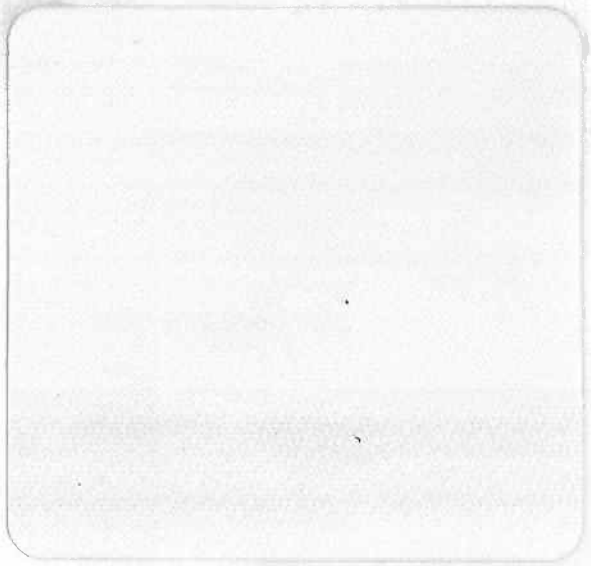

URS CONSULTANTS

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CONSULTANTS
MAKING
TECHNOLOGY
WORK

GIRTY'S RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE (SWM 2:13)

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November, 1990

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GIRTY'S RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

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Preface

This Plan Update has been prepared pursuant to the Pennsylvania Stormwater Management Act (Act of October 4, 1978, P.L. 864, No. 167) and in accordance with adopted guidelines of the Pennsylvania Department of Environmental Resources (PADER). The preparation of this Plan Update was financed in part by a grant from PaDER.

Acknowledgements

The Allegheny County Department of Planning and the consultants wish to acknowledge the contributions of the following persons and agencies, whose cooperation and assistance facilitated the preparation and completion of the Girty's Run Watershed Stormwater Management Plan Update.

Members of the Watershed Plan Advisory Committee
Allegheny County Department of Elections
Allegheny County Department of Engineering
Allegheny County Department of Special Services and Maintenance Operations
G.J. Nelson and Company
Girty's Run Joint Sewer Authority
North Hills Council of Governments
PADER Bureau of Dams and Waterway Management/ Southwest District Office

EXECUTIVE SUMMARY

GIRTY'S RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

EXECUTIVE SUMMARY

INTRODUCTION

The Girty's Run Watershed Stormwater Management Plan Update was prepared in accordance with the requirements of Act 167, the Stormwater Management Act. The final report contains descriptions of the delineated tasks, the activities performed to complete those tasks, conclusions, and recommendations. This Executive Summary is intended to provide a condensed source of the Plan Update information, with the supporting data and text available for reference in the body of the main report.

PROJECT DESCRIPTION AND PURPOSE

This project involved updating the original Girty's Run Watershed Stormwater Management Plan. The requirement for updating watershed management plans is an integral part of the Stormwater Management Act. The original Plan was one of the first four Pilot Watershed Plans to be developed in the Commonwealth of Pennsylvania.

The purpose of the project was to update the information contained in the original Plan so that the watershed models, land use information, technical standards, and municipal ordinances reflect the latest conditions and technology. Administrative and implementation issues were also addressed so that future Plan updates can be completed in an efficient and consistent manner.

ADMINISTRATIVE APPROACH

The administrative issues and tasks addressed in the Plan Update involved the following:

- Municipal/Public Involvement
- Plan Update Adoption
- Plan Update Implementation
- Future Plan Updates
- Model Municipal Ordinances

In general, the Administrative Issues noted above remained relatively unchanged in concept from the original Plan. Municipal involvement continues to be tied to the passage of ordinance language that reflects the technical performance standards and model ordinance contained in the Plan Update. Since all of the watershed municipalities promulgated such ordinances following the original Plan, it is assumed that they will do so again. An increase in Public Involvement was attempted through the Watershed Plan Advisory Committee Meetings and the Public Hearing process. This met with little success as the meetings were poorly attended and only one person not affiliated with the project came to the

Public Hearing. While the lack of significant rainfall and flooding problems during the project was probably a contributing factor to the poor attendance, individual municipal interaction instead of the general "large meeting" philosophy may increase both municipal and public attention. Plan adoption, implementation, and update guidelines still adhere primarily to the Act 167 process. Technical improvements in the products delivered to Allegheny County by URS Consultants should allow for more efficient Plan Updates in the future.

TECHNICAL APPROACH

The technical issues and tasks addressed in the Plan Update included the following:

- Data Collection
- Watershed Modeling
- Technical Standards and Criteria
- Performance Standards for Development
- Relationship with Other Studies and Programs

The Plan Update featured many improvements in the collection, processing, and production of the technical data necessary for the Watershed Stormwater Management Plan process. Since the original Plan was a Pilot Plan project in scope, many parameters were approximated or generalized. Aerial photography, digitized soils and topography data, field verification, and stream flow monitoring were some of the techniques utilized during the Update to produce more specific watershed characteristics data. Additionally, while the Penn State Runoff Model was used in both projects, enhancements in both the model itself and the data development and input functions enabled the updated model to more closely emulate the actual watershed conditions than the original model. This allowed for the development of better technical and performance standards. Changes in the Release Rate Percentages, the primary performance standards resulting from the model, are shown in the table on the following page.

One of the primary changes resulting from the Plan Update was the policy governing the release of stormwater from development sites within the watershed. Following the original Plan, this policy was:

- The 2-year post-development peak runoff rate must not exceed the 2-year pre-development peak runoff rate.
- The 10-year post-development peak runoff rate must not exceed the 2-year pre-development peak runoff rate.
- The 100-year post-development peak runoff rate must not exceed the 10-year pre-development peak runoff rate.

Several actual development project sites in the watershed were analyzed using the watershed model assuming both pre- and post-

development conditions and the above discharge requirements. These same sites were also analyzed using alternative discharge standards. The results showed that there was little or no increase in benefit in terms of stream flows and flooding conditions utilizing the above requirements than from using the more traditional and widely accepted standards described below:

- The 2-year post-development peak runoff rate must not exceed the 2-year pre-development peak runoff rate.

- The 5-year post-development peak runoff rate must not exceed the 5-year pre-development peak runoff rate.

- The 10-year post-development peak runoff rate must not exceed the 10-year pre-development peak runoff rate.

- The 50-year post-development peak runoff rate must not exceed the 50-year pre-development peak runoff rate.

- The 100-year post-development peak runoff rate must not exceed the 100-year pre-development peak runoff rate.

Since these revised standards are technically supportable and are more widely accepted by the watershed communities, they are recommended for adoption in the Plan Update.

Other changes from the Original Plan include:

o Release Rates Based Upon Design Storm

The modeling indicated a definitive difference in required release rates between the 2-, 5-, and 10-year and 50- and 100-year design storms. This is because the timing of the runoff hydrographs resulting from the more frequent storms creates different downstream problems than from the less frequent storms. For example, while the runoff rates and volumes from the 50- and 100-year storms may be greater than the others, the flow may be at a slower overall velocity because of obstructions and backwater conditions. The change in flow timing results in different release rates. Multiple release rates based upon design storms have been utilized in other parts of the State. They provide for the appropriate level of control necessary based upon groupings of similar storm and runoff patterns.

o Data Transmission To Allegheny County

The final data submitted to Allegheny County for the Plan Update will facilitate interactive usage and future updates. The watershed models are PC-based which are easier to use than the main frame models from the original Plan. The data disks were submitted to the County so that the models could be continually updated

based upon any new development occurring in the watershed. Additionally, the watershed mapping was produced from the geographic information system (GIS) data that generated the model input data. The mapping was also submitted on disks so that it could eventually be integrated into the County's GIS.

CONCLUSIONS AND RECOMMENDATIONS

The primary conclusions and recommendations resulting from the Plan Update Project are as follows:

- The Allegheny County Board of Commissioners should adopt the Plan Update by resolution.

- Each municipality within the watershed should adopt the provisions of the Plan Update in to the appropriate ordinances and aggressively monitor and enforce their requirements.

- Each municipality within the watershed should execute an agreement with the Allegheny County Department of Planning to review the stormwater management provisions of all development submittals. This includes residential subdivisions, commercial areas, and industrial facilities.

- The Allegheny County Department of Planning should actively update and maintain the computerized land use data and watershed models produced during the Plan Update. This data can be used to interactively evaluate development submittals and no-harm evaluations.

- Allegheny County should work in conjunction with PADER to identify and correlate data on obstruction, encroachment, and other appropriate permit holders and the associated facilities.

- Allegheny County should work in conjunction with the U.S. Army Corps of Engineers and the affected municipalities to analyze the impacts of the modeled stream flow figures on the 100-year floodplain limits.

INTRODUCTION

GIRTY'S RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

1.0 INTRODUCTION

1.1 Legal Basis and Purpose

This Stormwater Management Plan Update for the Girty's Run Watershed has been prepared in accordance with the requirements of the Pennsylvania Stormwater Management Act (Act of October 4, 1978, P.L. 864, No. 167). The law, commonly referred to as Act 167, requires that Pennsylvania counties prepare stormwater management plans for each designated watershed within their boundaries. It also requires that each adopted plan is periodically reviewed and updated. This report is the culmination of the efforts to prepare the initial Plan Update.

The original Girty's Run Watershed Stormwater Management Plan was adopted by the Allegheny County Board of Commissioners on December 19, 1985. It was one of four Allegheny County watersheds selected as part of the Pennsylvania Department of Environmental Resources (PADER) pilot program to develop guidelines for preparing stormwater management plans in accordance with Act 167. The Allegheny County Planning Department administered the development of both the original Plan and this Update.

The purpose of this project was to update the key information contained in the original Plan so that the watershed models, land use information, technical standards, and ordinances reflect current conditions and technology. Administration and management issues were also addressed so that the Plan Update adoption, implementation, and future updates can be completed in a consistent and efficient manner. References are made to the original Plan where possible. Since this project was an update of a pilot plan, however, some areas of information required significant revision or augmentation. As a result, some portions of this report more closely resemble an initial watershed plan in content and format. It is hoped that this Plan Update will provide a basis to facilitate future update efforts.

1.2 Plan Update Summary

The scope of the Girty's Run Watershed Stormwater Management Plan Update was developed utilizing the required tasks delineated in Act 167 as a basis. These tasks were also listed in the original Plan. The tasks were modified to reflect the nature of the Update project. The actual tasks used to guide the Update preparation are as follows:

- Task 1 - Project Initiation

This task involved the administrative work required to initiate contracts and to plan coordination activities with the Allegheny County Management Committee, the Watershed Plan Advisory Committee, and the municipalities.

- Task 2 - Project Coordination/Public Participation through the Watershed Plan Advisory Committee

This task involved reconvening the Watershed Plan Advisory Committee (WPAC). The purpose of the WPAC meetings were to review project progress, provide guidance, elicit support, and generate feedback from the WPAC members, the public, and the municipalities.

- Task 3 - Data Collection/Review/Analysis

This task involved the efforts to gather, review, and analyze the necessary data to complete the technical and institutional planning steps for the Plan Update. Particular attention was paid to land use changes, existing problem areas, and significant obstructions.

- Task 4 - Data Preparation for Technical Analysis

This task involved the engineering work necessary to transform the raw data collected as part of Task 3 into a format that could be used directly in the technical tasks.

- Task 5 - Model Selection and Setup

This task involved selecting and preparing a hydrologic model appropriate for the analysis of the watershed.

- Task 6 - Model Runs

This task involved running the selected model and developing watershed-level storm runoff characteristics for the 2, 5, 10, 50, and 100-year frequency storms.

- Task 7 - Review and Update Technical Standards and Criteria

This task involved performing a detailed evaluation of the modeling results and their impacts on the existing design criteria and standards for runoff control.

- Task 8 - Plan Report Preparation

This task involved the preparation of this final report.

- Task 9 - Priorities for Plan Adoption, Implementation, and Updates

This task involved addressing and prioritizing issues for adopting and implementing the Plan Update and planning for future updates.

Detailed descriptions of how the tasks listed above were addressed for the Plan Update can be found in Sections 2 through 6 of this report.

1.3 Plan Update Recommendations

The primary recommendations resulting from the Girty's Run Watershed Stormwater Management Plan Update are as follows:

- The Allegheny County Board of Commissioners should adopt the Plan Update by resolution.

- Each municipality within the watershed should adopt the provisions of the Plan Update in to the appropriate ordinances and aggressively monitor and enforce their requirements.

- Each municipality within the watershed should execute an agreement with the Allegheny County Department of Planning to review the stormwater management provisions of all development submittals. This includes residential subdivisions, commercial areas, and industrial facilities.

- The Allegheny County Department of Planning should actively update and maintain the computerized land use data and watershed models produced during the Plan Update. This data can be used to interactively evaluate development submittals and no-harm evaluations.

- Allegheny County should work in conjunction with PADER to identify and correlate data on obstruction, encroachment, and other appropriate permit holders and the associated facilities.

- Allegheny County should work in conjunction with the U.S. Army Corps of Engineers and the affected municipalities to analyze the impacts of the modeled stream flow figures on the 100-year floodplain limits.

2.0 DATA COLLECTION/REVIEW/ANALYSIS

2.0 DATA COLLECTION/REVIEW/ANALYSIS

This section describes the work involved in compiling, reviewing, and analyzing the data necessary to perform the Plan Update project. The information obtained included technical data such as land use and stream flow and institutional data such as municipal ordinances. The primary purpose of this effort was to evaluate the stormwater management facilities, planning, and administrative measures developed since the original Plan was prepared.

A primary tool in the data collection effort was a questionnaire sent to all municipalities and affected agencies in the watershed. The questionnaire requested information on both the technical and administrative aspects of stormwater control under each recipient's jurisdiction. A sample copy of the questionnaire is included in Appendix C.

2.1 Watershed Characteristics

The Girty's Run Watershed is shown on Figure 1. General information concerning the watershed (ie. size, demographics, climate, etc.) is contained in the original Plan. Although the original Plan was adopted in 1985, much of the watershed data was developed before 1983. A primary objective for the update project, therefore, was to revise the land use and drainage facility data to reflect current conditions.

Aerial photography and geographical information systems (GIS) techniques were used to facilitate the land use and drainage characteristic investigations. Aerial photos of 1:8400 scale were obtained form the Allegheny County Department of Elections. The photos were taken in March, 1986. These photos were combined with digitized soil and topography data and entered into PC/ARCINFO GIS data files by GeoDecisions, Inc. of LeMont, Pennsylvania. GeoDecisions then developed the input data for each subarea. The files were also delivered to the Allegheny County Planning Department for use in the County's GIS program.

Subdivision and development plan submissions were reviewed to reconcile land use changes occurring in the watershed from 1986 to 1990. This review also allowed for an evaluation of the hydrologic effects of development for use in the model.

The primary results of the watershed characteristics review are as follows:

- The watershed was divided into 43 subareas, compared with 26 in the original Plan. This was done to better define the watershed for modeling purposes. Some of the new subareas are "dummy", or junction, subareas required for the watershed model input. These subareas do not contain any actual land

area, they are strictly a function of the model. Others, however, were formed to improve the modeling operation and results. For example, subarea 41 incorporates Hoffman Run, a tributary to Girty's Run which was not delineated in the original Plan. More detailed descriptions concerning the modeling aspects of the watershed data can be found in Sections 3.2 and 3.3.

- Based upon the modeling input data, the overall impervious area of the watershed increased from approximately 17 percent to approximately 41 percent. It is believed, however, that the 17 percent figure, taken from the original Plan, was a low estimate. The original land use data was developed with less precision because of the nature of the Pilot Plan. A significant amount of development occurred from 1983 to 1990, however. The majority of the new development occurred in the upper half of the watershed, in McCandless, Ross, and Shaler townships. The lower half of the watershed, while experiencing some development, was already densely developed at the time of the original Plan. Additionally, from the subdivision plan review, about 11 percent of the total watershed area was under some phase of development from 1986 to 1990.

- The major individual developments occurred along the McKnight Road corridor. These include the Ross Park Mall area in Ross Township and Interstate 279 along the southwestern border of the watershed. Ross Park Mall, its surrounding offices, and other facilities alone account for about 150 acres. Part of this area's drainage is to Pine Creek, however.

- It is estimated that development will continue in the watershed, but at a reduced rate from the 1983 to 1990 pace. The majority of the development will, again, likely occur in the upper half of the watershed. However, since a large percentage of the developable area in the watershed has already been developed, much of the new development may involve a transition from one developed state to another (ie. expansion of existing buildings, new buildings on former parking lots, etc.), as compared to the initial development of large areas of open land.

- The stream channels, particularly the main branch of Girty's Run along Babcock Boulevard, seem to be subject to continuing deposition of silt and sediment. Portions of the stream that were reportedly dredged after the completion of the original Plan have channel elevations at or above the previously observed levels. Culverts that were installed as recently as 1988 are subject to blockage. This condition indicates a lack of enforcement of erosion and sediment control requirements on the numerous completed and ongoing developments in the watershed. Increased enforcement of the requirements and more

frequent stream channel maintenance should be implemented to mitigate these conditions. This condition also indicates that increased stream flows due to runoff may be eroding sections of the stream channels, with the resultant downstream deposition.

2.2 Significant Obstructions

Information on significant obstructions was obtained from the original Plan, Allegheny County records, PADER permit files, and field investigations. The obstruction locations are shown on Figure 2 with the available information listed in Table 2.1. Capacity data, where available, has been applied to the watershed model to indicate areas of surcharge or flooding.

Obstruction data was difficult to coordinate because the DER permit files do not always contain a precise location for the permitted structure. Additionally, many obstructions in the Girty's Run Watershed, particularly along the main branch of the stream adjacent to Babcock Boulevard, appear either not to be permitted or have an old permit under previous owners' names and/or DER numbering systems.

An attempt was made during the Plan Update, therefore, to more closely identify obstructions with accurate locations and permit numbers, when possible. Table 2.1 lists the obstruction information that was within the scope of this project to obtain. It is recommended that a detailed investigation be conducted into the locations, sizes, capacities, and permits for the significant obstructions along Girty's Run and its major tributaries.

Additionally, owners of both permitted and non-permitted structures requiring maintenance, repair, or replacement should be notified and required to perform the required activities. Many obstructions, particularly property retaining walls along the stream channel, are in serious conditions of disrepair.

2.3 Floodplain Data

Data concerning the 100-year floodplain has not changed since the original Plan. The Federal Emergency Management Agency (FEMA) Flood Insurance Study maps remain the official source of the floodplain locations. Copies of the applicable studies and maps are available for reference at the Allegheny County Planning Department.

An issue to be addressed, however, is the disparity between stream flows estimated by this Update and by the Flood Insurance Studies. The flow modeling data is described in Section 3.0. The Corps of Engineers, Allegheny County, and the municipalities must review the results of this project and determine if updates are necessary for the Flood Insurance Studies.

TABLE 2.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

VERIFIED OBSTRUCTIONS

MAP NO.	PADER PERMIT/FILE NO.	LOCATION	STREAM	OBSTRUCTION TYPE/SIZE	APPROX. LOCATION
1	WL-02-88-7-11	McCandless	Girtys Run	Culvert - 4' x 3'	Approx. 1700' north of Township line
2		Ross	Girtys Run	Culvert - 10' x 7.5'	Babcock Blvd. & Three Degree Rd.
3	13543	Ross	Girtys Run	Bridge - 14' span	Babcock Blvd. - E.W. Tire Co.
4	15880	Ross	Girtys Run	Arch - 7.6' x 11.8'	3471 Babcock Blvd.
5		Ross	Girtys Run	Building Crossing Stream	3457 Babcock Blvd.
6		Ross	Girtys Run	Culvert - 14'-6" x 7'9"	3447 Babcock Blvd.
7		Ross	Girtys Run	Bridge - 13' x 4.5'	3445 Babcock Blvd.
8	0274766	Ross	Girtys Run	Arch - 7.6' x 11.8'	3439 Babcock Blvd.
9		Ross	Girtys Run	Bridge - 16' x 5'2"	Babcock Blvd. & Bernice Rd.
10		Ross	Girtys Run	Bridge - 11'9" x 5'5"	3435 Babcock Blvd.
11		Ross	Girtys Run	Bridge - Private	3425 Babcock Blvd.
12		Ross	Girtys Run	Bridge - Unmeasurable	3413 Babcock Blvd.
13		Ross	Girtys Run	Arch - 13'4" x 5'2"	3404 Babcock Blvd.
14		Ross	Girtys Run	Buildings and street cross stream	3333 Babcock Blvd.
15		Ross	Girtys Run	Building across stream	3301 Babcock Blvd.
16		Ross	Girtys Run	Bridge - 16' x 6'	3297 Babcock Blvd.
17		Ross	Girtys Run	Arch - 16' x 7'	3279 Babcock Blvd.
18		Ross	Girtys Run	Arch - 16' (est.)	Babcock Blvd. & Seibert Rd.
19	11935	Ross	Girtys Run	Bridge - 14' x 7'	3261 Babcock Blvd.
20	16505	Ross	Girtys Run	Bridge - 14' x 5'5"	3251 Babcock Blvd.
21	16678	Ross	Girtys Run	Bridge - 16' x 5'	Babcock Blvd. & 7th St.
22	15429	Ross	Girtys Run	Arch - 16' x 5'10"	3233 Babcock Blvd.
23		Ross	Girtys Run	Culvert - 8'	3227 Babcock Blvd.
24	6605	Ross	Girtys Run	R.C. Culvert - 10' x 11'	Babcock Blvd. & Rochester Rd.
25		Ross	Girtys Run	Bridge - 21' x 7'	Babcock Blvd. & Cemetery Ln.
26	9441	Ross	Girtys Run	Bridge - 54' span	Babcock Blvd. & McKnight Rd.
27	15567	Ross	Girtys Run	Bridge - 25' x 10'	Babcock Blvd. & Brookview Ln.
28	12039	Ross	Girtys Run	Building - 26' x 7'	2329 Babcock Blvd.
29		Ross	Girtys Run	Building - 24.5' x 6.7'	2247 Babcock Blvd.
30	02-621	Shaler	Girtys Run	Retaining walls	Girtys Run @ Dravo St.
31	02-02	Shaler	Girtys Run	Bridge - 30' span & 8.4' clearance	Evergreen Rd. - 1.5 mi. upstream from river
32	0278701	Millvale	Girtys Run	Bridges - 28' span w/ 9' 9" clearance	Station 44+
				29' span w/ 7'8" clearance	Station 51+
33		Millvale	Girtys Run	Bridge - 180' span	North Ave. & Evergreen Ave.
34		Millvale	Girtys Run	Culvert - 260' long	Evergreen Ave. & North Ave.
35		Millvale	Girtys Run	Bridge - 40' x 10'	Evergreen Ave. & Girtys Run
36		Millvale	Girtys Run	Bridge - 50' x 8'	North Ave. & Girtys Run
37		Millvale	Girtys Run	Culvert - 16' x 9'	North Ave. area
38		Millvale	Girtys Run	Culvert - 16' x 10'	Residential Area
39		Millvale	Girtys Run	Culvert - 16' x 10'	Millvale Business Dist.
40		Millvale	Girtys Run	Bridge - 20' x 10'	Sedgewick Ave. & Girtys Run
41		Millvale	Girtys Run	Bridge - 50' x 12'	Sherman Ave. & Girtys Run
42		Millvale	Girtys Run	Bridge - 50' x 10'	Sheridan Ave. & Girtys Run
43		Millvale	Girtys Run	Bridge - 50' x 12'	Grant Ave. & Girtys Run
44		Millvale	Girtys Run	Culvert	Outlet under Rt. 28 & RR

TABLE 2.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

VERIFIED OBSTRUCTIONS

MAP NO.	PADER PERMIT/FILE NO.	LOCATION	STREAM	OBSTRUCTION TYPE/SIZE	APPROX. LOCATION
45		Ross	McKnight Run	Culvert - 10' inlet Culvert - 15' x 7' outlet	McKnight Rd. & Braunlich Rd.
46	02-775	Ross	McKnight Run	Stream enclosure - 9'	4766 McKnight Rd. - Red Lobster
47	8733	Ross	McKnight Run	Culvert - 6' x 12'	4720 McKnight Rd. - U Haul
48	8732	Ross	McKnight Run	Culvert - 6' x 12'	McKnight Rd. @ Babcock Blvd. exit
49	9445	Ross	McKnight Run	Culvert - 6' x 12'	McKnight Rd. @ Babcock Blvd. entrance ramp
50	9444	Ross	McKnight Run	Culvert - 5.2' x 18'	Babcock Blvd. @ McKnight Rd. exit ramp
51	WL-02-88-7-13	Shaler/Ross	Thompson Run	Stream Enclosure - 4' x 3'	Approx. 425 ft south of Vilsak & Thompson Run Rds.
52		Ross	Thompson Run	Bridge - 6' x 5'	Thompson Run Rd. @ Woodbridge
53		Ross	Thompson Run	Bridge - 9' x 4.5'	Thompson Run Rd. just above obst. no. 37
54		Ross	Thompson Run	Bridge - 8' x 5'	Thompson Run Rd. above McSorley's Rest.
55		Ross	Thompson Run	Culvert - 5.5'	Thompson Run Rd. above Babcock Blvd. - McSorley's Rest.
56		Ross	Anderson Rd. Tributary	Culvert - 7' x 3'	Anderson Rd. approx. 100 yds. upstream of Wible Run
57		Ross	Anderson Rd. Tributary	Culvert - 3'	Anderson Rd. approx. 80 yds. upstream of Wible Run
58	SS-02-89-7-22	Shaler	Wible Run	Retention Pond	Downstream of H.S.
59	02-126	Shaler	Wible Run	C.M.P. Culvert - 72" diam.	n/a
60	02-127	Shaler	Wible Run	C.M.P. Culvert - 72" diam.	319 Wible Run Rd.
61	02-128	Shaler	Wible Run	C.M.P. Culvert - 72" diam.	327 Wible Run Rd.
62	02-129	Shaler	Wible Run	C.M.P. Culvert - 72" diam.	311 Wible Run Rd.
63	02-067	Shaler	Wible Run	Retaining wall	1) Soose Rd. @ Wible Run Rd. 2) 150' downstream of 1) 3) 100' downstream of Hillwood Rd. & Wible Run Rd. 4) Wible Run Rd. - Bridge No. 2
64	02-191	Shaler	Wible Run	Bridge - 18' span & 7'6" clearance	Wible Run @ Wible Run Rd.
65	02-273	Shaler	Wible Run	Culvert - 12' x 6'	Wible Run Rd.
66	02-274	Shaler	Wible Run	Culvert - 14' x 6'	Wible Run Rd.
67	02-332	Shaler	Wible Run	C.M.P. Culvert - 72"	Approx. 1.5 mi. upstream from mouth
68	02-559	Shaler	Wible Run	Stream enclosure - 6' x 7'	Approx. 500 ft upstream from L.R. 02151
69	02-632	Shaler	Wible Run	Bridge - 28' span & 2.7' clearance	Approx. 0.7 mi upstream from mouth

TABLE 2.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

VERIFIED OBSTRUCTIONS

MAP NO.	PADER PERMIT/FILE NO.	LOCATION	STREAM	OBSTRUCTION TYPE/SIZE	APPROX. LOCATION
70		Ross	Rochester Run	Culvert - 10' x 5'	Rochester Rd. & Babcock Blvd.
71		Ross	Cemetery Ln. Tributary	Culvert - 3'	Cemetery Lane & Babcock Blvd.
72	GP-03-02-88-201	Ross	Nelson Run	Retaining walls	Nelson Run Rd.
73	WL-02-88-7-02	Millvale/ Reserve	Hoffman Run	Stream enclosure - 12'6" x 6'	Hoffman Run @ Hoffman Rd.
74	02-250	Millvale	Hoffman Run	C.M.P. Culvert - 84" diameter	Hoffman Run @ Stanton Ave.

TABLE 2.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

REPORTED OBSTRUCTIONS

PADER PERMIT/FILE NO.	LOCATION	STREAM	OBSTRUCTION TYPE/SIZE	APPROX. LOCATION
02-717	Ross	Girtys Run	Culvert - 10' x 11'	S.R. 4011
02-034	Ross	Girtys Run	Bridge/culvert	6 mi. upstream from River
02-094	Ross	Girtys Run	n/a	n/a
02-573	Ross	Girtys Run	Waterline - 6" diam.	200' downstream of Evergreen
02-633	Ross	Girtys Run	Gas line - 3" diam.	n/a
02-756	Ross	Girtys Run	Stream enclosure - 72" diam.	800 ft upstream of Thompson Run Road
02-785	Ross	Girtys Run	Stream improvement project	n/a
02-034A	Ross	Girtys Run	Bridge - 20' span & 4.5' clearance Culvert - 65" x 40"	n/a
11439	Ross	Girtys Run	Bridge - 14' span	n/a
17366	Ross	Girtys Run	Arch - 7.6' x 11.8'	n/a
11188	Ross	Girtys Run	Bridge - 14' span	n/a
5011	Ross	Girtys Run	R.C. Culvert - 20' diam.	n/a
19845	Ross	Girtys Run	Pipe - 8' diam.	n/a
7957	Ross	Girtys Run	Bridge - 36' span	n/a
5083	Ross	Girtys Run	Bridge - 27' span	n/a
5069	Ross	Girtys Run	Bridge - 31' span	n/a
6247	Shaler	Girtys Run	Culvert - 25' span	n/a
6246	Shaler	Girtys Run	Bridge - 25' span	n/a
6245	Shaler	Girtys Run	Bridge - 74' span	n/a
5958	Shaler	Girtys Run	Bridge - 31' span	n/a
02-430	Shaler	Girtys Run	Gabion walls	n/a
6734	Millvale	Girtys Run	Bridge - 40'span	n/a
02-144	Millvale	Girtys Run	Bridge/culvert	n/a
02-177	Millvale	Girtys Run	Bridge - 25.7' span	1.5 mi. upstream from mouth
02-196	Millvale	Girtys Run	Telephone conduit	Girtys Run @ North Ave.
02-509	Millvale	Girtys Run	n/a	Girtys Run @ Grant Ave.
02-600	Millvale	Girtys Run	8" sanitary sewer	1300 ft upstream of mouth
17875	Ross	McKnight Run	Pipe - 10' diam.	n/a
8730	Ross	McKnight Run	R.C. Box Culvert - 6' x 12'	n/a
11923	Ross	McKnight Run	Pipe - 10' diam.	n/a
16385	Ross	McKnight Run	Pipe - 6' diam.	n/a
02-541	Ross	McKnight Run	Bridge/culvert	n/a
11638	Ross	Thompson Run	R.C. Culvert - 8' x 10'	n/a
02-50	Ross	Thompson Run	R.C. Culvert - 5' x 7'	n/a
			R.C. Culvert - 5' x 6'	n/a
			R.C. Culvert - 3.5' x 6'	n/a
0278707	Ross	Thompson Run	R.C. Culvert - 6' x 6.5'	4000' north of Girtys Run
02-398	Ross	Thompson Run	C.M.P. Culvert - 12.3' x 7.8'	n/a
02-609	Ross	Thompson Run	R.C. Culvert - 10' x 8'	Station 25+ on L.R. 02328
02-679	Ross	Thompson Run	R.C. Culvert - 12' x 4'	Approx 300' north of Babcock Blvd. & Thompson Run Rd.
WL-02-88-7-03	Ross	Thompson Run	Culvert - 91" x 58"	n/a

TABLE 2.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

REPORTED OBSTRUCTIONS

PADER PERMIT/FILE NO.	LOCATION	STREAM	OBSTRUCTION TYPE/SIZE	APPROX. LOCATION
02-063	Shaler	Wible Run	Bridge/culvert	n/a
02-607WL	Ross	Nelson Run	Storm Sewer - 42"	n/a
10406	Ross	Tributary	Bridges (2) - 20' spans	n/a
6559	Ross	Tributary	R.C. Culvert - 6.5' x 12'	n/a
GP-03-02-89-205	Ross	Tributary	Retaining wall	n/a
02-358	Ross	Tributary	Gabion walls	n/a

2.4 Existing and Proposed Collection Systems

As described in the original Plan, local storm drainage collection systems are constructed primarily as part of new development and to correct flooding problem areas. These systems are designed to the requirements of the agency or municipality with jurisdiction over the system location, with release rates applied in accordance with the Plan. This will continue under the requirements of the Update.

2.5 Stream Flow Data

Other than the Corps of Engineers' staff gauges in Millvale, no formal attempt had previously been made to quantify the stream flows in Girty's Run. In an effort to gather stream flow data, and as an aid in calibrating the watershed model, an electronic open channel flow monitor was installed in Girty's Run in subarea 19. This location was chosen for two primary reasons. The first is that it would allow flows from the upper half of the watershed to be measured. This is important because of the number of newer developments in this area, most built with some form of stormwater controls. The timing of the stream flow related to rainfall could also be checked. The other reason for this location was that it was a relatively clean and uniform box culvert section beneath a building. The culvert provided an adequate control section for calibrating the monitor. Additionally, the building provided easy access and protection from vandalism.

The monitor installed was a Marsh McBirney Flo-Tote Model 250, designed for use in sewers and open channels. It consists of a velocity/level sensor and a data storage unit. Flow velocities and depths were read at a preset interval of 15 minutes and stored until the unit was downloaded onto a portable computer. Flows were then computed based upon the channel hydraulics.

The monitor was installed on October 25, 1989 and removed on January 31, 1990. Rainfall records for that time period were obtained from the Girty's Run Joint Sewer Authority. The data was utilized as described in Section 3.0 to calibrate the watershed model.

3.0 WATERSHED MODELING

3.0 WATERSHED MODELING

3.1 General

The purpose of the watershed modeling tasks for the Girty's Run Watershed Stormwater Management Plan Update were to select and prepare a hydrologic computer model to estimate the quantity and timing of runoff generated by various rainfall events. The resulting model would then be used to:

- Update the modeling results in the original Plan;
- Calculate updated release rate percentages for each subarea;
- Identify areas of potential surcharge or flooding; and
- Provide a basis for future modeling and development evaluations.

The background for hydrologic modeling in the Girty's Run Watershed is described in the original Plan. The Penn State Runoff Method (PSRM) was utilized in the Plan and again for the Update. The 1988 version of PSRM was selected for the Update because of its technical applicability to the watershed and its familiarity among the watershed municipalities.

The following paragraphs describe the watershed modeling efforts performed for the Girty's Run Update.

3.2 Subarea Delineation

Stormwater drainage subareas are areas within a watershed that are tributary to a particular point of interest or portion of a stream. The Girty's Run Watershed was divided into 43 subareas for modeling purposes. The subareas are shown on Figure 1. The purpose of subareas in watershed modeling is described in the original Plan.

As noted in Section 2.1, the original Plan model utilized 26 subareas. The reasons for the increase to 43 subareas are as follows:

- The revised subareas allow for better definition of the watershed. Tributaries such as Nelson Run and Hoffman Run are now clearly identified and modeled as one or more separate subareas.

- The 1988 release of PSRM, utilized for this project, required the formation of "dummy", or junction, subareas at any confluence of two or more streams. Thus, subareas 7, 9, 12, 18, 22, 24, 28, 30, 36, 38, and 42 were added to the model. These subareas, although assigned an area of 0.1 acre in the model, do not actually incorporate any land area and are not "developable". No release rate percentages or other performance standards are applicable

to these subareas.

3.3 Input Data Development

The basic PSRM input data from the original Plan was reviewed for the applicability of its use in the Update. While some data was directly transferable, much of the input for the updated model had to be developed because of the realignment of subareas and revised modeling requirements. For example, the 1988 release of PSRM redefined the "Average Length" category and added the assignment of an X and Y coordinate to the centroid of each subarea.

The other primary changes in the input data from the original to the updated model were caused by the significant changes in land use occurring within the watershed and the precision with which those changes were measured. The development patterns and input data gathering techniques are discussed in Section 2.1. The model input data reflects the increased watershed urbanization in the factors related to development. These factors are the Curve Numbers and Percent Impervious Area. The average Curve Number for the entire watershed increased from about 73 to about 84. Similarly the overall impervious area increased from approximately 17 percent to approximately 41 percent. While the magnitude of these changes partially reflects the data gathering techniques used for each study, it is obvious that significant development has taken place since the original Plan was prepared. Final adjustments to the input data were made during the model calibration and testing runs. These are described in Section 3.5.

A summary of the final PSRM input data is provided in Table 3.1, on Figure 1, and with the PSRM run results in Appendix D.

3.4 Design Storm Selection

Rainfall data used in the original Plan was obtained from rain gauges in the area and "Analysis of Rainfall - Duration - Frequency for Pennsylvania", published by the Pennsylvania Department of Environmental Resources in 1983. This data was based on both recorded rainfall depths and calculations to extrapolate the depths to different return frequencies and durations. This was done due to the general lack of design storm data developed specifically for this area.

For the Plan Update, a number of rainfall data sources were researched. This included the procedure utilized in the original Plan, rain gauges installed within the watershed, and other state publications. It was decided to use the rainfall data published in the "Field Manual of the Pennsylvania Department of Transportation Storm Intensity - Duration - Frequency Charts (PDT-IDF)". This manual divides the state into regions of similar rainfall patterns based upon the records of over 150 climatological stations. Design storm curves for each region are given.

TABLE 3.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE
SUBAREA DATA

SUBAREA NO.	AREA (ac.)	AVG. LENGTH (ft)	AVG. SLOPE (%)	CURVE NO.	% IMPERV.	ROUGH. COEF.	X COORD.	Y COORD.
1	673.1	2050	14.2	86.7	54.0	0.03	6.0	19.2
2	290.6	1790	15.4	86.4	53.6	0.03	7.0	17.1
3	285.1	1460	18.1	85.5	51.0	0.03	7.7	15.6
4	217.0	1190	21.3	82.7	41.3	0.03	8.4	13.9
5	386.2	1310	16.4	86.6	53.8	0.03	6.2	15.1
6	417.8	1800	19.9	87.6	54.1	0.03	5.6	12.8
7	0.1	50	18.0	84.0	44.0	0.03	6.8	13.3
8	205.8	1330	21.8	82.9	40.0	0.03	7.5	13.4
9	0.1	50	18.0	84.0	44.0	0.03	8.4	13.1
10	75.9	840	22.2	76.8	18.5	0.06	8.7	12.7
11	432.4	1710	24.2	80.9	32.9	0.05	7.5	11.5
12	0.1	50	18.0	84.0	44.0	0.03	9.1	12.3
13	104.6	780	22.2	84.0	44.0	0.06	9.4	12.1
14	237.8	830	11.9	90.8	67.5	0.02	7.7	19.2
15	193.9	1490	16.3	88.4	54.3	0.04	8.7	17.8
16	297.7	1500	15.8	87.7	57.4	0.03	9.1	16.1
17	337.5	1140	16.2	86.0	50.5	0.04	9.7	13.7
18	0.1	50	18.0	84.0	44.0	0.03	9.9	12
19	173.2	1070	19.3	81.0	33.9	0.05	10.6	11.9
20	309.9	990	15.2	84.2	45.9	0.04	10.8	13.9
21	230.1	1230	14.4	84.6	44.3	0.04	11.8	13.4
22	0.1	50	18.0	84.0	44.0	0.03	11.3	12.5
23	97.0	860	18.4	76.0	16.2	0.06	11.6	12.1
24	0.1	50	18.0	84.0	44.0	0.03	11.4	11.4
25	271.8	1730	16.3	83.2	37.9	0.05	12.3	11.4
26	543.2	1470	21.9	81.1	26.3	0.05	9.0	10.5
27	202.7	910	26.8	78.8	28.2	0.05	10.1	9.7
28	0.1	50	18.0	84.0	44.0	0.03	11.2	10.5
29	67.6	640	26.8	78.8	28.2	0.05	11.4	10.4
30	0.1	50	18.0	84.0	44.0	0.03	11.9	10.4
31	78.7	933	19.0	81.0	30.0	0.04	12.2	10.2
32	406.8	2280	27.5	79.9	24.7	0.05	12.3	9.5
33	365.7	1370	13.4	84.0	39.6	0.04	13.6	12.4
34	377.5	1290	18.9	80.2	28.1	0.05	14.9	10.3
35	189.8	880	12.8	83.7	40.4	0.04	13.6	10.7
36	0.1	50	18.0	84.0	44.0	0.03	13.8	9.7
37	32.1	690	21.5	80.0	25.0	0.05	14.0	9.5
38	0.1	50	18.0	84.0	44.0	0.03	13.6	9.2
39	811.1	2675	23.5	82.3	37.9	0.05	14.2	8.1
40	206.6	1475	21.5	80.9	34.0	0.05	14.5	6.5
41	353.4	1510	24.0	80.0	30.0	0.05	12.6	6.4
42	0.1	50	18.0	84.0	44.0	0.03	13.7	5.7
43	225.9	1375	17.5	85.0	40.3	0.03	14.5	5.7

TABLE 3.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE
DRAINAGE ELEMENT DATA

DRAINAGE ELEMENT NO.	DRAINAGE	INCOMING ELEMENT	NUMBERS	DRAINAGE ELEMENT CAPACITY	TRAVEL TIME (min)	OVERBANK FLOW RATIO
1	0	0	0	657.0	7.9	4.0
2	1	0	0	795.0	8.5	4.0
3	2	0	0	1412.0	7.8	4.0
4	3	0	0	833.0	0.2	4.0
5	0	0	0	875.0	0.2	4.0
6	0	0	0	875.0	0.2	4.0
7	5	6	0	875.0	8.8	4.0
8	7	0	0	833.0	0.2	4.0
9	4	8	0	833.0	3.8	4.0
10	9	0	0	1740.0	0.2	4.0
11	0	0	0	1740.0	0.2	4.0
12	10	11	0	1740.0	3.7	4.0
13	12	0	0	933.0	0.2	4.0
14	0	0	0	1435.0	0.7	4.0
15	14	0	0	1435.0	6.5	4.0
16	15	0	0	927.0	8.4	4.0
17	16	0	0	933.0	0.2	4.0
18	13	17	0	933.0	4.7	4.0
19	18	0	0	1598.0	0.2	4.0
20	0	0	0	831.0	0.2	4.0
21	0	0	0	681.0	0.2	4.0
22	20	21	0	831.0	4.9	4.0
23	22	0	0	1598.0	0.2	4.0
24	19	23	0	1598.0	5.7	4.0
25	24	0	0	1598.0	0.2	4.0
26	0	0	0	574.0	0.2	4.0
27	0	0	0	574.0	0.2	4.0
28	26	27	0	574.0	2.6	4.0
29	28	0	0	1598.0	0.2	4.0
30	25	29	0	1598.0	3.7	4.0
31	30	0	0	1658.0	5.3	4.0
32	31	0	0	2300.0	0.2	4.0
33	0	0	0	581.0	8.5	4.0
34	33	0	0	375.0	0.2	4.0
35	0	0	0	375.0	0.2	4.0
36	34	35	0	375.0	2.6	4.0
37	36	0	0	375.0	0.2	4.0
38	32	37	0	2300.0	8.1	4.0
39	38	0	0	2500.0	2.5	4.0
40	39	0	0	2500.0	0.2	4.0
41	0	0	0	506.0	0.2	4.0
42	40	41	0	2500.0	5.8	4.0
43	42	0	0	9999.0	0.0	4.0

The selection of the PDT-IDF curves provides a consistent base of information for both the modeling and future development evaluations. This data is also available automatically within the 1988 release of PSRM. The Girty's Run Watershed, as with most of northern Allegheny County, lies within PDT region 1.

The rainfall depths associated with different frequencies and durations are listed in Table 4.2.

3.5 Model Calibration and Results

Hydrologic model calibration is desirable in order for the model to represent as closely as possible the runoff patterns that occur in the watershed. While the input data developed from maps, photography, and limited field investigations provide sound initial base information, some refinement is usually necessary due to specific watershed conditions.

For the Girty's Run Update, the initial subarea input data was developed by GeoDecisions, Inc. based upon the aerial photography and digitized surface information. Adjustments to this data were made to refine the hydrograph timing and were based upon field investigations, the flow monitoring results, and other information, as described below.

The primary purposes of the field investigations were to obtain obstruction sizes and stream channel conditions. The model in the original Plan did not include many obstruction or channel capacities, so that the timing impacts of surcharging or flooding were not fully addressed. While a detailed hydraulic evaluation of each obstruction and channel reach was beyond the scope of the Plan Update, a limiting channel flow capacity was estimated for each drainage element in the model based upon obstruction sizes and channel conditions. The travel time for each drainage element was also recalculated to reflect the existing conditions and the realigned subareas.

Similarly, discussions with the Corps of Engineers indicated that the new PSRM model was probably not adequately addressing the impacts of surcharging, overland flow, and channel storage on the timing of the peak flow hydrographs. Since the flow generated by the model exceeds the capacities of many of the drainage elements in the watershed, these conditions can have a significant effect on the estimated peak flow. To account for the surcharging, flooding, and other backwater effects, the overland flow factor in the PSRM input data was increased from 2.0 to 4.0. The result of this adjustment is to increase the travel time of the peak flow hydrograph whenever the capacity of an obstruction or stream channel section is exceeded. This simulates channel storage and surcharging conditions and, in effect, lowers the peak flow to more realistic levels.

The flow monitoring results were also evaluated to aid in the calibration of the watershed model. Six significant storms occurred during the flow monitoring period where rainfall and stream flow data could be directly compared. The storms ranged in total depth from 0.24 to 0.91 inches and in duration from 1 to 21 hours. The peak hourly intensity, based upon 60-minute depth readings, ranged from 0.09 to 0.28 in/hr. While none of these storms approached the model design storms in depth or intensity, they provided valuable data concerning the timing of the runoff from the upper half of the watershed. Rainfall hyetographs from each storm were entered into the model and the modeled flows were compared against the monitored flows. Differences in peak flow timing and magnitude were noted. Input data parameters were then adjusted until the best correlation between the modeled and monitored flows was obtained. Since the release rate percentages to be developed form the model are primarily time-dependent, an emphasis was placed on matching modeled and monitored peak flow times; with comparative flows to be kept within a reasonable range. This was achieved most effectively by reducing the overland flow Manning's "n" factors by approximately 25 percent. The predicted timing of the peak flow versus the monitored peak flow was within a range of 30 minutes for 4 of the 6 storms. This was deemed very acceptable due to the accuracy limitations of the rain gauges and the flow monitor. The new "n" factors were then entered into the input data for the final model runs.

The PSRM model was then run for the 2-year, 5-year, 10-year, 50-year, and 100-year storms. The results of the model runs are summarized in Table 3.2. Copies of the model printouts are included in Appendix D of this report.

The model results show a significant increase in peak flows over those estimated by the original Plan model. This can be attributed to the increased urbanization of the watershed, increased watershed definition in the model input, and advances within the model itself.

3.6 Release Rate Percentage Calculations

The primary stormwater management performance standard derived from the watershed models is the release rate percentage. The application of release rate percentages is described in Section 4.2 and in the original Plan. The following paragraphs discuss the derivation of the release rate percentages for the Girty's Run watershed.

The release rate percentage is intended to mitigate the damaging effects of runoff from different subareas reaching critical points of interest at the same time, creating surcharging or even flooding conditions. It is based on how the timing of the runoff hydrographs from each subarea relates to the peak runoff hydrograph at the point of interest. For the Girty's Run watershed, stream

TABLE 3.2
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

PEAK FLOWS/CONTROL DISCHARGES
(IN CFS)

SA #	2-YR STORM			5-YR STORM			10-YR STORM			50-YR STORM			100-YR STORM		
	2-HR	6-HR	24-HR	2-HR	6-HR	24-HR	2-HR	6-HR	24-HR	2-HR	6-HR	24-HR	2-HR	6-HR	24-HR
1	610	520	610	770	640	740	950	770	890	1320	1060	1240	1580	1270	1460
2	690	700	670	790	860	800	860	1000	870	1080	1130	1130	1380	1310	1410
3	750	810	730	890	980	890	1010	1130	970	1200	1260	1170	1420	1430	1470
4	780	860	740	930	1030	900	1060	1180	1080	1300	1500	1310	1510	1710	1500
5	440	320	380	540	390	470	650	470	550	870	660	770	1030	790	910
6	500	380	450	610	460	540	750	550	630	1010	750	870	1190	880	1010
8	860	780	700	900	950	820	960	1090	880	1560	1190	1200	1990	1490	1480
10	1390	1560	1390	1610	1890	1690	1870	2130	1930	2610	2600	2450	3070	2910	2850
11	260	240	290	320	300	370	410	380	460	590	570	690	740	710	840
13	1470	1650	1520	1740	1940	1790	2040	2340	2090	2720	2890	2730	3160	3290	3200
14	390	250	290	460	300	350	540	350	400	710	470	540	820	550	630
15	570	400	440	680	490	540	810	580	630	1090	790	870	1270	940	1010
16	650	640	630	810	770	760	1000	920	910	1370	1260	1260	1630	1500	1470
17	820	830	760	1010	1020	930	1170	1230	1110	1300	1490	1350	1550	1610	1510
19	1970	2190	2040	2470	2570	2440	2710	2990	2810	3510	3910	3700	4240	4700	4420
20	310	230	280	380	290	350	460	350	420	630	500	600	750	610	710
21	200	160	190	250	200	240	300	240	290	420	350	420	510	430	500
23	380	410	410	470	510	510	590	630	630	820	910	860	990	1010	940
25	2110	2360	2340	2590	2820	2810	2970	3310	3280	3780	4250	4210	4480	5050	4940
26	260	260	330	340	340	430	430	440	540	650	680	840	820	860	1020
27	130	120	150	170	150	200	210	200	240	310	300	360	390	370	440
29	370	400	430	470	520	560	570	630	670	970	950	930	1220	1200	1090
31	2140	2430	2410	2610	2920	2930	3060	3480	3450	3890	4480	4500	4570	5340	5370
32	1890	2300	2320	2430	2970	2940	3060	3540	3480	3910	4560	4570	1600	5420	5470
33	270	230	280	340	290	350	420	360	430	590	520	620	720	640	750
34	370	400	400	470	510	510	580	640	630	840	950	960	950	1170	1100
35	210	160	190	260	190	230	310	230	270	420	330	380	500	390	450
37	520	540	500	660	670	580	830	840	720	1180	1240	1040	1410	1500	1260
39	2210	2420	2510	2500	2980	3070	2840	3780	3740	3990	4880	4970	4720	5820	5960
40	2230	2460	2520	2510	2910	3060	2790	3740	3700	3980	4900	4940	4720	5860	5910
41	190	180	230	240	230	300	310	300	370	460	460	560	570	580	680
43	2290	2550	2660	2570	2820	3050	2850	3780	3760	3960	4960	5030	4720	5930	6020

confluences and obstructions with capacities significantly lower than the expected stream flow were chosen as the points of interest. These conditions occurred in subareas 7, 9, 12, 18, 24, 28, 30, 36, 38, and 42.

To calculate the release rate percentages, the Peak Flow Presentation Table in the PSRM output for each of the above subareas, plus subarea 43 as the watershed outlet, were analyzed. The Peak Flow Presentation table facilitates the release rate analysis by summarizing the timing of the subarea runoff hydrographs tributary to the point of interest. The Peak Flow from each subarea is compared to the flow occurring at the time of the peak runoff at the point of interest. This contributing flow is divided by the subarea peak flow to determine the release rate percentage.

This procedure was performed for each storm at each point of interest. The resulting percentages were compiled and analyzed to select the appropriate release rate for each subarea. During the analysis, it became apparent that many subareas would be subject to more stringent release rate requirements for the 2-, 5-, and 10-year storms than for the 50- and 100-year storms. This is to be expected because of the different runoff and stream flow timing patterns for the larger, less frequent storms. The larger floods tend to move at lower overall velocities because of obstructions and backwater conditions. Designing control measures, particularly detention basins, to the stricter standards would result in very large facilities which could be over-controlling the runoff from the large storms. Separate release rate percentages were, therefore, calculated for the two storm groupings. This procedure has been utilized in other parts of Pennsylvania and seems equitable to both municipalities and developers while controlling increased runoff to the requirements of the model.

The final subarea release rate percentages for the Girty's Run Watershed are listed in Table 4.1 and on Figure 3.

4.0 TECHNICAL STANDARDS AND CRITERIA

4.0 TECHNICAL STANDARDS AND CRITERIA

The purpose of this task was to review and evaluate the standards and criteria developed as a result of the Pilot Study and recommend revisions or new criteria where necessary. This involved a detailed evaluation of the modeling results, problem area analyses, and developing technical data to be made part of the recommended ordinance.

The following paragraphs summarize the findings and conclusions of the standards and criteria review. In order to properly implement the provisions of the Girty's Run Watershed Stormwater Management Plan Update, the watershed communities must adopt these Standards and Criteria as minimum requirements for the proper control of stormwater runoff. The appropriate ordinances in each community must include the following criteria either directly or through reference.

4.1 Subarea Boundaries

The drainage subareas within the Girty's Run watershed were revised during the Update work, as described in Section 3.2. The subareas are indicated on Figure 1. The subarea boundaries are important elements of the overall stormwater management program because they define the limits of different release rate percentages and other criteria requirements. As such, while the stormwater control criteria do not govern the types of development that may occur within each subarea, they do impact what efforts must be made to manage the runoff from that development. Therefore, to increase the implementability and efficiency of the technical standards and criteria for the Girty's Run watershed, each community within the watershed is directed to adopt the drainage subarea boundaries as a part of, or an overlay to, the zoning district boundaries.

4.2 Release Rate Percentages

The release rate percentage shall remain the primary performance standard for the control of stormwater in the Girty's Run Watershed. The release rate percentages were calculated as described in Section 3.6. The specific release rate percentages for each "developable" subarea are listed in Table 4.1.

The release rate percentage shall apply to all non-exempt land development or earth disturbance activities within each subarea. Developers, builders, and land owners must implement appropriate stormwater control measures, consistent with other local regulations, such that the applicable release rate percentage is not exceeded. Additionally, the control measures selected must not alter the magnitude, direction, or velocity of flow so that it will cause harm to downstream areas.

Release rate percentages are applied to the project site runoff

TABLE 4.1
GIRTYS RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

RECOMMENDED RELEASE RATES

SUB AREA #	2, 5, 10 YR STORMS RELEASE RATE %	50, 100 YR STORMS RELEASE RATE %
1	90	100
2	70	95
3	65	90
4	65	85
5	50	50
6	50	50
8	50	85
10	55	95
11	50	50
13	60	95
14	60	50
15	50	50
16	50	50
17	50	50
19	65	90
20	50	50
21	50	50
23	55	55
25	70	90
26	70	55
27	55	100
29	75	50
31	75	95
32	85	100
33	60	100
34	50	100
35	50	100
37	50	100
39	95	95
40	100	100
41	100	100
43	100	100

release rates described in Section 4.5.2. For example, assume that a development is designed in a subarea with a 75% release rate percentage requirement for the appropriate design storm. If the calculated peak pre-development runoff rate is 100 CFS, the allowable release rate will be (0.75) (100 CFS) = 75 CFS. Similarly, the final allowable release rate for any project site will be the initially calculated runoff multiplied by the applicable release rate percentage.

4.3 Design Storms

The selection of a design storm is the basis for all runoff calculations and facility design for both the entire watershed and for individual project sites. The design storms used in the Plan Update effort were developed as described in Section 3.4. These storms were adapted from the, "Field Manual for the Pennsylvania Department of Transportation, Storm Intensity - Duration - Frequency Charts (PDT)", published in 1986. They reflect a Pennsylvania Region 1 storm. These same storms, as listed below in Table 4.2, shall be used for all runoff calculations within the Girty's Run watershed.

Table 4.2
Girty's Run Watershed
Stormwater Management Plan Update
Design Storms

Return Period (Yrs)	Duration (Hrs)	Rainfall Depth (In)
2	2	1.27
	6	1.68
	24	2.28
5	2	1.49
	6	1.98
	24	2.69
10	2	1.75
	6	2.34
	24	3.07
50	2	2.25
	6	3.00
	24	3.96
100	2	2.62
	6	3.54
	24	4.56

Either the SCS Type II or PDT Region I storm distributions may be

used.

4.4 Control Discharges

Control discharges were developed at the downstream outlet of each "developable" subarea as described in Section 3.0. These discharges shall be used to compare the impacts of future development within subareas and as benchmarks for "No-Harm Evaluations". The updated Control Discharges for the Girty's Run watershed are listed in Table 3.1.

4.5 Facility Design Criteria

4.5.1 Runoff Calculation Methods

The runoff calculation procedures to be utilized for future design within the Girty's Run watershed depend upon the size of the proposed project or development. Correct utilization of these procedures should result in the best available estimation of existing and projected runoff. Their use will also provide the consistency of results necessary when applied to project sites throughout the watershed. It is required that practicing engineers involved with preparing drainage plans have adequate knowledge and experience with the recommended procedures.

The recommended runoff calculation procedures for projects of any size are the Soil Conservation Service (SCS) methods and the Penn State Runoff Method (PSRM). The SCS methods include the Technical Release No. 20 (TR-20) and Technical Release No. 55 (TR-55) methods. PSRM was used to develop the watershed model and, therefore, would allow direct correlation with any project designed with it. The Girty's Run watershed model is available for use and reference at the Allegheny County Department of Planning offices.

For projects of 20 acres or less in size, the Rational Method is also allowable for runoff calculation.

4.5.2 Project Site Release Rates

The stormwater runoff from developed sites must be controlled according to the following criteria:

- The 2-year post-development peak runoff rate must not exceed the 2-year pre-development peak runoff rate.
- The 5-year post-development peak runoff rate must not exceed the 5-year pre-development peak runoff rate.
- The 10-year post-development peak runoff rate must not exceed the 10-year pre-development peak runoff rate.

- The 50-year post-development peak runoff rate must not exceed the 50-year pre-development peak runoff rate.

- The 100-year post-development peak runoff rate must not exceed the 100-year pre-development peak runoff rate.

These requirements are also subject to any applicable release rate percentages depending upon the subarea in which the project is located.

It is recommended that runoff control facilities such as detention basins be designed with multi-stage outlet structures configured to control at least three of the above storms. An example would be a structure designed for the 2-year, 10-year, and 100-year storms. It would be expected that such a structure would also control the other mid-range storms, the 5-year and 50-year, although this must be proven through calculations. If necessary, the structure must be modified to control the flow to the correct levels for all storms. All outlet structure design assumptions and calculations must be included with the project site stormwater management plans submitted for review.

All runoff shall be conveyed from its point of origin to the control facilities, whether located on the same property or elsewhere, in a manner which avoids adverse impacts such as flooding, erosion, and scouring of land and drainage channels located between the point of origin and the control facilities.

4.6 Exemptions

The following project and development types and land uses shall be exempt from certain detailed requirements as described. No project, development or land use shall be exempt, however, from the application of proper runoff, erosion, and sediment controls so that downstream properties and watercourses are not harmed.

4.6.1 Small Developments

Any development resulting in the creation of less than 5,000 square feet of new impervious surface area shall be exempt from the application of release rate controls and from submitting a detailed stormwater management plan. Provisions for stormwater management on small development sites must be approved by the municipal engineer prior to issuance of a building permit.

4.6.2 Farming

Farming operations shall be exempt from stormwater management plan submission requirements under municipal stormwater ordinance provisions as long as there is an approved erosion and sedimentation control plan for the site. The erosion and sedimentation control plan must be submitted for approval

concurrently with the application for farm operations zoning approval.

4.6.3 Mining

Mining activities are regulated by state and federal law. The Pennsylvania law for surface mining preempts any local regulation except those adopted pursuant to the Municipalities Planning Code. The municipal ordinance shall state that zoning approval for mining is contingent upon receipt of all state and federal permits. This includes approval of the drainage and erosion and sedimentation control plans required under state regulations. According to Act No. 167, DER and the county must assure that any erosion and stormwater control facilities are consistent with the approved watershed plan.

4.7 Project Site Stormwater Management Plan Requirements

Stormwater management plans for projects proposed in the Girty's Run watershed must be prepared in accordance with the requirements of this section. Plans shall be prepared and submitted in "preliminary" and "final" formats. The following paragraphs contain detailed descriptions of the required plan components. In general, however, the minimum requirements for stormwater management plan submission include:

- The plan must be prepared by or under the direction of a licensed Pennsylvania professional engineer experienced in similar work.
- A brief written description of the proposed development and the proposed stormwater management controls shall be included.
- Calculations shall be indexed and all charts, figures, tables, etc. obtained from texts or other materials shall be referenced.
- Detailed plans, sections, and specifications shall clearly indicate the proposed construction methods for any stormwater management facilities.
- The supervising engineer shall seal the plan prior to submission.

The omission of any of these general items shall cause the plan to be immediately returned to the engineer for corrections.

4.7.1 Preliminary Plan Contents

The required components for a preliminary project site stormwater management plan are described below. Each of these components must

be addressed in order for the plan to be approved.

A. Project Location - Provide a key map showing the project site location within the Girty's Run watershed and subarea(s). Show watershed and/or subarea boundaries as required on all site drawings. Identify the watershed and/or subarea by name or number, respectively.

B. Floodplain Boundaries - Identify the 100 - year floodplain limit(s) as necessary on all site drawings. Floodplain boundaries shall be based on available FEMA Flood Insurance Maps.

C. Natural Features - Show the location of all bodies of water (natural and artificial), watercourses (permanent and intermittent), swales, wetlands, and other natural drainage courses both on-site and off-site if they will be affected by the development's runoff.

D. Soils - Indicate the soils, types, and boundaries existing within the project site.

E. Contours - Show the existing and final contours at two-foot intervals. Five-foot intervals may be used in areas with slopes greater than 15 percent.

F. Existing Stormwater Management Controls - Show any existing stormwater management or drainage control facilities such as sewers, swales, culverts, etc., located on the project site. Show any off-site facilities which will be affected by runoff from the development.

G. Runoff Calculations - Calculations for determining pre- and post-development discharge rates and for designing proposed stormwater control facilities must be included. All calculations shall be performed in accordance with Sections 4.2, 4.3, 4.4, and 4.5 of this report.

H. Proposed Stormwater Management Controls - All proposed runoff control measures must be shown on the plan. This includes methods of collecting, conveying, and storing stormwater runoff during and after construction. Erosion and sedimentation controls approved by the Allegheny County Conservation District shall also be shown. The plan must provide information on the general type, location, sizing, etc., of all proposed facilities and their relationship to the existing watershed drainage system. If the development is to constructed in stages, the plan must illustrate how the control facilities will be installed to safely manage stormwater and erosion during each development stage.

I. Easements, Rights-of-Way, Deed Restrictions - Show all existing and proposed easements and rights-of-way for drainage and/or access to stormwater control facilities and identify the current property owner. Show any areas subject to special deed restrictions relative to or affecting stormwater management on the development site.

J. Other Permits/Approvals - Include a list of any approvals or permits relative to stormwater management that will be required from other governmental agencies and anticipated dates of submission and receipt. This includes, for example, an obstruction permit from PADER.

K. Maintenance Program - The plan must contain a proposed maintenance plan for all stormwater control facilities constructed as part of the development and affected by the development's runoff. The proposed ownership entities (initial, interim, and final) must be identified, along with the time period for which each is responsible. The maintenance program must be described, including the type of maintenance activities required, probable frequencies, personnel and equipment requirements, and estimated annual costs.

A method of financing the continuing operation and maintenance of the facility must be identified if it is to be owned by an entity other than the municipality.

4.7.2 Final Plan Contents

The final project site stormwater management plan must be comprised of the following items:

A. All information pertaining to stormwater management of the site from the preliminary plan along with any changes or additions.

B. Final plan maps showing the exact nature and location of all temporary and permanent stormwater management control facilities along with design and construction specifications.

C. A schedule for the installation of all temporary and permanent stormwater control facilities.

D. An accurate survey showing all current and proposed easements and rights-of-way, along with copies of all proposed deed restrictions.

E. The maintenance program establishing ownership and maintenance responsibilities for all stormwater control facilities, as well as any legal agreements required to

implement the maintenance program and copies of the maintenance agreement.

F. Financial guarantees to ensure that all stormwater control facilities will be installed properly and function satisfactorily.

4.7.3 Plan Review Procedures

All preliminary and final project site stormwater management plans must be submitted to the appropriate municipality for review in conjunction with the subdivision/land development plans for the site. Each municipality in the Girty's Run Watershed shall, by the time of adoption of this Plan Update, have executed a formal agreement with the Allegheny County Planning Department (ACPD) to review the stormwater management provisions of the subdivision and land development submittals. A copy of the stormwater plan including all runoff calculations shall, therefore, be forwarded to the ACPD by the municipality or, if requested, submitted directly to the ACPD by the developer.

The ACPD review will assure that the stormwater plan conforms to the requirements of this Plan Update and that downstream impacts have been adequately addressed. The ACPD shall report the results of the review to the municipality within 30 days of plan submission. If any deficiencies are noted, the developer will be advised so that the necessary modifications can be made to the plan. The municipal engineer cannot approve the stormwater plan until it receives a positive review from the ACPD.

The developer must also receive all of the other required approvals and permits prior to issuance of a building permit.

4.8 No-Harm Evaluations

The "No-Harm Evaluation" shall remain an alternative method for analyzing proposed developments in the Girty's Run Watershed. The procedure for performing these evaluations shall remain as described in the original Plan. It is recommended that anyone proposing to perform a no-harm evaluation contact the Allegheny County Planning Department so that the current watershed model and land use data can be utilized.

5.0 PUBLIC INFORMATION AND WATERSHED PLAN ADVISORY COMMITTEE ACTIVITIES

5.0 PUBLIC INFORMATION AND WATERSHED PLAN ADVISORY COMMITTEE ACTIVITIES

5.1 General

Activities conducted to disseminate information concerning the Girty's Run Stormwater Management Plan Update to citizens and municipal officials were primarily associated with the Watershed Plan Advisory Committee (WPAC). The WPAC was formed in accordance with Act 167, with each community and affected agency within the watershed requested to designate at least one representative to the committee. The purpose of the WPAC was to provide a forum for presenting and discussing the project progress, results, and recommendations and obtaining feedback from the committee members and other interested persons. The WPAC and other public information tasks conducted during the project are described in the following paragraphs.

5.2 Watershed Plan Advisory Committee

Section 6 of Act 167 stipulates establishing a WPAC in any watershed for which a Plan or a Plan Update is being prepared. For the Girty's Run Watershed, the following municipalities and agencies were requested to designate at least one representative to serve on the committee:

- Town of McCandless
- Shaler Township
- Reserve Township
- Ross Township
- West View Borough
- Millvale Borough
- City of Pittsburgh
- U.S. Army Corps. of Engineers - Pittsburgh District
- Allegheny County Conservation District

Three WPAC meetings were held during the project. The first meeting took place in October, 1989 at the Shaler Township Municipal Building. The purpose of this meeting was to introduce the project to the committee members, receive initial comments concerning the extent of the study, and present the proposed action plan.

The second meeting occurred in February, 1990. It was held in conjunction with the North Hills Council of Governments Infrastructure Planning Committee meeting. The project status was described and interim findings and results were presented.

The third meeting was held in conjunction with the Public Hearing in June, 1991. It took place at the Shaler Township Municipal Building. Unfortunately, the meeting was attended by only the Shaler Township Manager and one watershed resident. The project

was discussed and summarized, however, and the attendees' questions were noted to be addressed in the Final Report.

5.3 Municipal Meetings

At the beginning of the Update project, it was determined that many of the current municipal managers and other interested officials in the watershed were not in office during the preparation of the original Plan. This fact, coupled with the desire to establish personal contact and receive any individual comments concerning the project, led to meetings with each municipality except the City of Pittsburgh and Shaler Township. Since such a small percentage of the watershed area is within the Pittsburgh city limits, information was exchanged via the telephone. Additionally, since Shaler officials had extensive experience with the Act 167 process because of projects in the Pine Creek watershed, a separate meeting was not scheduled. Meetings were held, however, with McCandless, Reserve, Ross, West View, and Millvale officials. These meetings took place during October, 1989, prior to the first WPAC meeting. They allowed for personnel introductions and discussions concerning the purpose and scope of the Plan Update. The meetings provided an important initial dialogue with each municipality and facilitated the subsequent data gathering process.

6.0 PRIORITIES FOR PLAN ADOPTION IMPLEMENTATION AND UPDATES

6.0 PRIORITIES FOR PLAN UPDATE ADOPTION, IMPLEMENTATION, AND FUTURE UPDATES

6.1 General

The previously described efforts to develop the Girty's Run Stormwater Management Plan Update culminate in what are perhaps the three most important issues of the program - Plan Update Adoption, Implementation, and Planning for Future Updates. Many of the institutional and administrative requirements for these activities are described in detail in the original Plan and remain the same for the Plan Update. While these requirements are not repeated in this report, the following paragraphs do list the tasks necessary to appropriately administer the Plan Update.

6.2 Plan Update Adoption

The specific procedures required to adopt the Plan Update are delineated in Act 167. The primary steps are listed below in the order of expected completion:

- Each municipality within the watershed must review the Plan Update and provide any comments to Allegheny County.
- A public hearing must be held to present the findings of the Plan Update and receive further public comment.
- The Board of Allegheny County Commissioners must approve the Plan Update and adopt it by resolution.
- The Pennsylvania Department of Environmental Resources must review and approve the Plan Update.
- Each municipality must adopt the provisions of the Plan Update into their appropriate ordinances within six months after PADER approval.

Each municipality and affected agency shall receive ample time to review and offer comments on the Plan Update prior to the public hearing.

6.3 Plan Update Implementation

The steps required to implement the Plan Update are primarily the responsibility of the watershed municipalities and Allegheny County. The municipalities must enforce the provisions of their updated ordinances so that development is accomplished in accordance with the performance standards outlined in the Plan Update. Allegheny County, through its subdivision and land development plan review function, must continue to identify deficiencies in proposed plans and assist the municipalities in ensuring their correction.

Additionally, to facilitate the implementation and ongoing performance of the Plan Update provisions, Allegheny County should maintain and make the updated watershed model available for use by municipalities, developers, and engineers. This will provide improved estimates of the impact of any development or other land use change on the downstream environment and infrastructure. This will also aid in the review of any no-harm evaluations submitted with development plans.

6.4 Future Plan Updates

Section 5 of Act 167 requires that stormwater management plans must be updated at least every 5 years, or when development conditions make an update project desirable. Given the expected pace of continued development in the Girty's Run Watershed, it is recommended that Allegheny County plan to complete the next Plan Update in 1996. Many of the products and procedures resulting from the 1990 Update effort should facilitate the future work. These include the updated watershed model and the computer-based watershed land use data.

APPENDIX A

REFERENCES

REFERENCES

1. Stormwater Management Plan for the Girty's Run Watershed (SWM 2:13), Allegheny County Department of Planning, December, 1985

2. Act 167 Pilot Watershed Stormwater Management Plans, Allegheny County Department of Planning, January, 1982.

3. Implementing Stormwater Management in Allegheny County - A Training Manual, Allegheny County Department of Planning, June, 1985.

4. Girty's Run: A Study in Urban Watershed Management, Carnegie Mellon University, May 1974.

5. Girty's Run, Millvale, Pennsylvania, Local Flood Protection Project, Detailed Project Report, U.S. Army Engineer District, Corps of Engineers, Pittsburgh, PA, February, 1975.

6. Storm Water Management Guidelines & Model Ordinances, Bureau of Dams and Waterway Management, Pennsylvania Department of Environmental Resources, May, 1985.

7. Penn State Runoff Model for IBM-PC, Users Manual, Gert Aron, Penn State University, January, 1987.

APPENDIX B

DEFINITIONS

DEFINITIONS

ACT: The Storm Water Management Act (Act of October 4, 1978, P.L. 864 No. 167; 32 P.S. 680.1-680.17, as amended by Act of May 24, 1984, No. 63).

CHANNEL: A natural stream that conveys water; a ditch or open channel excavated for the flow of water.

CONDUIT: Any channel intended for the conveyance of water, whether open or closed.

CONFLUENCE: Points where watercourses join together.

CONSERVATION DISTRICT (ACCD): The Allegheny County Conservation District.

COUNTY: The County of Allegheny, Pennsylvania.

CULVERT: A pipe, conduit or similar structure including appurtenant works which carries a stream under or through an embankment or fill.

DAM: Any artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water, or a structure for highway, railroad or other purposes which may impound water.

DESIGN STORM: The amount of precipitation from a storm event measured in probability of frequency of occurrence (e.g., 50-year storm) and duration (e.g., 24-hour), and used in computing stormwater management control systems.

DETENTION: Slowing, dampening, or attenuating runoff flows entering the storm drainage system by temporarily holding water in areas such as detention basins, reservoirs, on roof tops, in streets, parking lots, or within the drainage system itself, and releasing the water at a desired rate of discharge.

DETENTION BASIN: A basin designed to retard stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate.

DEVELOPER: Any landowner, agent of such landowner or tenant with the permission of such landowner, who makes or causes to be made a subdivision or land development.

DEVELOPMENT: Any activity, construction, alteration, change in land use or similar action that affects storm water runoff characteristics.

DISCHARGE: Rate of flow, specifically fluid flow. A volume of fluid flowing from a conduit or channel, or being released from detention storage, per unit of time. Commonly expressed as cubic feet per second (cfs), million gallons per day (mgd), gallons per minute (gpm), or cubic meters per second (cms).

DISCHARGE CONTROL POINT: A point of hydraulic concern, such as a bridge, culvert, or channel section, for which the rate of runoff is computed or measured in the watershed plan.

DRAINAGE: Interception and removal of excess surface water or groundwater from land by artificial or natural means.

DRAINAGE AREA: The contributing area to a single drainage basin, expressed in acres, square miles, or other units of area; also called a catchment area, watershed, or river basin, the area served by a drainage system or by a watercourse receiving storm and surface water.

ENCROACHMENT: Any structure or activity which in any manner changes, expands or diminishes the course, current or cross section of any watercourse, floodway or body of water.

EROSION: The wearing away of the land surface by running water, wind, ice, or other geological agents.

FLOOD CONTROL PROJECT: Any device or structure designed and constructed to protect a designated area from flood flows of a specified magnitude and probability (frequency) of occurrence.

FLOOD HAZARD AREA: A normally dry land area that has been and is susceptible to being inundated by surface or subsurface flow in addition to stream overflow.

FLOODPLAIN: A normally dry land area adjacent to stream channels that is susceptible to being inundated by overbank stream flows. For regulatory purposes, the Flood Plain Management Act (Act of October 4, 1978, P.L. 851, No. 166) and regulations pursuant to the Act define the floodplain as the area inundated by a 100-year flood and delineated on a map by FEMA (Federal Emergency Management Agency).

FLOODWAY: A channel, either natural, excavated, or bounded by dikes and levees used to carry excessive flood flows to reduce flooding. Sometimes considered to be the transitional area between the active channel and the floodplain.

GROUNDWATER: That part of the subsurface water which is below the zone of saturation.

HYDRAULIC CHARACTERISTICS: The features of a watercourse which determine its water conveyance capacity. These include size and configuration of the cross section of the watercourse, alignment of watercourse, gradient of the watercourse, texture of materials

along the watercourse, amount and type of vegetation within the watercourse, and size, configuration and other characteristics of structures within the watercourse.

HYDROLOGY: The science dealing with the waters of the earth and their distribution and circulation through the atmosphere. Engineering hydrology deals with the application of hydrologic concepts to the design of projects for use and control of water.

IMPERVIOUS MATERIAL OR SURFACE: Material which resists the entrance or passing through of water or other liquids.

INFILTRATION: The penetration and movement of water through the earth's surface.

LAND DEVELOPMENT: As defined by the Municipalities Planning Code [Section 107 (11)]: "(i) the improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving (a) a group of two or more buildings, or (b) a division or allocation of land or space between or among two or more buildings, or (c) a division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of, streets, common areas, leaseholds, and condominiums, building groups, or other features; (ii) a division of land."

LAND DISTURBANCE: Any activity involving grading, tilling, digging, filling, or stripping of vegetation; or any other activity which causes land to be exposed to the danger of erosion.

OBSTRUCTION: Any surface structure, or fill above or below the surface of land or water, any activity which might impede, retard, or change flood flows.

OUTFALL: Points or areas at which storm water runoff leaves a site, which may include streams, storm sewers, swales or other well defined natural or artificial drainage features, as well as areas of dispersed overland flows.

OUTLET STRUCTURE: A structure designed to control the volume of storm water runoff that passes through it during a specific length of time.

PEAK RATE OF RUNOFF (OR DISCHARGE): The maximum rate of flow of water at a given point and time resulting from a predetermined storm.

PERFORMANCE STANDARD: A standard which establishes an end result or outcome which is to be achieved but does not prescribe specific means for achieving it.

PERMEABILITY: The rate at which water will move through a saturated soil.

PERVIOUS MATERIAL: Material which permits the passage or entrance of water or other liquid.

POINT OF INTEREST: A point of hydrological and hydraulic importance used for computing a release rate percentage. These may include points of stream confluences, an existing obstruction or problem area, or other similar points.

RATE OF RUNOFF: Instantaneous measurement of water flow expressed in a unit of volume per unit of time, also referred to as DISCHARGE. Usually stated in cubic feet per second (cfs) or gallons per minute (gpm).

RELEASE RATE PERCENTAGE: The percentage of predevelopment peak rate of runoff from a watershed subarea (as delineated in the watershed plan), which defines the allowable post-development peak discharge from any development site in that subarea. The release rate percentage is determined by computing the following:

$$\frac{\text{Subarea predevelopment rate of runoff contributing to peak at downstream point of interest}}{\text{Subarea pre-development peak rate of runoff}} \times 100 = \text{Release Rate Percentage}$$

RESERVOIR: Any basin, either natural or artificial, which contains or will contain the water impounded by a dam.

RUNOFF CHARACTERISTICS: The surface components of any watershed which affect the rate, amount, and direction of storm water runoff. These may include but are not limited to: vegetation, soils, slopes, and man-made landscape alterations.

SCS: Soil Conservation Service, U.S. Department of Agriculture.

SEDIMENT: Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site or origin by air, water, gravity, or ice and has come to rest on the earth's surface.

SEDIMENTATION: The process by which mineral or organic matter is accumulated or deposited by moving wind, water, or gravity.

SOIL-COVER COMPLEX METHOD: A method of runoff computation developed by the U.S. Soil Conservation Service and found in its publication "Urban Hydrology for Small Watersheds," Technical Release No. 55, SCS, January 1975 (or most current edition).

STORM SEWER: A sewer that carries intercepted surface runoff, street water, and other washwaters, or drainage, but excludes sewage and industrial wastes.

STORM SEWER DISCHARGE: Flow from a storm sewer that is discharged into a receiving stream.

STORM WATER COLLECTION SYSTEM: Natural or engineered structures which collect and transport storm water through or from a drainage area to the point of final outlet, including but not limited to, any of the following: conduits and appurtenant features, canals, channels, ditches, streams, culverts, streets and pumping stations.

STORM WATER MANAGEMENT PLAN: The plan for managing storm water runoff from a specific development site.

STORM WATER RUNOFF: Waters resulting from snow melt or precipitation within a drainage basin, flowing over the surface of the ground, collected in channels and conduits, and carried by receiving streams.

SUBAREA: A portion of the watershed that has similar hydrological characteristics and drains to a common point.

TIME OF CONCENTRATION: The time period necessary for surface runoff to reach the outlet of a subarea from the hydraulically most remote point in the tributary drainage area.

VOLUME OF STORM WATER RUNOFF: Quantity of water normally measured in inches, cubic feet, or acre-feet, measured or determined analytically from (1) runoff coefficients; (2) rainfall/runoff ratios; and (3) areas underneath hydrographs.

WATERCOURSE (WATERWAY): Any channel of conveyance of surface water having a defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

WATERSHED: The entire region or area drained by a river or other body of water whether natural or artificial.

WATERSHED STORM WATER MANAGEMENT PLAN (OR WATERSHED PLAN): The plan for management of storm water runoff throughout a designated watershed as required by the Pennsylvania Storm Water Management Act.

APPENDIX C

MUNICIPAL QUESTIONNAIRE

GIRTY'S RUN WATERSHED
STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

QUESTIONNAIRE

Preface

The following questionnaire has been prepared to facilitate the data gathering process for the Girty's Run Watershed Stormwater Management Plan Update project. Your participation in answering these questions is requested and appreciated so that the results of this project truly represent the conditions existing within the watershed. This questionnaire will also assist the County by indicating what information is available, where it is, and how it is being utilized among the communities involved.

The questionnaire is organized into two sections, primarily administrative and primarily technical. Please feel free to distribute each section to the person(s) within your organization who can most easily provide the requested information.

Please return the completed questionnaire to:

Mr. David R. French
Project Manager
Allegheny County Department of Planning
441 Smithfield Street
2nd Floor
Pittsburgh, PA 15222

ADMINISTRATIVE

INFORMATION

I. STORMWATER AUTHORITY

A. Name and Address of Municipality/Agency:

_____

_____

_____

B. Person responsible for internal drainage plan coordination/review (Name and Title)

_____

C. Engineer/Consultant responsible for drainage plan coordination/review (include designated contact of firm)

_____

_____

_____

_____

II. BACKGROUND DATA

A. Please list any existing stormwater management policies/regulations.

List	Year Adopted
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B. Please list pertinent reports or studies that deal with stormwater management or specialized drainage problems for your municipality/agency.

Title	Year Prepared	Copies Available?
_____	_____	_____
_____	_____	_____
_____	_____	_____

C. Existing Facilities Inventory

1. Are there maps or master plans available depicting the existing drainage facilities for which your municipality/agency has responsibility?

_____ Yes _____ No

If available, please note the date of the latest revision.

_____

Typically, do these plans include:

Scale - 1" = _____ ft.

Topographic Lines	_____ Yes	_____ No
Pipe Sizes	_____ Yes	_____ No
Pipe Slopes	_____ Yes	_____ No
Design Capacities	_____ Yes	_____ No
Runoff Calculations	_____ Yes	_____ No
Sanitary/Combined Sewer Overflows	_____ Yes	_____ No
Retention Facility Design Calculations	_____ Yes	_____ No

2. Please list any major construction activities, residential commercial industrial developments, or other changes in land use that affect stormwater drainage that have occurred in your municipality/agency since January 1, 1986.

Title	Year	Plans Available?

(Please attach separate sheet if necessary)

3. Please list the locations of any known rain gauges in your municipality/agency.

_____

_____

III RUNOFF CONTROL

A. Current Activities

1. Do you require drainage improvements to control runoff so as not to exceed pre-development conditions? _____ Yes _____ No

Comments _____ _____

_____

2. Please indicate which of the following control measures you require, recommend, or have used?

	Require	Recommend	Have Used	Never Used
Velocity Reduction Measures	____	_____	____	____
Parking Lot Storage	____	_____	____	____
Retention Basins	____	_____	____	____
Surface Detention Basins	____	_____	____	____
Subsurface Detention Basins	____	_____	____	____
Infiltration Ditches	____	_____	____	____

Other _____

_____

3. For detention basin installations:

a) Please specify who is responsible for maintenance.

_____

_____

_____

b) Are basins protected by:

Fence	_____ Yes	_____ No
Shallow Depth (< 3 ft.)	_____ Yes	_____ No
Landscaping	_____ Yes	_____ No

c) Please describe any erosion control requirements.

_____

_____

B. Flooding History

1. Have you ever experienced storm flooding due to:

	Yes	No
Inadequate Design Standards	____	_____
Reduced Capacity From Sedimentation	____	_____
Reduced Capacity From Urbanization	____	_____
Channel Blockage	____	_____
Inadequate Culvert Capacity	____	_____
Inadequate Detention/Retention	____	_____
Lack of Maintenance	____	_____
Sanitary Sewer Back-ups	____	_____

Other/Comments _____

_____

2. Please describe any roadway impacts (i.e. flooding, blockage) that occur in your community due to drainage problems. Please include specific locations if applicable.

_____

_____

_____

3. Do you consider sedimentation a problem in your area?

_____ Yes _____ No

Comments _____

_____

IV. MAINTENANCE/CONSTRUCTION

A. Responsibilities

Please indicate which of the following agencies/entities perform drainage system maintenance within your municipality.

	Yes	No
Municipal Personnel	_____	_____
County	_____	_____
State	_____	_____
Homeowners Associations	_____	_____

Other _____

_____

B. Funding

1. How are your local drainage maintenance/construction projects funded?

_____

_____

_____

2. What was the total drainage maintenance/construction expenditure for your most recent fiscal year?

_____

3. What are the typical employment positions and hourly rates for personnel performing drainage maintenance/construction activities in your municipality/agency?

_____

_____

4. In your opinion, is the current level of drainage funding adequate?

_____ Yes _____ No Comments_____

_____

5. Do you have an existing capital improvements plan of needed/desired drainage maintenance/construction projects?

_____ Yes _____ No

Comments _____

_____

6. Would you be in favor of a separate agency/entity with fund raising capabilities to oversee and implement major drainage maintenance-construction projects within your municipality?

_____ Yes _____ No

Comments _____

_____

_____

C. Activities

1. Please indicate which of the following functions are performed by your municipal/agency personnel.

	Yes	No
Catch Basin Cleaning	____	____
Sewer Cleaning	____	____
Culvert Cleaning	____	____
Ditch/Channel Clearing	____	____
Catch Basin Reconstruction	____	____
Manhole Rehabilitation	____	____

Other _____

_____

_____

2. Please list the types and numbers of drainage maintenance/construction equipment that your municipality/agency owns, rents, or leases? From whom do you rent or lease equipment?

_____ ____ _____

_____

TECHNICAL

DATA

TECHNICAL DATA

A. Standards

1. Does your municipality/agency have a standard design criteria for calculating runoff volume and peak flows?

_____ Yes _____ No

Name _____

2. Please list the design criteria established for your municipality/agency below.

a) Design Storm Frequency

Residential/Multi-Family	_____	Year Storm
Commercial/Industrial	_____	Year Storm
Downtown/Business Area	_____	Year Storm
Ditches	_____	Year Storm
Culverts	_____	Year Storm
Detention Facilities	_____	Year Storm

b) Rainfall Intensity-Duration-Frequency Data

Frequency	Volume (inches)	Duration (hour)	Intensity (in/hour)
2-Year Storm	_____	_____	_____
5-Year Storm	_____	_____	_____
10-Year Storm	_____	_____	_____
25-Year Storm	_____	_____	_____
50-Year Storm	_____	_____	_____
100-Year Storm	_____	_____	_____

Please list the source(s) of the above data:

_____

_____

c) Time of Concentration (T/C)

Please list the time of concentration value used for critical inlets.

Residential Area	_____	Minutes
Commercial/Multi-Family	_____	Minutes
Industrial	_____	Minutes
Urban Areas/Shopping Centers	_____	Minutes

d) Hydraulic Capacity

Do you use Manning's Equation for determining design capacity of storm sewers and culverts?

_____ Yes _____ No

Please list other formulas used.

_____

_____

B. Runoff Calculations

Please describe the method used to calculate stormwater runoff volume and peak flows. (i.e. Rational Method, TR-55, etc.)

Method	Limitations (if any)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Would you prefer to see standardized methodology adopted throughout the watershed? _____ Yes _____ No

Comments _____

_____

GENERAL COMMENTS

Please provide any general comments regarding the state of stormwater management for your municipality/agency. Please include your opinions on how the overall program has progressed since the pilot Girty's Run study was prepared.

APPENDIX D

PSRM RESULTS

```
*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
*****************************************
```

GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

2-YEAR 2-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 1.27 INCHES

********** General Watershed Information **********

No. of Subareas = 43 No. of Reservoirs = 0 No. of Obs. Hydrog. = 0

No. of Raingages, recording = 0 nonrecording = 1

Time Interv, min.; Routing 1.2 Printing 12.0 Rainfall 12.0 Total = 720.0
Residual Infiltration Time = 1080 min.

Std. Parameters:	Manning n		Depression Storage		SCS CN,		IA	CTS Ratio
	Imp=0.040	Prv=0.200	Imp=0.06	Prv=0.00	97.0	74.0	.10	4.0

Baseflow Coefficient = 0.0005 cfs/ac.

0.04	0.04	0.06	0.09	0.21	0.57	0.13	0.06	0.05	0.04

Hydrographs will be listed for Subareas:
43

Peak Flow Presentations Requested for Subareas:
43

Subarea Properties and Dimensions

I.D. No.	Area ac.	Length ft.	Slope ft/ft	Manning's n Imp.	Manning's n Perv.	Imperv. Fract.	SCS. CN. Imp	SCS. CN. Perv	IA	Coordinates x	Coordinates y
1	673.1	2050.	0.142	0.030	0.150	0.54	97.0	74.0	0.10	6.0	19.2
2	290.6	1790.	0.154	0.030	0.150	0.54	97.0	74.0	0.10	7.0	17.1
3	285.1	1460.	0.181	0.030	0.150	0.51	97.0	74.0	0.10	7.7	15.6
4	217.0	1190.	0.213	0.030	0.150	0.41	97.0	74.0	0.10	8.4	13.9
5	386.2	1310.	0.164	0.030	0.150	0.54	97.0	74.0	0.10	6.2	15.1
6	417.8	1800.	0.199	0.030	0.150	0.62	97.0	74.0	0.10	5.6	12.8
7	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	6.8	13.3
8	205.8	1330.	0.218	0.030	0.150	0.40	97.0	74.0	0.10	7.5	13.4
9	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	8.4	13.1
10	75.9	840.	0.222	0.060	0.150	0.19	97.0	74.0	0.10	8.7	12.7
11	432.4	1710.	0.242	0.045	0.150	0.33	97.0	74.0	0.10	7.5	11.5
12	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.1	12.3
13	104.6	780.	0.222	0.060	0.150	0.44	97.0	74.0	0.10	9.4	12.1
14	237.8	830.	0.119	0.022	0.150	0.68	97.0	74.0	0.10	7.7	19.2
15	193.9	1490.	0.163	0.038	0.150	0.54	97.0	74.0	0.10	8.7	17.8
16	297.7	1500.	0.158	0.030	0.150	0.57	97.0	74.0	0.10	9.1	16.1
17	337.5	1140.	0.162	0.038	0.150	0.51	97.0	74.0	0.10	9.7	13.7
18	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.9	12.0
19	173.2	1070.	0.193	0.045	0.150	0.34	97.0	74.0	0.10	10.6	11.9
20	309.9	990.	0.152	0.038	0.150	0.46	97.0	74.0	0.10	10.8	13.9
21	230.1	1230.	0.144	0.038	0.150	0.44	97.0	74.0	0.10	11.8	13.4
22	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.3	12.5
23	97.0	880.	0.184	0.060	0.150	0.16	97.0	74.0	0.10	11.6	12.1
24	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.4	11.4
25	271.8	1730.	0.163	0.045	0.150	0.38	97.0	74.0	0.10	12.3	11.4
26	543.2	1470.	0.219	0.053	0.150	0.27	97.0	74.0	0.10	9.0	10.5
27	202.7	910.	0.268	0.053	0.150	0.29	97.0	74.0	0.10	10.1	9.7
28	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.2	10.5
29	67.6	640.	0.268	0.053	0.150	0.28	97.0	74.0	0.10	11.4	10.4
30	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.9	10.4

31	79.7	933.	0.190	0.045	0.150	0.30	97.0	74.0	0.10	12.2	10.2
32	406.8	2280.	0.275	0.053	0.150	0.25	97.0	74.0	0.10	12.3	9.5
33	365.7	1370.	0.134	0.038	0.150	0.40	97.0	74.0	0.10	13.6	12.4
34	377.5	1290.	0.189	0.053	0.150	0.30	97.0	74.0	0.10	14.9	10.3
35	189.8	880.	0.128	0.038	0.150	0.51	97.0	74.0	0.10	13.6	10.7
36	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.8	9.7
37	32.1	690.	0.215	0.053	0.150	0.25	97.0	74.0	0.10	14.0	9.5
38	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.6	9.2
39	811.1	2675.	0.235	0.045	0.150	0.38	97.0	74.0	0.10	14.2	8.1
40	206.6	1475.	0.215	0.045	0.150	0.34	97.0	74.0	0.10	14.5	6.5
41	353.4	1510.	0.240	0.053	0.150	0.30	97.0	74.0	0.10	12.6	6.4
42	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.7	5.7
43	225.9	1375.	0.175	0.030	0.150	0.40	97.0	74.0	0.10	14.5	5.7

I.D.	Depr.Storage		Incoming Drainage Elements			Drainage Element		
No.	Imp.	Perv.				Cap,cfs	Tt,min	CTS
1	0.060	0.000	0	0	0	657.0	7.9	4.0
2	0.060	0.000	1	0	0	795.0	8.5	4.0
3	0.060	0.000	2	0	0	1412.0	7.8	4.0
4	0.060	0.000	3	0	0	833.0	0.2	4.0
5	0.060	0.000	0	0	0	875.0	0.2	4.0
6	0.060	0.000	0	0	0	875.0	0.2	4.0
7	0.060	0.000	5	6	0	875.0	8.8	4.0
8	0.060	0.000	7	0	0	833.0	0.2	4.0
9	0.060	0.000	4	8	0	833.0	3.8	4.0
10	0.060	0.000	9	0	0	1740.0	0.2	4.0
11	0.060	0.000	0	0	0	1740.0	0.2	4.0
12	0.060	0.000	10	11	0	1740.0	3.7	4.0
13	0.060	0.000	12	0	0	933.0	0.2	4.0
14	0.060	0.000	0	0	0	1435.0	0.7	4.0
15	0.060	0.000	14	0	0	1435.0	6.5	4.0
16	0.060	0.000	15	0	0	927.0	8.4	4.0
17	0.060	0.000	16	0	0	933.0	0.2	4.0
18	0.060	0.000	13	17	0	933.0	4.7	4.0
19	0.060	0.000	18	0	0	1598.0	0.2	4.0
20	0.060	0.000	0	0	0	831.0	0.2	4.0
21	0.060	0.000	0	0	0	681.0	0.2	4.0
22	0.060	0.000	20	21	0	831.0	4.9	4.0
23	0.060	0.000	22	0	0	1598.0	0.2	4.0
24	0.060	0.000	19	23	0	1598.0	5.7	4.0
25	0.060	0.000	24	0	0	1598.0	0.2	4.0
26	0.060	0.000	0	0	0	574.0	0.2	4.0
27	0.060	0.000	0	0	0	574.0	0.2	4.0
28	0.060	0.000	26	27	0	574.0	2.6	4.0
29	0.060	0.000	28	0	0	1598.0	0.2	4.0
30	0.060	0.000	25	29	0	1598.0	3.7	4.0
31	0.060	0.000	30	0	0	1658.0	5.3	4.0
32	0.060	0.000	31	0	0	2300.0	0.2	4.0
33	0.060	0.000	0	0	0	581.0	8.5	4.0
34	0.060	0.000	33	0	0	375.0	0.2	4.0
35	0.060	0.000	0	0	0	375.0	0.2	4.0
36	0.060	0.000	34	35	0	375.0	2.6	4.0
37	0.060	0.000	36	0	0	375.0	0.2	4.0
38	0.060	0.000	32	37	0	2300.0	8.1	4.0
39	0.060	0.000	38	0	0	2500.0	2.5	4.0
40	0.060	0.000	39	0	0	2500.0	0.2	4.0
41	0.060	0.000	0	0	0	506.0	0.2	4.0
42	0.060	0.000	40	41	0	2500.0	5.8	4.0
43	0.060	0.000	42	0	0	9999.0	0.0	4.0

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 1.27 inches and 68.7 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.035	0.035	0.1			4.5	0.0	
24.0	0.079	0.076	0.1			4.5	0.0	
36.0	0.136	0.125	0.1			4.5	0.0	
48.0	0.222	0.192	0.6			6.0	0.0	
60.0	0.432	0.339	32.4			102.9	0.0	
72.0	0.998	0.637	191.7			779.3	0.0	
84.0	1.124	0.692	96.0			1451.0	0.0	
96.0	1.186	0.718	56.8			1987.3	0.0	
108.0	1.235	0.738	41.8			2277.6	0.0	
120.0	1.274	0.755	33.6			2287.3	0.0	
132.0	1.274	0.771	18.1			2188.5	0.0	
144.0	1.274	0.787	10.1			2110.4	0.0	
156.0	1.274	0.803	5.6			2049.8	0.0	
168.0	1.274	0.819	3.2			1925.6	0.0	
180.0	1.274	0.825	2.2			1533.9	0.0	
192.0	1.274	0.825	1.6			893.2	0.0	
204.0	1.274	0.825	1.3			407.6	0.0	
216.0	1.274	0.825	1.0			215.2	0.0	
228.0	1.274	0.826	0.8			140.6	0.0	
240.0	1.274	0.826	0.6			99.6	0.0	
252.0	1.274	0.826	0.4			74.2	0.0	
264.0	1.274	0.826	0.4			57.4	0.0	
276.0	1.274	0.826	0.3			45.8	0.0	
288.0	1.274	0.826	0.3			37.2	0.0	
300.0	1.274	0.826	0.2			30.7	0.0	
312.0	1.274	0.827	0.2			25.6	0.0	
324.0	1.274	0.827	0.2			21.6	0.0	
336.0	1.274	0.827	0.2			18.4	0.0	
348.0	1.274	0.827	0.2			15.9	0.0	
360.0	1.274	0.827	0.1			13.9	0.0	
372.0	1.274	0.827	0.1			12.2	0.0	
384.0	1.274	0.827	0.1			10.9	0.0	
396.0	1.274	0.828	0.1			9.7	0.0	
408.0	1.274	0.828	0.1			8.8	0.0	
420.0	1.274	0.828	0.1			8.0	0.0	
432.0	1.274	0.828	0.1			7.4	0.0	
444.0	1.274	0.828	0.1			6.9	0.0	
456.0	1.274	0.828	0.1			6.5	0.0	
468.0	1.274	0.828	0.1			6.2	0.0	
480.0	1.274	0.828	0.1			5.9	0.0	
492.0	1.274	0.829	0.1			5.6	0.0	
504.0	1.274	0.829	0.1			5.4	0.0	
516.0	1.274	0.829	0.1			5.2	0.0	
528.0	1.274	0.829	0.1			5.1	0.0	
540.0	1.274	0.829	0.1			5.0	0.0	
552.0	1.274	0.829	0.1			4.9	0.0	
564.0	1.274	0.829	0.1			4.8	0.0	
576.0	1.274	0.829	0.1			4.8	0.0	
588.0	1.274	0.829	0.1			4.7	0.0	
600.0	1.274	0.830	0.1			4.7	0.0	
612.0	1.274	0.830	0.1			4.7	0.0	
624.0	1.274	0.830	0.1			4.6	0.0	
636.0	1.274	0.830	0.1			4.6	0.0	
648.0	1.274	0.830	0.1			4.6	0.0	
660.0	1.274	0.830	0.1			4.6	0.0	
672.0	1.274	0.830	0.1			4.6	0.0	
684.0	1.274	0.830	0.1			4.6	0.0	
696.0	1.274	0.830	0.1			4.6	0.0	
708.0	1.274	0.831	0.1			4.6	0.0	
720.0	1.274	0.831	0.1			4.6	0.0	

Runoff = 0.42 inches, Runoff Peak = 191.6 cfs Peak Timing = 72.0 min.
Runoff Volume = 95.0 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 60	72	84	96	108	120	132	144	156	168	180
43	0.0	102	779	1451	1987	2278	2287	2189	2110	2050	1926	1534
42	5.8	71	588	1355	1930	2236	2254	2170	2100	2044	1922	1532
41	8.0	13	107	156	103	73	57	41	24	14	8	5
40	6.0	56	474	1200	1828	2166	2198	2130	2076	2030	1915	1530
39	8.5	36	331	1094	1730	2169	2179	2099	2062	2023	1928	1576
38	16.6	5	99	715	1556	1993	2010	1979	1987	1972	1944	1586

37	17.0	1	32	231	449	449	298	193	137	97	51	30
36	21.7	1	16	161	506	436	273	193	145	92	53	31
35	21.9	0	7	67	190	92	54	40	30	15	8	5
34	21.9	0	8	89	323	346	217	152	116	76	44	26
33	30.4	0	0	19	148	218	131	87	66	46	27	16
32	16.8	4	59	476	1110	1549	1714	1786	1851	1886	1894	1560
31	25.7	3	5	115	819	1421	1703	1826	1841	1955	2116	1523
30	32.3	3	4	58	488	1364	1784	1841	1882	2062	2063	1536
29	32.5	0	1	17	145	349	274	184	139	105	63	35
28	35.1	0	0	5	82	380	244	163	126	101	57	32
27	35.3	0	0	2	28	131	71	45	35	28	14	6
26	35.3	0	0	3	49	256	172	117	91	74	43	25
25	32.7	3	3	38	325	1013	1514	1660	1742	1966	2013	1503
24	42.4	2	2	4	93	625	1324	1691	1956	2077	1915	1411
23	42.6	0	0	1	25	193	372	308	183	128	92	56
22	47.5	0	0	0	5	100	487	258	153	111	87	47
21	47.7	0	0	0	1	36	196	108	65	47	37	21
20	47.7	0	0	0	2	59	302	149	87	63	50	26
19	42.7	2	2	3	65	419	952	1381	1779	1960	1921	1355
18	54.9	0	0	2	3	87	688	1581	1935	1987	1657	1212
17	56.1	0	1	1	1	38	307	703	739	511	306	208
16	63.5	0	0	0	0	1	75	493	618	397	230	161
15	70.0	0	0	0	0	0	19	183	517	247	138	98
14	70.7	0	0	0	0	0	10	116	366	136	73	53
13	55.4	0	2	2	2	45	360	882	1206	1429	1355	999
12	59.1	0	1	1	2	14	193	904	1128	1487	1402	986
11	59.3	0	0	0	0	3	50	249	158	104	78	62
10	59.3	0	1	1	1	9	134	664	967	1391	1329	924
9	68.3	0	0	1	1	2	45	389	1131	1453	1186	885
8	68.5	0	0	1	1	1	23	208	625	747	440	301
7	78.7	0	0	0	0	0	1	69	402	730	392	239
6	78.9	0	0	0	0	0	1	35	258	399	217	133
5	78.9	0	0	0	0	0	1	33	230	343	173	106
4	68.5	0	0	1	1	1	20	173	508	717	745	585
3	76.3	0	0	0	1	1	1	48	339	664	719	535
2	84.8	0	0	0	0	0	0	1	71	525	686	441
1	92.7	0	0	0	0	0	0	1	26	235	547	336

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	612.9	73.2	358.7	612.9	73.2
2	2207.7	72.0	156.0	634.8	84.0
3	300.2	72.0	147.6	796.0	84.0
4	304.0	72.0	95.6	734.4	96.0
5	438.8	72.0	210.4	438.8	72.0
6	428.7	72.0	254.4	428.7	72.0
7	0.1	72.0	0.1	995.1	72.0
8	133.3	72.0	88.3	837.2	84.0
9	0.1	72.0	0.1	1535.2	84.0
10	33.5	72.0	20.3	1333.1	96.0
11	285.0	73.2	156.8	285.0	73.2
12	0.1	72.0	0.1	1491.7	96.0
13	89.2	72.0	49.9	1474.4	108.0
14	392.2	72.0	159.3	392.2	72.0
15	191.7	72.0	105.0	566.1	72.0
16	336.5	72.0	168.8	654.6	72.0
17	352.8	72.0	176.2	818.7	84.0
18	0.1	72.0	0.1	2002.2	96.0
19	123.1	72.0	66.2	1967.9	108.0
20	305.7	72.0	149.3	305.7	72.0
21	198.0	72.0	105.6	198.0	72.0
22	0.1	72.0	0.1	497.2	72.0
23	35.5	73.2	23.1	382.4	84.0
24	0.1	72.0	0.1	2090.1	108.0
25	165.1	73.2	108.5	2114.4	132.0
26	263.0	73.2	170.8	263.0	73.2
27	174.7	72.0	71.1	174.7	72.0
28	0.1	72.0	0.1	339.0	132.0
29	69.0	72.0	23.8	355.9	108.0
30	0.1	72.0	0.1	2114.4	108.0
31	135.5	72.0	27.6	2114.4	108.0
32	134.6	73.2	116.4	1334.6	108.0
33	219.6	72.0	153.6	883.6	72.0
34	206.4	73.2	123.0	340.9	84.0
35	258.7	72.0	99.7	340.7	72.0
36	0.1	72.0	0.1	314.3	72.0
37	19.9	72.0	10.4	513.1	84.0
38	0.1	72.0	0.1	2073.4	96.0

39	428.4	73.8	317.8	2709.1	108.0
40	130.4	72.0	77.2	2227.9	108.0
41	189.8	73.8	120.4	189.8	73.2
42	0.1	72.0	0.1	2295.1	108.0
43	191.6	72.0	96.0	2287.3	120.0

Surcharge Flow Occurred in Areas
7 8 9 13 18 19 24 25 30 31 36 37
Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas
9 13 18

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
*****************************************
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

2-YEAR 6-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 1.68 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 1.68 inches and 208.1 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.014	0.014	0.1			4.5	0.0	
24.0	0.028	0.028	0.1			4.5	0.0	
36.0	0.042	0.042	0.1			4.5	0.0	
48.0	0.059	0.058	0.1			4.5	0.0	
60.0	0.076	0.074	0.1			4.5	0.0	
72.0	0.093	0.089	0.1			4.5	0.0	
84.0	0.116	0.108	0.1			4.5	0.0	
96.0	0.138	0.127	0.1			4.5	0.0	
108.0	0.160	0.145	0.1			4.5	0.0	
120.0	0.193	0.171	0.1			4.5	0.0	
132.0	0.226	0.195	0.9			6.8	0.0	
144.0	0.259	0.220	3.1			16.5	0.0	
156.0	0.327	0.269	10.0			51.7	0.0	
168.0	0.396	0.316	16.6			123.7	0.0	
180.0	0.464	0.360	21.2			236.8	0.0	
192.0	0.765	0.530	87.7			596.1	0.0	
204.0	1.065	0.671	125.9			1221.3	0.0	
216.0	1.366	0.792	148.2			2016.5	0.0	
228.0	1.410	0.808	70.4			2457.3	0.0	
240.0	1.453	0.824	48.8			2550.8	0.0	
252.0	1.497	0.840	40.8			2533.4	0.0	
264.0	1.523	0.856	31.4			2485.0	0.0	
276.0	1.550	0.871	26.1			2418.9	0.0	
288.0	1.576	0.886	22.9			2403.5	0.0	
300.0	1.596	0.901	18.8			2416.3	0.0	
312.0	1.615	0.916	16.1			2361.5	0.0	
324.0	1.634	0.931	14.3			2012.9	0.0	
336.0	1.650	0.945	12.0			1369.7	0.0	
348.0	1.665	0.960	10.4			850.1	0.0	
360.0	1.680	0.974	9.3			633.3	0.0	
372.0	1.680	0.988	5.4			526.7	0.0	
384.0	1.680	1.001	3.3			437.6	0.0	
396.0	1.680	1.001	2.4			355.9	0.0	
408.0	1.680	1.002	1.8			281.9	0.0	
420.0	1.680	1.002	1.4			217.5	0.0	
432.0	1.680	1.002	1.1			164.8	0.0	
444.0	1.680	1.002	0.9			122.9	0.0	
456.0	1.680	1.002	0.7			92.5	0.0	
468.0	1.680	1.002	0.5			71.1	0.0	
480.0	1.680	1.002	0.4			56.1	0.0	
492.0	1.680	1.002	0.4			45.4	0.0	
504.0	1.680	1.002	0.3			37.4	0.0	
516.0	1.680	1.002	0.3			31.2	0.0	
528.0	1.680	1.002	0.2			26.4	0.0	
540.0	1.680	1.002	0.2			22.6	0.0	
552.0	1.680	1.003	0.2			19.6	0.0	
564.0	1.680	1.003	0.2			17.1	0.0	
576.0	1.680	1.003	0.2			15.1	0.0	

588.0	1.680	1.003	0.2	13.5	0.0
600.0	1.680	1.003	0.2	12.1	0.0
612.0	1.680	1.003	0.2	11.0	0.0
624.0	1.680	1.003	0.1	10.0	0.0
636.0	1.680	1.003	0.1	9.2	0.0
648.0	1.680	1.003	0.1	8.5	0.0
660.0	1.680	1.003	0.1	8.0	0.0
672.0	1.680	1.003	0.1	7.5	0.0
684.0	1.680	1.003	0.1	7.1	0.0
696.0	1.680	1.003	0.1	6.8	0.0
708.0	1.680	1.003	0.1	6.5	0.0
720.0	1.680	1.004	0.1	6.3	0.0

Runoff = 0.65 inches, Runoff Peak = 148.1 cfs Peak Timing = 216.0 min.
Runoff Volume = 148.5 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 180	192	204	216	228	240	252	264	276	288	300
43	0.0	237	596	1221	2017	2457	2551	2533	2485	2419	2403	2416
42	6.1	213	498	1079	1850	2396	2535	2484	2417	2393	2381	2397
41	6.3	18	52	112	160	146	93	71	57	46	38	32
40	6.3	194	444	965	1688	2255	2444	2414	2359	2348	2342	2365
39	8.8	177	379	857	1575	2217	2420	2384	2308	2328	2314	2342
38	18.0	127	248	559	1160	1805	2182	2186	2156	2205	2204	2308
37	18.3	34	57	137	287	411	497	420	249	184	145	118
36	23.4	28	51	78	252	432	543	380	240	186	146	118
35	23.6	11	18	25	97	135	152	69	46	38	28	23
34	23.7	16	33	50	155	298	397	310	192	148	117	94
33	32.2	7	16	25	60	145	203	196	110	80	65	51
32	18.2	92	191	417	869	1396	1690	1771	1902	2023	2059	2188
31	28.5	50	127	245	548	1083	1495	1803	1963	1981	2125	2347
30	36.1	24	83	191	330	828	1469	1987	1965	1963	2274	2461
29	36.3	5	18	32	45	166	291	395	275	187	150	117
28	38.9	5	15	28	40	144	259	354	256	172	138	109
27	39.1	2	6	10	13	48	83	111	75	47	38	29
26	39.1	3	9	18	27	95	176	243	182	125	100	80
25	36.5	19	64	157	283	656	1169	1586	1694	1779	2136	2351
24	47.5	8	29	93	205	353	852	1293	1694	2084	2318	2310
23	47.7	2	6	20	39	57	176	319	405	295	172	130
22	52.6	2	6	19	36	51	162	293	370	269	153	114
21	52.8	1	2	7	14	20	63	117	151	113	65	49
20	52.8	1	4	12	22	31	97	176	219	158	87	65
19	47.9	6	21	71	165	285	673	971	1283	1796	2168	2188
18	60.7	2	7	25	85	188	307	777	1446	2033	2202	2098
17	60.9	1	3	10	36	76	115	307	589	817	707	462
16	69.3	0	1	5	19	46	77	144	361	556	588	373
15	75.8	0	0	2	8	26	46	60	201	330	390	247
14	76.5	0	0	1	6	19	32	40	131	213	241	147
13	61.2	2	4	14	48	111	191	464	848	1283	1503	1640
12	64.9	1	3	12	42	102	180	414	783	1146	1463	1620
11	65.1	0	1	2	8	17	25	79	156	215	177	111
10	65.1	1	3	10	34	85	155	333	626	932	1286	1511
9	74.2	1	1	4	16	53	119	193	470	988	1474	1533
8	74.4	1	1	2	9	29	65	101	242	531	741	690
7	83.2	0	0	1	5	17	50	83	127	440	622	680
6	83.4	0	0	0	2	8	26	44	65	235	337	373
5	83.4	0	0	0	2	8	24	39	57	206	286	314
4	74.4	1	1	2	7	24	54	92	228	456	733	846
3	82.2	1	1	1	3	12	35	70	130	323	588	803
2	90.7	0	0	0	1	5	18	43	74	173	391	609
1	98.6	0	0	0	0	2	7	24	46	67	237	406

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	524.5	216.0	537.7	524.5	216.0
2	232.7	216.0	233.9	702.0	216.0
3	225.8	216.0	222.4	810.6	216.0
4	150.2	216.0	146.9	860.4	228.0
5	322.9	216.0	315.0	322.9	216.0
6	383.1	216.0	376.1	383.1	216.0
7	0.1	216.0	0.1	705.0	216.0
8	137.8	216.0	136.3	777.3	216.0
9	0.1	216.0	0.1	1560.4	216.0
10	34.5	216.0	33.8	1551.2	240.0
11	235.4	216.0	248.9	235.4	216.0
12	0.1	216.0	0.1	1645.8	240.0
13	79.6	216.0	75.5	1652.1	240.0

14	248.2	216.0	232.9	248.2	216.0
15	157.0	216.0	157.3	404.4	216.0
16	255.9	216.0	251.6	636.8	216.0
17	270.7	216.0	265.1	834.7	216.0
18	0.1	216.0	0.1	2211.1	228.0
19	104.1	216.0	104.0	2190.6	252.0
20	232.8	216.0	227.1	232.8	216.0
21	160.9	216.0	161.7	160.9	216.0
22	0.1	216.0	0.1	393.1	216.0
23	39.0	216.0	39.6	407.5	216.0
24	0.1	216.0	0.1	2320.4	252.0
25	156.9	216.0	169.4	2359.6	264.0
26	258.9	216.0	278.2	258.9	216.0
27	117.2	216.0	112.7	117.2	216.0
28	0.1	216.0	0.1	375.1	216.0
29	41.4	216.0	37.5	397.2	216.0
30	0.1	216.0	0.1	2462.3	264.0
31	44.7	216.0	44.1	2427.3	276.0
32	166.1	216.0	192.8	2303.6	288.0
33	231.2	216.0	238.4	231.2	216.0
34	196.6	216.0	206.9	399.0	216.0
35	155.0	216.0	149.8	155.0	216.0
36	0.1	216.0	0.1	550.9	216.0
37	17.7	216.0	16.6	538.1	228.0
38	0.1	216.0	0.1	2407.4	288.0
39	437.4	216.0	496.5	2421.3	228.0
40	117.4	216.0	122.0	2462.7	240.0
41	182.2	216.0	193.2	182.2	216.0
42	0.1	216.0	0.1	2539.9	240.0
43	148.1	216.0	148.5	2550.8	240.0

Surcharge Flow Occurred in Areas
4 9 13 18 19 24 25 30 31 32 34 36 37 38 42
Surcharge Flow above 80 Percent of Channel Capacity Occurred in Areas
9 18

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*       IBM-PC Version, Jan. 1988       *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

2-YEAR 24-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 2.28 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 2.28 inches and 742.8 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
24.0	0.008	0.008	0.1			4.5	0.0	
48.0	0.016	0.016	0.1			4.5	0.0	
72.0	0.024	0.024	0.1			4.5	0.0	
96.0	0.032	0.032	0.1			4.5	0.0	
120.0	0.041	0.041	0.1			4.5	0.0	
144.0	0.050	0.050	0.1			4.5	0.0	
168.0	0.060	0.059	0.1			4.5	0.0	
192.0	0.070	0.068	0.1			4.5	0.0	
216.0	0.080	0.077	0.1			4.5	0.0	
240.0	0.091	0.087	0.1			4.5	0.0	
264.0	0.102	0.097	0.1			4.5	0.0	
288.0	0.114	0.107	0.1			4.5	0.0	
312.0	0.126	0.117	0.1			4.5	0.0	
336.0	0.139	0.128	0.1			4.5	0.0	
360.0	0.153	0.139	0.1			4.5	0.0	
384.0	0.168	0.151	0.1			4.5	0.0	
408.0	0.183	0.163	0.1			4.5	0.0	
432.0	0.200	0.176	0.1			4.5	0.0	
456.0	0.218	0.190	0.4			7.3	0.0	
480.0	0.237	0.204	1.3			17.6	0.0	
504.0	0.258	0.220	2.2			36.7	0.0	
528.0	0.282	0.237	2.9			62.8	0.0	
552.0	0.308	0.255	3.6			92.6	0.0	
576.0	0.337	0.276	4.4			123.8	0.0	
600.0	0.369	0.298	5.2			156.0	0.0	
624.0	0.409	0.325	6.4			193.2	0.0	
648.0	0.458	0.357	8.3			241.7	0.0	
672.0	0.523	0.397	11.5			314.2	0.0	
696.0	0.621	0.454	19.0			449.9	0.0	
720.0	0.784	0.541	32.4			716.3	0.0	
744.0	1.461	0.828	164.8			2058.6	0.0	
768.0	1.707	0.911	72.3			2517.6	0.0	
792.0	1.789	0.937	44.3			2660.3	0.0	
816.0	1.846	0.955	32.6			2609.5	0.0	
840.0	1.892	0.968	25.9			2560.6	0.0	
864.0	1.928	0.979	21.0			2114.1	0.0	
888.0	1.959	0.990	17.4			1325.7	0.0	
912.0	1.987	1.000	14.7			884.5	0.0	
936.0	2.013	1.010	12.6			688.7	0.0	
960.0	2.035	1.021	10.9			576.4	0.0	
984.0	2.055	1.031	9.4			498.8	0.0	
1008.0	2.070	1.041	8.2			424.8	0.0	
1032.0	2.091	1.051	7.2			365.2	0.0	
1056.0	2.107	1.061	6.3			323.4	0.0	
1080.0	2.123	1.070	5.6			285.3	0.0	
1104.0	2.137	1.080	5.0			253.0	0.0	
1128.0	2.150	1.090	4.4			225.2	0.0	
1152.0	2.163	1.099	4.0			201.3	0.0	

1176.0	2.175	1.105	3.6	180.9	0.0
1200.0	2.187	1.113	3.3	163.4	0.0
1224.0	2.198	1.127	3.0	148.3	0.0
1248.0	2.208	1.137	2.7	135.5	0.0
1272.0	2.218	1.146	2.5	124.7	0.0
1296.0	2.228	1.154	2.4	115.9	0.0
1320.0	2.238	1.160	2.3	109.0	0.0
1344.0	2.247	1.165	2.2	103.3	0.0
1368.0	2.255	1.170	2.2	98.7	0.0
1392.0	2.264	1.176	2.1	94.7	0.0
1416.0	2.272	1.181	2.0	91.3	0.0
1440.0	2.280	1.185	2.0	88.2	0.0

Runoff = 1.06 inches, Runoff Peak = 180.2 cfs Peak Timing = 750.0 min.
Runoff Volume = 241.7 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 672	696	720	744	768	792	816	840	864	888	912
43	0.0	314	450	716	2059	2518	2660	2609	2561	2114	1327	884
42	6.6	300	426	675	1845	2519	2589	2546	2555	2070	1334	881
41	6.8	12	18	32	154	139	84	58	44	35	29	24
40	6.8	285	408	642	1688	2382	2505	2488	2511	2036	1305	856
39	9.3	280	394	617	1556	2324	2468	2454	2484	2039	1288	828
38	18.8	242	331	506	1019	2117	2271	2353	2444	2158	1039	726
37	19.2	33	47	76	191	485	398	214	148	114	92	75
36	23.4	31	42	68	127	559	359	208	145	112	90	74
35	23.6	9	13	21	37	171	67	38	27	22	17	14
34	23.6	22	29	47	86	395	291	169	118	91	73	60
33	32.1	12	16	25	42	183	168	92	62	47	38	31
32	19.0	210	284	429	819	1642	1873	2138	2896	2053	940	649
31	29.3	189	248	362	584	1418	1914	2157	2365	1777	970	643
30	37.0	180	233	332	528	1257	1972	2225	2383	1729	932	655
29	37.2	17	23	34	59	235	359	229	148	108	84	68
28	39.8	15	20	30	52	190	354	207	134	99	78	63
27	40.0	5	6	9	16	60	110	56	35	25	19	16
26	40.0	11	14	21	36	129	247	151	100	74	59	47
25	37.4	163	210	296	466	1010	1618	1998	2247	1625	839	588
24	48.2	145	184	246	374	618	1586	2281	2153	1555	780	577
23	48.4	17	22	31	49	85	401	270	147	100	76	61
22	53.3	16	21	29	46	78	356	243	128	86	66	53
21	53.5	7	9	12	18	32	144	103	55	37	29	23
20	53.5	10	12	17	27	46	211	142	73	49	37	30
19	48.6	128	161	215	324	533	1181	2017	2006	1449	708	517
18	61.0	116	145	189	273	439	1195	2012	1846	1267	776	547
17	61.2	36	45	59	87	142	440	672	450	251	165	126
16	69.6	25	31	40	56	91	190	601	331	167	114	89
15	76.1	15	18	24	33	54	88	383	209	102	69	53
14	76.8	9	12	15	21	35	55	235	120	52	36	28
13	61.5	80	100	130	185	295	745	1349	1402	1014	607	421
12	65.2	77	95	123	174	275	634	1335	1426	1013	562	404
11	65.4	8	10	13	20	33	106	225	127	82	61	48
10	65.4	69	85	110	154	242	524	1114	1303	932	498	355
9	73.9	65	79	101	135	208	344	1331	1290	813	511	361
8	74.1	29	36	45	61	96	160	654	555	285	178	133
7	82.9	24	30	38	51	78	130	493	515	233	145	109
6	83.1	13	16	21	28	42	71	265	281	125	78	58
5	83.1	11	13	17	23	36	60	226	239	106	67	51
4	74.1	36	44	56	74	112	184	677	736	528	333	228
3	81.9	30	37	47	63	92	151	506	677	489	298	201
2	90.4	23	28	35	46	65	104	273	619	416	229	157
1	98.3	15	19	23	30	41	65	111	518	288	160	111

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	611.2	750.0	843.2	611.2	750.0
2	272.6	750.0	365.5	665.0	744.0
3	268.2	750.0	348.7	732.4	744.0
4	183.9	750.0	236.3	737.4	768.0
5	382.2	750.0	489.1	382.2	750.0
6	445.7	750.0	573.9	445.7	750.0
7	0.1	750.0	0.1	768.3	744.0
8	168.6	750.0	220.8	899.8	744.0
9	0.1	750.0	0.1	1413.3	744.0
10	46.7	750.0	59.7	1387.4	768.0
11	291.2	750.0	418.5	291.2	750.0
12	0.1	750.0	0.1	1327.0	768.0
13	97.5	750.0	118.7	1523.2	768.0

14	290.4	750.0	349.3	290.4	750.0
15	184.9	750.0	244.6	443.0	744.0
16	300.2	750.0	388.5	628.3	744.0
17	323.0	750.0	413.6	756.7	744.0
18	0.1	750.0	0.1	2083.2	768.0
19	130.2	750.0	171.5	2036.9	768.0
20	281.4	750.0	358.8	281.4	750.0
21	193.8	750.0	258.8	193.8	750.0
22	0.1	750.0	0.1	433.0	744.0
23	53.7	750.0	72.1	406.9	744.0
24	0.1	750.0	0.1	2287.9	768.0
25	189.8	750.0	280.4	2339.4	792.0
26	329.5	750.0	481.4	329.5	750.0
27	150.7	750.0	187.8	150.7	750.0
28	0.1	750.0	0.1	415.0	744.0
29	53.7	750.0	62.0	425.7	744.0
30	0.1	750.0	0.1	2489.8	792.0
31	57.0	750.0	73.8	2411.5	816.0
32	210.5	750.0	345.1	2334.7	840.0
33	279.6	750.0	389.5	279.6	750.0
34	247.6	750.0	350.8	396.3	744.0
35	185.7	750.0	233.1	185.7	750.0
36	0.1	750.0	0.1	564.5	744.0
37	23.3	750.0	28.0	495.9	744.0
38	0.1	750.0	0.1	2443.8	816.0
39	525.0	750.0	829.5	2506.6	840.0
40	145.3	750.0	203.3	2522.5	840.0
41	229.1	750.0	328.1	229.1	750.0
42	0.1	750.0	0.1	2517.3	768.0
43	180.2	750.0	241.7	2660.3	792.0

Surcharge Flow Occurred in Areas
9 13 18 19 24 25 30 31 32 34 36 37 38 39 40 42

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas
9 13 18 30 36

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*       IBM-PC Version, Jan. 1988       *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

5-YEAR 2-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 1.49 INCHES

********** General Watershed Information **********

No. of Subareas = 43 No. of Reservoirs = 0 No. of Obs. Hydrog. = 0

No. of Raingages, recording = 0 nonrecording = 1

Time Interv, min.; Routing 1.2 Printing 12.0 Rainfall 12.0 Total = 480.0
Residual Infiltration Time = 720 min.

Std. Parameters:	Manning n		Depression Storage		SCS CN,		IA	CTS Ratio
	Imp=0.040	Prv=0.200	Imp=0.06	Prv=0.00	97.0	74.0	.10	4.0

Baseflow Coefficient = 0.0005 cfs/ac.
0.04 0.05 0.06 0.10 0.25 0.64 0.15 0.08 0.06 0.05

Hydrographs will be listed for Subareas:
43

Peak Flow Presentations Requested for Subareas:
43

Subarea Properties and Dimensions

I.D. No.	Area ac.	Length ft.	Slope ft/ft	Manning's n Imp.	Manning's n Perv.	Imperv. Fract.	SCS. CN. Imp	SCS. CN. Perv	IA	Coordinates x	Coordinates y
1	673.1	2050.	0.142	0.030	0.150	0.54	97.0	74.0	0.10	6.0	19.2
2	290.6	1790.	0.154	0.030	0.150	0.54	97.0	74.0	0.10	7.0	17.1
3	285.1	1460.	0.181	0.030	0.150	0.51	97.0	74.0	0.10	7.7	15.6
4	217.0	1190.	0.213	0.030	0.150	0.41	97.0	74.0	0.10	8.4	13.9
5	386.2	1310.	0.164	0.030	0.150	0.54	97.0	74.0	0.10	6.2	15.1
6	417.8	1800.	0.199	0.030	0.150	0.62	97.0	74.0	0.10	5.6	12.8
7	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	6.8	13.3
8	205.8	1330.	0.218	0.030	0.150	0.40	97.0	74.0	0.10	7.5	13.4
9	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	8.4	13.1
10	75.9	840.	0.222	0.060	0.150	0.19	97.0	74.0	0.10	8.7	12.7
11	432.4	1710.	0.242	0.045	0.150	0.33	97.0	74.0	0.10	7.5	11.5
12	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.1	12.3
13	104.6	780.	0.222	0.060	0.150	0.44	97.0	74.0	0.10	9.4	12.1
14	237.8	830.	0.119	0.022	0.150	0.68	97.0	74.0	0.10	7.7	19.2
15	193.9	1490.	0.163	0.038	0.150	0.54	97.0	74.0	0.10	8.7	17.8
16	297.7	1500.	0.158	0.030	0.150	0.57	97.0	74.0	0.10	9.1	16.1
17	337.5	1140.	0.162	0.038	0.150	0.51	97.0	74.0	0.10	9.7	13.7
18	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.9	12.0
19	173.2	1070.	0.193	0.045	0.150	0.34	97.0	74.0	0.10	10.6	11.9
20	309.9	990.	0.152	0.038	0.150	0.46	97.0	74.0	0.10	10.8	13.9
21	230.1	1230.	0.144	0.038	0.150	0.44	97.0	74.0	0.10	11.8	13.4
22	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.3	12.5
23	97.0	860.	0.184	0.060	0.150	0.16	97.0	74.0	0.10	11.6	12.1
24	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.4	11.4
25	271.3	1730.	0.163	0.045	0.150	0.38	97.0	74.0	0.10	12.3	11.4
26	543.2	1470.	0.219	0.053	0.150	0.27	97.0	74.0	0.10	9.0	10.5
27	202.7	910.	0.268	0.053	0.150	0.29	97.0	74.0	0.10	10.1	9.7
28	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.2	10.5
29	67.6	640.	0.268	0.053	0.150	0.28	97.0	74.0	0.10	11.4	10.4
30	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.9	10.4

31	78.7	933.	0.190	0.045	0.150	0.30	97.0	74.0	0.10	12.2	10.2
32	406.8	2280.	0.275	0.053	0.150	0.25	97.0	74.0	0.10	12.3	9.5
33	365.7	1370.	0.134	0.038	0.150	0.40	97.0	74.0	0.10	13.6	12.4
34	377.5	1290.	0.189	0.053	0.150	0.30	97.0	74.0	0.10	14.9	10.3
35	189.8	880.	0.128	0.038	0.150	0.51	97.0	74.0	0.10	13.6	10.7
36	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.8	9.7
37	32.1	690.	0.215	0.053	0.150	0.25	97.0	74.0	0.10	14.0	9.5
38	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.6	9.2
39	811.1	2675.	0.235	0.045	0.150	0.38	97.0	74.0	0.10	14.2	8.1
40	206.6	1475.	0.215	0.045	0.150	0.34	97.0	74.0	0.10	14.5	6.5
41	353.4	1510.	0.240	0.053	0.150	0.30	97.0	74.0	0.10	12.6	6.4
42	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.7	5.7
43	225.9	1375.	0.175	0.030	0.150	0.40	97.0	74.0	0.10	14.5	5.7

I.D.	Depr.Storage		Incoming Drainage Elements			Drainage Element		
No.	Imp.	Perv.				Cap.cfs	Tt,min	CTS
1	0.060	0.000	0	0	0	657.0	7.9	4.0
2	0.060	0.000	1	0	0	795.0	8.5	4.0
3	0.060	0.000	2	0	0	1412.0	7.8	4.0
4	0.060	0.000	3	0	0	833.0	0.2	4.0
5	0.060	0.000	0	0	0	875.0	0.2	4.0
6	0.060	0.000	0	0	0	875.0	0.2	4.0
7	0.060	0.000	5	6	0	875.0	8.8	4.0
8	0.060	0.000	7	0	0	833.0	0.2	4.0
9	0.060	0.000	4	8	0	833.0	3.8	4.0
10	0.060	0.000	9	0	0	1740.0	0.2	4.0
11	0.060	0.000	0	0	0	1740.0	0.2	4.0
12	0.060	0.000	10	11	0	1740.0	3.7	4.0
13	0.060	0.000	12	0	0	933.0	0.2	4.0
14	0.060	0.000	0	0	0	1435.0	0.7	4.0
15	0.060	0.000	14	0	0	1435.0	6.5	4.0
16	0.060	0.000	15	0	0	927.0	8.4	4.0
17	0.060	0.000	16	0	0	933.0	6.1	4.0
18	0.060	0.000	13	17	0	933.0	4.7	4.0
19	0.060	0.000	18	0	0	1598.0	0.2	4.0
20	0.060	0.000	0	0	0	831.0	0.2	4.0
21	0.060	0.000	0	0	0	681.0	0.2	4.0
22	0.060	0.000	20	21	0	831.0	4.9	4.0
23	0.060	0.000	22	0	0	1598.0	0.2	4.0
24	0.060	0.000	19	23	0	1598.0	5.7	4.0
25	0.060	0.000	24	0	0	1598.0	0.2	4.0
26	0.060	0.000	0	0	0	574.0	0.2	4.0
27	0.060	0.000	0	0	0	574.0	0.2	4.0
28	0.060	0.000	26	27	0	574.0	2.6	4.0
29	0.060	0.000	28	0	0	1598.0	0.2	4.0
30	0.060	0.000	25	29	0	1598.0	3.7	4.0
31	0.060	0.000	30	0	0	1658.0	5.3	4.0
32	0.060	0.000	31	0	0	2300.0	0.2	4.0
33	0.060	0.000	0	0	0	581.0	8.5	4.0
34	0.060	0.000	33	0	0	375.0	0.2	4.0
35	0.060	0.000	0	0	0	375.0	0.2	4.0
36	0.060	0.000	34	35	0	375.0	2.6	4.0
37	0.060	0.000	36	0	0	375.0	0.2	4.0
38	0.060	0.000	32	37	0	2300.0	8.1	4.0
39	0.060	0.000	38	0	0	2500.0	2.5	4.0
40	0.060	0.000	39	0	0	2500.0	0.2	4.0
41	0.060	0.000	0	0	0	506.0	0.2	4.0
42	0.060	0.000	40	41	0	2500.0	5.8	4.0
43	0.060	0.000	42	0	0	9999.0	0.0	4.0

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 1.49 inches and 68.8 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.043	0.043	0.1			4.5	0.0	
24.0	0.096	0.091	0.1			4.5	0.0	
36.0	0.159	0.143	0.1			4.5	0.0	
48.0	0.263	0.222	3.9			15.1	0.0	
60.0	0.512	0.388	49.9			171.3	0.0	
72.0	1.151	0.703	235.7			1026.9	0.0	
84.0	1.302	0.763	117.8			1821.4	0.0	
96.0	1.379	0.792	71.7			2357.2	0.0	
108.0	1.438	0.816	53.4			2557.0	0.0	
120.0	1.486	0.840	42.4			2567.5	0.0	
132.0	1.486	0.863	21.7			2497.6	0.0	
144.0	1.486	0.886	11.3			2314.9	0.0	
156.0	1.486	0.908	5.8			2249.5	0.0	
168.0	1.486	0.927	3.3			2274.0	0.0	
180.0	1.486	0.928	2.3			2242.8	0.0	
192.0	1.486	0.928	1.7			1835.8	0.0	
204.0	1.486	0.928	1.3			1057.0	0.0	
216.0	1.486	0.928	1.0			422.4	0.0	
228.0	1.486	0.928	0.8			177.1	0.0	
240.0	1.486	0.928	0.6			109.2	0.0	
252.0	1.486	0.929	0.4			79.5	0.0	
264.0	1.486	0.929	0.3			60.7	0.0	
276.0	1.486	0.929	0.3			47.9	0.0	
288.0	1.486	0.929	0.2			38.6	0.0	
300.0	1.486	0.929	0.2			31.6	0.0	
312.0	1.486	0.929	0.2			26.2	0.0	
324.0	1.486	0.930	0.2			21.9	0.0	
336.0	1.486	0.930	0.2			18.6	0.0	
348.0	1.486	0.930	0.1			16.0	0.0	
360.0	1.486	0.930	0.1			13.8	0.0	
372.0	1.486	0.930	0.1			12.1	0.0	
384.0	1.486	0.930	0.1			10.7	0.0	
396.0	1.486	0.930	0.1			9.5	0.0	
408.0	1.486	0.931	0.1			8.6	0.0	
420.0	1.486	0.931	0.1			7.8	0.0	
432.0	1.486	0.931	0.1			7.2	0.0	
444.0	1.486	0.931	0.1			6.8	0.0	
456.0	1.486	0.931	0.1			6.4	0.0	
468.0	1.486	0.931	0.1			6.1	0.0	
480.0	1.486	0.931	0.1			5.8	0.0	

Runoff = 0.53 inches, Runoff Peak = 235.6 cfs Peak Timing = 72.0 min.
Runoff Volume = 120.8 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 60	72	84	96	108	120	132	144	156	168	180
43	0.0	171	1027	1821	2357	2557	2567	2498	2315	2250	2274	2243
42	6.4	112	737	1668	2289	2570	2518	2399	2308	2245	2267	2247
41	6.6	21	132	204	135	96	74	52	28	15	8	5
40	6.6	89	596	1467	2156	2478	2445	2346	2280	2229	2258	2243
39	9.1	56	416	1343	2111	2484	2411	2300	2272	2210	2241	2275
38	18.6	11	125	724	1695	2235	2212	2146	2180	2137	2194	2360
37	19.1	3	47	217	495	618	449	257	184	115	64	35
36	25.0	0	8	113	608	591	387	265	201	128	70	38
35	25.2	0	4	51	235	134	76	53	41	21	11	6
34	25.3	0	4	62	370	460	309	212	161	107	60	33
33	33.8	0	1	15	114	313	183	118	88	66	37	21
32	18.9	7	74	491	1201	1631	1765	1881	1999	2024	2129	2327
31	30.0	3	10	114	688	1377	1748	1938	1970	2065	2323	2547
30	38.0	3	3	18	232	1262	1880	1955	1952	2174	2502	2615
29	38.2	0	0	5	71	401	406	284	206	159	100	52
28	40.8	0	0	4	57	335	392	259	188	147	95	50
27	41.0	0	0	2	21	113	125	74	52	40	24	10
26	41.0	0	0	0	35	220	271	184	135	106	71	39
25	38.4	3	3	12	157	843	1465	1674	1749	2021	2414	2569
24	50.7	6	8	2	17	222	1047	1572	1913	2346	2561	2393
23	50.9	9	0	0	5	68	371	471	319	203	149	98
22	55.8	0	0	0	4	51	296	511	277	175	130	91
21	56.0	0	0	0	1	19	113	208	116	74	56	40
20	56.0	0	0	0	2	31	179	311	159	100	75	52
19	51.1	0	2	2	12	150	662	1097	1589	2156	2424	2293
18	64.6	0	0	2	2	13	169	928	1819	2329	2422	2139

17	72.0	0	0	1	1	1	11	152	706	1005	748	488
16	80.4	0	0	0	0	0	4	60	363	787	619	335
15	86.9	0	0	0	0	0	0	11	126	559	407	211
14	87.6	0	0	0	0	0	0	8	89	362	257	115
13	65.0	0	0	2	2	9	113	588	1109	1488	1701	1665
12	68.7	0	0	1	1	6	73	433	1080	1424	1728	1659
11	68.9	0	0	0	0	1	18	126	293	186	126	97
10	68.9	0	0	1	1	4	52	300	793	1237	1607	1565
9	78.7	0	0	0	1	1	8	110	646	1424	1648	1475
8	78.9	0	0	0	1	1	4	59	340	747	773	598
7	93.8	0	0	0	0	0	0	4	59	405	1032	535
6	94.0	0	0	0	0	0	0	2	29	208	564	293
5	94.0	0	0	0	0	0	0	2	27	197	488	237
4	78.9	0	0	0	1	1	4	49	295	680	886	875
3	86.7	0	0	0	0	1	1	7	95	532	835	839
2	95.2	0	0	0	0	0	0	1	16	160	683	771
1	106.6	0	0	0	0	0	0	0	1	26	218	732

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	768.4	72.0	444.8	768.4	72.0
2	357.5	72.0	193.7	785.0	84.0
3	367.8	72.0	183.9	888.7	84.0
4	248.2	72.0	120.4	934.5	96.0
5	535.5	72.0	261.6	535.5	72.0
6	614.1	72.0	314.4	614.1	72.0
7	0.2	72.0	0.1	1135.0	72.0
8	224.0	72.0	111.3	902.9	84.0
9	0.2	72.0	0.1	1739.1	84.0
10	43.7	72.0	26.8	1608.0	96.0
11	323.2	72.0	199.3	323.2	72.0
12	0.2	72.0	0.1	1735.4	96.0
13	123.1	72.0	62.7	1743.8	108.0
14	464.1	72.0	196.6	464.1	72.0
15	238.7	72.0	130.4	683.0	72.0
16	413.5	72.0	209.3	814.0	72.0
17	433.9	72.0	219.7	1005.1	84.0
18	0.2	72.0	0.1	2460.4	96.0
19	154.0	72.0	84.3	2465.5	120.0
20	375.1	72.0	187.4	375.1	72.0
21	246.1	72.0	132.4	246.1	72.0
22	0.2	72.0	0.1	613.5	72.0
23	46.9	73.2	30.8	473.4	84.0
24	0.2	72.0	0.1	2593.5	120.0
25	209.8	73.2	136.6	2587.0	144.0
26	337.4	73.2	219.7	337.4	73.2
27	169.5	72.0	91.5	169.5	72.0
28	0.2	72.0	0.1	498.9	72.0
29	61.4	72.0	30.9	471.8	72.0
30	0.2	72.0	0.1	2626.2	144.0
31	65.7	72.0	35.6	2611.7	156.0
32	201.6	73.2	149.8	2428.5	168.0
33	338.3	72.0	193.5	338.3	72.0
34	262.9	73.2	165.1	466.6	84.0
35	255.0	72.0	124.5	255.0	72.0
36	0.2	72.0	0.1	652.0	72.0
37	25.2	72.0	13.5	657.0	84.0
38	0.2	72.0	0.1	2443.8	168.0
39	551.4	73.2	399.2	2496.3	96.0
40	165.1	72.0	98.1	2506.0	108.0
41	242.1	73.2	153.9	242.1	73.2
42	0.2	72.0	0.1	2587.3	108.0
43	235.6	72.0	120.8	2567.5	120.0

Surcharge Flow Occurred in Areas
1 4 7 8 9 13 17 18 19 24 25 30 31 32 34 36
37 38 40 42

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas
9 13 18 19 24 25 30 31 36 37

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*      G. Aron, Dept. of Civil Engr.    *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*           Std. SCS or PDT-IDF Storms  *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

5-YEAR 6-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 1.98 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 1.98 inches and 208.0 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.017	0.017	0.1			4.5	0.0	
24.0	0.034	0.034	0.1			4.5	0.0	
36.0	0.050	0.050	0.1			4.5	0.0	
48.0	0.071	0.069	0.1			4.5	0.0	
60.0	0.092	0.088	0.1			4.5	0.0	
72.0	0.113	0.106	0.1			4.5	0.0	
84.0	0.140	0.128	0.1			4.5	0.0	
96.0	0.167	0.150	0.1			4.5	0.0	
108.0	0.194	0.171	0.1			4.5	0.0	
120.0	0.234	0.201	1.4			8.2	0.0	
132.0	0.274	0.231	4.4			22.4	0.0	
144.0	0.314	0.259	7.6			53.1	0.0	
156.0	0.395	0.315	16.8			124.4	0.0	
168.0	0.476	0.368	23.9			243.7	0.0	
180.0	0.557	0.417	28.4			407.6	0.0	
192.0	0.904	0.598	111.0			871.3	0.0	
204.0	1.250	0.747	155.6			1622.6	0.0	
216.0	1.597	0.873	183.9			2379.9	0.0	
228.0	1.650	0.891	89.0			2603.3	0.0	
240.0	1.703	0.908	63.3			2780.8	0.0	
252.0	1.756	0.925	53.7			2803.3	0.0	
264.0	1.788	0.940	41.8			2824.8	0.0	
276.0	1.820	0.954	35.2			2753.3	0.0	
288.0	1.853	0.968	31.4			2756.5	0.0	
300.0	1.876	0.982	26.0			2758.5	0.0	
312.0	1.900	0.996	22.6			2722.8	0.0	
324.0	1.923	1.010	20.3			2725.0	0.0	
336.0	1.942	1.024	17.2			2744.7	0.0	
348.0	1.960	1.037	15.2			2451.5	0.0	
360.0	1.979	1.050	13.7			1682.3	0.0	
372.0	1.979	1.064	8.2			791.2	0.0	
384.0	1.979	1.076	4.9			616.6	0.0	
396.0	1.979	1.089	2.9			498.7	0.0	
408.0	1.979	1.097	2.0			389.0	0.0	
420.0	1.979	1.097	1.5			292.2	0.0	
432.0	1.979	1.097	1.2			213.3	0.0	
444.0	1.979	1.097	1.0			154.1	0.0	
456.0	1.979	1.097	0.8			112.4	0.0	
468.0	1.979	1.097	0.6			83.8	0.0	
480.0	1.979	1.097	0.5			64.5	0.0	
492.0	1.979	1.097	0.4			51.1	0.0	
504.0	1.979	1.097	0.3			41.6	0.0	
516.0	1.979	1.097	0.3			34.6	0.0	
528.0	1.979	1.097	0.3			29.2	0.0	
540.0	1.979	1.097	0.2			25.0	0.0	
552.0	1.979	1.098	0.2			21.7	0.0	
564.0	1.979	1.098	0.2			18.9	0.0	
576.0	1.979	1.098	0.2			16.7	0.0	

588.0	1.979	1.098	0.2	14.9	0.0
600.0	1.979	1.098	0.2	13.4	0.0
612.0	1.979	1.098	0.2	12.2	0.0
624.0	1.979	1.098	0.2	11.2	0.0
636.0	1.979	1.098	0.2	10.3	0.0
648.0	1.979	1.098	0.1	9.5	0.0
660.0	1.979	1.098	0.1	8.9	0.0
672.0	1.979	1.098	0.1	8.4	0.0
684.0	1.979	1.098	0.1	7.9	0.0
696.0	1.979	1.098	0.1	7.5	0.0
708.0	1.979	1.098	0.1	7.2	0.0
720.0	1.979	1.098	0.1	6.9	0.0

Runoff = 0.86 inches, Runoff Peak = 183.8 cfs Peak Timing = 216.0 min.
Runoff Volume = 194.8 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 204	216	228	240	252	264	276	288	300	312	324
43	0.0	1623	2380	2603	2781	2803	2825	2753	2757	2758	2723	2725
42	8.4	1287	2126	2725	2759	2767	2720	2728	2724	2701	2708	2764
41	8.6	132	196	207	128	97	80	64	54	46	39	33
40	8.7	1147	1924	2528	2636	2673	2636	2665	2671	2653	2670	2731
39	12.4	944	1726	2486	2638	2573	2612	2652	2617	2641	2635	2801
38	26.6	469	966	1641	2238	2471	2462	2513	2497	2596	2852	3045
37	27.1	91	233	370	535	649	496	309	224	180	152	129
36	33.2	82	149	367	572	642	450	296	232	186	153	132
35	33.4	27	50	130	170	168	80	56	46	35	30	26
34	33.6	55	95	234	403	484	367	238	187	150	124	106
33	42.1	28	38	100	198	262	221	131	100	81	65	56
32	27.0	376	723	1262	1702	1827	1962	2199	2273	2420	2711	2926
31	39.2	260	421	817	1344	1725	2076	2166	2279	2583	2858	2921
30	48.0	186	338	513	1094	1801	2244	2113	2361	2756	2959	2894
29	48.2	32	50	63	220	380	515	358	246	199	157	128
28	50.8	28	44	57	192	338	461	332	227	184	146	119
27	51.0	10	15	18	63	108	144	97	62	49	38	30
26	51.0	18	29	39	127	230	317	236	165	134	108	89
25	48.4	152	285	445	864	1410	1732	1754	2126	2571	2809	2765
24	61.3	83	179	323	481	975	1438	1950	2436	2735	2739	2572
23	61.5	16	34	56	73	204	376	495	390	239	175	138
22	66.4	15	31	52	68	174	346	446	371	204	151	121
21	66.6	6	12	20	27	69	139	182	155	86	65	52
20	66.6	9	19	32	41	104	208	264	219	116	86	69
19	61.8	66	144	265	406	763	1057	1447	2058	2510	2567	2431
18	75.4	30	73	156	283	424	894	1573	2282	2545	2495	2317
17	75.7	13	30	62	108	152	337	651	937	897	632	400
16	84.1	5	17	33	67	104	129	391	649	768	504	274
15	90.6	2	10	20	37	62	78	195	378	459	362	176
14	91.3	2	7	14	26	42	51	122	246	283	220	90
13	76.0	17	42	92	172	269	544	914	1353	1659	1869	1921
12	81.1	11	33	74	147	243	418	811	1177	1659	1965	1903
11	81.3	2	6	12	23	34	65	170	250	271	161	120
10	81.4	9	27	62	123	209	347	641	922	1389	1811	1792
9	91.6	3	14	38	82	156	247	447	945	1569	1884	1649
8	91.8	2	7	21	44	82	127	221	488	812	900	674
7	100.6	0	4	15	30	64	104	133	385	668	812	572
6	100.8	0	2	8	16	34	55	72	205	361	439	313
5	100.8	0	2	7	15	30	49	61	178	309	373	262
4	91.9	2	6	17	37	73	119	219	449	758	998	979
3	99.7	1	3	10	23	51	93	138	305	593	892	915
2	110.0	0	0	3	11	24	51	91	126	321	617	825
1	117.9	0	0	1	5	14	27	56	83	146	396	559

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	636.8	216.0	687.0	636.8	216.0
2	282.2	216.0	298.9	857.3	216.0
3	275.0	216.0	285.5	981.7	216.0
4	186.8	216.0	192.1	1032.9	228.0
5	391.8	216.0	402.3	391.8	216.0
6	460.6	216.0	475.1	460.6	216.0
7	0.1	216.0	0.1	851.3	216.0
8	171.5	216.0	178.7	948.1	216.0
9	0.1	216.0	0.1	1905.6	216.0
10	46.9	216.0	47.3	1883.3	240.0
11	299.1	216.0	332.8	299.1	216.0
12	0.1	216.0	0.1	2002.7	240.0
13	99.5	216.0	98.0	1935.4	240.0

14	296.2	216.0	291.9	296.2	216.0
15	191.3	216.0	201.0	486.5	216.0
16	309.2	216.0	320.0	768.7	216.0
17	331.2	216.0	340.2	1017.5	216.0
18	0.1	216.0	0.1	2569.3	228.0
19	132.5	216.0	138.4	2571.4	240.0
20	287.3	216.0	294.0	287.3	216.0
21	198.9	216.0	210.2	198.9	216.0
22	0.1	216.0	0.1	485.4	216.0
23	53.9	216.0	56.4	509.1	216.0
24	0.1	216.0	0.1	2765.6	240.0
25	197.0	216.0	223.6	2817.3	264.0
26	336.8	216.0	379.2	336.8	216.0
27	152.3	216.0	151.8	152.3	216.0
28	0.1	216.0	0.1	497.7	216.0
29	54.1	216.0	50.5	516.3	216.0
30	0.1	216.0	0.1	2959.0	264.0
31	57.7	216.0	59.3	2923.0	276.0
32	217.1	216.0	265.6	2970.1	300.0
33	287.7	216.0	313.0	287.7	216.0
34	253.3	216.0	279.0	505.6	216.0
35	189.8	216.0	192.8	189.8	216.0
36	0.1	216.0	0.1	636.6	216.0
37	23.4	216.0	22.6	672.6	228.0
38	0.1	216.0	0.1	3081.6	300.0
39	550.4	216.0	655.4	2978.3	324.0
40	148.8	216.0	162.6	2914.0	336.0
41	234.7	216.0	260.5	234.7	216.0
42	0.1	216.0	0.1	2935.5	336.0
43	183.8	216.0	194.6	2824.8	264.0

Surcharge Flow Occurred in Areas

2 4 8 9 10 12 13 17 18 19 24 25 30 31 32 34
36 37 38 39 40 42

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

9 13 18 19 24 25 30 31 36 37

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

5-YEAR 24-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 2.69 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 2.69 inches and 742.6 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
24.0	0.009	0.009	0.1			4.5	0.0	
48.0	0.018	0.018	0.1			4.5	0.0	
72.0	0.028	0.028	0.1			4.5	0.0	
96.0	0.038	0.038	0.1			4.5	0.0	
120.0	0.048	0.048	0.1			4.5	0.0	
144.0	0.059	0.058	0.1			4.5	0.0	
168.0	0.070	0.068	0.1			4.5	0.0	
192.0	0.082	0.079	0.1			4.5	0.0	
216.0	0.094	0.089	0.1			4.5	0.0	
240.0	0.106	0.100	0.1			4.5	0.0	
264.0	0.119	0.112	0.1			4.5	0.0	
288.0	0.133	0.123	0.1			4.5	0.0	
312.0	0.148	0.135	0.1			4.5	0.0	
336.0	0.163	0.147	0.1			4.5	0.0	
360.0	0.180	0.160	0.1			4.5	0.0	
384.0	0.197	0.174	0.1			4.5	0.0	
408.0	0.216	0.188	0.3			6.6	0.0	
432.0	0.236	0.203	1.3			16.2	0.0	
456.0	0.257	0.219	2.1			35.0	0.0	
480.0	0.280	0.235	2.8			60.8	0.0	
504.0	0.305	0.254	3.5			90.0	0.0	
528.0	0.333	0.273	4.2			120.2	0.0	
552.0	0.364	0.295	5.0			150.9	0.0	
576.0	0.399	0.319	5.8			182.8	0.0	
600.0	0.439	0.345	6.7			217.3	0.0	
624.0	0.487	0.375	8.4			260.5	0.0	
648.0	0.547	0.412	10.8			321.1	0.0	
672.0	0.625	0.457	15.1			416.0	0.0	
696.0	0.745	0.521	25.4			599.0	0.0	
720.0	0.943	0.619	43.0			958.6	0.0	
744.0	1.721	0.915	206.1			2352.1	0.0	
768.0	2.005	1.001	91.6			2783.2	0.0	
792.0	2.102	1.028	56.4			2868.7	0.0	
816.0	2.172	1.047	41.4			2872.8	0.0	
840.0	2.227	1.061	32.6			2937.4	0.0	
864.0	2.270	1.072	26.2			3050.1	0.0	
888.0	2.308	1.083	21.9			2848.4	0.0	
912.0	2.342	1.092	18.6			1353.3	0.0	
936.0	2.372	1.102	16.1			890.7	0.0	
960.0	2.399	1.111	14.0			732.4	0.0	
984.0	2.423	1.121	12.2			629.4	0.0	
1008.0	2.446	1.130	10.7			547.5	0.0	
1032.0	2.466	1.139	9.5			480.2	0.0	
1056.0	2.486	1.149	8.5			424.5	0.0	
1080.0	2.504	1.158	7.7			378.1	0.0	
1104.0	2.521	1.167	6.9			338.6	0.0	
1128.0	2.537	1.175	6.2			304.3	0.0	
1152.0	2.552	1.184	5.6			274.6	0.0	

1176.0	2.566	1.193	5.1	248.8	0.0
1200.0	2.580	1.202	4.7	226.4	0.0
1224.0	2.593	1.210	4.2	206.6	0.0
1248.0	2.605	1.219	3.9	189.0	0.0
1272.0	2.617	1.227	3.6	173.4	0.0
1296.0	2.629	1.236	3.3	159.5	0.0
1320.0	2.640	1.244	3.1	147.4	0.0
1344.0	2.650	1.252	2.8	136.5	0.0
1368.0	2.660	1.260	2.6	127.0	0.0
1392.0	2.670	1.268	2.5	118.7	0.0
1416.0	2.679	1.277	2.3	111.5	0.0
1440.0	2.689	1.284	2.3	105.7	0.0

Runoff = 1.37 inches, Runoff Peak = 225.4 cfs Peak Timing = 750.0 min.
Runoff Volume = 312.2 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 744	768	792	816	840	864	888	912	936	960	984
43	0.0	2352	2783	2869	2873	2937	3050	2848	1353	891	732	629
42	9.2	2046	2764	2822	2873	2975	3071	2522	1488	911	736	630
41	9.4	178	192	115	77	58	45	37	31	26	23	20
40	9.5	1857	2578	2711	2798	2920	3028	2485	1457	883	713	611
39	13.4	1613	2527	2677	2777	2924	3031	2495	1400	850	703	604
38	27.6	916	2088	2538	2730	2905	3058	2330	1192	805	663	567
37	28.0	142	500	581	365	219	159	125	102	86	73	63
36	34.3	127	473	570	349	219	160	126	102	85	73	63
35	34.5	38	139	139	63	40	30	24	19	16	14	12
34	34.7	89	331	434	285	179	130	102	83	69	59	51
33	43.2	44	116	285	144	91	67	53	43	36	30	26
32	28.0	772	1583	1958	2364	2692	2904	2199	1094	720	591	504
31	40.2	628	1156	1948	2400	2727	2769	2038	1071	713	585	497
30	49.1	533	880	2134	2357	2974	2791	1887	1000	727	596	505
29	49.3	59	107	539	369	224	155	118	94	77	65	56
28	51.7	53	95	478	344	208	144	110	87	72	61	52
27	51.9	17	30	151	97	53	36	27	22	18	15	13
26	51.9	36	66	326	248	154	108	83	66	54	46	39
25	49.5	471	769	1586	1993	2761	2635	1757	912	651	532	451
24	62.4	394	628	1236	2211	2685	2362	1669	983	662	535	450
23	62.6	51	85	272	444	275	159	112	87	70	58	50
22	67.5	45	76	194	481	217	131	95	75	60	50	43
21	67.7	18	31	78	198	93	57	42	33	26	22	19
20	67.7	27	45	114	288	123	74	54	42	34	28	24
19	52.8	341	539	955	1767	2429	2204	1554	894	591	478	401
18	76.2	275	419	686	2053	2448	2091	1355	654	619	493	410
17	76.4	96	134	221	801	734	430	256	193	143	117	98
16	84.8	59	89	146	454	604	323	179	129	101	83	69
15	91.3	33	51	85	202	469	177	104	76	60	49	41
14	98.0	20	32	54	119	294	88	53	40	32	26	22
13	76.7	193	293	463	1250	1721	1663	1093	672	477	377	312
12	81.2	175	266	433	1104	1713	1633	1090	656	464	369	305
11	91.4	20	31	55	227	240	140	94	71	57	46	39
10	91.4	159	234	378	874	1475	1496	997	584	407	322	266
9	91.0	144	203	321	725	1674	1450	907	574	417	328	270
8	91.2	65	92	148	340	793	604	320	201	154	124	103
7	101.6	52	71	113	189	763	502	249	166	128	102	84
6	101.8	28	39	61	102	409	272	133	88	68	54	45
5	101.8	23	32	52	86	353	233	115	78	60	48	40
4	91.2	80	110	172	377	892	849	585	372	262	204	167
3	99.0	65	89	136	225	907	794	520	321	229	179	147
2	107.6	48	65	97	160	508	685	443	259	183	144	118
1	118.3	32	41	58	93	189	659	306	181	132	105	85

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	744.8	750.0	1068.3	744.8	750.0
2	332.0	750.0	462.7	739.2	744.0
3	318.2	750.0	442.6	883.3	744.0
4	219.9	750.0	304.3	902.9	768.0
5	445.7	750.0	618.0	1463.7	750.0
6	507.2	750.0	718.6	1527.2	750.0
7	0.1	750.0	0.1	833.5	744.0
8	211.1	750.0	285.1	834.0	744.0
9	0.1	750.0	0.1	1701.1	744.0
10	63.0	750.0	80.8	1694.1	768.0
11	373.5	750.0	548.9	373.5	750.0
12	0.1	750.0	0.1	1862.5	768.0
13	122.0	750.0	151.8	1791.1	768.0

16	246.6	750.0	434.0	246.6	750.0
17	826.1	750.0	309.3	824.9	744.0
18	354.1	750.0	489.3	763.3	744.0
19	396.7	750.0	524.6	928.3	744.0
19	0.1	750.0	0.1	2471.5	768.0
19	166.6	750.0	223.9	2437.5	768.0
20	349.0	750.0	458.3	349.0	750.0
21	241.2	750.0	332.0	241.2	750.0
22	0.1	750.0	0.1	538.6	744.0
23	73.8	750.0	98.6	514.1	744.0
24	0.1	750.0	0.1	2744.1	768.0
25	240.2	750.0	364.6	2810.8	792.0
26	432.3	750.0	640.0	432.3	750.0
27	195.6	750.0	247.3	195.6	750.0
28	0.1	750.0	0.1	545.0	744.0
29	69.6	750.0	81.7	563.1	744.0
30	0.1	750.0	0.1	3001.7	792.0
31	73.7	750.0	97.0	2930.9	816.0
32	278.3	750.0	463.1	2325.7	840.0
33	350.7	750.0	503.8	350.7	750.0
34	321.5	750.0	462.8	509.5	744.0
35	228.1	750.0	295.5	228.1	750.0
36	0.1	750.0	0.1	713.7	744.0
37	30.6	750.0	37.2	582.9	768.0
38	0.1	750.0	0.1	3080.1	840.0
39	665.0	750.0	1081.0	3066.5	864.0
40	195.8	750.0	265.9	3083.9	864.0
41	297.6	750.0	432.9	297.6	750.0
42	0.1	750.0	0.1	3102.2	864.0
43	225.4	750.0	312.2	3050.1	864.0

Surcharge Flow Occurred in Areas
1 2 4 7 9 12 13 18 19 24 25 30 31 32 34 36
37 38 39 40 42
Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas
9 13 18 19 24 25 30 31 36 37

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

10-YEAR 2-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 1.75 INCHES

********** General Watershed Information **********

No. of Subareas = 43 No. of Reservoirs = 0 No. of Obs. Hydrog. = 0

No. of Raingages, recording = 0 nonrecording = 1

Time Interv, min.; Routing 1.2 Printing 12.0 Rainfall 12.0 Total = 480.0
Residual Infiltration Time = 1080 min.

Std. Parameters:	Manning n		Depression Storage		SCS CN,		IA	CTS Ratio
	Imp=0.040	Prv=0.200	Imp=0.06	Prv=0.00	97.0	74.0	.10	4.0

Baseflow Coefficient = 0.0005 cfs/ac.
0.05 0.07 0.09 0.12 0.29 0.72 0.18 0.09 0.08 0.06

Hydrographs will be listed for Subareas:
43

Peak Flow Presentations Requested for Subareas:
43

Subarea Properties and Dimensions

I.D. No.	Area ac.	Length ft.	Slope ft/ft	Manning's n Imp.	Manning's n Perv.	Imperv. Fract.	SCS. CN. Imp	SCS. CN. Perv	IA	Coordinates x	Coordinates y
1	673.1	2050.	0.142	0.030	0.150	0.54	97.0	74.0	0.10	6.0	19.2
2	290.6	1790.	0.154	0.030	0.150	0.54	97.0	74.0	0.10	7.0	17.1
3	285.1	1460.	0.181	0.030	0.150	0.51	97.0	74.0	0.10	7.7	15.6
4	217.0	1190.	0.213	0.030	0.150	0.41	97.0	74.0	0.10	8.4	13.9
5	386.2	1310.	0.164	0.030	0.150	0.54	97.0	74.0	0.10	6.2	15.1
6	417.8	1800.	0.199	0.030	0.150	0.62	97.0	74.0	0.10	5.6	12.8
7	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	6.8	13.3
8	205.8	1330.	0.218	0.030	0.150	0.40	97.0	74.0	0.10	7.5	13.4
9	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	8.4	13.1
10	75.9	840.	0.222	0.060	0.150	0.19	97.0	74.0	0.10	8.7	12.7
11	432.4	1710.	0.242	0.045	0.150	0.33	97.0	74.0	0.10	7.5	11.5
12	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.1	12.3
13	104.6	780.	0.222	0.060	0.150	0.44	97.0	74.0	0.10	9.4	12.1
14	237.8	830.	0.119	0.022	0.150	0.68	97.0	74.0	0.10	7.7	19.2
15	193.9	1490.	0.163	0.038	0.150	0.54	97.0	74.0	0.10	8.7	17.8
16	297.7	1500.	0.158	0.030	0.150	0.57	97.0	74.0	0.10	9.1	16.1
17	337.5	1140.	0.162	0.038	0.150	0.51	97.0	74.0	0.10	9.7	13.7
18	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.9	12.0
19	173.2	1070.	0.193	0.045	0.150	0.34	97.0	74.0	0.10	10.6	11.9
20	369.9	990.	0.152	0.038	0.150	0.46	97.0	74.0	0.10	10.8	13.9
21	230.1	1230.	0.144	0.038	0.150	0.44	97.0	74.0	0.10	11.8	13.4
22	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.3	12.5
23	97.0	860.	0.184	0.060	0.150	0.16	97.0	74.0	0.10	11.6	12.1
24	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.4	11.4
25	271.3	1730.	0.163	0.045	0.150	0.28	97.0	74.0	0.10	12.3	11.4
26	543.2	1470.	0.219	0.053	0.150	0.27	97.0	74.0	0.10	9.0	10.5
27	202.7	910.	0.269	0.053	0.150	0.29	97.0	74.0	0.10	10.1	9.7
28	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.2	10.5
29	67.6	640.	0.269	0.053	0.150	0.28	97.0	74.0	0.10	11.4	10.4
30	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.9	10.4

31	79.7	983.	0.190	0.045	0.150	0.30	97.0	74.0	0.10	12.2	10.2
32	406.8	2280.	0.275	0.053	0.150	0.25	97.0	74.0	0.10	12.3	9.5
33	365.7	1370.	0.134	0.038	0.150	0.40	97.0	74.0	0.10	13.6	12.4
34	377.5	1290.	0.189	0.053	0.150	0.30	97.0	74.0	0.10	14.9	10.3
35	199.8	890.	0.128	0.038	0.150	0.51	97.0	74.0	0.10	13.6	10.7
36	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.8	9.7
37	32.1	690.	0.215	0.053	0.150	0.25	97.0	74.0	0.10	14.0	9.5
38	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.6	9.2
39	811.1	2675.	0.235	0.045	0.150	0.38	97.0	74.0	0.10	14.2	8.1
40	206.6	1475.	0.215	0.045	0.150	0.34	97.0	74.0	0.10	14.5	6.5
41	353.4	1510.	0.240	0.053	0.150	0.30	97.0	74.0	0.10	12.6	6.4
42	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.7	5.7
43	223.9	1375.	0.175	0.020	0.150	0.40	97.0	74.0	0.10	14.5	5.7

I.D. No.	Depr. Imp.	Storage Perv.	Incoming Drainage Elements			Drainage Element Cap,cfs	Tt,min	CTS
1	0.060	0.000	0	0	0	657.0	7.9	4.0
2	0.060	0.000	1	0	0	795.0	8.5	4.0
3	0.060	0.000	2	0	0	1412.0	7.8	4.0
4	0.060	0.000	3	0	0	833.0	0.2	4.0
5	0.060	0.000	0	0	0	875.0	0.2	4.0
6	0.060	0.000	0	0	0	975.0	0.2	4.0
7	0.060	0.000	5	6	0	875.0	8.8	4.0
8	0.060	0.000	7	0	0	833.0	0.2	4.0
9	0.060	0.000	4	8	0	833.0	3.8	4.0
10	0.060	0.000	9	0	0	1740.0	0.2	4.0
11	0.060	0.000	0	0	0	1740.0	0.2	4.0
12	0.060	0.000	10	11	0	1740.0	3.7	4.0
13	0.060	0.000	12	0	0	933.0	0.2	4.0
14	0.060	0.000	0	0	0	1435.0	0.7	4.0
15	0.060	0.000	14	0	0	1435.0	6.5	4.0
16	0.060	0.000	15	0	0	927.0	8.4	4.0
17	0.060	0.000	16	0	0	933.0	0.2	4.0
18	0.060	0.000	13	17	0	933.0	4.7	4.0
19	0.060	0.000	18	0	0	1598.0	0.2	4.0
20	0.060	0.000	0	0	0	831.0	0.2	4.0
21	0.060	0.000	0	0	0	681.0	0.2	4.0
22	0.060	0.000	20	21	0	831.0	4.9	4.0
23	0.060	0.000	22	0	0	1598.0	0.2	4.0
24	0.060	0.000	19	23	0	1598.0	5.7	4.0
25	0.060	0.000	24	0	0	1598.0	0.2	4.0
26	0.060	0.000	0	0	0	574.0	0.2	4.0
27	0.060	0.000	0	0	0	574.0	0.2	4.0
28	0.060	0.000	25	27	0	574.0	2.6	4.0
29	0.060	0.000	26	0	0	1598.0	0.2	4.0
30	0.060	0.000	28	29	0	1598.0	3.7	4.0
31	0.060	0.000	30	0	0	1658.0	5.3	4.0
32	0.060	0.000	31	0	0	2300.0	0.2	4.0
33	0.060	0.000	0	0	0	581.0	3.5	4.0
34	0.060	0.000	33	0	0	375.0	0.2	4.0
35	0.060	0.000	0	0	0	375.0	0.2	4.0
36	0.060	0.000	34	35	0	375.0	2.6	4.0
37	0.060	0.000	36	0	0	375.0	0.2	4.0
38	0.060	0.000	32	37	0	2300.0	8.1	4.0
39	0.060	0.000	38	0	0	2500.0	2.5	4.0
40	0.060	0.000	39	0	0	2500.0	0.2	4.0
41	0.060	0.000	0	0	0	506.0	0.2	4.0
42	0.060	0.000	40	41	0	2500.0	5.8	4.0
43	0.060	0.000	42	0	0	9999.0	0.0	4.0

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 1.75 inches and 68.4 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.054	0.053	0.1			4.5	0.0	
24.0	0.121	0.112	0.1			4.5	0.0	
36.0	0.214	0.186	0.2			5.1	0.0	
48.0	0.338	0.276	13.8			45.4	0.0	
60.0	0.626	0.454	74.2			301.6	0.0	
72.0	1.343	0.778	287.3			1389.4	0.0	
84.0	1.521	0.842	144.6			2277.5	0.0	
96.0	1.614	0.874	91.1			2577.4	0.0	
108.0	1.689	0.899	71.3			2584.9	0.0	
120.0	1.749	0.918	59.3			2770.4	0.0	
132.0	1.749	0.932	32.9			2847.1	0.0	
144.0	1.749	0.947	19.6			2823.1	0.0	
156.0	1.749	0.961	12.1			2829.7	0.0	
168.0	1.749	0.975	7.4			2744.5	0.0	
180.0	1.749	0.989	4.3			2674.7	0.0	
192.0	1.749	1.003	2.4			2650.0	0.0	
204.0	1.749	1.016	1.5			2595.2	0.0	
216.0	1.749	1.016	1.2			1916.0	0.0	
228.0	1.749	1.016	0.9			592.0	0.0	
240.0	1.749	1.017	0.7			190.7	0.0	
252.0	1.749	1.017	0.5			102.0	0.0	
264.0	1.749	1.017	0.4			74.2	0.0	
276.0	1.749	1.017	0.4			56.6	0.0	
288.0	1.749	1.017	0.3			44.7	0.0	
300.0	1.749	1.017	0.3			36.3	0.0	
312.0	1.749	1.017	0.2			30.1	0.0	
324.0	1.749	1.017	0.2			25.4	0.0	
336.0	1.749	1.017	0.2			21.8	0.0	
348.0	1.749	1.017	0.2			18.9	0.0	
360.0	1.749	1.017	0.2			16.6	0.0	
372.0	1.749	1.017	0.2			14.6	0.0	
384.0	1.749	1.018	0.2			13.1	0.0	
396.0	1.749	1.018	0.1			11.8	0.0	
408.0	1.749	1.018	0.1			10.7	0.0	
420.0	1.749	1.018	0.1			9.7	0.0	
432.0	1.749	1.018	0.1			9.0	0.0	
444.0	1.749	1.018	0.1			8.3	0.0	
456.0	1.749	1.018	0.1			7.8	0.0	
468.0	1.749	1.018	0.1			7.3	0.0	
480.0	1.749	1.018	0.1			7.0	0.0	

Runoff = 0.71 inches, Runoff Peak = 287.2 cfs Peak Timing = 72.0 min.
Runoff Volume = 160.8 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 72	84	96	108	120	132	144	156	168	180	192
43	0.0	1389	2278	2577	2585	2770	2847	2823	2830	2745	2675	2650
42	7.8	873	2017	2553	2743	2811	2809	2795	2717	2664	2643	2688
41	8.0	148	273	181	130	105	80	49	30	19	11	7
40	8.1	707	1747	2377	2618	2712	2729	2749	2684	2643	2631	2681
39	11.5	393	1560	2337	2649	2640	2745	2690	2634	2632	2597	2784
38	25.8	58	399	1419	2366	2553	2516	2583	2508	2628	2920	3079
37	26.3	22	139	376	748	731	487	319	218	137	84	51
36	33.2	8	70	341	799	669	437	318	247	159	95	59
35	33.4	4	30	131	273	134	84	64	48	25	14	8
34	33.6	4	37	197	540	541	345	254	200	135	81	51
33	42.1	0	8	58	258	332	199	138	110	79	48	30
32	26.2	35	252	1025	1619	1824	2022	2261	2293	2499	2851	3037
31	38.8	4	45	319	1128	1742	2134	2181	2348	2737	3009	3005
30	47.8	3	5	83	533	1886	2275	2112	2471	2939	3087	2949
29	48.0	0	1	23	134	566	545	341	262	216	137	80
28	51.4	0	1	17	107	497	478	323	245	202	135	80
27	51.6	0	0	7	38	165	148	92	68	55	34	18
26	51.6	0	0	11	69	330	333	230	177	147	101	62
25	49.3	3	3	53	377	1313	1736	1763	2220	2742	2961	2868
24	61.5	0	2	3	71	480	1399	2004	2569	2886	2865	2687
23	62.0	0	0	1	19	120	512	583	377	252	196	134
22	66.9	0	0	0	15	102	431	597	328	218	170	122
21	67.1	0	0	0	6	39	169	245	138	92	72	53
20	67.1	0	0	0	9	62	258	360	188	125	98	69
19	62.2	0	2	3	50	352	874	1411	2206	2648	2672	2550
18	76.0	0	0	2	3	57	396	1522	2440	2657	2596	2465

17	76.4	0	0	1	1	25	171	718	1105	1008	705	433
16	80.6	0	0	0	0	1	36	215	840	893	541	333
15	93.1	0	0	0	0	0	12	92	372	710	340	202
14	93.8	0	0	0	0	0	7	61	235	480	184	108
13	76.6	0	0	0	2	2	30	214	776	1350	1660	1896	2019
12	81.8	0	0	0	1	2	12	116	517	1225	1665	2016	1999
11	82.0	0	0	0	0	0	3	28	144	384	242	167	133
10	82.0	0	0	0	1	1	8	83	365	844	1423	1861	1866
9	92.4	0	0	0	0	1	1	19	155	707	1617	1916	1818
8	92.7	0	0	0	0	1	1	9	83	368	820	895	780
7	111.1	0	0	0	0	0	0	0	1	48	283	1114	866
6	111.3	0	0	0	0	0	0	0	0	25	148	594	476
5	111.3	0	0	0	0	0	0	0	0	24	134	516	398
4	92.7	0	0	0	0	1	1	8	67	320	804	1040	1031
3	100.5	0	0	0	0	0	1	1	20	136	589	941	948
2	110.8	0	0	0	0	0	0	0	1	24	168	669	845
1	126.1	0	0	0	0	0	0	0	0	0	19	130	585

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	951.3	72.0	573.6	951.3	72.0
2	438.1	72.0	249.9	855.0	84.0
3	445.2	72.0	238.6	1011.8	84.0
4	300.0	72.0	159.5	1063.5	96.0
5	645.3	72.0	337.6	645.3	72.0
6	745.1	72.0	400.7	745.1	72.0
7	0.2	72.0	0.1	1373.9	72.0
8	271.8	72.0	148.0	957.2	84.0
9	0.2	72.0	0.1	1964.0	84.0
10	57.6	72.0	38.4	1867.4	108.0
11	408.8	72.0	271.2	408.8	72.0
12	0.2	72.0	0.1	2019.0	96.0
13	151.8	72.0	82.3	2037.1	120.0
14	543.1	72.0	248.3	543.1	72.0
15	293.4	72.0	168.4	814.8	72.0
16	501.0	72.0	268.8	999.5	72.0
17	527.7	72.0	285.1	1171.1	84.0
18	0.2	72.0	0.1	2657.3	96.0
19	191.8	72.0	114.0	2711.8	108.0
20	436.1	72.0	245.5	456.1	72.0
21	302.7	72.0	174.5	302.7	72.0
22	0.2	72.0	0.1	749.8	72.0
23	62.9	73.2	45.6	584.3	72.0
24	0.2	72.0	0.1	2926.1	108.0
25	254.9	72.0	183.0	2965.7	132.0
26	432.7	73.8	306.2	432.7	73.8
27	213.7	72.0	125.4	213.7	72.0
28	0.2	72.0	0.1	638.2	72.0
29	77.4	72.0	42.2	566.0	72.0
30	0.2	72.0	0.1	3029.6	132.0
31	82.2	72.0	48.8	3059.8	144.0
32	263.0	73.2	211.3	3062.7	168.0
33	420.5	72.0	257.7	420.5	72.0
34	335.6	72.0	227.0	584.8	84.0
35	308.3	72.0	161.4	308.3	72.0
36	0.2	72.0	0.1	819.5	72.0
37	32.1	72.0	18.7	825.7	84.0
38	0.2	72.0	0.1	3009.3	163.0
39	705.1	73.2	534.3	2640.6	192.0
40	207.7	72.0	133.0	2794.2	192.0
41	309.0	72.0	211.6	309.0	72.0
42	0.2	72.0	0.1	2823.1	192.0
43	297.2	72.0	160.8	2847.1	132.0

Surcharge Flow Occurred in Areas

1	2	4	7	8	9	10	12	13	16	17	18	19	24	25	28
30	31	32	34	36	37	38	39	40	42						

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

7	9	13	16	19	24	25	30	31	34	37

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

10-YEAR 6-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 2.34 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 2.34 inches and 207.8 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.019	0.019	0.1			4.5	0.0	
24.0	0.039	0.038	0.1			4.5	0.0	
36.0	0.058	0.057	0.1			4.5	0.0	
48.0	0.082	0.079	0.1			4.5	0.0	
60.0	0.107	0.100	0.1			4.5	0.0	
72.0	0.131	0.121	0.1			4.5	0.0	
84.0	0.164	0.148	0.1			4.5	0.0	
96.0	0.197	0.173	0.1			4.5	0.0	
108.0	0.229	0.198	1.1			7.4	0.0	
120.0	0.279	0.235	5.1			23.2	0.0	
132.0	0.329	0.270	9.5			60.4	0.0	
144.0	0.379	0.305	13.0			124.1	0.0	
156.0	0.482	0.372	25.9			247.2	0.0	
168.0	0.586	0.433	34.6			431.5	0.0	
180.0	0.689	0.491	39.7			665.8	0.0	
192.0	1.083	0.679	139.8			1256.7	0.0	
204.0	1.477	0.832	191.6			2141.4	0.0	
216.0	1.871	0.960	227.3			2681.8	0.0	
228.0	1.939	0.980	113.8			2645.2	0.0	
240.0	2.006	0.999	83.1			3063.7	0.0	
252.0	2.074	1.018	71.4			3168.8	0.0	
264.0	2.113	1.032	55.6			3007.8	0.0	
276.0	2.153	1.045	47.2			2993.4	0.0	
288.0	2.192	1.059	42.2			3131.7	0.0	
300.0	2.220	1.072	35.0			3194.5	0.0	
312.0	2.248	1.085	30.4			3231.7	0.0	
324.0	2.276	1.097	27.4			3237.8	0.0	
336.0	2.298	1.110	23.4			3332.1	0.0	
348.0	2.319	1.122	20.6			3579.6	0.0	
360.0	2.341	1.135	18.7			3780.6	0.0	
372.0	2.341	1.147	11.6			3067.1	0.0	
384.0	2.341	1.159	7.2			1359.6	0.0	
396.0	2.341	1.171	4.4			694.5	0.0	
408.0	2.341	1.183	2.6			526.3	0.0	
420.0	2.341	1.194	1.7			392.9	0.0	
432.0	2.341	1.195	1.3			283.0	0.0	
444.0	2.341	1.195	1.1			199.3	0.0	
456.0	2.341	1.195	0.9			140.5	0.0	
468.0	2.341	1.195	0.7			101.4	0.0	
480.0	2.341	1.195	0.5			75.8	0.0	
492.0	2.341	1.195	0.4			58.7	0.0	
504.0	2.341	1.195	0.4			46.8	0.0	
516.0	2.341	1.195	0.3			38.3	0.0	
528.0	2.341	1.195	0.3			32.0	0.0	
540.0	2.341	1.195	0.3			27.2	0.0	
552.0	2.341	1.195	0.2			23.6	0.0	
564.0	2.341	1.195	0.2			20.6	0.0	
576.0	2.341	1.195	0.2			18.2	0.0	

588.0	2.341	1.196	0.2	15.3	0.0
600.0	2.341	1.196	0.2	14.7	0.0
612.0	2.341	1.196	0.2	13.3	0.0
624.0	2.341	1.196	0.2	12.2	0.0
636.0	2.341	1.196	0.2	11.3	0.0
648.0	2.341	1.196	0.2	10.5	0.0
660.0	2.341	1.196	0.2	9.8	0.0
672.0	2.341	1.196	0.2	9.2	0.0
684.0	2.341	1.196	0.2	8.7	0.0
696.0	2.341	1.196	0.1	8.3	0.0
708.0	2.341	1.196	0.1	7.9	0.0
720.0	2.341	1.196	0.1	7.6	0.0

Runoff = 1.12 inches, Runoff Peak = 227.2 cfs Peak Timing = 216.0 min.
Runoff Volume = 255.1 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 300	312	324	336	348	360	372	384	396	408	420
43	0.0	3195	3232	3238	3332	3580	3781	3067	1360	695	526	393
42	11.6	3201	3207	3299	3551	3763	3718	2802	1267	783	593	451
41	11.8	66	55	47	42	35	31	27	18	11	7	4
40	12.0	3128	3150	3251	3520	3742	3712	2761	1230	772	588	449
39	17.1	3103	3147	3336	3601	3748	3491	2531	1422	831	614	475
38	34.4	2990	3275	3575	3688	3603	3299	2350	1107	811	681	547
37	34.9	272	223	191	163	139	122	106	92	81	61	40
36	41.9	287	232	196	169	144	125	109	95	84	68	47
35	42.1	55	44	38	32	27	24	21	18	17	13	7
34	42.3	233	189	159	137	117	101	88	77	67	56	39
33	50.8	125	100	83	73	62	53	48	41	36	33	24
32	34.8	2717	3063	3401	3536	3467	3188	2234	1002	730	623	509
31	48.4	2931	3241	3471	3467	3316	2974	1866	1021	765	669	570
30	58.1	2988	3357	3493	3409	3196	2727	1855	1009	808	705	618
29	58.3	315	256	204	169	146	122	104	91	77	66	57
28	61.6	292	241	191	158	138	114	97	86	73	63	55
27	61.8	78	64	49	40	34	28	24	21	17	15	13
26	61.8	213	177	142	118	103	86	74	65	55	48	42
25	58.6	2694	3120	3302	3243	3054	2611	1737	902	732	641	564
24	73.0	2938	3216	3216	3088	2770	2229	1607	1067	785	673	590
23	73.2	403	300	226	190	145	125	106	90	79	69	59
22	78.1	450	256	194	157	125	108	93	79	69	61	53
21	78.3	188	109	83	68	54	47	41	34	30	27	23
20	78.3	265	145	111	89	71	61	53	44	39	34	30
19	73.5	2773	2923	2993	2907	2618	2091	1493	987	712	606	532
18	87.8	2650	2933	2930	2814	2417	1840	1316	958	765	655	574
17	99.2	1125	1092	783	508	365	290	241	206	177	155	137
16	86.6	775	913	619	350	265	210	170	149	128	110	99
15	102.1	434	546	446	221	161	131	103	89	78	66	59
14	103.8	292	334	271	112	85	70	54	47	42	35	32
13	93.4	1538	1955	2150	2314	2055	1542	1065	752	591	503	439
12	94.9	1259	1961	2321	2260	1853	1538	1121	752	587	503	440
11	95.1	306	367	217	162	137	109	92	81	68	59	52
10	95.2	982	1595	2129	2105	1698	1435	1032	659	519	445	388
9	106.1	1040	1786	2206	1983	1535	1346	975	691	558	477	411
8	106.5	516	929	1060	834	546	487	300	240	207	180	153
7	119.0	240	692	912	973	469	325	270	208	176	157	132
6	119.2	126	373	493	529	251	174	144	110	93	84	70
5	119.2	106	323	421	455	211	150	126	97	82	74	61
4	106.5	505	860	1180	1148	975	862	677	451	352	298	258
3	114.3	352	563	994	1039	897	805	618	405	313	266	230
2	126.0	165	286	589	884	910	667	491	386	274	228	198
1	130.2	98	130	272	543	702	620	353	262	213	171	148

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	765.5	216.0	879.1	765.5	216.0
2	339.2	216.0	382.2	906.3	216.0
3	332.6	216.0	366.4	1127.7	216.0
4	231.2	216.0	250.6	1101.2	216.0
5	471.8	216.0	513.9	471.8	216.0
6	548.2	216.0	600.5	548.2	216.0
7	0.1	216.0	0.1	1018.6	216.0
8	212.4	216.0	233.8	1037.5	216.0
9	0.1	216.0	0.1	2233.3	216.0
10	62.9	216.0	65.4	2134.1	240.0
11	378.7	216.0	443.3	378.7	216.0
12	0.1	216.0	0.1	2323.4	228.0
13	123.3	216.0	126.8	2338.6	252.0

16	230.1	216.0	366.0	350.1	216.0
17	402.1	216.0	436.3	1228.9	216.0
18	0.1	216.0	0.1	2955.4	228.0
19	167.7	216.0	183.3	2994.2	252.0
20	352.5	216.0	380.0	352.5	216.0
21	244.5	216.0	273.1	244.5	216.0
22	0.1	216.0	0.1	595.9	216.0
23	73.5	216.0	79.0	632.6	216.0
24	0.1	216.0	0.1	3287.0	240.0
25	246.0	216.0	294.7	3306.9	264.0
26	438.7	216.0	513.3	438.7	216.0
27	196.3	216.0	203.1	196.3	216.0
28	0.1	216.0	0.1	631.0	216.0
29	69.7	216.0	67.6	631.2	216.0
30	0.1	216.0	0.1	3503.0	264.0
31	74.0	216.0	79.3	3479.2	276.0
32	303.2	216.0	363.5	354.8	300.0
33	356.2	216.0	410.2	356.2	216.0
34	325.2	216.0	374.2	538.0	216.0
35	230.7	216.0	246.4	230.7	216.0
36	0.1	216.0	0.1	858.0	216.0
37	30.6	216.0	30.6	848.0	228.0
38	0.1	216.0	0.1	3607.1	300.0
39	667.6	216.0	865.5	3775.6	336.0
40	188.1	216.0	215.8	3742.4	336.0
41	301.2	216.0	349.5	301.2	216.0
42	0.1	216.0	0.1	3763.1	336.0
43	227.2	216.0	255.1	3780.6	360.0

Surcharge Flow Occurred in Areas

1 2 4 7 8 9 10 12 13 17 18 19 24 25 28 30
31 32 34 36 37 38 39 40 42

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

5 13 18 19 24 25 30 31 32 34 36 37 38 39 42

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*           Std. SCS or PDT-IDF Storms  *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

10-YEAR 24-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 3.07 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 3.07 inches and 743.1 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
24.0	0.008	0.008	0.1			4.5	0.0	
48.0	0.017	0.017	0.1			4.5	0.0	
72.0	0.025	0.025	0.1			4.5	0.0	
96.0	0.035	0.035	0.1			4.5	0.0	
120.0	0.044	0.044	0.1			4.5	0.0	
144.0	0.054	0.054	0.1			4.5	0.0	
168.0	0.065	0.063	0.1			4.5	0.0	
192.0	0.076	0.074	0.1			4.5	0.0	
216.0	0.088	0.084	0.1			4.5	0.0	
240.0	0.100	0.095	0.1			4.5	0.0	
264.0	0.113	0.106	0.1			4.5	0.0	
288.0	0.127	0.118	0.1			4.5	0.0	
312.0	0.141	0.130	0.1			4.5	0.0	
336.0	0.157	0.142	0.1			4.5	0.0	
360.0	0.174	0.156	0.1			4.5	0.0	
384.0	0.192	0.170	0.1			4.5	0.0	
408.0	0.211	0.185	0.2			5.3	0.0	
432.0	0.232	0.201	1.2			13.7	0.0	
456.0	0.255	0.217	2.1			32.5	0.0	
480.0	0.280	0.236	3.0			60.3	0.0	
504.0	0.308	0.256	3.9			93.5	0.0	
528.0	0.340	0.278	4.7			129.2	0.0	
552.0	0.375	0.302	5.7			166.6	0.0	
576.0	0.415	0.329	6.7			206.6	0.0	
600.0	0.462	0.359	8.0			250.8	0.0	
624.0	0.520	0.395	10.2			307.7	0.0	
648.0	0.593	0.438	13.6			389.7	0.0	
672.0	0.690	0.492	19.8			522.2	0.0	
696.0	0.837	0.568	33.3			773.2	0.0	
720.0	1.075	0.678	54.9			1241.7	0.0	
744.0	1.957	0.987	250.0			2478.1	0.0	
768.0	2.299	1.079	117.6			3101.4	0.0	
792.0	2.427	1.111	72.9			3172.2	0.0	
816.0	2.514	1.132	52.5			3242.8	0.0	
840.0	2.580	1.147	40.7			3406.7	0.0	
864.0	2.632	1.159	32.2			3607.8	0.0	
888.0	2.676	1.169	26.5			3760.1	0.0	
912.0	2.715	1.179	22.4			3195.0	0.0	
936.0	2.749	1.187	19.2			1331.7	0.0	
960.0	2.779	1.195	16.7			899.1	0.0	
984.0	2.805	1.204	14.4			751.7	0.0	
1008.0	2.830	1.213	12.6			648.4	0.0	
1032.0	2.852	1.221	11.1			564.3	0.0	
1056.0	2.872	1.230	9.8			495.0	0.0	
1080.0	2.891	1.238	8.6			437.6	0.0	
1104.0	2.909	1.246	7.8			388.8	0.0	
1128.0	2.925	1.255	7.0			346.7	0.0	
1152.0	2.940	1.263	6.3			310.2	0.0	

1176.0	2.955	1.671	5.7	278.7	0.0
1200.0	2.968	1.279	5.1	251.4	0.0
1224.0	2.981	1.287	4.6	227.3	0.0
1248.0	2.993	1.295	4.2	205.9	0.0
1272.0	3.004	1.303	3.8	186.9	0.0
1296.0	3.015	1.310	3.5	170.1	0.0
1320.0	3.026	1.318	3.2	155.2	0.0
1344.0	3.036	1.326	2.9	142.0	0.0
1368.0	3.045	1.333	2.6	130.1	0.0
1392.0	3.054	1.341	2.4	119.7	0.0
1416.0	3.063	1.348	2.3	110.6	0.0
1440.0	3.071	1.356	2.1	102.8	0.0

Runoff = 1.68 inches, Runoff Peak = 273.4 cfs Peak Timing = 750.0 min.
Runoff Volume = 382.6 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 768	792	816	840	864	888	912	936	960	984	1008
43	0.0	3101	3172	3243	3407	3608	3760	3195	1332	899	752	648
42	11.6	3040	3148	3275	3468	3659	3610	2784	1572	936	766	659
41	11.8	257	155	102	74	58	46	38	32	28	24	21
40	12.0	2792	2991	3176	3397	3605	3567	2746	1535	907	743	639
39	17.0	2735	2948	3155	3409	3619	3574	2736	1448	874	738	635
38	34.1	1990	2758	3108	3386	3593	3403	2421	1331	853	711	609
37	34.6	463	701	567	337	217	165	132	109	92	79	68
36	41.6	379	796	517	313	219	167	132	109	92	79	68
35	41.8	108	215	93	56	40	31	25	21	17	15	13
34	42.1	264	592	422	256	179	136	108	88	74	64	55
33	50.6	81	353	219	132	92	71	56	46	39	33	29
32	34.5	1516	2060	2544	3056	3383	3240	2289	1220	760	633	541
31	48.1	1097	1919	2603	3111	3445	3088	2229	998	752	626	535
30	57.8	968	1893	2647	3236	3375	2969	2005	1136	790	649	552
29	58.0	118	449	568	371	230	166	128	102	85	72	61
28	61.9	101	367	564	333	215	156	120	96	79	67	57
27	62.1	32	114	171	87	54	38	29	23	19	17	14
26	62.1	69	250	397	245	161	117	91	72	60	51	43
25	58.3	844	1435	2084	2871	3158	2801	1877	1027	706	578	491
24	72.6	642	1039	2102	3167	3023	2598	1800	982	708	580	490
23	72.8	87	145	613	426	237	159	119	93	76	63	54
22	77.7	80	132	531	381	205	137	103	80	65	55	47
21	77.9	32	53	216	161	89	60	45	35	29	24	21
20	77.9	47	78	314	222	116	77	58	45	37	31	26
19	73.0	553	890	1483	2756	2786	2435	1671	896	635	518	437
18	87.1	448	715	1596	2732	2694	2259	1493	915	670	540	451
17	87.4	142	229	582	1013	705	401	262	197	155	127	108
16	95.8	89	147	238	902	513	266	181	138	109	89	75
15	102.3	54	88	137	505	344	166	110	83	65	53	45
14	103.0	34	56	86	304	199	85	57	44	34	28	24
13	87.6	303	482	988	1739	1993	1867	1225	711	516	413	344
12	93.5	270	427	759	1702	2128	1826	1206	670	505	406	338
11	93.7	31	53	117	392	225	142	102	79	62	51	43
10	93.7	238	373	635	1312	1913	1684	1105	589	442	354	294
9	104.0	210	322	519	1449	1906	1547	988	635	464	367	302
8	104.2	95	148	240	676	857	626	351	223	172	138	114
7	118.6	70	102	168	312	1068	449	264	189	146	116	96
6	118.8	38	55	91	166	577	239	140	100	77	61	51
5	118.8	32	47	77	141	502	207	124	89	69	54	45
4	104.3	115	173	278	769	1054	921	637	412	293	229	188
3	112.1	95	140	223	520	968	871	581	353	254	201	165
2	122.8	67	93	147	241	797	767	474	283	207	163	133
1	136.9	42	57	85	139	378	691	344	216	158	124	100

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	885.9	750.0	1289.0	885.9	750.0
2	394.7	750.0	558.0	870.5	744.0
3	391.5	750.0	535.1	967.8	744.0
4	278.5	750.0	372.1	1079.3	768.0
5	553.4	750.0	744.7	553.4	750.0
6	633.1	750.0	859.7	633.1	750.0
7	0.2	750.0	0.2	1106.8	744.0
8	256.2	750.0	349.1	884.9	744.0
9	0.2	750.0	0.2	1920.9	768.0
10	80.2	750.0	102.5	1931.4	768.0
11	461.6	750.0	679.9	461.6	750.0
12	0.2	750.0	0.2	2155.4	768.0
13	147.4	750.0	184.9	2086.7	792.0

14	405.1	750.0	515.9	405.1	750.0
15	269.5	750.0	372.9	631.0	744.0
16	431.2	750.0	588.1	905.2	744.0
17	474.3	750.0	634.1	1109.9	744.0
18	0.2	750.0	0.2	2779.0	768.0
19	205.0	750.0	276.6	2812.6	768.0
20	420.1	750.0	557.0	420.1	750.0
21	291.4	750.0	404.8	291.4	750.0
22	0.2	750.0	0.2	650.4	744.0
23	95.0	750.0	126.0	628.3	744.0
24	0.2	750.0	0.2	3192.1	768.0
25	294.3	750.0	448.5	3278.8	792.0
26	542.8	750.0	800.7	542.8	750.0
27	242.8	750.0	307.7	242.8	750.0
28	0.2	750.0	0.2	685.0	744.0
29	85.9	750.0	101.8	667.0	744.0
30	0.2	750.0	0.2	3529.2	792.0
31	91.4	750.0	120.6	3445.9	816.0
32	352.1	750.0	582.3	3483.6	840.0
33	426.6	750.0	617.6	426.6	750.0
34	400.6	750.0	575.8	631.5	744.0
35	272.6	750.0	357.1	272.6	750.0
36	0.2	750.0	0.2	873.6	744.0
37	38.1	750.0	46.7	723.5	768.0
38	0.2	750.0	0.2	3664.8	840.0
39	815.7	750.0	1331.2	3737.5	864.0
40	229.0	750.0	328.8	3697.4	864.0
41	370.9	750.0	538.7	370.9	750.0
42	0.2	750.0	0.2	3742.1	864.0
43	273.4	750.0	382.6	3760.1	888.0

Surcharge Flow Occurred in Areas

1	2	4	7	8	9	10	12	13	17	18	19	24	25	28	30
31	32	34	36	37	38	39	40	42							

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

9	13	18	19	24	25	30	31	32	34	36	37	38

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*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*          Std. SCS or PDT-IDF Storms   *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

50-YEAR 2-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 2.25 INCHES

********** General Watershed Information **********

No. of Subareas = 43 No. of Reservoirs = 0 No. of Obs. Hydrog. = 0

No. of Raingages, recording = 0 nonrecording = 1

Time Interv, min.; Routing 1.2 Printing 12.0 Rainfall 12.0 Total = 480.0
Residual Infiltration Time = 1080 min.

Std. Parameters:	Manning n		Depression Storage		SCS CN,		IA	CTS Ratio
	Imp=0.040	Prv=0.200	Imp=0.06	Prv=0.00	97.0	74.0	.10	4.0

Baseflow Coefficient = 0.0005 cfs/ac.

0.07 0.08 0.10 0.18 0.38 0.88 0.24 0.14 0.09 0.08

Hydrographs will be listed for Subareas:
43

Peak Flow Presentations Requested for Subareas:
43

Subarea Properties and Dimensions

I.D. No.	Area ac.	Length ft.	Slope ft/ft	Manning's n Imp.	Manning's n Perv.	Imperv. Fract.	SCS. CN. Imp	SCS. CN. Perv	IA	Coordinates x	Coordinates y
1	673.1	2050.	0.142	0.030	0.150	0.54	97.0	74.0	0.10	6.0	19.2
2	290.6	1790.	0.154	0.030	0.150	0.54	97.0	74.0	0.10	7.0	17.1
3	285.1	1460.	0.181	0.030	0.150	0.51	97.0	74.0	0.10	7.7	15.6
4	217.0	1190.	0.213	0.030	0.150	0.41	97.0	74.0	0.10	8.4	13.9
5	386.2	1310.	0.164	0.030	0.150	0.54	97.0	74.0	0.10	6.2	15.1
6	417.8	1800.	0.199	0.030	0.150	0.62	97.0	74.0	0.10	5.6	12.8
7	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	6.8	13.3
8	205.8	1330.	0.218	0.030	0.150	0.40	97.0	74.0	0.10	7.5	13.4
9	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	8.4	13.1
10	75.9	840.	0.222	0.060	0.150	0.19	97.0	74.0	0.10	8.7	12.7
11	432.4	1710.	0.242	0.045	0.150	0.33	97.0	74.0	0.10	7.5	11.5
12	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.1	12.3
13	104.6	780.	0.222	0.060	0.150	0.44	97.0	74.0	0.10	9.4	12.1
14	237.8	830.	0.119	0.022	0.150	0.68	97.0	74.0	0.10	7.7	19.2
15	193.9	1490.	0.163	0.038	0.150	0.54	97.0	74.0	0.10	8.7	17.8
16	297.7	1500.	0.158	0.030	0.150	0.57	97.0	74.0	0.10	9.1	16.1
17	337.5	1140.	0.162	0.038	0.150	0.51	97.0	74.0	0.10	9.7	13.7
18	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.9	12.0
19	173.2	1070.	0.193	0.045	0.150	0.34	97.0	74.0	0.10	10.6	11.9
20	309.9	990.	0.152	0.038	0.150	0.46	97.0	74.0	0.10	10.8	13.9
21	230.1	1230.	0.144	0.038	0.150	0.44	97.0	74.0	0.10	11.8	13.4
22	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.3	12.5
23	97.0	860.	0.194	0.060	0.150	0.16	97.0	74.0	0.10	11.6	12.1
24	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.4	11.4
25	271.8	1730.	0.163	0.045	0.150	0.38	97.0	74.0	0.10	12.3	11.4
26	543.2	1470.	0.219	0.053	0.150	0.27	97.0	74.0	0.10	9.0	10.5
27	202.7	910.	0.268	0.053	0.150	0.29	97.0	74.0	0.10	10.1	9.7
28	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.2	10.5
29	67.6	640.	0.268	0.053	0.150	0.28	97.0	74.0	0.10	11.4	10.4
30	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.9	10.4

31	78.7	933.	0.190	0.045	0.150	0.30	97.0	74.0	0.10	12.2	10.2
32	406.8	2280.	0.275	0.053	0.150	0.25	97.0	74.0	0.10	12.3	9.5
33	365.7	1370.	0.134	0.038	0.150	0.40	97.0	74.0	0.10	13.6	12.4
34	377.5	1290.	0.189	0.053	0.150	0.30	97.0	74.0	0.10	14.9	10.3
35	189.8	880.	0.128	0.038	0.150	0.51	97.0	74.0	0.10	13.6	10.7
36	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.8	9.7
37	32.1	690.	0.215	0.053	0.150	0.25	97.0	74.0	0.10	14.0	9.5
38	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.6	9.2
39	811.1	2675.	0.235	0.045	0.150	0.38	97.0	74.0	0.10	14.2	8.1
40	206.6	1475.	0.215	0.045	0.150	0.34	97.0	74.0	0.10	14.5	6.5
41	353.4	1510.	0.240	0.053	0.150	0.30	97.0	74.0	0.10	12.6	6.4
42	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.7	5.7
43	225.9	1375.	0.175	0.030	0.150	0.40	97.0	74.0	0.10	14.5	5.7

I.D.	Depr.Storage		Incoming Drainage			Drainage Element		
No.	Imp.	Perv.	Elements			Cap.cfs	Tt,min	CTS
1	0.060	0.000	0	0	0	657.0	7.9	4.0
2	0.060	0.000	1	0	0	795.0	8.5	4.0
3	0.060	0.000	2	0	0	1412.0	7.8	4.0
4	0.060	0.000	3	0	0	833.0	0.2	4.0
5	0.060	0.000	0	0	0	875.0	0.2	4.0
6	0.060	0.000	0	0	0	875.0	0.2	4.0
7	0.060	0.000	5	6	0	875.0	8.8	4.0
8	0.060	0.000	7	0	0	833.0	0.2	4.0
9	0.060	0.000	4	8	0	833.0	3.8	4.0
10	0.060	0.000	9	0	0	1740.0	0.2	4.0
11	0.060	0.000	0	0	0	1740.0	0.2	4.0
12	0.060	0.000	10	11	0	1740.0	3.7	4.0
13	0.060	0.000	12	0	0	933.0	0.2	4.0
14	0.060	0.000	0	0	0	1435.0	0.7	4.0
15	0.060	0.000	14	0	0	1435.0	6.5	4.0
16	0.060	0.000	15	0	0	927.0	8.4	4.0
17	0.060	0.000	16	0	0	933.0	0.2	4.0
18	0.060	0.000	13	17	0	933.0	4.7	4.0
19	0.060	0.000	18	0	0	1598.0	0.2	4.0
20	0.060	0.000	0	0	0	831.0	0.2	4.0
21	0.060	0.000	0	0	0	681.0	0.2	4.0
22	0.060	0.000	20	21	0	831.0	4.9	4.0
23	0.060	0.000	22	0	0	1598.0	0.2	4.0
24	0.060	0.000	19	23	0	1598.0	5.7	4.0
25	0.060	0.000	24	0	0	1598.0	0.2	4.0
26	0.060	0.000	0	0	0	574.0	0.2	4.0
27	0.060	0.000	0	0	0	574.0	0.2	4.0
28	0.060	0.000	26	27	0	574.0	2.6	4.0
29	0.060	0.000	28	0	0	1598.0	0.2	4.0
30	0.060	0.000	25	29	0	1598.0	3.7	4.0
31	0.060	0.000	30	0	0	1638.0	5.3	4.0
32	0.060	0.000	31	0	0	2300.0	0.2	4.0
33	0.060	0.000	0	0	0	581.0	8.5	4.0
34	0.060	0.000	33	0	0	375.0	0.2	4.0
35	0.060	0.000	0	0	0	375.0	0.2	4.0
36	0.060	0.000	34	35	0	375.0	2.6	4.0
37	0.060	0.000	36	0	0	375.0	0.2	4.0
38	0.060	0.000	32	37	0	2300.0	8.1	4.0
39	0.060	0.000	38	0	0	2500.0	2.5	4.0
40	0.060	0.000	39	0	0	2500.0	0.2	4.0
41	0.060	0.000	0	0	0	506.0	0.2	4.0
42	0.060	0.000	40	41	0	2500.0	5.8	4.0
43	0.060	0.000	42	0	0	9999.0	0.0	4.0

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 2.25 inches and 68.7 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.068	0.066	0.1			4.5	0.0	
24.0	0.152	0.138	0.1			4.5	0.0	
36.0	0.256	0.217	3.3			13.4	0.0	
48.0	0.432	0.338	30.6			109.8	0.0	
60.0	0.812	0.552	119.7			557.7	0.0	
72.0	1.697	0.899	397.6			2036.4	0.0	
84.0	1.941	0.974	209.8			2719.2	0.0	
96.0	2.076	1.012	140.1			2804.8	0.0	
108.0	2.171	1.038	106.5			3105.8	0.0	
120.0	2.246	1.057	86.7			3266.0	0.0	
132.0	2.246	1.070	48.5			3166.8	0.0	
144.0	2.246	1.083	29.7			3252.6	0.0	
156.0	2.246	1.096	19.1			3481.9	0.0	
168.0	2.246	1.108	12.4			3439.2	0.0	
180.0	2.246	1.121	8.0			3498.8	0.0	
192.0	2.246	1.133	5.0			3521.2	0.0	
204.0	2.246	1.145	3.0			3526.5	0.0	
216.0	2.246	1.157	1.7			3754.7	0.0	
228.0	2.246	1.169	1.0			3964.5	0.0	
240.0	2.246	1.169	0.8			2977.7	0.0	
252.0	2.246	1.169	0.6			852.2	0.0	
264.0	2.246	1.169	0.5			140.4	0.0	
276.0	2.246	1.169	0.4			75.3	0.0	
288.0	2.246	1.169	0.3			56.3	0.0	
300.0	2.246	1.170	0.3			43.9	0.0	
312.0	2.246	1.170	0.3			35.2	0.0	
324.0	2.246	1.170	0.2			28.9	0.0	
336.0	2.246	1.170	0.2			24.3	0.0	
348.0	2.246	1.170	0.2			20.9	0.0	
360.0	2.246	1.170	0.2			18.3	0.0	
372.0	2.246	1.170	0.2			16.2	0.0	
384.0	2.246	1.170	0.2			14.5	0.0	
396.0	2.246	1.170	0.2			13.1	0.0	
408.0	2.246	1.170	0.2			12.0	0.0	
420.0	2.246	1.170	0.2			11.0	0.0	
432.0	2.246	1.170	0.1			10.1	0.0	
444.0	2.246	1.170	0.1			9.4	0.0	
456.0	2.246	1.170	0.1			8.8	0.0	
468.0	2.246	1.170	0.1			8.3	0.0	
480.0	2.246	1.170	0.1			7.8	0.0	

Runoff = 1.05 inches, Runoff Peak = 397.5 cfs Peak Timing = 72.0 min.
Runoff Volume = 239.3 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 168	180	192	204	216	228	240	252	264	276	288
43	0.0	3439	3499	3521	3526	3755	3965	2978	852	140	75	56
42	12.2	3488	3516	3508	3733	3962	3916	2900	858	209	89	64
41	12.4	34	22	14	9	5	3	2	2	1	1	1
40	12.7	3456	3495	3494	3732	3964	3911	2865	878	217	90	63
39	18.0	3462	3468	3570	3833	3982	3728	2661	1166	291	92	67
38	36.3	3304	3516	3901	3971	3941	3786	2769	965	194	112	79
37	36.9	321	189	117	75	49	31	20	13	8	6	4
36	44.8	358	229	140	89	58	38	24	15	10	7	5
35	45.1	66	35	20	12	7	4	3	2	1	1	1
34	45.3	294	196	121	78	51	34	22	14	9	6	4
33	54.4	163	117	71	46	31	21	14	9	6	4	2
32	36.7	2986	3342	3799	3900	3893	3751	2719	972	199	107	75
31	51.2	3065	3597	3836	3883	3825	3563	2571	1088	316	140	94
30	61.4	3185	3813	3852	3890	3783	3432	2602	1119	334	169	113
29	61.6	420	335	220	133	81	50	31	19	12	7	4
28	67.3	415	326	239	142	87	55	35	21	13	8	5
27	67.5	113	87	61	32	17	9	5	2	1	1	1
26	67.9	300	239	173	110	70	46	30	19	12	7	4
25	68.0	3707	3493	3638	3760	3702	3376	2555	1105	333	164	109
24	77.6	3118	3529	3658	3714	3497	3107	2392	1016	509	223	144
23	77.7	702	493	309	212	136	79	48	30	18	11	7
22	85.5	621	388	281	201	130	75	47	29	19	11	7
21	85.7	230	164	120	85	57	35	22	14	9	6	4
20	85.7	365	223	161	126	72	41	24	15	9	5	3
19	78.0	2401	3076	3354	3501	3364	3021	2339	1288	493	212	138
18	93.2	2748	3093	3349	3544	3235	2932	2225	1222	580	304	189

17	93.5	1382	1290	1162	1064	649	330	198	115	71	46	30
16	110.1	373	1207	1206	732	462	341	224	147	75	47	31
15	116.6	173	564	930	463	287	210	151	78	45	28	17
14	117.3	115	352	613	250	154	112	81	35	19	11	6
13	93.7	1489	1830	2186	2507	2578	2626	2037	1082	502	260	161
12	101.5	1090	1818	2352	2516	2637	2467	1864	1193	623	307	182
11	101.7	384	483	322	237	188	134	83	54	36	24	16
10	101.9	698	1321	2038	2295	2449	2342	1770	1142	593	283	166
9	113.7	421	1391	2194	2278	2481	2245	1562	1104	712	391	212
8	114.1	225	698	1051	1030	1268	1065	443	261	150	93	60
7	136.9	9	92	403	1337	1323	734	486	369	242	137	85
6	137.2	4	47	211	710	725	396	261	196	130	74	46
5	137.1	4	44	189	620	615	333	224	171	113	62	38
4	114.1	181	658	1163	1258	1204	1210	1101	841	565	303	152
3	121.9	85	307	982	1098	1045	1178	1051	805	559	246	140
2	137.1	4	48	245	778	1022	1019	1046	737	395	241	153
1	156.9	0	0	8	90	360	1251	797	504	363	287	175

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	1322.8	72.0	826.1	1322.8	72.0
2	602.9	72.0	359.7	1079.2	72.0
3	606.5	72.0	345.3	1204.7	108.0
4	412.7	72.0	236.1	1304.0	84.0
5	874.0	72.0	485.1	874.0	72.0
6	1011.5	72.0	567.5	1011.5	72.0
7	0.3	72.0	0.1	1857.8	72.0
8	375.2	72.0	219.9	1358.6	108.0
9	0.3	72.0	0.1	2718.4	108.0
10	90.5	72.0	61.6	2611.2	120.0
11	593.8	72.0	413.7	593.8	72.0
12	0.3	72.0	0.1	2759.5	120.0
13	214.1	72.0	120.4	2717.6	132.0
14	709.3	72.0	347.6	709.3	72.0
15	406.0	72.0	242.2	1088.8	72.0
16	680.9	72.0	384.2	1374.7	72.0
17	724.1	72.0	412.0	1303.6	72.0
18	0.3	72.0	0.1	3625.0	108.0
19	275.1	72.0	172.3	3514.5	132.0	
20	628.8	72.0	358.7	628.8	72.0
21	422.1	72.0	256.7	422.1	72.0
22	0.1	72.0	0.1	1039.2	72.0
23	101.4	73.8	74.0	822.7	84.0
24	0.1	72.0	0.1	3742.3	120.0
25	363.9	72.0	275.1	3702.3	144.0
26	647.0	72.0	478.1	647.0	72.0
27	314.3	72.0	191.9	314.3	72.0
28	0.1	72.0	0.1	946.3	72.0
29	114.5	72.0	64.4	958.8	84.0
30	0.1	72.0	0.1	3996.0	144.0
31	119.3	72.0	74.6	3889.8	156.0
32	399.8	73.2	335.6	3905.0	168.0
33	594.0	72.0	384.1	594.0	72.0
34	495.9	72.0	349.6	842.2	84.0
35	421.1	72.0	233.0	421.1	72.0
36	0.1	72.0	0.1	1158.3	72.0
37	48.2	72.0	29.0	1181.4	84.0
38	0.1	72.0	0.1	3972.5	168.0
39	1030.0	73.2	804.7	3953.3	204.0
40	299.9	72.0	201.9	3977.1	204.0
41	457.1	72.0	326.3	457.1	72.0
42	0.1	72.0	0.1	3967.0	204.0
43	397.5	72.0	239.3	3964.5	228.0

Surcharge Flow Occurred in Areas

1	2	4	6	7	8	9	10	12	13	16	17	18	19	22	24
25	26	29	30	31	32	33	34	35	36	37	38	39	40	42	

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

2	4	6	7	8	9	10	12	13	16	17	18	19	22	24
25	26	29	30	31	32	33	34	35	36	37	38	39	40	42

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*           Std. SCS or PDT-IDF Storms  *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

50-YEAR 6-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 3.00 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 3.00 inches and 207.5 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.025	0.025	0.1			4.5	0.0	
24.0	0.049	0.049	0.1			4.5	0.0	
36.0	0.074	0.072	0.1			4.5	0.0	
48.0	0.105	0.099	0.1			4.5	0.0	
60.0	0.136	0.125	0.1			4.5	0.0	
72.0	0.167	0.150	0.1			4.5	0.0	
84.0	0.209	0.183	0.1			4.7	0.0	
96.0	0.251	0.214	2.6			11.9	0.0	
108.0	0.292	0.244	6.0			32.8	0.0	
120.0	0.355	0.288	12.2			82.6	0.0	
132.0	0.418	0.330	17.2			167.8	0.0	
144.0	0.481	0.370	20.5			286.8	0.0	
156.0	0.619	0.452	40.1			486.7	0.0	
168.0	0.757	0.527	52.0			763.6	0.0	
180.0	0.895	0.595	58.9			1100.1	0.0	
192.0	1.398	0.804	203.3			1915.3	0.0	
204.0	1.901	0.968	276.7			2621.3	0.0	
216.0	2.405	1.103	330.4			2864.3	0.0	
228.0	2.489	1.123	163.9			3213.2	0.0	
240.0	2.574	1.143	118.8			3749.5	0.0	
252.0	2.658	1.162	100.6			3756.5	0.0	
264.0	2.708	1.174	77.9			3470.3	0.0	
276.0	2.758	1.186	65.9			3656.2	0.0	
288.0	2.808	1.197	59.0			3996.1	0.0	
300.0	2.844	1.209	49.0			4142.1	0.0	
312.0	2.880	1.220	42.9			4180.8	0.0	
324.0	2.915	1.232	39.0			4324.1	0.0	
336.0	2.943	1.243	33.5			4594.7	0.0	
348.0	2.970	1.254	29.9			4829.9	0.0	
360.0	2.998	1.265	27.5			4961.4	0.0	
372.0	2.998	1.275	17.6			4958.2	0.0	
384.0	2.998	1.286	11.4			4855.2	0.0	
396.0	2.998	1.297	7.5			3917.0	0.0	
408.0	2.998	1.307	4.8			1930.5	0.0	
420.0	2.998	1.317	3.0			615.5	0.0	
432.0	2.998	1.327	1.8			424.3	0.0	
444.0	2.998	1.337	1.2			298.8	0.0	
456.0	2.998	1.338	1.0			208.1	0.0	
468.0	2.998	1.338	0.8			145.5	0.0	
480.0	2.998	1.338	0.6			103.7	0.0	
492.0	2.998	1.338	0.5			76.5	0.0	
504.0	2.998	1.338	0.4			58.7	0.0	
516.0	2.998	1.338	0.4			46.6	0.0	
528.0	2.998	1.338	0.3			37.9	0.0	
540.0	2.998	1.338	0.3			31.5	0.0	
552.0	2.998	1.338	0.3			26.8	0.0	
564.0	2.998	1.338	0.3			23.2	0.0	
576.0	2.998	1.338	0.2			20.4	0.0	

588.0	2.998	1.338	0.2	18.2	0.0
600.0	2.998	1.338	0.2	16.4	0.0
612.0	2.998	1.338	0.2	14.9	0.0
624.0	2.998	1.338	0.2	13.7	0.0
636.0	2.998	1.338	0.2	12.6	0.0
648.0	2.998	1.338	0.2	11.7	0.0
660.0	2.998	1.338	0.2	11.0	0.0
672.0	2.998	1.338	0.2	10.3	0.0
684.0	2.998	1.338	0.2	9.8	0.0
696.0	2.998	1.338	0.2	9.3	0.0
708.0	2.998	1.338	0.2	8.9	0.0
720.0	2.998	1.338	0.2	8.5	0.0

Runoff = 1.63 inches, Runoff Peak = 330.3 cfs Peak Timing = 216.0 min.
Runoff Volume = 372.1 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 300	312	324	336	348	360	372	384	396	408	420
43	0.0	4142	4191	4324	4535	4830	4961	4958	4855	3917	1990	615
42	14.4	4121	4239	4489	4741	4904	4943	4882	4602	3694	1836	874
41	14.6	96	81	70	62	54	47	43	31	21	14	9
40	14.9	4028	4160	4425	4686	4856	4898	4838	4566	3655	1830	866
39	21.1	3994	4178	4479	4725	4862	4870	4776	4405	3414	1965	967
38	41.7	3946	4282	4560	4709	4743	4674	4399	3945	3172	1914	1008
37	42.3	513	380	293	251	215	187	165	145	129	109	79
36	50.4	480	376	305	262	224	192	170	150	132	119	91
35	50.6	88	68	55	49	41	36	32	28	25	23	16
34	50.9	388	309	251	214	184	157	138	122	107	96	77
33	59.4	200	157	131	111	98	82	72	65	57	51	46
32	42.2	3436	3914	4278	4467	4532	4490	4233	3791	3034	1814	924
31	57.5	3538	4003	4307	4415	4468	4359	3975	3494	2818	1669	997
30	68.3	3684	4103	4352	4417	4455	4265	3811	3316	2642	1688	1018
29	68.5	814	443	352	280	233	201	170	147	130	112	99
28	74.3	642	435	347	274	225	196	165	141	125	108	95
27	74.5	180	113	89	68	55	48	40	34	30	26	23
26	74.6	463	321	258	206	170	148	125	107	95	82	72
25	68.9	2879	3688	4015	4138	4230	4073	3633	3162	2516	1563	909
24	85.1	3283	3799	3968	4143	4151	3770	3326	2906	2237	1523	1046
23	85.3	888	693	438	316	248	200	172	147	125	111	98
22	90.6	783	660	363	271	218	173	149	129	109	97	86
21	90.8	320	277	155	117	95	76	65	56	48	43	38
20	90.8	463	389	205	153	123	97	84	73	61	54	48
19	85.7	2409	3122	3539	3833	3906	3564	3145	2751	2100	1410	958
18	101.2	2431	3155	3540	3836	3818	3380	3015	2576	1864	1262	952
17	101.6	1030	1385	1333	1139	962	632	399	330	282	244	213
16	116.7	385	806	1138	1144	722	426	331	263	218	191	164
15	123.2	165	461	676	774	463	260	204	159	130	116	98
14	123.9	103	288	419	463	266	132	107	84	67	61	52
13	101.8	1400	1794	2212	2699	2868	2754	2611	2251	1575	1006	736
12	109.9	1055	1610	2474	2854	2794	2620	2525	2085	1561	1056	758
11	110.1	262	423	548	368	254	206	164	136	119	101	87
10	110.3	789	1179	1926	2503	2544	2410	2360	1938	1442	963	675
9	121.9	646	1212	2079	2594	2466	2339	2332	1745	1287	934	702
8	122.3	311	579	1039	1179	1087	1081	1025	532	346	294	256
7	141.1	213	267	452	1026	1287	1224	599	426	350	272	233
6	141.3	115	145	240	552	690	659	317	226	185	144	123
5	141.3	99	122	204	479	598	577	275	199	165	128	110
4	122.4	332	619	1047	1430	1378	1254	1305	1214	932	643	450
3	130.2	274	400	773	1138	1232	1084	1232	1177	869	576	382
2	146.3	144	221	281	598	992	1122	991	968	798	470	341
1	163.3	62	97	156	197	394	770	978	861	482	359	292

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	1063.9	216.0	1247.6	1063.9	216.0
2	471.9	216.0	541.7	1134.3	216.0
3	467.3	216.0	521.3	1262.5	216.0
4	335.6	216.0	363.8	1503.3	216.0
5	658.2	216.0	726.5	658.2	216.0
6	750.2	216.0	837.9	750.2	216.0
7	0.2	216.0	0.2	1406.4	216.0
8	309.3	216.0	340.6	1189.7	216.0
9	0.2	216.0	0.2	2665.1	216.0
10	100.3	216.0	101.3	2603.2	228.0
11	568.7	216.0	660.2	568.7	216.0
12	0.2	216.0	0.2	2898.2	228.0
13	177.5	216.0	182.2	2888.2	240.0

14	473.7	216.0	504.7	473.7	216.0
15	322.9	216.0	363.5	794.9	216.0
16	512.5	216.0	572.8	1264.9	216.0
17	567.2	216.0	619.9	1494.4	216.0
18	0.2	216.0	0.2	3962.1	240.0
19	250.7	216.0	270.9	3911.1	264.0
20	504.4	216.0	545.2	504.4	216.0
21	351.8	216.0	394.5	351.8	216.0
22	0.2	216.0	0.2	854.5	216.0
23	119.9	216.0	124.2	907.6	216.0
24	0.2	216.0	0.2	4160.2	252.0
25	362.0	216.0	433.9	4245.4	276.0
26	676.3	216.0	778.7	676.3	216.0
27	298.0	216.0	303.5	298.0	216.0
28	0.2	216.0	0.2	966.0	216.0
29	104.9	216.0	101.0	953.9	228.0
30	0.2	216.0	0.2	4478.6	276.0
31	112.2	216.0	118.4	4476.8	288.0
32	443.7	216.0	559.3	4551.1	312.0
33	518.8	216.0	599.4	518.8	216.0
34	496.1	216.0	561.3	951.1	216.0
35	325.4	216.0	349.7	325.4	216.0
36	0.2	216.0	0.2	1260.9	216.0
37	47.0	216.0	46.2	1235.4	228.0
38	0.2	216.0	0.2	4746.8	312.0
39	1011.6	216.0	1278.6	4881.9	336.0
40	281.3	216.0	320.0	4900.7	348.0
41	459.8	216.0	524.6	459.8	216.0
42	0.2	216.0	0.2	4946.0	348.0
43	330.3	216.0	372.1	4961.4	360.0

Surcharge Flow Occurred in Areas

1 2 4 7 8 9 10 12 13 16 17 18 19 22 24 25
25 28 30 31 32 34 36 37 38 39 40 42

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

1 4 7 9 12 13 17 18 19 24 25 28 30 31 32 34
36 37 38 39 40 42

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*    The Pennsylvania State University  *
* Storm Options: User-Defined Storms    *
*           Std. SCS or PDT-IDF Storms  *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

50-YEAR 24-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 3.96 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 3.96 inches and 742.6 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
24.0	0.011	0.011	0.1			4.5	0.0	
48.0	0.023	0.023	0.1			4.5	0.0	
72.0	0.035	0.035	0.1			4.5	0.0	
96.0	0.047	0.047	0.1			4.5	0.0	
120.0	0.060	0.059	0.1			4.5	0.0	
144.0	0.073	0.071	0.1			4.5	0.0	
168.0	0.088	0.084	0.1			4.5	0.0	
192.0	0.103	0.097	0.1			4.5	0.0	
216.0	0.118	0.110	0.1			4.5	0.0	
240.0	0.135	0.124	0.1			4.5	0.0	
264.0	0.152	0.138	0.1			4.5	0.0	
288.0	0.170	0.153	0.1			4.5	0.0	
312.0	0.190	0.168	0.1			4.5	0.0	
336.0	0.210	0.184	0.2			5.2	0.0	
360.0	0.232	0.200	1.2			13.5	0.0	
384.0	0.256	0.218	2.2			32.9	0.0	
408.0	0.282	0.237	3.1			61.7	0.0	
432.0	0.309	0.256	3.9			95.4	0.0	
456.0	0.339	0.277	4.6			129.5	0.0	
480.0	0.371	0.300	5.2			162.2	0.0	
504.0	0.408	0.324	6.1			194.8	0.0	
528.0	0.449	0.351	7.0			229.6	0.0	
552.0	0.494	0.379	8.2			269.1	0.0	
576.0	0.546	0.411	9.7			315.6	0.0	
600.0	0.605	0.445	11.4			371.2	0.0	
624.0	0.678	0.486	14.5			447.7	0.0	
648.0	0.770	0.535	19.4			563.0	0.0	
672.0	0.893	0.595	28.3			753.6	0.0	
696.0	1.088	0.684	51.3			1148.8	0.0	
720.0	1.426	0.817	89.4			1875.9	0.0	
744.0	2.544	1.138	364.0			2774.5	0.0	
768.0	2.969	1.229	163.3			3799.4	0.0	
792.0	3.125	1.260	98.0			3877.6	0.0	
816.0	3.234	1.280	69.6			4029.9	0.0	
840.0	3.318	1.296	53.5			4391.8	0.0	
864.0	3.384	1.307	42.1			4795.5	0.0	
888.0	3.440	1.317	34.6			5030.7	0.0	
912.0	3.490	1.326	29.4			4892.0	0.0	
936.0	3.534	1.333	25.6			4242.5	0.0	
960.0	3.573	1.341	22.5			1699.5	0.0	
984.0	3.607	1.348	19.7			1029.0	0.0	
1008.0	3.638	1.356	17.4			877.1	0.0	
1032.0	3.667	1.363	15.6			772.9	0.0	
1056.0	3.694	1.370	14.1			687.4	0.0	
1080.0	3.719	1.378	12.8			616.6	0.0	
1104.0	3.742	1.385	11.6			556.1	0.0	
1128.0	3.763	1.392	10.5			503.8	0.0	
1152.0	3.784	1.399	9.6			458.2	0.0	

1176.0	3.803	1.406	6.9	418.7	0.0
1200.0	3.821	1.413	8.2	384.3	0.0
1224.0	3.838	1.420	7.5	353.7	0.0
1248.0	3.854	1.427	7.0	326.2	0.0
1272.0	3.869	1.433	6.5	301.5	0.0
1296.0	3.884	1.440	6.0	279.5	0.0
1320.0	3.898	1.447	5.6	259.8	0.0
1344.0	3.911	1.453	5.2	241.9	0.0
1368.0	3.924	1.460	4.9	225.4	0.0
1392.0	3.936	1.466	4.5	210.4	0.0
1416.0	3.948	1.472	4.3	196.7	0.0
1440.0	3.959	1.479	4.0	184.3	0.0

Runoff = 2.42 inches, Runoff Peak = 396.3 cfs Peak Timing = 750.0 min.
Runoff Volume = 551.7 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 768	792	816	840	864	888	912	936	960	984	1008
43	0.0	3799	3878	4030	4392	4796	5031	4892	4243	1899	1029	877
42	14.5	3688	3843	4097	4491	4846	4954	4640	3638	2088	1097	903
41	14.8	412	229	142	102	78	62	51	44	38	33	29
40	15.0	3293	3619	3957	4395	4775	4898	4591	3594	2041	1060	875
39	21.2	3247	3502	3936	4414	4832	4933	4570	3607	1840	1012	872
38	42.0	2151	3240	3836	4400	4772	4699	4181	3220	1785	1005	852
37	42.6	464	964	950	569	338	235	184	151	127	110	97
36	50.7	313	1182	870	504	327	242	188	152	128	110	97
35	50.9	87	326	164	85	58	44	35	28	24	21	19
34	51.3	225	857	707	416	270	198	154	124	104	89	78
33	61.4	104	326	439	228	145	106	82	65	54	47	41
32	42.5	1669	2285	2893	3840	4447	4473	3996	3074	1644	892	756
31	57.8	1313	1935	2899	3886	4393	4296	3769	2826	1585	917	758
30	68.7	1123	1760	3045	4068	4533	4265	3705	2750	1425	933	779
29	68.9	148	337	913	763	364	249	187	147	121	102	89
28	75.1	117	223	949	629	360	242	181	141	115	97	84
27	75.3	37	69	294	169	89	59	44	34	28	24	21
26	75.5	79	153	654	461	272	184	137	107	87	73	63
25	69.3	968	1408	2127	3323	4198	4020	3520	2607	1280	831	691
24	85.4	751	1121	2038	3446	4050	3818	3223	2324	1422	882	705
23	85.6	102	181	508	767	499	263	182	139	110	91	78
22	92.2	84	151	346	850	375	221	157	121	95	79	68
21	92.4	34	61	140	353	162	97	69	53	42	35	30
20	92.4	50	90	202	505	210	123	88	68	53	44	38
19	86.0	643	937	1515	2684	3576	3561	3041	2178	1307	791	628
18	101.2	489	785	1308	2878	3582	3514	2917	1963	1172	810	651
17	101.6	151	250	423	1145	1249	851	459	299	229	184	153
16	116.6	92	136	236	486	1174	638	330	226	173	137	113
15	123.1	54	77	138	222	785	385	196	134	103	81	67
14	123.8	34	49	88	136	466	212	100	69	54	43	35
13	101.8	335	530	877	1735	2344	2665	2460	1660	939	626	499
12	109.6	303	461	762	1492	2415	2680	2314	1626	971	623	500
11	109.8	36	58	106	347	496	274	173	125	96	77	64
10	109.9	266	401	653	1137	1923	2420	2140	1498	876	545	436
9	121.4	231	321	528	898	2246	2498	2109	1306	808	564	448
8	121.7	103	145	244	416	1000	1191	864	383	266	208	168
7	141.9	74	99	146	256	506	1452	583	341	243	188	149
6	142.1	41	54	78	137	267	779	307	179	128	100	79
5	142.1	34	45	67	119	231	689	271	160	115	89	70
4	121.8	128	175	282	479	1249	1311	1238	921	544	358	281
3	129.6	108	146	229	388	887	1159	1144	867	491	313	248
2	145.6	73	95	132	220	382	1010	1120	699	369	269	211
1	164.6	44	56	75	110	190	422	1059	494	301	218	169

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	1236.5	750.0	1812.0	1236.5	750.0
2	550.3	750.0	784.2	1125.0	768.0
3	549.4	750.0	755.6	1166.1	744.0
4	401.4	750.0	535.4	1310.6	768.0
5	770.3	750.0	1046.1	770.3	750.0
6	866.2	750.0	1192.8	866.2	750.0
7	0.2	750.0	0.3	1534.0	744.0
8	370.9	750.0	503.4	1202.7	768.0
9	0.2	750.0	0.3	2508.0	768.0
10	124.5	750.0	156.0	2446.4	768.0
11	691.7	750.0	996.4	691.7	750.0
12	0.2	750.0	0.3	2753.7	768.0
13	209.8	750.0	264.4	2730.0	792.0

14	344.8	750.0	709.6	544.8	750.0
15	377.0	750.0	524.0	865.8	744.0
16	596.4	750.0	822.2	1255.7	744.0
17	666.5	750.0	895.4	1350.2	744.0
18	0.2	750.0	0.3	3665.9	768.0
19	303.4	750.0	404.1	3697.4	792.0
20	597.5	750.0	793.6	597.5	750.0
21	418.3	750.0	579.1	418.3	750.0
22	0.2	750.0	0.3	934.9	744.0
23	150.7	750.0	193.7	860.2	744.0
24	0.2	750.0	0.3	4089.1	768.0
25	434.5	750.0	650.1	4214.3	792.0
26	834.4	750.0	1191.3	834.4	750.0
27	362.0	750.0	455.0	362.0	750.0
28	0.2	750.0	0.3	1055.1	744.0
29	126.6	750.0	150.9	926.6	744.0
30	0.2	750.0	0.3	4563.9	792.0
31	136.7	750.0	177.9	4498.2	816.0
32	551.9	750.0	871.9	4565.0	840.0
33	621.4	750.0	891.0	621.4	750.0
34	606.9	750.0	849.9	955.3	744.0
35	382.3	750.0	504.2	382.3	750.0
36	0.2	750.0	0.3	1291.3	744.0
37	57.2	750.0	69.7	1043.9	768.0
38	0.2	750.0	0.3	4808.5	840.0
39	1208.9	750.0	1930.9	4967.4	864.0
40	341.2	750.0	480.6	4942.3	864.0
41	562.6	750.0	795.2	562.6	750.0
42	0.2	750.0	0.3	5000.0	864.0
43	396.3	750.0	551.7	5030.7	888.0

Surcharge Flow Occurred in Areas

1 2 4 7 8 9 10 12 13 16 17 18 19 22 24 25
26 28 30 31 32 33 34 35 36 37 38 39 40 41 42

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

1 4 7 9 12 13 18 19 24 25 28 30 31 32 34 36
37 38 39 40 42

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*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*           Std. SCS or PDT-IDF Storms  *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

100-YEAR 2-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 2.62 INCHES

********** General Watershed Information **********

No. of Subareas = 43 No. of Reservoirs = 0 No. of Obs. Hydrog. = 0

No. of Raingages, recording = 0 nonrecording = 1

Time Interv, min.; Routing 1.2 Printing 12.0 Rainfall 12.0 Total = 480.0
Residual Infiltration Time = 1080 min.

Std. Parameters:	Manning n	Depression Storage	SCS CN,	IA	CTS Ratio
	Imp=0.040 Prv=0.200	Imp=0.06 Prv=0.00	97.0 74.0	.10	4.0

Baseflow Coefficient = 0.0005 cfs/ac.

0.09	0.11	0.15	0.20	0.44	0.99	0.28	0.15	0.12	0.10

Hydrographs will be listed for Subareas:
43

Peak Flow Presentations Requested for Subareas:
43

Subarea Properties and Dimensions

I.D. No.	Area ac.	Length ft.	Slope ft/ft	Manning's n Imp.	Manning's n Perv.	Imperv. Fract.	SCS. CN. Imp	SCS. CN. Perv	IA	Coordinates x	Coordinates y
1	673.1	2050.	0.142	0.030	0.150	0.54	97.0	74.0	0.10	6.0	19.2
2	290.6	1790.	0.154	0.030	0.150	0.54	97.0	74.0	0.10	7.0	17.1
3	285.1	1460.	0.181	0.030	0.150	0.51	97.0	74.0	0.10	7.7	15.6
4	217.0	1190.	0.213	0.030	0.150	0.41	97.0	74.0	0.10	8.4	13.9
5	386.2	1310.	0.164	0.030	0.150	0.54	97.0	74.0	0.10	6.2	15.1
6	417.8	1800.	0.199	0.030	0.150	0.62	97.0	74.0	0.10	5.6	12.8
7	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	6.8	13.3
8	205.8	1330.	0.218	0.030	0.150	0.40	97.0	74.0	0.10	7.5	13.4
9	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	8.4	13.1
10	75.9	840.	0.222	0.060	0.150	0.19	97.0	74.0	0.10	8.7	12.7
11	432.4	1710.	0.242	0.045	0.150	0.33	97.0	74.0	0.10	7.5	11.5
12	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.1	12.3
13	104.6	780.	0.222	0.060	0.150	0.44	97.0	74.0	0.10	9.4	12.1
14	237.8	830.	0.119	0.022	0.150	0.68	97.0	74.0	0.10	7.7	19.2
15	193.9	1490.	0.163	0.038	0.150	0.54	97.0	74.0	0.10	8.7	17.8
16	297.7	1500.	0.158	0.030	0.150	0.57	97.0	74.0	0.10	9.1	16.1
17	337.5	1140.	0.162	0.038	0.150	0.51	97.0	74.0	0.10	9.7	13.7
18	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	9.9	12.0
19	173.2	1070.	0.193	0.045	0.150	0.34	97.0	74.0	0.10	10.6	11.9
20	309.9	990.	0.152	0.038	0.150	0.46	97.0	74.0	0.10	10.8	12.9
21	230.1	1230.	0.144	0.038	0.150	0.44	97.0	74.0	0.10	11.8	13.4
22	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.3	12.5
23	97.0	860.	0.184	0.060	0.150	0.16	97.0	74.0	0.10	11.6	12.1
24	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.4	11.4
25	271.8	1730.	0.163	0.045	0.150	0.38	97.0	74.0	0.10	12.3	11.4
26	543.2	1470.	0.219	0.053	0.150	0.27	97.0	74.0	0.10	9.0	10.5
27	202.7	910.	0.268	0.053	0.150	0.29	97.0	74.0	0.10	10.1	9.7
28	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.2	10.5
29	67.6	640.	0.268	0.053	0.150	0.28	97.0	74.0	0.10	11.4	10.4
30	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	11.9	10.4

31	78.7	933.	0.190	0.045	0.150	0.30	97.0	74.0	0.10	12.2	10.2
32	406.8	2280.	0.275	0.053	0.150	0.25	97.0	74.0	0.10	12.3	9.5
33	365.7	1370.	0.134	0.038	0.150	0.40	97.0	74.0	0.10	13.6	12.4
34	377.5	1290.	0.189	0.053	0.150	0.30	97.0	74.0	0.10	14.9	10.3
35	189.8	880.	0.128	0.038	0.150	0.51	97.0	74.0	0.10	13.6	10.7
36	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.8	9.7
37	32.1	690.	0.215	0.053	0.150	0.25	97.0	74.0	0.10	14.0	9.5
38	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.6	9.2
39	811.1	2675.	0.235	0.045	0.150	0.38	97.0	74.0	0.10	14.2	8.1
40	206.6	1475.	0.215	0.045	0.150	0.34	97.0	74.0	0.10	14.5	6.5
41	353.4	1510.	0.240	0.053	0.150	0.30	97.0	74.0	0.10	12.6	6.4
42	0.1	50.	0.180	0.030	0.150	0.44	97.0	74.0	0.10	13.7	5.7
43	225.9	1375.	0.175	0.030	0.150	0.40	97.0	74.0	0.10	14.5	5.7

I.D.	Depr. Storage		Incoming Drainage Elements			Drainage Element		
No.	Imp.	Perv.				Cap, cfs	Tt, min	CTS
1	0.060	0.000	0	0	0	657.0	7.9	4.0
2	0.060	0.000	1	0	0	795.0	8.5	4.0
3	0.060	0.000	2	0	0	1412.0	7.8	4.0
4	0.060	0.000	3	0	0	833.0	0.2	4.0
5	0.060	0.000	0	0	0	875.0	0.2	4.0
6	0.060	0.000	0	0	0	875.0	0.2	4.0
7	0.060	0.000	5	6	0	875.0	8.8	4.0
8	0.060	0.000	7	0	0	833.0	0.2	4.0
9	0.060	0.000	4	8	0	833.0	3.8	4.0
10	0.060	0.000	9	0	0	1740.0	0.2	4.0
11	0.060	0.000	0	0	0	1740.0	0.2	4.0
12	0.060	0.000	10	11	0	1740.0	3.7	4.0
13	0.060	0.000	12	0	0	933.0	0.2	4.0
14	0.060	0.000	0	0	0	1435.0	0.7	4.0
15	0.060	0.000	14	0	0	1435.0	6.5	4.0
16	0.060	0.000	15	0	0	927.0	8.4	4.0
17	0.060	0.000	16	0	0	933.0	0.2	4.0
18	0.060	0.000	13	17	0	933.0	4.7	4.0
19	0.060	0.000	18	0	0	1598.0	0.2	4.0
20	0.060	0.000	0	0	0	831.0	0.2	4.0
21	0.060	0.000	0	0	0	681.0	0.2	4.0
22	0.060	0.000	20	21	0	831.0	4.9	4.0
23	0.060	0.000	22	0	0	1598.0	0.2	4.0
24	0.060	0.000	19	23	0	1598.0	5.7	4.0
25	0.060	0.000	24	0	0	1598.0	0.2	4.0
26	0.060	0.000	0	0	0	574.0	0.2	4.0
27	0.060	0.000	0	0	0	574.0	0.2	4.0
28	0.060	0.000	26	27	0	574.0	2.6	4.0
29	0.060	0.000	28	0	0	1598.0	0.2	4.0
30	0.060	0.000	25	29	0	1598.0	3.7	4.0
31	0.060	0.000	30	0	0	1658.0	5.3	4.0
32	0.060	0.000	31	0	0	2300.0	0.2	4.0
33	0.060	0.000	0	0	0	581.0	8.5	4.0
34	0.060	0.000	33	0	0	375.0	0.2	4.0
35	0.060	0.000	0	0	0	375.0	0.2	4.0
36	0.060	0.000	34	35	0	375.0	2.6	4.0
37	0.060	0.000	36	0	0	375.0	0.2	4.0
38	0.060	0.000	32	37	0	2300.0	8.1	4.0
39	0.060	0.000	38	0	0	2500.0	2.5	4.0
40	0.060	0.000	39	0	0	2500.0	0.2	4.0
41	0.060	0.000	0	0	0	506.0	0.2	4.0
42	0.060	0.000	40	41	0	2500.0	5.8	4.0
43	0.060	0.000	42	0	0	9999.0	0.0	4.0

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 2.62 inches and 68.2 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.087	0.083	0.1			4.5	0.0	
24.0	0.195	0.171	0.1			4.5	0.0	
36.0	0.347	0.282	15.9			50.3	0.0	
48.0	0.546	0.408	50.6			233.2	0.0	
60.0	0.982	0.632	154.7			858.4	0.0	
72.0	1.969	0.981	477.5			2294.1	0.0	
84.0	2.247	1.056	256.3			2798.7	0.0	
96.0	2.398	1.094	171.0			3329.5	0.0	
108.0	2.520	1.123	136.1			3609.2	0.0	
120.0	2.617	1.146	112.3			3679.7	0.0	
132.0	2.617	1.158	61.8			3465.4	0.0	
144.0	2.617	1.169	37.7			3669.4	0.0	
156.0	2.617	1.181	24.5			3942.9	0.0	
168.0	2.617	1.193	16.3			3892.1	0.0	
180.0	2.617	1.204	10.8			4091.0	0.0	
192.0	2.617	1.216	7.1			4251.6	0.0	
204.0	2.617	1.227	4.6			4335.5	0.0	
216.0	2.617	1.238	2.8			4555.8	0.0	
228.0	2.617	1.249	1.6			4714.1	0.0	
240.0	2.617	1.260	0.9			4677.2	0.0	
252.0	2.617	1.262	0.7			3553.4	0.0	
264.0	2.617	1.262	0.5			1080.7	0.0	
276.0	2.617	1.262	0.4			129.1	0.0	
288.0	2.617	1.262	0.4			70.2	0.0	
300.0	2.617	1.262	0.3			52.6	0.0	
312.0	2.617	1.262	0.3			41.1	0.0	
324.0	2.617	1.262	0.3			33.0	0.0	
336.0	2.617	1.262	0.2			27.2	0.0	
348.0	2.617	1.262	0.2			22.9	0.0	
360.0	2.617	1.262	0.2			19.7	0.0	
372.0	2.617	1.262	0.2			17.4	0.0	
384.0	2.617	1.263	0.2			15.5	0.0	
396.0	2.617	1.263	0.2			14.0	0.0	
408.0	2.617	1.263	0.2			12.7	0.0	
420.0	2.617	1.263	0.2			11.7	0.0	
432.0	2.617	1.263	0.2			10.8	0.0	
444.0	2.617	1.263	0.2			10.1	0.0	
456.0	2.617	1.263	0.2			9.4	0.0	
468.0	2.617	1.263	0.1			8.8	0.0	
480.0	2.617	1.263	0.1			8.4	0.0	

Runoff = 1.33 inches, Runoff Peak = 477.4 cfs Peak Timing = 72.0 min.
Runoff Volume = 302.5 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 168	180	192	204	216	228	240	252	264	276	288
43	0.0	3892	4091	4252	4336	4556	4714	4677	3553	1081	129	70
42	14.0	4035	4211	4303	4504	4686	4691	4559	3382	1169	278	97
41	14.2	47	31	21	14	9	5	3	2	2	1	1
40	14.5	3991	4186	4286	4495	4683	4687	4553	3355	1190	280	97
39	20.5	4044	4213	4323	4565	4708	4673	4417	3241	1385	331	92
38	40.9	4069	4221	4532	4651	4647	4590	4294	3284	1393	386	122
37	41.6	588	339	182	115	76	50	33	22	14	9	6
36	49.9	551	357	216	136	89	59	39	26	17	11	7
35	50.2	100	57	31	18	11	7	4	3	2	1	1
34	50.5	448	302	189	119	79	53	36	24	15	10	6
33	63.9	246	199	134	82	53	36	25	17	12	8	5
32	41.4	3495	3888	4363	4550	4572	4542	4259	3254	1399	265	116
31	56.9	3493	4046	4502	4495	4569	4460	4036	3193	1459	378	150
30	67.9	3573	4219	4561	4473	4590	4371	3878	3132	1668	373	187
29	68.1	729	482	366	226	136	85	54	35	22	14	8
28	74.7	624	477	388	248	149	94	60	39	25	15	9
27	74.9	174	129	102	60	31	17	10	5	3	1	1
26	75.1	449	345	286	191	118	77	51	34	22	14	9
25	68.4	2844	3757	4232	4231	4470	4297	3814	3112	1657	328	180
24	85.1	3185	4071	4011	4381	4452	4006	3584	2938	1722	616	258
23	85.3	969	983	482	336	237	136	81	51	32	20	13
22	95.1	1204	661	430	334	265	143	84	53	34	22	14
21	98.3	495	275	182	143	115	64	39	25	17	11	8
20	95.3	731	380	245	191	151	78	45	28	17	11	7
19	85.7	2222	3206	3538	4033	4219	3865	3495	2876	1674	621	252
18	101.5	2344	3222	3514	4097	4136	3745	3383	2668	1644	790	365

17	101.9	1059	1451	1330	1421	1276	729	361	212	124	79	52
16	121.2	177	529	1524	1327	811	540	419	269	149	88	57
15	127.7	92	264	746	1037	524	334	258	183	92	53	33
14	128.4	64	171	460	670	282	178	139	98	41	22	13
13	102.1	1254	1814	2174	2694	2882	3006	3035	2464	1509	704	316
12	111.0	743	1545	2369	2839	2806	3131	2895	2189	1614	876	382
11	111.2	173	597	543	369	283	231	154	96	63	42	29
10	111.4	559	939	1818	2484	2530	2904	2745	2076	1546	851	359
9	123.7	225	748	1983	2562	2457	2996	2637	1880	1429	987	485
8	124.3	122	399	983	1155	1082	1662	1252	571	299	172	108
7	148.9	0	44	176	547	1598	1555	867	597	462	303	169
6	149.2	0	22	91	287	850	851	462	313	245	163	91
5	149.1	0	21	83	252	740	728	395	274	217	143	78
4	124.2	96	329	985	1430	1376	1329	1406	1300	1129	817	385
3	132.1	33	149	500	1309	1157	1105	1414	1188	1134	881	247
2	151.4	0	14	82	294	809	1195	1104	1273	1119	586	332
1	173.1	0	0	0	24	107	360	1126	1180	704	493	391

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	1577.3	72.0	1026.8	1577.3	72.0
2	715.3	72.0	446.6	1378.3	108.0
3	717.8	72.0	429.7	1415.8	108.0
4	494.8	72.0	297.4	1510.3	84.0
5	1030.3	72.0	601.3	1030.3	72.0
6	1188.9	72.0	697.9	1188.9	72.0
7	0.4	72.0	0.1	2172.2	72.0
8	450.5	72.0	277.6	1992.6	108.0
9	0.4	72.0	0.1	3271.0	108.0
10	118.5	72.0	80.6	3070.5	120.0
11	735.0	72.0	530.1	735.0	72.0
12	0.4	72.0	0.1	3251.7	120.0
13	260.0	72.0	150.5	3163.1	132.0
14	818.5	72.0	424.3	818.5	72.0
15	463.7	72.0	300.4	1272.6	72.0
16	802.2	72.0	474.9	1631.4	72.0
17	861.3	72.0	512.2	1545.7	108.0
18	0.4	72.0	0.1	4409.3	108.0
19	378.8	72.0	219.5	4237.2	132.0
20	732.3	72.0	448.3	732.3	72.0
21	507.7	72.0	322.0	707.7	72.0
22	0.4	72.0	0.1	1846.5	72.0
23	134.8	73.2	97.9	991.2	84.0
24	0.4	72.0	0.1	4054.8	132.0
25	472.1	72.0	349.3	4480.6	144.0
26	818.5	72.0	619.7	818.5	72.0
27	394.4	72.0	245.6	394.4	72.0
28	0.4	72.0	0.1	1185.7	72.0
29	144.3	72.0	82.3	1016.5	84.0
30	0.4	72.0	0.1	4547.0	120.0
31	148.5	72.0	95.6	4570.4	156.0
32	510.1	73.2	439.4	4600.8	180.0
33	720.3	72.0	486.2	720.3	72.0
34	621.7	72.0	449.8	349.4	72.0
35	500.2	72.0	289.4	500.2	72.0
36	0.4	72.0	0.1	1398.5	72.0
37	61.3	72.0	37.3	1409.2	84.0
38	0.4	72.0	0.1	4572.5	156.0
39	1272.6	73.2	1026.8	4719.9	152.0
40	370.0	72.0	257.9	4713.0	204.0
41	573.4	72.0	420.1	573.4	72.0
42	0.4	72.0	0.1	4714.4	204.0
43	477.4	72.0	302.5	4714.1	228.0

Surcharge Flow Occurred in Areas

1	2	3	4	5	6	7	8	9	10	12	13	16	17	18	19
22	24	25	26	28	30	31	32	33	34	35	36	37	38	39	40
41	42														

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

2	4	7	9	2	10	12	13	16	17	18	19	24	25	28
29	31	32	34	36	37	38	39	40	42					

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*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*           Std. SCS or PDT-IDF Storms  *
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

100-YEAR 6-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 3.54 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 3.54 inches and 207.4 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
12.0	0.029	0.029	0.1			4.5	0.0	
24.0	0.059	0.058	0.1			4.5	0.0	
36.0	0.088	0.084	0.1			4.5	0.0	
48.0	0.126	0.116	0.1			4.5	0.0	
60.0	0.163	0.147	0.1			4.5	0.0	
72.0	0.201	0.176	0.1			4.5	0.0	
84.0	0.253	0.215	2.8			12.2	0.0	
96.0	0.304	0.252	7.5			37.8	0.0	
108.0	0.356	0.289	11.8			89.0	0.0	
120.0	0.436	0.342	20.0			185.3	0.0	
132.0	0.516	0.392	25.8			327.5	0.0	
144.0	0.596	0.439	29.3			505.1	0.0	
156.0	0.763	0.530	54.6			778.6	0.0	
168.0	0.930	0.611	69.0			1138.5	0.0	
180.0	1.097	0.686	77.8			1555.2	0.0	
192.0	1.664	0.895	252.2			2358.3	0.0	
204.0	2.231	1.059	340.2			2859.8	0.0	
216.0	2.798	1.192	404.1			3234.7	0.0	
228.0	2.907	1.214	205.8			3621.2	0.0	
240.0	3.016	1.236	151.7			4361.1	0.0	
252.0	3.125	1.257	129.8			4201.7	0.0	
264.0	3.188	1.269	99.5			4018.1	0.0	
276.0	3.251	1.281	84.3			4410.9	0.0	
288.0	3.314	1.292	75.8			4716.6	0.0	
300.0	3.357	1.303	62.7			4808.2	0.0	
312.0	3.401	1.313	55.0			4965.4	0.0	
324.0	3.445	1.323	50.2			5239.6	0.0	
336.0	3.478	1.333	43.0			5555.1	0.0	
348.0	3.511	1.343	38.5			5873.1	0.0	
360.0	3.544	1.353	35.5			6079.2	0.0	
372.0	3.544	1.363	22.8			6141.2	0.0	
384.0	3.544	1.373	15.0			6034.1	0.0	
396.0	3.544	1.382	10.1			5617.3	0.0	
408.0	3.544	1.392	6.8			4568.2	0.0	
420.0	3.544	1.401	4.5			2674.0	0.0	
432.0	3.544	1.410	2.9			608.0	0.0	
444.0	3.544	1.419	1.8			395.8	0.0	
456.0	3.544	1.428	1.1			276.9	0.0	
468.0	3.544	1.434	0.8			194.0	0.0	
480.0	3.544	1.434	0.6			137.2	0.0	
492.0	3.544	1.434	0.5			98.7	0.0	
504.0	3.544	1.434	0.4			72.9	0.0	
516.0	3.544	1.434	0.4			55.7	0.0	
528.0	3.544	1.434	0.3			44.1	0.0	
540.0	3.544	1.434	0.3			35.9	0.0	
552.0	3.544	1.434	0.3			29.8	0.0	
564.0	3.544	1.434	0.3			25.3	0.0	
576.0	3.544	1.434	0.2			21.9	0.0	

588.0	3.544	1.434	0.2	19.3	0.0	
600.0	3.544	1.434	0.2	17.3	0.0	
612.0	3.544	1.434	0.2	15.7	0.0	
624.0	3.544	1.434	0.2	14.3	0.0	
636.0	3.544	1.434	0.2	13.2	0.0	
648.0	3.544	1.434	0.2	12.3	0.0	
660.0	3.544	1.434	0.2	11.5	0.0	
672.0	3.544	1.434	0.2	10.8	0.0	
684.0	3.544	1.434	0.2	10.2	0.0	
696.0	3.544	1.434	0.2	9.7	0.0	
708.0	3.544	1.434	0.2	9.2	0.0	
720.0	3.544	1.434	0.2	8.8	0.0	

Runoff = 2.08 inches, Runoff Peak = 404.0 cfs Peak Timing = 216.0 min.
Runoff Volume = 474.8 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	312	324	336	348	360	372	384	396	408	420	432
					Time, minutes							
43	0.0	4965	5240	5555	5873	6079	6141	6034	5617	4568	2574	608
42	16.1	5074	5380	5707	5964	6094	6072	5786	5208	4333	2565	1118
41	16.3	107	91	81	71	62	56	43	29	20	13	9
40	16.6	4970	5295	5633	5900	6037	6018	5742	5171	4300	2560	1107
39	23.5	4906	5328	5686	5931	6038	5996	5648	5008	4090	2662	1229
38	46.5	4981	5393	5692	5845	5886	5622	5051	4377	3704	2785	1573
37	46.8	512	412	341	291	251	223	196	173	154	118	81
36	51.4	491	396	340	291	249	221	195	171	155	122	84
35	51.6	89	71	63	53	46	42	36	32	30	21	13
34	51.7	402	325	277	238	204	179	159	139	125	101	72
33	61.0	220	172	144	129	108	94	85	74	66	60	42
32	47.1	4478	4996	5366	5562	5651	5408	4848	4189	3547	2669	1490
31	63.5	4519	5014	5312	5525	5504	5116	4506	3861	3287	2534	1570
30	75.2	4630	5102	5347	5555	5457	4969	4318	3678	3131	2452	1609
29	75.4	729	522	406	329	282	240	205	182	159	139	125
28	79.3	635	481	391	310	265	230	193	170	151	131	117
27	79.5	165	122	98	76	65	57	47	42	37	32	29
26	79.6	465	358	293	234	200	173	146	129	114	99	89
25	75.8	3913	4596	4949	5230	5180	4727	4104	3487	2963	2306	1487
24	93.4	4105	4635	4947	5192	4952	4388	3754	3174	2689	2150	1589
23	93.6	1033	818	472	371	295	241	210	179	154	138	121
22	99.4	992	666	411	328	257	209	184	156	134	121	106
21	99.6	408	283	177	142	112	92	80	68	59	53	46
20	99.6	584	386	232	185	145	117	104	88	75	68	59
19	94.0	3100	3834	4491	4848	4669	4143	3533	2981	2530	2007	1460
18	110.1	3047	3862	4572	4840	4509	3959	3316	2834	2415	1816	1315
17	110.4	1366	1759	1758	1394	955	599	476	400	343	296	261
16	122.0	768	1226	1465	1068	630	464	367	295	257	221	190
15	128.5	353	730	874	783	377	276	230	176	152	135	113
14	129.2	208	463	524	470	187	143	123	91	80	72	59
13	110.7	1689	2112	2821	3454	3659	3359	2834	2428	2067	1515	1047
12	120.2	1307	2056	3139	3620	3622	3111	2551	2249	1978	1633	1162
11	120.4	374	562	704	420	307	257	201	169	150	125	109
10	120.7	930	1480	2449	3220	3316	2840	2337	2073	1822	1512	1063
9	133.1	874	1541	2564	3323	3242	2661	2199	2004	1736	1419	1019
8	133.4	414	711	1276	1668	1741	1291	716	544	430	368	321
7	146.4	326	369	1002	1421	1631	961	601	489	380	313	279
6	146.6	177	201	534	759	866	513	317	257	201	165	147
5	146.6	149	168	466	663	766	452	282	231	180	148	132
4	133.6	457	817	1300	1668	1500	1364	1483	1460	1303	1045	698
3	141.7	377	538	954	1292	1311	1168	1378	1402	1229	987	635
2	160.2	193	285	361	642	1021	1234	1233	1273	1122	694	451
1	179.6	89	109	192	248	301	831	1111	1246	658	479	405

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak, min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak, min
1	1267.8	216.0	1567.4	1267.8	216.0
2	562.6	216.0	679.9	1308.7	240.0
3	560.0	216.0	655.7	1433.1	252.0
4	408.9	216.0	462.8	1713.4	216.0
5	784.9	216.0	910.3	784.9	216.0
6	884.2	216.0	1041.8	884.2	216.0
7	0.2	216.0	0.2	1666.6	216.0
8	377.9	216.0	434.2	1745.1	228.0
9	0.2	216.0	0.2	3387.9	216.0
10	127.3	216.0	133.5	3319.6	240.0
11	708.5	216.0	852.1	708.5	216.0
12	0.2	216.0	0.2	3627.6	228.0
13	214.1	216.0	230.5	3680.1	252.0

14	553.4	216.0	623.0	553.4	216.0
15	385.7	216.0	455.8	937.0	216.0
16	608.4	216.0	715.9	1497.2	216.0
17	680.0	216.0	779.1	1830.2	216.0
18	0.2	216.0	0.2	4870.5	240.0
19	309.9	216.0	348.1	4867.2	252.0
20	609.3	216.0	689.0	609.3	216.0
21	427.3	216.0	500.5	427.3	216.0
22	0.2	216.0	0.2	1034.6	216.0
23	154.2	216.0	164.8	1066.5	216.0
24	0.2	216.0	0.2	5226.1	252.0
25	446.5	216.0	556.4	5320.6	276.0
26	855.4	216.0	1014.8	855.4	216.0
27	369.6	216.0	392.5	369.6	216.0
28	0.2	216.0	0.2	1218.0	216.0
29	129.0	216.0	130.6	1234.6	216.0
30	0.2	216.0	0.2	5612.4	276.0
31	138.6	216.0	153.1	5586.2	288.0
32	667.5	216.0	734.6	5969.0	312.0
33	635.6	216.0	765.6	635.6	216.0
34	622.0	216.0	727.2	1165.8	216.0
35	389.7	216.0	439.3	389.7	216.0
36	0.2	216.0	0.2	1546.4	216.0
37	58.4	216.0	60.1	1472.1	216.0
38	0.2	216.0	0.2	5914.3	312.0
39	1249.1	216.0	1643.8	6039.3	336.0
40	349.2	216.0	412.1	6069.4	348.0
41	576.8	216.0	679.9	576.8	216.0
42	0.2	216.0	0.2	6123.7	348.0
43	404.0	216.0	474.8	6141.2	372.0

Surcharge Flow Occurred in Areas

1	2	3	4	6	7	8	9	10	12	13	16	17	18	19	22
24	25	26	28	30	31	32	33	34	35	36	37	38	39	40	41
42															

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

1	2	4	7	8	9	10	12	13	16	17	18	19	24	25	28
30	31	32	34	36	37	38	39	40	42						

```
*****************************************
*                                       *
*  Penn State Runoff Model  -  PSRM-88  *
*        IBM-PC Version, Jan. 1988      *
*     G. Aron, Dept. of Civil Engr.     *
*   The Pennsylvania State University   *
* Storm Options: User-Defined Storms    *
*           Std. SCS or PDT-IDF Storms  *
*****************************************
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GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE

ALLEGHENY COUNTY DEPARTMENT OF PLANNING

100-YEAR 24-HOUR STORM

1990 CONDITIONS

PREPARED BY URS CONSULTANTS

PDT REGION 1 STORM = 4.56 INCHES

Hydrograph for Subarea 43 Dr.A = 225.9 ac. Cum. Dr.A = 9099.6 ac.
Storm Total and Centroid = 4.56 inches and 743.2 min.

Time min.	Precip inches	Infilt inches	Runoff cfs	Reservoir Inflow	Reservoir W.S.El.	Pipe Q cfs	Surch cfs	Obs Q cfs
24.0	0.010	0.010	0.1			4.5	0.0	
48.0	0.020	0.020	0.1			4.5	0.0	
72.0	0.031	0.031	0.1			4.5	0.0	
96.0	0.043	0.043	0.1			4.5	0.0	
120.0	0.055	0.054	0.1			4.5	0.0	
144.0	0.068	0.066	0.1			4.5	0.0	
168.0	0.081	0.079	0.1			4.5	0.0	
192.0	0.096	0.091	0.1			4.5	0.0	
216.0	0.111	0.104	0.1			4.5	0.0	
240.0	0.127	0.118	0.1			4.5	0.0	
264.0	0.145	0.133	0.1			4.5	0.0	
288.0	0.164	0.148	0.1			4.5	0.0	
312.0	0.184	0.163	0.1			4.5	0.0	
336.0	0.205	0.180	0.1			4.6	0.0	
360.0	0.228	0.197	1.0			11.3	0.0	
384.0	0.253	0.216	2.1			29.7	0.0	
408.0	0.281	0.236	3.2			59.8	0.0	
432.0	0.311	0.258	4.2			97.3	0.0	
456.0	0.344	0.281	5.0			137.0	0.0	
480.0	0.380	0.306	5.9			176.3	0.0	
504.0	0.422	0.334	6.9			216.7	0.0	
528.0	0.469	0.364	8.2			260.9	0.0	
552.0	0.522	0.397	9.8			312.2	0.0	
576.0	0.584	0.433	11.8			373.8	0.0	
600.0	0.655	0.473	14.1			448.7	0.0	
624.0	0.746	0.522	18.5			554.1	0.0	
648.0	0.861	0.580	25.6			717.0	0.0	
672.0	1.017	0.653	38.5			991.7	0.0	
696.0	1.254	0.752	66.7			1498.1	0.0	
720.0	1.634	0.889	109.1			2280.3	0.0	
744.0	2.894	1.214	436.9			2955.2	0.0	
768.0	3.407	1.311	205.8			4236.7	0.0	
792.0	3.614	1.346	124.4			4384.8	0.0	
816.0	3.752	1.368	87.4			4671.5	0.0	
840.0	3.857	1.384	66.6			5185.8	0.0	
864.0	3.937	1.396	51.7			5702.1	0.0	
888.0	4.005	1.406	42.1			6022.7	0.0	
912.0	4.064	1.415	35.4			5995.5	0.0	
936.0	4.115	1.422	30.6			5309.8	0.0	
960.0	4.159	1.429	26.8			4027.3	0.0	
984.0	4.198	1.436	23.2			1495.5	0.0	
1008.0	4.233	1.442	20.4			1054.3	0.0	
1032.0	4.265	1.449	18.1			908.2	0.0	
1056.0	4.295	1.456	16.2			801.2	0.0	
1080.0	4.321	1.462	14.6			712.9	0.0	
1104.0	4.346	1.469	13.1			637.7	0.0	
1128.0	4.368	1.475	11.8			572.6	0.0	
1152.0	4.389	1.481	10.7			516.2	0.0	

1176.0	4.402	1.466	9.6	467.3	0.0
1200.0	4.427	1.474	9.0	425.0	0.0
1224.0	4.444	1.500	8.1	387.5	0.0
1248.0	4.460	1.506	7.4	353.9	0.0
1272.0	4.474	1.512	6.8	323.9	0.0
1296.0	4.489	1.519	6.3	297.1	0.0
1320.0	4.502	1.524	5.8	273.2	0.0
1344.0	4.515	1.530	5.3	251.6	0.0
1368.0	4.526	1.536	4.9	231.9	0.0
1392.0	4.538	1.542	4.5	213.9	0.0
1416.0	4.548	1.548	4.2	197.5	0.0
1440.0	4.559	1.553	3.9	182.8	0.0

Runoff = 2.95 inches, Runoff Peak = 474.0 cfs Peak Timing = 750.0 min.
Runoff Volume = 671.1 cfs-hrs

Peak Flow Presentation for Subarea 43

Sub-Area	Travel Time	Time, minutes 760	792	816	840	864	888	912	936	960	984	1008
43	0.0	4237	4383	4671	5186	5702	6023	5896	5310	4027	1496	1054
42	15.9	4099	4356	4746	5282	5755	5949	5690	4933	3559	1957	1123
41	16.3	525	295	183	129	98	77	63	53	46	40	35
40	16.5	3598	4064	4566	5160	5666	5881	5631	4681	3511	1903	1087
39	23.3	3548	3977	4564	5167	5740	5952	5613	4867	3408	1726	1052
38	46.1	2211	3537	4402	5080	5697	5736	5220	4389	3247	1588	1049
37	46.7	432	1096	1235	800	494	311	235	189	158	135	118
36	55.1	359	1172	1169	747	462	320	244	194	160	136	118
35	53.4	97	327	249	121	78	58	45	36	30	26	23
34	55.7	260	842	929	623	382	263	200	158	130	111	96
33	69.8	107	216	651	335	205	144	110	86	70	59	51
32	46.6	1753	2451	3182	4288	5223	5439	4988	4198	3093	1431	931
31	62.9	1429	2040	3060	4280	5133	5237	4741	3910	2770	1586	953
30	74.4	1259	1860	3105	4503	5349	5232	4699	3789	2695	1398	990
29	74.6	171	304	1007	1026	578	345	250	192	154	129	110
28	81.6	139	248	897	943	534	339	245	187	149	123	105
27	81.8	44	77	275	268	133	82	60	46	37	31	26
26	82.0	95	170	617	682	400	257	185	142	112	93	79
25	75.0	1081	1543	2100	3487	4782	4891	4447	3591	2532	1270	881
24	92.1	839	1222	1891	3571	4780	4719	4198	3300	2315	1389	905
23	92.3	116	198	394	929	811	367	247	185	144	116	98
22	101.0	95	159	261	942	629	337	223	166	128	103	86
21	101.2	39	64	107	386	269	147	98	73	56	43	38
20	101.2	58	95	154	565	363	189	125	93	72	58	48
19	98.7	713	1020	1473	2544	4005	4369	3937	3109	2165	1263	807
18	108.5	583	887	1389	2418	3975	4276	3797	2998	1971	1183	855
17	108.9	190	290	452	931	1497	1261	742	412	309	241	196
16	126.6	104	159	244	554	1182	1013	547	353	242	186	149
15	133.1	62	95	142	325	608	731	318	196	143	111	88
14	133.8	36	55	69	139	354	434	160	100	75	59	46
13	109.1	330	502	931	1610	2501	3024	3061	2347	1661	931	659
12	117.8	347	506	807	1855	2603	3169	3042	2402	1568	949	651
11	118.0	41	63	110	228	727	401	245	171	130	101	82
10	118.3	304	439	694	1011	1875	2796	2807	2226	1430	848	569
9	130.2	270	377	586	944	1973	2794	2737	2071	1324	846	604
8	130.7	120	170	268	433	864	1326	1266	731	374	283	223
7	153.1	83	112	160	260	417	1302	1148	560	360	266	205
6	153.3	46	61	87	139	223	686	613	295	190	140	109
5	153.3	38	51	74	121	193	610	545	263	170	125	97
4	130.7	149	206	315	506	1102	1483	1475	1341	945	562	382
3	139.3	122	168	245	374	710	1286	1309	1355	875	455	333
2	156.9	81	105	145	222	361	737	1257	1202	705	396	301
1	179.8	49	61	80	113	178	292	867	997	522	339	249

OUTFLOW SUMMARY TABLE

Subarea No.	Peak Runoff cfs	Time of peak,min	Runoff Volume cfs-hrs	Peak Outflow cfs	Time of peak,min
1	1456.7	750.0	2179.2	1456.7	750.0
2	947.8	750.0	942.8	1406.0	768.0
3	948.0	750.0	910.2	1461.3	792.0
4	948.2	750.0	650.4	1430.0	744.0
5	950.2	750.0	1257.0	1905.2	750.0
6	1010.3	750.0	1425.1	1010.3	750.0
7	0.3	750.0	0.3	1737.5	744.0
8	1743.0	750.0	612.8	1775.0	768.0
9	0.3	750.0	0.3	2325.5	768.0
10	1382.2	750.0	194.2	2247.0	732.0
11	638.5	750.0	1221.3	638.5	750.0
12	0.3	750.0	0.3	3176.1	768.0
13	248.1	750.0	320.3	3198.0	792.0

[illegible]	[illegible]30.0	[illegible]75[illegible]	[illegible]843.[illegible]	[illegible]630.0	[illegible]750.0
[illegible]	[illegible]73.9	[illegible]750.[illegible]	629.9	1010.8	[illegible]44.0
16	609.1	750.0	985.8	1470.8	744.0
17	785.7	750.0	1078.5	1506.4	768.0
18	0.3	750.0	0.3	4363.2	768.0
19	365.0	750.0	494.5	4416.4	792.0
20	707.7	750.0	959.8	707.7	750.0
21	498.1	750.0	701.9	498.1	750.0
22	0.3	750.0	0.3	1114.1	744.0
23	185.8	750.0	242.1	936.1	744.0
24	0.3	750.0	0.3	4791.2	792.0
25	524.1	750.0	793.0	4942.4	792.0
26	1021.0	750.0	1469.7	1021.0	750.0
27	436.0	750.0	559.6	436.0	750.0
28	0.3	750.0	0.3	1292.0	744.0
29	131.6	750.0	185.6	1092.0	744.0
30	0.3	750.0	0.3	5428.7	792.0
31	155.0	750.0	218.5	5373.2	816.0
32	[illegible]42.4	[illegible]75[illegible]	1072.[illegible]	5[illegible]4.2	840.0
33	745.1	750.0	1084.3	745.1	750.0
34	728.0	750.0	1044.9	1097.9	744.0
35	450.1	750.0	607.1	450.1	750.0
36	0.3	750.0	0.3	1433.2	744.0
37	69.1	750.0	86.1	1252.0	768.0
38	0.3	750.0	0.3	5775.5	840.0
39	1462.6	750.0	2357.2	5961.5	864.0
40	412.4	750.0	588.3	5914.3	864.0
41	684.7	750.0	977.8	684.7	750.0
42	0.3	750.0	0.3	5904.2	864.0
[illegible]	474.0	750.[illegible]	671.1	6022.7	828.0

Surcharge Flow Occurred in Areas

1 2 3 4 5 6 7 8 9 10 12 13 16 17 18 19
22 24 25 26 28 30 31 32 33 34 35 36 37 38 39 40
41 42

Surcharge Flow above 50 Percent of Channel Capacity Occurred in Areas

1 2 4 7 8 9 10 12 13 16 17 18 19 24 25 26
28 30 31 32 34 36 37 38 39 40 42

APPENDIX E

MODEL ORDINANCE

MODEL ORDINANCE LANGUAGE TO IMPLEMENT THE GIRTY'S RUN WATERSHED PLAN UPDATE

1. Ordinance language to implement 4.1, Subarea Boundaries:

Section ___ - Stormwater management districts

A. For purposes of stormwater management, the municipality of _____ is divided into the following stormwater management districts:[1]

1. Girty's Run Watershed

(List any other DER-designated watershed in the municipality.)

One or more of these districts may be further subdivided into subareas which have similar hydrological characteristics and drain to a common point.

B. The location and boundaries of the watershed(s) and subareas are shown on the "Municipal Stormwater Management District Map", dated (include date of new watershed subarea map to distinguish it from the previously adopted map) which is hereby adopted as a part of this section.[2]

(NOTES:

1. The stormwater management districts may be adopted either as overlay districts to the municipal zoning map or as designated districts in the subdivision/land development ordinance or a separate, single-purpose stormwater management ordinance.

2. Map may be included as an appendix to the ordinance or copies made available in the municipal offices.)

2. Ordinance language to implement 4.2, Release Rate Percentages

Section ___ - Release rate percentages

A. Definition. The release rate percentage defines the percentage of the pre-development peak rate of runoff

that can be discharged from an outfall on the site after development. It applies uniformly to all land development or alterations within a subarea. A listing of the release rate percentage by watershed and subareas appears in Appendix __ of this ordinance; the subareas are delineated on the municipal stormwater management district map (refer to Section ___).

B. Procedure for use

1. Identify the specific subarea in which the development site is located from the watershed map and obtain the subarea release rate percentage from Appendix __.

2. Compute the pre- and post-development runoff hydrographs for each stormwater outfall on the development site using an acceptable calculation method for the design storms prescribed by this ordinance (see Section ___). Apply no on-site detention for stormwater management but include any techniques to minimize impervious surfaces and/or increase the time of concentration for stormwater runoff flowing from the development site.

3. Multiply the subarea release rate percentage by the predevelopment rate of runoff from the development site to determine the maximum allowable release rate from any detention facility for the prescribed storm events.

3. Ordinance language to implement 4.3, Design Storms

Section - Design Storms

A. Predevelopment and post development peak runoff rates and volumes shall be calculated for the 2-, 5-, 10-, 50- and 100-year storm frequencies. Either the SCS Type II or PDT Region I storm distributions may be used for analyzing stormwater runoff, but the same type storm distribution shall be used for analyzing both pre- and post-development conditions. The rainfall depths for the prescribed design storms in the watershed are:

Return Period (yrs)	Duration (hrs)	Rainfall depth (in)
2-year	2	1.27
	6	1.68
	24	2.28
5-year	2	1.49
	6	1.98
	24	2.69
10-year	2	1.75
	6	2.34
	24	3.07
50-year	2	2.25
	6	3.00
	24	3.96
100-year	2	2.62
	6	3.54
	24	4.56

(For additional information or data on other storm return periods, consult the Field Manual of the Pennsylvania Department of Transportation, Storm Intensity-Duration-Frequency Charts, May, 1986.)

(**NOTE**: Municipal officials will have to review all sections of the existing stormwater ordinances to ensure that any design storm references specify the 2-, 5, 10-, 50- and 100-year storm frequencies.)

4. Ordinance language to implement 4.4, Control Discharges

(Only reference to control discharge points in existing model ordinance appears to be in no harm evaluation procedure in Appendix B; no language changes seem necessary.)

5. Ordinance language to implement 4.5.1, Runoff Calculation Methods

Section - Calculation methods[1]

1. Development sites: For the purposes of computing peak flow rates and runoff hydrographs from development sites, calculations shall be performed using one of the following: SCS publications, Technical Release (TR) 55 or 20, or the Penn State Runoff Model (PRSM). The Rational Method may be utilized for development sites of 20 acres or less.

2. Stormwater collection/conveyance facilities: For the purposes of designing storm sewers, open swales and other stormwater runoff collection and conveyance facilities, the Rational Method shall be applied. Rainfall intensities for design should be obtained from the Pennsylvania Department of Transportation rainfall charts.

3. Predevelopment conditions: Predevelopment conditions shall be assumed to be those which exist on any site at the time of adoption of the Girty's Run Watershed Stormwater Management Plan, 1990 Update. Hydrologic conditions for all areas with pervious cover (i.e., fields, woods, lawn areas, pastures, cropland, etc.) shall be assumed to be in "good" condition, and the lowest recommended SCS runoff curve number (CN) shall be applied for all pervious land uses within the respective range for each land use and hydrologic soil group.

6. Ordinance language to implement 4.5.2, Project Site Release Rates

The following language shall be included in the section on criteria for stormwater detention facilities in the municipality's existing ordinance.[2]

---

[1]See Section 102C of the complete model ordinance for additional information.

[2]See Section 103 of complete model ordinance in Appendix __ for further information on minimally acceptable criteria for stormwater detention facilities.

Section - Criteria for stormwater detention facilities

A. If detention facilities are utilized for the development site, the facility(s) shall be designed such that post-development peak runoff rates from the developed site are controlled according to the following:

1. The 2-year post-development peak runoff rate must not exceed the 2-year pre-development peak runoff rate;
2. The 5-year post-development peak runoff rate must not exceed the 5-year pre-development peak runoff rate;
3. The 10-year post-development peak runoff rate must not exceed the 10-year pre-development peak runoff rate; and
4. The 50-year post-development peak runoff rate must not exceed the 50-year pre-development peak runoff rate; and
5. The 100-year post-development peak runoff rate must not exceed the 100-year pre-development peak runoff rate.

These requirements shall be subject to the applicable release rate percentages for the subarea in which the development site is located.

B. Runoff control facilities shall be designed and equipped with multi-stage outlet structures configured to control at least three of the above storms, such as the 2-, 10- and 100-year storms. However, calculations shall be provided for all five storms and the structure shall control the flow to the correct levels for all storms.

C. All runoff shall be conveyed from its point of origin to the detention facilities in a manner which avoids adverse impacts such as flooding, erosion and scouring of land and drainage channels located between the point of origin and the control facilities.

7. Ordinance language to implement 4.6, Exemptions

The following provisions shall be included in the section of the existing ordinance dealing with stormwater plan requirements and submission procedures.[3]

Section - Exemptions from Stormwater Plan Submissions

A. Certain land alteration activities shall be exempt from the application of the release rate controls and submission of preliminary and final stormwater management plans as required by this ordinance. **No land alteration activity, however, shall be exempt from the application of proper runoff, erosion and sediment controls so that downstream properties and watercourses are not harmed.**

B. Small developments

1. A small development is any subdivision or land development which results in (or will result when fully constructed) the creation of 5,000 or less square feet of impervious surface area.

2. The municipality shall determine if a development qualifies as a small development. If it so qualifies, the applicant shall submit a plan showing and describing the following:

   a. the type and location of proposed on-site stormwater management techniques or the proposed connection to an existing storm sewer system

   b. accurate site boundaries, five-foot interval contours, location of watershed and/or subarea boundaries on the site (if applicable) and any watercourses, floodplains, or existing drainage facilities or structures located on the site

3. The plan does not have to be prepared by a registered professional engineer,surveyor or landscape architect, but the municipality reserves the right to require such preparation.

4. The municipal engineer shall review and approve the proposed provisions for stormwater management

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[3]See Section 106 of the complete model ordinance for additional information on plan review procedures.

in accordance with the standards and requirements of this ordinance.

C. Farming or forestry management activities

1. Farming activities, nurseries and forestry management operations, where permitted by local ordinance, shall be not be required to submit a stormwater management plan in accordance with requirements of this section provided:

   a. farming activities are operated in accordance with a conservation plan or erosion and sedimentation control plan prepared by the Allegheny County Conservation District;

   b. forestry management operations are following PaDER management practices contained in its publication Soil Erosion and Sedimentation Control Guidelines for Forestry and are operating under an erosion and sedimentation control plan.

D. Mining

Strip mining, where permitted by local ordinance, shall have a plan, approved by the PaDER, for controlling erosion and sedimentation and stormwater runoff in accordance with the criteria and standards of the approved watershed stormwater management plan. A copy of the state-approved erosion/sedimentation and stormwater control plan shall be filed with municipality prior to commencing mining operations.

8. Ordinance language to implement 4.7, Project Site Stormwater Management Plan Requirements

Section - Stormwater Plan Contents

A. General Format

1. The stormwater plan shall be drawn to a scale of not less that 1 inch = 100 feet. All sheets shall contain a title block with: name and address of applicant and engineer, scale, north arrow, legend and date of preparation.

2. The stormwater management plan (including all calculations) must be prepared and sealed by a registered professional engineer, surveyor or

landscape architect with training and expertise in hydrology and hydraulics. Documentation of qualifications may be required by the municipality.

3. A brief written description of the proposed development and stormwater management controls shall be included.

4. Calculations shall be indexed, and all charts, figures, tables or similar information obtained from texts or other materials shall be referenced.

5. The omission of any of these general items shall cause the plan to be returned immediately to the applicant for corrections.

B. Preliminary Plan

The plan shall show the following:

1. Watershed location - Provide a key map showing development site's location within the watershed(s) and watershed subarea(s). On all site drawings, show the boundaries of the watershed(s) and subarea()s as they are located on the development site and identify watershed name(s) and subarea number(s).

2. Floodplain boundaries - Identify 100-year floodplains on the development site (as appropriate) based on the municipal Flood Insurance Study maps.

3. Natural features - Show all bodies of water (natural and artificial), watercourses (permanent and intermittent), swales, wetlands and other natural drainage courses on the development site and off-site if they will be affected by runoff from the development.

4. Soils - Provide an overlay showing soil types and boundaries within development site (consult county, SCS, U.S. Geological Survey for information).

5. Contours - Show existing and final contours at intervals of 2 feet; in areas with slopes greater than 15%, five-foot contour intervals may be used.

6. Existing stormwater controls - Show any existing stormwater management or drainage controls and/or

structures, such as sanitary and storm sewers, swales, culverts, etc. which are located on the development site, or which are located off-site but will be affected by runoff from the development.

7. Runoff calculations - Submit calculations for determining pre-and post-development discharge rates and for designing proposed stormwater control facilities with the stormwater management plan. All calculations shall be prepared using the method and data prescribed by Section ___ of this ordinance.

8. Proposed stormwater controls - Show all proposed stormwater runoff control measures on the plan including methods for collecting, conveying and storing stormwater runoff on-site, which are to be used both during and after construction. Erosion/sedimentation controls shall be shown in accordance with applicable municipal and County Conservation District requirements. The plan shall provide information on the exact type, location, sizing, design and construction of all proposed facilities and relationship to the existing watershed drainage system.

   a. If the development is to be constructed in stages, the applicant must demonstrate that stormwater facilities will be installed to manage stormwater runoff safely during each stage of development.

   b. A schedule for the installation of all temporary and permanent stormwater control measures and devices shall be submitted.

9. Easements, rights-of-way, deed restrictions - Show all existing and proposed easements and rights-of-way for drainage and/or access to stormwater control facilities and identify the proposed owner. Show any areas subject to special deed restrictions relative to or affecting stormwater management on the development site.

10. Other permits/approvals - Include a list of any approvals/permits related to stormwater management that will be required from other governmental agencies (e.g., an obstructions permit from PaDER) and the anticipated dates of submission and/or approval. Copies of permit applications may be

requested by the municipality where they may be helpful for the plan review.

11. Maintenance program - Provide a proposed maintenance plan for all stormwater control facilities constructed as part of the development or affected by the development's runoff. The maintenance plan shall:

    a. Identify the proposed ownership entity (initial, interim and final) and the time period for which each is responsible.

    b. Include a maintenance program for all facilities, outlining the type of maintenance activities required, probable frequencies, personnel and equipment requirements and estimated annual maintenance costs.

    c. Identify method of financing continuing operation and maintenance if the facility is to be owned by other than the municipality or a governmental agency.

C. Final Plan Contents

The final stormwater management plan for the development site shall include:

1. All information from the preliminary plan pertaining to stormwater management on the development site, along with any changes or additions.

2. Maps and drawings showing the exact nature and location of all temporary and permanent stormwater management control facilities. Detailed plans, sections and specifications shall clearly indicate the proposed construction methods for any stormwater management facilities.

3. A schedule for the installation of all temporary and permanent stormwater control facilities.

4. An accurate survey showing all current and proposed easements and rights-of-way together with copies of all proposed deed restrictions.

4. The maintenance program establishing ownership and maintenance responsibilities for all stormwater control facilities, as well as any legal agreements required to implement the maintenance

program. Submit also a copy of the maintenance agreement as required by Section ___ of this ordinance.[4]

5. Financial guarantees, in accordance with Section ___ of this ordinance, to ensure that all stormwater control facilities will be installed properly and function satisfactorily.

9. Ordinance language to implement Section 4. , County Planning Department Review of Project Site Stormwater Management Plan

The following provision shall be included in the section of the existing ordinance that details the procedures for stormwater plan reviews.[5]

Section - County Planning Department review

A. The Allegheny County Planning Department shall review the development site's preliminary stormwater plan, along with all runoff calculations, to assure that watershed plan standards have been applied appropriately and that downstream impacts have been adequately addressed. A report of the Department's findings will be returned to the municipality within 30 days.

B. If the Planning Department review identifies the possibility of harmful downstream impacts from the development site, the applicant will be advised so that the necessary modifications can be made to the stormwater management controls for the development site. The municipal engineer shall not approve the development site's stormwater management plan until modifications are made and the plan receives a positive review from the County Planning Department.

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[4]For additional information, refer to Section 105 of the complete model stormwater management ordinance contained in Appendix __ of this plan update.

[5]See Section 107 of the complete model ordinance, Appendix __, for a full description of the plan review procedures.

MODEL STORMWATER PROVISIONS FOR MUNICIPAL SUBDIVISION AND LAND DEVELOPMENT ORDINANCES

Article ___, Stormwater Management

Section 101 - General provisions

A. Purpose

These regulations are adopted and implemented to achieve the following general purposes and objectives:

1. To manage and stormwater runoff resulting from land alteration and disturbance activities in accordance with the watershed stormwater management plans adopted pursuant to the Pennsylvania Storm Water Management Act (Act 167 of 1978, as amended).

2. To utilize and preserve the desirable existing natural drainage systems and to preserve the flood-carrying capacity of streams.

3. To encourage natural infiltration of rainfall to preserve groundwater supplies and stream flows.

4. To provide for adequate maintenance of all permanent stormwater management structures in the municipality.

B. Applicability

The provisions of this article shall apply to all subdivisions and land development activity within the municipality of _____.

C. Repealer

This ordinance shall repeal all other ordinances, or parts thereof, which are contrary to or conflict with the provisions of this ordinance to the extent necessary to give this ordinance full force and effect.

D. Severability

Should any section or provision of this ordinance be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of this ordinance as a whole or any other part hereof; the parts or sections remaining shall remain in effect as if the part of the

section declared unconstitutional had never been a part of this ordinance.

E. Liability disclaimer

1. Neither the granting of any approval under the stormwater management provisions of this ordinance, nor the compliance with the provisions of this ordinance, or with any condition imposed by a municipal official hereunder, shall relieve any person from any responsibility for damage to persons or property resulting therefrom, or as otherwise imposed by law, nor impose any liability upon the municipality for damages to persons or property.

2. The granting of a permit which includes any stormwater management facilities shall not constitute a representation, guarantee or warranty of any kind by the municipality, or by an official or employee thereof, of the practicability or safety of any structure, use or other plan proposed, and shall create no liability upon or cause of action against such public body, official or employee for any damage that may result pursuant thereto.

Section 102 - Stormwater management performance standards

A. Stormwater management performance districts

1. For purposes of stormwater management, the municipality of _____ is divided into the following stormwater management districts:

(List each DER-designated watershed in the municipality.)

One or more of these districts may be further subdivided into subareas which have similar hydrological characteristics and drain to a common point.

2. The location and boundaries of the watershed(s) and subareas are shown on the "Municipal Stormwater Management District Map" which is hereby adopted as a part of this section.

(NOTES:

1. The stormwater management districts may be adopted either as overlay districts to the municipal zoning map or as designated districts in the subdivision/land development ordinance or a

separate, single-purpose stormwater management ordinance.

2. Map may be included as an appendix to the ordinance or copies made available in the municipal offices.)

B. General standards

1. The following provisions shall be considered the overriding performance standards against which all proposed stormwater control measures shall be evaluated and shall apply throughout the municipality of _____:

a. Any landowner and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include such actions as are required:

(1) To assure that the maximum rate of stormwater runoff is no greater after development than prior to development activities; or

(2) To manage the quantity, velocity and direction of resulting stormwater runoff in a manner which otherwise adequately protects health and property from possible injury.

2. The stormwater management plan for the development site must consider all the stormwater runoff flowing over the site.

3. No discharge of toxic materials shall be permitted into any stormwater management system.

C. Technical standards: (Name of Stormwater Management District)[1]

1. The stormwater performance standards contained in this section are intended to implement the standards and criteria contained in the _____ Stormwater Management Plan, adopted and approved in accordance with the Pennsylvania Storm Water Management Act. If

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[1]Municipalities that include more than one DER-designated watershed will need to add provisions following this section for the other designated watersheds.

there is any discrepancy between the provisions of this section and the standards and criteria of the plan, or if the watershed plan is subsequently amended, then the standards/criteria of the current watershed plan shall govern.

2. Design Storms. Predevelopment and post development peak runoff rates and volumes shall be calculated for the 2-, 5-, 10-, 50- and 100-year storm frequencies. Either the SCS Type II or PDT Region I storm distributions may be used for analyzing stormwater runoff, but the same type storm distribution shall be used for analyzing both pre- and post-development conditions. The rainfall depths for the prescribed design storms in the watershed are:

Return Period (yrs)	Duration (hrs)	Rainfall depth (in)
2-year	2	1.27
	6	1.68
	24	2.28
5-year	2	1.49
	6	1.98
	24	2.69
10-year	2	1.75
	6	2.34
	24	3.07
50-year	2	2.25
	6	3.00
	24	3.96
100-year	2	2.62
	6	3.54
	24	4.56

(For additional information or data on other storm return periods, consult the Field Manual of the Pennsylvania Department of Transportation, Storm Intensity-Duration-Frequency Charts, May, 1986.)

3. Calculation methods

a. Development sites: For the purposes of computing peak flow rates and runoff hydrographs from development sites, calculations shall be performed using one of the following: SCS publications, Technical Release (TR) 55 or 20, or the Penn State

Runoff Model (PSRM). The Rational Method may be utilized for development sites of 20 acres or less.

b. Stormwater collection/conveyance facilities: For the purposes of designing storm sewers, open swales and other stormwater runoff collection and conveyance facilities, the Rational Method shall be applied. Rainfall intensities for design should be obtained from the Pennsylvania Department of Transportation rainfall charts.

c. Predevelopment conditions: Predevelopment conditions shall be assumed to be those which exist on any site at the time of adoption of the _____ Stormwater Management Plan. Hydrologic conditions for all areas with pervious cover (i.e., fields, woods, lawn areas, pastures, cropland, etc.) shall be assumed to be in "good" condition, and the lowest recommended SCS runoff curve number (CN) shall be applied for all pervious land uses within the respective range for each land use and hydrologic soil group.

4. Release rate percentage

a. Definition. The release rate percentage defines the percentage of the pre-development peak rate of runoff that can be discharged from an outfall on the site after development. It applies uniformly to all land development or alterations within a subarea. A listing of the release rate percentage by watershed and subareas appears in Appendix __ of this ordinance; the subareas are delineated on the municipal stormwater management district map (refer to Section ___).

b. Procedure for use

(1) Identify the specific subarea in which the development site is located from the watershed map and obtain the subarea release rate percentage from Appendix __.

(2) Compute the pre- and post-development runoff hydrographs for each stormwater outfall on the development site using an acceptable calculation method for the design storms prescribed by this ordinance (see Section ___). Apply no on-site detention for stormwater management but include any techniques to minimize impervious surfaces

and/or increase the time of concentration for stormwater runoff flowing from the development site.

(3) Multiply the subarea release rate percentage by the predevelopment rate of runoff from the development site to determine the maximum allowable release rate from any detention facility for the prescribed storm events.

5. No harm evaluation

a. An applicant may seek to exceed the otherwise applicable subarea release rate percentage by performing the "No Harm Evaluation". This evaluation requires an independent engineering analysis to demonstrate that other reasonable options exist to prevent the occurrence of increased stormwater runoff discharge rates and/or velocities or that measures can be provided to prevent increased stormwater discharge rates and/or velocities from increasing flood elevations and accelerating erosion at all downstream points in the watershed.

b. The analysis for the no-harm evaluation shall be submitted to the municipal engineer and Allegheny Planning Department for review and approval.

Section 103 - Design criteria for stormwater management controls

A. General criteria

1. Applicants may select runoff control techniques, or a combination of techniques, which are most suitable to control stormwater runoff from the development site. All controls must be subject to approval of the municipal engineer. The municipal engineer may request specific information on design and/or operating features of the proposed stormwater controls in order to determine their suitability and adequacy in terms of the standards of this ordinance.

2. The applicant should consider the effect of the proposed stormwater management techniques on any special soil conditions or geological hazards which may exist on the development site. In the event such conditions are identified on the site, the municipal engineer may require in-depth studies by a competent geotechnical engineer. Not all stormwater control

methods may be advisable or allowable at a particular development site.

3. The stormwater management practices to be used in developing a stormwater management plan for a particular site shall be selected according to the following order of preference:

   a. Infiltration of runoff on-site

   b. Flow attenuation by use of open vegetated swales and natural depressions

   c. Stormwater retention/detention structures

4. Infiltration practices shall be used to the extent practicable to reduce volume increases and promote groundwater recharge. A combination of successive practices may be used to achieve the applicable minimum control requirements. Justification shall be provided by the applicant for rejecting each practice based on actual site conditions.

B. Criteria for infiltration systems

1. Infiltration systems shall be sized and designed based upon local soil and ground water conditions.

2. Infiltration systems greater than 3 feet deep shall be located at least 10 feet from basement walls.

3. Infiltration systems designed to handle runoff from commercial or industrial parking areas shall be a minimum of 100 feet from any water supply well.

4. Infiltration systems may not receive runoff until the entire drainage area to the system has received final stabilization.

5. The stormwater infiltration facility design shall provide an overflow system with measures to provide a non-erosive velocity of flow along its length and at the outfall.

C. Criteria stormwater detention facilities

1. If detention facilities are utilized for the development site, the facility(s) shall be designed such that post-development peak runoff rates from the developed site are controlled according to the following:

a. The 2-year post-development peak runoff rate must not exceed the 2-year pre-development peak runoff rate;

b. The 5-year post-development peak runoff rate must not exceed the 5-year pre-development peak runoff rate;

c. The 10-year post-development peak runoff rate must not exceed the 10-year pre-development peak runoff rate; and

d. The 50-year post-development peak runoff rate must not exceed the 50-year pre-development peak runoff rate; and

e. The 100-year post-development peak runoff rate must not exceed the 100-year pre-development peak runoff rate.

These requirements shall be subject to the applicable release rate percentages for the subarea in which the development site is located.

2. Runoff control facilities shall be designed and equipped with multi-stage outlet structures configured to control at least three of the above storms, such as the 2-, 10- and 100-year storms. However, calculations shall be provided for all five storms and the structure shall control the flow to the correct levels for all storms.

3. All runoff shall be conveyed from its point of origin to the detention facilities in a manner which avoids adverse impacts such as flooding, erosion and scouring of land and drainage channels located between the point of origin and the control facilities.

4. Shared-storage facilities, which provide detention of runoff for more than one development site within a single subarea may be considered. Such facilities shall meet the criteria contained in this section. In addition, runoff from the development sites involved shall be conveyed to the facility in a manner that avoids adverse impacts (such as flooding or erosion) to channels and properties located between the development site and the shared-storage facilities.

5. Where detention facilities will be utilized, multiple-use facilities, such as lakes, ballfields or similar recreational uses, are encouraged wherever feasible, subject to approval of the municipality.

6. Other considerations which should be incorporated into the design of the detention facilities include:

   a. Inflow and outflow structures shall be designed and installed to prevent erosion, and bottoms of impoundment type structures should be protected from soil erosion.

   b. Control and removal of debris both in storage structure and in all inlet or outlet devices shall be a design consideration.

   c. Inflow and outflow structures, pumping stations, and other structures shall be protected and designed to minimize safety hazards.

   d. The water depth at the perimeter of a storage pond should be limited to that which is safe for children. This is especially necessary if bank slopes are steep or if ponds are full and recirculating in dry periods. Restriction of access (fence, walls, etc.) may be necessary depending on location of the facility.

   e. Side slopes of storage ponds shall not exceed a ratio of two-and-one-half to one (2.5:1) horizontal to vertical dimension.

   f. Landscaping shall be provided for the facility which harmonizes with the surrounding area.

   g. Facility shall be located to facilitate maintenance, considering the frequency and type of equipment that will be required.

D. Criteria for collection/conveyance facilities

1. All stormwater runoff collection or conveyance facilities, whether storm sewers or other open or closed channels, shall be designed in accordance with the following basic standards:

   a. All sites shall be graded to provide drainage away from and around the structure in order to prevent any potential flooding damage.

   b. Lots located on the high side of streets shall extend roof and french drains to the curb line storm sewer (if applicable). Low side lots shall extend roof and french drains to a stormwater collection/conveyance system or natural watercourse in accordance with the approved

stormwater management plan for the development site.

c. Collection/conveyance facilities should not be installed parallel and close to the top or bottom of a major embankment to avoid the possibility of failing or causing the embankment to fail.

d. All collection/conveyance facilities shall be designed to convey the 25-year storm peak flow rate from the contributing drainage area and to carry it to the nearest suitable outlet such as a curbed street, storm sewer or natural watercourse.

e. Where drainage swales or open channels are used, they shall be suitably lined to prevent erosion and designed to avoid excessive velocities.

2. Wherever storm sewers are proposed to be utilized, they shall comply with the following criteria:

a. Where practical, designed to traverse under seeded and planted areas. If constructed within 10 feet of road paving, walks or other surfaced areas, drains shall have a narrow trench and maximum compaction of backfill to prevent settlement of the superimposed surface or development.

b. Preferably installed after excavating and filling in the area to be traversed is completed, unless the drain is installed in the original ground with a minimum of 3 feet cover and/or adequate protection during the fill construction.

c. Designed: (1) with cradle when traversing fill areas of indeterminate stability, (2) with anchors when gradient exceeds 20 percent, and (3) with encasement or special backfill requirements when traversing under a paved area.

d. Designed to adequately handle the anticipated stormwater flow and be economical to construct and maintain. The minimum pipe size shall be 15 inches in diameter.

e. Drain pipe, trenching, bedding and backfilling requirements shall conform to the requirements of the municipal and/or applicable PaDOT Specifications, Form 408.

f. All corrugated metal pipe shall be polymer coated, and with asbestos bonding and paved inverts where

prone to erode. Pipe within a municipal right of way shall be reinforced concrete pipe with a minimum diameter of 15 inches.

g. Storm inlets and structures shall be designed to be adequate, safe, self-cleaning and unobtrusive and consistent with municipal standards.

h. Appropriate grates shall be designed for all catch basins, stormwater inlets and other entrance appurtenances.

i. Manholes shall be designed so that the top shall be at finished grade and sloped to conform to slope of finished grade. Top castings of structures located in roads or parking areas shall be machined or installed to preclude "rattling."

j. Where proposed sewer connects with an existing storm sewer system, the applicant shall demonstrate that sufficient capacity exists in the downstream system to handle the additional flow.

k. Storm sewer outfalls shall be equipped with energy dissipation to prevent erosion and conform with applicable requirements of the PaDER for stream encroachments (Chapter 105 of PADER Rules and Regulations).

Section 104 - Erosion and sedimentation controls

A. Erosion/sedimentation plan shall be provided in accordance with the PA Erosion/Sedimentation Regulations (25 PA Code, Chapter 102) and the standards and guidelines of the County Conservation District.

(If the municipality has a grading or other ordinance which contains its erosion/sedimentation provisions, then it should be referenced here.)

B. Proposed erosion/sedimentation measures shall be submitted with the stormwater management plan as part of the preliminary and final applications.

Section 105 - Maintenance of stormwater management controls

A. Maintenance responsibilities

1. The stormwater management plan for the development site shall establish responsibilities for the continuing operation and maintenance of all proposed stormwater

control facilities, consistent with the following principles:

a. If a development consists of structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the municipality, stormwater control facilities should also be dedicated to and maintained by the municipality.

b. If a development site is to be maintained in single ownership or if streets, sewers and other public improvements are to be privately owned and maintained (e.g., by a homeowners' association), then the ownership and maintenance of stormwater control facilities should be the responsibility of the owner or private management entity.

2. The governing body, upon recommendation of the municipal engineer, shall make the final determination on the continuing maintenance responsibilities prior to final approval of the stormwater management plan. The governing body reserves the right to accept the ownership and operating responsibility for any or all of the stormwater management controls.

B. Maintenance agreement for privately owned stormwater facilities

1. Prior to final approval of the site's stormwater management plan the property owner shall sign and record a maintenance agreement covering all stormwater control facilities which are to be privately owned. The agreement shall stipulate that:

a. The owner shall maintain all facilities in accordance with the approved maintenance schedule and shall keep all facilities maintained in a safe and attractive manner.

b. The owner shall convey to the municipality easements and/or rights of way to assure access for periodic inspections by the municipality and maintenance if required.

c. The owner shall keep on file with the municipality the name, address and telephone number of the person or company responsible for maintenance activities; in the event of a change new information will be submitted to the municipality within 10 days of the change.

d. If the owner fails to maintain the stormwater control facilities following due notice by the municipality to correct the problem(s), the municipality may perform the necessary maintenance work or corrective work and the owner shall reimburse the municipality for all costs.

2. Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The maintenance agreement shall be subject to the review and approval of the municipal solicitor and governing body.

C. Municipal stormwater maintenance fund

This provision as an example of one way that a municipality could establish a special fund to finance its maintenance and inspection activities for stormwater retention/detention facilities. It is an optional provision of the ordinance. If a municipality is interested in establishing such a fund, it is recommended that it consult with its solicitor for legal requirements and procedures.

1. Persons installing stormwater storage facilities shall be required to pay a specified amount to the Municipal Stormwater Maintenance Fund to help defray costs of periodic inspections and annual maintenance expenses. The amount of the deposit shall be determined as follows:

   a. If the storage facility is to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the municipality for a period of 10 years, as estimated by the municipal engineer. After that period of time, inspections will be performed at the expense of the municipality.

   b. If the storage facility is to be owned and maintained by the municipality, the deposit shall cover the estimated annual costs for maintenance and inspections for 10 years. The municipal engineer will establish the estimated annual maintenance costs utilizing information submitted by the applicant.

   c. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The municipal engineer shall determine

the present worth equivalents which shall be subject to the approval of the governing body.[2]

2. If a storage facility is proposed that also serves as a recreation facility (e.g., ballfield, lake), the municipality may reduce or waive the amount of the maintenance fund deposit based on the value of the land for public recreation purposes.

3. If at some future time a storage facility (whether publicly or privately owned) is eliminated due to the installation of storm sewers or another storage facility, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of the deposit remaining after the costs of abandonment are paid will be returned to the depositor.

Section 106 - Stormwater Plan Requirements

A. General requirements. No final subdivision/land development plan shall be approved, no permit authorizing construction issued, or any earthmoving or land disturbance activity initiated until the final stormwater management plan for the development site is approved in accordance with the provisions of this ordinance.

B. Exemptions from stormwater plan submissions

1. Certain land alteration activities shall be exempt from the application of the release rate controls and submission of preliminary and final stormwater management plans as required by this ordinance. **No land alteration activity, however, shall be exempt from the application of proper runoff, erosion and sediment controls so that downstream properties and watercourses are not harmed.**

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[2]The required deposit would be equal to an amount that with interest would generate sufficient income annually to pay the maintenance and inspection costs over ten years. If the estimate maintenance/inspection cost is $500 per year, instead of requiring a deposit of $5,000 ($500 x 10 years), the deposit would be reduced to $3,690 with the present worth approach, assuming a 6 percent annual interest rate and that the funds would be reduced to zero at the end of 10 years.

2. Small developments

a. A small development is any subdivision or land development which results in (or will result when fully constructed) the creation of 5,000 or less square feet of impervious surface area.

b. The municipality shall determine if a development qualifies as a small development. If it so qualifies, the applicant shall submit a plan showing and describing the following:

(1) the type and location of proposed on-site stormwater management techniques or the proposed connection to an existing storm sewer system

(2) accurate site boundaries, five-foot interval contours, location of watershed and/or subarea boundaries on the site (if applicable) and any watercourses, floodplains, or existing drainage facilities or structures located on the site

c. The plan does not have to be prepared by a registered professional engineer,surveyor or landscape architect, but the municipality reserves the right to require such preparation.

d. The municipal engineer shall review and approve the proposed provisions for stormwater management in accordance with the standards and requirements of this ordinance.

3. Farming or forestry management activities

a. Farming activities, nurseries and forestry management operations, where permitted by local ordinance, shall be not be required to submit a stormwater management plan in accordance with requirements of this section provided:

(1) farming activities are operated in accordance with a conservation plan or erosion and sedimentation control plan prepared by the Allegheny County Conservation District;

(2) forestry management operations are following PaDER management practices contained in its publication Soil Erosion and Sedimentation Control Guidelines for Forestry and are

operating under an erosion and sedimentation control plan.

4. Mining

Strip mining, where permitted by local ordinance, shall have a plan, approved by the PaDER, for controlling erosion and sedimentation and stormwater runoff in accordance with the criteria and standards of the approved watershed stormwater management plan. A copy of the state-approved erosion/sedimentation and stormwater control plan shall be filed with municipality prior to commencing mining operations.

C. Stormwater plan contents

1. General Format

a. The stormwater plan shall be drawn to a scale of not less that 1 inch = 100 feet. All sheets shall contain a title block with: name and address of applicant and engineer, scale, north arrow, legend and date of preparation.

b. The stormwater management plan (including all calculations) must be prepared and sealed by a registered professional engineer, surveyor or landscape architect with training and expertise in hydrology and hydraulics. Documentation of qualifications may be required by the municipality.

c. A brief written description of the proposed development and stormwater management controls shall be included.

d. Calculations shall be indexed, and all charts, figures, tables or similar information obtained from texts or other materials shall be referenced.

e. The omission of any of these general items shall cause the plan to be returned immediately to the applicant for corrections.

2. Preliminary Plan

The plan shall show the following:

a. Watershed location - Provide a key map showing development site's location within the watershed(s) and watershed subarea(s). On all site drawings, show the boundaries of the

watershed(s) and subarea()s as they are located on the development site and identify watershed name(s) and subarea number(s).

b. Floodplain boundaries - Identify 100-year floodplains on the development site (as appropriate) based on the municipal Flood Insurance Study maps.

c. Natural features - Show all bodies of water (natural and artificial), watercourses (permanent and intermittent), swales, wetlands and other natural drainage courses on the development site and off-site if they will be affected by runoff from the development.

d. Soils - Provide an overlay showing soil types and boundaries within development site (consult county, SCS, U.S. Geological Survey for information).

e. Contours - Show existing and final contours at intervals of 2 feet; in areas with slopes greater than 15%, five-foot contour intervals may be used.

f. Existing stormwater controls - Show any existing stormwater management or drainage controls and/or structures, such as sanitary and storm sewers, swales, culverts, etc. which are located on the development site, or which are located off-site but will be affected by runoff from the development.

g. Runoff calculations - Submit calculations for determining pre-and post-development discharge rates and for designing proposed stormwater control facilities with the stormwater management plan. All calculations shall be prepared using the method and data prescribed by Section ___ of this ordinance.

h. Proposed stormwater controls - Show all proposed stormwater runoff control measures on the plan including methods for collecting, conveying and storing stormwater runoff on-site, which are to be used both during and after construction. Erosion/sedimentation controls shall be shown in accordance with applicable municipal and County Conservation District requirements. The plan shall provide information on the exact type, location, sizing, design and construction of all

proposed facilities and relationship to the existing watershed drainage system.

(1) If the development is to be constructed in stages, the applicant must demonstrate that stormwater facilities will be installed to manage stormwater runoff safely during each stage of development.

(2) A schedule for the installation of all temporary and permanent stormwater control measures and devices shall be submitted.

i. Easements, rights-of-way, deed restrictions - Show all existing and proposed easements and rights-of-way for drainage and/or access to stormwater control facilities and identify the proposed owner. Show any areas subject to special deed restrictions relative to or affecting stormwater management on the development site.

j. Other permits/approvals - Include a list of any approvals/permits related to stormwater management that will be required from other governmental agencies (e.g., an obstructions permit from PaDER) and the anticipated dates of submission and/or approval. Copies of permit applications may be requested by the municipality where they may be helpful for the plan review.

k. Maintenance program - Provide a proposed maintenance plan for all stormwater control facilities constructed as part of the development or affected by the development's runoff. The maintenance plan shall:

(1) Identify the proposed ownership entity (initial, interim and final) and the time period for which each is responsible.

(2) Include a maintenance program for all facilities, outlining the type of maintenance activities required, probable frequencies, personnel and equipment requirements and estimated annual maintenance costs.

(3) Identify method of financing continuing operation and maintenance if the facility is to be owned by other than the municipality or a governmental agency.

3. Final Plan Contents

The final stormwater management plan for the development site shall include:

a. All information from the preliminary plan pertaining to stormwater management on the development site, along with any changes or additions.

b. Maps and drawings showing the exact nature and location of all temporary and permanent stormwater management control facilities. Detailed plans, sections and specifications shall clearly indicate the proposed construction methods for any stormwater management facilities.

c. A schedule for the installation of all temporary and permanent stormwater control facilities.

4. An accurate survey showing all current and proposed easements and rights-of-way together with copies of all proposed deed restrictions.

d. The maintenance program establishing ownership and maintenance responsibilities for all stormwater control facilities, as well as any legal agreements required to implement the maintenance program. Submit also a copy of the maintenance agreement as required by Section ___ of this ordinance.

e. Financial guarantees, in accordance with Section ___ of this ordinance, to ensure that all stormwater control facilities will be installed properly and function satisfactorily.

Section 107 - Plan review procedures

A. Pre-application phase

1. Before submitting the stormwater plan, applicants are urged to consult with the municipality, County Planning Department and County Conservation District on the requirements for safely managing runoff from the development site in a manner consistent with the municipal ordinances and applicable watershed stormwater management plan. These agencies may also be helpful in providing necessary data for the stormwater management plan.

2. Applicants are encouraged to submit a sketch plan with a narrative description of the proposed stormwater management controls for general guidance and discussion with municipality and other agencies.

3. The pre-application phase is not mandatory; any review comments provided by the municipality or other agencies are advisory only and do not constitute any legally binding action on the part of the municipality or any county agency.

B. Stormwater plan reviews

1. Submission of plans. Stormwater plan applications shall be submitted with the preliminary and final subdivision/land development applications.

2. Notification of affected municipalities. The municipality shall notify municipalities upstream and downstream of the development site, which may be affected by the stormwater runoff and proposed controls for the site. Copies of the plans will be made available to the municipalities upon request. Comments received from any affected municipality will be considered by the municipal engineer and county agencies in their reviews.

3. Review by municipal engineer and County Conservation District. Stormwater plans shall be reviewed by the municipal engineer and County Conservation District. At its discretion, the municipality may also engage other specialists in hydrology or hydraulics to assist with the stormwater plan review.

4. County planning review

a. The Allegheny County Planning Department shall review the development site's preliminary stormwater plan, along with all runoff calculations, to assure that watershed plan standards have been applied appropriately and that downstream impacts have been adequately addressed. A report of the Department's findings will be returned to the municipality within 30 days.

b. If the Planning Department review identifies the possibility of harmful downstream impacts from the development site, the applicant will be advised so that the necessary modifications can be made to the stormwater management controls for the development site. The municipal engineer shall not approve the development site's stormwater

management plan until modifications are made and the plan receives a positive review from the County Planning Department.

5. Municipal engineer's review. The municipal engineer shall approve or disapprove the stormwater management plan based on the requirements of the municipal ordinances, the standards and criteria of the watershed plan and good engineering practice. The engineer shall submit a written report, along with supporting documentation, stating the reasons for approval and disapproval.

6. Status of the engineer's determination. The approval/disapproval of the site's stormwater management plan by the municipal engineer shall be considered final. The governing body[3] shall not reverse the engineer's determination by approving or disapproving the site's stormwater management plan or any specific control measure in contradiction to the engineer's action. The governing body may request modifications or alternative approaches to the stormwater management controls, provided these are agreed to by the municipal engineer and the applicant's engineer.

(Note: It is important that the applicant's engineer concur with the requested modifications because he/she is certifying the development's stormwater management system.)

7. Permits required from other governmental agencies. Where the proposed development requires an obstruction permit from PaDER or an erosion/sedimentation permit from the County Conservation District, then final stormwater management plan approval shall be conditional upon receipt of such permits. However, no building permit shall be issued, nor construction started, until the permits are received and copies filed with the municipality.

Section 108 - Status of the stormwater plan after final approval

A. Upon final stormwater plan approval and receipt of all necessary permits, the applicant may commence to install or implement the approved stormwater management controls.

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[3]If the municipal Planning Commission has the final authority for approving plans, then this section should be changed as appropriate.

B. If site development or building construction does not begin with two years of the date of final approval of the stormwater management plan, then before doing so, the applicant shall resubmit the stormwater management plan to verify that no condition has changed within the watershed that would affect the feasibility or effectiveness of the previously approved stormwater management controls. Further, if for any reason development activities are suspended for two years or more, then the same requirement for resubmission of the stormwater management plan shall apply.

Section 109 - Stormwater plan modifications

A. If the request for a plan modification is initiated before construction begins, the stormwater plan must be resubmitted and reviewed according to the procedures contained Section 107 above.

B. If the request for a plan modification is initiated after construction is underway, the municipal engineer shall have the authority to approve or disapprove the modification based on field inspection provided: (1) the requested changes in stormwater controls do not result in any modifications to other approved municipal land use/development requirements (e.g., building setbacks, yards, etc.) and (2) the performance standards in Section 102 are met. Notification of the engineer's action shall be sent to the governing body which may issue a stay of the plan modification within 5 days and require the permittee to resubmit the plan modification for full stormwater plan review in accordance with Section 107 above.

Section 110 - Inspections of stormwater management controls

This section outlines a model schedule for performing inspections of stormwater controls during construction. However, the inspection procedures will have to be tailored to each municipality's needs and resources.

A. The municipal engineer or a designated representative shall inspect the construction of the temporary and permanent stormwater management system for the development site. The permittee shall notify the engineer 48 hours in advance of the completion of the following key development phases:

1. At the completion of preliminary site preparation including stripping of vegetation, stockpiling of topsoil and construction of temporary stormwater management and erosion control facilities.

2. At the completion of rough grading but prior to placing topsoil, permanent drainage or other site development improvements and ground covers.

3. During construction of the permanent stormwater facilities at such times as specified by the municipal engineer.

4. Completion of permanent stormwater management facilities including established ground covers and plantings.

5. Completion of an final grading, vegetative control measures or other site restoration work done in accordance with the approved plan and permit.

B. No work shall commence on any subsequent phase until the preceding one has been inspected and approved. If there are deficiencies in any phase, the municipal engineer shall issue a written description of the required corrections and stipulate the time by which they must be made.

C. If during construction, the contractor or permittee identifies any site condition, such as subsurface soil conditions, alterations in surface or subsurface drainage which could affect the feasibility of the approved stormwater facilities, he/she shall notify the municipal engineer within 24 hours of the discovery of such condition and request a field inspection. The municipal engineer shall determine if the condition requires a stormwater plan modification.

D. In cases where stormwater facilities are to be installed in areas of landslide-prone soils or other special site conditions exist, the municipality may require special precautions such as soil tests and core borings, full-time resident inspectors and/or similar measures. All costs of any such measures shall be borne by the permittee.

Section 111 - Financial guarantees and dedication of public improvements

A. Guarantee of completion. A completion guarantee in the form of a bond, cash deposit, certified check or other negotiable securities acceptable to the municipality, shall be filed. The guarantee shall cover all streets, sanitary sewers, stormwater management facilities, water systems, fire hydrants, sidewalks and other required improvements; it shall be in the amount and form prescribed by the Municipalities Planning Code (Section 509).

B. Release of completion guarantee. The completion guarantee shall be returned or released upon written certification by the municipal engineer or a designated agent that improvements and facilities have been installed and completed in accordance with the approved plan and specifications. The procedures for requesting and obtaining a release of the completion guarantee shall be in manner prescribed by the Municipalities Planning Code (Section 510).

C. Default of completion guarantee. If improvements are not installed in accordance with the approved final plan, the governing body may enforce any corporate bond or other security by appropriate legal and equitable remedies. If proceeds of such bond or other security are insufficient to pay the cost of installing or making repairs or corrections to all the improvements covered by said security, the governing body may at its option install part of such improvements in all or part of the development and may institute appropriate legal or equitable action to recover the monies necessary to complete the remainder of the improvements. All proceeds, whether resulting from the security or from any legal or equitable action brought against the developer, or both, shall be used solely for the installation of the improvements covered by such security and not for any other municipal purpose.

D. Dedication of public improvements

1. When streets, sanitary sewers, stormwater management facilities, water lines or other required improvements in the development have been completed in accordance with final approved plan, such improvements shall be deemed private until such time as they have been offered for dedication to the municipality and accepted by separate ordinance or resolution or until they have been condemned for use as a public facility.

2. Prior to acceptance of any improvements or facilities, the municipal engineer shall inspect it to ensure that it is constructed in accordance with the approved plan and is functioning properly. In the case of any stormwater control facility, it must be free of sediment and debris.

3. The owner shall submit as-built plans for all facilities proposed for dedication.

E. Maintenance guarantee. Prior to acceptance of any improvements or facilities, the applicant shall provide a financial security to secure the structural integrity and functioning of the improvements. The security shall: (1) be

in the form of a bond, cash, certified check or other negotiable securities acceptable to the municipality, (2) be for a term of 18 months, and (3) be in an amount equal to 15 percent of the actual cost of the improvements and facilities so dedicated.

Section 112 - Fee schedule

The municipal governing body may adopt by resolution from time to time a reasonable schedule of fees to cover the cost of plan reviews, inspections and other activities necessary to administer the provisions of this ordinance. All fees shall be set in accordance with the applicable provisions of the Municipalities Planning Code and any dispute over the fee amount shall be resolved in the manner prescribed by the Planning Code.

Section 113 - Enforcement procedures and remedies

This section is drafted to be consistent with the new provisions of the Municipalities Planning Code for enforcement of a municipal subdivision and land development ordinance. If the municipality adopts a separate, single-purpose stormwater management ordinance, then this section should be modified as appropriate to meet the provisions of the municipal code.

A. Right of entry. Upon presentation or proper credentials, duly authorized representatives of the municipality may enter at reasonable times upon any property to investigate or ascertain the condition of the subject property in regard to an aspect regulated by this ordinance.

B. Notification. In the event that the applicant, developer, owner or his/her agent fails to comply with the requirements of this ordinance or fails to conform to the requirements of any permit, a written notice of violation shall be issued. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of the violations(s). Upon failure to comply within the time specified, unless otherwise extended by the municipality, the applicant, developer, owner or his/her agent shall be subject to the enforcement remedies of this ordinance.

C. Preventive Remedies

1. In addition to other remedies, the municipality may institute and maintain appropriate actions by law or in equity to restrain, correct or abate a violation, to prevent unlawful construction, to recover damages and to prevent illegal occupancy of a building or premises.

2. In accordance with the Planning Code (Sec. 515.1), the municipality may refuse to issues any permit or grant approval to further improve or develop any property which have been developed in violation of this chapter.

D. Enforcement Remedies

1. Any person, who has violated or permitted the violation of the provisions of this Ordinance shall, upon being found liable therefor in a civil enforcement proceeding commenced by the municipality, pay a fine of not less than $50.00 and not more than $500.00 dollars plus court costs, including reasonable attorney fees incurred by the municipality. No judgement shall commence or be imposed, levied or be payable until the date of the determination of a violation by the district justice.

2. If the defendant neither pays nor timely appeals the judgement, the municipality may enforce the judgment pursuant to applicable rules of civil procedure.

3. Each day that a violation continues shall constitute a separate violation unless the district justice further determines that there was a good faith basis for the person violating the ordinance to have believed that there was no such violation. In such case there shall be deemed to have been only one such violation until the fifth day following the date of the district justice's determination of a violation; thereafter each day that a violation continues shall constitute a separate violation.

4. All judgments, costs and reasonable attorney fees collected for the violation of this Ordinance shall be paid over to the municipality.

5. The court of common pleas, upon petition, may grant an order of stay, upon cause shown, tolling the per diem fine pending a final adjudication of the violation and judgment.

6. Nothing contained in this section shall be construed or interpreted to grant to any person or entity other that the municipality the right to commence any action for enforcement pursuant to this section.

E. Additional remedies. In addition to the above remedies, the municipality may also seek remedies and penalties under applicable Pennsylvania statutes, or regulations adopted pursuant thereto, including but not limited to the Storm Water Management Act (32 P.S. Section 680 et seq.), the Dam

Safety and Encroachment Act (32 P.S. Section 693.1-693.27) and the Erosion and Sedimentation Regulations (25 Pennsylvania Code, Chapter 102). Any activity conducted in violation of this ordinance or any PaDER-approved watershed stormwater management plan may be declared a public nuisance by the municipality and abatable as such.

Section 114 - Definitions

(Insert definitions from existing model ordinances.)

If definition included for "land development", amend to comply with recent change in Planning Code:

Land development: Any of the following activities:

(1) the improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving: (a) a group of two or more residential or noresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure; or (b) the division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features;

(2) a subdivision of land.

FIGURES

GIRTY'S RUN WATERSHED
ALLEGHENY COUNTY DEPARTMENT OF PLANNING
STORMWATER MANAGEMENT PLAN UPDATE
(SWM 2:13)

LEGEND	
.....	SUB–BASIN BOUNDARY
▬	WATERSHED BOUNDARY
—	MAJOR STREAM/SEWER
38	"DUMMY" SUB–AREA NUMBER
(26)	SUB–AREA NUMBER
- - -	COMMUNITY BOUNDARY

GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE
RECOMMENDED RELEASE RATES

SUB AREA #	2, 5, 10 YR STORMS RELEASE RATE %	50, 100 YR STORMS RELEASE RATE %
1	90	100
2	70	95
3	65	90
4	65	85
5	50	50
6	50	50
8	50	85
10	55	95
11	50	50
13	60	95
14	60	50
15	50	50
16	50	50
17	50	50
19	65	90
20	50	50
21	50	50
23	55	55
25	70	90
26	70	55
27	55	100
29	75	50
31	75	95
32	85	100
33	60	100
34	50	100
35	50	100
37	50	100
39	95	95
40	100	100
41	100	100
43	100	100

FIGURE 3 – RECOMMENDED RELEASE RATES

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Pittsburgh, PA

October, 1990

GIRTY'S RUN WATERSHED
ALLEGHENY COUNTY DEPARTMENT OF PLANNING
STORMWATER MANAGEMENT PLAN UPDATE
(SWM 2:13)

LEGEND	
.....	SUB-BASIN BOUNDARY
▬▬	WATERSHED BOUNDARY
——	MAJOR STREAM/SEWER
38	"DUMMY" SUB-AREA NUMBER
(26)	SUB-AREA NUMBER
– – –	COMMUNITY BOUNDARY

"NOTE: FIGURE 1 IN THE FINAL REPORT WILL INCLUDE COMPLETE TOPOGRAPHICAL INFORMATION."

GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE
SUBAREA DATA

SUBAREA NO.	AREA (ac.)	AVG. LENGTH (ft)	AVG. SLOPE (%)	CURVE NO.	% IMPERV.	ROUGH. COEF.	X COORD.	Y COORD.
1	673.1	2050	14.2	86.7	54.0	0.03	6.0	19.2
2	290.6	1790	15.4	86.4	53.6	0.03	7.0	17.1
3	285.1	1460	18.1	85.5	51.0	0.03	7.7	15.6
4	217.0	1190	21.3	82.7	41.3	0.03	8.4	13.9
5	386.2	1310	16.4	86.6	53.8	0.03	6.2	15.1
6	417.8	1800	19.9	87.6	54.1	0.03	5.6	12.8
7	0.1	50	18.0	84.0	44.0	0.03	6.8	13.3
8	205.8	1330	21.8	82.9	40.0	0.03	7.5	13.4
9	0.1	50	18.0	84.0	44.0	0.03	8.4	13.1
10	75.9	840	22.2	76.8	18.5	0.06	8.7	12.7
11	432.4	1710	24.2	80.9	32.9	0.05	7.5	11.5
12	0.1	50	18.0	84.0	44.0	0.03	9.1	12.3
13	104.6	780	22.2	84.0	44.0	0.06	9.4	12.1
14	237.8	830	11.9	90.8	67.5	0.02	7.7	19.2
15	193.9	1490	16.3	88.4	54.3	0.04	8.7	17.8
16	297.7	1500	15.8	87.7	57.4	0.03	9.1	16.1
17	337.5	1140	16.2	86.0	50.5	0.04	9.7	13.7
18	0.1	50	18.0	84.0	44.0	0.03	9.9	12
19	173.2	1070	19.3	81.0	33.9	0.05	10.6	11.9
20	309.9	990	15.2	84.2	45.9	0.04	10.8	13.9
21	230.1	1230	14.4	84.6	44.3	0.04	11.8	13.4
22	0.1	50	18.0	84.0	44.0	0.03	11.3	12.5
23	97.0	860	18.4	76.0	16.2	0.06	11.6	12.1
24	0.1	50	18.0	84.0	44.0	0.03	11.4	11.4
25	271.8	1730	16.3	83.2	37.9	0.05	12.3	11.4
26	543.2	1470	21.9	81.1	26.3	0.05	9.0	10.5
27	202.7	910	26.8	78.8	28.2	0.05	10.1	9.7
28	0.1	50	18.0	84.0	44.0	0.03	11.2	10.5
29	67.6	640	26.8	78.8	28.2	0.05	11.4	10.4
30	0.1	50	18.0	84.0	44.0	0.03	11.9	10.4
31	78.7	933	19.0	81.0	30.0	0.04	12.2	10.2
32	406.8	2280	27.5	79.9	24.7	0.05	12.3	9.5
33	365.7	1370	13.4	84.0	39.6	0.04	13.6	12.4
34	377.5	1290	18.9	80.2	28.1	0.05	14.9	10.3
35	189.8	880	12.8	83.7	40.4	0.04	13.6	10.7
36	0.1	50	18.0	84.0	44.0	0.03	13.8	9.7
37	32.1	690	21.5	80.0	25.0	0.05	14.0	9.5
38	0.1	50	18.0	84.0	44.0	0.03	13.6	9.2
39	811.1	2675	23.5	82.3	37.9	0.05	14.2	8.1
40	206.6	1475	21.5	80.9	34.0	0.05	14.5	6.5
41	353.4	1510	24.0	80.0	30.0	0.05	12.6	6.4
42	0.1	50	18.0	84.0	44.0	0.03	13.7	5.7
43	225.9	1375	17.5	85.0	40.3	0.03	14.5	5.7

FIGURE 1 – SUBAREA DATA

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October, 1990

GIRTY'S RUN WATERSHED
ALLEGHENY COUNTY DEPARTMENT OF PLANNING
STORMWATER MANAGEMENT PLAN UPDATE
(SWM 2:13)

LEGEND

.....	SUB-BASIN BOUNDARY
▬▬	WATERSHED BOUNDARY
——	MAJOR STREAM/SEWER
38	"DUMMY" SUB-AREA NUMBER
(26)	SUB-AREA NUMBER
– – –	COMMUNITY BOUNDARY
	OBSTRUCTIONS
	FLOODING AREAS

GIRTYS RUN WATERSHED STORMWATER MANAGEMENT PLAN UPDATE
SUBAREA DATA

MAP LOCATION NO.	PADER PERMIT/FILE NO.	MUNICIPALITY	STREAM	OBSTRUCTION TYPE/SIZE
1	WL-02-88-7-11	McCandless	Girtys Run	Culvert – 4' x 3'
2		Ross	Girtys Run	Culvert – 10' x 7.5'
3	13543	Ross	Girtys Run	Bridge – 14' span
4	15880	Ross	Girtys Run	Arch – 7.6' x 11.8'
5		Ross	Girtys Run	Building Crossing Stream
6		Ross	Girtys Run	Culvert – 14'-6" x 7'9"
7		Ross	Girtys Run	Bridge – 13' x 4.5'
8	0274766	Ross	Girtys Run	Arch – 7.6' x 11.8'
9		Ross	Girtys Run	Bridge – 16' x 5'2"
10		Ross	Girtys Run	Bridge – 11'9" x 5'5"
11		Ross	Girtys Run	Bridge – Private
12		Ross	Girtys Run	Bridge – Unmeasurable
13		Ross	Girtys Run	Arch – 13'4" x 5'2"
14		Ross	Girtys Run	Buildings/street cross stream
15		Ross	Girtys Run	Building across stream
16		Ross	Girtys Run	Bridge – 16' x 6'
17		Ross	Girtys Run	Arch – 16' x 7'
18		Ross	Girtys Run	Arch – 16' (est.)
19	11935	Ross	Girtys Run	Bridge – 14' x 7'
20	18505	Ross	Girtys Run	Bridge – 14' x 5'5"
21	16678	Ross	Girtys Run	Bridge – 16' x 5'
22	15429	Ross	Girtys Run	Arch – 16' x 5'10"
23		Ross	Girtys Run	Culvert – 8'
24	6605	Ross	Girtys Run	R.C. Culvert – 10' x 11'
25		Ross	Girtys Run	Bridge – 21' x 7'
26	9441	Ross	Girtys Run	Bridge – 54' span
27	15567	Ross	Girtys Run	Bridge – 25' x 10'
28	12039	Ross	Girtys Run	Building – 26' x 7'
29		Ross	Girtys Run	Building – 24.5' x 6.7'
30	02-621	Shaler	Girtys Run	Retaining walls
31	02-02	Shaler	Girtys Run	Bridge – 30'x 8.4'
32	0278701	Millvale	Girtys Run	Bridges
33		Millvale	Girtys Run	Bridge – 180' span
34		Millvale	Girtys Run	Culvert – 260' long
35		Millvale	Girtys Run	Bridge – 40' x 10'
36		Millvale	Girtys Run	Bridge – 50' x 8'
37		Millvale	Girtys Run	Culvert – 16' x 9'
38		Millvale	Girtys Run	Culvert – 16' x 10'
39		Millvale	Girtys Run	Culvert – 16' x 10'
40		Millvale	Girtys Run	Bridge – 20' x 10'
41		Millvale	Girtys Run	Bridge – 50' x 12'
42		Millvale	Girtys Run	Bridge – 50' x 10'
43		Millvale	Girtys Run	Bridge – 50' x 12'
44		Millvale	Girtys Run	Culvert
45		Ross	McKnight Run	Culvert – 10' inlet
46	02-775	Ross	McKnight Run	Stream enclosure – 9'
47	8733	Ross	McKnight Run	Culvert – 8' x 12'
48	8732	Ross	McKnight Run	Culvert – 8' x 12'
49	9445	Ross	McKnight Run	Culvert – 8' x 12'
50	9444	Ross	McKnight Run	Culvert – 5.2' x 18'
51	WL-02-88-7-13	Shaler/Ross	Thompson Run	Stream Enclosure – 4' x 3'
52		Ross	Thompson Run	Bridge – 6' x 5'
53		Ross	Thompson Run	Bridge – 9' x 4.5'
54		Ross	Thompson Run	Bridge – 8' x 5'
55		Ross	Thompson Run	Culvert – 5.5'
56		Ross	Anderson Rd. Trib.	Culvert – 7' x 3'
57		Ross	Anderson Rd. Trib.	Culvert – 3'
58	SS-02-89-7-22	Shaler	Wible Run	Retention Pond
59	02-126	Shaler	Wible Run	C.M.P. Culvert – 72" diam.
60	02-127	Shaler	Wible Run	C.M.P. Culvert – 72" diam.
61	02-128	Shaler	Wible Run	C.M.P. Culvert – 72" diam.
62	02-129	Shaler	Wible Run	C.M.P. Culvert – 72" diam.
63	02-067	Shaler	Wible Run	Retaining wall
64	02-191	Shaler	Wible Run	Bridge – 18'x 7.5'
65	02-273	Shaler	Wible Run	Culvert – 12' x 6'
66	02-274	Shaler	Wible Run	Culvert – 14' x 6'
67	02-332	Shaler	Wible Run	C.M.P. Culvert – 72"
68	02-559	Shaler	Wible Run	Stream enclosure – 6' x 7'
69	02-632	Shaler	Wible Run	Bridge – 28'x 2.7'
70		Ross	Rochester Run	Culvert – 10' x 5'
71		Ross	Cemetery Ln. Trib.	Culvert – 3'
72	GP-03-02-88-201	Ross	Nelson Run	Retaining walls
73	WL-02-88-7-02	Millvale/	Hoffman Run	Stream enclosure – 12.5' x 6'
74	02-250	Millvale	Hoffman Run	C.M.P. Culvert – 84"

FIGURE 2 – SIGNIFICANT OBSTRUCTIONS

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October, 1990