APPENDIX H

HOOSIC RIVER MODELING REPORT

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HOOSIC RIVER MODELING STUDY REPORT

Pownal Tannery Superfund Site
Pownal, Vermont

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1.0 INTRODUCTION

Metcalf & Eddy of Wakefield, Massachusetts (M&E) received Work Assignment (WA) No. 045-RICO-01N9 under EPA Response Action Contract (RAC) No. 68-W6-0042 to complete a Remedial Investigation/Feasibility Study (RI/FS) at the Pownal Tannery Superfund Site in North Pownal, Vermont. M&E assigned the primary responsibility for completing most of the RI/FS to TRC Environmental Corporation of Lowell, Massachusetts (TRC). M&E is responsible for overall project administration and other tasks included in the overall effort.

The EPA preferred remedy selected for this site calls for construction of a solid waste landfill within the floodplain of the Hoosic River. In order to comply with various Applicable or Relevant and Appropriate Requirements (ARARs), including the Pownal Zoning By-Laws and Vermont Solid Waste Rules, a professional engineer's certification is required relative to the hydrodynamic impact of the EPA preferred Remedial Alternative (RAA-3) on the Hoosic River. EPA requested TRC to provide this certification and to develop a design basis report for the preferred remedy. This report presents the results of the hydrologic evaluation and the engineer's certification.

1.1 EPA Preferred Remedial Alternative

The Remedial Investigation (RI) for the Pownal Tannery site indicated the presence of contamination posing unacceptable risk to human health via direct contact in soils and sludge material within Lagoons 1, 3 and 5. Subsequent to the RI, a Feasibility Study (FS) was completed to identify and evaluate potential remedial alternatives to address these areas of contamination.

Based on the results of the FS, EPA selected a preferred remedial alternative for the Lagoon Area, consisting of the excavation of contaminated materials within Lagoons 1 and 5 and consolidation of these materials within an onsite landfill to be located over Lagoons 3 and 4. This remedial approach addresses concerns associated with materials found to pose unacceptable risk to human health in the most cost-effective manner and is consistent with the intended future use of the property.

1.2 Objective

The Vermont Solid Waste Rules and Pownal Zoning Bylaws prohibit siting of a solid waste landfill within the "floodway" due to the potential flooding impacts. The Pownal Zoning Bylaws state that "Development within the floodway is prohibited unless a registered professional engineer certifies that the proposed development will not result in any increase in flood levels during the occurrence of the base flood." However, the bylaws do provide the ability to obtain a variance to this restriction "Upon a determination that the variance will not result in a risk to public safety, extraordinary public expense, create nuisances or victimization of the public or conflict with existing local laws or ordinances."

The primary objective of this modeling effort is to provide the technical basis for securing a variance from the Pownal Zoning By-law. A secondary objective is to develop preliminary design details for the EPA preferred remedy.

The scope of this effort is to evaluate potential flood condition impacts associated with the implementation of the preferred remedial alternative. The hydrologic analyses performed as part of this study were based on the 1979 FEMA Flood Insurance Study (FIS) which delineated the Floodplain and Floodway of the Hoosic River. Note that a comprehensive evaluation of changes to the hydrologic conditions within the Hoosic River Basin since the 1979 study was not an objective of this study.

2.0 TECHNICAL APPROACH

FEMA originally developed a hydrologic model for the Hoosic River in 1979. TRC determined that since this model has already been calibrated, has been subjected to the scrutiny of both the State and Federal government, and currently serves as the basis for floodplain management decisions, that this model should be used as the starting point for the current modeling study. Despite the fact that there have been some modifications to the river system since 1979, incorporation of these changes into the current model would add variables that would complicate evaluation of the final result. Use instead of the FEMA model would eliminate any potential concerns related to selection of different input parameters (friction coefficients, topography, bathymetry, etc.).

2.1 Model Selection

The 1979 FEMA model was developed using the HEC-2, Water Surface Profiles, computer program (U.S. Army Corps of Engineers), that calculates water surface profiles (elevations) under steady gradually varied flow conditions in natural and man made channels.

However, since 1979, the HEC-2 program has been generally superceded by an improved program called HEC-RAS. HEC-RAS incorporates most of the original capabilities of HEC-2 plus it provides for a more thorough treatment of cross-section geometry, added special computational components and utilizes a more user-friendly Windows® driven platform.

Consequently, the modeling approach used for this study began with an attempt to replicate the original FEMA model results using HEC-2 and the original FEMA input model data set. After demonstrating that the 1979 FEMA HEC-2 model results could be replicated, the input model data were then transferred to HEC-RAS, the model was re-calibrated and then the HEC-RAS model was used for the predictive simulations.

Both HEC-2 and HEC-RAS calculate water surface profiles through the solution of the one-dimensional energy and momentum equations, with appropriate treatment of energy losses due to friction, contractions, and expansions, as described in the respective user's manuals. Both programs perform successive calculations moving in an upstream direction based on representative channel cross-sections at specific intervals, which are defined by the user. In order to provide increased detail in this specific region of interest, it was necessary to input additional cross-sections in the vicinity of the proposed landfill.

Both modeling systems provide an estimated water surface elevation for a given storm discharge. The intersection of this elevation with the existing topography defines the limits of the floodplain for the specified storm. Additionally, both models have the capability to perform encroachment calculations, which provide the increase in water surface elevation associated with specified encroachments within the floodplain. The floodway is that portion of the channel which carries the majority of the flow and is

delineated by the limits of the encroachment that results in a specified water surface elevation increase (typically one foot).

2.2 Model Setup

Figure 2.2-1 shows a diagram of the individual steps in the river modeling technical approach and the order in which these various tasks were completed. The approach consisted of three major components: Model Setup, Model Calibration, and Predictive Simulations.

The FIS for the Town of Pownal, Vermont, Bennington County, dated October 1979, and prepared by FEMA and the Federal Insurance Administration (FIA) was based on hydrologic and hydraulic analyses performed for FIA by Dufresne-Henry Engineering Corporation. These analyses, which consisted primarily of a hydrologic analysis to identify the magnitude of the 10, 50, 100, and 500-year floods, and a HEC-2 model of the watershed, were completed in January 1978.

Figure 2.2-2 shows the area extent of the Hoosic River that was examined in this modeling study. The modeling results presented in the 1979 FIS encompass approximately 8 miles of the Hoosic River, as well as two significant tributaries within the Town of Pownal. The area of interest adjacent to the proposed solid waste landfill is approximately 4,000 feet. However, in order to adequately characterize potential flooding impacts within this region, a longer reach of stream (approximately 13,000 feet) was used as the model domain for this study. This reach extends upstream to a dam at the former Pownal Tannery and downstream to a railroad bridge.

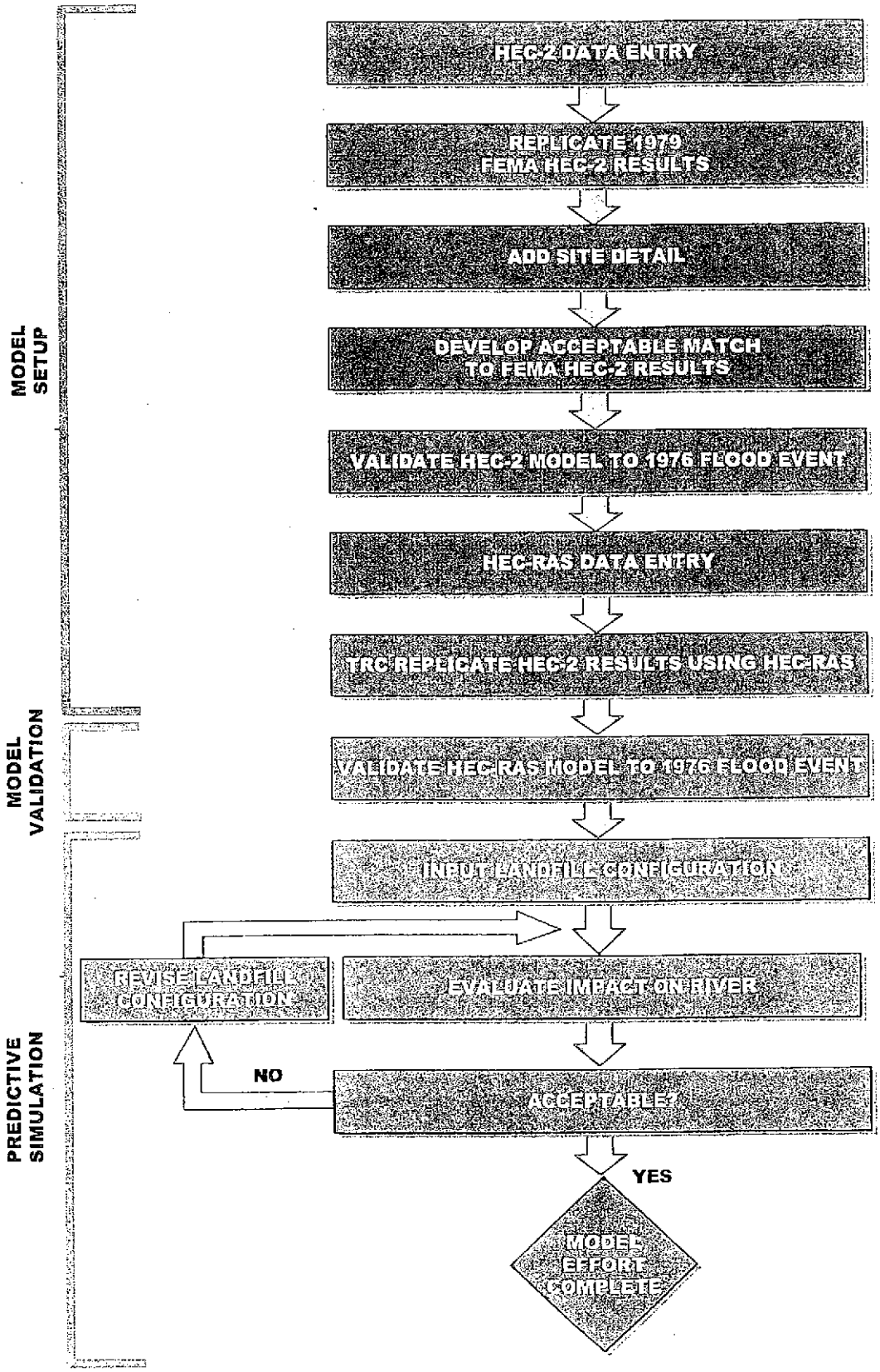
Note that this approach of modeling only a subregion of the Hoosic River is acceptable (per FEMA guidance) as long as flow conditions (i.e., water surface elevation, flow velocity, and total volumetric flowrate) at the downstream end of the selected region can be matched to the values obtained in the original 1979 modeling effort. The subregion study area is bounded upstream by the dam where the water surface is fixed. The Study Area extends a suitable distance downstream from the project area where impacts to the river are expected to be insignificant.

Note also that the specific area of interest for this study (the 4,000 foot reach adjacent to the proposed solid waste landfill) is represented in the original FEMA HEC-2 model by only one cross-section in the immediate vicinity of the proposed landfill construction. Accordingly, additional cross sections were added to the model in the area of interest to provide for adequate simulation of the various Landfill Configurations in the predictive simulation.

2.2.1 HEC-2 Model Setup

Data Input: The first step in the modeling process was to reproduce the original FEMA HEC-2 model results for the study area reach. TRC obtained paper copies of the original

Figure 2.2-1
Modeling Technical Approach



01238/POWHALJHYDRO/CHART

FEMA HEC-2 model input files to use as a basis for replicating the FEMA HEC-2 model results for the modeled reach.

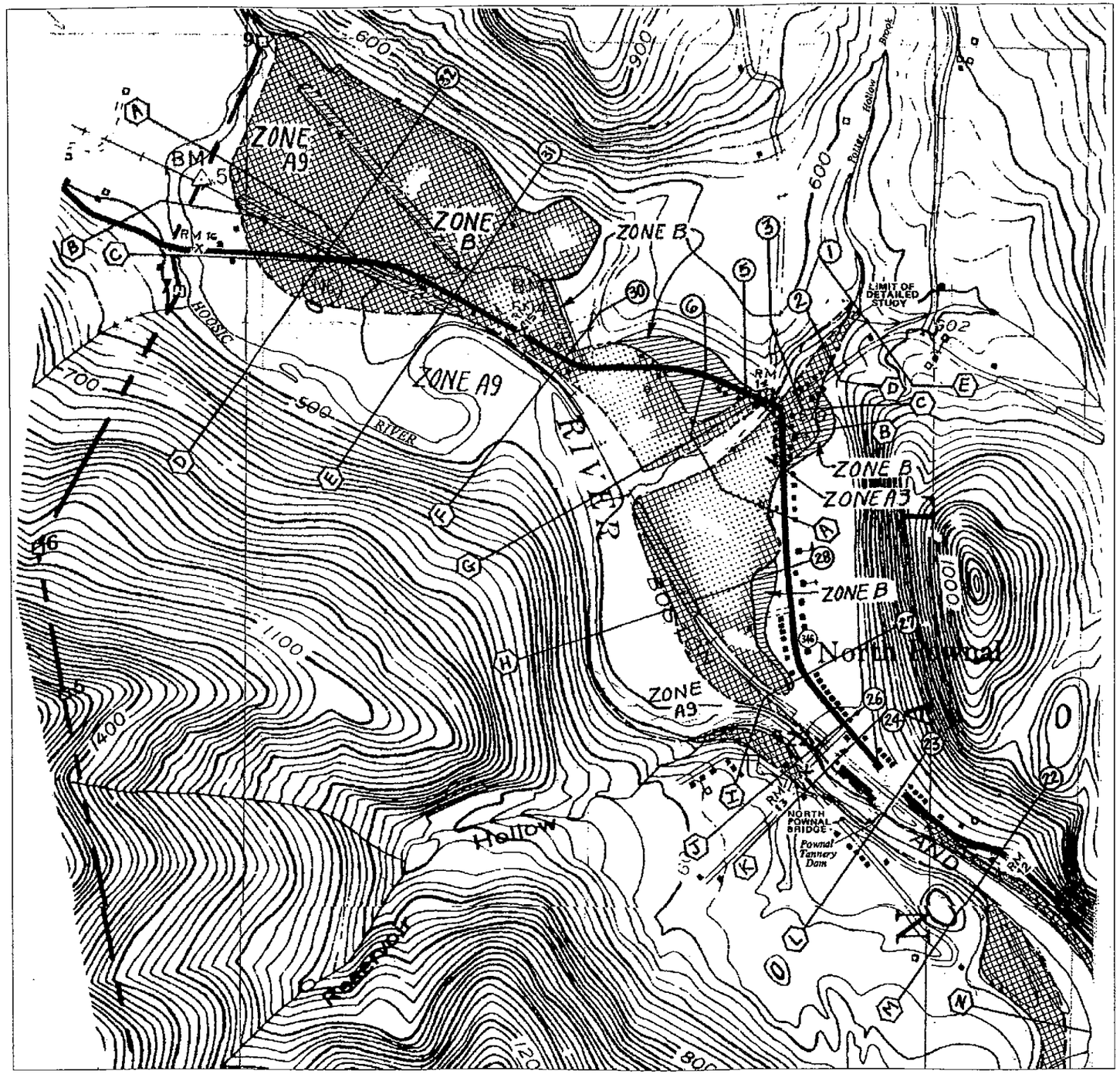
All flows representing specific storm return periods from the original model were used to setup the model for this study. The original flow curves were developed based on 50 years of record from USGS gauging station 01332500, located near Williamstown, Massachusetts. Although an additional 25 years of records are now available, the use of the flow rates as originally defined is considered conservative (per discussion with State of Vermont officials), in light of the fact that no major flooding events have occurred in the past 25 years. For this reason, no additional hydrologic evaluations were incorporated into the model.

Appendix A contains a copy of the original 1979 FEMA HEC-2 model output and Appendix B contains the TRC HEC-2 Baseline Conditions model results. The TRC HEC-2 Baseline Conditions model results for the 100-year flood event successfully matched the FEMA results to within a tenth of a foot at all cross-sections.

Incorporation of Additional Site Detail: Figure 2.2-3 shows the location of nine additional cross sections (27.1 through 27.7, 28.1, 28.2 plus the revised FEMA cross section 28) that TRC added to allow modeling of the river in response to the proposed solid waste Landfill Configurations. Appendix C shows the individual cross sections. Addition of these new cross sections was needed because there is only one cross section in the original FEMA model located within the area of interest (FEMA Cross section 28) and this single cross section would not allow incorporation of sufficient detail for the predictive simulations. The placement of additional cross-sections within the existing model provides a higher level of detail, allowing the new model to respond to smaller scale physical features than were accessible to the original 1979 model.

The new cross-sections were generally extended on the left (western) bank to the top of the steep rise on that side of the channel, and on the right (eastern) bank to the Boston and Maine railroad tracks. Inspection of the flood maps from the 1979 FIS indicates that a significant region to the east of the railroad tracks is within the flood plain. However, the flooding in that area is the result of flood waters in Potter Hollow Brook, a tributary to the Hoosic, and not directly related to flood waters within the Hoosic channel. Therefore, extension of the cross-sections only to the railroad embankment is sufficient to contain the 100-year flood.

The topography of the new cross-sections was defined by the topographic information collected during the RI. Bathymetry of the channel was not delineated in recent surveys, however, and was estimated based on cross-section information from the original 1979 HEC-2 model. The cross-sections shown in Figure 2.2-3 are bent to represent the flow area perpendicular to the flow direction, and also to prevent adjacent cross-sections from intersecting.



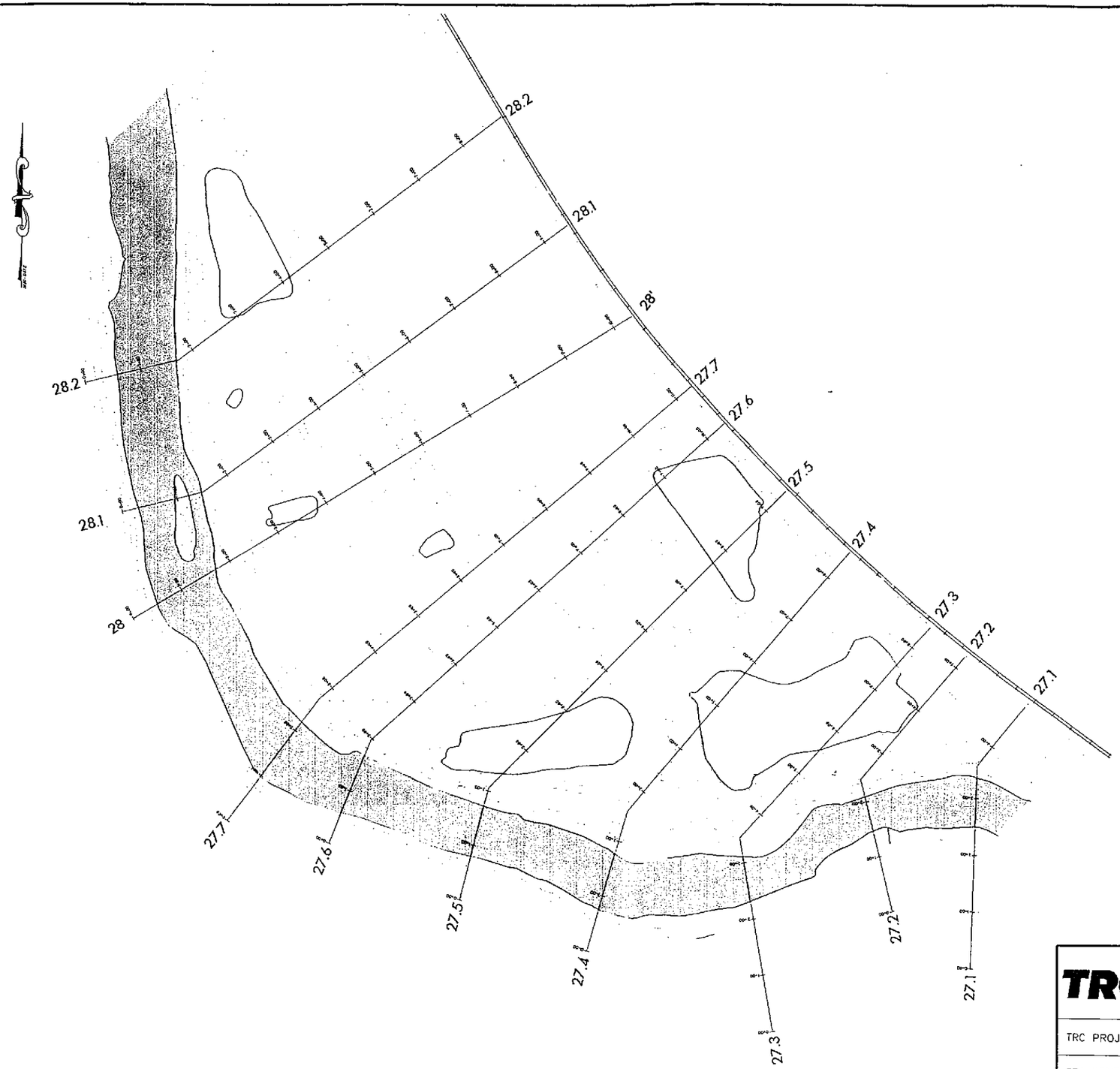
APPROXIMATE GRAPHIC SCALE

0' 500' 1,000' 2,000'

NOTE:
BASE MAP WAS TAKEN FROM A PLAN ENTITLED FLOODWAY MAP, TOWN OF POWNAL, VERMONT PANEL 5 OF 20, DATED APRIL 1, 1980
ORIGINAL SCALE 1"=800'
COMMUNITY-PANEL NUMBER 500016 0005 C

TRC — Boott Mills South, Foot of John Street, Lowell, MA 01852, 978-970-5600	FIGURE 2.2-2 STUDY AREA AND ORIGINAL FEMA CROSS-SECTION LOCATIONS
TRC PROJ. NO.: 02136-0220-01N93	POWNAL TANNERY POWNAL, VERMONT
EPA CONTRACT NO.: 68-W6-0042	
RAC SUBCONTRACTOR NO.: 107061	M&E Metcalf & Eddy

02136\POWNAL\HYDRO\FFMAXSECT



GRAPHIC SCALE

0' 100' 200' 400'

02136\POWNAL\HYDRO\SITENORTH

TRC — Boott Mills South, Foot of John Street, Lowell, MA 01852, 978-970-5600	FIGURE 2.2-3 NEW CROSS-SECTION LOCATIONS
TRC PROJ. NO.: 02136-0380-01N96	POWNAL TANNERY POWNAL, VERMONT
EPA CONTRACT NO.: 68-W6-0042	
RAC SUBCONTRACTOR NO.: 107061	M&E Metcalf & Eddy

TRC also examined historical aerial photographs to determine whether there were any significant changes in the berm configuration over time. TRC determined that the berms along the river channel have not changed significantly since the original FEMA model was prepared.

Friction Coefficients: TRC also conducted a site visit on February 15, 2002 to examine the condition of the current river channel and to evaluate the suitability of the assumptions made in the original FEMA HEC-2 cross-section geometry at Sections 22 to 29.

The site visit indicated that the vegetation outside the river channel has probably matured since the original FEMA Study (based on interpretation of the friction coefficient values used in the original study). However, TRC determined that modification of the friction coefficients in the TRC model would not be desirable because this could lead to additional sources of variance between the TRC model and the FEMA model, making it more difficult to isolate the effects of the proposed landfill construction.

In addition, TRC identified a photograph showing the flood water height for a 1976 event. TRC desired to use the information from this photograph to validate the calibrated model, requiring the use of friction coefficients representative of site conditions at the time of the flood.

Impact of Added Site Detail: Figures 2.2-2 and 2.2-3 show the one cross section in the area of interest that was included in the original FEMA model (Cross Section 28). During input of the additional site detail, TRC discovered that some of the elevations in FEMA cross-section 28 appeared to be incorrect in the original FEMA model.

Figure 2.2-4 shows a comparison of the cross section 28 used by FEMA and the cross section developed by TRC based on the survey information from the RI. This comparison indicated that the elevations used for the FEMA cross-section 28 should be modified to better reflect existing conditions.

The site detail added to the TRC revised Current Conditions model input also resulted in a significant difference versus the FEMA Baseline model input for the channel width. The flow channel in the TRC Revised Current Conditions Model (which more closely approximates the actual river geometry) is generally narrower than was used by FEMA. Had the FEMA model input used this additional detail, the resulting water level elevations in the FEMA model would have been higher.

Figure 2.2-5 shows the mean channel width versus channel location for the modeled cross sections. The two curves plotted on the figure represent data the original FEMA model input and data from the TRC Revised Current Conditions model input. Generally, the width of the channel in the TRC Revised Current Conditions model is narrower than in the FEMA Baseline Conditions model. The channel is most constricted at cross section

Figure 2.2-4
Comparison of FEMA Cross Section 28 to TRC Cross section 28 Elevations

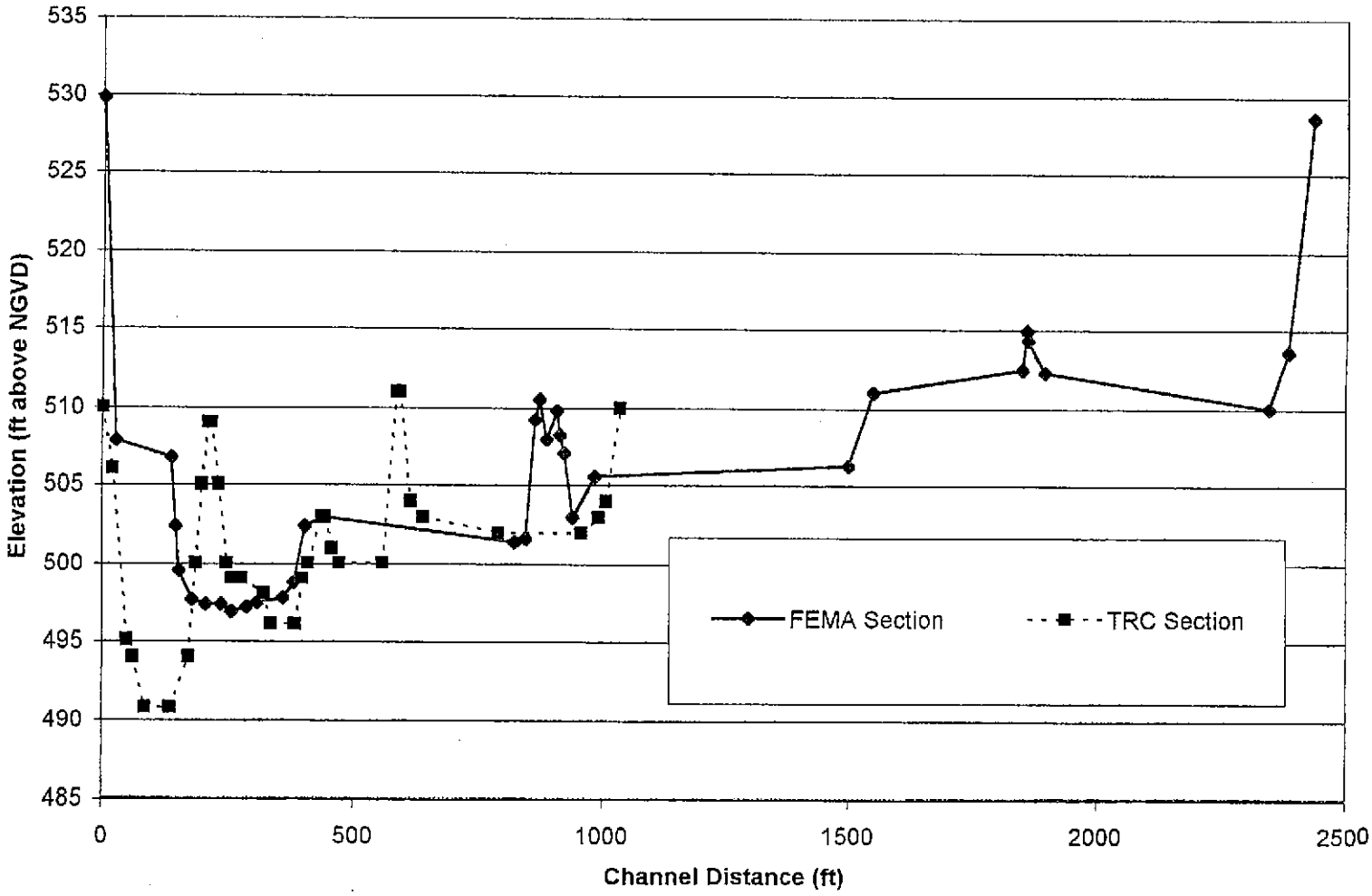
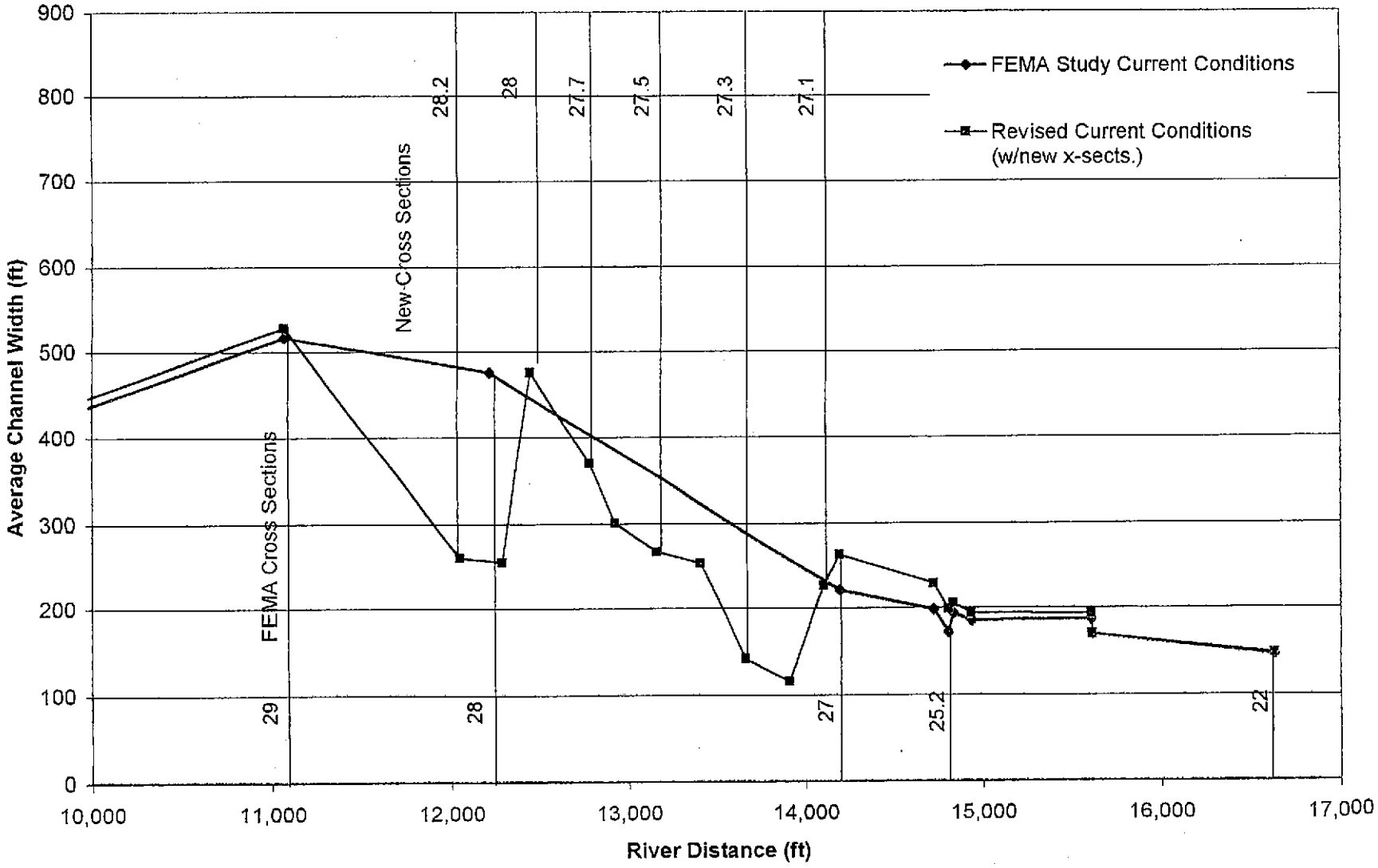


Figure 2.2-5
Comparison of Average Channel Width
between FEMA Study and Revised Current Conditions Channel Widths



27.2. This effect was not well represented by the upstream or downstream cross-sections in the original FEMA model.

The omission of this constriction in the original FEMA model may have limited the accuracy of the FEMA Baseline Conditions model. If the channel widths in the FEMA model were narrower (as in the actual physical system) the resulting model would have predicted higher flood elevations. The resulting increase in water surface elevation would propagate upstream in the model. By incorporating cross-section 27.2 into the TRC Revised Current Conditions model, the water surface elevations increased 1 to 2 feet between cross section 27.2 and the upstream Pownal Tannery Dam as shown in Table 2.2-1. This explains why the TRC Revised Current Conditions model water surface elevations (Appendix D) are higher than the original FEMA model output. The TRC Revised Current Conditions results are therefore more accurate due to the additional detail contained in the model.

2.2.2 HEC-RAS Model Setup

The second task in the model setup involved the conversion of the model data in HEC-2 format to the HEC-RAS system. Appendix D presents the TRC HEC-RAS model results that document the success of this conversion.

In general, the HEC-RAS software can import HEC-2 data, and most of the calculations and results are unaffected. In specific instances, particularly at bridge openings, the HEC-RAS software provides calculation detail not present in the HEC-2 model, which can result in output differences between the two models. These differences manifested themselves in the conversion of the baseline model in only one instance, at the North Pownal Bridge, located approximately 600 feet downstream of the Pownal Tannery Dam.

In HEC-2, bridge openings are modeled simplistically as a trapezoidal opening, where the base elevation and side slope of the trapezoid are input by the user. In HEC-RAS, actual ground elevation, as input by the user, is used to calculate the flow area at the bridge opening. In most cases, the representative trapezoid can provide adequate results. However, in cases where the cross-section topography is irregular, and there is no clear base elevation for the trapezoid, significant differences can result between the two modeling approaches.

This was the case at the North Pownal Bridge, where HEC-RAS returned water surface elevations on the order of 2 feet lower than HEC-2. The North Pownal Bridge cross-section (as defined by the ground elevations input into the 1979 HEC-2 model) is plotted in Figure 2.2-6, and compared with the trapezoid defined in the original 1979 HEC-2 input. This figure indicates significant differences between the HEC-2 trapezoid and the natural cross-section data, particularly the base elevation of the trapezoid, which is 1 to 2 feet higher than the deepest portion of the natural channel. Reanalysis of the HEC-2 model using a base trapezoid elevation of 496.4 feet returns results that are consistent with the HEC-RAS output, implying that the increased detail in the HEC-RAS model

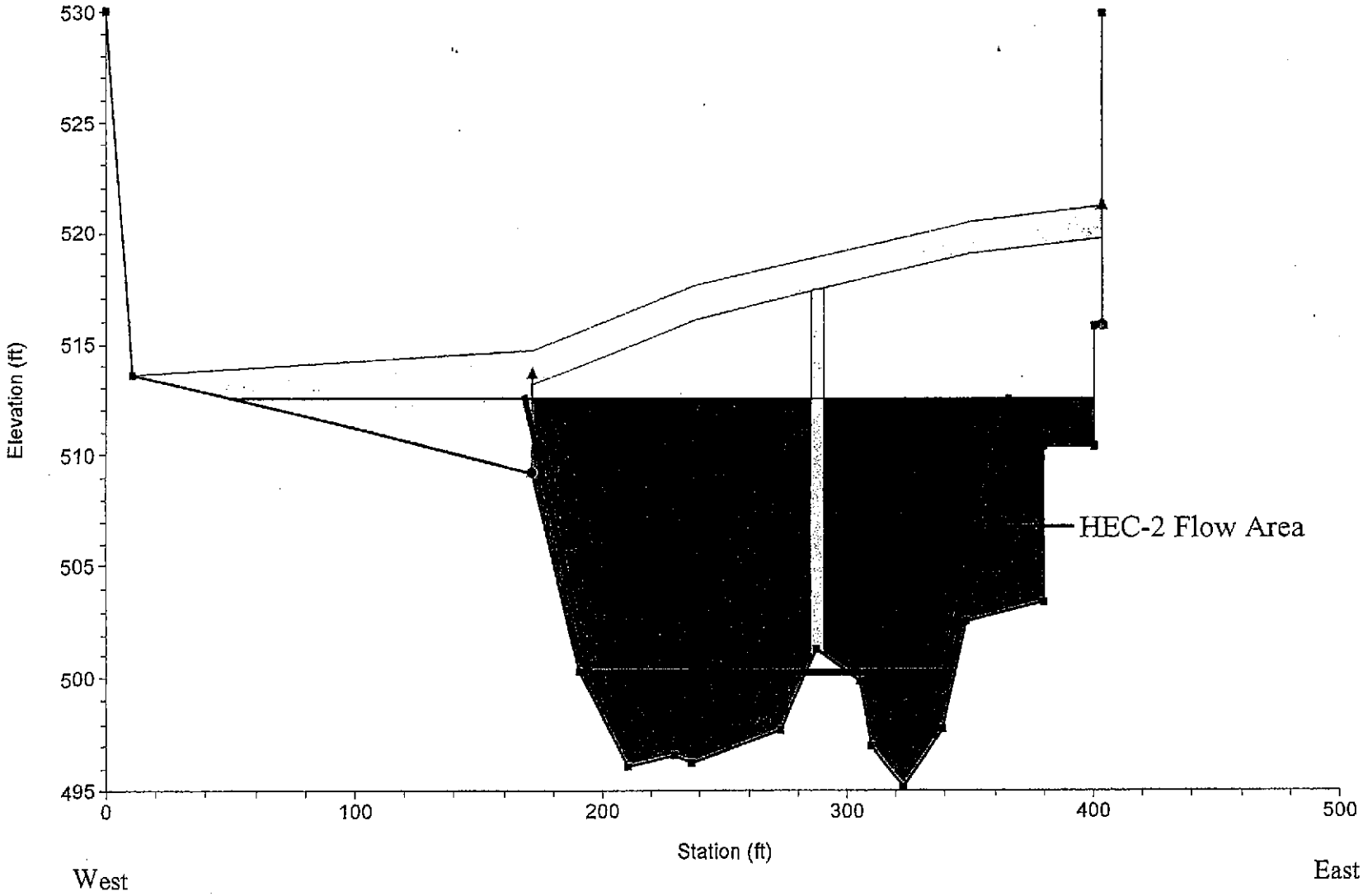
TABLE 2.2-1
COMPARISON OF WATER SURFACE ELEVATIONS
BETWEEN HEC-2 BASELINE CONDITIONS AND HEC-RAS BASELINE CONDITIONS

Cross Section Identification	FEMA Study WSEL		Current Conditions WSEL		Change in WSEL	
	Floodplain	*Floodway*	*Floodplain*	*Floodway*	*Floodplain*	*Floodway*
39	488.65	489.7	488.5	488.73	-0.15	-0.97
38	493.07	493.68	493.02	493.68	-0.05	0
37	495.58	495.95	495.58	495.95	0	0
36.2	496.16	496.45	496.16	496.45	0	0
36.1	498.53	498.56	498.56	498.58	0.03	0.02
35	498.37	498.4	498.42	498.46	0.05	0.06
34.2	498.68	499	498.77	499.1	0.09	0.1
34.1	499.22	499.38	499.48	499.62	0.26	0.24
33	500.51	500.4	500.6	500.54	0.09	0.14
32	500.94	501.07	501.01	501.17	0.07	0.1
31	502.36	502.95	502.39	502.98	0.03	0.03
30	505.97	506.21	505.98	506.22	0.01	0.01
29	507.27	507.55	507.27	507.56	0	0.01
28	508.01	508.52	508.03	508.54	0.02	0.02
27	511.42	511.02	511.49	511.13	0.07	0.11
26	512.48	513.12	512.52	513.18	0.04	0.06
25.2	512.52	513.6	512.57	513.66	0.05	0.06
25.1	514.2	514.84	512.7	514	-1.5	-0.84
24	514.29	514.93	513.12	514.13	-1.17	-0.8
23.2	515.42	515.9	514.62	515.31	-0.8	-0.59
23.1	528.58	528.58	528.95	528.95	0.37	0.37
22	528.9	528.89	529.26	529.23	0.36	0.34

WSEL - Water Surface Elevation

Figure 2.2-6

HEC-2 Flow Area Compared to HEC-RAS Flow Area



provides more realistic results. The revised baseline model incorporates the water surface elevations at the North Pownal Bridge suggested by the HEC-RAS model.

Encroachment calculations for floodway delineation were carried out in the HEC-RAS model similarly to their calculation within the original HEC-2 model. The encroachment stations calculated in HEC-RAS were refined using a Method 4 encroachment analysis, as defined in the HEC-RAS users manual. Method 4 calculates encroachment stations so that conveyance within the encroached cross-section, at a target increase of 1-foot above the calculated floodplain elevation, is equal to the conveyance of the unencroached cross-section at the floodplain elevation.

Figure 2.2-7 compares calculated water surface elevations for the 100-year flood between the original 1979 HEC-2 analysis (Appendix A), and the Revised Current Conditions as modeled using HEC-RAS (Appendix C), including the additional cross-sections. This comparison is also shown in tabular form on Table 2.2-2.

Deviations between the models are mainly attributable to the two issues discussed above, which provide enhanced detail to the new model, through both the addition of new cross-sections, and the improved modeling algorithms of HEC-RAS.

As expected, the two models are in good agreement downstream of the constriction at cross-section 27.2, and upstream of the Pownal Tannery Dam, which resets the water surface elevation through the presence of weir flow over the dam crest. Between the constriction and the dam, there is some divergence of water surface elevations between the two models. Immediately upstream of the constriction, the water surface elevations differ by up to two feet. The effect of the North Pownal Bridge, however, has an opposite effect, which, when combined with the upstream propagation of the increase in water surface elevation caused by the constriction, tends to return water surface levels to values more consistent with the original model.

Given the increased detail in the HEC-RAS model, as compared to the HEC-2 modeling performed as part of the original 1979 FIS, the results of the HEC-RAS model should be more representative of true baseline conditions. Additional model runs incorporating the proposed landfill construction into the cross-sections will be compared to the new baseline HEC-RAS model to evaluate the effect of the proposed landfill construction on the flood bearing capacity of the river channel.

2.3 Model Validation

In addition to comparing the HEC-RAS baseline results to the original 1979 HEC-2 model results, an attempt was made to validate the HEC-RAS model with an observed 1976 flood elevation as shown on a photograph in the 1979 FIS. This photograph, reproduced as Figure 2.3-1 in this report, shows a person standing next to the old Tannery Building with predicted and observed water surface elevations superimposed. Scaling of the 1976 flood mark, based on the known model output elevations for the 10-year and 50-year floods, and their heights as labeled in the photograph, yields an elevation of

Figure 2.2-7
Revised Water Surface Profile
Resulting from Insertion of New Cross Sections
for the 100 Year Flood

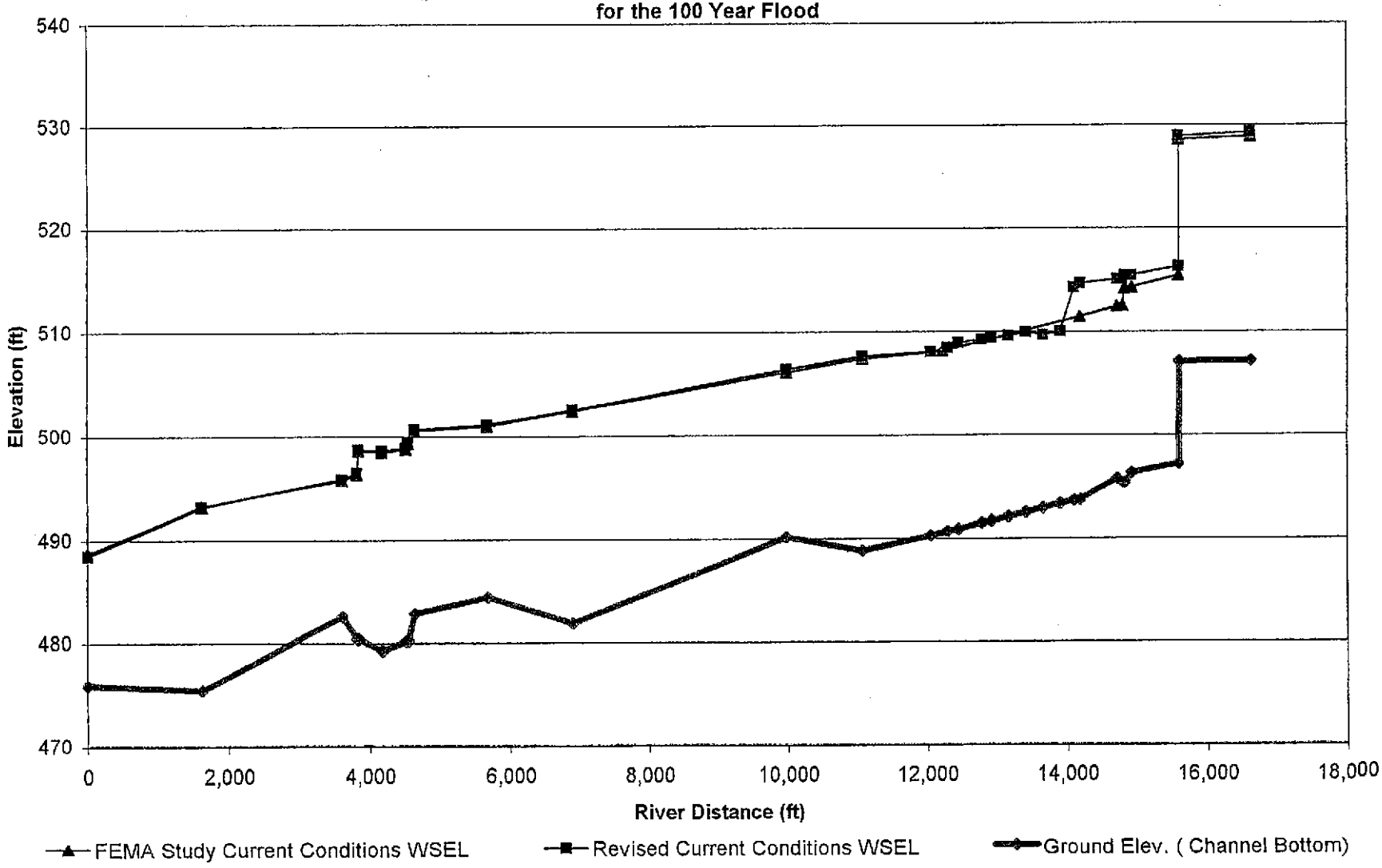


TABLE 2.2-2
COMPARISON OF WATER SURFACE ELEVATIONS
BETWEEN BASELINE CONDITIONS AND HEC-2 REVISED CURRENT CONDITIONS

Cross Section Identification	FEMA Study WSEL		Revised Current Conditions WSEL		Change in WSEL	
	Floodplain	*Floodway*	*Floodplain*	*Floodway*	*Floodplain*	*Floodway*
39	488.65	489.7	488.42	488.49	-0.23	-1.21
38	493.07	493.68	493.03	493.55	-0.04	-0.13
37	495.58	495.95	495.7	495.96	0.12	0.01
36.2	496.16	496.45	496.37	496.48	0.21	0.03
36.1	498.53	498.56	498.65	498.59	0.12	0.03
35	498.37	498.4	498.54	498.47	0.17	0.07
34.2	498.68	499	498.84	499.11	0.16	0.11
34.1	499.22	499.38	499.4	499.6	0.18	0.22
33	500.51	500.4	500.64	500.52	0.13	0.12
32	500.94	501.07	501.1	501.23	0.16	0.16
31	502.36	502.95	502.47	503.02	0.11	0.07
30	505.97	506.21	506.27	506.29	0.3	0.08
29	507.27	507.55	507.51	507.64	0.24	0.09
28.2	n.i.	n.i.	507.96	508.36		
28.1	n.i.	n.i.	508.35	508.71		
28	508.01	508.52	508.86	509.17	0.85	0.65
27.7	n.i.	n.i.	509.22	509.48		
27.6	n.i.	n.i.	509.3	509.57		
27.5	n.i.	n.i.	509.57	509.85		
27.4	n.i.	n.i.	509.89	509.99		
27.3	n.i.	n.i.	509.63	510.15		
27.2	n.i.	n.i.	509.98	510.45		
27.1	n.i.	n.i.	514.31	514.37		
27	511.42	511.02	514.67	514.73	3.25	3.71
26	512.48	513.12	515.07	514.94	2.59	1.82
25.2	512.52	513.6	515.07	515.41	2.55	1.81
25.1	514.2	514.84	515.46	515.7	1.26	0.86
24	514.29	514.93	515.48	515.76	1.19	0.83
23.2	515.42	515.9	516.33	516.57	0.91	0.67
23.1	528.58	528.58	528.95	528.95	0.37	0.37
22	528.9	528.89	529.26	529.25	0.36	0.36

WSEL - Water Surface Elevation
n.i. - New cross sections not included in FEMA study

TRC	Boott Mills South Foot of John Street Lowell, MA 01852 978-970-5600	FIGURE 2.3-1 PHOTOGRAPH FROM FLOOD INSURANCE STUDY
TRC PROJ. NO.: 02136-0220-01N93		POWNAL TANNERY POWNAL, VERMONT
EPA CONTRACT NO.: 68-W6-0042		
RAC SUBCONTRACTOR NO.: 107061		M&E Metcalf & Eddy

02136\POWNAL\HYDRO\FLOOD

approximately 510.2 feet. The FIS indicates that the magnitude of the 1976 flood has a return frequency of roughly 18 years. From this information, appropriate flow rates were interpolated for model input using the peak discharges for the 10-, 50-, 100-, and 500-year floods as summarized in the FIS. Discharge was plotted against return period on probability paper and the approximate magnitude of the 1976 discharge was then read from the graph, corresponding to an 18-year return period. This was done for the discharge both upstream and downstream of the confluence with Potter Hollow Brook, representing sufficient input discharge data to model the 18-year flood event within the study reach using the HEC-RAS system.

The results of this validation process are shown in Table 2.3-1. Appendix E presents the model validation results. The water surface elevations are from cross-section 24, which is the closest cross section to the location shown in Figure 2.2-1. The original cross-section geometry was modeled in HEC-2 using flow rates of 14,600 cfs for the reach upstream of Potter Hollow Brook and 15,000 cfs for the reach downstream of Potter Hollow Brook. The new cross-section geometry was modeled in both HEC-2 and HEC-RAS using the above flow rates.

Table 2.3-1 1976 Calibration, Water Surface Elevations at Cross-Section 24

Model Run	18-yr Floodplain Elevation (feet)	Elevation Difference from 510.2 feet (feet)
Original FEMA HEC-2	509.42	0.78
TRC HEC-2 w/new cross-sections	510.24	-0.04
TRC HEC-RAS w/new cross-sections	510.13	0.07

Table 2.3-1 shows that there is a marked improvement in predicting the elevation of the 1976 flood, by adding cross sections with additional detail through the Lagoon Area.

Differences between the HEC-2 and HEC-RAS results are negligible and well within the error associated with scaling the 1976 flood height off the photograph. This analysis indicates that the physical characteristics of the modeled reach are well represented by the revised HEC-RAS baseline model.

2.4 Predictive Simulations

Once a satisfactory existing conditions model was constructed in HEC-RAS, the effect of the proposed landfill design on the floodplain and floodway delineations was evaluated by modifying cross-sections within the model to reflect the proposed landfill construction

Modeling of the various proposed conceptual landfill designs was performed using HEC-RAS by modifying the geometry of cross-sections 27.1 through 28.1. Cross-sections were modified to reflect the placement of the consolidation landfill, as well as the removal of berm areas from Lagoons 1 and 5. The geometry of the cross-sections was modified to match the Landfill Configurations described below.

The assumptions made for the landfill cap modeling effort were based significantly on the original FEMA model of the river reach, and the TRC HEC-RAS model. Few changes to the physical structure of the model were invoked, beyond the topographic alteration of the cross-sections. Friction factors within the model were generally held consistent with the original FEMA model and revised baseline model, with a few exceptions as described below.

Manning's n Coefficients: Friction between the flowing water and the underlying channel bed is represented in the model by a Manning's n coefficient, which is an empirical scale designed to represent the resistance of flow due to various types of bed forms and obstructions. For the Baseline model, the Manning's n coefficients for cross-sections 27.1 through 28.2 were keep the same as the original section 28 coefficients of 0.06 for the left overbank and 0.045 for the channel and right overbank. A Manning's coefficient of 0.06 for the left overbank describes a normal range, natural stream floodplain that has light brush and trees in the summer. A coefficient of 0.045 for the main channel describes a normal range, natural stream that is clean, winding with some pools, shoals, weeds and stones. The coefficient 0.045 for the right overbank describes a minimum range, natural stream floodplain light brush and trees in the summer. The descriptions for the Manning's n coefficients were determined from Table 3.1 presented in the HEC-RAS River Analysis System Hydraulic Reference Manual.

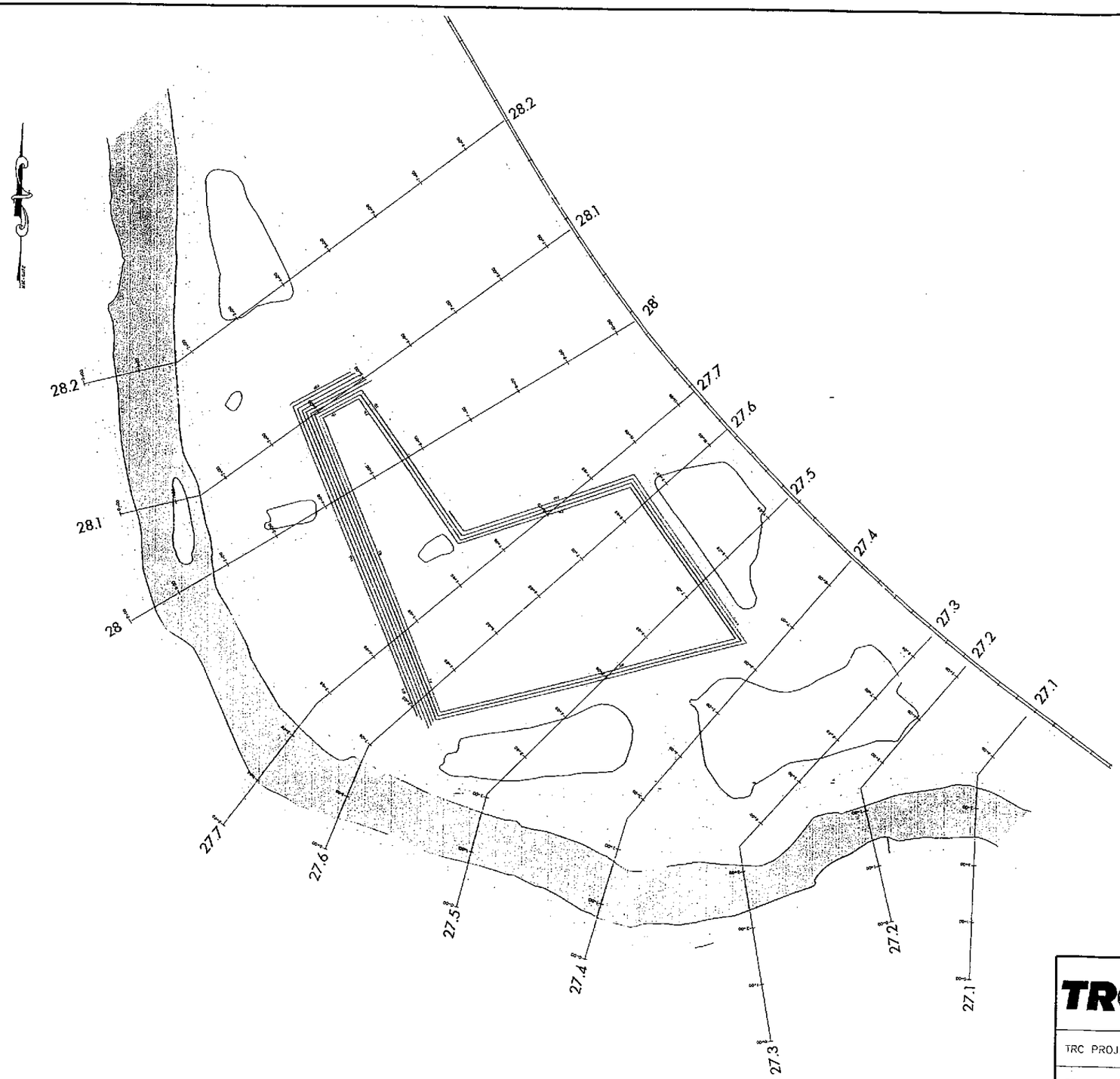
The Manning's coefficients were modified in the landfill cap runs to evaluate impacts associated with the placement of rip rap along the western slope of the landfill. A maximum 'n' value of 0.036 was selected for a lined channel with sides of riprap. The coefficient of 0.045 was still used for the right overbank to allow for a more conservative model estimate.

Floodway Determination: Encroachment stations for existing cross-sections within the landfill HEC-RAS runs were set using Encroachment Method 1, as defined in the HEC-RAS users manual. Method 1 allows the user to specify the locations of the encroachment stations for each individual cross-section. Based on the initial results determined using Method 4, the stations at the new cross-sections were adjusted further using Method 1 to bring the floodway water elevations closer to the one foot target above the floodplain water elevation.

2.4.1 Landfill Configuration 1

Figure 2.4-1 shows the Landfill Configuration based on the conceptual design presented in the Feasibility Study. This footprint and ground surface elevations shown in Figure 2.4-1 were used to develop a more detailed three dimensional understanding of the Landfill Configuration sufficient for use in the HEC-RAS model. Appendix F presents the revised cross sections for this Landfill Configuration.

A predictive simulation was completed to determine the effect of this landfill design on the Hoosic River hydrology under extreme flood conditions. Based on the results of this



GRAPHIC SCALE

0' 100' 200' 400'

TRC	Booth Mills South Foot of John Street Lowell, MA 01852 978-970-5600	FIGURE 2.4-1 CONCEPTUAL FOOTPRINT OPTION 1
TRC PROJ. NO.: 02136-0380-01N96		POWNAL TANNERY POWNAL, VERMONT
EPA CONTRACT NO.: 68-W6-0042		
RAC SUBCONTRACTOR NO.: 107061		M&E Metcalf & Eddy

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simulation (presented in Section 3), it was determined that this footprint was not optimum and might result in unacceptable impacts to the Hoosic River during a flood.

2.4.2 Landfill Configuration 2

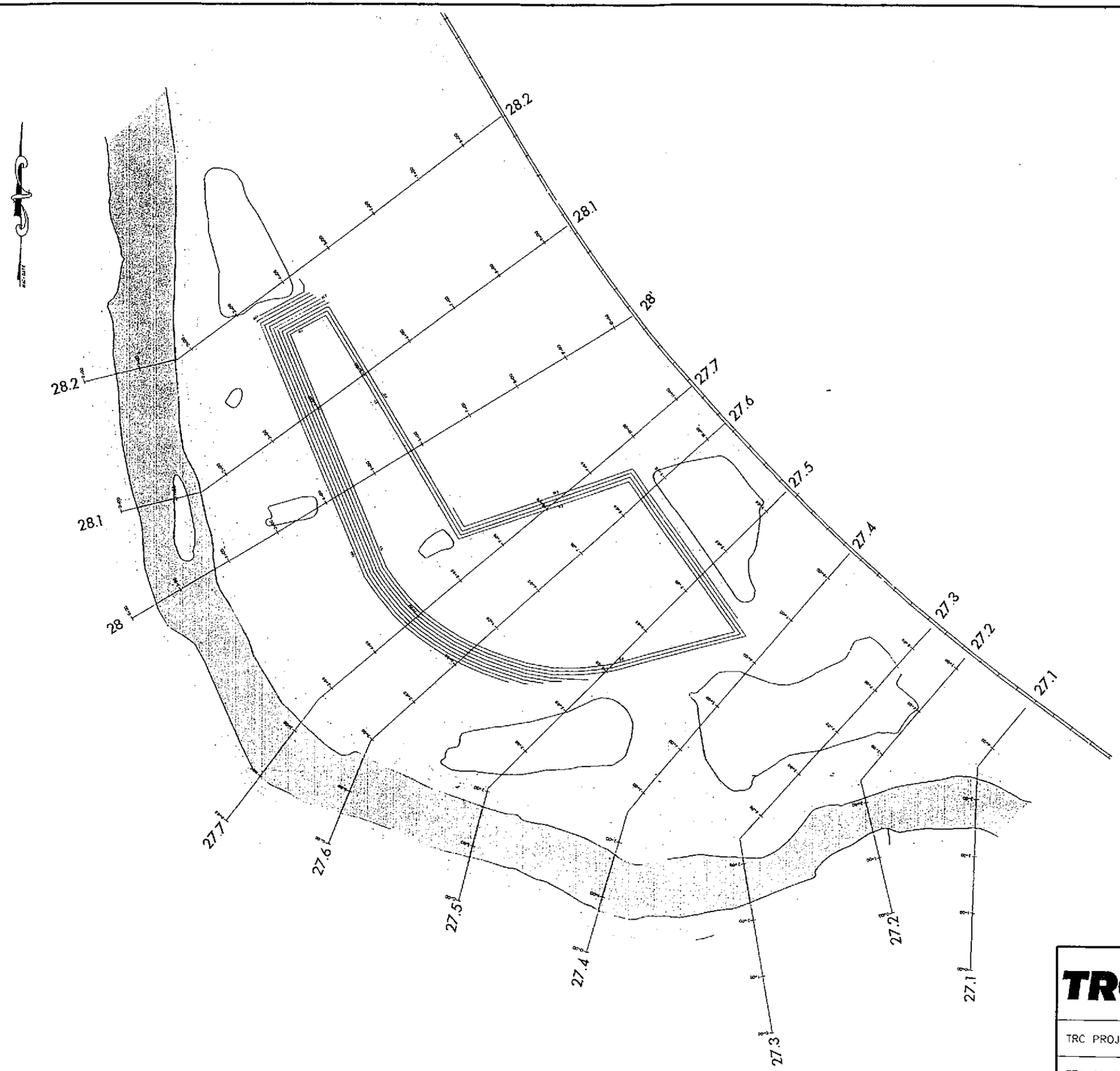
Vermont Solid Waste Management Rules prescribe minimum separation distances between discrete solid waste disposal facilities and certain features, such as ground water table, water bodies and property lines. Construction of the proposed consolidation landfill anywhere within the lagoon area cannot be completed in full compliance with the mandated separation distances. Therefore, any proposed footprint of the landfill will require special consideration by the State of Vermont. The limits of the proposed landfill were controlled by site-specific considerations as described below.

Landfill encroachment to the west and to the south must be minimized due to the potential impacts to flow characteristics of the Hoosic River under extreme flood conditions. To the north and northeast, available landfill area is bounded by open water in the northern portion of Lagoon No. 4 and the site property line.

The planned construction of a WWTP restricts the placement of material of questionable geotechnical integrity, such as the lagoon sludge, within Lagoon No. 2, which in turn bounds the landfill area to the east.

With consideration to the issues mentioned above, limited options are available as to where an onsite consolidation landfill can be constructed. As a result of these various limitations on the placement of the waste, TRC modified Landfill Configuration 1 to reduce the channel constriction and extend the waste placement further north into Lagoon 4. TRC determined that this footprint is optimal for the site. Figure 2.4-2 shows the optimal landfill footprint developed using the HEC-RAS model. Appendix G presents the revised cross sections for this Landfill Configuration.

In addition to the physical location and structure of the landfill, further site modifications are necessary to mitigate potential adverse impacts to the flood bearing capacity of the river. This includes the removal of the upper portion of the length of earthen berm which currently isolates Lagoons 1 and 5 from the Hoosic River. Additionally, the berm currently separating lagoons 4 and 5 will require removal, as well as modification of the berm at the northern end of lagoon 4 to provide an outlet for flow back to the main channel of the Hoosic. The net result of this berm restructuring is to create an emergency overflow channel through lagoons 1, 5 and 4 to handle extreme flood flows. Under most normal circumstances, this channel would not convey flow, allowing maintenance of a separation distance between the toe of the landfill and the potentially erosive currents of the Hoosic River.



GRAPHIC SCALE

0' 100' 200' 400'

02136\POWNAL\HYDRO\SITENORTH

TRC — Boott Mills South, Foot of John Street, Lowell, MA 01852, 978-970-5600	FIGURE 2.4-2 CONCEPTUAL FOOTPRINT OPTION 2 POWNAL TANNERY POWNAL, VERMONT
TRC PROJ. NO.: 02136-0380-01N96	
EPA CONTRACT NO.: 68-W6-0042	
RAC SUBCONTRACTOR NO.: 107061	M&E Metcalf & Eddy

3.0 MODELING RESULTS

TRC evaluated the impact of two separate Landfill Configurations using the calibrated FEMA model modified to incorporate the additional cross sections. This section discusses the results of these model simulations.

3.1 Impact of Landfill Configuration 1 on Hoosic River

Appendix F presents the results of the HEC-RAS model in response to Landfill Configuration 1. Table 3.1-1 shows a comparison of the 100 year flood water surface elevations between the revised current conditions and each of the two Landfill Configurations. Figure 3.1-1 shows a graphic depiction of the water surface elevations for the revised current conditions model and the two Landfill Configurations.

For the first landfill option, the modeling effort indicates that the water surface elevation increases over 1 foot at cross-sections 27.2 through 27.5, with a maximum increase of 1.63 feet occurring at cross-section 27.3. Farther upstream, at section 25.1, the predicted water surface elevation decreases 2 feet due to the modifications made to the berm located to the southwest of Lagoons 1 and 5.

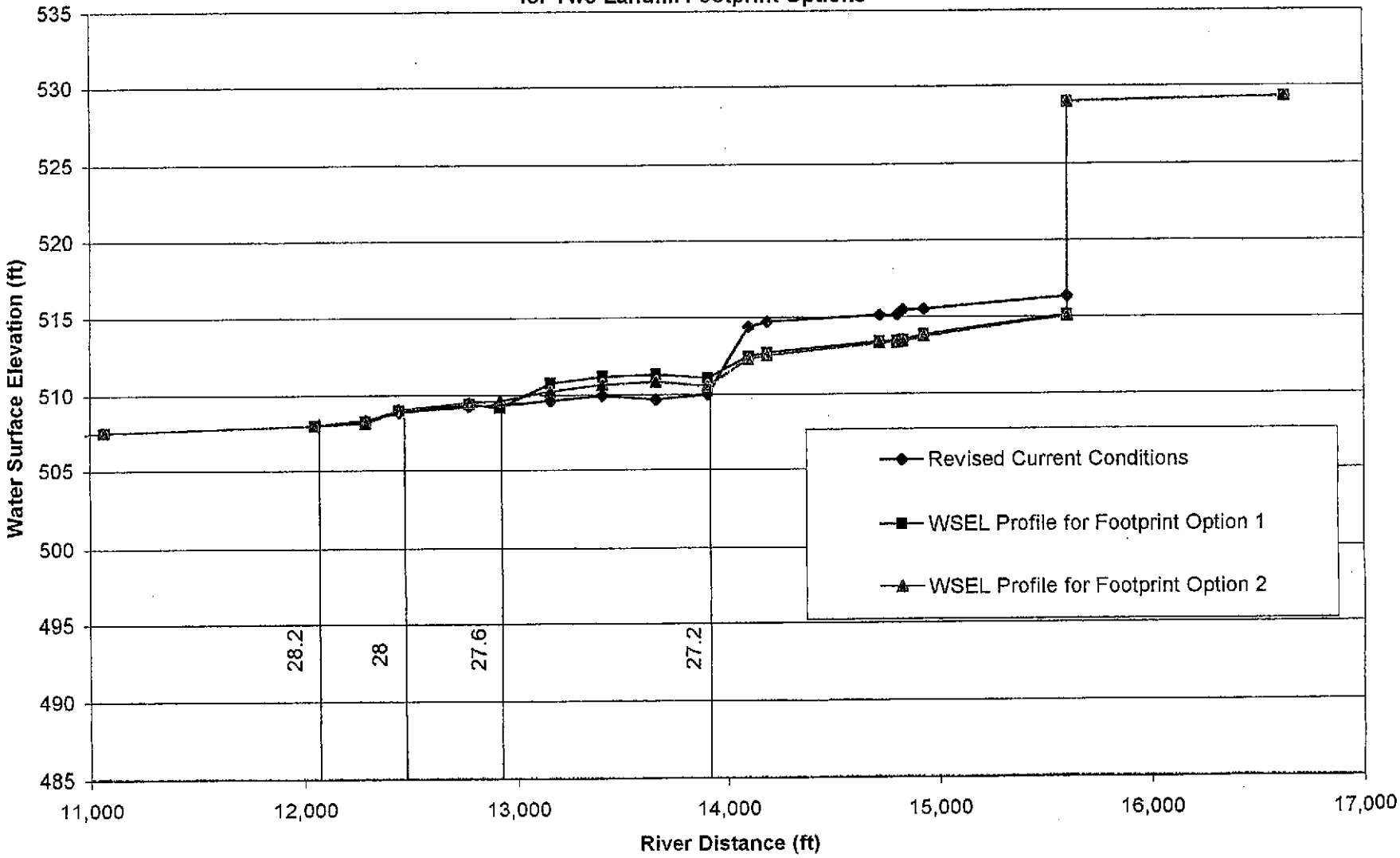
There is a major flow constriction in the Landfill Configuration 1 scenario at cross-section 27.6.

3.2 Impact of Landfill Configuration 2 on Hoosic River

Based on the results of the simulation for Landfill Configuration 1 that indicated an increase in the water surface elevations upstream of the constriction at cross section 27.6, it was determined that an alternate Landfill Configuration could be developed that encroached less closely to the river channel, and would hopefully result in lower flood water surface elevations.

To reduce the constriction in Landfill Configuration 2, the western corner of the landfill footprint for Option 2 was rounded at cross-sections 27.6 and 27.7. The effect of this modification can be seen in the last three columns of Table 3.1-1. The maximum increase in surface water elevation due to Landfill Configuration 2 is equal to 1.17 ft. at cross-section 27.3, a reduction of approximately 0.5 feet from landfill Option 1. Additionally, a decrease in elevation at the upstream cross-sections is also observed due to the removal of the upper portion of the berm that allows utilization of the emergency overflow channel through the former areas of Lagoons 1, 4, and 5.

Figure 3.1-1
Comparison of
Water Surface Profile Changes
for Two Landfill Footprint Options

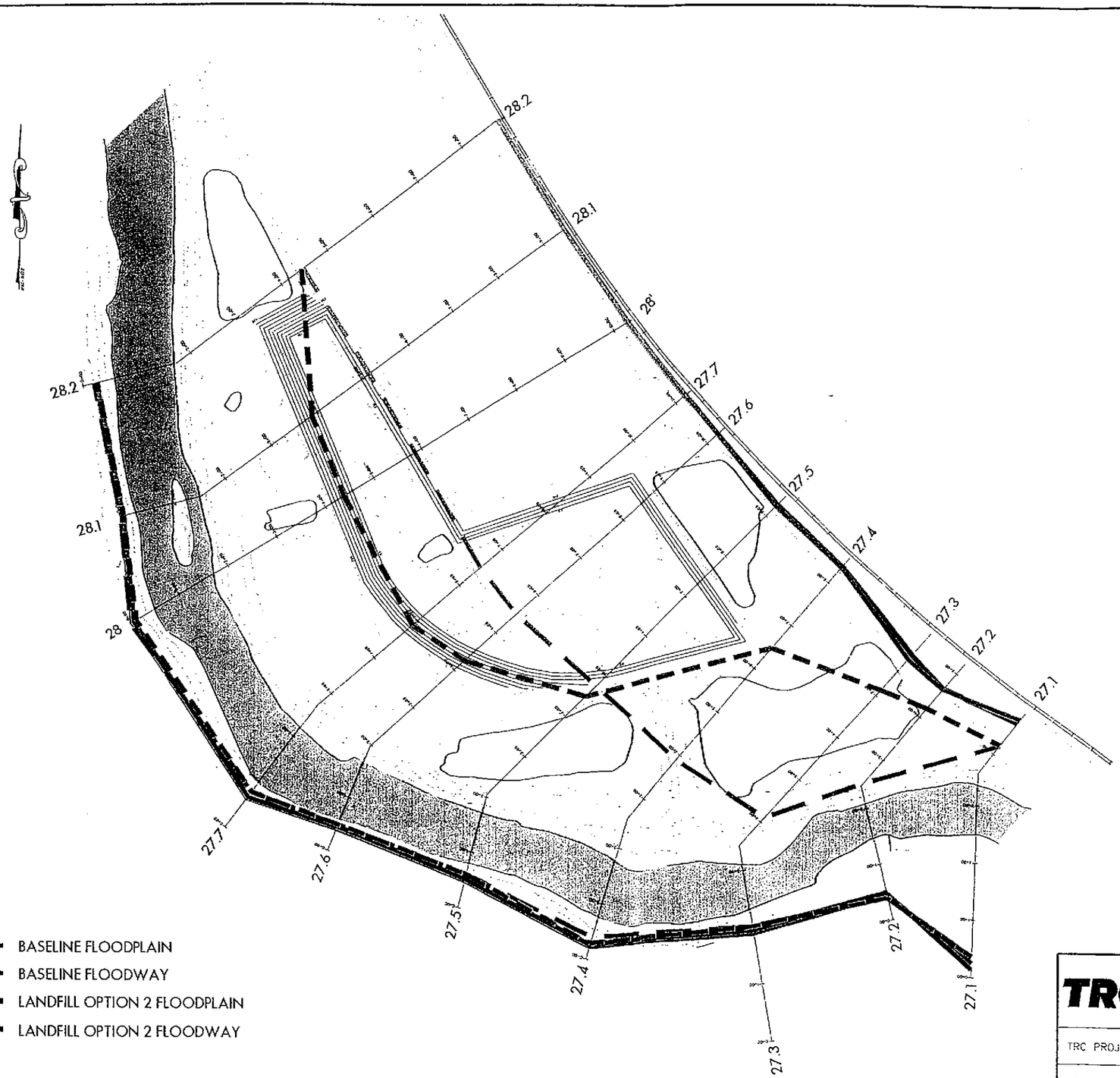


Appendix G presents the results of the HEC-RAS model in response to Landfill Configuration 2. Figure 3.1-1 shows a comparison of calculated water surface elevations between the revised current conditions, and Landfill Configurations 1 and 2. The plot clearly illustrates the effect of the constriction caused by the landfill footprints at section 27.6. Landfill Configuration 1 results in the largest rise in water surface elevations when compared to revised current conditions. Landfill Configuration 2 elevations fall between Landfill Configuration 1 and the revised conditions. Both Landfill Configurations 1 and 2 improve conditions farther upstream of section 27.2. The removal of the berm located between Lagoons 1 and 5 and the river channel opens up the flow area significantly and decreases the constriction at section 27.2.

3.3 Horizontal Extent of Floodplain and Floodway

Figure 3.3-1 compares the horizontal extent of the floodplain and floodway calculations from the revised HEC-RAS baseline run and the model run for Landfill Configurations 1 and 2. Due to the steepness of the topography near the floodplain edges, the changes in water surface elevation ranging from –2.2 to +1.2 feet result in negligible differences in the lateral extent of the floodplain. Significant restructuring of the berms, and construction of the landfill will, however, significantly alter the boundary of the floodway. The revised floodway boundary generally follows the edge of the emergency overflow channel created by removal of the top portion of the berm at Lagoons 1 and 5 adjacent to the river and between Lagoons 1, 4, and 5.

Inspection of the cross-sections contained in Appendix C indicates that the flooded area between the landfill and the railroad embankment is considered ineffective flow. From the point of view of hydraulic conveyance these areas could be filled without any significant impact to the flood carrying capacity of the channel. This may be important in the region of Lagoon 2, in order to provide adequate foundation elevations for the proposed WWTP. Filling of these areas would shift the floodplain boundary towards the main river channel.



LEGEND:

- BASELINE FLOODPLAIN
- BASELINE FLOODWAY
- LANDFILL OPTION 2 FLOODPLAIN
- LANDFILL OPTION 2 FLOODWAY

GRAPHIC SCALE

0' 100' 200' 400'

02136\POWNAL\HYDRO\SITENORTH

TRC

Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0380-01N98

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACTOR NO.: 107061

FIGURE 3.3-1
FLOODWAY AND FLOOD PLAIN DELINEATION FOR BASELINE AND FOOTPRINT OPTION 2

POWNAL TANNERY
POWNAL, VERMONT

M&E Metcalf & Eddy

4.0 CONCLUSIONS

This analysis considered the impact of EPA's preferred remedial alternative, construction of a Solid Waste Landfill (Remedial Action Alternative 4) on the flood bearing capacity of the Hoosic River, specifically for a 100-year flood event. The study utilized the 1979 FIS, produced by FEMA, as a baseline for the analysis, and focused on a sub-basin of the FEMA model extending upstream and downstream from the proposed landfill construction site. The study focused on predicting the relative flood elevation differences that would result from topographic changes caused by the landfill construction.

Based on the analyses summarized in this report, Landfill Option No. 2 appears to present the optimal landfill footprint for the project, causing the least increase in flood water elevations and most improved lateral changes to floodplain boundaries. As shown in the modeling results, construction of Option No. 2 would result in relatively minor increases in flood elevations within the river length adjacent to the Lagoon Area. Upstream of the Lagoon Area, predicted flood elevations are actually reduced under Option No. 2 due to the broadening of the Floodway.

The Town of Pownal Zoning By-laws prohibit construction of the proposed project in the floodway prohibited unless a professional engineer certifies that the proposed development will not result in any increase in flood levels. Since the modeling indicates a slight increase in flood levels in some areas and a slight decrease in flood levels in other areas, it is not possible to provide this certification.

However, based on the results of this modeling effort and careful consideration of the projected hydraulic impacts of the proposed project, TRC determined that the variance will not result in increased flood heights that pose threats to public safety, extraordinary public expense, create nuisances or victimization of the public or conflict with existing local laws or ordinances. Therefore, the results of this analysis support the issuance of a variance, per the Town Zoning By-law.

Appendix B
TRC HEC-2 Baseline Conditions Model Results

```
*  WATER SU   CE PROFILES                          *                                  *  U.S. ARMY CORPS OF ENGINEERS
*  VERSION OF NOVEMBER 1976                        *                                  *  THE HYDROLOGIC ENGINEERING
ENTER  *
*  UPDATED MAY 1984                                *                                  *  609 SECOND STREET, SUITE D
*  IBM-PC-XT VERSION AUGUST 1985                   *                                  *  DAVIS, CALIFORNIA 95616
*  RUN DATE  03-05-02   TIME  13:54:15                *                                  *  (916) 440-2105 (FTS) 448-
105      *
*****************************************************
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X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
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THIS RUN EXECUTED 03-05-02

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  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
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T1 TOWN OF POWNAL FLOOD INSURANCE STUDY
T2 100-YEAR FLOOD
T3 POWNAL, VT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	6.	0.	0.	.016000	.00	.0	0.	488.700	.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1.000	.000	-1.000	.000	.000	.000	.000	.000	.000	15.000

	1.000	34.000	3.000	4.000	27.000	28.000	9.000	150.000	200.000	.000

NC	.035	.030	.040	.100	.300	.000	.000	.000	.000	.000
QT	6.000	12000.000	22500.000	29400.000	55800.000	29400.000	29400.000	.000	.000	.000
NH	4.000	.035	1940.000	.100	2140.000	.050	2240.000	.040	2540.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	1390.000	2290.000
X1	39.000	15.000	2140.000	2290.000	.000	.000	.000	.000	.000	.000
GR	495.000	.000	489.300	250.000	487.800	625.000	487.300	745.000	486.000	1775.000
GR	485.000	2110.000	484.600	2140.000	477.500	2170.000	476.500	2180.000	477.000	2218.000
GR	476.000	2240.000	477.500	2252.000	490.000	2290.000	497.700	2440.000	500.000	2540.000
NC	.040	.040	.050	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	1494.000	2394.000
X1	38.000	16.000	2226.000	2394.000	1397.000	1600.000	1620.000	.000	.000	.000
GR	498.000	579.000	491.700	627.000	491.000	751.000	491.200	943.000	491.200	1068.000
GR	496.500	1246.000	490.000	1531.000	488.100	1830.000	487.800	2226.000	477.500	2258.000
GR	476.400	2271.000	477.000	2307.000	475.500	2338.000	477.500	2363.000	487.800	2394.000
GR	497.500	2423.000	.000	.000	.000	.000	.000	.000	.000	.000
NC	.060	.035	.045	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	100.000	1000.000
X1	37.000	16.000	600.000	814.000	1290.000	2160.000	1990.000	.000	.000	.000
GR	498.000	.000	491.700	48.000	491.000	220.000	488.900	600.000	483.800	614.000
GR	482.400	644.000	482.900	679.000	482.900	709.000	483.600	727.000	486.100	790.000
GR	490.500	814.000	489.400	885.000	491.000	919.000	495.100	955.000	495.100	2300.000
GR	503.600	2325.000	.000	.000	.000	.000	.000	.000	.000	.000

1

NC	.035	.035	.045	.300	.500	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	1733.000	2633.000
X1	36.200	29.000	2382.000	2632.000	210.000	210.000	210.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	495.000	498.000	.000
GR	525.000	.000	498.000	100.000	491.000	2000.000	489.900	2118.000	487.600	2378.900
GR	487.600	2379.000	487.600	2381.900	487.600	2382.000	481.700	2401.000	481.800	2428.000
GR	482.700	2465.000	483.400	2479.000	495.600	2479.100	495.600	2493.000	485.700	2493.100
GR	485.700	2497.000	480.900	2497.100	480.300	2508.000	485.600	2558.000	488.100	2587.000
GR	488.900	2632.000	488.900	2632.100	489.400	2667.000	491.000	2698.000	495.100	2737.000
GR	495.100	2923.000	495.100	3249.000	495.100	4082.000	504.300	5199.000	.000	.000
SB	.000	1.560	2.900	.000	250.000	.000	2687.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	1733.000	2633.000
X1	36.100	.000	.000	.000	22.000	22.000	22.000	.000	.000	.000
X2	.000	.000	1.000	496.100	498.000	.000	.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	498.000	500.700	.000
BT	29.000	.000	525.000	525.000	100.000	498.000	498.000	2000.000	498.100	491.000
BT	2118.000	498.800	489.900	2378.900	499.800	487.600	2379.000	505.300	487.600	2381.900
BT	505.300	487.600	2382.000	505.300	495.200	2401.000	505.400	495.300	2428.000	505.500
BT	495.400	2465.000	505.600	495.500	2479.000	505.700	495.600	2479.100	500.200	495.600
BT	2493.000	500.200	495.600	2493.100	500.200	495.600	2497.000	500.200	495.600	2[illegible].100

BT	2698.0[illegible]	501.000	491.000	2737.000	501.100	495.100	2923.000	501.700	495.100	32[illegible].000
BT	501.[illegible]	495.100	4082.000	502.900	495.100	99.000	504.300	504.300	.000	000
NH	5.000	.035	241.000	.050	262.000	.045	371.000	.070	764.000	.035
NH	1434.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	241.000	941.000
X1	35.000	19.000	241.000	451.000	280.000	120.000	340.000	.000	.000	.000
GR	515.500	.000	503.000	90.000	491.600	241.000	484.000	262.000	480.600	306.000
GR	479.200	324.000	480.500	341.000	484.200	371.000	484.300	393.000	484.500	405.000
GR	484.100	423.000	483.500	428.000	484.200	432.000	492.800	451.000	496.800	764.000
GR	496.100	1123.000	496.600	1365.000	497.900	1396.000	501.800	1434.000	.000	.000
NC	.035	.035	.045	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	201.000	901.000
X1	34.200	19.000	205.000	360.000	330.000	330.000	340.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	497.300	493.200	.000
GR	510.000	.000	502.000	100.000	501.400	123.000	499.300	200.000	482.400	205.000
GR	482.400	205.100	480.100	236.000	484.200	278.000	483.800	310.000	485.200	339.000
GR	483.900	360.000	483.900	360.100	498.400	364.000	494.500	482.000	497.700	794.000
GR	497.900	893.000	499.100	1035.000	503.400	1661.000	503.600	1695.000	.000	.000
SB	.000	1.560	2.800	.000	155.000	.000	1757.000	.000	482.500	482.500
ET	.000	.000	.000	.000	.000	.000	9.100	.000	204.500	904.500
X1	34.100	.000	.000	.000	27.000	27.000	27.000	.000	.000	.000
X2	.000	.000	1.000	494.900	494.500	.000	.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	499.300	494.500	.000
BT	19.000	.000	510.000	510.000	100.000	502.000	502.000	123.000	501.400	501.400
BT	200.000	499.300	499.300	205.000	499.300	482.400	205.100	499.300	494.900	236.000
BT	499.100	494.700	278.000	498.900	494.500	310.000	498.700	494.300	339.000	498.500
BT	494.100	360.000	498.400	494.000	360.100	498.400	483.900	364.000	498.400	498.400

BT	482.000	494.500	494.500	794.000	497.700	497.700	893.000	497.900	497.900	1305.000
BT	499.100	499.100	1661.000	503.400	503.400	1695.000	503.600	503.600	.000	.000
NC	.100	.035	.045	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	65.000	865.000
X1	33.000	21.000	65.000	247.000	130.000	60.000	99.000	.000	.000	.000
GR	508.900	.000	488.700	65.000	484.200	80.000	482.800	87.000	482.900	111.000
GR	482.700	123.000	483.300	150.000	483.700	181.000	483.900	213.000	484.600	237.000
GR	488.700	247.000	489.700	303.000	491.900	317.000	495.900	496.000	497.800	706.000
GR	497.300	895.000	498.400	1075.000	497.800	1248.000	497.400	1363.000	495.600	1623.000
GR	503.600	1644.000	.000	.000	.000	.000	.000	.000	.000	.000
NC	.000	.000	.000	.100	.300	.000	.000	.000	.000	.000
NH	4.000	.100	141.000	.045	209.000	.047	390.000	.035	1284.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	113.000	913.000
X1	32.000	21.000	141.000	269.000	1140.000	460.000	1030.000	.000	.000	.000
GR	512.300	.000	489.300	30.000	489.600	141.000	486.100	174.000	484.700	201.000
GR	484.300	222.000	484.800	239.000	486.100	257.000	486.700	259.000	493.000	269.000
GR	491.400	380.000	496.200	390.000	495.900	454.000	498.600	634.000	497.800	874.000

NC	.100	.090	.050	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	3.350	803.350
X1	31.000	40.000	.000	187.000	1170.000	1110.000	1220.000	.000	.000	.000
GR	507.000	.000	503.700	.100	486.700	41.000	483.300	67.000	482.000	80.000
GR	481.700	100.000	482.000	107.000	482.700	116.000	485.700	153.000	485.200	169.000
GR	486.700	180.000	490.100	187.000	491.700	223.000	494.300	247.000	494.300	287.000
GR	497.600	330.000	497.800	398.000	497.800	447.000	497.500	520.000	496.900	563.000
GR	497.400	623.000	498.000	703.000	495.800	774.000	499.400	836.000	501.200	910.000
GR	501.200	986.000	501.300	1047.000	501.400	1147.000	501.200	1202.000	501.600	1216.000
GR	501.500	1226.000	501.700	1253.000	501.200	1268.000	502.800	1349.000	504.300	1356.000
GR	502.800	1363.000	502.500	1385.000	502.000	1483.000	502.000	1506.000	505.000	1786.000
NC	.100	.060	.045	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	22.650	822.650
X1	30.000	35.000	490.000	748.000	820.000	1140.000	3080.000	.000	.000	.000
X4	1.000	506.100	825.000	.000	.000	.000	.000	.000	.000	.000
GR	516.100	.000	499.100	38.000	498.000	61.000	496.800	111.000	497.100	161.000
GR	496.800	211.000	496.800	261.000	499.900	278.000	500.300	390.000	500.100	490.000
GR	492.700	545.000	490.700	573.000	491.300	599.000	491.200	634.000	490.200	647.000
GR	490.700	668.000	492.700	688.000	494.400	692.000	494.200	706.000	492.900	712.000
GR	490.100	729.000	492.900	732.000	503.000	748.000	506.000	756.000	504.000	764.000
GR	502.800	790.000	504.400	800.000	503.000	808.000	505.100	925.000	506.100	936.000
GR	505.400	958.000	506.400	1027.000	510.300	1041.000	510.200	1051.000	519.200	1082.000
QT	6.000	11900.000	22500.000	29400.000	55700.000	29400.000	29400.000	.000	.000	.000
NH	5.000	.100	139.000	.040	282.000	.100	642.000	.030	1700.000	.050
NH	1994.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	139.000	939.000

X1	29.000	24.000	139.000	642.000	990.000	1080.000	1090.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
GR	512.800	.000	497.700	27.000	496.000	139.000	493.800	156.000	491.000	177.000
GR	488.800	217.000	489.900	267.000	493.900	277.000	498.100	282.000	499.500	302.000
GR	498.500	362.000	498.800	456.000	499.100	516.000	497.900	618.000	506.900	642.000
GR	506.900	652.000	502.600	668.000	505.500	678.000	505.400	687.000	500.100	692.000
GR	502.300	1012.000	508.300	1450.000	511.500	1712.000	515.500	1994.000	.000	.000
QT	6.000	11700.000	22100.000	28900.000	54700.000	28900.000	28900.000	.000	.000	.000
NH	7.000	.100	139.000	.040	405.000	.050	442.000	.035	846.000	.020
NH	940.000	.060	2345.000	.100	2433.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	61.120	861.120
X1	28.000	34.000	139.000	874.000	1150.000	1150.000	1150.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
GR	529.800	.000	507.800	28.000	506.700	139.000	502.400	148.000	499.500	153.000
GR	497.600	179.000	497.300	207.000	497.300	237.000	496.800	258.000	497.100	289.000
GR	497.400	310.000	497.700	361.000	498.700	383.000	502.400	405.000	503.000	442.000
GR	501.400	824.000	501.600	846.000	509.200	864.000	510.500	874.000	507.900	888.000
GR	509.800	908.000	508.200	914.000	507.000	922.000	503.000	940.000	505.500	984.000
GR	506.2[illegible]	1497.000	511.000	1547.000	512.500	948.000	514.900	1857.000	514.300	1[illegible].000

NC	.0	.060	.045	.000	.000	.000	.000	.000	.000	000
ET	.0	.000	.000	.000	.000	.000	9.100	.000	261.000	000
X1	27.000	33.000	261.000	594.000	2000.000	1410.000	1970.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
GR	527.500	.000	509.300	43.000	505.800	136.000	505.900	153.000	504.700	164.000
GR	502.300	217.000	504.400	261.000	501.700	265.000	495.900	314.000	493.600	342.000
GR	494.000	354.000	494.900	371.000	496.000	393.000	500.100	430.000	514.000	458.000
GR	513.900	467.000	511.000	474.000	511.000	526.000	513.400	534.000	513.200	545.000
GR	515.200	570.000	516.600	580.000	516.800	594.000	515.400	604.000	511.200	620.000
GR	509.200	697.000	514.900	764.000	517.400	967.000	519.000	979.000	517.900	1005.000
GR	516.800	1348.000	517.400	1426.000	533.000	1486.000	.000	.000	.000	.000
NH	4.000	.100	61.000	.025	207.000	.040	397.000	.030	527.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	207.000	407.000
X1	26.000	28.000	207.000	397.000	520.000	690.000	530.000	.000	.000	.000
GR	527.300	.000	514.100	25.000	511.800	61.000	512.600	67.000	512.300	87.000
GR	509.900	107.000	509.700	118.000	510.700	159.000	510.900	172.000	508.600	207.000
GR	497.600	221.000	496.100	229.000	496.800	245.000	495.600	261.000	495.900	277.000
GR	496.700	290.000	497.600	307.000	499.200	326.000	497.800	344.000	496.100	363.000
GR	497.800	377.000	504.800	397.000	505.400	423.000	519.800	479.000	519.900	491.000
GR	520.200	511.000	520.700	516.000	520.700	527.000	.000	.000	.000	.000
NC	.060	.060	.045	.300	.500	.000	.000	.000	.000	.000
NH	4.000	.100	67.000	.025	172.000	.040	404.000	.030	907.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	104.010	404.010
X1	25.200	25.000	172.000	404.000	90.000	60.000	83.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	510.000	520.300	.000
GR	527.300	.000	514.100	25.000	511.800	61.000	512.600	67.000	512.300	87.000
GR	512.500	103.000	509.200	172.000	500.300	191.000	496.100	211.000	496.600	230.000
GR	496.300	237.000	497.700	273.000	501.300	288.000	499.800	305.000	497.000	310.000
GR	495.200	323.000	497.800	339.000	502.600	349.000	503.400	380.000	515.800	404.000
GR	522.500	491.000	521.700	592.000	522.400	701.000	522.900	877.000	532.200	907.000

SB	1.050	1.560	2.800	.000	140.000	5.000	3781.000	2.266	499.400	499.400
NC	.030	.030	.040	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	104.010	404.010
X1	25.100	20.000	172.000	404.000	27.000	27.000	27.000	.000	.000	.000
X2	.000	.000	1.000	519.700	513.600	.000	.000	.000	.000	.000
X3	10.000	.000	.000	.000	.000	.000	.000	513.600	521.200	.000
BT	8.000	.000	530.000	530.000	11.000	513.600	513.600	172.000	514.700	509.200
BT	172.100	514.700	513.200	239.000	517.600	516.100	351.000	520.500	519.000	404.000
BT	521.200	519.700	404.100	529.900	515.800	.000	.000	.000	.000	.000
GR	530.000	.000	513.600	11.000	509.200	172.000	500.300	191.000	496.100	211.000
GR	496.600	230.000	496.300	237.000	497.700	273.000	501.300	288.000	499.800	305.000
GR	497.000	310.000	495.200	323.000	497.800	339.000	502.600	349.000	503.400	380.000
GR	510.400	380.100	510.400	401.000	515.800	401.100	515.800	404.000	529.900	404.100
NC	.040	.070	.040	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	15.050	315.050

GR	497.700	140.000	496.200	166.000	496.500	201.000	497.700	219.000	499.700	235.000
GR	497.600	240.000	496.600	265.000	497.600	293.000	499.900	315.000	530.000	315.100
ET	.000	.000	.000	.000	.000	.000	9.100	.000	10.400	315.050
X1	23.200	.000	.000	.000	675.000	675.000	675.000	.000	.900	.000
SB	.000	1.560	3.500	.000	.100	.000	.010	.000	507.000	507.000
NC	.040	.020	.020	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	.010	173.400
X1	23.100	6.000	.000	168.000	5.000	5.000	5.000	.000	.000	.000
X2	.000	.000	1.000	507.100	515.700	.000	.000	.000	.000	.000
BT	7.000	.000	535.000	535.000	.100	515.700	507.000	150.000	516.700	507.000
BT	168.000	516.000	507.000	169.000	523.400	523.400	173.000	523.400	523.400	174.000
BT	536.400	536.400	.000	.000	.000	.000	.000	.000	.000	.000
GR	535.000	.000	507.000	.100	507.000	168.000	523.400	169.000	523.400	173.000
GR	536.400	174.000	.000	.000	.000	.000	.000	.000	.000	.000
NC	.040	.030	.040	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	10.400	.000	.000	.000
X1	22.000	13.000	.000	204.000	1020.000	1020.000	1020.000	.000	.000	.000
GR	541.200	.000	515.900	33.000	511.500	79.000	508.200	106.000	507.800	124.000
GR	507.300	148.000	507.100	169.000	515.900	184.000	525.200	204.000	526.300	210.000
GR	526.300	223.000	525.200	235.000	534.800	249.000	.000	.000	.000	.000
NC	.000	.000	.000	.100	.300	.000	.000	.000	.000	.000
NH	5.000	.030	110.000	.100	228.000	.030	407.000	.040	545.000	.030
NH	608.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	95.000	545.000
X1	21.000	25.000	407.000	545.000	1590.000	1770.000	1770.000	.000	.000	.000
GR	530.400	.000	522.700	22.000	522.700	43.000	505.100	63.000	521.900	110.000
GR	521.100	163.000	520.900	194.000	520.700	228.000	523.200	263.000	520.000	272.000
GR	520.600	307.000	519.000	407.000	516.000	410.000	511.700	429.000	509.800	450.000
GR	508.200	470.000	503.500	492.000	506.000	502.000	506.100	525.000	516.000	535.000
GR	524.400	545.000	525.800	567.000	526.200	580.000	525.800	586.000	544.400	608.000

NC	.050	.030	.040	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	.000	.000	.000	.000	9.100	.000	54.040	1303.750
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

1490 NH CAR USED
*SECNO 39.0
3720 CRITICAL DEPTH ASSUMED

39.00	12.65	488.65	488.65	488.70	489.72	1.07	.00	.00	484.60
29400.	14235.	15165.	0.	3452.	1396.	0.	0.	0.	490.00
.00	4.12	10.87	.00	.048	.047	.000	.000	476.00	412.58
.005931	0.	0.	0.	0	6	0	.00	1873.31	2285.90

FLOW DISTRIBUTION FOR SECNO= 39.00 CWSEL= 488.65

STA=	413.	625.	745.	1775.	2110.	2140.	2290.
PER Q=	.6	1.6	36.4	8.8	1.1	51.6	
AREA=	90.2	132.0	2059.7	1055.1	115.5	1395.7	
VEL=	1.8	3.5	5.2	2.5	2.8	10.9	

*SECNO 38.000

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

38.00	17.57	493.07	.00	.00	493.46	.39	3.67	.07	487.80
29400.	14369.	14927.	103.	4333.	2392.	42.	196.	55.	487.80
.09	3.32	6.24	2.48	.040	.050	.040	.000	475.50	616.53
.001313	1397.	1620.	1600.	4	0	0	.00	1527.98	2409.77

FLOW DISTRIBUTION FOR SECNO= 38.00 CWSEL= 493.07

STA=	617.	627.	751.	943.	1068.	1131.	1531.	1830.	2226.	2394.	2410.
PER Q=	.0	1.4	2.7	1.6	.3	1.3	13.9	27.6	50.8	.4	
AREA=	7.2	213.8	379.1	234.3	59.0	207.2	1203.3	2029.2	2391.7	41.6	
VEL=	1.0	1.9	2.1	2.0	1.3	1.8	3.4	4.0	6.2	2.5	

*SECNO 37.000

37.00	13.18	495.58	.00	.00	496.04	.46	2.55	.02	488.90
29400.	8906.	16325.	4169.	2925.	2410.	1322.	447.	130.	490.50
.18	3.04	6.77	3.15	.060	.045	.035	.000	482.40	18.42
.001682	1290.	1990.	2160.	3	0	0	.00	2282.99	2301.42

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 37.00 CWSEL= 495.58

STA=	18.	48.	220.	600.	814.	885.	919.	955.	2300.	2301.

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    VEL=      1.6      2.7      3.2      6.8      5.5      5.3      3.2      1.1       .7

CCHV=     .300 CEHV=     .500
*SECNO 36.200

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      495.00 ELREA=      498.00

    36.20    15.86   496.16      .00      .00   496.34      .18      .21      .09   487.60
   29400.   18151.   11249.       0.    6247.    2802.       0.     485.     140.    488.90
      .20     2.91     4.01      .00     .035     .045     .035     .000   480.30   599.37
  .000679     210.     210.     210.        2        0        0      .00  2032.63  2632.00
)
FLOW DISTRIBUTION FOR SECNO=     36.20          CWSEL=    496.16

STA=     599.    2000.    2118.    2379.    2379.    2382.    2382.    2632.
  PER Q=     25.6      8.1     27.6       .0       .4       .0     38.3
   AREA=   3613.8    673.8   1933.3       .9     24.8       .9   2801.9
    VEL=      2.1      3.5      4.2      4.6      4.6      4.6      4.0


SPECIAL BRIDGE

5070,VARIABLE ELCHU OR ELCHD ON CARD SB NOT SPECIFIED
SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     .00      1.56      2.90       .00    250.00       .00   2687.00       .00    480.30    480.30

*SECNO 36.100
PRESSURE AND WEIR FLOW


 EGPRS      EGLWC       H3        QWEIR      QPR       BAREA   TRAPEZOID      ELLC      ELTRD
                                                                  AREA
   499.06    497.87       .00      2282.    26973.     2687.     3950.     496.10    498.00


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      498.00 ELREA=      500.70

    36.10    18.23   498.53      .00      .00   498.60      .07     2.26      .00   487.60
   29400.   21016.    8384.       0.   11206.    3395.       0.     491.     141.    488.90
      .20     1.88     2.47      .00     .035     .045     .000     .000   480.30    98.02
  .000199      22.      22.      22.        2        0        2      .00  2533.98  2632.00
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST
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STA=      98      2000.     2118.     2379.     2379.     2382.     2[illegible]2.     2632.
  PER Q=        .5       7.8      23.8        .0        .3        .0      28.5
   AREA=    7665.9     954.0    2552.7       1.1      31.7       1.1    3395.4
    VEL=       1.5       2.4       2.7       2.9       2.9       2.9       2.5

1490 NH CARD USED
*SECNO 35.000

3301 HV CHANGED MORE THAN HVINS

    35.00     19.17    498.37       .00       .00    499.03       .66       .13       .30    491.60
   29400.     1194.    22632.     5574.      303.     3107.     2331.      556.      152.     492.80
      .21      3.94      7.28      2.39      .035      .050      .049      .000    479.20    151.34
  .001697      280.      340.      120.         2         0         0       .00   1249.24   1400.57

FLOW DISTRIBUTION FOR SECNO=     35.00          CWSEL=    498.37

STA=      151.      241.      451.      764.     1123.     1365.     1401.
  PER Q=       4.1      77.0       7.8       6.3       4.6        .2
   AREA=     303.5    3106.8    1117.2     689.0     488.7      35.8
    VEL=       3.9       7.3       2.0       2.7       2.8       1.8

*SECNO 34.200

3301 HV CHANGED MORE THAN HVINS

    34.20     18.58    498.68       .00       .00    500.09      1.41       .69       .37    482.40
   29400.      145.    24756.     4499.       39.     2413.     1224.      593.      160.     483.90
      .22      3.70     10.26      3.67      .035      .045      .035      .000    480.10    200.18
  .002491      330.      340.      330.         0         0         0       .00    785.54    985.73

FLOW DISTRIBUTION FOR SECNO=     34.20          CWSEL=    498.68

STA=      200.      205.      360.      360.      364.      482.      794.      893.      986.
  PER Q=        .5      84.2        .1        .3       3.2      10.9        .6        .1
   AREA=      39.2    2412.7       1.5      29.4     263.6     806.1      87.5      36.3
    VEL=       3.7      10.3      12.8       3.3       3.6       4.0       2.0       1.1
```



```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     .00      1.56      2.80       .00    155.00       .00   1757.00       .00    482.50    482.50
```

PRESS FLOW BECAUSE EGLWC OF 502.49 EXCEEDS 1.5 DEPTH
PRESSURE AND WEIR FLOW

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD
505.46	502.49	.00	14986.	14703.	1757.	1922.	494.90	494.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 499.30 ELREA= 494.50

34.10	19.12	499.22	.00	.00	500.38	1.16	.29	.00	482.40
29400.	0.	23619.	5781.	0.	2494.	1569.	595.	160.	483.90
.23	.00	9.47	3.68	.000	.045	.035	.000	480.10	205.00
.002031	27.	27.	27.	4	0	3	.00	845.76	1050.76

FLOW DISTRIBUTION FOR SECNO= 34.10 CWSEL= 499.22

STA=	205.	360.	360.	364.	482.	794.	893.	1035.	1051.
PER Q=	80.3	.1	.3	4.2	13.4	1.1	.5	.0	
AREA=	2494.1	1.5	31.4	325.5	969.8	139.4	100.6	.9	
VEL=	9.5	11.8	3.1	3.8	4.1	2.4	1.5	.3	

*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

33.00	17.81	500.51	.00	.00	500.73	.22	.07	.28	488.70
29400.	232.	14251.	14917.	224.	3030.	5586.	607.	162.	488.70
.23	1.03	4.70	2.67	.100	.045	.035	.000	482.70	27.00
.000483	130.	99.	60.	3	0	0	.00	1608.89	1635.89

FLOW DISTRIBUTION FOR SECNO= 33.00 CWSEL= 500.51

STA=	27.	65.	247.	303.	317.	496.	706.	895.	1075.	1248.	1363.	1623.	1636.
PER Q=	.8	48.5	10.1	1.9	13.2	5.8	3.7	2.9	2.4	2.2	8.4	.2	
AREA=	224.4	3030.0	633.4	135.9	1183.3	768.7	559.5	478.9	417.0	334.7	1042.7	31.6	
VEL=	1.0	4.7	4.7	4.2	3.3	2.2	1.9	1.8	1.7	1.9	2.4	1.6	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 32.000

```
   32.00      3.64   500.94       .00       .00   501.34       .4       .55       .05   489.60
  29400.     3465.   12596.    13339.     1364.    1895.     3694.     735.      181.    493.00
     .28      2.54     6.65      3.61      .100     .046      .039     .000    484.30     14.81
 .001196     1140.    1030.      460.         2        0         0      .00   1226.31   1274.51

FLOW DISTRIBUTION FOR SECNO=     32.00          CWSEL=    500.94

STA=      15.     141.     269.     380.     454.     634.     874.     976.    1210.    1275.
  PER Q=     11.8     42.8     15.3      5.4      7.9      6.4      3.6      6.5       .2
   AREA=   1364.2   1894.6    970.5    384.6    664.8    658.4    330.8    653.6     31.2
    VEL=      2.5      6.6      4.6      4.1      3.5      2.9      3.2      2.9      1.5

*SECNO 31.000

3265 DIVIDED FLOW

   31.00     20.66   502.36       .00       .00   502.94       .58      1.55       .06   507.00
  29400.        0.   21096.     8304.        0.    2958.     4297.     923.      215.    490.10
     .33       .00     7.13      1.93      .100     .050      .090     .000    481.70      3.32
 .001462     1170.    1220.     1110.         2        0         0      .00   1451.50   1539.85

FLOW DISTRIBUTION FOR SECNO=     31.00          CWSEL=    502.36

STA=       3.     187.     223.     287.     398.     520.     623.     774.    1202.    1540.
  PER Q=     71.8      4.5      4.9      3.9      3.4      3.4      4.8      3.0       .2
   AREA=   2957.7    412.7    547.2    592.8    567.6    534.8    760.9    763.9    117.5
    VEL=      7.1      3.2      2.6      2.0      1.8      1.9      1.9      1.2       .5

*SECNO 30.000

3265 DIVIDED FLOW

   30.00     15.87   505.97       .00       .00   506.49       .52      3.54       .01   500.10
  29400.     7072.   22071.      257.     3376.    3345.      211.     1236.      255.    503.00
     .46      2.09     6.60      1.22      .100     .045      .060     .000    490.10     22.64
 .001347      820.    3080.     1140.         3        0         0      .00    955.29    997.34


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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


FLOW DISTRIBUTION FOR SECNO=     30.00          CWSEL=    505.97

STA=      23.     111.     161.     211.     261.     390.     490.     748.     997.
  PER Q=      4.7      3.6      3.6      3.7      4.9      3.4     75.1       .9
   AREA=    651.9    451.0    451.0    458.5    787.0    577.0   3345.5    210.7
```

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1490 NH CARD USED
*SECNO 29.000
    29.00     18.47    507.27       .00       .00    507.43       .16       .90       .04    496.00
   29400.     2058.    17449.     9893.     1249.     5310.     2960.     1437.      283.    506.90
      .56      1.65      3.29      3.34      .100      .052      .030      .000    488.80      9.89
  .000574      990.     1090.     1080.         2         0         0       .00   1365.01   1374.89

FLOW DISTRIBUTION FOR SECNO=     29.00          CWSEL=    507.27

STA=       10.      139.      642.     1012.     1375.
  PER Q=       7.0      59.3      27.0       6.7
   AREA=    1249.1    5310.5    2058.0     902.0
    VEL=       1.6       3.3       3.9       2.2

1490 NH CARD USED
*SECNO 28.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      506.70 ELREA=      510.50

    28.00     11.21    508.01       .00       .00    508.48       .47       .96       .09    506.70
   28900.       38.    28862.        0.       85.     5251.        0.     1633.      312.    510.50
      .61       .45      5.50       .00      .100      .037      .030      .000    496.80     27.73
  .001319     1150.     1150.     1150.         2         0         0       .00    833.45    861.18

FLOW DISTRIBUTION FOR SECNO=     28.00          CWSEL=    508.01

STA=       28.      139.      874.
  PER Q=       .1      99.9
   AREA=     84.5    5250.5
    VEL=       .5       5.5

*SECNO 27.000

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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      504.40 ELREA=      516.80

    27.00     17.82    511.42       .00       .00    512.42      1.00      3.78       .16    504.40
   28900.     6156.    22744.        0.     1303.     2617.         0     1842.      342.    516.80
```

```
FLOW DISTRI.   ON FOR SECNO=     27.00          CWSEL=    511.

STA=      38.      43.     136.     153.     164.     217.     261.     594.
  PER Q=       .0      4.2      1.4      1.1      7.9      6.7     78.7
   AREA=      5.3    360.1     94.7     67.3    419.9    355.2   2616.6
    VEL=      1.3      3.4      4.3      4.5      5.4      5.5      8.7

1490 NH CARD USED
*SECNO 26.000

3265 DIVIDED FLOW

    26.00    16.88   512.48      .00      .00   513.73     1.25     1.24      .08   508.60
   28900.    1198.   25694.    2008.     274.    2767.     289.    1887.     347.    504.80
      .70     4.36     9.29     6.94     .025     .040     .030     .000   495.60    50.35
  .001825     520.     530.     690.        2        0        0      .00   391.32   450.53

FLOW DISTRIBUTION FOR SECNO=     26.00          CWSEL=    512.48

STA=      50.     207.     397.     423.     451.
  PER Q=      4.1     88.9      5.3      1.6
   AREA=    274.4   2767.3    191.9     97.5
    VEL=      4.4      9.3      8.0      4.8

CCHV=    .300 CEHV=    .500
1490 NH CARD USED
```



```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 25.200

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      510.00 ELREA=      520.30

    25.20    17.32   512.52      .00      .00   514.04     1.52      .18      .13   509.20
   28900.     494.   28406.       0.     125.    2851.       0.    1893.     348.    515.80
      .70     3.94     9.96      .00     .025     .040     .030     .000   495.20    49.66
  .002549      90.      83.      60.        2        0        0      .00   342.39   397.66

FLOW DISTRIBUTION FOR SECNO=     25.20          CWSEL=    512.52

STA=      50.     172.     404.
  PER Q=      1.7     98.3
```

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	1.05	1.56	2.80	.00	140.00	5.00	3781.00	2.27	499.40	499.40

*SECNO 25.100
6840,FLOW IS BY WEIR AND LOW FLOW
3420 BRIDGE W.S.= 512.68 BRIDGE VELOCITY=, 12.89 CALCULATED CHANNEL AREA=, 2192.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD
519.70	515.26	.15	535.	28261.	3781.	3674.	519.70	513.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 513.60 ELREA= 521.20

25.10	19.00	514.20	.00	.00	515.26	1.06	1.22	.00	509.20
28900.	1823.	27077.	0.	451.	3200.	0.	1895.	348.	515.80
.70	4.04	8.46	.00	.030	.040	.000	.000	495.20	10.60
.001684	27.	27.	27.	3	0	2	.00	390.47	401.07

FLOW DISTRIBUTION FOR SECNO= 25.10 CWSEL= 514.20

STA=	11.	172.	404.
PER Q=	6.3	93.7	
AREA=	451.4	3200.3	
VEL=	4.0	8.5	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 24.000

24.00	18.09	514.29	.00	.00	515.51	1.22	.17	.08	513.60
28900.	186.	28714.	0.	112.	3228.	0.	1903.	349.	530.00
.71	1.65	8.90	.00	.040	.040	.070	.000	496.20	10.54
.001637	100.	100.	100.	2	0	0	.00	304.51	315.05

FLOW DISTRIBUTION FOR SECNO= 24.00 CWSEL= 514.29

STA=	11.	39.	55.	110.	315.
PER Q=	.1	.1	.4	99.4	
AREA=	25.0	22.2	65.3	3227.6	
VEL=	1.4	1.9	1.7	8.9	

```
   23.20      8.32    515.42       .00       .00    516.60      1.1      1.08       .01    514.50
  28900.      243.    28657.        0.      134.     3273.        0     1955.      353.    530.90
     .73      1.81      8.76       .00      .040      .040     .070      .000    497.10     10.39
 .001558      675.      675.      675.         0         0        0       .00    304.66    315.05

FLOW DISTRIBUTION FOR SECNO=     23.20          CWSEL=    515.42

STA=      10.      39.      55.     110.     315.
  PER Q=      .2       .2       .5     99.2
   AREA=    31.3     25.7     77.4   3272.8
    VEL=     1.6      2.0      1.8      8.8


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     .00      1.56      3.50       .00       .10       .00       .01       .00     507.00    507.00

*SECNO 23.100
PRESSURE AND WEIR FLOW


 EGPRS      EGLWC       H3       QWEIR      QPR       BAREA   TRAPEZOID      ELLC      ELTRD
                                                                 AREA
**********   526.50      .00     28987.       0.        0.        0.      507.10    515.70


   23.10     21.58   528.58       .00       .00    529.56       .98     12.96       .00    535.00
  28900.        0.   28847.       53.        0.     3625.       35.     1956.      353.    507.00
     .73       .00     7.96      1.51      .000      .020      .020      .000    507.00       .02
 .000224        5.       5.        5.         2         0         6       .00    173.38    173.40
```



```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


FLOW DISTRIBUTION FOR SECNO=     23.10          CWSEL=    528.58

STA=       0.     168.     169.     173.     173.
  PER Q=    99.8       .0       .1       .0
   AREA=  3624.6     13.4     20.7      1.0
    VEL=     8.0      1.0      1.9       .4

*SECNO 22.000
   22.00     21.80   528.90       .00       .00    530.20      1.30       .48       .16    541.20
  28900.        0.   28511.      389.        0.     3097.      101.     2036.      358.    525.20
     .76       .00     9.21      3.87      .040      .040      .030      .000    507.10     16.04
```

```
FLOW DISTRIBUTION FOR SECNO=     22.00          CWSEL=    528.90

STA=       16.      204.      210.      223.      235.      240.
  PER Q=     98.7        .3        .4        .5        .1
   AREA=   3096.5      18.9      33.8      37.8      10.0
    VEL=      9.2       4.2       3.7       4.2       2.6

CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 21.000
3280 CROSS SECTION     21.00 EXTENDED       .59 FEET


3301 HV CHANGED MORE THAN HVINS

    21.00    27.49   530.99      .00      .00   531.23      .24      .92      .11   519.00
   28900.   15302.   13011.     586.    4490.    2928.     240.    2247.     374.    524.40
      .88     3.41     4.44     2.44     .036     .040     .030     .000   503.50      .00
  .000267    1590.    1770.    1770.        2        0        0      .00   592.14   592.14
0
FLOW DISTRIBUTION FOR SECNO=     21.00          CWSEL=    530.99

STA=        0.       63.      110.      194.      263.      307.      407.      545.      592.
  PER Q=      7.9      14.9       3.1       5.2       6.1      15.7      45.0       2.0
   AREA=    613.8     822.2     812.9     663.1     458.8    1119.3    2927.8     240.5
    VEL=      3.7       5.2       1.1       2.3       3.8       4.0       4.4       2.4

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                                                                                                   THIS RUN EXECUTED 03-05-02
**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
**************************************************


T1 TOWN OF POWNAL FLOOD INSURANCE STUDY
T2 100-YR
T3 DETERMINATION OF FLOODWAY

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0.       7.        0.        0.   .000000       .00        .0        0.   489.700     .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     15.000     .000    -1.000     .000      .000      .000      .000      .000      .000    15.000
```

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


*PROF 2

CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 39.000

3470 ENCROACHMENT STATIONS=    1390.0    2290.0  TYPE=     1  TARGET=     900.000
    39.00     13.70    489.70      .00    488.65    490.78     1.08       .00       .00    484.60
   29400.    13206.    16194.       0.     2885.     1551.       0.        0.        0. 100000.00
      .00      4.58     10.44      .00      .056      .047     .000      .000    476.00   1390.00
  .004871        0.        0.       0.         0         0        0       .00    899.09   2289.09

FLOW DISTRIBUTION FOR SECNO=     39.00          CWSEL=    489.70

STA=    1390.    1775.    2110.    2140.    2290.
  PER Q=     30.5      12.9       1.5      55.1
   AREA=   1331.0    1407.0     147.0    1550.6
    VEL=      6.7       2.7       3.0      10.4

*SECNO 38.000

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    1494.0    2394.0  TYPE=     1  TARGET=     900.000
    38.00     18.18    493.68      .00    493.07    494.07      .39      3.22       .07    487.80
   29400.    14531.    14869.       0.     3772.     2493.       0.      182.       30. 100000.00
      .09      3.85      5.96      .00      .040      .050     .040      .000    475.50   1494.00
  .001187     1397.     1620.    1600.         4         0        0       .00    900.00   2394.00

FLOW DISTRIBUTION FOR SECNO=     38.00          CWSEL=    493.68

STA=    1494.    1531.    1830.    2226.    2394.
  PER Q=      1.1      16.7      31.6      50.6
   AREA=    120.5    1383.6    2268.1    2493.1
    VEL=      2.7       3.6       4.1       6.0

*SECNO 37.000

3470 ENCROACHMENT STATIONS=     100.0    1000.0  TYPE=     1  TARGET=     900.000
    37.00     13.55    495.95      .00    495.58    496.44      .49      2.34       .03    488.90
   29400.     8914.    16648.    3837.     2846.     2489.     765.      413.       61.    490.50
      .17      3.13      6.69     5.02      .060      .045     .035      .000    482.40    100.00
  .001571     1290.     1990.    2160.         3         0        0       .00    900.00   1000.00
```

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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

FLOW DISTRIBUTION FOR SECNO=     37.00          CWSEL=    495.95

STA=     100.      220.      600.      814.      885.      919.      955.     1000.
  PER Q=      5.2      25.1      56.6       8.1       3.6       1.2        .2
   AREA=    565.0    2280.8    2488.9     426.2     195.6     104.5      38.3
    VEL=      2.7       3.2       6.7       5.6       5.4       3.4       1.5

CCHV=    .300 CEHV=    .500
*SECNO 36.200

3470 ENCROACHMENT STATIONS=    1733.0    2633.0  TYPE=     1  TARGET=     900.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      495.00 ELREA=      498.00

    36.20     16.15    496.45       .00    496.16    496.73       .28       .23       .06    487.60
   29400.    16772.    12628.        0.     4068.     2874.        0.      444.       66.    488.90
      .19      4.12      4.39       .00      .035      .045      .035      .000    480.30   1733.00
  .000785      210.      210.      210.         2         0         0       .00    899.00   2632.00
0
FLOW DISTRIBUTION FOR SECNO=     36.20          CWSEL=    496.45

STA=    1733.     2000.     2118.     2379.     2379.     2382.     2382.     2632.
  PER Q=     15.4       9.5      31.7        .0        .4        .0      43.0
   AREA=   1323.8     708.0    2008.9        .9      25.7        .9    2874.3
    VEL=      3.4       3.9       4.6       5.1       5.1       5.1       4.4

SPECIAL BRIDGE

5070,VARIABLE ELCHU OR ELCHD ON CARD SB NOT SPECIFIED
SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
      .00      1.56      2.90       .00    250.00       .00   2687.00       .00    480.30    480.30

*SECNO 36.100
PRESSURE AND WEIR FLOW

 EGPRS      EGLWC      H3        QWEIR     QPR       BAREA   TRAPEZOID     ELLC      ELTRD
                                                              AREA
    499.35    498.07       .00     3183.    26101.     2687.     3950.     496.10    498.00


3470 ENCROACHMENT STATIONS=    1733.0    2633.0  TYPE=     1  TARGET=     900.000
```

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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      498.00 ELREA=      500.70

    36.10     18.26    498.56       .00    498.53    498.74       .17      2.01       .00    487.60
   29400.    18129.    11271.        0.     5440.     3403.        0.      448.       66.    488.90
      .19      3.33      3.31       .00      .035      .045      .000      .000    480.30   1733.00
  .000356       22.       22.       22.         2         0         2       .00    899.00   2632.00
)
 FLOW DISTRIBUTION FOR SECNO=     36.10          CWSEL=    498.56

 STA=    1733.    2000.    2118.    2379.    2379.    2382.    2382.    2632.
   PER Q=     18.7      10.5      32.0        .0        .4        .0      38.3
    AREA=   1888.2     957.4    2560.4       1.1      31.8       1.1    3402.8
     VEL=      2.9       3.2       3.7       4.0       4.0       4.0       3.3

 1490 NH CARD USED
 *SECNO 35.000

 3301 HV CHANGED MORE THAN HVINS


 3470 ENCROACHMENT STATIONS=     241.0     941.0  TYPE=     1  TARGET=     700.000
    35.00     19.20    498.40       .00    498.37    499.35       .95       .22       .39    491.60
   29400.        0.    25829.     3571.        0.     3113.     1440.      493.       71.    492.80
      .20       .00      8.30      2.48      .035      .049      .061      .000    479.20    241.00
  .002235      280.      340.      120.         2         0         0       .00    700.00    941.00
)
 FLOW DISTRIBUTION FOR SECNO=     35.00          CWSEL=    498.40

 STA=     241.     451.     764.     941.
   PER Q=     87.9       9.0       3.1
    AREA=   3113.2    1126.7     313.7
     VEL=      8.3       2.4       2.9

 *SECNO 34.200

 3470 ENCROACHMENT STATIONS=     201.0     901.0  TYPE=     1  TARGET=     700.000
    34.20     18.90    499.00       .00    498.68    500.25      1.26       .75       .15    482.40
   29400.      136.    24084.     5180.       39.     2461.     1364.      526.       76.    483.90
      .21      3.47      9.78      3.80      .035      .045      .035      .000    480.10    201.00
  .002206      330.      340.      330.         2         0         0       .00    700.00    901.00
)
(
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   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST

FLOW DISTRIBUTION FOR SECNO=     34.20          CWSEL=    499.00

STA=     201.     205.     360.     360.     364.     482.     794.     893.     901.
  PER Q=       .5     81.9       .1       .3      3.8     12.5       .9       .1
   AREA=     39.3   2461.3      1.5     30.6    300.5    903.9    118.5      8.5
    VEL=      3.5      9.8     12.2      3.2      3.7      4.1      2.2      1.9

SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
      .00      1.56      2.80       .00    155.00       .00   1757.00       .00    482.50    482.50

*SECNO 34.100
 PRESS FLOW BECAUSE EGLWC OF    502.65  EXCEEDS 1.5 DEPTH
PRESSURE AND WEIR FLOW

 EGPRS      EGLWC       H3       QWEIR      QPR       BAREA   TRAPEZOID      ELLC      ELTRD
                                                               AREA
    505.78    502.65       .00    15642.    13758.     1757.     1922.      494.90    494.50


3470 ENCROACHMENT STATIONS=     204.5     904.5  TYPE=     1  TARGET=     700.000
    34.10     19.28    499.38      .00   499.22   500.48     1.10      .23      .00    482.40
   29400.        9.    23326.    6064.       8.    2521.    1578.     528.      76.     483.90
      .21      1.13      9.25     3.84     .035     .045     .035     .000   480.10    204.50
  .001910       27.       27.      27.        3        0        4      .00   700.00    904.50
0
FLOW DISTRIBUTION FOR SECNO=     34.10          CWSEL=    499.38

STA=     205.     205.     360.     360.     364.     482.     794.     893.     904.
  PER Q=       .0     79.3       .1       .3      4.5     14.3      1.3       .1
   AREA=      8.1   2521.3      1.5     32.1    346.2   1024.5    156.8     16.5
    VEL=      1.1      9.3     11.5      3.1      3.8      4.1      2.5      2.2

*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=      65.0     865.0  TYPE=     1  TARGET=     800.000
    33.00     17.70    500.40      .00   500.51   500.79      .39      .10      .21    488.70
   29400.        0.    17112.   12288.       0.    3010.    3118.     538.      78.     488.70
      .22       .00      5.68     3.94     .100     .045     .035     .000   482.70     65.00
  .000773      130.       99.      60.        3        0        0      .00   800.00    865.00
0
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


FLOW DISTRIBUTION FOR SECNO=     33.00          CWSEL=    500.40

STA=       65.      247.      303.      317.      496.      706.      865.
  PER Q=     58.2      12.6       2.4      16.3       7.0       3.5
   AREA=   3010.2     627.3     134.4    1163.8     745.8     447.1
    VEL=      5.7       5.9       5.3       4.1       2.7       2.3

CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 32.000

3470 ENCROACHMENT STATIONS=     113.0     913.0  TYPE=     1  TARGET=     800.000
    32.00    16.77   501.07       .00   500.94   501.74       .67       .86       .08   489.60
   29400.     800.   15240.    13360.     322.    1912.     2888.      632.       88.   493.00
      .25     2.48      7.97     4.63      .100      .046      .040      .000    484.30   113.00
  .001699    1140.     1030.     460.         2         0         0       .00    800.00   913.00

FLOW DISTRIBUTION FOR SECNO=     32.00          CWSEL=    501.07

STA=      113.      141.      269.      380.      454.      634.      874.      913.
  PER Q=      2.7      51.8      18.7       6.8      10.0       8.3       1.6
   AREA=    322.4    1911.8     985.3     394.5     688.9     690.5     129.3
    VEL=      2.5       8.0       5.6       5.0       4.3       3.5       3.7

*SECNO 31.000

3470 ENCROACHMENT STATIONS=       3.3     803.3  TYPE=     1  TARGET=     800.000
    31.00    21.25   502.95       .00   502.36   503.49       .54      1.74       .01100000.00
   29400.       0.   21018.     8382.       0.    3065.     3945.      793.      109.   490.10
      .31      .00      6.86     2.12      .100      .050      .090      .000    481.70     3.35
  .001294    1170.     1220.    1110.         2         0         0       .00    800.00   803.35

FLOW DISTRIBUTION FOR SECNO=     31.00          CWSEL=    502.95

STA=        3.      187.      223.      287.      398.      520.      623.      774.      803.
  PER Q=     71.5       4.6       5.2       4.4       3.9       3.9       5.4       1.1
   AREA=   3065.4     433.8     584.8     657.9     639.2     595.2     849.4     184.8
    VEL=      6.9       3.1       2.6       2.0       1.8       1.9       1.9       1.8

*SECNO 30.000
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
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   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


 3470 ENCROACHMENT STATIONS=      22.6     822.7  TYPE=     1  TARGET=     800.000
     30.00    16.11   506.21      .00   505.97   506.70      .50     3.21      .00   500.10
    29400.    7187.   21950.     263.    3487.    3406.     170.    1108.     138.    503.00
       .44     2.06     6.44     1.55     .100     .045     .060     .000   490.10    22.65
   .001255     820.    3080.    1140.        3        0        0      .00   800.00   822.65
0
 FLOW DISTRIBUTION FOR SECNO=     30.00          CWSEL=    506.21

 STA=      23.     111.     161.     211.     261.     390.     490.     748.     823.
   PER Q=      4.8      3.7      3.7      3.8      5.0      3.6     74.7       .9
    AREA=    672.7    462.8    462.8    470.3    817.4    600.6   3406.3    169.7
     VEL=      2.1      2.3      2.3      2.3      1.8      1.7      6.4      1.6

 1490 NH CARD USED
 *SECNO 29.000

 3470 ENCROACHMENT STATIONS=     139.0     939.0  TYPE=     1  TARGET=     800.000
     29.00    18.75   507.55      .00   507.27   507.82      .27     1.09      .02   496.00
    29400.       0.   20963.    8437.       0.    5450.    1759.    1283.     158.    506.90
       .52      .00     3.85     4.80     .100     .053     .030     .000   488.80   139.00
   .000833     990.    1090.    1080.        0        0        0      .00   800.00   939.00
0
 FLOW DISTRIBUTION FOR SECNO=     29.00          CWSEL=    507.55

 STA=     139.     642.     939.
   PER Q=     71.3     28.7
    AREA=   5449.6   1758.9
     VEL=      3.8      4.8

 1490 NH CARD USED
 *SECNO 28.000

 3470 ENCROACHMENT STATIONS=      61.1     861.1  TYPE=     1  TARGET=     800.000

 3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      506.70 ELREA=   100000.00

     28.00    11.72   508.52      .00   508.01   508.92      .41     1.07      .04   506.70
    28900.      67.   28833.       0.     111.    5615.       0.    1453.     179. 100000.00
       .58      .60     5.13      .00     .100     .037     .030     .000   496.80    61.12
   .001040    1150.    1150.    1150.        2        0        0      .00   800.00   861.12
0
1
  03-05-02     13:54:15                                                                          PAGE    24


    SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
    Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
    TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
    SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST
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FLOW DISTRIBUTION FOR SECNO=     28.00          CWSEL=    508

STA=      61.      139.      874.
  PER Q=        .2      99.8
   AREA=    111.4    5615.0
    VEL=        .6       5.1

*SECNO 27.000

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     261.0     461.0  TYPE=     1  TARGET=     200.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      504.40 ELREA=   100000.00

    27.00    17.42   511.02       .00   511.42   513.06     2.05     3.65      .49   504.40
   28900.       0.   28900.       0.       0.    2518.       0.    1640.     201. 100000.00
      .63      .00    11.48      .00     .060     .045     .060     .000   493.60   261.00
  .004174    2000.    1970.    1410.        2        0        0      .00   191.00   452.00
)
FLOW DISTRIBUTION FOR SECNO=     27.00          CWSEL=    511.02

STA=     261.      594.
  PER Q=    100.0
   AREA=   2517.6
    VEL=     11.5

1490 NH CARD USED
*SECNO 26.000

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     207.0     407.0  TYPE=     1  TARGET=     200.000
    26.00    17.52   513.12       .00   512.48   514.60     1.49     1.48      .06   508.60
   28900.       0.   28403.     497.       0.    2888.      82.    1673.     203.    504.80
      .64      .00     9.83     6.06     .060     .040     .030     .000   495.60   207.00
  .001993     520.     530.     690.        2        0        0      .00   200.00   407.00
)
1
 03-05-02     13:54:15                                                                          PAGE   25


   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


FLOW DISTRIBUTION FOR SECNO=     26.00          CWSEL=    513.12

STA=     207.      397.      407.
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    VEL=       9.8       6.1

CCHV=     .300 CEHV=     .500
1490 NH CARD USED
*SECNO 25.200

3470 ENCROACHMENT STATIONS=      104.0      404.0  TYPE=      1  TARGET=      300.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=       510.00 ELREA=       520.30

    25.20     18.40    513.60       .00    512.52    514.84      1.24       .16       .07    509.20
   28900.      955.    27945.        0.      189.     3096.        0.     1679.      204.    515.80
      .64      5.06      9.03       .00      .025      .040      .030      .000    495.20    104.01
  .001901       90.       83.       60.         2         0         0       .00    295.74    399.75
0
FLOW DISTRIBUTION FOR SECNO=      25.20          CWSEL=     513.60

STA=      104.      172.      404.
  PER Q=       3.3      96.7
   AREA=     188.7    3095.7
    VEL=       5.1       9.0


SPECIAL BRIDGE

SB  XK         XKOR       COFQ       RDLEN      BWC        BWP        BAREA      SS         ELCHU      ELCHD
     1.05       1.56       2.80        .00     140.00       5.00    3781.00       2.27     499.40     499.40

*SECNO 25.100
6840,FLOW IS BY WEIR AND LOW FLOW
3420 BRIDGE W.S.=     513.70 BRIDGE VELOCITY=,      11.72       CALCULATED CHANNEL AREA=,      2395.

 EGPRS       EGLWC        H3         QWEIR       QLOW       BAREA    TRAPEZOID       ELLC       ELTRD
                                                                        AREA
    519.70     515.84        .10      1024.     28067.      3781.      3674.       519.70     513.60


3470 ENCROACHMENT STATIONS=      104.0      404.0  TYPE=      1  TARGET=      300.000
1
 03-05-02      13:54:15                                                                                    PAGE    26

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=       513.60 ELREA=       521.20

    25.10     19.64    514.84       .00    514.20    515.84       .00      1.00       .00    509.20
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   .001470       27.       27.       27.         2         0         [illegible]       .00   297.07   401.08
0
 FLOW DISTRI[illegible]TION FOR SECNO=     25.10            CWSEL=    514.[illegible]4

 STA=      104.      172.      404.
   PER Q=       5.7      94.3
    AREA=     321.2    3349.4
     VEL=       5.2       8.1

 *SECNO 24.000

 3470 ENCROACHMENT STATIONS=       15.1       315.0  TYPE=      1  TARGET=      300.000
     24.00     18.73    514.93       .00    514.29    516.04      1.11       .14       .06    513.60
    28900.      352.    28548.        0.      171.     3360.        0.     1690.      205. 100000.00
       .65      2.06      8.50       .00      .040      .040      .070      .000    496.20     15.05
   .001421      100.      100.      100.         2         0         0       .00    300.00    315.05
0
 FLOW DISTRIBUTION FOR SECNO=     24.00            CWSEL=    514.93

 STA=        15.       39.       55.      110.      315.
   PER Q=        .2        .3        .7      98.8
    AREA=      37.4      32.5     100.7    3359.8
     VEL=       1.8       2.2       2.1       8.5

 *SECNO 23.200

 3470 ENCROACHMENT STATIONS=       10.4       315.0  TYPE=      1  TARGET=      304.650
     23.20     18.80    515.90       .00    515.42    516.99      1.09       .95       .00    514.50
    28900.      387.    28513.        0.      184.     3375.        0.     1745.      210. 100000.00
       .67      2.10      8.45       .00      .040      .040      .070      .000    497.10     10.40
   .001396      675.      675.      675.         0         0         0       .00    304.65    315.05
0
 FLOW DISTRIBUTION FOR SECNO=     23.20            CWSEL=    515.90

 STA=        10.       39.       55.      110.      315.
   PER Q=        .3        .3        .8      98.7
    AREA=      45.6      33.7     104.9    3375.2
     VEL=       1.9       2.3       2.1       8.4
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     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS    BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA    LEFT/RIGHT
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN        SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID       ENDST


 SPECIAL BRIDGE

 SB  XK         XKOR       COFQ       RDLEN      BWC        BWP        BAREA      SS         ELCHU      ELCHD
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*SECNO 23.100
PRESSURE AND WEIR FLOW

 EGPRS      EGLWC       H3       QWEIR      QPR       BAREA   TRAPEZOID      ELLC     ELTRD
                                                          AREA
**********   526.89      .00     28992.       0.         0.        0.      507.10    515.70


3470 ENCROACHMENT STATIONS=        .0     173.4  TYPE=     1  TARGET=     173.390
    23.10    21.58   528.58      .00   528.58   529.56      .98    12.57      .00100000.00
   28900.       0.   28847.      53.       0.    3625.      35.    1745.     210.    507.00
      .67      .00     7.96     1.51     .000     .020     .020     .000   507.00      .02
  .000224       5.       5.       5.        2        0        6      .00   173.37   173.40
0
 FLOW DISTRIBUTION FOR SECNO=     23.10          CWSEL=    528.58

 STA=       0.     168.     169.     173.     173.
   PER Q=     99.8       .0       .1       .0
    AREA=   3624.9     13.4     20.7      1.0
     VEL=      8.0      1.0      1.9       .4

 *SECNO 22.000
  2800 NAT Q1=   7311.58  WSEL=    528.90  ENC Q1=   7915.43  WSEL=    529.90  RATIO=  -.0826
  NAT Q1=   8077.  RATIOS LOB,CH,ROB=   .0000   .9799   .0201  WSEL=    529.90
    22.00    21.78   528.88      .00   528.90   530.24     1.36      .49      .19   541.20
   28900.       0.   28900.       0.       0.    3093.       0.    1824.     214.    525.20
      .70      .00     9.34      .00     .040     .040     .030     .000   507.10    16.06
  .001651    1020.    1020.    1020.        2        0        0      .00   187.94   204.00
0
 FLOW DISTRIBUTION FOR SECNO=     22.00          CWSEL=    528.88

 STA=      16.     204.
   PER Q=    100.0
    AREA=   3093.0
     VEL=      9.3

1
  03-05-02     13:54:15                                                                    PAGE   28


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


 CCHV=    .100 CEHV=    .300
 1490 NH CARD USED
 *SECNO 21.000

 3301 HV CHANGED MORE THAN HVINS
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3470 ENCROA MENT STATIONS=      95.0      545.0  TYPE=     1    RGET=     450.000
    21.00    27.79   531.29      .00   530.99   531.66                 1.33      .10   519.00
   28900.   12315.   16585.       0.     3324.    2969.       0.     2008.     226. 100000.00
      .80     3.70     5.59      .00     .040     .040     .030     .000   503.50    95.00
  .000440    1590.    1770.    1770.        2        0        0      .00   450.00   545.00
0
 FLOW DISTRIBUTION FOR SECNO=     21.00          CWSEL=    531.29

 STA=       95.      163.      228.      263.      307.      407.      545.
   PER Q=      4.7       3.5       5.2       8.2      21.0      57.4
    AREA=    700.1     675.8     327.0     471.9    1149.2    2969.0
     VEL=      1.9       1.5       4.6       5.0       5.3       5.6

1
  03-05-02     13:54:15                                                                                                PAGE   29


                                                                                                  THIS RUN EXECUTED 03-05-02
 ***************************************************
   HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
   ERROR CORR -  01,02,03,04,05,06
   MODIFICATION -  50,51,52,53,54,55,56
   IBM-PC-XT VERSION AUGUST 1985
 ***************************************************


 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST


 L, VT

 SUMMARY PRINTOUT
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	CWSEL	.01K	EG	TOPWID	STENCL	STENCR	WSELK
*	488.650	3817.67	489.72	1873.31	.00	.00	488.70
	489.700	4212.64	490.78	899.09	1390.00	2290.00	488.65
	493.071	8113.53	493.46	1527.98	.00	.00	.00
	493.677	8534.98	494.07	900.00	1494.00	2394.00	493.07
	495.576	7168.52	496.04	2282.99	.00	.00	.00
	495.948	7418.64	496.44	900.00	100.00	1000.00	495.58
	496.159	11285.66	496.34	2032.63	.00	.00	.00
	496.450	10490.17	496.73	899.00	1733.00	2633.00	496.16
	498.534	20856.98	498.60	2533.98	.00	.00	.00
	498.564	15571.29	498.74	899.00	1733.00	2633.00	498.53

498.682	5890.22	500.09	785.54	.00	.00	.00
498.996	6259.20	500.25	700.00	201.00	901.00	498.68
499.218	6524.40	500.38	845.76	.00	.00	.00
499.380	6726.93	500.48	700.00	204.50	904.50	499.22
500.511	13380.59	500.73	1608.89	.00	.00	.00
500.402	10577.23	500.79	800.00	65.00	865.00	500.51
500.940	8501.78	501.34	1226.31	.00	.00	.00
501.074	7132.66	501.74	800.00	113.00	913.00	500.94
502.362	7688.34	502.94	1451.50	.00	.00	.00
502.949	8174.50	503.49	800.00	3.35	803.35	502.36

CWSEL	.01K	EG	TOPWID	STENCL	STENCR	WSELK
505.970	8010.35	506.49	955.29	.00	.00	.00
506.206	8299.92	506.70	800.00	22.65	822.65	505.97
507.271	12271.59	507.43	1365.01	.00	.00	.00
507.549	10185.02	507.82	800.00	139.00	939.00	507.27
508.011	7957.23	508.48	833.45	.00	.00	.00
508.516	8960.19	508.92	800.00	61.12	861.12	508.01
511.423	5245.45	512.42	469.25	.00	.00	.00
511.017	4473.31	513.06	191.00	261.00	461.00	511.42
512.480	6765.69	513.73	391.32	.00	.00	.00
513.115	6473.27	514.60	200.00	207.00	407.00	512.48
512.524	5723.79	514.04	342.39	.00	.00	.00
513.600	6627.96	514.84	295.74	104.01	404.01	512.52
514.202	7042.47	515.26	390.47	.00	.00	.00
514.845	7537.52	515.84	297.07	104.01	404.01	514.20
514.286	7143.72	515.51	304.51	.00	.00	.00
514.931	7667.75	516.04	300.00	15.05	315.05	514.29
515.417	7321.15	516.60	304.66	.00	.00	.00
515.900	7734.43	516.99	304.65	10.40	315.05	515.42
528.580	19299.73	529.56	173.38	.00	.00	.00
528.582	19302.26	529.56	173.37	.01	173.40	528.58
528.90[illegible]	7311.58	530.20	224.36	.00	.0[illegible]	.00

530.995	17688.82	531.23	592.14	.00	.00	.00
531.2	13778.49	531.66	450.00	95.00	545.(	530.99

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L, VT

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	39.000	.00	.00	.00	476.00	29400.00	488.65	488.65	489.72	59.31	10.87	4848.20	3817.67
	39.000	.00	.00	.00	476.00	29400.00	489.70	.00	490.78	48.71	10.44	4435.60	4212.64
	38.000	1620.00	.00	.00	475.50	29400.00	493.07	.00	493.46	13.13	6.24	6766.37	8113.53
	38.000	1620.00	.00	.00	475.50	29400.00	493.68	.00	494.07	11.87	5.96	6265.27	8534.98
	37.000	1990.00	.00	.00	482.40	29400.00	495.58	.00	496.04	16.82	6.77	6657.48	7168.52
	37.000	1990.00	.00	.00	482.40	29400.00	495.95	.00	496.44	15.71	6.69	6099.24	7418.64
	36.200	210.00	.00	.00	480.30	29400.00	496.16	.00	496.34	6.79	4.01	9049.35	11285.66
	36.200	210.00	.00	.00	480.30	29400.00	496.45	.00	496.73	7.85	4.39	6942.33	10490.17
	36.100	22.00	498.00	496.10	480.30	29400.00	498.53	.00	498.60	1.99	2.47	14601.92	20856.98
	36.100	22.00	498.00	496.10	480.30	29400.00	498.56	.00	498.74	3.56	3.31	8842.72	15571.29
	35.000	340.00	.00	.00	479.20	29400.00	498.37	.00	499.03	16.97	7.28	5740.98	7137.65
	35.000	340.00	.00	.00	479.20	29400.00	498.40	.00	499.35	22.35	8.30	4553.51	6218.15
	34.200	340.00	.00	.00	480.10	29400.00	498.68	.00	500.09	24.91	10.26	3676.27	5890.22
	34.200	340.00	.00	.00	480.10	29400.00	499.00	.00	500.25	22.06	9.78	3864.20	6259.20
	34.100	27.00	494.50	494.90	480.10	29400.00	499.22	.00	500.38	20.31	9.47	4063.11	6524.40
	34.100	27.00	494.50	494.90	480.10	29400.00	499.38	.00	500.48	19.10	9.25	4107.05	

33.000	99.00	.00	.00	482.70	29400.00	500.51	.00	500.73	4.83	4.70	8840.19
13380.59											
33.000	99.00	.00	.00	482.70	29400.00	500.40	.00	500.79	7.73	5.68	6128.68
10577.23											
32.000	1030.00	.00	.00	484.30	29400.00	500.94	.00	501.34	11.96	6.65	6952.84
8501.78											
32.000	1030.00	.00	.00	484.30	29400.00	501.07	.00	501.74	16.99	7.97	5122.62
7132.66											
31.000	1220.00	.00	.00	481.70	29400.00	502.36	.00	502.94	14.62	7.13	7254.98
7688.34											
31.000	1220.00	.00	.00	481.70	29400.00	502.95	.00	503.49	12.94	6.86	7010.43
8174.50											
30.000	3080.00	.00	.00	490.10	29400.00	505.97	.00	506.49	13.47	6.60	6932.68
8010.35											
30.000	3080.00	.00	.00	490.10	29400.00	506.21	.00	506.70	12.55	6.44	7062.54
8299.92											
29.000	1090.00	.00	.00	488.80	29400.00	507.27	.00	507.43	5.74	3.29	9519.59
12271.59											
29.000	1090.00	.00	.00	488.80	29400.00	507.55	.00	507.82	8.33	3.85	7208.51
10185.02											
28.000	1150.00	.00	.00	496.80	28900.00	508.01	.00	508.48	13.19	5.50	5335.09
7957.23											
28.000	1150.00	.00	.00	496.80	28900.00	508.52	.00	508.92	10.40	5.13	5726.43
8960.19											
27.000	1970.00	.00	.00	493.60	28900.00	511.42	.00	512.42	30.35	8.69	3919.17
5245.45											
27.000	1970.00	.00	.00	493.60	28900.00	511.02	.00	513.06	41.74	11.48	2517.58
4473.31											
26.000	530.00	.00	.00	495.60	28900.00	512.48	.00	513.73	18.25	9.29	3331.09
6765.69											
26.000	530.00	.00	.00	495.60	28900.00	513.12	.00	514.60	19.93	9.83	2970.18
6473.27											

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA
.01K											
25.200	83.00	.00	.00	495.20	28900.00	512.52	.00	514.04	25.49	9.96	2976.71
5723.79											
25.200	83.00	.00	.00	495.20	28900.00	513.60	.00	514.84	19.01	9.03	3284.41
6627.96											
25.100	27.00	513.60	519.70	495.20	28900.00	514.20	.00	515.26	16.84	8.46	3651.73

7537.52											
24.000	100.00	.00	.00	496.20	28900.00	514.29	.00	515.51	16.37	8.90	3339.98
7143.72											
24.000	100.00	.00	.00	496.20	28900.00	514.93	.00	516.04	14.21	8.50	3530.35
7667.75											
23.200	675.00	.00	.00	497.10	28900.00	515.42	.00	516.60	15.58	8.76	3407.17
7321.15											
23.200	675.00	.00	.00	497.10	28900.00	515.90	.00	516.99	13.96	8.45	3559.38
7734.43											
23.100	5.00	515.70	507.10	507.00	28900.00	528.58	.00	529.56	2.24	7.96	3659.76
19299.73											
23.100	5.00	515.70	507.10	507.00	28900.00	528.58	.00	529.56	2.24	7.96	3660.06
19302.26											
22.000	1020.00	.00	.00	507.10	28900.00	528.90	.00	530.20	15.62	9.21	3197.10
7311.58											
22.000	1020.00	.00	.00	507.10	28900.00	528.88	.00	530.24	16.51	9.34	3093.02
7111.99											
21.000	1770.00	.00	.00	503.50	28900.00	530.99	.00	531.23	2.67	4.44	7658.49
17688.82											
21.000	1770.00	.00	.00	503.50	28900.00	531.29	.00	531.66	4.40	5.59	6292.94
13778.49											

L, VT

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	39.000	29400.00	488.65	.00	.00	-.05	1873.31	.00
	39.000	29400.00	489.70	1.05	.00	1.05	899.09	.00
	38.000	29400.00	493.07	.00	4.42	.00	1527.98	1620.00
	38.000	29400.00	493.68	.61	3.98	.61	900.00	1620.00
	37.000	29400.00	495.58	.00	2.50	.00	2282.99	1990.00
	37.000	29400.00	495.95	.37	2.27	.37	900.00	1990.00
	36.200	29400.00	496.16	.00	.58	.00	2032.63	210.00
	36.200	29400.00	496.45	.29	.50	.29	899.00	210.00
	36.100	29400.00	498.53	.00	2.37	.00	2533.98	22.00
	36.100	29400.00	498.56	.03	2.11	.03	899.00	22.00

34.200	29400.00	498.68	.00	.31	.00	785.54	340.00
34.200	29400.00	499.00	.31	.60	.31	700.00	340.00
34.100	29400.00	499.22	.00	.54	.00	845.76	27.00
34.100	29400.00	499.38	.16	.38	.16	700.00	27.00
33.000	29400.00	500.51	.00	1.29	.00	1608.89	99.00
33.000	29400.00	500.40	-.11	1.02	-.11	800.00	99.00
32.000	29400.00	500.94	.00	.43	.00	1226.31	1030.00
32.000	29400.00	501.07	.13	.67	.13	800.00	1030.00
31.000	29400.00	502.36	.00	1.42	.00	1451.50	1220.00
31.000	29400.00	502.95	.59	1.87	.59	800.00	1220.00
30.000	29400.00	505.97	.00	3.61	.00	955.29	3080.00
30.000	29400.00	506.21	.24	3.26	.24	800.00	3080.00
29.000	29400.00	507.27	.00	1.30	.00	1365.01	1090.00
29.000	29400.00	507.55	.28	1.34	.28	800.00	1090.00
28.000	28900.00	508.01	.00	.74	.00	833.45	1150.00
28.000	28900.00	508.52	.51	.97	.51	800.00	1150.00
27.000	28900.00	511.42	.00	3.41	.00	469.25	1970.00
27.000	28900.00	511.02	-.41	2.50	-.41	191.00	1970.00
26.000	28900.00	512.48	.00	1.06	.00	391.32	530.00
26.000	28900.00	513.12	.63	2.10	.63	200.00	530.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
25.200	28900.00	512.52	.00	.04	.00	342.39	83.00
25.200	28900.00	513.60	1.08	.49	1.08	295.74	83.00
25.100	28900.00	514.20	.00	1.68	.00	390.47	27.00
25.100	28900.00	514.84	.64	1.24	.64	297.07	27.00
24.000	28900.00	514.29	.00	.08	.00	304.51	100.00
24.000	28900.00	514.93	.64	.09	.64	300.00	100.00
23.200	28900.00	515.42	.00	1.13	.00	304.66	675.00
23.200	28900.00	515.90	.48	.97	.48	304.65	675.00
23.100	28900.00	528.58	.00	13.16	.00	173.38	5.00
23.100	28900.00	528.58	.00	12.68	.00	173.37	5.00
22.000	28900.00	528.90	.00	.32	.00	224.36	1020.00

21.0	28900.00	530.99	.00	2.09	.0	592.14	1770.00
21.0	28900.00	531.29	.30	2.41	.3	450.00	1770.00

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SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 39.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

1

FLOODWAY DATA, L, VT
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
39.000	899.	4436.	6.6	489.7	488.6	1.1
38.000	900.	6265.	4.7	493.7	493.1	.6
37.000	900.	6099.	4.8	496.0	495.6	.4
36.200	899.	6942.	4.2	496.5	496.2	.3
36.100	899.	8843.	3.3	498.5	498.5	.0
35.000	700.	4554.	6.5	498.4	498.4	.0
34.200	700.	3864.	7.6	499.0	498.7	.3
34.100	700.	4107.	7.2	499.4	499.2	.2
33.000	800.	6129.	4.8	500.5	500.5	.0
32.000	800.	5123.	5.7	501.0	500.9	.1
31.000	800.	7010.	4.2	503.0	502.4	.6
30.000	800.	7063.	4.2	506.2	506.0	.2
29.000	800.	7209.	4.1	507.6	507.3	.3
28.000	800.	5726.	5.0	508.5	508.0	.5
27.000	191.	2518.	11.5	511.1	511.4	-.3
26.000	200.	2970.	9.7	513.1	512.5	.6
25.200	296.	3284.	8.8	513.6	512.5	1.1
25.100	297.	3671.	7.9	514.8	514.2	.6
24.000	300.	3530.	8.2	514.9	514.3	.6
23.200	305.	3559.	8.1	515.9	515.4	.5
23.100	173.	3660.	7.9	528.6	528.6	.0
22.000	188.	3093.	9.3	528.9	528.9	.0
21.000	450.	6293.	4.6	531.3	531.0	.3

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THIS RUN EXECUTED 03-05-02

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  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
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EJ