Loop 303 Corridor/White Tanks
Area Drainage Master Plan Update
Contract FCD 99-40

FINAL

VOLUME IV

Level III

Area Drainage Master Plan Update Report

APPENDIX A

Prepared for:

Flood Control District of Maricopa County

February 2005

Prepared by:

URS

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APPENDIX A-I

SCOPE OF WORK

LOOP 303 CORRIDOR/WHITE TANKS AREA DRAINAGE MASTER PLAN UPDATE PROJECT

SCOPE OF WORK
LOOP 303 CORRIDOR/WHITE TANKS
AREA DRAINAGE MASTER PLAN
UPDATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Revised 10/12/99

1. GENERAL DESCRIPTION

1.1. PROJECT DESCRIPTION

This scope of work is to contract for professional engineering services necessary for updating an existing Area Drainage Master Plan (ADMP) to identify drainage problems and develop cost-effective solutions for a storm water collection and disposal system. This Scope of Work will include but is not limited to: public coordination and involvement, document/data review and research, survey and mapping, hydrology, hydraulics, identification of drainage problems, development of alternative solutions, cost estimates, and preparation of conceptual design plans and cost estimates based on a preferred alternative.

The Loop 303 Corridor included as part of this study and as described herein is under consideration as a regional drainage corridor. This corridor way will be aligned adjacent to the Maricopa County Department of Transportation (MCDOT) proposed Loop 303 transportation expressway from approximately Grand Avenue to the Gila River.

The development of the alternative solutions will be divided into three levels of analysis. The first, Level I Analysis (Alternatives Formulation / Preliminary Analysis), is conducted after performing the data collection and analyzing the existing conditions which is to identify the possible solutions and to narrow the number of alternatives. The second, Level II Analysis (Alternative Analysis) is to study the alternatives selected in the Level I Analysis using existing topography and hydrology. The final analysis, Level III (Preferred Alternative Analysis) is to refine the design of the recommended alternative, a budget level cost estimate, and prepare conceptual designs and plans.

1.2. PURPOSE

The purpose of the study is to evaluate the existing drainage studies conducted in the White Tanks / Agua Fria watershed and the drainage studies performed for the Maricopa County Loop 303 Roadway (Estrella Parkway) by quantifying the extent of flooding problems and developing alternative solutions to the flooding problems. There are two major objectives of the study. The first is to develop a plan to control runoff to prevent flood damage in the watershed. The second is to develop an implementation plan to manage the interim condition due to discontinuous development in order to preserve the ability to provide protection to lands downstream from 100-year flood events. The plan shall develop and identify preliminary costs, alignments, typical sections, right-of-way requirements, aesthetic / Landscape themes, utility conflicts, and potential project participants for

the preferred alternatives.

1.3. LOCATION

The ADMP encompasses approximately 220 square miles area which includes the cities of Goodyear, Glendale, Buckeye, Litchfeild Park, El Mirage, and Surprise, and as well as unincorporated Maricopa County as shown on figure No. 1. The Study area is bounded westerly by the White Tank Mountains, northerly by the McMicken Dam and Deer Valley Road, easterly by the Agua Fria River, and southerly by the Gila River.

1.4. GENERAL REQUIREMENTS

The CONSULTANT shall comply with the requirements of the Flood Control District of Maricopa County's *Consultant Guideline,* Dated October 1, 1998 (CONSULTANT GUIDELINE) for the items of work referenced under this Scope of Work.

The CONSULTANT shall comply with the Section 1.0 – General Provisions. However, the requirement for restoration of survey monuments under Sections 3.2.8 and 11.3.4.4 of the CONSULTANT GUIDELINE shall not be required under this scope of work.

AGENCIES – Shall be the representatives or designee of the Cities and public officials listed in section 1.5 of this Scope of Work and any other stakeholder within the project area as determined by the DISTRICT.

1.5. AGENCIES

The CONSULTANT shall coordinate with the following representatives who will be receiving copies of project submittals and will act as a point of contact:

1.5.1. Mr. Gregory L. Jones
Project Manager
Flood Control District of Maricopa County
(602) 506-5537

1.5.2. Mr. Neil Urban
Maricopa County Department of Planning and Development
(602) 506-3430

1.5.3. Mr. Mike Smith
Maricopa County Department of Transportation
(602) 506-6823

1.5.4. Mr. Jim Host
Maricopa County Department of Parks and Recreation
(602) 506-8675

1.5.5. Mr. Jim Badowich
City of Avondale
(602) 932-1909

1.5.6. Mr. Larry Tysiac
City Engineer for the City of El Mirage
(623) 861-2200

1.5.7. Mr. Androw Cooper
City of Goodyear
(623) 932-1637

1.5.8. Mr. Dan Serwood
City of Glendale
(623) 930-3634

1.5.9. Mr. E.M. "Al" DeShalzo
City of Surprise
(623) 583-6462

1.5.10. Mr. Zane Hoit
Luke Air Field Base
(623) 856-6462

1.5.11. Mr. Joe Blanton
Town of Buckeye
(623) 386-4691

1.5.12. **Mike Cartsonis**
(623) 935-5033
City of Litchfeild Park

1.6. CONTRACT TIME

Phase I - The CONSULTANT shall complete the Level I Analysis for the entire project and the Level II Analysis for the area described above along the Loop 303 alignment from just north of I-10 to the Gila River within the contract period of 120 calendar days, which includes review time for the DISTRICT and the Cities.

Phase II - The CONSULTANT shall complete the entire scope of work within the contract period of 450 calendar days from Notice to Proceed, which includes review time for the DISTRICT.

1.7. PROJECT REFERENCES

1.7.1. The CONSULANT will be provided the following data by the DISTRICT at the project Kickoff Meeting:

1.7.1.1. HEC 1 Model for the White Tanks Watershed Area/ADMP

1.7.1.2. HEC 1 Model for the White Tanks Watershed Area/ADMS.

1.7.1.3. HEC 2 Model for the White Tanks Watershed Area

1.7.1.4. Digital Topography for the White Tanks Watershed Area.

1.7.1.5. White Tanks/Agua Fria ADMS./ADMP Final Report Part A and Part B, dated 1992.

1.7.1.6. Estrella Corridor Study – MC 85 to Interstate 17 Drainage Technical Memorandum, dated August 1998.

1.7.1.7. Drainage Channel Right-of-Way Requirement Study for West Half of Estrella Freeway Loop 303 from I-10 to Bell Road, dated March 1997.

1.7.1.8. Digital Aerial Photographs.

The DISTRICT will provide the CONSULTANT with base mapping from the DISTRICT'S GIS data base. Base mapping will include land ownership, land use types, soil types, and hydrologic points of concentration. The land ownership maps will indicate whether property is publicly or privately held and the owning agency. The CONSULTANT will use and update applicable digital information provided by the DISTRICT to prepare base maps for the interim and final reports.

1.8. OUT-OF-SCOPE ITEMS

1.8.1. Should the CONSULTANT feel that the DISTRICT, or any partner such as a city or agency staff, is requiring the CONSULTANT to provide work that is not within the scope of the contract documents, the CONSULTANT must notify the District Project Manager immediately in writing and describe the work, which the CONSULTANT feels is out of scope. Such notification shall be provided to the District Project Manager prior to the commencement of any such out-of-scope work.

1.8.2. It is the CONSULTANT's sole responsibility to assure that no additional services beyond the Scope of Work defined in the contract documents shall commence without the written authorization of the District Project Manager.

1.8.3. Retroactive requests for additional fee shall neither be considered nor approved.

2. SCHEDULES

2.1. The CONSULTANT will submit a schedule for the project at the Kick-Off Meeting, which will be scheduled within 14 days after the Notice to Proceed. The schedule will show coordination meetings, dates of all required submittals for each of the tasks in the scope, significant project milestones, and DISTRICT review periods, formatted to conform with the Schedule Template (Exhibit 5 of the CONSULTANT GUIDELINE). The schedule shall be developed in computerized format. The schedule shall contain the anticipated beginning and end dates for the tasks identified in the scope, the time duration of each task, a bar chart (Gantt Chart) showing the tasks and the overall duration of the project. The computer program MS Project, Version 98 or compatible is required. The CONSULTANT shall update this project schedule monthly.

2.2. A projection of estimated project costs consistent with the scheduled project man-hours and project schedule as provided in the fee proposal shall be submitted at the Kick-Off Meeting. The monthly expenditure forecast of costs shall be presented in tabular and graphic form (Exhibit 9 of the CONSULTANT GUIDELINE).

2.3. The CONSULTANT shall allow for a three (3) week review and comment period by the DISTRICT and the AGENCIES in the schedule for all reports and data identified in the Scope of Work.

3. SPECIFIC TASKS

3.1. PROJECT MANAGER

The CONSULTANT shall appoint a Project Manager who shall be knowledgeable of the progress and have responsible charge of the progress of each phase of the project. The Project Manager shall be the same person listed in the Consultant's Technical Proposal, unless otherwise approved by the DISTRICT. The DISTRICT may request replacement of the Project Manager if it becomes apparent that this would be in the best interest of the project. The Project Manager shall be the point of contact for the DISTRICT. The DISTRICT may terminate this Contract if the Project Manager is not available or if the CONSULTANT is unable to provide a replacement Project Manager acceptable to the DISTRICT

3.2. INVOICES

3.2.1. The CONSULTANT will submit a monthly estimation of the projected billing at the Kick-Off Meeting. The estimation shall include the amount of retention to be withheld monthly. Thereafter, this estimation will be updated and submitted to the District's Project Manager at least 10 days prior to the end of each quarter. This estimation will include the method to be used by the CONSULTANT for measuring the actual progress of the work (e.g. earned value system) in comparison to the schedule and expended budget.

3.2.2. CONSULTANT will submit monthly (or other time intervals approved by the DISTRICT) invoices requesting progress payment, which reflect work accomplished during the invoice period. The invoices shall identify the contract number and shall include: the amount for each work task and subcontracted service identified in the approved fee proposal multiplied by the percent complete and a total for all work tasks; the amounts previously billed; and the amount due for the period. Invoice may require additional detail in levels of effort, man-hours worked, and rates paid when requested by the DISTRICT.

3.2.3. All original invoices shall be submitted to the DISTRICT's accounts payable. Additionally, the CONSULTANT shall submit an invoice marked "COPY" to the District Project Manager.

3.3. PROGRESS REPORTS

3.3.1. The CONSULTANT will submit monthly progress reports with the invoice. These reports shall discuss project activities for the same time period as included in the monthly invoices. The report shall be brief (no more than two typed pages). At a minimum, the monthly report shall contain the following:

3.3.1.1. A description of the significant work accomplished during the reporting month.

3.3.1.2. A determination of the percent (%) completed for the month and percent (%) cumulative completed for the contract.

3.3.1.3. A brief description of the work to be accomplished in the following month.

3.3.1.4. A description of any problems encountered and actions to resolve the problems.

3.3.2. The monthly progress shall be submitted even if the CONSULTANT does not submit an invoice.

The CONSULTANT shall include an additional brief description of why no invoice is being submitted for the contract period.

3.4. COORDINATION

3.4.1. The Project Manager shall call the District's Project Manager once a week to provide a verbal progress report, unless directed otherwise by the District's Project Manager.

3.4.2. The Project Manager shall keep the DISTRICT informed of all coordination with outside agencies and other affected parties. These coordination efforts shall be included and documented in the Project Administration Report.

3.4.3. The Project Manager shall provide copies of minutes of all meetings, and significant telephone conversations, and correspondence to the DISTRICT on a monthly basis. At the end of the project, copies of all schedules, minutes, conversations, correspondence, etc. shall be submitted in the Project Administration Report.

3.4.4. The CONSULTANT shall provide a summary of the monthly and cumulative invoice amounts compared to the projected amounts as established at the project Kick-Off Meeting or as subsequently revised to reflect project change orders.

3.5. MEETINGS - GENERAL REQUIREMENTS

3.5.1. The CONSULTANT shall participate in the presentation at the public meetings, and respond to questions as required by making formal presentations or by written document addressing the issue.

3.5.2. The CONSULTANT shall be responsible for all aspects of the neighborhood meetings and public agency board presentations, which shall be subject to prior review, comment, and approval by the District Project Manager. These responsibilities shall include the following iktems:

3.5.2.1. Notification and placement of the legal advertising, to notifying the public of the study. The advertisement will be run in a widely circulated newspaper twice, with approximately one week between runs. The advertisement must also run twice in a local newspaper that serves the area being studied or other local publication as approved by the District Project Manager. After the advertisement is run the CONSULTANT will supply the DISTRICT with the original affidavit of publication from each of the newspapers for each day that the advertisement ran.

3.5.2.2. Preparation of a news release announcing the public meeting shall be developed for distribution to local media which explains the study and its purpose and informs them of the meeting date, time, and location, along with a telephone number to call for additional information.

3.5.2.3. Selection and arrangements for the location of the public involvement meetings.

3.5.2.4. Preparation of handouts and display boards. Typical handouts are a fact sheet explaining the purpose of the study, how it is conducted, a description of the study area, and a study map.

3.5.2.5. Chairing and presenting the information at the meetings in an open house format.

3.5.3. The CONSULTANT shall provide refreshments at all public meetings as appropriate for the meeting type, time, and duration.

3.5.4. The CONSULTANT will be required to hold each of the neighborhood meetings at two locations.

The first location shall be in the Surprise/El Mirage area and the second location shall be in the Goodyear/Avondale area.

3.5.5. The CONSULTANT shall prepare a public involvement plan (PIP). Specific milestones of the PIP for the project will be developed into this plan, including the number and types of public meetings and outreaches, the use and frequency of communiqués such as advertisements and news releases, lists of key constituencies and stakeholders, and the methods for providing opportunities for the public to influence the decision-making process. The CONSULTANT shall submit 10 copies of the PIP.

3.5.6. Public Sensing – CONSULTANT shall develop a Public Desired Future Character Questionnaire(s) for the neighborhood public meetings and document and analyze the response. Information gathered through these questionnaires will be used to help determine desired future landscape character and to help develop landscape themes that will be illustrated in the graphic exhibits as appropriate.

3.6. MEETINGS

3.6.1. Kick Off Meeting - The CONSULTANT shall meet with the DISTRICT within 14 days of the Notice to Proceed. At the meeting the CONSULTANT will submit the project schedule which shall include dates of all proposed coordination meetings, dates of all required submittals for each of the tasks in the scope, significant project milestones, and DISTRICT review periods. The CONSULTANT will also submit a monthly estimation of the projected billing. The CONSULTANT shall bring the key project team members, including the project reviewers, to the meeting to introduce them to the DISTRICT staff who will be working on the project. The DISTRICT will provide to the CONSULTANT such project information and data as the DISTRICT may have, including aerial topographic mapping, utility record drawings, and other information and data as outlined in the Scope of Work.

The CONSULTANT shall be prepared to discuss and explain the schedule and the tasks necessary to accomplish it.

3.6.2. Data Collection Report Review Meeting - The CONSULTANT shall meet with the District Project Manager to review the overall project status and to discuss the Data Collection Report review comments which will be provided to the CONSULTANT at the meeting. The CONSULTANT should be prepared to explain all information and any assumptions made up to this point. Any problems will be identified and discussed

3.6.3. Committee Meeting No.1 - A brainstorming session with Review Committee members to discuss existing flooding problems, existing studies, and to identify additional potential solutions as required in the Level I Analysis, section 3.11.

3.6.4. The first neighbor hood meeting(s) will be to inform the public of the purpose and scope of the study and to receive comments and concerns. This meeting shall be conducted after the formulation of the initial alternatives. The purpose of the meeting shall be to request public input regarding the alternatives, their preferences, and any recommendations they may have for other alternatives that should be evaluated.

3.6.5. Committee Meeting No. 2 - A meeting with Review Committee members to evaluate the alternatives for further studies and to establish desirable levels of flood protection as required in the Level I Analysis, section 3.11.

3.6.6. Alternatives Analysis Report Review Meeting for the Phase I of the Scope – The CONSULTANT shall meet with the District Project Manager to review the overall project status and to discuss the Alternatives Analysis Report for the area south of I-10 as required under section 1.6. The CONSULTANT should be prepared to discuss the alternative flood mitigation solutions and the preliminary cost estimates.

3.6.7. Alternatives Analysis Report Review Meeting - The CONSULTANT shall meet with the District Project Manager to review the overall project status and to discuss the Alternatives Analysis Report review comments which will be provided to the CONSULTANT at the meeting as required in the Level II Analysis, section 3.12. The CONSULTANT should be prepared to discuss alternative flood mitigation solutions and the preliminary cost estimates.

3.6.8. The second neighborhood meeting(s) will be to present project alternatives to be studied and receive public comments. This meeting shall be conducted after the alternative analysis has been completed, and prior to establishing a preferred alternative. The purpose of the meeting shall be to request input from the public on the alternatives.

3.6.9. 90% Submittal of Area Drainage Master Plan Update Report Review Meeting - The CONSULTANT shall meet with the District Project Manager to review the overall project status and to discuss the preferred alternative analysis review comments which will be provided to the CONSULTANT at the meeting. All calculations, analyses, drawings, and the report should be substantially complete at this point. The CONSULTANT should be prepared to discuss the final recommended solution. The final submittal requirements will be reviewed.

3.6.10. The third neighborhood meeting(s) will be to inform the public and obtain public comment on the study results. This meeting shall be conducted upon completion of the draft Area Drainage Master Plan Update Report. The purpose of the meeting is to present the results of the alternative analysis and the recommended alternative.

3.6.11. Area Drainage Master Plan Update Report and Conceptual Plans Submittal Meeting - The CONSULTANT shall meet with the District Project Manager and members of the project review team to review and to discuss the Area Drainage Master Plan Update Report, and the Conceptual plans. The CONSULTANT will be prepared to explain all assumptions and calculations completed up to this point. Any problems will be identified and corrective actions agreed upon at this meeting. The CONSULTANT will make any necessary corrections and provide written responses to all comments and will resubmit the Area Drainage Master Plan Update Report and Conceptual Plans as required to the satisfaction of the DISTRICT

3.6.12. Monthly Coordination Meeting(s): The CONSULTANT shall meet with the District Project Manager and the Review Committee to review and discuss the current status of the project. This meeting may be combined with another required meeting contingent on prior approval by the District Project Manager.

3.6.13. Aesthetic Advisory Committee Meetings: The CONSULTANT shall meet with the DISTRICT'S Landscape and Aesthetics Advisory Committee three times during the course of the project to review Aesthetic and Landscaping issues.

3.7. MEETINGS WITH GOVERNING BODIES AND ADDITIONAL PUBLIC MEETINGS (OPTIONAL)

3.7.1. The CONSULTANT may be directed to participate in additional meetings with the governing bodies and the general public. These meetings and payment are not authorized with the execution of the contract, and only will be authorized in writing by the DISTRICT as required. Project fee proposals

and invoices shall list the authorized amounts for the additional meetings separately from the balance of the contract amount, and shall list the total amounts authorized. This price shall include all activities associated with holding a neighborhood meeting or public agency presentation.

3.8. EXHIBITS

3.8.1. The CONSULTANT will provide an exhibit (8 1/2 inch X 11 inch) showing the general project features or project impact area suitable for reproduction or publication for each public meeting.

3.8.2. The CONSULTANT will be responsible for preparation of graphic displays for the neighborhood meetings and governing bodies meetings. Presentation materials will be rendered in color if applicable, mounted on foam core boards and will include at the minimum the following items for the listed meetings:

3.8.2.1 Neighborhood Meeting No. 1:Presentation materials will include the mapping exhibits required under the visual assessment at the map scale indicated in section 5.3.1.2. Additionally, the CONSULTANT shall prepare approximately 10 perspective sketches depicting typical landscape/character themes for the possible alternatives developed from the brainstorming meeting.

3.8.2.2 Neighborhood Meeting No. 2: The CONSULTANT shall prepare perspective sketches depicting Landscape/character themes for each of the alternatives identified under the Level II Analysis.

3.8.2.3 Neighborhood/Public Meeting No. 3: The CONSULTANT shall prepare perspective sketches depicting Landscape/character themes for each of the preferred alternatives identified under the Level III Analysis for the areas.

The landscape/character theme sketches shall included plan, section, and/or perspective as required to depict the landscape/character theme. These sketches will be 24" by 36" in size and rendered in color, and maybe half sized for reports at the CONSULTANTS option.

3.9. SITE VISITS

The CONSULTANT shall make site visits as necessary to become familiar with existing conditions and to facilitate the design and preparation of the study documents. The CONSULTANT shall document the results of site visits in the Data Collection Report and other required reports as appropriate. The documentation shall include photographs of areas of concern and interest.

The CONSULTANT shall make at least three site visits. The first site visit is to review the existing site conditions prior to starting work on the study, and to determine any initial conflicts or opportunities. The second site visit will occur near the end of the Alternative Analysis. The third site visit will occur during the Preferred Alternative Analysis to identify any possible oversights.

The CONSULTANT shall include field reconnaissance for the aesthetics/visual resources assessment and the multiple-use opportunities assessment as required by section 4.12, Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment.

3.10. DATA COLLECTION & EXISTING CONDITIONS ANALYSIS

3.10.1. The CONSULTANT shall collect and review the pertinent data received from the DISTRICT as specified in sections 1.7 and 3.6.2. The CONSULTANT shall collect data from the AGENCIES, developers, and other outside sources. The data to be collected shall include materials relevant to the project such as: previous hydrology developed for developments within the study area; existing topographic mapping; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, drainage reports, site plans and future drainage improvement plans and other pertinent information. Interviews should be arranged with appropriate agencies for information on drainage problems in the area. The CONSULTANT shall prepare a list summarizing the collected data.

3.10.2. The CONSULTANT shall develop a comprehensive list and historic photographs if available of known flooding problems within the study area. Development of this list will require coordination with the officials from each of the municipalities, transportation agencies, Irrigation Districts, and other sources. The CONSULTANT shall document historical, known flood damage costs.

3.10.3. The CONSULTANT will obtain, review, and document the data necessary for aesthetics / visual resources assessment and multiple-use opportunities assessment as required in section 4.12 - Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment. The CONSULTANT shall include the documentation as a section in or appendix to the Data Collection Report entitled Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment.

3.10.4. The CONSULTANT shall prepare an inventory of drainage facilities that are being planned by other public jurisdictions, Irrigation Districts or private development. These will be illustrated on the Existing Facilities Exhibit. These facilities are to be incorporated into the alternatives as appropriate.

3.10.5. The CONSULTANT shall develop a comprehensive list and a map of current-on-going and proposed developments within the study area. This information shall include the engineering consulting firm, principle contact, phone number as well as the developer. The map shall be submitted in an electronic GIS format per the requirements of the CONSULTANT GUIDELINE section 4.0 GIS/HIS DTM Standards or in accordance with section 4.14 Deliverables.

3.10.6. The CONSULTANT shall contact utilities, known or suspected to have facilities within the project area, to request the alignment and size of the utility facilities. Utilities within the study limits shall be identified and shown in the Data Collection Report.

3.10.7. The CONSULTANT shall prepare an Existing Facilities Exhibit illustrating the location of major natural washes and man-made drainage facilities in the watershed. The condition, capacity and ownership of man-made facilities will be noted. These facilities will become part of the base map for alternatives. The CONSULTANT shall make maximum use of these facilities, where feasible, as part of the storm water management plan alternatives. The base map for the exhibit will be developed from base mapping provided by the DISTRICT.

3.10.8. The CONSULTANT shall prepare a Data Collection Report with the Existing Facilities Exhibit summarizing the data collection effort. The report shall include documentation of existing flooding problems, current drainage and topographic features, existing flood plains, and current plans for facilities by others. The CONSULTANT shall submit a draft of this report and include the final report with the Area Drainage Master Plan Update Report.

3.11. LEVEL I ANALYSIS – ALTERNATIVES FORMULATION / PRELIMINARY ANALYSIS

3.11.1. The purpose of the Level I Analysis (Alternatives Formulation / Preliminary Analysis) is to identify possible solutions to the flooding problem and to narrow the number of alternatives to those which are the most feasible. Elements of each alternative plan may include, but are not limited to alternative design concepts (e.g. incorporating storage to affect peak flows, non-structural alternatives, and conduits vs. open channels), alternative alignments, alternative construction materials, and multi-use.

The CONSULTANT shall develop and refine the alternatives by involving and coordinating the development of the alternatives with landscape aesthetics and multi-use opportunities/constraints as appropriate.

3.11.2. The CONSULTANT shall identify a minimum of 10 possible project to mitigate the existing flooding problems after completing the draft Data Collection Report. At a minimum, two of the alternatives shall be natural appearing, multiple-use alternatives. One of the natural appearing alternatives shall emphasize maximum participation with the Agencies. The other natural appearing alternative shall emphasize minimum participation with the Agencies.

3.11.3. The CONSULTANT shall meet with the DISTRICT to review and discuss these alternatives (Committee Meeting No. 1) and identify additional alternatives. Those alternatives which can be initially eliminated with no or minimal analysis shall be identified and eliminated from further consideration. The Review Committee will make the final selection of these alternatives to be presented to the public at Neighborhood Meeting No. 1.

3.11.4. The CONSULTANT shall document and prepare rough concept drawings and aesthetic treatment illustrations for the selected alternatives from the Brain Storming Meeting and conduct the neighborhood meeting No. 1. The CONSULTANT will prepare Typical Landscape Theme Sketches, a maximum of 10 typical themes, which can be applied to the alternatives for public meeting exhibits and as part of the Alternative Analysis Report.

The CONSULTANT will develop a narrative description of future landscape character and multi-use features of each alternative and document them in the Alternative Analysis Report.

The CONSULTANT shall develop a narrative identifying the pros and cons of each alternative and analyze each alternative with respect to evaluation criteria, which shall be documented in the Alternative Analysis Report. Examples of Evaluation criteria includes the following:

1. Consistency with Desired Future Character
2. Captures opportunities to improve landscape aesthetics
3. Protects valued aesthetic features
4. Captures opportunities to incorporate multi-uses

The CONSULTANT shall prepare an Environmental Overview analysis. The Environmental Overview shall include a comparative analysis for each of the alternatives identified to include socioeconomic, physical and natural environmental impacts and cultural aspects of the study area as applicable. This comprehensive analysis shall address all of the major environmental disciplines and identify any potential problem areas (fatal flaws) that might exist.

The CONSULTANT shall develop estimates of typical costs (square foot costs for each typical theme)

3.11.5. The CONSULTANT shall re-evaluate the alternatives from the Brain Storming Meeting to incorporate the concepts and/or new alternatives suggested by the public, the local jurisdictions, and the DISTRICT. However, the proposed Four Basin and Channel alternative in the "Drainage Channel Study for West Half of Estrella Freeway Loop 303 from Interstate 17 – Drainage Technical Memorandum", dated August 1998 shall be included as the benchmark for comparison of all alternatives for the Loop 303 regional drainage corridor. The benchmark for all other areas shall be the non-build concept.

3.11.6. The CONSULTANT shall complete the study at a level of detail sufficient to compare the alternatives. The level of detail shall be able to evaluate and consider items such as technical feasibility, approximate project costs, potential environmental impacts, potential for incorporating multi-use activities, aesthetics, and social value. Documentation of the findings shall be prepared and submitted to the DISTRICT. The documentation shall be submitted as a working document for decision purposes and will be included as a chapter/section in the Alternatives Analysis Report. The documentation shall include a summary description of the alternatives, exhibits, the findings of the evaluation, and a recommendation of those alternatives to be studied in further detail.

3.11.7. The CONSULTANT shall meet with the DISTRICT, Committee Meeting No. 2, to review and discuss the working document from section 3.11.6, and to select the alternatives for further consideration in the Level II Analysis. The Review Committee will make the final selection of alternatives. The eliminated alternatives shall be documented in the Alternatives Analysis Report. The list of alternatives shall be reduced to not more than three major alternatives plus the alternative specified under section 3.11.5.

3.12. LEVEL II ANALYSIS – ALTERNATIVE ANALYSIS

3.12.1. The purpose of the Level II Analysis – Alternative Analysis is to study the alternatives selected in the Level I phase at a level of detail to allow comparison of the alternatives and selection of the preferred alternative. The CONSULTANT shall develop and refine the alternatives by involving and coordinating the development of the alternatives to include landscape aesthetics and multi-use opportunities/constraints as applicable while providing for flood protection.

3.12.2. Those alternatives designated for further study shall be further evaluated in sufficient detail to select a recommended plan. All alternatives shall be evaluated in the same level of detail, e.g. based upon generalized hydraulics and cost estimates, with a separate line item estimate for the landscape theme for each alternative, to determine the engineering feasibility and approximate costs. The studies shall be completed in sufficient detail to demonstrate technical feasibility. The designs shall be based on available topographic mapping and shall be supplemented with field surveys at hydraulically or structurally critical locations as required.

The CONSULTANT will develop a narrative description of the future landscape character and the aesthetic and multi-use features of each alternative and document it in the Alternative Analysis Report.

The CONSULTANT will prepare Landscape Theme Sketches for neighborhood meetings exhibits as per section 3.5 for each alternative and as documentation for the Alternative Analysis Report.

The CONSULTANT will develop a narrative identifying the pros and cons of each alternative and analyze each alternative with respect to evaluation criteria. Examples of Evaluation criteria includes the following:

1. Consistency with Desired Future Character
2. Captures opportunities to improve landscape aesthetics
3. Protects valued aesthetic features
4. Captures opportunities to incorporate multi-uses

3.12.3. The CONSULTANT shall prepare a weighted matrix by which alternatives will be evaluated by assigning weighted scores to each of the evaluation criteria. The 100-year level of protection will be considered as the baseline with more frequent events given consideration based upon the evaluation criteria.

3.12.4. The CONSULTANT shall evaluate the selected alternatives on any or all of the following evaluation criteria which will be formalized in the CONSULTANT'S matrix by the DISTRICT and the Agencies:

Desired level of flood protection
Engineering feasibility
Approximate capital costs
Environmental impacts
Potential for staged construction
Approximate maintenance requirements and cost
Acceptability to local residents
Compatibility with other projects and plans
Potential for removal of existing FEMA flood zones
Site accessibility, inconvenience and loss of productivity
Major or minor transportation routes
Sole access
Partnering
Multi-Use/function
Aesthetics

3.12.5. The CONSULTANT shall prepare an Alternatives Analysis Report that shall discuss the selected alternatives, the discarded alternatives, the results of the alternative analysis, the associated cost estimates, and other items considered in the evaluation criteria. The report shall also include discussion on public preferences, and the overall success of each alternative in meeting the objectives of the Project. The CONSULTANT shall submit a draft report for review and comment. The CONSULTANT shall address all appropriate comments when the Alternatives Analysis Report is incorporated into the final Alternatives Analysis Report.

3.12.6. The CONSULTANT shall meet with the DISTRICT to review and discuss the alternatives, and to select the recommended alternative for further consideration. The DISTRICT and the Agencies will make the final selection of the preferred alternative based upon the CONSULTANT's findings and recommendation, comments from the public, comments from affected agencies, municipalities and local jurisdictions and the matrix.

3.13. LEVEL III ANALYSIS – PREFERRED ALTERNATIVE ANALYSIS

3.13.1. The purpose of the Level III Analysis – Preferred Alternative Analysis is to refine the design of the recommended alternative sufficient to evaluate alternatives for major features, to finalize locations and alignments, and determine project costs sufficient for budgeting. It is appropriate to base designs upon available topographic mapping, supplemented with field surveys at hydraulically or structurally critical locations. Design detail shall be refined to allow approximate calculation of unit quantities of major project features. Design of the project features shall be limited to typical sizes and dimensions and shall be sufficient to determine the costs of major project components. All alternatives for major features shall be analyzed with the same level of detail and cost estimates shall be comparative. The level of detail shall be sufficient to determine the approximate environmental impacts, such as approximate depths or areas.

The CONSULTANT shall develop and refine the alternatives by involving and coordinating the development of the alternatives to include landscape aesthetics and multi-use opportunities/constraints as applicable while providing for flood protection

The CONSULTANT shall prepare Landscape/character theme sketches per section 3.8.2 for public meeting and documentation in the Area Drainage Master Plan Update Report for the preferred alternative(s).

The CONSULTANT shall develop a narrative description of the future landscape character and the aesthetic and multi-use features of the selected alternative and document in the Area Drainage Master Plan Update Report.

The CONSULTANT shall develop narrative identifying the pros and cons of the selected alternative and analyze each alternative with respect to evaluation criteria and document in the Area Drainage Master Plan Update Report. Examples of Evaluation criteria includes the following:

1. Consistency with Desired Future Character
2. Captures opportunities to improve landscape aesthetics
3. Protects valued aesthetic features
4. Captures opportunities to incorporate multi-uses
5. Identify pros and cons

3.13.2. The CONSULTANT shall refine the design and cost estimate including costs for the landscape theme for the recommended alternative identified in the Alternatives Analysis Report. The CONSULTANT shall document the results of the Preferred Alternative Analysis in the Area Drainage Master Plan Update Report. Calculations, computer printouts and files, notes, sketches, quantity calculations, and detailed cost estimates shall be submitted in the Technical Data Report which shall accompany each submittal Area Drainage Master Plan Report.

3.13.3. The CONSULTANT shall complete designs and prepare conceptual design plans. The design plans shall be included in the Area Drainage Master Plan Update Report. The designs and plans shall identify the approximate sizes, slopes, aesthetic features, profiles, alignments, and planimetric view of proposed project features. Major existing utility locations and relocation requirements shall be shown on the design plans. Recommended landscaping and aesthetic features shall be included in project drawings and cost estimates.

3.13.4. The CONSULTANT shall provide project cost estimates for major construction items. An allowance for unlisted or miscellaneous items shall be included as appropriate. The cost estimates shall include separate line items for the major construction items and utility relocations showing quantities, unit costs, and extended totals. Costs for contingencies, engineering, and rights-of-way shall be included in the total project cost.

3.13.5. (Optional) Additional Cost Estimating and Related Design Analysis - The CONSULTANT may be directed to perform cost estimating and design analysis of the preferred alternative to quantify potential project partners project contribution. The additional cost estimation, design analysis and payment are not authorized with the execution of the contract, and only will be authorized in writing by the DISTRICT as required. Project fee proposals and invoices shall list the authorized amounts for the additional estimation and design analysis separately from the balance of the contract amount, and shall list the total amounts authorized. This price shall include all activities required to perform and document the additional cost estimate and related design analysis. The results from this optional item shall be included in the Area Drainage Master Plan Update Report.

3.13.6. The CONSULTANT shall review parcel ownership maps and identify which properties will be affected by the preferred alternative. The CONSULTANT shall identify permanent and temporary right-of-way and easement requirements necessary for the preferred alternative. Estimated right of way costs shall be based upon unit cost values to be provided by the DISTRICT and shall include relocation costs if relocation of businesses or residences is required. The required acreage and costs shall be included in the project cost estimate as a separate line item. The CONSULTANT shall document the right-of-way and/or easements in the Area Drainage Master Plan Update Report.

3.13.7. The CONSULTANT shall estimate maintenance requirements and costs for the preferred alternative on an annual basis. The life cycle to be used in calculations shall be 50 years. The CONSULTANT shall document a maintenance plan in the Area Drainage Master Plan Update Report.

3.13.8. The CONSULTANT shall prepare an implementation plan that shall document the available tools or procedures for implementing the preferred alternative. The CONSULTANT shall identify tools, such as existing ordinances and regulations, for each jurisdiction within the study area that may be modified or created to encourage development standards that are compatible with the preferred alternative.

3.13.9. The implementation plan shall also include methods for phasing the construction of preferred alternative. This shall specifically address which feature(s) of the project must be completed for the storm water drainage system to operate in interim uses until the entire system is built out.

3.13.10. The CONSULTANT shall include the implementation plan in the Area Drainage Master Plan Update Report.

3.13.11. The CONSULTANT shall prepare a draft 90% complete submittal of the Area Drainage Master Plan Update Report for review and comment.

3.13.12. The CONSULTANT shall meet with the DISTRICT to review and discuss the 90% completed submittal of the Area Drainage Master Plan Update Report. The DISTRICT will provide all review comments of the 90% submittal at this meeting.

3.13.13. The CONSULTANT shall address all the appropriate comments from the 90% review in the Final Submittal of the Area Drainage Master Plan Update Report.

3.13.14. The CONSULTANT shall meet with the DISTRICT to review the Area Drainage Master Plan Update Report. If there are any deficiencies the DISTRICT will provide these comments at this meeting. The CONSULTANT shall correct and resubmit the final Area Drainage Master Plan Update Report.

4. GENERAL TASKS

4.1. SURVEY, PHOTOGRAMMETRY, AND MAPPING

4.1.1. SUPERVISORY QUALIFICATION REQUIREMENTS :

All survey work shall be supervised by a registered land surveyor.

4.1.2. PHOTOGRAMMETRIC MAPPING (Optional)

4.1.2.1. The District has existing photogrammetric mapping and it is not anticipated that Photogrammetric mapping will be required under this scope of work. However, the Contractor shall evaluate the need for additional topologic data, and shall make recommendations if additional mapping is required. If in the CONSULTANT's judgement, supplemental photogrammetric mapping is required, the CONSULTANT shall prepare and submit a supplement photogrammetric mapping plan done in accordance with chapter 3, Survey, Photogrametry and Mapping, of the CONSULTANT GUIDELINE. The supplemental photogrammetric mapping plan is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period. All invoices shall separately identify costs for work under this paragraph. Implementation of supplemental photogrammetric mapping may include an extension of the contract time period. The CONSULTANT's original schedule for the contract shall, therefore, not include a scheduled optional activity for the supplemental photogrammetric mapping.

4.1.3. FIELD SURVEYING, AND MAPPING

4.1.3.1. The field surveying and mapping shall be done in accordance with chapter 3, Survey, Photogrametry and Mapping, of the CONSULTANT GUIDELINE with the following change; spot elevations to a 1-foot contour interval will be obtained on mile roadway crossings.

4.2. HYDROLOGIC ANALYSIS

4.2.1. The CONSULTANT shall update the existing 100-Year, 24-hour, HEC-1 model to include drainage projects and land uses that have occurred since the model was created in 1990. The CONSULANT shall also update the model to include changes in the DISTRICT's hydrologic methods and runoff parameters. After the existing model has been updated and verified for the reasonableness of its runoff predictions, the following additional models shall be developed.

4.2.1.1. **100-Year, 6-Hour Storm** – The sub-watershed for each major outfall within the study area shall be modeled with the 100-year, 6-hour storm. The storm shall be centered over the individual sub-watershed without the use of the Hec-1, JD option.

4.2.1.2. **Future Conditions 100-Year, 6-Hour Storm** – The future conditions 100-year, 24-hour runoff shall be modeled by assuming that the developable parcels within the watershed will be developed with on-site storm water retention. The appropriate jurisdictional retention shall be

applied. Similarly, retention volumes on lands in other jurisdictions will be based on the corresponding local requirements.

4.2.1.3. **10-Year, 24-Hour Storm** – The rainfall data in the 100-year, 24-hour, HEC-1 existing conditions model will be modified to predict runoff for the 10-year, 24-hour storm. The output will be reviewed to ensure the reasonableness of the resulting 10-year runoff volumes and peak discharges.

4.2.2. The CONSULTANT shall perform complete and detailed hydrologic analysis of the project area in order to compare the alternatives.

4.2.3. The CONSULTANT shall research, become familiar and give consideration to existing hydrologic studies and models, and assumptions made and will assess the reasonableness of the input data and results. A detailed field reconnaissance shall be done to determine the following:

Verify sub-basin delineation boundaries
Verify flow patterns
Determine the actual land use for parcels
Identify flow diversion locations caused by natural obstructions, drainage structures, storm drains, site grading, etc.
Obtain field cross-sections at key hydraulic flow splits locations

4.2.4. The CONSULTANT shall bring any concerns or discrepancies concerning modeling to the DISTRICT's attention in the Initial Hydrological Report. The modeling concerns will then be addressed by the DISTRICT and resolved with the CONSULTANT prior to completing the revised hydrology.

4.2.5. Following selection of the recommended alternative the CONSULTANT will update the hydrologic model and as a means to test the effectiveness of preferred alternative, the CONSULTANT will re-run the existing condition hydrology with plan elements in place for the design events.

4.2.6. The CONSULTANT shall follow the procedures outlined in the "Drainage Design Manual for Maricopa County, Volume I Hydrology" for all hydrologic modeling and calculations.

4.2.7. The CONSULTANT shall submit an Initial Hydrological Report as a section in the Data Collection Report which shall specifically identify all the CONSULTANTS concerns and or acceptance of the data. All the discrepancies will be resolved in the Data Collection Report Meeting.

4.2.8. The CONSULTANT shall submit a Draft Hydrological Report as a section in the Alternatives Analysis Report. The report shall document the resolution of each discrepancy identified in the Initial Hydrology Report and revise the hydrology as applicable.

4.2.9. The CONSULTANT shall submit a 90% completed Hydrological Report as a section in the Technical Data Report with the 90% Complete Area Drainage Master Plan Update Report. The report shall include the resolutions and revise the hydrology for the preferred alternative.

4.2.10. The CONSULTANT shall submit a Final Hydrology Report as a section in the Technical Data Report with the final Area Drainage Master Plan Update Report.

4.3. HYDRAULIC ANALYSIS

4.3.1. The CONSULTANT shall perform complete and detailed hydraulic analysis of the project area in order to determine existing capacities of drainage facilities. Preliminary hydraulic calculations will need to be prepared for the alternative design structures to substantiate size and shapes of the facilities. The hydraulic grade line shall be provided for the recommended alternative. Hydraulic analysis shall be completed in sufficient detail to document the hydraulic adequacy of the project and the anticipated sizes of project elements.

4.3.2. The CONSULTANT shall research and give consideration to existing drainage studies of the area.

4.3.3. The CONSULTANT shall complete hydraulic computations and water surface profiles consistent with the procedures as provided in the Drainage Design Manual for Maricopa County, Volume II Hydraulics, and the CONSULTANT GUIDELINE, Section 10. However, the CONSULTANT GUIDELINE Sections 10.3 (Geotechnical), 10.4 (Channel Stabilization Design), and 10.5 (Sediment Transport, Scour, Lateral Migration, and River Mechanics) will be excluded from the requirements of this Scope of Work.

4.3.4. The CONSULTANT shall use and update the HEC-2 or HEC-RAS computer models developed for the FIS, to document the hydraulic conditions resulting from the preferred alternative to include existing, approved or planned developments within the floodplain that have occurred since the completion of the topographic mapping for the respective FIS. The CONSULTANT shall modify the HEC-2 or HEC-RAS model during the development of the requirements of this Scope of Work. Floodplain encroachments shall be documented to ensure that they are consistent with the procedures of the CONSULTANT GUIDELINE.

4.3.5. The CONSULTANT shall provide a hard copy and a CD-ROM with input and output files for review. The HEC input and output files shall be prepared in a format suitable for submittal to FEMA.

4.3.6. The CONSULTANT shall submit the hydraulic calculations and data with each submission of the Hydrology Report.

4.4. FLOODPLAIN DELINEATION (OPTIONAL)

4.4.1.1. Floodplain delineations shall be preformed in accordance with the CONSULTANT GUIDELINE. The delineations and application for letter of Map Revisions (LOMR"s) to FEMA may be done to modify existing delineated flood plains that have significantly changed since pervious Flood Insurance Rate Maps (FIRM's) were printed.

4.4.1.2. Floodplain delineations may be prepared for the areas where the ADMP Update preferred alternative(s) significantly modifies existing delineations shown on FEMA FIRM maps. The CONSULTANT will perform the studies / delineations per the CONSULTANT GUIDELINE and submit to FEMA for Conditional Letter of Map Revisions (CLOMR's).

4.4.1.3. Preparation of supporting analysis and coordination with FEMA may be part of this task

4.4.1.4. The floodplain delineation study is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period. All invoices shall separately identify costs for work

under this paragraph. Implementation of the floodplain delineation study will include an extension of the contract time period. The CONSULTANT's original schedule for the contract shall, therefore, not include a scheduled optional activity for the plain delineation study.

4.5. ECOLOGICAL ASSESSMENT

The CONSULTANT shall conduct a non-intensive field survey and use current aerial photographs to identify, inventory, and map the existing ecological resources within the project area, excluding the DISTRICT'S White Tanks FRS No. 3 study area, the area north-northeast of Grand Avenue and Bell Road (i.e. Sun City West), and the area from the western Agua Fria river bank eastward, including the vegetation community, wildlife, sensitive species and critical habitat, water resources, and wetlands. The CONSULTANT shall contact the U.S. Fish and Wildlife Service (FWS) and the Arizona Game and Fish Department (AGFD) to obtain information regarding the presence of listed Threatened and Endangered Species, Wildlife Species of Special Concern, and designated critical habitat in the project area.

The CONSULTANT shall summarize and document the results of the ecological assessment. The documentation shall include a description and maps or aerial photographs depicting the locations of the identified ecological resources. This documentation shall also include a discussion as to what the possible effects of the proposed alternatives will have on the identified ecological resources. This shall be included a section or an appendix of the Data Collection Report and available for use during the alternatives analysis task.

The maps to be included with this report shall locate all identified ecological resources within the project area on aerial photographs. The CONSULANT shall obtain a digital color aerial photograph(s) which are to be semi-ortho rectified. The CONSULTANT shall submit an appropriately scaled map, including this information, and the color aerial photograph produced from an electronic digital photograph locating the ecological resources.

During the alternative analysis tasks, the CONSULTANT shall use the ecological assessment summary to determine the effects of each of the proposed alternatives on the identified ecological resources and any identified sensitive species or habitat. In the Alternatives Analysis Report, the CONSULTANT shall describe the possible effects of each alternative analyzed on the ecological resources. During the alternatives analysis process the CONSULTANT shall recommend methods to avoid or minimize any negative effects the proposed alternatives may have on the ecological resources. If any of the negative effects can not be avoided or minimized, then the CONSULTANT shall make a qualitative estimate of the general mitigation costs for the negative effects in terms of the relative magnitude, i.e. high, moderate or low. This information will be used in the analysis of the alternatives and the selection of a preferred alternative and will be documented in the Alternatives Analysis Report and the Area Drainage Master Plan Update Report.

4.6. CULTURAL RESOURCES

The CONSULTANT shall conduct an Archeological Assessment to identify any prehistoric and historic resources within the entire study area, excluding the DISTRICT'S White Tanks FRS No. 3 study area, the area north-northeast of Grand Avenue and Bell Road (i.e. Sun City West), and the area from the western Agua Fria river bank eastward. The results of the Archeological Assessment will be used in the Pre-Alternative formulation and the Alternative Analysis process to determine the effects of each alternative on the identified cultural resources. The objective is to avoid and minimize impacts to the archeological resources when feasible.

The CONSULTANT shall prepare documentation of the results of the archeological inventory. The documentation shall describe the significance of any identified or known cultural resources. The documentation shall include a description of the specific findings of all of the identified archeological resources within the Project Area including, but not limited to:

a. Location
b. Bibliographic reference
c. Site size
d. Type of site
e. Physical features of site

This shall be documented in the Data Collection Report as a separate appendix, and be available for use during the alternatives analysis process.

The CONSULTANT shall address the potential impacts of any of the preliminary project alternatives on the sites based on existing information in the Data Collection Report and shall be included in the Alternative Analysis Report. The documentation shall include, if possible, recommendations for further study including an approximate range of costs for testing and/or mitigation for known cultural resources that maybe impacted by a project alternative.

The CONSULTANT shall locate all identified pre-historic and historical resources within the Project Area on the digital aerial photographs. No electronic file for this data shall be submitted to the DISTRICT.

The CONSULTANT shall also document a summary of the findings of Archeological Assessment as a section in the Area Drainage Master Plan Update Report.

4.7. ENVIRONMENTAL PERMITS AND APPROVALS

The CONSULTANT shall identify and document in the Alternative Analysis Report plan approvals, permits, or licenses from other agencies that would be required to implement the alternatives as required under the alternative analysis tasks. Other agencies may include, but may not be limited to: municipalities, tribal governments, the U.S. Environmental Protection Agency (EPA), the Maricopa County Department of Environmental Services (MCDES), the Arizona Department of Environmental Quality (ADEQ), the Arizona Department of Water Resources (ADWR), the Army Corps of Engineers (CORPS), railroads, utilities, and water districts. Requirements for necessary permits and approvals for the preferred alternative(s) shall be documented in the Area Drainage Master Report. No other deliverables are required

4.8. HAZARDOUS WASTE INVENTORY

The CONSULTANT shall conduct a search of the federal, state, and local environmental lists and databases located in the project area and their respective search radius (ASTM 1527 - 97). An "area search" corresponding to the study area will be acceptable. The CONSULTANT shall use a commercial database search service to complete this task and supply a digital GIS formatted location map of the search.

The GIS data will not be submitted for review and approval. It will only be submitted as information to the DISTRICT.

The CONSULTANT shall document the location of the regulatory sites on an area map and provide a brief description. If possible, the brief description of the regulatory sites should include: the location of the site, the type of regulated substance or waste, the extent of the contamination, the status of the site (i.e. closed or open status), remediation plans of the site, and the named potentially responsible party(s).

The CONSULTANT is not expected to conduct extensive file review on the identified regulatory sites to obtain this information.

The CONSULTANT shall complete a non-intensive field reconnaissance of the major regulatory sites identified during the database search. The purpose of this reconnaissance will be to: 1) confirm the location and condition of the identified sites and to note and photograph any pertinent information and features that will be useful during the alternatives analysis, and 2) to visually identify any regulatory site(s) not included in the database search.

The CONSULTANT shall document the results of the regulatory records review search. This documentation shall be included in the Data Collection Report, and made available for use during the alternative analysis process. During the alternatives analysis process, the CONSULTANT shall use this information to recommend alternative locations and/or solutions to avoid costly remediation if any of the proposed alternatives appears to require land that is listed as a regulatory site or may be affected by a regulatory site.

If required, during the alternative(s) analysis, the CONSULTANT shall make a qualitative estimate of the general cost to investigate and remediate the potential problem resulting from the regulatory site(s) in terms of relative magnitude, i.e. high, moderate or low. This information will be used in the analysis of the alternatives. If necessary, the CONSULTANT shall also prepare a summary section in the Area Drainage Master Plan Update Report documenting the area(s) where the preferred alternative(s) will impact regulated site(s). This section will also contain a brief discussion of the required steps to be taken in these areas so that the preferred alternative can be implemented and cross referenced to the Implementation Plan section/appendix.

The CONSULTANT shall locate all identified regulatory sites within the project area on the appropriate aerial photographs. Alternatively, the CONSULTANT may elect to submit an appropriately scaled map (either in electronic or hard copy format), including this information.

4.9. HISTORICAL AND PRE-HISTORICAL THEMES EVALUATION

The CONSULTANT shall conduct a non-intensive survey of the project area to collect information necessary to produce a brief historical and pre-historical theme report. This report shall include a brief discussion of the general prehistory and history of the project area. General themes to be researched shall include, but not be limited to, the prehistory of the region, early European exploration or the area, historical Native American activities, homesteading, agricultural history (with particular emphasis on any notable religious or ethnic settlement areas), irrigation projects, and World War II and post-World War II industrial boom activities.

In collecting this information, the CONSULTANT will research the records and photographic archives of the Arizona Room and the Arizona Historical Foundation at Arizona State University, the Arizona State Archives, the Arizona Historical Society, the Phoenix Public Library, the archives at Salt River Project, and Pueblo Grande Museum in Phoenix.

The deliverable for this task shall be a brief summary document of the themes of the prehistory and history of the project area and will include a representative number of typical historic photographs for each theme identified. This information will be reviewed and utilized by the project landscape architect and team members during the completion of the visual analysis portion of this project.

4.10. WETLAND DELINEATION (OPTIONAL)

The CONSULTANT shall delineate the potential wetlands located in the study area in accordance with

the current Army Corps of Engineers Wetland Delineation Manual. This information shall be plotted on the same set of maps/aerial produced for the ecological assessment report. The Wetland delineation study is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period. All invoices shall separately identify costs for work under this paragraph. Implementation of wetland delineation study will not include an extension of the contract time period. The CONSULTANT's original schedule for the contract shall, therefore, include a scheduled optional activity for the wetland delineation study.

4.11. TITLE VI ENVIRONMENTAL JUSTICE ASSESSMENT (OPTIONAL)

The CONSULTANT shall document and map the social and economic attributes of the citizens within this study with regards to the Title VI Environmental Justice Executive Order. The CONSULTANT'S documentation shall include a brief letter report summarizing the findings of the assessment and a set of map(s) identifying basic the social and economic attributes of the project area. This report shall be completed and document as a section in or an appendix to the Data Collection Report. The mapped information shall be marked on the appropriate U.S.G.S. 7½' Quadrangle Topographic Maps and aerial photographs. Alternatively, the CONSULTANT may elect to submit an appropriately scaled map, including this information, produced in an electronic format in accordance with section 4.14.2.

The title VI environmental justice study is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period. All invoices shall separately identify costs for work under this paragraph. Implementation of the title VI environmental justice study will not include an extension of the contract time period. The CONSULTANT's original schedule for the contract shall, therefore, include a scheduled optional activity for the title VI environmental justice study.

4.12. LANDSCAPE AESTHETICS ASSESSMENT AND MULTI-USE OPPORTUNITIES ASSESSMENT

The CONSULTANT will conduct a Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment. This work will be performed in the Data Collection Phase of the project, and shall be document in the Data Collection Report.

4.12.1. DATA COLLECTION AND EXISTING CONDITIONS ANALYSIS

4.12.1.1. Data Collection and Review

The CONSULTANT will collect and review data necessary for Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment.

Some information will be provided by the DISTRICT or collected by the CONSULTANT for use in preparing the Landscape / Aesthetic and Multi-Use Analysis. This includes but may not be limited to the following:

Aerial photos
Topographic mapping
Vegetation survey (existing conditions and historical information)
Cultural survey (existing conditions and historical information)
Existing land use map
Proposed land use map
Existing DISTRICT facilities map

DISTRICT Standards
Developer plans
Agency plans / master plans
Existing and ongoing studies / reports

The CONSULTANT shall also be responsible for supplementing the above information as necessary for the preparation the Landscape / Aesthetic and Multi-Use Analysis. This includes but may not be limited to the following:

Developer plans
Agency plans / master plans
Agency standards
Existing and ongoing studies / reports

4.12.1.2. Site Visits / Field Reconnaissance

The CONSULTANT will conduct site visits / field reconnaissance as required to review, assess, refine delineations, and document (map and photograph) existing site conditions including:

Existing landscape character.

Visual resources opportunities and constraints:
- Scenic quality (identify outstanding features to avoid/ preserve, identify areas that could be enhanced by increasing variety).
- Visual integrity (identify opportunities to harmonize discordant features).
- Identify opportunities to improve public viewing.
- Review existing DISTRICT facilities and identify the extent to which those facilities Meet the current DISTRICT aesthetic treatment guideline and policy.

Multi-Use Opportunities:
- Existing parks, trails, open spaces, transportation corridors and nodes, natural areas.

4.12.2. Visual Resources Assessment

The CONSULTANT shall prepare a reconnaissance level inventory and assessment of visual resources within the study area. The purpose of this assessment is to identify aesthetic features and areas of the project area that may be preserved, enhanced or improved, and to serve as a basis for establishing landscape design theme and the future desired character for each alternative.

4.12.2.1. Existing Landscape Character

The CONSULTANT shall prepare an assessment of Existing Landscape Character taking into account both natural and cultural features of the study area. The assessment shall include a map exhibit delineating the Characteristic Landscapes that comprise the study area; one or more typical photographs of each landscape character unit, dated and cross referenced as to their location on the map exhibit; and a brief narrative description of the characteristics of landform, rock formations, vegetation, water features and cultural features which give each unit an identifiable character and sense of place. The CONSULTANT shall utilize the Existing Landscape Character Assessment during the alternatives formulation phase to establish a landscape design theme and identify the visual characteristics that will be retained in each alternative.

4.12.2.2. Scenic Quality

The CONSULTANT shall assess the Scenic Quality of the natural and cultural features in the study area taking into consideration the degree of variety or uniqueness of landscape features. Features and areas of High scenic quality to be preserved shall be identified and located on the map exhibit, briefly described in the narrative, and documented with typical photographs. Features and areas that are low in scenic quality and offer potential opportunities for scenic quality improvement through the introduction of positive landscape variety shall be identified and located on the map exhibit and briefly described in the narrative. The CONSULTANT shall utilize the Scenic Quality Assessment during the alternatives formulation phase to develop flood protection alternatives that maximize opportunities to protect and enhance existing scenic quality.

4.12.2.3. Existing Visual Conditions / Visual Integrity

The CONSULTANT shall prepare an assessment of Existing Visual Conditions or Visual Integrity within the study area. This assessment shall identify the relative visual intactness of natural and cultural features within the study area. Undisturbed natural and cultural features that are to be preserved shall be identified and located on the map exhibit, briefly described in the narrative and documented with photographs. Opportunities for natural and cultural landscape restoration as an integral part of project alternatives shall be identified and located on the map exhibit and briefly described in the narrative. The CONSULTANT shall utilize the Existing Conditions Assessment during the alternatives formulation stage to develop flood protection alternatives that maximize opportunities to protect or enhance the visual integrity of existing natural and cultural landscape features.

4.12.2.4. Assessment of Existing DISTRICT Facilities

The CONSULTANT shall assess the extent to which existing flood control facilities and their related features incorporate the aesthetic treatment guidelines contained in the DISTRICT's Policy for Aesthetic Treatment and Landscaping of Flood Control Projects. In cases where existing flood control facilities are found to be in non conformance with the DISTRICT's aesthetic treatment policy, The CONSULTANT shall identify possible measures for retrofitting existing facilities to achieve consistency with that policy. The CONSULTANT shall utilize the assessment of the DISTRICT's existing flood control facilities in the alternatives formulation stage to identify flood protection alternatives that maximize opportunities enhance the appearance and multi-use potential of existing facilities.

4.12.2.5. Viewing Analysis

The CONSULTANT shall identify the major viewing points and views within and adjacent to the study area on the map exhibit. This assessment shall include a brief narrative with photographs describing the major views and focal points to be preserved within the study area. This assessment will include an identification of ways to enhance public landscape viewing opportunities through the location, orientation and design of new project features or the relocation or modification of existing features. The CONSULTANT shall utilize the view analysis in the alternatives formulation phase to develop flood protection alternatives that maximize opportunities to protect or enhance primary views and focal point features within the study area.

4.12.2.6. Historic Character

The CONSULTANT shall assess the Historic Character (historic and prehistoric landscape) of the study area using the cultural resource inventory. The CONSULTANT shall utilize the Historic Character Assessment during the alternatives formulation phase to identify opportunities and constraints and to establish the basis for an alternative landscape design theme.

4.12.2.7. Future Desired Landscape Character

The CONSULTANT shall assess the Future Desired Landscape Character for the study area. This will be done through a combination of compiling developer and agency plans as well as through public sensing (feedback from meetings with the general public and special interest groups as required by section 3.5.5). The CONSULTANT shall utilize the Future Desired Landscape Character assessment during the alternatives formulation phase as a basis for establishing alternative landscape design themes.

4.12.2.8. Landscape Character Themes

The CONSULTANT shall utilize the Visual Resources Assessment to develop landscape character themes (visions) and aesthetic design guidelines for each alternative that will protect and enhance local community character and create aesthetic value. The CONSULTANT shall prepare graphic exhibits, including rendered conceptual plans, cross sections, sketches and other media appropriate for public communication that illustrates the landscape concept design concept (vision) and future visual conditions that will be produces by each alternative.

4.12.2.9. Assessment of Visual Impacts

The CONSULTANT shall assess the visual impacts of each alternative based on evaluation criteria designed to measure the alternative's Landscape aesthetic characteristics and benefits.

4.12.3. Multi-Use Opportunities Assessment

The CONSULTANT shall prepare an assessment of the opportunities and limitations of integrating multiple-use functions into the project. The purpose of this assessment is to serve as a basis for the formulation of alternatives that will fully provide flood control functions while maximizing opportunities to meet local community needs for recreation open space, protection and enhancement of natural landscape and local community character, alternative forms of transportation, and ground water recharge.

4.12.3.1. Inventory of Existing and Future Planned Land Uses

The CONSULTANT shall inventory existing and future planned land uses, including recreation sites, open spaces, natural areas, transportation systems and nodes, and residential, commercial, educational, and employment centers, within and adjacent to the project area. The CONSULTANT shall also review the inventory of existing conditions and identify opportunities for protection or restoration of the natural and/or cultural landscape features and areas. This assessment shall include one or more map exhibits and brief narrative description of the above conditions. It shall also include an interpretation of the information describing Multi-Use options.

4.12.3.2. Identification of Multi-use Opportunities

The CONSULTANT shall utilize the inventory of existing and future land uses and the planning and design requirements for flood control to briefly identify and describe the types of multi-uses that might be appropriately incorporated into the project. The CONSULTANT shall identify ways in which flood control facilities could be strategically located and designed to contribute to or serve as a vehicle for development of local community recreation facilities, open space systems, alternative forms of transportation, protect or restore natural resources, natural landscape, or local community character. The CONSULTANT shall identify the types of multi-uses that could be integrated into the floodway while fully providing for flood control. The identified opportunities shall be delineated on the map exhibit and briefly described in the narrative. The CONSULTANT

shall briefly describe the benefits associated with integrating the identified multi-use opportunities into the project.

4.12.3.3. Assessment of Existing DISTRICT Facilities for Multi-use potential

The CONSULTANT shall assess the suitability of existing DISTRICT facilities for multi-uses (recreation). This assessment will include identifying the constraints and opportunities associated with using existing DISTRICT facilities for multi-uses and identifying possible means for eliminating barriers.

4.12.3.4. Identification of Possible Partners and Funding Sources

The CONSULTANT shall identify and briefly describe in the narrative possible partners and funding sources for implementation of multi-use opportunities for each alternative.

4.12.3.5. Implementation Guidelines

The CONSULTANT shall identify design standards / implementation guidelines for integration of multi-use opportunities with flood control facilities, as needed to guide project planning and design in subsequent phases.

4.13. TRAFFIC

4.13.1. The CONSULTANT shall review and identify requirements for public and private access within and across the project for the ultimate build out section for all proposed roadways. The CONSULTANT shall coordinate and document all aspects of the traffic requirements with the jurisdictional authority as required within the project limits.

4.14. DELIVERABLES

4.14.1. GENERAL

4.14.1.1. The CONSULTANT shall submit all items 'sealed' by the appropriate registrant. Upon receipt of the final submittal, the DISTRICT shall review the report and preliminary plans for the accurate incorporation of all final comments. If incomplete and/or incorrect incorporation of those comments is found as determined by the DISTRICT, the original documents shall be returned to the CONSULTANT for correction and re-submittal. Additionally, all costs to correct these deficiencies shall be at the sole expense of the CONSULANT.

4.14.1.2. The CONSULTANT shall submit computer files of the information to the DISTRICT delivered on CDROMs. All reports shall be in Word 6.0 and all spreadsheets shall be in Excel 97 or an alternate format approved by the DISTRICT and be submitted with each required submittal. Data and plans shall be submitted in CADD ASCII.DXF format per the DISTRICT's Hydrologic Information System (HIS) database shall comply with the DISTRICT's HIS Data Delivery Specifications, *Rev 3.1, June 1, 1998* or alternate format approved by the DISTRICT. The Conceptual designs and plans shall be submitted in MicroStation PC Version 5.07 or alternate format or as otherwise approved by the DISTRICT

4.14.1.3. The CONSULTANT shall submit, unless otherwise specified in the Scope of Work, three copies of all draft submittals for review and five copies of the final submittals, and shall submit two copies of both draft and final reports to other review AGENCIES as specified in section 1.5.

4.14.2. REPORTS

4.14.2.1. DATA COLLECTION REPORT

The Data Collection Report will contain a description of the known flooding problems within the study area, the data collected, and the existing drainage structures in the area and discuss any surveying that has been performed. Existing major natural washes and existing and planned man-made drainage facilities in the watershed will be shown on the Existing Facilities Exhibit to be submitted with the Data Collection Report.

4.14.2.1.1. The Data Collection Report shall include but not limited to the following:

- Executive Summary
- Project Description
- Scope of Project
- Data Collection Results
  - Current Conditions
  - Areas of Flooding
  - Existing and Future Developments
  - Areas and Location of Potential Flooding
  - Existing and Future Drainage Facilities
- Environmental Overview
  - Ecological Assessment
  - Archeological Assessment
  - Environmental Permits and Approvals
  - Hazardous Waste Inventory
  - Aesthetic Treatments & Multi-Use Analysis
- Land
  - Rights-of-Entry Requirements
  - Land Use/Zoning Map
- Initial Hydrological Report
- Major Utilities
- Existing Facilities Exhibit
- References/Figures

4.14.2.2. PROJECT SURVEY REPORT

Survey data will be documented in a Project Survey Report. Copies of all survey note books or printout of digital files developed with data collectors will be provided. The horizontal and vertical benchmarks used for the survey shall be documented along with documentation of the datum upon which the benchmark was originally established. Conversion to other datums as required herein shall be documented in the report. A summary table of the ERM's and bench marks shall be included.

4.14.2.3. ALTERNATIVES ANALYSIS REPORT

4.14.2.3.1. The Alternatives Analysis Report shall be prepared containing narrative descriptions of the alternatives considered and discarded, the alternatives selected for analysis, the results of the analysis of alternatives, and comparative cost estimates. The advantages and disadvantages and general environmental impacts of each alternative shall be identified. The recommended alternative shall be identified in the report. Results from the brainstorming sessions and the alternatives analysis meeting will be documented in the Alternatives Analysis Report.

4.14.2.3.2. The Alternatives Analysis Report Format should include the following as a minimum;

- Summary
- Description of Study Area
- Scope of Project
- Alternatives Evaluation
- Selection of Recommended Alternative(s)
- Cost Estimates
- References
- List of Figures
- Location Map
- Topographic Map
- Map depicting Project Area
- Alternatives Descriptions with drawing/sketches
- List of Tables

4.14.2.3.3. The report shall be submitted in draft form for review to the DISTRICT. Upon receipt of review comments, the CONSULTANT shall incorporate appropriate revisions and complete the final report

4.14.2.4. AREA DRAINAGE MASTER PLAN UPDATE REPORT

4.14.2.4.1. The CONSULTANT shall prepare a design and cost estimate for the preferred alternative. The preferred alternative shall be designed and plans prepared to a level of detail that includes inlets and catch basins, and the resolution of any utility conflicts. It is appropriate to base designs upon available topographic mapping, supplemented with field surveys at hydraulically or structurally critical locations. Design detail shall be refined to allow the calculation of unit quantities of major project features. Design of the project features shall be sufficient to determine the costs.

4.14.2.4.2. The Area Drainage Master Plan Update Report shall include the following as a minimum:

Summary
Description of Study Area
Scope of Project
Design Criteria and Objectives
Existing Utilities and Site Constraints
Design Features
Environmental and Permit Issues
Implementation and Phasing Plan
Maintenance Plan
References
Conceptual Plans
List of Figures
Location Map
Map depicting phasing Plan for Preferred Alternative
List of Tables
Peak Discharges
Preliminary Design Costs

4.14.2.4.3. TECHNICAL DATA REPORT

The report shall be submitted to the DISTRICT for review. Upon receipt of review comments, the CONSULTANT shall make appropriate revisions and submit the final report.

4.14.2.4.4. Conceptual Drawings:

Indicate existing topography.
Indicate lateral alignment, plan/profile, cross-section requirements.
Indicate cultural, biological, and environmental impact areas
Include the approximate size and configuration of project features.
Indicate conflicting utilities that may require relocation and/or protection.
Details need not be included.

4.14.2.5. PROJECT ADMINISTRATION REPORT

The Project Administration Report shall include copies of all invoices, schedules, correspondence, minutes of meetings and conversations with the DISTRICT, affected agencies and others as appropriate.

4.14.2.6. THE HYDROLOGIC REPORT

4.14.2.6.1. The 90% and final findings of the hydrologic study will be presented in a section of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97). The report will be organized as specified by the DISTRICT, following SSA 1-97 format. The report shall be submitted as required in section 4.2.

4.14.2.6.2. Initial and draft findings of the hydrologic study will be presented in a separate report for review and comment by the DISTRICT as per section 4.2.

4.14.2.6.3. Each of the report(s) shall also contain a section for hydraulic data as required by section 4.3.

4.14.2.6.4. Tables and Figures for the appendices:

Soils map(s) at the same scale as the base map.
Land use map(s) at the same scale as above.
One set of study maps (i.e. sub-basin boundary maps, flow path maps, soils maps, land use maps) to be folded and delivered in a binder.
Schematic map for the HEC-1 showing the 100-year flow (cfs) at each concentration and combination point.
Locations of Cross sections used for water surface profile calculations.

4.14.2.7. TECHNICAL DATA REPORT

4.14.2.7.1. The CONSULTANT shall submit a Technical Data Report with each submittal of the Area Drainage Master Plan Update Report. The report shall be organized and tabulated for easy reference.

4.14.2.7.2. The report shall contain all technical data, calculations, sketches and details as specified in this Scope of Work.

4.14.2.7.3. The report shall be submitted both in a hard copy and CD-ROM formats specified in this Scope of Work.

4.14.2.7.4. Monthly Progress Report
The CONSULTANT shall submit a Monthly Progress Report as specified in section 3.3 of this Scope of Work.

5. REFERENCES AND STANDARDS

5.1. STANDARD DETAILS AND SPECIFICATIONS

5.1.1. "Uniform Standard Details for Public Works Construction", Maricopa Association of Governments (MAG), 1998;

5.1.2. "Uniform Standard Specifications for Public Works Construction", MAG, 1998;

5.1.3. City of Phoenix (COP) "Supplement to the MAG Uniform Standards Details and Specifications, together with current revisions shall be utilized as part of the design criteria.

5.1.4. Use standard MAG details on plans unless otherwise requested by DISTRICT. ADOT standard details may be used, as approved and when appropriate, then modified to be referenced to MAG specifications.

5.1.5. "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects", latest revision.

5.2. DESIGN MANUALS, POLICIES AND PROCEDURES (done)

5.2.1. "Drainage Design Manual for Maricopa County, Arizona, Volume I Hydrology", latest edition.

5.2.2. "Drainage Design Manual for Maricopa County Arizona, Volume II Hydraulics", latest edition.

5.2.3. "Drainage Design Manual for Maricopa County, Arizona, Volume III Erosion Control", latest edition.

5.2.4. "Urban Highways, Channel Lining Design GUIDELINEs", February 1989, ADOT.

5.2.5. Structural design shall be in accordance with current AASHTO Specifications. Street and maintenance road crossings shall be designed to accommodate HS20-44 loading. Calculations shall be based on service loads and the working stress method.

5.2.6. "Policy on Geometric Design of Highways and Streets", AASHTO, 1994, commonly referred to as the "Green Book", and "Maricopa County Department of Transportation Roadway Design Manual" latest edition and revisions shall be used, unless otherwise requested by DISTRICT.

5.2.7. "Roadside Design Guide", 1989, AASHTO, to be used to establish clear distances and other related safety issues.

5.2.8. "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects", by the Flood Control District Of Maricopa County, latest edition.

5.2.9. "Channel Design Criteria for Major Watercourses", DISTRICT, latest edition.

5.2.10. "A Levee Policy for the National Flood Insurance Program", National Research Council, 1982.

5.3. STANDARDS

5.3.1. GIS/HIS

The CONSULTANT shall prepare digital data in conformance with the Deliver specs (Rev. 3.1 June 1, 1998) Chapter 3 – Appendix C, CADD Delivery specs.

5.3.1.1. Conceptual plans shall be prepared in accordance with the CONSULTANT GUIDELINES section 19 and shall include, but not be limited to:

I. Plan and profile sheets, and cross sections as applicable.
II. Utility relocations
III. Special details

5.3.1.2. Unless otherwise approved in writing by the DISTRICT, the CONSULTANT shall use the following scales.

Alternative Analysis and Other 1" = 1200'
Preferred Analysis 1"=400" Horizontally, 1" = 40' Vertically

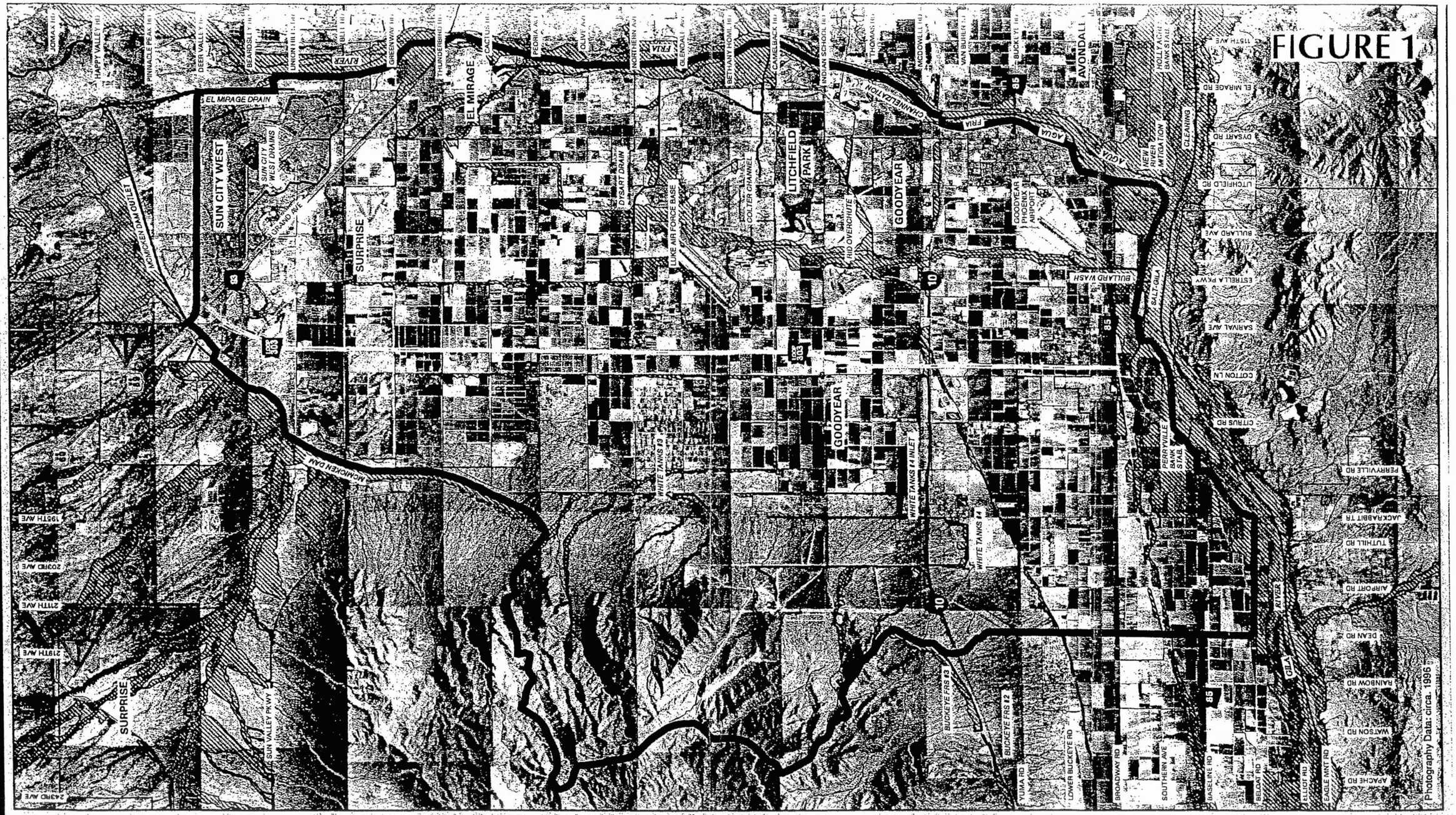
5.3.1.3. The CONSULTANT shall use a larger scale if necessary to obtain good clarity in the plans and reduced prints. The CONSULTANT shall be responsible for using a scale that results in good plan clarity.

5.3.1.4. Drawings shall be in MicroStation PC, Version 5.07 format or as otherwise approved by the DISTRICT.

5.3.1.4.1. All lettering on drawings shall be vertical, plain, and legible. 'Architectural' style lettering shall not be accepted. The following lettering sizes apply:

1/8"	Lettering and Notes
5/32"	Subtitles
7/32"	Main Titles

5.3.1.4.2. The DISTRICT shall provide the CONSULTANT with a CD-ROM diskette containing the files for the standard cover sheet and working drawing sheets.



SYMBOLS

- FEMA FLOODPLAINS (20.8 SQ MILES DELINEATED)
- WHITE TANKS WATERSHED (AREA = 226.5 SQ MI)
- USGS 1:100,000 HYDROGRAPHY
- PROPOSED 303 ALIGNMENT
- FCDMC STRUCTURES
- CITY LIMITS

LOOP 303 CORRIDOR
WHITE TANKS ADMP UPDATE

0 5000 10000 20000
Feet

APPENDIX A-II

EXISTING CONDITION HYDROLOGY – DISCHARGE COMPARISON

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% [1] Change
1	1342	12.5	1	1573	12.5	1	n/a	1573	12.5	*no change*
2	1174	12.75	2	1339	12.75	2	n/a	1339	12.75	*no change*
3	828	12.33	3	863	12.33	3	n/a	863	12.33	*no change*
4	339	12.25	4	396	12.25	4	n/a	396	12.25	*no change*
5	716	12.25	5	927	12.25	5	n/a	927	12.25	*no change*
6	591	12.08	6	746	12.08	6	n/a	746	12.08	*no change*
7	390	12.08	7	494	12.08	7	n/a	494	12.08	*no change*
8	704	12.33	8	890	12.33	8	n/a	890	12.33	*no change*
9	1096	12.42	9	1402	12.33	9	n/a	1402	12.33	*no change*
10	1173	12.75	10	1357	12.75	10	n/a	1357	12.75	*no change*
11	1313	12.5	11	1559	12.42	11	n/a	1559	12.42	*no change*
12	1149	12.58	12	1214	12.5	12	n/a	1214	12.5	*no change*
13	1170	12.42	13	1223	12.42	13	n/a	1223	12.42	*no change*
14	1163	12.33	14	1548	12.33	14	n/a	1548	12.33	*no change*
15	1039	12.42	15	1272	12.42	15	n/a	1272	12.42	*no change*
16	1255	12.42	16	1206	12.42	16	n/a	1206	12.42	*no change*
17	929	12.25	17	1036	12.33	17	n/a	1036	12.33	*no change*
18	923	12.17	18	1179	12.17	18	n/a	1179	12.17	*no change*
19	622	12.42	19	819	12.42	19	n/a	819	12.42	*no change*
20	861	12.33	20	1218	12.33	20	n/a	1218	12.33	*no change*
21	688	12.42	21	913	12.42	21	n/a	913	12.42	*no change*
22	525	12.25	22	730	12.25	22	n/a	730	12.25	*no change*
23	289	12.08	23	310	12.08	23	n/a	310	12.08	*no change*
24	207	12.25	24	193	12.25	24	n/a	193	12.25	*no change*
25	500	12.33	25	560	12.33	25	n/a	560	12.33	*no change*
26	943	12.5	26	1333	12.5	26	n/a	1333	12.5	*no change*
27	999	12.42	27	1153	12.33	27	n/a	1153	12.33	*no change*
28	747	12.5	28	734	12.5	28	n/a	734	12.5	*no change*
29	228	12.25	29	262	12.25	29	n/a	262	12.25	*no change*
30	244	12.33	30	338	12.25	30	n/a	338	12.25	*no change*
31	525	12.5	31	580	12.5	31	n/a	580	12.5	*no change*
32	956	12.42	32	1154	12.33	32	n/a	1154	12.33	*no change*
33	643	12.25	33	811	12.25	33	n/a	811	12.25	*no change*
34	361	12.25	34	457	12.25	34	n/a	457	12.25	*no change*
35	400	12.25	35	510	12.17	35	n/a	510	12.17	*no change*
36	193	12.25	36	301	12.25	36	n/a	301	12.25	*no change*
37	672	12.42	37	909	12.42	37	n/a	909	12.42	*no change*
38	715	12.25	38	911	12.25	38	n/a	911	12.25	*no change*
39	588	12.5	39	628	12.5	39	n/a	628	12.5	*no change*
40	525	12.25	40	586	12.25	40	n/a	586	12.25	*no change*
41	567	12.42	41	536	12.42	41	n/a	536	12.42	*no change*
42	1029	12.5	42	1055	12.5	42	n/a	1055	12.5	*no change*
43	23	12	43	23	12	43	n/a	23	12	*no change*
44	300	12.25	44	287	12.25	44	n/a	287	12.25	*no change*
45	401	12.42	45	845	12	45	n/a	845	12	*no change*
46	651	12.58	46	525	12.58	46	n/a	525	12.58	*no change*
101	233	12.25	101	215	12.25	101	n/a	215	12.25	*no change*
104	236	12.17	104	218	12.25	104	n/a	218	12.25	*no change*
105	354	12.25	105	306	12.25	105	n/a	306	12.25	*no change*
106	871	12.5	106	712	12.5	106	n/a	712	12.5	*no change*
111	443	12.67	111	482	12.08	111	n/a	482	12.08	*no change*
112	534	13.33	112	846	12.25	112	n/a	846	12.25	*no change*
114	326	13	114	2117	12.75	114	n/a	2117	12.75	*no change*
115	379	13.08	115	2122	12.67	115	n/a	2122	12.67	*no change*
116	575	13.5	116	872	12.33	116	n/a	872	12.33	*no change*
117	335	12.83	117	920	12.58	117	n/a	920	12.58	*no change*
118	126	12.83	118	326	12.08	118	n/a	326	12.08	*no change*
119	600	13.17	119	544	13.17	119	n/a	544	13.17	*no change*
120	397	13.25	120	388	13.25	120	n/a	388	13.25	*no change*
121	325	12.92	121	360	12.92	121	n/a	360	12.92	*no change*
123	338	13	123	320	13	123	n/a	320	13	*no change*
124	355	13.33	124	331	13.33	124	n/a	331	13.33	*no change*
125	1044	12.5	125	934	12.5	125	n/a	934	12.5	*no change*
126	562	13.33	126	1038	12.5	126	n/a	1038	12.5	*no change*
127	469	12.08	127	456	12.08	127	n/a	456	12.08	*no change*
128	312	12.92	128	299	12.92	128	n/a	299	12.92	*no change*
129	378	12.67	129	339	12.67	129	n/a	339	12.67	*no change*
130	647	13.25	130	571	13.25	130	n/a	571	13.25	*no change*
131	355	13.08	131	317	13.08	131	n/a	317	13.08	*no change*
132	271	13	132	253	13	132	n/a	253	13	*no change*
133	328	13.08	133	304	12.83	133	n/a	304	12.83	*no change*
134	334	13.08	134	313	13.08	134	n/a	313	13.08	*no change*
135	315	13.17	135	373	12.67	135	n/a	373	12.67	*no change*
136	315	13.08	136	291	13.08	136	n/a	291	13.08	*no change*
137	307	13.42	137	280	13.42	137	n/a	280	13.42	*no change*
138	587	13.33	138	278	13	138	n/a	278	13	*no change*
139	338	13.08	139	719	12.25	139	n/a	719	12.25	*no change*
140	194	12.67	140	180	12.67	140	n/a	180	12.67	*no change*
141	460	12.33	141	484	12.33	141	n/a	484	12.33	*no change*
142	351	13	142	305	13	142	n/a	305	13	*no change*
143	354	13	143	300	13	143	n/a	300	13	*no change*
144	351	13	144	328	13	144	n/a	328	13	*no change*
145	328	13.08	145	297	13.08	145	n/a	297	13.08	*no change*
146	548	13.17	146	523	13.17	146	n/a	523	13.17	*no change*
147	342	13	147	325	13	147	n/a	325	13	*no change*
148	328	13	148	307	13	148	n/a	307	13	*no change*
149	312	13.08	149	293	13.08	149	n/a	293	13.08	*no change*
150	193	12.75	150	188	12.75	150	n/a	188	12.75	*no change*
151	208	12.75	151	200	12.75	151	n/a	200	12.75	*no change*
152	284	12.92	152	252	12.92	152	n/a	252	12.92	*no change*
153	112	13.33	153	117	13.33	153	n/a	117	13.33	*no change*
154	171	12.58	154	174	12.58	154	n/a	174	12.58	*no change*
155	250	12.75	155	255	12.75	155	n/a	255	12.75	*no change*
156	252	12.75	156	233	12.75	156	n/a	233	12.75	*no change*
157	946	12.58	157	610	12.83	157	n/a	610	12.83	*no change*
158	494	13.08	158	1195	12.33	158	n/a	1195	12.33	*no change*
159	531	12.33	159	608	12.33	159	n/a	608	12.33	*no change*
160	432	12.42	160	409	12.42	160	n/a	409	12.42	*no change*
161	294	13	161	310	13	161	n/a	310	13	*no change*
162	268	12.5	162	268	12.5	162	n/a	268	12.5	*no change*

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% [1] Change
163	551	12.92	163	492	12.92	163	n/a	492	12.92	*no change*
164	363	13.08	164	314	13.08	164	n/a	314	13.08	*no change*
165	548	13.25	165	507	13.25	165	n/a	507	13.25	*no change*
166	533	13.33	166	496	13.33	166	n/a	496	13.33	*no change*
167	528	13.33	167	501	13.33	167	n/a	501	13.33	*no change*
168	340	13.17	168	312	13.17	168	n/a	312	13.17	*no change*
169	368	13.17	169	384	13.17	169	n/a	384	13.17	*no change*
170	301	12.67	170	296	12.67	170	n/a	296	12.67	*no change*
171	409	13.42	171	386	13.42	171	n/a	386	13.42	*no change*
172	122	12.58	172	111	12.58	172	n/a	111	12.58	*no change*
173	198	13	173	193	13	173	n/a	193	13	*no change*
174	612	12.25	174	572	12.25	174	n/a	572	12.25	*no change*
175	375	12.25	175	354	12.25	175	n/a	354	12.25	*no change*
176	701	12.42	176	635	12.42	176	n/a	635	12.42	*no change*
177	336	13.08	177	291	13.08	177	n/a	291	13.08	*no change*
178	298	13.08	178	274	13.08	178	n/a	274	13.08	*no change*
179	333	13.08	179	293	13.08	179	n/a	293	13.08	*no change*
180	574	13.33	180	515	13.33	180	n/a	515	13.33	*no change*
181	283	12.92	181	258	12.92	181	n/a	258	12.92	*no change*
182	212	12.75	182	191	12.75	182	n/a	191	12.75	*no change*
183	258	12.42	183	226	12.42	183	n/a	226	12.42	*no change*
184	531	13.17	184	465	13.17	184	n/a	465	13.17	*no change*
185	465	13.08	185	443	13.08	185	n/a	443	13.08	*no change*
186	187	13.25	186	180	13.25	186	n/a	180	13.25	*no change*
187	81	12	187	75	12	187	n/a	75	12	*no change*
188	240	12.25	188	256	12.25	188	n/a	256	12.25	*no change*
189	521	12.42	189	514	12.42	189	n/a	514	12.42	*no change*
190	657	12.92	190	534	12.92	190	n/a	534	12.92	*no change*
191	610	13.25	191	545	13.25	191	n/a	545	13.25	*no change*
192	346	13.08	192	282	13.08	192	n/a	282	13.08	*no change*
193	545	13.25	193	502	13.25	193	n/a	502	13.25	*no change*
195	256	13.5	195	239	13.5	195	n/a	239	13.5	*no change*
196	313	13	196	284	13	196	n/a	284	13	*no change*
197	524	13.5	197	468	13.5	197	n/a	468	13.5	*no change*
198	494	13.42	198	547	13.08	198	n/a	547	13.08	*no change*
199	74	13.08	199	71	13.08	199	n/a	71	13.08	*no change*
200	231	12.67	200	216	12.67	200	n/a	216	12.67	*no change*
201	420	12.33	201	379	12.33	201	n/a	379	12.33	*no change*
202	258	13.42	202	235	13.42	202	n/a	235	13.42	*no change*
203	162	12.25	203	145	12.25	203	n/a	145	12.25	*no change*
204	381	12.25	204	366	12.25	204	n/a	366	12.25	*no change*
205	125	12.08	205	112	12.08	205	n/a	112	12.08	*no change*
206	188	12.17	206	182	12.17	206	n/a	182	12.17	*no change*
207	619	13.25	207	508	13.25	207	n/a	508	13.25	*no change*
208	632	13.17	208	530	13.17	208	n/a	530	13.17	*no change*
209	336	13.08	209	308	13.08	209	n/a	308	13.08	*no change*
210	296	13.08	210	283	13.08	210	n/a	283	13.08	*no change*
211	309	13.08	211	300	13.08	211	n/a	300	13.08	*no change*
212	279	13.42	212	268	13.42	212	n/a	268	13.42	*no change*
213	373	12.5	213	335	12.5	213	n/a	335	12.5	*no change*
214	208	12.25	214	196	12.25	214	n/a	196	12.25	*no change*
215	419	12.33	215	383	12.33	215	n/a	383	12.33	*no change*
216	366	12.92	216	301	12.92	216	n/a	301	12.92	*no change*
217	350	13	217	309	13	217	n/a	309	13	*no change*
218	624	13.25	218	498	13.25	218	n/a	498	13.25	*no change*
219	343	13.08	219	278	13.08	219	n/a	278	13.08	*no change*
220	335	13.08	220	281	13.08	220	n/a	281	13.08	*no change*
221	303	13.08	221	292	13.08	221	n/a	292	13.08	*no change*
222	541	13.58	222	493	13.58	222	n/a	493	13.58	*no change*
223	1763	12.42	223	1689	12.42	223	n/a	1689	12.42	*no change*
224	1054	12.33	224	1022	12.33	224	n/a	1022	12.33	*no change*
225	460	12.42	225	430	12.5	225	n/a	430	12.5	*no change*
226	1573	12.33	226	1426	12.33	226	n/a	1426	12.33	*no change*
227	331	12.25	227	311	12.25	227	n/a	311	12.25	*no change*
228	361	12.33	228	326	12.33	228	n/a	326	12.33	*no change*
229	724	12.17	229	702	12.17	229	n/a	702	12.17	*no change*
230	56	12.33	230	59	12.33	230	n/a	59	12.33	*no change*
231	265	12.42	231	303	12.42	231	n/a	303	12.42	*no change*
232	1006	12.42	232	953	12.42	232	n/a	953	12.42	*no change*
233	496	12.42	233	464	12.42	233	n/a	464	12.42	*no change*
234	347	13.17	234	280	13.17	234	n/a	280	13.17	*no change*
235	303	13.17	235	243	13.17	235	n/a	243	13.17	*no change*
236	582	13.25	236	516	13.25	236	n/a	516	13.25	*no change*
237	300	13.25	237	280	13.25	237	n/a	280	13.25	*no change*
238	314	13.17	238	301	13.17	238	n/a	301	13.17	*no change*
239	313	13.08	239	300	13.08	239	n/a	300	13.08	*no change*
240	282	13	240	266	13	240	n/a	266	13	*no change*
241	1436	12.5	241	1380	12.5	241	n/a	1380	12.5	*no change*
242	965	12.67	242	1063	12.17	242	n/a	1063	12.17	*no change*
243	298	12.33	243	293	12.08	243	n/a	293	12.08	*no change*
244	200	12.58	244	95	13	244	n/a	95	13	*no change*
245	181	13.17	245	168	12.83	245	n/a	168	12.83	*no change*
246	670	12.5	246	619	12.5	246	n/a	619	12.5	*no change*
247	330	13.08	247	303	13.08	247	n/a	303	13.08	*no change*
248	592	13.25	248	471	13.25	248	n/a	471	13.25	*no change*
249	571	13.25	249	514	13.25	249	n/a	514	13.25	*no change*
250	316	13.08	250	294	13.08	250	n/a	294	13.08	*no change*
251	313	13.17	251	302	13.17	251	n/a	302	13.17	*no change*
252	326	13.17	252	294	13.17	252	n/a	294	13.17	*no change*
253	641	13.17	253	493	13	253	n/a	493	13	*no change*
254	556	12.58	254	434	12.17	254	n/a	434	12.17	*no change*
256	326	13	256	297	12.83	256	n/a	297	12.83	*no change*
257	217	13.42	257	207	13.42	257	n/a	207	13.42	*no change*
258	334	12.42	258	355	12.42	258	n/a	355	12.42	*no change*
259	242	12.25	259	263	12.17	259	n/a	263	12.17	*no change*
260	536	12.33	260	523	12.33	260	n/a	523	12.33	*no change*
261	264	13.17	261	212	13.17	261	n/a	212	13.17	*no change*
262	616	13.25	262	509	13.25	262	n/a	509	13.25	*no change*
263	328	13.08	263	291	13.08	263	n/a	291	13.08	*no change*
264	337	13	264	318	13	264	n/a	318	13	*no change*

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% [1] Change
265	118	13.33	265	98	13.08	265	n/a	98	13.08	no change
266	181	13.33	266	923	12.42	266	n/a	923	12.42	no change
267	335	13.17	267	1412	12.42	267	n/a	1412	12.42	no change
268	589	13.25	268	513	12.08	268	n/a	513	12.08	no change
269	491	13	269	405	12.17	269	n/a	405	12.17	no change
270	446	12.25	270	548	12.08	270	n/a	548	12.08	no change
272	231	12.25	272	267	12.25	272	n/a	267	12.25	no change
273	671	12.42	273	624	12.42	273	n/a	624	12.42	no change
274	329	13.5	274	282	13.5	274	n/a	282	13.5	no change
275	136	12.42	275	117	12.42	275	n/a	117	12.42	no change
276	187	13	276	167	13	276	n/a	167	13	no change
277	570	13.08	277	495	13.08	277	n/a	495	13.08	no change
278	537	13.33	278	452	13.33	278	n/a	452	13.33	no change
279	79	12.25	279	71	12.25	279	n/a	71	12.25	no change
280	340	13.33	280	313	13.33	280	n/a	313	13.33	no change
281	487	13.25	281	393	13	281	n/a	393	13	no change
282	161	12.33	282	160	12.33	282	n/a	160	12.33	no change
283	102	13.08	283	84	12.75	283	n/a	84	12.75	no change
284	326	13.17	284	201	12.75	284	n/a	201	12.75	no change
285	56	12.33	285	55	12.33	285	n/a	55	12.33	no change
286	473	13.08	286	420	12.92	286	n/a	420	12.92	no change
287	223	12.67	287	211	12.67	287	n/a	211	12.67	no change
288	160	13.25	288	125	13.25	288	n/a	125	13.25	no change
289	519	13.83	289	492	12.17	289	n/a	492	12.17	no change
290	413	12.67	290	453	12.67	290	n/a	453	12.67	no change
291	454	13.25	291	1555	12.17	291	n/a	1555	12.17	no change
292	1004	12.5	292	903	12.5	292	n/a	903	12.5	no change
293	679	12.67	293	586	12.67	293	n/a	586	12.67	no change
294	274	12.17	294	237	12.25	294	n/a	237	12.25	no change
295	419	12.25	295	428	12.25	295	n/a	428	12.25	no change
296	565	13	296	339	12.58	296	n/a	339	12.58	no change
297	240	13.17	297	231	13.17	297	n/a	231	13.17	no change
298	591	13	298	654	12.75	298	n/a	654	12.75	no change
299	289	13	299	324	12.75	299	n/a	324	12.75	no change
300	353	12.83	300	348	12.83	300	n/a	348	12.83	no change
301	535	12.17	301	504	12.17	301	n/a	504	12.17	no change
302	242	12.17	302	225	12.17	302	n/a	225	12.17	no change
303	910	12.67	303	626	12.67	303	n/a	626	12.67	no change
304	1221	12.33	304	1104	12.33	304	n/a	1104	12.33	no change
305	666	13	305	525	13	305	n/a	525	13	no change
306	367	12.92	306	343	12.92	306	n/a	343	12.92	no change
307	219	12.58	307	208	12.58	307	n/a	208	12.58	no change
308	270	12.75	308	260	12.75	308	n/a	260	12.75	no change
309	666	13.17	309	606	13.17	309	n/a	606	13.17	no change
310	183	12.58	310	165	12.58	310	n/a	165	12.58	no change
311	420	13.33	311	402	13.33	311	n/a	402	13.33	no change
312	423	13.17	312	415	13.17	312	n/a	415	13.17	no change
313	258	13.17	313	651	12.17	313	n/a	651	12.17	no change
314	293	13	314	337	12.67	314	n/a	337	12.67	no change
315	278	13.25	315	266	13.25	315	n/a	266	13.25	no change
316	512	13.17	316	502	13.17	316	n/a	502	13.17	no change
317	341	13.25	317	323	13.25	317	n/a	323	13.25	no change
318	581	12.67	318	547	12.67	318	n/a	547	12.67	no change
319	577	12.5	319	531	12.5	319	n/a	531	12.5	no change
320	677	12.42	320	685	12.42	320	n/a	685	12.42	no change
321	942	12.17	321	866	12.17	321	n/a	866	12.17	no change
322	261	12.92	322	212	12.92	322	n/a	212	12.92	no change
323	181	12.33	323	162	12.33	323	n/a	162	12.33	no change
324	279	12.83	324	237	12.83	324	n/a	237	12.83	no change
325	294	13.25	325	242	13.25	325	n/a	242	13.25	no change
326	373	13	326	344	13	326	n/a	344	13	no change
327	373	13	327	358	13	327	n/a	358	13	no change
328	521	12.92	328	473	12.92	328	n/a	473	12.92	no change
329	496	12.83	329	455	12.83	329	n/a	455	12.83	no change
330	467	12.83	330	484	12.67	330	n/a	484	12.67	no change
331	489	13.08	331	468	13.08	331	n/a	468	13.08	no change
332	353	13.17	332	315	13.17	332	n/a	315	13.17	no change
333	388	13.08	333	558	12.5	333	n/a	558	12.5	no change
334	452	13	334	269	12.5	334	n/a	269	12.5	no change
335	277	12.92	335	400	12.67	335	n/a	400	12.67	no change
336	552	13.92	336	540	13.92	336	n/a	540	13.92	no change
337	744	12.25	337	694	12.25	337	n/a	694	12.25	no change
338	260	12.58	338	255	12.58	338	n/a	255	12.58	no change
339	625	13.17	339	511	13.17	339	n/a	511	13.17	no change
340	348	13	340	283	13	340	n/a	283	13	no change
341	506	13.08	341	427	13.08	341	n/a	427	13.08	no change
342	327	12.83	342	278	12.83	342	n/a	278	12.83	no change
343	323	13.17	343	297	13.17	343	n/a	297	13.17	no change
344	343	13.33	344	325	13.33	344	n/a	325	13.33	no change
345	296	13	345	273	13	345	n/a	273	13	no change
346	403	12.75	346	358	12.75	346	n/a	358	12.75	no change
347	671	13.08	347	595	13.08	347	n/a	595	13.08	no change
348	283	12.75	348	261	12.75	348	n/a	261	12.75	no change
349	654	13	349	580	13	349	n/a	580	13	no change
350	106	13.33	350	101	13.33	350	n/a	101	13.33	no change
351	607	12.83	351	540	12.83	351	n/a	540	12.83	no change
352	150	12.75	352	144	12.75	352	n/a	144	12.75	no change
353	183	12.75	353	167	12.75	353	n/a	167	12.75	no change
354	315	12.58	354	297	12.58	354	n/a	297	12.58	no change
355	85	12.92	355	90	12.92	355	n/a	90	12.92	no change
356	346	12.58	356	333	12.58	356	n/a	333	12.58	no change
357	132	12.67	357	128	12.67	357	n/a	128	12.67	no change
358	119	13.17	358	122	13.17	358	n/a	122	13.17	no change
359	104	12.58	359	101	12.58	359	n/a	101	12.58	no change
360	168	13	360	176	13	360	n/a	176	13	no change
361	138	13.17	361	147	13.17	361	n/a	147	13.17	no change
362	339	12.83	362	325	12.83	362	n/a	325	12.83	no change
363	360	13.25	363	343	13.25	363	n/a	343	13.25	no change
364	559	13	364	305	13.08	364	n/a	305	13.08	no change
365	272	12.83	365	267	12.83	365	n/a	267	12.83	no change

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% [1] Change
366	289	13	366	249	13	366	n/a	249	13	*no change*
367	240	12.08	367	245	12.08	367	n/a	245	12.08	*no change*
368	367	13.58	368	367	13.58	368	n/a	367	13.58	*no change*
369	133	12.25	369	171	12.25	369	n/a	171	12.25	*no change*
370	61	12.33	370	60	12.33	370	n/a	60	12.33	*no change*
371	487	13.67	371	533	13.67	371	n/a	533	13.67	*no change*
372	796	13.75	372	884	13.75	372	n/a	884	13.75	*no change*
373	386	12.75	373	398	12.75	373	n/a	398	12.75	*no change*
374	459	13.5	374	493	13.5	374	n/a	493	13.5	*no change*
375	262	13.42	375	274	13.42	375	n/a	274	13.42	*no change*
376	344	13	376	357	13	376	n/a	357	13	*no change*
377	120	12.42	377	120	12.42	377	n/a	120	12.42	*no change*
378	349	13.42	378	415	13.42	378	n/a	415	13.42	*no change*
379	220	13.58	379	214	13.58	379	n/a	214	13.58	*no change*
380	188	12.83	380	199	12.83	380	n/a	199	12.83	*no change*
381	184	12.92	381	191	12.92	381	n/a	191	12.92	*no change*
382	539	13.17	382	552	13.17	382	n/a	552	13.17	*no change*
383	154	12.92	383	161	12.92	383	n/a	161	12.92	*no change*
384	262	12.83	384	271	12.83	384	n/a	271	12.83	*no change*
385	298	13.17	385	314	13.17	385	n/a	314	13.17	*no change*
386	222	13.25	386	241	13.25	386	n/a	241	13.25	*no change*
387	205	13	387	221	13	387	n/a	221	13	*no change*
			2711	226	12	2711	n/a	226	12	*no change*
			2712	705	12.17	2712	n/a	705	12.17	*no change*
100A	212	12.5	100A	173	12.5	100A	n/a	173	12.5	*no change*
102A	525	12.58	102A	462	12.5	102A	n/a	462	12.5	*no change*
			111A	870	12.25	111A	n/a	870	12.25	*no change*
113A	409	13.08	113A	772	12.25	113A	n/a	772	12.25	*no change*
119A	356	13.17	119A	296	13.17	119A	n/a	296	13.17	*no change*
121A	324	12.92	121A	366	12.92	121A	n/a	366	12.92	*no change*
			122A	587	12.25	122A	n/a	587	12.25	*no change*
			122B	734	12.25	122B	n/a	734	12.25	*no change*
131A	354	13.08	131A	316	13.08	131A	n/a	316	13.08	*no change*
			138A	717	12.17	138A	n/a	717	12.17	*no change*
141A	202	12.17	141A	214	12.17	141A	n/a	214	12.17	*no change*
145A	327	13.08	145A	287	13.08	145A	n/a	287	13.08	*no change*
156A	508	12.17	156A	501	12.17	156A	n/a	501	12.17	*no change*
164A	365	13.08	164A	309	13.08	164A	n/a	309	13.08	*no change*
173A	191	12.75	173A	161	12.75	173A	n/a	161	12.75	*no change*
173B	88	12.83	173B	110	12.83	173B	n/a	110	12.83	*no change*
175A	362	12.5	175A	417	12.5	175A	n/a	417	12.5	*no change*
176A	378	13.25	176A	327	13.25	176A	n/a	327	13.25	*no change*
177A	334	13.08	177A	293	13.08	177A	n/a	293	13.08	*no change*
181A	249	13.17	181A	227	13.17	181A	n/a	227	13.17	*no change*
192A	345	13.08	192A	327	12.83	192A	n/a	327	12.83	*no change*
			194A	210	12.75	194A	n/a	210	12.75	*no change*
			194B	206	12.75	194B	n/a	206	12.75	*no change*
			194C	707	13.42	194C	n/a	707	13.42	*no change*
207A	469	12.42	207A	497	12.42	207A	n/a	497	12.42	*no change*
209A	335	13.08	209A	276	13.08	209A	n/a	276	13.08	*no change*
215A	497	12.42	215A	453	12.42	215A	n/a	453	12.42	*no change*
221A	175	13.25	221A	172	13.25	221A	n/a	172	13.25	*no change*
225A	441	12.42	225A	409	12.42	225A	n/a	409	12.42	*no change*
228A	125	12.17	228A	129	12.08	228A	n/a	129	12.08	*no change*
22A	764	12.25	22A	733	12.25	22A	n/a	733	12.25	*no change*
230A	292	12.17	230A	287	12.17	230A	n/a	287	12.17	*no change*
242A	161	12.08	242A	204	12	242A	!!242A	204	12	*no change*
			242B	607	12.17	242B	n/a	607	12.17	*no change*
243A	253	12.42	243A	353	12.08	243A	n/a	353	12.08	*no change*
243B	64	12.67	243B	120	12.25	243B	n/a	120	12.25	*no change*
244A	486	12.17	244A	220	12.08	244A	n/a	220	12.08	*no change*
			244B	46	12.58	244B	n/a	46	12.58	*no change*
			245A	132	12.17	245A	n/a	132	12.17	*no change*
250A	308	13.17	250A	296	13.17	250A	n/a	296	13.17	*no change*
253A	291	12.33	253A	253	12.33	253A	n/a	253	12.33	*no change*
254A	443	12.08	254A	340	12.08	254A	n/a	340	12.08	*no change*
			254B	246	12.08	254B	n/a	246	12.08	*no change*
			255A	916	12.25	255A	n/a	916	12.25	*no change*
258A	150	12.25	258A	140	12.25	258A	n/a	140	12.25	*no change*
265A	627	13.08	265A	506	12.83	265A	n/a	506	12.83	*no change*
			269B	410	12.17	269B	n/a	410	12.17	*no change*
271A	95	13.33	271A	260	12.58	271A	n/a	260	12.58	*no change*
271C	263	12.17	271C	278	12.17	271C	n/a	278	12.17	*no change*
279A	89	12.33	279A	185	12	279A	n/a	185	12	*no change*
279B	46	12.25	279B	81	12	279B	n/a	81	12	*no change*
279C	78	12.25	279C	136	12	279C	n/a	136	12	*no change*
279D	33	12.17	279D	30	12.17	279D	n/a	30	12.17	*no change*
280A	53	12.75	280A	50	12.75	280A	n/a	50	12.75	*no change*
285A	82	12.33	285A	80	12.33	285A	n/a	80	12.33	*no change*
285B	83	12.33	285B	81	12.33	285B	n/a	81	12.33	*no change*
287A	331	12.83	287A	246	12.58	287A	n/a	246	12.58	*no change*
287B	127	12.5	287B	155	12.17	287B	n/a	155	12.17	*no change*
287C	270	12.67	287C	315	12.25	287C	n/a	315	12.25	*no change*
287D	239	12.67	287D	234	12.67	287D	n/a	234	12.67	*no change*
287E	194	12.58	287E	365	12.17	287E	n/a	365	12.17	*no change*
288A	607	13.33	288A	63	12.5	288A	n/a	63	12.5	*no change*
288B	179	13.42	288B	864	12.58	288B	n/a	864	12.58	*no change*
289A	326	13.17	289A	326	12.17	289A	n/a	326	12.17	*no change*
			289B	569	12.08	289B	n/a	569	12.08	*no change*
			289C	383	12.17	289C	n/a	383	12.17	*no change*
			289D	388	12.17	289D	n/a	388	12.17	*no change*
293A	76	12.5	293A	73	12.5	293A	n/a	73	12.5	*no change*
294A	368	12.25	294A	338	12.25	294A	n/a	338	12.25	*no change*
295A	114	12.08	295A	106	12.08	295A	n/a	106	12.08	*no change*
			296A	394	12.42	296A	n/a	394	12.42	*no change*
297A	206	12.92	297A	198	12.92	297A	n/a	198	12.92	*no change*
303A	531	12.25	303A	486	12.25	303A	n/a	486	12.25	*no change*
311A	241	12.92	311A	248	12.92	311A	n/a	248	12.92	*no change*
325A	404	13.08	325A	337	13.08	325A	n/a	337	13.08	*no change*
			335A	107	12.25	335A	n/a	107	12.25	*no change*

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% [1] Change
336A	149	14	336A	78	13.5	336A	n/a	78	13.5	*no change*
338A	736	12.42	338A	766	12.42	338A	n/a	766	12.42	*no change*
342A	240	13.17	342A	224	13.17	342A	n/a	224	13.17	*no change*
346A	110	13	346A	102	13	346A	n/a	102	13	*no change*
346B	159	13.25	346B	146	13.25	346B	n/a	146	13.25	*no change*
346C	135	12.5	346C	131	12.5	346C	n/a	131	12.5	*no change*
348A	229	12.58	348A	215	12.58	348A	n/a	215	12.58	*no change*
348B	355	13.33	348B	391	13.33	348B	n/a	391	13.33	*no change*
352A	89	13.08	352A	84	13.08	352A	n/a	84	13.08	*no change*
355A	46	12.5	355A	47	12.5	355A	n/a	47	12.5	*no change*
364A	99	12.25	364A	92	12.67	364A	n/a	92	12.67	*no change*
			364B	146	13.08	364B	n/a	146	13.08	*no change*
377A	188	13	377A	184	13	377A	n/a	184	13	*no change*
377B	58	13.58	377B	55	13.58	377B	n/a	55	13.58	*no change*
381A	115	12.58	381A	123	12.58	381A	n/a	123	12.58	*no change*
381B	67	12.75	381B	69	12.75	381B	n/a	69	12.75	*no change*
383A	122	13	383A	134	13	383A	n/a	134	13	*no change*
3A	296	12.33	3A	313	12.33	3A	!BC1	313	12.33	*no change*
41-1	208	12.17	41-1	223	12.17	41-1	n/a	223	12.17	*no change*
41-2	143	12.17	41-2	150	12.17	41-2	n/a	150	12.17	*no change*
41A	91	12.08	41A	92	12	41A	n/a	92	12	*no change*
41A1	48	12	41A1	47	12	41A1	n/a	47	12	*no change*
41A2	60	12	41A2	64	12	41A2	n/a	64	12	*no change*
41A3	69	12	41A3	61	12	41A3	n/a	61	12	*no change*
43-1	76	12.08	43-1	73	12.08	43-1	n/a	73	12.08	*no change*
43-2	19	12	43-2	19	12	43-2	n/a	19	12	*no change*
43-3	107	12	43-3	106	12	43-3	n/a	106	12	*no change*
43-4	64	12	43-4	64	12	43-4	n/a	64	12	*no change*
43-5	43	12	43-5	44	12	43-5	n/a	44	12	*no change*
43-6	45	12	43-6	44	12	43-6	n/a	44	12	*no change*
43-7	45	12	43-7	46	12	43-7	n/a	46	12	*no change*
43-8	23	12	43-8	23	12	43-8	n/a	23	12	*no change*
45-1	143	12.08	45-1	137	12.08	45-1	n/a	137	12.08	*no change*
46-1	184	12.25	46-1	151	12.25	46-1	n/a	151	12.25	*no change*
CP10	5141	12.75	CP10	6522	12.75	CP10	!BC3	6322	12.83	*-3.1%*
			CP102A	597	12.42	CP102A	n/a	597	12.42	*no change*
			CP106	409	12.83	CP106	n/a	409	12.83	*no change*
			CP111A	271	12.42	CP111A	n/a	271	12.42	*no change*
CP112	790	13.33	CP112	393	12.67	CP112	n/a	393	12.67	*no change*
CP113A	560	13.08	CP113A	766	12.25	CP113A	!LP0	772	12.25	*0.8%*
CP114	376	13.08	CP114	860	13.5	CP114	n/a	586	13.42	*-31.9%*
CP115	2705	13.17	CP115	513	13.58	CP115	n/a	381	13.58	*-25.7%*
CP117	1172	13.75	CP117	454	13.08	CP117	n/a	454	13.08	*no change*
CP119A	533	13.25	CP119A	439	13.25	CP119A	n/a	439	13.25	*no change*
CP12	4125	12.83	CP12	4459	12.83	CP12	!BC4	6593	12.92	*47.9%*
CP120	1056	13.33	CP120	857	13.33	CP120	n/a	857	13.33	*no change*
CP121	708	13	CP121	692	12.92	CP121	n/a	353	12.92	*-49.0%*
CP121A	465	12.92	CP121A	402	12.92	CP121A	!LP	854	12.92	*112.4%*
			CP122A	911	14	CP122A	!RM1	709	12.5	*-22.2%*
			CP122B	719	12.25	CP122B	n/a	719	12.25	*no change*
CP124	665	13.33	CP124	618	13.33	CP124	n/a	618	13.33	*no change*
CP125	1318	14.08	CP125	924	12.5	CP125	n/a	924	12.5	*no change*
CP126	856	13.33	CP126	776	12.83	CP126	n/a	762	12.83	*-1.8%*
CP128	537	13.25	CP128	481	12.92	CP128	n/a	481	12.92	*no change*
CP13	1743	12.58	CP13	2062	12.58	CP13	n/a	2062	12.58	*no change*
CP130	1703	13.42	CP130	1457	13.42	CP130	n/a	1457	13.42	*no change*
CP131	1909	13.5	CP131	1727	13.5	CP131	n/a	514	13.25	*-70.2%*
CP131A	1102	13.58	CP131A	979	13.58	CP131A	n/a	979	13.58	*no change*
CP132	460	13.58	CP132	415	13.58	CP132	n/a	288	13	*-30.6%*
CP133	725	14.33	CP133	1005	14.42	CP133	!RM2	957	12.92	*-4.8%*
CP134	2847	14	CP134	558	13.25	CP134	n/a	313	13.08	*-43.9%*
CP135	970	14.08	CP135	389	12.83	CP135	n/a	388	12.83	*-0.3%*
CP136	931	14.92	CP136	527	13.17	CP136	n/a	523	13.17	*-0.8%*
CP137	1306	14.5	CP137	867	13.5	CP137	n/a	929	13.5	*7.2%*
CP138	1326	15	CP138	314	14.08	CP138	!RR1	425	13.5	*35.4%*
			CP138A	453	16.08	CP138A	n/a	115	12.5	*-74.6%*
CP139	569	13.33	CP139	870	13	CP139	!LE1	683	12.42	*-21.5%*
CP141A	540	12.33	CP141A	571	12.33	CP141A	n/a	571	12.33	*no change*
CP142	692	12.5	CP142	690	12.5	CP142	n/a	690	12.5	*no change*
CP143	992	13	CP143	921	12.92	CP143	n/a	921	12.92	*no change*
CP144	1398	13.67	CP144	1199	13.08	CP144	n/a	1199	13.08	*no change*
CP145	2946	14	CP145	2498	14	CP145	n/a	454	13.92	*-81.8%*
CP145A	1467	13.25	CP145A	1318	13.25	CP145A	n/a	1318	13.25	*no change*
CP146	1441	14.08	CP146	727	13.5	CP146	!RM3	1366	13.25	*87.9%*
CP147	2010	14.42	CP147	372	15.33	CP147	n/a	312	13	*-16.1%*
CP148	323	13	CP148	291	13	CP148	n/a	291	13	*no change*
CP149	533	13.58	CP149	400	13.67	CP149	n/a	399	13.67	*-0.3%*
CP15	1920	12.5	CP15	2485	12.5	CP15	n/a	2485	12.5	*no change*
CP150	196	12.75	CP150	183	12.75	CP150	n/a	183	12.75	*no change*
CP151	638	13.75	CP151	531	13.42	CP151	n/a	565	13.42	*6.4%*
CP152	320	13.25	CP152	266	13	CP152	!RR3	785	13.5	*195.1%*
CP153	423	16.17	CP153	234	15.83	CP153	!RR2	492	13.42	*110.3%*
CP154	1017	16	CP154	366	16	CP154	*LLE1*	*173*	*12.58*	*-52.7%*
CP155	243	12.75	CP155	237	12.75	CP155	n/a	237	12.75	*no change*
CP156	598	13	CP156	965	13	CP156	!LE2	808	13	*-16.3%*
CP157	1733	15	CP157	1487	12.92	CP157	!LE3	1386	12.92	*-6.8%*
CP158	557	14.17	CP158	534	12.58	CP158	n/a	534	12.58	*no change*
CP160	955	12.42	CP160	996	12.42	CP160	n/a	996	12.42	*no change*
CP161	1032	12.58	CP161	1087	12.58	CP161	n/a	1087	12.58	*no change*
CP163	1575	13	CP163	1565	13	CP163	n/a	1565	13	*no change*
CP164	2141	13.25	CP164	1944	13.25	CP164	n/a	304	13.08	*-84.4%*
CP164A	1865	13.17	CP164A	1765	13.17	CP164A	n/a	1765	13.17	*no change*
CP165	3187	15.08	CP165	1945	15.17	CP165	!RM4	1640	13.67	*-15.7%*
CP166	1975	15.58	CP166	506	13.42	CP166	n/a	506	13.42	*no change*
CP167	1870	15.92	CP167	924	13.75	CP167	n/a	924	13.75	*no change*
CP168	515	13.5	CP168	424	13.58	CP168	!RR4	936	13.58	*120.8%*
CP169	491	13.83	CP169	463	13.83	CP169	n/a	370	13.83	*-20.1%*
CP17	3428	12.75	CP17	4474	12.67	CP17	n/a	4474	12.67	*no change*
CP172	1729	15.08	CP172	1573	12.92	CP172	!LE4	1356	13.08	*-13.8%*
CP173	1706	15.42	CP173	1578	13.33	CP173	!LE5	865	13.92	*-45.2%*

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% [1] Change
CP173A	421	13.58	CP173A	387	13.67	CP173A	n/a	387	13.67	*no change*
CP173B	496	14.58	CP173B	257	13.17	CP173B	n/a	257	13.17	*no change*
CP175A	687	12.42	CP175A	721	12.42	CP175A	n/a	721	12.42	*no change*
CP176	792	12.5	CP176	708	12.5	CP176	n/a	708	12.5	*no change*
CP176A	378	13.25	CP176A	322	13.25	CP176A	n/a	322	13.25	*no change*
CP177	902	13.75	CP177	738	13.75	CP177	n/a	286	13.08	*-61.2%*
CP177A	581	13.17	CP177A	493	13.17	CP177A	n/a	493	13.17	*no change*
CP178	993	13.42	CP178	810	13.42	CP178	n/a	486	13.17	*-40.0%*
CP179	3923	14.17	CP179	1834	14	CP179	!RM5	2179	13.67	*18.8%*
CP180	1797	14.33	CP180	1185	16.5	CP180	n/a	477	13.33	*-59.7%*
CP181	292	14.75	CP181	240	12.92	CP181	n/a	239	12.92	*-0.4%*
CP181A	1200	16.25	CP181A	736	13.83	CP181A	n/a	736	13.83	*no change*
CP182	903	16.58	CP182	582	14.17	CP182	n/a	172	12.75	*-70.4%*
CP183	1078	16.42	CP183	638	14.17	CP183	!RR6	1733	14.25	*171.6%*
CP184	1574	17.5	CP184	1085	15.25	CP184	n/a	525	13.83	*-51.6%*
CP185	552	13.67	CP185	486	13.67	CP185	n/a	486	13.67	*no change*
CP187	173	13.67	CP187	166	13.67	CP187	n/a	166	13.67	*no change*
CP188	1457	12.83	CP188	2517	12.83	CP188	n/a	244	12.25	*-90.3%*
CP189	940	12.58	CP189	954	12.58	CP189	n/a	954	12.58	*no change*
CP19	1353	12.33	CP19	1799	12.33	CP19	n/a	1799	12.33	*no change*
CP190	1336	13.08	CP190	1224	13.08	CP190	!NR2	1309	13	*6.9%*
CP191	2358	13.25	CP191	2050	13.25	CP191	!NR3	2246	13.25	*9.6%*
CP192	1241	13.75	CP192	747	13.83	CP192	!NR5	262	13.08	*-64.9%*
CP192A	1140	13.5	CP192A	704	13.58	CP192A	!LP5	2624	13.42	*272.7%*
CP193	2347	14.5	CP193	926	14.42	CP193	!RM6	826	13	*-10.8%*
			CP194A	192	12.75	CP194A	n/a	188	12.75	*-2.1%*
			CP194B	921	14.75	CP194B	!!194B	1120	12.92	*21.6%*
			CP194C	748	13.42	CP194C	n/a	812	13.42	*8.6%*
CP195	2559	15.5	CP195	1360	18	CP195	!!C195	1722	14.75	*26.6%*
CP196	945	17.42	CP196	1483	18.08	CP196	!!C196	1784	14.67	*20.3%*
CP197	611	18.42	CP197	435	16.17	CP197	n/a	421	13.5	*-3.2%*
CP198	1418	19.17	CP198	1111	16.75	CP198	n/a	684	15.25	*-38.4%*
CP2	2284	12.75	CP2	2657	12.75	CP2	n/a	2657	12.75	*no change*
CP200	231	12.67	CP200	216	12.67	CP200	n/a	216	12.67	*no change*
CP202	565	13.42	CP202	1480	18.25	CP202	!!C202	1816	14.83	*22.7%*
CP203	598	18.92	CP203	431	16.58	CP203	n/a	378	14	*-12.3%*
CP204	1721	19.25	CP204	2295	17.5	CP204	n/a	2375	15.25	*3.5%*
CP205	1721	19.33	CP205	2294	17.58	CP205	!!C205	2375	15.33	*3.5%*
CP206	1722	19.33	CP206	153	12.17	CP206	n/a	153	12.17	*no change*
CP207A	1450	13	CP207A	2469	13	CP207A	n/a	671	12.42	*-72.8%*
CP208	2175	13.33	CP208	1969	13.58	CP208	n/a	678	13.25	*-65.6%*
CP209	1285	14.08	CP209	800	14.17	CP209	n/a	294	13.08	*-63.3%*
CP209A	1706	13.58	CP209A	1479	13.67	CP209A	*1D209A*	*1539*	*14.5*	*4.1%*
CP21	1933	12.42	CP21	2606	12.42	CP21	n/a	2606	12.42	*no change*
CP210	304	13.08	CP210	277	13.08	CP210	n/a	276	13.08	*-0.4%*
			CP211	287	13.08	CP211	n/a	287	13.08	*no change*
CP212	1350	15.58	CP212	289	13.75	CP212	n/a	289	13.75	*no change*
CP214	1392	13.08	CP214	2423	13.08	CP214	n/a	738	12.42	*-69.5%*
CP215	1484	12.42	CP215	376	13.58	CP215	n/a	374	12.5	*-0.5%*
CP217	372	13.08	CP217	1415	13.42	CP217	n/a	506	13.25	*-64.2%*
CP218	669	13.25	CP218	468	13.25	CP218	n/a	485	13.25	*3.6%*
CP219	1270	14.58	CP219	1083	14.75	CP219	!LP7	1770	14.83	*63.4%*
CP220	1241	14.58	CP220	898	14.67	CP220	n/a	273	13.08	*-69.6%*
CP221	1018	15.17	CP221	579	15.42	CP221	n/a	414	13.75	*-28.5%*
CP221A	1377	16.17	CP221A	451	14.67	CP221A	n/a	451	14.67	*no change*
CP222	1380	16.5	CP222	499	15.08	CP222	n/a	499	15.08	*no change*
CP223	2480	16.33	CP223	1534	12.42	CP223	n/a	1534	12.42	*no change*
CP224	2410	16.58	CP224	1856	12.5	CP224	!BD1N	2103	12.5	*13.3%*
CP225	959	12.42	CP225	832	12.42	CP225	n/a	832	12.42	*no change*
CP229	863	12.33	CP229	771	12.33	CP229	n/a	771	12.33	*no change*
CP22A	1108	12.33	CP22A	1285	12.33	CP22A	n/a	1285	12.33	*no change*
CP23	288	12.08	CP23	909	12.92	CP23	n/a	909	12.92	*no change*
CP230	672	12.42	CP230	637	12.33	CP230	n/a	637	12.33	*no change*
CP230A	530	12.25	CP230A	508	12.25	CP230A	n/a	508	12.25	*no change*
CP231	279	12.5	CP231	305	12.5	CP231	n/a	305	12.5	*no change*
CP233	1685	12.58	CP233	722	12.5	CP233	n/a	713	12.5	*-1.2%*
CP234	2084	12.83	CP234	1565	13.17	CP234	n/a	1303	12.75	*-16.7%*
CP235	1467	13.42	CP235	1956	13.75	CP235	n/a	1139	13.42	*-41.8%*
CP236	1222	13.58	CP236	1176	14	CP236	n/a	897	13.67	*-23.7%*
CP237	993	13.83	CP237	856	14.08	CP237	!LP8	2097	14.92	*145.0%*
CP238	1226	15.25	CP238	1053	15.33	CP238	*1D238*	*158*	*21.75*	*-85.0%*
CP239	2367	16.17	CP239	1863	15.92	CP239	!CM2	372	14.83	*-80.0%*
CP240	634	16.5	CP240	544	13	CP240	!CM3	485	13.08	*-10.8%*
CP241	4216	17.08	CP241	2376	12.92	CP241	!BD2N	3244	12.5	*36.5%*
CP242	1051	12.58	CP242	1054	12.17	CP242	!!C242	1054	12.17	*no change*
			CP242B	678	12.17	CP242B	!!242B	678	12.17	*no change*
CP243	1462	12.67	CP243	650	12.42	CP243	!!C243	650	12.42	*no change*
CP243A	1263	12.67	CP243A	1160	12.25	CP243A	!!243A	1160	12.25	*no change*
CP243B	1112	12.67	CP243B	768	12.25	CP243B	n/a	768	12.25	*no change*
CP244	1195	12.5	CP244	746	12.58	CP244	n/a	746	12.58	*no change*
CP244A	485	12.17	CP244A	215	12.08	CP244A	n/a	215	12.08	*no change*
			CP244B	1160	12.33	CP244B	!!244B	1160	12.33	*no change*
CP245	1861	13.17	CP245	1132	12.33	CP245	!!C245	1132	12.33	*no change*
			CP245A	617	12.58	CP245A	!!245A	617	12.58	*no change*
CP246	1239	12.58	CP246	1150	12.58	CP246	n/a	613	12.5	*-46.7%*
CP248	2174	13.67	CP248	1848	14	CP248	n/a	1365	13.58	*-26.1%*
CP249	694	14	CP249	553	14.25	CP249	n/a	512	13.58	*-7.4%*
CP25	1414	12.42	CP25	1670	12.42	CP25	n/a	1670	12.42	*no change*
CP250	909	14.42	CP250	693	14.67	CP250	!LP9	557	13.67	*-19.6%*
CP250A	1254	14.58	CP250A	535	14.92	CP250A	!!250A	268	13.17	*-49.9%*
CP251	2394	16.5	CP251	1503	16.5	CP251	!!C251	482	13.25	*-67.9%*
CP252	439	16.83	CP252	1538	16.83	CP252	!!C252	621	13.58	*-59.6%*
CP253	4103	17.67	CP253	2640	13.33	CP253	!BD3N	3410	12.75	*29.2%*
			CP254B	244	12.08	CP254B	n/a	244	12.08	*no change*
			CP255A	1107	12.17	CP255A	n/a	1107	12.17	*no change*
CP256	325	13	CP256	296	12.83	CP256	n/a	296	12.83	*no change*
CP259	243	12.25	CP259	262	12.17	CP259	n/a	262	12.17	*no change*
CP260	1336	12.75	CP260	1237	12.75	CP260	n/a	787	12.42	*-36.4%*
CP261	264	13.17	CP261	212	13.17	CP261	n/a	212	13.17	*no change*
CP262	2219	13.83	CP262	1786	14.17	CP262	n/a	1466	13.83	*-17.9%*

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% [1] Change
CP263	1071	14.08	CP263	840	14.33	CP263	n/a	710	14.08	-15.5%
CP264	412	14.33	CP264	332	13.08	CP264	n/a	332	13.08	no change
			CP265	507	13.75	CP265	!LP10	624	13.75	23.1%
CP265A	604	13.08	CP265A	587	14	CP265A	n/a	458	12.83	-22.0%
CP267	2106	16.92	CP267	2557	13.75	CP267	!BD4N	3248	12.92	27.0%
CP268	4676	17.92	CP268	914	12.17	CP268	n/a	914	12.17	no change
CP269	491	13	CP269	592	12.17	CP269	n/a	592	12.17	no change
CP27	3011	12.5	CP27	3741	12.5	CP27	n/a	3741	12.5	no change
			CP2711	338	12.08	CP2711	n/a	338	12.08	no change
			CP2712	1359	12.25	CP2712	!!2712	1359	12.25	no change
CP271A	284	13.42	CP271A	260	12.58	CP271A	n/a	260	12.58	no change
CP271C	263	12.17	CP271C	274	12.17	CP271C	n/a	274	12.17	no change
CP272	304	12.25	CP272	318	12.25	CP272	n/a	318	12.25	no change
CP273	1407	12.83	CP273	1275	12.92	CP273	!10W1	970	12.67	-23.9%
CP274	687	13.17	CP274	541	13.17	CP274	!10W2	1010	12.75	86.7%
CP275	135	12.42	CP275	113	12.42	CP275	!10W3	1046	12.75	825.7%
CP276	186	13	CP276	162	13	CP276	!10W4	1175	12.92	625.3%
CP277	606	13.17	CP277	471	13.08	CP277	!10W5	1588	13.08	237.2%
CP278	1660	15.42	CP278	1348	15.75	CP278	!LP11	988	13.33	-26.7%
CP279	1632	15.58	CP279	1313	16	CP279	!LP12	1127	15.83	-14.2%
CP279A	88	12.42	CP279A	34	12.58	CP279A	2D294A	0	0	-100.0%
CP279B	45	12.25	CP279B	74	12	CP279B	!10W8	743	14	904.1%
CP279C	76	12.25	CP279C	126	12	CP279C	2D294	0	0	-100.0%
CP279D	32	12.17	CP279D	27	12.17	CP279D	!10W6	1590	13.08	5788.9%
CP280	826	16.17	CP280	646	16.5	CP280	n/a	307	13.33	-52.5%
CP280A	585	17.58	CP280A	458	17.92	CP280A	n/a	190	15	-58.5%
CP281	742	13.92	CP281	631	13.75	CP281	n/a	630	13.75	-0.2%
CP282	669	14.17	CP282	571	14	CP282	n/a	569	14	-0.4%
CP284	1266	17.58	CP284	199	12.75	CP284	n/a	199	12.75	no change
CP285	1007	18	CP285	49	12.33	CP285	!10C3	170	12.42	246.9%
CP285A	1259	17.83	CP285A	71	12.33	CP285A	!10C2	131	12.33	84.5%
CP285B	229	17.58	CP285B	79	12.33	CP285B	DI297	0	0	-100.0%
CP286	4638	18.5	CP286	2552	14.33	CP286	!BD1S	3556	13	39.3%
CP287	5293	18.58	CP287	2521	14.5	CP287	!BD2S	2321	13.42	-7.9%
CP287A	618	13.83	CP287A	245	12.58	CP287A	n/a	606	13.67	147.3%
CP287B	212	14.25	CP287B	687	12.33	CP287B	n/a	687	12.33	no change
CP287C	649	16.83	CP287C	1414	13.92	CP287C	n/a	1414	13.92	no change
CP287D	382	19.58	CP287D	460	15	CP287D	n/a	460	15	no change
			CP288B	1207	12.58	CP288B	n/a	1207	12.58	no change
CP289	660	16.17	CP289	1239	13.58	CP289	n/a	1239	13.58	no change
			CP289B	1762	12.58	CP289B	n/a	1762	12.58	no change
			CP289C	1636	12.33	CP289C	n/a	1636	12.33	no change
			CP289D	1376	13	CP289D	n/a	1376	13	no change
CP291	453	13.25	CP291	116	12.67	CP291	n/a	116	12.67	no change
CP292	1704	13.25	CP292	1508	13.33	CP292	n/a	891	12.5	-40.9%
CP293	1408	13.5	CP293	1130	13.58	CP293	n/a	903	12.67	-20.1%
CP293A	1367	14.08	CP293A	1101	14.17	CP293A	n/a	742	13.42	-32.6%
CP294	264	12.17	CP294	223	12.25	CP294	n/a	213	12.25	-4.5%
CP294A	730	15.92	CP294A	631	16.25	CP294A	n/a	297	12.25	-52.9%
CP295	722	16.08	CP295	625	16.42	CP295	!LP13	697	18.33	11.5%
CP296	674	18.83	CP296	454	18.33	CP296	n/a	296	12.58	-34.8%
			CP296A	533	16	CP296A	n/a	474	14.75	-11.1%
CP297	230	13.17	CP297	208	13.17	CP297	n/a	208	13.17	no change
CP297A	519	18.33	CP297A	214	12.92	CP297A	n/a	178	12.92	-16.8%
CP298	4491	19.83	CP298	2260	14.92	CP298	!BD3S	2494	13.42	10.4%
CP3	2245	12.92	CP3	2655	12.92	CP3	n/a	0	0	-100.0%
CP3	1755	12.92	CP3	2655	12.92	CP3	n/a	0	0	no change
CP30	879	12.5	CP30	923	12.5	CP30	!JR3	933	12.5	1.1%
CP302	241	12.17	CP302	221	12.17	CP302	n/a	221	12.17	no change
CP303	911	12.67	CP303	621	12.67	CP303	n/a	621	12.67	no change
CP303A	516	12.25	CP303A	479	12.25	CP303A	n/a	479	12.25	no change
CP304	1646	12.42	CP304	1474	12.42	CP304	!TC1	1417	12.42	-3.9%
CP306	974	13	CP306	807	13	CP306	n/a	646	12.83	-20.0%
CP308	1063	13.25	CP308	888	13.25	CP308	n/a	727	13.17	-18.1%
CP309	1190	15.25	CP309	932	15.5	CP309	n/a	560	13.17	-39.9%
CP31	1258	12.58	CP31	1368	12.58	CP31	!JR4	1324	12.58	-3.2%
CP311	721	13	CP311	611	16.83	CP311	!LP14	695	18.33	13.7%
CP311A	270	12.92	CP311A	267	12.92	CP311A	n/a	267	12.92	no change
CP312	645	20	CP312	817	19.75	CP312	n/a	418	16.25	-48.8%
CP313	247	13.17	CP313	5	12.92	CP313	n/a	5	12.92	no change
CP315	510	19.92	CP315	249	13.25	CP315	n/a	249	13.25	no change
CP316	4483	20.08	CP316	2252	15.33	CP316	!BD4S	2691	13.67	19.5%
CP317	341	13.25	CP317	322	13.25	CP317	n/a	322	13.25	no change
CP318	580	12.67	CP318	547	12.67	CP318	n/a	547	12.67	no change
CP319	578	12.5	CP319	531	12.5	CP319	n/a	531	12.5	no change
CP320	675	12.42	CP320	676	12.42	CP320	n/a	676	12.42	no change
CP321	1309	12.25	CP321	1084	12.25	CP321	n/a	1084	12.25	no change
CP322	1104	13	CP322	660	13.17	CP322	n/a	653	13.08	-1.1%
CP323	1600	12.58	CP323	1417	12.58	CP323	!TC2	1553	12.42	9.6%
CP324	1180	13.25	CP324	921	13.33	CP324	!TC3	1491	12.58	61.9%
CP325	880	13.33	CP325	689	13.33	CP325	n/a	689	13.33	no change
CP326	533	13.08	CP326	489	13.08	CP326	n/a	489	13.08	no change
CP327	1232	13.5	CP327	1024	13.5	CP327	n/a	866	13.42	-15.4%
CP328	1086	16.5	CP328	815	16.83	CP328	n/a	461	14.42	-43.4%
CP329	663	12.83	CP329	600	12.83	CP329	n/a	600	12.83	no change
CP33	1003	12.25	CP33	1259	12.25	CP33	n/a	1259	12.25	no change
CP330	1446	13.08	CP330	1108	13.17	CP330	!LP15	676	12.83	-39.0%
CP331	632	21.25	CP331	809	21	CP331	n/a	426	13.08	-47.3%
CP332	388	13.75	CP332	281	13.17	CP332	n/a	281	13.17	no change
CP333	388	13.08	CP333	555	12.5	CP333	n/a	555	12.5	no change
CP334	4960	20.33	CP334	2398	15.58	CP334	!BD5S	2652	13.75	10.6%
CP335	4949	20.58	CP335	2340	15.92	CP335	!BD6S	2633	13.83	12.5%
			CP335A	2334	16	CP335A	n/a	2618	13.92	12.2%
			BLRD3	2484	16	BLRD1	BLRD2	3111	14.08	
CP336	4943	20.75	CP336	704	13.92	CP336	n/a	704	13.92	no change
CP337	1120	12.83	CP337	1020	12.83	CP337	n/a	1020	12.83	no change
CP337B	58	13.58	CP337B	55	13.58	CP337B	n/a	55	13.58	no change
CP338	852	12.67	CP338	869	12.67	CP338	n/a	869	12.67	no change
CP338A	734	12.42	CP338A	755	12.42	CP338A	n/a	755	12.42	no change
CP339	1396	13.33	CP339	846	13.5	CP339	n/a	838	13.5	-0.9%

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

Concentration Point Comparison
Original ADMS vs. URS Model Output
FCDMC ADMP
Appendix A-II-i

Original ADMS			*Existing Condition - No Projects* URS - 1/19/04			*Existing Condition - With Projects* URS - 2/16/2004				
HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	HEC-1 Station	'Propsed' HEC-1 Station	Peak Flow (cfs)	Time to Peak (hours)	% Change[1]
CP340	1090	13.67	CP340	826	13.75	CP340	!TC4	1546	12.83	*87.2%*
CP341	518	13.92	CP341	425	13.08	CP341	n/a	425	13.08	*no change*
CP342	858	13.75	CP342	648	13.75	CP342	n/a	648	13.75	*no change*
CP342A	625	13.58	CP342A	565	13.58	CP342A	n/a	565	13.58	*no change*
CP343	1821	13.83	CP343	1502	13.83	CP343	n/a	1340	13.75	*-10.8%*
CP344	974	17.33	CP344	730	17.83	CP344	n/a	427	13.92	*-41.5%*
CP345	756	13.17	CP345	671	13.17	CP345	n/a	671	13.17	*no change*
CP346A	1404	13.5	CP346A	1075	13.67	CP346A	!LP16	751	13	*-30.1%*
CP346B	1268	14.25	CP346B	951	21.83	CP346B	n/a	130	13.25	*-86.3%*
CP346C	1244	14.08	CP346C	980	14.33	CP346C	n/a	116	12.5	*-88.2%*
CP347	635	13.08	CP347	521	13.08	CP347	n/a	521	13.08	*no change*
CP348A	379	13.42	CP348A	594	12.92	CP348A	n/a	594	12.92	*no change*
CP348B	667	13.42	CP348B	877	13.25	CP348B	n/a	877	13.25	*no change*
CP349	1430	13.83	CP349	873	14	CP349	n/a	867	13.92	*-0.7%*
CP35	2155	12.33	CP35	2717	12.25	CP35	n/a	2717	12.25	*no change*
CP350	1417	14.25	CP350	872	14.5	CP350	n/a	865	14.42	*-0.8%*
CP351	1053	14	CP351	763	14.08	CP351	!TC5	1926	12.92	*152.4%*
CP352	1238	14.33	CP352	925	14.42	CP352	n/a	925	14.42	*no change*
CP352A	925	14.75	CP352A	674	15	CP352A	!TC6	646	13.67	*-4.2%*
CP353	1291	13.92	CP353	982	14	CP353	n/a	982	14	*no change*
CP354	604	13.92	CP354	546	13.92	CP354	n/a	546	13.92	*no change*
CP355	2031	14.75	CP355	1735	14.75	CP355	n/a	1489	14.67	*-14.2%*
CP356	1792	14.08	CP356	1481	14.08	CP356	n/a	1324	13.92	*-10.6%*
CP357	750	13.42	CP357	663	13.42	CP357	n/a	663	13.42	*no change*
CP358	896	18	CP358	914	24.83	CP358	n/a	175	19.17	*-80.9%*
CP359	1281	14.42	CP359	895	14.75	CP359	n/a	897	13.42	*0.2%*
CP36	2886	12.42	CP36	3736	12.33	CP36	n/a	3736	12.33	*no change*
CP360	1026	15.83	CP360	932	22.92	CP360	n/a	182	16	*-80.5%*
CP362	4429	22.33	CP362	1321	14.67	CP362	n/a	1321	14.67	*no change*
CP363	4435	21.92	CP363	1155	13.92	CP363	n/a	1155	13.92	*no change*
CP364	3139	21.08	CP364	302	13.08	CP364	n/a	302	13.08	*no change*
CP364A	4940	20.83	CP364A	120	12.75	CP364A	n/a	120	12.75	*no change*
			CP367	392	13.92	CP367	n/a	392	13.92	*no change*
CP368	367	13.58	CP368	366	13.58	CP368	n/a	366	13.58	*no change*
CP371	1698	20.67	CP371	1251	21.5	CP371	n/a	1013	14.83	*-19.0%*
CP372	2124	19.42	CP372	1487	20.17	CP372	!TC7	1323	13.83	*-11.0%*
CP373	1770	15.92	CP373	1343	16.08	CP373	n/a	957	16.25	*-28.7%*
CP374	1870	16.83	CP374	1377	17.25	CP374	n/a	989	17.5	*-28.2%*
CP377	120	12.42	CP377	119	12.42	CP377	n/a	119	12.42	*no change*
CP378	4403	23.17	CP378	1193	16.5	!LP17	n/a	447	24.83	*-62.5%*
CP379	1797	21.67	CP379	1466	16.67	CP379	n/a	1619	14.25	*10.4%*
CP38	3253	12.42	CP38	4305	12.42	CP38	n/a	4305	12.42	*no change*
CP380	188	12.83	CP380	198	12.83	CP380	n/a	198	12.83	*no change*
CP382	556	13.17	CP382	544	13.17	!TC8	n/a	1506	13.92	*176.8%*
CP384	269	14.33	CP384	309	14.25	CP384	n/a	309	14.25	*no change*
CP39	6110	12.67	CP39	7708	12.58	CP39	n/a	7708	12.58	*no change*
CP41	567	12.42	CP41	535	12.42	CP41	n/a	535	12.42	*no change*
CP41-1	208	12.17	CP41-1	222	12.17	CP41-1	n/a	222	12.17	*no change*
CP41-2	143	12.17	CP41-2	149	12.17	CP41-2	n/a	149	12.17	*no change*
CP41A	91	12.08	CP41A	91	12	CP41A	n/a	91	12	*no change*
CP41A1	0	0.08	CP41A1	0	0	CP41A1	n/a	0	0	*no change*
CP41A2	60	12	CP41A2	63	12	CP41A2	n/a	63	12	*no change*
CP41A3	86	12.08	CP41A3	83	12.08	CP41A3	n/a	83	12.08	*no change*
CP42	7140	12.67	CP42	8776	12.67	CP42	n/a	8776	12.67	*no change*
CP43	6786	12.83	CP43	8794	12.75	CP43	n/a	8794	12.75	*no change*
CP43-1	465	12.58	CP43-1	423	12.58	CP43-1	n/a	423	12.58	*no change*
CP43-2	19	12	CP43-2	18	12	CP43-2	n/a	18	12	*no change*
CP43-3	107	12	CP43-3	103	12	CP43-3	n/a	103	12	*no change*
CP43-4	64	12	CP43-4	61	12	CP43-4	n/a	61	12	*no change*
CP43-5	43	12	CP43-5	42	12	CP43-5	n/a	42	12	*no change*
CP43-6	45	12	CP43-6	43	12	CP43-6	n/a	43	12	*no change*
CP43-7	45	12	CP43-7	44	12	CP43-7	n/a	44	12	*no change*
CP43-8	23	12	CP43-8	22	12	CP43-8	n/a	22	12	*no change*
			CP44	4880	12.92	CP44	n/a	4880	12.92	*no change*
CP45	1030	13.08	CP45	2581	12.92	CP45	n/a	2891	12.92	*12.0%*
CP45-1	1440	12.92	CP45-1	3296	12.83	CP45-1	n/a	3296	12.83	*no change*
CP46	1737	12.67	CP46	1672	12.75	CP46	!JR5	1683	12.67	*0.7%*
CP46-1	316	13.25	CP46-1	1567	13.08	CP46-1	n/a	1893	13.08	*20.8%*
CP5	1053	12.25	CP5	1315	12.25	CP5	n/a	1315	12.25	*no change*
			CP6	1854	12.17	CP6	n/a	1854	12.17	*no change*
CP7	1668	12.17	CP7	2245	12.17	CP7	n/a	2245	12.17	*no change*
CP9	3227	12.33	CP9	4190	12.33	CP9	n/a	4190	12.33	*no change*
CPWT3	6649	12.92	CPWT3	7618	12.92	CPWT3	!!WT3	9847	12.92	*29.3%*
CPWT4	6026	13	CPWT4	6896	12.92	CPWT4	!!WT4	6833	12.92	*-0.9%*
			SUB6	183	12.17	SUB6	n/a	183	12.17	*no change*
			SUB7	413	12.17	SUB7	n/a	413	12.17	*no change*
WT3	413	12.5	WT3	383	12.5	WT3	n/a	383	12.5	*no change*
WT4	997	12.25	WT4	919	12.25	WT4	n/a	919	12.25	*no change*

1. The change from the 'Existing Condition - No Projects' model to the 'Existing Condition - With Projects' model.

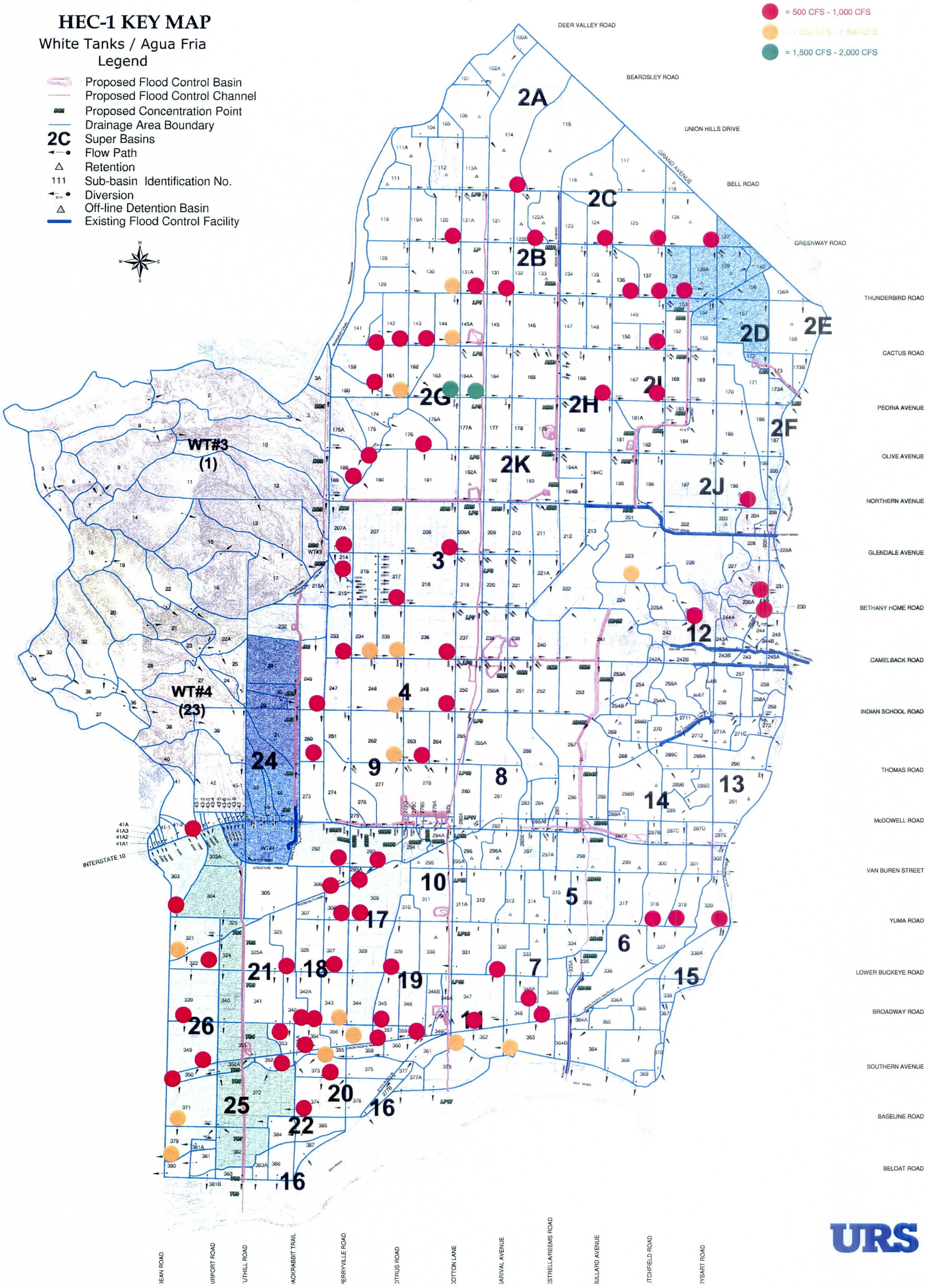
Locations Recommended for
Future Study
Appendix A-II-ii

HEC-1 Station	No Projects - Peak Flow (cfs)	With Projects - Peak Flow (cfs)	%change	Comments/Approximate Location
CP114	860	586	-32%	Bell Road/Cotton - large area northeast of SR 303L drains to this location.
CP120	857	857	0%	Greenway Road - west of Cotton
CP122B	719	719	0%	Greenway, east of SR303L - not reduced by sr303L since contributing watershed from north (not west)
CP124	618	618	0%	Greenway and Bullard - no change since existing reems channel already shown in existing hydrology model.
CP125	924	924	0%	Greenway and Bullard - no change since existing reems channel already shown in existing hydrology model.
CP126	776	762	-2%	Greenway and Bullard - no change since existing reems channel already shown in existing hydrology model.
CP130	1457	1457	0%	Thunderbird, west of Cotton
CP131	1727	514	-70%	Thunderbird, west of Cotton
CP131A	979	979	0%	Thunderbird, west of Cotton
CP136	527	523	-1%	Thunderbird, east of Bullard Ave.
CP137	867	929	7%	Thunderbird, east of Bullard Ave.
CP141A	571	571	0%	Cactus, west of Citrus
CP142	690	690	0%	Cactus, west of Citrus
CP143	921	921	0%	Cactus, east of Citrus
CP144	1199	1199	0%	Cactus, west of SR 303L
CP145A	1318	1318	0%	Cactus, west of SR 303L
CP151	531	565	6%	Cactus and Litchfield Rd.
CP160	996	996	0%	Peoria Ave., west of Citrus Rd.
CP161	1087	1087	0%	Peoria Ave., west of Citrus Rd.
CP163	1565	1565	0%	Peoria Ave., west of Cotton Ln.
CP164A	1765	1765	0%	Peoria Ave., east of Cotton Ln.
CP166	506	506	0%	Peoria Ave. and Bullard Ave.
CP167	924	924	0%	Peoria Ave. and Litchfield Rd.
CP175A	721	721	0%	Olive Ave., west of Cotton Ln.
CP176	708	708	0%	Olive Ave., west of Cotton Ln.
CP189	954	954	0%	between Northern Ave. and Olive Ave., east of Perryville Rd.
CP198	1111	684	-38%	Northern Ave., east of Dysart Rd.
CP207A	2469	671	-73%	Glendale Ave., west of Perryville Rd.
CP208	1969	678	-66%	Glendale Ave., west of Cotton Ln.
CP214	2423	738	-70%	between Glendale Ave. and Bethany Home Rd., west of Perryville Rd.
CP217	1415	506	-64%	Bethany Home Rd. and Citrus Rd.
CP223	1534	1534	0%	between Bethany Home Rd. and Glendale Ave., on LAFB
CP225	832	832	0%	Bethany Home Rd., east of Litchfield Rd.
CP229	771	771	0%	between Bethany Home Rd. and Glendale Ave., west of El Mirage Rd.
CP230	637	637	0%	just north of Bethany Home Rd., east of El Mirage Rd.
CP230A	508	508	0%	just north of Bethany Home Rd., west of El Mirage Rd.
CP233	722	713	-1%	Camelback Rd. and Perryville Rd.
CP234	1565	1303	-17%	Camelback Rd., west of Citrus
CP235	1956	1139	-42%	Camelback Rd. and Citrus
CP236	1176	897	-24%	Camelback Rd. and Cotton Ln.
CP246	1150	613	-47%	Indian School Rd. and Perryville Rd.
CP248	1848	1365	-26%	Indian School Rd. and Citrus Rd.
CP249	553	512	-7%	Indian School Rd. and Cotton Ln.
CP260	1237	787	-36%	Thomas Rd. and Perryville Rd.
CP262	1786	1466	-18%	Thomas Rd. and Citrus Rd.
CP263	840	710	-15%	Thomas Rd., west of Cotton Ln.
CP281	631	630	0%	RID north of I-10 and east of 303/I-10 TI - handled by local developer
CP282	571	569	0%	RID north of I-10 and east of 303/I-10 TI - handled by local developer
CP292	1508	891	-41%	Vanburen St. and Perryville Rd.
CP293	1130	903	-20%	Vanburen St., east of Citrus Rd.
CP293A	1101	742	-33%	south of Vanburen St., east of Perryville Rd.
CP303	621	621	0%	Yuma Rd., west of Airport Rd.
CP306	807	646	-20%	south of Vanburen St., west of Perryville Rd.
CP308	888	727	-18%	Yuma Rd., west of Perryville Rd.
CP309	932	560	-40%	Yuma Rd., east of Perryville Rd.
CP318	547	547	0%	Yuma Rd., east of Bullard Wash outfall
CP319	531	531	0%	Yuma Rd., east of Bullard Wash outfall
CP320	676	676	0%	Yuma Rd., east of Bullard Wash outfall
CP321	1084	1084	0%	south of Yuma Rd., west of Airport Rd.
CP322	660	653	-1%	Lower Buckeye Rd., west of Airport Rd.
CP325	689	689	0%	Lower Buckeye Rd., west of Perryville Rd.
CP327	1024	866	-15%	Lower Buckeye Rd., east of Perryville Rd.
CP329	600	600	0%	Lower Buckeye Rd., east of Citrus Rd.
CP333	555	555	0%	Lower Buckeye Rd., west of Reems Rd.
CP337	1020	1020	0%	north of Yuma Rd., east of Bullard Wash outfall
CP338	869	869	0%	north of Broadway Rd., east of Bullard Wash outfall
CP338A	755	755	0%	Lower Buckeye Rd., east of Bullard Wash outfall
CP339	846	838	-1%	Broadway Rd., west of Airport Rd.
CP342	648	648	0%	Broadway Rd., west of Perryville Rd.
CP342A	565	565	0%	Broadway Rd., east of Perryville Rd.
CP343	1502	1340	-11%	Broadway Rd., east of Perryville Rd.
CP345	671	671	0%	Broadway Rd., west of Citrus Rd.
CP347	521	521	0%	MC85 and Srival Rd.
CP348A	594	594	0%	Broadway Rd., and Reems Rd.
CP348B	877	877	0%	Broadway Rd., and Reems Rd.
CP349	873	867	-1%	Southern Ave., west of Airport Rd.
CP350	872	865	-1%	Southern Ave., west of Airport Rd.
CP352	925	925	0%	Southern Ave., east of Airport Rd.
CP353	982	982	0%	Southern Ave., west of Jackrabbit Tr.
CP354	546	546	0%	Southern Ave., east of Jackrabbit Tr.
CP355	1735	1489	-14%	Southern Ave., west of Perryville Rd.
CP356	1481	1324	-11%	Southern Ave., and Perryville Rd.
CP357	663	663	0%	Union Pacific Rairoad west of Citrus Rd.
CP359	895	897	0%	Union Pacific Rairoad east of Citrus Rd.
CP362	1321	1321	0%	MC85, east of Cotton Ln.
CP363	1155	1155	0%	Southern Ave., east of Sarival Ave.
CP371	1251	1013	-19%	Baseline Rd., west of Airport Rd.
CP373	1343	957	-29%	Southern Ave., west of Perryville Rd.
CP374	1377	989	-28%	Baseline Rd., east of Jackrabbit Tr.
CP379	1466	1619	10%	Beloat Rd. east of Dean Rd.
CP41	535	535	0%	I-10, and Dean Rd.

1. See following figure for the location of each point listed above relative to the HEC-1 drainage basin map.

LOCATIONS RECOMMENDED FOR FURTHER STUDY

LOOP 303 CORRIDOR/WHITE TANKS AREA DRAINAGE MASTER PLAN UPDATE PROPOSED\WITH PROJECTS IN PLACE



APPENDIX A-III

COMPUTATION OF POST STORM

BASIN BLEED TIME

Level III Analysis of the ADOT Basin Post Storm Bleed Time

Once the ADOT basins were analyzed for peak stage, equalization performance and overall capacity, URS performed computations to estimate the post-storm drain bleed time using the existing 48-inch RCP. The most conservative (largest drain time) inflow assumptions (future conditions with projects in place) were used to estimate the time to bleed all of the volume from the basins within the standard 36-hour time frame as required by the FCDMC. Note that the bleed volume used in all other proposed basins for the Selected Alternative was based on the existing condition hydrology with projects in place.

Since the discharge rate through an outlet pipe will vary based on headwater and tailwater conditions, the calculation of drain time was simplified by the assumption that the pipe operates under a constant tailwater condition. The tailwater elevation was set at the flow line of the existing pipe, or 967 feet. This assumption is valid since the existing 48-inch RCP storm drain pipe outlets to the Agua Fria River, which has a much larger watershed area and is somewhat regulated by the existing upstream New Waddell Dam. Therefore, the odds of a relatively large peak flow being present within the Agua Fria River immediately following the peak storm event local to the ADOT basins are considered very remote. However, if this does occur, the basins would merely drain at a rate slower than predicted.

1.1.1.1.1 Detailed Bleed Time Calculation Procedure

The following method was used to estimate the drain time associated with the ADOT basins:

- The ADOT basins were considered a single composite basin. Analysis of the existing connecting pipes between the four basins discussed above indicates that the basins will equalize during the storm event. (i.e., there should not be a situation where a basin overflows due to the rate of inflow exceeding a connector pipe's conveyance capacity).
- The area/stage/volume relationship for the basins was generated using the individual basin rating curves from the original WLB study and combining them into a single (composite) basin. See *Table AI*
- The total inflow volume was determined using the HEC-1 model(s) developed for the existing condition hydrology (with projects in place) and the future condition hydrology (with projects in place).
- The future condition controlled since FCDMC directed URS to assume that future development within the ADOT basin watershed would take place without providing on-site retention.
- The stage-discharge relationship for the existing 48-inch RCP storm drain was developed using two methods. The most conservative of the two was used for the remaining computation. The following steps were taken:
  - ***Method 1***: Use the Haestad Methods, Culvertmaster program to develop a stage–discharge relationship by the following steps:
    - Assume a maximum basin stage of 984.5 feet for the composite facility based on the total inflow volume and interpolating the stage storage relationship to approximate the peak basin stage. The assumption is based on the basins equalizing through the existing connector pipes during the storm event.
    - Assume a maximum TW of 967 feet (or at the flow line of the existing 48-inch RCP 2 feet above the downstream invert elevation of 965 feet.
    - Develop a stage-discharge curve for the existing 48-inch outlet pipe. *Table AII* shows the total incremental volume in the composite basin between the following headwater elevations (970.5, 974, 976, 978, 980, 982, and 984.5).
    - The maximum allowable headwater of 986 feet is not used as the upper limit for the incremental volume estimates due to the maximum inflow volume resulting in an approximate peak stage elevation of 984.5 feet within the composite basin.
    - *Table AII* shows the discharge rates for the 48-inch RCP that correspond with the headwater elevations noted above. *Table AII* also shows the average discharge rates computed for each interval from one basin stage elevation to the next using the rates obtained at each stage on the rating curve. Using the average rate of discharge for each basin stage interval, the time required to drain the incremental volume present within that interval was calculated. The total composite ADOT basin drain time was estimated by a summation of all the incremental drain times obtained for each of the basin stage intervals analyzed.
  - ***Method 2***: Use a hydraulic grade line (HGL) calculation spreadsheet to develop a stage–discharge relationship according to the procedure detailed in "Modern Sewer Design," by the American Iron and Steel Institute, dated 1995. This procedure was used to develop a stage-discharge relationship by the following procedure:
    - Assuming a starting tailwater elevation at the flow-line of the pipe.

- Summing losses through the pipe segments from downstream to upstream for the following:
  - Manhole losses
  - Bend losses – if applicable
  - Entrance/exit losses
  - Friction losses
- The HGL was analyzed by determining the maximum flow rate through the 48-inch RCP at each of the ADOT basin stages listed above.
- Using the same approach as with the Culvertmaster program, an Excel spreadsheet was used to estimate the total time to drain each increment of volume contained between successive headwater elevations as defined by the ADOT basin stage storage relationship.

- From a comparison of the above two methods, the method yielding the longest drain time, ***Method 2***, was selected. *Table AII* summarizes the methods described above. *Tables AIIa-AIIg* located within *Appendix A-III* of this report summarize the HGL computations performed to determine the discharge rates through the existing 48-inch RCP at each stage on the ADOT basin rating curve.

- ***Method 2*** was also used for the subsequent analysis involving the determination of the proposed outlet pipe improvement required to achieve the evacuation of the volume impounded by the composite ADOT basin within 36 hours.
  - The proposed alignment for the improved outlet defined in CAD and the profile developed. This alignment exits the far west basin, Basin D, and proceeds east through the rear parking lot area of the existing Wal-Mart adjacent to the westbound off-ramp from I-10 at Dysart Road. The outlet daylights within the Agua Fria River, less than one-half mile east of Basin D.
  - The HGL spreadsheet was run for this proposed pipe outlet for both an RCB and an RCP option.
  - Using the peak flow rates developed above, the average drain time for each stage incremental volume was determined and a total basin drain time approximated as described in detail above.
  - Pipe sizes were selected on a trial-and-error basis until a total drain time of less than or equal to 36 hours was achieved.

From the analysis results, the four-barrel 48-inch RCP was selected as the best alternative outlet improvement. This was lower in cost than the RCB option and resulted in a total drain time of approximately 34.8 hours. *Table AIII* shows the summary of the computation for bleed time using the proposed improved outlet.

1.1.1.1.2 Bleed Time Calculation by Derived Equation

Although the method(s) outlined above used to determine the total bleed time for a given basin volume seem to give reasonable results, the process is extremely time consuming. Since the procedure requires several steps to complete which include detailed hydraulic grade line calculations at several basin stages to estimate the average flow rates required for the estimate a quick estimate for basin bleed time is not possible. In addition to the ADOT basins, there are another 15 proposed basins. To use the above method for determining the drain time is not feasible given the project time constraints.

Therefore, URS has derived an equation and tested it against the results obtained above to ensure its applicability for use in basin drain time estimates throughout the balance of the project area.

Since the tailwater is assumed to be constant at the flow line of the pipe outlet, the variable having the most significant impact on the outlet discharge rates over time is the inlet headwater. Since the headwater will change over time, the equation derived by URS was set up as a function of that parameter. The equation derived is summarized below:

$$T_{drain} = 8A/C*3.14*d^2 * [(Z+H)^{.5} - Z^{.5}] / 3{,}600$$

Where,

T_{drain} = the estimated time to drain in hours

A = the average basin area over the design operating range of stages, V_{basin}/H

V_{basin} = the total volume impounded by the proposed detention/retention basin

H = the maximum or peak basin stage

d = the proposed drain pipe diameter

Z = the height of the basin bottom above the free outfall invert elevation

3,600 = converts seconds to hours

$C = ((2gd)/(d + fL))^{1/2}$, derived from the Darcey-Weisbach equation

$h_f = v^2/2g + f * [(L/d) * (v^2/2g)]$

g = the acceleration of gravity, 32.15 f/s

f = factor as a function of pipe material, velocity, diameter and length

L = the length of the pipe

v = pipe velocity

The detailed derivation can be found in *Appendix A-III* of this report. *Table AIV* shows the derived formula applied to the bleed time computation for the ADOT Basins. The 'f' factor is a function of the pipe characteristics proposed for the outlet. This value is computed by the following method:

- Calculate the Reynold's number according to, Re = v*d/ν where;
  - ν = kinematic viscosity of water
- Use the Moody Diagram to determine f

From a comparison of the bleed time computed with the derived formula versus that computed using the methodology described above, there was essentially no difference in the final result.

Since the drain time is very sensitive to the 'f' value used, the value was computed at each basin location for the given outlet pipe configuration/characteristics.

Table A.III.i
ADOT Basin Post Storm
Drain Time
Existing 48" RCP Only

Using Methodology from Hand Computations

Diameter: 48 inch

Flow Rate Estimates Based on Culvertmaster

HW Interval No.	Elevation (ft)	Incremental Volume (AF)	Actual Volume to Drain (AF)	HW Interval Range	Flow Rate at Given HW (cfs)	Ave. Flow Rate per Interval (cfs)	Time to Drain Interval Volume	
1	970.5				0			
2	974.0	19.83	19.83	0-3.5	42.73	21.4	11.2 hrs.	
3	976.0	60.19	60.19	3.5-5.5	53.08	47.9	15.2 hrs.	
4	978.0	117.05	117.05	5.5-7.5	59.05	56.1	25.3 hrs.	
5	980.0	172.58	172.58	7.5-9.5	64.51	61.8	33.8 hrs.	
6	982.0	208.84	208.84	9.5-11.5	69.55	67.0	37.7 hrs.	
7	986.0	450.71	284 AF	11.5-15.5	78.68	74.1	46.3 hrs.	
							169.5 hrs.	*Total Drain Time*

Total Inflow Volume: 862 AF (HEC-1 - Future Condition)

entrance type: square edge with headwall
entrance loss: 0.5
manning: 0.013

Flow Rate Estimates Based on HGL Computation

Diameter: 48 inch

HW Interval No.	Elevation (ft)	Incremental Volume (AF)	Actual Volume to Drain (AF)	HW Interval Range	Flow Rate at Given HW (cfs)	Ave. Flow Rate per Interval (cfs)	Time to Drain Interval Volume	
1	970.5				0			
2	974.0	19.83	19.83	0-3.5	44	22.0	10.9 hrs.	
3	976.0	60.19	60.19	3.5-5.5	50	47.0	15.5 hrs.	
4	978.0	117.05	117.05	5.5-7.5	55	52.6	26.9 hrs.	
5	980.0	172.58	172.58	7.5-9.5	60	57.6	36.2 hrs.	
6	982.0	208.84	208.84	9.5-11.5	64	62.2	40.6 hrs.	
7	986.0	450.71	284 AF	11.5-15.5	73	68.5	50.1 hrs.	
							180.3 hrs.	*Total Drain Time*

Total Inflow Volume: 862 AF (HEC-1 - Future Condition)

A.III.ia-HGL at 986
Existing 48" RCP Only

HGL Calculation sheet - (English Units) - Post Storm Bleed Pipe

Date: 07/28/04
Project No.: 24178601 23441586
Location: Existing 48" RCP Outlet Pipe from ADOT Basins
Max. Flow: 1,000.0 cfs
Max. Volume: 862.0 AF Pipe Diameter: 4.0 ft

Project Name: Bleed time for ADOT Basins Using Existing 48" Storm Drain Pipe

Sta. to	Sta.	Length of pipe L (ft)	Slope S (ft/ft)	D/S Inv Elev. of pipe I.E. (ft)	U/S Inv Elev. of pipe I.E. (ft)	Box or Pipe? (B/P)	Pipe Dia. D (in)	single barrel values Pipe Area A (ft^2)	single barrel values Hydraulic Radius R (ft)	multiple barrel values Pipe Area A (ft^2)	multiple barrel values Hydraulic Radius R (ft)	Single Flow Rate Q (ft3/s)	Total Flow Rate Q (ft3/s)	Velocity V (ft/s)	Velocity Head $V^2/2g$ (ft)	Friction Slope S_f (ft/ft)	Minor Losses: Frict. Loss h_f (ft)	(Kb) Bend Loss h_b (ft)	Junct. Loss h_j (ft)	Trans. Loss h_t (ft)	(Ke) Ent./Ext. Loss h_e (ft)	(Kmh) MH Loss h_{mh} (ft)	***FINAL HGL Elev.*** *(ft)*	*overide start HGL: 967.00 HGL Elev.* *(ft)*	EGL Elev. (ft)	*Maximum Allowable Headwater* *(ft)*	HGL vs. Hw_{max} Elev. (ft)	Head Water Depth (ft)	Flow Condition	*overide No. Pipes: 1.00* computed No. Pipes	actual No. Pipes	Pipe Material
																								967.00									
075+95.22	073+85.22	210.00	0.0033	965.00	965.69	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	0.67				0.104	0.026	*967.80*	*967.80*	968.32	*972.50*	4.70	972.50	Partial Flow	1.0	1.0	RCP
																								967.80									
073+85.22	068+71.22	514.00	0.0033	965.69	967.39	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	1.65					0.026	*969.48*	*969.48*	970.00	*976.25*	6.77	976.25	Partial Flow	1.0	1.0	RCP
																								969.48									
068+71.22	062+20.00	651.22	0.0006	967.39	967.80	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	2.09					0.026	*971.59*	*971.59*	972.11	*980.00*	8.41	980.00	Partial Flow	1.0	1.0	RCP
																								971.59									
062+20.00	055+58.14	661.86	0.0006	967.80	968.22	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	2.12					0.026	*973.74*	*973.74*	974.26	*982.30*	8.56	982.30	Full Flow	1.0	1.0	RCP
																								973.74									
055+58.14	049+54.00	604.14	0.0006	968.22	968.60	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	1.94					0.026	*975.71*	*975.71*	976.23	*983.50*	7.79	983.50	Full Flow	1.0	1.0	RCP
																								975.71									
049+54.00	043+40.00	614.00	0.0006	968.60	968.98	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	1.97					0.026	*977.71*	*977.71*	978.22	*985.00*	7.29	985.00	Full Flow	1.0	1.0	RCP
																								977.71									
043+40.00	037+25.00	615.00	0.0006	968.98	969.36	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	1.97					0.026	*979.70*	*979.70*	980.22	*986.00*	6.30	986.00	Full Flow	1.0	1.0	RCP
																								979.70									
037+25.00	031+10.00	615.00	0.0006	969.36	969.74	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	1.97					0.026	*981.70*	*981.70*	982.22	*986.00*	4.30	986.00	Full Flow	1.0	1.0	RCP
																								981.70									
031+10.00	024+97.44	612.56	0.0006	969.74	970.12	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	1.97					0.026	*983.70*	*983.70*	984.21	*986.00*	2.30	986.00	Full Flow	1.0	1.0	RCP
																								983.70									
024+97.44	021+01.25	396.19	0.0006	970.12	970.37	P	48.00	12.57	1.00	12.57	1.00	n/a	73	5.77	0.52	0.00321	1.27					0.026	*984.99*	*984.99*	985.51	*986.00*	1.01	986.00	Full Flow	1.0	1.0	RCP
																								984.99									
021+01.25	019+81.00	120.25	0.0008	970.37	970.46	P	48.00	12.57	1.00	12.57	1.00	73	0	5.77	0.52	0.00321	0.39				0.104		*985.48*	*985.48*	986.00	*986.00*	0.52	986.00	Full Flow	1.0	1.0	RCP

gravity (g) = 32.2 ft/s^2
Manning's coefficient (n) = 0.0146 RCP 0.011 PVC
Bend loss coefficient (K_b) = 0.162 (Eq. pg. 129 - "Modern Sewer Design")
Entrance loss coefficient (K_e) = 0.2 (Eq. pg. 111 - "Modern Sewer Design")
Manhole loss coefficient (K_{mh}) = 0.05 (Fig. 10.15)

Instructions:
1. Compute the single barrel cpacity for a given pipe size (enter pipe size in K16), compute P32 by using
goal seek to change P32 until the HGL is at the maximum allowable.
2. Take a look at how the proposed pipe(s) act for the range of lower flow rates (Q16:Q30).

Back to top

A.III.ib-HGL at 982
Existing 48" RCP Only

HGL Calculation sheet - (English Units) - Post Storm Bleed Pipe

Date: 07/28/04
Project No.: 24178601 23441586
Location: Existing 48" RCP Outlet Pipe from ADOT Basins
Max. Flow: 1,000.0 cfs
Max. Volume: 862.0 AF Pipe Diameter: 4.0 ft

Project Name: Bleed time for ADOT Basins Using Existing 48" Storm Drain Pipe

Sta. to	Sta.	Length of pipe L (ft)	Slope S (ft/ft)	D/S Inv Elev. of pipe I.E. (ft)	U/S Inv Elev. of pipe I.E. (ft)	Box or Pipe? (B/P)	Pipe Dia. D (in)	single barrel values Pipe Area A (ft^2)	Hydraulic Radius R (ft)	multiple barrel values Pipe Area A (ft^2)	Hydraulic Radius R (ft)	Single Flow Rate Q (ft3/s)	Total Flow Rate Q (ft3/s)	Velocity V (ft/s)	Velocity Head $V^2/2g$ (ft)	Friction Slope S_f (ft/ft)	Minor Losses: Frict. Loss h_f (ft)	(Kb) Bend Loss h_b (ft)	Junct. Loss h_j (ft)	Trans. Loss h_t (ft)	(Ke) Ent./Ext. Loss h_e (ft)	(Kmh) MH Loss h_{mh} (ft)	***FINAL HGL Elev.*** *(ft)*	*overide start HGL: 967.00 HGL Elev. (ft)*	EGL Elev. (ft)	*Maximum Allowable Headwater (ft)*	HGL vs. Hw_{max} Elev. (ft)	Head Water Depth (ft)	Flow Condition	*overide No. Pipes: 1.00* computed No. Pipes	actual No. Pipes	Pipe Material
																								967.00									
075+95.22	073+85.22	210.00	0.0033	965.00	965.69	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	0.53				0.082	0.020	*967.63*	*967.63*	968.04	*972.50*	4.87	972.50	Partial Flow	1.0	1.0	RCP
																								967.63									
073+85.22	068+71.22	514.00	0.0033	965.69	967.39	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.30					0.020	*968.96*	*968.96*	969.37	*976.25*	7.29	976.25	Partial Flow	1.0	1.0	RCP
																								968.96									
068+71.22	062+20.00	651.22	0.0006	967.39	967.80	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.65					0.020	*970.63*	*970.63*	971.04	*980.00*	9.37	980.00	Partial Flow	1.0	1.0	RCP
																								970.63									
062+20.00	055+58.14	661.86	0.0006	967.80	968.22	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.68					0.020	*972.32*	*972.32*	972.73	*982.30*	9.98	982.30	Full Flow	1.0	1.0	RCP
																								972.32									
055+58.14	049+54.00	604.14	0.0006	968.22	968.60	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.53					0.020	*973.88*	*973.88*	974.28	*983.50*	9.62	983.50	Full Flow	1.0	1.0	RCP
																								973.88									
049+54.00	043+40.00	614.00	0.0006	968.60	968.98	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.56					0.020	*975.45*	*975.45*	975.86	*985.00*	9.55	985.00	Full Flow	1.0	1.0	RCP
																								975.45									
043+40.00	037+25.00	615.00	0.0006	968.98	969.36	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.56					0.020	*977.03*	*977.03*	977.44	*986.00*	8.97	986.00	Full Flow	1.0	1.0	RCP
																								977.03									
037+25.00	031+10.00	615.00	0.0006	969.36	969.74	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.56					0.020	*978.61*	*978.61*	979.02	*986.00*	7.39	986.00	Full Flow	1.0	1.0	RCP
																								978.61									
031+10.00	024+97.44	612.56	0.0006	969.74	970.12	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.55					0.020	*980.18*	*980.18*	980.59	*986.00*	5.82	986.00	Full Flow	1.0	1.0	RCP
																								980.18									
024+97.44	021+01.25	396.19	0.0006	970.12	970.37	P	48.00	12.57	1.00	12.57	1.00	n/a	64	5.13	0.41	0.00253	1.00					0.020	*981.20*	*981.20*	981.61	*986.00*	4.80	986.00	Full Flow	1.0	1.0	RCP
																								981.20									
021+01.25	019+81.00	120.25	0.0008	970.37	970.46	P	48.00	12.57	1.00	12.57	1.00	64	0	5.13	0.41	0.00253	0.30				0.082		*981.59*	*981.59*	982.00	*986.00*	4.41	986.00	Full Flow	1.0	1.0	RCP

gravity (g) = 32.2 ft/s^2
Manning's coefficient (n) = 0.0146 RCP 0.011 PVC
Bend loss coefficient (K_b) = 0.162 (Eq. pg. 129 - "Modern Sewer Design")
Entrance loss coefficient (K_e) = 0.2 (Eq. pg. 111 - "Modern Sewer Design")
Manhole loss coefficient (K_{mh}) = 0.05 (Fig. 10.15)

Instructions:
1. Compute the single barrel cpacity for a given pipe size (enter pipe size in K16), compute P32 by using
goal seek to change P32 until the HGL is at the maximum allowable.
2. Take a look at how the proposed pipe(s) act for the range of lower flow rates (Q16:Q30).

Back to top

A.III.ic-HGL at 980
Existing 48" RCP Only

HGL Calculation sheet - (English Units) - Post Storm Bleed Pipe

Date: 07/28/04
Project No.: 24178601 23441586
Location: Existing 48" RCP Outlet Pipe from ADOT Basins
Max. Flow: 1,000.0 cfs
Max. Volume: 862.0 AF Pipe Diameter: 4.0 ft

Project Name: Bleed time for ADOT Basins Using Existing 48" Storm Drain Pipe

Sta. to	Sta.	Length of pipe L (ft)	Slope S (ft/ft)	D/S Inv Elev. of pipe I.E. (ft)	U/S Inv Elev. of pipe I.E. (ft)	Box or Pipe? (B/P)	Pipe Dia. D (in)	single barrel values Pipe Area A (ft^2)	single barrel values Hydraulic Radius R (ft)	multiple barrel values Pipe Area A (ft^2)	multiple barrel values Hydraulic Radius R (ft)	Single Flow Rate Q (ft3/s)	Total Flow Rate Q (ft3/s)	Velocity V (ft/s)	Velocity Head $V^2/2g$ (ft)	Friction Slope S_f (ft/ft)	Minor Losses: Frict. Loss h_f (ft)	(Kb) Bend Loss h_b (ft)	Junct. Loss h_j (ft)	Trans. Loss h_t (ft)	(Ke) Ent./Ext. Loss h_e (ft)	(Kmh) MH Loss h_{mh} (ft)	***FINAL HGL Elev.*** *(ft)*	*overide start HGL: 967.00 HGL Elev. (ft)*	EGL Elev. (ft)	*Maximum Allowable Headwater (ft)*	HGL vs. Hw_{max} Elev. (ft)	Head Water Depth (ft)	Flow Condition	*overide No. Pipes: 1.00* computed No. Pipes	actual No. Pipes	Pipe Material
																								967.00									
075+95.22	073+85.22	210.00	0.0033	965.00	965.69	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	0.46				0.071	0.018	*967.55*	*967.55*	967.90	*972.50*	4.95	972.50	Partial Flow	1.0	1.0	RCP
																								967.55									
073+85.22	068+71.22	514.00	0.0033	965.69	967.39	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.13					0.018	*968.70*	*968.70*	969.05	*976.25*	7.55	976.25	Partial Flow	1.0	1.0	RCP
																								968.70									
068+71.22	062+20.00	651.22	0.0006	967.39	967.80	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.43					0.018	*970.14*	*970.14*	970.50	*980.00*	9.86	980.00	Partial Flow	1.0	1.0	RCP
																								970.14									
062+20.00	055+58.14	661.86	0.0006	967.80	968.22	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.45					0.018	*971.61*	*971.61*	971.97	*982.30*	10.69	982.30	Partial Flow	1.0	1.0	RCP
																								971.61									
055+58.14	049+54.00	604.14	0.0006	968.22	968.60	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.33					0.018	*972.96*	*972.96*	973.31	*983.50*	10.54	983.50	Full Flow	1.0	1.0	RCP
																								972.96									
049+54.00	043+40.00	614.00	0.0006	968.60	968.98	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.35					0.018	*974.32*	*974.32*	974.68	*985.00*	10.68	985.00	Full Flow	1.0	1.0	RCP
																								974.32									
043+40.00	037+25.00	615.00	0.0006	968.98	969.36	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.35					0.018	*975.69*	*975.69*	976.05	*986.00*	10.31	986.00	Full Flow	1.0	1.0	RCP
																								975.69									
037+25.00	031+10.00	615.00	0.0006	969.36	969.74	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.35					0.018	*977.06*	*977.06*	977.41	*986.00*	8.94	986.00	Full Flow	1.0	1.0	RCP
																								977.06									
031+10.00	024+97.44	612.56	0.0006	969.74	970.12	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	1.34					0.018	*978.42*	*978.42*	978.78	*986.00*	7.58	986.00	Full Flow	1.0	1.0	RCP
																								978.42									
024+97.44	021+01.25	396.19	0.0006	970.12	970.37	P	48.00	12.57	1.00	12.57	1.00	n/a	60	4.78	0.35	0.00220	0.87					0.018	*979.31*	*979.31*	979.67	*986.00*	6.69	986.00	Full Flow	1.0	1.0	RCP
																								979.31									
021+01.25	019+81.00	120.25	0.0008	970.37	970.46	P	48.00	12.57	1.00	12.57	1.00	60	0	4.78	0.35	0.00220	0.26				0.071		*979.65*	*979.65*	980.00	*986.00*	6.35	986.00	Full Flow	1.0	1.0	RCP

gravity (g) =	32.2	ft/s^2	
Manning's coefficient (n) =	0.0146	RCP	0.011 PVC
Bend loss coefficient ($K_{b)}$) =	0.162	(Eq. pg. 129 - "Modern Sewer Design")	
Entrance loss coefficient (K_e) =	0.2	(Eq. pg. 111 - "Modern Sewer Design")	
Manhole loss coefficient (K_{mh}) =	0.05	(Fig. 10.15)	

Instructions:
1. Compute the single barrel cpacity for a given pipe size (enter pipe size in K16), compute P32 by using
goal seek to change P32 until the HGL is at the maximum allowable.
2. Take a look at how the proposed pipe(s) act for the range of lower flow rates (Q16:Q30).

Back to top

A.III.id-HGL at 978
Existing 48" RCP Only

HGL Calculation sheet - (English Units) - Post Storm Bleed Pipe

Date: 07/28/04
Project No.: 24178601 23441586
Location: Existing 48" RCP Outlet Pipe from ADOT Basins
Max. Flow: 1,000.0 cfs
Max. Volume: 862.0 AF Pipe Diameter: 4.0 ft

Project Name: Bleed time for ADOT Basins Using Existing 48" Storm Drain Pipe

Sta. to	Sta.	Length of pipe L (ft)	Slope S (ft/ft)	D/S Inv Elev. of pipe I.E. (ft)	U/S Inv Elev. of pipe I.E. (ft)	Box or Pipe? (B/P)	Pipe Dia. D (in)	single barrel values Pipe Area A (ft^2)	Hydraulic Radius R (ft)	multiple barrel values Pipe Area A (ft^2)	Hydraulic Radius R (ft)	Single Flow Rate Q (ft3/s)	Total Flow Rate Q (ft3/s)	Velocity V (ft/s)	Velocity Head $V^2/2g$ (ft)	Friction Slope S_f (ft/ft)	Minor Losses: Frict. Loss h_f (ft)	(Kb) Bend Loss h_b (ft)	Junct. Loss h_j (ft)	Trans. Loss h_t (ft)	(Ke) Ent./Ext. Loss h_e (ft)	(Kmh) MH Loss h_{mh} (ft)	***FINAL HGL Elev.*** *(ft)*	*overide start HGL: 967.00 HGL Elev.* *(ft)*	EGL Elev. (ft)	*Maximum Allowable Headwater* *(ft)*	HGL vs. Hw_{max} Elev. (ft)	Head Water Depth (ft)	Flow Condition	*overide No. Pipes: 1.00* computed No. Pipes	actual No. Pipes	Pipe Material
																								967.00									
075+95.22	073+85.22	210.00	0.0033	965.00	965.69	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	0.39				0.060	0.015	*967.47*	*967.47*	967.76	*972.50*	5.03	972.50	Partial Flow	1.0	1.0	RCP
																								967.47									
073+85.22	068+71.22	514.00	0.0033	965.69	967.39	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	0.95					0.015	*968.44*	*968.44*	968.73	*976.25*	7.81	976.25	Partial Flow	1.0	1.0	RCP
																								968.44									
068+71.22	062+20.00	651.22	0.0006	967.39	967.80	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	1.21					0.015	*969.66*	*969.66*	969.96	*980.00*	10.34	980.00	Partial Flow	1.0	1.0	RCP
																								969.66									
062+20.00	055+58.14	661.86	0.0006	967.80	968.22	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	1.23					0.015	*970.90*	*970.90*	971.20	*982.30*	11.40	982.30	Partial Flow	1.0	1.0	RCP
																								970.90									
055+58.14	049+54.00	604.14	0.0006	968.22	968.60	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	1.12					0.015	*972.04*	*972.04*	972.34	*983.50*	11.46	983.50	Partial Flow	1.0	1.0	RCP
																								972.04									
049+54.00	043+40.00	614.00	0.0006	968.60	968.98	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	1.14					0.015	*973.20*	*973.20*	973.50	*985.00*	11.80	985.00	Full Flow	1.0	1.0	RCP
																								973.20									
043+40.00	037+25.00	615.00	0.0006	968.98	969.36	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	1.14					0.015	*974.36*	*974.36*	974.65	*986.00*	11.64	986.00	Full Flow	1.0	1.0	RCP
																								974.36									
037+25.00	031+10.00	615.00	0.0006	969.36	969.74	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	1.14					0.015	*975.51*	*975.51*	975.81	*986.00*	10.49	986.00	Full Flow	1.0	1.0	RCP
																								975.51									
031+10.00	024+97.44	612.56	0.0006	969.74	970.12	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	1.14					0.015	*976.67*	*976.67*	976.97	*986.00*	9.33	986.00	Full Flow	1.0	1.0	RCP
																								976.67									
024+97.44	021+01.25	396.19	0.0006	970.12	970.37	P	48.00	12.57	1.00	12.57	1.00	n/a	55	4.39	0.30	0.00186	0.74					0.015	*977.42*	*977.42*	977.72	*986.00*	8.58	986.00	Full Flow	1.0	1.0	RCP
																								977.42									
021+01.25	019+81.00	120.25	0.0008	970.37	970.46	P	48.00	12.57	1.00	12.57	1.00	55	0	4.39	0.30	0.00186	0.22				0.060		*977.70*	*977.70*	978.00	*986.00*	8.30	986.00	Full Flow	1.0	1.0	RCP

gravity (g) = 32.2 ft/s^2
Manning's coefficient (n) = 0.0146 RCP 0.011 PVC
Bend loss coefficient ($K_{b)}$ = 0.162 (Eq. pg. 129 - "Modern Sewer Design")
Entrance loss coefficient ($K_{e)}$ = 0.2 (Eq. pg. 111 - "Modern Sewer Design")
Manhole loss coefficient ($K_{mh)}$ = 0.05 (Fig. 10.15)

Instructions:
1. Compute the single barrel cpacity for a given pipe size (enter pipe size in K16), compute P32 by using
goal seek to change P32 until the HGL is at the maximum allowable.
2. Take a look at how the proposed pipe(s) act for the range of lower flow rates (Q16:Q30).

Back to top

A.III.ie-HGL at 976
Existing 48" RCP Only

HGL Calculation sheet - (English Units) - Post Storm Bleed Pipe

Date: 07/28/04
Project No.: 24178601 23441586
Location: Existing 48" RCP Outlet Pipe from ADOT Basins
Max. Flow: 1,000.0 cfs
Max. Volume: 862.0 AF Pipe Diameter: 4.0 ft

Project Name: Bleed time for ADOT Basins Using Existing 48" Storm Drain Pipe

Sta. to	Sta.	Length of pipe L (ft)	Slope S (ft/ft)	D/S Inv Elev. of pipe I.E. (ft)	U/S Inv Elev. of pipe I.E. (ft)	Box or Pipe? (B/P)	Pipe Dia. D (in)	single barrel values Pipe Area A (ft^2)	single barrel values Hydraulic Radius R (ft)	multiple barrel values Pipe Area A (ft^2)	multiple barrel values Hydraulic Radius R (ft)	Single Flow Rate Q (ft3/s)	Total Flow Rate Q (ft3/s)	Velocity V (ft/s)	Velocity Head $V^2/2g$ (ft)	Friction Slope S_f (ft/ft)	Minor Losses: Frict. Loss h_f (ft)	Minor Losses: (Kb) Bend Loss h_b (ft)	Minor Losses: Junct. Loss h_j (ft)	Minor Losses: Trans. Loss h_t (ft)	Minor Losses: (Ke) Ent./Ext. Loss h_e (ft)	Minor Losses: (Kmh) MH Loss h_{mh} (ft)	***FINAL HGL Elev.*** *(ft)*	*overide start HGL: 967.00 HGL Elev. (ft)*	EGL Elev. (ft)	*Maximum Allowable Headwater (ft)*	HGL vs. Hw_{max} Elev. (ft)	Head Water Depth (ft)	Flow Condition	*overide No. Pipes: 1.00* computed No. Pipes	actual No. Pipes	Pipe Material
																								967.00									
075+95.22	073+85.22	210.00	0.0033	965.00	965.69	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.32				0.049	0.012	*967.38*	*967.38*	967.63	*972.50*	5.12	972.50	Partial Flow	1.0	1.0	RCP
																								967.38									
073+85.22	068+71.22	514.00	0.0033	965.69	967.39	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.78					0.012	*968.17*	*968.17*	968.42	*976.25*	8.08	976.25	Partial Flow	1.0	1.0	RCP
																								968.17									
068+71.22	062+20.00	651.22	0.0006	967.39	967.80	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.99					0.012	*969.18*	*969.18*	969.42	*980.00*	10.82	980.00	Partial Flow	1.0	1.0	RCP
																								969.18									
062+20.00	055+58.14	661.86	0.0006	967.80	968.22	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	1.01					0.012	*970.19*	*970.19*	970.44	*982.30*	12.11	982.30	Partial Flow	1.0	1.0	RCP
																								970.19									
055+58.14	049+54.00	604.14	0.0006	968.22	968.60	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.92					0.012	*971.13*	*971.13*	971.37	*983.50*	12.37	983.50	Partial Flow	1.0	1.0	RCP
																								971.13									
049+54.00	043+40.00	614.00	0.0006	968.60	968.98	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.93					0.012	*972.07*	*972.07*	972.32	*985.00*	12.93	985.00	Partial Flow	1.0	1.0	RCP
																								972.07									
043+40.00	037+25.00	615.00	0.0006	968.98	969.36	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.93					0.012	*973.02*	*973.02*	973.26	*986.00*	12.98	986.00	Partial Flow	1.0	1.0	RCP
																								973.02									
037+25.00	031+10.00	615.00	0.0006	969.36	969.74	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.93					0.012	*973.97*	*973.97*	974.21	*986.00*	12.03	986.00	Full Flow	1.0	1.0	RCP
																								973.97									
031+10.00	024+97.44	612.56	0.0006	969.74	970.12	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.93					0.012	*974.91*	*974.91*	975.15	*986.00*	11.09	986.00	Full Flow	1.0	1.0	RCP
																								974.91									
024+97.44	021+01.25	396.19	0.0006	970.12	970.37	P	48.00	12.57	1.00	12.57	1.00	n/a	50	3.97	0.25	0.00152	0.60					0.012	*975.52*	*975.52*	975.77	*986.00*	10.48	986.00	Full Flow	1.0	1.0	RCP
																								975.52									
021+01.25	019+81.00	120.25	0.0008	970.37	970.46	P	48.00	12.57	1.00	12.57	1.00	50	0	3.97	0.25	0.00152	0.18				0.049		*975.75*	*975.75*	976.00	*986.00*	10.25	986.00	Full Flow	1.0	1.0	RCP

gravity (g) =	32.2	ft/s^2
Manning's coefficient (n) =	0.0146	RCP 0.011 PVC
Bend loss coefficient (K_b) =	0.162	(Eq. pg. 129 - "Modern Sewer Design")
Entrance loss coefficient (K_e) =	0.2	(Eq. pg. 111 - "Modern Sewer Design")
Manhole loss coefficient (K_{mh}) =	0.05	(Fig. 10.15)

Instructions:
1. Compute the single barrel cpacity for a given pipe size (enter pipe size in K16), compute P32 by using
goal seek to change P32 until the HGL is at the maximum allowable.
2. Take a look at how the proposed pipe(s) act for the range of lower flow rates (Q16:Q30).

Back to top

A.III.if-HGL at 974
Existing 48" RCP Only

HGL Calculation sheet - (English Units) - Post Storm Bleed Pipe

Date: 07/28/04
Project No.: 24178601 23441586
Location: Existing 48" RCP Outlet Pipe from ADOT Basins
Max. Flow: 1,000.0 cfs
Max. Volume: 862.0 AF Pipe Diameter: 4.0 ft

Project Name: Bleed time for ADOT Basins Using Existing 48" Storm Drain Pipe

Sta. to	Sta.	Length of pipe L (ft)	Slope S (ft/ft)	D/S Inv Elev. of pipe I.E. (ft)	U/S Inv Elev. of pipe I.E. (ft)	Box or Pipe? (B/P)	Pipe Dia. D (in)	single barrel values Pipe Area A (ft^2)	single barrel values Hydraulic Radius R (ft)	multiple barrel values Pipe Area A (ft^2)	multiple barrel values Hydraulic Radius R (ft)	Single Flow Rate Q (ft3/s)	Total Flow Rate Q (ft3/s)	Velocity V (ft/s)	Velocity Head $V^2/2g$ (ft)	Friction Slope S_f (ft/ft)	Minor Losses: Frict. Loss h_f (ft)	Minor Losses: (Kb) Bend Loss h_b (ft)	Minor Losses: Junct. Loss h_j (ft)	Minor Losses: Trans. Loss h_t (ft)	Minor Losses: (Ke) Ent./Ext. Loss h_e (ft)	Minor Losses: (Kmh) MH Loss h_{mh} (ft)	***FINAL HGL Elev.*** *(ft)*	*overide start HGL: 967.00 HGL Elev. (ft)*	EGL Elev. (ft)	*Maximum Allowable Headwater (ft)*	HGL vs. Hw_{max} Elev. (ft)	Head Water Depth (ft)	Flow Condition	*overide No. Pipes: 1.00* computed No. Pipes	actual No. Pipes	Pipe Material
																								967.00									
075+95.22	073+85.22	210.00	0.0033	965.00	965.69	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.25				0.038	0.010	*967.30*	*967.30*	967.49	*972.50*	5.20	972.50	Partial Flow	1.0	1.0	RCP
																								967.30									
073+85.22	068+71.22	514.00	0.0033	965.69	967.39	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.61					0.010	*967.91*	*967.91*	968.10	*976.25*	8.34	976.25	Partial Flow	1.0	1.0	RCP
																								967.91									
068+71.22	062+20.00	651.22	0.0006	967.39	967.80	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.77					0.010	*968.69*	*968.69*	968.88	*980.00*	11.31	980.00	Partial Flow	1.0	1.0	RCP
																								968.69									
062+20.00	055+58.14	661.86	0.0006	967.80	968.22	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.78					0.010	*969.48*	*969.48*	969.68	*982.30*	12.82	982.30	Partial Flow	1.0	1.0	RCP
																								969.48									
055+58.14	049+54.00	604.14	0.0006	968.22	968.60	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.71					0.010	*970.21*	*970.21*	970.40	*983.50*	13.29	983.50	Partial Flow	1.0	1.0	RCP
																								970.21									
049+54.00	043+40.00	614.00	0.0006	968.60	968.98	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.73					0.010	*970.94*	*970.94*	971.13	*985.00*	14.06	985.00	Partial Flow	1.0	1.0	RCP
																								970.94									
043+40.00	037+25.00	615.00	0.0006	968.98	969.36	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.73					0.010	*971.68*	*971.68*	971.87	*986.00*	14.32	986.00	Partial Flow	1.0	1.0	RCP
																								971.68									
037+25.00	031+10.00	615.00	0.0006	969.36	969.74	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.73					0.010	*972.42*	*972.42*	972.61	*986.00*	13.58	986.00	Partial Flow	1.0	1.0	RCP
																								972.42									
031+10.00	024+97.44	612.56	0.0006	969.74	970.12	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.72					0.010	*973.15*	*973.15*	973.34	*986.00*	12.85	986.00	Partial Flow	1.0	1.0	RCP
																								973.15									
024+97.44	021+01.25	396.19	0.0006	970.12	970.37	P	48.00	12.57	1.00	12.57	1.00	n/a	44	3.50	0.19	0.00118	0.47					0.010	*973.63*	*973.63*	973.82	*986.00*	12.37	986.00	Partial Flow	1.0	1.0	RCP
																								973.63									
021+01.25	019+81.00	120.25	0.0008	970.37	970.46	P	48.00	12.57	1.00	12.57	1.00	44	0	3.50	0.19	0.00118	0.14				0.038		*973.81*	*973.81*	974.00	*986.00*	12.19	986.00	Partial Flow	1.0	1.0	RCP

gravity (g) =	32.2	ft/s^2	
Manning's coefficient (n) =	0.0146	RCP	0.011 PVC
Bend loss coefficient (K_b) =	0.162	(Eq. pg. 129 - "Modern Sewer Design")	
Entrance loss coefficient (K_e) =	0.2	(Eq. pg. 111 - "Modern Sewer Design")	
Manhole loss coefficient (K_{mh}) =	0.05	(Fig. 10.15)	

Instructions:
1. Compute the single barrel cpacity for a given pipe size (enter pipe size in K16), compute P32 by using
goal seek to change P32 until the HGL is at the maximum allowable.
2. Take a look at how the proposed pipe(s) act for the range of lower flow rates (Q16:Q30).

Back to top

A.III.ig-HGL at 970.5
Existing 48" RCP Only

HGL Calculation sheet - (English Units) - Post Storm Bleed Pipe

Date: 07/28/04
Project No.: 24178601 23441586
Location: Existing 48" RCP Outlet Pipe from ADOT Basins
Max. Flow: 1,000.0 cfs
Max. Volume: 862.0 AF Pipe Diameter: 4.0 ft

Project Name: Bleed time for ADOT Basins Using Existing 48" Storm Drain Pipe

Sta. to	Sta.	Length of pipe L (ft)	Slope S (ft/ft)	D/S Inv Elev. of pipe I.E. (ft)	U/S Inv Elev. of pipe I.E. (ft)	Box or Pipe? (B/P)	Pipe Dia. D (in)	single barrel values Pipe Area A (ft^2)	single barrel values Hydraulic Radius R (ft)	multiple barrel values Pipe Area A (ft^2)	multiple barrel values Hydraulic Radius R (ft)	Single Flow Rate Q (ft3/s)	Total Flow Rate Q (ft3/s)	Velocity V (ft/s)	Velocity Head $V^2/2g$ (ft)	Friction Slope S_f (ft/ft)	Minor Losses: Frict. Loss h_f (ft)	Minor Losses: (Kb) Bend Loss h_b (ft)	Minor Losses: Junct. Loss h_j (ft)	Minor Losses: Trans. Loss h_t (ft)	Minor Losses: (Ke) Ent./Ext. Loss h_e (ft)	Minor Losses: (Kmh) MH Loss h_{mh} (ft)	***FINAL HGL Elev.*** *(ft)*	*overide start HGL: 967.00 HGL Elev. (ft)*	EGL Elev. (ft)	*Maximum Allowable Headwater (ft)*	HGL vs. Hw_{max} Elev. (ft)	Head Water Depth (ft)	Flow Condition	*overide No. Pipes: 1.00* computed No. Pipes	actual No. Pipes	Pipe Material
																								967.00									
075+95.22	073+85.22	210.00	0.0033	965.00	965.69	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*972.50*	5.50	972.50	Partial Flow	1.0	1.0	RCP
																								967.00									
073+85.22	068+71.22	514.00	0.0033	965.69	967.39	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*976.25*	9.25	976.25	Partial Flow	1.0	1.0	RCP
																								967.00									
068+71.22	062+20.00	651.22	0.0006	967.39	967.80	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*980.00*	13.00	980.00	Partial Flow	1.0	1.0	RCP
																								967.00									
062+20.00	055+58.14	661.86	0.0006	967.80	968.22	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*982.30*	15.30	982.30	Partial Flow	1.0	1.0	RCP
																								967.00									
055+58.14	049+54.00	604.14	0.0006	968.22	968.60	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*983.50*	16.50	983.50	Partial Flow	1.0	1.0	RCP
																								967.00									
049+54.00	043+40.00	614.00	0.0006	968.60	968.98	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*985.00*	18.00	985.00	Partial Flow	1.0	1.0	RCP
																								967.00									
043+40.00	037+25.00	615.00	0.0006	968.98	969.36	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*986.00*	19.00	986.00	Partial Flow	1.0	1.0	RCP
																								967.00									
037+25.00	031+10.00	615.00	0.0006	969.36	969.74	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*986.00*	19.00	986.00	Partial Flow	1.0	1.0	RCP
																								967.00									
031+10.00	024+97.44	612.56	0.0006	969.74	970.12	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*986.00*	19.00	986.00	Partial Flow	1.0	1.0	RCP
																								967.00									
024+97.44	021+01.25	396.19	0.0006	970.12	970.37	P	48.00	12.57	1.00	12.57	1.00	n/a	0	0.00	0.00	0.00000	0.00				0.000	0.000	*967.00*	*967.00*	967.00	*986.00*	19.00	986.00	Partial Flow	1.0	1.0	RCP
																								967.00									
021+01.25	019+81.00	120.25	0.0008	970.37	970.46	P	48.00	12.57	1.00	12.57	1.00	0	0	0.00	0.00	0.00000	0.00				0.000		*967.00*	*967.00*	967.00	*986.00*	19.00	986.00	Partial Flow	1.0	1.0	RCP

gravity (g) = 32.2 ft/s^2
Manning's coefficient (n) = 0.0146 RCP 0.011 PVC
Bend loss coefficient (K_b) = 0.162 (Eq. pg. 129 - "Modern Sewer Design")
Entrance loss coefficient (K_e) = 0.2 (Eq. pg. 111 - "Modern Sewer Design")
Manhole loss coefficient (K_{mh}) = 0.05 (Fig. 10.15)

Instructions:
1. Compute the single barrel cpacity for a given pipe size (enter pipe size in K16), compute P32 by using
goal seek to change P32 until the HGL is at the maximum allowable.
2. Take a look at how the proposed pipe(s) act for the range of lower flow rates (Q16:Q30).

Back to top

Table A.III.ii
Existing 48" RCP Plus Proposed 4 - Barell 48" RCP
Post Storm Drain Time

ADOT Basin Outflow from Existing 48" RCP Outlet

Diameter: 48

HW Interval No.	Elevation (ft)	Incremental Volume (AF)	Actual Volume to Drain (AF)	HW Interval Range	Flow Rate at Given HW (cfs)	Ave. Flow Rate per Interval (cfs)	Time to Drain Interval Volume
1	970.5						
2	974.0	19.83	19.83	0-3.5	44	22.0	10.9 hrs.
3	976.0	60.19	60.19	3.5-5.5	50	47.0	15.5 hrs.
4	978.0	117.05	117.05	5.5-7.5	55	52.6	26.9 hrs.
5	980.0	172.58	172.58	7.5-9.5	60	57.6	36.2 hrs.
6	982.0	208.84	208.84	9.5-11.5	64	62.2	40.6 hrs.
7	986.0	450.71	283.51	11.5-15.5	73	68.5	50.1 hrs.
							180.3 hrs.

Total Inflow Volume: 862 (HEC-1 - Future Condition)

Additional ADOT Basin Outflow from Proposed 4-Barrel 48" RCP Outlet Improvement

Proposed Outlet: 4.00 - 48 in RCP

HW Interval No.	Elevation (ft)	Incremental Volume (AF)	Actual Volume to Drain (AF)	HW Interval Range	[1] Flow Rate at Given HW (cfs)	Ave. Flow Rate per Interval (cfs)	Time to Drain Interval Volume	
1	970.5				0			
2	974.0	19.83	19.83	0-3.5	0	0.0	0.0 hrs.	
3	976.0	60.19	60.19	3.5-5.5	275	137.5	5.3 hrs.	
4	978.0	117.05	117.05	5.5-7.5	275	275.0	5.2 hrs.	
5	980.0	172.58	172.58	7.5-9.5	400	337.3	6.2 hrs.	
6	982.0	208.84	208.84	9.5-11.5	494	446.6	5.7 hrs.	
7	986.0	450.71	284 AF	11.5-15.5	642	567.7	6.0 hrs.	
							28.3 hrs.	**19.8 AF left undrained*

Total Inflow Volume: 862 AF (HEC-1 - Future Condition)

Total ADOT Basin Outflow from Combination of Existing 48" RCP and Proposed 4-Barrel 48" RCP Outlet(s)

Proposed Outlet: 4.00 - 48 in RCP

HW Interval No.	Elevation (ft)	Incremental Volume (AF)	Actual Volume to Drain (AF)	HW Interval Range	Flow Rate at Given HW (cfs)	Ave. Flow Rate per Interval (cfs)	Time to Drain Interval Volume	
1	970.5				0			
2	974.0	19.83	19.83	0-3.5	44	22.0	10.9 hrs.	
3	976.0	60.19	60.19	3.5-5.5	325	184.5	3.9 hrs.	
4	978.0	117.05	117.05	5.5-7.5	330	327.6	4.3 hrs.	
5	980.0	172.58	172.58	7.5-9.5	460	394.9	5.3 hrs.	
6	982.0	208.84	208.84	9.5-11.5	558	508.9	5.0 hrs.	
7	986.0	450.71	284 AF	11.5-15.5	714	636.2	5.4 hrs.	
							34.8 hrs.	*Total Drain Time*

Total Inflow Volume: 862 AF (HEC-1 - Future Condition)

1. The proposed outlet improvement structure is set at an invert of 974.0' Therefore, the impounded flow below 974' will be drained by the existing 48" RCP.

Table A.III.iv
Existing ADOT Basins
Post Storm Drain Bleed Time

Preoject: Loop 303
Subject: Determination of the time to bleed the volume from the Existing ADOT Basins via the existing single-barrel 48" RCP

Computed By: RJS

Empty the detention basins within 36 hours
Equation: T=8*A/(C*3.14*d2)*((Z+H)^0.5-Z^0.5)/3600
Where

T: hours to empty detention basin (hours)
A: Area of detenrion basin (ft2), A=V/H*43560
V: volume retained within basin in ac-ft
H: height of detension basin (feet)
C: Constant where C=(2*g*d/(d+f*L)
d: Pipe diameter (feet)
F: Friction factor
Z: Elevation difference between the bason bottom and pipe outlet (feet)
L: Length of pipe (feet)
Elev-1: elevation of the proposed basin bottom (feet)
Elev-2: elevation of the pipe at the outlet (feet)

Detention Basin	d (ft)	Elev-1 (ft)	Elev-2 (ft)	Z (ft)	H (ft)	f	L (ft)	C	V (acre-feet)	A ft^2	T (hours)	
ADOT Basin Outlet Pipe	4	970.5	967.0	3.5	14	0.02	5614.2	1.41977	862.0	2,503,248	180.81	*48 in*

$Q_{average}$ =	58	The average pipe discharge over the entire drain time interval, cfs
$V_{average}$ =	4.6	The average pipe velocity over the entire drain time interval, f/s
L/d =	1,404	The friction factor, f is sensative to the pipe parameters and the velocity
f =	0.022	

Table A.III.v
ADOT Composite Basin Summary

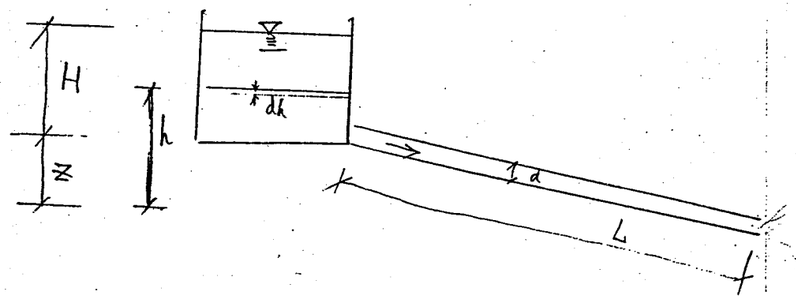
Cone Approximation: Volume = $1/3h[(A_2+A_1)+(A_2+A_1)^{1/2}]$

Elevation (ft)	Elevation Increment (ft)	Area (sf)	Incremental Volume (cf)	Total Volume (AF)
970.5	0	0.00	0.00	0.00
974	3.5	740,300.70	863684.15	19.83
976	2	1,981,276.61	2621778.61	80.02
978	2	3,163,249.84	5098652.43	197.06
980	2	4,387,582.98	7517525.77	369.64
982	2	4,711,249.72	9096913.16	578.48
986	4	5,107,927.81	19633011.16	1029.19
988	2	5,916,811.87	11014835.04	1282.06
990	2	13391448	18806430.80	1713.79

URS

Job: Loop 303 | Project No. | Page 1 of 3
Description: Determination of the times to empty detention basins | Computed by: GL | Sheet ___ of ___
Checked by | Date: 12/20/01
Date | Reference

Assumption: A (area of Detention Basin) does not change with depth that is A = constant
A is area of detention basin



$$h = \frac{v^2}{2g} + f\frac{L}{d}\frac{v^2}{2g}$$

$$h = v^2\left(\frac{1}{2g} + f\frac{L}{2gd}\right)$$

$$v = \sqrt{\frac{2gd}{d+fL}}\sqrt{h}$$

let $C = \sqrt{\frac{2gd}{d+fL}}$

$$\therefore v = C\sqrt{h}$$

$$Q = v\frac{\pi d^2}{4} = C\frac{\pi d^2}{4}\sqrt{h}$$

URS

Job: Loop 303 | Project No. | Page 2 of 3
Description: Determination of the times to empty detention basins | Computed by: GL | Sheet ___ of ___
Checked by | Date: 12/20/01
Date | Reference

$$-\frac{dh}{dt} = \frac{Q}{A} = \frac{C\pi d^2}{4A}\sqrt{h}$$

$$dt = -\frac{4A}{C\pi d^2}\frac{dh}{\sqrt{h}}$$

$$t = \int_{z+H}^{z} dt = \int_{z+H}^{z} -\frac{4A}{C\pi d^2}\frac{dh}{\sqrt{h}}$$

$$= -\frac{4A}{C\pi d^2}\int_{z+H}^{z}\frac{dh}{\sqrt{h}} = -\frac{4A\times 2}{C\pi d^2}\, h^{\frac{1}{2}}\Big|_{z+H}^{z}$$

$$= \frac{8A}{C\pi d^2}\left[(z+H)^{\frac{1}{2}} - z^{\frac{1}{2}}\right]$$

DATE 12/20/01

Derived Equation for Post Storm Drain Bleed Time

Preoject: Loop 303
Subject: Determination of the time to bleed

Computed By: GL

Empty the detention basins within 36 hours
Equation: T=8*A/(C*3.14*d2)*((Z+H)^0.5-Z^0.5)/3600
Where

T: hours to empty detention basin (hours)
A: Area of detenrion basin (ft2), A=V/H*43560
V: volume retained within basin in ac-ft
H: height of detension basin (feet)
C: Constant where C=(2*g*d/(d+f*L)
d: Pipe diameter (feet)
F: Friction factor
Z: Elevation difference between the bason bottom and pipe outlet (feet)
L: Length of pipe (feet)
Elev-1: elevation of the proposed basin bottom (feet)
Elev-2: elevation of the pipe at the outlet (feet)

Table A.IV
Existing ADOT Basins
Post Storm Drain Bleed Time

Preoject: Loop 303
Subject: Determination of the time to bleed the volume from the Existing ADOT Basins via the existing single-barrel 48" RCP

Computed By: RJS

Empty the detention basins within 36 hours
Equation: T=8*A/(C*3.14*d2)*((Z+H)^0.5-Z^0.5)/3600
Where

T: hours to empty detention basin (hours)
A: Area of detenrion basin (ft2), A=V/H*43560
V: volume retained within basin in ac-ft
H: height of detension basin (feet)
C: Constant where C=(2*g*d/(d+f*L)
d: Pipe diameter (feet)
F: Friction factor
Z: Elevation difference between the bason bottom and pipe outlet (feet)
L: Length of pipe (feet)
Elev-1: elevation of the proposed basin bottom (feet)
Elev-2: elevation of the pipe at the outlet (feet)

Detention Basin	d (ft)	Elev-1 (ft)	Elev-2 (ft)	Z (ft)	H (ft)	f	L (ft)	C	V (acre-feet)	A ft^2	T (hours)	
ADOT Basin Outlet Pipe	4	970.5	967.0	3.5	14	0.02	5614.2	1.41977	862.0	2,503,248	180.81	*48 in*

$Q_{average}$ = 58 The average pipe discharge over the entire drain time interval, cfs
$V_{average}$ = 4.6 The average pipe velocity over the entire drain time interval, f/s
L/d = 1,404 The friction factor, f is sensative to the pipe parameters and the velocity
f = 0.022

Table A.I
ADOT Composite Basin Summary

Cone Approximation: Volume = $1/3h[(A_2+A_1)+(A_2+A_1)^{1/2}]$

Elevation (ft)	Elevation Increment (ft)	Area (sf)	Incremental Volume (cf)	Total Volume (AF)
970.5	0	0.00	0.00	0.00
974	3.5	740,300.70	863684.15	19.83
976	2	1,981,276.61	2621778.61	80.02
978	2	3,163,249.84	5098652.43	197.06
980	2	4,387,582.98	7517525.77	369.64
982	2	4,711,249.72	9096913.16	578.48
986	4	5,107,927.81	19633011.16	1029.19
988	2	5,916,811.87	11014835.04	1282.06
990	2	13391448	18806430.80	1713.79

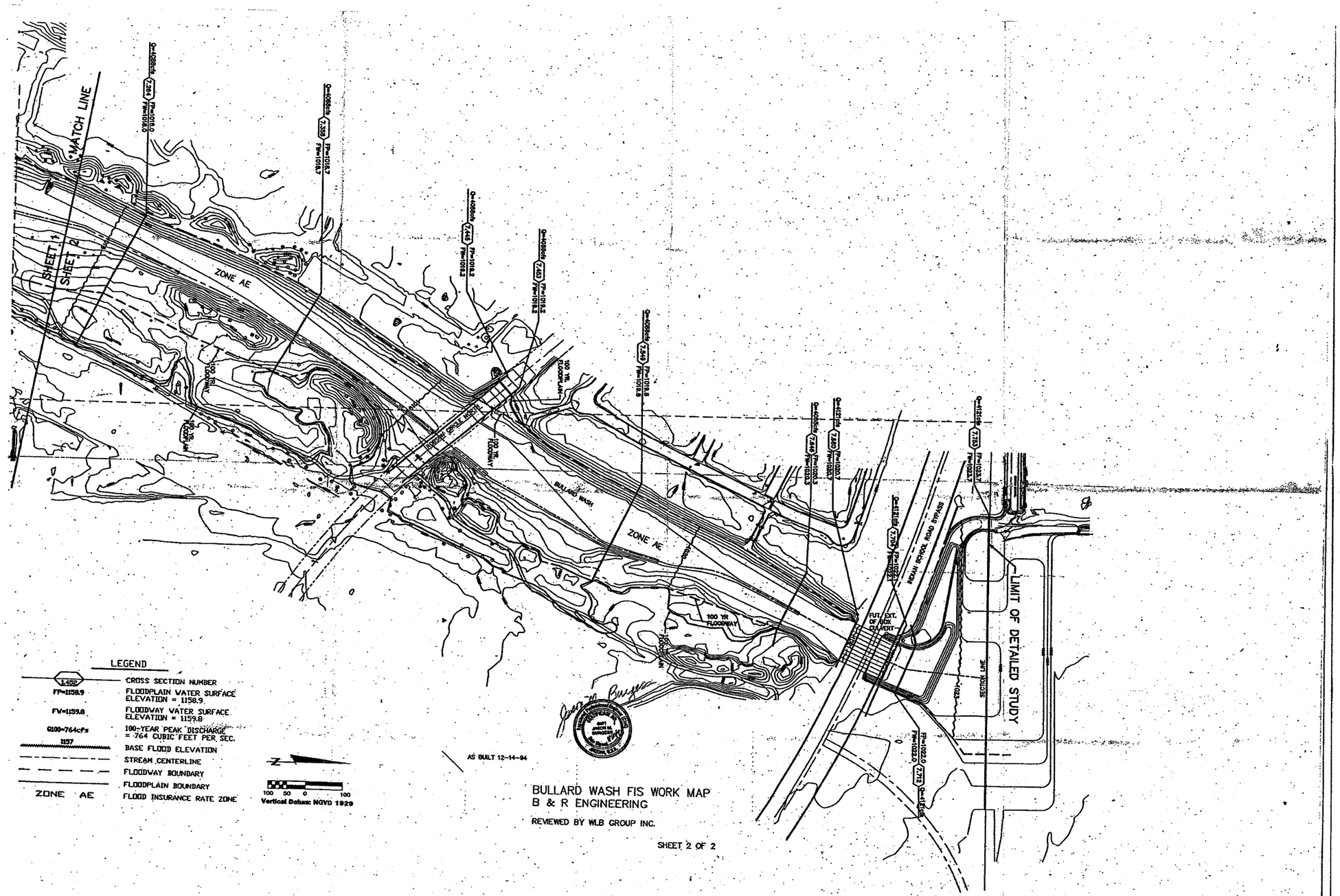
APPENDIX A-IV

BULLARD WASH

CURRENT FLOODPLAIN DELINEATION

THROUGH PALM VALLEY/PEBBLE CREEK

MATCH WHITE TANKS/AQUA FRIA
AREA DRAINAGE MASTER STUDY
FLOODPLAIN MAP 44 OF 64 (as revised 1-25-95)
MATCH LINE
SHEET 1
SHEET 2
UNIT 10
UNIT 11
UNIT 16
UNIT 17
ZONE AE
BULLARD WASH
100 YR. FLOODWAY
100 YR. FLOODPLAIN
5' MASONRY PERIMETER WALL
FIN. GROUND = 1430
LANE
FAN SUPPLY
AS BUILT 12-14-94
LEGEND
CROSS SECTION NUMBER
FLOODPLAIN WATER SURFACE ELEVATION = 1158.9
FLOODWAY WATER SURFACE ELEVATION = 1159.8
100-YEAR PEAK DISCHARGE = 764 CUBIC FEET PER SEC.
BASE FLOOD ELEVATION
STREAM CENTERLINE
Vertical Datum: NGVD 1929
BULLARD WASH FIS WORK MAP
B & R ENGINEERING
REVIEWED BY WLB GROUP INC.


MATCH LINE
SHEET 1
SHEET 2
ZONE AE
100 YR. FLOODPLAIN
BULLARD WASH
ZONE AE
100 YR FLOODWAY
INDIAN SCHOOL ROAD BYPASS
FUT. EXT. OF BOX CULVERT
LIMIT OF DETAILED STUDY
SECTION LINE
LEGEND
CROSS SECTION NUMBER
FLOODPLAIN WATER SURFACE ELEVATION = 1158.9
FLOODWAY WATER SURFACE ELEVATION = 1159.8
100-YEAR PEAK DISCHARGE = 764 CUBIC FEET PER SEC.
BASE FLOOD ELEVATION
STREAM CENTERLINE
FLOODWAY BOUNDARY
FLOODPLAIN BOUNDARY
ZONE AE FLOOD INSURANCE RATE ZONE
Vertical Datum: NGVD 1929
AS BUILT 12-14-94
BULLARD WASH FIS WORK MAP
B & R ENGINEERING
REVIEWED BY WLB GROUP INC.
SHEET 2 OF 2

Federal Emergency Management Agency
Washington, D.C. 20472

MAR 0 3 1995

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Carl Gow
Mayor, City of Goodyear
629 North Litchfield Road
Goodyear, Arizona 85338

IN REPLY REFER TO:
Case No.: 95-09-266P

Community: City of Goodyear, Arizona
Community No.: 040046

106

Dear Mayor Gow:

This is in response to a letter dated February 7, 1995, from Mr. Mark T. Gavan, P.E., R.L.S., Project Manager, The WLB Group Inc., regarding the effective Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. With his February 7 letter, Mr. Gavan submitted additional data in support of his February 1, 1995, request for a revision to the effective FIS and FIRM for Bullard Wash, from the Roosevelt Irrigation District Canal to Indian School Road. This revision is based on a detailed hydraulic analysis of this reach of Bullard Wash, which was previously unstudied. All data required to review this revision request were submitted by Mr. Gavan with his February 1 and February 7 letters.

We have completed our review of the data submitted and have determined that the items listed below represent the best available data for the flooding source listed above.

- Sheets 1 and 2 of the as-built topographic work maps entitled "Bullard Wash FIS Work Map," prepared by B & R Engineering, dated January 30, 1995

- HEC-2 hydraulic model, entitled "White Tanks/Agua Fria Drainage Master Study, 100-Year Storm Event Floodplain Run File: 'BULL-RID.H2I,' Bullard Wash, Wash 10, Roosevelt Irrigation District Canal (RID Canal) to Indian School Road Reach. Sections 6.320-7.753," dated January 25, 1995

We will include this information in our next physical map revision of the FIRM for Maricopa County, Arizona and Incorporated Areas. The tentative date for the next preliminary FIRM is fall 1996. In the interim, your community may use these data in its floodplain management programs.

If you have any questions regarding this matter, please contact Mr. John Magnotti of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-4596.

Sincerely,

Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate

cc: Mr. Ron Nevitt
Floodplain Administration
Flood Control District of Maricopa County

Mr. Mark T. Gavan, P.E., R.L.S.
Project Manager
The WLB Group Inc.

APPENDIX A-V

UNIT COST INFLATION ADJUSTMENTS

Adjusted Unit Costs
Cost Group A

MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVE
										1.81%
3.02%	2.22%	2.06%	2.11%	2.11%	2.16%	2.32%	2.04%	1.77%	1.88%	2.27%
1.48%	1.64%	1.18%	1.07%	1.46%	1.80%	1.51%	2.03%	2.20%	2.38%	1.59%
2.92%	3.27%	3.62%	3.25%	2.72%	2.72%	2.65%	2.13%	1.90%	1.55%	2.83%
3.76%	3.07%	3.19%	3.73%	3.66%	3.41%	3.45%	3.45%	3.45%	3.39%	3.38%
1.73%	2.28%	2.09%	1.96%	2.14%	2.26%	2.63%	2.56%	2.62%	2.68%	2.19%
1.37%	1.44%	1.69%	1.68%	1.68%	1.62%	1.49%	1.49%	1.55%	1.61%	1.55%
2.76%	2.50%	2.23%	2.30%	2.23%	2.23%	2.15%	2.08%	1.83%	1.70%	2.34%

ent cost

ference Manual, Pg. 2-2

t_0	t_1	n	(Ann. Inflation) i	F
1997	1998	1	2.34%	$50.46
1998	1999	1	1.55%	$51.25
1999	2000	1	2.19%	$52.37
2000	2001	1	3.38%	$54.14
2001	2002	1	2.83%	$55.67
2002	2003	1	1.59%	$56.56
2003	2004	1	2.04%	$57.71
			Rounded Value:	***$58.00***
1997	1998	1	2.34%	$56.61
1998	1999	1	1.55%	$57.49
1999	2000	1	2.19%	$58.74
2000	2001	1	3.38%	$60.73
2001	2002	1	2.83%	$62.45
2002	2003	1	1.59%	$63.44
2003	2004	1	2.04%	$64.74
			Rounded Value:	***$65.00***
1997	1998	1	2.34%	$64.88
1998	1999	1	1.55%	$65.89
1999	2000	1	2.19%	$67.33
2000	2001	1	3.38%	$69.61
2001	2002	1	2.83%	$71.58
2002	2003	1	1.59%	$72.72
2003	2004	1	2.04%	$74.20
			Rounded Value:	***$74.00***
1997	1998	1	2.34%	$56.61
1998	1999	1	1.55%	$57.49
1999	2000	1	2.19%	$58.74
2000	2001	1	3.38%	$60.73
2001	2002	1	2.83%	$62.45
2002	2003	1	1.59%	$63.44
2003	2004	1	2.04%	$64.74
			Rounded Value:	***$65.00***
1997	1998	1	2.34%	$73.51
1998	1999	1	1.55%	$74.65
1999	2000	1	2.19%	$76.29
2000	2001	1	3.38%	$78.86
2001	2002	1	2.83%	$81.10
2002	2003	1	1.59%	$82.38
2003	2004	1	2.04%	$84.07
			Rounded Value:	***$84.00***
1997	1998	1	2.34%	$87.09
1998	1999	1	1.55%	$88.44
1999	2000	1	2.19%	$90.38
2000	2001	1	3.38%	$93.43
2001	2002	1	2.83%	$96.07
2002	2003	1	1.59%	$97.60
2003	2004	1	2.04%	$99.59
			Rounded Value:	***$100.00***
1997	1998	1	2.34%	$108.92
1998	1999	1	1.55%	$110.61
1999	2000	1	2.19%	$113.03
2000	2001	1	3.38%	$116.85
2001	2002	1	2.83%	$120.16
2002	2003	1	1.59%	$122.07
2003	2004	1	2.04%	$124.56
			Rounded Value:	***$125.00***
1997	1998	1	2.34%	$113.47
1998	1999	1	1.55%	$115.23
1999	2000	1	2.19%	$117.76
2000	2001	1	3.38%	$121.74
2001	2002	1	2.83%	$125.18
2002	2003	1	1.59%	$127.17
2003	2004	1	2.04%	$129.77
			Rounded Value:	***$130.00***
1997	1998	1	2.34%	$139.83
1998	1999	1	1.55%	$141.99
1999	2000	1	2.19%	$145.10
2000	2001	1	3.38%	$150.01
2001	2002	1	2.83%	$154.25
2002	2003	1	1.59%	$156.71
2003	2004	1	2.04%	$159.90
			Rounded Value:	***$160.00***
1997	1998	1	2.34%	$209.37
1998	1999	1	1.55%	$212.61
1999	2000	1	2.19%	$217.27
2000	2001	1	3.38%	$224.61
2001	2002	1	2.83%	$230.97
2002	2003	1	1.59%	$234.64
2003	2004	1	2.04%	$239.43
			Rounded Value:	***$239.00***

Adjusted Unit Costs
Cost Group A

1997	1998	1	2.34%	$234.92
1998	1999	1	1.55%	$238.56
1999	2000	1	2.19%	$243.79
2000	2001	1	3.38%	$252.03
2001	2002	1	2.83%	$259.16
2002	2003	1	1.59%	$263.28
2003	2004	1	2.04%	$268.65
			Rounded Value:	***$269.00***

1997	1998	1	2.34%	$262.89
1998	1999	1	1.55%	$266.97
1999	2000	1	2.19%	$272.81
2000	2001	1	3.38%	$282.03
2001	2002	1	2.83%	$290.01
2002	2003	1	1.59%	$294.63
2003	2004	1	2.04%	$300.64
			Rounded Value:	***$301.00***

1997	1998	1	2.34%	$278.73
1998	1999	1	1.55%	$283.05
1999	2000	1	2.19%	$289.25
2000	2001	1	3.38%	$299.03
2001	2002	1	2.83%	$307.49
2002	2003	1	1.59%	$312.38
2003	2004	1	2.04%	$318.75
			Rounded Value:	***$319.00***

1997	1998	1	2.34%	$314.18
1998	1999	1	1.55%	$319.05
1999	2000	1	2.19%	$326.04
2000	2001	1	3.38%	$337.06
2001	2002	1	2.83%	$346.60
2002	2003	1	1.59%	$352.11
2003	2004	1	2.04%	$359.29
			Rounded Value:	***$359.00***

Adjusted Unit Costs
Cost Group B

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVE
2004	1.93%	1.69%											1.81%
2003	2.60%	2.98%	3.02%	2.22%	2.06%	2.11%	2.11%	2.16%	2.32%	2.04%	1.77%	1.88%	2.27%
2002	1.14%	1.14%	1.48%	1.64%	1.18%	1.07%	1.46%	1.80%	1.51%	2.03%	2.20%	2.38%	1.59%
2001	3.73%	3.53%	2.92%	3.27%	3.62%	3.25%	2.72%	2.72%	2.65%	2.13%	1.90%	1.55%	2.83%
2000	2.74%	3.22%	3.76%	3.07%	3.19%	3.73%	3.66%	3.41%	3.45%	3.45%	3.45%	3.39%	3.38%
1999	1.67%	1.61%	1.73%	2.28%	2.09%	1.96%	2.14%	2.26%	2.63%	2.56%	2.62%	2.68%	2.19%
1998	1.57%	1.44%	1.37%	1.44%	1.69%	1.68%	1.68%	1.62%	1.49%	1.49%	1.55%	1.61%	1.55%
1997	3.04%	3.03%	2.76%	2.50%	2.23%	2.30%	2.23%	2.23%	2.15%	2.08%	1.83%	1.70%	2.34%

Estimate future cost given present cost

F = P(I+I%)n - Civil Engineering Reference Manual, Pg. 2-2

Concrete	P	Period	t0	t1	n	(Ann. Inflation) i	F	
$/CY	$162.50	years	0	0	0	2.34%	$162.50	
$/CY	$162.50	years	0	0	0	1.55%	$162.50	
$/CY	$162.50	years	0	0	0	2.19%	$162.50	
$/CY	$162.50	years	0	0	0	3.38%	$162.50	
$/CY	$162.50	years	0	0	0	2.83%	$162.50	
$/CY	$162.50	years	0	0	0	1.59%	$162.50	
$/CY	$162.50	years	2004	2004	0	2.04%	$162.50	*Used $162.5/CY per Oscar Oliden
						Rounded Value:	$162.50	given range of $150 - $175 / CY

Steel	P	Period	t0	t1	n	(Ann. Inflation) i	F
$/lb	$0.45	years	0	0	0	2.34%	$0.45
$/lb	$0.45	years	0	0	0	1.55%	$0.45
$/lb	$0.45	years	0	0	0	2.19%	$0.45
$/lb	$0.45	years	0	0	0	3.38%	$0.45
$/lb	$0.45	years	0	0	0	2.83%	$0.45
$/lb	$0.45	years	0	0	0	1.59%	$0.45
$/lb	$0.45	years	2004	2004	0	2.04%	$0.45

Rip-Rap Energy Dissipator	P	Period	t0	t1	n	(Ann. Inflation) i	F
$/EA	$5,000.00	years	0	0	0	2.34%	$5,000.00
$/EA	$5,000.00	years	0	0	0	1.55%	$5,000.00
$/EA	$5,000.00	years	0	0	0	2.19%	$5,000.00
$/EA	$5,000.00	years	0	0	0	3.38%	$5,000.00
$/EA	$5,000.00	years	0	0	0	2.83%	$5,000.00
$/EA	$5,000.00	years	0	0	0	1.59%	$5,000.00
$/EA	$5,000.00	years	2004	2004	0	2.04%	$5,000.00
						Rounded Value:	$5,000.00

Adjusted Unit Costs
Cost Group B

Structural Backfill	P	Period	t0	t1	n	(Ann. Inflation) i	F
$/CY	$20.00	years	0	0	0	2.34%	$20.00
$/CY	$20.00	years	0	0	0	1.55%	$20.00
$/CY	$20.00	years	0	0	0	2.19%	$20.00
$/CY	$20.00	years	0	0	0	3.38%	$20.00
$/CY	$20.00	years	0	0	0	2.83%	$20.00
$/CY	$20.00	years	0	0	0	1.59%	$20.00
$/CY	$20.00	years	2004	2004	0	2.04%	$20.00
						Rounded Value:	$20.00

Structural Excavation	P	Period	t0	t1	n	(Ann. Inflation) i	F
$/CY	$5.00	years	0	0	0	2.34%	$5.00
$/CY	$5.00	years	0	0	0	1.55%	$5.00
$/CY	$5.00	years	0	0	0	2.19%	$5.00
$/CY	$5.00	years	0	0	0	3.38%	$5.00
$/CY	$5.00	years	0	0	0	2.83%	$5.00
$/CY	$5.00	years	0	0	0	1.59%	$5.00
$/CY	$5.00	years	2004	2004	0	2.04%	$5.00
						Rounded Value:	$5.00

Adjusted Unit Costs
Cost Group C

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVE
2004	1.93%	1.69%											1.81%
2003	2.60%	2.98%	3.02%	2.22%	2.06%	2.11%	2.11%	2.16%	2.32%	2.04%	1.77%	1.88%	2.27%
2002	1.14%	1.14%	1.48%	1.64%	1.18%	1.07%	1.46%	1.80%	1.51%	2.03%	2.20%	2.38%	1.59%
2001	3.73%	3.53%	2.92%	3.27%	3.62%	3.25%	2.72%	2.72%	2.65%	2.13%	1.90%	1.55%	2.83%
2000	2.74%	3.22%	3.76%	3.07%	3.19%	3.73%	3.66%	3.41%	3.45%	3.45%	3.45%	3.39%	3.38%
1999	1.67%	1.61%	1.73%	2.28%	2.09%	1.96%	2.14%	2.26%	2.63%	2.56%	2.62%	2.68%	2.19%
1998	1.57%	1.44%	1.37%	1.44%	1.69%	1.68%	1.68%	1.62%	1.49%	1.49%	1.55%	1.61%	1.55%
1997	3.04%	3.03%	2.76%	2.50%	2.23%	2.30%	2.23%	2.23%	2.15%	2.08%	1.83%	1.70%	2.34%

Estimate future cost given present cost

F = P(I+I%)n - Civil Engineering Reference Manual, Pg. 2-2

Acres	P	Period	t0	t1	n	(Ann. Inflation) i	F	
$/AC	$60,000.00	years	0	0	0	2.34%	$60,000.00	
$/AC	$60,000.00	years	0	0	0	1.55%	$60,000.00	
$/AC	$60,000.00	years	0	0	0	2.19%	$60,000.00	
$/AC	$60,000.00	years	0	0	0	3.38%	$60,000.00	
$/AC	$60,000.00	years	0	0	0	2.83%	$60,000.00	
$/AC	$60,000.00	years	0	0	0	1.59%	$60,000.00	
$/AC	$60,000.00	years	2004	2004	0	2.04%	$60,000.00	*Used $162.5/CY per Oscar Oliden
						Rounded Value:	$60,000.00	given range of $150 - $175 / CY

Structure Relocation	P	Period	t0	t1	n	(Ann. Inflation) i	F
$/EA	$100,000.00	years	0	0	0	2.34%	$100,000.00
$/EA	$100,000.00	years	0	0	0	1.55%	$100,000.00
$/EA	$100,000.00	years	0	0	0	2.19%	$100,000.00
$/EA	$100,000.00	years	0	0	0	3.38%	$100,000.00
$/EA	$100,000.00	years	0	0	0	2.83%	$100,000.00
$/EA	$100,000.00	years	0	0	0	1.59%	$100,000.00
$/EA	$100,000.00	years	2004	2004	0	2.04%	$100,000.00

Adjusted Unit Costs
Cost Group D

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVE
2004	1.93%	1.69%											1.81%
2003	2.60%	2.98%	3.02%	2.22%	2.06%	2.11%	2.11%	2.16%	2.32%	2.04%	1.77%	1.88%	2.27%
2002	1.14%	1.14%	1.48%	1.64%	1.18%	1.07%	1.46%	1.80%	1.51%	2.03%	2.20%	2.38%	1.59%
2001	3.73%	3.53%	2.92%	3.27%	3.62%	3.25%	2.72%	2.72%	2.65%	2.13%	1.90%	1.55%	2.83%
2000	2.74%	3.22%	3.76%	3.07%	3.19%	3.73%	3.66%	3.41%	3.45%	3.45%	3.45%	3.39%	3.38%
1999	1.67%	1.61%	1.73%	2.28%	2.09%	1.96%	2.14%	2.26%	2.63%	2.56%	2.62%	2.68%	2.19%
1998	1.57%	1.44%	1.37%	1.44%	1.69%	1.68%	1.68%	1.62%	1.49%	1.49%	1.55%	1.61%	1.55%
1997	3.04%	3.03%	2.76%	2.50%	2.23%	2.30%	2.23%	2.23%	2.15%	2.08%	1.83%	1.70%	2.34%

Estimate future wotth given present value

$F = P(I+I\%)^n$ - Civil Engineering Reference Manual, Pg. 2-2

annual inflation

Cactus Basin O&M Costs	*P*	Period	t_0	t_1	n	*i*	*F*
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

annual inflation

Northern Basin O&M Costs	*P*	Period	t_0	t_1	n	*i*	*F*
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

annual inflation

LAFB NW Basin O&M Costs	*P*	Period	t_0	t_1	n	*i*	*F*
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

Adjusted Unit Costs
Cost Group D

LAFB NE Basin

O&M Costs	P	Period	t_0	t_1	n	i (annual inflation)	F
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

LAFB SW Basin

O&M Costs	P	Period	t_0	t_1	n	i (annual inflation)	F
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

LAFB SE Basin

O&M Costs	P	Period	t_0	t_1	n	i (annual inflation)	F
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

I-10 N Basin O&M

Costs	P	Period	t_0	t_1	n	i (annual inflation)	F
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

Adjusted Unit Costs
Cost Group D

I-10S Basin O&M

Costs	P	Period	t_0	t_1	n	annual inflation i	F
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

Yuma Basin O&M

Costs	P	Period	t_0	t_1	n	annual inflation i	F
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

MC85 Basin O&M

Costs	P	Period	t_0	t_1	n	annual inflation i	F
$/AC/Year	$160.44	years	0	0	0	2.34%	$160.44
$/AC/Year	$160.44	years	0	0	0	1.55%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.19%	$160.44
$/AC/Year	$160.44	years	0	0	0	3.38%	$160.44
$/AC/Year	$160.44	years	0	0	0	2.83%	$160.44
$/AC/Year	$160.44	years	2002	2003	1	1.59%	$162.99
$/AC/Year	$162.99	years	2003	2004	1	2.04%	$166.32
						Rounded Value:	***$166.00***

Channel O&M

Costs	P	Period	t_0	t_1	n	annual inflation i	F
$/LF/Year	$2.96	years	0	0	0	2.34%	$2.96
$/LF/Year	$2.96	years	0	0	0	1.55%	$2.96
$/LF/Year	$2.96	years	0	0	0	2.19%	$2.96
$/LF/Year	$2.96	years	0	0	0	3.38%	$2.96
$/LF/Year	$2.96	years	0	0	0	2.83%	$2.96
$/LF/Year	$2.96	years	2002	2003	1	1.59%	$3.01
$/LF/Year	$3.01	years	2003	2004	1	2.04%	$3.07
						Rounded Value:	***$3.00***

Adjusted Unit Costs
Cost Group E

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVE
2004	1.93%	1.69%											1.81%
2003	2.60%	2.98%	3.02%	2.22%	2.06%	2.11%	2.11%	2.16%	2.32%	2.04%	1.77%	1.88%	2.27%
2002	1.14%	1.14%	1.48%	1.64%	1.18%	1.07%	1.46%	1.80%	1.51%	2.03%	2.20%	2.38%	1.59%
2001	3.73%	3.53%	2.92%	3.27%	3.62%	3.25%	2.72%	2.72%	2.65%	2.13%	1.90%	1.55%	2.83%
2000	2.74%	3.22%	3.76%	3.07%	3.19%	3.73%	3.66%	3.41%	3.45%	3.45%	3.45%	3.39%	3.38%
1999	1.67%	1.61%	1.73%	2.28%	2.09%	1.96%	2.14%	2.26%	2.63%	2.56%	2.62%	2.68%	2.19%
1998	1.57%	1.44%	1.37%	1.44%	1.69%	1.68%	1.66%	1.62%	1.49%	1.49%	1.55%	1.61%	1.55%
1997	3.04%	3.03%	2.76%	2.50%	2.23%	2.30%	2.23%	2.23%	2.15%	2.08%	1.83%	1.70%	2.34%

Estimate future wotth given present value

$F = P(I+i\%)^n$ - Civil Engineering Reference Manual, Pg. 2-2

Grouted Rip Rap	*P*	Period	t_0	t_1	n	*annual inflation* *i*	*F*
$/CY	$130.00	years	0	0	0	2.34%	$130.00
$/CY	$130.00	years	0	0	0	1.55%	$130.00
$/CY	$130.00	years	0	0	0	2.19%	$130.00
$/CY	$130.00	years	0	0	0	3.38%	$130.00
$/CY	$130.00	years	2001	2002	1	2.83%	$133.68
$/CY	$133.68	years	2002	2003	1	1.59%	$135.80
$/CY	$135.80	years	2003	2004	1	2.04%	$138.57
						Rounded Value:	***$139.00***

Hydroseed	*P*	Period	t_0	t_1	n	*annual inflation* *i*	*F*
$/AC	$2,080.00	years	0	0	0	2.34%	$2,080.00
$/AC	$2,080.00	years	0	0	0	1.55%	$2,080.00
$/AC	$2,080.00	years	0	0	0	2.19%	$2,080.00
$/AC	$2,080.00	years	0	0	0	3.38%	$2,080.00
$/AC	$2,080.00	years	2001	2002	1	2.83%	$2,138.86
$/AC	$2,138.86	years	2002	2003	1	1.59%	$2,172.87
$/AC	$2,172.87	years	2003	2004	1	2.04%	$2,217.20
						Rounded Value:	***$2,218.00***

Channel Excavation	*P*	Period	t_0	t_1	n	*annual inflation* *i*	*F*
$/CY	$3.00	years	0	0	0	2.34%	$3.00
$/CY	$3.00	years	0	0	0	1.55%	$3.00
$/CY	$3.00	years	0	0	0	2.19%	$3.00
$/CY	$3.00	years	0	0	0	3.38%	$3.00
$/CY	$3.00	years	2001	2002	1	2.83%	$3.08
$/CY	$3.08	years	2002	2003	1	1.59%	$3.13
$/CY	$3.13	years	2003	2004	1	2.04%	$3.20
						Rounded Value:	***$3.00***

Adjusted Unit Costs
Cost Group E

Fill	*P*	Period	t_0	t_1	n	*i*	*F*
$/CY	$3.00	years	0	0	0	2.34%	$3.00
$/CY	$3.00	years	0	0	0	1.55%	$3.00
$/CY	$3.00	years	0	0	0	2.19%	$3.00
$/CY	$3.00	years	0	0	0	3.38%	$3.00
$/CY	$3.00	years	2001	2002	1	2.83%	$3.08
$/CY	$3.08	years	2002	2003	1	1.59%	$3.13
$/CY	$3.13	years	2003	2004	1	2.04%	$3.20
						Rounded Value:	***$3.00***

Detention Basin Excavation	*P*	Period	t_0	t_1	n	*i*	*F*
$/CY	$5.00	years	0	0	0	2.34%	$5.00
$/CY	$5.00	years	0	0	0	1.55%	$5.00
$/CY	$5.00	years	0	0	0	2.19%	$5.00
$/CY	$5.00	years	0	0	0	3.38%	$5.00
$/CY	$5.00	years	2001	2002	1	2.83%	$5.14
$/CY	$5.14	years	2002	2003	1	1.59%	$5.22
$/CY	$5.22	years	2003	2004	1	2.04%	$5.33
						Rounded Value:	***$5.00***

APPENDIX A-VI

DETAILED COST ESTIMATE

Table A-6.1
Loop 303 ADMP Update Proposed Channel Quantities

Camelback Channel Preferred Alternative

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L	Channel Excavation	C.Y.	$3.00	91,829	$275,487
	Channel Fill	C.Y.	$3.00	13,949	$41,848
	Channel ROW - daylight only	ACRE	$60,000.00	24.1	$1,447,697
	Landscaping & Aesthetic Treatment[2]	SF	$1.00	1,045,440	$1,045,440
	Structure Relocation	EA.	$100,000.00	2	$200,000
	3 Barrel 100' Long, 10' X 4' RCB Culvert	EA.	$118,888.08	1	$118,888
				Sub Total =	*$3,129,361*
				Engineering (10% Construction) =	*$312,936*
				30% Contingency =	*$938,808*
				Operation and Maintenance - 50-year life cycle =	$964,498
				Total =	***$5,345,603***

Camelback Channel Preferred Alternative

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L	Channel Excavation	C.Y.	$3.00	91,829	$275,487
	Channel Fill	C.Y.	$3.00	13,949	$41,848
	Channel ROW - rectangular bounding lines	ACRE	$60,000.00	26	$1,571,064
	Landscaping & Aesthetic Treatment[2,3]	SF	$1.55	1,045,440	$1,620,000
	Structure Relocation	EA.	$100,000.00	2	$200,000
	1 Barrel 100' Long, 8' Wide, 10' High RCB Pedestrian Crossing	C.Y.	$65,083.38	1	$65,083
	3 Barrel 100' Long, 10' X 4' RCB Culvert	EA.	$118,888.08	1	$118,888
				Sub Total =	*$3,892,370*
				Engineering (10% Construction) =	*$389,237*
				30% Contingency =	*$1,167,711*
				Operation and Maintenance - 50-year life cycle =	$964,498
				Total =	***$6,413,816***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.2
Loop 303 ADMP Update Proposed Channel Quantities

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Jackrabbit Channel		Channel Excavation	C.Y.	$3.00	542,695	$1,628,085
		Channel Fill	C.Y.	$3.00	59,134	$177,401
		Detention Basin Net Excavation	C.Y.	$5.00	150,217	$751,085
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	1,293	$179,765
		Channel ROW - enveloping boundary	ACRE	$60,000.00	107	$6,411,828
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	8	$507,562
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	4,215,737	$4,215,737
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
		Structure Relocations	EA.	$100,000.00	2	$200,000
		6" Waterline Relocation	LF	$46.05	181	$8,335
		8" Waterline Relocation	LF	$56.08	361	$20,245
		Overhead Electric Relocation	EA	$20,000.00	1	$20,000
	1	Barrel 24" RCP Low Flow Bleed Pipe	LF	$65.00	8,323	$540,995
	9	Barrel 48' Long, 10' Wide, 4' High RCB Culvert	EA.	$171,057.74	2	$342,115
	4	Barrel 170' Long, 10' Wide, 4' High RCB Culvert	EA.	$252,132.64	1	$252,133
	1	Barrel 174' Long, 10' Wide, 4' High RCB Culvert	EA.	$74,915.44	1	$74,915
	4	Barrel 179' Long, 10' Wide, 4' High RCB Culvert	EA.	$264,543.55	1	$264,544
	4	Barrel 194' Long, 10' Wide, 4' High RCB Culvert	EA.	$285,557.47	1	$285,557
	1	Barrel 97' Long, 30" DIAM. RCP Culvert	EA.	$12,212.76	1	$12,213
	1	Barrel 102' Long, 30" DIAM. RCP Culvert	EA.	$12,725.76	1	$12,726
	2	Barrel 178' Long, 30" DIAM. RCP Culvert	EA.	$42,009.28	1	$42,009
	1	Barrel 89' Long, 36" DIAM. RCP Culvert	EA.	$11,882.88	1	$11,883
	1	Barrel 178' Long, 36" DIAM. RCP Culvert	EA.	$22,295.88	1	$22,296
	4	Barrel 90' Long, 48" DIAM. RCP Culvert	EA.	$75,620.20	1	$75,620
	3	Barrel 98' Long, 48" DIAM. RCP Culvert	EA.	$61,769.10	1	$61,769
	2	Barrel 105' Long, 48" DIAM. RCP Culvert	EA.	$44,768.00	1	$44,768
	2	Barrel 109' Long, 48" DIAM. RCP Culvert	EA.	$45,993.00	1	$45,993
	2	Barrel 112' Long, 66" DIAM. RCP Culvert	EA.	$73,556.20	1	$73,556
	8	Barrel 120' Long, 66" DIAM. RCP Culvert	EA.	$296,788.40	1	$296,788
					Sub Total =	*$16,584,924*
					Engineering (10% construction) =	*$1,658,492*
					30% Contingency =	*$4,975,477*
					Basin Operation and Maintenance - 50-year life cycle =	$56,955
					Channel Operation and Maintenance - 50-year life cycle =	$3,185,308
					Total =	***$26,461,157***

Jackrabbit Channel Cost - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Jackrabbit Channel		Channel Excavation	C.Y.	$3.00	542,695	$1,628,085
		Channel Fill	C.Y.	$3.00	59,134	$177,401
		Detention Basin Net Excavation	C.Y.	$5.00	150,217	$751,085
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	1,293	$179,765
	1	Channel ROW - enveloping boundary	ACRE	$60,000.00	107	$6,411,828
	1	Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	8	$507,562
		Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.55	3,910,817	$6,060,000
		Landscaping & Aesthetic Treatment - basin[2,3]	SF	$1.41	304,920	$430,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
		Structure Relocations	EA.	$100,000.00	2	$200,000
		6" Waterline Relocation	LF	$46.05	181	$8,335
		8" Waterline Relocation	LF	$56.08	361	$20,245
		Overhead Electric Relocation	EA	$20,000.00	1	$20,000
		Barrel 24" RCP Low Flow Bleed Pipe	LF	$65.00	8,323	$540,995
	1	Barrel 194' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$110,988.56	1	$110,989
	1	Barrel 179' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$103,688.81	1	$103,689
	1	Barrel 48' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$39,607.72	2	$79,215
	9	Barrel 48' Long, 10' Wide, 4' High RCB Culvert	EA.	$171,057.74	2	$342,115
	4	Barrel 170' Long, 10' Wide, 4' High RCB Culvert	EA.	$252,132.64	1	$252,133
	1	Barrel 174' Long, 10' Wide, 4' High RCB Culvert	EA.	$74,915.44	1	$74,915
	4	Barrel 179' Long, 10' Wide, 4' High RCB Culvert	EA.	$264,543.55	1	$264,544
	4	Barrel 194' Long, 10' Wide, 4' High RCB Culvert	EA.	$285,557.47	1	$285,557
	1	Barrel 97' Long, 30" DIAM. RCP Culvert	EA.	$12,212.76	1	$12,213
	1	Barrel 102' Long, 30" DIAM. RCP Culvert	EA.	$12,725.76	1	$12,726
	2	Barrel 178' Long, 30" DIAM. RCP Culvert	EA.	$42,009.28	1	$42,009
	1	Barrel 89' Long, 36" DIAM. RCP Culvert	EA.	$11,882.88	1	$11,883
	1	Barrel 178' Long, 36" DIAM. RCP Culvert	EA.	$22,295.88	1	$22,296
	4	Barrel 90' Long, 48" DIAM. RCP Culvert	EA.	$75,620.20	1	$75,620
	3	Barrel 98' Long, 48" DIAM. RCP Culvert	EA.	$61,769.10	1	$61,769
	2	Barrel 105' Long, 48" DIAM. RCP Culvert	EA.	$44,768.00	1	$44,768
	2	Barrel 109' Long, 48" DIAM. RCP Culvert	EA.	$45,993.00	1	$45,993
	2	Barrel 112' Long, 66" DIAM. RCP Culvert	EA.	$73,556.20	1	$73,556
	8	Barrel 120' Long, 66" DIAM. RCP Culvert	EA.	$296,788.40	1	$296,788
					Sub Total =	*$19,353,080*
					Engineering (10% construction) =	*$1,935,308*
					30% Contingency =	*$5,805,924*
					Basin Operation and Maintenance - 50-year life cycle =	$56,955
					Channel Operation and Maintenance - 50-year life cycle =	$3,185,308
					Total =	***$30,336,576***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3a-i
Cost Estimate Summary
for The SR 303L Channel

Costs Given in Terms of ADMP Update 'Reaches' - Option A

Linear Feet	Approx. Mile Number	From	To	Cost per Reach	Cost per Foot	O&M[1] Cost per Reach
5950	1 to 2	Gila River	MC 85	$2,980,172.72	($501)	($885,000)
6050	2 to 3	MC 85	Lower Buckeye Road	$11,737,470.32	($1,940)	($1,328,370)
5350	3 to 4	Lower Buckeye Road	Yuma Road	$2,878,669.62	($538)	($787,500)
5350	4 to 5	Yuma Road	Van Buren Street	$7,436,805.17	($1,390)	($1,072,250)
5079.56	5 to 6	Van Buren Street	Approx. 342' south of I-10	$3,185,142.79	($627)	($769,434)
8420.44	6 to 7	Approx. 342' south of I-10	Thomas Road	$23,206,969.45	($2,756)	($2,098,846)
5450	7 to 8	Thomas Road	Indian School Road	$2,555,001.92	($469)	($810,000)
5350	8 to 9	Indian School Road	Camelback Road	$1,490,929.93	($279)	($810,000)
5350	9 to 10	Camelback Road	Bethany Home Road	$31,136,118.80	($5,820)	($2,132,960)
5300	10 to 11	Bethany Home Road	Glendale Avenue	$2,758,733.76	($521)	($795,000)
5300	11 to 12	Glendale Avenue	Northern Avenue	$3,095,444.77	($584)	($802,500)
5300	12 to 13	Northern Avenue	Olive Avenue	$10,817,857.77	($2,041)	($1,086,330)
5300	13 to 14	Olive Avenue	Peoria Avenue	$3,250,755.00	($613)	($795,000)
5350	14 to 15	Peoria Avenue	Cactus Road	$3,000,460.22	($561)	($802,500)
5300	15 to 16	Cactus Road	Waddell/Thunderbird Road	$15,366,512.73	($2,899)	($1,195,890)
5250	16 to 17	Waddell/Thunderbird Road	Greenway Road	$2,111,258.24	($402)	($795,000)
5280.42	17 to 18	Greenway Road	Bell Road	$1,750,905.69	($332)	($792,063)

Sub Total =	$128,759,208.90	*$17,758,643.00*
Engineering (10% Construction) =	*$12,875,921*	
30% Contingency =	*$38,627,763*	
Sub Total =	*$180,262,892*	
Total Including O&M =	$198,021,535.46	

1. Operation and maintenance for a 50-year life cycle.

Table A-6.3b-i

SR 303L Channel Preferred Alternative - from the Gila River to MC 85 - Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L		Channel Excavation	C.Y.	$3.00	27,597	$82,792
		Channel Fill	C.Y.	$3.00	8,942	$26,826
		Concrete&Steel	L.F.	$218.32	5,900	$1,288,096
		Channel ROW	ACRE	$60,000.00	9.2	$549,624
		Landscaping & Aesthetic Treatment	SF	$1.00	59,000	$59,000
		Structure Relocations	EA.	$100,000.00	1	$100,000
	3	Single span bridge(s)	EA.	$858,420.00	1	$858,420
					Sub Total =	*$2,980,173*
					Engineering (10% Construction) =	*$298,017*
					30% Contingency =	*$894,052*
		Channel Operation and Maintenance - 50-year life cycle =				$885,000
					Total =	***$5,057,242***

Table A-6.3c-i

SR 303L Channel Preferred Alternative - from MC 85 to Lower Buckeye Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	19,065	$57,196
	Channel Fill	C.Y.	$3.00	2,000	$6,000
	Concrete&Steel	L.F.	$149.57	4,301	$643,298
	Rétention Basin Net Excavation	C.Y.	$5.00	1,003,758	$5,018,790
	Drop Structures - additional concrete	C.Y.	$162.50	0	$0
	Channel ROW	ACRE	$60,000.00	7.1	$423,081
	Basin ROW - area boudary	ACRE	$60,000.00	51.7	$3,101,446
	Hydroseed & Topsoil	ACRE	$2,218.00	49.4	$109,569
	Landscaping & Aesthetic Treatment	SF	$1.00	61,500	$61,500
	Utility Relocation	EA.	$47,700.00	1	$47,700
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1- 54" Low Flow Drain Pipe	L.F.	$160.00	2,872	$459,510
	3 Single span bridge(s)	EA.	$1,603,200.00	1	$1,603,200
	4 Barrel 269' Long, 48" RCP Culvert	EA.	$201,179.20	1	$201,179
				Sub Total =	*$11,737,470*
				Engineering (10% Construction) =	*$1,173,747*
				30% Contingency =	*$3,521,241*
				Channel Operation and Maintenance - 50-year life cycle =	*$922,500*
				Basin Operation and Maintenance - 50-year life cycle =	*$405,870*
				Total =	***$17,760,828***

Table A-6.3d-i

SR 303L Channel Preferred Alternative - from Lower Buckeye Road to Yuma Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	24,558	$73,673
	Channel Fill	C.Y.	$3.00	421	$1,263
	Concrete&Steel	L.F.	$207.79	5,250	$1,090,881
	Channel ROW	ACRE	$60,000.00	10.1	$605,632
	Landscaping & Aesthetic Treatment	SF	$1.00	52,500	$52,500
	Structure Relocations	EA.	$100,000.00	4	$400,000
	Utility Relocation	EA.	$42,000.00	1	$42,000
	1 Single span bridge(s)	EA.	$612,720.00	1	$612,720
				Sub Total =	*$2,878,670*
				Engineering (10% Construction) =	*$287,867*
				30% Contingency =	*$863,601*
				Channel Operation and Maintenance - 50-year life cycle =	*$787,500*
				Total =	***$4,817,637***

Table A-6.3e-i

SR 303L Channel Preferred Alternative - from Yuma Road to Van Buren Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	30,748	$92,245
	Channel Fill	C.Y.	$3.00	0	$0
	Concrete&Steel	L.F.	$160.21	4,624	$740,726
	Rètention Basin Net Excavation	C.Y.	$5.00	532,903	$2,664,515
	Channel ROW	ACRE	$60,000.00	11.2	$673,089
	Basin ROW - area boudary	ACRE	$60,000.00	37.8	$2,266,480
	Hydroseed & Topsoil	ACRE	$2,218.00	32.5	$72,085
	Landscaping & Aesthetic Treatment	SF	$1.00	53,500	$53,500
	Utility Relocation	EA.	$42,000.00	1	$42,000
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1- 48" Low Flow Drain Pipe	L.F.	$130.00	4,092	$531,965
	1 Long Span Culvert	EA.	$295,200.00	1	$295,200
				Sub Total =	*$7,436,805*
				Engineering (10% Construction) =	*$743,681*
				30% Contingency =	*$2,231,042*
				Channel Operation and Maintenance - 50-year life cycle =	*$802,500*
				Basin Operation and Maintenance - 50-year life cycle =	*$269,750*
				Total =	***$11,483,777***

Table A-6.3f-i

SR 303L Channel Preferred Alternative - from Van Buren to I-10 - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	114,578	$343,735
	Channel Fill	C.Y.	$3.00	0	$0
	Concrete&Steel	L.F.	$143.26	5,130	$734,905
	Channel ROW	ACRE	$60,000.00	22.4	$1,346,082
	Landscaping & Aesthetic Treatment	SF	$1.00	51,296	$51,296
	Utility Relocation	EA.	$176,325.00	1	$176,325
1	5-span bridge(s)	EA.	$532,800.00	1	$532,800
				Sub Total =	*$3,185,143*
				Engineering (10% Construction) =	*$318,514*
				30% Contingency =	*$955,543*
				Channel Operation and Maintenance - 50-year life cycle =	*$769,434*
				Total =	***$5,228,634***

Table A-6.3g-i

SR 303L Channel Preferred Alternative - from I-10 to Thomas Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	60,616	$181,847
	Channel Fill	C.Y.	$3.00	16	$48
	Concrete&Steel	L.F.	$132.62	4,874	$646,412
	Retention Basin Net Excavation	C.Y.	$5.00	2,159,567	$10,797,835
	Channel ROW	ACRE	$60,000.00	7.0	$419,088
	Basin ROW - area boudary	ACRE	$60,000.00	93.2	$5,594,175
	Hydroseed & Topsoil	ACRE	$2,218.00	87.6	$194,297
	Landscaping & Aesthetic Treatment	SF	$1.00	83,704	$83,704
	Utility Relocation	EA.	$178,750.00	1	$178,750
	Rip Rap Energy Dissipater	EA.	$5,000.00	2	$10,000
	1 - 48" Low Flow Drain Pipe	L.F.	$130.00	527	$68,568.50
	3 - 54" Low Flow Drain Pipe	L.F.	$160.00	6,094	$2,925,120.00
	3 - 10' X 6' Equalizer Pipe	EA.	$540,272.14	1	$540,272
	1 Single span bridge(s)	EA.	$219,780.00	1	$219,780
	4 - Barrel 1021' Long, 72" RCP Culvert	EA.	$1,347,072.60	1	$1,347,073
				Sub Total =	*$23,206,969*
				Engineering (10% Construction) =	*$2,320,697*
				30% Contingency =	*$6,962,091*
				Channel Operation and Maintenance - 50-year life cycle =	*$1,255,566*
				Basin Operation and Maintenance - 50-year life cycle =	*$843,280*
				Total =	***$34,588,603***

Table A-6.3h-i

SR 303L Channel Preferred Alternative - from Thomas Road to Indian School Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	62,709	$188,127
	Channel Fill	C.Y.	$3.00	0	$0
	Concrete&Steel	L.F.	$135.74	5,400	$732,988
	Channel ROW	ACRE	$60,000.00	9.1	$545,047
	Landscaping & Aesthetic Treatment	SF	$1.00	54,000	$54,000
	Utility Relocation	EA.	$167,000.00	1	$167,000
	2 Single span bridge(s)	EA.	$867,840.00	1	$867,840
				Sub Total =	*$2,555,002*
				Engineering (10% Construction) =	*$255,500*
				30% Contingency =	*$766,501*
				Channel Operation and Maintenance - 50-year life cycle =	$810,000
				Total =	***$4,387,003***

Table A-6.3i-i

SR 303L Channel Preferred Alternative - Indian School Road to Camelback Road - Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L						
		Channel Excavation	C.Y.	$3.00	32,272	$96,816
		Channel Fill	C.Y.	$3.00	159	$476
		Concrete&Steel	L.F.	$104.14	3,834	$399,323
		Channel ROW	ACRE	$60,000.00	2.5	$147,315
		Landscaping & Aesthetic Treatment	SF	$1.00	54,000	$54,000
		Utility Relocation	EA.	$331,000.00	1	$331,000
	1	Long Span Culvert	EA.	$462,000.00	1	$462,000
					Sub Total =	*$1,490,930*
					Engineering (10% Construction) =	*$149,093*
					30% Contingency =	*$447,279*
					Channel Operation and Maintenance - 50-year life cycle =	*$810,000*
					Total =	***$2,897,302***

Table A-6.3j-i

SR 303L Channel Preferred Alternative - Camelback Road to Bethany Home Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	57,275	$171,825
	Channel Fill	C.Y.	$3.00	1,174	$3,521
	Concrete&Steel	L.F.	$302.18	5,300	$1,601,545
	Retention Basin Net Excavation	C.Y.	$5.00	1,981,906	$9,909,530
	Drop Structures - additional concrete	C.Y.	$162.50	208	$33,850
	Channel ROW	ACRE	$60,000.00	4.5	$272,738
	Basin ROW - area boudary	ACRE	$60,000.00	176.3	$10,578,812
	Hydroseed & Topsoil	ACRE	$2,218.00	162.8	$361,090
	Landscaping & Aesthetic Treatment	SF	$1.00	53,000	$53,000
	Utility Relocation	EA.	$86,000.00	1	$86,000
	Rip Rap Energy Dissipater	EA.	$5,000.00	4	$20,000
	1 - 6' X 4' RCB Basin Outfall Pipe and Headwalls	EA.	$283,265.09	1	$283,265
	1 - 36" Low Flow Drain Pipe	L.F.	$100.00	2,926	$292,596
	1 - 24" Low Flow Drain Pipe	L.F.	$65.00	1,417	$92,131
	1 - 18" Low Flow Drain Pipe	L.F.	$58.00	971	$56,302
	1 - 18" Low Flow Drain Pipe	L.F.	$58.00	1,699	$98,533
	1 - 54" Low Flow Drain Pipe	L.F.	$160.00	9,976	$1,596,085
	1 - 54" RCP Basin Equalizer and Headwalls	EA.	$91,603.42	1	$91,603
	4 - 84" RCP Basin Equalizer and Headwalls	EA.	$1,320,992.63	1	$1,320,993
	4 - 10' X 6' RCB Basin Equalizer and Headwalls	EA.	$1,840,508.81	1	$1,840,509
	3 - 10' X 6' RCB Basin Equalizer and Headwalls	EA.	$1,320,992.63	1	$1,320,993
	1 Long Span Culvert	EA.	$1,051,200.00	1	$1,051,200
				Sub Total =	*$31,136,119*
				Engineering (10% Construction) =	*$3,113,612*
				30% Contingency =	*$9,340,836*
				Channel Operation and Maintenance - 50-year lfie cycle =	*$795,000*
				Basin Operation and Maintenance - 50-year lfie cycle =	*$1,337,960*
				Total =	***$45,723,526***

Table A-6.3k-i

SR 303L Channel Preferred Alternative - from Bethany Home Road to Glendale Avenue - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	40,305	$120,914
	Channel Fill	C.Y.	$3.00	6,366	$19,097
	Concrete&Steel	L.F.	$242.25	5,300	$1,283,949
	Drop Structures - additional concrete	C.Y.	$162.50	296	$48,086
	Channel ROW	ACRE	$60,000.00	5.9	$356,487
	Landscaping & Aesthetic Treatment	SF	$1.00	53,000	$53,000
	Utility Relocation	EA.	$90,000.00	1	$90,000
	1 Long Span Culvert	EA.	$787,200.00	1	$787,200
				Sub Total =	*$2,758,734*
				Engineering (10% Construction) =	*$275,873*
				30% Contingency =	*$827,620*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Total =	***$4,657,227***

Table A-6.3l-i

SR 303L Channel Preferred Alternative - from Glendale Avenue to Northern Avenue - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	50,365	$151,096
	Channel Fill	C.Y.	$3.00	1,254	$3,761
	Concrete&Steel	L.F.	$230.17	5,350	$1,231,419
	Channel ROW	ACRE	$60,000.00	5.6	$337,069
	Landscaping & Aesthetic Treatment	SF	$1.00	53,500	$53,500
	Structure Relocations	EA.	$100,000.00	3	$300,000
	Utility Relocation	EA.	$106,000.00	1	$106,000
	1 Single span bridge(s)	EA.	$912,600.00	1	$912,600
				Sub Total =	*$3,095,445*
				Engineering (10% Construction) =	*$309,544*
				30% Contingency =	*$928,633*
				Channel Operation and Maintenance - 50-year life cycle =	*$802,500*
				Total =	***$5,136,123***

Table A-6.3m-i

SR 303L Channel Preferred Alternative - from Northern Avenue to Olive Avenue - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	96,911	$290,734
	Channel Fill	C.Y.	$3.00	170	$510
	Concrete&Steel	L.F.	$205.72	5,300	$1,090,310
	Rètention Basin Net Excavation	C.Y.	$5.00	776,553	$3,882,765
	Drop Structures - additional concrete	C.Y.	$162.50	687	$111,602
	Channel ROW	ACRE	$60,000.00	8.1	$483,176
	Basin ROW - area boudary	ACRE	$60,000.00	41.7	$2,504,876
	Hydroseed & Topsoil	ACRE	$2,218.00	38.9	$86,280
	Landscaping & Aesthetic Treatment	SF	$1.00	53,000	$53,000
	Structure Relocations	EA.	$100,000.00	3	$300,000
	Utility Relocation	EA.	$124,850.00	1	$124,850
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
1 -	54" Low Flow Drain Pipe	L.F.	$160.00	7,120	$1,139,200
1	Single span bridge(s)	EA.	$645,660.00	1	$645,660
2 -	Barrel 256' Long, 60" RCP Culvert	EA.	$99,894.80	1	$99,895
				Sub Total =	*$10,817,858*
				Engineering (10% Construction) =	*$1,081,786*
				30% Contingency =	*$3,245,357*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Basin Operation and Maintenance - 50-year life cycle =	*$291,330*
				Total =	***$16,231,331***

Table A-6.3n-i

SR 303L Channel Preferred Alternative - Olive Avenue to Peoria Avenue - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	43,184	$129,551
	Channel Fill	C.Y.	$3.00	6,300	$18,901
	Concrete&Steel	L.F.	$257.13	5,300	$1,362,780
	Drop Structures - additional concrete	C.Y.	$162.50	300	$48,808
	Channel ROW	ACRE	$60,000.00	5.3	$315,416
	Landscaping & Aesthetic Treatment	SF	$1.00	53,000	$53,000
	Structure Relocations	EA.	$100,000.00	2	$200,000
	Utility Relocation	EA.	$121,200.00	1	$121,200
	1 Single span bridge(s)	EA.	$1,001,100.00	1	$1,001,100
				Sub Total =	*$3,250,755*
				Engineering (10% Construction) =	*$325,076*
				30% Contingency =	*$975,227*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Total =	***$5,346,057***

Table A-6.3o-i

SR 303L Channel Preferred Alternative - Peoria Avenue to Cactus Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	49,260	$147,779
	Channel Fill	C.Y.	$3.00	1,680	$5,040
	Concrete&Steel	L.F.	$270.84	5,350	$1,449,001
	Channel ROW	ACRE	$60,000.00	3.2	$192,540
	Landscaping & Aesthetic Treatment	SF	$1.00	53,500	$53,500
	Utility Relocation	EA.	$267,000.00	1	$267,000
1	Single span bridge(s)	EA.	$885,600.00	1	$885,600
				Sub Total =	*$3,000,460*
				Engineering (10% Construction) =	*$300,046*
				30% Contingency =	*$900,138*
				Channel Operation and Maintenance - 50-year life cycle =	*$802,500*
				Total =	***$5,003,144***

Table A-6.3p-i

SR 303L Channel Preferred Alternative - from Cactus Road to Thunderbird/Waddell Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	63,885	$191,654
	Channel Fill	C.Y.	$3.00	2,063	$6,190
	Concrete&Steel	L.F.	$191.83	5,300	$1,016,685
	Rétention Basin Net Excavation	C.Y.	$5.00	1,519,682	$7,598,410
	Drop Structures - additional concrete	C.Y.	$162.50	652	$105,888
	Channel ROW	ACRE	$60,000.00	2.5	$151,517
	Basin ROW - area boudary	ACRE	$60,000.00	50.9	$3,052,476
	Hydroseed & Topsoil	ACRE	$2,218.00	48.3	$107,129
	Landscaping & Aesthetic Treatment	SF	$1.00	53,000	$53,000
	Utility Relocation	EA.	$185,200.00	1	$185,200
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	2 - 54" Low Flow Drain Pipe	L.F.	$160.00	5,636	$1,803,392.00
	1 Single span bridge(s)	EA.	$1,003,200.00	1	$1,003,200
	2 - Barrel 263' Long, 48" RCP Culvert	EA.	$86,771.50	1	$86,772
				Sub Total =	*$15,366,513*
				Engineering (10% Construction) =	*$1,536,651*
				30% Contingency =	*$4,609,954*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Basin Operation and Maintenance - 50-year life cycle =	*$400,890*
				Total =	***$22,709,008***

Table A-6.3q-i

SR 303L Channel Preferred Alternative - Waddell/Thunderbird Road to Greenway Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	22,364	$67,093
	Channel Fill	C.Y.	$3.00	8,365	$25,096
	Concrete&Steel	L.F.	$202.59	5,300	$1,073,705
	Channel ROW	ACRE	$60,000.00	2.2	$134,765
	Landscaping & Aesthetic Treatment	SF	$1.00	53,000	$53,000
	Structure Relocations	EA.	$100,000.00	1	$100,000
	Utility Relocation	EA.	$96,000.00	1	$96,000
	1 Single span bridge(s)	EA.	$561,600.00	1	$561,600
				Sub Total =	*$2,111,258*
				Engineering (10% Construction) =	*$211,126*
				30% Contingency =	*$633,377*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Total =	***$3,750,762***

Table A-6.3r-i

SR 303L Channel Preferred Alternative - Greenway Road to Bell Road - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	24,279	$72,837
	Channel Fill	C.Y.	$3.00	11,728	$35,183
	Concrete&Steel	L.F.	$187.56	5,280	$990,339
	Channel ROW	ACRE	$60,000.00	4.6	$273,651
	Landscaping & Aesthetic Treatment	SF	$1.00	52,804	$52,804
	Utility Relocation	EA.	$117,100.00	1	$117,100
	3 Barrel 183' Long, 10' X 4' RCB Culvert	EA.	$208,991.53	1	$208,992
				Sub Total =	*$1,750,906*
				Engineering (10% Construction) =	*$175,091*
				30% Contingency =	*$525,272*
				Channel Operation and Maintenance - 50-year life cycle =	*$792,063*
				Total =	***$3,243,331***

Table A-6.3a-ii
Cost Estimate Summary
for The SR 303L Channel

Costs Given in Terms of ADMP Update 'Reaches' - Option B

Linear Feet		Approx. Mile Number	From	To	Cost per Reach	Cost per Foot
5950		1 to 2	Gila River	MC 85	$3,011,481.64	($506)
6050		2 to 3	MC 85	Lower Buckeye Road	$14,670,536.68	($2,425)
5350		3 to 4	Lower Buckeye Road	Yuma Road	$2,906,529.25	($543)
5350		4 to 5	Yuma Road	Van Buren Street	$9,373,110.46	($1,752)
5079.56		5 to 6	Van Buren Street	Approx. 342' south of I-10	$3,212,363.29	($632)
8420.44		6 to 7	Approx. 342' south of I-10	Thomas Road	$28,397,091.20	($3,372)
5450		7 to 8	Thomas Road	Indian School Road	$2,583,657.54	($474)
5350		8 to 9	Indian School Road	Camelback Road	$1,519,585.55	($284)
5350		9 to 10	Camelback Road	Bethany Home Road	$40,733,153.36	($7,614)
5300		10 to 11	Bethany Home Road	Glendale Avenue	$2,786,858.72	($526)
5300		11 to 12	Glendale Avenue	Northern Avenue	$3,123,835.06	($589)
5300		12 to 13	Northern Avenue	Olive Avenue	$13,129,702.53	($2,477)
5300		13 to 14	Olive Avenue	Peoria Avenue	$3,278,879.96	($619)
5350		14 to 15	Peoria Avenue	Cactus Road	$3,028,850.51	($566)
5300		15 to 16	Cactus Road	Waddell/Thunderbird Road	$18,237,508.29	($3,441)
5250		16 to 17	Waddell/Thunderbird Road	Greenway Road	$2,139,383.20	($408)
5280.42		17 to 18	Greenway Road	Bell Road	$1,778,926.75	($337)

Sub Total =	$153,911,454.01
Engineering (10% Construction) =	*$15,391,145*
30% Contingency =	*$46,173,436*

Table A-6.3b-ii

SR 303L Channel Preferred Alternative - from the Gila River to MC 85 - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L	Channel Excavation	C.Y.	$3.00	27,597	$82,792
	Channel Fill	C.Y.	$3.00	8,942	$26,826
	Concrete&Steel	L.F.	$218.32	5,900	$1,288,096
	Channel ROW	ACRE	$60,000.00	9.2	$549,624
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	59,000	$90,309
	Structure Relocations	EA.	$100,000.00	1	$100,000
	3 Single span bridge(s)	EA.	$858,420.00	1	$858,420
				Sub Total =	*$3,011,482*
				Engineering (10% Construction) =	*$301,148*
				30% Contingency =	*$903,444*
				Channel Operation and Maintenance - 50-year life cycle =	$885,000
				Total =	***$5,101,074***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3c-ii

SR 303L Channel Preferred Alternative - from MC 85 to Lower Buckeye Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	19,065	$57,196
	Channel Fill	C.Y.	$3.00	2,000	$6,000
	Concrete&Steel	L.F.	$149.57	4,301	$643,298
	Retention Basin Net Excavation	C.Y.	$5.00	1,003,758	$5,018,790
	Drop Structures - additional concrete	C.Y.	$162.50	0	$0
	Channel ROW	ACRE	$60,000.00	7.1	$423,081
	Basin ROW - area boudary	ACRE	$60,000.00	51.7	$3,101,446
	Landscaping & Aesthetic Treatment - basin[1]	SF	$1.40	2,151,864.0	$3,010,000
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	61,500	$94,136
	Utility Relocation	EA.	$47,700.00	1	$47,700
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
1-	54" Low Flow Drain Pipe	L.F.	$160.00	2,872	$459,510
3	Single span bridge(s)	EA.	$1,603,200.00	1	$1,603,200
4	Barrel 269' Long, 48" RCP Culvert	EA.	$201,179.20	1	$201,179
				Sub Total =	*$14,670,537*
				Engineering (10% Construction) =	*$1,467,054*
				30% Contingency =	*$4,401,161*
				Channel Operation and Maintenance - 50-year life cycle =	$922,500
				Basin Operation and Maintenance - 50-year life cycle =	$405,870
				Total =	***$21,867,121***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3d-ii

SR 303L Channel Preferred Alternative - from Lower Buckeye Road to Yuma Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	24,558	$73,673
	Channel Fill	C.Y.	$3.00	421	$1,263
	Concrete&Steel	L.F.	$207.79	5,250	$1,090,881
	Channel ROW	ACRE	$60,000.00	10.1	$605,632
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	52,500	$80,360
	Structure Relocations	EA.	$100,000.00	4	$400,000
	Utility Relocation	EA.	$42,000.00	1	$42,000
	1 Single span bridge(s)	EA.	$612,720.00	1	$612,720
				Sub Total =	*$2,906,529*
				Engineering (10% Construction) =	*$290,653*
				30% Contingency =	*$871,959*
				Channel Operation and Maintenance - 50-year life cycle =	$787,500
				Total =	***$4,856,641***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3e-ii

SR 303L Channel Preferred Alternative - from Yuma Road to Van Buren Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	30,748	$92,245
	Channel Fill	C.Y.	$3.00	0	$0
	Concrete&Steel	L.F.	$160.21	4,624	$740,726
	Rétention Basin Net Excavation	C.Y.	$5.00	532,903	$2,664,515
	Channel ROW	ACRE	$60,000.00	11.2	$673,089
	Basin ROW - area boudary	ACRE	$60,000.00	37.8	$2,266,480
	Landscaping & Aesthetic Treatment - basin[1]	SF	$1.40	1,415,700.0	$1,980,000
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,500	$81,890
	Utility Relocation	EA.	$42,000.00	1	$42,000
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1- 48" Low Flow Drain Pipe	L.F.	$130.00	4,092	$531,965
	1 Long Span Culvert	EA.	$295,200.00	1	$295,200
				Sub Total =	*$9,373,110*
				Engineering (10% Construction) =	*$937,311*
				30% Contingency =	*$2,811,933*
				Channel Operation and Maintenance - 50-year life cycle =	$802,500
				Basin Operation and Maintenance - 50-year life cycle =	$269,750
				Total =	***$14,194,605***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3f-ii

SR 303L Channel Preferred Alternative - from Van Buren to I-10 - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	114,578	$343,735
	Channel Fill	C.Y.	$3.00	0	$0
	Concrete&Steel	L.F.	$143.26	5,130	$734,905
	Channel ROW	ACRE	$60,000.00	22.4	$1,346,082
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	51,296	$78,516
	Utility Relocation	EA.	$176,325.00	1	$176,325
1	5-span bridge(s)	EA.	$532,800.00	1	$532,800
				Sub Total =	*$3,212,363*
				Engineering (10% Construction) =	*$321,236*
				30% Contingency =	*$963,709*
				Channel Operation and Maintenance - 50-year life cycle =	$769,434
				Total =	***$5,266,743***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3g-ii

SR 303L Channel Preferred Alternative - from I-10 to Thomas Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	60,616	$181,847
	Channel Fill	C.Y.	$3.00	16	$48
	Concrete&Steel	L.F.	$132.62	4,874	$646,412
	Retention Basin Net Excavation	C.Y.	$5.00	2,159,567	$10,797,835
	Channel ROW	ACRE	$60,000.00	7.0	$419,088
	Basin ROW - area boudary	ACRE	$60,000.00	93.2	$5,594,175
	Landscaping & Aesthetic Treatment - basin[1]	SF	$1.40	3,815,856.0	$5,340,000
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	83,704	$128,123
	Utility Relocation	EA.	$178,750.00	1	$178,750
	Rip Rap Energy Dissipater	EA.	$5,000.00	2	$10,000
1 -	48" Low Flow Drain Pipe	L.F.	$130.00	527	$68,568.50
3 -	54" Low Flow Drain Pipe	L.F.	$160.00	6,094	$2,925,120.00
3 -	10' X 6' Equalizer Pipe	EA.	$540,272.14	1	$540,272
1	Single span bridge(s)	EA.	$219,780.00	1	$219,780
4 -	Barrel 1021' Long, 72" RCP Culvert	EA.	$1,347,072.60	1	$1,347,073
				Sub Total =	*$28,397,091*
				Engineering (10% Construction) =	*$2,839,709*
				30% Contingency =	*$8,519,127*
				Channel Operation and Maintenance - 50-year life cycle =	$1,255,566
				Basin Operation and Maintenance - 50-year life cycle =	$843,280
				Total =	***$41,854,774***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3h-ii

SR 303L Channel Preferred Alternative - from Thomas Road to Indian School Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	62,709	$188,127
	Channel Fill	C.Y.	$3.00	0	$0
	Concrete&Steel	L.F.	$135.74	5,400	$732,988
	Channel ROW	ACRE	$60,000.00	9.1	$545,047
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	54,000	$82,656
	Utility Relocation	EA.	$167,000.00	1	$167,000
	2 Single span bridge(s)	EA.	$867,840.00	1	$867,840
				Sub Total =	*$2,583,658*
				Engineering (10% Construction) =	*$258,366*
				30% Contingency =	*$775,097*
				Channel Operation and Maintenance - 50-year life cycle =	$810,000
				Total =	***$4,427,121***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3i-ii

SR 303L Channel Preferred Alternative - Indian School Road to Camelback Road - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L						
		Channel Excavation	C.Y.	$3.00	32,272	$96,816
		Channel Fill	C.Y.	$3.00	159	$476
		Concrete&Steel	L.F.	$104.14	3,834	$399,323
		Channel ROW	ACRE	$60,000.00	2.5	$147,315
		Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	54,000	$82,656
		Utility Relocation	EA.	$331,000.00	1	$331,000
	1	Long Span Culvert	EA.	$462,000.00	1	$462,000
					Sub Total =	*$1,519,586*
					Engineering (10% Construction) =	*$151,959*
					30% Contingency =	*$455,876*
					Channel Operation and Maintenance - 5-year life cycle =	$810,000
					Total =	***$2,937,420***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3j-ii

SR 303L Channel Preferred Alternative - Camelback Road to Bethany Home Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	57,275	$171,825
	Channel Fill	C.Y.	$3.00	1,174	$3,521
	Concrete&Steel	L.F.	$302.18	5,300	$1,601,545
	Retention Basin Net Excavation	C.Y.	$5.00	1,981,906	$9,909,530
	Drop Structures - additional concrete	C.Y.	$162.50	208	$33,850
	Channel ROW	ACRE	$60,000.00	4.5	$272,738
	Basin ROW - area boudary	ACRE	$60,000.00	176.3	$10,578,812
	Landscaping & Aesthetic Treatment - basin[1]	SF	$1.40	7,091,568.0	$9,930,000
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,000	$81,125
	Utility Relocation	EA.	$86,000.00	1	$86,000
	Rip Rap Energy Dissipater	EA.	$5,000.00	4	$20,000
	1 - 6' X 4' RCB Basin Outfall Pipe and Headwalls	EA.	$283,265.09	1	$283,265
	1 - 36" Low Flow Drain Pipe	L.F.	$100.00	2,926	$292,596
	1 - 24" Low Flow Drain Pipe	L.F.	$65.00	1,417	$92,131
	1 - 18" Low Flow Drain Pipe	L.F.	$58.00	971	$56,302
	1 - 18" Low Flow Drain Pipe	L.F.	$58.00	1,699	$98,533
	1 - 54" Low Flow Drain Pipe	L.F.	$160.00	9,976	$1,596,085
	1 - 54" RCP Basin Equalizer and Headwalls	EA.	$91,603.42	1	$91,603
	4 - 84" RCP Basin Equalizer and Headwalls	EA.	$1,320,992.63	1	$1,320,993
	4 - 10' X 6' RCB Basin Equalizer and Headwalls	EA.	$1,840,508.81	1	$1,840,509
	3 - 10' X 6' RCB Basin Equalizer and Headwalls	EA.	$1,320,992.63	1	$1,320,993
	1 Long Span Culvert	EA.	$1,051,200.00	1	$1,051,200
				Sub Total =	*$40,733,153*
				Engineering (10% Construction) =	*$4,073,315*
				30% Contingency =	*$12,219,946*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Basin Operation and Maintenance - 50-year life cycle =	*$1,337,960*
				Total =	***$59,159,375***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3k-ii

SR 303L Channel Preferred Alternative - from Bethany Home Road to Glendale Avenue - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	40,305	$120,914
	Channel Fill	C.Y.	$3.00	6,366	$19,097
	Concrete&Steel	L.F.	$242.25	5,300	$1,283,949
	Drop Structures - additional concrete	C.Y.	$162.50	296	$48,086
	Channel ROW	ACRE	$60,000.00	5.9	$356,487
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,000	$81,125
	Utility Relocation	EA.	$90,000.00	1	$90,000
1	Long Span Culvert	EA.	$787,200.00	1	$787,200
				Sub Total =	*$2,786,859*
				Engineering (10% Construction) =	*$278,686*
				30% Contingency =	*$836,058*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Total =	***$4,696,602***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3I-ii

SR 303L Channel Preferred Alternative - from Glendale Avenue to Northern Avenue - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	50,365	$151,096
	Channel Fill	C.Y.	$3.00	1,254	$3,761
	Concrete&Steel	L.F.	$230.17	5,350	$1,231,419
	Channel ROW	ACRE	$60,000.00	5.6	$337,069
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,500	$81,890
	Structure Relocations	EA.	$100,000.00	3	$300,000
	Utility Relocation	EA.	$106,000.00	1	$106,000
1	Single span bridge(s)	EA.	$912,600.00	1	$912,600
				Sub Total =	*$3,123,835*
				Engineering (10% Construction) =	*$312,384*
				30% Contingency =	*$937,151*
				Channel Operation and Maintenance	*$802,500*
				Total =	***$5,175,869***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3m-ii

SR 303L Channel Preferred Alternative - from Northern Avenue to Olive Avenue - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	96,911	$290,734
	Channel Fill	C.Y.	$3.00	170	$510
	Concrete&Steel	L.F.	$205.72	5,300	$1,090,310
	Retention Basin Net Excavation	C.Y.	$5.00	776,553	$3,882,765
	Drop Structures - additional concrete	C.Y.	$162.50	687	$111,602
	Channel ROW	ACRE	$60,000.00	8.1	$483,176
	Basin ROW - area boudary	ACRE	$60,000.00	41.7	$2,504,876
	Landscaping & Aesthetic Treatment - basin[1]	SF	$1.40	1,694,484.0	$2,370,000
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,000	$81,125
	Structure Relocations	EA.	$100,000.00	3	$300,000
	Utility Relocation	EA.	$124,850.00	1	$124,850
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1 - 54" Low Flow Drain Pipe	L.F.	$160.00	7,120	$1,139,200
	1 Single span bridge(s)	EA.	$645,660.00	1	$645,660
	2 - Barrel 256' Long, 60" RCP Culvert	EA.	$99,894.80	1	$99,895
				Sub Total =	*$13,129,703*
				Engineering (10% Construction) =	*$1,312,970*
				30% Contingency =	*$3,938,911*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Basin Operation and Maintenance - 50-year life cycle =	*$291,330*
				Total =	***$19,467,914***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3n-ii

SR 303L Channel Preferred Alternative - Olive Avenue to Peoria Avenue - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	43,184	$129,551
	Channel Fill	C.Y.	$3.00	6,300	$18,901
	Concrete&Steel	L.F.	$257.13	5,300	$1,362,780
	Drop Structures - additional concrete	C.Y.	$162.50	300	$48,808
	Channel ROW	ACRE	$60,000.00	5.3	$315,416
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,000	$81,125
	Structure Relocations	EA.	$100,000.00	2	$200,000
	Utility Relocation	EA.	$121,200.00	1	$121,200
1	Single span bridge(s)	EA.	$1,001,100.00	1	$1,001,100
				Sub Total =	*$3,278,880*
				Engineering (10% Construction) =	*$327,888*
				30% Contingency =	*$983,664*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Total =	***$5,385,432***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3o-ii

SR 303L Channel Preferred Alternative - Peoria Avenue to Cactus Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	49,260	$147,779
	Channel Fill	C.Y.	$3.00	1,680	$5,040
	Concrete&Steel	L.F.	$270.84	5,350	$1,449,001
	Channel ROW	ACRE	$60,000.00	3.2	$192,540
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,500	$81,890
	Utility Relocation	EA.	$267,000.00	1	$267,000
1	Single span bridge(s)	EA.	$885,600.00	1	$885,600
				Sub Total =	*$3,028,851*
				Engineering (10% Construction) =	*$302,885*
				30% Contingency =	*$908,655*
				Channel Operation and Maintenance - 50-year life cycle =	*$802,500*
				Total =	***$5,042,891***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

SR 303L Channel Preferred Alternative - from Cactus Road to Thunderbird/Waddell Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	63,885	$191,654
	Channel Fill	C.Y.	$3.00	2,063	$6,190
	Concrete&Steel	L.F.	$191.83	5,300	$1,016,685
	Retention Basin Net Excavation	C.Y.	$5.00	1,519,682	$7,598,410
	Drop Structures - additional concrete	C.Y.	$162.50	652	$105,888
	Channel ROW	ACRE	$60,000.00	2.5	$151,517
	Basin ROW - area boudary	ACRE	$60,000.00	50.9	$3,052,476
	Landscaping & Aesthetic Treatment - basin[1]	SF	$1.40	2,103,948.0	$2,950,000
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,000	$81,125
	Utility Relocation	EA.	$185,200.00	1	$185,200
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
2 -	54" Low Flow Drain Pipe	L.F.	$160.00	5,636	$1,803,392.00
1	Single span bridge(s)	EA.	$1,003,200.00	1	$1,003,200
2 -	Barrel 263' Long, 48" RCP Culvert	EA.	$86,771.50	1	$86,772
				Sub Total =	*$18,237,508*
				Engineering (10% Construction) =	*$1,823,751*
				30% Contingency =	*$5,471,252*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Basin Operation and Maintenance - 50-year life cycle =	*$400,890*
				Total =	***$26,728,402***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3q-ii

SR 303L Channel Preferred Alternative - Waddell/Thunderbird Road to Greenway Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	22,364	$67,093
	Channel Fill	C.Y.	$3.00	8,365	$25,096
	Concrete&Steel	L.F.	$202.59	5,300	$1,073,705
	Channel ROW	ACRE	$60,000.00	2.2	$134,765
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	53,000	$81,125
	Structure Relocations	EA.	$100,000.00	1	$100,000
	Utility Relocation	EA.	$96,000.00	1	$96,000
1	Single span bridge(s)	EA.	$561,600.00	1	$561,600
				Sub Total =	*$2,139,383*
				Engineering (10% Construction) =	*$213,938*
				30% Contingency =	*$641,815*
				Channel Operation and Maintenance - 50-year life cycle =	*$795,000*
				Total =	***$3,790,136***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.3r-ii

SR 303L Channel Preferred Alternative - Greenway Road to Bell Road - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
SR 303L					
	Channel Excavation	C.Y.	$3.00	24,279	$72,837
	Channel Fill	C.Y.	$3.00	11,728	$35,183
	Concrete&Steel	L.F.	$187.56	5,280	$990,339
	Channel ROW	ACRE	$60,000.00	4.6	$273,651
	Landscaping & Aesthetic Treatment - channel[1]	SF	$1.53	52,804	$80,825
	Utility Relocation	EA.	$117,100.00	1	$117,100
	3 Barrel 183' Long, 10' X 4' RCB Culvert	EA.	$208,991.53	1	$208,992
				Sub Total =	*$1,778,927*
				Engineering (10% Construction) =	*$177,893*
				30% Contingency =	*$533,678*
				Channel Operation and Maintenance - 50-year life cycle =	*$792,063*
				Total =	***$3,282,560***

1. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.4
Loop 303 ADMP Update Proposed Channel Quantities

Upper Northern Channel

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Upper Northern Channel						
		Channel Excavation	C.Y.	$3.00	311,496	$934,488
		Channel Fill	C.Y.	$3.00	4,327	$12,980
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	1,291	$179,408
		Channel ROW - enveloping lines	ACRE	$60,000.00	59.1	$3,547,974
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	2,250,310	$2,250,310
	7 -	Barrel 86' Long, 10' X 6' RCB Culvert	EA.	$246,421.65	1	$246,422
	11 -	Barrel 86' Long, 10' X 6' RCB Culvert	EA.	$378,288.48	1	$378,288
					Sub Total =	*$7,549,870*
					Engineering (10% Construction) =	*$754,987*
					30% Contingency =	*$2,264,961*
					Operation and Maintenance - 50-year life cycle =	$1,913,876
					Total =	***$12,483,694***

Upper Northern Channel

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Upper Northern Channel		Channel Excavation	C.Y.	$3.00	311,496	$934,488
		Channel Fill	C.Y.	$3.00	4,327	$12,980
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	1,291	$179,408
		Channel ROW - enveloping lines	ACRE	$60,000.00	59	$3,547,974
		Landscaping & Aesthetic Treatment[2,3]	SF	$1.55	2,250,310	$3,490,000
	1	Barrel 86' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$58,224.55	1	$58,225
	1	Barrel 86' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$58,224.55	1	$58,225
	7 -	Barrel 86' Long, 10' X 6' RCB Culvert	EA.	$246,421.65	1	$246,422
	11 -	Barrel 86' Long, 10' X 6' RCB Culvert	EA.	$378,288.48	1	$378,288
					Sub Total =	*$8,906,010*
					Engineering (10% Construction) =	*$890,601*
					30% Contingency =	*$2,671,803*
					Operation and Maintenance - 50-year life cycle =	*$1,913,876*
					Total =	***$14,382,290***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.5
Loop 303 ADMP Update Proposed Channel Quantities

Lower Northern Channel Cost - Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Lower Northern Channel						
		Channel Excavation	C.Y.	$3.00	113,319	$339,956
		Channel Fill	C.Y.	$3.00	480	$1,441
		Detention Basin Net Excavation	C.Y.	$5.00	146,310	$731,549
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	307	$42,708
		Channel ROW - enveloping lines	ACRE	$60,000.00	16.1	$965,688
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	12.0	$717,425
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	1,031,501	$1,031,501
		Structure Relocation	EA.	$100,000.00	2	$200,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1	Barrel 24" RCP Low Flow Bleed Pipe	LF	$65.00	1,413	$91,845
					Sub Total =	*$4,127,113*
					Engineering (10% Construction) =	*$412,711*
					30% Contingency =	*$1,238,134*
					Channel Operation and Maintenance - 50-year life cycle =	$571,360
					Basin Operation and Maintenance - 50-year life cycle =	$75,405
					Total =	***$6,424,723***

Lower Northern Channel Cost - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Lower Northern Channel						
		Channel Excavation	C.Y.	$3.00	113318.55	$339,956
		Channel Fill	C.Y.	$3.00	480.27	$1,441
		Detention Basin Net Excavation	C.Y.	$5.00	146309.8913	$731,549
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	307.2531433	$42,708
		Channel ROW - enveloping lines	ACRE	$60,000.00	16.1	$965,688
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	12.0	$717,425
		Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.56	623,779	$970,000
		Landscaping & Aesthetic Treatment - basin[2,3]	SF	$1.40	407,722	$570,000
		Structure Relocation	EA.	$100,000.00	2	$200,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1	Barrel 86' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$58,224.55	5	$291,123
	2	Barrel 86' Long, 10' Wide, 6' High RCB Culvert	EA.	$72,725.75	1	$72,726
	1	Barrel 24" RCP Low Flow Bleed Pipe	LF	$65.00	1413	$91,845
					Sub Total =	*$4,999,460*
					Engineering (10% Construction) =	*$499,946*
					30% Contingency =	*$1,499,838*
					Channel Operation and Maintenance - 50-year life cycle =	*$571,360*
					Basin Operation and Maintenance - 50-year life cycle =	*$75,405*
					Total =	***$6,999,245***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.6
Loop 303 ADMP Update Proposed Channel Quantities

Reems Channel Cost - Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Reems Channel						
		Channel Excavation	C.Y.	$3.00	394,308	$1,182,924
		Channel Fill	C.Y.	$3.00	20,607	$61,820
		Detention Basin Net Excavation	C.Y.	$5.00	601,714	$3,008,570
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	1,925	$267,539
		Channel ROW - enveloping lines	ACRE	$60,000.00	98	$5,873,085
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	51	$3,088,496
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	5,473,314	$5,473,314
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
		185 LF 30" sewer relocation - perpendicular to channel	EA.	$56,400.00	1	$56,400
		205 LF 42" sewer relocation - perpendicular to channel	EA.	$73,500.00	1	$73,500
	1	Barrel 42" RCP Low Flow Drain Pipe	LF	$125.00	1,449	$181,125
	5	Barrel 121' Long, 10' Wide, 4' High RCB Culvert	EA.	$226,438.85	1	$226,439
	7	Barrel 92' Long, 10' Wide, 4' High RCB Culvert	EA.	$241,379.84	2	$482,760
	8	Barrel 92' Long, 10' Wide, 5' High RCB Culvert	EA.	$287,473.36	1	$287,473
	9	Barrel 92' Long, 10' Wide, 5' High RCB Culvert	EA.	$321,487.67	1	$321,488
					Sub Total =	*$20,589,933*
					Engineering (10% Construction) =	*$2,058,993*
					30% Contingency =	*$6,176,980*
					Channel Operation and Maintenance - 50-year life cycle =	$2,976,199
					Basin Operation and Maintenance - 50-year life cycle =	$335,312
					Total =	***$32,137,417***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility footprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.6
Loop 303 ADMP Update Proposed Channel Quantities

Reems Channel Cost - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Reems Channel		Channel Excavation	C.Y.	$3.00	394308.07	$1,182,924
		Channel Fill	C.Y.	$3.00	20606.78	$61,820
		Detention Basin Net Excavation	C.Y.	$5.00	601714	$3,008,570
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	1924.741121	$267,539
		Channel ROW - enveloping lines	ACRE	$60,000.00	98	$5,873,085
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	51	$3,088,496
		Hydroseed & Topsoil	ACRE	$2,500.00	0.0	$0
		Landscaping & Aesthetic Treatment - channels[2,3]	SF	$1.49	3,650,328	$5,430,000
		Landscaping & Aesthetic Treatment - basins[2,3]	SF	$1.40	1,822,986	$2,560,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
		185 LF 30" sewer relocation - perpendicular to channel	EA.	$56,400.00	1	$56,400
		205 LF 42" sewer relocation - perpendicular to channel	EA.	$73,500.00	1	$73,500
	1	Barrel 42" RCP Low Flow Drain Pipe	LF	$125.00	1,449	$181,125
	1	Barrel 92' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$61,164.05	4	$244,656
	1	Barrel 121' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$75,371.63	1	$75,372
	5	Barrel 121' Long, 10' Wide, 4' High RCB Culvert	EA.	$226,438.85	1	$226,439
	7	Barrel 92' Long, 10' Wide, 4' High RCB Culvert	EA.	$241,379.84	2	$482,760
	8	Barrel 92' Long, 10' Wide, 5' High RCB Culvert	EA.	$287,473.36	1	$287,473
	9	Barrel 92' Long, 10' Wide, 5' High RCB Culvert	EA.	$321,487.67	1	$321,488
					Sub Total =	*$23,426,647*
					Engineering (10% Construction) =	*$2,342,665*
					30% Contingency =	*$7,027,994*
					Channel Operation and Maintenance - 50-year life cycle =	*$2,976,199*
					Basin Operation and Maintenance - 50-year life cycle =	*$335,312*
					Total =	***$36,108,817***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table 6.7
Loop 303 ADMP Update Proposed Channel Quantities

AT&SF Railroad Channel Cost - Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
AT&SF Railroad Channel						
		Channel Excavation	C.Y.	$3.00	859,423	$2,578,270
		Channel Fill	C.Y.	$3.00	29,444	$88,332
		Detention Basin Net Excavation	C.Y.	$5.00	291,295	$1,456,476
		Channel ROW - enveloping lines	ACRE	$60,000.00	115.0	$6,900,910
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	21.5	$1,287,090
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	5,321,290	$5,321,290
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
		1678 LF 30" sewer relocation - parallel to channel	EA.	$281,700.00	1	$281,700
		200 LF 12" water relocation - perpendicular to channel	EA.	$18,000.00	1	$18,000
		200 LF 12" water relocation - perpendicular to channel	EA.	$18,000.00	1	$18,000
		2640 LF 8" water relocation - parallel to channel	EA.	$237,600.00	1	$237,600
		200 LF 24" sewer relocation - Dysart Interceptor	EA.	$52,000.00	1	$52,000
		238 LF OH Electric - perpendicular to channel	EA.	$10,000.00	1	$10,000
		260 LF OH Electric - perpendicular to channel	EA.	$20,000.00	1	$20,000
		200 LF Irrigation ditch - perpendicular to channel	EA.	$26,000.00	1	$26,000
		287 LF OH Electric - perpendicular to channel	EA.	$20,000.00	1	$20,000
	1	Barrel 42" RCP Low Flow Drain Pipe	LF	$125.00	1,832	$229,000
	3	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$108,032.24	1	$108,032
	6	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$204,327.90	1	$204,328
	7	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$236,534.99	1	$236,535
	8	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$268,742.09	1	$268,742
	9	Barrel 90' Long, 10' Wide, 6' High RCB Culvert	EA.	$325,567.76	1	$325,568
	7	Barrel 190' Long, 10' Wide, 6' High RCB Culvert	EA.	$515,835.75	1	$515,836
					Sub Total =	*$20,208,708*
					Engineering (10% Construction) =	*$2,020,871*
					30% Contingency =	*$6,062,612*
					Channel Operation and Maintenance - 50-year life cycle =	$141,184
					Basin Operation and Maintenance - 50-year life cycle =	$3,831,238
					Total =	***$32,264,614***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table 6.7
Loop 303 ADMP Update Proposed Channel Quantities

AT&SF Railroad Channel Cost - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
AT&SF Railroad Channel						
		Channel Excavation	C.Y.	$3.00	859423.31	$2,578,270
		Channel Fill	C.Y.	$3.00	29443.9	$88,332
		Detention Basin Net Excavation	C.Y.	$5.00	291295.2338	$1,456,476
		Channel ROW - enveloping lines	ACRE	$60,000.00	115	$6,900,910
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	21.5	$1,287,090
		Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.46	4,553,327	$6,660,000
		Landscaping & Aesthetic Treatment - basin[2,3]	SF	$1.39	767,963	$1,070,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
		1678 LF 30" sewer relocation - parallel to channel	EA.	$281,700.00	1	$281,700
		200 LF 12" water relocation - perpendicular to channel	EA.	$18,000.00	1	$18,000
		200 LF 12" water relocation - perpendicular to channel	EA.	$18,000.00	1	$18,000
		2640 LF 8" water relocation - parallel to channel	EA.	$237,600.00	1	$237,600
		200 LF 24" sewer relocation - Dysart Interceptor	EA.	$52,000.00	1	$52,000
		238 LF OH Electric - perpendicular to channel	EA.	$10,000.00	1	$10,000
		260 LF OH Electric - perpendicular to channel	EA.	$20,000.00	1	$20,000
		200 LF Irrigation ditch - perpendicular to channel	EA.	$26,000.00	1	$26,000
		287 LF OH Electric - perpendicular to channel	EA.	$20,000.00	1	$20,000
	1	Barrel 90' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$60,184.21	5	$300,921
	1	Barrel 190' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$109,175.87	1	$109,176
	1	Barrel 42" RCP Low Flow Drain Pipe	LF	$125.00	1832	$229,000
	3	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$108,032.24	1	$108,032
	6	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$204,327.90	1	$204,328
	7	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$236,534.99	1	$236,535
	8	Barrel 90' Long, 10' Wide, 4' High RCB Culvert	EA.	$268,742.09	1	$268,742
	9	Barrel 90' Long, 10' Wide, 6' High RCB Culvert	EA.	$325,567.76	1	$325,568
	7	Barrel 190' Long, 10' Wide, 6' High RCB Culvert	EA.	$515,835.75	1	$515,836
					Sub Total =	*$23,027,516*
					Engineering (10% Construction) =	*$2,302,752*
					30% Contingency =	*$6,908,255*
					Channel Operation and Maintenance - 50-year life cycle =	*$141,184*
					Basin Operation and Maintenance - 50-year life cycle =	*$3,831,238*
					Total =	***$36,210,944***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.8
Loop 303 ADMP Update Proposed Channel Quantities

Lower El Mirage Channel Cost - Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Lower El Mirage Channel						
		Channel Excavation	C.Y.	$3.00	44,014	$132,042
		Channel Fill	C.Y.	$3.00	23,877	$71,630
		Detention Basin Net Excavation	C.Y.	$5.00	192,993	$964,965
		Channel ROW - enveloping lines	ACRE	$60,000.00	19.9	$1,194,901
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	16.7	$1,003,850
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	1,485,396	$1,485,396
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	5	Barrel 50' Long, 10' Wide, 4' High RCB Culvert	EA.	$102,033.01	1	$102,033
	7	Barrel 400' Long, 60" RCP Basin Outlet Pipe	LF	$240.00	400	$672,000
	1	Barrel 30" RCP Low Flow Drain Pipe	EA.	$85.00	2,068	$175,780
					Sub Total =	*$5,807,596*
					Engineering (10% Construction) =	*$580,760*
					30% Contingency =	*$1,742,279*
					Channel Operation and Maintenance - 50-year life cycle =	$720,613
					Basin Operation and Maintenance - 50-year life cycle =	$125,140
					Total =	***$8,976,388***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.8
Loop 303 ADMP Update Proposed Channel Quantities

Lower El Mirage Channel Cost - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Lower El Mirage Channel						
		Channel Excavation	C.Y.	$3.00	44013.84	$132,042
		Channel Fill	C.Y.	$3.00	23876.51	$71,630
		Detention Basin Net Excavation	C.Y.	$5.00	192993	$964,965
		Channel ROW - enveloping lines	ACRE	$60,000.00	20	$1,194,901
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	17	$1,003,850
		Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.56	808,038	$1,260,000
		Landscaping & Aesthetic Treatment - basin[2,3]	SF	$1.40	677,358	$950,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1	Barrel 50' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$60,184.21	1	$60,184
	5	Barrel 50' Long, 10' Wide, 4' High RCB Culvert	EA.	$102,033.01	1	$102,033
	7	Barrel 400' Long, 60" RCP Basin Outlet Pipe	LF	$240.00	400	$96,000
	1	Barrel 30" RCP Low Flow Drain Pipe	EA.	$85.00	2068	$175,780
					Sub Total =	*$6,016,384*
					Engineering (10% Construction) =	*$601,638*
					30% Contingency =	*$1,804,915*
					Channel Operation and Maintenance - 50-year life cycle =	*$720,613*
					Basin Operation and Maintenance - 50-year life cycle =	*$125,140*
					Total =	***$9,268,692***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility footprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table 6.9
Loop 303 ADMP Update Proposed Channel Quantities

Bullard Channel Cost Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Bullard Channel						
		Channel Excavation	C.Y.	$3.00	710,176	$2,130,529
		Channel Fill	C.Y.	$3.00	130,926	$392,779
		Retention Basin Net Excavation	C.Y.	$5.00	274,486	$1,372,430
		Drop Structures - grouted rip rap	C.Y.	$139.00	3,595	$499,672
		Channel ROW	ACRE	$60,000.00	162.6	$9,755,305
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	20.3	$1,219,515
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	7,305,012	$7,305,012
		Utility Relocation	EA.	$145,000.00	1	$145,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1	Single span bridge at Camelback Road	EA.	$1,162,320.00	1	$1,162,320
	1	Barrel 42" RCP Low Flow Outlet Pipe	LF	$125.00	4,390	$548,750
	20	Barrel 92' Long, 10' X 6' RCB Culvert	EA.	$718,325.44	1	$718,325
					Sub Total =	*$25,254,638*
					Engineering (10% Construction) =	*$2,525,464*
					30% Contingency =	*$7,576,391*
					Operation and Maintenance - channel - 50-year life cycle =	$3,452,129
					Operation and Maintenance - basin - 50-year life cycle =	$150,008
					Total =	***$38,958,630***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table 6.9
Loop 303 ADMP Update Proposed Channel Quantities

Bullard Channel Cost Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Bullard Channel						
		Channel Excavation	C.Y.	$3.00	710,176	$2,130,529
		Channel Fill	C.Y.	$3.00	130,926	$392,779
		Retention Basin Net Excavation	C.Y.	$5.00	274,486	$1,372,430
		Drop Structures - grouted rip rap	C.Y.	$139.00	3,595	$499,672
		Channel ROW	ACRE	$60,000.00	163	$9,755,305
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	20	$1,219,515
		Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.57	6,490,440	$10,190,000
		Landscaping & Aesthetic Treatment - basin[2,3]	SF	$1.40	814,572	$1,140,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1	Single span bridge at Camelback Road	EA.	$1,162,320.00	1	$1,162,320
	1	Barrel 42" RCP Low Flow Outlet Pipe	LF	$125.00	4,390	$548,750
	20	Barrel 92' Long, 10' X 6' RCB Culvert	EA.	$718,325.44	1	$718,325
	1	Barrel 92' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$61,164.05	1	$61,164
					Sub Total =	*$29,340,790*
					Engineering (10% Construction) =	*$2,934,079*
					30% Contingency =	*$8,802,237*
					Operation and Maintenance - channel - 50-year life cycle =	*$3,452,129*
					Operation and Maintenance - basin - 50-year life cycle =	*$150,008*
					Total =	***$44,679,243***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.10
Loop 303 ADMP Update Proposed Channel Quantities

I-10 West Channel - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST	
I-10 West						
	Channel Excavation	C.Y.	$3.00	147,357	$442,070	
	Channel Fill	C.Y.	$3.00	508	$1,524	
	Retention Basin Net Excavation	C.Y.	$5.00	197,163	$985,815	
	Channel ROW - enveloping lines	ACRE	$60,000.00	25.0	$1,500,941	
	Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	17.2	$1,030,942	
	Landscaping & Aesthetic Treatment[2]	SF	$1.00	1,616,076	$1,616,076	
	relocate 6" waterline	EA.	$20,000.00	1	$20,000	#REF!
	relocate 6" waterline	EA.	$10,350.00	1	$10,350	
	relocate 8" waterline	EA.	$13,000.00	1	$13,000	
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000	
	36" Low Flow Drain Pipe	L.F.	$100.00	2,487	$248,700	
	3 - barell 118.32 l.f., 10'x6' RCB Storm Drain Pipe	L.F.	$126.00	118	$14,908	
	3 - barell 1,588 l.f., 6'x4' RCB Lower Storm Drain Pipe	L.F.	$688.35	1,245	$856,997	
	3 - barell 118.32 l.f., 6'x4' RCB Upper Storm Drain Pipe	L.F.	$1,177.76	1,588	$1,870,280	
	5 - barell 62 l.f., 10'x4' RCB	EA.	$123,059.35	1	$123,059	
	6 - barell 65 l.f., 10'x4' RCB	EA.	$152,145.16	1	$152,145	
	9 - barell 133 l.f., 10'x5' RCB	EA.	$453,590.90	1	$453,591	
				Sub Total =	*$9,345,399*	
				Engineering (10% Construction) =	*$934,540*	
				30% Contingency =	*$2,803,620*	
				Channel Operation and Maintenance - 50-year life cycle =	$1,541,240	$1,654,347
				Basin Operation and Maintenance - 50-year life cycle =	$113,108	
				Total =	***$14,737,905***	

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.10
Loop 303 ADMP Update Proposed Channel Quantities

I-10 West Channel - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
I-10 West					
	Channel Excavation	C.Y.	$3.00	147,357	$442,070
	Channel Fill	C.Y.	$3.00	508	$1,524
	Retention Basin Net Excavation	C.Y.	$5.00	197,163	$985,815
	Channel ROW - enveloping lines	ACRE	$60,000.00	25	$1,500,941
	Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	17	$1,030,942
	Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.55	1,001,880	$1,550,000
	Landscaping & Aesthetic Treatment - basin[2,3]	SF	$1.40	614,196	$860,000
	relocate 6" waterline	EA.	$20,000.00	1	$20,000
	relocate 6" waterline	EA.	$10,350.00	1	$10,350
	relocate 8" waterline	EA.	$13,000.00	1	$13,000
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	36" Low Flow Drain Pipe	L.F.	$100.00	2,487	$248,700
	3 - barell 118.32 l.f., 10'x6' RCB Storm Drain Pipe	L.F.	$126.00	118	$14,908
	3 - barell 1,588 l.f., 6'x4' RCB Lower Storm Drain Pipe	L.F.	$688.35	1,245	$856,997
	3 - barell 118.32 l.f., 6'x4' RCB Upper Storm Drain Pipe	L.F.	$1,177.76	1,588	$1,870,280
	5 - barell 62 l.f., 10'x4' RCB	EA.	$123,059.35	1	$123,059
	6 - barell 65 l.f., 10'x4' RCB	EA.	$152,145.16	1	$152,145
	9 - barell 133 l.f., 10'x5' RCB	EA.	$453,590.90	1	$453,591
	1 - Barrel 133' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$81,397.60	1	$81,398
				Sub Total =	*$10,315,123*
				Engineering (10% Construction) =	*$1,031,512*
				30% Contingency =	*$3,094,537*
				Channel Operation and Maintenance - 50-year life cycle =	*$1,541,240*
				Basin Operation and Maintenance - 50-year life cycle =	*$113,108*
				Total =	***$16,095,520***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.11
Loop 303 ADMP Update Proposed Channel Quantities

Tuthill Channel Cost - Option A

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Tuthill Channel						
		Channel Excavation	C.Y.	$3.00	1,077,375	$3,232,125
		Channel Fill	C.Y.	$3.00	119,074	$357,222
		Detention Basin Net Excavation	C.Y.	$5.00	294,889	$1,474,445
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	3,056	$424,739
		Channel ROW - enveloping lines	ACRE	$60,000.00	197.0	$11,818,514
		Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	25.7	$1,540,542
		Landscaping & Aesthetic Treatment[2]	SF	$1.00	7,641,295	$7,641,295
		Structure Relocations	EA.	$100,000.00	22	$2,200,000
		OH Electric - perpendicular to channel	EA.	$20,000.00	4	$80,000
		OH Electric - parallel to channel	EA.	$61,000.00	1	$61,000
		Fiber Optic Crossing	EA.	$185,000.00	1	$185,000
		RID Canal Crossing - siphon	EA.	$174,750.00	1	$174,750
		BID Canal Crossing - siphon	EA.	$171,375.00	1	$171,375
		Canal Crossing - siphon	EA.	$203,775.00	1	$203,775
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1	Barrel 30" DIAM. RCP Low Flow Pipe Outlet	LF.	$85.00	2,100	$178,500
	2	Barrel 91.5' Long, 60" DIAM. RCP Culvert	EA.	$42,319.80	1	$42,320
	6	Barrel 105' Long, 72" DIAM. RCP Culvert	EA.	$232,091.60	1	$232,092
	7	Barrel 48' Long, 10x4 RCB Culvert	EA.	$134,793.18	1	$134,793
	14	Barrel 48' Long, 10x4 RCB Culvert	EA.	$261,719.14	1	$261,719
	7	Barrel 114' Long, 10x4 RCB Culvert	EA.	$294,673.17	1	$294,673
	8	Barrel 30' Long, 10x5 RCB Culvert	EA.	$110,610.00	1	$110,610
	6	Barrel 48' Long, 10x5 RCB Culvert	EA.	$124,375.97	2	$248,752
	7	Barrel 48' Long, 10x5 RCB Culvert	EA.	$143,166.70	1	$143,167
	11	Barrel 53' Long, 10x5 RCB Culvert	EA.	$237,782.65	1	$237,783
	6	Barrel 48' Long, 10x6 RCB Culvert	EA.	$128,555.59	1	$128,556
					Sub Total =	*$31,582,746*
					Engineering (10% Construction) =	*$3,158,275*
					30% Contingency =	*$9,474,824*
					Channel Operation and Maintenance - 50-year life cycle =	$5,171,261
					Basin Operation and Maintenance - 50-year life cycle =	$147,602
					Total =	***$49,534,707***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.11
Loop 303 ADMP Update Proposed Channel Quantities

Tuthill Channel Cost - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
Tuthill Channel						
		Channel Excavation	C.Y.	$3.00	1,077,375	$3,232,125
		Channel Fill	C.Y.	$3.00	119,074	$357,222
		Detention Basin Net Excavation	C.Y.	$5.00	294,889	$1,474,445
		Drop Structures - Grouted Rip-Rap	C.Y.	$139.00	3,056	$424,739
		Channel ROW - enveloping lines	ACRE	$60,000.00	197	$11,818,514
	1	Basin ROW - rectangular parcel bounding daylight lines	ACRE	$60,000.00	26	$1,540,542
		Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.47	6,835,435	$10,030,000
		Landscaping & Aesthetic Treatment - basin[2,3]	SF	$1.40	805,860	$1,130,000
		Structure Relocations	EA.	$100,000.00	22	$2,200,000
		OH Electric - perpendicular to channel	EA.	$20,000.00	4	$80,000
		OH Electric - parallel to channel	EA.	$61,000.00	1	$61,000
		Fiber Optic Crossing	EA.	$185,000.00	1	$185,000
		RID Canal Crossing - siphon	EA.	$174,750.00	1	$174,750
		BID Canal Crossing - siphon	EA.	$171,375.00	1	$171,375
		Canal Crossing - siphon	EA.	$203,775.00	1	$203,775
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
	1	Barrel 67' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$48,916.13	1	$48,916
	1	Barrel 53' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$42,057.30	1	$42,057
	1	Barrel 51' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$41,077.47	1	$41,077
	1	Barrel 48' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$39,607.72	6	$237,646
	1	Barrel 30' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$30,789.22	1	$30,789
	1	Barrel 30" DIAM. RCP Low Flow Pipe Outlet	LF.	$85.00	2,100	$178,500
	2	Barrel 91.5' Long, 60" DIAM. RCP Culvert	EA.	$42,319.80	1	$42,320
	6	Barrel 105' Long, 72" DIAM. RCP Culvert	EA.	$232,091.60	1	$232,092
	7	Barrel 48' Long, 10x4 RCB Culvert	EA.	$134,793.18	1	$134,793
	14	Barrel 48' Long, 10x4 RCB Culvert	EA.	$261,719.14	1	$261,719
	7	Barrel 114' Long, 10x4 RCB Culvert	EA.	$294,673.17	1	$294,673
	8	Barrel 30' Long, 10x5 RCB Culvert	EA.	$110,610.00	1	$110,610
	6	Barrel 48' Long, 10x5 RCB Culvert	EA.	$124,375.97	2	$248,752
	7	Barrel 48' Long, 10x5 RCB Culvert	EA.	$143,166.70	1	$143,167
	11	Barrel 53' Long, 10x5 RCB Culvert	EA.	$237,782.65	1	$237,783
	6	Barrel 48' Long, 10x6 RCB Culvert	EA.	$128,555.59	1	$128,556
					Sub Total =	*$35,501,937*
					Engineering (10% Construction) =	*$3,550,194*
					30% Contingency =	*$10,650,581*
					Channel Operation and Maintenance - 50-year life cycle =	*$5,171,261*
					Basin Operation and Maintenance - 50-year life cycle =	*$147,602*
					Total =	***$55,021,575***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.12
Loop 303 ADMP Update Proposed Channel Quantities

I-10 East Diversion Channel - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
I-10 East Diversion Channel					
	Channel Excavation	C.Y.	$3.00	202,564	$607,692
	Channel Fill	C.Y.	$3.00	121	$362
	Channel ROW - enveloping lines	ACRE	$60,000.00	16.6	$994,207
	Landscaping & Aesthetic Treatment[2]	SF	$1.00	687,377	$687,377
	Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
5	Barell, 92 l.f., 10'x4' RCB	EA.	$175,625.20	1	$175,625
				Sub Total =	*$2,470,263*
				Engineering (10% Construction) =	*$247,026*
				30% Contingency =	*$741,079*
				Channel Operation and Maintenance - 50-year life cycle =	$490,439
				Total =	***$3,948,808***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.12
Loop 303 ADMP Update Proposed Channel Quantities

I-10 East Diversion Channel - Option B

CHANNEL NAME		ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
I-10 East Diversion Channel						
		Channel Excavation	C.Y.	$3.00	202,564	$607,692
		Channel Fill	C.Y.	$3.00	121	$362
		Channel ROW - enveloping lines	ACRE	$60,000.00	17	$994,207
		Landscaping & Aesthetic Treatment[2,3]	SF	$1.50	687,377	$1,030,000
		Rip Rap Energy Dissipater	EA.	$5,000.00	1	$5,000
		Barell, 92 l.f., 10'x4' RCB	EA.	$175,625.20	1	$175,625
	1	Barrel 92' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$61,164.05	1	$61,164
					Sub Total =	*$2,874,051*
					Engineering (10% Construction) =	*$287,405*
					30% Contingency =	*$862,215*
					Channel Operation and Maintenance - 50-year life cycle =	*$490,439*
					Total =	***$4,514,110***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.13
Loop 303 ADMP Update Proposed Channel Quantities

I-10 Central Channel - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
I-10 Central Channel					
	Channel Excavation	C.Y.	$3.00	67,961	$203,883
	Channel Fill	C.Y.	$3.00	2,117	$6,352
	Channel ROW - enveloping lines	ACRE	$60,000.00	17.0	$1,018,449
	Landscaping & Aesthetic Treatment[2]	SF	$1.00	707,414	$707,414
	4 Barell, 92 l.f., 48" RCP	EA.	$77,020.20	1	$77,020
				Sub Total =	*$2,013,119*
				Engineering (10% Construction) =	*$201,312*
				30% Contingency =	*$603,936*
				Channel Operation and Maintenance - 50-year life cycle =	$948,137
				Total =	***$3,766,503***

1. Unit cost varies with channel reach, a weighted unit cost was used for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table A-6.13
Loop 303 ADMP Update Proposed Channel Quantities

I-10 Central Channel - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
I-10 Central Channel					
	Channel Excavation	C.Y.	$3.00	67,961	$203,883
	Channel Fill	C.Y.	$3.00	2,117	$6,352
	Channel ROW - enveloping lines	ACRE	$60,000.00	17	$1,018,449
	Landscaping & Aesthetic Treatment - channel[2,3]	SF	$1.48	707,414	$1,050,000
	Barell, 92 l.f., 48" RCP	EA.	$77,020.20	1	$77,020
1	Barrel 92' Long, 8' Wide, 10' High RCB Pedestrian Crossing	EA.	$61,164.05	1	$61,164
				Sub Total =	*$2,416,868*
				Engineering (10% Construction) =	*$241,687*
				30% Contingency =	*$725,060*
				Channel Operation and Maintenance - 50-year life cycle =	*$948,137*
				Total =	***$4,331,753***

1. Unit cost varies with channel reach, a weighted unit cost was used for the entire channel.
2. SF costs based on daylight facility fooprint.
3. Refer to the Design Guidelines (separate cover) for detailed costs.

Table 6.14
Loop 303 ADMP Update Proposed Channel Quantities

ADOT Basin Improvements - Option A

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
ADOT Basin Improvements					
	Improved Outlet Trench Excavation	C.Y.	$3.00	31,175	$93,525
	Improved Outlet Trench Structural Backfill	C.Y.	$20.00	26,611	$532,217
	Retention Basin Net Excavation	C.Y.	$5.00	41,504	$207,522
	Proposed Outlet Improvement ROW	ACRE	$60,000.00	1.9	$116,145
	Landscaping & Aesthetic Treatment[1]	SF	$1.00	1,547,390	$1,547,390
4	Barell, 2217 LF, 48" RCP Outlet Pipe	EA.	$1,158,029.08	1	$1,158,029
				Sub Total =	*$3,654,829*
				Engineering (10% Construction) =	*$365,483*
				30% Contingency =	*$1,096,449*
				Operation and Maintenance - 50-year life cycle =	$98,668
				Total =	***$5,215,429***

ADOT Basin Improvements - Option B

CHANNEL NAME	ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
ADOT Basin Improvements					
	Improved Outlet Trench Excavation	C.Y.	$3.00	31,175	$93,525
	Improved Outlet Trench Structural Backfill	C.Y.	$20.00	26,611	$532,217
	Retention Basin Net Excavation	C.Y.	$5.00	41,504	$207,522
	Proposed Outlet Improvement ROW	ACRE	$60,000.00	2	$116,145
	Landscaping & Aesthetic Treatment[1,2]	SF	$1.40	1,547,390	$2,161,411
	Utility Relocation	EA.	$0.00	0	$0
4	Barell, 2217 LF, 48" RCP Outlet Pipe	EA.	$1,158,029.08	1	$1,158,029
				Sub Total =	*$4,268,850*
				Engineering (10% Construction) =	*$426,885*
				30% Contingency =	*$1,280,655*
				Operation and Maintenance - 50-year life cycle =	*$98,668*
				Total =	***$6,075,058***

1. Unit cost varies with channel reach, this represents a weighted unit cost for the entire channel.
2. Quantity only for the portion of Existing Basin 'A' proposed for minor regrading.
3. SF costs based on daylight facility fooprint-refer to the Design Guidelines (separate cover) for detailed costs.

1. SF costs based on daylight facility fooprint.
2. Refer to the Design Guidelines (separate cover) for detailed costs.

APPENDIX A-VII

EXPLANATION OF PROJECT RANKING AND CONSTRUCTION PRIORITY FOR IMPLEMENTATION/PHASING

Assigned 'Scores' Used to Rank Proposed Facilities

The methods used and the assumptions made to determine the 'weighted scores' for each of the categories considered in the ranking analysis presented in the implementation section of the report will be explained below.

Channel Impact to Existing Floodplains, Table 4.1

This category was used rank the various projects (identified with the selected alternative) based on relative ability to reduce existing floodplains mapped throughout the project area. A proposed facility that reduced a relatively large amount of existing floodplain area was given a high score. By contrast, a proposed facility having little or no impact on existing floodplains received a minimal score.

Note, that although a facility may reduce a large amount of floodplain, if that facility is proposed in an area that will not develop for 15 years, it is not necessarily a relatively high-ranking priority. For this reason, all of the categories considered in the ranking analysis must be viewed in a broad context. Using this 'big picture' view a 'relative importance' of each category analyzed must be assessed in order to adequately rank each proposed project. Each category is summarized by a specific table (see Table(s) 4.1 – 4.4). This approach is very similar to the weighted matrix used to rank alternatives analyzed under *the Level I Alternative Analysis Report, Level II Phase I*, and the *Level II Phase II Technical Memorandum* portions of the ADMP Update respectively.

Table 4.1 was developed by super-imposing the proposed facilities onto the existing floodplain map. Three columns were created within the table showing a total number of possible points based on the proximity (and hence impact) of a particular proposed facility on existing floodplains. The sum of the points shown across the three table columns is 100 points. The highest number of points is scored when a proposed facility directly removes existing floodplain. An example computation for this case is as follows:

SCORE = (RFP/CL)*(CP) where,

RFP = Miles of removed floodplain

CL = Total channel length, miles

CP = Column points (max. for that column, 50 points)

The next two columns are worth 30 and 20 points respectively. These are based on the relative impact of a proposed facility on existing floodplains based on proximity. For the 30-point column, the total length of the proposed facility that lies within 1-mile of existing floodplain is assessed. For the 20-point column, the total length of the proposed facility that lies between 1 and 3 miles from an existing floodplain is assessed. As above, the scores are weighted based on the total channel length adjacent to the existing floodplain for each category as a percentage of the overall facility length multiplied by the respective number of points available in that particular category.

Finally, the scores were weighted based on the relative facility size. For example, if a 12-mile facility scored 80-points, and a 20-mile facility scored 55-points which is more important? If there were 40 miles of proposed channels in the overall project, then the 20-mile facility would receive a much higher 'weighted score' (12/40*80 = 24 vs. 20/40*55 = 27.5).

These 'weighted' (adjusted) scores for the 'entire project' became the basis for the final weighted score computed for each proposed facility across all categories analyzed (Tables 4.1 – 4.4).

Facility Impact to Future Adjacent Land Use, Table 4.2

Table 4.2 is generally based on the proximity of a proposed facility to various future land uses as defined by the MAG Future Land Use Map.

Three factors are used to compute a composite weighted score for each proposed facility. The first of these factors is as follows:

- The proposed facility orientation versus future desired land-use (upstream and/or downstream).

For example, if a facility is located upstream of a high-density land use, it receives a higher point value than it would if it were located downstream. This is due to the fact that a facility planned upstream of high density development provides a good measure of protection against offsite storm water discharge. By comparison, if the facility were located downstream of the development, it would be beneficial from a regional outfall standpoint but not necessarily as a means of direct flood protection

The second factor is as follows:

- The proposed facility proximity to the adjacent future desired land-use (i.e., 0-1 mile distance or 1-2 mile distance).

For example, if the facility is within 0 to 1 mile of a particular land use, it receives a higher score than it would if it were from 1 to 2 miles away.

The third and final factor is as follows:

- The future land use designation, which is adjacent to the proposed facility (R1, R2, etc…).

For example, the land uses (shown at the upper left hand corner of Table 4.2) have been assigned point values totaling 100. The point assignments were based on the type of land use with the highest numbers assigned to high-density uses and the lowest assigned to low density and open space use.

The 'weighted' scores for each proposed facility were based on a weighted average of the scores computed using the three factors summarized above.

The final 'weighted' score for each proposed facility is then adjusted in light of the entire ADMP Update project. The approximate percentage of the overall ADMP Update that each proposed facility represents is used to adjust each proposed facility score.

As with Table 4.1 above, this score becomes the basis for the final weighted score computed for each proposed facility across all 4 categories analyzed (Tables 4.1 – 4.4).

Facility Impact to Future Urban Concentration, Table 4.3

The scores shown on Table 4.3 were based on the percent of a proposed channel traversing various 'urban concentration zones' shown on 'Future (2010) Urban Concentrations' maps prepared by MAG using census data.

A proposed facility is considered to have more benefit when a large percentage of its overall length traverses zones of relatively high urban concentration (projected). Using a measure of 'amount of urban concentration per square mile', a facility is analyzed based on the percentage of its length located within each of 4 zones defined as follows:

- 0 to 1,000 per sm, 20 points
- 1,000 to 5,000 per sm, 35 points
- 5,000 to 10,000 per sm, 45 points
- Greater than 10,000 per sm – not applicable

The facility score is computed by multiplying the percentage of channel length traversing a particular zone by the number of points assigned to that zone.

The final 'weighted' score for each proposed facility is then adjusted in light of the entire ADMP Update project. The approximate percentage of the overall ADMP Update that each proposed facility represents is used to adjust each proposed facility weighted score.

Again as with Tables 4.1 and 4.2 above, the adjusted facility weighted score becomes the basis for the final weighted score computed for each proposed facility across all 4 categories analyzed (Tables 4.1 – 4.4).

Facility Impact to Future Population Density, Table 4.4

The scores shown on Table 4.4 were based on the percent of a proposed channel traversing various 'population density zones' shown on 'Future (2010) Population Density' maps prepared by MAG using census data.

A proposed facility is considered to have more benefit when a large percentage of its overall length traverses zones of relatively high population density (projected). Using a measure of 'amount of population density per square mile', a facility is analyzed based on the percentage of its length located within each of 5 zones defined as follows:

- 0 to 50 per sm, 10 points
- 50 to 1,000 per sm, 20 points
- 1,000 to 2,000 per sm, 30 points
- 2,000 to 5,000 per sm, 40 points
- Greater than 5,000 per sm – not applicable

The facility score is computed by multiplying the percentage of channel length traversing a particular zone by the number of points assigned to that zone.

The final 'weighted' score for each proposed facility is then adjusted in light of the entire ADMP Update project. The approximate percentage of the overall ADMP Update that each proposed facility represents is used to adjust each proposed facility weighted score.

Again as with Tables 4.1 - 4.3 above, the adjusted facility weighted score becomes the basis for the final weighted score computed for each proposed facility across all 4 categories analyzed (Tables 4.1 – 4.4).

Ranking Summary, Table 4.5A & Adjusted Ranking, Table 4.5B

Table 4.5A shows the adjusted 'weighted' (composite) scores for the 'entire project' tabulated for each category (Tables 4.1 – 4.4) studied (i.e., floodplain reduction, future land use, projected urban concentration and projected population density). The final step employed in ranking each of the proposed facilities was to 'normalize' the adjusted composite category scores. The normalization was done based on a 100-scale and allowed for a direct performance comparison of each facility in all four categories.

At this point, each category was assigned a relative importance reflected in assigned points that totaled 100. The 'normalized' scores were then weighted based on the relative importance assigned to each category. This final scoring was shown in Table 4.5B. In some cases, the final score shown in Table 4.5B is negated or trivialized by other, extenuating factors. In those instances, the table provides comments and further details with an explanation.

APPENDIX A-VIII

MISCELLANEOUS BACKUP DATA AND INFORMATION

L.O.M.R. EXHIBIT FOR THE LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION
A PORTION OF THE EL MIRAGE MASTER DRAINAGE PLAN

SECTIONS 11 AND 14, T3N, R1W, OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA

GENERAL NOTES:

ALL WORK AND MATERIALS SHALL CONFORM TO THE CURRENT MAG UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION AS AMENDED BY THE SPECIAL PROVISIONS.

THE CONTRACTOR IS TO OBTAIN ANY PERMITS REQUIRED UNLESS OTHERWISE NOTED.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION, PROTECTION AND REPAIR OF ALL UTILITIES, EXISTING AND PROPOSED DURING CONSTRUCTION. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE LOCATION OF THE EXISTING UNDERGROUND UTILITIES. THE UTILITIES SHOWN ON PLANS HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. TWO DAYS PRIOR TO EXCAVATION, THE CONTRACTOR SHALL CONTACT THE "BLUE STAKE CENTER" AT 263-1100 FOR THE LOCATION AND IDENTIFICATION OF UNDERGROUND UTILITIES.

THE TEMPORARY REMOVAL, BARRICADING, DE-ENERGIZATION OR SHUT-OFF OF APS AND/OR SOUTHWEST GAS LINES OR EQUIPMENT SHALL BE PERFORMED BY APS AND/OR SOUTHWEST GAS AS REQUIRED BY APS AND/OR SOUTHWEST GAS AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL INCLUDE AN AMOUNT FOR THE WORK DONE BY APS AND/OR SOUTHWEST GAS IN HIS OR HER BID FOR THIS PROJECT.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATE DRAINAGE AND EROSION PROTECTION OF THE CONSTRUCTION AREA.

ALL SURROUNDING AREAS SHALL BE RESTORED TO MATCH THE EXISTING CONDITIONS PRIOR TO CONSTRUCTION, UNLESS NOTED OTHERWISE ON PLANS.

ANY WORK PERFORMED WITHOUT THE APPROVAL OF THE OWNER AND ALL WORK NOT IN CONFORMANCE WITH MAG SPECIFICATIONS AND DETAILS OR THE PROJECT PLANS OR SPECIFICATIONS IS SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.

ALL THE CONTRACTOR'S WORK SHALL BE SUBJECTED TO TESTING AS OUTLINED IN MAG AND AS REQUIRED BY THE ENGINEER.

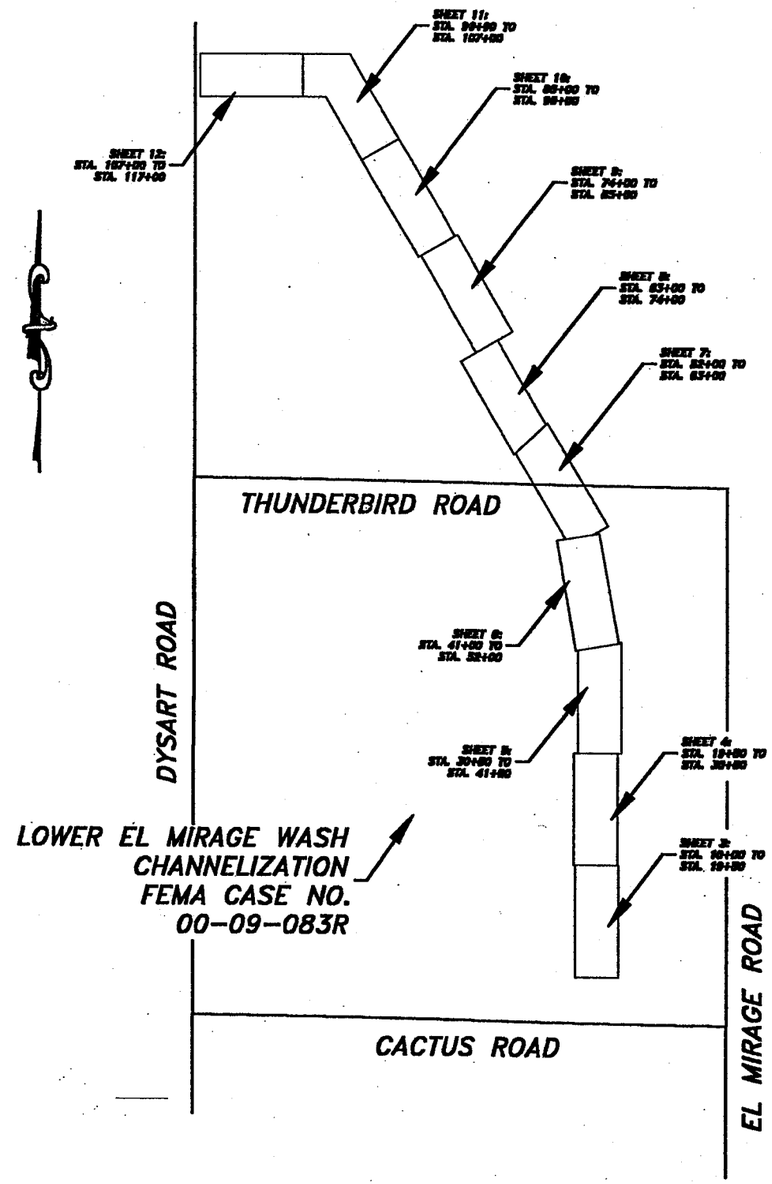
ALL ELEVATIONS ARE BASED ON THE BRASS CAP IN H.H. LOCATED AT THE INTERSECTION OF THUNDERBIRD ROAD AND EL MIRAGE ROAD, ELEVATION=1135.52 PER COUNTY DATUM.*

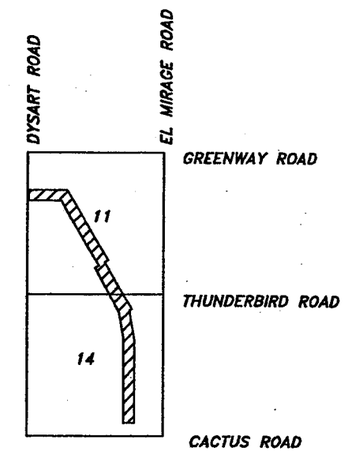
BASIS OF BEARINGS: THE NORTH LINE OF THE NE 1/4 OF SECTION 14, T3N, R1W, SAID BEARING = S89°14'26"E.

* NOTE COUNTY DATUM = FEMA DATUM = NVGD (1929)

NOTE:
THE ELEVATIONS SHOWN ON THIS PLAN ARE BASED ON THE COUNTY DATUM.* ALL CONSTRUCTION WITHIN THE CITY OF EL MIRAGE MUST BE DONE WITH PLANS USING THE EL MIRAGE DATUM. THESE PLANS ARE TO BE USED AS A L.O.M.R. EXHIBIT AND SHOULD NOT BE USED FOR CONSTRUCTION.

UTILITY	CONTACT	DATE SUB.	RESPONSE	REV'D BY
APS ELECTRIC	BOB GARZA			
U.S. WEST COMMUNICATIONS	ROBERT ARRIETA			
SOUTHWEST GAS	SUE MOSLEY			
COX COMMUNICATIONS	ANGIE HARDISTY			





VICINITY MAP

INDEX OF SHEETS:

SHEET NO.	SHEET TYPE
1	COVER
2	TYPICAL CHANNEL SECTIONS AND DETAILS
3 – 12	PLANS & PROFILES
13 –18	CHANNEL CROSS SECTIONS

NO.	DATE	DESCRIPTION	BY

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
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(602) 681-2100
phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

JOB NO.	719-18	DESIGN	LLT
DWG. NO.	719181R2001	DRAWN	WDK
DATE	11/14/01	CHECK	LLT
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		VERT.	N/A

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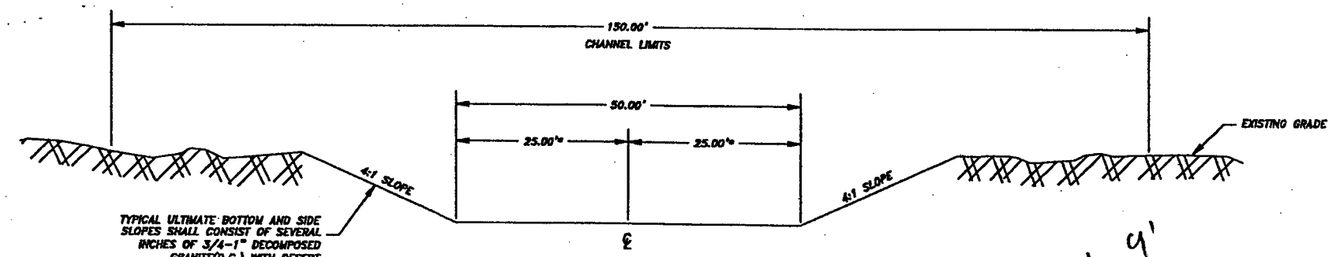
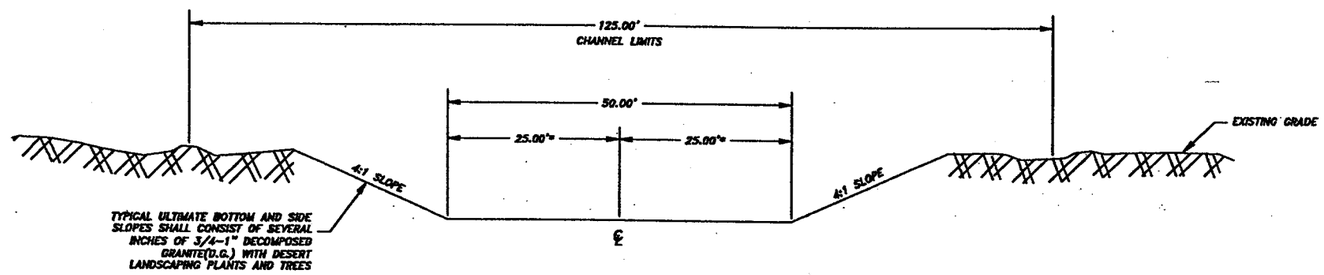


TYPICAL CHANNEL SECTION A
STA. 10+00.00 to 56+63.38

* 20' @ STA 40+25 to 56+63.38

d = 9'

RLE1 76+77 - 117+40
RLE2 56+97 - 76+77
RLE3 10+00 - 56+97

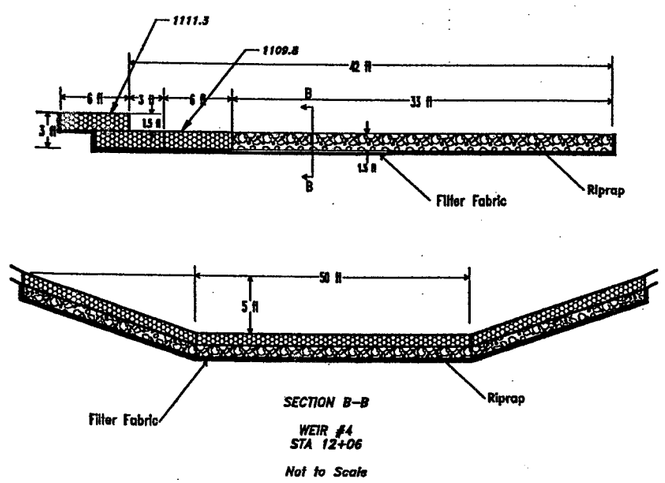


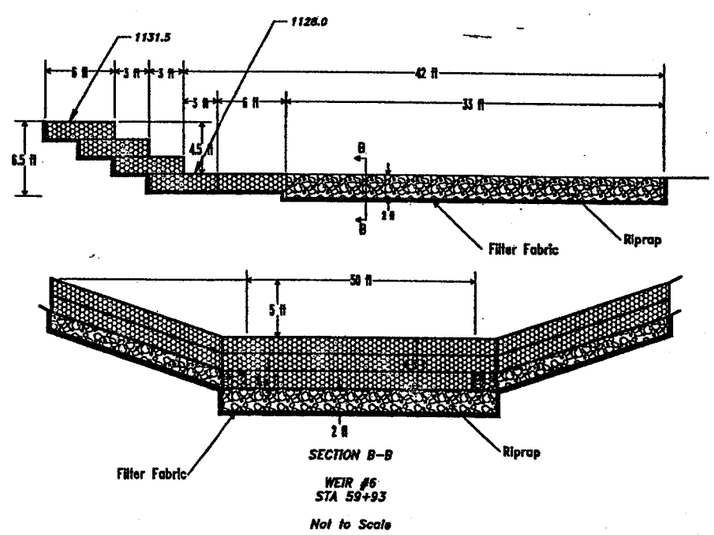
TYPICAL CHANNEL SECTION A
STA. 77+00 to 117+40.62

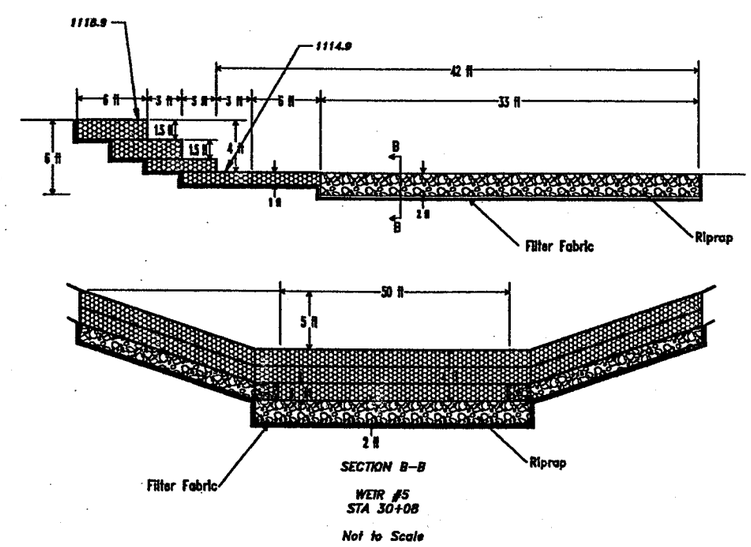
* 15' @ STA 59+28 to 77+00

GENERAL GABION NOTES:

1. GABIONS: ASTM A 975-97
2. FILTER FABRIC: MACTEX MX 275 OR APPROVED EQUAL.
3. ROCK: WEIR #4 & #7: 4 in. to 8 in., d_{50}=6 in.
   WEIR #5-6: 4 in. to 12 in., d_{50}=9 in.
4. RIPRAP: 4 in. to 12 in., d_{50}=9 in.







GRADE/VELOCITY CONTROL STRUCTURE DETAIL
PROFILE VIEW

PLOT DATE: 09-09-01 INITIALS: CMB DRAWING: 71915STRT.DWG XREFS: SHTR, XCONT, PCONT, ABBUILT

NO.	DATE	DESCRIPTION	BY

Registered Professional Engineer (Civil) CERTIFICATE NO. 13225 LAWRENCE L. TISAC Date Signed 9-9-01 ARIZONA U.S.A.

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EL MIRAGE MASTER DRAINAGE PLAN

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

DWG. NO.	71915-15	DESIGN	LLT
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DATE	11/14/99	CHECK	LLT
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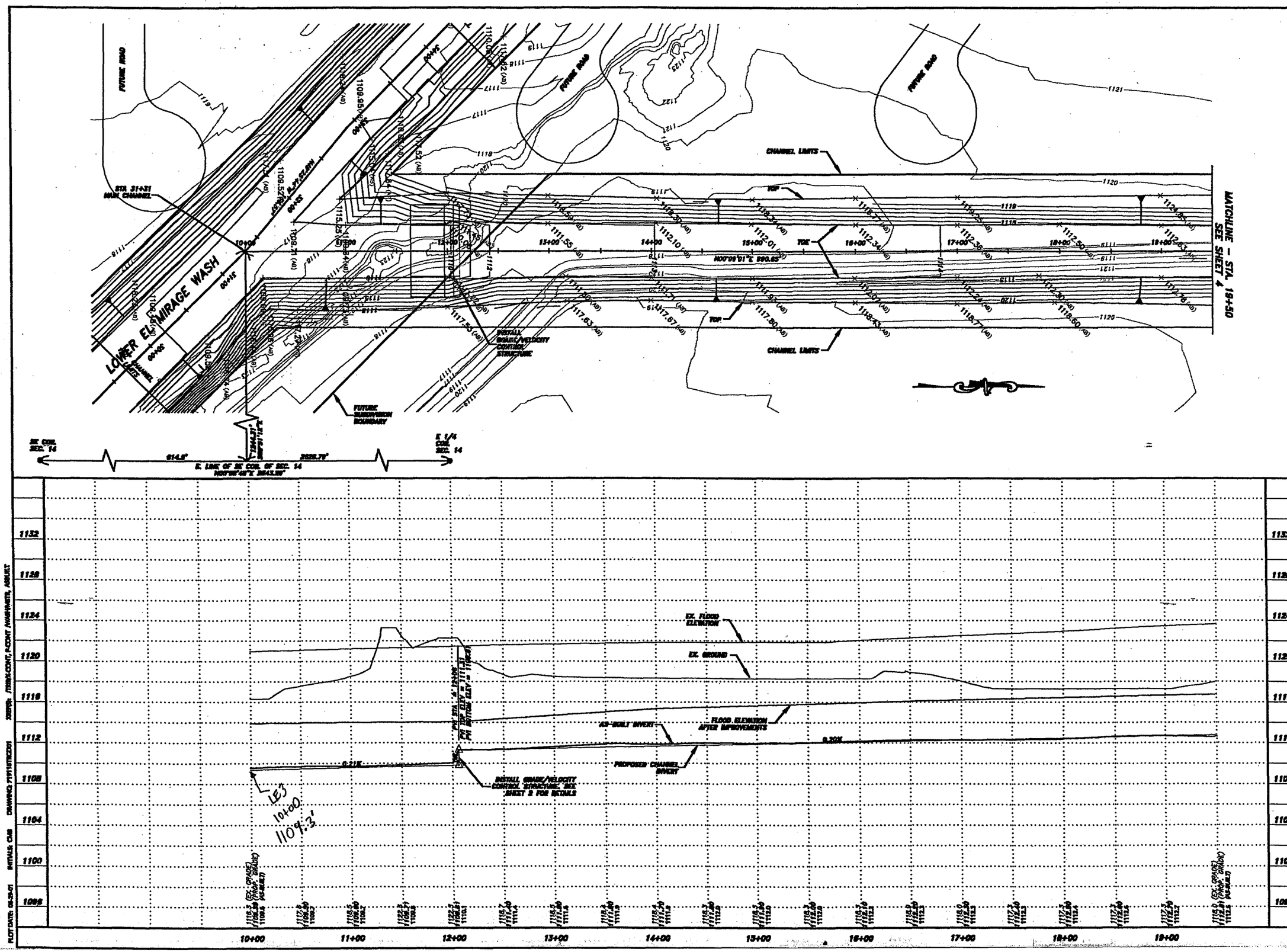
		VERT.	N/A

SHEET 2 OF 18

L.O.M.R. EXHIBIT - NOT FOR CONSTRUCTION



263-1100
1-800-STAKE-IT

NO.	DATE	DESCRIPTION	BY

A-N WEST INC.
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phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

JOB NO.	7191-18	DESIGN	SCALE
DWG. NO.	7191(18)(1)(02).DWG	DRAWN	HORIZ. 1"=40'
DATE	5/14/09	CHECK	VERT. 1"=4

SHEET 3 of 18

PLOT DATE: 05-29-01 INITIALS: CMB DRAWING: 7191(18)(1)(02) XREFS: /7191/X-CONT, X-CONT /NAVD/NAVTS, ABS.XLT

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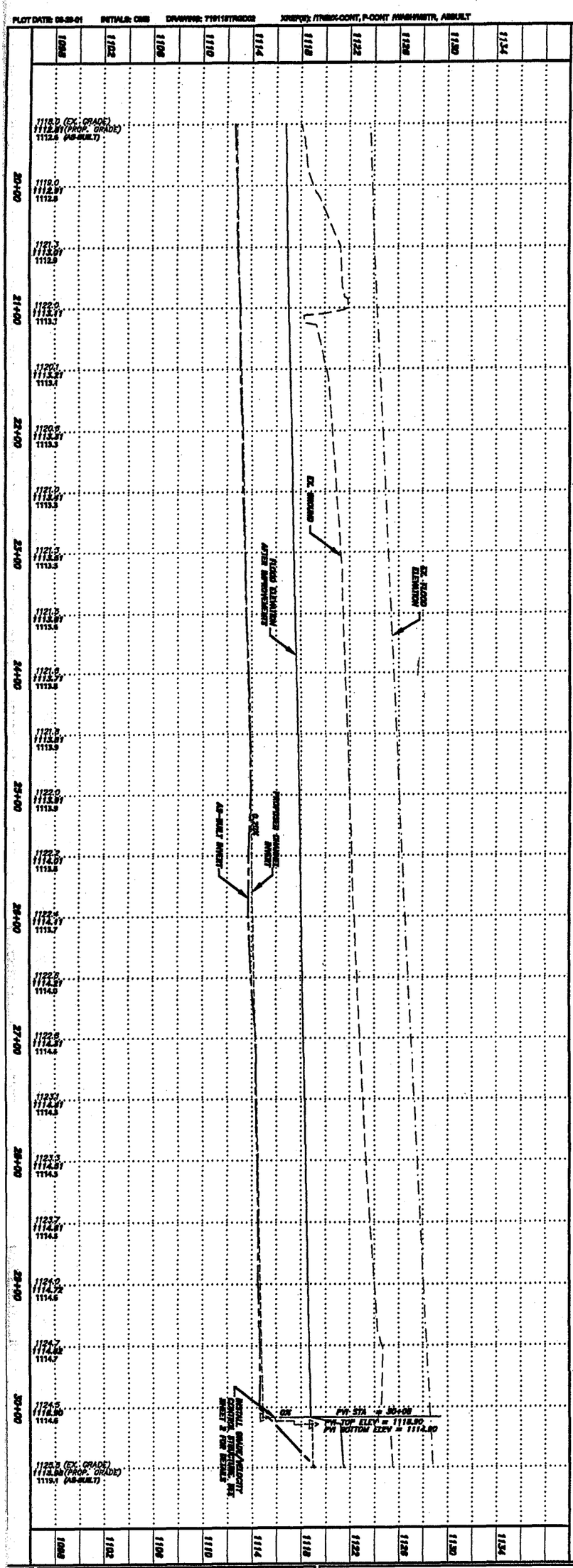

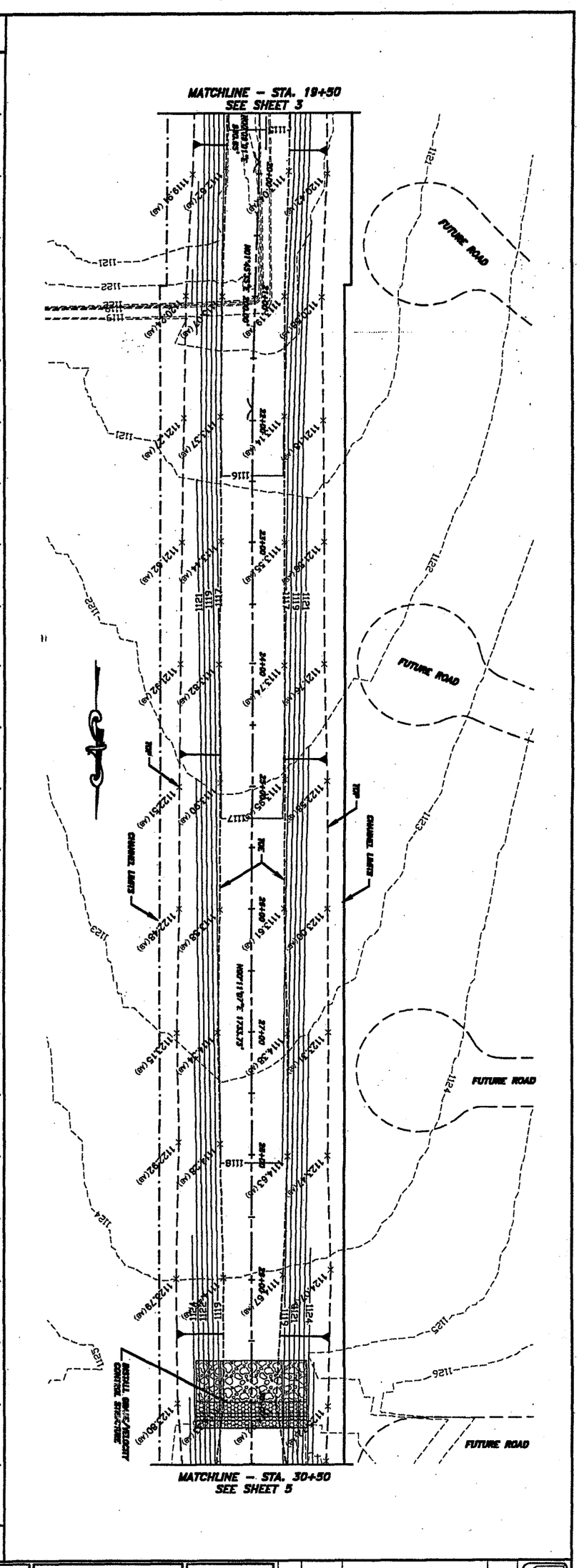

SHEET 4 of 18	LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.				
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	DATE 11/16/00	CHECK LAT	VERT. 1"=4'		

EL MIRAGE MASTER DRAINAGE PLAN

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Registered Professional Engineer (Civil) CERTIFICATE NO. 29923 LAWRENCE L. TYSKO Date Signed ARIZONA, U.S.A.

NO.	DATE	DESCRIPTION	BY

P-CONT-SHEET-01

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

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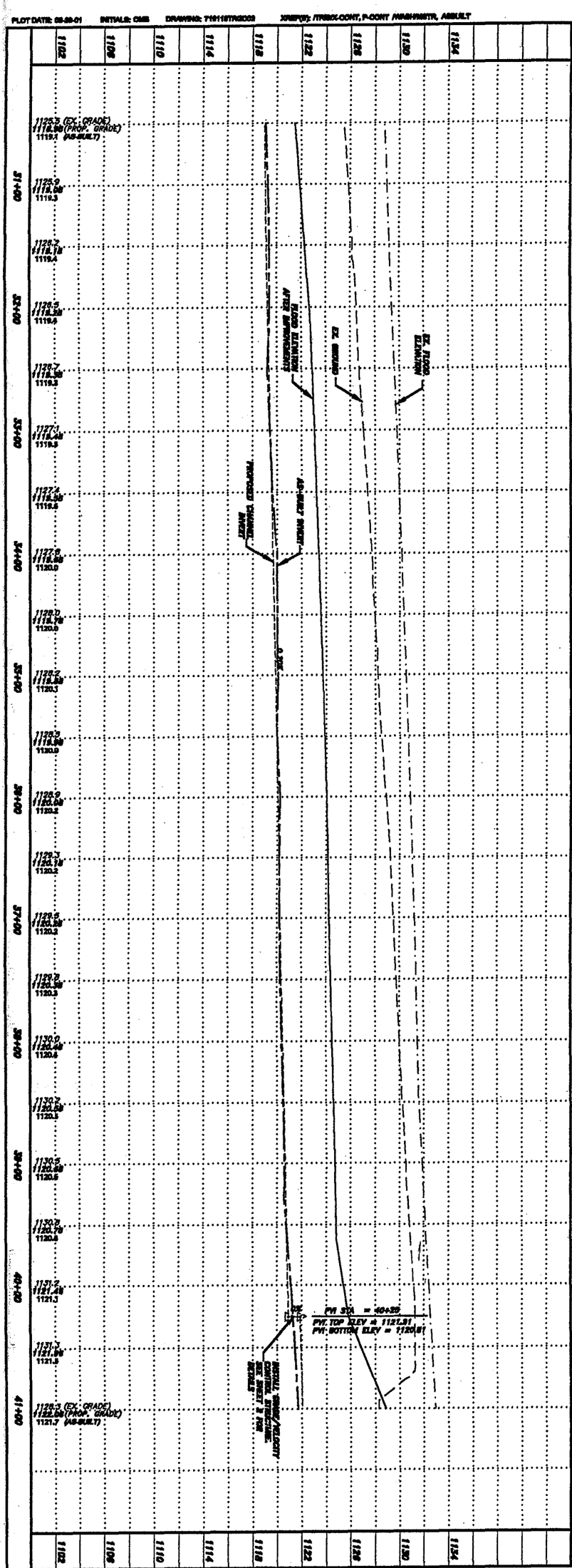

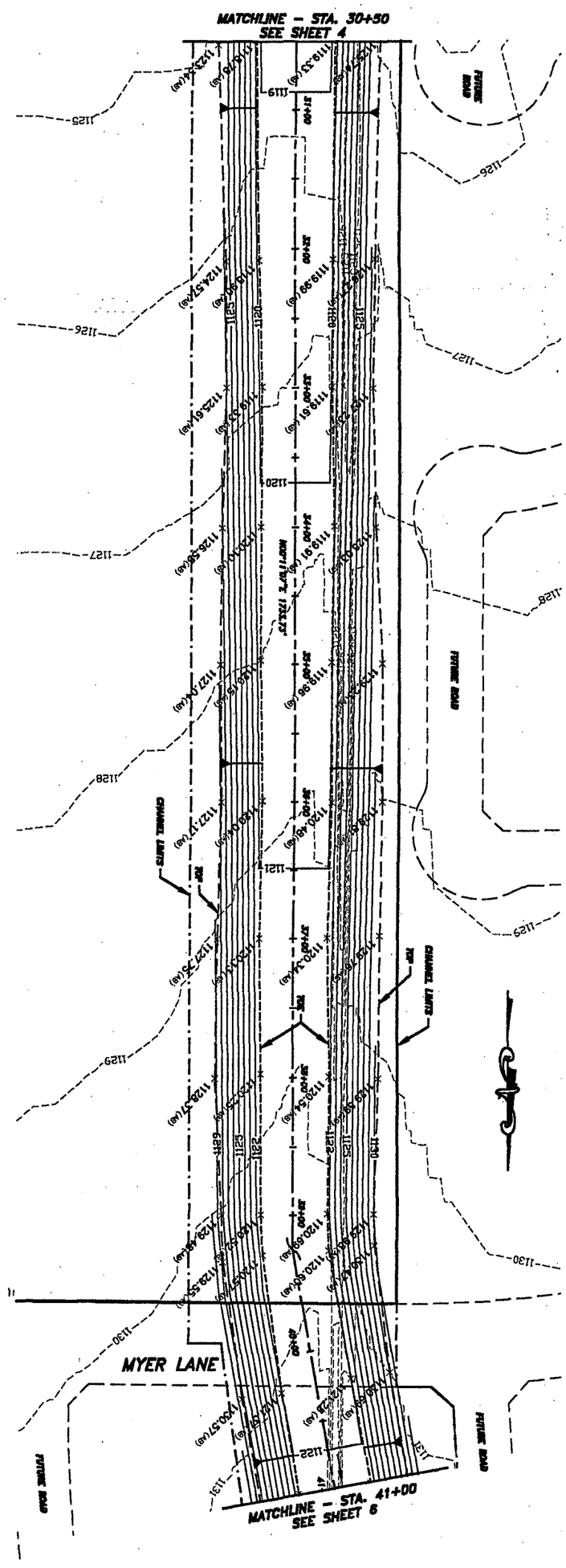

SHEET 5 of 18

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

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DATE	11/16/98	CHECK	LLT	VERT.	1"=5'

EL MIRAGE MASTER DRAINAGE PLAN

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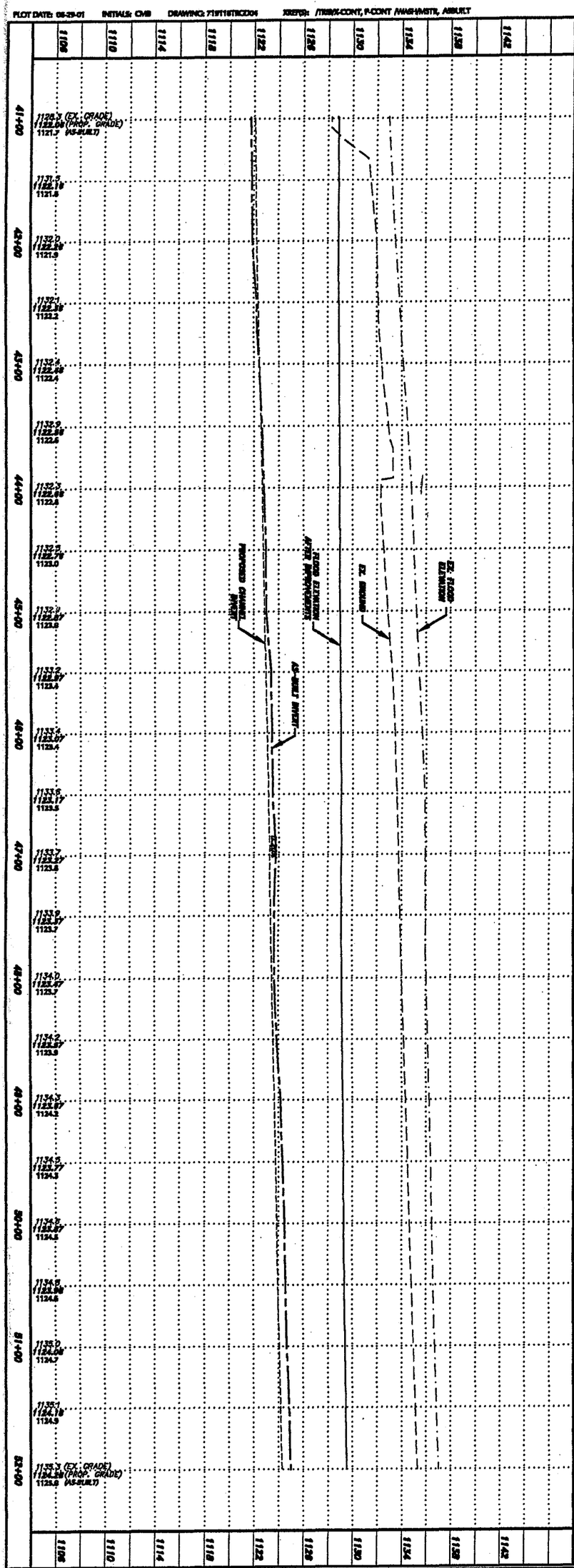
Registered Professional Engineer (Civil) CERTIFICATE NO. 13925 LAWRENCE L. TYSIAC ARIZONA, U.S.A.

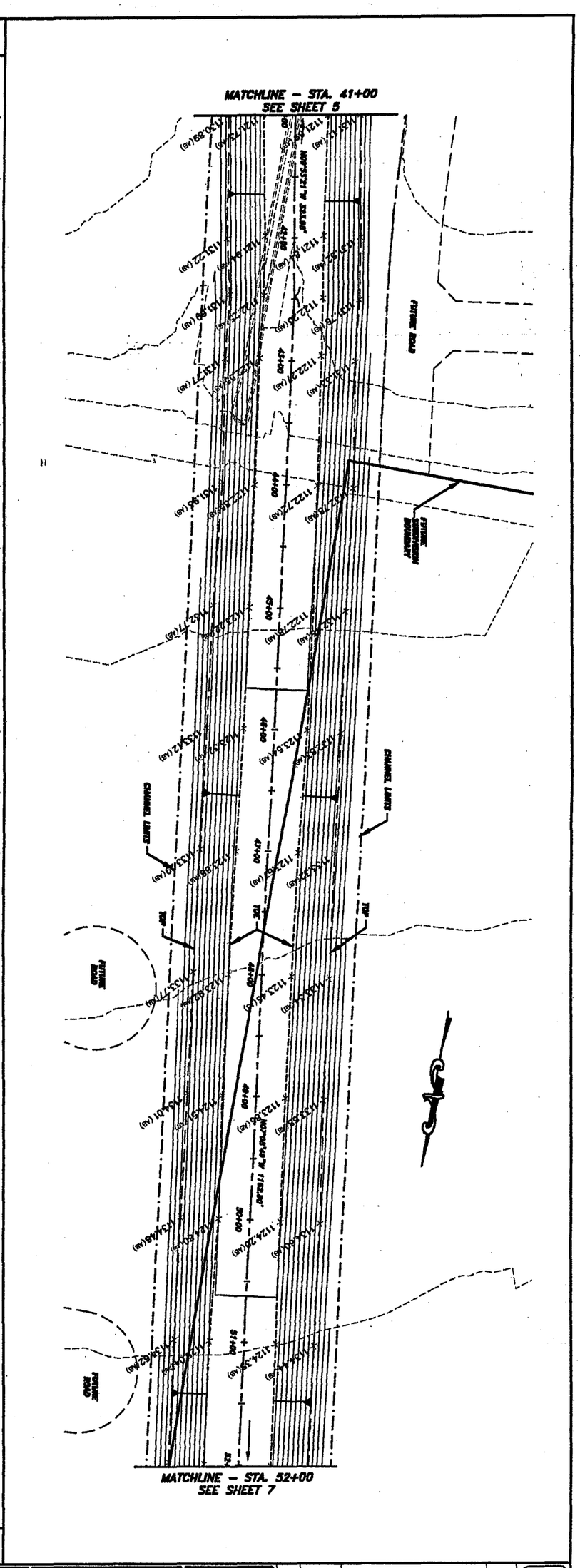
NO.	DATE	DESCRIPTION	BY

PROJECT NO. 7191-18

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

PLOT DATE: 08-29-01 INITIALS: CMB DRAWING: 7191116TRCD04 XREFS: /TRBX-CONT, F-CONT /WASHMSTR, ASBUILT





SHEET 8 of 18

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

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DATE	11/19/99	CHECK	LLT	VERT. 1"=5'

EL MIRAGE MASTER DRAINAGE PLAN

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phoenix@anwestinc.com

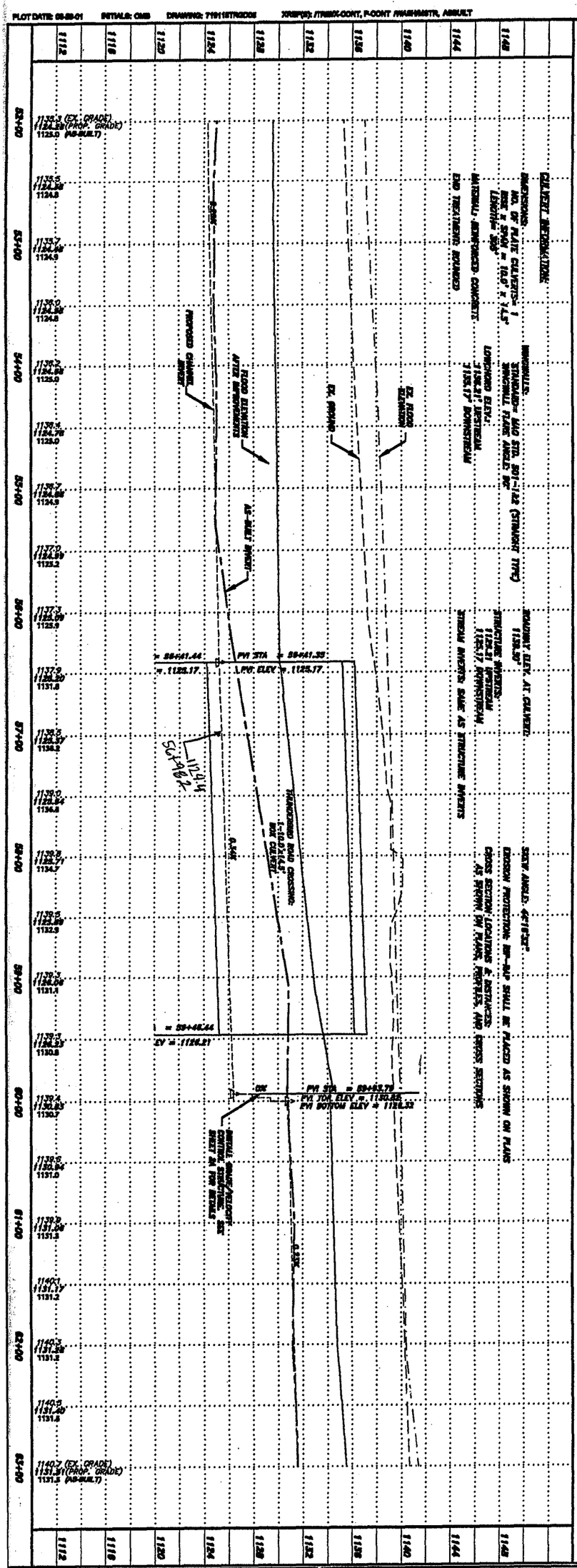
Registered Professional Engineer (Civil) CERTIFICATE NO. 13825 LAWRENCE L. TYSAC ARIZONA, U.S.A.

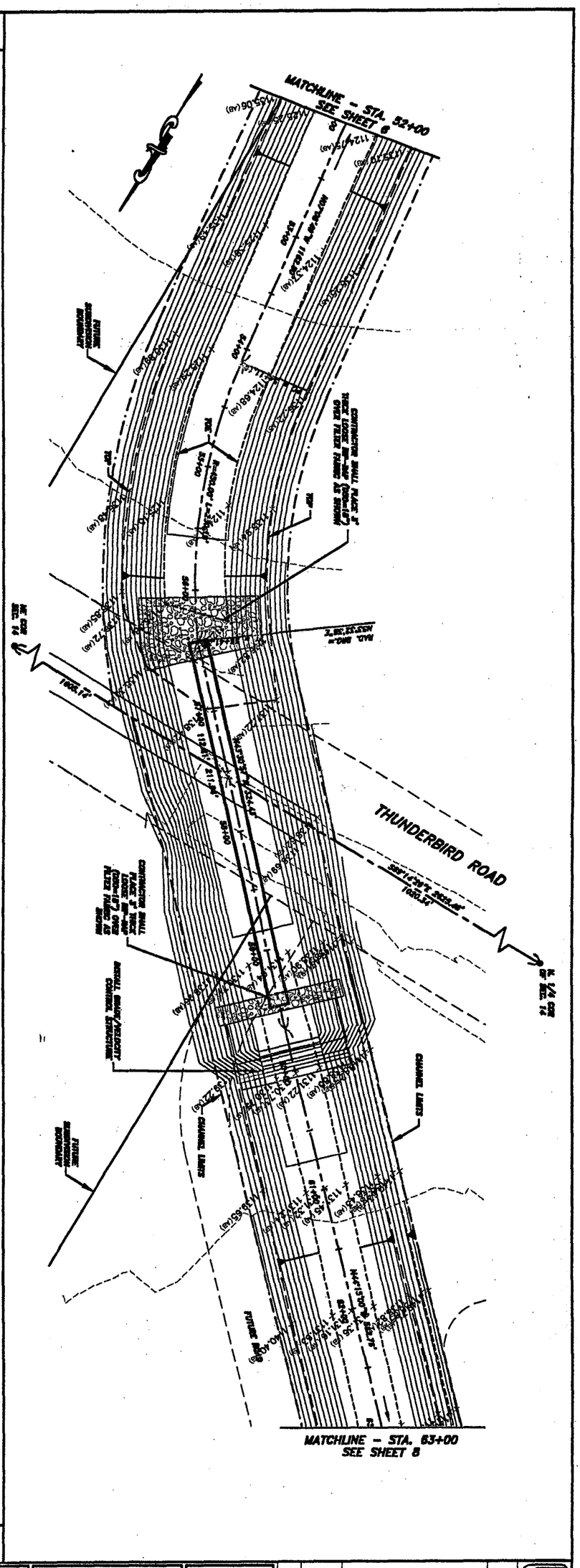
NO.	DATE	DESCRIPTION	BY

PROJECT NO. 7191-18
PROJECT ENGR. LLV

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

PLOT DATE: 09-09-01 SETVALS: CMS DRAWING: 7191118TRG005 XREF(S): /TRMX-CONT, P-CONT /WASHMASTR, ABSULT





SHEET 7 OF 18

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

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DATE	11/15/99	CHECK	LLY

SCALE: HORIZ. 1"=40' VERT. 1"=5'

EL MIRAGE MASTER DRAINAGE PLAN

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Registered Professional Engineer (Civil) CERTIFICATE NO. 13925 LAWRENCE L. TYSAC ARIZONA, U.S.A.

NO.	DATE	DESCRIPTION	BY

REF. DWG. NO. 6-08-1100
REF. DWG. NO. 7-01-1100-1-H-01
FIRST ISSUE DATE: 11/99

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

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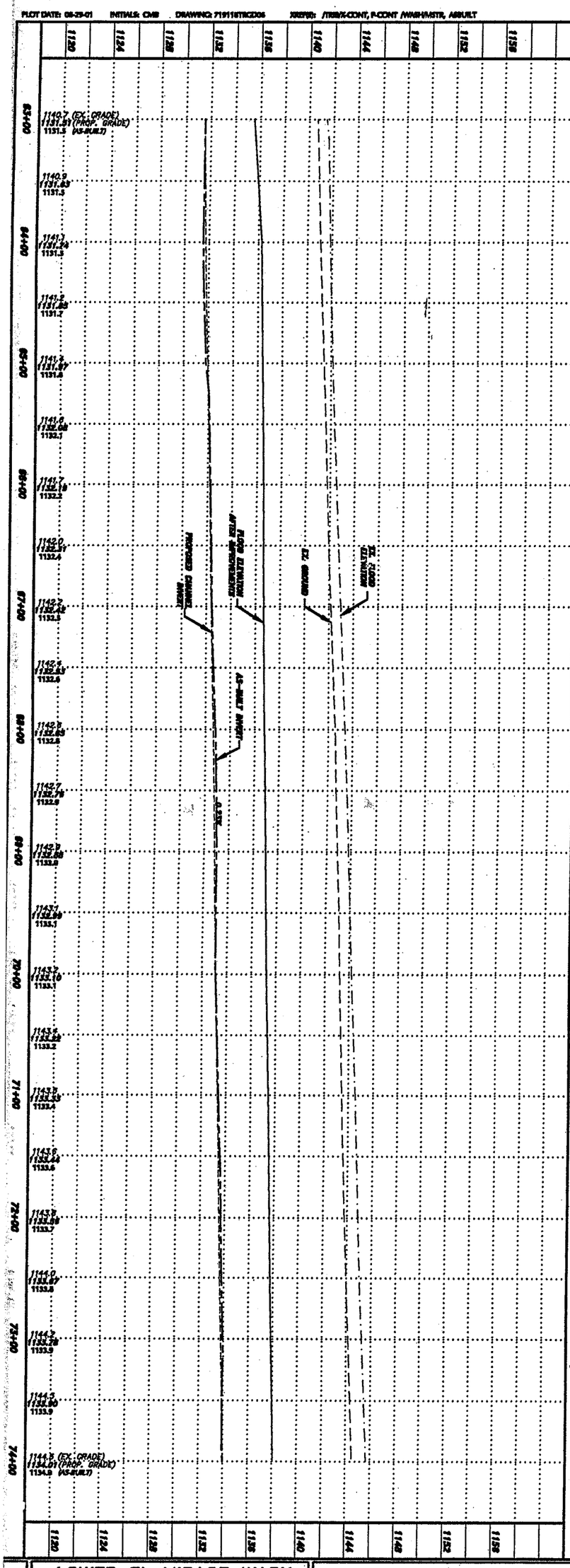

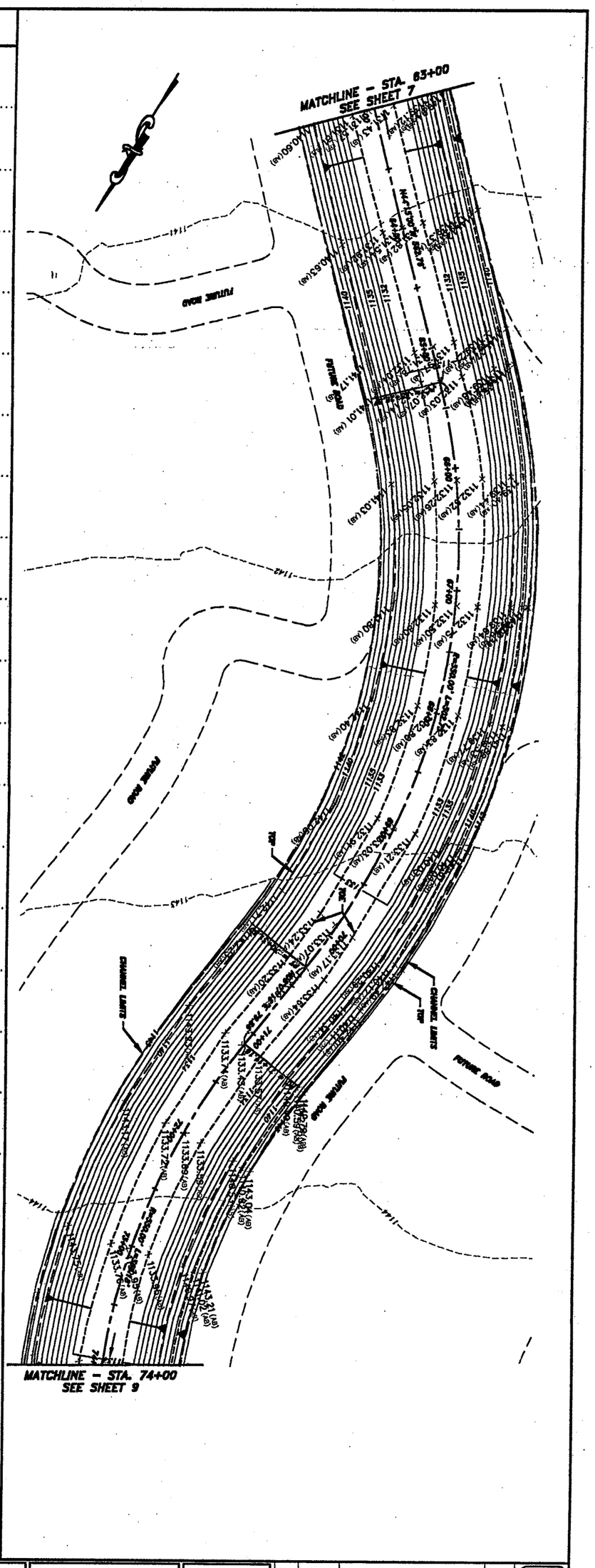

SHEET 8 OF 18	LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.				
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	DATE 11/18/99	CHECK LLT	VERT. 1"=4'		

EL MIRAGE MASTER DRAINAGE PLAN

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phoenix@anwestinc.com

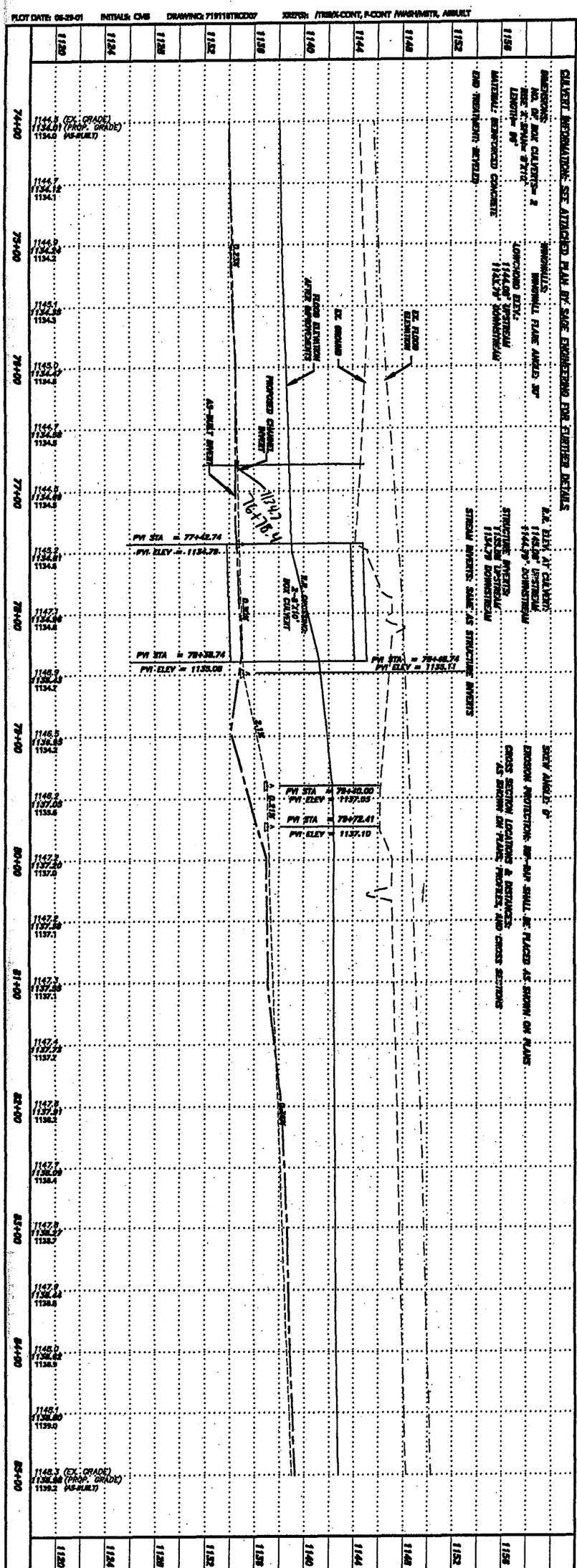
Registered Professional Engineer (Civil)
CERTIFICATE NO. 13923
LAWRENCE L. TYSIAC
Date Signed
ARIZONA, U.S.A.

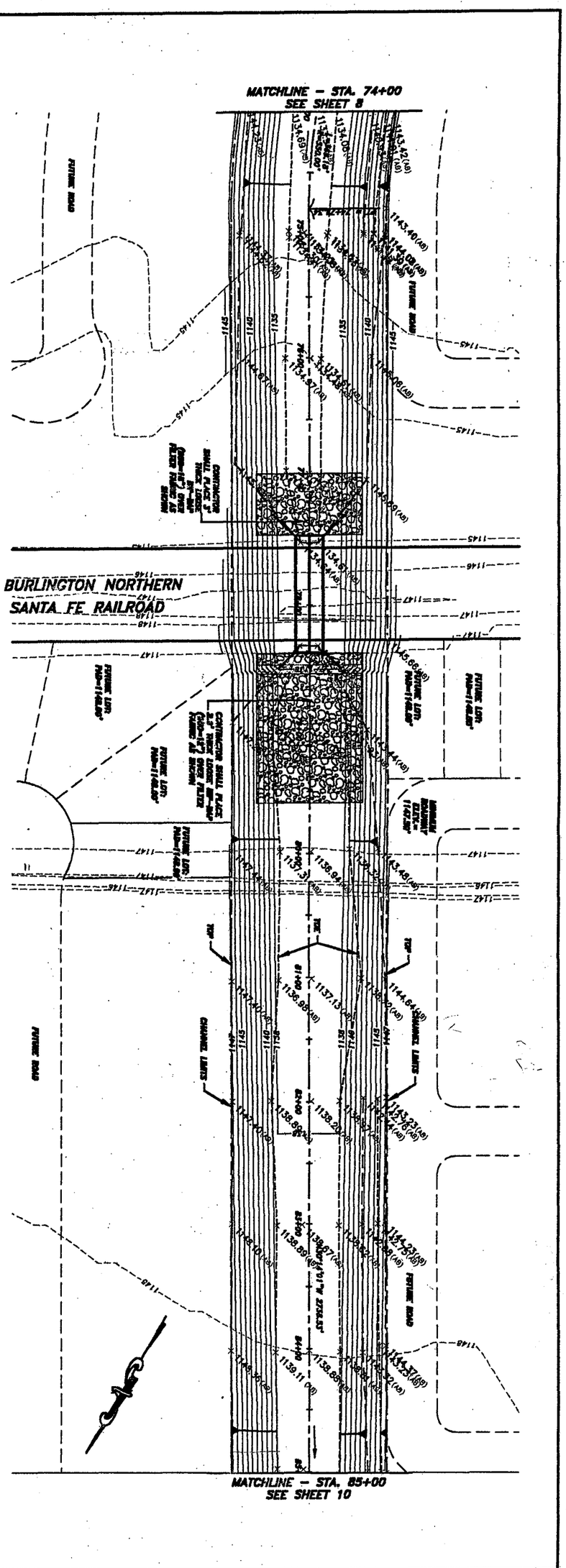
NO.	DATE	DESCRIPTION	BY

FLOOD SCHEDULE

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

PLOT DATE: 06-29-01 INITIALS: CMB DRAWING: 7191118TRCD07 XREFS: /TRIB/X-CONT; P-CONT /WASH/MSTR, ABBUILT



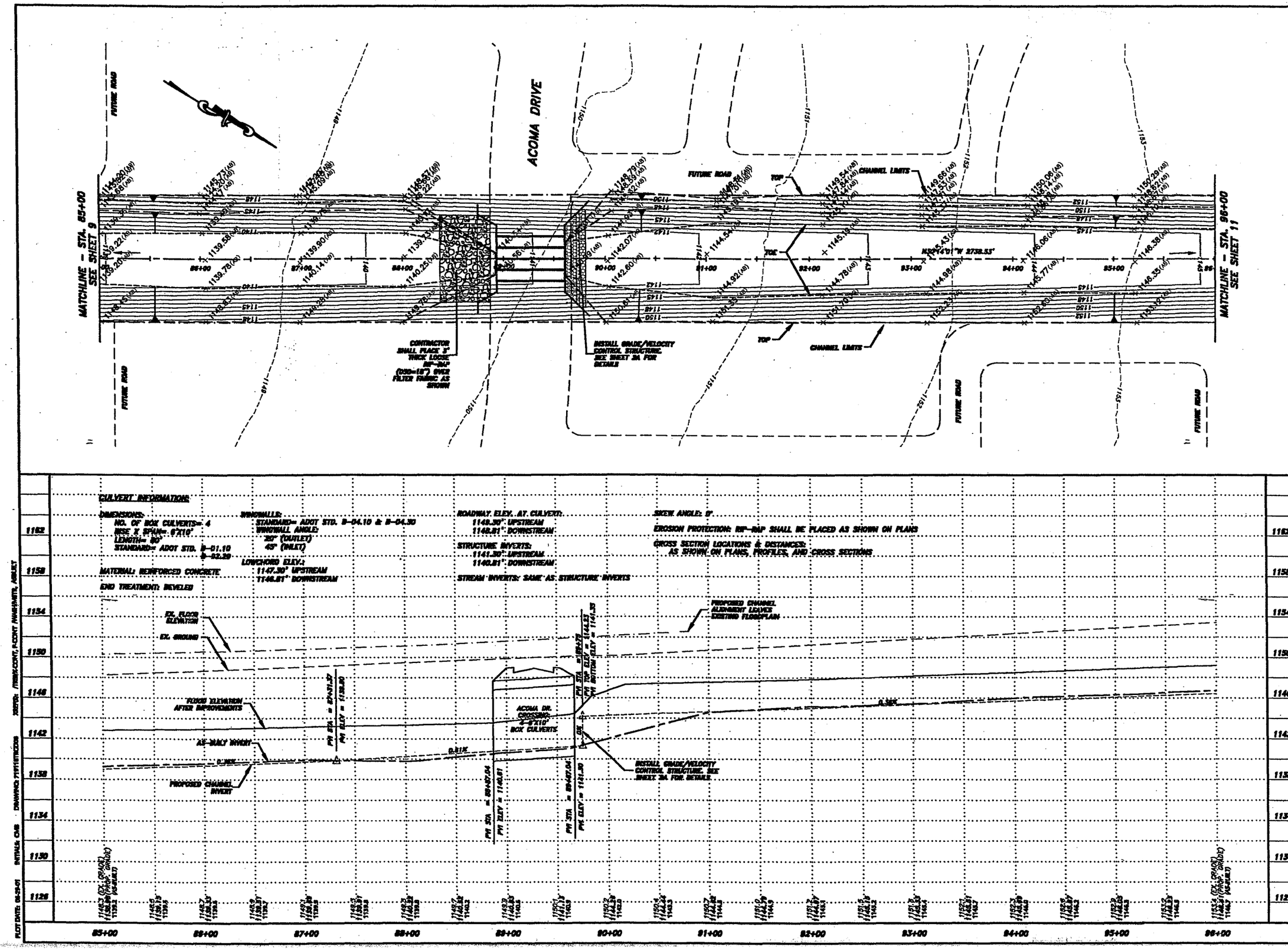


SHEET 9 of 18	LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.	EL MIRAGE MASTER DRAINAGE PLAN	A-N WEST INC. Consulting Engineers, 7600 N. 15th Street, Suite 200, Phoenix, Arizona 85020, (602) 861-2200, phoenix@anwestinc.com	Registered Professional Engineer (Civil) Certificate No. 13925 LAWRENCE L. TYSMC Date Signed ARIZONA, U.S.A.	23-00

JOB NO.	7191-18	DESIGN	LLT	SCALE
DWG. ID.	7191118TRCD07.DWG	DRAWN	WDR	HORIZ. 1"=40'
DATE	11/18/99	CHECK	LLT	VERT. 1"=4'

NO.	DATE	DESCRIPTION	BY

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION



2S3-1100
1-800-STAKE-IT

NO.	DATE	DESCRIPTION	BY

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

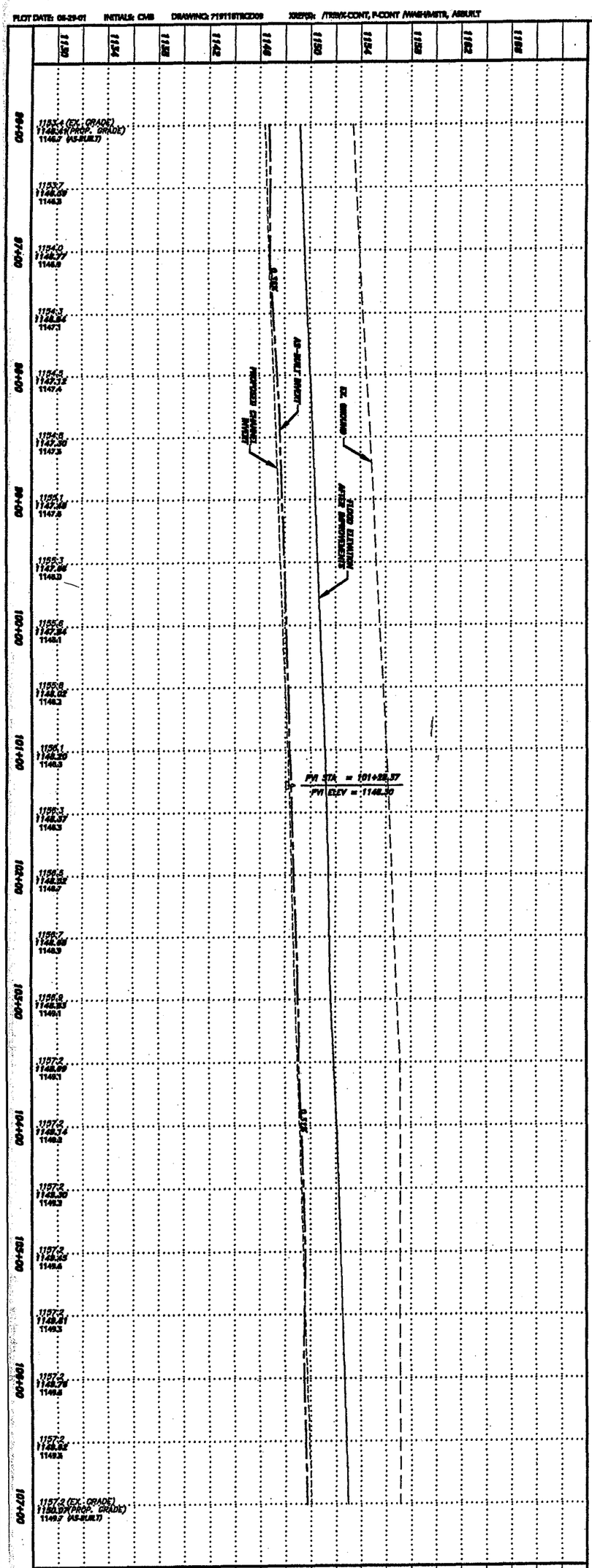
LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

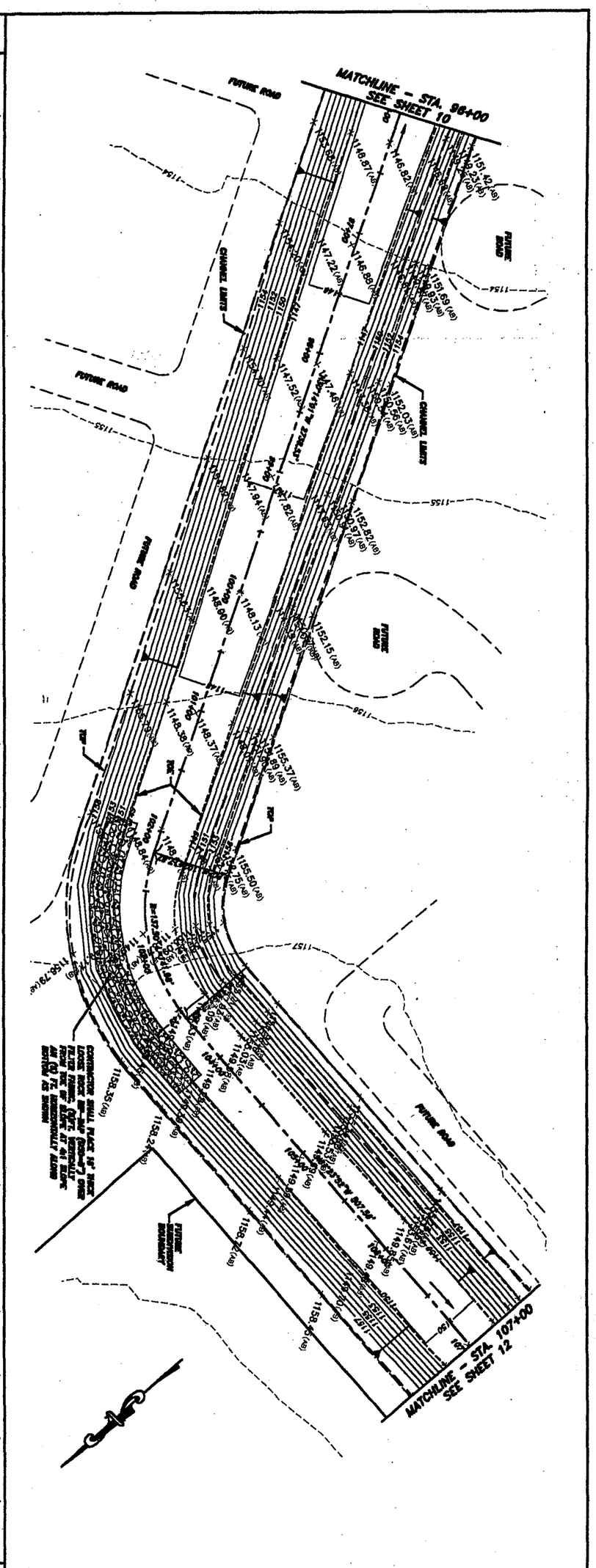
JOB NO. 7191C18
DRAWN B. 7191C18TRIB.DWG
DATE 11/13/02
DESIGN LLT
DRAWN WDR
CHECK LLT
SCALE HORIZ. 1"=40' VERT. 1"=5'

SHEET 10 of 18

PLOT DATE: 02-12-01 INITIALS: CVB DRAWING: 7191SECTIONS XREFS: 7191BASECONT, 7191CONT, 7191NAME, ABLUE

PLOT DATE: 06-29-01 INITIALS: CMB DRAWING: 7191116TRC009 XREFS: /TRIM/X-CONT, P-CONT /WASH/MSTR, ASBUILT





SHEET 11 of 18	LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.	EL MIRAGE MASTER DRAINAGE PLAN	A-N WEST INC. Consulting Engineers, 7600 N. 15th Street, Suite 200, Phoenix, Arizona 85020, (602) 581-2200, phoenix@anwestinc.com

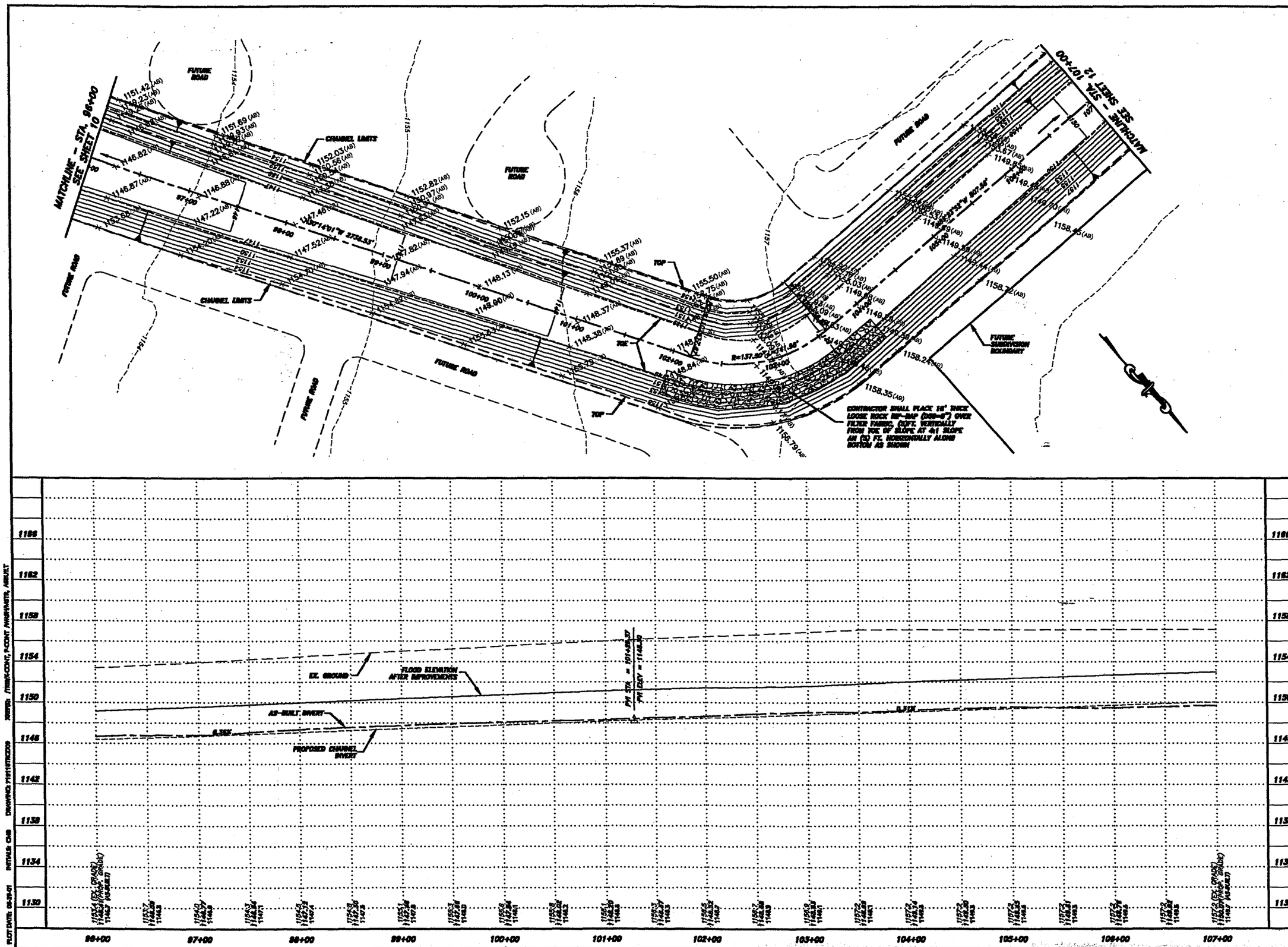
JOB NO.	7191-16	DESIGN	LLT	SCALE
DWG. ID.	7191116TRC009.DWG	DRAWN	WDR	HORIZ. 1"=40'
DATE	11/16/99	CHECK	LLT	VERT. 1"=4'

Registered Professional Engineer (Civil) CERTIFICATE NO. 13925 LAWRENCE L. TYSAC ARIZONA, U.S.A.

NO.	DATE	DESCRIPTION	BY

DRAWING NO. 98-0405-1-1

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION



263-1100
1-800-STAKE-IT

NO.	DATE	DESCRIPTION	BY

Registered Professional Engineer (Civil) 13025 LAWRENCE L. TISAC ARIZONA U.S.A.

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 331-2000
phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

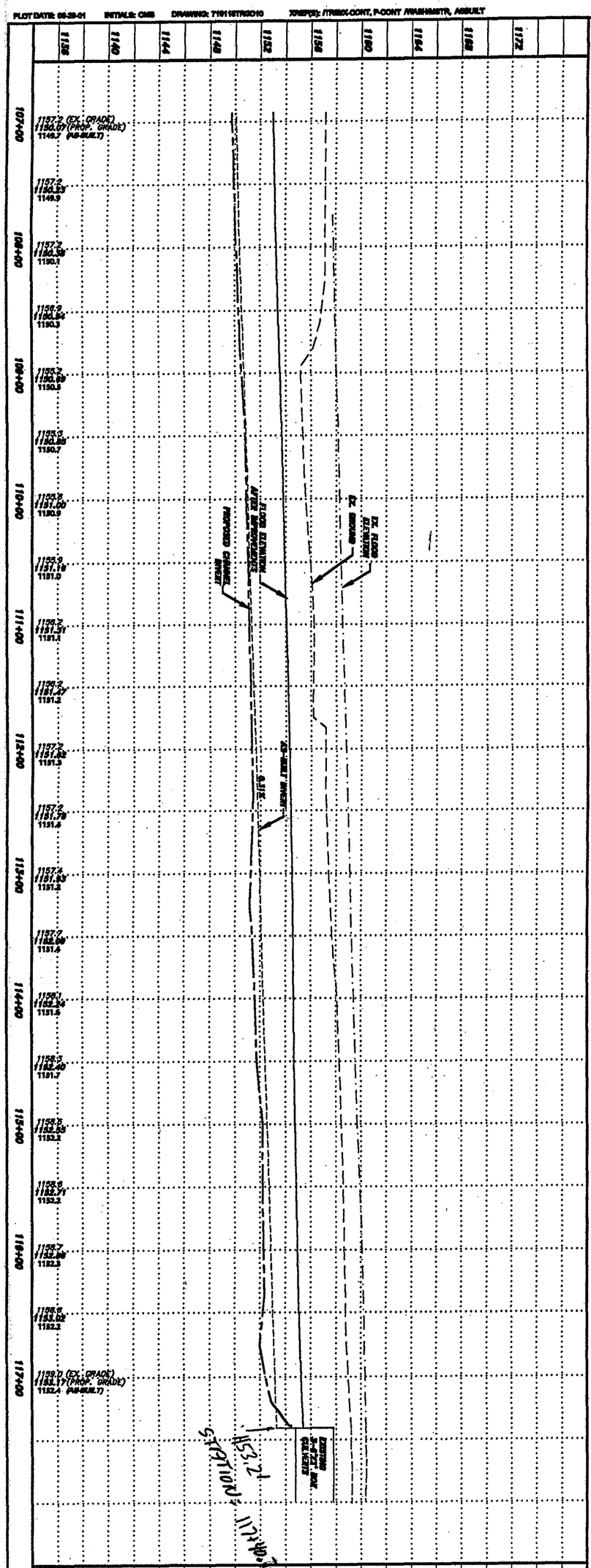
JOB NO.	7191-18		
DESIGN	LLT	SCALE	
DRAWN	WDR	HORIZ.	1"=200'
CHECK	LLT	VERT.	1"=4'
DATE	11/14/09		

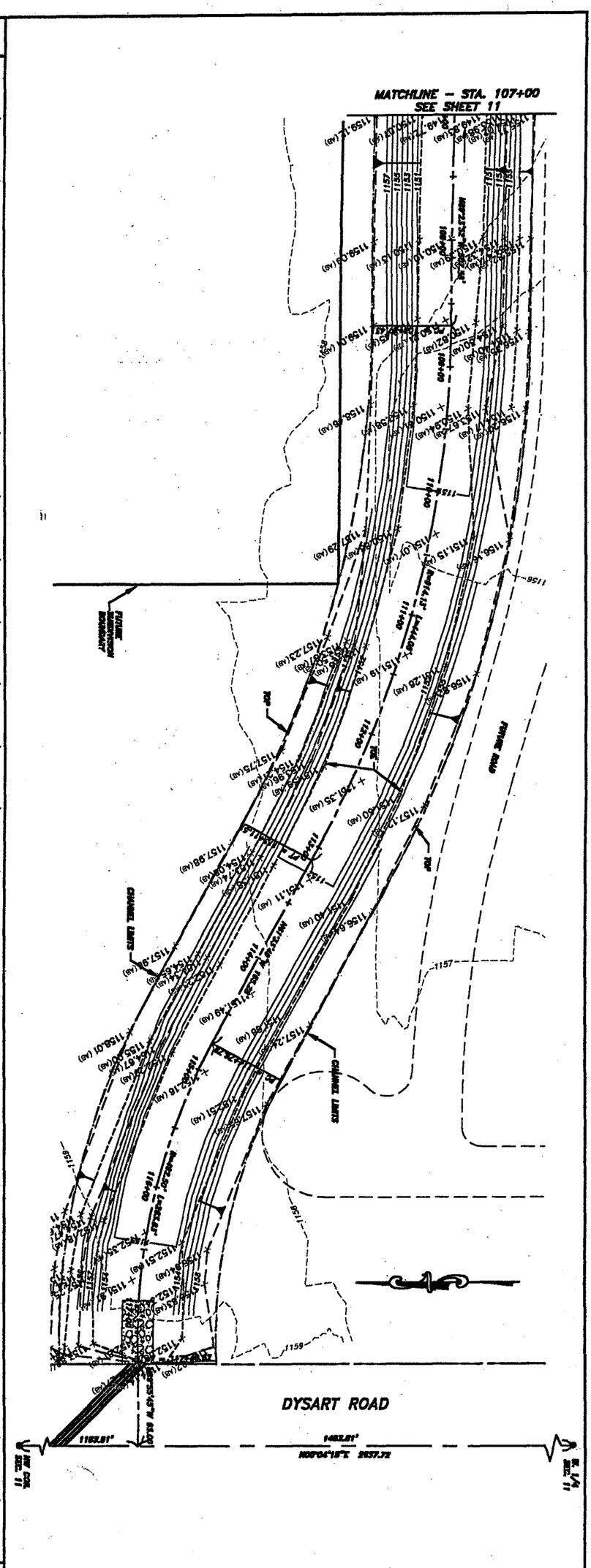
SHEET 11 of 18

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

PLOT DATE: 05-29-01 INITIALS: CAB DRAWING: 7191181RC009 XREFS: /7191X-CONT, R-CONT /WSR/ASTS, ASBUILT

PLOT DATE: 05-30-01 INITIALS: CMB DRAWING: 7191181RG010 XREF(S): /7191X-CONT, P-CONT /WASHMSTR, ASBUILT





LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.	EL MIRAGE MASTER DRAINAGE PLAN	A-N WEST INC. Consulting Engineers, 7600 N. 15th Street, Suite 200, Phoenix, Arizona 85020, (602) 861-2200, phoenix@anwestinc.com	Registered Professional Engineer (Civil) CERTIFICATE NO. 13925 LAWRENCE L. TYSAC ARIZONA, U.S.A.

NO.	7191-18	DESIGN	LLT	SCALE:
D.	7191181RG010.DWG	DRAWN	WDR	HORIZ. 1"=40'
	11/16/99	CHECK	LLT	VERT. 1"=4'

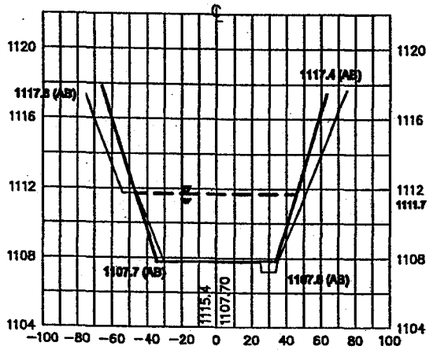
SHEET 12 of 12

NO.	DATE	DESCRIPTION	BY

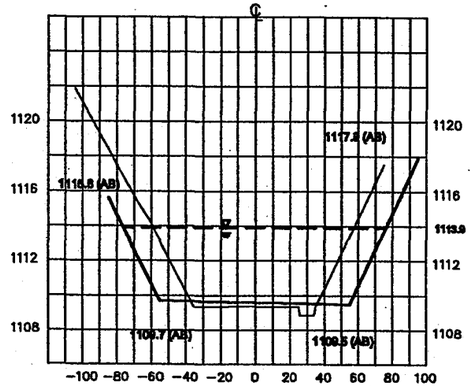
P-00-0-0-0-H-D

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

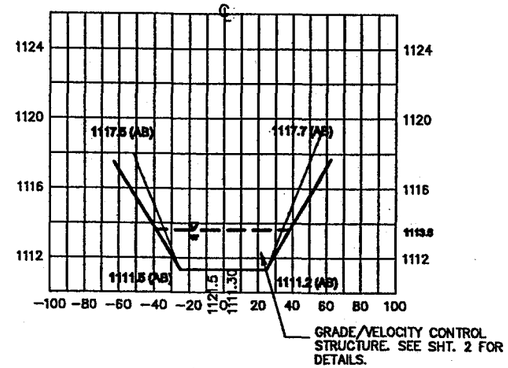
26+24 ALONG LOWER WASH



10+00: CONFLUENCE/ BEGIN TRIBUTARY

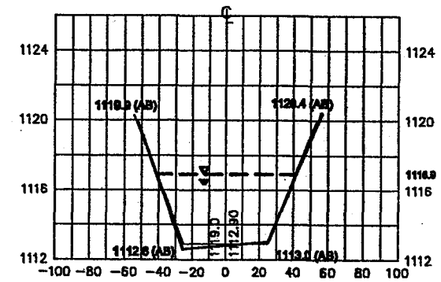


12+07

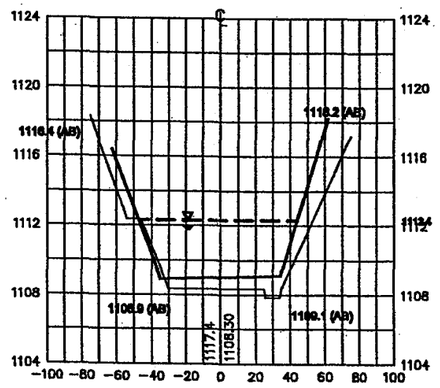


GRADE/VELOCITY CONTROL STRUCTURE. SEE SHT. 2 FOR DETAILS.

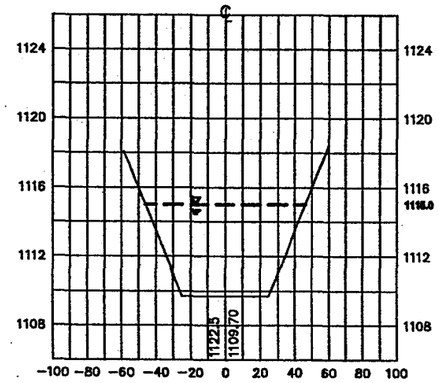
19+98



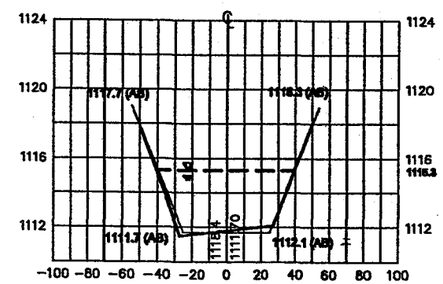
28+31 ALONG LOWER WASH



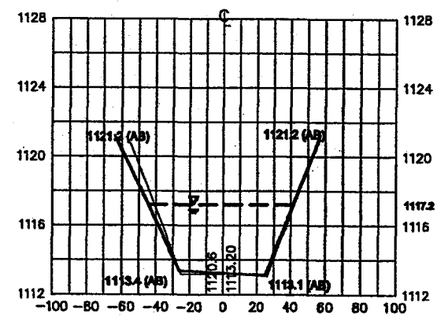
11+50



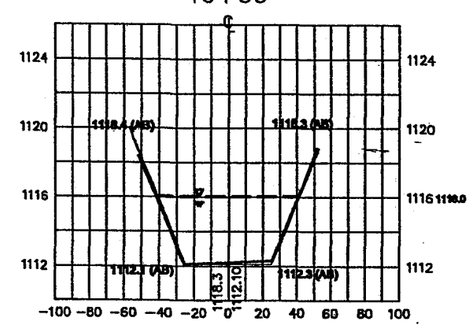
14+02



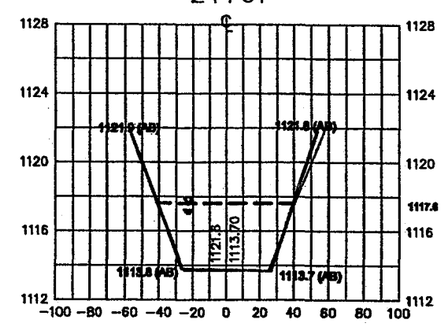
21+98



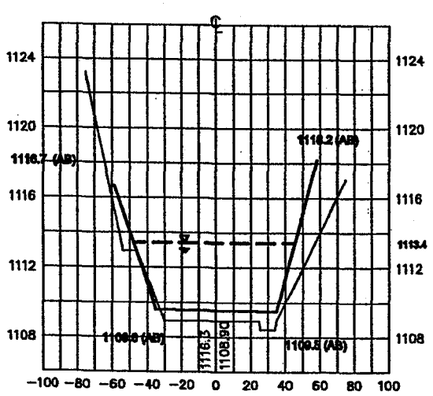
16+00



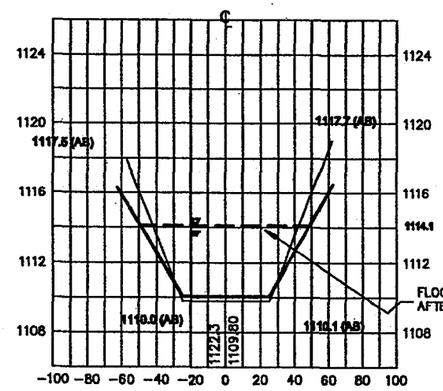
24+01



30+44 ALONG LOWER WASH

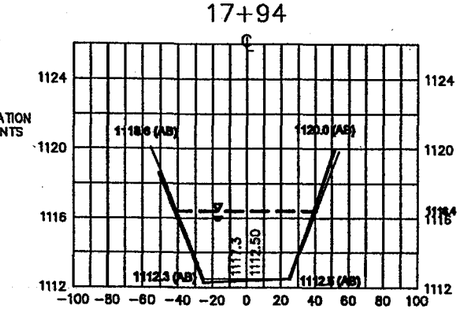


12+06



FLOODPLAIN ELEVATION AFTER IMPROVEMENTS

17+94



NOTE: CROSS SECTIONS SHOWN ARE LOOKING DOWNSTREAM. CENTERLINE ELEVATIONS REPRESENT FINISHED AND EXISTING GRADE.

263-1100
1-800-STAKE-IT

NO.	DATE	DESCRIPTION	BY

A-N WEST INC.
Consulting Engineers
7600 N. 16th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

JOB NO.	791-16	DESIGN	LLI
DWG. No.	791161RDS01.DWG	DRAWN	WDR
DATE	11/13/99	CHECK	LLI

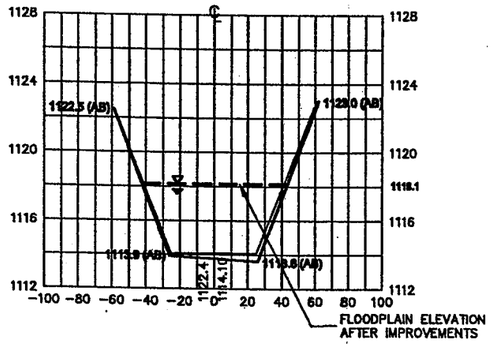
SCALE: HORIZ. 1"=40' VERT. 1"=4'

SHEET 13 OF 18

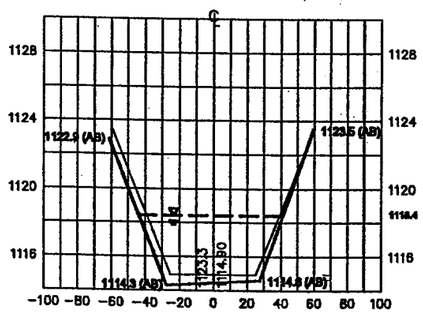
L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

PLOT DATE: 09-28-01 INITIALS: CMB DRAWING: 791161RDS01 XREFS: NONE

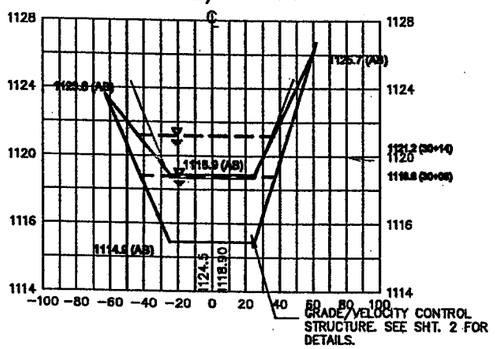
26+00



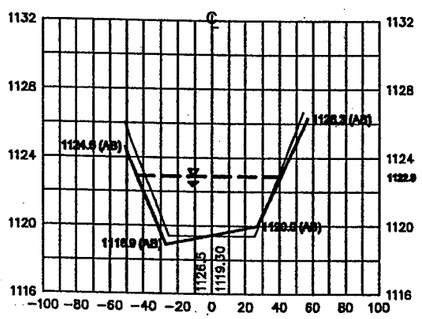
27+96



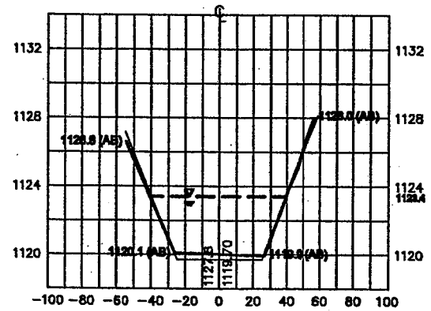
30+08/30+14



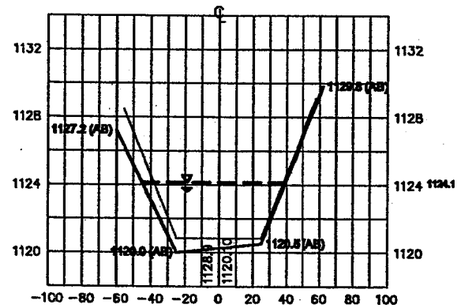
32+08



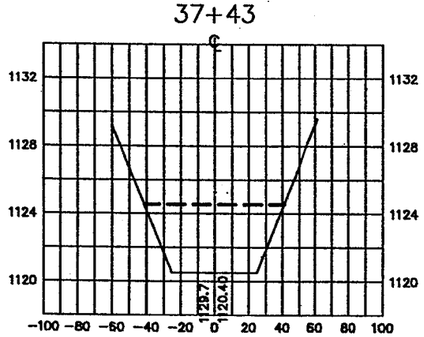
34+00



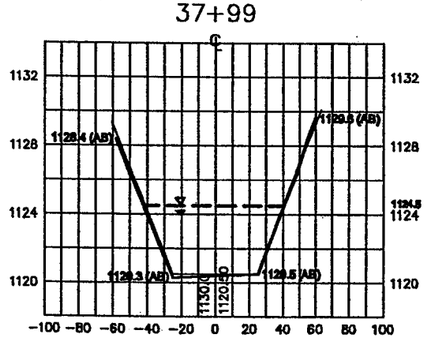
36+00



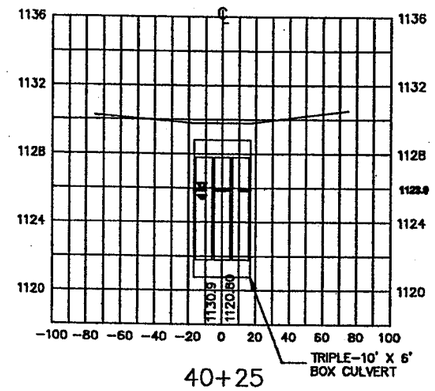
37+43



37+99



39+64



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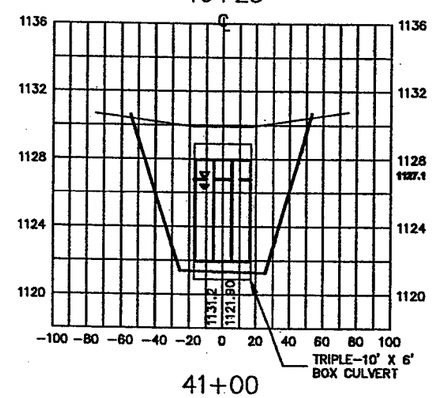
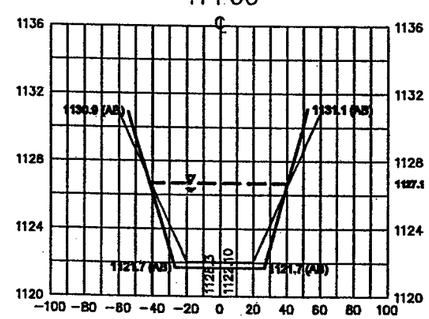
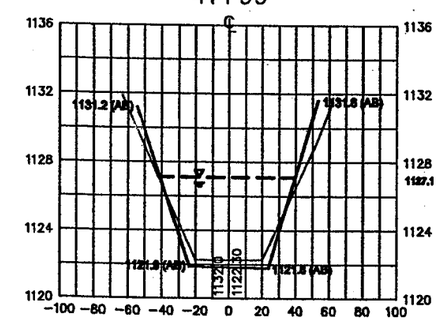


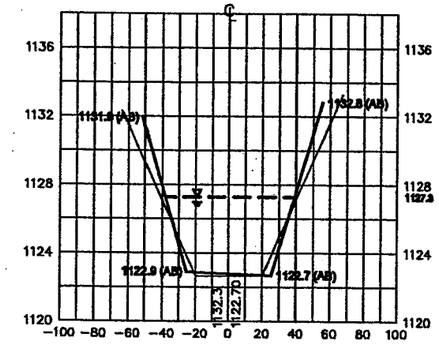
41+00



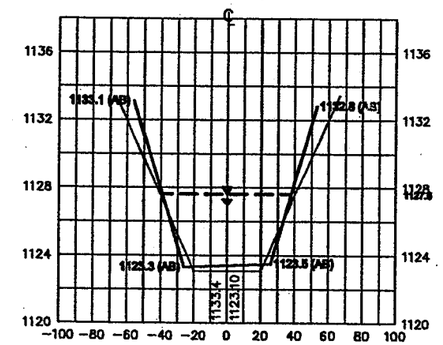
41+99



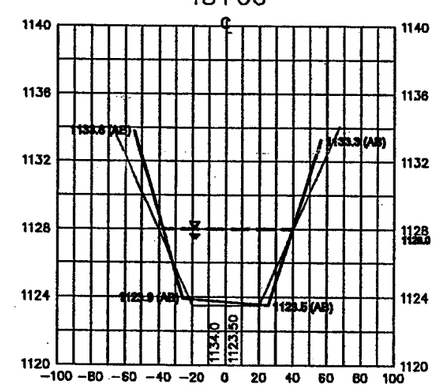
44+00



46+00



48+00



NOTE: CROSS SECTIONS SHOWN ARE LOOKING DOWNSTREAM. CENTERLINE ELEVATIONS REPRESENT FINISHED AND EXISTING GRADE.

NO.	DATE	DESCRIPTION	BY

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

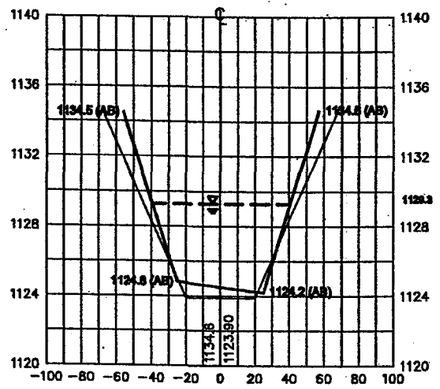
JOB NO. 791-18
DWG. ID. 791811(0503).DWG
DATE 11/19/99
DESIGN LLY
DRAWN WDR
CHECK LLY
SCALE HORIZ. 1"=40' VERT. 1"=4'

SHEET 14 of 18

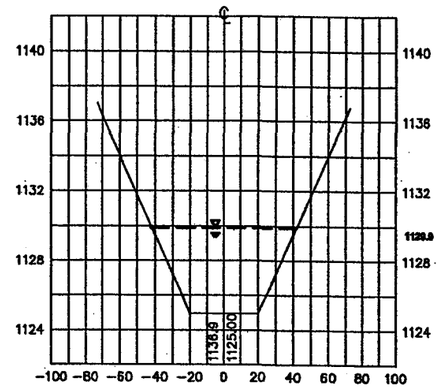
L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

PLOT DATE: 06/29/01 INITIALS: CMB DRAWING: 791811(0503) XREF(S): NONE

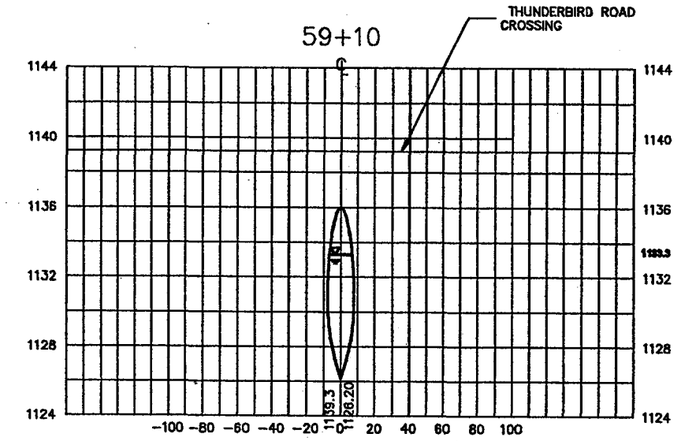
50+00



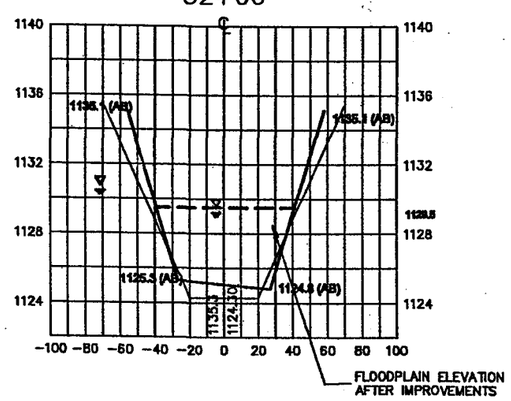
55+33



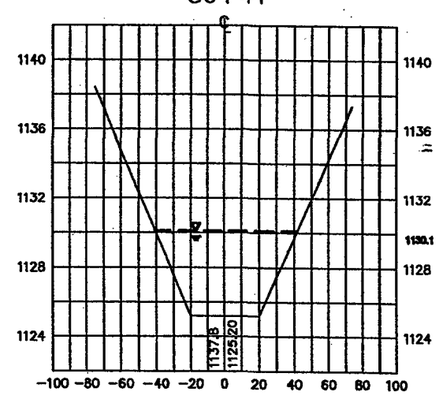
59+10



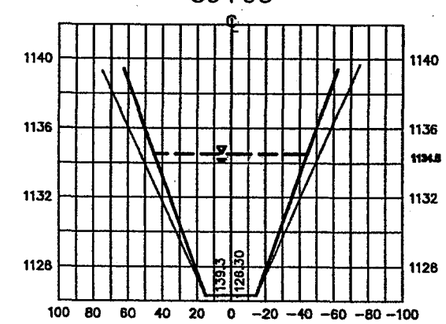
52+00



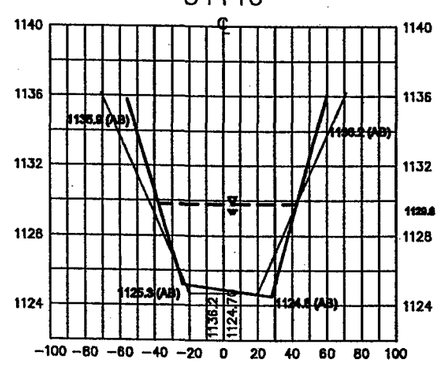
56+41



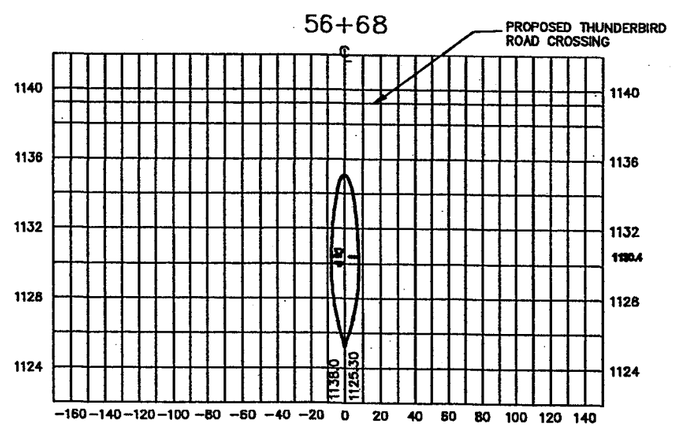
59+90



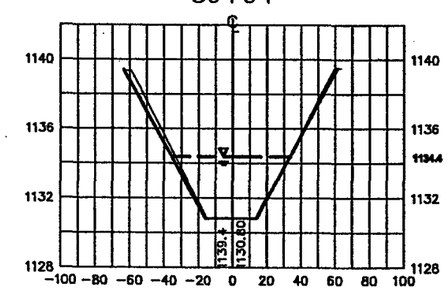
54+10



56+68



59+94



NOTE: CROSS SECTIONS SHOWN ARE LOOKING DOWNSTREAM. CENTERLINE ELEVATIONS REPRESENT FINISHED AND EXISTING GRADE.

CALL THE ARIZONA BLUE STAKE, INC. 263-1100 1-800-STAKE-IT

NO.	DATE	DESCRIPTION	BY

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

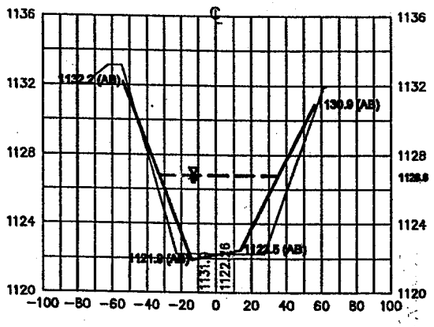
LOWER EL MIRAGE WASH TRIBUTARY CHANNELIZATION L.O.M.R.

JOB NO. 719-13
DWG. NO. 719118T0001.DWG
DATE 11/18/98
DESIGN LLT
DRAWN WDR
CHECK LLT
SCALE HORIZ. 1"=40' VERT. 1"=5'

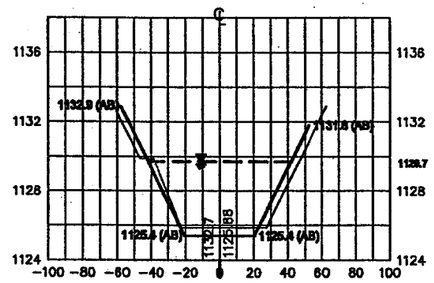
L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

PLOT DATE: 06-30-01 INITIAL: CMB DRAWING: 719118T0001 XREF(S): NONE

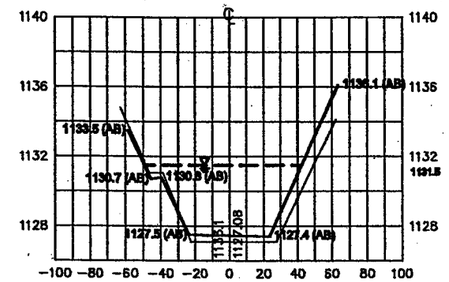
64+79



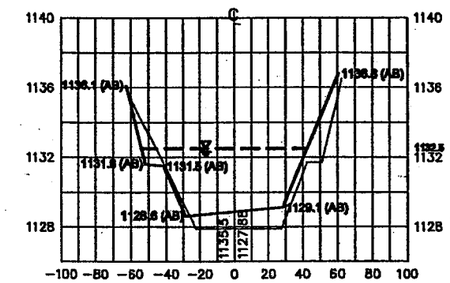
67+81



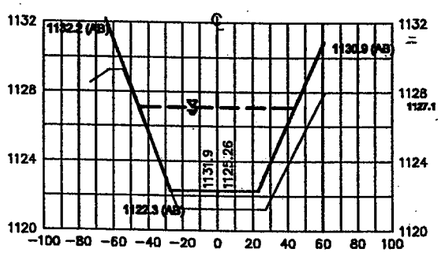
73+97



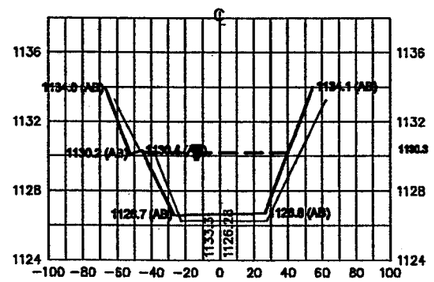
77+74



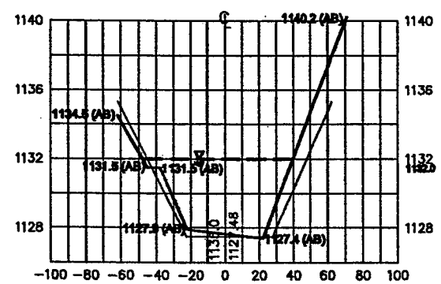
65+00



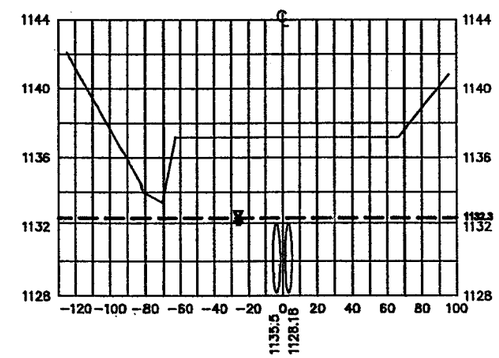
70+08



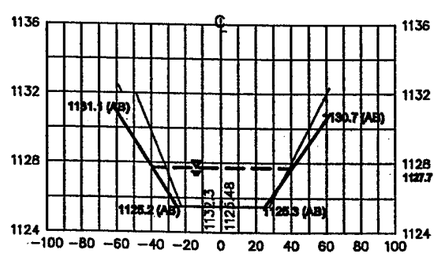
76+00



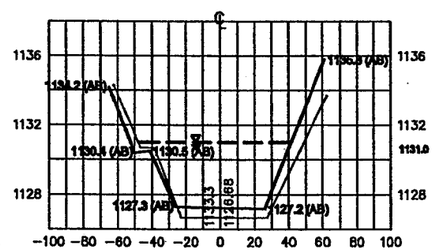
79+52



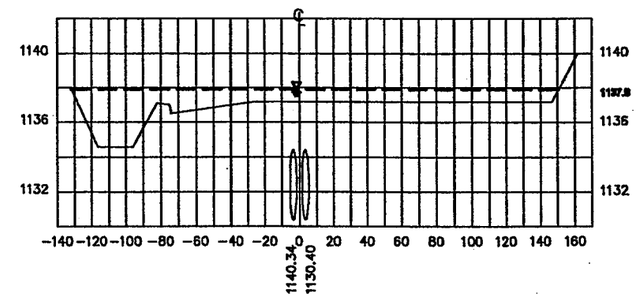
65+06



72+00



80+14



NOTE: CROSS SECTIONS SHOWN ARE LOOKING DOWNSTREAM. CENTERLINE ELEVATIONS REPRESENT FINISHED AND EXISTING GRADE.

NO.	DATE	DESCRIPTION	BY

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
phoenix@anwestinc.com

EL MIRAGE MASTER DRAINAGE PLAN

LOWER EL MIRAGE WASH CHANNELIZATION L.O.M.R.

L.O.M.R. EXHIBIT – NOT FOR CONSTRUCTION

JOB NO.	7181-18	DESIGN	LLY
DWG. ID.	7181182501.DWG	DRAWN	WDK
DATE	9/25/00	CHECK	LLY

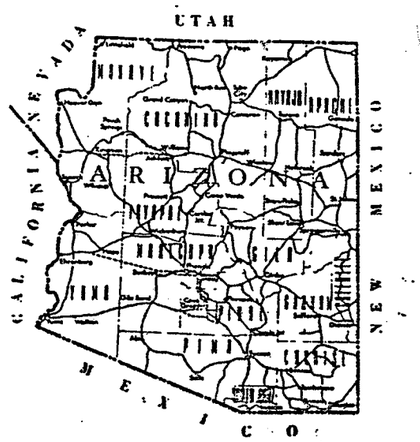
SCALE: HORIZ. 1"=40' VERT. 1"=4'

SHEET 17 of 18

PLOT DATE: 09-26-01 INITIALS: CMB DRAWING: 7181182501 XREF(S): NONE

FF2

11/122



STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PLAN AND PROFILE OF PROPOSED

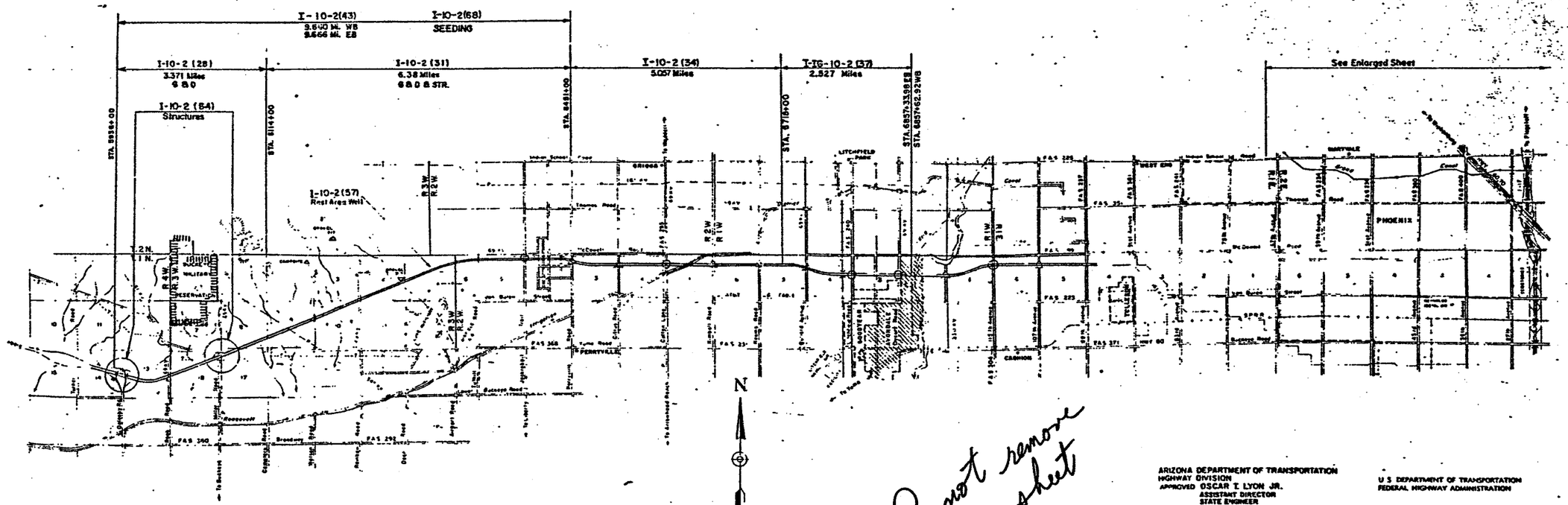
STATE HIGHWAY

EHRENBERG — PHOENIX

MARICOPA COUNTY

I-IG-10-2(37)

AS BUILT
DATE 2-26-80



Do not remove this sheet

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
APPROVED OSCAR T. LYON JR.
ASSISTANT DIRECTOR
STATE ENGINEER

U S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED DATE
CHIEF DEPUTY STATE ENGINEER

APPROVED DATE
DIVISION ENGINEER

APPROVED DATE
DEPUTY STATE ENGINEER

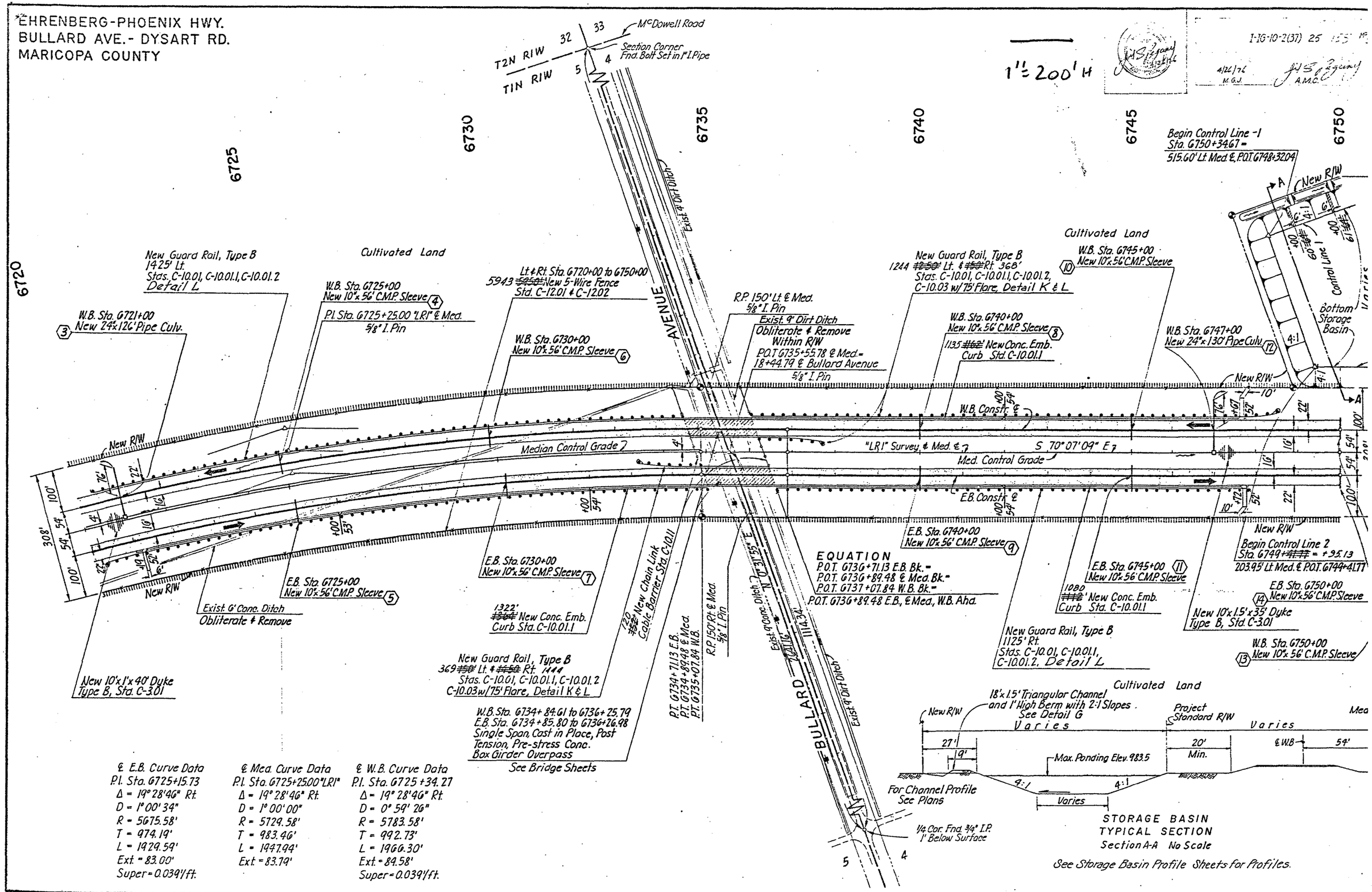
7	I-10-2(37)	1 of 85

EHRENBERG-PHOENIX HWY.
BULLARD AVE.- DYSART RD.
MARICOPA COUNTY

1" = 200' H

I-IG-10-2(37) 25

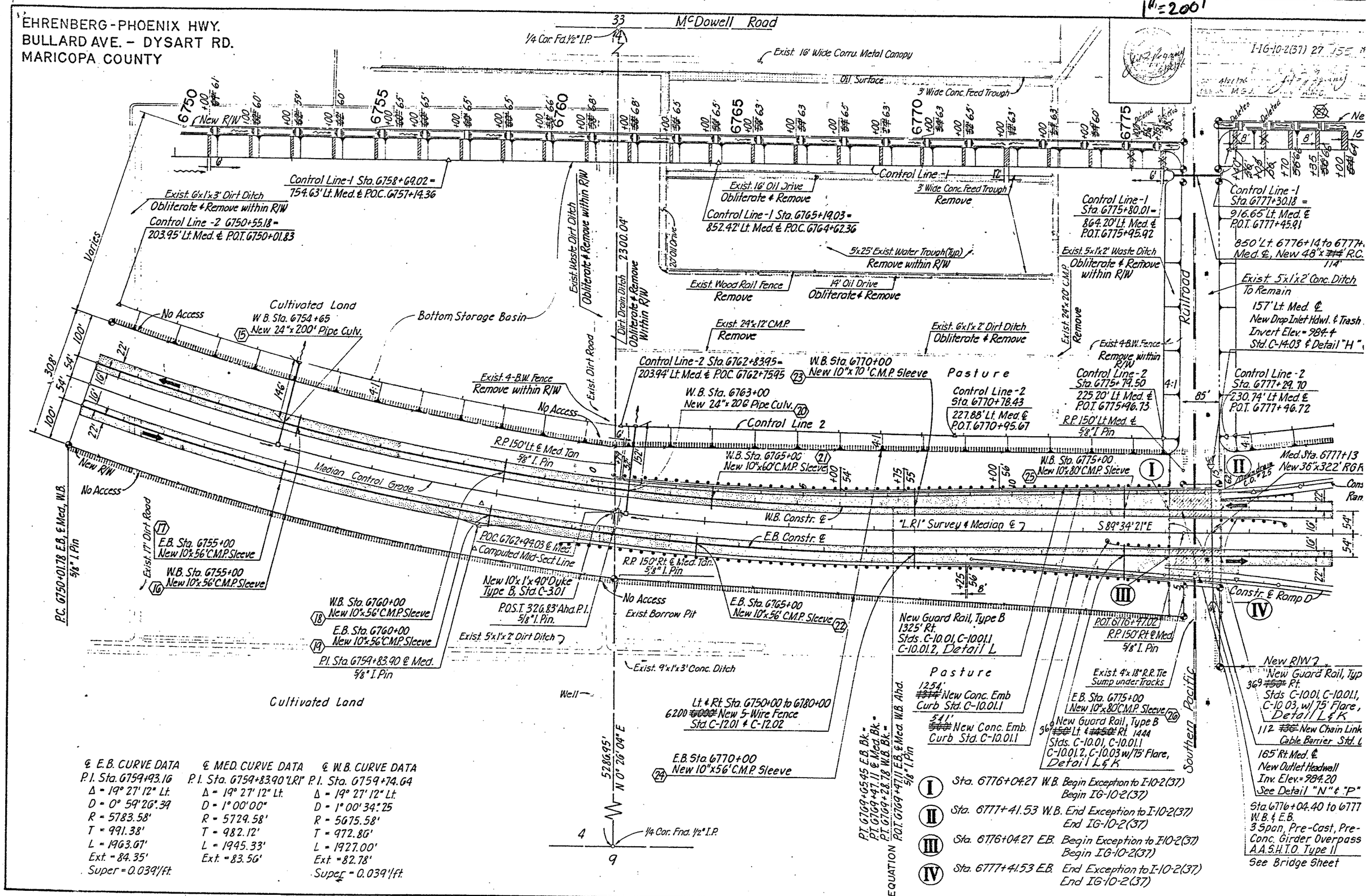
4/22/76 M.G.J. A.M.C.



℄ E.B. Curve Data	℄ Med. Curve Data	℄ W.B. Curve Data
P.I. Sta. G725+15.73	P.I. Sta. G725+25.00 "LR1"	P.I. Sta. G725+34.27
Δ = 19°28'46" Rt.	Δ = 19°28'46" Rt.	Δ = 19°28'46" Rt.
D = 1°00'34"	D = 1°00'00"	D = 0°59'26"
R = 5675.58'	R = 5729.58'	R = 5783.58'
T = 974.19'	T = 983.46'	T = 992.73'
L = 1929.59'	L = 1947.94'	L = 1966.30'
Ext. = 83.00'	Ext. = 83.79'	Ext. = 84.58'
Super = 0.039'/ft.		Super = 0.039'/ft.

EHRENBERG-PHOENIX HWY.
BULLARD AVE. - DYSART RD.
MARICOPA COUNTY

1" = 200'



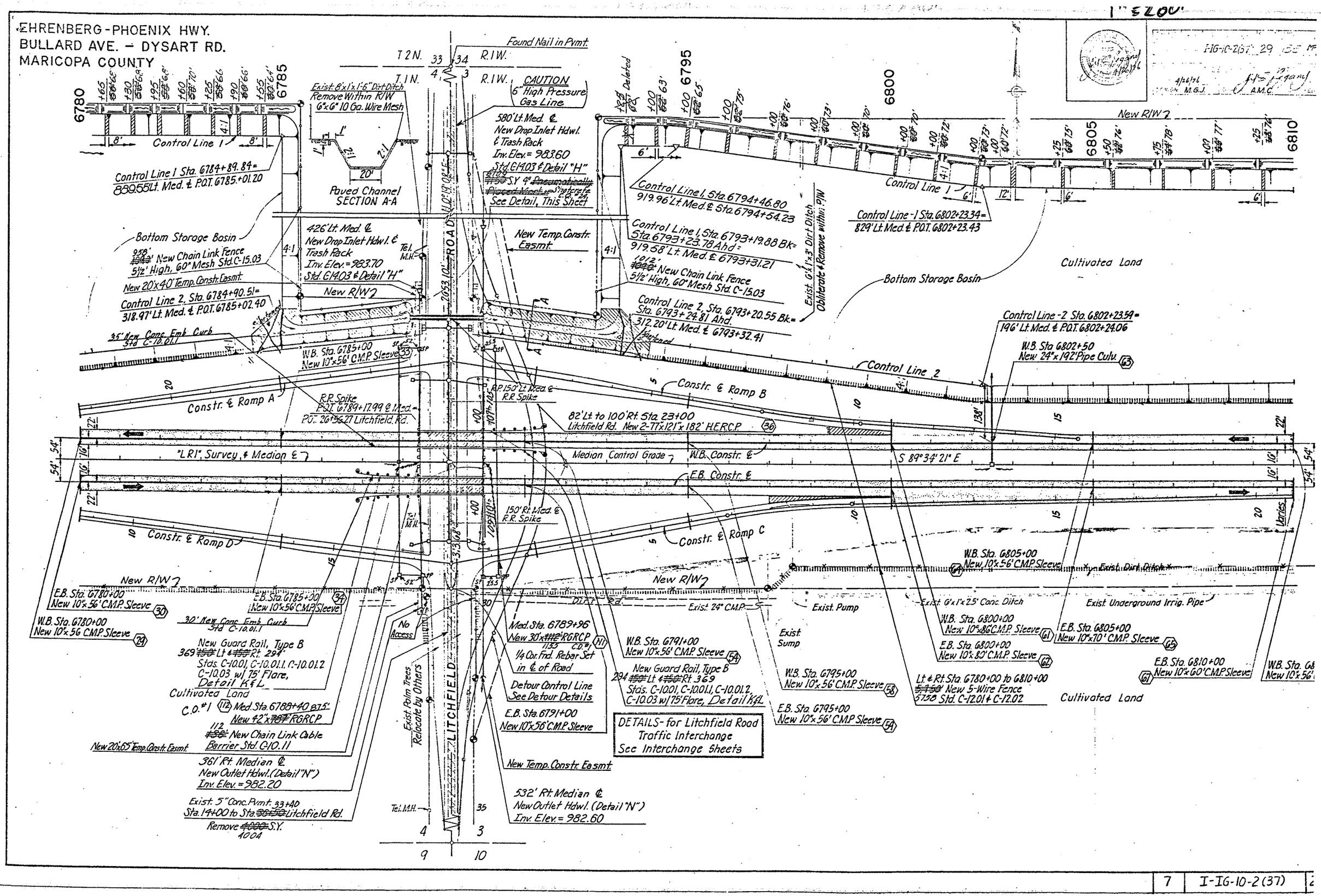
℄ E.B. CURVE DATA	℄ MED. CURVE DATA	℄ W.B. CURVE DATA
P.I. Sta. 6759+93.16	P.I. Sta. 6759+83.90 "L.R.I"	P.I. Sta. 6759+74.64
Δ = 19° 27' 12" Lt.	Δ = 19° 27' 12" Lt.	Δ = 19° 27' 12" Lt.
D = 0° 59' 26".39	D = 1° 00' 00"	D = 1° 00' 34".25
R = 5783.58'	R = 5729.58'	R = 5675.58'
T = 991.38'	T = 982.12'	T = 972.86'
L = 1963.67'	L = 1945.33'	L = 1927.00'
Ext. = 84.35'	Ext. = 83.56'	Ext. = 82.78'
Super = 0.039'/ft.		Super = 0.039'/ft.

EHRENBERG-PHOENIX HWY.
BULLARD AVE. – DYSART RD.
MARICOPA COUNTY

1" = 200'

FIG-IC-2(37) 29 SHEETS

4/26/76 M.G.J. A.M.C.

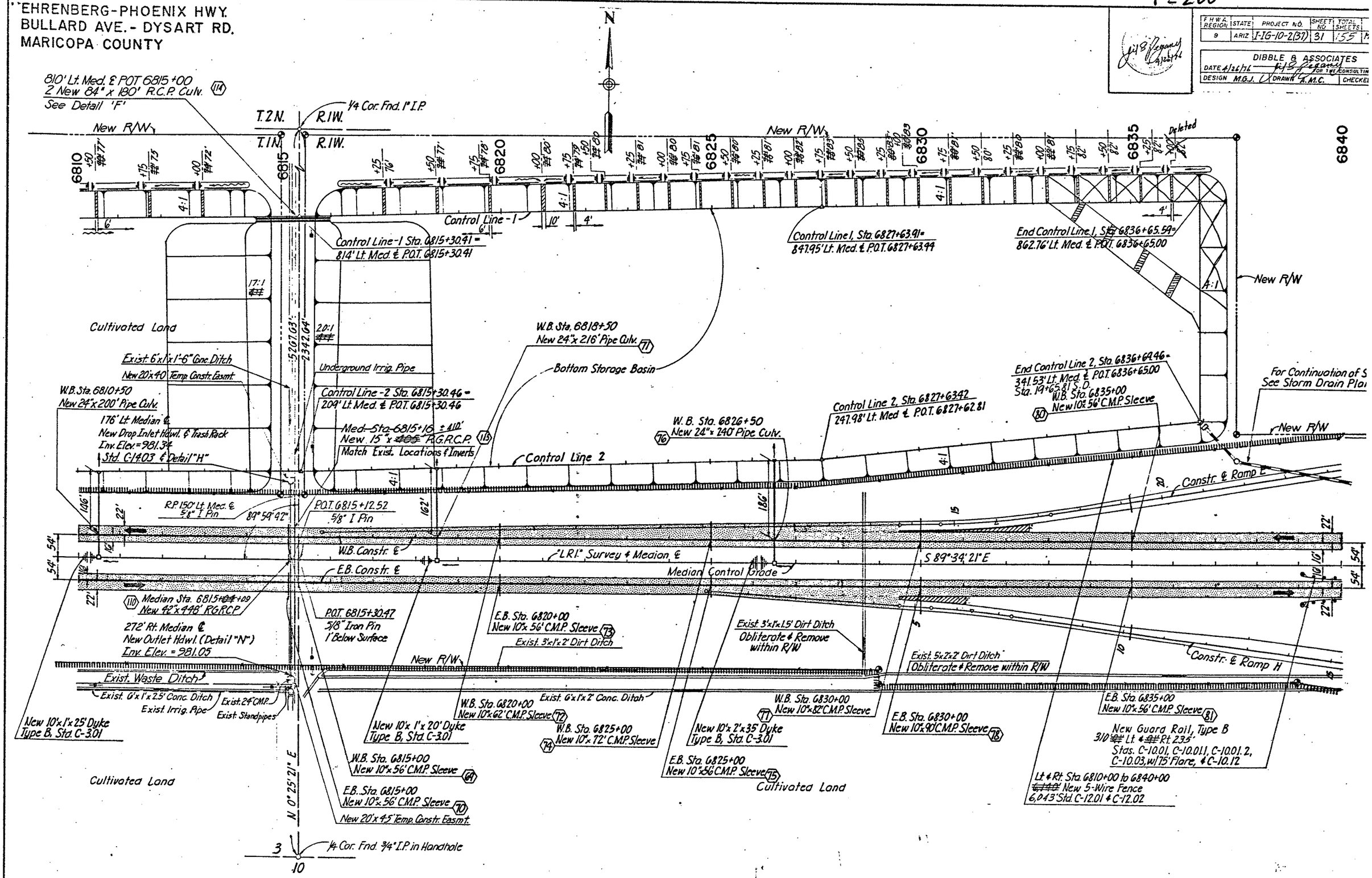


1" = 200'

EHRENBERG-PHOENIX HWY.
BULLARD AVE. - DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	ARIZ	I-IG-10-2(37)	31	155

DIBBLE & ASSOCIATES
DATE 4/26/76 FOR THE CONSULTING
DESIGN M.G.J. DRAWN A.M.C. CHECKED



1" = 200'

EHRENBERG-PHOENIX HWY.
BULLARD AVE.-DYSART RD.
MARICOPA COUNTY

I-IG-10-2(37) 33 155

4/26/76 M.G.J. A.M.C.

NOTE: For Special Irrigation Pipe System at Dysart Road, See Detail Q

34 | 35 T.2N. R.1N.
3 | 2 T.1N. R.1W.

Fd. Brass Cap in Handhole

MATCH LINE

6840 6845 6850 6855 6860 6865 6870

Exist. Well & Pump

Cultivated Land

Exist. 10'x1.5' Dirt Ditch Remove

ROAD

N 0°33'17" E

112 ~~120~~ New Chain Link Cable Barrier C-10.11

New Guard Rail, Type B
150' Lt. & 150' Rt.
Stds. C-10.01, C-10.01.1, C-10.01.2
C-10.03 w/75' Flare, C-10.04 & C-10.12
Future

Exist. Dirt Road

W.B. Sta. 6848+00
New 10"x64' C.M.P. Sleeve (103)

Exist. 18" Irrig. Pipe

Exist. 12" Alfalfa Valves

Exist Conc. Ditch

Med. & 6854+67.00
New 36"x376' R.G.R.C.P. (104)

New R/W

R.P. 154' Lt. Med. R.R. Spike

Constr. ℄ Ramp E

W.B. Sta. 6843+00
New 10"x56' C.M.P. Sleeve (99)

W.B. Sta. 6853+00
New 10"x112' C.M.P. Sleeve (106)

P.O.T. 6854+63.08 Med. ℄
5/8" I. Pin

End Fence 6856+92.83

Constr. ℄ Ramp F

R.P. 150' Lt. Med. ℄ 5/8" I. Pin

New R/W

See Storm Drain Plans.

Exist. 18" Irrig. Pipe

70:1 Taper

W.B. Constr. ℄

S 89°34'21" E

"LRI" Survey & Median ℄

Median Control Grade

E.B. Constr. ℄

70:1 Taper

Varies

R.P. 154' Rt. Med. ℄ R.R. Spike

Constr. ℄ Ramp H

Constr. ℄ Ramp G

R.P. 150' Rt. Med. ℄ 5/8" I. Pin

New R/W

End Fence 6840+30

Exist. 6' Chain Link Fence

Exist. Well & Pump

New Guard Rail, Type B
59' Lt. & 59' Rt.
Stds. C-10.01, C-10.01.1, C-10.01.2, C-10.04
See Det. 'K' & 'L'

Exist. Conc. Curb & Gutter
Remove ~~650'~~ Lt. & 798' Rt. 373'

No Access

E.B. Sta. 6848+00
New 10"x56' C.M.P. Sleeve (104)

Exist. 5'x1'x2' Dirt Ditch
Obliterate & Remove within R/W

New 10'x20'x520' Dyke Rt.
See Detail This Sheet

E.B. Sta. 6853+00
New 10"x80' C.M.P. Sleeve (107)

Exist. 4-Wire Fence
Remove within R/W

Lt. & Rt. Sta. 6840+00 to ~~6857+00~~
3,143 ~~3,450~~ New 5-Wire Fence
Std. C-12.01 & C-12.02

Cultivated Land

E.B. Sta. 6843+00
New 10"x56' C.M.P. Sleeve (100)

Exist. 6" San. Sewer & 3" Water Line
Remove within R/W

1/4 Cor. Fnd. Brass Cap in Handhole

21' New Conc. Emb. Curb Std. C-10.01.1 C.O.# 25

DETAILS-for Dysart Road Traffic Interchange See Interchange Sheets

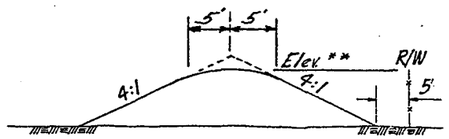
DYSART

Watkins Dr.

Coffelt Dr.

3 2 10 11

** ① 1004
② 1008
③ 1008
④ 999.5



SPECIAL DYKE FOR NOISE ATTENUATOR

New R/W

W.B. Sta. 6856+70 ~~6857+00~~
New 24"x154' Pipe Culv. (108)

New 10'x2'x40' Dyke Type B, Std. C-3.01

Pasture

Pasture

RIVER

W.B. Sta. 6857+62.92 to 6869+64.52
Agua Fria Bridge
See Bridge Sheets (Future)

R.P. 150' Lt. Med. ℄ 5/8" I. Pin

34 1/4 Cor. Fnd. 3/4" I.P.
2

Exist. 4 B.W. Fence

5290.17'
2350.06'
P.O.T. 6867+72.27 Med. ℄
5/8" I. Pin.

Exist. 2-B.W. Fence To Remain

Exist. 5'x1'x2' Conc. Ditch To Remain

36' 100' 54' 72' 54' 36' 146'

End Fence 6856+07.06

Exist. 4" B.W. Fence
Remove within R/W (Future)

AGUA FRIA

E.B. Sta. 6857+33.98 to 6869+35.58
Agua Fria Bridge
See Bridge Sheets (Future)

Pasture

R.P. 150' Rt. Med. ℄ 5/8" I. Pin

New R/W

Exist. 5'x1'x2.5' Conc. Ditch

N 0°20'01" E

STA. 6857+62.92 W.B.
STA. 6857+33.98 E.B
END I-IG-10-2(37) 128

1/4 Cor. 1" I. Pin

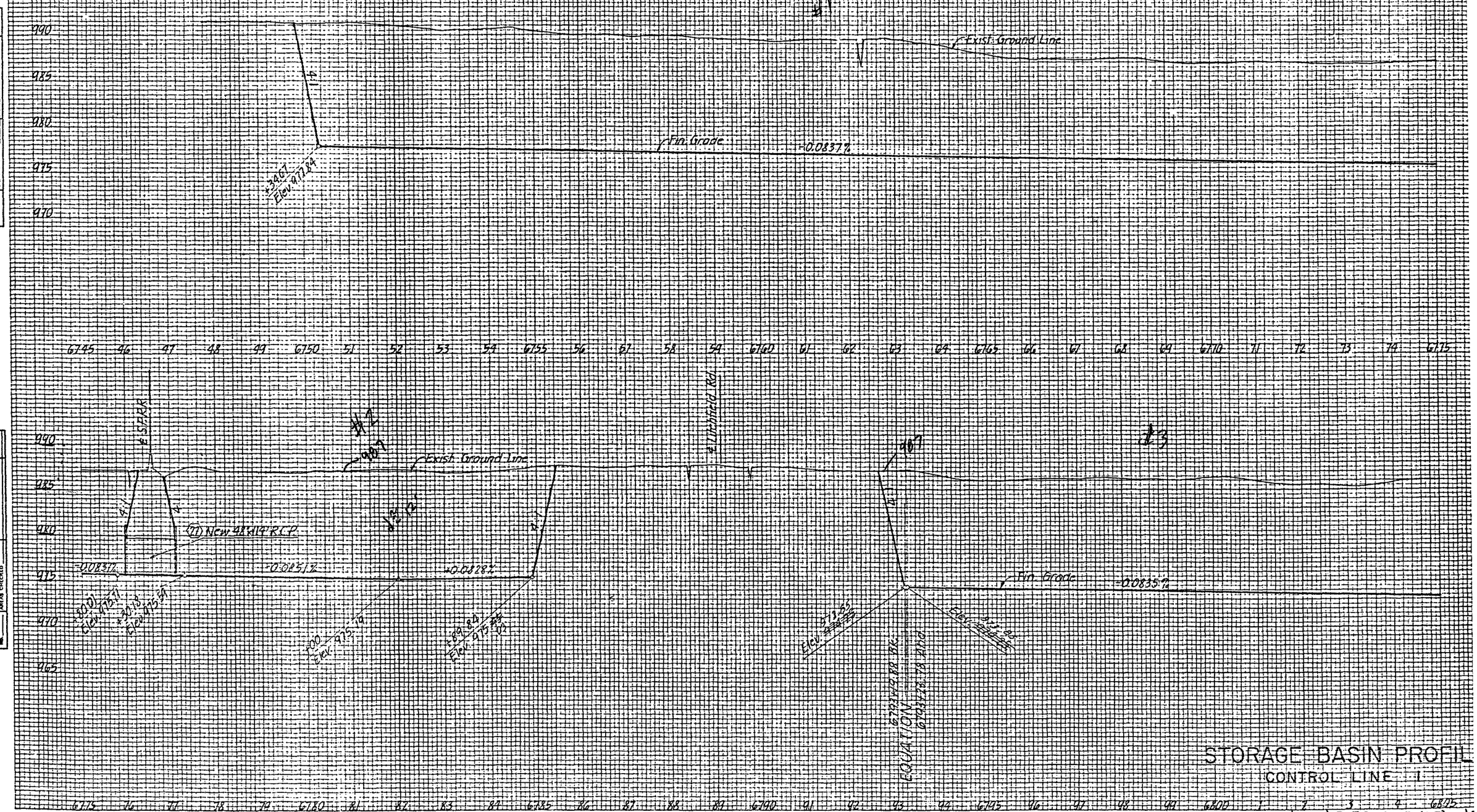
New R/W

EHRENBERG-PHOENIX HWY.
BULLARD AVE. - DYSART RD.
MARICOPA COUNTY

FHWA DIV.	STATE	PROJECT NO	SHEET NO.	TOTAL SHEETS
9	ARIZ.	I-IG-10-2(37)	57	155

DIBBLE & ASSOCIATES
DATE 4/26/76 DESIGN F.M.N. DRAWN A.M.C. CHECKED

1" = 10' V
1" = 200' H



STORAGE BASIN PROFIL
CONTROL LINE 1

FINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		
NOTE BOOK NO.		

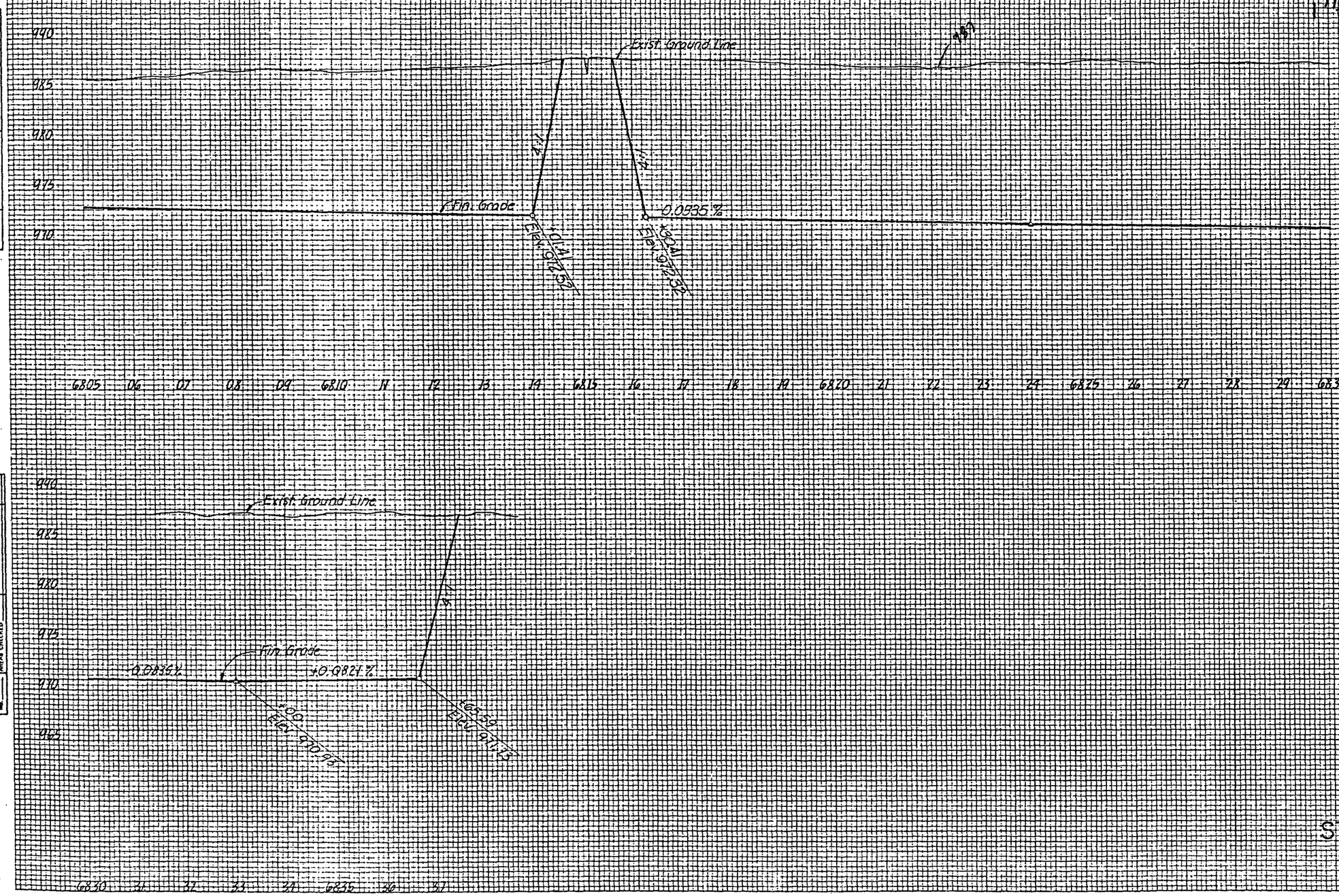
ORIGINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		
NOTE BOOK NO.		

EHRENBERG-PHOENIX HWY.
BULLARD AVE. - DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO	SHEET NO.	TOTAL SHEETS
9	ARIZ	I-IG-10-2(37)	58	155

DIBBLE & ASSOCIATES
DATE 4/26/76
DESIGN F.M.N. DRAWN A.M.C. CHECKED

1" = 10' V
1" = 200' H



STORAGE BASIN PROFIL
CONTROL LINE 1

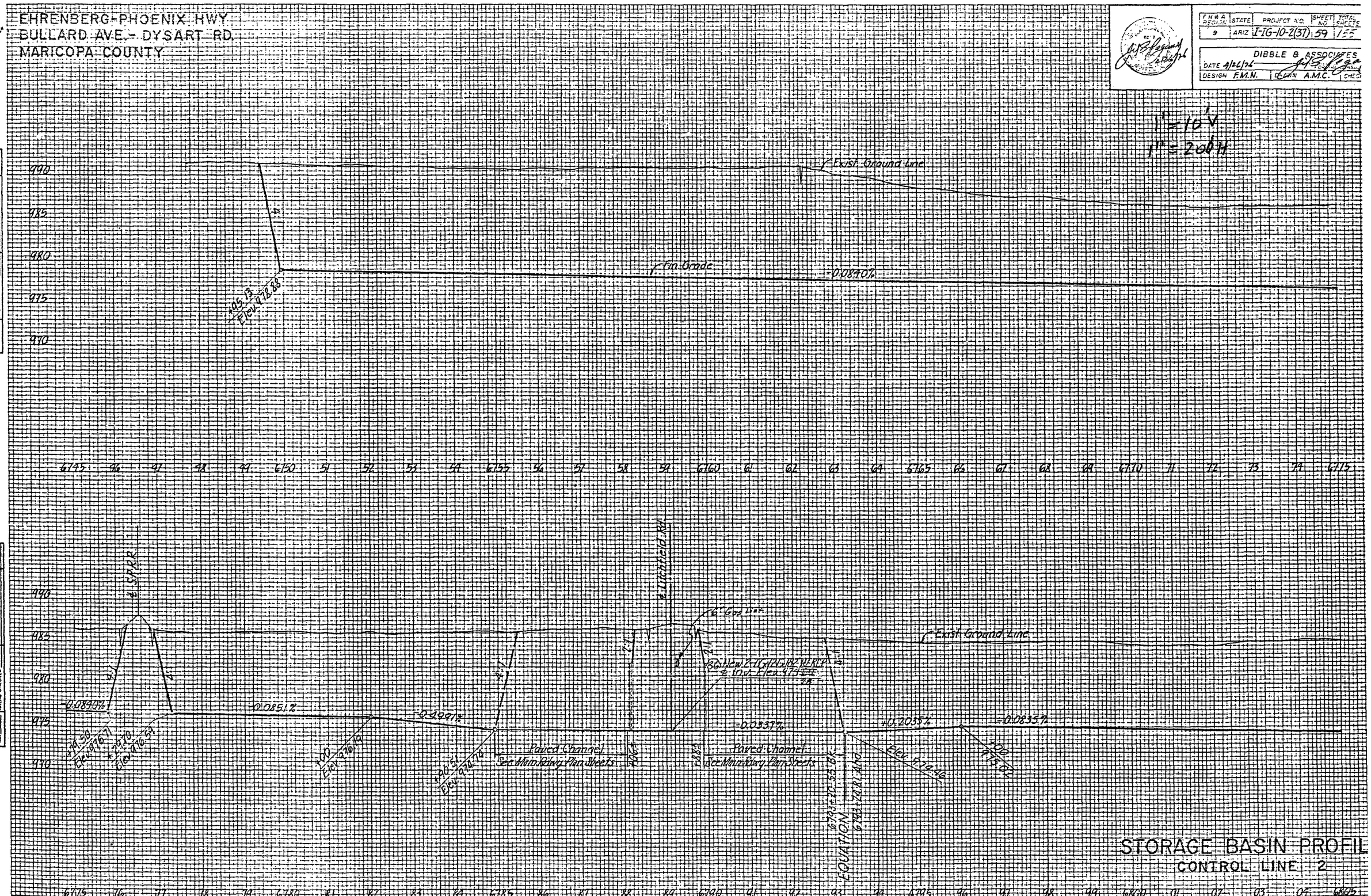
7	I-IG-10-2(37)	5

EHRENBERG-PHOENIX HWY.
BULLARD AVE. - DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	ARIZ	I-IG-10-2(37)	59	155

DIBBLE & ASSOCIATES
DATE 4/26/76
DESIGN F.M.N. DRAWN A.M.C. CHECKED

1" = 10' V
1" = 200' H



STORAGE BASIN PROFIL
CONTROL LINE 2

FINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		
NOTE BOOK		
NO.		

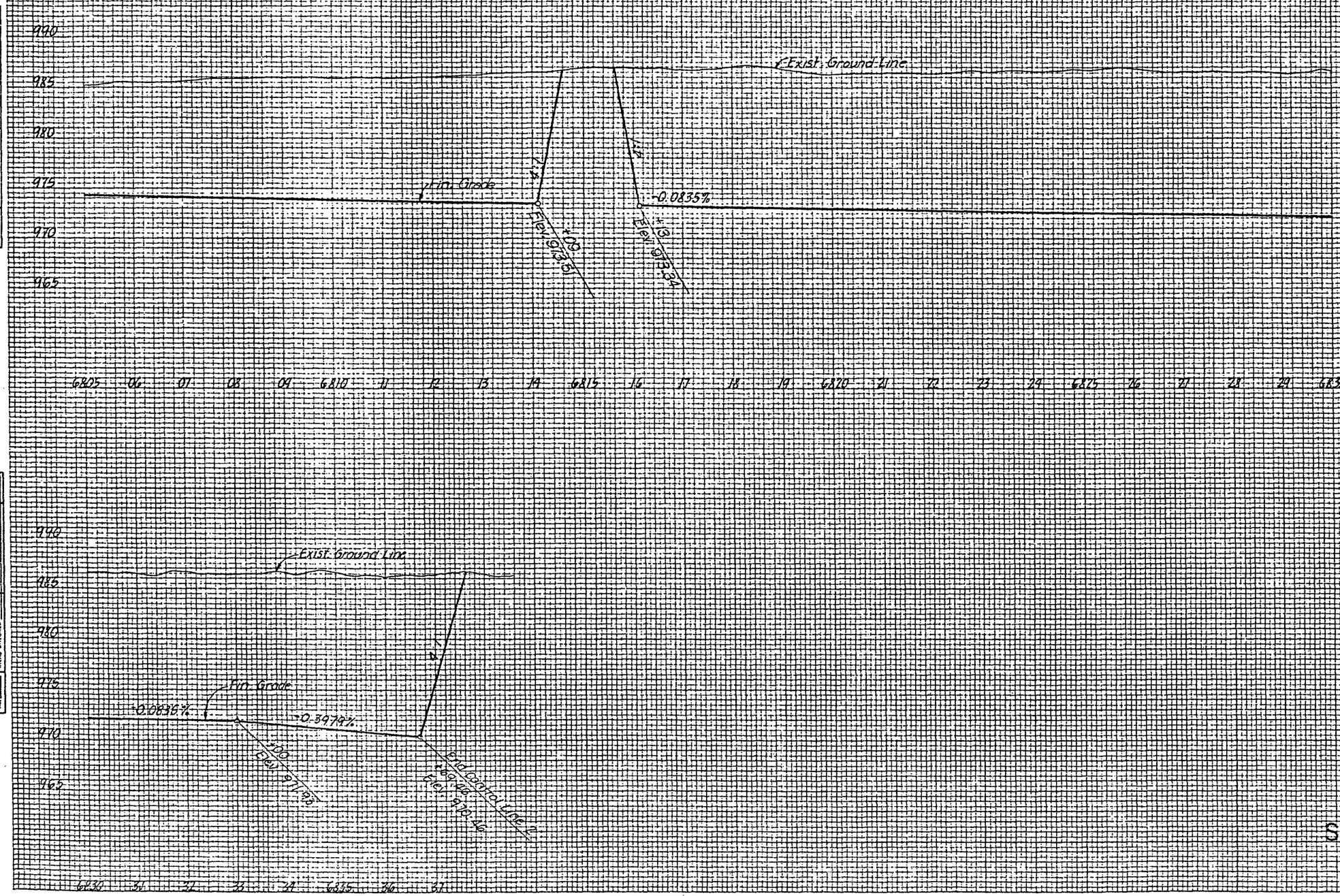
ORIGINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		
NOTE BOOK		
NO.		

EHRENBERG-PHOENIX HWY.
BULLARD AVE. - DYSART RD.
MARICOPA COUNTY

FEDERAL AID PROJECT NO.	STATE	PROJECT NO.	SHEET NO.
9	ARIZ.	I-IG-10-2(37)	60

DIBBLE & ASSOCIATES
DATE 4/24/72
DESIGN F.M.N. DRAWN A.M.C.

1" = 10' V
1" = 200' H



STORAGE BASIN PROFIL
CONTROL LINE 2

7	I-IG-10-2(37)

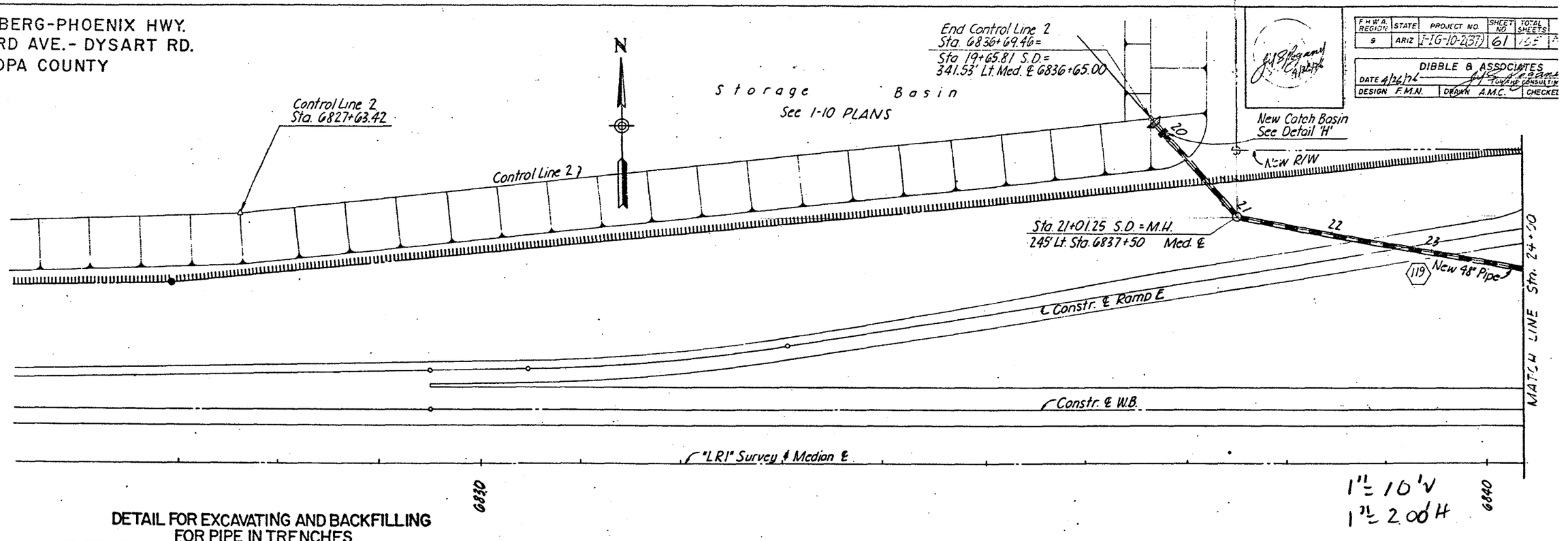
FINAL SURVEY — SURVEYED, PLOTTED, TEMPLATE, AREAS, AREAS CHECKED, NOTE BOOK NO., BY, DATE

ORIGINAL SURVEY — SURVEYED, PLOTTED, TEMPLATE, AREAS, AREAS CHECKED, NOTE BOOK NO., BY, DATE

EHRENBERG-PHOENIX HWY.
BULLARD AVE.- DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	ARIZ	I-IG-10-2(37)	61	155

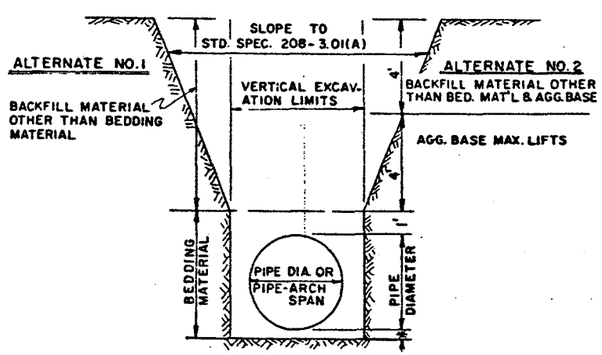
DIBBLE & ASSOCIATES
TOWNE CONSULTING
DATE 4/26/76 DESIGN F.M.N. DRAWN A.M.C. CHECKED



PLAN
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RT OF WAY CHECKED
NOTE BOOK NO.
BY
DATE

DETAIL FOR EXCAVATING AND BACKFILLING FOR PIPE IN TRENCHES

PIPE SIZE	VERTICAL EXCAVATION LIMITS	
INSIDE DIAMETER OR PIPE-ARCH SPAN	MAXIMUM WIDTH GREATER THAN OUTSIDE DIAMETER OR PIPE-ARCH SPAN	MINIMUM WIDTH EACH SIDE OF PIPE
INCHES	INCHES	INCHES
LESS THAN 18	16	6
18 - 24	19	7 1/2
25 - 39	22	9
40 - 60	1/2 OUTSIDE DIAMETER OR PIPE-ARCH SPAN	12
60 OR LARGER	36	12



*BEDDING MATERIAL UNDER PIPE, EITHER ALTERNATE		
TYPE OF PIPE	SIZE OF PIPE (INSIDE PIPE DIA. OR PIPE-ARCH SPAN)	MINIMUM DEPTH OF MATERIAL, INCHES
CORRUGATED METAL	ALL	6
OTHER THAN C.M.P.	39" & UNDER	4
OTHER THAN C.M.P.	OVER 39"	1/12 OUTSIDE DIAMETER OR PIPE-ARCH SPAN

PROFILE
SURVEYED
PLOTTED
GRADES CHECKED
B.M.'s NOTED
STRUCTURE NOTATIONS CHKD
NOTE BOOK NO.
BY
DATE

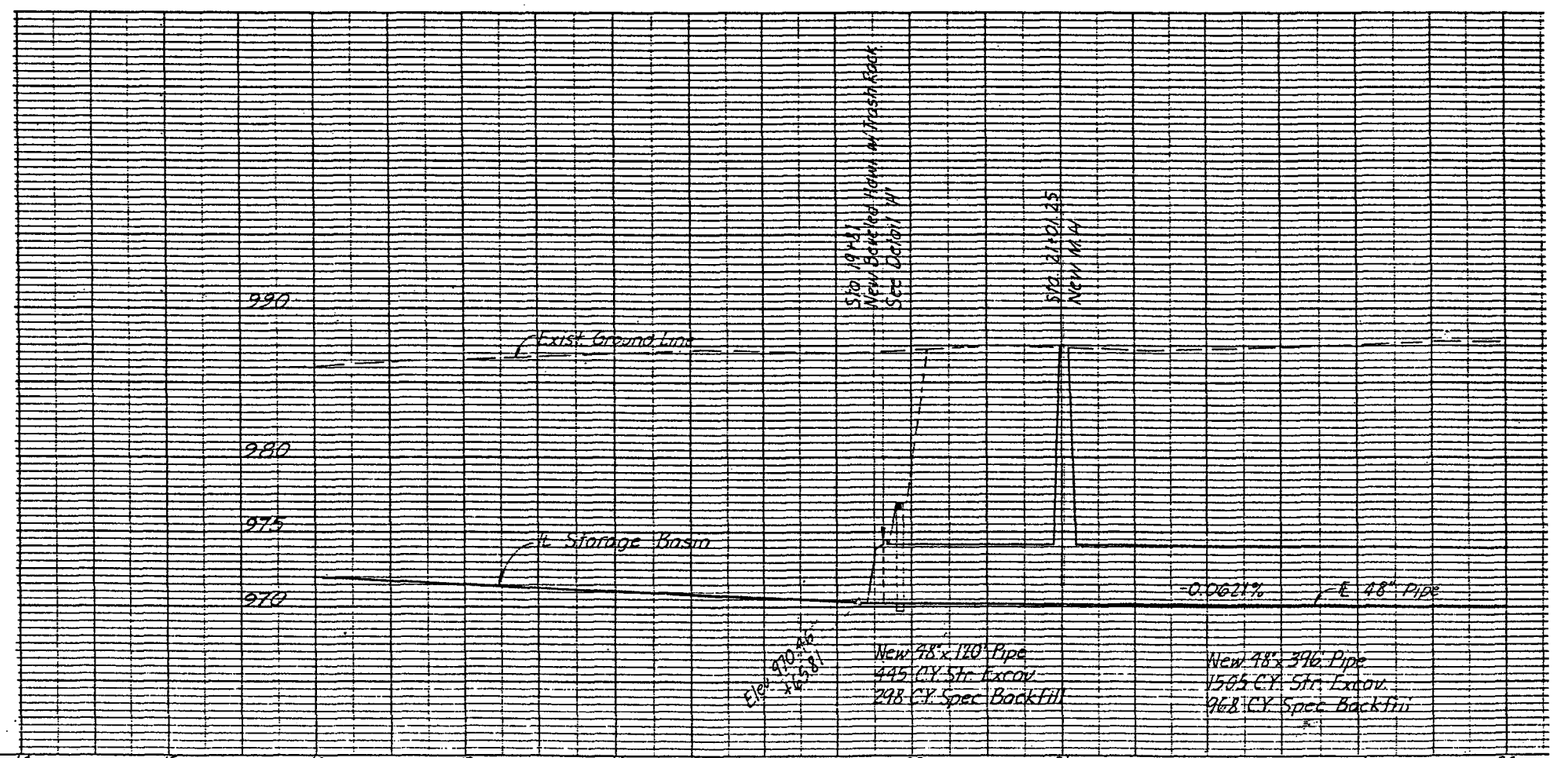
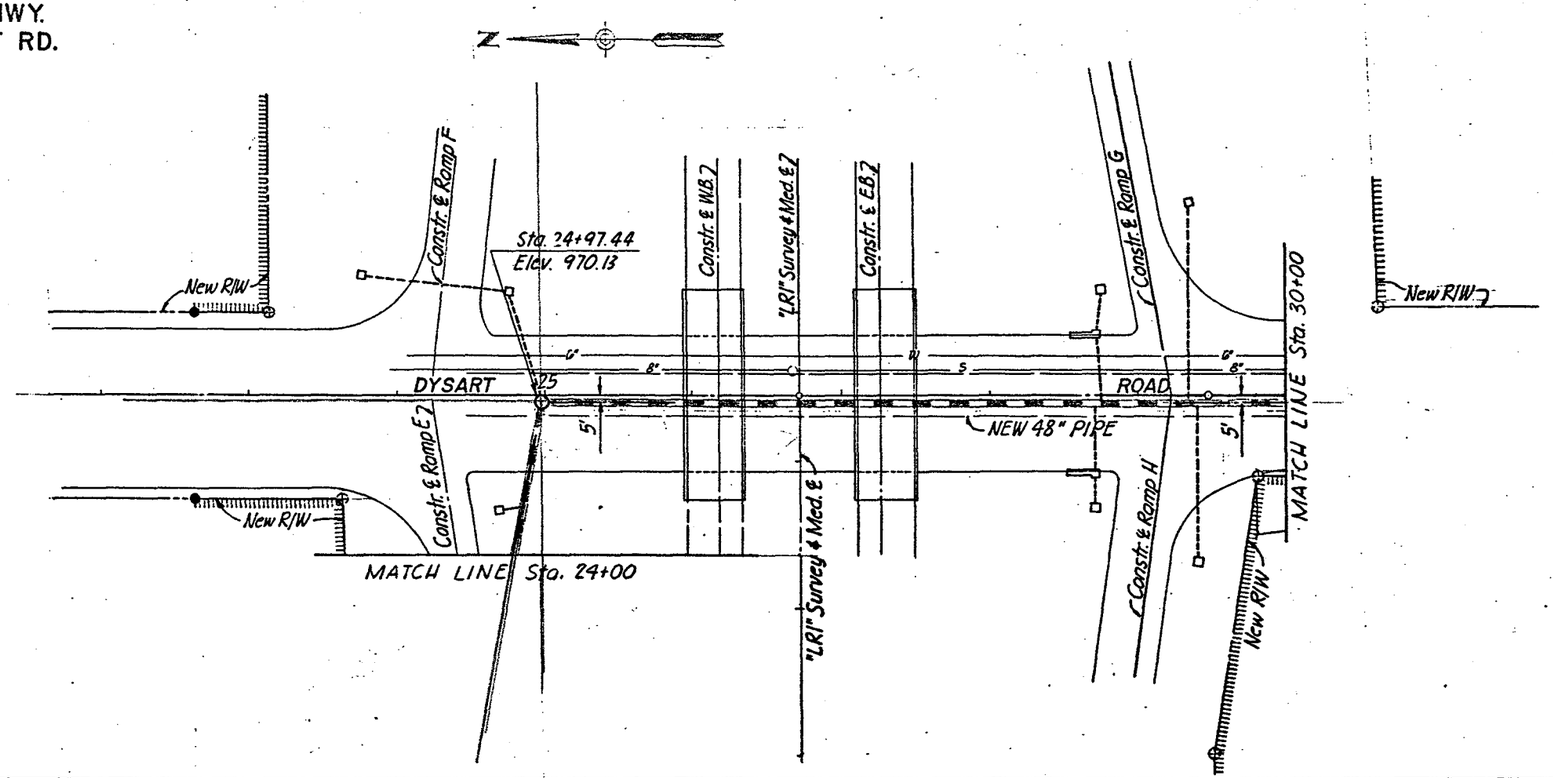


PLATE 1 SINGLE PLAN - PROFILE
CHARLES BRUNING CO.
MADE IN U.S.A.

EHRENBERG-PHOENIX HWY.
BULLARD AVE.- DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	ARIZ	I-IG-10-2(37)	62	155

DIBBLE & ASSOCIATES
DATE 4-24-72 H.S. Fegan
DESIGN F.M.N. DRAWN A.M.C. CHECKED



1" = 10' V
1" = 20' H

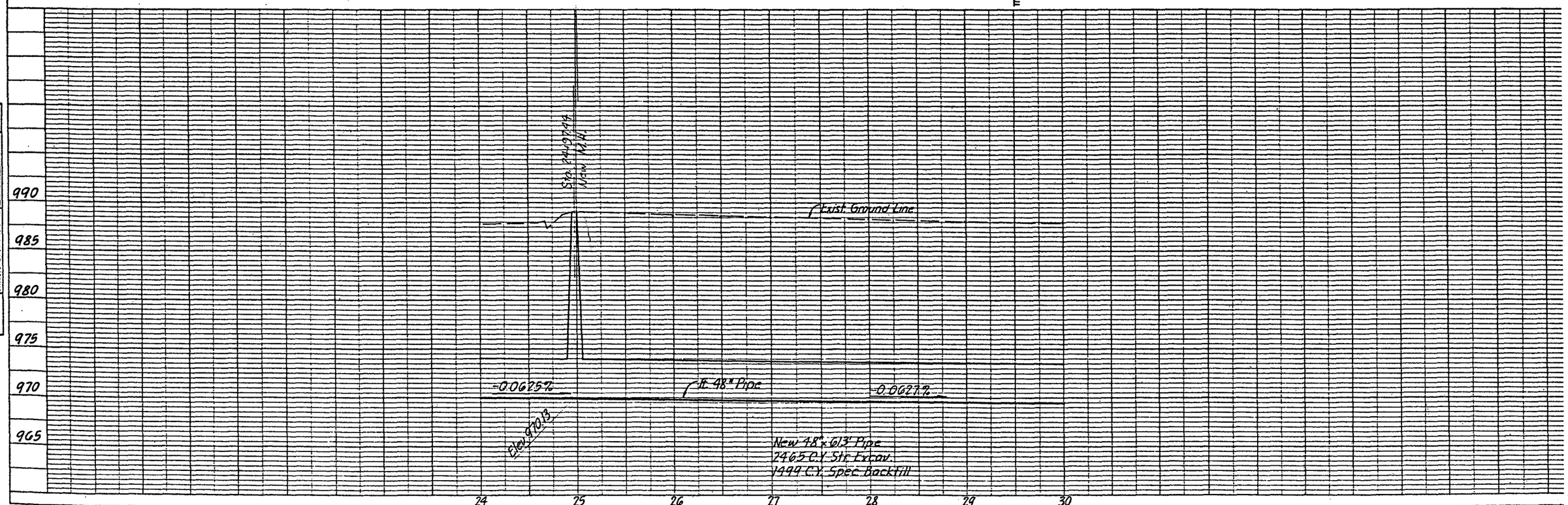


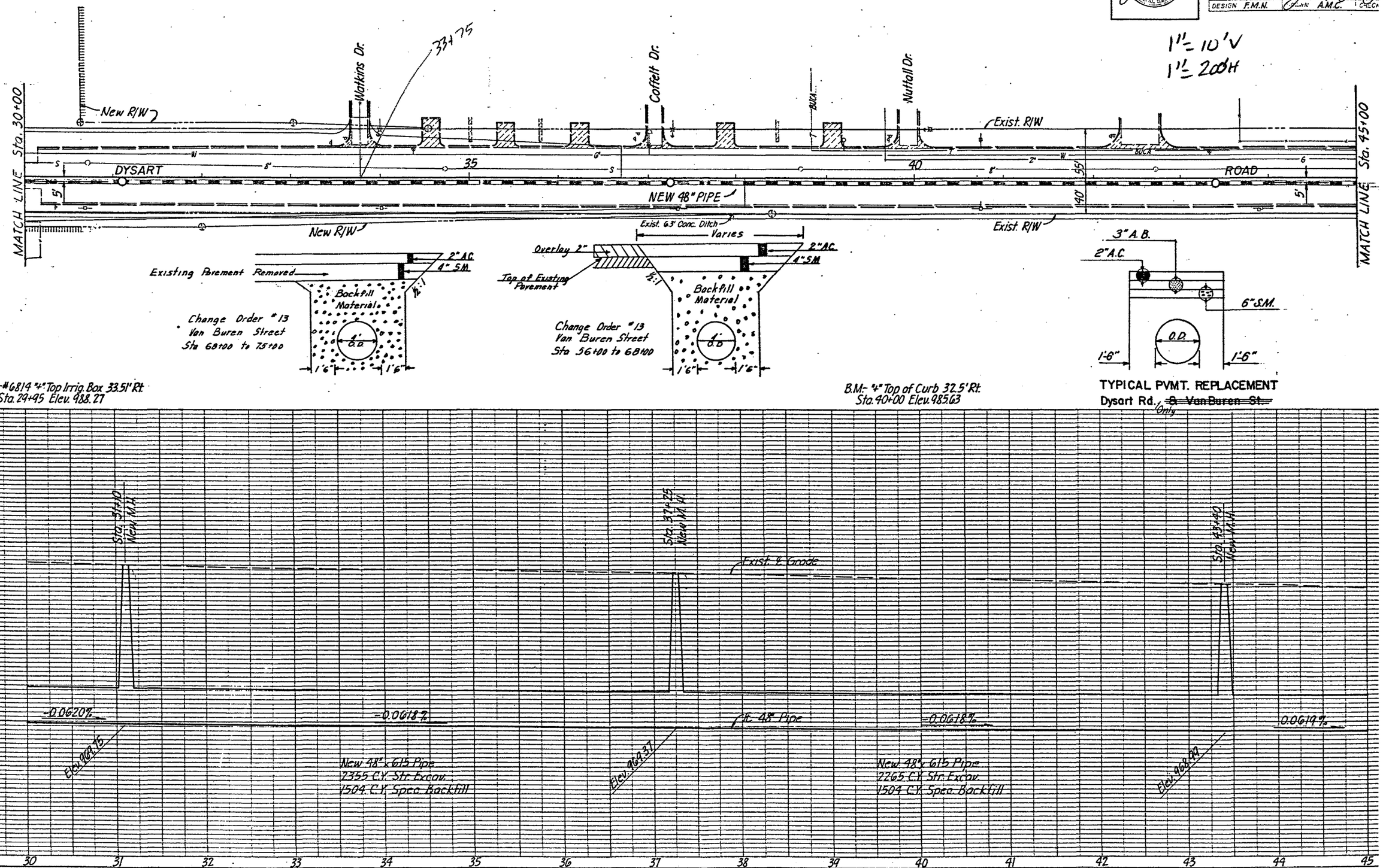
PLATE 1 SINGLE PLAN - PROFILE
CHARLES BRUNING CO.

EHRENBERG-PHOENIX HWY.
BULLARD AVE.- DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO	SHEET NO.	TOTAL
9	ARIZ	I-IG-10-2(37)	63	155.

DIBBLE & ASSOCIATES
DATE 4/20/76 DESIGN F.M.N. DRAWN A.M.C. CHECKED

1" = 10' V
1" = 200' H



TYPICAL PVMT. REPLACEMENT
Dysart Rd., ~~& VanBuren St.~~ Only

PLAN
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RIGHT OF WAY CHECKED
NOTE BOOK NO.
DATE

PROFILE
SURVEYED
PLOTTED
GRADES CHECKED
BRIDGE NOTE
STRUCTURE NOTATIONS OFRD
NOTE BOOK NO.
BY
DATE

C. Thomas Sewed-Plans Services 10-76

PLATE 1 SINGLE PLAN - PROFILE
CHARLES BRUNING CO.
MADE IN U.S.A.

EHRENBERG-PHOENIX HWY.
BULLARD AVE.- DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO	SHEET NO.	TOTAL SHEETS
9	ARIZ.	I-IG-10-2(37)	64	155

DIBBLE & ASSOCIATES
DATE 4/26/76
DESIGN F.M.N. DR. A.M.C. CHEC

1" = 10' V
1" = 20' H

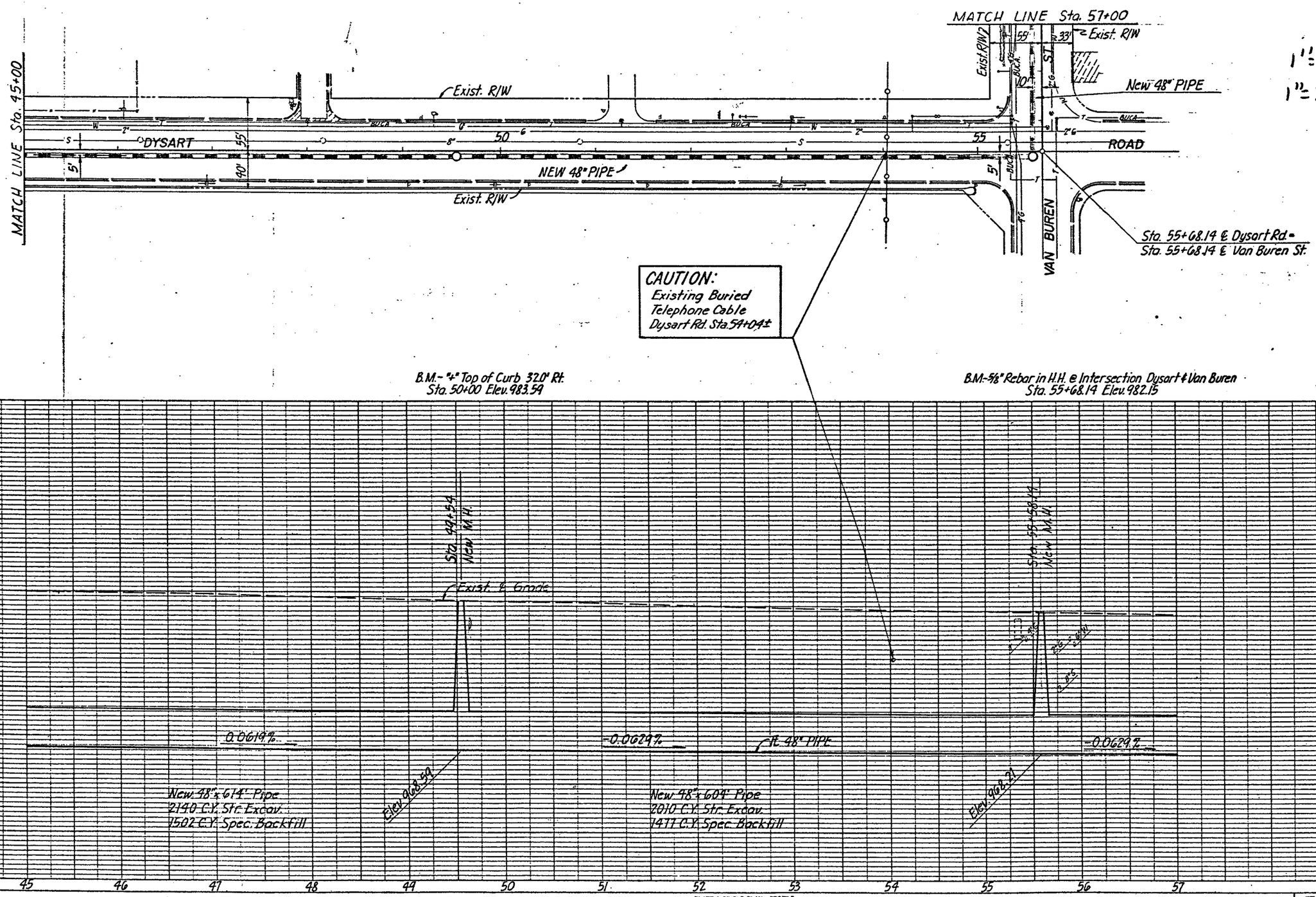
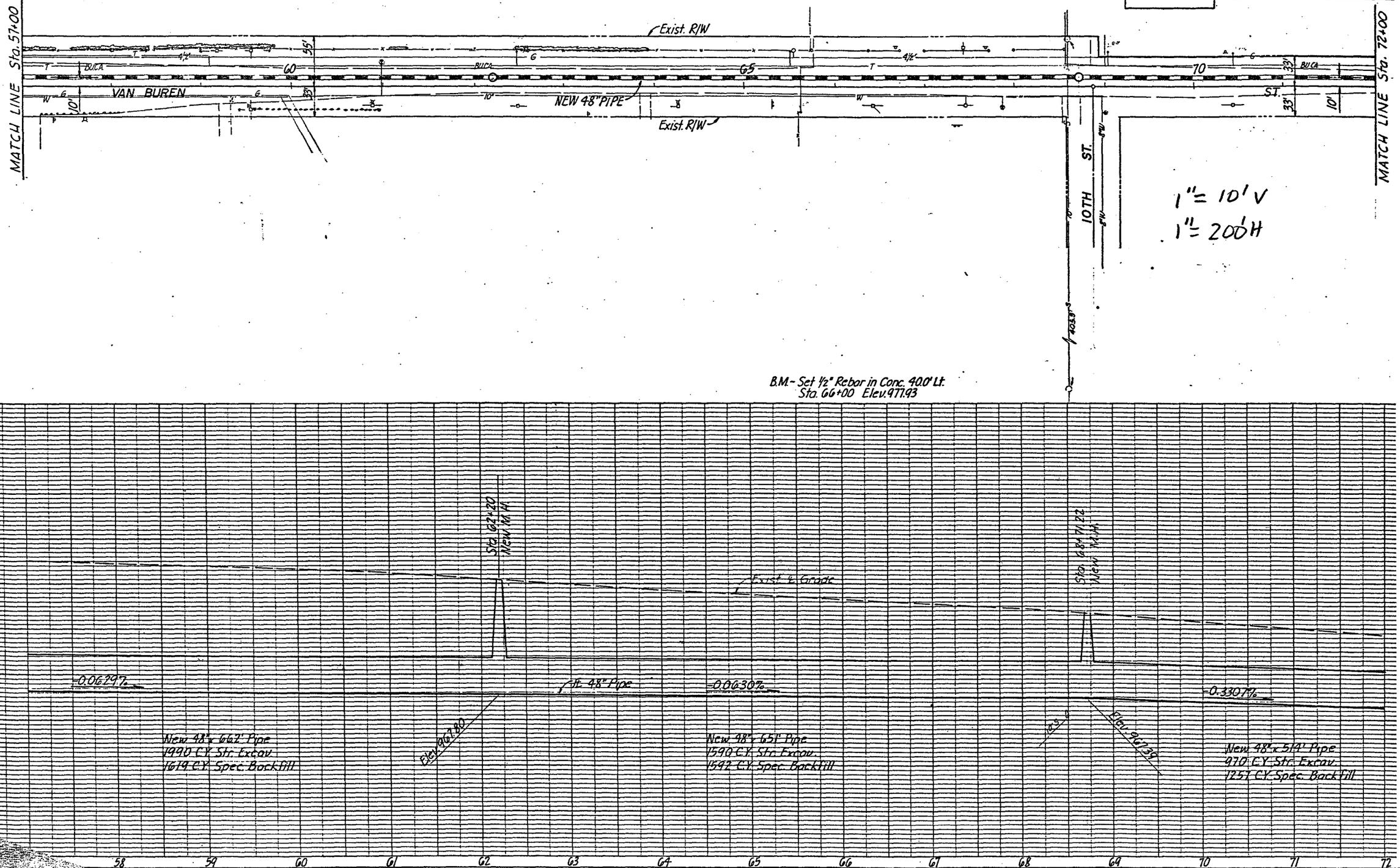


PLATE 1 SINGLE PLAN - PROFILE
CHARLES BRUNING CO.

EHRENBERG-PHOENIX HWY.
BULLARD AVE.- DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	ARIZ	I-IG-10-2(37)	65	155

DIBBLE & ASSOCIATES
DATE 4/26/76
DESIGN F.M.N. DRAWN A.M.C. CHECKED



PLAN: SURVEYED, PLOTTED, ALIGNMENT CHECKED, R/W & INV. CHECKED

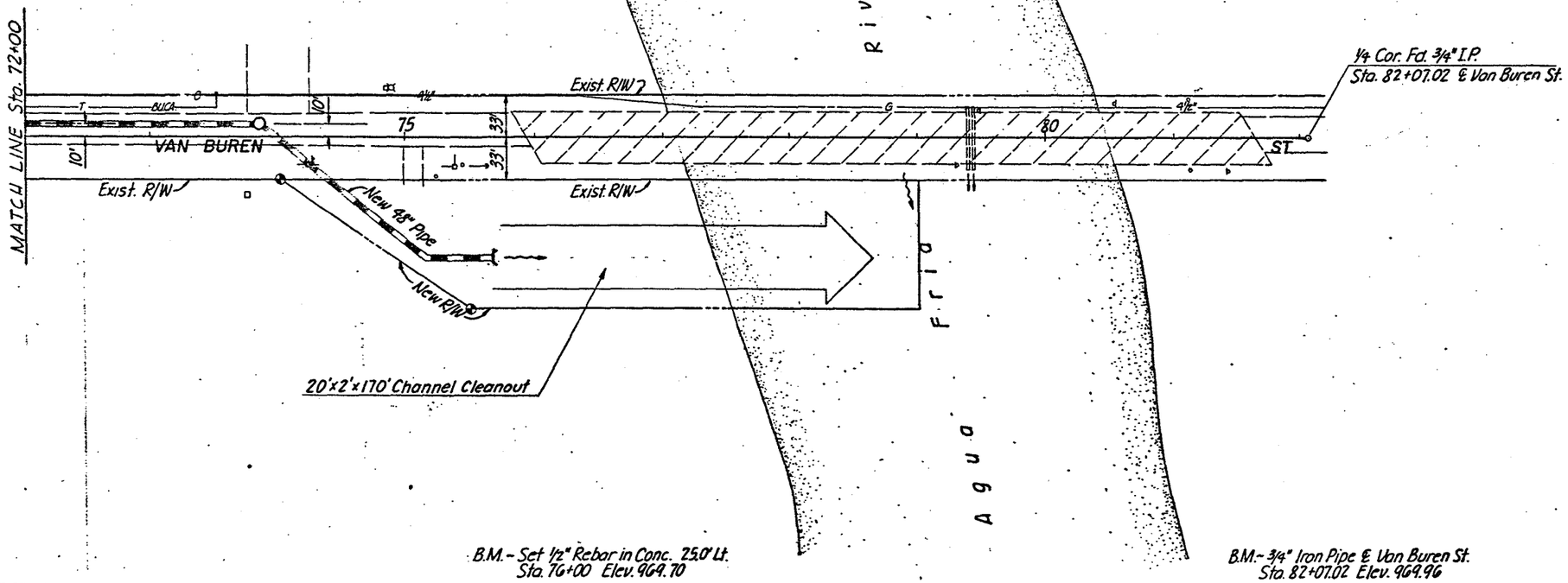
PROFILE: SURVEYED, PLOTTED, GRADES CHECKED, B.M. NOTED, STRUCTURE NOTE(S) CHKD

PLATE 1 SINGLE PLAN - PROFILE
CHARLES BRUNING CO.
MADE IN U.S.A.

EHRENBERG-PHOENIX HWY.
BULLARD AVE.- DYSART RD.
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO	SHEET	TOTAL
9	ARIZ	I-IG-10-2(37)	66	166

DIBBLE & ASSOCIATES
DATE 4/26/76 DESIGN F.M.N. DRAWN A.M.C. CHECKED



N

1" = 10' V
1" = 20' H

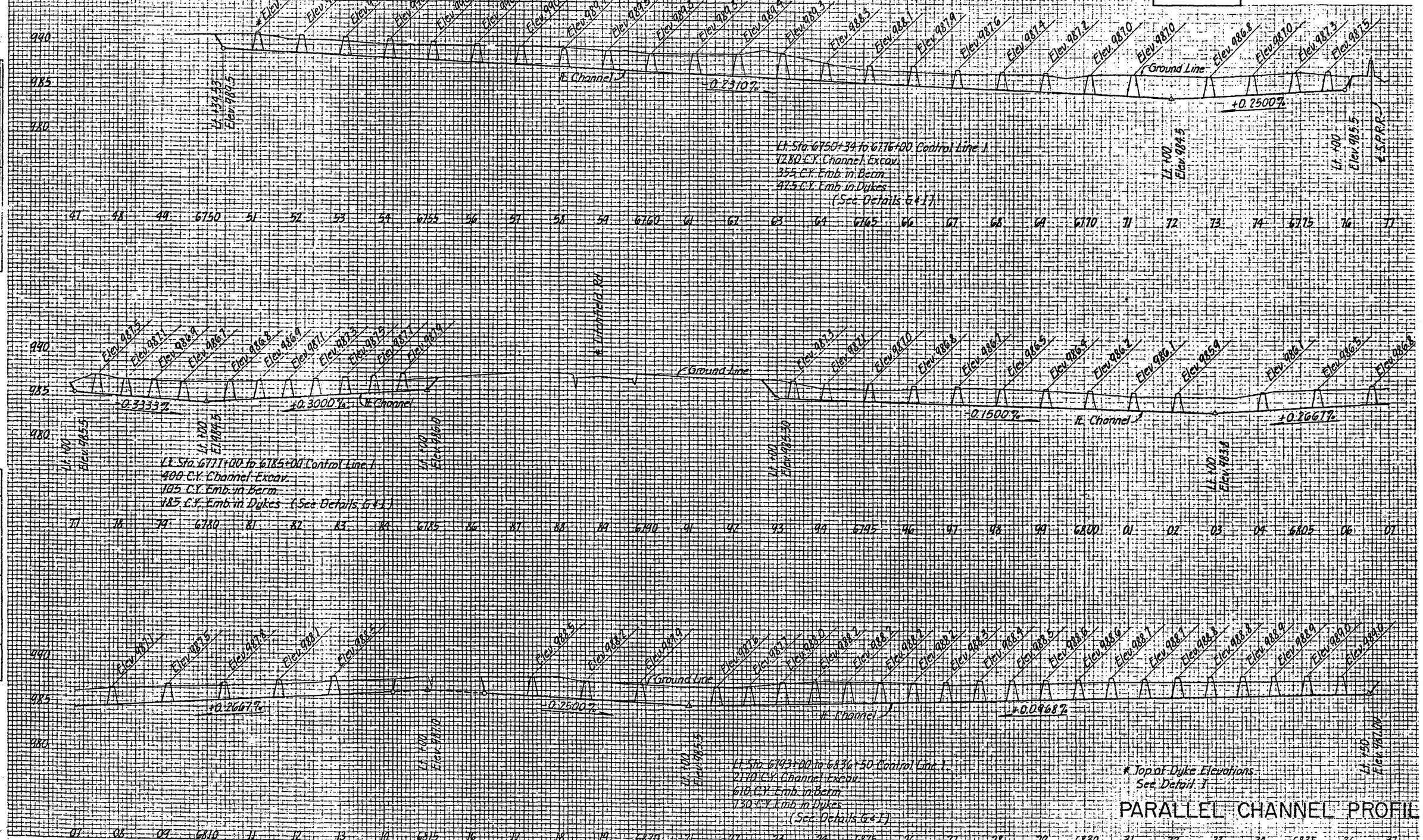
PLATE 1 SINGLE PLAN - PROFILE
CHARLES BRUNING CO.

EHRENBERG-PHOENIX HWY.
BULLARD AVE.-DYSART RD.
MARICOPA COUNTY

1" = 10' V
1" = 200' H

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	ARIZ	IG-10-2(37)	71	165

DIBBLE & ASSOCIATES
DATE 4/26/76
DESIGN F.N. DRN. A.M.C. CHK.



* Top of Dyke Elevations
See Detail 1

PARALLEL CHANNEL PROFILE

FINAL SURVEY	SURVEYED	BY	DATE
	PLOTTED		
	TEN'S AVE		
NOTE BOOK			
NO.	AREAS CHECKED		

ORIGINAL SURVEY	SURVEYED	BY	DATE
	PLOTTED		
	TEN'S AVE		
NOTE BOOK			
NO.	AREAS CHECKED		

Existing ADOT Basins
Post Storm Drain Bleed Time

Preoject: Loop 303
Subject: Determination of the time to bleed the volume from the Existing ADOT Basins via the existing single-barrel 48" RCP

Computed By: RJS

Empty the detention basins within 36 hours
Equation: T=8*A/(C*3.14*d2)*((Z+H)^0.5-Z^0.5)/3600
Where

T: hours to empty detention basin (hours)
A: Area of detenrion basin (ft2), A=V/H*43560
V: volume retained within basin in ac-ft
H: height of detension basin (feet)
C: Constant where C=(2*g*d/(d+f*L)
d: Pipe diameter (feet)
F: Friction factor
Z: Elevation difference between the bason bottom and pipe outlet (feet)
L: Length of pipe (feet)
Elev-1: elevation of the proposed basin bottom (feet)
Elev-2: elevation of the pipe at the outlet (feet)

Detention Basin	d (ft)	Elev-1 (ft)	Elev-2 (ft)	Z (ft)	H (ft)	f	L (ft)	C	V (acre-feet)	A ft^2	T (hours)	
ADOT Basin Outlet Pipe	4	970.5	967.0	3.5	14	0.02	5614.2	1.41977	862.0	2,503,248	180.81	*48 in*

$Q_{average}$ =	58	The average pipe discharge over the entire drain time interval, cfs
$V_{average}$ =	4.6	The average pipe velocity over the entire drain time interval, f/s
L/d =	1,404	The friction factor, f is sensative to the pipe parameters and the velocity
f =	0.022	