TECHNICAL DATA NOTEBOOK

FOR

Camino Real Wash,
Pima County, AZ

Contract #25-59-C-13522-0507

Prepared For:
Pima County Regional Flood Control District
97 E. Congress, 3rd Floor
Tucson, AZ 85701

Prepared by

Castro Engineering corp
consulting engineers and surveyors

3580 W. Ina, Ste 200
Tucson, AZ 85741
(520) 293-2550

Castro Job No. PCFCD009

Registered Professional Engineer (Civil)
CERTIFICATE NO.
37622
FRANK EMMETT
FRY IV
Date Signed 7/2/08
ARIZONA, U.S.A.
Expires 06/30/11

PIMA COUNTY
REGIONAL FLOOD CONTROL DISTRICT
97 EAST CONGRESS STREET, THIRD FLOOR
TUCSON, ARIZONA 85701-1797

SUZANNE SHIELDS, P.E.
DIRECTOR

(520) 243-1800
FAX (520) 243-1821

July 29, 2008

Mounir Boudjemaa
Revisions Manager
Michael Baker Jr. Inc.
3601 Eisenhower Avenue
Alexandria, VA 22304

RE: Camino Real Wash LOMR

Dear Mr. Boudjemaa:

Enclosed you will find a LOMR application from the Pima County Flood Control District for the Camino Real Wash. Also enclosed is a check made out to the National Flood Insurance Program for $4,800.00. A copy of the newspaper notification will be forwarded within the next month. This LOMR is a follow-up to an approved CLOMR, FEMA case # 04-09-0406R (copy attached). During the preparation of the LOMR we noticed an error with the hydrology. As a result, the upstream discharge was reduced from 2,067 cfs to 1,956 cfs. Castro Engineering has closed for business therefore; please send all review comments to my attention.

Sincerely,

R. "Terry" Hendricks, CFM, Chief Hydrologist
Planning and Development Division

RTH/cd:

CERTIFIED MAIL

Cc: Suzanne Shield, Chief Engineer and Director
Bill Zimmerman, Manager, Planning and Development Division
Priscilla Cornelio, Director, Department of Transportation, Pima County
James Vogelsberg, Floodplain Administrator, City of Tucson

Enclosures

Federal Emergency Management Agency

Washington, D.C. 20472

OCT 04 2004

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 04-09-0406R

The Honorable Bob Walkup
Mayor, City of Tucson
City Hall
255 West Alameda Street
Tucson, AZ 85701

Community: City of Tucson, AZ
Community No.: 040076

104

Dear Mayor Walkup:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) comment on the effects that a proposed project would have on the effective Flood Insurance Rate Map (FIRM) for Pima County, Arizona and Incorporated Areas (the effective FIRM for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated December 22, 2003, Mr. Ian P. Sharp, E.I.T., CFM, Assistant Division Manager, Water Resources, Castro Engineering Corporation, requested that FEMA evaluate the effects along Camino Real Wash that updated topographic information from the confluence with Rillito Creek to approximately 500 feet upstream of River Road and the proposed project would have on the flood hazard information shown on the effective FIRM. The project will consist of improvements to an existing channel identified as West Downstream Channel from Rillito Creek to just downstream of River Road; proposed construction of a channel identified as East Downstream Channel from approximately 250 feet north of Rillito Creek to approximately 100 feet south of the intersection of River Road and Camino Pablo Road; proposed construction of four 8-foot by 5-foot reinforced-concrete box culverts (RCBs) beneath the intersection of River Road and Camino Real Road and two 8-foot by 5-foot RCBs beneath the intersection of River Road and Camino Pablo Road; proposed construction of storm drain systems from Rillito Creek to the proposed East Downstream Channel approximately 250 feet north of Rillito Creek; and proposed construction of a floodwall north of River Road which will extend north along the east side of Camino Real Drive and north along the west side of Camino Pablo Road. On the effective FIRM, the Special Flood Hazard Area (SFHA), the area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), along Camino Real Wash is designated Zone A, with no Base Flood Elevations determined.

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Mr. Sharp.

Because this revision request also affects the unincorporated areas of Pima County, a separate CLOMR for that community was issued on the same date as this CLOMR.

We reviewed the submitted data and the data used to prepare the effective FIRM for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. We believe that, if the proposed project is constructed as shown on the submitted undated work map entitled "Figure 4 Design Concept" and as described in the submitted reports entitled "Conditional Letter of Map Revision for Camino Real Wash Area," dated December 22, 2003, and "Addendum to Conditional Letter

of Map Revision for Camino Real Wash Area," dated June 24, 2004, all prepared by Castro Engineering Corporation, and the data listed below are received, a revision to the FIRM would be warranted.

As a result of the proposed project and updated topographic information, the SFHA shown on the effective FIRM along Camino Real Wash will be removed from the confluence with Rillito Creek to approximately 300 feet upstream. The base flood will be contained in the improved West Downstream Channel, the proposed East Downstream Channel, and the storm drain systems. The maximum decrease in SFHA width, approximately 400 feet, will occur approximately 1,900 feet downstream of River Road.

Upon completion of the project, your community may submit the data listed below and request that we make a final determination on revising the effective FIRM.

- Detailed application and certification forms, which were used in processing this request, must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview & Concurrence Form," must be included. (A copy of this form is enclosed.)

- The detailed application and certification forms listed below may be required if as-built conditions differ from the conceptual plans. If required, please submit new forms (copies of which are enclosed) or annotated copies of the previously submitted forms showing the revised information.

  Form 2, entitled "Riverine Hydrology & Hydraulics Form"

  Form 3, entitled "Riverine Structures Form"

- Effective September 1, 2002, FEMA revised the fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps. In accordance with this schedule, the current fee for this map revision request is $3,800 and must be received before we can begin processing the request. Please note, however, that the fee schedule is subject to change, and requesters are required to submit the fee in effect at the time of the submittal. Payment of this fee shall be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card. The payment must be forwarded to the following address:

  Federal Emergency Management Agency
  Fee-Charge System Administrator
  P.O. Box 3173
  Merrifield, VA 22116-3173

- As-built plans, certified by a registered professional engineer, of all proposed project elements

- Community acknowledgment of the map revision request

- Hydraulic analyses, for as-built conditions, of the base flood if they differ from the proposed conditions models

- Before FEMA can certify that the floodwall meets the requirements of Section 65.10 of the NFIP regulations, the following items must be addressed and appropriate documentation submitted.

    - Please provide as-built plans, certified by a registered professional engineer, that include the grading along the north side of River Road between the east side of Camino Real Drive and the west side of Camino Pablo Road and the requirements for embankment construction and subgrade preparation.
    - The top protection must tie into the high ground at the upstream and downstream ends of the floodwall, and the grade and topwidth of the top protection should be consistent.
    - The operation and maintenance plan should address the management of vegetation.

- Our review revealed that the proposed conditions SFHA boundary delineations at the upstream limit of the project reach for Camino Real Wash do not tie into the SFHA boundary delineations shown on the effective FIRM. Please revise the hydraulic analysis so that the proposed conditions SFHA boundary delineations tie into the effective SFHA boundary delineations at the upstream limit of the project reach for Camino Real Wash.

- Please provide a topographic work map, certified by a registered professional engineer, that shows how the upstream limit of the proposed SFHA, based on the revised analysis described above, ties into the SFHA boundary delineations shown on the effective FIRM. In addition, please submit an annotated FIRM, at the scale of the effective FIRM, that reflects the revised proposed conditions analysis of the base floodplain at the upstream limit of the proposed revision for Camino Real Wash.

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM.

The basis of this CLOMR is, in whole or in part, a channel-modification/culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the modified channel and culverts rests with your community.

This CLOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by calling the Director, Federal Insurance and Mitigation

Division of FEMA in Oakland, California, at (510) 627-7103. If you have any questions regarding this CLOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

Enclosures

cc: The Honorable Sharon Bronson
Chair, Pima County
Board of Supervisors

Mr. Yash Desai, P.E., CFM
Engineering Manager
Technical Services Section
Department of Transportation
City of Tucson

Ms. Suzanne Shields, P.E.
Deputy Director
Pima County Flood Control District

Mr. R. "Terry" Hendricks, CFM
Chief Hydrologist
Pima County Department of Transportation
and Flood Control District

Mr. Steve M. Dolan, CFM
Project Manager
Pima County Department of Transportation
and Flood Control District

Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources

Mr. Ian P. Sharp, E.I.T., CFM
Assistant Division Manager
Water Resources
Castro Engineering Corporation

[redacted]

WARRANT NO.

[redacted]

TREASURER OF PIMA COUNTY

PAY

IN PAYMENT OF APPROVED CLAIM
FOR SUPPLIES AND/OR SERVICES
BY ORDER OF THE BOARD OF SUPERVISORS
PIMA COUNTY, ARIZONA

FOUR THOUSAND EIGHT HUNDRED DOLLARS AND NO CENTS

TO THE ORDER OF

DATE

WARRANT AMOUNT

NATIONAL FLOOD INSURANCE PROG
500 C ST,SW, FEDERAL CTR PLAZA
WASHINGTON DC 20472

07/23/08 **********4,800.00

[redacted]

BANK OF AMERICA, TUCSON, U.S.A.

[redacted]

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FOR
Camino Real Wash,
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Contract #25-59-C-13522-0507

Prepared For:
Pima County Regional Flood Control District
97 E. Congress, 3rd Floor
Tucson, AZ 85701

Prepared by

Castro Engineering corp
consulting engineers and surveyors

3580 W. Ina, Ste 200
Tucson, AZ 85741
(520) 293-2550

Castro Job No. PCFCD009

Registered Professional Engineer (Civil)
CERTIFICATE NO.
37622
FRANK EMMETT
FRY IV
Date Signed 7/2/08
ARIZONA, U.S.A.
Expires 06/30/11

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APPENDICES

1.0 Introduction

This study documents the As-built condition and provides hydraulic support for a LOMR revising the Camino Real Wash from its terminus at the Rillito River to approximately 3000 feet upstream of River Road. Thus revising the Effective FIRM Panels 040191637K, 04191645K for Pima County & unincorporated areas. See Figure 1, Location and Vicinity Map.

Much of this analysis was presented as CLOMR case no. 04-09-0406R in October 04, 2004. As the improvements were constructed as proposed in the approved CLOMR, the scope of this study was expanded to include the analysis of the Camino Real Wash upstream of River Road to a point approximately 3000 feet upstream in support of a revision based on better information.

1.1 Authority for Study

This study is being conducted for Pima County Regional Flood Control District Contract #25-59-C-13522-0507, April 27, 2007. Suzanne Shields P.E., District Chief Engineer/Director, has acknowledged and accepted this study on behalf of Pima County and Andy Dinauer P.E. has acknowledged and accepted this study on behalf of City of Tucson.

1.2 Methodology

Initial hydrology for this study was conducted in a 1998 study by Arroyo Engineering, Inc, and uses the accepted Pima County Hydrology Method. Hydrologic input changes have been made by Pima County Regional Flood Control District See Section 4.1. Hydraulics for this study were modeled with the program HEC-RAS v. 3.1.3., HY8 and CulvertMaster. Cross-Section geometry and floodplain delineation was generated with HEC GEORAS for ArcView 3.3

1.3 Results

This study confirms that improvements proposed within the CLOMR case No. 04-09-0406R have been constructed in substantial conformance with the approved plans and when field changes were made by the contractor, those changes have been evaluated and incorporated into the new models to reflect as-built conditions. The new hydraulic models show that the 1% chance storm event is contained within the Camino Real improvements and poses no flood risk to the properties downstream of River Road, thus revising the current FIRM to remove special flood hazard areas from the Camino Real Wash.

Upstream of River Road, the effective Zone A floodplain has widened and is more accurate as a result of better information. The new floodplain delineation ties into the effective Zone A floodplain approximately 3200' upstream of River Road.

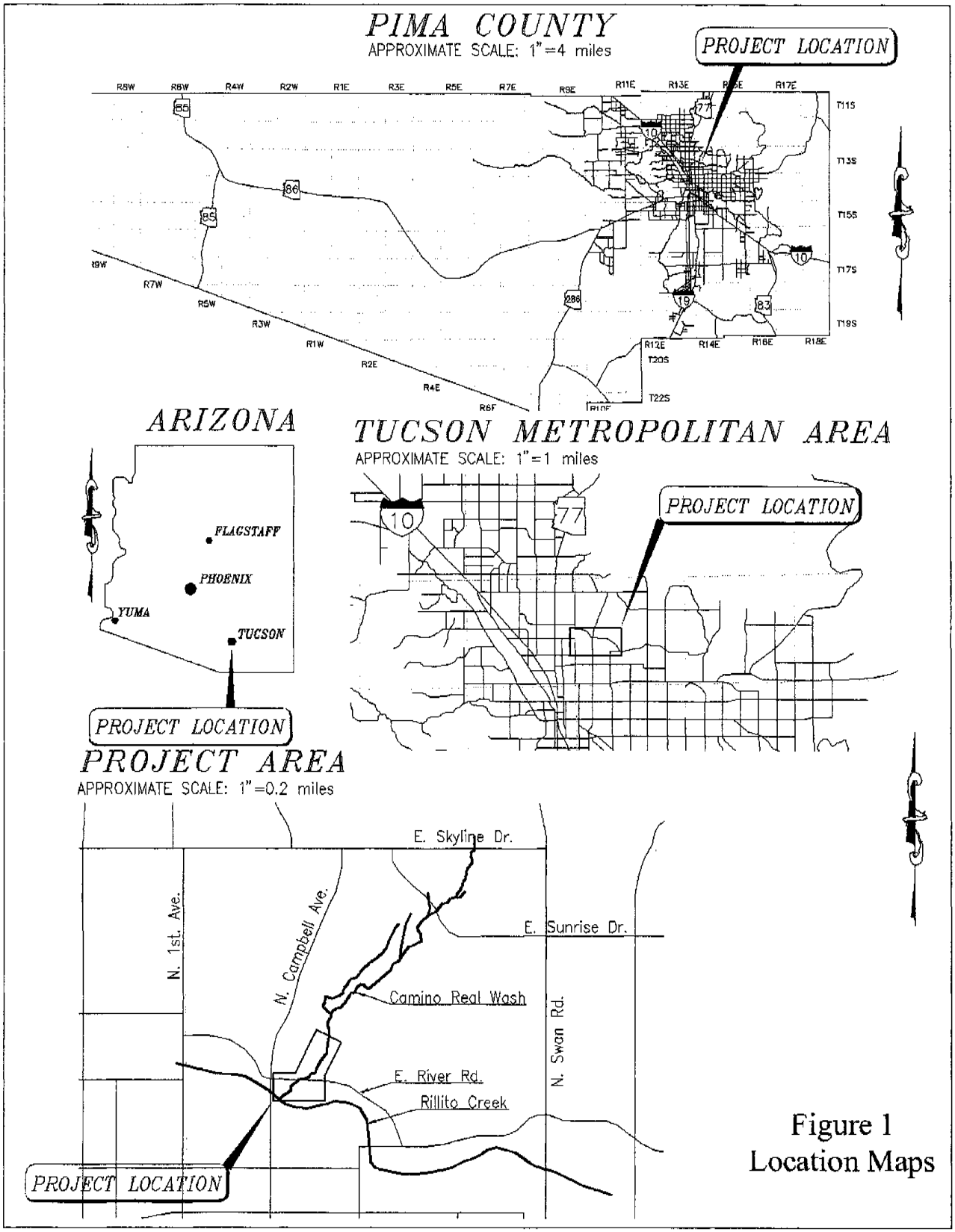


Figure 1
Location Maps

2.0 ADWR/FEMA FORMS

Study Documentation Abstract for FEMA Submittals		Initial Study	Restudy	CLOMR	LOMR	Other
Section 2.1: Study Documentation Abstract for FEMA Submittals						
2.1.1	**Date Study Accepted**					
2.1.2	**Study Contractor** **Contact(s)** **Address** **Phone** **Internal Reference Number**	Castro Engineering Frank Fry P.E., Adrian Leon, E.I.T. 3580 W. Ina Rd. Tucson, AZ 85741 (520) 293-2550				
2.1.3	**FEMA Technical Review Contractor** **Contact(s)** **Address** **Phone** **Internal Reference Number**					
2.1.4	**FEMA Regional Reviewer** **Phone**					
2.1.5	**State Technical Reviewer** **Phone**					
2.1.6	**Local Technical Reviewer** **Phone**	Terry Hendricks, CFM, Pima County Regional Flood Control District (520)-243-1800				
2.1.7	**Reach Description**	Camino Real Wash, FIRM Panels 04019C1637K, 04019C1645K				
2.1.8	**USGS Quad Sheet(s) with original photo date & latest photo revision date**	N/A				
2.1.9	**Unique Conditions and Problems**	The Reach encounters many properties with patio walls, which may act as levees. Two flood walls are designed on the project.				
2.1.10	**Coordination of Q's Discharges (Agency, Date, Comments)**	Discharge was determined in separate study approved at the CLOMR stage. Both City of Tucson and Pima County signed community acknowledgement.				

2.1 FEMA FORM

The MT-2 forms are included as required by CLOMR case No. 04-09-0406R. Basis for revision request is a physical change and better information. See Appendix B.1 for forms.

3.0 Survey and Mapping

3.1 Field Survey Information

Two field surveys were conducted by Castro Engineering Corp. The objective of the survey was to obtain elevations of the ground at the location of the upstream floodplain. This includes any structures that would influence the natural flow of water. The east and west downstream channels were surveyed to ensure the elevation of the existing ground at the channel banks was higher than the water surface elevation obtained in HEC-RAS. Field surveys were also used to verify inverts of culverts for the upstream and downstream reaches. Survey provides elevation on the NAVD 88 vertical Datum. The field notes can be found in Appendix C.

3.2 Mapping

The project site is located within Pima County and within the incorporated limits of Tucson, Sections 20, 21, and 28 of Township 13 South, Range 14 East, Gila and Salt River Baseline and Meridian. All elevations given in this LOMR are on the NAVD 88 vertical datum. Year 2005 LiDAR imagery was obtained from Pima County Department of Transportation, GIS division. Aerial imagery is also year 2005, and is pre-construction of Camino Real Improvements.

4.0 Hydrology

4.1 Method Description

Arroyo Engineering on the behalf of Pima County has previously documented existing conditions and hydrologic characteristics. Refer to the CLOMR package. Pima County Regional Flood Control District has adjusted the basin factor that was used in the hydrologic analysis of the CLOMR. The basin factor was adjusted from 0.039 to the more applicable value of 0.041. The resulting change of, the 1% chance flood event, discharge is reduced to 1956 cfs, from the previously modeled 2067 cfs in the CLOMR. See Appendix D.5

4.2.0 Parameter Estimation

Refer to the CLOMR.

4.2.1 Drainage Area Boundaries

The drainage area studied is a portion of the Camino Real Wash watershed.

4.2.2 Watershed Work Maps

Refer to CLOMR

4.2.3 Gage Data

N/A

4.2.4 Statistical Parameters

N/A

4.2.5 Precipitation

N/A

4.2.6 Physical Parameters

See Arroyo Report

4.3 Problems Encountered During the Study

4.3.1 Special Problems and Solutions

N/A

4.3.2 Modeling Warning and Error Messages

Not Applicable to this study.

4.4 Calibration

Not Applicable to this study.

4.5 Final Results

4.5.1 Hydrologic Analysis Results

See Arroyo Report in CLOMR

4.5.2 Verification of Results

See Arroyo Report

5.0 Hydraulics

5.1 Method Description

The Camino Real Wash has two components an improved reach and a natural reach. The natural reach exists upstream of River Road and consists of a typical desert wash while the improved reach begins at the cross-drainage inlets at the upstream side of River Road and continues as fully lined improvements until its confluence with the Rillito River.

Because of the significantly different components, Camino Real Wash was modeled in two distinct methods. First, the upstream natural component of Camino Real would be modeled with HEC-RAS in a sub-critical flow regime and would use the River Road cross-drainage culverts headwater elevations as a downstream boundary condition. Second, the downstream improved component would be modeled in a super-critical flow regime, as allowed by FEMA Guidelines and Specifications when channels are fully lined and not susceptible to erosion, using HEC-RAS and an upstream boundary condition of normal depth as flow leaves the culverts.

Overall, the methodology does not differ from what was presented in the CLOMR, with the exception that the reach upstream of River Road was originally modeled with HEC-2. As stated previously, the scope of the study was expanded to re-model the floodplain in the upstream channel (beyond the limits of the CLOMR), and it was determined that HEC-GeoRAS was the tool we preferred to use to accomplish this. HEC-RAS was selected because of its compatibility with the pre-processing output of HEC-GeoRAS.

Cross-culverts under River Road continue to be evaluated with the Federal Highway Administrations HY8 computer program to maintain consistency with the CLOMR. The reason the culverts are not modeled within HEC-RAS is that the upstream east culvert has a side lateral weir which feeds the Overflow Channel. HEC-RAS does not allow a lateral weir at the structure inlet face. Additionally, the HY8 program calculates headwater which is used as a boundary condition for the upstream models. As stated previously, the downstream is modeled in a supercritical regime while the upstream is modeled in a sub-critical regime. HEC-RAS cannot accommodate the change of a regime from reach to reach, so it is with this limitation that it also supports the external calculation of the culverts which divide the upstream and downstream reaches.

5.2 Work Study Maps

Work maps are provided to display the stream alignments, cross-sections, structures, floodplain delineations, topography, and aerial photos. The work maps are separated into the Upstream Reach, Figure 2, and the Downstream Reach, Figure 3. See Exhibit Maps for figures.

The Downstream Reach displays the east and west downstream channels and was prepared in AutoCAD. Because new aerial and topography was not available to show these improvements constructed, the workmap shows the AutoCAD channel linework as shown originally in the plans. Additionally, hydraulic cross-sections are shown and labeled with HEC-RAS river stations. The improvements downstream will effectively contain the 1% chance flood event and therefore it is anticipated there will not be any floodplain delineation downstream of River Road on the revised

FIRM; rather there will be lines representing the channels and culvert structures which will be labeled "Contained in Channel", "Contained in Culvert", etc.

The Upstream Reach Figure was generated with ArcView 9.3 and the floodplain is projected in both the Pima County State Plane Coordinate system and the FEMA, UTM coordinates system. The workmap shows an aerial photo, contours, channel and inlet improvement linework, drainage structures, split flow junction, and hydraulic cross-sections with HEC-RAS river stationing. This exhibit also shows how the floodplain ties to the existing Zone A floodplain on the upstream limit.

Judging by the scale of the effective FIRMs it is anticipated that the revised floodplain will remain a Zone A, and the hydraulic modeling has been carried out accordingly under this assumption.

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

Manning's Roughness coefficients were estimated using the Table 8.1: Manning's Roughness Coefficients in the 'Standards Manual for Drainage Design and Floodplain Management In Tucson, Arizona' December, 1989 (Revised July, 1998). The method to determine Manning's Roughness was observation and analysis of aerial photos provided by Pima County, along with field visits to verify findings. Photos were taken to show field conditions of the Camino Real Wash. For all cross-sections that were established in the CLOMR by Castro Engineering, the Manning's roughness value was maintained.

5.3.2 Expansion and Contraction coefficient

Values for contraction and expansion coefficients were selected in accordance with HEC-RAS guidelines. For the downstream channels and culverts there is almost no contraction or expansion taking place due to the consistency in the channel section and culverts sizes; values were selected accordingly.

5.4 Cross Section Description

There are four HEC-RAS river reaches for the Camino Real Wash north of River Road. The main reach flows from north to south and splits into the east and west branches at the junction. The last reach is the overflow channel that conveys overflow from the east branch to the west culvert. The following table correlates the reaches to their HEC-RAS nomenclature:

Table 1: Reach Descriptions

River Reach	HEC-RAS Nomenclature	River Station Range
Main reach	Camino Real Upstream	8+46.09 to 34+29.86
West Branch	Camino Real West	0+67.63 to 7+51.24
East Branch	Camino Real East	0+38.44 to 6+33.54
Overflow Weir	Overflow	0+00 to 2+37.37

Cross sections were obtained by establishing a stream centerline for the portion of the Camino Real Wash using the contour and aerial photo information provided by Pima County GIS Division, and developing a cross section that is perpendicular to flow in that area. Cross Sections were placed at approximately 100' intervals, and at locations just upstream and downstream of drainage structures (i.e. bridges and culverts). The stationing convention used was stationing increases in the upstream direction. All cross sections that were established for the CLOMR analysis and overlap with this LOMR analysis remain unchanged, however stationing has been revised to match the revised stream centerline.

Downstream channel cross-section locations did not change except at locations where field modifications to the plans were made and new cross-sections were necessitated. River stations should be consistent with the CLOMR.

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and drop analysis

HEC-RAS uses the momentum equation to determine hydraulic jumps. A true hydraulic jump is when the flow regime transitions from supercritical to subcritical and would be evident when looking at a profile that was run in mixed regime. We did not run a mixed regime for our downstream channels because the results indicate the flow remains supercritical. If there were any possible locations of hydraulic jumps, the results would show the water surface elevation defaulting to critical depth and that is not the case.

We also did not run a mixed regime for our upstream reach as this is a natural earthen wash and should be run in sub-critical for the highest/most-conservative water surface elevation.

5.5.2 Bridge and Culverts

The west branch of the Camino Real Wash north of River Road (Camino Real West) has three culverts, and one bridge structure that were not modeled within the CLOMR. At each culvert location there are two 36" corrugated metal pipes. Survey crews shot the inverts on these culverts and the field notes are included in Appendix C.

The major culverts crossing River Road were constructed as proposed in the CLOMR. As-builts will document that. The culvert at River Station 15+95 in the downstream west channel was proposed to be replaced with a free-span bridge within the CLOMR. After further analysis, it was determined that the existing culvert was viable and could contain the 100-year flood without overtopping. A revised analysis has been included as documentation.

A two-barrel culvert west of Camino Real Rd, previously proposed in the CLOMR, was constructed per plan. This culvert was provided to drain the flow which is trapped on the west side of Camino Real Road. The flow to this culvert will be described in more detail in Section 5.5.4.

The existing 2-barrel 6'x4' RCBC at the downstream end of the east downstream channel (River Station 7+77) was surveyed. This culvert was built as anticipated by an adjacent development and is consistent with the CLOMR analysis.

Table 2: Structures South of River Road

Summary Table Structures South of River Road				
Structure	Description	Location	Modeling	As-builts
West Culvert	4-8'x5' RCBC	Intersection of River and Camino Real, North of River Rd.	HEC-RAS	River Road As-builts signed 7/20/07
East Culvert	2-8'x5' RCBC	Intersection of River and Camino Pablo, North of River Rd.	HEC-RAS	River Road As-builts signed 7/20/07
Weir	Overflow channel from east culvert to west Culvert	Between West and East Culvert	HEC-RAS	River Road As-builts signed 7/20/07
Culvert	3-4'x6' RCBC	STA.15+95 on West Downstream Channel	HEC-RAS	River Road As-builts signed 7/20/07

Table 3: Structures Upstream of River Road

Summary Table of Structures Upstream of River Road				
Structure	Description	Location	Modeling	As-builts
Bridge	Bridge spanning approx.16', 3' above ground	STA.191.64 at private driveway east of Camino Real	HEC-RAS	Field Survey
Culvert	3-24" CMPs	STA.288.25 east of Camino Real Road.	HEC-RAS	Field Survey
Culvert	3-24" CMPs	STA.380.66 east of Camino Real Road	HEC-RAS	Field Survey
Culvert	3-24" CMPs	STA.534.16 East of Camino Real Road	HEC-RAS	Field Survey

5.5.3 Levees and Dikes

Two floodwalls were designed and constructed on this project. The floodwalls have not changed in location from the CLOMR submittal. As-builts of the top of walls have been provided and the models have been updated to show sufficient freeboard in accordance with Part 65.10 of the NFIP regulations.

The HEC-RAS models will show the floodwalls on the Overflow reach upstream of River Road and on the West Downstream Channel near the bend. Structural analysis was provided on the CLOMR MT-2 forms and will be re-submitted for reference in Appendix E.4.

In order to meet NFIP guidelines as listed at 44 CFR §65.10, Terracon Consultants, did an analysis to ensure that Embankment Protection, Embankment and Foundation Stability, and Settlement were all acceptable per FEMA requirements. Per the letters dated March 17, and April 3, 2008, found in Appendix E.4, it was established that the embankments were expected to be resistant to erosion. It was also found that due to the short duration of the 100-year flood, and a low water surface elevation differential in a flood condition, that minimal seepage potential is expected. And based upon the field results and laboratory tests the expected total settlement is not to exceed one-inch. We have verified, based upon the As-built data that even with the maximum settlement of one-inch the floodwalls still provided adequate freeboard.

The Region IX Levee certification checklist has been filled out and provided within the Operations and Maintenance (O & M) Plan. In addition, within the O & M Plan, there is a copy of the official levee maintenance plan for Pima County, adopted by the Pima County Board of Supervisors.

Table 4: Levee Structures

Summary Table Levee Structures Impacting Camino Real Wash				
Structure	Description	Location	Modeling	As-builts
Floodwall	Constructed floodwall North of River Road	Left Bank of Overflow Channel	HEC-RAS	River Road As-builts signed 7/20/07
Floodwall	Super-elevation floodwall	STA.10+75 to STA.11+76 West Downstream Channel	HEC-RAS	River Road As-builts signed 7/20/07

5.5.4 Islands and Flow Splits

On the Camino Real Upstream Reach a flow split occurs right after River Station 8+46. This flow split was modeled in the CLOMR at the same location but with HEC-2. As it was stated earlier because the entire upstream reach was added to the scope, the Upstream Reach was modeled with HEC-RAS. HEC-RAS models the flow split with the momentum equation which is different methodology than HEC-2. The discharges below the split are 1205 cfs for the Camino Real West Reach and 1151 cfs for the Camino Real East Reach at River Road; these values include the additional 200 cfs used as a safety factor to account for changes over time to the split. The CLOMR showed discharges of 1300 cfs and 1200 cfs at River Road respectively, with the new methodology imposed by Pima County Regional Flood Control, the new discharges have been decreased slightly. Please refer to the CLOMR for the composition of the flows at each culvert.

An additional split occurs and was documented in the CLOMR. Flow in the Camino Real West reach becomes divided as it approaches River Road. A flow distribution was performed on River Station 1+21.37 and it was determined that 69 cfs is carried in the roadside ditch west of Camino Real Road. This flow was accounted for in the design of River Road cross drainage and is collected and conveyed to the (2) 36" RCPs inlet.

5.5.5 Ineffective Flow Areas
Ineffective flows were modeled similar to the previous analysis.

5.5.6 Supercritical Flow
The East Downstream Channel and West Downstream Channel were both modeled in a super-critical flow regime as stated in Section 5.1.

5.7 Problems Encountered during the Study
As documented in the CLOMR there is a natural flow split around a group of houses in the upstream reach. The residences have exterior privacy walls that act to divert water around the houses in the respective Camino Real East and Camino Real West reaches. The walls do not meet certification requirements listed in Part 65.10 of the NFIP regulations and therefore must be assumed to fail. However, it was discussed in the Arroyo Engineering Report (see CLOMR) that the "walls-in-place" condition is actually the worst-case scenario for water surface elevations and floodplain extents. Acknowledging that this area will be mapped as a Zone A, the worst-case flood limits are the more appropriately mapped limits. As a result, the Upstream Reach, specifically the Camino Real East and Camino Real West channels were modeled with the levee option in HEC-RAS to simulate the effect of the privacy walls.

5.8 Calibration
Gage data or documented historical high-water marks do not exist for Camino Real Wash.

5.9 Final Results

5.9.1 Hydraulic Analysis Results
The results confirm that the improvements proposed and constructed in substantial conformance with the CLOMR serve to contain the 1% chance floodplain downstream of River Road. Upstream of River Road the floodplain has become wider and has been re-delineated to approximately 3200 feet upstream of River Road where it ties into the effective Zone A floodplain limits. Refer to Appendix E for the Hydraulic Analysis supporting documentation. Refer to Figure 2, Upstream Reach and Figure 3, Downstream Reach for revised floodplain limits and proposed improvements respectively. See Tables Below.

Table 5: Bridge Summary Table

Plan: wwalls Camino Real W West RS: 191.64 Profile: PF 2				
E.G. US. (ft)	2389.64	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	2389.47	E.G. Elev (ft)	2389.57	2389.07
Q Total (cfs)	1151	W.S. Elev (ft)	2388.96	2388.62
Q Bridge (cfs)	141.08	Crit W.S. (ft)	2388.96	2388.62
Q Weir (cfs)		Max Chl Dpth (ft)	4.18	4.2
Weir Sta Lft (ft)		Vel Total (ft/s)	4.88	3.91
Weir Sta Rgt (ft)		Flow Area (sq ft)	235.92	294.18
Weir Submerg		Froude # Chl	0.45	0.38
Weir Max Depth (ft)		Specif Force (cu ft)	463.17	438.49
Min El Weir Flow (ft)	2385.74	Hydr Depth (ft)	1.25	.95
Min El Prs (ft)	2387.69	W.P. Total (ft)	232.64	353.38
Delta EG (ft)	0.81	Conv. Total (cfs)	7323.8	8795.6
Delta WS (ft)	1.08	Top Width (ft)	272.69	310.62
BR Open Area (sq ft)	37.37	Frctn Loss (ft)	0.26	0.08
BR Open Vel (ft/s)	3.78	C & E Loss (ft)	0.04	0
Coef of Q		Shear Total (lb/sq ft)	1.56	0.89
Br Sel Method	Energy only	Power Total (lb/ft s)	7.63	3.48

Table 6: Culvert Summary Table

HEC-RAS Plan: wwalls River: Camino Real W Reach: West Profile: PF 2

River Sta	E.G. US.	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Culv Frctn Ls	Culv Entr Loss	Culv Exit Loss
	(ft)	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	(ft)	(ft)	(ft)
534.16 Culvert	2395.5	2395.31	2393.27	24.97	1336.67	5.3	5.3	0.21	0.22	0.13
380.66 Culvert	2393.1	2392.58	2390.28	23.75	1333.66	5.04	5.04	0.22	0.2	0.01
288.25 Culvert	2391.5	2391	2387.42	41.86	1318.61	4.79	4.79	0.19	0.32	0.01

Table 7: Upstream Reach Summary Table

River: Camino Real		Reach: Upstream								
River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	Vel Chnl	Top Width	Hydr Depth	Froude # Channel	Sta W.S. Left	Sta W.S. Right
	(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
3429.864	1956	2453.94	2456.13	2456	5.01	349.42	1.12	0.83	49.51	398.94
3331.857	1956	2451.65	2454.45	2454.45	6.46	235.79	1.28	1.01	114.84	350.63
3241.052	1956	2449.91	2452.33	2452.33	6.04	294.7	1.1	1.01	74.58	374.73
3150.14	1956	2447.96	2450.84	2450.84	6.13	281.66	1.13	1.02	30.36	326.06

River: Camino Real		Reach: Upstream								
River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	Vel Chnl	Top Width	Hydr Depth	Froude # Channel	Sta W.S. Left	Sta W.S. Right
	(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
3051.702	1956	2446.02	2448.29	2448.28	5.64	358.34	0.97	1.01	78.62	442.65
2936.949	1956	2443.55	2445.98	2445.98	5.62	360.44	0.97	1	75.97	518.16
2852.425	1956	2441.97	2444.01	2444.01	5.17	457.38	0.83	1	33.18	541
2743.588	1956	2439.89	2441.84	2441.84	5.24	451.92	0.84	1	41.06	616.8
2625.161	1956	2437.53	2439.56	2439.51	4.95	459.29	0.87	0.93	19.33	576.29
2477.176	1956	2433.79	2436.85	2436.85	6.78	206.09	1.4	1.01	217.39	486.18
2383.522	1956	2431.92	2435.01	2435.01	5.78	329.11	1.03	1	65.14	447.6
2255.96	1956	2429.12	2431.89	2431.81	5.4	376.17	1.01	0.88	31.87	526.78
2141.959	1956	2427.32	2429.66	2429.66	5.05	485.06	0.8	1	45.83	551.95
2064.338	1956	2424.54	2428.17		3.16	494.08	1.25	0.5	70.55	706.06
1943.236	1956	2422.5	2425.39	2425.32	4.69	534.21	0.82	0.84	121.73	727.32
1871.821	1956	2420.99	2423.64	2423.64	5.33	450.43	0.81	1.04	99.43	698.52
1821.303	1956	2420.08	2422.47	2422.47	5.26	438.74	0.85	1.01	50.35	614.33
1773.468	1956	2418.78	2421.33	2421.33	5.41	420.3	0.86	1.03	22.67	517.19
1647.316	1956	2415.75	2418.52	2418.52	5.44	395.02	0.91	1.01	19.74	484.41
1542.871	1956	2413.72	2416.09	2416.09	5.39	424.03	0.86	1.03	35.68	557.34
1424.651	1956	2411.46	2413.55	2413.38	4.47	421.39	1.04	0.77	82.42	567.92
1314.441	1956	2408.92	2411.47	2411.47	5.81	325.03	1.04	1.01	62.94	540.26
1181.912	1956	2406.35	2408.82	2408.82	6.16	275.01	1.15	1.01	63.83	493.53
1062.566	1956	2404.16	2406.37	2406.37	5.88	310.4	1.07	1	57.69	496.56
944.986	1956	2400.72	2403.33	2403.33	5.88	313.13	1.06	1.01	59.32	471.32
846.091	1956	2395.86	2401.37	2401.34	5.75	390.59	1.03	1	40.18	486.61

Table 8: East Reach Summary Table

River: Camino Real		Reach: East								
River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	Vel Chnl	Top Width	Hydr Depth	Froude # Channel	Sta W.S. Left	Sta W.S. Right
	(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
633.541	1205	2397.4	2400.02	2399.81	6.08	153.13	1.5	0.78	58.17	211.3
480.056	1205	2394.48	2397.03	2396.76	5.48	127.2	1.67	0.69	33.68	160.88
365.03	1205	2392.72	2394.73	2394.44	4.18	157.8	1.54	0.58	40.19	197.99
300.27	1205	2391.21	2393.04	2393.04	5.74	203.68	1.09	0.87	0	203.68
252.61	1205	2389.08	2391.56	2391.56	6.57	301.5	0.94	1.01	22.97	324.47
222.919	1205	2386.79	2390.7	2390.7	6.34	246.07	1.03	0.79	10.28	256.35
199.073	1205	2385.18	2389.66	2389.66	8.04	117.46	1.33	0.91	0	179.9
153.126	1205	2384.52	2388.87	2388.87	8.8	70.31	1.97	0.97	0	138.52
98.849	1205	2382.43	2387.05	2387.05	8.9	55.16	2.46	1	2	57.16
38.444	1205	2378.19	2383.21	2382.92	8.15	56.1	2.64	0.88	6.87	66.1

Table 9: West Reach Summary Table

River: Camino Real		Reach: West								
River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	Vel Chnl	Top Width	Hydr Depth	Froude # Channel	Sta W.S. Left	Sta W.S. Right
	(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
751.24	1151	2396.85	2399.87	2399.48	6.07	300.35	2.15	0.71	0	379.35
581.907	1151	2393.29	2395.54	2395.54	5.96	295.52	0.93	0.98	2.99	359.28
552.659	1151	2392.36	2395.15	2394.76	4.16	361	1.29	0.59	0	361
534.16	Culvert									
523.966	1151	2391.96	2394.54	2394.36	4.87	313.69	1.03	0.68	0	351.69
465.158	1151	2390.55	2393.88	2393.41	3.9	294.76	1.38	0.47	0	372.91
396.133	1151	2389.52	2392.38	2392.34	7.12	278.49	1.17	1.06	10	379.49
380.66	Culvert									
365.77	1151	2388.94	2392.06	2391.82	3.99	323.28	1.28	0.55	0	368.28
330.884	1151	2388.16	2391.44	2391.29	6.28	264.98	1.27	0.82	0	368.6
301.971	1151	2386.96	2390.82	2390.82	6.12	222.92	1.09	0.73	0	361.58
288.25	Culvert									
273.774	1151	2386.5	2390.17	2389.93	6.17	188.28	1.11	0.76	0	362.18
257.256	1151	2386.17	2389.57	2389.48	6.31	211.08	0.97	0.77	8.79	367.67
221.641	1151	2385.03	2389.49	2388.56	4.09	262.23	1.6	0.42	0	382.83
203.926	1151	2384.78	2389.47	2388.21	3.78	297.86	1.99	0.37	0	391.86
191.64	Bridge									
181.696	1151	2384.42	2388.38	2388.27	5.04	298.18	0.9	0.65	0	395.36
167.778	1151	2384.21	2387.99	2387.99	6.89	313.04	0.81	0.88	7.51	388.98
121.367	1151	2382.36	2387.27	2387.27	6.65	320.47	0.88	0.71	2.1	374.83
67.625	1151	2378.61	2384.35	2384.35	9.35	52.6	2.35	0.98	159.45	224.53

Table 10: South Reach Summary Table

River:Overflow		Reach: South								
River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	Vel Chnl	Top Width	Hydr Depth	Froude # Channel	Sta W.S. Left	Sta W.S. Right
	(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
237.369	370	2381.18	2382.77	2382.56	4.43	73.94	1.13	0.73	15.74	89.68
199.788	370	2380.38	2382.25	2382.18	5.81	53.38	1.19	0.94	19.33	72.72
174.844	370	2379.45	2382.29	2381.59	4.27	46	1.89	0.55	9.94	55.94
149.791	370	2379.26	2381.76	2381.65	6.53	34.9	1.62	0.9	18.31	53.2
129.767	370	2378.48	2381.79	2381.19	5.48	31.75	2.13	0.66	17.62	49.36
99.652	370	2378.21	2381.08	2381.08	7.85	24.61	1.92	1	19.71	44.32
74.912	370	2377.41	2381.1	2380.27	5.46	27.05	2.51	0.61	18.79	45.84
50.145	370	2377.1	2381.04	2380.11	5.22	28.23	2.51	0.58	18.6	46.83
25.041	370	2376.47	2381.14	2379.37	3.79	33.26	2.94	0.39	18.19	51.45
0.002	370	2375.85	2381.2	2378.28	2.63	41.2	3.5	0.22	15.81	59.14

5.9.2 Verification of Results

The results are reasonable and compare well with the CLOMR analysis.

Section 6: Erosion and Sediment Transport

6.1 Method description

The Camino Real Improvements have been analyzed for sedimentation potential which was documented within Section 2.8 of the CLOMR:

> "Potential sedimentation has been analyzed for the downstream channels and the RCBC crossings following methodology by Simons, Li & Associates as presented in the City of Tucson Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona (Reference 10). The sediment transport ratio equation, while presented as an equation to analyze culvert transport potential, has been used to analyze channel transport potential as well as culvert transport potential. The sediment transport ratio is calculated using information including discharge, longitudinal slope, Manning's roughness coefficient, and hydraulic radius of flow for the approach channel and the structure in question. A calculated ratio of less than one suggests that the structure will be able to transport the sediment being delivered by the approach channel, while a calculated ratio greater than one will suggest that the structure should be redesigned."

> "Cross sectional information for the approach channels was taken from the HEC-2 cross section upstream of the drop structures for the improved upstream channels. The flow area, wetted perimeter, and weighted Manning's roughness coefficient were taken from a HEC-RAS model based on the HEC-2 models. The flow area and wetted perimeter for the culverts were found by assuming critical depth within the culverts and calculating these values. The calculations, contained within the appendix, show that the downstream channels and the RCBC structures will be able to transport the sediment being delivered by the approach channel."

As improvements were constructed per plan, re-evaluation of sedimentation potential should not be necessary.

An evaluation of Erosion potential was not necessary as all improvements are designed as fully lined channels. Adherence to the Operation and Maintenance plan is required to ensure that all channel protection is intact and fully functional.

6.2 Parameter estimation

The sediment transport ratio was calculated using information including discharge, longitudinal slope, Manning's roughness coefficient, and hydraulic radius of flow for the approach channel and the structure in question.

6.4 Modeling considerations

N/A

6.5 Problems encountered during the study

N/A

6.6 Calibration

N/A

6.7 Final results

6.7.1 Erosion and sediment transport analysis results

Results for sedimentation potential can be found in Appendix C of the CLOMR application. There is no erosion potential as long as the Operations and Maintenance Plan is carried out.

6.7.2 Verification of results

On July 28, 2007 a severe storm hit the Camino Real Wash Watershed. While the Camino Real Wash watershed is not gauged, adjacent watershed gages indicated that 2.52" of rain fell (2 inches of that occurred in a two hour period). The following pictures show the aftermath of the storm and substantiate that sedimentation is not a problem as the improvements have sufficient capacity to convey the sediment supply.

East Upstream Inlet (Looking Downstream)

West Upstream Inlet (Looking Downstream)

East Upstream Outlet (Looking Upstream)

West Upstream Outlet (Looking Upstream)

APPENDIX A
REFERENCES
FOR
CAMINO REAL WASH
LOMR

City of Tucson, 1998, Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona; City of Tucson Department of Transportation, Engineering Division, Revised July 1998

Arroyo Engineering, Inc., 1998, Hydrologic and Hydraulic Analyses of Camino Real Wash Between Rillito Creek and Camino La Lomita, Prepared for: Pima County Department of Transportation and Flood Control District, March 15, 1998.

U.S Army Corps of Engineers, HEC-RAS V.3.1.3, May 2005, www.hec.usace.army.mil

Environmental Systems Research, Institute, Inc. (ESRI), 2005, ArcView software version 3.1, www.esri.com

Federal Highway Administration, 2001 HY8 software version 6.1, www.fha.dot.gov

Haestad Methods Inc., 1995-2000, CulvertMaster software version 2.0, www.haestad.com

APPENDIX B.1
FEMA MT-2 FORMS
FOR
CAMINO REAL WASH
LOMR

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
04019	Pima County	AZ	04019	1637K	02/08/99
04019	Pima County	AZ	04019	1645K	02/08/99

2. Flooding Source: Camino Real Wash

3. Project Name/Identifier: Camino Real Wash LOMR

4. FEMA zone designations affected: A (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☒ Physical Change ☒ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding:	☒ Riverine	☐ Coastal	☐ Shallow Flooding (e.g., Zones AO and AH)
	☐ Alluvial fan	☐ Lakes	☐ Other (Attach Description)
Structures:	☒ Channelization	☒ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $_____

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Frank E. Fry, P.E.	Company: Castro Engineering Corp.	
Mailing Address: 3580 W. Ina Road. Tucson, AZ 85741	Daytime Telephone No.: (520)293-2550	Fax No.: (520)293-2115
	E-Mail Address: ffry@castroeng.com	
Signature of Requester (required):		Date: 7/2/08

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Suzanne Shields, P.E. Chief Engineer		Telephone No.: (520) 243-1800
Community Name: Pima County	Community Official's Signature (required): Suzanne Shields	Date: 7/14/08

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Frank E. Fry	License No.: 37622	Expiration Date: 6/30/2008
Company Name: Castro Engineering Corp.	Telephone No.: (520) 293-2550	Fax No.: (520) 293-2115
Signature:		Date: 7/2/08

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Registered Professional Engineer (Civil) CERTIFICATE NO. 37622 FRANK EMMETT FRY IV Date Signed 7/2/08 ARIZONA, U.S.A. Expires 06/30/11

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $_____

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Frank E. Fry, P.E.	Company: Castro Engineering Corp.	
Mailing Address: 3580 W. Ina Road. Tucson, AZ 85741	Daytime Telephone No.: (520)293-2550	Fax No.: (520)293-2115
	E-Mail Address: ffry@castroeng.com	
Signature of Requester (required):		Date: 7/2/08

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Andrew C. Dinauer, Engineering Administrator, Dept. of Transportation		Telephone No.: 520-791-4251
Community Name: City of Tucson	Community Official's Signature (required):	Date: 7/16/08

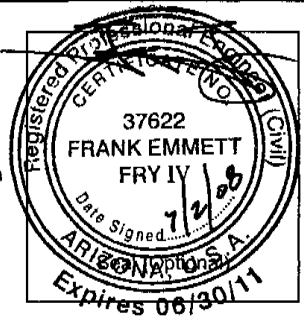
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Frank E. Fry	License No.: 37622	Expiration Date: 6/30/08
Company Name: Castro Engineering Corp.	Telephone No.: (520) 293-2550	Fax No.: (520) 293-2115
Signature:		Date: 7/2/08

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans



FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Camino Real Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Existing Bridge**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Camino Real West Reach Sta.191.64

   Downstream Limit/Cross Section: Camino Real West Reach Sta.181.70

   Upstream Limit/Cross Section: Camino Real West Reach Sta.203.9

2. **Name of Structure: Existing Culvert 3-24" CMP, 19 L.F.**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Camino Real West Reach Sta.288.25

   Downstream Limit/Cross Section: Camino Real West Reach Sta.273.77

   Upstream Limit/Cross Section: Camino Real West Reach Sta.301.97

3. **Name of Structure: Existing Culvert 3-24" CMP, 22.77 L.F.**

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Camino Real West Reach Sta.380.66

   Downstream Limit/Cross Section: Camino Real West Reach Sta.365.77

   Upstream Limit/Cross Section: Camino Real West Reach Sta.396.13

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: Camino Real Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport..... complete Section F (if required)

Description Of Structure

1. Name of Structure: West Downstream Channel

Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: South of River Road, Northwest of Rio Cancion Townhomes, Southeast of Rio Vista Apartments

Downstream Limit/Cross Section: Rillito Creek/ STA.0+00 West downstream channel

Upstream Limit/Cross Section: River Road West RCBC/ STA.20+15 of West downstream channel

2. Name of Structure: East Downstream Channel

Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: Elk's Club east property line

Downstream Limit/Cross Section: Villas at Hacienda Del Sol Storm Drain Outlet to Rillito River / 6+34

Upstream Limit/Cross Section: River Road East RCBC/ 17+75

3. Name of Structure: Lateral Flow Channel

Type (check one) ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: North of River Road, Between Inlets of East and West RCBC

Downstream Limit/Cross Section: West RCBC/ 0+00

Upstream Limit/Cross Section: East RCBC / 2+38

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: Camino Real Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Culvert at West Downstream Channel**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: West Downstream Channel

   Downstream Limit/Cross Section: 15+72.5

   Upstream Limit/Cross Section: 16+17.5

2. **Name of Structure: West River Road RCBC**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: River Road Station 692+38.69

   Downstream Limit/Cross Section: West Downstream Channel Inlet / Sta 20+15 of West Downstream Channel

   Upstream Limit/Cross Section: Station 23+48 of West Upstream Channel and Station 0+00 of Overflow Channel

3. **Name of Structure: East River Road RCBC**

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: River Road Statio 698+89.12

   Downstream Limit/Cross Section: East Downstream inlet/ 17+75

   Upstream Limit/Cross Section: station 0+00 of East Upstream Channe 0 +00

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: Camino Real Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport..... complete Section F (if required)

Description Of Structure

1. Name of Structure: East Upstream Channel

Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: West of Camino Pablo, Upstream of East RCBC, Upstream of Overflow Channel

Downstream Limit/Cross Section: East RCBC/ 0+00

Upstream Limit/Cross Section: STA.252.61

2. Name of Structure: RCP West of Camino Real Drive

Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: West of Camino Real Drive, North of River Road

Downstream Limit/Cross Section: West Barrel of West River Road RCBC

Upstream Limit/Cross Section: Proposed Driveway River Road STA.691+95

3. Name of Structure: Levee Upstream of River Road

Type (check one) ☐ Channelization ☐ Bridge/Culvert ☒ Levee/Floodwall ☐ Dam

Location of Structure: North of River Road

Downstream Limit/Cross Section: 2+37.37

Upstream Limit/Cross Section: 0+00.00

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: Camino Real Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: West Upstream Channel**

   Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: East of Camino Real Drive, Upstream of East RCBC, Downstream of Overflow channel

   Downstream Limit/Cross Section: West RCBC/ Sta.0+00

   Upstream Limit/Cross Section: STA.147+00

2. **Name of Structure: West Downstream Levee**

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☒ Levee/Floodwall ☐ Dam

   Location of Structure: West Downstream channel sta.1074.46 to 1165

   Downstream Limit/Cross Section: Sta.1074.46

   Upstream Limit/Cross Section: sta.1165

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Camino Real Wash

Name of Structure: Existing Culvert @ Camino Real West Reach Sta.380.66

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Camino Real Wash

Name of Structure: Existing Culvert @ Camino Real West Reach Sta.288.25

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

B. CHANNELIZATION

Flooding Source: Camino Real Wash

Name of Structure: West Upstream Channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 1205 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Camino Real Wash

Name of Structure: Existing Bridge @ Camino Real Reach Sta.191.64

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

B. CHANNELIZATION

Flooding Source: Camino Real Wash

Name of Structure: East Upstream Channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 1151 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Camino Real Wash

Name of Structure: RCP West of Camino Real Drive

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): CulvertMaster
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

B. CHANNELIZATION

Flooding Source: Camino Real Wash

Name of Structure: Overflow Channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 370 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Camino Real Wash

Name of Structure: East River Road RCBC

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HY8
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

B. CHANNELIZATION

Flooding Source: Camino Real Wash

Name of Structure: East Downstream Channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 781 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☒ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Camino Real Wash

Name of Structure: West River Road RCBC

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HY8
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

B. CHANNELIZATION

Flooding Source: Camino Real Wash

Name of Structure: West Downstream Channel

1. Accessory Structures

The channelization includes (check one):

- ☒ Levees [Attach Section E (Levee/Floodwall)]
- ☒ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☒ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 1205 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☒ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Camino Real Wash

Name of Structure: Culvert at West Downstream Channel Sta.15+95

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS V.3.1.3
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

E. LEVEE/FLOODWALL

1. System Elements **Floodwall North of River Road**

a. This Levee/Floodwall analysis is based on (check one):

☐ upgrading of an existing levee/floodwall system
☒ a newly constructed levee/floodwall system
☒ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc.	Station to
☒ structural floodwall	Station 0+00 to 2+37.37 of Camino Real Overflow Reach
☐ Other (describe):	Station to

c. Structural Type (check one):

☐ monolithic cast-in place reinforced concrete
☒ reinforced concrete masonry block
☐ sheet piling
☐ Other (describe):

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☒No

If Yes, by which agency?

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures.	Sheet Numbers: See As-Builts, Sheet FW1
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system.	Sheet Numbers: See As-Builts, Sheet FW1
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure.	Sheet Numbers: N/A
4. A layout detail for the embankment protection measures.	Sheet Numbers: N/A
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations.	Sheet Numbers: N/A

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☒ Yes	☐ No
3.5 feet or more at the upstream end	☒ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☒ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☒ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☒ No

E. LEVEE/FLOODWALL (CONTINUED)

2. Freeboard (continued)

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☒ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☒ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope landside is: N/A

b. The maximum levee slope floodside is: N/A

c. The range of velocities along the levee during the base flood is: (min.) to (max.)

d. Embankment material is protected by (describe what kind):

e. Riprap Design Parameters (check one): ☐ Velocity ☒ Tractive stress
Attach references

					Stone Riprap			
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): See Appendix E.4

☐ UBC (1988) or ☐Other (specify):

b. Stability analysis submitted provides for:

☒ Overturning ☒ Sliding If not, explain:

c. Loading included in the analyses were: See Appendix E.4

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

☐ Seepage (Uplift); ☐ Earthquake @ P_{eq} = %g

☐ 1%-annual-chance significant wave height: ft.

☐ 1%-annual-chance significant wave period: sec.

d. Summary of Stability Analysis Results: Factors of Safety. See Appendix E.4

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)

(Note: Extend table on an added sheet as needed and reference)

e. Foundation bearing strength for each soil type: See Appendix E.4

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection is, is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

7. Settlement See Report

   a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

   b. The computed range of settlement is ft. to ft.

   c. Settlement of the levee crest is determined to be primarily from :

      ☐ Foundation consolidation
      ☐ Embankment compression
      ☐ Other (Describe):

   d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

      Attach engineering analysis to support construction plans.

8. Interior Drainage N/A

   a. Specify size of each interior watershed:

      Draining to pressure conduit: acres
      Draining to ponding area: acres

   b. Relationships Established

Ponding elevation vs. storage	☐ Yes ☐ No
Ponding elevation vs. gravity flow	☐ Yes ☐ No
Differential head vs. gravity flow	☐ Yes ☐ No

   c. The river flow duration curve is enclosed: ☐ Yes ☐ No

   d. Specify the discharge capacity of the head pressure conduit: cfs

   e. Which flooding conditions were analyzed?

      - Gravity flow (Interior Watershed) ☐ Yes ☐ No
      - Common storm (River Watershed) ☐ Yes ☐ No
      - Historical ponding probability ☐ Yes ☐ No
      - Coastal wave overtopping ☐ Yes ☐ No

      If No for any of the above, attach explanation.

   f. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No

      If No, attach explanation.

   g. The rate of seepage through the levee system for the base flood is cfs

   h. The length of levee system used to drive this seepage rate in item g: ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued) N/A

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants:
For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria N/A

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem
Hydrocompaction ☐ is ☐ is not a problem
Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐No

Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

E. LEVEE/FLOODWALL (CONTINUED)

10. Operational Plan And Criteria

    a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☒ Yes ☐ No

    b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
    ☐ Yes ☐No **N/A**

    c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
    ☐ Yes ☐ No **N/A**

    If the answer is No to any of the above, please attach supporting documentation.

11. Maintenance Plan

    a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☒ Yes ☐ No
    If No, please attach supporting documentation.

12. Operations and Maintenance Plan **See O&M Plan**

    Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

F. SEDIMENT TRANSPORT

Flooding Source: Camino Real Wash

Name of Structure: Culvert Under River Rd.

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume acre-feet

Debris load associated with the base flood discharge: Volume acre-feet

Sediment transport rate (percent concentration by volume)

Method used to estimate sediment transport: See Section 6.7.1

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition:

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport:
Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

E. LEVEE/FLOODWALL

1. System Elements **Floodwall South of River Road on the West Downstream Channel**

   a. This Levee/Floodwall analysis is based on (check one):

   ☐ upgrading of an existing levee/floodwall system
   ☒ a newly constructed levee/floodwall system
   ☒ reanalysis of an existing levee/floodwall system

   b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc.	Station to
☒ structural floodwall	Station 10+74.46 to 11+65.0 of West Downstream Channel
☐ Other (describe):	Station to

   c. Structural Type (check one):

   ☐ monolithic cast-in place reinforced concrete
   ☒ reinforced concrete masonry block
   ☐ sheet piling
   ☐ Other (describe):

   d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

   ☐ Yes ☒No

   If Yes, by which agency?

   e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

   1. Plan of the levee embankment and floodwall structures. Sheet Numbers: See As-Builts, Sheet FW2
   2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: See As-Builts, Sheet FW2
   3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: N/A
   4. A layout detail for the embankment protection measures. Sheet Numbers: N/A
   5. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations. Sheet Numbers: N/A

2. Freeboard

   a. The minimum freeboard provided above the BFE is:

   Riverine

3.0 feet or more at the downstream end and throughout	☒ Yes	☐ No
3.5 feet or more at the upstream end	☒ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☒ Yes	☐ No

   Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☒ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☒ No

E. LEVEE/FLOODWALL (CONTINUED)

2. Freeboard (continued)

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☒ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☒ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope landside is: N/A

b. The maximum levee slope floodside is: N/A

c. The range of velocities along the levee during the base flood is: (min.) to (max.)

d. Embankment material is protected by (describe what kind):

e. Riprap Design Parameters (check one): ☐ Velocity ☒ Tractive stress
Attach references

					Stone Riprap			
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): See Appendix E.4

☐ UBC (1988) or ☐Other (specify):

b. Stability analysis submitted provides for:

☒ Overturning ☒ Sliding If not, explain:

c. Loading included in the analyses were: See Appendix E.4

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

☐ Seepage (Uplift); ☐ Earthquake @ P_{eq} = %g

☐ 1%-annual-chance significant wave height: ft.

☐ 1%-annual-chance significant wave period: sec.

d. Summary of Stability Analysis Results: Factors of Safety. See Appendix E.4

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)

(Note: Extend table on an added sheet as needed and reference)

e. Foundation bearing strength for each soil type: See Appendix E.4

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection is, is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

7. Settlement See Report

   a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

   b. The computed range of settlement is ft. to ft.

   c. Settlement of the levee crest is determined to be primarily from :

      ☐ Foundation consolidation
      ☐ Embankment compression
      ☐ Other (Describe):

   d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

      Attach engineering analysis to support construction plans.

8. Interior Drainage N/A

   a. Specify size of each interior watershed:

      Draining to pressure conduit: acres
      Draining to ponding area: acres

   b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

   c. The river flow duration curve is enclosed: ☐ Yes ☐ No

   d. Specify the discharge capacity of the head pressure conduit: cfs

   e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

      If No for any of the above, attach explanation.

   f. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No

      If No, attach explanation.

   g. The rate of seepage through the levee system for the base flood is cfs

   h. The length of levee system used to drive this seepage rate in item g: ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued) N/A

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants:
For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria N/A

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem
Hydrocompaction ☐ is ☐ is not a problem
Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐No

Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

E. LEVEE/FLOODWALL (CONTINUED)

10. Operational Plan And Criteria

    a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☒ Yes ☐ No

    b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
    ☐ Yes ☐No **N/A**

    c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
    ☐ Yes ☐ No **N/A**

    If the answer is No to any of the above, please attach supporting documentation.

11. Maintenance Plan

    a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☒ Yes ☐ No
    If No, please attach supporting documentation.

12. Operations and Maintenance Plan **See O&M Plan**

    Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

F. SEDIMENT TRANSPORT

Flooding Source: Camino Real Wash

Name of Structure: Culvert Under River Rd.

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume acre-feet

Debris load associated with the base flood discharge: Volume acre-feet

Sediment transport rate (percent concentration by volume)

Method used to estimate sediment transport: See Section 6.7.1

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition:

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport:
Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

FEDERAL EMERGENCY MANAGEMENT AGENCY

PAYMENT INFORMATION FORM

Community Name:

Project Identifier:

THIS FORM MUST BE MAILED, ALONG WITH THE APPROPRIATE FEE, TO THE ADDRESS BELOW OR FAXED TO THE FAX NUMBER BELOW.

Type of Request:

☐ MT-1 application
☒ MT-2 application

FEMA
Fee Charge System Administrator
P.O. Box 22787
Alexandria, VA 22304
FAX (703) 317-3076

☐ EDR application

FEMA Project Library
3601 Eisenhower Avenue
Alexandria, VA 22304
FAX (703) 751-7391

Request No.: _____ (if known)

Amount: $4,800.00

☐ INITIAL FEE* ☐ FINAL FEE ☐ FEE BALANCE** ☐ MASTER CARD ☐ VISA ☒ CHECK ☐ MONEY ORDER

*Note: Check only for EDR and/or Alluvial Fan requests (as appropriate).

**Note: Check only if submitting a corrected fee for an ongoing request.

COMPLETE THIS SECTION ONLY IF PAYING BY CREDIT CARD

CARD NUMBER

				—				—				—			
1	2	3	4		5	6	7	8	9	10	11	12	13	14	15	16

EXP. DATE

		—	
Month			Year

_____ _____

Date Signature

NAME *(AS IT APPEARS ON CARD)*: _____
(please print or type)

ADDRESS: _____
(for your credit card receipt-please print or type) _____

DAYTIME PHONE: _____

APPENDIX C:
CAMINO REAL WASH

- Geodetic Control Points From NGVD29 to NAVD88
- Survey field notes
- Survey field note key
- Figure 4: Survey Field Visit Results River Road, SHT 1 of 2
- Figure 5: Survey Field Visit Results East Downstream Channel, SHT 2 of 2
- Figure 6: Flow Allocation

Geodetic Control Points

Township 13S
Range 14E

Index Code	*NGVD29*	*NGVD88*	*Elev. Difference*	*Distance to Wash*
L05	2490.9	2493.13	2.23	
L07	2519.24	2521.47	2.23	
L09	2518.65	2520.88	2.23	
N05	2444.37	2446.6	2.23	3500
N07	2467.98	2470.21	2.23	875
N09	2519.62	2521.88	2.26	1750
P06	2357.49	2359.71	2.22	2600
P07	2384.67	2386.93	2.26	0
P09	2418.79	2421.01	2.22	2628
		Ave=	**2.23**	

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code L09

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

This geodetic control point is, at best, third order and is not a horizontal control point as defined by ARS 33-133. A monument existed at the time the geodetic position was determined. The monument that existed may have been in the proximity of, or may in fact have been, an aliquot corner, or a section corner. The survey which determined the geodetic positions was for the purpose of controlling the City of Tucson and Pima Association of Governments Orthophoto Project, ***not*** for determining whether the monuments represented aliquot corners, or section corners nor to establish horizontal control. Also, read the Pima County DOT Disclaimer.

Township, Range	13S, 14E (Code B)	**Occupation Date**	1996-12-11
Index Code	L09	**Orthometric height (NAVD88)**	2,520.88
NAD 83 Northing (Y)	474,775.147	**Geoid height (NAVD88)**	-94.55
NAD 83 Easting (X)	1,005,792.790	**Ellipsoid height (NAVD88)**	2,426.33
Latitude	N 32°18' 4.89418"	**Orthometric height (NGVD29)**	2,518.65
Longitude	W 110°55'37.06953"	**Vertcon (meters)**	0.680
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.23
Elevation ref. Field Book/Page	Trig Elev	**Combined Factor**	0.9998864960

Comment

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code L05

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

This geodetic control point is, at best, third order and is not a horizontal control point as defined by ARS 33-133. A monument existed at the time the geodetic position was determined. The monument that existed may have been in the proximity of, or may in fact have been, an aliquot corner, or a section corner. The survey which determined the geodetic positions was for the purpose of controlling the City of Tucson and Pima Association of Governments Orthophoto Project, ***not*** for determining whether the monuments represented aliquot corners, or section corners nor to establish horizontal control. Also, read the Pima County DOT Disclaimer.

Township, Range	13S, 14E (Code B)	**Occupation Date**	1996-12-11
Index Code	L05	**Orthometric height (NAVD88)**	2,493.13
NAD 83 Northing (Y)	474,585.141	**Geoid height (NAVD88)**	-94.78
NAD 83 Easting (X)	1,000,204.778	**Ellipsoid height (NAVD88)**	2,398.35
Latitude	N 32°18'3.51991"	**Orthometric height (NGVD29)**	2,490.90
Longitude	W 110°56'42.18994"	**Vertcon (meters)**	0.68
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.231
Elevation ref. Field Book/Page	Trig Elev	**Combined Factor**	0.9998839440

Comment

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code L07

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

This geodetic control point is, at best, third order and is not a horizontal control point as defined by ARS 33-133. A monument existed at the time the geodetic position was determined. The monument that existed may have been in the proximity of, or may in fact have been, an aliquot corner, or a section corner. The survey which determined the geodetic positions was for the purpose of controlling the City of Tucson and Pima Association of Governments Orthophoto Project, ***not*** for determining whether the monuments represented aliquot corners, or section corners nor to establish horizontal control. Also, read the Pima County DOT Disclaimer.

Township, Range	13S, 14E (Code B)	**Occupation Date**	1996-12-11
Index Code	L07	**Orthometric height (NAVD88)**	2,521.47
NAD 83 Northing (Y)	474,545.212	**Geoid height (NAVD88)**	-94.66
NAD 83 Easting (X)	1,003,150.613	**Ellipsoid height (NAVD88)**	2,426.81
Latitude	N 32°18'2.85938"	**Orthometric height (NGVD29)**	2,519.24
Longitude	W 110°56'7.87536"	**Vertcon (meters)**	0.68
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.231
Elevation ref. Field Book/Page	Trig Elev	**Combined Factor**	0.9998846280

Comment

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

Distance ≈ 3500 ft

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code N05

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

This geodetic control point is, at best, third order and is not a horizontal control point as defined by ARS 33-133. A monument existed at the time the geodetic position was determined. The monument that existed may have been in the proximity of, or may in fact have been, an aliquot corner, or a section corner. The survey which determined the geodetic positions was for the purpose of controlling the City of Tucson and Pima Association of Governments Orthophoto Project, ***not*** for determining whether the monuments represented aliquot corners, or section corners nor to establish horizontal control. Also, read the Pima County DOT Disclaimer.

Township, Range	13S, 14E (Code B)	**Occupation Date**	1996-12-04
Index Code	N05	**Orthometric height (NAVD88)**	2,446.60
NAD 83 Northing (Y)	472,027.092	**Geoid height (NAVD88)**	-94.86
NAD 83 Easting (X)	1,000,561.104	**Ellipsoid height (NAVD88)**	2,351.74
Latitude	N 32°17'38.17710"	**Orthometric height (NGVD29)**	2,444.37
Longitude	W 110°56'38.30910"	**Vertcon (meters)**	0.68
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.231
Elevation ref. Field Book/Page	Trig Elev	**Combined Factor**	0.9998864160

Comment

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

DISTANCE ≈ 875 FT

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code N07

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

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Township, Range	13S, 14E (Code B)	**Occupation Date**	1996-12-04
Index Code	N07	**Orthometric height (NAVD88)**	2,470.21
NAD 83 Northing (Y)	472,033.992	**Geoid height (NAVD88)**	-94.75
NAD 83 Easting (X)	1,003,207.661	**Ellipsoid height (NAVD88)**	2,375.46
Latitude	N 32°17'38.00678"	**Orthometric height (NGVD29)**	2,467.98
Longitude	W 110°56' 7.47849"	**Vertcon (meters)**	0.680
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.23
Elevation ref. Field Book/Page	Trig Elev	**Combined Factor**	0.9998871180

Comment

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

Distance ≈ 1750ft

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code N09

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

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Township, Range	13S, 14E (Code B)	**Occupation Date**	1996-12-05
Index Code	N09	**Orthometric height (NAVD88)**	2,521.88
NAD 83 Northing (Y)	472,119.382	**Geoid height (NAVD88)**	-94.65
NAD 83 Easting (X)	1,005,830.246	**Ellipsoid height (NAVD88)**	2,427.23
Latitude	N 32°17'38.61320"	**Orthometric height (NGVD29)**	2,519.62
Longitude	W 110°55'36.91877"	**Vertcon (meters)**	0.69
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.264
Elevation ref. Field Book/Page	Trig Elev	**Combined Factor**	0.9998864780

Comment

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

Distance ≈ 2600ft

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code P06

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

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Township, Range	13S, 14E (Code B)	**Occupation Date**	2006-05-03
Index Code	P06	**Orthometric height (NAVD88)**	2,359.71
NAD 83 Northing (Y)	469,389.090	**Geoid height (NAVD88)**	-095.23
NAD 83 Easting (X)	1,000,677.994	**Ellipsoid height (NAVD88)**	2,264.48
Latitude	N 32°17'12.06463"	**Orthometric height (NGVD29)**	2,357.49
Longitude	W 110°56'37.22625"	**Vertcon (meters)**	0.675
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.22
Elevation ref. Field Book/Page	2232 / 26	**Combined Factor**	0.9998951590

Comment The original point (BP05) was destroyed due to construction. A new point (BP06) was set.

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

DISTANCE = ON WASH

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code P07

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

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Township, Range	13S, 14E (Code B)	**Occupation Date**	1996-12-04
Index Code	P07	**Orthometric height (NAVD88)**	2,386.93
NAD 83 Northing (Y)	469,437.209	**Geoid height (NAVD88)**	-94.85
NAD 83 Easting (X)	1,003,244.039	**Ellipsoid height (NAVD88)**	2,292.08
Latitude	N 32°17'12.30943"	**Orthometric height (NGVD29)**	2,384.67
Longitude	W 110°56'7.33151"	**Vertcon (meters)**	0.69
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.264
Elevation ref. Field Book/Page	1989-J-1 / 51	**Combined Factor**	0.9998911270

Comment

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

Pima County DOT - City of Tucson DOT

Geodetic Control Point

Township 13S, Range 14E, Index Code P09 DISTANCE ≈ 2628 ft

All **CORS users** should read Use of Geodetic Control Points with NGS Datums first.

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Township, Range	13S, 14E (Code B)	**Occupation Date**	2006-05-02
Index Code	P09	**Orthometric height (NAVD88)**	2,421.01
NAD 83 Northing (Y)	469,463.096	**Geoid height (NAVD88)**	-95.03
NAD 83 Easting (X)	1,005,860.278	**Ellipsoid height (NAVD88)**	2,325.98
Latitude	N 32°17'12.32770"	**Orthometric height (NGVD29)**	2,418.79
Longitude	W 110°55'36.85451"	**Vertcon (meters)**	0.677
View this point's	GPS Occupation Sheet (s)	**Vertcon (feet)**	2.221
Elevation ref. Field Book/Page	Trig Elev	**Combined Factor**	0.9998958190

Comment 1/2" rebar was replaced with a 2 1/2" ACP

There are no other occupation dates for this point

Zoom to this control point on the Main MapGuide Map using Autodesk MapGuide.

[Support Information and Glossary] [Geodetic Control Points home page]

PCFCD 069 08-20-07

JR
BF

HI = 6.245
HR = 6.50

Set New base @ 4001/1296
New pt #5000

Pt #'s	DESC
#5100	CP # 77 NEW SET UP
5101	CP # 14 NEW SET UP
5102	CP # 1302 NEW SET UP
5103	CP # 4095 NEW SET UP
5104	CHK / # 4096
5105	CHK / # 4047
5200 - 5255	X-SEC CMND REAL RD.
5256 - 5262	GS's "SWALE"
5263 - 5273	RIP = TOP RIP 1 = TOE
5274 - 5275	36" RCP INV's
5276 - 5283	TOP & TOE SMALL SWALE
5284 - 5287	RANDOM GS's BY SWALE
5288 - 5292	GS's @ WALL N. SIDE
5293 - 5302 & 5304	GS's @ WALL W. SIDE
5303 & 5305	1½ OFF WALL BECAUSE OF DIRT BERM
5306 & 5307	GS's @ WALL W. SIDE
5308 - 5317	℄ SCUPPER INV'S OUTLET
5318 - 5340	RIP 2 = TOP RIP 3 = TOE RIP 4 = TOE & RIP 5 = TOP
5341 - 5344	EP @ SCUPPER
5345 & 5346	℄ INV'S 4' X 6'
5347 & 5348	℄ INV'S UPSTREAM 5' X 8'
5349 & 5350	℄ INV'S DOWNSTREAM 4' X 6'

FB-306

6-13-07 PCFCD 009

JE
BC HI=5.16

TP #1
CHK= BC #4047

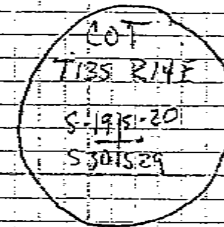
Pt #	DESC
4050-4064	PAD ELEV GROUND SHOTS
4065-4094	TOPO SHOTS
4095	3" ALUMINUM DISK PCHD STA 19 Height=2347.22
4096	3" ALUMINUM DISK PCHD STA 19 Height=2349.35
4097-4119	GROUND SHOTS ROADSIDE RIVER RD.

6-12-07 PCFCD 009

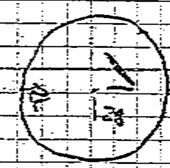
JR
BF

BASE- GOD NAIL ORANGE PT #1

#14 - FD 3" BCSM
IN HH DOWN .7'



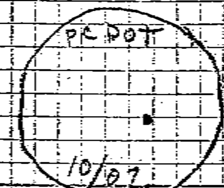
#1302 - FD 2" LC
IN Asphalt
Down .4' ±



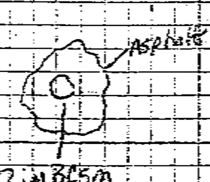
Marked as Shown
Dented SCRATCHED
Could not Read

#4000 Chk pt #77

FD - 2" BCSM
Flush



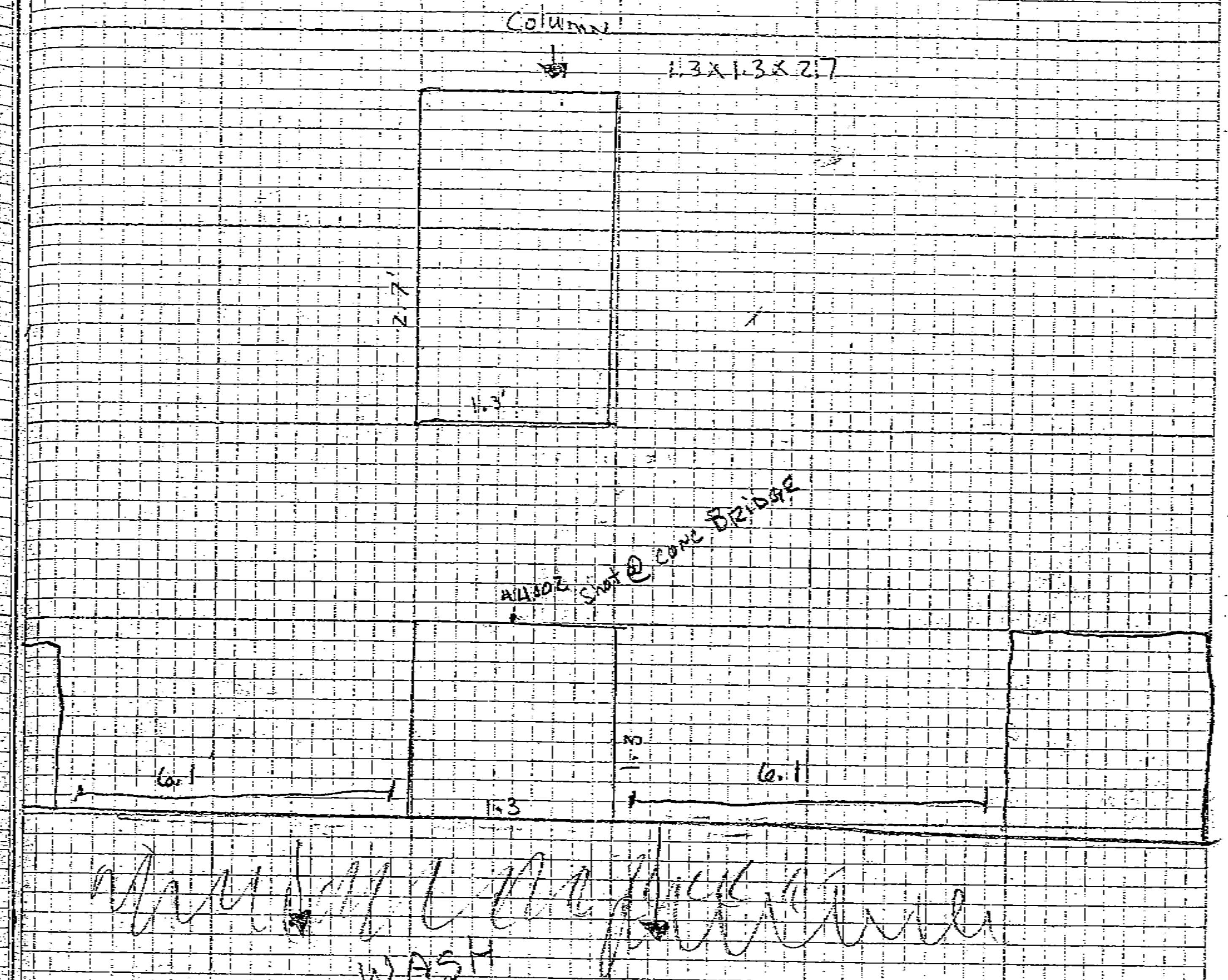
#9001 - FD 2 in BCSM
Down .95'
Could not correctly
Recover



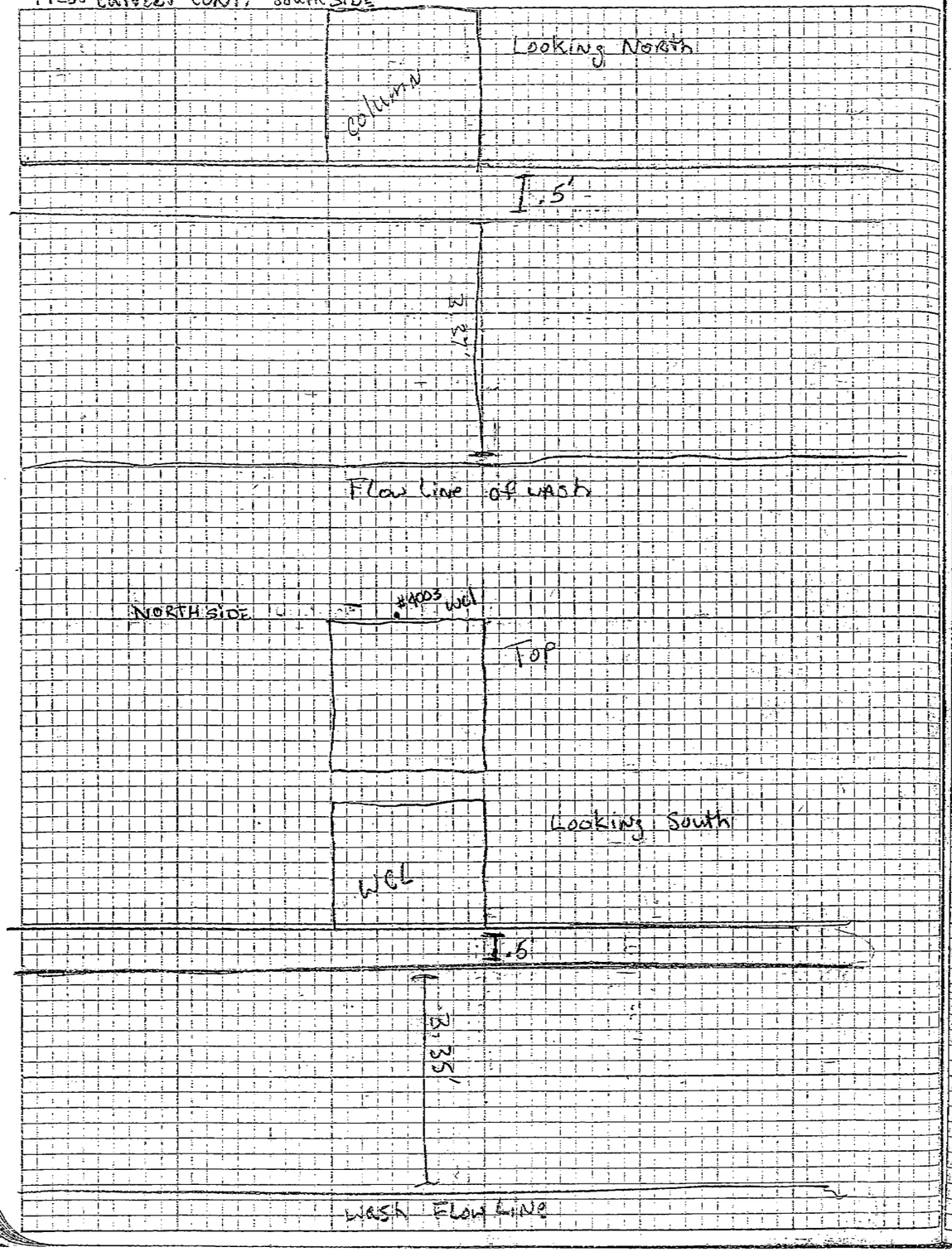
Lat: 32.171292177
Long: -110.561108069
El: 2786.333851

First Culvert
South side

(47)
FB #306



First culvert CONT. south side

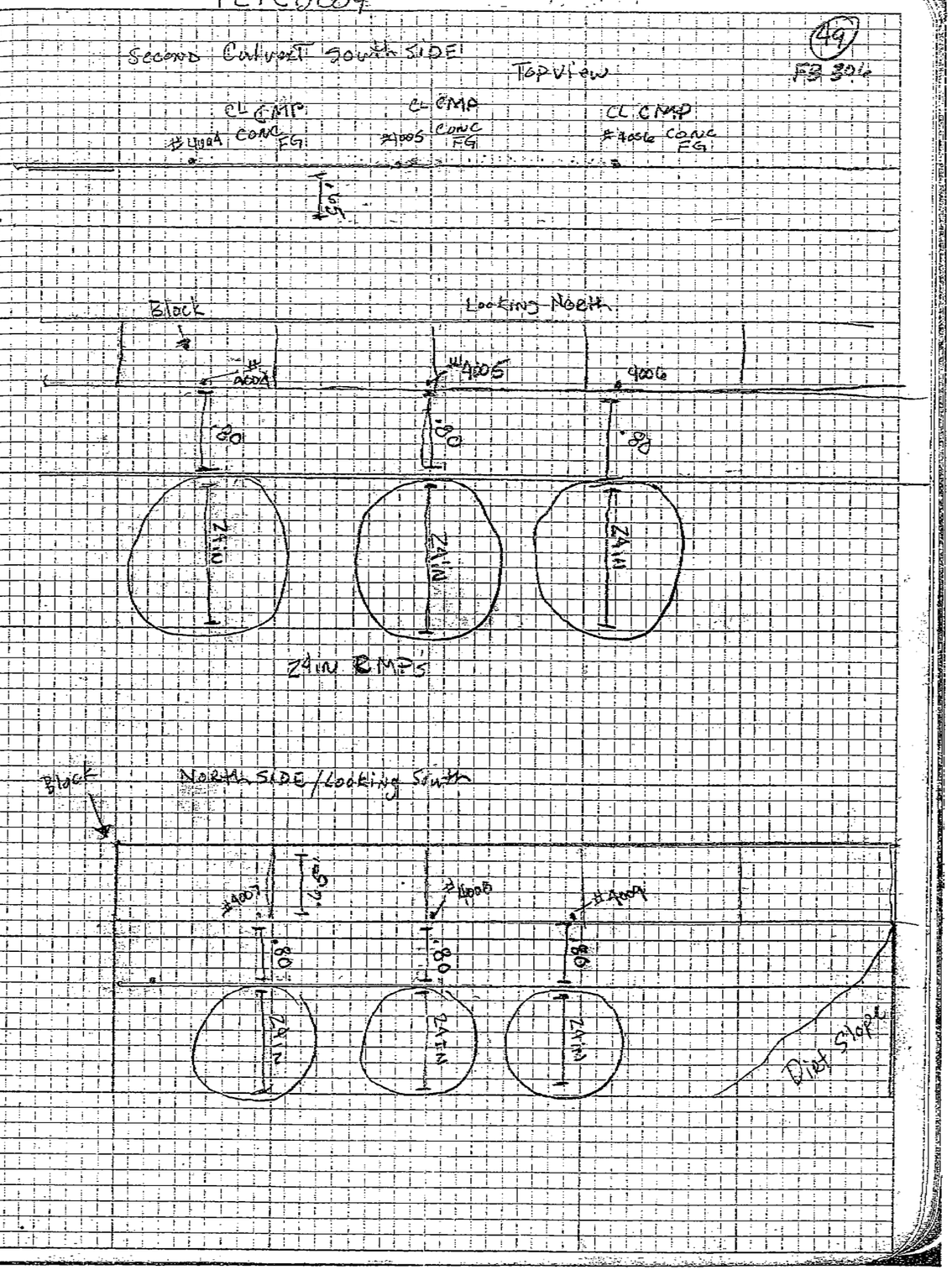


PCFCD009

49

FB 304

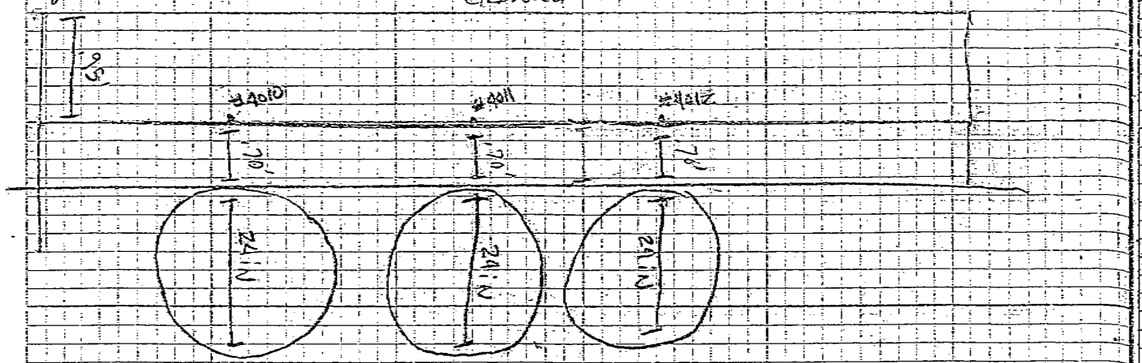
Second Culvert South SIDE



Third culvert southside

Looking NORTH

Graveled

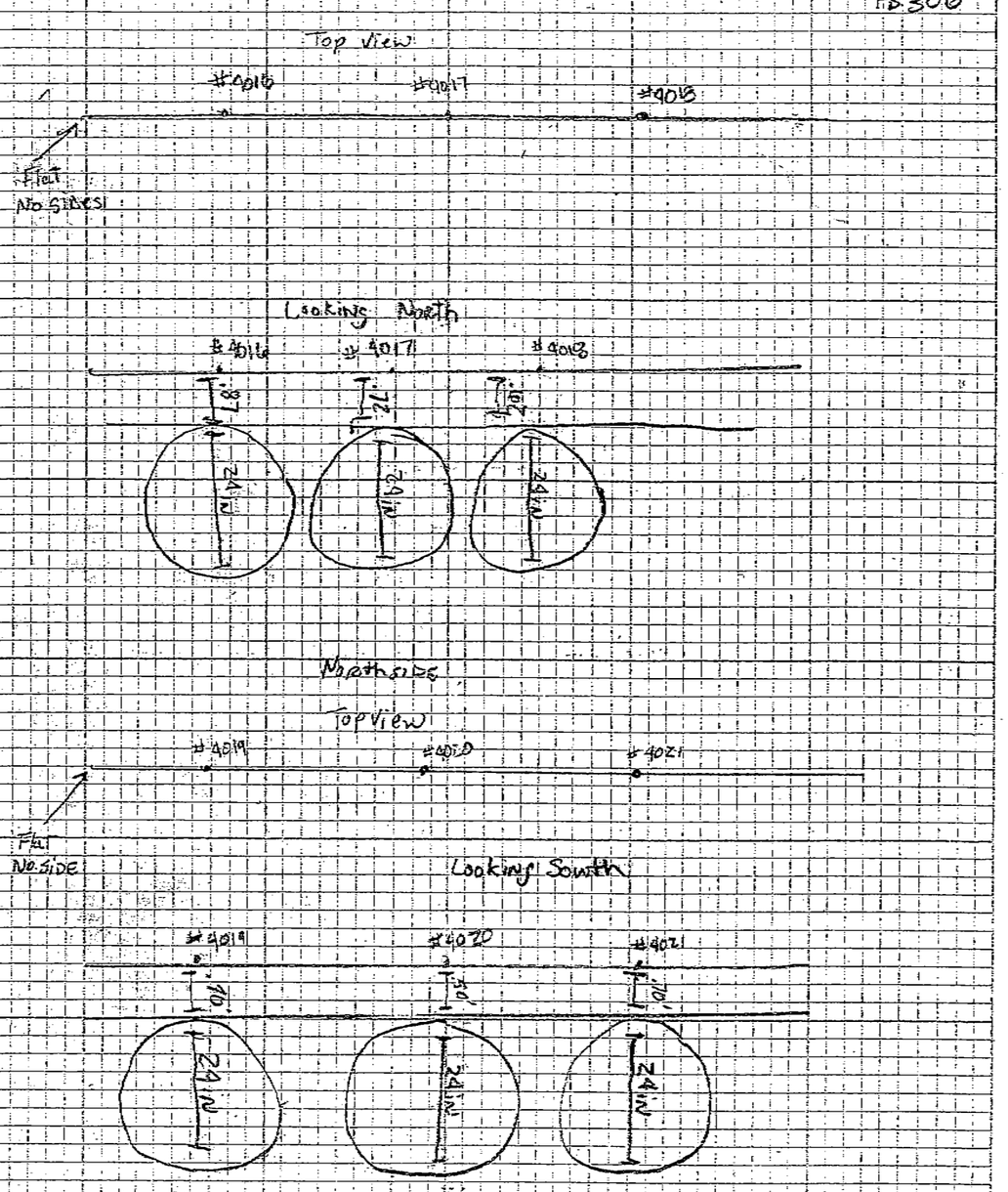


NORTHSIDE Looking South

PCFCD009

Earth Culvert

South side



Fifth culvert

Top View

#4022

FLAT AD SIDE

Looking North

#4022

6.6'

Steel Plate w/Rip Rap

1.85'

Steel Plate w/Rip Rap

Stee Pipe

Top View

#4023

CMP

#4024

#4023 #4024

2.42'

Dirt w/Rip Rap

Dirt w/Rip Rap

CMP starts @ northside steps 1/2 way under driveway and connects to steel pipe

PCFCD009

53

FS 305

North most Wall

#4035 - Block wall 5.05' Height
#4034 - Block wall A.P. 5.38 Hgt
#4027 - Block wall AP 5.38 Hgt
#4028 - B wall COR 5.5 Hgt
#4029 - Bwall COR 5.47 Hgt
#4030 - Bwall COR 4.90 Hgt
#4031 - Bwall AP 5.5 Hgt
#4032 - Bwall COR 4.95 Hgt
#4033 - Bwall COR 5.20 Hgt
#4034 - Bwall COR 5.10 Hgt

Mid House Wall

#4035 - Stucco Wall 7.15 Hgt
#4036 - Stucco wall AP 6.70 Hgt
#4037 - Stucco Wall AP 5.23 Hgt
#4038 - Stucco wall Bldg 10.0 Hgt

Southern Most Wall

#4039 - Block wall 2.95 Hgt
#4040 - Block wall AP 3.10 Hgt
#4041 - Block wall AP 3.5 Hgt
#4042 - Block wall AP 3.11 Hgt
#4043 - Block wall AP 3.6 Hgt
#4044 - Block wall PC 4.0 Hgt
#4045 - Block wall MID 4.08 Hgt
#4046 - Block wall 4.80 Hgt

#4047 - FD Z in 305M RLS 27755

PAD Elevation For House = 2913.00
Elevation Taken from Floor Cert
#4048 - PAD Elevation - North most House

BLUESTAKE		
Code	Full Name	Entity
BSG	BLUESTAKE CATV	2DPline
BSE	BLUESTAKE ELECTRIC	2DPline
BSF	BLUESTAKE FIBEROPTIC	2DPline
BSG	BLUESTAKE GAS	2DPline
BSS	BLUESTAKE SEWER	2DPline
BST	BLUESTAKE TELE	2DPline
BSW	BLUESTAKE WATER	2DPline
BSD	BLUSTAKE STORM SEWER	2DPline
BSRW	BS RECLAIMED WATER	2DPline
COMM		
Code	Full Name	Entity
CAP	CATV PEDESTAL	Point
CUG	Comm. Vault	Point
FOJ	FIBER OPTIC JBOX	2DPline
FOM	Fiber Optic Mkr.	Point
FPD	Fiber Optic Ped.	Point
SAT	SATELLITE DISH	Point
TEP	Tel. Ped	Point
TOS	TELE CLOSURE BOX	3DPline
TUG	TELE UG VAULT	3DPline
TMH	Tele. Manhole	Point
PHN	Telephone	Point
GAS		
Code	Full Name	Entity
GL	GAS LINE	2DPline
GLM	GAS LINE MARKER	Point
GM	Gas Meter	Point
GV	Gas Valve	Point
ELECTRIC		
Code	Full Name	Entity
AC	AC UNIT	Point
ECB	ECB	Point
EBX	ELEC. BOX MISC	3DPline
EJB	ELEC. J BOX	3DPline
EMH	ELEC MANHOLE	Point
EM	ELEC METER	Point
EPN	ELEC PANEL	2DPline
EPD	ELEC PED	Point
ERI	ELEC RISER	Point
EUG	ELEC UG VAULT	Point
EVG	Evap	Point
TRN	TRANSFORMER	Point
OVERHEAD		
Code	Full Name	Entity
OHE	OHE	2DPline
OHET	OHET	2DPline
OHETC	OHETC	2DPline
OHT	OHT	2DPline
UTILITY POLES		
Code	Full Name	Entity
GUY	GUY WIRE	Point
UPL	Pole/Light Mast	Point
UPRL	POLE/RISER/LITE	Point
UPRT	POLE/RISER/TRANS	Point
UPRTL	POLE/RISER/TRANS/LITE	Point
UPTL	POLE/TRANS/LITE	Point
UPR	UPR	Point
UP	UTILITY POLE	Point
UPT	UTILITY POLE/TRANS	Point

SEWER		
Code	Full Name	Entity
HOS	HOS	Point
INS	INVERT SEWER	Point
MH	MH	Point
CO	SEWER CLEAN OUT	Point
SPV	SEWER PRESURE VALVE	Point
SSM	STORM SEWER MANHOLE	Point
WATER		
Code	Full Name	Entity
ARV	AIR RELEASE VALVE	Point
BWV	Back Water Valve	Point
DWM	DOUBLE WM	Point
FH	FH	Point
WMH	WATER MANHOLE	Point
WM	WATER METER	Point
WP	Water Pump	Point
SPG	WATER SPIGOT	Point
WV	WATER VALVE	Point
WVT	Water Vault	3DPline
WEL	Well	Point
RECLAIMED WATER		
Code	Full Name	Entity
RWV	Reclaimed Water Valve	Point
IRRIGATION		
Code	Full Name	Entity
ICB	Irrig. Control Box	Point
ITB	Irrig. Timer Box	Point
IRV	Irrig. Valve	Point
SPR	SPRINKLER	Point
LIGHTING		
Code	Full Name	Entity
LT	LANDSCAPE LIGHT	Point
LCB	Light Control Box	Point
LP	LIGHT POLE	Point
LPD	LIGHT POLE/DOUBLE MAST	Point
LPS	LIGHT POLE/SINGLE MAST	Point
TEST STATIONS		
Code	Full Name	Entity
CTS	Corr. Test Sta.	Point
CTSR	CORR. TEST RISER	Point
MWEL	MONITOR WELL	Point
ROADWAY		
Code	Full Name	Entity
BPG	BIKE PATH GRAVEL	3DPline
BPP	BIKE PATH PAVEMENT	3DPline
BPD	BIKE PATH DIRT	3DPline
DTR	DIRT ROAD	3DPline
DRC	DRIVE-CONC	3DPline
DRD	DRIVE-DIRT	3DPline
DRG	DRIVE-GRAVEL	3DPline
DRP	DRIVE-PAVEMENT	3DPline
EP	EP	3DPline
GB	GRADE BREAK	3DPline
GRD	GRAVEL ROAD	3DPline
GR	GUARD RAIL	2DPline
GUT	GUT	3DPline
SB	SPEED BUMP	2DPline

DRAINAGE		
Code	Full Name	Entity
BOX	BOX CULVERT	3DPline
CB	CATCH BASIN	3DPline
CMP	CMP	2DPline
DP	DRAIN PIPE	Point
DMH	DRAINAGE MANHOLE	Point
FL	FL	3DPline
GRT	GRATE INLET	3DPline
INV	INVERT DRAINAGE	Point
RFD	ROOF DRAIN	Point
RCP	Round Conc. Pipe	2DPline
SC	SCUPPER	3DPline
CHANNEL		
Code	Full Name	Entity
CHD	CHANNEL DIRT	3DPline
CHR	CHANNEL RIP RAP	3DPline
CHC	CHANNEL CONC	3DPline
CHP	CHANNEL PVMT	3DPline
TRAFFIC		
Code	Full Name	Entity
TSM	Traffic Marker	Point
TS	TRAFFIC SIGNAL	Point
TSB	TRAFFIC SIGNAL BOX	Point
TSL	Traffic Signal/Light Mast	Point
SIGNAGE		
Code	Full Name	Entity
CW	CROSSWALK	2DPline
HDC	HANDICAP MARKING	Point
SGL	LARGE SIGN	2DPline
PST	PAVEMENT STRIPING	3DPline
SSN	Sign	Point
CURB		
Code	Full Name	Entity
CBA	CURB BARRIER TRANS	3DPline
CFM	CURB FORM	3DPline
DC	DEPRESSED CURB	3DPline
EC	EXCURB	3DPline
HDR	HDR	3DPline
RC	ROLLED CURB	3DPline
VC	Vert. Curb	3DPline
WD	WEDGE CURB	3DPline
SIDEWALK		
Code	Full Name	Entity
SWB	WALK-BRICK	3DPline
SWC	WALK-CONC	3DPline
SWG	WALK-GRAVEL	3DPline
SWP	WALK-PAVMT	3DPline
BRIDGE		
Code	Full Name	Entity
BAB	BRIDGE ABUTMENT	3DPline
BAC	BRIDGE ACCESS RAMP	3DPline
BBK	BRIDGE DECK	3DPline
BPR	BRIDGE PIER	3DPline
BPI	BRIDGE PILING	Point
BWW	BRIDGE WINGWALL	3DPline

MONUMENT		
Code	Full Name	Entity
X	4" Conc	Point
4R	1/2" REBAR	Point
5R	5/8" REBAR	Point
AGP	AGP	Point
AD	AOSM	Point
BC	BCSM	Point
BM	BM	Point
CL	CENTERLINE	3DPline
CHK	CHECK SHOT	Point
CP	CONTROL POINT	Point
GLO	GLO Brass Cap	Point
STN	GLO STONE	Point
LCP	Lead Cap Pipe	Point
MAG	Mag Nail	Point
MON	Monument	Point
NL	Nail	Point
OIP	OIP I.D.	Point
PNL	PANEL POINT	Point
PIN	PIN	Point
PK	PK Nail	Point
RWM	RW Marker	Point
SURFACE		
Code	Full Name	Entity
BR	Brick Pavers	3DPline
C	C	3DPline
SP	CONC SPLASH PAD	3DPline
CS	CONCRETE SHOT	Point
EG	EDGE GUNITE	3DPline
GRV	GRAVEL	2DPline
GS	GS	Point
NG	NG	Point
BMP	Parking Bumper	2DPline
PAV	PAVEMENT SLAB	3DPline
PS	PS	Point
RIP	RIPRAP	3DPline
RHM	ROCK VERY LARGE	Point
TOE	TOE	3DPline
TOP	TOP	3DPline
RAILROAD		
Code	Full Name	Entity
BAL	BALLAST	3DPline
RRG	RR CROSSING GATE	Point
RRS	RR SIGNAL	Point
RR	RR SNAP	Point
RRT	RR TRACK	3DPline
TRO	Trolley Track	3DPline

STRUCTURE		
Code	Full Name	Entity
BAR	BARRIER	3DPline
BB	Basketball Rim/Pole	Point
BAT	BATTING CAGE	3DPline
BLC	BLEACHERS	3DPline
BOL	BOLLARD	Point
BLD	BUILDING	3DPline
BOH	BUILDING OVERHANG	2DPline
CG	CATTLE GUARD	3DPline
FTR	CONC FOOTER	3DPline
RPC	CONC RAMP	3DPline
STC	CONC STEPS	3DPline
CLT	COOLING TOWER	2DPline
FEE	FFE	Point
GAB	Gabion	3DPline
HR	HANDRAIL	2DPline
LDK	LOADING DOCK	3DPline
LKR	LOCKER	2DPline
MBX	Mailbox	Point
RPM	METAL RAMP	3DPline
STM	METAL STEPS	2DPline
PM	Parking meter	Point
PLR	PILLAR	Point
PRC	PORCH	3DPline
POR	PORTABLE BUILDING	2DPline
SHD	SHED	3DPline
TRL	Trailer	2DPline
VEN	Vent Pipe	Point
WCR	Wheel Chair Ramp	3DPline
MISC		
Code	Full Name	Entity
DUM	DUMPSTER	2DPline
MIL	MISC LINE	Line
MIP	MISC POINT	Point
LLI	MISC. LANDSCAPE LINE	3DPline
POL	Misc. Pole	Point
MH	UNKNOW MH	Point

WALL/FENCES		
Code	Full Name	Entity
WA	Adobe Wall	3DPline
BWF	BARB WIRE FENCE	2DPline
WBL	Block Wall	3DPline
WBR	Brick Wall	3DPline
CLF	CHAINLINK FENCE	2DPline
WCN	Concrete Wall	3DPline
COL	FENCE COLUMN	Point
FP	Fence Post	Point
GAT	GATE	2DPline
HDW	HEADWALL	3DPline
HWF	HOG WIRE FENCE	2DPline
MF	MISC FENCE	2DPline
WCL	Wall Column	Point
WRT	Wall-Retaining	3DPline
WRK	Wall-Rock	3DPline
WW	WING WALL	3DPline
WF	Wood Fence	2DPline
WIF	WROUGHT IRON FENCE	2DPline
VEGETATION		
Code	Full Name	Entity
AGV	AGAVE	Point
BCA	BARREL CACTUS	Point
BSH	BUSH	Point
CHO	CHOLLA	Point
CNF	CONIFER TREE	Point
DEC	DECIDUOUS TREE	Point
EUC	EUCALYPTUS TREE	Point
VEG	Flower/Cactus Bed	3DPline
GRS	GRASS	2DPline
HEG	HEDGE	2DPline
IRN	IRONWOOD TREE	Point
MES	MESQUITE TREE	Point
OAK	OAK TREE	Point
OCO	OCOTILLO	Point
PLM	PALM TREE	Point
PAL	PALO VERDE TREE	Point
PLN	PLANTER	3DPline
PRI	PRICKLEY PEAR	Point
SAG	SAGUARO	Point

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT

CAMINO REAL WASH
L.O.M.R.

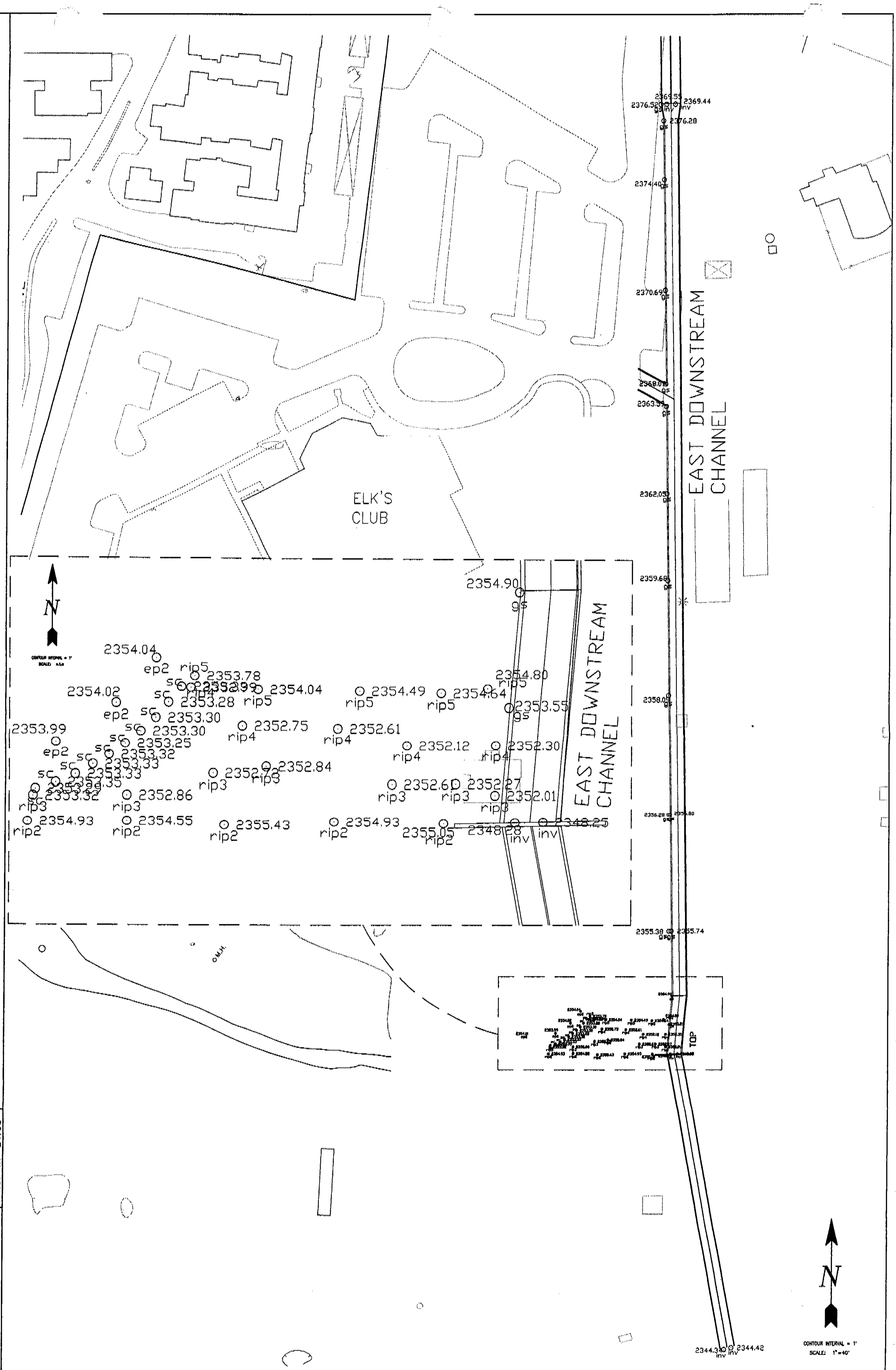
SURVEY FIELD VISIT RESULTS
FIGURE 4

Castro Engineering
CIVIL ENGINEERING
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2110 (fax)

CASTRO JOB NO. PCDT009

1"=20'
C.I. = 1'

SHEET 1 of 2



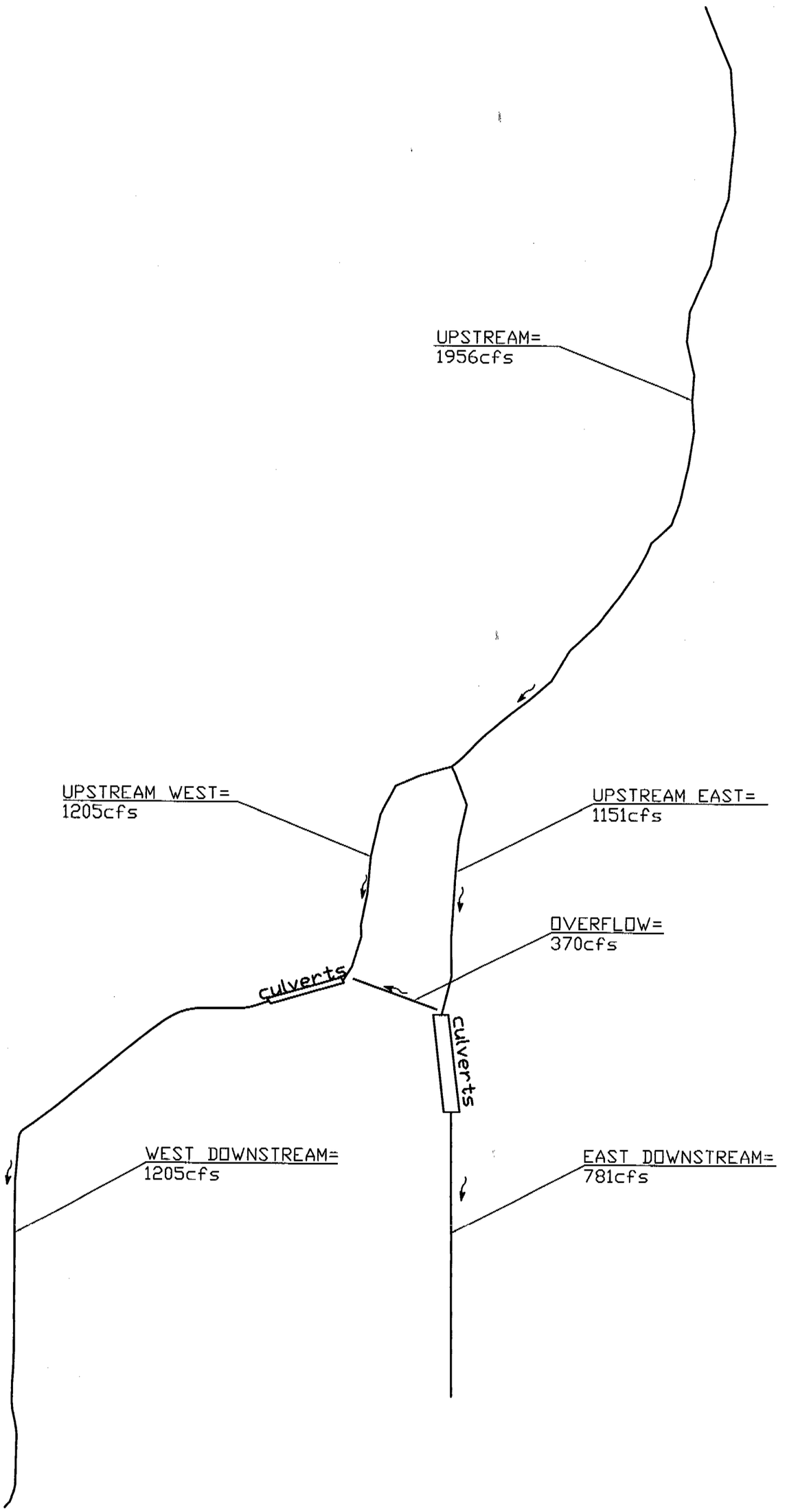
CASTRO JOB NO. PCDT009 | SCALE: 1"=40' | SHEET 2 of 2

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT

CAMINO REAL WASH
L.O.M.R.

FIGURE 5
SURVEY FIELD VISIT RESULTS
EAST DOWNSTREAM CHANNEL

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2116 (fax)



CASTRO JOB NO. PCDT009

SCALE: N.T.S.

SHEET 1

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT

CAMINO REAL WASH
L.O.M.R.

FIGURE 6
FLOW ALLOCATION

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

APPENDIX D
HYDROLOGIC ANALYSIS
SUPPORTING DOCUMENTATION
FOR
CAMINO REAL WASH
LOMR

Pima County Regional
FLOOD CONTROL
DISTRICT

PIMA COUNTY
REGIONAL FLOOD CONTROL DISTRICT
97 EAST CONGRESS STREET, THIRD FLOOR
TUCSON, ARIZONA 85701-1797

SUZANNE SHIELDS, P.E.
DIRECTOR

(520) 243-1800
FAX (520) 243-1621

May 27, 2008

Andy MacLeod
Castro Engineering Corp.
3580 W. Ina Road, Suite 200
Tucson, Arizona 85741

Re: Correction of the Camino Real Wash discharge

Dear Mr. MacLeod:

The District is requesting a fee proposal to process a Change Order for the Camino Real Wash LOMR. We have reanalyzed the hydrology with the Camino Real Wash and discovered a minor error in the basin factor. The average basin factor upstream of River Road should be 0.041. Enclosed you find a revised hydrologic data. No other hydrologic data has been modified from the original CLOMR. Even though the drainage infrastructure will fit the higher discharge Castro Engineering has modeled, the LOMR application must be updated to reflect the discharge values associated with the corrected basin factor. We anticipate the change in discharge from the FEMA approved CLOMR may create additional review comments from FEMA with the LOMR application.

The District is also requesting additional survey work to define a drainage maintenance and access easement in the Rio Cancion Business Park. I have provided you with the approximate location of the easement boundaries. I will want to meet with you at the site to field fit the easement. The legal description of the easement must be formatted for use as an exhibit for a recorded instrument.

Please prepare a fee proposal and a small Scope of Work so that I may process a Change Order for the additional services we are requesting. Make sure the fee proposal includes what additional funds are needed within the tasks contained in the existing Scope of Work.

Sincerely,

R. "Terry" Hendricks, CFM, Chief Hydrologist
Planning and Development Division

RTH:cd

cc: Chirs Cawein, Deputy Director
Bill Zimmerman, Manager, Planning and Development Division.

ENCLOSURE

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

(PC-HYDRO Version 3.0)

Arroyo Engineering, Inc.

Client: Pima County | Prepared by: Terry Hendricks

Project Name: Camino Real Wash | Date: 5/15/2008

Concentration Point: CP120, River Road | Job #:

Watershed Area: 1.7 sm | Watershed Type: Suburban-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	280.0	5,600	0.0500	.041
2	75.0	3,000	0.0250	.041
3	70.0	4,200	0.0167	.041
4	150.0	6,800	0.0221	.041
5	35.0	1,200	0.0292	.041
6	34.0	1,500	0.0227	.041

Length of Watercourse (Lc): 22,300 feet | Mean Slope: 0.0256

Length to Cen. of Gravity (Lca): 10,300 feet | Weighted Basin Fac.: 0.041

Veg. Cover Type(s): Desert Brush | Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Values

	1-hour	2-hour	3-hour	6-hour	24-hour
Point Values (in)	2.59	2.92	3.14	3.55	4.53
Areal Values (in)	2.59	2.92	3.14	3.55	4.53

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	71	82.	86.22	0.515
C	0	.	.	0.000
D	29	90.	92.26	0.695
Imp.	18	99.	99.	0.955

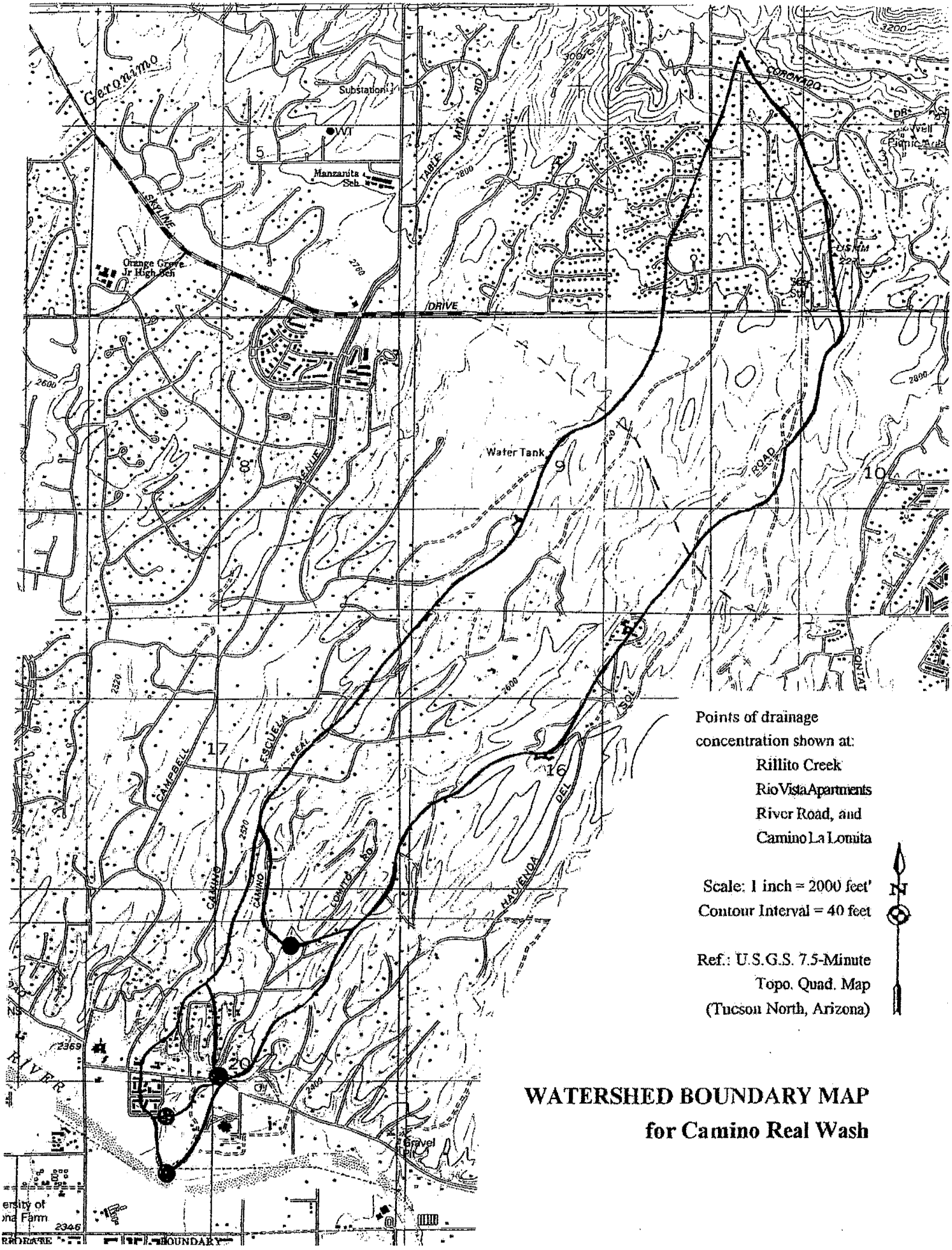
Weighted Runoff Coef. (Cw): 0.637

Time of Concentration: 55.0 min

Rainfall Intensity (i) @ Tc: 2.75 in/hr

Runoff Supply Rate (q) @ Tc: 1.75 in/hr

PEAK DISCHARGE: 1,955.8 cfs



Points of drainage concentration shown at:
Rillito Creek
Rio Vista Apartments
River Road, and
Camino La Lomita

Scale: 1 inch = 2000 feet'
Contour Interval = 40 feet

Ref.: U.S.G.S. 7.5-Minute
Topo. Quad. Map
(Tucson North, Arizona)

WATERSHED BOUNDARY MAP
for Camino Real Wash

APPENDIX E:
HYDRAULIC ANALYSIS SUPPORTING DOCUMENTATION
FOR
CAMINO REAL WASH LOMR

Appendix E.1

Exhibit 1: Camino Real West Channel
Looking Upstream

Exhibit 2: Camino Real Upstream Reach
Looking Upstream

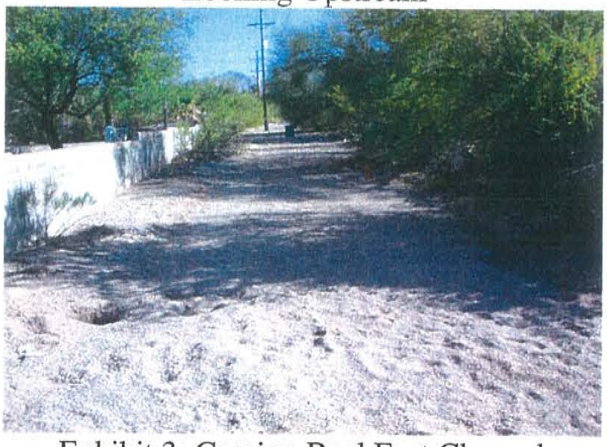


Exhibit 3: Camino Real East Channel
Looking Upstream

Manning's Roughness
Summary Table

Appendix E.1

River	Reach	River Station	n value	n #1	n #2	n #3	n #4	n #5	n #6	n #7	n #8
Camino Real	Upstream	3429.864	n	0.045	0.035	0.045					
Camino Real	Upstream	3331.857	n	0.045	0.035	0.045					
Camino Real	Upstream	3241.052	n	0.045	0.035	0.03	0.045				
Camino Real	Upstream	3150.14	n	0.045	0.035	0.03	0.045				
Camino Real	Upstream	3051.702	n	0.045	0.035	0.04	0.035	0.04			
Camino Real	Upstream	2936.949	n	0.09	0.055	0.045	0.035	0.045			
Camino Real	Upstream	2852.425	n	0.045	0.04	0.03	0.04				
Camino Real	Upstream	2743.588	n	0.045	0.04	0.035	0.04				
Camino Real	Upstream	2625.161	n	0.04	0.035	0.04	0.035	0.045			
Camino Real	Upstream	2477.176	n	0.04	0.035	0.04	0.045				
Camino Real	Upstream	2383.522	n	0.045	0.04	0.035	0.04				
Camino Real	Upstream	2255.96	n	0.04	0.09	0.04	0.035	0.04	0.055	0.09	
Camino Real	Upstream	2141.959	n	0.045	0.04	0.035	0.045	0.04	0.055	0.09	
Camino Real	Upstream	2064.338	n	0.045	0.04	0.09	0.35	0.045			
Camino Real	Upstream	1943.236	n	0.045	0.04	0.065	0.035	0.04	0.045		
Camino Real	Upstream	1871.821	n	0.045	0.04	0.035	0.04				
Camino Real	Upstream	1821.303	n	0.045	0.04	0.035	0.04				
Camino Real	Upstream	1773.468	n	0.045	0.04	0.035	0.05				
Camino Real	Upstream	1647.316	n	0.45	0.04	0.035	0.04				
Camino Real	Upstream	1542.871	n	0.05	0.035	0.05					
Camino Real	Upstream	1424.651	n	0.045	0.04	0.035	0.04	0.065	0.09	0.035	0.04
Camino Real	Upstream	1314.441	n	0.04	0.035	0.09	0.04	0.045			
Camino Real	Upstream	1181.912	n	0.04	0.035	0.04	0.045				
Camino Real	Upstream	1062.566	n	0.04	0.035	0.04					
Camino Real	Upstream	944.986	n	0.04	0.035	0.03	0.04				
Camino Real	Upstream	846.091	n	0.065	0.045	0.05	0.09	0.045	0.065		
Camino Real	West	751.24	n	0.09	0.06	0.09	0.06	0.07			
Camino Real	West	581.907	n	0.05	0.065	0.05	0.065				
Camino Real	West	552.659	n	0.045	0.065	0.045	0.065				
Camino Real	West	534.16	Culvert								
Camino Real	West	523.966	n	0.04	0.065	0.09	0.065	0.045	0.065		
Camino Real	West	465.158	n	0.09	0.065	0.045	0.065				
Camino Real	West	396.133	n	0.09	0.045	0.065					
Camino Real	West	380.66	Culvert								
Camino Real	West	365.77	n	0.09	0.065	0.045	0.065	0.045	0.065		
Camino Real	West	330.884	n	0.09	0.065	0.045	0.065				
Camino Real	West	301.971	n	0.09	0.045	0.065	0.045	0.065	0.045	0.065	
Camino Real	West	288.25	Culvert								
Camino Real	West	273.774	n	0.09	0.065	0.045	0.065	0.045	0.065		
Camino Real	West	257.256	n	0.09	0.065	0.045	0.065				
Camino Real	West	221.641	n	0.09	0.065	0.045	0.065				
Camino Real	West	203.926	n	0.09	0.065	0.045	0.065	0.045	0.065		
Camino Real	West	191.64	Bridge								
Camino Real	West	181.696	n	0.09	0.045	0.065	0.045	0.065	0.045	0.065	
Camino Real	West	167.778	n	0.09	0.065	0.045	0.065				
Camino Real	West	121.367	n	0.045	0.028	0.045	0.065				
Camino Real	West	67.625	n	0.09	0.028	0.045					
Camino Real	East	633.541	n	0.065	0.04	0.065	0.065				
Camino Real	East	480.056	n	0.065	0.045	0.065					
Camino Real	East	365.03	n	0.065	0.045						

Manning's Roughness
Summary Table

River	Reach	River Station	n value	n #1	n #2	n #3	n #4	n #5	n #6	n #7	n #8
Camino Real	East	300.27	n	0.065	0.045						
Camino Real	East	252.61	n	0.028	0.045	0.09					
Camino Real	East	222.919	n	0.045	0.028	0.04	0.045	0.09			
Camino Real	East	199.073	n	0.028	0.045						
Camino Real	East	153.126	n	0.028	0.045	0.045					
Camino Real	East	98.849	n	0.028	0.028	0.028					
Camino Real	East	38.444	n	0.028	0.028	0.028					
Overflow	South	237.369	n	0.028	0.028	0.028					
Overflow	South	199.788	n	0.028	0.028	0.028					
Overflow	South	174.844	n	0.028	0.028	0.028					
Overflow	South	149.791	n	0.028	0.028	0.028					
Overflow	South	129.767	n	0.028	0.028	0.028					
Overflow	South	99.652	n	0.028	0.028	0.028					
Overflow	South	74.912	n	0.028	0.028	0.028					
Overflow	South	50.145	n	0.028	0.028	0.028					
Overflow	South	25.041	n	0.028	0.028	0.028					
Overflow	South	0.002	n	0.028	0.028	0.028					

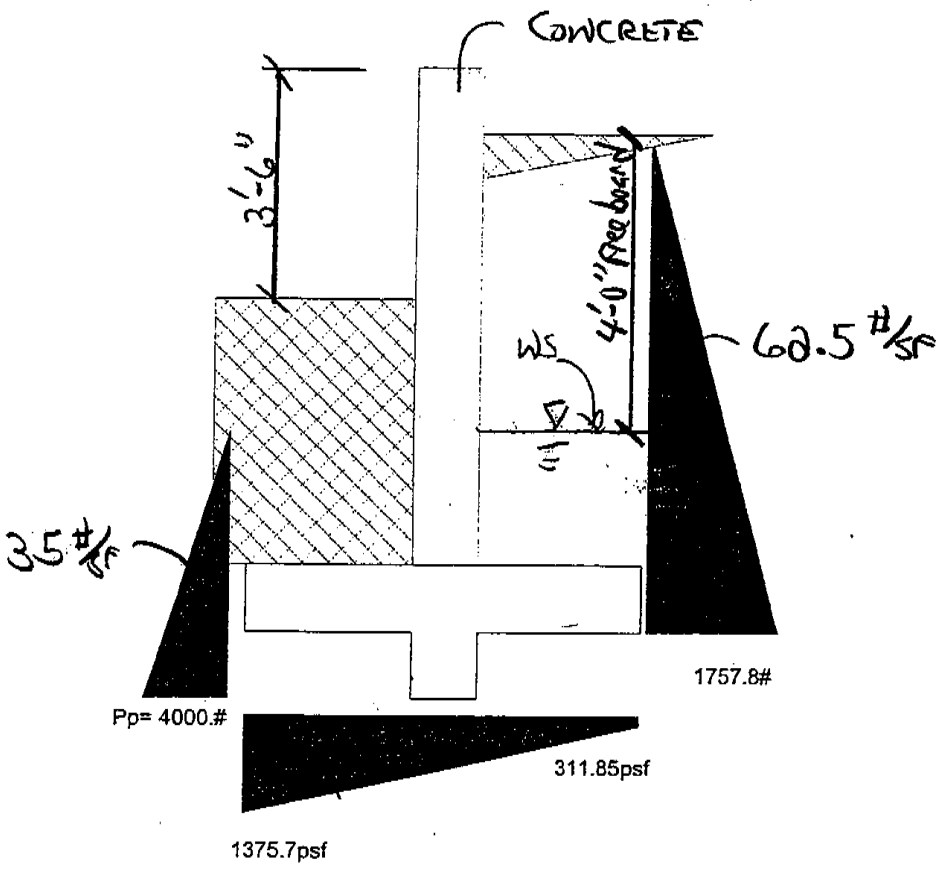
APPENDIX E.4:
CAMINO REAL WASH

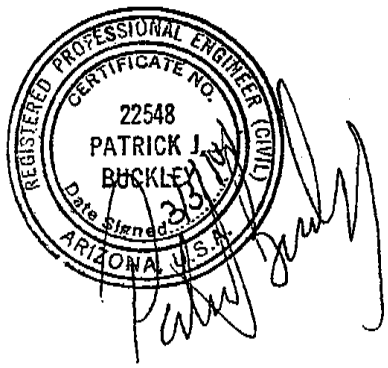
- LEVEE AND FLOODWALL DESIGN FORMS
- LEVEE AND FLOODWALL CALCULATIONS

River Road Flood Wall
Camino Real Wash

DSN: RJB
3/31/04
P. 1/4

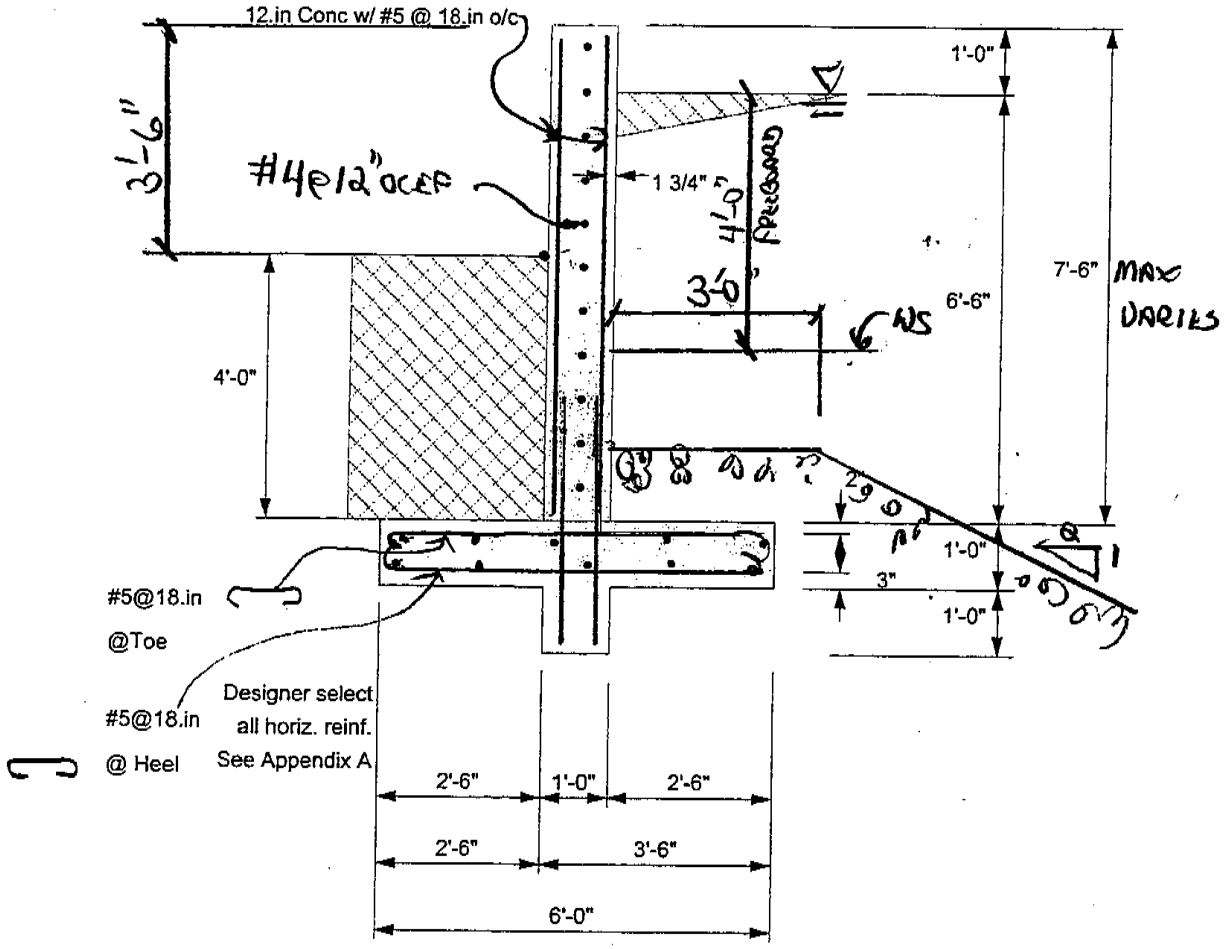
Design of Wall: Top of Wall 3'-6" of Roadside Grade.
Wall Design 4' water (flood) above proposed water surface (W.S)
Concrete Design

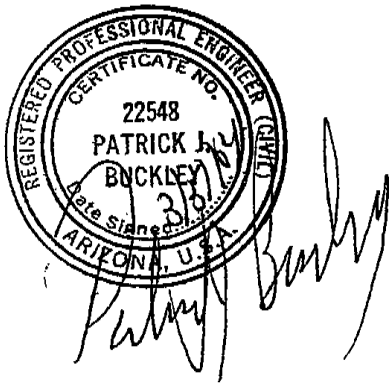




RIVER ROAD FLOOD WALL
CAMINO REAL WASH

DSN. RB
3/31/04
Pg. 21





Title : River Road Flood Wall
Job # : #4TRRCA Dsgnr: PJB
Description....
Flood Wall at Camino Real Wash

Date: MAR 31,2004

This Wall in File: c:\rp6\river road flood wall.rp5

etainPro Version 6.0
uild Date : 10-SEP-2001, (c) 1989-2001

Cantilevered Retaining Wall Design

Criteria

Retained Height	=	6.50 ft
Wall height above soil	=	1.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	48.00 in
Soil Density	=	110.00 pcf
Wind on Stem	=	0.0 psf

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	62.5 psf/ft
Toe Active Pressure	=	30.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Water height over heel	=	0.0 ft
Footing||Soil Frictior	=	0.300
Soil height to ignore for passive pressure	=	24.00 in

Footing Dimensions & Strengths

Toe Width	=	2.50 ft
Heel Width	=	3.50
Total Footing Width	=	6.00
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	12.00 in
Key Distance from Toe	=	2.50 ft

f'c = 2,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Design Summary

Total Bearing Load	=	5,063 lbs
...resultant ecc.	=	7.56 in
Soil Pressure @ Toe	=	1,376 psf OK
Soil Pressure @ Heel	=	312 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,926 psf
ACI Factored @ Heel	=	437 psf
Footing Shear @ Toe	=	15.4 psi OK
Footing Shear @ Heel	=	10.2 psi OK
Allowable	=	76.0 psi

Wall Stability Ratios

Overturning	=	3.73 OK
Sliding	=	3.14 OK

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	1,757.8 lbs
less 100% Passive Force	= -	4,000.0 lbs
less 100% Friction Force	= -	1,518.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Footing Design Results

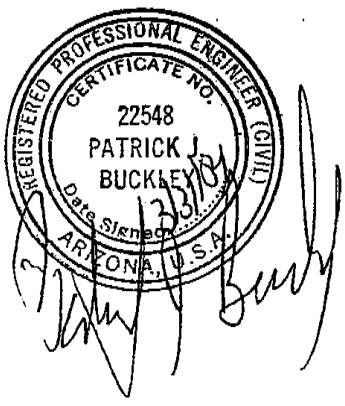
		Toe	Heel
Factored Pressure	=	1,926	437 psf
Mu' : Upward	=	5,372	2,011 ft-#
Mu' : Downward	=	2,581	3,784 ft-#
Mu: Design	=	2,791	1,774 ft-#
Actual 1-Way Shear	=	15.41	10.18 psi
Allow 1-Way Shear	=	76.03	76.03 psi

Toe Reinforcing = # 5 @ 18.00 in
Heel Reinforcing = # 5 @ 18.00 in
Key Reinforcing = None Spec'd

Stem Construction

		Top Stem	2nd
		Stem OK	Bar Lap/Emb
Design height	ft =	3.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Thickness	=	12.00	12.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	18.00	18.00
Rebar Placed at	=	Edge	Edge
Design Data			
fb/FB + fa/Fa	=	0.081	0.465
Total Force @ Section	lbs =	625.3	1,836.5
Moment....Actual	ft-# =	750.7	4,319.2
Moment.....Allowable	ft-# =	9,285.4	9,285.4
Shear.....Actual	psi =	5.1	15.0
Shear.....Allowable	psi =	93.1	93.1
Lap Splice if Above	in =	35.60	35.60
Lap Splice if Below	in =	35.60	11.74
Wall Weight	psf =	150.0	150.0
Rebar Depth 'd'	in =	10.19	10.19
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Special Inspection	=		
Modular Ratio 'n'	=		
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type = Normal Weight			
Concrete Data			
f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

Other Acceptable Sizes & Spacings
Toe: #4@ 13.25 in, #5@ 20.50 in, #6@ 29.00 in, #7@ 39.25 in, #8@ 48.25 in, #9@ 4
Heel: Not req'd, Mu < S,* Fr
Key: Not req'd, Mu < S * Fr



RetainPro Version 6.0
Build Date : 10-SEP-2001, (c) 1989-2001

Cantilevered Retaining Wall Design

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	1,757.8	2.50	4,394.5	Soil Over Heel	= 1,787.5	4.75	8,490.6
Toe Active Pressure	=				Sloped Soil Over Heel	=		
Surcharge Over Toe	=				Surcharge Over Heel	=		
Adjacent Footing Load	=				Adjacent Footing Load	=		
Added Lateral Load	=				Axial Dead Load on Stem	=	0.00	
Load @ Stem Above Soil	=				Soil Over Toe	= 1,100.0	1.25	1,375.0
					Surcharge Over Toe	=		
					Stem Weight(s)	= 1,125.0	3.00	3,375.0
					Earth @ Stem Transitions	=		
					Footing Weight	= 900.0	3.00	2,700.0
					Key Weight	= 150.0	3.00	450.0
					Vert. Component	=		
Total	=	1,757.8	**O.T.M.** =	4,394.5	**Total** =	5,062.5 lbs	**R.M.=**	16,390.6

Resisting/Overturning Ratio = **3.73**

Vertical Loads used for Soil Pressure = 5,062.5 lbs

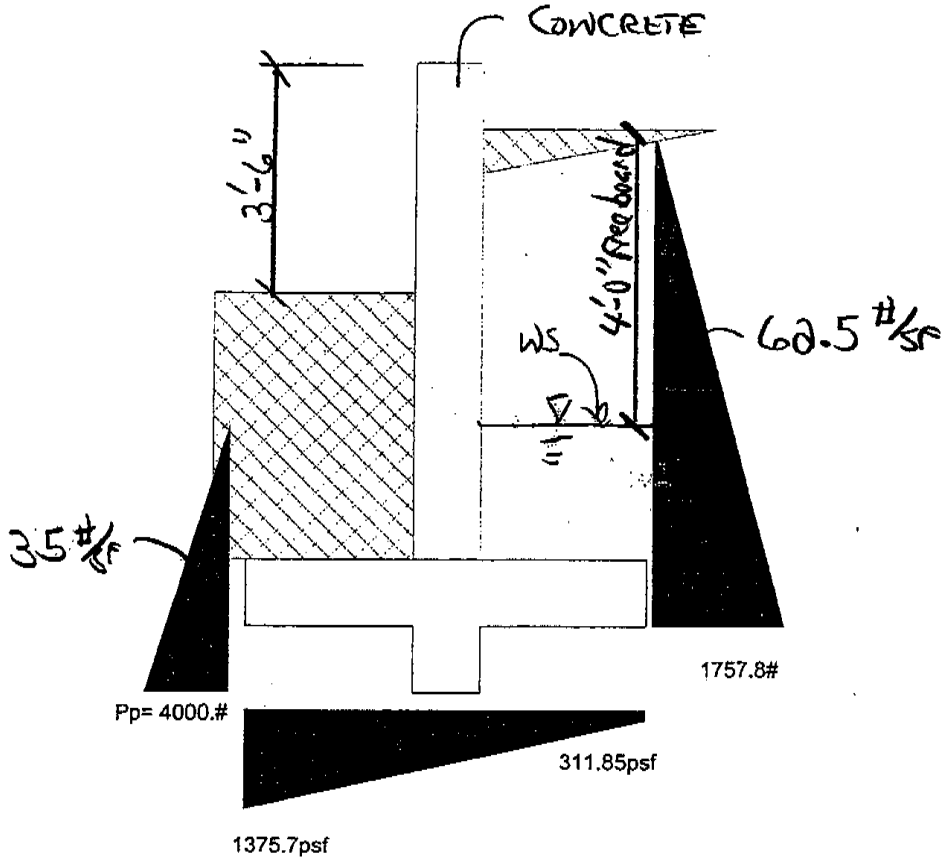
Vertical component of active pressure NOT used for soil pressure

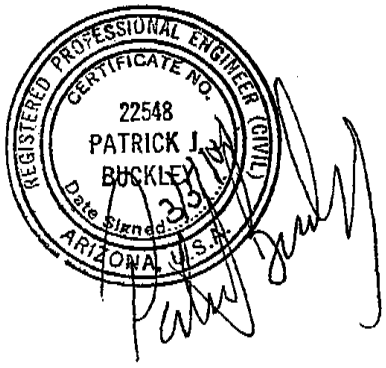
REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
22548
PATRICK J.
BUCKLEY
Date Signed 3/31/04
ARIZONA, U.S.A.

River Road Flood Wall
Camino Real Wash

DSN: RJB
3/31/04
P. 1/4

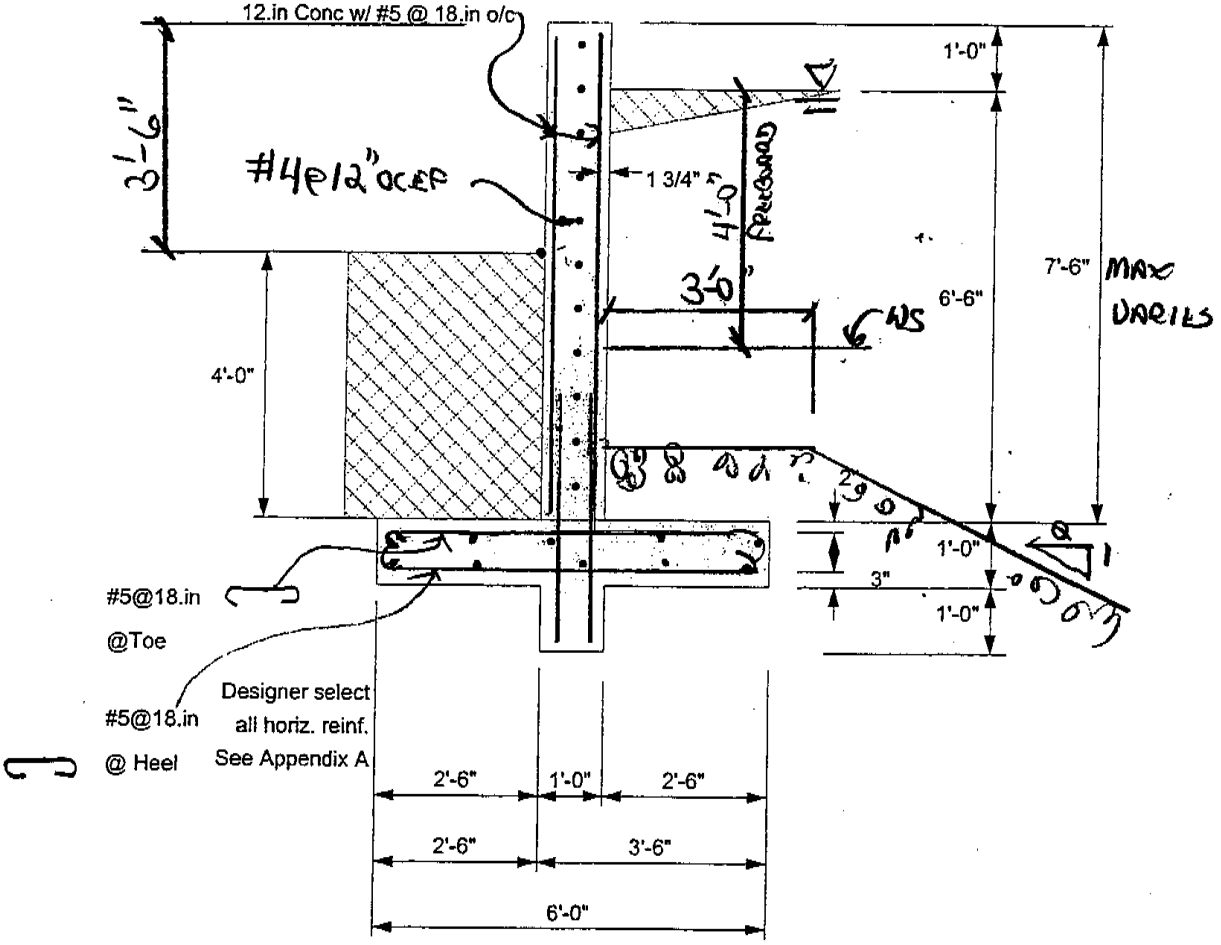
Design of Wall: Top of Wall 3'-6" of Roadside Grade.
Wall Design: 4' water (flood) above proposed water surface (W.S)
Concrete Design





RIVER ROAD FLOOD WALL
CAMINO REAL WASH

DSN. RJB
3/31/04
Pg. 21



REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
22548
PATRICK J.
BUCKLEY
Date Signed 3/31/04
ARIZONA, U.S.A.

RetainPro Version 6.0
Build Date : 10-SEP-2001, (c) 1989-2001

Cantilevered Retaining Wall Design

Criteria

Retained Height	=	6.50 ft
Wall height above soil	=	1.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	48.00 in
Soil Density	=	110.00 pcf
Wind on Stem	=	0.0 psf

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	62.5 psf/ft
Toe Active Pressure	=	30.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Water height over heel	=	0.0 ft
Footing||Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	24.00 in

Footing Dimensions & Strengths

Toe Width	=	2.50 ft
Heel Width	=	3.50
Total Footing Width	=	6.00
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	12.00 in
Key Distance from Toe	=	2.50 ft

f'c = 2,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Design Summary

Total Bearing Load	=	5,063 lbs
...resultant ecc.	=	7.56 in
Soil Pressure @ Toe	=	1,376 psf OK
Soil Pressure @ Heel	=	312 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,926 psf
ACI Factored @ Heel	=	437 psf
Footing Shear @ Toe	=	15.4 psi OK
Footing Shear @ Heel	=	10.2 psi OK
Allowable	=	76.0 psi

Wall Stability Ratios

Overturning	=	3.73 OK
Sliding	=	3.14 OK

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	1,757.8 lbs
less 100% Passive Force	= -	4,000.0 lbs
less 100% Friction Force	= -	1,518.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Footing Design Results

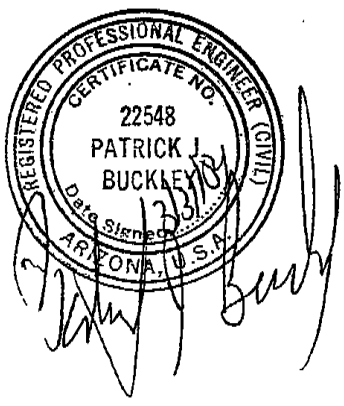
		Toe	Heel
Factored Pressure	=	1,926	437 psf
Mu' : Upward	=	5,372	2,011 ft-#
Mu' : Downward	=	2,581	3,784 ft-#
Mu: Design	=	2,791	1,774 ft-#
Actual 1-Way Shear	=	15.41	10.18 psi
Allow 1-Way Shear	=	76.03	76.03 psi

Toe Reinforcing = # 5 @ 18.00 in
Heel Reinforcing = # 5 @ 18.00 in
Key Reinforcing = None Spec'd

Stem Construction

		Top Stem Stem OK	2nd Bar Lap/Emb
Design height	ft =	3.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Thickness	=	12.00	12.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	18.00	18.00
Rebar Placed at	=	Edge	Edge
Design Data			
fb/FB + fa/Fa	=	0.081	0.465
Total Force @ Section	lbs =	625.3	1,836.5
Moment....Actual	ft-# =	750.7	4,319.2
Moment.....Allowable	ft-# =	9,285.4	9,285.4
Shear.....Actual	psi =	5.1	15.0
Shear.....Allowable	psi =	93.1	93.1
Lap Splice if Above	in =	35.60	35.60
Lap Splice if Below	in =	35.60	11.74
Wall Weight	psf =	150.0	150.0
Rebar Depth 'd'	in =	10.19	10.19
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Special Inspection	=		
Modular Ratio 'n'	=		
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type = Normal Weight			
Concrete Data			
f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

Other Acceptable Sizes & Spacings
Toe: #4@ 13.25 in, #5@ 20.50 in, #6@ 29.00 in, #7@ 39.25 in, #8@ 48.25 in, #9@ 4
Heel: Not req'd, Mu < S_1* Fr
Key: Not req'd, Mu < S * Fr



RetainPro Version 6.0
Build Date : 10-SEP-2001, (c) 1989-2001

Cantilevered Retaining Wall Design

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	1,757.8	2.50	4,394.5	Soil Over Heel =	1,787.5	4.75	8,490.6
Toe Active Pressure	=				Sloped Soil Over Heel =			
Surcharge Over Toe	=				Surcharge Over Heel =			
Adjacent Footing Load	=				Adjacent Footing Load =			
Added Lateral Load	=				Axial Dead Load on Stem =		0.00	
Load @ Stem Above Soil	=				Soil Over Toe =	1,100.0	1.25	1,375.0
					Surcharge Over Toe =			
					Stem Weight(s) =	1,125.0	3.00	3,375.0
					Earth @ Stem Transitions =			
					Footing Weight =	900.0	3.00	2,700.0
					Key Weight =	150.0	3.00	450.0
					Vert. Component =			
Total	=	1,757.8	**O.T.M.** =	4,394.5	**Total** =	5,062.5 lbs	**R.M.**=	16,390.6

Resisting/Overturning Ratio = **3.73**

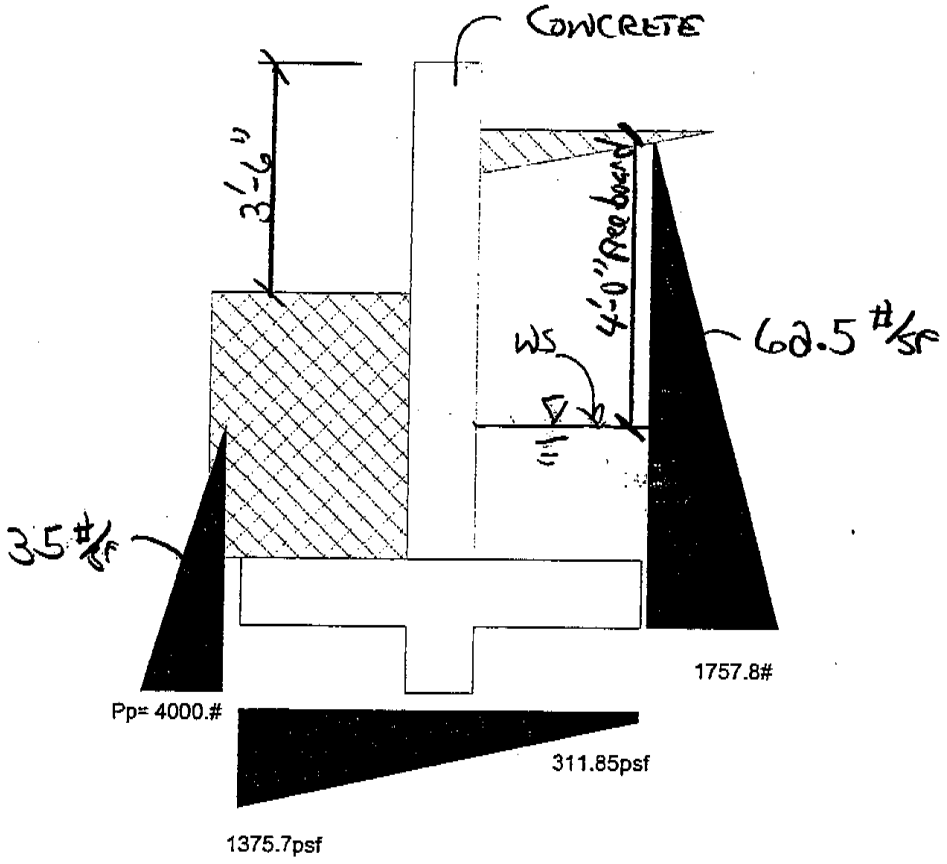
Vertical Loads used for Soil Pressure = 5,062.5 lbs

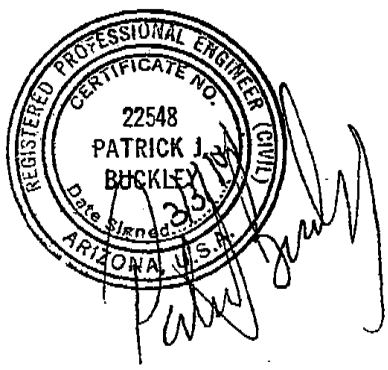
Vertical component of active pressure NOT used for soil pressure

RIVER ROAD FLOOD WALL
CAMINO REAL WASH

DSN: RJB
3/31/04
P. 1/4

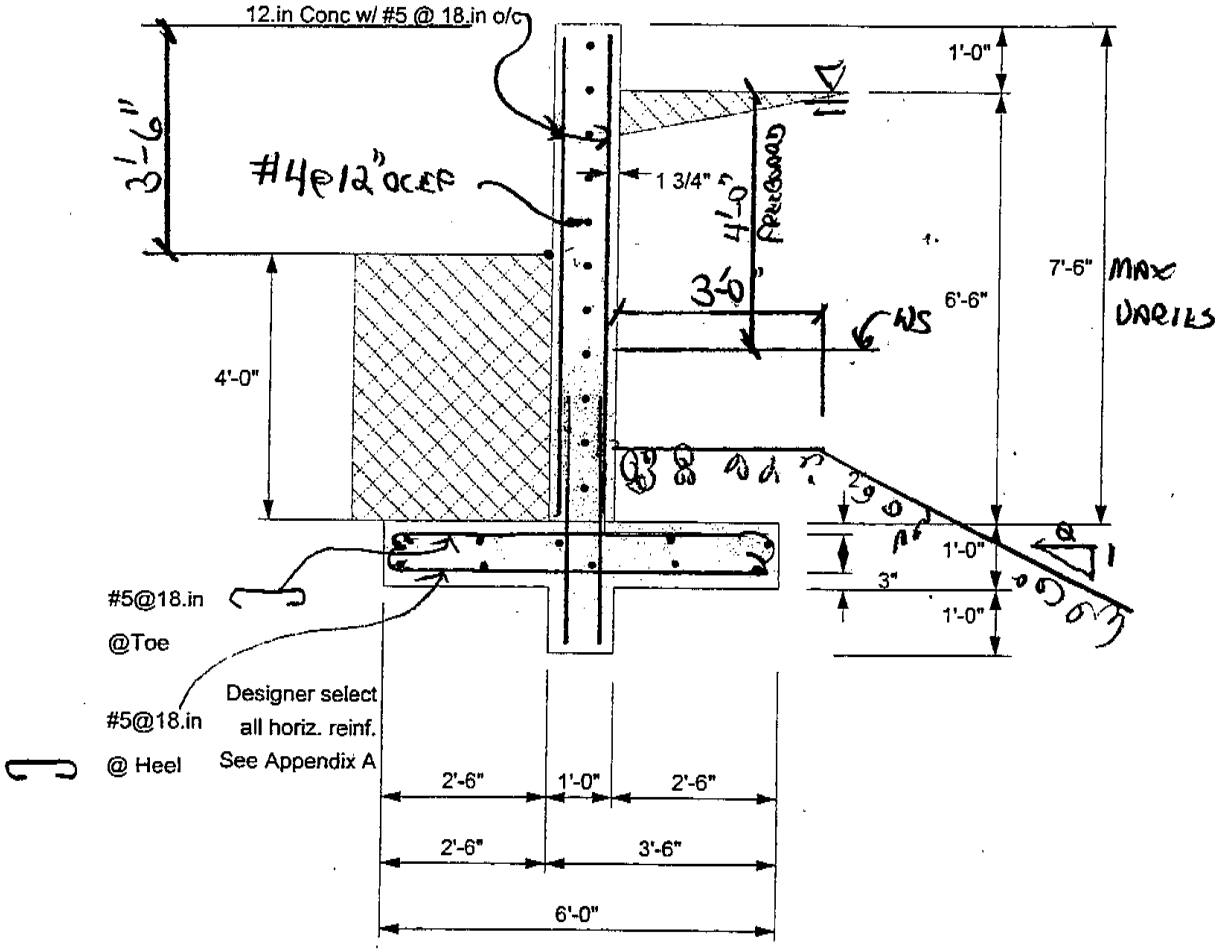
DESIGN OF WALL: TOP OF WALL 3'-6" OF ROADSIDE GRADE.
WALL DESIGN 4' WATER (FLOOD) ABOVE proposed water surface (W.S)
CONCRETE DESIGN





'RIVER ROAD FLOOD WALL
CAMINO REAL WASH

DSN. RJB
3/31/04
Pg. 21



This Wall in File: c:\rp6\river road flood wall.rp5

RetainPro Version 6.0
Build Date : 10-SEP-2001, (c) 1989-2001

Cantilevered Retaining Wall Design

Criteria

Retained Height	=	6.50 ft
Wall height above soil	=	1.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	48.00 in
Soil Density	=	110.00 pcf
Wind on Stem	=	0.0 psf

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	62.5 psf/ft
Toe Active Pressure	=	30.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Water height over heel	=	0.0 ft
Footing||Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	24.00 in

Footing Dimensions & Strengths

Toe Width	=	2.50 ft
Heel Width	=	3.50
Total Footing Width	=	6.00
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	12.00 in
Key Distance from Toe	=	2.50 ft

f'c = 2,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Design Summary

Total Bearing Load	=	5,063 lbs
...resultant ecc.	=	7.56 in
Soil Pressure @ Toe	=	1,376 psf OK
Soil Pressure @ Heel	=	312 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,926 psf
ACI Factored @ Heel	=	437 psf
Footing Shear @ Toe	=	15.4 psi OK
Footing Shear @ Heel	=	10.2 psi OK
Allowable	=	76.0 psi

Wall Stability Ratios

Overturning	=	3.73 OK
Sliding	=	3.14 OK

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	1,757.8 lbs
less 100% Passive Force	= -	4,000.0 lbs
less 100% Friction Force	= -	1,518.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Footing Design Results

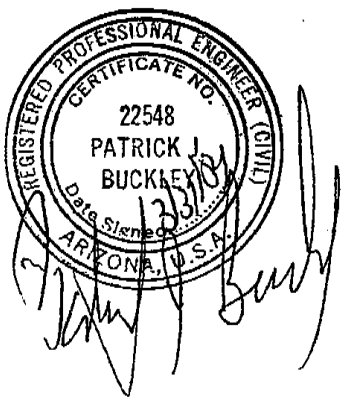
		Toe	Heel
Factored Pressure	=	1,926	437 psf
Mu' : Upward	=	5,372	2,011 ft-#
Mu' : Downward	=	2,581	3,784 ft-#
Mu: Design	=	2,791	1,774 ft-#
Actual 1-Way Shear	=	15.41	10.18 psi
Allow 1-Way Shear	=	76.03	76.03 psi

Toe Reinforcing = # 5 @ 18.00 in
Heel Reinforcing = # 5 @ 18.00 in
Key Reinforcing = None Spec'd

Stem Construction

		Top Stem	2nd
		Stem OK	Bar Lap/Emb
Design height	ft =	3.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Thickness	=	12.00	12.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	18.00	18.00
Rebar Placed at	=	Edge	Edge
Design Data			
fb/FB + fa/Fa	=	**0.081**	**0.465**
Total Force @ Section	lbs =	625.3	1,836.5
Moment....Actual	ft-# =	750.7	4,319.2
Moment.....Allowable	ft-# =	9,285.4	9,285.4
Shear.....Actual	psi =	5.1	15.0
Shear.....Allowable	psi =	93.1	93.1
Lap Splice if Above	in =	35.60	35.60
Lap Splice if Below	in =	35.60	11.74
Wall Weight	psf =	150.0	150.0
Rebar Depth 'd'	in =	10.19	10.19
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Special Inspection	=		
Modular Ratio 'n'	=		
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type	= Normal Weight		
Concrete Data			
f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

Other Acceptable Sizes & Spacings
Toe: #4@ 13.25 in, #5@ 20.50 in, #6@ 29.00 in, #7@ 39.25 in, #8@ 48.25 in, #9@ 4
Heel: Not req'd, Mu < S_y* Fr
Key: Not req'd, Mu < S * Fr



RetainPro Version 6.0
Build Date : 10-SEP-2001, (c) 1989-2001

Cantilevered Retaining Wall Design

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	1,757.8	2.50	4,394.5	Soil Over Heel	=	1,787.5	4.75	8,490.6
Toe Active Pressure	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=		0.00	
Load @ Stem Above Soil	=				Soil Over Toe	=	1,100.0	1.25	1,375.0
					Surcharge Over Toe	=			
					Stem Weight(s)	=	1,125.0	3.00	3,375.0
					Earth @ Stem Transitions	=			
					Footing Weight	=	900.0	3.00	2,700.0
					Key Weight	=	150.0	3.00	450.0
					Vert. Component	=			
Total	=	1,757.8	**O.T.M.** =	4,394.5	**Total** =		5,062.5 lbs	**R.M.=**	16,390.6

Resisting/Overturning Ratio = **3.73**

Vertical Loads used for Soil Pressure = 5,062.5 lbs

Vertical component of active pressure NOT used for soil pressure

APPENDIX E.5:
CAMINO REAL WASH

Existing HEC-RAS output
- Camino Real Upstream
- Camino Real West Channel
- Camino Real East Channel
- Camino Real Overflow

As-Built Condition HEC-RAS output
- Camino Real West Downstream Channel
- Camino Real East Downstream Channel

Culvert Model output
- West RCBC HY8 output
- East RCBC HY8 output
- RCP west of Camino Real Road, at River Rd. STA.691+95 CulvertMaster output

Supercritical Flow Regime Superelevation of Camino Real Wash, West Channnel

Curve #	Radius ($R_{c\text{-}design}$)	River Sta	Q Total	Min Ch El	W.S. Elev	Channel Depth	Vel Chnl	Top Width	Froude # Chl	Minimum Radius of Curvature ($R_{c\text{-}min}$)	Super-elevation	Channel Bed Cross Slope
	(ft)		(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)		(ft)	(ft)	(ft/ft)
1	200	2015	1205	2371.95	2374.77	2.82	10.58	46	1.19	227	0.80	0.017
		2000	1205	2371.72	2374.41	2.69	11.14	46	1.28	264	0.89	0.019
		1950	1205	2370.69	2372.79	2.1	13.34	49	1.72	512	1.34	0.028
2	200	1800	1205	2367.47	2369.65	2.18	13.32	50	1.74	504	1.37	0.028
		1750	1205	2366.16	2369.02	2.86	12.43	47	1.52	312	1.12	0.024
		1700	1300	2365.23	2368.81	3.58	12.2	35	1.27	178	0.80	0.023
3	100	1150	1205	2348.48	2350.77	2.29	30.52	39	4.76	1962	11.23	0.289
		1131.91	1205	2348.2	2350.39	2.19	29.75	35	4.86	1746	9.56	0.275
		1074.46	1205	2347.94	2350.16	2.22	27.06	32	4.02	1298	7.20	0.227

Curve #	Super-elevation	Outer Bank W.S. Rise
1	1.01	0.51
2	1.10	0.55
3	9.33	4.66

* Data taken directly from HEC-RAS

Channel Depth = W.S. Elev - Min Ch El

$R_{c\text{-}min} = 4 \times \{(\text{Vel Chnl})^2 * (\text{Top Width})\} / \{32.2 * (\text{Channel Depth})\}$

* $R_{c\text{-}min}$ is calculated for comparison to $R_{c\text{-}design}$

Superelevation = $\{(\text{Vel Chnl})^2 * (\text{Top Width})\} / \{32.2 * (R_{c\text{-}design})\}$

Channel Bed Cross Slope = $(\text{Vel Chnl})^2 * / \{32.2 * (R_{c\text{-}design})\}$

Outer Bank W.S. Rise = Superelevation / 2

CURRENT DATE: 07-31-2007
CURRENT TIME: 13:03:09

FILE DATE: 07-31-2007
FILE NAME: CRWEST

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2375.20	2372.27	235.29	4 RCB	8.00	5.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: CRWEST DATE: 07-31-2007

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2376.43	131.9	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2377.15	263.8	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2377.76	395.7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2378.31	527.6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2378.82	659.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2379.30	791.4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2379.76	923.3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2380.19	1045.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2380.70	1187.1	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2381.20	1319.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CRWEST DATE: 07-31-2007

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
0.00	0.000	0.00	0.00	0.00
2376.43	0.000	131.90	0.00	0.00
2377.15	0.000	263.80	0.00	0.00
2377.76	0.000	395.70	0.00	0.00
2378.31	0.000	527.60	0.00	0.00
2378.82	0.000	659.50	0.00	0.00
2379.30	0.000	791.40	0.00	0.00
2379.76	0.000	923.30	0.00	0.00
2380.19	0.000	1045.00	0.00	0.00
2380.70	0.000	1187.10	0.00	0.00
2381.20	0.000	1319.00	0.00	0.00

CURRENT DATE: 07-31-2007
CURRENT TIME: 13:03:09

FILE DATE: 07-31-2007
FILE NAME: CRWEST

PERFORMANCE CURVE FOR CULVERT 1 - 4(8.00 (ft) BY 5.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2375.20	0.00	0.00	0-NF	0.00	0.00	0.00	-0.58	0.00	0.00
131.90	2376.43	1.23	1.23	1-S2n	0.51	0.81	0.41	-0.14	10.06	7.39
263.80	2377.15	1.95	1.95	1-S2n	0.77	1.29	0.69	0.08	12.03	9.65
395.70	2377.76	2.56	2.56	1-S2n	1.02	1.68	1.04	0.26	11.87	11.27
527.60	2378.31	3.11	3.11	1-S2n	1.22	2.04	1.27	0.42	12.98	12.56
659.50	2378.82	3.62	3.62	1-S2n	1.43	2.37	1.49	0.56	13.85	13.66
791.40	2379.30	4.10	4.10	1-S2n	1.62	2.67	1.70	0.69	14.51	14.62
923.30	2379.76	4.56	4.56	1-S2n	1.79	2.96	1.91	0.81	15.08	15.47
1045.00	2380.19	4.99	4.99	1-S2n	1.96	3.22	2.10	0.92	15.56	16.19
1187.10	2380.70	5.50	5.50	5-S2n	2.14	3.50	2.30	1.04	16.10	16.96
1319.00	2381.20	6.00	6.00	5-S2n	2.30	3.76	2.50	1.14	16.50	17.63

El. inlet face invert 2375.20 ft El. outlet invert 2372.27 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	2107.11 ft
INLET ELEVATION	2375.20 ft
OUTLET STATION	1871.84 ft
OUTLET ELEVATION	2372.27 ft
NUMBER OF BARRELS	4
SLOPE (V/H)	0.0125
CULVERT LENGTH ALONG SLOPE	235.29 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	8.00 ft
BARREL RISE	5.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 07-31-2007
CURRENT TIME: 13:03:09

FILE DATE: 07-31-2007
FILE NAME: CRWEST

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH	40.00 ft
SIDE SLOPE H/V (X:1)	2.0
CHANNEL SLOPE V/H (ft/ft)	0.025
MANNING'S n (.01-0.1)	0.018
CHANNEL INVERT ELEVATION	2371.69 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2372.27 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2371.69	0.000	0.00	0.00	0.00
131.90	2372.13	1.969	0.44	7.39	0.68
263.80	2372.35	2.092	0.66	9.65	1.03
395.70	2372.53	2.164	0.84	11.27	1.31
527.60	2372.69	2.214	1.00	12.56	1.56
659.50	2372.83	2.253	1.14	13.66	1.78
791.40	2372.96	2.283	1.27	14.62	1.99
923.30	2373.08	2.309	1.39	15.47	2.17
1045.00	2373.19	2.329	1.50	16.19	2.34
1187.10	2373.31	2.350	1.62	16.96	2.53
1319.00	2373.41	2.367	1.72	17.63	2.69

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	169.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	2382.00 ft

CURRENT DATE: 07-31-2007
CURRENT TIME: 13:21:52

FILE DATE: 07-31-2007
FILE NAME: CREAST

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2376.07	2369.51	243.84	2 RCB	8.00	5.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: CREAST DATE: 07-31-2007

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2376.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2377.90	122.2	122.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2378.99	244.4	244.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2379.92	366.6	366.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2380.78	488.8	488.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2381.61	611.0	603.2	0.0	0.0	0.0	0.0	0.0	7.65	4
2382.02	733.2	657.4	0.0	0.0	0.0	0.0	0.0	73.28	3
2382.36	855.4	699.9	0.0	0.0	0.0	0.0	0.0	154.05	3
2382.67	977.6	735.8	0.0	0.0	0.0	0.0	0.0	240.59	3
2382.77	1022.0	747.4	0.0	0.0	0.0	0.0	0.0	273.95	3
2383.21	1222.0	797.0	0.0	0.0	0.0	0.0	0.0	424.51	3
2381.49	586.8	586.8	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CREAST DATE: 07-31-2007

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2376.07	0.000	0.00	0.00	0.00
2377.90	0.000	122.20	0.00	0.00
2378.99	0.000	244.40	0.00	0.00
2379.92	0.000	366.60	0.00	0.00
2380.78	0.000	488.80	0.00	0.00
2381.61	-0.001	611.00	0.20	0.03
2382.02	-0.007	733.20	2.48	0.34
2382.36	-0.003	855.40	1.41	0.16
2382.67	-0.002	977.60	1.17	0.12
2382.77	-0.001	1022.00	0.63	0.06
2383.21	-0.001	1222.00	0.52	0.04

CURRENT DATE: 07-31-2007
CURRENT TIME: 13:21:52

FILE DATE: 07-31-2007
FILE NAME: CREAST

PERFORMANCE CURVE FOR CULVERT 1 - 2(8.00 (ft) BY 5.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2376.07	0.00	0.00	0-NF	0.00	0.00	0.00	-0.02	0.00	0.00
122.20	2377.90	1.83	1.83	1-S2n	0.57	1.22	0.52	0.58	14.64	11.44
244.40	2378.99	2.92	2.92	1-S2n	0.90	1.94	0.84	0.89	18.20	14.69
366.60	2379.92	3.85	3.85	1-S2n	1.18	2.54	1.25	1.13	18.31	16.92
488.80	2380.78	4.71	4.71	1-S2n	1.44	3.08	1.56	1.34	19.60	18.66
603.15	2381.61	5.54	5.54	5-S2n	1.66	3.54	1.83	1.53	20.58	20.11
657.43	2382.02	5.95	5.95	5-S2n	1.76	3.75	1.95	1.70	21.06	21.35
699.94	2382.36	6.29	6.29	5-S2n	1.84	3.91	2.06	1.86	21.23	22.46
735.84	2382.66	6.59	6.59	5-S2n	1.90	4.04	2.14	2.01	21.46	23.44
747.43	2382.76	6.69	6.69	5-S2n	1.92	4.09	2.18	2.06	21.47	23.78
796.97	2383.20	7.13	7.13	5-S2n	2.01	4.26	2.26	2.28	22.00	25.16

El. inlet face invert 2376.07 ft El. outlet invert 2369.51 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	2086.57 ft
INLET ELEVATION	2376.07 ft
OUTLET STATION	1842.82 ft
OUTLET ELEVATION	2369.51 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0269
CULVERT LENGTH ALONG SLOPE	243.84 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	8.00 ft
BARREL RISE	5.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 07-31-2007
CURRENT TIME: 13:21:52

FILE DATE: 07-31-2007
FILE NAME: CREAST

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ***********

BOTTOM WIDTH	16.50 ft
SIDE SLOPE H/V (X:1)	2.0
CHANNEL SLOPE V/H (ft/ft)	0.042
MANNING'S n (.01-0.1)	0.018
CHANNEL INVERT ELEVATION	2369.49 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2369.51 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2369.49	0.000	0.00	0.00	0.00
122.20	2370.09	2.596	0.60	11.44	1.58
244.40	2370.40	2.716	0.91	14.69	2.38
366.60	2370.64	2.778	1.15	16.92	3.02
488.80	2370.85	2.818	1.36	18.66	3.57
611.00	2371.04	2.846	1.55	20.11	4.06
733.20	2371.21	2.867	1.72	21.35	4.51
855.40	2371.37	2.887	1.88	22.46	4.93
977.60	2371.52	2.901	2.03	23.44	5.32
1022.00	2371.57	2.905	2.08	23.78	5.45
1222.00	2371.79	2.922	2.30	25.16	6.03

ROADWAY OVERTOPPING DATA

WEIR COEFFICIENT	2.70
EMBANKMENT TOP WIDTH	2.00 ft
CREST LENGTH	70.00 ft
OVERTOPPING CREST ELEVATION	2381.49 ft

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

Culvert Designer/Analyzer Report
2-36" RCP Culvert at 691+95

Analysis Component			
Storm Event	Design	Discharge	69.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	69.00 cfs	Check Discharge	0.00 cfs

Tailwater properties: Rectangular Channel

Tailwater conditions for Design Storm.			
Discharge	69.00 cfs	Bottom Elevation	2,373.58 ft
Depth	0.83 ft	Velocity	10.42 ft/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	2-36 inch Circular	68.98 cfs	2,381.14 ft	16.04 ft/s
Weir	Roadway	0.00 cfs	2,381.14 ft	N/A
Total	----------	68.98 cfs	2,381.14 ft	N/A

Highline Civil Engineering
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666
Project Engineer: Chris Langham

Culvert Designer/Analyzer Report
2-36" RCP Culvert at 691+95

Component:Culvert-1

Culvert Summary			
Computed Headwater Elev	2,381.14 ft	Discharge	68.98 cfs
Inlet Control HW Elev.	2,380.86 ft	Tailwater Elevation	2,374.41 ft
Outlet Control HW Elev.	2,381.14 ft	Control Type	Entrance Control
Headwater Depth/Height	1.05		

Grades			
Upstream Invert	2,378.00 ft	Downstream Invert	2,374.58 ft
Length	51.00 ft	Constructed Slope	0.067059 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.03 ft
Slope Type	Steep	Normal Depth	0.87 ft
Flow Regime	Supercritical	Critical Depth	1.91 ft
Velocity Downstream	16.04 ft/s	Critical Slope	0.004240 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Concrete	Span	3.00 ft
Section Size	36 inch	Rise	3.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	2,381.14 ft	Upstream Velocity Head	0.82 ft
Ke	0.50	Entrance Loss	0.41 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,380.86 ft	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall	Area Full	14.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

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Culvert Designer/Analyzer Report
2-36" RCP Culvert at 691+95

Component:Weir

Hydraulic Component(s): Roadway					
Discharge	0.00	cfs	Allowable HW Elevation	2,381.14	ft
Roadway Width	0.00	ft	Overtopping Coefficient	3.09	US
Low Point	2,381.57	ft	Headwater Elevation	N/A	ft
Discharge Coefficient (Cr)	3.09		Submergence Factor (Kt)	1.00	
Tailwater Elevation	2,374.41	ft			

Sta (ft)	Elev. (ft)
0.00	2,382.50
0.00	2,381.57
26.42	2,382.49

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EXHIBIT MAPS:
FOR
CAMINO REAL WASH LOMR

- **FIGURE 2**, CAMINO REAL WORKMAP NORTH OF RIVER ROAD
- **FIGURE 3**, CAMINO REAL WORKMAP SOUTH OF RIVER ROAD

UPSTREAM		
River Sta	NAVD88 W.S. Elev (ft)	NGVD29 (ft)
3429.864	2456.13	2453.9
3331.857	2454.45	2452.22
3241.052	2452.33	2450.1
3150.14	2450.84	2448.61
3051.702	2448.29	2446.06
2936.949	2445.98	2443.75
2852.425	2444.01	2441.78
2743.588	2441.84	2439.61
2625.161	2439.56	2437.33
2477.176	2436.85	2434.62
2383.522	2435.01	2432.78
2255.96	2431.89	2429.66
2141.959	2429.66	2427.43
2064.338	2428.17	2425.94
1943.236	2425.39	2423.16
1871.821	2423.64	2421.41
1821.303	2422.47	2420.24
1773.468	2421.33	2419.1
1647.316	2418.52	2416.29
1542.871	2416.09	2413.86
1424.651	2413.55	2411.32
1314.441	2411.47	2409.24
1181.912	2408.82	2406.59
1062.566	2406.37	2404.14
944.986	2403.33	2401.1
846.091	2401.37	2399.14

WEST		
River Sta	NAVD88 W.S. Elev (ft)	NGVD29 (ft)
751.24	2399.87	2397.64
581.907	2395.54	2393.31
552.659	2395.15	2392.92
534.16	Culvert	
523.966	2394.54	2392.31
465.158	2393.88	2391.65
396.133	2392.38	2390.15
380.66	Culvert	
365.77	2392.06	2389.83
330.884	2391.44	2389.21
301.971	2390.82	2388.59
288.25	Culvert	
273.774	2390.17	2387.94
257.256	2389.57	2387.34
221.641	2389.49	2387.26
203.926	2389.47	2387.24
191.64	Bridge	
181.696	2388.38	2386.15
167.778	2387.99	2385.76
121.367	2387.27	2385.04
67.625	2384.35	2382.12

CONVERSION COMPUTED AS NAVD88 - 2.23 FT = NGVD29. REFER TO APPENDIX C OF REPORT

EAST		
River Sta	NAVD88 W.S. Elev (ft)	NGVD29 (ft)
633.541	2400.02	2397.79
480.056	2397.03	2394.8
365.03	2394.73	2392.5
300.27	2393.04	2390.81
252.61	2391.56	2389.33
222.919	2390.7	2388.47
199.073	2389.66	2387.43
153.126	2388.87	2386.64
98.849	2387.05	2384.82
38.444	2383.21	2380.98

OVERFLOW		
River Sta	NAVD88 W.S. Elev (ft)	NGVD29 (ft)
237.369	2382.77	2380.54
199.788	2382.25	2380.02
174.844	2382.29	2380.06
149.791	2381.76	2379.53
129.767	2381.79	2379.56
99.652	2381.08	2378.85
74.912	2381.1	2378.87
50.145	2381.04	2378.81
25.041	2381.14	2378.91
0.002	2381.2	2378.97

Camino Real
La Lomita
Camino Corto
Caminito de los Ranchos
Camino del Santo
Camino Pablo
Via Quinta Deanna
River Road
City of Tucson
Pima County

3429.86 2456.13
3331.86 2454.45
3241.05 2452.33
3150.14 2450.84
3051.70 2448.29
2936.95 2445.98
2852.43 2444.01
2743.59 2441.84
2625.16 2439.56
2477.18 2436.85
2383.52 2435.01
2255.96 2431.89
2141.96 2429.66
2064.34 2428.17
1943.24 2425.39
1871.82 2423.64
1821.30 2422.47
1773.47 2421.33
1647.32 2418.52
1542.87 2416.09
1424.65 2413.55
1314.44 2411.47
1181.91 2408.82
1062.57 2406.37
944.99 2403.33
846.09 2401.37
751.24 2399.87
633.54 2400.02
480.06 2397.03
365.03 2394.73
300.27 2393.04
252.61 2391.56
222.92 2390.70
199.07 2389.66
153.13 2388.87
98.85 2387.05
38.44 2383.21
0 2381.20
25.04 2381.14
50.15 2381.04
74.91 2381.10
99.65 2381.08
129.77 2381.79
149.79 2381.76
174.84 2382.29
199.79 2382.25
237.37 2382.77

TIE TO EXISTING FLOODPLAIN
LIMIT OF DETAILED STUDY
TIE TO EXISTING FLOODPLAIN
Camino Real Upstream Reach
Camino Real Model Junction 2
Camino Real West Reach
Camino Real East Reach
OVERFLOW REACH

3 - 24" CMP CULVERT
STA. 534.16
UP INV. = 2391.35
DOWN INV. = 2390.91

3 - 24" CMP CULVERT
STA. 380.66
UP INV. = 2388.52
DOWN INV. = 2387.94

3 - 24" CMP CULVERT
STA. 288.25
UP INV. = 2386.57
DOWN INV. = 2386.18

BRIDGE STA. 191.64
HIGH CHORD = 2388.19
LOW CHORD = 2387.69
GROUND = 2384.78

2 - 36" RCP
UP INV. = 2378.04
DOWN INV. = 2374.50

4 - 8' x 5' RCBC
UP INV. = 2375.20
DOWN INV. = 2372.27

OVERFLOW WEIR
CREST LENGTH = 49 FT
CREST ELEV. = 2381.46

2 - 8' x 5' RCBC
UP INV. = 2376.07
DOWN INV. = 2369.51

STREAM
CROSS SECTIONS RIVER STATION WSEL (NAVD88)
STREETS
FLOOD WALL
MODELED FLOODPLAIN
EFFECTIVE ZONE A
JURISDICTIONAL BOUNDARY
SECTION LINE
PARCEL BOUNDARY

CONTOURS
2 ft
10 ft

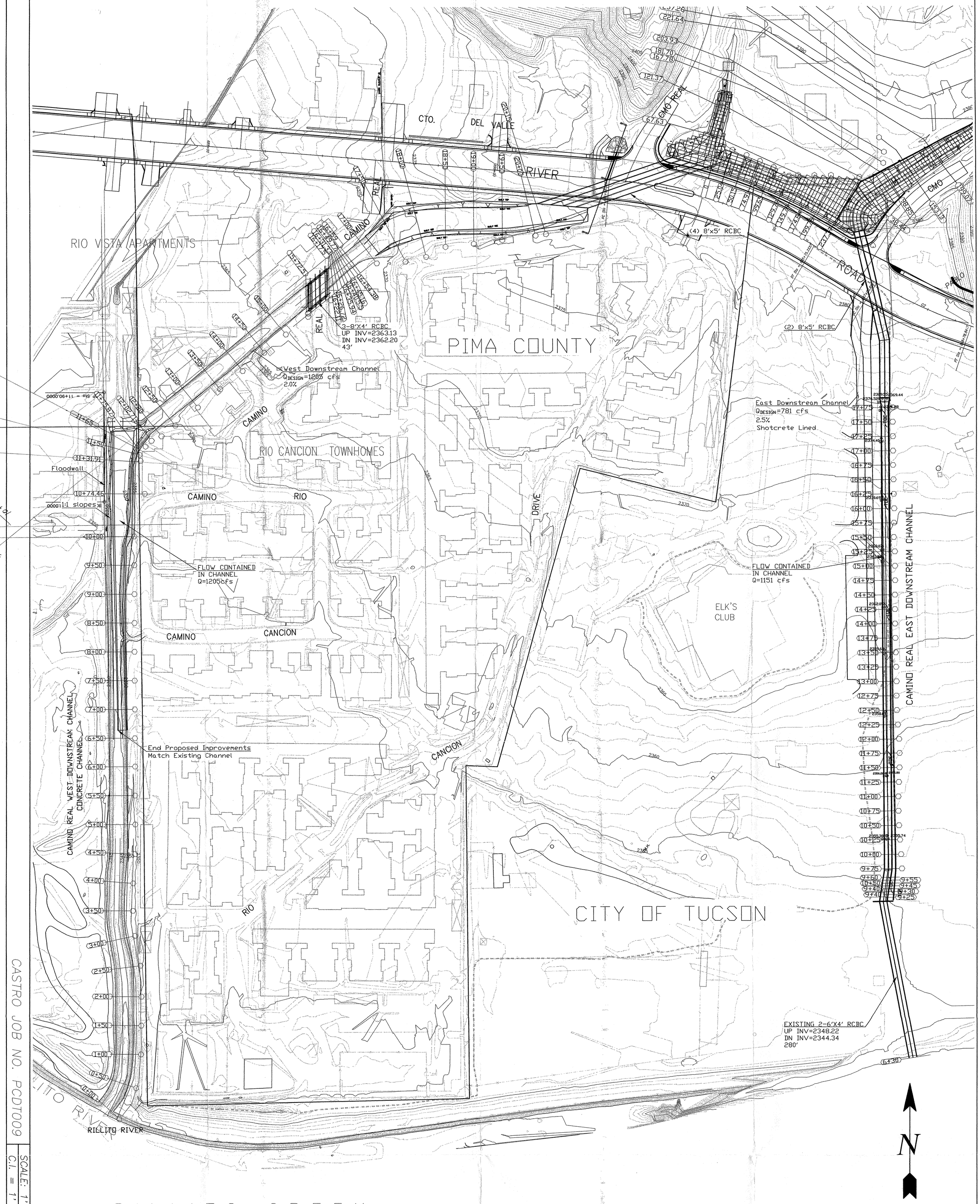
1 inch equals 100 feet

CAMINO REAL LOMR HYDRAULIC STUDY: FIGURE 2 - UPSTREAM REACH

NOTES
Project view is within FIRM Panel 04019C1645K
Located in: T. 13 S, R. 14 E, Sections 17 & 20
No LOMR or LOMA are in this view
Vertical Datum NAVD88

Registered Professional Engineer (Civil) CERTIFICATE NO. 37622 FRANK EMMETT FRY IV Date Signed 7/2/08 ARIZONA, U.S.A. Expires 06/30/11

Castro Engineering



CONTOUR INTERVAL = 1'
SCALE: 1"=80'

LEGEND

- ROAD
- PARCEL BOUNDARY
- SURVEY POINT (2355.38)
- 1' CONTOURS
- 5' CONTOURS
- FLOODWALL
- CROSS-SECTION (100)
- JURISDICTIONAL LIMITS

NOTES:
PROJECT VIEW IS WITHIN FIRM PANEL 04019C1645K
LOCATED IN: T. 13 S, R. 14 E, SECTIONS 17 & 20
NO LOMA
VERTICAL DATUM NAVD88

Registered Professional Engineer (Civil)
CERTIFICATE NO.
37622
FRANK EMMETT FRY IV
Date Signed 7/2/08
ARIZONA, U.S.A.
Expires 06/30/11

CASTRO JOB NO. PCDT009

SCALE: 1"=80'
C.I. = 1'

SHEET 1

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT

CAMINO REAL WASH L.O.M.R.

FIGURE 3
DOWNSTREAM REACH

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

O & M PLAN
FOR
CAMINO REAL WASH
LOMR
ADOPTED: 2007

OPERATIONS AND MAINTENANCE PLAN
FOR CAMINO REAL WASH
ADOPTED: 2007

This Operations and Maintenance Plan has been prepared to address the Pima County Regional Flood Control District requirements for a plan, acceptable to both the PCRFCD and Maintenance Operations Division. This plan includes the Camino Real Wash improvements and floodwalls.

Camino Real Wash is located in parts of Sections 3, 9, 10, 16, 17, and 20 of Township 13 South, Range 14 East, Gila and Salt River Base and Meridian. It is accessible from River Road between Camino Real Road, and Camino Pablo Road.

The project site is found within a portion of the Federal Insurance Rate Map (FIRM) Panel Numbers 04019C1637K and 04019C1645K, with effective revision dates of February 8, 1999, and is located within a Zone A – defined as a 100-year Special Flood Hazard Area with no base flood elevations determined.

A Conditional Letter of Map Revision (CLOMR) has been approved through FEMA (Case No.: 04-09-0406R) on October 04, 2004. A Letter of Map Revision (LOMR) is being submitted to FEMA in order to revise the FEMA Firm Panels 1637K and 1645K to show containment of Camino Real Wash within improved channels and structures and a revised floodplain upstream based on better information.

Public Maintenance Items:
The following list shall be performed by anyone performing the scheduled and unscheduled maintenance referenced within this Operations and Maintenance Plan. Certification of such maintenance shall be undertaken by an Arizona Registered Civil Engineer. All inspection items listed below are to be performed annually unless damage to the drainage structures is noted between scheduled inspections. Included with this Operation and Maintenance Plan is a set of the approved Grading Plans to facilitate in maintaining the drainage items to original design standards.

Watersheds –

Verify that the watershed conditions have not changed since the project was last inspected. If changes have occurred, state what they are, and if modifications are required, design them to conform to original construction documents and/or the current Pima County floodplain regulations.

Drainage Channels –

Drainage channels must be maintained in an As-built condition, conforming to original construction documents, which will include removal of sediment and clearing of vegetation when necessary. See Figure A for general placement of all structures.

East Downstream Drainage Channel– Necessary maintenance check will include:

- Verify that all drainage structures are free of debris;
- Verify that the shotcrete protection is intact;
- Verify that no outlets exist other than the designated discharge outlets;
- Verify that the top of banks are intact;
- Verify the stability of any shotcrete slope protection.
- Verify that excessive erosion or sedimentation is not occurring at the inlet, outlet, and within the 2-8' x 5' RCBCs

West Downstream Drainage Channel

- Verify that all drainage structures are free of debris;
- Verify that the shotcrete protection along side-slopes is intact;
- Verify that no outlets exist other than the designated discharge outlets;
- Verify that ARUs are intact and functioning properly.
- Verify that the top of banks are intact;
- Verify the stability of any slope protection.
- Verify that excessive sedimentation is not occurring at the inlet, outlet, and within the 4-8' x 5' RCBCs

West Upstream Drainage Channel

- Verify that all drainage structures are free of debris;
- Verify that the gabion protection along side-slopes is intact;
- Verify that no outlets exist other than the designated discharge outlets;
- Verify that the top of banks are intact;
- Verify the stability of any slope protection.
- Verify that excessive sedimentation is not occurring at the inlet, outlet, and within the 4-8' x 5' RCBCs

East Upstream Drainage Channel

- Verify that all drainage structures are free of debris;
- Verify that the side-slope protection is intact;
- Verify that no outlets exist other than the designated discharge outlets;
- Verify that the top of banks are intact;
- Verify the stability of any slope protection and toe-down, rock rip-rap splash pad, or grouted rip-rap aprons.
- Verify that excessive erosion or sedimentation is not occurring at the inlet, outlet, and within the 4-8' x 5' RCBCs

Floodwalls

- Refer to Adopted Levee Maintenance Plan

Overflow Weir

- Verify no change in Mannings roughness
- Verify Reno Mattresses are per as-built conditions
- Verify no significant settling of weir
- Remove all vegetation along and downstream of weir alignment.

Storm Drain Inlet

- Verify that all drainage structures are free of debris;
- Verify that excessive scour is not occurring
- Verify that excessive erosion or sedimentation is not occurring at the inlet

Attached is the support documentation showing the Rights to Access/Maintenance for this project including recorded documents, Region IX Levee Certification Checklist, Official Board of Supervisors Adopted Levee Maintenance Plan, and As-Builts.

Attachments:

- Figure 1- Rights to Access/Maintenance
- Region IX Levee Certification Checklist
- Official Board of Supervisors Adopted Levee Maintenance Plan
- Signed As-Builts

Certificate of Clerk

Board of Supervisors of Pima County, Arizona

State of Arizona
County of Pima

I, Lori Godoshian, the duly appointed, and qualified, Clerk of the Board of Supervisors of Pima County, Arizona, hereby certify that the following is a true, correct, and compared extract of the minutes of a meeting of the Board of Supervisors held on the 9th day of October, 2007, and that a quorum was present thereat.

LEVEE MAINTENANCE AND OPERATIONS PLAN

Staff requests adoption of the Levee Maintenance and Operations Plan.

On consideration, it was moved by Supervisor Bronson, seconded by Supervisor Valadez, and unanimously carried by a five to zero vote, to approve the Levee Maintenance and Operations Plan.

In Witness Whereof, I have hereunto set my hand and affixed the seal of the Board of Supervisors of Pima County, Arizona, this 9th day of October, 2007.

Lori Godoshian
Clerk

Oct 9, 2006

Pima County Regional FLOOD CONTROL DISTRICT

MEMORANDUM

Director's Office
Regional Flood Control District

DATE: October 2, 2007

TO: C. H. Huckelberry
County Administrator

FROM: Suzanne Shields, P.E.
Director

SUBJECT: **Levee Maintenance and Operations Plan for Pima County, Arizona**

We would like to place the attached item on the Board of Supervisors October 9, 2007 agenda to ensure that the levees in Pima County are recognized as adequate by the National Flood Insurance Program. This will allow property owners whose properties are protected by recognized levees to continue to pay the reduced flood insurance rates. Once this plan is approved, property owners whose land is not currently mapped as a Special Flood Hazard Area will remain outside floodplain boundaries.

Your assistance in expediting this agenda item will be greatly appreciated.

SS/tj
Attachments

c: John Bernal, Deputy County Administrator – Public Works
Chris Cawein, Deputy Director – Regional Flood Control District

APPROVED:

C. H. Huckelberry, County Administrator **Date**

BOARD OF SUPERVISORS AGENDA ITEM SUMMARY

Requested Board Meeting Date: ***October 9, 2007***

FLOOD CONTROL AGENDA

ITEM SUMMARY, JUSTIFICATION &/or SPECIAL CONSIDERATIONS:

Levee Maintenance and Operations Plan

The Flood Control District is required by the Federal Emergency Management Agency (FEMA) to establish and maintain minimum guidelines for flood control levees (44 CFR § 65.10). The District must also have operations plans for levees recognized as adequate by the National Flood Insurance Program, administered through FEMA. The operations plans sets out specific requirements for routine inspections and maintenance of the levees. The plan also addresses steps to be taken following a major flow event with a link to our ALERT network of stream and precipitation gauges.

CONTRACT NUMBER (If applicable):

STAFF RECOMMENDATION(S):

Staff recommends approval of the Levee Maintenance and Operations Plan in order for property owners in floodplain areas can qualify to purchase flood insurance from the National Flood Insurance Program at a reduced rate.

*CORPORATE HEADQUARTERS:*_____

CLERK OF BOARD USE ONLY: BOS MTG. _____

ITEM NO. _____

PIMA COUNTY COST: $ N/A and/or REVENUE TO PIMA COUNTY: $ N/A

FUNDING SOURCE(S): N/A
(i.e. General Fund, State Grant Fund, Federal Fund, Stadium D. Fund, etc.)

Advertised Public Hearing:

		YES	***X***	***NO***

Board of Supervisors District:

1		*2*		*3*		*4*		*5*		*All*	*X*

MPACT:

IF APPROVED: Levees shall be recognized by the Federal Emergency Management Agency as being compliant. Property owners whose properties are protected by recognized levees with have reduced flood insurance rates. The Pima County Regional Flood Control District will be responsible for most of the levee maintenance within the County. The District will increase inspections of levees and will monitor levees in response to flow events that trigger the ALERT system network throughout the County.

IF DENIED: Many property owners whose land is not now mapped in a Special Flood Hazard Area will be mapped into the floodplain by the Federal Emergency Management Agency. Large county infrastructure such as the Roger Road Waste Water Sewage treatment facility would also be mapped into the floodplain.

DEPARTMENT NAME: *Pima County Regional Flood Control District*

DEPARTMENT DIRECTOR: *Suzanne Shields, P.E., Director*

PROJECT MANAGER: *Terry Hendricks, Chief Hydrologist, RFCD (520) 243-1832*

CONTACT PERSON: *Connie Maraschiello, Director's Office ,RFCD (520) 243-1883*

Pima County Regional FLOOD CONTROL DISTRICT

MEMORANDUM

Director's Office
Regional Flood Control District

DATE: October 1, 2007

TO: Flood Control District Board of Directors

FROM: Suzanne Shields, P.E.
Director

SUBJECT: **FEMA's Levee Evaluation and Assessment Requirements**

The Federal Emergency Management Agency (FEMA) has begun a process requiring communities to evaluate their levees and associated operations and maintenance plans due to levee failures following Hurricane Katrina.

Pima County along with the Town of Marana, Town of Oro Valley and the City of Tucson have received letters from FEMA dated July 20, 2007 that identifies levees and levee-like structures within incorporated and unincorporated Pima County. FEMA is requiring each levee owner/operator to provided documentation on inspections to evaluate levee conditions.

Because levees are designed to provide a specific level of flood protection and require regular maintenance as a result of flood events, annual inspections, maintenance and even upgrades to a levee may be necessary in order to insure levees maintain their level of protection. FEMA is requiring the adoption of a Levee Maintenance and Operations Plan for levees owned by the Regional Flood Control District (District).

The District has prepared a Levee Maintenance and Operations Plan to address the specific FEMA requirements for levee maintenance for the following flood control structures with levees or levee-like structures:

Ajo Detention Basin	Canyon Shadows Levee	Rams Canyon Levee
Big Wash Levee	Grant Road Levee	Riverside Crossing Levees
Camino Del Cerro Levee	Lower Santa Cruz Levees	Sotomayor Ranch Levee
Canada Del Oro Levee	Mission West Floodwall	Sweetwater Levee

We respectfully present this Levee Maintenance and Operations Plan to the Pima County Flood Control District Board of Directors for consideration and approval.

SS/tj
Attachment

c: C.H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator – Public Works

THE PIMA COUNTY FLOOD CONTROL DISTRICT LEVEE MAINTENANCE AND OPERATIONS PLAN FOR PIMA COUNTY, ARIZONA

I. OVERVIEW

Levees are designed to provide a specific level of flood protection. Levees require regular maintenance. If flow conditions change based on better information or as a result of flood events, maintenance and even upgrades to a levee may be necessary in order to insure levees maintain their level of protection. This Maintenance and Operations Plan is required to address the specific requirements of levees to provide flood protection from the regulatory event.

II. FEDERAL REQUIREMENT FOR LEVEE MAINTENANCE AND OPERATIONS

This manual has been prepared pursuant to the Code of Federal Regulations, Title 44, §65.10 (c) and (d), which mandates operations plans for levees to be recognized by the National Flood Insurance Program, which is administered by the Federal Emergency Management Agency (FEMA).

III. DEFINITION OF LEVEE

"Levee" means a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices for the purpose of controlling or diverting the flow of water so as to provide protection from temporary flooding. (Ord. 1999 FC-1 §§ 1 (part) 1999; Ord. 1988 FC-2 Art. 4 (part), 1988).

IV. LEVEES COVERED BY THIS MAINTENANCE AND OPERATIONS PLAN

All levees defined by FEMA that have been accepted and certified by the Pima County Regional Flood Control District will be operated and maintained in accordance with the plan as presented in this document.

V. LEVEES CONSTRUCTED IN OTHER JURISDICTIONS

The District is not responsible for the maintenance and inspection of levees within incorporated communities unless such maintenance and inspection authority is approved by the Board of Directors of the Flood Control District (Board) and the conditions of the inspection and maintenance of the levee is also approved by the local floodplain jurisdiction via an Intergovernmental Agreement.

VI. PREVIOUS LEVEE MAINTENANCE AND OPERATIONS PLANS

All previously adopted Levee Maintenance and Operations Plans are null and void and replaced by this document.

VII. PRIVATELY OWNED LEVEES

Privately owned levees require additional assurances to guarantee maintenance, if they are to be recognized by FEMA as providing flood protection. This Maintenance and Operations Plan does not cover privately owned levees.

VIII. LEVEE CONSTRUCTION PLANS

The Chief Engineer is responsible to have on hand the construction plans for levees. For older levees where original construction plans are not available, the Chief Engineer is responsible for certifying the levees that are built and maintained in accordance with sound engineering practices to provide protection from the regulatory flood event.

IX. RESPONSIBLE PARTY

The District's Chief Engineer is the individual responsible for the oversight and implementation of this Levee Maintenance and Operations Plan. The Chief Engineer's office is located at:

Pima County Regional Flood Control District
97 E. Congress Street, 3rd Floor
Tucson, Arizona 85701-1797

X. ROUTINE INSPECTIONS

Annual levee inspections and inspection reports are required for each levee covered by this operations and maintenance plan. The Chief Engineer will assign an inspector to periodically monitor the condition of levees. Table 1 contains the levee maintenance checklist that shall be used for all levee inspections. Generally, any item determined to be "unacceptable" will be properly maintained in a timely manner. Items identified as "minimally acceptable" may be subject to more frequent inspection. Levee inspections will assess the following items:

1. **Closures.** All flap gates will be inspected. Hinges must be functional and the inlet and outlet must be free of debris and excessive sediment. The seats on the flap gates must seal.

2. **Interior drainage.** The interior or "landside" of levees is to be inspected for evidence of ponding and settling. Any erosion of the earthen fill slopes, which impacts the foundation of the levee, is considered a high maintenance priority.

3. **Aggradation and freeboard.** Some watercourses may be susceptible to aggradation under certain flow conditions. The inspector will check the conditions of the channel to determine if surveys are needed to assess the need for the removal of excessive sediment. Under no circumstances should aggradation reduce the freeboard to a level which does not meet the requirements as outlined in the National Flood Insurance Program Regulations (44 CFR Ch. §65.10(b) (1)).

4. **Erosion.** Inspections will include observations of embankment erosion. Evidence of significant erosion at toe-downs or key-ins will be brought to the attention of the Chief Engineer to determine if maintenance is warranted.

5. **Degradation.** The inspector will note any areas in which the invert of the channel appears to be significantly lower than the design invert. Any areas of significant degradation of the invert are to be brought to the attention of the Chief Engineer to determine if maintenance is warranted.

6. **Debris.** Inspections are to monitor the amount of debris along the levees, especially at bridge piers, flap gates, and confluences of tributaries. Debris within a riverine system is to be expected. Not all debris is to be considered a maintenance issue. Any areas where significant accumulation of debris is identified are to be brought to the attention of the Chief Engineer to determine if maintenance is warranted.

7. **Foundation stability (slumping, rotation, settling).** The inspector will examine the foundation of the levee for signs of slumping, rotation or settling. Any signs of significant foundation instability are to be brought to the attention of the Chief Engineer to determine if maintenance is warranted.

8. **Seepage.** The "landside" of the levee is to be inspected for signs of seepage. Should seepage be identified, the Chief Engineer will be notified to determine the proper course of action.

9. **Transitions.** Transitions or tributary confluence areas are to be inspected to insure freeboard is not compromised and that tributary drainage is not blocked.

10. **Access.** Maintenance access ramps and gates to the levee and the channel will be inspected to ensure that they are clear and accessible. Damaged gates and ramps will be repaired.

11. **Handrail.** Damaged handrails will be repaired as required.

12. **Vandalism.** Vandalism will be reported to the Pima County Sheriff's Department and or to the law enforcement office of the local jurisdiction. Vandalism to sensitive drainage infrastructure such as flap gates will be investigated aggressively and significant damage repaired in a timely manner.

13. **Excessive vegetation.** Excessive vegetation may interfere with channel capacity, levee freeboard or it may inhibit maintenance and access along the levee. Should significant levels of vegetation compromise the function of the levee, the Chief Engineer will determine the degree of trimming and/or removal that is required to re-establish acceptable conditions. Significant removal of vegetation may require additional approvals from local and federal agencies.

14. **Animal control.** Burrowing animals may induce damage to reinforced earthen embankment levees. Not all animal burrows pose a risk to levees. However, evidence of significant presence of burrowing animals should be brought to the attention of the Chief Engineer to determine if eradication is necessary or if levee repair is necessary.

15. **Additional maintenance inspection issues with soil cement.** Cavities are to be repaired in the solid portions of the soil cement that are greater than two feet deep. Because soil cement is installed in lifts, some layers may erode at different rates. The inspector is to check for erosion associated with the layering that appears excessive. The inspector is to consult with the Chief Engineer to determine if maintenance is warranted.

16. **Additional Maintenance inspection issues with gunite and shotcrete.** Gunite and shotcrete surfaces are to be inspected for evidence of damage caused by spalling, scaling or cracking.

17. **Additional maintenance inspection issues with rip-rap.** Rip-rap is to be inspected for slumping and for evidence of piping. Filter fabric should not be exposed to sunlight.

18. **Additional maintenance inspection issues with floodwalls.** In addition to foundation and erosion inspections, floodwalls are to be inspected for tilting and sliding. Monolithic joists are to be inspected for signs of deterioration.

19. **Pumps and mechanical devices.** Some levee systems require pumps and mechanical devices to handle the backside or tributary drainage issues. There are no pumps or mechanical devices with the current list of levees that the District maintains.

XI. EVENT-TRIGGERED INSPECTIONS AND THE ALERT NETWORK

Large storm events may require increased surveillance of levee systems. The District owns and operates an Automated Local Evaluation in Real Time (ALERT) flood warning system. The system as currently configured consists of 93 rain gauges, 36 stream gauges, and 4 weather stations. The ALERT system will be used as part of this maintenance manual to prompt additional inspections and monitoring of levees as determined by the Chief Engineer.

XII. FREEBOARD ASSESSMENTS

An essential component to levee certification is freeboard. FEMA has established the minimum freeboard requirements for levees to be certified to provide protection from the regulatory flood event (44 CFR 6510.b.1). In order to insure that the minimum guidelines for freeboard are met or exceeded, the Chief Engineer may request additional surveying and/or riverine modeling in response to changes in channel geometry, maintenance assessments and flood events.

XIII. ENCROACHMENT RESTRICTIONS

No encroachments are allowed that would interfere with maintenance access or function of a levee. Encroachments into the floodplain adjacent to a levee must result in a no rise in water surface elevation for the regulatory event, in order to insure levee freeboard is not compromised. Future Intergovernmental Agreements where the Distinct is to assume the maintenance of levees within other jurisdictions must include "No Rise in Base Flood Elevation" encroachment language.

XIV. REPORTING

Inspection reports are to be generated with levee inspections. The levee maintenance inspection checklist in Table 1 is to be used for all levee inspections. Inspections are to be performed on a minimum annual basis. Additional inspections may be requested by the Chief Engineer in response to storm events. Inspection reports are also required after repairs are made to levees and after levee construction. Inspection reports are to be kept at the District's office.

XV. MAINTENANCE

Levee maintenance is an essential component of levee certification. The District shall perform maintenance, as deemed necessary based on inspections and consultation with the Chief Engineer on the levees in a timely manner. If the levee inspection indicates there are "unacceptable" rated areas, maintenance is considered critical and maintenance will be completed on a priority basis.

Pima County Flood Control District
Board of Directors

_____

Richard Elias, Chairman Date

ATTEST:

_____

Clerk of the Board Date

TABLE 1

Inspection Guide for Flood Control Works
Levees/ Floodwalls/ Pump Stations

Name of Project: _____

Date Inspected: _____

Levee Owner: _____

Owner Phone/ Email: _____

Inspector: _____

Type of Inspection (Check One):

- ☐ **Routine**
- ☐ **Repair/Maintenance**

Overall Project Rating (Check One):

- ☐ **Acceptable**
- ☐ **Minimally Acceptable**
- ☐ **(Maintenance is required)**
- ☐ **Unacceptable**

INSPECTOR'S OBSERVATIONS:

Contents of this Inspection Report:

- ☐ Levees
- ☐ Concrete Floodwalls
- ☐ Interior Drainage System Pump Stations
  Earthen Flood Control Channels
- ☐ Instructions

General Rating Comments

OPERATIONS ND MAINTENANCE MANUAL	A	M	U	N/A	EVALUATION		REMARKS / RECOMMENDATIONS
1. Project Operations and Maintenance Manual | (A or U only)					A	Levee Owner's Operation and Maintenance Manual(s), are available and meet the minimum National Flood Insurance Program guidelines.	
					M	Minor revisions to the manual are needed.	
					U	These manuals are lost or missing.	

Key: A = Acceptable, M = Minimally Acceptable; Maintenance is required, U = Unacceptable, N/A = Not Applicable, RODI = Requires Operation During Inspection

Field Observations

RATED ITEM EMBANKMENT/FOUNDATION	A	M	U	N/A	EVALUATION		LOCATIONS/ REMARKS / RECOMMENDATIONS
1. Embankment Fill					A	Embankment shows no evidence of slumping settling, erosion.	
					M	Minor settling (less than 3 inches) with no evidence of damage to levee structure.	
					U	Embankment material is settling or slumping and is likely to contribute to the development of slides or seepage problems.	
2. Foundations					A	Foundation does not show evidence of piping, sand boils, seepage, or settling that would reduce the level of protection.	
					M	Foundation material may show signs of excessive seepage, minor sand boils, and localized settlement.	
					U	Foundation materials are unsuitable and likely to cause excessive uncontrolled seepage, sand boils, and / or piping.	
					N/A	**The foundation problems described above do not apply to this type of FCW.**	

Key: A = Acceptable, M = Minimally Acceptable; Maintenance is required, U = Unacceptable, N/A = Not Applicable, RODI = Requires Operation During Inspection

Levees

For use during all Initial and Continuing Eligibility Inspections of levees

RATED ITEM LEVEE	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
1. Unwanted Vegetation Growth					**A** The levee has no unwanted trees, bushes, or excessive vegetation. Trees and shrubs may be allowed if the vegetation complies with levee landscaping plans or pose no threat to the levee or floodwall. Vegetation does not interfere with maintenance access.	
					M Minimal number of trees (5 cm (2") diameter or smaller) and/or brush present on the levee or within the 5 meter (15') zone, that will not threaten the integrity of the project but which need to be removed.	
					U Tree, weed, and brush cover exists in the FCW requiring removal to reestablish or ascertain FCW integrity. Vegetation prohibits maintenance access.	
2. Erosion/ Bank Caving					**A** No active erosion or bank caving observed on the landward or on the riverward side of the levee.	
					M There are areas where active erosion is occurring or has occurred on or near the levee embankment, but levee integrity is not threatened.	
					U Erosion or caving is occurring or has occurred that threatens the stability and integrity of the levee. The erosion or caving has progressed into the levee section or into the extended footprint of the levee foundation and has compromised the levee foundation stability.	
3. Slope Stability					**A** No slides present.	
					M Minor superficial sliding that with deferred repairs will not pose an immediate threat to FCW integrity.	
					U Evidence of deep-seated sliding that threatens FCW integrity. Repairs are required to reestablish FCW integrity.	
4. Cracking					**A** No cracking observed on the levee greater than 15 cm (6 inches) deep.	
					M Longitudinal and/or transverse cracking greater than 15 cm (6 inches) deep. No evidence of vertical movement along the crack.	
					U Longitudinal and/or transverse cracking present and exhibits signs of vertical movement.	
5. Animal Control					**A** Continuous animal burrow control program in place that includes the elimination of active burrowing and the filling in of existing burrows.	
					M The existing animal burrow control program needs to be improved. Several animal burrows present which may lead to seepage or slope stability problems and they require immediate attention.	
					U Animal burrow control program is not effective or is nonexistent. Significant maintenance is required to fill existing burrows, and the levee will not provide reliable flood protection until this maintenance is complete.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Levees - Continued on Next Page

Levees

For use during all Initial and Continuing Eligibility Inspections of levees

RATED ITEM LEVEE	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
6. Encroachments					A No trash, debris, excavations, structures, or other obstructions present within the project easement area which would reduce flow conveyance. Encroachments which do not diminish proper functioning of the project.	
					U Trash, debris, excavation, structures, or other obstructions present or inappropriate activities that will inhibit project operations and maintenance or emergency operations.	
7. Riprap Revetments & Banks					A Existing riprap protection is properly maintained and is undamaged. Riprap clearly visible.	
					M No riprap displacement or scouring activity that could undercut banks, erode embankments, or restrict desired flow. Unwanted vegetation must be cleared and sprayed with an appropriate herbicide.	
					U Dense brush, trees, or grasses hide the rock protection, or meandering and/or scour activity is undercutting banks, eroding embankments, or impairing channel flows by causing turbulence or shoaling.	
					N/A There is no riprap protecting the levee.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Additional issues noted during the inspection:

Concrete Floodwalls

For use during all Initial and Continuing Eligibility Inspections of concrete floodwalls

RATED ITEM FLOODWALL	A	M	U	N/A	EVALUATION		LOCATIONS/ REMARKS / RECOMMENDATIONS
1. Concrete Surfaces					A	Negligible spalling, scaling or cracking.	
					M	Spalling, scaling, and open cracking present, but the immediate integrity or performance of the structure is not threatened. Reinforcing steel may be exposed.	
					U	Surface deterioration or deep, controlled cracks present that result in an unreliable structure.	
2. Tilting, Sliding or					A	There are no significant areas of tilting, sliding, or settlement that would endanger the integrity of the project.	
					M	There are areas of tilting, sliding, or settlement (either active or inactive) that need to be repaired. The integrity of the structure is not in danger.	
					U	There are areas of tilting, sliding, or settlement (either active or inactive) that threaten the structure's integrity and performance.	
3. Foundation of Concrete and Sheet Pile Structures					A	No scouring / erosion, or undermining near the structure.	
					M	Scouring / erosion near the footing of the structure but not close enough to affect structure stability during the next flood.	
					U	Scouring or undermining at the foundation that has affected structural integrity.	
4. Monolith Joints					A	The monolith joint material is in good condition.	
					M	The monolith joint material is deteriorating and needs to be repaired or replaced to prevent spalling and cracking.	
					U	The monolith joint material is severely deteriorated and the concrete has spalled and cracked, damaging the waterstop to the point where it will not provide the intended level of protection during a flood.	
					N/A	**There are no monolith joints in the floodwall.**	
5. Erosion/ Bank Caving					A	No active erosion or bank caving on the riverward side of the floodwall which might endanger its stability.	
					M	There are areas where the ground is eroding towards the base of the floodwall and efforts need to be taken to slow and repair this erosion, but the erosion has not yet progressed to the point that the floodwall will loose stability during a flood event.	
					U	Erosion or bank caving is occurring or has occurred riverward of the levee which threatens the stability of the floodwall.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Concrete Floodwalls- Continued on the next page

Concrete Floodwalls (continued)

For use during all Initial and Continuing Eligibility Inspections of concrete floodwalls

RATED ITEM FLOODWALL	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
6. Unwanted Vegetation Growth					**A** A no tree and underbrush zone is maintained. All trees, brush, and unwanted vegetation have been removed from this zone for maintenance, flood-fighting activities, and to protect the floodwall. The no tree and underbrush zone extends from the concrete wall to a point 2.5 meters (8') beyond the underground toe and heel of the floodwall. Reference EM 1110-2-30 and/or local Corps policy.	
					M There are some areas where trees and underbrush are growing near the floodwall. This vegetation must be removed, but does not currently threaten the integrity of the project.	
					U There is a significant amount of tree, weed, or brush growth near the floodwall, which may limit access during flood fight operations or the roots of which may offer accelerated seepage paths under the structure.	
7. Encroachments					**A** No trash, debris, excavations, structures, or other obstructions present within the project easement area, which would inhibit maintenance or impact conveyance. Encroachments which do not diminish proper functioning of the FCW.	
					M Trash, debris, excavations, structures, or other obstructions present, or inappropriate activities that will not inhibit project operations and maintenance or emergency operations.	
					U Trash, debris, excavation, structures, or other obstructions present, or inappropriate activities that will inhibit project operations and maintenance or emergency operations.	
8. Closure Structures					**A** Closure structure in good repair. Components of closure clearly marked and installation instructions / procedures readily available.	
					U Closure structure in poor condition. Parts missing or corroded. Placing equipment may not be available within normal warning time.	
					N/A There are no closure structures along the floodwall.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Additional issues noted during the inspection:

Interior Drainage System

For use during all Initial and Continuing Eligibility Inspections of systems carrying interior drainage through the FCW

RATED ITEM Interior Drainage	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
1. Vegetation and Obstructions					A Minimal, scattered obstructions or vegetation. The flow is not impeded.	
					M Debris, vegetation growth (such as cat tails, bull rushes, bushes, or saplings), starting to impact conveyance	
					U Debris jams, snags, vegetation growth (such as cat tails, bull rushes, bushes, or saplings), or other obstructions block approximately 50% of the FCW.	
2. Encroachments					A No trash, debris, excavations, structures, or other obstructions present within the project.	
					M Trash, debris, excavations, structures, or other obstructions present, or inappropriate activities that will not inhibit project operations and maintenance or emergency operations.	
					U Trash, debris, excavation, structures, or other obstructions present, or inappropriate activities that will inhibit project operations and maintenance or emergency operations.	
3. Riprap Erosion protection at Inlet/Outlet Structure.					A Existing riprap protection is properly maintained and is undamaged. Riprap clearly visible.	
					M No riprap displacement or scouring activity that could undercut banks, erode embankments, or restrict desired flow. Unwanted vegetation must be cleared and/or treated with an appropriate herbicide.	
					U Dense brush, trees, or grasses hide the rock protection, or meandering and/or scour activity is undercutting banks, eroding embankments, or impairing channel flows by causing turbulence.	
					N/A There is no riprap protecting the interior drainage system, or the riprap is discussed in another section.	
4. Erosion of Inlet/ Discharge Areas					A No active erosion or bank caving observed on the landward or on the riverward side of the levee.	
					M There are areas where active erosion is occurring or has occurred on or near the levee embankment, but levee integrity is not threatened.	
					U Erosion or caving is occurring or has occurred that threatens the stability and integrity of the levee. The erosion or caving has progressed into the levee section or into the extended footprint of the levee foundation and has compromised the levee foundation stability.	
					N/A There are no inlet/discharge areas.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Interior Drainage - Continued on Next Page

Interior Drainage System (continued)

For use during all Initial and Continuing Eligibility Inspections of systems carrying interior drainage through the FCW

RATED ITEM Interior Drainage	A	M	U	N/A	EVALUATION		LOCATIONS/ REMARKS / RECOMMENDATIONS
5. Blockage of Culverts (Inlets, Sump, and Discharge Areas)					A	There is little or no debris, sediment, or vegetation blocking the culverts, inlets, sump, or discharge areas. The channel capacity for designed flow is not affected.	
					M	Debris, sediment, or vegetation blocks less than 10 percent of the culvert opening, but must be removed.	
					N/A	**There are no culverts**	
6. Culverts					A	There are no breaks, holes, cracks in the culvert that would result in significant water leakage. Corrugated metal pipes, if present, are in good condition or have been relined with appropriate material, which is still in good condition.	
					M	There are breaks, holes, cracks in the culvert that would result in water leakage and need to be repaired, but do not threaten the integrity of the project. Corrugated metal pipes, if present, are showing deterioration but the entire length of pipe is still structurally sound and is not in danger of collapsing.	
					U	Culvert has deterioration and/or has significant leakage such that it threatens the integrity of the FCW. Corrugated metal pipes are in danger of collapsing or have already begun to collapse	
					N/A	**There are no culverts**	
8. Trash Racks (or debris grates)					A	Trash racks are fastened in place and properly maintained.	
					M	Trash racks are in place but are unfastened or have bent bars that allow debris to enter into the pipe or pump station. Repair or replacement is required.	
					U	Trash rack is missing or damaged to the extent that it is no longer functional and must be replaced	
					N/A	**There are no trash racks.**	
9. Flap Gates RODI					A	Flap gates open and close easily with minimal leakage. Gates show no corrosion damage and have been maintained.	
					M	Gate will not fully open or close because of obstructions that can be easily removed, or has corrosion damage that requires maintenance.	
					U	Gate is missing, has been damaged, or has deteriorated and needs repair	
					N/A	**There are no flap gates..**	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Interior Drainage - Continued on Next Page

Interior Drainage System (continued)

For use during all Initial and Continuing Eligibility Inspections of systems carrying interior drainage through the FCW

RATED ITEM Interior Drainage	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
11. Electric Gate Operators for Sluice / Slide Gates RODI					A All electric gate operators are in good working condition and are adequately powered, and are capable of opening and closing the gate properly. Preventative maintenance is being performed and the system is tested periodically.	
					M All electric gate operators are operational with minor deficiencies, but should perform through the next period of usage.	
					U The electric gate operators are not operational, or the power source is not considered reliable to sustain operations during flood conditions.	
					N/A There is no electric gate operators.	
12. Manual Operators (Backups) for Sluice / Slide Gates RODI					A All manual gate operators are in good working condition and are capable of opening and closing the gate properly. Preventative maintenance is being performed and the system is tested periodically.	
					M Manual gate operators are operational with minor deficiencies, but should perform through the next period of usage.	
					U Manual gate operators are not operational.	
					N/A If there are sluice or slide gates, there needs to be means of operating them manually. If there are no sluice/slide gates, this item is N/A.	
13. Concrete Surfaces (Such as gate wells, outfalls, intakes, or culverts)					A Negligible spalling, scaling or cracking. If the concrete surface is weathered, rough to the touch, or holds moisture, it is still satisfactory.	
					M Spalling, scaling, and open cracking present, but the immediate integrity or performance of the structure is not threatened. Reinforcing steel may be exposed. Repairs/ sealing is necessary.	
					U Surface deterioration or deep, controlled cracks present that result in an unreliable structure.	
					N/A There are no concrete surfaces.	

Key: A = Acceptable, M = Minimally Acceptable, Maintenance is required. U = Unacceptable. N/A = Not Applicable. **RODI** = Requires Operation During Inspection

Interior Drainage - Continued on Next Page

Interior Drainage System (continued)

For use during all Initial and Continuing Eligibility Inspections of systems carrying interior drainage through the FCW

RATED ITEM Interior Drainage	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
14. Security Gates RODI					**A** Safety gates is in good condition and provides protection against falling or unauthorized access. Gates open and close freely, locks are in place, and there is little corrosion on metal parts.	
					M Security gates are damaged or corroded but appear to be maintaintable. Locks may be missing or damaged.	
					U Safety/ security fencing and gates are damaged or corroded to the point that replacement is required, or potentially dangerous project features are not secured.	
					N/A There are no features of the internal drainage system that require safety fencing.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Additional issues noted during the inspection:

Pump Stations

For use during all Initial and Continuing Eligibility Inspections of pump stations

RATED ITEM PUMP STATIONS	A	M	U	N/A	EVALUATION		LOCATIONS/ REMARKS / RECOMMENDATIONS
1. Pump Stations Operating Log (A or U only)					A	Operation and maintenance log is present at the pump station and is being used and updated, and personnel have been trained in pump station operations. Names and last training date shown in the log book.	
					U	No operating log present, or refresher training for personnel has not been conducted.	
2. Pump Station Operations					A	Operation and Maintenance Manual and/or posted operating instructions are present and adequately cover all pertinent pump station features.	
					U	Operation and Maintenance Manual missing or sponsor is unsure of location.	
3. Plant Building					A	The building is in good structural condition, with no major cracks in concrete or brick. The roof is not leaking, exhaust fans are operational, there are no exposed electrical components, and the working environment is safe.	
					M	There is significant cracking in the building structure, or the building is damaged in other ways such that it needs repair but does not threaten pumping operations.	
					U	The structural integrity or stability of the building is threatened, or there is other damage to the building such a that pumping operations can not be performed as intended.	
4. Safety					A	Exhaust fans, vents/louvers are working properly. Fuel storage / distribution meets state / local requirements. Fire extinguishers of sufficient quality, quantity, and type are on hand and are properly charged. Safety hardware (hand rails, grates for wet-wells, etc) is installed. Required safety items used (hearing, eyes, etc).	
					U	Safety issues exist that could cause injury or loss of life.	
					N/A	**The pump station does not require safety equipment.**	
5. Safety Fencing RODI					A	Safety/ security fencing is in good condition and provides protection against falling or unauthorized access. Gates open and close freely, locks are in place, and there is little corrosion on metal parts.	
					M	Safety/ security fencing or gates are damaged or corroded but appear to be maintainable. Locks may be missing or damaged.	
					U	Safety/ security fencing and gates are damaged or corroded to the point that replacement is required, or potentially dangerous project features are not secured.	
					N/A	**There are no features in or around the pump stations that require safety fencing.**	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Pump Stations - Continued on Next Page

Pump Stations (continued)

For use during all Initial and Continuing Eligibility Inspections of pump stations

RATED ITEM PUMP STATIONS	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
6. Pumps					**A** All pumps are properly maintained and lubricated. Systems are periodically tested, and there is no evidence of cavitation, vibrations, or unusual sounds.	
					M Minor deficiencies exist which need to be closely monitored or repaired, such as the presence of minor vibrations or the corrosion of the pump shaft housing. However, the pumps are operational and are expected to perform through the next period of usage.	
					U One or more of the pumps are not operational, or the pump capacity has degraded to the point where project performance is in question.	
7. Power					**A** The power source is adequate, safe, and reliable. Backup generators are on hand or there is a reliable backup power plan in place. Backup units are properly sized, operational, periodically exercised, and properly maintained.	
					U Power source not considered safe or reliable to sustain operations during flood conditions.	
8. Motors, Engines, Fans and Gear Reducers					**A** All items are operational. Preventative maintenance and lubrication is being performed and the system is periodically subjected to performance testing. Instrumentation, alarms, and auto shutdowns are operational.	
					M Systems have minor deficiencies, but are operational and will function adequately through the next flood.	
					U One or more of the primary motors or systems is not operational.	
9. Pump Control Systems					**A** Operational and maintained free of damage, corrosion, or other debris.	
					M Operational with minor discrepancies. Will function adequately during the next flood event.	
					U Pump controls not operational. May not function adequately during the next flood event.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. **RODI** = Requires Operation During Inspection

Pump Stations - Continued on Next Page

Pump Stations (continued)

For use during all Initial and Continuing Eligibility Inspections of pump stations

RATED ITEM PUMP STATIONS	A	M	U	N/A	EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
10. Sumps / Wet well					A Clear of excessive debris, sediment, or other obstructions. Procedures are in place to remove debris accumulation during operation.	
					M Debris, sediment, or other obstructions are present and must be removed, but the sump/ wet well will function as intended during the next flood. Procedures are in place to remove debris accumulation during operation.	
					U Large debris or excessive silt present which will hinder or damage pumps during operation, or no procedures have been established to remove debris accumulation during operation.	
11. Trash Rakes					A Drive chain, bearing, gear reducers, and other components are in good operating condition and are being properly maintained.	
					M The trash rake is in need of maintenance, but is still operational.	
					U Trash rake not operational or deficiencies will inhibit operations during the next flood event.	
					N/A There are no mechanical trash rakes.	
12. Trash Racks (non-mechanical)					A Trash racks are fastened in place and properly maintained.	
					M Trash racks are in place but are unfastened or have bent bars that allow debris to enter into the pipe or pump station. Repair or replacement is required.	
					U Trash rack is missing or damaged to the extent that it is no longer functional and must be replaced.	
					N/A There are no non-mechanical trash rakes.	

Key: A = Acceptable, M = Minimally Acceptable; Maintenance is required, U = Unacceptable, N/A = Not Applicable, RODI = Requires Operation During Inspection

Pump Stations - Continued on Next Page

Pump Stations (continued)

For use during all Initial and Continuing Eligibility Inspections of pump stations

RATED ITEM PUMP STATIONS	A	M	U	N/A		EVALUATION	LOCATIONS/ REMARKS / RECOMMENDATIONS
13. Electric Gate Operators for Sluice / Slide Gates (Intake/ Discharge) RODI					A	All electric gate operators are in good working condition and are adequately powered, and are capable of opening and closing the gate properly. Preventative maintenance is being performed and the system is tested periodically.	
					M	All electric gate operators are operational with minor deficiencies, but should perform through the next period of usage.	
					U	The electric gate operators are not operational, or the power source is not considered reliable to sustain operations during flood conditions.	
					N/A	**There are no electric gate operators.**	
14. Manual Operators (Backups) for Sluice / Slide Gates RODI					A	All manual gate operators are in good working condition and are capable of opening and closing the gate properly. Preventative maintenance is being performed and the system is tested periodically.	
					M	Manual gate operators are operational with minor deficiencies, but should perform through the next period of usage.	
					U	Manual gate operators are not operational.	
					N/A	**If there are sluice or slide gates, there needs to be means of operating them manually. If there are no sluice/slide gates, this item is N/A.**	

Key: A = Acceptable, M = Minimally Acceptable; Maintenance is required, U = Unacceptable, N/A = Not Applicable, RODI = Requires Operation During Inspection

Additional issues noted during the inspection:

Additional issues noted during the inspection:

Instructions for the Inspection Guide

GENERAL INSTRUCTIONS:

1. Determination of Minimum Evaluation for Levees and Floodwalls. Depending on available data, the minimum National Flood Insurance Program Regulations must be met.
2. All other sections of this guide that correspond to project features in the Flood Control Work must be fully completed during every Continuing and Initial Eligibility Inspection.
3. RODI stands for "Requires Operation During Inspection". Items marked "RODI" will be rated based on the way they work during the inspection.
4. Additional areas for inspection will be incorporated by the inspector into this guide if the layout or physical characteristics of the project warrant this. Appropriate entries will be made in the REMARKS block.

RATINGS OF INDIVIDUAL ITEMS:

The following terms and definitions are used when determining the rating for each item and/or component in the flood control work.

A – Acceptable: The rated item is in satisfactory condition, with no deficiencies, and will function as designed and intended during the next flood event.

M – Minimally Acceptable: This rated item has minor deficiencies that need to be corrected. The minor deficiencies will not seriously impair the functioning of the item during the next flood event. The overall reliability of the project will be lowered because of the minor deficiency.

U – Unacceptable: The deficiencies are serious enough that the rated item will not adequately function during the next flood event, compromising the project's ability to provide reliable flood protection.

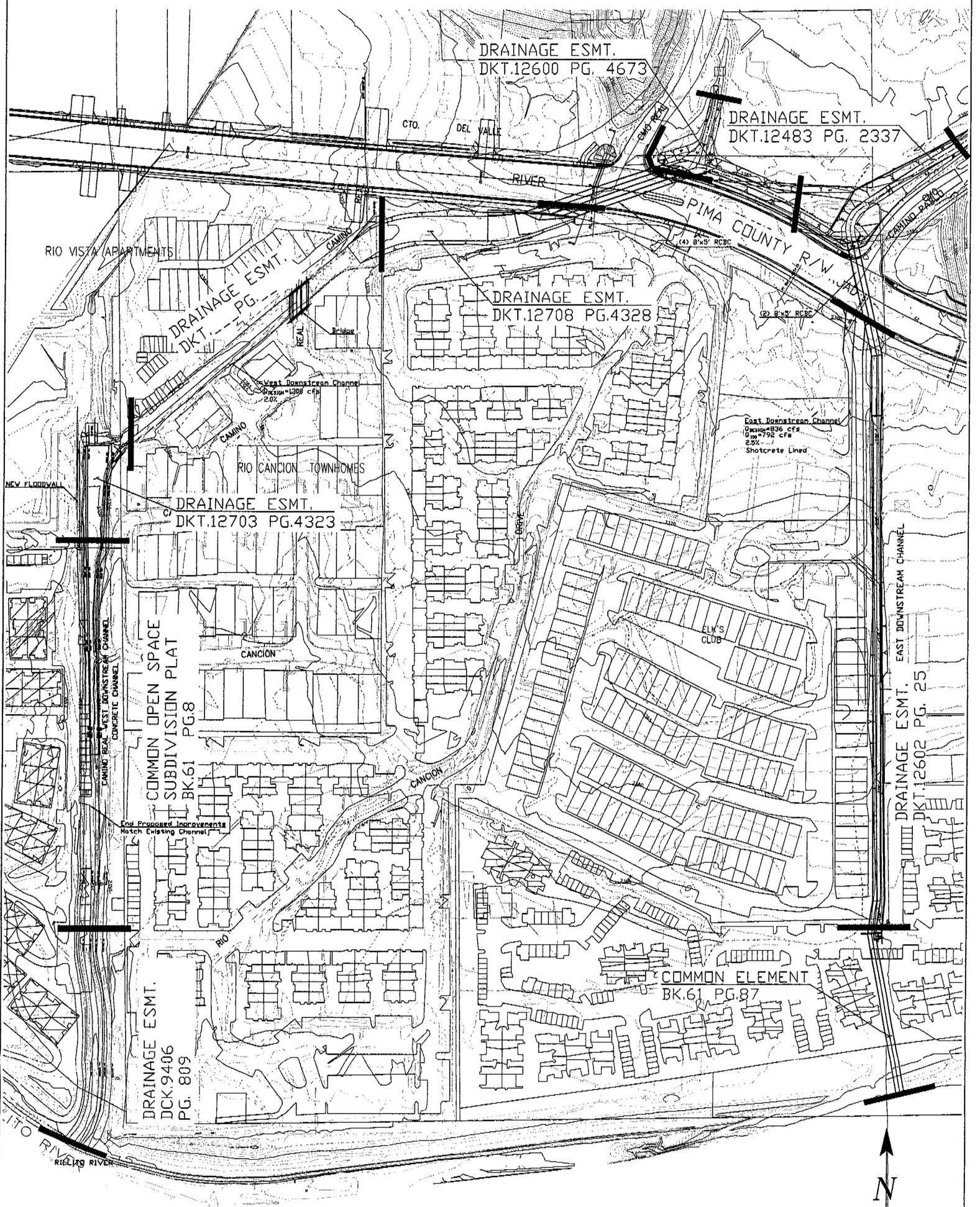
DETERMINATION OF OVERALL PROJECT CONDITION CODE:

The lowest single rating given for a rated item will determine the overall condition of the project.

1. If all items are rated as Acceptable, the overall project condition will be rated as Acceptable.
2. If one ore more items are rated as Minimally Acceptable, the overall project condition will be rated Minimally Acceptable.
3. If one or more item is rated as Unacceptable, the overall project condition will be rated as Unacceptable.

DEMONSTRATION
OF
RIGHTS TO MAINTAIN ACCESS
FOR
CAMINO REAL WASH
LOMR

Owner	Tax Code	Document	Proposed Acquisition	Docket	Page
Marvin	108-24-011A	Deed	Drainage Esmt	12536	2313
Kokroko	108-23-070B	Temp. Esmt	Drainage Esmt	12600	4673
Kokroko	108-25-0010	Deed	Drainage Esmt	12652	39
Kokroko	108-25-0010	Esmt	Drainage Esmt	12600	4673
Gall	108-22-0150	Esmt	Drainage Esmt	12483	2337
HSL Rio Cancion Apt.	108-25-006C	Esmt	Drainage Esmt	12708	4328
Rio Cancion Condominiums	180-28-3940	n/a	n/a	BK 33	10
Rro Cancion Townhomes Assn.	180-25-1390	n/a	n/a	BK 61	8-2
Rio Cancion Townhomes Assn.	180-25-1390	n/a	n/a	9406	809
River Elks LLC		Esmt	Drainage Esmt	12602	25



RILLITO CREEK

CASTRO JOB NO. PCDT009

SCALE: 1"=80'
CI = 1'

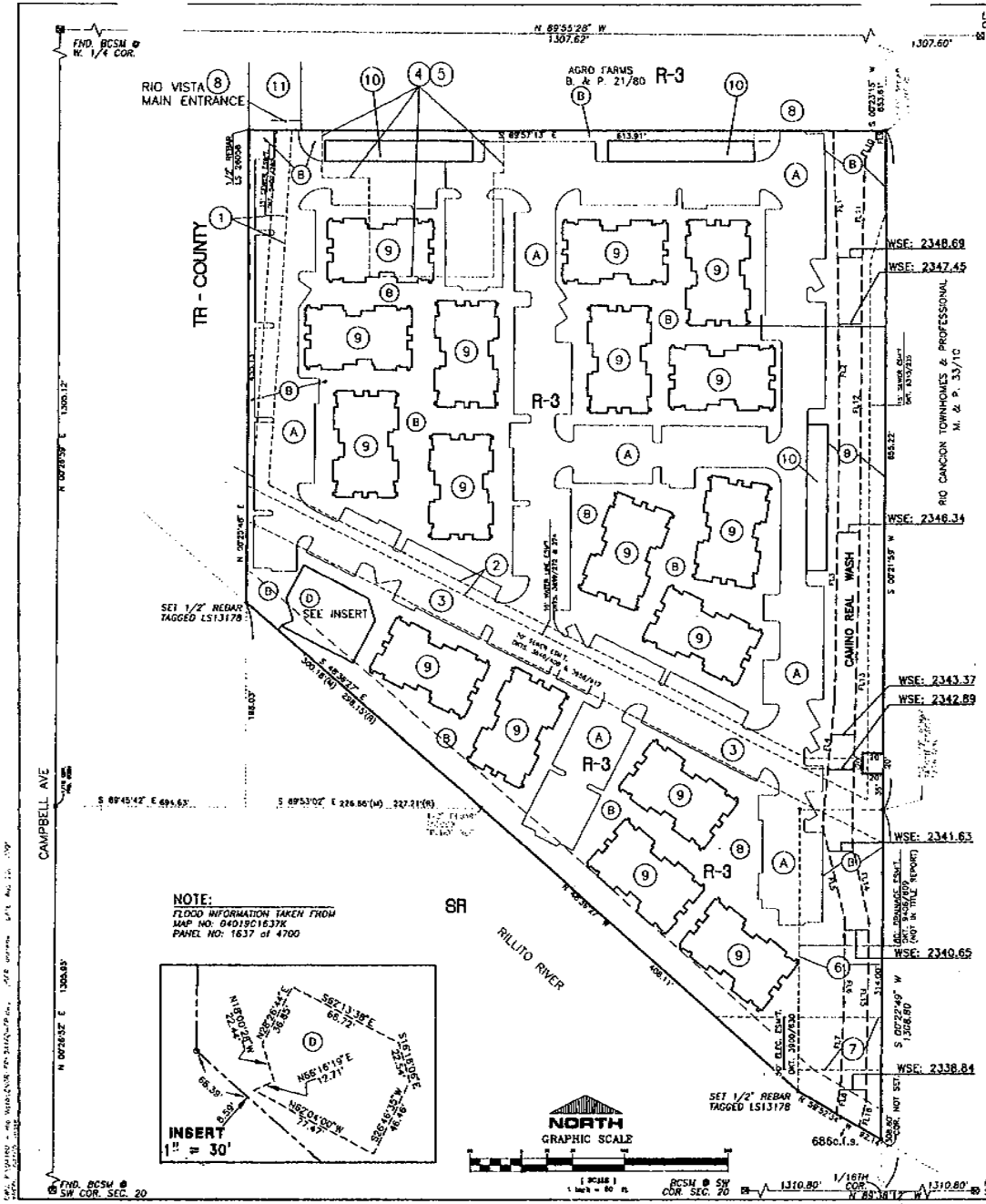
SHEET 1

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT

CAMINO REAL WASH L.O.M.R.

FIGURE 1
RIGHTS TO ACCESS/MAINTENANCE

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2560 (520)293-2115 (fax)



LEGAL DESCRIPTION

PARCEL 1:
The East half of the Northwest quarter of the Southwest quarter of Section 20; EXCEPT the West 40 feet thereof, and that part of the East half of the Southwest Quarter of the Northwest quarter of Section 20,lying South of the South right of way line of River Road, EXCEPT the West 40 feet thereof; EXCEPT The North 20 feet of the South 55 feet of the East 20 feet of the Northwest quarter of the Southwest quarter all in Township 13 South of Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona; AND EXCEPT that portion of the said East half known as AGRO FARMS, Lots 1 and 2, according to the plat of record in the Office of the Pima County Recorder, in Book 21 of Maps, Page 80. LESS those portions conveyed by Deed recorded in Docket 9667, Page 307.

PARCEL 2:
A parcel of land located in the Southwest quarter of the Southwest quarter of Section 20, Township 13 South, Range 14 East, Gila and Salt River Base and Meridian, Pima County, Arizona, described as follows: Beginning at the Northeast corner of the Southwest quarter of the Southwest quarter of said Section 20, being a 1/2 inch pin tagged "PCDOT"; thence South 0°22'49" West, along the East line of the Southwest quarter of the Southwest quarter of said Section, a distance of 314.00 feet; thence North 59°52'34" West, 92.14 feet to a 1/2 inch rebar tagged LS 13178; thence North 48°36'27" West, 408.11 feet to a 1/2 inch pin tagged "PCDOT REF" at the East corner of that properly described by Docket 7249 at page 248; thence South 89°41'25" East, along the North line of the Southwest quarter of the Southwest quarter of said Section 20, a distance of 387.95 feet to the POINT OF BEGINNING.

KEYNOTES

(1) 15' SEWER EASEMENT, DKT. 5402, PG. 282 (TO REMAIN)
(2) 10' WATER EASEMENT, DKT. 3899, PG. 222 & 224 (TO REMAIN)
(3) 30' SEWER EASEMENT, DKT. 3840/3958, PG. 408/917 (TO REMAIN)
(4) TENNIS COURT EASEMENT, DKT. 5429, PG. 621 & 625 (TO BE ABANDONED)
(5) TENNIS COURT EASEMENT, DKT. 5629, PG. 77 & 79 (TO BE ABANDONED)
(6) 80' DRAINAGE EASEMENT, DKT. 9406, PG. 809 (TO REMAIN)
(7) 50' ELECTRIC EASEMENT, DKT. 3900, PG. 630 (TO REMAIN)
(8) EASEMENT FOR INGRESS, EGRESS, ACCESS, FIRE LANE, UTIL'S AND REFUSE COLLECTION PER DKT. 11379, PG. 894.
(9) 2 STORY CONDOMINIUM BUILDING
(10) 1 STORY STORAGE AND GARAGE BUILDING
(11) 50' INGRESS/EGRESS EASEMENT – RIVER ROAD : DKT 11379, PG. 894

(A) VEHICULAR OPEN SPACE STREETS, UNCOVERED PARKING & CIRCULATION.
(B) COMMON OPEN SPACE CURB TO BUILDING/PROPERTY LINE.
(C) LIMITED OPEN SPACE PATIOS. SEE SHEET 4 of 5.
(D) RECREATION OPEN SPACE POOL AREA, FENCE LINE IN.
(E) LIMITED VEHICULAR OPEN SPACE COVERED PARKING

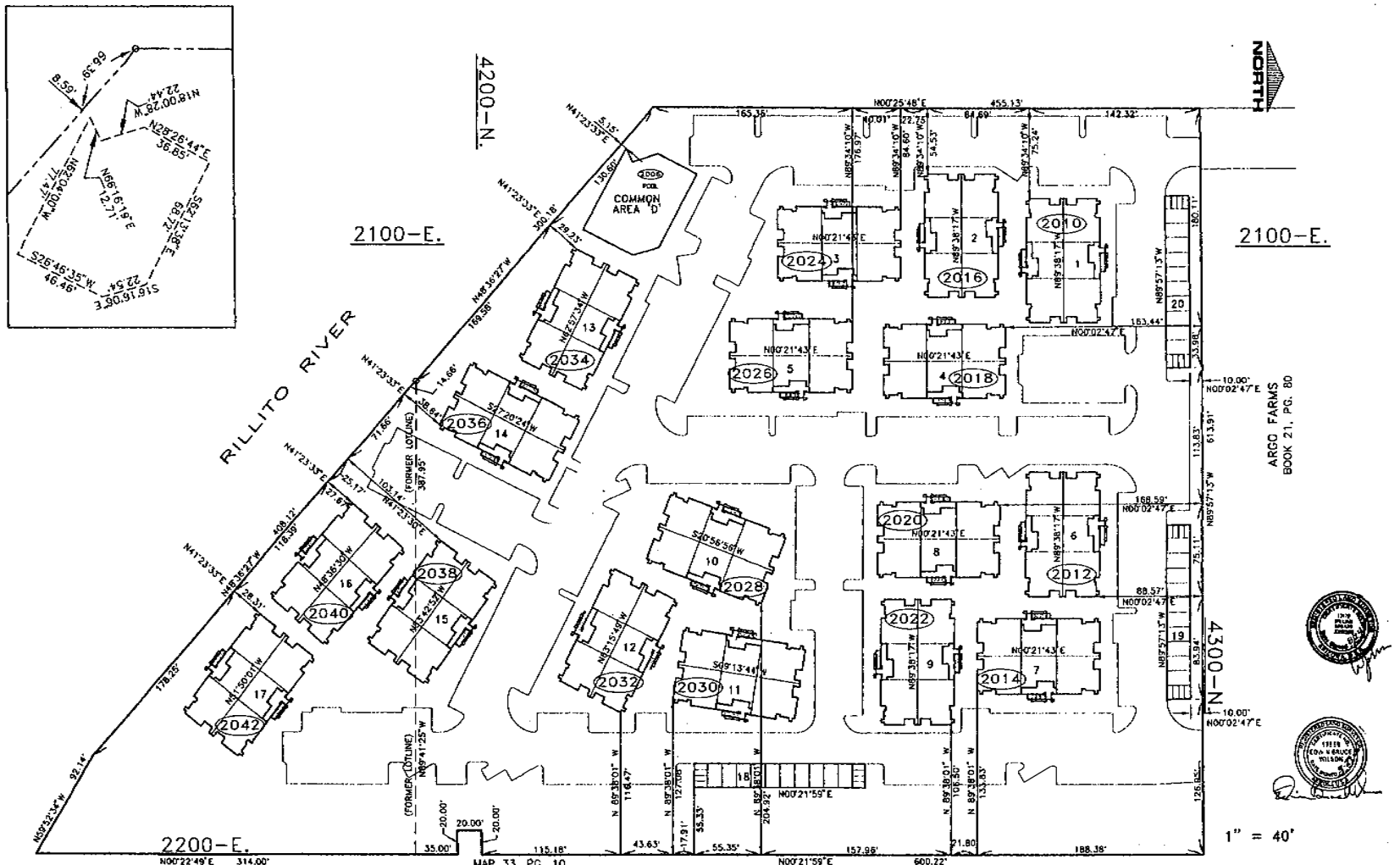
FLOOD LINE TABLE		
LINE	LENGTH	BEARING
FL1	146.02	S01°30'48"E
FL2	168.53	S00°09'48"E
FL3	233.82	S01°00'48"W
FL4	123.17	S05°37'34"W
FL5	89.43	S13°37'44"E
FL6	80.92	S00°10'35"W
FL7	75.51	S02°20'26"W
FL8	30.14	S08°40'00"W
FL9	7.39	S00°03'04"W
FL10	22.31	S28°22'01"W
FL11	106.00	S02°10'57"W
FL12	258.65	S00°27'06"W
FL13	295.83	S01°32'06"W
FL14	77.58	S12°07'57"E
FL15	169.49	S00°56'07"W
FL16	25.14	S15°59'34"W

REFERENCE CASE NO.
C15-94-04
C15-97-03

FINAL PLAT
(SO4-178)
PLACITA ESCONDIDA
A COHOUSING NEIGHBORHOOD,
COMMON AREA "A" (VEHICLE USE)
COMMON AREA "B" (LANDSCAPE),
COMMON AREA "C" (LIMITED USE OPEN SPACE)
COMMON AREA "D" (RECREATION AREA)
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 20, T-13-S, R-14-E, G.&S.R.B.&M., PIMA COUNTY, AZ.
UNITS 1-204 TOGETHER W/BLDGS. 18,19&20
A CONDOMINIUM PROJECT

LANDMARK ENGINEERING INC
3645 NORTH BUSINESS CENTER DRIVE, SUITE #107, TUCSON, AZ. 85705
PHONE: (520) 888-1382 FAX: (520) 888-1382

BOOK 61 PAGE 8
2 of 5
BOOK 61 PAGE 8-2



BUILDING LEGEND

BLDG. NO.	SQ. FT.	FF ELEV.	NUMBER OF STORIES/HEIGHT
BLDG. 1	5512 S.F.	48.10	2 / 28'
BLDG. 2	5512 S.F.	47.40	2 / 28'
BLDG. 3	5512 S.F.	47.20	2 / 28'
BLDG. 4	5512 S.F.	46.75	2 / 28'
BLDG. 5	5512 S.F.	45.80	2 / 28'
BLDG. 6	5512 S.F.	47.50	2 / 28'
BLDG. 7	5512 S.F.	49.00	2 / 28'
BLDG. 8	5512 S.F.	46.65	2 / 28'
BLDG. 9	5512 S.F.	48.15	2 / 28'
BLDG. 10	5512 S.F.	46.50	2 / 28'
BLDG. 11	5512 S.F.	48.15	2 / 28'
BLDG. 12	5512 S.F.	48.00	2 / 28'
BLDG. 13	5512 S.F.	45.50	2 / 28'
BLDG. 14	5512 S.F.	45.75	2 / 28'
BLDG. 15	5512 S.F.	47.00	2 / 28'
BLDG. 16	5512 S.F.	45.50	2 / 28'
BLDG. 17	5512 S.F.	46.25	2 / 28'
GARG. 18	2780 S.F.	47.96, 47.66, 47.36	1 / 10.5'
GARG. 19	2780 S.F.	47.16, 47.36, 47.60	1 / 10.5
GARG. 20	2780 S.F.	47.39, 47.66, 48.07	1 / 10.5'

NOTE:
ALL BUILDING CORNER TIES ARE PERPENDICULAR (@ 90°) TO THE BASE LINE AS SHOWN.

REFERENCE CASE NO.
C15-94-04
C15-97-03

FINAL PLAT
(SO4-178)
PLACITA ESCONDIDA
A COHOUSING NEIGHBORHOOD,
COMMON AREA "A" (VEHICLE USE)
COMMON AREA "B" (LANDSCAPE),
COMMON AREA "C" (LIMITED USE OPEN SPACE)
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A PORTION OF THE SOUTHEAST QUARTER OF SECTION 20, T-13-S, R-14-E, G&SRB&M, PIMA COUNTY, AZ.
UNITS 1-204 TOGETHER W/BLDGS. 18,19 & 20
A CONDOMINIUM PROJECT

LANDMARK ENGINEERING INC
3845 NORTH BUSINESS CENTER DRIVE, SUITE 107, TUCSON, AZ. 85705
PHONE: (520) 628-1389 FAX: (520) 628-1392

THE VILLAS AT HACIENDA DEL SOL

UNITS 1 THRU 218, UNITS G1 THRU G29,
LIMITED COMMON ELEMENTS C1 THRU C205
AND COMMON ELEMENT

GENERAL NOTES

1. THE GROSS AREA OF THIS SUBDIVISION IS 12.127 ACRES MORE OR LESS.
2. THE TOTAL NUMBER OF RESIDENTIAL CONDOMINIUM UNITS IS 218
3. TOTAL MILES OF NEW PUBLIC STREETS IS 0.
   TOTAL MILES OF NEW PRIVATE STREETS IS 0.
4. THIS PLAT IS SUBJECT TO THE CONDITIONS OF REZONING CASE NUMBERS C09-95-22 AND C9-01-10, UNLESS SUPERCEDED BY A SUBSEQUENT REZONING ORDINANCE.

   EXCEPT AS PROVIDED BY THE DECLARATION, PURSUANT TO ARS 33-1212:

   A. IF WALLS, FLOORS OR CEILINGS ARE DESIGNATED AS BOUNDARIES OF A UNIT, ALL LATHE, FURRING, WALLBOARD, PLASTERBOARD, PLASTER, PANELING, TILES, WALLPAPER, PAINT, FINISHED FLOORING AND ANY OTHER MATERIALS CONSTITUTING ANY PART OF THE FINISHED SURFACES ARE A PART OF THE UNIT, AND ALL OTHER PORTIONS OF THE WALLS, FLOORS OR CEILINGS ARE A PART OF THE COMMON ELEMENTS.
   B. IF ANY CHUTE, FLUE, DUCT, WIRE, CONDUIT, BEARING WALL, BEARING COLUMN, OR OTHER FIXTURE LIES PARTIALLY WITHIN AND PARTIALLY OUTSIDE THE DESIGNATED BOUNDARIES OF A UNIT, ANY PORTION SERVING ONLY THAT UNIT IS A LIMITED COMMON ELEMENT ALLOCATED SOLELY TO THAT UNIT AND ANY PORTION SERVING MORE THAN ONE UNIT OR ANY PORTION OF THE COMMON ELEMENTS IS A PART OF THE COMMON ELEMENTS.
   C. SUBJECT TO THE PROVISIONS OF PARAGRAPH 2, ALL SPACES, INTERIOR PARTITIONS AND OTHER FIXTURES AND IMPROVEMENTS WITHIN THE BOUNDARIES OF A UNIT ARE A PART OF THE UNIT.
   D. ANY SHUTTERS, AWNING, WINDOW BOXES, DOORSTEPS, STOOPS, PORCHES, BALCONIES, ENTRYWAYS OR PATIOS AND ALL EXTERIOR DOOR AND WINDOWS OR OTHER FIXTURES DESIGNED TO SERVE A SINGLE UNIT, BUT LOCATED OUTSIDE THE UNIT'S BOUNDARIES, ARE LIMITED COMMON ELEMENTS ALLOCATED EXCLUSIVELY TO THE UNIT.

5. BASIS OF BEARING: BEING THE CENTER SECTION LINE BETWEEN THE CENTER OF SECTION AND THE 1/4 TN CORNER AT THE SOUTHEAST CORNER OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 20, TOWNSHIP 13 SOUTH, RANGE 14 EAST, GILA AND SALT RIVER MERIDIAN, PIMA COUNTY, ARIZONA. SAID LINE BEING MONUMENTED BY A 2" LEAD CAPPED PIPE AT THE CENTER OF SECTION AND A 3" ALUMINUM CAPPED PIPE MARKED "LS 14145" AT SAID 1/4 TN CORNER WITH A BEARING OF S00°09'11"W.
6. THERE WILL BE NO FURTHER DIVISION WITHOUT THE EXPRESSED APPROVAL OF THE CITY OF TUCSON.
7. THE BOUNDARY SURVEY AS SHOWN ON THIS PLAT WAS BASED UPON THAT ALTA/ACSM SURVEY OF VILLAS AT LA HACIENDA BY THOMAS E. HOSACK, RLS 27242 DATED 10/10/02 AND THAT ALTA/ACSM SURVEY BY MERIDIAN SURVEYING DATED 03/02/06 SIGNED BY MICHAEL L. DEMPLE, RLS 21762.
8. DRAINAGE INFORMATION SHOWN BASED UPON HYDROLOGY REPORT FOR VILLAS AT HACIENDA DEL SOL BY CMG DRAINAGE ENGINEERING, INC. DATED 10/30/01.
9. PROPERTY IS SUBJECT TO THE FOLLOWING:

   RESERVATIONS AND EXCEPTIONS IN THE PATENT FROM THE UNITED STATES OF AMERICA, RECORDED IN BOOK 44 OF DEEDS AT PAGE 511 AND IN BOOK 52 OF DEEDS AT PAGE 214

   AGREEMENT UPON THE TERMS AND CONDITIONS CONTAINED THEREIN FOR WATER RECORDED IN BOOK 4 OF MISCELLANEOUS RECORDS AT PAGE 375 AND IN BOOK 5 OF MISCELLANEOUS RECORDS AT PAGE 575

   EASEMENTS FOR THE PURPOSES SET FORTH THEREIN AND RIGHTS INCIDENT THERETO RECORDED IN DOCKET 4443 AT PAGE 246

   EASEMENTS FOR THE PURPOSES SET FORTH THEREIN AND RIGHTS INCIDENT THERETO RECORDED IN DOCKET 5294 AT PAGE 265

   COVENANTS, CONDITIONS AND RESTRICTION, BUT OMITTING ANY COVENANT OR RESTRICTION BASED ON RACE, COLOR, RELIGION, SEX, HANDICAP, FAMILIAL STATUS OR NATIONAL ORIGIN UNLESS AND ONLY TO THE EXTENT SAID COVENANT (A) IS EXEMPT UNDER CHAPTER 42, SECTION 3607 OF THE UNITED STATES CODE OR (B) RELATES TO HANDICAP BUT DOES NOT DISCRIMINATE AGAINST HANDICAPPED PERSONS, RECORDED IN DOCKET 11864, PAGE 609

10. THE PROPOSED USE OF THIS PROPERTY IS MULTI FAMILY RESIDENTIAL. THIS DEVELOPMENT IS SUBJECT TO SECTION 3.5.7.1.F OF THE CITY OF TUCSON LAND USE CODE
11. THE PROJECT IS DESIGNED TO COMPLY WITH LUC. SEC. 2.8.2 (SCENIC CORRIDOR ZONE) AND LUC. SEC. 2.8.5 (MAJOR STREETS AND ROUTES)
12. DRAINAGE WILL REMAIN IN IT'S NATURAL STATE AND WILL NOT BE ALTERED DISTURBED OR OBSTRUCTED OTHER THAN AS SHOWN ON THE DEVELOPMENT PLAN. THE VILLAS AT HACIENDA DEL SOL, BOOK 25, PAGE 9.
13. NO STRUCTURE OR VEGETATION SHALL BE LOCATED OR MAINTAINED SO AS TO INTERFERE WITH THE SIGHT VISIBILITY TRIANGLES IN ACCORDANCE WITH STREET DEVELOPMENT STANDARD 3-01 0.
14. ANY RELOCATION, MODIFICATION, ETC., OF EXISTING UTILITIES AND/OR PUBLIC IMPROVEMENTS NECESSITATED BY THE PROPOSED DEVELOPMENT WILL BE AT NO EXPENSE OF THE PUBLIC.
15. ON SITE SANITARY SEWERS, EXCEPT PUBLIC SEWERS WITHIN PUBLIC SEWER EASEMENTS OR RIGHTS OF WAY, WILL BE PRIVATE, AND WILL BE CONSTRUCTED, OPERATED AND MAINTAINED ON A PRIVATE BASIS. THE LOCATION AND METHOD OF CONNECTION TO AN EXISTING PUBLIC SANITARY SEWER IS SUBJECT TO REVIEW AND APPROVAL BY THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT AT THE TIME OF SUBMITTAL OF PLUMBING OR BUILDING PLANS.
16. THE ON-SITE SANITARY SEWERS, EXCEPT PUBLIC SEWERS WITHIN PUBLIC SEWER EASEMENTS OR RIGHTS OF WAY, ARE EXISTING AND PRIVATE. NO NEW SEWERS ARE PROPOSED.
17. THE LANDSCAPING WITHIN ALL PUBLIC SEWER EASEMENTS SHOWN HEREON SHALL BE IN ACCORDANCE WITH THE PLANTING GUIDELINES OF PC/COT STANDARD DETAIL WWM A-4.

GENERAL NOTES CONT.

18. THE OWNERS SHALL NOT CONSTRUCT ANY PERMANENT STRUCTURE (I.E., MASONRY WALLS, FENCES, ETC.) ON OR THROUGH THE PUBLIC SEWER EASEMENTS WITHOUT SEPARATE WRITTEN CONSENT OF THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT.
19. NO LOADING SPACE IS REQUIRED, PER LUC. SEC. 3.4.5.
20. THIS PROJECT IS AFFECTED BY THE CITY OF TUCSON FLOODPLAIN REGULATIONS
21. SEE SCZ CASE SCZ-02-07 FOR APPROVED COLORS AND MATERIALS OF SIGNS AND BUILDINGS WITHIN 30' SCZ BUFFER AND 400' AREA OF APPLICABILITY.
22. ALL RESIDENTIAL BUILDINGS WILL BE SPRINKLED.

LEGAL DESCRIPTION

SEE SHEET 3 OF 7

DEDICATION

I, THE UNDERSIGNED, HEREBY WARRANT THAT I AM THE OWNER AND THE ONLY PARTY HAVING ANY INTEREST IN THE LAND SHOWN ON THIS PLAT, AND I CONSENT TO THE SUBDIVISION OF SAID LAND IN THE MANNER SHOWN HEREON.

I HEREBY GRANT TO THE PUBLIC AND ALL UTILITY COMPANIES ALL EASEMENTS AS SHOWN HEREON FOR THE PURPOSES OF ACCESS, INSTALLATION AND MAINTENANCE OF ALL PUBLIC SEWERS AND UTILITIES AND OTHER USES AS DESIGNATED BY THIS PLAT.

I, THE UNDERSIGNED, DO HEREBY HOLD HARMLESS THE CITY OF TUCSON, ITS SUCCESSORS AND ASSIGNS, THEIR EMPLOYEES, OFFICERS, AND AGENTS FROM ANY AND ALL CLAIMS FOR DAMAGES RELATED TO THE USE OF THE PROPERTY DEPICTED ON THIS PLAT NOW AND IN THE FUTURE BY REASON OF FLOODING, FLOWAGE, EROSION, OR DAMAGE CAUSED BY WATER, WHETHER SURFACE FLOOD OR RAINFALL.

COMMON ELEMENTS SHOWN ON THIS PLAT ARE RESERVED FOR THE PRIVATE USE AND CONVENIENCE OF ALL OWNERS OF PROPERTY WITHIN THIS SUBDIVISION AND ARE GRANTED AS EASEMENTS TO CITY OF TUCSON, PIMA COUNTY AND ALL UTILITY COMPANIES FOR THE PURPOSE OF ACCESS, INSTALLATION, MAINTENANCE, AND IMPROVEMENTS OF ABOVEGROUND AND UNDERGROUND UTILITIES, PUBLIC AND PRIVATE SEWERS, AND DRAINAGE. TITLE TO THE LAND OF ALL COMMON ELEMENTS SHALL BE VESTED IN AN ASSOCIATION OF INDIVIDUAL CONDOMINIUM OWNERS AS ESTABLISHED BY COVENANTS, CONDITIONS, AND RESTRICTIONS RECORDED IN DOCKET 61 AT PAGE 87 IN THE OFFICE OF THE PIMA COUNTY RECORDER. THE ASSOCIATION WILL ACCEPT RESPONSIBILITY FOR THE CONTROL, MAINTENANCE, AND LIABILITY OF THE PRIVATE SEWERS AND COMMON ELEMENTS WITHIN THIS SUBDIVISION.

TICOR TITLE AGENCY OF ARIZONA, INC., AN ARIZONA CORPORATION AS TRUSTEE UNDER TRUST NO. 12,284, AS TRUSTEE ONLY AND NOT IN ITS CORPORATE CAPACITY.

BY: Janice M. Fischer 09/12/06
TRUST OFFICER — DATE

BENEFICIARY

* PURSUANT TO A.R.S. SECTION 33-401(B), THE NAME AND ADDRESS OF THE SOLE BENEFICIARY OF TRUST NO. 12,284, DESCRIBED ABOVE AS DISCLOSED BY THE RECORDS OF SAID TRUST IS:

VHOS, L.L.C. A DELAWARE LIMITED LIABILITY COMPANY
A DELAWARE ~~CORPORATION~~ LIMITED LIABILITY COMPANY
5871 N. ORACLE ROAD SUITE 1103
TUCSON, AZ 85704

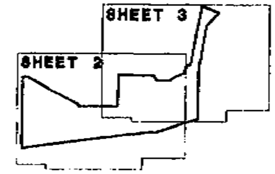
ACKNOWLEDGEMENT

STATE OF ARIZONA }
} SS.
COUNTY OF PIMA }

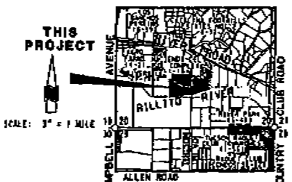
THE FOREGOING INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS 12th DAY OF September 2006, BY Janice M. Fischer, OF TICOR TITLE AGENCY OF ARIZONA, TRUST NO. 12,284, AN ARIZONA CORPORATION COMPANY.

[signature] — NOTARY PUBLIC
October 31, 2006 — MY COMMISSION EXPIRES

OFFICIAL SEAL
JANIS R. SKOGEN
NOTARY PUBLIC - ARIZONA
PIMA COUNTY
My Comm. Expires Oct. 31, 2006



INDEX MAP



LOCATION MAP
SECTION 20, T 13 S, R 14 E
G & SRM
PIMA COUNTY, ARIZONA

APPROVAL

I, KATHLEEN DETRICK, CLERK OF THE CITY OF TUCSON, ARIZONA, HEREBY CERTIFY THAT THIS PLAT WAS APPROVED BY THE MAYOR AND COUNCIL OF THE CITY OF TUCSON, ARIZONA, ON THIS THE 4th DAY OF October, 2006.

Kathleen S. Detrick — CLERK, CITY OF TUCSON
10/24/2006 — DATE

RECORDING

STATE OF ARIZONA }
} SS.
COUNTY OF PIMA }

NO. 20062080816
FEE $144.00

FILED FOR RECORD AT THE REQUEST OF RICK ENGINEERING COMPANY, INC. ON THIS 27 DAY OF October, 2006 AT 12:32 P.M. IN BOOK 61 OF MAPS AND PLATS AT PAGE 87 THEREOF. WITNESS MY HAND AND OFFICIAL SEAL, THE DAY AND YEAR ABOVE AS WRITTEN.

F. Ann Rodriguez
F. ANN RODRIGUEZ
COUNTY RECORDER

COUNTY RECORDER PIMA COUNTY ARIZONA

Carol R. McClain
DEPUTY COUNTY RECORDER

Map and plat picked up in 45 days will be recycled Oct 27 2006 Clk

ASSURANCES

THIS IS TO CERTIFY THAT ALL IMPROVEMENTS, SUCH AS STREETS, SIDEWALKS, SEWERS, WATER AND UTILITY INSTALLATION, DRAINAGE AND FLOOD CONTROL FACILITIES, AND MONUMENTS, REQUIRED BY THE CITY OF TUCSON HAVE BEEN COMPLETED OR THE FUTURE COMPLETION OF SUCH IMPROVEMENTS HAS BEEN ASSURED BY THE POSTING OF PERFORMANCE BONDS, ASSURANCES, OR OTHER SECURITY AS THE CITY OF TUCSON DEEMS NECESSARY AND PROPER.

Craig L. Gross — CITY OF TUCSON DEVELOPMENT SERVICES DEPARTMENT DIRECTOR
10-2-06 — DATE

[signature] — CITY OF TUCSON DEVELOPMENT SERVICES DEPARTMENT ENGINEERING ADMINISTRATOR
10-2-06 — DATE

CERTIFICATION OF SURVEY

I HEREBY CERTIFY THAT THE BOUNDARY SURVEY AS SHOWN ON THIS PLAT WAS PERFORMED UNDER MY DIRECTION AND THAT ALL EXISTING OR PROPOSED SURVEY MONUMENTS AND MARKERS SHOWN ARE CORRECTLY DESCRIBED. I FURTHER CERTIFY THAT THIS PLAT WAS PREPARED UNDER MY DIRECTION.

REGISTERED LAND SURVEYOR CERTIFICATE NO. 17479 DOUGLAS E. SCHNEIDER ARIZONA U.S.A.

DOUGLAS E. SCHNEIDER — RLS 17479

LEGEND

Symbol	Description
•	FOUND SURVEY MONUMENT, AS NOTED
———	PROJECT BOUNDARY LINE
— — —	EASEMENT LINE
- - - -	BUILDING REFERENCE LINE (FLOOR UNIT SHEETS)
— - — -	BUILDING REFERENCE LINE (SHEET x)
———	UNIT BOUNDARY
CH	PARKING SPACE DESIGNATOR (LIMITED COMMON ELEMENT)
C.E.	COMMON ELEMENT
L.C.E.	LIMITED COMMON ELEMENT
TP	TIE POINT
(M)	MEASURED
⊥	INDICATES PERPENDICULAR (90° ANGLE)
(R)	RECORD PER LEGAL DESCRIPTION IN THE CONDITION OF TITLE REPORT ORDER NO. 51003568, EFFECTIVE DATE: MARCH 22, 2006
(R1)	RECORD PER ALTA/ACSM LAND TITLE SURVEY BY MERIDIAN SURVEYING AND DEVELOPMENT, INC. BY MICHAEL L. DEMPLE, RLS DATED 4/04/06
- · - ·	CITY JURISDICTIONAL LIMITS
168	DENOTES UNIT CONDOMINIUM UNIT
168•	DENOTES FIRST FLOOR UNIT
162••	DENOTES SECOND FLOOR UNIT
168•••	DENOTES THIRD FLOOR UNIT
(1)	BUILDING TYPE

SEE DP 61/87

CITY OF TUCSON
PROJ#: S06-089
ZONE: SEE GENERAL NOTES
Adm. Address:
2550 E RIVER RD + UNIT #'S

FINAL PLAT

THE VILLAS AT HACIENDA DEL SOL

UNITS 1 THRU 218, UNITS G1 THRU G29,
LIMITED COMMON ELEMENTS C1 THRU C205
AND COMMON ELEMENTS "A" AND "B"

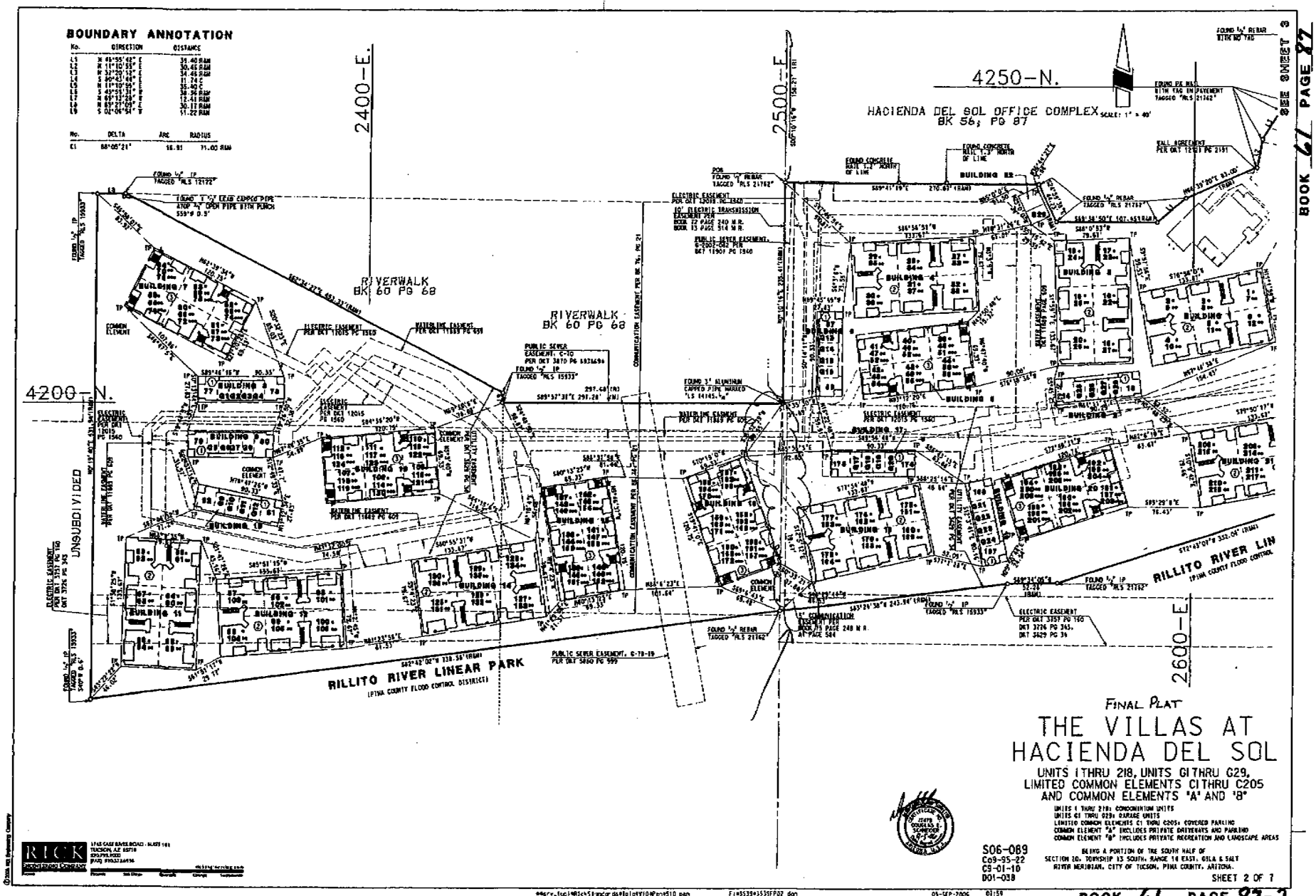
UNITS 1 THRU 218: CONDOMINIUM UNITS
UNITS G1 THRU G29: GARAGE UNITS
LIMITED COMMON ELEMENTS C1 THRU C205: COVERED PARKING
COMMON ELEMENT "A" INCLUDES PRIVATE DRIVEWAYS AND PARKING
COMMON ELEMENT "B" INCLUDES PRIVATE RECREATION AND LANDSCAPE AREAS

BEING A PORTION OF THE SOUTH HALF OF SECTION 20, TOWNSHIP 13 SOUTH, RANGE 14 EAST, GILA & SALT RIVER MERIDIAN, CITY OF TUCSON, PIMA COUNTY, ARIZONA.

S06-089
Co9-95-22
C9-01-10
D01-038

SHEET 1 OF 7

RICK ENGINEERING COMPANY
1745 EAST RIVER ROAD - SUITE 101
TUCSON, AZ 85718
520.795.1000
(FAX) 520.322.6956



FINAL PLAT

THE VILLAS AT HACIENDA DEL SOL

UNITS 1 THRU 218, UNITS G1 THRU G29,
LIMITED COMMON ELEMENTS C1 THRU C205
AND COMMON ELEMENTS 'A' AND 'B'

UNITS 1 THRU 218: CONDOMINIUM UNITS
UNITS G1 THRU G29: GARAGE UNITS
LIMITED COMMON ELEMENTS C1 THRU C205: COVERED PARKING
COMMON ELEMENT "A" INCLUDES PRIVATE DRIVEWAYS AND PARKING
COMMON ELEMENT "B" INCLUDES PRIVATE RECREATION AND LANDSCAPE AREAS

BEING A PORTION OF THE SOUTH HALF OF
SECTION 20, TOWNSHIP 13 SOUTH, RANGE 14 EAST, GILA & SALT
RIVER MERIDIAN, CITY OF TUCSON, PIMA COUNTY, ARIZONA.

S06-089
C9-95-22
C9-01-10
D01-038

RICK ENGINEERING COMPANY
1745 EAST RIVER ROAD - SUITE 101
TUCSON, AZ 85718
(520) 575-9222
(FAX) 575-8696

05-SEP-2006 01:59

moving and relocating any fences, or other structures that might be made necessary by this instrument. If any gates or passageways through GRANTORS' fences appear necessary, they will be provided and installed by GRANTEE in a manner satisfactory to the GRANTOR.

5. The parties agree to be bound by applicable state and federal rules governing Equal Employment Opportunity and Non-Discrimination.

6. The easement is subject to the provisions of A.R.S. §38-511 and may be voided pursuant to that statute for conflict of interest.

7. The parties must agree that should a dispute arise between them in any manner, concerning the attached contract, and said dispute involves the sum of THIRTY THOUSAND DOLLARS ($30,000) or less in money damages only, exclusive of interest, cost or attorney's fees, the parties will submit the matter to Binding Arbitration pursuant to the Arizona Supreme Court Rules for Compulsory Arbitration and the decision of the arbitrator(s) shall be final and binding upon the parties.

IN WITNESS WHEREOF, the said ARIZONA BOARD OF REGENTS has caused this instrument to be signed and executed by said Board this 8th day of October, 1992.

ARIZONA BOARD OF REGENTS for
the UNIVERSITY OF ARIZONA

By: J M. Klees
Jeanne M. Kleespie
Contracting Officer

STATE OF ARIZONA)
) ss.
COUNTY OF PIMA)

The foregoing instrument was acknowledged before me this 8th day of October, 1992, by JEANNE M. KLEESPIE, Contracting Officer, University of Arizona.

Cynthia B Capcavale
Notary Public

My Commission Expires:

My Commission Expires May 29, 1994

LEGAL DESCRIPTION
PREPARED BY
JERRY R. JONES & ASSOCIATES, INC.
JJA JOB NO. EJMD0001
JULY 8, 1992

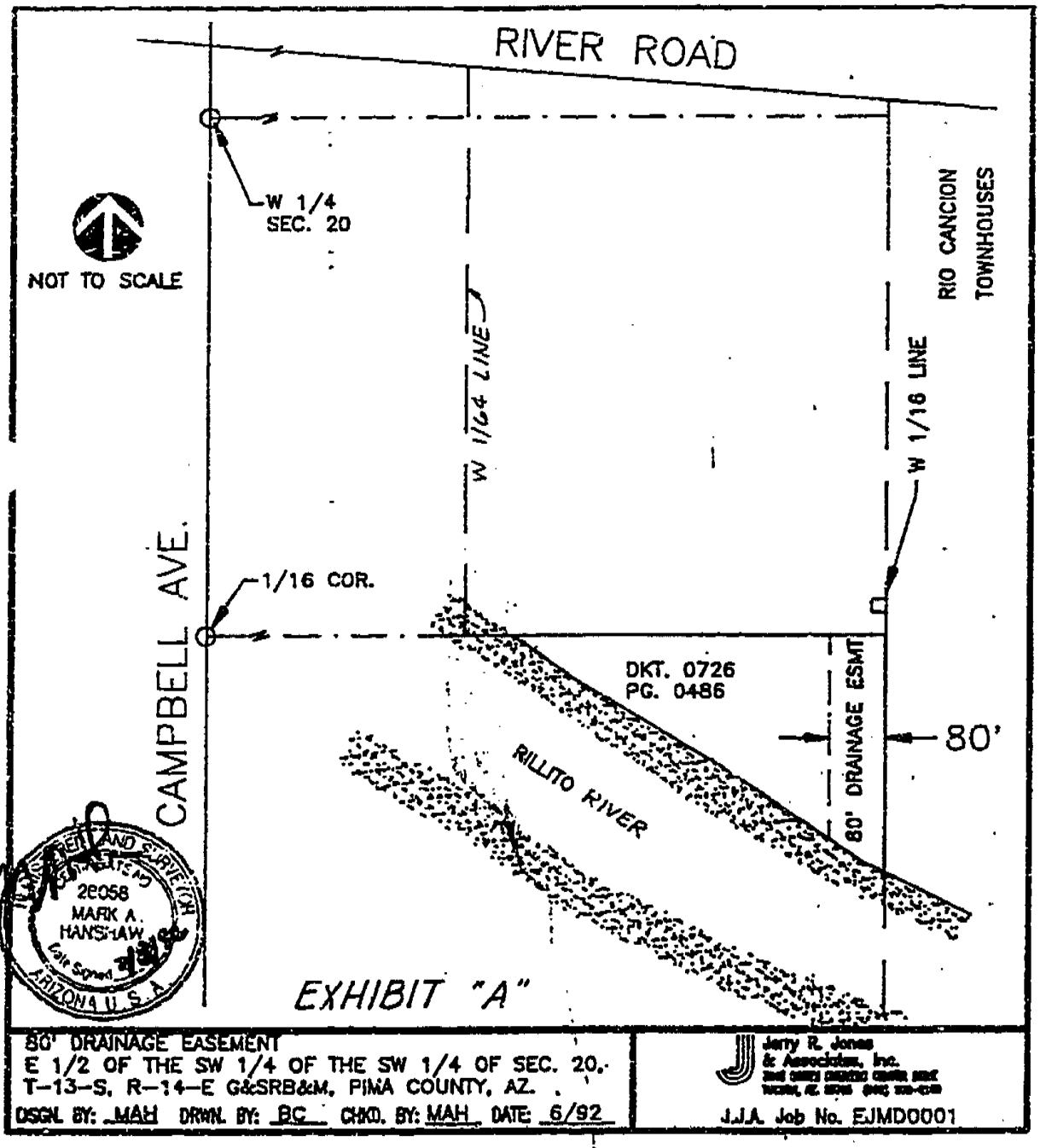
80' Drainage Easement

A portion of Section 20 Township 13 South, Range 14 East, Gila and Salt River Base and Meridian, Pima County, Arizona, further described as follows:
The east 80 feet of the East 1/2 of the Southwest 1/4 of the Southwest 1/4 from the North property line of that parcel of land recorded in the Office of the County Recorder of Pima County, in Docket 726 Page 486 thereof;

South to the north right-of-way line of the Rillito River as now established as shown in Exhibit "A";

MAH.jc (LEG-2 EJMD00C1)

ATTACHMENT A



80' DRAINAGE EASEMENT
E 1/2 OF THE SW 1/4 OF THE SW 1/4 OF SEC. 20,
T-13-S, R-14-E G&SRB&M, PIMA COUNTY, AZ.

DSGN. BY: MAH DRWN. BY: BC CHKD. BY: MAH DATE: 6/92

Jerry R. Jones & Associates, Inc.

J.J.A. Job No. EJMD0001

E
A
S
T
S
I
D
E

F. ANN RODRIGUEZ, RECORDER
RECORDED BY: HEM
DEPUTY RECORDER
2057 ES4

TTIGA
PIMA COUNTY
201 N STONE AVE
TUCSON AZ 85701

DOCKET: 12483
PAGE: 2337
NO. OF PAGES: 4
SEQUENCE: 20050240555
02/04/2005
EASMNT 15:17

MAIL

AMOUNT PAID $ 10.00

WHEN RECORDED, MAIL TO:

PIMA COUNTY, REAL PROPERTY SERVICES
201 N. STONE, 6TH FLOOR
TUCSON, AZ 85701
ATTN: DANA HAUSMAN

RE: ESCROW# 252924

NAME OF DOCUMENT: **DRAINAGE EASEMENT**

4

DRAINAGE EASEMENT

For valuable consideration, **Christopher Gall and Ann Courtney, husband and wife,** ("Grantors"), do hereby convey to Pima County, a political subdivision of the State of Arizona, ("County") an easement for the construction and maintenance of drainage improvements over, under and across the property described on the attached **<u>Exhibit "A"</u>** (the Property) and depicted in **<u>Exhibit "A-1"</u>**.

County shall have the right to construct and maintain improvements within the Property and to enter upon the Property for the purpose of maintaining the easement and any of its improvements located thereon.

Grantors agree that no buildings, structures, fences or trees shall be placed upon, over or under the Property and that the natural contours of the Property shall not be excavated, filled or altered without the prior written approval of the Director of the Department of Transportation and Flood Control District.

All grants, covenants and conditions of this easement shall inure to the benefit of and be binding upon the successors in interest to the County and Grantors.

IN WITNESS WHEREOF, Grantors have executed this easement this 3 day of Feb, 2004 [5 written over 4].

Christopher Gall

Ann Courtney

STATE OF ARIZONA)
) ss
COUNTY OF PIMA)

This instrument was acknowledged before me, the undersigned authority, on this 3rd day of February, 2004 [5 written over 4], by Christopher Gall and Ann Courtney.

Notary Public

My Commission Expires:
4-1-07

Procurement Approval: 9/8/04			
Agent: CC	File #: 10,624-115	Activity #: 4TRRCA	P [✓] De [ ] Do [ ] E [ ]

Gall.DE

12483 02338

EXHIBIT “A”

108-22-0150
LEGAL DESCRIPTION
DRAINAGE EASEMENT
4a-A

A portion of Lot 213 of Catalina Foothills Estates No. 2, described in Book 8 of Maps and Plats at Page 32, Records of Pima County, and as described in Docket 9089 at page 1318, Records of Pima County, Arizona a part of the east half of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, more particularly described as follows;

COMMENCING at the center quarter corner of Section 20 as monumented by a 2-inch lead cap on pipe; lying S 89° 26' 00" W, a distance of 2616.61 feet from the east quarter corner of Section 20, as monumented by a 3-1/4 inch aluminum disk on 5/8" hex bar marked "¼ 20|21 T13S R14E RLS 18557 RLS 29881 MMLA 2004";

THENCE upon the north-south quarter line of said Section 20, S 00°51'53" E a distance of 26.22 feet to the **POINT OF BEGINNING**;

THENCE continuing upon said quarter line, S 00° 51' 53" E a distance of 30.73 feet to a point on the arc of a non-tangent curve concave northerly, a radial line through said point having a bearing of S 09°30'20" E, said curve lying on the southeasterly line of said Lot 213;

THENCE upon said southeasterly line, a curve to the left, having a radius of 263.19 feet and a central angle of 20° 23' 31" for an arc distance of 93.67 feet to the beginning of a non-tangent line, having a radial bearing of S 29° 53' 51" E;

THENCE continuing upon said southeasterly line, N 60°16'15" E, a distance of 135.59 feet;

THENCE N 30° 07' 17" E, a distance of 75.16 feet;

THENCE N 50° 22' 11" W, a distance of 37.62 feet;

THENCE S 42° 03' 33" W, a distance of 112.83 feet;

THENCE S 62° 15' 13" W, a distance of 157.16 feet to the **POINT OF BEGINNING.**

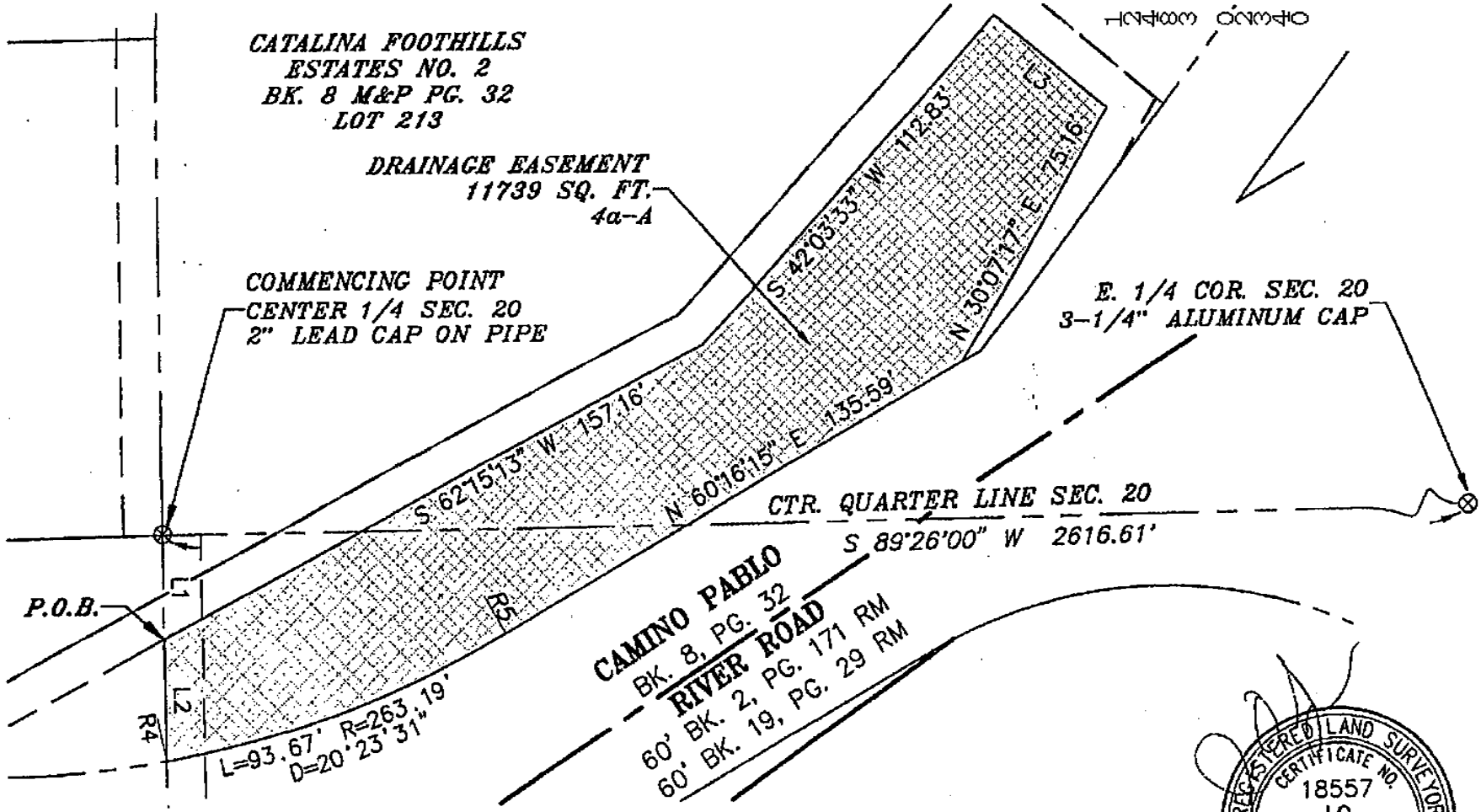
The herein described portion containing 11739 square feet (0.269 acres), more or less.

SEE ATTACHED EXHIBIT.

J.O. Teague, R.L.S. 18557

Registered Land Surveyor
Certificate No.
18557
J.O.
TEAGUE
Date Signed
Arizona U.S.A.

EXHIBIT "A-1"



REGISTERED LAND SURVEYOR
CERTIFICATE NO.
18557
J.O.
TEAGUE
Date Signed 11-9-03
ARIZONA U.S.A.

PARCEL INFORMATION
I.D. NO.: 108-22-0150
OWNERS: & GALL, CHRISTOPHER
COURTNEY, ANN

AREA: 11739 SQ. FT.
RECORDING INFO:
DKT. 9089, PG. 1318

SCALE: 1" = 40'

A PORTION OF THE EAST HALF
OF SEC. 20, T-13-S, R-14-E
GILA & SALT RIVER MERIDIAN
PIMA COUNTY, ARIZONA

LINE	BEARING	DISTANCE
L1	S 00°51'53" E	26.22'
L2	S 00°51'53" E	30.73'
L3	N 50°22'11" W	37.62'
R4	S 09°30'20" E	263.19'
R5	S 29°53'51" E	263.19'

MMLA
01048-01

DATE: 11/19/03 • DRAWN BY: mrf • CHK: JOT

E:\01048\01\Legals-MMLA\Legal-4a-A-DRAIN_MRF.dwg JO Wed, 09 Jun 2004, 8:55am

F. ANN RODRIGUEZ, RECORDER
RECORDED BY: RJL
DEPUTY RECORDER
9544 ES2

TTIGA
TITLE GUARANTY
101 N WILMOT
TUCSON AZ 85711

DOCKET: 12600
PAGE: 4673
NO. OF PAGES: 6
SEQUENCE: 20051410990
07/22/2005
EASMNT 16:36

PICKUP

AMOUNT PAID $ 10.00

252943 f DM

DRAINAGE EASEMENT

For valuable consideration, I, Joseph E. Kokroko, a married man as his sole and separate property ("Grantor"), do hereby convey to Pima County, a political subdivision of the State of Arizona, ("County") an easement for the construction and maintenance of drainage improvements over, under and across the property described on the attached **Exhibit "A" and "B"** (the Property).

County shall have the right to construct and maintain improvements within the Property and to enter upon the Property for the purpose of maintaining the easement and any of its improvements located thereon.

Grantor agrees that no buildings, structures, fences or trees shall be placed upon, over or under the Property and that the natural contours of the Property shall not be excavated, filled or altered without the prior written approval of the Director of the Department of Transportation and Flood Control District.

All grants, covenants and conditions of this easement shall inure to the benefit of and be binding upon the successors in interest to the County and Grantor.

IN WITNESS WHEREOF, Grantor has executed this easement this 21 day of July, 2005.

Grantor: Joseph E. Kokroko

STATE OF ARIZONA)
) ss
COUNTY OF PIMA)

This instrument was acknowledged before me, the undersigned authority, on this 21 day of July, 2005 by Joseph E. Kokroko.

Notary Public

OFFICIAL SEAL
BONNIE D. MURPHY
Notary Public - Arizona
Pima COUNTY
My Commission Expires
April 1, 2007

My Commission Expires: 4-1-07

12600 0467 3

Procurement Approval:			
Agent:	File #: 10,	Activity #:	P [X] De [ ] Do [ ] E [ ]

EASEMENT-Drainage(way) - Rev. -01-04

6

EXHIBIT A

108-25-0010
LEGAL DESCRIPTION
DRAINAGE EASEMENT
4-D

A portion of that property described in Docket 12144, Page 7329, Records of Pima County, Arizona, a part of the southwest one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, more particularly described as follows;

COMMENCING at the center quarter corner of Section 20 as monumented by a 2-inch lead cap on pipe;

THENCE upon the center quarter line of said Section 20, S 88° 54' 42" W a distance of 278.43 feet, to the **POINT OF BEGINNING,** said point lying N 88° 54' 42" E a distance of 2336.56 feet from the west one-quarter corner of said Section 20, as monumented by a 3-inch brass disk in concrete marked "ADOT 10/02";

THENCE continuing upon said center quarter line, N 88° 54' 42" E a distance of 92.55 feet, to the point on the arc of a non-tangent curve concave northeasterly, a radial line through said point having a bearing of S 69° 12' 34" W,

THENCE upon the arc of said curve to the left, having a radius of 35.00 feet and a central angle of 58° 25' 49" for an arc distance of 35.69 feet, to a point of reverse curvature of a tangent curve, concave southerly, said curve lying on the south line of said property described in Docket 12144 at page 7329;

THENCE upon the arc of said south line of said curve, to the right, having a radius of 609.74 feet and a central angle of 4° 28' 31" for an arc distance of 47.63 feet to a non-tangent line;

THENCE continuing upon said south line, S 85° 08' 13" E a distance of 137.78 feet to a point hereafter referred to as **POINT "A";**

THENCE N 68° 32' 20" W a distance of 126.06 feet to the **POINT OF BEGINNING,**

The herein described portion containing 4514 square feet (0.104 acres), more or less.

TOGETHER WITH:

A portion of said property described in Docket 12144, Page 7329, more particularly described as follows;

BEGINNING at aforementioned **POINT "A",** said point lying on the south line of said property;

12600 0474

THENCE upon said south line, S 85° 08' 13" E a distance of 94.08 feet to a point on the arc of a non-tangent curve concave northerly, a radial line of said curve through said point having a bearing of S 05° 23' 15" W;

THENCE upon the arc of said south line of said curve to the left, having a radius of 263.19 feet and a central angle of 14° 53' 35" for an arc distance of 68.41 feet to a point on the north-south center quarter line of said Section 20, being the east line of said property;

THENCE upon said center quarter line and the east line of said property, N 00° 51' 53" W a distance of 30.73 feet;

THENCE S 62° 15' 13" W a distance of 62.20 feet;

THENCE N 87° 58' 38" W a distance of 106.47 feet to said **POINT A**, the **POINT OF BEGINNING.**

The herein described portion containing 1330 square feet (0.031 acres), more or less

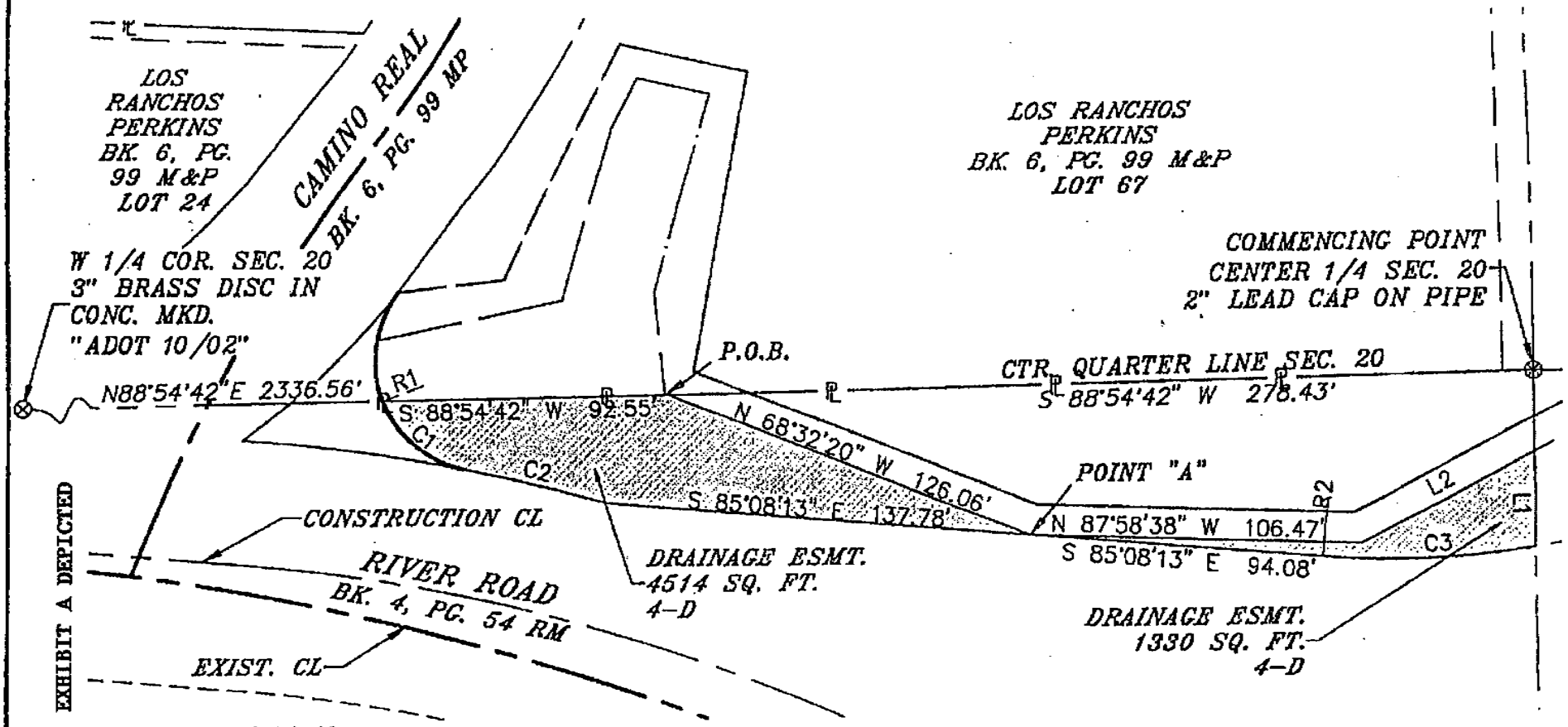
The total of both portions containing 5844 square feet (0.134 acres), more or less

SEE ATTACHED EXHIBIT.

J.O. Teague, R.L.S. 18557

Registered Land Surveyor
CERTIFICATE NO.
18557
J O
TEAGUE
DATE SIGNED 6-9-00
ARIZONA U.S.A.

1200 0475



PARCEL INFORMATION
I.D. NO.: 108-25-0010
OWNERS: Kokroko, Joseph E.
AREA: 5844 SQ. FT.
RECORDING INFO:
DKT. 12144, PG. 7329

CURVE	RADIUS	ARC LENGTH	DELTA ANGLE
C1	35.00'	35.69'	58°25'49"
C2	609.74'	47.63'	04°28'31"
C3	263.19'	68.41'	14°53'35"

LINE	BEARING	DISTANCE
L1	N 00°51'53" W	30.73'
L2	S 62°15'13" W	62.20'
R1	S 69°12'34" W	35.00'
R2	S 05°23'15" W	263.19'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
18557
J.O.
TEAGUE
Date Signed 6-9-04
ARIZONA U.S.A.

MMLA
01048-01

SCALE: 1" = 50'

A PORTION OF THE SW 1/4
OF SEC. 20, T-13-S, R-14-E
GILA & SALT RIVER MERIDIAN
PIMA COUNTY, ARIZONA

DATE: 02/24/04 • DRAWN BY: mrf • CHK: JOT

E:\01048\01\Legals-MMLA\Legal-4-D-DRAIN_MRF.dwg JO Wed, 09 Jun 2004, 8:49am

EXHIBIT B

108-23-070B

LEGAL DESCRIPTION
DRAINAGE EASEMENT
4-C

A portion of Lot 67 of Los Ranchos Perkins, recorded in Book 6, page 99 of Maps and Plats, Records of Pima County and as described in Docket 12144 at page 7329, Records of Pima County, Arizona, a part of the northwest one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, more particularly described as follows;

COMMENCING at the center quarter corner of Section 20 as monumented by a 2-inch lead cap on pipe;

THENCE upon the center quarter line of said Section 20, S 88° 54' 42" W a distance of 278.43 feet to the **POINT OF BEGINNING,** said point lying N 88° 54' 42" E a distance of 2336.56 feet from the west one-quarter corner of said Section 20, as monumented by a 3-inch brass disk in concrete marked "ADOT 10/02";

THENCE continuing upon said center quarter line, S 88° 54' 42" W a distance of 92.55 feet to the point on the arc of a curve concave easterly, a radial line through said point having a bearing of S 69° 12' 34" W;

THENCE upon the arc of said curve to the right, having a radius of 35.00 feet and a central angle of 31° 48' 19", an arc distance of 19.43 feet to a non-tangent line;

THENCE N 78° 36' 25" E, a distance of 61.18 feet;

THENCE N 16° 12' 34" E, a distance of 57.27 feet;

THENCE N 25° 55' 07" E, a distance of 19.08 feet;

THENCE S 77° 01' 14" E, a distance of 23.94 feet;

THENCE S 15° 33' 20" W, a distance of 67.01 feet;

THENCE S 06° 16' 00" E, a distance of 31.44 feet;

THENCE S 68° 32' 20" E, a distance of 1.15 feet to the **POINT OF BEGINNING,**

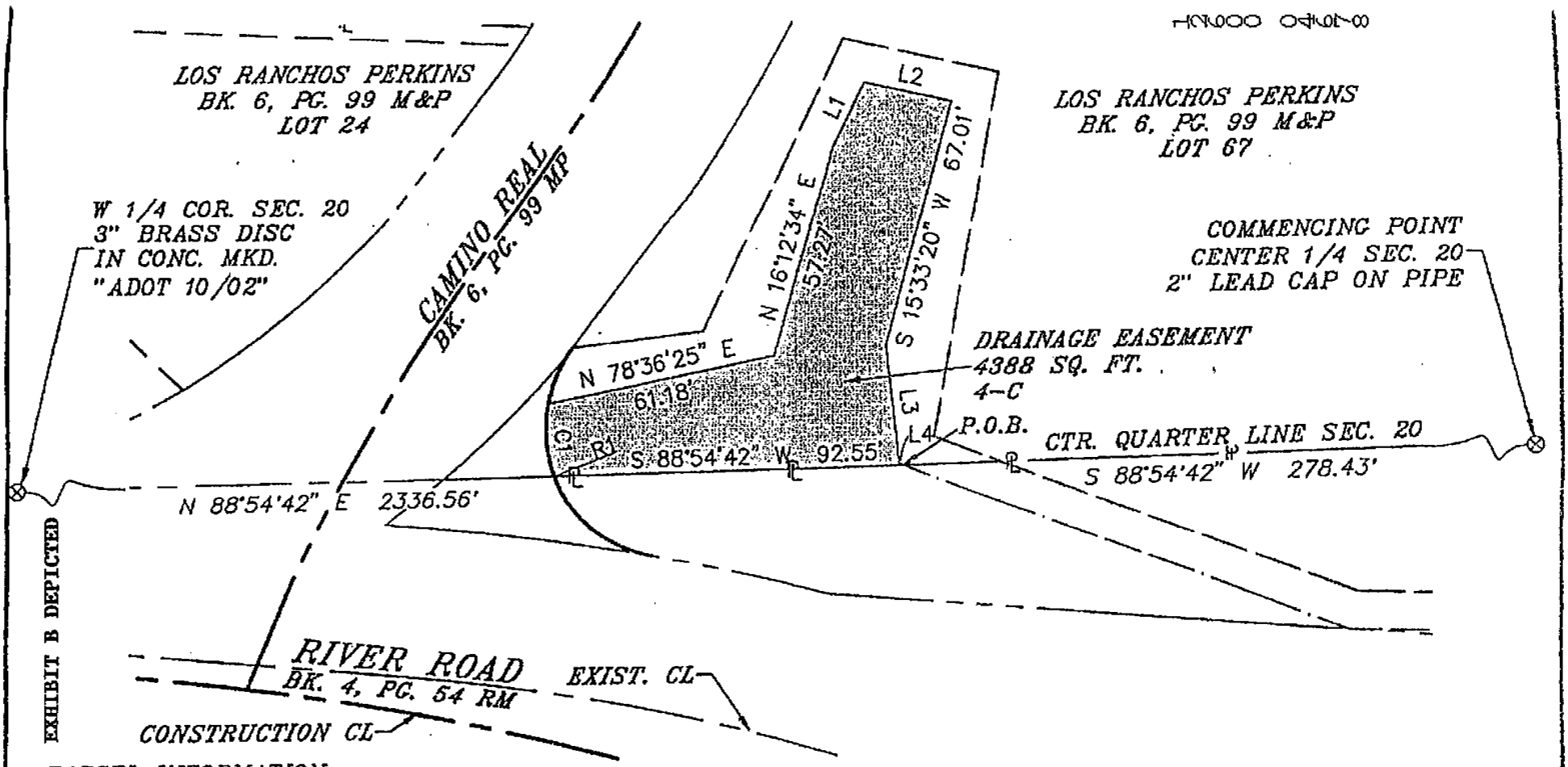
The herein described portion containing 4388 square feet (0.101 acres), more or less.

SEE ATTACHED EXHIBIT.

J.O. Teague, R.L.S. 18557

Registered Land Surveyor
CERTIFICATE NO.
18557
J.O.
TEAGUE
DATE SIGNED 4-9-04
ARIZONA U.S.A.

12600 0467



PARCEL INFORMATION
I.D. NO.: 108-23-070B
OWNERS: Kokroko, Joseph E.
AREA: 4388 SQ. FT.
RECORDING INFO:
DKT. 12144, PG. 7329

CURVE	RADIUS	ARC LENGTH	DELTA ANGLE
C1	35.00'	19.43'	31°48'19"

LINE	BEARING	DISTANCE
L1	N 25°55'07" E	19.08'
L2	S 77°01'14" E	23.94'
L3	S 06°16'00" E	31.44'
L4	S 68°32'20" E	1.15'
R1	N 69°12'34" E	35.00'

SCALE: 1" = 40'

A PORTION OF THE NW 1/4
OF SEC. 20, T-13-S, R-14-E
GILA & SALT RIVER MERIDIAN
PIMA COUNTY, ARIZONA

MMLA
01048-01

DATE: 02/25/04 • DRAWN BY: mrf • CHK: JOT

E:\01048\01\Legals-MMLA\Final\...gal-4-C-DRAIN_MRF.dwg JO Wed, 09 Jun 2004, 8:30am

F. ANN RODRIGUEZ, RECORDER
RECORDED BY: J_V
DEPUTY RECORDER
4437 PE4

PCREA
PIMA CO REAL PROPERTY SERVICES
PICK UP
ATTN ANNA OR LINDA

DOCKET: 12602
PAGE: 25
NO. OF PAGES: 5
SEQUENCE: 20051430015
07/26/2005
EASMNT 10:22

PICKUP

AMOUNT PAID $ 0.00

WHEN RECORDED, RETURN TO:
Pima County Real Property Services
201 N. Stone Ave. 6th Floor
Tucson, Arizona 85701
Attn. Debbie Knutson

DRAINAGE AND MAINTENANCE EASEMENTS

For valuable consideration, River Elks LLC, an Arizona limited liability company ("Grantor"), does hereby convey to Pima County and to the Pima County Flood Control District, political subdivisions of the State of Arizona, (jointly and severally referred to herein as "County"): (i) an easement for the discharge and flowage of water and debris from the County's box culvert under River Road over and across the property described on Exhibit "A" and depicted on Exhibit "A-1" attached hereto (the "Property"); and (ii) an easement for maintenance of the improvements (the "Drainage Channel") located on the Property, over and across the Property and over and across the property described on Exhibit "B" attached hereto (the "Maintenance Property").

County shall have the nonexclusive right to enter upon the Property and the Maintenance Property for the purpose of maintaining, improving, repairing and replacing the Drainage Channel.

Grantor agrees that, except for Grantor's right: (i) to construct block patio walls on top of the vertical side walls of the drainage channel to be built on the Property; (ii) to enclose the drainage channel; (iii) to pave and landscape over the enclosed portion of the drainage channel; and (iv) to run utilities under and over the drainage channel, no buildings, structures, fences or trees shall be placed upon, over or under the Property and that the natural contours of the Property shall not be excavated, filled or altered without the prior written approval of the Director of the Department of Transportation .

All grants, covenants and conditions of this easement shall inure to the benefit of and be binding upon the successors in interest to the County and Grantor. The easements shall run with the land and be binding upon successor owners of any portion thereof.

IN WITNESS WHEREOF, Grantor has executed this easement this 15th day of June, 2005.

20051430015 12602

5

RIVER ELKS LLC,
an Arizona limited liability company

By: _____
Louis A. Marson, Manager

By: _____
Andrew J. Kacic, Manager

STATE OF ARIZONA)
)ss
COUNTY OF PIMA)

This instrument was acknowledged before me, the undersigned authority, on this 15TH day of JUNE, 2005, by Louis A. Marson as Manager, and Andrew J. Kacic as Manager of River Elks LLC.

(Seal)

OFFICIAL SEAL
DEBORAH G. KNUTSON
NOTARY PUBLIC - State of Arizona
PIMA COUNTY
My Comm. Expires July 14, 2008

_____
Notary Public

20050900026

EXHIBIT A

THE PROPERTY

108-25-002G
LEGAL DESCRIPTION
DRAINAGE EASEMENT
4-G

A portion of that parcel as described in Docket 6059 at page 1 therein, Records of Pima County, Arizona, said parcel being a part of the southwest one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

COMMENCING at the northwest corner of said southwest one-quarter;

THENCE upon the north line of said southwest one-quarter, N 88°54'42" E, a distance of 2614.98 feet to the northeast corner thereof;

THENCE upon the east line of said southwest one-quarter, S 00°51'53" E, a distance of 301.61 feet to a point on the southerly right-of-way line of River Road as recorded in Docket 6251 at page 859 therein, Records of Pima County, Arizona;

THENCE continue upon said east line, said line being coincident with said right-of-way line, S 00°53'41" E, a distance of 11.44 feet to the northeasterly corner of the aforementioned described parcel;

THENCE leaving said right-of-way line, upon said east line, said east line being coincident with the east line of said parcel, S 00°51'30" E, a distance of 27.13 feet to THE POINT OF BEGINNING;

THENCE continue upon said east line, S 00°51'29" E, a distance of 971.02 feet;

THENCE upon the south line of said parcel, S 89°02'25" W, a distance of 25.42 feet;

THENCE leaving said south line, N 04°59'01" E, a distance of 53.29 feet;

THENCE N 00°51'29" W, a distance of 802.73 feet;

THENCE N 08°55'09" W, a distance of 15.15 feet;

THENCE N 00°51'30" W, a distance of 106.38 feet;

THENCE N 12°40'46" W, a distance of 6.76 feet to a point on the arc of a non-tangent curve, the radius point of said curve bears N 28°18'59" E;

THENCE southeasterly upon the arc of said curve, to the left, having a radius of 895.00 feet, a central angle of 01°42'35", for an arc length of 26.71 feet to THE POINT OF BEGINNING.

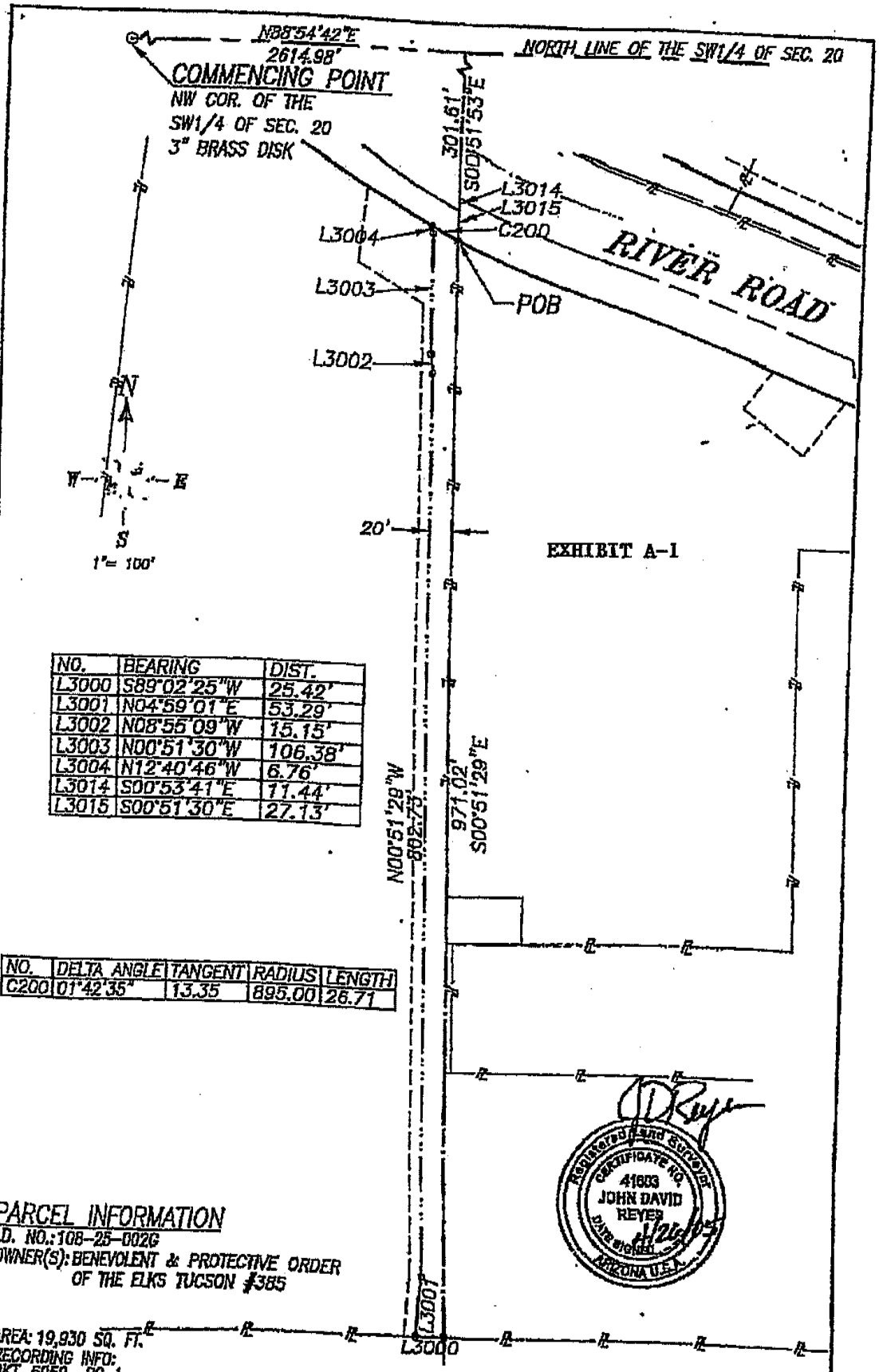
The herein described portion containing 19,930 square feet (0.458 acres), more or less.

SEE ATTACHED EXHIBIT

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
14603
JOHN DAVID
REYES
DATE SIGNED
ARIZONA U.S.A.

John David Reyes, R.L.S.

12602 0002



NO.	BEARING	DIST.
L3000	S89°02'25"W	25.42'
L3001	N04°59'01"E	53.29'
L3002	N08°55'09"W	15.15'
L3003	N00°51'30"W	106.38'
L3004	N12°40'46"W	6.76'
L3014	S00°53'41"E	11.44'
L3015	S00°51'30"E	27.13'

NO.	DELTA ANGLE	TANGENT	RADIUS	LENGTH
C200	01°42'35"	13.35	895.00	26.71

Registered Land Surveyor
CERTIFICATE NO.
41803
JOHN DAVID
REYES
DATE SIGNED
ARIZONA U.S.A.

PARCEL INFORMATION

I.D. NO.: 108-25-002G
OWNER(S): BENEVOLENT & PROTECTIVE ORDER OF THE ELKS TUCSON #385

AREA: 19,930 SQ. FT.
RECORDING INFO:
DKT. 6059 PG. 1

A PORTION OF THE SW1/4 OF SEC. 20
T-13-S, R-14-E, PIMA COUNTY, ARIZONA
DSGN. BY: JET DRAWN BY: LLR CHKD. BY: JDR DATE: APRIL, 2005

Castro Engineering
3550 WEST RIA ROAD SOUTH #00
TUCSON, ARIZONA 85741
(520)293-3550 (520)293-3115 (fax)

EXHIBIT B

THE MAINTENANCE PROPERTY

As shown on plat for River Walk, Lots 1 through 140, Blocks A and B, and Commons A, B, C, and D.

F. ANN RODRIGUEZ, RECORDER
RECORDED BY: J_V
DEPUTY RECORDER
4437 PE3
PCREA
PIMA CO REAL PROPERTY SERVICES
PICK UP
ATTN ANNA OR LINDA

DOCKET: 12652
PAGE: 39
NO. OF PAGES: 6
SEQUENCE: 20051930009
10/04/2005
WTDEED 10:40

PICKUP
AMOUNT PAID $ 0.00

WHEN RECORDED RETURN TO:

DEBBIE KNUTSON
REAL PROPERTY SERVICES
PIMA COUNTY PUBLIC WORKS
201 N. STONE AVE., 6TH FLOOR
TUCSON, AZ 85701

DOCUMENT TITLE: WARRANTY DEED

RE-RECORDING TO CORRECT SCRIVENER'S ERROR IN LEGAL DESCRIPTION IN PARAGRAPH 4 OF EXHIBIT A, CHANGING THE DIRECTIONS IN THE FIRST LINE.

20051930009

6

F. ANN RODRIGUEZ, RECORDER
RECORDED BY: RJL
DEPUTY RECORDER
9544 ES2

TTIGA
TITLE GUARANTY
101 N WILMOT
TUCSON AZ 85711

DOCKET: 12600
PAGE: 4668
NO. OF PAGES: 5
SEQUENCE: 20051410989
07/22/2005
WTDEED 16:36

PICKUP

AMOUNT PAID $ 9.00

25294 3BAM

WARRANTY DEED

For valuable consideration, I, Joseph E. Kokroko, a married man as his sole and separate property, ("Grantor"), does hereby convey to Pima County, a political subdivision of the State of Arizona, the following described property situate in Pima County, Arizona:

SEE ATTACHED **EXHIBIT "A"and "B"** FOR LEGAL DESCRIPTIONS

SUBJECT TO all matters of record.

And I do warrant the title against all persons whomsoever, subject only to matters above set forth.

Dated this 21st day of July, 2005.

Joseph E Kokroko
Grantor: Joseph E. Kokroko

STATE OF ARIZONA)
) ss
COUNTY OF PIMA)

This instrument was acknowledged before me this 21st day of July, 2005, by Joseph E. Kokroko.

B D Murphy
Notary Public

My Commission Expires: 4-1-07

OFFICIAL SEAL
BONNIE D. MURPHY
Notary Public - Arizona
Pima COUNTY
My Commission Expires
April 1, 2007

EXEMPTION: A.R.S. § 11-1134.A.3.			
Agent: CC	File #: 10624-018 & 092	Activity #: 4TRRCA	P [X] De [ ] Do [ ] E [ ]

DEED.WARRANTY DOT - Rev. 01/04

20051410989

EXHIBIT A

108-25-0010
LEGAL DESCRIPTION
RIGHT-OF-WAY ACQUISITION
4-D

A portion that property described in Docket 12144, Page 7329, Records of Pima County, Arizona, a part of the southwest one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, more particularly described as follows;

COMMENCING at the center quarter corner of Section 20 as monumented by a 2-inch lead cap on pipe;

THENCE upon the center quarter line of said Section 20 and the north line of said property described in Docket 12144 at page 7329, S 88° 54' 42" W a distance of 370.97 feet to the **POINT OF BEGINNING** said point lying N 88° 54' 42" E a distance of 2244.01 feet from the west one-quarter corner of said Section 20, as monumented by a 3-inch brass disk in concrete marked "ADOT 10/02";

THENCE continuing upon said center quarter line and said property line, ~~N~~ S 88° 54' 42" ~~E~~ W, a distance of 29.71 feet to the point on the arc of a non-tangent curve concave northwesterly, a radial line through said point having a bearing of S 39° 44' 34" E, said curve being the northwesterly line of said property and said point being the southwest corner of said Lot 67, recorded in Book 6 of Maps and Plats at Page 99, records of Pima County, Arizona;

THENCE upon said northwesterly line, a curve to the right, having a radius of 300.62 feet and a central angle of 3°45'55", an arc distance of 19.76 feet to a point of cusp of a non-tangent curve concave southerly, a radial line through said point having a bearing of N 04° 00' 08" E, said curve being the south line of said property and said point of cusp being the most westerly corner of said property;

THENCE upon said south line, a curve to the right, having a radius of 609.74 feet and a central angle of 6°46'37" for an arc distance of 72.12 feet to a point of cusp of a non-tangent curve concave northeasterly, a radial line of said curve through said point having a bearing of S 10°46'45" W;

THENCE upon said curve to the right, having a radius of 35.00 feet and a central angle of 58°25'49" for an arc distance of 35.69 feet, to the **POINT OF BEGINNING,**

The herein described portion containing 683 square feet (0.016 acres), more or less.

SEE ATTACHED EXHIBIT.

J.O. Teague, R.L.S. 18557

Registered Land Surveyor
CERTIFICATE NO.
18557
J.O.
TEAGUE
DATE SIGNED 6-9-08
ARIZONA U.S.A.

H4000 0004N

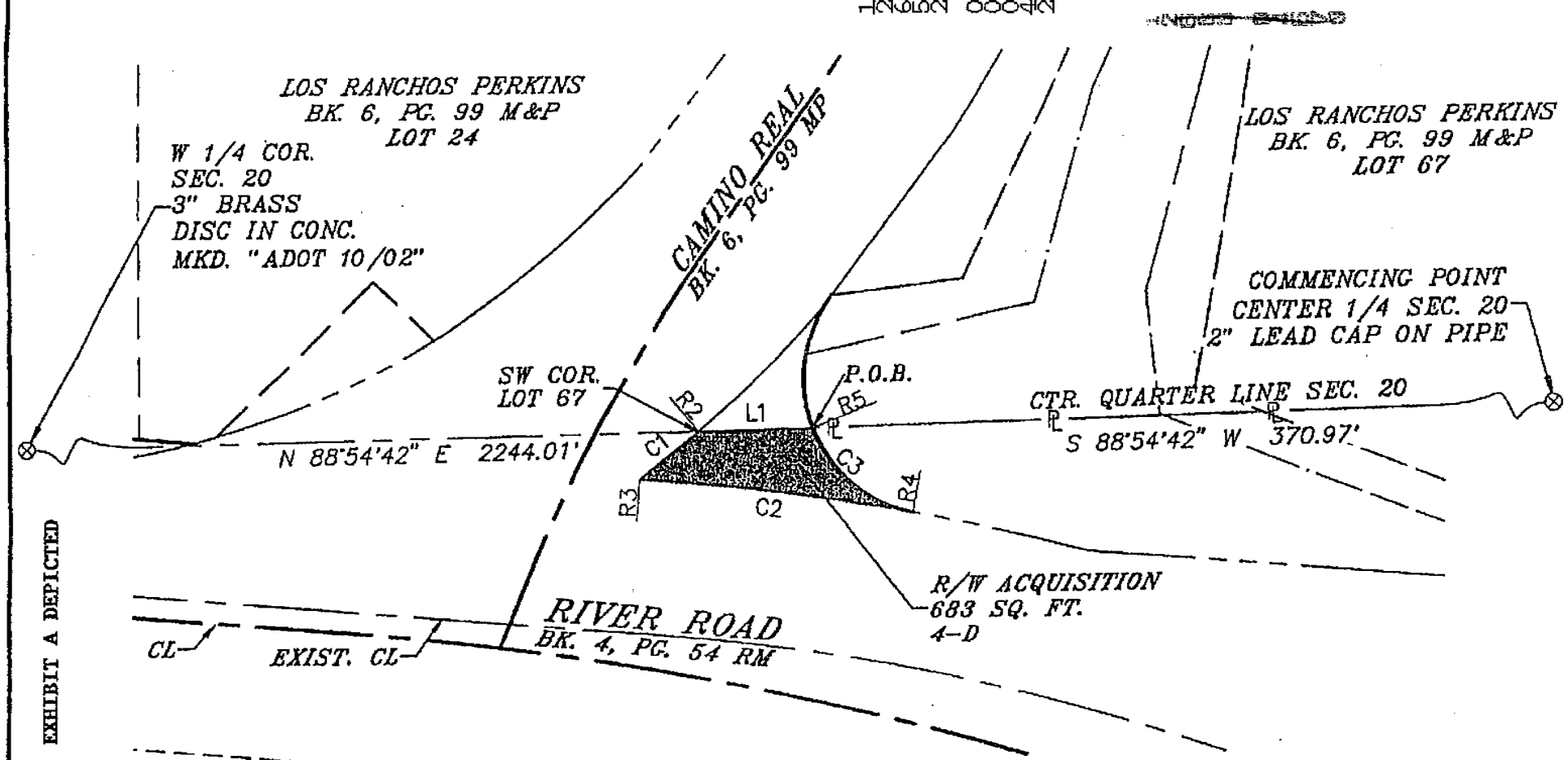


EXHIBIT A DEPICTED

PARCEL INFORMATION
I.D. NO.: 108-25-0010
OWNERS: Kokroko, Joseph E.
AREA: 683 SQ. FT.
RECORDING INFO:
DKT. 12144, PG. 7329

CURVE	RADIUS	ARC LENGTH	DELTA ANGLE
C1	300.62'	19.76'	03°45'55"
C2	609.74'	72.12'	06°46'37"
C3	35.00'	35.69'	58°25'49"

LINE	BEARING	DISTANCE
L1	N 88°54'42" E	29.71'
R2	S 39°44'34" E	300.62'
R3	N 04°00'08" E	609.74'
R4	S 10°46'45" W	35.00'
R5	S 69°12'34" W	35.00'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
18557
J.O.
TEAGUE
Date Signed 1-9-04
ARIZONA U.S.A.

MMLA
01048-01

SCALE: 1" = 40'

A PORTION OF THE SW 1/4
OF SEC. 20, T-13-S, R-14-E
GILA & SALT RIVER MERIDIAN
PIMA COUNTY, ARIZONA

DATE: 11/19/03 • DRAWN BY: mrf • CHK: JOT

E:\01048\01\Legals-MMLA\Final\Legal-4-D-TAKE_MRF.dwg JO Wed, 09 Jun 2004, 8:52am

EXHIBIT B

108-23-070B
LEGAL DESCRIPTION
RIGHT-OF-WAY ACQUISITION
4-C

A portion of Lot 67 of Los Ranchos Perkins, recorded in Book 6, page 99 of Maps and Plats, Records of Pima County and as described in Docket 12144 at page 7329, Records of Pima County, Arizona, a part of the northwest one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, more particularly described as follows;

COMMENCING at the center quarter corner of Section 20 as monumented by a 2-inch lead cap on pipe;

THENCE upon the center quarter line of Section 20, S 88° 54' 42" W, a distance of 400.69 feet to the **POINT OF BEGINNING**, the southwest corner of Lot 67, lying N 88° 54' 42" E, a distance of 2214.29 feet from the west quarter corner of Section 20, as monumented by a 3-inch brass disk in concrete marked "ADOT 10/02", said point lies on the easterly right-of-way of Camino Real as recorded in said Book 6, Page 99 of Maps and Plats, said right-of-way being a curve concave to the northwest having a radius of 300.62 feet. A radial line bears S 39° 44' 34" E to said southwest corner of Lot 67;

THENCE upon said easterly right-of-way line of Lot 67 and upon a curve to the left, an arc distance of 44.76 feet through a central angle of 8° 31' 50" to the end of the non-tangent curve having a radial line of S 48° 16' 24" E;

THENCE continue upon said easterly right-of-way line of Lot 67, N 37° 46' 12" E, a distance of 4.25 feet to the beginning of a non-tangent curve, concave to the east with a radius of 35.00 feet, and a radial bearing of N 52° 13' 48" W;

THENCE upon said curve to the left, an arc distance of 35.78 feet through a central angle of 58° 33' 38" to a point on the southerly line of Lot 67, being also said center quarter line;

THENCE upon the southerly line of Lot 67 and the center quarter line, S 88° 54' 42" W, a distance of 29.71 feet to the **POINT OF BEGINNING**;

The herein described portion containing 360 square feet (0.008 acres), more or less.

SEE ATTACHED EXHIBIT.

J.O. Teague, R.L.S. 18557

Registered Land Surveyor
CERTIFICATE NO.
18557
J.O.
TEAGUE
DATE SIGNED
ARIZONA U.S.A.

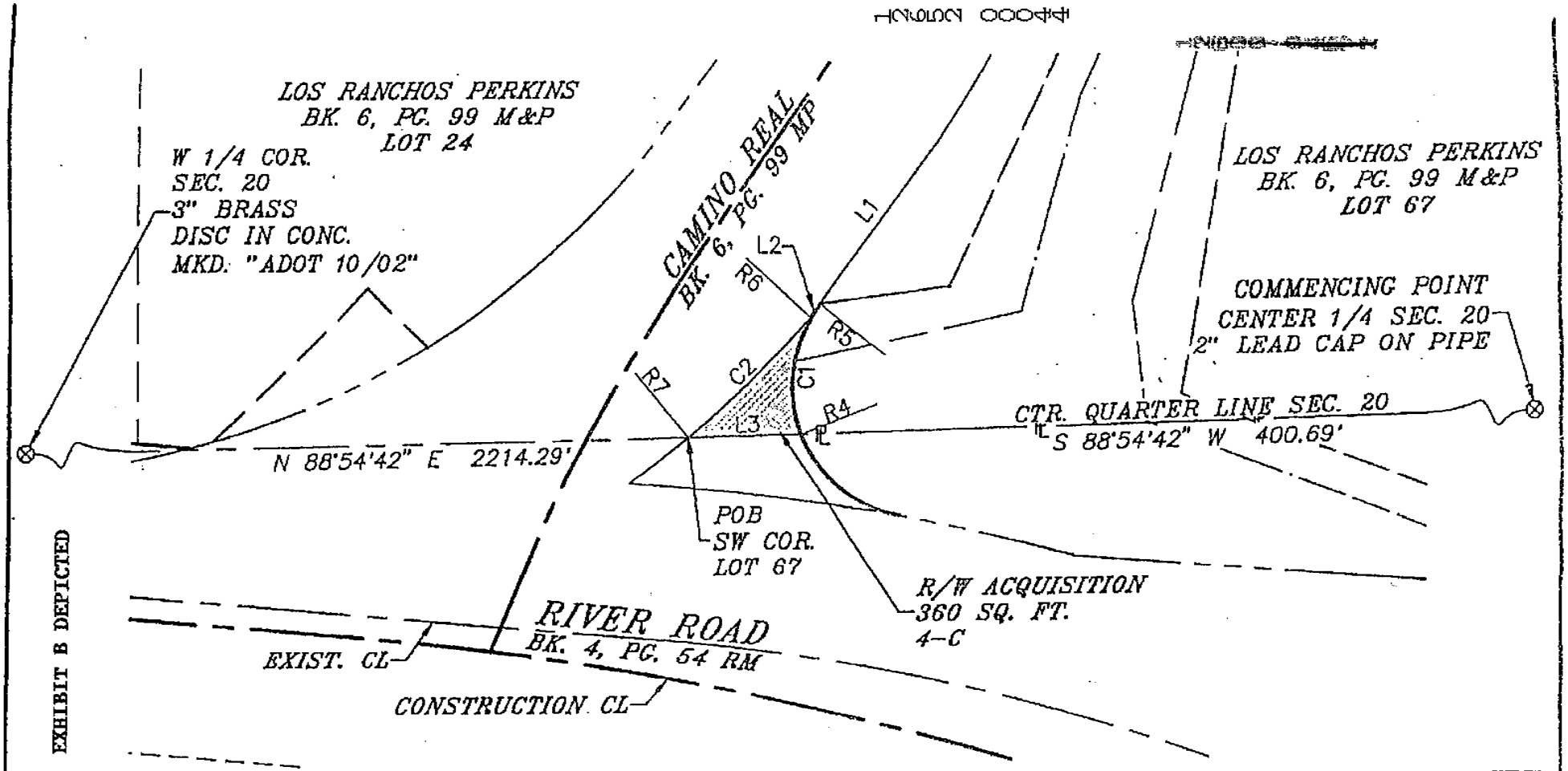


EXHIBIT B DEPICTED

PARCEL INFORMATION
I.D. NO.: 108-23-070B
OWNERS: KOKROKO, JOSEPH E.
AREA: 360 SQ. FT.
RECORDING INFO:
DKT. 12144, PG. 7329

CURVE	RADIUS	ARC LENGTH	DELTA ANGLE
C1	35.00'	35.78'	58°33'38"
C2	300.62'	44.76'	08°31'50"

LINE	BEARING	DISTANCE
L1	N 37°46'12" E	52.03'
L2	N 37°46'12" E	4.25'
L3	N 88°54'42" E	29.71'
R4	S 69°12'34" W	35.00'
R5	N 52°13'48" W	35.00'
R6	S 48°16'24" E	300.62'
R7	S 39°44'34" E	300.62'

SCALE: 1" = 40'

A PORTION OF THE NW 1/4
OF SEC. 20, T-13-S, R-14-E
GILA & SALT RIVER MERIDIAN
PIMA COUNTY, ARIZONA

MMLA
01048-01

DATE: 11/18/03 • DRAWN BY: mrf • CHK: jot

E:\01048\01\Legals-MMLA\Fina[illegible]-4-C-TAKE_MRF.dwg JO Wed, 09 Jun 2004, 8:29am

Recorded in
DKT 12708
PG 4323

108-25-020B
LEGAL DESCRIPTION
DRAINAGE EASEMENT
3A-B

A portion of that parcel as described in Docket 5429 at page 625 therein, Records of Pima County, Arizona, said parcel being a part of the southwest one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

COMMENCING at the northwest corner of the northwest one-quarter of said section 20;

THENCE upon the west line of said northwest one-quarter, S 00°42'39" E, a distance of 2435.17 feet to a point distant 177.10 feet from the southwest corner thereof;

THENCE leaving said west line, S 85°07'14" E, a distance of 702.58 feet;

THENCE S 04°52'46" W, a distance of 49.94 feet to the northwesterly corner of that parcel as recorded in Docket 9593 at page 1813 therein, Records of Pima County, Arizona;

THENCE upon the northerly line of said parcel, said northerly line coincident with the southerly right-of-way line of River Road as recorded in Book 21 of Maps and Plats at page 80 therein, Records of Pima County, Arizona, S 85°08'24" E, a distance of 135.53 feet;

THENCE continue upon said northerly line and said southerly right-of-way line, S 85°10'01" E, a distance of 198.26 feet;

THENCE continue upon said northerly line and said southerly right-of-way line, S 85°05'59" E, a distance of 239.05 feet;

THENCE leaving said northerly line, S 00°47'10" E, a distance of 300.57 feet to a point on the southerly line of said parcel, said southerly line coincident with the northerly line of the aforementioned described parcel, said point being **THE POINT OF BEGINNING**, the northeast corner of said parcel bears N 88°52'28" E, a distance of 42.96 feet;

THENCE continue S 00°47'10" E, a distance of 119.85 feet;

THENCE S 89°42'09" W, a distance of 21.45 feet;

THENCE S 00°17'51" E, a distance of 8.40 feet to a point on the north line of that parcel as recorded in Docket 6104 at page 2022 therein, Records of Pima County, Arizona;

THENCE upon said north line, N 89°13'21" E, a distance of 8.52 feet to the northeast corner thereof;

THENCE upon the east line of said parcel, S 00°46'39" E, a distance of 19.97 feet to the southeast corner thereof;

THENCE upon the south line of said parcel, S 89°13'21" W, a distance of 8.68 feet;

THENCE leaving said south line S 00°17'51" E, a distance of 127.63 feet;

THENCE N 89°42'09" E, a distance of 12.53 feet;

THENCE S 00°34'49" E, a distance of 72.30 feet to a point on the south line of the aforementioned described parcel;

THENCE upon said south line, N 88°52'28" E, a distance of 30.77 feet;

THENCE leaving said south line, N 04°21'57" E, a distance of 122.70 feet;

THENCE N 27°17'43" E, a distance of 24.73 feet to a point on the east line of the aforementioned described parcel;

THENCE upon said east line, N 00°46'39" W, a distance of 54.79 feet;

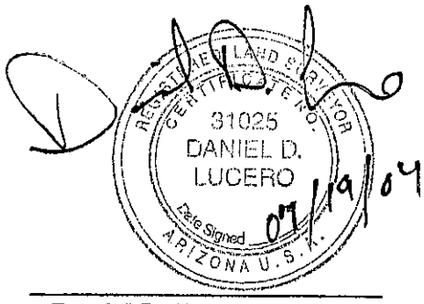
THENCE leaving said east line, N 90°00'00" W, a distance of 24.94 feet;

THENCE N 00°47'10" W, a distance of 148.83 feet to a point on the north line of the aforementioned described parcel;

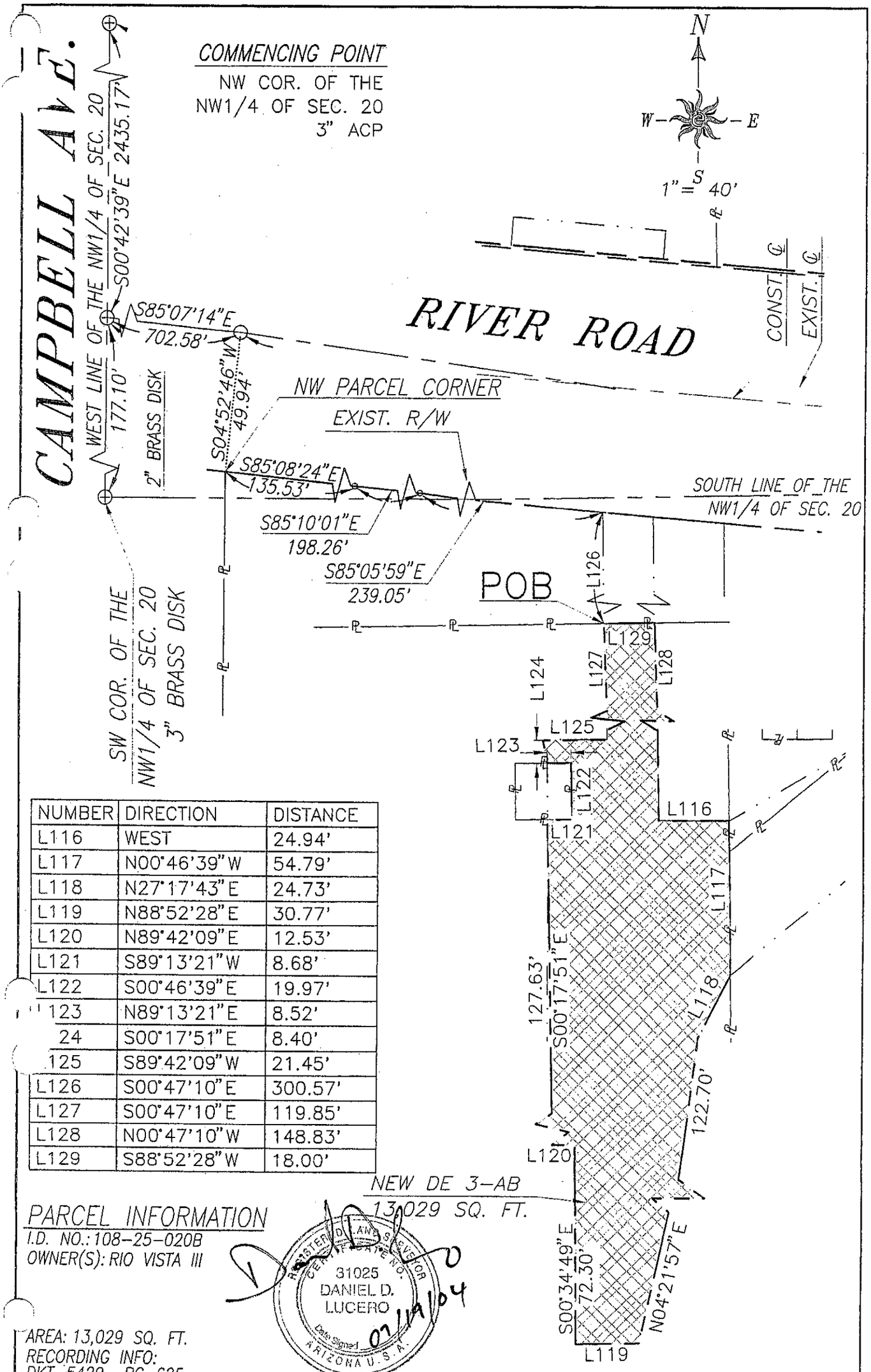
THENCE upon said north line, S 88°52'28" W, a distance of 18.00 feet to **THE POINT OF BEGINNING.**

The herein described portion containing 13,029 square feet (0.299 acres), more or less.

SEE ATTACHED EXHIBIT



Daniel D. Lucero, R.L.S.



NUMBER	DIRECTION	DISTANCE
L116	WEST	24.94'
L117	N00°46'39"W	54.79'
L118	N27°17'43"E	24.73'
L119	N88°52'28"E	30.77'
L120	N89°42'09"E	12.53'
L121	S89°13'21"W	8.68'
L122	S00°46'39"E	19.97'
L123	N89°13'21"E	8.52'
L124	S00°17'51"E	8.40'
L125	S89°42'09"W	21.45'
L126	S00°47'10"E	300.57'
L127	S00°47'10"E	119.85'
L128	N00°47'10"W	148.83'
L129	S88°52'28"W	18.00'

PARCEL INFORMATION

I.D. NO.: 108-25-020B
OWNER(S): RIO VISTA III

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
31025
DANIEL D.
LUCERO
Date Signed 07/19/04
ARIZONA U.S.A.

AREA: 13,029 SQ. FT.
RECORDING INFO:
DKT. 5429 PG. 625

A PORTION OF THE SW1/4 OF SEC. 20
T-13-S, R-14-E, PIMA COUNTY, ARIZONA

DSGN. BY:DCH DRAWN BY:EWM CHKD. BY: SM DATE: APRIL, 2004

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

3-AB DE Revised 7/19/04

Recorded in
DKT 12708
PG 4326

108-24-0110
LEGAL DESCRIPTION
DRAINAGE EASEMENT
5-J

A portion of that parcel as described in Docket 11347 at page 2600 therein, Records of Pima County, Arizona, said parcel being a part of the southeast one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

COMMENCING at the northeast corner of said southeast one-quarter, from which the northwest corner of the southwest one-quarter of said Section bears S 88°54'42" W a distance of 2614.98 feet;

THENCE upon the west line of said southeast one-quarter, S 00°51'53" E, a distance of 301.61 feet to the northwesterly corner of the aforementioned described parcel;

THENCE continue upon said west line, said west line being coincident with the west line of said parcel, S 00°53'41" E, a distance of 11.44 feet;

THENCE continue upon said west line, said west line being coincident with the west line of said parcel, S 00°51'30" E, a distance of 27.13 feet to **THE POINT OF BEGINNING;**

THENCE continue upon said west line, said west line being coincident with the west line of said parcel, S 00°51'30" E, a distance of 577.25 feet to the southwest corner of said parcel;

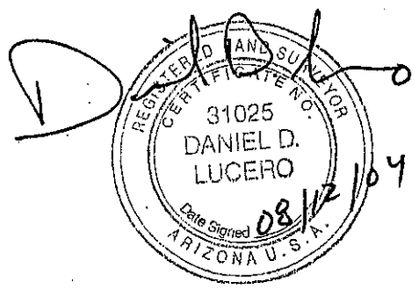
THENCE upon said south line, N 89°09'13" E, a distance of 10.00 feet;

THENCE leaving said south line, N 00°51'30" W, a distance of 572.14 feet to a point on the arc of a non-tangent curve, the radius point of said curve bears N 25°53'15" E;

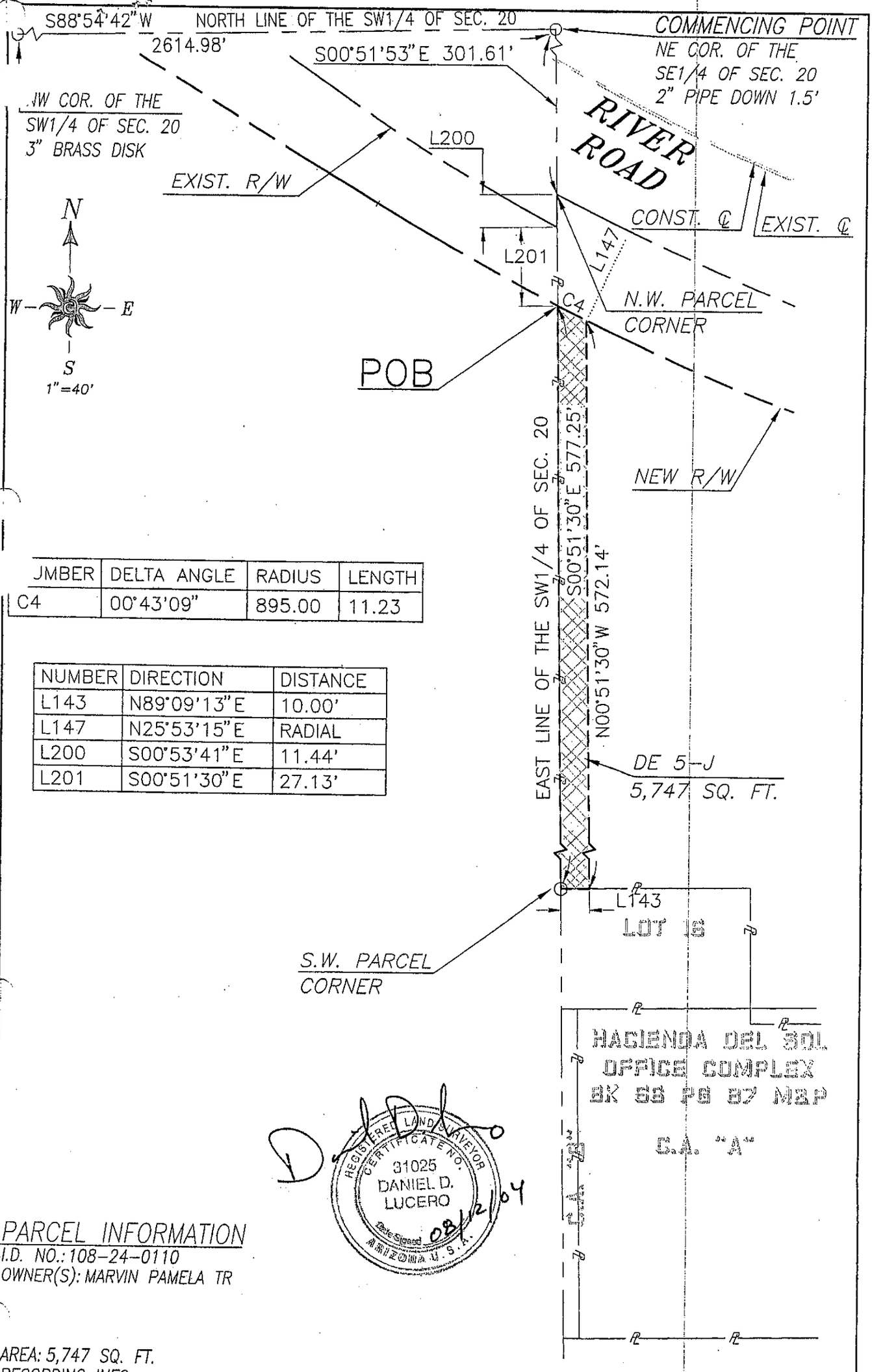
THENCE northwesterly upon the arc of said curve, to the right, having a radius of 895.00 feet, a central angle of 0°43'09", for an arc length of 11.23 feet to **THE POINT OF BEGINNING.**

The herein described portion containing 5,747 square feet (0.132 acres), more or less.

SEE ATTACHED EXHIBIT



Daniel D. Lucero, R.L.S.



JMBER	DELTA ANGLE	RADIUS	LENGTH
C4	00°43'09"	895.00	11.23

NUMBER	DIRECTION	DISTANCE
L143	N89°09'13"E	10.00'
L147	N25°53'15"E	RADIAL
L200	S00°53'41"E	11.44'
L201	S00°51'30"E	27.13'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
31025
DANIEL D. LUCERO
Date Signed 08/12/04
ARIZONA U.S.A.

PARCEL INFORMATION

I.D. NO.: 108-24-0110
OWNER(S): MARVIN PAMELA TR

AREA: 5,747 SQ. FT.
RECORDING INFO:
DKT. 11347 PG. 2600

A PORTION OF THE SE1/4 OF SEC. 20
T-14-S, R-13-E, PIMA COUNTY, ARIZONA
DSGN. BY:JOT DRAWN BY:EWM CHKD. BY: SWM DATE: AUGUST, 2004

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

5-J DE

Recorded In
DKT 12708
PG 4326

108-24-0950
LEGAL DESCRIPTION
DRAINAGE EASEMENT
4-BF

A portion of that parcel as described in Docket 11937 at page 6180 therein, Records of Pima County, Arizona, said parcel being a part of the southwest one-quarter of Section 20, Township 13 South, Range14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

COMMENCING at the northwest corner of said southwest one-quarter;

THENCE upon the north line of said southwest one-quarter, N 88°54'42" E, a distance of 2614.98 feet to the northeast corner thereof;

THENCE upon the east line of said southwest one-quarter, S 00°51'53" E, a distance of 301.61 feet to a point on the southerly right-of-way line of River Road as recorded in Docket 6251 at page 859 therein, Records of Pima County, Arizona;

THENCE continue upon said east line, said line being coincident with said right-of-way line, S 00°53'41" E a distance of 11.44;

THENCE leaving said right-of-way line, upon said east line, S 00°51'30" E a distance of 27.13 feet;

THENCE continue upon said east line, S 00°51'30" E a distance of 577.25 feet to the northwest corner of the aforementioned described parcel and the **POINT OF BEGINNING**;

THENCE upon the north line of said parcel, N 89°09'13" E a distance of 10.00 feet;

THENCE leaving said north line, S 00°51'27" E a distance of 41.86 feet to a point on the south line of said parcel;

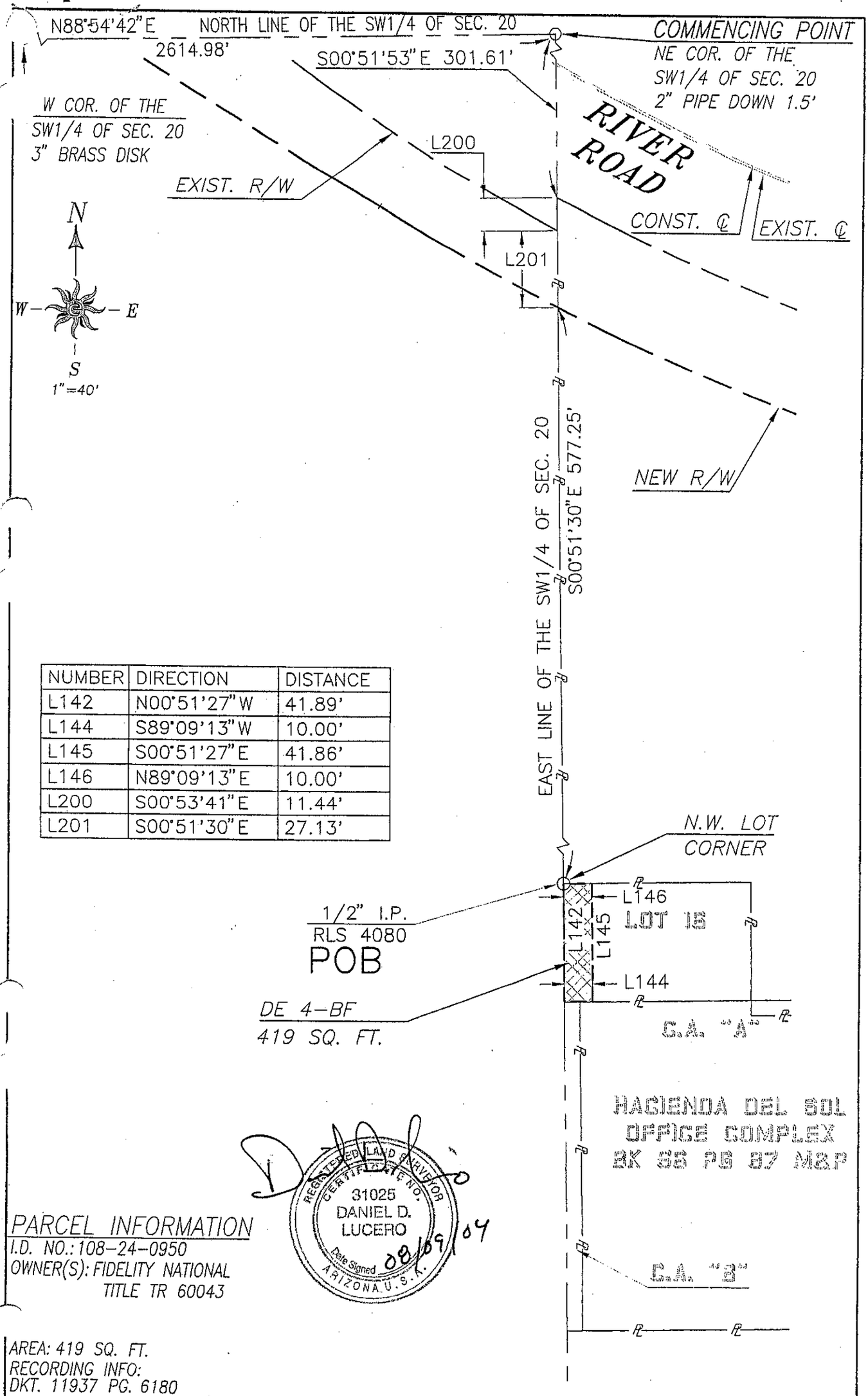
THENCE upon said south line, S 89°09'13" W a distance of 10.00 feet to the southwest corner of said parcel;

THENCE upon the west line of said parcel, N 00°51'27" W a distance of 41.89 feet to the **POINT OF BEGINNING**.

The herein described portion containing 419 square feet (0.010 acres), more or less.

SEE ATTACHED EXHIBIT

Daniel D. Lucero, R.L.S.



NUMBER	DIRECTION	DISTANCE
L142	N00°51'27"W	41.89'
L144	S89°09'13"W	10.00'
L145	S00°51'27"E	41.86'
L146	N89°09'13"E	10.00'
L200	S00°53'41"E	11.44'
L201	S00°51'30"E	27.13'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
31025
DANIEL D.
LUCERO
Date Signed 08/09/04
ARIZONA U.S.A.

PARCEL INFORMATION

I.D. NO.: 108-24-0950
OWNER(S): FIDELITY NATIONAL TITLE TR 60043

AREA: 419 SQ. FT.
RECORDING INFO:
DKT. 11937 PG. 6180

A PORTION OF THE SE1/4 OF SEC. 20
T-14-S, R-13-E, PIMA COUNTY, ARIZONA

DSGN. BY:JOT DRAWN BY:EWM CHKD. BY: SWM DATE: MARCH, 2004

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

4-BF DE

1104

Recorded In
DKT 12708
PG 4326

108-24-0980
LEGAL DESCRIPTION
DRAINAGE EASEMENT
4-BD

A portion of that parcel as described in Docket 11983 at page 434 therein, Records of Pima County, Arizona, said parcel being a part of the southwest one-quarter of Section 20, Township 13 South, Range14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

COMMENCING at the northwest corner of said southwest one-quarter;

THENCE upon the north line of said southwest one-quarter, N 88°54'42" E, a distance of 2614.98 feet to the northeast corner thereof;

THENCE upon the east line of said southwest one-quarter, S 00°51'53" E, a distance of 301.61 feet to a point on the southerly right-of-way line of River Road as recorded in Docket 6251 at page 859 therein, Records of Pima County, Arizona;

THENCE continue upon said east line, said line being coincident with said right-of-way line, S 00°53'41" E, a distance of 11.44;

THENCE leaving said right-of-way line, upon said east line, S 00°51'30" E a distance of 27.13 feet;

THENCE continue upon said east line, S 00°51'30" E a distance of 577.25 feet;

THENCE continue upon said east line, S 00°51'27" E a distance of 41.89 feet to the northwest corner of the aforementioned described parcel and the **POINT OF BEGINNING;**

THENCE upon the north line of said parcel, N 89°09'13" E a distance of 5.50 feet;

THENCE leaving said north line, S 00°51'27" E a distance of 116.34 feet to a point on the south line of said parcel;

THENCE upon said south line, S 89°16'58" W a distance of 5.50 feet to the southwest corner of said parcel;

THENCE upon the west line of said parcel, N 00°51'27" W a distance of 116.32 feet to the **POINT OF BEGINNING.**

The herein described portion containing 640 square feet (0.015 acres), more or less.

SEE ATTACHED EXHIBIT

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
31025
DANIEL D.
LUCERO
Date Signed 08/12/04
ARIZONA U.S.A.

Daniel D. Lucero, R.L.S.

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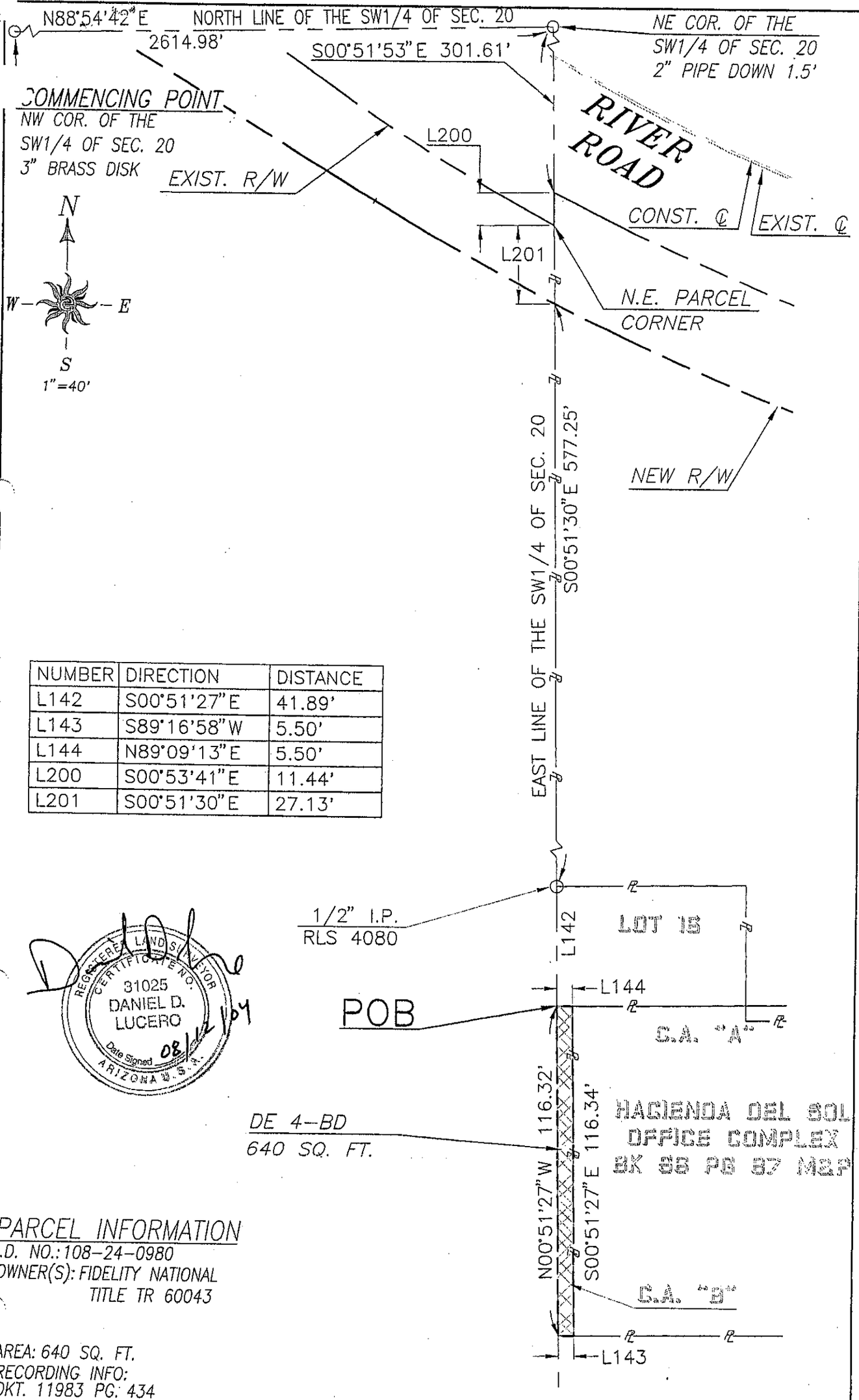

NUMBER	DIRECTION	DISTANCE
L142	S00°51'27"E	41.89'
L143	S89°16'58"W	5.50'
L144	N89°09'13"E	5.50'
L200	S00°53'41"E	11.44'
L201	S00°51'30"E	27.13'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
31025
DANIEL D. LUCERO
Date Signed 08/12/04
ARIZONA U.S.A.

PARCEL INFORMATION

I.D. NO.: 108-24-0980
OWNER(S): FIDELITY NATIONAL TITLE TR 60043

AREA: 640 SQ. FT.
RECORDING INFO:
DKT. 11983 PG. 434

A PORTION OF THE SW1/4 OF SEC. 20
T-14-S, R-13-E, PIMA COUNTY, ARIZONA
DSGN. BY:JOT DRAWN BY:EWM CHKD. BY: SWM DATE: AUGUST, 2004

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

4-BD DE

Recorded In
DKT 12708
PG 4326

108-24-0970
LEGAL DESCRIPTION
DRAINAGE EASEMENT
4-BE

A portion of that parcel as described in Docket 11983 at page 434 therein, Records of Pima County, Arizona, said parcel being a part of the southwest one-quarter of Section 20, Township 13 South, Range14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

COMMENCING at the northwest corner of said southwest one-quarter;

THENCE upon the north line of said southwest one-quarter, N 88°54'42" E, a distance of 2614.98 feet to the northeast corner thereof;

THENCE upon the east line of said southwest one-quarter, S 00°51'53" E, a distance of 301.61 feet to a point on the southerly right-of-way line of River Road as recorded in Docket 6251 at page 859 therein, Records of Pima County, Arizona;

THENCE continue upon said east line, said line being coincident with said right-of-way line, S 00°53'41" E, a distance of 11.44;

THENCE leaving said right-of-way line, upon said east line, S 00°51'30" E a distance of 27.13 feet;

THENCE continue upon said east line, S 00°51'30" E a distance of 577.25 feet;

THENCE continue upon said east line, S 00°51'27" E a distance of 41.89 feet;

THENCE departing said east line, N 89°09'03" E a distance of 5.50 feet to the northwest corner of the aforementioned described parcel and the **POINT OF BEGINNING**;

THENCE upon the north line of said parcel, N 89°09'03" E a distance of 4.50 feet;

THENCE leaving said north line, S 00°51'27" E a distance of 116.35 feet to a point on the south line of said parcel;

THENCE upon said south line, S 89°16'58" W a distance of 4.50 feet to the southwest corner of said parcel;

THENCE upon the west line of said parcel, N 00°51'27" W a distance of 116.34 feet to the **POINT OF BEGINNING.**

The herein described portion containing 523 square feet (0.012 acres), more or less.

SEE ATTACHED EXHIBIT

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
31025
DANIEL D.
LUCERO
08/12/04
ARIZONA U.S.A.

Daniel D. Lucero, R.L.S.

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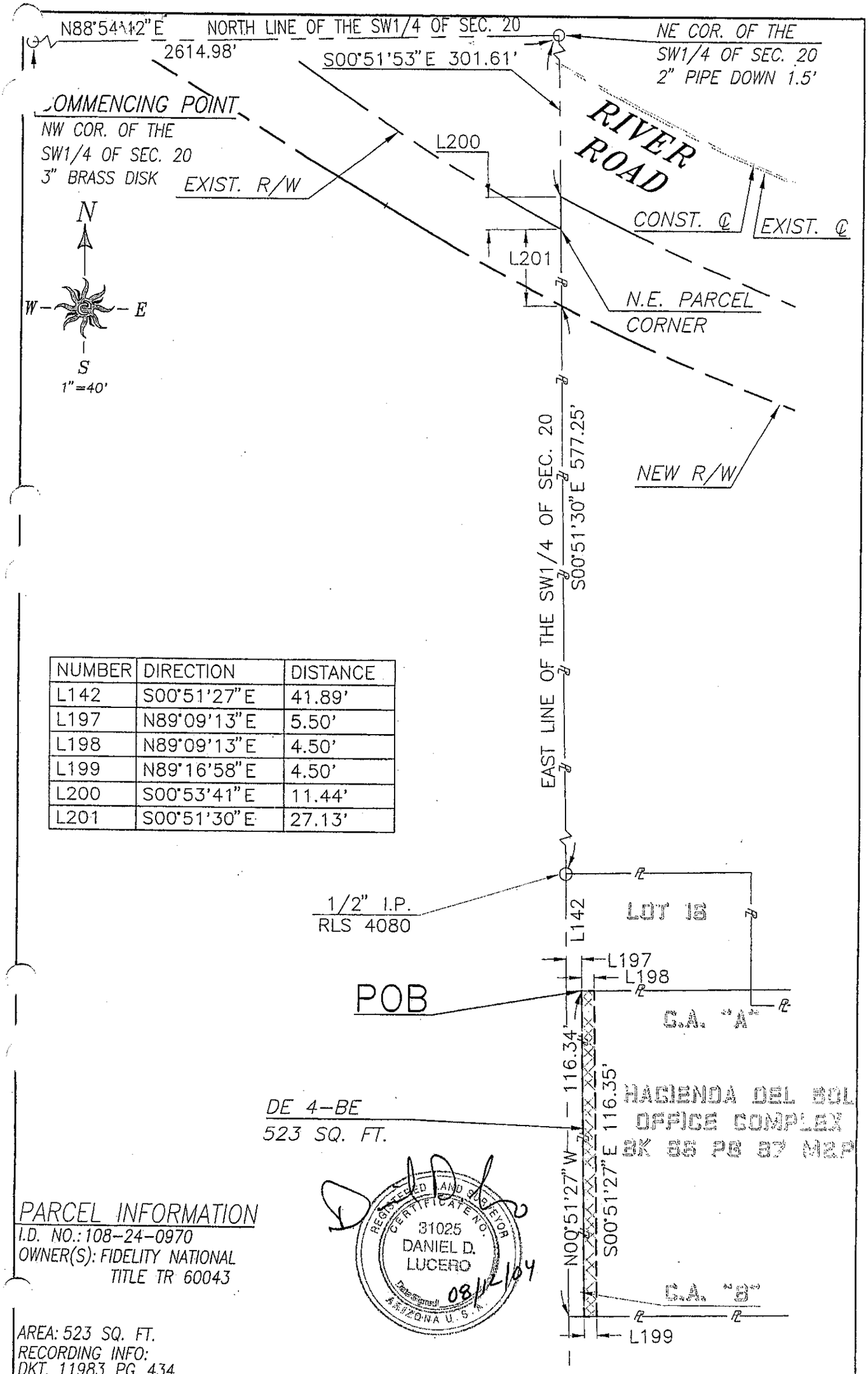
8/9/2004



NUMBER	DIRECTION	DISTANCE
L142	S00°51'27"E	41.89'
L197	N89°09'13"E	5.50'
L198	N89°09'13"E	4.50'
L199	N89°16'58"E	4.50'
L200	S00°53'41"E	11.44'
L201	S00°51'30"E	27.13'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
31025
DANIEL D. LUCERO
Date Signed 08/12/04
ARIZONA U.S.A.

PARCEL INFORMATION

I.D. NO.: 108-24-0970
OWNER(S): FIDELITY NATIONAL TITLE TR 60043

AREA: 523 SQ. FT.
RECORDING INFO:
DKT. 11983 PG. 434

A PORTION OF THE SW1/4 OF SEC. 20
T-14-S, R-13-E, PIMA COUNTY, ARIZONA

DSGN. BY:JOT DRAWN BY:EWM CHKD. BY: SWM DATE: AUGUST, 2004

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

4-BE DE

F. ANN RODRIGUEZ, RECORDER
RECORDED BY: LAM
DEPUTY RECORDER
6545 AS2

TTIGA
TITLE GUARANTY
PICKUP

DOCKET: 12708
PAGE: 4328
NO. OF PAGES: 3
SEQUENCE: 20052490891
12/27/2005
EASMNT 17:30

PICKUP
AMOUNT PAID $ 9.00

DRAINAGE EASEMENT

252920 MH

For valuable consideration, HSL Rio Cancion, L.L.C., an Arizona limited liability company, ("Grantors"), do hereby convey to Pima County, a political subdivision of the State of Arizona, ("County") an easement for the construction and maintenance of drainage facilities and appurtenances, including but not limited to, drainage improvements over, under and across the property described on the attached **Exhibit "A" and depicted on Exhibit "A-1"** (the Property).

County shall have the right to construct and maintain improvements within the Property and to enter upon the Property for the purpose of maintaining the easement and any of its improvements located thereon.

Grantors agree that no buildings, structures, fences or trees shall be placed upon, over or under the Property and that the natural contours of the Property shall not be excavated, filled or altered without the prior written approval of the Director of the Department of Transportation and Flood Control District.

All grants, covenants and conditions of this easement shall inure to the benefit of and be binding upon the successors in interest to the County and Grantors.

IN WITNESS WHEREOF, Grantors have executed this easement this 22 day of Dec., 2005.

HSL Rio Cancion, L.L.C.

Omar Mireles, Member/Manager

STATE OF ARIZONA)
) ss
COUNTY OF PIMA)

This instrument was acknowledged before me, the undersigned authority, on this 22nd day of Dec., 2005, by Omar Mireles as Member/Manager of HSL Rio Cancion, L.L.C.

OFFICIAL SEAL
MARLYS MEACHAM
NOTARY PUBLIC - ARIZONA
PIMA COUNTY
My Comm. Expires May 2, 2008

Marlys Meacham
Notary Public

My Commission Expires:
May 2 2008

Procurement Approval: May 20, 2005			
Agent: CC	File #: 10624-015	Activity #: 4TRRCA	P [X] De [ ] Do [ ] E [ ]

12708 4328

EXHIBIT "A"

108-25-006C
LEGAL DESCRIPTION
DRAINAGE EASEMENT
4-I

A portion of that parcel as described in Docket 12114 at page 3414 therein, Records of Pima County, Arizona, said parcel being a part of the southwest one-quarter of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

COMMENCING at the northwest corner of said southwest one-quarter;

THENCE upon the north line of said southwest one-quarter, N 88°54'42" E, a distance of 1756.27 feet to a point distant 858.71 feet from the northeast corner thereof;

THENCE leaving said north line, S 01°05'18" E, a distance of 56.63 feet to the northwesterly corner of the aforementioned described parcel;

THENCE upon the southerly right-of-way line of River Road as recorded in Docket 6899 at page 839 therein, Records of Pima County, Arizona, said right-of-way line being coincident with the northerly line of said parcel, S 85°00'56" E, a distance of 220.01 feet to a point on the arc of a non-tangent curve, the radius point of said curve bears S 04°49'53" W;

THENCE continue upon said right-of-way line, southeasterly upon the arc of said curve, to the right, having a radius of 1380.00 feet, a central angle of 0°27'10", for an arc length of 10.90 feet to a point on a non-tangent line and **THE POINT OF BEGINNING;**

THENCE leaving said right-of-way line, S 83°49'56" W, a distance of 36.10 feet;

THENCE N 90°00'00" W, a distance of 100.11 feet to a point on the arc of a curve;

THENCE southwesterly upon the arc of said curve, to the left, having a radius of 200.00 feet, a central angle of 27°50'02", for an arc length of 97.16 feet to a point on the west line of the aforementioned described parcel;

THENCE upon said west line, S 00°48'05" E, a distance of 58.24 feet to a point on the arc of a non-tangent curve, the radius point of said curve bears S 28°52'08" E;

THENCE northeasterly upon the arc of said curve, to the right, having a radius of 172.00 feet, a central angle of 28°52'08", for an arc length of 86.66 feet;

THENCE N 90°00'00" E, a distance of 109.63 feet to a point on the arc of a curve;

THENCE northeasterly upon the arc of said curve, to the left, having a radius of 228.00 feet, a central angle of 18°46'46", for an arc length of 74.73 feet;

THENCE N 71°13'14" E, a distance of 101.66 feet to a point on the aforementioned right-of-way line, said point being on the arc of a non-tangent curve, the radius point of said curve bears S 10°53'44" W;

THENCE northwesterly upon said right-of-way line, upon the arc of said curve, to the left, having a radius of 1380.00 feet, a central angle of 5°36'42", for an arc length of 135.16 feet to **THE POINT OF BEGINNING.**

The herein described portion containing 18,084 square feet (0.415 acres), more or less.

SEE ATTACHED EXHIBIT

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
29881
STEPHEN W.
McLAIN
Date Signed 4-26-04
ARIZONA U.S.A.

Stephen W. McLain, R.L.S.

12-08 0439

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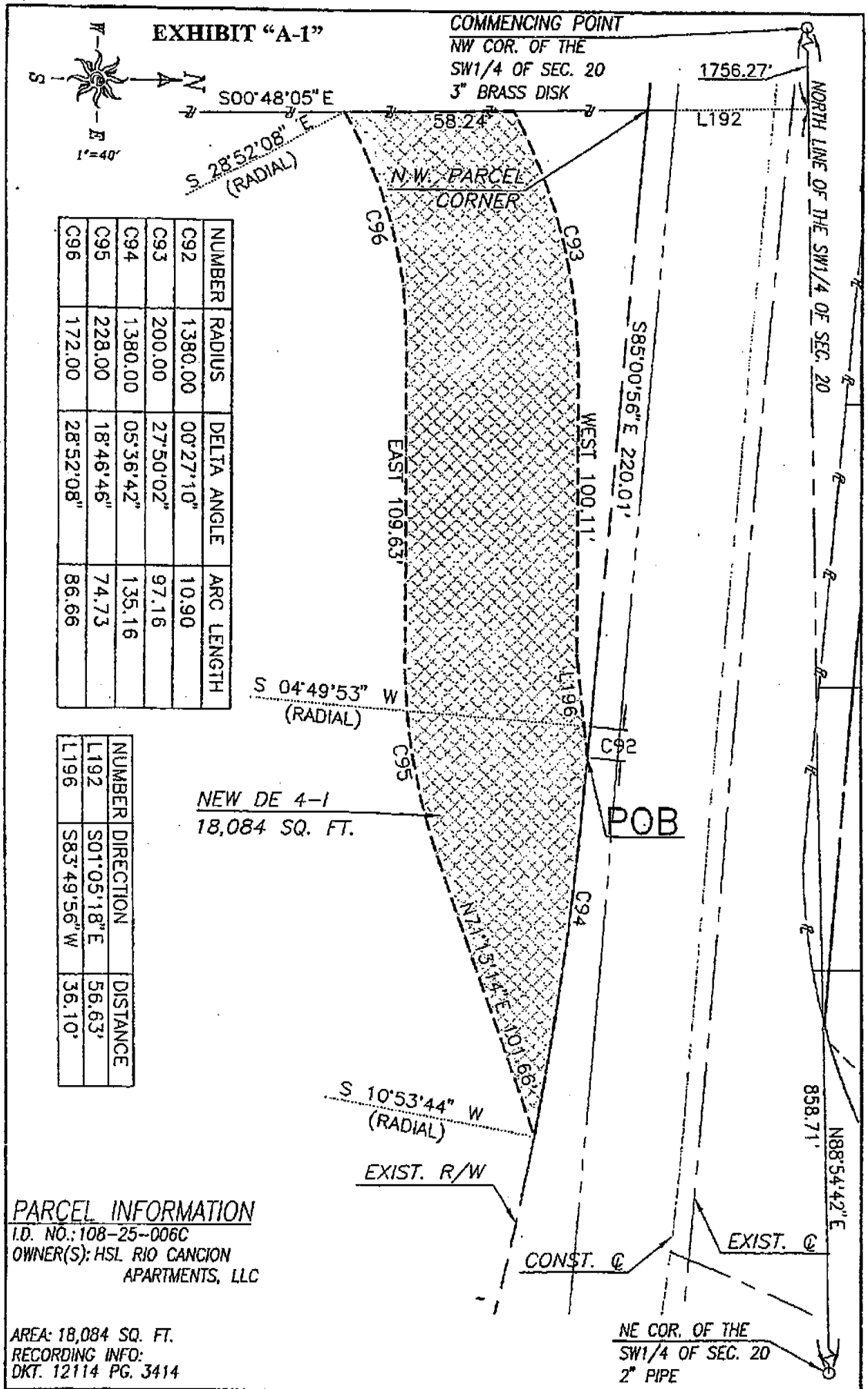
4/26/2004

EXHIBIT "A-1"



NUMBER	RADIUS	DELTA ANGLE	ARC LENGTH
C92	1380.00	00°27'10"	10.90
C93	200.00	27°50'02"	97.16
C94	1380.00	05°36'42"	135.16
C95	228.00	18°46'46"	74.73
C96	172.00	28°52'08"	86.66

NUMBER	DIRECTION	DISTANCE
L192	S01°05'18"E	56.63'
L196	S83°49'56"W	36.10'

PARCEL INFORMATION

I.D. NO.: 108-25-006C
OWNER(S): HSL RIO CANCION APARTMENTS, LLC

AREA: 18,084 SQ. FT.
RECORDING INFO:
DKT. 12114 PG. 3414

A PORTION OF THE SW1/4 OF SEC. 20
T-13-S, R-14-E, PIMA COUNTY, ARIZONA
DSCN. BY:JOT DRAWN BY:EWM CHKD. BY: SWM DATE: APRIL, 2004

Castro Engineering corp
consulting engineers and surveyors
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

Recorded In
DKT ____
PG ____

108-25-1390
LEGAL DESCRIPTION
DRAINAGE EASEMENT
3-F

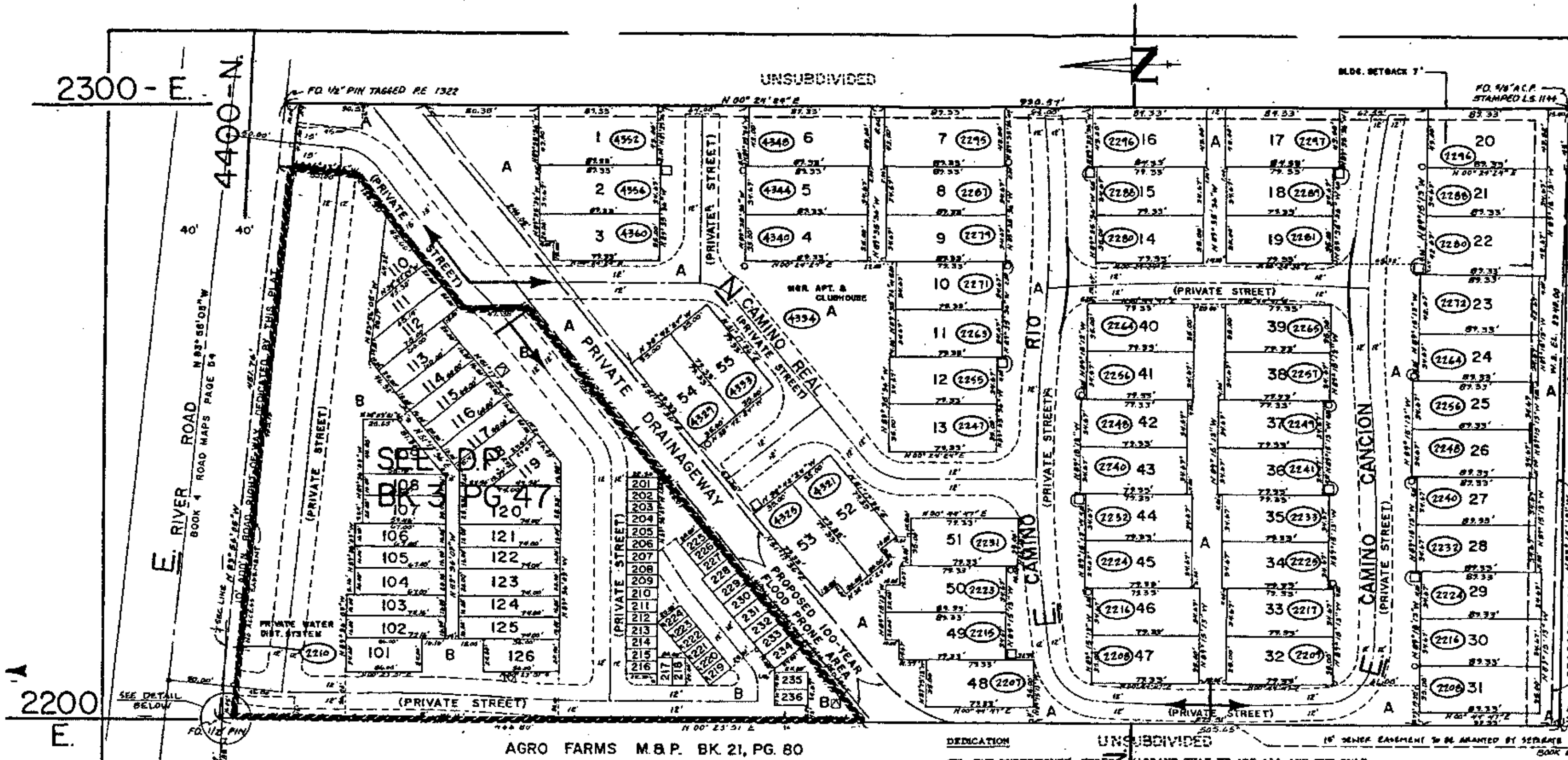
A portion of that parcel as schematically shown in Book 33, Page 10 therein, Records of Pima County, Arizona, said parcel being a part of the West Half of Section 20, Township 13 South, Range 14 East, Gila & Salt River Meridian, Pima County, Arizona, said portion more particularly described as follows;

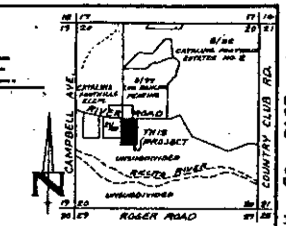
All that portion of Private Drainageway as dedicated in Maps and Plats, Book 33, Page 10, Rio Cancion Townhomes and Professional, Lots 1 Thru 55, 101 Thru 126, 201 Thru 236, & Common Areas A & B (see attached plat).

6-18-07

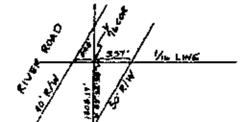
Frank G. Castro, R.L.S.

P:\PCDT059A\SURVEY\Legals\DRAINAGE-ESMNT 108-25-1390.rtf
6/18/2007





LOCATION PLAN
SECTION 20, T13S, R14E, G.&S.R.B.&M.
PIMA COUNTY, ARIZONA
SCALE: 3" = 1 MILE



DETAIL

NOTES

1. THE GROSS AREA OF THIS SUBDIVISION IS 9.81 ACRES.
2. THE TOTAL NUMBER OF LOTS IS 55-RESIDENTIAL, 24- PROFESSIONAL, 36-PARKING, & COMMON AREAS A & B.
3. THE TOTAL MILES OF NEW PUBLIC STREETS IS 0, PRIVATE STREETS IS 0.6.
4. BASIS OF BEARING: 1/16TH LINE (WEST PROPERTY LINE). SAID BEARING IS N 00 23' 51" E AS PER DOCKET 6988 PAGE 235.
5. DATUM OF ELEVATION: PIMA CO. HIGHWAY DEPT. DATUM FOUND 1/2" IRON PIN P.E. 1322 AT NORTHEAST PROPERTY CORNER. SAID ELEVATION BEING 2364.75 AT TOP OF PIN.
6. THE DEVELOPER WILL PAVE ALL PRIVATE ROADS SHOWN ON THIS PLAT, BUT NOT NECESSARILY TO MINIMUM PIMA COUNTY STANDARDS.
7. DRAINAGEWAYS WILL BE CONSTRUCTED ACCORDING TO PLANS APPROVED BY THE PIMA CO. DEPT. OF TRANSPORTATION & FLOOD CONTROL DISTRICT, PRIOR TO THE ISSUANCE OF ANY PERMITS FROM THE ZONING INSPECTOR FOR LOTS 1-55, AND PRIOR TO ISSUANCE OF OCCUPANCY PERMITS FOR LOTS 115-126.
8. THE 100-YEAR FREQUENCY FLOOD LIMIT WILL BE ENTIRELY CONTAINED WITHIN THE CONSTRUCTED DRAINAGEWAY AS SHOWN ON THIS PLAT.
9. BUILDING PADS FOR LOTS 20 THROUGH 31 WILL BE FILLED ABOVE ELEVATION 2346.00 AND VERIFIED BY A REGISTERED PROFESSIONAL ENGINEER OR LAND SURVEYOR PRIOR TO THE ISSUANCE OF ANY PERMITS FROM THE ZONING INSPECTOR.
10. PHYSICAL ACCESS WILL BE PROVIDED ACROSS THE 100-YEAR FLOOD PRONE AREA TO THE BUILDING SITES ON LOTS 1 THRU 55. CONSTRUCTION PLANS FOR SAID ACCESS WILL BE SUBMITTED TO THE PCDOT & FCD FOR REVIEW AND APPROVAL. IN ADDITION, THE OWNER WILL CONSTRUCT THE ACCESS ACROSS THE 100-YEAR FLOOD PRONE AREA IN ACCORDANCE WITH APPROVED PLANS PRIOR TO THE OCCUPANCY OF SAID LOTS.
11. ALL WEATHER ACCESS WILL BE PROVIDED TO ALL LOTS.
12. ANY ONE-FOOT NO ACCESS EASEMENTS TO BE ADJACENT TO RIVER ROAD WILL BE DEDICATED AND CONVEYED TO PIMA COUNTY BY THIS PLAT.
13. IF, IN THE OPINION OF THE PIMA COUNTY HIGHWAY DEPT., VIOLATION OF THE ONE-FOOT NO-ACCESS EASEMENT IS CREATING HAZARDOUS CONDITIONS, THE PROPERTY OWNER SHALL INSTALL PHYSICAL BARRIERS OR MODIFY EXISTING PHYSICAL BARRIERS IN ORDER TO RESTRICT VEHICULAR ACCESS TO DESIGNATED POINTS OF INGRESS/EGRESS.
14. ANY UTILITIES THAT MAY HAVE TO BE RELOCATED AS A RESULT OF THIS DEVELOPMENT WILL BE DONE SO AT NO EXPENSE TO PIMA COUNTY.
15. NO FURTHER SUBDIVIDING WILL BE DONE NOR ANY LOTS SPLIT WITHOUT THE WRITTEN APPROVAL OF THE PIMA COUNTY BOARD OF SUPERVISORS.
16. EXISTING ZONING: SR PROPOSED ZONING: TR
17. DIMENSIONS FOR PARKING LOTS: LOTS 201 THRU 216 = 9' x 22.3'
    LOTS 217 THRU 227 = 10' x 20'
    LOTS 225 THRU 236 = 12' x 24'
18. IMPACT FEES (D.O.T), CATALINA FOOTHILLS AREA, HIGH DENSITY DISCOUNT.

ASSURANCES - APPROVALS

"SATISFACTORY ASSURANCES IN THE FORM OF A THIRD PARTY TRUST FROM STEWART TITLE & TRUST RECORDED IN BOOK 6357 PAGE 971-982 HAVE BEEN PROVIDED TO GUARANTEE STREET IMPROVEMENTS, DRAINAGE IMPROVEMENTS, SANITATION IMPROVEMENTS, AND UTILITY IMPROVEMENTS (ELECTRIC, WATER AND GAS) IN THIS SUBDIVISION.

BY: [signature] DATE: 8/21/80
CHAIRMAN, BOARD OF SUPERVISORS
PIMA COUNTY, ARIZONA

[signature] 8-19-80
PIMA COUNTY PLANNING DEPARTMENT - DATE

[signature] 8-19-80
PIMA CO. DEPT. OF TRANSPORTATION - DATE
& FLOOD CONTROL DISTRICT, DIRECTOR

PIMA CO. DEPT. OF WASTEWATER MGT. - DATE

I, EUGENIA W. WELLS, CLERK OF THE BOARD OF SUPERVISORS, HEREBY CERTIFY THAT THIS PLAT WAS APPROVED BY THE BOARD OF SUPERVISORS OF PIMA COUNTY, ARIZONA ON THIS THE 1 DAY OF [illegible] 1980.

[signature] [date]
CLERK, BOARD OF SUPERVISORS - DATE

THIS DEVELOPMENT LIES WITHIN AN AREA DESIGNATED AS HAVING AN ASSURED WATER SUPPLY.

BY: [signature]
PIMA CO. SUBDIVISION COORDINATOR - DATE

DEDICATION

WE, THE UNDERSIGNED, HEREBY WARRANT THAT WE ARE ALL AND THE ONLY PARTIES HAVING ANY RECORD TITLE INTEREST IN THE LAND SHOWN ON THIS PLAT, AND WE CONSENT TO THE SUBDIVISION OF SAID LAND IN THE MANNER SHOWN ON THIS PLAT. WE HEREBY DEDICATE AND CONVEY TO PIMA COUNTY THE RIGHT-OF-WAY AS SHOWN HEREON FOR RIVER ROAD, WE HEREBY GRANT AN EASEMENT TO PIMA COUNTY OVER COMMON AREAS A & B FOR THE PURPOSE OF INSTALLATION AND MAINTENANCE OF SEWERS AND UTILITIES.

WE, THE UNDERSIGNED, OUR SUCCESSORS AND ASSIGNS, DO HEREBY SAVE PIMA COUNTY, ITS SUCCESSORS AND ASSIGNS, THEIR EMPLOYEES, OFFICERS, AND AGENTS HARMLESS FROM ANY AND ALL CLAIMS FOR DAMAGES RELATED TO THE USE OF SAID LANDS NOW AND IN THE FUTURE BY REASON OF FLOODING, FLOWAGE, EROSION, OR DAMAGE CAUSED BY WATER, WHETHER SURFACE FLOOD OR RAINFALL. IT IS FURTHER UNDERSTOOD AND AGREED THAT DRAINAGE SHALL NOT BE ALTERED, DISTURBED OR OBSTRUCTED OTHER THAN AS NOTED HEREON WITHOUT THE WRITTEN APPROVAL OF THE PIMA COUNTY FLOODPLAIN BOARD.

COMMON AREAS, AS SHOWN HEREON ARE RESERVED FOR THE PRIVATE USE AND CONVENIENCE OF ALL OWNERS OF PROPERTY WITHIN THIS SUBDIVISION, THEIR GUEST AND INVITEES, AND (EXCEPT FOR DRAINAGEWAYS), FOR THE INSTALLATION AND MAINTENANCE OF UTILITIES AND SEWERS. TITLE TO THE LAND OF ALL PRIVATE STREETS, ROADS, DRAINAGEWAYS AND COMMON AREAS SHALL BE VESTED IN AN ASSOCIATION OF INDIVIDUAL LOT OWNERS AS ESTABLISHED BY COVENANTS, CONDITIONS AND RESTRICTIONS RECORDED IN DOCKET BOOK 6357 AT PAGE 983-996 & DOCKET BOOK 6357 AT PAGE 997-1001 IN THE OFFICE OF THE PIMA COUNTY RECORDER. EACH AND EVERY LOT OWNER WITHIN THE SUBDIVISION SHALL BE A MEMBER OF THE ASSOCIATION, WHICH WILL ACCEPT ALL RESPONSIBILITY FOR THE CONTROL, MAINTENANCE, SAFETY AND LIABILITY OF THE PRIVATE STREETS, ROADS, DRAINAGEWAYS AND COMMON AREAS WITHIN THIS SUBDIVISION, AS SHOWN HEREON."

STEWART TITLE AND TRUST OF TUCSON, AN ARIZONA CORPORATION, AS TRUSTEE/UNDER TRUST NO. 2091 AND NOT OTHERWISE.

BY [signature]
TRUST OFFICER

STATE OF ARIZONA ss
COUNTY OF PIMA

ON THIS THE 19th DAY OF August, 1980, BEFORE ME [signature], THE UNDERSIGNED PERSONALLY APPEARED [signature], WHO ACKNOWLEDGED [signature] TO BE THE TRUST OFFICER OF STEWART TITLE AND TRUST OF TUCSON, AN ARIZONA CORPORATION, AND THAT AS SUCH TRUST OFFICER BEING AUTHORIZED SO TO DO, EXECUTED THE FOLLOWING INSTRUMENT FOR THE PURPOSE THEREIN CONTAINED

IN WITNESS WHEREOF I HEREUNTO SET MY HAND AND OFFICIAL SEAL.

[signature] MY COMMISSION EXPIRES: 3-15-84
NOTARY PUBLIC

ENGINEERS CERTIFICATION

I HEREBY CERTIFY THAT THE BOUNDARY SURVEY SHOWN ON THIS PLAT WAS PERFORMED UNDER MY DIRECTION AND THAT ALL EXISTING AND/OR PROPOSED SURVEY MONUMENTS AND MARKERS SHOWN ARE CORRECTLY DESCRIBED. I FURTHER CERTIFY THAT THIS PLAT WAS PREPARED UNDER MY DIRECTION.

COUNTY RECORDER

STATE OF ARIZONA ss NO. 93586
COUNTY OF PIMA FEE $10.00

THIS PLAT FILED FOR RECORD AT THE REQUEST OF LIND ENGINEERING, INC., ON THIS 4th DAY OF September, 1980, AT 2:55 Pm IN BOOK 33 OF MAPS AND PLATS AT PAGE 10 THEREOF.

JOE BEDARD
COUNTY RECORDER
PIMA COUNTY, ARIZONA
BY: [signature]
DEPUTY

Ⓡ
1. LANDSCAPED WALL FACING RIVER RD.
2. NUMBER OF TOWNHOUSES LIMITED TO 25.
3. NUMBER OF OFFICE BLDGS. LIMITED TO 60, SINGLE STORY.
4. BLDG. FACING RIVER RD. LIMITED TO SINGLE STORY.
5. EASTERN BOUNDRY SHALL PRESENT VISABLE EFFECT OF A WALL.

BENEFICIARIES OF STEWART TITLE AND TRUST, TRUST NO. 2091 IS THE BOHM COMPANY, AN ARIZONA CORP.

LEGEND

- FD. PIN AS NOTED
- SET 1/2" PIN TAGGED PE 9367
- PROPOSED 100-YEAR FLOOD LINE
- NEW SURVEY MONUMENT (STAMPED PE 9367)
- EXISTING SURVEY MONUMENT
- 5' X 5' ELECTRIC PEDESTAL EASEMENT
- 6' X 6' ELECTRIC TRANSFORMER EASEMENT
- 10' X 10' ELEC. TRANSFORMER EASEMENT
- 16'X45' OVERHEAD ELEC. EASEMENT

MAP 24
ZONE TR®

RIO CANCION TOWNHOMES AND PROFESSIONAL

LOTS 1 THRU 55, 101 THRU 126, 201 THRU 236, & COMMON AREAS A & B

A PORTION OF W 1/2 OF SECTION 20, T-13S, R-14E, G.&S.R.B.&M., PIMA COUNTY, ARIZONA
CO. 9-78-125, Co. 9-79-179, Co. 12-79-145, CO. 9-77-16

Lind Engineering, Inc.

Scale 1" = 40'	D.L.	R.W.	7925-4
	M.W.	MAR 1980	SHEET 1 OF 1

FEMA REGION IX
LEVEE CERTIFICATION CHECKLIST
FOR
CAMINO REAL WASH
LOMR

FEMA Region IX
Levee Certification Checklist
(44CFR65.10)

FEMA

Please complete a checklist for each levee.

County Name Pima County

Levee Name Camino Real Floodwalls

Levee Owner Pima County Regional Flood Control District

Flooding Source Camino Real Wash

Date July 1, 2008

Checklist Purpose

The purpose of this checklist is to aid in the documentation of data to be provided for the purposes of levee certification pursuant to 44CFR 65.10.

Was levee designed and constructed by a federal agency? Yes ☐ No ☒

If yes, please provide a certification from that agency and proceed to section B below. In the event a certification cannot be acquired from the federal agency, it remains the community's responsibility to satisfy all requirements in section A.

If no, please proceed to section A below

	Provided /Yes	Not Provided/No	Not Applicable
A. Design Criteria			
1. Structural Adequacy a. Structural adequacy of levee provided by a Registered Professional Engineer?	☒	☐	☐
2. Certified as-built construction plans			
a. Certified as-built construction plans provided?	☒	☐	☐
3. Freeboard			
b. Minimum of three (3) feet of freeboard provided above adjacent Base Flood Elevation (BFE) along riverside of levee?	☒	☐	☐
c. Additional one (1) foot of freeboard provided within 100 feet of either side of structures?	☒	☐	☐

	Provided/Yes	Not Provided/No	Not Applicable
d. Additional one-half (1/2) foot of freeboard provided above the minimum freeboard at the upper end of the levee?	☒	☒	☐
e. On coastal levees, one (1) foot of freeboard provided above the higher of the wave height or the maximum wave run-up associated with the one hundred (100) year stillwater surge?	☐	☐	☒
f. Exception to the minimum freeboard requirements may be allowed with adequate supporting data. In no case shall freeboard provided be less than two (2) feet above the BFE for riverine levees less than two (2) feet above 100-year stillwater surge elevation for coastal levees.			
Adequate supporting data that levee meets aforementioned exception criteria provided?	☐	☐	☒
4. Closures			
g. Required closure devices provided at all openings?	☐	☐	☒
5. Embankment Protection			
h. Engineering analysis provided that demonstrates that no appreciable erosion will occur for levee embankments during the base flood or will result from the effects of currents or waves?	☒	☐	☐
6. Embankment and Foundation Stability			
i. Engineering analyses provided that evaluates levee embankment for seepage and which demonstrates that no failure of embankment or foundation will occur?	☒	☐	☐
7. Settlement			
j. Engineering analyses provided that assesses potential magnitude of future losses of freeboard resulting from levee settlement and which demonstrates maintenance of minimum freeboard?	☒	☐	☐
8. Interior Drainage			
k. Engineering analysis provided that considers joint probability of interior and exterior flooding and capacity of facilities for evacuating interior flooding?	☐	☐	☒
9. Other Design Criteria			
l. Areas of relatively high vulnerability may be subject to other analyses and design criteria. Other analyses and design criteria provided for areas of relatively high vulnerability?	☐	☐	☒

	Provided /Yes	Not Provided/No	Not Applicable
B. Operations Criteria			
1. Closures			
a. Documentation of flood warning system used to trigger emergency operations to facilitate safe operation procedures provided?	☐	☐	☒
b. Formal plan of operations provided?	☐	☐	☒
c. Evidence (i.e., a board resolution) that the Operations Plan has been officially adopted?	☐	☐	☒
d. Provisions for periodic exercise and operation of closures provided?	☐	☐	☒
2. Interior Drainage System			
e. Documentation of flood warning system used to trigger emergency operations providing safe operation procedures provided?	☐	☐	☒
f. Formal plan of operations provided?	☐	☐	☒
g. Evidence (i.e., a board resolution) that the Operations Plan has been officially adopted?	☐	☐	☒
h. Provision for manual backup for automatic systems included?	☐	☐	☒
i. Provision for periodic inspections included?	☐	☐	☒
3. Other Operations Plans and Criteria			
j. Other operations plans and criteria provided?	☒	☐	☐
C. Maintenance Criteria			
1. Maintenance Plan			
a. Maintenance Plan which is the basis for continued levee system maintenance provided?	☒	☐	☐
b. Evidence (i.e., a board resolution) that the Maintenance Plan has been officially adopted?	☒	☐	☐

	Provided /Yes	Not Provided/No	Not Applicable
2. Maintenance Jurisdiction Maintenance activities must be under the jurisdiction of Federal or State agency, an agency created by Federal or State law, or an agency of a participating NFIP community.			
c. Levee is under jurisdiction of a Federal or State agency.	☐	☐	☒
d. Levee is under jurisdiction of an agency created by Federal or State law.	☐	☐	☒
e. Levee is under jurisdiction of an agency of a participating NFIP community.	☒	☐	☐
3. Maintenance Activities Maintenance plans shall specify activities to be performed, frequency of performance, and identification and title of persons responsible for performance.			
f. Information provided to indicate activities to be performed?	☒	☐	☐
g. Information provided to indicate frequency of performance?	☒	☐	☐
h. Information provided to indicate identification and title of persons responsible for performance?	☒	☐	☐

The aforementioned levee certification checklist information is submitted as being true and correct to the best knowledge of the undersigned authorized levee district representative. Supporting documentation is attached to this checklist.

Comments: See provided adopted 'Levee Maintenance and Operations Plan'

Signed _____ Date _____
Authorized Levee District Representative

For Internal Use Only

☐ Certification Adequate

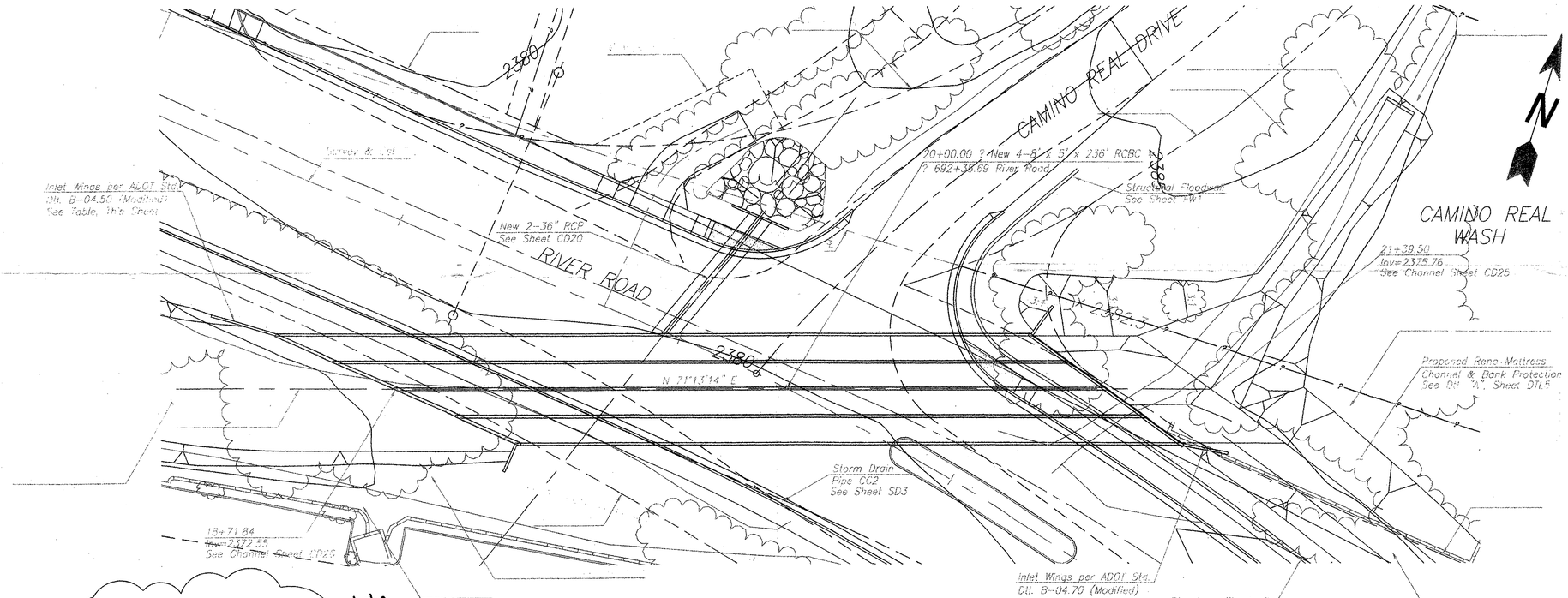
☐ Certification Inadequate

Comments: _____

Signed _____ Date _____
FEMA Representative

AS-BUILT PLANS
FOR
CAMINO REAL WASH
LOMR

W.O. 4TRRCA
PLAN SHEETS 112, 113, 134-140, 169 AND 170 OF 366

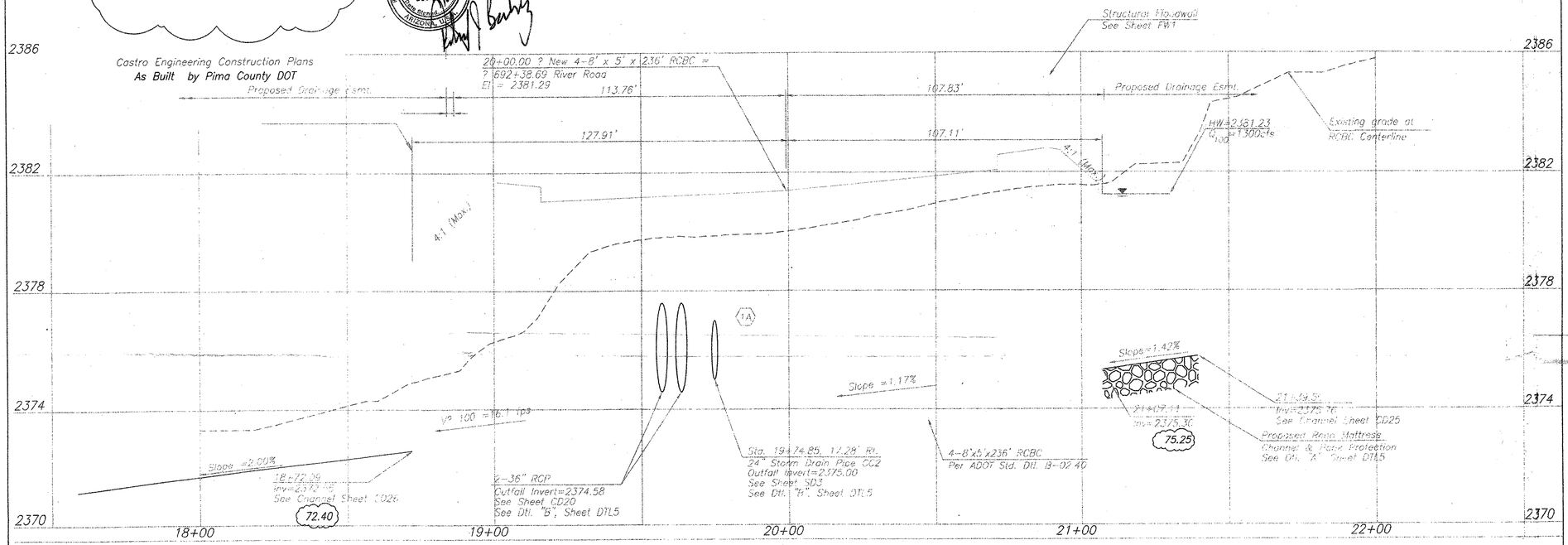


AS BUILT

3/31/08

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO.
22548
PATRICK J. BUCHANAN
STATE REGISTERED
ARIZONA, U.S.A.

Castro Engineering Construction Plans
As Built by Pima County DOT



River Road Sta. 692+38.69
New 4 – 8' x 5' x 236' RCBC at Skew 64° Rt

EARTHWORK QUANTITIES

Structural Excavation: 1334 CY
Pipe Excavation: N/A
Drainage Excavation: N/A
Structural Backfill: 274 CY
Pipe Backfill: N/A
Trench Backfill: 0 CY

RENO MATTRESS QUANTITIES

Entire Camino Real Inlet: 4,100 SY

MODIFIED WINGWALL TABLE

	Inlet	Outlet
A	1'-6"	1'-6"
B	1'-1"	1'-1"
C	1'-0"	1'-0"
D	3'-7"	3'-7"
E	12'-0"	10'-6"
F	2'-8"	2'-8"
G	16' 0"	22'-0"
J	2'-4"	2'-4"
K	1'-1 1/8"	1'-1 1/8"
L	3'-7"	3'-7"
M	3'-9"	3'-9"
θ_1	35.5°	23.8°
θ_2	25.0°	7.0°

Priscilla S. Cornelio, P.E., Director

Date
Designed
Drawn
Checked

Date

Castro Engineering
consulting engineers and surveyors
6545 N. WEST AVE., SUITE 200
TUCSON, ARIZONA 85743
(520)293-8550 (520)293-2115 (fax)

Pima County Department of Transportation

RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
CROSS DRAINAGE PLAN & PROFILE
STA. 692+39
W.O. 4TRRCA

Castro Eng. Job No. PCDT059

Scales: Horiz. 1"=20' Vert. 1"=2'

Sheet CD1a of CD48

Survey & Cst ?

Proposed TCE

Existing R/W

Existing=New R/W

New Esmt.

Inlet Wings per ADOT Std. Dtl. B-04.30, Skew=0° 4:1 Fill Slope

20+96.57 El.=2376.14 Match Channel Sheet CD23

New Outlet Channel See Sheet CD29

Sta.18+99.32

Proposed Drainage Easement

RIVER ROAD

Sta.17+92.00 Begin RCBC See Sheet CD29

N00°51'30"W 10.32'

~~N 8°41'14" W~~

N12°40'46"W

~~N 12°38'18" W~~

Culvert Control Centerline

~~18+44.04 El.=2371.16 Match Sheet CD29~~

~~Proposed Drainage Easement~~

~~Proposed TCE~~

CAMINO PABLO

New Inlet Channel See Sheet CD23

CAMINO REAL WASH

Proposed R/W

Existing R/W

20+00, ? New 2-8'x5'x~~244'~~295'RCBC= 696+89.14, ? River Road

New R/W

Structural Floodwall See Sheet FW1

3/31/08

CERTIFICATE NO. 22548 PATRICK J. BUCKLEY REGISTERED PROFESSIONAL ENGINEER STATE OF ARIZONA, U.S.A.

AS BUILT

Castro Engineering Construction Plans As Built by Pima County DOT

Proposed Drainage Esmt. | New R/W 31.79' | Existing R/W 31.89' | 69.53' | 59.34' | Existing R/W | Proposed Drainage Esmt.

Structural Floodwall See Sheet FW1

~~155.96'~~ 86.57'

20+00, ? New 2-8'x5'x ~~244'~~ 295'RCBC= 696+89.14, ? River Road El = 2382.69

HW=2383.52 Q_{100}=767cfs

1.6% 1.6%

3:1 (MAX)

~~41 L.F. New Handrail Per PC/COT Std. Dtl. 105~~

~~Reinforced Concrete Outlet Headwall Per ADOT Std. Dtl. B-04.10 (MOD) El. = 2376.85~~

16 L.F. New Handrail Per PC/COT Standard Detail 105

Existing grade at RCBC Centerline

4:1

2382

2378

Reinforced Concrete Outlet Headwall Per ADOT Std. Dtl. B-04.10 (MOD)

2

1.40%

2374

Slope=1.83%

V?100 =11.4 fps

20+86.57 El.=2376.00

76.07

20+96.57 El.=2376.14 Match Channel Sheet CD23

Reno Mattress Channel & Bank Protection See Dtl. "A", Sheet Dtl 5

17+92.00 ~~17+91.54~~ El.=2369.56 Match Channel Sheet CD29

69.50

Slope=2.80% Slope=3.05%

~~18+27.36 El.=2372.17~~

19+18.78 El.=2372.33

Sta.18+99.32 El.=2372.57

2-8'x5'x ~~236'~~ 295' RCBC Per ADOT Std. Dtl. B-02.40

2370

18+00 19+00 20+00 21+00 22+00

River Road Sta. 696+89.12

New 2 - 8' x 5' x ~~244'~~ (295') RCBC at Skew 41° Lt.

EARTHWORK QUANTITIES

Structural Excavation: 1892 CY
Pipe Excavation: N/A
Drainage Excavation: N/A
Structural Backfill: 40 CY
Pipe Backfill: N/A
Trench Backfill: 492 CY

REVISED QUANTITIES

1. (2)-8'x5' RCBC Length: (+)51 LF
   -Revised from 244' to 295'
2. Handrail Length: (-)25 LF
   -Revised from 41' to 16'

Priscilla S. Cornelio, P.E., Director
Pima County Department of Transportation

Date	Designed	Drawn	Checked	PCDT Engr.

Date: 05-05

Correct Channel Horiz. Control JTH/FEF

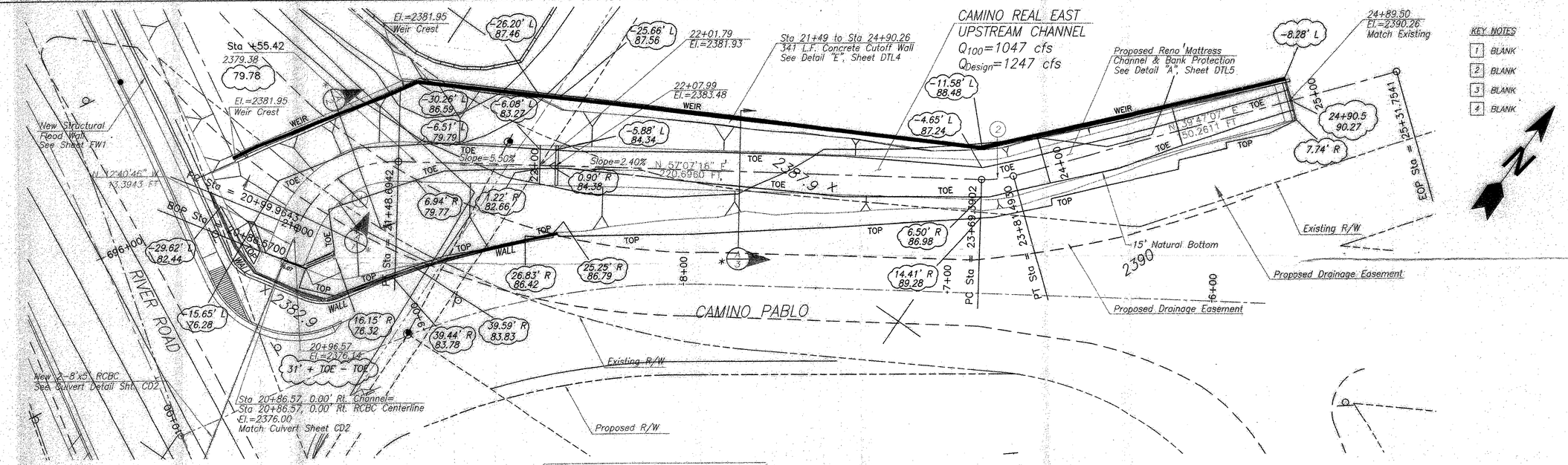
Castro Engineering
Civil Engineering
3560 WEST INA ROAD SUITE 209
TUCSON, ARIZONA 85741
(520)293-2566 (520)293-2115 (fax)

RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
CROSS DRAINAGE PLAN & PROFILE
STA. 696+89
W.O. 4TRRCA

Castro Eng. Job No. PCDT059

Scales: Horiz. 1"=20' Vert. 1"=2'

Sheet CD2 of CD48



Channel Control Data				
No.	Delta	T	R	L
1	69°48'02"	27.91'	40.00'	48.73'
2	17°20'10"	6.10'	40.00'	12.10'

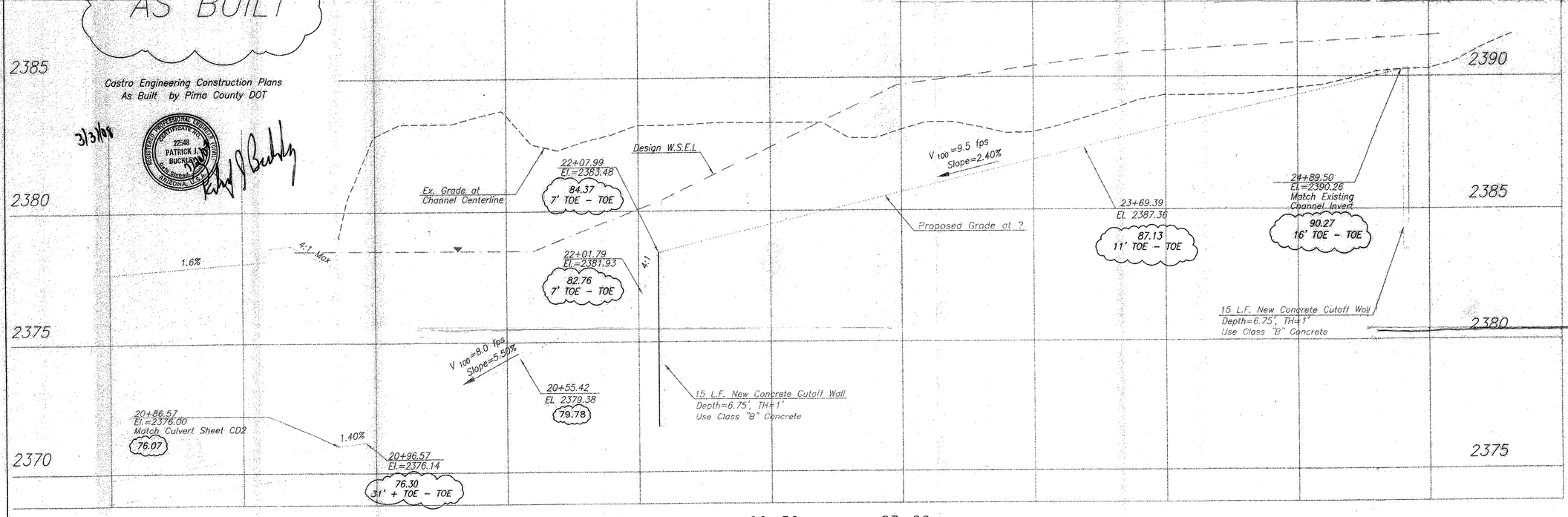
*See Sheet CD36 for Cross Sections

AS BUILT

Castro Engineering Construction Plans
As Built by Pima County DOT

3/3/09

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO. 22548
PATRICK J. BUCKLEY
Date Signed
ARIZONA, U.S.A.



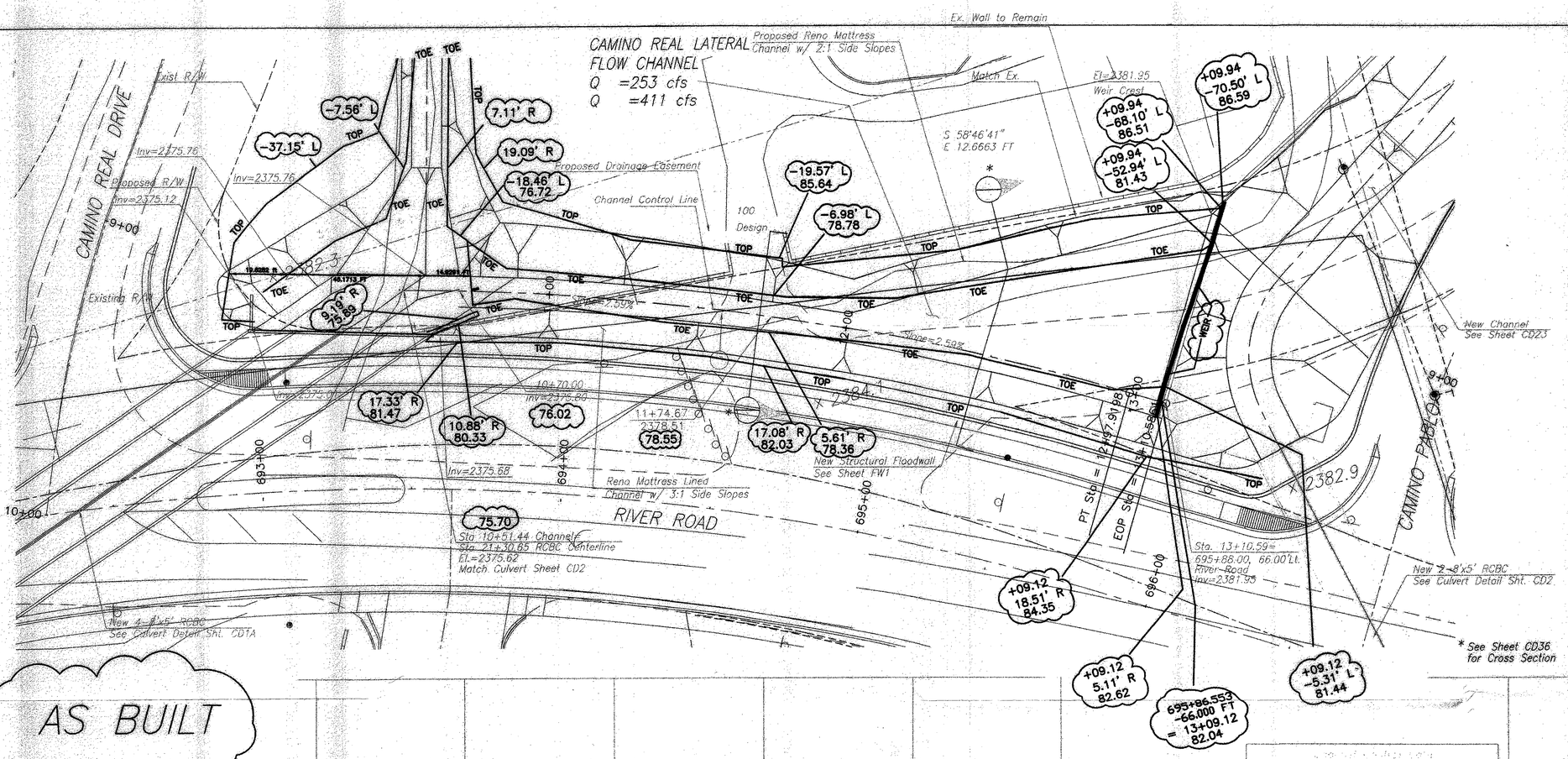
Priscilla S. Cornelio, P.E., Director
Pima County Department of Transportation

No.	Revision Description	Div. Engineer	Date
	Preparer	Reviewer	Proj. Engr.

Castro Engineering
3550 WEST INA ROAD SUITE 240
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
CHANNEL IMPROVEMENT PLANS
STA. 20+00 TO EXISTING
W.O. 411RRCA

Castro Eng. Job No. PCDT059 | Scales: Horiz. 1"=20' Vert. 1"=2' | Sheet CD23 of CD48 | Page 134 of 366

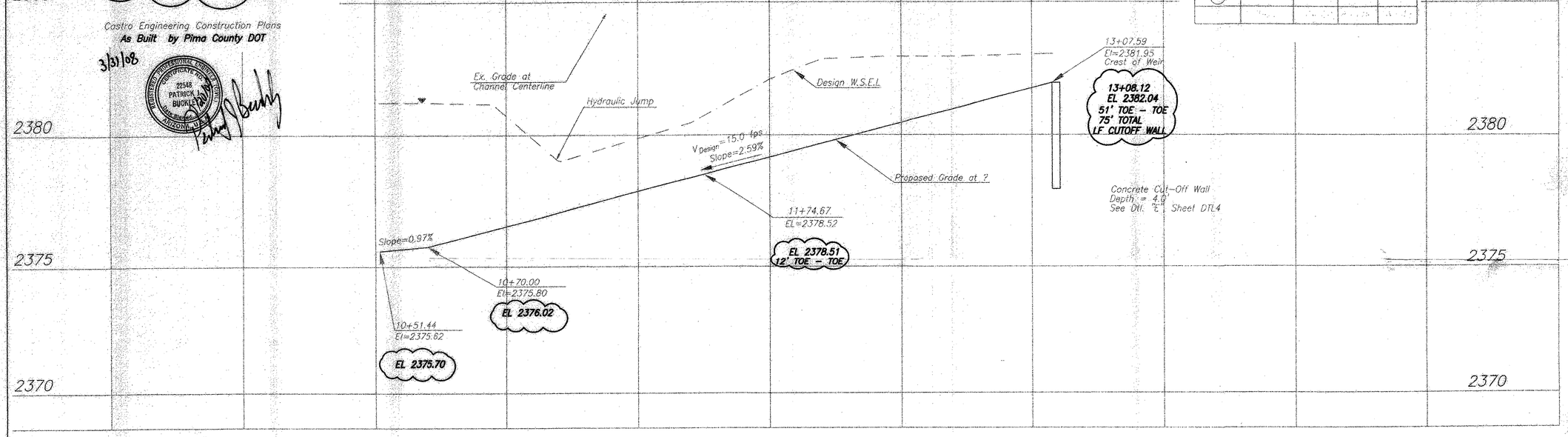


AS BUILT

Castro Engineering Construction Plans
As Built by Pima County DOT

3/31/08

PATRICK J. BUCKLEY 22548 REGISTERED PROFESSIONAL ENGINEER CERTIFICATE NO. ARIZONA U.S.A.



Priscilla S. Cornelio, P.E., Director

No.	Revision Description	Date

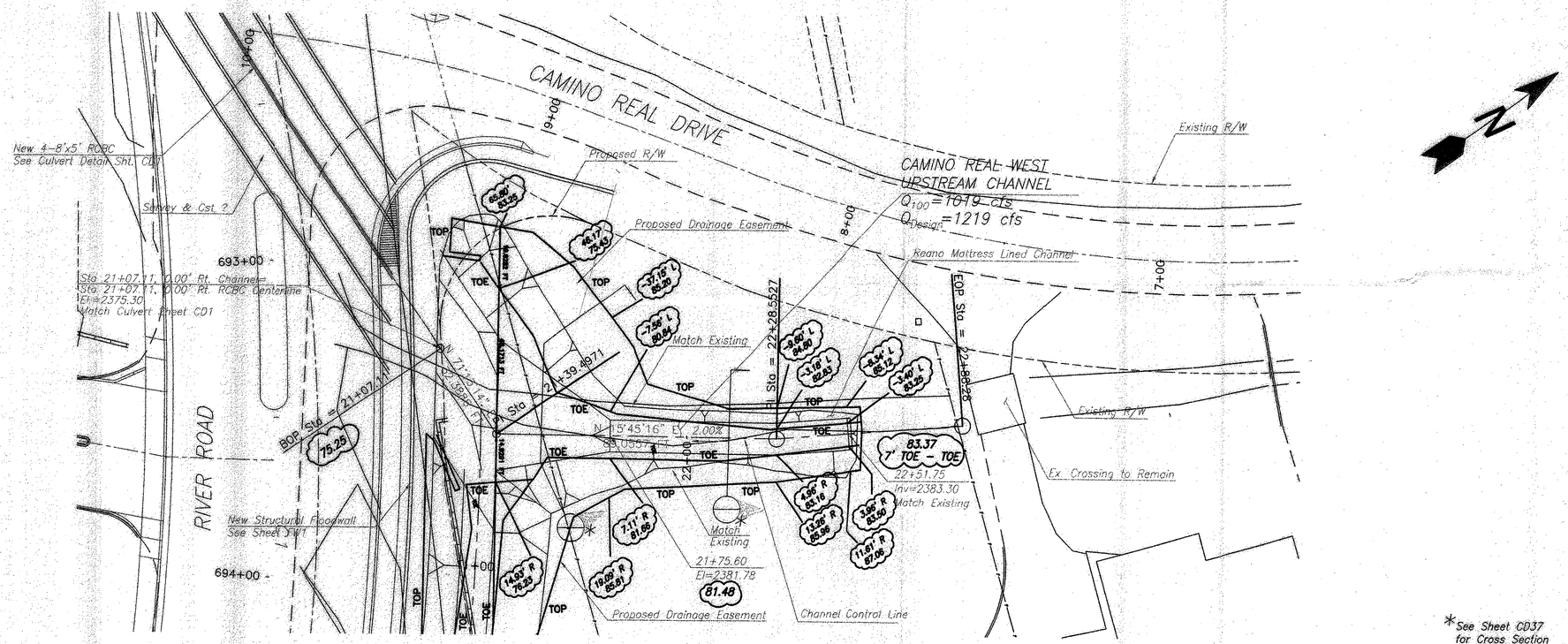
Designed
Drawn
Checked
Proj. Engr.

Castro Engineering
3500 WEST IRA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2600 (520)293-2115 (fax)

Pima County Department of Transportation

RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
CHANNEL IMPROVEMENT PLANS
STA. 10+50 TO 13+25
W.O. 4THRCA

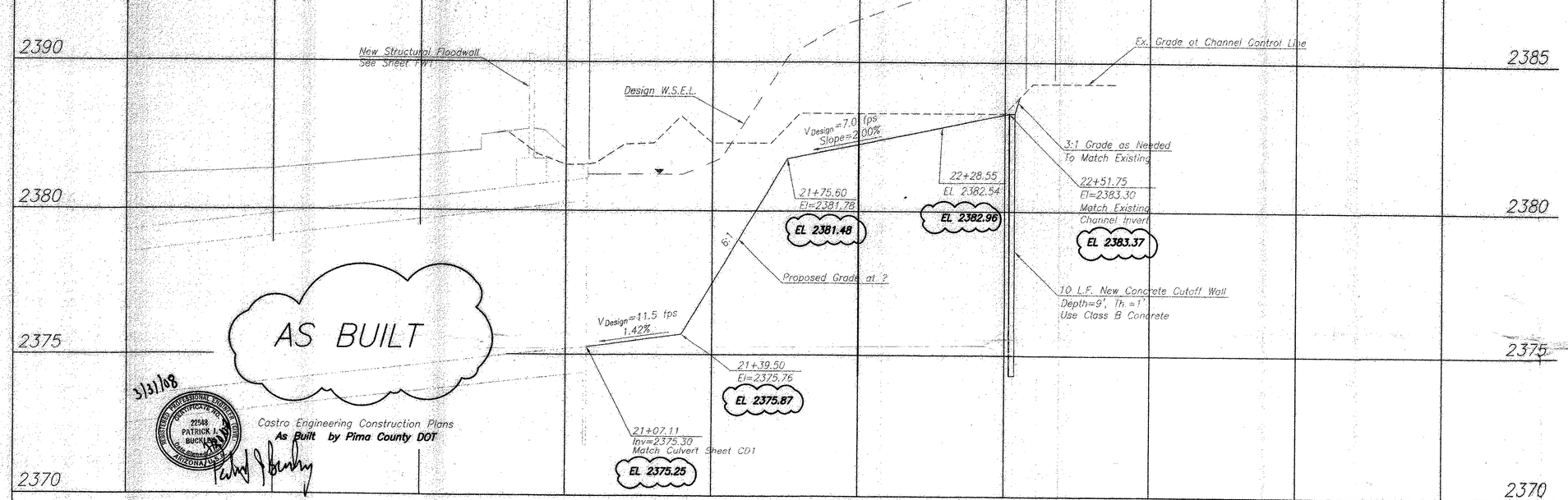
Castro Eng. Job No. PCDT059 | Scales: Horiz. 1"=20' Vert. 1"=2' | Sheet CD24 of CD48 | Page 135 of 366



*See Sheet CD37 for Cross Section

KEY NOTES

1. BLANK
2. BLANK
3. BLANK
4. BLANK



AS BUILT

5/31/08

REGISTERED PROFESSIONAL ENGINEER — CERTIFICATE NO. — 22548 — PATRICK J. BUCKLEY — 5/31/08 — ARIZONA U.S.A.

Castro Engineering Construction Plans
As Built by Pima County DOT

Priscilla S. Cornelio, P.E., Director
Pima County Department of Transportation

No.	Revision Description	Div. Engineer	Date

Designed
Drawn
Checked
Proj. Engr.
Date

Castro Engineering
Consulting Engineers and Land Surveyors
2560 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2580 (520)293-2115 (fax)

RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
CHANNEL IMPROVEMENT PLANS
CAMINO REAL WEST UPSTREAM
W.O. 4TRR0A

Castro Eng. Job No. PCDT059 | Scales: Horiz. 1"=20', Vert. 1"=2' | Sheet CD25 of CD48 | Page 136 of 366

RIVER ROAD

KEY NOTES

1. 15+26.56 to 18+71.84 Construct Drainage Channel See Detail E Sheet CD 37 Drainage Ex= 1,770± C.Y.
2. 15+26.56 to 18+71.84 Install 18,062 S.Y. of Articulated Concrete Block Revetment.
3. BLANK
4. BLANK

Sta 15+71.00 Lt. Transition Channel Embankment to Match Ex. Embankment

Sta 15+26.56 Match Exist Channel Invert

Existing Concrete Lined Channel

2:1 Grass Lined Slopes Block Revetment

40' Grass Lined Bottom

Slope=2.00%

N 90°00'00" E 109.630 FT

Proposed R/W

New 4-8'x5' RCBC See Culvert Detail Sheet CD1

N 71°13'14" E 38.0353 FT

Sta 18+71.84 0.000' Rt. Channel= Sta 18+71.84 0.000' Rt. RCBC Centerline El.=2372.55 Match Culvert Sheet CD1A

PT Sta = 16+58.6193

PC Sta = 17+68.2520

PT Sta = 18+40.0353

BUILT TOP

BUILT TOE

BUILT TOE ONLY

EXISTING TOE WALL

EXISTING TOP

RAMP

Drainage Channel

Channel Control Line

Proposed Drainage Easement

CAMINO REAL WEST DOWNSTREAM CHANNEL
Q_{Design}=1300 cfs

See Sheet CD37 for Cross Section

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Castro Engineering Construction Plans

As Built by Pima County DOT

3/3/11

22548 PATRICK J. BUCKLEY

River Road Survey & Const. ?

Left Bank Superelevated W.S.E.L.

Design W.S.E.L.

Hydraulic Jump

Ex. Grade at Channel Control Line

Right Bank Superelevated W.S.E.L.

V_{Design}=13.5 fps
Slope=2.00%

Proposed Grade at ?

15+26.56
Inv=2365.57
Match Exist Channel Invert
2365.54
29' TOE – TOE

16+00
2367.05
2367.70
43'+ TOE – TOE

17+00
2369.07
2369.36
38' TOE – TOE

18+00
2371.10
2371.44
35'+ TOE – TOE

18+71.84
Inv=2372.55
Match Culvert Sheet CD1
2372.40

2370
2365
2360

14+00 15+00 16+00 17+00 18+00 19+00

Castro Eng. Job No. PCDT059

Scales: Horiz. 1"=20' Vert. 1"=2'

Sheet CD26 of CD48

Page 137 of 366

Pima County Department of Transp

RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
CHANNEL IMPROVEMENT PLANS
CAMINO REAL DOWNSTREAM
W.O. 417PCA

Castro Engineering
3580 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-2850 (520)293-2115 (fax)

Priscilla S. Cornelio, P.E., Director

No.	Revision Description	Div. Engineer	Date

Designed
Drawn
Checked
Proj. Engr.

Date

Sta 4+80.00
Begin Reconstruct Channel
Match Ex. Channel

EXISTING TOP

Channel Control Line

Proposed TOE

Proposed Drainage Esmt.

BUILT TOP

BUILT TOE

0.70%

V@100?=17.5 fps

Channel Reconstruction
See DTL F Sheet 37

MATCH LINE, STA. 7+40.00
SEE THIS SHEET

* See Sheet CD37 for Cross Section

3/31/08

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO. 22548
PATRICK J. BUCKLEY
DATE SIGNED
ARIZONA, U.S.A.

AS BUILT

Castro Engineering Construction Plans
As Built by Pima County DOT

RAMADA

EX WALL

Proposed Precast 8'x3' RCBC
See Sheet SD7 for Plan and Profile
See Sheet SD11A for End Treatment Detail
Inv.=2348.50

Proposed Floodwall
See Sheet FW2

Grade Area As Shown
3:1 Max., 2% Min.

S 00°51'29" E 191.359 FT

Superelevated
W.S.=2354.94

Sta. 9+40.00
CL=2348.43
W.S.=2349.87

Sta. 9+60.00
CL=2348.56

Sta. 9+80.00
CL=2348.70

10' Shotcrete Bank Protection

Sta. 10+00.00
CL=2348.84

Sta. 10+22.00
CL=2349.00

Sta. 10+32.80
End Reconstruct Channel
Match Ex. Channel

Castro Eng. Job No. PCDT059

MATCH LINE, STA. 7+40.00
SEE THIS SHEET

Priscilla S. Cornelio, P.E., Director
Pima County Department of Transportation

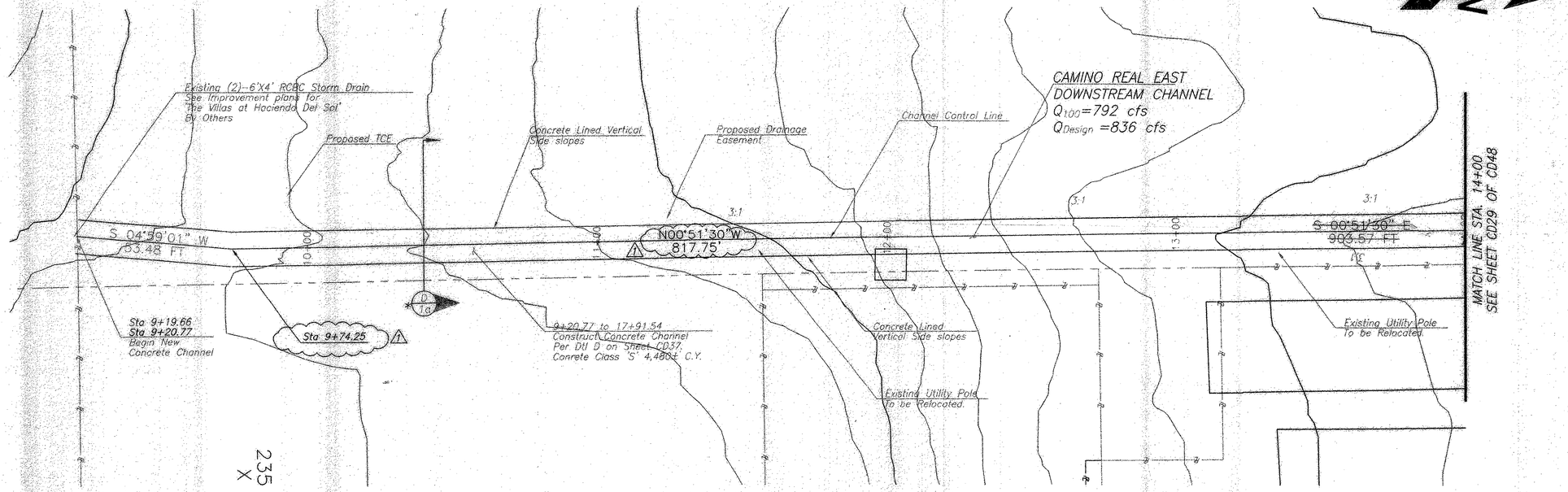
Castro Engineering
3500 WEST IVA ROAD, SUITE 220
TUCSON, ARIZONA 85741
(520)292-2260 (800)892-2115 (fax)

CAMPBELL AVE. TO ALVERNON WAY
RIVER ROAD
CHANNEL IMPROVEMENT PLANS
CAMINO REAL WEST CHANNEL
W.O. 417ROA

Date | Designed | Drawn | Checked | Proj. Engr. | Div. Engineer | Date

Scales: Horiz. 1"= 10' | Vert. N/A

Sheet CD27of CD 48



*See Sheet CD37
for Cross Section

3/3/08

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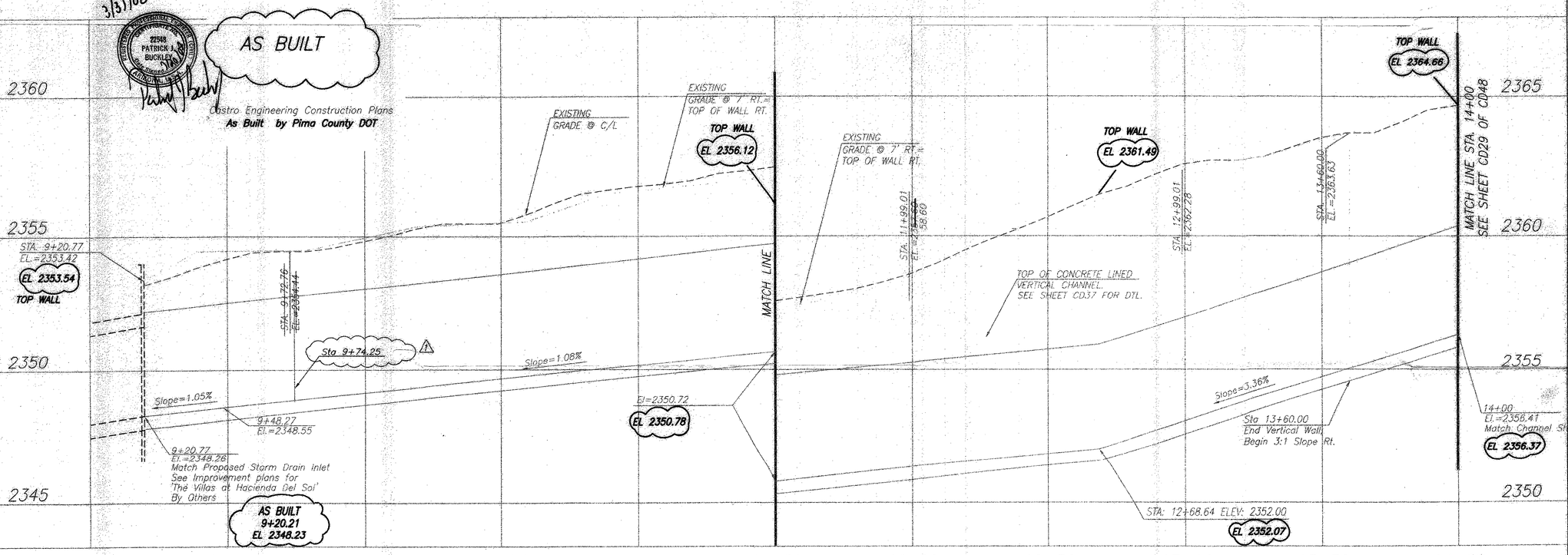
Castro Engineering Construction Plans
As Built by Pima County DOT



Priscilla S. Cornelio, P.E., Director
Pima County Department of Transportation

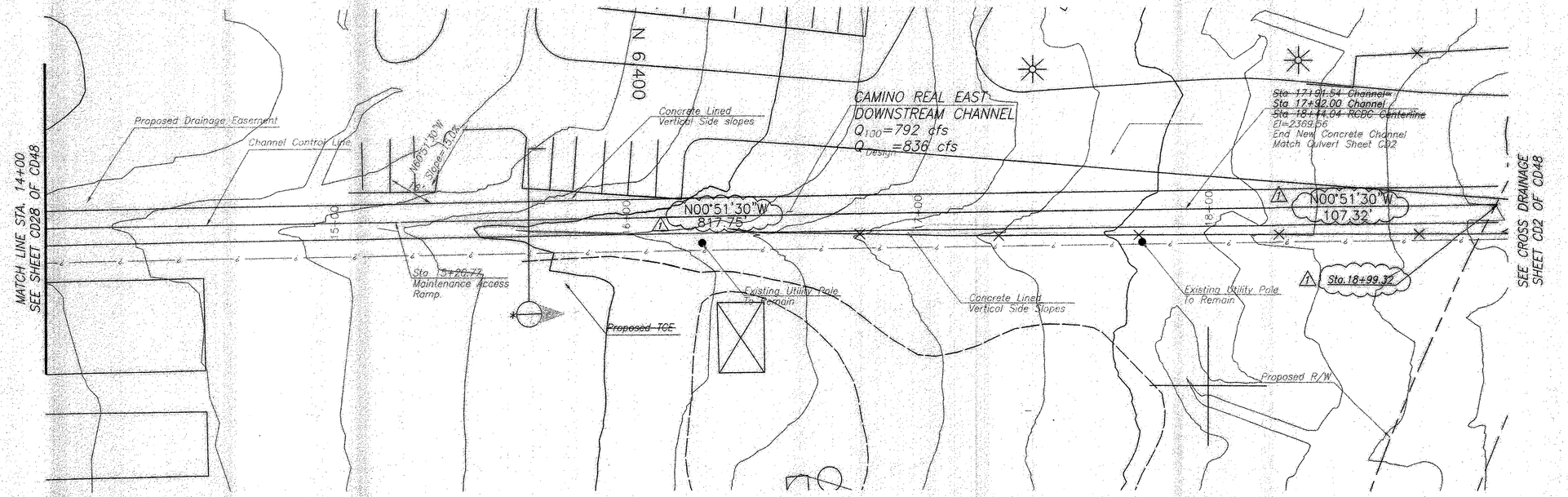
No.	Revision Description	Div. Engineer	Date

Designed	Date
Drawn	
Checked	
Proj. Engr.	

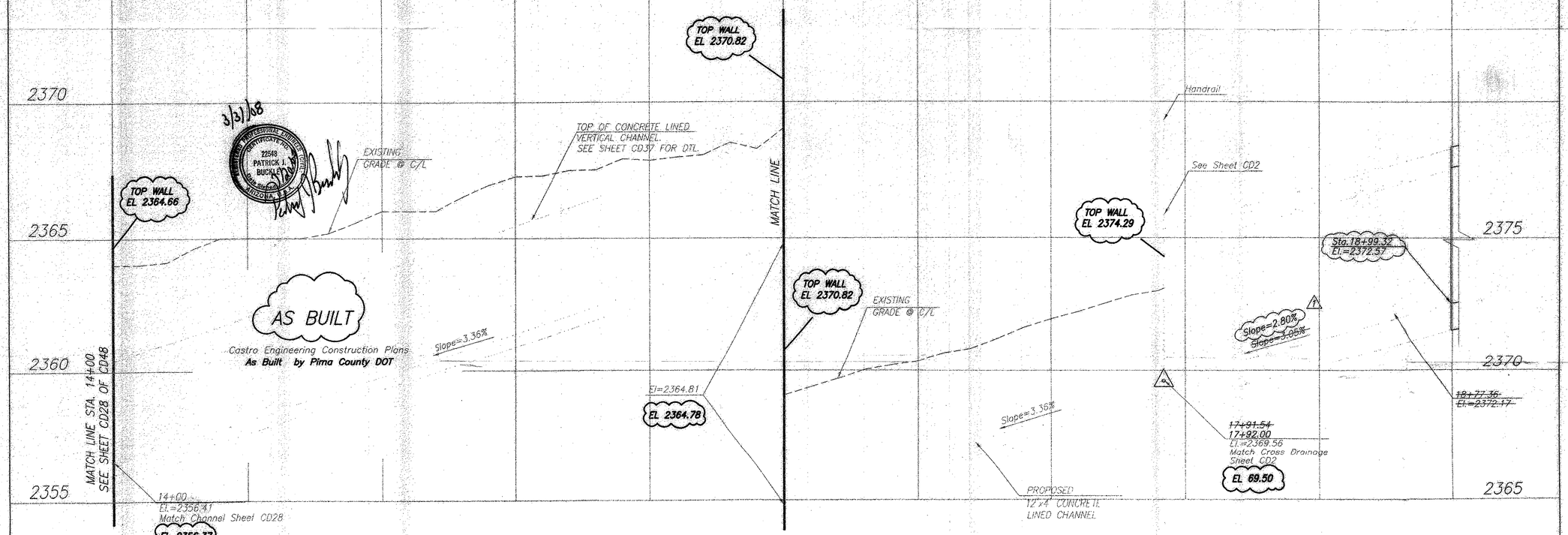
Castro Engineering
3686 WEST INA ROAD, SUITE 200
TUCSON, ARIZONA 85741
(520)293-2550 (520)293-2115 (fax)

RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
CHANNEL IMPROVEMENT PLANS
CAMINO REAL EAST CHANNEL
W.O. 417PRCA

Castro Eng. Job No. PCDT059 | Scales: Horiz. 1"=20' Vert. 1"=2' | Sheet CD28 of CD48 | Page 139 366



*See Sheet CD37
for Cross Section



Castro Eng. Job No. PCDT058 | Scales: Horiz. 1"=20', Vert. 1"=2' | Sheet CD29 of CD48 | 140 366

Pima County Department of Transportation
Priscilla S. Cornelio, P.E., Director

No.	Revision Description	Div. Engineer	Date

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Checked
Proj. Engr.
Date

Castro Engineering
Consulting Engineers and Land Surveyors
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TUCSON, ARIZONA 85741
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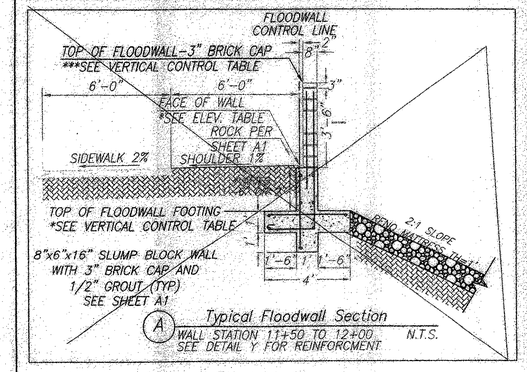
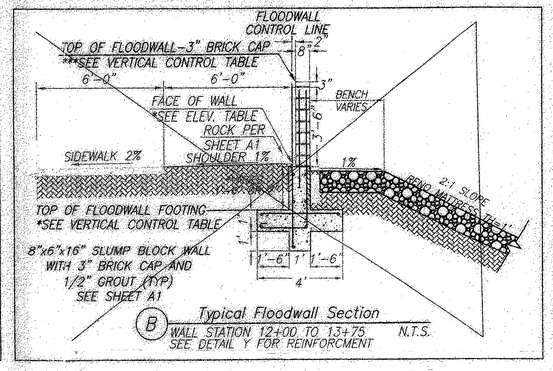
CAMPBELL AVE. TO ALVERNON WAY
"CHANNEL IMPROVEMENT PLANS"
CAMINO REAL EAST CHANNEL
W.O. 4TRRCA

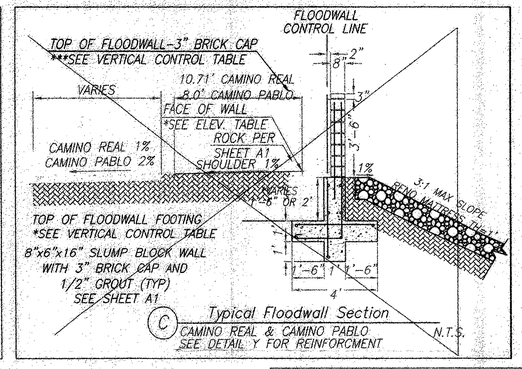
RIVER ROAD



A Typical Floodwall Section
WALL STATION 11+50 TO 12+00 N.T.S.
SEE DETAIL Y FOR REINFORCMENT



B Typical Floodwall Section
WALL STATION 12+00 TO 13+75 N.T.S.
SEE DETAIL Y FOR REINFORCMENT

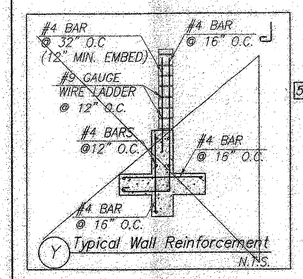


C Typical Floodwall Section
CAMINO REAL & CAMINO PABLO N.T.S.
SEE DETAIL Y FOR REINFORCMENT

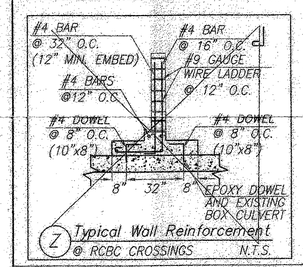
FLOODWALL HORIZ. CONTOL – CURVE DATA				
NO.	DELTA ANGLE	TAN(FT)	RAD(FT)	LEN(FT)
C1	108°08'55"	33.12	24.00	45.30
C2	19°08'37"	146.16	866.71	289.59
C3	43°54'04"	6.05	15.00	11.49
C4	45°40'14"	7.58	18.00	14.35
C5	14°37'11"	41.31	322.00	82.16

FLOODWALL HORIZ. CONTOL – LINE DATA		
NO.	BEARING	LENGTH
L6	S30°13'36"W	31.54'
L7	S58°46'41"E	45.88'
L8	N77°19'14"E	20.05'

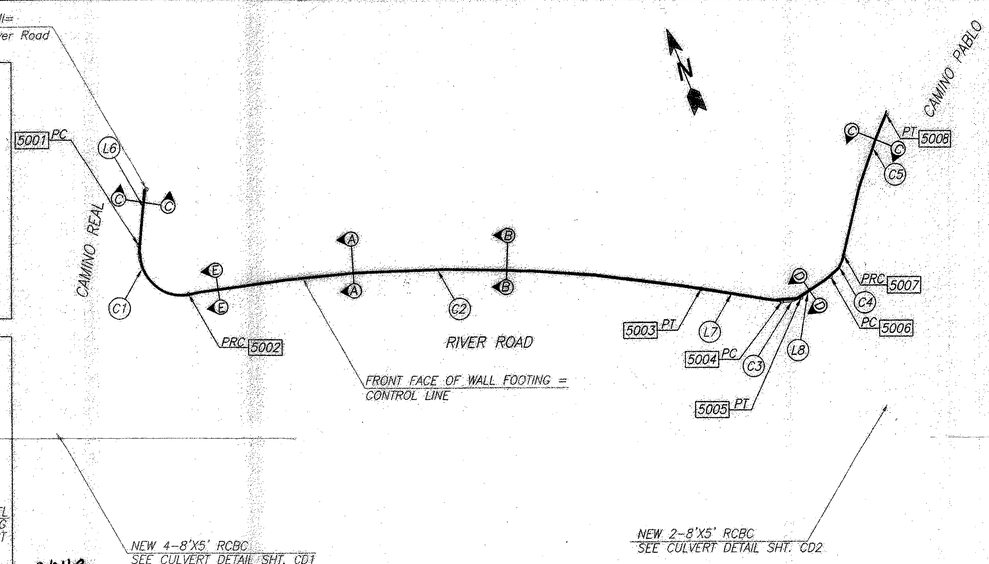
FLOODWALL VERTICAL CONTROL TABLE			
OFFSET TO FRONT FACE			
WALL STA. RANGE	WALL LENGTH	ELEVATION AT TOP OF WALL	ELEVATION AT TOP OF FTG
10+00.00			
10+17.33	17'-4"	2387.37	2382.12
10+00.23 1.5' R		87.28	
10+17.33			
10+34.67	17'-4"	2387.37	2381.62
10+34.86 0.4' L		87.27	
10+34.67			
10+52.00	17'-4"	2386.87	2381.12
10+37.77 0.2' L		86.25	
10+89.39 0.2' R		86.25	
10+52.00			
10+65.33	13'-4"	2386.37	2380.62
10+83.23 0.3' R		86.32	
11+28.21 0.3' R		86.30	
10+65.33			
11+29.00	63'-8"	2386.37	2380.62
11+30.60 0.3' R		86.80	
11+69.98 0.2' R		86.81	
11+29.00			2380.62
11+72.52 0.1' R		87.34	
12+20.83 0.1' R		87.31	
12+22.91 0.1' R		87.81	
11+72.00			
12+24.00	52'	2386.87	2382.12
12+68.84 0.2' R		87.83	
12+71.09 0.2' R		88.32	
12+24.00			
12+72.00	48'	2387.37	2381.62
13+06.37 0.2' R		88.30	
12+72.00			
13+29.33	57'-4"	2387.87	2382.12
13+54.93 0.2' R		88.28	
13+29.33			
13+66.67	37'-4"	2388.37	2382.62
14+07.75 0.0'		88.29	
13+66.67			
14+20.84	54'-2"	23987.87	2382.12
14+21.07 0.4' L		88.30	
14+20.84			
14+39.09	18'-3"	23987.87	2382.12
14+40.67 0.2' R		88.31	
14+48.99 0.1' R		88.33	
14+50.75 0.2' R		88.79	
14+55.93 0.1' R		88.75	
14+39.09			
14+76.00	36'-11"	23987.87	2382.12
14+76.00			
14+89.33	13'-4"	2388.37	2382.62
14+96.30 0.3' R		88.76	
14+98.95 0.3' R		89.77	
14+89.33			
15+01.33	12'	2388.87	2383.12
15+01.33			
15+14.67	13'-4"	2389.37	2383.62
15+20.90 0.3' R		89.79	
15+23.18 0.2' R		90.70	
15+14.67			
15+28.00	13'-4"	2389.87	2384.12
15+28.00			
15+40.35	13'-4"	2390.37	2384.62
15+42.23 0.0		90.69	

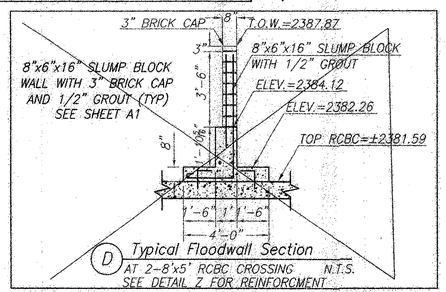


Y Typical Wall Reinforcement
N.T.S.

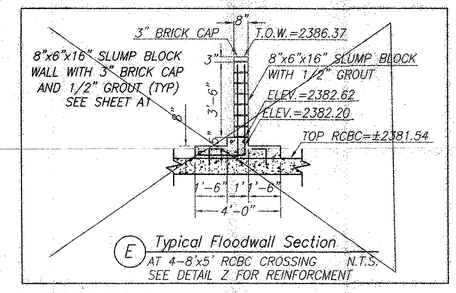


Z Typical Wall Reinforcement
@ RCBC CROSSINGS N.T.S.

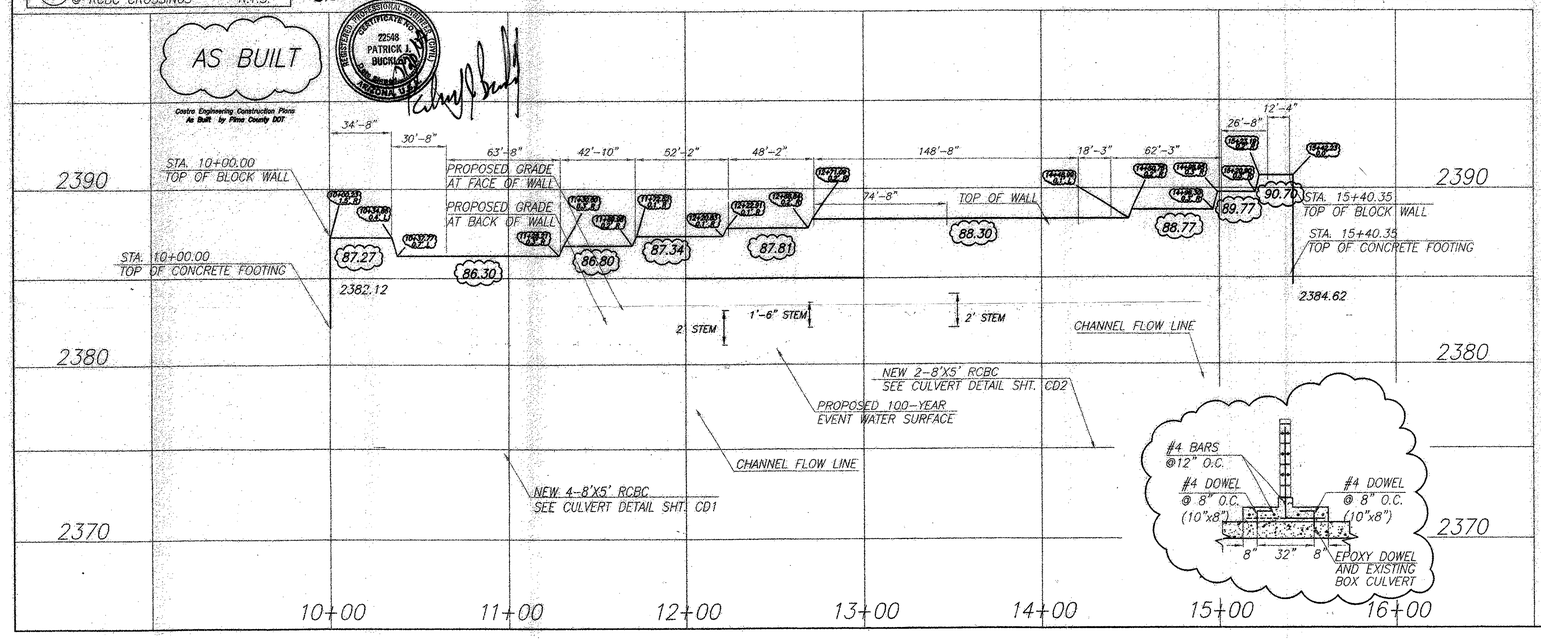




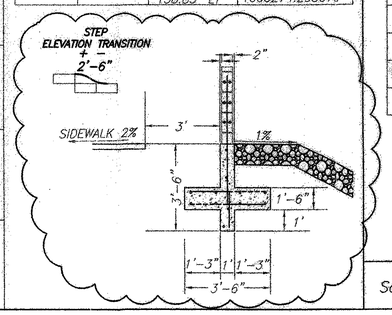
D Typical Floodwall Section
AT 2-8'x5' RCBC CROSSING N.T.S.
SEE DETAIL Z FOR REINFORCMENT



E Typical Floodwall Section
AT 4-8'x5' RCBC CROSSING N.T.S.
SEE DETAIL Z FOR REINFORCMENT



FLOODWALL HORIZONTAL CONTOL – POINT DATA			
NO.	STATION	RIVER RD STA./OFFSET	NORTHING EASTING
5000	10+00.00	692+89.89 108.24' LT	469470.392460 1002873.795973
5001	10+31.54	692+80.54 78.48' LT	469443.143627 1002857.919704
5002	10+76.84	693+01.35 46.71' LT	469407.592733 1002873.634742
5003	13+66.42	695+75.33 46.71' LT	469301.250397 1003141.541202
5004	14+12.30	696+21.21 46.71' LT	469277.467829 1003180.777079
5005	14+23.80	696+31.62 50.90' LT	469275.661120 1003191.844797
5006	14+43.84	696+46.06 64.80' LT	469250.060910 1003211.401090
5007	14+58.19	696+51.58 77.64' LT	469288.176819 1003222.773029
5008	15+40.35	696+62.61 158.83' LT	469351.892206 1003274.295070



Castro Eng. Job No. PCDT059

Scales Horiz. 1"=40' Vert. 1"= 4'

Sheet FW1 FW2

Page 169 366

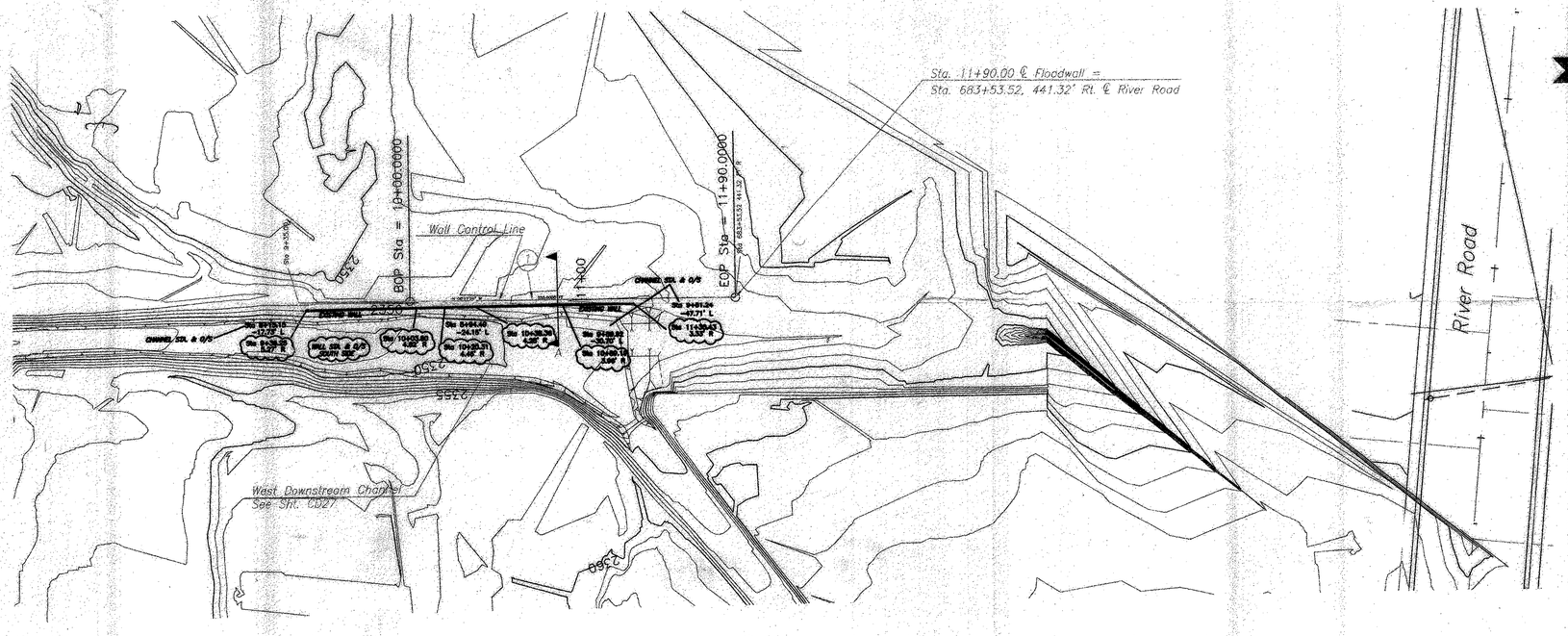
Priscilla S. Cornelio, P.E., Director

Date	Designed	Drawn	Checked	Proj. Engr.

Date	
05-04-06	FLOODWALL ALIGNMENT REVISIONS JTH/PEF
10-01-06	FLOODWALL FOOTING REVISIONS JTH/FEF

Castro Engineering
CIVIL ENGINEERING PROFESSIONAL SERVICES
3660 WEST INA ROAD SUITE 200
TUCSON, ARIZONA 85741
(520)293-4252 (520)293-2115 (fax)

Pima County Department of Transportation
RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
STRUCTURAL FLOODWALL
PLAN & PROFILE
W.O. 417RCA

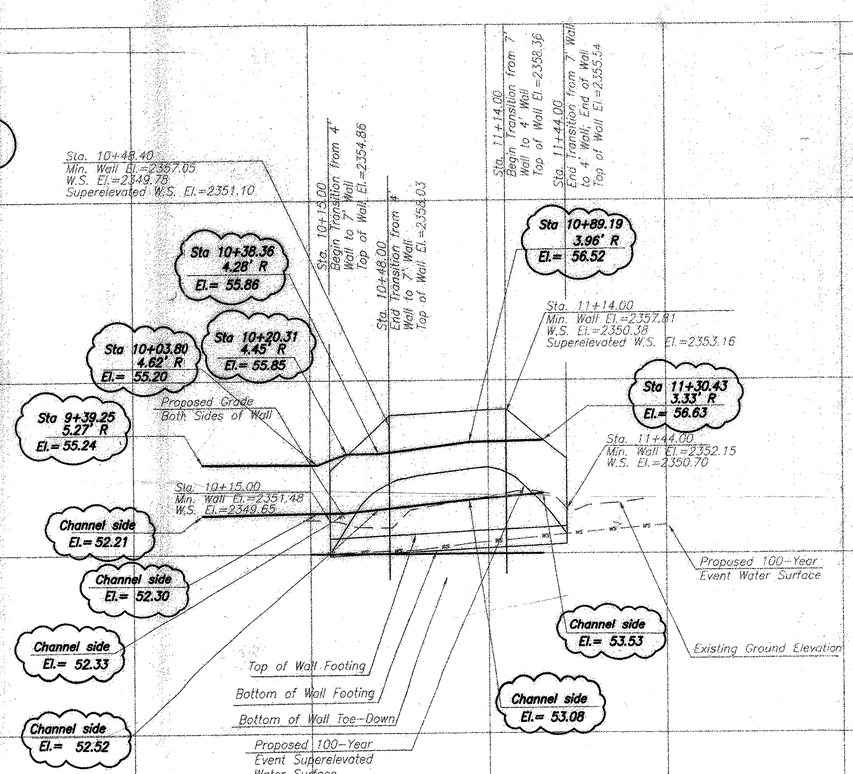


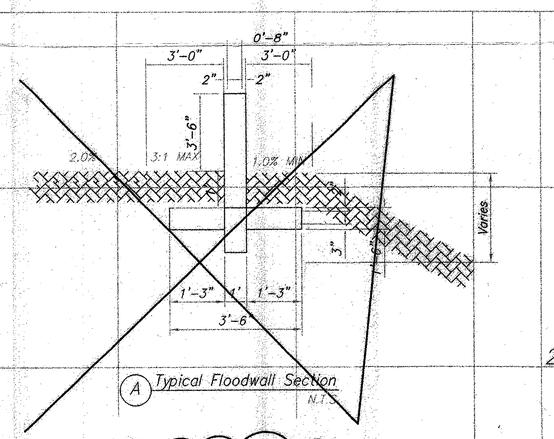
Wall Control Line Data		
No.	Bearing	Length
1	S 00°17'51" E	190.00'

AS BUILT

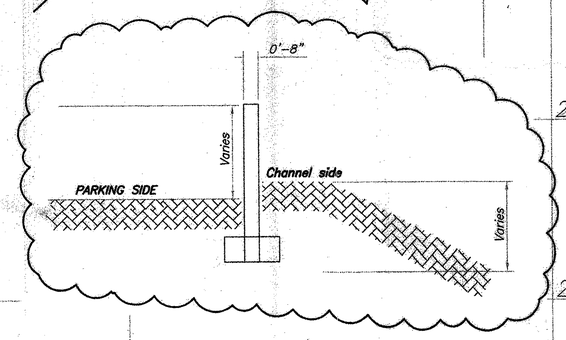
Castro Engineering Construction Plans
As Built by Pima County DOT
3/31/08

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO. 23548
PATRICK J. BUCKLEY
ARIZONA U.S.A.





A Typical Floodwall Section
N.T.S.



Priscilla S. Cornelio, P.E. Director

Date	Designed	Drawn	Checked	Proj. Engr.

Date

Castro Engineering
3500 WEST DNA ROAD, SUITE 200
TUCSON, ARIZONA 85741
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Pima County Department of Transportation
RIVER ROAD
CAMPBELL AVE. TO ALVERNON WAY
STRUCTURAL FLOODWALL
PLAN & PROFILE
W.O. 417RCA

Castro Eng. Job No. PCDT059

Scales	Horiz. 1"=40'
	Vert. 1"= 4'

Sheet FW2 FW2

JE Fuller/ Hydrology & Geomorphology, Inc.

Jon Fuller, PE, RG, PH, CFM, DWRE
Ted Lehman, PE
W. Scott Ogden, PE, CFM
Robert Lyons, PE, CFM
Mike Kellogg, RG, MS, CFM
Hari Sundararaghavan, PhD, PE, CFM
Brian Iserman, PE, CFM
Jeff Despain, PE, CFM
Patricia Quinn, PE, RLS
Brian Fry, PE, CFM
Brian Schalk, PE, CFM
Jon Ahern, PE, CFM
Cory Helton, EIT, MS
Nate Vaughan, EIT
Dwight Nield, BS
Skyler Witalison, BS
Dave Meyer, GIT
Annette Griffin, AAS
John Wallace, PE
Robert Shand, PE
Ian Sharp, PE, CFM
Chris Rod, PE, CFM
Joaquin Solis, PE
Cyrus Miller, PE, CFM
Marti Craft, MS, CFM

December 10, 2008

Mr. Kishore Sirvole
Case Reviewer
Michael Baker Jr. Inc.
3601 Eisenhower Avenue
Alexandria, VA 22304-6425

ELECTRONIC COPY OF FINAL DOCUMENT
ORIGINAL SEALED DOCUMENT WITH
ROBERT L. SHAND, P.E. (CIVIL), NO. 24026

RE: Case No. 08-09-1560P – Response to 316-AD dated October 31, 2008

Dear Mr. Sirvole:

The four issues listed in your letter are addressed in the same order that they were presented.

1. Although the floodplain delineations shown on the two topographic work maps appear to coincide with the alignment of the two referenced floodwalls, containment of flows at either location is not dependent on the walls as is evident by the attached profile plots (Exhibits 1a and 2a), which consolidate as-built information from the various plans, the HEC-RAS models, and the attached cross section plots (Exhibits 1d and 2d). The profile plots were prepared as part of a follow-up investigation that was initiated by your comment. The results of this investigation indicate that the two walls are not containing flood flows at either location; therefore, they are not technically floodwalls. In addition, the walls were not constructed on "levee-like" structures as is evident from the attached aerial photographs (Exhibits 1b and 2b) and ground photographs (Exhibits 1c and 2c). Again, based on the results of this follow-up investigation, which is summarized in the paragraphs that follow, Paragraph 65.10 is not applicable to these two structures.

   With respect to the River Road or north wall (Exhibit 1), the computed water-surface elevations are below the toe of the wall and below the centerline profile of the slightly elevated River Road embankment. On Exhibit 1a, which is based on the control stationing of the wall, the western tie-back portion is located between Station 0+00 and 0+75 (which also corresponds to Station 692+85 of the as-built roadway plans). The eastern tie-back portion is located between Station 4+35 (which also corresponds to Station 696+45 of the as-built roadway plans) and Station 5+42. The segment between Station 0+75 and Station 4+35 parallels River Road. The water-surface profile shown along the western tie-back portion of the wall corresponds to the downstream profile for the West sub-reach. The profile along the eastern tie-back portion and along the River Road portion corresponds to the profiles for the East sub-reach and the Overflow South sub-reach, respectively. All three of these sub-reaches are included in the HEC-RAS project file "CaminoRealUpstream". The computed inlet-control headwater elevations associated with the two River Road drainage structures, which were modeled using HY-8, are also shown on Exhibit 1a. When the roadway improvements were designed, there was some concern by Castro Engineering that the River Road embankment would be considered a "levee-like" structure. As a result, the north "floodwall" was provided solely to ensure

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Tempe, Arizona 85284
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Phoenix, AZ 85027
623-889-0166 (voice)
480-839-2193 (fax)

2160 N. 4th St., Ste 202C
Flagstaff, AZ 86004
928-214-0887 (voice)
928-214-0887 (fax)

40 E. Helen Street
Tucson, Arizona 85705
520-623-3112 (voice)
520-623-3130 (fax)

www.jefuller.com

that at least three feet of freeboard would be provided above the northern edge of the roadway. However, River Road is only elevated approximately two feet above natural ground relative to the downstream side of the roadway, and the two drainage structures discharge flow into two well-defined (i.e., incised) channel sections. Consequently, the water-surface profile on the upstream side of the roadway is not significantly higher than the ground profile on the downstream side. Given the relative low embankment height and the width of the roadway embankment itself, which equals or exceeds 90 feet, embankment stability and/or settlement is not a factor. Therefore, the roadway embankment does not constitute a "levee-like" structure (see Exhibits 1b and 1c).

With respect to the western downstream channel wall or west wall (Exhibit 2), the computed water-surface profile and the critical water-surface profile are well below the toe of the wall on both the landward side (i.e., parking lot side) and the river side (channel side). The water-surface profiles shown on Exhibit 2a are from the HEC-RAS project file "CaminoRealWestDS". The stationing corresponds to the control stationing as taken from the as-built plans. Initially, when improvements to the western channel were proposed, Castro Engineering felt that a 4.5-foot "floodwall" was required to provide a minimum of three-feet of freeboard to address superelevation at the junction of the north-to-south reach (the receiving channel) with the northeast-to-southwest reach (the approach channel). Under as-built conditions, the toe of the wall on the channel side is approximately 4.7 feet above the computed water-surface profile. This depth corresponds to the computed super-elevated rise (4.66 feet) relative to RS 1074.46 through 1150 as presented in Appendix E.5 of the TDN. As a result, the super-elevated water-surface profile is approximately 1.5 feet above the ground on the parking-lot side. The hydraulics of flow in a channel bend is complex and accurately estimating the magnitude of a transverse hydraulic gradient or superelevated rise in the water surface is difficult. To simplify the process, equations that are commonly used to estimate superelevation assume gradually-varied flow in a uniform channel section of constant slope. At this junction, the receiving channel section is approximately twice the width of the approach channel section, and the slope of the receiving channel is approximately half the slope of the approach channel. In addition, two abrupt three-foot drops in the profile of the approach channel occur immediately upstream of the junction. Under these conditions, rapidly-varied, turbulent flow will exist, not gradually-varied, uniform flow. Since this reach of the western channel is a junction and not a channel bend, superelevation calculations are not applicable. In addition, if superelevation was applicable, Castro's approach to the computations significantly overestimates the potential rise in the water surface along the outer or western bank. Typically, the hydraulic properties of the approach channel are used to compute the super-elevated rise in the water surface under uniform-flow conditions. The computations provided in Appendix E.5 of the TDN were based on the hydraulic properties of the receiving channel. Since the computed rise is directly proportional to the velocity and top width of flow, using the hydraulic properties of the receiving channel overestimates the rise. When the hydraulic properties of the approach channel are used, the computed rise is limited to 1.8 feet, which is less than the average difference (2.25 feet) between the computed water-surface profile and the critical water-surface profile. Given the rapidly-varied flow conditions at the junction, critical depth would be a more reasonable approximation of the water-surface profile at the junction. As previously noted, this profile is well below the toe of the wall on both the landward side (i.e., parking lot side) and the river side (channel side).

If there is still some concern that full or partial compliance with Paragraph 65.10 is warranted, the TDN prepared by Castro Engineering included (1) a structural analysis of the wall in Appendix E.4; (2) an operations and maintenance plan; and (3) the FEMA Region IX Levee Certification Checklist. In addition, embankment protection, embankment and foundation stability and settlement were addressed in two geotechnical letter reports prepared by Terracon, Inc. Although these letter reports were referenced on Page 11 of the TDN, copies were not included in Appendix E.4. These two documents (i.e., two letters dated March 17, 2008 and April 3, 2008) are provided as attachments to this response letter.

2. An annotated FIRM is included as an attachment to this letter (Exhibit 3).

3. MT-2, Form 2 and a supplemental information sheet are included as an attachment to this letter.

4. All of the affected property owners were notified via a certified letter. A copy of the letter and a listing of the affected property owners, including the associated identification number from the certified mailing label, are included as an attachment to this letter.

In addition to the attachments described above, a revised HEC-RAS model for the western channel (project file "CaminoRealWestDS") is included on the attached compact disk. Some input parameters in the original model were either changed or corrected during our review to more accurately depict the site conditions represented on the as-built plans. Overall these revisions did not significantly change the base flood elevations. The revisions were (1) bank station adjustments for RS 1000 and RS 1074.46 through RS 1165; (2) expansion/contraction increases at RS 1209.21, RS 1205.9, and between RS 950 and RS 1165; and (3) channel and overbank distance corrections for RS 1205.09 through RS 1220.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,
JE Fuller/Hydrology & Geomorphology, Inc.

EXPIRES 06/30/2010

Robert L. Shand, P.E.
Project Manager

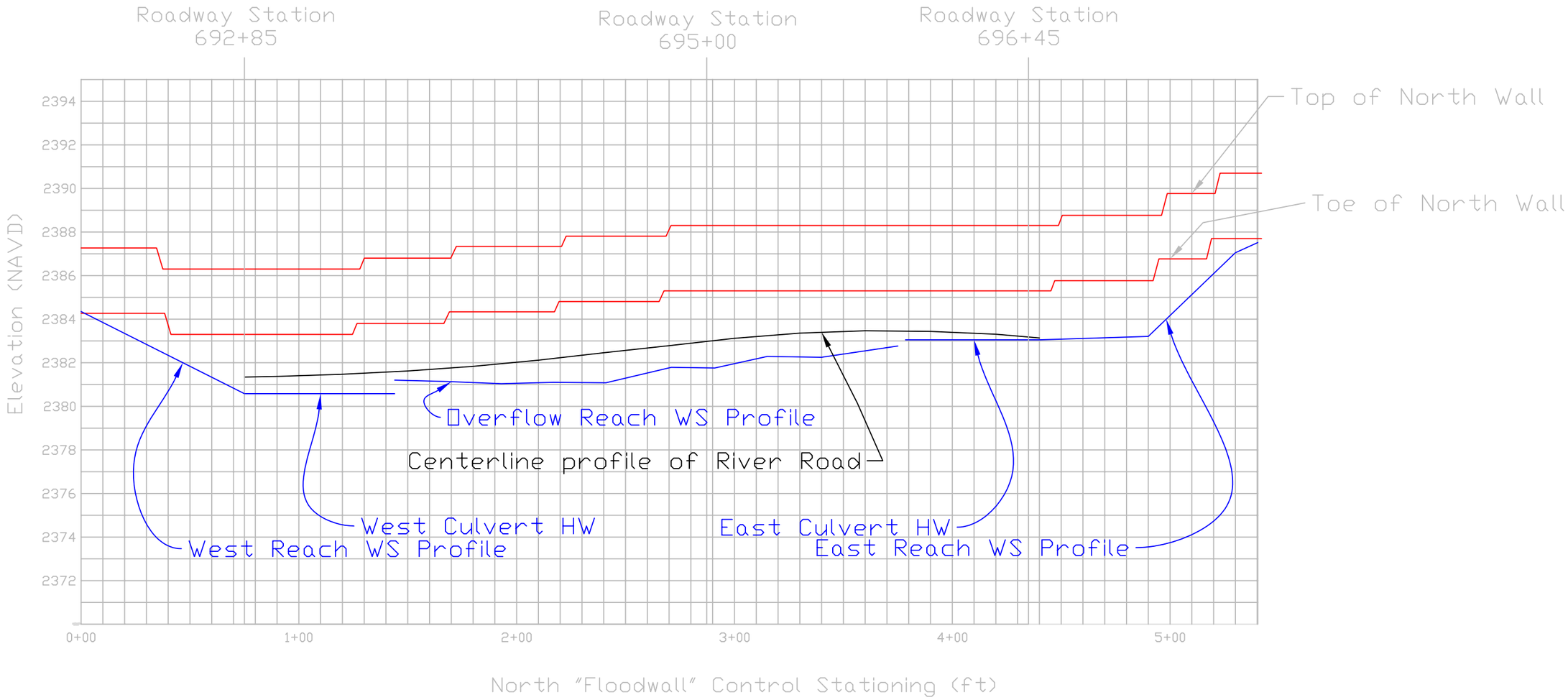


Exhibit 1a

Profile of North Wall

JE Fuller/Hydrology & Geomorphology, Inc.

Looking north at north wall along River Road

New culvert inlets and overflow channel along upstream side of north wall.

Looking north at outlet to new 4-8'x5' RCBC and at-grade property along south side of River Road.

Looking north at outlet to new 2-8'x5' RCBC.

Looking east along overflow channel from inlet to the new 4-8'x5' RCBC.
The north wall is visible along northern edge of River Road.

Looking southwest at River Road and properties to the south from inlet to new 4-8'x5' RCBC. The north wall, including the western tie-back portion, is also shown.

Looking south along the eastern tie-back portion of the north wall at the inlet to the new 2-8'x5 RCBC beneath River Road.

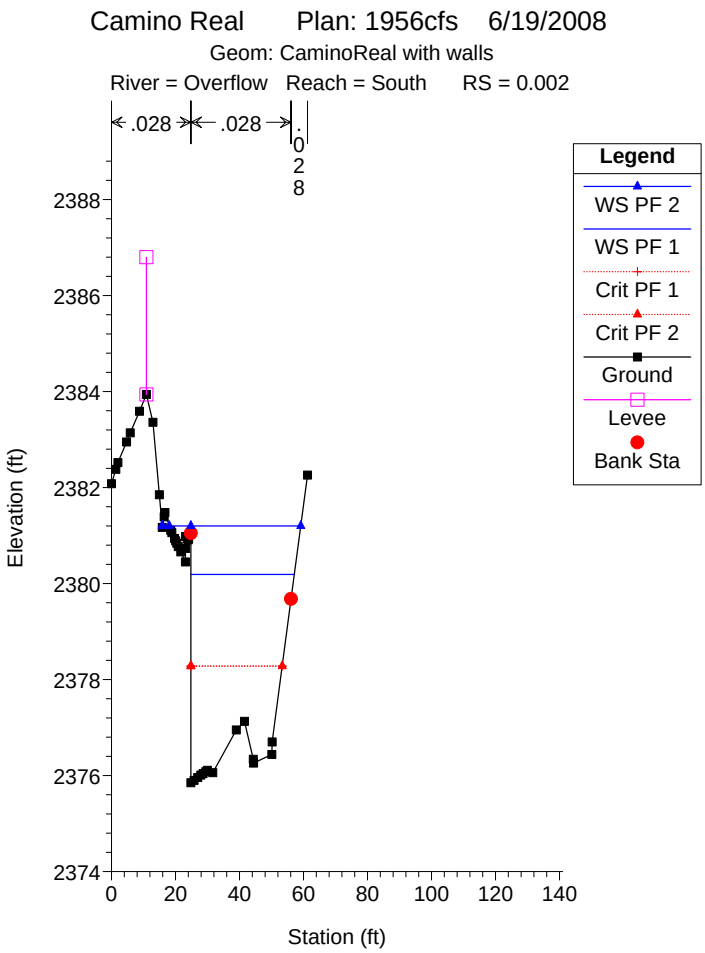
Looking northeast from the outlet of the new 4-8'x5' RCBC beneath River Road. North wall is visible in background.

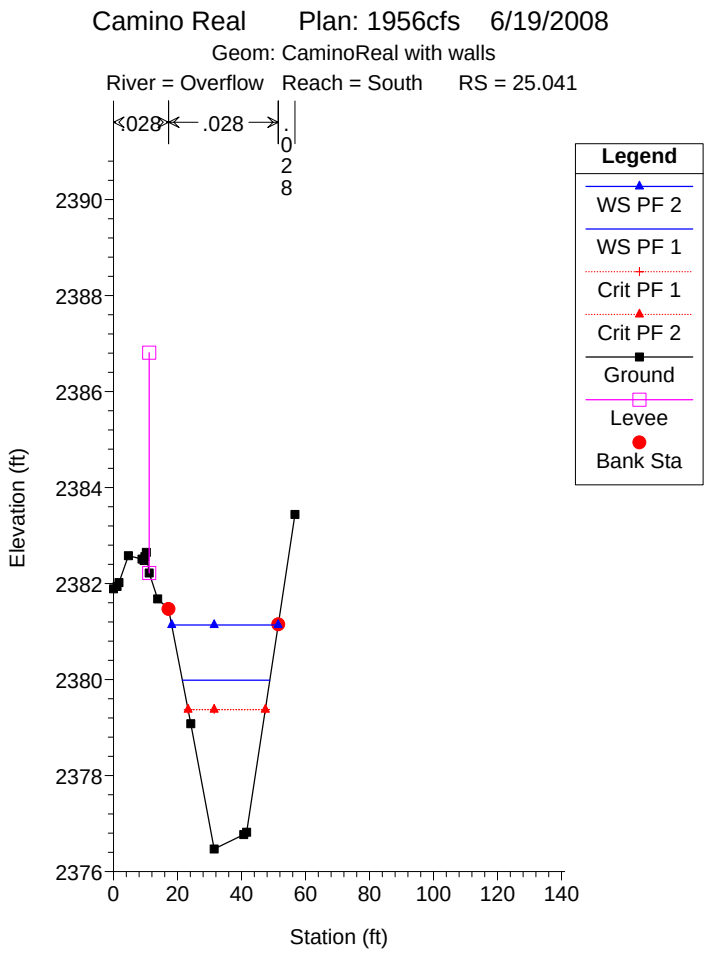
Looking west along western channel from outlet to new 4-8'x5' RCBC.

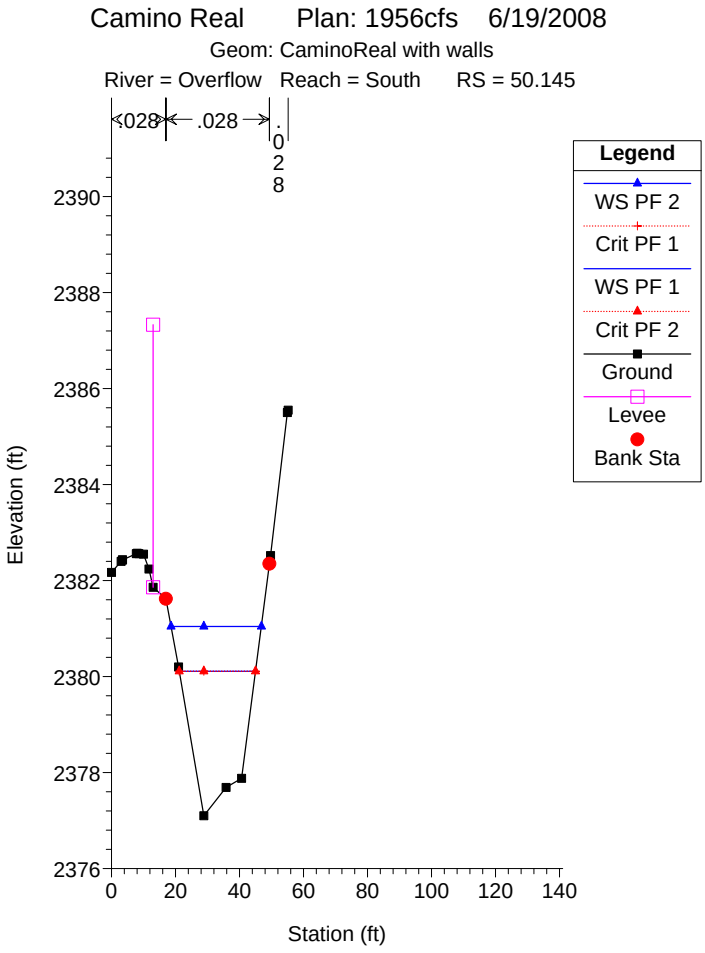
Looking south along eastern channel from outlet to new 2-8'x5' RCBC

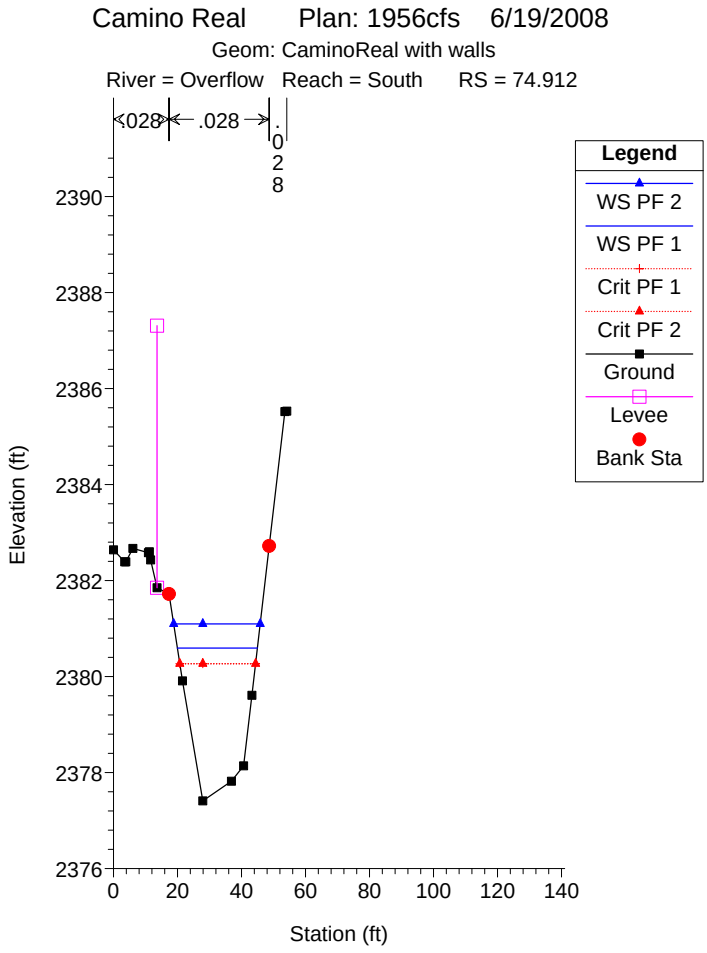
Looking northwest along south side of River Road.
The north wall is visible along the north side.

Looking northwest at north wall along north side of River Road.

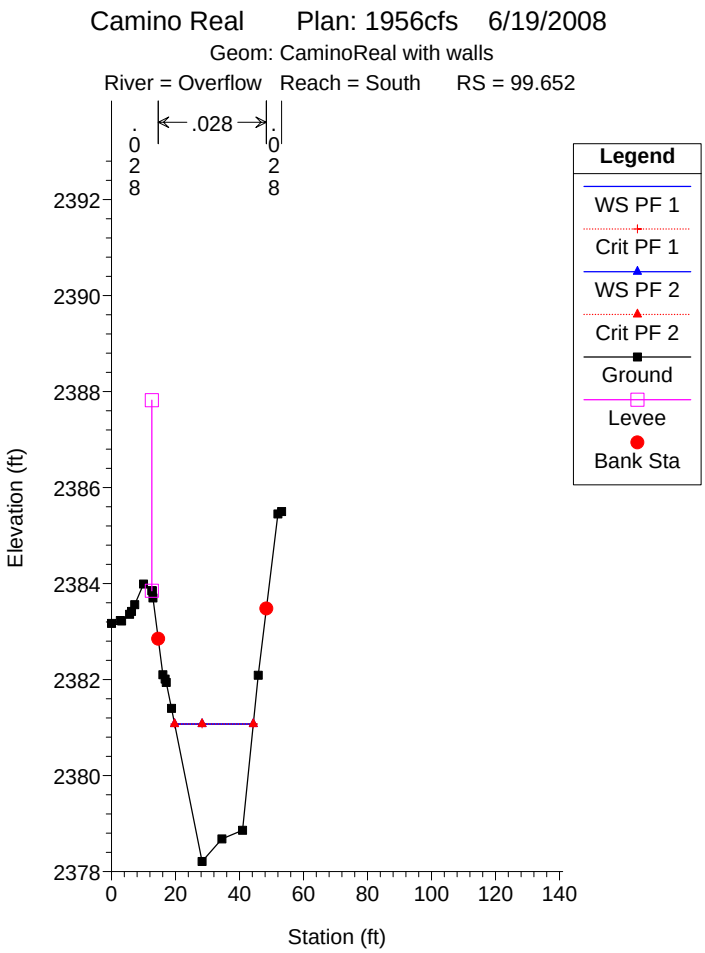


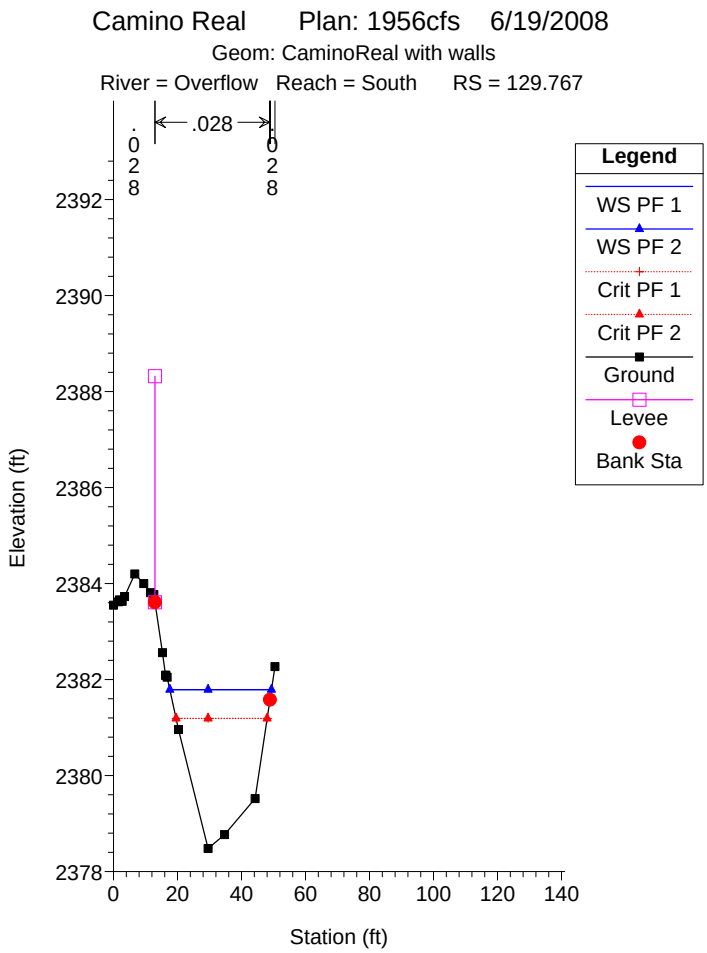


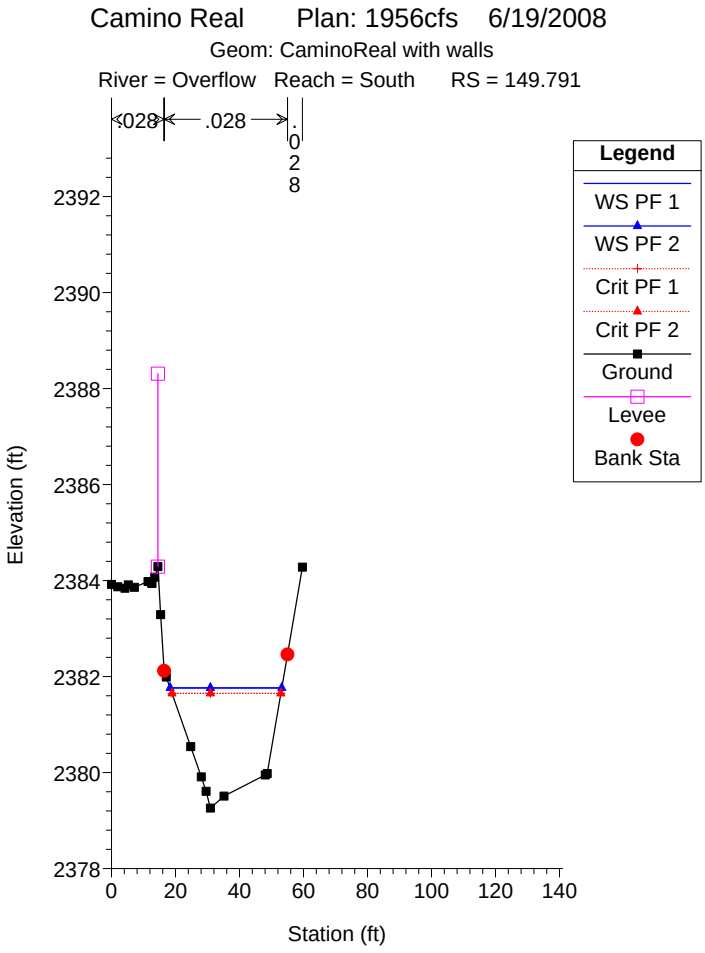


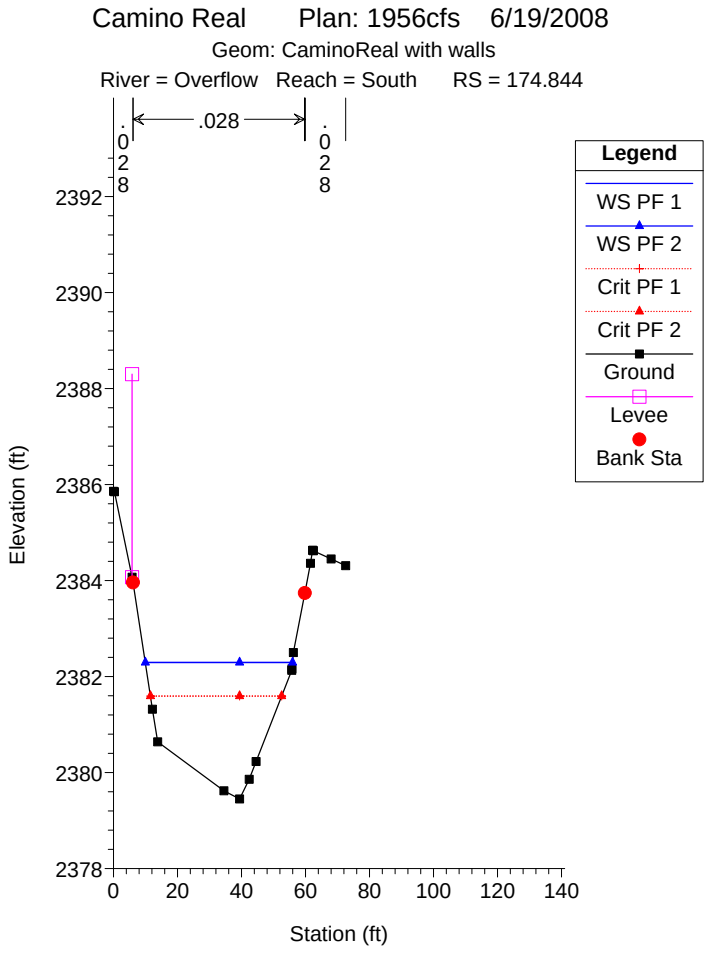


1 in Horiz. = 60 ft 1 in Vert. = 4 ft









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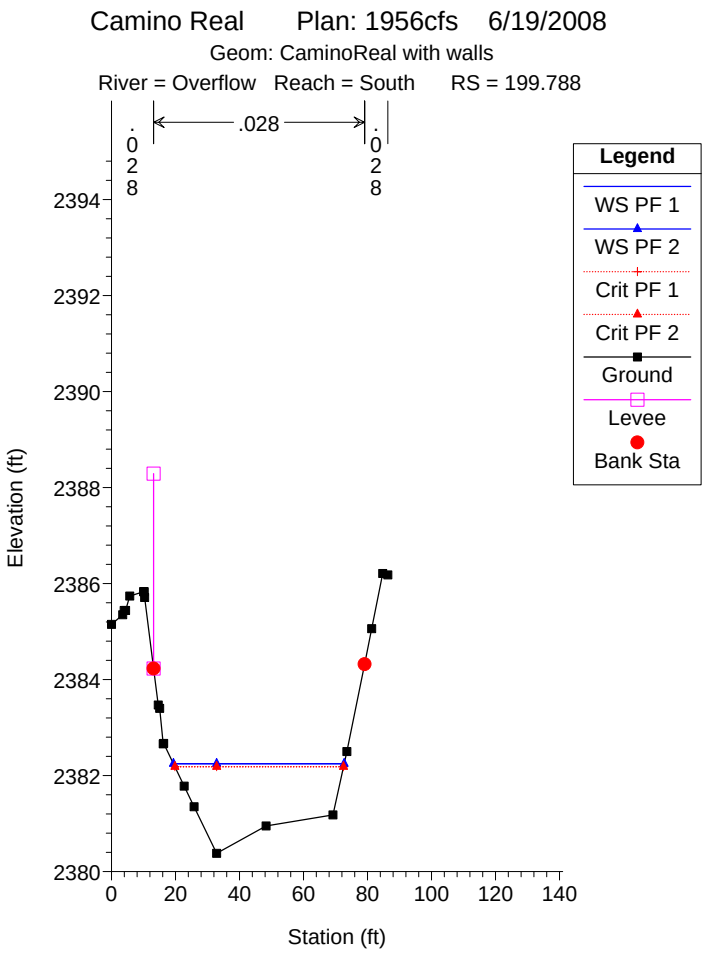

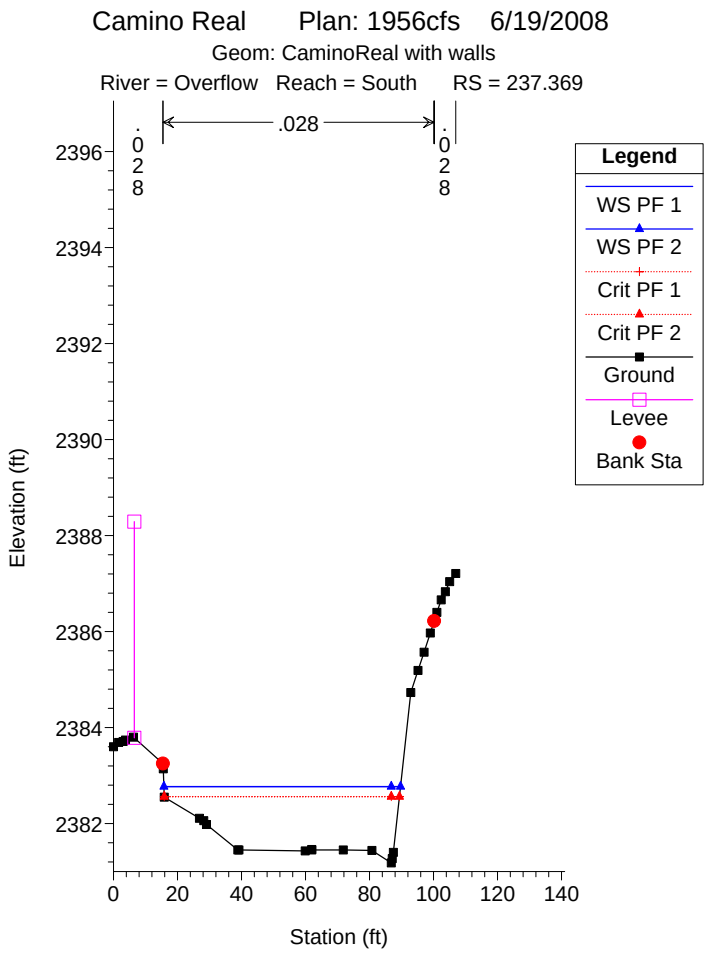

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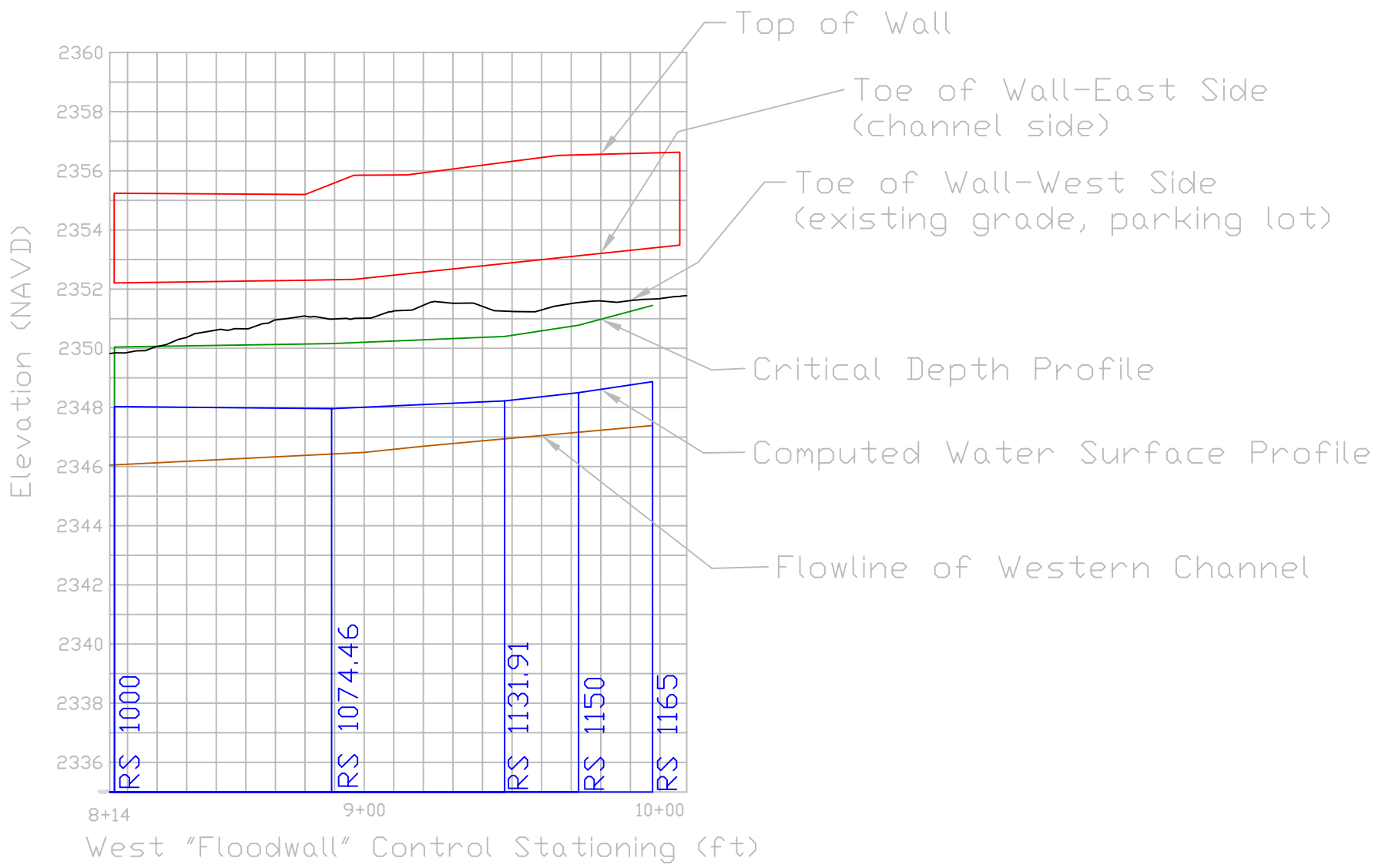


Exhibit 2a

Profile of West Wall

JE Fuller/Hydrology & Geomorphology, Inc.

Looking west at the west wall (in front of carport) along the west top-of-bank of the north to south reach of the western channel.

Looking down on the junction of the north to south reach with the northeast to southwest reach (entering at upper right corner of photograph) of the western channel.

Looking northeast at the junction of the north to south reach with
the northeast to southwest reach (entering at upper right corner of photograph).

Looking east at junction of north-south reach with northeast-southwest
reach (entering at upper left corner of photograph). The first in a series
of two three-foot drops is visible just upstream of junction.

Looking southwest at the west wall along the top of bank
of the north to south reach of the western channel.

Looking southwest at the west wall along the top of bank
of the north to south reach of the western channel.

Looking west at the northern limit of the west wall
along the top of bank of the western channel

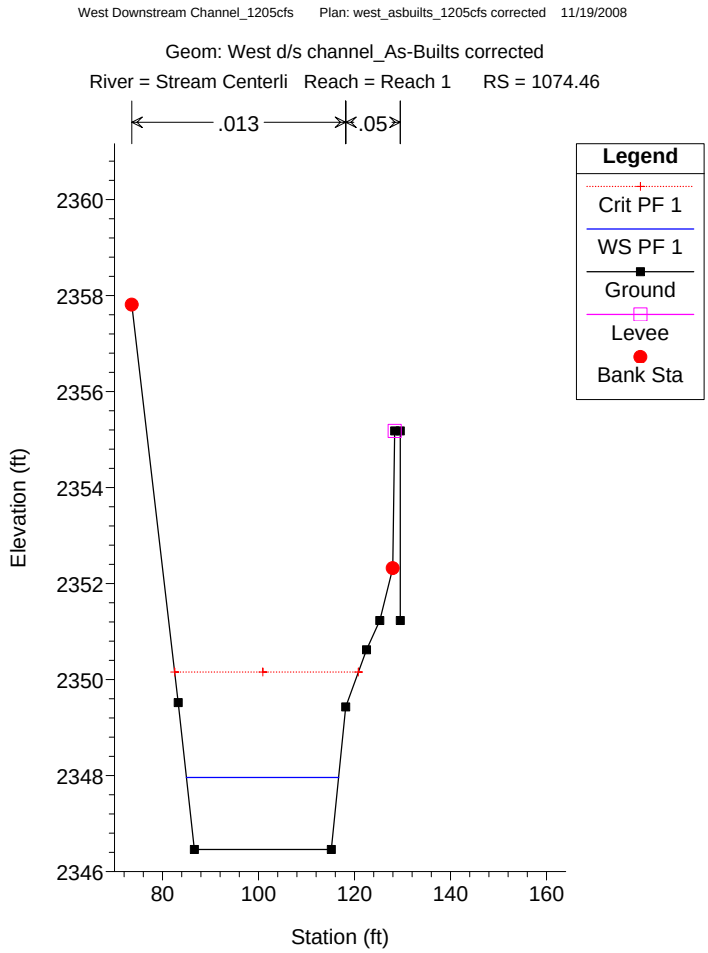
Looking south along the parking lot side of the west wall from the north limit.

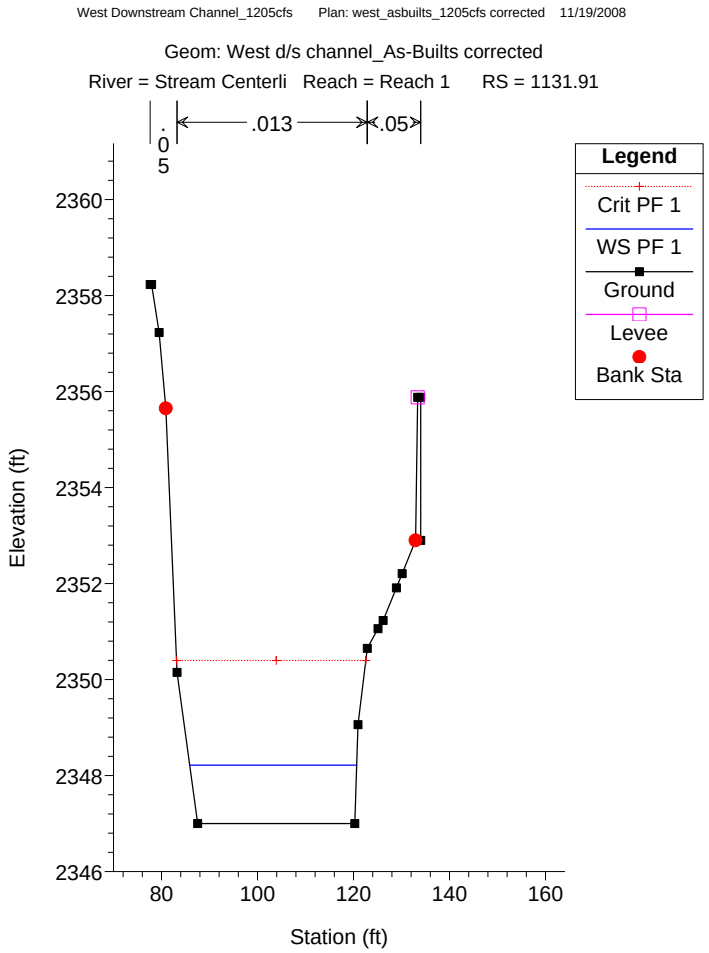
Looking south along the channel side of the west wall from the north limit.

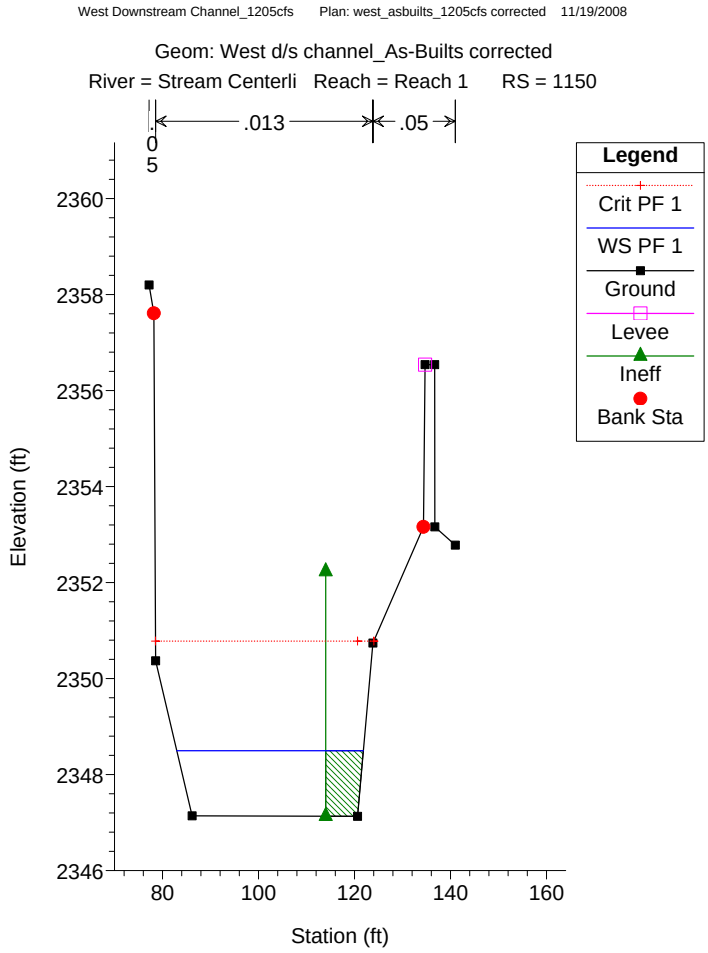
Looking northeast along the northeast to southwest reach of the western channel from its junction with the north to south reach (note the series of two three-foot drops in the flow line just upstream of the junction).

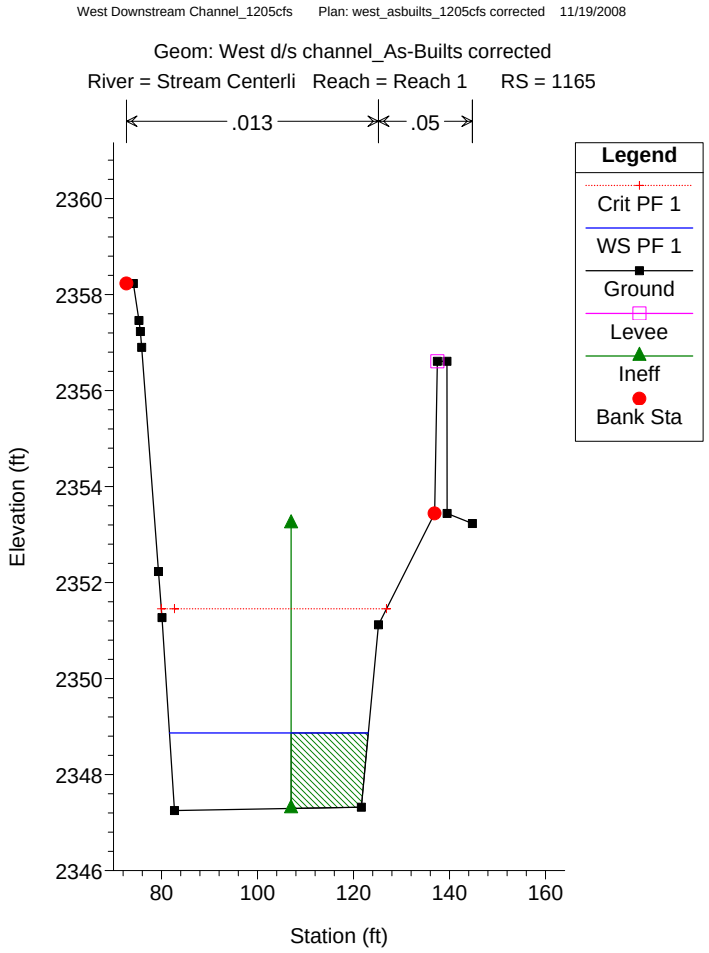
Looking north (upstream) at the junction of the north to south reach of the western channel with the northeast to southwest reach, including the southern limit of the west wall.

Looking downstream along the west bank from the junction of the north to south reach of the western channel with the northeast to southwest reach.









1 in Horiz. = 40 ft 1 in Vert. = 4 ft

April 3, 2008

Terracon
Consulting Engineers & Scientists

Terracon Consultants, Inc.
355 S. Euclid, Suite 107
Tucson, Arizona 85719
Phone 520.770.1789
Fax 520.792.2539
www.terracon.com

Castro Engineering
3580 West Ina Road
Suite 200
Tucson, Arizona 85741

Attn: Mr. Frank Fry

RE: Executive Summary to Geotechnical Engineering Services
River Road, Campbell to Dodge
Camino Real Flood Walls
Pima County, Arizona
Terracon Project No. 63085037

Terracon Consultants, Inc. (Terracon) has completed our review of the floodwalls at this site. This is a summary of our findings contained in a our report dated March 17, 2008, with respect to National Flood Insurance 44 CFR 65.10.b.3, 4, and 5.

44 CFR 65.10.b.3 – Embankment Protection: The embankments at both locations are either concrete lined, or lined with gabion mattresses. These embankments are expected to be resistant to erosion.

44 CFR 65.10.b.4 – Embankment and Foundation Stability: Due to the short duration of the design 100-year flood, and a low water surface elevation differential in a flood condition, we expect minimal seepage potential. The embankment slopes are expected to be stable even where they are not concrete lined because of the relatively low slope geometry.

44 CFR 65.10.b.5 – Settlement: Based upon the field and laboratory test results from our previous work, we expect total and differential settlement to not exceed one-inch (1"), even if the soils supporting the foundation for the floodwall become saturated.

If you have any questions regarding this report, please contact us.

Sincerely,
TERRACON CONSULTANTS, INC.

Oleg B. Lysyj, P.E.
Principal

Copies: Addressee (3)

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Expires 03/31/2009

March 17, 2008

Terracon
Consulting Engineers & Scientists

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Castro Engineering
3580 West Ina Road
Suite 200
Tucson, Arizona 85741

Attn: Mr. Frank Fry

RE: Geotechnical Engineering Services
River Road, Campbell to Dodge
Camino Real Flood Walls
Pima County, Arizona
Terracon Project No. 63085037

Terracon Consultants, Inc. (Terracon) has completed our review of the floodwalls at this site. Our services were performed in general conformance with our proposal number D6308012, Revision No. 1, dated January 24, 2008.

PROJECT DESCRIPTION

This project consists of a review of our previous geotechnical report (Terracon Project No. 63025158) and a review of the existing floodwalls at and near the intersection of the Camino Real Wash and River Road. We understand the floodwall foundations bear on undisturbed native soils as opposed to engineered fill as recommended in our original geotechnical report.

WORK PERFORMED

We reviewed the information previously obtained for this project, as well as plans showing wall details provided to us by Castro Engineering. We visited the site on March 12, 2008 to review the site conditions in the field. We obtained information regarding the stability and permeability of the soils supporting the existing flood walls in relation to the analyses referenced in the National Flood Insurance 44 CFT 65.10.b.3, 65.10.b.4, 65.10.b.5.

FINDINGS CONCLUSION AND RECOMMENDATIONS

Site Conditions: The Camino Real Wash flows from north to south and reaches the north side of River Road at the intersection of Camino Real and River Road. The wash then flows westward along the north side of River Road until it passes under River Road via a box culvert. It is along this stretch along the north side of River Road that a floodwall has been built along the River Road right-of-way, and the bank slopes and wash bottom are covered with gabion mattresses.

After crossing under River Road the wash flows southward toward the Rillito River along the eastern side of Rio Cancion Apartments. There is another floodwall on the eastside of the east

parking areas of the apartment complex. The wash in this area is lined with concrete on its bank slopes and bottom.

Subsurface Soil Conditions: Based on our review of the geotechnical borings from this area of the project (primarily Borings B-4, B-5, and B-6) the soils are typically silty sands, and sands with silt and gravel. In-situ dry densities ranged from about 107 pcf to 119 pcf. Consolidation test results from Boring B-4 showed relatively low compression potentials at existing and increased moisture contents, especially compared to other areas of the larger roadway project.

Wall Stability: We understand the footings for these floodwalls were not constructed on engineered fill as recommended in the original geotechnical report. However, this recommendation was made primarily to mitigate the more highly collapsible soils found on other portions of the project. Based on the field and laboratory test results from our previous work, we expect total and differential settlement to not exceed one-inch even if the soils supporting the foundation for the floodwall on the north side of River Road becomes saturated. The wash bank slopes are gently sloped (3 to 1, horizontal to vertical, or less steep) and covered with gabion mattresses. We believe these slopes will be stable and resistant to erosion, even when saturated. Given that the wash banks and bottom adjacent to the east side of Rio Cancion Apartments are concrete lined, we believe it unlikely that the soils supporting the foundation for this particular floodwall will become saturated.

Permeability: Given the minimal difference in water surface elevation in a flood condition between the flood side of the floodwalls and the grade at the back sides of the floodwalls, we expect no seepage will daylight behind the floodwalls. This is also in part due to the short duration of the design 100-year flood.

GENERAL COMMENTS

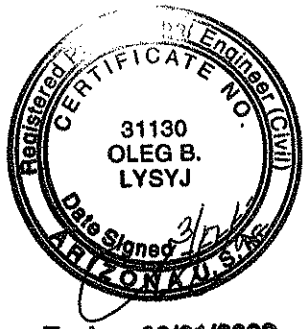
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations appear, it will be necessary to reevaluate the recommendations of this report.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this report, are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes, and either verifies or modifies the conclusions of this report in writing.

If you have any questions regarding this report, please contact us.

Sincerely,
TERRACON CONSULTANTS, INC.



Expires 03/31/2009

Oleg B. Lysyj, P.E.
Principal

Copies: Addressee (3)

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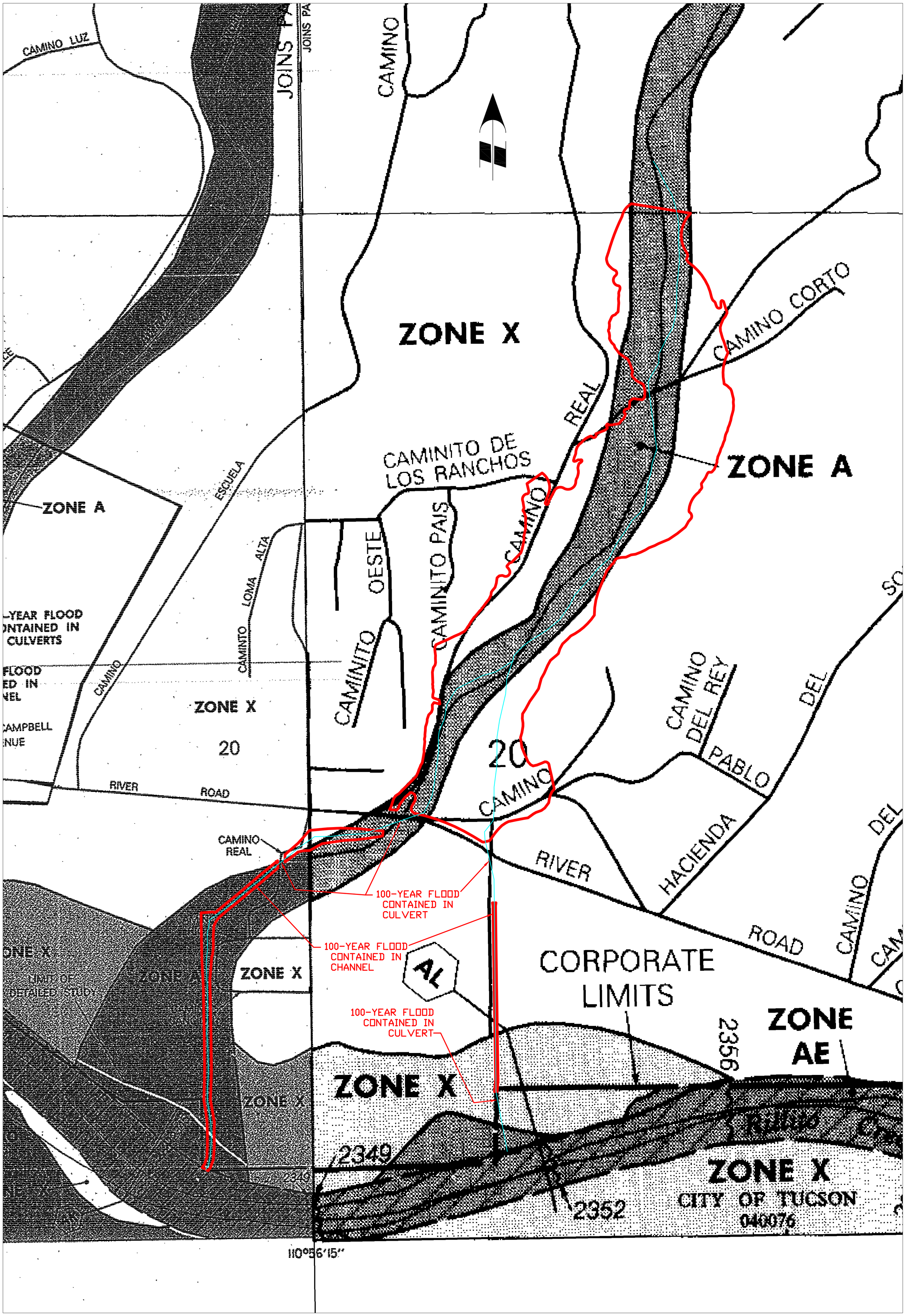


200' 0' 200' 200'

SCALE: 1 INCH = 200 FEET

Legend

Revised Zone A Boundary

Watercourse Centerline

Exhibit 3

Annotated FIRM

JE Fuller / Hydrology & Geomorphology, Inc.

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Camino Real Wash
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section B) ☐ No existing analysis ☒ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
River Road	1.7	2067	1956

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model Pima County Methodology
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit	Confluence with Rillito Creek	0	n/a	2338.3
Upstream Limit	Approx. 3450' upstream of River Rd	3429.864	n/a	2456.13

2. Hydraulic Method/Model Used

HEC-RAS, HY-8

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs may help verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. **These tools do not replace engineering judgment.** CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/plan/prevent/fhm/frm_soft.shtm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. Review of your submittal and resolution of valid modeling discrepancies may result in reduced review time.

4. Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: n/a	Plan Name:	File Name:	Plan Name:	_____
Corrected Effective Model*	File Name: n/a	Plan Name:	File Name:	Plan Name:	_____
Existing or Pre-Project Conditions Model	File Name: n/a	Plan Name:	File Name:	Plan Name:	_____
Revised or Post-Project Conditions Model	File Name: attached	Plan Name: attached	File Name:	Plan Name:	
_____ Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	_____

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:
   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot.

   b. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR/CLOMR requests, does this request have the potential to impact an endangered species? ☐ Yes ☒ No

   If Yes, please submit documentation to the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA). Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species. If an action might harm an endangered species, a permit is required from U.S. Fish and Wildlife Service or National Marine Fisheries Service under Section 10 of the ESA.

   For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

MT-2, Form 2 – Riverine Hydrology and Hydraulics (Supplemental Information)

Section A, HYDROLOGY

- Item 1, Reason for New Hydrologic Analysis – For the CLOMR (FEMA Case No. 04-09-0406R), a new hydrologic analysis of the Camino Real Wash was conducted by Arroyo Engineering, Inc. (Arroyo), since no previous analysis existed. A copy of their report was provided in Appendix B of the CLOMR TDN. The Arroyo study addressed three concentration points – one at the upstream end of the study reach, one at River Road, and one at the downstream limit (the confluence with the Rillito River). Do to flow splits upstream of River Road, the original flooding source was divided into two flooding sources at River Road – Camino Real East and Camino Real West. Consequently, the final floodplain analysis presented in this LOMR was based on a single regulatory discharge – the one associated with River Road. In addition, during preparation of the LOMR, a minor error was noticed in the original computation and the corresponding hydrologic data sheet was revised accordingly. This resulted in a reduction in the regulatory discharge as presented in the CLOMR (2,067 cfs) to the current value presented in this LOMR (1,956 cfs).
- Item 5, Impacts of Sediment Transport on Hydrology – Since the degree of urbanization within the upstream watershed has remained constant over the past few years and no significant change is anticipated (i.e., the watershed is almost totally development at the current zoning), no significant impacts associated with sediment transport were noted during the course of the hydrologic study.

Section B, HYDRAULICS

- Item 1, Reach to be Revised – The reach of the Camino Real Wash that is being revised as part of this LOMR extends from the Rillito Creek confluence to a point located approximately 3450 feet upstream of River Road. However, during the course of a detailed hydraulic analysis of the upstream reach, a major breakout or bifurcation of flood flows was noted approximately 850 feet upstream of River Road. From this point downstream the primary flooding source (i.e.,, the Camino Real Wash) is divided into the two nearly parallel reaches – Camino Real West, which follows the original flow path, and Camino Real East. Between River Road and the Rillito River, drainage infrastructure was either provided or upgraded to accommodate the regulatory discharge associated with each reach.
- Item 2, Hydraulic Method/Model Used – The water surface profiles for the two reaches downstream of River Road and the three reaches upstream of River Road were defined using HEC-RAS. The two primary River Road structures were modeled using HY-8.
- Item 4, Models Submitted – The revised or post-project conditions models for each reach are identified as follows:

Flooding Source	Reach	File Name	Subreach	Plan Name	Plan No.
Camino Real Wash	Upstream	CaminoRealUpstream	Upstream East West Overflow South	1956cfs	P07
	West Downstream	CaminoRealWestDS	n/a	west_asbuilts_1205cfs corrected	P02
	East Downstream	CaminoRealEastDS	n/a	as-built_781cfs	P11

- Section D, COMMON REGULATORY REQUIREMENTS

  - Item 1a, Do BFEs increase? – No, BFEs were not previously established for this flooding source (i.e., the effective mapping is Zone A).
  - Item 1b, Proof of Property Owner Notification – Property owners were notified by certified mail. Copies of the mailing receipts are attached.

December 3, 2008

«MAIL1»
«MAIL2»
«MAIL3»
«MAIL4»
«MAIL5»
«ZIP9»

Re: Notification of Changes to the Camino Real Wash Floodplain

Dear Property Owner:

The Pima County Regional Flood Control District has applied for a Letter of Map Revision (LOMR) from the Federal Emergency Management Agency to re-map the Camino Real Wash floodplain through the Federal Emergency Management Agency (FEMA). If you are receiving this letter, the proposed changes would impact your property at «PARCEL5» (Parcel No. «PARCEL1»).

The proposed map revisions north of River Road reflect better topographic information. The proposed modifications south of River Road reflect that the Regulatory Flood is contained within the drainage infrastructure. Attached is a map reflecting the current 1% chance flood (100-year floodplain) and the proposed floodplain. Enclosed is a brochure that addresses the most common questions associated with FEMA's LOMR process.

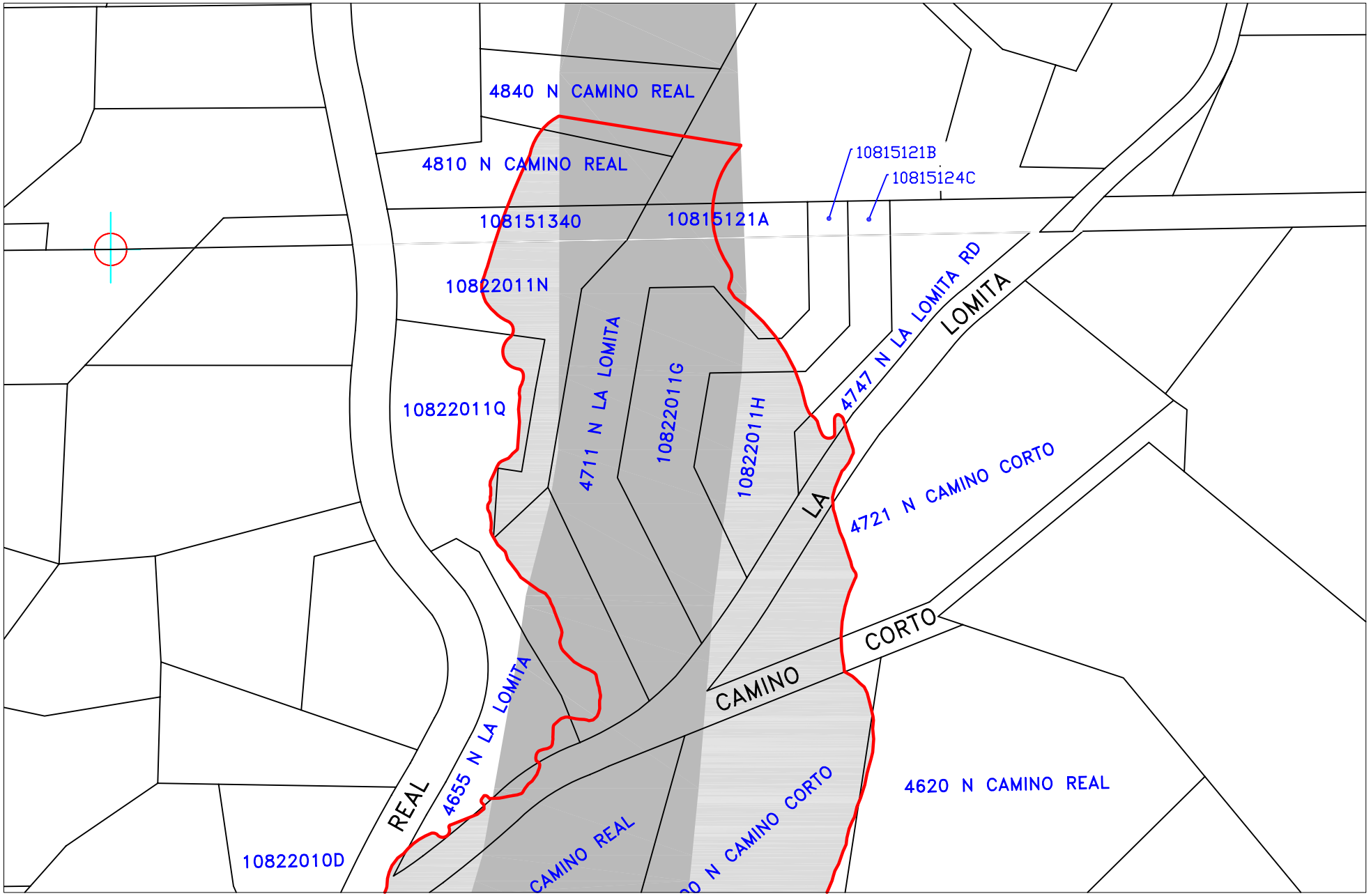
If you have any questions or concerns about the proposed changes to the FIRM or its effects on your property, you may contact me at 520-243-1800.

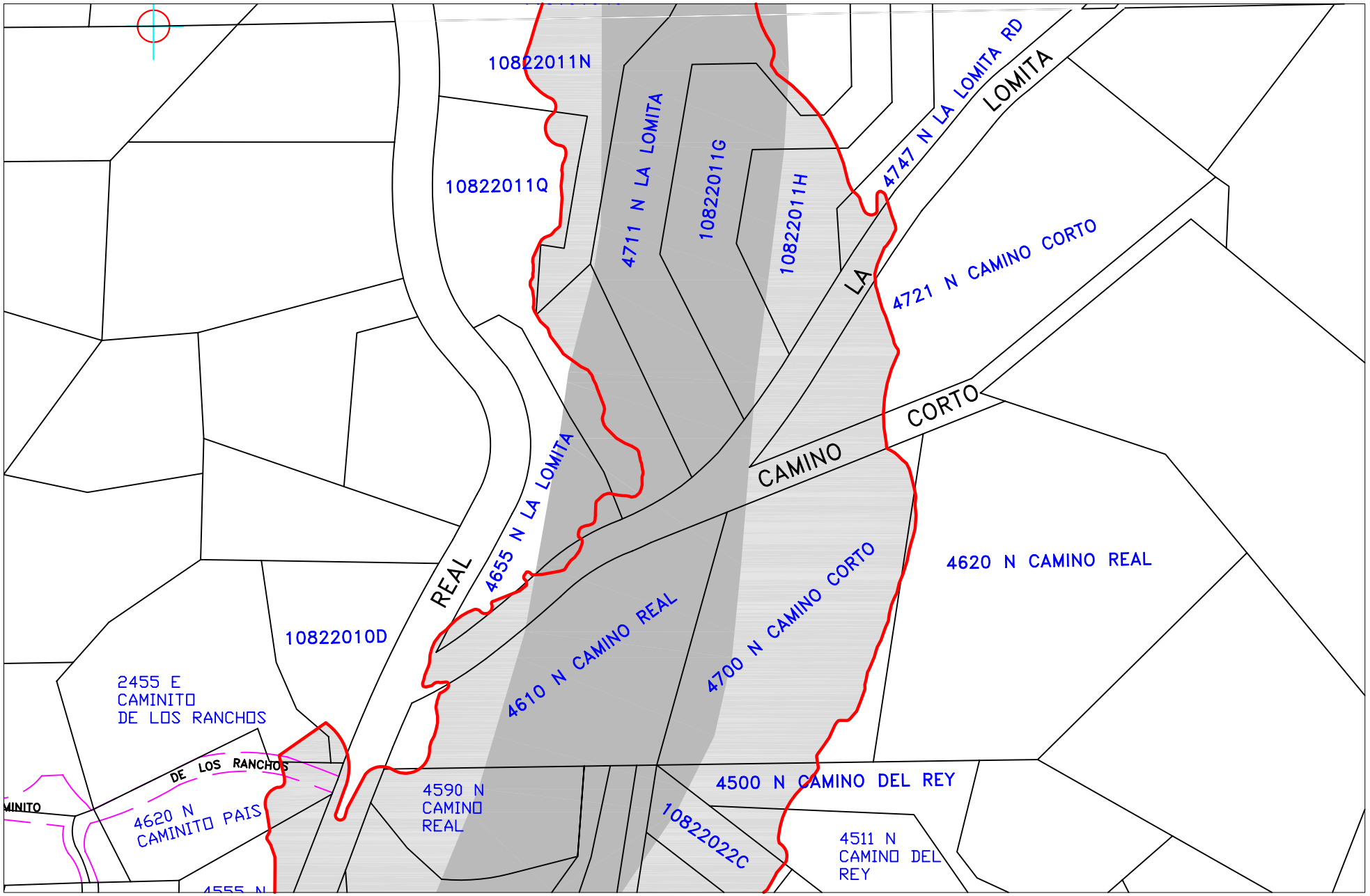
Sincerely,

R. "Terry" Hendricks CFM, Chief Hydrologist
Planning and Development Division

RTH

Cc James Vogelsberg. P.E. City of Tucson Development Services


4840 N CAMINO REAL
4810 N CAMINO REAL
10815121B
10815124C
10815121A
10815134O
10822011N
10822011Q
4711 N LA LOMITA
10822011G
10822011H
4747 N LA LOMITA RD
LOMITA
LA
4721 N CAMINO CORTO
CORTO
CAMINO
REAL
4655 N LA LOMITA
CAMINO REAL
4620 N CAMINO REAL
10822010D
200' 0' 200' 200'
SCALE: 1 INCH = 200 FEET
Legend
Current Zone A Boundary
Revised Zone A Boundary (Map 1)
Revised Floodplain Exhibit



200' 0' 200' 200'

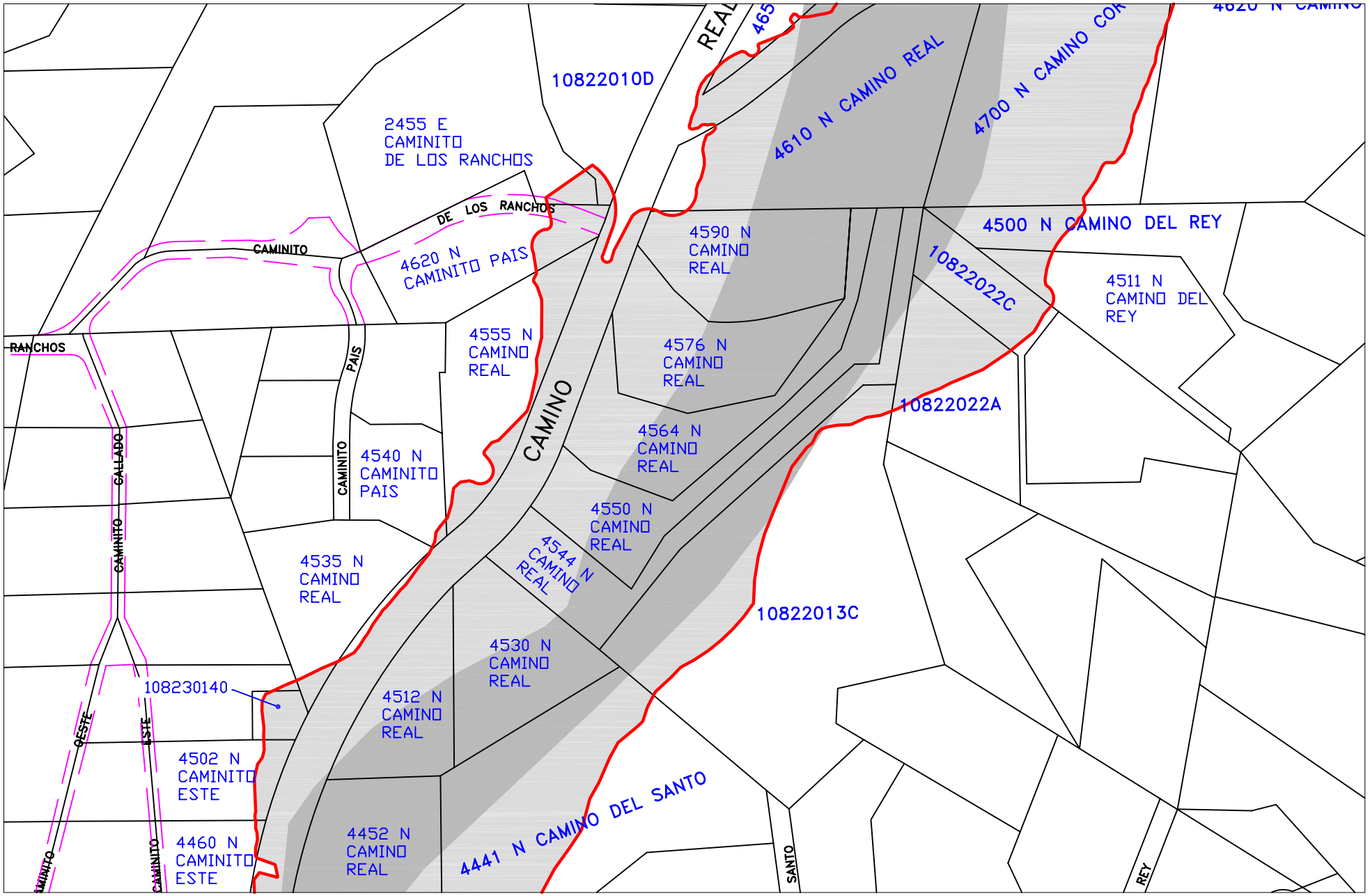
SCALE: 1 INCH = 200 FEET

Legend

Current Zone A Boundary

Revised Zone A Boundary (Map 2)

Revised Floodplain Exhibit



200' 0' 200' 200'

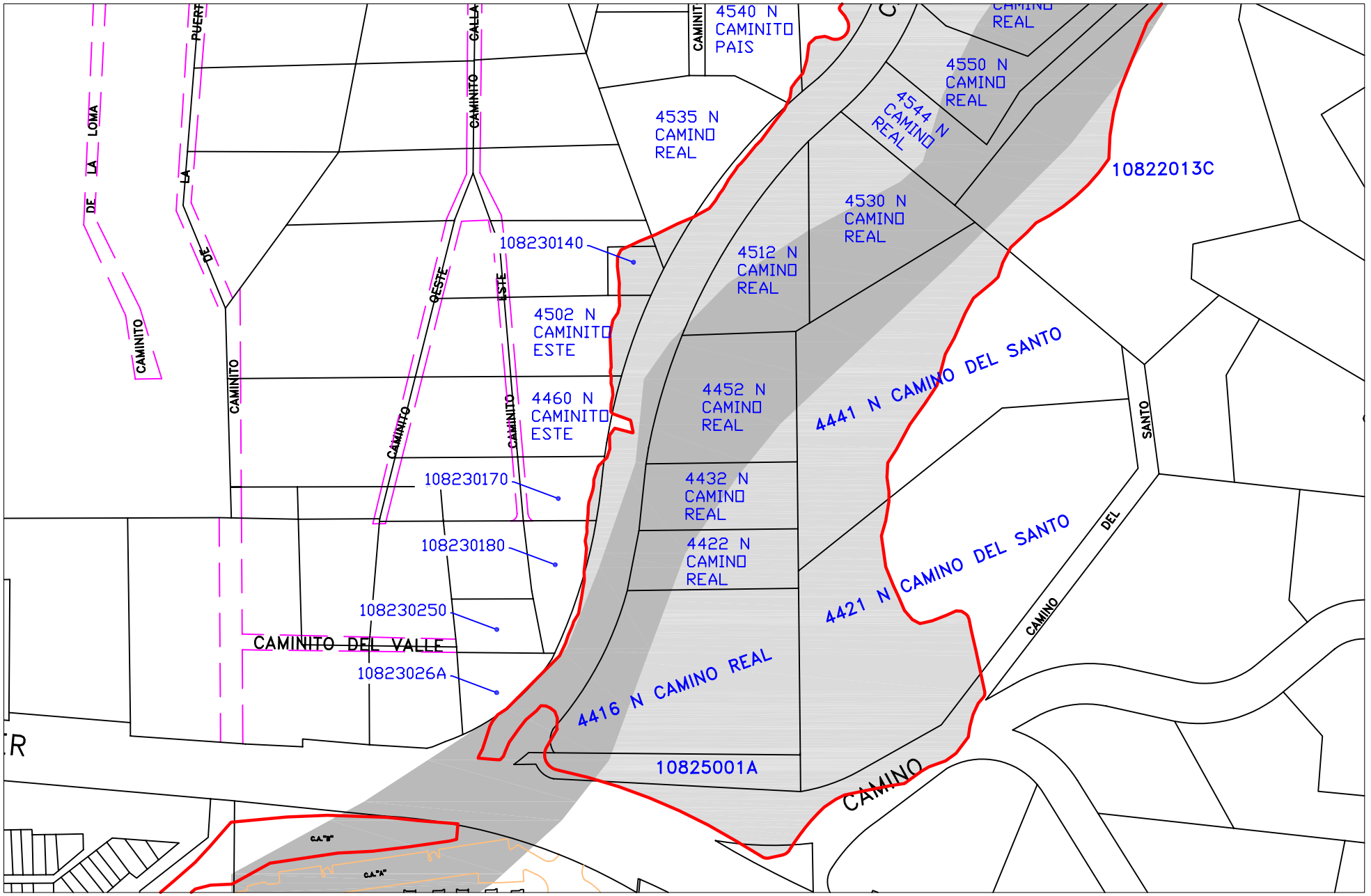
SCALE: 1 INCH = 200 FEET

Legend

Current Zone A Boundary

Revised Zone A Boundary (Map 3)

Revised Floodplain Exhibit



200' 0' 200' 200'

SCALE: 1 INCH = 200 FEET

Legend

Current Zone A Boundary

Revised Zone A Boundary (Map 4)

Revised Floodplain Exhibit

PARCEL1	PARCEL5	MAIL1	MAIL2	MAIL3	MAIL4	MAIL5	ZIP9	CERTIFIED1	CERTIFIED2	Map
10823070C	4416 N CAMINO REAL	4416 N CAMINO REAL LLC			PO BOX 43065	TUCSON AZ	85733-3065	7007268000027540	2529	4
10825001A	NOT APPLICABLE	4416 N CAMINO REAL LLC			PO BOX 43065	TUCSON AZ	85733-3065	7007268000027540	2529	4
10815121B	NOT APPLICABLE	BOGEN EARL TR		ATTN: HENRY BOGEN & BETSY C	4723 N LA LOMITA	TUCSON AZ	85718-5941	7007268000027540	2536	1
10822011G	4723 N LA LOMITA	BOGEN EARL TR		ATTN: HENRY BOGEN & BETSY C	4723 N LA LOMITA	TUCSON AZ	85718-5941	7007268000027540	2536	1
108220890	4721 N CAMINO CORTO	BURKE FAMILY DECEDENTS TR		ATTN: JAMES L BURKE	4721 N CAMINO CORTO	TUCSON AZ	85718	7007268000027540	2543	1
10822012H	4700 N CAMINO CORTO	CALDWELL JAY & DIANA S			PO BOX 65587	TUCSON AZ	85728-5587	7007268000027540	2550	2
10822013C	NOT APPLICABLE	CAMINO ANTONIO LLC		ATTN: NCH CORPORATION	2850 E SKYLINE DR STE 200	TUCSON AZ	85718-8014	7007268000027540	2567	3
10823003C	4540 N CAMINITO PAIS	CHANDLER KEALY			PO BOX 65734	TUCSON AZ	85728-5734	7007268000027540	2574	3
108230140	NOT APPLICABLE	CITY OF TUCSON	REAL ESTATE DIVISION	ATTN: PROPERTY MANAGMENT	PO BOX 27210	TUCSON AZ	85726-7210	7007268000027540	2581	3
10822012C	4620 N CAMINO REAL	COLE EDWARD R & AMBRE J REVOCABLE TRUST			4620 N CAMINO REAL	TUCSON AZ	85718	7007268000027540	2895	2
10822014B	4530 N CAMINO REAL	CONZE ELIZABETH B			4441 N CAMINO DEL SANTO	TUCSON AZ	85718	7007268000027540	2598	4
10822014C	4441 N CAMINO DEL SANTO	CONZE ELIZABETH B			4441 N CAMINO DEL SANTO	TUCSON AZ	85718	7007268000027540	2598	3
10822012R	4590 N CAMINO REAL	DECONCINI JEFF & YAGER-DECONCINI ERIN			3233 N TREAT CIR	TUCSON AZ	85716-1145	7007268000027540	2604	2
10823065A	4512 N CAMINO REAL	DEED & NOTE TRADERS LLC			1302 N ALVERNON WAY	TUCSON AZ	85712-3802	7007268000027540	2611	4
10823068O	4432 N CAMINO REAL	FICO JOE			4432 N CAMINO REAL	TUCSON AZ	85718-6415	7007268000027540	2628	4
10823073L	2455 E CAMINITO DE LOS RANCHOS	FOX BYRON NEAL & PENNER CYNTHIA L			2455 E CAMINITO DE LOS RANCHOS	TUCSON AZ	85718	7007268000027540	2635	2
10815003E	4810 N CAMINO REAL	FRANKENBURG WILLIAM & WILHELMINE			PO BOX 10247	BAINBRIDGE ISLAND WA	98110-0247	7007268000027540	2642	1
10815003D	4840 N CAMINO REAL	G A B 1982 TR		ATTN: GEORGE A BINNEY TR	PO BOX 7	CRYSTAL BAY NV	89402-0007	7007268000027540	2659	1
108220150	4421 N CAMINO DEL SANTO	GALL CHRISTOPHER & COURTNEY ANN JT/RS			4421 N CAMINO DEL SANTO	TUCSON AZ	85718	7007268000027540	2871	4
108230150	4502 N CAMINITO ESTE	GATTMANN J REED & DOROTHY C TRUSTEES	TRUST OPERATIONS OC4-7	ATTN: UNITED CALIFORNIA BANK	PO BOX 54400	LOS ANGELES CA	90054- 0400	7007268000027540	2888	3
10823007A	4535 N CAMINO REAL	GOTTLIEB STEVEN T & PENNY LAURA J			4535 N CAMINO REAL	TUCSON AZ	85718	7007268000027540	2666	3
10823073F	4620 N CAMINITO PAIS	JONES JOSEPH L A			4620 N CAMINITO PAIS	TUCSON AZ	85718	7007268000027540	2673	2
10822011L	4655 N LA LOMITA	LINDQUIST SUZANNE TR			4655 N LA LOMITA	TUCSON AZ	85718-5939	7007268000027540	2680	1
10823072A	4555 N CAMINO REAL	LOGAN ROBERT K & JUNE D TR			PO BOX 65297	TUCSON AZ	85728-5297	7007268000027540	2697	3
108151340	NOT APPLICABLE	MC NAMARA GOLDSMITH & JACKSON PC	PROFIT SHARING PLAN		1670 E RIVER RD #200	TUCSON AZ	85718	7007268000027540	2703	1
10822011N	NOT APPLICABLE	MC NAMARA GOLDSMITH & JACKSON PC	PROFIT SHARING PLAN		1670 E RIVER RD #200	TUCSON AZ	85718	7007268000027540	2703	1
10822011Q	4685 N LA LOMITA	MC NAMARA MICHAEL F & MARISU			4685 N LA LOMITA RD	TUCSON AZ	85718	7007268000027540	2710	1
10822012L	4610 N CAMINO REAL	MEINKE TOD R & HOLUP JILL A REVOC TR			4610 N CAMINO REAL	TUCSON AZ	85718	7007268000027540	2727	2
10822012P	4564 N CAMINO REAL	MOORE CYRUS & KRISTIN REVOC TR		ATTN: CYRUS E & KRISTIN A MOORE TR	4564 N CAMINO REAL	TUCSON AZ	85718-6417	7007268000027540	2734	3
10822012Q	4576 N CAMINO REAL	MOORE RUSSELL CHASE LIVING TR			2568 E WATER	TUCSON AZ	85716-2432	7007268000027540	2741	3
10822024B	4511 N CAMINO DEL REY	PARADIES JED			4511 N CAMINO DEL REY	TUCSON AZ	85718-6609	7007268000027540	2758	3
10822024D	4500 N CAMINO DEL REY	PARADIES JED			4511 N CAMINO DEL RAY	TUCSON AZ	85718	7007268000027540	2758	3
10822012M	4544 N CAMINO REAL	PARTAGAS RAUL & MARISELA			2728 E 6TH	TUCSON AZ	85716	7007268000027540	5265	3
10822011J	4747 N LA LOMITA RD	RASOUMOFF THEADORE			4747 N LA LOMITA RD	TUCSON AZ	85718	7007268000027540	2901	1
10822010D	NOT APPLICABLE	RYAN KENNETH J & JUDITH A			4621 N CAMINO REAL	TUCSON AZ	85718	7007268000027540	2772	2
108230160	4460 N CAMINITO ESTE	SANCHEZ PHILLIP R LIVING TR			98 WOODS LOOP	SANTA FE NM	87505-1449	7007268000027540	2789	4
10822022A	NOT APPLICABLE	SHISSLAK CATHERINE M			4411 N CAMINO DEL REY	TUCSON AZ	85718-6607	7007268000027540	2796	3
108230170	NOT APPLICABLE	SOSNICKI RICHARD & SANDRA			2389 E RIVER RD	TUCSON AZ	85718	7007268000027540	2802	4
108230180	NOT APPLICABLE	SOSNICKI RICHARD & SANDRA			2389 E RIVER RD	TUCSON AZ	85718	7007268000027540	2802	4
108230250	NOT APPLICABLE	SOSNICKI RICHARD & SANDRA			2389 E RIVER RD	TUCSON AZ	85718	7007268000027540	2802	4
10823026A	NOT APPLICABLE	SOSNICKI RICHARD & SANDRA			2389 E RIVER RD	TUCSON AZ	85718	7007268000027540	2802	4
10823066A	4452 N CAMINO REAL	STAPLES ROBERT B & JENNIFER H			PO BOX 65447	TUCSON AZ	85728-5447	7007268000027540	2819	4
10815121C	NOT APPLICABLE	STEENLAND ROGER & ANN			4735 N LA LOMITA	TUCSON AZ	85718	7007268000027540	2826	1
10822011H	NOT APPLICABLE	STEENLAND ROGER & ANN			4735 N LA LOMITA	TUCSON AZ	85718	7007268000027540	2826	1
10823069A	4422 N CAMINO REAL	TERZONI GIACOMO FRANK			4422 N CAMINO REAL	TUCSON AZ	85718	7007268000027540	2833	4
10822022C	NOT APPLICABLE	TRELO INVESTMENTS LLC			4479 N CAMINO DEL REY	TUCSON AZ	85718-6607	7007268000027540	2840	3
10815121A	NOT APPLICABLE	VAN DYKE JOAN STEARNS TRUST			4711 N LA LOMITA	TUCSON AZ	85718-5941	7007268000027540	2857	1
10822011F	4711 N LA LOMITA	VAN DYKE JOAN STEARNS TRUST			4711 N LA LOMITA	TUCSON AZ	85718-5941	7007268000027540	2857	1
10822012N	4550 N CAMINO REAL	YAGER CASEY & LESLIE			3790 N CAMINO LEAMARIA	TUCSON AZ	85716	7007268000027540	2864	3

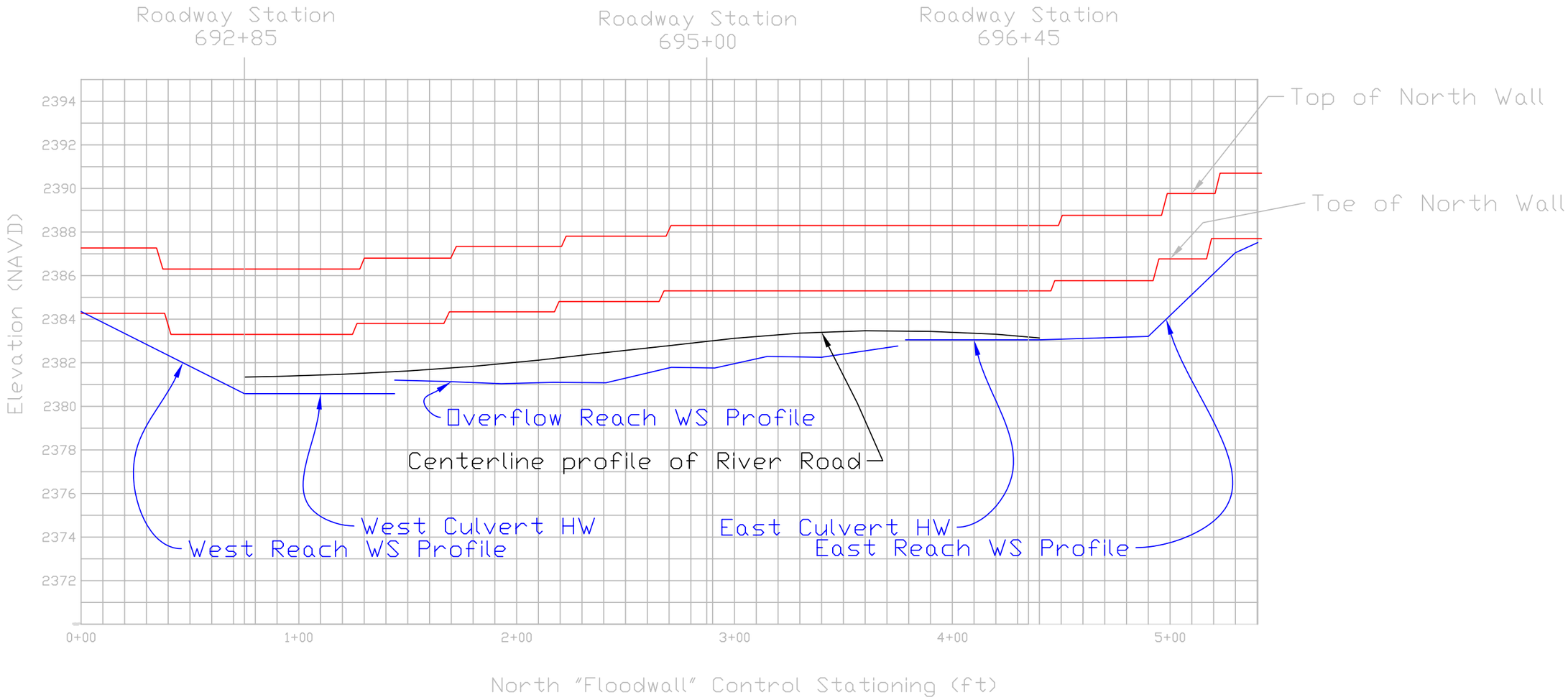


Exhibit 1a

Profile of North Wall

JE Fuller/Hydrology & Geomorphology, Inc.

Looking north at north wall along River Road

New culvert inlets and overflow channel along upstream side of north wall.

Looking north at outlet to new 4-8'x5' RCBC and at-grade property along south side of River Road.

Looking north at outlet to new 2-8'x5' RCBC.

Looking east along overflow channel from inlet to the new 4-8'x5' RCBC.
The north wall is visible along northern edge of River Road.

Looking southwest at River Road and properties to the south from inlet to new 4-8'x5' RCBC. The north wall, including the western tie-back portion, is also shown.

Looking south along the eastern tie-back portion of the north wall at the inlet to the new 2-8'x5 RCBC beneath River Road.

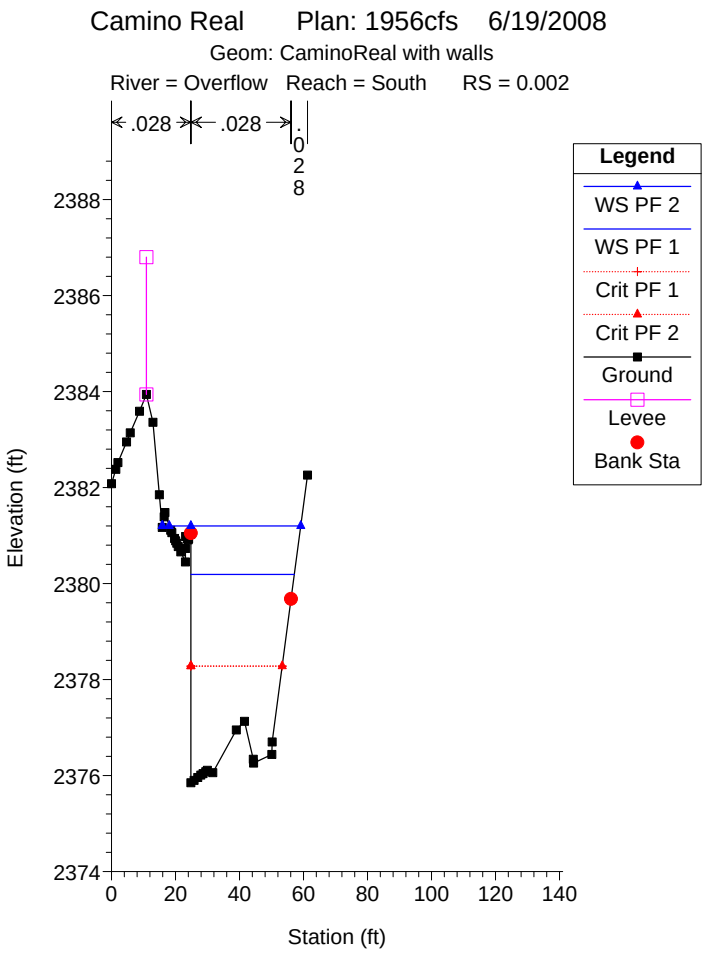
Looking northeast from the outlet of the new 4-8'x5' RCBC beneath River Road. North wall is visible in background.

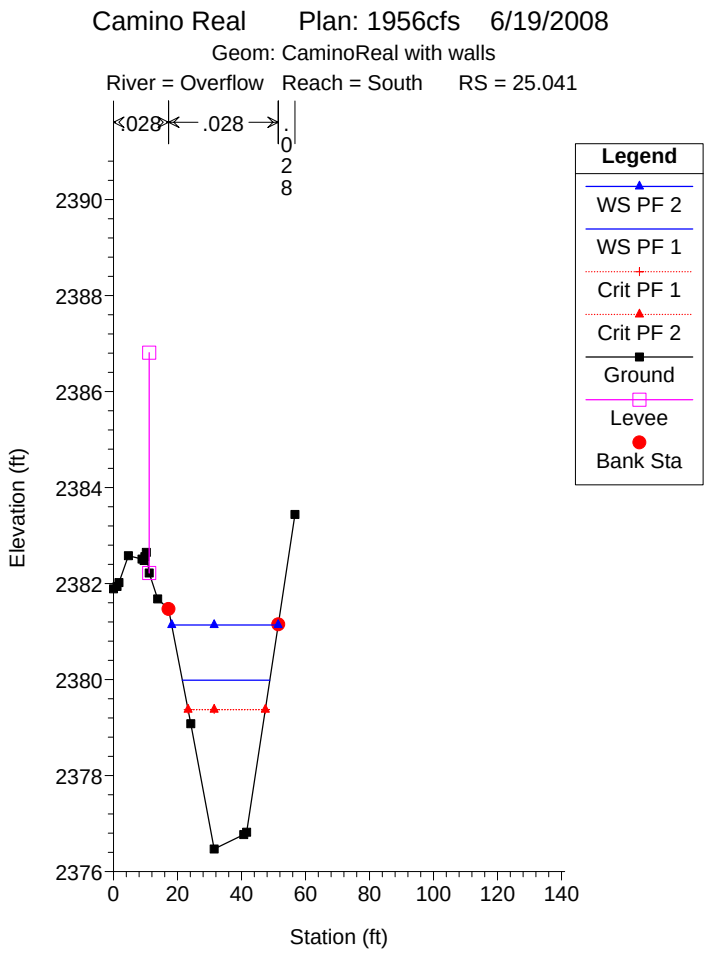
Looking west along western channel from outlet to new 4-8'x5' RCBC.

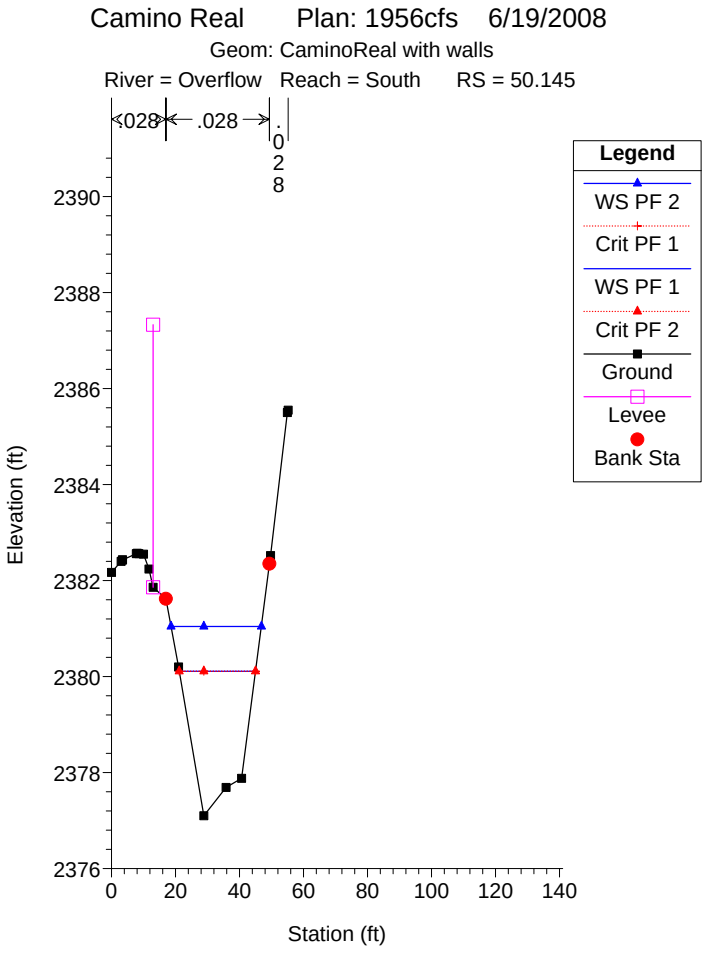
Looking south along eastern channel from outlet to new 2-8'x5' RCBC

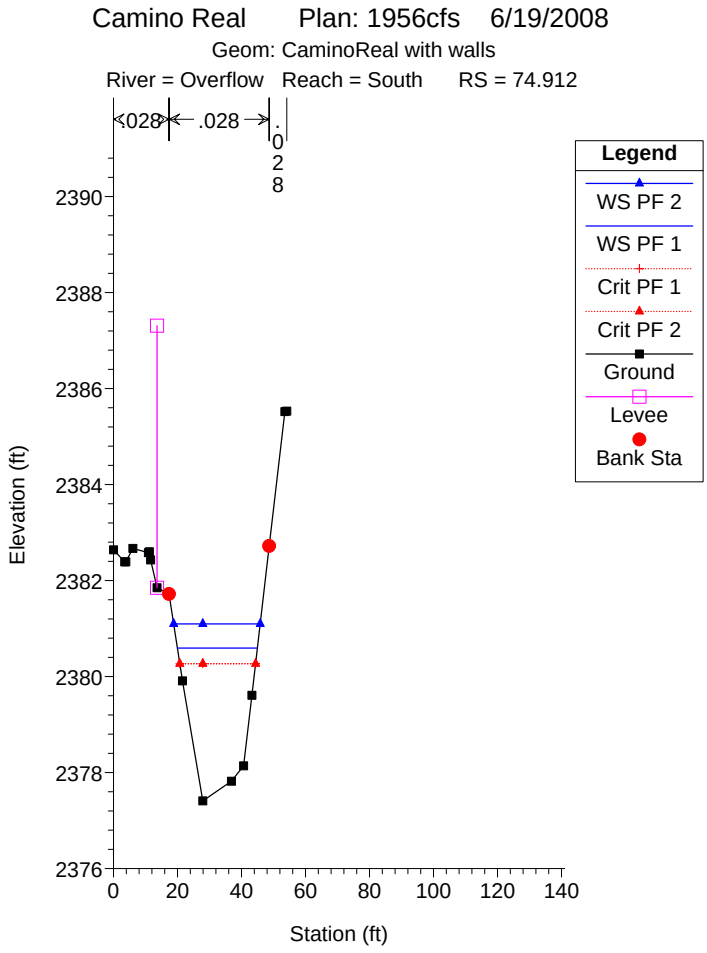
Looking northwest along south side of River Road.
The north wall is visible along the north side.

Looking northwest at north wall along north side of River Road.

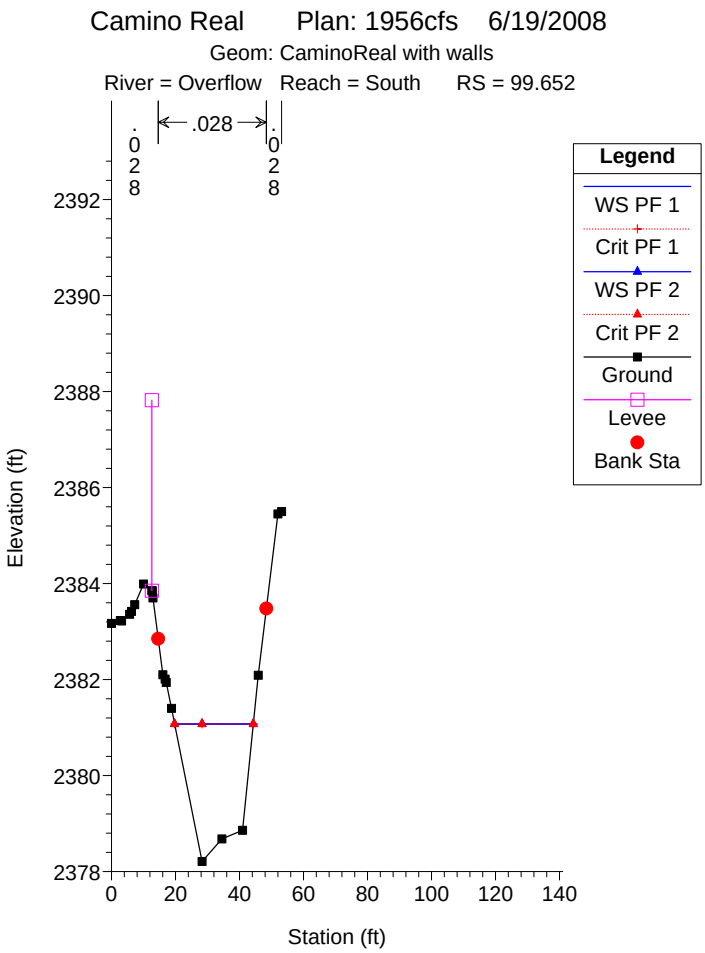


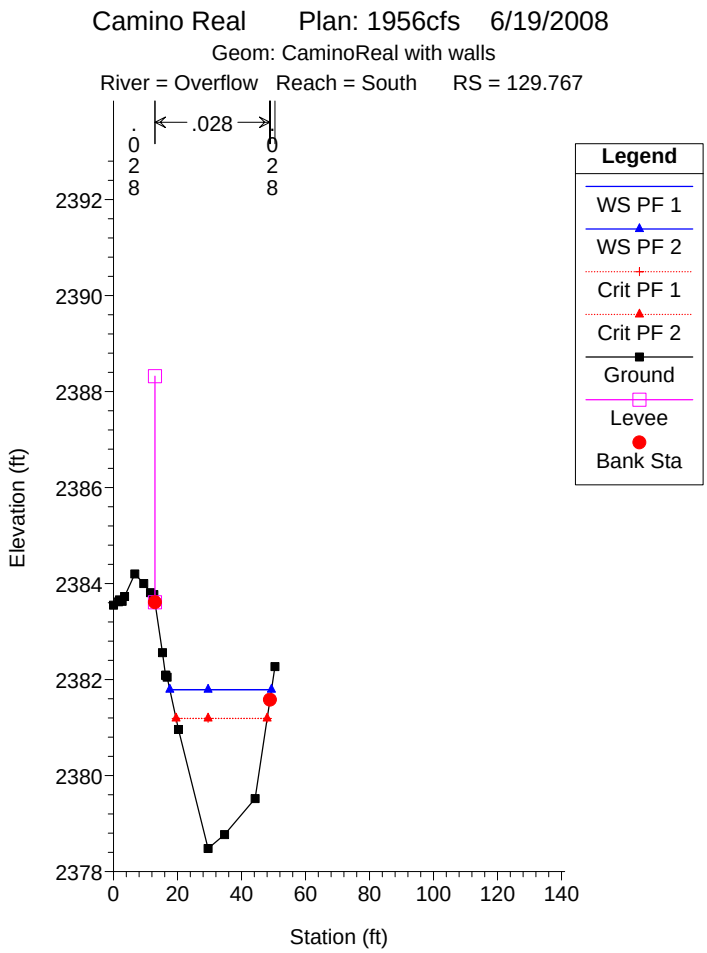


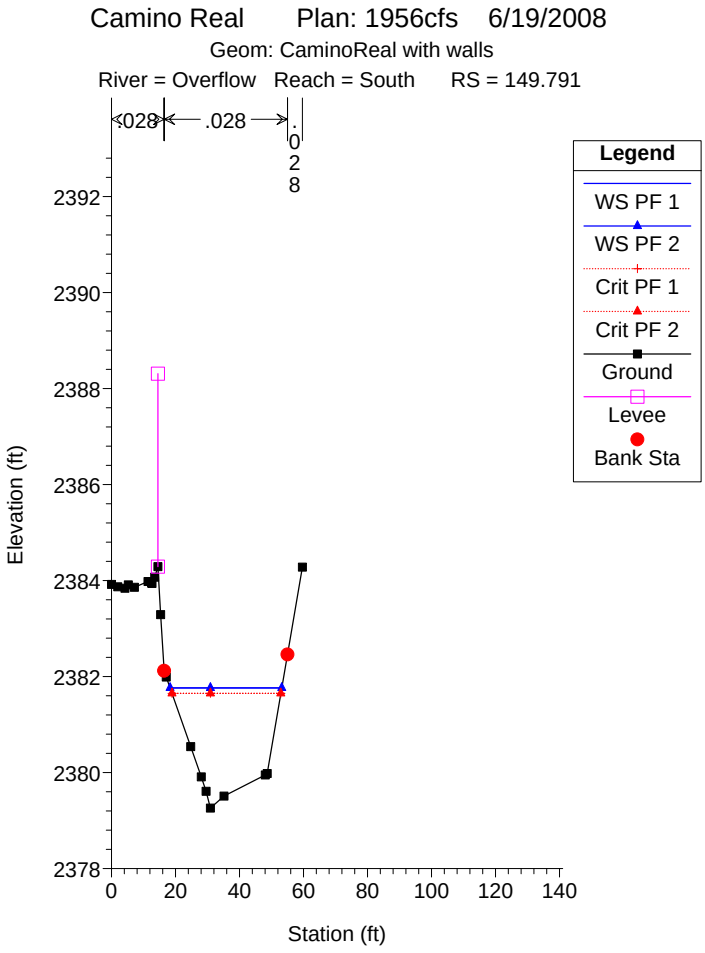


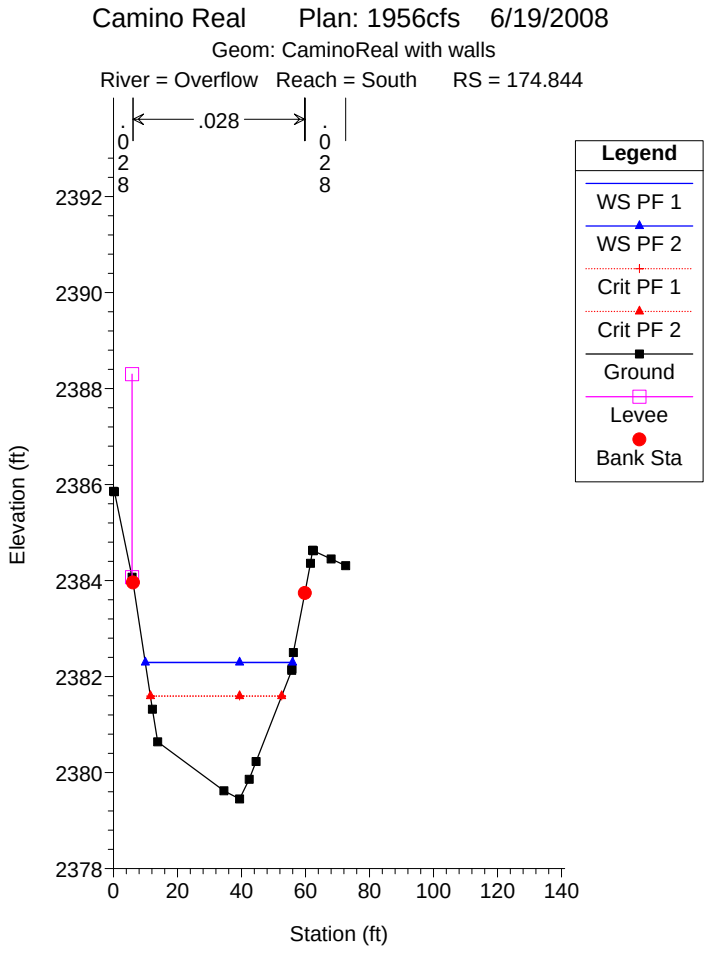


1 in Horiz. = 60 ft 1 in Vert. = 4 ft

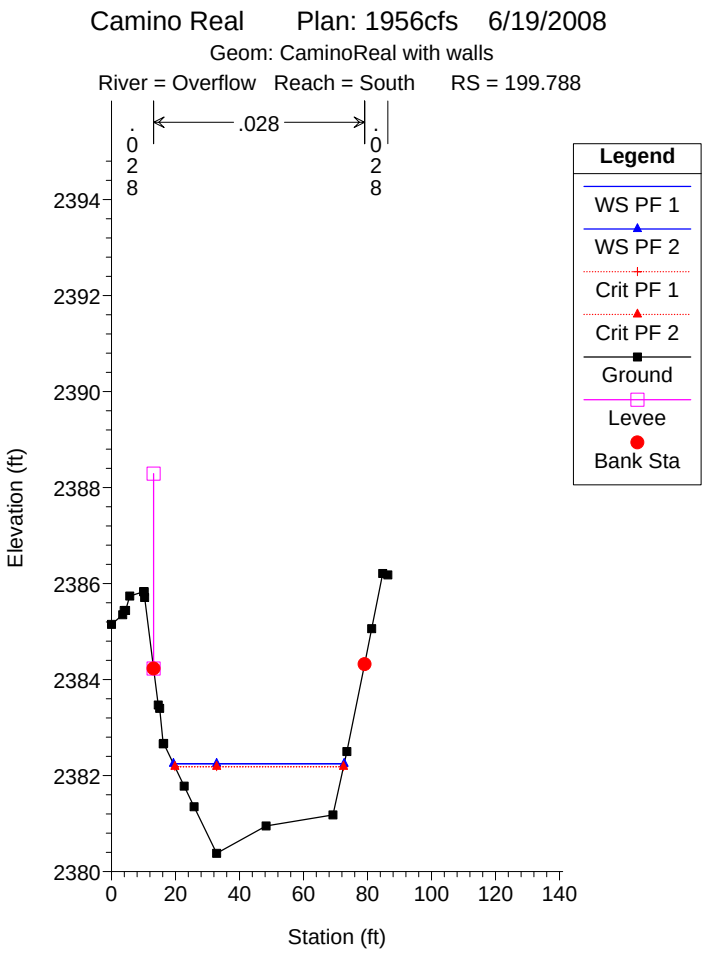


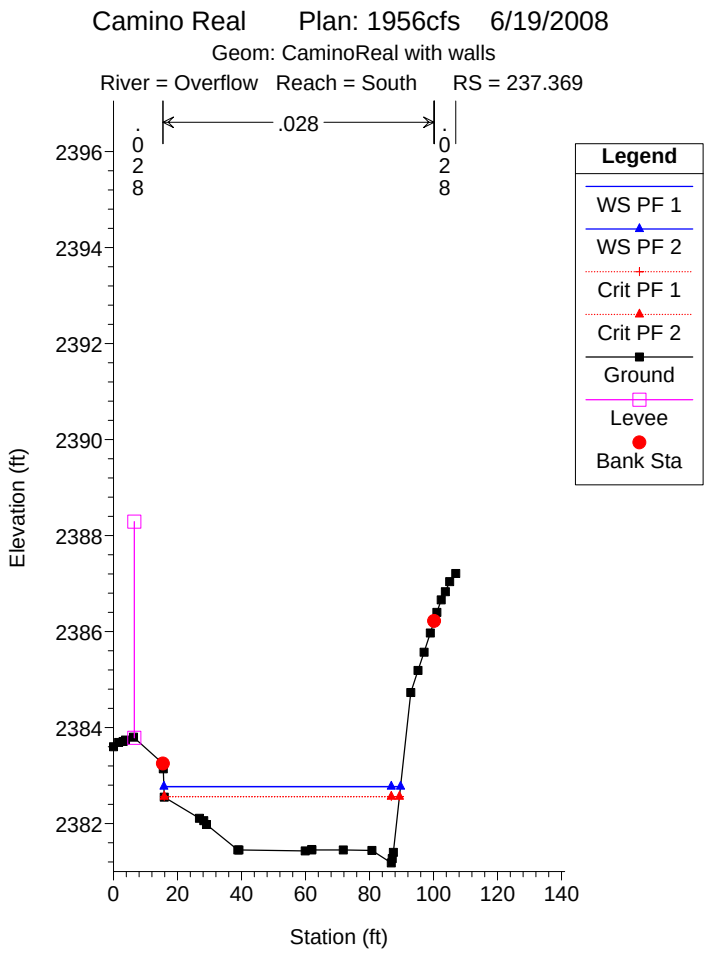






1 in Horiz. = 60 ft 1 in Vert. = 4 ft





1 in Horiz. = 60 ft 1 in Vert. = 4 ft

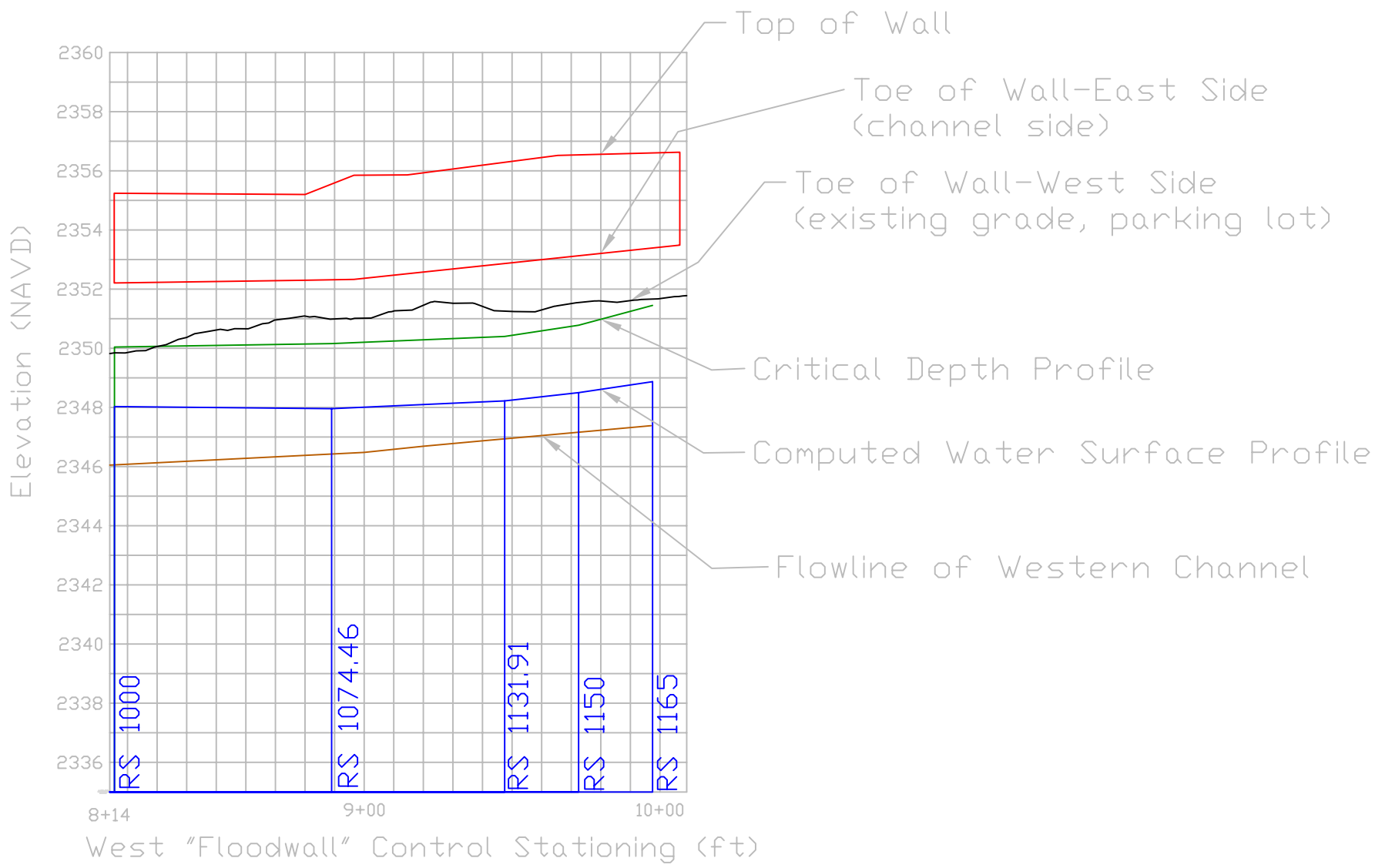


Exhibit 2a

Profile of West Wall

JE Fuller/Hydrology & Geomorphology, Inc.

Looking west at the west wall (in front of carport) along the west top-of-bank of the north to south reach of the western channel.

Looking down on the junction of the north to south reach with the northeast to southwest reach (entering at upper right corner of photograph) of the western channel.

Looking northeast at the junction of the north to south reach with
the northeast to southwest reach (entering at upper right corner of photograph).

Looking east at junction of north-south reach with northeast-southwest
reach (entering at upper left corner of photograph). The first in a series
of two three-foot drops is visible just upstream of junction.

Looking southwest at the west wall along the top of bank
of the north to south reach of the western channel.

Looking southwest at the west wall along the top of bank
of the north to south reach of the western channel.

Looking west at the northern limit of the west wall
along the top of bank of the western channel

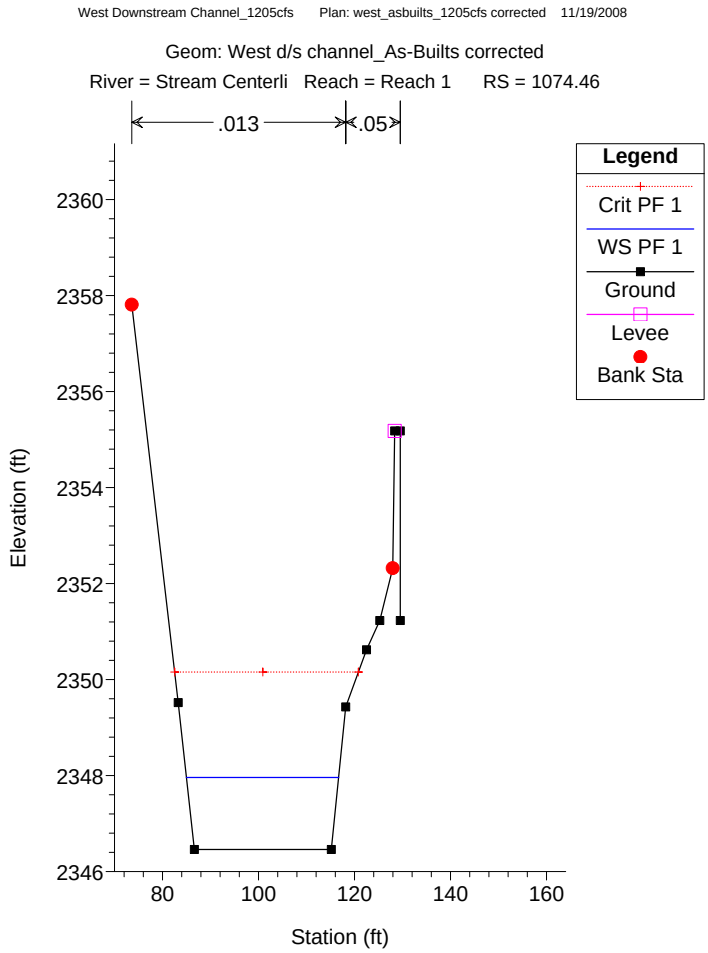
Looking south along the parking lot side of the west wall from the north limit.

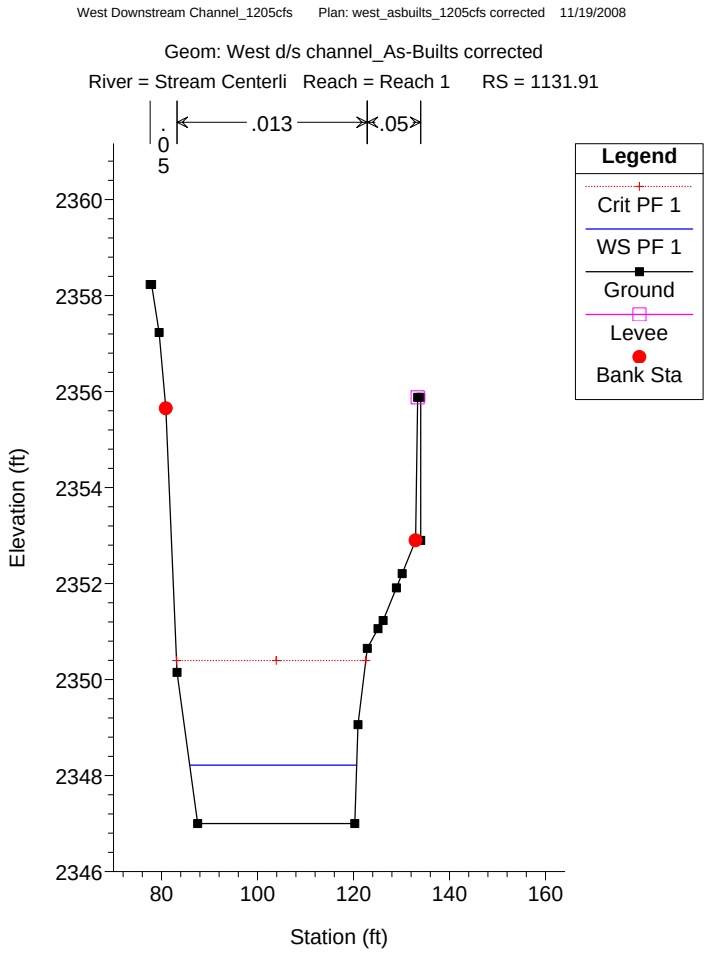
Looking south along the channel side of the west wall from the north limit.

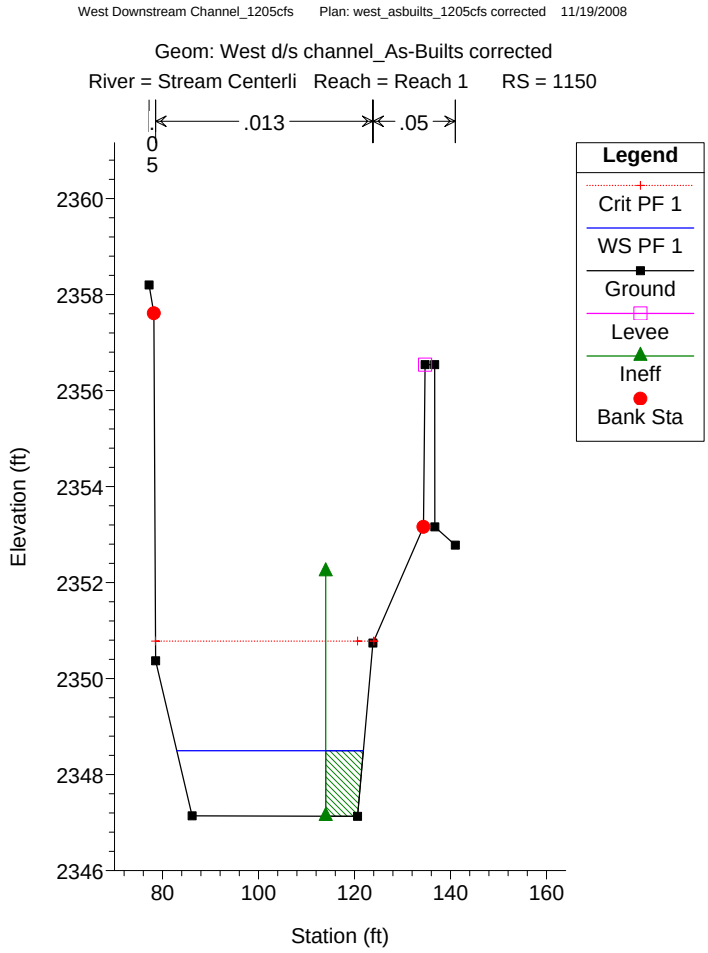
Looking northeast along the northeast to southwest reach of the western channel from its junction with the north to south reach (note the series of two three-foot drops in the flow line just upstream of the junction).

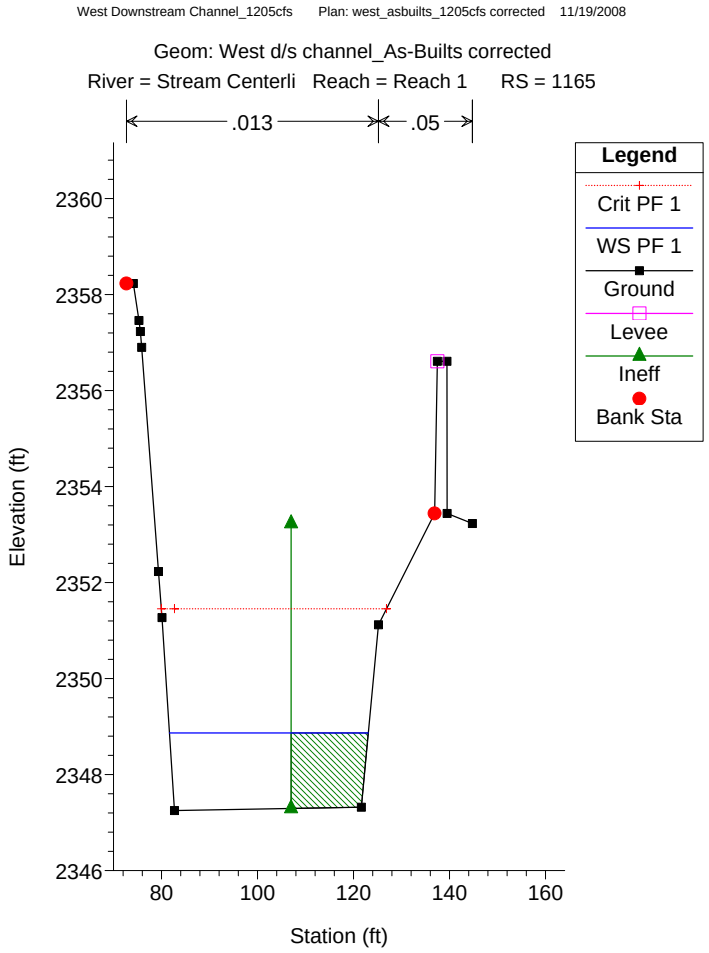
Looking north (upstream) at the junction of the north to south reach of the western channel with the northeast to southwest reach, including the southern limit of the west wall.

Looking downstream along the west bank from the junction of the north to south reach of the western channel with the northeast to southwest reach.

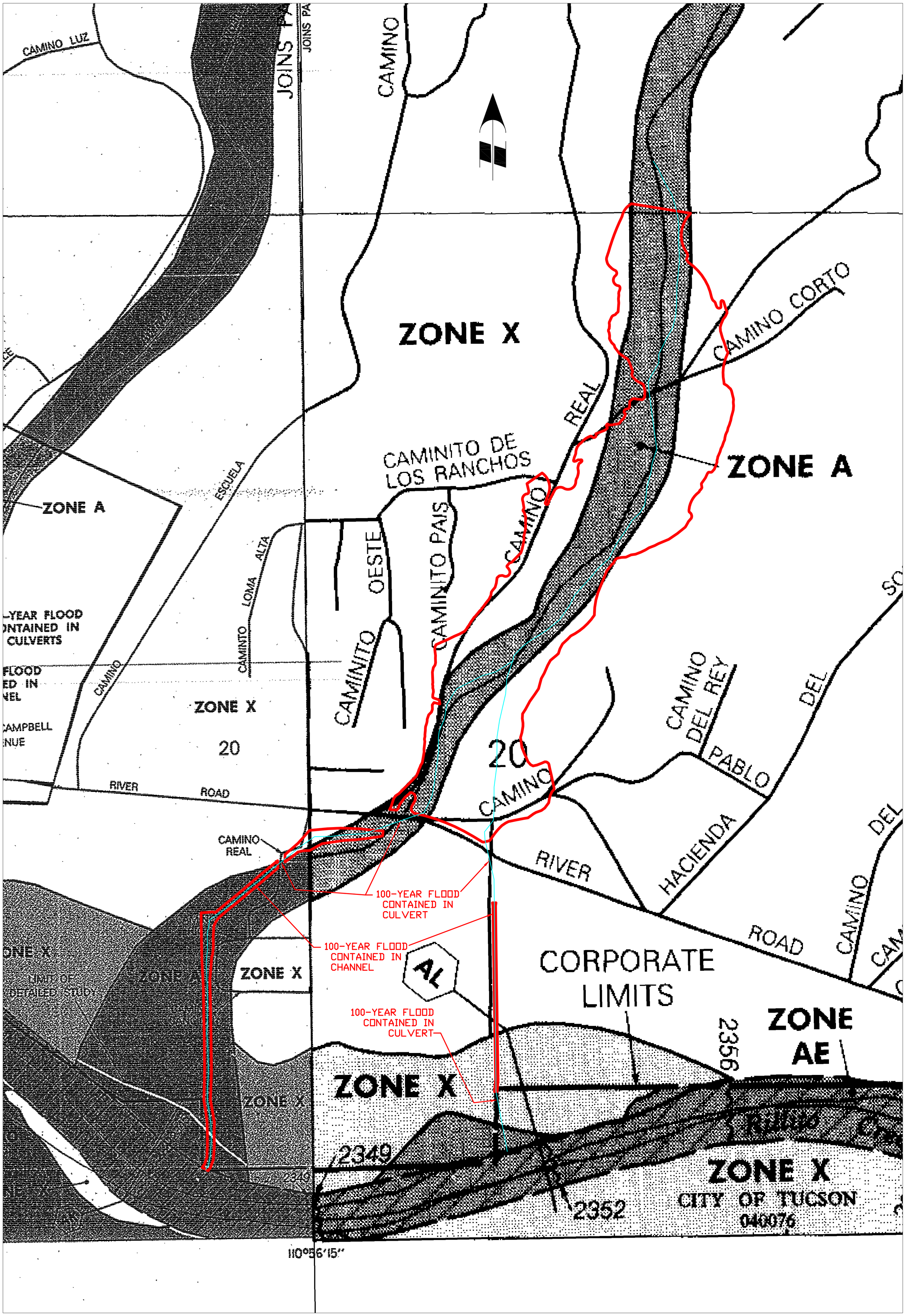








1 in Horiz. = 40 ft 1 in Vert. = 4 ft



200' 0' 200' 200'

SCALE: 1 INCH = 200 FEET

Legend

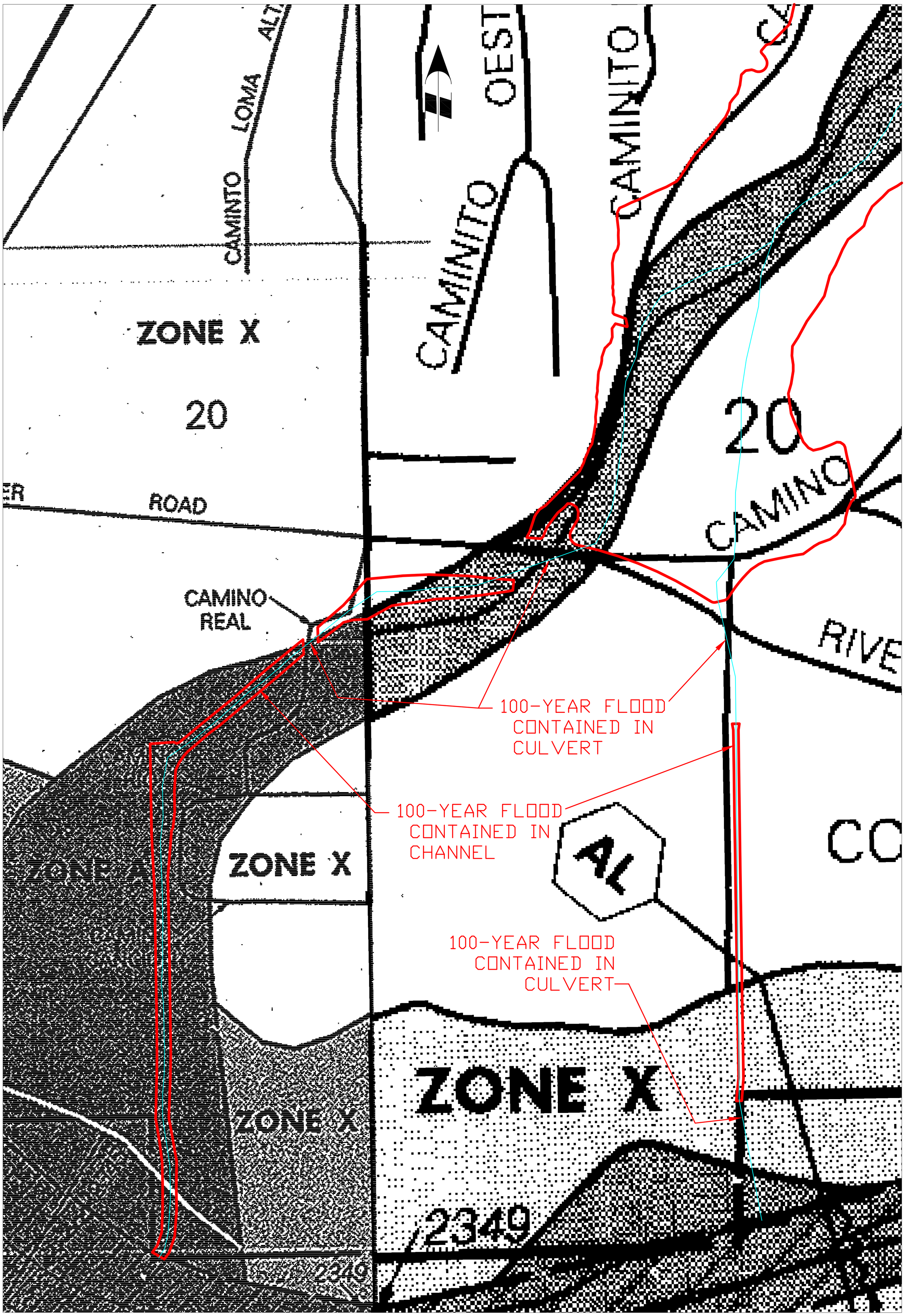
Revised Zone A Boundary

Watercourse Centerline

Exhibit 3

Annotated FIRM

JE Fuller / Hydrology & Geomorphology, Inc.



100' 0' 100' 100'

SCALE: 1 INCH = 100 FEET

Legend

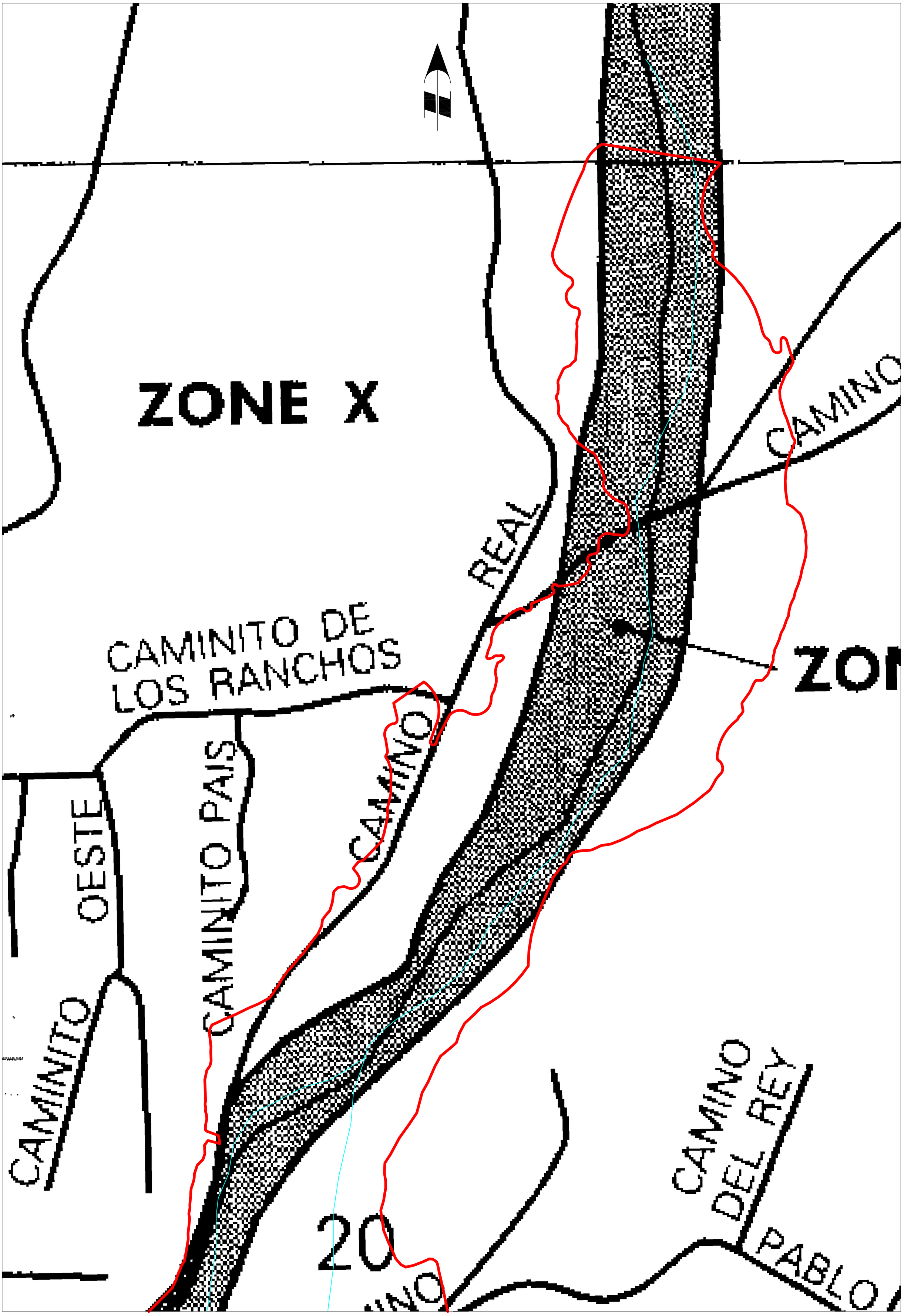
- Revised Zone A Boundary
- Watercourse Centerline

Exhibit 3

Annotated FIRM

Sheet 1 of 2

JE Fuller / Hydrology & Geomorphology, Inc.



100' 0' 100' 100'

SCALE: 1 INCH = 100 FEET

Legend

- Revised Zone A Boundary
- Watercourse Centerline

Exhibit 3

Annotated FIRM

Sheet 2 of 2

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