that early season captures of bog turtles were concentrated on and near hummocks that served as hibernacula at the interface zone between open fen habitats and shrub and wooded swamp. These hummocks were covered with small trees and shrubs including primarily alder (*Alnus spp.*), gray birch, red maple (*Acer rubrum*), and tamarack (*Larix laricina*) with springs percolating up around them. Narrow, tunnel-like cavities were angled downward through these hummocks, passing in between the tangled tree roots, and then down into the water. Bog turtles were observed basking at the mouths of these tunnels in early May, but by mid-May most turtles had moved from the sheltered hummock areas out into the open fen, although a few turtles remained around a spring-fed alder clump throughout the spring and summer

activity season. Turtles have been found hibernating in spring-fed rivulets under soft mud, in muskrat burrows, under sedge clumps, at the base of tree stumps, and in burrows created by meadow voles.

In southeastern New York, several bog turtles were found over-wintering together with spotted turtles (*Clemmys guttata*) in an old muskrat lodge, muskrat burrows, and a stone wall. The turtles demonstrated strong fidelity to their hibernacula. All hibernacula were flooded throughout the year, but were never judged to be anoxic as they were located along spring-fed rivulets, or in a stream on a flood plain. Hibernating turtles have been found under water in soft mud, in crevices between rocks, or between tangled roots. It has been reported that daily activity in Massachusetts's populations varied considerably with the time of year, prevailing weather conditions, and the previous night's temperature. During periods of warm weather in late May and June, bog turtles usually emerged between 0800-0900 hours and basked for several hours. However, during spring and autumn, or during periods of cool weather, turtles emerged in mid-morning and were found basking throughout the day; on windy days, bog turtles basked under the dead, dry vegetation atop tussocks.

In southeastern New York biologists found that bog turtles are primarily active between 0800-1700 hours; however, following mild May-June nights, turtles were observed to leave their nocturnal retreats as early as 0600-0700 hours to bask in the early morning sun, and in June, nesting females were active until 2000-2100 hours. Basking behavior was affected by weather conditions. Sluggish, early season basking turtles were usually found well-exposed on the side or top of a tussock. On cooler, windy days, basking turtles were often partially hidden under dry vegetation, and during warm summer days, individuals were most frequently observed basking half-buried in a self-made depression on a shallow, flooded mud flat, with only a small portion of their carapace breaking the water's surface.

The greatest threats to the survival of this species is the continued loss, alteration, and fragmentation of its highly specialized wetland habitat, compounded by the loss of long-lived adult animals from wild populations for a lucrative, illegal wildlife trade. Habitat fragmentation and alteration expose adult turtles to elevated risk of pollution and incidental mortality including being crushed by livestock or on roads by vehicular traffic, as well as increased exposure to predation and collection.

Conversely, farm ponds, reservoirs, and other impoundments are created by inundating the shallow, open wet meadows and fens required for bog turtle survival. Alterations to local hydrologic systems are an important threat to bog turtle populations. Bog turtle habitats are sustained by groundwater regimes that are sensitive to changes in subsurface water supplies. Patterns of subsurface water flow can be altered by infrastructure construction and other development projects. Drilling under wetlands (e.g., to install utility lines or fiber optic cable) has the potential to disrupt the flow of water and even fracture bedrock and significantly impact a small wetland system.

Even if the patches of open canopy wetlands occupied by bog turtles are protected, they are threatened by a variety of problems stemming from a landscape that is subject to increasing levels of human use, including habitat fragmentation, nutrient enrichment, and contaminant inputs from septic, road, and fertilizer runoff. The latter causes rapid growth of vegetation with subsequent canopy closure. Although light grazing may be beneficial in controlling succession, intensive pasturing adds excessive nutrient loading from fecal material, results in significant soil disturbance, (which may accelerate exotic plant invasion), destroys the unique plant community by overgrazing, and will result in bog turtles being crushed.

The specific livestock species employed for grazing management practices determines the effect on the habitat. For example, horses appear to cause more damage to a pasture than cows, animal for animal. It has been observed that horses "graze lower to the soil, like sheep, and this coupled with their hoofs somehow appear to damage the substrate more - areas become mud holes with only a few horses whereas it would take many more cows to inflict the same amount of damage." Protected wetland areas that seek to protect bog turtles either directly or indirectly are usually relatively small and, although encompassing the turtle's primary habitat, leave the majority of the wetlands systems and drainage basin largely unprotected. Therefore, although the core wetland habitats may be protected, these watersheds and/or wetland drainage basins continue to be vulnerable external factors, including subdivisions, wells, road construction activities, and associated activities. These activities may alter both the supply and quality of the water entering the turtle's habitat and impede the dispersal of turtles within a drainage basin. Ultimately, external activities at the landscape level can greatly diminish the suitability of any one wetland to support bog turtles.

In summarizing, some of the most persistent and widespread problems associated with maintaining bog turtle habitat are succession of open meadows to wooded swamps, drainage and flooding of habitats through diversion or damming of feeder streams, chemical and heavy metal pollution, nutrient enrichment from fertilizer and septic runoff, and the establishment of alien plants. Disturbance of surface soils and degraded water quality may result in the establishment and spread of invasive wetland plant species such as the alien purple loosestrife or common reed. These aggressive species rapidly invade wetlands when areas of disturbance and/or impaired water quality are created. Favored colonization sites are the piles of excavated soil placed alongside ponds and ditches. After taking root in a disturbed microhabitat, these plants quickly spread into the adjacent wetlands, replacing a diverse botanical community with a dense monoculture. This monoculture is

unsuitable for many wetland species, including bog turtles. Other invasive species implicated in reducing the value of bog turtle habitats include reed canary grass and multiflora rose (*Rosa multiflora*).

2 METHODOLOGY

2.1 Phase 1 Survey

Initially, a habitat assessment for potential bog turtle habitat was conducted on the subject site. The Bog Turtle Northern Population Recovery Plan, prepared by the USFWS, identifies habitat assessments as a Phase 1 Survey.

When determining potential bog turtle habitat, it is of importance to rely on data collected in the field. The analysis of wetland systems and associated wetland conditions are important to document. Wetland maps such as National Wetland Inventory Maps can be reviewed as background data but should not be solely relied upon to determine where Phase 1 bog turtle surveys are to be performed.

Background data on the site were obtained and analyzed. Data included US Geological Survey Quadrangle Maps, USFWS National Wetland Inventory Maps, aerial photography, and other pertinent information.

Criteria used to evaluate site conditions in relation to potential bog turtle habitat included a vegetative assessment. Bog turtles prefer habitats with mossy cover, native clumping grasses, some selected woody vegetation, and smaller herbaceous plants that occur in wetlands. A botanical list of suitable vegetation as described in the US Fish and Wildlife Service includes tussock sedge (*Carex stricta*), soft rush (*Juncus effuses*), skunk cabbage, and woody wetland vegetation (referred to as scrub-shrub wetlands) such as alders, willow saplings, (*Salix spp.*), and red maple saplings.

Hydrologic regimes that are indications of potential or suitable habitat for bog turtles include wetlands that are associated with stream channels. Wetlands sites with a stream entering the wetland system and possessing characteristics such as year round surface water at shallow depths and/or year round saturated soils are indications of bog turtle habitat. The recharge of subsurface or/and surface water in these wetlands is a result of rainfall and stream flow recharge. The exact duration of surface water presence and saturated soil conditions may vary, but are considered to be needed year-round for suitable bog turtle habitat. Exceptions to these year-round wet conditions criteria that may be employed include abnormal low rainfall years or similar climatic variation occurrences.

Hydric soils should be present with any potential bog turtle habitat. Specifically, soils with peat or a mucky composition are indications of suitable soil characteristics for bog turtle habitat.

Additional site characteristics associated with bog turtle habitat include situations when ample sunlight conditions penetrate the tree canopy and reach the ground surface. Many of the circumstances relating to vegetation, hydrology, and soil that cumulatively result in suitable habitat (within a wetland) may not be evenly distributed on a particular site. This is also true for sunlight conditions, surface water cover, or generally speaking any of the three parameters (vegetation, hydrology, and soils). Certain portions of these parameters may be absent form a particular site while bog turtle habitat or occurrence of turtles may be present.

When measurable combinations of appropriate vegetation, hydraulic regimes, and soil characteristics are present in wetland systems qualified wetland scientists/delineators or/and qualified bog turtle surveyors should assume that the site has potential habitat.

2.2 Phase 2 Survey

A Phase 2 Survey seeks to determine if turtles are present on a site. This survey typically does not seek to determine population dynamics of the listed turtles, rather it is merely intended to survey for presence or absence of individuals. Surveys conducted within the Phase 2 process need to be preformed within specific parameters and according to federal and state agency guidelines. In New York State, no state specific protocol for surveying has been established.

Surveying for bog turtles in New York State are conducted and based upon the survey standards and guidelines in the US Fish and Wildlife Service Bog Turtle Northern Population Recovery Plan. These standards were utilized for the bog turtle surveys on the subject site and are briefly discussed below.

Surveys need to be conducted when the bog turtle is emerging following the winter season. This time period is also the breeding time for the bog turtle. Specifically, a 60 day window between the periods of mid April and mid June is suggested bog turtle survey times. Reasoning to survey within this time frame has been established due to a number of considerations related to species activity, survey methods, and turtle protection. Surveys conducted during mid May and mid June need to be on days that are 55◦ degrees (f) and above and when the sunlight entering the site is > than 50% (the use of a densitometer is used to measure incoming light through the canopy). These two climate conditions should be the prevailing weather on the survey days. Four surveys per wetland shall be conducted within the Phase 2 surveys with two of the surveys being conducted in the month of May. Duration of surveys should be between three and six hours per each surveyor and time duration between surveys should be between six days for mid-April

to mid-May surveys and three days for mid-May to mid-June surveys. Surveyors should total between one and three people based on the qualifications mentioned in the US Fish and Wildlife Service Bog Turtle Northern Population Recovery Plan.

According to the NYSDEC, the maximum length of the bog turtle in New York is 4.5". Due to the relatively small size of the bog turtle, great care is needed when traveling through potential habitat. It is also the responsibility of the biologist to know how to travel through potential habitats without disturbing the biomass or surface of the ground.

During a Phase 2 survey if the presence of bog turtles is confirmed in the field, all survey efforts should cease and documentation of the individual species should be recorded. Turtles are sensitive to handling. Sun, heat, and stress may pose a danger to turtles. Therefore it is necessary after proper documentation has been appropriately recorded to release turtles in a quick time at the exact location where occurrence was first observed. Photographs, measurements, weight, and sex determination as well as more specific information to confirm species characteristics are conducted and recorded in accordance with the USFWS Bog Turtle Northern Population Recovery Plan.

Based upon field investigations by the NYSDEC, USFWS, and ERS Consultants, Inc., a report was sent to the NYSDEC and USFWS detailing the methodologies to be utilized during the Phase 2 Survey of the subject site. These methods were based upon current standards developed by both the NYSDEC and USFWS. These methods concurrently follow the guidelines found in the Bog Turtle Northern Population Recovery Plan. The NYSDEC approved the level of effort proposed as well as the methodologies implemented. Field studies would focus on the following: 1) the central portion of the eastern (NYSDEC regulated) wetland on the subject site, where marginal potential habitat may exist; 2) the adjacent palustrine emergent

wetland off the subject site to the northeast, where more promising potential habitat exists; 3) the edge of the adjacent palustrine forested wetland off site to the east, within the same wetland system where bog turtles have been identified off site; 4) the tributary system on the subject site within the western (Wetland D) wetland system, where no habitat was observed but is within the same watershed where bog turtles have been identified; and 5) the palustrine emergent portion (within the subject site), within Wetland D, where bog turtles have been identified off site much further to the northwest.

Presence/absence studies began in mid-April 2000 and extended to mid-June 2000. Site surveys were conducted by two field biologists, David Griggs and Randy Stechert, intensively searching previously identified areas twice a week. These biologists have considerable experience in field herpetology and are recognized by the NYSDEC as qualified scientists. Field work was conducted on days with favorable field conditions for observing bog turtles. Ambient air temperature were 55◦ degrees (f) or above. Searches would begin in later morning, about 1000 hours and consist of walking carefully back and forth through the wetland areas. Additionally, biologists probed with hands in mud, around tussocks and in rivulets. Searches ended in the afternoon, around 1500 hours.

Due to the illusive nature of this species, trapping surveys were also conducted. A total of 30 traps were utilized. These traps were specifically made by Kuhlmann's Trap Company and are currently used by the NYSDEC Endangered Species Unit and the NYSDEC Natural Heritage Program. Trapping occurred in the central portion of the eastern wetland, the palustrine emergent wetland system off the site to the northeast, and the palustrine emergent wetland system within the western wetland on the subject site. Traps were set in the early morning and meticulously checked the same day in the late afternoon. Due to possible predation by raccoons and other mammal species, traps were turned over and closed after checking in the late afternoon

so that turtles could not enter the traps during the night. Traps were concealed and shaded by vegetation so that sun, heat and stress would not pose a danger to this species. Care was taken to ensure that no traps were completely submerged in water.

Mainly due to project delays the presence/absence studies were repeated in the spring of 2002. The study was initiated in mid-April 2002 and completed in mid-June 2002. Two field biologists conducted site investigations, intensively searching previously identified study areas. Field work was conducted on days with favorable field conditions for observing bog turtles. Ambient air temperatures were at or above 55◦ degrees (f). Searches began in late morning, at about 1000 hours and consisted of walking carefully back and forth through each wetland area. Additionally, biologists used muddling techniques to probe the substrate and around tussocks. Searches ended in the afternoon, about 1500 hours.

Again, due to project delays, a third and final study was conducted in 2004. Presence/absence studies were initiated in mid May 2004 and completed in mid June 2004. Again, two field biologists conducted site investigations, thoroughly searching previously identified study areas. Field work was conducted on days with favorable field conditions for observing bog turtles. Ambient air temperatures were at or above 55◦ degrees (f). Searches began in late morning, at about 1000 hours and consisted of walking carefully back and forth through each wetland area. Additionally, biologists used muddling techniques to probe the substrate and around tussocks. Searches ended in the afternoon, about 1500 hours.

3 FINDINGS

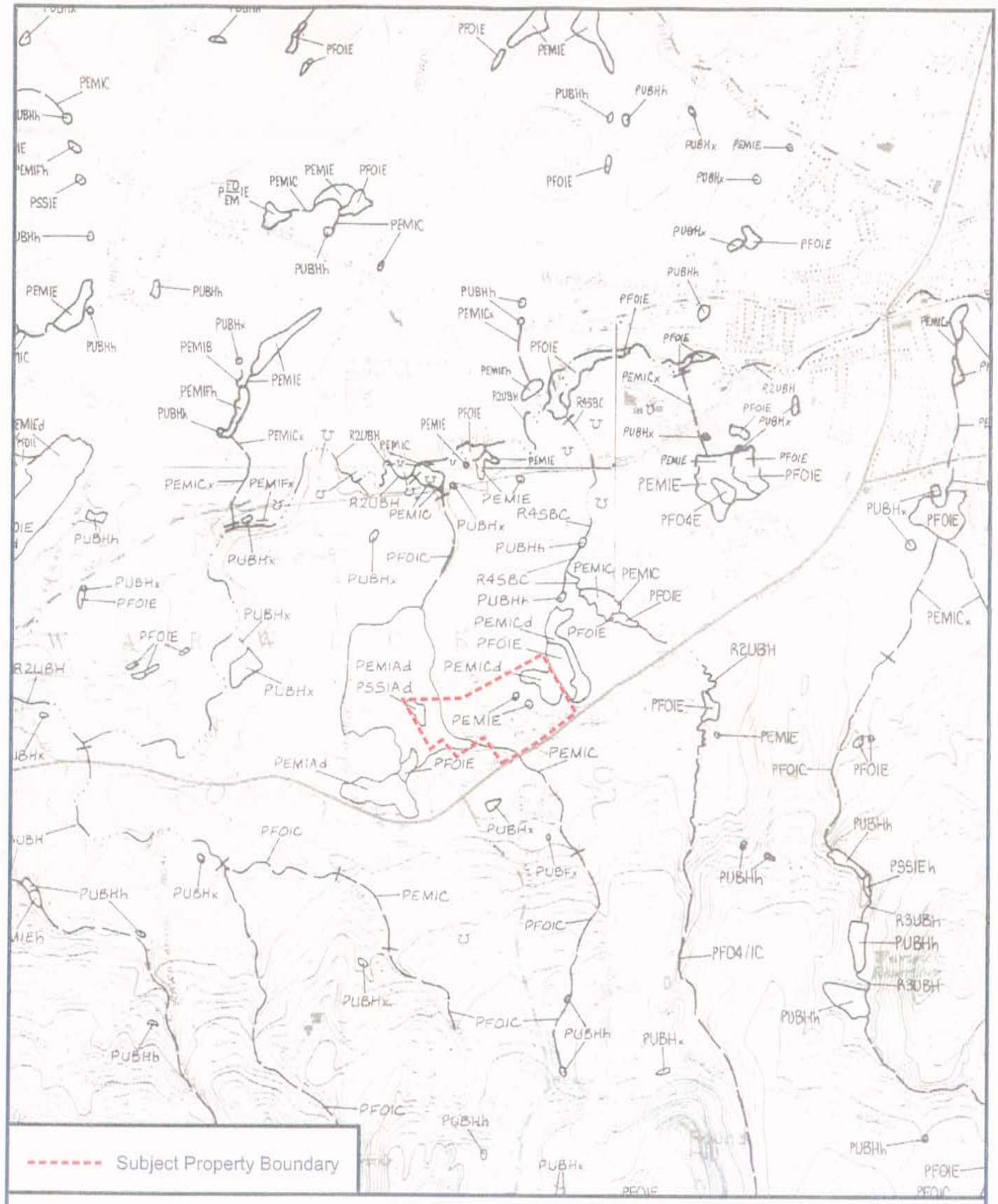
3.1 Phase 1 Survey

As part of a Phase 1 Survey, background data for the site was obtained and analyzed. The National Wetland Inventory (NWI) maps show the general configuration, location and type of wetlands found within a given area of coverage. The NWI wetland maps for Wawayanda, New York (using the 7.5 minute USGS topographic base) covers the project site (see Figure 5).

Because the NWI maps are limited in precision by their scale (1:24,000) and by the identification method used, the boundaries of wetlands shown on the NWI maps need to be more precisely determined in the field. Commonly, small wetland areas, and, less frequently, large wetland areas are not shown on NWI maps.

The NWI maps for the site show four wetland systems within the project site. A Palustrine Emergent Persistent, Temporary Water Regime Partially Drained Ditch System is identified in the western portion of the site. Two small isolated wetlands are identified as Palustrine Emergent Persistent, Seasonal Saturation Water Regime System.

The NYSDEC is responsible for mapping freshwater wetlands that are 12.4 acres in size or larger, or those smaller wetlands that are of unusual local importance (Environmental Conservation Law, Article 24). The NYSDEC Freshwater Wetlands Map #23 for Orange County covers the site area (see Figure 6). The NYSDEC Freshwater Wetlands Map identifies a wetland (WW-3) in the northeast portion of the site.



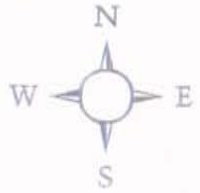


Figure 5 : National Wetlands Inventory Map
Fairgrounds Site
Town of Warwick, Orange County, New York
Source: U.S. Dept. of the Interior, Fish and Wildlife Service
Scale: 1 inch = 2,000 feet

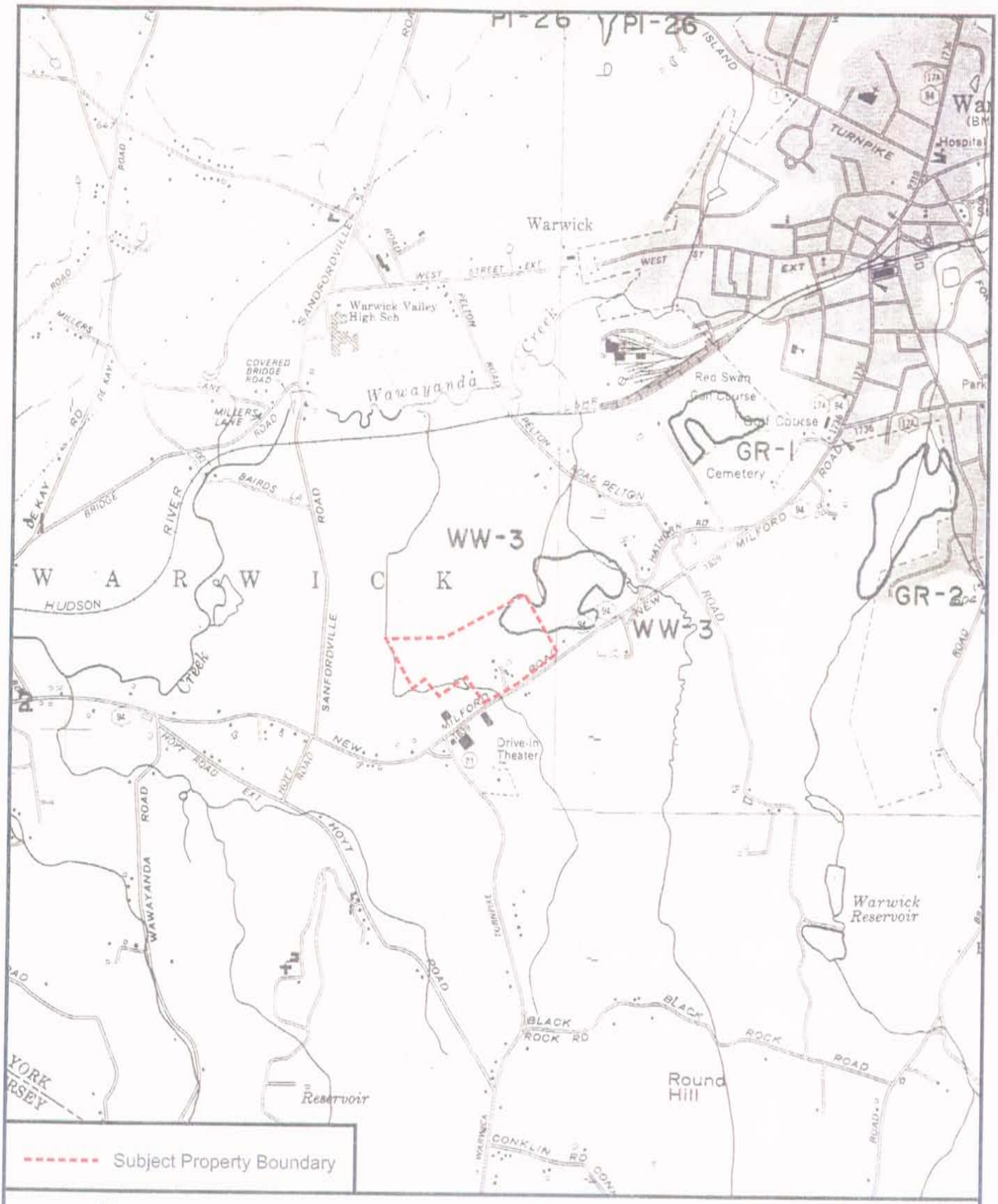


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Figure 6 . NYSDEC Wetlands Map
Fairgrounds Site
Town of Warwick, Orange County, New York
Source: NYSDEC
Scale: 1 inch = 2,000 feet

Suitable vegetative species found in bog turtle habitat, as described by the US Fish and Wildlife Service includes tussock sedge, soft rush, skunk cabbage, and woody wetland vegetation (referred to as scrub-shrub wetlands) such as alders, willow saplings, and red maple saplings. Within the subject site Wetland A contains all of the above mentioned species. However, invasive exotic species are also present, and dominate this wetland. These plant species include purple loosestrife, reed canary grass and common reed. Invasive exotic species including common reed also dominate most of Wetland D.

Within the subject site, Wetland A has been identified on the NWI maps as having a "seasonal flooded" water regime. This means that surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season. This wetland is also "partially drained/ditched". This means that the water level has been artificially lowered. Wetland D has been identified on the NWI maps as a "temporarily flooded" water regime. This means that surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface. This wetland is also "partially drained/ditched". Again, this means that the water level has been artificially lowered. Based upon this data, water regimes for either wetland is not typically suitable for bog turtle habitat.

Hydric soils exist on the subject site within the wetland areas. Wetland A consists of Raynham and Canandaigua silt loams. These soils consist of deep, somewhat to very poorly drained soils. They contain silts and very fine sands. Wetland D contains Middlebury silt loam. These soils consist of somewhat poorly drained soils. None of these hydric soils contain peaty or mucky soils typically suitable for bog turtle habitat.

ERS Consultants, Inc. assessed potential bog turtle habitat within the subject site and determined that possibly very marginal potential habitat may exist within a very small portion of Wetland A. However, no potential habitat exists within Wetland D, on the subject site. Potential bog turtle habitat does exist northeast of the site where Wetland A extends off site. Bog turtle habitat also exists northwest of the site where Wetland D extends off site. Both locations are within the same watershed (Wawayanda) as the subject site. ERS Consultants, Inc. invited both USFWS and NYSDEC biologists to visit the subject site in early 2000. Both agencies concurred with these initial findings. For the Fairgrounds project, Phase 1 survey results concluded that suitable habitat was not present at the site however bog turtle occurrences were known to exist in the (Wawayanda Creek) watershed. It was determined that a Phase 2 bog turtle survey would be conducted.

3.2 Phase 2 Survey

No bog turtles were observed during the field investigations conducted in 2000, 2002 or 2004. Additionally, no bog turtles were captured during the trapping effort in 2000.

During the 2000 field investigations, five spotted turtles were both observed and captured in the traps off site, in the NYSDEC regulated wetland system northeast of the site. Two young of the year snapping turtles (*Chelydra serpentina*) were observed within Wetland A. Numerous green frogs (*Rana clamitans*) were observed throughout the wetlands both on and off site.

During the 2002 field investigations, two additional spotted turtles were observed along with two recaptures from the 2000 field investigations. No other turtles were observed. Numerous green frogs and several American toads (*Bufo americanus*) were observed within the study areas.

During the 2004 field investigations, one additional spotted turtle was observed along with two recaptures from the 2000 field investigations. No other turtles were observed. Numerous green frogs, several American toads (*Bufo americanus*) and northern two-lined salamanders (*Eurycea bislineata*) were observed within the study areas.

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APPENDIX A

PHOTO PLATES

PHOTO 1 Looking west from Wetland Boundary Line Point A5 at PEM Wetland A.

PHOTO 2 Looking east at PEM Wetland A from PEM Wetland B.

PHOTO 3 Same view as Photo 2 except taken during the summer.

PHOTO 4 Looking west at PEM Wetland B. Note canary reed grass dominating wetland.

PHOTO 5 Looking northwest at PEM Wetland C.

PHOTO 6 Looking north from Wetland Boundary Line Point D10. Note PSS1/PF01 wetlands to the left.

PHOTO 7 Looking Wetland Boundary Line Point D12 looking north at farmed fields and upland forested area.

PHOTO 8 Looking north from Wetland Boundary Line Point D27. Note wetlands on left and farmed fields to the right.

PHOTO 9 Looking south from Wetland Boundary Line Point D35 to box culvert under Route 94..

APPENDIX B

QUALIFICATIONS

Qualifications

The two biologists that conducted these assessments are listed below. Their qualifications and resumes follow.

Mr. Randy Stechert is a qualified herpetologist with over 25 years of professional experience. Mr. Stechert has conducted hundreds of habitat assessments and surveys for a variety of threatened and endangered reptile and amphibian species. He has worked throughout New York and New Jersey. He has been contracted by such agencies as New York State Department of Environmental Conservation, Natural Conservancy, Natural Heritage Program, New Jersey Department of Environmental Protection, United States Military Academy Natural Resources Branch, Palisades Interstate Parks Commission, as well as a variety of local governments and private clients.

Mr. David Griggs is an ecologist, certified as a Professional Wildlife Biologist and Wetland Scientist. Mr. Griggs has over twenty years of professional experience, conducting hundreds of assessments and surveys for a variety of threatened and endangered species including reptile and amphibian species. He has worked throughout the eastern United States as well as in Central and South America conducting field investigations. Currently, the majority of his field work is in the New York/New Jersey area. Recently, Mr. Griggs has been responsible for finding previously unknown locations for the longtail salamander, blue-spotted salamander, Jefferson salamander, Blanding's turtle, timber rattlesnake and wood turtle.

EDUCATION

Brevard College, North Carolina, AS in Forest Biology, 1979
SUNY College of Environmental Sciences and Forestry, BS in Wildlife Biology and Management, 1981
Syracuse University, BS, 1981
New York University, Graduate Courses, 1983-1984
Rutgers University, Graduate Courses, 1988-1989

TECHNICAL TRAINING

US Fish and Wildlife Service Habitat Evaluation Procedures (HEP), Certified
Adamus Wetland Functional Assessment Methodology (WET), Certified
US Fish and Wildlife Service Instream Flow Incremental Methodology (IFIM)
Health/Safety Training Course for Hazardous Waste Operations

RESPONSIBILITIES

Principal Ecologist. As a Certified Professional Wildlife Scientist, Mr. Griggs is responsible for coordinating and supervising environmental impact statements, natural resource/endangered species inventories and assessments, wetland delineations and mitigation projects, environmental permitting and technical training in wetland ecology.

EXPERIENCE

Twenty years of professional experience in ecology and wildlife management in the US and abroad.

1984 - DATE

Representative projects include:

Ramapo Mountain Land Company, New York. Survey and inventory of endangered/threatened fauna and flora, verification of historical sightings, evaluation of habitat suitability, and determination of probability of occurrence. Performed radio-telemetry of timber rattlesnakes over three-year period.

Manhattan Woods Golf Course, Rockland County, New York. Supervised wetland delineation for a 220-acre proposed golf course. Services also included wetland permits; preparation, approval and implementation of mitigation (wetland creation) plans.

Fairway Park, P.U.R.D. Mixed-Use Project, Atlantic County, New Jersey. Prepared an Environmental Impact Statement for the proposed 200 residential unit and commercial facility project. Performed an inventory of existing conditions including vegetation, wetlands, wildlife, soils, water quality, and an endangered/threatened species survey. Additionally, proposed impacts were analyzed and mitigation measures prepared for both environmental and social resources.

Landfill Design and Environmental Studies for Major New York State Regional Landfill. Performed wildlife and habitat inventories of proposed landfill and resource recovery sites for environmental impact statements conducted under NYSEQRA. Evaluation of sensitive environmental features including endangered species and wetlands using GIS and GPS technologies.

(over)

Bog Turtle Phase 1 and 2 Surveys, Northern New Jersey, Southern New York and Western North Carolina. Field herpetologist conducted numerous surveys and habitat assessment for bog turtles at various locations throughout northern New Jersey, southern New York, and western North Carolina in accordance with U. S. Fish and Wildlife Service methodology.

Harmon Meadow Wetland Mitigation Design and Construction Services, Secaucus, New Jersey. Field Manager for a 150-acre wetland mitigation project, including design, construction inspection, federal and state regulatory coordination and approvals, pre/post project environmental monitoring and coordination of public presentations. This project won first prize for environmental engineering from the New York Association of Consulting Engineers. Also, prepared assessments using a computer-based Habitat Evaluation Procedures (HEP) and Adamus (WET) analysis development.

Virginia Department of Transportation - Environmental Services (statewide). Field Manager of Williamsburg and Alexandria Environmental Assessments and Springfield Bypass 4(f) statements for the Virginia Department of Highways and Transportation to meet FHWA environmental requirements. Conducted biotic surveys, including endangered/threatened species studies and the computer-based Biotic of Virginia (BOVA) analysis.

Air Force Base Joint Use Master Plan and Environmental Assessment, Illinois. Technical Specialist responsible for the coordination of the environmental assessment for the proposed expansion of the air base and introduction of civil air traffic for the Illinois Department of Transportation. Analysis focused on impacts to the natural resources including wetlands and farmlands, and mitigation plans for bottomland hardwoods.

Pumped Storage Hydroelectric Project and FERC License Application, New Jersey. Assessment of existing conditions and potential impacts on terrestrial and aquatic fauna and flora for the FERC license application. Qualitative and quantitative impact assessment analysis using both WET and HEP methodologies.

1983 - 1984

New York University Medical Center (Laboratory for Experimental Medicine and Surgery in Primates). Consultant for primate release program in tropical portions of Africa. Responsible for breeding and behavior analysis and monitoring environmental conditions for 300 primates.

1982 - 1983

Lawler, Matusky and Skelly Engineers, New York. Field Technician responsible for the analysis of ichthyoplankton samples, seining, identifying and sorting various species of fish for the FHWA/NYSDOT Westway project. Also, well water sampling and analysis for IBM, New York; fish and water sampling for Orange and Rockland Utilities' EIS to determine the effects of electric generating stations on the fishery of the Hudson River. Other techniques utilized include botanical identification and surveying, avian and mammal live trapping and land use mapping.

MEMBERSHIPS

Member, Society of Wetland Scientists
Member, Wildlife Society
Adjunct Faculty for Continuing Education, Rutgers University

EDUCATION

Ridgewood High School, Ridgewood, NJ, Graduated 1970

EXPERIENCE

Twenty-five years of professional experience in herpetology.

1996-1997 - Annual Contracts with USMA Natural Resource Division West Point, New York; NYSDEC Region 3; and Natural Heritage Program to research various timber rattlesnakes' habitat, population movements, and general biology.

1995 - Second year of 3-year contract with Natural Resources Department, United States Military Academy, West Point, New York for mark/recapture and radio telemetry study of timber rattlesnakes (*Crotalus horridus*) from West Point Border Line den, Brooks Hollow den, and Crows Nest den to determine critical habitat, home range parameters, population size estimates, causes of attrition and recovery program for West Point Border Line rattlesnake population.

Annual contract (1981 to present) with New York State Department of Environmental Conservation (NYSDEC), Delmar, New York to determine rattlesnake den locations, critical habitat, population size estimates, and threats to individual populations.

Contract with New York Natural Heritage Program (Nature Conservancy), Latham, New York to conduct field surveys for timber rattlesnakes and other endangered and threatened species in western New York, and the Lake George-Lake Champlain Valley in northeastern New York.

Contract with New Jersey Department of Environmental Protection to identify and update timber rattlesnake den locations and population size estimates in northern New Jersey.

October 31, 1995 - Courtroom consultation for The Chazen Companies, Montogmery, New York, and subsequent letters on the possible impact of a proposed mining operation to a population of timber rattlesnakes located on the Fishkill Ridge in Dutchess County, New York. Field surveys scheduled for spring of 1996

Contract with New Jersey Department of Environmental Protection to determine timber rattlesnake den locations in Picatinny Arsenal, Hibernia, New Jersey.

June 26, 1994 - Field survey of Central Hudson pipeline project in Orange County, New York for Phenix Environmental, Inc., and development of mitigation plan for rattlesnakes encountered and habitat restoration.

1993 - Contract with USMA, West Point, New York to determine den locations, critical habitat, and causes of attrition on West Point Military Reservation.

(over)

(continued)

Annual contract (1981 to 1993) with Dr. William S. Brown, Associated Professor of Biology, Skidmore College, Saratoga, New York to provide lab and field assistance and instruct Dr. Brown in locating den sites, transient rocks, and summer basking habitat for rattlesnake populations in the Lake George region.

1989 to 1992 - Contract with LMS Environmental Engineers, Pearl River, New Jersey to determine den locations, summer ranges, and population size estimates of rattlesnake populations in Sterling Forest, New York.

1992 - Contract with New York Natural Heritage Program (Nature Conservancy), Latham, New York to conduct field surveys for timber rattlesnakes and other endangered and threatened species in the Mongaup River Wildlife Management Area.

August 18, 1992 - Field survey for Bob Zappalorti, Herpetological Associates, Forked River, New Jersey of the Sterling Forest, New Jersey rattlesnake den and summer basking habitat.

1992 - Contract with the New York State Museum, Albany, New York to conduct field surveys for timber rattlesnakes, bog turtles, and general reptile and amphibian populations on West Point Military Reservation.

May 8, 1991 - Field survey for Steve Hill, developer, Glen Spey, New York of the glen Spey and Rock Hill rattlesnake dens.

May 7, 1991 - Field survey for Bob Zappalorti, Herpetological Associates of the Sterling Forest, New Jersey rattlesnake den.

April 18, May 2, 1991 - Field surveys for Bob Zappalorti, Herpetological Associates of the Mt. Rushmore rattlesnake den sites in Highland Mills, New York.

October 8,1990 - Field survey for Steve Hill, Glen Spey, New York of the Glen Spey and Rock Hill rattlesnake dens.

1990, 1991 - Contract with Bob Zappalorti, Herpetological Associates, for Phenix Environmental to conduct field surveys along the Iroquois Gas Pipeline on West Mt. and near Dogtail Corners, New York, and Candlewood Lake, Connecticut.

1990 - Contract with Bob Zappalorti, Herpetological Associates, for Phenix Environmental to conduct rattlesnake surveys near the proposed Jug End development in South Egremont, Massachusetts.

1988 - Contract with Bagdon Environmental Associates, Delmar, New York to conduct a survey of the Cat Rocks rattlesnake den near Amenia, New York.

1987 - Contract with NYSDEC, Delmar, New York to survey historic northern cricket frog (*Acris crepitans*) sites to determine if populations are extirpated or extant and potential threats to extant populations.

(over)

(continued)

June 10, 1987 - Consultation with Carmel McGill and Raymond Heimbuch, Clarke and Rapuano, Inc., New York, New York on the potential impact of the proposed Mt. Rushmore development to the Schunemunk Mt. Rattlesnake dens in Highland Mills, New York.

1986 - Contract with NYSDEC, Delmar, New York to survey historic bog turtle (*Clemmys muhlenbergi*) sites to ascertain which populations are still extant and potential threats to those populations.

September 15, 1985 - Field survey for New York Power Authority, March, New York along proposed transmission lines near Harvard, New York to determine possible existence of timber rattlesnake populations in the area.

August 31, 1983 - Survey for the Nature Conservancy, Eastern New York Chapter, near Cooperstown, New York to determine possible existence of timber rattlesnakes on property for sale.

SPECIAL LICENSES

Annual licenses from New York State DEC, New Jersey DEP, Sterling Forest Corporation and Palisades Interstate Park Commission to conduct Endangered and Threatened Species research in New York and New Jersey.

COMMUNITY SERVICE

Volunteer for NYSDEC Endangered Species Unit and NJDEP Endangered and Non-game Species Program when not working under contract.

Volunteer field surveys done for Georgia Gopher Tortoise Council, Georgia Nature Conservancy, South Carolina Wildlife and Marine Resources, Arizona-Sonora Desert Museum.

Appendix I

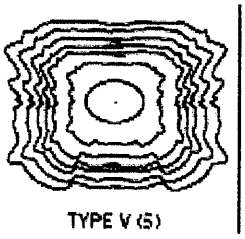
LIGHTING SPECIFICATIONS

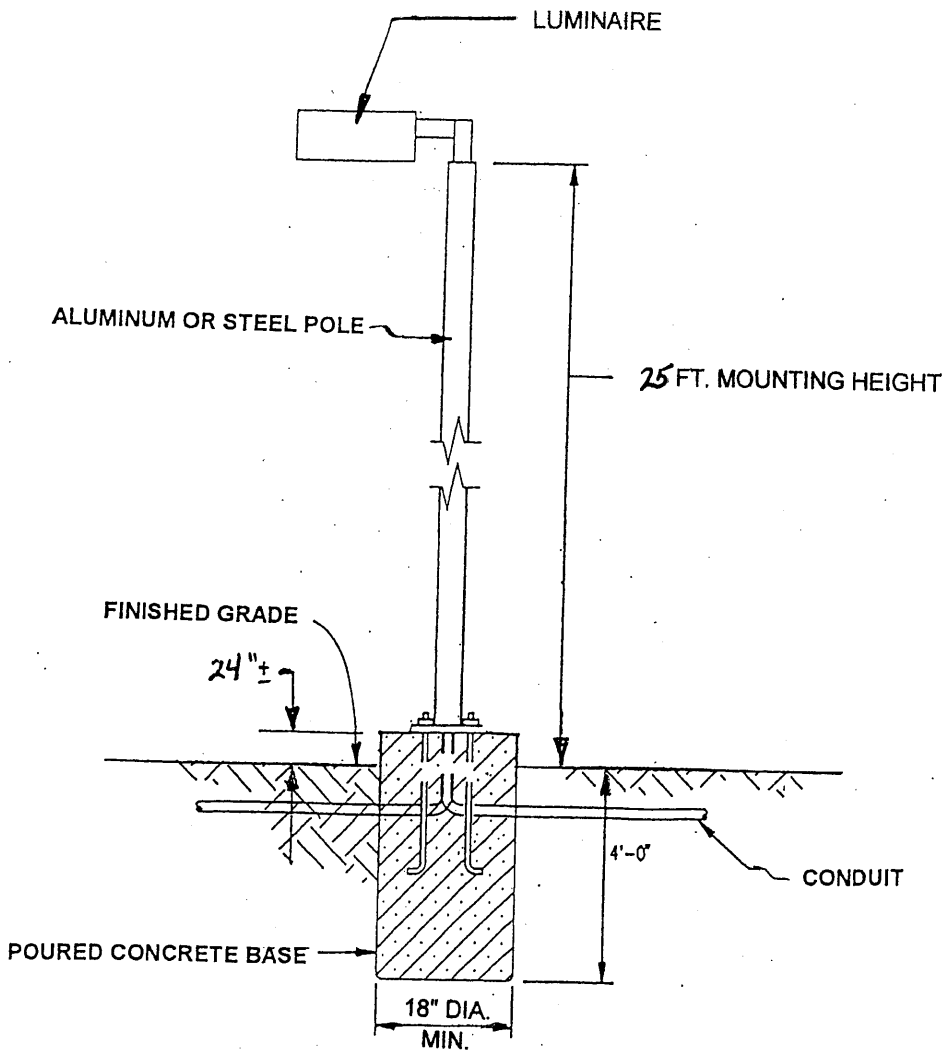
Fairgrounds Lighting Specifications

WLS Lighting Systems – FV & WLS-H-S Series

Symbol	Quantity	Distribution	Wattage	Light Source	Lens	Voltage	Luminaire
SINGLE	15	WLS-H-S Wall Mount	400 W	Metal Halide Reduced Envelope	Flat Glass	480V	Bronze Finish
D180°	16	FVM Type 5 Pole mounted	400 W	Metal Halide Reduced Envelope	Flat Glass	480V	Bronze Finish
TN120°	14	FVM Type 5 Pole mounted	400 W	Metal Halide Reduced Envelope	Flat Glass	480V	Bronze Finish

Type V Optical Distribution





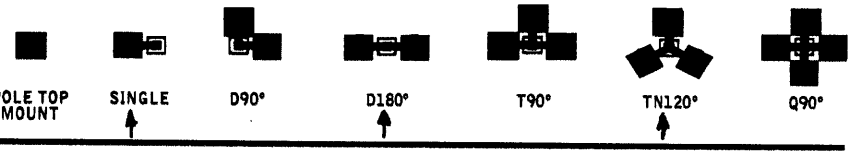
LIGHT POLE DETAIL

N.T.S.

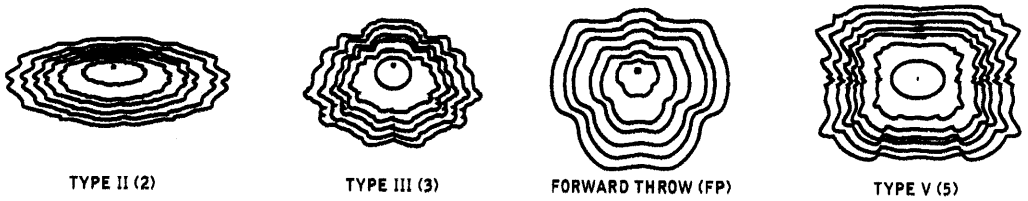
FV SERIES

VERTICAL LAMP/FLAT GLASS LENS

FIXTURE MOUNTING CONFIGURATIONS



OPTICS



TYPE II (2) | TYPE III (3) | FORWARD THROW (FP) | TYPE V (5)

NOTE: Based on 1000 Watt MH vertical burn. Consult factory for accurate optics.

ORDERING INFORMATION

SELECT APPROPRIATE CHOICE FROM EACH COLUMN TO FORMULATE ORDER CODE. Refer to example below.

LUMINAIRE PREFIX	DISTRIBUTION	LAMP WATTAGE	LIGHT SOURCE	LENS	LINE VOLTAGE	LUMINAIRE FINISH	OPTIONS
FVM	2 - Type II 3 - Type III FP - Perimeter Forward Throw 5 - Type V	250W 320W 400W	PSMH - Pulse-Start Metal Halide 250, 320 Watt HPS - High Pressure Sodium 250, 400 Watt MHR - Metal Halide Reduced Envelope 400 Watt MH - Metal Halide 250 Watt	FG - Flat Glass	480V MT - Multi Tap[3] TT - Tri Tap[2]	BRZ - Bronze BLK - Black PLT - Platinum BUF - Buff WHT - White GRN - Green CC - Custom Color	LL - Less Lamp GS - Glare Shield 8BK - 8" Bracket RPP - Round Pole Plate BKT-WM - Wall Mount Plate PT - Pole Top SF - Single Fusing DF - Double Fusing AS - Accent Striping PC - Photo Cell NO - No Options
FVR	2 - Type II 3 - Type III FP - Perimeter Forward Throw 5 - Type V AF - Automotive Forward	400W 750W 1000W	MHR - Metal Halide Reduced Envelope 1000 Watt PSMH - Pulse-Start Metal Halide HPS - High Pressure Sodium[1]				
FVR (EXAMPLE ORDER)	5	1000	MHR	FG	MT	BRZ	NO

ORDER:

WLS _____ ___ _____ _____ _____ _____ _____ _____

NOTE:
1. Voltage for 750W High Pressure Sodium must be specified.
2. Consult factory for international voltages. (120, 277, 347 Voltage)
3. MT - Multi Tap is shipped standard unless otherwise specified. (Multi Tap consists of 120V, 208V, 240V, and 277V. Multi Tap is pre-wired for highest voltage. Alternate voltages will require field re-wiring.)

Approved By: _____

Project Name: _____

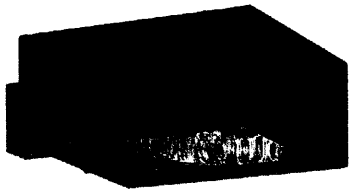
Location: _____

Date: _____

P.O. Box 100519 Fort Worth, TX 76185

WLS LIGHTING SYSTEMS

H-Wall Mount



SPECIFICATIONS

HOUSING The H Series one piece aluminum housing is designed to ensure weather-tight construction. Continuous heliarc welds at all seams produce a clean sharp appearance. The bottom access door provides ease of installation and servicing.

LENS AND FRAME The standard lens is flat impact resistant tempered glass. A contoured lens is provided with the vertical lamp option. The lens door frame is attached with 2 stainless steel hinges, is equipped with a spring-loaded fastener for easy access, and closes securely on a poron gasket preventing entry of moisture and insects.

FINISHES Fixtures are finished with a thermoset baked-on polyester powder finishing process to give the fixture an exceptionally attractive appearance. The polyester finish withstands extreme weather change without cracking or peeling. Standard and custom colors available.

REFLECTORS/DISTRIBUTION PATTERNS Fixtures are equipped with a polished aluminum segmented reflector available in four distribution patterns with vertical or horizontal burn lamps: Type III (3), Type V (5), Perimeter Forward Throw (FP) and Automotive Forward Throw (AF).

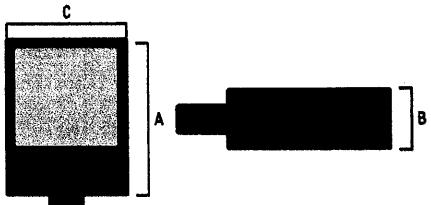
LIGHT SOURCES Designed to operate up to 1000 Watt High Pressure Sodium and Metal Halide lamps with the larger housings. The vertical burn lamp is designed to operate up to 400 Watt Metal Halide Reduced envelope.

SOCKETS Glazed porcelain mogul-base sockets feature spring-reinforced contacts. Rated to 600V.

BALLAST CWA or HPF regulating auto transformers. Available in Metal Halide and High Pressure Sodium. Starting temperature is -20 F for Metal Halide and -40 F for High Pressure Sodium. Maximum wattage is 1000W.

Wall Mount Bracket: A 2 1/2" x 5 3/8" x 6" is shipped with size H-V and H-S. H-M is shipped with an 8" arm, and H-L is shipped with a 12" arm. A 6" arm is shipped with the H-M and H-L for single and D180 configurations. A round pole plate is available for round poles.

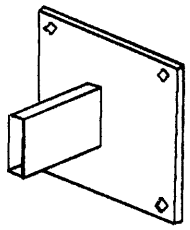
DIMENSIONS



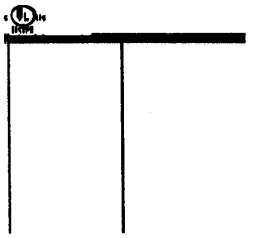
	A	B	C	EPA
H-V (vertical)	20 1/8"	8"	14 5/8"	1.5
H-S	20 1/8"	8"	14 5/8"	1.4
H-M	25"	8"	18 3/8"	2.2
H-L	29"	10"	21"	3.2

NOTE: Add to H Vertical: 3 1/4" for Vertical Burn Sag Glass

MOUNTING BRACKETS



WALL MOUNT



Approved By: _____

Project Name: _____

Location: _____

Date: _____

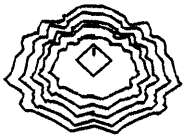
WLS LIGHTING SYSTEMS
MANUFACTURING SINCE 1969

P.O. Box 100519 • Fort Worth, TX 76185
800.633.8711 • Fax: 817.735.4824 • **www.wlslighting.com**

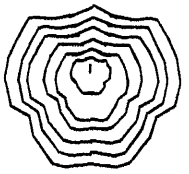
H-Wall Mount

OPTICS

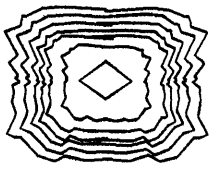
TYPE II (2)



TYPE III (3)



FORWARD THROW (FP)



TYPE V (5)

NOTE: Based on 1000 Watt MH vertical burn. Consult factory for accurate optics.

ORDERING INFORMATION

SELECT APPROPRIATE CHOICE FROM EACH COLUMN TO FORMULATE ORDER CODE. Refer to example below.

LUMINAIRE PREFIX	DISTRIBUTION	LAMP WATTAGE	LIGHT SOURCE	LENS	LINE VOLTAGE	LUMINAIRE FINISH	OPTIONS
Vertical Burn **H-V**	**FP** - Perimeter Forward Throw **5** - Type V **AF** - Automotive Forward	**150W** **175W** **250W** **320W** **400W**	**MH** - Metal Halide (175, 250W) **MHR** - Metal Halide Reduced (400W) **SMHR** - Super Metal Halide Reduced (400W) **PSMH** - Pulse-Start Metal Halide (175, 250, 320W) **HPS** - High Pressure Sodium (150W)	**CT** - Contoured Glass	**480V** **MT** - Multi Tap[3] **TT** - Tri Tap[2]	**BRZ** - Bronze **BLK** - Black **PLT** - Platinum **BUF** - Buff **WHT** - White **GRN** - Green **CC** - Custom Color	**RPP** - Round Pole Plate **LL** - Less Lamp **BKT-WM** - Wall Mount Plate **GS** - Glare Shield **GR** - Tool-less Entry Ground Relamp (Vertical Only) **PC** - Photo Cell **SF** - Single Fusing **DF** - Double Fusing **NO** - No Options
Horizontal Burn **H-S**	**3** - Type III **FP** - Perimeter Forward Throw **5** - Type V	**100W** **150W** **175W** **250W** **350W** **400W**	**MH** - Metal Halide (175, 250W) **MHR** - Metal Halide Reduced (400W) **SMHR** - Super Metal Halide Reduced (400W) **SMH** - Super Metal Halide (175, 250W) **HPS** - High Pressure Sodium (100, 150, 250, 400W)	**FG** - Flat Glass			
H-M	**3** - Type III **FP** - Perimeter Forward Throw **5** - Type V	**250W** **400W**	**SMH** - Super Metal Halide **MH** - Metal Halide **HPS** - High Pressure Sodium				
H-L	**3** - Type III **FP** - Perimeter Forward Throw[1]	**1000W**	**MH** - Metal Halide **HPS** - High Pressure Sodium				

H-V	5	400	MHR	CT	MT	BRZ	NO

(EXAMPLE ORDER)

ORDER:

WLS _____ _____ _____ _____ _____ _____ _____

NOTE:
1. Forward Throw reflectors are field-rotatable.
2. Consult factory for international voltages. (120, 277, 347 Voltage)
3. MT - Multi Tap is shipped standard unless otherwise specified. (Multi Tap consists of 120V, 208V, 240V, and 277V. Multi Tap is pre-wired for highest voltage. Alternate voltages will require field re-wiring.)

Approved By: _____

Project Name: _____

Location: _____

Date: _____

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