Drainage Report

For

New River Road Bridge
Project No. 68738

For

Maricopa County Department of Transportation
2901 W. Durango
Phoenix, Arizona

Registered Professional Engineer (Civil)
CERTIFICATE NO.
23268
LYNN M.
THOMAS
Date Signed 4.8.94
ARIZONA, U.S.A.

STANTEC
602-438-2200

DARCC BRADLEY
w/ STANTEC

By

Kaminski-Hubbard Engineering, Inc.
4550 North Black Canyon Highway, Suite C
Phoenix, Arizona 85017
(602) 242-5588

April 8, 1994

DATE: April 13, 1994

TO: Amir Motamedi
Flood Control District

FROM: Philip Epstein

VIA: Barry Nauseda

RE: New River Road Bridge at New River - 95% Plans
MCDOT WO No. 68738

Transmitted for your review are the following:

1. Two sets of prints of channelization plans

2. One set of prints of channelization x-sections

3. One copy of drainage report

We would appreciate your comments and/or approval as soon as possible.

KAMINSKI HUBBARD
engineering inc.
SURVEYING • CIVIL • HYDROLOGY

Daniel L. Kaminski, P.E., R.L.S.
James O. Hubbard, P.E.

April 8, 1994

Mr. Phil Epstein, P.E.
Maricopa County Department of Transportation
2901 West Durango
Phoenix, Arizona 85009

Re: New River Road Bridge
Work Order No. 68738

Dear Mr. Epstein:

We have revised the enclosed drainage report in accordance with review comments from MCDOT and FCDMC for the above referenced 90% project submittal. The following addresses each comment specified in interoffice memos from the FCDMC (copy attached):

<u>FCDMC Comment - Pier Scour Computations</u>

1. The accumulation of debris around the pier can increase the effective area of pier, causing the scour depth to increase. The C.S.U. equation used by the consultant does not account for debris accumulation. To account for that, the Consultant should assume 2' of debris on each side of pier and increase effective pier width from 4' to 8' in C.S.U. equation.

2. From the HEC-II run, at cross-section 33,184 the flow goes through critical depth and also there is a warning of hydraulic jump at this location. In this situation the froude number should be one or close to one. In C.S.U. equation, the Consultant used 0.72 for froude number. Please verify and use corrected froude number.

3. By applying above correction to C.S.U. equation, the scour depth calculated is increased from 8.74' to 16.25'. Our recommendation is to apply at least 1.3 factor of safety to final pier scour depth to account for any un-certainty and/or non-uniformity of velocity distribution in HEC-II run.

4. Since, the piers are anchored in bed rock the local scour may not jeopardize the bridge piers, but the zone of influence of pier scour may affect the toe down depth required for bank protection in the vicinity of the bridge. Please verify.

<u>KHE Response</u>

1. The pier scour computations have been doubled as requested and are included in Appendix C of the report.

2. The Froude number used in pier scour calculations has been revised to equal one (1) to account for a hydraulic jump through the bridge.

3. The above corrections to the C.S.U. equation increases scour depth calculations and a factor of safety of 1.3 has been used in final calculations.

4. The piers and abutments may be anchored in bedrock but are below the calculated scour depths in the vicinity of the bridge as documented in Appendix C.

FCDMC Comment - Freeboard Analysis

Since the levees are designed according to FEMA criteria, a minimum of 3' of freeboard and additional 1' of freeboard within 100' upstream of bridge provided should be adequate. The equation used by the Consultant is not required.

KHE Response

See Appendix D for the toe-down analysis documentation.

FCDMC Comment - Riprap Design

1. The procedure used by Consultant for design of riprap is only for loose riprap. It is not appropriate to use if for grouted riprap design. For grouted riprap design, we recommend "Design of Riprap Revetment" (HEC-11) by FHWA.

2. The grouted riprap layer should have full grout penetration.

KHE Response

1. The grouted riprap revetment design has been designed in accordance with the HEC-11 manual published by the Federal Highway Administration as requested (See Appendix E and Special Provisions).

2. The grouted riprap layer is specified as having full grout penetration.

FCDMC Comment - Pipe Culvert Analysis

The pipe culvert should be analyzed assuming following two conditions: 1) 100-year flow in pipe with 10-year flow in channel and 2) 10-year flow in pipe with 100-year flow in channel. From above two conditions, the worse condition governs.

KHE Response

Pipe culverts have been designed based on 100-year flows in New River. Automatic drainage gates or more commonly called backflow prevention devices will be installed to prevent New River backwater effects to adjacent parcels. These pipe culverts have been designed to allow 100-year gravity drainage for adjacent parcels once floodwaters recede in New River. This analysis is the most conservative ("worse condition") case which will occur and is depicted on Figure 3 as ponding limits in the legend (See Appendix F).

FCDMC Comment - Toe-Down Calculations

The total toe-down depth for the bank protection shall be the sum of 1) Local scour due to pier or any other obstruction, 2) Bed-form scour due to the passage of dunes or antidunes, 3) Long term degradation/aggradation and 4) Bend scour due to bend in the river. The appropriate component from the above scour component shall be summed together and multiplied by factor of safety of at least 1.3.

KHE Response

Toe-down calculations have been included in Appendix D as suggested.

FCDMC Comment - Plans

1. Sheet 2, Construction Note #10:

   a. The 36" pipe is shown as CMP, but in culvert calculations, it is treated as concrete pipe. Please verify. Also, verify inlet and outlet elevation and length of pipe.

   b. Check the profile of 36" pipe.

2. Sheet 3, Construction Note #3:

   The 2-36" pipe are shown as CMP, but in culvert analysis they are treated as concrete pipes. Please verify. Also, verify inlet and outlet elevation and length of pipe.

3. On Plan & Profile Sheet Station 10+74 to 15+00, the 36" pipe draining the property northwest of the proposed bridge is plotted backwards (sloping away from the river) on the profile drawing. In addition, the pipe is not plotted at the stated invert elevations.

4. What is the purpose of the pipes shown on Plan & Profile Sheet Station 10+74 to 15+00 and Plan and Profile Sheet Station 15+00 to 10+00 running from the north side to the south side of proposed New River Road? Are these existing pipes?

5. The culvert invert elevations stated on Plan & Profile Sheet Station 10+74 to 15+00 and Plan and Profile Sheet Station 15+00 to 20+00 do not match the elevations sated and used in the submitted design computations.

6. The 36" pipe shown on Plan & Profile Sheet Station 10+74 to 15+00 is sated to be CMP on this profile sheet. In the design computations, however, the type of material is said to be concrete. Which is correct?

7. The length of the pipes draining the properties to the north of New River Road are stated on the profile sheets as 39 LF and 38 LF. With a 20 foot levee top width and 2:1 sideslopes on the levee, the proposed lengths will not be sufficient to pass through the levee. (The computations state the lengths as 49 LF and 50 LF).

KHE Response

Pipe culvert calculations have been revised based on material as shown on plans (See Appendix F). Pipe inverts, lengths and profiles have been checked and verified. The plans show new pipe in locations where interior drainage is needed and where existing pipe will be replaced under driveways. In addition, new pipes have been located crossing New River Road at Station 20+64. These have been designed for the purpose of maintaining historical drainage patterns. Prior to bridge construction, historical drainage patterns show that floodwaters crossed New River Road at this location. Pipe profiles are shown on Sheets 11 and 12. The automatic drainage gate detail is shown on Sheet 33 of the plans.

FCDMC Comment - Channelization Plans

1. The grouted riprap protection should specify rock gradation (D_{15}, D_{50}, D_{85}), grout penetration depth and grout strength.
2. Provide calculations to show 2:1 back slope of levee is stable.
3. Provide calculation to support 6' of toe-down depth.
4. De we need to provide week holes to relive hydrostatic pressure from behind the levee?
5. Provide plan and profile of east and west bank. The profile should include top of bank, toe of bank, channel invert, existing ground at control line, and 100-year water surface elevation.
6. The side slope for the toe excavation should be shown on typical cross sections.
7. The compaction requirement for the toe back fill should be specified.
8. Some type of cut-off was should be provided at the top of bank.

KHE Response

1. Rock gradation, grout penetration and grout strength have been specified in the special provisions for this project.
2. According to the geotechnical investigation, the 2:1 back slope of the levees is stable provided the compacted fill is composed of native material. We have specified the type of material to be used for the levee construction in the special provisions.
3. Levee toe-down calculations are included in Appendix D of the report.
4. Weep holes have been provided as shown on Sheet 16.
5. Profiles for the east and west levees have been prepared showing top of bank, toe of bank, channel invert, existing ground of survey control line and 100-year water surface elevation (See Figure 4). Plan view of levees are shown on Sheet 15 and Figure 3.
6. Typical cross-sections are shown as 2:1 on Sheet 16.

7. The toe backfill compaction is specified in the special provisions.

8. The detail E on Sheet 16 shows a cut-off wall at the top of grouted riprap.

<u>FCDMC Comment - General</u>

1. Provide Special Provision for the District's review.

2. The narrative portion of the submitted Preliminary Drainage Report states that bridge pier widths were doubled in the HEC-2 to evaluate the effects of debris accumulation. However, the HEC-2 model contained in this report does not reflect this condition. The consultant should clarify this issue.

3. The tailwater elevation used in the culvert computations is based on the crown of the outlet pipe. To be conservative, I believe that the 100-year CWSEL in New River should be used as the tailwater elevation in the design computations even though I realize that it is unlikely that the peak discharge from the culvert watersheds will occur at the same time as New River's peak flow. I will, however, defer to Engineering on this matter.

4. Regarding the ponding areas on the adjoining properties, I believe that a comparison should be made between the existing and proposed conditions and, as a minimum, be included in the narrative report. We need to be sure that the proposed work will not exacerbate any existing problems.

<u>KHE Response</u>

1. Special Provisions have been included for review.

2. See Appendix B of the drainage report

3. Tailwater elevations are based on the crown of the outlet pipe due to the use of automatic drainage gates. The purpose of this detail is to prevent New River floodwater from entering the pipe. Once floodwater's recede, interior drainage will be capable of gravity drainage to New River.

4. See Page 8 of the drainage report.

If you have any questions or need any additional information, please don't hesitate to call.

Very truly yours,

KAMINSKI-HUBBARD ENGINEERING, INC.

Lynn M. Thomas

Lynn M. Thomas, P.E.

0179-01.LTR

Construction Specifications

Maricopa County Department of Transportation Project
For
New River Road Bridge At New River

Work Order No. 68738

LOCATION OF WORK:

This project is located on New River Road crossing New River. The project limits are bordered on the west by the I-17 Frontage Road and on the east by Kelley Road.

PROPOSED WORK:

The work consists of constructing a concrete bridge, approach roadways, detour road, levee channelization improvements and miscellaneous items of work.

PROGRESS SCHEDULE:

The Contractor shall submit his proposed work progress schedule to the Engineer for approval before starting work.

CONTRACT TIME:

The Contractor shall complete all work on the project within one hundred-eighty (180) calendar days after the date of Notice To Proceed has been issued.

SOIL BORING REPORT:

A copy of the soil boring report is available for viewing at the offices of the Maricopa County Department of Transportation.

SECTION 105.2 - PLANS AND SHOP DRAWINGS:

Shop drawings shall be submitted as follows:

> Initial submittal for review - three copies, of which one copy will be returned to the Contractor within five working days.
>
> Final submittal for approval - five copies, of which two copies will be returned to the Contractor within five working days.

Plans of the existing bridge are available for viewing at the offices of the Maricopa County Department of Transportation.

SECTION 105.6 - COOPERATION WITH UTILITIES:

When the Contractor's operations result in damage to any utility, the location of which has been brought to his attention, he shall assume full responsibility for such damage.

Utility Contacts:

U.S. West Communications	Mr. Andy Andrade	395-2527
Southwest Gas	Paul McLaughlin	484-5649
Arizona Public Service	Mr. Steve Goodman	371-6965
MCDOT Utility Coordinator	Bob Arviso	506-2879
Location of Staking	Blue Stake	263-1100

SECTION 107.2.1 - NPDES CONSTRUCTION PERMIT REQUIREMENTS:

This project is subject to the National Pollutant Discharge Elimination System (NPDES) Stormwater requirements for construction sites under the Environmental Protection Agency (EPA) General Permit for Arizona.

SECTION 206 - STRUCTURE EXCAVATION AND BACKFILL:

Structure excavation consists of the removal of material for the construction of the bridge abutments in accordance with the plans and Section 206 of the Uniform Standard Specifications.

Structure backfill consists of furnishing, placing and compacting backfill material in accordance with the plans and Section 206 of the Uniform Standard Specifications. Backfill material may be suitable excavated material or select material conforming to the requirements of Section 702.

No separate payment will be made for structure excavation and backfill as such and the cost thereof shall be included in the price bid for items to which they are appurtenant.

SECTION 210 - BORROW EXCAVATION:

The work under this section consists of obtaining borrow material to construct the approach roadway and detour road embankments in accordance with Section 210 of the Uniform Standard Specifications. Measurement of borrow excavation volumes will be computed by the average end area method.

Payment for all work under this section will be made at the price bid per cubic yard for ITEM No. 210 - BORROW EXCAVATION.

SECTION 211 - FILL CONSTRUCTION:

The work under this section consists of constructing the roadway embankments in accordance with the plans and Section 211 of the Uniform Standard Specifications.

Payment for all work under this section will be incidental to ITEM NO. 210 - BORROW EXCAVATION.

SECTION 215 - CHANNEL EXCAVATION:

The work under this section consists of excavating and shaping the wash channel in accordance with the plans and Section 215 of the Uniform Standard Specifications, and includes removal of the fill material placed for the detour road. Measurement of channel excavation volumes will be computed by the average end area method.

Payment for all work under this section will be made at the price bid per cubic yard for ITEM NO. 215 - CHANNEL EXCAVATION.

SECTION 220 - GROUTED RIPRAP CONSTRUCTION:

The work under this section consists of constructing grouted riprap in accordance with the plans and Section 220 of the Uniform Standard Specifications.

Payment for all work under this section will be made at the price bid per cubic yard for ITEM NO. 220 - GROUTED RIPRAP, complete in place, including excavation and rock.

SECTION 225 - WATERING:

The work under this section consists of providing water for compacting embankments, constructing subgrade, placement of screened gravel and crushed surfacing, and for laying dust caused from grading operations or public travel in accordance with the plans and Section 225 of the Uniform Standard Specifications.

Payment for all work under this section will be made at the price bid per M.GAL. for ITEM NO. 225 - WATERING.

SECTION 301 - SUBGRADE PREPARATION:

The work under this section consists of preparing the subgrade for the pavement and detour road in accordance with the plans and Section 301 of the Uniform Standard Specifications. It also includes the preparation of subgrade for the tapered portions of the project and those locations where driveway turnouts are indicated on the plans or as requested by the Engineer.

Shoulders shall be rolled and compacted to a minimum of ninety percent (90%) Proctor density.

Direct payment will not be made for excavation, drainage excavation, structure excavation, waste, haul, overhaul, clearing, rolling or the disposal of construction debris, except as noted.

Existing asphalt and other roadway surfacing materials may be used as fill if they are thoroughly broken to a size not exceeding four inches (4"), to the satisfaction of the Engineer.

The earthwork quantities shown on the roadway plans include the existing asphalt in the quantities, assuming that it will be crushed and included in the embankment and shall be placed at least two (2) feet below subgrade elevation.

Any disposal area selected by the Contractor shall be approved by the Engineer prior to its use as such. Disposal of debris in approved areas shall be made in such a manner that natural drainage will not be blocked or diverted, unless so directed by the Engineer.

The earthwork quantities shown on the plans are approximate and were determined during the design process. They are included for the sole purpose of aiding the bidder in formulating his bid.

SECTION 310 - UNTREATED BASE:

Aggregate base shall conform to the requirements of Section 702 of the Uniform Standard Specifications. Aggregate base shall be crushed in accordance with Section 702.2.

The Contractor shall furnish the Engineer certified weight tickets for all of the aggregate base placed on the project. Final pay quantities will be based upon the scale tickets submitted to the Engineer.

SECTION 315 - BITUMINOUS PRIME COAT (CONTINGENT ITEM):

The bituminous material shall be Grade MC-70 or MC-250 liquid asphalt as determined by the Engineer. Prime coat shall be applied to the total width of the aggregate base material at the rate of 0.40 gallons per square yard unless otherwise specified by the Engineer. Prime coat shall be allowed to penetrate for not less than 48 hours prior to beginning asphalt concrete paving.

SECTION 321 - ASPHALTIC CONCRETE:

The bituminous material shall be AC-40, complying with Table 711-1.

The mineral aggregate shall meet the grading requirements for Mix Designation C-3/4 and D-1/2, in accordance with Section 710.

The Contractor will be required to furnish the Engineer with certified weight tickets for all the asphaltic concrete placed on the project.

SECTION 329 - BITUMINOUS TACK COAT

The work under this section consists of the application of emulsified asphalt in accordance with the plans and Section 329 of the Uniform Standard Specifications.

SECTION 333 - FOG SEAL:

The bituminous material shall be SS-1h, diluted fifty percent (50%) with water and shall be applied at the rate of 0.10 gallons per square yard, unless otherwise requested by the Engineer.

Payment for this work will be made at the price bid per ton for ITEM 331-1 - FOG SEAL COAT.

Sand blotter shall be applied to the treated surface at a rate of two (2) pounds per square yard, as requested by the Engineer.

Payment for this work will be made at the price bid per ton for ITEM 333-2 - SAND BLOTTER.

SECTION 340 - CONCRETE SCUPPER, SPILLWAY & SPILLWAY OUTLET:

The work under this section consists of constructing concrete scuppers, spillway and spillway outlets at the bridge in accordance with the plans and the applicable provisions of Section 340 of the Uniform Standard Specifications.

Payment for this work will be made at the price bid per each for ITEM 340-1 - CONCRETE SCUPPER, SPILLWAY & SPILLWAY OUTLET.

SECTION 340 - 6' CONCRETE SIDEWALK:

The work under this section consists of constructing concrete sidewalks in accordance with the plans and Section 340 of the Uniform Standard Specifications.

Payment for this work will be made at the price bid per square foot for ITEM 340-2 - 6' CONCRETE SIDEWALK.

SECTION 340 - CONCRETE VERTICAL CURB & GUTTER:

The work under this section consists of constructing concrete vertical curb and gutter, modified vertical curb and gutter and single curb terminations in accordance with the plans and Section 340 of the Uniform Standard Specifications.

Payment for this work will be made at the price bid per lineal foot for ITEM 340-3 - CONCRETE VERTICAL CURB & GUTTER.

SECTION 350 - REMOVAL OF EXISTING IMPROVEMENTS:

The work under this section consists of the removal and disposal of the existing bridge and any other construction debris, unless specified on the plans to be removed or relocated by others.

Arrangements for disposal of all non-hazardous material or construction debris shall be the responsibility of the Contractor, except that all usable pipe culvert, as determined by the Engineer, shall be stockpiled for salvage by the County.

After the Detour Road has been abandoned, it shall be scarified and the ground restored to its original condition.

SECTION 401 - TRAFFIC CONTROL:

Traffic control shall comply with the guidance contained in part VI of the Manual on Uniform Traffic Control Devices for Streets and Highway (US DOT Federal Highway Administration) with current revisions, the current City of Phoenix barricade manual, and these special provisions.

It shall be the contractor's responsibility to provide, erect, maintain and remove all necessary signs, barricades, temporary paved travel lanes, barriers, sand berms, high level warning devices, lights, delineator, flagmen and other devices necessary to properly mark and control the construction areas for the safe and efficient movement of traffic. Temporary traffic control warning signs and devices shall be installed prior to the start of any work. The contractor shall provide other adequate devices or measures deemed necessary by the Transportation Director or his representative.

Construction shall not commence or proceed without an approved Traffic Control Plan (TCP). At the time of the pre-job conference, the contractor shall submit for review preliminary traffic control plans for advance closure signing and the detour road signing.

A road closure of the I-17 Frontage Road is not authorized and two lanes of traffic shall be maintained open at all times. Traffic lanes shall be a minimum of ten feet (10') wide and have a safe operating speed of 25 miles per hour. Local access to residences shall be maintained at all times.

The contractor shall install a deceleration sand berm (washed sand approximately five feet high) across the pavement in the blocked traffic path at each approach to the bridge construction site to prevent errant vehicles from entering the active work site.

All temporary traffic control devices shall be ballasted with sandbags or other approved ballast. Rope, flagging, fencing and woven plastic tape may be required at open excavations and or used between barricades and channelizing devices to provide additional guidance and security.

The "SPEED LIMIT 25" sign is used where traffic is maintained on unpaved shoulders, temporary detour roads, the existing pavement has been removed, or on traffic lanes that are severely restricted.

The contractor shall maintain or relocate all warning signs, STOP, YIELD and street name signs erect, clean and in full view of the intended traffic at all times. Portable signs should be used to supplement blocked or removed signs. All unnecessary traffic signs shall be covered or removed and stored.

The contractor is responsible for the cost of replacing lost traffic warning signs. The Traffic Engineering division will reset all disturbed signs to permanent locations when construction is completed.

The contractor shall provide and maintain all necessary signs, barricades and center line vertical panels for five working days beyond any construction concrete cure time or acceptance of the project by the County, whichever is greater.

Access to all properties and emergency services shall be maintained at all times where possible. In no case shall the access be restricted for more than four hours without approval. The contractor shall give 48 hours notification to the affected responsible person concerning all restrictions. If prolonged access restriction is required by construction, the contractor shall notify the property owner/resident before closing the road.

Concrete barrier railing shall be temporary pin-together jersey type barriers and on pavement shall be placed on one inch (1") by two foot (2') square foam pads at each end.

Payment for traffic control shall be made on a lump sum basis for ITEM 401-1, TRAFFIC CONTROL, which price shall be full compensation for the work, including labor, materials, traffic control devices, and miscellaneous incidentals necessary to complete the work, except as noted below. Payment for concrete barrier railing will be paid for at the price bid per lineal foot for ITEM NO. 401-2, TEMPORARY PRECAST CONCRETE BARRIER RAILING, including furnishing, installation, removal and delivery to M.C.D.O.T. Durango Yard, located on 2801 West Durango Street, Phoenix.

SECTION 405 - SURVEY MONUMENT:

The work under this section consists of furnishing and installing survey monuments at the location shown on the plans and in accordance with Section 405 of the Uniform Standard Specifications.

Payment for this work will be made at the price bid per each for ITEM 405 - SURVEY MONUMENTS.

SECTION 415 - FLEXIBLE METAL GUARD RAIL:

The work under this section consists of constructing steel beam guard rail in accordance with the plans and Section 415 of the Uniform Standard Specifications.

Payment for this work will be made at the price bid per lineal foot for ITEM NO. 415 - GUARD RAIL, complete in place, including terminal assemblies and transitions.

SECTION 420 - CHAIN LINK FENCE:

The work under this section consists of constructing chain link fence on the bridge deck in accordance with the plans and Section 420 of the Uniform Standard Specifications.

SECTION 450-1 - DETOUR TRAFFIC STRIPING & PAVEMENT MARKERS:

The Contractor shall submit a traffic striping and pavement marker plan to the Transportation Director or his representative for the detour as shown on the plans.

The Contractor shall not commence construction of the detour until the detour traffic striping and pavement marking plan has been approved in writing by the Transportation Director or his representative.

Payment shall be made at the lump sum price bid for ITEM 450-1 - DETOUR TRAFFIC STRIPING & PAVEMENT MARKERS, which price shall be full compensation for developing the plan, obtaining approvals, striping the detour, furnishing and placing the pavement markers, and maintaining these items during the use of the detour.

SECTION 502 - CAISSONS:

The work under this section consists of drilling the holes for the cast-in-place concrete piles in accordance with the plans and Section 501 of the Uniform Standard Specifications.

After reaching the desired pile tip elevation, the hole shall be carefully matching cleaned to remove all loose, disturbed soil from the bottom of the hole. All holes shall be inspected and approved by the Engineer prior to placing concrete.

The maximum deviation of the shaft from plumb shall not exceed one percent (1%), and the maximum variation of the center axis of any shaft at the top shall not exceed three inches (3") from its plan location.

Concrete and reinforcing steel will be paid for under Section 505 - Concrete Structures.

Payment for drilling the holes for the concrete piles will be made at the price bid per lineal foot for ITEM NO. 502 CAISSONS.

SECTION 505 - CONCRETE STRUCTURES:

The work under this section consists of constructing in place the concrete portions of the bridge, approach slabs and concrete barrier transition in accordance with the plans and Section 505 of the Uniform Standard Specifications.

The concrete shall conform to Section 725 and the reinforcing steel shall conform to Section 727.

The use of fly ash will be permitted in al concrete mixes.

All items embedded in the concrete, such as deck drains, etc, are incidental.

The concrete and reinforcing steel in the concrete barrier transition are incidental to the pay item.

Joints in concrete bridge railing shall be saw-cut within 24 hours of removal of forms.

SECTION 505.8 - CURING:

All concrete in bridge decks and approach slabs, shall be water cured, utilizing the wet burlap method, unless otherwise authorized by the Engineer.

SECTION 505.9 - FINISHING CONCRETE:

The use of wood trowels will not be permitted in any finishing operations for concrete slabs.

Payment for all work under this section will be made at the price bid per cubic yard for ITEM NO. 505-1 CLASS "A" CONCRETE and ITEM NO. 505-2 CLASS "AA" CONCRETE; at the price bid per bound for ITEM NO. 505-3 REINFORCING STEEL, respectively; and at the price bid per lineal foot for ITEM NO. 505-4 CONCRETE BARRIER TRANSITION, complete in place.

SECTION 618 - REINFORCED CONCRETE PIPE:

The work under this section consists of furnishing and placing concrete pipe as called for on the plans, including connections, in accordance with Section 618 of the Uniform Standard Specifications.

All concrete pipe shall be Class III with rubber gasket joints.

Measurement will be made along the centerline of the concrete pipe placed between the ends of the pipe.

Payment for this item will be made at the price bid per lineal foot for Item No. 618 - 24" RCP w/End Sections and Riprap Outlet Protection, complete in place. No separate payment will be made for furnishing and placing the end sections and riprap as such and the cost thereof shall be included in the price bid for Reinforced Concrete Pipe.

SECTION 621 - PIPE CULVERT

The work under this section consists of furnishing and placing pipe culvert at locations shown on the plans, including connections, end sections, outlet headwalls and automatic drainage gates.

The Contractor may furnish Reinforced Concrete Pipe, Class III, Rubber Gasket, conforming to the requirements of Section 735; or 16 gauge Corrugated Metal Pipe, AASHTO Designation M-190, Type "A". Corrugated metal pipe shall be bituminous coated outside, conforming to Section 621.

Measurement will be made along the centerline of the pipe culvert placed, between the ends of the pipe.

Payment for this item will be made at the price bid per lineal foot, of the size shown, complete in place. No separate payment will be made for furnishing all materials and constructing the end sections, headwalls and automatic drainage gates in accordance with the plans and respective Uniform Standard Specifications as such and the cost thereof shall be included in the price bid for Pipe Culvert. The Automatic Drainage Gates will be Neenah R-5050 Series, Type SF or approved equal.

GENERAL COMMENTS:

The cost of all work required under this contract, as shown on the plans, for which there are to specific items shown on the Bidding Schedule, shall be included in the bid price for related items.

The County reserves the right to adjust design grades or the location of drainage structures prior to construction, if deemed necessary by the Engineer, without additional cost to Maricopa County.

It shall be the Contractor's responsibility to protect the structures and construction site from any excessive or detrimental flooding, within the wash right-of-way, which may occur during the construction period, until final acceptance of the completed structures by the Engineer.

Upon completion of the construction, the Contractor shall clear the wash bed and work area of all debris to the satisfaction of the Engineer.

No vehicular loads will be permitted on the bridge before the lapse of twenty-one (21) days from the date of the last pour of concrete for the bridge deck or approach slabs, unless specific approval is obtained in writing from the Engineer.

The Contractor shall take special precautions to keep the area around the structure properly barricaded and marked with flares to prevent automotive traffic from running into the wash or crossing the new structure prior to acceptance of the completed project by the Engineer.

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Registered Professional Engineer (Civil)
CERTIFICATE NO. 23268
LYNN M. THOMAS
Date Signed 4-8-94
ARIZONA, U.S.A.

INTRODUCTION

The Maricopa County Department of Transportation (MCDOT) contracted with Kaminski-Hubbard Engineering, Inc., in 1991 to provide professional engineering services for New River Road Bridge at New River, Work Order No. 68738. Professional services included preparation of contract documents for design of a new bridge with approach roadways, field surveys identifying public right-of-way and private ownership, and design of a temporary detour road during construction. In addition, a channel study from Interstate 17 (I-17) to north of New River Road was included to document bridge modifications to the existing 100-year floodplain of New River. Results of the channel study recommended design of levees and spur dikes to direct 100-year peak discharges through the New River Road bridge. This report documents design requirements for the bridge and levee improvements.

The unincorporated community of New River is situated in northwest Maricopa County (See Figure 1). Presently, several residential and neighborhood commercial developments exist within the New River community. The proposed New River Road bridge and levee system is located within Section 27, Township 7 North, Range 2 East of the Gila & Salt River Base & Meridian. New River is an ephemeral stream with a southerly slope of one percent. The main stream channel is void of vegetation but, the area behind the levee contains a sparse to moderate growth of grasses, weeds and brush.

PROJECT DESCRIPTION

The existing New River Road Bridge is located approximately 500-feet east of the I-17 Frontage Road. This bridge is a six-span, 300-foot long, 28-foot wide concrete structure that was built in 1971. According to as-built record drawings, the structure is supported on spread footings placed on shale or conglomerate. Subsurface conditions consisted of granular alluvial soils overlying an irregular bedrock surface. A perched ground water table was observed to exist in the vicinity of the stream channel. The existing stream channel is naturally armored with cobbles, boulders up to four feet in diameter and occasional sand bars. Flood control levees are located upstream and downstream of the bridge. Preliminary hydraulic analysis indicates that the levees are unstable and do not confine 100-year floodwaters. Flows spread and are capable of crossing the east and west roadway approaches in New River Road.

Bridge and levee improvements are proposed to provide better 100-year access to the New River community. The bridge improvements will include a four span, 400-foot long, 68-foot wide structure supported by drilled piers into existing bedrock. Upstream levees and downstream spur dikes will be constructed to confine and direct floodwaters under New River Road.

HYDRAULIC ANALYSIS

The hydraulic analysis for design of the New River Road bridge and levee system was prepared using the U.S. Army Corps of Engineer's HEC-2 computer program with the HEC-2 data prepared for the 1987 Flood Insurance Study (See Appendix B). The HEC-2 data was modified to simulate bridge and levee improvements. Peak discharges and Manning "n" values were not changed. Results of proposed improvements were compared to results of the 1987 study to verify that flood hazard factors were not increased relative to water surface elevations and velocities.

The HEC-2 special bridge routine was used to model the proposed four span bridge with three-four foot diameter piers spaced one hundred feet on center. Results of the analysis were used to establish design of freeboard between 100-year water surface elevation and the bridge low chord.

The HEC-2 encroachment method 1 was used to model the effectiveness of proposed levee improvements upstream and downstream of the New River Road bridge. Side slopes of two feet horizontal to one foot vertical with a level levee top width of 20 feet was used to simulate cross-section geometry. Cross-section locations were selected immediately upstream and downstream of the bridge opening, at a sufficient distance downstream so that the bridge has no effect upon flow characteristics and at a sufficient distance upstream of the bridge opening to evaluate the structure's effect upon flow characteristics. In general, HEC-2 results indicated a supercritical flow regime within the New River Road bridge and levee system.

Results of the HEC-2 analysis indicated that a Class B low flow condition exists for the proposed New River Road bridge. This condition occurs when the water surface profile passes through critical depth in the bridge opening. This may indicate a hydraulic jump occurs within the reach between cross-section 33.082 and 33.184. Embankment protection and foundation stability have been designed for higher velocities as computed in the supercritical flow regime. Freeboard requirements have been designed for higher water surfaces as computed in the subcritical flow regime.

BRIDGE DESIGN

The New River Road bridge was designed for 100-year floodwaters occurring in New River. The bridge opening will be constructed normal to the stream and supported on 25-four foot diameter drilled piers. The piers will be anchored in the underlying bedrock material. Scour depths were evaluated for long term aggradation or degradation, general scour, local scour, bend scour and bed-form scour due to dunes and antidunes (See Appendix C). The bridge low chord has been designed in the range of a minimum of two feet of freeboard above the 100-year water elevation. This freeboard should be adequate for debris accumulation. During HEC-2 and scour analysis, pier widths were doubled to evaluate debris accumulation effects on water surfaces and velocities (See Appendix B). There was no significant increase in water surfaces and velocities.

LEVEE & SPUR DIKE DESIGN

The New River Road levee system has been designed and analyzed in accordance with FEMA guidelines and criteria. A minimum of three feet of freeboard above the 100-year water surface elevation was provided for the levee system. In addition, a minimum of four feet of freeboard was provided within 100 feet of the bridge in New River Road. The upstream beginning of levee, approximately 800 feet north of New River Road, was designed to provide more than three and one-half feet of freeboard.

Depth of flow and streambed scour within the levee system can be significantly affected by the formation of waves or antidunes, superelevation of flow through bends, accumulation of debris, obstructions and sediment transport. These hydraulic characteristics may have an impact on conveyance capacity and bank protection toe-down. The following elaborates on the factors which were evaluated.

1. Sediment Transport

non-existent in Appendix D.

Transport capacity as well as amount of material eroded was analyzed for the New River Road bridge (See Appendix D). Transport capacity of a given reach is dependent on the gradation of the bed material, flow rate, geometric and hydraulic variables. Of the variables listed, the single most influential on sediment transport rates is the velocity. Small changes in velocity can create large variances in channel transport capacity thus creating undesirable aggradation and degradation affects. Aggradation or degradation occurs when sediment transport is not in equilibrium. The sediment transport analysis was evaluated using the following sediment transport rate continuity equation:

$$q_s = 0.0064 \frac{n^{1.77} V^{4.32} G^{0.45}}{Y_h^{0.33} D_{50}^{0.61}}$$

where:

q_s	=	Bed-Material Discharge, cfs/ft.
n	=	Mannings Roughness Coefficient
V	=	Mean Velocity, fps.
G	=	Gradation Coefficient = ½ $[D_{84.1}/D_{50}) + (D_{50}/D_{15.9})]$
Y_h	=	Hydraulic Depth, ft.
D_{50}	=	Median Diameter, mm.

2. Antidune Waves

Antidunes can form in transition zones and in supercritical flow regimes. Results of the New River HEC-2 model showed a supercritical flow regime therefore, the levee system was analyzed for antidune wave heights and bed-form scour depths (See Appendix D). The wave heights and scour depths for these antidunes can be estimated using the following relation:

$$h_a = 0.14 \frac{2\pi V^2}{g} = 0.027V^2$$

where:

h_a	=	Antidune Height From Crest To Trough (ft.)
g	=	Gravitational Constant - 32.2 ft./sec.
V	=	Velocity Of Flow (fps)
$h_a/2$	=	Antidune Wave Height From Crest Of Wave To The Original Water Surface Elevation Or Original Bed Elevation.

therefore:

H	=	$0.0137V^2$ = Antidune Wave Height From Original Water Surface Or Bed Elevation.

3. Superelevation

Since the New River stream bed does not meander within the study reach, superelevation was not considered in the analysis.

4. Debris Accumulation

The watershed area contributing stormwater runoff to New River consists of a moderate to heavy growth of desert grasses, trees, shrubs and cacti. When stormwater flow depths become sufficient to float debris, dead trees and debris from prior large floods may accumulate in the channel. Debris accumulation can potentially increase flow depths and increase local scour. There are no good quantitative analyses to account for debris accumulation. Judgement is required to estimate the potential for debris accumulation. A minimum of three feet of freeboard is provided for potential debris accumulation.

Depth of toe-down for the grouted riprap bank protection was calculated using the following equation.

$$Y = (y_l + H + y_s + y_b) S.F.$$

where:

Y	=	Toe-Down Depth (ft.)
y_l	=	Local Scour Depth (ft.)
H	=	Bed-Form Depth (ft.)
y_s	=	Long Term Aggradation/Degradation (ft.)
y_b	=	Scour due to bends and super elevation (ft.)
S.F.	=	Factor of Safety

Grouted riprap will be used for embankment and toe down protection. The riprap will extend from the top of levee to the toe down depth as shown on plans. Toe down depths were based on results of scour analysis (See Appendix D). Riprap sizing was prepared in accordance with the Federal Highway Administration's criteria (See Appendix E).

Estimated settlements are on the order of ½" inch or less based on results of soil testing. The majority of settlement will occur during construction. The embankment fill area will be required to be scarified to a minimum depth of 8 inches. Levee embankment material will be required to be inorganic soil, free of vegetation, debris, organic contaminants and fragments larger than six inches in size. Compaction of the levees are specified as 95 percent minimum. No water jetting or settling will be allowed for compaction during construction.

INTERIOR DRAINAGE

The New River Road approach roadway profile has been designed for approximately three to four feet of fill. This provided a vertical alignment with a design speed of 55 miles per hour. Since the roadway profile is above adjacent ground and New River levees have a minimum three feet of freeboard, pipe culverts will be constructed to provide gravity drainage to properties north of the roadway approaches. These pipes will drain directly to New River. Automatic drainage gates will be attached to the downstream end of the pipe in order to prevent New River floodwaters entering the pipe. The Rational Method was used to generate 100-year, 24-hour peak discharge values in accordance with Maricopa County criteria. Pipe culvert hydraulics were evaluated in accordance with Federal Highway Administration's procedures in order to establish limits of ponding (See Appendix F). The ponding limits are delineated on Figure 3. Presently, the ponding area has no mechanism to drain for the existing conditions. The levee and bridge improvements will provide gravity to drainage for adjacent properties for the proposed condition.

SUMMARY OF RESULTS

This study documents design considerations for bridge and levee improvements in New River Road. Design of these improvements included evaluation of erosion, freeboard and embankment protection. Calculations have been prepared in accordance with Maricopa County criteria. No increased flood hazards are anticipated with construction of these improvements. The New River community will be provided with better access during 100-year flooding events.

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8. "Evaluating Scour at Bridges", February 1991, Federal Highway Administration.

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APPENDIX A

HEC-2 Analysis

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**********************************************        ****************************************
*  HEC-2 WATER SURFACE PROFILES              *        *  U.S. ARMY CORPS OF ENGINEERS
*                                            *        *  HYDROLOGIC ENGINEERING CENTER
*  Version   4.6.2;  May 1991                *        *  609 SECOND STREET, SUITE D
*                                            *        *  DAVIS, CALIFORNIA 95616-4687
*  RUN DATE    07APR94    TIME   10:17:44    *        *          (916) 756-1104
**********************************************        ****************************************
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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 07APR94    10:17:44
****************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
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T1      NEW RIVER FLOODPLAIN ANALYSIS - BRIDGE AND FLOODPLAIN IMPROVEMENTS
T2      100-YEAR PROPOSED FLOODPLAIN    **0179L.DAT**
T3      NEW RIVER:  I-17 TO NEW RIVER ROAD
T4      REVISED:  APRIL 8, 1994 PER 95% CONSTRUCTION PLANS

J1  ICHECK     INQ      NINV      IDIR      STRT    METRIC     HVINS      Q        WSEL       FQ

       0        2         0         0         0        0         0        0    1981.58        0

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN       ALLDC     IBW      CHNIM     ITRACE

      -1        0        -1         0         0        0        -1        0         0        15


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

      38       43         1         8        42        3         2       26         5        39
      53        4        54                  38       67        68       69

NC     .050      .050      .035       0.3       0.5
QT        1     30400
ET   32.174       9.1                                                                   9843.9     10300
        3000 CFS BREAK OUT OVER THE LEFT OVERBANK.  THE 3000 CFS FLOWS SOUTH
        AND THEN WEST OVER I-17 TO GO BACK INTO THE MAIN CHANNEL AT ABOUT
        SECTION 31.974.  THE EXTENT OF THE ZONE A02 FLOOD LIMIT IS BASED ON
        NORMAL DEPTH CALCULATIONS USING DIGITIZED CROSS SECTION INFORMATION.
X1   32.174        40    9844.0   10075.2       520        50       300
GR   1985.5   09531.7    1982.9   09551.8    1982.0   09567.5    1983.0   09585.1    1983.2   09628.5
GR   1975.5   09650.1    1975.8   09664.9    1975.6   09709.1    1976.7   09773.5    1978.4   09781.1
GR   1978.9   09791.4    1978.7   09802.1    1980.8   09812.7    1981.9   09844.0    1970.7   09877.9
GR   1972.3   09907.9    1970.4   09932.5    1968.4   09965.8    1967.6   09981.2    1967.8   10000.0
GR   1968.5   10014.2    1969.4   10028.2    1970.2   10054.5    1975.8   10069.6    1977.2   10075.2
GR   1990.7   10104.6    1992.3   10134.0    1994.3   10206.2    1997.2   10299.1    1998.9   10366.0
GR   1994.1   10408.3    1990.1   10445.8    1991.9   10463.7    1997.5   10490.8    2004.7   10535.9
GR   2009.5   10563.3    2015.7   10590.7    2020.9   10651.2    2022.4   10673.6    2023.0   10683.4

QT        1     33400
NC     .050      .050      .035       0.1       0.3
X1   32.267        35    9941.7   10151.4       490       480       490
GR   2025.1   09590.7    2010.7   09629.4    2000.2   09656.0    1993.6   09674.4    1986.3   09680.0
GR   1987.0   09719.5    1984.9   09732.9    1980.2   09746.4    1980.6   09809.1    1981.2   09842.1
GR   1980.0   09852.4    1982.0   09893.6    1978.7   09909.0    1982.0   09920.5    1980.4   09941.7
GR   1972.4   09949.0    1972.7   09977.0    1972.6   09993.8    1973.1   10000.0    1974.2   10008.6
GR   1974.4   10030.7    1975.8   10080.0    1975.9   10111.9    1977.3   10123.7    1982.7   10151.4
GR   1984.3   10181.0    1989.8   10207.1    1995.1   10245.1    1996.1   10282.6    1998.7   10300.0
```

GR	2003.6	10320.4	2008.4	10337.2	2011.8	10367.7	2018.5	10411.7	2024.4	10456.5
ET	32.358	9.1							9748.6	10400
X1	32.358	35	9966.4	10123.4	490	490	480			
GR	2022.9	09615.1	2010.1	09647.3	1997.2	09672.7	1988.0	09687.3	1983.4	09697.9
GR	1983.3	09726.5	1988.5	09748.6	1987.6	09795.9	1983.3	09813.5	1984.1	09841.8
GR	1984.5	09858.0	1985.3	09902.3	1985.0	09966.4	1975.9	09979.5	1973.3	09987.4
GR	1973.9	10000.0	1977.6	10027.9	1978.0	10038.9	1978.0	10057.9	1976.9	10063.8
GR	1977.7	10086.7	1980.9	10103.0	1982.0	10123.4	1980.1	10190.0	1976.5	10214.6
GR	1974.4	10238.4	1982.0	10266.1	1991.6	10284.0	1994.8	10290.2	1997.9	10312.9
GR	2005.4	10336.9	2009.9	10394.3	2013.8	10439.7	2016.9	10474.1	2024.8	10548.8
NC	.065	.065	.035	0.1	0.3					
ET	32.455	9.1							9752.2	10400
X1	32.455	50	9935.0	10149.7	510	520	510			
GR	2020.1	09118.3	2018.5	09138.1	2016.9	09203.9	2014.6	09243.4	2010.2	09282.0
GR	2007.2	09305.0	2008.5	09335.7	2005.3	09367.7	2002.3	09387.8	1998.5	09416.6
GR	1997.3	09444.3	1997.1	09459.5	1993.7	09485.8	1995.5	09522.2	1996.3	09539.5
GR	1993.5	09581.5	1991.4	09619.8	1986.8	09649.8	1987.1	09663.8	1990.3	09689.5
GR	1990.3	09704.1	1987.0	09715.3	1989.6	09727.3	1990.3	09736.6	1993.5	09752.2
GR	1991.5	09793.7	1987.9	09806.5	1986.6	09817.7	1986.3	09838.2	1986.5	09897.8
GR	1986.3	09935.0	1980.5	09957.1	1979.0	09972.5	1979.6	10000.0	1980.1	10059.0
GR	1981.4	10101.6	1981.4	10125.6	1989.6	10149.7	1996.8	10183.6	2000.1	10201.2
GR	2005.3	10256.3	2008.6	10288.2	2013.2	10339.2	2016.3	10363.8	2016.7	10375.6
GR	2024.2	10415.6	2028.4	10449.2	2033.7	10469.6	2036.0	10495.7	2037.5	10528.4
NC	.065	.065	.035	0.3	0.5					
ET	32.553	9.1							9800	10500
X1	32.553	65	9973.1	10086.7	520	520	520			
GR	2025.3	09002.0	2018.1	09061.3	2014.1	09094.9	2013.2	09143.6	2008.9	09206.9
GR	2007.2	09241.6	2003.5	09275.5	1998.5	09297.0	1999.7	09306.0	1998.8	09316.1
GR	1997.1	09321.1	2001.2	09329.5	2006.4	09359.2	2006.5	09395.0	2010.5	09416.3
GR	2012.4	09454.3	2011.1	09481.5	2009.9	09491.6	2012.6	09512.5	2015.1	09518.7
GR	2018.3	09538.9	2019.1	09555.6	2021.7	09571.9	2025.7	09592.0	2029.7	09610.0
GR	2038.6	09646.4	2047.6	09681.7	2055.7	09713.6	2061.3	09738.8	2065.3	09763.4
GR	2048.8	09774.1	2035.8	09791.7	2020.5	09811.6	2003.4	09826.7	1995.6	09832.0
GR	1994.2	09874.3	1991.4	09897.5	1990.4	09933.6	1987.4	09945.4	1986.6	09973.1
GR	1983.6	09989.0	1980.8	09996.3	1980.8	10000.0	1981.4	10012.8	1983.5	10023.2
GR	1982.6	10041.7	1981.1	10052.3	1981.2	10064.3	1988.5	10086.7	1992.4	10107.7
GR	1993.4	10138.5	1994.0	10176.0	1996.9	10202.3	2001.4	10246.0	2003.9	10267.8
GR	2006.5	10304.8	2010.1	10354.0	2013.0	10404.4	2015.9	10467.9	2019.5	10530.1
GR	2021.3	10561.4	2022.8	10592.2	2023.4	10611.5	2024.7	10626.9	2026.0	10644.8
ET		9.1							9844.062	10184.75

DOWNSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.

X1	32.585	47	9860.0	10251.6	83	430	183	0.87		
X2									0.87	
BT	-45	9737.4	2014.8		9776.9	2003.1		9859.9	2004.0	
BT		9860.0	2006.5	2002.0	9892.0	2006.5	2002.0	9933.3	2006.5	2002.0
BT		9933.3	2006.5	2002.0	9938.3	2006.5	2002.0	9938.3	2006.5	2002.0
BT		10013.3	2006.5	2002.0	10013.3	2006.5	2002.0	10018.3	2006.5	2002.0
BT		10018.3	2006.5	2002.0	10093.3	2006.5	2002.0	10093.3	2006.5	2002.0
BT		10098.3	2006.5	2002.0	10098.3	2006.5	2002.0	10173.3	2006.5	2002.0
BT		10173.3	2006.5	2002.0	10178.3	2006.5	2002.0	10219.0	2006.5	2002.0

BT		10251.6	2006.5	2002.0	10251.7	2004.0		10251.8	2004.0	
BT		10270.1	1998.0		10323.7	1996.0		10373.0	1995.5	
BT		10416.0	1995.1		10432.6	1991.6		10449.9	1993.5	
BT		10478.5	1993.7		10500.9	1989.4		10511.2	1989.5	
BT		10536.7	1995.9		10552.7	1997.4		10596.0	1999.0	
BT		10631.0	1999.4		10661.0	1998.7		10701.3	1999.6	
BT		10748.3	2000.6		10790.3	2002.0		10826.1	2004.0	
BT		10871.5	2006.7		10904.5	2008.4		10930.8	2010.4	
GR	2014.8	9737.4	2003.1	9776.9	2004.0	9859.9	2002.0	9860.0	1987.0	9892.0
GR	1987.0	9933.3	2002.0	9933.3	2002.0	9938.3	1987.0	9938.3	1987.0	10013.3
GR	2002.0	10013.3	2002.0	10018.3	1987.0	10018.3	1987.0	10093.3	2002.0	10093.3
GR	2002.0	10098.3	1987.0	10098.3	1987.0	10173.3	2002.0	10173.3	2002.0	10178.3
GR	1987.0	10178.3	1987.0	10219.0	2002.0	10251.6	2004.0	10251.7	2004.0	10251.8
GR	1999.1	10270.1	1998.0	10270.1	1996.0	10323.7	1995.5	10373.0	1995.1	10416.0
GR	1991.6	10432.6	1993.5	10449.9	1993.7	10478.5	1989.4	10500.9	1989.5	10511.2
GR	1995.9	10536.7	1997.4	10552.7	1999.0	10596.0	1999.4	10631.0	1998.7	10661.0
GR	1999.6	10701.3	2000.6	10748.3	2002.0	10790.3	2004.0	10826.1	2006.7	10871.5
GR	2008.4	10904.5	2010.4	10930.8						

ET		9.1							9844.062	10184.75

UPSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.
THIS BRIDGE IS PROPOSED TO BE FIVE SPANS WITH 4-5 FT DIAMETER PIERS
SPACED 80 FT ON CENTER. THE BRIDGE LOW CHORD WILL BE ESTABLISHED
A MINIMUM 2 FT ABOVE THE 100-YEAR WATER SURFACE. THE FRONTAGE ROAD
WILL BE ESTABLISHED A MINIMUM 3 FT ABOVE THE 100-YEAR WATER SURFACE.

X1	32.601	47	9860.0	10251.6	68	68	68	0.87		
X2									0.87	
BT	-45	9737.4	2014.8		9776.9	2003.1		9859.9	2004.0	
BT		9860.0	2006.5	2002.0	9892.0	2006.5	2002.0	9933.3	2006.5	2002.0
BT		9933.3	2006.5	2002.0	9938.3	2006.5	2002.0	9938.3	2006.5	2002.0
BT		10013.3	2006.5	2002.0	10013.3	2006.5	2002.0	10018.3	2006.5	2002.0
BT		10018.3	2006.5	2002.0	10093.3	2006.5	2002.0	10093.3	2006.5	2002.0
BT		10098.3	2006.5	2002.0	10098.3	2006.5	2002.0	10173.3	2006.5	2002.0
BT		10173.3	2006.5	2002.0	10178.3	2006.5	2002.0	10219.0	2006.5	2002.0
BT		10251.6	2006.5	2002.0	10251.7	2004.0		10251.8	2004.0	
BT		10270.1	1998.0		10323.7	1996.0		10373.0	1995.5	
BT		10416.0	1995.1		10432.6	1991.6		10449.9	1993.5	
BT		10478.5	1993.7		10500.9	1989.4		10511.2	1989.5	
BT		10536.7	1995.9		10552.7	1997.4		10596.0	1999.0	
BT		10631.0	1999.4		10661.0	1998.7		10701.3	1999.6	
BT		10748.3	2000.6		10790.3	2002.0		10826.1	2004.0	
BT		10871.5	2006.7		10904.5	2008.4		10930.8	2010.4	
GR	2014.8	9737.4	2003.1	9776.9	2004.0	9859.9	2002.0	9860.0	1987.0	9892.0
GR	1987.0	9933.3	2002.0	9933.3	2002.0	9938.3	1987.0	9938.3	1987.0	10013.3
GR	2002.0	10013.3	2002.0	10018.3	1987.0	10018.3	1987.0	10093.3	2002.0	10093.3
GR	2002.0	10098.3	1987.0	10098.3	1987.0	10173.3	2002.0	10173.3	2002.0	10176.6
GR	1987.0	10178.3	1987.0	10219.0	2002.0	10251.6	2004.0	10251.7	2004.0	10251.8
GR	1999.1	10270.1	1998.0	10270.1	1996.0	10323.7	1995.5	10373.0	1995.1	10416.0
GR	1991.6	10432.6	1993.5	10449.9	1993.7	10478.5	1989.4	10500.9	1989.5	10511.2
GR	1995.9	10536.7	1997.4	10552.7	1999.0	10596.0	1999.4	10631.0	1998.7	10661.0
GR	1999.6	10701.3	2000.6	10748.3	2002.0	10790.3	2004.0	10826.1	2006.7	10871.5
GR	2008.4	10904.5	2010.4	10930.8						

```
ET           9.1                                                                      9948.4    10614.3
      SECTIONS 32.686 TO 32.983 THE MAIN CHANNEL HAS BEEN REGRADED TO BE
      WIDER ALONG THE RIGHT OVERBANK.
X1   32.686       70    9968.6   10179.4       530       350      450
GR   2059.5  09851.9    2044.9   09883.0    2038.3   09898.1   2028.0   09930.0    2016.3    09948.4
GR   1998.2  09968.6    1986.7   09986.8    1986.5   10000.0   1986.5   10016.2    1986.5    10038.0
GR   1986.5  10059.6    1986.5   10075.0    1986.5   10095.7   1986.5   10123.7    1986.5    10139.4
GR   1994.5  10179.4    1995.7   10202.3    1997.7   10237.0   1996.2   10291.5    1995.3    10335.5
GR   1994.4  10354.0    1992.8   10366.8    1992.9   10379.4   1997.0   10397.1    1998.2    10435.1
GR   1997.8  10488.3    1997.3   10538.1    1996.4   10580.1   2005.0   10614.3    1998.7    10666.3
GR   1998.5  10692.6    1999.7   10706.3    1996.8   10737.4   1997.0   10772.1    1999.6    10811.3
GR   2000.9  10851.9    2001.7   10873.2    2000.7   10894.5   2000.3   10952.2    1999.3    10959.4
GR   2001.0  10969.5    2001.1   10997.5    1997.8   11024.6   1994.1   11029.4    1994.7    11038.4
GR   1998.2  11048.4    2000.2   11073.6    2000.9   11102.7   2001.5   11124.0    2003.5    11155.1
GR   2003.8  11177.8    2007.2   11197.1    2004.1   11218.1   2005.6   11283.8    2006.7    11331.7
GR   2008.6  11372.0    2010.4   11391.3    2013.1   11417.3   2014.6   11453.5    2019.0    11489.6
GR   2022.2  11540.8    2024.9   11578.6    2026.7   11605.4   2029.9   11639.0    2033.0    11664.8
GR   2033.6  11679.9    2035.2   11718.5    2039.8   11745.4   2041.9   11754.9    2044.8    11773.4

NC     .075     .075      .035       0.1       0.3
ET              9.1                                                                  9785.5    10669.5
X1   32.743       75    9947.0   10197.8       380       200      300
GR   2017.7  09727.6    2013.3   09750.6    2009.2   09765.7   2005.9   09785.5    2001.7    09806.0
GR   1994.5  09823.9    1989.8   09843.5    1989.3   09861.7   1998.5   09875.4    1999.2    09896.7
GR   1999.6  09947.0    1991.5   09962.7    1991.5   10000.0   1991.5   10029.9    1991.5    10066.3
GR   1991.5  10081.1    1991.5   10163.8    1998.3   10197.8   1997.2   10248.2    1994.0    10276.8
GR   1999.5  10287.4    1999.6   10361.0    2000.2   10393.2   1999.6   10410.0    1997.9    10474.4
GR   1998.5  10486.7    1997.7   10508.0    1996.7   10521.7   1997.9   10561.1    2001.3    10587.5
GR   2001.8  10634.5    2001.2   10646.8    2002.2   10656.6   2005.5   10669.5    2001.3    10719.3
GR   2000.3  10738.3    1999.8   10762.7    1999.2   10821.5   1999.2   10843.0    1997.4    10860.1
GR   1998.5  10877.4    2000.3   10891.4    2001.4   10963.4   2001.8   11016.8    2001.9    11058.3
GR   2002.3  11087.9    2000.6   11113.1    1997.4   11133.0   1998.6   11148.9    2000.1    11157.3
GR   2002.8  11202.4    2004.3   11234.6    2004.6   11267.6   2006.7   11321.4    2007.5    11365.6
GR   2008.0  11383.5    2008.6   11411.5    2009.1   11428.3   2011.7   11476.7    2015.7    11512.3
GR   2017.7  11532.7    2020.7   11586.1    2023.0   11618.1   2023.8   11647.7    2027.3    11686.6
GR   2029.3  11705.4    2031.1   11749.1    2032.8   11787.1   2034.0   11799.4    2037.0    11812.3
GR   2036.8  11836.9    2039.0   11858.8    2039.2   11868.8   2040.7   11882.3    2041.6    11903.8

ET              9.1                                                                  9143.7    10673.7
      CONFLUENCE WITH TRIBUTARY.
X1   32.790       90    9955.2   10200.1       300       180      250
GR   2029.5  09143.7    2029.8   09183.5    2027.7   09205.9   2025.3   09274.7    2022.2    09341.3
GR   2017.9  09382.8    2016.6   09418.6    2014.1   09457.2   2012.4   09483.5    2003.9    09490.3
GR   2002.7  09537.8    2001.8   09628.0    2002.2   09687.9   1995.9   09707.5    1993.1    09734.3
GR   1994.9  09757.0    1995.8   09774.1    1999.6   09791.4   2000.7   09859.2    2000.8    09905.9
GR   2000.5  09936.4    1999.6   09955.2    1993.9   09970.6   1992.2   09995.2    1992.2    10000.0
GR   1992.2  10019.3    1992.2   10043.3    1992.2   10088.7   1992.2   10129.3    1992.2    10147.9
GR   1999.0  10181.9    1999.7   10200.1    1997.6   10209.0   2000.3   10218.0    2001.5    10262.8
GR   2001.1  10314.8    2000.9   10333.6    1999.3   10398.5   1998.8   10423.4    1997.5    10432.1
GR   1999.1  10482.2    2002.6   10494.3    2003.2   10511.6   2002.3   10641.8    2004.8    10662.5
GR   2007.5  10673.7    2003.9   10724.6    2002.2   10749.2   2001.8   10770.0    2004.1    10785.6
GR   2003.5  10805.2    2003.2   10827.6    2001.6   10860.0   1999.2   10891.1    2001.7    10906.8
GR   2002.3  10940.4    2004.8   10987.4    2004.1   11015.9   2003.8   11039.5    2004.1    11056.8
```

GR	2002.8	11066.3	2004.3	11079.2	2004.4	11101.6	2003.9	11167.6	2002.4	11220.3
GR	1999.1	11233.1	2000.0	11241.5	2007.3	11260.6	2009.0	11280.2	2010.4	11351.8
GR	2011.2	11396.0	2011.3	11451.5	2012.2	11490.7	2014.6	11510.2	2013.8	11525.4
GR	2015.7	11578.3	2017.2	11622.8	2019.3	11674.3	2020.1	11725.2	2023.7	11762.7
GR	2026.1	11775.0	2028.6	11830.2	2028.7	11857.6	2028.8	11871.3	2031.8	11874.7
GR	2032.5	11894.8	2033.2	11915.5	2033.8	11937.4	2034.5	11954.2	2035.3	11971.8

QT	1	32000								
ET	32.887	9.1							9866.2	10565.9

SECTIONS 32.887 TO 32.983 THE RIGHT LEVEE HAS BEEN REMOVED.

X1	32.887	95	9882.4	10160.6	540	470	510			
GR	2020.6	08590.1	2018.2	08666.5	2016.8	08740.4	2015.7	08746.6	2016.5	08767.8
GR	2015.4	08790.2	2015.0	08849.3	2012.6	08913.7	2012.1	08959.8	2011.2	08986.7
GR	2009.3	08999.0	2005.7	09014.7	2004.7	09041.0	2004.1	09052.2	2004.7	09067.9
GR	2001.1	09084.1	2001.4	09094.8	2007.2	09116.6	2009.5	09131.1	2008.5	09182.1
GR	2007.2	09208.1	2008.6	09223.5	2008.1	09248.1	2005.4	09268.3	2007.3	09289.6
GR	2007.8	09350.9	2007.8	09403.8	2007.6	09455.3	2007.6	09524.7	2010.4	09549.9
GR	2011.0	09582.3	2010.5	09585.4	2010.6	09616.5	2010.9	09630.5	2009.9	09683.4
GR	2011.1	09717.5	2012.5	09751.4	2013.2	09806.0	2016.5	09812.4	2017.5	09841.5
GR	2017.0	09849.4	2017.7	09866.2	2009.5	09882.4	2000.3	09898.1	2001.5	09960.2
GR	1999.4	09967.5	1999.4	09992.1	1999.4	10000.0	1999.4	10012.8	1999.4	10048.7
GR	1999.4	10103.2	1999.4	10126.5	1999.4	10147.2	2003.5	10160.6	2005.2	10203.2
GR	2005.1	10229.5	2004.1	10255.8	2003.9	10292.2	2004.7	10306.2	2005.3	10349.8
GR	2004.1	10388.5	2002.7	10401.3	2003.2	10405.8	2005.1	10422.9	2004.8	10459.5
GR	2004.4	10508.5	2010.0	10565.9	2006.9	10575.4	2005.9	10616.0	2004.9	10637.3
GR	2004.1	10667.8	2002.7	10709.8	2003.4	10760.2	2003.4	10784.2	2002.6	10796.0
GR	2000.9	10803.0	2005.2	10820.6	2005.6	10874.6	2005.7	10904.0	2006.5	10937.6
GR	2005.1	10958.9	2005.7	10974.8	2005.3	11003.1	2004.8	11072.8	2004.6	11095.5
GR	2001.6	11112.8	2002.6	11126.3	2008.0	11144.7	2010.5	11192.9	2010.9	11261.2
GR	2012.3	11313.5	2013.3	11369.2	2016.9	11426.9	2019.1	11471.1	2021.6	11517.0

ET	32.983	9.1							9570	10565.3
X1	32.983	95	9823.1	10160.9	510	510	510			
GR	2019.0	08431.4	2018.2	08443.7	2018.5	08475.1	2019.9	08517.0	2020.0	08542.8
GR	2017.0	08622.3	2016.5	08683.9	2013.0	08745.2	2013.5	08791.3	2013.7	08807.9
GR	2013.1	08861.0	2008.3	08889.9	2006.2	08899.4	2006.6	08925.1	2013.5	08951.7
GR	2014.2	08982.0	2012.2	09047.2	2011.6	09101.2	2014.3	09130.3	2017.9	09163.6
GR	2018.7	09250.4	2017.7	09280.6	2015.9	09290.7	2016.7	09326.0	2015.4	09373.3
GR	2013.8	09417.8	2004.1	09444.9	2002.9	09491.9	2003.1	09500.0	2007.2	09525.2
GR	2008.5	09552.9	2009.8	09579.0	2010.3	09620.4	2009.0	09650.6	2006.7	09680.9
GR	2007.3	09716.7	2006.1	09757.6	2007.6	09786.1	2015.8	09805.1	2016.7	09823.1
GR	2008.8	09832.6	2007.1	09899.7	2006.4	09946.2	2006.1	10000.0	2005.8	10013.4
GR	2005.8	10053.1	2005.8	10074.4	2005.8	10118.6	2005.8	10123.7	2005.8	10140.0
GR	2010.0	10160.9	2011.6	10197.6	2011.6	10243.7	2009.6	10296.1	2006.8	10314.3
GR	2006.1	10360.5	2006.2	10382.3	2011.7	10397.4	2012.1	10411.7	2010.6	10470.2
GR	2009.8	10492.0	2011.2	10536.5	2011.7	10565.3	2012.7	10579.3	2013.4	10622.4
GR	2009.9	10650.4	2010.1	10686.3	2011.8	10748.4	2007.7	10770.2	2009.2	10787.3
GR	2010.7	10813.9	2010.8	10840.2	2010.0	10862.0	2010.3	10913.0	2011.2	10975.1
GR	2010.3	11022.1	2011.3	11045.9	2010.8	11071.4	2007.6	11081.5	2008.1	11091.6
GR	2011.6	11103.9	2011.4	11164.3	2012.0	11169.9	2014.1	11189.2	2015.4	11228.7
GR	2015.2	11269.0	2015.5	11337.3	2016.4	11389.4	2017.0	11413.7	2019.7	11475.0
GR	2021.7	11508.6	2022.9	11537.7	2027.7	11590.3	2032.5	11629.0	2036.1	11710.1

NC	.075	.075	.035	0.3	0.5					
ET	33.082	9.1							9680	10470
X1	33.082	95	9812.4	10132.9	520	520	520			
GR	2022.6	08590.4	2023.2	08621.2	2021.8	08660.6	2019.6	08673.8	2018.2	08710.2
GR	2020.6	08729.8	2021.6	08757.8	2025.0	08825.5	2028.2	08880.4	2030.2	08920.1
GR	2029.7	08962.6	2031.0	09000.7	2030.8	09048.8	2033.2	09088.0	2031.8	09131.7
GR	2031.1	09161.9	2031.3	09197.2	2029.7	09215.4	2022.9	09259.6	2020.2	09303.8
GR	2019.3	09339.4	2019.2	09398.2	2016.1	09435.1	2015.4	09458.6	2016.8	09467.9
GR	2013.2	09506.2	2012.7	09543.2	2013.5	09610.3	2013.7	09673.0	2012.7	09740.8
GR	2012.4	09778.8	2021.7	09797.3	2022.1	09812.4	2016.4	09825.3	2012.7	09846.3
GR	2013.9	09884.4	2013.1	09918.2	2011.4	09950.7	2011.6	09973.1	2013.0	10000.0
GR	2013.0	10041.9	2011.7	10072.2	2011.2	10105.8	2021.0	10118.3	2022.0	10132.9
GR	2014.3	10148.9	2015.9	10160.9	2010.4	10171.2	2011.2	10180.8	2014.9	10189.2
GR	2015.5	10211.6	2015.3	10231.1	2016.0	10242.3	2014.6	10282.9	2009.3	10301.4
GR	2010.8	10335.8	2011.9	10361.3	2011.7	10396.8	2016.0	10408.6	2016.7	10434.1
GR	2016.5	10460.7	2017.6	10483.9	2016.7	10536.8	2016.3	10563.9	2017.9	10581.0
GR	2018.1	10620.8	2015.5	10635.9	2015.1	10674.5	2013.6	10695.8	2015.4	10731.3
GR	2015.5	10774.2	2015.9	10828.7	2015.4	10858.1	2013.8	10904.9	2014.5	10956.1
GR	2014.5	10972.9	2020.1	10993.0	2019.5	11046.8	2018.6	11064.1	2019.1	11108.4
GR	2016.1	11133.8	2012.9	11140.8	2012.9	11146.4	2016.1	11159.0	2016.4	11170.2
GR	2018.0	11187.6	2018.1	11238.2	2017.7	11270.7	2018.7	11314.4	2019.9	11354.1
GR	2021.1	11399.5	2023.8	11447.0	2025.1	11494.1	2027.5	11532.7	2032.7	11574.7
ET		9.1							9832.6	10232.6

SECTIONS 33.173 TO 33.277 THE PROPOSED LEVEES AT THE LEFT AND RIGHT
BANKS HAVE BEEN ENGINEERED TO BE STABLE. THE EFFECTIVE FLOW AREA IS
ENCROACHED TO REFLECT BRIDGE MODELING.
DOWNSTREAM FACE OF NEW RIVER ROAD BRIDGE.

X1	33.173	75	9832.6	10232.6	463	463	463			
X3	10							2027.4	2027.4	
GR	2031.7	08419.1	2032.8	08540.0	2034.2	08619.5	2035.0	08704.9	2035.3	08782.9
GR	2036.3	08838.4	2035.6	08937.4	2035.3	09032.6	2033.3	09146.8	2030.3	09226.9
GR	2027.6	09301.0	2025.1	09393.1	2023.8	09476.0	2024.0	09537.0	2024.4	09588.2
GR	2025.6	09652.9	2026.2	09719.5	2026.7	09779.9	2027.4	09832.6	2016.0	09856.0
GR	2016.0	09868.4	2016.0	09895.8	2016.0	09911.5	2016.0	09936.7	2016.0	09952.9
GR	2016.0	09977.6	2016.0	09993.8	2016.0	10000.0	2016.0	10011.7	2016.0	10025.4
GR	2016.0	10058.7	2016.0	10073.0	2016.0	10110.8	2016.0	10149.4	2016.0	10209.8
GR	2027.4	10232.6	2025.2	10292.4	2023.2	10373.1	2023.5	10446.7	2023.9	10516.6
GR	2024.2	10557.0	2024.5	10620.8	2024.5	10668.9	2021.0	10682.6	2019.7	10714.0
GR	2020.5	10736.4	2025.7	10759.3	2023.8	10828.5	2023.0	10888.1	2023.5	10931.2
GR	2027.8	10958.6	2029.0	10981.3	2029.0	11012.6	2027.0	11048.7	2026.8	11100.0
GR	2026.5	11115.1	2027.8	11121.2	2026.9	11139.7	2025.5	11161.3	2025.8	11187.8
GR	2026.3	11205.8	2025.0	11227.9	2024.1	11273.8	2023.2	11298.1	2020.6	11309.9
GR	2023.2	11320.0	2023.5	11329.5	2026.5	11355.8	2027.7	11389.4	2029.6	11407.6
GR	2033.4	11441.2	2036.8	11464.4	2040.9	11509.2	2043.2	11524.8	2043.3	11558.7
ET	33.184	9.11							9849.4	10249.4
SB	1.05	1.56	2.7		350.4	12	4000	2.00	2016.0	2016.0

24 in next model

UPSTREAM FACE OF NEW RIVER ROAD BRIDGE.
THIS BRIDGE IS PROPOSED TO BE FOUR SPANS WITH 3-4 FT DIAMETER PIERS
SPACED 100 FT ON CENTER. THE BRIDGE LOW CHORD WILL BE ESTABLISHED

X1	33.184	80	9849.4	10249.4	68	68	68			
X2			1	2027.0	2028.0					
X3	10									
BT	-5	9209.0	2032.5		9849.4	2028.7		9849.5	2032.0	2027.0
BT		10249.3	2032.0	2027.0	10249.4	2028.0				
GR	2032.0	08430.6	2034.2	08554.5	2035.1	08630.7	2036.9	08732.0	2037.9	08832.8
GR	2038.4	08874.8	2037.2	08903.3	2037.5	09016.4	2035.2	09115.5	2032.5	09209.0
GR	2029.7	09248.7	2027.8	09309.7	2026.4	09370.2	2024.6	09412.7	2024.6	09504.0
GR	2023.8	09557.7	2024.9	09618.2	2025.2	09667.1	2024.8	09741.9	2026.2	09790.0
GR	2027.5	09824.2	2028.7	09849.4	2016.0	09875.0	2016.0	09900.9	2016.0	09938.9
GR	2016.0	09960.2	2016.0	09984.3	2016.0	10000.0	2016.0	10034.4	2016.0	10048.4
GR	2016.0	10071.0	2016.0	10106.9	2016.0	10125.9	2016.0	10143.8	2016.0	10158.4
GR	2016.0	10172.4	2016.0	10225.4	2028.0	10249.4	2024.1	10331.9	2025.0	10396.3
GR	2025.9	10424.8	2024.8	10501.8	2024.0	10550.5	2024.7	10597.3	2025.4	10624.7
GR	2025.8	10659.1	2025.1	10677.3	2023.7	10697.2	2022.7	10714.3	2026.1	10731.3
GR	2024.8	10788.4	2024.1	10831.3	2024.4	10882.2	2025.1	10918.0	2028.3	10949.4
GR	2029.2	10967.8	2029.0	11002.0	2027.9	11052.4	2028.3	11087.1	2027.7	11092.4
GR	2027.7	11117.9	2028.4	11121.8	2027.0	11141.4	2026.4	11187.8	2027.3	11218.6
GR	2026.8	11253.6	2025.8	11280.8	2024.8	11302.0	2024.2	11322.5	2024.7	11348.2
GR	2021.9	11358.3	2024.6	11377.1	2029.2	11404.8	2034.8	11437.5	2036.6	11452.6
GR	2038.8	11474.5	2041.5	11504.1	2043.1	11539.4	2044.8	11576.9	2044.8	11581.7

NC	.050	.050	.035	0.3	0.5					
ET	33.277	9.1							9854	10488 ✓
X1	33.277	85	9854.4	10139.3	453	493	473			
GR	2053.9	09189.1	2044.6	09216.5	2039.5	09256.3	2045.0	09288.4	2051.7	09316.7
GR	2052.0	09329.3	2055.0	09332.4	2056.0	09344.7	2058.3	09348.1	2059.8	09369.3
GR	2058.4	09403.5	2054.9	09420.6	2041.3	09447.1	2039.7	09488.0	2040.5	09507.0
GR	2036.7	09521.6	2036.2	09528.9	2041.0	09544.6	2044.3	09561.9	2041.2	09592.7
GR	2044.9	09624.6	2044.8	09652.6	2044.9	09686.7	2040.6	09701.3	2032.0	09725.6
GR	2024.8	09738.8	2025.1	09770.7	2027.2	09808.5	2027.3	09843.8	2031.4	09854.4
GR	2021.8	09874.3	2020.4	09916.0	2020.5	09962.7	2021.3	10000.0	2022.4	10046.1
GR	2022.3	10071.9	2023.4	10114.4	2032.7	10139.3	2027.3	10153.1	2026.9	10224.1
GR	2024.3	10244.9	2021.4	10261.7	2022.7	10287.1	2027.6	10312.0	2027.6	10324.1
GR	2027.6	10341.7	2027.6	10365.5	2027.6	10390.1	2027.6	10475.8	2033.7	10488.0
GR	2033.7	10508.0	2027.6	10520.2	2027.8	10581.3	2031.4	10593.1	2029.9	10647.9
GR	2029.8	10679.3	2028.1	10687.7	2032.9	10714.0	2032.9	10750.4	2031.7	10758.2
GR	2034.5	10773.9	2034.1	10832.7	2033.4	10892.6	2032.5	10940.7	2033.0	11004.0
GR	2033.5	11061.6	2033.7	11106.4	2034.5	11138.9	2035.2	11211.1	2037.3	11272.1
GR	2040.8	11298.4	2044.6	11339.3	2046.4	11360.0	2048.1	11397.2	2047.6	11418.2
GR	2050.0	11427.2	2050.8	11478.7	2051.4	11502.7	2050.2	11526.8	2050.4	11538.0
GR	2051.8	11561.0	2049.4	11598.5	2045.2	11643.0	2042.7	11677.4	2053.9	11696.4

NC	.050	.050	.035	0.1	0.3					
ET	33.375	9.1							9650	10778
X1	33.375	60	9872.0	10142.1	550	500	520			
GR	2126.8	09600.8	2103.7	09632.2	2072.7	09674.1	2051.1	09704.4	2030.1	09733.5
GR	2031.6	09761.5	2030.7	09788.3	2031.3	09838.7	2029.4	09860.6	2029.4	09872.0
GR	2026.1	09886.3	2026.5	09907.0	2024.6	09949.6	2025.7	09976.7	2026.6	10000.0
GR	2027.7	10022.9	2027.7	10076.6	2030.8	10094.6	2030.8	10116.7	2032.3	10142.1
GR	2030.7	10214.4	2027.0	10227.5	2027.5	10249.6	2029.4	10265.6	2030.0	10309.0

ET on 33.277
Different!

GR	2032.0	10336.7	2030.9	10379.2	2029.0	10404.7	2025.5	10410.8	2026.4	10430.4
GR	2030.6	10446.7	2031.3	10525.0	2032.1	10557.8	2035.9	10581.0	2035.1	10652.7
GR	2034.8	10699.7	2035.4	10725.5	2037.2	10741.7	2037.8	10778.1	2034.5	10796.5
GR	2034.4	10810.0	2033.2	10815.6	2034.2	10836.3	2035.2	10879.4	2036.9	10907.4
GR	2037.2	10930.3	2036.6	10987.4	2036.4	11043.4	2036.9	11122.9	2037.1	11191.2
GR	2037.8	11244.9	2038.9	11293.4	2040.7	11349.1	2041.4	11378.7	2043.9	11419.0
GR	2047.1	11449.0	2052.5	11492.4	2058.9	11527.9	2070.4	11588.7	2078.8	11644.6
ET	33.466	9.1							9515	10750
X1	33.466	65	9927.5	10150.5	500	440	480			
GR	2090.6	09514.9	2072.6	09559.7	2053.2	09592.7	2037.7	09619.6	2037.8	09699.1
GR	2032.3	09717.8	2033.3	09744.4	2034.5	09757.3	2036.5	09791.4	2032.6	09824.5
GR	2035.1	09836.2	2036.1	09863.4	2037.0	09927.5	2031.6	09938.1	2031.4	09969.4
GR	2032.7	10000.0	2034.2	10014.2	2032.1	10040.5	2030.4	10055.1	2030.5	10060.7
GR	2033.4	10073.0	2030.6	10103.2	2030.7	10117.5	2035.1	10130.7	2036.9	10150.5
GR	2036.5	10195.6	2035.9	10232.0	2037.1	10247.7	2037.1	10291.3	2035.2	10329.4
GR	2035.2	10375.0	2035.2	10430.2	2031.6	10453.7	2031.7	10465.4	2033.9	10481.7
GR	2030.7	10505.7	2031.0	10523.6	2034.1	10535.4	2037.0	10557.2	2034.7	10569.0
GR	2036.6	10589.1	2037.8	10634.5	2039.3	10649.0	2040.7	10689.3	2041.1	10710.3
GR	2041.2	10751.5	2037.8	10770.5	2037.4	10788.4	2038.7	10805.8	2038.1	10834.6
GR	2039.7	10888.6	2041.0	10939.6	2041.7	10995.8	2041.1	11062.7	2041.8	11156.8
GR	2041.7	11226.2	2041.0	11306.2	2041.7	11353.5	2042.9	11409.2	2044.2	11465.8
GR	2045.6	11487.1	2046.9	11503.3	2051.4	11512.8	2057.0	11521.8	2066.8	11538.0
NC	.055	.055	.035	0.1	0.3					
X1	33.559	60	9898.9	10133.2	470	500	490			
GR	2086.8	09445.2	2084.9	09517.4	2066.5	09552.9	2050.8	09573.9	2041.3	09590.7
GR	2038.0	09604.7	2038.0	09610.9	2040.4	09623.2	2041.8	09661.6	2041.8	09673.6
GR	2040.4	09689.3	2041.0	09703.8	2038.5	09713.1	2039.1	09745.2	2040.6	09752.0
GR	2041.1	09766.5	2040.3	09820.0	2039.2	09873.7	2038.6	09889.9	2038.8	09898.9
GR	2037.0	09925.5	2035.1	09950.7	2035.4	09970.8	2040.5	09982.3	2036.1	09994.4
GR	2035.8	10000.0	2035.2	10006.1	2037.3	10049.8	2040.6	10107.4	2039.3	10122.5
GR	2041.9	10133.2	2042.3	10190.8	2041.7	10238.1	2040.7	10308.4	2040.9	10365.5
GR	2041.2	10425.4	2041.7	10449.2	2040.8	10473.5	2036.5	10506.6	2034.8	10517.2
GR	2035.2	10529.0	2048.8	10550.8	2047.1	10605.9	2048.0	10629.4	2047.8	10673.4
GR	2043.8	10692.4	2045.6	10763.2	2044.9	10785.3	2045.8	10873.2	2046.9	10918.3
GR	2047.9	10981.8	2048.6	11044.5	2049.7	11098.3	2050.6	11164.6	2051.1	11209.4
GR	2053.3	11233.7	2055.3	11249.4	2060.4	11265.7	2066.8	11280.5	2081.2	11320.0
X1	33.661	55	9688.7	9839.8	500	540	540			
GR	2136.8	09399.8	2118.5	09439.0	2104.6	09458.1	2088.9	09476.5	2077.7	09509.0
GR	2061.1	09542.6	2053.4	09565.0	2048.0	09605.0	2045.8	09648.4	2042.7	09663.8
GR	2042.9	09671.9	2046.6	09682.3	2046.6	09688.7	2039.5	09702.7	2042.8	09732.4
GR	2043.1	09753.1	2044.5	09766.0	2045.1	09789.5	2044.4	09795.6	2044.7	09820.8
GR	2046.0	09839.8	2045.8	09859.4	2044.1	09876.8	2045.7	09895.8	2044.9	09934.5
GR	2046.6	09963.0	2045.5	09998.8	2045.1	10000.0	2042.6	10044.7	2044.4	10063.2
GR	2044.3	10101.3	2042.4	10124.2	2042.7	10136.3	2043.6	10142.7	2045.3	10176.8
GR	2045.3	10200.4	2043.6	10230.0	2044.0	10244.6	2049.5	10270.3	2050.3	10299.4
GR	2051.4	10310.9	2051.9	10352.6	2051.7	10434.9	2052.2	10506.0	2051.9	10550.2
GR	2054.1	10568.4	2054.6	10573.2	2054.0	10583.3	2058.2	10611.3	2060.1	10625.2
GR	2059.8	10666.7	2066.4	10677.3	2073.1	10709.2	2079.3	10747.8	2090.8	10861.5

X1	33.756	40	9900.3	10092.0	500	500	500			
GR	2089.3	09650.1	2076.1	09702.1	2062.6	09729.6	2049.2	09759.0	2048.1	09793.4
GR	2048.8	09806.8	2050.2	09819.7	2050.3	09839.3	2049.1	09849.9	2048.5	09900.3
GR	2048.8	09932.8	2048.7	09979.2	2047.9	10000.0	2047.3	10023.7	2051.7	10035.8
GR	2051.8	10092.0	2051.8	10144.9	2050.8	10168.4	2053.0	10188.0	2052.9	10247.4
GR	2050.3	10265.9	2050.5	10291.3	2052.4	10304.8	2051.3	10328.6	2047.4	10345.3
GR	2048.0	10353.7	2058.5	10376.1	2057.4	10426.0	2057.5	10506.0	2058.1	10557.2
GR	2061.5	10586.3	2064.5	10627.5	2068.8	10660.0	2065.3	10668.6	2066.0	10714.3
GR	2075.6	10717.3	2080.4	10731.3	2082.1	10749.0	2081.0	10756.2	2082.5	10765.2

X1	33.851	50	9881.8	10031.9	490	500	500			
X3						10360.7	2061.5			
GR	2088.1	09394.2	2080.7	09436.8	2076.6	09472.1	2073.7	09526.9	2072.0	09594.9
GR	2071.8	09652.9	2070.5	09671.6	2062.9	09692.3	2055.4	09710.0	2053.5	09734.6
GR	2053.2	09773.2	2053.7	09789.2	2054.3	09839.3	2054.3	09881.8	2051.7	09889.9
GR	2051.9	09928.3	2050.3	09959.4	2047.7	09988.2	2047.7	10000.0	2048.3	10013.4
GR	2054.5	10031.9	2056.5	10084.5	2056.9	10110.0	2057.2	10126.7	2056.2	10141.6
GR	2056.3	10175.7	2055.1	10198.1	2053.0	10213.8	2053.2	10222.8	2056.6	10233.4
GR	2056.1	10267.5	2055.7	10289.9	2057.9	10303.9	2056.3	10316.8	2060.7	10342.5
GR	2061.5	10360.7	2060.2	10415.9	2060.9	10425.4	2060.8	10442.5	2059.0	10447.8
GR	2060.8	10475.2	2063.9	10541.8	2068.5	10566.7	2069.7	10578.8	2070.5	10588.0
GR	2068.5	10594.5	2070.2	10639.2	2074.2	10642.6	2077.0	10651.0	2079.4	10661.6

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


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS



CCHV=     .300 CEHV=     .500
*SECNO 32.174

3470 ENCROACHMENT STATIONS=     9843.9   10300.0  TYPE=       1  TARGET=      456.100
        3000 CFS BREAK OUT OVER THE LEFT OVERBANK.  THE 3000 CFS FLOWS SOUTH
        AND THEN WEST OVER I-17 TO GO BACK INTO THE MAIN CHANNEL AT ABOUT
        SECTION 31.974.  THE EXTENT OF THE ZONE A02 FLOOD LIMIT IS BASED ON
        NORMAL DEPTH CALCULATIONS USING DIGITIZED CROSS SECTION INFORMATION.
   32.174     13.98   1981.58   1978.93       .00   1983.97      2.39       .00       .00   1981.90
  30400.0        .0   30340.0      60.0        .0    2444.2      20.9        .0        .0   1977.20
      .00       .00     12.41      2.87      .000      .035      .050      .000   1967.60   9844.97
  .003731      520.      300.       50.         0        14         0       .00    239.77  10084.74


FLOW DISTRIBUTION FOR SECNO=     32.17          CWSEL=    1981.58

STA=    9845.    10075.    10085.
  PER Q=      99.8        .2
   AREA=    2444.2      20.9
    VEL=      12.4       2.9
  DEPTH=      10.6       2.2

CCHV=     .100 CEHV=     .300
*SECNO 32.267

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   32.267     11.96   1984.36   1984.36       .00   1987.55      3.19      2.46       .24   1980.40
  33400.0    4291.0   29052.0      57.0     739.7    1912.0      25.5      28.9       3.9   1982.70
      .01      5.80     15.19      2.23      .050      .035      .050      .000   1972.40   9734.45
  .006905      490.      490.      480.         0        15         0       .00    446.85  10181.29


FLOW DISTRIBUTION FOR SECNO=     32.27          CWSEL=    1984.36
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


STA=   9734.    9746.    9809.    9842.    9852.    9894.    9909.    9921.    9942.   10151.   10181.
 PER Q=      .3      4.6      1.9       .7      2.3      1.1       .8      1.1     87.0       .2
  AREA=    24.9    248.4    114.2     38.7    138.5     61.8     46.1     67.0   1912.0     25.5
   VEL=     3.9      6.2      5.7      5.9      5.5      6.1      6.1      5.3     15.2      2.2
 DEPTH=     2.1      4.0      3.5      3.8      3.4      4.0      4.0      3.2      9.1       .9

*SECNO 32.358

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     9748.6   10400.0  TYPE=      1  TARGET=      651.400
    32.358     15.04   1988.34   1986.25       .00   1990.03      1.70      2.34       .15   1985.00
   33400.0    2553.6   20142.1   10704.3     620.3    1667.3    1358.7      64.1       9.3   1982.00
       .02      4.12     12.08      7.88      .050      .035      .050      .000   1973.30   9756.65
   .003586      490.      480.      490.         2         8         0       .00    521.28  10277.93


FLOW DISTRIBUTION FOR SECNO=     32.36          CWSEL=   1988.34

STA=   9757.    9796.    9814.    9842.    9858.    9902.    9966.   10123.   10190.   10215.   10238.   10266.   10278.
 PER Q=      .0       .5      2.0       .9      1.9      2.4     60.3      9.7      6.1      9.0      6.9       .4
  AREA=    14.7     51.0    131.5     65.6    152.7    204.9   1667.3    486.0    247.1    307.0    281.1     37.6
   VEL=      .9      3.5      5.0      4.5      4.1      3.9     12.1      6.7      8.2      9.8      8.1      3.5
 DEPTH=      .4      2.9      4.6      4.0      3.4      3.2     10.6      7.3     10.0     12.9     10.1      3.2

CCHV=     .100 CEHV=     .300
*SECNO 32.455

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9752.2   10400.0  TYPE=      1  TARGET=      647.800
    32.455     11.17   1990.17   1990.17       .00   1993.91      3.73      2.58       .61   1986.30
   33400.0    2289.4   31109.9        .7     483.6    1943.1        .8      99.8      14.4   1989.60
       .03      4.73     16.01       .86      .065      .035      .065      .000   1979.00   9798.41
   .007642      510.      510.      520.         0        19         0       .00    353.99  10152.40
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 32.46 CWSEL= 1990.17

STA=	9798.	9807.	9818.	9838.	9898.	9935.	10150.	10152.
PER Q=	.1	.4	1.1	3.3	2.0	93.1	.0	
AREA=	9.2	32.8	76.3	224.9	140.4	1943.1	.8	
VEL=	2.1	4.1	4.8	4.8	4.8	16.0	.9	
DEPTH=	1.1	2.9	3.7	3.8	3.8	9.1	.3	

CCHV= .300 CEHV= .500
*SECNO 32.553
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9800.0 10500.0 TYPE= 1 TARGET= 700.000

32.553	15.74	1996.54	1996.54	.00	2000.72	4.17	3.39	.22	1986.60
33400.0	4254.9	27541.5	1603.5	714.6	1540.9	375.9	130.0	18.7	1988.50
.04	5.95	17.87	4.27	.065	.035	.065	.000	1980.80	9831.36
.005626	520.	520.	520.	0	11	0	.00	367.68	10199.04

FLOW DISTRIBUTION FOR SECNO= 32.55 CWSEL= 1996.54

STA=	9831.	9874.	9898.	9934.	9945.	9973.	10087.	10108.	10139.	10176.	10199.
PER Q=	.5	1.1	3.3	1.8	6.1	82.5	2.2	1.4	1.1	.2	
AREA=	69.7	86.8	203.6	90.2	264.3	1540.9	127.9	112.1	106.5	29.3	
VEL=	2.4	4.1	5.4	6.5	7.7	17.9	5.7	4.1	3.4	2.0	
DEPTH=	1.6	3.7	5.6	7.6	9.5	13.6	6.1	3.6	2.8	1.3	

*SECNO 32.585

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.78

3370 NORMAL BRIDGE, NRD= 45 MIN ELTRD= 1989.40 MAX ELLC= 2002.00

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

3470 ENCROACHMENT STATIONS= 9844.1 10184.8 TYPE= 1 TARGET= 340.688

DOWNSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.

32.585	14.21	2001.21	1994.71	.00	2002.20	1.00	.53	.95	2002.00
33400.0	.0	33400.0	.0	.0	4172.2	.0	144.5	20.3	100000.00
.05	.00	8.01	.00	.000	.035	.000	.000	1987.00	9845.54
.001777	83.	183.	430.	4	12	0	.00	320.31	10183.25

FLOW DISTRIBUTION FOR SECNO= 32.58 CWSEL= 2001.21

STA= 9846. 10185.
PER Q= 100.0
AREA= 4172.2
VEL= 8.0
DEPTH= 13.0

*SECNO 32.601

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 45 MIN ELTRD= 1989.40 MAX ELLC= 2002.00

3470 ENCROACHMENT STATIONS= 9844.1 10184.8 TYPE= 1 TARGET= 340.688

UPSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.
THIS BRIDGE IS PROPOSED TO BE FIVE SPANS WITH 4-5 FT DIAMETER PIERS
SPACED 80 FT ON CENTER. THE BRIDGE LOW CHORD WILL BE ESTABLISHED
A MINIMUM 2 FT ABOVE THE 100-YEAR WATER SURFACE. THE FRONTAGE ROAD
WILL BE ESTABLISHED A MINIMUM 3 FT ABOVE THE 100-YEAR WATER SURFACE.

32.601	14.36	2001.36	1994.70	.00	2002.33	.97	.12	.01	2002.00
33400.0	.0	33400.0	.0	.0	4232.0	.0	151.1	20.8	100000.00
.05	.00	7.89	.00	.000	.035	.000	.000	1987.00	9845.25
.001705	68.	68.	68.	2	12	0	.00	322.31	10183.54

FLOW DISTRIBUTION FOR SECNO= 32.60 CWSEL= 2001.36

STA= 9845. 10185.
PER Q= 100.0
AREA= 4232.0
VEL= 7.9
DEPTH= 13.1

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

*SECNO 32.686

3470 ENCROACHMENT STATIONS= 9948.4 10614.3 TYPE= 1 TARGET= 665.899

SECTIONS 32.686 TO 32.983 THE MAIN CHANNEL HAS BEEN REGRADED TO BE
WIDER ALONG THE RIGHT OVERBANK.

32.686	15.48	2001.98	1997.53	.00	2003.06	1.09	.68	.06	1998.20
33400.0	8.5	27380.1	6011.4	8.0	2993.0	2242.7	197.5	25.3	1994.50
.07	1.07	9.15	2.68	.065	.035	.065	.000	1986.50	9964.38
.001385	530.	450.	350.	2	12	0	.00	637.89	10602.28

FLOW DISTRIBUTION FOR SECNO= 32.69 CWSEL= 2001.98

STA=	9964.	9969.	10179.	10292.	10354.	10397.	10538.	10602.
PER Q=	.0	82.0	4.9	3.6	3.5	4.0	1.9	
AREA=	8.0	2993.0	614.6	405.9	346.6	598.4	277.2	
VEL=	1.1	9.1	2.7	3.0	3.4	2.2	2.3	
DEPTH=	1.9	14.2	5.5	6.5	8.0	4.2	4.3	

CCHV= .100 CEHV= .300

*SECNO 32.743

3470 ENCROACHMENT STATIONS= 9785.5 10669.5 TYPE= 1 TARGET= 884.000

32.743	13.08	2002.38	1999.98	.00	2003.66	1.28	.54	.06	1999.60
33400.0	3366.7	25888.6	4144.7	853.0	2549.4	1594.0	229.1	29.6	1998.30
.07	3.95	10.15	2.60	.075	.035	.075	.000	1989.30	9802.68
.002634	380.	300.	200.	2	19	0	.00	854.62	10657.30

FLOW DISTRIBUTION FOR SECNO= 32.74 CWSEL= 2002.38

STA=	9803.	9844.	9862.	9947.	10198.	10277.	10474.	10561.	10657.
PER Q=	3.4	3.9	2.8	77.5	4.1	4.2	3.6	.6	
AREA=	278.2	233.5	341.2	2549.4	427.2	623.2	413.7	129.9	
VEL=	4.1	5.6	2.7	10.2	3.2	2.2	2.9	1.5	
DEPTH=	6.8	12.8	4.0	10.2	5.4	3.2	4.8	1.4	

*SECNO 32.790

3265 DIVIDED FLOW

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

3470 ENCROACHMENT STATIONS= 9143.7 10673.7 TYPE= 1 TARGET= 1530.000

CONFLUENCE WITH TRIBUTARY.

32.790	10.65	2002.85	2001.62	.00	2004.60	1.75	.80	.14	1999.60
33400.0	4394.2	26706.1	2299.7	1221.1	2270.5	863.8	255.2	34.7	1999.70
.08	3.60	11.76	2.66	.075	.035	.075	.000	1992.20	9532.03
.003978	300.	250.	180.	2	15	0	.00	1052.85	10646.32

FLOW DISTRIBUTION FOR SECNO= 32.79 CWSEL= 2002.85

STA=	9532.	9734.	9757.	9859.	9955.	10200.	10399.	10482.	10646.
PER Q=	4.4	3.2	4.1	1.4	80.0	3.1	3.6	.2	
AREA=	402.9	200.8	400.0	217.4	2270.5	452.9	363.1	47.8	
VEL=	3.6	5.3	3.5	2.2	11.8	2.3	3.3	1.2	
DEPTH=	2.0	8.8	3.9	2.3	9.3	2.3	4.3	.3	

*SECNO 32.887

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9866.2 10565.9 TYPE= 1 TARGET= 699.700

SECTIONS 32.887 TO 32.983 THE RIGHT LEVEE HAS BEEN REMOVED.

32.887	8.11	2007.51	2007.51	.00	2010.14	2.64	2.67	.27	2009.50
32000.0	.0	28230.5	3769.5	.0	2043.7	1078.8	298.5	44.5	2003.50
.09	.00	13.81	3.49	.000	.035	.075	.000	1999.40	9885.80
.007393	540.	510.	470.	0	15	0	.00	654.53	10540.33

FLOW DISTRIBUTION FOR SECNO= 32.89 CWSEL= 2007.51

STA=	9886.	10161.	10292.	10401.	10509.	10540.
PER Q=	88.2	4.5	3.5	3.5	.4	
AREA=	2043.7	400.4	315.2	313.8	49.4	
VEL=	13.8	3.6	3.5	3.5	2.3	
DEPTH=	7.4	3.0	2.9	2.9	1.6	

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

*SECNO 32.983

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9570.0 10565.3 TYPE= 1 TARGET= 995.300

32.983	9.49	2012.39	2012.03	.00	2014.17	1.78	3.94	.09	2016.70
32000.0	4677.1	23362.6	3960.3	953.1	1913.3	954.7	339.1	53.9	2010.00
.11	4.91	12.21	4.15	.075	.035	.075	.000	2002.90	9570.00
.008081	510.	510.	510.	2	8	0	.00	964.22	10565.30

FLOW DISTRIBUTION FOR SECNO= 32.98 CWSEL= 2012.39

STA=	9570.	9681.	9717.	9758.	9797.	10161.	10361.	10397.	10565.
PER Q=	4.2	3.3	4.1	3.0	73.0	7.5	3.2	1.7	
AREA=	342.7	193.0	232.8	184.5	1913.3	539.6	188.0	227.1	
VEL=	3.9	5.5	5.7	5.2	12.2	4.4	5.4	2.4	
DEPTH=	3.1	5.4	5.7	4.7	5.8	2.7	5.1	1.4	

CCHV= .300 CEHV= .500
*SECNO 33.082

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9680.0 10470.0 TYPE= 1 TARGET= 790.000

33.082	8.31	2017.61	2017.57	.00	2019.93	2.32	5.49	.27	2022.10
32000.0	3128.7	20341.7	8529.6	490.1	1407.5	1244.9	380.7	64.0	2022.00
.12	6.38	14.45	6.85	.075	.035	.075	.000	2009.30	9680.00
.014381	520.	520.	520.	1	15	0	.00	728.52	10470.00

FLOW DISTRIBUTION FOR SECNO= 33.08 CWSEL= 2017.61

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

STA=	9680.	9741.	9779.	9789.	10133.	10181.	10283.	10336.	10361.	10397.	10470.
PER Q=	5.2	4.2	.4	63.6	3.1	3.5	9.8	4.0	4.9	1.3	
AREA=	271.0	192.1	27.0	1407.5	152.7	250.7	364.6	159.5	206.1	111.3	
VEL=	6.2	7.0	4.2	14.5	6.5	4.4	8.6	8.1	7.7	3.7	
DEPTH=	4.5	5.1	2.6	4.8	3.2	2.5	6.9	6.3	5.8	1.5	

*SECNO 33.173

3470 ENCROACHMENT STATIONS= 9832.6 10232.6 TYPE= 1 TARGET= 400.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2027.40 ELREA= 2027.40

SECTIONS 33.173 TO 33.277 THE PROPOSED LEVEES AT THE LEFT AND RIGHT
BANKS HAVE BEEN ENGINEERED TO BE STABLE. THE EFFECTIVE FLOW AREA IS
ENCROACHED TO REFLECT BRIDGE MODELING.
DOWNSTREAM FACE OF NEW RIVER ROAD BRIDGE.

33.173	6.49	2022.49	2022.24	.00	2025.29	2.80	5.12	.24	2027.40
32000.0	.0	32000.0	.0	.0	2381.3	.0	410.0	69.9	100000.00
.13	.00	13.44	.00	.000	.035	.000	.000	2016.00	9842.68
.008765	463.	463.	463.	1	15	0	.00	380.10	10222.78

FLOW DISTRIBUTION FOR SECNO= 33.17 CWSEL= 2022.49

STA=	9843.	10233.
PER Q=	100.0	
AREA=	2381.3	
VEL=	13.4	
DEPTH=	6.3	

SPECIAL BRIDGE

5227 DOWNSTREAM ELEV IS 2021.49 , NOT 2022.49 HYDRAULIC JUMP OCCURS DOWNSTREAM (IF LOW FLOW CONTROLS)

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	1.05	1.56	2.70	.00	350.40	12.00	4000.00	2.00	2016.00	2016.00

*SECNO 33.184
BTCARD, BRIDGE STENCL= 9849.40 STENCR= 10249.40

3301 HV CHANGED MORE THAN HVINS

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

CLASS B LOW FLOW

3420 BRIDGE W.S.= 2022.44 BRIDGE VELOCITY= 14.15 CALCULATED CHANNEL AREA= 2262.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
.00	2025.70	.00	0.	32000.	4000.	3964.	2027.00	2028.00	0.

3470 ENCROACHMENT STATIONS= 9849.4 10249.4 TYPE= 1 TARGET= 400.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2028.70 ELREA= 100000.00

UPSTREAM FACE OF NEW RIVER ROAD BRIDGE.
THIS BRIDGE IS PROPOSED TO BE FOUR SPANS WITH 3-4 FT DIAMETER PIERS
SPACED 100 FT ON CENTER. THE BRIDGE LOW CHORD WILL BE ESTABLISHED

33.184	7.69	2023.69	.00	.00	2025.70	2.01	.41	.00	2028.70
32000.0	.0	32000.0	.0	.0	2814.9	.0	414.1	70.5	100000.00
.13	.00	11.37	.00	.000	.035	.000	.000	2016.00	9859.49
.005050	68.	68.	68.	0	0	0	.00	381.30	10240.79

FLOW DISTRIBUTION FOR SECNO= 33.18 CWSEL= 2023.69

STA= 9859. 10249.
PER Q= 100.0
AREA= 2814.9
VEL= 11.4
DEPTH= 7.4

CCHV= .300 CEHV= .500
*SECNO 33.277

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

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

3470 ENCROACHMENT STATIONS= 9854.0 10488.0 TYPE= 1 TARGET= 634.000

33.277	8.81	2029.21	2029.21	.00	2031.72	2.51	2.91	.25	2031.40
32000.0	.0	26602.6	5397.4	.0	1946.7	886.7	445.0	75.9	2032.70
.14	.00	13.67	6.09	.000	.035	.050	.000	2020.40	9858.93
.007577	453.	473.	493.	0	8	0	.00	601.84	10479.03

FLOW DISTRIBUTION FOR SECNO= 33.28 CWSEL= 2029.21

STA=	9859.	10139.	10153.	10224.	10245.	10262.	10287.	10312.	10324.	10342.	10366.	10390.	10476.
PER Q=	83.1	.0	2.0	1.4	2.9	5.5	2.1	.2	.3	.4	.4	1.5	
AREA=	1946.7	4.7	150.0	75.2	106.9	181.9	101.2	19.5	28.4	38.4	39.7	138.2	
VEL=	13.7	2.4	4.3	6.1	8.8	9.6	6.5	3.6	3.6	3.6	3.6	3.6	
DEPTH=	7.2	.3	2.1	3.6	6.4	7.2	4.1	1.6	1.6	1.6	1.6	1.6	

STA=	10476.	10479.
PER Q=	.0	
AREA=	2.6	
VEL=	2.1	
DEPTH=	.8	

CCHV= .100 CEHV= .300
*SECNO 33.375

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9650.0 10778.0 TYPE= 1 TARGET= 1128.000

33.375	9.29	2033.89	2033.40	.00	2035.45	1.56	3.63	.09	2029.40
32000.0	2283.5	20165.0	9551.5	442.8	1715.3	1534.4	483.5	84.4	2032.30
.16	5.16	11.76	6.22	.050	.035	.050	.000	2024.60	9728.25
.006544	550.	520.	500.	2	5	0	.00	840.48	10568.73

FLOW DISTRIBUTION FOR SECNO= 33.38 CWSEL= 2033.89

STA=	9728.	9839.	9872.	10142.	10228.	10250.	10309.	10405.	10430.	10525.	10569.
PER Q=	4.7	2.4	63.0	3.7	3.9	5.6	4.5	5.6	5.5	1.0	
AREA=	314.1	128.7	1715.3	238.8	146.7	268.9	284.2	196.1	318.0	81.6	
VEL=	4.8	6.0	11.8	5.0	8.5	6.6	5.1	9.2	5.6	3.8	
DEPTH=	2.8	3.9	6.4	2.8	6.6	4.5	3.0	7.6	3.4	1.9	

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

*SECNO 33.466
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9515.0 10750.0 TYPE= 1 TARGET= 1235.000

33.466	7.87	2038.27	2038.27	.00	2040.06	1.80	3.69	.07	2037.00
32000.0	4858.6	17030.2	10111.2	754.8	1284.8	1428.2	521.9	94.4	2036.90
.17	6.44	13.26	7.08	.050	.035	.050	.000	2030.40	9618.62
.009597	500.	480.	440.	0	15	0	.00	1020.39	10639.01

FLOW DISTRIBUTION FOR SECNO= 33.47 CWSEL= 2038.27

STA=	9619.	9744.	9791.	9836.	9928.	10151.	10329.	10430.	10465.	10506.	10524.	10569.	10639.
PER Q=	5.5	3.1	3.9	2.7	53.2	4.1	5.9	5.4	6.8	4.6	3.4	1.4	
AREA=	246.9	150.7	174.7	182.5	1284.8	305.1	309.1	191.8	232.3	132.7	155.2	102.1	
VEL=	7.1	6.5	7.2	4.7	13.3	4.3	6.1	9.1	9.3	11.1	7.1	4.3	
DEPTH=	2.0	3.2	3.9	2.0	5.8	1.7	3.1	5.4	5.8	7.4	3.4	1.5	

CCHV= .100 CEHV= .300
*SECNO 33.559
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

33.559	8.74	2043.54	2043.54	.00	2045.40	1.86	4.63	.02	2038.80
32000.0	6578.3	18640.8	6780.9	1067.3	1393.9	1134.5	561.5	105.4	2041.90
.18	6.16	13.37	5.98	.055	.035	.055	.000	2034.80	9586.73
.009335	470.	490.	500.	0	8	0	.00	955.64	10542.37

FLOW DISTRIBUTION FOR SECNO= 33.56 CWSEL= 2043.54

STA=	9587.	9623.	9713.	9745.	9820.	9874.	9899.	10133.	10308.	10425.	10507.	10529.	10542.
PER Q=	3.1	3.6	3.5	3.6	4.0	2.7	58.3	4.0	4.7	5.2	6.1	1.1	
AREA=	146.7	229.6	152.2	216.2	203.7	118.8	1393.9	320.8	305.9	267.5	184.5	55.8	
VEL=	6.8	5.0	7.4	5.3	6.3	7.3	13.4	4.0	5.0	6.3	10.6	6.1	
DEPTH=	4.0	2.6	4.7	2.9	3.8	4.7	5.9	1.8	2.6	3.3	8.2	4.2	

*SECNO 33.661

33.661	9.73	2049.23	2049.16	.00	2051.40	2.16	5.91	.09	2046.60
32000.0	2295.0	13041.6	16663.3	299.1	849.9	1919.8	602.1	115.3	2046.00
.20	7.67	15.35	8.68	.055	.035	.055	.000	2039.50	9595.88
.013295	500.	540.	540.	1	8	0	.00	673.17	10269.05

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

FLOW DISTRIBUTION FOR SECNO= 33.66 CWSEL= 2049.23

STA=	9596.	9664.	9689.	9840.	9877.	9935.	9999.	10045.	10063.	10101.	10124.	10143.	10177.
PER Q=	3.9	3.3	40.8	3.3	5.8	4.6	7.3	3.3	5.2	4.3	4.0	4.5	
AREA=	183.5	115.6	849.9	139.8	234.5	213.1	245.3	106.0	186.0	134.7	119.8	163.1	
VEL=	6.8	9.0	15.3	7.6	7.9	6.9	9.5	9.9	9.0	10.1	10.8	8.8	
DEPTH=	2.7	4.6	5.6	3.8	4.1	3.3	5.3	5.7	4.9	5.9	6.5	4.8	

STA=	10177.	10230.	10269.
PER Q=	6.2	3.5	
AREA=	234.3	143.2	
VEL=	8.4	7.9	
DEPTH=	4.4	3.7	

*SECNO 33.756

33.756	7.98	2055.28	2055.04	.00	2057.43	2.16	6.03	.00	2048.50
32000.0	8692.3	16015.4	7292.3	919.8	1114.9	1028.2	637.3	122.8	2051.80
.21	9.45	14.37	7.09	.055	.035	.055	.000	2047.30	9745.65
.011005	500.	500.	500.	2	15	0	.00	623.59	10369.24

FLOW DISTRIBUTION FOR SECNO= 33.76 CWSEL= 2055.28

STA=	9746.	9793.	9820.	9850.	9900.	10092.	10145.	10188.	10266.	10291.	10345.	10369.
PER Q=	7.8	5.0	4.2	10.1	50.0	3.8	3.4	3.6	3.2	5.6	3.3	
AREA=	268.8	166.2	157.9	326.8	1114.9	184.3	160.0	206.8	124.1	232.6	120.3	
VEL=	9.3	9.7	8.5	9.9	14.4	6.5	6.8	5.6	8.2	7.7	8.7	
DEPTH=	5.6	6.3	5.2	6.5	5.8	3.5	3.7	2.7	4.9	4.3	5.0	

*SECNO 33.851

3470 ENCROACHMENT STATIONS= .0 10360.7 TYPE= 1 TARGET= 10360.700

33.851	11.67	2059.37	2059.30	.00	2061.83	2.46	4.31	.09	2054.30
32000.0	6580.9	20196.8	5222.4	950.9	1335.3	999.0	673.6	130.0	2054.50
.22	6.92	15.12	5.23	.055	.035	.055	.000	2047.70	9700.64
.006981	490.	500.	500.	4	14	0	.00	634.08	10334.72

FLOW DISTRIBUTION FOR SECNO= 33.85 CWSEL= 2059.37

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

STA=	9701.	9773.	9839.	9882.	10032.	10085.	10176.	10214.	10268.	10335.
PER Q=		8.1	8.0	4.5	63.1	3.5	3.5	3.2	3.7	2.3
AREA=		371.9	363.6	215.4	1335.3	203.5	252.8	165.6	206.7	170.4
VEL=		7.0	7.0	6.7	15.1	5.6	4.5	6.1	5.8	4.4
DEPTH=		5.1	5.5	5.1	8.9	3.9	2.8	4.3	3.8	2.5

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****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

NEW RIVER: I-17 TO NEW

SUMMARY PRINTOUT

	SECNO	Q	CWSEL	DEPTH	ELMIN	EG	CRIWS	VCH	10*KS	XLCH	SSTA	TOPWID	ENDST
	32.174	30400.00	1981.58	13.98	1967.60	1983.97	1978.93	12.41	37.31	.00	9844.97	239.77	10084.74
*	32.267	33400.00	1984.36	11.96	1972.40	1987.55	1984.36	15.19	69.05	490.00	9734.45	446.85	10181.29
	32.358	33400.00	1988.34	15.04	1973.30	1990.03	1986.25	12.08	35.86	480.00	9756.65	521.28	10277.93
*	32.455	33400.00	1990.17	11.17	1979.00	1993.91	1990.17	16.01	76.42	510.00	9798.41	353.99	10152.40
*	32.553	33400.00	1996.54	15.74	1980.80	2000.72	1996.54	17.87	56.26	520.00	9831.36	367.68	10199.04
*	32.585	33400.00	2001.21	14.21	1987.00	2002.20	1994.71	8.01	17.77	183.00	9845.54	320.31	10183.25
	32.601	33400.00	2001.36	14.36	1987.00	2002.33	1994.70	7.89	17.05	68.00	9845.25	322.31	10183.54
	32.686	33400.00	2001.98	15.48	1986.50	2003.06	1997.53	9.15	13.85	450.00	9964.38	637.89	10602.28
	32.743	33400.00	2002.38	13.08	1989.30	2003.66	1999.98	10.15	26.34	300.00	9802.68	854.62	10657.30
	32.790	33400.00	2002.85	10.65	1992.20	2004.60	2001.62	11.76	39.78	250.00	9532.03	1052.85	10646.32
*	32.887	32000.00	2007.51	8.11	1999.40	2010.14	2007.51	13.81	73.93	510.00	9885.80	654.53	10540.33
	32.983	32000.00	2012.39	9.49	2002.90	2014.17	2012.03	12.21	80.81	510.00	9570.00	964.22	10565.30
	33.082	32000.00	2017.61	8.31	2009.30	2019.93	2017.57	14.45	143.81	520.00	9680.00	728.52	10470.00
	33.173	32000.00	2022.49	6.49	2016.00	2025.29	2022.24	13.44	87.65	463.00	9842.68	380.10	10222.78
*	33.184	32000.00	2023.69	7.69	2016.00	2025.70	.00	11.37	50.50	68.00	9859.49	381.30	10240.79
*	33.277	32000.00	2029.21	8.81	2020.40	2031.72	2029.21	13.67	75.77	473.00	9858.93	601.84	10479.03
	33.375	32000.00	2033.89	9.29	2024.60	2035.45	2033.40	11.76	65.44	520.00	9728.25	840.48	10568.73

	SECNO	Q	CWSEL	DEPTH	ELMIN	EG	CRIWS	VCH	10*KS	XLCH	SSTA	TOPWID	ENDST
*	33.466	32000.00	2038.27	7.87	2030.40	2040.06	2038.27	13.26	95.97	480.00	9618.62	1020.39	10639.01
*	33.559	32000.00	2043.54	8.74	2034.80	2045.40	2043.54	13.37	93.35	490.00	9586.73	955.64	10542.37
	33.661	32000.00	2049.23	9.73	2039.50	2051.40	2049.16	15.35	132.95	540.00	9595.88	673.17	10269.05
	33.756	32000.00	2055.28	7.98	2047.30	2057.43	2055.04	14.37	110.05	500.00	9745.65	623.59	10369.24
	33.851	32000.00	2059.37	11.67	2047.70	2061.83	2059.30	15.12	69.81	500.00	9700.64	634.08	10334.72

NEW RIVER: I-17 TO NEW

SUMMARY PRINTOUT

	SECNO	SHEAR	FRCH	POWER
	32.174	2.47	.67	30.68
*	32.267	3.93	.89	59.70
	32.358	2.38	.65	28.70
*	32.455	4.32	.94	69.09
*	32.553	4.76	.86	85.12
*	32.585	1.37	.40	10.97
	32.601	1.33	.39	10.50
	32.686	1.23	.43	11.23
	32.743	1.67	.56	16.97
	32.790	2.30	.68	27.07
*	32.887	3.43	.89	47.39
	32.983	2.86	.90	34.88
	33.082	3.94	1.22	56.96
	33.173	3.43	.95	46.05
*	33.184	2.33	.74	26.45
*	33.277	3.28	.91	44.86
	33.375	2.59	.82	30.48
*	33.466	3.45	.97	45.74
*	33.559	3.47	.97	46.34
	33.661	4.67	1.14	71.60
	33.756	3.99	1.05	57.37
	33.851	3.88	.89	58.61

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 32.267 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 32.267 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 32.455 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 32.455 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 32.553 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 32.553 PROFILE= 1 MINIMUM SPECIFIC ENERGY

WARNING SECNO= 32.585 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO= 32.887 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 32.887 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 33.184 PROFILE= 1 HYDRAULIC JUMP D.S.

CAUTION SECNO= 33.277 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 33.277 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 33.466 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 33.466 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 33.559 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 33.559 PROFILE= 1 MINIMUM SPECIFIC ENERGY

APPENDIX B

HEC-2 Analysis For
Anticipated Debris Accumulation

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**********************************************
*  HEC-2 WATER SURFACE PROFILES              *
*                                            *
*  Version  4.6.2;  May 1991                 *
*                                            *
*  RUN DATE    07APR94    TIME    10:11:15   *
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**************************************
*  U.S. ARMY CORPS OF ENGINEERS
*  HYDROLOGIC ENGINEERING CENTER
*  609 SECOND STREET, SUITE D
*  DAVIS, CALIFORNIA 95616-4687
*         (916) 756-1104
**************************************
```

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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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****************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
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T1      NEW RIVER FLOODPLAIN ANALYSIS - BRIDGE AND FLOODPLAIN IMPROVEMENTS
T2      100-YEAR PROPOSED FLOODPLAIN    **0179DBL.DAT**    PIERS DOUBLED
T3      NEW RIVER:  I-17 TO NEW RIVER ROAD
T4      REVISED:  APRIL 8, 1994 PER 95% CONSTRUCTION PLANS

J1  ICHECK    INQ      NINV     IDIR     STRT    METRIC    HVINS     Q       WSEL      FQ

       0        2        0        0        0        0        0        0   1981.58       0

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH      FN     ALLDC     IBW     CHNIM    ITRACE

      -1        0       -1        0        0        0       -1        0        0       15


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

      38       43        1        8       42        3        2       26        5       39
      53        4       54                38       67       68       69

NC     .050      .050      .035      0.3       0.5
QT        1     30400
ET   32.174       9.1                                                           9843.9     10300
         3000 CFS BREAK OUT OVER THE LEFT OVERBANK.  THE 3000 CFS FLOWS SOUTH
         AND THEN WEST OVER I-17 TO GO BACK INTO THE MAIN CHANNEL AT ABOUT
         SECTION 31.974.  THE EXTENT OF THE ZONE A02 FLOOD LIMIT IS BASED ON
         NORMAL DEPTH CALCULATIONS USING DIGITIZED CROSS SECTION INFORMATION.
X1   32.174        40    9844.0   10075.2       520        50       300
GR   1985.5   09531.7    1982.9   09551.8    1982.0   09567.5    1983.0   09585.1    1983.2   09628.5
GR   1975.5   09650.1    1975.8   09664.9    1975.6   09709.1    1976.7   09773.5    1978.4   09781.1
GR   1978.9   09791.4    1978.7   09802.1    1980.8   09812.7    1981.9   09844.0    1970.7   09877.9
GR   1972.3   09907.9    1970.4   09932.5    1968.4   09965.8    1967.6   09981.2    1967.8   10000.0
GR   1968.5   10014.2    1969.4   10028.2    1970.2   10054.5    1975.8   10069.6    1977.2   10075.2
GR   1990.7   10104.6    1992.3   10134.0    1994.3   10206.2    1997.2   10299.1    1998.9   10366.0
GR   1994.1   10408.3    1990.1   10445.8    1991.9   10463.7    1997.5   10490.8    2004.7   10535.9
GR   2009.5   10563.3    2015.7   10590.7    2020.9   10651.2    2022.4   10673.6    2023.0   10683.4

QT        1     33400
NC     .050      .050      .035      0.1       0.3
X1   32.267        35    9941.7   10151.4       490       480       490
GR   2025.1   09590.7    2010.7   09629.4    2000.2   09656.0    1993.6   09674.4    1986.3   09680.0
GR   1987.0   09719.5    1984.9   09732.9    1980.2   09746.4    1980.6   09809.1    1981.2   09842.1
GR   1980.0   09852.4    1982.0   09893.6    1978.7   09909.0    1982.0   09920.5    1980.4   09941.7
GR   1972.4   09949.0    1972.7   09977.0    1972.6   09993.8    1973.1   10000.0    1974.2   10008.6
GR   1974.4   10030.7    1975.8   10080.0    1975.9   10111.9    1977.3   10123.7    1982.7   10151.4
GR   1984.3   10181.0    1989.8   10207.1    1995.1   10245.1    1996.1   10282.6    1998.7   10300.0
```

GR	2003.6	10320.4	2008.4	10337.2	2011.8	10367.7	2018.5	10411.7	2024.4	10456.5
ET	32.358	9.1							9748.6	10400
X1	32.358	35	9966.4	10123.4	490	490	480			
GR	2022.9	09615.1	2010.1	09647.3	1997.2	09672.7	1988.0	09687.3	1983.4	09697.9
GR	1983.3	09726.5	1988.5	09748.6	1987.6	09795.9	1983.3	09813.5	1984.1	09841.8
GR	1984.5	09858.0	1985.3	09902.3	1985.0	09966.4	1975.9	09979.5	1973.3	09987.4
GR	1973.9	10000.0	1977.6	10027.9	1978.0	10038.9	1978.0	10057.9	1976.9	10063.8
GR	1977.7	10086.7	1980.9	10103.0	1982.0	10123.4	1980.1	10190.0	1976.5	10214.6
GR	1974.4	10238.4	1982.0	10266.1	1991.6	10284.0	1994.8	10290.2	1997.9	10312.9
GR	2005.4	10336.9	2009.9	10394.3	2013.8	10439.7	2016.9	10474.1	2024.8	10548.8
NC	.065	.065	.035	0.1	0.3					
ET	32.455	9.1							9752.2	10400
X1	32.455	50	9935.0	10149.7	510	520	510			
GR	2020.1	09118.3	2018.5	09138.1	2016.9	09203.9	2014.6	09243.4	2010.2	09282.0
GR	2007.2	09305.0	2008.5	09335.7	2005.3	09367.7	2002.3	09387.8	1998.5	09416.6
GR	1997.3	09444.3	1997.1	09459.5	1993.7	09485.8	1995.5	09522.2	1996.3	09539.5
GR	1993.5	09581.5	1991.4	09619.8	1986.8	09649.8	1987.1	09663.8	1990.3	09689.5
GR	1990.3	09704.1	1987.0	09715.3	1989.6	09727.3	1990.3	09736.6	1993.5	09752.2
GR	1991.5	09793.7	1987.9	09806.5	1986.6	09817.7	1986.3	09838.2	1986.5	09897.8
GR	1986.3	09935.0	1980.5	09957.1	1979.0	09972.5	1979.6	10000.0	1980.1	10059.0
GR	1981.4	10101.6	1981.4	10125.6	1989.6	10149.7	1996.8	10183.6	2000.1	10201.2
GR	2005.3	10256.3	2008.6	10288.2	2013.2	10339.2	2016.3	10363.8	2016.7	10375.6
GR	2024.2	10415.6	2028.4	10449.2	2033.7	10469.6	2036.0	10495.7	2037.5	10528.4
NC	.065	.065	.035	0.3	0.5					
ET	32.553	9.1							9800	10500
X1	32.553	65	9973.1	10086.7	520	520	520			
GR	2025.3	09002.0	2018.1	09061.3	2014.1	09094.9	2013.2	09143.6	2008.9	09206.9
GR	2007.2	09241.6	2003.5	09275.5	1998.5	09297.0	1999.7	09306.0	1998.8	09316.1
GR	1997.1	09321.1	2001.2	09329.5	2006.4	09359.2	2006.5	09395.0	2010.5	09416.3
GR	2012.4	09454.3	2011.1	09481.5	2009.9	09491.6	2012.6	09512.5	2015.1	09518.7
GR	2018.3	09538.9	2019.1	09555.6	2021.7	09571.9	2025.7	09592.0	2029.7	09610.0
GR	2038.6	09646.4	2047.6	09681.7	2055.7	09713.6	2061.3	09738.8	2065.3	09763.4
GR	2048.8	09774.1	2035.8	09791.7	2020.5	09811.6	2003.4	09826.7	1995.6	09832.0
GR	1994.2	09874.3	1991.4	09897.5	1990.4	09933.6	1987.4	09945.4	1986.6	09973.1
GR	1983.6	09989.0	1980.8	09996.3	1980.8	10000.0	1981.4	10012.8	1983.5	10023.2
GR	1982.6	10041.7	1981.1	10052.3	1981.2	10064.3	1988.5	10086.7	1992.4	10107.7
GR	1993.4	10138.5	1994.0	10176.0	1996.9	10202.3	2001.4	10246.0	2003.9	10267.8
GR	2006.5	10304.8	2010.1	10354.0	2013.0	10404.4	2015.9	10467.9	2019.5	10530.1
GR	2021.3	10561.4	2022.8	10592.2	2023.4	10611.5	2024.7	10626.9	2026.0	10644.8
ET		9.1							9844.062	10184.75

DOWNSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.

X1	32.585	47	9860.0	10251.6	83	430	183	0.87		
X2									0.87	
BT	-45	9737.4	2014.8		9776.9	2003.1		9859.9	2004.0	
BT		9860.0	2006.5	2002.0	9892.0	2006.5	2002.0	9933.3	2006.5	2002.0
BT		9933.3	2006.5	2002.0	9938.3	2006.5	2002.0	9938.3	2006.5	2002.0
BT		10013.3	2006.5	2002.0	10013.3	2006.5	2002.0	10018.3	2006.5	2002.0
BT		10018.3	2006.5	2002.0	10093.3	2006.5	2002.0	10093.3	2006.5	2002.0
BT		10098.3	2006.5	2002.0	10098.3	2006.5	2002.0	10173.3	2006.5	2002.0
BT		10173.3	2006.5	2002.0	10178.3	2006.5	2002.0	10219.0	2006.5	2002.0

BT		10251.6	2006.5	2002.0	10251.7	2004.0		10251.8	2004.0	
BT		10270.1	1998.0		10323.7	1996.0		10373.0	1995.5	
BT		10416.0	1995.1		10432.6	1991.6		10449.9	1993.5	
BT		10478.5	1993.7		10500.9	1989.4		10511.2	1989.5	
BT		10536.7	1995.9		10552.7	1997.4		10596.0	1999.0	
BT		10631.0	1999.4		10661.0	1998.7		10701.3	1999.6	
BT		10748.3	2000.6		10790.3	2002.0		10826.1	2004.0	
BT		10871.5	2006.7		10904.5	2008.4		10930.8	2010.4	
GR	2014.8	9737.4	2003.1	9776.9	2004.0	9859.9	2002.0	9860.0	1987.0	9892.0
GR	1987.0	9933.3	2002.0	9933.3	2002.0	9938.3	1987.0	9938.3	1987.0	10013.3
GR	2002.0	10013.3	2002.0	10018.3	1987.0	10018.3	1987.0	10093.3	2002.0	10093.3
GR	2002.0	10098.3	1987.0	10098.3	1987.0	10173.3	2002.0	10173.3	2002.0	10178.3
GR	1987.0	10178.3	1987.0	10219.0	2002.0	10251.6	2004.0	10251.7	2004.0	10251.8
GR	1999.1	10270.1	1998.0	10270.1	1996.0	10323.7	1995.5	10373.0	1995.1	10416.0
GR	1991.6	10432.6	1993.5	10449.9	1993.7	10478.5	1989.4	10500.9	1989.5	10511.2
GR	1995.9	10536.7	1997.4	10552.7	1999.0	10596.0	1999.4	10631.0	1998.7	10661.0
GR	1999.6	10701.3	2000.6	10748.3	2002.0	10790.3	2004.0	10826.1	2006.7	10871.5
GR	2008.4	10904.5	2010.4	10930.8						
ET		9.1							9844.062	10184.75

UPSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.
THIS BRIDGE IS PROPOSED TO BE FIVE SPANS WITH 4-5 FT DIAMETER PIERS
SPACED 80 FT ON CENTER. THE BRIDGE LOW CHORD WILL BE ESTABLISHED
A MINIMUM 2 FT ABOVE THE 100-YEAR WATER SURFACE. THE FRONTAGE ROAD
WILL BE ESTABLISHED A MINIMUM 3 FT ABOVE THE 100-YEAR WATER SURFACE.

X1	32.601	47	9860.0	10251.6	68	68	68	0.87		
X2									0.87	
BT	-45	9737.4	2014.8		9776.9	2003.1		9859.9	2004.0	
BT		9860.0	2006.5	2002.0	9892.0	2006.5	2002.0	9933.3	2006.5	2002.0
BT		9933.3	2006.5	2002.0	9938.3	2006.5	2002.0	9938.3	2006.5	2002.0
BT		10013.3	2006.5	2002.0	10013.3	2006.5	2002.0	10018.3	2006.5	2002.0
BT		10018.3	2006.5	2002.0	10093.3	2006.5	2002.0	10093.3	2006.5	2002.0
BT		10098.3	2006.5	2002.0	10098.3	2006.5	2002.0	10173.3	2006.5	2002.0
BT		10173.3	2006.5	2002.0	10178.3	2006.5	2002.0	10219.0	2006.5	2002.0
BT		10251.6	2006.5	2002.0	10251.7	2004.0		10251.8	2004.0	
BT		10270.1	1998.0		10323.7	1996.0		10373.0	1995.5	
BT		10416.0	1995.1		10432.6	1991.6		10449.9	1993.5	
BT		10478.5	1993.7		10500.9	1989.4		10511.2	1989.5	
BT		10536.7	1995.9		10552.7	1997.4		10596.0	1999.0	
BT		10631.0	1999.4		10661.0	1998.7		10701.3	1999.6	
BT		10748.3	2000.6		10790.3	2002.0		10826.1	2004.0	
BT		10871.5	2006.7		10904.5	2008.4		10930.8	2010.4	
GR	2014.8	9737.4	2003.1	9776.9	2004.0	9859.9	2002.0	9860.0	1987.0	9892.0
GR	1987.0	9933.3	2002.0	9933.3	2002.0	9938.3	1987.0	9938.3	1987.0	10013.3
GR	2002.0	10013.3	2002.0	10018.3	1987.0	10018.3	1987.0	10093.3	2002.0	10093.3
GR	2002.0	10098.3	1987.0	10098.3	1987.0	10173.3	2002.0	10173.3	2002.0	10176.6
GR	1987.0	10178.3	1987.0	10219.0	2002.0	10251.6	2004.0	10251.7	2004.0	10251.8
GR	1999.1	10270.1	1998.0	10270.1	1996.0	10323.7	1995.5	10373.0	1995.1	10416.0
GR	1991.6	10432.6	1993.5	10449.9	1993.7	10478.5	1989.4	10500.9	1989.5	10511.2
GR	1995.9	10536.7	1997.4	10552.7	1999.0	10596.0	1999.4	10631.0	1998.7	10661.0
GR	1999.6	10701.3	2000.6	10748.3	2002.0	10790.3	2004.0	10826.1	2006.7	10871.5
GR	2008.4	10904.5	2010.4	10930.8						

```
ET             9.1                                                                          9948.4    10614.3
        SECTIONS 32.686 TO 32.983 THE MAIN CHANNEL HAS BEEN REGRADED TO BE
        WIDER ALONG THE RIGHT OVERBANK.
X1   32.686        70    9968.6   10179.4       530       350       450
GR   2059.5   09851.9    2044.9   09883.0    2038.3   09898.1    2028.0   09930.0    2016.3   09948.4
GR   1998.2   09968.6    1986.7   09986.8    1986.5   10000.0    1986.5   10016.2    1986.5   10038.0
GR   1986.5   10059.6    1986.5   10075.0    1986.5   10095.7    1986.5   10123.7    1986.5   10139.4
GR   1994.5   10179.4    1995.7   10202.3    1997.7   10237.0    1996.2   10291.5    1995.3   10335.5
GR   1994.4   10354.0    1992.8   10366.8    1992.9   10379.4    1997.0   10397.1    1998.2   10435.1
GR   1997.8   10488.3    1997.3   10538.1    1996.4   10580.1    2005.0   10614.3    1998.7   10666.3
GR   1998.5   10692.6    1999.7   10706.3    1996.8   10737.4    1997.0   10772.1    1999.6   10811.3
GR   2000.9   10851.9    2001.7   10873.2    2000.7   10894.5    2000.3   10952.2    1999.3   10959.4
GR   2001.0   10969.5    2001.1   10997.5    1997.8   11024.6    1994.1   11029.4    1994.7   11038.4
GR   1998.2   11048.4    2000.2   11073.6    2000.9   11102.7    2001.5   11124.0    2003.5   11155.1
GR   2003.8   11177.8    2007.2   11197.1    2004.1   11218.1    2005.6   11283.8    2006.7   11331.7
GR   2008.6   11372.0    2010.4   11391.3    2013.1   11417.3    2014.6   11453.5    2019.0   11489.6
GR   2022.2   11540.8    2024.9   11578.6    2026.7   11605.4    2029.9   11639.0    2033.0   11664.8
GR   2033.6   11679.9    2035.2   11718.5    2039.8   11745.4    2041.9   11754.9    2044.8   11773.4

NC     .075      .075      .035       0.1       0.3
ET                9.1                                                                       9785.5    10669.5
X1   32.743        75    9947.0   10197.8       380       200       300
GR   2017.7   09727.6    2013.3   09750.6    2009.2   09765.7    2005.9   09785.5    2001.7   09806.0
GR   1994.5   09823.9    1989.8   09843.5    1989.3   09861.7    1998.5   09875.4    1999.2   09896.7
GR   1999.6   09947.0    1991.5   09962.7    1991.5   10000.0    1991.5   10029.9    1991.5   10066.3
GR   1991.5   10081.1    1991.5   10163.8    1998.3   10197.8    1997.2   10248.2    1994.0   10276.8
GR   1999.5   10287.4    1999.6   10361.0    2000.2   10393.2    1999.6   10410.0    1997.9   10474.4
GR   1998.5   10486.7    1997.7   10508.0    1996.7   10521.7    1997.9   10561.1    2001.3   10587.5
GR   2001.8   10634.5    2001.2   10646.8    2002.2   10656.6    2005.5   10669.5    2001.3   10719.3
GR   2000.3   10738.3    1999.8   10762.7    1999.2   10821.5    1999.2   10843.0    1997.4   10860.1
GR   1998.5   10877.4    2000.3   10891.4    2001.4   10963.4    2001.8   11016.8    2001.9   11058.3
GR   2002.3   11087.9    2000.6   11113.1    1997.4   11133.0    1998.6   11148.9    2000.1   11157.3
GR   2002.8   11202.4    2004.3   11234.6    2004.6   11267.6    2006.7   11321.4    2007.5   11365.6
GR   2008.0   11383.5    2008.6   11411.5    2009.1   11428.3    2011.7   11476.7    2015.7   11512.3
GR   2017.7   11532.7    2020.7   11586.1    2023.0   11618.1    2023.8   11647.7    2027.3   11686.6
GR   2029.3   11705.4    2031.1   11749.1    2032.8   11787.1    2034.0   11799.4    2037.0   11812.3
GR   2036.8   11836.9    2039.0   11858.8    2039.2   11868.8    2040.7   11882.3    2041.6   11903.8

ET                9.1                                                                       9143.7    10673.7
        CONFLUENCE WITH TRIBUTARY.
X1   32.790        90    9955.2   10200.1       300       180       250
GR   2029.5   09143.7    2029.8   09183.5    2027.7   09205.9    2025.3   09274.7    2022.2   09341.3
GR   2017.9   09382.8    2016.6   09418.6    2014.1   09457.2    2012.4   09483.5    2003.9   09490.3
GR   2002.7   09537.8    2001.8   09628.0    2002.2   09687.9    1995.9   09707.5    1993.1   09734.3
GR   1994.9   09757.0    1995.8   09774.1    1999.6   09791.4    2000.7   09859.2    2000.8   09905.9
GR   2000.5   09936.4    1999.6   09955.2    1993.9   09970.6    1992.2   09995.2    1992.2   10000.0
GR   1992.2   10019.3    1992.2   10043.3    1992.2   10088.7    1992.2   10129.3    1992.2   10147.9
GR   1999.0   10181.9    1999.7   10200.1    1997.6   10209.0    2000.3   10218.0    2001.5   10262.8
GR   2001.1   10314.8    2000.9   10333.6    1999.3   10398.5    1998.8   10423.4    1997.5   10432.1
GR   1999.1   10482.2    2002.6   10494.3    2003.2   10511.6    2002.3   10641.8    2004.8   10662.5
GR   2007.5   10673.7    2003.9   10724.6    2002.2   10749.2    2001.8   10770.0    2004.1   10785.6
GR   2003.5   10805.2    2003.2   10827.6    2001.6   10860.0    1999.2   10891.1    2001.7   10906.8
GR   2002.3   10940.4    2004.8   10987.4    2004.1   11015.9    2003.8   11039.5    2004.1   11056.8
```

GR	2002.8	11066.3	2004.3	11079.2	2004.4	11101.6	2003.9	11167.6	2002.4	11220.3
GR	1999.1	11233.1	2000.0	11241.5	2007.3	11260.6	2009.0	11280.2	2010.4	11351.8
GR	2011.2	11396.0	2011.3	11451.5	2012.2	11490.7	2014.6	11510.2	2013.8	11525.4
GR	2015.7	11578.3	2017.2	11622.8	2019.3	11674.3	2020.1	11725.2	2023.7	11762.7
GR	2026.1	11775.0	2028.6	11830.2	2028.7	11857.6	2028.8	11871.3	2031.8	11874.7
GR	2032.5	11894.8	2033.2	11915.5	2033.8	11937.4	2034.5	11954.2	2035.3	11971.8
QT	1	32000								
ET	32.887	9.1							9866.2	10565.9

SECTIONS 32.887 TO 32.983 THE RIGHT LEVEE HAS BEEN REMOVED.

X1	32.887	95	9882.4	10160.6	540	470	510			
GR	2020.6	08590.1	2018.2	08666.5	2016.8	08740.4	2015.7	08746.6	2016.5	08767.8
GR	2015.4	08790.2	2015.0	08849.3	2012.6	08913.7	2012.1	08959.8	2011.2	08986.7
GR	2009.3	08999.0	2005.7	09014.7	2004.7	09041.0	2004.1	09052.2	2004.7	09067.9
GR	2001.1	09084.1	2001.4	09094.8	2007.2	09116.6	2009.5	09131.1	2008.5	09182.1
GR	2007.2	09208.1	2008.6	09223.5	2008.1	09248.1	2005.4	09268.3	2007.3	09289.6
GR	2007.8	09350.9	2007.8	09403.8	2007.6	09455.3	2007.6	09524.7	2010.4	09549.9
GR	2011.0	09582.3	2010.5	09585.4	2010.6	09616.5	2010.9	09630.5	2009.9	09683.4
GR	2011.1	09717.5	2012.5	09751.4	2013.2	09806.0	2016.5	09812.4	2017.5	09841.5
GR	2017.0	09849.4	2017.7	09866.2	2009.5	09882.4	2000.3	09898.1	2001.5	09960.2
GR	1999.4	09967.5	1999.4	09992.1	1999.4	10000.0	1999.4	10012.8	1999.4	10048.7
GR	1999.4	10103.2	1999.4	10126.5	1999.4	10147.2	2003.5	10160.6	2005.2	10203.2
GR	2005.1	10229.5	2004.1	10255.8	2003.9	10292.2	2004.7	10306.2	2005.3	10349.8
GR	2004.1	10388.5	2002.7	10401.3	2003.2	10405.8	2005.1	10422.9	2004.8	10459.5
GR	2004.4	10508.5	2010.0	10565.9	2006.9	10575.4	2005.9	10616.0	2004.9	10637.3
GR	2004.1	10667.8	2002.7	10709.8	2003.4	10760.2	2003.4	10784.2	2002.6	10796.0
GR	2000.9	10803.0	2005.2	10820.6	2005.6	10874.6	2005.7	10904.0	2006.5	10937.6
GR	2005.1	10958.9	2005.7	10974.8	2005.3	11003.1	2004.8	11072.8	2004.6	11095.5
GR	2001.6	11112.8	2002.6	11126.3	2008.0	11144.7	2010.5	11192.9	2010.9	11261.2
GR	2012.3	11313.5	2013.3	11369.2	2016.9	11426.9	2019.1	11471.1	2021.6	11517.0
ET	32.983	9.1							9570	10565.3
X1	32.983	95	9823.1	10160.9	510	510	510			
GR	2019.0	08431.4	2018.2	08443.7	2018.5	08475.1	2019.9	08517.0	2020.0	08542.8
GR	2017.0	08622.3	2016.5	08683.9	2013.0	08745.2	2013.5	08791.3	2013.7	08807.9
GR	2013.1	08861.0	2008.3	08889.9	2006.2	08899.4	2006.6	08925.1	2013.5	08951.7
GR	2014.2	08982.0	2012.2	09047.2	2011.6	09101.2	2014.3	09130.3	2017.9	09163.6
GR	2018.7	09250.4	2017.7	09280.6	2015.9	09290.7	2016.7	09326.0	2015.4	09373.3
GR	2013.8	09417.8	2004.1	09444.9	2002.9	09491.9	2003.1	09500.0	2007.2	09525.2
GR	2008.5	09552.9	2009.8	09579.0	2010.3	09620.4	2009.0	09650.6	2006.7	09680.9
GR	2007.3	09716.7	2006.1	09757.6	2007.6	09786.1	2015.8	09805.1	2016.7	09823.1
GR	2008.8	09832.6	2007.1	09899.7	2006.4	09946.2	2006.1	10000.0	2005.8	10013.4
GR	2005.8	10053.1	2005.8	10074.4	2005.8	10118.6	2005.8	10123.7	2005.8	10140.0
GR	2010.0	10160.9	2011.6	10197.6	2011.6	10243.7	2009.6	10296.1	2006.8	10314.3
GR	2006.1	10360.5	2006.2	10382.3	2011.7	10397.4	2012.1	10411.7	2010.6	10470.2
GR	2009.8	10492.0	2011.2	10536.5	2011.7	10565.3	2012.7	10579.3	2013.4	10622.4
GR	2009.9	10650.4	2010.1	10686.3	2011.8	10748.4	2007.7	10770.2	2009.2	10787.3
GR	2010.7	10813.9	2010.8	10840.2	2010.0	10862.0	2010.3	10913.0	2011.2	10975.1
GR	2010.3	11022.1	2011.3	11045.9	2010.8	11071.4	2007.6	11081.5	2008.1	11091.6
GR	2011.6	11103.9	2011.4	11164.3	2012.0	11169.9	2014.1	11189.2	2015.4	11228.7
GR	2015.2	11269.0	2015.5	11337.3	2016.4	11389.4	2017.0	11413.7	2019.7	11475.0
GR	2021.7	11508.6	2022.9	11537.7	2027.7	11590.3	2032.5	11629.0	2036.1	11710.1

```
NC      .075      .075      .035       0.3       0.5
ET    33.082       9.1                                                          9680     10470
X1    33.082        95    9812.4   10132.9       520       520       520
GR    2022.6   08590.4    2023.2   08621.2    2021.8   08660.6    2019.6   08673.8    2018.2   08710.2
GR    2020.6   08729.8    2021.6   08757.8    2025.0   08825.5    2028.2   08880.4    2030.2   08920.1
GR    2029.7   08962.6    2031.0   09000.7    2030.8   09048.8    2033.2   09088.0    2031.8   09131.7
GR    2031.1   09161.9    2031.3   09197.2    2029.7   09215.4    2022.9   09259.6    2020.2   09303.8
GR    2019.3   09339.4    2019.2   09398.2    2016.1   09435.1    2015.4   09458.6    2016.8   09467.9
GR    2013.2   09506.2    2012.7   09543.2    2013.5   09610.3    2013.7   09673.0    2012.7   09740.8
GR    2012.4   09778.8    2021.7   09797.3    2022.1   09812.4    2016.4   09825.3    2012.7   09846.3
GR    2013.9   09884.4    2013.1   09918.2    2011.4   09950.7    2011.6   09973.1    2013.0   10000.0
GR    2013.0   10041.9    2011.7   10072.2    2011.2   10105.8    2021.0   10118.3    2022.0   10132.9
GR    2014.3   10148.9    2015.9   10160.9    2010.4   10171.2    2011.2   10180.8    2014.9   10189.2
GR    2015.5   10211.6    2015.3   10231.1    2016.0   10242.3    2014.6   10282.9    2009.3   10301.4
GR    2010.8   10335.8    2011.9   10361.3    2011.7   10396.8    2016.0   10408.6    2016.7   10434.1
GR    2016.5   10460.7    2017.6   10483.9    2016.7   10536.8    2016.3   10563.9    2017.9   10581.0
GR    2018.1   10620.8    2015.5   10635.9    2015.1   10674.5    2013.6   10695.8    2015.4   10731.3
GR    2015.5   10774.2    2015.9   10828.7    2015.4   10858.1    2013.8   10904.9    2014.5   10956.1
GR    2014.5   10972.9    2020.1   10993.0    2019.5   11046.8    2018.6   11064.1    2019.1   11108.4
GR    2016.1   11133.8    2012.9   11140.8    2012.9   11146.4    2016.1   11159.0    2016.4   11170.2
GR    2018.0   11187.6    2018.1   11238.2    2017.7   11270.7    2018.7   11314.4    2019.9   11354.1
GR    2021.1   11399.5    2023.8   11447.0    2025.1   11494.1    2027.5   11532.7    2032.7   11574.7

ET                 9.1                                                        9832.6   10232.6
         SECTIONS 33.173 TO 33.277 THE PROPOSED LEVEES AT THE LEFT AND RIGHT
         BANKS HAVE BEEN ENGINEERED TO BE STABLE.  THE EFFECTIVE FLOW AREA IS
         ENCROACHED TO REFLECT BRIDGE MODELING.
         DOWNSTREAM FACE OF NEW RIVER ROAD BRIDGE.
X1    33.173        75    9832.6   10232.6       463       463       463
X3        10                                                        2027.4    2027.4
GR    2031.7   08419.1    2032.8   08540.0    2034.2   08619.5    2035.0   08704.9    2035.3   08782.9
GR    2036.3   08838.4    2035.6   08937.4    2035.3   09032.6    2033.3   09146.8    2030.3   09226.9
GR    2027.6   09301.0    2025.1   09393.1    2023.8   09476.0    2024.0   09537.0    2024.4   09588.2
GR    2025.6   09652.9    2026.2   09719.5    2026.7   09779.9    2027.4   09832.6    2016.0   09856.0
GR    2016.0   09868.4    2016.0   09895.8    2016.0   09911.5    2016.0   09936.7    2016.0   09952.9
GR    2016.0   09977.6    2016.0   09993.8    2016.0   10000.0    2016.0   10011.7    2016.0   10025.4
GR    2016.0   10058.7    2016.0   10073.0    2016.0   10110.8    2016.0   10149.4    2016.0   10209.8
GR    2027.4   10232.6    2025.2   10292.4    2023.2   10373.1    2023.5   10446.7    2023.9   10516.6
GR    2024.2   10557.0    2024.5   10620.8    2024.5   10668.9    2021.0   10682.6    2019.7   10714.0
GR    2020.5   10736.4    2025.7   10759.3    2023.8   10828.5    2023.0   10888.1    2023.5   10931.2
GR    2027.8   10958.6    2029.0   10981.3    2029.0   11012.6    2027.0   11048.7    2026.8   11100.0
GR    2026.5   11115.1    2027.8   11121.2    2026.9   11139.7    2025.5   11161.3    2025.8   11187.8
GR    2026.3   11205.8    2025.0   11227.9    2024.1   11273.8    2023.2   11298.1    2020.6   11309.9
GR    2023.2   11320.0    2023.5   11329.5    2026.5   11355.8    2027.7   11389.4    2029.6   11407.6
GR    2033.4   11441.2    2036.8   11464.4    2040.9   11509.2    2043.2   11524.8    2043.3   11558.7

ET    33.184      9.11                                                        9849.4   10249.4
SB      1.05      1.56       2.7                350.4        24      4000      2.00    2016.0    2016.0
```

12 in previous model

UPSTREAM FACE OF NEW RIVER ROAD BRIDGE.
THIS BRIDGE IS PROPOSED TO BE FOUR SPANS WITH 3-4 FT DIAMETER PIERS
SPACED 100 FT ON CENTER. THE BRIDGE LOW CHORD WILL BE ESTABLISHED

X1	33.184	80	9849.4	10249.4	68	68	68			
X2			1	2027.0	2028.0					
X3	10									
BT	-5	9209.0	2032.5		9849.4	2028.7		9849.5	2032.0	2027.0
BT		10249.3	2032.0	2027.0	10249.4	2028.0				
GR	2032.0	08430.6	2034.2	08554.5	2035.1	08630.7	2036.9	08732.0	2037.9	08832.8
GR	2038.4	08874.8	2037.2	08903.3	2037.5	09016.4	2035.2	09115.5	2032.5	09209.0
GR	2029.7	09248.7	2027.8	09309.7	2026.4	09370.2	2024.6	09412.7	2024.6	09504.0
GR	2023.8	09557.7	2024.9	09618.2	2025.2	09667.1	2024.8	09741.9	2026.2	09790.0
GR	2027.5	09824.2	2028.7	09849.4	2016.0	09875.0	2016.0	09900.9	2016.0	09938.9
GR	2016.0	09960.2	2016.0	09984.3	2016.0	10000.0	2016.0	10034.4	2016.0	10048.4
GR	2016.0	10071.0	2016.0	10106.9	2016.0	10125.9	2016.0	10143.8	2016.0	10158.4
GR	2016.0	10172.4	2016.0	10225.4	2028.0	10249.4	2024.1	10331.9	2025.0	10396.3
GR	2025.9	10424.8	2024.8	10501.8	2024.0	10550.5	2024.7	10597.3	2025.4	10624.7
GR	2025.8	10659.1	2025.1	10677.3	2023.7	10697.2	2022.7	10714.3	2026.1	10731.3
GR	2024.8	10788.4	2024.1	10831.3	2024.4	10882.2	2025.1	10918.0	2028.3	10949.4
GR	2029.2	10967.8	2029.0	11002.0	2027.9	11052.4	2028.3	11087.1	2027.7	11092.4
GR	2027.7	11117.9	2028.4	11121.8	2027.0	11141.4	2026.4	11187.8	2027.3	11218.6
GR	2026.8	11253.6	2025.8	11280.8	2024.8	11302.0	2024.2	11322.5	2024.7	11348.2
GR	2021.9	11358.3	2024.6	11377.1	2029.2	11404.8	2034.8	11437.5	2036.6	11452.6
GR	2038.8	11474.5	2041.5	11504.1	2043.1	11539.4	2044.8	11576.9	2044.8	11581.7
NC	.050	.050	.035	0.3	0.5					
ET	33.277	9.1							9854	10488
X1	33.277	85	9854.4	10139.3	453	493	473			
GR	2053.9	09189.1	2044.6	09216.5	2039.5	09256.3	2045.0	09288.4	2051.7	09316.7
GR	2052.0	09329.3	2055.0	09332.4	2056.0	09344.7	2058.3	09348.1	2059.8	09369.3
GR	2058.4	09403.5	2054.9	09420.6	2041.3	09447.1	2039.7	09488.0	2040.5	09507.0
GR	2036.7	09521.6	2036.2	09528.9	2041.0	09544.6	2044.3	09561.9	2041.2	09592.7
GR	2044.9	09624.6	2044.8	09652.6	2044.9	09686.7	2040.6	09701.3	2032.0	09725.6
GR	2024.8	09738.8	2025.1	09770.7	2027.2	09808.5	2027.3	09843.8	2031.4	09854.4
GR	2021.8	09874.3	2020.4	09916.0	2020.5	09962.7	2021.3	10000.0	2022.4	10046.1
GR	2022.3	10071.9	2023.4	10114.4	2032.7	10139.3	2027.3	10153.1	2026.9	10224.1
GR	2024.3	10244.9	2021.4	10261.7	2022.7	10287.1	2027.6	10312.0	2027.6	10324.1
GR	2027.6	10341.7	2027.6	10365.5	2027.6	10390.1	2027.6	10475.8	2033.7	10488.0
GR	2033.7	10508.0	2027.6	10520.2	2027.8	10581.3	2031.4	10593.1	2029.9	10647.9
GR	2029.8	10679.3	2028.1	10687.7	2032.9	10714.0	2032.9	10750.4	2031.7	10758.2
GR	2034.5	10773.9	2034.1	10832.7	2033.4	10892.6	2032.5	10940.7	2033.0	11004.0
GR	2033.5	11061.6	2033.7	11106.4	2034.5	11138.9	2035.2	11211.1	2037.3	11272.1
GR	2040.8	11298.4	2044.6	11339.3	2046.4	11360.0	2048.1	11397.2	2047.6	11418.2
GR	2050.0	11427.2	2050.8	11478.7	2051.4	11502.7	2050.2	11526.8	2050.4	11538.0
GR	2051.8	11561.0	2049.4	11598.5	2045.2	11643.0	2042.7	11677.4	2053.9	11696.4
NC	.050	.050	.035	0.1	0.3					
ET	33.375	9.1							9650	10778
X1	33.375	60	9872.0	10142.1	550	500	520			
GR	2126.8	09600.8	2103.7	09632.2	2072.7	09674.1	2051.1	09704.4	2030.1	09733.5
GR	2031.6	09761.5	2030.7	09788.3	2031.3	09838.7	2029.4	09860.6	2029.4	09872.0
GR	2026.1	09886.3	2026.5	09907.0	2024.6	09949.6	2025.7	09976.7	2026.6	10000.0
GR	2027.7	10022.9	2027.7	10076.6	2030.8	10094.6	2030.8	10116.7	2032.3	10142.1
GR	2030.7	10214.4	2027.0	10227.5	2027.5	10249.6	2029.4	10265.6	2030.0	10309.0

GR	2032.0	10336.7	2030.9	10379.2	2029.0	10404.7	2025.5	10410.8	2026.4	10430.4
GR	2030.6	10446.7	2031.3	10525.0	2032.1	10557.8	2035.9	10581.0	2035.1	10652.7
GR	2034.8	10699.7	2035.4	10725.5	2037.2	10741.7	2037.8	10778.1	2034.5	10796.5
GR	2034.4	10810.0	2033.2	10815.6	2034.2	10836.3	2035.2	10879.4	2036.9	10907.4
GR	2037.2	10930.3	2036.6	10987.4	2036.4	11043.4	2036.9	11122.9	2037.1	11191.2
GR	2037.8	11244.9	2038.9	11293.4	2040.7	11349.1	2041.4	11378.7	2043.9	11419.0
GR	2047.1	11449.0	2052.5	11492.4	2058.9	11527.9	2070.4	11588.7	2078.8	11644.6
ET	33.466	9.1							9515	10750
X1	33.466	65	9927.5	10150.5	500	440	480			
GR	2090.6	09514.9	2072.6	09559.7	2053.2	09592.7	2037.7	09619.6	2037.8	09699.1
GR	2032.3	09717.8	2033.3	09744.4	2034.5	09757.3	2036.5	09791.4	2032.6	09824.5
GR	2035.1	09836.2	2036.1	09863.4	2037.0	09927.5	2031.6	09938.1	2031.4	09969.4
GR	2032.7	10000.0	2034.2	10014.2	2032.1	10040.5	2030.4	10055.1	2030.5	10060.7
GR	2033.4	10073.0	2030.6	10103.2	2030.7	10117.5	2035.1	10130.7	2036.9	10150.5
GR	2036.5	10195.6	2035.9	10232.0	2037.1	10247.7	2037.1	10291.3	2035.2	10329.4
GR	2035.2	10375.0	2035.2	10430.2	2031.6	10453.7	2031.7	10465.4	2033.9	10481.7
GR	2030.7	10505.7	2031.0	10523.6	2034.1	10535.4	2037.0	10557.2	2034.7	10569.0
GR	2036.6	10589.1	2037.8	10634.5	2039.3	10649.0	2040.7	10689.3	2041.1	10710.3
GR	2041.2	10751.5	2037.8	10770.5	2037.4	10788.4	2038.7	10805.8	2038.1	10834.6
GR	2039.7	10888.6	2041.0	10939.6	2041.7	10995.8	2041.1	11062.7	2041.8	11156.8
GR	2041.7	11226.2	2041.0	11306.2	2041.7	11353.5	2042.9	11409.2	2044.2	11465.8
GR	2045.6	11487.1	2046.9	11503.3	2051.4	11512.8	2057.0	11521.8	2066.8	11538.0
NC	.055	.055	.035	0.1	0.3					
X1	33.559	60	9898.9	10133.2	470	500	490			
GR	2086.8	09445.2	2084.9	09517.4	2066.5	09552.9	2050.8	09573.9	2041.3	09590.7
GR	2038.0	09604.7	2038.0	09610.9	2040.4	09623.2	2041.8	09661.6	2041.8	09673.6
GR	2040.4	09689.3	2041.0	09703.8	2038.5	09713.1	2039.1	09745.2	2040.6	09752.0
GR	2041.1	09766.5	2040.3	09820.0	2039.2	09873.7	2038.6	09889.9	2038.8	09898.9
GR	2037.0	09925.5	2035.1	09950.7	2035.4	09970.8	2040.5	09982.3	2036.1	09994.4
GR	2035.8	10000.0	2035.2	10006.1	2037.3	10049.8	2040.6	10107.4	2039.3	10122.5
GR	2041.9	10133.2	2042.3	10190.8	2041.7	10238.1	2040.7	10308.4	2040.9	10365.5
GR	2041.2	10425.4	2041.7	10449.2	2040.8	10473.5	2036.5	10506.6	2034.8	10517.2
GR	2035.2	10529.0	2048.8	10550.8	2047.1	10605.9	2048.0	10629.4	2047.8	10673.4
GR	2043.8	10692.4	2045.6	10763.2	2044.9	10785.3	2045.8	10873.2	2046.9	10918.3
GR	2047.9	10981.8	2048.6	11044.5	2049.7	11098.3	2050.6	11164.6	2051.1	11209.4
GR	2053.3	11233.7	2055.3	11249.4	2060.4	11265.7	2066.8	11280.5	2081.2	11320.0
X1	33.661	55	9688.7	9839.8	500	540	540			
GR	2136.8	09399.8	2118.5	09439.0	2104.6	09458.1	2088.9	09476.5	2077.7	09509.0
GR	2061.1	09542.6	2053.4	09565.0	2048.0	09605.0	2045.8	09648.4	2042.7	09663.8
GR	2042.9	09671.9	2046.6	09682.3	2046.6	09688.7	2039.5	09702.7	2042.8	09732.4
GR	2043.1	09753.1	2044.5	09766.0	2045.1	09789.5	2044.4	09795.6	2044.7	09820.8
GR	2046.0	09839.8	2045.8	09859.4	2044.1	09876.8	2045.7	09895.8	2044.9	09934.5
GR	2046.6	09963.0	2045.5	09998.8	2045.1	10000.0	2042.6	10044.7	2044.4	10063.2
GR	2044.3	10101.3	2042.4	10124.2	2042.7	10136.3	2043.6	10142.7	2045.3	10176.8
GR	2045.3	10200.4	2043.6	10230.0	2044.0	10244.6	2049.5	10270.3	2050.3	10299.4
GR	2051.4	10310.9	2051.9	10352.6	2051.7	10434.9	2052.2	10506.0	2051.9	10550.2
GR	2054.1	10568.4	2054.6	10573.2	2054.0	10583.3	2058.2	10611.3	2060.1	10625.2
GR	2059.8	10666.7	2066.4	10677.3	2073.1	10709.2	2079.3	10747.8	2090.8	10861.5

X1	33.756	40	9900.3	10092.0	500	500	500			
GR	2089.3	09650.1	2076.1	09702.1	2062.6	09729.6	2049.2	09759.0	2048.1	09793.4
GR	2048.8	09806.8	2050.2	09819.7	2050.3	09839.3	2049.1	09849.9	2048.5	09900.3
GR	2048.8	09932.8	2048.7	09979.2	2047.9	10000.0	2047.3	10023.7	2051.7	10035.8
GR	2051.8	10092.0	2051.8	10144.9	2050.8	10168.4	2053.0	10188.0	2052.9	10247.4
GR	2050.3	10265.9	2050.5	10291.3	2052.4	10304.8	2051.3	10328.6	2047.4	10345.3
GR	2048.0	10353.7	2058.5	10376.1	2057.4	10426.0	2057.5	10506.0	2058.1	10557.2
GR	2061.5	10586.3	2064.5	10627.5	2068.8	10660.0	2065.3	10668.6	2066.0	10714.3
GR	2075.6	10717.3	2080.4	10731.3	2082.1	10749.0	2081.0	10756.2	2082.5	10765.2

X1	33.851	50	9881.8	10031.9	490	500	500			
X3						10360.7	2061.5			
GR	2088.1	09394.2	2080.7	09436.8	2076.6	09472.1	2073.7	09526.9	2072.0	09594.9
GR	2071.8	09652.9	2070.5	09671.6	2062.9	09692.3	2055.4	09710.0	2053.5	09734.6
GR	2053.2	09773.2	2053.7	09789.2	2054.3	09839.3	2054.3	09881.8	2051.7	09889.9
GR	2051.9	09928.3	2050.3	09959.4	2047.7	09988.2	2047.7	10000.0	2048.3	10013.4
GR	2054.5	10031.9	2056.5	10084.5	2056.9	10110.0	2057.2	10126.7	2056.2	10141.6
GR	2056.3	10175.7	2055.1	10198.1	2053.0	10213.8	2053.2	10222.8	2056.6	10233.4
GR	2056.1	10267.5	2055.7	10289.9	2057.9	10303.9	2056.3	10316.8	2060.7	10342.5
GR	2061.5	10360.7	2060.2	10415.9	2060.9	10425.4	2060.8	10442.5	2059.0	10447.8
GR	2060.8	10475.2	2063.9	10541.8	2068.5	10566.7	2069.7	10578.8	2070.5	10588.0
GR	2068.5	10594.5	2070.2	10639.2	2074.2	10642.6	2077.0	10651.0	2079.4	10661.6

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

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .300 CEHV= .500
*SECNO 32.174

3470 ENCROACHMENT STATIONS= 9843.9 10300.0 TYPE= 1 TARGET= 456.100
3000 CFS BREAK OUT OVER THE LEFT OVERBANK. THE 3000 CFS FLOWS SOUTH
AND THEN WEST OVER I-17 TO GO BACK INTO THE MAIN CHANNEL AT ABOUT
SECTION 31.974. THE EXTENT OF THE ZONE A02 FLOOD LIMIT IS BASED ON
NORMAL DEPTH CALCULATIONS USING DIGITIZED CROSS SECTION INFORMATION.

32.174	13.98	1981.58	1978.93	.00	1983.97	2.39	.00	.00	1981.90
30400.0	.0	30340.0	60.0	.0	2444.2	20.9	.0	.0	1977.20
.00	.00	12.41	2.87	.000	.035	.050	.000	1967.60	9844.97
.003731	520.	300.	50.	0	14	0	.00	239.77	10084.74

FLOW DISTRIBUTION FOR SECNO= 32.17 CWSEL= 1981.58

STA=	9845.	10075.	10085.
PER Q=	99.8	.2	
AREA=	2444.2	20.9	
VEL=	12.4	2.9	
DEPTH=	10.6	2.2	

CCHV= .100 CEHV= .300
*SECNO 32.267

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

32.267	11.96	1984.36	1984.36	.00	1987.55	3.19	2.46	.24	1980.40
33400.0	4291.0	29052.0	57.0	739.7	1912.0	25.5	28.9	3.9	1982.70
.01	5.80	15.19	2.23	.050	.035	.050	.000	1972.40	9734.45
.006905	490.	490.	480.	0	15	0	.00	446.85	10181.29

FLOW DISTRIBUTION FOR SECNO= 32.27 CWSEL= 1984.36

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

STA=	9734.	9746.	9809.	9842.	9852.	9894.	9909.	9921.	9942.	10151.	10181.
PER Q=	.3	4.6	1.9	.7	2.3	1.1	.8	1.1	87.0	.2
AREA=	24.9	248.4	114.2	38.7	138.5	61.8	46.1	67.0	1912.0	25.5
VEL=	3.9	6.2	5.7	5.9	5.5	6.1	6.1	5.3	15.2	2.2
DEPTH=	2.1	4.0	3.5	3.8	3.4	4.0	4.0	3.2	9.1	.9

*SECNO 32.358

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9748.6 10400.0 TYPE= 1 TARGET= 651.400

32.358	15.04	1988.34	1986.25	.00	1990.03	1.70	2.34	.15	1985.00
33400.0	2553.6	20142.1	10704.3	620.3	1667.3	1358.7	64.1	9.3	1982.00
.02	4.12	12.08	7.88	.050	.035	.050	.000	1973.30	9756.65
.003586	490.	480.	490.	2	8	0	.00	521.28	10277.93

FLOW DISTRIBUTION FOR SECNO= 32.36 CWSEL= 1988.34

STA=	9757.	9796.	9814.	9842.	9858.	9902.	9966.	10123.	10190.	10215.	10238.	10266.	10278.
PER Q=	.0	.5	2.0	.9	1.9	2.4	60.3	9.7	6.1	9.0	6.9	.4
AREA=	14.7	51.0	131.5	65.6	152.7	204.9	1667.3	486.0	247.1	307.0	281.1	37.6
VEL=	.9	3.5	5.0	4.5	4.1	3.9	12.1	6.7	8.2	9.8	8.1	3.5
DEPTH=	.4	2.9	4.6	4.0	3.4	3.2	10.6	7.3	10.0	12.9	10.1	3.2

CCHV= .100 CEHV= .300
*SECNO 32.455

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9752.2 10400.0 TYPE= 1 TARGET= 647.800

32.455	11.17	1990.17	1990.17	.00	1993.91	3.73	2.58	.61	1986.30
33400.0	2289.4	31109.9	.7	483.6	1943.1	.8	99.8	14.4	1989.60
.03	4.73	16.01	.86	.065	.035	.065	.000	1979.00	9798.41
.007642	510.	510.	520.	0	19	0	.00	353.99	10152.40

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

FLOW DISTRIBUTION FOR SECNO= 32.46 CWSEL= 1990.17

STA=	9798.	9807.	9818.	9838.	9898.	9935.	10150.	10152.
PER Q=	.1	.4	1.1	3.3	2.0	93.1	.0	
AREA=	9.2	32.8	76.3	224.9	140.4	1943.1	.8	
VEL=	2.1	4.1	4.8	4.8	4.8	16.0	.9	
DEPTH=	1.1	2.9	3.7	3.8	3.8	9.1	.3	

CCHV= .300 CEHV= .500
*SECNO 32.553
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9800.0 10500.0 TYPE= 1 TARGET= 700.000

32.553	15.74	1996.54	1996.54	.00	2000.72	4.17	3.39	.22	1986.60
33400.0	4254.9	27541.5	1603.5	714.6	1540.9	375.9	130.0	18.7	1988.50
.04	5.95	17.87	4.27	.065	.035	.065	.000	1980.80	9831.36
.005626	520.	520.	520.	0	11	0	.00	367.68	10199.04

FLOW DISTRIBUTION FOR SECNO= 32.55 CWSEL= 1996.54

STA=	9831.	9874.	9898.	9934.	9945.	9973.	10087.	10108.	10139.	10176.	10199.
PER Q=	.5	1.1	3.3	1.8	6.1	82.5	2.2	1.4	1.1	.2	
AREA=	69.7	86.8	203.6	90.2	264.3	1540.9	127.9	112.1	106.5	29.3	
VEL=	2.4	4.1	5.4	6.5	7.7	17.9	5.7	4.1	3.4	2.0	
DEPTH=	1.6	3.7	5.6	7.6	9.5	13.6	6.1	3.6	2.8	1.3	

*SECNO 32.585

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.78

3370 NORMAL BRIDGE, NRD= 45 MIN ELTRD= 1989.40 MAX ELLC= 2002.00

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


3470 ENCROACHMENT STATIONS=     9844.1    10184.8  TYPE=      1  TARGET=      340.688
        DOWNSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.
   32.585     14.21   2001.21   1994.71       .00   2002.20      1.00       .53       .95   2002.00
  33400.0        .0   33400.0        .0        .0    4172.2        .0     144.5      20.3 100000.00
      .05       .00      8.01       .00      .000      .035      .000      .000   1987.00   9845.54
  .001777       83.      183.      430.         4        12         0       .00    320.31  10183.25

FLOW DISTRIBUTION FOR SECNO=     32.58          CWSEL=   2001.21

STA=    9846.   10185.
  PER Q=     100.0
   AREA=    4172.2
    VEL=       8.0
  DEPTH=      13.0

*SECNO 32.601

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  45 MIN ELTRD=  1989.40 MAX ELLC=  2002.00


3470 ENCROACHMENT STATIONS=     9844.1    10184.8  TYPE=      1  TARGET=      340.688
        UPSTREAM FACE OF PROPOSED FRONTAGE ROAD BRIDGE.
        THIS BRIDGE IS PROPOSED TO BE FIVE SPANS WITH 4-5 FT DIAMETER PIERS
        SPACED 80 FT ON CENTER.  THE BRIDGE LOW CHORD WILL BE ESTABLISHED
        A MINIMUM 2 FT ABOVE THE 100-YEAR WATER SURFACE.  THE FRONTAGE ROAD
        WILL BE ESTABLISHED A MINIMUM 3 FT ABOVE THE 100-YEAR WATER SURFACE.
   32.601     14.36   2001.36   1994.70       .00   2002.33       .97       .12       .01   2002.00
  33400.0        .0   33400.0        .0        .0    4232.0        .0     151.1      20.8 100000.00
      .05       .00      7.89       .00      .000      .035      .000      .000   1987.00   9845.25
  .001705       68.       68.       68.         2        12         0       .00    322.31  10183.54

FLOW DISTRIBUTION FOR SECNO=     32.60          CWSEL=   2001.36

STA=    9845.   10185.
  PER Q=     100.0
   AREA=    4232.0
    VEL=       7.9
  DEPTH=      13.1
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 32.686

3470 ENCROACHMENT STATIONS= 9948.4 10614.3 TYPE= 1 TARGET= 665.899

SECTIONS 32.686 TO 32.983 THE MAIN CHANNEL HAS BEEN REGRADED TO BE WIDER ALONG THE RIGHT OVERBANK.

32.686	15.48	2001.98	1997.53	.00	2003.06	1.09	.68	.06	1998.20
33400.0	8.5	27380.1	6011.4	8.0	2993.0	2242.7	197.5	25.3	1994.50
.07	1.07	9.15	2.68	.065	.035	.065	.000	1986.50	9964.38
.001385	530.	450.	350.	2	12	0	.00	637.89	10602.28

FLOW DISTRIBUTION FOR SECNO= 32.69 CWSEL= 2001.98

STA=	9964.	9969.	10179.	10292.	10354.	10397.	10538.	10602.
PER Q=	.0	82.0	4.9	3.6	3.5	4.0	1.9	
AREA=	8.0	2993.0	614.6	405.9	346.6	598.4	277.2	
VEL=	1.1	9.1	2.7	3.0	3.4	2.2	2.3	
DEPTH=	1.9	14.2	5.5	6.5	8.0	4.2	4.3	

CCHV= .100 CEHV= .300

*SECNO 32.743

3470 ENCROACHMENT STATIONS= 9785.5 10669.5 TYPE= 1 TARGET= 884.000

32.743	13.08	2002.38	1999.98	.00	2003.66	1.28	.54	.06	1999.60
33400.0	3366.7	25888.6	4144.7	853.0	2549.4	1594.0	229.1	29.6	1998.30
.07	3.95	10.15	2.60	.075	.035	.075	.000	1989.30	9802.68
.002634	380.	300.	200.	2	19	0	.00	854.62	10657.30

FLOW DISTRIBUTION FOR SECNO= 32.74 CWSEL= 2002.38

STA=	9803.	9844.	9862.	9947.	10198.	10277.	10474.	10561.	10657.
PER Q=	3.4	3.9	2.8	77.5	4.1	4.2	3.6	.6	
AREA=	278.2	233.5	341.2	2549.4	427.2	623.2	413.7	129.9	
VEL=	4.1	5.6	2.7	10.2	3.2	2.2	2.9	1.5	
DEPTH=	6.8	12.8	4.0	10.2	5.4	3.2	4.8	1.4	

*SECNO 32.790

3265 DIVIDED FLOW

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

3470 ENCROACHMENT STATIONS= 9143.7 10673.7 TYPE= 1 TARGET= 1530.000

CONFLUENCE WITH TRIBUTARY.

32.790	10.65	2002.85	2001.62	.00	2004.60	1.75	.80	.14	1999.60
33400.0	4394.2	26706.1	2299.7	1221.1	2270.5	863.8	255.2	34.7	1999.70
.08	3.60	11.76	2.66	.075	.035	.075	.000	1992.20	9532.03
.003978	300.	250.	180.	2	15	0	.00	1052.85	10646.32

FLOW DISTRIBUTION FOR SECNO= 32.79 CWSEL= 2002.85

STA=	9532.	9734.	9757.	9859.	9955.	10200.	10399.	10482.	10646.
PER Q=	4.4	3.2	4.1	1.4	80.0	3.1	3.6	.2	
AREA=	402.9	200.8	400.0	217.4	2270.5	452.9	363.1	47.8	
VEL=	3.6	5.3	3.5	2.2	11.8	2.3	3.3	1.2	
DEPTH=	2.0	8.8	3.9	2.3	9.3	2.3	4.3	.3	

*SECNO 32.887

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9866.2 10565.9 TYPE= 1 TARGET= 699.700

SECTIONS 32.887 TO 32.983 THE RIGHT LEVEE HAS BEEN REMOVED.

32.887	8.11	2007.51	2007.51	.00	2010.14	2.64	2.67	.27	2009.50
32000.0	.0	28230.5	3769.5	.0	2043.7	1078.8	298.5	44.5	2003.50
.09	.00	13.81	3.49	.000	.035	.075	.000	1999.40	9885.80
.007393	540.	510.	470.	0	15	0	.00	654.53	10540.33

FLOW DISTRIBUTION FOR SECNO= 32.89 CWSEL= 2007.51

STA=	9886.	10161.	10292.	10401.	10509.	10540.
PER Q=	88.2	4.5	3.5	3.5	.4	
AREA=	2043.7	400.4	315.2	313.8	49.4	
VEL=	13.8	3.6	3.5	3.5	2.3	
DEPTH=	7.4	3.0	2.9	2.9	1.6	

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

*SECNO 32.983

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9570.0 10565.3 TYPE= 1 TARGET= 995.300

32.983	9.49	2012.39	2012.03	.00	2014.17	1.78	3.94	.09	2016.70
32000.0	4677.1	23362.6	3960.3	953.1	1913.3	954.7	339.1	53.9	2010.00
.11	4.91	12.21	4.15	.075	.035	.075	.000	2002.90	9570.00
.008081	510.	510.	510.	2	8	0	.00	964.22	10565.30

FLOW DISTRIBUTION FOR SECNO= 32.98 CWSEL= 2012.39

STA=	9570.	9681.	9717.	9758.	9797.	10161.	10361.	10397.	10565.
PER Q=	4.2	3.3	4.1	3.0	73.0	7.5	3.2	1.7
AREA=	342.7	193.0	232.8	184.5	1913.3	539.6	188.0	227.1
VEL=	3.9	5.5	5.7	5.2	12.2	4.4	5.4	2.4
DEPTH=	3.1	5.4	5.7	4.7	5.8	2.7	5.1	1.4

CCHV= .300 CEHV= .500
*SECNO 33.082

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9680.0 10470.0 TYPE= 1 TARGET= 790.000

33.082	8.31	2017.61	2017.57	.00	2019.93	2.32	5.49	.27	2022.10
32000.0	3128.7	20341.7	8529.6	490.1	1407.5	1244.9	380.7	64.0	2022.00
.12	6.38	14.45	6.85	.075	.035	.075	.000	2009.30	9680.00
.014381	520.	520.	520.	1	15	0	.00	728.52	10470.00

FLOW DISTRIBUTION FOR SECNO= 33.08 CWSEL= 2017.61

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

STA=	9680.	9741.	9779.	9789.	10133.	10181.	10283.	10336.	10361.	10397.	10470.
PER Q=	5.2	4.2	.4	63.6	3.1	3.5	9.8	4.0	4.9	1.3	
AREA=	271.0	192.1	27.0	1407.5	152.7	250.7	364.6	159.5	206.1	111.3	
VEL=	6.2	7.0	4.2	14.5	6.5	4.4	8.6	8.1	7.7	3.7	
DEPTH=	4.5	5.1	2.6	4.8	3.2	2.5	6.9	6.3	5.8	1.5	

*SECNO 33.173

3470 ENCROACHMENT STATIONS= 9832.6 10232.6 TYPE= 1 TARGET= 400.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2027.40 ELREA= 2027.40

SECTIONS 33.173 TO 33.277 THE PROPOSED LEVEES AT THE LEFT AND RIGHT
BANKS HAVE BEEN ENGINEERED TO BE STABLE. THE EFFECTIVE FLOW AREA IS
ENCROACHED TO REFLECT BRIDGE MODELING.
DOWNSTREAM FACE OF NEW RIVER ROAD BRIDGE.

33.173	6.49	2022.49	2022.24	.00	2025.29	2.80	5.12	.24	2027.40
32000.0	.0	32000.0	.0	.0	2381.3	.0	410.0	69.9	100000.00
.13	.00	13.44	.00	.000	.035	.000	.000	2016.00	9842.68
.008765	463.	463.	463.	1	15	0	.00	380.10	10222.78

FLOW DISTRIBUTION FOR SECNO= 33.17 CWSEL= 2022.49

STA=	9843.	10233.
PER Q=	100.0	
AREA=	2381.3	
VEL=	13.4	
DEPTH=	6.3	

SPECIAL BRIDGE

5227 DOWNSTREAM ELEV IS 2021.17 , NOT 2022.49 HYDRAULIC JUMP OCCURS DOWNSTREAM (IF LOW FLOW CONTROLS)

SB XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
1.05	1.56	2.70	.00	350.40	24.00	4000.00	2.00	2016.00	2016.00

*SECNO 33.184
BTCARD, BRIDGE STENCL= 9849.40 STENCR= 10249.40

3301 HV CHANGED MORE THAN HVINS

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

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.52

CLASS B LOW FLOW

3420 BRIDGE W.S.= 2022.59 BRIDGE VELOCITY= 14.29 CALCULATED CHANNEL AREA= 2239.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
.00	2026.06	.00	0.	32000.	4000.	3832.	2027.00	2028.00	0.

3470 ENCROACHMENT STATIONS= 9849.4 10249.4 TYPE= 1 TARGET= 400.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2028.70 ELREA= 100000.00

UPSTREAM FACE OF NEW RIVER ROAD BRIDGE.
THIS BRIDGE IS PROPOSED TO BE FOUR SPANS WITH 3-4 FT DIAMETER PIERS
SPACED 100 FT ON CENTER. THE BRIDGE LOW CHORD WILL BE ESTABLISHED

33.184	8.38	2024.38	.00	.00	2026.06	1.68	.77	.00	2028.70
32000.0	.0	32000.0	.0	.0	3075.9	.0	414.3	70.5	100000.00
.13	.00	10.40	.00	.000	.035	.000	.000	2016.00	9858.12
.003798	68.	68.	68.	0	0	0	.00	384.04	10242.15

FLOW DISTRIBUTION FOR SECNO= 33.18 CWSEL= 2024.38

STA=	9858.	10249.
PER Q=	100.0	
AREA=	3075.9	
VEL=	10.4	
DEPTH=	8.0	

CCHV= .300 CEHV= .500
*SECNO 33.277

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

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


7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9854.0   10488.0  TYPE=      1  TARGET=      634.000
    33.277      8.78   2029.18   2029.18       .00   2031.72      2.54      2.49       .43   2031.40
   32000.0        .0   26642.0    5358.0        .0    1937.9     875.9     446.5      76.0   2032.70
       .14       .00     13.75      6.12      .000      .035      .050      .000   2020.40   9859.00
   .007710      453.      473.      493.         0         8         0       .00    601.54  10478.96


FLOW DISTRIBUTION FOR SECNO=     33.28          CWSEL=   2029.18

STA=    9859.   10139.   10153.   10224.   10245.   10262.   10287.   10312.   10324.   10342.   10366.   10390.   10476.
  PER Q=     83.3       .0      2.0      1.4      2.9      5.5      2.0       .2       .3       .4       .4      1.5
   AREA=   1937.9      4.5    147.7     74.5    106.3    181.1    100.4     19.1     27.8     37.6     38.9    135.4
    VEL=     13.7      2.4      4.3      6.1      8.8      9.7      6.5      3.5      3.5      3.5      3.5      3.5
  DEPTH=      7.2       .3      2.1      3.6      6.3      7.1      4.0      1.6      1.6      1.6      1.6      1.6

STA=   10476.   10479.
  PER Q=       .0
   AREA=      2.5
    VEL=      2.1
  DEPTH=       .8

CCHV=     .100 CEHV=     .300
*SECNO 33.375

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     9650.0   10778.0  TYPE=      1  TARGET=     1128.000
    33.375      9.31   2033.91   2033.41       .00   2035.45      1.54      3.63       .10   2029.40
   32000.0    2294.3   20135.4    9570.2     446.2    1721.7    1544.4     485.0      84.4   2032.30
       .16      5.14     11.70      6.20      .050      .035      .050      .000   2024.60   9728.22
   .006444      550.      520.      500.         2         5         0       .00    840.66  10568.87


FLOW DISTRIBUTION FOR SECNO=     33.38          CWSEL=   2033.91

STA=    9728.    9839.    9872.   10142.   10228.   10250.   10309.   10405.   10430.   10525.   10569.
  PER Q=      4.8      2.4     62.9      3.8      3.9      5.6      4.5      5.6      5.6      1.0
   AREA=    316.7    129.5   1721.7    240.8    147.3    270.3    286.5    196.7    320.3     82.6
    VEL=      4.8      5.9     11.7      5.0      8.4      6.6      5.1      9.1      5.5      3.8
  DEPTH=      2.9      3.9      6.4      2.8      6.7      4.6      3.0      7.7      3.4      1.9
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 33.466
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9515.0 10750.0 TYPE= 1 TARGET= 1235.000

33.466	7.87	2038.27	2038.27	.00	2040.06	1.80	3.66	.08	2037.00
32000.0	4858.6	17030.2	10111.2	754.8	1284.8	1428.2	523.5	94.4	2036.90
.17	6.44	13.26	7.08	.050	.035	.050	.000	2030.40	9618.62
.009597	500.	480.	440.	0	15	0	.00	1020.39	10639.01

FLOW DISTRIBUTION FOR SECNO= 33.47 CWSEL= 2038.27

STA=	9619.	9744.	9791.	9836.	9928.	10151.	10329.	10430.	10465.	10506.	10524.	10569.	10639.
PER Q=	5.5	3.1	3.9	2.7	53.2	4.1	5.9	5.4	6.8	4.6	3.4	1.4	
AREA=	246.9	150.7	174.7	182.5	1284.8	305.1	309.1	191.8	232.3	132.7	155.2	102.1	
VEL=	7.1	6.5	7.2	4.7	13.3	4.3	6.1	9.1	9.3	11.1	7.1	4.3	
DEPTH=	2.0	3.2	3.9	2.0	5.8	1.7	3.1	5.4	5.8	7.4	3.4	1.5	

CCHV= .100 CEHV= .300
*SECNO 33.559
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

33.559	8.74	2043.54	2043.54	.00	2045.40	1.86	4.63	.02	2038.80
32000.0	6578.3	18640.8	6780.9	1067.3	1393.9	1134.5	563.1	105.5	2041.90
.18	6.16	13.37	5.98	.055	.035	.055	.000	2034.80	9586.73
.009335	470.	490.	500.	0	8	0	.00	955.64	10542.37

FLOW DISTRIBUTION FOR SECNO= 33.56 CWSEL= 2043.54

STA=	9587.	9623.	9713.	9745.	9820.	9874.	9899.	10133.	10308.	10425.	10507.	10529.	10542.
PER Q=	3.1	3.6	3.5	3.6	4.0	2.7	58.3	4.0	4.7	5.2	6.1	1.1	
AREA=	146.7	229.6	152.2	216.2	203.7	118.8	1393.9	320.8	305.9	267.5	184.5	55.8	
VEL=	6.8	5.0	7.4	5.3	6.3	7.3	13.4	4.0	5.0	6.3	10.6	6.1	
DEPTH=	4.0	2.6	4.7	2.9	3.8	4.7	5.9	1.8	2.6	3.3	8.2	4.2	

*SECNO 33.661

33.661	9.73	2049.23	2049.16	.00	2051.40	2.16	5.91	.09	2046.60
32000.0	2295.0	13041.6	16663.3	299.1	849.9	1919.8	603.8	115.4	2046.00
.20	7.67	15.35	8.68	.055	.035	.055	.000	2039.50	9595.88
.013295	500.	540.	540.	1	8	0	.00	673.17	10269.05

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

FLOW DISTRIBUTION FOR SECNO= 33.66 CWSEL= 2049.23

STA=	9596.	9664.	9689.	9840.	9877.	9935.	9999.	10045.	10063.	10101.	10124.	10143.	10177.
PER Q=	3.9	3.3	40.8	3.3	5.8	4.6	7.3	3.3	5.2	4.3	4.0	4.5	
AREA=	183.5	115.6	849.9	139.8	234.5	213.1	245.3	106.0	186.0	134.7	119.8	163.1	
VEL=	6.8	9.0	15.3	7.6	7.9	6.9	9.5	9.9	9.0	10.1	10.8	8.8	
DEPTH=	2.7	4.6	5.6	3.8	4.1	3.3	5.3	5.7	4.9	5.9	6.5	4.8	

STA=	10177.	10230.	10269.
PER Q=	6.2	3.5	
AREA=	234.3	143.2	
VEL=	8.4	7.9	
DEPTH=	4.4	3.7	

*SECNO 33.756

33.756	7.98	2055.28	2055.04	.00	2057.43	2.16	6.03	.00	2048.50
32000.0	8692.3	16015.4	7292.3	919.8	1114.9	1028.2	639.0	122.8	2051.80
.21	9.45	14.37	7.09	.055	.035	.055	.000	2047.30	9745.65
.011005	500.	500.	500.	2	15	0	.00	623.59	10369.24

FLOW DISTRIBUTION FOR SECNO= 33.76 CWSEL= 2055.28

STA=	9746.	9793.	9820.	9850.	9900.	10092.	10145.	10188.	10266.	10291.	10345.	10369.
PER Q=	7.8	5.0	4.2	10.1	50.0	3.8	3.4	3.6	3.2	5.6	3.3
AREA=	268.8	166.2	157.9	326.8	1114.9	184.3	160.0	206.8	124.1	232.6	120.3
VEL=	9.3	9.7	8.5	9.9	14.4	6.5	6.8	5.6	8.2	7.7	8.7
DEPTH=	5.6	6.3	5.2	6.5	5.8	3.5	3.7	2.7	4.9	4.3	5.0

*SECNO 33.851

3470 ENCROACHMENT STATIONS= .0 10360.7 TYPE= 1 TARGET= 10360.700

33.851	11.67	2059.37	2059.30	.00	2061.83	2.46	4.31	.09	2054.30
32000.0	6580.9	20196.8	5222.4	950.9	1335.3	999.0	675.2	130.0	2054.50
.22	6.92	15.12	5.23	.055	.035	.055	.000	2047.70	9700.64
.006981	490.	500.	500.	4	14	0	.00	634.08	10334.72

FLOW DISTRIBUTION FOR SECNO= 33.85 CWSEL= 2059.37

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

STA=	9701.	9773.	9839.	9882.	10032.	10085.	10176.	10214.	10268.	10335.
PER Q=		8.1	8.0	4.5	63.1	3.5	3.5	3.2	3.7	2.3
AREA=		371.9	363.6	215.4	1335.3	203.5	252.8	165.6	206.7	170.4
VEL=		7.0	7.0	6.7	15.1	5.6	4.5	6.1	5.8	4.4
DEPTH=		5.1	5.5	5.1	8.9	3.9	2.8	4.3	3.8	2.5

THIS RUN EXECUTED 07APR94 10:11:36

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

NEW RIVER: I-17 TO NEW

SUMMARY PRINTOUT

	SECNO	Q	CWSEL	DEPTH	ELMIN	EG	CRIWS	VCH	10*KS	XLCH	SSTA	TOPWID	ENDST
	32.174	30400.00	1981.58	13.98	1967.60	1983.97	1978.93	12.41	37.31	.00	9844.97	239.77	10084.74
*	32.267	33400.00	1984.36	11.96	1972.40	1987.55	1984.36	15.19	69.05	490.00	9734.45	446.85	10181.29
	32.358	33400.00	1988.34	15.04	1973.30	1990.03	1986.25	12.08	35.86	480.00	9756.65	521.28	10277.93
*	32.455	33400.00	1990.17	11.17	1979.00	1993.91	1990.17	16.01	76.42	510.00	9798.41	353.99	10152.40
*	32.553	33400.00	1996.54	15.74	1980.80	2000.72	1996.54	17.87	56.26	520.00	9831.36	367.68	10199.04
*	32.585	33400.00	2001.21	14.21	1987.00	2002.20	1994.71	8.01	17.77	183.00	9845.54	320.31	10183.25
	32.601	33400.00	2001.36	14.36	1987.00	2002.33	1994.70	7.89	17.05	68.00	9845.25	322.31	10183.54
	32.686	33400.00	2001.98	15.48	1986.50	2003.06	1997.53	9.15	13.85	450.00	9964.38	637.89	10602.28
	32.743	33400.00	2002.38	13.08	1989.30	2003.66	1999.98	10.15	26.34	300.00	9802.68	854.62	10657.30
	32.790	33400.00	2002.85	10.65	1992.20	2004.60	2001.62	11.76	39.78	250.00	9532.03	1052.85	10646.32
*	32.887	32000.00	2007.51	8.11	1999.40	2010.14	2007.51	13.81	73.93	510.00	9885.80	654.53	10540.33
	32.983	32000.00	2012.39	9.49	2002.90	2014.17	2012.03	12.21	80.81	510.00	9570.00	964.22	10565.30
	33.082	32000.00	2017.61	8.31	2009.30	2019.93	2017.57	14.45	143.81	520.00	9680.00	728.52	10470.00
	33.173	32000.00	2022.49	6.49	2016.00	2025.29	2022.24	13.44	87.65	463.00	9842.68	380.10	10222.78
*	33.184	32000.00	23.69 2024.38	8.38	2016.00	2026.06	.00	10.40	37.98	68.00	9858.12	384.04	10242.15
*	33.277	32000.00	26.55 2029.18	8.78	2020.40	2031.72	2029.18	13.75	77.10	473.00	9859.00	601.54	10478.96
	33.375	32000.00	2033.91	9.31	2024.60	2035.45	2033.41	11.70	64.44	520.00	9728.22	840.66	10568.87

	SECNO	Q	CWSEL	DEPTH	ELMIN	EG	CRIWS	VCH	10*KS	XLCH	SSTA	TOPWID	ENDST
*	33.466	32000.00	2038.27	7.87	2030.40	2040.06	2038.27	13.26	95.97	480.00	9618.62	1020.39	10639.01
*	33.559	32000.00	2043.54	8.74	2034.80	2045.40	2043.54	13.37	93.35	490.00	9586.73	955.64	10542.37
	33.661	32000.00	2049.23	9.73	2039.50	2051.40	2049.16	15.35	132.95	540.00	9595.88	673.17	10269.05
	33.756	32000.00	2055.28	7.98	2047.30	2057.43	2055.04	14.37	110.05	500.00	9745.65	623.59	10369.24
	33.851	32000.00	2059.37	11.67	2047.70	2061.83	2059.30	15.12	69.81	500.00	9700.64	634.08	10334.72

NEW RIVER: I-17 TO NEW

SUMMARY PRINTOUT

	SECNO	SHEAR	FRCH	POWER
	32.174	2.47	.67	30.68
*	32.267	3.93	.89	59.70
	32.358	2.38	.65	28.70
*	32.455	4.32	.94	69.09
*	32.553	4.76	.86	85.12
*	32.585	1.37	.40	10.97
	32.601	1.33	.39	10.50
	32.686	1.23	.43	11.23
	32.743	1.67	.56	16.97
	32.790	2.30	.68	27.07
*	32.887	3.43	.89	47.39
	32.983	2.86	.90	34.88
	33.082	3.94	1.22	56.96
	33.173	3.43	.95	46.05
*	33.184	1.90	.65	19.75
*	33.277	3.33	.92	45.73
	33.375	2.56	.82	29.98
*	33.466	3.45	.97	45.74
*	33.559	3.47	.97	46.34
	33.661	4.67	1.14	71.60
	33.756	3.99	1.05	57.37
	33.851	3.88	.89	58.61

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=     32.267  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     32.267  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     32.455  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     32.455  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     32.553  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     32.553  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     32.585  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     32.887  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     32.887  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     33.184  PROFILE=  1  HYDRAULIC JUMP D.S.
WARNING SECNO=     33.184  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     33.277  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     33.277  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     33.466  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     33.466  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     33.559  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     33.559  PROFILE=  1  MINIMUM SPECIFIC ENERGY
```

APPENDIX C

Pier & Abutment Scour Analysis

KAMINSKI HUBBARD engineering inc.	• Surveying • Civil • Hydrology	Made by L. Thomas	Date 4-8-94	Job No. 179
		Checked by	Date	Sheet No. 1
		For New River Rd. Project No. 62738		

PIER & ABUTMENT SCOUR COMPUTATIONS

Colorado State University Equation

$$\frac{y_s}{y_1} = 2.0\, K_1 K_2 K_3 \left(\frac{a}{y_1}\right)^{0.65} F_R^{0.43}$$

where: y_s = scour depth
y_1 = flow depth upstream of pier
K_1 = 1.0 for group of cylinders
K_2 = 1.0 for 0° skew
K_3 = 1.1 for clear water scour
a = 4.0 for pier width
$F_R = V/(gy)^{0.5}$ = Froude Number

Both HEC-2 analyses were evaluated at HEC-2 cross section 33.184 to determine pier scour depths. The analyses indicate a hydraulic jump occurs within the bridge. Using the out put results from the HEC-2 analysis with pier dimensions doubled to account for debris accumulation yeilded the following:

$y_1 = 6.59$ ft V = 14.29 fps $F_R = 0.98$

$$y_s = 2.0 \times 1.0 \times 1.0 \times 1.1 \left(\frac{8}{6.59}\right)^{0.65} (0.98)^{0.43} (6.59) = 16.30 \text{ ft}$$

Using a factor of safety of 1.3 to account for non-uniform and uncertain velocity distribution yeilds:

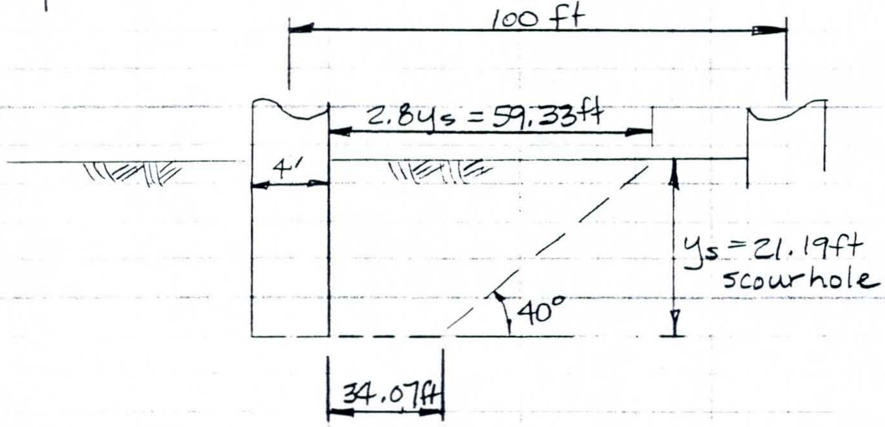
$$y_s = 16.30 \times 1.3 = 21.19 \text{ ft}$$

This would result in pier scour elevation of 1994.81 below the stream bed elevation of 2016. The piers will be socketed into bedrock at elevations of 1995 and 1990.

ME101-0374-20M

KAMINSKI HUBBARD engineering inc.	• Surveying • Civil • Hydrology	Made by L. Thomas	Date 4-8-94	Job No. 179
		Checked by	Date	Sheet No. 2
		For New River Rd. Project No. 68738		

The following diagram shows the probable lateral extent of the scour holes at the pier cylinders using 2.8 ys to estimate scour hole width on each side of the pier.



The factor of 2.8 is the upper limit for estimating the lateral extent of the scour hole.

ME101-0374 20M

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		Checked by	Date	Sheet No. 3
		For New River Rd. Project No. 68738		

ABUTMENT SCOUR COMPUTATIONS

Velocity to determine clear-water or live-bed scour:

$$V_c = 1.58\left[(S_s - 1)\, g\, D_{50}\right]^{1/2}\left(\frac{y}{D_{50}}\right)^{1/6}$$

where: V_c = critical velocity to move bed material

S_s = specific gravity of bed material = 2.4

g = 32.2 ft/sec²

D_{50} = Bed material mean diameter size

y = depth of flow

HEC-2 SECTION	33.173	33.184	33.277
D_{50}	15	3	10
y_h	6.3	6.6	7.1
V_c	35.5	21.0	30.0
V_{AVG}	13.4	14.3	13.8

Since $V_{AVG} < V_c$ for each cross-section above, clear water-scour is anticipated within the bridge and levee improvements.

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	Checked by	Date	Sheet No. 4
	For New River Rd. Project No. 68738		

ABUTMENT - SCOUR COMPUTATIONS (Continued)

To compute clear-water scour at the bridge abutments the following equation was used:

$$\frac{y_s}{y_1} = 0.13 \left[\frac{Q}{(1.25\,D_{50})^{1/3}\, y_1^{7/6}\, BW}\right]^{6/7} - 1$$

where: y_s = depth of scour
y_1 = depth of upstream flow
Q = Discharge through the bridge opening
D_{50} = Bed material mean diameter size
BW = Bottom width of channel less pier width

$$y_s = 6.59 \times 0.13 \times \left[\frac{32000}{(1.25 \times 3)^{1/3} (6.59)^{7/6} (350.4)}\right]^{6/7} - 1 = 3.27 \text{ Ft}$$

Since the bridge abutments will be protected using grouted riprap from bridge low chord to toedown depths of 6 feet, no problems are anticipated with the abutment scour depths. In addition, the entire levee toedown depth of 6 feet will be protected with grouted riprap.

APPENDIX D

Bridge & Levee Toe-Down Analysis

KAMINSKI HUBBARD engineering inc.	• Surveying • Civil • Hydrology	Made by L. Thomas	Date 4-8-94	Job No. 179
		Checked by	Date	Sheet No. 1
		For New River Rd. Project No. 68738		

TOE-DOWN DEPTH COMPUTATIONS

anti dune
ht

HEC-2 XSECTN	n	Y_h	V*	G	D50 (inch)	y_s	H	Y** (Toe Down depth)
33.173	0.035	6.30	13.44	13.3	15	0.03	2.47	4.0
33.184	0.035	6.59	14.29	18.6	3	0.12	2.80	4.7
33.277	0.035	7.10	13.75	15.2	10	0.04	2.59	4.2

long term agg deg

* NOTE: Velocities were taken from HE2- Analysis for anticipated debris accumulation by doubling piers.

** NOTE: Safety factor of 1.6 was used in calculations.

6 ft of toe down provided

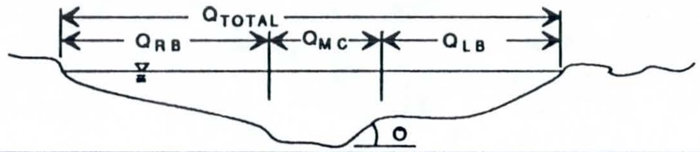
Toe-down protection has been provided 6ft below the stream bed and therefore is adequate.

APPENDIX E

Riprap Revetment Analysis

Project: New River Rd. Project No. 68738	Prepared by/date: L. Thomas / 4-8-94
Description: Riprap Revetment Analysis	Checked by/date: /
	sheet 1 of 1

Definition Sketch:



Q_{TOTAL} 32000
Q_{MC} 20165
Q_{LB} 2283
Q_{RB} 9552

Soil Characteristics:
D_{15} ____
D_{50} ____
D_{85} ____

DEPTH OR W.S. (ft) ①	A (ft^2) ②	V_a (ft/sec) ③	d_a (ft) ④	θ ⑤	Φ ⑥	K_1 ⑦	D_{50} (ft) ⑧	SF ⑨	S_s ⑩	C ⑪	$C_{P/A}$ ⑫	D_{50} (ft) ⑬	NOTES ⑭
7.2	1946.7	13.7	7.2	26.6°	40°	0.72	1.5	—	—	—	—	1.5	

Design Sketch

RIPRAP CHARACTERISTICS: -GROUTED

Size:
D_{50} 1.5ft
Class 1/4 Ton

Thickness:
1.5 × D_{50} 2.25
D_{100} 2.25
Use ____

AASHTO Gradation:

Size: (ft)	Percent Finer
2.25	100
1.5	50
—	5-10

FABRIC CHARACTERISTICS:

Granular:

Size (ft)	Percent Finer
____	85
____	50
____	15

Fabric:
AOS* < ____
Perm. > ____

*Average Opening Size

① Water Surface Elevation
② Main channel flow area
③ Main channel average velocity
④ Main channel average depth
⑤ Bank angle
⑥ Riprap angle of repose (Chart 4)
⑦ Bank angle correction (Chart 3)
⑧ Riprap size (Chart 1)
⑨ Stability Factor
⑩ Riprap specific gravity
⑪ Riprap size correction factor (Chart 2)
⑫ Pier/Abutment Correction (3.38 if applicable)
⑬ Correction D_{50} = ⑧ · ⑪ · ⑫
⑭ Notes or Comments

Form 1. Riprap size - particle erosion

APPENDIX F

Pipe Culvert Analysis

KAMINSKI HUBBARD engineering inc.	• Surveying • Civil • Hydrology	Made by L. Thomas	Date 1-17-96	Job No. 79
		Checked by	Date	Sheet No. 1
		For New River Rd. Project No. 63733		

RATIONAL METHOD FOR CALCULATING PEAK DISCHARGES FOR AREAS BEHIND LEVEES

Location: New River - Section 27, T7N, R2E

Subbasin	A	B
Drainage Area (Acres)	5.58	16.95
Flow Path Length (miles)	0.16	0.25
Average Slope (LF/mile)	82.5	512.2
Land Use	Neighborhood Business	Suburban Residential
Frequency (Years)	100	100
Runoff Coefficient, C_{100}	0.70	0.50
Watershed Resistance Type C	0.13	0.12
Rainfall Intensity (inch/hour) $i = i_p\left(\frac{2.78}{2.07}\right)$		
Time of Concentration (minutes) $T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	$0.402 i^{-0.38}$	$0.274 i^{-0.38}$
BY TRIAL AND ERROR T_c	10	7
i_p (See Figure 3.3)	7.0	8.0
i	9.4	10.7
T_c	10.3	6.7
Peak Discharge (cfs) $Q = CiA$	37	91
Volume (Ac-Ft), P = 2.8 inches $V = C\left(\frac{P}{12}\right)A$	0.91	1.98
Ponding Elevation	23.17	24.52

MF101 0374 20M

KAMINSKI HUBBARD engineering inc. • Surveying • Civil • Hydrology	Made by L. Thomas	Date 4-5-94	Job No. 179
	Checked by	Date	Sheet No. 2
	For New River Rd. Project No. 68738		

PONDING AREA VOLUME CALCULATIONS

The volume of runoff contributing to pipe culverts was calculated for the 100-year, 2-hour precipation values. Ponding limits depicted on Figure 3 are based on these water surface elevations. The following rating curves were prepared for each area.

Drainage Area A

ELEVATION	AREA(AC)	VOLUME(AC·FT)	Σ VOLUME(AC·FT)
20.49	0	0	0
22.0	0.389	0.207	0.207
24.0	0.805	1.194	1.404

Drainage Area B

ELEVATION			
20.22	0	0	0
22.0	0.080	0.045	0.045
24.0	1.020	1.100	1.145
26.0	2.218	3.238	4.383

ME101-0374-20M

KAMINSKI HUBBARD engineering inc. • Surveying • Civil • Hydrology	Made by L. Thomas	Date 2-7-94	Job No. 179
	Checked by	Date	Sheet No. 3
	For New River Rd. Project No. 68738		

ANALYSIS FOR PIPE CULVERT CROSSING AT STATION 20+64

Drainage Area = 7.4 Acres
Flow Path Length = 0.21 miles
Average Slope = 424.8 ft/mile
Land Use – Suburban Residential
Frequency 100 Year
Runoff Coefficient, $C_{100} = 0.50$
Watershed Resistance Type C = 0.13

Rainfall Intensity (inch/hour)

$$i = i_p\left(\frac{2.78}{2.07}\right)$$

Time of Concentration (minutes)

$$T_c = 11.4\, L^{0.5}\, K_b^{0.52}\, S^{-0.31}\, i^{-0.38} = 0.275\, i^{-0.38}$$

By Trial and Error, $T_c = 7.0$ minutes

$i_p = 8.0$ in/hr
$i = 10.7$ in/hr
$T_c = 6.7$ minutes

Peak Discharge, $Q = CiA = 0.50 \times 10.7 \times 7.4 = 40$ cfs

Contour mapping and field surveys indicate there is no potential for water to pond upstream of the pipe culverts. These culverts have been constructed for the purpose of maintaining historical drainage patterns. Field investigation during rainfall events resulted in design of this culvert crossing (2-24" RCP).

$$\text{Culvert Capacity } Q = \left[\frac{1.486}{0.012}\left(\frac{\pi 2^2}{4}\right)\left(\frac{2}{4}\right)^{2/3}\left(\frac{24.8-22.9}{92}\right)^{1/2}\right] \times 2$$

$= 70.4$ cfs > 40 cfs ∴ ACCEPTABLE

4E101-0374-20M

PROJECT: New River Rd. - Drainage Area A, Project No. 68738	STATION: 13+94.5 to 14+31.27 Lt; SHEET 4 OF 6	CULVERT DESIGN FORM; DESIGNER / DATE: L. Thomas / 4-8-94; REVIEWER / DATE: /

HYDROLOGICAL DATA

SEE ADD'L. SHTS.

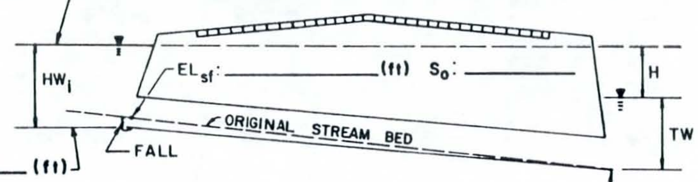
- ☐ METHOD: Rational Method
- ☐ DRAINAGE AREA: 5.58Ac ☐ STREAM SLOPE: 82.5'/mi
- ☐ CHANNEL SHAPE: TRAP
- ☐ ROUTING: N/A ☐ OTHER: —

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
100	37	3.0

EL_{hd}: 23.17 (ft)

~~ROADWAY~~ LEVEE ELEVATION: 28 (ft)



EL_i 20.49 (ft)

$S \approx S_o - FALL / L_a$

$S =$ 0.0200'/LF

$L_a =$ 39LF

EL_o: 19.71 (ft)

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_{hi} (4)	OUTLET CONTROL TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
1-36"ϕ CMP w/End Sections	37	37	1.07	3.21	—	23.70	3.0	2.2	2.6	3.0	0.5	1.04	23.75	23.75	5.23	

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho. HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

SIZE: 1-36 inch Pipe

SHAPE: Circular

MATERIAL: CMP n: 0.024

ENTRANCE: End Sections

PROJECT: New River Rd. - Drainage Area B
Project No. 68738

STATION: 17+92 to 18+30, 80' Lt

SHEET 5 **OF** 6

CULVERT DESIGN FORM

DESIGNER / DATE: L. Thomas / 4-8-94

REVIEWER / DATE: _____ / _____

HYDROLOGICAL DATA

SEE ADD'L. SHTS.

☐ METHOD: Rational Method

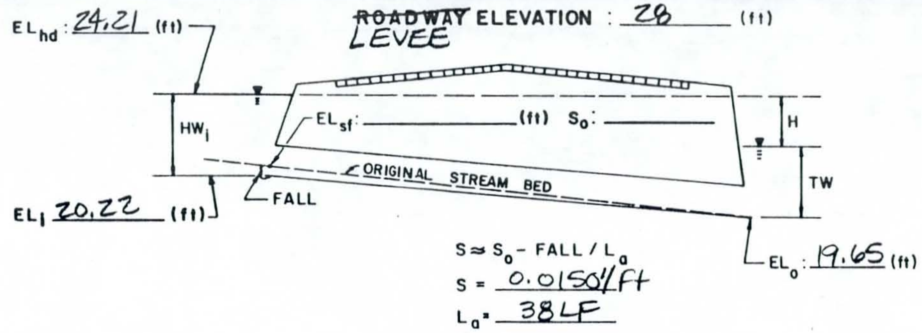
☐ DRAINAGE AREA: 16.95Ac ☐ STREAM SLOPE: 512.2'/mi

☐ CHANNEL SHAPE: TRAP

☐ ROUTING: N/A ☐ OTHER: —

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
100	91	3.0



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_{hi} (4)	OUTLET CONTROL TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2-36" φ CMP w/End Sections	91	45.5	1.3	3.9	-	24.12	3.0	2.2	2.6	3.0	0.5	1.56	24.21	24.21	6.43	

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HW_i /D = HW /D OR HW_f/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho. HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

SIZE: 2-36" Pipe

SHAPE: CIRCULAR

MATERIAL: CMP n=0.024

ENTRANCE: END SECTION

240

PROJECT: New River Rd. Project No. 68738	STATION: 17+92.5 to 18+29.5 Rt SHEET 6 OF 6	CULVERT DESIGN FORM DESIGNER / DATE: L. Thomas / 4-8-94 REVIEWER / DATE: ____ / ____

HYDROLOGICAL DATA

SEE ADD'L. SHTS.

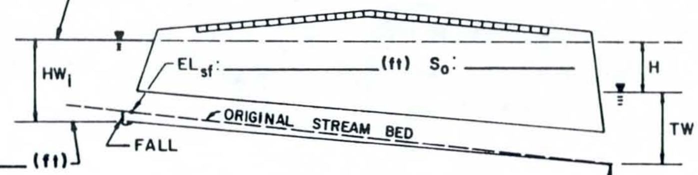
- ☐ METHOD: Rational Method
- ☐ DRAINAGE AREA: 7.4 Ac ☐ STREAM SLOPE: 424.8'/mi
- ☐ CHANNEL SHAPE: Trap
- ☐ ROUTING: — ☐ OTHER: —

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
100	40	3.0

EL_{hd}: 23.64 (ft)

ROADWAY ELEVATION: 27.5 (ft)



EL_i: 19.95 (ft)

EL_o: 19.59 (ft)

$S \approx S_o - FALL / L_a$

S = 0.0098'/ft

L_a = 37 ft

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_{hi} (4)	OUTLET CONTROL TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
1-36" φ CMP w/End Sections	40	40	1.15	3.45	–	23.40	3.0	2.2	2.6	3.0	0.5	1.05	23.64	23.64	5.66	

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho. HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

SIZE: 1-36" Pipe

SHAPE: CIRCULAR

MATERIAL: CMP n 0.024

ENTRANCE: END SECTION

APPENDIX G

Geotechnical Report

REPORT FOR
GEOTECHNICAL ENGINEERING SERVICES
NEW RIVER ROAD BRIDGE
OVER NEW RIVER
MARICOPA COUNTY, ARIZONA
MCDOT Work Order No. 68738

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10971
KENNETH L.
RICKER
Date Signed 1-26-93
ARIZONA, U.S.A.

THOMAS-HARTIG & ASSOCIATES, INC.

GEOTECHNICAL, MATERIALS TESTING, AND ENVIRONMENTAL CONSULTANTS

REPORT FOR
GEOTECHNICAL ENGINEERING SERVICES
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REPORT FOR
GEOTECHNICAL ENGINEERING SERVICES
NEW RIVER ROAD BRIDGE
OVER NEW RIVER
MARICOPA COUNTY, ARIZONA
MCDOT Work Order No. 68738

Submitted To:

Kaminski-Hubbard Engineering, Inc.
Attention: Daniel L. Kaminski, P.E. RLS
4550 North Black Canyon Highway, Suite C
Phoenix, Arizona 85017

Project No. 93-0060

21 January 1993

THOMAS-HARTIG & ASSOCIATES, INC.
Geotechnical, Materials Testing, and Environmental Consultants
7031 West Oakland Street • Chandler, Arizona 85226
Chandler: Phone (602) 961-1169, Fax (602) 940-0952 • Phoenix: Phone (602) 437-5450

Tom W. Thomas, P.E.
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Charles H. Atkinson, P.E.
James M. Willson, P.E.
Steven A. Haire, P.E.
Judith A. McBee
Dale V. Bedenkop, P.E.
John C. Patton
Kenneth D. Walsh, P.E.

Kaminski-Hubbard Engineering, Inc.
4550 North Black Canyon Highway, Suite C
Phoenix, Arizona 85017

21 January 1993

Attention: Daniel L. Kaminski, P.E., RLS

Subject: Report for Geotechnical Engineering Services
New River Road Bridge
Over New River
Maricopa County, Arizona
MCDOT Work Order No. 68738

Project No. 93-0060

This report presents the results of the geotechnical engineering services authorized on the site for the proposed New River Road Bridge located in Maricopa County, Arizona.

The purpose of these services is to determine the soil conditions at the locations indicated which thereby provide a basis for the design discussions and recommendations presented herein. This firm should be notified for evaluation if conditions other than described herein are encountered during construction.

The services performed provide an evaluation at selected locations of the soils throughout the zone of significant foundation influence. Our field services have not included exploration for underlying geologic conditions or evaluation of potential geologic hazards such as seismic activity, faulting, or the presence of contamination.

The recommendations presented in this report are based upon the project information received and described in "Scope" Part I. This firm should be contacted for review if the design conditions are changed substantially.

If requested, we will be available to review project plans and specifications relative to compliance to the intent of this report.

Respectfully submitted,

THOMAS-HARTIG & ASSOCIATES, INC.

By: Registered Professional Engineer (Civil) Certificate No. 10871 KENNETH L. RICKER 1-21-93 Date Signed Arizona, U.S.A.

Reviewed By: Registered Professional Engineer (Civil) Certificate No. 7354 JOHN P. BOYD 1-21-93 Date Signed Arizona, U.S.A.

/cm
Copies to: Addressee (5)

TABLE OF CONTENTS

PART I - REPORT

APPENDIX A - FIELD RESULTS

APPENDIX B - LABORATORY RESULTS

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10971
KENNETH L.
RICKER
Date Signed
ARIZONA, U.S.A.

PROJECT NO. 93-0060

PART I - REPORT

SCOPE

This report presents the results of our geotechnical engineering services conducted for the proposed new New River Road Bridge, which will carry traffic over the New River in Maricopa County near New River, Arizona. The new bridge will replace an existing two lane structure. The new structure will be longer, wider and higher than the existing structure to accommodate the 100-year design flood. Our services were requested by Kaminski-Hubbard Engineering, Inc. to supplement their work for Maricopa County. This report represents the results of the field and laboratory investigation and recommendations for foundation support of the structure, for the approach road and channelization of New River.

PROPOSED CONSTRUCTION

The proposed new bridge will be a four-span structure, utilizing pre-cast AASHTO girders. The structure will be about 400 feet long and about 68 feet wide. Preliminary designs call for support of the abutment and pier loads on spread footings, and/or drilled piles. The bridge deck will be about 17 feet above the existing channelized river bed (Elevation 2016 feet) with approach roadways supported on newly placed fills. The 100-year design flood elevation will be approximately Elevation 2025 feet. Anticipated foundation loads are about 1825 kips at the abutments and about 3200 kips at the pier bents. The new approach fills will be 3 to 5 feet higher than the existing roadway grades. The New River will be widened and improved with spur dikes and channelization for a distance of approximately 950 feet upstream and 300 feet downstream from the bridge.

SITE CONDITIONS

The proposed bridge site is located along the alignment of the existing New River Road Bridge approximately 500 feet east of the I-17 Frontage Road in Maricopa County, Arizona. The existing bridge is a six-span, 300-foot long, 28-foot wide concrete structure built in 1971. According to as-built drawings, the structure is supported on spread footings founded between Elevation 2003.00 and 2006.46 feet on shale or conglomerate. The as-built drawings also contained the boring logs from the original test boring program. The existing river channel is confined by flood control dikes both up and downstream from the bridge. The stream channel is naturally armored with cobbles and boulders with occasional sand bars. The boulders are up to 4-foot in diameter. The existing approach fills are constructed of granular fills up to 9 feet deep. The stream channel is devoid of vegetation. The existing dikes and the area behind the dikes contained a sparse to moderate growth of grasses, weeds and brush. Existing utilities cross New River on and adjacent to the existing bridge on the up and down stream sides. These utilities include a fiber optic telephone lines, power lines, wire telephone lines and a gas line.

FIELD INVESTIGATION

The field investigation included a site review, a site reconnaissance, and subsurface exploration. The subsurface exploration consisted of drilling three test borings (1 to 3) for the bridge, two test borings (R1 and R2) for the road and four test trenches (T1 to T4) for the stream channelization at the locations shown on the site Plan in Appendix A. The three test borings for the bridge were advanced and drilled with a truck-mounted Drill Systems AP1000 Percussion Hammer Drill. With the percussion hammer drill method, a double-wall drive pipe with a 9-inch O.D. and a 6-inch I.D. was advanced by a diesel pile hammer having a maximum rated energy of 8100 foot-pounds per blow. During percussion drilling, compressed air was directed down the annulus of the drive pipe to continuously lift cuttings to the surface through the interior pipe section. Removed cuttings were continuously discharged through a cyclone for continuous examination and sampling, and representative samples were obtained. Driving records for the drive pipe were recorded for a qualitative indication of the relative density and/or consistency of the formation being penetrated. In Test Borings 2 and 3, the bottom 20 and 10 feet, respectively, were cored with an HX double tube core barrel equipped with a carbide saw-tooth bit. The percent recovery and rock quality determination (RQD) were measured for each core run. The two test borings along the roadway were drilled with a CME-55 drill rig using 4-inch diameter flight augers. Soil samples were obtained from the test borings by driving a 2.0-inch O.D., standard split spoon sampler at selected intervals. The four test trenches were excavated with an old D-7 Catipillar tractor.

During the field investigation, the soils and rock encountered were visually classified by our field engineer. The results of the test drilling conducted for this project are presented on the boring logs in Appendix A, "Field Results". In addition, the results of the test borings and the foundation as-built plans for the existing structure are presented.

LABORATORY INVESTIGATION

Laboratory tests were conducted on representative soil and rock samples obtained during the test drilling. The tests were conducted to obtain the data necessary to develop foundation design recommendations for this project. The following laboratory tests were conducted:

Test	Sample(s)	Purpose
Sieve Analysis & Atterberg Limits	*Representative (11)	Classification, erosion and correlation of engineering properties
pH/Resistivity	Representative (2)	Corrosion potential
Unconfined Compression	Bedrock (1)	Bearing pressure
Unit Weight	Bedrock (1)	Correlation of engineering properties

* Material obtained from the test trenches are representative of the minus 3-inch size materials. Visual estimates of the plus 3-inch material (cobbles and boulders) are also presented.

SUBSURFACE CONDITIONS

The subsurface conditions along the proposed bridge were evaluated by drilling three test borings and reviewing the original boring logs and foundation profile presented on the as-built design plans presented in Appendix A. The subsurface conditions consisted of granular alluvial soils overlying bedrock at elevations ranging from 1999 feet to 2006 feet. The surface of the bedrock may be irregular over short distances due to past stream erosion and differential weathering of the surface. The bedrock was composed of gray to dark gray thinly laminated, hard to very hard clay shale containing reddish brown vanes along laminations and bedding planes at and west of Test Boring 2. The deposit was moderately weathered to depths of 2 to 5 feet and slightly weathered to fresh below. West of Test Boring 2 the bedrock is a reddish brown, hard conglomerate with a clayey sandstone matrix around subrounded to angular clasts of volcanic, sedimentary and quartz rocks.

The granular alluvial soils overlying the bedrock consisted of brown sandy gravel, cobbles and boulders stratified with layers of sand and occasional layers of clayey sand underlain by reddish brown sandy gravel, cobbles and boulders with traces of medium plasticity clay fines and stratified with layers of clayey sand and sand. At the abutments the granular soils are overlain by silty sand and silty sand and gravel fill materials. At Test Boring 1, the existing approach fill was overlain by 2.5 inches of asphalt concrete on 6 inches of aggregate base.

Along the approach roads natural soils consist of silty sand with gravel and cobbles. These soils were overlain by an existing pavement section consisting of 2.5 to 3.0 inches of asphalt concrete on 3.5 to 13.5 inches of aggregate base.

In the trench excavations along the channel, the same granular alluvial soils described above were excavated and visually examined. These materials contained 10 to 60 percent cobble and boulder size material (plus 3-inch) with a maximum size observed of approximately 48 inches. A majority of the cobble and boulder size material was less than 18 inches in size. Clay shale was encountered in Trenches T2 and T4 at depths of 8 and 8.5 feet, respectively.

A perched groundwater table was observed in Test Borings 1, 2 and 3 and Test Trenches T1, T2, T3 and T4 at depths ranging from 5.5 to 18 feet below existing grades. The perched groundwater appears to exist in the alluvial soils overlying the relatively dry bedrock materials and is expected to fluctuate with wet periods and flows in the river. No groundwater was encountered to the depth explored in Test Borings R1 and R2.

FOUNDATION RECOMMENDATIONS

Due to the presence of shallow bedrock, spread footings and/or drilled cast-in-place piles found in the bedrock are appropriate for support of the proposed bridge foundation loads.

Spread Footings: The bridge may be supported on shallow footings bearing in undisturbed clay shale and/or conglomerate bedrock. An allowable bearing pressure of 14 ksf may be used for footings founded at least 2 feet into bedrock. The footings should be excavated until the entire footing is bearing on a clean horizontal bedrock surface or on horizontal benches at least 2 feet below the level of moderate to heavy weathering at the top of the formation.

Retaining walls and wing walls may be founded in the near surface natural granular soils. An allowable bearing pressure of 2000 psf for footings founded 1.5 feet below lowest adjacent grade may be used in design.

Due to the possible variation of rock surface elevation and possible variable weathering of the rock between our widely spaced test borings, the footing excavations should be observed by the geotechnical engineer to verify rock conditions prior to placing concrete. If highly weathered rock or soil are present, those materials should be removed and the footing deepened or the removed material replaced with lean concrete.

The recommended foundation bearing pressure should be considered an allowable maximum for dead load plus design live loads and may be increased by one-third when considering transient wind or seismic forces. The weight of the foundation concrete below grade may be neglected in dead load computations. All bridge spread footings should have a minimum width of 5 feet. Retaining walls and wing walls should have a minimum width of 1.33 feet.

Estimated settlements for spread footings supporting the anticipated pier and abutment loads are approximately 1/2 inch or less assuming proper cleaning of the bearing surface.

<u>Lateral Design Parameters</u>: The following tabulation presents recommendations for lateral stability analyses:

Maximum Allowable	
[1]Lateral Backfill Pressures:	
Unrestrained walls	35 psf/ft
Restrained walls	55 psf/ft
Lateral Passive Pressures:	
Continuous walls/footings:	
For soil	250 psf/ft
For bedrock	900 psf/ft
Coefficient of Base Friction:	
Independent of passive resistance:	
For soil	0.40
For bedrock	0.50
In Conjunction with Passive Resistance:	
For soil	0.30
For rock	0.40

[1]Equivalent fluid pressures for vertical walls and horizontal backfill surfaces. Pressured do not include temporary forces imposed during construction of the backfill, swelling pressures developed by over-compacted clayey backfill, or surcharge loads. Walls should be suitably braced during backfilling to prevent damage and excessive deflection.

Axial Capacity-Drilled Cast-in-Place Straight Shaft Piles: The following section present drilled pile design recommendations. The required depth of pile embedment and pile diameter should be determined for both design axial and design lateral loading, to determine the most critical design case. The recommendations presented are based on currently available preliminary bridge geometry and loads. If bridge plans and/or loads change significantly, we should be notified for review and possible supplemental recommendations.

Drilled pile capacities were estimated assuming no support from surface soils or abutment fills and all loads resisted by bedrock. For piles socketed into bedrock a depth of one pile diameter or more, only a small portion of the load is transferred to the bottom of the shaft, provided the pile is not loaded beyond the limit of sidewall bond strength. For this reason, we conservatively neglected the end bearing capacity. An ultimate sidewall adhesion of 120 psi was used in the analysis. The value was estimated based on a correlation of bond strength vs. uniaxial compressive strength of rock compiled from load test data presented by Horvath (ref. 1). In addition, a factor of safety of 2.5 relative to ultimate sidewall adhesion was used to calculate axial pile capacity.

The allowable downward capacities of straight-shaft, cast-in-place drilled piles are:

Diameter (Feet)	Length of Rock Socket (Feet)	Allowable Vertical Capacity (kips)
4.0	4.0 (min.)	347
	8.0	695
	12.0	1042
	16.0	1389

Diameter (Feet)	Length of Rock Socket (Feet)	Allowable Vertical Capacity (kips)
5.0	5.0 (min.)	543
	10.0	1085
	15.0	1628
	20.0	2171

These allowable drilled pile capacities should be considered maximums for dead plus design live loads, and may be increased by one-third when considering total loads including transient wind or seismic forces. The weight of the foundation concrete below grade may be neglected in dead load computations. Estimated settlements are less than 1/2 inch for the anticipated loading conditions. Piles should be spaced no closer than 2.5 diameters, center to center.

Due to the size and amount of cobbles and boulders observed in the alluvial soils overlying the bedrock, we recommend that a minimum pile diameter of 4 feet be used. Even at that size or at larger diameters, penetrating the alluvial soils will be difficult and very slow to accomplish even with large, heavy duty crane mounted equipment. In addition, construction of the rock socket will probably require coring and/or rock drilling equipment.

We recommend that most of the drilling spoil (no more than one or two inches remaining) be removed from the base of the excavation prior to concrete placement. If significant groundwater seeps into the excavation, cleaning will have to be assured by careful use of a cleanout bucket under the observation of the geotechnical engineer. If underwater concrete placement is required, it should be completed according to ADOT Standard Specifications and the concrete placement should be carefully observed. For concrete placed under water, the relative density of the in-place concrete should be tested with a nuclear density probe at each drilled shaft. All foundation drilling should be completed under the observation of the geotechnical engineer.

<u>Lateral Capacity - Drilled Cast-in-Place Piles</u>: The following parameters are recommended to construct P-Y curves to model the bedrock at the site. These P-Y

curves can be input to COM624G or LPILE1 computer programs to analyze pile response.

For bedrock:

k = 5000 pci

P-Y Curves:

Y (lateral movement of pile in inches)	P (rock resistance in pounds/inch of pile length)
0.0	0.0
0.0004b	0.8 $S_u b$
0.0024b	1.0 $S_u b$

Where:

b = shaft diameter, inches

S_u = rock shear strength

= 1500 psi for bedrock

The P-Y curves presented above were generated according to recommendations presented by Reese and Nyman (ref. 2), based on the behavior of an instrumented pile installed in rock. The test was performed for the purpose of gaining information for the design of foundations for highway bridges in the Florida Keys.

Structure Backfilling: Backfill required against abutment walls and other retaining structures should be granular soils meeting the Maricopa County Department of Transportation Specifications for Select Backfill Materials. The backfill soils should be free of any silty or clayey fines so that the backfill will be free-draining and not susceptible to increase loadings due to hydrostatic forces. Compaction should be accomplished to a minimum 95 percent of the ASTM D698 maximum density. Retaining structures should be braced to resist equipment loadings during compaction of the backfill.

Approach Fills: Current roadway design indicates that additional approach fills on the order of 3 to 4 feet will be required. Test Boring SR1 and R2 were drilled along the roadway.

The following procedure is presented for development of the approach fill zones.

1. Strip and remove all existing asphalt concrete pavement, dumped or loose spread fill zones, any organic or debris materials, and any obviously loose surface soils.

2. Clean and widen any depressions.

3. Scarify to a minimum depth of 8 inches, moisture condition, and compact all cleaned subgrade.

4. Place all required fills in lifts of a thickness compatible with the compaction equipment used.

Compaction of all soil should be accomplished to a minimum 95 percent of the ASTM D698 maximum dry density at a moisture range of optimum -2 percent or lower.

Settlements are estimated at 1/2 inch or less, and the majority of settlement will occur during initial construction.

Pavement Recommendation: The project will include the reconstruction and widening of approximately 1100 linear feet of New River Road from I-17 Frontage Road (Sta 10+00) to 650 feet east of the east abutment of the new bridge (Sta 24+55). All design and construction will be accomplished in accordance with Maricopa County Department of Transportation. The Arizona Department of Transportations' (ADOT) design procedures and the following design parameters were utilized to determine the recommended pavement section for this project.

Design "R" Value = 60
Regional factor = 1.5
Traffic, 20 year = 273,512 SEAL*
Structural coefficients:
  Aggregate base: 0.12
  Asphalt concrete: 0.36 to 0.40 (depending on thickness)
*SEAL = equivalent 18 kip single-axle load applications

Traffic volume data and percentage of cars/trucks were provided by Kaminski-Hubbard Engineering. The traffic analysis is based upon a projected present day two-way traffic count of 1543 vehicles per day and a projected 20 year two-way traffic count of 3086 vehicles per day. We also understand vehicle use of the roadways will primarily consist of cars (92.4%) lightweight trucks (4.5%), medium trucks (1.8%) and heavy trucks (1.5%). This traffic data resulted in approximately 273,512 equivalent 18 kip single-axle load applications over the 20 year life of the pavement.

Based upon the above data, a structural number (SN) of 1.65 was computed. However, a minimum structural number of 2.0 was used and can be satisfied by various thicknesses of asphalt concrete and base course materials utilizing their corresponding structural coefficients.

The following tabulation presents alternate equivalent pavement sections for the project based upon the above data.

Asphalt Concrete	Aggregate Base
3.0 in. (min.) 1½" (C-¾) on 1½" (C-¾)	8 in.
3.5 in. 1½" (C ¾) on 2" (C ¾)	6 in.
5.0 in. 2" (C-¾) 3" ([illegible] A1½)	0 in.

A minimum 3.0 inch asphalt concrete surface is recommended. The above tabulated alternatives may be used for the pavement section and the alternative chosen will be primarily dependent upon the economics involved. The existing asphalt pavement should be removed. However, if grades permit, the existing granular base material may remain. The asphalt concrete for this project should consist of either a new virgin mix or recycling of the existing asphalt pavement. The existing asphalt pavement may also be milled and used for aggregate base material. meet gradation of ABC MAG.

All earthwork and asphalt construction should be in accordance with the Maricopa County Department of Transportation (MCDOT) Specifications. A compacted subgrade of existing site soils or imported soils with comparable supporting properties is assumed.

Fill Materials: All fill materials should be inorganic soils free of vegetation, debris, organic contaminants, and fragments larger than 6 inches in size. Native site soils may be used for required fills in all areas. Any imported fill should have soil support properties equal to or greater than the native soils.

Base Course: Base course materials for use beneath pavements should be well graded sand and gravel materials meeting the MCDOT Specifications for Aggregate Base Course Materials.

Asphalt Pavement: Pavement materials should be in accordance with the requirements of the MCDOT Specifications for Asphalt Concrete.

Corrosion: Laboratory testing was performed on two selected soil samples to determining pH and minimum resistivity. The results are presented in Appendix B.

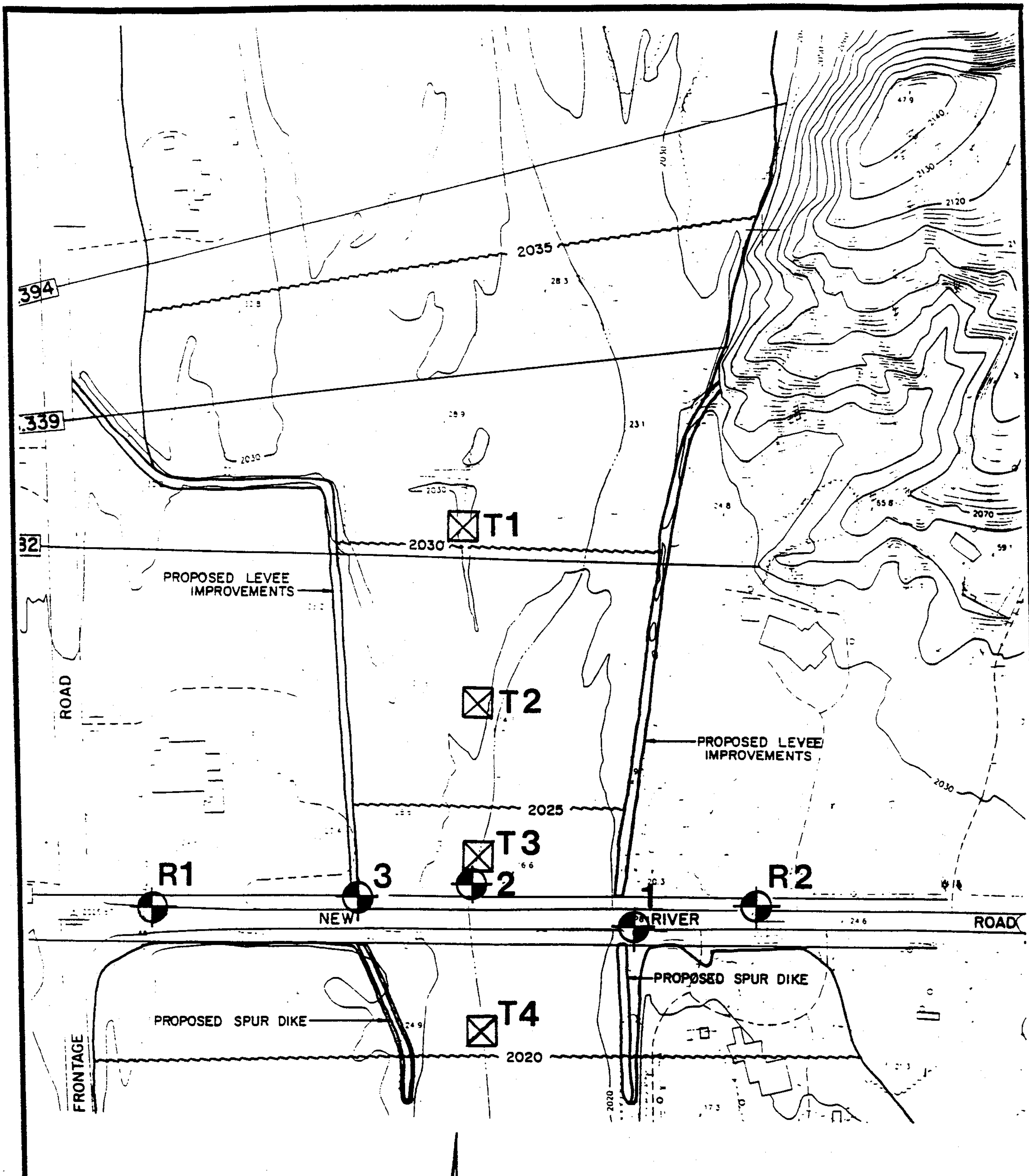
Erosion and Scour Soil Parameters: The results of the Sieve Analysis and Atterberg Limits Tests of the minus 3-inch material from the test trenches in the channel are presented in Appendix B. When used in erosion and scour analysis, these values should be adjusted to account for the observed plus 3-inch material present in Appendix A.

REFERENCES

1. Horvath, R.G., "Field Load Test Data on Concrete-to-Rock Bond Strength for Drilled Pier Foundations", Report 78-07, Dept. of Civil Engineering, University of Toronto, Ontario, July 1978, 97 p.

2. Reese, L.C. and K.J. Nyman, "Field Load Tests of Instrumented Drilled Shafts at Islamorada, Florida," a report to Girdler Foundation and Exploration Corporation, Clearwater, Florida, February, 1978.

APPENDIX A - FIELD RESULTS



Test Boring Location

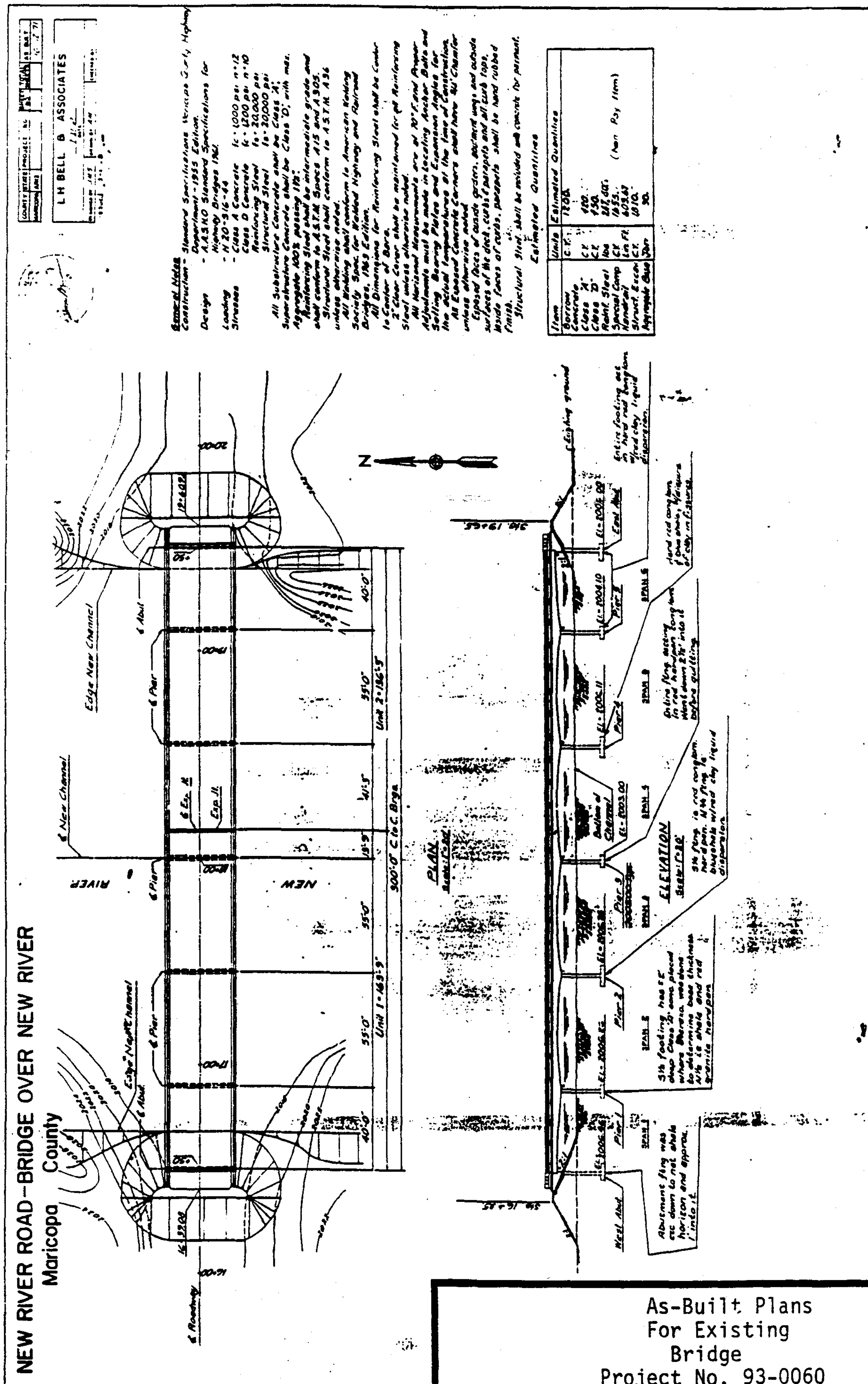
Test Trench Location

Note: Test Boring and Test Trench Elevation Interpolated from Topographic Plan by Kaminski-Hubbard

Site Plan

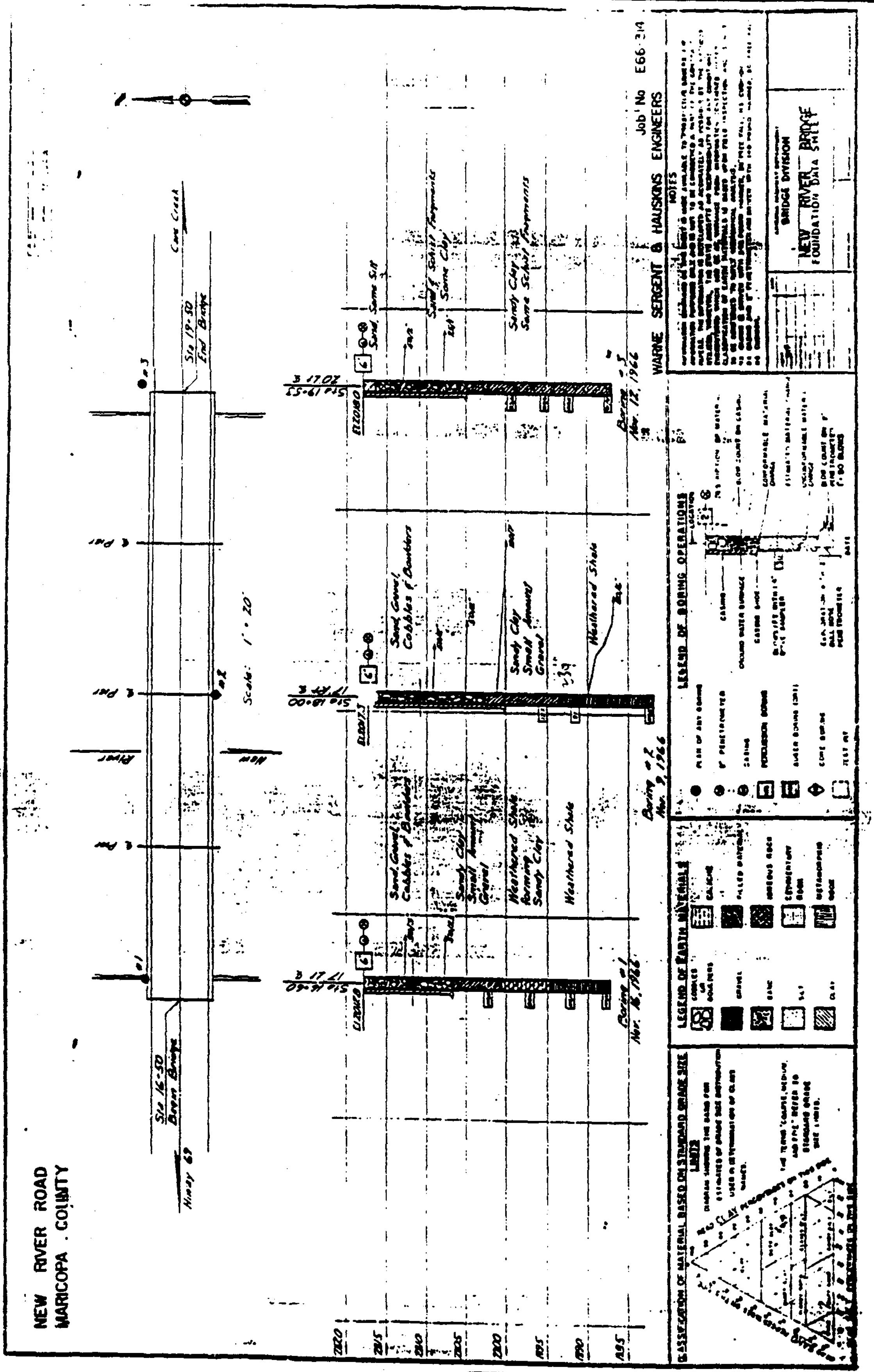
Project No. 93-0060

THOMA...



As-Built Plans
For Existing
Bridge
Project No. 93-0060

THOMAS-HARTIG & ASSOCIATES, INC.



As-Built Plans for Existing Bridge

Project No. 93-0060

THOMAS-HARTIG & ASSOCIATES, INC.

LEGEND

SOIL CLASSIFICATION

COARSE-GRAINED SOIL

More than 50% larger than 200 sieve size

SYMBOL	LETTER	DESCRIPTION	MAJOR DIVISIONS
	GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES. LESS THAN 5% - #200 FINES	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
	GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES. LESS THAN 5% - #200 FINES	
	GM	SILTY GRAVELS. GRAVEL-SAND-SILT MIXTURES. MORE THAN 12% - #200 FINES	
	GC	CLAYEY GRAVELS. GRAVEL-SAND-CLAY MIXTURES. MORE THAN 12% - #200 FINES	
	SW	WELL-GRADED SANDS OR GRAVELLY SANDS. LESS THAN 5% - #200 FINES	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
	SP	POORLY-GRADED SANDS OR GRAVELLY SANDS. LESS THAN 5% - #200 FINES	
	SM	SILTY SANDS. SAND-SILT MIXTURES MORE THAN 12% - #200 FINES	
	SC	CLAYEY SANDS. SAND-CLAY MIXTURES MORE THAN 12% - #200 FINES	

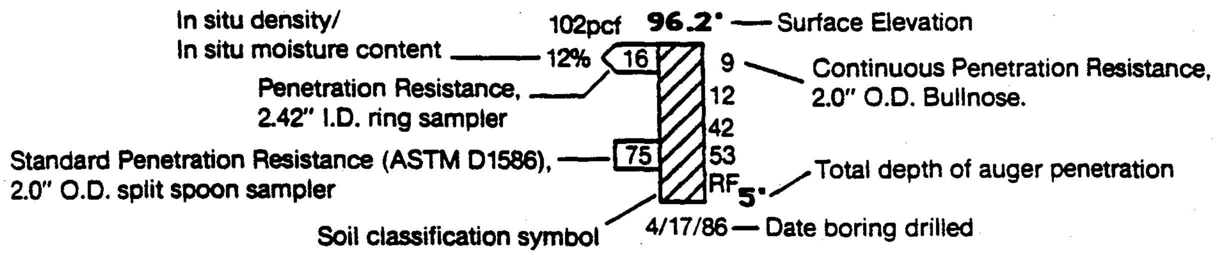
FINE-GRAINED SOIL

More than 50% smaller than 200 sieve size

SYMBOL	LETTER	DESCRIPTION	MAJOR DIVISIONS
	ML	INORGANIC SILTS. ROCK FLOUR. AND FINE SANDY OR CLAYEY SILTS OF LOW TO MEDIUM PLASTICITY	SILTS AND CLAYS Liquid limit less than 50
	CL	INORGANIC CLAYS. GRAVELLY CLAYS. SANDY CLAYS. SILTY CLAYS. AND LEAN CLAYS OF LOW TO MEDIUM PLASTICITY	
	OL	ORGANIC SILTS AND ORGANIC SILT-CLAY MIXTURES OF LOW TO MEDIUM PLASTICITY	
	MH	INORGANIC SILTS. MICACEOUS OR DIATOMACEOUS. AND FINE SANDY OR CLAYEY SILTS OF HIGH PLASTICITY	SILTS AND CLAYS Liquid limit greater than 50
	CH	INORGANIC CLAYS. FAT CLAYS. AND SILTY CLAYS OF HIGH PLASTICITY	
	OH	ORGANIC CLAYS AND ORGANIC SILTS OF MEDIUM TO HIGH PLASTICITY	
	PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	

LEGEND FOR GRAPHICAL BORING LOGS:

Log denotes visual approximation unless accompanied by mechanical analysis and Atterberg limits.



PENETRATION RESISTANCE: Blows per foot using 140 lb. hammer with 30" free-fall unless otherwise noted.

GRAIN SIZES								
	U.S. STANDARD SERIES SIEVE 200	40	10	4	CLEAR SQUARE SIEVE OPENINGS 3/4"		3"	12"
SILTS & CLAYS DISTINGUISHED ON BASIS OF PLASTICITY	SAND			GRAVEL		COBBLES	BOULDERS	
	FINE	MEDIUM	COARSE	FINE	COARSE			

MOISTURE CONDITION (INCREASING MOISTURE →)

DRY	SLIGHTLY DAMP	DAMP (Plastic Limit)	MOIST	VERY MOIST	WET (SATURATED) (Liquid Limit)

CONSISTENCY CORRELATION		RELATIVE DENSITY CORRELATION	
CLAYS & SILTS	BLOWS/FOOT*	SANDS & GRAVELS	BLOWS/FOOT*
VERY SOFT	0-2	VERY LOOSE	0-4
SOFT	2-4	LOOSE	4-10
FIRM	4-8	MEDIUM DENSE	10-30
STIFF	8-16	DENSE	30-50
VERY STIFF	16-32	VERY DENSE	OVER 50
HARD	OVER 32		

*Number of blows of 140 lb. hammer falling 30" to drive a 2" O.D. (1-3/8" I.D.) split-spoon sampler (ASTM D1586).

Project No. 93-0060

LEGEND OF SOIL TYPES

ASPHALT CONCRETE OVER AGGREGATE BASE (See individual logs for thicknesses).

FILL MATERIAL - SILTY SAND AND GRAVEL (SM-GM); brown; medium dense to loose; slightly damp; none plastic fines.

FILL MATERIAL - SILTY VERY FINE SAND (SM); grayish brown; medium dense; slightly damp; non-plastic fines; some gravel and cobbles below 3 feet.

SANDY GRAVEL COBBLES AND BOULDERS (GP); brown; medium dense; slightly damp; traces silt; stratified with layers of sand and occasional clayey sand.

SANDY GRAVEL COBBLES AND BOULDERS (GP); reddish brown; dense to very dense; damp to wet; traces medium plasticity clay fines; stratified with some clayey sand and sand layers.

CLAY SHALE; gray to dark gray with some reddish brown zones along laminations and beddng planes; thinly laminated, moderately bedded; hard to very hard; laminations and bedding planes moderately sloping; moderately weathered upper 2 to 5 feet; slightly weathered to fresh below; nearly dry below weathered zone.

CONGLOMERATE; reddish brown; clayey sandstone matrix around subrounded to angular clastics of volcanic, quartz and sedimentary rocks; hard; nearly dry.

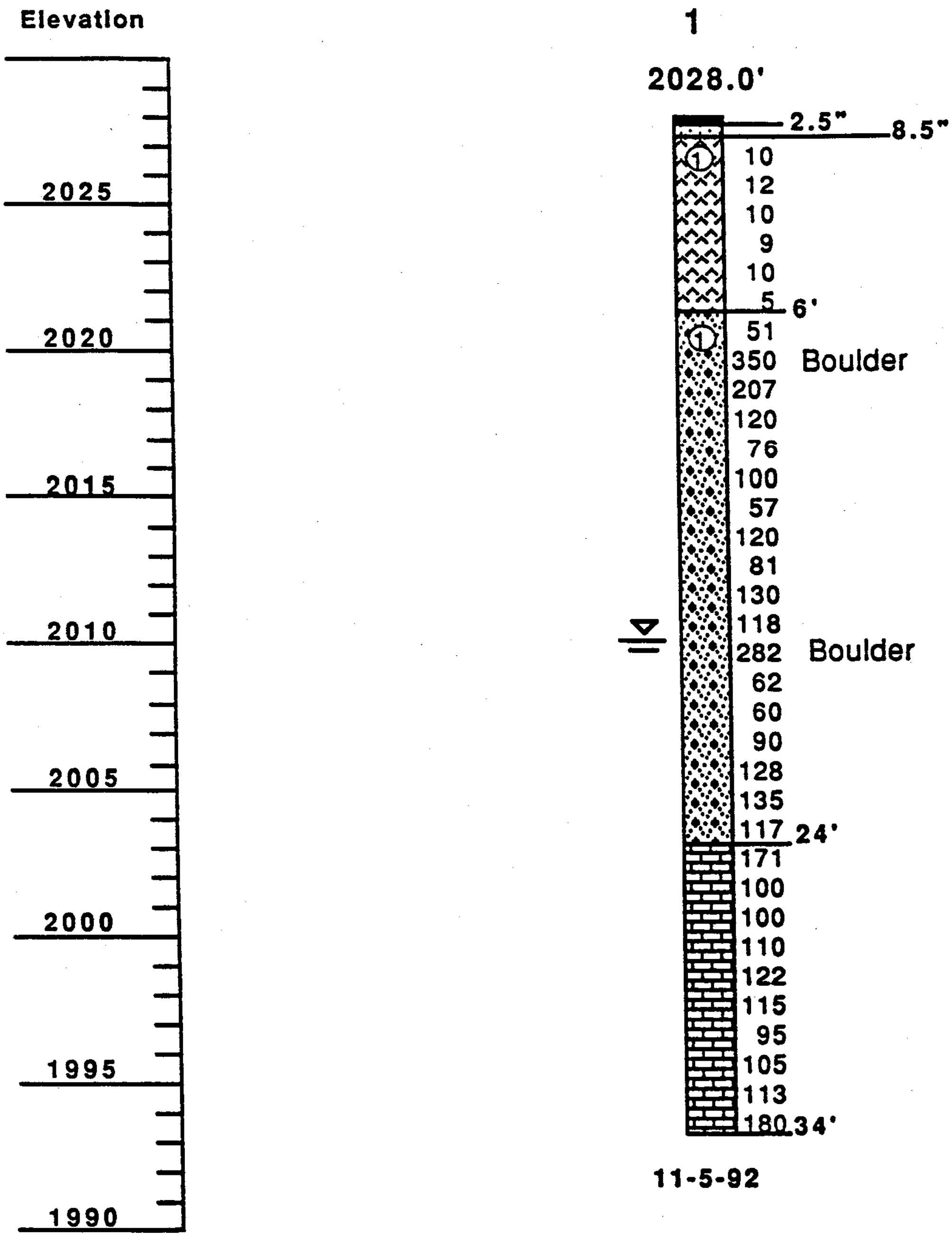
SILTY SAND WITH GRAVEL AND COBBLES (SM); brown; medium dense; slightly damp; none to low plasticity fines.

CLAYEY SAND (SC); reddish brown; medium dense; damp; medium plasticity fines.

NOTE: The data presented on the boring logs represents subsurface conditions only at the specific locations and at the time designated. This data may not represent conditions at other locations and/or times. Contacts between soil strata are approximate and changes between soil types may be gradual rather than abrupt. This boring data was compiled primarily for design purposes and should not be construed as part of the plans governing construction or defining construction techniques. Bidders are fully responsible for interpretations or conclusions they draw from the boring log.

APPENDIX B - LABORATORY RESULTS

GRAPHICAL BORING LOGS

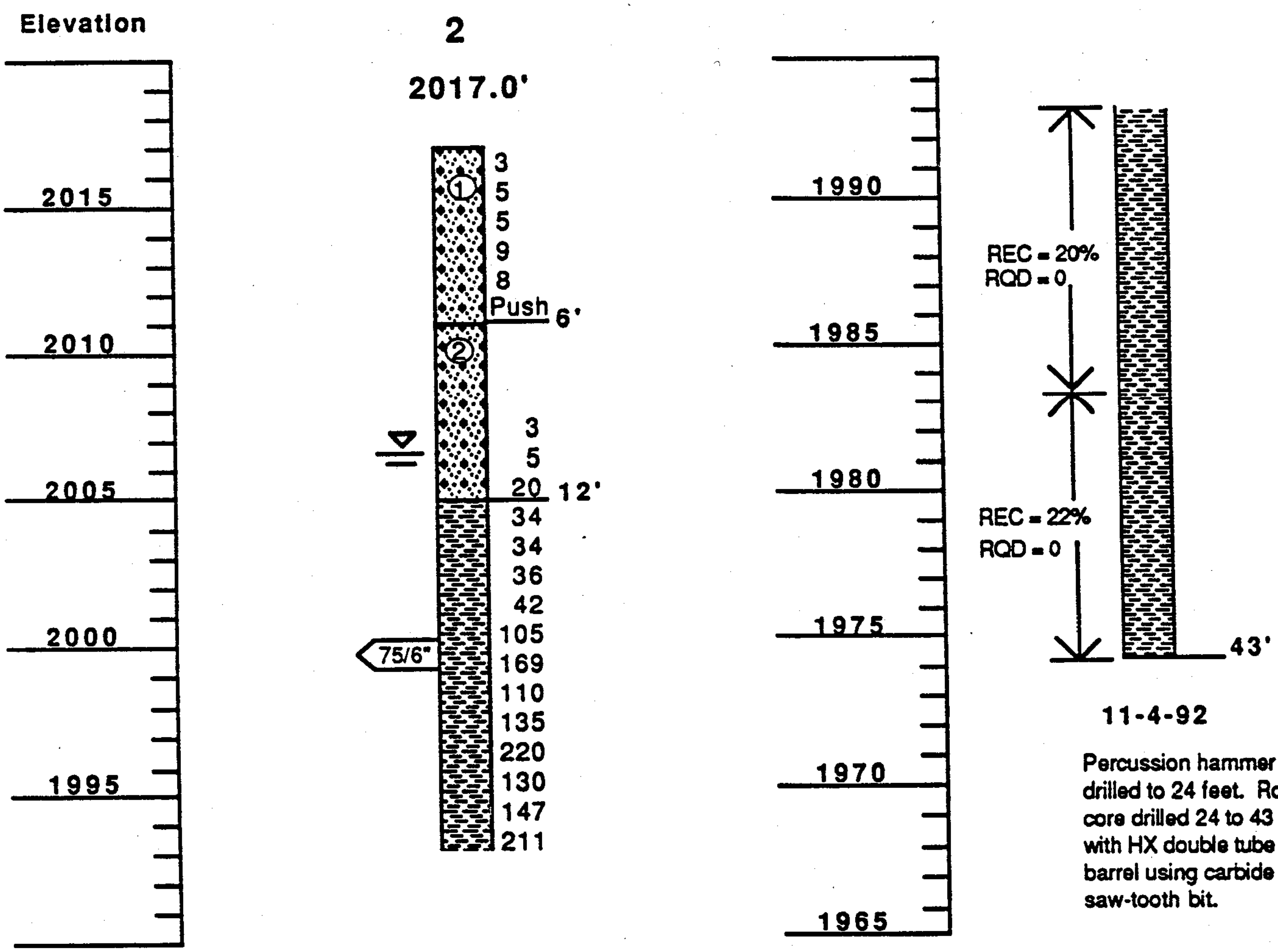


Boring drilled with 9" OD DWP by AP1000 drill rig

NOTE: The data presented on the boring logs represents subsurface conditions only at the specific locations and at the time designated. This data may not represent conditions at other locations and/or times. Contacts between soil strata are approximate and changes between soil types may be gradual rather than abrupt. This boring data was compiled primarily for design purposes and should not be construed as part of the plans governing construction or defining construction techniques. Bidders are fully responsible for interpretations or conclusions they draw from the boring log.

Project No. 93-0060
Thomas-Hartig & Associates

GRAPHICAL BORING LOGS



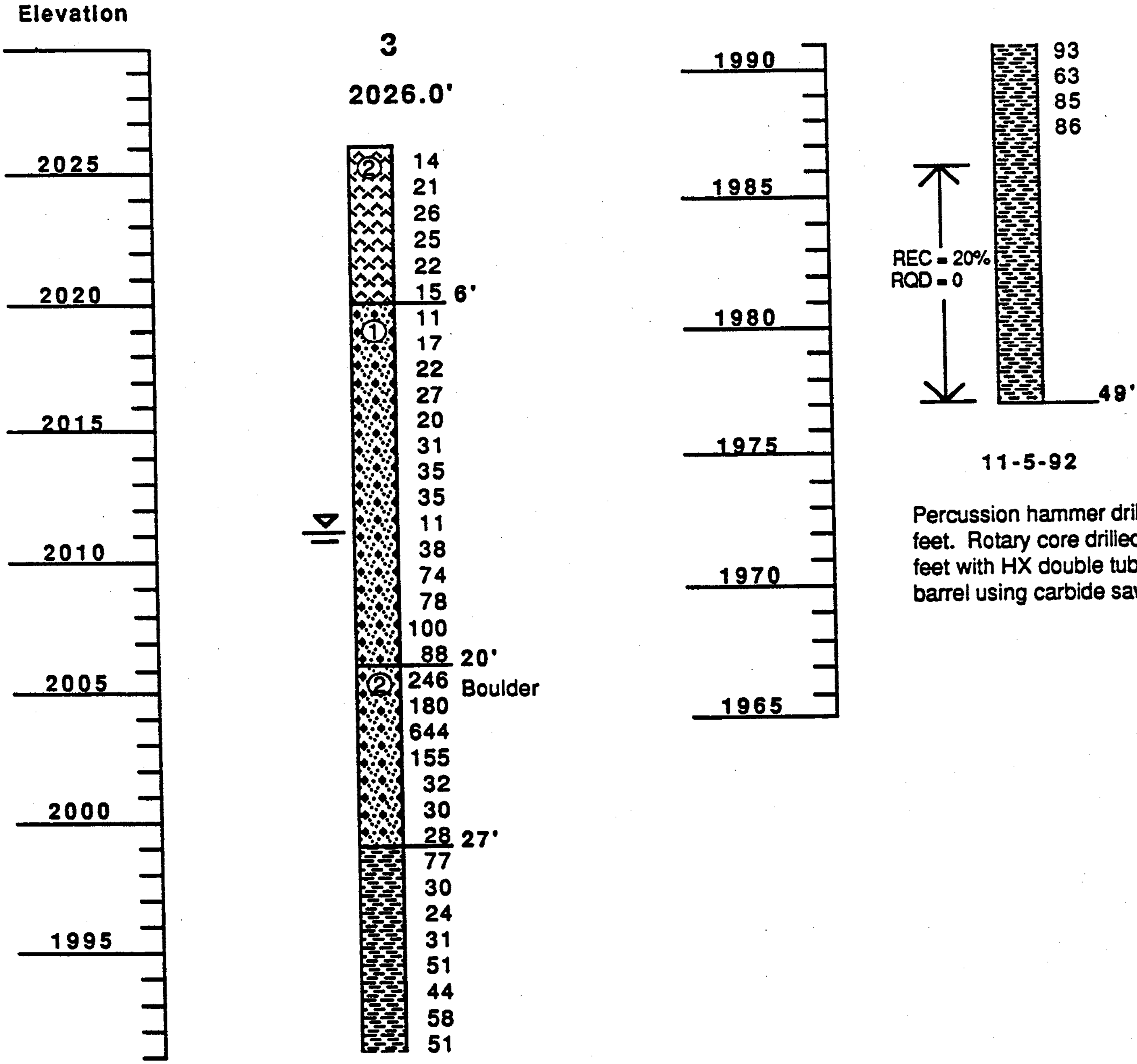
Percussion hammer drilled to 24 feet. Rotary core drilled 24 to 43 feet with HX double tube core barrel using carbide saw-tooth bit.

Boring drilled with 9" OD DWP by AP1000 drill rig

NOTE: The data presented on the boring logs represents subsurface conditions only at the specific locations and at the time designated. This data may not represent conditions at other locations and/or times. Contacts between soil strata are approximate and changes between soil types may be gradual rather than abrupt. This boring data was compiled primarily for design purposes and should not be construed as part of the plans governing construction or defining construction techniques. Bidders are fully responsible for interpretations or conclusions they draw from the boring log.

Project No. 93-0060
Thomas-Hartig & Associates

GRAPHICAL BORING LOGS



Percussion hammer drilled 0 to 39 feet. Rotary core drilled 39 to 49 feet with HX double tube core barrel using carbide saw-tooth bit.

Boring drilled with 9" OD DWP by AP1000 drill rig

NOTE: The data presented on the boring logs represents subsurface conditions only at the specific locations and at the time designated. This data may not represent conditions at other locations and/or times. Contacts between soil strata are approximate and changes between soil types may be gradual rather than abrupt. This boring data was compiled primarily for design purposes and should not be construed as part of the plans governing construction or defining construction techniques. Bidders are fully responsible for interpretations or conclusions they draw from the boring log.

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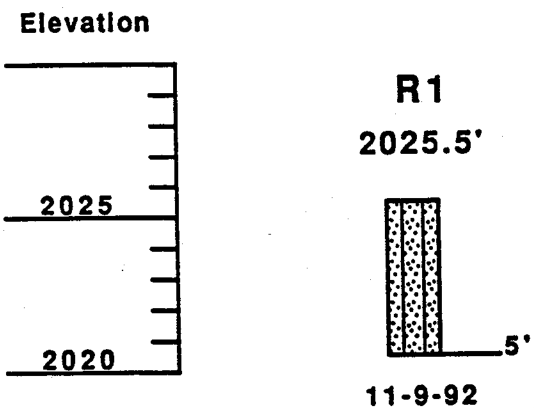
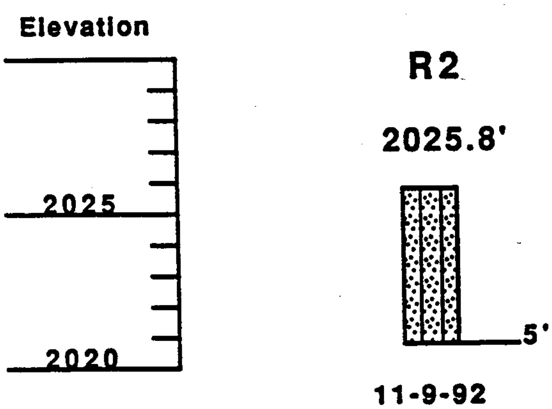
GRAPHICAL BORING LOGS



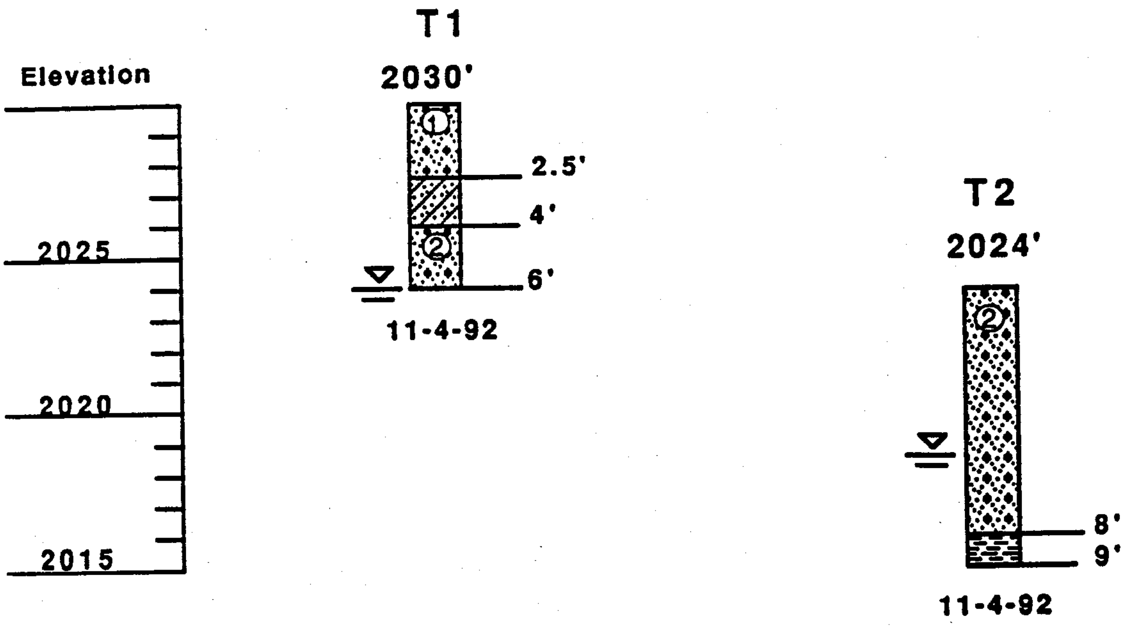


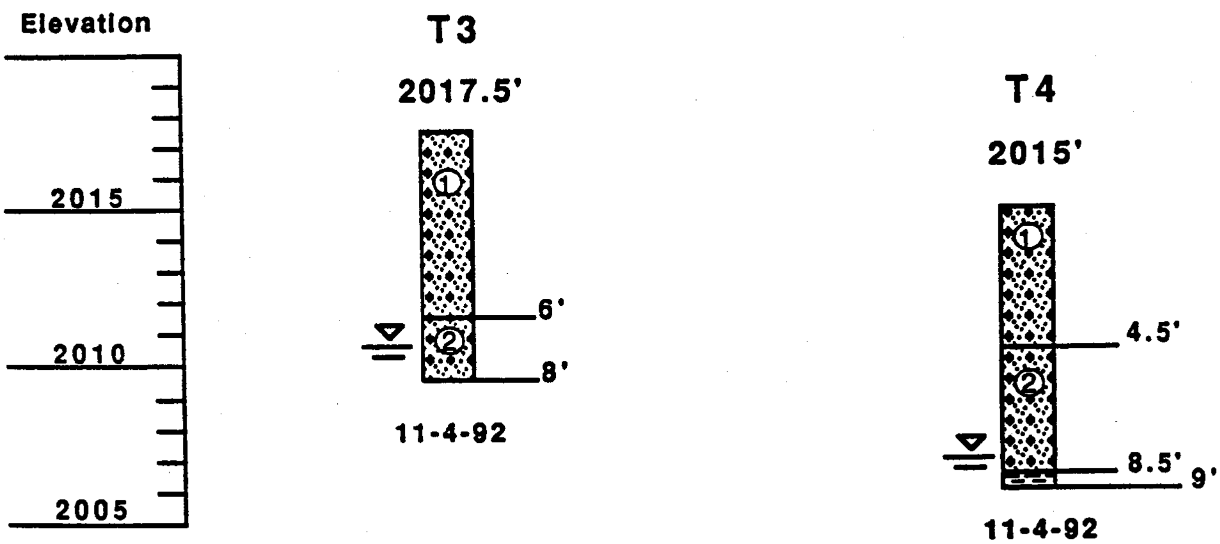
No free groundwater was encountered in any of the borings during drilling.

All borings drilled with CME 55 using 4" diameter auger unless otherwise noted.

NOTE: The data presented on the boring logs represents subsurface conditions only at the specific locations and at the time designated. This data may not represent conditions at other locations and/or times. Contacts between soil strata are approximate and changes between soil types may be gradual rather than abrupt. This boring data was compiled primarily for design purposes and should not be construed as part of the plans governing construction or defining construction techniques. Bidders are fully responsible for interpretations or conclusions they draw from the boring log.

GRAPHICAL TRENCH LOGS





Test Trenches Excavated with an old D-7 Cat

NOTE: The data presented on the trench logs represents subsurface conditions only at the specific locations and at the time designated. This data may not represent conditions at other locations and/or times. Contacts between soil strata are approximate and changes between soil types may be gradual rather than abrupt. This data was compiled primarily for design purposes and should not be construed as part of the plans governing construction or defining construction techniques. Bidders are fully responsible for interpretations or conclusions they draw from the trench log.

Project No. 93-0060
Thomas-Hartig & Associates

REPORT ON FIELD TESTS

SAMPLE: Date: 12-14-92

Source:	Noted Below
Type:	Subsoil
Material:	Subsoil
Sampled By:	TH/Thompson/Ricker

TESTED: Visual Estimates of Plus 3-inch material (cobble & boulders) in Test Trench Walls

TEST RESULTS

Location	Estimated % Plus 3-inch
T1; 0 - 2 1/2'	50 to 60
T1; 2 1/2 - 4'	0
T1; 4 - 8'	10 to 20
T2; 0 - 8'	50 to 60
T3; 0 - 3'	20 to 30
T3; 3 - 6'	20 to 30
T3; 6 - 8'	10 to 20
T4; 0 - 4 1/2'	30 to 50
T4; 4 1/2 - 8'	10 to 20

Project No. 93-0060

Thomas-Hartig & Associates, Inc.

REPORT ON SIEVE ANALYSIS AND PLASTICITY INDEX

SAMPLE: Date: 12-14-92

Source: Noted Below
Type: Bulk
Material: Subsoil
Sampled By: TH/Thompson/Ricker

TESTED: Sieve Analysis and Atterberg Limits

RESULTS

			Sieve Size -				Accumulative % Passing							*
Sample	LL	PI	200	100	50	30	16	8	4	3/4"	1"	2"	3"	Class.
2; 15'	33	10	25	28	31	35	41	51	61	88	97	100		GC
R1; 0 - 3'	–	NP	18	25	33	44	57	70	79	100				SM
R2; 0 - 3'	23	4	20	27	35	44	54	63	74	100				SM
T1; 0 - 2-1/2"	–	NP	2	3	5	9	18	30	37	58	65	90	** 100	GP
T1; 2-1/2 - 4'	41	23	34	43	48	59	80	96	98	100				SC
T2; 0 - 8'	31	16	5	6	9	16	29	41	49	69	74	93	** 100	GP-GC
T3; 0 - 3'	23	4	9	11	15	24	36	49	56	75	79	95	** 100	GP-GM
T3; 3 - 6'	–	NP	1	1	2	5	16	30	37	54	61	81	** 100	GP
T3; 6 - 8'	32	15	5	6	10	23	41	57	64	78	83	95	** 100	GP-GC
T4; 0 - 4-1/2'	–	NP	1	2	3	8	17	29	36	53	58	77	*** 93	GP
T4; 4-1/2 - 8'	32	17	4	5	7	15	27	38	43	60	66	81	*** 93	GP

NP - Non-Plastic

*Unified Soil Classification

** Sieve Analysis on minus 3-inch material (see page 22 for estimated plus 3-inch material)

*** Sieve analysis on minus 6-inch material (see page 22 for estimate of plus 3-inch material).

Project No. 93-0060

Thomas-Hartig & Associates, Inc.

REPORT ON pH/RESISTIVITY

SAMPLE: Date: 12-14-92

Source: Noted Below
Type: Bulk
Material: Subgrade
Sampled By: TH/Thompson

TESTED: pH and Minimum Resistivity

TEST RESULTS

Location	Minimum Resistivity (ohm-cm)	pH
R-1; 3 - 5	2168	7.93
R-2; 3 - 5	2201	7.86

Project No. 93-0060

Thomas-Hartig & Associates, Inc.

REPORT ON UNCONFINED COMPRESSION AND UNIT WEIGHT

SAMPLE: Date: 12-14-92

Source: Test Trench T2
Type: Piece of Bedrock
Material: Shale
Sampled By: TH/Ricker

TESTED: Unconfined compress & unit weight of rock core from shale piece

TEST RESULTS

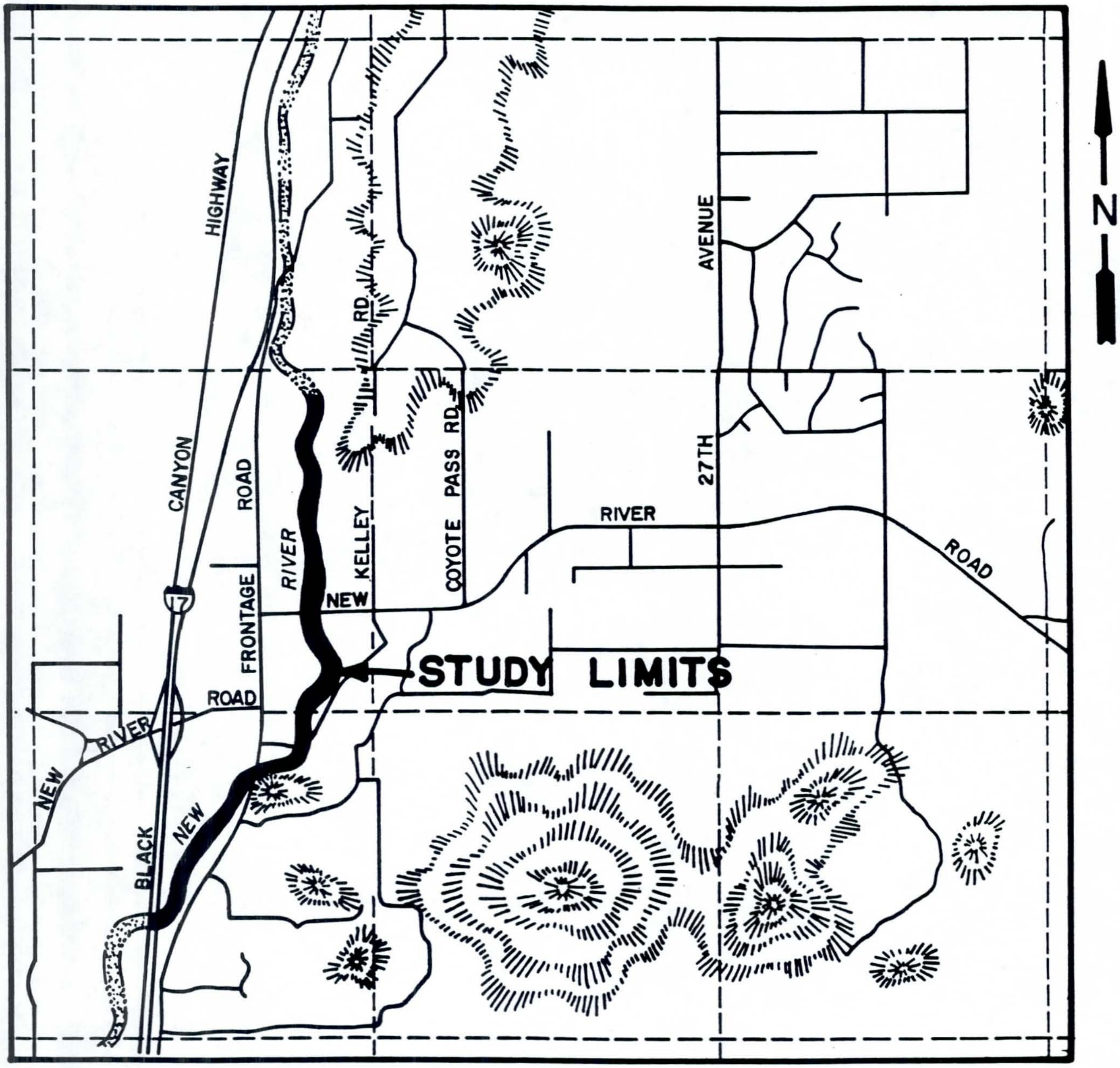
Unit Weight	Unconfined Compression
168.7 pcf	7559 psi

Project No. 93-0060

Thomas-Hartig & Associates, Inc.

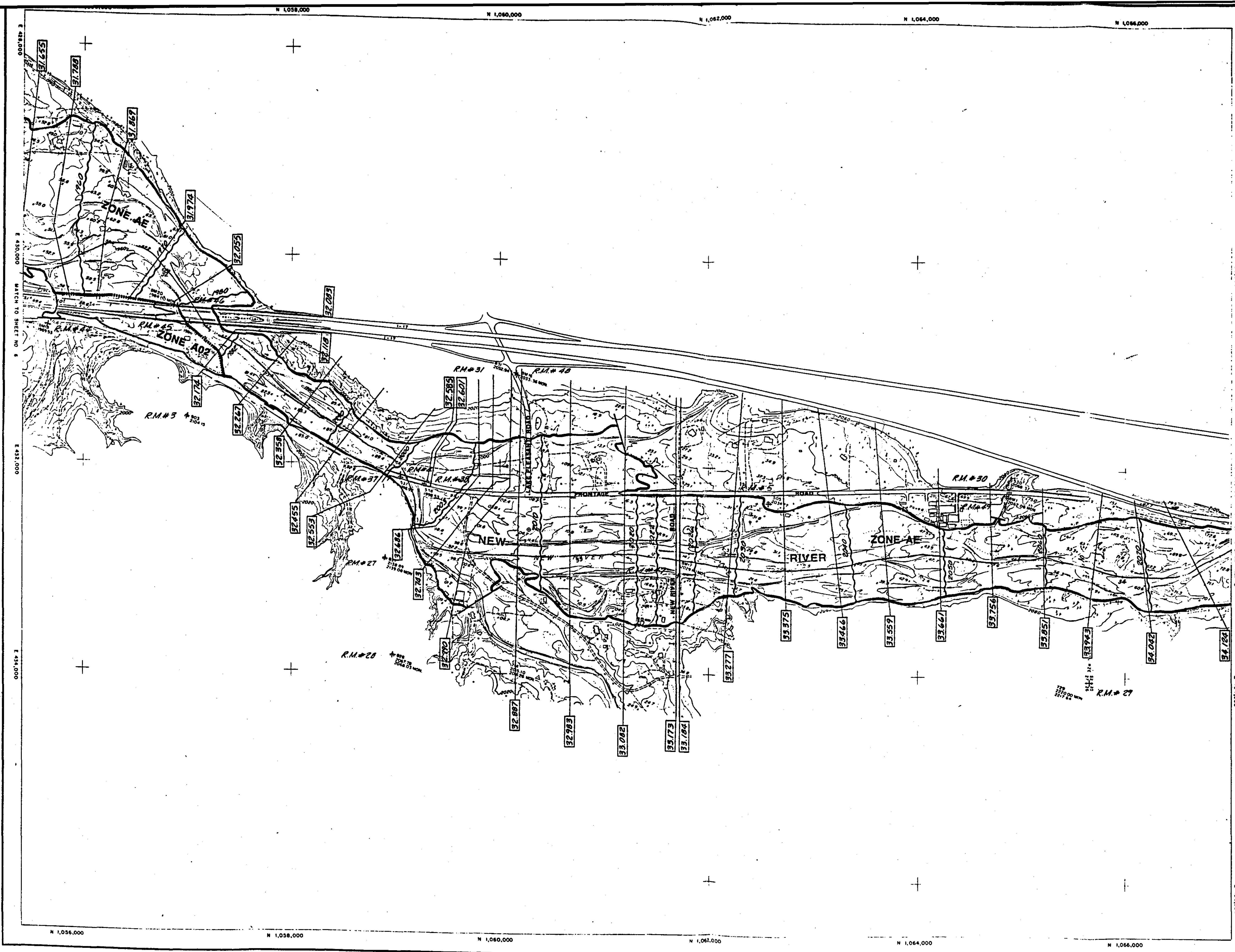
APPENDIX H

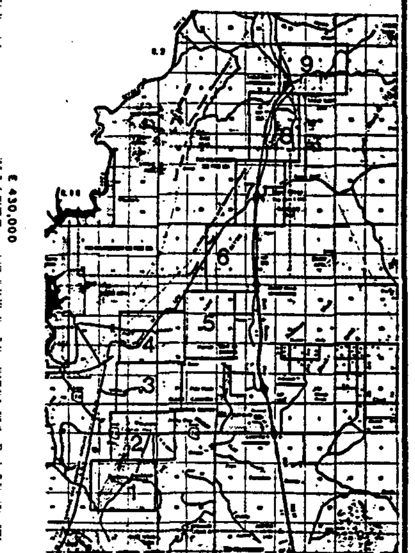
HEC-2 Floppy Disk



LOCATION MAP

FIGURE 1





KEY MAP
NTS

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- BASE FLOOD ELEVATION
- STATIONING IN RIVER MILES UPSTREAM FROM NEW RIVER DAM
- 1.2 CROSS-SECTION NUMBER
- + RM#4 REFERENCE MARK
- CONTROL LINE
- FLOOD ZONE LIMIT

NOTES

THIS FLOOD INSURANCE STUDY WORK MAP HAS BEEN PREPARED IN ACCORDANCE WITH FEDERAL EMERGENCY MANAGEMENT AGENCY GUIDELINES.

MAP BASED ON 1" = 100' TOPOGRAPHIC MAPPING PREPARED BY AERIAL MAPPING COMPANY, INC. FROM PHOTOGRAPHS TAKEN IN MARCH 85 AND DECEMBER 86.

ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

NEW RIVER, ARIZONA

COMPILATION SCALE 1"=100'
CONTOUR INTERVAL 4'
FLIGHT ALTITUDE 3000
DATUM MSL 1929
FLOWN BY: AMCI
COMPILED BY: AMCI
PHOTOGRAPHY DATE 6/14/85
CONTROL BY: AMCI

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER
FLOODPLAIN DELINEATION

NEW RIVER DAM RESERVOIR TO ROCK SPRINGS

RECOMMENDED DATE:
APPROVED BY: DATE:
FLOODPLAIN ADMINISTRATOR

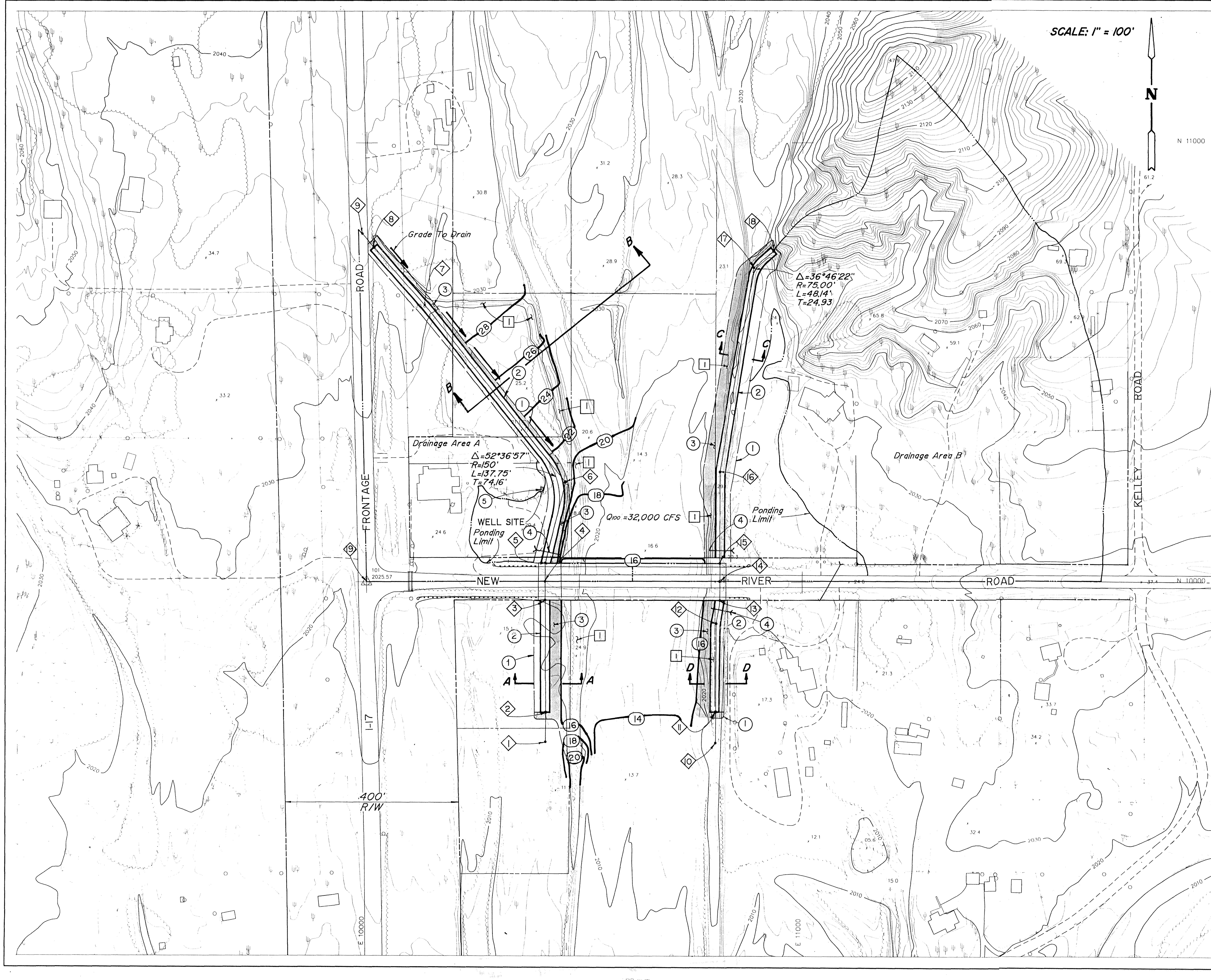
SHEET 7 OF 9

COE & VAN LOO CONSULTING ENGINEERS INC. PHOENIX ARIZONA

FIGURE 2

CVL JOB NO. 1090-01

COUNTY	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	ASBUILT
MARICOPA	AZ.	68738	15	33	



MARICOPA COUNTY
HIGHWAY DEPARTMENT
NEW RIVER ROAD BRIDGE

WEST LEVEE

	NORTH	EAST	TOP OF LEVEE ELEVATION
1	9630.4150	10410.1144	—
2	9700.4150	10410.0435	24.0
3	9960.4159	10409.7803	28.0
4	10000.4149	10409.7398	—
5	10040.4198	10409.6993	28.0
6	10226.9606	10455.7641	29.0
7	10629.7282	10132.5675	36.0
8	10765.5918	10017.0974	37.0
9	10796.0709	9991.1933	—

EAST LEVEE

	NORTH	EAST	TOP OF LEVEE ELEVATION
10	9630.8200	10800.1142	—
11	9700.8200	10800.0433	24.0
12	9900.8098	10799.8408	27.0
13	9960.8199	10809.7801	28.0
14	10000.8198	10809.7396	—
15	10040.8198	10809.6991	28.0
16	10244.3691	10809.4930	29.0
17	10715.8704	10886.4914	36.0
18	10758.1731	10930.3699	36.0
19	10,000.0000	10,000.0000	Fnd. Cotton Spindle

CONSTRUCT

1. Match Exist. Ground & Max. Slope. (2'Horiz., To 1'Vert.)
2. Construct Levee (See Sheet 16 For Typical Sections)
3. Construct Grouted Rip Rap Bank Protection. See Special Provisions
4. Construct 36" Pipes W/Automatic Drainage Gates. See Sheets 5 and 6 For Details.
5. Contractor To Protect Well And Well Site. Any Damages Incurred During Construction Shall Be Fixed At The Contractors Expense.

REMOVE

1. Remove Exist. Levee.

ESTIMATED QUANTITIES

Excavation	= 31,200 C.Y.
15% Shrink	= 4,680 C.Y.
Embankment	= 22,800 C.Y.
0.1' Ground Compaction	= 1,240 C.Y.
Waste	= 2,480 C.Y.
Grouted Riprap	= 3,800 C.Y.

LEGEND

- 2020 — Existing Elevation
- (14) — Proposed Elevation
- Grouted Riprap Bank Protection
- Property Line
- Drainage Area Boundary
- Ponding Limits

KAMINSKI HUBBARD engineering, inc.
SURVEYING • CIVIL • HYDROLOGY
4550 N. BLACK CANYON HWY., SUITE C
PHOENIX, ARIZONA 85017
(602) 242-5588

DESIGN	LMT	10/93	SUBMITTED BY	DATE	SHEET
DESIGN CHK	ESB	10/93	RECOMMENDED BY	DATE	
PLANS	NC	10/93	APPROVED BY	DATE	
PLANS CHK	LMT	10/93	CHIEF ENGINEER AND GENERAL MANAGER		OF

CHANNELIZATION PLAN

FIGURE 3

NEW RIVER
LEVEE PROFILES
FIGURE 4