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## City of Peoria

*Contract Documents for*

### ***Embankment and Pavement Repair at the Greenway Sports Complex - Project SS-9103***

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March 1992

**JMM** James M. Montgomery  
Consulting Engineers Inc.



CONTRACT DOCUMENTS  
FOR  
THE CITY OF PEORIA, ARIZONA  
FOR

EMBANKMENT AND PAVEMENT REPAIR  
AT THE GREENWAY SPORTS COMPLEX

PROJECT SS-9103

MARCH 1992

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.  
6245 North 24th Parkway, Suite 208  
Phoenix, Arizona 85016

FLOOR DISTRICT	
RECEIVED	
MAR 4 1992	
CH. ENG.	P & PM
DEF.	HYDRO
ADVIS.	EMST
FINANC.	FILE
CITY	1 RWS
STATE	
REMARKS	
<i>W</i>	



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6245 North 24th Parkway  
Suite 208  
Phoenix, Arizona 85016

**JMM** James M. Montgomery

Consulting Engineers, Inc.

March 3, 1992



Flood Control District of  
Maricopa County  
2801 W. Durango St.  
Phoenix, Az 85009

Attention: Mr. R. W. Shobe, P.E.

Subject: Repair of the Skunk Creek Channelization  
Embankment at 81st Avenue

FLOOD CONTROL	
RECEIVED	
MAR 4 1992	
CH ENG	P & PM
DES	HYDRO
ADMIN	LMGT
FINANCE	FILE
GEN	J. RWS
ENGR	
REMARKS	
<i>[Signature]</i>	

Gentlemen:

James M. Montgomery, Consulting Engineers, Inc. (JMM) was retained by the City of Peoria (City) to prepare plans and specifications for repair of the Skunk Creek Channelization embankment at 81st Avenue. The City has requested that JMM submit the draft plans and specifications to the Flood Control District of Maricopa County (District) for review and comment with respect to flood control operations in Skunk Creek.

During a severe storm on September 3, 1990, a large trash receptacle was carried by runoff to a culvert at the 81st Avenue cul-de-sac which drains to Skunk Creek. The trash receptacle subsequently plugged the culvert entrance, preventing runoff from draining into Skunk Creek. As a result, runoff collected in the area until it overtopped the Skunk Creek embankment and washed out a portion of the embankment, as well as a portion of the 81st Avenue cul-de-sac.

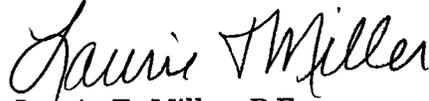
In addition to repair of the embankment and cul-de-sac, JMM has designed improvements to the culvert and slope protection to the embankment to mitigate flooding in the future. These improvements are described below.

**Culvert:** A handrail will be constructed two feet in front of the entrance to the existing 36-inch diameter CMP culvert. The handrail will prevent future blockage of the pipe by large debris or trash receptacles. The handrail was selected in lieu of a trash rack at the pipe entrance because a trash rack would encourage plugging by debris.

**Slope Protection:** Soil cement slope protection will be added to the face of the Skunk Creek embankment in the vicinity of the wash-out. The slope protection will extend ten feet below the toe of slope to the anticipated scour depth. It is noted that the topography of the area is such that, should the cul-de-sac be flooded in the future, the embankment will be overtopped within the protected section, thus minimizing the likelihood of future washout of the embankment.

We would appreciate it if you would review the enclosed plans (5 sets) and specifications (3 sets) at your earliest convenience. Thank you in advance for your cooperation.

Very truly yours,



Laurie T. Miller, P.E.  
Project Manager



/dl

c: Dan L. Nissan, City of Peoria  
1391.0120

**SPECIAL NOTICE**

BIDDER'S ATTENTION IS CALLED TO THE FACT THAT NO BID IS COMPLETE WITHOUT THE RETURN OF THIS BOOK OF SPECIAL PROVISIONS AND CONTRACT DOCUMENTS WITH ALL PAGES INTACT. ADDENDA SHALL BE ATTACHED INSIDE THE FRONT COVER OF THIS BOOKLET.

BID SHALL BE SUBMITTED IN A SEALED ENVELOPE. THE OUTSIDE LOWER RIGHT HAND CORNER SHALL BE MARKED:

BID OF \_\_\_\_\_ CONTRACTOR

FOR: PEORIA PROJECT NO. SS-9103  
EMBANKMENT AND PAVEMENT REPAIR

BID WILL BE RETURNED UNOPENED IF NOT SUBMITTED PROPERLY SEALED.

**NOTICE TO CONTRACTORS**

Sealed bids will be received at the office of Materials Management, 8401 West Monroe, Room 150, Peoria, Arizona 85345 until \_\_\_\_\_, M.S.T., \_\_\_\_\_, 1992, for furnishing all plant, material, equipment and labor and to complete construction of:

Project No. SS-9103 - Embankment and Pavement Repair

Any bid received after close of bids will not be considered, and will be returned unopened.

Plans, Specifications and Contract Documents may be examined at the Materials Management Department and obtained at the office of the City Engineer, City of Peoria, 8401 West Monroe, Room 210, Peoria, Arizona, upon payment of \_\_\_\_\_ Dollars (\$\_\_\_\_\_) for each set. Any Bidder or Non-Bidder upon returning the Plans, Specifications, and Contract Documents within one week and in good condition will be refunded his payment.

Each bid shall be in accordance with the Plans, Specifications and Contract Documents, and shall be made out on the bid form(s) included in the Project Specification book. Each Bid shall be accompanied by a Proposal Guarantee, in the form of a certified or cashier's check or bid bond for ten percent (10%) of the amount of the bid, made payable to the order of the City of Peoria, Arizona. All proposal guarantees, except those of the three lowest qualified bidders, will be returned immediately following the opening and checking of Proposals. The proposal guarantees of the three lowest qualified bidders will be returned immediately after the Contract Documents have been executed by the successful Bidder.

Bids will be opened and publicly read aloud immediately after the hour of closing at the City of Peoria Municipal Complex in the Multi-Purpose Room, Room 100, 8401 West Monroe, Peoria, Arizona 85345.

The City of Peoria reserves the right to reject any or all bids or waive any informality in any bid, and to award the Contract as may be in the best interest of the City. The bidder may not withdraw his bid for a period of sixty (60) days following the date of opening hereof.

City of Peoria, Arizona

By: Richard Gomez, City Clerk

Dated: \_\_\_\_\_  
Published Daily News Sun:

\_\_\_\_\_  
\_\_\_\_\_

## INFORMATION FOR BIDDERS

### 1. RECEIPT AND OPENING OF BIDS

The City of Peoria, Arizona (herein called the "Owner") invites bids on the proposal form attached hereto. All blanks must be appropriately filled in. Bids will be received by the Owner at the office of the Materials Management until \_\_\_\_\_, M.S.T., \_\_\_\_\_, 1992, and then publicly opened and read aloud at the City Municipal Complex, Room 100. The envelopes containing the bids must be sealed, addressed to the City of Peoria, Materials Management Department, 8401 West Monroe, Room 150, Peoria, Arizona 85345, and designated as Bid for:

PEORIA PROJECT NO. SS-9103  
EMBANKMENT AND PAVEMENT REPAIR  
PEORIA, ARIZONA

The owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. The Bidder may not withdraw a bid within sixty (60) days after the actual date of the bid opening thereof.

### 2. PREPARATION OF BIDS

Bids to receive consideration shall be made in accordance with the following instructions:

No consideration will be granted for any alleged misunderstanding of the material, articles or piece of equipment to be furnished or work to be done. It is understood that the tender of the Bid Proposal carries with it the agreement to all items and conditions referred to herein or indicated in the Contract Documents.

Before submitting a bid, bidders shall carefully examine the Plans, read the Specifications and the forms of other Contract Documents, visit the site of the work, fully inform themselves as to all existing conditions and limitations, and shall include sums in the bid covering the cost of each item included in the Contract.

No bid will be considered unless it is made upon the proposal forms contained in and submitted with this project specification book, intact and with all items filled out. The signature of persons signing shall be in longhand. The completed forms shall be without interlineations, alternations, or erasures. All blank spaces for bid prices must be filled in, in ink or typewritten, in figures. In case of an error in the extension of the unit price and the total, the unit price shall govern.

Bids shall not contain recapitulation of the work to be done. Alternative proposals will not be considered unless called for. No oral, telegraphic, or telephonic proposals or modifications will be considered. It is the sole responsibility of the Bidder to see that his bid is received in proper time. Any bids received after the scheduled closing time for receipt of bids will be returned to the Bidder unopened. Any Bidder may withdraw his bid, either personally or by telegraphing or by written request, at any time prior to the scheduled closing time for receipt of bids. No bid may be withdrawn by telephone.

Each bid must be submitted to the Office of Materials Management, City of Peoria, 8401 West Monroe, Room 150, Peoria, Arizona, on or before the day and hour set for the opening of bids in the advertisement for Bids as published, in a sealed envelope bearing on the outside the

name of the Bidder, his address, and the name and number of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified for the sealed bid. Any bids received after the scheduled closing time for receipt of bids will be returned to the Bidder unopened.

3. AWARD OR REJECTION OF BIDS

The Contract will be awarded to the lowest responsible Bidder complying with the MAG Specifications, these Special Provisions, the Advertisement for Bids and the Arizona Revised Statutes. The City of Peoria, however, reserves the right to accept or reject any or all bids, and to waive informalities, and to award the Contract as may be in the best interest of the City.

4. QUALIFICATIONS OF BIDDER

The Owner may make such investigations as it deems necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein. Conditional bids will not be accepted.

5. BID SECURITY

Each bid must be accompanied by cash, certified check of the Bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the Bidder as Principal and having as Surety thereon a Surety company approved by the Owner, with a Best rating of "A" or better, in the amount of ten (10) percent of the bid, payable without condition to the City. The proposal guarantee shall guarantee that the Bidder, if awarded the contract, will, within ten (10) working days after the award, execute such contract documents, and will furnish good and sufficient bond for the faithful performance of the same, a payment bond and a certificate of insurance.

6. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

Proposal Guarantees will be returned to all except the three lowest Bidders promptly after the opening of bids, and the remaining Proposal Guarantee will be returned promptly after the City and the accepted Bidder have executed the Contract, or if no award has been made within sixty (60) days after the date of the opening of bids, upon demand of the Bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

7. CONTRACT, BONDS AND INSURANCE

The form of Contract, which the successful Bidder as Contractor will be required to execute, and the forms of bonds which he will be required to furnish, as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract, are included in the Contract Documents and should be carefully examined by the Bidder. The Contract and the bonds shall be executed in four (4) original counterparts; the Contractor shall execute the contracts within the specified time limits as set forth in Section 103.7 (B) of the MAG Specifications. Bonds in the following amounts will be required at the time of executing the formal contract. The bonding company used must have a Best rating "A" or better.

- A. Performance Bond, one hundred percent (100%) of the contract price.
- B. Payment Bond, one hundred percent (100%) of the contract price.

The Contractor shall not commence work under this Contract until he has obtained all the insurance required under these Documents, nor shall the Contractor allow any subcontractor to commence work on this subcontract until the insurance required of the subcontractor has been obtained. Certificates of Insurance must be delivered to the office of the City Engineer prior to commencement of any work.

The Certificate of Insurance shall be on the form provided in the specification and shall name the City of Peoria and James M. Montgomery, Consulting Engineers, Inc. as additional insured. It is the sole responsibility of the Contractor to maintain the required insurance in force during the term of the Contract.

8. LIQUIDATED DAMAGES

The successful Bidder, upon his failure or refusal to execute and deliver the Contract, Bonds, and Insurance Certificates required within ten (10) days after he has been requested to do so by the City, shall forfeit to the City, as liquidated damages for such failure or refusal, the security deposited with his bid.

9. POWER OF ATTORNEY

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

10. INTERPRETATION OF PLANS, SPECIFICATIONS AND DRAWINGS

If any person contemplating submitting a bid for the proposed Contract is in doubt as to the true meaning of any part of the Plans, Specifications or other proposed Contract Documents, or finds discrepancies in, or omissions from the Drawings or Specifications, he may, no later than five (5) days prior to the time of bid opening, submit to the City Engineer or his authorized representative a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretations or corrections of the proposed documents will be made only by Addendum duly issued and a copy of each such Addendum will be mailed or delivered to each person receiving a set of such documents. The City of Peoria will not be responsible for any other explanations or interpretations of the proposed documents.

11. ADDENDA

Any changes to the plans and documents made prior to the bid opening shall be made only by Addendum. Addenda issued during the time of bidding shall be attached to and made a part of the Contract Documents. Addenda shall be attached inside the front cover of this booklet. Bidders shall acknowledge all addenda in the appropriate location on the "PROPOSAL" form. Failure to acknowledge receipt of Addenda shall render the bid proposal non-responsive and it will be rejected.

No interpretation of the meaning of the Plans, Specifications or other prebid documents will be made to any Bidder orally.

12. ASSIGNMENT OF CONTRACT

No assignment by the Contractor or any Contract to be entered into hereunder, or any part thereof, or of funds to be received thereunder by the Contractor, will be recognized by the Owner unless such assignment has had prior approval of the Owner and the Surety has been given due notice of such assignment in writing and has consented thereto in writing.

13. CONDITIONS OF WORK

Each Bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder of his obligation to furnish all material and labor necessary to carry out the provisions of this Contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.

14. LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

15. TIME OF COMPLETION

The Contractor shall commence work under this project on or before the fifth (5th) day following receipt of the "Notice to Proceed" for that project from the City of Peoria and shall fully complete all work under the project within the time stipulated in the bid proposal. The Contractor shall, at all times, during the continuance of the contract, prosecute the work with such force and equipment as is sufficient to complete all work within the time specified.

16. PLANS AND SPECIFICATIONS TO SUCCESSFUL BIDDER

The successful Bidder may obtain five (5) sets of Plans and Specifications for this project from the City Engineer at no cost.

17. APPROVAL OF SUBSTITUTIONS

The materials, products, and equipment described in the Documents and Addenda establish a standard or required function, dimension, appearance, and quality to be met by any proposed substitution. No substitute will be considered, before bid opening, unless written request for approval has been received by the City Engineer at least ten (10) working days prior to the scheduled closing time for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including any drawings, cuts, performance, and test data and any other information necessary for evaluation of the substitute. Bidder shall not be entitled to approval of a substitute. If a substitute is approved, the approval shall be by an Addendum set forth herein an Addendum. Bidders shall not rely upon approvals made in any other manner.

18. USE OF EQUALS

When the specifications for materials, articles, products, and equipment state "or equal", Contractor may bid upon, and use materials, articles, products, and equipment which will perform equally the duties imposed by the general design. The City Engineering Department will have the final approval of all materials, articles, products, and equipment proposed to be used as an "equal". It shall not be purchased or installed without the prior written approval from the City Engineering Department.

Approvals for "equals", before bid opening, may be requested in writing to the City Engineering Department for approval. Requests must be received at least five (5) days prior to the date set for opening the Bid Proposals. The request shall state the name of the material, article, product, or equipment for which the items is sought to be considered an equal and a complete description of the proposed equal including any drawings, cuts, performance and

test data and any other information necessary for approval of the equal. All approvals will be issued in the form of written addenda, as stated herein.

19. CITY AND STATE TAXES

The City of Peoria Transaction Privilege Tax shall not be waived under the conditions of this Contract. The current Privilege Tax Rate can be obtained from the City of Peoria Sales Tax and License Department at 412-7156. The Contractor shall be responsible for reporting and payment of all City, County, State, or Federal taxes.

If the Contractor is required to be licensed under either A.R.S.-32-1101 et seq or is regulated under A.R.S. 41-2151 et seq, the Contractor shall observe and comply with the provisions of A.R.S. 42-1305.01 and A.R.S. 42-1305.02 applicable to contractors having their principal place of business outside of the State of Arizona or not having conducted business within the State of Arizona for one year.

20. CITY OF PEORIA OFF-SITE PERMIT

The Contractor shall obtain an off-site permit; however, the fee shall be limited to a \$5.00 charge. The Contractor shall be responsible for any required Maricopa County permits.

**PROPOSAL FOR  
EMBANKMENT AND PAVEMENT REPAIR  
PEORIA, ARIZONA**

PLACE: City of Peoria, AZ

DATE: \_\_\_\_\_

Project No. SS-9103

Contractor's Registration No. \_\_\_\_\_

Proposal of \_\_\_\_\_ (hereinafter called "Bidder"), organized and existing under the laws of the State of Arizona, doing business as \_\_\_\_\_.\*

TO:

THE HONORABLE MAYOR AND CITY COUNCIL  
CITY OF PEORIA  
PEORIA, ARIZONA

GENTLEMEN:

The Bidder in compliance with your invitation to bid for:

The repair and slope protection of an existing earthen embankment and pavement replacement of adjacent cul-de-sac, and related facilities, at 81st Avenue and Skunk Creek near the Greenway Sports Complex.

having examined the Plans and Specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

\*Insert "corporation", "partnership" or "individual" as applicable.

Bidder hereby agrees to commence work under this Contract within five (5) working days from the issuance of the "Notice to Proceed" of the Owner and to fully complete the project within \_\_\_\_\_ consecutive calendar days.

Bidder further agrees to pay as liquidated damages, the sum per calendar day shown in Table 108 of MAG Specification Section 108.9 for failure to complete the project in the time stipulated.

Bidder acknowledges receipt of the following addenda:

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Bidder agrees to perform all the construction work prescribed in the Specifications and as shown on the Plans, within the time set forth therein, and at the unit prices stated on the following pages.

(Extension of these unit prices on the basis of estimated quantities and the totaling of these extensions is for the purpose of comparing bids only. The mathematics of such extensions and totaling will be checked and corrected by the City Engineer before evaluating the bids, and the lowest of such corrected and checked totals will determine the lowest bid. In case of discrepancy, the unit price shall govern.)

It is understood that the above referenced unit prices shall include all labor, materials, bailing, shoring, removal, overhead, taxes, licenses, permits, profit, insurance, etc., to cover the finished work of the several kinds called for.

Bidder understands that the City of Peoria reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that his bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the Formal Contract attached within five (5) days and deliver a Surety Bond or Bonds as required by the Special Provisions. The bid security in the sum of \_\_\_\_\_ Dollars (\$) is to become the property of the City of Peoria in the event the Contract and Bonds are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the City of Peoria caused thereby.

The undersigned has checked carefully all the above figures and information and understands that the City of Peoria, Arizona, will not be responsible for any errors or omissions on the part of the undersigned in making up this bid.

Respectfully submitted,

CORPORATION;

\_\_\_\_\_  
a Corporation

By:

\_\_\_\_\_  
President

ATTEST:

\_\_\_\_\_  
Secretary

INDIVIDUAL:

\_\_\_\_\_  
d/b/a

\_\_\_\_\_

PARTNERSHIP:

\_\_\_\_\_  
By:

\_\_\_\_\_  
Partner

(Seal if bid is by a corporation)

**BID FORMS**

<u>Item</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
<p>1. Mobilization for the sum of</p> <p>_____</p> <p>_____</p> <p>_____ Dollars per ls</p>	ls	\$ _____	\$ _____
<p>2. Excavation and offsite disposal of excess material including existing broken grouted riprap and any other unsuitable material which does not meet the specification for embankment fill or soil cement materials for the sum of</p> <p>_____</p> <p>_____</p> <p>_____ Dollars per ls</p>	ls	\$ _____	\$ _____
<p>3. Furnishing and installing earthen embankment, including overexcavation and compaction of existing and/or new material for the sum of</p> <p>_____</p> <p>_____</p> <p>_____ Dollars per cy</p>	1300 cy	\$ _____	\$ _____
<p>4. Furnishing and installing soil cement embankment protection for the sum of</p> <p>_____</p> <p>_____</p> <p>_____ Dollars per cy</p>	1500 cy	\$ _____	\$ _____

5. Furnishing and installing 18-inch diameter riprap for the sum of

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Dollars per cy

25 cy      \$ \_\_\_\_\_      \$ \_\_\_\_\_

6. Furnishing and installing asphalt concrete pavement at the 81st Avenue cul-de-sac including aggregate base course, asphalt concrete, tack coat, and sawcutting and removing a minimum of 2 feet of existing pavement along the edge of the cul-de-sac for washout or the sum of

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Dollars per sy

70 sy      \$ \_\_\_\_\_      \$ \_\_\_\_\_

7. Furnishing and installing concrete curb for the sum of

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Dollars per lf

60 lf      \$ \_\_\_\_\_      \$ \_\_\_\_\_

8. Furnishing and installing 36-inch diameter CMP culvert extension including connecting band for the sum of

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Dollars per lf

15 lf      \$ \_\_\_\_\_      \$ \_\_\_\_\_

9. Furnishing and installing 1-1/2" Sch. 40 galvanized steel pipe handrail, including fabrication, and reinforced concrete post supports for the sum of

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Dollars per ls

ls      \$ \_\_\_\_\_      \$ \_\_\_\_\_

TOTAL (Items 1-9 Inclusive)

\$ \_\_\_\_\_

& /100 Dollars

---

WRITTEN WORDS

**BID BOND  
(SURETY BOND)**

KNOW ALL MEN BY THESE PRESENTS:

That we, \_\_\_\_\_,  
As Principal, (hereinafter called the Principal), and the \_\_\_\_\_,  
A Corporation duly organized under the laws of the State of \_\_\_\_\_, as  
Surety, (hereinafter called the Surety), are held and firmly bound unto the City of Peoria, a  
municipal corporation as Obligee, in the sum of ten percent (10%) of the total amount of the  
bid of Principal, submitted by him to the Mayor and Council of the City of Peoria, for the work  
described below, for the payment of which sum, well and truly to be made, the said Principal  
and the said Surety, bind ourselves, or heirs, executors, and administrators, successors, and  
assigns, jointly and severally, firmly by these presents, and in conformance with A.R.S. 34-  
201.

Whereas, the said Principal is herewith submitting its proposal for:

Project SS-9103 - Embankment and Pavement Repair

Now, therefore, if the City of Peoria, Arizona shall accept the proposal of the Principal and the  
Principal shall enter into a Contract with the City of Peoria, Arizona in accordance with the  
terms of such proposal and give such Bonds and Certificates of Insurance as specified in the  
Standard Specifications with good and sufficient surety for the faithful performance of such  
Contract and for the prompt payment of labor and material furnished in the prosecution  
thereof, or in the event of the failure of the Principal to enter into such Contract and give such  
Bond and Certificates of Insurance, if the Principal shall pay to the City of Peoria, Arizona the  
sum of money set forth above as liquidated damages for failure of the Principal to enter into  
the contract, then this obligation shall be null and void, otherwise to remain in full force and  
effect.

Signed and Sealed this \_\_\_\_\_ day of \_\_\_\_\_, 1992.

WITNESS:

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Title

WITNESS:

\_\_\_\_\_  
Surety

\_\_\_\_\_  
Title

## CONTRACT

This agreement, made and entered into this \_\_\_\_ day of \_\_\_\_\_, 1992, by and between the City of Peoria, Arizona, a municipal corporation, organized and existing under and by virtue of the laws of the State of Arizona, party of the first part, hereinafter designated the Owner, and \_\_\_\_\_, of the City of \_\_\_\_\_, County of \_\_\_\_\_, and State of \_\_\_\_\_, Party of the second part, hereinafter designated the Contractor.

WITNESSETH: That the said Contractor has covenanted, and agreed, for and in consideration of the payments made as provided for in the Proposal and Specifications, to the Contractor by the said Owner, and under the penalty expressed in the Bond hereto attached, at his proper cost and expense to do all the work and furnish all materials, tools, labor and all appliances and appurtenances called for by the agreement, free from all claims, liens, and charges whatsoever, in the manner and under the conditions hereinafter specified, that are necessary for the construction of:

Project SS-9103 - Embankment and Pavement Repair

The work done and materials and equipment furnished shall be strictly pursuant to and in conformity with the Specifications and Plans. The Specifications and Drawings furnished by the Contractor with his proposal and the additional Drawings or prints and other information to be furnished by the Contractor in accordance with the Specifications are made a part of this agreement when and as approved by the City of Peoria, Arizona, are intended to be complementary and all Specifications, Plans, drawings or prints furnished by the Contractor and approved by the City of Peoria shall be complementary therewith. Any work appearing in or upon the one and not mentioned in the others shall be executed according to the true intent and meaning of the said Specifications and Plans, Drawings, or Prints the same as though the said work were contained and described in all.

The Notice to Contractors, Information for Bidders, Notice to Proceed, Special and Technical Provisions, Proposal, Bid Bond, Payment Bond, General Conditions, Performance Bond, Plans and Addenda thereto, are hereby understood to be a part of this Contract.

It is further covenanted and agreed that the work shall be executed under the direction and supervision of the City of Peoria, Arizona, or its properly authorized agents, on whose inspection all work shall be accepted or rejected.

The City shall have full power to reject or condemn all materials furnished or work performed under this Contract which do not conform to the terms and conditions herein expressed.

To prevent all disputes and litigation, it is further agreed by and between the said City of Peoria, Arizona, and said Contractor that the Engineering Department of the City of Peoria shall determine all questions in relation to the work and the construction thereof, and it shall in all cases decide all questions which may arise relative to the execution of the work under this Contract on the part of the said Contractor and its estimates and decisions shall be final and conclusive; and such estimates and decisions, in case any question may arise, shall be a

condition precedent to the right of said Contractor to receive any money or compensation for anything done or furnished under this Contract.

This Contract is subject to the provisions of ARS 38-511, and notice of the provisions of said ARS 38-511 is herewith given.

IN WITNESS WHEREOF, four (4) identical counterparts of this Contract, each of which shall for all purposes be deemed an original thereof, have been duly executed by the parties herein above named, on the date and year first herein written.

CITY OF PEORIA, ARIZONA  
PARTY OF THE FIRST PART (OWNER)  
BY:

ATTEST:

\_\_\_\_\_  
City Clerk

\_\_\_\_\_  
Mayor/City Manager

PARTY OF THE SECOND PART

CORPORATION:

PARTNERSHIP:

\_\_\_\_\_  
a Corporation

\_\_\_\_\_  
Partner

By:

ATTEST:

\_\_\_\_\_  
President

\_\_\_\_\_  
Secretary

INDIVIDUAL:

\_\_\_\_\_  
d/b/a/ \_\_\_\_\_

By:  
\_\_\_\_\_

APPROVED AS TO FORM:

\_\_\_\_\_  
City Attorney

**CONTRACT BOND**

STATUTORY PERFORMANCE BOND PURSUANT TO TITLE 34,  
CHAPTER 2, ARTICLE 2 OF THE ARIZONA REVISED STATUTES  
(PENALTY OF THIS BOND MUST BE 100% OF THE CONTRACT AMOUNT)

KNOW ALL MEN BY THESE PRESENTS:

THAT, \_\_\_\_\_,  
(HEREIN CALLED THE PRINCIPAL). AS PRINCIPAL, AND \_\_\_\_\_  
\_\_\_\_\_, A CORPORATION ORGANIZED AND  
EXISTING UNDER THE LAWS OF THE STATE OF \_\_\_\_\_, WITH ITS  
PRINCIPAL OFFICE IN THE CITY OF \_\_\_\_\_ (HEREIN CALLED THE  
SURETY), AS SURETY, ARE HELD AND FIRMLY BOUND UNTO THE CITY OF PEORIA,  
ARIZONA, A MUNICIPAL CORPORATION, (HEREIN CALLED THE OBLIGEE) IN THE  
AMOUNT OF \_\_\_\_\_ DOLLARS, (\$ \_\_\_\_\_),  
FOR THE PAYMENT WHEREOF THE SAID PRINCIPAL AND SURETY BIND THEMSELVES,  
AND THEIR HEIRS, ADMINISTRATORS, EXECUTORS, SUCCESSORS AND ASSIGNS,  
JOINTLY AND SEVERALLY, FIRMLY BY THESE PRESENTS.

WHEREAS, The Principal has entered into a certain written Contract with the Obligee, dated  
the \_\_\_\_\_ day of \_\_\_\_\_, 1992.

Project SS-9103 - Embankment and Pavement Repair

Which contract is hereby referred to and made a part hereof as fully and to the same extent as  
if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal  
shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and  
agreements of said Contract during the original term of said Contract and any extensions  
thereof, with or without notice to the Surety, and during the life of any guaranty required under  
the Contract and shall also perform and fulfill all the undertakings, covenants, terms,  
conditions and agreements of any and all duly authorized modifications of said Contract that  
may hereafter be made, notice of which modifications to the Surety being hereby waived; then  
the above obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34,  
Chapter 2, Article 2, of the Arizona Revised Statutes, and all liabilities on this bond shall be  
determined in accordance with the provisions of said Title, Chapter, and Article, to the extent  
as if it were copied at length herein.

The prevailing party or any party which recovers judgment on this bond shall be entitled to such reasonable attorney's fees as may be fixed by the court or a judge thereof.

Witness our hands this \_\_\_\_\_ day of \_\_\_\_\_, 1992.

\_\_\_\_\_  
Principal Seal

By: \_\_\_\_\_

\_\_\_\_\_  
Surety Seal

By: \_\_\_\_\_

\_\_\_\_\_  
Agency of Record

\_\_\_\_\_  
Agency Address

**LABOR AND MATERIALS BOND**

STATUTORY PAYMENT BOND PURSUANT TO TITLE 34,  
CHAPTER 2, ARTICLE 2 OF THE ARIZONA REVISED STATUTES  
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL MEN BY THESE PRESENTS:

THAT, \_\_\_\_\_,  
(HEREIN CALLED THE PRINCIPAL). AS PRINCIPAL, AND \_\_\_\_\_  
\_\_\_\_\_, A CORPORATION ORGANIZED AND  
EXISTING UNDER THE LAWS OF THE STATE OF \_\_\_\_\_, WITH ITS  
PRINCIPAL OFFICE IN THE CITY OF \_\_\_\_\_ (HEREINAFTER CALLED  
THE SURETY), AS SURETY, ARE HELD AND FIRMLY BOUND UNTO THE CITY OF PEORIA,  
ARIZONA, A MUNICIPAL CORPORATION, (HEREIN CALLED THE OBLIGEE) IN THE  
AMOUNT OF \_\_\_\_\_ DOLLARS, (\$\_\_\_\_\_),  
FOR THE PAYMENT WHEREOF THE SAID PRINCIPAL AND SURETY BIND THEMSELVES,  
AND THEIR HEIRS, ADMINISTRATORS, EXECUTORS, SUCCESSORS AND ASSIGNS,  
JOINTLY AND SEVERALLY, FIRMLY BY THESE PRESENTS.

WHEREAS, The Principal has entered into a certain written Contract with the Obligee, dated  
the \_\_\_\_\_ day of \_\_\_\_\_, 1992, to construct:

Project SS-9103 - Embankment and Pavement Repair

Which contract is hereby referred to and made a part hereof as fully and to the same extent as  
if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal  
shall promptly pay all monies due to all persons supplying labor or materials to him or his  
subcontractors in the prosecution of the work provided for in said Contract, then this obligation  
shall be void, otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34,  
Chapter 2, Article 2, of the Arizona Revised Statutes, and all liabilities on this bond shall be  
determined in accordance with the provisions of said Title, Chapter, and Article, to the extent  
as if it were copied at length herein.

The prevailing party or any party which recovers judgment on this bond shall be entitled to  
such reasonable attorney's fees as may be fixed by the court or a judge thereof.

Witness our hands this \_\_\_\_\_ day of \_\_\_\_\_, 1992.

\_\_\_\_\_  
Principal Seal

By: \_\_\_\_\_

\_\_\_\_\_  
Surety Seal

By: \_\_\_\_\_

\_\_\_\_\_  
Agency of Record

\_\_\_\_\_  
Agency Address

**CITY OF PEORIA, ARIZONA  
ENGINEERING DEPARTMENT  
CERTIFICATE OF INSURANCE**

The \_\_\_\_\_  
certifies that the following insurance policies have been issued on behalf of:

Name of Insured \_\_\_\_\_

Address of Insured \_\_\_\_\_

Name and Address of Additional Insured:                      City of Peoria, Arizona  
8401 West Monroe  
Room 210  
Peoria, Arizona 85345

James M. Montgomery,  
Consulting Engineers, Inc.  
6245 North 24th Parkway, Suite 208  
Phoenix, Arizona 85016

Type of Insurance	Policy No.	Eff. Date	Exp. Date	Limits of Liability
(1) Workmen's Compensation				Statutory
(2) Contractor's Protective Bodily Injury				\$500,000 Each Occurrence
(2) Contractor's Protective Property Damage				\$100,000 Each Accident \$100,000 Aggregate
(3) Contractual Bodily Injury				\$500,000 Each Occurrence
(3) Contractual Property Damage				\$100,000 Each Accident \$100,000 Aggregate
(4) Automobile Bodily Injury & Property Damage				\$500,000 Each Occurrence

When the project includes construction of a new, or modification of an existing building (in addition to the above types):

(5) Fire and extended coverage plus vandalism and malicious mischief - for the full amount of the contract.

(6) All-risk ("special form") insurance including theft coverage, with the City of Peoria and James M. Montgomery, Consulting Engineers, Inc. as additional insured.

Policy Includes Coverage For:

- (1) A. Damage Caused by Blasting.  
B. Damage Caused by Collapse or Structural Injury.  
C. Damage to Underground Utilities.
- (2) Liability assumed in construction agreements and other types of contracts or agreements in effect in connection with insured operations.
- (3) All owned, hired or non-owned automotive equipment used in connection with the insured operation.

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It is agreed that none of these policies will be cancelled or changed so as to affect this certificate until ten (10) days written notice of such cancellation or change has been delivered to the City of Peoria.

It Is Further Agreed That:

These policies shall not expire until all work has been completed and the project has been accepted by the City of Peoria. (If a policy does expire during the life of the Contract, a renewal certificate of the required coverage must be sent to the City of Peoria not less than five (5) days prior to expiration date.) The Contractor hereby agrees to indemnify and save harmless the City of Peoria, James M. Montgomery, Consulting Engineers, Inc., and any jurisdiction or agency issuing permits for any work included in the project, their officers, agents and representatives from all suits, actions, loss, damage, expense, cost or claims of any character or any nature brought on account of any injuries sustained by any person or property arising out of the work done in fulfillment of the construction of the improvement under the terms of this agreement, or an account of any act or omission by the Contractor or his agents, or from any claims or amounts arising or recovered under workmen's compensation laws or any other law, by-law, ordinance or order of decree.

This certificate is not valid unless countersigned by an authorized representative of the insurance company.

Countersigned By

\_\_\_\_\_

Date:

Signature

\_\_\_\_\_

Schedule A

**CERTIFICATE OF INSURANCE**  
**(Construction Contract)**

It is further certified that the City of Peoria and James M. Montgomery, Consulting Engineers, Inc., (JMM) have been named as additional insured as is required under said contract and that the independent contractor's insurance is primary over any insurance available to the City or to JMM and as to any claims resulting from the contract, it being the intention of the parties that the insurance policies so effected shall protect all parties and be primary coverage for any and all losses covered by the described insurance.

We understand that the Contractor has agreed that none of these policies will be cancelled until ten (10) days written notice of such cancellation or change has been delivered to City of Peoria.

We understand the Contractor has signed the following statement in the contract:

"The Contractor agrees to indemnify, defend, and save harmless the City of Peoria, its Mayor and Council, appointed boards and commissions, officials, officers, employees, individually and collectively and JMM, its officers, employees, individually and collectively; from all losses, claims, suits, actions, payments and judgments, demands, expenses, attorney's fees, defense cost, or actions of any kind and nature resulting from personal injury to any person, including employees of the Contractor or of any subcontractor employed by the Contractor (including bodily injury and death) or damages to any property, arising or alleged to have arisen out of the negligent performance of the Contractor for the work done in fulfillment of the construction of the improvement under the terms of this agreement, or on account of any act or omission by the Contractor or his agents, or from any claims or amounts arising or recovered under Workmen's Compensation laws or any other law, bylaw, ordinance, or order of decree, except any such injury or damages arising out of the sole negligence of the City or JMM, their officers, agents or employees. IT IS THE INTENTION OF THE PARTIES to this contract that the City of Peoria, its Mayor and Council, appointed boards and commissions, officials, officers, employees, individually and collective, and JMM, its officers, employees, individually and collectively, are to be indemnified against their own negligence unless and except their negligence is found to be the sole cause of the injury to persons or damages to property. The amount and type of insurance coverage requirements set forth in the contract will in no way be construed as limiting the scope of indemnity in this paragraph."

We understand that the insurance companies issuing the policy or policies shall have no recourse against the City of Peoria or JMM (including their agents and agencies as aforesaid) for payment of any premiums or for assessments under any form of policy.

We understand that any and all deductibles in the above described insurance policies shall be assumed by and be for the account of, and at the sole risk of the Contractor.

This certificate is not valid unless countersigned by an authorized representative of the insurance company.

Date \_\_\_\_\_

Countersigned by \_\_\_\_\_

\_\_\_\_\_  
Signature

Applies to Project No. SS-9103

Policy Numbers \_\_\_\_\_

**CONTRACTOR'S AFFIDAVIT  
REGARDING  
SETTLEMENT OF CLAIMS**

MAG Part 100, Section 109, General Conditions

\_\_\_\_\_, Arizona  
Date \_\_\_\_\_

Embankment and Pavement Repair  
Project SS-9103  
Contract No. 1

To The City of Peoria, Arizona

Gentlemen:

This is to certify that all lawful claims for materials, rental of equipment and labor used in connection with the construction of the above project, whether by subcontractor or claimant in person, having been duly discharged.

The undersigned, for the consideration of \$\_\_\_\_\_, as set out in the final pay estimate, as full and complete payment under the terms of the contract, hereby waives and relinquishes any and all further claims or right of lien under, in connection with, or as a result of the above described project. The undersigned further agrees to indemnify and save harmless the City of Peoria against any and all liens, claims of liens, suits, actions, damages, charges and expenses whatsoever, which said City may suffer arising out of the failure of the undersigned to pay for all labor performance and materials furnished for the performance of said installations.

Signed and dated at \_\_\_\_\_, this \_\_\_\_\_ day of \_\_\_\_\_, 19 \_\_\_\_.

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
By

STATE OF ARIZONA )  
COUNTY OF MARICOPA ) SS

The foregoing instrument was subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 19 \_\_\_\_.

\_\_\_\_\_  
Notary Public

My Commission Expires \_\_\_\_\_

**CERTIFICATE OF COMPLETION**

I hereby certify that all goods and/or services required by:

Project No. SS-9103

Embankment and Pavement Repair

Contract No. 1

have been delivered in accordance with the Contract, and all activities required by the Contractor under the Contract have been completed as of \_\_\_\_\_ Date

Firm \_\_\_\_\_

Principal \_\_\_\_\_

Name

Position

Signature

\_\_\_\_\_ Date

CITY OF PEORIA  
ENGINEERING DEPARTMENT  
CHANGE ORDER  
NO. \_\_\_\_\_

PROJECT \_\_\_\_\_ DATE \_\_\_\_\_  
CONTRACT NO. \_\_\_\_\_ AGREEMENT DATE \_\_\_\_\_  
CONTRACTOR \_\_\_\_\_ COMPLETION DATE \_\_\_\_\_

The changes as shown on the attached sheet are hereby made to the CONTRACT DOCUMENTS:

CHANGE TO CONTRACT PRICE:

ORIGINAL CONTRACT PRICE \$ \_\_\_\_\_  
Current CONTRACT PRICE adjusted by previous CHANGE ORDERS \$ \_\_\_\_\_  
The CONTRACT PRICE due to this CHANGE ORDER will be increased or (decreased) by: \$ \_\_\_\_\_  
The new CONTRACT PRICE including this CHANGE ORDER will be \$ \_\_\_\_\_

CHANGE TO CONTRACT TIME:

The CONTRACT TIME will be increased or (decreased) by: \_\_\_\_\_ calendar days.  
The new date for completion of all work will be \_\_\_\_\_.

Requested: \_\_\_\_\_  
Project Manager Date

Accepted by Contractor: \_\_\_\_\_  
Date

Recommended: \_\_\_\_\_  
City Engineer Date

Authorized: \_\_\_\_\_  
Director of Public Works Date

Approved: \_\_\_\_\_  
City Manager/City Council Date

Distribution: City Clerk (original) Consultant  
Finance Subject File  
Contractor

## GENERAL CONDITIONS

1. DEFINITIONS. The following terms, as used in or pertaining to the contract documents, are defined as follows:

OWNER. The OWNER is the City of Peoria, Arizona, with Municipal offices located at 8401 West Monroe, Peoria, Arizona.

CITY. The word 'City' refers to the City of Peoria, Arizona. The official representative of said City in these proceedings shall be the City Engineer.

CONTRACTOR. The word 'Contractor' means the person, firm or corporation with whom the contract is made by the City.

ENGINEER. The ENGINEER is the City of Peoria Engineering Department, located at 8401 West Monroe, Peoria, Arizona.

DESIGN ENGINEER. The DESIGN ENGINEER is the firm of James M. Montgomery, Consulting Engineers, Inc., located at 6245 North 24th Parkway, Suite 208, Phoenix, Arizona, 85016.

MATERIALS. The term 'Materials' includes, in addition to materials incorporated in the project, equipment and other material used and/or consumed in the performance of the work.

SUBCONTRACTOR. The word 'Subcontractor' includes those having a direct contract with the contractor and those who furnish material worked to a special design according to the plans and/or specifications for this work, but does not include those who merely furnish materials not so worked.

WORK. Includes all labor necessary to accomplish the construction required by the Contract Documents and all materials and equipment incorporated or to be incorporated in said construction.

CONTRACT DOCUMENTS. The words 'Contract Documents' means the Special Notice, Notice to Contractors, Information for Bidders, Proposal, Bid Bond, Contract, Performance Bond, Payment Bond, Notice of Award, Notice to Proceed, Change Order, Certificate of Insurance & Schedule A, Certificate of Completion, Contractor's Affidavit Regarding Settlement of Claims, Contractor's Affidavit Certifying Non-Collusion in Bidding, General Conditions, Special Provisions, Technical Provisions, Performance Provisions, Plans and Addenda thereto.

2. REFERENCE STANDARDS

- A. The "Uniform Standard Specifications for Public Works Construction" and the Uniform Standard Details for Public Works Construction" which are sponsored and distributed by the Maricopa Association of Governments (MAG), and which are hereinafter referred to as the "MAG Specifications", are hereby adopted as part of these contract documents. Copies of these documents, with revisions, may be obtained at 1820 West Washington Avenue, Phoenix, Arizona.

- B. On December 20, 1989 by Ordinance 89-41, the City of Peoria adopted the Uniform Standard Details for Public Works Construction from the Maricopa County Association of Governments, 1979 and the 1983, 1984, 1985, 1986 and 1988 amendments thereto" by reference with certain exceptions.

A copy of these documents is kept on file at the office of the City Clerk of the City of Peoria at 8401 West Monroe, Room 330, Peoria, Arizona.

3. LAWS AND REGULATIONS. The Contractor shall keep himself fully informed of all existing and future City and County ordinances and regulations and state and federal laws and Occupational Safety and Health Standards (OSHA) in any manner affecting the work herein specified. He shall at all times observe and comply with said ordinances, laws and regulations, and shall protect and indemnify the City of Peoria, Arizona, and its officers and agents against any claim or liability arising from or based on the violation of any such ordinances, regulations or laws.

This contract shall be governed by and construed in accordance with the laws of the State of Arizona.

4. SUBCONTRACTS. Subcontracts shall be in accordance with, the Contractor shall be bound by, the following provisions:

All subcontractors shall be subject to the approval of the City.

All subcontracts shall be in writing and shall provide that all work to be performed thereunder shall be performed in accordance with terms of the contract.

Certified copies of any and all subcontracts shall be furnished to the Office of the City Engineer; however, prices may be omitted.

Subcontractors shall conform to the regulations governing employment of labor.

The subcontracting of any part of the work will in no way relieve the Contractor of his responsibility under the contract.

5. RIGHTS-OF-WAY. The City will provide Rights-of-Way and easements for all work specified in this contract, and the Contractor shall not enter or occupy with men, tools, equipment or materials any private ground outside the property of the City of Peoria, Maricopa County, Arizona, without the consent of the owner.

The Contractor, at his own expense, is responsible for the acquisition of any additional easements or rights-of-way that he may desire to complete the work of this contract.

6. PROPOSAL QUANTITIES. It is expressly understood and agreed by the parties hereto that the quantities of the various classes of work to be done and material to be furnished under this Contract, which have been estimated as stated in the Proposal, are only approximate and are to be used solely for the purpose of comparing, on a consistent basis, the proposals offered for the work under this Contract; and the Contractor further agrees that the City of Peoria will not be held responsible if any of the quantities shall be found incorrect; and the Contractor will not make any claim for damages or for loss of profits because of a difference between the quantities of the various classes of work as estimated and the work actually done. If any error, omission, or misstatement is found to occur in the estimated quantities, the same shall not invalidate this Contract or release the Contractor from the execution and completion of the whole or any part of the work in accordance with the Specifications and Plans herein mentioned, and for the prices herein agreed upon and fixed therefore, or excuse him from any of the obligations or liabilities hereunder, or entitle him to any damage or compensation except as may be provided in this contract.

7. PAYMENTS TO CONTRACTOR. Payments will be made on the basis of itemized monthly statements provided by the Contractor in accordance with the Standard Specifications, and these Specifications. Three (3) copies of the itemized statement should be submitted along with a 'Claim of the City of Peoria' form to the Office of the City Engineer. After verification, payments will be mailed by the Finance Department. The City will make payment to the Contractor in accordance with MAG Section 109.7.

The City will make a partial payment to the Contractor on the basis of an estimate prepared by the Contractor, and approved by the City Engineer, for work completed through the last day of the preceding calendar month.

The City will retain ten percent (10%) of each such estimate until acceptance of the project and final payment.

When required by the City Engineer or his authorized representative for the purposes of determining the equitableness of the Contractor's payment request the Contractor shall furnish evidence satisfactory to the City Engineer or his authorized representative, of the sums paid by the Contractor for materials, supplies and other items of expense.

8. INDEMNITY AND RESPONSIBILITY FOR DAMAGES. The Contractor agrees to indemnify, defend, and save harmless the City of Peoria, its Mayor and Council, appointed boards and commissions, officials, officers, agents, representatives, employees, individually and collectively, and James M. Montgomery, Consulting Engineers, Inc., (JMM), its officers and employees, individually and collectively; against and from all losses, claims, liabilities, damages, suits, actions, payments and judgements, demands, expenses, attorney's fee, defense cost, cost of litigation, or actions of any kind and nature resulting from personal injury to any person, including employees of the Contractor or of any subcontractor employed by the Contractor (including bodily injury and death) or damages to any property, arising or alleged to have arisen out of the negligent performance of the Contractor for the work done in fulfillment of the construction of the improvement under the terms of this agreement, or on account of any act or omission by the Contractor, his employees or his agents, or from any claims or amounts arising or recovered under Workman's Compensation laws or any other law, bylaw, ordinance, or order or decree, except any such injury or damages arising out of the sole negligence of the City or JMM, their officers, agents or employees. IT IS THE INTENTION OF THE PARTIES to this contract that the City of Peoria, its Mayor and Council, appointed boards and commissions, officials, officers, employees, individually and collectively, and JMM, its officers and employees, individually and collectively, are to be indemnified against their own negligence unless and except their negligence is found to be the sole cause of the injury to persons or damages to property. The amount and type of insurance coverage requirements set forth in the contract will in no way be construed as limiting the scope of indemnity in this paragraph. Contractor's insurance shall be in accordance with MAG Specification Section 103.6.

9. GUARANTEE. The Contractor shall guarantee the work done on this project for one (1) year after acceptance against faulty materials, faulty workmanship, and failure to meet the requirements of the specifications. Said guarantee by the contractor shall not apply to damage caused by earthquakes or other acts of God, land subsidence, faulty operations or any abuse on the project by others.

10. LOSSES AND DAMAGES. All loss or damage arising out of the nature of the work to be done or from the action of the elements or from any unforeseen circumstances in the prosecution of the same, or from any unusual obstructions or difficulties which may be encountered in and/or during the prosecution of the work, or from any casualty

whatsoever of every description, shall be sustained and borne by the Contractor at his own cost and expense.

11. HINDRANCES AND DELAYS. No charge shall be made by the Contractor for hindrances or delays from any cause during the progress of any portion of the work embraced in this Contract; but such delays, if due to no fault or neglect of the Contractor, shall entitle the Contractor to a time extension sufficient to compensate for the delays. The amount of the delay shall be determined by the City Engineer provided the Contractor gives the City Engineer immediate notice in writing of the cause of such delay.

In the event a delay is caused solely by the City, is unreasonable under the circumstances and was not within the contemplation of the parties at the time of executing the contract, the City and Contractor shall negotiate, in good faith, the recovery of damages related to expenses incurred by the Contractor as a result of the delay.

12. CHARACTER AND STATUS OF WORKMEN. None but skilled foremen and workmen shall be employed on work requiring special qualifications.

When required by the City Engineer, the Contractor shall discharge any person who is, in the opinion of the Engineer, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable. The Contractor shall keep the City harmless from damages or claims for compensation that may occur in the enforcement of this section of the specifications.

The Contractor shall be responsible for assuring the legal working status of its employees and its subcontractor's employees.

The Contractor shall employ only such superintendents, foremen and workmen as are careful, competent and skilled, and the Engineer may order the dismissal of any person employed by the Contractor who shall misconduct himself, or shall be incompetent or negligent in the performance of his duties, and such person or persons shall not be reemployed without the consent in writing of the Engineer.

The methods, equipment and appliances used on the work shall be such as will produce a satisfactory quality of work, and shall be adequate to complete the contract within the time limit specified.

Except as is otherwise specified, the Contractor's procedure and methods of construction may, in general, be of his own choosing, provided they follow best general practice and are calculated to secure results which will satisfy the requirements of the specifications and the supervision of the work.

The work covered by this Contract shall be carefully laid out in advance and performed in a manner to minimize interference with normal operation and utilization of the roads. The Contractor shall exercise caution during the course of this construction work to avoid damage to all known existing or possible unknown existing underground utilities. He shall conduct his construction operations in such a manner as to avoid injury to his personnel and to avoid damage to all utilities. Any damage done will be repaired without delay and at the expense of the Contractor.

The Contractor shall hold and save harmless the City of Peoria and JMM and their officers, agents, servants, and employees from liability of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention,

process, article, or appliance manufactured or used in the performance of the Contract Documents.

13. PRE-CONSTRUCTION CONFERENCE. Prior to the issuance of the Notice to Proceed, a pre-construction conference will be held. The time and place will be established at a later date. Representatives of the City, County, the Engineer and the affected utility companies will be required to provide the following information:

- A. Names and emergency telephone numbers of key personnel involved in the project.
- B. Names of all subcontractors proposed for use on the project.
- C. A construction progress schedule showing the estimated time for start and completion of the major items of work.
- D. A payment schedule showing the estimated dollar volume of work for each calendar month during the life of the project.

The purpose of the meeting is to outline specific construction items and procedures the City feels requires special attention on the part of the Contractor. The Contractor may also present any variations in procedures that he feels may improve the workability of the project, reduce the cost, or reduce inconvenience to the public.

The Contractor shall submit to the Engineer an approximate construction schedule at this time. This will allow the City to schedule inspections in advance. The frequency and offset of alignment and elevation stakes shall be mutually agreed upon between the City and the Contractor, in writing, at this time.

The Contractor shall submit a written proposal at this conference outlining his intended plans for maintaining continuous access to residences and businesses along the construction site, and traffic control.

The Notice to Proceed shall not be issued until the Contractor's construction schedule and traffic control plans have been reviewed and approved by the City.

Both the schedule of progress and the dollar value will be subject to review and modifications by the City Engineer or his authorized representative.

No Work shall be started until after all required permits, licenses, and easements have been obtained.

No Work shall be started until all applicable submittals have been submitted and returned approved by the Owner's Representative.

The Contractor shall notify the Engineering Department of the City of Peoria at least seventy-two (72) hours before the following events:

- A. The start of construction in order to arrange for inspection.
- B. Construction staking to be provided by the City or its authorized representative.
- C. Shutdown of City water, sewer, drainage, irrigation and traffic control facility.

- D. Shutdown of existing water wells and booster pumps. Shutdown shall not exceed seventy-two (72) hours of any installation. Only one installation may be shutdown at anytime.
  - E. Coordination of all draining and filling of waterlines and irrigation laterals and all operations of existing valves or gates with the City Engineer.
  - F. Start-up or testing of any water well or booster pump to be connected to any part of the existing City water system. This includes operation of existing valves necessary to accommodate the water.
14. **TRAFFIC REGULATIONS.** All traffic affected by this construction shall be regulated in accordance with the "City of Phoenix 'Traffic Barricade Manual', revised July 1989", latest edition and the City of Phoenix in the "Traffic Barricade Manual" shall be referred to the City of Peoria Traffic Superintendent for interpretation.

At the time of the pre-construction conference, the Contractor shall designate an employee who is well qualified and experienced in construction traffic control and safety to be responsible for implementing, monitoring and altering traffic control measures, as necessary. At the same time the City will designate a representative who will be responsible to see that all traffic control and any alterations are implemented and monitored to the extent that traffic is carried through the work area in an effective manner and that motorists, pedestrians, bicyclists and workers are protected from hazard and accidents.

The following traffic regulations are a minimum requirement throughout the project duration:

- A. The following shall be considered major streets:
  - All major (section line), minor (mid-section line), arterial and collector (quarter section line) streets so classified by the City of Peoria street standards.
- B. All traffic control devices required for this project shall be the responsibility of the Contractor. The Contractor shall place advance warnings, reduce speed, loose gravel, 25 mph speed limit, and do not pass signs in accordance with the "Traffic Barricade Manual".
- C. When construction activities or traffic hazards at the construction site require the use of flagmen, it shall be the Contractor's responsibility to provide adequate personnel including flagmen to direct traffic safely.
- D. Manual traffic control shall be in conformity with the "Traffic Barricade Manual" of the City of Phoenix, revised July 1989, except the liaison officer shall be contacted at the Peoria Police Department, telephone 979-4222.
- E. When traffic hazards at construction sites warrant the use of certified police personnel to direct traffic, arrangement should be made with the liaison officer at the Peoria Police Department, telephone 979-4222.
- F. The assembly and turnarounds of the Contractor's equipment shall be accomplished using adjacent local streets when possible.

Equipment used and/or directed by the Contractor shall travel with traffic at all times. Supply trucks shall travel with traffic except when being spotted. Provide a flagman or officer to assist with this operation.

- G. During construction, it may be necessary to alter traffic control. Alterations shall be in accordance with the "Traffic Barricade Manual".
- H. No street within this project may be closed to through traffic or to local emergency traffic without prior written approval of the Traffic Engineer of the City of Peoria. Written approval, if given, will be done if sufficient time exists to allow notification of the public at least two (2) days in advance of such closing. Partial closure of streets within the project shall be done in strict conformity with written directions to be obtained from the City Traffic Superintendent.

Use care when excavating near intersections with traffic signal underground cable. Notify the Traffic Engineer 24 hours in advance of any work at such intersections. Install and maintain temporary overhead traffic signal cable as specified by the Traffic Engineer when underground conduit is to be severed by excavations at intersections. Provide an off-duty uniformed police officer to direct traffic while the traffic signal is turned off and the wiring is transferred. Repair and restore all damaged or modified traffic signal overhead and underground items to the Traffic Engineer's satisfaction. Do not splice magnetic detector loops.

The Contractor shall submit a written proposal at the pre-construction conference outlining plans for traffic control and maintaining continuous access to residences and businesses affected by the traffic control of this project.

Any changes to the traffic control plan during construction shall be submitted to the Engineer for approval at least seventy-two (72) hours before implementation.

The Contractor shall provide, erect and maintain all necessary flashing arrow boards, barricades, suitable and sufficient red lights, warning and danger signals and signs and take all necessary precautions for the protection of the work and safety of the public. The Contractor shall provide, erect and maintain acceptable and adequate detour signs at all closures and along detour routes.

The Contractor shall maintain all existing traffic signs erect, clean and in full view of the intended traffic at all times. Street name signs at major street intersections shall be maintained erect at all times. If these signs interfere with construction, the Contractor shall notify the Inspector at least 48 hours in advance for City forces to temporarily relocate said signs. The Traffic Superintendent will re-set all traffic and street name signs to permanent locations when notified by the Engineer that construction is complete.

Payment for this item shall be made at the contract lump sum price for TRAFFIC CONTROL.

The Contractor shall address how local access to adjacent properties will be handled in accordance with the specifications herein.

All barricades and obstructions shall be illuminated at night, and all safety lights shall be kept burning from sunset until sunrise. All barricades and signs used by the Contractor shall conform to the standard design, generally accepted for such purposes, and payment for all such services and materials shall be considered as included in the other pay items of the Contract.

- I. Where crossings of existing pavements occur, no open trenches shall be permitted overnight, but plating may be permitted if conditions allow as

determined by City Engineer or his authorized representative. If plates cannot be used, crossings shall be backfilled or Contractor shall provide a detour.

15. SURVEY CONTROL POINTS. Existing survey markers (either brass caps or iron pipes) shall be protected by the Contractor or removed and replaced under direct supervision of the City Engineer or his authorized representatives. Survey monuments shall be constructed to conform to the requirements of MAG Specifications, Section 405, and Standard Details. Lot corners shall not be disturbed without knowledge and consent of the property owner.

The Contractor shall replace benchmarks or monuments moved or destroyed during construction at no expense to the Owner. Contractor and his sureties shall be liable for correct replacement of disturbed survey benchmarks except where the Owner elects to replace monuments using his own forces.

16. PROTECTION OF FINISHED OR PARTIALLY FINISHED WORK. The Contractor shall properly guard and protect all finished or partially finished work, and shall be responsible for the same until the entire contract is completed and accepted by the City Engineer. He shall turn over the entire work in full accordance with these Specifications before final settlement shall be made.

17. STOCKPILE OF MATERIALS.

A. The Contractor may, if approved by the City Engineer, place or stockpile materials in the public right-of-way provided they do not prevent access to adjacent properties or prevent compliance with traffic regulations.

B. Traffic shall not be required to travel over stockpiled materials, and proper dust control shall be maintained.

18. EXCESS MATERIAL. When excavations are made, resultant loose earth shall be utilized for filling by compacting in place or disposed of off the site.

Excess or unsuitable material, broken asphaltic concrete and broken portland cement concrete excavated from the right-of-way shall be removed from the project and disposed of by the Contractor. Disposal of material within the Peoria City Limits or Planning Area must be approved by the City Engineer or his authorized representative.

Waste material shall not be placed on private property without express permission of the property owner.

The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the work, he shall remove all equipment, tools and surplus materials, and shall completely clean the premises, removing and disposing of all debris and rubbish, and cleaning all stains, spots, marks, dirt, smears, etc. When work premises are turned over to the City, they shall be thoroughly clean and ready for immediate use.

After all work under the contract is completed, the Contractor shall remove from the site of the work all loose concrete, lumber, wire, reinforcing, rubbish, debris and other materials not incorporated in the work. Cleanup shall include removal of all excess pointing mortar materials within pipes and removal of oversized rocks and boulders left after finish grading. The Contractor shall provide for the legal disposal of all waste products, debris, etc., and shall make necessary arrangements for such disposal.

19. DUST CONTROL AND WATER. Existing regulations, namely Regulation II, Rule 20, Subparagraph C of the Maricopa County Health Department shall be rigidly observed and enforced. Water or other approved dust palliative in sufficient quantities shall be applied during all phases of construction involving open earthwork to prevent unnecessary discharge of dust and dirt into the air.

The Contractor shall be required to obtain the necessary permit from the Maricopa County Air Pollution Control Bureau, 1845 East Roosevelt Street, (602) 258-6381, Extension 372.

The Contractor shall keep suitable equipment on hand at the job site for maintaining dust control on the project streets, and shall employ sufficient labor, materials and equipment for that purpose, at all times during the project to the satisfaction of the Engineer. The dust control measures shall be in accordance with the requirements of the "Maricopa County Health Department Air Pollution Control Regulations."

Watering shall conform to the provisions of Section 225 of the MAG Standard Specifications. The cost of watering will be included in the price bid for the construction operation to which such watering is incidental or appurtenant.

Installation and removal of fire hydrant meters should be scheduled at least forty-eight (48) hours in advance through the City of Peoria Water Department at 412-7160. A \$200 deposit is required for each meter. The cost of the water is at the prevailing rate.

The Contractor shall take all necessary reasonable measures to reduce air and water pollution by any materials and/or equipment used during construction. Keep the site clean of trash and debris including but not limited to loose construction materials, such as sand, cement, lime, wood, pieces, building paper, etc. Place all trash and debris in approved containers and remove and dispose of off the site daily in a location where it will not be possible to be disposed. No burning of trash or debris will be permitted on the site.

20. TEMPORARY SANITARY FACILITIES. The Contractor shall provide ample toilet facilities with proper enclosures for the use of workmen employed on the work. Toilet facilities shall be installed and maintained in conformity with all applicable state and local laws, codes, regulations and ordinances. They shall be properly lit and ventilated, and kept clean at all times.

Adequate and satisfactory drinking water shall be provided at all times and under no circumstances and under no conditions will the use of common cups be permitted. The Contractor must supply sanitary drinking cups for the benefit of all employees.

21. ELECTRIC POWER, WATER AND TELEPHONE. Unless specified otherwise, the Contractor shall make his own arrangements for electric power, water and telephone. Subject to the convenience of the utility, he may be permitted to connect to existing facilities where available, but he shall meter and bear the cost of such power or water, and installation and disconnect of such power, water and telephone services.

22. ENERGIZED AERIAL ELECTRICAL POWER LINES. The utility company may maintain energized aerial electrical power lines in the immediate vicinity of this project. Do not consider these lines to be insulated. Construction personnel working in proximity to these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees and all other construction personnel working on this project must be warned of the danger and instructed to take adequate protective measures, including maintaining a minimum ten (10) feet clearance between the lines and all construction equipment and personnel. (See: OSHA Std. 1926.550 (A) 15).

As an additional safety precaution, Contractors should also be instructed to call the utility company to arrange, if possible, to have these lines de-energized or relocated when the work reaches their immediate vicinity. The cost of such temporary arrangements would be borne by the Contractor. The utility company can often respond to such requests if two (2) days advance notice is given, but some situations may require up to sixty (60) days lead time for relocation or other arrangements.

Electrical utility companies may maintain energized underground electrical power lines in the immediate vicinity of this project. These power lines represent an extreme hazard from electrical shock to any construction personnel or equipment coming in contact with them. Arizona law requires all parties planning excavations in public rights-of-way to contact all utility firms for locations of their underground facilities. Contractors, their employees, and all other personnel working near any underground power lines must be warned to take adequate protective measures. (See: OSHA Std. 1926-651 (A)). Notify the electrical utility company to arrange, if possible, to have these lines de-energized when the work reaches their immediate vicinity. The cost of such temporary arrangements shall be borne by the Contractor.

23. The following report was prepared of explorations and tests of subsurface conditions at the site of the WORK:

1. Report dated February 12, 1992, prepared by Western Technologies, Inc., entitled "Geotechnical Engineering Exploration - North Embankment Erosion of Skunk Creek Channelization 81st Avenue, South of Milwaukee Avenue, Peoria, Arizona". The technical data contained in such report upon which the CONTRACTOR may rely is found in the Appendix to these specifications.

The CONTRACTOR may rely upon the accuracy of the technical data contained in such reports; however, the interpretation of such technical data, including any interpolation or extrapolation thereof, together with nontechnical data, interpretations, and opinions contained in such reports or the completeness thereof is the responsibility of the CONTRACTOR.

## COORDINATION

### PART 1 GENERAL

#### 1.01 PERMITS

- A. Obtain, pay for, and comply with all required permits, licenses and other authorizations from appropriate agencies, including an Excavation and Dirt Moving Permit from the Maricopa County Health Department, and any permits which may be required by the City of Peoria, and the Arizona Department of Water Resources before start of construction.
- B. The Contractor shall obtain an off-site permit and pay the \$5.00 charge for this permit.

#### 1.02 RESPONSIBILITY FOR PRIVILEGE (SALE) AND OTHER TAXES

- A. The Contractor shall report and pay all Federal, State, City, and local taxes.
- B. The City of Peoria transaction privilege tax shall not be waived under the conditions of this contract. The current privilege tax rate can be obtained from the City of Peoria Sales Tax and License Department at 412-7156.

#### 1.03 COORDINATION WITH OWNER

- A. The Contractor shall meet with the Owner's representative for a pre-construction conference before commencing work.
- B. At the pre-construction conference, the Contractor may present any variations in procedures that he feels may improve the workability of the project, reduce cost, or reduce inconvenience to the public.
- C. The Notice to Proceed will not be issued until the Contractor's construction schedule has been approved by the Owner's Representative.
- D. Notify the Owner's Representative at least 72 hours before the start of construction.
- E. Inspection will be provided by the Owner. Inspection shall not be considered as direct control of the individual workman and his work.

#### 1.04 COORDINATION WITH CITY OF PEORIA

- A. The Contractor shall contact the City of Peoria Engineering Department 72 hours before the start of construction.
- B. Notify the Engineering Department of the City at least 72 hours before any shutdown of City water, sewer, or drainage facilities.
- C. Coordinate all draining and filling of waterlines, and all operation of existing valves with the City Engineer.

1.05 COORDINATION WITH UTILITIES

- A. Call the Blue Stake service (263-1100) and notify all utilities at least 2 working days before excavating. Contractor shall be responsible for any damage done to public or private property shown on plans or blue staked.

Utility companies and other interested parties will be provided with construction plans and the construction schedule for this project.

- B. Electrical utility companies may maintain energized aerial electrical power lines in the immediate vicinity of this project. do not consider these lines to be insulated. Construction personnel working near these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees and all other construction personnel working on this project must be warned of the danger and instructed to take adequate protective measures, including maintaining a minimum of 10 feet clearance between the lines and all construction equipment and personnel. (See OSHA Std. 1926.550 (A) 15). As an additional safety precaution, call the electrical utility company to arrange, if possible, to have these lines de-energized or relocated when the work reaches their immediate vicinity. The cost of such temporary arrangements shall be borne by the Contractor.

1.06 SUBMITTALS

- A. Progress schedule to be submitted to Owner at pre-construction conference shall show the order in which he proposes to carry out the work, the dates on which he shall start the several phases of work, and the expected date of completion of each phase.
- B. Supplementary progress schedules may be submitted after the work is in progress. Schedule changes requiring an increase in the City's Engineering personnel on the project shall not be put into effect until the City has made arrangements for additional personnel.

## SUBMITTALS

### PART 1 GENERAL

#### 1.01 SUBMITTALS

- A. Submit 4 copies of all submittals unless otherwise stated herein.
- B. Number submittals consecutively.
- C. Submittals shall clearly note any exception to or departure from the Contract Documents along with justification for each exception or departure. Otherwise, review or approval of submittals shall not constitute approval of exceptions or departures.
- D. Each submittal shall include the following, or it will be returned without review and stamped "REJECTED":
- Project name, Owner's project number, and description.
  - Submittal number and revision number.
  - Submittal date and revision dates.
  - Reference to the applicable section of the specifications or MAG Uniform Standard Specifications and page number.
  - Name of Contractor or Subcontractor.
  - Contractor's stamp, initialed or signed, dated, and certifying to review of submittal, certification of field measurements and compliance with Contract.
  - Space for the Owner's stamp identification of exceptions or departures from the Contract Documents.
- E. In addition, shop drawings, catalog data, installation or application instructions and operation and maintenance instructions shall include the following or they will be returned without review and stamped "REJECTED":
- Identification of equipment, product or material
  - Name of supplier and manufacturer
- F. Stock or standard drawings will not be accepted for review unless full identification and supplementary informations shown thereon in ink or typewritten form.
- G. Check and approve all submittals to determine that they comply with the requirements of the Contract Documents before transmitting them to the Owner's Representative for review. Do not submit submittals which are incomplete or are not in compliance with the Contract Documents. Contractor shall place his signature or initials on his stamp of approval on all submittals to indicate compliance with this requirement.

This approval shall constitute a representation that all quantities, dimensions, field construction criteria and similar data have been verified and that the Contractor is of the opinion that the submittal fully meets the requirements of the Contract Documents.

- H. Review of submittals shall constitute review of the specific subject matter for which the drawings were submitted and not of any other structure, material, equipment, or apparatus shown on the submittal.
- I. The review of submittals shall be general and shall not relieve the Contractor of responsibility for the accuracy of such submittals, nor for the proper fitting and construction of the work, nor for the furnishing of work or materials or work required by the Contract and not indicated on the submittal, nor for the coordination of work between trades. Approval of submittals shall not relieve Contractor of responsibility to meet design requirements, governing codes, standards, and regulations.
- J. The procedure for seeking review of submittals shall be as follows:
1. Submit 4 complete submittals together with one copy of a letter of transmittal to the Owner's Representative for review. The letter of transmittal shall contain the name of the project, specification number, the name of the Contractor, the list of submittals including numbers and titles, and any other pertinent information. Submittals shall be folded to approximately 9 inches by 12 inches.
  2. Submittals will be stamped "NO EXCEPTION TAKEN", "MAKE CORRECTIONS NOTED", "REVISE AND RESUBMIT", "SUBMIT SPECIFIED ITEM" or "REJECTED". One copy with a letter of transmittal will be mailed to the Contractor.
  3. If submittal is stamped "NO EXCEPTION TAKEN", insert the date of approval on five additional copies of the document and transmit the five copies to the Owner together with one copy of a letter of transmittal containing the same information as required the first letter of transmittal.
  4. If a submittal is stamped "MAKE CORRECTIONS NOTED", make the corrections shown and proceed as in Instruction 3.
  5. If a drawing or data is stamped "REVISE AND RESUBMIT", "SUBMIT SPECIFIED ITEM", or "REJECTED", make the necessary corrections and resubmit the documents as required in Instruction 1. The letter transmitting the documents shall indicate that the documents comprise a resubmittal. Revisions and resubmittal shall be numbered as Revision #1, Revision #2, or as appropriate.
  6. If any corrections other than those noted by the Owner are made on a submittal before resubmittal, such changes shall be so noted on the resubmittal.
  7. Revise and resubmit submittals as required, until confirmation of compliance is obtained.
- K. The costs incurred by the Owner for second and subsequent resubmittals shall be deducted from the payment due to the Contractor.
- L. No work called for by submittals shall be done until such submittals have been reviewed and approved in writing by the Owner.

- M. Contractor's acceptance of delivery of any materials or equipment prior to receipt of Owner's Representative's written approval of all applicable submittals shall be at Contractor's own risk.

1.02 INITIAL SUBMITTAL

- A. Submit the following within 48 hours after receipt of Notice of Award.
- The Construction Schedule  
Names and addresses of materials and equipment manufacturers and locations of the shops at which the manufacture will take place.  
A general description of the materials and equipment proposed, including sizes and catalog numbers.
  - A statement as to whether the materials and equipment are already designed or in production.  
A list of installations in which the materials and equipment comparable in size, capacity and rating with those required in the Contract Documents are now in regular operation.

1.03 SUBMITTALS ON OWNER'S REQUEST

- A. Certification of compliance with any listed reference standards will be submitted by manufacturers on Owner's request. When requested, the certification shall be filed with the Owner's Representative before delivery of material or equipment to the jobsite. Failure of the Owner to request certification of compliance shall not serve as a waiver of Contractor's duty to comply with reference standards.
- B. Written transcripts of results of acceptance tests performed at point of manufacture of products furnished shall be submitted by manufacturers on Owner's request.
- C. When it is doubtful that a manufacturer's product conforms to the specifications, the Owner reserves the right to require submittal of more complete information before approval.

1.04 PROGRESS SCHEDULE

- A. Construction schedule shall show all work, including work to be done by subcontractors. The schedule shall be in enough detail to assure the owner that the Contractor understands the work to be performed, that it can be accomplished within the specified contract time period, and that the sequence of activities is appropriate.
- B. Include a schedule of estimated submittal dates in the construction schedule.
- C. Verify delivery times of equipment and materials from manufacturers and suppliers when developing construction schedule.
- D. Schedule, prepare and submit all submittals in accordance with a time-table that will allow suppliers and manufacturers sufficient time to fabricate, manufacture, inspect, test, and deliver their respective products in a timely manner so as not to delay the complete performance of the work.

- E. The construction schedule shall indicate the start and completion times of each major phase of the project, and such intermediate phases as will serve for well defined control points. It shall also indicate the anticipated date of receipt of major items of equipment as well as materials and equipment whose receipt and installation are critical to the scheduled progress of the project.

1.05 PROGRESS REPORTS

- A. Schedule updates shall be submitted with monthly pay requests. If work falls behind schedule, monthly pay requests shall include supplementary schedules to demonstrate how the Contractor intends to bring work back on schedule.
- B. Partial payment requests may be withheld if daily logs, schedule updates or record drawings are not kept current.

1.06 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. The following definitions apply:

1. Shop Drawings: Detailed plans as required to adequately control work where details are not specifically included in plans furnished by Owner. Shop drawings shall clearly show dimensions, clearances, tolerances, finishes, performance characteristics, and weight and type of materials or equipment. Shop drawings shall indicate the location at which the equipment or materials are to be installed, how equipment will be mounted, how it relates to adjacent structures or materials, and how connection will be made between work under this contract and work under other contracts. Shop drawings shall show parts lists and details of all appurtenances to be furnished with the specified items along with references to appropriate ASTM, Federal Specifications and other reference standards.
2. Catalog Data: Manufacturer's printed literature describing a product or service. Clearly indicate applicable items when several products are covered on one page. Using black ink, indicate on submitted catalog data the specification section or plan reference being satisfied.
3. Installation or Application Instructions: Manufacturer's instructions including warranty requirements, clearance required and proper field procedures to deliver, handle, install and prepare product for use.
4. Operation and Maintenance Instructions: Manufacturer's instruction for correct operation and maintenance procedures for product. Instructions shall include listing of recommended spare parts and their costs. Instructions shall also include ordering information. Instructions shall be indexed for easy reference and contain information for the installed equipment only.
5. Engineering Calculations: Calculations signed and sealed by a registered engineer licensed in the state in which the product is to be installed. Calculations shall be clearly legible, and shall be sufficient to demonstrate compliance with state and local codes, applicable standards, and the contract requirements.

PART 2 PRODUCTS

Not Used

PART 3

3.01 CONTRACT CLOSEOUT

- A. Contractor's and Subcontractors' books, records, correspondence, accounting procedures and practices, and any other supporting evidence relating to this contract shall be open to inspection and subject to audit and/or reproduction during normal working hours by the Owner or his representative, to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims based on Contractor's or Subcontractor's actual costs including direct and indirect costs and overhead allocations incurred, or units expended directly in the performance of work under this Contract. For the purpose of evaluating or verifying such actual or claimed costs or units expended, the Owner or his representative shall have access to said records from the effective date of this contract for the duration of the work and until 3 years after the date of final payment by the Owner to Contractor pursuant to this Contract.
- B. The Owner or his representative shall have access during normal working hours to all necessary Contractor and Subcontractor facilities, and shall be provided adequate and appropriate work space to conduct audits in compliance with the provisions of this article. The Owner shall give Contractor or Subcontractor reasonable advance notice of intended audits.
- C. Contractor shall require Subcontractors to comply with the provisions of this article by insertion of the requirements herein in any subcontract pursuant to this contract.

## GENERAL PROVISIONS

Except as otherwise required in these specifications, construction of this project shall be in accordance with all applicable Maricopa Association of Governments' (MAG) Uniform Standard Specifications and Uniform Standard Details, latest revision.

As a minimum, the following sections of the MAG Uniform Standard Specifications are applicable to this project. Additional sections of the MAG Uniform Standard Specifications referenced by the following sections are also applicable to this project.

### PART 100 - GENERAL CONDITIONS

<u>Section</u>	<u>Title</u>
101	Abbreviations and Definitions
102	Bidding Requirements and Conditions
103	Award and Execution of Contract
104	Scope of Work
105	Control of Work
106	Control of Materials
107	Legal Relations and Responsibility to Public
108	Commencement, Prosecution and Progress
109	Measurements and Payments

### PART 200 - EARTHWORK

<u>Section</u>	<u>Title</u>
201	Clearing and Grubbing
205	Roadway Excavation
210	Borrow Excavation
211	Fill Construction
215	Earthwork for Open Channels
225	Watering

### PART 300 - STREETS AND RELATED WORK

<u>Section</u>	<u>Title</u>
301	Subgrade Preparation
321	Asphalt Concrete Pavement
329	Tack Coat
336	Pavement Matching and Surface Replacement
340	Concrete Curb, Gutter, Sidewalk, Driveways and Alley Entrances

PART 400 - RIGHT-OF-WAY AND TRAFFIC CONTROL

Section                      Title

401                      Traffic Control

PART 600 - WATER AND SEWER

Section                      Title

601                      Trench Excavation, Backfilling and Compaction  
621                      Corrugated Metal Pipe and Arches

PART 700 - MATERIALS

Section                      Title

701                      Rock, Gravel and Sand  
702                      Base Materials  
703                      Rip Rap  
710                      Asphalt Concrete  
711                      Paving Asphalt  
725                      Portland Cement Concrete  
726                      Concrete Curing Materials  
727                      Steel Reinforcement  
729                      Expansion Joint Filler  
753                      Galvanized Pipe and Fittings  
760                      Coating Corrugated Metal Pipe and Arches  
761                      Structural Plate Pipe, Arches, and Pipe Arches  
770                      Structural and Rivet Steel, Rivets, Bolts, Pins, and Anchor Bolts  
771                      Galvanizing  
776                      Masonry Mortar and Grout  
792                      Dust Palliative

## SECTION 01010 - SUMMARY OF WORK

### PART 1. -- GENERAL

#### 1.1 GENERAL

- A. The WORK to be performed under this Contract shall consist of furnishing all plant, tools, equipment, materials, supplies, and manufactured articles and furnishing all labor, transportation and services, including fuel, power, water, and essential communications, and performing all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The WORK shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to the OWNER.

#### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The WORK of this Contract comprises the construction of repair of a portion of the northern Skunk Creek channelization embankment and a portion of an adjacent cul-de-sac, including reconstruction of embankment, soil cement stabilization, culvert extension, paving, curb, and handrail.
- B. The WORK is located near the Greenway Sports Complex, at 81st Avenue and the Skunk Creek channelization, within the City of Peoria, Arizona.

#### 1.3 CONTRACT METHOD

- A. The WORK, hereunder will be constructed under a single unit-price contract.

#### 1.4 WORK BY OTHERS

- A. The CONTRACTOR's attention is directed to the fact that work may be conducted at the site by other contractors during the performance of the WORK under this Contract. The CONTRACTOR shall conduct its operations so as to cause a minimum of interference with the WORK of such other contractors, and shall cooperate fully with such contractors to provide continued safe access to their respective portions of the site, as required to perform work under their respective contracts.
- B. **Interference With Work On Utilities:** The CONTRACTOR shall cooperate fully with all utility forces of the OWNER or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the WORK, and shall schedule the WORK so as to minimize interference with said relocation, altering, or other rearranging of facilities.

1.5 CONTRACTOR USE OF PROJECT SITE

- A. The CONTRACTOR's use of the project site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities, and field offices.

1.6 PROJECT MEETINGS

- A. **Preconstruction Conference:** A preconstruction conference shall be conducted in accordance with the requirements of the General Conditions, Section GC-13, of these Specifications.

- B. **Progress Meetings**

- 1. The CONTRACTOR shall schedule and hold regular on-site progress meetings at least weekly and at other times as requested by ENGINEER or as required by progress of the WORK. The CONTRACTOR, ENGINEER, and all subcontractors active on the site must attend each meeting. CONTRACTOR may at its discretion request attendance by representatives of its suppliers, manufacturers, and other subcontractors.
- 2. The ENGINEER shall preside at the meetings and will arrange for keeping and distributing the minutes. The purpose of the meetings will be to review the progress of the WORK, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the CONTRACTOR is required to present any issues which may impact his work, with a view to resolve these issues expeditiously.

1.7 DEFINITIONS APPLICABLE TO TECHNICAL SPECIFICATIONS

- A. The following words have the meaning defined in the Technical Portions of the WORK:

**Indicated** is a word used to direct the CONTRACTOR to information contained on the drawings or in the Specifications. Terms such as "shown," "noted," "scheduled," and "specified" also may be used to assist in locating information but no limitation of location is implied or intended.

**Furnish** - means to supply and deliver to the site, to unload and unpack ready for assembly, installation, testing, and startup.

**Install** - defines operations at the site including assembly, erection, placing, anchoring, applying, shaping to dimension, finishing, curing, protecting, and cleaning, ready for the OWNER's use.

**Provide** - is defined as furnish and install, ready for the intended use.

**Installer** - a person or firm engaged by the CONTRACTOR or its subcontract or any subcontractor for the performance of installation, erection, or application

work at the site. Installers must be expert in the operations they are engaged to perform.

**PART 2. -- PRODUCTS (Not Used)**

**PART 3. -- EXECUTION (Not Used)**

- END OF SECTION -



## SECTION 01025 - MEASUREMENT AND PAYMENT

### PART 1 -- GENERAL

#### 1.1 SCOPE

- A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for the various appurtenant items of work.

#### 1.2 MOBILIZATION (Bid Item No. 1)

- A. Payment for mobilization will be made at the lump sum price named in the Bid Schedule under Item No. 1, for completion of all mobilization items listed in Section 01505 of this Specification.

#### 1.3 DISPOSAL OF UNSUITABLE MATERIAL (Bid Item No. 2)

- A. Measurement for payment for disposing of unsuitable material, including existing broken grouted riprap and other native material which does not meet the Specifications for embankment fill or soil cement, will be based on the completion of the entire work as a lump sum item, all in accordance with the requirements of the Contract Documents.
- B. Payment of offsite disposal of existing broken grouted riprap and other unsuitable material will be made at the lump sum price named in the Bid Schedule under Item No. 2, all in accordance with the Contract Documents.

#### 1.4 IMPORTED EMBANKMENT FILL MATERIAL (Bid Item No. 3)

- A. Measurement for payment for placement and compaction of imported embankment fill material, will be based on the in-place volumes of material after construction, computed by the average-end-area method, at a length of 160 feet, a depth of 15 feet, and a width as shown on the Plans, all in accordance with the Contract Documents.
- B. Payment for imported embankment fill material will be made at the unit price named in the Bid Schedule under Item No. 3, which price shall constitute full compensation for excavation, placement, and compaction and all related work as specified in the Contract Documents.
- C. No separate payment will be made for excavation of existing loose fill material.

- 1.5 SOIL CEMENT EMBANKMENT PROTECTION (Bid Item No. 4)
- A. Measurement for payment for construction of soil cement embankment protection, including portland cement, will be based on the in-place volume of material after construction as calculated from the length, width and depth measurements, as shown on the Plans.
  - B. Payment for said soil cement embankment protection will be made at the unit price named in the Bid Schedule under Item No. 4.
- 1.6 RIPRAP (Bid Item No. 5)
- A. Measurement for payment for placing riprap will be based on the number of cubic yards of material actually installed, all in accordance with the requirements of the Contract Documents.
  - B. Payment for placing riprap will be made at the unit price named in the Bid Schedule under Item 5, which price shall constitute full compensation for completion and maintenance of such work, including area preparation, material placement, and appurtenant work.
- 1.7 ASPHALT CONCRETE PAVEMENT (81ST AVENUE CUL-DE-SAC) (Bid Item No. 6)
- A. Measurement for payment for asphalt pavement for the 81st Avenue cul-de-sac will be based upon the number of square yards of surface area of such material actually placed, all in accordance with the requirements of the Contract Documents.
  - B. No separate payment will be made for asphalt or aggregate, and all costs therefore shall be included in the prices named in the Bid Schedule under Item No. 6.
  - C. Payment for construction of asphalt concrete pavement will be made at the unit price, square yards, named in the Bid Schedule under Item No. 6, which price shall constitute full compensation for construction of all asphalt concrete, complete, including appurtenant pavements, as required, and including all sawcutting, subgrade preparation, aggregate base, tack coat, and asphalt concrete; furnishing all material, labor, plant, and equipment; furnishing all transportation, hauling, spreading, rolling, and protection; and shall include the cost of all permits, inspections, and all appurtenant work, and cleanup.
- 1.8 CONCRETE CURB (Bid Item No. 7)
- A. Measurement for payment for construction of concrete curb will be based upon the actual number of linear feet of such curb actually placed, all in accordance with MAG Specification 340.5.
  - B. Payment for concrete curb will be made at the unit price named in the Bid Schedule under Item No. 7, in accordance with MAG Specification 340.6.
- 1.9 CORRUGATED METAL PIPE (CMP) (Bid Item No. 8)
- A. Measurement for payment for construction of corrugated metal pipe (CMP) culvert extension will be based upon the number of linear feet of such extension actually

constructed as determined by measurement along the centerline of the bottom of pipe in place, all in accordance with MAG Specification 621.5.

- B. Payment for CMP culvert extension will be made at the unit price per linear foot of pipe named in the Bid Schedule under Item No. 8, which price shall constitute full compensation for furnishing and placing all such culvert extension, all in accordance with MAG Specification Section 621.6.

1.10 STEEL PIPE HANDRAIL (Bid Item No. 9)

- A. Measurement for payment for constructing the steel pipe handrail will be based upon the completion of the entire work as a lump sum item, complete and installed, all in accordance with the requirements of the Contract Documents.
- B. Payment for the steel pipe handrail will be made at the lump sum price named in the Bid Schedule under Item No. 9, for fabrication and installation, all in accordance with the Contract Documents.

**PART 2 -- PRODUCTS (Not Used)**

**PART 3 -- EXECUTION (Not Used)**

- END OF SECTION -



## SECTION 01070 - ABBREVIATIONS OF INSTITUTIONS

### PART 1. -- GENERAL

#### 1.1 GENERAL

- A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations which may appear in these Specifications shall have the meanings indicated herein.

#### 1.2 ABBREVIATIONS

AAMA	Architectural Aluminum Manufacturer's Association
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AGA	American Gas Association
AGMA	American Gear Manufacturer's Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANS	American Nuclear Society
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ASA	Acoustical Society of America
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association

BBC	Basic Building Code, Building Officials and Code Administrators International
BHMA	Builders Hardware Manufacturer's Association
CBM	Certified Ballast Manufacturers
CEMA	Conveyors Equipment Manufacturer's Association
CGA	Compressed Gas Association
CLPCA	California Lathing and Plastering Contractors Association
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drill Manufacturer's Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
FPL	Forest Products Laboratory
HI	Hydronics Institute
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IOS	International Organization for Standardization
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ITE	Institute of Traffic Engineers
MBMA	Metal Building Manufacturer's Association
MPTA	Mechanical Power Transmission Association
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
RIS	Redwood Inspection Service
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendation

SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

**PART 2. -- PRODUCTS (Not Used)**

**PART 3. -- EXECUTION (Not Used)**

**\*\* END OF SECTION \*\***



## SECTION 01090 - REFERENCE STANDARDS

### PART 1. -- GENERAL

#### 1.1 GENERAL

- A. **Titles of Sections and Paragraphs:** Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.
- B. **Applicable Publications:** Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the WORK is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.
- C. **Specialists, Assignments:** In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

#### 1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.
- B. References herein to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

- C. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.
- D. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.
- E. **Applicable Standard Specifications:** References in the Contract Documents to "Standard Specifications" shall mean the Uniform Standard Specifications for Public Works Construction, Maricopa Association of Governments (MAG), 1979, including all supplements, addenda, and revisions thereof.
- F. **Applicable Standard Drawings:** References herein to "Standard Drawings" shall mean the Uniform Standard Details for Public Works Construction, Maricopa Association of Governments (MAG), 1979, including all supplements, addenda, and revisions thereof, which drawings are hereby incorporated in and made a part of these Contract Documents.
- G. References herein to "OSHA Regulations for Construction" shall mean **Title 29, Part 1926, Construction Safety and Health Regulations**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- H. References herein to "OSHA Standards" shall mean **Title 29, Part 1910, Occupational Safety and Health Standards**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

**PART 2. -- PRODUCTS (Not Used)**

**PART 3. -- EXECUTION (Not Used)**

**\*\* END OF SECTION \*\***

## SECTION 01300 - CONTRACTOR SUBMITTALS

### PART 1. -- GENERAL

#### 1.1 GENERAL

- A. Wherever submittals are required hereunder, all such submittals by the CONTRACTOR shall be submitted to the ENGINEER. All submittals as identified herein, shall conform to the requirements of Submittals, Section SM.
- B. Within 7 days after the date of commencement as stated in the Notice to Proceed, the CONTRACTOR shall submit the following items to the ENGINEER for review:
  - 1. A preliminary schedule of Shop Drawings, Samples, and proposed Substitutes ("Or-Equal") submittals.
  - 2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER.
- D. The ENGINEER's review of CONTRACTOR shop drawing submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

#### 1.2 SAMPLES

- A. Whenever in the Specifications samples are required, the CONTRACTOR shall submit not less than 3 samples of each such item or material to the ENGINEER for acceptance at no additional cost to the OWNER.
- B. Samples, as required herein, shall be submitted for acceptance a minimum of 14 days prior to ordering such material for delivery to the jobsite, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the WORK.
- C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's name for identification and submitted to the ENGINEER for acceptance. Upon receiving acceptance of the ENGINEER, one set of the samples will be stamped and dated by the ENGINEER and

returned to the CONTRACTOR, and one set of samples will be retained by the ENGINEER, and one set of samples shall remain at the job site until completion of the WORK.

- D. Unless indicated otherwise, all colors and textures of specified items presented in sample submittals shall be from the manufacturer's standard colors and standard materials, products, or equipment lines. If the samples represent non-standard colors, materials, products, or equipment lines and their selection will require an increase in contract time or price, the CONTRACTOR will clearly indicate same on the transmittal page of the submittal.

### 1.3 RECORD DRAWINGS

- A. The CONTRACTOR shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the WORK as actually constructed. These master record drawings of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the WORK.
- B. Record drawings shall be accessible to the ENGINEER at all times during the construction period and shall be delivered to the ENGINEER upon completion of the WORK.
- C. Final payment will not be acted upon until the CONTRACTOR-prepared record drawings have been delivered to the ENGINEER. Said up-to-date record drawings shall be in the form of a set of prints with carefully plotted information overlaid in red.
- D. Upon substantial completion of the WORK and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of record drawings to the ENGINEER for transmittal to the OWNER, conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected drawings showing the reported location of the WORK. The information submitted by the CONTRACTOR in the Record Drawings will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the Record Drawings as a result.

**PART 2. -- PRODUCTS** (Not Used)

**PART 3. -- EXECUTION** (Not Used)

- END OF SECTION -

## SECTION 01400 - QUALITY CONTROL

### PART 1. -- GENERAL

#### 1.1 DEFINITION

- A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

#### 1.2 INSPECTION AT PLACE OF MANUFACTURE

- A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.
- B. The presence of the ENGINEER at the place of manufacturer, however, shall not relieve the CONTRACTOR of the responsibility for furnishing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is a duty of the CONTRACTOR, and said duty shall not be avoided by any act or omission on the part of the ENGINEER.

#### 1.3 SAMPLING AND TESTING

- A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the Uniform Standard Specifications for Public Works Construction, Maricopa Association of Governments (MAG), 1979, latest revisions.
- B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents.
- C. Notwithstanding the existence of such waiver, the ENGINEER reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents, shall be reasonable cause for the ENGINEER to require the removal or correction and reconstruction of any such work in accordance with the General Conditions.

### PART 2. -- PRODUCTS (Not Used)

### **PART 3. -- EXECUTION**

#### **3.1 INSTALLATION**

- A. Inspection:** The CONTRACTOR shall inspect materials or equipment upon the arrival on the job site and immediately prior to installation, and reject damaged and defective items.
- B. Measurements:** The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.
- C. Manufacturer's Instructions:** Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

- END OF SECTION -

## SECTION 01505 - MOBILIZATION

### PART 1. -- GENERAL

#### 1.1 GENERAL

A. Mobilization shall include the obtaining of all permits; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items:

1. Moving on to the site of all CONTRACTOR's plant and equipment required for first month operations.
2. Installing temporary construction power, wiring, and lighting facilities.
3. Establishing fire protection system.
4. Developing construction water supply.
5. Providing on-site sanitary facilities and potable water facilities.
6. Arranging for and erection of CONTRACTOR's work and storage yard.
7. Obtaining all required permits.
8. Having all OSHA required notices and establishment of safety programs.
9. Having the CONTRACTOR's superintendent at the job site full time.
10. Submitting initial submittals.

#### 1.2 PAYMENT FOR MOBILIZATION

A. The CONTRACTOR's attention is directed to the condition that no payment for mobilization, or any part thereof will be approved for payment under the Contract until all mobilization items listed above have been completed as specified.

### PART 2. -- PRODUCTS (Not Used)

### PART 3. -- EXECUTION (Not Used)

- END OF SECTION -

## SECTION 01510 - TEMPORARY UTILITIES

### PART 1 -- GENERAL

#### 1.1 GENERAL

- A. It shall be the CONTRACTOR's responsibility to provide plant and equipment that is adequate for the performance of the WORK under this Contract within the time specified. All plant and equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required WORK, and shall be subject to inspection and approval by the OWNER's representative at any time within the duration of the Contract. All work hereunder shall conform to the applicable requirements of the OSHA Standards for Construction.

#### 1.2 POWER AND LIGHTING

- A. **Power:** The CONTRACTOR shall provide all necessary power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the WORK in a safe and satisfactory manner.
- B. **Construction Lighting:** All WORK conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper WORK and to afford adequate facilities for inspection and safe working conditions.
- C. **Approval of Electrical Connections:** All temporary connections for electricity shall be subject to approval of the ENGINEER and the power company representative, and shall be removed in like manner at the CONTRACTOR's expense prior to final acceptance of the WORK.
- D. **Separation of Circuits:** Unless otherwise permitted by the ENGINEER, circuits separate from lighting circuits shall be used for all power purposes.
- E. **Construction Wiring:** All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

#### 1.3 WATER SUPPLY

- A. **General:** The OWNER will furnish, without charge, reasonable quantities of water required by the CONTRACTOR in performance of the WORK under the Contract; however, the CONTRACTOR shall provide all facilities necessary to convey the water from the OWNER-designated source to the points of use in accordance with the requirements of the Contract Documents.
- B. The CONTRACTOR shall provide and operate all pumping facilities, pipelines, valves, hydrants, storage tanks, and all other equipment necessary for the adequate development and operation of the water supply system. The CONTRACTOR shall be solely responsible for the adequate functioning of its water supply system and shall be solely liable for any claims arising from the use of same, including discharge or waste of water therefrom.

- C. **Potable Water:** All drinking water on the site during construction shall be furnished by the CONTRACTOR and shall be bottled water or water furnished in approved metal dispensers. Notices shall be posted conspicuously throughout the site warning the CONTRACTOR's personnel that piped water may be contaminated.
- D. **Water Connections:** The CONTRACTOR shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency.
- E. **Removal of Water Connections:** Before final acceptance of the WORK on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the ENGINEER and to the agency owning the affected utility.
- F. **Fire Protection:** The construction plant and all other parts of the WORK shall be connected with the CONTRACTOR's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the WORK, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction.

#### 1.4 SANITATION

- A. **Toilet Facilities:** Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.
- B. **Sanitary and Other Organic Wastes:** The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the ENGINEER and in accordance with all laws and regulations pertaining thereto.

**PART 2 -- PRODUCTS** (Not Used)

**PART 3 -- EXECUTION** (Not Used)

- END OF SECTION -

## SECTION 01530 - PROTECTION OF EXISTING FACILITIES

### PART 1. -- GENERAL

#### 1.1 GENERAL

- A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.
- B. The CONTRACTOR shall verify the exact locations and depths of all utilities shown and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the WORK. All such exploratory excavations shall be performed as soon as practicable after award of the contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's work. When such exploratory excavations show the utility location as shown to be in error, the CONTRACTOR shall so notify the ENGINEER.
- C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

#### 1.2 RIGHTS-OF-WAY

- A. The CONTRACTOR shall not do any work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified by the ENGINEER that the OWNER has secured authority therefor from the proper party. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin work, if required by said party, and shall remove, shore, support or otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the same. When two or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that on another, the OWNER shall determine the sequence and order of the WORK. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the OWNER to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted. No such decision as to the method or time of conducting the WORK or the use of territory shall be made the basis of any claim for delay or damage, except as provided for temporary suspension of the WORK in Article 11 of the General Conditions of the Contract.

#### 1.3 PROTECTION OF STREET OR ROADWAY MARKERS

- A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly

referenced. All survey markers or points disturbed by the CONTRACTOR shall be accurately after all street or roadway resurfacing has been completed.

#### 1.4 RESTORATION OF PAVEMENT

- A. **General:** All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement owner. All pavements which are subject to partial removal shall be neatly saw cut in straight lines.
- B. **Temporary Resurfacing:** Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.
- C. **Permanent Resurfacing:** In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.
- D. **Restoration of Sidewalks or Private Driveways:** Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with the final restoration or, if no such period of times is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

#### 1.5 EXISTING UTILITIES AND IMPROVEMENTS

- A. **General:** The CONTRACTOR shall protect all Underground Utilities and other improvements which may be impaired during construction operations. It shall be the CONTRACTOR's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The CONTRACTOR shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.
- B. **Utilities to be Moved:** In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient

time in advance for the necessary measures to be taken to prevent interruption of service.

- C. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the ENGINEER and the owner of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.
- D. **OWNER's Right of Access:** The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.
- E. **Underground Utilities Indicated:** Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR.
- F. **Underground Utilities Not Indicated:** In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the ENGINEER. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra work contained in Section 104 of the Standard Specifications (MAG).
- G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of Section 109 of the Standard Specifications (MAG).
- H. **Approval of Repairs:** All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement owner before being concealed by backfill or other work.
- I. **Maintaining in Service:** All oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the ENGINEER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section

shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

#### 1.6 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

- A. **General:** The CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.
- B. **Trimming:** Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. All cuts over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.
- C. **Replacement:** The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree at its own expense. The tree shall be of a like size and variety as the tree damaged, or, if of a smaller size, the CONTRACTOR shall pay to the owner of said tree a compensatory payment acceptable to the tree owner, subject to the approval of the jurisdictional agency or OWNER. The size of the trees shall be not less than 1-inch diameter nor less than 6 feet in height.

#### 1.7 NOTIFICATION BY THE CONTRACTOR

- A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way the CONTRACTOR shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire.

**PART 2. -- PRODUCTS (Not Used)**

**PART 3. -- EXECUTION (Not Used)**

- END OF SECTION -

## SECTION 01550 - SITE ACCESS AND STORAGE

### PART 1. -- GENERAL

#### 1.1 HIGHWAY LIMITATIONS

- A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

#### 1.2 TEMPORARY CROSSINGS

- A. **General:** Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300 feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.
- B. **Temporary Bridges:** Wherever necessary, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.
- C. **Street Use:** Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall so conduct its operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.

- D. **Traffic Control:** For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and Highway Construction and Maintenance Operations," published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1).

The CONTRACTOR shall take all necessary precautions for the protection of the WORK and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.

The CONTRACTOR shall submit three (3) copies of a traffic control plan to City Engineer for approval at the pre-construction conference. The City Engineer reserves the right to observe these traffic control plans in use and to make any changes as field conditions warrant. Any changes shall supersede these plans and be done solely at the CONTRACTOR's expense.

The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.

- E. **Temporary Street Closure:** If closure of any street is required during construction, the CONTRACTOR shall apply in writing to the City Engineer. A Detour and Traffic Control Plan shall accompany the application. Written approval, if given, will be done if sufficient time exists to allow notification of the public at least two (2) days in advance of such closing.
- F. **Temporary Driveway Closure:** The CONTRACTOR shall notify the owner or occupant (if not owner-occupied) of the closure of the driveways to be closed more than one (1) eight-hour work day at least three (3) working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the owner/occupant how long the work will take and when closure is to start.

### 1.3 CONTRACTOR'S WORK AND STORAGE AREA

- A. Access to the project site is from 81st Avenue. The portion of the project which includes embankment repair of Skunk Creek may also be accessed from a gated and locked road operated by the Flood Control District of Maricopa County (District) and located on the south bank of Skunk Creek west of 83rd Avenue. Prior to the start of construction, the Contractor shall coordinate with, and obtain any permits required by, the District regarding use of the access road.

- B. The OWNER will designate and arrange for the CONTRACTOR's use, a portion of the property adjacent to the WORK for its exclusive use during the term of the Contract as a storage and shop area for its construction operations relative to this contract.
- C. The CONTRACTOR shall make its own arrangements for any necessary off-site storage or shop areas necessary for the proper execution of the WORK.

1.4 PARKING

- A. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The CONTRACTOR shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

**PART 2. -- PRODUCTS (Not Used)**

**PART 3. -- EXECUTION (Not Used)**

- END OF SECTION -

## SECTION 01560 - TEMPORARY ENVIRONMENTAL CONTROLS

### PART 1. -- GENERAL

#### 1.1 EXPLOSIVES AND BLASTING

- A. The use of explosives on the WORK will not be permitted.

#### 1.2 DUST ABATEMENT

- A. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the ENGINEER.

#### 1.3 RUBBISH CONTROL

- A. During the progress of the WORK, the CONTRACTOR shall keep the site of the WORK and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the WORK site, and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

#### 1.4 SANITATION

- A. **Toilet Facilities:** Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. **Sanitary and Other Organic Wastes:** The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the ENGINEER and in accordance with all laws and regulations pertaining thereto.

1.5 CHEMICALS

- A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

**PART 2. -- PRODUCTS** (Not Used)

**PART 3. -- EXECUTION** (Not Used)

- END OF SECTION -

**SECTION 01600 - PRODUCTS, MATERIALS, EQUIPMENT  
AND SUBSTITUTIONS**

**PART 1. -- GENERAL**

**1.1 DEFINITIONS**

- A. The word "Products," as used herein, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying and erection of the WORK.

**1.2 QUALITY ASSURANCE**

- A. **Source Limitations:** To the greatest extent possible for each unit of work, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.
- B. **Compatibility of Options:** Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

**1.3 PRODUCT DELIVERY AND STORAGE**

- A. The CONTRACTOR shall deliver and store the WORK in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.

#### 1.4 TRANSPORTATION AND HANDLING

- A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.
- B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment including those provided by OWNER, by methods to prevent soiling and damage.
- C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

#### 1.5 STORAGE AND PROTECTION

- A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.
- B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.
- C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.
- E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

#### 1.6 MAINTENANCE OF STORAGE

- A. Stored products shall be periodically inspected on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request.
- B. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.
- C. The CONTRACTOR shall maintain manufacturer-required environmental conditions continually.
- D. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.

1.7 PROPOSED SUBSTITUTES OR "OR-EQUAL" ITEM

- A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other suppliers may be accepted if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:
1. The burden of proof as to the type, function, and quality of any such substitute product, material or equipment shall be upon the CONTRACTOR.
  2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitute and the ENGINEER's decision shall be final.
  3. The ENGINEER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense additional data about the proposed substitute.
  4. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense a special performance guarantee or other surety with respect to any substitute.
  5. Acceptance by the ENGINEER of a substitute item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute.
  6. The CONTRACTOR shall be responsible for resultant changes including design and construction changes and all additional costs resulting from the changes which the accepted substitution requires in the CONTRACTOR'S WORK, the WORK of its subcontractors and of other contractors, and shall effect such changes without cost to the OWNER.
- B. The procedure for review by the ENGINEER will include the following:
1. If the CONTRACTOR wishes to provide a substitute item, the CONTRACTOR shall make written application to the ENGINEER.
  2. Wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.
  3. The CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, and be similar and of equal substance to that indicated, and be suited to the same use as that specified.
  4. The ENGINEER will evaluate each proposed substitute within a reasonable period of time.

5. As applicable, no shop drawing submittals shall be made for a substitute item nor shall any substitute item be ordered, installed, or utilized without the ENGINEER'S prior written acceptance of the CONTRACTOR'S request for substitution.
  6. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby. Whether or not the ENGINEER accepts a proposed substitute, the CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitute.
- C. The CONTRACTOR's application shall contain the following statements and information which shall be considered by the ENGINEER in evaluating the proposed substitution:
1. The evaluation and acceptance of the proposed substitute will not prejudice the CONTRACTOR's achievement of substantial completion on time.
  2. Whether or not acceptance of the substitute for use in the WORK will require a change in any of the Contract Documents to adopt the design to the proposed substitute.
  3. Whether or not incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty.
  4. All variations of the proposed substitute from the items originally specified will be identified.
  5. Available maintenance, repair, and replacement service will be indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.
  6. Itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change.

**PART 2. -- PRODUCTS (Not Used)**

**PART 3. -- EXECUTION (Not Used)**

- END OF SECTION -

## SECTION 01700 - PROJECT CLOSEOUT

### PART 1. -- GENERAL

#### 1.1 FINAL CLEANUP

- A. The CONTRACTOR shall promptly remove from the vicinity of the completed work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily complied with the foregoing requirements for final cleanup of the project site.

#### 1.2 FINAL SUBMITTALS

- A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the OWNER:
  - 1. Written guarantees, where required.
  - 2. Completed record drawings.
  - 3. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
  - 4. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

#### 1.3 MAINTENANCE AND GUARANTEE

- A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in the General Conditions, Paragraph GC-9, and in the Standard Specifications (MAG), Section 108.8.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.
- C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and his surety shall be liable to the OWNER for the cost thereof.

**PART 2. -- PRODUCTS (Not Used)**

**PART 3. -- EXECUTION (Not Used)**

- END OF SECTION -

## SECTION 02200 - EARTHWORK

### PART 1. -- GENERAL

#### 1.1 THE REQUIREMENT

- A. The work of this Section includes all earthwork required for construction of the WORK. Such earthwork shall include, but not be limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents, which shall include, but not be limited to, the furnishing, placing, and removing of sheeting and bracing necessary to safely support the sides of all excavation; all pumping, ditching, draining, and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to make up deficiencies for fills; and all other incidental earthwork, all in accordance with the requirements of the Contract Documents.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 Contractor Submittals.

#### 1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. **Codes:** All codes, as referenced herein, are specified in Section 01090, "Reference Standards."

B. **Commercial Standards:**

ASTM D 422	Method for Particle-Size Analysis of Soils.
ASTM D 698	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in (304.8-mm) Drop.
ASTM D 1556	Test Method for Density of Soil in Place by the Sand-Cone Method.
ASTM D 1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop.
ASTM D 1633	Test Method for Compressive Strength of Molded Soil-Cement Cylinders.
ASTM D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

ASTM D 2487	Classification of Soils for Engineering Purposes.
ASTM D 2901	Test Method for Cement Content of Freshly-Mixed Soil-Cement.
ASTM D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 4253	Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
ASTM D 4254	Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.

#### 1.4 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR's attention is directed to the provisions of Subpart P, Section 1926.652 of the OSHA Safety and Health Standards for Construction, which require that all banks and trenches over 5 feet high shall be shored or sloped to the angle of repose.
- B. The CONTRACTOR shall submit samples of materials in accordance with the requirements in Section 01300, "Contractor Submittals."

#### 1.5 QUALITY ASSURANCE

- A. **General:** All soils testing will be done by a testing laboratory of the OWNER's choice at the OWNER's expense except as specified in Paragraph 1.5C below.
- B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 698. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 2922, or by such other means acceptable to the ENGINEER.
- C. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the OWNER and shall be at the CONTRACTOR's expense.
- D. Particle size analysis of soils and aggregates will be performed using ASTM D 422.
- E. Determination of sand equivalent value will be performed using ASTM D 2419.
- F. **Unified Soil Classification System:** References in these specifications to soil classification types and standards set forth in ASTM D 2487 shall have the meanings and definitions indicated in the chart illustrated at the end of this Section. The chart is reproduced herein for the convenience of the CONTRACTOR only, and no limitation,

amendment, or modification is intended thereby. The CONTRACTOR shall be bound by all applicable provisions of said ASTM D 2487 in the interpretation of soil classifications.

## **PART 2. -- PRODUCTS**

### **2.1 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS**

- A. General:** Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.
- B.** Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.
- C. Suitable Materials:** Soils not classified as unsuitable as defined in Paragraph entitled, "Unsuitable Material" herein, are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the specified limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.
- D.** Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project the CONTRACTOR shall provide the imported materials at no additional expense to the OWNER, unless a unit price item is included for imported materials in the bidding schedule.
- E.** The following types of suitable materials are designated and defined as follows:
  - 1.** Type A (one inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1-inch sieve and a sand equivalent value not less than 50.
  - 2.** Type B (one-half inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1/2-inch sieve and a sand equivalent value not less than 50.
  - 3.** Type C (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a Number 4 sieve, and a sand equivalent value not less than 30.
  - 4.** Type D (coarse rock backfill): Crushed rock or gravel with 100 percent passing a 1-inch sieve and not more than 10 percent passing a Number 4 sieve.
  - 5.** Type E (pea gravel backfill): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 10 percent passing a Number 4 sieve.

6. Type F (coarse drainrock): Crushed rock or gravel meeting the following gradation requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
2-inch	100
1-1/2-inch	90 - 100
1-inch	20 - 55
3/4-inch	0 - 15
No. 200	0 - 3

7. Type G (aggregate base): Aggregate base shall meet the requirements of MAG Specification Section 702.

8. Type H (graded drainrock): Drainrock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
1-inch	100
3/4-inch	90 - 100
3/8-inch	40 - 100
No. 4	25 - 40
No. 8	18 - 33
No. 30	5 - 15
No. 50	0 - 7
No. 200	0 - 3

The drainrock shall have a sand equivalent value not less than 75. The finish graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs. The CONTRACTOR shall use, at its option, one of the asphalt types listed below:

	<u>Type 1</u>	<u>Type 2</u>	<u>Type 3</u>
Designation	SC-70	SC-250	RS-1
Spray Temperature (°F)	135-175	165-200	70-120
Coverage (gal/sq yd)	0.50	0.50	0.50

If the surface remains tacky, sufficient sand shall be applied to absorb the excess asphalt.

9. Type I: Any other suitable material as defined herein.

Native material which conforms to the following:

- a. Gradation:

<u>Sieve Size</u>	<u>Percentage by Weight Passing Screen</u>
6-inch	100
4-inch	70 - 100
No. 4	50 - 100
No. 200	25 (max)

- b. Maximum expansive potential: 1.5%
  - c. Maximum soluble sulfates: 0.10%
  - d. Plasticity index: <10
10. Type J (cement-treated backfill): Material which consists of Type H material, or any mixture of Types B, C, G, and H materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D 2901. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633.
  11. Type K (topsoil): Stockpiled topsoil material which has been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris as specified.
  12. Type L (Class I crushed stone): Manufactured angular, granular crushed stone, rock, or slag, with 100 percent passing a 1-inch sieve and less than 5 percent passing a Number 4 sieve.
  13. Type M (aggregate subbase): Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. The sand equivalent value shall be not less than 18 and shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
3-inch	100
2-1/2 inch	87 - 100
No. 4	35 - 95
No. 200	0 - 29

14. Type N (trench plug): Low permeable fill material, a nondispersible clay material having a minimum plasticity index of 10.

2.2 UNSUITABLE MATERIAL

- A. Unsuitable soils for fill material shall include soils which, when classified under ASTM D 2487, fall in the classifications of Pt, OH, CH, MH, or OL.

- B. In addition, any soil which cannot be compacted sufficiently to achieve the percentage of maximum density specified for the intended use, shall be classed as unsuitable material.

## 2.3 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

- A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.
- B. Where these Specifications conflict with the requirements of any local agency having jurisdiction, or with the requirements of a material manufacturer, the ENGINEER shall be immediately notified. In case of conflict therewith, the CONTRACTOR shall use the most stringent requirement, as determined by the ENGINEER.
- C. Fill and backfill types shall be used in accordance with the following provisions:
  - 1. Embankment fills shall be constructed of Type I material, as defined herein, or any mixture of Type I and Type A through Type H materials.
  - 2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" herein, shall consist of the following materials for each pipe material listed below.
    - a. Corrugated metal pipe shall be backfilled with Type G pipe zone backfill material.
  - 3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be Type I backfill material or any of Types A through H backfill materials or any mixture thereof.
  - 4. Aggregate base materials under pavements shall be Type G material constructed to the thicknesses shown or specified. Where specified or shown, aggregate subbase shall be Type M material.

## PART 3. -- EXECUTION

### 3.1 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

- A. **General:** Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures for the removal or exclusion of water, including taking care of storm water, groundwater, and wastewater reaching the site of the work from any source so as to prevent damage to the work or adjoining property. Excavations shall be sloped or otherwise supported in a safe manner in

accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

- B. **Excavation Beneath Embankments:** Where shown or ordered, areas beneath fills shall be over-excavated. When such over-excavation is shown, both over-excavation and subsequent backfill to the required grade shall be performed by the CONTRACTOR. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density.
- C. **Excavation Beneath Paved Areas:** Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the top 12 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.
- D. **Notification of ENGINEER:** The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

### 3.2 PIPELINE AND UTILITY TRENCH EXCAVATION

- A. **General:** Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the CONTRACTOR, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 24 inches for mechanical compaction methods and 18 inches for water consolidation methods. The maximum width at the top of the pipe shall be equal to the outside diameter of the pipe plus 36 inches for pipe diameters 18 inches and larger and to the outside diameter of the pipe plus 24 inches for pipe diameters less than 18 inches, or as shown on the Drawings.
- B. **Trench Bottom:** Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. The trench bottom shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required. Excavations for pipe bells and welding shall be made as required.
- C. **Open Trench:** The maximum amount of open trench permitted in any one location shall be 500 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel

plate will be waived in cases where the trench is located further than 100 feet from any travelled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained.

- D. **Trench Over-Excavation:** Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.
- E. **Over-Excavation:** When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth shown. Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe. All work specified in this Section shall be performed by the CONTRACTOR when the over-excavation ordered by the ENGINEER is less than 6 inches below the limits shown. When the over-excavation ordered by the ENGINEER is 6 inches or greater below the limits shown, additional payment will be made to the CONTRACTOR for that portion of the work which is located below said 6-inch distance. Said additional payment will be made under separate unit price bid items for over-excavation and bedding if such bid items have been established; otherwise payment will be made in accordance with a negotiated price.
- F. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

### 3.3 OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN

- A. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction. Such work shall be performed by the CONTRACTOR at its own expense.

### 3.4 EXCAVATION IN LAWN AREAS

- A. Where excavation occurs in lawn areas, the sod shall be carefully removed, kept damp, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling [and testing of the pipeline], the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

### 3.5 EXCAVATION IN VICINITY OF TREES

- A. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

### 3.6 ROCK EXCAVATION

- A. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting.
- B. Said rock excavation shall be performed by the CONTRACTOR; provided, that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the contract price will be made under a separate bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price.
- C. **Explosives and Blasting:** Blasting will not be permitted, except by express permission of the ENGINEER on a case-by-case basis. The use of explosives will be subject to the approval and regulations of all agencies having jurisdiction. If blasting is utilized at the site of the WORK, the CONTRACTOR shall take all precautions and provide all protective measures necessary to prevent damage to property and structures or injury to person. Prior to blasting, the CONTRACTOR shall secure all permits required by law for blasting operations and shall provide any additional hazard insurance required by the OWNER. The CONTRACTOR shall have a fully qualified and experienced blasting foreman in charge of all blasting operations.
- D. The CONTRACTOR will be held responsible for all and shall make good any damage caused by blasting or resulting from its possession or use of explosives on the WORK.
- E. All operations involving the handling, storage, and use of explosives shall be conducted in accordance with the requirements of the OSHA Standards for Construction, and in accordance with all local laws and regulations.

### 3.7 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- A. The CONTRACTOR shall remove and dispose of all excess excavated material at a site selected by the CONTRACTOR and reviewed by the ENGINEER.

### 3.8 BACKFILL - GENERAL

- A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed.
- B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

### 3.9 PLACING AND SPREADING OF BACKFILL MATERIALS

- A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.
- B. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.
- C. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.
- D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

### 3.10 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

- A. Each layer of Types A, B, C, G, H, I, and K backfill materials as defined herein, where the material is graded such that at least 10 percent passes a No. 4 sieve, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.
- B. Each layer of Type D, E, F, and J backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.
- C. Type L material requires mechanical spreading and placement to fill voids but does not require mechanical compaction or vibration.
- D. Flooding, ponding, or jetting shall not be used for final backfill materials or aggregate base materials.
- E. Pipe zone backfill materials that are granular, may be compacted by a combination of flooding and vibration using concrete vibrators or by jetting, when acceptable to the ENGINEER.
- F. Pipeline trench zone backfill materials, containing 5 percent or less of material passing a No. 200 sieve, may be compacted using flooding and jetting or vibration if the CONTRACTOR uses effective procedures that yield the specified compaction test results. Flooding and jetting shall not be done in such a manner that the pipe or nearby utilities are damaged, in areas of poorly draining or expansive soils, or where the use of the procedure is prohibited by any agency having jurisdiction over the street or right-of-way. Approved jet pipes or immersible vibrators shall be used so that each backfill layer is saturated and consolidated to its full depth before the next layer is

placed. Jet pipes shall be kept at least 6 inches away from the pipe where the backfill is being consolidated and 2 feet away from other pipes or utilities.

- G. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.
- H. **Compaction Requirements:** The following compaction test requirements shall be in accordance with ASTM D 698 for Type A, B, C, G, H, I, K, M, and N materials and in accordance with ASTM D 4253 and D 4254 for Type D, E, F, and J materials. Where agency or utility company requirements govern, the highest compaction standards shall apply.

<u>Location or Use of Fill</u>	<u>Percentage of Maximum Density</u>	<u>Percentage of Relative Density</u>
Pipe zone backfill portion above bedding for flexible pipe.	90	70
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for flexible pipe, including trench plugs.	95	70
Final backfill, beneath paved areas or structures.	95	70
Final backfill, not beneath paved areas or structures.	90	55
Trench zone backfill, not beneath paved areas or structures, including trench plugs.	90	55
Embankments.	90	55
Embankments, beneath paved areas or structures.	95	70
Topsoil (Type K material)	80	N.A.
Aggregate base or subbase (Type G or M material)	95	N.A.

- I. **Trench Backfill Requirements:** The pipe has been structurally designed based upon the trench configuration specified herein.
- J. The CONTRACTOR shall maintain the indicated trench cross section up to a horizontal plane lying 6 inches above the top of the pipe.

- K. If, at any location under said horizontal plane, the CONTRACTOR slopes the trench walls or exceeds the maximum trench widths indicated in the Contract Documents, the pipe zone backfill shall be "improved" or the pipe class increased as specified herein, at no additional cost to the OWNER. "Improved" backfill shall mean sand-cement backfill or other equivalent materials acceptable to the ENGINEER.
- L. If the allowable deflection specified for the pipe is exceeded, the CONTRACTOR shall expose and reround or replace the pipe, repair all damaged lining and coating, and reinstall the pipe zone material and trench backfill as specified at no additional expense to the OWNER.

### 3.11 PIPE AND UTILITY TRENCH BACKFILL

- A. **Pipe Zone Backfill:** The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, i.e., the trench subgrade, and a plane at a point 6 inches above the top surface of the pipe. The bedding for flexible pipe is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The bedding for rigid pipe is defined as that portion of the pipe zone backfill material between the trench subgrade and a level line which varies from the bottom of the pipe to the springline as shown.
- B. Bedding shall be provided for all sewers, drainage pipelines, and other gravity flow pipelines. Unless otherwise specified or shown, for other pipelines the bedding may be omitted if all the following conditions exist.
  - 1. The pipe bears on firm, undisturbed native soil which contains only particles that will pass a one-inch sieve.
  - 2. The trench excavation is not through rock or stones.
  - 3. The trench subgrade soils are classified as suitable fill and backfill materials per Paragraph 2.1.
  - 4. The trench subgrade soils have, as a maximum, a moisture content that allows compaction.
- C. Where bedding is required, after compacting the bedding the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe.
- D. The pipe zone shall be backfilled with the specified backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.
- E. **Trench Zone Backfill:** After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe

and a plane at a point 18 inches below the finished surface grade. If flooding, ponding, or jetting is used the pipe shall be filled with water to prevent flotation.

- F. **Final Backfill:** Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade.

### 3.12 EMBANKMENT CONSTRUCTION

- A. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. All loose or soft existing surface soils beneath planned filled areas shall be thoroughly stripped and excavated prior to placement of fill. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated as necessary, to achieve optimum moisture content,  $\pm 3\%$ . Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density under structures and paved areas, and 90 percent of maximum density elsewhere.
- B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground, as shown on the Plans.
- C. Where embankment fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

- END OF SECTION -

in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any travelled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained.

- D. **Trench Over-Excavation:** Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.
- E. **Over-Excavation:** When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth shown. Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe. All work specified in this Section shall be performed by the CONTRACTOR when the over-excavation ordered by the ENGINEER is less than 6 inches below the limits shown. When the over-excavation ordered by the ENGINEER is 6 inches or greater below the limits shown, additional payment will be made to the CONTRACTOR for that portion of the work which is located below said 6-inch distance. Said additional payment will be made under separate unit price bid items for over-excavation and bedding if such bid items have been established; otherwise payment will be made in accordance with a negotiated price.
- F. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

### 3.3 OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN

- A. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction. Such work shall be performed by the CONTRACTOR at its own expense.

### 3.4 EXCAVATION IN LAWN AREAS

- A. Where excavation occurs in lawn areas, the sod shall be carefully removed, kept damp, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling [and testing of the pipeline], the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

### 3.5 EXCAVATION IN VICINITY OF TREES

- A. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut

without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

### 3.6 ROCK EXCAVATION

- A. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting.
- B. Said rock excavation shall be performed by the CONTRACTOR; provided, that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the contract price will be made under a separate bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price.
- C. **Explosives and Blasting:** Blasting will not be permitted, except by express permission of the ENGINEER on a case-by-case basis. The use of explosives will be subject to the approval and regulations of all agencies having jurisdiction. If blasting is utilized at the site of the WORK, the CONTRACTOR shall take all precautions and provide all protective measures necessary to prevent damage to property and structures or injury to person. Prior to blasting, the CONTRACTOR shall secure all permits required by law for blasting operations and shall provide any additional hazard insurance required by the OWNER. The CONTRACTOR shall have a fully qualified and experienced blasting foreman in charge of all blasting operations.
- D. The CONTRACTOR will be held responsible for all and shall make good any damage caused by blasting or resulting from its possession or use of explosives on the WORK.
- E. All operations involving the handling, storage, and use of explosives shall be conducted in accordance with the requirements of the OSHA Standards for Construction, and in accordance with all local laws and regulations.

### 3.7 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- A. The CONTRACTOR shall remove and dispose of all excess excavated material at a site selected by the CONTRACTOR and reviewed by the ENGINEER.

### 3.8 BACKFILL - GENERAL

- A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed.
- B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

### 3.9 PLACING AND SPREADING OF BACKFILL MATERIALS

- A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.
- B. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.
- C. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.
- D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

### 3.10 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

- A. Each layer of Types A, B, C, G, H, I, and K backfill materials as defined herein, where the material is graded such that at least 10 percent passes a No. 4 sieve, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.
- B. Each layer of Type D, E, F, and J backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.
- C. Type L material requires mechanical spreading and placement to fill voids but does not require mechanical compaction or vibration.
- D. Flooding, ponding, or jetting shall not be used for final backfill materials or aggregate base materials.
- E. Pipe zone backfill materials that are granular, may be compacted by a combination of flooding and vibration using concrete vibrators or by jetting, when acceptable to the ENGINEER.
- F. Pipeline trench zone backfill materials, containing 5 percent or less of material passing a No. 200 sieve, may be compacted using flooding and jetting or vibration if the CONTRACTOR uses effective procedures that yield the specified compaction test results. Flooding and jetting shall not be done in such a manner that the pipe or nearby utilities are damaged, in areas of poorly draining or expansive soils, or where the use of the procedure is prohibited by any agency having jurisdiction over the street or right-of-way. Approved jet pipes or immersible vibrators shall be used so that each backfill layer is saturated and consolidated to its full depth before the next layer is

placed. Jet pipes shall be kept at least 6 inches away from the pipe where the backfill is being consolidated and 2 feet away from other pipes or utilities.

- G. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.
- H. **Compaction Requirements:** The following compaction test requirements shall be in accordance with ASTM D 698 for Type A, B, C, G, H, I, K, M, and N materials and in accordance with ASTM D 4253 and D 4254 for Type D, E, F, and J materials. Where agency or utility company requirements govern, the highest compaction standards shall apply.

<u>Location or Use of Fill</u>	<u>Percentage of Maximum Density</u>	<u>Percentage of Relative Density</u>
Pipe zone backfill portion above bedding for flexible pipe.	90	70
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for flexible pipe, including trench plugs.	95	70
Final backfill, beneath paved areas or structures.	95	70
Final backfill, not beneath paved areas or structures.	90	55
Trench zone backfill, not beneath paved areas or structures, including trench plugs.	90	55
Embankments.	90	55
Embankments, beneath paved areas or structures.	95	70
Topsoil (Type K material)	80	N.A.
Aggregate base or subbase (Type G or M material)	95	N.A.

- I. **Trench Backfill Requirements:** The pipe has been structurally designed based upon the trench configuration specified herein.
- J. The CONTRACTOR shall maintain the indicated trench cross section up to a horizontal plane lying 6 inches above the top of the pipe.

- K. If, at any location under said horizontal plane, the CONTRACTOR slopes the trench walls or exceeds the maximum trench widths indicated in the Contract Documents, the pipe zone backfill shall be "improved" or the pipe class increased as specified herein, at no additional cost to the OWNER. "Improved" backfill shall mean sand-cement backfill or other equivalent materials acceptable to the ENGINEER.
- L. If the allowable deflection specified for the pipe is exceeded, the CONTRACTOR shall expose and reround or replace the pipe, repair all damaged lining and coating, and reinstall the pipe zone material and trench backfill as specified at no additional expense to the OWNER.

### 3.11 PIPE AND UTILITY TRENCH BACKFILL

- A. **Pipe Zone Backfill:** The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, i.e., the trench subgrade, and a plane at a point 6 inches above the top surface of the pipe. The bedding for flexible pipe is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The bedding for rigid pipe is defined as that portion of the pipe zone backfill material between the trench subgrade and a level line which varies from the bottom of the pipe to the springline as shown.
- B. Bedding shall be provided for all sewers, drainage pipelines, and other gravity flow pipelines. Unless otherwise specified or shown, for other pipelines the bedding may be omitted if all the following conditions exist.
  - 1. The pipe bears on firm, undisturbed native soil which contains only particles that will pass a one-inch sieve.
  - 2. The trench excavation is not through rock or stones.
  - 3. The trench subgrade soils are classified as suitable fill and backfill materials per Paragraph 2.1.
  - 4. The trench subgrade soils have, as a maximum, a moisture content that allows compaction.
- C. Where bedding is required, after compacting the bedding the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe.
- D. The pipe zone shall be backfilled with the specified backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.
- E. **Trench Zone Backfill:** After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe

and a plane at a point 18 inches below the finished surface grade. If flooding, ponding, or jetting is used the pipe shall be filled with water to prevent flotation.

- F. **Final Backfill:** Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade.

### 3.12 EMBANKMENT CONSTRUCTION

- A. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. All loose or soft existing surface soils beneath planned filled areas shall be thoroughly stripped and excavated prior to placement of fill. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated as necessary, to achieve optimum moisture content,  $\pm 3\%$ . Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density under structures and paved areas, and 90 percent of maximum density elsewhere.
- B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground, as shown on the Plans.
- C. Where embankment fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

- END OF SECTION -

TABLE 1 Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification		
				Group Symbol	Group Name <sup>B</sup>	
Coarse-Grained Soils More than 50 % retained on No. 200 sieve	Gravels More than 50 % of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5 % fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel <sup>F</sup>	
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel <sup>F</sup>	
		Gravels with Fines More than 12 % fines <sup>C</sup>	Fines classify as ML or MH	GM	Silty gravel <sup>F,G,H</sup>	
		Fines classify as CL or CH	GC	Clayey gravel <sup>F,G,H</sup>		
	Sands 50 % or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5 % fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand	
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand <sup>I</sup>	
Sands with Fines More than 12 % fines <sup>D</sup>		Fines classify as ML or MH	SM	Silty sand <sup>G,H,I</sup>		
	Fines classify as CL or CH	SC	Clayey sand <sup>G,H,I</sup>			
Fine-Grained Soils 50 % or more passes the No. 200 sieve	Sils and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line <sup>J</sup>	CL	Lean clay <sup>K,L,M</sup>	
			PI < 4 or plots below "A" line <sup>J</sup>	ML	Silt <sup>K,L,M</sup>	
		organic	Liquid limit - oven dried Liquid limit - not dried < 0.75	OL	Organic clay <sup>K,L,M,N</sup> Organic silt <sup>K,L,M,O</sup>	
				OH	Fat clay <sup>K,L,M</sup>	
	Sils and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay <sup>K,L,M</sup>	
			PI plots below "A" line	MH	Elastic silt <sup>K,L,M</sup>	
		organic	Liquid limit - oven dried Liquid limit - not dried < 0.75	OH	Organic clay <sup>K,L,M,P</sup> Organic silt <sup>K,L,M,O</sup>	
				PT	Peat	
	Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

<sup>A</sup> Based on the material passing the 3-in. (75-mm) sieve.

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12 % fines require dual symbols:  
GW-GM well-graded gravel with silt  
GW-GC well-graded gravel with clay  
GP-GM poorly graded gravel with silt  
GP-GC poorly graded gravel with clay

<sup>D</sup> Sands with 5 to 12 % fines require dual symbols:  
SW-SM well-graded sand with silt  
SW-SC well-graded sand with clay  
SP-SM poorly graded sand with silt  
SP-SC poorly graded sand with clay

$E \quad Cu = D_{60}/D_{10} \quad \frac{(D_{30})^2}{D_{10} \times D_{60}}$

<sup>F</sup> If soil contains  $\geq 15$  % sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15$  % gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30$  % plus No. 200, predominantly sand, add "sandy" to group name.

<sup>M</sup> If soil contains  $\geq 30$  % plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup> PI  $\geq 4$  and plots on or above "A" line.

<sup>O</sup> PI < 4 or plots below "A" line.

<sup>P</sup> PI plots on or above "A" line.

<sup>Q</sup> PI plots below "A" line.

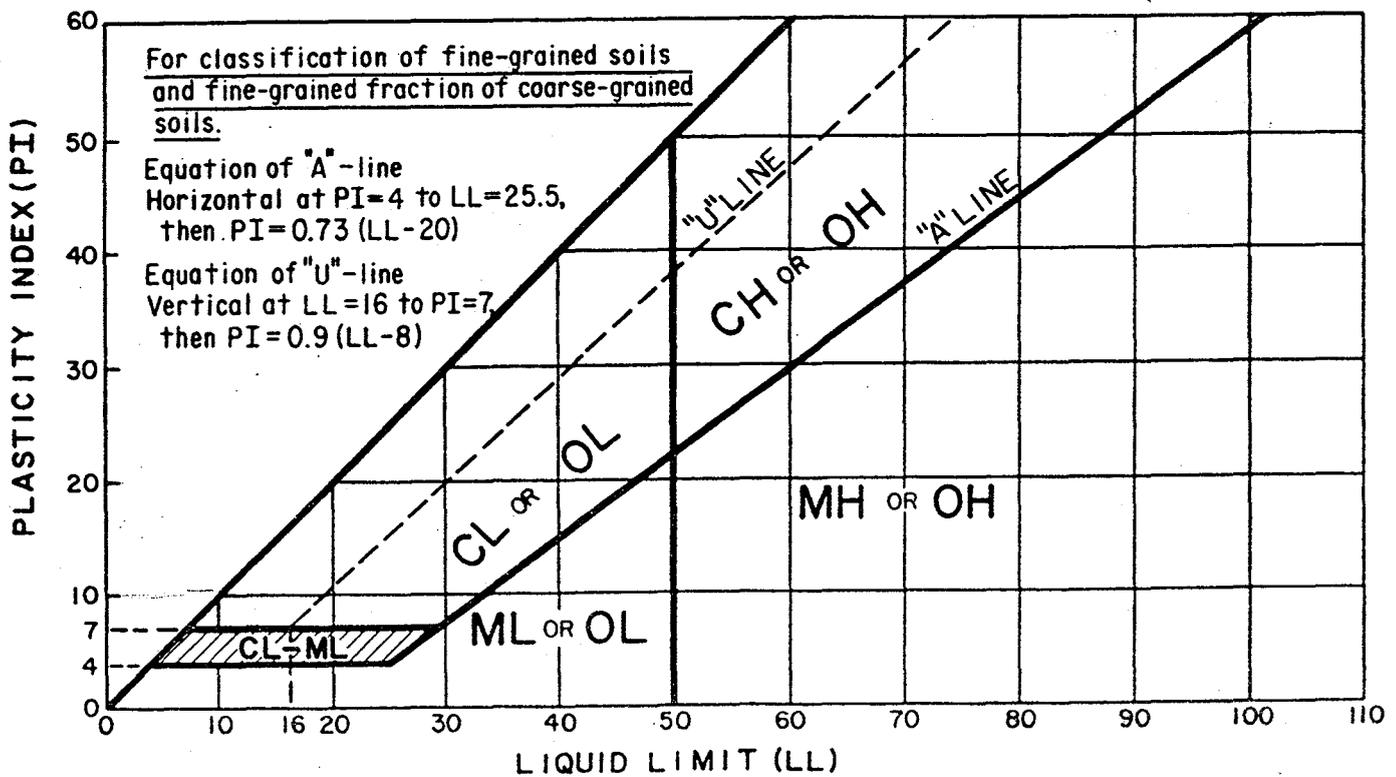


FIG. 3 Plasticity Chart

## SECTION 02210 - SOIL CEMENT EMBANKMENT PROTECTION

### PART 1. -- GENERAL

#### 1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish and install soil cement embankment protection, including excavation and disposal of excess waste material, in accordance with the Contract Documents. The soil cement shall be a mixture of soil, portland cement, and water.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 Contractor Submittals.
- B. Section 02200 Earthwork.

#### 1.3 CONTRACTOR SUBMITTAL

- A. **Mix Design:** Prior to beginning the WORK, the CONTRACTOR shall submit to the ENGINEER, for review, a preliminary soil cement mix design which shall show the proportions and gradations of all materials proposed for each class and type of cement and soil specified herein in accordance with Section 01300, "Contractor Submittals." The mix design shall be checked by an independent testing laboratory acceptable to the ENGINEER. All costs related to such checking shall be borne by the CONTRACTOR.

#### 1.4 QUALITY ASSURANCE

##### A. General

1. The mix design submitted by the CONTRACTOR shall be tested for compressive strength as specified herein. The minimum 7-day compressive strength of the trial mix shall be 125% of the specified compressive strength of the soil cement.
2. The cost of all laboratory tests on soil cement will be borne by the OWNER. However, the CONTRACTOR shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications.
3. Soil cement for testing shall be supplied by the CONTRACTOR at no cost to the OWNER, and the CONTRACTOR shall provide assistance to the ENGINEER in obtaining samples, and disposal and cleanup of excess material.

##### B. Field Compression Tests:

1. Compression test specimens will be taken during construction from the first placement of soil cement and at intervals thereafter as selected by the ENGINEER to insure continued compliance with these specifications. Each set of test specimens will be a minimum of 3 cylinders.

2. Compression test specimens shall be 6-inch diameter by 12-inch high cylinders.
3. Compression tests shall be performed in accordance with ASTM D 1633. Two test cylinders will be tested at 7 days. The remaining cylinder will be held to verify test results, if needed.

**C. Evaluation and Acceptance of Concrete:**

1. All soil cement which fails to meet these specifications, is subject to removal and replacement at the cost of the CONTRACTOR.

**PART 2. -- PRODUCTS**

**2.1 SOIL**

- A. Soil used for soil cement embankment protection shall conform to the following parameters:

1. Gradation:

<u>Sieve Size</u>	<u>Percentage by Weight Passing Screen</u>
6-inch	100
4-inch	70 - 100
No. 4	50 - 100
No. 200	25 (max)

2. Maximum expansive potential: 1.5%
3. Maximum soluble sulfates: 0.10%
4. Plasticity index: <10

**2.2 SOIL CEMENT MIXTURE**

- A. The soil cement mixture shall obtain a 7-day compressive strength of 750 psi.

**PART 3. -- EXECUTION**

**3.1 SOIL CEMENT MIXTURE PREPARATION**

- A. Mixing shall be accomplished by means of multiple-pass soil-cement mixer, single-pass soil-cement mixer, or may be mixed on-site.

**3.2 SOIL CEMENT CONSTRUCTION**

- A. Soil cement shall be placed and compacted in stair-step horizontal layers, 6 inches in thickness. Beginning at the lowest layer of soil-cement, each succeeding layer shall be stepped back at a distance as specified on the Plans.

- B. The exposed face of the soil cement embankment protection shall be trimmed after placement to attain a smooth 2(h):1(v) sideslope. The location of the layers shall be such that the trimmed exposed face is flush with the existing adjacent earthen embankment on either side of the new construction.
- C. Construction methods shall conform to the requirements of Section 311 of the Standard Specifications (MAG).

- END OF SECTION -

## SECTION 02273 - RIPRAP

### PART 1. -- GENERAL

#### 1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish and install riprap, compacted embankment or other fill material, excavation and disposal of excess waste material, in accordance with the requirements of the Contract Documents.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 Contractor Submittals.
- B. Section 02200 Earthwork.

#### 1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

##### A. Commercial Standards:

ASTM C 88	Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
ASTM C 535	Test Method for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
AASHTO T 85	Method of Test for Specific Gravity and Absorption of Coarse Aggregate.
AASHTO T 210	Method of Test for Aggregate Durability Index.

#### 1.4 CONTRACTOR SUBMITTAL

- A. Testing certificates from a qualified testing agency shall be submitted prior to acceptance of the rock source to verify the conformity to the requirements of the Contract Documents. The submittal shall be in conformance with the requirements of Section 01300, "Contractor Submittals."

### PART 2. -- PRODUCT

#### 2.1 STONE FOR RIPRAP

- A. Average rock size shall be 18 inches. The greatest dimension of 50 percent of the riprap stone shall be at least two-thirds but not more than 1-1/2 times the diameter of the average rock size. The stones shall be graded in size to produce a reasonably dense mass. Riprap shall consist of dense, natural rock fragments. Stone shall be resistant to weathering and to water action; free from overburden, spoil, shale and

organic material; and shall meet the gradation requirements specified. Shale and stone with shale seams are not acceptable.

- B. Rock shall consist of durable, sound, hard, angular rock meeting the following requirements for durability absorption ratio, soundness test, and abrasion test:

<u>Durability Absorption Ratio</u>	<u>Acceptability</u>
Greater than 23	Passes
10 to 23	Passes only if Durability Index is 52 or greater
Less than 10	Fails

$$\text{Durability Absorption Ratio} = \frac{\text{Durability Index (Coarse)}}{\% \text{ absorption} + 1}$$

The durability index and percent absorption shall be determined by AASHTO T 210 and AASHTO T 85, respectively. The minimum apparent specific gravity of the stone shall be 2.5 as determined by AASHTO T 85.

- C. Rock riprap shall have less than 10 percent loss of weight after five cycles, when tested per ASTM C 88.
- D. Riprap stone or rock shall have a wear not greater than 40 percent, when tested per ASTM C 535.
- E. Neither the breadth nor thickness of any piece of riprap shall be less than one-third its length. Material shall be of shapes which will form a stable protection structure of required depth as shown. Rounded boulders or cobbles shall not be used.
- F. Rock riprap shall conform to the sizes shown as follows:
1. Type III (18-inch Average Rock Size):

<u>Diameter</u>	<u>Percentage Passing</u>
24-inch	95 - 100
18-inch	25 - 75
12-inch	0 - 5

- G. Control of gradation shall be by visual inspection. The CONTRACTOR shall provide a sample of the specified riprap gradation of at least 5 tons or 10 percent of the total riprap weight, whichever is less. The sample at the construction site may be a part of the finished riprap covering. This sample shall be used as a frequent reference for judging the gradation of riprap supplied. Any difference of opinion between the ENGINEER and the CONTRACTOR shall be resolved by dumping and checking the gradation of two random truckloads of stone. Mechanical equipment, a sorting site,

and labor needed in checking gradation shall be provided by the CONTRACTOR at no additional cost to the OWNER.

- H. The acceptability of the stone shall be determined by the ENGINEER prior to construction.

### **PART 3. -- EXECUTION**

#### **3.1 SURFACE PREPARATION**

- A. Surfaces to receive riprap shall be smooth and firm, free of brush, trees, stumps and other objectionable material, and shall be brought to the line and grade shown.

#### **3.2 PLACEMENT OF RIPRAP**

- A. Placement of riprap shall begin at the toe of the slope and proceed up the slope. The rock may be placed by dumping and may be spread by bulldozers or other suitable equipment as long as the underlying material is not displaced. Rock shall be placed so as to provide a minimum of voids. Smaller stones shall be uniformly distributed throughout the mass. Sufficient hand work shall be done to produce a neat and uniform surface, true to the lines, grades, and sections shown.

- END OF SECTION -

## SECTION 02625 - CORRUGATED METAL PIPE

### PART 1. -- GENERAL

#### 1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish and install corrugated metal pipe and appurtenant work, complete in place, in accordance with the requirements of MAG Specification Sections 621 and 760, except as modified herein.
- B. Corrugated metal pipe shall include round pipe, corrugated steel, without a paved invert, and including fittings, couplings, and related accessories.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02200 Earthwork.

#### 1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

##### A. Commercial Standards:

AASHTO M36	Specification for Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.
AASHTO M190	Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
AASHTO M196	Specification for Corrugated Aluminum Alloy Culverts and Underdrains.
AASHTO M243	Specification for Field-Applied Coating of Corrugated Plate for Pipe, Pipe Arches, and Arches.
AASHTO M246	Specification for Precoated Galvanized Steel Sheet for Culverts and Underdrains.

#### 1.4 CONTRACTOR SUBMITTALS

- A. Shop drawings and catalog data submittals shall be made in accordance with Section 01300, "Contractor Submittals."
- B. A manufacturer's or fabricator's Certificate of Compliance shall be furnished stating that samples representing each lot have been tested and inspected in accordance with the Contract Documents and have been found to meet the requirements for the material described.

## **PART 2. -- PRODUCTS**

### **2.1 CORRUGATED STEEL PIPE, PIPE ARCH, AND UNDERDRAIN**

- A. Corrugated steel pipe, pipe arch, and underdrain and coupling bands and fittings for each type, shall conform to the requirements of AASHTO M36, and shall be fabricated from either zinc-coated steel sheet or aluminum-coated steel sheet, as specified herein.

### **2.2 COUPLING BANDS**

- A. Coupling bands shall be the universal (dimpled) type, in accordance with Section 760 of the Standard Specifications (MAG).

### **2.3 REQUIREMENTS**

- A. Corrugated metal pipe shall meet the following requirements:

- 1. Type of pipe: Circular
- 2. Pipe material: Steel
- 3. If steel, type of coating: Zinc
- 4. Size: 36-inch
- 5. Wall thickness: .064
- 6. Corrugation: Helical
- 7. Corrugation dimension: 2-2/3" x 1/2"

## **PART 3. -- EXECUTION**

### **3.1 INSTALLATION**

- A. Pipeline trench excavation shall be in accordance with the requirements of Section 02200, "Earthwork," including the situation where pipelines are to be installed in embankment or structure fills.
- B. Pipe bedding shall be in accordance with the requirements of Section 02200, "Earthwork," and shall have a thickness of 8 inches under the pipe, unless otherwise shown.
- C. All pipe shall be transported, stored, and handled with care. It shall not be rolled or dragged over gravel or rock, and during placement, shall be prevented from striking rock or other hard objects. Special care shall be taken in handling and placing coated pipe to avoid damaging the coating.

- D. Pipe laying shall begin at the downstream end of the line and proceed upstream. Pipe shall be laid carefully and true to line and grade. Pipe shall be placed with longitudinal seams at the sides and with outside laps of circumferential joints upgrade.
- E. Pipe sections shall be laid in the trench with a maximum spacing between sections of 1-1/2 inches. Connecting bands shall be placed with clamping angles and bolts at top of the pipe. The pipe coupling corrugations or projections shall properly engage the pipe sections before bolts are tightened. Care shall be taken to ensure that dirt or other particles do not get between the outside of the pipe and the coupling. For watertight joints, the band and gasket material shall be placed in accordance with the manufacturer's recommendations.
- F. Any damage to the zinc coating shall be repaired prior to the backfilling around the pipe.
- G. Pipe trench backfill shall be in accordance with the requirements of Section 02200, "Earthwork." Particular care shall be taken to assure that specified compaction is attained under the haunches of the pipe.

- END OF SECTION -

## SECTION 05500 - MISCELLANEOUS METALWORK

### PART 1. -- GENERAL

#### 1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish, fabricate, and install miscellaneous metalwork and appurtenances, complete, in accordance with the requirements of the Contract Documents.

#### 1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. **Codes:** All codes, as referenced herein, are specified in Section 01090, "Reference Standards."

B. **Federal Specifications:**

QQ-F-461 C (1) Floor Plate, Steel, Rolled.

MIL-6-18015 (Ships) Aluminum Planks. (6063-T6)

C. **Commercial Standards:**

Aluminum Assn. AA-M32 C22A41.

AASHTO HS-20 Truck Loading.

AISC Specifications and Commentary

AISI Specifications and Commentary

ASTM A36 Specification for Structural Steel.

ASTM A 48 Specification for Gray Iron Castings.

ASTM A 53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

ASTM A 123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A 125 Specification for Steel Springs, Helical, Heat Treated.

ASTM A 153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM A 307 Specification for Carbon Steel Bolts and Studs, 6,000 psi Tensile.

ASTM A 563	Specification for Carbon and Alloy Steel Nuts.
ASTM A 575	Specifications for Steel Bars, Carbon, Merchant Quality, M-Grades.
ASTM B 98	Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
ASTM B 438	Specification for Sintered Bronze Bearings (Oil-Impregnated).
ANSI/AWS D1.1	Structural Welding Code - Steel.
NFPA 101	Life Safety Code.
NAAMM	Metal Stairs Manual.

### 1.3 CONTRACTOR SUBMITTALS

- A. **Shop Drawings:** Shop drawings of all miscellaneous metalwork shall be submitted to the ENGINEER for review in accordance with Section 01300, "Contractor Submittals."
- B. **Anchors:** Wherever power-driven pins will be utilized for anchorage or support, complete information describing pin capacity, connections, and proposed use locations shall be furnished to the ENGINEER.

## PART 2. -- PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. **Standard:** All structural steel shapes, plates, bars, and their products shall conform to the requirements of ASTM A 36.
- B. **Corrosion Protection:** All miscellaneous steel metalwork shall be hot-dip galvanized after fabrication as specified herein.
- C. **Stainless Steel:** Unless otherwise shown, stainless steel metalwork and bolts shall be of Type 316 stainless steel and shall not be galvanized.

### 2.2 STEEL PIPE HANDRAILS

- A. All steel pipe handrails shall be standard 1-1/2-inch black steel pipe made up by welding and hot-dip galvanized after fabrication.

### 2.3 BOLTS AND ANCHORS

- A. **Standard Service Bolts (Not Buried or Submerged):** Except where otherwise shown or specified, all bolts, anchor bolts, and nuts shall be steel, galvanized after fabrication as specified herein. Threads on galvanized bolts and nuts shall be formed

with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing. Except as otherwise specified herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 307 Grade A or B, or threaded parts of ASTM A 36.

- B. **Buried or Submerged Bolts:** Unless other corrosion-resistant bolts are shown, all bolts, anchor bolts and washers which are buried or submerged shall be of Type 316 stainless steel, with bronze nuts, or cap screws (where screwed into stainless steel), of copper-silicon alloy, conforming to ASTM B 98, alloy C 65100, designation H04, or alloy C 65500, designation H04. Wherever stainless steel bolts and nuts are specified, it shall refer to the above material combination, unless specifically excluded.
- C. **Bolt Requirements:**
  - 1. The bolt and nut material shall be free-cutting steel.
  - 2. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
  - 3. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 1/2-inch beyond the nut.

### PART 3. -- EXECUTION

#### 3.1 FABRICATION AND INSTALLATION REQUIREMENTS

- A. **Fabrication and Erection:** Except as otherwise shown, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

#### 3.2 WELDING

- A. **Method:** All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.
- B. **Quality:** In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS Code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

### 3.3 GALVANIZING

- A. All structural steel plates shapes, bars and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123. Any galvanized part that becomes warped during the galvanizing operation shall be straightened. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153. Field repairs to galvanizing shall be made using "**Galvinox,**" "**Galvo-Weld,**" or equal.

- END OF SECTION -

**APPENDIX**  
**SOILS REPORT**

**GEOTECHNICAL ENGINEERING EXPLORATION**

**NORTH EMBANKMENT EROSION OF  
SKUNK CREEK CHANNELIZATION  
81ST AVENUE,  
SOUTH OF MILWAUKEE AVENUE  
PEORIA, ARIZONA**

**JOB NO. 2122K043**



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TECHNOLOGIES  
INC.**

*The Quality People*

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James M. Montgomery Consulting Engineers, Inc. February 12, 1992  
6245 North 24th Parkway, Suite 208  
Phoenix, Arizona 85016

Attn: Ms. Laurie T. Miller, P.E.  
Senior Engineer

Re: **Geotechnical Engineering Exploration** Job No. 2122K043  
**North Embankment Erosion of**  
**Skunk Creek Channelization**  
**81st Avenue, south of Milwaukee Avenue**  
**Peoria, Arizona**

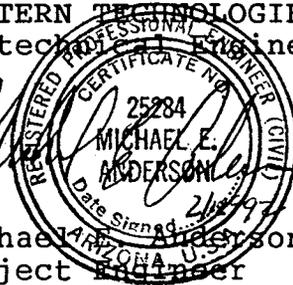
Western Technologies Inc. (WT) has completed the geotechnical engineering exploration for the north embankment erosion of Skunk Creek Channelization located at 81st Avenue, south of Milwaukee Avenue in Peoria, Arizona. This study was requested and authorized by Ms. Laurie T. Miller, P.E., and was performed in general accordance with the Project Contract, Job No. 1391.0120 dated January 22, 1992.

The results of our study, including the boring location diagram, laboratory test results, test boring records, and the geotechnical recommendations needed to aid in the design and construction of the roadway, embankment and other earth connected phases of this project are attached.

We appreciate the opportunity to have provided the geotechnical engineering for this project. We are available for consultation during the various design stages. In order to provide complete professional services, we should perform construction observation and testing.

If you have any questions concerning this report, or require additional consultation, design, observation, or testing services, please contact us. We look forward to working with you on future projects.

Sincerely,  
WESTERN TECHNOLOGIES INC.  
Geotechnical Engineering Services

  
  
Michael E. Anderson, P.E.  
Project Engineer

  
  
Reviewed by: Donald R. Clark, P.E.  
Director

sfp/0734

Copies to: Addressee (2)

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Logs of Borings	Plates 7 & 8
Laboratory Test Data	Plate 9 & 10



Geotechnical Engineering Exploration  
North Embankment Erosion of  
Skunk Creek Channelization  
81st Avenue, south of Milwaukee Avenue  
Peoria, Arizona  
February 12, 1992

INTRODUCTION

This report contains the results of our geotechnical engineering exploration at the north embankment erosion of Skunk Creek Channelization at 81st Avenue, south of Milwaukee Avenue in Peoria, Arizona. The purpose of these services is to provide information and recommendations regarding:

- earthwork and embankment construction;
- slope protection for the repair of the Skunk Creek Channelization embankment;
- pavement section reconstruction for the 81st Avenue cul-de-sac; and,
- drainage.

BACKGROUND INFORMATION

As we understand, distress has occurred within portions of the 81st Avenue cul-de-sac and the adjoining north embankment of the Skunk Creek Channelization. The conditions observed included severe erosion of the north embankment of Skunk Creek, and portions of the 81st Avenue cul-de-sac.

It is our understanding that the cause of the washout was a significant volume of surface water flowing from the north end of 81st Avenue and discharging at the south side of the cul-de-sac. The flood of water apparently transported a trash dumpster to a culvert outlet, which obstructed flow. With a buildup of hydrostatic pressure, the stability of the embankment was



decreased, resulting in erosion of portions of the roadway and embankment. Apparently, grouted riprap had been used for slope protection prior to the erosion of the embankment.

#### INTERPRETATION OF SUBSURFACE CONDITIONS

Exploration: Two exploratory borings were drilled across the project site at the locations shown on the Site Plan, Plate 2. Test Boring No. 1 was drilled in the existing 81st Avenue cul-de-sac to obtain information regarding street reconstruction, and Test Boring No. 2 was drilled within the foundation area of the eroded embankment to obtain information regarding subsurface soil conditions. The borings were drilled to auger refusal encountered at depths of 5-1/2 to 7-1/2 feet below existing ground surface. The test borings were located in the field by pacing from existing physical reference points.

The test borings were advanced with a CME 45 truck-mounted drilling rig utilizing 7-inch outside diameter hollow stem auger drilling techniques. Samples of the subsurface materials encountered in the borings were taken at regular intervals using a multiring or standard split-spoon sampler. In addition, bulk disturbed samples were obtained at selected intervals. Penetration resistance measurements were taken with each sampling by driving the sampler with a 140-pound hammer, falling 30 inches. A record of the number of blows that the sampler was driven at each location is shown on the Logs of Boring in the Appendix to this report. When properly interpreted, the penetration resistance is a useful index to the consistency, hardness or relative density of the materials encountered. All samples retrieved during drilling were sealed and returned to our laboratory for further evaluation and testing.



Stratigraphy: As presented on the Logs of Borings, approximately two inches of asphaltic concrete overlying 6-1/2 inches of aggregate base course was encountered at the ground surface in Test Boring No. 1. Underlying the pavement materials in this boring were sandy clay and sandy gravel which was encountered to the maximum depth of exploration. The sandy clay was stiff to very stiff in relative consistency, and moist. The sandy gravels contained some cobbles, were dense to very dense in relative density, and moist.

Sand with gravel and some cobbles was encountered at the ground surface in Test Boring No. 2. The sandy clay was not encountered in this boring. However, as previously outlined, a majority of the embankment and pavement materials had been eroded from this area. Test Boring No. 2 was drilled approximately 6 feet below the level of the existing pavement. The sand with gravel was medium dense in relative density, and moist to very moist. Underlying this material was sandy gravel with cobbles. The sandy gravel was very dense in relative density, and moist.

Refusal to auger drilling was encountered in both borings at depths of 5-1/2 to 7-1/2 feet below the existing ground surface.

Groundwater: Groundwater was not encountered in any test boring at the time of exploration. These observations represent the groundwater conditions at the time of measurements and may not be indicative of other times. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions.

Logs of Boring containing groundwater observations, penetration resistance data, and descriptions of the subsurface materials encountered, are presented in the Appendix to this report.



**Laboratory Testing:** Upon completion of the field exploration, samples of the subsurface materials were returned to our laboratory for subsequent laboratory testing. The following tests were performed on selected soil samples:

- Water content
- Dry density
- Gradation
- Plasticity

The results of the classification testing performed on samples of the subsurface materials indicated the subgrade soils beneath the existing 81st Avenue cul-de-sac are sandy clays of moderate plasticity overlying sandy gravels. The materials within the foundation area of the eroded embankment consist of gravelly sand and sandy gravel, nil to low in plasticity.

All laboratory tests were performed in general accordance with the applicable ASTM standard or other accepted laboratory practice.

#### CONCLUSIONS AND RECOMMENDATIONS

**General:** The recommendations presented in this report are based on the assumption that the soil conditions do not deviate appreciably from those disclosed by the borings. If variations are encountered during construction, we should be notified for supplemental recommendations.

**Embankment Construction:** Construction of new fill embankments on the site should consist of proper foundation preparation, constructing embankment benching when necessary, disposition of any strippings, and proper fill placement and compaction.



- All loose or soft existing surface soils beneath planned fill areas should be thoroughly stripped and removed prior to fill placement. These materials will be suitable for use as structural fill provided they are clean and free of organic materials. We recommend that this work be performed in accordance with Section 201 of the Maricopa Association of Governments (MAG) Standard Specifications.
- Where fill will be placed against existing slopes exceeding 5:1 (horizontal to vertical), we recommend benching for structural integrity, prior to fill placement. Horizontal benching is recommended, and can be completed during the placement of fill by "keying" into the sides of the existing slopes.
- Fill slopes should be constructed no steeper than 2.5:1 to limit erosion and for slope protection. If existing right-of-ways or property boundaries limit embankment construction resulting in slopes steeper than 2.5:1, adequate slope protection will need to be provided. Details of slope protection are discussed in latter sections of this report.
- After the foundation area has been prepared, the subgrade soils should be scarified to a minimum depth of 6 inches, brought to the proper moisture content and then compacted to a minimum of 95 percent of standard Proctor density as defined by ASTM D698. If soft or unstable soils are encountered, scarifying, drying and/or overexcavation and replacement with granular materials may be required. We recommend that this work be performed in accordance with Section 211 of the MAG specifications.



- The compaction and moisture control of the soils will be dependent upon material types. It is our understanding that embankment construction materials will be imported soils. Specifications for imported soils are outlined in the following section. The loose thickness of each fill layer shall not exceed 8 inches and should be compacted to a uniform density of not less than 90 percent of ASTM D698 standard Proctor, except the upper two feet supporting pavement materials should be compacted to a minimum of 95 percent of ASTM D698 standard Proctor. The embankment soils should be compacted within a moisture content of 3 percent below, to 3 percent above optimum. Compaction should be performed in accordance with Section 211 of the MAG specifications.
  
- Imported soils should closely conform to to the composition of on-site soils, or to the following specifications:

- Gradation (ASTM C136):  
percent finer by weight
  - 6" 100
  - 4" 70-100
  - No. 4 Sieve 50-100
  - No. 200 Sieve 25 (max)
  
- Maximum expansive potential(%)\* 1.5
  
- Maximum soluble sulfates(%) 0.10
  
- Plasticity Index Less than 10

\*Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged.



On-site soils, located within the channel of Skunk Creek, should be suitable for fill placement.

- Particular attention should be paid to compaction of the exterior faces of the slopes (i.e. slopes should be compacted to the minimum specification to the surface of the fill embankment). Alternately, compacted materials can be trimmed, after fill placement, to the final slope configuration.

Slope Protection: It is our understanding that two, and possibly three types of slope protection are being considered to provide long-term stability for the new embankment. These alternatives include grouted riprap, gabions and soil cement. A brief description of these alternatives is outlined below.

- Grouted Riprap: This alternative will involve the placement of stabilizing materials along the slope face upon completion in the construction of the embankment. The stabilizing materials required will include large diameter rock and Type II portland cement grout. Import rock should be obtained from an approved riprap source. Based upon preliminary studies, the nearest source of riprap is a granite pit located approximately 6-1/2 miles north of Bell Road at 67th Avenue.

It is anticipated that specialized equipment (Bull Dozer) will be required to properly place the riprap along the embankment face. In addition, the grout must be placed in a manner to adequately penetrate the interstices of the rock layer in order to reduce or minimize any "piping" effects of the underlying embankment soils.

The design depth and size of material required should be determined when final hydrologic studies have been completed. For preliminary purposes, we anticipate that the completed



thickness of riprap will range between 18 to 36 inches. The grouted riprap should extend to, or below anticipated scour depth in the channel. We recommend grouted riprap sections conform to Section 220 of MAG standard specifications.

- **Gabions:** This alternative involves the placement of 8 to 24 inch diameter rock in wire mesh gabions. The gabions form individual cells or units which will be interconnected to construct one massive structure along the embankment face. The use of this alternative will involve importing suitable rock material. Based upon the type of imported materials specified for embankment construction, a filter fabric will be required in order to minimize any "piping" or erosion of the finer grained materials through the gabion structure.

Specialized equipment will not necessarily be needed for construction, however, hand placement of rock will be required to satisfactorily fill the units to maximize the amount of rock, to prevent bulging of the gabion cells and to provide a level top prior to placement of the next cell. Each cell will also need to be tied into the adjoining cells at all contacting edges.

Gabions should extend to, or below design scour depths in the channel. We recommend that gabion construction conform to Section 913 of the Arizona Department of Transportation (ADOT) Standard Specifications For Road And Bridge Construction.

- **Soil Cement:** This alternative would involve stabilizing the embankment materials utilizing portland cement. Based upon using embankment materials meeting the specification of this report, soil cement stabilization will be suitable for slope protection. We recommend a minimum 2 foot thickness, measured normal to the final slope and that the soil cement mixture obtain a 7-day compressive strength of 750 psi



(pounds per square inch). We estimate that 7 to 10 percent portland cement by dry weight of soil will be required for stabilization measures. This estimate should be used only for budgetary purposes and should be confirmed by further testing and soil cement mix design prior to construction.

The soil-cement should be placed and compacted in stair-step horizontal layers, 6 inches in thickness. This will promote maximum construction efficiency and operational effectiveness. Beginning at the lowest layer of soil-cement, each succeeding layer should be stepped back a distance equal to the product of the compacted layer thickness (in feet) times the embankment slope. For example, if the slope is 2:1 and the compacted thickness is 6 inches, the step-back is 2 times 1/2 or 1 foot. Soil cement construction generally should conform to Section 311 of the MAG specification.

Discussion of Slope Protection Alternatives: All three alternatives should provide adequate slope protection for the embankment. Provisions should be made to extend the slope protection alternatives an adequate distance upstream and downstream of the site, and to tie the new system into existing slope protection. Selection of the final alternative should be based upon economic analysis, future maintenance requirements, construction schedules, and compatibility with previous slope protection.

Use of grouted riprap and gabion structure alternatives will require importing stabilization materials, in addition to import soils for embankment construction. Furthermore, both of these alternatives will either require specialized equipment and/or significant amounts of hand labor. In the case of gabion structures, proper installation of the individual units and cells may be difficult and time consuming as compared to grouted riprap. Furthermore, a filter fabric will need to be placed prior to



construction if the gabions are constructed. Periodic maintenance will be needed to ensure that the structure remains intact. In the case of the riprap alternative, it may be difficult to properly place sufficient grout within the interstices of the riprap to minimize "piping" effects of the embankment soils and therefore some limited periodic maintenance will be required.

Of the three alternatives proposed, soil cement stabilization of the embankment materials appears to be the most feasible. This procedure would eliminate the costs associated with importing large rock, or filter fabric. The specified imported soils for embankment construction would be suitable for use as soil cement.

Pavement Reconstruction Recommendations: Design recommendations for the flexible pavement section for the 81st Avenue cul-de-sac were developed from the results of classification testing and information supplied to us by the City of Peoria. Design recommendations were formulated in accordance with City of Phoenix Standard Detail P-1103 as utilized by the City of Peoria. This detail is used in the design of local commercial and light industrial streets. If this detail is not adequate in determining the pavement thickness, we should be contacted to provide supplemental recommendations.

Classification testing was performed on the subgrade materials beneath the existing pavement. Based upon utilizing a value of 56 for the percent passing the No. 200 sieve, and a value of 12 for the plasticity index, a design pavement section consisting of 2 inches of asphaltic concrete overlying 9 inches of aggregate base course was determined. The existing pavement section consists of approximately 2 inches of asphaltic concrete overlying 6.5 inches of aggregate base course.



However, if imported soils as specified in this report or the on-site sands and sandy gravels are used for subgrade materials, a design pavement section matching the existing section of 2 inches of asphaltic concrete overlying 6.5 inches of aggregate base course is adequate.

Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphaltic concrete. Base course and asphaltic concrete should conform with MAG or City of Peoria specifications.

All subgrade should be scarified, moisture conditioned (if required), and recompacted to a minimum depth of 6 inches prior to the placement of fill and pavement materials. Compaction should be performed at a minimum of 95 percent of ASTM D698 and within a moisture content of 3 percent below to 3 percent above optimum.

The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections. The native clayey subgrade soils will soften and lose stability if subjected to conditions which result in an increase in water content.

Drainage: Positive drainage should be provided during construction and maintained throughout the life of the proposed embankment. An adequate storm sewerline or culvert should be installed to ensure that any surface water flows from 81st Avenue be directed away from the embankment and pavement materials.

#### CLOSURE

In the event that any changes of the proposed project are planned, the conclusions and recommendations contained in this report should be reviewed and the report modified or supplemented as necessary.



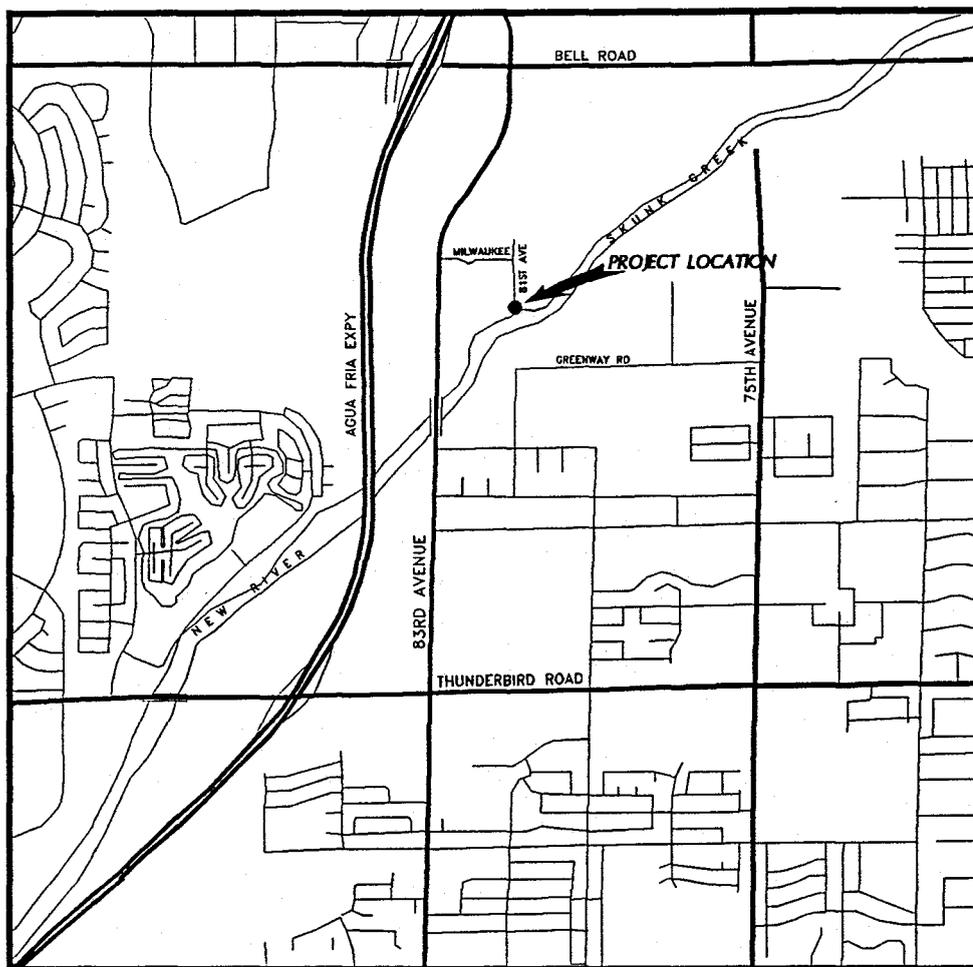
The analyses and recommendations in this report are based in part upon data obtained from the explorations. The nature and extent of variations beyond the explorations may not become evident until construction. If variations then appear evident, it may be necessary to reevaluate the recommendations of this report.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No other warranty, express or implied, is made. We prepared the report as an aid in design of the proposed project. This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific construction techniques to be used on this project.



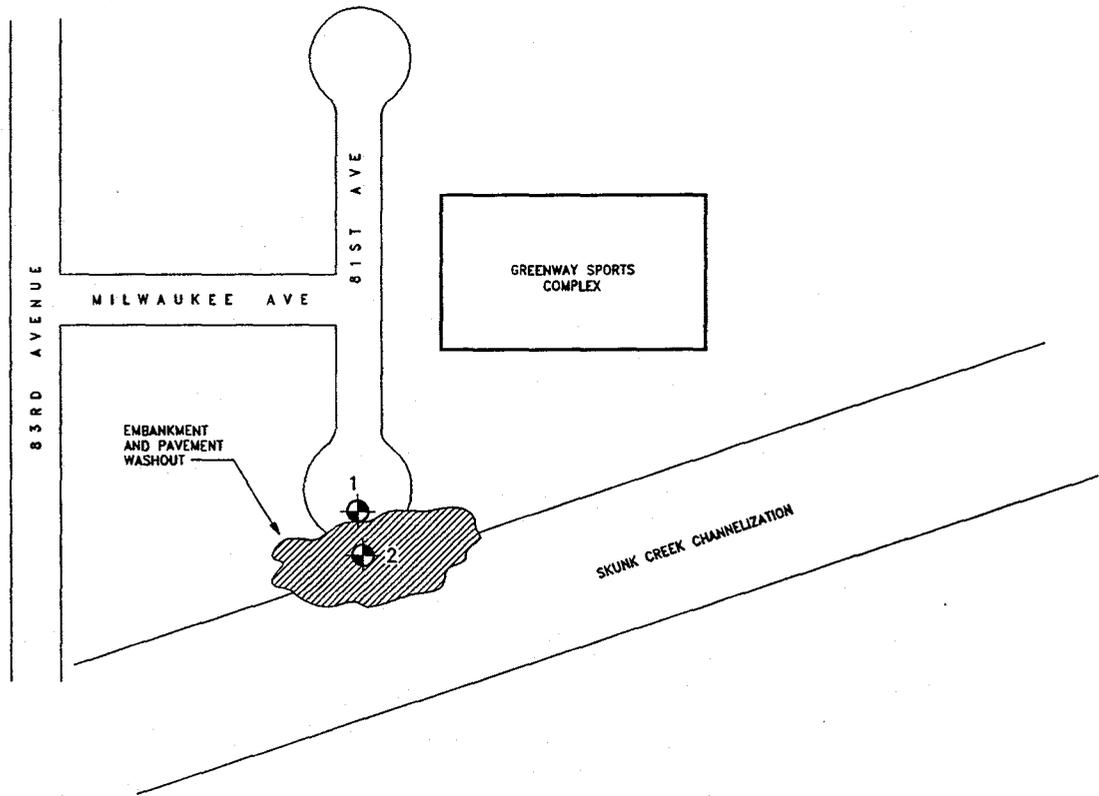
**APPENDIX A**

T3N R1E



NOT TO SCALE

Project: <b>SKUNK CREEK CHANNELIZATION</b>	
Diagram: <b>Vicinity Map</b>	
<b>WESTERN TECHNOLOGIES INC.</b>	
Job No. <b>2122K043</b>	Plate: <b>1</b>



**LEGEND:**  
 TEST BORING LOCATION



NOT TO SCALE

Project: <b>SKUNK CREEK CHANNELIZATION</b>	
Diagram: <b>Site Plan</b>	
<b>WESTERN TECHNOLOGIES INC.</b>	
Job No. 2122K043	Plate: 2

## DEFINITION OF TERMINOLOGY

<b>Allowable Soil Bearing Capacity</b>	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
<b>Allowable Foundation Pressure</b>	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
<b>Backfill</b>	A specified material placed and compacted in a confined area.
<b>Base Course</b>	A layer of specified material placed on a subgrade or subbase.
<b>Base Course Grade</b>	Top of base course.
<b>Bench</b>	A horizontal surface in a sloped deposit.
<b>Caisson</b>	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
<b>Concrete Slabs-on-Grade</b>	A concrete surface layer cast directly upon a base, subbase or subgrade.
<b>Crushed Rock Base Course</b>	A base course composed of crushed rock of a specified gradation.
<b>Differential Settlement</b>	Unequal settlement between or within foundation elements of a structure.
<b>Engineered Fill</b>	Specified material placed and compacted to specified density and/or moisture conditions under observation of a representative of a soil engineer.
<b>Existing Fill</b>	Materials deposited through the action of man prior to exploration of the site.
<b>Existing Grade</b>	The ground surface at the time of field exploration.
<b>Expansive Potential</b>	The potential of a soil to expand (increase in volume) due to absorption of moisture.
<b>Fill</b>	Materials deposited by the actions of man.
<b>Finished Grade</b>	The final grade created as a part of the project.
<b>Gravel Base Course</b>	A base course composed of naturally occurring gravel with a specified gradation.
<b>Heave</b>	Upward movement.
<b>Native Grade</b>	The naturally occurring ground surface.
<b>Native Soil</b>	Naturally occurring on-site soil.
<b>Rock</b>	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
<b>Sand &amp; Gravel Base</b>	A base course of sand and gravel of a specified gradation.
<b>Sand Base Course</b>	A base course composed primarily of sand of a specified gradation.
<b>Scarify</b>	To mechanically loosen soil or break down existing soil structure.
<b>Settlement</b>	Downward movement.
<b>Soil</b>	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
<b>Strip</b>	To remove from present location.
<b>Subbase</b>	A layer of specified material placed to form a layer between the subgrade and base course.
<b>Subbase Grade</b>	Top of subbase.
<b>Subgrade</b>	Prepared native soil surface.

**METHOD OF SOIL CLASSIFICATION  
(ASTM D 2487)**

**COARSE-GRAINED SOILS**

LESS THAN 50% FINES\*

**FINE-GRAINED SOILS**

MORE THAN 50% FINES\*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS	GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size	ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS Liquid limit less than 50
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% FINES		OL	ORGANIC SILTS OR ORGANIC SILTY-CLAYS OF LOW PLASTICITY	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% FINES		SANDS More than half of coarse fraction is smaller than No. 4 sieve size	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 12% FINES	PT		PEAT, MUCK, AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS
SC	CLAYEY SANDS, SAND-CLAY MIXTURES, MORE THAN 12% FINES				

**NOTE:**  
Coarse-grained soils receive dual symbols if they contain 5 to 12% fines (e.g. SW-SM, GP-GC, etc.)

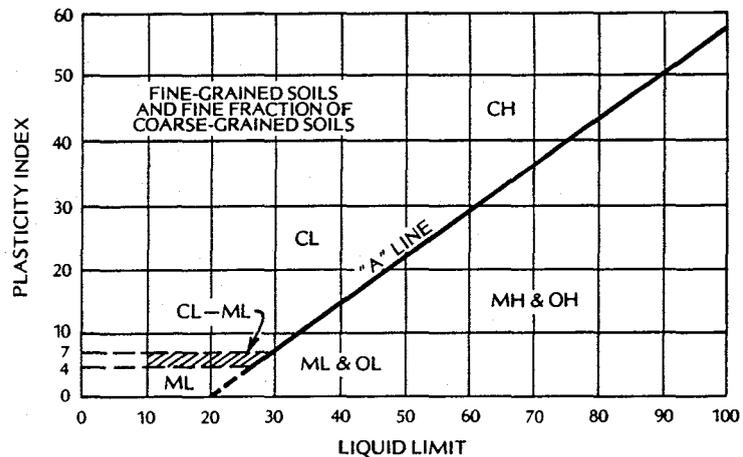
**NOTE:**  
Fine-grained soils receive dual symbols if their limits plot in the hatched zone on the Plasticity Chart (CL-ML)

**SOIL SIZES**

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 in.
COBBLES	3 in. to 12 in.
GRAVEL	No. 4 to 3 in.
Coarse	¾ in. to 3 in.
Fine	No. 4 to ¾ in.
SAND	No. 200 to No. 4
Coarse	No. 10 to No. 4
Medium	No. 40 to No. 10
Fine	No. 200 to No. 40
*FINES (Silt or Clay)	BELOW No. 200

**NOTE:**  
Only sizes smaller than three inches are used to classify soils.

**PLASTICITY CHART**



### BORING LOG NOTES

The number shown in "LOG OF BORING NO." refers to the approximate location of the same number indicated on the "Site Plan" as positioned in the field by pacing from property lines and/or existing features.

"ELEVATION" refers to ground surface elevation at the boring location relative to the indicated "DATUM" established by top of the existing pavement.

"TYPE/SIZE BORING" refers to the exploratory equipment used in the boring wherein HSA = hollow-stem auger.

"N" in "Blows/Foot" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a two-inch-outside-diameter split-barrel sampler a distance of 1 foot, Standard Penetration Test (ASTM D1586). Refusal to penetration is defined as more than 100 blows per foot.

"R" in "Blows/Foot" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a 2.42-inch-inside-diameter ring sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per foot.

"Sample Type" refers to the form of sample recovery, in which N = Split-barrel sample, R = Ring sample, G = Grab sample.

"Dry Density, pcf" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol "NR" indicates that no sample was recovered. The symbol "DU" indicates that determination of dry density was not possible.

"Water Content, %" refers to the laboratory-determined moisture content in percent (ASTM D2216).

"Unified Classification" refers to the soil type as defined by "Method of Soil Classification". The soils were classified visually in the field and, where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

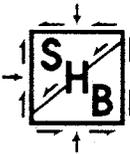
These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and soil characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

James M. Montgomery Consulting Engineers, Inc.  
Job No. 2122K043

**BORING LOG NOTES (Cont'd)**

In general, terms and symbols on the boring logs conform with "Standard Definitions of Terms and Symbols Relating to Soil and Rock Mechanics" (ASTM D653).



**SERGEANT, HAUSKINS & BECKWITH CONSULTING GEOTECHNICAL ENGINEERS**

SOIL & FOUNDATION ENGINEERING • ENGINEERING GEOLOGY • HYDROGEOLOGY  
MATERIALS ENGINEERING • MATERIALS TESTING • ENVIRONMENTAL SERVICES

July 6, 1992

Maricopa County Flood  
Control District  
2801 West Durango Street  
Phoenix, Arizona 85009

SHB Job No. E92-117

Attention: Warren F. Rosenbraugh, P.E.

Re: **Soil Sampling & Testing**  
**Skunk Creek & 83rd Avenue**  
**Maricopa County, Arizona**

FLOOD CONTROL DISTRICT RECEIVED	
JUL 0 9 1992	
CHENG	P & PM
DEF	HYDRO
ADMIN	WATER
FINANCE	FILE
C & O	1 DEF
ENGR	
REMARKS	KAC

Gentlemen:

This letter report is submitted pursuant to your request for a soil sampling and testing of stockpile and bank material located near Skunk Creek and 83rd Avenue. The objective was to excavate six test pits for the purpose of soil sampling and testing to provide information on stockpile materials and proposed bank material for the design and construction of erosion protection for the north bank of Skunk Creek.

It is understood that approximately 4,000 lineal feet of erosion protection is to be constructed along the north bank of Skunk Creek. The construction is to extend upstream from the existing soil-cement section just east of 83rd Avenue to a point east of the Greenway Sports Complex. Soil materials in a stockpile located

REPLY TO: 3232 W. VIRGINIA, PHOENIX, ARIZONA 85009

PHOENIX (602) 272-6848 FAX 272-7239	TUCSON (602) 792-2779 FAX 888-0014	ALBUQUERQUE (505) 884-0950 FAX 884-1694	SALT LAKE CITY (801) 266-0720 FAX 266-0727	EL PASO (915) 542-0046 FAX 542-0078	RENO/SPARKS (702) 331-2375 FAX 331-4153	DENVER/LAKWOOD (303) 763-8432 FAX 763-8012
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west of and adjacent to State Highway 101 and along the north bank of Skunk Creek are being considered for use in the construction.

1. Field Investigation

Six test pits were excavated using a Case 580K backhoe provided by 4-J's Excavating. Three test pits (SP-1, SP-2 and SP-3) were excavated on the stockpile and three (NB-1, NB-2 and NB-3) were excavated along the north bank of Skunk Creek. Test pits in the stockpile were advanced to a depth of 10 feet and representative soil samples were obtained. Test pits along the north bank were excavated along the side of the existing stream bank. The excavations were advanced into the bank until the field engineer could obtain a representative sample from each soil stratum observed.

Materials with particle sizes exceeding 3 inches were placed on plastic sheets for field gradation studies. Engineering technicians determined the amount of material exceeding 3 inches in the field. The remaining material less than 3 inches in diameter was collected and transported to the laboratory for further tests. Our field engineer supervised the excavation of the test pits, logged excavations and collected representative samples. The soils were classified based on field observations and laboratory test results using the Unified Soil Classification System (ASTM D2487).

Results of the field program are attached, which includes a site plan showing test pit locations and logs of the test pits.

Soil Sampling & Testing  
Skunk Creek & 83rd Avenue  
Maricopa County, Arizona  
SHB Job No. E92-117

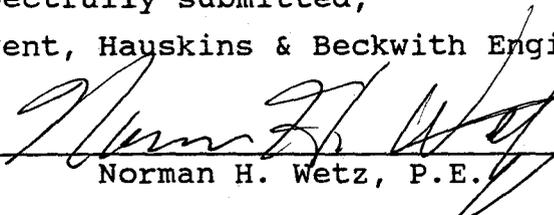
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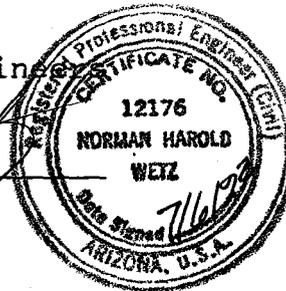
2. Laboratory Tests

Laboratory technicians performed field gradation tests on materials with particle sizes larger than 3 inches, and sieve analyses were performed in our laboratory on materials with particle sizes smaller than 3 inches. Plasticity index and liquid limit tests were also performed on the fine grained portion of the materials. Total grain-size distributions and Atterberg limits for the samples tested are attached.

Should you have any questions pertaining to this letter report, please do not hesitate to contact us.

Respectfully submitted,  
Sergent, Hauskins & Beckwith Engineers

By   
Norman H. Wetz, P.E.



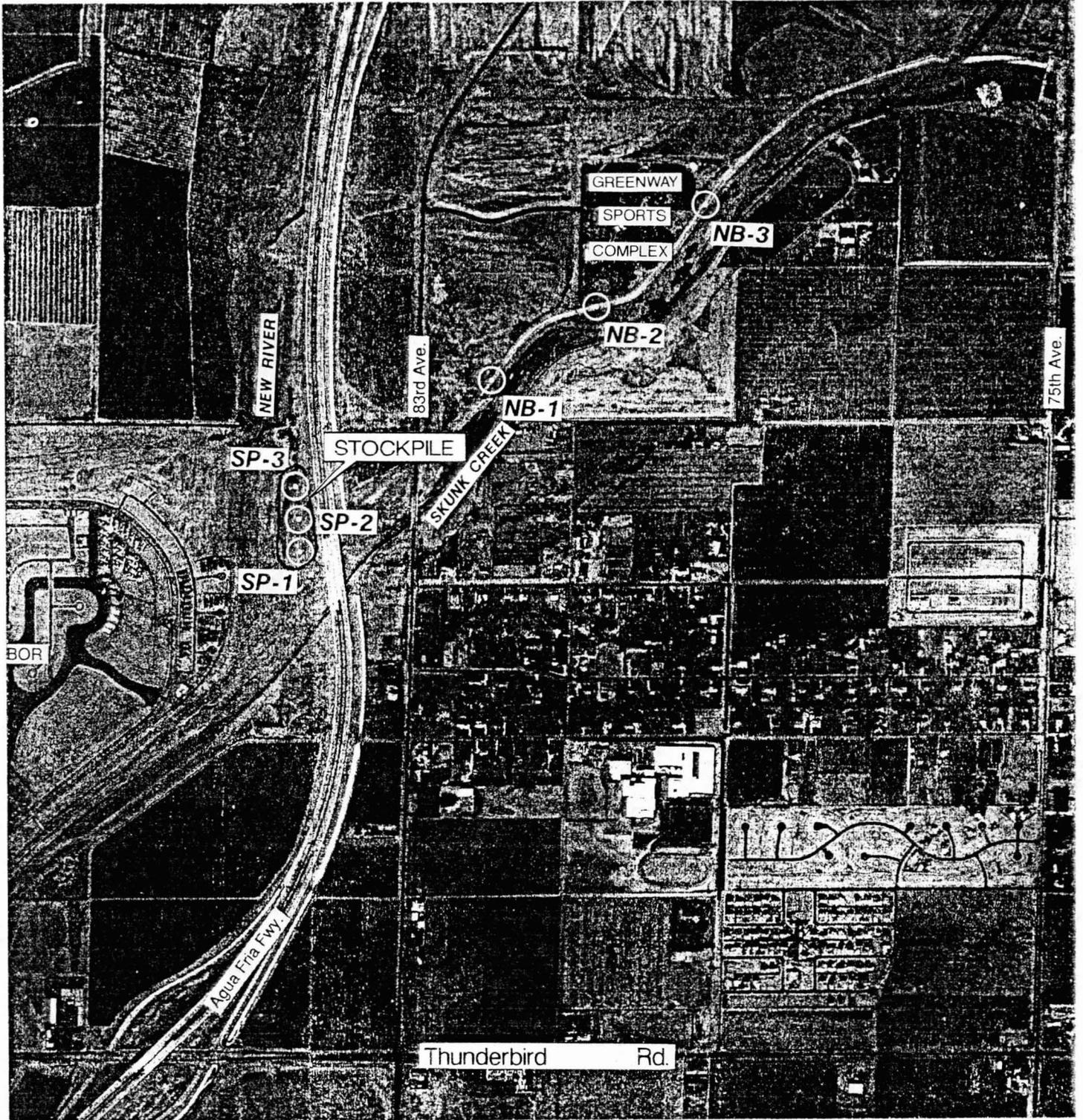
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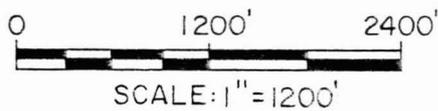


SERGENT, HAUSKINS & BECKWITH

CONSULTING GEOTECHNICAL ENGINEERS  
PHOENIX • TUCSON • ALBUQUERQUE  
DENVER/LAKEWOOD • SALT LAKE CITY • EL PASO • RENO/SPARKS



**SITE PLAN**  
SHOWING LOCATION OF TEST PITS



Soil Sampling & Testing  
Skunk Creek & 83rd Avenue  
Maricopa County, Arizona  
SHB Job No. E92-117



**SERGEANT, HAUSKINS & BECKWITH**

CONSULTING GEOTECHNICAL ENGINEERS  
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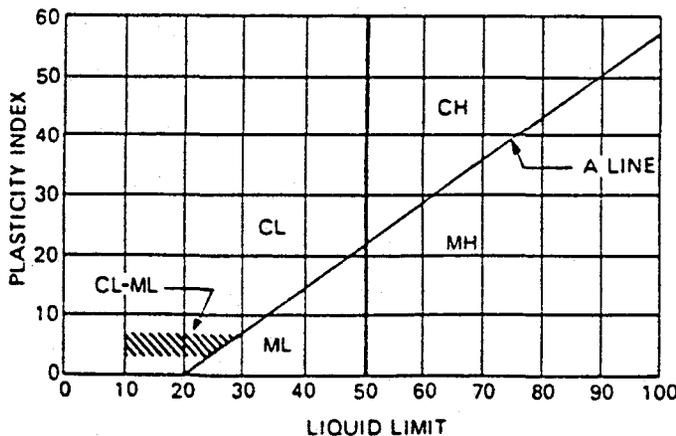
## UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS		GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)	GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		Limits plot below "A" line & hatched zone on plasticity chart	GM	Silty gravels, gravel-sand-silt mixtures.
		Limits plot above "A" line & hatched zone on plasticity chart	GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)	SW	Well graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	SP	Poorly graded sands, gravelly sands.
		Limits plot below "A" line & hatched zone on plasticity chart	SM	Silty sands, sand-silt mixtures.
		Limits plot above "A" line & hatched zone on plasticity chart	SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)	ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)	MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)	CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

**NOTE:** Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve





PROJECT Skunk Creek Soil Sampling & Testing

LOG OF TEST PIT NO. SP-2

JOB NO. E92-117 DATE 6-15-92

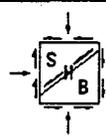
BACKHOE TYPE CASE 580K

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

LOCATION \_\_\_\_\_  
 ELEVATION \_\_\_\_\_  
 DATUM \_\_\_\_\_

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent of Dry weight	Unified Soil Classification	GROUNDWATER		REMARKS	VISUAL CLASSIFICATION	
						DEPTH	HOUR			
0								slightly moist	CLAYEY SAND & GRAVEL, some to considerable cobbles, medium to coarse grained, subrounded cobbles, low to medium plasticity, light brown	
5					GC					
10			D							
15										
20										
25										
									Stopped Backhoe at 10'	

SAMPLE TYPE  
 B - Undisturbed Block Sample.  
 D - Disturbed Bulk Sample.  
 J - Jar Sample



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PROJECT Skunk Creek Soil Sampling & Testing

LOG OF TEST PIT NO. NB-1

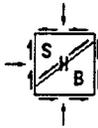
JOB NO. E92-117 DATE 6-15-92

BACKHOE TYPE CASE 580K  
 LOCATION \_\_\_\_\_  
 ELEVATION \_\_\_\_\_  
 DATUM \_\_\_\_\_

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	<b>SILTY SAND</b> , considerable gravel, trace of cobbles, subangular, nonplastic to low plasticity, light brown
					SM		
5			D				
					GW	slightly moist	<b>SANDY GRAVEL</b> , some cobbles, well graded, subangular, nonplastic, brown
			D		SP	slightly moist	<b>GRAVELLY SAND</b> , trace of cobbles, poorly graded, medium to coarse grained, nonplastic, light brown
10					GP	slightly moist	<b>SAND &amp; GRAVEL</b> , trace of to some cobbles, trace of silt, medium to coarse grained, subangular to subrounded, low plasticity, light brown
			D				
15							Stopped Backhoe at 15'
20							
25							

**SAMPLE TYPE**  
 B - Undisturbed Block Sample.  
 D - Disturbed Bulk Sample.  
 J - Jar Sample



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PROJECT Skunk Creek Soil Sampling & Testing

LOG OF TEST PIT NO. NB-2

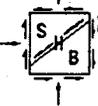
JOB NO. E92-117 DATE 6-15-92

BACKHOE TYPE CASE 580K  
 LOCATION \_\_\_\_\_  
 ELEVATION \_\_\_\_\_  
 DATUM \_\_\_\_\_

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content of Dry Weight	Unified Soil Classification	REMARKS		VISUAL CLASSIFICATION	
0					CL	slightly moist		<b>SILTY CLAY</b> , trace of gravel, trace of coarse grained sand, strongly lime cemented, medium plasticity, brown	
5		D	D		SP	slightly moist		<b>SAND</b> , some gravel, medium to coarse grained, brown note: some lenses of coarse grained gravel	
10		D	D		ML	slightly moist		<b>SANDY SILT</b> , some clay, weakly to moderately lime cemented, low plasticity, brown	
10		D	D		SP	slightly moist			
10					GP-GM	slightly moist		<b>SAND</b> , trace of gravel, poorly graded, medium grained, low plasticity, brown	
15		D	D			slightly moist		<b>SAND &amp; GRAVEL</b> , considerable cobbles, trace of silt & clay, poorly graded, subrounded to subangular, medium plasticity, light brown	
15								Stopped Backhoe at 15'	
20									
25									

SAMPLE TYPE  
 B - Undisturbed Block Sample.  
 D - Disturbed Bulk Sample.  
 J - Jar Sample


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PROJECT Skunk Creek Soil Sampling & Testing

LOG OF TEST PIT NO. NB-3

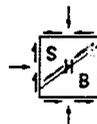
JOB NO. E92-117 DATE 6-15-92

BACKHOE TYPE CASE 580K  
 LOCATION \_\_\_\_\_  
 ELEVATION \_\_\_\_\_  
 DATUM \_\_\_\_\_

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	CLAYEY SILT, trace of sand, moderately lime cemented, low plasticity, light brown
		D			ML		
5							
		D			SP	slightly moist	SAND, trace of cobbles, trace of gravel, subrounded, medium to coarse grained, poorly graded, light brown
10							
		D			GP-GC	slightly moist	SAND & GRAVEL, considerable cobbles, trace of clay, subrounded to subangular, poorly graded, medium plasticity, dark brown
15							
		D					
20							Stopped Backhoe at 18'
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
  - D - Disturbed Bulk Sample.
  - J - Jar Sample



**SERGEANT, HAUSKINS & BECKWITH**

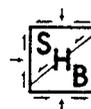
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**SOIL SAMPLING & TESTING**  
**SKUNK CREEK & 83RD AVENUE**  
**SHB JOB NO. E92-17**

**Sieve Analysis Accum. % Passing**

Test Pit Number and Depth							
Sieve Size	SP-1 e 9'	SP-2 e 7'	SP-3 e 9'	NB-1 e 4'	NB-1 e 12'	NB-2 e 12'	NB-3 e 17'
12"	100	100	100	100	100	100	100
9"	100	100	97	100	100	100	100
7"	99	98	96	100	100	100	100
5"	97	95	96	97	97	95	98
3"	88	87	91	90	86	80	82
2"	78	79	85	85	73	74	73
1"	67	70	75	77	54	61	58
3/4"	63	66	72	74	49	56	53
1/2"	58	62	67	71	43	50	46
#4	51	52	53	66	34	40	38
#10	43	45	50	60	28	33	31
#30	26	31	31	45	21	18	16
#40	21	26	25	39	9	14	13
#50	18	23	20	32	6	12	11
#100	13	18	14	24	4	10	8
#200	11	15	11	18	3	9	6
PI	11	15	2	2	4	20	26
LL	28	37	21	21	25	52	50
USC*	SP-SC	SC	SW-SM	SM	GP	GW-GM	GP-GC

\* Unified Soil Classification  
 Classification based on material finer than 3" per ASTM D2487



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DATE DRILLED: 01-24-1992

BORING NUMBER: 2

LOCATION: 81st Avenue And Skunk Creek

ELEVATION: - 6.0 Feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH	USCS	GRAPHIC	SOIL DESCRIPTION
		G				SP-SM		SAND; with gravel, some cobbles, dark brown, medium dense, moist to very moist
	DU	N		20				
		N		16				very moist, wet in some zones
					5			
						GP		SANDY GRAVEL; some cobbles, brown, very dense, moist, difficult drilling
								Auger Refusal At 7.5 Feet
					10			

SPT - STANDARD PENETRATION TEST    S - SHELBY TUBE  
 R - RING SAMPLE (2.42 in. I.D.)  
 C - DYNAMIC CONEHEAD                    DRIVING WEIGHT: 140 LBS  
 B - BAG    G - GRAB    N - SPLIT SPOON SAMPLER

NOTES:  
 Datum - Top of pavement 0.0 feet

<b>SKUNK CREEK CHANNELIZATION</b>	
<b>Boring Log</b>	
<b>WESTERN TECHNOLOGIES INC.</b>	
Job No: 2122K043	Plate: 8

Type of Material SANDY CLAY Job No. 2122K043  
 Source of Material Boring No. 1 (0-2 feet) Lab/Inv. No. \_\_\_\_\_  
 Test Procedure ASTM D422 Tested/Calc. By D. George Date 2-3-92  
 Reviewed By M. Anderson Date 2-6-92

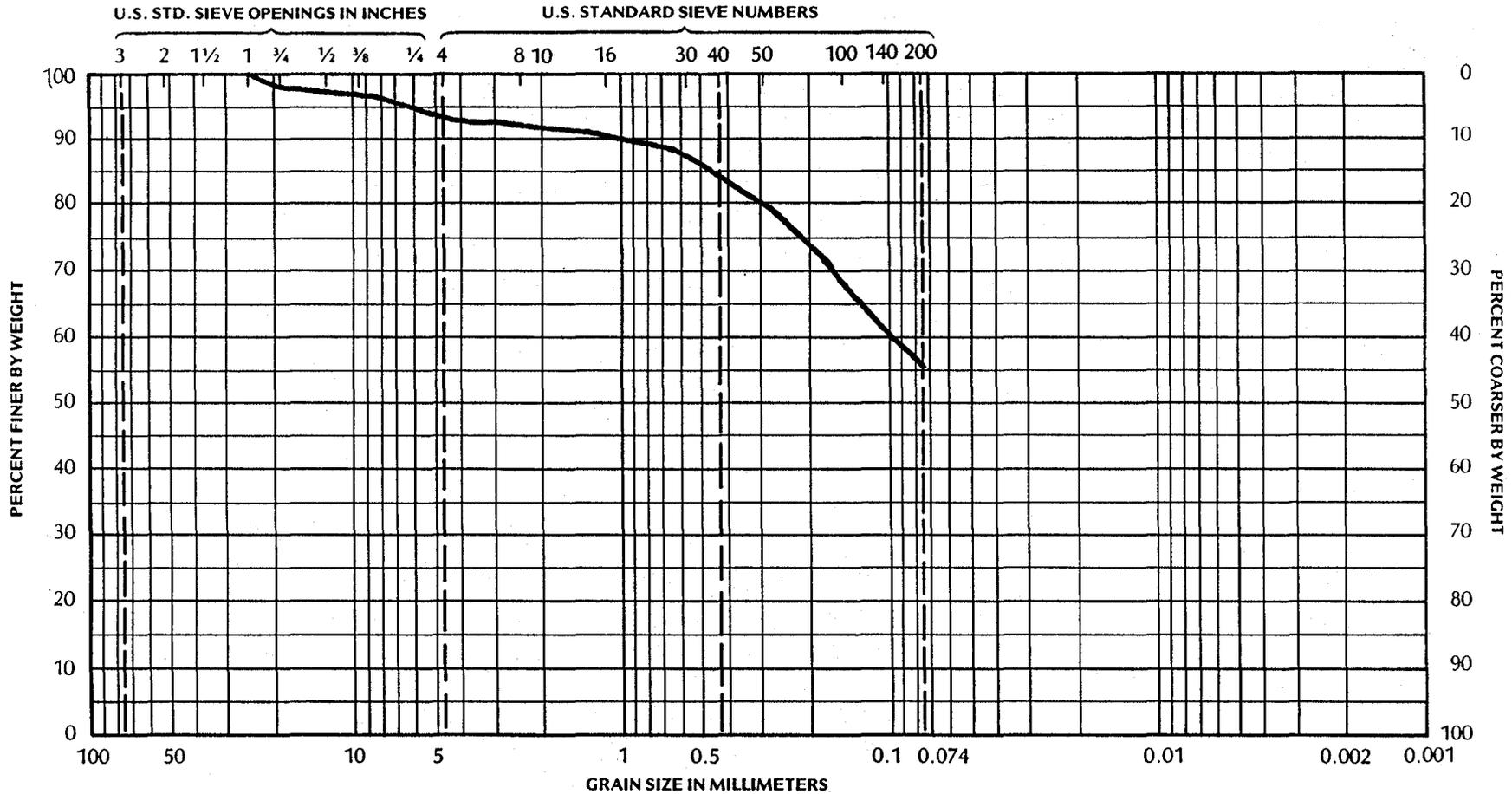


Plate 9

PARTICLE SIZE DISTRIBUTION CHART

Unified	Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt or Clay	
AASHTO	Gravel	Coarse Sand	Coarse Sand	Fine Sand	Silt	Clay

Particle Size, Percent Passing										Atterberg Limits						
2"	100	1"	100	½"	96	#10	92	#30	87	#100	67	0.05 mm	Liquid Limit	27	P.I.	12
1½"	100	¾"	97	#4	94	#16	90	#50	80	#200	56	0.002 mm	Plastic Limit	15	Sp. Gr.	

Type of Material SAND; with gravel, some cobble Job No. 2122K043  
 Source of Material Boring No. 2 (0-2 feet) Lab/Inv. No. \_\_\_\_\_  
 Test Procedure ASTM D422 Tested/Calc. By D. George Date 2-3-92  
 Reviewed By M. Anderson Date 2-6-92

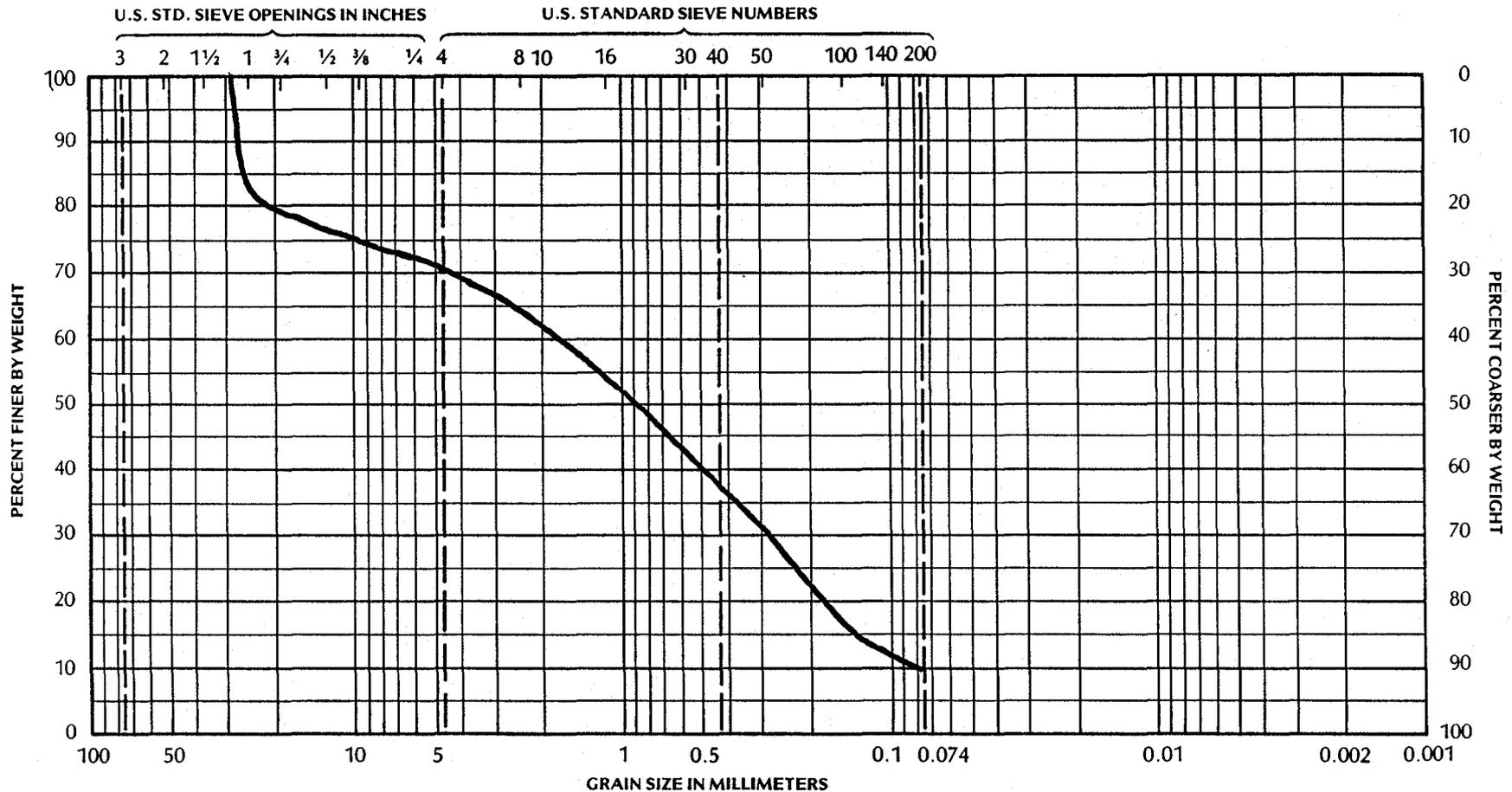
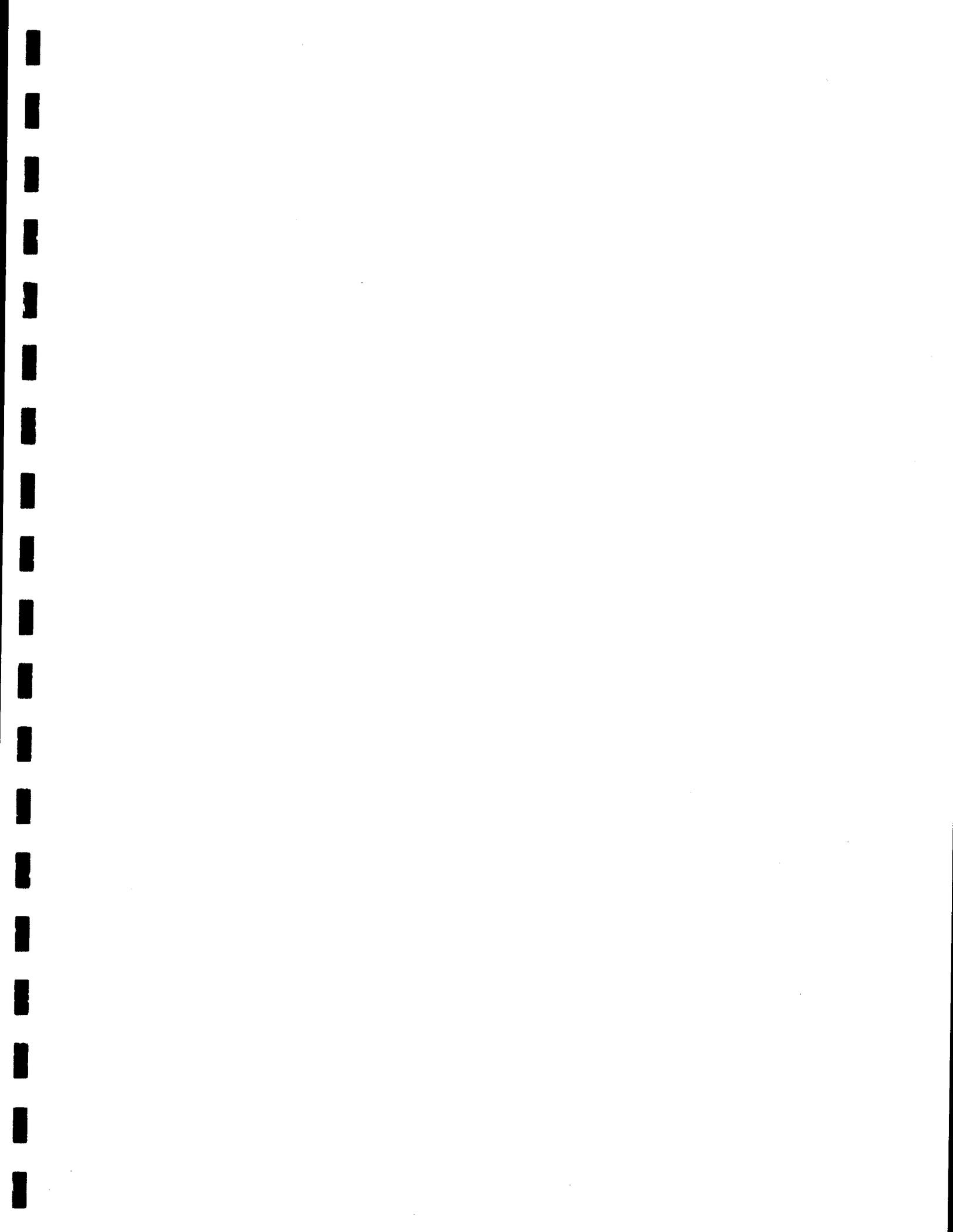


Plate 10

PARTICLE SIZE DISTRIBUTION CHART

Unified	Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt or Clay	
AASHTO	Gravel	Coarse Sand	Coarse Sand	Fine Sand	Silt	Clay

Particle Size, Percent Passing											Atterberg Limits					
2"	100	1"	81	½"	77	#10	62	#30	43	#100	15	0.05 mm	Liquid Limit	NV	P.I.	--
1½"	100	¾"	79	#4	70	#16	54	#50	30	#200	10	0.002 mm	Plastic Limit	NP	Sp. Gr.	



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
INTEROFFICE MEMORANDUM

**SUBJECT:** 83RD. AVE WETLANDS

**DATE:** FEBRUARY 10, 1993

**TO:** ROGER MILLER

**VIA:** ED RALEIGH

**FROM:** RAJ SHAH

I have reviewed the memo dated December 18, 1992 from the Wetlands Taskforce to Mr. Park. As I understand, the purpose of the dike is to prevent debris from entering into the "wildlife areas" and to provide water to the wetlands during dry seasons.

From our calculations, the general scour depth for the 100-year flood event is approximately 9' around that vicinity. The toe-down of the dike should be below the scour depth. The provided cross-section shows grouted riprap dike, but our opinion is to use gabion baskets or loose riprap as the dike. The dike will not stop debris from entering into the "wildlife areas" during the higher flooding stage. Regular maintenance would be required in order to maintain the entrance of the low flow channel or mouth of the wetland clear of debris or sediment. Also, have to make sure that the low flow channel leading to the wetlands is not meandered during the dry season.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SUBJECT: 83RD AVE. WETLANDS

TO: DON PARK  
VIA: BOB PANASEWICZ  
CATESBY MOORE

FROM: WETLANDS TASKFORCE

DATE: 18 DEC 1992

A recent visit to the Wetlands at 83rd Ave. revealed that the low flows from the ACDC and Skunk Creek Wash are not entering the wetlands. The annual storm events have washed many tons of sediment and vegetative debris into this area causing the mouth of the wetlands to be blocked. The low flow channel should be reestablished to maintain the wetlands ecosystem. The wetlands taskforce has formulated a 4 point plan to restore the wetlands to its intended purpose.

**1. CLEAN-UP DEBRIS AND REMOVE SEDIMENTS**

This can be accomplished by using Aspen crews to hand clear dead vegetation; broken or downed tree limbs; debris that has been washed into area and any other material that may be considered trash; clearing and grubbing of unwanted vegetation such as salt cedar (anticipate 2 aspen crews 1.5 weeks). These obstructions could impede large flows creating sufficient force on the wetlands to uproot trees and cause damage to other structures. Sediments should be excavated from mouth of the wetlands and around its perimeter. This will help maintain the correct flow path of the water (we anticipate that approximately 250 cubic yards to be removed).

**2. REESTABLISHING PONDS AND LOW FLOW IN WETLANDS**

This can be accomplished by using a trackhoe and backhoe to excavate silt build up in 2 existing ponds: the sediment pond and wetland pond; and low flow channels. Care should be taken to avoid damaging surrounding vegetation. Next, an intermediate pond should be constructed to maintain a water source for vegetation and wildlife, this will also create a secondary sediment trap. Location of pond will be determined before construction begins. Ponds should be excavated to 4' and low flow channels to 3' depth.

**3. CONSTRUCTION OF ARMORED DIKES**

Construct two armored dikes of rip rap and cement grout. Dike dimensions should be, 8' X 50' X 6' with a 4' apron to prevent scouring (see attachment). Dikes should be placed at a 45 degree angle to the mouth of the wetlands, 3' to 4' will be below invert elevation. This will prevent sediment buildup and debris from entering the wetlands and causing impedance during minor storm events. The dikes will also serve as a flow metering device, controlling the amount and the speed of the water that enters the wetlands. (The placement of these dikes will not create any more impedance than the wetlands itself.)

**4. ANNUAL MAINTENANCE**

Annual maintenance should be scheduled in the dry seasons, May or Sept. Annual maintenance will consist of clearing and grubbing of unwanted plants and debris; making sure that all low flow channels are free flowing. This area should also be checked after large storm events for damage.

This plan can be accomplished with joint cooperation of the wetlands taskforce and C&O. The taskforce would be more than happy to help supervise this operation to its completion. Please contact Roger Miller for further information.

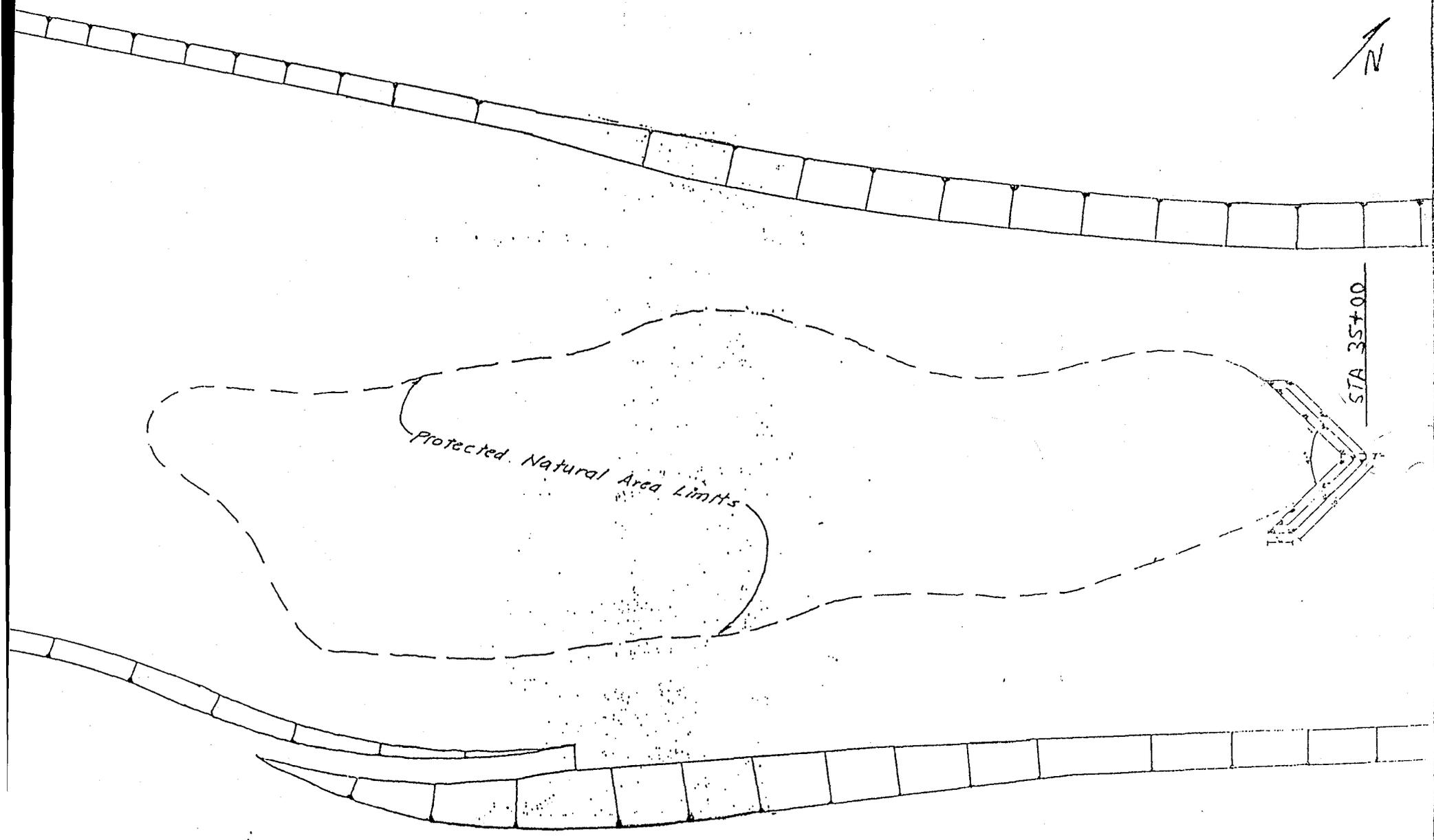
*For Questions -> Tue*

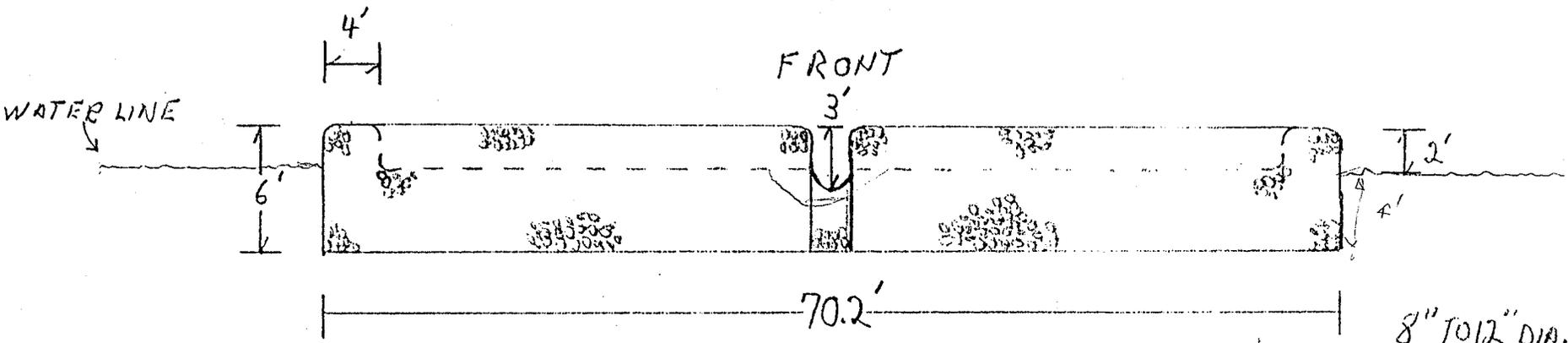
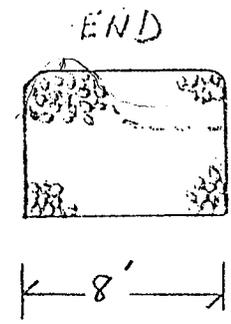
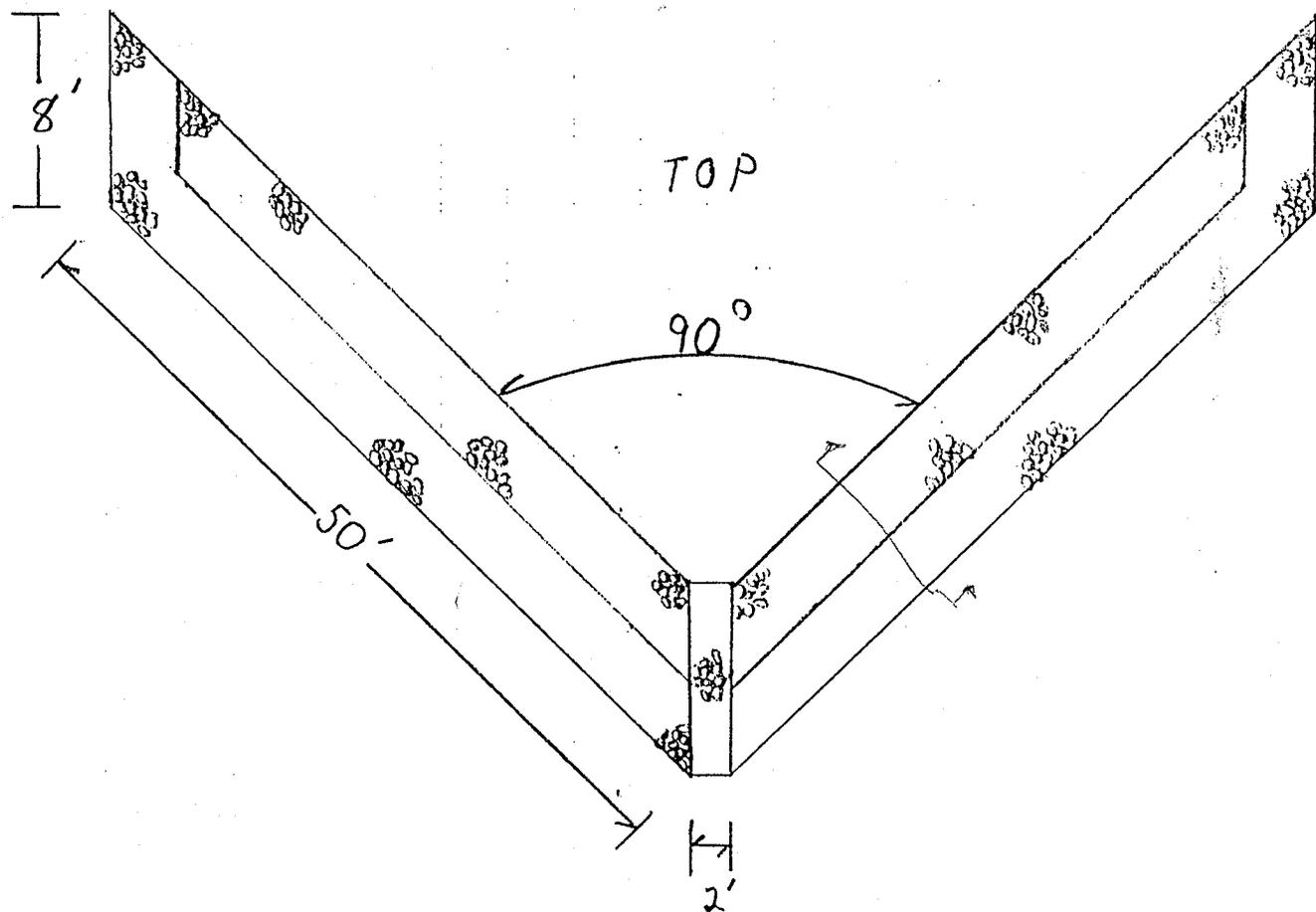
83 RD. AVE. WETLANDS



STA 35+00

*Protected Natural Area Limits*





8" TO 12" DIA. RIPRAP  
 134 CU YD.  
 188 TONS  
 41 CU YD GROUT

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Interoffice Memorandum

Subject: Skunk Creek  
83<sup>rd</sup> Ave Wetlands  
Proposed Rip-Rap Dike

File:

To: RLMiller  
Via: ~~PACatza~~ *PRC*

From: CWRegester *CWR*

Date: 1/8/92

I have run the HEC-2 model with the proposed rip-rap dike inserted above the Habitat Mitigation Area identified on the Skunk Creek Floodplain Delineation Maps. The Q used in the model was the SPF storm of 55,000 CFS. Results of the modeling showed a maximum increase in the water surface elevation of 0.17 FT at approximately 135 FT upstream of the proposed dike. Velocities changed less than 0.5 FPS. Increases in the water surface elevation are all contained within the channel. With depths of 15 to 16 FT, this 0.17 FT increase is insignificant. Therefore, from a floodplain management standpoint, we have no objection to the proposed dike.

I am, however, concerned with the potential for scouring during low flow events and, therefore, recommend that Engineering be given the opportunity to review and comment on the plans.

SKUNKWET.OUT

WITH DIKE ADDED TO X-SECTION 37.00

SPF EVENT

SPF SCSPP  
SUMMARY PRINTOUT TABLE 150

.01K	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	
7390.53	15.250	.00	.00	.00	1155.00	55000.00	1167.13	1166.31	1171.61	55.38	16.98	3239.30
10017.47	17.000	175.00	.00	.00	1155.30	55000.00	1169.70	1166.47	1172.74	30.14	13.99	3930.70
10491.92	19.000	200.00	1188.00	1179.50	1155.70	55000.00	1170.51	.00	1173.35	27.48	13.52	4066.88
13455.37	20.850	185.00	.00	.00	1155.90	55000.00	1171.86	1166.19	1173.83	16.71	11.26	4883.21
14007.59	22.000	115.00	.00	.00	1156.10	55000.00	1172.21	1166.27	1174.03	15.42	10.83	5077.02
13058.42	23.900	190.00	.00	.00	1156.50	55000.00	1172.34	1166.90	1174.42	17.74	11.57	4754.88
12902.97	24.890	94.00	.00	.00	1156.80	55000.00	1172.48	1167.14	1174.60	18.17	11.68	4708.48
* 6435.00	24.900	6.00	.00	.00	1162.80	55000.00	1172.90	1172.90	1177.84	73.05	17.83	3084.51
8172.37	25.400	50.00	.00	.00	1162.90	55000.00	1174.67	1173.01	1178.26	45.29	15.20	3618.42
9236.81	26.700	130.00	.00	.00	1163.20	55000.00	1175.76	1173.32	1178.91	35.46	14.24	3861.12
8753.26	27.800	110.00	1185.50	1177.50	1163.50	55000.00	1176.47	.00	1180.09	39.48	15.26	3605.06
11710.69	29.600	180.00	.00	.00	1163.90	55000.00	1178.39	1174.00	1180.74	22.06	12.28	4479.85
* 7880.30	30.000	40.00	.00	.00	1164.00	55000.00	1178.77	1174.04	1180.90	48.71	11.73	4689.19
10822.04	31.750	175.00	.00	.00	1163.40	55000.00	1180.49	1173.65	1181.69	25.83	8.80	6253.29
9012.39	33.000	125.00	.00	.00	1164.10	55000.00	1180.61	1175.02	1182.25	37.24	10.28	5351.11
7905.25	35.000	200.00	.00	.00	1165.90	55000.00	1181.18	1176.36	1183.29	48.41	11.65	4722.01
8437.90	37.000	200.00	.00	.00	1166.90	55000.00	1181.74	1178.04	1184.43	42.49	13.16	4180.21
10865.26	38.320	132.00	.00	.00	1167.50	55000.00	1182.22	1178.41	1184.86	25.62	13.05	4215.87
11842.52	40.050	173.00	.00	.00	1166.50	55000.00	1182.93	1178.16	1185.29	21.57	12.34	4457.97
12036.44	43.000	295.00	.00	.00	1166.70	55000.00	1183.64	1178.58	1185.93	20.88	12.15	4528.52
11815.12	46.920	392.00	.00	.00	1167.60	55000.00	1184.32	1179.56	1186.82	21.67	12.70	4329.49
12808.07	50.900	398.00	.00	.00	1168.00	55000.00	1185.42	1179.94	1187.65	18.44	11.97	4593.42
12837.85	55.000	410.00	.00	.00	1169.00	55000.00	1186.18	1180.57	1188.40	18.35	11.96	4598.69
13206.09	60.000	500.00	.00	.00	1169.70	55000.00	1187.17	1181.42	1189.30	17.35	11.71	4695.93

depth

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PAGE 17

.01K	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA
12096.13	64.000	400.00	.00	.00	1170.50	55000.00	1187.69	1182.55	1190.16	20.67	12.61	4361.69
12862.22	65.450	145.00	.00	.00	1171.00	55000.00	1188.29	1182.84	1190.47	18.28	11.84	4643.45
13712.57	66.900	145.00	.00	.00	1171.20	55000.00	1188.72	1182.60	1190.73	16.09	11.40	4823.24
13349.40	67.900	100.00	.00	.00	1171.30	55000.00	1188.81	1182.96	1190.93	16.97	11.67	4712.25
13342.23	68.690	73.00	.00	.00	1171.40	55000.00	1188.92	1183.00	1191.06	16.99	11.74	4684.80
* 6498.40	68.700	7.00	.00	.00	1178.40	55000.00	1189.17	1189.17	1194.28	71.63	18.14	3032.42
7753.02	69.100	40.00	.00	.00	1178.50	55000.00	1190.50	1189.33	1194.62	50.32	16.29	3376.96

SCSPF. OUT  
 EXISTING CONDITIONS  
 SPF EVENT

94.00	24.890	55000.00	1172.48	1167.14	15.68	1156.80	4708.48	1174.60	11.68	9855.40	315.11	10170.51
*	24.900	55000.00	1172.90	1172.90	10.10	1162.80	3084.51	1177.84	17.83	9855.18	315.74	10170.92
6.00	25.400	55000.00	1174.67	1173.01	11.77	1162.90	3618.42	1178.26	15.20	9855.36	328.07	10183.42
50.00	26.700	55000.00	1175.76	1173.32	12.56	1163.20	3861.12	1178.91	14.24	9862.63	319.74	10182.37
130.00	27.800	55000.00	1176.47	.00	12.97	1163.50	3605.06	1180.09	15.26	9867.60	290.76	10158.36
110.00	29.600	55000.00	1178.39	1174.00	14.49	1163.90	4479.85	1180.74	12.28	9870.88	323.23	10194.12
180.00	30.000	55000.00	1178.77	1174.04	14.77	1164.00	4689.19	1180.90	11.73	9860.23	336.54	10196.77
* 40.00	31.750	55000.00	1180.49	1173.65	17.09	1163.40	6253.29	1181.69	8.80	9783.60	436.79	10220.40
175.00	33.000	55000.00	1180.61	1175.02	16.51	1164.10	5351.11	1182.25	10.28	9803.18	385.95	10189.13
125.00	35.000	55000.00	1181.18	1176.36	15.28	1165.90	4722.01	1183.29	11.65	9821.85	343.23	10165.09
200.00	37.000	55000.00	1181.79	1177.51	14.89	1166.90	4345.65	1184.28	12.66	9835.82	316.26	10152.08

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XLCH	SECNO	Q	CWSEL	CRWS	ELMIN	AREA	EG	SSTA	TOPWID	ENDST		
132.00	38.320	55000.00	1182.05	1178.41	14.55	1167.50	4164.11	1184.76	13.21	9834.41	314.70	10149.10
173.00	40.050	55000.00	1182.80	1178.16	16.30	1166.50	4417.81	1185.21	12.45	9835.98	318.32	10154.30
295.00	43.000	55000.00	1183.53	1178.57	16.83	1166.70	4493.49	1185.86	12.24	9845.96	320.55	10166.51
392.00	46.920	55000.00	1184.23	1179.56	16.63	1167.60	4303.19	1186.77	12.78	9851.85	296.23	10148.08
398.00	50.900	55000.00	1185.36	1179.98	17.36	1168.00	4573.88	1187.60	12.02	9848.29	304.79	10153.07
410.00	55.000	55000.00	1186.13	1180.58	17.13	1169.00	4583.30	1188.37	12.00	9849.84	304.32	10154.15
500.00	60.000	55000.00	1187.13	1181.42	17.43	1169.70	4684.38	1189.27	11.74	9852.73	307.00	10159.74
400.00	64.000	55000.00	1187.66	1182.55	17.16	1170.50	4352.16	1190.14	12.64	9854.75	289.23	10143.97
145.00	65.450	55000.00	1188.26	1182.84	17.26	1171.00	4634.71	1190.45	11.87	9831.12	311.45	10142.57
145.00	66.900	55000.00	1188.69	1182.60	17.49	1171.20	4815.62	1190.72	11.42	9837.09	310.29	10147.38
100.00	67.900	55000.00	1188.79	1182.96	17.49	1171.30	4705.03	1190.91	11.69	9839.69	304.61	10144.31
73.00	68.690	55000.00	1188.90	1183.00	17.50	1171.40	4677.77	1191.04	11.76	9841.31	299.71	10141.03
* 7.00	68.700	55000.00	1189.17	1189.17	10.77	1178.40	3032.68	1194.28	18.14	9841.16	300.35	10141.51
40.00	69.100	55000.00	1190.50	1189.32	12.00	1178.50	3376.89	1194.62	16.29	9840.01	300.66	10140.66
100.00	70.100	55000.00	1190.99	1189.75	12.19	1178.80	3374.29	1195.12	16.30	9840.82	297.29	10138.10
170.00	71.800	55000.00	1191.99	1190.44	12.69	1179.30	3445.76	1195.94	15.96	9841.42	293.45	10134.87
170.00	73.500	55000.00	1193.40	1190.80	13.70	1179.70	3781.34	1196.68	14.55	9829.88	301.91	10131.80
282.00	76.320	55000.00	1194.59	1191.42	14.69	1179.90	3933.47	1197.62	13.98	9838.99	302.11	10141.10
468.00	81.000	55000.00	1196.12	1192.42	15.62	1180.50	4047.66	1198.99	13.59	9853.00	297.51	10150.50
370.00	84.700	55000.00	1197.97	1192.13	16.77	1181.20	5015.58	1199.84	10.97	9817.63	339.34	10156.97

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SKUNK 100.00  
 100 YR Q  
 W/ DIKE AT  
 SEC. 37.00

SB XK XKOR COFQ RDLN BWC BWP BAREA SS ELCHU ELCHD  
 1.05 1.00 2.80 .00 315.00 12.00 4980.00 1.00 1163.30 1163.20

\*SECNO 27.800  
 CLASS A LOW FLOW

3420 BRIDGE W.S.= 1172.53 BRIDGE VELOCITY= 12.07 CALCULATED CHANNEL AREA= 2883.

EGPRS	EWLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
.00	1175.91	.48	0.	35000.	4980.	4504.	1177.50	1185.50	0.
27.800	9.76	1173.26	.00	.00	1175.91	2.65	.89	.00	1177.10
35000.0	.0	35000.0	.0	.0	2681.5	.0	91.0	8.8	1177.10
.03	.00	13.05	.00	.000	.032	.000	.000	1163.50	9870.67
.004117	110.	110.	110.	0	0	0	.00	284.38	10155.05

CCHV= .100 CEHV= .300  
 \*SECNO 29.600

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SECNO	DEPTH	CWSEL	CRISW	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	

3301 HV CHANGED MORE THAN HVINS

29.600	10.94	1174.84	1171.40	.00	1176.54	1.70	.54	.09	1179.30
35000.0	.0	35000.0	.0	.0	3343.3	.0	103.4	10.0	1179.30
.04	.00	10.47	.00	.000	.032	.000	.000	1163.90	9874.35
.002276	180.	180.	180.	3	15	0	.00	316.31	10190.65

CCHV= .200 CEHV= .400  
 \*SECNO 30.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .67

BEGINNING OF WILDLIFE HABITATE MITIGATION AREA									
30.000	11.12	1175.12	1171.51	.00	1176.70	1.57	.13	.03	1180.00
35000.0	.0	35000.0	.0	.0	3476.4	.0	106.6	10.3	1180.00
.04	.00	10.07	.00	.000	.050	.000	.000	1164.00	9863.88
.005140	44.	40.	40.	2	14	0	.00	329.25	10193.12

\*SECNO 31.750

3301 HV CHANGED MORE THAN HVINS

31.750	13.17	1176.57	1171.45	.00	1177.48	.91	.65	.13	1181.30
35000.0	.0	35000.0	.0	.0	4574.0	.0	122.7	11.8	1181.30
.04	.00	7.65	.00	.000	.050	.000	.000	1163.40	9791.39
.002813	200.	175.	152.	2	19	0	.00	421.23	10212.61

\*SECNO 33.000

33.000	12.69	1176.79	1172.66	.00	1178.04	1.25	.42	.14	1183.00
35000.0	.0	35000.0	.0	.0	3896.5	.0	134.9	12.9	1181.50
.05	.00	8.98	.00	.000	.050	.000	.000	1164.10	9811.71
.004128	180.	125.	135.	2	14	0	.00	373.67	10185.38

\*SECNO 35.000

35.000	11.61	1177.51	1173.76	.00	1179.08	1.56	.91	.12	1183.00
35000.0	.0	35000.0	.0	.0	3488.7	.0	151.9	14.6	1182.10
.05	.00	10.03	.00	.000	.050	.000	.000	1165.90	9832.46
.005047	205.	200.	180.	2	14	0	.00	328.98	10161.44

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SECNO	DEPTH	CWSEL	CRISW	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 37.000

37.000	11.12	1175.12	1171.51	.00	1176.70	1.57	.13	.03	1180.00
35000.0	.0	35000.0	.0	.0	3476.4	.0	106.6	10.3	1180.00
.06	.00	10.07	.00	.000	.050	.000	.000	1164.00	9863.88
.005140	44.	40.	40.	2	14	0	.00	329.25	10193.12

CCHV= .100 CEHV= .300  
 \*SECNO 38.320

38.320	11.19	1178.69	1175.67	.00	1180.64	1.94	.44	.00	1184.00
35000.0	.0	35000.0	.0	.0	3128.2	.0	176.4	16.9	1183.00
.06	.00	11.19	.00	.000	.032	.000	.000	1167.50	9840.87
.002637	132.	132.	132.	2	15	0	.00	302.56	10143.43

\*SECNO 40.050

40.050	12.88	1179.38	1175.37	.00	1181.06	1.68	.40	.03	1188.00
35000.0	.0	35000.0	.0	.0	3369.3	.0	189.3	18.1	1183.70
.07	.00	10.39	.00	.000	.032	.000	.000	1166.50	9850.98
.002010	173.	173.	173.	2	15	0	.00	297.03	10148.02

*SECNO 43.000										
43.000	13.33	1180.03	1175.73	.00	1181.64	1.61	.57	.01	1188.00	
35000.0	.0	35000.0	.0	.0	3436.1	.0	212.3	20.1	1184.50	
.07	.00	10.19	.00	.000	.032	.000	.000	1166.70	9852.94	
.001875	258.	295.	330.	2	19	0	.00	296.09	10149.04	
*SECNO 46.920										
46.920	13.09	1180.69	1176.68	.00	1182.46	1.77	.77	.05	1189.00	
35000.0	.0	35000.0	.0	.0	3276.9	.0	242.5	22.7	1186.80	
.08	.00	10.68	.00	.000	.032	.000	.000	1167.60	9860.35	
.002075	324.	392.	474.	2	14	0	.00	283.48	10143.83	
*SECNO 50.900										
50.900	13.66	1181.66	1177.06	.00	1183.24	1.58	.76	.02	1191.00	
35000.0	.0	35000.0	.0	.0	3474.9	.0	273.4	25.3	1187.00	
.10	.00	10.07	.00	.000	.032	.000	.000	1168.00	9855.67	
.001765	398.	398.	398.	2	19	0	.00	290.99	10146.66	

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SECNO	DEPTH	CWSEL	CRISW	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XLN	XLNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONF	CORAR	TOPWID	ENDST	
*SECNO 55.000										
55.000	13.38	1182.38	1177.65	.00	1183.96	1.57	.72	.00	1192.00	
35000.0	.0	35000.0	.0	.0	3475.3	.0	306.1	28.1	1187.10	
.11	.00	10.07	.00	.000	.032	.000	.000	1169.00	9859.28	
.001741	500.	410.	314.	2	14	0	.00	287.49	10146.77	
*SECNO 60.000										
60.000	13.60	1183.30	1178.55	.00	1184.82	1.52	.86	.01	1194.00	
35000.0	.0	35000.0	.0	.0	3533.9	.0	346.3	31.4	1189.00	
.12	.00	9.90	.00	.000	.032	.000	.000	1169.70	9859.04	
.001690	522.	500.	470.	2	14	0	.00	293.21	10152.26	
*SECNO 64.000										
64.000	13.36	1183.86	1179.62	.00	1185.62	1.76	.73	.07	1195.00	
35000.0	.0	35000.0	.0	.0	3286.5	.0	377.6	34.0	1190.00	
.13	.00	10.65	.00	.000	.032	.000	.000	1170.50	9861.05	
.001986	400.	400.	400.	2	14	0	.00	274.04	10135.09	
*SECNO 65.450										
65.450	13.30	1184.30	1179.96	.00	1185.92	1.62	.28	.01	1195.90	
35000.0	.0	35000.0	.0	.0	3425.0	.0	388.8	35.0	1191.00	
.14	.00	10.22	.00	.000	.032	.000	.000	1171.00	9838.68	
.001905	130.	145.	160.	2	14	0	.00	297.50	10136.18	
*SECNO 66.900										
66.900	13.53	1184.73	1179.76	.00	1186.19	1.45	.25	.02	1197.00	
35000.0	.0	35000.0	.0	.0	3615.8	.0	400.5	35.9	1191.00	
.14	.00	9.68	.00	.000	.032	.000	.000	1171.20	9843.43	
.001586	145.	145.	145.	2	14	0	.00	296.04	10139.47	
*SECNO 67.900										
67.900	13.55	1184.85	1180.04	.00	1186.38	1.53	.16	.02	1197.50	
35000.0	.0	35000.0	.0	.0	3525.2	.0	408.7	36.6	1191.00	
.14	.00	9.93	.00	.000	.032	.000	.000	1171.30	9845.34	
.001702	100.	100.	100.	2	14	0	.00	293.29	10138.63	

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SECNO	DEPTH	CWSEL	CRISW	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XLN	XLNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONF	CORAR	TOPWID	ENDST	
*SECNO 68.690										
DROP STRUCTURE BUILT IN CONJUNCTION WITH 83RD AVENUE BRIDGE CONSTRUCTION										
68.690	13.57	1184.97	1180.06	.00	1186.50	1.53	.12	.00	1198.00	
35000.0	.0	35000.0	.0	.0	3520.4	.0	414.6	37.1	1192.00	
.14	.00	9.94	.00	.000	.032	.000	.000	1171.40	9846.08	
.001674	73.	73.	73.	0	14	0	.00	287.85	10133.93	
*SECNO 68.700										
3301 HV CHANGED MORE THAN HVINS										
7185 MINIMUM SPECIFIC ENERGY										
3720 CRITICAL DEPTH ASSUMED										
68.700	8.03	1186.43	1186.43	.00	1190.29	3.85	.02	.70	1198.00	
35000.0	.0	35000.0	.0	.0	2222.0	.0	415.1	37.2	1192.00	
.14	.00	15.75	.00	.000	.032	.000	.000	1178.40	9844.99	
.007812	7.	7.	7.	0	14	0	.00	291.59	10136.58	
*SECNO 69.100										
3301 HV CHANGED MORE THAN HVINS										



# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT \_\_\_\_\_ PAGE 1 OF \_\_\_\_\_  
DETAIL Toe-down depth for COMPUTED RLS DATE 2/10  
SFF Event (Q = 55,000 cfs) CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

From HEC-II Run (By CW Register)

① SEC 37+00

$$V_{CH} = 13.16 \text{ ft/sec}$$

$$S = .00425$$

$$\text{Depth of flow} = 14.8'$$

To calculate the scour @ levee. use general scour eq.

$$D_{50} = 1.5 \text{ mm} = 0.059 \text{ ft.} \quad \therefore T_c = 0.4 \text{ psf.}$$

$$\text{using } F_s = 1.5, \quad \eta = .025$$

$e = \text{super elevation.}$

$$d_s = 0.9(Rte) - \frac{T_c * \eta^2}{.082 * K * F_s * d_{50}^{1/3} * S}$$

$$= 0.9(14.8') - \frac{0.4 * .025^2}{.082 * 1 * 1.5 * .059^{1/3} * .00425}$$

$$= 13.32' - 1.23'$$

$$= 12'$$

The toe-down of the levee should be 12'.



# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT \_\_\_\_\_ PAGE 2 OF \_\_\_\_\_  
DETAIL Toe-down depth for COMPUTED DES DATE 2/10  
100-year Event (Cl = 35,000 cfs) CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

From HEC-II Run (Poy CW Register)

@ Sec. 37.00:

$$V_{CH} = 11.33 \text{ ft/sec.}$$

$$T_D = 11.3 \text{ ft}$$

$$S = .00441 \text{ ft/ft.}$$

$$D_{250} = 1.5 \text{ mm} = .059 \text{ ft}$$

$$\tau_c = .4 \text{ psf}$$

Pay using  $F_s = 1.5$ ,  $n = .025$

$$d_s = 0.9R - \frac{\tau_c * n^2}{.082 * K * F_s * d_{50}^{1/3} * S}$$

$$= 0.9 * 11.3 - \frac{.4 * (.025)^2}{.082 * 1 * 1.5 * (.059)^{1/3} * .0044}$$

$$= 10.17' - 1.18'$$

$$= 8.98' \quad \text{say } 9'$$

The toe down of the levee should be at least 9'



# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT \_\_\_\_\_ PAGE 3 OF \_\_\_\_\_  
 DETAIL Riprap Design for SPF event COMPUTED RCS DATE 2/10  
Q = 55,000 cfs CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

## Design of loose Riprap:

@ Sec. 3700,  $V = 13.2$  ft/sec  
 $D = 14.8'$   
 $S = .00425$  1/ft.

Average Boundary shear stress

$$T_0 = \frac{n^2}{2.21} \times \gamma_w \times D^{-1/3} \times V^2$$

$$= \frac{(0.025)^2}{2.21} \times (62.4) \times (14.8)^{-1/3} \times (13.2)^2 \text{ ----- ("Sizing Riprap.....")}$$

PHWS-A289-260)  
Vol. II Design Procedure.

$$= 1.25 \text{ lb/ft}^2$$

$$D_{50} = \frac{T_0 \times SF}{C_s (\gamma_s - \gamma_w)}$$

$$= \frac{1.25 \times 1.5}{(0.047)(150 - 62.4)}$$

$$= 0.46 \text{ ft OR } 5.5'' \text{ SAY } 6''$$

$C_s$  = shield's parameter  
 = 0.047  
 $\gamma_s$  = unit wt. of stone  
 $\gamma_w$  = unit wt of water  
 SF = Safety factor = 1.5

The 6"  $D_{50}$  riprap levee can be built to protect the wetlands

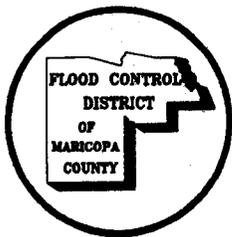
The gradation of the riprap layer:

$$D_{100} = 12''$$

$$D_{50} = 6''$$

$$D_{20} = 3''$$

The thickness of the riprap layer:  $2 \times D_{50} = 2 \times 6'' = \underline{12''}$



# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT \_\_\_\_\_ PAGE 4 OF \_\_\_\_\_  
DETAIL Riprap Design for 100-yr COMPUTED RCS DATE 2/10  
Event ( $Q_{100} = 35,000$  cfs) CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

## Design of loose Riprap:

(a) Sec 37.00

$$V_{ch} = 11.33 \text{ ft/sec}$$
$$b = 11.3 \text{ ft}$$
$$S = .0044 \text{ 1/ft.}$$

Average Boundary Shear

$$T_0 = \frac{n^2}{2.21} * \gamma_w * D^{-1/3} * V^2$$
$$= \frac{(1.025)^2}{2.21} * (62.4) * (11.3)^{-1/3} * (11.33)^2$$
$$= 1.001 \text{ psf}$$

$$D_{30} = \frac{T_0 * SF}{C_s (\gamma_s - \gamma_w)}$$
$$= \frac{1.00 * 1.5}{.047 (150 - 62.4)}$$

$$= 0.37 \text{ ft OR } 4.4" \text{ SAY } 5"$$

The 5"  $D_{30}$  riprap levee can be built to protect the wetlands.

The Gradation of the riprap layer:

$$D_{100} = 12"$$

$$D_{50} = 6"$$

$$D_{20} = 3"$$

The thickness of the riprap layer:  $2 * D_{50} = 2 * 6" = 12"$